

## 4U, 10 I/O Slot Data, Ethernet, Voice E1 Managed Multiplexer

### ERM-MUX-PLUS



The ERM-Mux / plus is a 4U 19(23)" 14 slot rack type E1 Time Division Multiplexer for Fractional E1 network access which is designed for non-stop operation. There are 10 slots available for hot-swappable ERM-Mux / plus-I/O cards. Two slots are provided for Mux-E1 cards, which may be configured as four separate E1 links or for redundant 1+1 operation of the E1 lines, safe guarding against expensive network down time. Two slots are also available for CPU cards, with the second CPU card acting as a hot standby in case of primary card failure. Each Mux-E1 card may be linked to another ERM-Mux / plus Rack to provide a point-to-point variety of datacom, Ethernet & voice over E1 network services. The ERM-Mux/plus optionally accommodates up to two separate powerpllies, which may derive power from AC (110/220) or DC (-48V) power sources. When two power supplies are installed, the modules provide complete power redundancy and are hot swappable even during the E1 cards' transmission. The ERM-Mux/plus provides all interface connections on the front panel. BNC and RJ-45 are used for E1 Line interface connections, RJ-45 connections are used for all voice (FXO, FXS, E&M), for 10/100 Ethernet Bridge and G.703-64K co-directional / contra-directional / center. Optional cable adapters are used to convert the DB-62F DCE ports of the I/O cards to 6xRS-232, HP68F DCE port of I/O card to 4x V.35, RS-232, RS-530, RS-449, RS-422 and X.21 or 5x X.50 channels.

