

Multiservice Access Platform (MAP)

RAD Data Communications offers carriers, telecom operators and service providers a winning service deployment strategy. It is designed to speed return on investment in access network equipment and Local Loop plant, as well as to facilitate the rollout of a variety of services. Most importantly, carriers can quickly generate income without incurring substantial infrastructure costs.

RAD's Multiservice Access Platform (MAP™) is based on deploying specialized equipment at the customer premises, in the Local Loop and at the carrier's point of presence (POP). The MAP product family includes the FCD range of dedicated multiservice network termination units as well as the Megaplex line of multiservice access multiplexers (TDM or hybrid TDM, IP and Frame Relay), and the DXC series of multiservice access nodes. All products offer built-in Last Mile solutions such as HDSL, SHDSL and fiber optics.

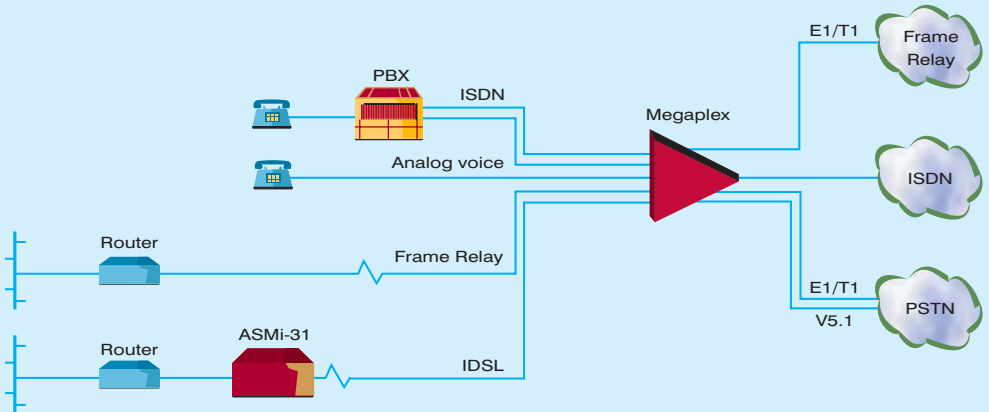
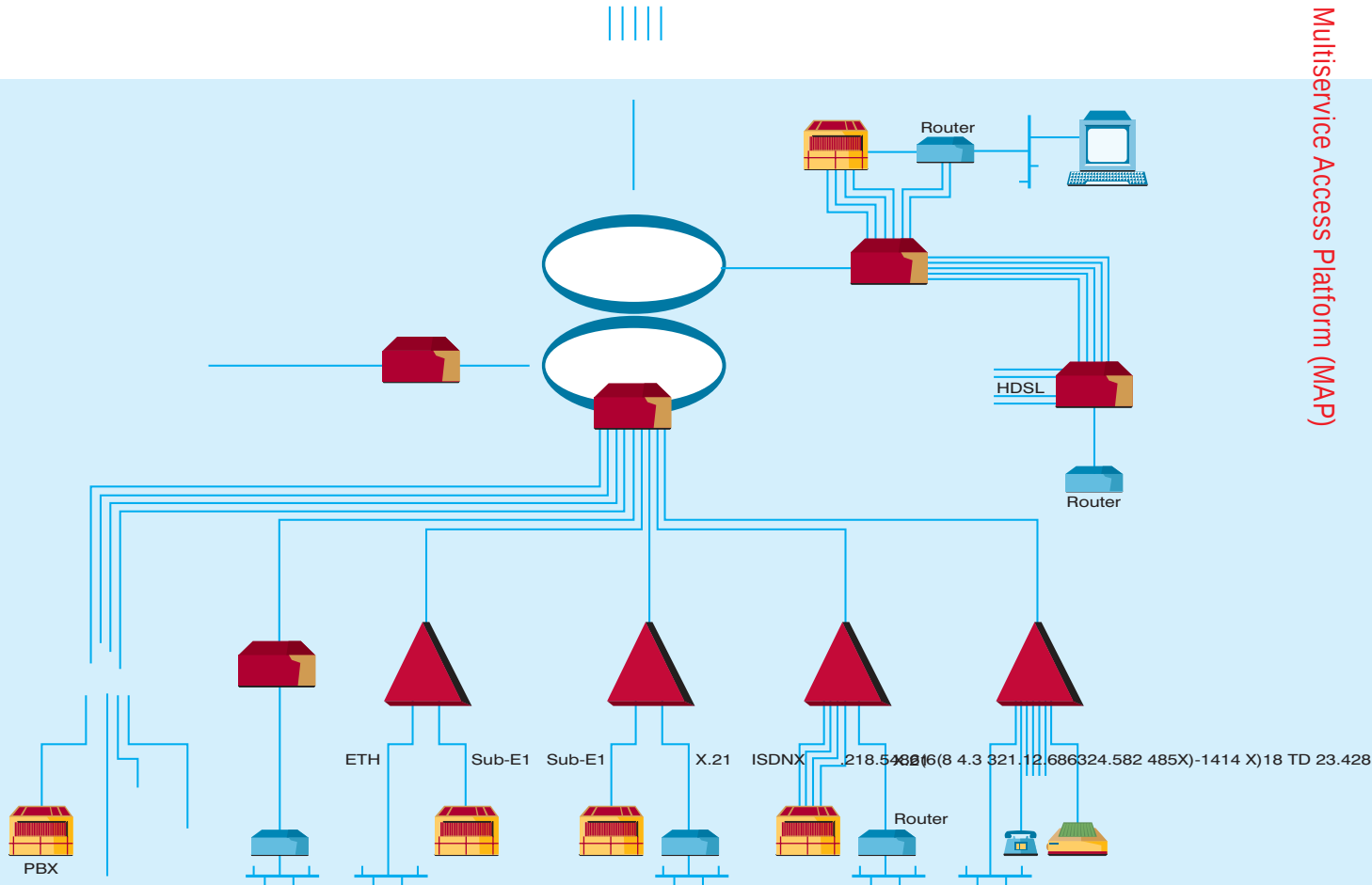
The **FCD family** of compact, low cost, multiservice network termination units (NTUs) extends the E1/T1 network to the customer premises, enabling carriers and service providers to create a flexible, service-independent access model while offering a competitive and wide service portfolio. Controllable from a single management platform, the NTUs feature optional, cost-saving, built-in HDSL, SHDSL or fiber optic modems. Complementing the FCD family, intelligent NTUs are available with powerful demarcation features, offering a cost-effective and quick service deployment alternative for global carriers expanding their offered services over a third party's infrastructure while offering extensive diagnostics capabilities.

RAD's **Megaplex-2100/2200** multiservice access multiplexers offer a wide range of data, LAN and voice services. They also offer a wide variety of analog and digital voice connections – PCM, ADPCM, G.723.1, BRI ISDN and digital E1/T1 interfaces. These include tail-end modems and up to four E1/T1 lines (including hybrid TDM and Frame Relay connectivity) for distributing different services over the same infrastructure and splitting these services at the POP. They also include built-in fiber optic and HDSL main trunk modems.

The **DXC family** of modular multiservice access nodes provides non-blocking DS0 cross connect for up to 30 E1/T1 lines and supports built-in Local Loop solutions. Plug-in interface modules supporting n x 56/64 kbps, E1 or T1 transmission with built-in HDSL, SHDSL and fiber optic modems, E3/T3, fractional E3/T3, STM-1 or fractional STM-1 are available. The optional DIM module provides inverse multiplexing capabilities for up to eight E1/T1 lines, supporting native LAN connectivity and video streaming applications.

The **Optimux family** of TDM multiplexers enables operators to quickly and effectively extend E1, T1 and LAN services over E2/E3/T3 fiber/coax from add-drop multiplexers (ADMs) located at the distribution node to remote locations at distances up to 75 km (47 miles).

The **R-STM-1E** offers STM-1 ADM capabilities, providing a robust and resilient alternative to access network extension in the carrier environment. It is a quick, cost-effective alternative for service deployment for utility companies. To further rationalize service deployment, the SDH segment of the access solution is coherently managed and provisioned from a single management application, controlling both SDH and PDH equipment.



DXC Family

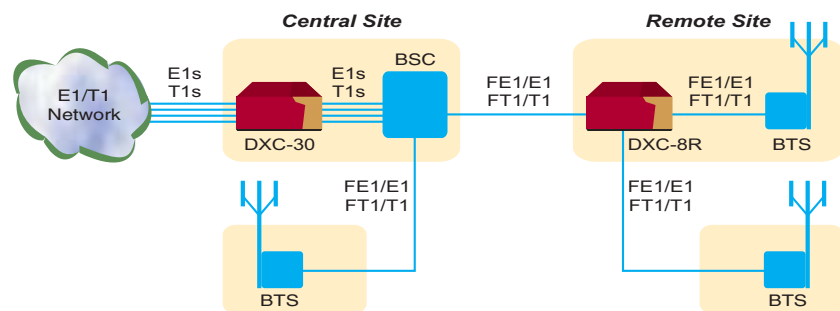
Multiservice Access Nodes

- Small 1U or 3U high enclosure
- Modular construction with four, five or 15 I/O slots
- Services supported: n x 56/64 kbps, ISDN, IDSL, HDSL, SHDSL, E1, T1, E3, T3 and STM-1
- Optional system redundancy
- Optional link and/or hardware protection
- Integrated fiber optic, SHDSL, HDSL and IDSL modems
- Diagnostic capabilities include local and remote loopbacks and BER test
- Inverse multiplexing up to 15.7 Mbps
- DS0 non-blocking cross connect and groomer
- Built-in E1/T1 converter including A-law/ μ -law and signaling conversion for PCM timeslots
- Broadcast capabilities (single point to multipoint)
- Auxiliary control from an ASCII terminal
- SNMP agent for in-band and out-of-band network management using RADview software
- Separate dial-in/dial-out option

The DXC family consists of modular multiservice access nodes providing non-blocking DS0 cross connect for up to 120 lines (32 lines in the DXC-8R, 40 lines in the DXC-10A and 120 lines in the DXC-30).

Plug-in interface modules can accommodate up to eight links (see Modules section below). Support is provided for n x 56/64 kbps, ISDN, E1, T1, E3, T3 and STM-1 over fiber, copper, IDSL, HDSL and SHDSL. An inverse multiplexing module with a rate capacity of up to 15.7 Mbps is also available.

The DXC modules are available with an integrated fiber optic, IDSL, HDSL or SHDSL modem for Local Loop applications. An optional internal CSU/LTU is available for range extension. Diagnostic and test tools, such as loopbacks and internal BER test, are supported.



Grooming fractional traffic

Cross connect, groomer and broadcast

The DXC family allows maximum flexibility between its ports. A user-programmable connection table connects any incoming 56/64 kbps timeslot to any outgoing 56/64 kbps timeslot. The ports can be any of the DXC modules. Support is provided for cross connect functions such as drop-and-insert, distribute and collect.

The DXC family enables grooming fractional traffic from the user side into full E1/T1, E3/T3 or STM-1 trunks, for connection to the network. Grooming and bandwidth maximization is implemented by placing the n x 56/64 kbps data channels into an E1 or T1 frame (including internal E1/T1 of the E3, T3 or T3/747 modules or VC-12 containers of the STM-1 module), using only the required number of timeslots. This provides fractional CSU/DSU functionality.

The DXC family can broadcast any traffic combination from a single input to numerous destinations. Channel relocating and half duplex conferencing are also supported.

T1/E1 converter

The DXC family is also capable of converting between E1/T1 ports. A-law/ μ -law and signaling conversion are performed according to E1 and T1 standards. DXC-8R and DXC-10A convert up to 15 ports; DXC-30, up to 17 ports.

E3, T3, T3/G.747 and STM-1 multiplexer modules

These modules provide full channelization functionality for the multiplexing and demultiplexing of DS0 traffic. E3 aggregated payload is up to 34 Mbps; T3 and T3/747 aggregated payload is up to 45 Mbps. STM-1 aggregated payload from a single chassis is equivalent to 61 Mbps. When chaining a number of units, the aggregated payload is equivalent to a full STM-1 (63 E1 links).

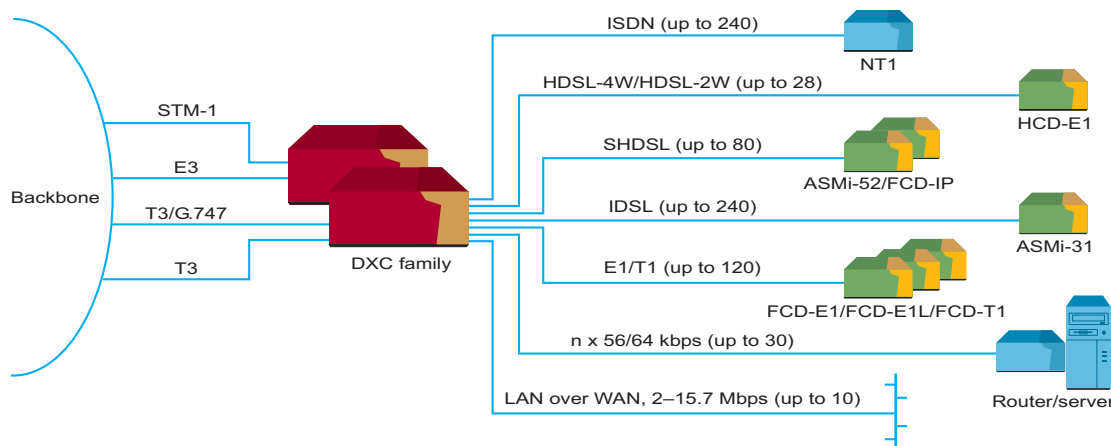
The G.747-compliant T3 interface supports standard multiplexing of 21 independent E1 lines into a T3 frame.

Redundancy

The DXC family provides flexible redundancy and protection to accommodate each user's needs and help minimize service downtime. DXC-30 system redundancy, whether partial or full, can be added at any time. The modules' link protection is user-programmable. Hardware protection can be added at any time.

Redundancy in each unit:

- DXC-30 system redundancy (power supply and common logic) is optional and can be added at any time. Partial redundancy can also be provided.
- DXC-8R has built-in full system redundancy
- DXC-10A has no system redundancy option



Maximum flexibility in grooming and cross connect

Basic units

All of the DXCs are compact 1U or 3U high units with optional hardware for mounting in a 19" rack.

DXC-8R

The compact 1U high unit can support up to 32 ports. The basic unit is fully redundant and includes two power supplies, two common logic modules and four I/O slots for the plug-in interface modules.

DXC-10A

The compact 1U high unit can support up to 40 ports. The basic unit is not redundant and includes one power supply, one common logic module and five I/O slots for the plug-in interface modules.

DXC-30

The space-saving 3U high unit can support up to 120 ports. The basic unit includes one power supply, one common logic module and 15 I/O slots for the plug-in interface modules. Optional secondary power supply and/or common logic can be ordered at any time for full or partial system redundancy.

DXC-30E

The enhanced 6U high xDSL multiservice unit can support up to 240 ports (see page 8).

DXC-STM-1

The DXC-STM-1 is a 7U high hybrid version of the R-STM-1E multiplexer and the DXC-30 digital cross connect, assembled in a single integrated chassis and featuring both DXC I/O cross connect and SDH ADM capabilities (see pages 34-36).

Various timing options cover all timing possibilities for the E1/T1 interface. These include internal clock, external clock and loopback timing sourcing from any selected E1/T1, n x 56/64 kbps, E3/T3 or fractional STM-1 port.

Setup, management and diagnostic tools

Setup, control and diagnostics can be performed via an ASCII terminal or Ethernet port. A built-in SNMP agent enables three management options:

- independent management
- management by the RADview-HPOV/TDM network management system running on an HP OpenView platform
- management by the RADview-PC/TDM network management system running on a Windows NT platform.

Configuration and diagnostics of remote services are provided through either TS0 or a dedicated timeslot, which can be groomed by the DXC alongside the payload traffic (for up to 30

management links supporting PPP). Out-of-band management is available via PPP or SLIP.

Diagnostic loopback support for most modules includes loopback toward the local or remote DTE. Data monitoring capabilities are supported by configuring any high speed port to monitor any given port in the enclosure.

Most modules feature BER test, which can be activated on each port at the timeslot level.

