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## User Guide

### Ethernet Fiber TDM Modem

#### FRM220-ET100



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### Introduction

**FRM220-ET100** is a single port Fiber WAN (TDM) card with built-in HDLC Bridge for FRM220 Series Platform Media Converter Racks. The converter supports Nx64 data rates from 64Kbps up to 2.048Mbps when linked by fiber to FRM220-Data or FRM220-E1/T1 cards. The clock source may be selected internally or recovered from received fiber signal. The Ethernet port utilizes a single RJ-45 connector. When **FRM220-ET100** card is placed in 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, data rate and provide diagnostic loopbacks. A unique feature of **FRM220-ET100** is the use of a common card design which may either be inserted in the FRM220-CH01 single slot chassis as a stand-alone modem or as a card when placed in the FRM220-CH20 managed rack.

### Features

- Card type, 1 port Ethernet to HDLC (TDM fiber) converter.
- P2P Fiber link compatible with FRM220-E1/T1 and FRM220-Data
- Interface connectors, RJ-45 for 10/100 Base-Tx.
- Fixed optical for SC or ST, 2km(MM) to 120km(SM)
- TDM settings.
  - Clock source (internal or external).
  - Nx64k data rate (64kbps~2048kbps).
- Ethernet encapsulated with ISO 13239 standard HDLC.
- Loop Back for TDM and Protocol layers
- LED indicators
- Firmware upgradeable, when placed in managed FRM220 chassis

### Specifications

- TDM (fiber) Interface**
  - Connector** SC, ST, FC options (SFP cage option)
  - Data rate** 64~2048kb/s (nx64)
  - Indications** LED (PWR, TD/RD act., Test, Sys, 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** <5W
- 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** Local, Remote and Request Remote Loop back
- HDLC Loops** Local, Remote and Request Remote Loop back

### Management Features

**FRM220-ET100** has three on-board 8 pole DIP Switches which can be used to configure the device for stand-alone operation. 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, all DIP switches are ignored and the card is configured and monitored through the chassis NMC (network management controller) via console, Telnet, Web HTTP or SNMP.

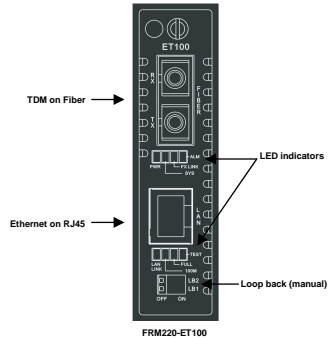
### Deployment

Note: It makes no sense to connect **FRM220-ET100** to a remote **FRM220-ET100**. If you have the fiber link, use an Ethernet media converter and run at Fast Ethernet or even Gigabit speeds. **FRM220-ET100**, when paired with another **FRM220-ET100**, **Data** or **E1/T1** remote, has a maximum throughput of 2.048Mbps (full unframed E1).\*

\*T1 maximum unframed throughput is 1.544Mbps.

### Panel

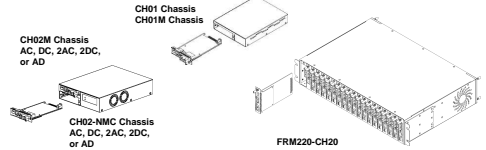
- Figure 1. Front Panel of **FRM220-ET100**



### Installation

- Figure 2. Slide-in Card mounting of **FRM220-ET100**

This converter card can be placed in the CH01 with external AC adapter, CH01 w/built-in power, CH01M, CH-02M, CH02-NMC or the full CH-20 chassis.



Follow all ESD precautions when handling the card.

