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# User Guide

## FRM220-E1/T1R/E1B to fiber Converter



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## Introduction

The FRM220-E1/T1 family are stand-alone fiber media converters available in a number of different models that also act as cards for placement in the FRM220 Platform media converter chassis. The FRM220-E1/T1R is a fiber media transport for both G.703 E1 120 ohm and T1 100 ohm transmission with RJ45 connector. The FRM220-E1B model provides unbalanced E1 75 ohm coaxial connections. All media converters are available with either multi-model 2km or single-mode 15/30/50/80/120km optical transceivers and with connectors for SC, ST, FC. In single fiber WDM mode, the SC connector is also available in 20, 40, 60 and 80km. When the FRM220-E1/T1 card is placed in the FRM220 rack with SNMP management, the card status, type, version, fiber link status, E1 or T1 link status and alarms can all be displayed. Configuration is also available to enable or disable the port, reset the port, do far end fault setting and initiate local or far end loopback tests.

## Features

- Interface connectors –RJ-48C for E1T1R, BNC x 2 for E1B
- Supports fiber connection to FRM220-DATA (E1 only)
- E1/T1, Line Code, Full or Fractional setting
- Frame setting, E1(CCS/CAS), T1(D4/ESF)
- CRC enable disable setting
- Idle code setting (0x7E or 0xFF)
- Auto laser shutdown setting
- Auto generate the blue (AIS) alarm enable disable setting.
- Active timeslot number setting (E1 CCS 1-31, E1 CAS 1-30, T1 1-24)
- Base timeslot setting (E1 CCS 1-31, E1 CAS 1-15 and 17-31, T1 1-24).
- Loop Back (LLB,RLB,RRLB) set by DIPSW on front panel
- Timing source setting (Remote recovery, Internal oscillator, Local recovery E1/T1)

# Specifications

## Optical Specification

- **Connector Type** 1x9 Transceiver: ST,SC,FC or WDM(single fiber) connectors  
SFP Transceiver: SFP or SFP WDM(single fiber) connectors.
- **Optical mode** Multi-mode or Single-mode
- **Wave length** 1310nm,1550nm,WDM
- **Power Margin** 11dB(2Km,M/M) ,12dB~ 35 dB(15 ~ 120Km,S/M)
- **Data rate** 36.864Mbps
- **Line coding** Scrambled NRZ
- **Bit Error Rate** Less than  $10^{-10}$
- **Test Loops** - LLB (Local Loop Back)  
- RLB (Remote Loop Back)  
- RRLB (Far end remote loop back)

## E1 Specification

- **Ports** 1 port
- **Standards** ITU-T G.703,G.823
- **Framing** Unframed or n x 64
- **Line Code** HDB3/AMI
- **Data Rate** 2.048 Mbps
- **Receive Level** -43dB
- **Line impedance** 75 ohm for BNC type  
120 ohm for RJ-48C type
- **Pulse amplitude** Nominal 2.37+/-10% for 75 ohms  
Nominal 3.0+/-10% for 120 ohms
- **Zero amplitude** +/-0.1V
- **Connector** E1/T1: RJ-48C E1: BNC x 2
- **Test Loops** - LLB (Local Loop Back)  
- RLB (Remote Loop Back)  
- RRLB (Far end remote loop back)
- **Bit Error Rate** Less than  $10^{-10}$

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## T1 Specification

- **Ports** 1 port
- **Standards** ITU-T G.703,G.824
- **Framing** Unframed or n x 64
- **Line Code** B8ZS/AMI
- **Data Rate** 1.544 Mbps
- **Receive Level** -36dB
- **Line impedance** 100 ohm for RJ-48C type
- **Pulse amplitude** Nominal 3.0+/-20%
- **Zero amplitude** +/-0.15V
- **Connector** RJ-48C
- **Test Loops** - LLB (Local Loop Back)  
- RLB (Remote Loop Back)  
- RRLB (Far end remote loop back)
- **Bit Error Rate** Less than  $10^{-10}$

## Environment

Operating -- 0°C – 50°C, Storage -- 0°C – 70°C,  
Humidity -- 10 – 90%, (non-condensing)

## Power

Adapter: 12V DC 1A, Built-in AC Power 100~240 V,  
Built-in DC Power 18~72VDC

## Dimensions: (W x D x H) mm

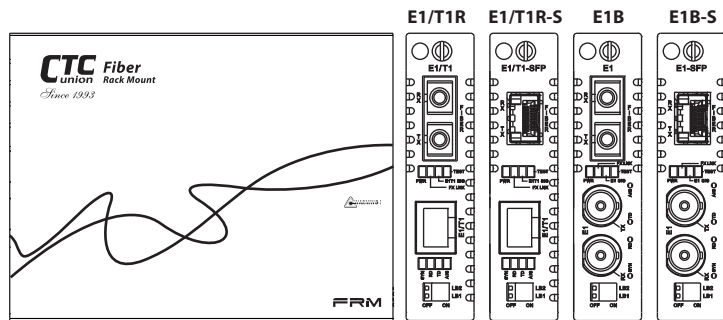
FRM220-E1/T1-DC12 : 88 x 160 x 24 FRM220-E1/T1-AC: 135 x 201 x 35  
FRM220-E1/T1-DC48 : 135 x 201 x 35 FRM220-E1/T1-AD: 135 x 201 x 35

