

# FCD-IPM

E1/T1 or Fractional E1/T1 Modular Access Device with Integrated Router



Modular access device  
providing bundled  
services over E1/T1  
access lines

- Modular Integrated Access Device (IAD), providing bundled data, IP and telephony services over E1/T1 access lines
- E1/T1 uplink over copper or fiber optic media
- E1 over SHDSL uplink
- Variety of user interfaces that include E1, T1, analog voice, LAN and data ports
- Supports Frame Relay, PPP and MLPPP

FCD-IPM is an E1/T1 or fractional E1/T1 IAD. It enables service providers to bundle data, IP, and voice access services over a single E1 or T1 line (see *Figure 1*).

FCD-IPM features two slots for various modules:

- Single or dual sub-E1/T1 module
- 4-port or 8-port analog voice module
- 10/100BaseT 5-port LAN module
- Transparent  $n \times 64$ ,  $n \times 56$  data module.

An integrated router supports IP/IPX routing and transparent bridging.

An optional integrated 4-port Ethernet/Fast Ethernet switch can be installed in place of single or dual LAN ports.



## FCD-IPM

### E1/T1 or Fractional E1/T1 Modular Access Device with Integrated Router

A single transparent  $n \times 64$ ,  $n \times 56$  data port enables connecting an external router or other HDLC-based devices.

Supported WAN services include:

- E1 or fractional E1, with or without LTU, operating at rates of up to 2.048 Mbps
- T1 or fractional T1 CSU/DSU operating at rates of up to 1.544 Mbps
- E1 or T1 over fiber optic links
- Frame Relay with auto-learn of DLCI and maintenance protocol
- ISDN BRI ("U" or "S" interface) for data services backup.

Internet access capabilities are enhanced through:

- **IP Service Access** – authentication is provided by PAP/CHAP
- **Solid Firewall** – protects an office LAN from undesired entry from the Internet
- **NAT** – allows various LAN users to share several legal IP addresses
- **Single IP address translation** – allows a small or medium office LAN to connect to the Internet using a single IP address that can be allocated in a dynamic or static way
- **DHCP server** – allows sharing IP address pools between DHCP clients on the LAN.

FCD-IPM supports up to 12 analog voice channels. These channels are PCM-encoded with A-Law or  $\mu$ -Law. The interface options are:

- 2-wire FXS for direct connection to telephones
- 2-wire FXO for direct connection to a PBX extension line
- 2-wire or 4-wire E&M for connection to PBX tie lines.

The sub-E1/T1 or analog voice ports provide toll-quality voice transmission.

The fail-safe bypass of the built-in sub-E1/T1 link ensures the continuity of voice services in case of power supply failures. The bypass is not available for the fiber optic main links.

ISDN or PSTN backup, using an external dial-up modem, ensures the continuity of data services

An optional data port can be utilized as a second serial router port.

Configuration is easily accomplished through a quick setup menu, using a terminal attached to the control port or by Telnet access into the device over the LAN/WAN.

FCD-IPM features a variety of inband and out-of-band management options. These options include dedicated timeslot, dedicated DLCI and dial-in connectivity.

The SNMP agent provides management by RADview or any other standard SNMP management station.

Undesired access to FCD-IPM via Telnet or SNMP can be blocked or protected by a password.

The dual-level management authentication allows access to router configuration parameters, while restricting access to network configuration parameters.

Software download is available via the control port, using XMODEM or via LAN/WAN using TFTP.

Parameter file download and upload is available via LAN or WAN using TFTP.

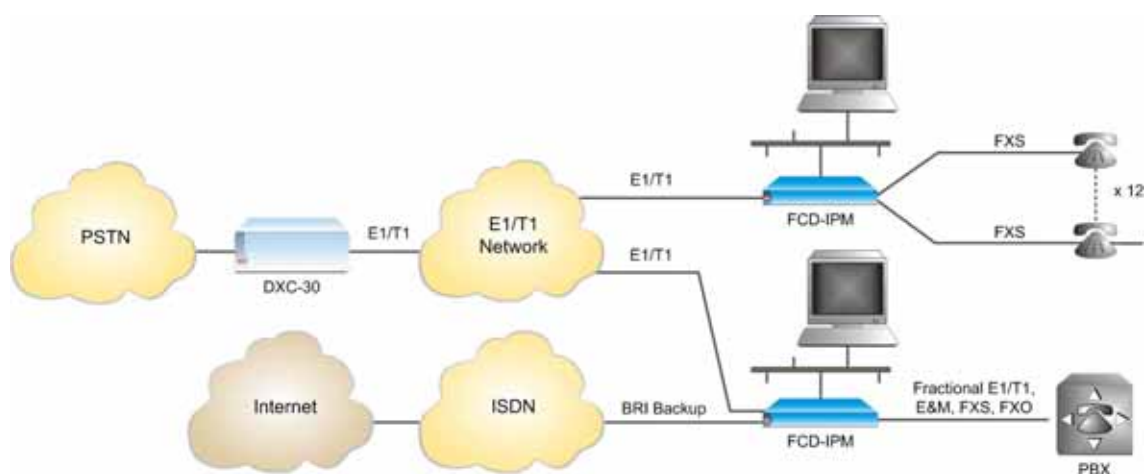


Figure 1. Bundled Services

### Specifications

#### E1 INTERFACE

**Framing**

G732N (no MF, CCS)  
G732N (no MF, CCS) with CRC-4  
G732S (TS16 MF, CAS)  
G732S (TS16 MF CAS) with CRC-4

