

# FCD-E1L

## E1 or Fractional E1 Managed Access Unit



Managed TDM multiplexer for access to full or fractional E1 services

- Managed access units for accessing E1 or fractional E1 services
- E1 main link for both framed and unframed data
- One or two data ports with synchronous data rate of  $n \times 64$  kbps
- Serial data port interfaces: V.35, RS-530, V.36/RS-449, V.24, or X.21
- Optional Fast Ethernet bridge, with VLAN support

FCD-E1L is a managed access unit that converts rates and interfaces for full or fractional E1 services.

This unit features a single or dual serial  $n \times 64$  kbps data user interface. The second serial data interface can be replaced by an Ethernet LAN interface to allow LAN-to-LAN connectivity over TDM networks.

FCD-E1L operates with RAD's modular DXC (DACS) and Megaplex products, as well as E1 equipment of other vendors, to support multilink star applications, such as access to SDH networks. The DXC and FCD units can be managed with centralized SNMP network management.



## FCD-E1L

### E1 or Fractional E1 Managed Access Unit

The E1 interface is compatible with virtually all carrier-provided E1 services and meets ITU recommendations G.703, G.704, G.706, G.732, G.823, and G.826. It supports both 2 and 16 frames per multiframe, with or without CRC-4. It can also accept a 2048-kbps data stream and convert it to an ITU-T Rec. G.703 unframed signal for transport over the E1 main link. Line code is HDB3. The software-selectable integral LTU provides a range of up to 2 km (1.2 miles).

Programmable timeslot assignment allows data from each data port to be placed automatically into consecutive timeslots. Alternatively, timeslots can be assigned manually at user discretion.

FCD-E1L features autoconfiguration for plug-and-play connectivity. Upon connection to the E1 link, the unit detects the E1 parameters and performs autoconfiguration accordingly. This E1 learning process can be activated via either a push-button on the FCD-E1L front panel or a terminal command. The state of the learning process is monitored by a dedicated LED indicator and/or supervision terminal messages.

Multiple clock source selection ensures maximum flexibility to support different applications. The E1 main link may be timed from an internal oscillator, the recovered receive clock, or one of the data ports.

Front panel LEDs indicate alarms, E1 signal loss, and diagnostic loopback operation. Rear panel LEDs on the Ethernet interface modules indicate LAN status and activity.

FCD-E1L is a compact standalone unit. A rack mount adapter kit enables installation of one or two (side-by-side) units in a 19-inch rack (see *Ordering*).

## USER INTERFACES

FCD-E1L supports the following types of user interfaces:

- Serial data interfaces: RS-530, V.35, X.21, V.24, V.36/RS-449
- Ethernet LAN interface modules with a built-in IR-ETH/QN bridge.

The synchronous data ports operate in the following clock modes:

- DCE: FCD-E1L provides both transmit and receive clocks to the user equipment, with optional sampling of incoming data with an inverted clock.
- DTE1: FCD-E1L provides the transmit clock, and the attached user equipment provides the receive clock.
- DTE2: The attached user equipment provides both transmit and receive clocks.

When equipped with IR-ETH/QN interface module, FCD-E1L transparently connects remote LANs over E1 links. They filter Ethernet frames, forwarding only frames that are destined to the WAN. The IR-ETH/QN port supports autonegotiation and VLAN frames. The IR-ETH/QN port has a 10/100BaseT interface.

