User Manual

FRM220-NMC

Network Management Controller

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FRM220 NMC Software Operation Manual

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Media Platform Rack, 20 Slot, 2U

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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 provisioning of the Network Management Controller, proceed to Chapter 2.

This manual is used to explain the configuration of the ***FRM220-NMC*** (Network Management Controller) and operating procedures. This manual is divided into 4 Sections, the Introduction, Provisioning, Web Based Management and Trouble Shooting, plus the Appendices. The Appendices include the details for each card, pin assignments of special cables and gives further information on options for placing the device in service.

The divisions of the manual are intended for use by personnel to answer questions in general areas. Planners and potential purchasers may read the Introduction to determine the suitability of the product to its intended use; Installers should read the **FRM220 Hardware Installation Manual** and the Cabling Specification Appendix in this manual; Operating Personnel would use the Provisioning and Web Based Management Chapters and Appendices to become familiar with the various media converter cards and settings. Network Administrators should read the chapters on Provisioning, Web Based Management and Trouble Shooting to become familiar with the diagnostic capabilities, network settings and management strategies for the SNMP managed chassis with NMC.

1.1 Brief Functional Description

The ***FRM220-CH20*** is a 2U, 19(23)", 20 slot modular media converter rack. The ***FRM220-CH20*** provides an economic solution in high density Fiber Converter installations for FTTx, Metro LAN, or in enterprises, campus and central offices. All critical components such as power modules, fans assemblies, management modules and interface cards are hot swappable, allowing online field replacement. Additional features allow the ***FRM220-CH20*** 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.

The ***FRM220-CH20*** has a total of 20 slots in the front of the chassis. There are 19 slots available for installation of ***FRM220*** converter cards with 1 (one) slot reserved for the ***FRM220-NMC*** network management controller. The ***FRM220-NMC*** or Network Management Controller is installed in the first reserved slot, for local and remote management purposes. Each ***FRM220*** card is an independent electrical to electrical, optical to electrical, or optical to optical converter. When linked to a compatible ***FRM220*** stand-alone "OAM" 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 available that support multi-mode or single-mode fiber types and connections to LC, SC, ST, FC or even the latest single fiber WDM (Wave Division Multiplexing) in ranges from 2Km to 120Km. Converter cards include Fast Ethernet, Gigabit Ethernet, Asynchronous Serial (RS-485, RS-232 and RS-422), G.703 E1, T1(DS1), Asynchronous and Synchronous Data (V.35, RS-530, X.21, RS-449, and RS-232), POTS over fiber, 2.7G 3R repeater, 10G 3R repeater, 4G 2R repeater, 4E1/T1 FOM and more as the product matures.

1.2 Installing the NMC

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

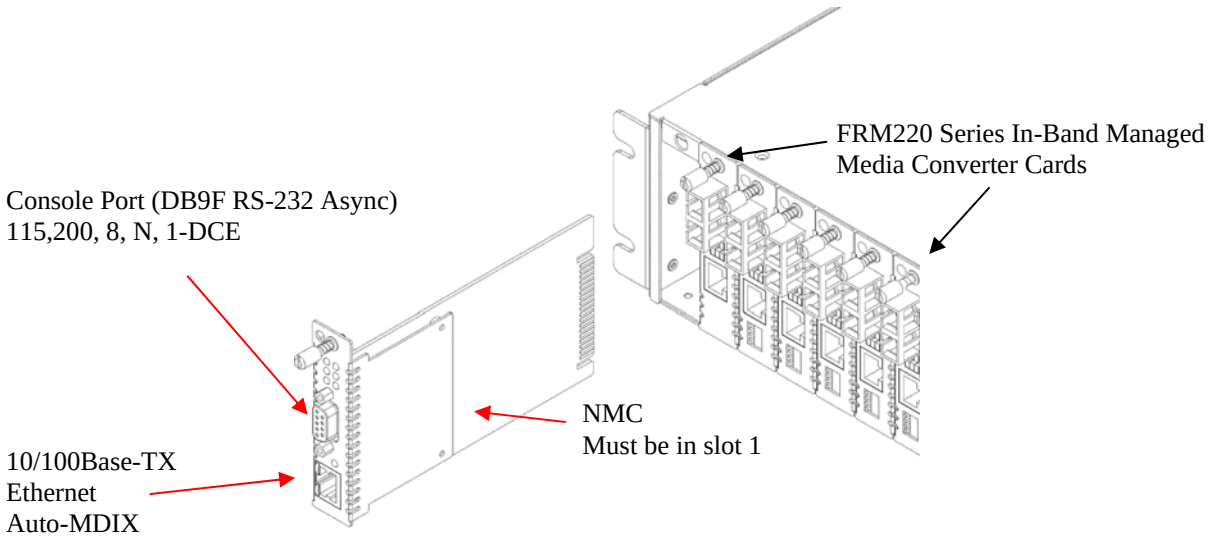


Figure 1-1 Chassis Front View

1.3 Card Options

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

1.4 NMC (SNMP)

1.4.1 NMC Introduction

The ***FRM220*** must be ordered with an NMC (Network Management Controller) Card in order to support management. 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 based interface provides an easy method for the user to operate and monitor the whole system through a more user friendly point and click graphic system, using any web browser. Almost all ***FRM220*** cards support remote in-band configuration when paired with the same type ***FRM220*** or ***FMC*** stand-alone in-band converter.

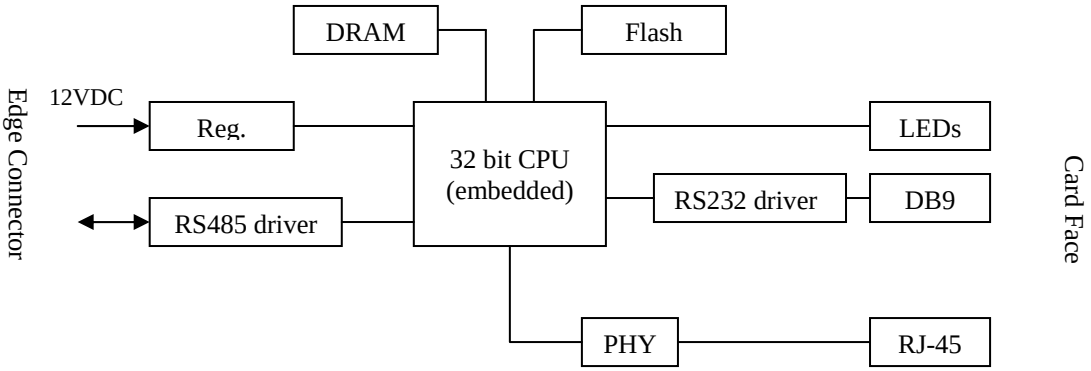


Figure 1-2 NMC Block Diagram

The design of the Network Management Controller is built around a 32 bit embedded processor. Most cards are designed using 8 bit 8051 microprocessors that handle all configuration of the converter card through software and provide the communication via RS-485 bus from the converter card to the Network Management Controller (NMC).

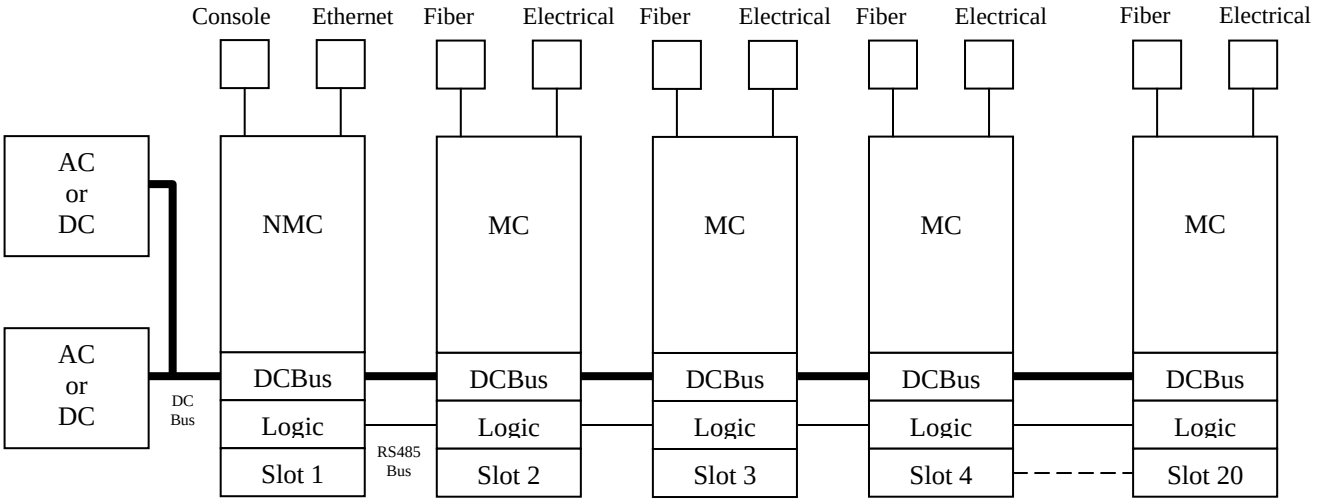


Figure 1-3 FRM220 System Block Diagram

1.4.2 FRM220 NMC Connections

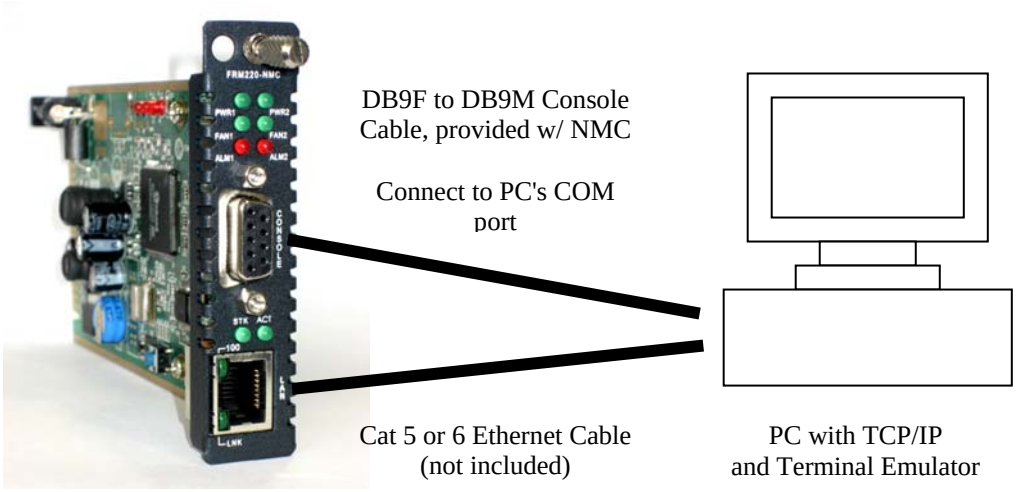


Figure 1-4 FRM220 NMC Connections

1.4.3 FRM220 NMC Fault Handling

The ***FRM220*** management is designed is such a way as to minimize any disruption to normal traffic in the event of any single component failure and to allow rapid recovery of full operations through replacement of FRUs (Field Replaceable Units).

The Power Modules support fully redundant operation. Utilizing a modular design, any mix of AC or DC power sources may be used to supply power to the ***FRM220 CH20*** Chassis. Power modules are completely "Hot Swappable". As long as one module is able to supply power, the chassis will operate non-stop. Removing any one power module from a two module redundant chassis will not effect the operation of the entire chassis in any manner.

All cards are designed to be "Hot Swappable". This includes any media converter cards as well as the NMC card itself. The following describes what happens logically for any card fault and subsequent replacement.

1.4.4 NMC card Fault and Replacement

If the NMC card should develop a fault, all media converter cards in the chassis will continue to run with their current configuration settings, with no negative effect to any traffic. The defective NMC may be pulled from the running chassis, without affecting any other media converter card. When a replacement NMC is inserted into the "hot" chassis, it will boot and immediately recognize that it is booting into an already running "hot" chassis. The TCP/IP and SNMP settings will either be factory default (if the card was not previously provisioned) or the settings will reflect previous provisioning. All provisioning settings from all the installed media converter cards and all remote media converters will be downloaded into the new NMC card and saved. If any future system power off is experienced, all previous settings are restored to each media converter card from the NMC.

When the NMC is rebooted, hot swapped, or upgraded, it will not effect any running media converter card's transmissions in any way.

1.4.5 Media Converter card Fault and Replacement

If a media converter card develops a fault, it may immediately be replaced with a spare media converter card of same type. The new card will be loaded with exactly the same settings as the previous card, from the provisioning settings stored in the NMC.

If a media converter card is replaced with a different type media converter in the same slot, the NMC will recognize that the card has been changed with different type converter and will upload the factory default for that card.

1.4.6 NMC LED Indicators

Indication	Color	State	Description
PWR1	Green	ON	Indicates that the No. 1 power module is correctly providing power
		OFF	No power from No. 1 power module or not installed
PWR2	Green	ON	Indicates that the No. 2 power module is correctly providing power
		OFF	No power from No. 2 power module or not installed
FAN1	Green	ON	Indicates that the No. 1 cooling fan is operating correctly
		OFF	No. 1 cooling fan is not working or not installed
FAN2	Green	ON	Indicates that the No. 2 cooling fan is operating correctly
		OFF	No. 2 cooling fan is not working or not installed
ALM1	Red	ON	Alarm 1 is active
		OFF	Alarm 1 is inactive
ALM2	Red	ON	Alarm 2 is active
		OFF	Alarm 2 is inactive
STK	Green	ON	NMC is ID0 or it is slave with good connection to master
		OFF	NMC is slave (ID1~9) with no connection to master
ACT	Green	ON	NMC kernel is booting or has hung
		Blink	NMC kernel has booted and running normally
		OFF	NMC kernel
100	Green	ON	LAN port has link at 100M speed
		OFF	LAN port has no link or the link speed is 10M
LNK	Green	ON	LAN port has good Ethernet link
		OFF	LAN port has no link
		Blink	LAN port has Ethernet link and activity

1.5 FRM220 Application

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

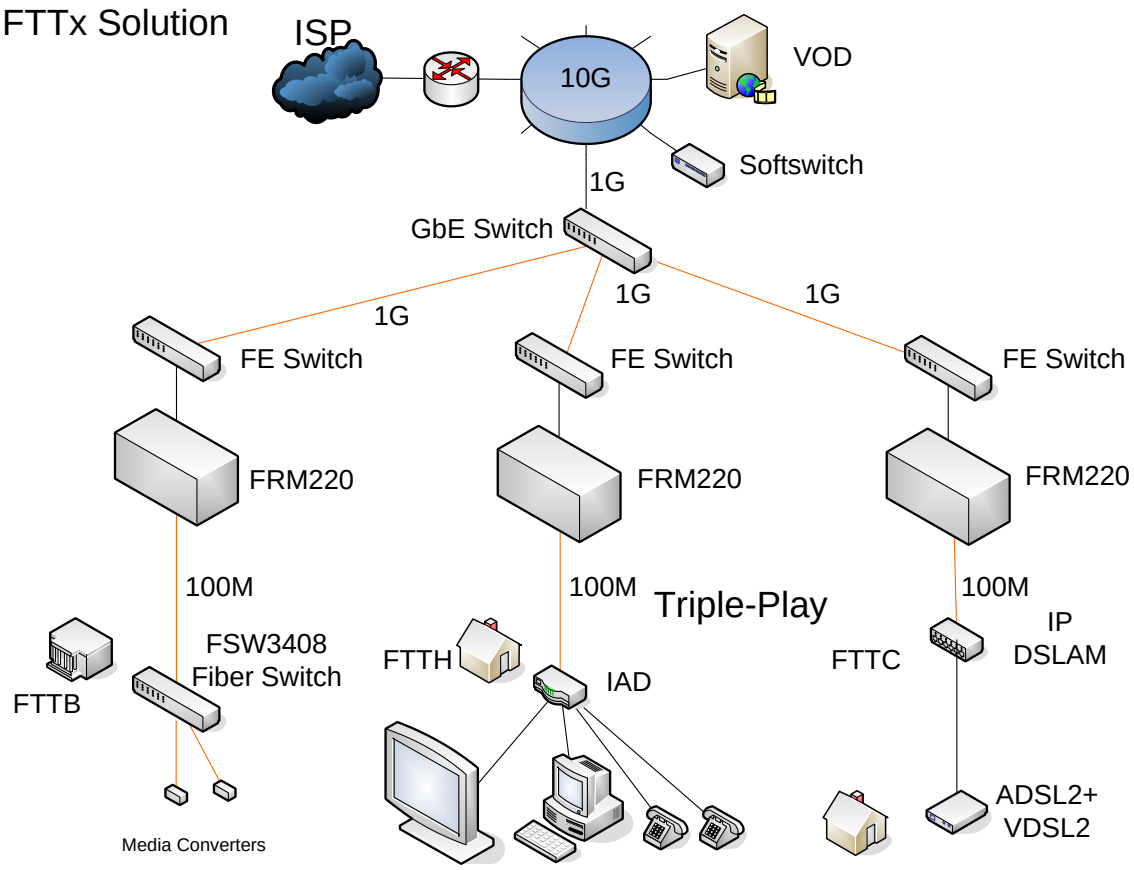


Figure 1-5 Application

Chapter 2 Console Provisioning

2.1 Introduction

This chapter will go into the details of the specific provisioning and operation of the ***FRM220-NMC***. Broken into two chapters, this chapter outlines the procedures and functions when using the serial console for configuration. The next chapter will outline the operation when using a network connection, including the Web based management. For initial operation, until the TCP/IP settings are completed, a terminal connection to the Console port is typically required.

All of the features and controls described in this chapter require the ***FRM220*** chassis to have the ***NMC*** (Network Management Controller) installed. The Management System is a collection of three control modes for the ***FRM220***. The simplest and most basic mode is "Console Mode". The terminal or console mode is a local control which requires an VT100 based terminal and an RS-232 connection to the RS-232 console port of the ***NMC*** card. Provisioning and monitoring are performed through a series of menus and menu selection items. All changes made to cards through console mode are executed immediately or when escaping a menu and do not require any separate 'save' operations. From the console mode, the initial network configuration can be accomplished. This will allow remote network configuration to proceed from Telnet connection (remote console), web browser or any network management software after compiling the enterprise MIB-II compliant file for ***FRM220-NMC***. A MIB browser provides another simple platform for the user to setup using the SNMP protocol remotely.

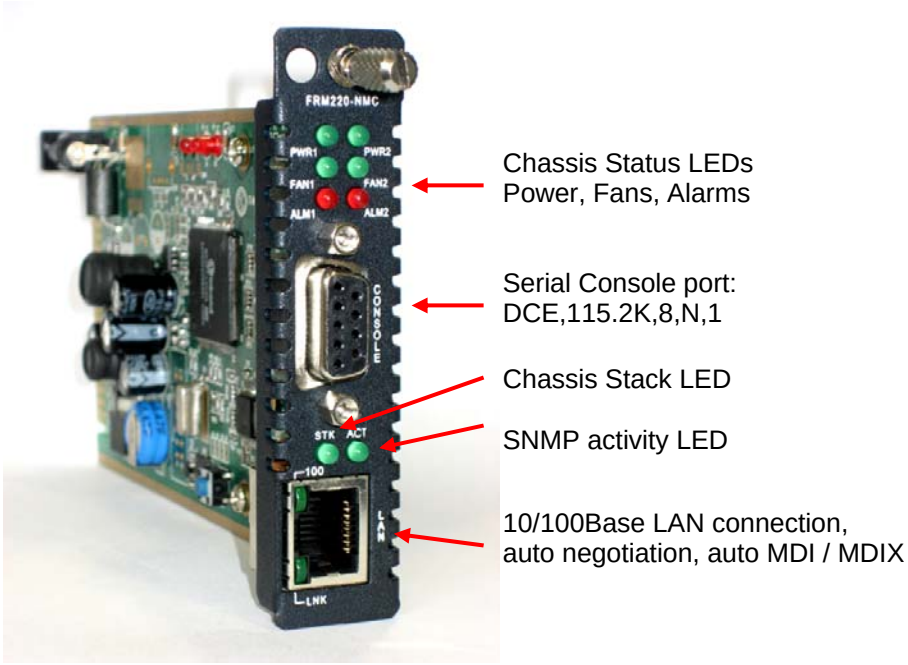


Figure 2-1 NMC card front panel, management interfaces

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

The DB9 Female connector is an RS-232 DCE connector designed to connect directly to a terminal or a PC running terminal emulation software.

The 'ACT' LED will flash once per second when the ***NMC*** has successfully booted and is running. The 'STK' LED will always be lit on the master chassis. If multiple chassis are cascaded, the slave ***NMC*** cards will have the 'STK' (stack) LED lit if the stack connection is normal. 'STK' LED will be off if the link to upstream chassis is broken.

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

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

2.2 Console Mode

2.2.1 Control Port General

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

2.2.2 Terminal Connection

A laptop computer has become an invaluable tool of the Systems Engineer. Connection to the computer is very simple. The ***FRM220 SNMP*** acts as a DCE to the PC's DTE communications port. The only hardware required is a DB9-pin one-to-one, male to female cable. If the laptop does not have a serial COM port, you may also use a commercially available USB to RS-232 adapter. A convenient application, provided with the Microsoft Windows® operating systems, is "HyperTerminal ™". To Start the HyperTerminal program, following the steps below: Please follow the instruction to connect in console mode. HyperTerminal is no longer provided with Windows since the release of Vista. We recommend using HyperTerminal PE or PuTTY on Vista OS computers.

1. Start "HyperTerminal" program --
Click 'Start', select 'Programs', 'Accessories', 'Communication', 'HyperTerminal'
Enter Connection Name
Select an Icon ' Click OK
2. Select COM port to communicate with SNMP Card
Choose direct to COM1 or COM2 ' click OK (COM number may also depend on your USB to RS-232 adapter)
3. Set Port Properties --
Port Settings:
Bits per second: 115200
Data bits: 8
Parity bits: None
Stop bits: 1
Flow Control: None

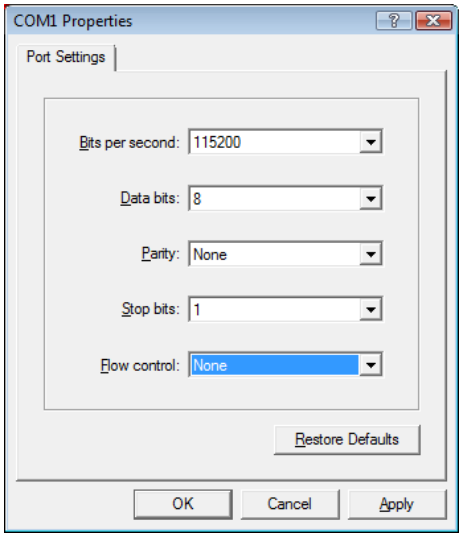


Figure 2-2 HyperTerminal port settings for FRM220

NOTE : Make the appropriate connections between the ***NMC*** card and the COM port, apply power to the ***FRM220-CH20*** , then press ESC, SPACE or ENTER after ***NMC*** card is fully booted (about 20 seconds). When the 'ACT' LED is flashing steadily once per second, you may then use the "Console Mode" to access the ***FRM220***.

2.2.3 Terminal Pin Definition

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

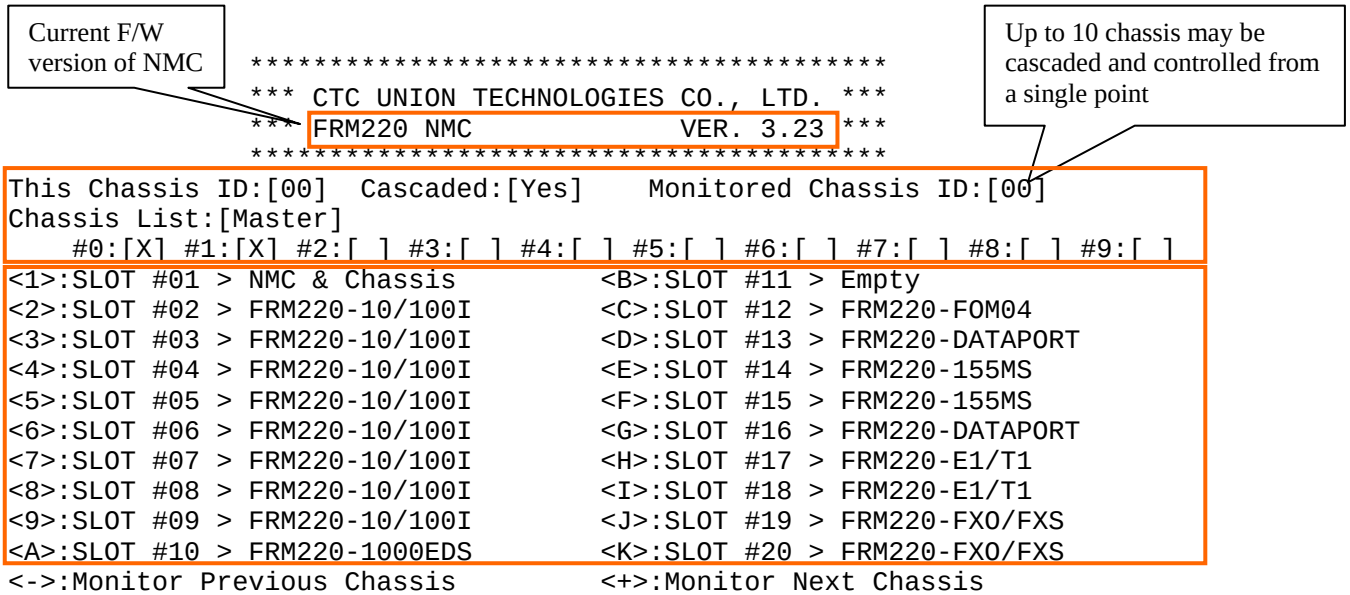
DB9(M)	**signal**	**DB9(F)**
5	GND	5
2	TD	2
3	RD	3

2.2.4 Terminal Login

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

```
                ****************************************
                *** CTC UNION TECHNOLOGIES CO., LTD. ***
                *** FRM220 NMC              VER. 1.95 ***
                ****************************************
Login: admin
Password:
```

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




```
                ****************************************
                *** CTC UNION TECHNOLOGIES CO., LTD. ***
                *** FRM220 NMC              VER. 3.23 ***
                ****************************************
This Chassis ID:[00]  Cascaded:[Yes]    Monitored Chassis ID:[00]
Chassis List:[Master]
    #0:[X] #1:[X] #2:[ ] #3:[ ] #4:[ ] #5:[ ] #6:[ ] #7:[ ] #8:[ ] #9:[ ]
<1>:SLOT #01 > NMC & Chassis          <B>:SLOT #11 > Empty
<2>:SLOT #02 > FRM220-10/100I         <C>:SLOT #12 > FRM220-FOM04
<3>:SLOT #03 > FRM220-10/100I         <D>:SLOT #13 > FRM220-DATAPORT
<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-DATAPORT
<7>:SLOT #07 > FRM220-10/100I         <H>:SLOT #17 > FRM220-E1/T1
<8>:SLOT #08 > FRM220-10/100I         <I>:SLOT #18 > FRM220-E1/T1
<9>:SLOT #09 > FRM220-10/100I         <J>:SLOT #19 > FRM220-FXO/FXS
<A>:SLOT #10 > FRM220-1000EDS         <K>:SLOT #20 > FRM220-FXO/FXS
<->: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 inventory of all slots in the rack is shown. In this example, the chassis is filled with a mix of 10/100 Ethernet in-band cards, Gigabit Ethernet cards, Data, E1/T1, FXO/FXS and of course the NMC card. If no card is found in a slot, the slot status will display 'Empty'. The cards are number in slots #01~#20, left to right, looking from the front of the ***FRM220-CH20***, and can be selected with single keyin of 1~9 or A~K. Pressing the card number will immediately display card's status and configuration screen. For details of line card settings, please refer to **Appendix A** for the specific line card type. The other function keys are explained below.

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

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

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

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

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

Z: this key will logout of the console mode.

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

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

2.2.5 TCP/IP Configuration

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

Two Step Configuration

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

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

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

```
          << SNMP System Configuration Setup of Chassis 0 >>
     Model = NMC
     S/N   = 000000
     Target MAC Address        = 00:02:ab:0d:64:fc
<1>: Target IP                 : 192.168.1.1
<2>: Target Netmask            : 255.255.255.0
<3>: Target Gateway            : 192.168.1.254
<4>: Target Name               : FRM220
<5>: TFTP Server IP            : 192.168.1.100
<6>: TFTP Download Kernel      : kernel14622.gz
<7>: TFTP Download File System : romfs323.gz
<8>: Load default settings and write to system.
<9>: Do TFTP and Flash Kernel function.
<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.
```

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

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

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

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

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

4: Use this key to set the System Name

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

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

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

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

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

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

T: Use this key get to the date and time setting menu, including network time setting.

U: This will enter the menu used to upgrade line cards installed in the chassis.

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

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

Step Two: Manager Configuration Process
a.) Assign Managers Press the 'M' key

```
          << SNMP Manager Configuration Setup of Chassis 0 >>
   Manager's IP        Community String Access
   ================== ================ ==========
#1 ---                 ---              ---
#2 ---                 ---              ---
#3 ---                 ---              ---
#4 ---                 ---              ---
#5 ---                 ---              ---
#6 ---                 ---              ---
#7 ---                 ---              ---
#8 ---                 ---              ---
Command Function Key:
<1>~<8>: Edit manager #1 to #8 setting.
<D>    : Delete all settings.
<N>    : Go to Trap Configuration menu.
<X>    : Go to Syslog Configuration menu.
<S>    : Confirm above setting and restart SNMP.
<ESC>  : Back to main menu without modification.
Please select an item.
```

These eight locations can be used to setup a single or large number of authorized managers.

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

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

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

X: Use this key to go to the Syslog server setting menu.

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

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

```
                ****************************************
                *** CTC UNION TECHNOLOGIES CO., LTD. ***
                *** FRM220 NMC              VER. 1.95 ***
                ****************************************
<< SNMP Manager Configuration Setup >>
   Manager's IP        Community String Access
   ================== ================ ==========
#1 192.168.1.0/24      private          read-write
#2 default             public           read-only
#3 172.24.1.125        private          read-write
#4 ---                 ---              ---
#5 ---                 ---              ---
#6 ---                 ---              ---
#7 ---                 ---              ---
#8 ---                 ---              ---
Command Function Key:
<1>~<8>: Edit manager #1 to #8 setting.
<D>    : Delete all settings.
<N>    : Go to Trap Configuration menu.
<X>    : Go to Syslog Configuration menu.
<S>    : Confirm above setting and restart SNMP.
<ESC>  : Back to main menu without modification.
Please select an item.
```

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

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

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

b.) Trap Management

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

```
                ***************************************
                *** CTC UNION TECHNOLOGIES CO., LTD. ***
                *** FRM220 NMC              VER. 1.95 ***
                ***************************************
             << Trap Configuration Setup of Chassis 0 >>
   Trap Receiver IP Community String
   ================ ================
#1 192.168.1.100    private
#2 ---              ---
#3 ---              ---
#4 ---              ---
#5 ---              ---
#6 ---              ---
#7 ---              ---
#8 ---              ---
Command Function Key:
<1>~<8>: Edit trap receiver #1 to #8 setting.
<D>    : Delete all settings.
<N>    : Go to Manager Configuration menu.
<X>    : Go to Syslog Configuration menu.
<S>    : Confirm above setting and restart SNMP.
<ESC>  : Back to main menu without modification.
Please select an item.
```

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

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

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

D: Use this to clear all settings.

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

X: Use this key to go to the Syslog server setting menu.

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

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

Conclusion

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

Now that both the 'System' and 'Manager' settings are complete, the ***FRM220*** is ready to be managed remotely over an IP network. The system provides a Telnet server feature that allows login over TCP/IP networks and provides a menu display almost identical to that of the serial console mode. All functions available from Console are available in the Telnet session.

The ***FRM220-NMC*** is supplied with an enterprise MIB file (Management Information Base) that can be compiled into any standard SNMP network management software. The MIB file complies with MIB-II and ANS.1 standards. The SNMP protocol used in the ***FRM220-NMC*** is compliant with both SNMP V1 and SNMP V2C. The kernel in the ***FRM220-NMC*** is capable of supporting SNMP V3, however as of this writing that support has not yet been enabled. The major difference between SNMP V2C and V3 is the use of encryption layer for SNMP traffic. This requires the passing of public keys and key checks to ensure that both agent and manager are who they really say they are. It also ensures that should it be intercepted by a sniffer, the SNMP traffic is encrypted and not sent in plain text format, making a "man-in-the-middle" attack less likely.

2.2.6 Using a Syslog Server

Syslog is a standard for logging program messages and is now standardized within the Syslog working group of the IETF. Syslog allows separation of the software that generates messages from the system that stores them and the software that reports and analyzes them.

Syslog, in the ***FRM220-NMC***, can be used for security auditing (login) as well as generalized informational (link down), analysis, and debugging (loop back) messages. The syslog function of the ***FRM220-NMC*** can be used to integrate log data into a central repository.

Messages are assigned a priority/level (Emergency, Alert, Critical, Error, Warning, Notice, Info or Debug) by the ***FRM220-NMC*** and then sent to syslog server.

The syslog messages are sent to a syslog server via TCP/IP. Therefore, we must configure in the ***FRM220-NMC***, the destination address for syslog messages.

From the Main Menu, select the <M> (SNMP Manager Configuration Setup) and from this menu select <X> (Syslog Server Settings).

```
            << Syslog Configuration Setup of Chassis 0 >>
   Syslog Receiver IP
   ==================
#1 ---
#2 ---
#3 ---
#4 ---
#5 ---
#6 ---
#7 ---
#8 ---
Command Function Key:
<1>~<8>: Edit trap receiver #1 to #8 setting.
<D>    : Delete all settings.
<N>    : Go to Manager Configuration menu.
<S>    : Confirm above setting and restart SNMP.
<ESC>  : Back to main menu without modification.
Please select an item.
```

Set up to 8 Syslog server receivers, entering their IP addresses.

There are up to eight entries that can be filled for individual syslog server destination IP addresses. Press any number key, 1 through 8 and key in the syslog server's IP address. Press the <D> key to delete all entries. Using <S> will save the settings and restart the SNMP daemon. Press <ESC> to exit back to the Main Menu.

2.2.7 Chassis Information and Alarm setup

The ***FRM220*** supports two dry contact alarms that are user configurable for a number of different alarm conditions. Alarm conditions are configurable for alarms from Power, Fans, and UTP or Fiber link and Far End Fault states for local and remote converters. The alarms must also be configured for NMC to send SNMP traps.

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

Version display meaning:
Hardware version 1.00
Software version 3.23
Kernel build 14622

```
                ****************************************
                *** CTC UNION TECHNOLOGIES CO., LTD. ***
                *** FRM220 NMC              VER. 3.23 ***
                ****************************************
This Chassis ID:[00]  Cascaded:[Yes]    Monitored Chassis ID:[00]
SLOT #01 > NMC and Chassis                [Ver:1.00-3.23 #14622  ]
Power#1 Type:[DC36-72V ] Status:[Fail]  Fan#1 RPM:[3810] Status:[OK  ]
Power#2 Type:[AC90-250V] Status:[OK  ]  Fan#2 RPM:[3750] Status:[OK  ]
Alarm#1 Status:[Active]        Alarm#2 Status:[Inactive]
<1>:  Alarm#1 Mode:   [By User#1]
<2>:  User#1: Chassis [ ]Power#1   [ ]Power#2   [ ]Fan#1   [ ]Fan#2
<3>:          Local   [ ]UTP_Link_Down*  [ ]FX_Link_Down
                      [ ]FEF_Detect      [ ]Remote_Power_Fail*
<4>:          Remote  [ ]UTP_Link_Down*  [ ]FX_Link_Down
                      [ ]FEF_Detect      [ ]Remote_Power_Fail*
<5>:  Alarm#2 Mode:   [By Fan   ]
<6>:  User#2: Chassis [ ]Power#1   [ ]Power#2   [ ]Fan#1   [ ]Fan#2
<7>:          Local   [ ]UTP_Link_Down*  [ ]FX_Link_Down
                      [ ]FEF_Detected    [ ]Remote_Power_Fail*
<8>:          Remote  [ ]UTP_Link_Down*  [ ]FX_Link_Down
                      [ ]FEF_Detected    [ ]Remote_Power_Fail*
<R>:  Redundancy Mode:[Disable]*                          (*)10/100I only
<ESC>: Go to previous menu. Please select an item.
```

Description of Menu contents:

This Chassis ID: This ID number will reflect the actual ID number set on the selector switch on the rear of the chassis
Power#1 and Power#2 Type: & Status

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

1. AC Model, supports 90~250VAC input, 150watt maximum output.
2. DC48 Model, supports 36-75VDC input, 150 watt maximum output
3. DC24 Model, supports 18~36VDC input, 150 watt maximum output

(200 watt power supplies were introduced in the second half of 2010, replacing the 150 watt as the standard power option.)
Fan#1 and Fan#2 RPM & Status

There are two hot swappable cooling fan assemblies that may be field replaced. The normal operational revolutions per minute (RPM) is between 2800 and 4000. The threshold for fan alarm is activated if the fan's RPM falls below 1650RPM.

Alarm#1.

In the default configuration, Alarm #1 is Active if any failure condition exists for power. Alarm #2 is active if any fan fails or the RPM falls below the acceptable threshold (1650RPM).

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

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

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

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

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

0 : This will completely disable Alarm #2. The relay dry contact will not close and the NMC ALM2 red LED will not light.
1 : This is the factory default setting. This alarm will only be off when one or both fans fail or are removed.
2 : This setting will take the user parameters and set the alarm according to failures in any parameters set under items 6,7,8.
3 : This selection will set the alarm for testing purposes. The ALM2 LED will light and dry contact for Alarm 2 will close.

User Alarm Definitions

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

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

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

```
                ****************************************
                *** CTC UNION TECHNOLOGIES CO., LTD. ***
                *** FRM220 NMC              VER. 1.95 ***
                ****************************************
This Chassis ID:[00]  Cascaded:[Yes]    Monitored Chassis ID:[00]
SLOT #01 > NMC and Chassis              [ Ver:1.00-1.95 #12314 ]
Power#1 Type:[Empty    ] Status:[----]  Fan#1 RPM:[2910] Status:[OK  ]
Power#2 Type:[AC90-250V] Status:[OK  ]  Fan#2 RPM:[2940] Status:[OK  ]
Alarm#1 Status:[Inactive]        Alarm#2 Status:[Inactive]
<1>:  Alarm#1 Mode:   [User#1   ]
<2>:  User#1: Chassis [X]Power#1   [X]Power#2   [X]Fan#1   [X]Fan#2
<3>:          Local   [ ]UTP_Link_Down   [ ]FX_Link_Down
                      [ ]FEF_Detect      [ ]Remote_Power_Fail
<4>:          Remote  [ ]UTP_Link_Down   [ ]FX_Link_Down **

<5>:  Alarm#2 Mode:   [User#2   ]
<6>:  User#2: Chassis [ ]Power#1   [ ]Power#2   [ ]Fan#1   [ ]Fan#2
<7>:          Local   [X]UTP_Link_Down   [X]FX_Link_Down
                      [X]FEF_Detected    [X]Remote_Power_Fail
<8>:          Remote  [ ]UTP_Link_Down   [ ]FX_Link_Down **
                                  (** for 2 OAM units only)
<R>:  Redundance Mode:[Disable]  (10/100I Series only.)
<ESC>: Go to previous menu. Please select an item.
```

Note: When receiving traps via SNMP management, Alarm1 is seen as “Major Alarm” while Alarm2 is seen as “Minor Alarm”.

Note: Do not enable redundancy mode for 10/100i unless you know exactly what you are doing. This mode is discussed in detail in Chapter 3 under Web Management.

2.2.8 User Password Setup

From the main menu page, press the 'P' key to enter the Password Setup. There are two user setups.

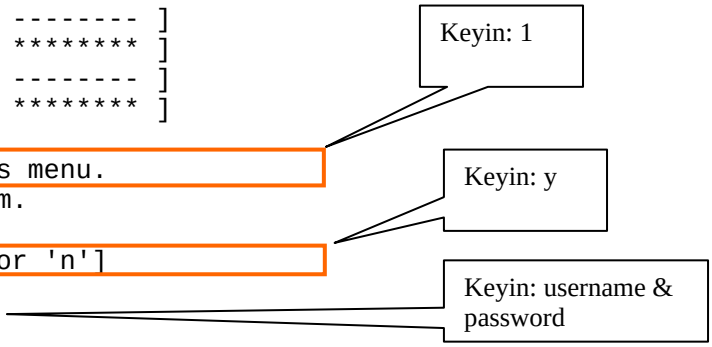
```
<< Password Setup >>

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

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

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

User Password #1=
```



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

2.2.9 Upgrading the NMC

The ***NMC*** and any cards, including any remotely connected (over fiber) in-band managed converters, are all capable of online software upgrade. The original version 1.0 hardware NMC was released with SNMP code version 1.xx for the ***FRM220***. In March of 2010, the code had progressed to 2.xx branch. By August of 2010, NMC-R2 (Ram increased from 16 to 32MB) was released and follows the 3.xx code branch. As of this manual edition, both 2.xx and 3.xx codes are being maintained.

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

2.2.9.1 Preconditions

Software upgrade is performed by the user by interacting with the NMC via the serial console port on an ASCII terminal (optionally via Telnet or Web). The software transfer mechanism is the TCP/IP protocol TFTP (Trivial File Transfer Protocol). The end user or network engineer can perform an upgrade easily from one personal computer or from a Laptop Computer connected to the same network as the ***NMC***.

2.2.9.2 Items required

a. The ***FRM220*** unit with NMC installed, configured and network connected. Version 1.XX to be upgraded to version 1.YY.
b. A Windows® based PC with a network connection and with at least one free COM port and terminal emulation software (such as HyperTerminal), PuTTY or Telnet.
c. Serial console cable (DB9M to DB9F) [not required if performing by Telnet or Web]
d. Ethernet UTP cables
e. FRM220-NMC latest version kernel and romfs file system
f. Free TFTP server for Windows® (Ph. Jounin TFTP32)

2.2.9.3 Equipment Setup

The upgrade procedure should not have any effect on the traffic passing through an online ***FRM220*** unit. It is not required that the unit be taken offline for maintenance. It is also a good idea to do a reset of the ***NMC*** prior to upgrading. The internal memory will become fragmented over a long period of uptime and this could lead to not having enough contiguous space to hold the newly extracted image prior to flashing.

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

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

2.2.9.4 Setup the FRM220

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

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

```
              ****************************************
              *** CTC UNION TECHNOLOGIES CO., LTD. ***
              *** FRM220 NMC              VER. 3.16 ***
              ****************************************
This Chassis ID:[00]  Cascade:[Yes]    Monitored Chassis ID:[00]
Chassis List:
    #0:[X] #1:[ ] #2:[ ] #3:[ ] #4:[ ] #5:[ ] #6:[ ] #7:[ ] #8:[ ] #9:[ ]

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

Press 'L' to enter the System Configuration Setup.

```
              ****************************************
              *** CTC UNION TECHNOLOGIES CO., LTD. ***
              *** FRM220 NMC              VER. 3.16 ***
              ****************************************
<< SNMP System Configuration Setup >>
     Model= FRM220
     S/N= 123456789
     Target MAC Address= 00:02:ab:06:20:20
<1>: Target IP=          192.168.1.1
<2>: Target Netmask=     255.255.255.0
<3>: Target Gateway=     192.168.1.254
<4>: Target Name=        FRM220
<5>: TFTP Server IP=     192.168.1.100
<6>: TFTP Download Kernel= linux.zip
<7>: TFTP Download File System= romfs.zip
<8>: Load default settings and write to syste...
<9>: Do TFTP and Flash Kernel function.
<A>: Do TFTP and Flash File System function.
<ESC>: Write to system and go to previous menu.

Please select an item.
```

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

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

If you have made any changes to items 1-5, you must write (ESC) and reboot (R) the ***NMC***. Press 'ESC' to store the results and at the main menu press 'R' and confirm with 'y'. The NMC will reboot completely in about 20 ~ 30 seconds.

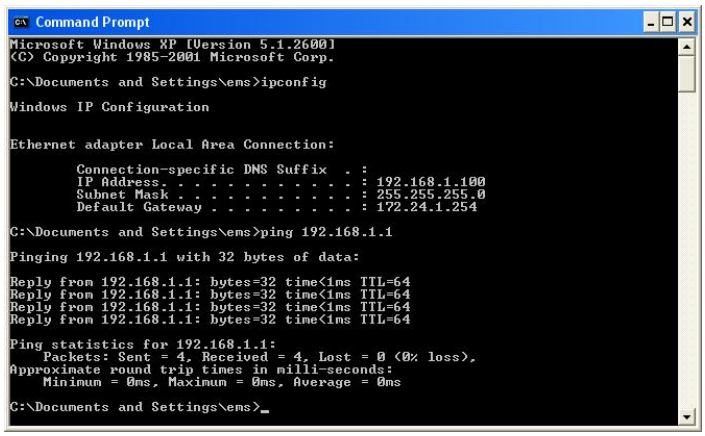
The kernel and filesystem are in compressed format. We previously used the 'zip' file extension, but to avoid confusion we now use the 'gz' file extension so that users will not mistakenly unzip the images.

The version format is imbedded in the compressed gz file's name. This will make it easier to identify different versions. For example:

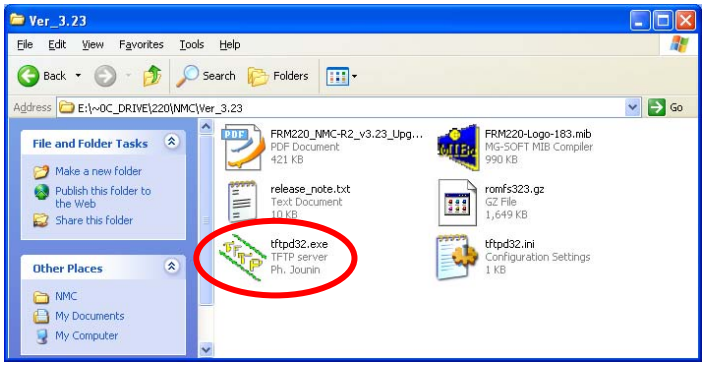
kernel12314.gz would refer to kernel with build #12314

romfs316.gz is a file system image for version 3.16

Kernel versions will change less often, while file system versions will change more often.

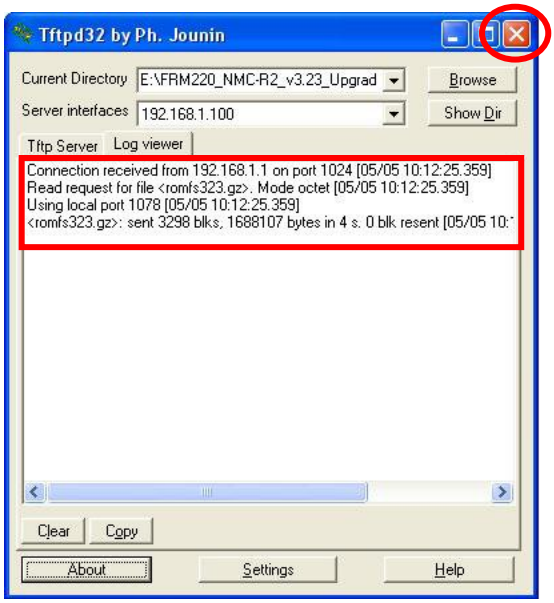


Ping the ***NMC*** from the TFTP server PC and be sure there is a response.



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

Start the TFTP server on the connected PC. In our example, we are using the free tftp32 TFTP server. If Windows® is running a firewall, a security alert will popup. Click the "Unblock" button to allow TFTP protocol from the TFTP Server application.



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

The screen at the left shows that the romfs323.gz file was transferred OK.

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

You may now close the TFTP server on the PC by click the upper-right corner “X”.

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

Note that the version is now the new version. (in our example, 3.23)

```
 ************************************************************
 *** CTC UNION TECHNOLOGIES CO., LTD      V3.23           ***
 *** FRM-220 Fiber Optical Media Converter Rack Management ***
 ************************************************************
 Main Menu and Rack Status:
   1:Slot #1 >> Empty       << || 9:Slot #9  >> E1 BNC      <<
   2:Slot #2 >> Empty       << || A:Slot #10 >> 10/100 Base <<
   3:Slot #3 >> Empty       << || B:Slot #11 >> 10/100 Base <<
   4:Slot #4 >> Empty       << || C:Slot #12 >> 10/100 Base <<
   5:Slot #5 >> Empty       << || D:Slot #13 >> 10/100 Base <<
   6:Slot #6 >> Empty       << || E:Slot #14 >> 10/100 Base <<
   7:Slot #7 >> Empty       << || F:Slot #15 >> 10/100 Base <<
   8:Slot #8 >> Empty       << || G:Slot #16 >> 10/100 Base <<
 Command Function Key:
 '1' to '9', 'A' to 'G': I/O Cards Setting
 'P': Show Fans and Powers Status
 'R': Refresh Status
 'ESC' Logout
 'M': Manager Configuration Setup
 'S': System Configuration and TFTP Setup
Console:[On  line] Telnet:[Off line]    GUI:[Off line]
```

This completes the NMC upgrade procedure.

Note: When CTC Union releases an update, a 'package' will be generated that includes all required code, the TFTP server application, a detailed upgrade procedure in PDF format specifically for the release and a release notice listing the fixes or added features of the firmware. Latest packages may be found on our support Web site (http://support.ctcu.com/) and are available to registered members (registration is free).

This completes the basic chassis provisioning for the FRM220 2U 20 slot Platform Media Converter Rack through serial console. You will find provisioning and use of the web interface in the next chapter, Chapter 3. Specific configuration for line cards are located in the Appendix, starting with the first release line card, the FRM220-10/100i, in-band managed Fast Ethernet fiber media converter.

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Chapter 3 Web Based Management

3.1 Introduction

This chapter will explain the operation of the ***FRM220-NMC*** Web based interface used to monitor and configure the ***FRM220*** fiber media converter rack.

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

Follow the procedures in Chapter 2 for configuring the ***NMC*** for TCP/IP communication. Once this is completed and the Ethernet port of the ***NMC*** is connected to your network, the unit may be managed from any browser under any Operating System. The examples that follow are done with Internet Explorer 8 running on XP.

3.2 Web Based Management Operation

3.2.1 Introduction

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

3.2.2 Configuration

3.2.2.1 Start the Web Based application

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

Figure 3.1 Web manager login

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

Note: CTC Union has an online demo unit placed on a public IP and answerable by DNS. We hope this demo will help our resellers to promote our product. End users may also find that evaluating our unit could lead to a decision to purchase our product. We are also trusting everyone to behave and not corrupt our demo unit or place any graffiti on it.

http://frm220.ctcu.com.tw

No password is required.

3.2.2.2 Home Page

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

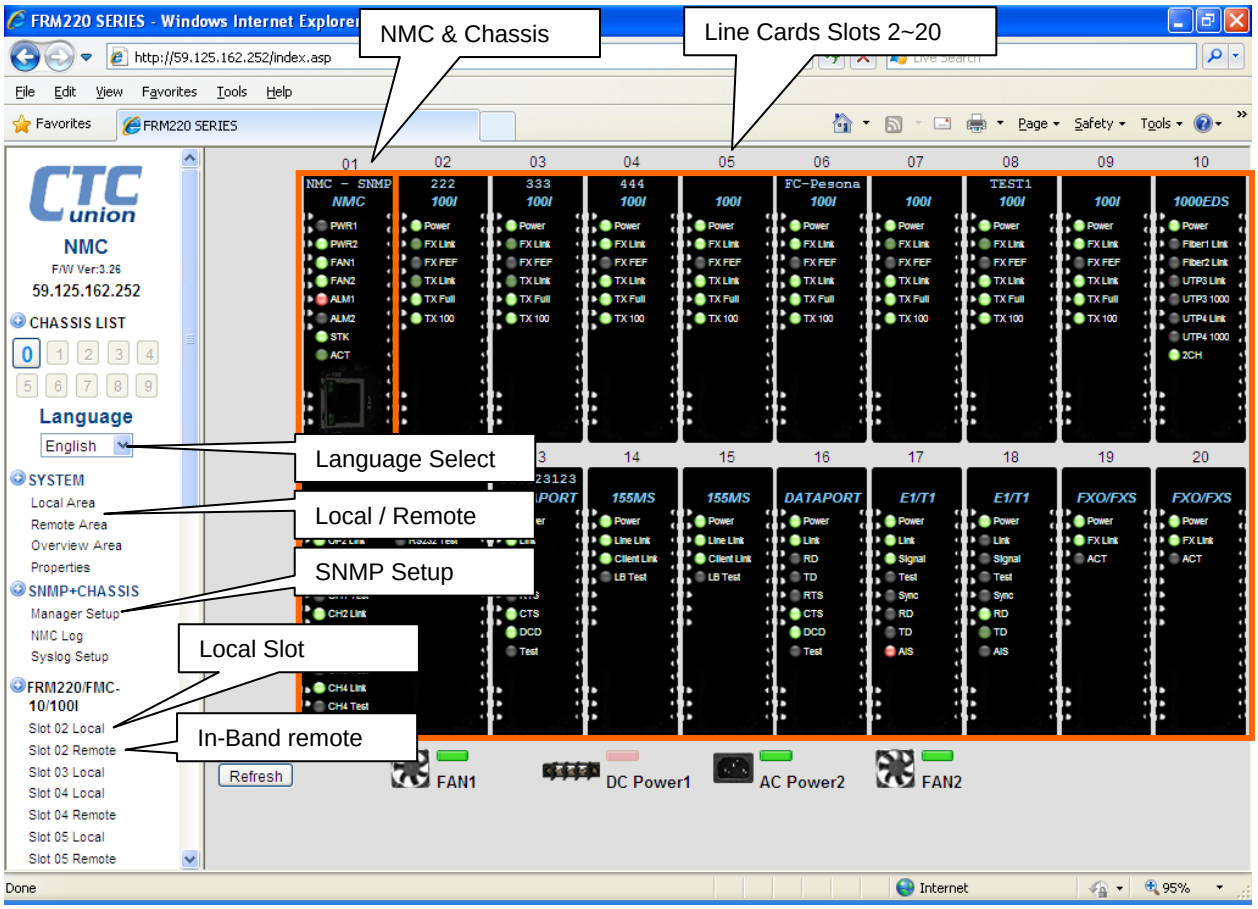


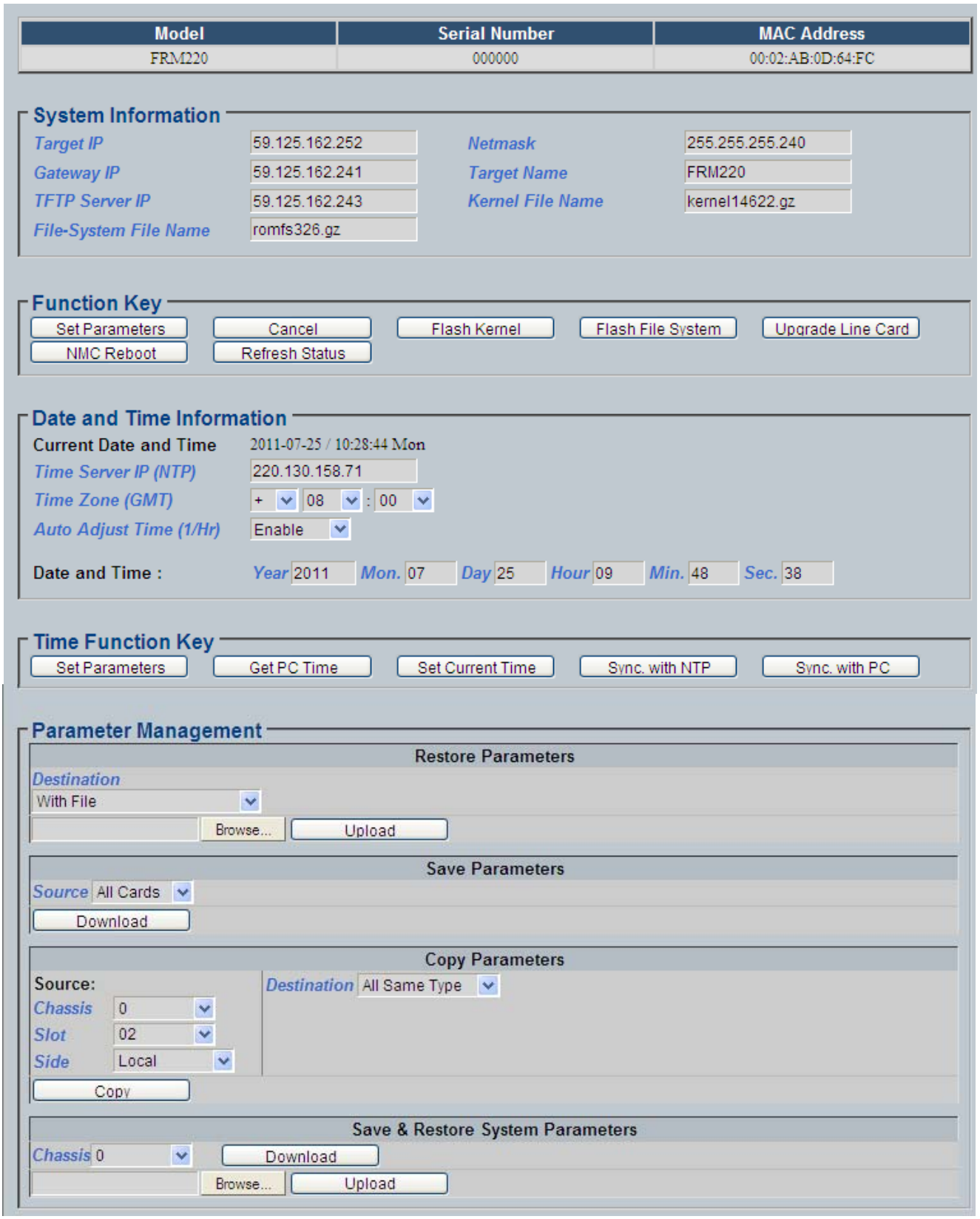
Figure 3.2 Selectable features of the Main Web GUI

Use the "Chassis List" control to select the chassis in the cascade group. Using only one IP address and one single point of management, up to 10 chassis (ID 0~9) can be managed.

The NMC currently supports four different language interfaces; English, Simplified Chinese, Traditional Chinese and Japanese user interfaces. If a user has never logged into the ***FRM220*** before, he will be presented with the default language that follows the operating system. For example, if a Simplified Chinese PC opens a browser and connects to the ***FRM220***, the user interface displayed will be Simple Chinese. If any other language is selected, that selection choice is recorded in a cookie. The next time the browser opens the ***FRM220*** web page for management, the cookie information is retrieved and the selected language interface will be displayed. The language can again be switch and the cookie will be modified. If cookies are deleted, the behavior returns to the initial case where the language interface of the ***FRM220*** follows the default operating system language.

3.2.2.3 System Information

Clicking on the "**System**" item will display an overview screen that allows setting system information, TFTP kernel and file system update, date & time setting, and parameter management.



The **System Information** field provides the following settings:

1. **Target IP** : This is the IPv4 dotted decimal IP address assigned to the NMC itself.
2. **Netmask** : This value is set to the subnet address of the network to which the NMC is attached.
3. **Gateway IP** : This IPv4 dotted decimal address is the default router to the network to which the NMC is attached.
4. **Target Name** : This is the 'sysName' given to the NMC that will be displayed via SNMP standard MIB-2.
5. **TFTP Server IP** : This is the IPv4 address of the TFTP server that will be used to download update images to the NMC.
6. **Kernel File Name**: When performing kernel update, this is the file name (case sensitive) of the kernel image file located on the TFTP server.
7. **File-System File Name** : When performing file system update, this is the file name (case sensitive) of the file-system image file located on the TFTP server.

Function Key

1. **Set Parameters** : This button must be clicked to save any changes made to the System Information.
2. **Cancel** : Before doing any Set Parameter, clicking cancel will restore all fields in System Information to their current saved parameters.
3. **Flash Kernel** : This button will start the kernel update via web interface (see below).
4. **Flash File System** : This button will start the file system update via web interface (see below).
5. **Upgrade Line Card** : This will bring up the window for doing online upgrade to cards installed in the chassis.
6. **NMC Reboot** : This button is used to do a soft reset of the NMC.
7. **Refresh Status** : After doing a Set Parameters operation, this button will load the newly set values in the system information fields.