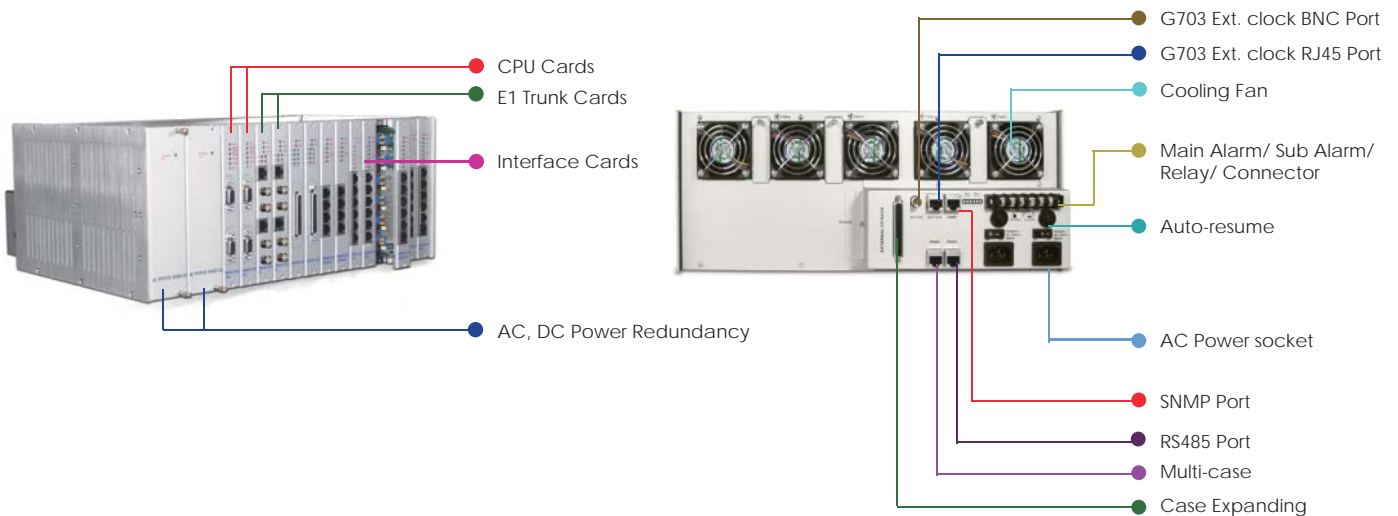
#### Features

- CPU redundancy (1+1)
- E1 redundancy (1+1) and E1 card redundancy
- Power redundancy (1+1) [2AC, 2DC, AC+DC]
- DCE hot swappable card types
- 4ch V.35 (nx64K)
- 4ch G.703 64K co-directional /contra-directional / center mode
- 2ch Ethernet bridge
- 6ch RS232
- 6ch FXS voice
- 6ch FXO voice
- 6ch E&M voice
- Drop & Insert function
- Console, NMP,SNMP, management

#### Specifications

Connectors	Console port (RJ45, RS232C) WAN port RJ45 Jack (2-wire, 4-wire)
Physical Specifications	Dimensions: 350 x 438 x 176mm (W x D x H) Weight: 8kg (chassis+dual power+8 I/O cards) 0.45kg per card
Power Characteristics	AC : AC 90 ~250VAC, DC : DC -48VDC
Environmental Specifications	Operating 0°C ~ 60°C Storage 0°C ~ 70°C Relative humidity 0% ~ 90% non-condensing Predicted MTBF : 65,000 hrs (25°C)
Certification	CE

#### ERM-Mux/plus overview



## 1+1 Redundant

The ERM-MUX/PLUS supports complete redundant functions for the electrical input service, the power module cards, CPU card and E1 card. The E1 backup provides 1+1 modes. All of these cards are capable of automatic switchover in case of failure. The system has complete warning and diagnostic functions for stable and reliable operation.

## Network Management

The ERM-MUX/PLUS supports SNMP and/or NMP GUI network management with local PC or via a dedicated timeslot from the E1 line. The NMP GUI can manage more ERM-MUX/PLUS equipment via the E1 network in-line or in nested structures. A console terminal mode is supported as well. When SNMP management mode is available and selected, remote Telnet and HTTP embedded web server are also available for management.

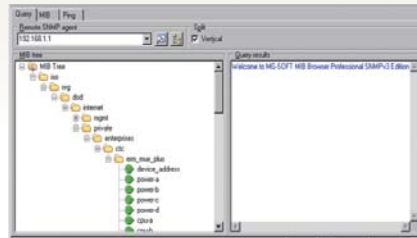
## ERM-Mux/Plus Management

The intelligent NMS provides the support that the network manager needs. It consists of three parts :

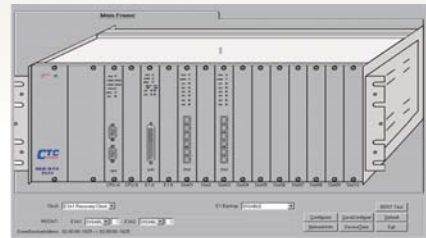
1. Terminal mode: Configuration by local RS-232 serial port; Maintenance & alarm.



2. MIB file SNMP: Configuration by RJ-45 10/100 Ethernet port; Complies with MIB-II standard.



3. GUI SNMP: Configuration by RJ-45 10/100 Ethernet port; Real time monitoring & trap alarm in Window® graphic mode.



## Cascade

RS-485 interface is used for cascading expansion rack, and are provided by RJ-45 x 2 connectors. DB62 connector for connecting backplane data to expansion rack.

## Power Redundancy

Power supply options for 110V AC, 220V AC or -48V DC, ensure maximum flexibility for central office installations. This equipment complies fully with all ITU-T standards for E1 transmissions. The modules are hot-swappable, capable of automatic switch over in case of module failure, stable, and reliable.

## Performance and BERT test

System supports performance monitoring and BERT test through NMP or Terminal console according RFC 1406 recommendation. CRC-4 and BPV monitoring: CURR ES / UAS , LONG ES / UAS. Loopback test and BERT test: display Rx error amounts, Error counts and Bit-error-rate. Test patterns: 2e9-1, 2e11-1 and 2e15-1. Error Insertions and rates: Single, 10e-1, 10e-2, 10e-3, 10e-4, 10e-5, 10e-6, 10e-7.