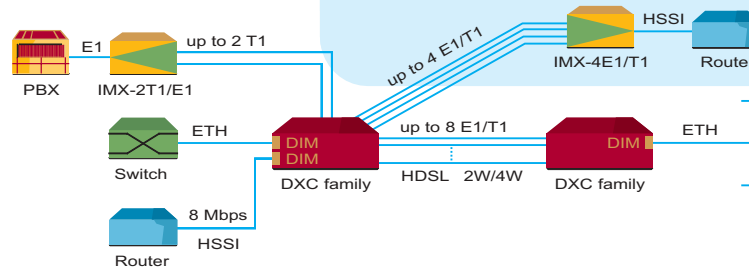
The DXC can be controlled remotely via dial-up modem.

Modules

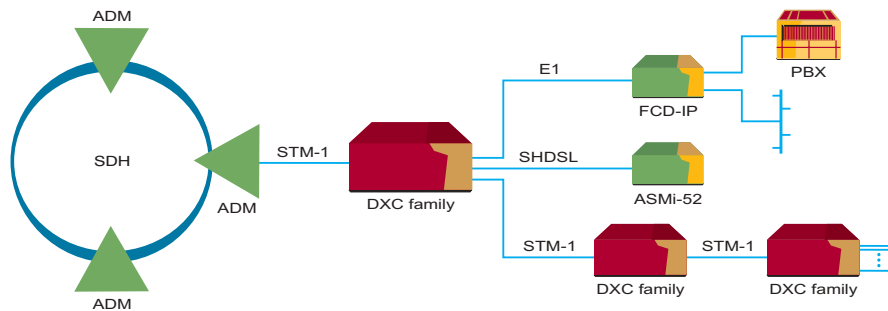
The following modules are supported by all of the DXC chassis. A variety of port densities are available, from single-port to eight-port modules. They are hot-swappable and support hardware and line redundancy. Most modules ensure a protective switching time of under 50 msec.

Additional features include Last Mile modems (fiber, IDSL, HDSL and SHDSL), range extenders and powerful, integrated testing capabilities that minimize network downtime. The DXC features built-in BER testing, programmable on any port on a timeslot level, and loopback capabilities.

DXC Family (Cont.)



Native LAN connection over $n \times E1/T1$ lines



Daisy chain access topology

STM-1 terminal module

DFSTM-1 one- or two-port standard 155 Mbps STM-1 interface provides direct access to the STM-n SDH ADM at the STM-n level. The STM-1 terminal multiplexer (TM) module grooms up to 61.44 Mbps of traffic to a standard STM-1 frame over fiber or copper. The two-port module can be used in a drop-and-insert daisy-chain to expand services or for redundancy. Each port interface can be ordered separately. Line redundancy is supported.

E3/T3 modules

DE3 one-port E3 interface module provides access to a standard E3 frame over an unbalanced E3 or fiber. A user-programmable connection table enables fractional data traffic from various sources to be groomed into full internal E1 trunks. Line and hardware redundancy are supported.

DT3 one-port T3 interface module provides access to a standard T3 frame over an unbalanced T3 or fiber. A user-programmable connection table enables fractional data traffic from various sources to be groomed into full internal T1 trunks. Line and hardware redundancy are supported.

E1 modules

D4E1/D8E1 four-port or eight-port interface modules transmit to a range of up to 2.2 km (1.4 miles) by using the built-in LTU. They have a data rate of up to 2.048 Mbps per port, and support BERT and loopback per timeslot. Resistive attenuation adjustment (10 dB – 30 dB) supports signaling monitoring applications (such as SS7 network maintenance and billing). Line redundancy is supported.

DE1B two-port E1 interface module transmits to a range of up to 2.2 km (1.4 miles) with an LTU option. BERT and loopback per timeslot are optional. Line and hardware redundancy are supported. Automatic traffic bypassing is optional.

T1 modules

D4T1/D8T1 four-port or eight-port interface modules transmit to a range of up to 2.2 km (1.4 miles) by using the built-in CSU. The data rate is up to 1.544 Mbps per port. The module supports BERT and loopback per timeslot. Line redundancy is supported.

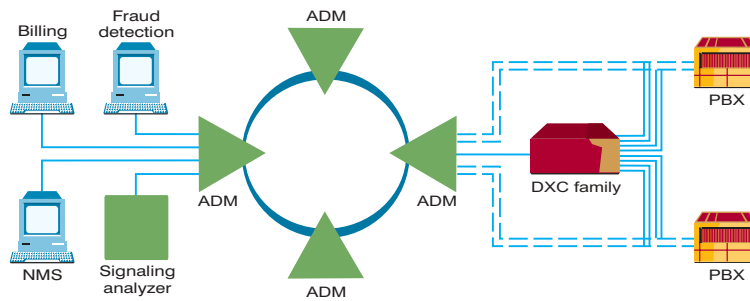
DT1B two-port T1 interface module transmits to a range of up to 2.2 km (1.4 miles), with a CSU option. BERT, loopback per timeslot and automatic traffic bypassing are optional. Line and hardware redundancy are supported.

xDSL modules

D8SL eight-port interface module uses standard SHDSL technology to extend the range of E1 connections over 2-wire cable up to 10.7 km (6.6 miles). NEW

DHL module uses HDSL technology to extend the range of E1/T1 connections over 4-wire cable up to 4.8 km (3 miles). The E1 connection range can be extended up to 2.5 km (1.6 miles) over 2-wire cable using HDSL technology. Line and hardware redundancy are supported.

D8U eight-port module enables IDSL extension to remote modems at ranges up to 5.5 km (3.4 miles) or as ISDN (U interface) 2B+D channel transmission at ranges up to 5.5 km (3.4 miles). The data rate is up to 128 kbps per port.



Signaling monitoring

Special modules

DHS two-port n x 56/64 kbps data module provides two high speed synchronous data channels. Each channel is independently selected for either 10/100BaseT Ethernet bridge including VLAN support, 10BaseT Ethernet router, V.35, RS-422/V.11, or X.21 interface.

DIM is a digital inverse multiplexer module for up to eight E1/T1 channels (15.7 Mbps of traffic). The module has an integrated 10/100BaseT Ethernet bridge, including VLAN support, 10BaseT Ethernet router, V.35, RS-530, HSSI, X.21 or E1 interface. Traffic can be groomed directly to any of the E1, E3, T1, T3, T3/747 or STM-1 modules. The module is interoperable with any of the IMX products (see pages 37–39).

DT3/747 one-port T3 interface module provides access to standard T3 according to G.747 from 21 independent E1 channels, over a copper or fiber interface. Line and hardware redundancy are supported.

Applications

The DXC family works opposite a variety of other RAD equipment or other standards-based products. The DXC-8R and DXC-10A 1U chassis are geared for installations that require a compact unit (e.g., cellular base stations) or lower capacity of up to 40 ports (e.g., a carrier’s initial stage of deployment). The most typical applications of the DXC include:

- E1/T1 access platform over SHDSL, HDSL, IDSL, fiber or copper, featuring data/voice

- concentration and an integrated management solution
- providing conversion/gateway between T1 and E1 networks, for both data and voice
- providing high speed access (e.g., Ethernet, HSSI) to a carrier’s high speed digital backbone over n x E1/T1, E3/T3 or STM-1, where n represents one to eight lines
- distributing services from an SDH or other network to a wide variety of end users by creating an E1/T1 or STM-1 daisy chain
- grooming fractional trunks to full trunks, maximizing data traffic payload over E3, T3 or STM-1 trunks
- grooming of monitoring signals (SS7 or other) for advanced services and Quality of Service
- broadcasting identical data to multiple destinations
- cross-connecting trunks at the point of presence (POP)

- grooming a variety of services at the POP over n x E1/T1, E3/T3 or STM-1

Target markets

DXC users and markets include the following:

- cellular operators
- wireless operators
- incumbent and alternative carriers
- international carriers
- utility companies
- enterprises
- multi-tenant units (MTUs)
- transportation
- ship-to-shore communications
- test and maintenance operators (SS7 networks)
- Internet service providers (ISPs)

DXC Family

Features	DXC-8R	DXC-10A	DXC-30
Height	1U	1U	3U
Maximum number of ports	32	40	120
Number of I/O ports	4	5	15
System redundancy	Built-in	None	Optional
Power supply	AC/DC	AC/DC	AC/DC
E1, T1, E3, T3, T3/747, STM-1 modules supported	All	All	All
xDSL modules supported	All	All	All
ASCII, SNMP, NMS management supported	All	All	All

DXC-30E

Enhanced xDSL Multiservice Access Node

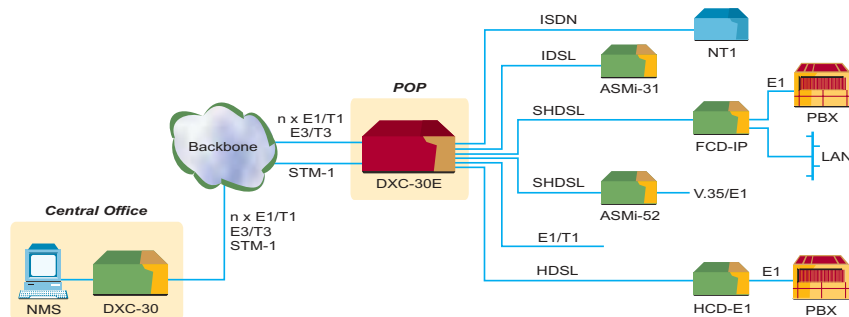
- 6U high enclosure, modular construction with 15 I/O slots
- Services supported: n x 56/64 kbps, ISDN, IDSL, HDSL, SHDSL, E1, T1, E3, T3, T3/G.747 and STM-1
- High xDSL capacity: up to 80 SHDSL ports and up to 240 IDSL or ISDN U ports
- Special high port density ISDN/IDSL module (16 ports)
- Optional system redundancy
- Integrated fiber optic, SHDSL, HDSL and IDSL modems
- Diagnostic capabilities including local and remote loopbacks and BER test
- Inverse multiplexing up to 15.7 Mbps
- DS0 non-blocking cross connect and groomer
- Built-in E1/T1 converter including A-law/ μ -law and signaling conversion for PCM timeslots
- Broadcast capabilities (single point to multipoint)
- Auxiliary control from an ASCII terminal
- SNMP agent for in-band and out-of-band network management using RADview software
- Separate dial-in/dial-out option

The DXC-30E is a modular multiservice access node providing non-blocking DS0 cross connect for up to 240 lines. It is designed to provide a high port density solution for xDSL applications. The DXC-30E features optional redundant AC or DC power supplies and two redundant common logic modules.

Plug-in interface modules can accommodate up to 16 links (see description of the additional special modules following). Support is provided for all DXC family modules: n x 56/64 kbps, ISDN, E1, T1, E3, T3, T3/G.747 and STM-1 over fiber, copper, IDSL, HDSL and SHDSL (see pages 4–7). An inverse multiplexing module with rate capacity of up to 15.7 Mbps is also available.

Cross connect groomer and broadcast

The DXC-30E allows the same flexibility between ports as in the DXC family. Please see pages 4–7 for additional information.



T1/E1 converter

The DXC-30E can convert up to 17 E1/T1 ports. A-law/ μ -law and signaling conversion are performed according to E1 and T1 standards.

E3, T3, T3/G.747 and STM-1 multiplexer modules

The DXC-30E supports all DXC family multiplexer modules. (see pages 4–7).

Redundancy

The redundancy features of the DXC-30E are identical to those of the DXC-30 (see pages 4–7).

Basic unit

The 6U high chassis can support up to 240 ports. The basic unit includes one power supply, one common logic module and 15 I/O slots for the plug-in interface modules. Optional secondary power supply and/or common logic can be ordered at any time for full or partial system redundancy.

The DXC-30E supports all the features and modules of the DXC family (see pages 4–7), but in an extended 6U high enclosure.

Setup, management and diagnostic tools

The DXC-30E supports all the features and management capabilities of the DXC family (see pages 4–7).

Modules

The DXC-30E offers the same features and supports all the I/O modules of the DXC-30: DE1B, D4E1, D8E1, DT1B, D4T1, D8T1, DE3, DT3, DT3/G.747, DFSTM-1, DIM, D8U, D8SL and DHS (see pages 4–7).

Dedicated modules for the DXC-30E:

- DHL HDSL module provides the same features as in the other DXC chassis (see pages 4–7), but occupies only one I/O slot
- D16U high density 16-port module enables IDSL extension to remote modems at ranges up to 5.5 km (3.4 miles) or ISDN (U interface) 2B+D channel transmission at ranges up to 5.5 km (3.4 miles), at data rates up to 128 kbps per port

Applications

In addition to supporting all the typical DXC applications (see DXC family, pages 4–7), the DXC-30E is ideal for xDSL applications that require many SHDSL, HDSL, IDSL or ISDN services. When loaded with the higher port density cards or single-slot cards (DHL), the capacity of the DXC-30E unit increases to up to 80 SHDSL ports, 28 HDSL ports or 224 IDSL ports (14 D16U modules and one STM-1/E3/T3 module).

Target Markets

The DXC-30E serves the same markets as the DXC-30 (see pages 4–7).

DXC-2

E1/T1 Converter and Cross Connect

1

 DXC-30E • DXC-2
 Multiservice Access Nodes

- Converts between E1 and T1 data and signaling
- Configurable A-law/ μ -law and signaling conversion; or transparent conversion at 64 kbps timeslot level
- Controlled slip for buffer overflow/underflow
- Soft-selectable to comply with ITU Rec. G.802, Annex 2
- Optionally available with built-in LTU (E1) or CSU (T1)



The DXC-2 E1/T1 converter and timeslot cross connect enables conversion between one E1 signal and one T1 signal (24 timeslots). For applications requiring timeslot swapping between two devices operating at the same speed, the unit can also be ordered with two ports of the same type (i.e., two E1 or two T1 ports). An optional built-in LTU (E1) or CSU (T1) is available on either port.

A user-programmable connection table defines the connection of any 64 kbps incoming timeslot to any outgoing timeslot. The DXC-2 can also perform the required A-law/ μ -law and signaling conversion in compliance with E1 and T1 standards. The E1-to-T1 conversion method can be soft-selected to comply with ITU G.802.

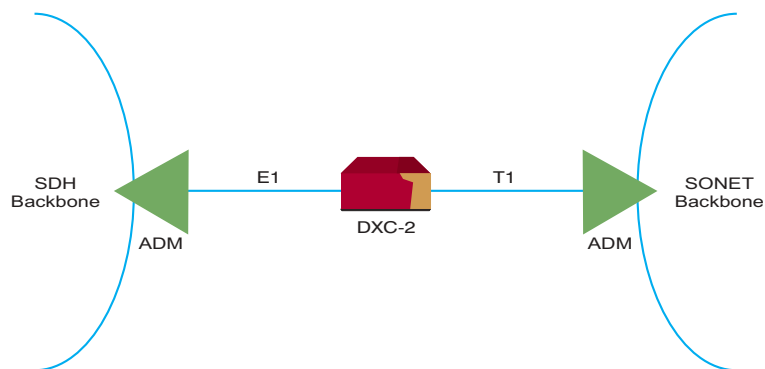
Diagnostic loopback support for E1/T1 interfaces includes loopback towards the local or remote DTE.

Several clock modes cover all timing possibilities for the E1/T1 interface. These include internal clock and loopback timing, for either the E1 or T1 interface.

The E1 interface complies with ITU G.703, G.704, G.732 and G.823, and supports both two and 16 frames per multiframe without CRC-4, and framing with CRC-4. Line code is HDB3.

The T1 interface complies with AT&T TR-62411 and ANSI T1.403 requirements, and supports both D4 or ESF framing formats and AMI line code. Zero suppression is selectable between transparent transmission, B7ZS or B8ZS.

Setup, control and diagnostics can be performed via the front panel or an ASCII terminal.



- Integrated access platform performing both traffic grooming and concentration
- Highly flexible modular multiplexer
- E1/T1/E2 main links with built-in programmable non-blocking DS0 cross connect
- IP main link (TDMoIP support)
- PSTN, ISDN and data services supported directly or through built-in 2-wire U interface modems
- V5.1 support
- R2 support (transparent DTMF/decadic)
- Capacity:
 - up to 124 analog voice channels
 - up to 132 V.24/RS-232 low speed data channels
 - up to 124 n x 64 kbps data channels (V.24/RS-232 or ISDN S and U ports)
 - up to 44 G.703 V.110 low speed data channels
- Supports multiple alternative routing in event of trunk failure
-

The Megaplex is a flexible, modular multiplexer that supports up to four full E1/T1 links per chassis. PSTN, ISDN and data services are supported, either directly or via IDSL/HDSL modems compatible with the ASMi-31, HCD and HTU modems.

