

# FCD-E1LC, FCD-T1LC

Managed E1/T1 or Fractional E1/T1 Access Unit



## FEATURES

- Managed access units for E1/T1 or Fractional E1/T1 service
- E1/T1 main link and sublink support both framed and unframed signals
- One or two data ports with selectable sync data rates of  $n \times 56$  kbps or  $n \times 64$  kbps with serial data port interfaces: V.35, RS-530, V.36/RS-449, or X.21
- Optional sub-E1/T1 drop-and-insert port for PBX connectivity
- Optional Ethernet 10/100BaseT bridge (with or without VLAN support)
- SNMP agent
- Management:
  - Out-of-band via RS-232 supervisory port
  - Inband via TSO over E1, F Bit over T1, or dedicated timeslot using Frame Relay Protocol (RFC 1490)
- 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
  - Fractional E1/T1 inband loop
- Monitors and stores 24 hours of E1 or T1 network performance and last 100 alarms
- Alarm mask configurable for any alarm

## DESCRIPTION

- FCD-E1LC and FCD-T1LC interconnect with RAD modular DXC (DACS) products and E1/T1 equipment from other vendors, to support multilink star applications such as access to SDH networks. DXC, FCD, and Megaplex units operate together under 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. The E1 interface also accepts a 2048-kbps data stream and converts it to an ITU-T Rec. G.703 unframed signal for transport over the E1 main link and sublink. Line code is HDB3. The integral LTU ensures a range of up to 2 km (1.2 miles) and is software selectable.
- The T1 interface is compatible with virtually all carrier-provided T1 services, including ASDS from AT&T, and complies with TR-62411 and TR-62421. The T1 interface supports D4 and ESF framing formats. Zero suppression over the line is software-selectable for either transparent, B7ZS or B8ZS. The software-selectable integral CSU ensures a range of up to 2.1 km (1.3 miles).
- 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.
- FCD-E1LC and FCD-T1LC are managed access units that can convert rates and interfaces for E1/T1 and Fractional E1/T1 services.
- FCD-E1LC and FCD-T1LC support a single or dual serial  $n \times 56$  kbps or  $n \times 64$  kbps data user interface. An Ethernet LAN interface can substitute the serial data interface port to allow LAN-to-LAN connectivity over TDM media.

# FCD-E1LC, FCD-T1LC

## Managed E1/T1 or Fractional E1/T1 Access Unit

- The optional sub-T1 port can be configured with D4 or ESF framing, while the T1 main link framing is ESF. This enables connection of T1 D4 equipment over an ESF T1 network.
- The unit can be programmed to assign data automatically from each data port into consecutive timeslots. The user can also assign timeslots manually.
- Multiple clock source selection ensures maximum flexibility for supporting different applications. Timing for the E1/T1 main link and sublink may come from the recovered receive clock, an internal oscillator, or one of the data ports.
- Front panel LEDs indicate alarms, E1/T1 signal loss, and diagnostic loopback operation. Rear panel LEDs on the Ethernet interface modules indicate LAN status and activity.
- FCD-E1LC and FCD-T1LC 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*).

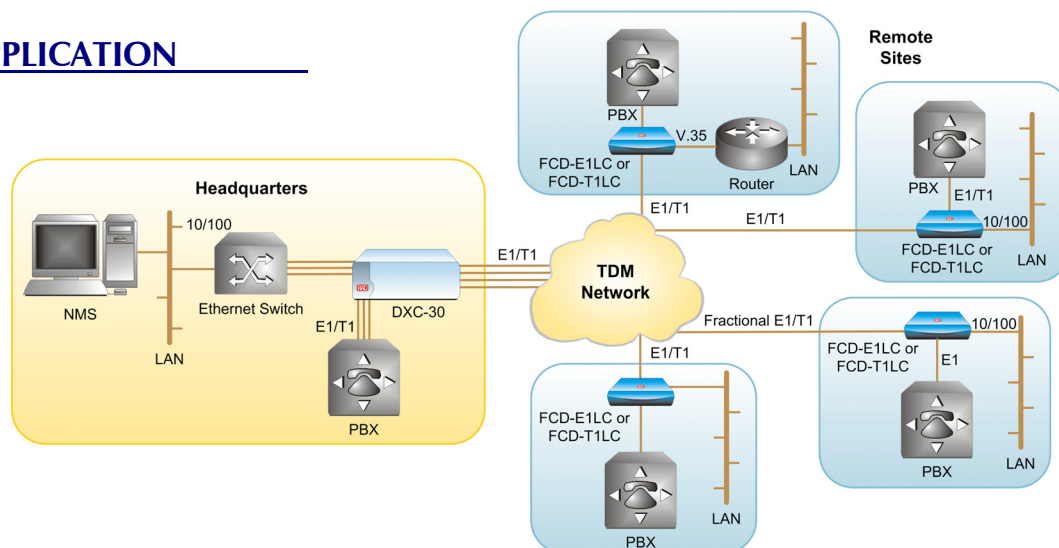
### USER INTERFACES

- FCD-E1LC and FCD-T1LC feature the following user interfaces:
  - Serial data interfaces: RS-530, V.35, X.21, V.36/RS-449
  - Ethernet 10/100BaseT LAN interface module with a built-in bridge (IR-ETH/QN).
- FCD-E1LC and FCD-T1LC have synchronous data ports that operate in the following clock modes:
  - DCE: The FCD units provide both transmit and receive clocks to the user equipment, with optional sampling of the incoming data with an inverted clock.
  - DTE1: The FCD units provide the transmit clock. The attached user equipment provides the receive clock.
  - DTE2: the attached user equipment provides both transmit and receive clocks.
- The IR-ETH/QN interface module has a 10/100BaseT interface that supports VLAN frames, autonegotiation, fault propagation, and automatic learning and aging. The module transparently connects FCD-E1LC and FCD-T1LC to remote LANs over E1/T1 links. It filters Ethernet frames and forwards only frames that are destined for the WAN.