## Ordering Information

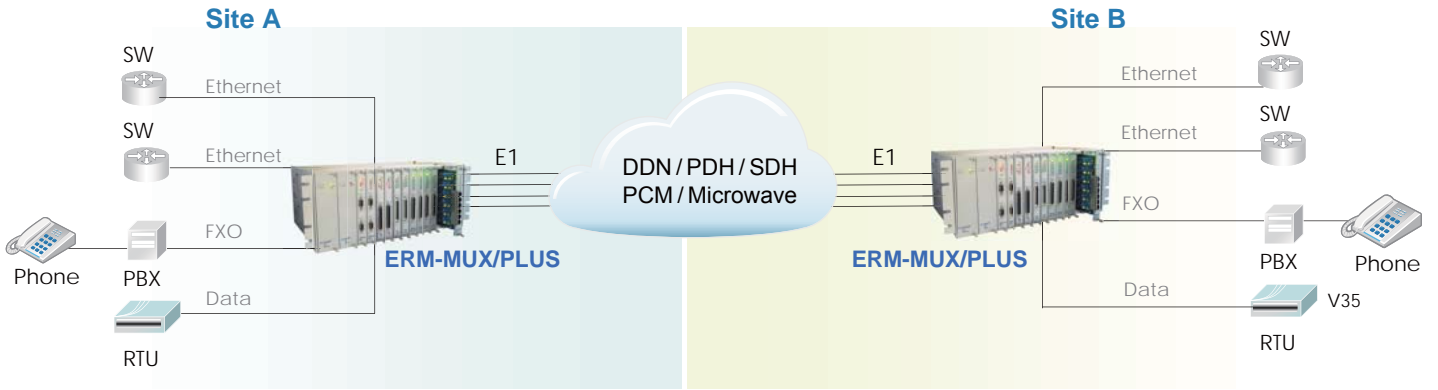
Model Name	Type	Description
ERM-MUX-PLUS/AA-CH	Chassis	4U 19" 14 slot Chassis for AC+AC power
ERM-MUX-PLUS/DD-CH	Chassis	4U 19" 14 slot Chassis for DC+DC power
ERM-MUX-PLUS/AD-CH	Chassis	4U 19" 14 slot Chassis for AC+DC power
ERM-MUX/AC	Power	AC Power plug-in module ( 90 to 250 VAC )
ERM-MUX/ACV	Power	AC Power plug-in module ( 90 to 250 VAC ) with Voice support
ERM-MUX/DC	Power	DC Power plug-in module ( ±36 to ±76 VDC )
ERM-MUX/DCV	Power	DC Power plug-in module ( ±36 to ±72 VDC ) with Voice support
ERM-MUX-PLUS/GUI	Management	GUI for ERM; support Windows 95, 98, 2000, XP
ERM-MUX-PLUS-2E1R	Card	2 Ch Main-E1 LTU card(V1.2); w/DB37M to 2xRJ45 cable
ERM-MUX-PLUS-2E1B	Card	2 Ch Main-E1 LTU card(V1.2); w/DB37M to 2xBNC cable
ERM-MUX-PLUS-4E1R	Card	4 Ch Main-E1 LTU card(V1.2); w/DB37M to 4xRJ45 cable
ERM-MUX-PLUS-4E1B	Card	4 Ch Main-E1 LTU card(V1.2); w/DB37M to 4xBNC cable
ERM-MUX-PLUS-8E1R	Card	8 Ch Main-E1 LTU card(V1.2); w/DB37M to 8xRJ45 cable
ERM-MUX-PLUS-8E1B	Card	8 Ch Main-E1 LTU card(V1.2); w/DB37M to 8xBNC cable
ERM-MUX-PLUS-CPU	Card	CPU card (V4.3) for NMP management
ERM-MUX-PLUS-SNMP	Card	SNMP card (V2.2) for NMP management
ERM-MUX-PLUS-FXO	Card	6 Ch FXO interface card(V2.1)
ERM-MUX-PLUS-FXS	Card	6 Ch FXS interface card(V4.1)
ERM-MUX-PLUS-E&M	Card	6 Ch 2/4 wires E&M voice interface card (V4.1)
ERM-MUX-PLUS-RS-232	Card	6 Ch RS-232 interface card (V4.0)
ERM-MUX-PLUS-G64K	Card	4 Ch G.703 64k interface card (V4.0)
ERM-MUX-PLUS-HS-SERIAL	Card	4 Ch V.35/X.21/RS-449/RS-530 interface card
ERM-MUX-PLUS-RS485	Card	6 Ch RS-485 / RS-422 Interface card
ERM-MUX-PLUS-ET100	Card	2 Ch Ethernet(10/100Base Tx) interface card (V4.0)