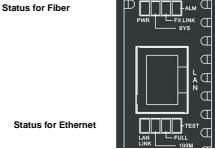
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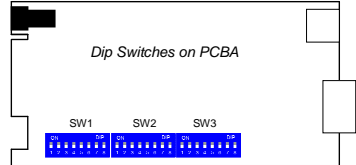
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### LED Indicators



### DIP Settings



### Switch 1 Settings

DIP SW1	1	2	3	4	5	Function
1,2,3,4,5	OFF	OFF	OFF	OFF	OFF	Data Rate (times) setting
	ON	OFF	OFF	OFF	OFF	E1-2048K T1-1544K (Full)
	OFF	ON	OFF	OFF	OFF	64K
	OFF	ON	OFF	OFF	OFF	128K
	ON	OFF	OFF	OFF	OFF	192K
	OFF	ON	OFF	OFF	OFF	256K
	ON	OFF	ON	OFF	OFF	320K
	OFF	ON	ON	OFF	OFF	384K
	ON	ON	ON	OFF	OFF	448K
	OFF	OFF	OFF	ON	OFF	512K
	OFF	ON	OFF	ON	OFF	576K
	OFF	ON	OFF	ON	OFF	640K
	ON	ON	OFF	ON	OFF	704K
	OFF	OFF	ON	ON	OFF	768K
	ON	OFF	ON	ON	OFF	832K
	OFF	ON	ON	ON	OFF	896K
	ON	ON	ON	ON	OFF	960K
	OFF	OFF	OFF	OFF	ON	1024K
	ON	OFF	OFF	OFF	ON	1088K
	OFF	ON	OFF	OFF	ON	1152K
	ON	ON	OFF	OFF	ON	1216K
	OFF	OFF	ON	OFF	ON	1280K
	ON	ON	ON	OFF	ON	1344K
	OFF	ON	ON	ON	OFF	1408K
	ON	ON	ON	ON	OFF	1472K
6	OFF	OFF	OFF	ON	ON	1536K
	ON	OFF	OFF	ON	ON	1600K
	OFF	ON	OFF	ON	ON	1664K
	ON	ON	OFF	ON	ON	1728K
7	OFF	OFF	ON	ON	ON	1792K
	ON	OFF	ON	ON	ON	1856K
	OFF	ON	ON	ON	ON	1920K
	ON	ON	ON	ON	ON	1984K
8	OFF	OFF	OFF	OFF	OFF	E1 Mode
	ON	OFF	OFF	OFF	OFF	T1 (DS1) Mode
	OFF	ON	OFF	OFF	OFF	CCS (E1, DS1/ET1)
	ON	ON	OFF	OFF	OFF	CAS (E1), ESF (T1)
	OFF	OFF	OFF	OFF	OFF	CRC Disable
	ON	ON	ON	ON	ON	CRC Enable

### Front Panel DIP Switch (Loop back)

DIPSW	Switch State	Function
LB1	LB2	Loop Back Setting**
	OFF	OFF
ON	OFF	LLB (Local Loop Back)
	ON	RLB (Remote Loop Back)
ON	ON	RRLB (Request Remote Loop Back)

\*\* The setting of DIP Switch 3 position 7 determines the loop back group, either TDM (transmission layer) or HDLC (protocol layer).

