FCD-E1M

Modular E1 or Fractional E1 Access Unit

FEATURES

- E1 or Fractional E1 access unit
- Supports one data port with selectable sync data rates: n x 56, n x 64 kbps
- Optional sub-E1 drop & insert port for PABX connectivity
- Single slot supports MEGAPLEX I/O modules
- Fail-safe sub-E1 link ensuring uninterrupted service (G.703 only)
- Data interfaces: V.35, RS-530, V.36/RS-449 or X.21
- Optional high performance built-in Ethernet bridge/router
- SNMP agent
- Management:
  - Out-of-band via V.24 supervisory port or Ethernet management port
  - Inband via TS 0 or dedicated timeslot
- Dial-in option for remote out-of-band management
- Dial-out for alarm report
- The E1 main link can be supplied with the following options:
  - Built-in LTU
  - Fiber optic interface
- E1 interface complies with: ITU G.703, G.704, G.706, G.732, G.823
- Enhanced diagnostics include:
  - User activated local and remote loopbacks
  - Integrated BER tester
  - Fractional E1 in-band loop
- Stores 24 hours of E1 network performance monitoring and last 100 alarms
- Relay activation upon alarm event
- Alarm mask configurable for any alarm

DESCRIPTION

- FCD-E1M serves as a dedicated access multiplexer for business customers, providing modular integration of voice and data traffic over E1 or Fractional E1 services (see *Figure 1*).
- FCD-E1M also operates opposite RAD's modular DXC (multiservice access node) products or other vendors' E1 equipment, for multilink star applications, such as access to SDH networks. The DXCs and FCD-E1M operate together with centralized SNMP network management (see *Figure 2*).
- FCD-E1M can be ordered with a regular E1 (G.703) or a fiber optic link. Both configurations are also available with an optional sub-E1 drop & insert port. The unit includes one data port or an optional Ethernet bridge/router.
- FCD-E1M includes a single I/O module slot that supports one Megaplex I/O module. This provides field upgrade and service profile change capabilities that are available only on larger modular devices (for full module details and ordering information, see individual module data sheets).

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BASIC UNIT

- The basic unit includes power supply, E1 link and one data port.
- The E1 interface is compatible with virtually all carrier provided E1 services and meets ITU recommendations G.703, G.704, G.706 and G.732. The E1 interface supports either 2 or 16 frames per multiframe, with or without CRC-4. Zero suppression over the line is HDB3. The integral LTU (optional) ensures a range of up to 2 km.
- FCD-E1M can be ordered with a fiber optic link, which eliminates the need for an external fiber optic modem. The fiber optic link provides a secure link in hazardous or hostile environments. It complies with ITU standards G.921 and G.956.
- Four fiber optic interfaces are available:
  - 850 nm LED for use over multimode fiber at distances up to 5 km (3 miles)
  - 1300 nm LED for use over single mode fiber at distances up to 47 km (29 miles)
  - 1300 nm laser diode for use over single mode fiber at distances up to 62 km (38 miles)
  - 1550 nm laser diode for use over single mode fiber for extended range up to 100 km (62 miles).
- Timeslot assignment is programmable, allowing data from each data port and from the sub-E1 port to be placed into timeslots consecutively. FCD-E1M also provides additional flexibility, by giving full user control over the data ports timeslot allocation without restrictions.
- Multiple clock source selection ensures maximum flexibility for supporting different applications. The E1 main link may be clocked from the recovered receive clock, from an internal oscillator, from one of the data ports or from the sub-E1 port.
- Bypassing the sub-E1 port to the main link (non-fiber optic), ensures uninterrupted service to the sub-E1 port and provides immunity to hardware and power failure.
- FCD-E1M is available as a standalone unit. A rack mount adapter kit enables installation of the unit in a 19" rack.