ERM - MUX - PLUS -

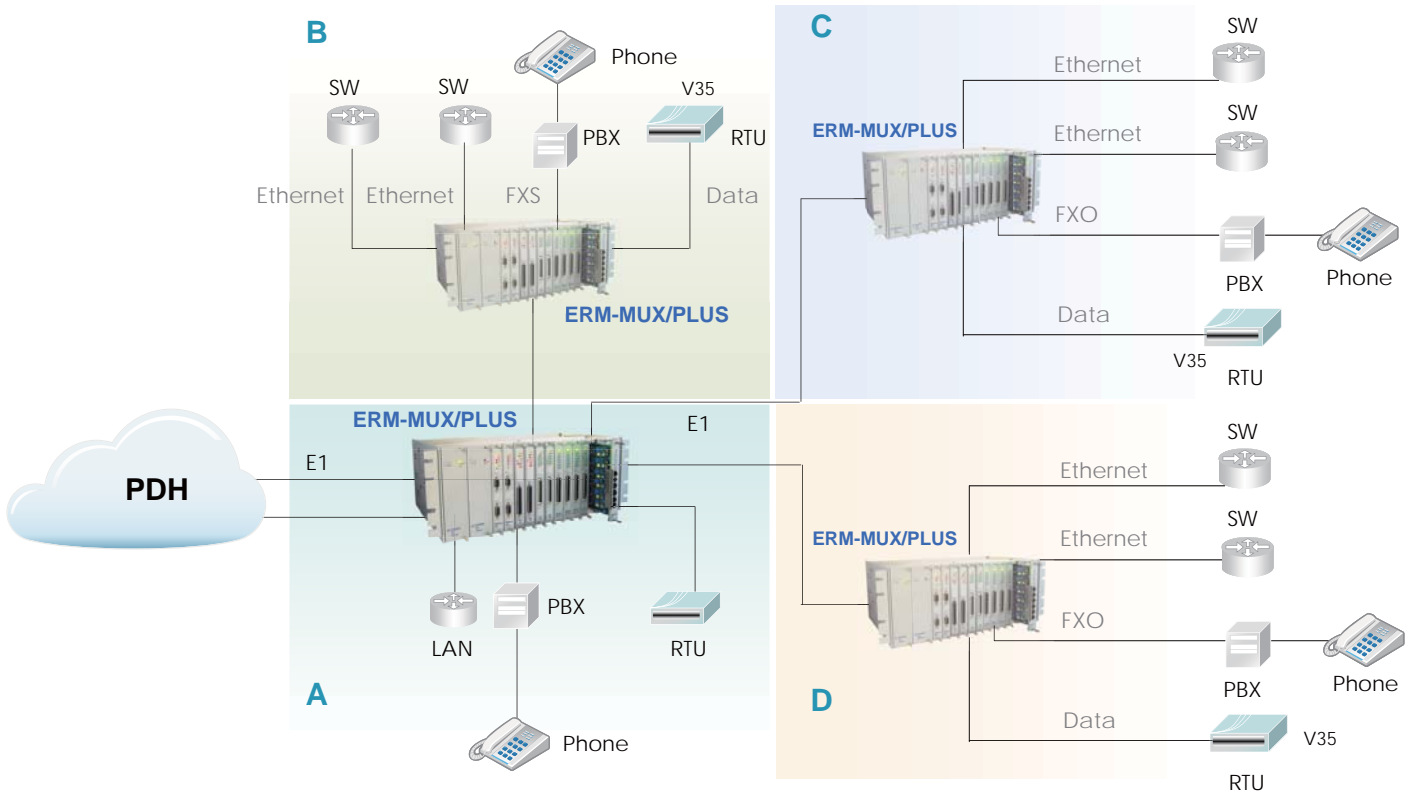
Example: ERM - MUX - PLUS - 2E1R

# E1 Access Multiplexer

## Connection with PBX (Private Branch Exchange)



## The extension and expansion of DDN (Distributed Data)



## E1 Access Multiplexer



### G.703 E1 Aggregate Card

## ERM-Mux/Plus-E1

The ERM-Mux/plus has two dedicated slots for installing E1 aggregate cards. Currently E1 cards are available with 2, 4 or 8E1 ports. In the backplane design of the ERM-Mux/plus, a maximum of 4 E1s can carry data to and from tributary (I/O) cards. One typical application could be to install two 4E1 cards in the chassis and have the cards act as one master and one hot-standby card for E1 redundancy. For other applications, an 8E1 card could be used to cross connect E1 timeslots prior to assignment to the four available backplane channels. Another application can use the 'extra' E1 aggregate channels for drop & insert (Sub-E1) rather than performing cross connection. It can quickly be seen that a large number of applications are possible with the ERM-Mux/plus's flexible design.

#### Features

- Available in 2, 8 E1 channels
- Supports PCM31 or PCM30 framing
- Can provide path/card redundancy
- E1 timeslots can support cross-connect function
- E1 channel can act as Sub-E1 for Drop&Insert
- Hot Swappable

#### Specifications

Frame format	CAS(PCM30) / CCS(PCM31)
CRC on/off	
Bit rate	2.048Mbps
Line codes	HDB3/AMI
Rx sensitivity	0 ~ -43dB
Tx driver	1.5km over 0.5mm E1 cable
Line impedance	75 ohms (unbalanced) 120 ohms (balanced)