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Switch 2 Settings

DIP SW2	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	TS 1
	OFF	ON	OFF	OFF	OFF	TS 2
	ON	ON	OFF	OFF	OFF	TS 3
	OFF	OFF	ON	OFF	OFF	TS 4
	ON	OFF	ON	OFF	OFF	TS 5
	OFF	ON	ON	OFF	OFF	TS 6
	ON	ON	ON	OFF	OFF	TS 7
	OFF	OFF	OFF	ON	OFF	TS 8
	ON	OFF	OFF	ON	OFF	TS 9
	OFF	ON	OFF	ON	OFF	TS 10
	ON	ON	OFF	ON	OFF	TS 11
	OFF	OFF	ON	ON	OFF	TS 12
	ON	OFF	ON	ON	OFF	TS 13
	OFF	ON	ON	ON	OFF	TS 14
	ON	ON	ON	ON	OFF	TS 15
	OFF	OFF	OFF	OFF	ON	TS 16 (cannot set if rmt E1 CAS)
	ON	OFF	OFF	OFF	ON	TS 17
	OFF	ON	OFF	OFF	ON	TS 18
	ON	ON	OFF	OFF	ON	TS 19
	OFF	OFF	ON	OFF	ON	TS 20
	ON	OFF	ON	OFF	ON	TS 21
	OFF	ON	ON	OFF	ON	TS 22
	ON	ON	ON	OFF	ON	TS 23
	OFF	OFF	ON	ON	ON	TS 24
	ON	OFF	OFF	ON	ON	TS 25 (Do not use 25-31 for T1)
	OFF	ON	OFF	ON	ON	TS 26
	ON	ON	OFF	ON	ON	TS 27
	OFF	OFF	ON	ON	ON	TS 28
	ON	OFF	ON	ON	ON	TS 29
	OFF	ON	ON	ON	ON	TS 30
	ON	ON	ON	ON	ON	TS 31
6,7,8	6					Unused timeslot (idle code)
	OFF					0x7E
	ON					0x7F
	OFF					Clock Source
	ON					Recovered from received E1/T1
	OFF					Internal clock source
	ON					Auto Laser Shutdown (ALS)
	OFF					Disable
	ON					Enable

Notice: If Switch 3-8 is OFF, all of these settings are ignored if the card is placed in FRM220-CH20 with NMC management. The card will follow the settings done via the chassis management. (Refer to NMC operation manual for details on managing all cards.)

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Switch 3 Settings

DIP SW3	SW STATE	Function
1	1	IEEE 802.3u Auto-negotiation
	OFF	Auto
	ON	Forced (Manual)
2	2	Forced Speed
	OFF	100M
	ON	10M
3	3	Forced Duplex
	OFF	Full Duplex
	ON	Half Duplex
4	4	IEEE 802.3X Flow Control
	OFF	Enable
5	5	HDLC Flow Control
	OFF	Enable
	ON	Disable
6	6	Reserved
	OFF	
7	7	Loop Back Group
	OFF	TDM
	ON	HDLC (protocol layer)
8	8	Management Setting Priority
	OFF	[high] NMC(SNMP) / Local Serial Console / DIP Switch [low]
	ON	Follow DIP only, ignore all other management

Notice: If Switch 3-8 is OFF, all of these settings are ignored if the card is placed in FRM220-CH20 with NMC management. The card will follow the settings done via the chassis management. (Refer to NMC operation manual for details on managing all cards.)

Note: It makes no sense to connect **FRM220-ET100** to a remote **FRM220-ET100**. If you have the fiber link, use an Ethernet media converter and run at Fast Ethernet or even GbE speeds. The **FRM220-ET100**, when paired with another ET100, Data or E1 remote, has a maximum throughput of 2.048Mbps (full unframed E1).

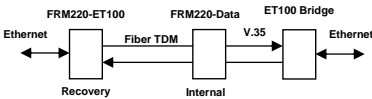
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Applications

**FRM220-ET100** LAN Bridge works in Ethernet point-to-point applications, either as a stand-alone (in CH01 or 02) or when placed in FRM220-CH20 managed rack.

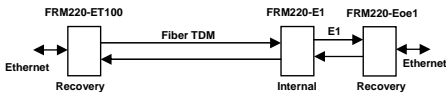
Ethernet over Synchronous Data



Deployment in Data Communications Network

The TDM transmission signal traditionally has been used to carry voice within the Public Switched Telephone Network. With the emergence of IP, TDM has also found use as a carrier for Data. TDM is able to carry Ethernet data by using HDLC (High-level Data Link Control) WAN encapsulation. **FRM220-ET100** uses an HDLC bridge to send the Layer 2 encapsulated synchronous bit stream (TDM) which can terminate at either **FRM220-E1/T1** or **FRM220-Data**. A carrier can then use this transparent Ethernet to provide Ethernet service. **FRM220-ET100** supports ISO 13239 standard HDLC encapsulation. **It is not compatible with PPP or with Cisco proprietary HDLC.**

Ethernet over E1



Deployment in PDH (E1) Network

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Console Management

When placed in the 1-slot CH01M or 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. (Be sure DIP Switch 3 pole 8 is in the OFF position.)

