FCD-E1L, FCD-T1L

E1/T1 or Fractional E1/T1 Managed Access Units

FEATURES

- Managed access device for E1/T1 or Fractional E1/T1 services
- E1/T1 main link interfaces support both framed and unframed data
- One or two data ports with selectable sync data rates of n × 64 kbps
- Serial data port interfaces: V.35, RS-530, V.36/RS-449, V.24, or X.21
- Optional Ethernet or Fast Ethernet bridge (with or without VLAN support) or IP router
- Autoconfiguration function for plug-and-play operability
- SNMP agent
- Management:
  - Out-of-band via V.24 supervisory port
  - Inband via TS0 or dedicated timeslot over Frame Relay
- Dial-in option for remote out-of-band management
- Dial-out for alarm report
- Enhanced diagnostics:
  - User-activated local and remote loopbacks
  - Integrated BER tester
  - Fractional E1/T1 inband loop
- Stores 24 hours of monitored E1 network performance and last 100 alarms
- Alarm mask configurable for any alarm

DESCRIPTION

- FCD-E1L and FCD-T1L are managed access units that can be used as rate and interface converters for E1/T1 and fractional E1/T1 services.
- FCD-E1L and FCD-T1L support a single- or dual-serial n × 64 kbps data user interface. Instead of a serial data interface port, an Ethernet LAN interface can be ordered, allowing LAN-to-LAN connectivity over TDM media.
- FCD-E1L and FCD-T1L operates with RAD's modular DXC (DACS) products, as well as E1/T1 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.
- 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).
- The T1 interface is compatible with virtually all carrier provided T1 services, including ASDS from AT&T and complies with TR-62421. The T1 interface supports D4 and ESF framing formats. Zero suppression over the line is selectable for either transparent, B7ZS, or B8ZS coding. The software-selectable integral CSU ensures a range of up to 2.1 km (1.3 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 and FCD-T1L feature autoconfiguration for plug-and-play connectivity. Upon connection to the E1/T1 link, the units detect the E1/T1 parameters and perform autoconfiguration accordingly. This E1/T1 learning process can be activated via either a push-button on the FCD-E1L/FCD-T1L front panel or a terminal command. The state of the learning process is monitored by a dedicated LED indicator and/or supervision terminal messages.

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- Multiple clock source selection ensures maximum flexibility to support different applications. The E1/T1 main link may be timed from an internal oscillator, the recovered receive clock, or one of the data ports.
- Front panel LEDs indicate alarms, an E1/T1 signal loss condition, and diagnostic loopback operation. Rear panel LEDs on the Ethernet interface modules indicate activity and status of the LAN.
- FCD-E1L and FCD-T1L are compact standalone units. A rack mount adapter kit enables installation of one or two (side-by-side) units in a 19-inch rack (see *Ordering*).

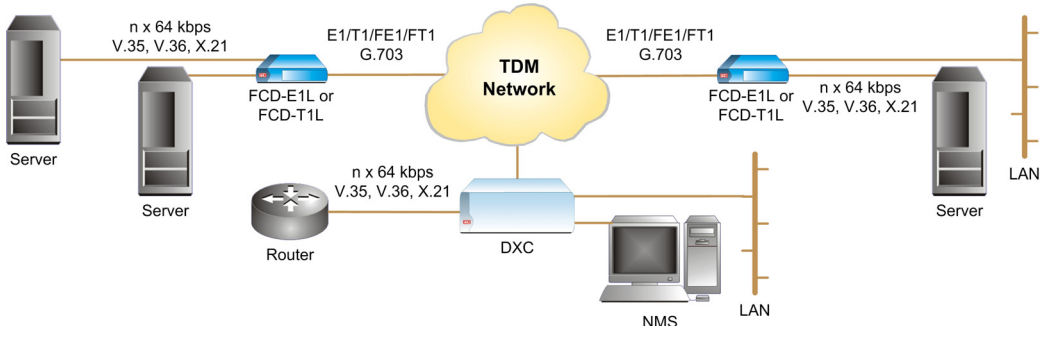
USER INTERFACES

- FCD-E1L and FCD-T1L support 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 bridge (IR-ETH, IR-ETH/Q, IR-ETH/QN) or an IP router (IR-IP).
- The synchronous data ports can operate in the following clock modes:
  - **DCE**: the unit provides both transmit and receive clocks to the user equipment, with optional sampling of incoming data with an inverted clock.
  - **DTE1**: the FCD unit provides the transmit clock, the attached user equipment provides the receive clock
  - **DTE2**: the attached user equipment provides both transmit and receive clocks.
- When equipped with IR-ETH, IR-ETH/Q, or IR-ETH/QN interface modules, FCD-E1L and FCD-T1L transparently connect remote LANs over E1/T1 links. They filter Ethernet frames, forwarding only frames that are destined to the WAN. The IR-ETH/QN port supports autonegotiation and VLAN frames.
- When an IR-IP interface module is installed, the units operate as IP gateways to forward IP packets that are destined to the IP network. This prevents broadcast to the WAN and enables LAN users to register for IP multicast groups.
- FCD-E1L and FCD-T1L with the IR-IP interface module also connect local IP networks to public networks at full E1/T1 speed, in contrast with connection over statistical protocols, such as Frame Relay.
- The IR-ETH/QN port has a 10/100BaseT interface while other Ethernet ports have 10BaseT (UTP) interfaces.