### MANAGEMENT & 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-E1LC and FCD-T1LC 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.
- Up to 100 time-stamped alarms are available for retrieval through the supervision terminal, a Telnet host, or a RADview management station.

## APPLICATION



# FCD-E1LC, FCD-T1LC

## Managed E1/T1 or Fractional E1/T1 Access Unit

- Inband management can be performed either by dedicated timeslot using standard Frame Relay protocol (RFC 1490), or by using the spare Sa bits on Timeslot 0 for FCD-E1LC or FDL bits for FCD-T1LC. This allows the user to setup, 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, sublink, and data ports. The user can activate a BER test on the main link. Also, the main link responds to an ANSI FT1 RDL (T1E1.2/93-003) inband loop code, or a user-configured pattern generated by a remote FCD-E1LC, FCD-T1LC, or DXC in a specific bundle of timeslots allocated only to that port. The user can also define BER or inband tests to run on any timeslot.
- 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.
- **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
  - 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, using adaptor cable (see *Ordering*)
- **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
- **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 via adaptor cables to
  - V.35
  - X.21
  - V.36/RS-449 (see *Ordering*)
- **Data Rate**  
n × 56/64 kbps (n=1 to 24) for T1  
n × 64 kbps (n=1 to 31) for E1
- **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)  
DTE2: RX and TX clock from user device (not for X.21)
- **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 PORT

- **Interface and Connector**  
10/100BaseT (UTP) with shielded RJ-45
- **Maximum Frame Length**  
1536 bytes
- **LAN Table**  
2048 MAC addresses

## SPECIFICATIONS

### E1 MAIN LINK AND SUBLINK

- **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

### T1 MAIN LINK AND SUBLINK

- **Framing**
  - D4
  - ESF
  - Unframed (main link only)
- **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

# FCD-E1LC, FCD-T1LC

## Managed E1/T1 or Fractional E1/T1 Access Unit

- **Throughput**  
4,000 pps
- **Latency**  
300  $\mu$ sec (64-byte frame size, 2M LAN rate)
- **Buffer**  
120 frames
- **Line Code**  
10BaseT: Manchester  
100BaseT: MLT3
- **Wan Protocol**  
HDLC

### DIAGNOSTICS

- **Main E1/T1 link**
  - Local loopback
  - Remote loopback
  - BER test
  - Code-activated inband loopback per data port
  - Code-activated T1 network loopback (FCD-T1LC only)
- **Sublink**
  - Local loopback
  - Remote loopback
  - Code-activated T1 network loopback (FCD-T1LC only)
- **Data Port**
  - Local loopback
  - Remote loopback

### 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:  
RS-232, 9-pin D-type, female
  - Format: Asynchronous
  - Baud rate: 1.2–115.2 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 (red)  
Main/Sub-E1: LOC SYNC LOSS (red), REM SYNC LOSS (red)  
Main/Sub-T1: RED ALARM (red), YEL ALARM (yellow)
- **Physical**  
Height: 4.4 cm (1.7 in)  
Width: 24.0 cm (9.4 in)  
Depth: 17.0 cm (6.7 in)  
Weight 0.8 kg (1.8 lbs)
- **Power**  
AC/DC: 100 to 240 VAC,  
–48 to –60 VDC, nominal  
Power consumption: 5W max.
- **Environment**  
Temperature: 0°–50°C  
(32°–122°F)  
Humidity: up to 90%,  
non condensing

## ORDERING

**FCD-E1LC/&/\*/%**  
E1 or Fractional E1 Access Unit

**FCD-T1LC/&/\*/%**  
T1 or Fractional T1 Access Unit

**&** Specify data port interface:

**530** for RS-530

**V35** for V.35

**X21** for X.21

**V36** for V.36/RS-449

**\*** Specify **S1** for optional drop-and-insert E1/T1 sublink

**%** Specify optional second data port interface:

**530** for RS-530 interface

**V35** for V.35 interface

**X21** for X.21 interface

**V36** for V.36/RS-449

**ETQN** for 10/100BaseT Ethernet bridge with VLAN support

### SUPPLIED ACCESSORIES

Power cord and AC/DC adapter plug

**CBL-RJ45/2BNC/E1/X**

Interface adapter cable, single RJ-45 to two BNC connectors, 15 cm (6 in) (supplied when unbalanced E1 interface is ordered)

**CBL-RJ45/2BNC/E1**

Interface adapter cable, single RJ-45 to two BNC connectors, 15 cm (6 in) (supplied when unbalanced sublink interface is ordered)

The following cables are supplied for each data port interface specified when operating in DCE clock mode:

**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

**RM-33-2**

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

**CBL-DB9F-DB9M-STR**

Control port cable

The following cables convert 25-pin data port connectors into the respective interface. Cable length is 2m (6 ft).

**CBL-HS2/\*/#**

Adaptor 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



data communications

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