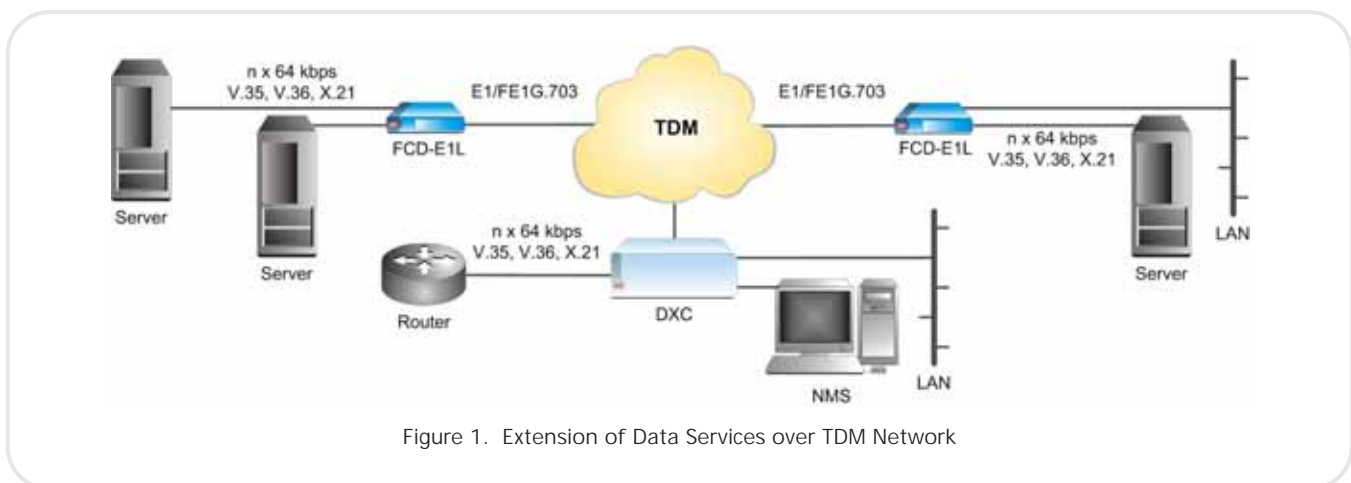


Figure 1. Extension of Data Services over TDM Network

## FCD-E1L

### E1 or Fractional E1 Managed Access Unit

#### MANAGEMENT

Status and diagnostic information is defined, configured, and monitored using one of the following methods:

- ASCII terminal connected to the async control port
- SNMP management
- Telnet.

FCD-E1L has an internal SNMP agent, managed by the RADview SNMP network management application or any generic SNMP station.

The unit performs both dial-in and dial-out modem connections through the serial RS-232 port, by using SLIP or PPP, or a command line interpreter on an ASCII terminal. These out-of-band connections can be used for remote configuration and monitoring, as well as for sending callout alarm messages.

Up to 100 time-stamped alarms are available for retrieval through the supervision terminal, a Telnet host, or a RADview management station.

Inband management is performed either via a dedicated timeslot with standard Frame Relay (RFC 1490), or by using the spare bits ( $S_a$  bits) on timeslot 0. This allows the user to set up, monitor, and run diagnostics on the remote unit. If spare bits on TSO are used for inband access, they must be passed transparently end-to-end.

#### DIAGNOSTICS

Diagnostic capabilities include user-activated local and remote loopbacks on the E1 main link and data ports. Local loopbacks can be activated either from the terminal or via the DIP switch. The user can activate a BER test on the data port. Additionally, the data port responds to an ANSI FT1 RDL (T1.403) inband loop code, generated by the remote FCD-E1L or DXC in a specific bundle of timeslots allocated only to that port.

E1 network statistics are stored in memory, according to RFC 1406. Statistical information can be retrieved locally through the control port.