The Megaplex (starting with phase 7) includes R2 support with transparent MFC/decadic implemented within the main link. This allows the customer to connect a legacy R2-PBX to a digital (E1 CAS) PBX, thus extending the life span of existing equipment. In this version, the Megaplex offers up to four E1/T1 capacity for all chassis with a non-blocking cross connect capability. This provides drop-and-insert capability between two links on one or two modules. In addition, the user will be able to implement any of the protection profiles (parallel Tx, Y cable or database flip).

The Megaplex enables integration of multiple, dedicated voice, ISDN, video and LAN channels onto E1/T1 trunks. It splits the voice and data channels and redirects the traffic to separate trunks, maximizing efficiency by directly connecting each trunk to the appropriate service.

The Megaplex is especially suitable for use as an economical, compact remote distribution node. It is ideal for small communities, providing mixed services for both business and residential customers.

Megaplex can be deployed both at the exchange in the point-of-presence, or at the remote

distribution node location (such as in an office building's basement or telecommunications cabinet).

The Megaplex can be mounted in 19" racks for carrier and service provider environments.

The Megaplex units allow hot-swapping of all modules.

The optional common logic, main link and power supply redundancy ensures a high level of system reliability on Megaplex hubs.

The 2/4 E1/T1 main links support 1+1 protection switching for any full or fractional E1/T1 port. The main links also support optional integrated CSU/DSU and LTU.

Megaplex is standards compliant, ensuring compatibility in multivendor environments worldwide. The E1 and T1 TDM framing and signaling, PCM voice coding and ISDN and data interfaces all conform to international standards.

Megaplex devices store up to 10 different configuration databases and can switch between them. This feature enables alternate routing in the event of network failure.

Extensive network management is provided on multivendor management platforms using

standard SNMP protocol. Megaplex provides the control and monitoring required in large networks using the HP OpenView platform. For smaller networks, a PC-based SNMP platform is available.

V5.1 interface support

V5.1, the new ETSI standard interface, operates between the access network and the switch for basic telephony, ISDN and semi-permanent leased lines. The V5.1 standard effectively opens the access network to competition and allows operators to deploy optimal access technology.

Megaplex with the V5.1 main link interface facilitates the connection of PSTN and ISDN residential and SOHO users to V5.1 local exchanges.

TDM over IP support

From phase 8, the Megaplex offers a one-box solution for the TDM over IP (TDMoIP) concept. The incorporation of the ML-IP main link module enables TDM applications to be implemented over IP networks. ML-IP facilitates daisy chain and cascading of Megaplex units and enables these units to operate opposite the IPmux family of TDMoIP gateways. Based on RAD RFER

(Resilient Fast Ethernet Ring), the ML-IP allows the provisioning of all Megaplex services over Fast Ethernet Ring topology with 50 msec protection speed.

The addition of TDMoIP functionality further expands the broad scope of solutions supported by the Megaplex family. For more information about the TDMoIP concept, please refer to the "TDM over IP" chapter.

Management

Network management provides centralized control of all network nodes, including interface configuration, connection setup, alarms and management.

All parameters are user-programmable for up to 10 independent configurations (10 databases). All configurations are saved in non-volatile memory.

Alarm status and system configurations are available at all times. Multiple Megaplex hubs can be controlled from a single PC or UNIX workstation.

Programming and setup of a remote Megaplex device is accomplished:

- out-of-band, through the Ethernet port

- out-of-band, through the supervisory port of the remote unit, over a modem link or FRAD
- in-band, using a dedicated timeslot, dedicatedFR, PPP or RIP-2.

Diagnostics

Megaplex incorporates test features for rapid fault detection and easy maintenance. Once in operation, all system and I/O modules undergo self-testing, and problems are reported to the management system. Local and remote loops may be performed on each channel and on the main links.

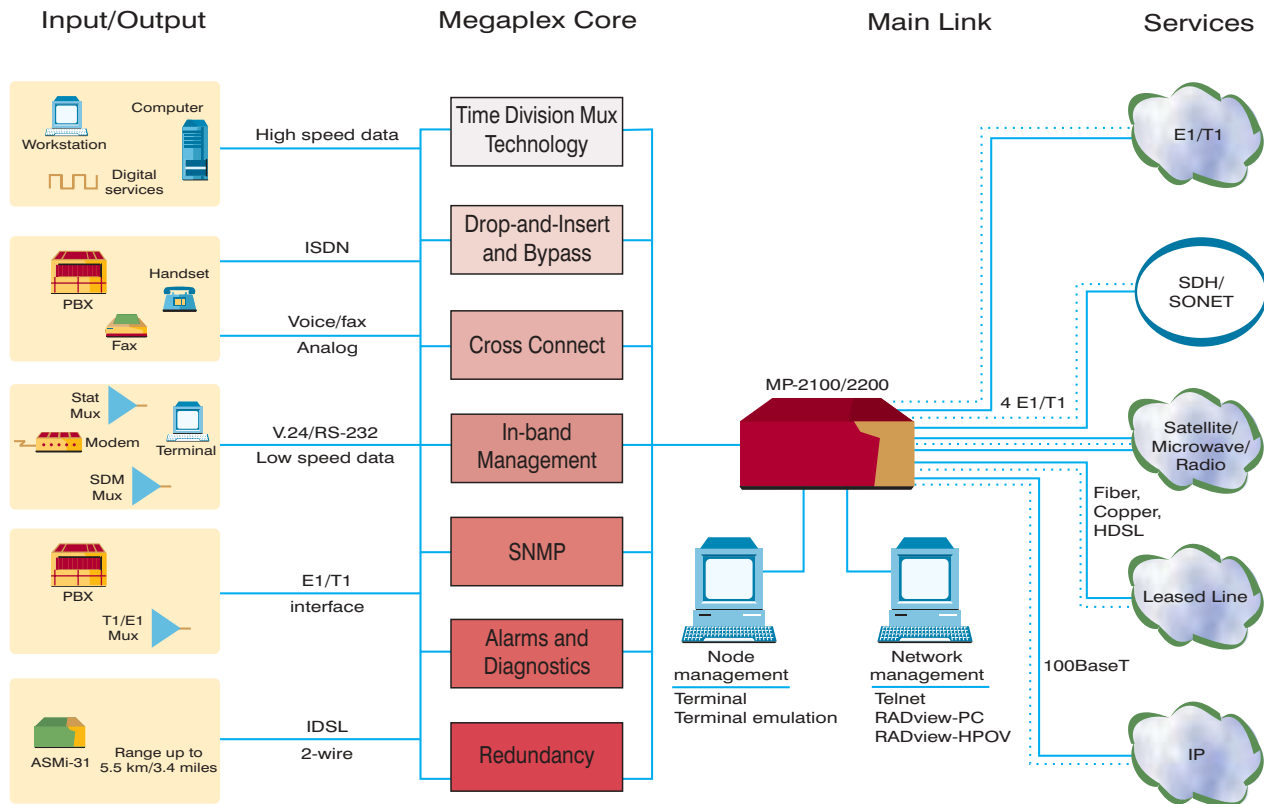
Any timeslot can be selected for BERT/tone injection. In addition, a loop can be initiated per any timeslot.

Signaling monitoring – the ABCD status of any voice channel can be obtained with one click.

Alarms

Alarm information is stored in the common logic module, and is automatically read by the management system from any node. Up to 256 alarms can be stored in a queue and a maximum of 1,024 alarms can be stored in a file on the PC, to be read by the management system.

Megaplex Family (cont.)



System modules

The common logic module stores configuration and event information, and uses a SLIP/PPP or Ethernet connection to communicate with the management station via an SNMP agent. Flash EPROM for software download, Telnet and an ASCII terminal are also supported.

Main link modules

The 1/2/4 E1/T1, ML-E2 and ML-IP main link modules store the DS0 matrix between the I/O channels and each of the E1/T1 trunks. The modules support non-blocking cross connect for any DS0 coming from either the channels or from the trunks. Multiple fractional E1/T1 ports are supported. The main link supports 1+1 protective switching within 50 msec for any E1/T1 port.

Four timing options are available:

- link receive clock

- internal crystal oscillator channel
- clock from any high speed module (HS-12/6, HS-S, HS-U, HS-703, HS-Q/N, HS-2)
- station clock

Any clock source can be set as fallback in the event of primary clock source failure.

Megaplex-2100/Megaplex-2104

The 4U high Megaplex-2100 has 12 slots (five in the 2U high Megaplex-2104 chassis) for both I/O and main link modules. This allows a wide variety of data, voice, fax and LAN applications. All Megaplex-2100 modules fit both chassis.

Megaplex-2100 main link modules requiring CL.2 (from phase 6)

These main links offer increased functionality and efficiency. With two ports, these main links enable redundant configuration for two

aggregate links (database flip). In addition, the new main links support a non-blocking DS0 cross connect between two trunks and 1+1 protective switching within 50 msec. The CL.2 platform does not support main links from Megaplex-2100, phase 5.0 and earlier.

ML-IP

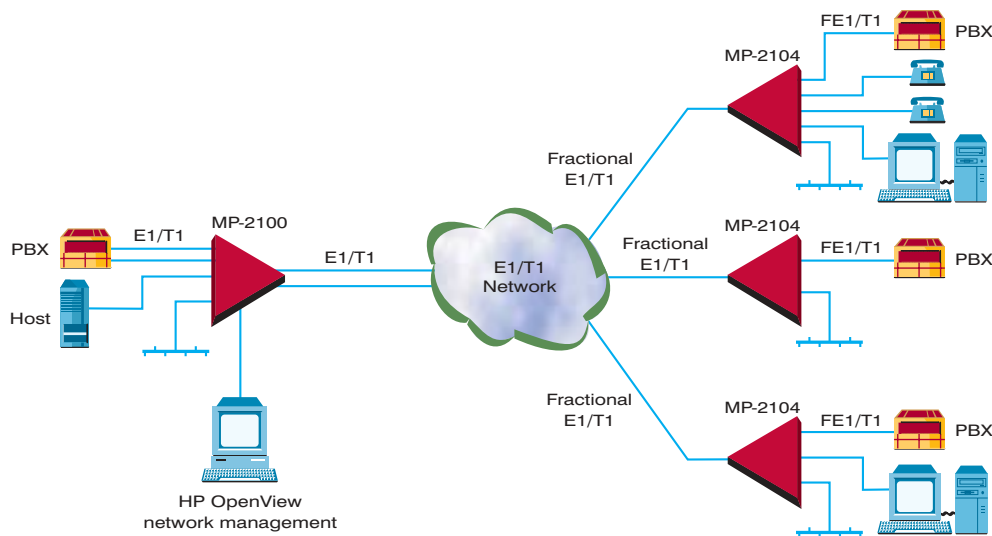
Three-port 10/100BaseT Ethernet uplink module with up to 4 Mbps uplink capacity. This module serves as the main link to the IP network, placing the packetized TDM data stream from the I/O modules onto the IP network in the form of TDMoIP framing.

ML-2E1, ML-1E1, ML-2T1, ML-1T1

Dual/single E1/T1 links with integral CSU/LTU.

MLF-2E1, MLF-1E1, MLF-2T1, MLF-1T1

Dual/single E1/T1 links with fiber interfaces, eliminating the need for an external fiber optic modem.



Corporate network over public E1/T1 network

MLH-2E1

Dual port with integrated HDSL modems that enable connection at E1 rates over copper lines at distances up to 4.8 km (3 miles). Interoperable with other RAD HDSL modems.

Megaplex-2100 I/O Modules

Data modules

HS-2, HS-3, HS-Q, HS-Q/N

Two, three or four channels, each with independently selectable data rates of $n \times 64$ kbps or $n \times 56$ kbps ($n=1$ to 31 for E1, or 1 to 24 for T1). Interface is field-selectable for V.35, V.36/V.11, X.21 or RS-530/RS-422.

HS-Q/M

Four channels, operating at 64 kbps, with built-in 4-wire short range modems compatible with SRM-8H.

HS-ETH

One, two or four 10BaseT UTP/BNC Ethernet bridge/router channels, supporting one, two or four LAN-to-LAN connections.

HS-703

Four 64 kbps G.703, codirectional channels.

HS-R

Four V.24/RS-232 low speed channels. Supports channel data rates up to 38.4 kbps async and up to 64 kbps sync.

LS-12

Twelve sync/async V.24/RS-232 channels with rates from 300 baud to 64 kbps, and end-to-end control signal and BERT.

HS-U, HS-U-12

Twelve (the 12-channel module is supported by CL.2 only) or four U interface channels (2B+D) using 2B1Q line code for full duplex operation over 2-wire. Supports data rates up to 128 kbps and a range of up to 5 km (3 miles), and includes power feeding to the remote NT. Includes full duplex mode for management of remote ASMi-31.

HS-S

Four ISDN S interface channels (2B+D). Operates as either TE or NT. Each channel supports data rates up to 128 kbps.

HSH-2E1

Two high speed channels (supported by CL.2 only) with integrated HDSL modems that enable connection of subscribers at E1 data rates up to 4.8 km (3 miles).

Voice/fax modules

VC-16A

Sixteen toll-quality, non-signaling PCM/ADPCM (32/64 kbps) voice compression channels, enabling two voice channels to be placed on each 64 kbps timeslot.

VC-16, VC-8

Sixteen (supported by CL.2 only) or eight PCM voice channels with optional E&M, FXS and FXO interfaces.

VC-6A/4LB

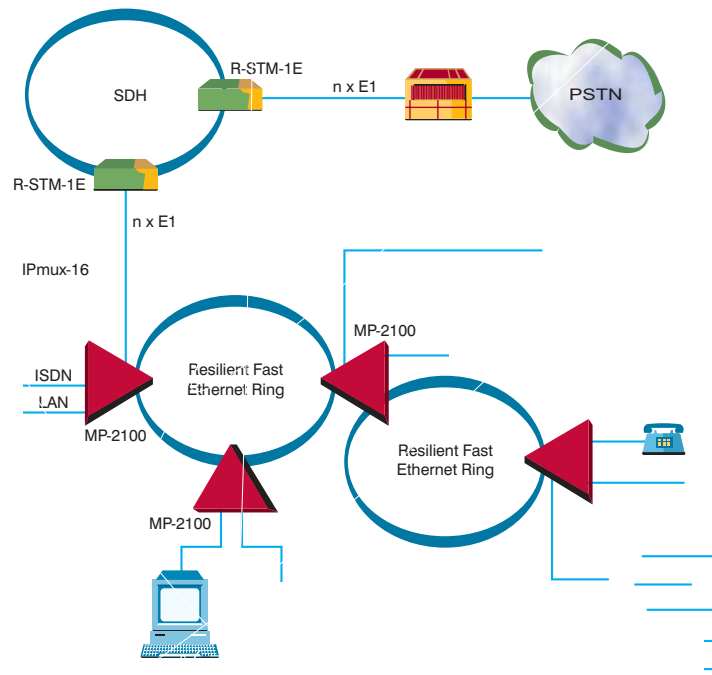
Four voice channels for operation with special line battery telephone sets (e.g., military field telephones).

VC-2

Four analog voice channels with optional interfaces:

- 2-wire or 4-wire E&M
- 2-wire FXS for direct connection to a phone
- 2-wire FXO for direct connection to a PBX extension
- 2-wire FXS-3 for direct connection to public telephone and PTT
- 2-wire FXO-3 for direct connection to public PBX and PTT

The voice is digitized into standard PCM at 64 kbps.



RfER (Resilient Fast Ethernet Ring) combined with daisy chain

VC-6, VC-6A

Six analog voice channel modules support the following interfaces:

- 2-wire or 4-wire E&M
- 2-wire FXS for direct connection to a phone with loop start and ground start signaling (VC-6A only)
- 2-wire FXO for direct connection to a PBX extension with loop start and ground start signaling (VC-6A only)
- 2-wire FXS for direct connection to public telephone (VC-6A only) and PTT
- 2-wire FXO for direct connection to public PBX (VC-6A only) and PTT

The voice is digitized into standard PCM at 64 kbps. For the VC-6A module, each channel can also be compressed into ADPCM 32 kbps.

When using ADPCM compression, two channels occupy one timeslot. (VC-6A supported by CL.2 only.)

