PRODUCT
Quick Start Guide

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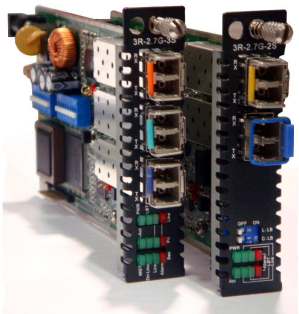
ISO 9001 Quality System Certified

User Guide

2.7G MultiRate 3R Transponder

FRM220-2.7G-2S & FRM220-2.7G-3S



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Version 1.1 May 2010

Introduction

The **FRM220-2.7G-2S** is a multi-rate, up to 2.7G 3R optical regeneration device with clock data recovery (CDR). The "3R" consists of Re-amplification, Re-shaping and Re-timing. The transponder card converts a data signal to the correct wavelength for transmission on a specific channel by supporting SFP optics on both line side and client side interfaces. When the **FRM220-2.7G-2S** 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, provide client or line side diagnostic loopback, and set the desired data rate.

The **FRM220-2.7G-3S** is a multi-rate, up to 2.7G 3R optical regeneration device with clock data recovery (CDR). The "3R" consists of Re-amplification, Re-shaping and Re-timing. 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. 1+1 Automatic optical line Protection Switching is supported for the aggregate fiber ports. When the **FRM220-2.7G-3S** 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, provide client or line side diagnostic look back, and set the desired data rate.

The SFP sockets support a wide range of SFP modules to address any network situation.

Single-mode
Multi-mode
Multi-rate
Single fiber bi-directional
Coarse and Dense Wave Division Multiplexing (CWDM and DWDM)
Copper media

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.

Specifications

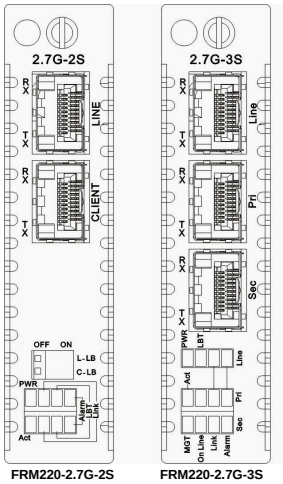
- **Optical Interface**
- **Connector** SFP cage
- **Data rate** E3 (34.368Mb/s) to OC-48/STM-16 (2.48832Gbps)
- **Duplex mode** Full duplex
- **Fiber** Depends on SFP
- **Distance** Depends on SFP
- **Wavelength** Depends on SFP
- **1+1 switch** <50ms (3S model only)
- **Indications** LED (PWR, Line Link, Client Link, Test, Loop back, Port Active, Alarm)
- **Power** (Card supports hot-swapping)
- **Input** Card : 12VDC, Standalone : AC, DC options
- **Consumption** <10W
- **Dimensions** 155 x 88 x 23mm (D x W x H)
- **Weight** 120g
- **Temperature** 0 ~ 50℃ (Operating), -10 ~ 70℃ (Storage)
- **Humidity** 10 ~ 90% non-condensing
- **Certification** CE, FCC, LVD, RoHS
- **MTBF** 65000 hrs (25℃)
- **Test Loops** Client Side LB (2S model)
  Line Side LB (2S model)
  Client & Line LBs (3S model)

Management Features

Both models have an 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, 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.