Date and Time Information

The NMC supports time setting manually, by syncing to PC's clock or by SNTP network time protocol. To setup the unit for automatic time adjustment, enter the IP address of the Time Server, adjust the time zone offset, enable the 'automatic time adjustment' and then click the 'Set Parameters' button. Next click 'Sync. with NTP' button. The 'Current Date and Time' should now match the network Time Server's time.

1. Current Date and Time : This read-only field displays the date and time as currently set in the NMC.
2. Time Server IP (NTP) : This is the IPv4 dotted decimal address of the time keeping server which the NMC will use to get and update its clock.
3. Time Zone (GMT) : These are the plus and minus, from GMT that should be set to the physical time zone where the NMC is located.
4. Auto Adjust Time (1/Hr) : To keep synchronization with external time server, this must be enabled. The NMC will then check the time server hourly and correct its time to exactly match the time server's.
5. Date and Time : This field is used in conjunction with the Time Function Keys listed below.

Time Function Key

1. **Set Parameters** : This button must be clicked to save any changes made to the Date and Time information.
2. **Get PC Time** : This button will place the connected PC's time into the 'Date and Time' field.
3. **Set Current Time** : This button takes the time shown in the 'Data and Time' field and makes it the NMC time.
4. **Sync. with NTP** : This button manually forces the NMC to re-synchronize its time to NTP server. If the configured NTP server cannot be reach, a time out will occur.
5. **Sync. with PC** : This button will manually force the NMC to synchronize its time to the connected PC.

Parameter Management

1. **Restore Parameters** : The NMC is able to restore parameters from a previously saved parameter file. From the pull-down, it is also able to take the parameter settings saved of one card and place them to all other cards in the chassis of the same type. Lastly if checked, the parameter is able to be taken from a saved parameter file and restored to a specifically selected local or remote slot.
2. **Save Parameters** : The NMC is able to save all cards' parameters to a single file, or it can choose a single card slot to save just that card's parameters to an exported file.
3. **Copy Parameters** : The copy parameters dialogue allows copying once card's settings to all other cards of same type, or the settings can be copied to a selected group of cards through check boxes.
4. **Save & Restore System Parameters** : This function will backup all vital settings of the chassis with the exception of the Target IP, subnet mask, gateway and target name. It will backup all other system settings such as aliases, NTP, SNMP and Syslog server settings. It does NOT specifically backup any other card settings, only the system settings related to the NMC itself.

3.2.2.4 Update Kernel and File System

To update the NMC via the web interface, type in the kernel and file system image names and make sure those files are available from a TFTP server. Click the "Set Parameter" button. To update the kernel click the "Flash Kernel" button. To update the filesystem click the "Flash File System" button.

Image upload may fail due to memory fragmentation. In this case it is necessary to reboot the NMC before performing an update. Click the " NMC Reboot" button. Upgrading or rebooting the NMC will not affect any card transmissions.

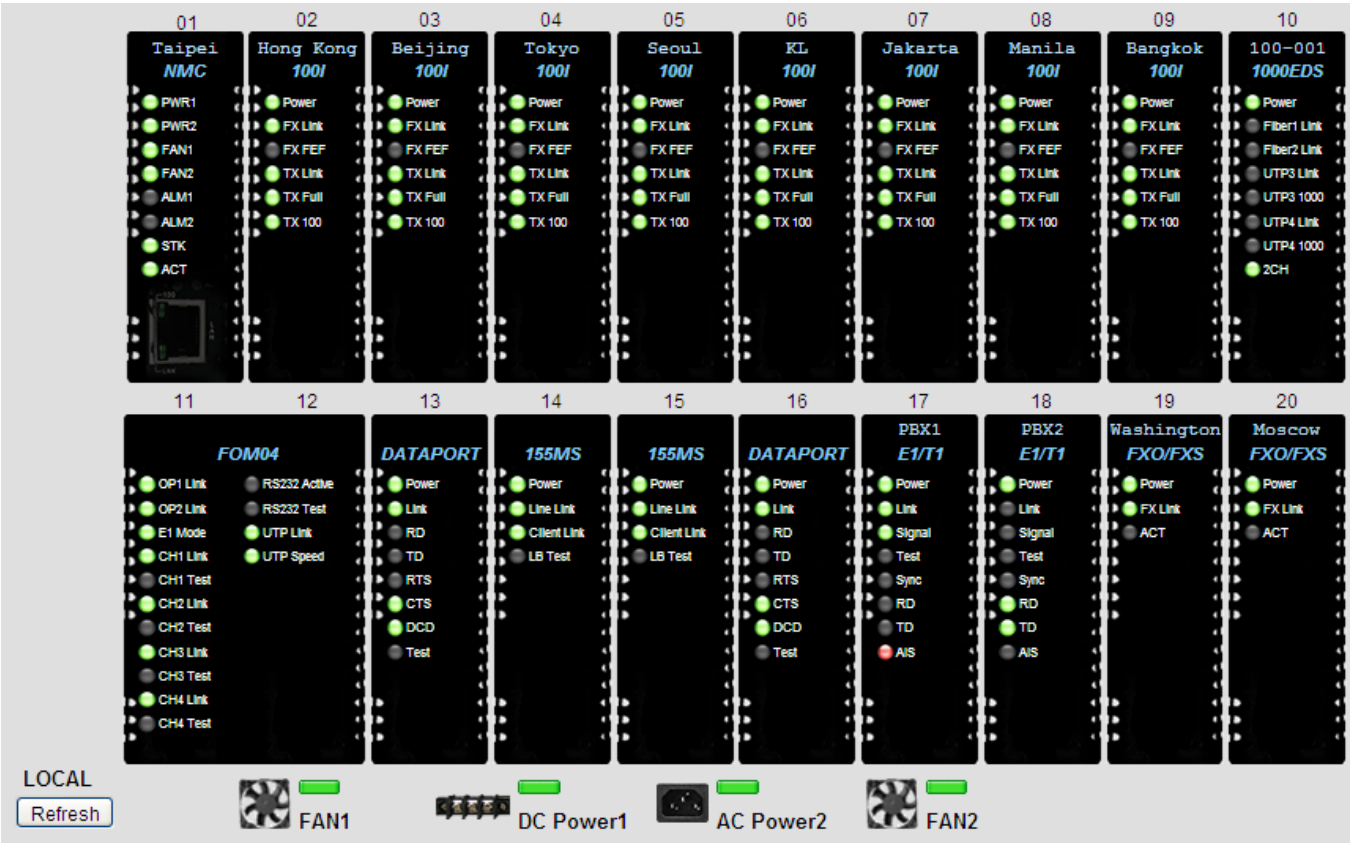
Cards can also be upgraded online. Click the "Upgrade Line Card" button. More details are in the appendix for each particular card. The update image for the card must also be on the TFTP server.

3.2.2.5 System / Local Area 

"**Local Area**" will display a graphic representation of all the cards inserted in the chassis and the real-time status of all LEDs (this display is also the default 'Home' page of the web interface).

Link states are shown with green LEDs. Flashing LEDs also indicate that there is traffic on the interface. Alarm LEDs are shown in RED. When any loop back test is being performed, the 'LB Test' LED will also be shown in RED.

When a 'Power' LED is not lit, it indicates that this converter has been disabled through software. You can click on any card and be taken directly to its management page. Please refer to **Appendix A** for all the detailed operation of the individual cards.

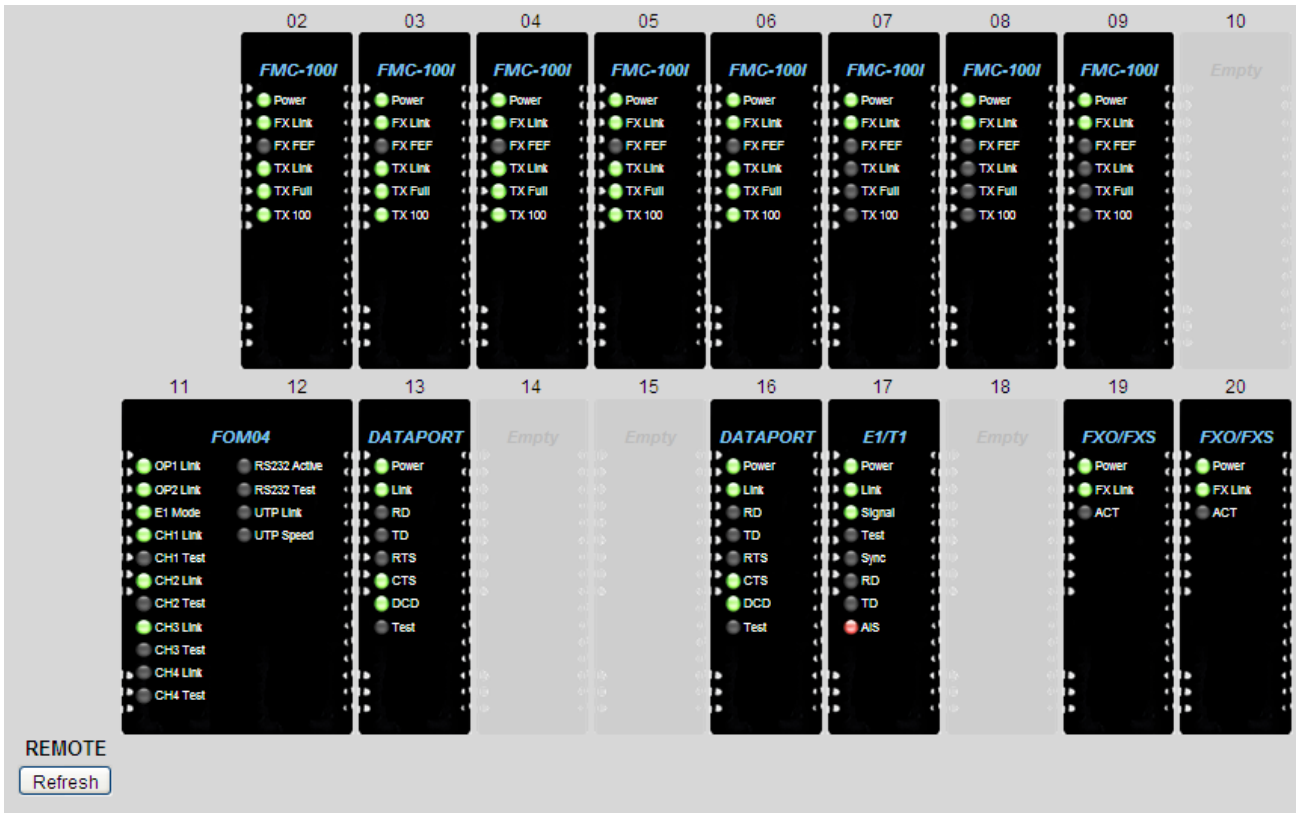


The graphic indicators at the bottom of the display show the real time status of the two Power Modules and the two chassis fans. An error in any of these will result in the effected icon's LED blinking in RED.

3.2.2.6 System / Remote Area

Remote Area

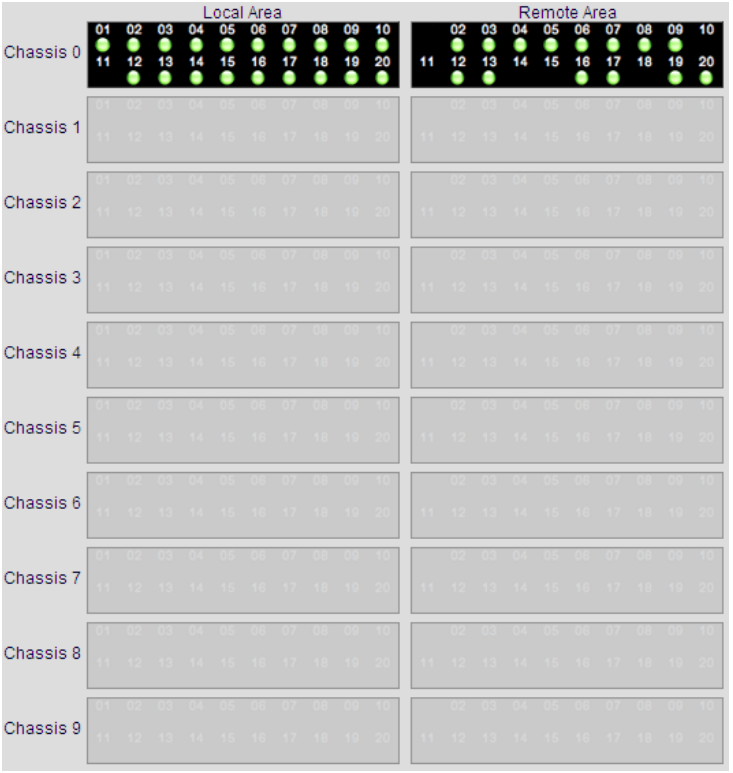
The "**Remote Area**" will give a graphic representation of all the remotely connected stand-alone converters. The following graphic shows all of the remote converters available through the in-band management. Click on any card to enter into the configuration graphic screen for that converter. Refer to **Appendix A** for each card type.



3.2.2.7 System / Overview Area

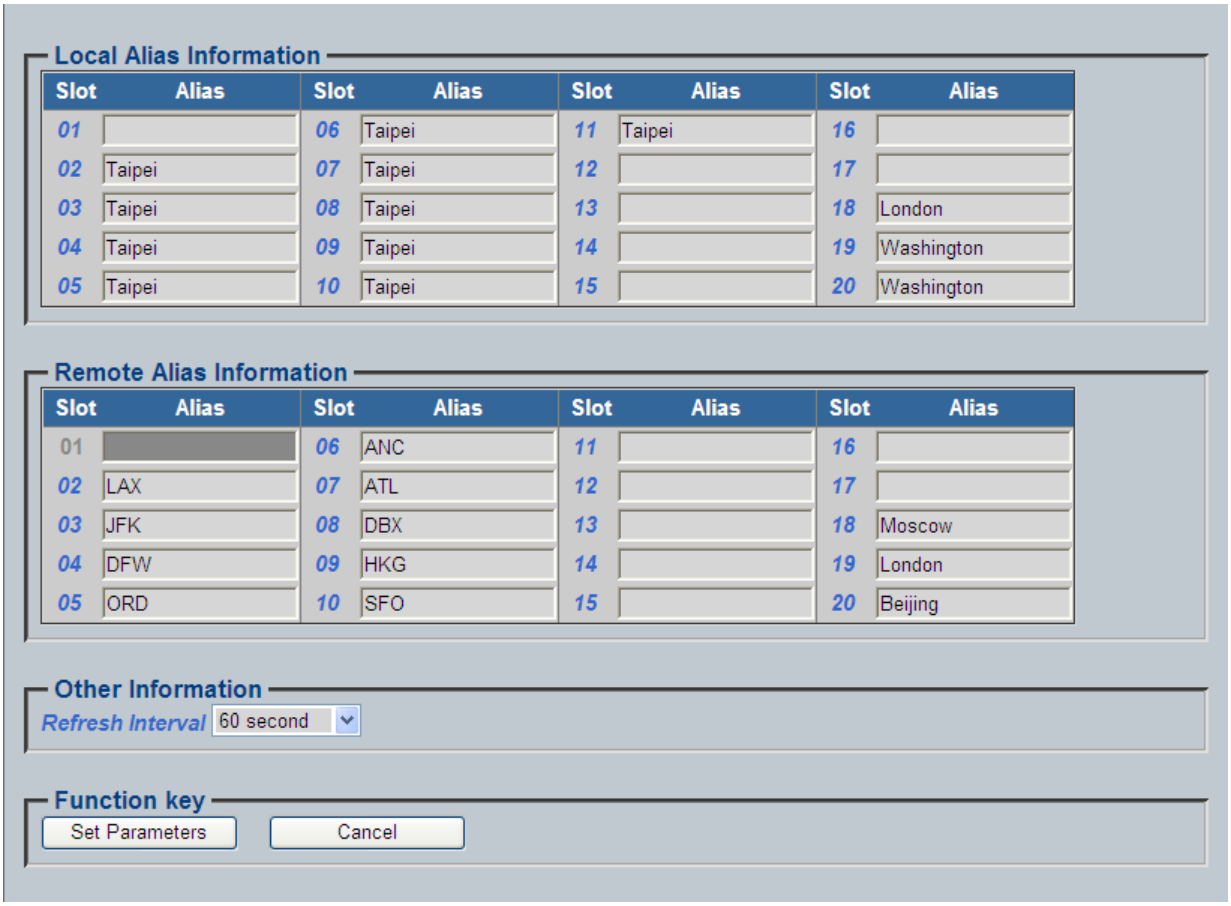
Overview Area

The "**Overview Area**" will give a quick link alarm indication of every card in all 10 managed chassis of a cascaded system. If there is no link to a remote, no LED will be displayed. A RED LED indicates an alarm for that card or remote.

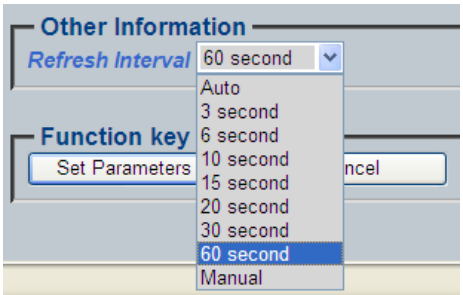


3.2.2.8 System / Properties

The "**Properties**" page allows setting naming information for each local and remote converter along with the "**Refresh**" rate to redraw the browser screen. The name entries are also capable of supporting Unicode characters. The naming space allows up to 10 ASCII characters or 5 2-Byte (Chinese) characters.

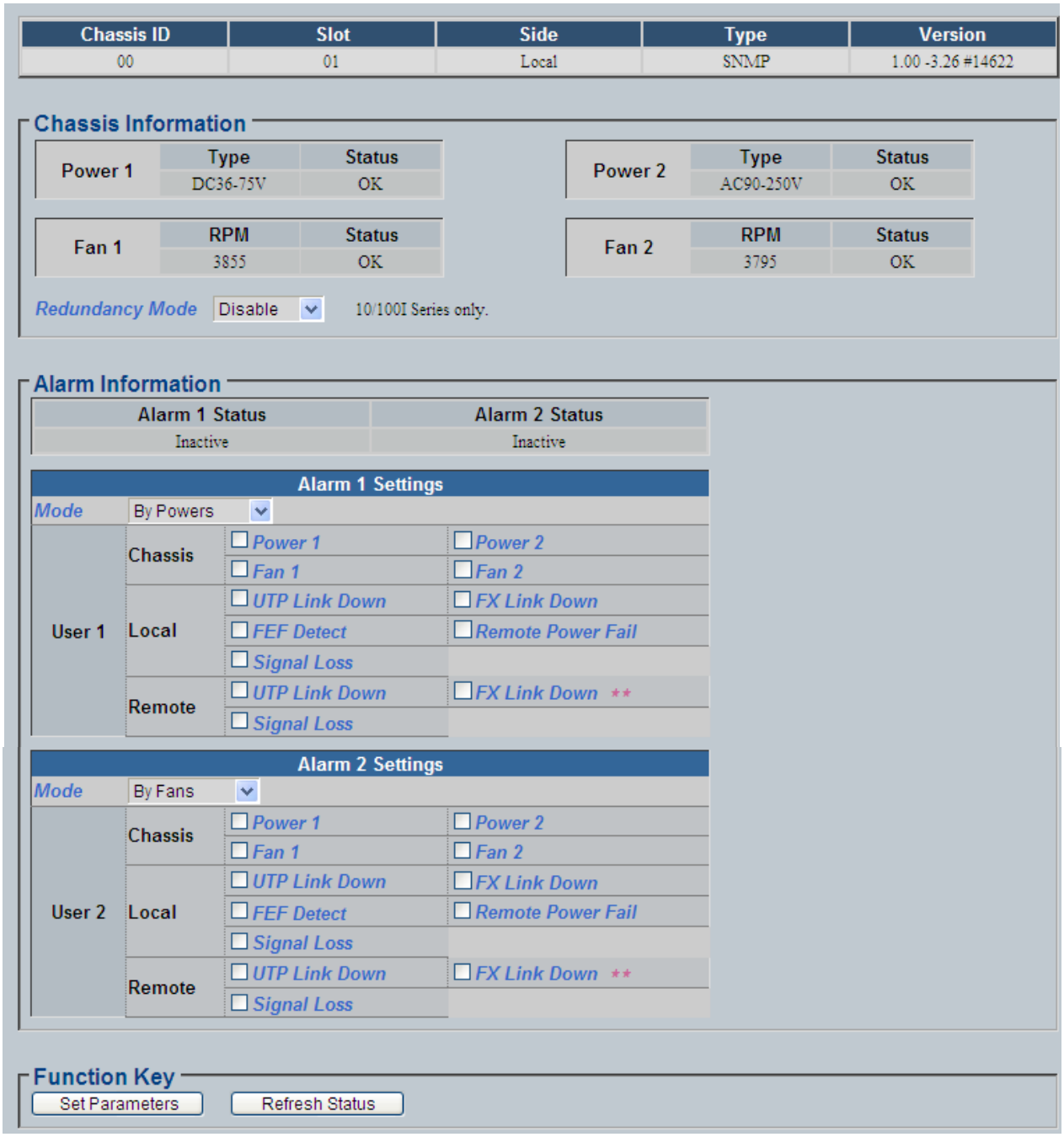


The "**Refresh**" rate setting is used to set the reload interval for the browser screen. On lower bandwidth management links it is better to set the refresh rate longer or even to 'Manual'.



3.3.2.9 SNMP + Chassis

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



Header

The top header displays the chassis ID (0 for the master chassis, 1~9 for cascaded slave chassis), the slot number for NMC is always 1, NMC is always in local and the version displayed in the format h/w-s/w. In the above example, the NMC hardware version is 1.0 while the software version is 3.263 and kernel build 14622.

Chassis Information

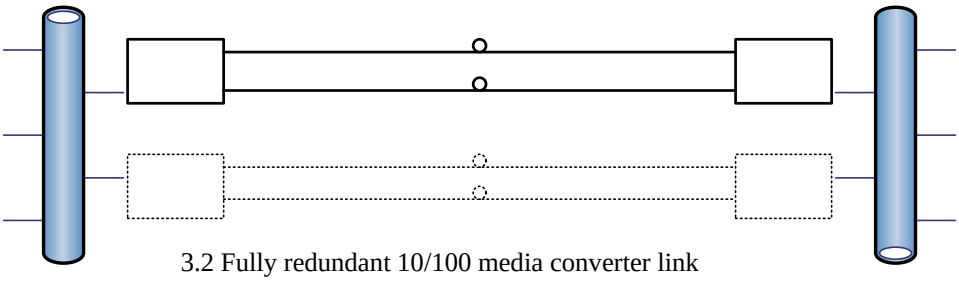
The Chassis Information group displays the power supply types and the power and fan status. There are slots for installing one or two power modules. They may hold either AC or DC type modules. Power 1 refers to the module installed in the left slot as viewed from the rear of the chassis, while Power 2 refers to the right slot. An OK status indicates the power module is working within normal parameters. Fan status is indicated with both the current RPM (speed) of the cooling fans and with a status of OK or Failed. If the RPM of the fan falls below 1650RPM, a failed status will be indicated.

Redundancy Mode

Caution: Exercise extreme care and do not enable this mode unless you know what you are doing.

The redundancy feature is a special operation mode designed only for **FRM220-10/100i** in-band managed cards. This mode allows the converter cards to be paired for redundancy. If either local or remote converter or fiber becomes disconnected, the data path will fallback to the secondary converter/fiber pair. Referring to the following diagram, each link requires two completely redundant converters and fiber links. The active link is shown in bold, the standby link is grayed out. Note that any switch can be used as the NMC controls which path is active. A L2 switch with VLAN function or Spanning Tree is NOT required for this application.

Upon sensing a downed link, the alternate path is automatically promoted to the active state.

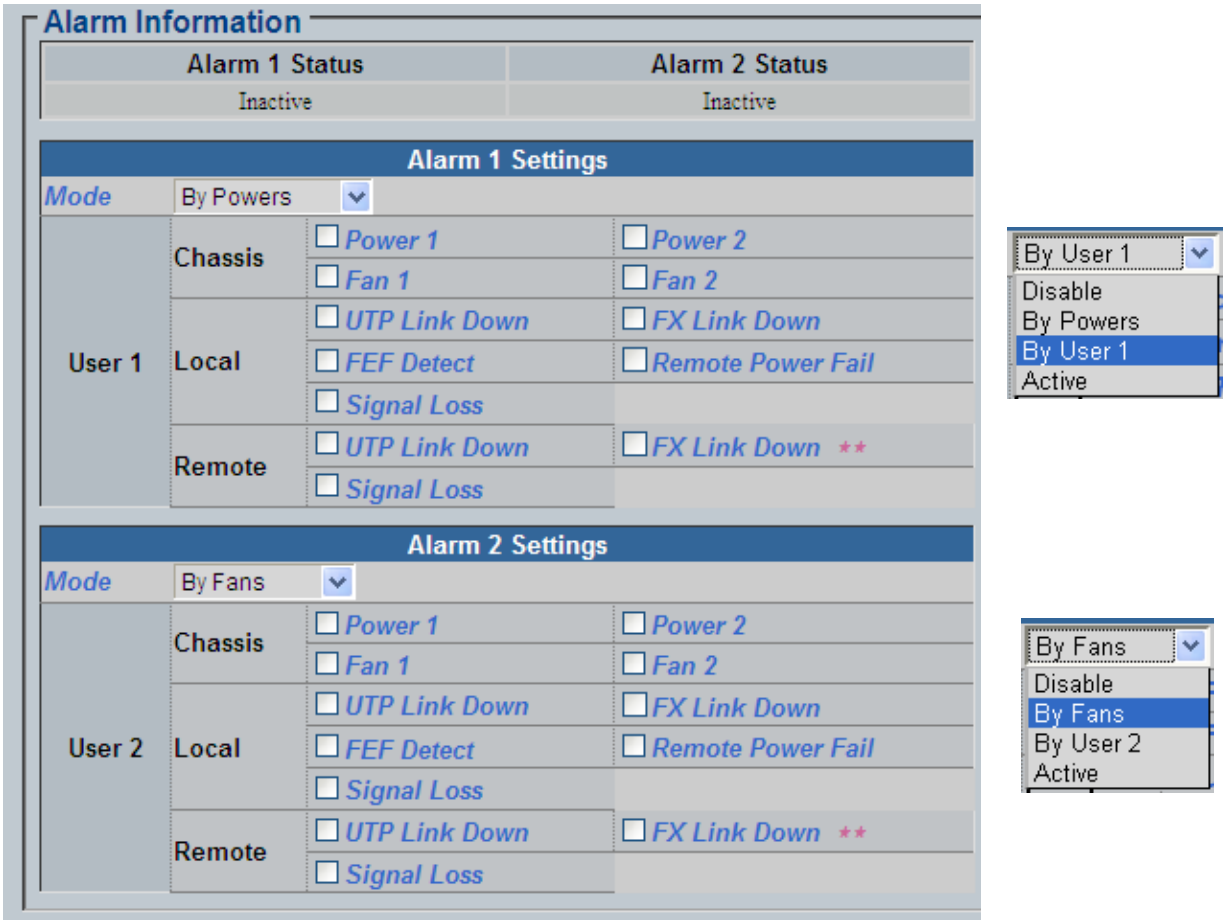


3.2 Fully redundant 10/100 media converter link

A fully loaded chassis can provide 9 pairs of redundant links. The screen graphic below shows the odd-even channel pairing (in the highlighted bars). Only one channel in the pair will be active at any time. The pairs are 3-4, 5-6, 7-8, 9-10, 11-12, 13-14, 15-16, 17-18 and 19-20. These pairs are fixed and cannot be changed, so insert the paired cards accordingly into the chassis. Slot 2 cannot be used in redundancy mode.

Switching will occur when NMC polling indicates an active 10/100i has experienced any fiber link, UTP link or FEF fault. The switch over should occur within 6-10 seconds of actual fault occurrence. As traffic is switched to a different pair, any connected switch will need to re-learn the MAC and generate new tables before normal filtering will be re-established.

Alarm 1 & 2 Settings



Alarm 1 Mode can choose Disabled, By Powers, By User 1 or Active from the drop-down menu. If disabled, no condition will cause the Alarm 1 relay to close or become active.

When selecting the "By Powers" option, the Alarm 1 relay will be closed on any single power failure. The "By User 1" option is used in conjunction with the "Chassis", "Local" and "Remote" User check boxes. User setting allows configuring custom alarm conditions. These alarm settings are also used to send SNMP traps. Therefore, the settings are not only important for the alarm relays but also for SNMP management as well.

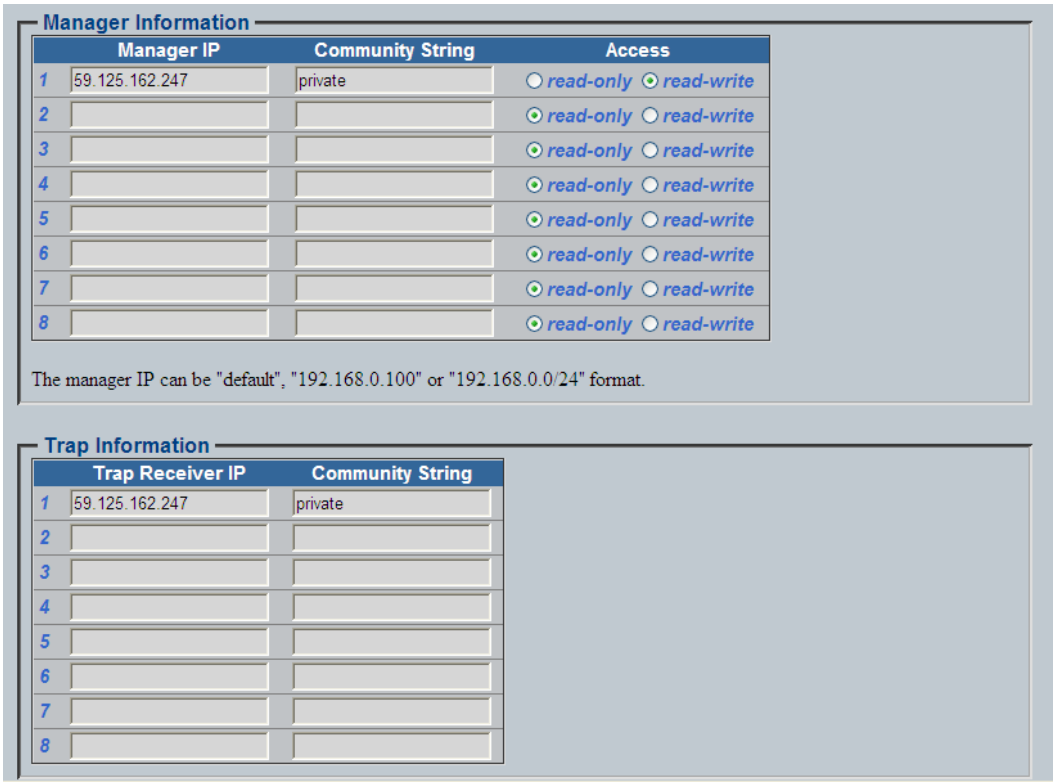
The "Active" setting will close the Alarm 1 relay for testing purposes. Set it back to any other mode after test.

Alarm 2 Mode can choose Disabled, By Fans, By User 2 or Active from the drop-down menu. If disabled, no condition will cause the Alarm 2 relay to close or become active.

When selecting the "By Fans" option, the Alarm 2 relay will be closed on any single fan failure. The "By User 2" option gives any user selectable fault option to be assigned to the Alarm 2 relay. The "Active" setting will close the Alarm 2 relay for testing purposes. Set it back to any other mode after test.

Note: The UTP remote UTP and Fiber link status monitoring and Remote Power Fail (dying gasp) only apply to OAM cards. (10/100i, 10/100A, 1000EAS). Signal loss only applies to the E1/T1 card. Remote power failure only works with in-band cards that support dying gasp.

3.3.2.10 SNMP + Chassis / Manager Setup



Please note the following when setting the Manager's IP:

1. Using the word 'default' will allow any IP address to manage the rack. They will be assigned the access authority per the assigned community string and radio button setting, read-only or read-write.

2. When using the subnet delimiter (/8 /16 /24, etc.) the entire subnet can be allowed management rights.

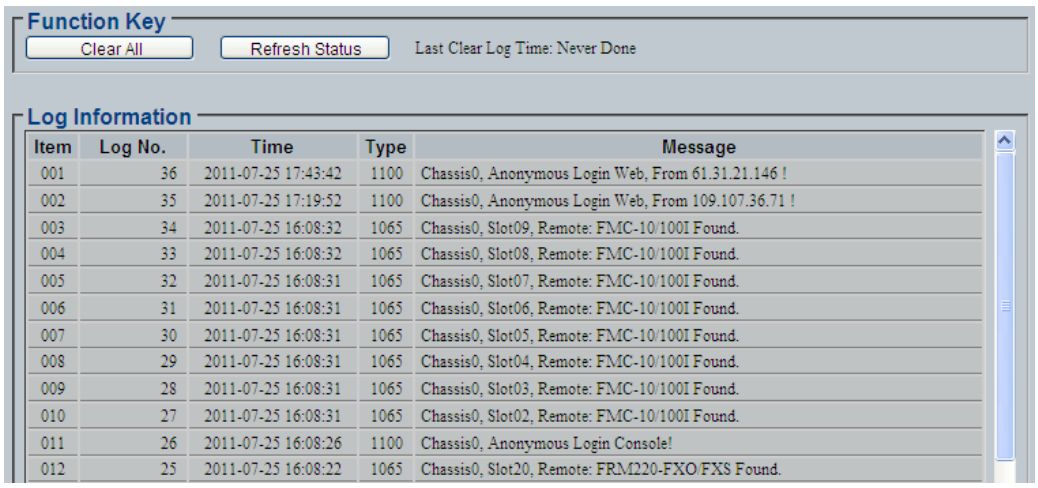
3. When assigning only a single IP address for management, use the /0 subnet.

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

3.3.2.11 SNMP + Chassis / NMC Log

The NMC maintains a System Log buffer with the last 255 log messages. Each new message is assigned a new and consecutive log number. The last 255 messages are available for view through the NMC Log page of the Web interface.

Pressing the "Clear All" button will delete all of the displayed alarms and reset the Log number to one.

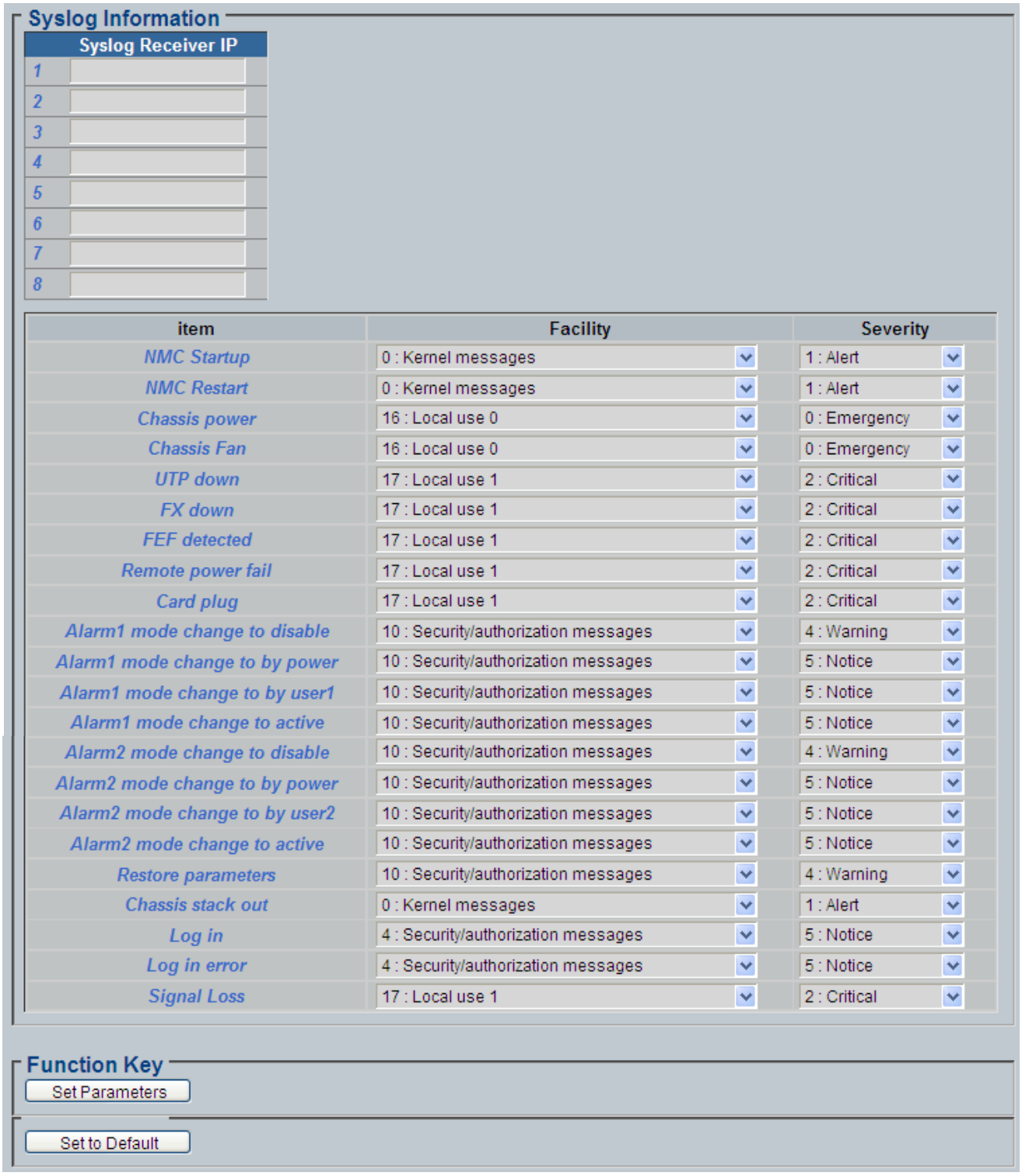


3.3.2.12 Syslog Setup

Syslog is a standard for logging program messages and is now standardized within the Syslog working group of the IETF. Syslog allows separation of the software that generates messages from the system that stores them and the software that reports and analyzes them.

Syslog, in NMC, can be used for security auditing (login) as well as generalized informational (link down), analysis, and debugging (loop back) messages. The syslog function of NMC can be used to integrate log data into a central repository.

Each alarm item in the NMC is assigned a specific “Facility message” and then is further assigned a Severity (Emergency, Alert, Critical, Error, Warning, Notice, Info or Debug) by NMC. Generated alarms are then sent to syslog server. There are 8 (eight) entries available for Syslog receiver IP addresses.



Chapter 4 Troubleshooting

4.1 Network Settings

4.1.1 Review Agent Settings

During unit startup, the "SNMP" LED will light as the agent boots up, and then it should blink at about one cycle per second after boot up and during normal operation. Refer to Chapter 2 section 2.2.5 TCP/IP Configuration for the SNMP agent settings. Be sure you have a valid IP address for the attached network, that the subnet mask is properly set and that the default gateway is set if you wish to manage the FRM220 from a remote network.

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

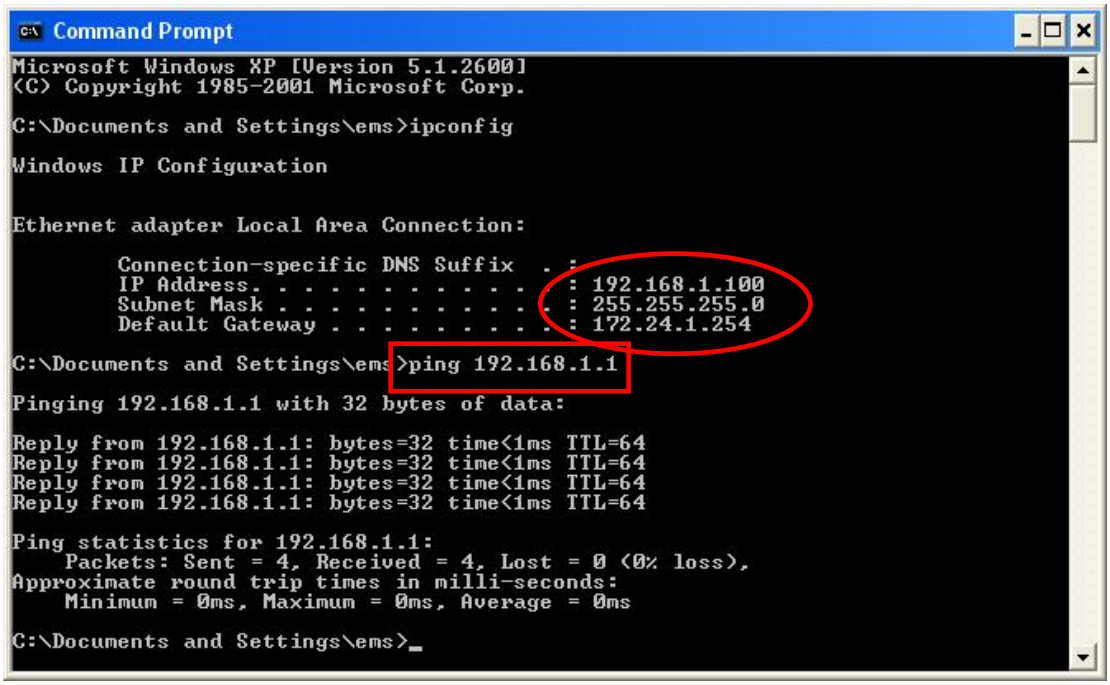


Figure 4.1 Ping

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

4.1.2 Review Manager Settings

For SNMP management software to connect to the FRM for management, the FRM's NMC must be properly configured with the manager's IP address and authorized for read/write (via community string setting) and trap messages. Review the settings explained in 2.2.5 TCP/IP Configuration.

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

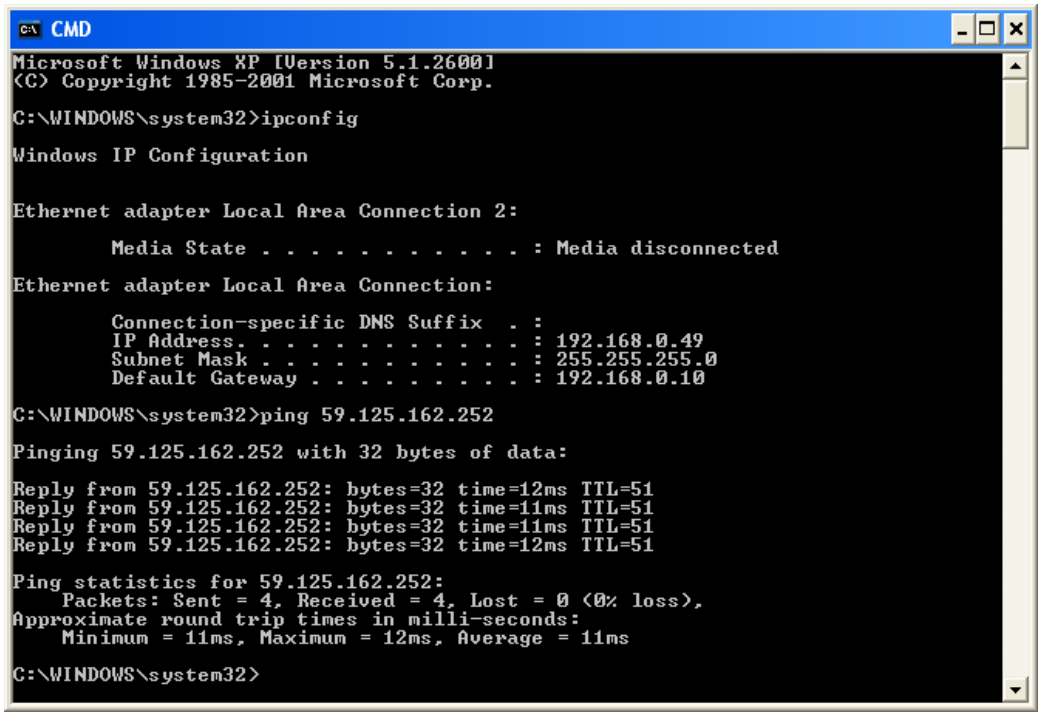


Figure 4.2 Ipconfig and Ping Remote Network Device

Check with your network administrator to ensure that any firewalls in place will allow passing of SNMP protocol in order to connect with an FRM on a remote network. By default SNMP uses port 161. Traps are unsolicited UDP messages that are sent out port 162.

Always check all connections and double check all configurations. We have tested the FRM220 extensively on local networks, on remote networks through bridges and routers and even over wireless links. You should not experience any problems if you follow each and every step in this guide. We hope you enjoy using the FRM with SNMP option and web based GUI manager.

Trouble with NAT

Because SNMP uses UDP, NAT between networks will not allow forwarding packets unless specific port forwarding rules are written into the firewall. If the NMC is on a public network and the manager workstation is behind a NAT firewall, then there is no way for traps to reach the manager (the firewall will block them). The alternative is to setup port forwarding on the network's firewall so that the traps on UDP port 162 are redirected to the internal SNMP management workstation.

Appendix A. FRM220 Cards Options

A.0 Introduction

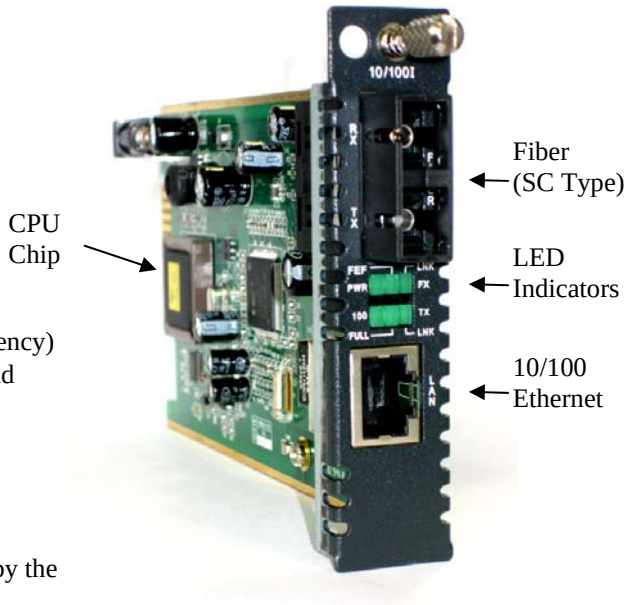
The ***FRM220*** In-Band Managed Media Converter Chassis is designed to accept a variety of optical to electrical or optical to optical converter cards. As cards are added, this section will be updated with the relevant information for the new cards. The management interface and all cards support software upgrading so that new cards and new features may be added at any future date. Please refer to Chapters 2&3 for details on the upgrade method and procedures for operating the ***FRM220 NMC***.

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

The FRM-10/100i (in-band converter) is an 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



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.

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)

A.1.1 Functional Details

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 parameters. 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. When using console port, both local and remote unit can be configured and monitored.

An additional model, 10/100iD model is available that adds a 4 pole DIP switch. However, this switch can only support the settings of auto or forced mode on the Ethernet UTP and enabling LFP. If placed in managed rack, the switch is ignored.

Operation Modes

The default operational mode for the FRM220-10/100i is **'switch mode'**.

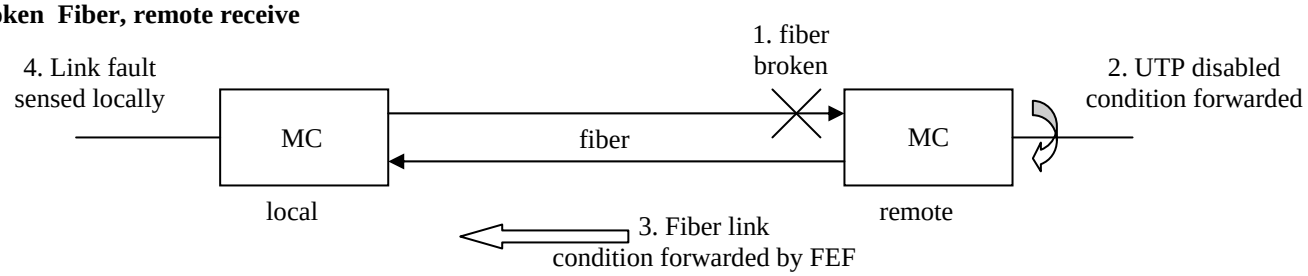
When the MC works in **'switch mode'** mode, it does not begin to forward a packet to a destination port until after the entire packet is received. The latency therefore depends on the packet length. The maximum packet length supported is up to 2046 bytes in this mode. Different from a normal switch chip, the MC's chip supports forwarding IEEE802.3x pause frame or 'flow control'. In **'switch mode'** the MC operates with a 'store & forward' method that supports a 1K MAC address table. The UTP side may be 10 or 100 speed and in full or half duplex, while the fiber side always runs in 100Base, full duplex.

In **'converter mode'**, the MC operates with low latency. The transmission does not wait until the entire frame is received, but instead it forwards the received data immediately. Both transceivers (UTP and Fiber) in the MC are interconnected via the OAM (Operation, Administration and Maintenance) engine while the internal switch engine and data buffer are not used. The MC filters OAM frames and supports 9KB jumbo packet in this mode. Again, the switch engine is disabled in this mode and the UTP must be 100Base, Full Duplex to match the fiber's 100Base-Full Duplex.

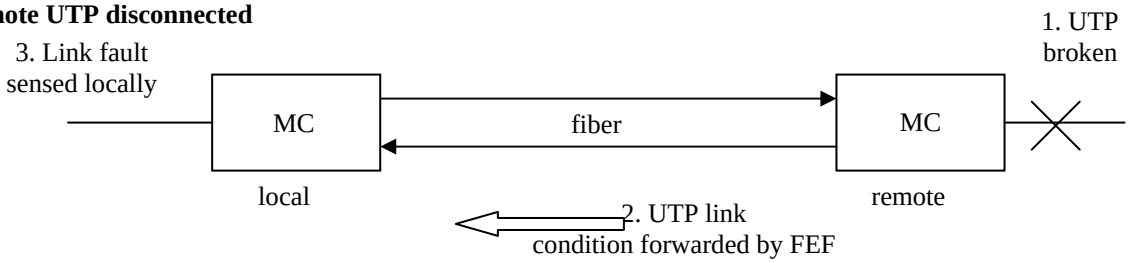
Link Fault Pass Through (AKA LFP)

This media converter incorporates a Link Fault Forwarding feature based on standard IEEE802.3u which allows indirect sensing of a Fiber or UTP Link Loss via both the 100 Base-TX UTP and 100Base-FX connections. When this feature is enabled and the media converter detects a Link Loss condition on the Receive fiber (Fiber LNK down), immediately sends a standard IEEE802.3u Far End Fault code by Transmit fiber to the remote converter and it disables its UTP transmitter so that a Link Loss condition will be sensed on the receive UTP port. (See the following figure) The link loss can then be sensed and reported by a Network Management agent at the host equipment of local and remote UTP port and at the local fiber port. This feature is disabled by default.

Broken Fiber, remote receive



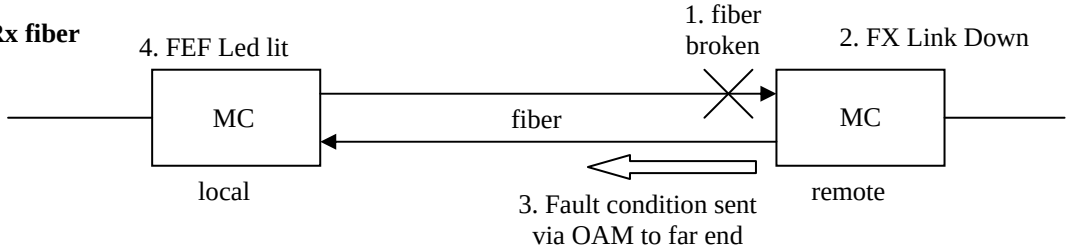
Remote UTP disconnected

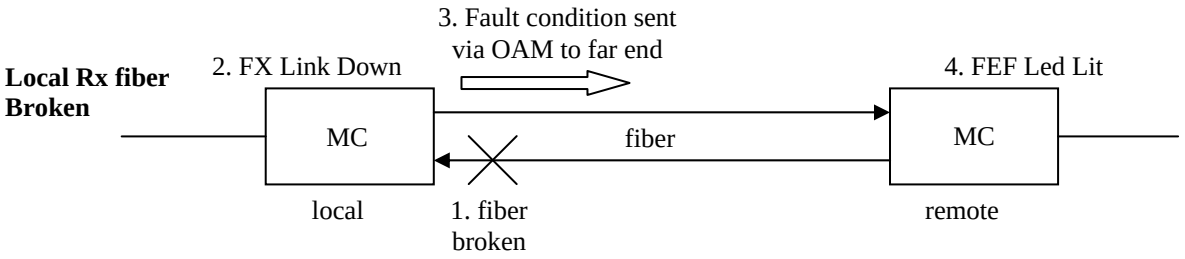


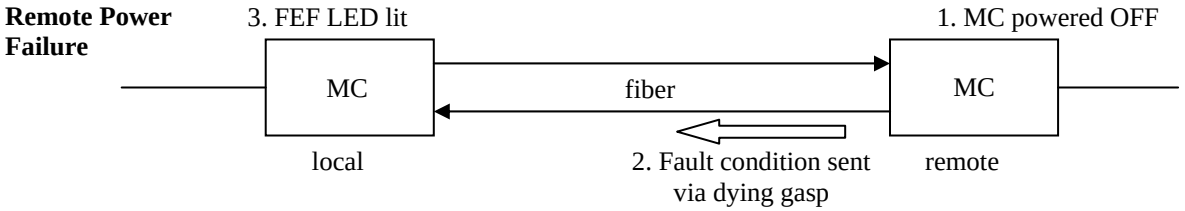
Far End Fault (FEF)

The Far End Fault or FEF feature is a built-in part of the OAM. Besides alerting the local MC of a remote fiber receive transmission break, the FEF is also used in reporting remote power failure or dying gasp.

Remote Rx fiber Broken







LED Status Indicators

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

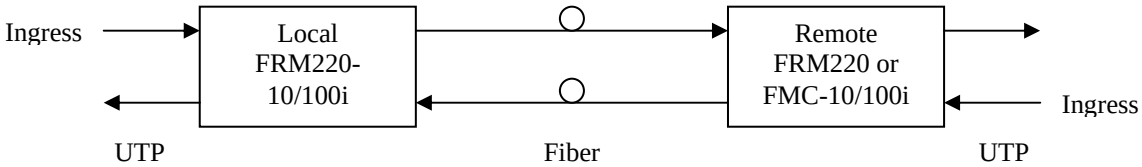
Bandwidth Control

The bandwidth control in this converter is settable in granules of 32Kbps or 512Kbps. In the user interface we define 'Ingress' as traffic flowing from electrical to optical and 'Egress' as flowing from optical to electrical. The actual mechanism uses egress with pause flow control at both ports of the switch. Flow control allows reasonable bandwidth control of layer 7 applications (FTP, WEB, etc.) without dropping packets.

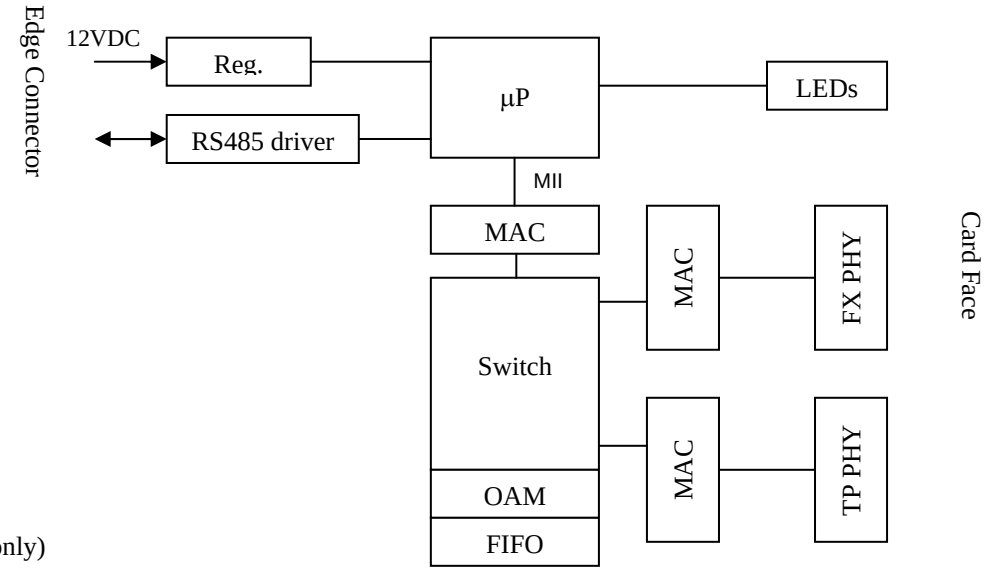
The settings for bandwidth control should be refined to follow the below setting suggestions.

1. Only use the Ingress setting and leave Egress set to unlimited.

2. For two way bandwidth control, set Ingress rate at CO side and at Remote side individually to attain 2-way bandwidth control.



A.1.2 Block Diagram of 10/100i



(For reference only)

A.1.3 FRM220-10/100i Console Configuration

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

```
This Chassis ID:[00]  Cascaded:[Yes]    Monitored Chassis ID:[00]
SLOT #02 > FRM220-10/100I       [Local ] [ Ver:1.100-1.279-0.000-0.000 ]
<1>: Port Active:[Enable ]
     UTP Link:[Up  ]  Rx Active:[On ]
<2>:     Negotiation:[Auto  ]
<3>:     Speed:      [100 ]
<4>:     Duplex:     [Full]
     FX  Link:[Up  ] Rx Active:[On ] FEF:[Off     ] Remote PWR:[OK      ]
<5>:     Loop Back Test:[Off   ]  Status:[----]
<6>: Operation Mode:    [Switch   ]
<7>: Ingress Rate Limit(IRL) Mode: [No Limit] [100.0M]
<8>: Egress Rate Limit(ERL) Mode:  [No Limit] [100.0M]
<9>: Link Fault Pass Through(LFP): [Disable]
<A>: Auto Laser Shutdown(ALS):     [Disable]
<B>: Send Remote Hardware Reset <M>: In Band Management:[Enable ]
<C>: Port Reset     <K>: Set to default
     Small Form Pluggable(SFP):[No ]  Digital Diagnostic(D/D) Function:[No]
<D>: Go to the D/D Functions menu. <N>: Go to the Remote menu.
<ESC>: Go to previous menu. Please select an item.
```

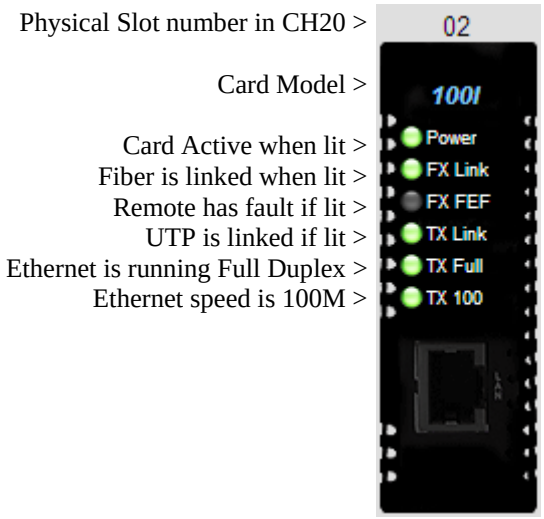
The chassis ID in a stacked set is shown on the first line.
The next line shows the slot number, card type, location and version. In this example the card's hardware version is 1.100 and the firmware version is 1.279.
<1> When the port is disabled, the PHY becomes inactive and all Ethernet traffic will be blocked.
<2> **<3>** **<4>** Control the auto-negotiation (n-way) and forced mode Ethernet settings.
<5> Performs an OAM loop back test, non-intrusive to client's transmitted data (i.e. no traffic is blocked).
<6> Configures the MC between either switch mode (store & forward) or converter mode (jumbo frame support).
<7> Sets a rate limit on packets passing from UTP to Fiber in either multiples of 32K or 512K
<8> Sets a rate limit on packets passing from Fiber to UTP in either multiples of 32K or 512K
<9> Enables or disables the Link Fault Pass-Through (LFP) function
<A> Enables or disables the Auto Laser Shutdown (ALS) function.
<B> Send a hardware reset to remote unit via fiber (must enable reception from the remote side first)
<C> Performs a reset on the local switch port.
<D> View the transceiver's digital diagnostics (DD) if available. (only for SFP modules that support DD function)
<N> Go to manage the remote via OAM.
<**ESC**> Escape back to previous menu.