**Bit Rate**

2.048 Mbps

**Line Code**

AMI

**Zero Suppression**

HDB3

**Impedance**

120 $\Omega$ , balanced  
75 $\Omega$ , unbalanced

**Signal Level**

Receive:

0 to -36 dB (with LTU)  
0 to -12 dB (without LTU)

Transmit:

3V ( $\pm 10\%$ ), balanced  
2.37V ( $\pm 10\%$ ), unbalanced

**Jitter Performance**

As per ITU G.823

**Compliance**

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

**Connectors**

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

**Diagnostics**

User activated local and remote loopbacks

#### T1 INTERFACE

**Framing**

D4, ESF

**Bit Rate**

1.544 Mbps

**Line Code**

AMI

**Zero Suppression**

Transparent, B7ZS, B8ZS

**Impedance**

100 $\Omega$ , balanced

**Signal Level**

Receive:

0 to -34 dB (CSU)  
0 to -10 dB (DSU)

Transmit:

0, -7.5, -15, -22.5 dB (CSU)  
0-655 ft (DSU)

**Jitter Performance**

As per AT&T TR-62411

**Compliance**

AT&T TR62411, ANSI T1.403

**Connectors**

RJ-45 8-pin, balanced

**Diagnostics**

User activated local and remote loopbacks  
Network activated loops and FDL loops  
(RLB, LLB)

**ISDN INTERFACE (DATA BACKUP)****Interfaces**

ISDN BRI, "S" and "U"

**Compliance**

ETS 300012, I.430, NTT, 5ESS, DMS-100, NI1

**ANALOG VOICE INTERFACES****Number of Voice Channels**

Up to 12

**Modulation Method**

PCM (per ITU-T G.711 and AT&T PUB-43801),  $\mu$ -Law or A-Law

**E&M Interface**

2 or 4-wire, supporting different types of E&M signaling: RS-464 Types I, II, III and V, and BT SSDC5, configured by software

**FXS Interface**

Loop start, wink start (reverse polarity) for direct connection to a 2-wire telephone, CID (Caller ID) support

**FXO Interface**

Loop start, wink start (reverse polarity) connection to a 2-wire telephone exchange subscriber line

Nominal level: 0 dBm

Nominal impedance: 600 $\Omega$

Return loss: (ERL), better than 20 dB

Frequency response (Ref: 1020 Hz)

$\pm 0.5$  dB, 300 to 3000 Hz

$\pm 1.1$  dB, 250 to 3400 Hz

Signal to total distortion, G.712, G.713 method 2:

0 to -30 dBm0, better than 33 dB

+3 to -45 dBm0, better than 22 dB

Idle channel noise: better than -70 dBm0 (+20 dBnc)

Transformer isolation: 1500 VRMS

**Diagnostics**

Local digital loopback towards the analog side

Remote analog loopback towards the

remote side, activated from local side

1 kHz tone injection towards the analog side

Activity indicators

**Connectors**

E&M: RJ-45, 8-pin

FXS, FXO: RJ-11, 6-pin

**LAN INTERFACE****Number of Ports**

1, 2, or 4

**Standards**

Conforms to Ethernet/IEEE 802.3

**Type**

Single 10/100BaseT (RJ-45)

Dual 10BaseT (RJ-45) or 10Base2 (BNC)

4-port 10/100BaseT (RJ-45) switch

# FCD-IPM

## E1/T1 or Fractional E1/T1 Modular Access Device with Integrated Router

### DATA PORT INTERFACES

#### Type

V.35 with 34-pin female  
V.24/RS-232 or RS-530 with 25-pin  
D-type, female  
X.21 with 15-pin D-type, female  
V.36/RS-422 with 37-pin  
D-type, female

#### Notes:

1. When FCD-IPM includes primary and secondary WAN interfaces, all synchronous data ports are equipped with 25-pin D-type, female connectors. See *Optional Accessories* to order adapter cables for V.35, V.36 and X.21 interfaces.
2. Data ports can only be ordered with Sub-E1 I/O modules or Voice modules.