Pulse amplitude	nominal 2.37V (75ohm) nominal 3.00V (120ohm)
Pulse shape	According to ITU-T G.703
Temperature	0°C ~ 50°C
Humidity	5 ~ 95%
MTFB	65,000 hrs



### CPU Control Card

## ERM-Mux/Plus-CPU

CPUA and CPUB slots can insert two CPU modules that automatically work in redundant operation mode. CPU modules are responsible for all parameter setup from local PC or from the selected in-band E1line. The setup of the ERM-MUX/Plus may be accomplished by:  
Local PC connected by Ethernet to SNMP  
(can be extend to multiple cases with RS485 twisted-pair ).  
Local PC connected by serial NMP port to Windows® NMP GUI.E1 network connected to SNMP/NMP GUI.Local terminal console mode.

#### Specifications

- RS-232 port for dumb terminal at 9.6k, 8bit, no parity
- SNMP V1 and V2C support
- MIB file compliant to MIB-II ASN.1
- Firmware upgrade by TFTP
- Hot swappable

## Fast Ethernet Bridge Tributary Card

### ERM-Mux/Plus-ET100



The ERM-Mux/plus Ethernet Bridge Tributary Card provides Ethernet over E1 capability. Incorporating two separate channels, this transparent bridge supports industry standard HDLC encapsulation. The WAN data rate depends on the number of E1 timeslots assigned (Nx64). The front panel has two RJ-45 shielded connectors for connection of 10Base-T or 100Base-TX Ethernet and status LEDs for each channel to display link state, speed, duplex and activity. Rounding out each bridge channel are support for 256 MAC filter address learning table and 340 packets buffer to aid in handling LAN side burst traffic.

