FCD-E1L

Managed E1/ Fractional E1 Access Unit

RAD

- 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 integral LTU ensures a range of up to 2 km / 1.2 miles and is soft-selectable.

- Timeslot assignment is programmable, allowing data from each data port to be placed into timeslots consecutively. FCD-E1L also provides additional flexibility, by giving full user control over the data port timeslot allocation without restrictions.

- 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 for supporting different applications. The E1 main link may be clocked from the recovered receive clock, from an internal oscillator, or from the data port.

FEATURES

- Managed E1/Fractional E1 access unit

- E1 interface complies with: ITU G.703, G.704, G.706, G.732, G.823, G.826

- Supports a single data port with selectable sync data rates of n x 64 kbps

- Synchronous data interfaces: V.35, RS-530, V.36/RS-449 or X.21

- Optional Ethernet bridge with or without VLAN support or IP router as DTE interface

- Autoconfiguration function for plug-and-play operability

- SNMP agent

- Management:
  - Out-of-band via V.24 supervisory port
  - Inband via TS0 or dedicated timeslot

- Dial-in option for remote out-of-band management

- Dial-out for alarm report

- Enhanced diagnostics include:
  - User-activated local and remote loopbacks
  - Integrated BER tester
  - Inband FT1/FE1 code-activated loopback

- Stores 24 hours of E1 network performance monitoring and last 100 alarms

- Alarm mask configurable for any alarm

DESCRIPTION

- FCD-E1L is a managed access unit for E1/Fractional E1 services. It can be used as a rate and interface converter for E1 and Fractional E1 services.

- FCD-E1L 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 DXC and FCD-E1L units operate together with centralized SNMP network management.

FCD-E1L

Managed E1/ Fractional E1 Access Unit

- FCD-E1L features front panel LEDs to indicate transmit/receive activity, E1 signal loss condition and diagnostic loopback operation. The rear panel LEDs of the Ethernet interface modules indicate the LAN status and activity.

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

USER INTERFACES

- FCD-E1L supports a wide range of digital interfaces: RS-530, V.35, X.21, and V.36/RS-449. In addition, FCD-E1L supports Ethernet interface modules with a built-in bridge (IR-ETH, IR-ETH/Q, IR-ETH/QN) or an IP router (IR-IP), which allow LAN-to-LAN connectivity over UTP or BNC media.

- The synchronous data ports can operate in the following clock modes:
  - **DCE**: FCD-E1L provides both transmit and receive clocks with optional sampling of the incoming data with an inverted clock
  - **DTE1**: FCD-E1L provides transmit clock, attached equipment provides receive clock
  - **DTE2**: attached equipment provides both transmit and receive clocks

- When equipped with IR-ETH, IR-ETH/Q or IR-ETH/QN interface modules, FCD-E1L transparently connects remote LANs, as well as VLANs, over unframed E1 links, utilizing the full E1 bandwidth, and filters Ethernet frames, forwarding only frames destined to the WAN.

- The IR-ETH/QN port has the 10/100BaseT interface and supports autonegotiation and VLAN frames.

- FCD-E1L equipped with the IR-IP interface module operates as an IP gateway, forwarding IP packets destined to the IP network. This prevents broadcast to the WAN and enables the LAN users to register for an IP multicast group.

- FCD-E1L with the IR-IP interface module connects the local IP networks to the public networks at full E1 speed, in contrast to connection over statistical protocols, such as Frame Relay.

- The IR-ETH/QN port is available with 10/100BaseT interface. Other Ethernet ports are available with 10BaseT (UTP) or 10Base2 (BNC) interfaces.

MANAGEMENT & MAINTENANCE

- Setup, control and monitoring of status and diagnostics information can be activated via:
  - ASCII terminal connected to the async control port
  - SNMP management connected to the async control port.

- FCD-E1L has an internal SNMP agent and can be managed by any generic SNMP station or by the user-friendly, GUI-based RADview SNMP network management application.

- FCD-E1L supports both dial-in and dial-out modem connections via the serial V.24/RS-232 port, by using SLIP protocol 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 by using the spare bits (Sa bits) on Timeslot 0 (TS0) or by using a dedicated timeslot with the standard Frame Relay (RFC 1490) or RAD proprietary protocol. This allows setup, monitoring and diagnostics of the remote unit. Inband access by using spare bits on TS0 is possible only if these bits are passed transparently end-to-end.

APPLICATION
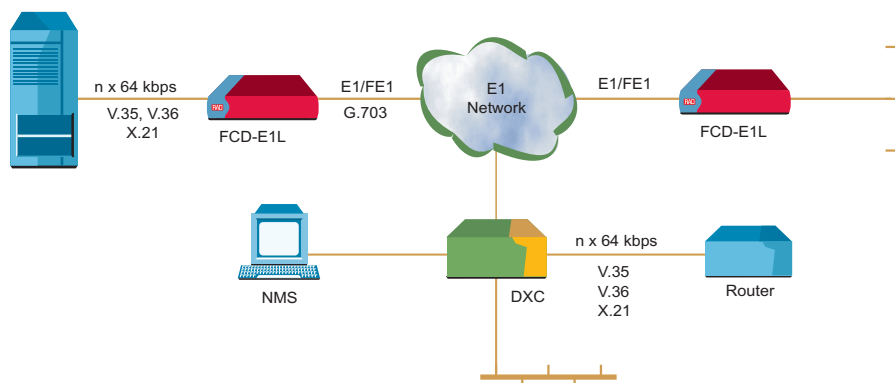
- Maintenance capabilities include user-activated local and remote loopbacks at the E1 main link and data port. The user can also activate a BER test on the data port. Additionally, the data port responds to an ANSI FT1 inband loop code (RDL), generated from the remote FCD-E1L or DXC in a specific bundle of timeslots allocated only to that port.