VC-Q

Four independent analog voice channels. Each channel is compressed into ADPCM 32 kbps or PCM 64 kbps. For ADPCM compression, two channels occupy one timeslot.

VF-3/E1

Three analog compressed voice channels using MPMLQ compression algorithm at 9.6 kbps or 4.8 kbps and supporting fax connections.

VF-PBX/E1

Six digital compressed voice channels using MPMLQ compression algorithm at 9.6 kbps or 4.8 kbps and supporting fax connections.

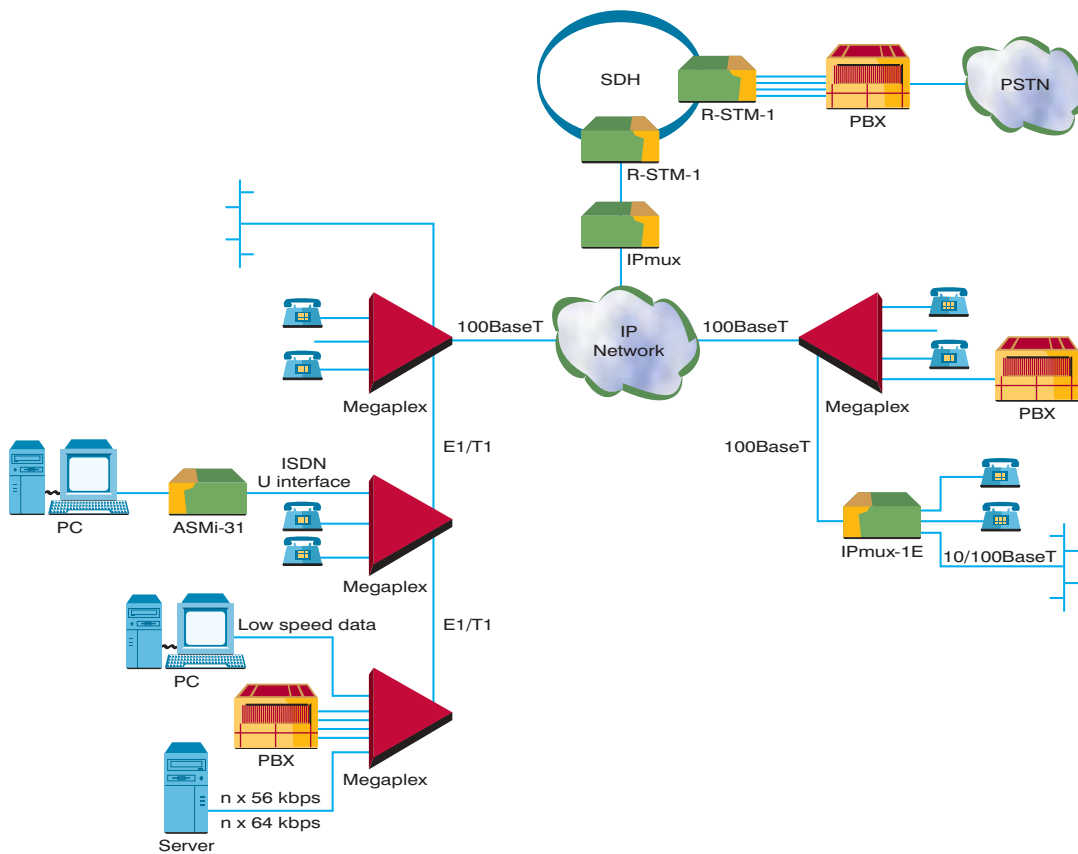
Megaplex-2200

The Megaplex-2200 chassis is available either in 6U high ANSI or 10U high ETSI models. Both chassis have 12 slots for main link and I/O modules. All modules are available for both chassis.

Megaplex-2200 main link modules

ML-IP

Three-port 10/100BaseT Ethernet uplink module with up to 8 Mbps uplink capacity. This module serves as the main link to the IP network, placing the packetized TDM data stream from the I/O modules onto the IP network.



Multiservice Access Platform (MAP) application over IP network

ML-4E1, ML-4T1

Four E1/T1 link module with integral CSU/LTU.

MLH-4E1

Includes an integrated HDSL modem that enables connection at E1 rates over copper lines at distances up to 4.8 km (3 miles).

ML-E2

Includes a single E2 link with copper/fiber interface. Enables the user to concatenate Megaplex units with 8 Mbps rate over a single copper or fiber connection.

Megaplex-2200 I/O modules

Data modules

HS-12

Twelve or six channels of n x 56/64 kbps synchronous data interfaces operating at multiples of 56 kbps and 64 kbps.

HS-703, HS-R, LS-12, HS-U-12, HS-U, HS-S-12, HS-S

(see Megaplex-2100)

HSH-4E1

Four high speed channels with integrated HDSL modems that enable connection of subscribers at E1 data rates up to 4.8 km (3 miles).

Voice/fax modules

VC-12, VC-6

Twelve or six PCM voice channels with optional E&M, FXS and FXO interfaces.

Megaplex-2100H

Frame Relay/TDM/IP Access Multiplexer

- Modular E1/T1 access multiplexer supports TDM, Frame Relay and IP networks
- Offers easy migration from a TDM network to a Frame Relay corporate network
- Supports E1/T1, fiber, hybrid or TDM main links
- Supports PCM, ADPCM and MPMLQ, low bit rate compressed voice (TDM), as well as compressed voice over Frame Relay/IP based on G.723 and G.729
- Supports H.323 VoIP and FRF11 VoFR
- Two chassis types:
 - Megaplex-2104H with five slots, 2U high
 - Megaplex-2100H with 12 slots, 4U high
- Supports a variety of network combinations with up to:
 - 40 high speed TDM data channels
 - 48 high speed Frame Relay data channels
 - 60 low speed Frame Relay data channels
 - 480 voice calls on a single E1; 348 voice calls on a single T1
 - 60 PCM voice channels
 - 88 Frame Relay voice ports
- Management through ASCII terminal or RADview SNMP management system, on PC or UNIX (HP OpenView) platforms

Megaplex-2100H is designed to give service providers the flexibility to offer cost-effective VoIP, Frame Relay and Internet services. It is part of RAD's managed Multiservice Access Platform (MAP), which delivers a wide selection of services such as data, Internet, voice, fax, ISDN and video over a single E1/T1 line.

The modular design and dynamic bandwidth features encourage simple, cost-effective expansion.

The main advantage of the Megaplex-2100H over traditional multiplexers is its hybrid support for legacy voice and VoIP traffic. This allows on-net and off-net voice to be carried by a single access unit.

The Megaplex-2100H also offers a wide range of access solutions using integrated CSU/DSU, LTU, HDSL and fiber optic main links. I/O modules include integrated 2/4-wire modems.

The Megaplex-2100H can be managed by the RADview SNMP network management system. The user-friendly, GUI-based software runs on PC/Windows. In addition, configuration and monitoring is provided either via Telnet or a dumb terminal.

Alarm information is stored in the common logic module. Alarm status is automatically read by the management system from any node.

Megaplex-2100H incorporates test features for rapid fault detection and easy maintenance. Once it is operational, all system and I/O modules undergo self-testing, and problems are

reported to the management system. Local and remote loops may be performed on each channel and on the main links.

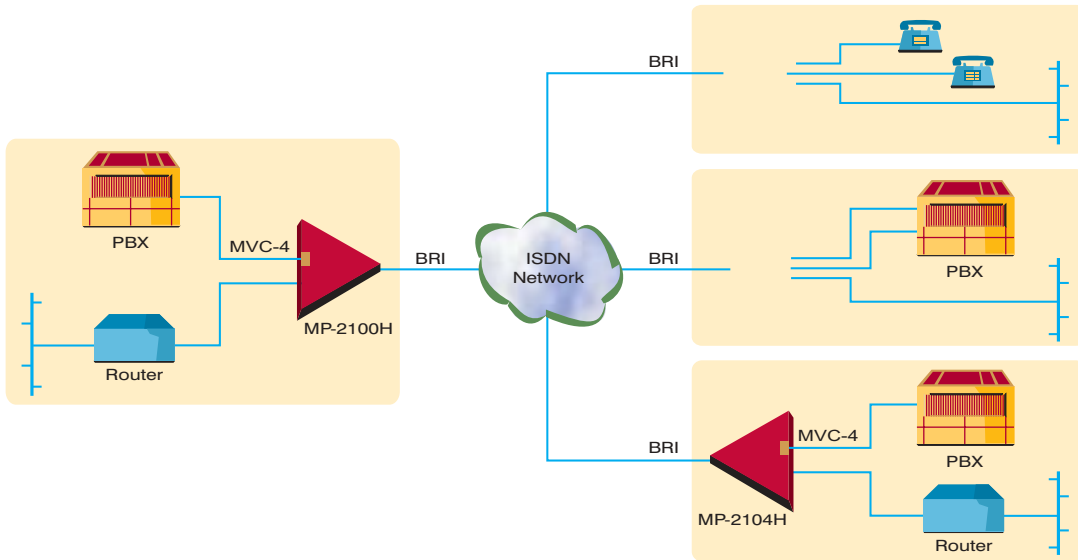
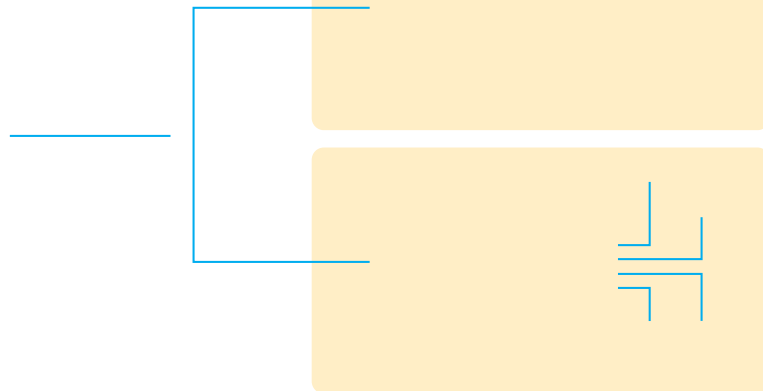
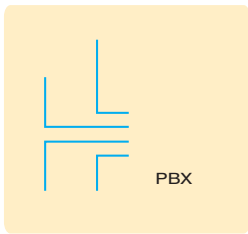
I/O modules

The Megaplex-2100H utilizes TDM modules of the Megaplex-2100 and Frame Relay modules of the MAXcess-3000. Up to 12 modules can be placed in the Megaplex-2100H chassis and up to five in the Megaplex-2104H.

TDM I/O modules

TDM I/O modules are compatible with I/O modules of the Megaplex-2100. For detailed information, refer to the modules description in the Megaplex section (pages 12–17).

- Low speed data modules: LS-6/N, HS-R, LS-12
- High speed data modules: HS-2, HS-3, HS-4, HS-Q/N, HS-Q/M, HS-703, HS-U, HS-S
- Voice/fax modules: VC-2, VC-6, VC-Q, VF-3, VF-PBX



Frame Relay I/O modules

Frame Relay I/O modules are compatible with I/O modules of the MAXcess-3000. For detailed information, refer to the module descriptions in the MAXcess-3000 section (pages 104–105).

- Low speed data modules: MLS-3, MLS-6
- High speed data modules: MHS-1, MHS-3, MHS-4, MHS-E1, MHS-T1, MHS-U, MHS-S
- Voice/fax modules: MVC-4, MVC-4/E1 and MVC-4/T1 in compliance with FRF11

VoIP I/O modules

VoIP I/O modules are compatible with I/O modules of the Megaplex-2100.

VG/UTP, VG/BNC

High performance H.323 VoIP gateway/gatekeeper modules.

VC4N, VC8N

Enhanced analog voice/fax modules for both VoIP and VoFR applications. Each module compresses four or eight voice channels.

V8/E1/M, V8/T1/M, V8/E1/SLV, V8/T1/SLV

Enhanced digital voice modules, compressing eight voice channels for VoIP and VoFR applications.

Megaplex-104, Megaplex-204

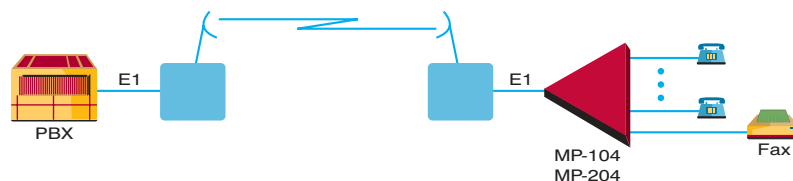


Compact Voice Channel Banks



- Analog PCM-encoded FXS channels
Megaplex-104: eight channels
Megaplex-204: 16 channels
- Single E1 uplink
- Rx/Tx gain control
- PCM encoded, A-Law or μ -Law
- SNMP managed
- Each FXS port supports loop-start, soft gain level setting, polarity reversal, metering, enhanced line tests
- Enhanced diagnostics per channel
- Caller ID enabled
- Support for Group III fax

The Megaplex-104 and Megaplex-204 are cost-effective channel banks designed specifically for small point-of-presence (POP) applications. They have one E1 uplink and can support up to eight or 16 FXS voice channels, respectively. The



Wireless Application

channels support various analog voice features that are required for voice services providers.

Each FXS port supports caller ID, loop-start signaling, reverse polarity and 12 kHz/16 kHz metering pulse, thereby meeting the specifications for public and coin-operated telephones.

In-band fax support for Group III fax machines complies with T.4 and T.30.

Management capabilities for the Megaplex-104 and Megaplex-204 include in-band management over the E1 uplink and out-of-band management

via an Ethernet port or via a terminal using the local serial port.

The Megaplex-104 and Megaplex-204 support both loopback timing (LBT mode) and a local, internal source clock (INT mode).

The Megaplex-104 1U high unit, suitable for the desktop, wall-mounting or mounting in a 19" rack (mounting kits available). Megaplex-104 uses an external power supply.

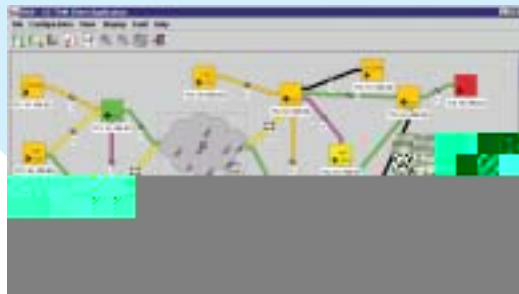
The Megaplex-204 is a 19" wide, 1U high unit in a metal chassis. Megaplex-204 uses an internal power supply.

RADview Service Center TDM

Service Management Application for MAP

- "Point-and-click" provisioning from a central workstation for MAP networks
- Automatic path routing, for efficient bandwidth utilization
- Automatic re-route of protected paths
- Dynamic network status indication and alarms
- Powerful simulator mode for network design, optimization and planning
- CORBA-based client-server architecture and northbound CORBA interface
- Easy integration with third-party NMS products via CORBA

RADview Service Center TDM (SC-TDM) application is the cornerstone of the RAD family of network management products. This



application enables end-to-end path management of RAD's Multiservice Access Platform (MAP) devices, for simplified service provisioning. Intuitive GUI, "point-and-click" functionality and easy-to-follow wizards increase the efficiency and accuracy of the service provisioning process.

The open, scalable, reliable, multi-access management capabilities enable network operators to add new services while minimizing overall operating costs, reducing provisioning times and maximizing efficiency of the network infrastructure.

Automated service provisioning

SC-TDM supports automatic path routing based on efficient bandwidth resource analysis and user-configurable cost per network uplink. To ensure network resilience, automatic re-route of protected paths is performed upon reception of SNMP alarm traps from managed network elements. Dynamic network status indication and alarms display per node, link and path, allow continuous monitoring and troubleshooting.

SC-TDM uses CORBA-based client-server architecture and a northbound interface, which can be easily integrated with the carrier's front office and back office systems, and any third-party application.

