

FCD-T1M

Modular T1 or Fractional T1 CSU/DSU



FEATURES

- T1 or Fractional T1 CSU/DSU
- Supports one data port with selectable sync data rates: n x 56, n x 64 kbps
- Optional sub-T1 drop & insert port for PABX connectivity
- Single slot supports MEGAPLEX I/O modules
- Fail-safe sub-T1 link ensuring uninterrupted service (G.703 only)
- Data interfaces: V.35, RS-530, V.36/RS-449 or X.21
- Optional high performance built-in Ethernet bridge/router
- SNMP agent
- Management:
 - Out-of-band via V.24 supervisory port or Ethernet management port
 - Inband via dedicated timeslot
- Dial-in option for remote out-of-band management
- Dial-out for alarm report
- The T1 main link can be supplied with the following options:
 - Built-in integral CSU/DSU
 - Fiber optic interface
- T1 interface complies with: AT&T TR62411, TR62421, ANSI T1.403 and AT&T 54016 (local support)
- Enhanced diagnostics include:
 - User activated local and remote loopbacks
 - Integrated BER tester
 - Fractional T1 inband loop
- Stores 24 hours of T1 network performance monitoring and last 100 alarms
- Relay activation upon alarm event
- Alarm mask configurable for any alarm

DESCRIPTION

- FCD-T1M is a CSU/DSU for T1 or fractional T1 services. It can be used as a dedicated access multiplexer for business customers, providing modular integration of voice and data traffic over T1 or Fractional T1 services (see *Figure 1*).
- FCD-T1M also operates opposite RAD's modular DXC (multiservice access node) products or other vendors' T1 equipment, for multilink star applications, such as access to SONET networks. The DXCs and FCD-T1M operate together with centralized SNMP network management (see *Figure 2*).
- FCD-T1M can be ordered with a regular T1 (including an integral CSU) or a fiber optic link. Both configurations are also available with an optional sub-T1 drop & insert port. The unit includes one data port or an optional Ethernet bridge/router port.
- FCD-T1M includes a single I/O module slot that supports one Megaplex I/O module. This provides field upgrade and service profile change capabilities that are available only on larger modular devices (for full module details and ordering information, see individual module data sheets).

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BASIC UNIT

- The basic unit includes power supply, T1 link with integral CSU and one data port.
- 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 framed formats. Zero suppression over the line is selectable for either transparent, B7ZS or B8ZS. The integral CSU ensures a range of up to one mile.
- FCD-T1M can be ordered with a fiber optic link, which eliminates the need for an external fiber optic modem. The fiber optic link provides a secure link in hazardous or hostile environments. It complies with ITU standards G.921 and G.956.
- Four fiber optic interfaces are available:
 - 850 nm LED for use over multimode fiber at distances up to 3 miles
 - 1300 nm LED for use over single mode fiber at distances up to 29 miles
 - 1300 nm laser diode for use over single mode fiber at distances up to 38 miles
 - 1550 nm laser diode for use over single mode fiber for extended range up to 62 miles.

- Timeslot assignment is programmable, allowing data from each data port and from the sub-T1 port to be placed into timeslots (DS0s) consecutively. FCD-T1M also provides additional flexibility, by giving full user control over the data ports timeslot allocation without restrictions.
- Multiple clock source selection ensures maximum flexibility for supporting different applications. The T1 main link may be clocked from the recovered receive clock, from an internal oscillator, from one of the data ports or from the sub-T1 port.
- Bypassing the sub-T1 port to the main link (non-fiber optic), ensures uninterrupted service to the sub-T1 port and provides immunity to hardware or power failures.
- FCD-T1M is available as a standalone unit. A rack mount adapter kit enables installation of the unit in a 19" rack.

USER INTERFACE

- The following data port interfaces can be ordered: V.35, RS-530, V.36/RS-449 or X.21. The ports can operate in the following clock modes:
 - DCE transmit and receive clocks are output
 - DTE1 external transmit clock is input (coming from the user DTE)
 - DTE2 both the transmit and receive clocks are externally input
 - Invert data is sampled using an invert clock.