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

```
This Chassis ID:[00]  Cascaded:[Yes]    Monitored Chassis ID:[00]
SLOT #02 > FRM220-10/100I       [Remote] [ Ver:1.100-1.279-0.000-0.000 ]
     Port Active:[Enable ]
     UTP Link:[Up  ]  Rx Active:[On ]
<2>:     Negotiation:[Auto  ]
<3>:     Speed:      [100 ]
<4>:     Duplex:     [Full]
     FX  Link:[Up  ] Rx Active:[On ] FEF:[Off     ] Remote PWR:[OK      ]
<5>:     Loop Back Test:[Off   ]  Status:[----]
<6>: Operation Mode:    [Switch   ]
<7>: Ingress Rate Limit(IRL) Mode: [No Limit] [100.0M]
<8>: Egress Rate Limit(ERL) Mode:  [No Limit] [100.0M]
<9>: Link Fault Pass Through(LFP): [Disable]
<A>: Auto Laser Shutdown(ALS):     [Disable]
<B>: Accept Remote Hardware Reset: [Disable]
<C>: Port Reset     <K>: Set to default
     Small Form Pluggable(SFP):[No ]  Digital Diagnostic(D/D) Function:[No]
<D>: Go to the D/D Functions menu. <N>: Go to the Local  menu.
<ESC>: Go to previous menu. Please select an item.
```

When managing the remote converter, the port cannot be disabled. To do so would put it to sleep forever as it cannot be awoken by any OAM command once the fiber is down. Therefore, no port disable option is provided in the remote. It really is no problem as you can always disable the link from the CO side, which is preferred anyway.

A.1.4 FRM220-10/100i Web Based Configuration



The above graphic represents a single slot in the FRM220. The entire chassis with all slots will be displayed in the 'Local Display' view. Double click on any slot to go to the management page for that particular converter card.

A.1.4.1 Header

The header information shows the current chassis ID, Slot, Side, Type and Version.

Chassis ID	Slot	Side	Type	Version
00	02	Local	FRM220-10/100I	1.100-1.279-0.000-0.000

Chassis ID

The chassis with management IP address is the first or ID zero chassis. From this NMC, up to 10 chassis may be managed using only a single IP address. Chassis ID are numbered from zero to nine.

Slot

The slots in the chassis are numbered 1 ~ 20 from left to right when viewing from the front of the FRM220. The first slot is reserved for the NMC card. This card is required in every chassis, even in a cascaded stack. The slots for cards are numbered 2 ~ 20. The example above shows the card in slot 2 or the first available slot for interface cards.

Side

Because most of the cards for the FRM220 series support in-band management, the "Side" parameter lets the user know if he is in the management screen for the "Local" or in the FRM220 chassis or for the "Remote" or fiber connected stand-alone converter.

Type

The field just tells the type of card installed in the slot (for local) or attached by fiber (for remote).

Version

The version parameter is broken into four fields as follows: 1.100-1.279-0.000-0.000

The first field represents the **hardware version** (version 1.1 in this case), the second field shows the **firmware or software version** (version 1.279 shown here), the third field shows the **CPLD version** and the forth field the **FPGA version** where applicable. The 10/100i has no CPLD or FPGA so those fields are shown as zeros.

A.1.4.2 FX Information

The FX Information shows the current state and settings of the optical interface of the media converter.

Link	Rx Active	FEF	Remote PWR	LB Status	SFP	D/D
Up	On	Off	OK	Off	No	No

Link

This field represents the fiber link state, either 'Up' or 'Down'.

Rx Active

This field shows whether or not there is transmission activity on the receive fiber. With a connected pair and "In Band Management" enabled, this will be 'On'.

FEF

FEF or Far End Fault uses a combination of standard IEEE802.3u and OAM to detect faults originating from the remote or "far end" unit. If the remote has LLF enabled and its UTP link goes down, the local side will receive the FEF code and FEF will be 'On'. If the remote unit is powered off, the local will also receive FEF code as well as dying gasp (see Remote PWR).

Remote PWR

In a normal link this field will have a status of 'Ok'. If a remote converter experiences a power failure, it will issue a FEF in what is commonly referred to as "dying gasp" to the local unit. In this case the administrator will be able to distinguish between a fiber down from broken fiber or fiber down because of remote power failure.

LB Status

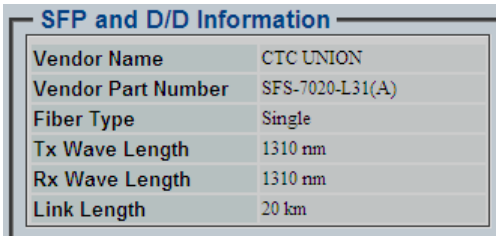
The 'loop back' function of this converter uses OAM and an echoed pattern to test the transmission connection and quality. By using only the OAM frames, the loop back functions runs non-intrusively without affecting any normal traffic on the Ethernet fiber link. When this status is 'OK', it indicates the OAM loop back is running without error. A 'Failed' status indicates that loop back is active but the loop back is failing. 'Off' indicates loop back is not running and is the normal condition.

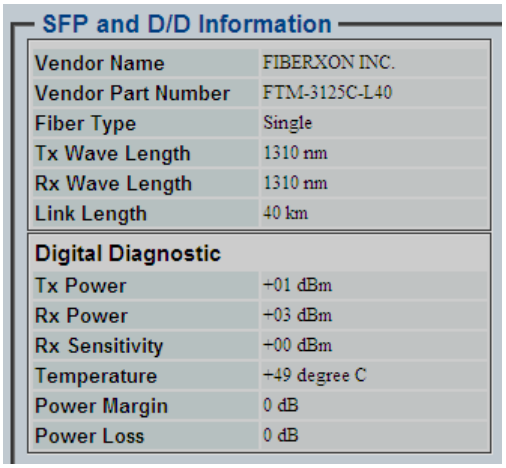
SFP

This field will be 'No' if the converter is using a standard fixed (1x9) transceiver and will be 'Yes' if the converter uses an SFP for optical connection (FRM220-10/100iS model).

DD

Digital Diagnostics is an extended function of SFP modules that is specified in MSA (Multi-Source Agreements). Standard information that can be read from SFP includes the manufacture's name, model and serial number of the SFP. DD includes real time values for transmit and receive power and temperature within the SFP.





Examples of SFP without and with DD function.

Port Active

Use this pull-down to select whether to enable or disable the state of the media converter. When disabled, all LEDs on the unit and in the Web GUI will be extinguished. This function is not allowed when managing the remote converter and will be 'grayed out'. To disable a link, the local or 'in-chassis' converter must have its port disabled.

Operation Mode

This pull-down chooses between switch mode and converter mode. When the media converter works in **'switch mode'** mode, it does not begin to forward a packet to a destination port until after the entire packet is received. The latency therefore depends on the packet length. The maximum packet length supported is up to 2046 bytes in this mode. Different from a normal switch chip, the media converter's chip supports forwarding IEEE802.3x pause frames. In **'switch mode'** the MC operates with a 'store & forward' method that supports a 1K MAC address table. The UTP side may be 10 or 100 speed and in full or half duplex, while the fiber side runs in 100Base, full duplex.

In **'converter mode'**, the MC operates with low latency. The transmission does not wait until the entire frame is received, but instead it forwards the received data immediately. Both transceivers (UTP and Fiber) in the MC are interconnected via the OAM (Operation, Administration and Maintenance) engine while the internal switch engine and data buffer are not used. The MC filters OAM frames and supports 9KB jumbo packet in this mode. Again, the switch engine is disabled in this mode and the UTP must be 100Base, Full Duplex to match the fiber's 100Base-Full. The default setting is switch mode for this media converter.

Link Fault Pass Through

This pull-down chooses between enabling and disabling the LFP function. The LFP function is explained in A.1.2. The default is disabled.

Auto Laser Shutdown

This pull-down chooses between enabling and disabling the ALS function. The default is disabled.

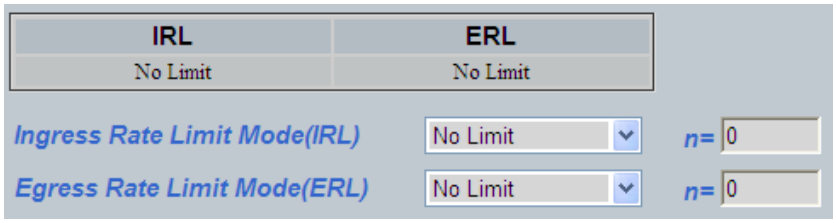
Loopback Test

Use this pull-down to activate the non-intrusive OAM loopback test function. Remember to turn it off when finished testing.

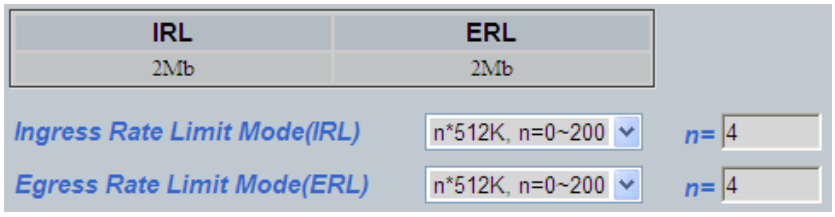
In Band Management

This pull-down is used to enable or disable the OAM (In Band Management) function. Once disabled the OAM maintenance frames will no longer be transmitted, while received frames will be ignored. Monitoring and managing of the remote converter will be disabled. The default setting for this function is enabled.

Bandwidth Limiting

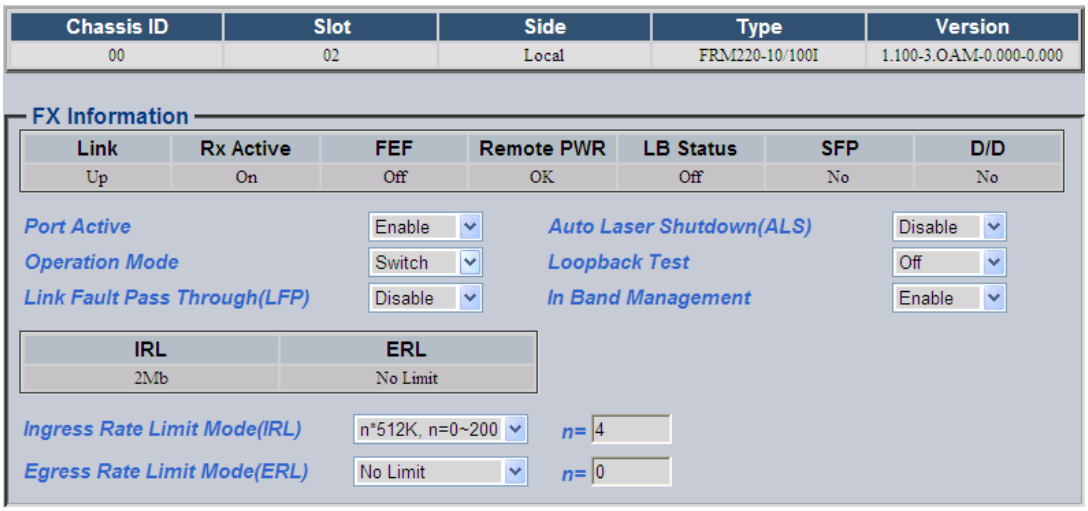


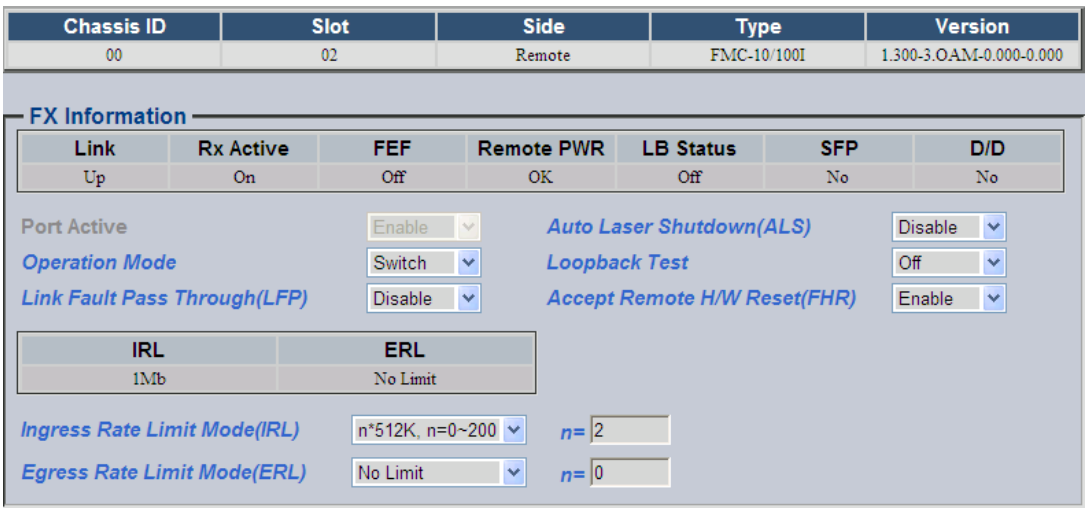
This converter supports both ingress (UTP to Fiber) and egress (Fiber to UTP) bandwidth control in granularities of 32K or 512K. This provides a very flexible and controllable bandwidth usage through the media converter. The default setting is with no limiting.



The above is an example of setting a 2Mbit bandwidth limit for both ingress and egress.

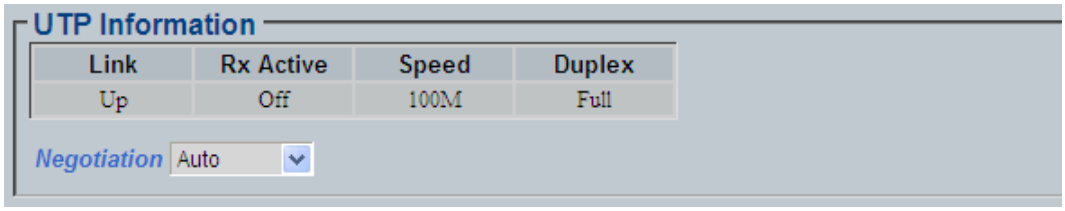
Note: Beginning with firmware version 1.240 in the 10/100i, whenever forced mode or bandwidth control are enabled, the flow control (802.3X) is disabled automatically on the fiber to avoid a traffic block caused by hanging of the IP113S switch chip in the 10/100i. Since this version, we recommend setting bandwidth at both local and remote converters and by adjusting Ingress only. The following example is a 2M download, 1M upload configuration. The local side set 2Mbps Ingress and the remote side set 1Mbps Ingress rate limits.

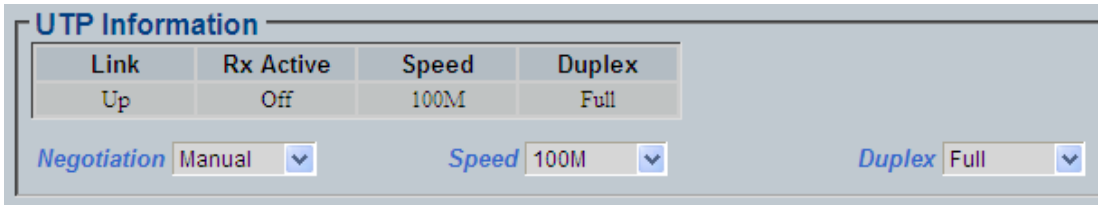




A.1.4.3 UTP Information

The basic link information can be viewed and the Ethernet parameters can be configured for forced mode here. The default setting is auto-negotiation enabled. Please be careful when setting manual or forced mode when connecting to another auto device to avoid performance killing duplex mismatch. Always connect auto to auto or set both connected interfaces to the same forced settings.

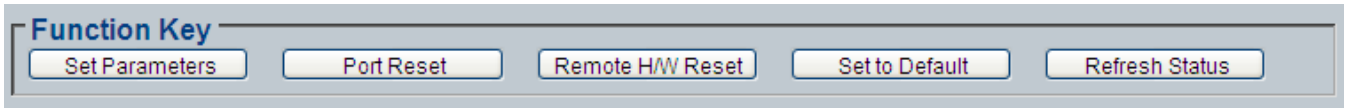




A.1.4.4 Function Keys

Set Parameters

This is the button used to actually set the parameters to the local or remote converter. The 'Set Parameters' button executes the changes while the 'Refresh Status' button displays the new parameters from the local or remote converter.



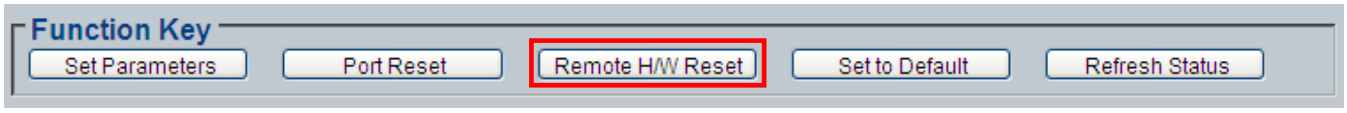
Port Reset

The port reset function does a reset of the switch chip of the converter. Normally this is not a function that should be used as it will cause a momentary traffic block, however, if after doing many different settings quickly and the chip becomes confused with those settings or hung, this will quickly bring it back. It is like a soft reset.

Remote H/W Reset

This function performs a software reset of the CPU on the remote converter. However, in order to perform the remote reset, the remote unit must first be set to allow the remote reset. The default remote setting is to disallow remote reset. Here is an example of configuring the remote to accept the hardware reset.

Click the 'Remote H/W Reset' once to have the remote do a soft restart.



Following a restart, the remote card should have a "Found" entry in the NMC log.

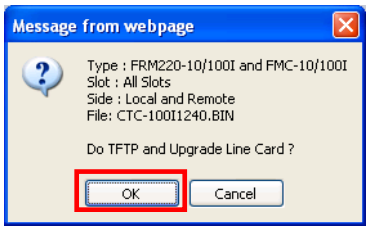
Set to Default

The ‘Set to Default’ button will return all fields to their factory default. The ‘Set Parameters’ button will then save those settings.

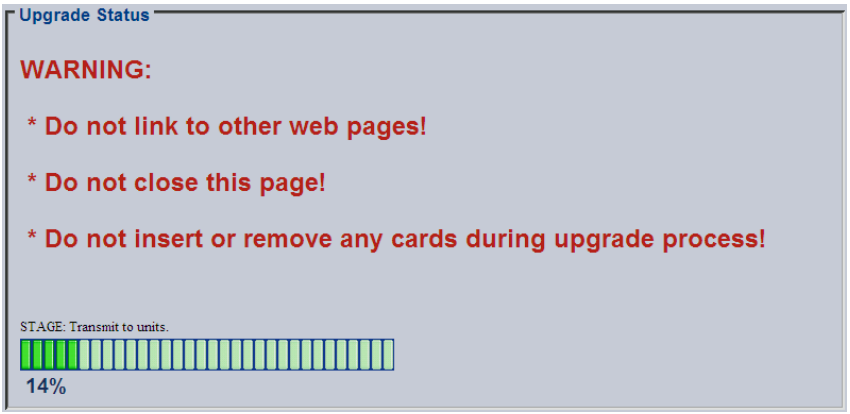
A.1.4.5 Firmware Upgrade

1. From the "System" menu click the "Upgrade Line Card" button.
2. Select the card type radio button, which in this case is the FRM220-10/100i and FMC-10/100i
3. Select the slot to update. Selecting "All Slots" will upgrade all local and remote 10/100i cards. (this may take up to 15 minutes)
4. If selecting an individual slot, you must also select either the local or remote unit.
5. The image file name needs to be keyed in. The TFTP server should be able to find this file and the "System" settings need to be correct (see Chapter 2, settings).
6. Click the "Upgrade" button to start the update.

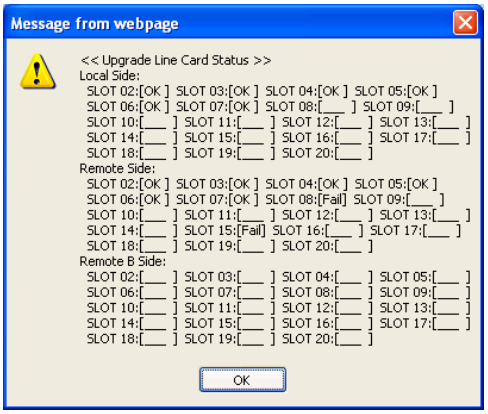
7. Click the "OK" button to confirm.



8. Heed the warning messages!!!!



9. View the success results

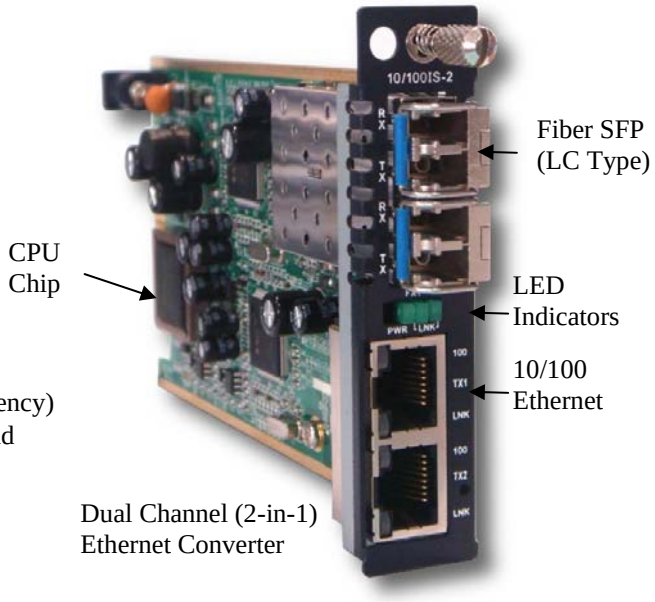


A.2 FRM220-10/100iS-2 Dual Channel In-band managed 10/100 Fiber Media Converter

The FRM-10/100iS-2 (in-band converter) is a 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



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.

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.

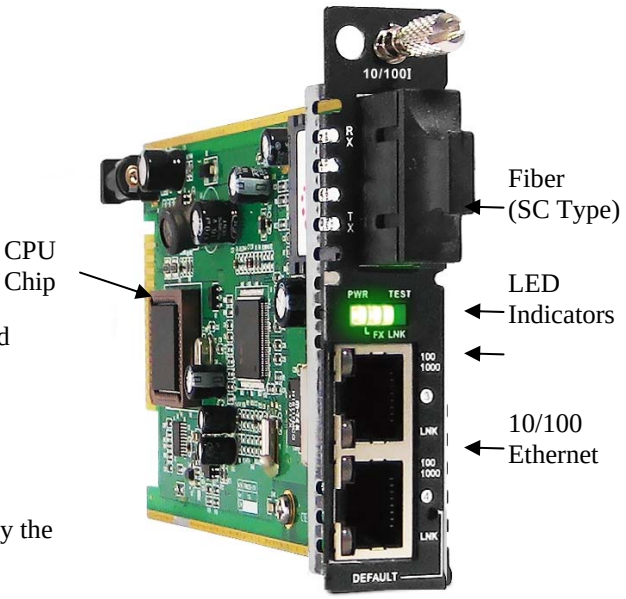
The management features for this card are identical to the 10/100i except that all functions are doubled on the dual independent channel card.

A.3 FRM220-10/100i-2E In-band managed 10/100 Fiber Media Converter

The FRM-10/100i-2E (in-band converter) is an In-band Managed (OAM) Fiber Ethernet media converter (MC) that supports 2 Ethernet channels of 10Base-T or 100Base-TX and converts to 100Base-FX (fiber). The UTP ports support auto-negotiation or forced settings for speed and duplex by setting as well as auto-MDIX. When the FRM-10/100i-2E is placed in the ***FRM220*** with NMC, the settings are controlled by the chassis management system. The remote FRM-10/100i-2E 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
- Supports optional Tag Based VLAN mode
- 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



10/100i-2E is a media converter that must be placed in FRM220-CH20 for management.
It utilizes fixed transceiver for 100Base-FX fiber connection and two 10/100 Ethernet electrical ports.

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)

A.3.1 Functional Details

Management

The 10/100i-2E 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 parameters. 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. When using console port, both local and remote unit can be configured and monitored.

Operation Modes

The default operational mode for the FRM220-10/100i-2E is **'switch mode'**.

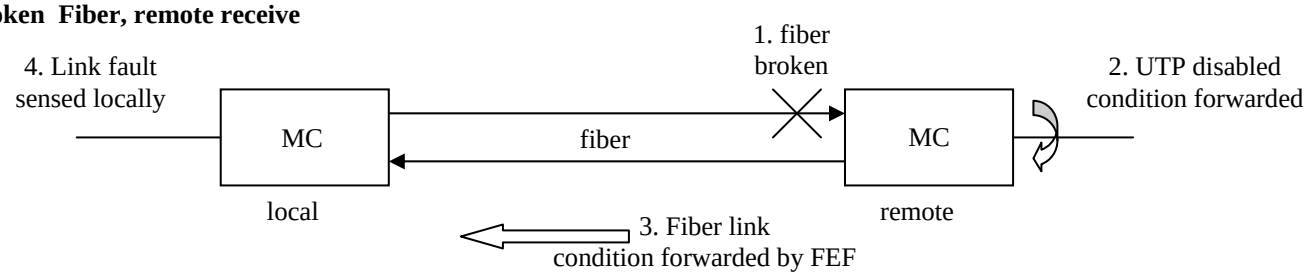
When the MC works in **'switch mode'** mode, it does not begin to forward a packet to a destination port until after the entire packet is received. The latency therefore depends on the packet length. The maximum packet length supported is up to 2046 bytes in this mode. Different from a normal switch chip, the MC's chip supports forwarding IEEE802.3x pause frame or 'flow control'. In **'switch mode'** the MC operates with a 'store & forward' method that supports a 1K MAC address table. The UTP side may be 10 or 100 speed and in full or half duplex, while the fiber side always runs in 100Base, full duplex.

In **'Tag Based VLAN mode'**, the MC is able to do VID tagging and untagging so that traffic between the two UTP ports can be isolated, sent over fiber, and then separated at the remote CPE between the two UTP ports. Each UTP supports setting a VID from 1 to 4094.

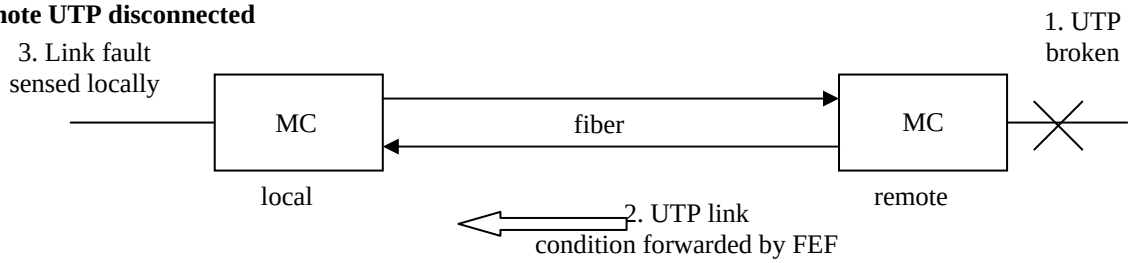
Link Fault Pass Through (AKA LFP)

This media converter incorporates a Link Fault Forwarding feature based on standard IEEE802.3u which allows indirect sensing of a Fiber or UTP Link Loss via both the 100 Base-TX UTP and 100Base-FX connections. When this feature is enabled and the media converter detects a Link Loss condition on the Receive fiber (Fiber LNK down), immediately sends a standard IEEE802.3u Far End Fault code by Transmit fiber to the remote converter and it disables its UTP transmitter so that a Link Loss condition will be sensed on the receive UTP port. (See the following figure) The link loss can then be sensed and reported by a Network Management agent at the host equipment of local and remote UTP port and at the local fiber port. This feature is disabled by default.

Broken Fiber, remote receive



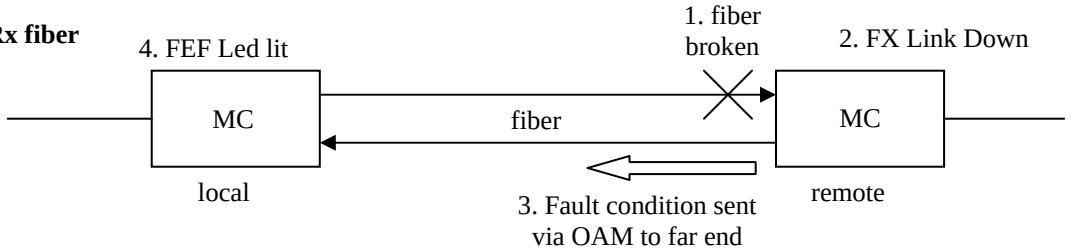
Remote UTP disconnected

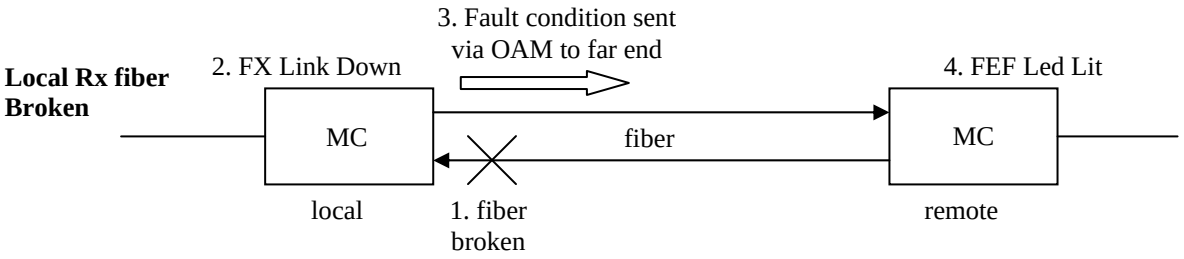


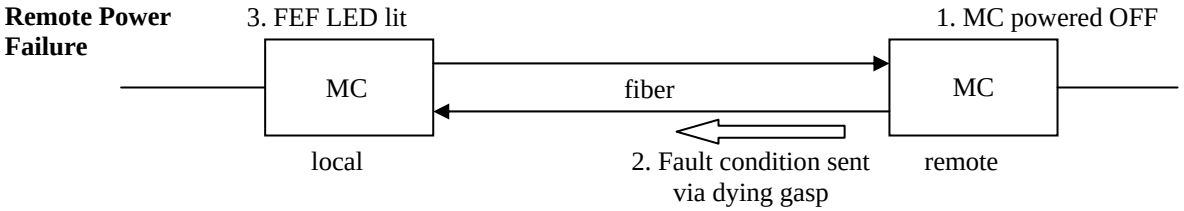
Far End Fault (FEF)

The Far End Fault or FEF feature is a built-in part of the OAM. Besides alerting the local MC of a remote fiber receive transmission break, the FEF is also used in reporting remote power failure or dying gasp.

Remote Rx fiber Broken







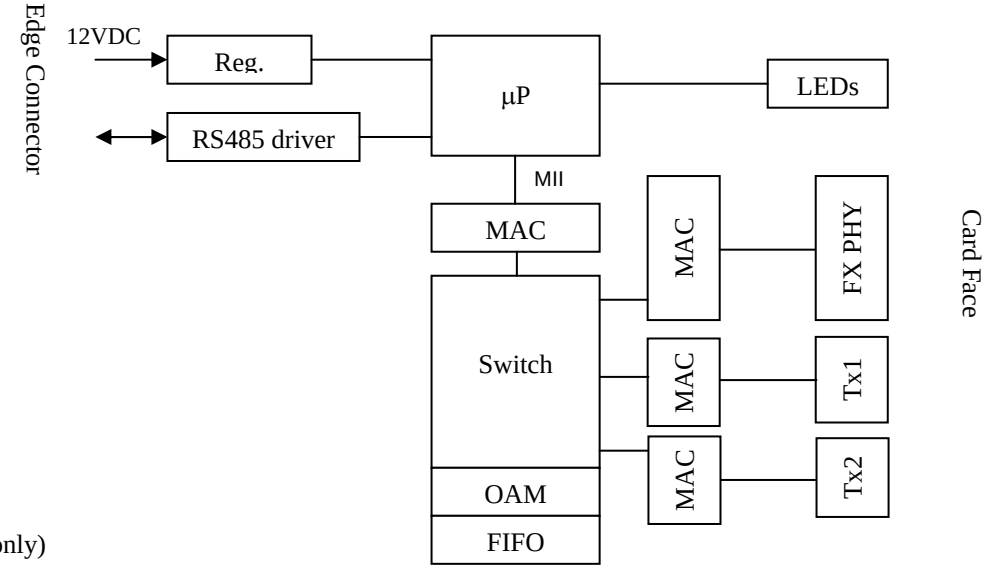
LED Status Indicators

LED	Function	State	Status
Power	Power indicator	On	Converter has power.
		Off	Converter has no power or has been disabled.
		Blinking	Card is being upgraded.
VLAN	VLAN mode	On	Indicates the media converter is set to Tag Based VLAN mode
		Off	Normal switch mode
FX Link	Fiber link	On	The fiber link is ok.
		Off	No link or the link is faulty.
		Blinking	Receiving data on the fiber.
Tx1 Link	Ethernet link	On	The UTP Port 1 link is ok.
		Off	No link or the link is faulty.
		Blinking	Receiving data on Ethernet.
Tx1 100M	mode display	On	UTP Port 1 is operating in 100Mbps mode.
		Off	UTP is operating in 10Mbps mode (or no link)
Tx2 Link	Ethernet link	On	The UTP Port 2 link is ok.
		Off	No link or the link is faulty.
		Blinking	Receiving data on Ethernet.
Tx2 100M	mode display	On	UTP Port 2 is operating in 100Mbps mode.
		Off	UTP is operating in 10Mbps mode (or no link)

Bandwidth Control

The bandwidth control in this converter is settable in granules of 32Kbps or 512Kbps. In the user interface we define 'Ingress' as traffic flowing from electrical to optical and 'Egress' as flowing from optical to electrical. The actual mechanism uses egress with pause flow control at both ports of the switch. Flow control allows reasonable bandwidth control of layer 7 applications (FTP, WEB, etc.) without dropping packets.

A.3.2 Block Diagram of 10/100i-2E



(For reference only)

A.3.3 FRM220-10/100i-2e Console Configuration

From the main menu of the FRM220 NMC console, select the slot number containing the 10/100i-2E line card.

```
This Chassis ID:[00]  Cascaded:[Yes]    Monitored Chassis ID:[00]
SLOT #09 > FRM220-10/100I-2E    [Local ] [ Ver:1.100-1.001-0.000-0.000 ]
<1>: Port Active:[Enable ]
<2>: UTP 1 Information and Settings.
<3>: UTP 2 Information and Settings.
     FX  Link:[Up  ] FEF:[Off     ] Remote PWR:[OK      ]
<4>: Operation Mode:    [Switch   ]
<5>: Link Fault Pass Through(LFP): [Disable]
<6>: Auto Laser Shutdown(ALS):     [Disable]
<7>: In Band Management:[Enable ]
<8>: Send Remote Hardware Reset
<9>: Port Reset
<A>: Set to default
     Small Form Pluggable(SFP):[No ]  Digital Diagnostic(D/D):[No ]
<D>: Go to Line Card Status menu. <N>:Go to the Remote menu.

Please select an item.
```

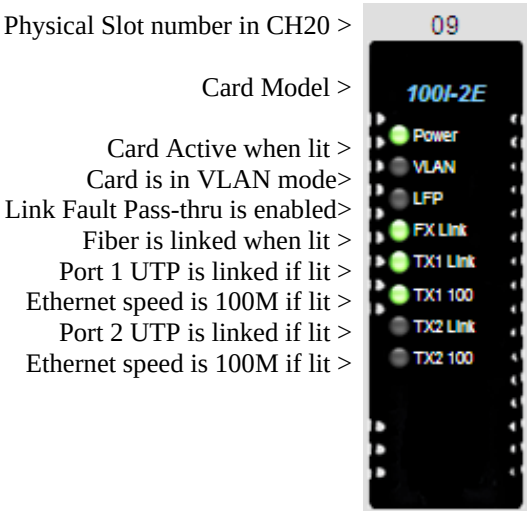
The chassis ID in a stacked set is shown on the first line.
The next line shows the slot number, card type, location and version. In this example the card's hardware version is 1.100 and the firmware version is 1.001.
<**1**> When the port is disabled, the PHY becomes inactive and all Ethernet traffic will be blocked.
<**2**> <**3**> Select the information and settings for the two UTP ports**.**
Informational : Shows fiber link status, far end fault alarm and any dying gasp indication.
<**4**> Sets the operational mode between the default 'switch' mode or the special 'Tag Based VLAN' mode.
<**5**> Enables or disables the Link Fault Pass-Through (LFP) function
<**6**> Enables or disables the Auto Laser Shutdown (ALS) function.
<**7**> Enables or disables the OAM in-band management function.
<**8**> Send a hardware reset to remote unit via fiber (must enable reception from the remote side first)
<**9**> Performs a reset on the local switch port.
<**A**> Resets the card to factory default settings
Informational : If this is SFP model and SFP is installed, will indicate "Yes". If SFP supports DD, will indicate "Yes".
<**D**> View the transceiver's digital diagnostics (DD) if available. (only for SFP modules that support DD function)
<**N**> Go to manage the remote via OAM.
<**ESC**> Escape back to previous menu.

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

```
This Chassis ID:[00]  Cascaded:[Yes]    Monitored Chassis ID:[00]
SLOT #09 > FRM220-10/100I-2E    [Remote] [ Ver:1.100-1.001-0.000-0.000 ]
     Port Active:[Enable ]
<2>: UTP 1 Information and Settings.
<3>: UTP 2 Information and Settings.
     FX  Link:[Up  ] FEF:[Off     ] Remote PWR:[OK      ]
<4>: Operation Mode:    [Switch   ]
<5>: Link Fault Pass Through(LFP): [Disable]
<6>: Auto Laser Shutdown(ALS):     [Disable]
<7>: In Band Management:[Enable ]
<8>: Accept Remote Hardware Reset: [Disable]
<9>: Port Reset
<A>: Set to default
     Small Form Pluggable(SFP):[No ]  Digital Diagnostic(D/D):[No ]
<D>: Go to Line Card Status menu. <N>:Go to the Local menu.

Please select an item.
```

When managing the remote converter, the port cannot be disabled. To do so would put it to sleep forever as it cannot be awoken by any OAM command once the fiber is down. Therefore, no port disable option is provided in the remote. It really is no problem as you can always disable the link from the CO side, which is preferred anyway.

A.3.4 FRM220-10/100i-2E Web Based Configuration



The above graphic represents a single slot in the FRM220. The entire chassis with all slots will be displayed in the 'Local Display' view. Double click on any slot to go to the management page for that particular converter card.

A.3.4.1 Header

The header information shows the current chassis ID, Slot, Side, Type and Version.

Chassis ID	Slot	Side	Type	Version
00	09	Local	FRM220-10/100I-2E	1.100-1.001-0.000-0.000

Chassis ID

The chassis with management IP address is the first or ID zero chassis. From this NMC, up to 10 chassis may be managed using only a single IP address. Chassis ID are numbered from zero to nine.

Slot

The slots in the chassis are numbered 1 ~ 20 from left to right when viewing from the front of the FRM220. The first slot is reserved for the NMC card. This card is required in every chassis, even in a cascaded stack. The slots for cards are numbered 2 ~ 20. The example above shows the card in slot 2 or the first available slot for interface cards.

Side

Because most of the cards for the FRM220 series support in-band management, the "Side" parameter lets the user know if he is in the management screen for the "Local" or in the FRM220 chassis or for the "Remote" or fiber connected stand-alone converter.

Type

The field just tells the type of card installed in the slot (for local) or attached by fiber (for remote).

Version

The version parameter is broken into four fields as follows: 1.100-1.001-0.000-0.000

The first field represents the **hardware version** (version 1.1 in this case), the second field shows the **firmware or software version** (version 1.001 shown here), the third field shows the **CPLD version** and the forth field the **FPGA version** where applicable. The 10/100i has no CPLD or FPGA so those fields are shown as zeros.

A.3.4.2 FX Information

The FX Information shows the current state and settings of the optical interface of the media converter.

Link	FEF	Remote PWR	SFP	D/D
Up	Off	OK	No	No

Link

This field represents the fiber link state, either 'Up' or 'Down'.

FEF

FEF or Far End Fault uses a combination of standard IEEE802.3u and OAM to detect faults originating from the remote or "far end" unit. If the remote has LLF enabled and its UTP link goes down, the local side will receive the FEF code and FEF will be 'On'. If the remote unit is powered off, the local will also receive FEF code as well as dying gasp (see Remote PWR).

Remote PWR

In a normal link this field will have a status of 'Ok'. If a remote converter experiences a power failure, it will issue a FEF in what is commonly referred to as "dying gasp" to the local unit. In this case the administrator will be able to distinguish between a fiber down from broken fiber or fiber down because of remote power failure.

SFP

This field will be 'No' if the converter is using a standard fixed (1x9) transceiver and will be 'Yes' if the converter uses an SFP for optical connection (FRM220-10/100iS model).

DD

Digital Diagnostics is an extended function of SFP modules that is specified in MSA (Multi-Source Agreements). Standard information that can be read from SFP includes the manufacture's name, model and serial number of the SFP. DD includes real time values for transmit and receive power and temperature within the SFP.

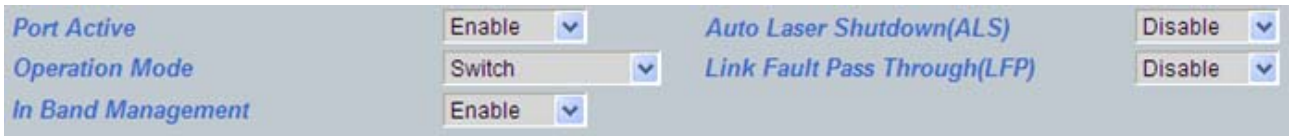
SFP and D/D Information

Vendor Name	CTC UNION
Vendor Part Number	SFS-7020-L31(A)
Fiber Type	Single
Tx Wave Length	1310 nm
Rx Wave Length	1310 nm
Link Length	20 km

SFP and D/D Information

Vendor Name	FIBERXON INC.
Vendor Part Number	FTM-3125C-L40
Fiber Type	Single
Tx Wave Length	1310 nm
Rx Wave Length	1310 nm
Link Length	40 km
Digital Diagnostic	
Tx Power	+01 dBm
Rx Power	+03 dBm
Rx Sensitivity	+00 dBm
Temperature	+49 degree C
Power Margin	0 dB
Power Loss	0 dB

Examples of SFP without and with DD function.



Port Active

Use this pull-down to select whether to enable or disable the state of the media converter. When disabled, all LEDs on the unit and in the Web GUI will be extinguished. This function is not allowed when managing the remote converter and will be 'grayed out'. To disable a link, the local or 'in-chassis' converter must have its port disabled.

Auto Laser Shutdown

This pull-down chooses between enabling and disabling the ALS function. The default is disabled.

Operation Mode

This pull-down chooses between switch mode and Tag Based VLAN mode. When the media converter works in **'switch mode'** mode, it does not begin to forward a packet to a destination port until after the entire packet is received. The latency therefore depends on the packet length. The maximum packet length supported is up to 2046 bytes in this mode. Different from a normal switch chip, the media converter's chip supports forwarding IEEE802.3x pause frames. In **'switch mode'** the MC operates with a 'store & forward' method that supports a 1K MAC address table. The UTP side may be 10 or 100 speed and in full or half duplex, while the fiber side runs in 100Base, full duplex.

In **'Tag Based VLAN mode'**, the MC is able to do VID tagging and untagging so that traffic between the two UTP ports can be isolated, sent over fiber, and then separated at the remote CPE between the two UTP ports. Each UTP supports setting a VID from 1 to 4094.

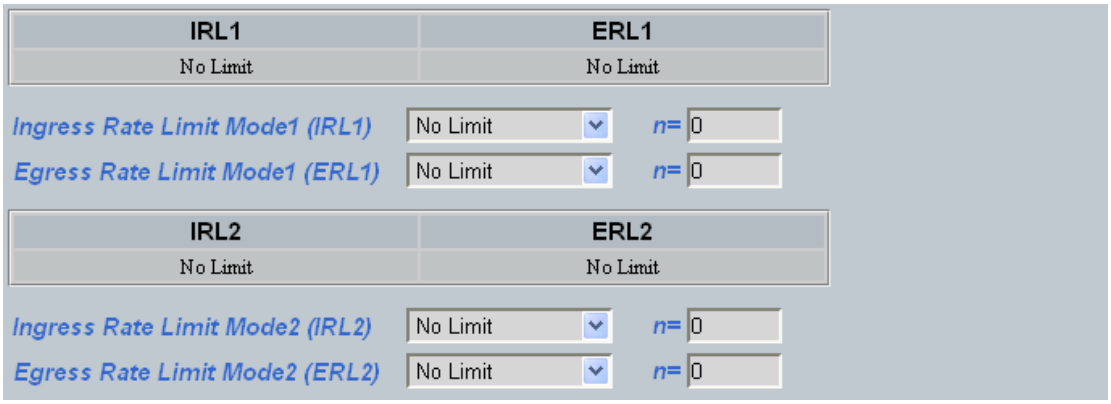
Link Fault Pass Through

This pull-down chooses between enabling and disabling the LFP function. The LFP function is explained in A.1.2. The default is disabled.

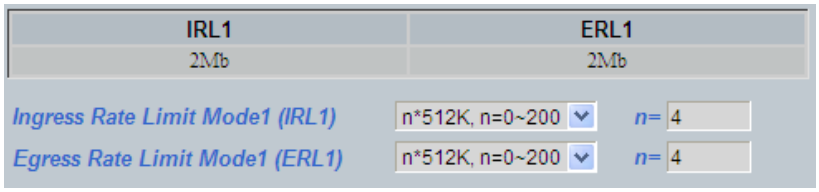
In Band Management

This pull-down is used to enable or disable the OAM (In Band Management) function. Once disabled the OAM maintenance frames will no longer be transmitted, while received frames will be ignored. Monitoring and managing of the remote converter will be disabled. The default setting for this function is enabled.

Bandwidth Limiting

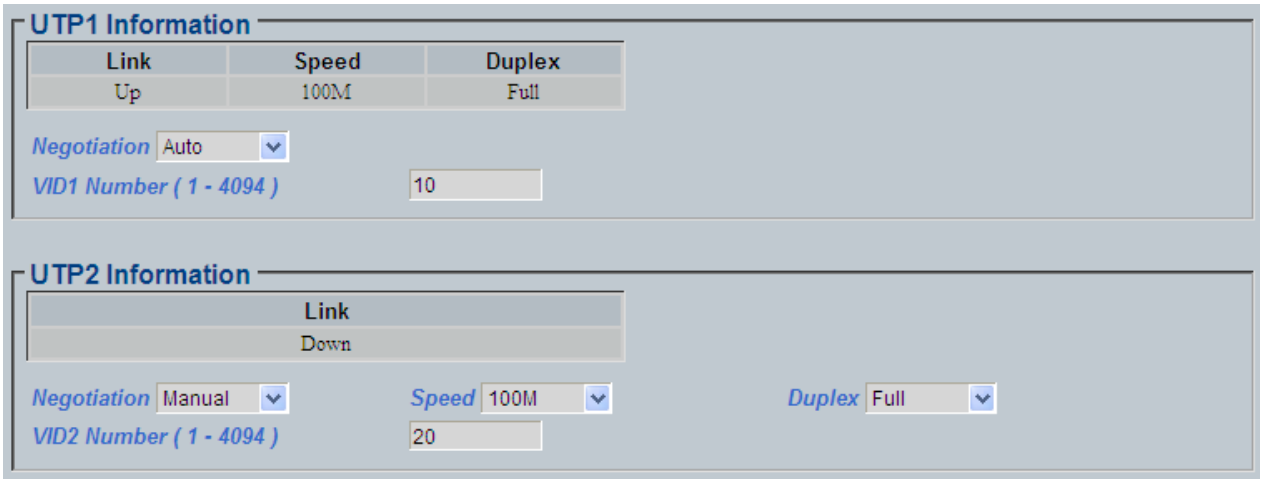


This converter supports both ingress (UTP to Fiber) and egress (Fiber to UTP) bandwidth control in granularities of 32K or 512K. This provides a very flexible and controllable bandwidth usage through the media converter. The default setting is with no limiting.



A.3.4.3 UTP Information

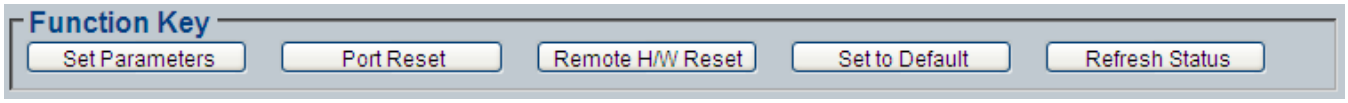
The basic link information can be viewed and the Ethernet parameters can be configured for forced mode here. The default setting is auto-negotiation enabled. Please be careful when setting manual or forced mode when connecting to another auto device to avoid performance killing duplex mismatch. Always connect auto to auto or set both connected interfaces to the same forced settings.



A.3.4.4 Function Keys

Set Parameters

This is the button used to actually set the parameters to the local or remote converter. The 'Set Parameters' button executes the changes while the 'Refresh Status' button displays the new parameters from the local or remote converter.



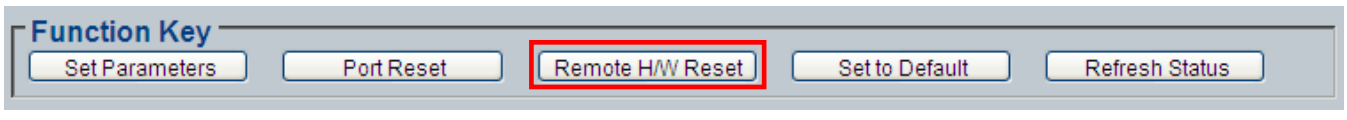
Port Reset

The port reset function does a reset of the switch chip of the converter. Normally this is not a function that should be used as it will cause a momentary traffic block, however, if after doing many different settings quickly and the chip becomes confused with those settings or hung, this will quickly bring it back. It is like a soft reset.

Remote H/W Reset

This function performs a software reset of the CPU on the remote converter. However, in order to perform the remote reset, the remote unit must first be set to allow the remote reset. The default remote setting is to disallow remote reset. Here is an example of configuring the remote to accept the hardware reset.

Click the 'Remote H/W Reset' once to have the remote do a soft restart.



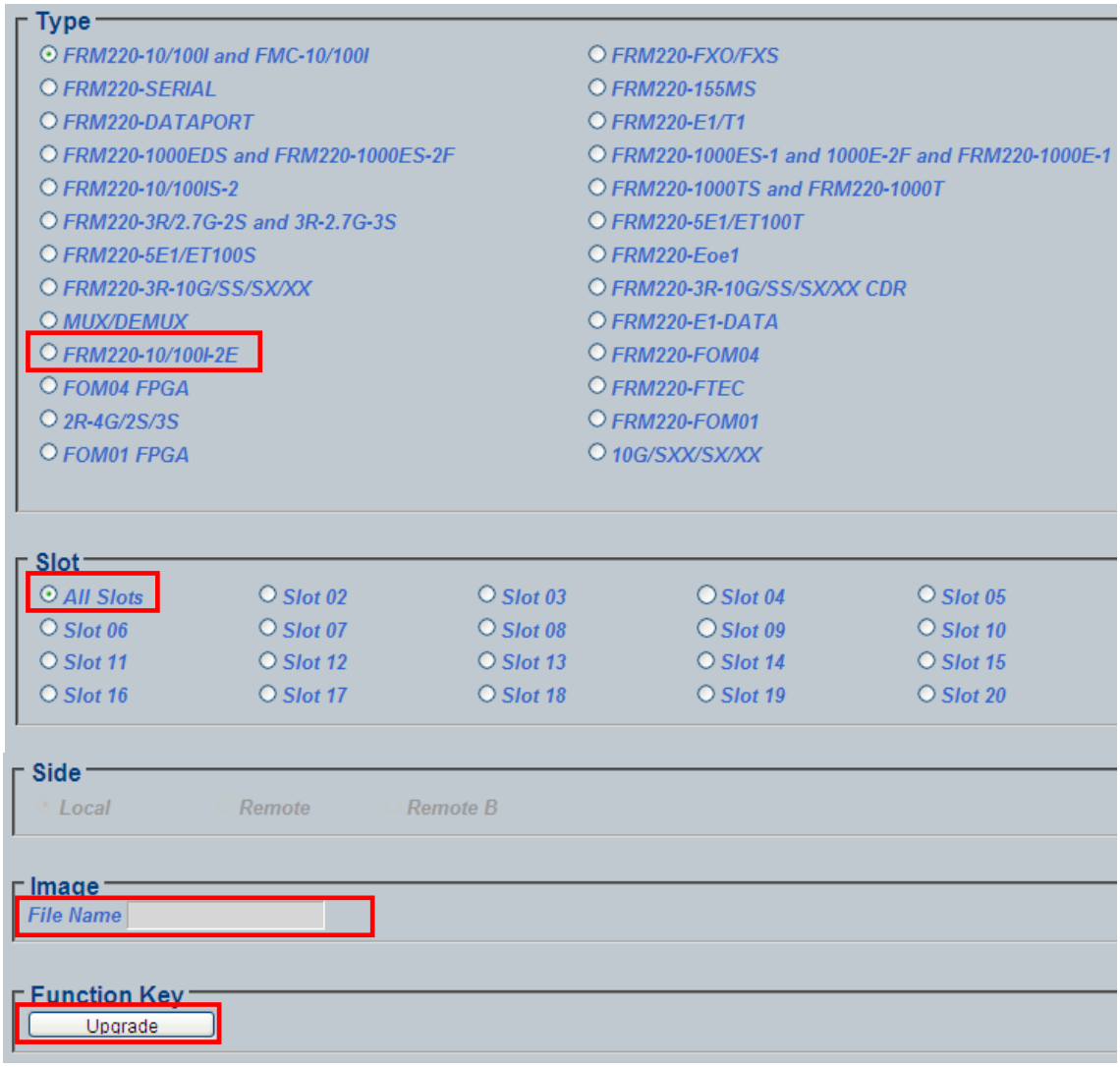
Following a restart, the remote card should have a "Found" entry in the NMC log.

Set to Default

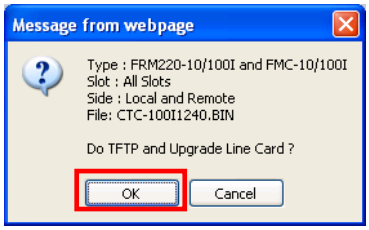
The ‘Set to Default’ button will return all fields to their factory default. The ‘Set Parameters’ button will then save those settings.

A.3.4.5 Firmware Upgrade

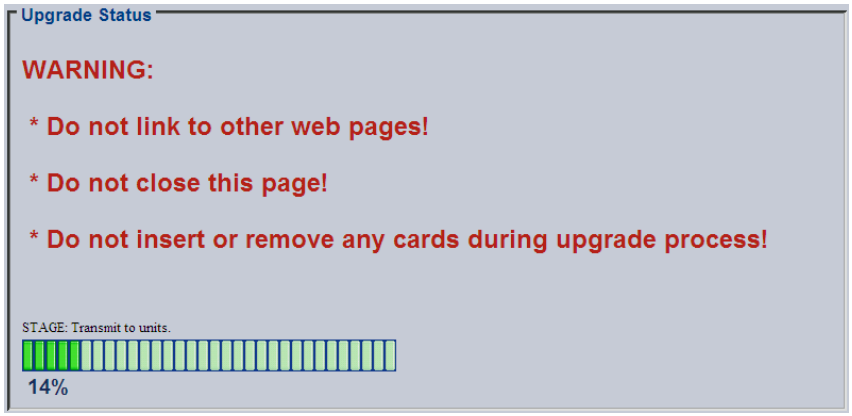
1. From the "System" menu click the "Upgrade Line Card" button.
2. Select the card type radio button, which in this case is the FRM220-10/100i-2E
3. Select the slot to update. Selecting "All Slots" will upgrade all local and remote 10/100i-2E cards. (this may take up to 15 minutes)
4. If selecting an individual slot, you must also select either the local or remote unit.
5. The image file name needs to be keyed in. The TFTP server should be able to find this file and the "System" settings need to be correct (see Chapter 2, settings).
6. Click the "Upgrade" button to start the update.



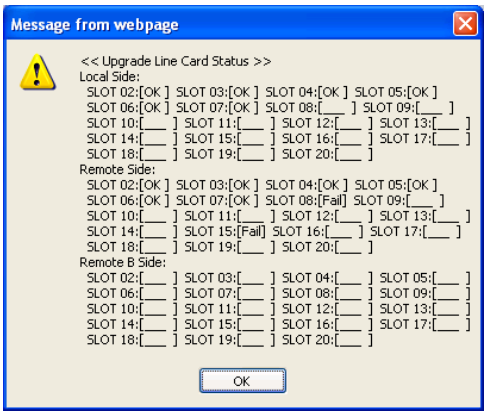
7. Click the "OK" button to confirm.

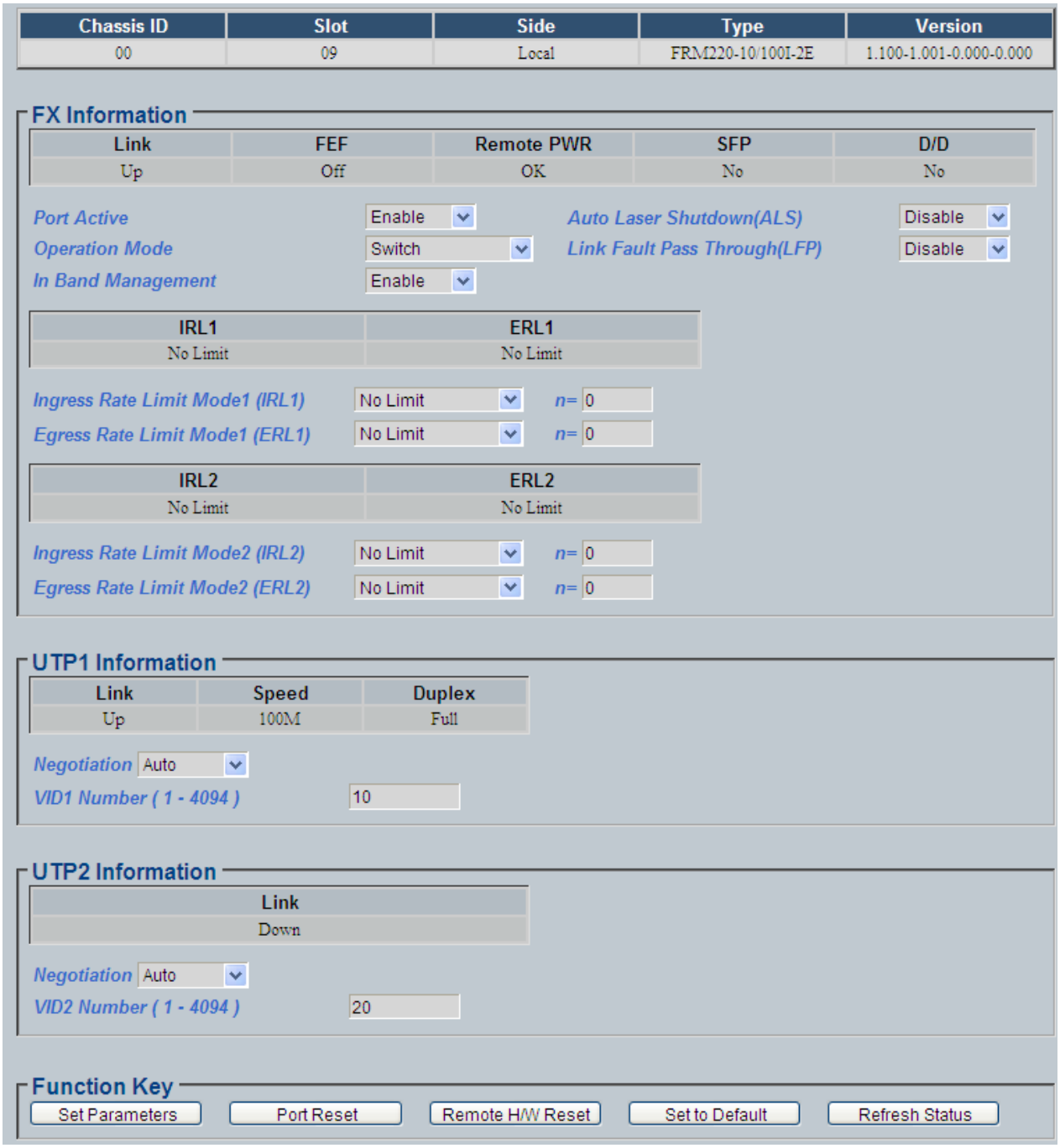


8. Heed the warning messages!!!!



9. View the success results





A.4 FRM220-10/100A(S) 802.3ah OAM/IP 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 its own built-in SNMP agent and GUI Web-based management or when placed in the managed 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 provides 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

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.