Panel

- Figure 1. Front Panel of FRM220-2.7G-2S and 3S

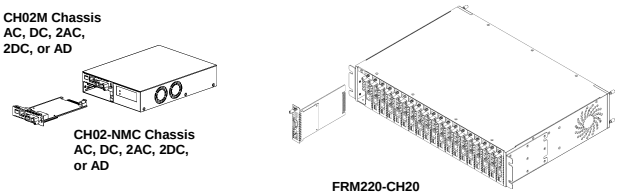


FRM220-2.7G-2S FRM220-2.7G-3S

Installation

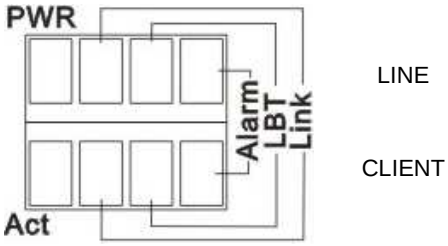
- Figure 2. Slide-in Card mounting of FRM220-2.7G-2S/3S

Note: Due to higher current requirements and excessive heat dissipation, this converter card can only be placed in the CH-02M, CH02-NMC or the full CH-20 chassis.



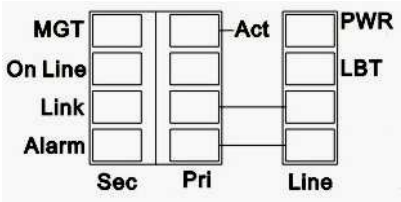
Follow all ESD precautions when handling the card and SFP modules.

LED Indicators (2S Model)



LED		*State*	*Status*
PWR	(Green)	On	Power on
		Flash	During upgrade
		Off	No Power
Link	(Green)	On	Line Side Fiber link
		Off	Line Side Fiber no link
LBT	(Green)	On	Line Loop Back Test Enabled
		Off	Line Loop Back Test Off
Alarm	(Red)	On	Tx Alarm from Line SFP
		Off	No Line SFP Alarm
Act	(Green)	On	Card is Active
		Off	Card is disabled
Link	(Green)	On	Client Side Fiber link
		Off	Client Side Fiber no link
LBT	(Green)	On	Client Loop Back Test Enabled
		Off	Client Loop Back Test Off
Alarm	(Red)	On	Tx Alarm from Client SFP
		Off	No Client SFP Alarm

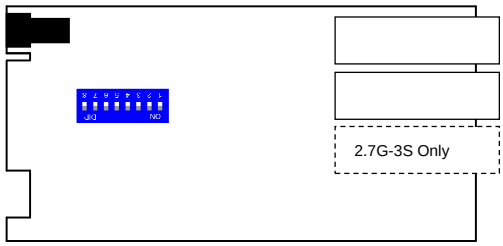
LED Indicators (3S Model)



LED		*State*	*Status*
MGT	(Green)	On	In-rack management
		Off	no rack management
Act	(Green)	On	Card active
		Off	Card disabled
PWR	(Green)	On	Power on
		Flash	During upgrade
		Off	No Power
Online	(Green)	On	Secondary Online
		Off	Secondary Offline
Online	(Green)	On	Primary Online
		Off	Primary Offline
LBT	(Green)	On	Line Loop Back Test Enabled
		Off	Line Loop Back Test Off
Link	(Green)	On	Secondary Fiber link
		Off	Secondary Fiber no link
Link	(Green)	On	Primary Fiber link
		Off	Primary Fiber no link
Link	(Green)	On	Line Fiber link
		Off	Line Fiber no link
Alarm	(Red)	On	Tx Alarm from Secondary SFP
		Off	No Secondary SFP Alarm
Alarm	(Red)	On	Tx Alarm from Primary SFP
		Off	No Primary SFP Alarm
Alarm	(Red)	On	Tx Alarm from Line SFP
		Off	No Line SFP Alarm

DIP Settings

DIP Switch On PCB



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

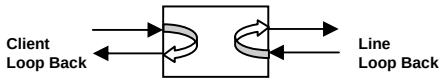
Sw8 Path (3S Only) Off=Client is on Primary; On=Client is on Secondary** ** works only when Sw7 is Off for manual forced setting

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

Loop back Testing (LBT):

The loopback capability of the FRM220-2.7G is useful for debugging a dysfunctional link, or when commissioning a site. In loopback mode, the signal is routed into the CDR circuitry and then routed back to the signal source. Loopback may be enabled via DIP switch selection or management terminal console. When placed in a managed FRM220-CH20 chassis, the loop back can be controlled by the NMC manager in FRM220 chassis.