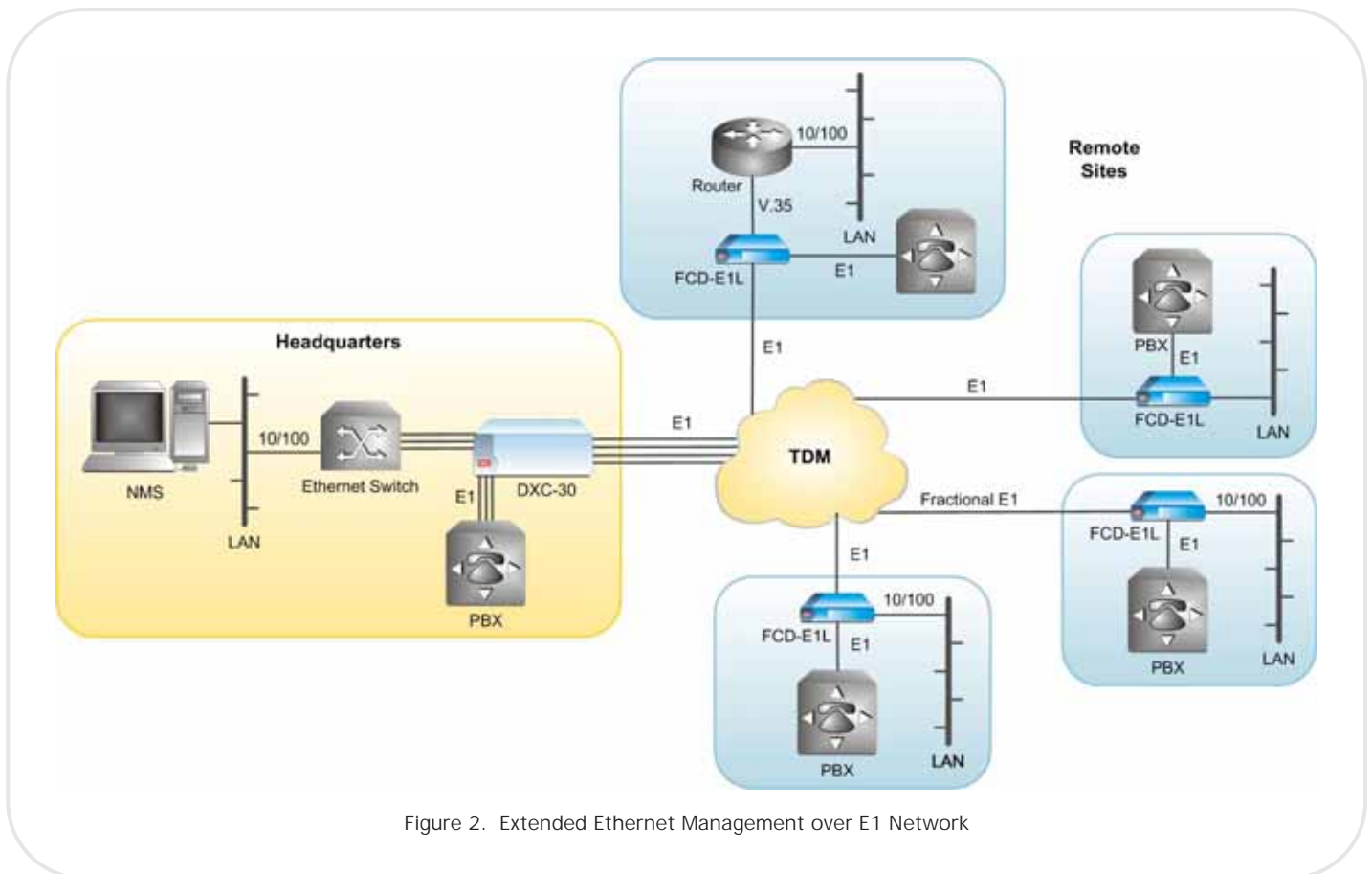


Figure 2. Extended Ethernet Management over E1 Network

## Specifications

### E1 MAIN LINK

#### Framing

256N (no MF, CCS)  
256N (no MF, CCS) with CRC-4  
256S (TS16 MF, CAS)  
256S (TS16 MF CAS) with CRC-4  
Unframed

#### Bit Rate

2.048 Mbps

#### Line Code

AMI

#### Zero Suppression

HDB3

#### Line Impedance

120Ω, balanced  
75Ω, unbalanced

#### Transmit Timing

Locked to the system clock

#### Signal Level

Receive:

0 to -10 dB without LTU:  
0 to -36 dB with LTU (main link only)

Transmit:

±3V (±10%), balanced:  
±2.37V (±10%), unbalanced:

#### Jitter Performance

As per ITU G.823, ETSI TBR-12 and TBR-13

#### Connectors

RJ-45, 8-pin, balanced  
Two BNC coaxial, unbalanced

#### Compliance

ITU G.703, G.704, G.706, G.732,  
G.823, G.826

#### Performance Monitoring

Local support of CRC-4  
Full statistical diagnostics according to  
RFC-1406

### DATA PORTS

#### Connectors

D-type 25-pin RS-530, female,  
converted to V.35, X.21, or  
V.36/RS-449 via adapter cables  
D-type 25-pin V.24, female

#### Data Rate

$n \times 64$  kbps ( $n = 1$  to 31)

#### Clock Modes

DCE: RX and TX clock to user device  
DTE1: RX clock to user device;  
TX clock from user device  
(not for X.21, V.24)  
DTE2: RX and TX clock from user device  
(not for X.21, V.24)

#### Control Signals

CTS follows RTS or constantly On,  
software selectable  
DSR constantly On, unless in test mode  
DCD constantly On, unless in sync loss

### ETHERNET BRIDGE PORT

#### Interface Module

IR-ETH/QN

#### LAN Table

512

#### Filtering and Forwarding

150,000 frame/second

#### Buffer

85 frames

#### Line Code

10BaseT: Manchester  
100BaseT: MLT3

#### WAN Protocol

HDLC

#### Compliance

IEEE 802.3/Ethernet V2, 802.1Q (relevant parts), 802.1p and 802.3x.