LAN Interface Specification

Two RJ-45 female connectors 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 (single port fixed type)
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)

A.4.1 Specifications

- **Optical Interface**
- **Connector** SFP cage (depending on model)
- **Optical rate** 125Mb/s
- **Duplex mode** Full duplex
- **Fiber** MM 50/125um, 62.5/125um
  SM 9/125um (depending on SFP)
- **Distance** MM 550M/2KM,
  SM 15/30/50/80/120KM (depending on SFP)
- **Wavelength** Depends on SFP and model
- **Electrical Interface**
- **Connector** RJ-45 x 2
- **Data Rates** 10Mbps, 100Mbps
- **Duplex** Full or Half Duplex
- **Cable** 10Base-T Cat. 3,4,5,5e UTP
- 100Base-TX Cat. 5, 5e or higher
- **Standards** IEEE802.3, 802.3u, 802.3ah, 802.3x
  802.1D, 802.1p, 802.1Q, 802.1ad, RFC 4330 (SNTP)
- **Maximum MTU** 1536 bytes
- **Indications** LED (PWR, Fiber 1&2 Link, Test, UTP 3&4 Link, UTP 3&4 Speed)
- **Power** (Card supports hot-swapping)
- **Input** Card : 12VDC, Standalone : AC, DC options
- **Consumption** <8W
- **Dimensions** 155 x 88 x 23mm (D x W x H)
- **Weight** 120g
- **Temperature** 0 ~ 50°C (Operating), -10 ~ 70°C (Storage)
- **Humidity** 10 ~ 90% non-condensing
- **Certification** CE (EMC/LVD), FCC, RoHS
- **MTBF** 75000 hrs (25°C)

A.4.2 Management Features

The **FRM220-10/100AS-2** has its own embedded processor which can be used to configure the device for stand-alone operation. When placed in a stand-alone chassis, this device supports a text based Telnet terminal with an easy to use menu system for configuration. The embedded **HTTP** server provides an easy to use **GU**I (Graphical User Interface) with any web browser. **SNMP** is also supported in the stand-alone operation. When using network management software and our proprietary MIB file specifically for the **100A,** all settings can be performed, performance monitoring realized and alarm traps received. When placed in a managed chassis, such as our **FRM220-CH20** with **NMC** (Network Management Controller) card, the **10/100A** card is configured and monitored through the chassis **NMC** via console, Telnet, Web HTTP or SNMP.

1. Stand-alone – IP settings allow management by Telnet, Web or SNMP
2. Rack management - When placed in **NMC** managed rack, all other settings can be overridden by the **NMC** management.

A.4.3 Factory Reset Procedure

Apply power to the **10/100A** and allow 30 seconds to fully boot. Using a pencil or ball-point pen, press the 'DEFAULT' recessed push-button switch (located on the face plate) and hold for 9~10 seconds. DO NOT POWER OFF. Allow the unit to again fully reboot. The defaults are:

IP=10.1.1.1
netmask=255.0.0.0
GW=10.1.1.254
TFTP server=10.1.1.200
(The username and password are both reset to 'admin' if enabled.)

A.4.4 Panel

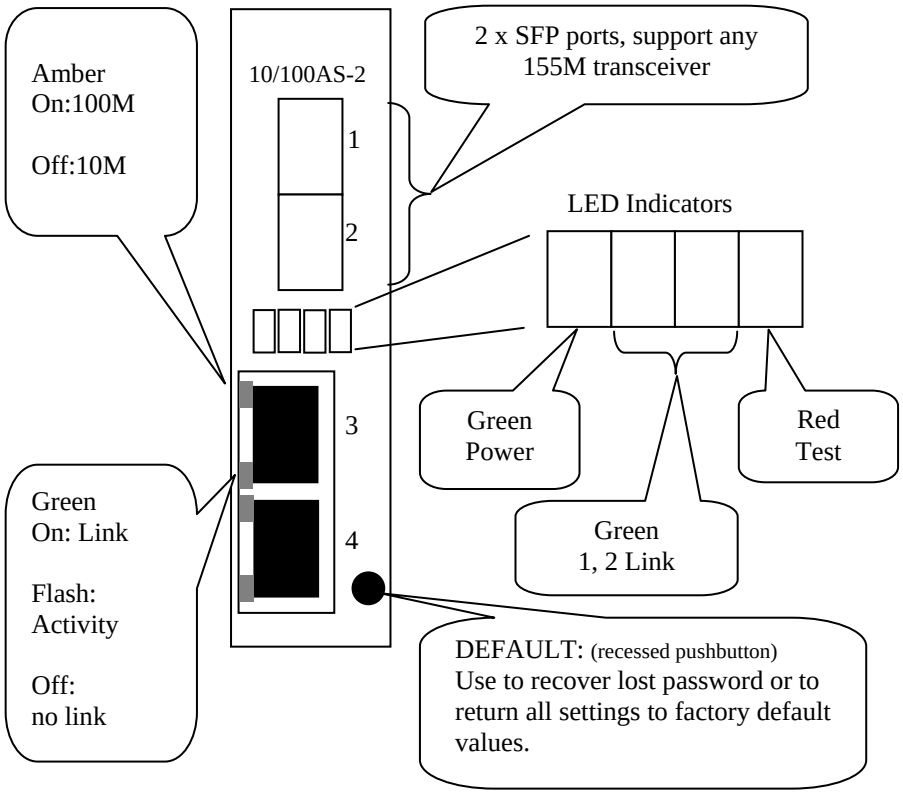


Figure A.4.1 Panel designations of **FRM220-100AS-2**

A.4.5 Installation of SFP Modules

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

Inserting a Bale Clasp SFP Module into the Cage
Step 1 Close the bale clasp upward before inserting the pluggable module.
Step 2 Line up the SFP module with the port, and slide it into the cage.

Removing a Bale Clasp SFP Module
Step 1 Open the bale clasp on the SFP module. Press the clasp downward with your index finger.
Step 2 Grasp the SFP module between your thumb and index finger and carefully remove it from the SFP cage.

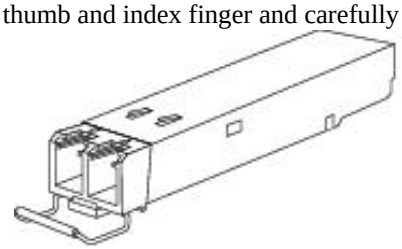


Figure A.4.2 Bale Clasp type SFP with bale open

A.4.6 Provisioning

Because of the complex settings of **10/100AS** and because there exists a stand-alone user manual for the **10/100AS**, this NMC user manual will not go into the detailed settings here.

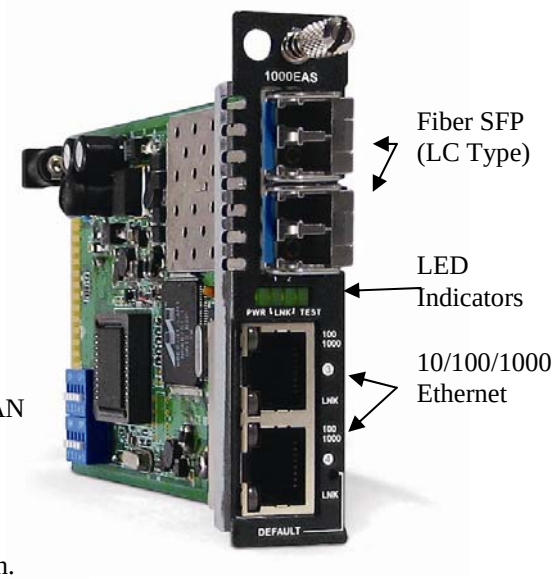
Please refer to the **FRM220-10/100AS User Manual**.

A.5 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



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

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)

A.5.1 Functional Details

Ethernet

The 1000EAS is based on a L2 switch chip which supports non-blocking switching fabric with up to 1024 MAC lookup filtering table and support for Egress tagging/untagging selectable per port in any combination using 802.1Q VLAN support for 4094 VIDs and BPDU handling for spanning tree protocol. There are also 28 32bit and 2 64 bit RMON counters per port that can be displayed through the management system or received via SNMP standard MIB statistics.

The 10/100/1000Base RJ-45 connectors are located on the front panel of the card along with two SFP cages for industry standard 1.25Gbps SFP modules. All UTP connections are designed for auto MDI-X operation, requiring only a straight connection to any device. A unique feature of the FRM220-1000EAS switch/converter is the use of a common PCB card which may either be used as a standalone converter (FRM220-CH01 series) or placed in the FRM220-CH20 rack.

Management

The **FRM220-1000EAS** has its own embedded processor which can be used to configure the device for stand-alone operation. When placed in a stand-alone chassis, this device supports a text based Telnet terminal with an easy to use menu system for configuration. The embedded **HTTP** server provides an easy to use **GU**I (Graphical User Interface) with any web browser. **SNMP** is also supported in the stand-alone operation. When using network management software and our proprietary MIB file specifically for the **1000EAS,** all settings can be performed, performance monitoring realized and alarm traps received. When placed in a managed chassis, such as our **FRM220-CH20** with **NMC** (Network Management Controller) card, the **1000EAS** card is configured and monitored through the chassis **NMC** via console, Telnet, Web HTTP or SNMP.

1. Stand-alone – IP settings allow management by Telnet, Web or SNMP
2. Rack management - When placed in **NMC** managed rack, all other settings can be overridden by the **NMC** management.

A.5.2 Panel

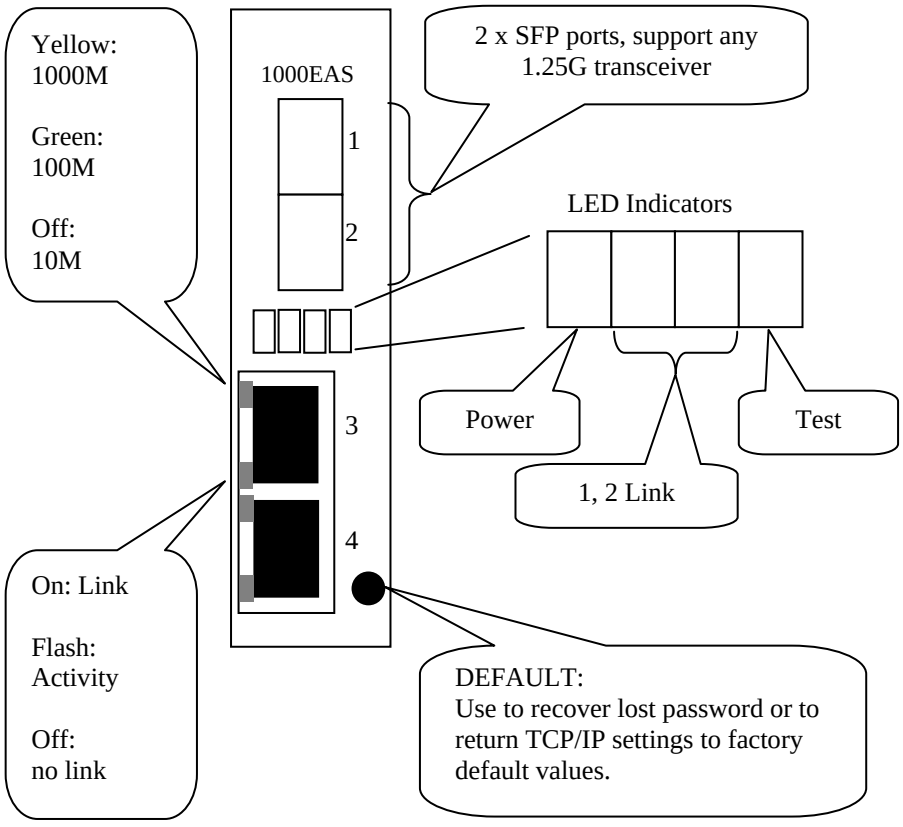


Figure A.5.1 Panel designations of **FRM220-1000EAS**

A.5.3 Factory Reset Procedure

Apply power to the **1000EAS** and allow 30 seconds to fully boot. Using a pencil or ball-point pen, press the 'DEFAULT' recessed push-button switch (located on the face plate) and hold for 9~10 seconds. DO NOT POWER OFF. Allow the unit to again fully reboot. The defaults are:

IP=10.1.1.1
netmask=255.0.0.0
GW=10.1.1.254
TFTP server=10.1.1.100

The username and password are both reset to 'admin' if enabled.

A.5.3.1 Installation of SFP Modules

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

A.5.3.2 Inserting a Bale Clasp SFP Module into the Cage

Step 1 Close the bale clasp upward before inserting the pluggable module.
Step 2 Line up the SFP module with the port, and slide it into the cage.

A.5.3.3 Removing a Bale Clasp SFP Module

Step 1 Open the bale clasp on the SFP module. Press the clasp downward with your index finger.
Step 2 Grasp the SFP module between your thumb and index finger and carefully remove it from the SFP cage.

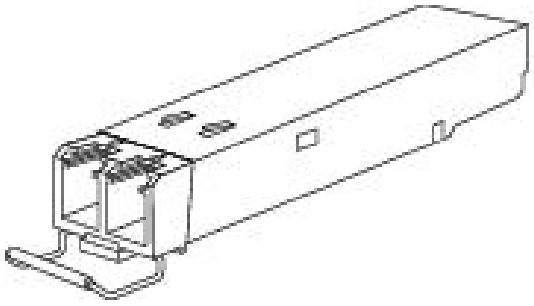


Figure A.5.2 Bale Clasp type SFP with bale open

A.5.4 Provisioning

Because of the complex settings of **1000EAS** and because there exists a stand-alone user manual for the **1000EAS**, this NMC user manual will not go into the detailed settings here.

Please refer to the **FRM220-1000EAS User Manual**.

A.6 FRM220-1000EDS Managed Gigabit Fiber Media Converter

The FRM220-1000EDS is a 4-port switch or 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 transceivers. 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 (in FRM220-CH20)

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 x 2 Optical Data rate : 1250Mbps 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 x 2 Data rate : 10Mbps, 100Mpbs, 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 (1 electrical plus 1 SFP)
- 1000E-1 (1 electrical plus 1 fixed optical)

A.6.1 Functional Details

Ethernet

The 1000EDS is based on a L2 switch chip which supports non-blocking switching fabric with up to 1024 MAC lookup filtering table. There are also two 64 bit RMON counters per port that can be displayed through the management system of the FRM220-CH20 chassis.

The 10/100/1000Base RJ-45 connectors are located on the front panel of the card along with two SFP cages for industry standard 1.25Gbps SFP modules. All UTP connections are designed for auto MDI-X operation, requiring only a straight connection to any device. A unique feature of the FRM220-1000EDS switch/converter is the use of a common PCB card which may either be used as a standalone converter (FRM220-CH01 series) or placed in the FRM220-CH20 rack.

Management

The **FRM220-1000EDS** has a small processor that is used to read the on-board DIP switches. When placed in a managed chassis, such as our **FRM220-CH20** with **NMC** (Network Management Controller), the **1000EDS** card is configured and monitored through the chassis **NMC** via console, Telnet, Web HTTP or SNMP.

1. Stand-alone – DIP settings when placed in CH01.
2. Rack management - When placed in **NMC** managed rack, all other settings can be overridden by the **NMC** management.
3. 1000EDS does not support in-band management.

A.6.2 Panel

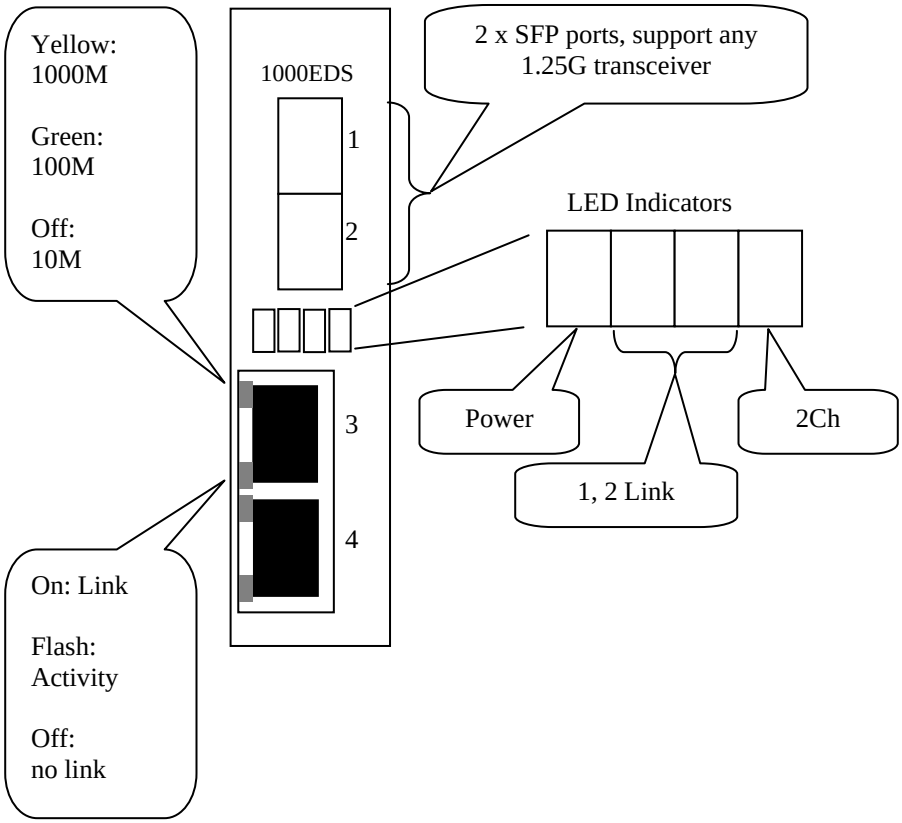


Figure A.6.1 Panel designations of **FRM220-1000EDS**

A.6.3 Installation of SFP Modules

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

A.6.3.1 Inserting a Bale Clasp SFP Module into the Cage

Step 1 Close the bale clasp upward before inserting the pluggable module.
Step 2 Line up the SFP module with the port, and slide it into the cage.

A.6.3.2 Removing a Bale Clasp SFP Module

Step 1 Open the bale clasp on the SFP module. Press the clasp downward with your index finger.
Step 2 Grasp the SFP module between your thumb and index finger and carefully remove it from the SFP cage.

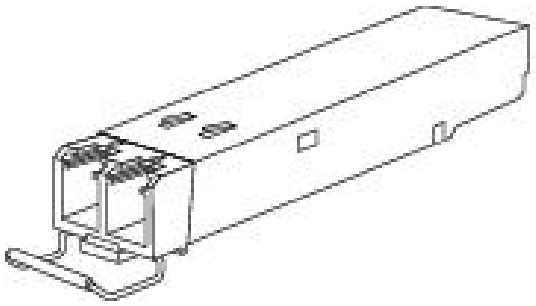
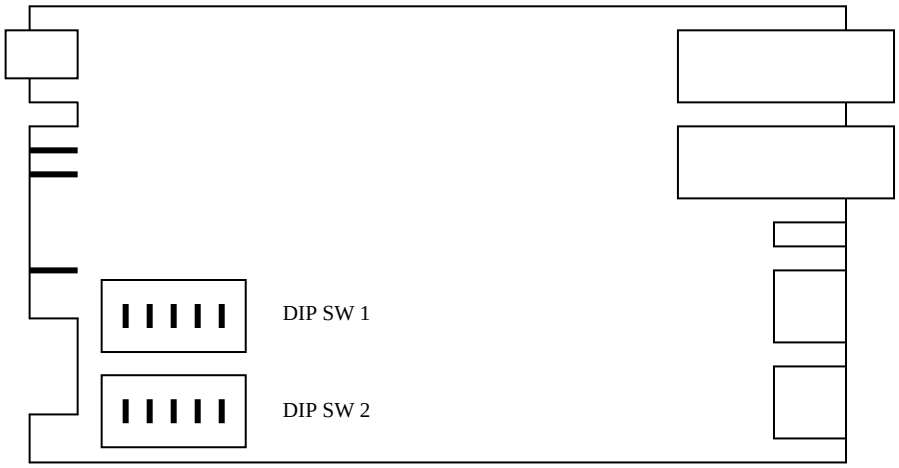


Figure A.6.2 Bale Clasp type SFP with bale open

A.6.4 Provisioning by DIP (Stand-alone)

There are two DIP Switches installed on the PCBA of the **1000EDS**



DIP SW 1 and DIP SW 2：

(note: 1000ES-1 has one DIP switch for its LAN 1 port only. SW5 has no function.)
(note2: 1000EDS has two DIP switches, DIPSW1 for LAN1 and DIPSW2 for LAN 2.)

SW 1	SW 2	SW 3	Mode of LAN Port
OFF	OFF	OFF	UTP/NWAY (auto)
ON	OFF	OFF	1000/FULL (forced)
OFF	ON	OFF	100/FULL (forced)
OFF	ON	ON	100/HALF (forced)
ON	ON	OFF	10/FULL (forced)
ON	ON	ON	10/HALF (forced)

SW4	ON	LFP Enable
	OFF	LFP Disable

SW5	ON	2 pair channel mode
	OFF	4 ports switch mode

← DIP SW 1 (SW5) dual mode
DIP SW 2 (SW5) not defined

DIP SW 1 (SW1~3) define the auto/forced port mode of Port 3, while DIP SW 2 (SW1~3) define the auto/forced mode of Port 4.

DIP SW1 (SW4) defines the LFP of Port 3, while DIP SW2 (SW4) defines the LFP of Port 4.

Use DIP SW1 (SW5) to select between 4 port switch mode and Port VLAN mode (dual converter). When this mode is selected, the front panel LED labeled “2CH” will light, indicating the media converter is in the ‘two-channel’ mode.

DIP SW2 (SW5) is reserved and has no function

A.6.5 Provisioning by NMC (Telnet)

When placed in the CH20 with NMC, this card can be configured through any of the NMC interfaces, including Telnet, Web GUI and SNMP.

```
This Chassis ID:[00]  Cascaded:[Yes]    Monitored Chassis ID:[00]
SLOT #09 > FRM220-1000EDS       [Local   ] [ Ver:1.200-1.600-0.000-0.000 ]
 <1> : Fiber 1  Information and Settings.
 <2> : Fiber 2  Information and Settings.
 <3> : UTP 3 Information and Settings.
 <4> : UTP 4 Information and Settings.
 <5> : Device Information and Settings.
 <6> : RMON IN/OUT Counters Information.
 <7> : Clear all RMON Counters.
 <8> : Device Reset.
 <9> : Set to Default.
```

Description of Menu Settings

<1> : Fiber 1 Displays information and settings for Port 1 fiber.
<2> : Fiber 2 Displays information and settings for Port 2 fiber.

```
This Chassis ID:[00]  Cascaded:[Yes]    Monitored Chassis ID:[00]
SLOT #09 > FRM220-1000EDS       [Local   ] [ Ver:1.200-1.600-0.000-0.000 ]
<<< Fiber 1 Information >>>
 <1> : Port Active:[Enable ]
       Link:[Down]  FEF:[Off     ]  Speed:[1000]
       Rx Active:[Off]  Remote Power:[Ok      ]
 <2> : Rate Limit Mode :[Unlimited]
 <3> : Ingress Rate Limit :[Disable]
 <4> : Egress  Rate Limit :[Disable]

       Small Form Pluggable(SFP):[Yes]  Digital Diagnostic(D/D):[No ]
 <D> : Go to the Line Card Status.
```

<1> : Port Active: The port can be disabled so that no traffic will pass. The default is with port enabled.
<2> : Rate Limit Mode: Used in conjunction with IRL and ERL settings, this item enables or disables rate limiting.
<3> : IRL or ingress rate limit provides pre-set limits to incoming packets. Must be enabled with item 2.
<4> : ERL or egress rate limit provides pre-set limits to outgoing packets. Must be enabled with item 2.

```
------------------------------------------------------------------------
 Ingress Rate Limit :
  <0>:Disable  <1>:250M     <2>:140M     <3>: 95M     <4>: 57M     <5>: 40M
  <6>: 31M     <7>: 25M     <8>: 20M     <9>: 14M     <A>: 10M     <B>:  8M
  <C>:  6M     <D>:  4M     <E>:  3M     <F>:  2M     <G>:  1M     <H>:960K
  <I>:896K     <J>:832K     <K>:768K     <L>:705K     <M>:640K     <N>:576K
  <O>:512K     <P>:448K     <Q>:384K     <R>:320K     <S>:256K     <T>:192K
  <U>:128K     <V>: 70K
```

<D> : Line card Status will display the SFP information and DD if SFP supports.

```
Vendor Name       :[ FIBERXON INC.    ]
Vendor Part Number:[ FTM-3125C-L40    ]
Fiber Type        :[ Single ]
Wave Length       :[ 1310nm ]
Wave Length 2     :[ ----nm ]
Link Length       :[ 0040km ]
Tx Power          :[ +01dBm ]
Rx Power          :[ -40dBm ]
Temperature       :[ +043C  ]
Rx Sensitivity    :[ ------ ]
Power Margin      :[ ------ ]
Power Loss        :[ -- dB  ]
```

<3> : UTP 3 Displays information and settings for Port 3 UTP.
<4> : UTP 4 Displays information and settings for Port 4 UTP.

```
<<< UTP 3 Information >>>
 <1> : Port Active:[Enable ]    Link:[Down]    Rx Active:[off]
 <2> : Negotiation:[Auto  ]
 <3> : Speed      :[10  ]
 <4> : Duplex     :[Half]
 <5> : Rate Limit Mode :[Unlimited]
 <6> : Ingress Rate Limit :[Disable]
 <7> : Egress  Rate Limit :[Disable]
```

<1> : Port Active: The port can be disabled so that no traffic will pass. The default is with port enabled.
<2> : Negotiation: The default is 'Auto' per 802.3u. Set to 'Manual' to configure forced mode
<3> : Speed : The UTP supports 10, 100, 1000 speed setting if negotiation is set to manual.
<4> : Duplex : The UTP supports Full or Half Duplex setting if negotiation is set to manual.
<5> : Rate Limit Mode : Used in conjunction with IRL and ERL settings, this item enables or disables rate limiting.
<6> : Ingress Rate Limit : Provides pre-set limits to incoming packets. Must be enabled with item 2.
<7> : Egress Rate Limit : Provides pre-set limits to outgoing packets. Must be enabled with item 2.]

```
--------------------------------------------------------------------------
Egress Rate Limit:
  <0>:Disable  <1>:250M     <2>:140M     <3>: 95M     <4>: 57M     <5>: 40M
  <6>: 31M     <7>: 25M     <8>: 20M     <9>: 14M     <A>: 10M     <B>:  8M
  <C>:  6M     <D>:  4M     <E>:  3M     <F>:  2M     <G>:  1M     <H>:960K
  <I>:896K     <J>:832K     <K>:768K     <L>:705K     <M>:640K     <N>:576K
  <O>:512K     <P>:448K     <Q>:384K     <R>:320K     <S>:256K     <T>:192K
  <U>:128K     <V>: 70K
```

<5> : Device Information and Settings.

```
<<< Device Information >>>
 <1> : Device  Active:[Enable ]
 <2> : Operation Mode:[Switch Mode   ]
 <3> : Auto Laser Shutdown 1 (ALS1): [Disable]
 <4> : Auto Laser Shutdown 2 (ALS2): [Disable]
 <5> : Link Fault Pass Through 1 (LFP1): [Disable]
 <6> : Link Fault Pass Through 1 (LFP2): [Disable]
```

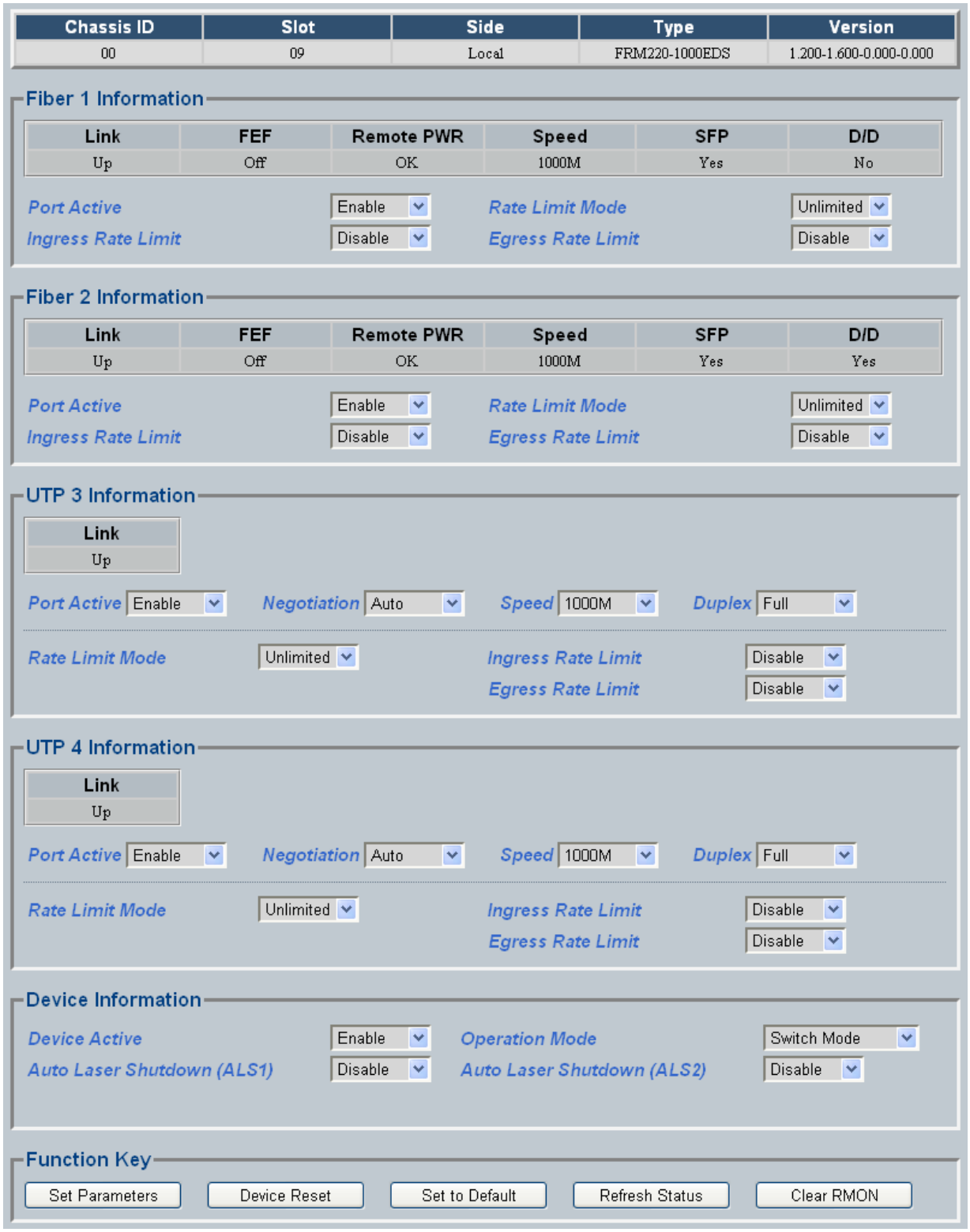
<1> : Device Active: Use this to completely disable the device and stop all transmissions.
<2> : Operation Mode: This toggles between 4-port **switch** mode and the **Port VLAN** mode.
<3> : Auto Laser Shutdown 1 (ALS1): Enable ALS for Fiber port 1
<4> : Auto Laser Shutdown 2 (ALS2): Enable ALS for Fiber Port 2
<5> : Link Fault Pass Through 1 (LFP1): Enable LFP for UTP port 3
<6> : Link Fault Pass Through 1 (LFP2): Enable LFP for UTP port 4

<6> : RMON IN/OUT Counters Information.
<7> : Clear all RMON Counters.

```
<<< RMON In/Out Counters >>>

  Fiber 1 In   :[                    0] Byte
  Fiber 1 Out  :[                    0] Byte

  Fiber 2 In   :[                    0] Byte
  Fiber 2 Out  :[                    0] Byte

  UTP 3 In     :[                    0] Byte
  UTP 3 Out    :[                    0] Byte

  UTP 4 In     :[                    0] Byte
  UTP 4 Out    :[                    0] Byte
```

<8> : Device Reset : This function will reset the switch and will cause some traffic loss until the unit recovers.
<9> : Set to Default : This will return the unit to factory default settings.

A.6.6 Provisioning by NMC (Web)

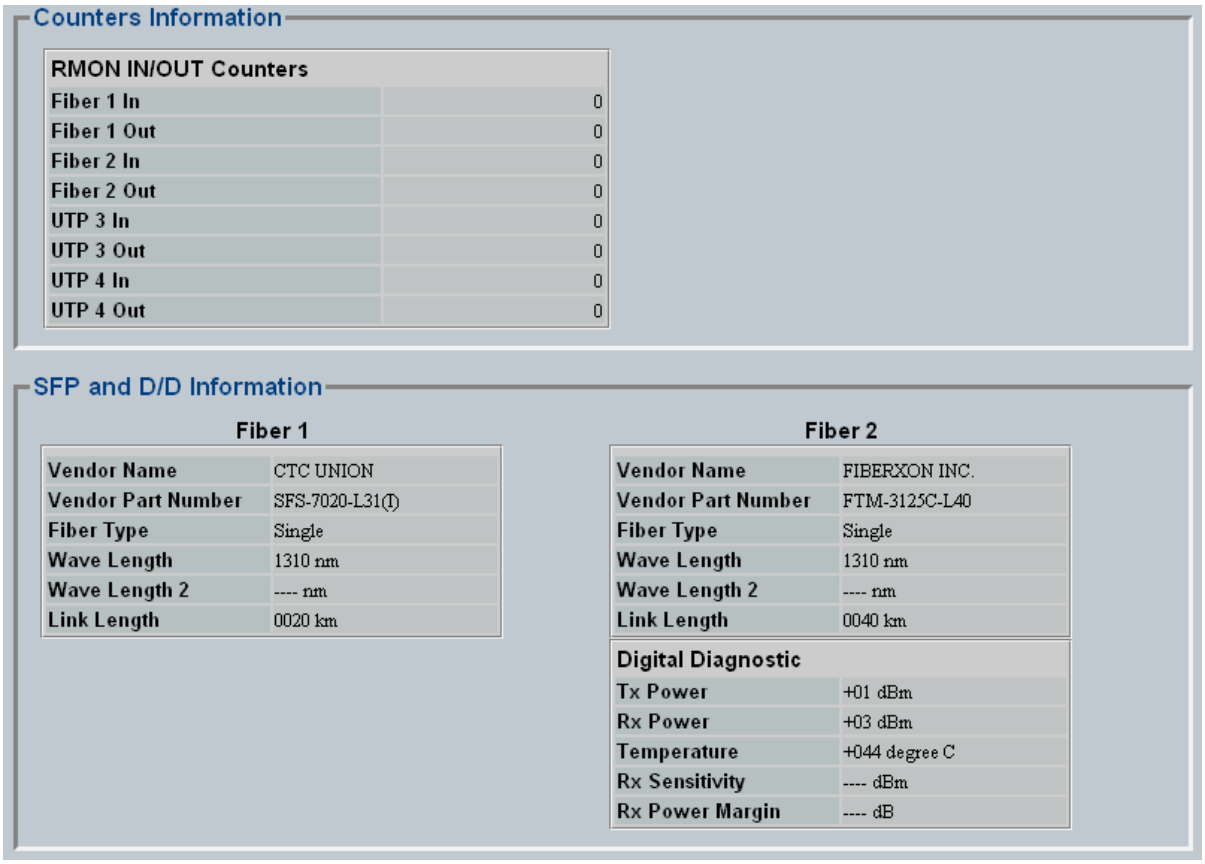


The settings, described in the Telnet operation, are easily manipulated here in the Web GUI. From the top, the Fiber port 1, Fiber port 2, UTP port 3 and UTP port 4 have their information and settings.

The Device Information box has the operation mode pull-down and the Auto Laser Shutdown settings.

After making any changes, be sure to click the “Set Parameters” button.

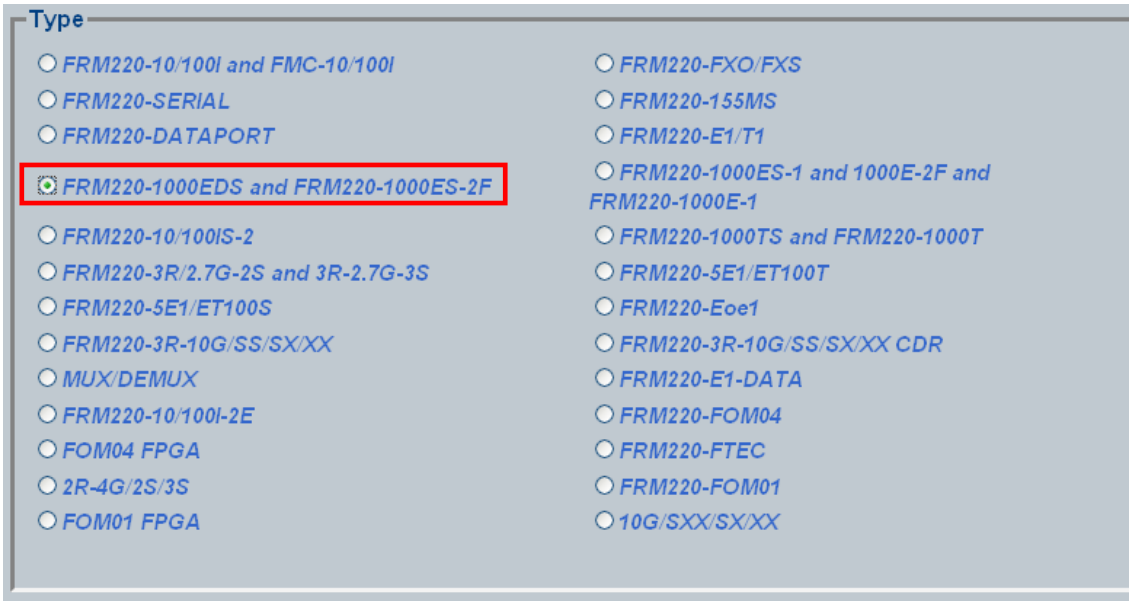
Lastly the 'counters' and SFP information is displayed at the bottom of the web page.

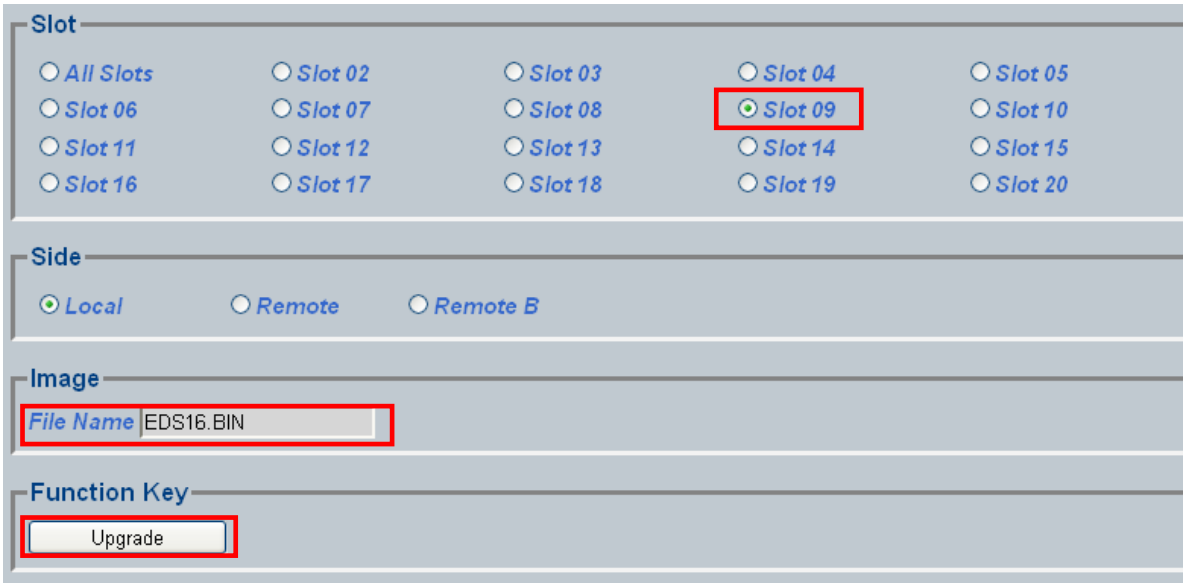


The counters are 64 bit registers for in and out traffic, for each port.

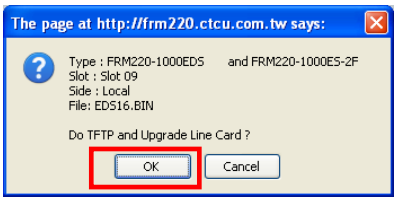
A.6.7 Firmware Upgrade

1. From the "System" menu click the "Upgrade Line Card" button.
2. Select the card type radio button, which in this case is the FRM220-1000EDS
3. Select the slot to update. Selecting "All Slots" will upgrade all local 1000EDS cards. (this may take up to 15 minutes)
4. If selecting an individual slot, you must also select either the local or remote unit.
5. The image file name needs to be keyed in. The TFTP server should be able to find this file and the "System" settings need to be correct (see Chapter 2, settings).
6. Click the "Upgrade" button to start the update.

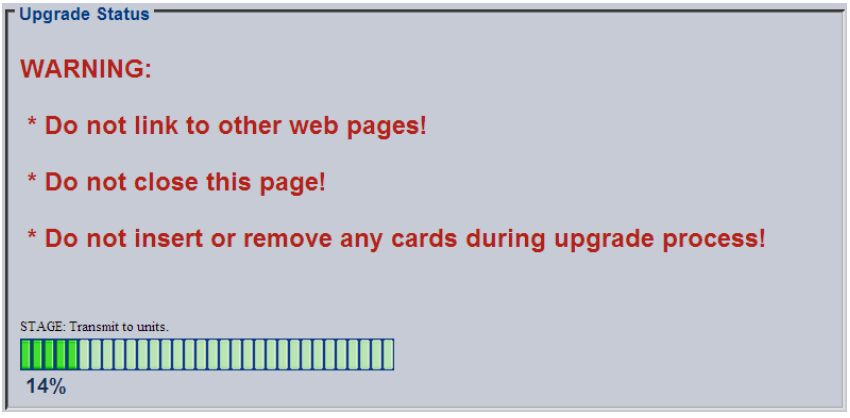




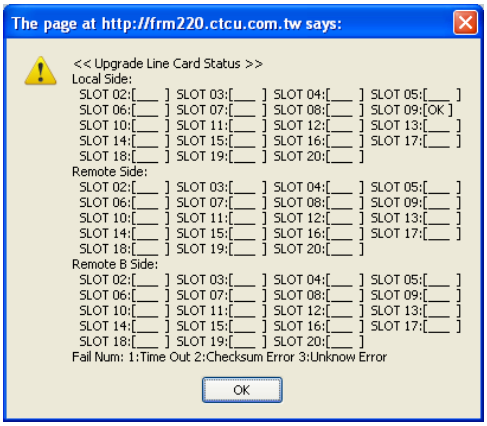
7. Click the "OK" button to confirm.



8. Heed the warning messages!!!!



9. View the success results



A.7 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 NMC, the local, the card status, type, version, fiber link status, E1 or T1 link status and alarms can all be displayed as well as the remotely fiber connected E1/T1 via in-band management. 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, web or SNMP in FRM220 chassis
- Supports simple text menu when in CH01M
- 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

Ports	Connector	1x9 (SC, ST, FC) or SFP LC
Optical Interface		
	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
Electrical Interface		
	Connector	RJ45 E1-120ohm, T1-100ohm, BNC E1-75ohm
	Data rate	E1: 2.048Mpbs, T1:1.544Mbps
	Line Code	E1 HDB3/AMI, T1 B8ZS/AMI
	Cable type	Cat.3 or higher Twisted-Pair cable
Standards		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
LEDs		Power, FX-Link, E1/T1 SIG, Test, SYN, RD, TD, AIS
Power		DC In 12V
Consumption		< 5W
Dimensions		155 x 88 x 23mm (D x W x H)mm
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)

This product includes the following models:

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

A.7.1 Functional Details

Fiber

The E1/T1 fiber modem uses a proprietary scrambled NRZ optical line coding to provide extremely low BER for E1 over fiber.

The electrical interface is an unbalanced 75 ohm for the BNC model or balanced twisted pair on industry standard USOC RJ48C wiring on a physical shielded RJ-45. In T1 mode, only unframed, clear channel transmissions are supported. In E1 mode, however, both transparent unframed and fractional (nx64) E1 are supported. The payload timeslots are assigned consecutively from a starting timeslot and continue through the number of timeslots assigned. Random timeslot assignment is not supported.

Management

The **FRM220-E1/T1** has a small processor that is used to read the on-board DIP switches. When used stand-alone, the configuration can be done via the DIP switches or through a text based menu driven console when the card is placed in the CH01M with DB9.

When placed in a managed chassis, such as our **FRM220-CH20** with **NMC** (Network Management Controller), the **E1/t1** card and remote are configured and monitored through the chassis **NMC** via console, Telnet, Web HTTP or SNMP.

1. Stand-alone – DIP settings when placed in CH01. Serial console when placed in CH01M
2. Rack management - When placed in **NMC** managed rack, all other settings can be overridden by the **NMC** management.
3. E1/T1 supports in-band management.

A.7.2 Panel

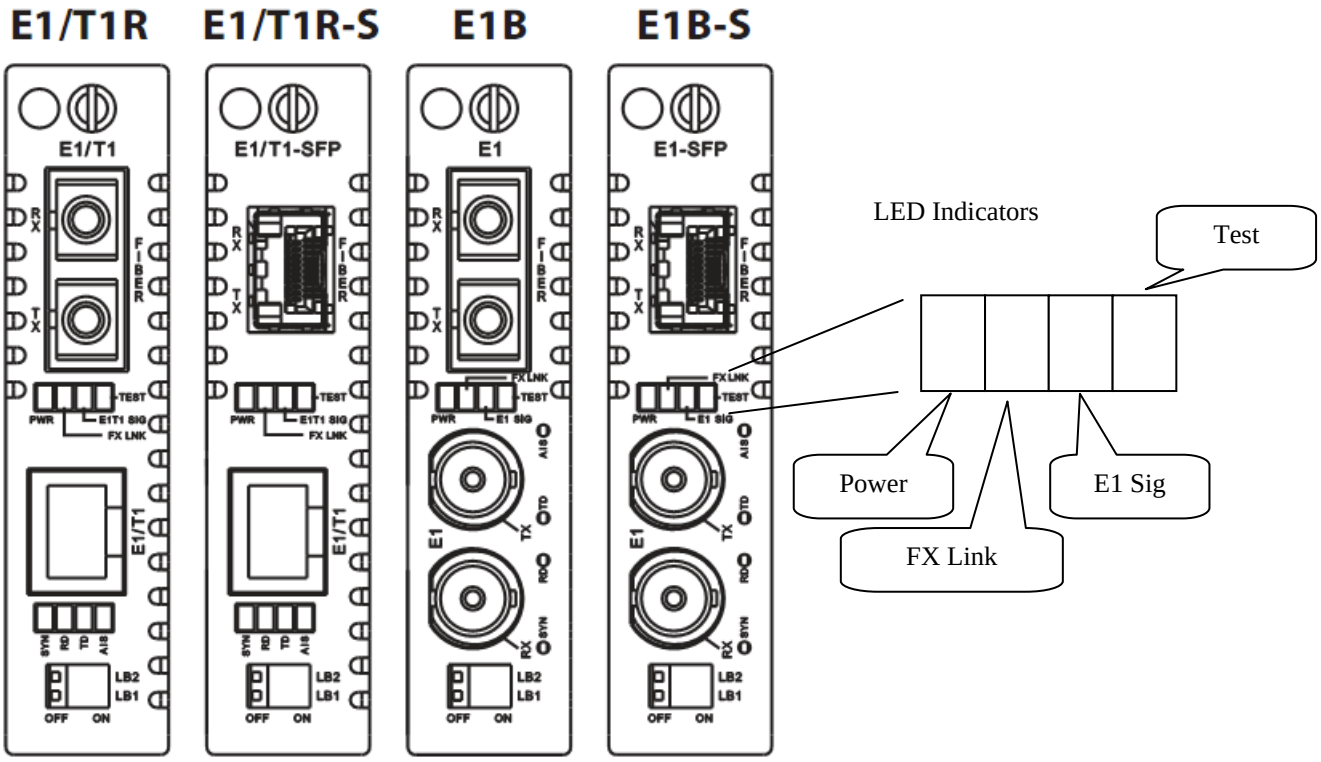


Figure A.7.1 Panel designations of **FRM220-E1/T1**

There are four variations of this media converter. The E1/T1 with RJ-45 comes with either a fixed optical transceiver or in a version that supports pluggable SFP optics. The E1 only with BNC also comes in either a fixed optical transceiver or in an SFP version.

A.7.3 Installation of SFP Modules

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

A.7.3.1 Inserting a Bale Clasp SFP Module into the Cage

Step 1 Close the bale clasp upward before inserting the pluggable module.
Step 2 Line up the SFP module with the port, and slide it into the cage.

A.7.3.2 Removing a Bale Clasp SFP Module

Step 1 Open the bale clasp on the SFP module. Press the clasp downward with your index finger.
Step 2 Grasp the SFP module between your thumb and index finger and carefully remove it from the SFP cage.

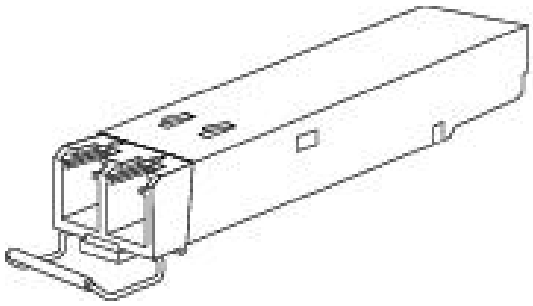
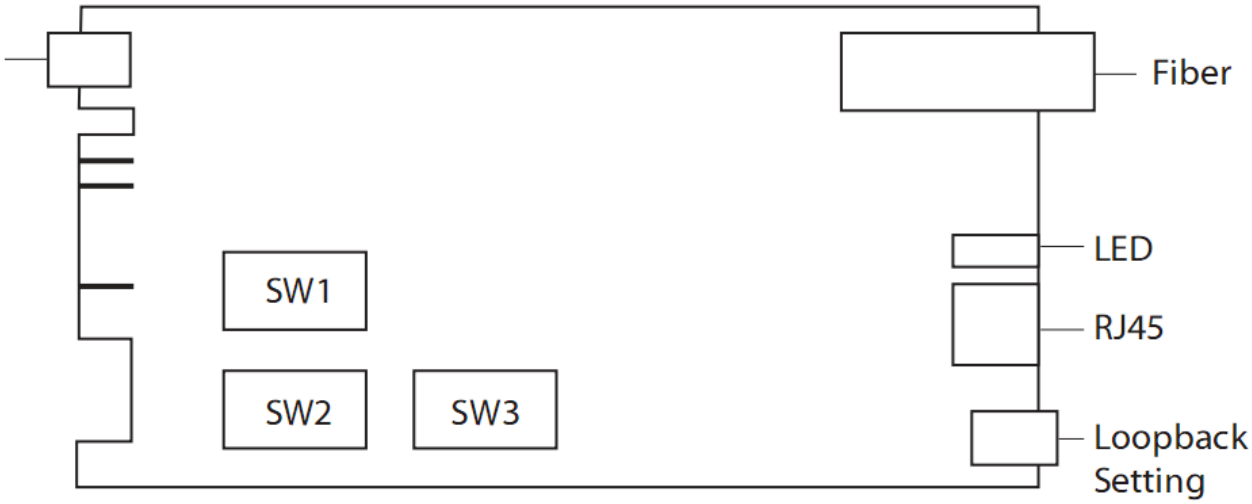


Figure A.7.2 Bale Clasp type SFP with bale open

A.7.4 Provisioning by DIP (Stand-alone)

There are three DIP Switches installed on the PCBA of the **E1/T1**



Switch 1 provides the E1/T1 settings for framing, line coding, CRC, and clocking. Switch 2 sets the number (nx64) of assigned active timeslots, while switch 3 configures the first or starting timeslot of the contiguous block of assigned timeslots.

Switch 1 settings

DIP SW1	SW STATE		Function
1	1		E1/T1 Setting
	OFF		E1
	ON		T1
2	2		Line Code Setting
	OFF		HDB3(E1)/B8ZS(T1)
	ON		AMI
3	3		Full or Fraction Setting
	OFF		Full E1/T1
	ON		Fractional E1/T1
4	4		Frame setting
	OFF		CCS(E1), D4(SF)(T1)
	ON		CAS(e1), ESF(T1)
5	5		CRC setting
	OFF		Disable
	ON		Enable
6	6		Auto transmitted AIS when
	OFF		Disable
	ON		Enable
7,8	7	8	E1/T1 transmitted timing setting
	OFF	OFF	Recovery from remote side
	ON	OFF	Internal oscillator.
	OFF	ON	Recovery from local E1/T1
	ON	ON	Reserve

Switch 2 settings

Use the switches 1~5 to set the nx64k rate

For T1, the maximum is 24 timeslots

For E1-CCS the maximum is 31 timeslots

For E1-CAS the maximum is 30 timeslots

DIP SW2	SW STATE					Function
1,2,3,4,5	1	2	3	4	5	Fraction timeslot number setting
	OFF	OFF	OFF	OFF	OFF	Full E1/T1
	ON	OFF	OFF	OFF	OFF	1 timeslot
	OFF	ON	OFF	OFF	OFF	2 timeslots
	ON	ON	OFF	OFF	OFF	3 timeslots
	OFF	OFF	ON	OFF	OFF	4 timeslots
	ON	OFF	ON	OFF	OFF	5 timeslots
	OFF	ON	ON	OFF	OFF	6 timeslots
	ON	ON	ON	OFF	OFF	7 timeslots
	OFF	OFF	OFF	ON	OFF	8 timeslots
	ON	OFF	OFF	ON	OFF	9 timeslots
	OFF	ON	OFF	ON	OFF	10 timeslots
	ON	ON	OFF	ON	OFF	11 timeslots
	OFF	OFF	ON	ON	OFF	12 timeslots
	ON	OFF	ON	ON	OFF	13 timeslots
	OFF	ON	ON	ON	OFF	14 timeslots
	ON	ON	ON	ON	OFF	15 timeslots
	OFF	OFF	OFF	OFF	ON	16 timeslots
	ON	OFF	OFF	OFF	ON	17 timeslots
	OFF	ON	OFF	OFF	ON	18 timeslots
	ON	ON	OFF	OFF	ON	19 timeslots
	OFF	OFF	ON	OFF	ON	20 timeslots
	ON	OFF	ON	OFF	ON	21 timeslots
	OFF	ON	ON	OFF	ON	22 timeslots
	ON	ON	ON	OFF	ON	23 timeslots
	OFF	OFF	OFF	ON	ON	24 timeslots
	ON	OFF	OFF	ON	ON	25 timeslots
	OFF	ON	OFF	ON	ON	26 timeslots
	ON	ON	OFF	ON	ON	27 timeslots
	OFF	OFF	ON	ON	ON	28 timeslots
	ON	OFF	ON	ON	ON	29 timeslots
	OFF	ON	ON	ON	ON	30 timeslots
	ON	ON	ON	ON	ON	31 timeslots
6	6					Auto laser shutdown setting
	OFF					Disable
	ON					Enable
7	7					Unused timeslot idle code setting
	OFF					0x7E
	ON					0xFF
8	8					Reserve

Switch 3 settings

After setting the required nx64k timeslot amount, set the starting timeslot number for the contiguous set of active timeslots.

Do not use TS16 if E1-CAS is used

For T1 there are no timeslots above TS24

DIP SW3	SW STATE					Function
1,2,3,4,5	1	2	3	4	5	First timeslot
	OFF	OFF	OFF	OFF	OFF	Full E1/T1
	ON	OFF	OFF	OFF	OFF	Timeslot 1
	OFF	ON	OFF	OFF	OFF	Timeslot 2
	ON	ON	OFF	OFF	OFF	Timeslot 3
	OFF	OFF	ON	OFF	OFF	Timeslot 4
	ON	OFF	ON	OFF	OFF	Timeslot 5
	OFF	ON	ON	OFF	OFF	Timeslot 6
	ON	ON	ON	OFF	OFF	Timeslot 7
	OFF	OFF	OFF	ON	OFF	Timeslot 8
	ON	OFF	OFF	ON	OFF	Timeslot 9
	OFF	ON	OFF	ON	OFF	Timeslot 10
	ON	ON	OFF	ON	OFF	Timeslot 11
	OFF	OFF	ON	ON	OFF	Timeslot 12
	ON	OFF	ON	ON	OFF	Timeslot 13
	OFF	ON	ON	ON	OFF	Timeslot 14
	ON	ON	ON	ON	OFF	Timeslot 15
	OFF	OFF	OFF	OFF	ON	Timeslot 16 (E1 CAS Don't use)
	ON	OFF	OFF	OFF	ON	Timeslot 17
	OFF	ON	OFF	OFF	ON	Timeslot 18
	ON	ON	OFF	OFF	ON	Timeslot 19
	OFF	OFF	ON	OFF	ON	Timeslot 20
	ON	OFF	ON	OFF	ON	Timeslot 21
	OFF	ON	ON	OFF	ON	Timeslot 22
	ON	ON	ON	OFF	ON	Timeslot 23
	OFF	OFF	OFF	ON	ON	Timeslot 24
	ON	OFF	OFF	ON	ON	Timeslot 25 (T1 TS25~31 Don't use)
	OFF	ON	OFF	ON	ON	Timeslot 26
	ON	ON	OFF	ON	ON	Timeslot 27
	OFF	OFF	ON	ON	ON	Timeslot 28
	ON	OFF	ON	ON	ON	Timeslot 29
	OFF	ON	ON	ON	ON	Timeslot 30
	ON	ON	ON	ON	ON	Timeslot 31
6,7	6,7					Reserved
	OFF					
	ON					
8	8					Loop Back Group Setting
	OFF					Fiber Side
	ON					E1/T1 Side

A.7.5 Provisioning by NMC (Telnet)

When placed in the CH20 with NMC, this card can be configured through any of the NMC interfaces, including Telnet, Web GUI and SNMP.

```
This Chassis ID:[00]  Cascaded:[Yes]    Monitored Chassis ID:[00]
SLOT #18 > FRM220-E1/T1         [Local ] [ Ver:1.000-1.110-1.020-0.000 ]
<1> :Port Active:[Enable ]
     FX Link  :[Down]   FX Signal:[No ]         FX FEF     :[Off     ]
     RD State :[On   ]  TD State :[Flash]       Test State :[Normal   ]
     E1/T1 Signal :[Signal loss]                Frame Sync :[Sync loss]
     Receive AIS  :[No ]                        Connector Type :[BNC   ]
<2> :E1/T1 Parameter.
<3> :Timing Source :[Recovery from E1/T1 receive]
<4> :Auto Laser Shutdown (ALS) :[Disable]
<5> :Active Rates :[T1:-----]
<6> :Start Timeslot :[T1:--]
<7> :Loop Back Setting :[Off            ]
<8> :Port Reset.
<9> :Set to default.
     Small Form Pluggable(SFP):[No ]  Digital Diagnostic(D/D):[No ]
<D>: Go to Line Card Status menu.
```

<1> : Port Active - Use this item to enable or disable the line card. When disabled all transmission will be blocked and all the line card LED indicators will be Off.
<2> : E1/T1 Parameters - This will bring up the sub menu (see below) for setting these specific parameters.
<3> : Timing Source - The timing source can be configured as Internal (Osc), Recover clock from received E1 signal, or recover clock from signal via fiber. Use the latter setting for the remotely connected fiber unit. Use internal clock for fixed point to point applications and use E1 recovery when connecting to other E1 networked devices.
<4> : Auto Laser Shutdown (ALS) - Enables or disables the ALS safety feature for the Optical port.
<5> : Active Rates - This item sets the total data nx64k rate for either the E1 (n=1 to 31) or T1 (n=1 to 24).
<6> : Start Timeslot - This unit does not support random timeslot assignment. It supports a contiguous range with a starting timeslot plus the number of timeslots. This item sets the starting timeslot (default is TS1).
<7> : Loop Back Setting - There is support for loop back of both E1 signal and optical. Refer to the next page.
<8> : Port Reset - This function will clear and reload the CPLD, effectively resetting the port. Data loss will occur when performing this reset. Use with care.
<9> : Set to Default - This action will return the E1/T1 card to factory default settings.
<D> : Go to Line Card Status menu - If an SFP is installed for optical, the information can be viewed here. See next page.
<N> : Go to the Remote menu - This device supports remote in-band management via Embedded Operations Channel.