2.7G-2S Fiber Loop Back



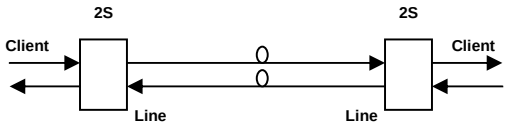
The FRM220-2.7G-2S model features a front panel mounted 2-pole DIP switch. This switch enabled loop back for either client or line fibers. The upper switch, when turned on, enables the Line side fiber loop back. The lower switch, when turned on, enables the Client side fiber loop back. The loop back function can also be enabled by using a serial terminal connected to the 9 pin D-Sub on the CH02M, via the terminal menu system. If placed in FRM220-CH20 with NMC/SNMP, the chassis management system can access the card and perform all setting functions. (The front panel switches will be ignored and overridden by NMC manager.)

The FRM220-2.7G-3S model can only do loop back through one of the management interfaces i.e. local console or NMC. The loop back function is enabled by using a serial terminal connected to the 9 pin D-Sub on the CH02M, via the terminal menu system. If placed in FRM220-CH20 with NMC/SNMP, the chassis management system can access the card and perform all setting functions. (The internal DIP switch settings will be ignored and overridden by NMC manager.)

Application

The FRM220-2.7G 3R repeater works in point-to-point applications, either as a stand-alone or when placed in the FRM220-CH20 managed rack.

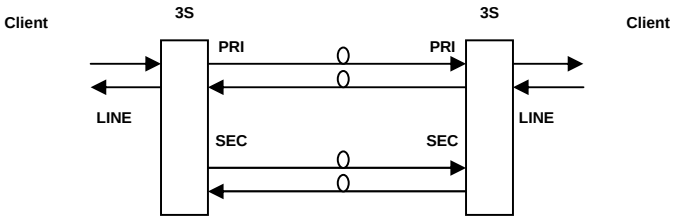
Extension Repeater



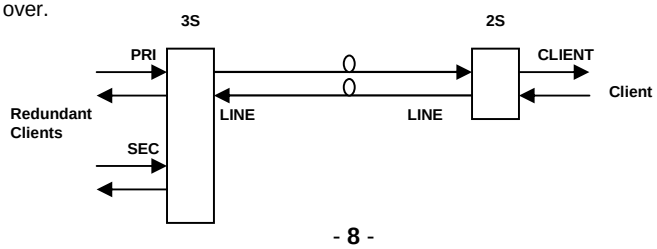
Set local and remote 3R repeater to the protocol's data rate either by local DIP or through management. The rate setting is the only setting required.

Protection

The **FRM220-2.7G-3S** has the ability to provide 1+1, non-revertive redundancy protection for single input, repeater/media converter applications complete with full 3R capabilities on each trunk. This first application of protection is line side protection. In this setup, the line connector actually faces the client.



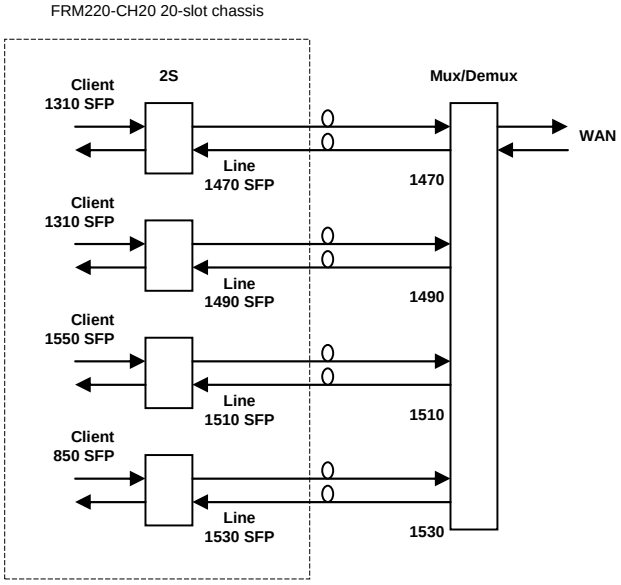
The second application provides for redundant clients and automatic fall over.