FCD-E1, FCD-T1, FCD-E1A

E1/T1 or Fractional E1/T1 Access Units

1



Megaplex-104, Megaplex 204 • RADview Service Center TDM • FCD-E1, FCD-T1, FCD-E1A

- One or two data ports
- Selectable sync data rates: n x 56 kbps, n x 64 kbps
- Data interfaces: V.35, RS-530, V.36/RS-449, X.21 or four S0 (FCD-E1A only)
- Integrated Ethernet bridge/router option
- Optional sub-E1/T1 drop-and-insert port for PBX connectivity
- Fail-safe sub-E1/T1 ensuring uninterrupted service
- Operates with RAD's DXC multiservice access node for multilink star configuration
- In-band remote SNMP-based management
- Main link available with optional integral LTU or with fiber optic modem
- Optional ISDN backup for data (FCD-E1A only)
- 24-hour performance monitoring storage
- Alarm mask configuration for any alarm

The FCD-E1 and FCD-T1 are access units for full or fractional E1/T1 services. They can be ordered with either one or two data ports and with an optional sub-E1/T1 drop-and-insert port. The data port rates are selectable for any multiple of 56 kbps or 64 kbps, up to 1,984 kbps. Alternatively, one of the data ports can be replaced by an Ethernet bridge, providing direct connection to the LAN. In the FCD-E1A model, one of the data ports can also be replaced by four S0 interfaces for ISDN BRI extension, or by an ISDN backup interface.

The FCD-E1 is available with or without an internal LTU (Line Termination Unit), allowing direct connection to the E1 network or connection via an external LTU. The FCD-E1A has this capability built-in and can be configured with or without LTU by the customer. The FCD-T1 has a built-in CSU, allowing direct connection to the T1 network.

Optionally, the FCD-E1, FCD-T1 and FCD-E1A also support a fiber optic main link interface for multimode or single mode fiber.

The FCD-E1, FCD-T1 and FCD-E1A can operate with RAD's modular DXC multiservice access node products for multilink star applications, including access to SDH/SONET networks. The DXC units and these FCD devices operate under centralized SNMP network management.

Timeslot assignment is programmable, allowing data from each data port and from the sub-E1/T1

port to be placed into timeslots on the main link, either consecutively or alternately. The FCD-E1, FCD-T1 and FCD-E1A also allow flexible timeslot allocation of the data port timeslots. Each timeslot of the sub-E1/T1 port is placed on the same timeslot of the main E1/T1 link.

Multiple clock source selection ensures maximum flexibility, both for the main link and for the data ports, enabling the support of different applications.

Immunity to hardware and power failures is provided by bypassing the sub-E1/T1 port to the main E1/T1 link, ensuring uninterrupted service to the sub-E1/T1 port.

The E1 interface meets all requirements of ITU recommendations G.703, G.704, G.706 and G.732. It supports both two and 16 frames per multiframe, with or without CRC-4. Zero suppression over the line is HDB3. The integral LTU ensures a range of up to 2 km (1.2 miles).

The T1 interface meets all requirements of TR-62411 and TR-62421. It supports both D4 and ESF frame formats. Zero suppression over the line is selectable for either transparent, B7ZS or B8ZS. The integral CSU ensures a range of up to 1.6 km (1 mile).

Setup, control and monitoring of status and diagnostic information can be activated in four ways:

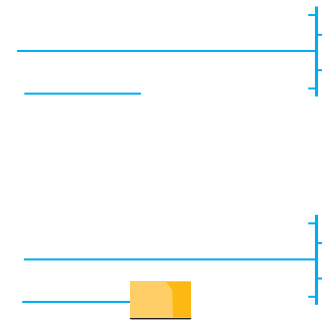
- Front panel LCD with pushbuttons (menu-driven management)
- ASCII terminal connected to the async control port (command line interpreter)
- SNMP management connected to the async control port
- In-band management through a datalink bit (T1), a dedicated timeslot or TSO (E1), supporting proprietary protocol and Frame Relay RFC 1490.

The FCD-E1, FCD-T1 and FCD-E1A support an internal SNMP agent and can be controlled by any generic SNMP station or by the RADview-HPOV/TDM, or RADview-PC/TDM (FCD-E1A only) SNMP network management application.

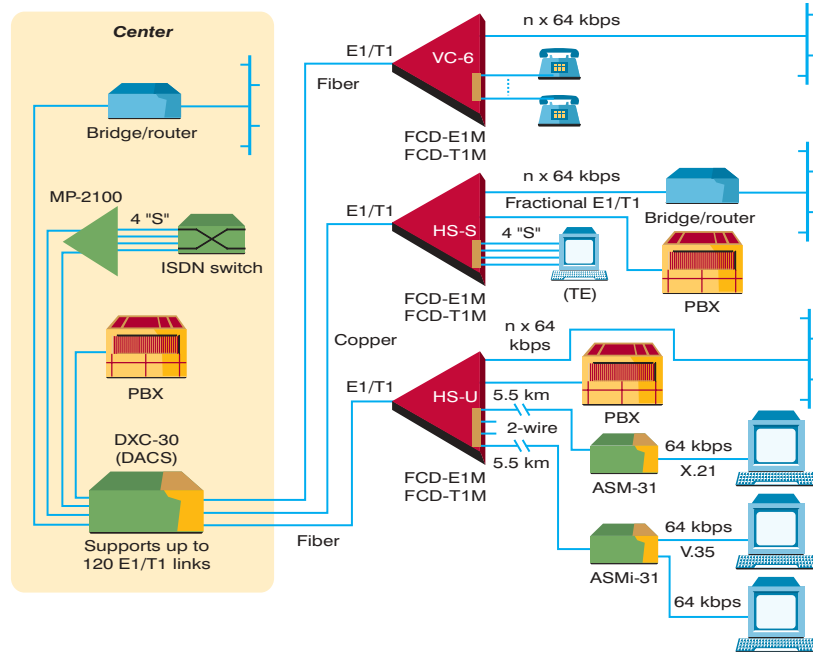
The FCD-E1, FCD-T1 and FCD-E1A support dial-in/dial-out, which can be used for remote out-of-band configuration and monitoring (dial-in) and for alarms (dial-out).

Maintenance capabilities include user-activated local and remote loopbacks and internal BERTS at the main E1/T1 link, sub-E1/T1 link and data ports. The FCD-T1 also responds to network-activated loops (RLB, LLB) when configured as a CSU.

The FCD-E1, FCD-T1 and FCD-E1A are available as standalone units for the desktop or a 19" rack shelf.



- One data port with selectable sync data rates: $n \times 56$ kbps, $n \times 64$ kbps
- Single slot supports the following Megaplex modules: HS-Q/N, VC-6, HS-S, HS-R or HS-U
- Optional sub-E1/T1 drop-and-insert port or PBX connectivity
- Fail-safe sub-E1/T1 ensures uninterrupted service
- Operates with RAD's DXC multiservice access node for multilink star configuration
- Main link available with optional integral LTU or optional fiber optic modem
- Data interfaces: V.35, RS-530, V.36/RS-449 or X.21
- Integrated Ethernet bridge/router option
- In-band remote management
- Dial-in/dial-out for remote out-of-band SNMP management
- 24-hour performance monitoring storage
- Alarm mask and priority configuration for any alarm



The FCD-E1M and FCD-T1M serve as dedicated access multiplexers for business customers, providing integration of voice and data traffic over E1/T1 or fractional E1/T1 links. They can also be used as integrating multiplexers. They have a single $n \times 56/64$ kbps data port and an I/O module slot supporting one Megaplex I/O module (HS-Q/N, HS-S, HS-U, HS-R or VC-6) providing four high or low speed data channels, four ISDN S or U interfaces, or six analog voice channels. Alternatively, the built-in data port can be replaced by an Ethernet bridge/router port. The FCD-E1M and FCD-T1M also offer an optional sub-E1/T1 drop-and-insert port for PBX connectivity.

The FCD-E1M can be ordered with an internal LTU (Line Termination Unit), allowing direct connection to the E1 network, or can connect via an external LTU. The FCD-T1M has an integral CSU, allowing direct connection to the T1 network. Optionally, either unit can support a fiber optic main link interface for multimode or single mode fiber, eliminating the need for an external fiber optic modem.

The FCD-E1M and FCD-T1M can operate with RAD's modular DXC multiservice access node

products in multilink star applications for access to SDH/SONET networks. The DXC and FCD units operate under centralized SNMP network management.

Timeslot assignment is programmable, allowing data from the data port and from the sub-E1/T1 link to be placed into timeslots consecutively. FCD-E1M and FCD-T1M also provide additional flexibility by giving full user control over the data port timeslot allocation.

Multiple clock source selection ensures maximum flexibility for supporting different applications. The main E1/T1 link may be clocked from the recovered receive clock, an internal oscillator, one of the data ports or the sub-E1/T1 link.

Immunity to hardware and power failures is provided by bypassing the sub-E1/T1 port to the main E1/T1 link, ensuring uninterrupted service to the sub-E1/T1 port.

The E1 interface meets all requirements of ITU recommendations G.703, G.704, G.706 and G.732. It supports both two and 16 frames per multiframe, with or without CRC-4. Zero suppression over the line is HDB3. The integral LTU ensures a range of up to 2 km (1.2 miles).

The T1 interface meets all requirements of TR-62411 and TR-62421. It supports both D4 and ESF frame formats. Zero suppression over the line is selectable for either transparent, B7ZS or B8ZS. The integral CSU ensures a range of up to 1.6 km (1 mile).

Setup, control and monitoring of status and diagnostics can be performed via an ASCII terminal. The FCD-E1M and FCD-T1M can also be managed via any standard SNMP application or the RADview SNMP network management application. In-band management is available via TSO (E1) or datalink bit (T1), or a dedicated timeslot using standard Frame Relay (RFC 1490), PPP and RIP-2 routing protocols.

The FCD-E1M and FCD-T1M support dial-in/dial-out, which can also be used for remote out-of-band configuration and monitoring, via serial V.24, SLIP, PPP or Ethernet ports.

Enhanced diagnostics include user-activated local and remote loopbacks, an integrated BER tester and fractional E1/T1 in-band loop.

The FCD-E1M and FCD-T1M are available as 19", 1U high, standalone units for desktop use. A rack-mount adapter kit enables installation in a 19" rack.

FCD-E1L

Managed E1 or Fractional E1 Access Unit

1

FCD-E1M, FCD-T1M • FCD-E1L
Universal Multiservice NTUs

- Single port access to E1 or fractional E1 services
- Plug and play configuration
- SNMP agent
- Out-of-band management via V.24 supervisory port
- Optional built-in LTU
- Selectable sync data rates, $n \times 64$ kbps or unframed E1
- Data interfaces: V.35, RS-530, V.36/RS-422, X.21
- Integrated Ethernet bridge, 10/100BaseT VLAN bridge or router options
- E1 interface complies with ITU G.703, G.704, G.706, G.732, G.823
- Main link diagnostics include loopbacks and BER test

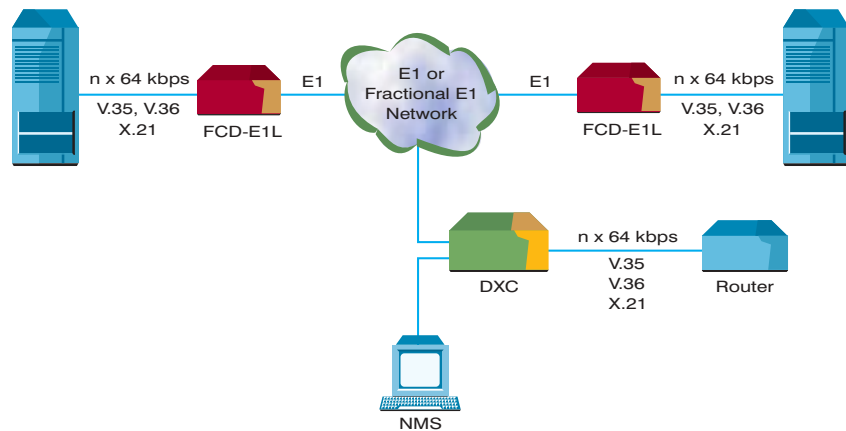


The FCD-E1L is a managed single port access unit for full or fractional E1 services, ideally used as a managed interface converter. Data port rates are selectable for any multiple of 64 kbps up to 1,984 kbps. Alternatively, unframed E1 can be supported up to 2.048 Mbps. The data port can be replaced by an Ethernet bridge, 10/100 VLAN bridge or 10BaseT router in order to provide direct connection to the LAN.

User data is placed into the E1 frame using only the required number of timeslots. Timeslot assignment is performed according to the data port speed and can be consecutive or random, starting from any timeslot.

For ease of installation, the FCD-E1L features plug-and-play connectivity. Upon connection to the E1 link, the unit automatically detects the E1 parameters and autoconfigures accordingly. Manual configuration is also possible. The FCD-E1L can be ordered with or without an LTU (Line Termination Unit). The integral LTU ensures a range of up to 2 km (1.2 miles).

The FCD-E1L meets all requirements of ITU G.703, G.704, G.706 and G.732. It supports both two and 16 frames per multiframe, with or without CRC-4. Zero suppression over the line is HDB3.



The unit may be clocked from the recovered receive clock of the main E1 link or from an internal oscillator. The data channel interface is RS-530. Adapter cables are available for V.35, V.36/RS-422 or X.21.

The FCD-E1L supports an internal SNMP agent and can be managed by any generic SNMP station or by the RADview SNMP network management application. The unit supports dial-in/dial-out, which can be used for remote out-of-band configuration and monitoring (dial-in) and for alarms (dial-out).

Maintenance capabilities include user-activated local and remote loopbacks and internal BERTs at the main E1 link and data port.

Diagnostics include user activated local loopbacks on the main E1 link and DCE data port. A pseudo-random data pattern (BERT) can be used to check the transmission path as well as the local and remote units.

The FCD-E1L is available as a standalone unit for the desktop or a 19" rack shelf.

FCD-E11

E1 or Fractional E1 Access Unit with "S" Interface

- One data port with selectable sync data rates: $n \times 56$ kbps, $n \times 64$ kbps
- Four ISDN BRI S interface ports
- Optional sub-E1 drop-and-insert port for PBX connectivity
- Operates with RAD's DXC multiservice access node for multilink star configuration
- Main link available with optional integral LTU or optional fiber optic modem
- Data interfaces: V.35, RS-530, V.36/RS-449 or X.21
- Dial-in for remote out-of-band SNMP management
- In-band remote management
- 24-hour performance monitoring storage
- Alarm mask configuration for any alarm

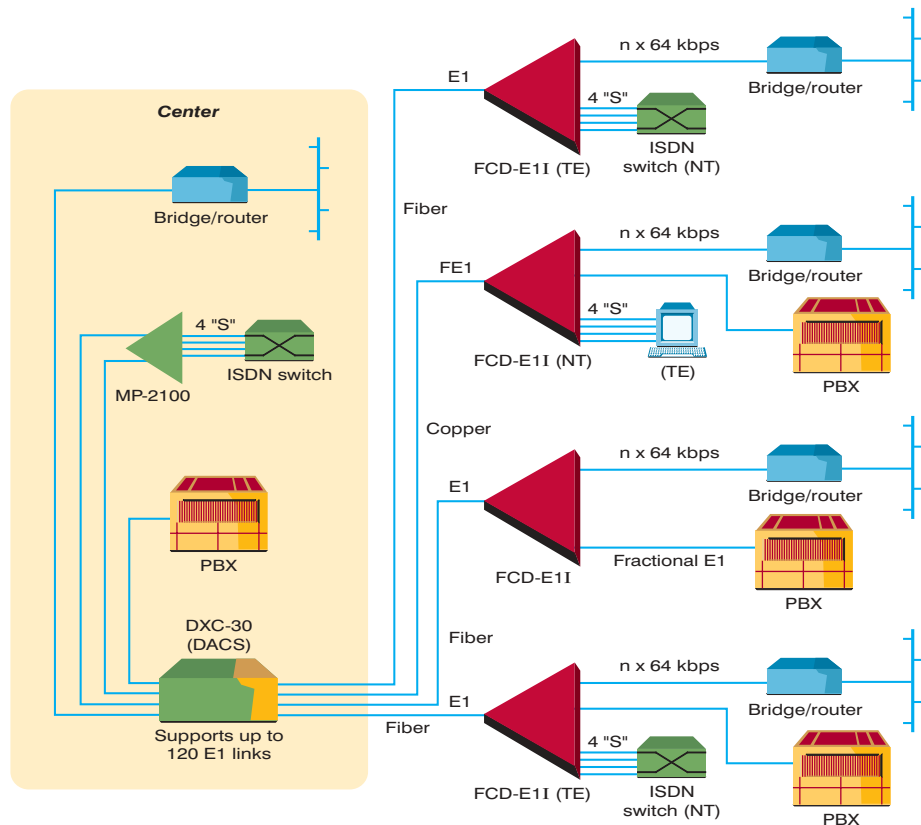
The FCD-E11 is an access unit for full or fractional E1 services. It has a single $n \times 56/64$ kbps data port and four ISDN S interface ports. In addition, the FCD-E11 offers an optional sub-E1 drop-and-insert port for PBX connectivity.