### FIBER OPTIC INTERFACES

#### Type

See *Table 1*

#### Compliance

ITU G.921, G.956

### GENERAL

#### WAN Protocols

Frame Relay - RFC 1490  
PPP and MLPPP

#### Routing Types

Static, RIP-1, RIP-2, RIP/SAP, OSPF

#### ARP Table

Up to 300 MAC addresses

#### Power

AC: 100 to 240 VAC, 50/60 Hz, 25 VA max  
DC: 24/48 VDC

#### Physical

Height: 43.7 cm (1.7 in)  
Width: 44.4 cm (17.3 in)  
Depth: 24.3 cm (9.5 in)  
Weight: 5 kg (11 lb)

#### Environment

Temperature: 0°C to 50°C (32°F to 122°F)  
Humidity: Up to 90%, non-condensing

Table 1. Fiber Optic Interface Characteristics

Wavelength [nm]	Fiber Type [μm]	Transmitter Type	Power [dBm]	Receiver Sensitivity [dBm]	Typical Max. Range [km]	Range [miles]
850	62.5/125 multimode	VCSEL	-18	-38	5	3
1310	9/125 single mode	Laser	-12	-39	62	38
1550	9/125 single mode	Laser	-12	-39	100	62

## Ordering

### STANDARD CONFIGURATIONS

#### Standalone

FCD-IPM/E1/FC13L/U/FXS

FCD-IPM/E1/SC13L/U/E&M

FCD-IPM/T1/ST15L/U/FXS

FCD-IPM/T1/U/S

FCD-IPM/DC/T1/ST15L/U/FXS

#### Module

FCD-IPM-M/VC4/FXO

FCD-IPM-M/VC4/E&M

FCD-IPM-M/VC4/V24C/E&M

FCD-IPM-M/VC8/E&M

FCD-IPM-M/S-T1

### SPECIAL CONFIGURATIONS

FCD-IPM/~/\$/+/\*

#### Legend

- ~ DC power supply (Default=AC power supply):
  - DC 24/48 VDC
- \$ Primary WAN interface with optional second data port:
  - E1/# E1 or fractional E1
  - T1/# T1 or fractional T1
  - E1/?/!/# E1 or fractional E1 with built-in fiber optic modem
  - T1/?/!/# T1 or fractional T1 with built-in fiber optic modem
- ? Fiber optic connector (for fractional E1 or T1 with built-in fiber optic modem):
  - ST ST connector
  - FC FC connector
  - SC SC connector
- ! Wavelength and transmitter (for fractional E1 or T1 with built-in fiber optic modem):
  - 85 850 nm, multimode
  - 13L 1310 nm, single mode laser
  - 15L 1550 nm, single mode laser

# Optional second WAN DTE interface:

V24T V.24/RS-232  
 V35T V.35  
 530T RS-530  
 V36T V.36  
 X21T X.21

*Note:* When FCD-IPM includes primary and secondary WAN interfaces, all synchronous data ports are equipped with 25-pin D-type, female connectors. Adapter cables can be ordered from RAD for V.35, V.36 and X.21 interfaces.

+ LAN interface:

B 10Base2 (BNC)  
 U 10/100BaseT (UTP)  
 2B 2 × 10Base2 (BNC)  
 2U 2 × 10BaseT (UTP)  
 UB 1 × 10BaseT (UTP)  
 1 × 10Base2 (BNC)  
 4U 4 × 10/100BaseT (UTP) built-in switch

\* Optional sub-E1/T1, analog voice or ISDN backup interfaces for E1/T1:

S sub-E1/T1  
 FXS 4 built-in FXS voice ports  
 FXO 4 built-in FXO voice ports  
 E&M 4 built-in E&M voice ports  
 IBE ISDN "S" interface  
 IBU ISDN "U" interface

FCD-IPM-M/ε/@/^

FCD-IPM Module

#### Legend

ε I/O module type:

S-E1 Sub-E1  
 S-T1 Sub-T1  
 S-2E1 2-port sub-E1  
 S-2T1 2-port sub-T1  
 VC4 4 analog voice ports  
 VC8 8 analog voice ports  
 Vxx Universal data  
 SWITCH 5-port 10/100BaseT Ethernet switch

#### Notes:

1. Data ports can only be ordered with Sub-E1 I/O modules or Voice modules.
2. The second WAN option is not available when ordering E1/T1 with an ISDN backup.
3. The dual LAN configuration is not available when ordering E1/T1 with an ISDN backup.
4. The 2-port sub-E1/T1 and 8-port analog voice modules occupy both slots.

@ DCE port interface:

V24C V.24  
 V35C V.35  
 530C RS-530  
 V36C V.36  
 X21C X.21

^ Analog voice interface:

FXS FXS  
 FXO FXO  
 E&M E&M

## FCD-IPM

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## OPTIONAL ACCESSORIES

**RM-34**

Hardware for mounting one FCD-IPM unit in a 19-inch rack

Adapter cables for DB-25 synchronous data interface connectors

**CBL-530/V35/F**

One male DB-25 to one female 34-pin (V.35) connector



**CBL-530/449/F**

One male DB-25 to one female DB-37 (V.36) connector

**CBL-530T/21C/F**

One male DB-25 to one female DB-15 (X.21) connector

Table 1. Comparison Table

Features	FCD-IP 	FCD-IPM 
Total user ports	Up to 11	Up to 19
Interface types	X.21, V.35, V.24, RS-530, E1/T1, E&M, FXS, FXO, ISDN, SHDSL, ETH	X.21, V.35, V.24, RS-530, E1/T1, E&M, FXS, FXO, ISDN, SHDSL, ETH
E1/T1 line type	✓	✓
SNMP management	✓	✓
Interoperability	✓	✓
E1 bypass	✓	✓
ETH performance	10/100 MB/s	10/100 MB/s

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