# PRODUCT
Quick Start Guide

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ISO 9001 Quality System Certified

# User Guide

**G.703E1 and T1(DS1) over Fiber**

FRM220-E1/T1

**(Fiber Optical Modem)**

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Version 1.1 November 2011 (update)



### *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 in 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 and FRM220-ET100 (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 generation of blue (AIS) alarm enable disable setting
- AIS always generated in the event of fiber receive loss of signal
- 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 (when standalone)
- Timing source setting (Remote recovery, Internal oscillator, Local recovery E1/T1)
- Read DDOM of SFP (SFP model only)

## *Technical Specifications*

**Optical Specifications**

- Connector Type: 1x9 Transceiver: ST,SC,FC or WDM (single fiber)<br>SFP Transceiver: SFP or SFP WDM (single fiber)
- 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 10e-10
- Test Loops: -LLB (Local Loop Back)<br>-RLB (Remote Loop Back)<br>-RRLB (Far end remote loop back)

**E1 Specifications**

- Ports: 1 port
- Standards: ITU-T G.703,G.704,G.823
- Framing: Unframed, PCM30(CAS) or PCM31(CCS)
- Line Code: HDB3/AMI
- Data Rate: 2.048 Mbps
- Min. Rx Level: -43dB
- Line impedance: 75 ohm for BNC type<br>120 ohm for RJ-48C type
- Pulse amplitude: Nominal 2.37+/-10% for 75 ohms<br>Nominal 3.0+/-10% for 120 ohms
- Zero amplitude: +/-0.1V
- Connector: E1/T1: RJ-45  E1: BNC x 2
- Test Loops: -LLB (Local Loop Back)<br>-RLB (Remote Loop Back)<br>-RRLB (Far end remote loop back)
- Bit Error Rate: Less than 10e-10



**T1 Specifications**

- Ports: 1 port
- Standards: ITU-T G.703,G.704,G.824
- Framing: Unframed, D4(SF) or ESF
- Line Code: B8ZS/AMI
- Data Rate: 1.544 Mbps
- Min. Rx Level: -36dB
- Line impedance: 100 ohm
- Pulse amplitude: Nominal 3.0+/-20%
- Zero amplitude: +/-0.15V
- Connector: RJ-45
- Test Loops: -LLB (Local Loop Back)<br>-RLB (Remote Loop Back)<br>-RRLB (Far end remote loop back)
- Bit Error Rate: Less than 10e-10

***Environment***

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

***Power***

| | |
|---|---|
| Adapter: | 12V DC 1A |
| Built-in AC | 100~240 VAC |
| Built-in DC | 18~72VDC |
| Consumption | <4 watts |

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

| | |
|---|---|
| E1/T1-DC12 | 88 × 160 × 24 |
| E1/T1-AC | 135 × 201 × 35 |
| E1/T1-DC48 | 135 × 201 × 35 |
| E1/T1-AD | 135 × 201 × 35 |

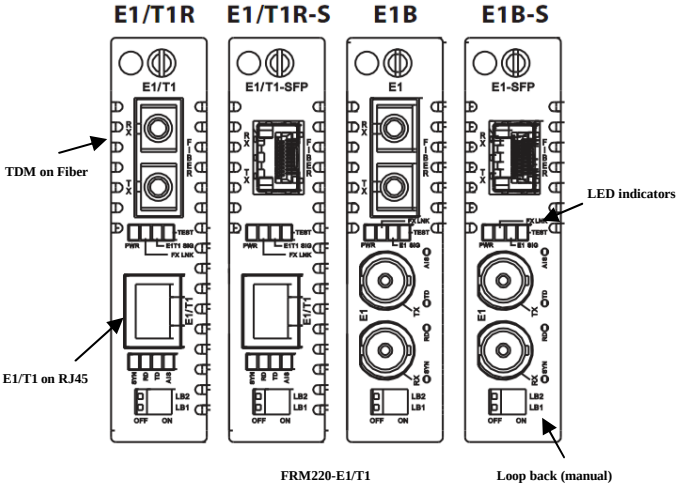
***Weight***

FRM220-E1/T1 (card): 140g

| | |
|---|---|
| FRM220-E1/T1-DC12: 400g | FRM220-E1/T1-AC: 750g |
| FRM220-E1/T1-DC48: 750g | FRM220-E1/T1-AD: 800g |

### *Panel*

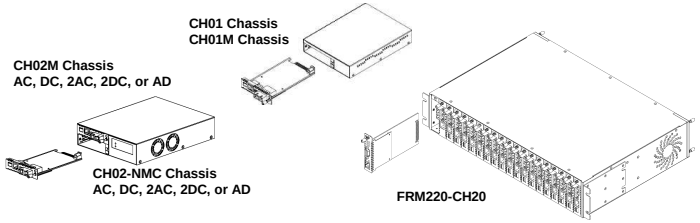
- Front Panel of FRM220-E1/T1 (RJ-45 and BNC models)