The ISDN S interfaces can be used for extending ISDN services to locations that do not have ISDN access facilities. Each S interface port operates in full duplex mode over 4-wire twisted pairs at a range of up to 1,000 meters (3,300 feet).

The FCD-E11 can be ordered with an internal LTU (Line Termination Unit), allowing direct connection to the E1 network, or connection via an external LTU. Optionally, it can also support a fiber optic main link interface for multimode or single mode fiber. This eliminates the need for an external fiber optic modem.

The FCD-E11 can operate opposite RAD's modular DXC multiservice access node products in multilink star applications for access to SDH networks. The DXC units and the FCD-E11 operate under centralized SNMP network management.

Timeslot assignment is programmable, allowing data from the data port and from the sub-E1 link to be placed into timeslots consecutively. The FCD-E11 also provides additional flexibility by giving full user control over the data port timeslot allocation.



Multiple clock source selection ensures maximum flexibility for supporting different applications. The main E1 link may be clocked from the recovered receive clock, an internal oscillator, one of the data ports or the sub-E1 link.

The E1 interface meets all requirements of ITU recommendations G.703, G.704, G.706 and G.732. It supports both two and 16 frames per multiframe, with or without CRC-4. Zero suppression over the line is HDB3. The integral LTU ensures a range of up to 2 km (1.2 miles).

Setup, control and monitoring of status and diagnostics can be performed via an ASCII terminal or SNMP. The FCD-E11 can be managed via any standard SNMP application or the RADview-HPOV/TDM SNMP network

management application. In-band management is available via TSO or a dedicated timeslot.

The FCD-E11 supports dial-in/dial-out, which can be used for remote out-of-band configuration and monitoring.

Enhanced diagnostics include user-activated local and remote loopbacks, an integrated BER tester and fractional E1 in-band loop.

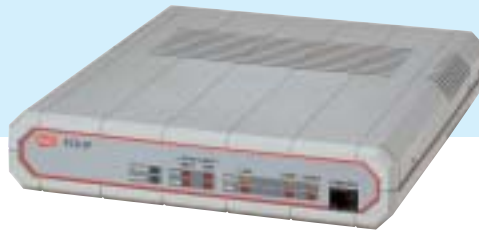
The FCD-E11 is available as a standalone unit for desktop use. A rack-mount adapter kit enables installation of one or two standalone units in a 19" rack.

FCD-IP

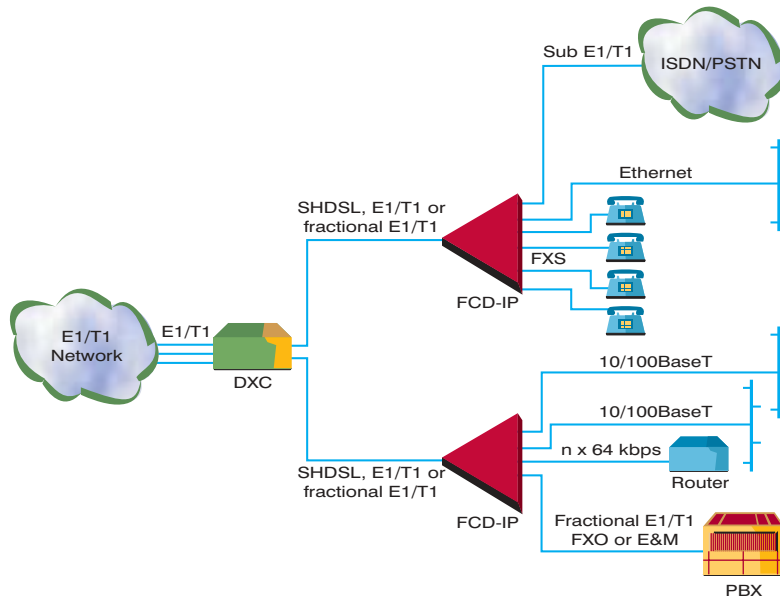
E1/T1 or Fractional E1/T1 Access Unit with Integrated Router

1

FCD-E11 • FCD-IP
Universal Multiservice NTUs



- E1/T1 access over copper, SHDSL or fiber
- One or two independent Ethernet ports
- Integrated 4-port switch
- IP/IPX routing and transparent bridging
- Support of Frame Relay (RFC 1490) and PPP protocols
- Optional data port
- Data interfaces: V.35, RS-530, V.36/RS-449, V.24, X.21
- Selectable sync data rates: n x 56 kbps, n x 64 kbps
- Optional sub-E1/T1 port or four analog ports (FXS, FXO, E&M) for PBX/phone connectivity
- Drop-and-insert capability
- Fail-safe sub-E1/T1 ensures uninterrupted service
- Dial backup over ISDN/PSTN
- Operates with RAD's DXC multiservice access node for multilink star configuration
- SNMP, Telnet or control port management



The FCD-IP is an access unit for full or fractional E1/T1 services with an integrated router. It can be ordered with one or two independent Ethernet LAN ports or alternatively with an integrated four-port switch that can replace an external hub or switch. An optional data port, sub-E1/T1 drop-and-insert port or four analog ports (FXS, FXO, E&M) are also available. The data port rates are selectable for any multiple of 56 kbps or 64 kbps, up to 1,984 kbps.

The FCD-IP is available with a software selectable internal LTU (Line Termination Unit), and allows direct connection to the E1 network or connection via an external LTU. A built-in CSU/DSU allows direct connection to a T1 network.

- The integrated router supports:
- IP and IPX routing and transparent bridging
 - backup router link capability
 - quick setup and configuration
 - Solid Firewall™ (session-based) protection
 - NAT and Single IP address translation
 - PAP/CHAP security

Optionally, the FCD-IP can support a built-in SHDSL modem, eliminating the need for an external modem.

The FCD-IP can also be used as an integrating multiplexer for LAN, data, and fractional E1/T1 services.

The FCD-IP operates with RAD's modular DXC multiservice access node products for multilink star applications, including access to SDH networks. The DXC and FCD-IP units operate under centralized SNMP network management.

Timeslot assignment is programmable, allowing data from the LAN, sub-E1/T1, analog voice and data ports to be placed into timeslots, either consecutively or alternately. The FCD-IP also allows flexible timeslot allocation of the data port timeslots. Each timeslot of the sub-E1/T1 port is placed on the same timeslot of the main E1/T1 link.

Data from the data port can either be assigned transparently to the main link timeslots or routed together with the LAN data.

Immunity to hardware and power failures is provided by bypassing the sub-E1/T1 port to the main E1/T1 link, ensuring uninterrupted service to the sub-E1/T1 port.

The E1 interface meets all requirements of ITU recommendations G.703, G.704, G.706 and G.732.

The T1 interface is compatible with virtually all carrier-provided T1 services.

Setup, control and monitoring of status and diagnostic information can be activated in four ways:

- ASCII terminal connected to the async control port
- SNMP management
- in-band management through a dedicated timeslot
- Telnet

The FCD-IP supports an internal SNMP agent and can be controlled by any generic SNMP station or by the RADview SNMP network management application.

The FCD-IP supports dial-in, which can be used for remote out-of-band configuration and monitoring.

Maintenance capabilities include user-activated local and remote loopbacks.

The FCD-IP is available as a standalone unit for the desktop or a 19" rack shelf.

FCD-IPD

Dual E1 Router

- Dual E1 router specially adapted for out-of-band ADM management over SDH or IP chain applications
- Single 10/100BaseT LAN interface or an integrated 4-port switch
- Enables shared E1/FE1 bandwidth over SDH or other E1 rings
- Supports spanning tree protocol
- Proprietary routing protocol supports up to 100 hops
- IP routing
- Supports Frame Relay and PPP
- DHCP server
- Quick setup and configuration
- In-band and out-of-band remote management
- SNMP and Telnet support
- Dual management authorization levels (carrier/user)

The FCD-IPD is a dual E1 main link router enabling shared E1 bandwidth over SDH or other E1 rings. The FCD-IPD is specially adapted for management applications in SDH environments. In these applications, the FCD-IPD can manage up to 100 ADMs of different manufacturers over a single shared E1 or fractional E1 link, dynamically allocating up to 2 Mbps bandwidth to each node for high speed management.

The FCD-IPD supports alternative routing in the event of physical ring failure. The FCD-IPD utilizes a specially developed proprietary routing protocol that can support up to 100 hops.

When configured as a bridge, FCD-IPD can function in a ring topology, implementing the spanning tree protocol.

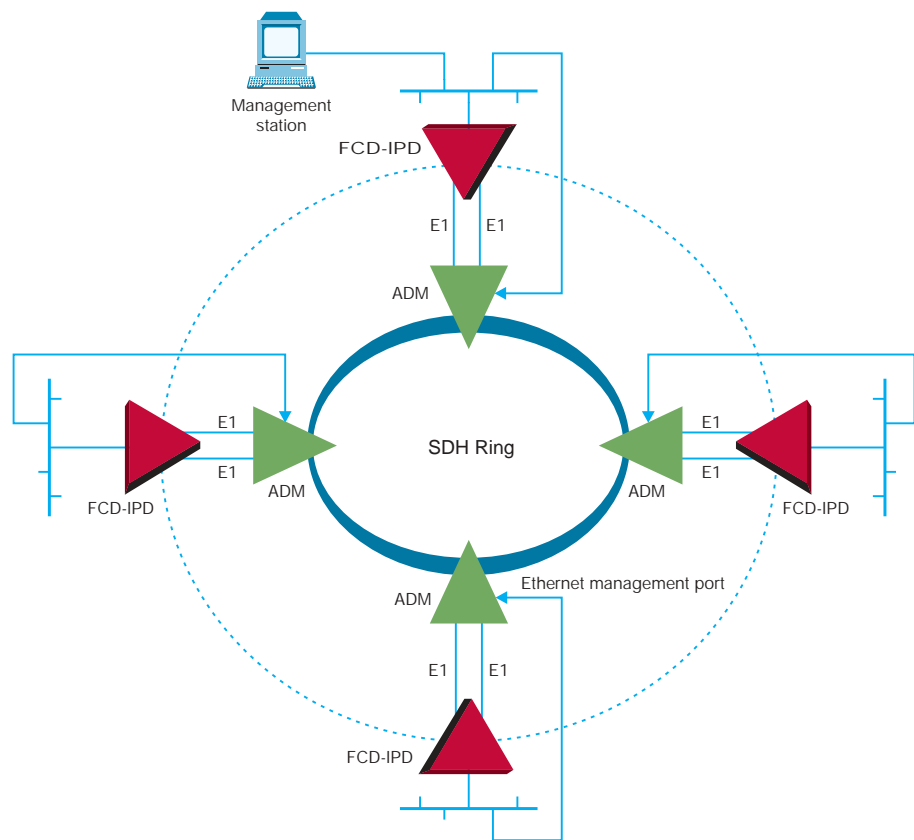
Supported WAN services are:

- dual E1 main links, with or without LTU, operating at up to 2.048 Mbps
- Frame Relay with auto-learn of DLCI and maintenance protocol

The integrated router supports:

- IP routing and transparent bridging
- backup router link capability
- quick setup and configuration

The E1 interface meets all requirements of ITU recommendations G.703, G.704, G.706 and G.732.



SDH network management via IP ring

Setup, control, status monitoring and diagnostics can be performed in four ways:

- ASCII terminal connected to the async control port
- SNMP management
- Telnet

The FCD-IPD supports an internal SNMP agent and can be controlled by any generic SNMP

station or by the RADview SNMP network management application.

Maintenance capabilities include user-activated local and remote loopbacks.

The FCD-IPD is available as a standalone unit for the desktop or a 19" rack shelf.

FCD-IPM



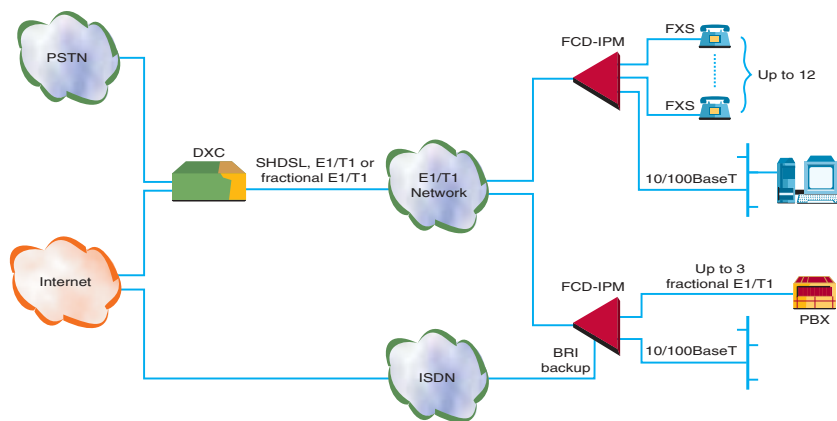
E1/T1 or Fractional E1/T1 Modular Access Device with Integrated Router

1

Universal Multiservice NTUs
FCD-IPD • FCD-IPM



- Modular integrated access device (IAD) for providing bundled services (telephony and Internet access) over E1/T1 lines
- E1/T1 access over copper, SHDSL or fiber
- One or two independent Ethernet ports
- Optional integrated four-port switch
- One or two expansion slots
- IP/IPX routing and transparent bridging
- Support for Frame Relay (RFC 1490) and PPP protocols
- Solid Firewall™ protection
- Data interfaces: V.35, RS-530, V.36/RS-449, V.24, X.21
- Selectable sync data rates: n x 56 kbps, n x 64 kbps
- Fail-safe sub-E1/T1 port ensures uninterrupted service
- Operates with RAD's DXC multiservice access node for multilink star configuration
- Optional hub/switch module, up to ten ports
- E1/T1 grooming of up to three fractional E1/T1 lines
- Supports up to 12 analog channels (FXS, FXO, E&M)
- Optional serial transparent data port
- Optional dial-up or integrated ISDN backup
- SNMP, Telnet or control port management



The FCD-IPM is an E1/T1 or fractional E1/T1 modular integrated access device (IAD) with a built-in router.

The FCD-IPM enables service providers to bundle data and voice services and Internet access over a single E1 or T1 line.

The modular design enables carriers to adopt and comply with changing customer needs. The modules include:

- four/eight analog voice ports
- one or two fractional E1/T1 ports
- universal data port
- 4-port hub/switch module

The FCD-IPM is available with a software-selectable internal line termination unit (LTU), and allows direct connection to the E1 network or connection via an external LTU. A built-in CSU/DSU allows direct connection to a T1 network.

The integrated router supports:

- IP and IPX routing and transparent bridging
- backup router link capability
- quick setup and configuration
- Solid Firewall (session-based) protection
- NAT and Single IP address translation
- PAP/CHAP security

The FCD-IPM can also be used as a rate and interface converter or as an integrating multiplexer for fractional E1/T1 analog voice and data services.

Optionally, the FCD-IPM can support a built-in SHDSL modem, eliminating the need for an external modem.

The FCD-IPM can operate with RAD's modular DXC multiservice access node products for multilink star applications, including access to SDH networks. The DXCs and FCD-IPM operate under centralized SNMP network management.

Timeslot assignment is programmable, allowing data from the LAN, sub-E1/T1 port, analog voice ports and data port to be placed into timeslots, either consecutively or alternately. The FCD-IPM also allows flexible timeslot allocation of the data port timeslots. Each timeslot of the sub-E1/T1 port is placed on the same timeslot of the main E1/T1 link.

Data from the data port can be either assigned transparently to the main link timeslots or routed together with the LAN data.

Immunity to hardware and power failures is provided by bypassing the sub-E1/T1 port to the main E1/T1 link, ensuring uninterrupted service to the sub-E1/T1 port.

The E1 interface meets all requirements of ITU recommendations G.703, G.704, G.706 and G.732.

The T1 interface is compatible with virtually all carrier-provided T1 services.

Setup, control and monitoring of status and diagnostic information can be activated in three ways:

- ASCII terminal connected to the async control port
- SNMP management
- in-band management through a dedicated timeslot

The FCD-IPM supports an internal SNMP agent and can be controlled by any generic SNMP station or by the RADview SNMP network management application.

The FCD-IPM supports dial-in, which can be used for remote out-of-band configuration and monitoring.

Maintenance capabilities include user-activated local and remote loopbacks.