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 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 ET100 Ver:1.000-1.000-1.000 ***
[Local] ***** [CH01M]
1: [Port Active: [Disable]]
  FX Link :[Up ] FX Signal :[Yes] FX PEP :[Off]
  LAN State :[Up ] LAN Speed :[100] LAN Duplex :[Full]

2: :E1/T1 Parameter set :[E1][Full][CCS(E1)/D4(T1)][CRC
  Disable:[0x7E]
3: :Active Rate :[Full]
4: :Start Timeslot :[Full]
5: :LAN setting :[Auto]
6: :Timing Source :[Recovery]
7: :Auto Laser Shutdown :[Disable]
8: :Loop Back Setting :[Off]
R: :Port Reset.
D: :Set to Default.
  Small Form Pluggable:[Off] Digital Diagnostic(D/D):[Off]

<Q> :Quit Terminal.
<S> :Save Setting Value.
Please select an item.
```

Example of Main Menu Console Screen, **FRM220-ET100**

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### 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 cards circuitry but not saved. 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

- Port Active** : This menu item can disable or enable the card. Beneath this menu item are the real-time status indications for the fiber (FX) and TP (LAN) connections.
- E1/T1 Parameter Set** : This menu provides all of the settings related to the TDM such as framer, CRC and idle code.
- Active Rate** : This sub-menu configures the nx64K rate of the TDM transmission.
- Start Timeslot** : The data rate must be configured from a contiguous range of timeslots. This sub-menu selects the first timeslot in that range, which normally would be timeslot #1.
- LAN Setting** : This sub-menu provides all of the settings related to the LAN port such auto, duplex and speed setting.
- Timing Source** : This sub-menu configures the timing source for TDM transmission. It may be set to internal clock or the default which is to recover clock from the fiber transmission.
- Auto Laser Shutdown** : Auto Laser Shutdown is a safety mechanism that will disable laser output when no received optical signal is sensed. By default, ALS is disabled.
- Loop Back Setting** : The diagnostic loopback is enabled through this sub-menu item. There are local, remote and request remote loop back for both the fiber side and the HDLC side.
- Reset** : If changes to the configuration are made, but not saved, this reset function will bring the card back to the previous saved state.
- Set to Default** : This item will return all settings to their factory default. Be careful, there is no further confirmation required.
- Quit Terminal** : From the main menu, the terminal will be logged out.
- Save Setting Value** : Changes are not saved to non-volatile RAM until this save function is performed.

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### E1/T1 (TDM) Parameter Set

The following screen capture shows the TDM setting items and current values. Choose the menu item and select the desired parameter. To exit press <ESC> and then **do not forget to save settings by pressing <s>**.

```
*****
***   CTC UNION TECHNOLOGIES CO., LTD.   ***
***   FRM220 ET100   Ver:1.000-1.000-1.000   ***
*****

[Local]
[CH01M]
E1/T1 Parameter Set Menu.
<1> : E1/T1 Set           :[E1]
<2> : Pull/Fractional Set :[Full]
<3> : Framer Setting      :[CS(RL)/D4(T1)]
<4> : CRC Setting         :[Disable]
<5> : Unused Timeslot Code:[0x7E]

