

FCD-E1

E1 or Fractional E1 Access Units



Access units for E1 or fractional E1 services

- Several data ports with selectable sync data rates of $n \times 56/64$ kbps
- Optional sub-E1 drop-and-insert port for PBX connectivity
- Fail-safe sub-E1 link ensuring uninterrupted service (G.703 only)
- SNMP internal agent
- Enhanced diagnostics functionality using user-activated local and remote loopbacks, Integrated BER tester and Fractional E1 inband loop

FCD-E1 is an access unit for E1 or fractional E1 services. It can be used as rate and interface converter or as integrating multiplexer for E1 and fractional E1 services (see *Figure 1* and *Figure 2*).

The units also operate opposite RAD's modular DXC (DACS) products or other vendors' E1 equipment, to support multilink star applications, such as access to SDH networks. The DXC and the FCD units are managed by SNMP, a centralized network management system (see *Figure 3*).

FCD-E1 is supplied with a copper E1 main link; an optional sub-E1 drop-and-insert port is also available. The units can be ordered with either one or two user data ports.

The basic unit includes a power supply, electrical/copper E1 link with integral LTU/CSU, and one data port.



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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. It supports either 2 or 16 frames per multiframe, with or without CRC-4. Line coding is HDB3. The user-selectable integral LTU ensures a range of up to 2 km (1.2 miles).

Timeslot assignment is programmable, allowing data from each data port and from the sub-E1 port to be placed automatically into consecutive timeslots. Alternatively, timeslots can be allocated manually, at user discretion.

Multiple clock source selection ensures ultimate flexibility for applications. The E1 main link timing can be taken from the recovered receive clock signal, an internal oscillator, one of the data ports, or the sub-E1 port.

The optional sub-E1 port can be configured to work without CRC-4, while the E1 main link is working with CRC-4. This allows non-CRC-4 E1 equipment to connect to an E1 network that uses CRC-4.

Bypassing the sub-E1 port to the main link ensures uninterrupted service to the sub-E1 port, providing full immunity to hardware and power failure.

FCD-E1 is a compact standalone unit. A rack mount adapter kit enables installation of one or two units side-by-side in a 19-inch rack.

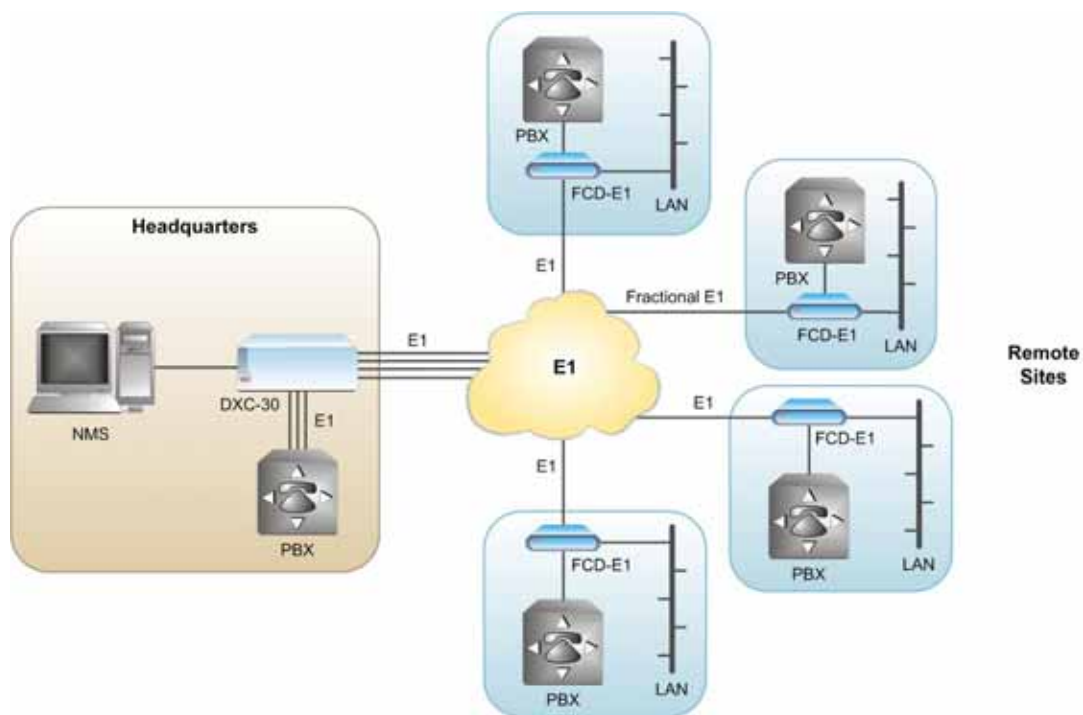


Figure 1. Extended Ethernet Management over E1 Network

USER INTERFACE

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

- **DCE:** transmit and receive clocks are output (option to sample the incoming data with an inverted clock)
- **DTE1:** external transmit clock is input (coming from the user DTE)
- **DTE2:** both transmit and receive clocks are externally input.