USER INTERFACE

- The following data port interfaces can be ordered: V.35, RS-530, V.36/RS-449 or X.21. The ports can operate in the following clock modes:

  DCE transmit and receive clocks are output

  DTE1 external transmit clock is input (coming from the user DTE)

  DTE2 both the transmit and receive clocks are externally input

  Invert data is sampled using an invert clock.
- The optional built-in Ethernet bridge is a high performance remote, self-learning bridge. It is ideal as a LAN extender or segmenter over E1 link applications. The LAN table stores up to 10,000 addresses and is automatically updated. Filtering and forwarding is performed at the maximum theoretical rate of 15,000 pps (wire speed) and the buffer can hold 256 frames with a throughput latency of 1 frame. Filtering can be disabled for extender or segmenter applications. The Ethernet port is available with 10BaseT (UTP) which operates in full duplex.
- The optional built-in Ethernet router is a high performance remote IP router. It is ideal as a LAN extender or segmenter over bit-stream type infrastructures. The router receives Ethernet frames from the LAN and forwards packets to the IP network on the Ethernet LAN or to the WAN according to their destination. The Ethernet port is available in 10BaseT (UTP) which operates in full duplex mode.
- The optional sub-E1 port can be configured to work without CRC-4, while the E1 main link is working with CRC-4. This enables connection of E1 equipment not supporting CRC-4, over an E1 network that is working with CRC-4.

APPLICATIONS

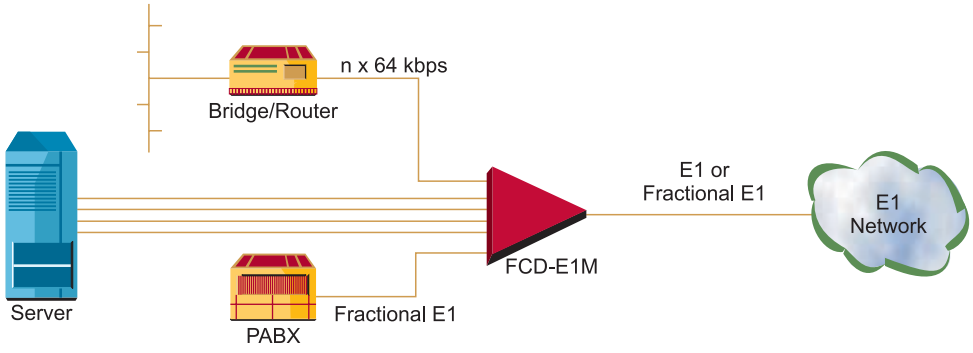

Figure 1. Connection of LAN Traffic together with PABX Traffic to E1 Network

FCD-E1M Rear Panel

FCD-E1M

Modular E1 or Fractional E1 Access Unit

MANAGEMENT & MAINTENANCE

- Setup, control and monitoring of status and diagnostics information can be activated via:
  - ASCII terminal connected to the async control port command line interpreter
  - SNMP management connected to the async control port.
- FCD-E1M has an internal SNMP agent and can be controlled by any generic SNMP station or by the RADview SNMP network management application.
- FCD-E1M supports dial-in, dial-out modem connections. These connections can be used for remote out-of-band configuration, monitoring and for sending callout alarm messages using serial V.24 SLIP, PPP or Ethernet ports.
- Inband management can be performed by using the spare bits (Sa bits) on timeslot 0 or by using a dedicated timeslot using standard protocols, Frame Relay (RFC 1490), PPP and standard RIP2 routing. This allows setup, monitoring and diagnostics of the remote unit. Inband access by using spare bits on timeslot 0 is possible only if those bits are passed transparently end-to-end.
- When operating with CRC-4, E1 network statistics are stored in memory, according to RFC-1406. The statistic information may be retrieved locally through the control port.
- Maintenance capabilities include user activated local and remote loopbacks at the E1 main link, sub-E1 and data ports. The user can activate a BER test for each data or sub-E1 port, individually. Each data or sub-E1 port responds to an ANSI FT1 RDL (T1E1.2/93-003) inband loop code, generated by the remote FCD-E1M, DXC or dedicated test equipment in a specific bundle of timeslots allocated only to that port.