CWDM Transponder

The FRM220-2.7G functions primarily as a repeater or a media converter. As a repeater for long-haul applications, the signal is fully regenerated at the trunk. Clock Data Recovery (CDR) helps in reshaping, retiming, and regenerating (3R) the output signal at a number of pre-assigned frequencies or protocols.

In the CWDM/DWDM application, the 3R transponder acts as a fiber-to-fiber repeater and optical frequency converter between the client side equipment and the Optical Multiplexer/De-multiplexer.



Set transponder to the protocol's data rate either by local DIP or through management. The rate setting is the only setting required.

Console Management

When placed in the 2-slot CH02M chassis, this card can be locally managed by connecting a simple serial terminal such as a notebook computer that has an RS232 port or via a commonly available USB to RS232 adapter. In Windows XP, HyperTerminal™ is an application available for emulating a serial terminal. You can also search for TeraTerm or PuTTY which are free alternatives, especially if the operating system is Vista or Win7.

Settings

Baud Rate: 38,400
Data bits: 8
Parity bits: none
Stop bits: 1
Handshaking: none
Emulation: VT-100

Connect the serial cable to the CH02M's DB9. Run the terminal emulation program. With power on, press [ESC], [space] or [Enter] to display the "Main Menu" screen. The following is an example.

```
          ***************************************
          ***  CTC UNION TECHNOLOGIES CO.,LTD  ***
          ***  FRM220 2.7G-2S Manager Ver:1.00 ***
          ***************************************

    Version:[1.100-1.000-1.100-0.000]   [CH-02M Slot-1  ]
    Line Status[Down]           Client Status[Down]
<1> Port Active:                        [Enable ]
<2> Baud Rate Select:                   [Fast Ethernet  ]
<3> Line Side Loopback Test:            [Off    ]
<4> Client Side Loopback Test:          [Off    ]
<5> Link Fault Pass-Through:            [Disable]
<6> Line Side Auto Laser Shutdown:      [Disable]
<7> Client Side Auto Laser Shutdown:    [Disable]
<D> D/D Function
<R> Port Reset
<S> Store Parameters
Please select an item.
```

Example of Main Menu Console Screen, FRM220-2.7G-2S

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, press "s" from the main menu to save the parameters in non-volatile RAM (NVR). To revert to previous settings before saving, press "r" to reset (reload previously saved parameters).

Explanation of Settings

1. Port Active: This will enable or disable the card. When inactive, no transmissions will be able to occur.
2. Baud Rate Select: This will bring up the data rate selection list. Select the required 3R recovery speed by choosing the protocol.
3. Line Side LBT: This will activate the Line side loop back diagnostics
4. Client Side LBT: This will activate Client side fiber loop back diagnostics
5. LFP: Enables or Disables Link Fault Pass Through function
6. Line ALS: This can enable Auto Laser Shutdown protection for Line side
7. Client ALS: Can enable Client side Auto Laser Shutdown protection

D. D/D: Enables user to read the serial data stored in SFP module
R. Reset: This will cause the parameters settings in NVR to be reloaded
S. Store: Saves the setting parameters into non-volatile RAM (NVR)

Example of reading Digital Diagnostics in SFP

```
    D/D Function:
<1> Line Side D/D Function:     [Yes ]
<2> Client Side D/D Function:   [Yes ]
<ESC> Go to previous menu. Please select an item.
------------------------------------------------------------
Client Side D/D Function:
 Vendor Name            :[FIBERXON INC.    ]
 Vendor Part Number     :[FTM-6128C-L5051  ]
 Fiber Type             :[Single  ]
 Tx Wave Length         :[1510 nm ]
 RX Wave Length         :[1510 nm ]
 Link Length            :[0050 Km ]
 Tx Power               :[ -01 dBm]
 Rx Power               :[ -41 dBm]
 Rx Sensitivity         :[  00 dBm]
 Temperature            :[  42 C  ]
<ESC> Go to previous menu.
```

Parameters are read from any MSA compliant SFP module. Extended information is only available in modules which support D/D function.

