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# User Guide

## 10G 3R Transponder

### FRM220-10G



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### Introduction

The **FRM220-10G** is a 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 XFP, and/or SFP+ optics on both line side and client side interfaces. When the **FRM220-10G** 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.

This card is specifically designed for four popular protocols that run at near ten gigabit speed. They include 10G Ethernet, 10G Fiber Channel, OC-192(STM-64) and OTU2.

The XFP and/or SFP+ sockets support a wide range of optical modules to address any 10 Gigabit network situation.

- Single-mode
- Multi-mode
- 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** XFP and/or SFP+ cage (depending on model)
  - **Data rate** ~10Gb/s
  - **Duplex mode** Full duplex
  - **Fiber** Depends on XFP/SFP+
  - **Distance** Depends on XFP/SFP+
  - **Wavelength** Depends on XFP/SFP+
- **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** <12W
- **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** None

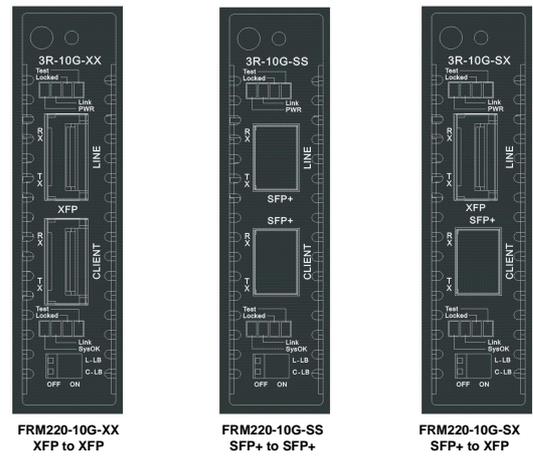
**Management Features**

The FRM220-10G has an on-board 8 pole DIP Switch which can be used to configure the device 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.

1. Stand-alone - Simple DIP settings, "set and forget"
2. Stand-alone - with serial console, menu driven, overrides DIP settings
3. Rack management - When placed in NMC managed rack, all other settings are overridden by the NMC management.

**Panel**

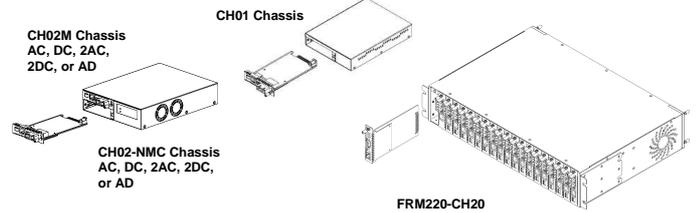
- Figure 1. Front Panels of FRM220-10G



**Installation**

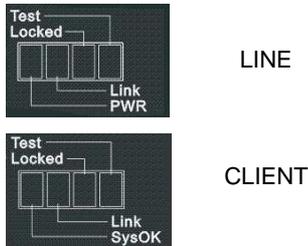
- Figure 2. Slide-in Card mounting of FRM220-10G

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 XFP/SFP+ modules.

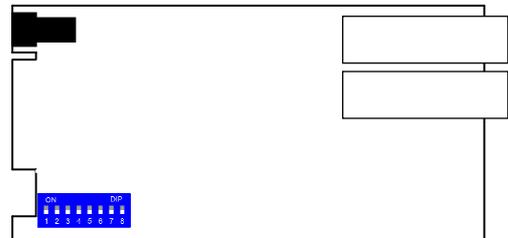
**LED Indicators**



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
Locked	(Green)	On Line Side CDR clock locked
		Off Line Side CDR clock not locked
Test	(Red)	On Line Side in Loop Back test
		Off Line Side normal
SysOK	(Green)	On System is OK
		Off System fault
Link	(Green)	On Client Side Fiber link
		Off Client Side Fiber no link
Locked	(Green)	On Client Side CDR clock locked
		Off Client Side CDR clock not locked
Test	(Red)	On Client Side in Loop Back test
		Off Client Side normal

**DIP Settings**

DIP Switch On PCB



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
10G	Off	Off	Off	Off	Protocol Supported		Fiber Data Rate	
	On	Off	Off	Off	10G Ethernet		10.3125Gbps	
	Off	On	Off	Off	10G Fiber Channel		10.51875Gbps	
	On	On	Off	Off	OC-192/STM-64		9.95328Gbps	
					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

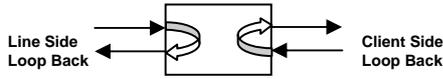
Sw8 Client ALS – On enables the client side Auto Laser Shutdown function

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

**Loop back Testing (LBT):**

The loop back capability of the FRM220-10G 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. Loop back 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.