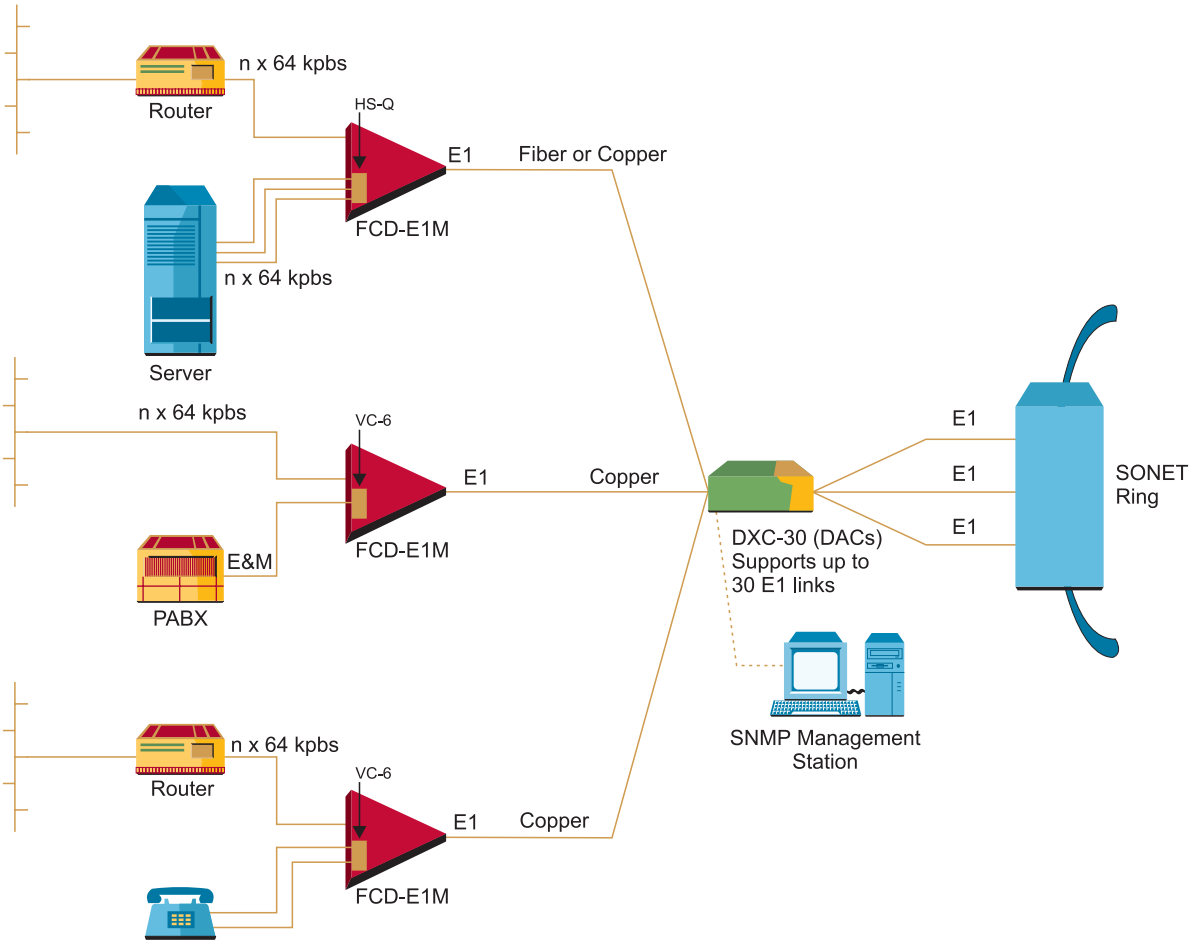

Figure 2. SDH Access Solution for Multiple Remote Sites

FCD-E1M

Modular E1 or Fractional E1 Access Unit

SPECIFICATIONS

E1 MAIN LINK (NETWORK)