#### Features

- Two independent Ethernet over E1 channels
- Utilizes HDLC WAN encapsulation
- MAC Address learning table with 5 minute aging
- Auto-MDIX and Auto-Negotiation
- Hot Swappable

#### Specifications

Standards	IEEE 802.3, IEEE802.3u
Automatic address learning, aging and deletion after 5 min.	
Throughput latency	1 frame
MDI / MDIX	Auto
Filtering	256 MAC address table
Buffer	340 packets
Encapsulation	HDLC
10Base-T/100Base-TX	Full or half duplex
Packet sizes	64 ~ 1522 bytes
Temperature	0°C ~ 50°C
Humidity	5 ~ 95% (non-condensing)
MTFB	65,000 hrs

## Nx64 Synchronous Serial Tributary Card

### ERM-Mux/Plus-Data



The ERM-Mux/plus Nx64 Serial Tributary Card provides V.35/ X.21/ RS-530/ RS-449 Synchronous data capability. Incorporating four separate channels, each channel can independently assign any Nx64 timeslots from the aggregate E1. The single HD68 connector mates to a 1 to 4 cable that terminates to the required connector type. Four different cables provide connection to V.35's MB34, X.21's DB15, RS-530's DB25 or RS-449's DB37 female connectors. Please be sure to select the right cable for your application when ordering this card.

#### Features

- Four independent Synchronous channels
- Nx64 setting from any E1 channel
- Each channel operates in native DCE mode
- Diagnostic loop backs
- LED indicators for Power, Alarm, RD/TD activity
- Hot Swappable

#### Specifications

ITU-T and ANSI compliant Datacom interfaces	
Multiplexing Nx64K data onto E1 time-slot.	
Data speed	Nx64K(N=1 to 30, or 31).
Data access	RS-530, RS-449, V.35, X.21, supplied with corresponding interface cable.
Access mode	DCE
Diagnostics	Local /Remote /Bi-directional Loop
Temperature	0°C ~ 50°C
Humidity	5 ~ 95%
MTFB	65,000 hrs

## E1 Access Multiplexer



### Asynchronous RS-485/442 Serial Tributary Card

## ERM-Mux/Plus-RS485

The ERM-Mux/plus Asynchronous RS485/422 Serial Tributary Card provides six independent RS-485/ RS-422 data channel capability. Incorporating six separate channels, each channel can independently assign any Nx64 timeslots from the aggregate E1. Each channel uses a pluggable 4-pin terminal block for connection one or two twisted pair wires. No cables are provided with this card. When connecting to RS-485, the channel supports 4-wire Full Duplex or 2-wire Half Duplex RS-485 transmissions for serial control or data acquisition.

#### Features

- Six independent channels
- Nx64 setting from any E1 channel
- Transparent asynchronous rates up to 128kbps
- Diagnostic loop backs
- Hot Swappable

#### Specifications

Interface	RS-422 4 wire, RS485 4/2 wire
LEDs	RS-485/422 TD/RD, Power, Alarm
Baud Rate	Async mode <= 128K
Bit Error Rate	Less than 10 <sup>-10</sup>
Connector	4pin Terminal Block x 6
Duplex	Full / Half
Temperature	0°C ~ 50°C
Humidity	5~95%
MTFB	65,000 hrs



### RS232 Sync/Asyn Tributary Card

## ERM-Mux/Plus-RS232

The ERM-Mux/plus Sync/Asyn RS232 Serial Tributary Card provides six independent RS-232 data channel capability. Incorporating six separate channels, each channel can independently assign any Nx64 timeslots from the aggregate E1. The single DB62 connector mates to a 1 to 6 cable that terminates to DB25 female connectors. These serial data channels may be linked to leased line modems for further extension or connected to other data terminal or data acquisition devices. When configured for synchronous use, the data connectors carry both clock and data. For asynchronous use, the clock signals can be ignored.