The FCD-IPM is available as a standalone unit for the desktop or a 19" rack shelf.

FCD-2L

E1 or Fractional E1 Access Unit



- Single port access to E1 or fractional E1 services
- Optional built-in LTU
- Selectable sync data rates: n x 56 kbps, n x 64 kbps
- Data interfaces: V.35, RS-530, V.36/RS-422, X.21
- Integrated Ethernet bridge option
- E1 interface complies with ITU G.703, G.704, G.706, G.732 and G.823
- Main link diagnostics include loopbacks, BER test and data port monitoring
- DTE2 support

The FCD-2L is a single port access unit for full or fractional E1 services. Data port rates are selectable for any multiple of 56 kbps or 64 kbps up to 1,984 kbps. Alternatively, the data port can be replaced by an Ethernet bridge, providing direct connection to the LAN. User data is placed

into the E1 frame, using only the required number of timeslots. Timeslot assignment is according to the data port speed and is consecutive, starting from any timeslot.

The FCD-2L can be ordered with or without an LTU (Line Termination Unit). The integral LTU ensures a range of up to 2 km (1.2 miles).

The FCD-2L meets all requirements of ITU for G.703, G.704, G.706 and G.732. It supports both two and 16 frames per multiframe, with or without CRC-4. Zero suppression over the line is HDB3.

The unit may be clocked from the recovered receive clock (LBT) of the main E1 link or from an internal oscillator.

The data channel interface is RS-530. Adapter cables are available for V.35, V.36/RS-422 or X.21.

The unit also supports an optional UTP bridge port.

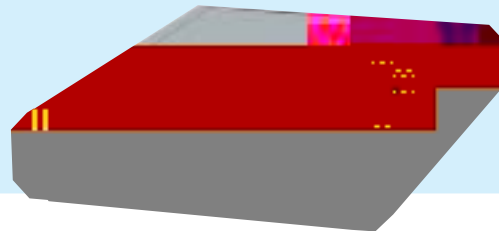
FCD-2L setup and control is by internal jumpers. Front panel switches control all diagnostic options.

Diagnostics include user activated local loopbacks on the main E1 link and DCE data port. A pseudo-random data pattern (BERT) can be used to check the transmission path and the local and remote units. The FCD-2L can display major and minor alarms, and indicate bit error rate on the E1 line in excess of 1×10^{-3} .

The FCD-2L is available as a standalone unit or as a card for a 19" rack. An adapter kit enables installation of one or two standalone units in a 19" rack.

FCD-1L

T1 or Fractional T1 CSU/DSU



- Single port access to T1 or fractional T1 services
- Optional built-in CSU
- Selectable sync data rates: n x 56 kbps, n x 64 kbps
- Data interfaces: V.35, RS-530, V.36/RS-422, X.21
- T1 interface complies with AT&T TR-62411, TR-62421, ANSI T1.403
- Main link diagnostics include loopbacks, BERT injection and data port monitoring

The FCD-1L is a single port access unit for full or fractional T1 services. Data port rates are selectable for any multiple of 56 kbps or 64 kbps up to 1,536 kbps. User data is placed into a T1 frame, using only the required number of timeslots. Timeslot assignment is performed

according to the data port speed and is consecutive, starting from any timeslot.

The FCD-1L can be ordered with or without a CSU. The integral CSU ensures a range of up to 2 km (1.2 miles).

The FCD-1L meets all the requirements of TR-62411 and TR-62421. It supports both D4 and ESF framing formats. Zero suppression over the line is selectable for B7ZS or B8ZS.

The main T1 link may be clocked from the recovered receive clock (LBT) or from an internal oscillator.

The data channel interface is RS-530. Adapter cables are available for V.35, V.36/RS-422 or X.21.

FCD-1L setup and control is by internal jumpers. Front panel switches control all diagnostic options.

Diagnostics include user-activated local loopbacks on the main T1 link and DCE data port. A pseudo-random data pattern (BERT) can be used to check the transmission path and the local and remote units. The FCD-1L can display major and minor alarms, and indicate bit error rate on the T1 line in excess of 1×10^{-3} .

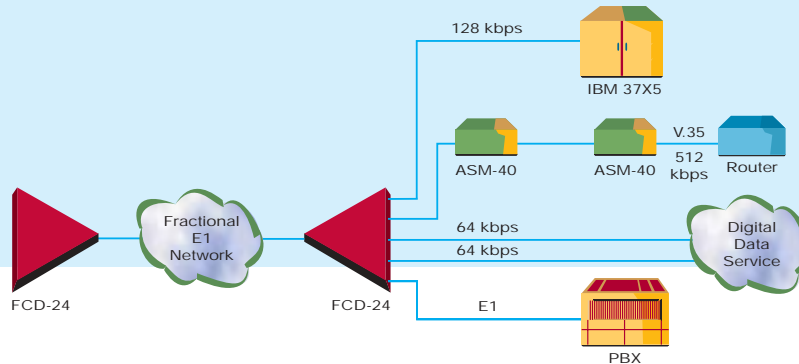
The FCD-1L is available as a standalone unit or as a card in a 19" rack. An adapter kit enables installation of one or two standalone units in a 19" rack.

FCD-24

Integrating E1 Multiplexer

- Integrates high speed data and an E1 link into E1 or fractional E1 services
- Two or four data channels
- Data interfaces: V.35, RS-530/V.36 or X.21
- Selectable data rates: n x 64 kbps
- Setup and control via front panel or supervisory port
- Complies with ITU G.703, G.704 and G.732
- Dial-out on alarm events

The FCD-24 is an integrating multiplexer for full and fractional E1 services. Two or four synchronous data channels and one E1 sub-link can be connected over the public E1 network. The E1 sub-link enables connection of user-defined timeslots from a PBX link to the main E1 interface.



The FCD-24 interface connections are modular, supporting two or four channels with or without an E1 sublink.

Data rates are selectable for any multiple of 64 kbps. Selectable timeslotting places data into timeslots either consecutively or user-defined, without restriction.

Channel interface is V.35, RS-530 or X.21. An interface for V.36/RS-422 is also available using an adapter cable.

The FCD-24 is compatible with virtually all carrier-provided E1 services, meeting all requirements of ITU recommendations G.703, G.704 and G.732. It supports both two and 16 frames per multiframe. Zero suppression over the line is HDB3. An optional integral LTU (Line

Termination Unit) supports a range of up to 2 km (1.2 miles).

Flexible clock source selection on the main link and data channels allows support for most applications.

Setup, control and monitoring of status and diagnostic information can be activated via the front panel or via a terminal or PC, or remotely via dial-up modems.

Maintenance capabilities include local and remote loopbacks, as well as a built-in BER tester.

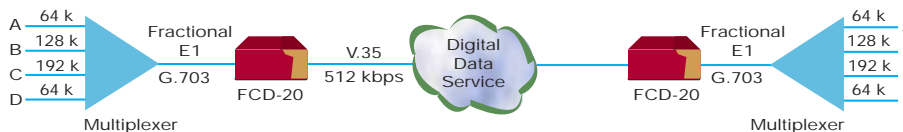
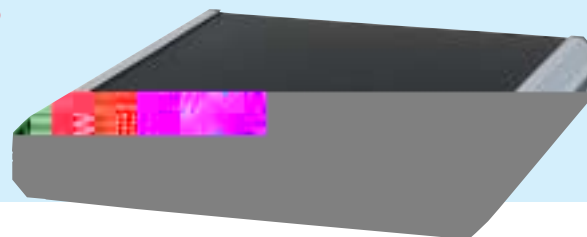
For dial-out operation, the FCD-24 automatically dials a pre-programmed number whenever an alarm event occurs.

1
Digital Service Access Devices
FCD-21 • FCD-11 • FCD-24 • FCD-20

FCD-20

Rate and Interface Converter for E1 Multiplexers

- Connects E1 multiplexers to digital data services or satellite links (n x 64 kbps)
- Maintains fractional E1 integrity end-to-end
- Data interfaces: V.35 or X.21
- Complies with ITU recommendations G.703, G.704 and G.732



The FCD-20 is a rate and interface converter, connecting E1 multiplexers to high speed public data services at any n x 64 kbps data rate. Because data rates of the digital services are usually lower than E1 (2.048 Mbps), only equipment with fractional E1 output (using only some of the timeslots) can be used.

The FCD-20 keeps the fractional E1 data channelized (i.e., the exact placement of data

into timeslots is maintained end-to-end). This unique feature allows connection of either multiplexers or single channel equipment to the data service.

Channelization integrity is implemented by allocating 8 kbps for synchronization between the two FCD-20 units. The remaining 56 kbps in the synchronization timeslot can be used for the user data channel. The channelized E1 interface is

compatible with G.703 and G.704. The FCD-20 is available with a V.35 or X.21 link interface.

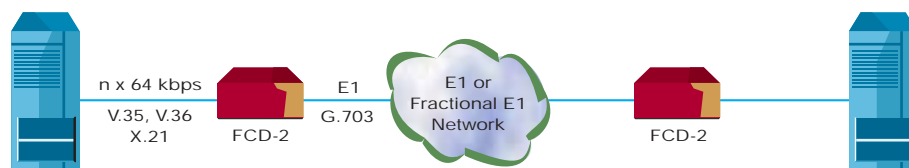
Both models provide setup and control from the front panel. Maintenance and diagnostic capabilities include local and remote loopbacks at various points.

FCD-2

E1 or Fractional E1 Access Unit



- E1 or fractional E1 rate and interface conversion
- Selectable sync data rates: $n \times 56$ kbps, $n \times 64$ kbps
- Available with or without LTU
- Data interfaces: V.35, V.36/RS-530, X.21
- Complies with ITU G.703, G.704 and G.732



The FCD-2 is a rate and interface converter for E1 or fractional E1 services, accepting unframed data at rates up to 1,984 kbps, at any multiple of 56 kbps or 64 kbps. Data is placed into an E1 frame using only the required number of timeslots. Synchronous data channel connection is provided over the public E1 network without the need for a multiplexer. Where fractional E1 service is available, the FCD-2 reduces billing costs to only the bandwidth used.

The FCD-2 meets all ITU requirements of G.703, G.704 and G.732. It supports both two and 16 frames per multiframe. CRC-4 can be supported selectively.

The unit can be ordered with or without an LTU (Line Termination Unit). The integral LTU ensures an operating range of up to 1.6 km (1 mile), which also allows the FCD-2 to be used as a short range modem. Three user interface options are available: V.36, V.35 and X.21.

Setup and control is provided from the front panel using control keys and a menu-driven LCD or via a terminal or PC connected to the supervisory port. Extensive diagnostic capabilities include local and remote loopbacks at various points, as well as a built-in BER tester for rapid fault isolation.

FCD-NTU

Intelligent Network Termination Unit (NTU)



- Intelligent network termination unit
- Interfaces supported:
 - V.35 at 56 kbps to 2.048 Mbps
 - X.21 at 56 kbps to 2.048 Mbps
 - G.703 unframed E1 at 2.048 Mbps
- Automatic activation/deactivation of remote and local loopbacks
- Supports a variety of patterns for diagnostics of digital communication systems
- Enhanced diagnostics include:
 - User activated local and remote loopbacks
 - Integrated BER tester
 - Fractional E1/T1 in-band loop
- Network link responds to an ANSI FT1 RDL (T1E1.2/93-003) in-band loop code, generated by the network

The FCD-NTU is an intelligent network termination unit (NTU) that includes two interfaces. Both DTE (network link) and DCE (user link) are V.35, X.21 or G.703.

The FCD-NTU supports dial-in and dial-out modem connections. These connections can be used for remote out-of-band configuration, monitoring and sending callout alarm messages using ASCII (terminal) or SLIP protocols.

Setup, control and monitoring of status and diagnostics information can be activated via:

- menu-driven management
- ASCII terminal connected to the async control port command line interpreter
- SNMP management connected to the async control port

The FCD-NTU has an internal SNMP agent and can be controlled by any generic SNMP station or by the RADview SNMP network management application.

Maintenance capabilities include user-activated local and remote loopbacks at the network link and user link. The user can activate a BER test for the user link. The network link responds to an ANSI FT1 RDL (T1E1.2/93-003) in-band loop code, generated from the remote network in a specific bundle of timeslots allocated only to that port. This enables control of the remote unit without installation of a separate control path.

When operating with CRC-4, E1 network statistics are stored in memory according to RFC 1406. The statistics information may be retrieved locally through the control port.

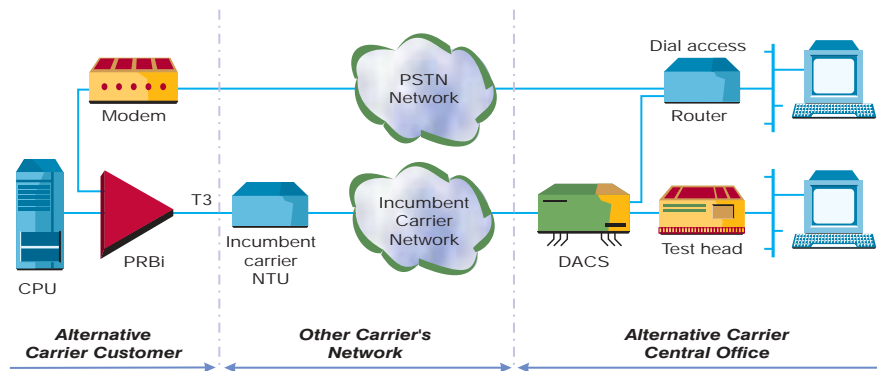
PRBi-E3, PRBi-T3

E3, T3 and HSSI Manageable Probes

1

FCD-2 • FCD-NTU • PRBi-E3, PRBi-T3
Intelligent Customer Located Equipment

- Manageable termination of public E3 and T3 services
- Real-time detection and isolation of faults in E3 and T3 networks
- Enables remote activation of diagnostic loops using reserve bits
- Enables high speed routers with HSSI interface to operate over public E3 and T3 networks
- Transparent to E3, T3 and HSSI framing
- Monitoring and diagnostic configuration activated locally via ASCII terminal or remotely via SNMP over SLIP protocol
- Dial-in/out capabilities for remote out-of-band alerts and diagnostics using dial-up modems
- Dry contact alarm port available for external alert systems
- Available as a compact standalone unit, designed for desktop or rack mounting



PRBi-E3 and PRBi-T3 are intelligent probes located at the customer premises that act as termination points for E3 and T3 public services. PRBi-E3 and PRBi-T3 are designed to detect faulty conditions on the network or user side, sending alerts when such conditions occur and enabling fault isolation.

- There are three different ways to manage and operate the PRBi-E3 and PRBi-T3:
- locally or remotely, using SNMP
 - locally, using an ASCII terminal. The product includes terminal operation software, which uses menu dialogs with numbered options to be selected by the user.
 - remote in-band activation of diagnostic loops

PRBi-E3 and PRBi-T3 are transparent to E3, T3 and HSSI framing. The units comply with all relevant international standards, including G.703, SNMP MIB II and DS3-MIB-05.TXT.

PRBi-E3 and PRBi-T3 can be managed via RADview, RAD's SNMP management application, which manages all of RAD's manageable products. RADview has a user-friendly GUI and can be run in both UNIX and PC environments in parallel to other vendors' management applications using the same platform.

- PRBi-E3 and PRBi-T3 enable different clock modes to allow a variety of applications. The following clock modes are supported:
- internal clock: a built-in oscillator enables the units to supply the clock
 - loopback timing: the units transmit and receive data according to the system clock received from the network
 - transparent mode: the units are divided into two independent clock routes, one from the network to the user and the other from the user to the network

A dry contact relay port is included. The port enables activation of external alarm devices, such as buzzers or alarm lamps. Major and minor alarm conditions are supported.

The compact, standalone units are 1U high, designed for the desktop or mounting in a 19" rack.