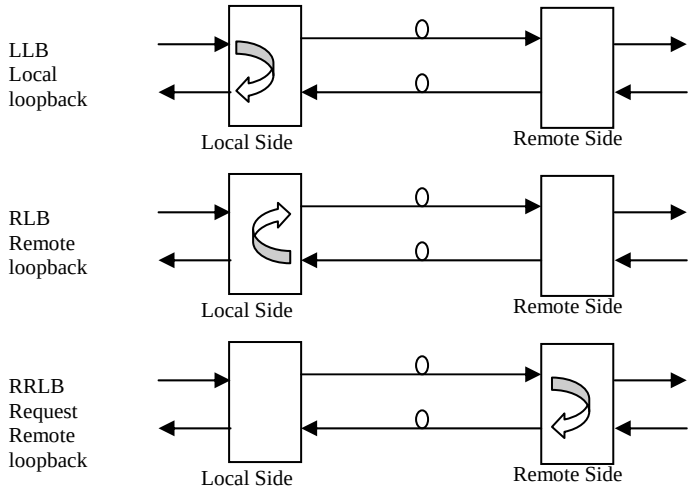
E1/T1 Parameter Menu

```
This Chassis ID:[00]  Cascaded:[Yes]    Monitored Chassis ID:[00]
SLOT #10 > FRM220-E1/T1         [Local ] [ Ver:1.000-1.110-1.020-0.000 ]
<1> : E1/T1 Select :[E1]
<2> : Line Code Setting :[HDB3(E1)/B8ZS(T1)]
<3> : Full/Fractional :[Full E1 T1    ]
<4> : Framer Setting  :[CCS(E1)/D4(T1) ]
<5> : CRC Setting :[Disable]
<6> : Receive Loss Transmit AIS :[Disable]
<7> : Unused Timeslot Code Setting :[0x7E]
```

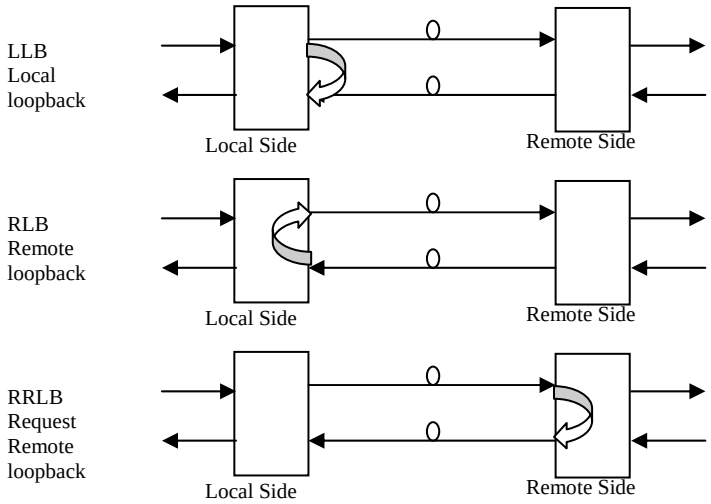
<1> : E1/T1 Select - Selects the operation mode between E1 or T1.
<2> : Line Code Setting - Selects either AMI line code or HDB3 (for E1) / B8ZS (for T1).
<3> : Full/Fractional - Sets either unframed mode or fractional (nx64k) framing.
<4> : Framer Setting - For E1 fractional, choose between CCS(PCM31) or CAS(PCM30) framing. For T1 select between D4(SF) or ESF framing.
<5> : CRC Setting - Disables or enable CRC4 for E1 or CRC6 for T1.
<6> : Receive Loss Transmit AIS - When enabled, if a fiber receive experiences LOS then the E1 transmit will issue AIS.
<7> Unused Timeslot Code Setting - Typically the un-used E1 timeslots will have an idle code of 0x7E inserted. This menu option allows setting the idle code instead to 0xFF.

E1/T1 and Fiber Loop Back

Here is a review of the loop back functions available for the E1/T1 line card.



E1/T1 Loop Back Functions



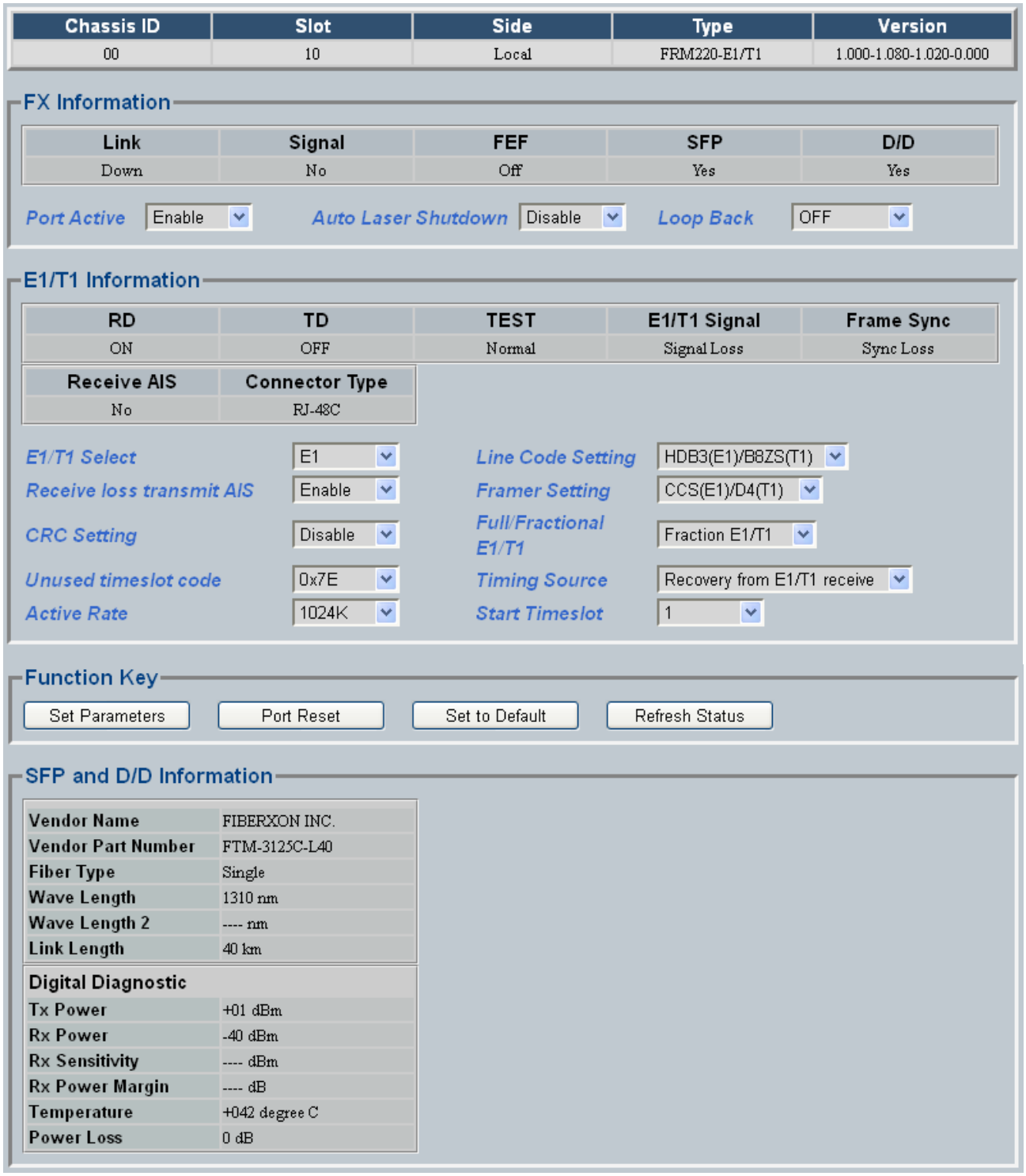
Fiber Loop Back Functions

Line Card Status Menu

```
This Chassis ID:[00]  Cascaded:[Yes]    Monitored Chassis ID:[00]
SLOT #10 > FRM220-E1/T1         [Local ] [ Ver:1.000-1.080-1.020-0.000 ]

Vendor Name       :[ FIBERXON INC.    ]
Vendor Part Number:[ FTM-3125C-L40    ]
Fiber Type        :[ Single ]
Wave Length       :[ 1310nm ]
Wave Length 2     :[ ----nm ]
Link Length       :[   40km ]
Tx Power          :[ +01dBm ]
Rx Power          :[ -28dBm ]
Rx Sensitivity    :[ ------ ]
Temperature       :[ +042C  ]
Power Margin      :[ ------ ]
Power Loss        :[ 00 dB  ]
```

When an SFP with digital diagnostic is installed in the E1/T1, the DOM contents can be displayed.

A.7.6 Provisioning by NMC (Web)

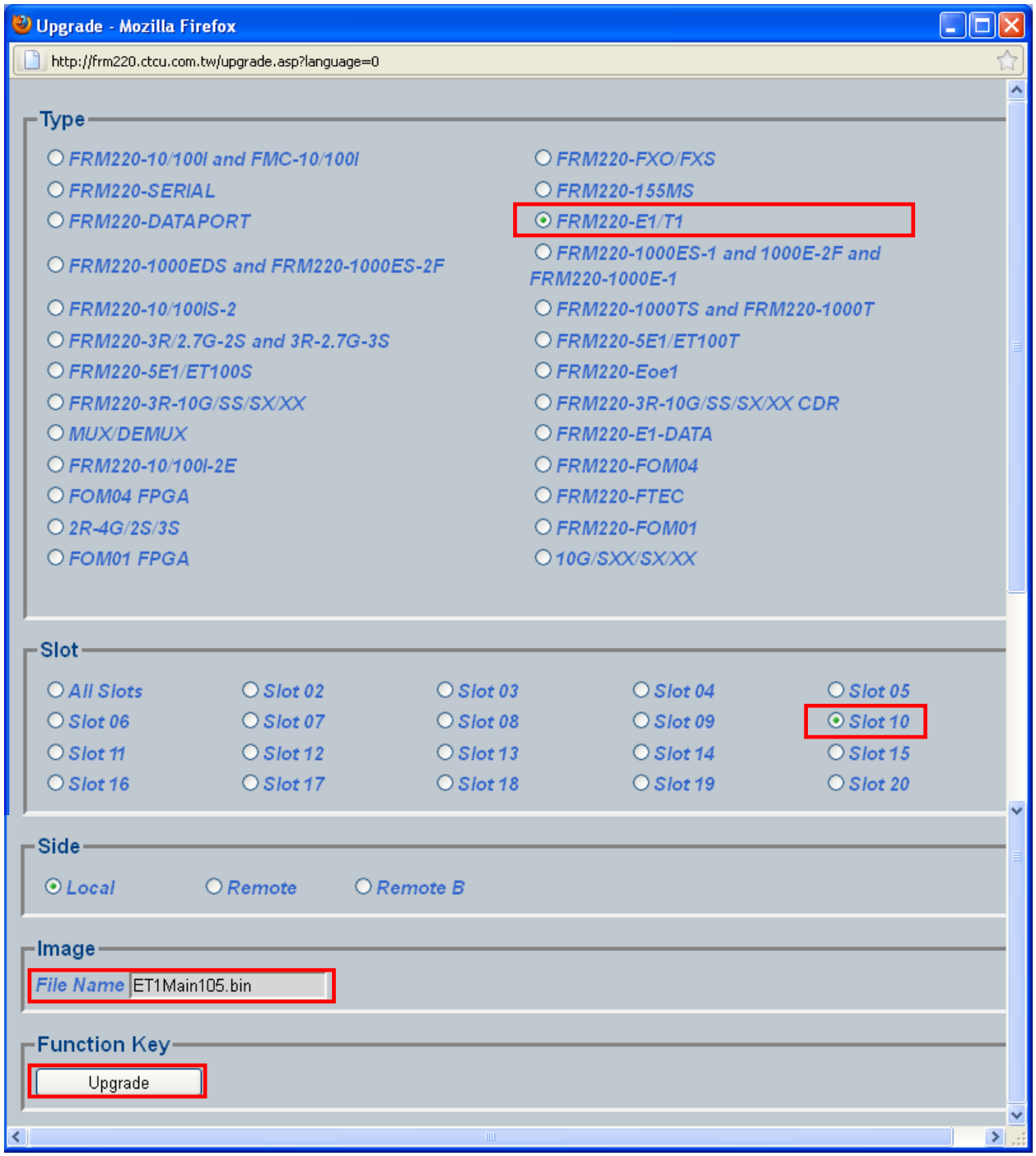


The settings, described in the Telnet operation, are easily manipulated here in the Web GUI. From the top, the Fiber port, E1/T1 port, Function buttons and SFP information at the bottom.

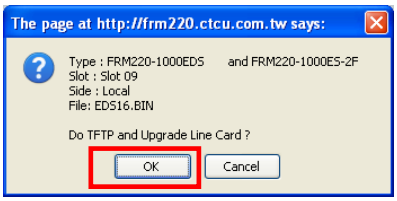
After making any changes, be sure to click the “Set Parameters” button.

A.7.7 Firmware Upgrade

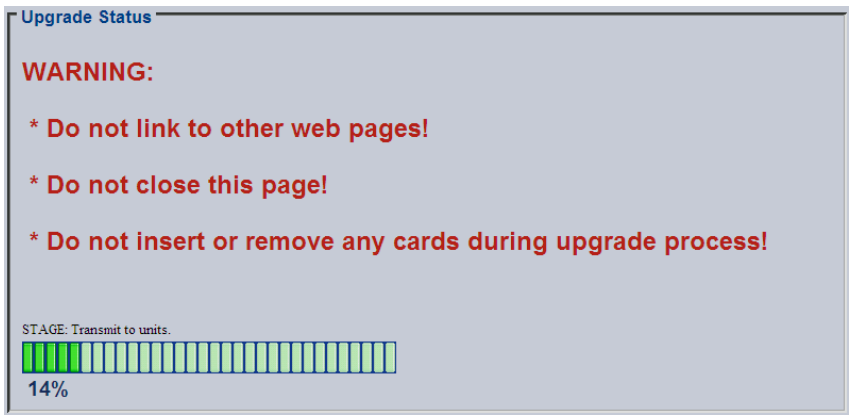
1. From the "System" menu click the "Upgrade Line Card" button.
2. Select the card type radio button, which in this case is the FRM220-E1/T1
3. Select the slot to update. Selecting "All Slots" will upgrade all local and remote E1/T1 cards. (this may take up to 15 minutes)
4. If selecting an individual slot, you must also select either the local or remote unit.
5. The image file name needs to be keyed in. The TFTP server should be able to find this file and the "System" settings need to be correct (see Chapter 2, settings).
6. Click the "Upgrade" button to start the update.



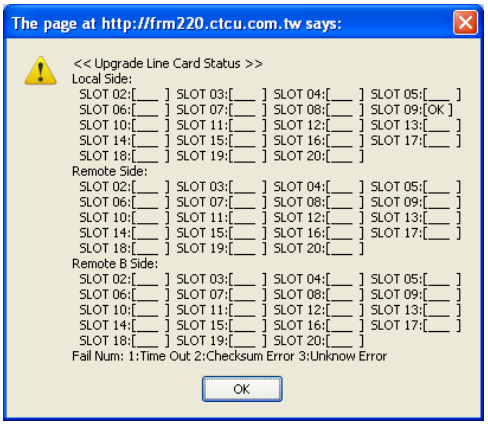
7. Click the "OK" button to confirm.



8. Heed the warning messages!!!!



9. View the success results



A.8 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 ~ 9152KKbps) Receive and Transmit Clock source :Internal, Recovery, External
Standards	ITU-T
LEDs	Power, FX Link, RTS, Test , TD, RD, CTS, DCD
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-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)

A.8.1 Functional Details

Fiber

The DATA fiber modem uses a proprietary scrambled NRZ optical line coding to provide extremely low BER for Serial Data over fiber.

The electrical interface is software selectable between RS-530 (including X.21 and RS-449), V.35 or RS-232. The interface is also software selectable between DCE and DTE, which will eliminate using any special cross-over or null-MODEM cables. The DATA card supports multiple options for clocking by using independent transmit and receive clocks. This provides the ability to have synchronous transmissions with different bi-directional data rates. This feature could be especially useful in satellite transmissions that may have different upstream and downstream rate requirements.

A HDB26 female connector provides the data port connection with a variety of adapter cables. The DB25 cable can be used for RS-530 or RS-232. The DB15 cable is for X.21. The DB37 cable is for RS-449. Finally, the MB34 cable is for V.35.

Management

The **FRM220-DATA** has a small processor that is used to read the on-board DIP switches. When used stand-alone, the configuration can be done via the DIP switches or through a text based menu driven console when the card is placed in the CH01M with DB9.

When placed in a managed chassis, such as our **FRM220-CH20** with **NMC** (Network Management Controller), the **DATA** card and remote are configured and monitored through the chassis **NMC** via console, Telnet, Web HTTP or SNMP.

1. Stand-alone – DIP settings when placed in CH01. Serial console when placed in CH01M
2. Rack management - When placed in **NMC** managed rack, all other settings can be overridden by the **NMC** management.
3. DATA supports in-band management.

A.8.2 Panel

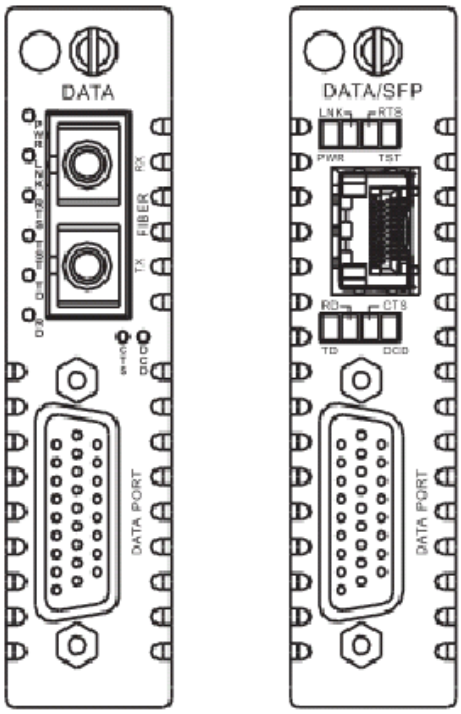


Figure A.8.1 Panel designations of **FRM220-DATA**

There are two variations of this media converter; the DATA converter with fixed optical transceiver or in an SFP version.

A.8.3 Installation of SFP Modules

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

A.8.3.1 Inserting a Bale Clasp SFP Module into the Cage

Step 1 Close the bale clasp upward before inserting the pluggable module.
Step 2 Line up the SFP module with the port, and slide it into the cage.

A.8.3.2 Removing a Bale Clasp SFP Module

Step 1 Open the bale clasp on the SFP module. Press the clasp downward with your index finger.
Step 2 Grasp the SFP module between your thumb and index finger and carefully remove it from the SFP cage.

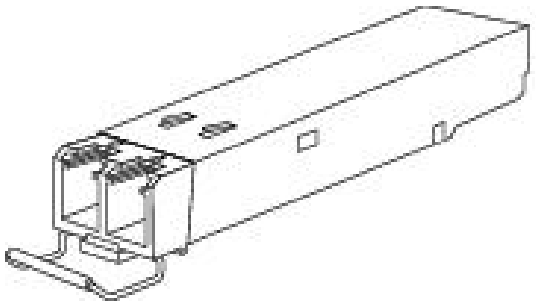
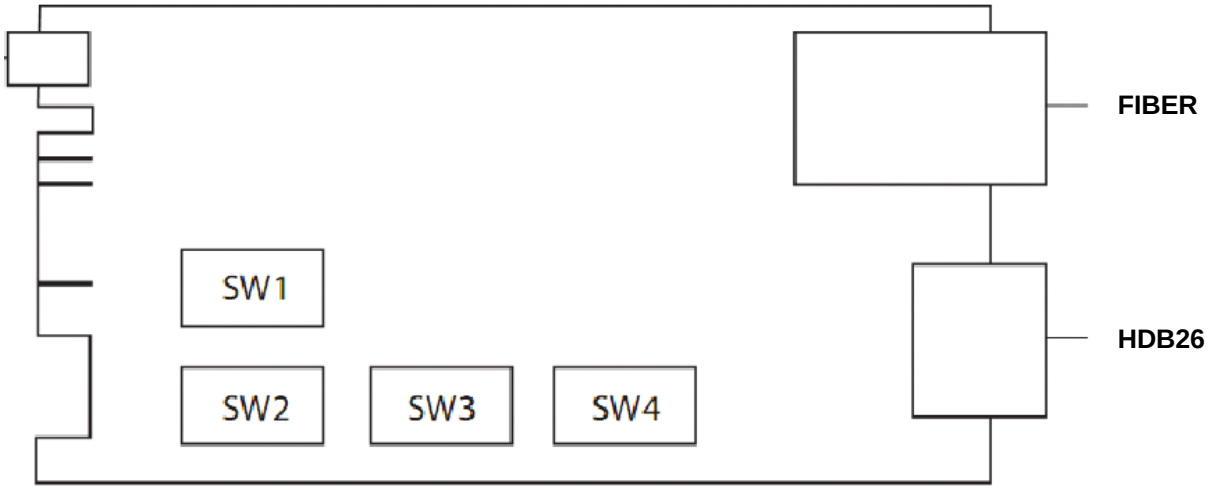


Figure A.8.2 Bale Clasp type SFP with bale open

A.8.4 Provisioning by DIP (Stand-alone)

There are four DIP Switches installed on the PCBA of the **DATA**



Switch 1 provides receive timing settings and switch 2 the transmit timing. The all important switch 3 sets handshaking, polarity, DCE/DTE mode and I/F type. Switch 4 provides the fiber/data loop back.

Switch 1 settings (Receive timing)

SW1	SW STATE					Function							
	1	2	3	4	5	Receive Data Rate Select							
						Group1	Group2	Group3	Group4	Group5	Group6	Group7	Group8
	OFF	OFF	OFF	OFF	OFF	64K	2112K	4160K	6208K	8256K	75	NA	NA
	ON	OFF	OFF	OFF	OFF	128K	2176K	4224K	6272K	8320K	112.5	NA	NA
	OFF	ON	OFF	OFF	OFF	192K	2240K	4288K	6336K	8384K	150	NA	NA
	ON	ON	OFF	OFF	OFF	256K	2304K	4352K	6400K	8448K	225	NA	NA
	OFF	OFF	ON	OFF	OFF	320K	2368K	4416K	6464K	8512K	300	NA	NA
	ON	OFF	ON	OFF	OFF	384K	2432K	4480K	6528K	8576K	450	NA	NA
	OFF	ON	ON	OFF	OFF	448K	2496K	4544K	6592K	8640K	600	NA	NA
	ON	ON	ON	OFF	OFF	512K	2560K	4608K	6656K	8704K	900	NA	NA
	OFF	OFF	OFF	ON	OFF	576K	2624K	4672K	6720K	8768K	1200	NA	NA
	ON	OFF	OFF	ON	OFF	640K	2688K	4736K	6784K	8832K	1800	NA	NA
	OFF	ON	OFF	ON	OFF	704K	2752K	4800K	6848K	8896K	2400	NA	NA
	ON	ON	OFF	ON	OFF	768K	2816K	4864K	6912K	8960K	3600	NA	NA
	OFF	OFF	ON	ON	OFF	832K	2880K	4928K	6976K	9024K	4800	NA	NA
	ON	OFF	ON	ON	OFF	896K	2944K	4992K	7040K	9088K	7200	NA	NA
1,2,3,4,	OFF	ON	ON	ON	OFF	960K	3008K	5056K	7104K	9152K	9600	NA	NA
5	ON	ON	ON	ON	OFF	1024K	3072K	5120K	7168K	NA	14400	NA	NA
	OFF	OFF	OFF	OFF	ON	1088K	3136K	5184K	7232K	NA	19200	NA	NA
	ON	OFF	OFF	OFF	ON	1152K	3200K	5248K	7296K	NA	28800	NA	NA
	OFF	ON	OFF	OFF	ON	1216K	3264K	5312K	7360K	NA	38400	NA	NA
	ON	ON	OFF	OFF	ON	1280K	3328K	5376K	7424K	NA	57600	NA	NA
	OFF	OFF	ON	OFF	ON	1344K	3392K	5440K	7488K	NA	76800	NA	NA
	ON	OFF	ON	OFF	ON	1408K	3456K	5504K	7552K	NA	115200	NA	NA
	OFF	ON	ON	OFF	ON	1472K	3520K	5568K	7616K	NA	153600	NA	NA
	ON	ON	ON	OFF	ON	1536K	3584K	5632K	7680K	NA	230400	NA	NA
	OFF	OFF	OFF	ON	ON	1600K	3648K	5696K	7744K	NA	307200	NA	NA
	ON	OFF	OFF	ON	ON	1664K	3712K	5760K	7808K	NA	460800	NA	NA
	OFF	ON	OFF	ON	ON	1728K	3776K	5824K	7872K	NA	NA	NA	NA
	ON	ON	OFF	ON	ON	1792K	3840K	5880K	7936K	NA	NA	NA	NA
	OFF	OFF	ON	ON	ON	1856K	3904K	5952K	8000K	NA	NA	NA	NA
	ON	OFF	ON	ON	ON	1920K	3968K	6016K	8064K	NA	NA	NA	NA
	OFF	ON	ON	ON	ON	1984K	4032K	6080K	8128K	NA	NA	NA	NA
	ON	ON	ON	ON	ON	2048K	4096K	6144K	8192K	NA	NA	NA	Async

	6	7	8	Receive Data Rate Group Select
	OFF	OFF	OFF	Group 1, N*64, N from 1 to 32, 64K~2048K
	ON	OFF	OFF	Group 2, N*64K, N from 33 to 64, 2112K~4096K
	OFF	ON	OFF	Group 3, N*64K, N from 65 to 96, 4160K~6144K
6,7,8	ON	ON	OFF	Group 4, N*64K, N from 97 to 128, 6208K~8192KK
	OFF	OFF	ON	Group 5, N*64K, N from 129 to 143, 8256K~9152K
	ON	OFF	ON	Group 6, Low Speed Rate, 75~460800
	OFF	ON	ON	Group 7, NA
	ON	ON	ON	Group 8, NA and Async

	9	10	Receive Side Timing Source
	OFF	OFF	Recovery from remote transmit side timing
9,10	ON	OFF	Internal
	OFF	ON	ETC (DCE) / RC input (DTE)
	ON	ON	Recover from remote receive side timing (DCE) / TC input (DTE)

Switch 2 settings (Transmit timing)

SW1	SW STATE					Function							
	1	2	3	4	5	Transmit Data Rate Select							
						Group1	Group2	Group3	Group4	Group5	Group6	Group7	Group8
	OFF	OFF	OFF	OFF	OFF	64K	2112K	4160K	6208K	8256K	75	NA	NA
	ON	OFF	OFF	OFF	OFF	128K	2176K	4224K	6272K	8320K	112.5	NA	NA
	OFF	ON	OFF	OFF	OFF	192K	2240K	4288K	6336K	8384K	150	NA	NA
	ON	ON	OFF	OFF	OFF	256K	2304K	4352K	6400K	8448K	225	NA	NA
	OFF	OFF	ON	OFF	OFF	320K	2368K	4416K	6464K	8512K	300	NA	NA
	ON	OFF	ON	OFF	OFF	384K	2432K	4480K	6528K	8576K	450	NA	NA
	OFF	ON	ON	OFF	OFF	448K	2496K	4544K	6592K	8640K	600	NA	NA
	ON	ON	ON	OFF	OFF	512K	2560K	4608K	6656K	8704K	900	NA	NA
	OFF	OFF	OFF	ON	OFF	576K	2624K	4672K	6720K	8768K	1200	NA	NA
	ON	OFF	OFF	ON	OFF	640K	2688K	4736K	6784K	8832K	1800	NA	NA
	OFF	ON	OFF	ON	OFF	704K	2752K	4800K	6848K	8896K	2400	NA	NA
	ON	ON	OFF	ON	OFF	768K	2816K	4864K	6912K	8960K	3600	NA	NA
	OFF	OFF	ON	ON	OFF	832K	2880K	4928K	6976K	9024K	4800	NA	NA
	ON	OFF	ON	ON	OFF	896K	2944K	4992K	7040K	9088K	7200	NA	NA
1,2,3,4,	OFF	ON	ON	ON	OFF	960K	3008K	5056K	7104K	9152K	9600	NA	NA
5	ON	ON	ON	ON	OFF	1024K	3072K	5120K	7168K	NA	14400	NA	NA
	OFF	OFF	OFF	OFF	ON	1088K	3136K	5184K	7232K	NA	19200	NA	NA
	ON	OFF	OFF	OFF	ON	1152K	3200K	5248K	7296K	NA	28800	NA	NA
	OFF	ON	OFF	OFF	ON	1216K	3264K	5312K	7360K	NA	38400	NA	NA
	ON	ON	OFF	OFF	ON	1280K	3328K	5376K	7424K	NA	57600	NA	NA
	OFF	OFF	ON	OFF	ON	1344K	3392K	5440K	7488K	NA	76800	NA	NA
	ON	OFF	ON	OFF	ON	1408K	3456K	5504K	7552K	NA	115200	NA	NA
	OFF	ON	ON	OFF	ON	1472K	3520K	5568K	7616K	NA	153600	NA	NA
	ON	ON	ON	OFF	ON	1536K	3584K	5632K	7680K	NA	230400	NA	NA
	OFF	OFF	OFF	ON	ON	1600K	3648K	5696K	7744K	NA	307200	NA	NA
	ON	OFF	OFF	ON	ON	1664K	3712K	5760K	7808K	NA	460800	NA	NA
	OFF	ON	OFF	ON	ON	1728K	3776K	5824K	7872K	NA	NA	NA	NA
	ON	ON	OFF	ON	ON	1792K	3840K	5880K	7936K	NA	NA	NA	NA
	OFF	OFF	ON	ON	ON	1856K	3904K	5952K	8000K	NA	NA	NA	NA
	ON	OFF	ON	ON	ON	1920K	3968K	6016K	8064K	NA	NA	NA	NA
	OFF	ON	ON	ON	ON	1984K	4032K	6080K	8128K	NA	NA	NA	NA
	ON	ON	ON	ON	ON	2048K	4096K	6144K	8192K	NA	NA	NA	Async

	6	7	8	Transmit Data Rate Group Select
	OFF	OFF	OFF	Group 1, N*64, N from 1 to 32, 64K~2048K
	ON	OFF	OFF	Group 2, N*64K, N from 33 to 64, 2112K~4096K
	OFF	ON	OFF	Group 3, N*64K, N from 65 to 96, 4160K~6144K
6,7,8	ON	ON	OFF	Group 4, N*64K, N from 97 to 128, 6208K~8192KK
	OFF	OFF	ON	Group 5, N*64K, N from 129 to 143, 8256K~9152K
	ON	OFF	ON	Group 6, Low Speed Rate, 75~460800
	OFF	ON	ON	Group 7, NA
	ON	ON	ON	Group 8, NA and Async

	9	10	Transmit Side Timing Source
	OFF	OFF	Same as receive side timing
9,10	ON	OFF	Internal
	OFF	ON	ETC (DCE) / RC input (DTE)
	ON	ON	Recover from remote receive side timing (DCE) / TC input (DTE)

Switch 3 settings

Use the switches 1~2 to set the DSR/DTR handshaking

Use the switches 3~4 to set the CTS/RTS handshaking

Use the switch 5 to set the ETC polarity

Use the switch 6 to set the TC polarity

Use the switch 7 to set the RC polarity

Use the switch 8 to select the port setting as DCE or DTE.

Use the switch 9~10 to set the Interface type

DIP	SW STATE		Function
1,2	1	2	DSR/DTR output Setting
	OFF	OFF	Constantly ON
	ON	OFF	Follow Local Input DTR/DSR
	OFF	ON	Follow Remote Input DTR/DSR
	ON	ON	NA
3,4	3	4	CTS/RTS output Setting
	OFF	OFF	Constantly ON
	ON	OFF	Follow Local Input RTS/CTS
	OFF	ON	Follow Remote Input RTS/CTS
	ON	ON	NA
5	5		ETC Polarity Setting
	OFF		Normal
	ON		Invert
6	6		TC Polarity Setting
	OFF		Normal
	ON		Invert
7	7		RC Polarity Setting
	OFF		Normal
	ON		Invert
8	8		Data Port Mode Setting
	OFF		DCE Mode
	ON		DTE Mode
9,10	9	10	Data Port Interface Setting
	OFF	OFF	RS-530,RS-449,X.21
	ON	OFF	V.35
	OFF	ON	RS-232
	ON	ON	NA

Switch 4 settings

Use the switches 1~2 to set the loop back type

Use the switches 3 to select either fiber or data port for loop back

Use the switch 4 to set the DCD behavior

DIP	SW STATE		Function
1,2	1	2	Loop Back Function Setting
	OFF	OFF	OFF
	ON	OFF	LLB
	OFF	ON	RLB
	ON	ON	RRLB
3	3		Loop Back Select
	OFF		Fiber Side Loop Back
	ON		Data Port Side Loop Back
4	4		DCD Output Setting
	OFF		Constantly ON (except when fiber LOS)
	ON		Follow Fiber Sync and remote DTE DCD

A.8.5 Provisioning by NMC (Telnet)

When placed in the CH20 with NMC, this card can be configured through any of the NMC interfaces, including Telnet, Web GUI and SNMP.

```
This Chassis ID:[00]  Cascaded:[Yes]    Monitored Chassis ID:[00]
SLOT #16 > FRM220-DATAPORT      [Local ] [ Ver:1.000-1.050-1.010-0.000 ]
<1> :Port Active:[Enable ]
     RD  State:[Off  ] TD  State:[Off  ] RTS State:[Off]   CTS State:[on ]
     DCD State:[on ]   DSR State:[on   ] DTR State:[Off  ] RLB
State:[Off  ]
     LLB State:[Off  ] TM  State:[Off  ]
     FX  Link :[Up  ]  FX  Signal:[Yes]   FX FEF:[Off     ]
 <2>: Receive Side Setting.    <3>: Transmit Side Setting.
 <4>: Auto Laser Shutdown(ALS):[Disable]
 <5>: Data Port  Control Setting:
 <6>: Loop Back  Setting:[Off              ]
 <7>: Data Port  Mode Setting:[DCE Mode]
 <8>: Data Port  Interface Setting:[V.35            ]
 <9>: Port Reset.              <A>: Set to Default.
     Small Form Pluggable(SFP):[No ]  Digital Diagnostic(D/D):[No ]
 <D>: Go to Line Card Status menu.
 <N>: Go to the Remote menu.
```

<1> : Port Active - Use this item to enable or disable the line card. When disabled all transmission will be blocked and all the line card LED indicators will be Off.
<2> : Receive Side Setting - This will bring up the sub menu (see below) for setting these specific parameters.
<3> : Transmit Side Setting - This will bring up the sub menu (see below) for setting these specific parameters.
<4> : Auto Laser Shutdown (ALS) - Enables or disables the ALS safety feature for the Optical port.
<5> : Data Port Control Settings - These are the handshaking and polarity settings (menu on next page).
<6> : Loop Back Settings - There is support for loop back of both DATA signal and optical. Refer to the next page.
<7> : Data Port Mode Setting - Selects between DCE (RxD is output) or DTE (TxD is output) mode.
<8> : Data Port Interface Setting - This sets the electrical interface to RS-530 (X.21, RS-449), V.35 or RS-232.
<9> : Port Reset - This function will clear and reload the CPLD, effectively resetting the port. Data loss will occur when performing this reset. Use with care.
<A> : Set to Default - This action will return the DATA card to factory default settings.
<D> : Go to Line Card Status menu - If an SFP is installed for optical, the information can be viewed here. See next page.
<N> : Go to the Remote menu - This device supports remote in-band management via Embedded Operations Channel.

Receive Side Setting Menu

```
------------------------------------------------------------------------
 Receive Side Setting:
<0> : Receive Data Rate & Group : [Group1:   256K]
<1> : Receive Timing Source     : [Recovery from remote transmit Side]

------------------------------------------------------------------------
```

Select the group rate and timing source for the receive clock.

Transmit Side Setting Menu

```
------------------------------------------------------------------------
 Transmit Side Setting:
<0> : Transmit Data Rate & Group : [Group1:   256K]
<1> : Transmit Timing Source     : [Same as Receive Timing Source     ]

------------------------------------------------------------------------
```

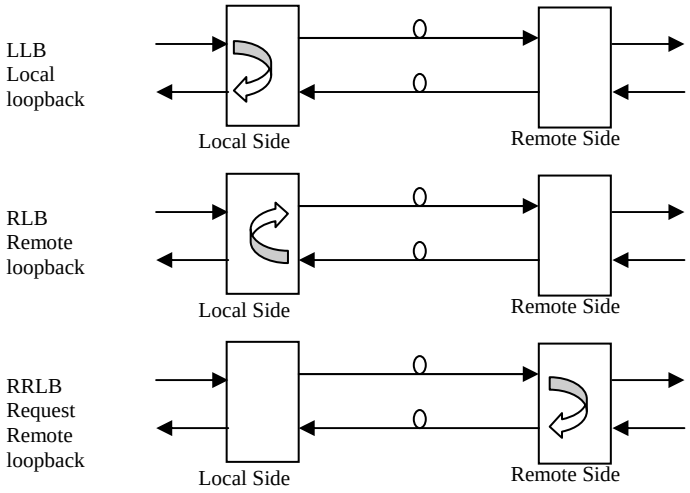
Select the group rate and timing source for the transmit clock.

Data Port Control Settings Menu

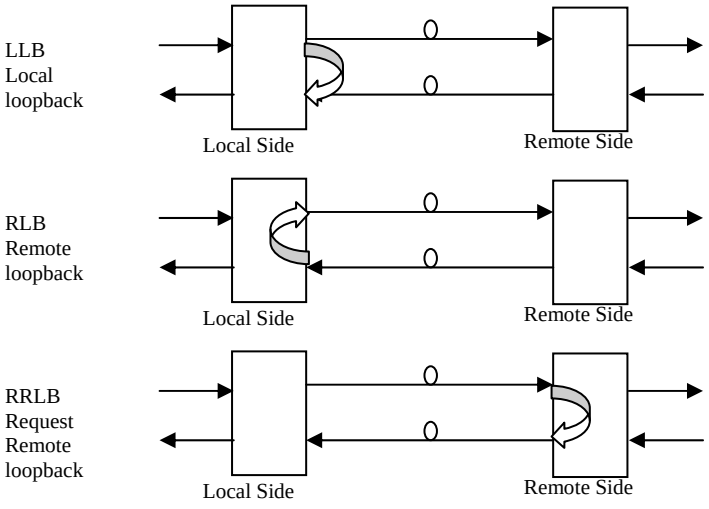
```
-------------------------------------------------------------------------
 Data Port Control Setting:
<0>:DSR/DTR output setting[Constantly ON       ]<1>:ETC polarity setting[Normal]
<2>:CTS/RTS output setting[Constantly ON       ]<3>:TC  polarity setting[Normal]
<4>:DCD     output setting[Constantly ON   ]    <5>:RC  polarity setting[Normal]
-------------------------------------------------------------------------
```

Data Port and Fiber Loop Back

Here is a review of the loop back functions available for the DATA line card.

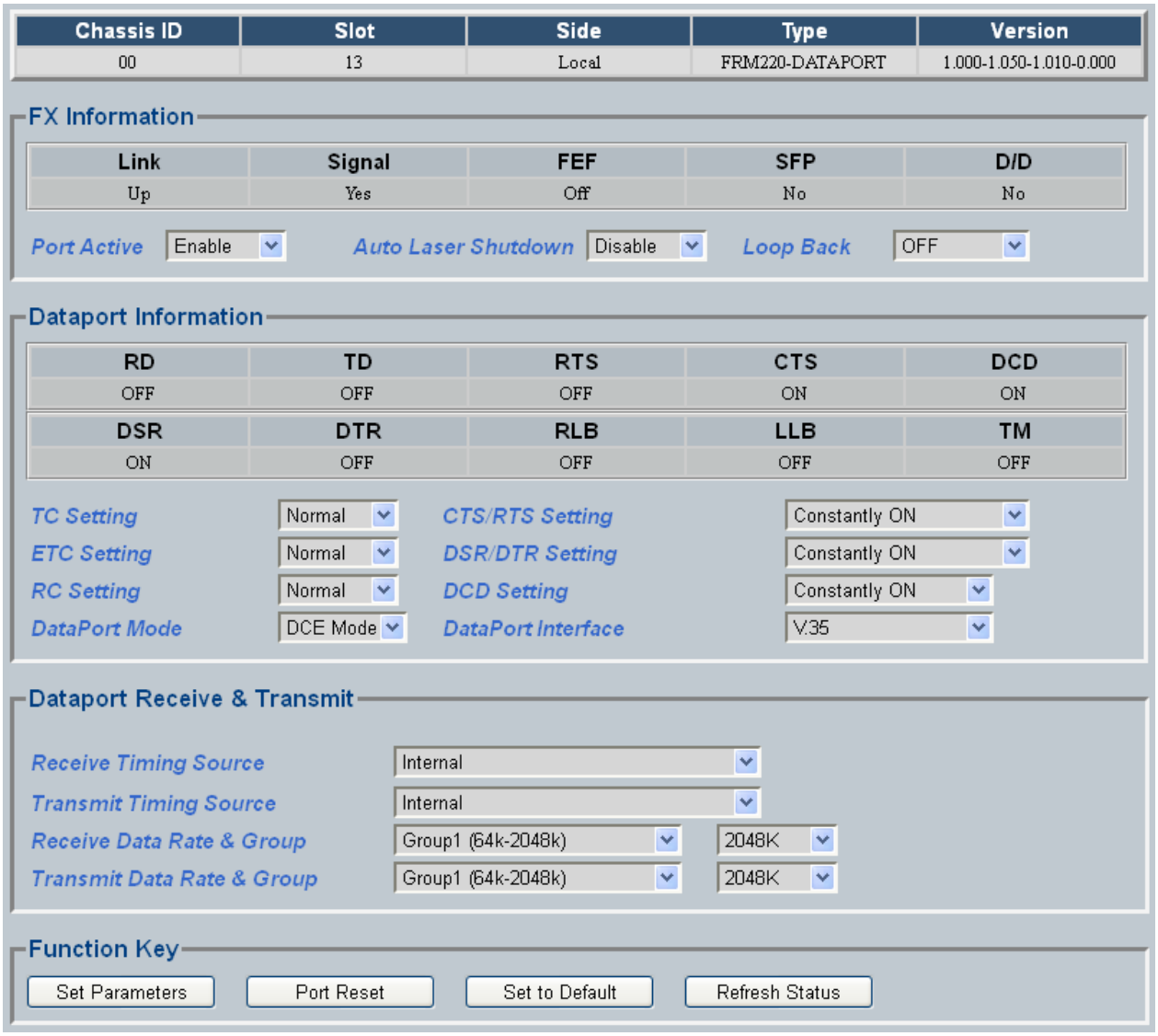


Data Port Loop Back Functions



Fiber Loop Back Functions

A.8.6 Provisioning by NMC (Web)

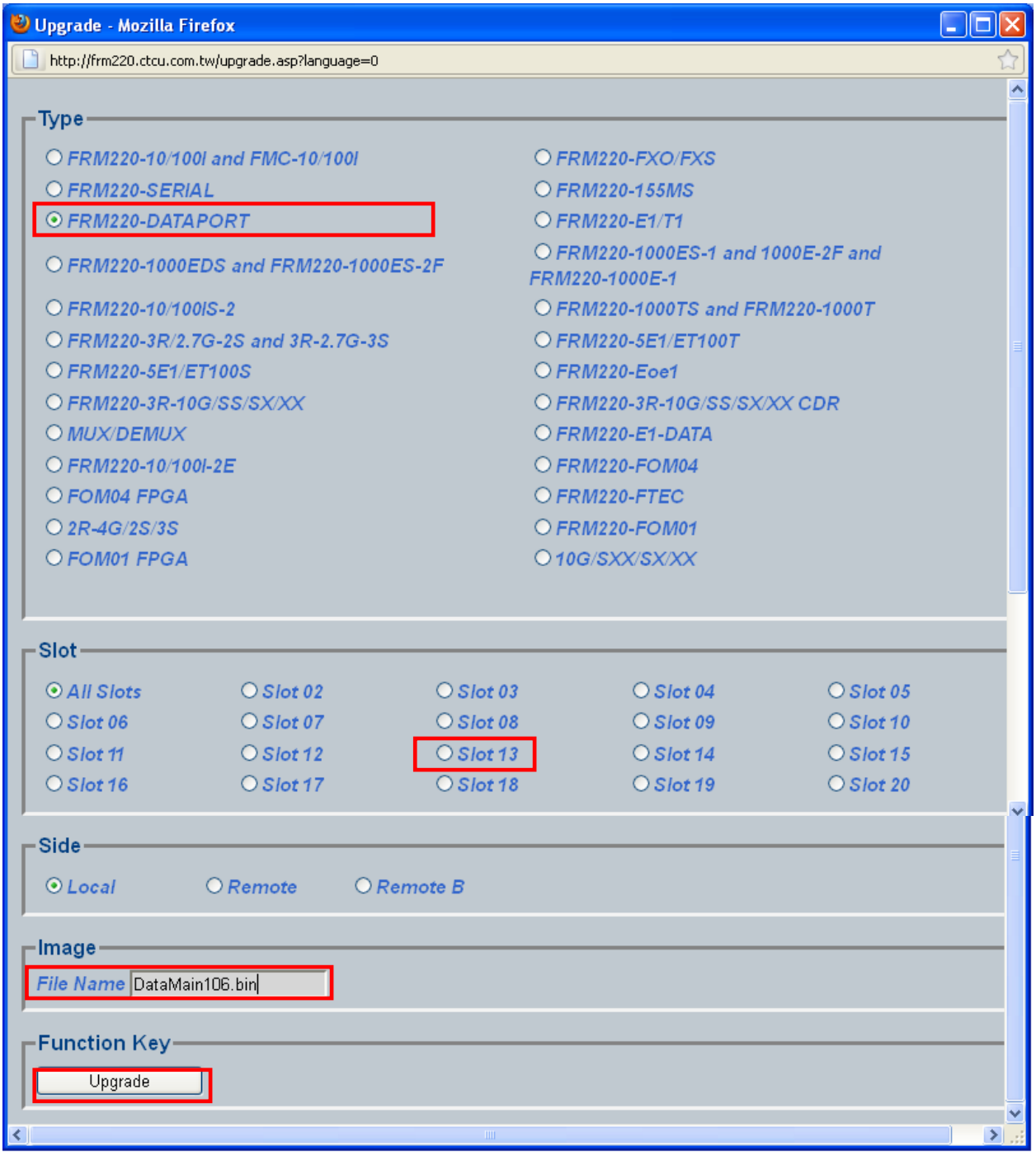


The settings, described in the Telnet operation, are easily manipulated here in the Web GUI. From the top, the Fiber port, DATA port, Function buttons and SFP information (if any) at the bottom.

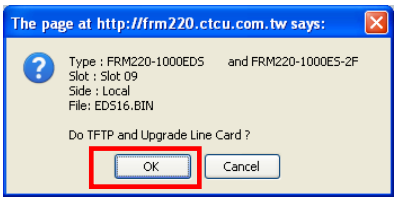
After making any changes, be sure to click the “Set Parameters” button.

A.8.7 Firmware Upgrade

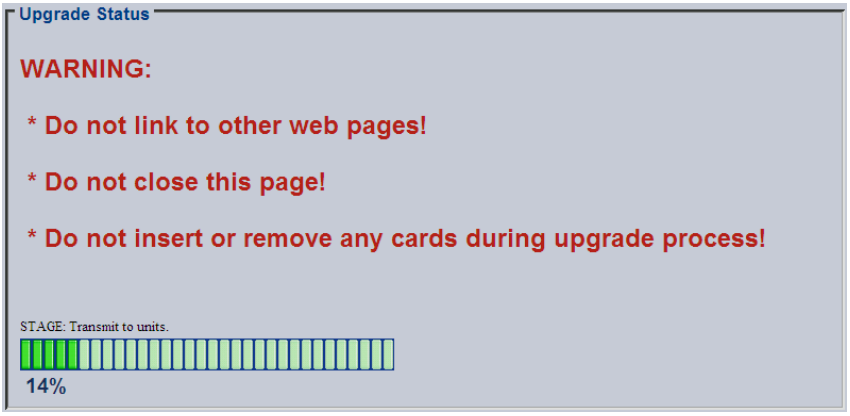
1. From the "System" menu click the "Upgrade Line Card" button.
2. Select the card type radio button, which in this case is the FRM220-DATA
3. Select the slot to update. Selecting "All Slots" will upgrade all local and remote DATA cards. (this may take up to 15 minutes)
4. If selecting an individual slot, you must also select either the local or remote unit.
5. The image file name needs to be keyed in. The TFTP server should be able to find this file and the "System" settings need to be correct (see Chapter 2, settings).
6. Click the "Upgrade" button to start the update.



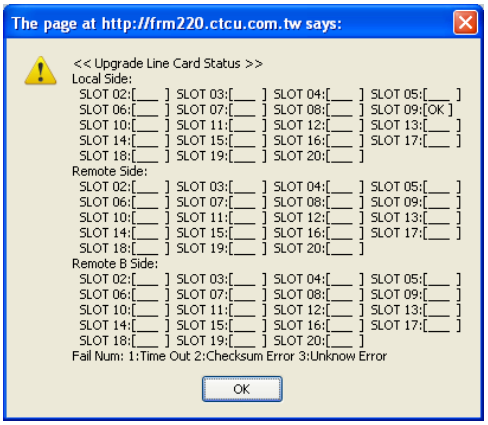
7. Click the "OK" button to confirm.



8. Heed the warning messages!!!!



9. View the success results



A.9 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 62.2/125μm, 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 : 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
Standard	EIA/TIA RS485, RS422, RS232
LEDs	Power, FX Link, DI, DO, 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-Serial/485 (6 pin terminal block and fixed fiber transceiver)
- FRM220-Serial/485S (6 pin terminal block with SFP)

A.9.1 Functional Details

Fiber

The Serial fiber modem uses a proprietary scrambled NRZ optical line coding to provide extremely low BER for Serial Data over fiber.

The electrical interface is software selectable between RS-232 3-wire or 5-wire and RS-485 4-wire Full Duplex or 2-wire Half Duplex interface.

A 6-Pin Terminal block provides the interface port connections.

Management

The **FRM220-Serial** has a small processor that is used to read the on-board DIP switches. When used stand-alone, the configuration can be done via the DIP switches.

When placed in a managed chassis, such as our **FRM220-CH20** with **NMC** (Network Management Controller), the **Serial** card and remote are configured and monitored through the chassis **NMC** via console, Telnet, Web HTTP or SNMP.

1. Stand-alone – DIP settings when placed in CH01.
2. Rack management - When placed in **NMC** managed rack, all other settings can be overridden by the **NMC** management.
3. DATA supports in-band management.

A.9.2 Panel

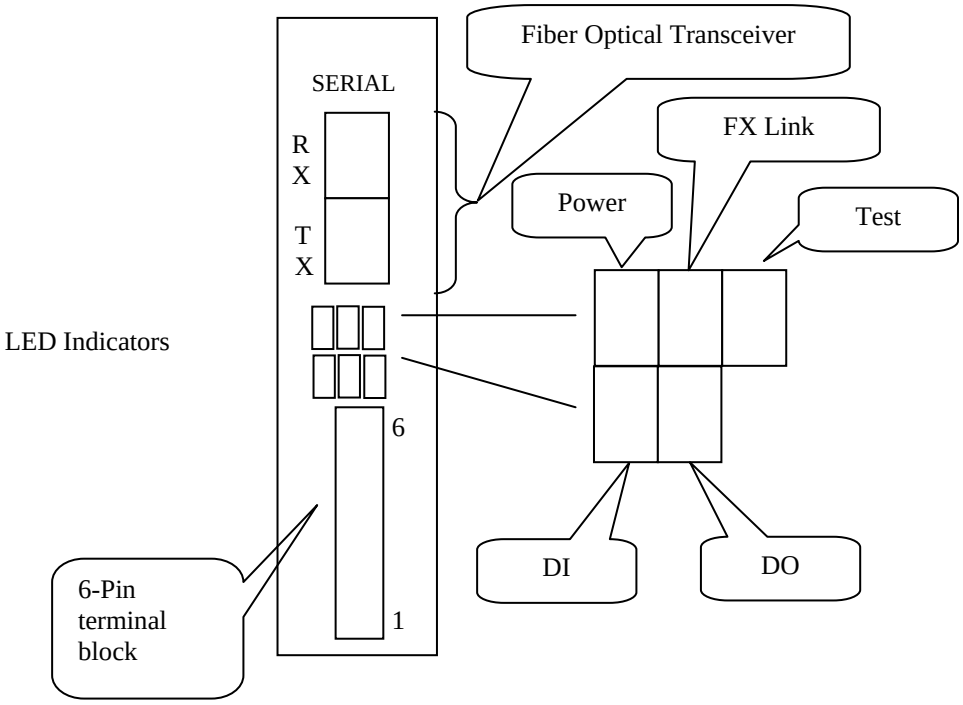


Figure A.9.1 Panel designations of **FRM220-Serial**

There are two variations of this media converter; the Serial converter with fixed optical transceiver or in an SFP version.

A.9.3 Installation of SFP Modules

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

A.9.3.1 Inserting a Bale Clasp SFP Module into the Cage

Step 1 Close the bale clasp upward before inserting the pluggable module.
Step 2 Line up the SFP module with the port, and slide it into the cage.

A.9.3.2 Removing a Bale Clasp SFP Module

Step 1 Open the bale clasp on the SFP module. Press the clasp downward with your index finger.
Step 2 Grasp the SFP module between your thumb and index finger and carefully remove it from the SFP cage.

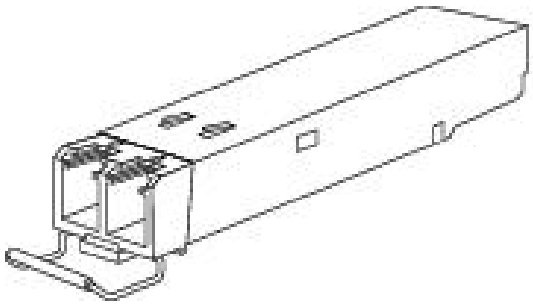
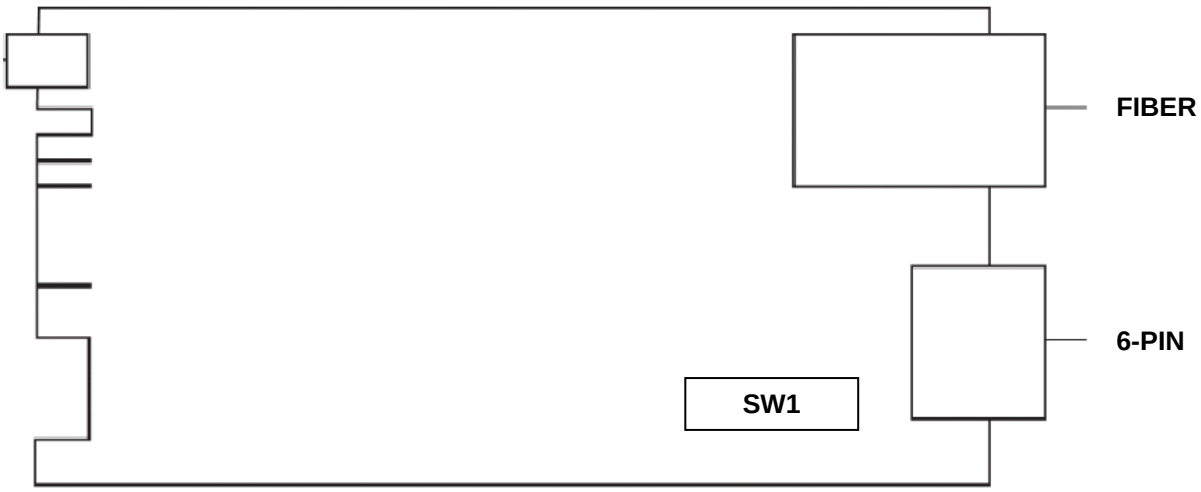


Figure A.8.2 Bale Clasp type SFP with bale open

A.9.4 Provisioning by DIP (Stand-alone)

There is one DIP Switch installed on the PCBA of the **Serial**



Switch 1 provides the interface setting, termination and pull up/down for RS-485.

Switch 1 settings

DIP SW NO.		SW State		Function
1	2	OFF	OFF	RS-422 4-Wire
		ON	OFF	RS-485 2-Wire
		OFF	ON	RS-232 with RTS/CTS 5-Wire
		ON	ON	RS-232 3-Wire
3		OFF		RS-422 Transmit Termination OFF
		ON		RS-422 Transmit Termination ON
4		OFF		RS-485/RS-422 Receive Termination OFF
		ON		RS-485/RS-422 Receive Termination ON
5		OFF		RS-485/RS-422 Receive(B)(-) 1K ohm “pull down” OFF
		ON		RS-485/RS-422 Receive(B)(-) 1K ohm “pull down” ON
6		OFF		RS-485/RS-422 Receive(A)(+) 1K ohm “pull up” OFF
		ON		RS-485/RS-422 Receive(A)(+) 1K ohm “pull up” ON

A.9.5 Provisioning by NMC (Telnet)

When placed in the CH20 with NMC, this card can be configured through any of the NMC interfaces, including Telnet, Web GUI and SNMP. NOTE: Termination and Pull-Up/Down must be set by DIP switch.