- The optional built-in Ethernet bridge is a high performance remote, self-learning bridge. It is ideal as a LAN extender or segmenter over T1 link applications. The LAN table stores up to 10,000 addresses and is automatically updated. Filtering and forwarding is performed at the maximum theoretical rate of 15,000 pps (wire speed) and the buffer can hold 256 frames with a throughput latency of 1 frame. Filtering can be disabled for extender or segmenter applications. The Ethernet port is available with 10BaseT (UTP) interface, which operates in full duplex.
- The optional built-in Ethernet router is a high performance remote IP router. It is ideal as a LAN extender or segmenter over bit-stream type infrastructures. The router receives Ethernet frames from the LAN and forwards packets to the IP network on the Ethernet LAN or to the WAN according to their destination. The Ethernet port is available with 10BaseT (UTP) which operates in full duplex mode.
- 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 a T1 network.

APPLICATIONS

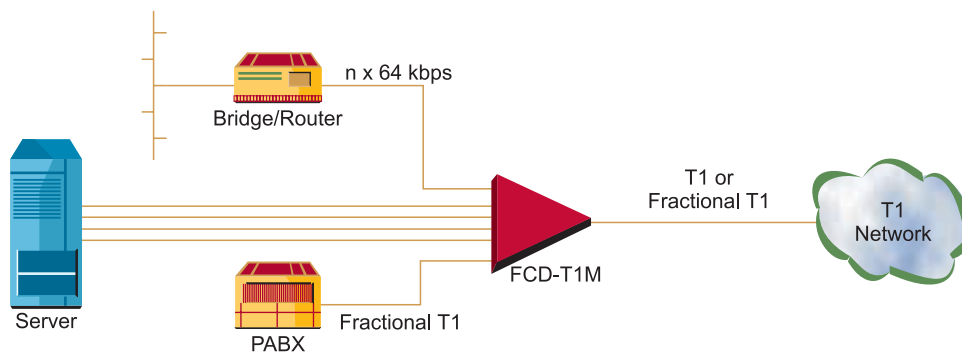


Figure 1. Connection of LAN Traffic together with PABX Traffic to T1 Network



FCD-T1M Rear Panel

FCD-T1M

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MANAGEMENT & MAINTENANCE

- Setup, control and monitoring of status and diagnostics information can be activated via:
 - ASCII terminal connected to the async control port command line interpreter
 - SNMP management connected to the async control port.
- FCD-T1M has an internal SNMP agent and can be controlled by any generic SNMP station or by the RADview SNMP network management application.
- FCD-T1M supports dial-in, dial-out modem connections. These connections can be used for remote out-of-band configuration, monitoring and for sending callout alarm messages using serial V.24 SLIP, PPP or Ethernet ports.
- Inband management can be performed by using the Facility Data Link (FDL) in the ESF framing format or by using a dedicated timeslot. This allows setup, monitoring and diagnostics of the remote unit. Inband access by using the FDL is possible only if the FDL is passed transparently end-to-end.
- When operating in the ESF format, 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.
- Maintenance capabilities include user activated local and remote loopbacks at the T1 main link, sub-T1 and data ports. FCD-T1M responds to network activated loops (PLB, LLB) when configured as CSU. The user can activate a BER test for each data or sub-T1 port, individually. Each data or sub-T1 port responds to an ANSI FT1 inband loop code, generated by the remote FCD-T1M, DXC or dedicated test equipment in a specific bundle of timeslots allocated only to that port.