Repeater with Protection

There are additional menu items for the FRM220-2.7G-3S model to control the behavior of the Pri. and Sec. fiber 1+1 behavior.

Explanation of Settings

1. Port Active: This will enable or disable the card
2. Baud Rate Select: This will bring up the protocol rate selection list
3. Fiber Protection: When set off, the fiber path is manually selected through item 4's selection. When set on, the fiber will automatically take the redundant path if working path fails (non-revertive)
4. Select Client Path: When item 3's protection is set to manual (off), this setting will force the client's path as either 'Primary' or 'Secondary'
5. LBT: This will enable simultaneous Line and Client fiber loop back
6. LFP: Enables the Link Fault Pass Through action
7. Line ALS: This can enable/disable Auto Laser Shutdown for Line side
8. Primary ALS: Can enable/disable Primary side Auto Laser Shutdown
9. Secondary ALS: Can enable/disable Secondary side Auto Laser Shutdown

D. D/D: Enables user to read the serial data stored in SFP module
R. Reset: This will cause the parameters settings in NVR to be reloaded
S. Store: Saves the setting parameters into non-volatile RAM (NVR)

```
          ***************************************
          ***  CTC UNION TECHNOLOGIES CO.,LTD  ***
          ***  FRM220 2.7G-3S Manager Ver:1.00 ***
          ***************************************

    Version:[1.100-1.000-1.100-0.000]   [CH-02M Slot-1  ]
    Line Status[Down]    Primary Status[Down]   Secondary
Status[Down]
<1> Port Active:                        [Disable]
<2> Baud Rate Select:                   [Fast Ethernet  ]
<3> Optic Fiber Protection:             [Off    ]
<4> Select Client Master:               [Primary  ]
<5> Loopback Test Function:             [Off    ]
<6> Link Fault Pass-Through:            [Disable]
<7> Line Side Auto Laser Shutdown:      [Disable]
<8> Primary Side Auto Laser Shutdown:   [Disable]
<9> Secondary Side Auto Laser Shutdown: [Disable]
<D> D/D Function
<R> Port Reset
<S> Store Parameters
Please select an item.
```

Example of Main Menu Console Screen, FRM220-2.7G-3S

Upgrading

The FRM220-2.7G card may be firmware upgraded when it is placed in the FRM220 with NMC management card. The user may use a local console connection to the NMC, a remote Telnet (IP) connection, or a Web based (HTTP) connection with any available browser. The NMC communicates to all cards through a serial RS485 control bus. The upgrade code is transferred to the NMC by way of TFTP server. All of these mentioned upgrade methods are well documented in the FRM220-NMC Software Operation Manual.

About SFP Units

The FRM220-2.7G accepts any SFP unit that complies with the MSA standard. Follow all ESD precautions when handling the card and SFP modules. Fiber optic components and cables are very sensitive to dirt, dust and mishandling, especially in high-speed networks. Dirty or mistreated fiber may cause errors and an unwanted degradation of signal quality. Remove the dust caps on SFP only when ready to plug in optical cables.

When choosing SFP optical modules, the SFP must be able to support the required data rate. OC3 SFP (155M) will operate fine at STM-1 and Fast Ethernet speeds, but not all modules will operate at lower speeds (E3, T3, or STM-0). Make sure the SFP modules chosen are suitable for the required data rate.

Installation

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

- Inserting a Bale Clasp SFP Module into a SFP cage
  Step 1 Close the bale clasp upward before inserting the SFP 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.