#### Features

- Six independent channels
- Nx64 setting from any E1 channel
- Transparent asynchronous rates up to 115.2kbps
- Synchronous 64 or 128Kbps, DCE mode
- Diagnostic loop backs
- LED indicators for Power, Alarm, RD/TD activity
- Hot Swappable

#### Specifications

ITU-T V.24 compliant Datacom interfaces	
Multiplexing Nx64K data onto E1 time-slot.	
Data speed	Nx64K(N=1 to 2).
Data access	RS-232, supplied with corresponding interface cable.
Access mode	DCE
Diagnostics	Local /Remote /Bi-directional Loop
Temperature	0°C ~ 50°C
Humidity	5~95%
MTFB	65,000 hrs





## G.703 64K Co-directional Tributary Card

### ERM-Mux/Plus-G64K

The ERM-Mux/plus G64K Tributary Card provides 4 independent G.703 64Kbps Co-directional data channel capability. Each channel can independently assign any 64Kbps timeslot from the aggregate E1. Individual Shielded RJ-45 connectors that conform to USOC RJ-48C standard wiring provide the G.703 connections. Standard UTP or alternately shielded UTP are both acceptable cabling media. These data channels may be linked to multiplexers, terminal equipment or satellite/micro-wave transmission equipment. In Co-directional signaling, the clock signals are recovered from the received G.703 data stream. Only Tx and Rx pairs or a total of 4 wires are required in 64Kbps co-directional transmission.

#### Features

- 4 independent channels
- 1x64 setting from any E1 channel
- Transparent synchronous rate of 64kbps
- Co-directional clock recovered from Rx G.703
- Diagnostic loop backs
- LED indicators for Power, Alarm, Tx/Rx activity
- Hot Swappable

#### Specifications

ITU-T G.703, G.823 64kbps compliant interfaces	
Multiplexing 1x64K data onto E1 time-slot.	
Data speed	: 64Kbps +/-100ppm.
Data access	: RJ-45 per USOC RJ-48C standard
Line code	: Co-directional
Pulse shape	: according to G.703
Transmit distance	: 600M or less (0.5-0.7mm TP)
Diagnostics	: Local /Remote /Bi-directional Loop
Temperature	: 0°C ~ 50°C
Humidity	: 5-95%
MTFB	: 65,000 hrs

## E&M Voice Tributary Card

### ERM-Mux/Plus-E&M



The ERM-Mux/plus E&M Voice Tributary Card provides six independent Ear & Mouth Voice channel capability. Each channel can independently assign any 64Kbps timeslot from the aggregate E1. Individual Shielded RJ-45 connectors provide the voice connections. Standard UTP or alternately shielded UTP are both acceptable cabling media. These voice channels may be linked to PBX (Private Branch Exchange) to facilitate voice to voice connections. The channels support selection of Type 1-5, support 2 or 4 wire operation and have 0.5dB steps for signal attenuation. When using this card, an appropriate voice compatible power module must be used in the ERM-MUX/Plus.

#### Features

- Six independent channels
- 2/4 wire independent setting
- 1x64 setting from any E1 channel
- E&M Signaling PBX trunks
- Provides E line, M line, SB (battery) and SG (ground) lines
- Supports types I, II, III, IV or V
- G.711 Codec
- LED indicators for Power, Alarm, activity
- Hot Swappable