- **Framing**
  - 256N (no MF, CCS)
  - 256N (no MF, CCS) with CRC-4
  - 256S (TS16 MF, CAS)
  - 256S (TS16 MF CAS) with CRC-4
- **Bit Rate**
  2.048 Mbps
- **Line Code**
  AMI
- **Signal Level**
  Receive:
  0 to -36 dB / with LTU
  0 to -10 dB / without LTU
  Transmit:
  ±3V (±10%), balanced
  ±2.37V (±10%), unbalanced
- **Zero Suppression**
  HDB3
- **Impedance**
  - 120Ω, balanced
  - 75Ω, unbalanced
- **Jitter Performance**
  - As per ITU G.823
  - ETSI TBR-12 and TBR-13
- **Connectors**
  - RJ-48c 8-pin, balanced
  - Two BNC coaxial, unbalanced
- **Transmit Timing**
  Internal accuracy:
  ±30 ppm
  Loopback timing:
  ±130 ppm
  Sub-E1:
  2.048 Mbps ±130 ppm
  External timing from data port:
  n x 56, n x 64 ±130 ppm
- **Compliance**
  ITU G.703, G.704, G.706, G.732

FIBER OPTIC LINK

- **Operating Wavelength**
  850, 1300 or 1550 nm (see *Ordering*)
- **Receiver Sensitivity**
  (For BER = $1x10^{-9}$)
  - -38 dBm at 850 nm
  - -40 dBm at 1300, 1550 nm
- **Connectors**
  ST, FC/PC or SC (see *Ordering*)
- **Output Power**
  - -18 dBm for 850 nm into 62.5/125
  - -18 dBm for 1300 nm into 9/125
  - -12 dBm for 1300 and 1550 nm laser into 9/125
- **Dynamic Range**
  28 dB for all types of optical interfaces
- **Budget (Max)**
  - 20 dB for 850 nm over 62.5/125
  - 22 dB for 1300 nm over 9/125
  - 28 dB for 1300 and 1550 nm laser over 9/125

SUB-E1 PORT

- **Framing**
  - 256N (no MF, CCS)
  - 256N (no MF, CCS) with CRC-4
  - 256S (TS16 MF, CAS)
  - 256S (TS16 MF, CAS) with CRC-4
- **Bit Rate**
  2.048 Mbps
- **Line Code**
  AMI
- **Zero Suppression**
  HDB3
- **Impedance**
  - 120Ω, balanced
  - 75Ω, unbalanced
- **Signal Level**
  Receive:
  0 to -10 dB
  Transmit:
  ±3V (±10%), balanced
  ±2.37V (±10%), unbalanced
- **Jitter Performance**
  - As per ITU G.823
  - ETSI TBR-12 and TBR-13
- **Connectors**
  - RJ-48c 8-pin, balanced
  - Two BNC coaxial, unbalanced
- **Transmit Timing**
  Locked on E1 main link
- **Compliance**
  ITU G.703, G.704, G.706, G.732

DATA PORT

- **Number of Data Ports**
  One
- **Interface**
  V.35, RS-530, V.36/RS-449, X.21
- **Connectors**
  D-type 25-pin, female RS-530 pinout
- **Data Rate**
  n x 56 or n x 64 kbps, (n=1,2...,31)
- **Clock Modes**
  DCE: RX and TX clock to DTE
  DTE1: RX clock to user device; TX clock from user device
  DTE2: RX and TX from DCE
- **Control Signals**
  - CTS follows RTS or constantly ON, soft-selectable
  - DSR constantly ON, unless in test mode
  - DCD constantly ON, unless in RED ALARM

ETHERNET BRIDGE/ROUTER PORT

- **LAN Table (Ethernet Bridge Port)**
  10,000 addresses
- **Filtering and Forwarding**
  Ethernet bridge port
  15,000 pps
  Ethernet router port
  30/35 kbps
- **Buffer**
  256 frames
- **Delay**
  1 frame
- **Standards**
  Ethernet bridge port
  Conforms to IEEE 802.3 / Ethernet
  Ethernet router port
  Conforms to IEEE 802.3 / Ethernet II
- **Connectors**
  10BaseT (UTP): Shielded RJ-45