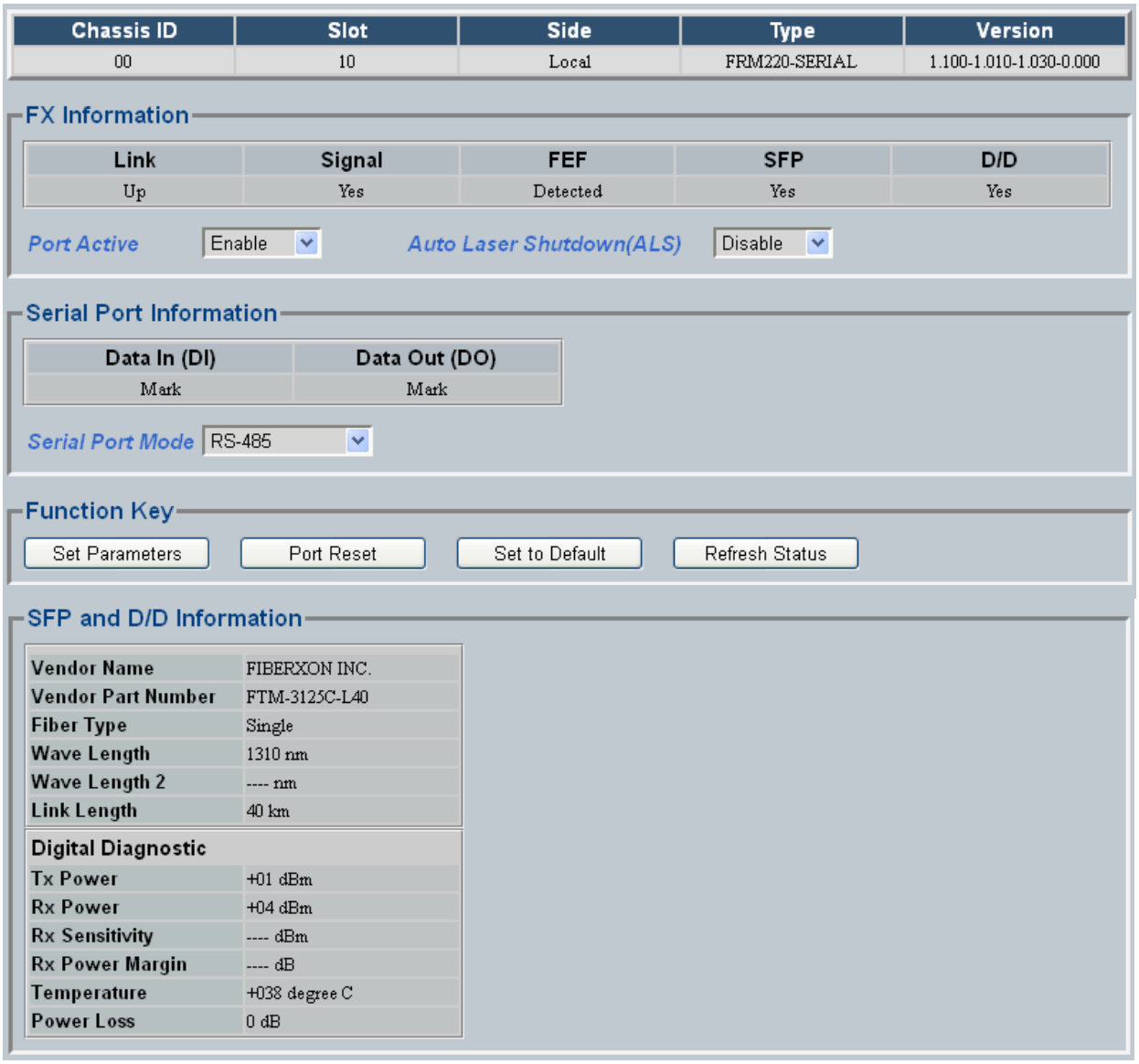
```
This Chassis ID:[00]  Cascaded:[Yes]    Monitored Chassis ID:[00]
SLOT #10 > FRM220-SERIAL        [Local ] [ Ver:1.100-1.010-1.030-0.000 ]
 <1> : Port Active:[Enable ]
       Data In(DI) Status:[Mark ]   Data Out(DO) Status:[Mark ]
       FX Link  :[Up  ]
       FX Signal:[Yes]
       FX FEF   :[Detected]
 <2> : Serial Port Mode  :[RS-422       ]
 <3> : Auto Laser Shutdown(ALS):[Disable]
 <4> : Port Reset.
 <5> : Set to Default.
       Small Form Pluggable(SFP):[Yes]  Digital Diagnostic(D/D):[Yes]
 <D> : Go to Line Card Status menu.
 <N> : Go to the Remote menu.
```

<1> : Port Active - Use this item to enable or disable the line card. When disabled all transmission will be blocked and all the line card LED indicators will be Off.
<2> : Serial Port Mode - This sets the electrical interface to RS-422 (4-wire), RS-485 (2-wire) or RS-232 (3 or 5-wire).
<3> : Auto Laser Shutdown (ALS) - Enables or disables the ALS safety feature for the Optical port.
<4> : Port Reset - This function will clear and reload the CPLD, effectively resetting the port. Data loss will occur when performing this reset. Use with care.
<5> : Set to Default - This action will return the Serial card to factory default settings.
<D> : Go to Line Card Status menu - If an SFP is installed for optical, the information can be viewed here. See next page..
<N> : Go to the Remote menu - This device supports remote in-band management via Embedded Operations Channel.

Line Card Status

```
SLOT #10 > FRM220-SERIAL        [Local ] [ Ver:1.100-1.010-1.030-0.000 ]

Vendor Name       :[ FIBERXON INC.    ]
Vendor Part Number:[ FTM-3125C-L40    ]
Fiber Type        :[ Single ]
Wave Length       :[ 1310nm ]
Wave Length 2     :[ ----nm ]
Link Length       :[   40km ]
Tx Power          :[ +01dBm ]
Rx Power          :[ +04dBm ]
Rx Sensitivity    :[ ------ ]
Temperature       :[ +042C  ]
Power Margin      :[ ------ ]
Power Loss        :[ 00 dB  ]
```

A.9.6 Provisioning by NMC (Web)



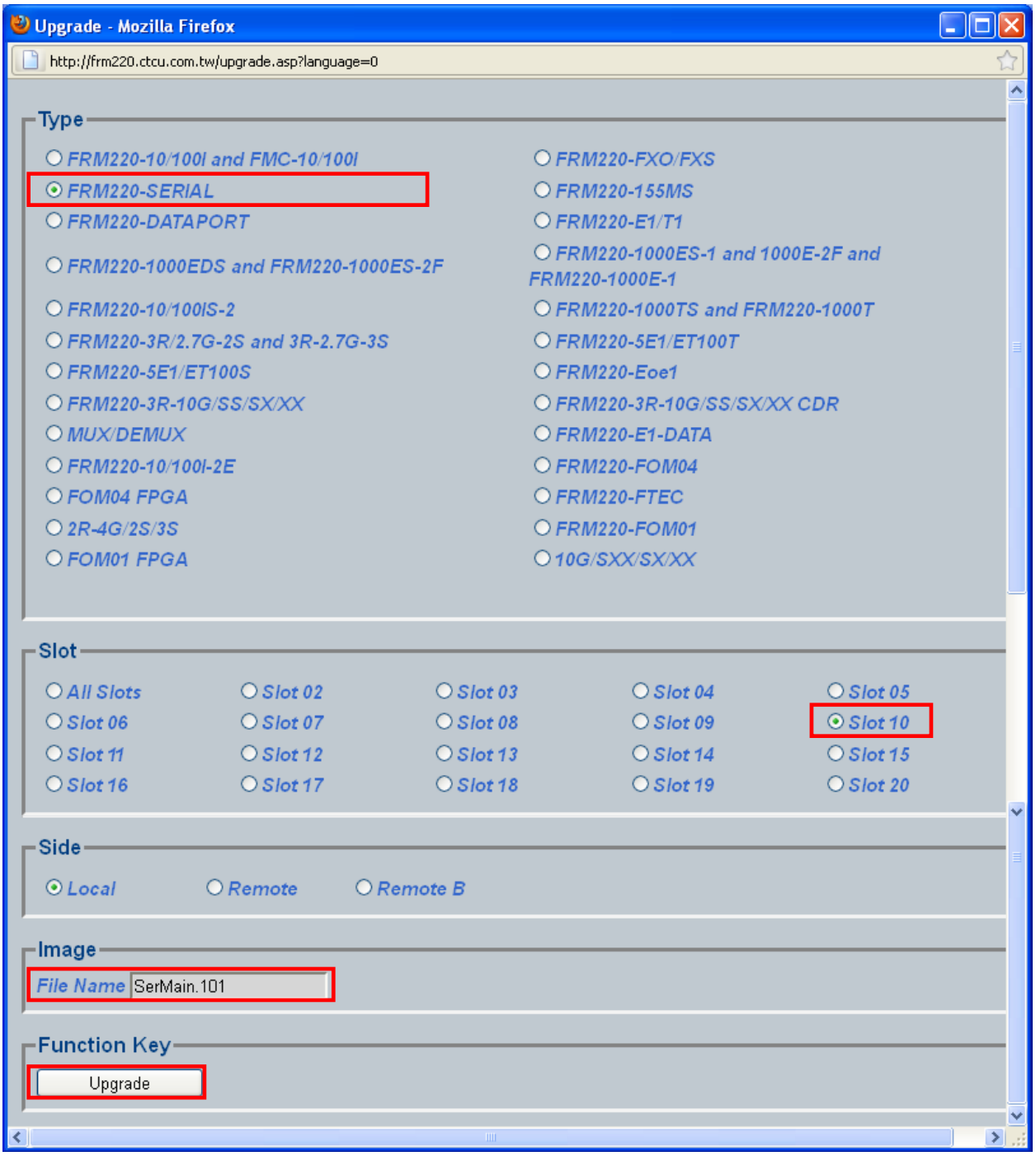
The settings, described in the Telnet operation, are easily manipulated here in the Web GUI. From the top, the Fiber port, DATA port, Function buttons and SFP information (if any) at the bottom.

After making any changes, be sure to click the “Set Parameters” button.

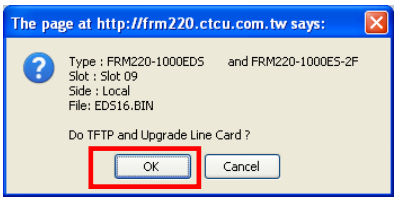
1. Port Active: Setting this to ‘Disable’ will halt all traffic through the card. In the remote in-band unit, this option is not allowed.
2. ALS: Auto Laser Shutdown is a safety measure. If a transceiver losses optical signal at its receive port, it will turn off the transmitting laser.
3. Serial Port Mode: The interface can be selected from RS-422 (4-wire, Tx and Rx pair), RS-485 (2-wire Half Duplex), RS-232 3-wire (TD, RD and SG) or RS-232 5-wire (TD, RD, SG plus handshaking In & Out).

A.9.7 Firmware Upgrade

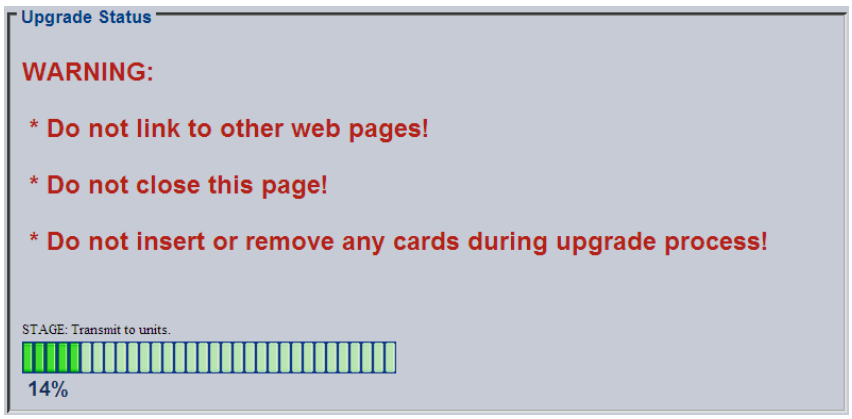
1. From the "System" menu click the "Upgrade Line Card" button.
2. Select the card type radio button, which in this case is the FRM220-Serial
3. Select the slot to update. Selecting "All Slots" will upgrade all local and remote Serial cards. (this may take up to 15 minutes)
4. If selecting an individual slot, you must also select either the local or remote unit.
5. The image file name needs to be keyed in. The TFTP server should be able to find this file and the "System" settings need to be correct (see Chapter 2, settings).
6. Click the "Upgrade" button to start the update.



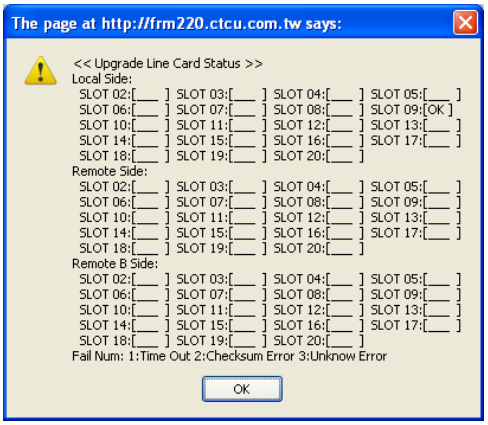
7. Click the "OK" button to confirm.



8. Heed the warning messages!!!!



9. View the success results



A.10 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 62.2/125µm, 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 : RJ-11 **FXO mode** Impedance : 600 ohms Coding : 16 bits liner Loop Current : 10~100mA Ring Frequency : Acceptable 20 ~50Hz Insertion Loss: 0.0 ± 1.0dB at 1000Hz **FXS mode** Impedance : 600 ohms Coding : 16 bits liner Dial: DTMF and Dial Paul Battery Source: 48VDC ± 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 ± 1.0dB at 1000Hz REN: 4.0B(Ring Equivalence Number)
LEDs	Power, FX Link, Phone Act, 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-FXO/FXS (POTS over Fiber fixed transceiver)
- FRM220-FXO/FXS-S (POTS over Fiber SFP)

A.10.1 Functional Details

Fiber

The FXO/FXS fiber modem uses a proprietary scrambled NRZ optical line coding to provide extremely low BER for Voice over fiber.

Electrical

The electrical interface is software selectable between FXO (Foreign eXchange Office) and FXS (Foreign eXchange Subscriber) interface.

An RJ-11 provides the interface port connections.

Management

The **FRM220-FXO/FXS** has a small processor that is used to read the on-board DIP switches. When used stand-alone, the configuration can be done via the DIP switches.

When placed in a managed chassis, such as our **FRM220-CH20** with **NMC** (Network Management Controller), the **FXO/FXS** card and remote are configured and monitored through the chassis **NMC** via console, Telnet, Web HTTP or SNMP.

1. Stand-alone – DIP settings when placed in CH01.
2. Rack management - When placed in **NMC** managed rack, all other settings can be overridden by the **NMC** management.
3. FXO/FXS supports in-band management.

A.10.2 Panel

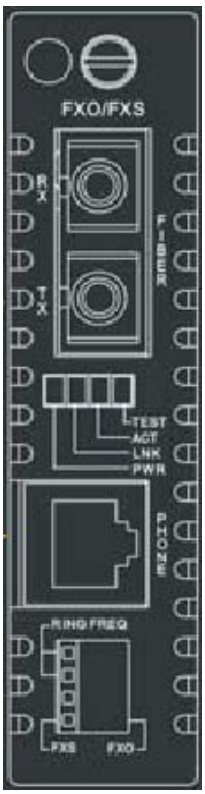


Figure A.10.1 Panel designations of **FRM220-FXO/FXS**

There are two variations of this media converter; the FXO/FXS converter with fixed optical transceiver or in an SFP version.

A.10.3 Installation of SFP Modules

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

A.10.3.1 Inserting a Bale Clasp SFP Module into the Cage

Step 1 Close the bale clasp upward before inserting the pluggable module.
Step 2 Line up the SFP module with the port, and slide it into the cage.

A.10.3.2 Removing a Bale Clasp SFP Module

Step 1 Open the bale clasp on the SFP module. Press the clasp downward with your index finger.
Step 2 Grasp the SFP module between your thumb and index finger and carefully remove it from the SFP cage.

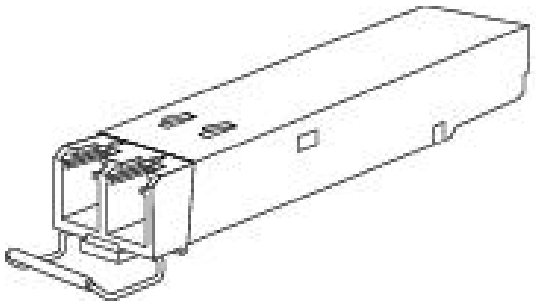
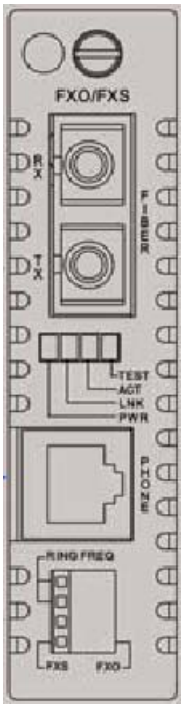


Figure A.8.2 Bale Clasp type SFP with bale open

A.10.4 Provisioning by DIP (Stand-alone)

There is one DIP Switch installed on the Face of the **FXO/FXS**



FIBER

RJ-11

SW1

Switch 1 provides the FXO/FXS setting, Leased line mode and Ring frequency.

Switch 1 settings (firmware version 3.03)

DIP SW State		Main Mode setting	DIP SW State		Sub-function
-1	-2		-3	-4	
OFF (1)	OFF (0)	**FXS Mode 20~35Hz**	OFF(1)	OFF(1)	Ring frequency, 20Hz
			ON(0)	OFF(1)	Ring frequency, 25Hz
			OFF(1)	ON(0)	Ring frequency, 30Hz
			ON(0)	ON(0)	Ring frequency, 35Hz
ON (0)	ON (1)	**FXS Mode 40~55Hz**	OFF(1)	OFF(1)	Ring frequency, 40Hz
			ON(0)	OFF(1)	Ring frequency, 45Hz
			OFF(1)	ON(0)	Ring frequency, 50Hz
			ON(0)	ON(0)	Ring frequency, 55Hz
ON (0)	OFF (0)	**FXO Mode**	OFF(1)	OFF(1)	Ring frequency, 20/25Hz
			ON(0)	OFF(1)	Ring frequency, 30/35Hz
			OFF(1)	ON(0)	Ring frequency, 40/45Hz
			ON(0)	ON(0)	Ring frequency, 50/55Hz
OFF (1)	ON (1)	**FXS leased line Mode**	OFF(1)	X	Master timing
			ON(0)	X	Slave timing
			X	OFF(1)	Leased line mode 1
			X	ON(0)	Leased line mode 2

A.10.5 Provisioning by NMC (Telnet)

When placed in the CH20 with NMC, this card can be configured through any of the NMC interfaces, including Telnet, Web GUI and SNMP.

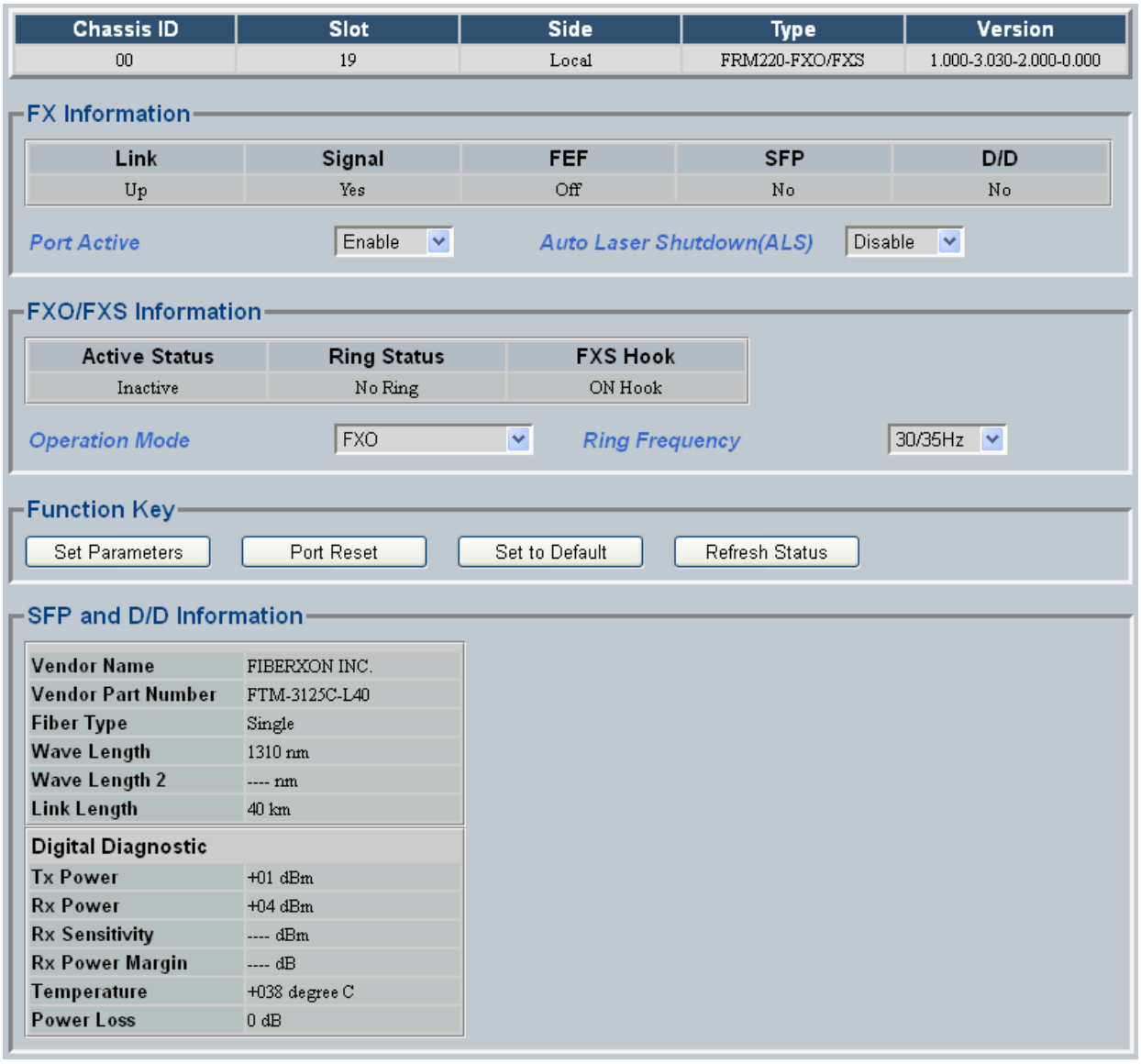
```
This Chassis ID:[00]  Cascaded:[Yes]    Monitored Chassis ID:[00]
SLOT #19 > FRM220-FXO/FXS       [Local ] [ Ver:1.000-3.030-2.000-0.000 ]
 <1> : Port Active:[Enable ]
       FX Link:[Up  ]   FX Signal:[Yes]   FX FEF:[Off     ]
       FXO/FXS Active Status:[Inactive]
       FXO/FXS Ring Status  :[NO Ring ]
       FXS ON/OFF Hook      :[ON Hook ]
 <2> : Operation Mode:[FXO            ]
 <3> : Ring Frequency:[30/35Hz]
     : Timeing select:[------]
     : Leased line mode:[-----]
 <6> : Auto Laser Shutdown(ALS):[Disable]
 <7> : Port Reset.
 <8> : Set to Default.
       Small Form Pluggable(SFP):[No ]  Digital Diagnostic(D/D):[No ]
 <D> : Go to Line Card Status menu..
 <N> : Go to the Remote menu.
```

<1> : Port Active - Use this item to enable or disable the line card. When disabled all transmission will be blocked and all the line card LED indicators will be Off.
<2> : Operating Mode - The electrical interface is software selectable between FXO (Foreign eXchange Office) and FXS (Foreign eXchange Subscriber) interface . When connecting to a PBX or PSTN, set FXO. When connecting to a telephone handset, set FXS.
<3> : Ring Frequency - Different carriers and national standards use different ring frequencies. Set the proper frequency here for your location.
<6> : Auto Laser Shutdown (ALS) - Enables or disables the ALS safety feature for the Optical port.
<7> : Port Reset - This function will clear and reload the CPLD, effectively resetting the port. Data loss will occur when performing this reset. Use with care.
<8> : Set to Default - This action will return the Serial card to factory default settings.
<D> : Go to Line Card Status menu - If an SFP is installed for optical, the information can be viewed here. See next page..
<N> : Go to the Remote menu - This device supports remote in-band management via Embedded Operations Channel.

Line Card Status

```
SLOT #19 > FRM220-FXO/FXS       [Local ] [ Ver:1.000-3.030-2.000-0.000 ]

Vendor Name       :[ FIBERXON INC.     ]
Vendor Part Number:[ FTM-3125C-L40     ]
Fiber Type        :[ Single ]
Wave Length       :[ 1310nm ]
Wave Length 2     :[ ----nm ]
Link Length       :[   40km ]
Tx Power          :[ +01dBm ]
Rx Power          :[ +04dBm ]
Rx Sensitivity    :[ ------ ]
Temperature       :[ +042C  ]
Power Margin      :[ ------ ]
Power Loss        :[ 00 dB  ]
```

A.10.6 Provisioning by NMC (Web)

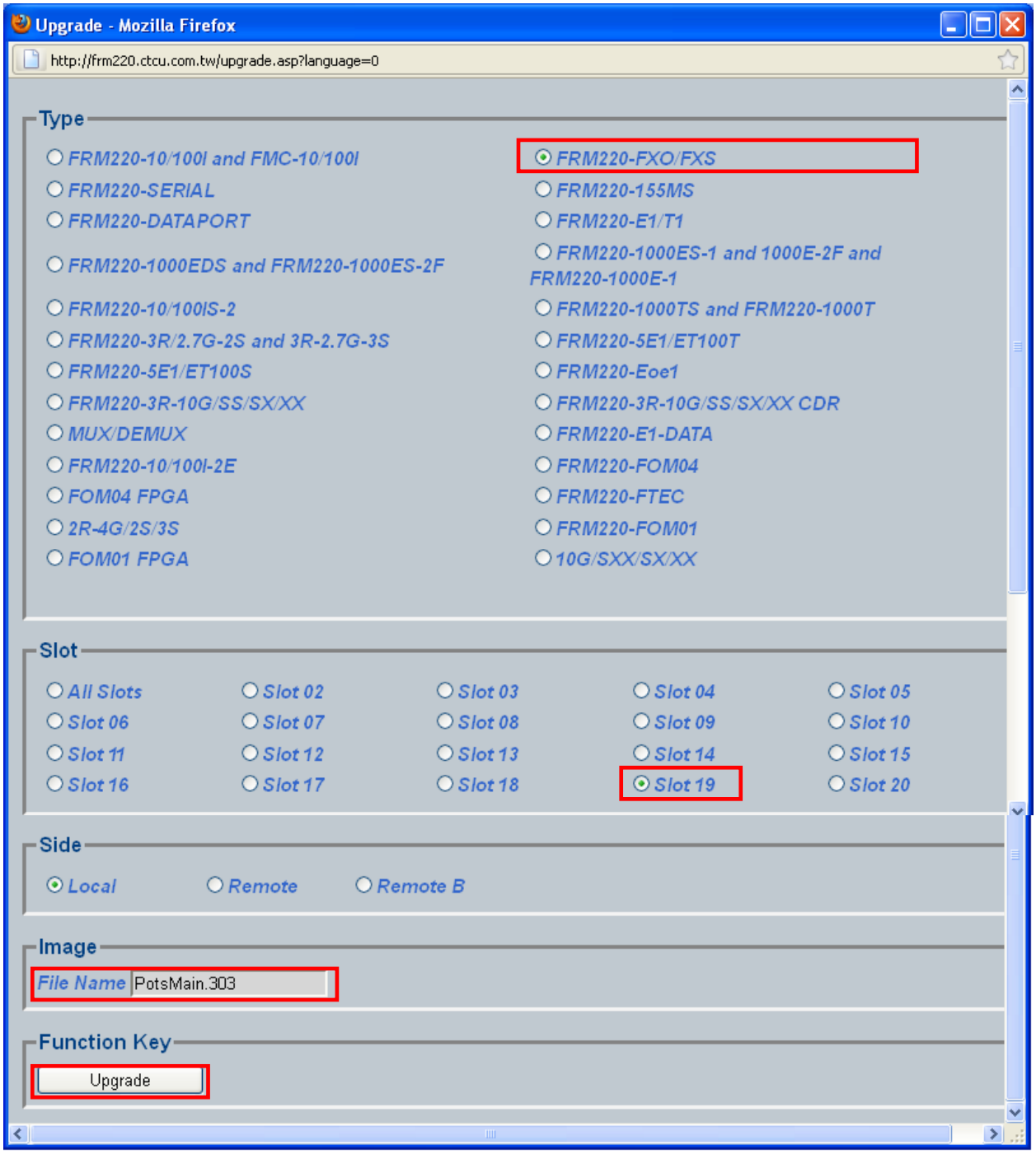


The settings, described in the Telnet operation, are easily manipulated here in the Web GUI. From the top, the Fiber port, voice port, Function buttons and SFP information (if any) at the bottom.

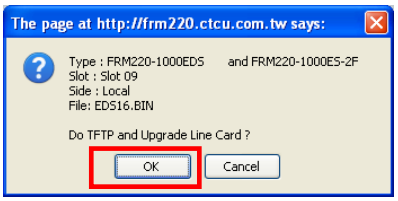
After making any changes, be sure to click the “Set Parameters” button.

A.10.7 Firmware Upgrade

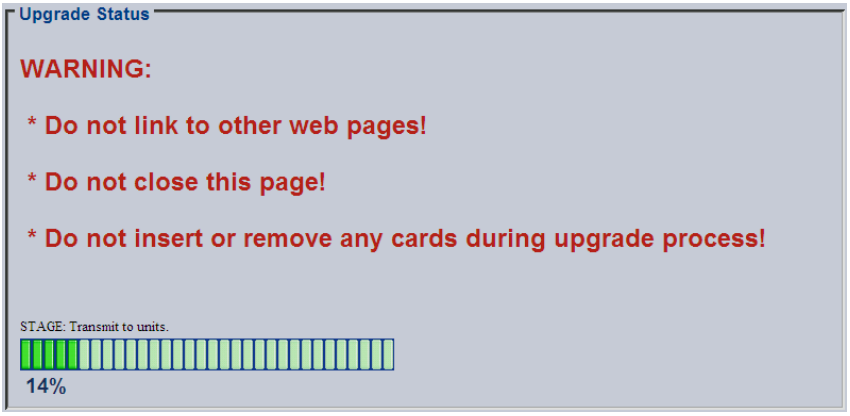
1. From the "System" menu click the "Upgrade Line Card" button.
2. Select the card type radio button, which in this case is the FRM220-FXO/FXS
3. Select the slot to update. Selecting "All Slots" will upgrade all local and remote FXO/FXS cards. (this may take up to 15 minutes)
4. If selecting an individual slot, you must also select either the local or remote unit.
5. The image file name needs to be keyed in. The TFTP server should be able to find this file and the "System" settings need to be correct (see Chapter 2, settings).
6. Click the "Upgrade" button to start the update.



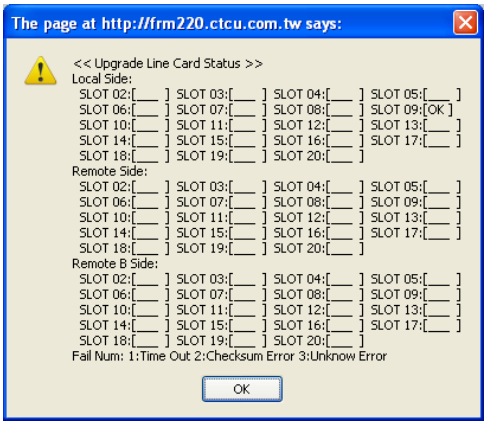
7. Click the "OK" button to confirm.



8. Heed the warning messages!!!!



9. View the success results



A.11 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)

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 62.2/125μm, 50/125μm. SM 9/125μm Wavelength:1310nm, 1550nm,
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)

A.11.1 Functional Details

Fiber

The 155MS fiber to fiber 2R repeater uses a proprietary scrambled NRZ optical line coding to provide extremely low BER for Voice over fiber.

A fixed transceiver or SFP models are available.

Management

The **FRM220-155MS** has a small processor that is used to communicate with the NMC. This model is NOT designed for stand-alone use and should be installed in managed chassis.

When placed in a managed chassis, such as our **FRM220-CH20** with **NMC** (Network Management Controller), the **155MS** card is configured and monitored through the chassis **NMC** via console, Telnet, Web HTTP or SNMP.

1. Stand-alone – DIP settings when placed in CH01.
2. Rack management - When placed in **NMC** managed rack, all other settings can be overridden by the **NMC** management.
3. 155MS does NOT support in-band management.

There are two variations of this media converter; the 155MS converter with fixed optical transceiver or in an SFP version.

A.11.2 Installation of SFP Modules

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

A.11.2.1 Inserting a Bale Clasp SFP Module into the Cage

Step 1 Close the bale clasp upward before inserting the pluggable module.
Step 2 Line up the SFP module with the port, and slide it into the cage.

A.11.2.2 Removing a Bale Clasp SFP Module

Step 1 Open the bale clasp on the SFP module. Press the clasp downward with your index finger.
Step 2 Grasp the SFP module between your thumb and index finger and carefully remove it from the SFP cage.

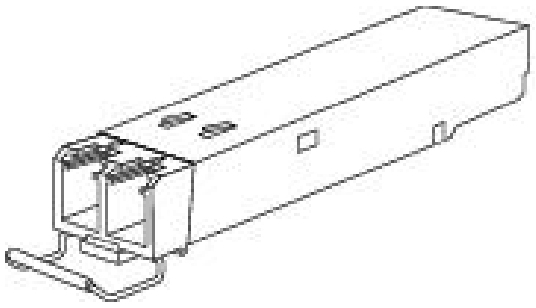


Figure A.11.2 Bale Clasp type SFP with bale open

A.11.3 Provisioning by DIP (Stand-alone)

There is NO DIP Switch installed on the PCBA of the **155MS**

A.11.4 Provisioning by NMC (Telnet)

When placed in the CH20 with NMC, this card can be configured through any of the NMC interfaces, including Telnet, Web GUI and SNMP.

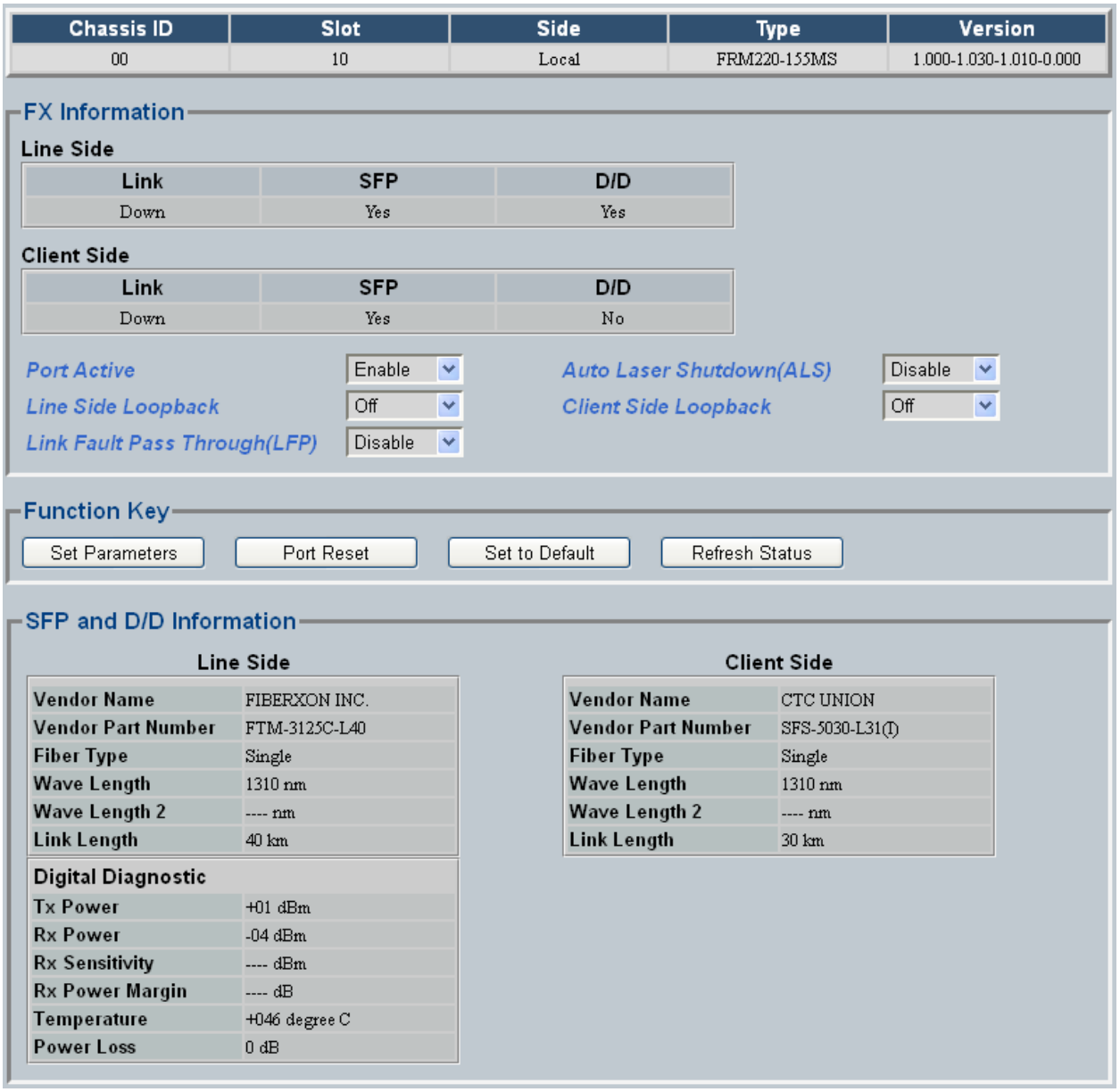
```
This Chassis ID:[00]  Cascaded:[Yes]    Monitored Chassis ID:[00]
SLOT #10 > FRM220-155MS         [Local ] [ Ver:1.000-1.030-1.010-0.000 ]
 <1> : Port Active:[Enable ]
           Line Side Link:[Down]  Client Side Link:[Down]
 <2> : Line  Side  Loopback:[Off]
 <3> : Client Side Loopback:[Off]
 <4> : Link Fault Pass Through(LFP):[Disable]
 <5> : Auto Laser Shutdown(ALS)    :[Disable]
 <6> : Port Reset.
 <7> : Set to Default.
       Line Side Small Form Pluggable(SFP)  :[Yes]
       Line Digital Diagnostic(D/D)         :[Yes]
       Client Side Small Form Pluggable(SFP):[Yes]
       Client Digital Diagnostic(D/D)       :[No ]
 <D> : Go to the SFP and D/D Functions menu.
```

<1> : Port Active - Use this item to enable or disable the line card. When disabled all transmission will be blocked and all the line card LED indicators will be Off.
<2> : Line Side Loop Back - This initiates the line side (top fiber connector) towards the connected fiber equipment.
<3> : Client Side Loop Back - This initiates the client side (bottom fiber connector) towards the connected fiber equipment.
<4> : Link Fault Pass Through - This enables or disables the LFP function of the converter.
<5> : Auto Laser Shutdown (ALS) - Enables or disables the ALS safety feature for the Optical port.
<6> : Port Reset - This function will clear and reload the CPLD, effectively resetting the port. Data loss will occur when performing this reset. Use with care.
<7> : Set to Default - This action will return the Serial card to factory default settings.
<D> : Go to Line Card Status menu - If an SFP is installed for optical, the information can be viewed here. See next page..

Line Card Status

```
SLOT #10 > FRM220-155MS         [Local ] [ Ver:1.000-1.030-1.010-0.000 ]
                      LINE Side              CLIENT Side
Vendor Name       :[ FIBERXON INC.    ]  [ CTC UNION        ]
Vendor Part Number:[ FTM-3125C-L40    ]  [ SFS-5030-L31(I)  ]
Fiber Type        :[ Single ]               [ Single ]
Wave Length       :[ 1310nm ]               [ 1310nm ]
Wave Length 2     :[ ----nm ]               [ ----nm ]
Link Length       :[   40km ]               [   30km ]
Tx Power          :[ +01dBm ]
Rx Power          :[ -04dBm ]
Rx Sensitivity    :[ ------ ]
Temperature       :[ +045C  ]
Power Margin      :[ ------ ]
Power Loss        :[ 00 dB  ]
```

A.11.6 Provisioning by NMC (Web)

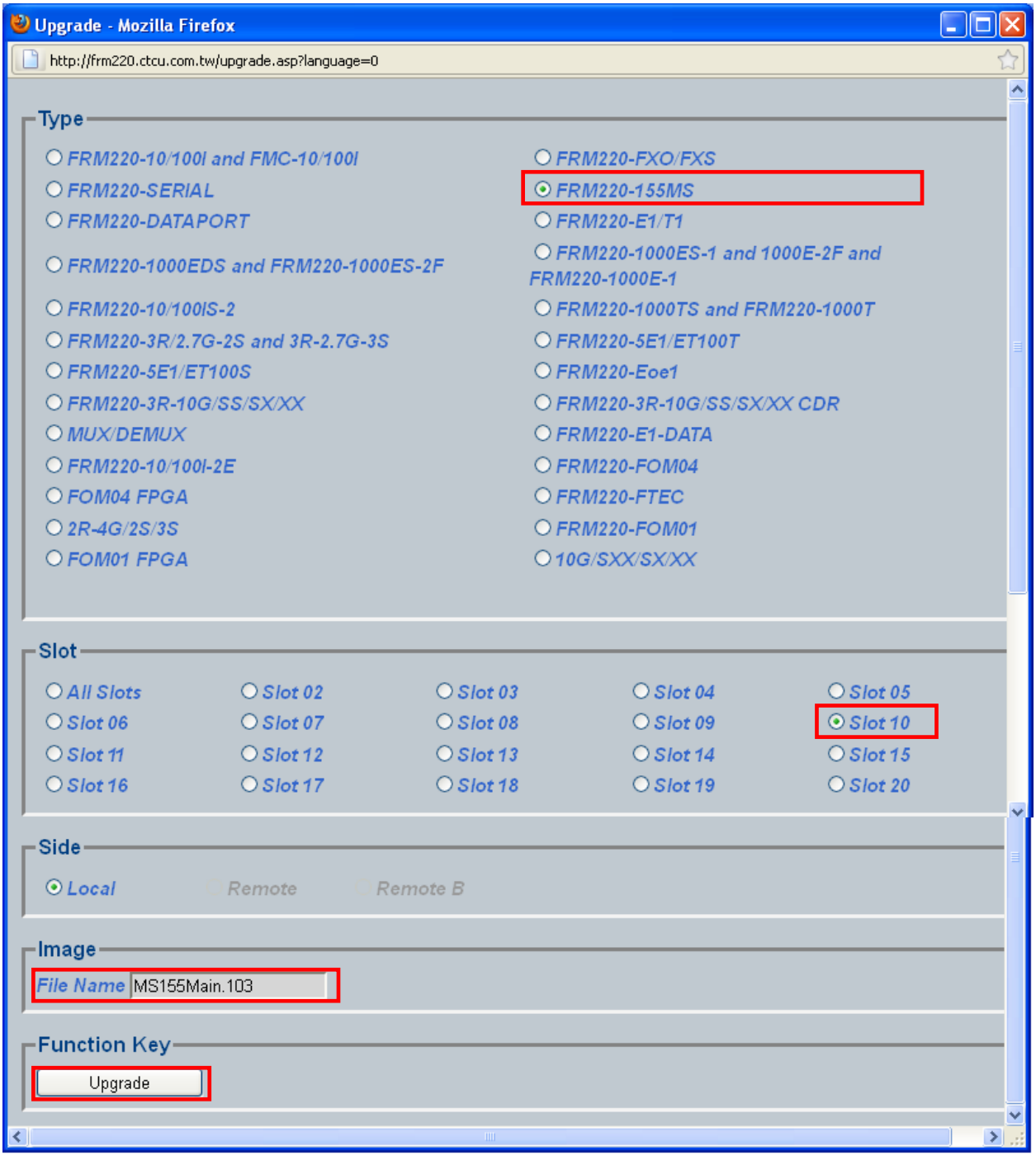


The settings, described in the Telnet operation, are easily manipulated here in the Web GUI. From the top, the Line and Client Fiber ports, Function buttons and SFP information (if any) at the bottom.

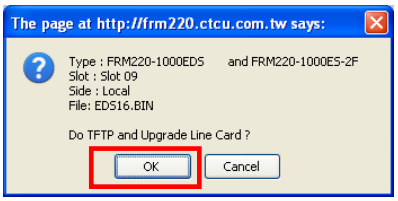
After making any changes, be sure to click the “Set Parameters” button.

A.11.7 Firmware Upgrade

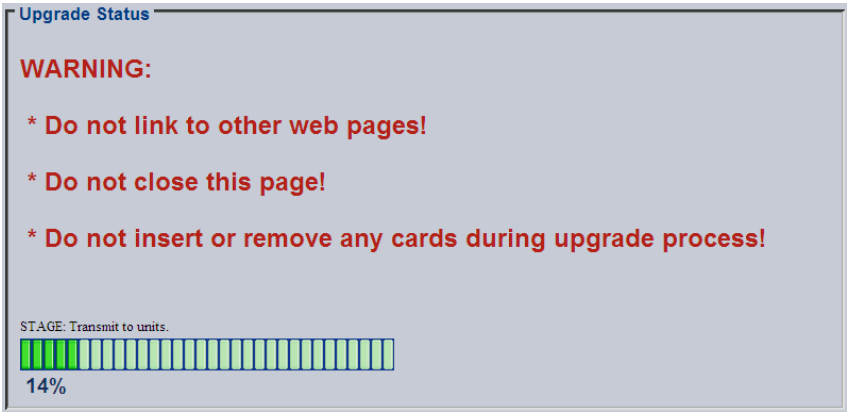
1. From the "System" menu click the "Upgrade Line Card" button.
2. Select the card type radio button, which in this case is the FRM220-155MS
3. Select the slot to update. Selecting "All Slots" will upgrade all local 155MS cards. (this may take up to 15 minutes)
4. If selecting an individual slot, you must also select either the local unit. (remote not supported in this model)
5. The image file name needs to be keyed in. The TFTP server should be able to find this file and the "System" settings need to be correct (see Chapter 2, settings).
6. Click the "Upgrade" button to start the update.



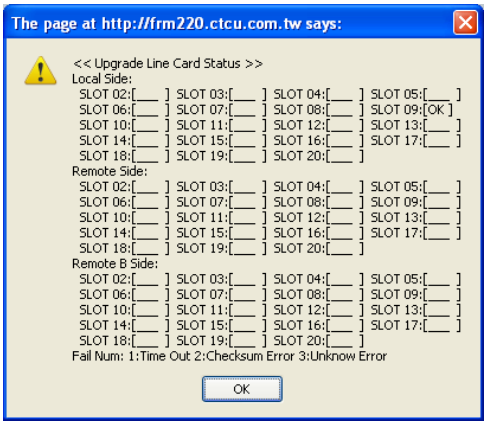
7. Click the "OK" button to confirm.



8. Heed the warning messages!!!!

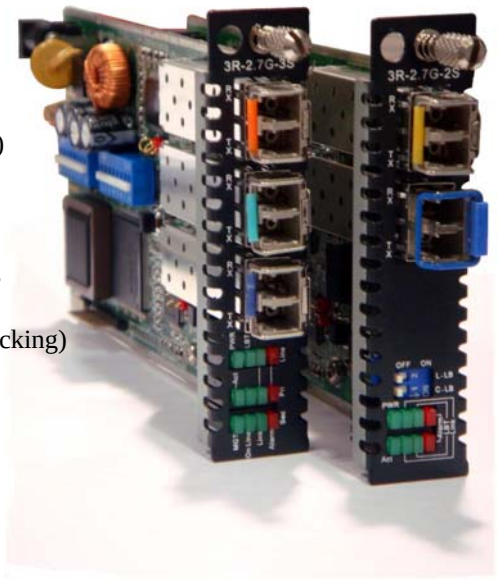


9. View the success results



A.12 FRM220-2.7G-2S/3S 3R Transponder with Protection

The FRM220-2.7G-2S/3S is an optical 3R regeneration device, which provides re-amplification, reshaping and retiming and offers fiber protection (3S model). 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-2S/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 (3S only)
- 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 CH02M two 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: E3 (34.368M) DS3/T3 (44.736M) OC1/STM-0 (51.84M) 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 9/125µm, MM 50/125µm, 62.2/125µm Wavelength: 850, 1310,1550nm,
LEDs	Power, Line Link, Primary Link, Secondary Link, Test, Alarm
Power	DC In 12V
Power Consumption	< 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)

A.12.1 Functional Details

Fiber

The 3R-2.7G-2S/3S fiber to fiber 3R repeater uses a transparent optical line coding and clock data recovery to provide an optical repeater / transponder function for use in extension or CWDM applications.

Only SFP models are available.

Management

The **FRM220-2.7G-2S/3S** has a small processor that is used to read the set DIP switches when used stand-alone or to communicate with the NMC when placed in the managed rack. This model is designed for both stand-alone use and for management when installed in managed chassis.

When placed in a managed chassis, such as our **FRM220-CH20** with **NMC** (Network Management Controller), the **2.7G-2S/3S** card is configured and monitored through the chassis **NMC** via console, Telnet, Web HTTP or SNMP.

1. Stand-alone – DIP settings when placed in CH01, serial console when placed in CH01M or CH02M.
2. Rack management - When placed in **NMC** managed rack, all other settings can be overridden by the **NMC** management.
3. 2.7G-2S/3S does NOT support in-band management.

There are two variations of this media converter; the 2.7G-2S converter with two optical ports (Line and Client) and the 2.7G-3S with three optical ports and support for 1+1 fiber protection.

A.12.2 Installation of SFP Modules

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

A.12.2.1 Inserting a Bale Clasp SFP Module into the Cage

Step 1 Close the bale clasp upward before inserting the pluggable module.
Step 2 Line up the SFP module with the port, and slide it into the cage.

A.12.2.2 Removing a Bale Clasp SFP Module

Step 1 Open the bale clasp on the SFP module. Press the clasp downward with your index finger.
Step 2 Grasp the SFP module between your thumb and index finger and carefully remove it from the SFP cage.

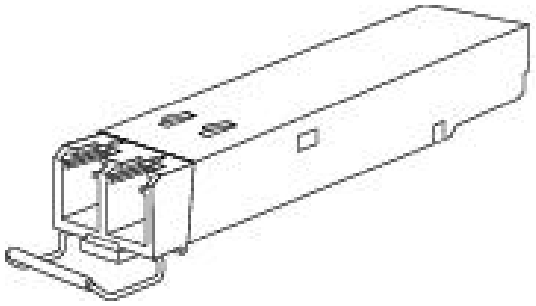
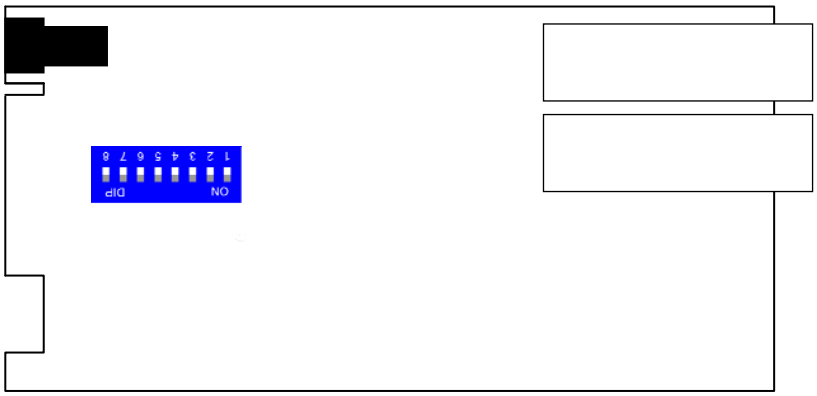


Figure A.12.2 Bale Clasp type SFP with bale open

A.12.3 Provisioning by DIP (Stand-alone)

There is one DIP Switch installed on the PCBA of the **2.7G-2S/3S**



Dip Sw	1	2	3	4	5	6	7	8
2S	Rate 1	Rate 2	Rate 3	Rate 4	LFP	ALS	X	X
3S	Rate 1	Rate 2	Rate 3	Rate 4	LFP	ALS	Protect	Client
					Protocol Supported		Fiber Data Rate	
2/3S	Off	Off	Off	Off	E3		34.368Mbps	
	On	Off	Off	Off	DS3/T3		44.736Mbps	
	Off	**On**	Off	Off	OC-1/STM-0		51.84Mbps	
	On	**On**	Off	Off	Fast Ethernet		125Mbps	
	Off	Off	**On**	Off	OC-3/STM-1		155.52Mbps	
	On	Off	**On**	Off	OC-12/STM-4		622.08Mbps	
	Off	**On**	**On**	Off	Fiber Channel-1		1.0625Gbps	
	On	**On**	**On**	off	OC-24/STM-8		1.24416Gbps	
	Off	Off	Off	**On**	Gigabit Ethernet		1.25Gbps	
	On	Off	Off	**On**	HD-SDI		1.485Gbps	
	Off	**On**	Off	**On**	Fiber Channel-2		2.125Gbps	
	On	**On**	Off	**On**	OC-48/STM-16		2.48832Gbps	

Sw5 LFP Off=Link Fault Pass-thru disabled; On=enabled

Sw6 ALS Off=Auto Laser Shutdown disabled; On=enabled

Sw7 Forced (3S Only) Off=Manual (Forced) Protection; On=Automatic Protection* * when On, Sw8 is not followed

Sw8 Path (3S Only) Off=Client is on Primary; On=Client is on Secondary**
** works only when Sw7 is Off for manual forced setting

Notice: All of these settings are ignored if the card is placed in the FRM220-CH20 with NMC/SNMP management or in the CH02M with local console. The card will follow the settings done via the chassis management.

A.12.4 Provisioning by NMC (Telnet)

When placed in the CH20 with NMC, this card can be configured through any of the NMC interfaces, including Telnet, Web GUI and SNMP.

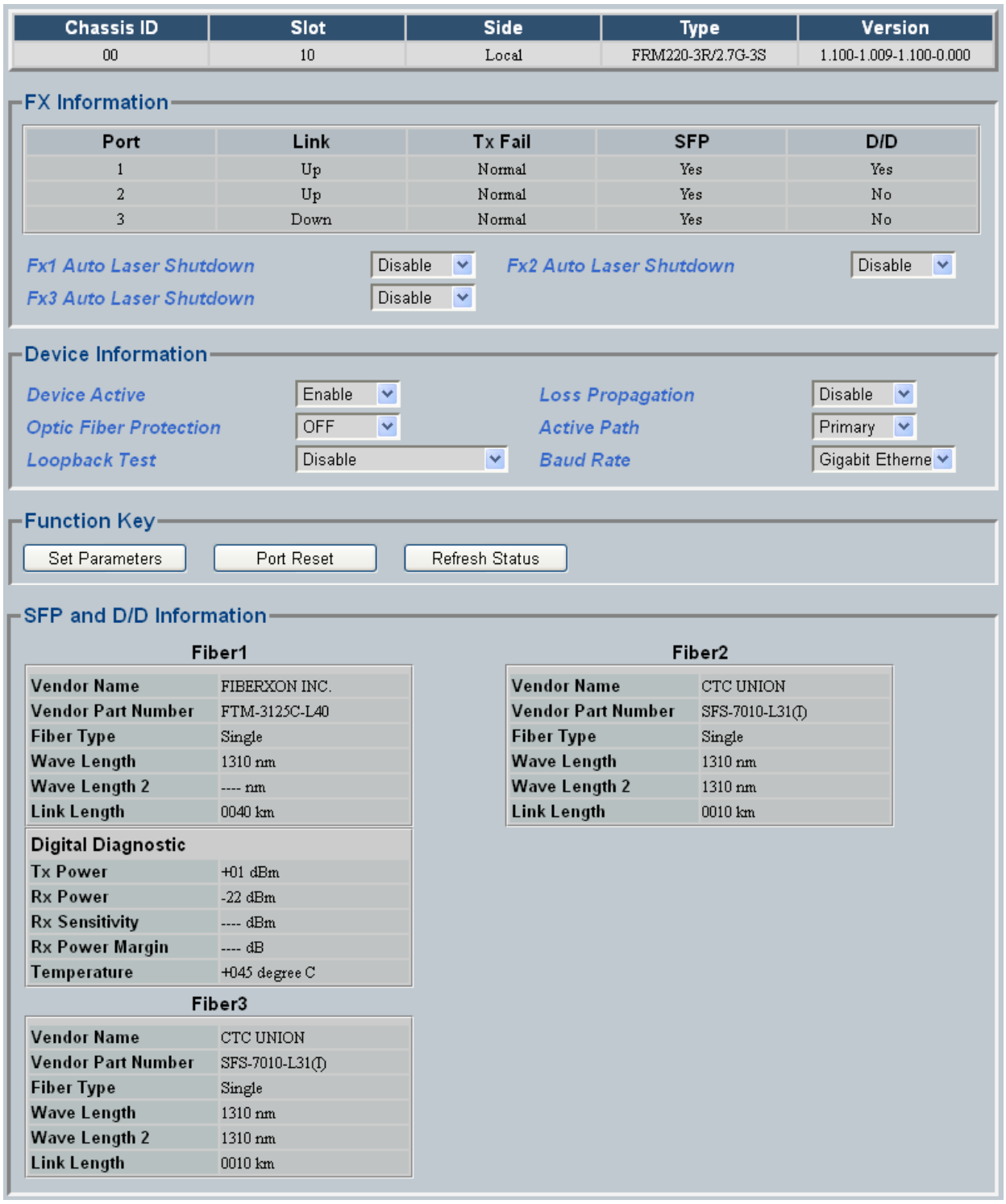
```
This Chassis ID:[00]  Cascaded:[Yes]    Monitored Chassis ID:[00]
SLOT #10 > FRM220-3R/2.7G-3S    [Local] [ Ver:1.100-1.009-1.100-0.000 ]
 Line Status:   [Up  ]   Primary Status:   [Up  ]   Secondary Status:
[Down]
 Line Tx Detect:[Normal] Primary Tx Detect:[Normal] Secondary Tx
Detect:[Normal]
<1> :Port Active:[Enable ]
<2> :Baud Rate Select:[Gigabit Ethernet]
<3> :Loopback Test Function: [Disable                 ]
<4> :Loss Propagation:[Disable]
<5> :Line Side Auto Laser Shutdown     :[Disable]
<6> :Primary Side Auto Laser Shutdown  :[Disable]
<7> :Secondary Side Auto Laser Shutdown:[Disable]
<8> :Optic Fiber Protection:[OFF]
<9> :Active Path           :[Primary  ]
<A> :Port Reset.
<D> :Go to Line Card Status menu.
```

<1> : Port Active - Use this item to enable or disable the line card. When disabled all transmission will be blocked and all the line card LED indicators will be Off.
<2> : Baud Rate Select - As a 3R repeater, the device needs to be set to the proper data rate for the intended application.
<3> : Loop Back Test - This initiates the sub-menu to select line side (top fiber connector), client side (bottom fiber connector) or both line and client simultaneous loop back.
<4> : Loss Propagation - This enables or disables the Link Fault Passthru function of the converter.
<5> : Line Side Auto Laser Shutdown (ALS) - Enables or disables the ALS safety feature for the Line Side Optical port.
<6> : Client Side Auto Laser Shutdown (ALS) - Enables or disables the ALS safety feature for the Client Optical port.
<A> : Port Reset - This function will clear and reload the CPLD, effectively resetting the port. Data loss will occur when performing this reset. Use with care.
<D> : Go to Line Card Status menu - If an SFP is installed for optical, the information can be viewed here. See below..