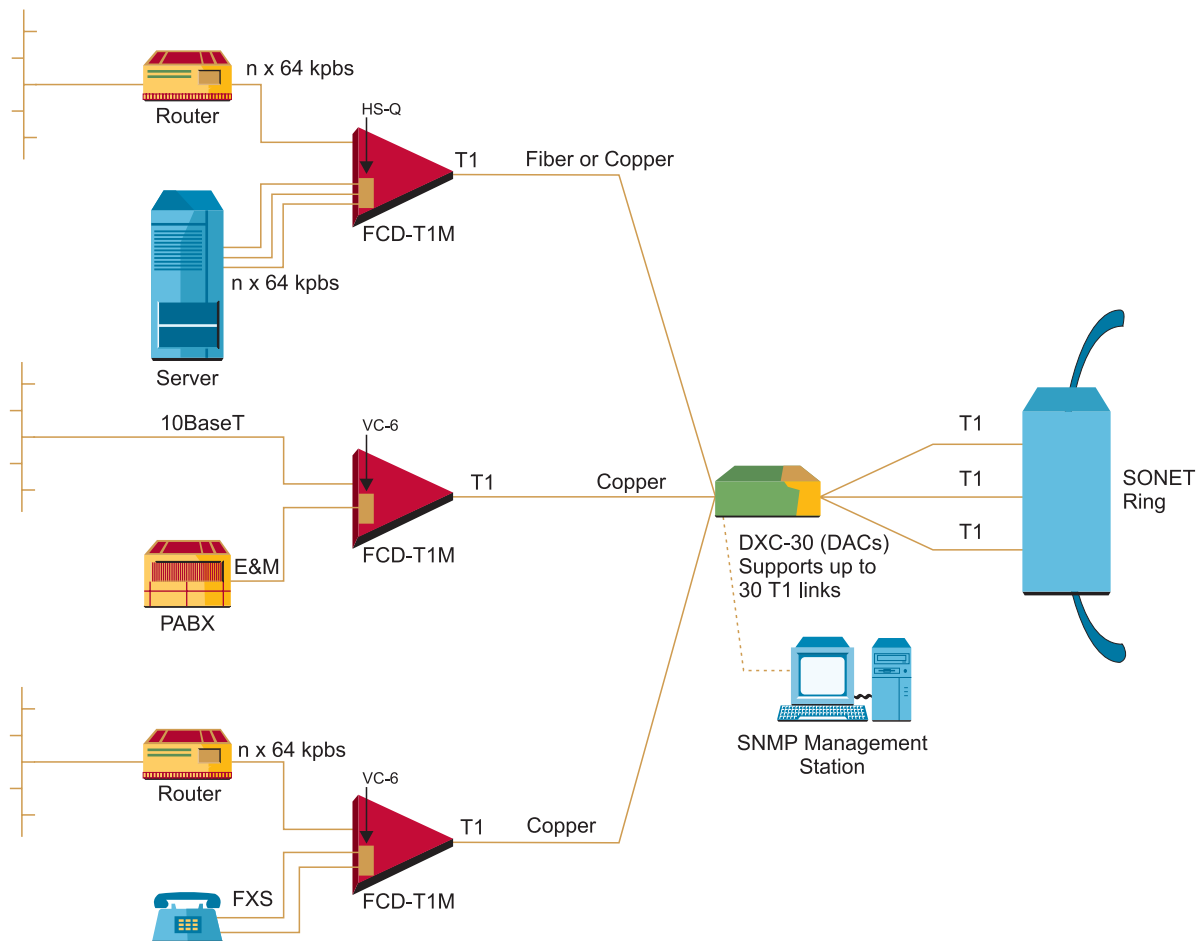


Figure 2. SDH Access Solution for Multiple Remote Sites

SPECIFICATIONS

T1 MAIN LINK

- **Framing**
D4, ESF
- **Bit Rate**
1.544 Mbps
- **Line Code**
AMI
- **Zero Suppression**
Transparent, B7ZS, B8ZS
- **Impedance**
100Ω, balanced
- **Signal Level**
Receive:
0 to -36 dB with CSU
0 to -10 dB without CSU
Transmit:
0, -7.5, -15, -22.5, dB with CSU
±3V, ±10% soft adjustable at
0 to 655 ft without CSU
- **Jitter Performance**
As per AT&T TR-62411
- **Connectors**
RJ-48c 8-pin
- **Transmit Timing**
 - Internal accuracy: ±30 ppm
 - Loopback timing: ±130 ppm
 - Sub-T1: 1.544 Mbps ±130 ppm
 - External timing from data port:
n x 56, n x 64 ±130 ppm
- **Compliance**
AT&T TR-62411, ANSI T1.403

FIBER OPTIC LINK

- **Operating Wavelength**
850, 1300 or 1550 nm (see *Ordering*)
- **Receiver Sensitivity (For BER = 1x10⁻⁹)**
 - -38 dBm at 850 nm
 - -40 dBm at 1300, 1550 nm
- **Connectors**
ST, FC/PC or SC (see *Ordering*)
- **Output Power**
 - -18 dBm for 850 nm into 62.5/125
 - -18 dBm for 1300 nm into 9/125
 - -12 dBm for 1300 and 1550 nm laser into 9/125
- **Dynamic Range**
28 dB for all types of optical interfaces

- **Budget (Max)**
 - 20 dB for 850 nm over 62.5/125
 - 22 dB for 1300 nm over 9/125
 - 28 dB for 1300 and 1550 nm laser over 9/125
- **Compliance**
AT&T TR-62411, ANSI T1.403