**10G Fiber Loop Back**



**Loop Back Switch**

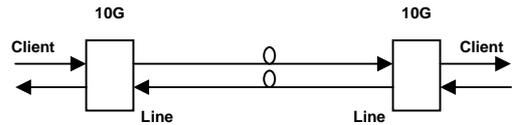


The FRM220-10G model features a front panel mounted 2-pole DIP switch. This switch enables loop back for either line or client fibers. The upper switch, when turned on, enables the Line side fiber loop back. The lower switch, when turned on, enables the Client side fiber loop back. The loop back function 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.)

**Applications**

The FRM220-10G 3R repeater works in point-to-point applications, either as a stand-alone or when placed in the FRM220-CH20 managed rack.

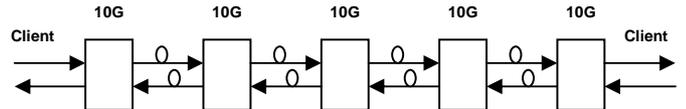
**Extension Repeater**



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.

For normal operation, ensure that the Loop Back switches are both in the OFF position.

**Multiple Repeaters**



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

For normal operation, ensure that the Loop Back switches are both in the OFF position.

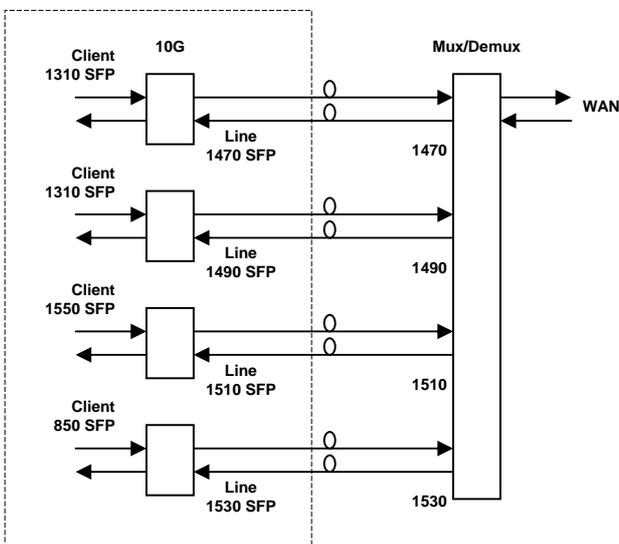
Since the FRM220-10G 3R transponder has a clock recovery device, it is able to repeat indefinitely and still maintain data integrity.

**CWDM Transponder**

The FRM220-10G 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.

FRM220-CH20 20-slot chassis



Set the 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] or [Enter] to display the "Main Menu" screen. The following is an example.

```

*****
*** CTC UNION TECHNOLOGIES CO.,LTD ***
*** FRM220-10G Manager Ver:1.00 ***
*****
Model:[FRM220-10G-SX] Ver:[1.000-1.000-1.000-0.000]
[CH-02M S1]
Line Side Link: [Up ] CDR Lock [Lock ]
Client Side Link: [Up ] CDR Lock [Lock ]
<1> Port Active: [Enable ] System Status [OK ]
<2> Baud Rate Select: [10G Ethernet ]
<3> Loopback Function: [Disable ]
<4> Line Side Loopback: [Off ]
<5> Client Side Loopback: [Off ]
<6> Line Side Link Fault Pass-Through: [Disable ]
<7> Client Side Link Fault Pass-Through:[Disable ]
<8> Line Side Auto Laser Shutdown: [Enable ]
<9> Client Side Auto Laser Shutdown: [Enable ]
<D> XFP/SFP+ Digital Diagnostic
<F> Factory Default
<R> Port Reset
<S> Store Parameters
Please select an item.
    
```

Example of Main Menu Console Screen, FRM220-10G

### 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. Loopback Function:** Regardless of settings for items 4&5, if disabled all loopback functions are terminated.
- 4. Line Side Loopback:** This will activate the Line side loop back diagnostics. Item 3 must also be enabled.
- 5. Client Side Loopback:** This will activate Client side fiber loop back diagnostics. Item 3 must also be enabled.
- 6. Line Side Link Fault Pass-Through:** Enables or Disables LFP function.
- 7. Client Side Link Fault Pass-Through:** Enables or Disables LFP function.
- 8. Line Side Auto Laser Shutdown:** This can enable ALS for line side.
- 9. Client Side Auto Laser Shutdown:** Can enable Client side ALS.
- D. XFP/SFP+ Digital Diagnostic:** Enables user to read the serial data stored in XFP/SFP+ modules.
- F. Factory Default:** Restores all settings to factory default.
- R. Port Reset:** This will cause the parameters settings in NVR to be reloaded.
- S. Store Parameters:** Saves the setting parameters into non-volatile RAM (NVR)

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.