GENERAL

- **Diagnostics**
  Main E1 link:
  Local and remote loopback
  Sub-E1 port:
  Local and remote loopback
  Sub-E1 port BER test
  Data port:
  Local data port loopback
  Remote data port loopback
  Data port BER test
  Inband code activated loopback per data port

FCD-E1M

Modular E1 or Fractional E1 Access Unit

- **Timeslot Allocation**
  - Consecutive (bundled)
  - User defined
- **Performance Monitoring (On E1 Main Link)**
  - Local support of CRC-4
  - Statistics according to RFC-1406
- **Control Port (DCE)**
  - Interface: V.24/RS-232
  - Connector: 9-pin D-type, female
  - Format: asynchronous
  - Baud rate: 1.2 to 19.2 kbps, autobaud
  - Character: 8 bit no parity, 7 bit odd or even parity
- **Indicators**
  General:
  Power (green), Test (yellow), MAJ ALARM (red), MIN ALARM (red)
  Main E1:
  LOC SYNC LOSS (red), REM SYNC LOSS (red)
  Sub-E1:
  LOC SYNC LOSS (red), REM SYNC LOSS (red)
- **Alarms**
  Last 100 alarms are stored and available for retrieval. Each alarm is time stamped.
- **Alarm Relay**
  3 relay contacts are available on the control DTE port. The alarm relay is activated by alarms in the alarm buffer.
- **Physical**
  Height: 43.7 mm / 1.7 in
  Width: 44.4 cm / 17.3 in
  Depth: 24.3 cm / 9.5 in
  Weight: 1.3 kg / 2.9 lb
- **Power**
  100-240 VAC; 47-63 Hz
  -48 VDC, nominal (36-72V)
  Power consumption: 6W
- **Environment**
  Temperature: 0–50°C / 32–122°F
  Humidity: up to 90%, non condensing

ORDERING

FCD-E1M/*/~/$/&/@/#+
Modular E1 or Fractional E1 Access Unit

* Specify optional drop-and-insert E1 sub-link:
S1 for E1 sub-link

~ Specify power supply voltage:
AC for 115 VAC and 230 VAC
48 for –48 VDC

$ Specify management port interface:
V24 for V.24/RS232 (DB-9)
UTP for Ethernet 10BaseT (UTP)
BNC for Ethernet 10Base2 (BNC)

& Specify interface:
530 for RS-530 interface
V35 for V.35 interface
X21 for X.21 interface
449 for RS-449 interface
ETUB for Ethernet bridge with 10BaseT interface
ETBB for Ethernet bridge with 10Base2 interface
ETUR for Ethernet router with 10BaseT interface
ETBR for Ethernet router with 10Base2 interface

@ Specify optional line interface:
LTU for integral Line Termination Unit

#+ Specify optional optical interface:

\# **ST** for ST connector
SC for SC connector
FC for FC/PC connector

\+ **85** for 850 nm, multimode
13 for 1300 nm, single mode
13L for 1300 nm, single mode, laser diode
15L for 1550 nm, single mode, laser diode
(Default is G.703 electrical interface)

Cables

The following cables convert the 25-pin channel connector into the respective interface. Cable length is 2m (6 ft), unless otherwise indicated.

CBL-HS2V1 to connect a V.35 DTE using DCE clock mode*

CBL-HS2V2 to connect a V.35 DCE using DTE1 clock mode*

CBL-HS2V3 to connect a V.35 DCE using DTE2 clock mode*

CBL-HS2R1 to connect an RS-449 (V.36) DTE using DCE clock mode*

CBL-HS2R2 to connect an RS-449 (V.36) DCE using DTE1 clock mode*

CBL-HS2R3 to connect an RS-449 (V.36) DCE using DTE2 clock mode*

CBL-HS2X1 to connect an X.21 DTE using DCE clock mode*

* **DCE clock mode**: FCD-E1M provides both transmit and receive clocks

DTE1 clock mode: FCD-E1M provides transmit clock, attached DCE provides receive clock

DTE2 clock mode: attached DCE provides both transmit and receive clocks

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data communications

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