MANAGEMENT AND MAINTENANCE

- 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 and FCD-T1L have an internal SNMP agent that is managed by any generic SNMP station or by the RADview SNMP network management application.
- The units support both dial-in and dial-out modem connections through the serial RS-232 port, by using SLIP or PPP protocol, 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.
- Inband management can be performed either via a dedicated timeslot with the standard Frame Relay (RFC 1490), or by using the spare bits (S_a bits) on Timeslot 0 (FCD-E1L) or FDL bits (FCD-T1L). This allows the user to set up, monitor, and run diagnostics on the remote unit. If spare bits on TS0 or FDL are used for inband access, they must be passed transparently end-to-end.
- Maintenance capabilities include user activated local and remote loopbacks on the E1/T1 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 (T1E1.2/93-003) inband loop code, generated by the remote FCD-E1L, FCD-T1L, or DXC in a specific bundle of timeslots allocated only to that port.

APPLICATION



- E1 network statistics are stored in memory, according to RFC 1406. Statistical information can be retrieved locally through the control port.
- T1 network statistics are stored in memory, according to ANSI and AT&T standards. The statistical information may be retrieved by the service provider (ANSI only) or locally through the control port.

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

T1 MAIN LINK

- **Framing**
  - D4
  - ESF
  - Unframed
- **Bit Rate**
  1.544 Mbps
- **Line Code**
  AMI
- **Zero Suppression**
  Transparent, B7ZS, B8ZS
- **Line Impedance**
  100Ω, balanced
- **Transmit Timing**
  Locked to the system clock
- **Signal Level**
  - Receive:
    0 to -10 dB without CSU
    0 to -36 dB with CSU (main link only)
  - Transmit:
    0, -7.5, -15, -22.5 dB with CSU
    ±3V,±10% soft-adjustable at 0 to 655 ft without CSU
- **T1 Jitter Performance**
  As per AT&T TR-62411
- **Connector**
  RJ-45, 8-pin, balanced
- **Compliance**
  AT&T TR-62411, AT&T 54016, AT&T TR-62421, ANSI T1.403
- **Performance Monitoring**
  - Local support of ESF diagnostics according to AT&T PUB 54016
  - Full statistical diagnostics according to ANSI T1.403-198

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 × 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 (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/ROUTER PORT

See *Table 1*

- **Interface and Connectors**
  - IR-ETH, IR-ETH/Q, IR-IP: 10BaseT (UTP) with shielded RJ-45
  - IR-ETH/QN: 10/100BaseT (UTP) with shielded RJ-45

DIAGNOSTICS

- **Main E1/T1 link**
  Local and remote loopback
- **Data Port**
  - Local loopback
  - Remote loopback
  - Data port BER test
  - Inband code activated loopback per data port
  - T1 network loopback, code-activated (FCD-T1L only)

GENERAL

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

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- **Indicators**
  General: PWR (green), TST (yellow), ALM MAJ, ALM MIN (red), AUTO ONFIGURATION (red or green)
  Main E1: LOC SYNC LOSS (red), REM SYNC LOSS (red)
  Main T1: RED ALARM (red), YEL ALARM (yellow)
- **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°–50°C (32°–122°F)
  Humidity: up to 90%, non-condensing

ORDERING

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

FCD-T1L/~/&/%
T1/Fractional T1 Access Unit

* Specify E1 main link interface type:
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
V35 for V.35
X21 for X.21
449 for V.36/RS-449

% Specify optional second data port interface:
530 for RS-530 interface
V35 for V.35 interface
X21 for X.21 interface
V24 for V.24 interface
449 for RS-449 interface
ETUB for IR-ETH Ethernet bridge (10BaseT)
ETUQ for IR-ETH/Q Ethernet bridge VLAN (10BaseT)
ETQN for IR-ETH/QN Ethernet bridge VLAN (10/100BaseT)
ETUR for IR-IP Ethernet router (10BaseT)

SUPPLIED ACCESSORIES

AC power cord (when AC power supply is ordered)

DC adapter plug (when DC power supply is ordered)

The following cables (suitable for use in DCE clock mode only) are supplied for each data port interface specified. Cable length is 2m (6 ft):

CBL-HS2/V/1 for 34-pin V.35
CBL-HS2/R/1 for 37-pin V.36/RS-449
CBL-HS2/X/1 for 15-pin X.21

OPTIONAL ACCESSORIES

CBL-HS2/*/#
Adapter cables for DB-25 channel connectors

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

Specify cable connector type:
F for female
M for male

CBL-DB9F-DB9M-STR
Control port cable

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

Table 1. Ethernet Interface Modules Characteristics

Interface Module	LAN Table [addresses]	Filtering & Forwarding [frames per second]	Buffer [frames]	Line Code	WAN Protocol
IR-ETH	10,000	15,000	256	Manchester	HDLC
IR-ETH/Q	2,000	2,000	256	Manchester	HDLC
IR-ETH/QN	512	150,000	85	▪ 10BaseT: Manchester ▪ 100BaseT: MLT3	HDLC
IR-IP	–	–	256	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.*

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