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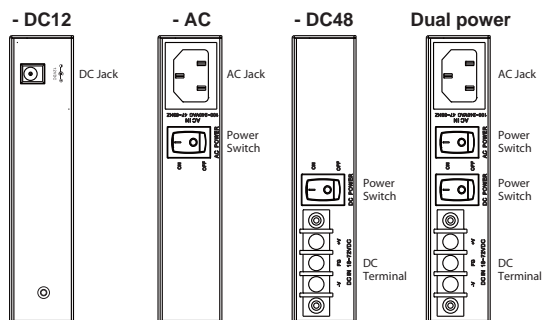
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## Panel

■ Figure 1. Upper Panel of FRM220-E1/T1R/ E1/ T1R-S/ E1B/ E1B-S



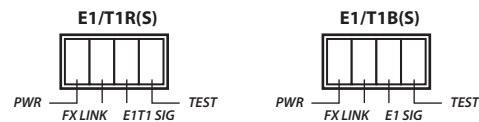
■ Figure 2. Stand-alone Rear Panel of FRM220-E1/T1



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## LED Indicators

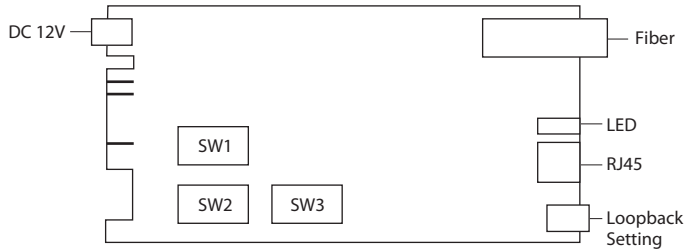


LED	State	Status
PWR	( Green )	On
		Flash
		Off
Fx LNK	( Green )	On
		Flash
		Off
E1T1 Sig	( Green )	On
		Flash
		Off
TEST	( Red )	On
		Flash
		Off
SYN	( Green )	On
		Flash
		Off
RD	( Green )	On
		Flash
		Off
TD	( Green )	On
		Flash
		Off
AIS	( Red )	On
		Flash
		Off

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## E1/T1 DIP Switch on PCB



### DIP Switch 1

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 received signal loss setting.	
	OFF	Disable	
	ON	Enable	
7,8	7	8	E1/T1 transmitted timing setting
	OFF	OFF	Recovery from remote side E1/T1 or DATA.
	ON	OFF	Internal oscillator.
	OFF	ON	Recovery from local E1/T1 receive.
	ON	ON	Reserve

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### DIP Switch 2

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

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### DIP Switch 3

DIP SW3	SW STATE					Function
1,2,3,4,5	1	2	3	4	5	Fractional started timeslot setting
	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 set this timeslot)
	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 don't set timeslot 25 to 31)
	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
8	8					Loopback group setting
	OFF					Fiber side
	ON					E1/T1 side

### DIP Switch 4

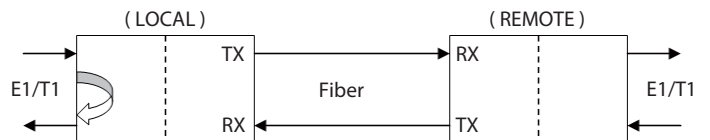
DIP SW4	SW STATE		Function
1,2	1	2	Loop Back Function Setting
	OFF	OFF	OFF
	ON	OFF	LLB
	OFF	ON	RLB
	ON	ON	RRLB

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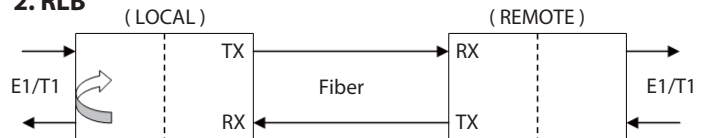
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### Loopback from E1/T1 side

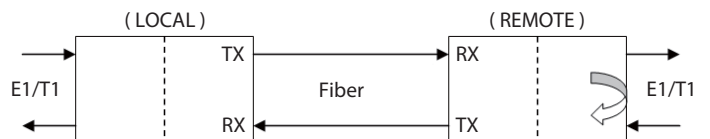
#### 1. LLB



#### 2. RLB



#### 3. RRLB

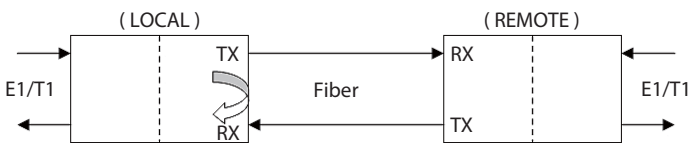


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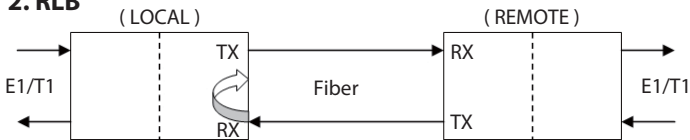
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## Loop-Back on Fiber Side