SUB-T1 PORT

- **Framing**
D4, ESF
- **Bit Rate**
1.544 Mbps
- **Line Code**
AMI
- **Zero Suppression**
Transparent, B7ZS, B8ZS
- **Impedance**
100Ω, balanced
- **Signal Level**
Receive:
0 to -10 dB
Transmit:
±3V, ±10%, soft adjustable at
0 to 655 ft
- **Jitter Performance**
 - As per AT&T TR-62411
 - ETSI TBR-12 and TBR-13
- **Connectors**
RJ-48c 8-pin
- **Transmit Timing**
Locked on T1 main link
- **Compliance**
AT&T TR-62411, ANSI T1.403

DATA PORT

- **Number of Data Ports**
One
- **Interface**
V.35, RS-530, V.36/RS-449, X.21
- **Connectors**
D-type 25-pin, female RS-530 pinout
- **Data Rate**
n x 56 or n x 64 kbps,
(n=1,2,...,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 RED ALARM

ETHERNET BRIDGE/ROUTER PORT

- **LAN Table (Ethernet Bridge Port)**
10,000 addresses
- **Filtering and Forwarding**
Ethernet bridge port
15,000 pps
Ethernet router port
30/35 kbps
- **Buffer**
256 frames
- **Delay**
1 frame
- **Standards**
Ethernet bridge port
Conforms to IEEE 802.3 / Ethernet
Ethernet router port
Conforms to IEEE 802.3 / Ethernet II
- **Connectors**
10BaseT (UTP): Shielded RJ-45

GENERAL

- **Timeslot Allocation**
 - Consecutive (bundled)
 - Alternate
 - User defined
- **Diagnostics**
Main T1 link:
Local and remote loopback
Sub-T1 port:
Local and remote loopback
Sub-T1 port BER test
Data port:
Local data port loopback
Remote data port loopback
Data port BER test
T1 network loopback, code activated
Inband code activated loopback per data port
- **Performance Monitoring (On T1 Main Link)**
 - Full statistical diagnostics according to ANSI T1.403-1989
 - Local support of ESF diagnostics according to AT&T PUB 54016

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- **Control Port (DCE)**
 - Interface: V.24/RS-232
 - Connector: 9-pin D-type, female
 - Format: asynchronous
 - Baud rate: 1.2 to 19.2 kbps, autobaud
 - Character: 8 bit no parity, 7 bit odd or even parity
- **Indicators**

General:
POWER (green), TST (yellow), MAJ ALARM (red), MIN ALARM (red)

Main T1:
RED SYNC LOS (red), YEL SYNC LOS (yellow)

Sub-T1:
RED SYNC LOS (red), YEL SYNC LOS (yellow)
- **Alarms**

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

3 relay contacts are available on the control DTE port. The alarm relay is activated by alarms in the alarm buffer.
- **Physical**

Height: 43.7 mm / 1.7 in
Width: 44.4 cm / 17.3 in
Depth: 24.3 cm / 9.5 in
Weight 1.3 kg / 2.9 lb
- **Power**

100-240 VAC; 47-63 Hz
-48 VDC, nominal (36-72V)
Power consumption: 6W
- **Environment**

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

ORDERING

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Modular T1 or Fractional T1 CSU/DSU

- * Specify optional drop-and-insert T1 sublink:
S1 for T1 sublink
- ~ Specify power supply voltage:
AC for 115/230 VAC
48 for -48 VDC
- \$ Specify management port interface:
V24 for V.24/RS232 (DB-9)
UTP for Ethernet 10BaseT (UTP)
BNC for Ethernet 10Base2 (BNC)
- & Specify interface:
530 for RS-530 interface
V35 for V.35 interface
X21 for X.21 interface
449 for RS-449 interface
ETUB for Ethernet bridge with 10BaseT interface
ETBB for Ethernet bridge with 10Base2 interface
ETUR for Ethernet router with 10BaseT interface
ETBR for Ethernet router with 10Base2 interface
- #+ Specify optional optical interface:
ST for ST connector
SC for SC connector
FC for FC/PC connector
- + **85** for 850 nm, multimode
13 for 1300 nm, single mode
13L for 1300 nm, single mode, laser diode
15L for 1550 nm, single mode, laser diode
(Default is G.703 electrical interface)

Cables

The following cables convert the 25-pin channel connector into the respective interface. Cable length is 6 ft, unless otherwise indicated.

- CBL-HS2V1** to connect a V.35 DTE using DCE clock mode*
- CBL-HS2V2** to connect a V.35 DCE using DTT1 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 DTT1 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*

* **DCE clock mode:** FCD-T1M provides both transmit and receive clocks

DTE1 clock mode: FCD-T1M provides transmit clock, attached DCE provides receive clock

DTE2 clock mode: attached DCE provides both transmit and receive clocks



data communications

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