Line Card Status

```
SLOT #10 > FRM220-3R/2.7G-3S    [Local ] [ Ver:1.100-1.009-1.100-0.000 ]

Vendor Name       :[ FIBERXON INC.    ]
Vendor Part Number:[ FTM-3125C-L40    ]
Fiber Type        :[ Single ]
Wave Length       :[ 1310nm ]
Wave Length 2     :[ ----nm ]
Link Length       :[ 0040km ]
Tx Power          :[ +01dBm ]
Rx Power          :[ -22dBm ]
Temperature       :[ +045C  ]
Rx Sensitivity    :[ ------ ]
Power Margin      :[ ------ ]
```

A.12.6 Provisioning by NMC (Web)



Chassis ID	Slot	Side	Type	Version
00	10	Local	FRM220-3R/2.7G-3S	1.100-1.009-1.100-0.000

FX Information

Port	Link	Tx Fail	SFP	D/D
1	Up	Normal	Yes	Yes
2	Up	Normal	Yes	No
3	Down	Normal	Yes	No

Fx1 Auto Laser Shutdown: Disable — Fx2 Auto Laser Shutdown: Disable
Fx3 Auto Laser Shutdown: Disable

Device Information

Device Active: Enable — Loss Propagation: Disable
Optic Fiber Protection: OFF — Active Path: Primary
Loopback Test: Disable — Baud Rate: Gigabit Etherne

Function Key

Set Parameters | Port Reset | Refresh Status

SFP and D/D Information

Fiber1

Vendor Name	FIBERXON INC.
Vendor Part Number	FTM-3125C-L40
Fiber Type	Single
Wave Length	1310 nm
Wave Length 2	---- nm
Link Length	0040 km

Digital Diagnostic

Tx Power	+01 dBm
Rx Power	-22 dBm
Rx Sensitivity	---- dBm
Rx Power Margin	---- dB
Temperature	+045 degree C

Fiber2

Vendor Name	CTC UNION
Vendor Part Number	SFS-7010-L31(I)
Fiber Type	Single
Wave Length	1310 nm
Wave Length 2	1310 nm
Link Length	0010 km

Fiber3

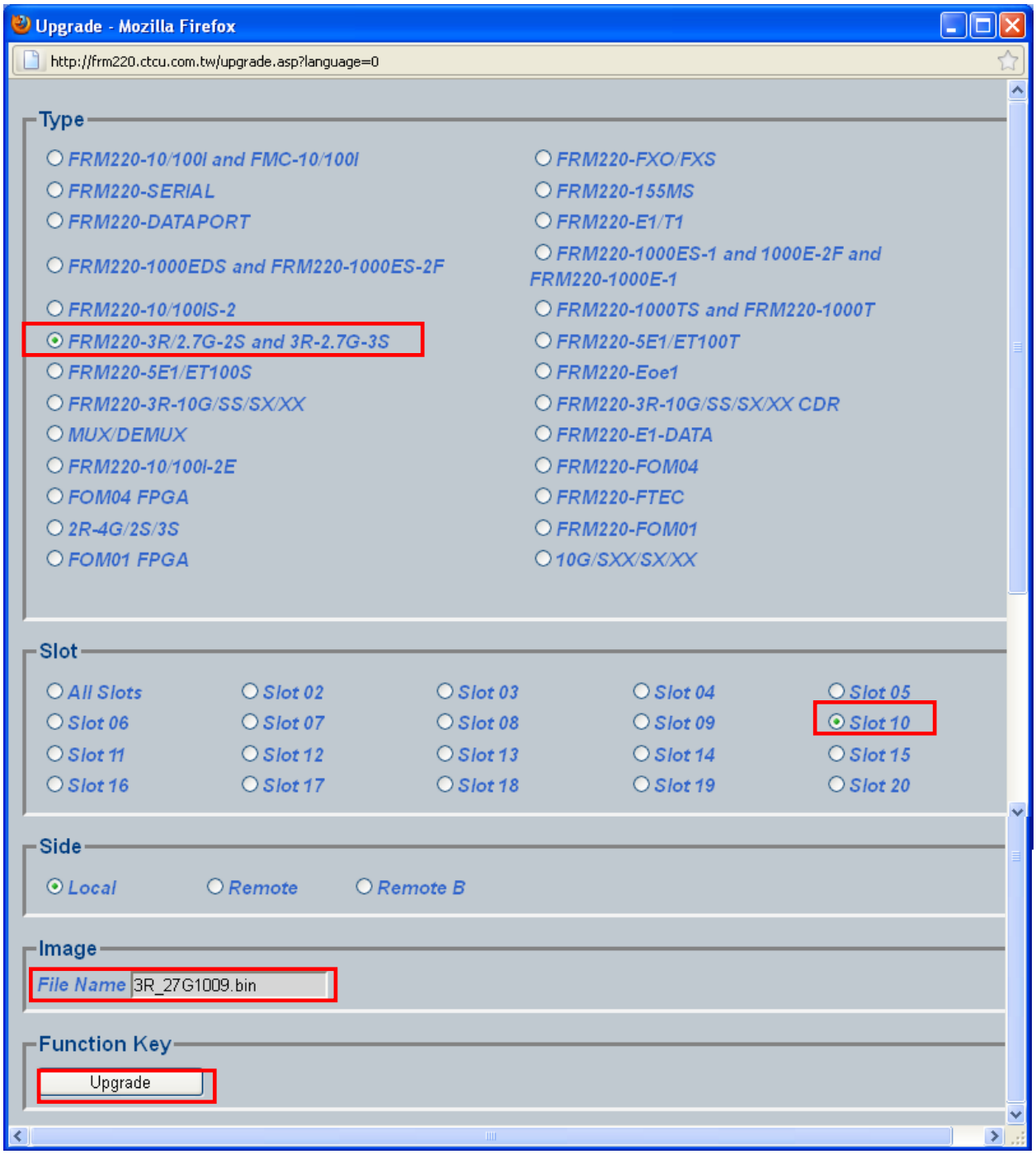
Vendor Name	CTC UNION
Vendor Part Number	SFS-7010-L31(I)
Fiber Type	Single
Wave Length	1310 nm
Wave Length 2	1310 nm
Link Length	0010 km

The settings, described in the Telnet operation, are easily manipulated here in the Web GUI. From the top, the Line (FX1), Primary (FX2) and Secondary (FX3) Fiber ports, Device Settings, Function buttons and SFP information (if any) at the bottom.

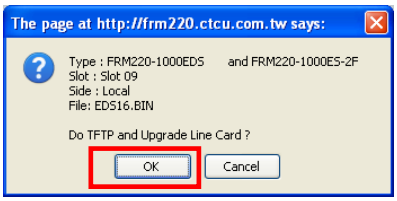
After making any changes, be sure to click the “Set Parameters” button.

A.12.7 Firmware Upgrade

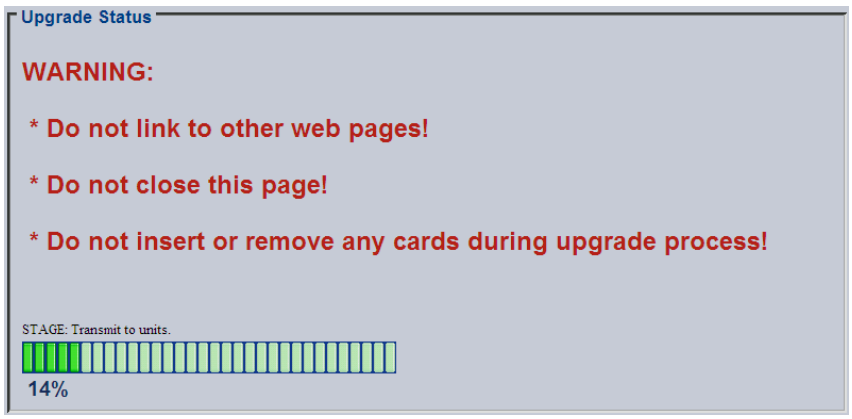
1. From the "System" menu click the "Upgrade Line Card" button.
2. Select the card type radio button, which in this case is the FRM220-2.7G-2S or 3S
3. Select the slot to update. Selecting "All Slots" will upgrade all local 2.7G-2S/3S cards. (this may take up to 15 minutes)
4. If selecting an individual slot, you must also select either the local unit. (remote not supported in this model)
5. The image file name needs to be keyed in. The TFTP server should be able to find this file and the "System" settings need to be correct (see Chapter 2, settings).
6. Click the "Upgrade" button to start the update.



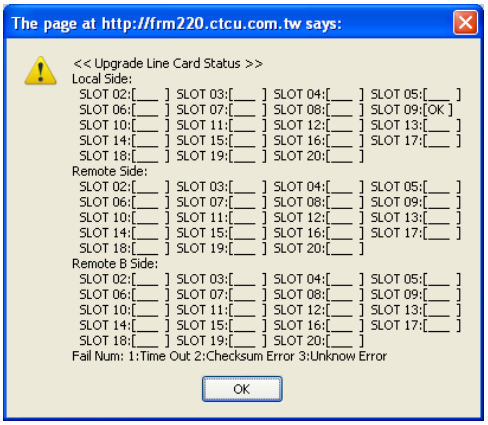
7. Click the "OK" button to confirm.



8. Heed the warning messages!!!!



9. View the success results

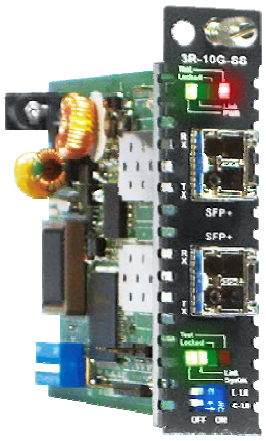


A.14 FRM220-10G-SS 10Gbps 3R Fiber Transponder

The FRM220-10G-SS is a series of managed 10G fiber to fiber 3R repeater/transponders. Based on a number of 10 Gigabit Fiber standards, this transponder supports 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-SS 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 10G Fiber Channel, 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 Two Slot Chassis



Specifications

Ports	*Optical Interface* **FRM220-10G-SS** Connector : LC, 1 Line SFP+, 1 Client SFP+ Data rates: 1G FC (1.0625G) 2G FC (2.125G) 4G FC (4.25G) 8G FC (8.5G) 10G FC (10.51875G) 10G Base Ethernet (10.3125G) STM-64/OC192 (9.95328G) OTN G.709 OTU2 (10.709225G) Loop back: Line/Client Cable type : SM 9/125µm, MM 50/125µm, 62.2/125µm Wavelength: 850, 1310, 1550nm,
LEDs	Power, Line Link, Client Link, Test
Power	DC In 12V
Power Consumption	< 8W
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)

Warning: Due to high power requirements and heat dissipation of 10G Series cards, they are limited to placing a maximum of 10 cards in CH20 chassis leaving an empty space between each card. 10G Series cards should not be placed in CH01 single slot chassis for this same reason. Additionally, only one card should be placed in CH02 with an additional NMC for management.

This product includes the following models:

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

A.14.1 Functional Details

Fiber

The 10G-SS fiber to fiber 3R repeater uses a transparent optical line coding and clock data recovery to provide an optical repeater / transponder function for use in extension or CWDM applications at speeds up to 10G.

Only SFP+ model is available. (See 10G-SXX model for XFP support.)

Management

The **FRM220-107G-SS** has a small processor that is used to read the set DIP switches when used stand-alone or to communicate with the NMC when placed in the managed rack. This model is designed for both stand-alone use and for management when installed in managed chassis.

When placed in a managed chassis, such as our **FRM220-CH20** with **NMC** (Network Management Controller), the **10G-SS** card is configured and monitored through the chassis **NMC** via console, Telnet, Web HTTP or SNMP.

1. Stand-alone – DIP settings when placed in CH01, serial console when placed in CH01M or CH02M.
2. Rack management - When placed in **NMC** managed rack, all other settings can be overridden by the **NMC** management.
3. 10G-SS does NOT support in-band management.

A.14.2 Installation of SFP Modules

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

A.14.2.1 Inserting a Bale Clasp SFP Module into the Cage

Step 1 Close the bale clasp upward before inserting the pluggable module.
Step 2 Line up the SFP module with the port, and slide it into the cage.

A.14.2.2 Removing a Bale Clasp SFP Module

Step 1 Open the bale clasp on the SFP module. Press the clasp downward with your index finger.
Step 2 Grasp the SFP module between your thumb and index finger and carefully remove it from the SFP cage.

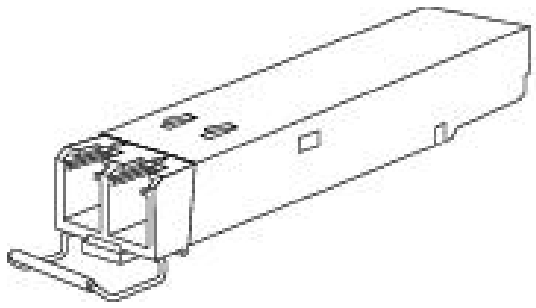
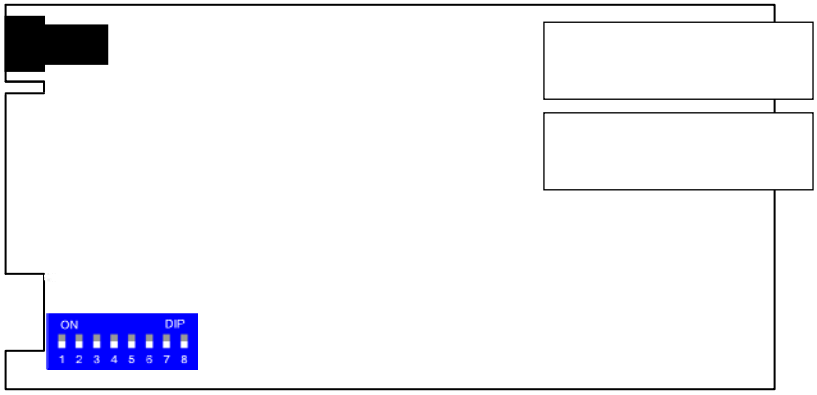


Figure A.14.2 Bale Clasp type SFP with bale open

A.14.3 Provisioning by DIP (Stand-alone)

There is one DIP Switch installed on the PCBA of the **10G-SS**



Dip Sw	1	2	3	4	5	6	7	8
	Rate 1	Rate 2	Rate 3	Rate 4	Line LFP	Line ALS	Client LFP	Client ALS
					Protocol Supported		Fiber Data Rate	
10G	Off	Off	Off	Off	10G Ethernet		10.3125Gbps	
	On	Off	Off	Off	10G Fiber Channel		10.51875Gbps	
	Off	**On**	Off	Off	OC-192/STM-64		9.95328Gbps	
	On	**On**	Off	Off	G.709 OTU2		10.709225Gbps	

Sw5 Line LFP – On enables the line side Link Fault Pass-thru function

Sw6 Line ALS – On enables the line side Auto Laser Shutdown function

Sw7 Client LFP – On enables the client side Link Fault Pass-thru function

Sw8 Client ALS – On enables the client side Auto Laser Shutdown function

Notice: All of these settings are ignored if the card is placed in the FRM220-CH20 with NMC/SNMP management or in the CH02M with local console. The card will follow the settings done via the chassis management. (Refer to NMC operation manual for details on managing all cards.)

A.14.4 Provisioning by NMC (Telnet)

When placed in the CH20 with NMC, this card can be configured through any of the NMC interfaces, including Telnet, Web GUI and SNMP.

```
This Chassis ID:[00]  Cascaded:[Yes]    Monitored Chassis ID:[00]
SLOT #10 > FRM220-3R/10G-SS     [Local] [ Ver:1.100-2.007-1.100-0.000 ]
 Line Side Link  :[Up  ]   Line Side CDR Lock  :[Locked    ] Tx Fail:[Normal]
 Client Side Link:[Up  ]   Client Side CDR Lock:[Locked    ] Tx Fail:[Normal]
<1> :Port Active:[Enable ]  System Status:[Ok     ]
<2> :Baud Rate Select:[1G Fiber Channel ]
<3> :Loopback Function:[Disable]
<4> :Line Side Loopback  :[OFF]
<5> :Client Side Loopback:[OFF]
<6> :Line Side Loss Propagation  :[Disable]
<7> :Client Side Loss Propagation:[Disable]
<8> :Line Side Auto Laser Shutdown  :[Disable]
<9> :Client Side Auto Laser Shutdown:[Disable]
<A> :Port Reset.
<B> :Set to default.
<C> :Line Side Small Form Pluggable(SFP):[Yes]  Digital Diagnostic(D/D):[Yes]
<D> :Client Side Small Form Pluggable(SFP):[Yes]  Digital Diagnostic(D/D):[No ]
```

<1> : Port Active - Use this item to enable or disable the line card. When disabled all transmission will be blocked and all the line card LED indicators will be Off.
<2> : Baud Rate Select - As a 3R repeater, the device needs to be set to the proper data rate for the intended application.
<3> : Loop Back Function - This is a master loop back item. If this is enabled, the loop back configured in 4&5 is enabled. If this is disabled, all loop back is disabled, regardless of the setting of 4&5.
<4> : Line Side Loop Back - This initiates the line side (top fiber connector) loop back.
<5> : Client Side Loop Back - This initiates the client side (bottom fiber connector) loop back.
<6> : Line Side Loss Propagation - This enables or disables the Line Side Link Fault Passthru function of the converter.
<7> : Client Side Loss Propagation - This enables or disables the Client Link Fault Passthru function of the converter.
<8> : Line Side Auto Laser Shutdown (ALS) - Enables or disables the ALS safety feature for the Line Side Optical port.
<9> : Client Side Auto Laser Shutdown (ALS) - Enables or disables the ALS safety feature for the Client Optical port.
<A> : Port Reset - This function will clear and reload the CPLD, effectively resetting the port. Data loss will occur when performing this reset. Use with care.
<B> : Set to default - This returns all settings to factory default.
<C> : Line Side SFP - If an SFP is installed for optical, the information can be viewed here. See below..
<D> : Client Side SFP - If an SFP is installed for optical, the information can be viewed here. See below..

Line Side SFP Status

```
SLOT #10 > FRM220-3R/10G-SS     [Local ] [ Ver:1.100-2.007-1.100-0.000 ]

Vendor Name       :[ FIBERXON INC.    ]
Vendor Part Number:[ FTM-3125C-L40    ]
Fiber Type        :[ Single ]
Wave Length       :[ 1310nm ]
Wave Length 2     :[ 1310nm ]
Link Length       :[ 0040km ]
Tx Power          :[ +01dBm ]
Rx Power          :[ +08dBm ]
Temperature       :[ +047C  ]
Rx Sensitivity    :[ ------ ]
Power Margin      :[ ------ ]
```

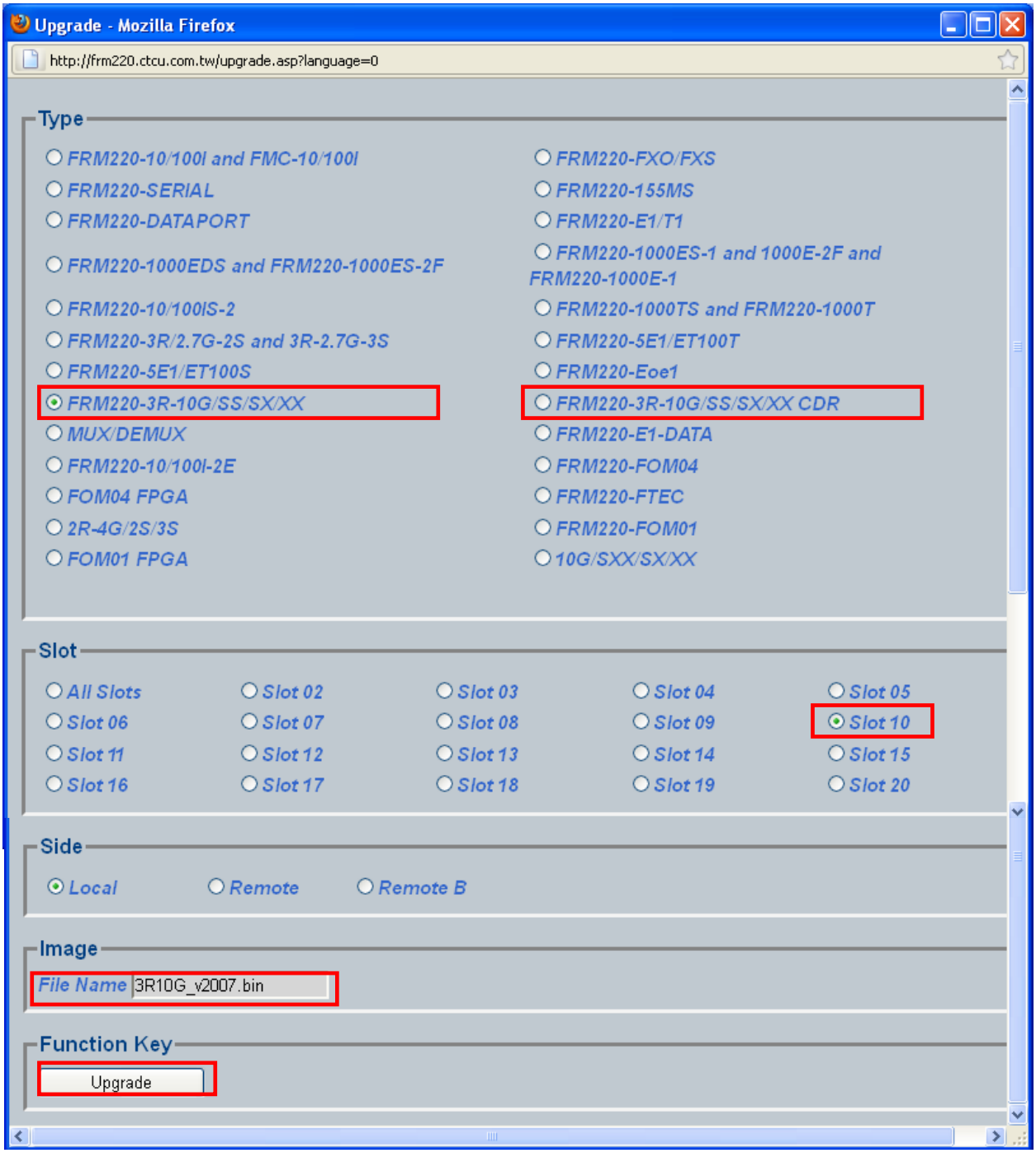
A.14.5 Provisioning by NMC (Web)

The settings, described in the Telnet operation, are easily manipulated here in the Web GUI. From the top, the Line (FX1) and Client (FX2) Fiber ports, Device Settings, Function buttons and SFP information (if any) at the bottom.

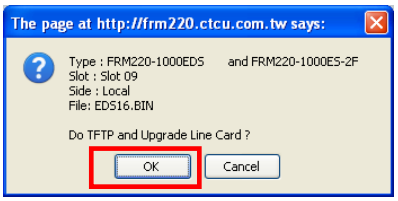
After making any changes, be sure to click the “Set Parameters” button.

A.14.6 Firmware Upgrade

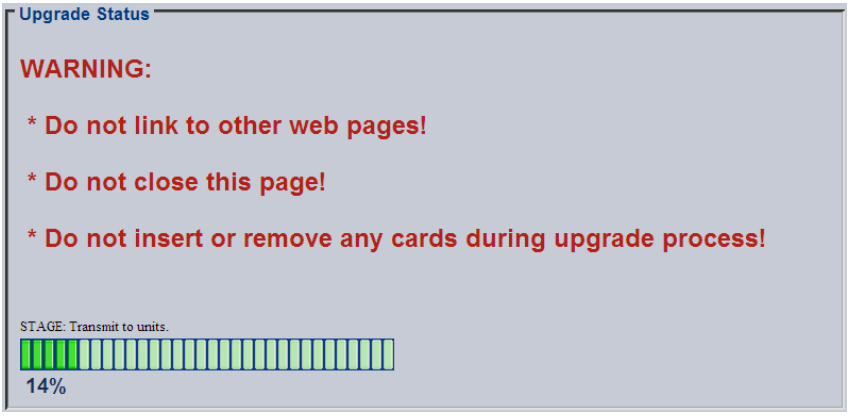
1. From the "System" menu click the "Upgrade Line Card" button.
2. Select the card type radio button, which in this case is the FRM220-10G-SS
3. Select the slot to update. Selecting "All Slots" will upgrade all local 10G-SS cards. (this may take up to 15 minutes)
4. If selecting an individual slot, you must also select either the local unit. (remote not supported in this model)
5. The image file name needs to be keyed in. The TFTP server should be able to find this file and the "System" settings need to be correct (see Chapter 2, settings). There are two image files for the 10G-SS, one is the firmware, the other is the CDR code. Upgrade the firmware first and then upgrade the CDR if required.
6. Click the "Upgrade" button to start the update.



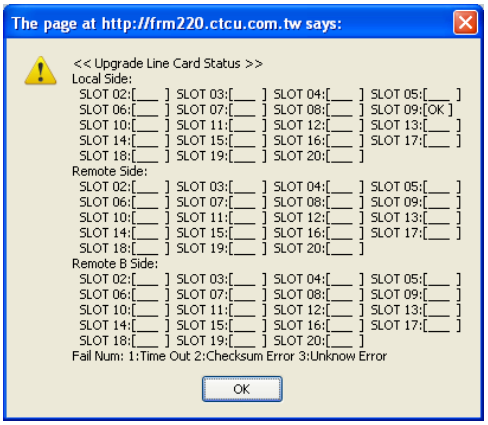
7. Click the "OK" button to confirm.



8. Heed the warning messages!!!!



9. View the success results

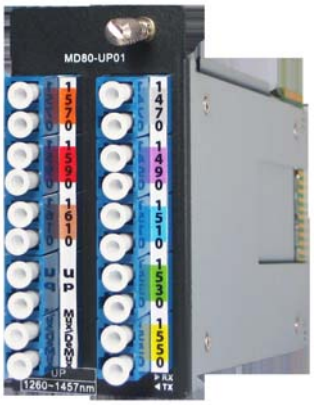


A.15 FRM220-MD40/80 CWDM Mux/DeMux

The FRM220-MD40 is 4 channels MUX / DEMUX, modular design card for CWDM wavelengths including 1510nm, 1530nm, 1550nm, 1570nm. The FRM220-MD40-UP02 is 4 channels MUX / DEMUX, modular design card for CWDM wavelengths including 1470nm, 1490nm, 1590nm, 1610nm and two upgrade ports for CWDM wavelength ranges of 1503nm ~ 1577nm and 1260nm ~ 1457nm. The FRM220-MD80-UP01 is 8 channels MUX/DEMUX, modular design card for CWDM wavelengths including 1470nm, 1490nm, 1510nm, 1530nm, 1550nm, 1570, 1590, 1610nm and one upgrade port for CWDM wavelength range of 1260nm ~ 1457nm. The MUX / DEMUX cards provide the primary wave division and combination functions for CWDM. Line side wave lengths require translation to client side equipment via a transponder card.

Features

- Full native mode performance
- Optical connectors : LC / UPC
- Passive model requires no power
- Protocol transparent, no limitation
- Utilizes industry standard ITU CWDM wavelength
- High isolation WDM
- Low insertion loss
- Wide Operation wavelength Range
- Environmentally Stable



Specifications
Connector : LC / UPC
Standard : ITU-T G.694.2 (CWDM grid)

FRM220-MD40 : 4 Wavelength CWDM Mux / DeMux Card
Wavelengths : 1510, 1530, 1550, 1570nm
Insertion Loss : <1.8dB (including connector loss)
Return Loss : >45dB

FRM220-MD40-2UP : 4 Wavelength CWDM Mux / DeMux Card + 2 upgrade ports
Wavelengths : 1470, 1490, 1590, 1610nm
Upgrade port 1 : 1503 ~ 1577nm
Upgrade port 2 : 1260 ~ 1457nm
Upgrade port isolation : >30dB
Insertion Loss : < 2.2dB (including connector loss)
Return Loss : > 45dB

FRM220-MD80 : 8 Wavelength CWDM Mux / DeMux Card
Wavelengths : 1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610nm
Insertion Loss : < 2.8dB (including connector loss)
Return Loss : > 45dB

FRM220-MD80-1UP : 8 Wavelength CWDM Mux / DeMux Card + 1 upgrade port
Wavelengths : 1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610nm
Upgrade port 1 : 1260 ~ 1457nm
Upgrade port isolation : > 30dB
Insertion Loss : < 2.8dB (including connector loss)
Return Loss : > 45dB

Environment :
Operating Temp.: 0°C – 50°C
Storage Temp. : -10°C – 70°C
Humidity : 5 – 90%(non-condensing)

Dimension : (D x W x H)
Single width blade : 155 x 88 x 23mm
Double width blade : 155 x 88 x 41mm

Weight :
Single width blade card : 200g
Double width blade card : 300g

Certification : RoHS
MTBF >275,000 hours

A.16 FRM220-iMUX Inverse Multiplexer Blades

The FRM220A-nE1/ET100 are 5, 8 or 16 E1 port inverse multiplexer cards with built-in Bridge for the FRM220/220A Series Platform Media Converter Rack. The multiplexers support bundling Unframed E1s using GFP-F (Generic Framing Procedure-Framed). The clock source may be selected internally or recovered from any one of the received E1 signals. The Ethernet port utilizes a single RJ-45 connector or SFP for optical fiber, depending on model. One single model supports either unbalanced 75 ohm or balanced 120 ohm (adapter cables required). When the FRM220A-nE1/ET100 card is placed in the FRM220A rack with GSW/SNMP management, the management can view the converter card's status, type, version, Ethernet link status and alarms. The card can be configured to enable or disable the port, reset the card, set clocking, Ethernet mode and provide E1 analog diagnostic loopbacks. A unique feature of the FRM220A-nE1/ET100 is the use of a common card design which may either be inserted in an appropriate single or dual slot chassis as a stand-alone modem or as a card when placed in the FRM220A-CH20 In-band managed rack.

Features

- Standalone type Ethernet to 5, 8, or 16 port E1 converter.
- Uplinks 100M Ethernet to aggregate trunk card of FRM220A
- Interface connectors, RJ-48C for 120Ω , BNCx2 for 75Ω per channel.
- E1s are bundled according to standard GFP-F
- LCAS (Link Capacity Adjustment Scheme) supports dynamic bandwidth of virtual concatenated containers.
- E1 settings.
  - E1 loopback (per channel)
  - 75 or 120 ohm impedance
- Timing source setting (Any receive E1 recovery or internal oscillator).
- Embedded Operations Channel (EOC) for remote in-band management.
- Integrated BERT function
- RMON counter for LAN Tx/Rx byte count.
- VLAN tag support
- Bandwidth control (32K to 100M)
- LED indicators

Specifications

G.703 Interface	
Connector	HDB26 Female with adapters for 75 or 120 Ohm
Data rate	2048kb/s
Impedance	75 ohm for unbalanced, 120 ohm for balanced
Framing	Requires Unframed, transparent clear channel E1s
RxSensitivity	-43dB (extra Long Haul)
TxPulseAmp.	3.00V p-p (120 ohm); 2.73V p-p (75 ohm)
Line code	HDB3
Indications	LED (PWR, Alarm, Individual E1 status, Link, SD)
Ethernet Port	1 x RJ-45, Auto-Negotiation, Auto-MDIX (T-model) 1 x caged SFP (100Base-FX) (S-model)
VLAN	IEEE802.1Q tagged VLAN support
Maximum MTU	1916 bytes
Ingress/Egress	Bandwidth control (32K to 100M, nx32K granularity)
GFP-F	per ITU-T G.7041
LCAS	Enabled or disabled
Power	(Card supports hot-swapping)
Input	Card : 12VDC, Standalone : AC, DC options
Consumption	<6W
Dimensions	155 x 88 x 23mm (D x W x H)
Weight	120g
Temperature	0 ~ 50°C (Operating), -10 ~ 70°C (Storage)
Humidity	10 ~ 90% non-condensing
Certification	CE, FCC, LVD, RoHS
MTBF	65000 hrs (25°C)
Test Loops	(set from console)
E1	Remote and Request Remote Loop back
BERT	Integral 511 pattern generator (set from console)

This product includes the following models:

FRM220A-5, 8, 16E1-ET100T (5E1, 8E1 or 16E1 with RJ-45 LAN)
FRM220A-5, 8, 16E1-ET100S (5E1, 8E1 or 16E1 with SFP LAN)

A.16.1 Functional Details

The **FRM220A-nE1/ET100** are 5, 8 or 16 E1 port inverse multiplexer cards with built-in Bridge for the FRM220/220A Series Platform Media Converter Rack. The multiplexers support bundling Unframed E1s using GFP-F (Generic Framing Procedure-Framed). The clock source may be selected internally or recovered from any one of the received E1 signals.

Fiber

The Ethernet port utilizes a single RJ-45 connector or SFP for optical fiber, depending on model. The SFP should meet the data rate for 100Base-FX.

Management

The **FRM220-nE1/ET100** has one on-board 6 pole DIP Switch which can be used to configure the device as 'master/slave' and E1 impedance (75 or 120 ohm). When placed in a stand-alone chassis with DB9 console port, these devices support a text based serial terminal with an easy to use menu system for configuration. When placed in a managed chassis, the card is configured and monitored through the chassis NMC (network management controller) via console, Telnet, Web HTTP or SNMP..

1. Stand-alone – DIP settings when placed in CH01. Serial console when placed in CH01M or CH02M.
2. Rack management - When placed in **NMC** managed rack, all other settings can be overridden by the **NMC** management.
3. E1/T1 supports in-band management.

A.16.2 Panel

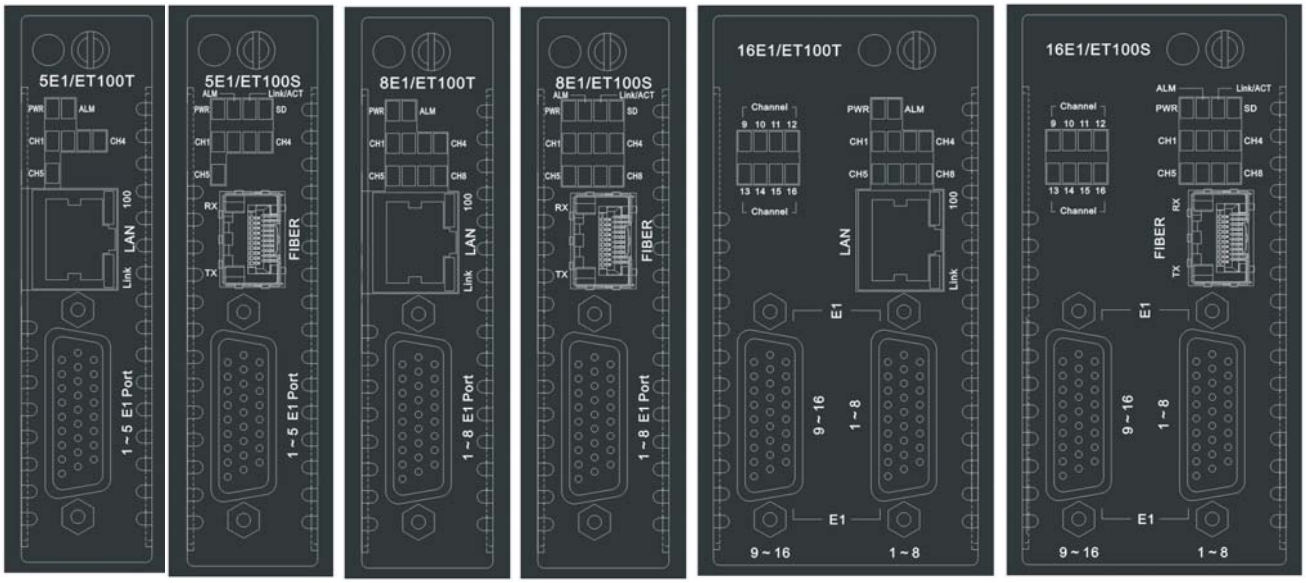


Figure A.16.1 Panel designations of **FRM220-nE1/ET100**

There are six variations of this media converter. There are 5xE1, 8xE1 and 16xE1 inverse multiplexer models, each available with either RJ-45 Ethernet (copper) or SFP 100Base-FX (fiber).

A.16.3 Installation of SFP Modules

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

A.16.3.1 Inserting a Bale Clasp SFP Module into the Cage

Step 1 Close the bale clasp upward before inserting the pluggable module.
Step 2 Line up the SFP module with the port, and slide it into the cage.

A.16.3.2 Removing a Bale Clasp SFP Module

Step 1 Open the bale clasp on the SFP module. Press the clasp downward with your index finger.
Step 2 Grasp the SFP module between your thumb and index finger and carefully remove it from the SFP cage.

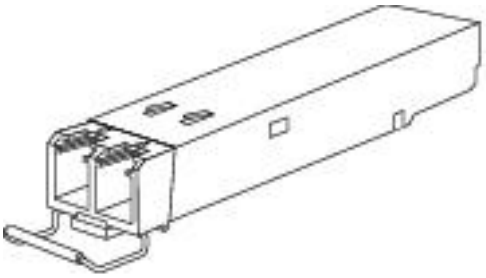
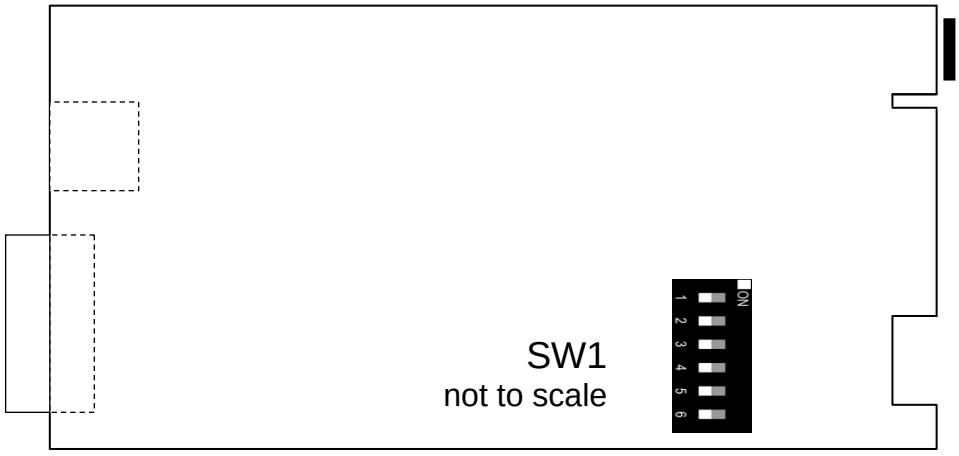


Figure A.16.2 Bale Clasp type SFP with bale open

A.16.4 Provisioning by DIP (Stand-alone)

There is one DIP Switch installed on the PCBA of the **nE1/ET100**



DIP	SW	Function
1	OFF	Sets the E1 impedance for all channels to 120 Ohms
	ON	Sets the E1 impedance for all channels to 75 Ohms
2	OFF	Slave – in this mode all stand-alone in-band management is disabled
	ON*	Master – In-band management is supported in stand-alone mode
3	OFF*	Default Setting is OFF
	ON	For factory use ONLY
4	OFF*	Default setting is OFF
	ON	For factory use ONLY
5/6	OFF*	(reserved)
	ON	

A.16.5 Provisioning by NMC (Telnet)

When placed in the CH20 with NMC, this card can be configured through any of the NMC interfaces, including Telnet, Web GUI and SNMP.

```
This Chassis ID:[00]  Cascaded:[Yes]    Monitored Chassis ID:[00]
SLOT #10 > FRM220-5E1/ET100T    [Local ] [ Ver:1.200-1.057-1.000-1.000 ]
     Remote:[Link Up  ]    Remote Power:[Normal   ]
<1> :E1 1~5 Port Status:
<2> :E1 1~5 Loopback & Parameters:
<3> :LAN Port Settings & Status:
<4> :Device Active:[Enable ]
<5> :Timing Source:[Recovery from E1-1 ]
<6> :GFP/VCG/LCAT Settings:
<7> :Speed Limit Settings:[   0 * 32K][      0]Kbps
<8> :VCG Member Settings & Status:
<9> :NMC Channel Settings:
<A> :BERT Settings & Status:
<B> :Port Reset:
<C> :Set to Default.    <R> : RMON IN/OUT Counters Information.

<D>: Go to Line Card Status menu.
<N>: Go to the Remote menu.
```

<1> : Port Status - Use this item to view the status of all E1 connections. See an example below.
<2> : E1 Loop Back & Parameters - This will bring up the sub menu (see below) for setting these specific parameters.
<3> : Timing Source - The timing source can be configured as Internal (Osc), Recover clock from received E1 signal, or recover clock from signal via fiber. Use the latter setting for the remotely connected fiber unit. Use internal clock for fixed point to point applications and use E1 recovery when connecting to other E1 networked devices.
<4> : Auto Laser Shutdown (ALS) - Enables or disables the ALS safety feature for the Optical port.
<5> : Active Rates - This item sets the total data nx64k rate for either the E1 (n=1 to 31) or T1 (n=1 to 24).
<6> : Start Timeslot - This unit does not support random timeslot assignment. It supports a contiguous range with a starting timeslot plus the number of timeslots. This item sets the starting timeslot (default is TS1).
<7> : Loop Back Setting - There is support for loop back of both E1 signal and optical. Refer to the next page.
<8> : Port Reset - This function will clear and reload the CPLD, effectively resetting the port. Data loss will occur when performing this reset. Use with care.
<9> : Set to Default - This action will return the E1/T1 card to factory default settings.
<D> : Go to Line Card Status menu - If an SFP is installed for optical, the information can be viewed here. See next page.
<N> : Go to the Remote menu - This device supports remote in-band management via Embedded Operations Channel.

Port Status

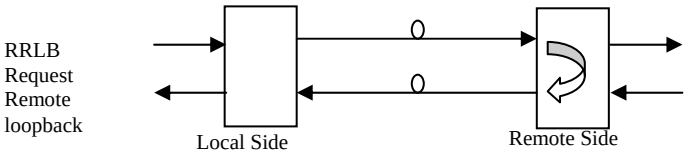
```
SLOT #10 > FRM220-5E1/ET100T    [Local ] [ Ver:1.200-1.057-1.000-1.000 ]
E1 Channel 1:
   E1 Signal:[Normal     ]  E1 Sync:[Sync     ]  Receive AIS:[No ]
   Connector Type:[RJ-48C]  RAI:[No ]  LOMF:[No ]  Active(VLAN):[Active  ]
E1 Channel 2:
   E1 Signal:[Normal     ]  E1 Sync:[Sync     ]  Receive AIS:[No ]
   Connector Type:[RJ-48C]  RAI:[No ]  LOMF:[No ]  Active(VLAN):[Active  ]
E1 Channel 3:
   E1 Signal:[Normal     ]  E1 Sync:[Sync     ]  Receive AIS:[No ]
   Connector Type:[RJ-48C]  RAI:[No ]  LOMF:[No ]  Active(VLAN):[Active  ]
E1 Channel 4:
   E1 Signal:[Normal     ]  E1 Sync:[Sync     ]  Receive AIS:[No ]
   Connector Type:[RJ-48C]  RAI:[No ]  LOMF:[No ]  Active(VLAN):[Active  ]
E1 Channel 5:
   E1 Signal:[Normal     ]  E1 Sync:[Sync     ]  Receive AIS:[No ]
   Connector Type:[RJ-48C]  RAI:[No ]  LOMF:[No ]  Active(VLAN):[Active  ]
```

E1 Loopback & Parameters

```
SLOT #10 > FRM220-5E1/ET100T    [Local ] [ Ver:1.200-1.057-1.000-1.000 ]
<1> :E1-1 Loop Back:[OFF] Loop Check Status:[ No] Defect Status:[ No]
<2> :E1-2 Loop Back:[OFF] Loop Check Status:[ No] Defect Status:[ No]
<3> :E1-3 Loop Back:[OFF] Loop Check Status:[ No] Defect Status:[ No]
<4> :E1-4 Loop Back:[OFF] Loop Check Status:[ No] Defect Status:[ No]
<5> :E1-5 Loop Back:[OFF] Loop Check Status:[ No] Defect Status:[ No]
<6> :Channel Defect:[1E-6]
<7> :Channel Loop Detection:[Enable ]
```

E1 Loop Back

Here is a review of the loop back functions available for the Inverse Multiplexer line card.



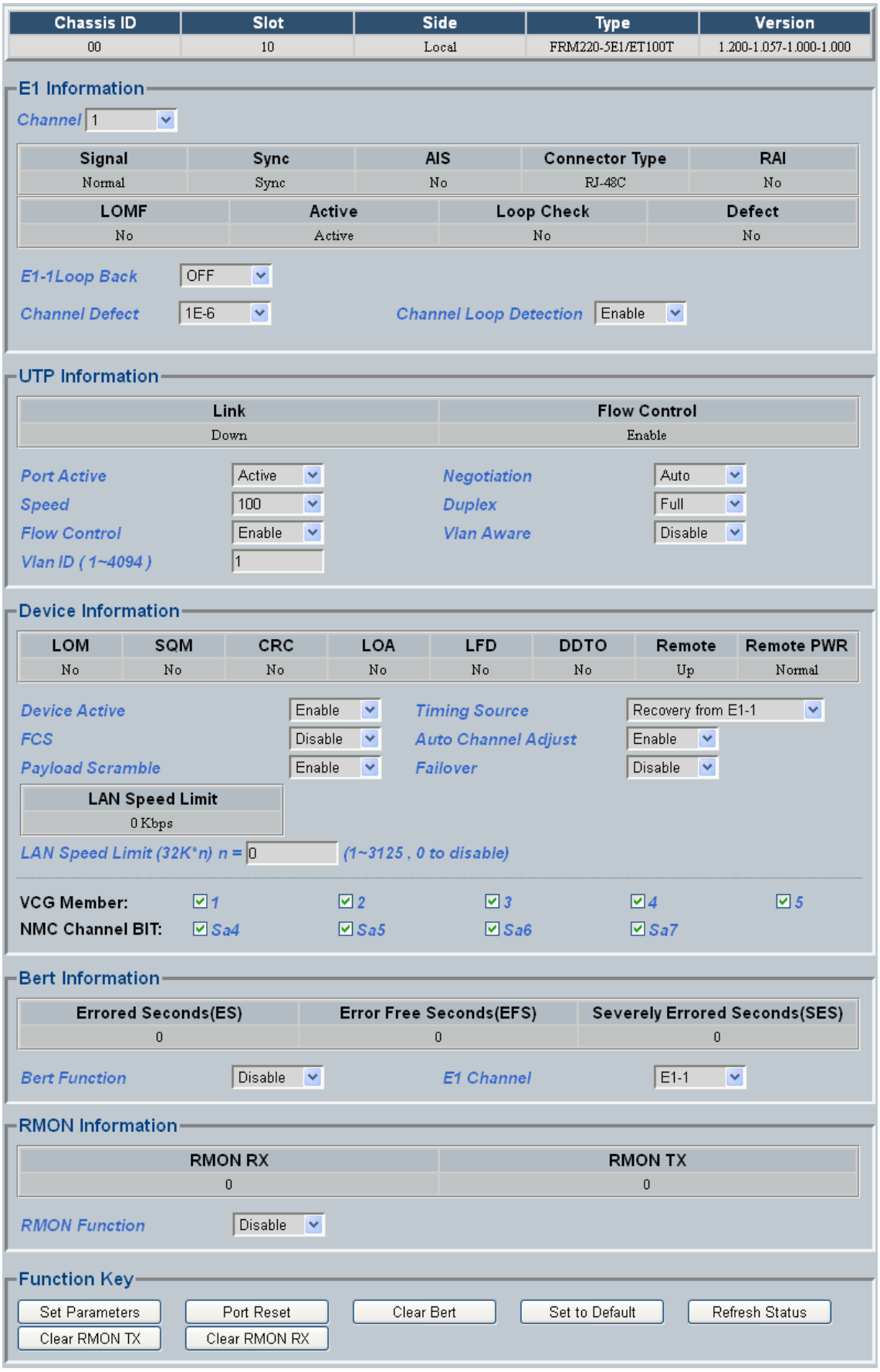
E1 Remote Loop Back Functions

Line Card Status Menu

```
This Chassis ID:[00]  Cascaded:[Yes]    Monitored Chassis ID:[00]
SLOT #10 > FRM220-E1/T1         [Local ] [ Ver:1.000-1.080-1.020-0.000 ]

Vendor Name       :[ FIBERXON INC.    ]
Vendor Part Number:[ FTM-3125C-L40    ]
Fiber Type        :[ Single ]
Wave Length       :[ 1310nm ]
Wave Length 2     :[ ----nm ]
Link Length       :[   40km ]
Tx Power          :[ +01dBm ]
Rx Power          :[ -28dBm ]
Rx Sensitivity    :[ ------ ]
Temperature       :[ +042C  ]
Power Margin      :[ ------ ]
Power Loss        :[ 00 dB  ]
```

When an SFP with digital diagnostic is installed in the E1/T1, the DOM contents can be displayed.

A.16.6 Provisioning by NMC (Web)

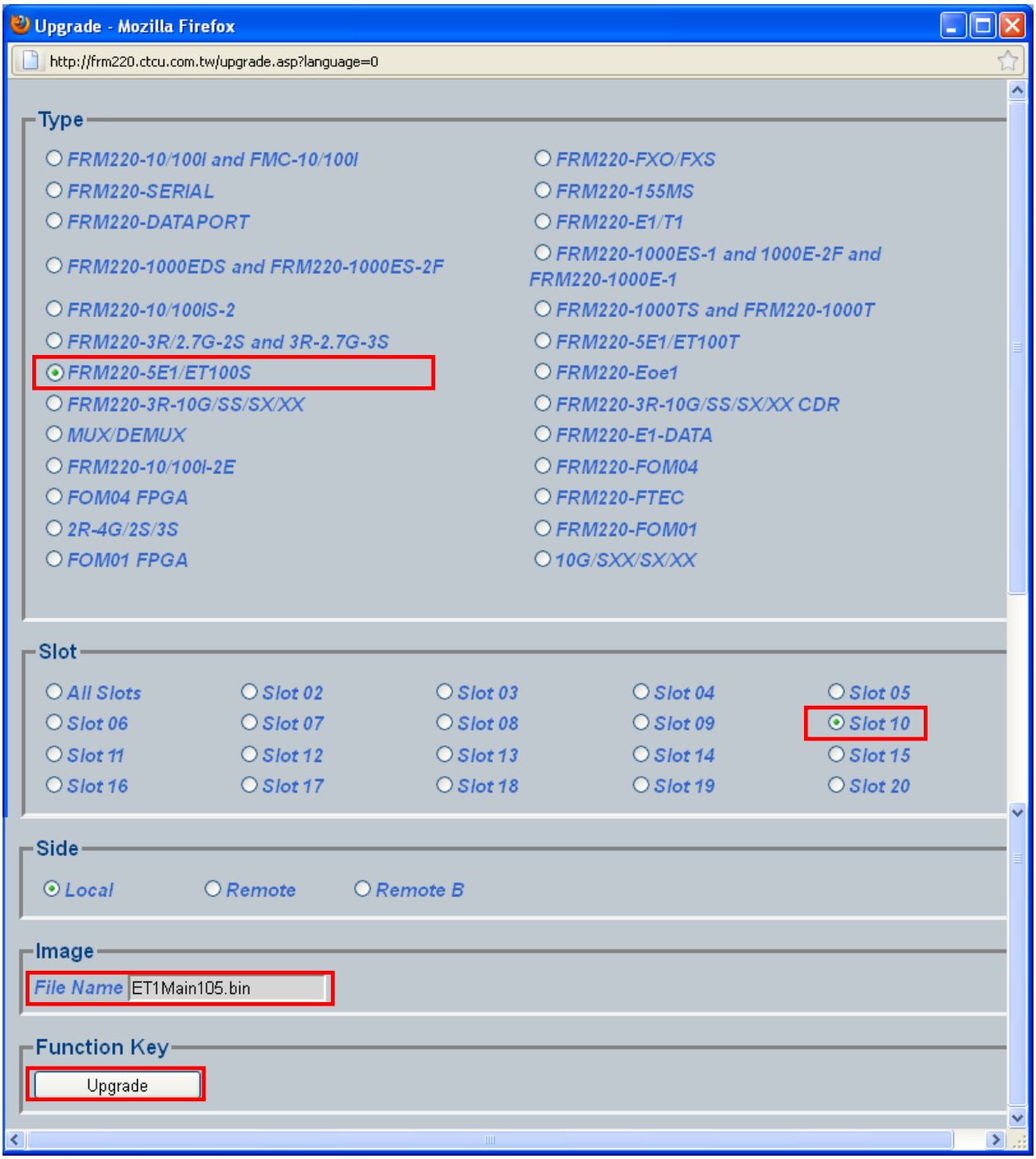


The settings, described in the Telnet operation, are easily manipulated here in the Web GUI. From the top, the Fiber port, E1/T1 port, function buttons and SFP information at the bottom.

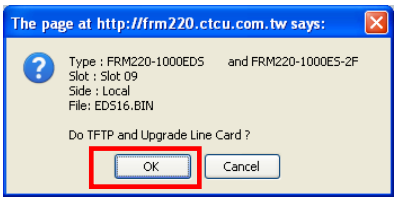
After making any changes, be sure to click the “Set Parameters” button.

A.16.7 Firmware Upgrade

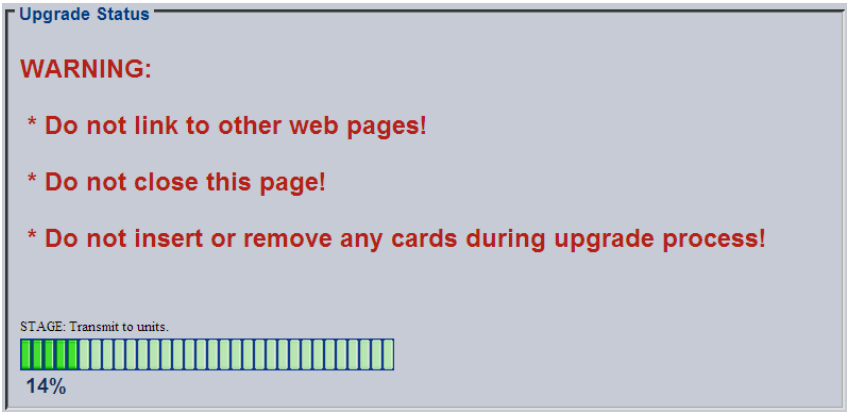
1. From the "System" menu click the "Upgrade Line Card" button.
2. Select the card type radio button, which in this case is the FRM220-5E1/ET1001
3. Select the slot to update. Selecting "All Slots" will upgrade all local and remote 5E1/ET100 cards. (this may take up to 15 minutes)
4. If selecting an individual slot, you must also select either the local or remote unit.
5. The image file name needs to be keyed in. The TFTP server should be able to find this file and the "System" settings need to be correct (see Chapter 2, settings).
6. Click the "Upgrade" button to start the update.



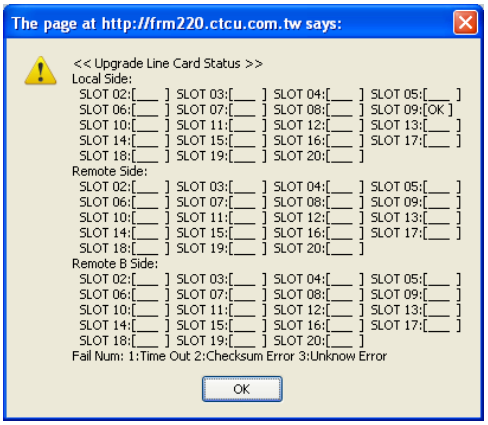
7. Click the "OK" button to confirm.



8. Heed the warning messages!!!!



9. View the success results



A.17 FRM220-Eoe1 Ethernet over E1 Converter

The FRM220A-Eoe1 is a single port G.703/704 Fractional E1 DSU/CSU card with built-in HDLC Bridge for the FRM220/220A Series Platform Media Converter Rack. The converter supports Unframed, PCM31, and PCM30 framing modes. The clock source may be selected internally or recovered from received E1 signal. The Ethernet port utilizes a single RJ-45 connector. One single model supports either unbalanced 75 ohm with two BNC connectors or balanced 120 ohm with one RJ-45 connector. When the FRM220A-Eoe1 card is placed in the FRM220 rack with SNMP management, the management can view the converter card's status, type, version, Ethernet link status and alarms. The card can be configured to enable or disable the port, reset the card, set clocking, frame mode and provide analog diagnostic loopbacks. A unique feature of the FRM220A-Eoe1 is the use of a common card design which may either be inserted in the FRM220-CH01M single slot chassis as a stand-alone modem or as a card when placed in the FRM220-CH20 In-band managed rack.

Features

- Standalone type, 1 port E1 to HDLC converter.
- Uplinks 100M Ethernet to Gigabit trunk card of FRM220A
- Interface connectors, RJ-48C for 120? , BNC*2 for 75?.
- E1 settings.
- Line Code HDB3 or AMI.
- Full or Fractional.
- Frame setting, E1(CCS/CAS).
- Idle code setting (0x7E or 0xFF).
- Auto generate (AIS) enable, disable setting.
- Timing source setting (Receive E1 recovery or internal oscillator).
- Active timeslot number setting (E1 CCS 1-31 or E1 CAS 1-30).
- Base timeslot setting (E1 CCS 1-31, E1 CAS 1-15 or 17-31.)
- Loop Back with integral BERT
- LED indicators

Specifications

- G.703 Interface
  - Connector 1 x RJ-45 and 2 x BNC
  - Data rate 2048kb/s
  - Impedance 75 ohm for unbalanced, 120 ohm for balanced
  - Framing CCS, CAS, Unframed
  - RxSensitivity -43dB (extra Long Haul)
  - TxPulseAmp. 3.00V p-p (120 ohm); 2.73V p-p (75 ohm)
  - Line code HDB3 or AMI selectable
  - Indications LED (PWR, TD/RD act., Test, Signal loss, Sync loss,
  - Alarm, Error
- Ethernet Port 1 x RJ-45, Auto-Negotiation, Auto-MDIX
- Power (Card supports hot-swapping)
  - Input Card : 12VDC, Standalone : AC, DC options
  - Consumption <6W
- Dimensions 155 x 88 x 23mm (D x W x H)
- Weight 120g
- Temperature 0 ~ 50°C (Operating), -10 ~ 70°C (Storage)
- Humidity 10 ~ 90% non-condensing
- Certification CE (EMI/LVD), FCC, RoHS
- MTBF 75000 hrs (25°C)
- Tests (set from console)
  - E1 Loops Remote and Request Remote Loop back
  - BERT Integral 511 pattern generator (set from console)

This product includes the following models:

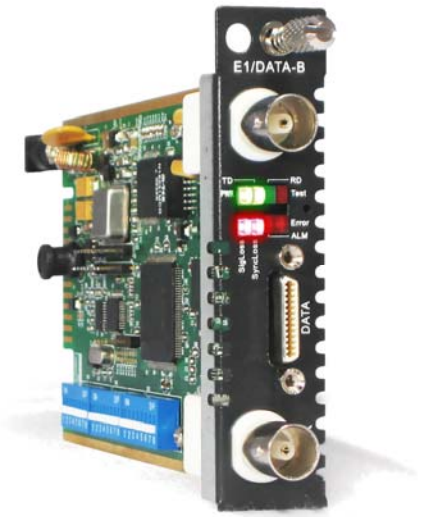
FRM220A-Eoe1 (Ethernet over E1 converter card)

A.18 FRM220-E1/Data DSU/CSU Converter Card

The FRM220-E1/Data is a single port G.703/704 Fractional E1 DSU/CSU card for the FRM220/220A Series Platform Media Converter Rack. The converter supports Unframed, PCM31, PCM31+CRC4, PCM30, and PCM30+CRC4 framing modes. The clock source may be selected internally, recovered from received E1 signal, externally from the Data port or transparent. The Data port interface utilizes a single Hi-Density 26pin connector. Cable solutions are provided for RS-530/449, X.21, V.35 and RS-232. The unit can recognize the cable type attached and automatically self-configure the interface circuits. Choosing from one of two model types, the E1 connection is either unbalanced 75 ohm with two BNC connectors or balanced 120 ohm with one RJ-45 connector. When the FRM220-E1/Data card is placed in the FRM220 rack with SNMP management, the management can view the converter card's status, type, version, E1 link status and alarms. The card can be configured to enable or disable the card, reset the card, set clocking, frame mode, interface type and provide analog or digital diagnostic loopbacks.

Features

- Standalone type, 1 port E1 to Synchronous Data converter.
- Interface connectors, RJ-48C for E1/Data-R, BNCx2 for E1/Data-B.
- E1 settings.
- Line Code HDB3 or AMI.
- Full or Fractional.
- Frame setting, E1(CCS/CAS).
- CRC enable/disable.
- Idle code setting (0x7E or 0xFF).
- Auto generate (AIS) enable, disable setting.
- Timing source setting (Receive E1 recovery, Internal oscillator, External from Synchronous Data port or transparent).
- Active timeslot number setting (E1 CCS 1-31 or E1 CAS 1-30).
- Base timeslot setting (E1 CCS 1-31, E1 CAS 1-15 or 17-31.)
- Loop Back with integral BERT
- LED indicators



Specifications

G.703 Interface		
	Connector	1xRJ-45 or 2xBNC (depending on model)
	Data rate	2048kb/s
	Impedance	75 ohm for unbalanced, 120 ohm for balanced
	Framing	CCS, CAS, w or w/o CRC4, Unframed
	RxSensitivity	-43dB (extra Long Haul)
	TxPulseAmp.	3.00V p-p (120 ohm); 2.73V p-p (75 ohm)
	Line code	HDB3 or AMI selectable
Indications		LED (PWR, TD/RD act., Test, Signal loss, Sync loss, Alarm, Error)
Data Port		HD26 w/cable for V.35, RS530, RS449, X.21 or RS232 (software selectable); DCE type
Power	(Card supports hot-swapping)	
	Input	Card : 12VDC, Standalone : AC, DC options
	Consumption	<6W
Dimensions		155 x 88 x 23mm (D x W x H)
Weight		120g
Temperature		0 ~ 50°C (Operating), -10 ~ 70°C (Storage)
Humidity		10 ~ 90% non-condensing
Certification		CE, FCC, LVD, RoHS
MTBF		65000 hrs (25°C)
Test Loops	(set from console)	
	E1	Local, Remote and Request Remote Loop back
	Data	Local, Remote and Request Remote Loop back
BERT		Integral 511 pattern generator (set from console)

This product includes the following models:

FRM220-E1/Data-R E1 DSU/CSU Converter Card with RJ-45
FRM220-E1/Data-B E1 DSU/CSU Converter Card with BNC

A.19 FRM220-FTEC E1/T1 Cross Rate Converter Card

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.
The T1 interface supports D4(SF) 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 coding is HDB3.
Tests and diagnostics can easily be performed from the local console interface or via Web based management of the FRM220. Diagnostics include T1 local/remote and E1 local/remote loop back.