#### Specifications

Loop current	: 5-30 mA, maximum 70 mA.
Return loss	: 300-600Hz >12dB (2W) 600-3400Hz >15dB (2W) 300-3400Hz >20dB (4W)
Group delay	: @-10dBm0 <750uSec(2W) <600uSec(4W)
Total Distortion	: according to ITU-T G.223
Channel crosstalk	: < -65dB, 1020Hz@0dBm0
Noise	: < -65dBm0p weighted
Temperature	: 0°C ~ 50°C
Humidity	: 5-95%
MTFB	: 65,000 hrs

# E1 Access Multiplexer



## FXO Voice Tributary Card

### ERM-Mux/Plus-FXO

The ERM-Mux/plus FXO Voice Tributary Card provides six independent Foreign Exchange Office Voice channel capability. Each channel can independently assign any 64Kbps timeslot from the aggregate E1. Individual Shielded RJ-45 connectors provide the voice connections. Standard UTP or alternately shielded UTP are both acceptable cabling media. These voice channels may be linked to PBX (Private Branch Exchange) or PSTN (Public Switched Telephone Network) to facilitate voice to voice connections. When using this card, an appropriate voice compatible power module must be used in the ERM-Mux/plus.

#### Features

- Six independent channels
- 2 wire
- G.711 Codec
- 1x64 setting from any E1 channel
- PCM30 R2 Signaling PSTN trunks
- Links PBX to PBX or extends POTS
- LED indicators for Power, Alarm, activity
- Hot Swappable

#### Specifications

On-hook DC resistance	: > 100K Ohms
Ring AC resistance	: > 7.5K Ohms
Ring power sensitivity	: < 50mW
Off-hook DC resistance	: < 300 Ohms
Max. Input Voltage	: 70VDC
Max. Input Current	: 150mA
Return loss	: 300-600Hz >12dB (2W) 600-3400Hz >15dB (2W) 300-3400Hz >20dB (4W)
Channel crosstalk	: < -65dB, 1020Hz@0dBm0
Noise	: < -65dBm0p weighted
Temperature	: 0°C ~ 50°C
Humidity	: 5~95%
MTFB	: 65,000 hrs



## FXS Voice Tributary Card

### ERM-Mux/Plus-FXS

The ERM-Mux/plus FXS Voice Tributary Card provides six independent Foreign Exchange Station Voice channel capability. These 6 channel tributary cards are designed for voice applications over E1. Typically, an FXS connects to a standard telephone set. The FXS needs to sense on-hook, off-hook or disconnected status. It also must be able to provide ring function to a telephone set and it must pass caller-ID information. In the ERM-Mux/plus point-to-point application, the FXS can connect to a remote FXO (Foreign Exchange Office) when deployed as an extension from PBX (Private Branch Exchange) or PSTN (Public Switched Telephone Network). It may also connect to a remote FXS, also for extension from PBX or as a direct 'hotline' voice connection. Individual Shielded RJ-45 connectors provide the voice connections. When using this card, an appropriate voice compatible power module must be used in the ERM-Mux/plus.

#### Features

- Six independent channels
- 2 wire
- G.711 Codec
- 1x64 setting from any E1 channel
- Provides ring function
- Supports caller-ID forwarding
- PSTN extension or direct "Hot-line"
- Links PBX to PBX or extends POTS
- LED indicators for Power, Alarm, activity
- Hot Swappable

#### Specifications

Effective ring voltage	: AC 75VRMS +/-15V@25Hz +/-3Hz, <10% THD Ring voltage at 300mA load : >50VACRMS
Loop resistance	: <1.8K Ohms, including 300 Ohms for telephone
On-hook current	: 10mA +/-3mA.
Off-hook loop current	: 18-50mA.
Surge protection	: 1000V, 10uSec transient response, decay to 50% in 700uSec 300VRMS for less than 200mSec; no component damage 220VRMS for 15 minutes; damage only local loop
Channel crosstalk	: < -65dB, 1020Hz@0dBm0
Noise	: < -65dBm0p weighted
Temperature	: 0°C ~ 50°C
Humidity	: 5~95%
MTFB	: 65,000 hrs