### Example of reading Digital Diagnostics in XFP

```
*****
*** CTC UNION TECHNOLOGIES CO.,LTD ***
*** FRM220-10G Manager Ver:1.00 ***
*****
XFP/SFP+ Digital Diagnostic
<1> Line Side Digital Diagnostic: [Have]
<2> Client Side Digital Diagnostic: [Have]
-----
Line Side:
Vendor Name           :[FINISAR CORP.   ]
Vendor Part Number    :[FTLX8511D3   ]
Fiber Type            :[Multi       ]
Tx Wave Length        :[0850 nm     ]
RX Wave Length        :[0850 nm     ]
Link Length           :[0082 m      ]
Tx Power              :[ -03 dBm    ]
Rx Power              :[ -13 dBm    ]
Rx Sensitivity        :[  00 dBm    ]
Temperature           :[  42 C     ]
<ESC> Go to previous menu.
```

Parameters are read from any MSA (Multisource Agreement) compliant XFP/SFP+ module. Extended information is only available in modules which support D/D or DOM function.

### Upgrading

The FRM220-10G 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.

### Quick Procedure

Place the line card's upgrade code on the TFTP server. Make sure you know the case sensitive file name. Connect to the FRM220-NMC by local console or by remote Telnet connection. From the main menu choose:

```
<L> SNMP System Configuration Setup
Then:
<U> Upgrade Line Card Menu
```

```
*****
*** CTC UNION TECHNOLOGIES CO., LTD. ***
*** FRM220 NMC VER. 2.01 ***
*****
<< Upgrade Line Card Menu >>
Target IP       : 59.125.162.252
Target Gateway  : 59.125.162.241
TFTP Server IP  : 59.125.162.243

Please select a card type:
<1> : FRM220-10/100I and FMC-10/100I   <3> : FRM220-SERIAL
<2> : FRM220-FXO/FXS                   <4> : FRM220-155MS
<5> : FRM220-DATAPORT                   <6> : FRM220-E1/T1
<7> : FRM220-1000ES/1000ES-2F          <8> : FRM220-1000ES-1/1000E-1/1000E-2F
<9> : FRM220-10/100IS-2                 <A> : FRM220-1000TS/1000T
<B> : FRM220-3R-2.7G-2S/3S             <C> : FRM220-5E1/ET100T
<D> : 5E1/ET100S                       <E> : E1/ET100T
<F> : E1/Data                           <G> : FRM220-3R-10G
<ESC>: Previous Menu
The card type = FRM220-3R-10G-SX
Please enter the slot number '2'~'20' or 'all': 3
The slot number = 3
Please select <1>: Local <2>: Remote Unit <3>: Remote B Unit
<ESC>: Previous menu.
```

Select the line card type (3R-10G) and local unit. Enter filename. The upgrade should complete in only a couple of minutes. DO NOT disconnect or pullout/insert any other cards during the upgrade process.

### About XFP/SFP+ Units

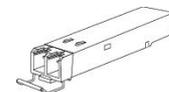
The FRM220-10G accepts any XFP or SFP+ unit that complies with the MSA standard. Follow all ESD precautions when handling the card and pluggable modules. Fiber optic components and cables are very sensitive to dirt, dust and mishandling, especially in high-speed networks. Dirty or mistreated fiber may cause errors and an unwanted degradation of signal quality. Remove the dust caps on XFP/SFP+ only when ready to plug in optical cables.

When selecting XFP/SFP+ optical modules, make sure the modules are able to support the required data rates. A 10G XFP/SFP+ should be able to support 10G Ethernet, OC-192/STM-64 or 10G Fiber Channel.

### Installation

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

- Inserting a Bale Clasp XFP/SFP+ Module into the cage  
Step 1 Close the bale clasp upward before inserting the pluggable module.  
Step 2 Line up the XFP/SFP+ module with the port, and slide it into the cage.
- Removing a Bale Clasp XFP/SFP+ Module  
Step 1 Open the bale clasp on the XFP/SFP+ module. Press the clasp downward with your index finger.  
Step 2 Grasp the XFP/SFP+ module between your thumb and index finger and carefully remove it from the XFP/SFP+ cage.



Bale Clasp type SFP+ with bale open