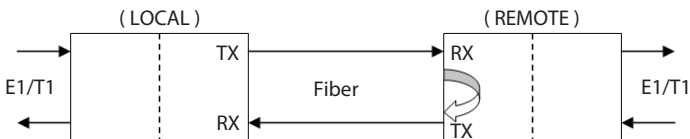
### 1. LLB



### 2. RLB



### 3. RRLB



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## Console Terminal Operation

Connect serial console with Hyperterminal or PuTTY with settings:

38400, 8 bits, no parity, 1 stop, no flow control (Press Enter key first to display menu)

```
*****
***   CTC UNION TECHNOLOGIES CO., LTD.   ***
*** FRM220 CH01M E1/T1 Ver:1.000-1.030-1.000 ***
[Local] *****
<1> :Port Active :[Enable]
      FX Link   :[Up]      FX Signal :[Yes]      FX FEF   :[Off]
      RD State  :[On]      TD State  :[On]      Test State:[Normal]
      E1/T1 Signal:[Loss]  Frame Sync:[Loss]  Receive AIS:[No]
      Connector :[RJ-48C]
<2> :E1/T1 Parameter setting.
<3> :Timing Source      :[Recovery from remote side]
<4> :Auto Laser Shutdown(ALS) :[Disable]
<5> :Active Rate        :[Full E1]
<6> :Start Timeslot    :[Full E1]
<7> :Loop Back Setting :[Off]
<8> :Port Reset.
<9> :Set to Default.
      Small Form Pluggable(SFP):[On]  Digital Diagnostic(D/D):[On]
<D> :Display SFP Information.
<N> :Go to the Remote Menu.
<S> :Save Setting Value.
<Q> :Quit Terminal.
```

## Description of All Functions

1. Port Active: Use this to enable or disable this device
2. E1/T1 Parameter setting: Opens a sub-menu, explained below
3. Timing source: Selects between Internal oscillator, recover from E1/T1 or recover from remote (fiber)
4. Auto Laser Shutdown: Enable or disable the ALS safety function
5. Active Rate: sets the nx64 rate, shown below
6. Start timeslot: Sets the first timeslot of a contiguous group of nx64 rate
7. Loop Back Setting: Sets the fiber and E1/T1 loop back, shown below
8. Port Reset: Resets the CPLD chip and initialize CPU
9. Set to default: Returns all settings to factory default
- D. Display SFP Information: Applicable only if converter has SFP module
- N. Go to remote card menu: Using EOC, enter the configuration screen for the remote card
- S. Save Setting Value: Stores the parameter settings to the card
- Q. Quit Terminal: leaves the terminal menu

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## E1/T1 Settings

```
*****
***   CTC UNION TECHNOLOGIES CO., LTD.   ***
*** FRM220 CH01M E1/T1 Ver:1.200-1.030-1.010 ***
[Local] *****
E1/T1 Parameter Set Menu.
<1> :E1/T1 Select      :[E1]
<2> :Line Code Setting :[HDB3(E1)/B8ZS(T1)]
<3> :Full/Fractional  :[Fractional]
<4> :Framer Setting   :[CCS(E1)/D4(T1)]
<5> :CRC Setting      :[Enable]
<6> :Rx Loss Tx AIS   :[Disable]
<7> :Unused Timeslot Code :[0x7E]

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

## Functions

1. E1/T1 Select: For converter with RJ-45, selects between E1 and T1 operation mode
2. Line code setting: For E1, selects between HDB3 and AMI; for T1, selects between B8ZS and AMI
3. Full/Fractional: Selects between unframed (2048K) or fractional (nx64) frame mode
4. Framer setting: When set for fractional operation, this selects the framer setting
5. CRC Setting: This enables or disables CRC4 for E1 or CRC6 for T1
6. Rx Loss Tx AIS: Normal telco protocol requires AIS in the event of signal loss. This enables or disables it.
7. Unused Timeslot code: The unused timeslots in fractional mode may stuff either 7E or FF value

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## Fractional E1/T1 Settings

### Listing of Active Rate values:

```
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 <G>: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.
```

### Listing of Starting Timeslot values:

```
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.
```

## Example of SFP Digital Diagnostics

```
*****
***   CTC UNION TECHNOLOGIES CO., LTD.   ***
*** FRM220 CH01M E1/T1 Ver:1.000-1.030-1.000 ***
[Local] *****
Display SFP information.
Vendor Name      :[ FIBERXON INC.      ]
Vendor Part Number :[ FTM-3125C-L40    ]
Fiber Type       :[ Single ]
Tx Wave Length   :[ 1310nm ]
Rx Wave Length   :[ 1310nm ]
Link Length      :[ 40km ]
Tx Power         :[ +01dBm ]
Rx Power         :[ +02dBm ]
Rx Sensitivity   :[ +00dBm ]
Temperature      :[ +39C ]
```

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