### *Installation*

- Slide-in Card mounting of FRM220-E1/T1

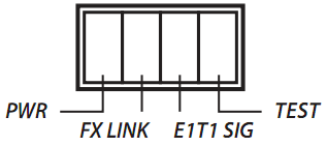
This converter card can be placed in the CH01 with external AC adapter, CH01 w/built-in power, CH01M, CH-02M, CH02-NMC, CH08 or the full CH-20 chassis.




Follow all ESD precautions when handling the card.



### *LED Indicators*



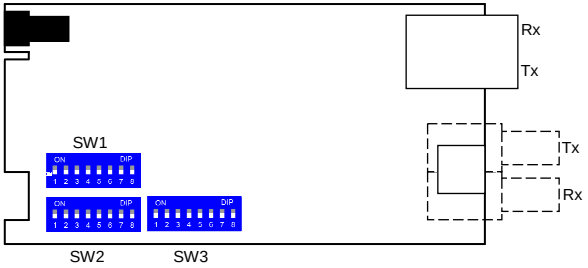

| *LED* | | *State* | *Status* |
|---|---|---|---|
| PWR | (Green) | On | Power on |
| | | Flash | During upgrade |
| | | Off | Power off or port disabled |
| FX LINK | (Green) | On | Fiber link |
| | | Flash | Remote side sync loss |
| | | Off | Fiber no link |
| E1T1 SIG | (Green) | On | E1/T1 Signal present |
| | | Off | Loss of Signal |
| TEST | (Red) | On | Loop Back Test active |
| | | Off | Normal operation |
| RD | (Green) | On | Receive zero data |
| | | Off | Receive one data |
| | | Flash | Data flow |
| TD | (Green) | On | Transmit zero data |
| | | Off | Transmit one data |
| | | Flash | Data flow |
| SYN | (Green) | On | E1/T1 Sync OK |
| | | Off | LOS or LOF |
| AIS | (Green) | On | Unit is transmitting AIS |
| | | Off | No local AIS alarm |

### *E1 Pin Assignment*

The RJ-45 connector follows USOC RJ48C wiring standard for a terminating unit. RJ48C utilizes pairs 1&2 and 4&5. In a terminating unit, pair 1&2 is receive signal while pair 4&5 is transmit signal.

| | |
|---|---|
| Pin 1 – RxRing | Pin 2 - RxTip |
| Pin 4 – TxRing | Pin 5 - TxTip |

### *DIP Switches On PCB*




| 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 |
| | 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 | Reserved |



| DIP SW2 | SW STATE | | | | | Function |
|---|---|---|---|---|---|---|
| 1,2,3,4,5 | 1 | 2 | 3 | 4 | 5 | Fraction timeslot number |
| | 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 (T1 does not use TS25~31) |
| | 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 |
| | OFF | | | | | 0x7E |
| | ON | | | | | 0xFF |
| 8 | 8 | | | | | Reserved |

| DIP SW3 | SW STATE | | | | | Function |
|---|---|---|---|---|---|---|
| 1,2,3,4,5 | 1 | 2 | 3 | 4 | 5 | First timeslot of contiguous TS 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 (except if E1 is CAS) |
| | 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 does not use TS25~31) |
| | 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 |
| | OFF | | | | | Fiber |
| | ON | | | | | E1/T1 |

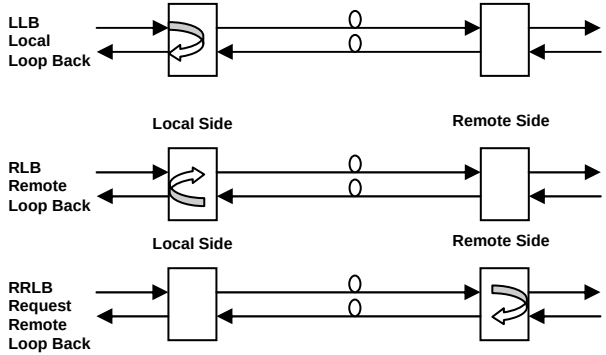
| | LB1 | LB2 | Loopback Group |
|---|---|---|---|
| Panel Switch | OFF | OFF | Loop Back DIsabled |
| | ON | OFF | Local Loop Back (LLB) |
| | OFF | ON | Remote Loop Back (RLB) |
| | ON | ON | Request Remote Loop Back (RRLB) |