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

### Active Rate

Select the TDM nx64k rate using the appropriate number/letter. To exit press <ESC> and then **do not forget to save settings by pressing <s>**.

```
-----
Active rates :
<1>:64K  <2>:128K  <3>:192K  <4>:256K  <5>:320K  <6>:384K  <7>:448K  <8>:512K
<9>:576K  <a>:640K  <b>:704K  <c>:768K  <d>:832K  <e>:896K  <f>:960K  <d>:1024K
<h>:1088K  <i>:1152K  <j>:1216K  <k>:1280K  <l>:1344K  <m>:1408K  <n>:1472K  <o>:1536K
<p>:1600K  <q>:1664K  <r>:1728K  <s>:1792K  <t>:1856K  <u>:1920K  <v>:1984K  <w>:Full
<ESC>: Go to previous menu. Please select an item.
```

### Start Timeslot

Select the first timeslot in the contiguous range of active timeslots.

```
-----
Start timeslot :
<1>:TS1  <2>:TS2  <3>:TS3  <4>:TS4  <5>:TS5  <6>:TS6  <7>:TS7  <8>:TS8
<9>:TS9  <a>:TS10 <b>:TS11 <c>:TS12 <d>:TS13 <e>:TS14 <f>:TS15 <g>:TS16
<h>:TS17 <i>:TS18 <j>:TS19 <k>:TS20 <l>:TS21 <m>:TS22 <n>:TS23 <o>:TS24
<p>:TS25 <q>:TS26 <r>:TS27 <s>:TS28 <t>:TS29 <u>:TS30 <v>:TS31 <w>:Full
<ESC>: Go to previous menu. Please select an item.
```

To exit press <ESC> and then **do not forget to save settings by pressing <s>**.

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### LAN Setting

The following screen capture shows the Ethernet port setting items and current default values. Choose the menu item and select the desired parameter. To exit press <ESC> and then **do not forget to save settings by pressing <s>**.

```
*****
***   CTC UNION TECHNOLOGIES CO., LTD.   ***
***   FRM220 ET100   Ver:1.000-1.000-1.000   ***
*****

[Local] ***** [CH01M]
LAN Parameter Set Menu.
<1> : Negotiation setting :[Auto]
<2> : Speed setting       :[100M]
<3> : Duplex setting      :[Full]
<4> : LAN flow control    :[Enable]
<5> : HDLC flow control   :[Enable]

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

### Timing Source

The timing source is set to recovery by default. It may also be set to internal if this unit will be the TDM clock source for the link. To exit press <ESC> and then **do not forget to save settings by pressing <s>**.

```
-----
Timing Source :
<0>:Recovery from remote side.
<1>:Internal oscillator.
<ESC>: Go to previous menu. Please select an item.
```

### Auto Laser Shutdown

The default ALS setting is disabled. It may be enabled here. To exit press <ESC> and then **do not forget to save settings by pressing <s>**.

```
-----
Auto Laser Shutdown :
<0>:Disable  <1>:Enable
<ESC>: Go to previous menu. Please select an item.
```

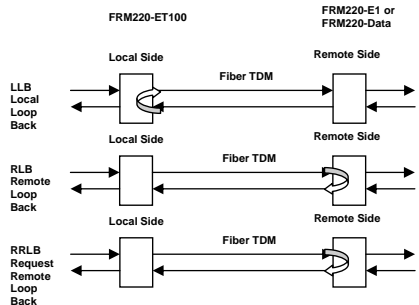
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### Loop Back Test:

**FRM220-ET100** converter incorporates loop back features which allow loop back testing to confirm that the Fiber loop is operating normally or not. Since Ethernet is a broadcast medium, loopback cannot be supported in the direction of LAN port. (Ethernet looped would cause a broadcast storm.) Therefore, only loop backs that specifically can test the Fiber link are supported in this model. The E1/T1 loop back tests the TDM layer while the HDLC loop back tests the protocol layer. The loop locations are shown below.

### TDM (E1/T1) and HDLC (protocol) Loop Back



### Upgrading

**FRM220-ET100** card may be firmware upgraded when it is placed in the FRM220 with 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 control bus. The upgrade code is transferred to the NMC by way of TFTP server. Refer to NMC operating manual.

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