Features

- Converts between T1 and E1 data and signaling
- Enable equipment to operate at T1 and E1 rates
- Support G.802 Annex B (T1 over E1)
- Configures A-law/u-law and signaling conversion
- Transparent conversion at 64kbps timeslot level
- Controlled slip for buffer over or under flow
- 24 timeslots of T1 Nx64 can be inserted into E1 Nx64, 30/CAS or 31/CCS timeslots

Specifications

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
- RJ-45 Connector USOC RJ-48C

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%)
- Impedance: 120 Ohm +/-3.0V (10%)
- Receive signal level: 0 to –30dB
- RJ-45 Connector USOC RJ-48C
- BNC via RJ-45 to 2xBNC adapter cable

Timeslot mapping selectable

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

This product includes the following models:

FRM220-FTEC E1/T1 Cross Rate Converter Card

A.20 FRM220-1000TS GbE to Gigabit Fiber Converter Card

The FRM220-1000T(S) is a 1000Base copper to fiber converter which transparently supports any protocol or packet size. This slide in fiber media converter is available in two different models that work stand-alone or as line cards for placement in the FRM220 Platform Media Converter chassis. The FRM220-1000T uses a fixed optical transceiver while the FRM220-1000TS features an standard SFP socket. The FRM220-CH01 is a stand-alone case for FRM220 slide-in cards with built-in power supply features.
All media converters are available with either multi-mode or single-mode optical transceivers with SC connectors for fixed transceivers or LC connectors for the SFP version. In single mode, WDM (Wave Division Multiplexing with SC or LC) or "Bidi" are also available in 20, 40, 60km reach, which provide the ability to transmit and receive data using only a single optical fiber. When the FRM220-1000T(S) card is placed in the FRM220 rack with SNMP management, the card status, type, fiber link status and UTP link status can all be displayed.
This converter is excellent when used in high speed gigabit networks that employ jumbo packets. The FRM220-1000T(S) supports unlimited packet size and has extremely low latency.

Features

- 1000Base-T to 1000Base-SX/LX
- Network management via terminal, web or SNMP in FRM220 chassis
- Forced 1000Base/Full Ethernet
- Auto MDI/MDIX
- Pass > 9K bytes packets
- Supports Link Fault Pass Through (LFP) function
- Auto Laser Shutdown (ALS)

Specifications

Standards

- IEEE802.3ab 1000Base-T, IEEE802.3z 1000Base-SX/LX, Gigabit Standards

1000Base-T RJ-45 Connectors

- 1000T(S) : One RJ45 connector is provided for UTP cable connection

All RJ45 ports utilizing auto MDI/MDIX, which allow all UTP connections for both straight and crossover UTP cable.

1000Base-X Fiber Optic Connectors

- 1000TS : One SFP slot is provided for standard 1.25Gbps SFP module.

Environment

- Operating -10 to 60C
- Storage -20 to 70C
- Humidity -- 10 to 90%, (non-condensing)

Power

- Adapter: 12V DC 1A (CH01-DC12)
- Built-in AC Power 100~240 V (CH01-AC)
- Built-in DC Power 18~72VDC (CD01-DC)

Dimensions: (W x D x H) mm

- 1000TS-DC12 : 88 × 160 × 24 1000T(S)-AC: 135 × 201 × 35
- 1000TS-DC48 : 135 × 201 × 35 1000T(S)-AD/AA/DD: 135 × 201 × 35

This product includes the following models:

FRM220-1000TS GbE to Gigabit Fiber Converter Card

A.21 FRM220-4G-(2S/3S) 2R 4.25G Transponder Card

FRM220-4G-2S is a multi-rate, 28M to 4.25G 2R optical repeater device. The "2R" consists of Re-amplification and Re-shaping. 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 FRM220-4G-2S card is placed in 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, provide client or line side diagnostic loop back, and set the desired data rate.

FRM220-4G-3S is in every way the same as the 2S model except an additional optical port is added to provide 1+1 optical protection. Automatic optical line Protection Switching is supported for the aggregate fiber port.

Features

- Supports multiple protocols and data rates from 28Mbps to 4.25Gbps.
- 2R Repeater functions for re-amplification and re-shaping.
- Low cost transponder application.
- Available with redundant fiber support (3S model).
- Supports rack management or stand-alone.
- Supports Auto-Laser Shutdown (ALS) and Link Fault Pass through (LFP).
- Supports both line side and client side optical loop backs.
- Digital Diagnostic Monitor of supported SFP modules.
- Optical Connector: SFP-LC (On both Line & Client Side)

Specifications

Optical Interface :	Connector :	SFP LC
	Data rate :	28Mbps ~ 4.25Gbps
	Fiber :	MM 62.2/125µm, 50/125µm. SM 9/125µm
	Distance :	2~120km
	Wavelength :	850, 1311, 1471 ~ 1611nm
Indications	Power, Link(Line), Link(Client), TX/Act, Loopback	
Power Input	Card: 12 VDC Stand-alone: AC, DC option	
Power Consumption	<5W	
Dimensions	155 x 88 x 23mm(D x W x H)	
Weight	120g	
Temperature	0~60°C (Operating), -10~70°C (Storage)	
Humidity	10~90% non-condensing	
Certification	CE, FCC, RoHS	
MTBF	75,000 hours	

This product includes the following models:

FRM220-4G-2S 2R 4.25G Transponder Card
FRM220-4G-3S 2R 4.25G Transponder Card w/1+1 fiber protection

A.21.1 Functional Details

Fiber

The 2R-4G-2S/3S fiber to fiber 2R repeater uses a transparent optical line coding to provide an optical repeater / transponder function for use in low cost extension, multimode to single mode conversion or CWDM applications.

Only SFP models are available.

Management

The **FRM220-4G-2S/3S** has a small processor that is used to read the set DIP switch when used stand-alone, to provide a texted based operation menu when used in CH01M and serial terminal or to communicate with the NMC when the card is placed in the managed rack.

This model is designed for both stand-alone use and for management when installed in managed chassis. Both models have a single on-board 8 pole DIP Switch which can be used to configure the devices for stand-alone operation. When placed in a stand-alone chassis with console port, these devices also support a text based serial terminal with an easy to use menu system for configuration. When placed in a managed chassis, the card is configured and monitored through the chassis NMC (network management controller) via console, Telnet, Web HTTP or SNMP.

When placed in a managed chassis, such as our **FRM220-CH20** with **NMC** (Network Management Controller), the **4G-2S/3S** card is configured and monitored through the chassis **NMC** via console, Telnet, Web HTTP or SNMP.

1. Stand-alone – DIP settings when placed in CH01, serial console when placed in CH01M or CH02M.
2. Rack management - When placed in **NMC** managed rack, all other settings can be overridden by the **NMC** management.
3. 4G-2S/3S does NOT support in-band management.

There are two variations of this media converter; the 4G-2S converter with two optical ports (Line and Client) and the 4G-3S with three optical ports (Line, Primary and Secondary) supporting 1+1 fiber protection.

A.21.2 Installation of SFP Modules

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

A.21.2.1 Inserting a Bale Clasp SFP Module into the Cage

Step 1 Close the bale clasp upward before inserting the pluggable module.
Step 2 Line up the SFP module with the port, and slide it into the cage.

A.21.2.2 Removing a Bale Clasp SFP Module

Step 1 Open the bale clasp on the SFP module. Press the clasp downward with your index finger.
Step 2 Grasp the SFP module between your thumb and index finger and carefully remove it from the SFP cage.

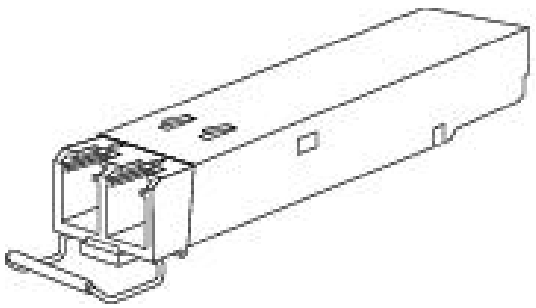
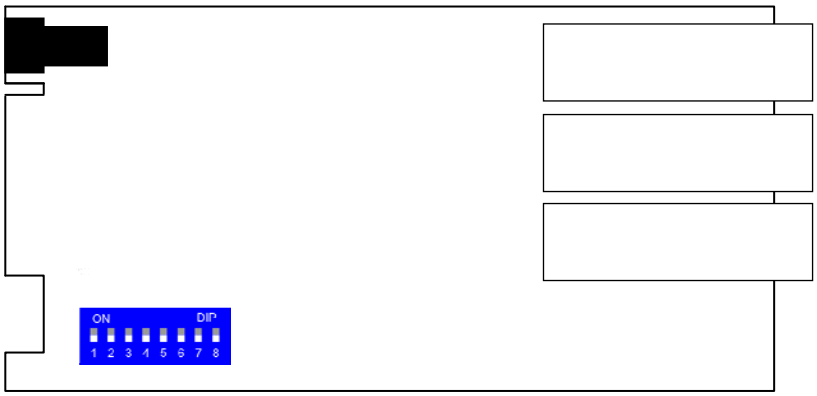


Figure A.21.2 Bale Clasp type SFP with bale open

A.12.3 Provisioning by DIP (Stand-alone)

There is one DIP Switch installed on the PCBA of the **4G-2S/3S**



DIP No.	1	2	Parameter
3S Only	OFF	OFF	Auto mode (revertive)
	ON	OFF	Semi-auto mode (non-revertive)
	OFF	ON	Manual Primary
	ON	ON	Manual Secondary

When set to 'Auto', the protection works in Revertive mode. This means when the damaged Primary path is repaired, the protection will switch back to the Primary path. When set 'Semi', the protection works in Non-Revertive mode. Even if the broken Primary path is restored, the protection will continue to operate on the Secondary path (i.e., will not revert back).

Dip Sw	3	4	5	6	7	8
2S/3S	ALS	Panel	LFP	Config	Reserved	Reserved

Switches 3 ~ 6 are described below, while 7 & 8 are reserved.

Sw3 ALS Off=Auto Laser Shutdown disabled; On=enabled
Sw4 Panel (S2 Only) Off=disable the front panel user loop back switches
On=enable the front panel loop back switches
Sw5 LFP Off=Link Fault Pass-thru disabled; On=enabled
Sw6 Config Off=Follow Dip switch settings;
On=Follow settings saved in EEPROM (from console setup).

Important!! When placing this card into a managed chassis with NMC, make sure that switch #6 is OFF. If this switch is mistakenly left ON, the symptom will be a blinking PWR LED. The web interface for the 4G card will show 'System Fail'.

Notice: All of these settings, except switch #6, are ignored if the card is placed in the FRM220-CH20 with NMC/SNMP management. The card will follow the settings done via the chassis management.

A.21.4 Provisioning by NMC (Telnet)

When placed in the CH20 with NMC, this card can be configured through any of the NMC interfaces, including Telnet, Web GUI and SNMP.

```
This Chassis ID:[00]  Cascaded:[Yes]    Monitored Chassis ID:[00]
SLOT #09 > FRM220-2R/4G-3S      [Local] [ Ver:1.200-1.800-0.000-0.000 ]
 Line Status:   [Up  ]   Primary Status:   [Up  ]   Secondary Status:   [Up  ]
 Line Tx Detect:[Normal] Primary Tx Detect:[Normal] Secondary Tx
Detect:[Normal]
<1> :Port Active:[Enable ]   System:[Ok  ]
<2> :Loopback Test Function: [Disable                  ]
<3> :Loss Propagation:[Disable]
<4> :Line Side Auto Laser Shutdown     :[Disable]
<5> :Primary Side Auto Laser Shutdown  :[Disable]
<6> :Secondary Side Auto Laser Shutdown:[Disable]
<7> :Optic Fiber Protection:[Semi-Auto]
<8> :Active Path           :[Primary  ]
<9> :Port Reset.
<A> :Set to default.
<D> :Go to Line Card Status menu.

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

<1> : Port Active - Use this item to enable or disable the line card. When disabled all transmission will be blocked and all the line card LED indicators will be Off.
<2> : Loop Back Test - This initiates the sub-menu to select Line Side, Primary & Secondary Side or All Enable (both line and client simultaneous) loop back.
<3> : Loss Propagation - This enables or disables the Link Fault Pass through function of the converter.
<4> : Line Side Auto Laser Shutdown (ALS) - Enables or disables the ALS safety feature for the Line Side Optical port.
<5> : Primary Side Auto Laser Shutdown (ALS) - Enables or disables the ALS safety feature for the Primary Optical port.
<6> : Secondary Side Auto Laser Shutdown (ALS) - Enables or disables the ALS safety feature for the Secondary Optical port.
<7> : Optical Fiber Protection: - Selects the protection type between:

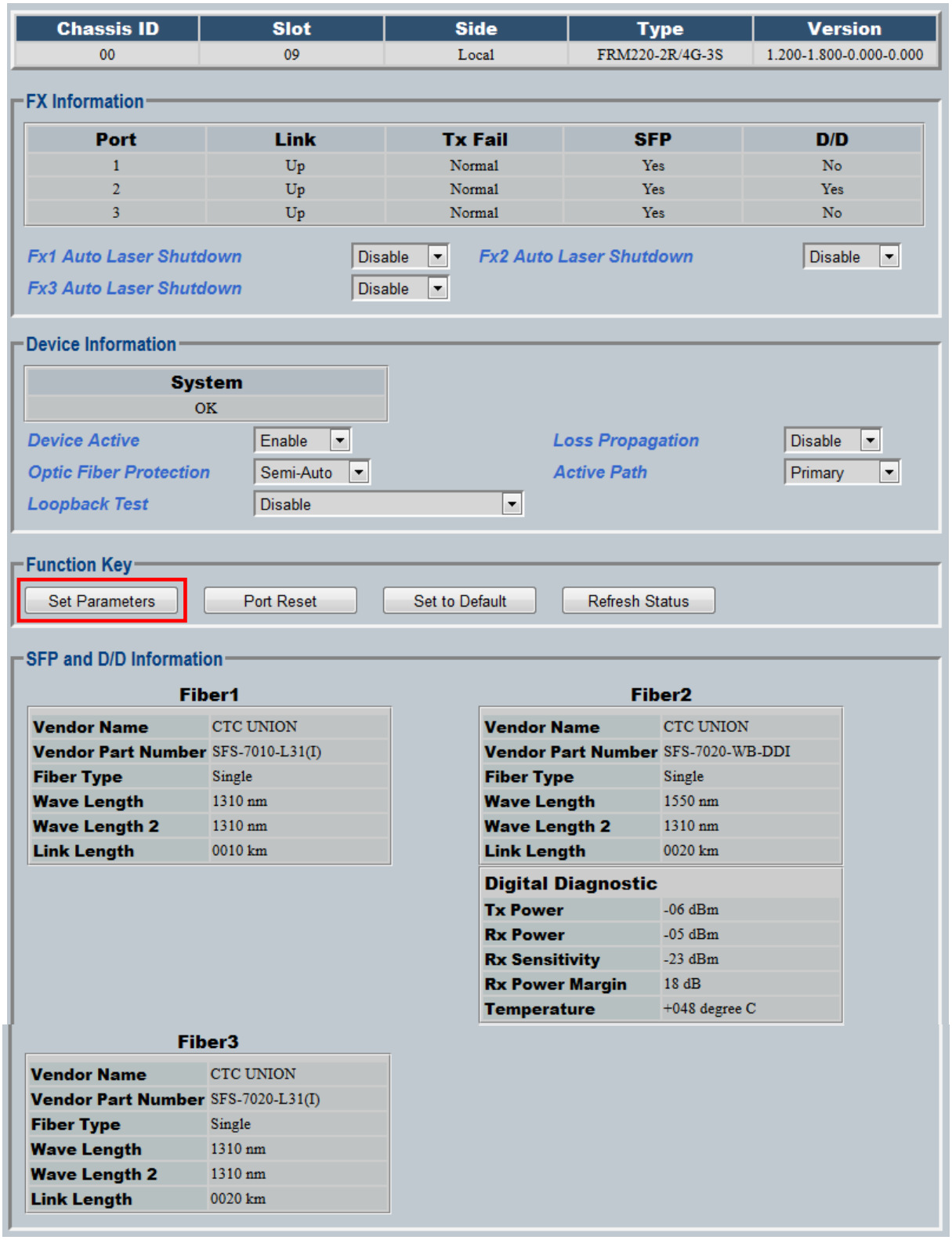
1. Manual -- Permanently forces the path to the selected 'Active Path' parameter.
2. Auto -- Sets the protection mode to 'Revertive' (automatically switches back to the active path when restored.
3. Semi-Auto -- Sets the protection mode to 'Non-Revertive' (will only switch back to active path from the protected path if forced or by breaking the protected path.

<8> : Active Path - Selects the path, Primary or Secondary which is used for Manual protection or which is used as the revert to path when both paths are good.
<9> : Port Reset - This function will clear and reload the CPLD, effectively resetting the port. Data loss will occur when performing this reset. Use with care.
<A> : Set to Default - Force all card settings back to their factory defaults.
<D> : Go to Line Card Status menu - Shows the installed status of SFP cages and whether the installed SFP supports DDI. Press the menu key number to view the SFP details.

Line Card Status

```
SLOT #09 > FRM220-2R/4G-3S      [Local ] [ Ver:1.200-1.800-0.000-0.000 ]

<1>: Line Side      : (SFP):[Yes]  (D/D):[No ]
<2>: Primary Side   : (SFP):[Yes]  (D/D):[Yes]
<3>: Secondary Side : (SFP):[Yes]  (D/D):[No ]
```

A.12.6 Provisioning by NMC (Web)

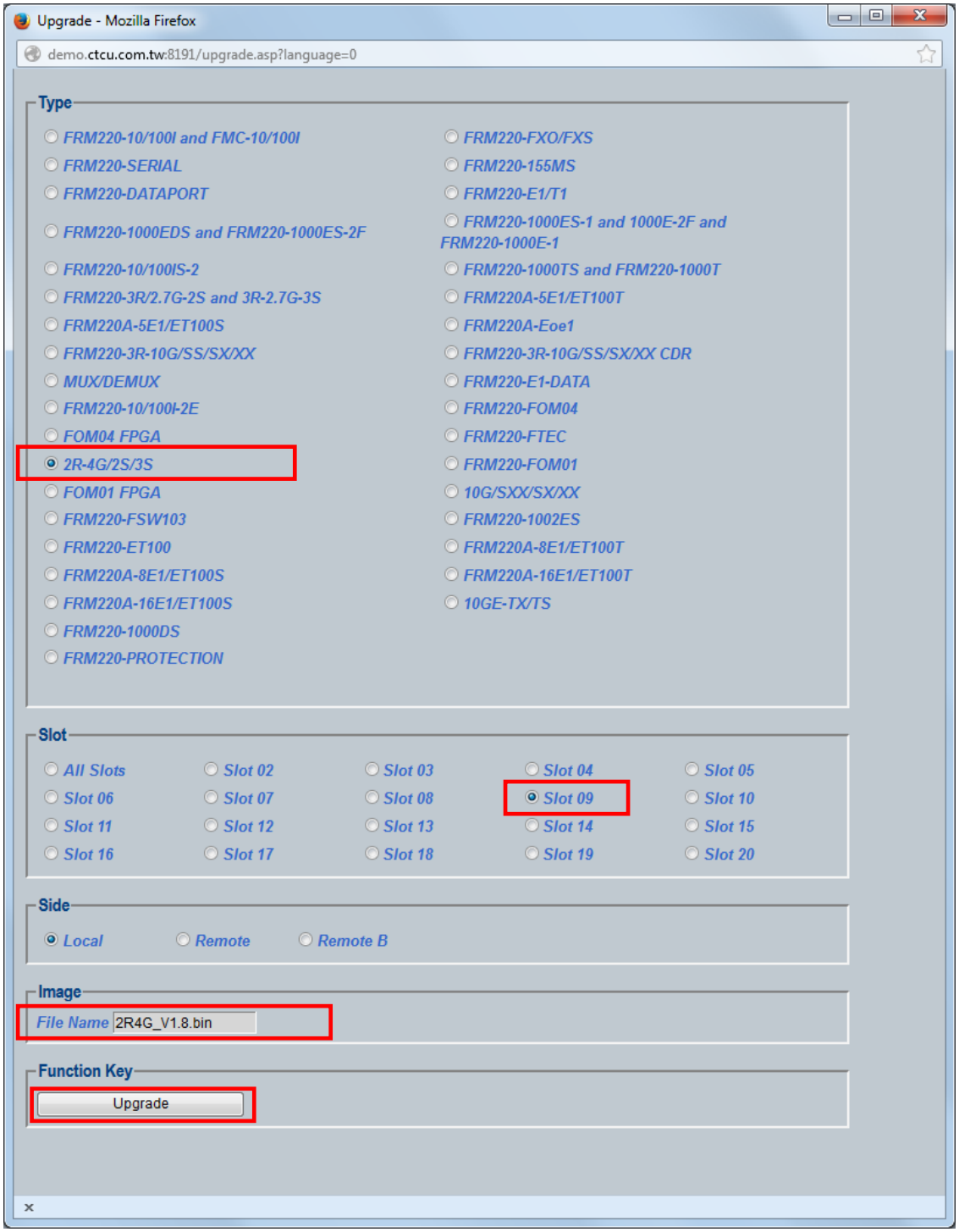


The settings, described in the Telnet operation, are easily manipulated here in the Web GUI. From the top, the Line (FX1), Primary (FX2) and Secondary (FX3) Fiber ports, Device Settings, Function buttons and SFP information (if any) at the bottom.

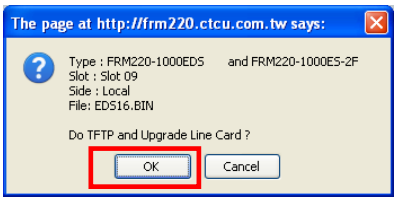
After making any changes, be sure to click the “Set Parameters” button.

A.12.7 Firmware Upgrade

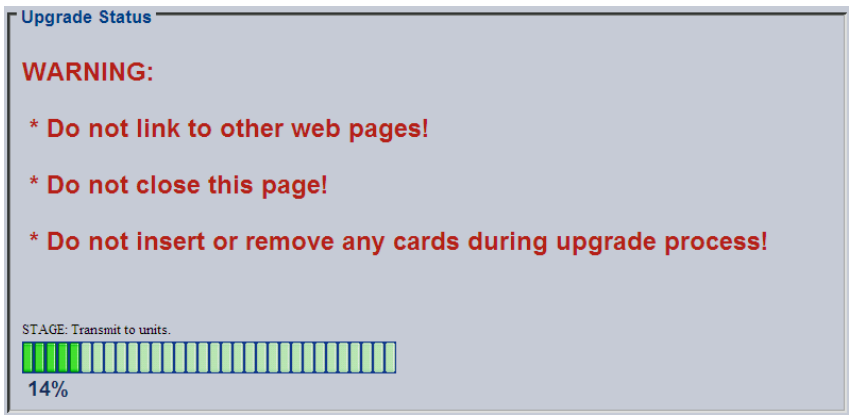
1. From the "System" menu click the "Upgrade Line Card" button.
2. Select the card type radio button, which in this case is the FRM220-2R-4G/2S/3S
3. Select the slot to update. Selecting "All Slots" will upgrade all local 2R-4G/2S/3S cards. (this may take up to 15 minutes)
4. If selecting an individual slot, you must also select ONLY the local unit. (no in-band supported in this model)
5. The image file name needs to be keyed in. The TFTP server should be able to find this file and the "System" settings need to be correct (see Chapter 2, settings).
6. Click the "Upgrade" button to start the update.



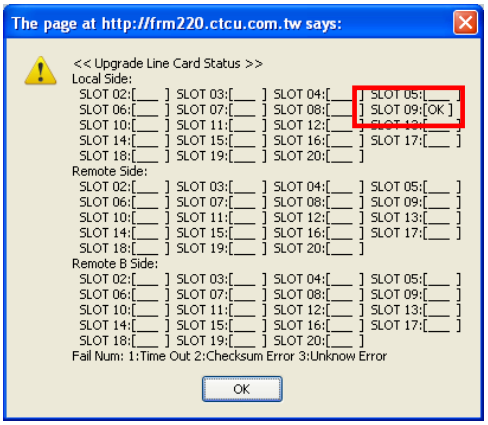
7. Click the "OK" button to confirm.



8. Heed the warning messages!!!!



9. View the success results



A.22 FRM220-FOM01 1xE1/T1 +100M Ethernet Fiber Optical Multiplexer Card

FRM220-FOM01 is a modular design for 1xE1/T1 + Fast Ethernet multi-service to dual strand fiber PDH multiplexer. FRM220-FOM01 provides E1/T1 transmission transparently and pure 100Mbps Fast Ethernet simultaneously. The fiber optic line uses either fixed transceiver or is based on the SFP technology that allows the flexible use of Multimode or Single mode lines and enables the support of different wavelengths and distances. The use of bi-directional SFPs maximizes the utilization of the fiber optic line and results in saving line costs. 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.

Features

- Single channel unframed E1/T1
- 10/100Base-TX Ethernet
- Auto MDI/MDIX
- Auto-Negotiation or Force mode
- Supports flow control
- Supports 9K jumbo packets
- Supports Link fault pass through (LFP)
- Supports Digital Diagnostics Monitoring Interface (DDMI)
- AIS on signal loss on E1/T1 and fiber port
- Loopback test on Optical and E1/T1 ports
- Supports Dying Gasp
- Supports local or remote In-band management
- Monitor and Configuration status by NMC manager
- Supports On-Line F/W upgrade

Specifications

E1/T1 ports		
	Framing	Unframed (transparent)
	Bit Rate	E1:2.048 Mb/s , T1: 1.544Mb/s
	Line Code	E1:AMI/HDB3, T1: AMI/B8ZS
	Line Impedance	E1: Unbalanced 75 ohms (BNC cable) E1: Balanced 120 ohms (RJ-45) T1: Balanced 100 ohms (RJ-45)
	Receiver sensitivity	Short haul
	“Pulse" Amplitude	Nominal 2.37V+/-10% for 75 ohms Nominal 3.00V+/-10% for 120 ohms
	“Zero" Amplitude	Nominal +/-0.3V
	Transmit Frequency Tracking	+/-30 ppm
	Internal Timing	Crystal Oscillator
	Jitter Performance	According to ITU-T G.823
	Performance monitoring	According to ITU-T G.821
	Standards	ITU-T G.703, G.704, G.706 and G.732
	Interface Connectors	RJ-45, BNC
	Test Loops	LLB (Local Loop Back) RLB (Remote Loop Back)
Ethernet		
	Interface Type	10/100Base-TX
	Connector	RJ-45
	Standards	IEEE 802.3, 802.3u
	Duplex modes	Full/Half
Indications		OP1 Link, OP2 link, E1/T1 Mode/Link/Loopback test, Order wire, LAN Link/Speed.
Power Input		AC adapter, 12VDC (or with built-in power in CH20 or CH02M)
Dimensions		88 x 23 x 139mm(DxWxH)
Temperature		0 ~ 60°C (Operating), -10 ~ 70°C (Storage)
Humidity		10 ~ 90% RH (non-condensing)
Certifications		CE, FCC, RoHS

This product includes the following models:

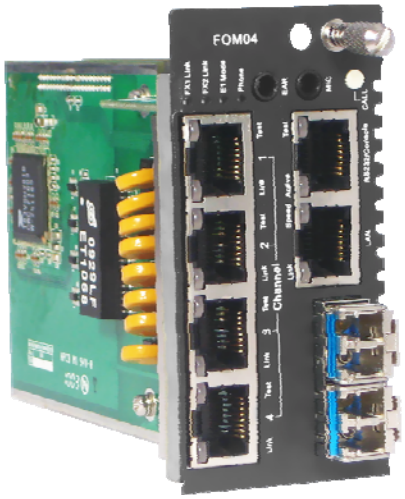
FRM220-FOM01 (Fiber Multiplexer Card)

FOM220-FOM01-CH01M (Stand-alone FOM in 1-slot chassis)

A.23 FRM220-FOM04 4xE1/T1 +100M Ethernet Fiber Optical Multiplexer Card

FRM220-FOM04 is a modular design for 4xE1/T1 + Fast Ethernet multi-service to dual strand fiber PDH multiplexer. FRM220-FOM04 provides E1/T1 transmission transparently and pure 100Mbps Fast Ethernet simultaneously. The fiber optic line is based on the SFP technology that allows the flexible use of Multimode or Single mode lines and enables the support of different wavelengths and distances. The use of bi-directional SFPs maximizes the utilization of the fiber optic line and results in saving line costs. 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.

Features



- 4 channels unframed E1/T1
- 10/100Base-TX Ethernet
- Auto MDI/MDIX
- Auto-Negotiation or Force mode
- Supports flow control
- Supports 9K jumbo packets
- Supports Link fault pass through (LFP)
- One clear channel RS232 up to 250Kbps(Async)
- 1+1 fiber protection, less than 50ms
- Supports Digital Diagnostics Monitoring Interface (DDMI)
- AIS on signal loss on E1/T1 and fiber port
- Loopback test on Optical, E1/T1, and RS232 ports
- Supports Dying Gasp
- Supports local or remote In-band management
- Monitor and Configuration status by console port and SNMP manager
- Supports Order wire Ear / Microphone port
- Supports On-Line F/W upgrade

Specifications

E1/T1 ports

Framing	Unframed (transparent)
Bit Rate	E1:2.048 Mb/s , T1: 1.544Mb/s
Line Code	E1:AMI/HDB3, T1: AMI/B8ZS
Line Impedance	E1: Unbalanced 75 ohms (BNC cable)
	E1: Balanced 120 ohms (RJ-45)
	T1: Balanced 100 ohms (RJ-45)
Receiver sensitivity	Short haul
“Pulse" Amplitude	Nominal 2.37V+/-10% for 75 ohms
	Nominal 3.00V+/-10% for 120 ohms
“Zero" Amplitude	Nominal +/-0.3V
Transmit Frequency Tracking	+/-30 ppm
Internal Timing	Crystal Oscillator
Jitter Performance	According to ITU-T G.823
Performance monitoring	According to ITU-T G.821
Standards	ITU-T G.703, G.704, G.706 and G.732
Interface Connectors	RJ-45, BNC
Test Loops	LLB (Local Loop Back)
	RLB (Remote Loop Back)

Ethernet

Interface Type	10/100Base-TX
Connector	RJ-45
Standards	IEEE 802.3, 802.3u
Duplex modes	Full/Half

Indications	OP1 Link, OP2 link, E1/T1 Mode/Link/Loopback test, Order wire, LAN Link/Speed.
Power Input	AC adapter, 12VDC (or with built-in power in CH20 or CH02M)
Dimensions	88 x 42 x 139mm(DxWxH)
Temperature	0 ~ 60°C (Operating), -10 ~ 70°C (Storage)
Humidity	10 ~ 90% RH (non-condensing)
Certifications	CE, FCC, RoHS

This product includes the following models:

FRM220-FOM04 (Fiber Multiplexer Card)

FOM220-FOM04-CH02M (Stand-alone FOM in 2-slot chassis)

A.24 FRM220-10G-SXX 10Gbps 3R Transponder with Protection

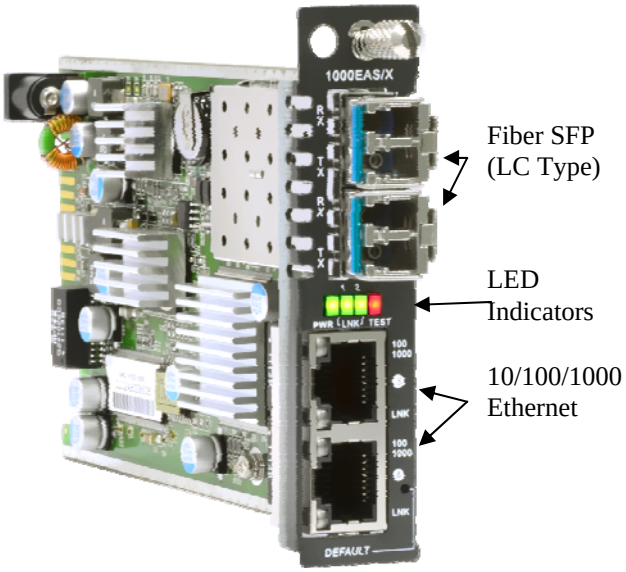
tba

A.25 FRM220A-1000EAS/X 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 100/1000Base-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 100/1000 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 packets
- Supports remote F/W upgrade (Out-band)
- Supports IEEE 802.1q Tagging VLAN and port-base VLAN
- Provides fiber transceiver information for management
- Compatible with FRM220/FRM220A Managed Chassis
- Supports Jumbo packets to 10240k bytes



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

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, Dual rate, 100/1000Mbps SFP slots
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
8 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)

A.25.1 Functional Details

Ethernet

The 1000EAS/X is based on a L2 switch chip which supports non-blocking switching fabric with up to 1024 MAC lookup filtering table and support for Egress tagging/untagging selectable per port in any combination using 802.1Q VLAN support for 4094 VIDs and BPDU handling for spanning tree protocol. There are also 28 32bit and 2 64 bit RMON counters per port that can be displayed through the management system or received via SNMP standard MIB statistics.

The 10/100/1000Base RJ-45 connectors are located on the front panel of the card along with two SFP cages for industry standard 155M or 1.25Gbps SFP modules. All UTP connections are designed for auto MDI-X operation, requiring only a straight connection to any device. A unique feature of the FRM220A-1000EAS/X switch/converter is the use of a common PCB card which may either be used as a standalone converter (FRM220-CH01 series) or placed in the FRM220/FRM220A-CH20 rack.

Management

The **FRM220A-1000EAS/X** has its own embedded processor which can be used to configure the device for stand-alone operation. When placed in a stand-alone chassis, this device supports a text based Telnet terminal with an easy to use menu system for configuration. The embedded **HTTP** server provides an easy to use **GU**I (Graphical User Interface) with any web browser. **SNMP** is also supported in the stand-alone operation. When using network management software and our proprietary MIB file specifically for the **1000EAS/X,** all settings can be performed, performance monitoring realized and alarm traps received. When placed in a managed chassis, such as our **FRM220-CH20** with **NMC** (Network Management Controller) card or the **FRM220A-CH20** with **GSW** (Gigabit Switch) card, the **1000EAS/X** card is configured and monitored through the chassis **NMC** or **GSW** via console, Telnet, Web HTTP or SNMP.

1. Stand-alone – IP settings allow management by Serial console, Telnet, Web or SNMP
2. Rack management - When placed in **NMC** or **GSW** managed rack, all other settings can be overridden by the management.

A.25.2 Panel

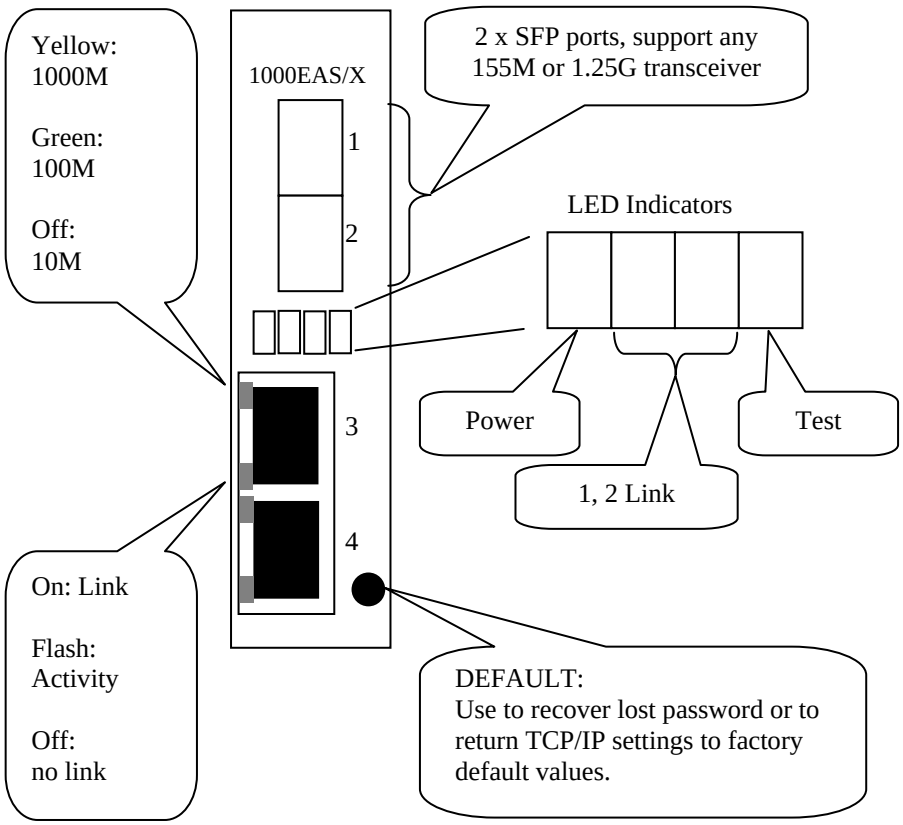


Figure A.25.1 Panel designations of **FRM220A-1000EAS/X**

A.25.3 Factory Reset Procedure

Apply power to the **1000EAS/X** and allow 30 seconds to fully boot. Using a pencil or ball-point pen, press the 'DEFAULT' recessed push-button switch (located on the face plate) and hold for 9~10 seconds. DO NOT POWER OFF. Allow the unit to again fully reboot. The defaults are:

IP=10.1.1.1
netmask=255.0.0.0
GW=10.1.1.254
TFTP server=10.1.1.100

The username and password are both reset to 'admin' if enabled.

A.25.3.1 Installation of SFP Modules

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

A.25.3.2 Inserting a Bale Clasp SFP Module into the Cage

Step 1 Close the bale clasp upward before inserting the pluggable module.
Step 2 Line up the SFP module with the port, and slide it into the cage.

A.25.3.3 Removing a Bale Clasp SFP Module

Step 1 Open the bale clasp on the SFP module. Press the clasp downward with your index finger.
Step 2 Grasp the SFP module between your thumb and index finger and carefully remove it from the SFP cage.

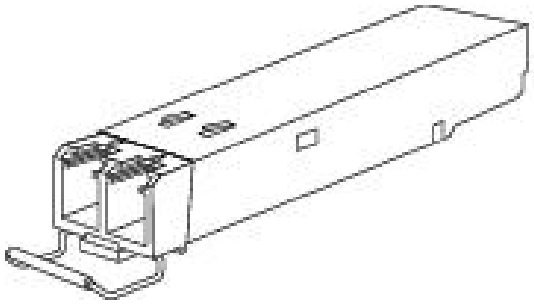


Figure A.25.2 Bale Clasp type SFP with bale open

A.25.4 Provisioning

Because of the complex settings of **1000EAS/X** and because there exists a stand-alone user manual for the **1000EAS/X**, this NMC user manual will not go into the detailed settings here.

Please refer to the **FRM220A-1000EAS/X User Manual**.

A.26 FRM220A-FSW301 Managed 1-Fiber + 3-UTP Fast Ethernet Switch Card

FRM220A-FSW103 is a three port copper to single port fiber Fast Ethernet solution designed to make conversion between 10/100Base-TX and 100Base-FX with SFP. With SNMP and Web-based management in FRM220-NMC or FRM220A-GSW/SNMP, the network administrator can monitor, configure and control the activity of each card from a centrally located managed rack controlling all converter settings including duplex and speed configuration. This media converter is completely transparent to Layer 2 and Layer 3 protocols including IEEE 802.1q, VLAN tag, Q in Q, STP, IPX, IP, etc.

Features

- 3 Port 10/100BASE-TX and 1 Port 100BASE-FX Converter.
- Auto-Cross over for MDI/MDIX at UTP port.
- Auto-Negotiation or Manual forced mode for UTP port.
- Supports flow control (802.3X).
- Forward 1552 bytes (max MTU). (VLAN tag transparent)
- Supports LED indicators : Power / FX-Link, TX1-Link/TX1-Speed, TX2-Link/TX2-Speed, TX3-Link/TX3-Speed.
- Supported by FRM220 or FRM220A (for Ethernet Aggregation) managed chassis systems.
- Supports the local management (Monitor or Configure status) by the SNMP manager when placed in managed system.
- Supports DOM function for SFP fiber transceiver.
- Supports Auto Laser Shutdown (ALS) function.
- Provides product information for management.
- Supports On-Line F/W upgrade (local) by the SNMP manager when placed in managed system.

Management Features

When placed in a stand-alone chassis with console port, these devices support a text based serial terminal with an easy to use menu system for configuration. When placed in a managed chassis, the card is configured and monitored through the chassis NMC (network management controller) via console, Telnet, Web HTTP or SNMP.

Specifications

Standard

IEEE802.3 10BASE-T, IEEE802.3u 100BASE-TX, l00BASE-FX
Supports Full Duplex Ethernet mode
Supports Ethernet Packet up to 1552KBytes in size.
10/100BASE-TX RJ-45 Connectors
FRM220A-FSW103 : Three RJ45 connectors and one SFP cage are provided
Auto MDI-X allows all UTP connections to be made using only a common straight-through UTP cable.

Optical Specifications

100Base-FX Connector
FRM220A-FSW103 : One SFP with LC connector can be provided for optic cable connection.

Power

Adapter: 12VDC, Built-in AC Power 100-240V, Built-in DC Power 18-72V Consumption <4W

Environment

Operating -- 0°C ~ 80°C, Storage -- -10°C ~ 80°C, Humidity -- 10 ~95% (non-condensing)

Weight

FRM220-FSW103-DC12: 400g FRM220-FSW103-AC: 750g
FRM220-FSW103-DC48: 750g FRM220-FSW103-AD/AA/DD: 800g

Dimensions (W x D x H) mm

FRM220- FSW103-DC12: 88 x 160 x 24FRM220- FSW103-AC: 135 x 201 x 35
FRM220- FSW103-DC48: 135 x 201 x 35 FRM220- FSW103-AD: 135 x 201 x 35
FRM220- FSW103-AD/AA/DD : 135 x 201 x 35

Certifications

CE (EMI/LVD), FCC Class A, RoHS compliant

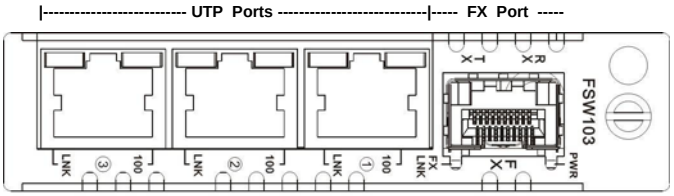
WARNING: Fiber optic equipment may emit laser or infrared light that can injure your eyes. Never look into an optical fiber or connector port. Always assume that fiber optic cables are connected to a laser light source.

A.26.1 Functional Details

FSW103 is a card based switch. The face has three 10/100Base electrical UTP and one SFP optical for 100Base-FX transceiver. The card's golden header provides power and management from the Platform Chassis and also has electrical Ethernet port which can be used by FRM220A-GSW/SNMP to aggregate Ethernet from all installed cards.

FSW103 can be managed stand-alone when placed in single slot chassis with console port. When placed in a managed chassis, all functions are controlled from the management card in the chassis. Any settings previously done in stand-alone are overridden by management card.

A.26.2 Panel



LED	*Color*	*State*	*Status*
PWR	(Green)	On	Power on
		Off	Power off or device disabled
		Flash	During firmware upgrade
FX	(Green)	On	Fiber port link
		Off	Fiber port no link
100	(Green)	On	UTP port at 100M
		Off	UTP port at 10M
LNK	(Green)	On	UTP port link
		Off	UTP port no link
		Flash	UTP port link and active

A.26.3 Installation of SFP

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

A.26.3.1 Inserting a Bale Clasp SFP Module into the Cage

Step 1 Close the bale clasp upward before inserting the pluggable module.
Step 2 Line up the SFP module with the port, and slide it into the cage.

A.26.3.2 Removing a Bale Clasp SFP Module

Step 1 Open the bale clasp on the SFP module. Press the clasp downward with your index finger.
Step 2 Grasp the SFP module between your thumb and index finger and carefully remove it from the SFP cage.

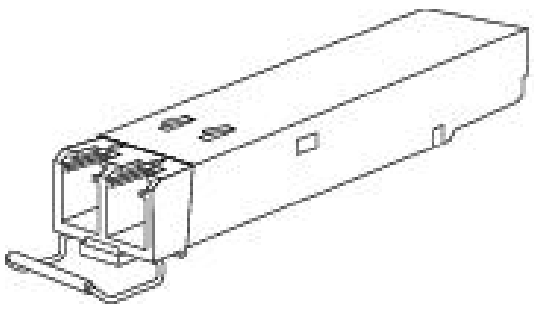


Figure A.26.2 Bale Clasp type SFP with bale open

A.26.4 Provision by DIP (Stand-alone)

FSW103 has no DIP. All provisioning stand-alone must be done through serial console when placed in CH01M chassis.

A.26.5 Provision by Console Management

Place FSW103 in a CH01M and connect serial console cable. Set terminal for 38.4K, 8,N,1, and no flow control.

```
                ****************************************
                ***  CTC UNION TECHNOLOGIES CO.,LTD  ***
                ***  FRM220A-FSW103  Manager Ver:1.0 ***
                ****************************************
              Version:[1.00 -1.000-0.000-0.000]         [ CH01M     ]

<1> LAN 1 Service    [ On     ]    Link  [ Up   ]
<2> Negotiation      [ Auto   ]
<3> Speed            [ 100    ]    Status[ 100  ]
<4> Duplex           [ Full   ]    Status[ Full ]

<5> LAN 2 Service    [ On     ]    Link  [ Down ]
<6> Negotiation      [ Auto   ]
<7> Speed            [ 100    ]    Status[ 10   ]
<8> Duplex           [ Full   ]    Status[ Half ]

<9> LAN 3 Service    [ On     ]    Link  [ Down ]
<A> Negotiation      [ Auto   ]
<B> Speed            [ 100    ]    Status[ 10   ]
<C> Duplex           [ Full   ]    Status[ Half ]
<D> Device  Status and Configuration
<E> Fiber   Status and Configuration
<P> Setting Password
```

Operation

Select any of the menu items by keying in the menu item number or letter. Use the [ESC] to return to a previous menu. Any setting is immediately applied to the transponder's circuitry. After all of the parameter settings have been selected, go to the <D>Device Status and Configuration menu from the main menu and press <2> Store Configuration to write the configuration in non-volatile RAM (NVR).

Explanation of Settings

<1,5,9>. LAN Service: This brings up the sub-menu to enable/disable the device's port. When disabled, no traffic can go through.

<2,6,A>. Negotiation: The default setting provides auto-negotiation per IEEE802.3u. Using this selection will bring up the sub-menu to switch to manual mode setting.

<3,7,B>. Speed: This will bring up the sub-menu to set the speed to either 10M or 100M. This setting will not be applied unless the negotiation is set to Manual.

<4,8,C> Duplex: This will bring up the sub-menu to set the duplex to either Full or Half. This setting will not be applied unless the negotiation is set to Manual.

<D> Device Status and Configuration: This will bring up the sub-menu that includes disabling the entire device (all ports), saving the configuration to NVR, restoring the factory default configuration, and resetting the switch.

<E> Fiber Status and Configuration: This will bring up the sub-menu specifically for the fiber interface. This includes enabling or disabling Auto Laser Shutdown (ALS) and displaying the SFP information.

<P>. Password: Use this menu item to set the device login password to protect it from unauthorized access.

Example of the Device Status and Configuration sub-menu:

```
                ***************************************
                ***  CTC UNION TECHNOLOGIES CO.,LTD  ***
                ***  FRM220A-FSW103  Manager Ver:1.0 ***
                ***************************************
            Version:[1.00 -1.000-0.000-0.000]           [ CH01M    ]

<< Device Status and Configuration >>
<1> Device Service      [ Enable    ]
<2> Store Configuration
<3> Default Configuration
<4> Reset Device Configuration

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

<**1**> **Device Service**: Disabling the device will halt all traffic through all ports.
<**2**> **Store Configuration**: After making device changes, use this to store the parameters into NVR.
<**3**> **Default Configuration**: This will restore the parameters to factory default. Then do a 'Store' to write changes to NVR.
<**4**> **Reset Device**: This will reset the CPU and the switch on the device (warm start).

Digital Optical Monitoring

Modern optical SFP transceivers support digital diagnostics monitoring (DDM) functions according to the industry-standard SFF-8472. This feature is also known as digital optical monitoring (DOM) and gives the end user the ability to monitor real-time parameters of the SFP, such as optical output power, optical input power, temperature, etc. Parameters are read from any MSA compliant SFP module. Extended information is only available in modules which support Digital Optical Monitor (DOM) function.

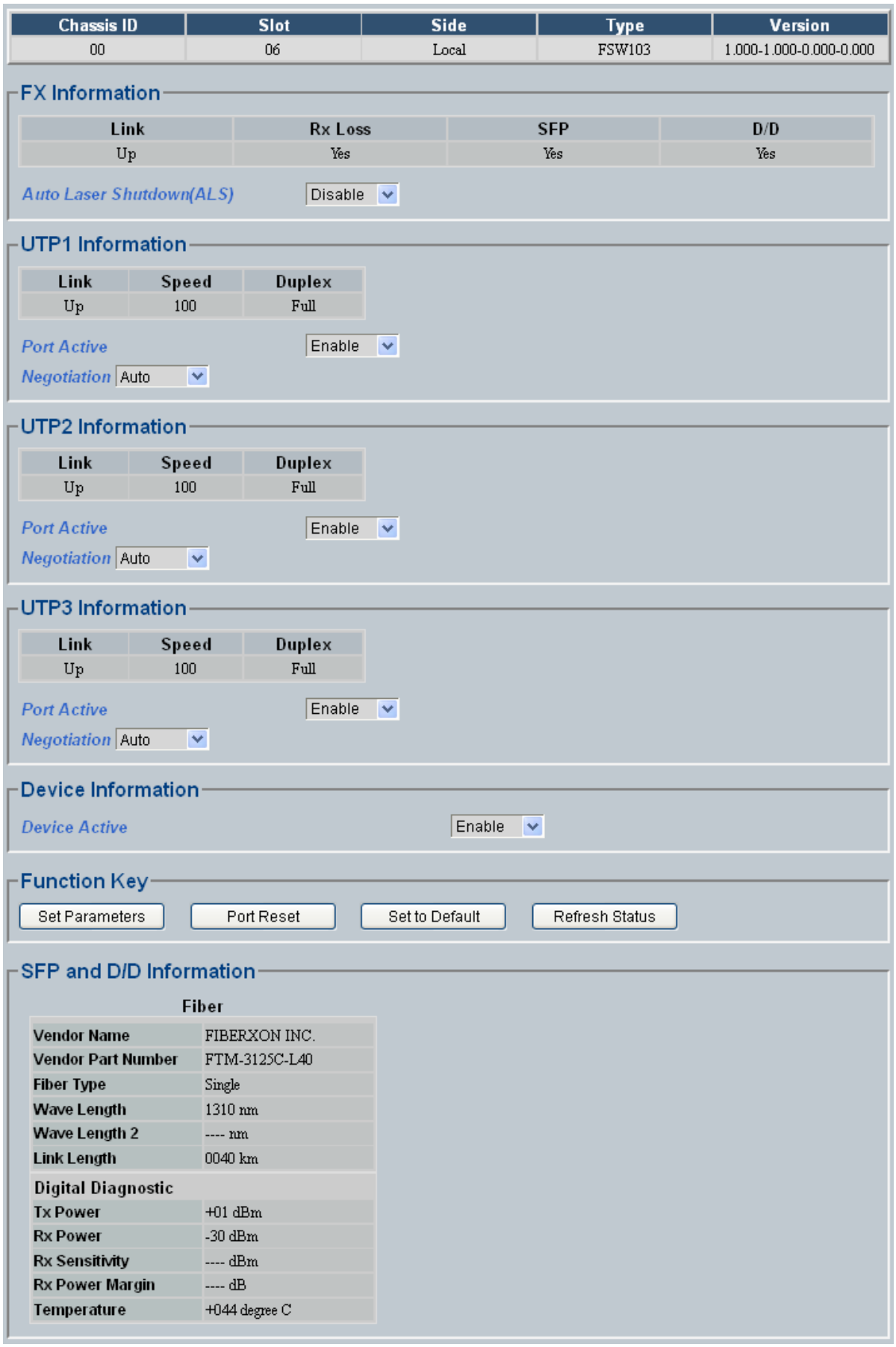
Example of reading Digital Diagnostics in SFP from Fiber sub-menu:

```
<< Fiber Side  Status and Configuration >>
<1> Auto Laser Shutdown [ Disable ]
    Fiber Link          [ Up      ]
    FX Small Form Pluggable     :[ Yes ]
    Digital Diagnostic Function :[ Yes ]

 Vendor Name        :[ CTC Union       ]
 Vendor Part Number :[ SFS-5030-L31(I) ]
 Fiber Type         :[ Single ]
 Tx Wave Length     :[ 1310nm ]
 RX Wave Length     :[ 1310nm ]
 Link Length        :[ 0030Km ]
 Tx Power           :[ -08 dBm]
 Rx Power           :[ -26 dBm]
 Rx Sensitivity     :[ -34 dBm]
 Temperature        :[  43 C  ]
<ESC> Go to previous menu.
```

Auto Laser Shutdown

Automatic Laser Shutdown (ALS) is a technique used to automatically shut down the output power of the transmitter in case of fiber break according to ITU-T G.664. This is a safety feature that prevents dangerous levels of laser light from leaking out of a broken fiber, provided ALS is provisioned on both ends of the fiber pair. The sequence of events is as follows. If a fiber is cut, the receiver will detect a Loss Of Signal (LOS). The ALS agent will turn off the transmitter. The receiver at the far end will then detect an LOS and its ALS agent will turn off the transmitter. In this way the entire fiber will go dark.

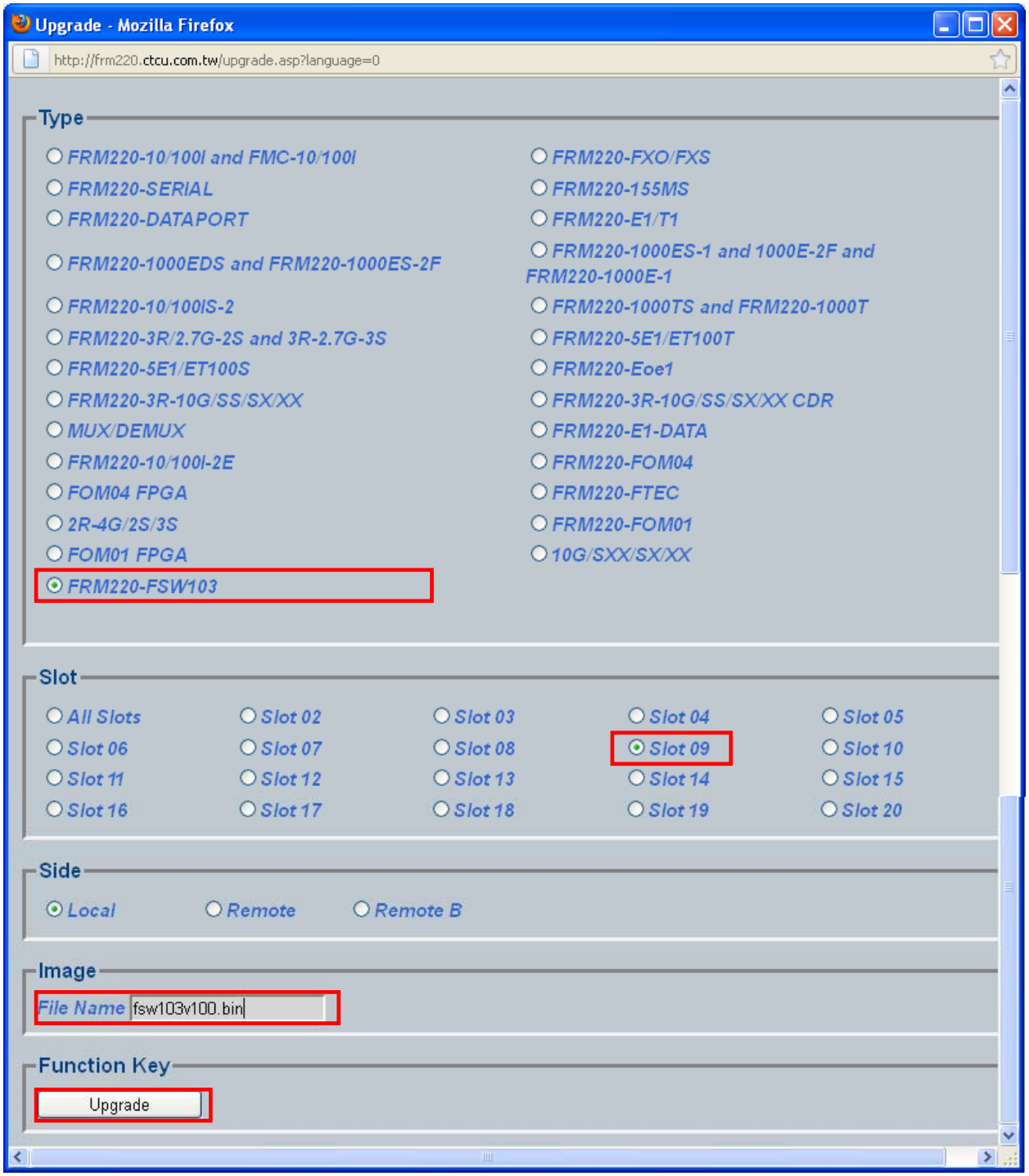
A.26.6 Provision by Web



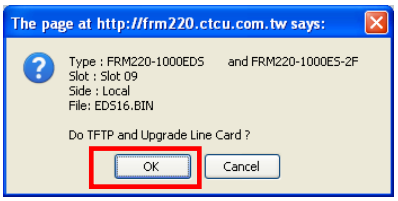
Refer to **A.26.5 Provision by Console Management** for more details of each setting. From this page ALS can be enabled and each UTP set either auto-negotiation or forced mode.

A.26.7 Firmware Upgrade

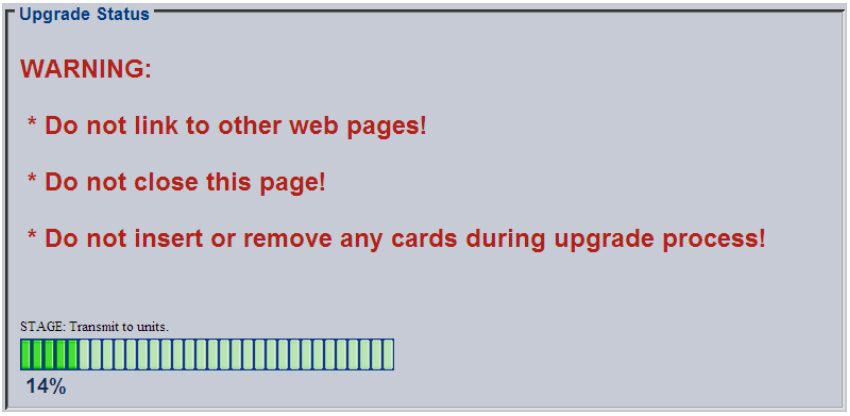
1. From the "System" menu click the "Upgrade Line Card" button.
2. Select the card type radio button, which in this case is the FRM220-FSW103
3. Select the slot to update. Selecting "All Slots" will upgrade all local switch cards. (this may take up to 15 minutes)
4. If selecting an individual slot, you must also select the local unit ONLY.
5. The image file name needs to be keyed in. The TFTP server should be able to find this file and the "System" settings need to be correct (see Chapter 2, settings).
6. Click the "Upgrade" button to start the update.



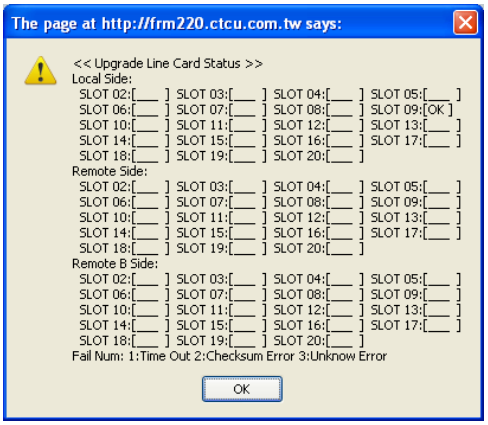
7. Click the "OK" button to confirm.



8. Heed the warning messages!!!!



9. View the success results



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