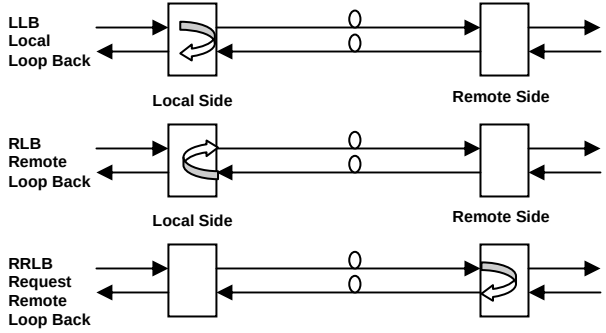
***Loop back Testing (LBT):***

This fiber modem incorporates loop back features which allow loop back testing to confirm that the fiber loop and interface transceivers are operating normally or not. Loop back is enabled by DIP switch or via NMC manager in FRM220 chassis

***E1/T1 Port Loop Back***




***Fiber Loop Back***



### *Console Operation*

**FRM220-E1/T1** may be configured with a local serial console when the card is placed in either a CH01M or a CH02M chassis with serial console port connection. When console port is chosen for configuration, the DIP switch settings have no effect.
Connect serial console using terminal emulation with settings:
38400, 8 bits, no parity, 1 stop, no low control (Press Enter key first to display menu)

```
         ************************************************
         ***      CTC UNION TECHNOLOGIES CO., LTD.       ***
         ***  FRM220  E1/T1       Ver:1.000-1.130-1.020  ***
[Local]  ************************************************
<1> :Port Active :[Enable]                                    CH-01M
     FX Link     :[Up]      FX Signal :[Yes]     FX FEF     :[Off]
     RD State    :[Flash]   TD State  :[Flash]   Test State :[Normal]
     E1/T1 Signal:[Normal]  Frame Sync:[Loss]    Receive AIS:[No]
     Connector   :[BNC]
<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):[Off] Digital Diagnostic(D/D):[Off]

<N> :Go to the Remote Menu.
<P> :Password Setup.
<Q> :Quit Terminal.
<S> :Save Setting Value.
```

Description of Functions

1. Port Active: Use this to enable or disable this device
2. E1/T1 Parameter setting: Opens a sub-menu, explained on next page
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 on next page
6. Start timeslot: Sets the first timeslot of a contiguous group of nx64 timeslots
7. Loop Back Setting: Sets the fiber and E1/T1 loop back, shown on next page
8. Port Reset: Resets the CPLD chip and initializes the 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
P. Password Setup: To protect against unauthorized access, a console password can be setup.
Q. Quit Terminal: leaves the terminal menu
S. Save Setting Value: Stores the parameter settings to the card
**IMPORTANT:** Settings must be saved or they revert at next power on.



### *E1 Parameter settings*

```
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.
```

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 protocol requires AIS be transmitted in the event of receive signal loss. Enabling this provides this function.
7. Unused Timeslot code: The unused timeslots in fractional mode may stuff either 7E or FF value

### *Active Rate*

```
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.
```

### *First Timeslot*

```
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.
```

The active rate and first timeslot are used to select the contiguous range of timeslots to carry data/voice within the framed E1 or T1 transmission.

***Monitoring SFP models and SFP with DDOM***

```
         ************************************************
         ***      CTC UNION TECHNOLOGIES CO., LTD.       ***
         ***  FRM220 CH01M E1/T1  Ver:1.000-1.130-1.020  ***
[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   ]
```

***Upgrading***

FRM220-E1/T1 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-E1/T1(S) 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. The optical data rate of this device is 36.864Mbps. Make sure the SFP modules chosen are suitable for the required data rate.



***Installation of SFP Modules***

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.

***Identifying E1/T1 Card Version***

```
         ************************************************
         ***      CTC UNION TECHNOLOGIES CO., LTD.       ***
         ***  FRM220 CH01M E1/T1  Ver:1.000-1.130-1.020  ***
[Local]  ************************************************
```

Each page viewed from the console menu has a 'header' that can identify the version of the E1/T1 card. There are three (3) fields shown. From left to right, these fields represent hardware, firmware and CPLD versions.

In the above example, the card is

Hardware Version: 1.000
Firmware Version: 1.130
CPLD Version: 1.020