- 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.

SPECIFICATIONS

E1 INTERFACE

- **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**
  HDB3

- **Impedance**
  120Ω, balanced
  75Ω, unbalanced

- **Signal Level**
  Receive:
    0 to -36 dB with LTU
    0 to -10 dB without LTU
  Transmit:
    ±3V (±10%), balanced
    ±2.37V (±10%), unbalanced

- **Jitter/Wander**
  As per ITU G.823,
  ETSI TBR-12 and TBR-13

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

- **Transmit Timing**
  Locked to the nodal clock

- **Compliance**
  ITU G.703, G.704, G.706, G.732

- **Performance Monitoring**
  Local support of CRC-4
  Statistics according to RFC 1406
  and G.826

DATA PORT

- **Connectors**
  D-type 25-pin RS-530, female
  V.35, X.21, and V.36/RS-449.

- **Data Rate**
  n x 64 kbps (n=1,2...,31)

- **Clock Modes**
  DCE: RX and TX clock to user device
  DTE1: RX clock to user device; TX clock from user device
  DTE2: RX and TX clock from user device

- **Control Signals**
  - CTS follows RTS or constantly ON, soft-selectable
  - DSR constantly ON, unless in test mode
  - DCD constantly ON, unless in sync loss

ETHERNET BRIDGE/ROUTER PORT
  Refer to *Table 1* below.

- **Connectors**
  10BaseT (UTP): Shielded RJ-45
  10/100BaseT (UTP): Shielded RJ-45
  10Base2 (BNC): Two BNC coaxial
  (not for IR-ETH/QN)

GENERAL

- **Nodal Clock**
  Internal clock:
    ±50 ppm
  Loopback timing:
    ±130 ppm
  External timing from data port:
  ±130 ppm

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

- **Timeslot Allocation**
  Consecutive (bundled)
  User-defined

- **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

Table 1. Ethernet Interface Modules Characteristics

Interface Module	LAN Table [addresses]	Filtering & Forwarding [frames per second]	Buffer [frames]	Delay [frames]	Line Code	WAN Protocol
IR-ETH	10,000	15,000	256	1	Manchester	HDLC
IR-ETH/Q	2,000	2,000	256	1	Manchester	HDLC
IR-ETH/QN	1,024	150,000	85	1	• 10BaseT: Manchester • 100BaseT: MLT3	HDLC
IR-IP	–	–	256	1	Manchester	• PPP (PAP/CHAP) • Frame Relay (RFC 1490) • HDLC

Note: *All the Ethernet interface modules conform to the IEEE 802.3/Ethernet V2 standard. Additionally, IR-ETH/Q supports IEEE 802.1/q frames, and IR-ETH/QN conforms to IEEE 802.1q (relevant parts), 802.1p and 802.3x.*

Managed E1/Fractional E1 Access Unit

- **Indicators**
  PWR: Power is ON
  TST: Test is active
  ALM MAJ: Major alarm condition
  ALM MIN: Minor alarm condition
  LOC SYNC LOSS: Local loss of
  synchronization on the E1 link
  REM SYNC LOSS: Remote loss of
  synchronization on the E1 link
  AUTO CONFIGURATION:
  Monitors E1 learning process

- **Front Panel Controls**
  AUTO CONFIGURATION
  push-button

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

- **Physical**
  Height: 44 mm / 1.75 in
  Width: 215 mm / 8.5 in
  Depth: 243 mm / 9.6 in
  Weight   0.9   kg / 2.0 lb

- **Power**
  AC: 100 to 240 VAC; 47 to 63 Hz
  DC: -48 VDC (36 to 72 VDC)
  Power consumption: 5W max.

- **Environment**
  Temperature: 0-50°C / 32-122°F
  Humidity: up to 90%,
                non condensing

ORDERING

FCD-E1L/*/~/&
E1/Fractional E1 Access Unit

* Specify main link interface:
B for balanced with RJ-45
connector
U for unbalanced with BNC
connector

~ Specify power supply voltage:
AC for 110 VAC to 240 VAC
48 for -48 VDC

& Specify data port interface:
530 for RS-530 interface
V35 for V.35 interface
X21 for X.21 interface
449 for RS-449 interface

ETUB for UTP Ethernet bridge
(10BaseT)
ETBB for BNC Ethernet bridge
(10Base2)
ETUQ for UTP Ethernet bridge
VLAN (10BaseT)
ETBQ for BNC Ethernet bridge
VLAN (10Base2)
ETQN for UTP Ethernet bridge
VLAN (10/100BaseT)
ETUR for UTP Ethernet router
(10BaseT)
ETBR for BNC Ethernet router
(10Base2)

CABLES

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

Note: Cables for DCE clock mode are
supplied in accordance with order.
Cables for DTE1 and DTE2 clock
modes are to be ordered separately.

RM-28
Hardware for mounting one or two
units in a 19" rack