MANAGEMENT

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

- ASCII terminal connected to the SLIP control port
- SNMP management through the SLIP control port or inband
- Telnet session through the SLIP control port or inband
- Menu-driven management using front panel LCD with three push-buttons.

FCD-E1 has an internal SNMP agent that can be controlled by the RADview SNMP network management application or any generic SNMP station.

FCD-E1 supports both dial-in and dial-out modem connections over the serial V.24/RS-232 port, using SLIP or ASCII terminal command line interpreter. These connections can be used for remote out-of-band configuration and monitoring, as well as for sending callout alarm messages.

Inband management can be performed using the spare bits (Sa bits) on timeslot 0 or through a dedicated timeslot that supports proprietary protocol and Frame Relay RFC 1490. Both methods allow monitoring and diagnostics of the remote unit.

Inband access using spare bits on Timeslot 0 is possible only if those bits are passed transparently end-to-end.

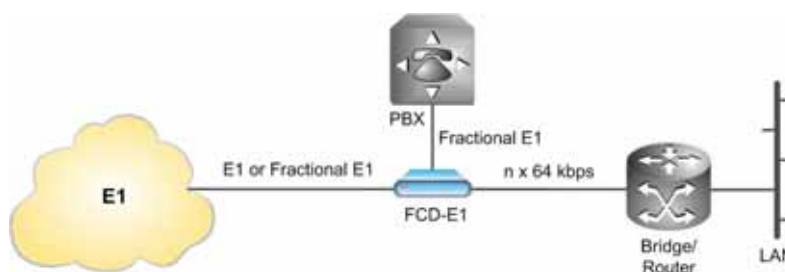


Figure 2. SDH/SONET Access Solution for Multiple Remote Sites

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MONITORING

When operating with CRC-4, E1 network statistics are stored in memory, according to RFC-1406. Statistical information may be retrieved locally through the control port.

DIAGNOSTICS

Diagnostic 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-E1 or DXC unit in a specific bundle of timeslots allocated only to that port.

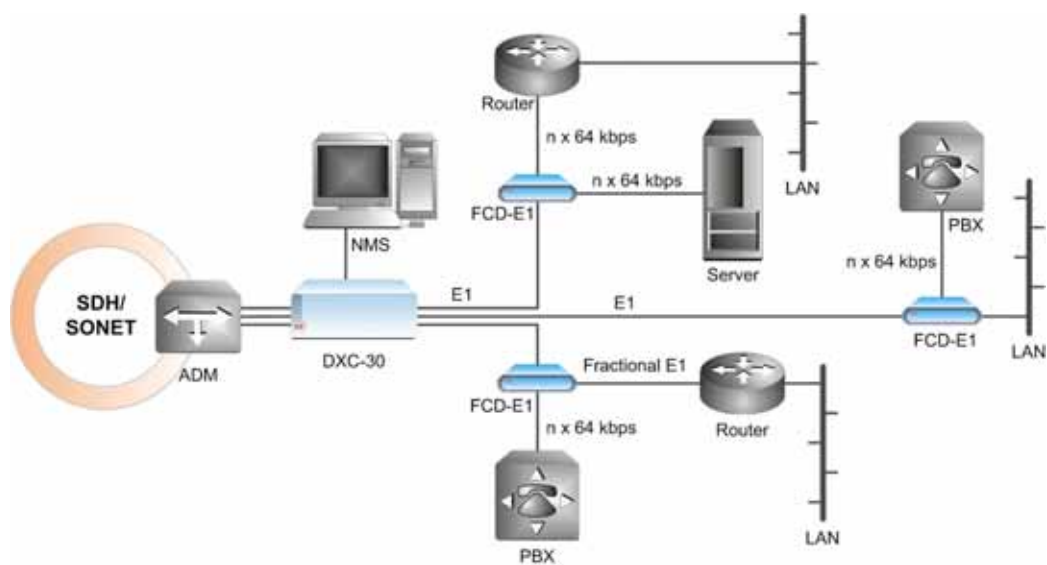


Figure 3. SDH/Sonet Access Solution for Multiple Remote Sites

Specifications

E1 MAIN LINK AND SUBLINK

E1 Framing

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

Bit Rate

2.048 Mbps

Line Code

HDB3

E1 Signal Level

Receive:

0 to -10 dB without LTU

0 to -36 dB with LTU (main link only)

Transmit:

$\pm 3V$ ($\pm 10\%$), balanced

$\pm 2.37V$ ($\pm 10\%$), unbalanced

E1 Main Link Performance Monitoring

Local support of CRC-4

Full statistical diagnostics according to RFC-1406

Line Impedance

120 Ω , balanced

75 Ω , unbalanced

Connectors

RJ-45, 8-pin, balanced

Two BNC coaxial, unbalanced

Main Link Timing

Internal accuracy: ± 30 ppm

Loopback timing: ± 130 ppm

Sub-E1: 2.048 Mbps ± 130 ppm

External timing from data port: $n \times 56$,
 $n \times 64 \pm 130$ ppm

Sublink Timing

Locked on the main link

Compliance

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

E1 Jitter Performance

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

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DATA PORTS

Number of Data Ports

One or two (see *Ordering*)

Interface

RS-530, V.35, X.21, V.36/RS-449

Connectors

D-type 25-pin, female RS-530 pinout

Data Rate

$n \times 56$ or $n \times 64$ kbps ($n=1,2,\dots,31$)

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 local sync
loss state

MANAGEMENT

Management Ports

Number of ports: 2 (CONTROL DCE and
CONTROL DTE)

Interface: V.24/RS-232

Connector: 9-pin D-type, female

Format: asynchronous

DCE baud rate: 0.3 to 19.2 kbps, autobaud

DTE baud rate: 0.3 to 9.6 kbps

Character: 8 bit no parity, 7 bit odd or
even parity

Front Panel Control

LCD: 2 rows of 16 characters

Push-buttons: Cursor, Scroll, Enter

Indicators

PWR (green) – Power

TST (yellow) – Test

ALM (red) – Alarm

Main E1 and Sub-E1:

LOC SYNC LOSS (red): Local sync loss

REM SYNC LOSS (red): Remote sync
loss

DIAGNOSTICS

Main E1 link

Local and remote loopback

Sub-E1 port

Local and remote loopback

BER test

Data ports

Local and Remote loopback

BER test

GENERAL

Timeslot Allocation

Consecutive (bundled)

Alternate

User defined

Alarms

The last 100 alarms are time-stamped,
stored, and available for retrieval.

Alarm Relay

Three relay contacts are available on the
CONTROL DTE connector. The alarm relay
is activated by each alarm in the alarm
buffer (user-defined).

Physical

Height: 4.3 cm (1.7 in)

Width: 21.5 cm (8.5 in)

Depth: 24.3 cm (9.5 in)

Weight: 1.3 kg (2.9 lb)

Power

100–240 VAC; 47–63 Hz



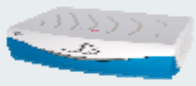


Power consumption: 10W

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-E1**E1 or Fractional E1 Access Units****Ordering****STANDARD CONFIGURATIONS****FCD-E1/S1/AC/V35****FCD-E1/AC/530****FCD-E1/S1/AC/V35/V35****FCD-E1/S1/AC/X21/X21****FCD-E1/AC/V35****SPECIAL CONFIGURATIONS****FCD-E1/*/~/&/%***Legend*

* Drop&insert copper E1 sublink
(Default=no sublink):

S1 With E1 sublink

~ Power supply (mandatory):

AC Single 100 to 240 VAC

& Data port interface:

530 RS-530**V35** V.35**X21** X.21**V36** V.36/RS-449

% Optional second data port interface:

530 RS-530**V35** V.35**X21** X.21**V36** V.36/RS-449**SUPPLIED ACCESSORIES**

AC power cord

CBL-HS2/*/#

Adapter cables for DB-25 channel connectors for use in DCE clock mode 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**OPTIONAL ACCESSORIES****CBL-HS2/*/#**

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

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

* 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 type:

F Female**M** Male**CBL-DB9F-DB9M-STR**

Control port cable

RM-17

Kit for mounting one or two FCD-E1 units into a 19-inch rack

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