#### Connector

Shielded RJ-45

### DIAGNOSTICS

#### Main E1 Link

Local and remote loopback

#### Data Port

Local loopback  
Remote loopback  
BER test  
Code-activated inband loopback per  
data port

# FCD-E1L

## E1 or Fractional E1 Managed Access Unit

### GENERAL

#### System Clock

Internal clock:  $\pm 50$  ppm  
 Loopback timing:  $\pm 130$  ppm  
 External timing from data port:  $\pm 130$  ppm

#### Management Port

Interface and connector:  
 V.24/RS-232, 9-pin D-type, female  
 Format: asynchronous  
 Baud rate: 1.2–19.2 kbps, autobaud  
 Character:  
 8 bit no parity,  
 7 bit odd or even parity

#### Timeslot Allocation

Consecutive (bundled)  
 User-defined

### Indicators

General  
 PWR (green)  
 TST (yellow)  
 ALM MAJ, ALM MIN (red)  
 AUTO CONFIGURATION (red or green)

Main Link  
 LOC SYNC LOSS (red)  
 REM SYNC LOSS (red)

### Front Panel Controls

Single push-button for autoconfiguration

### Alarms

Last 100 alarms are stored and available for retrieval. Each alarm is time stamped

### Physical

Height: 4.4 cm (1.75 in)  
 Width: 21.5 cm (8.5 in)  
 Depth: 24.3 cm (9.6 in)  
 Weight: 0.9 kg (2.0 lb)

### Power

AC: 100 to 240 VAC; 47 to 63 Hz  
 DC: -48 VDC (-40 to -57 VDC)



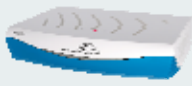


### Power Consumption

5W max

### Environment

Temperature: 0°C to 50°C (32°F to 122°F)  
 Humidity: up to 90%, non-condensing

Table 1. FCD Comparison Table

Features	FCD-E1	FCD-E1L	FCD-E1LC/T1LC	FCD-E1E	FCD-E1A
					
Total user ports	3	2	3	2	3
Interface types	RS-530, V.35, V.36, X.21, Sub-E1	RS-530, V.35, V.36, X.21, Ethernet bridge (10/100BaseT with VLAN support)	RS-530, V.24, V.35, V.36, X.21, Ethernet Bridge (10/100BaseT with VLAN support), Sub-E1/T1	RS-530, V.35, V.36/RS-449, X.21, V.24/RS-232, Ethernet Bridge (10/100BaseT with VLAN support), Sub-E1	RS-530, V.35, V.36/RS-449, X.21, Sub-E1
E1/T1 line type	Copper	Copper	Copper	Copper	Copper
LCD panel	✓	–	–	✓	✓
Auto-configuration	–	✓	–	–	–
SNMP management	✓	✓	✓	✓	✓
Interoperability	Megaplex, DXC	Megaplex, DXC	Megaplex, DXC	Megaplex, DXC	Megaplex, DXC
ETH out-of-band for management	✓	✓	✓	✓	✓
E1 bypass	✓	–	–	✓	✓
ETH performance	–	VLAN transparent	VLAN transparent	VLAN priority tagging (802.1p/Q)	VLAN transparent

## FCD-E1L

### E1 or Fractional E1 Managed Access Unit

## Ordering

### STANDARD CONFIGURATIONS

FCD-E1L/U/48/V35

FCD-E1L/B/AC/ETQN

FCD-E1L/B/AC/X21

FCD-E1L/B/AC/V35

FCD-E1L/B/48/ETQN

### SPECIAL CONFIGURATIONS

FCD-E1L/\*/-/!/%

#### Legend

\* E1 main link interface:  
**B** balanced (RJ-45)  
**U** unbalanced (BNC)

~ Power supply:

**AC** 100 to 240 VAC  
**48** -48 VDC

& Data port interface:

**530** RS-530  
**V35** V.35  
**X21** X.21  
**V36** RS-449

% Optional second data port interface:

**530** RS-530  
**V35** V.35  
**X21** X.21  
**V36** RS-449  
**ETQN** IR-ETH/QN Ethernet  
bridge VLAN (10/100BaseT)

### SUPPLIED ACCESSORIES

AC power cord (when AC power supply is ordered)

DC adapter plug (when DC power supply is ordered)

#### CBL-HS2/\*

Adapter cables for DB-25 channel connectors (for use in DCE clock modes only)

*Note: Cable length is 2m (6 ft).*

#### Legend

\* Data port interface:  
**V/1** 34-pin V.35  
**R/1** 37-pin V.36/RS-449  
**X/1** 15-pin X.21

#### CBL-HS2/^/#

Adapter cables for DB-25 channel connectors (for use in DTE clock modes only)

#### Legend

^ Interface, clock mode:  
**V/2** 34-pin V.35, DTE1  
**V/3** 34-pin V.35, DTE2  
**R/2** 37-pin V.36/RS-449, DTE1  
**R/3** 37-pin V.36/RS-449, DTE2

# Cable connector:

**F** female  
**M** male

### OPTIONAL ACCESSORIES

#### CBL-DB9F-DB9M-STR

Control port cable

#### RM-28

Hardware kit for mounting one or two units in a 19-inch rack

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