Optimum-T3

Multiple E1 or T1 to T3 Multiplexer

- Multiplexes up to 28 T1 channels or 21 E1 channels over a single T3 link
- Cross connect capabilities for drop-and-insert and ring applications
- Simultaneous multiplexing of E1 and T1 channels (according to G.747 standard recommendations)
- T3 transmission over coax or fiber optic cable
- Multimode or single mode fiber
- Single fiber (WDM) option
- Range up to 110 km (69 miles)
- Optional secondary link provides automatic backup
- Optional redundant power supply
- Full management support (SNMP and Telnet) by RADview or by ASCII terminal
- Conforms to ITU G.703, G.747, G.823, G.955, ANSI T1.107, ANSI T1.404, RFC 2495, RFC 2496
- T3, T1 and E1 statistical support
- Compact dimensions (1U high)

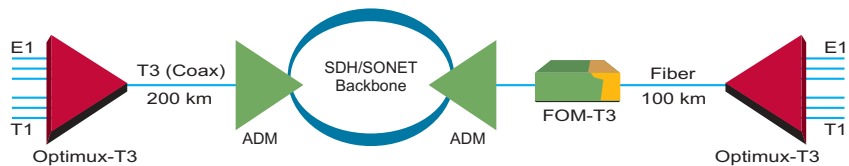
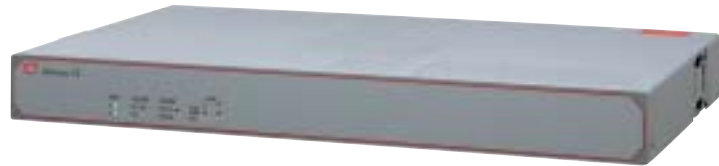


Figure 1 – Point-to-point application over an SDH/SONET backbone

Optimum-T3 is a manageable multiplexer that provides a highly cost-effective and simple solution for transporting multiple E1 and T1 links, as well as a combination of E1 and T1 (according to ITU G.747), over a T3 signal. It provides flexible solutions to meet the specific requirements of a broad range of applications.

Two versions of the Optimux-T3 are available:

- balanced version has 28 RJ-45 connectors and supports up to 28 T1 channels (balanced 100 ohms), up to 21 E1 channels (balanced 120 ohms) or mixed E1 and T1 channels in multiples of T2
- unbalanced version has 21 mini-BNC connectors and supports up to 21 E1 channels (unbalanced 75 ohms)

Both versions are non-modular and are designed for applications requiring full T3 bandwidth for multiple E1/T1 connectivity. In addition, both versions offer redundant power supply and secondary link options, enhancing system

reliability. An optional secondary link provides backup using automatic switchover upon main link failure.

The T3 link supports both electrical and optical interfaces. The electrical interface has BNC connectors in conformance with G.703 standards. The optical interface supports the following options:

- 850 nm for multimode fiber
- 1310 nm for single mode or multimode fiber
- 1310 nm and 1550 nm laser for extended range over single mode fiber
- 1310 nm and 1550 nm long haul
- single fiber option (WDM)

The Optimux-T3 has internal cross connect capabilities that enable it to support a wide range of applications. When deployed in a ring application, the Optimux-T3 provides a complete path protection mechanism that prevents any service failure, even if a fiber link is damaged or disconnected.

To facilitate system diagnostics, the Optimux-T3 features LED status indicators, AIS alarm generation, recognition and dry contact closure upon link failure. In addition, the Optimux-T3 setup, control and diagnostics can be performed through a supervisory port using an ASCII terminal, or from an SNMP management station via a dedicated management port (Ethernet or RS-232).

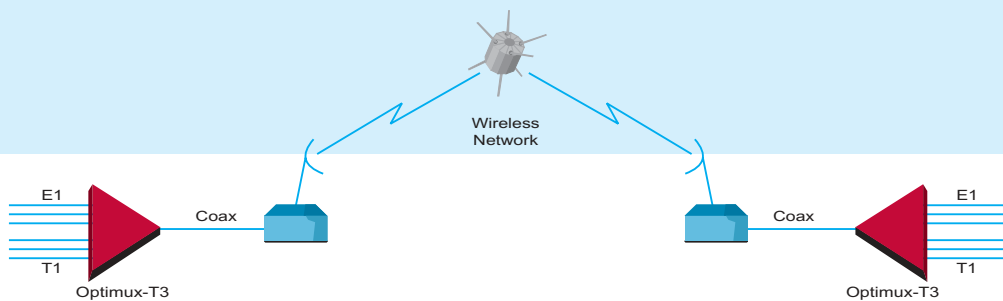
The SNMP management application offers:

- RADview-PC/TDM running in a Windows environment
- RADview-HPOV/TDM for HP OpenView UNIX platforms.

The T3 interface clock can be locked onto an external station clock.

The product supports various performance statistics on the T3, T1 and E1 lines.

The Optimux-T3 is available as a compact 1U high unit for mounting in a 19" rack.



Optimux-T3 rear panel with balanced connectors (RJ-45)

Optimux-XLE1, Optimux-XLT1

Multiple E1 or T1 and Ethernet Multiplexers

- Integrates multiple E1/T1, Ethernet and data channels over a single link
- E3 transmission over coax or fiber optic cable
- Multimode or single mode fiber
- Single fiber (WDM) option
- Conforms to ITU G.703, G.742, G.751, G.823, G.824, G.955, G.956
- Optional secondary link provides automatic backup
- Optional redundant power supply
- Management via an ASCII terminal or SNMP management application
- Compact dimensions (1U high)

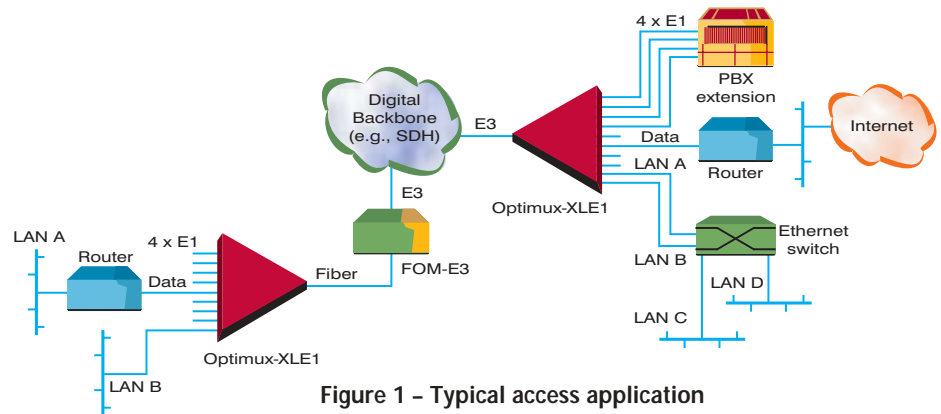


Figure 1 – Typical access application

The Optimux-XL products provide a simple and cost-effective solution for transporting multiple E1 or T1 links, as well as data and Ethernet at distances up to 110 km (69 miles). Two versions of the Optimux-XL multiplexer are available.

The modular version of the Optimux-XLE1 integrates up to 12 E1 channels, one to four Ethernet LANs and up to 12 transparent data interfaces over a single E3 link. The T1 version (Optimux-XLT1) combines Ethernet, data and T1 channels over fiber. This provides an easily upgradable solution that is flexible enough to meet the specific requirements of a broad range of applications.

The **modular version** supports one fixed 10/100BaseT Ethernet port and three additional plug-in channel modules. Available channel modules are:

- dual/quad channel E1 or T1
- 10BaseT Ethernet
- 10/100BaseT Ethernet (with VLAN support)
- quad port V.35/X.21/RS-530 (1.5/2 Mbps each)
- single port V.35/RS-530 (8 Mbps)
- n x 64 kbps plus optional dual channel E1
- HSSI (6/8 Mbps)

Using these modules enables various combinations, ranging from four Ethernet ports to a single Ethernet port with up to 12 E1 or T1 channels, or a combination of E1/T1, Ethernet and data.

Ethernet transmission utilizes an integrated bridge that supports up to 10,000 MAC addresses, and operates at 8.4 Mbps.

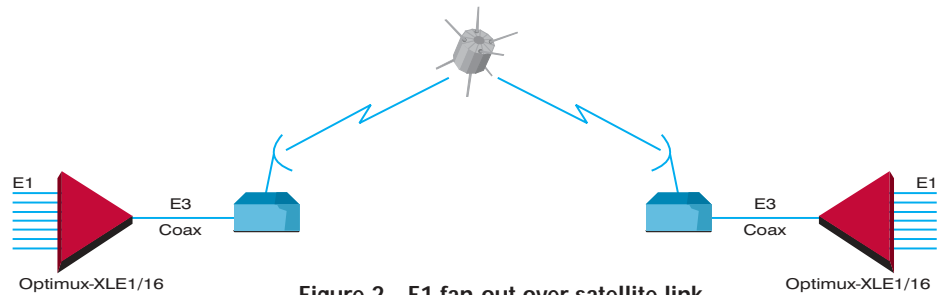


Figure 2 – E1 fan-out over satellite link

The **non-modular version** (Optimux-XLE1 only) supports 16 E1 channels. It is designed for applications requiring the full E3 bandwidth for multiple E1 connectivity (Figure 2).

Both modular and non-modular versions support redundant power supply and secondary link options, enhancing system reliability. The optional secondary link provides backup using automatic switchover upon main link failure.

The following optical interfaces are available:

- 850 nm for multimode fiber
- 1310 nm for single mode fiber
- 1310 nm and 1550 nm laser for extended range over single mode fiber
- 1310 nm and 1550 nm long haul for extended range over single mode fiber
- single fiber option (WDM)

The Optimux-XL devices transmit each of the E1 or T1 channels independently. The E1 interface can be 75 ohm unbalanced or 120 ohm balanced.

The E3 interface clock can be locked onto an external station clock.

To facilitate system diagnostics, the Optimux-XL units feature LED status indicators, AIS alarm generation, recognition and dry contact closure upon link failure. In addition, the Optimux-XL setup, control and diagnostics can be performed through a supervisory port using an ASCII terminal, or from an SNMP management station via the Ethernet ports or the dedicated management port (Ethernet or RS-232). Telnet is also supported.

The SNMP management application offers:

- RADview-PC/TDM running in a Windows environment
- RADview-HPOV/TDM for HP OpenView UNIX platforms

The Optimux-XL products are available as compact 1U high units for mounting in a 19" rack.

Optimux-4E1/4E1L, Optimux-4T1/4T1L

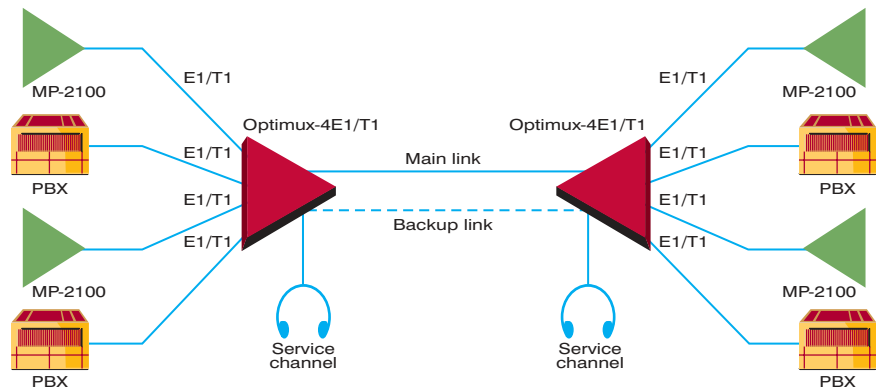
Four E1 or T1 Channel Multiplexer

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SDH/SONET Access

Optimux-XLE1, Optimux-XLT1 • Optimux-4E1/4E1L, Optimux-4T1/4T1L

- Multiplexes four E1 or T1 channels over a single link
- Transmissions over coax (E1 version only) or fiber optic
- Multimode or single mode fiber
- Single fiber (WDM) option
- Range up to 75 km (47 miles)
- Voice service channel
- Conforms with ITU G.703, G.742, G.823, G.829, G.955, G.956
- Optional secondary E2 link provides automatic backup
- Optional redundant power supply
- Management via an ASCII terminal or SNMP management application
- Compact, 1U high enclosure



Point-to-point application

The Optimux-4E1 multiplexer combines four E1 links over one coax E2 or fiber optic link. The T1 version (Optimux-4T1) combines four T1 links over a fiber link only.

A pair of Optimux-4E1 or Optimux-T1 units offers simple and low-cost connectivity for four E1 or T1 channels at distances up to 110 km (69 miles).

An optional secondary link provides backup using automatic switchover upon link failure, and an optional secondary power supply provides power redundancy and fail-safe operation.

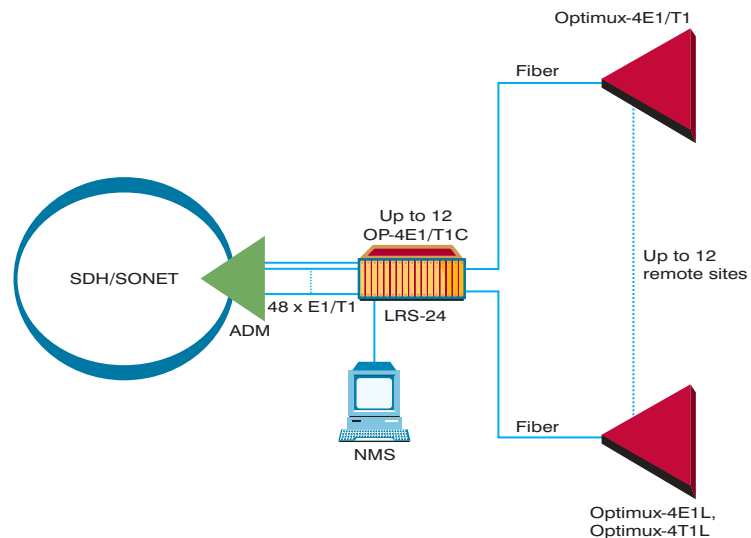
Optimux-4E1L and Optimux-4T1L, low cost versions without the redundant power supply and secondary main link, are available for increased competitiveness in applications where redundancy is not needed.

The Optimux transmits each of the E1 or T1 signals independently, so that the clock of each E1 or T1 channel is independent of the clock of any other E1 or T1 channel. The E1 interface can be 75 ohm unbalanced or 120 ohm balanced. The T1 interface is 100 ohm balanced.

Various optical interfaces are available:

- 850 nm for use with multimode fiber
- 1310 nm for use with single mode fiber
- 1310 nm or 1550 nm laser for extended range over single mode fiber
- Single fiber option (WDM)

A card version of the Optimux-4E1 and Optimux-4T1 with central SNMP management is available for mounting in the LRS-24 19" rack, providing a compact, cost-effective central solution.



Central site to multipoint application

Configuration, monitoring and maintenance operations can be performed via a supervisory port, using either an ASCII terminal or a SLIP connection to an SNMP management station. The SNMP management application supports:

- RADview-PC/TDM running in a Windows environment
- RADview-HPOV/TDM for HP OpenView UNIX platforms

To facilitate system diagnostics, the Optimux features LED status indicators, AIS alarm generation, recognition and dry contact closure upon link failure.

A voice service channel is available for end-to-end maintenance.

DXC-STM-1

Multiservice Access Node and Add-Drop Multiplexer

- 7U high enclosure
- Modular construction with 16 I/O slots
- Services supported on DS0: ISDN, IDSL, HDSL, SHDSL, n x 56/64 kbps, E1, T1, E3, T3 and STM-1
- Services supported on DS1: E1, E3 and T3
- STM-1 SDH add-drop multiplexing
- Flexible user configurations at STM-1 level, including 63 E1, three E3 or three T3 links
- Fully compatible with 34 Mbps and 45 Mbps PDH signals, and SDH microwave radio relays
- Supports entire range of SDH network topologies: point-to-point, chain, and STM-1 ring/folded ring, structured ring/star and ring/ring
- Optional system redundancy
- Optional link and/or hardware protection
- Integrated fiber optic, SHDSL, HDSL or IDSL modems
- Diagnostic capabilities including local and remote loopbacks and BER test
- Inverse multiplexing up to 15.7 Mbps
- DS0 non-blocking cross connect and groomer
- Broadcast capabilities (single point to multipoint)
- In-band management through TS0/FDL; dedicated timeslot supporting PPP proprietary protocol; and Frame Relay RFC 1490
- SNMP network management using RADview software
- Out-of-band management via V.24 port using SLIP or PPP protocol or via Ethernet port
- Standard RIP-2 and proprietary routing protocols



The DXC-STM-1 is a hybrid version of the R-STM-1E multiplexer and the DXC-30 digital cross connect, assembled in a single integrated chassis. The system features both DXC I/O cross connect and SDH add-drop multiplexer (ADM) capabilities.

The DXC-STM-1 can be deployed in access nodes as a terminal multiplexer (TM) or ADM. It enables expansion of the Local Loop up to 60 km (37 miles), creating a transmission layer fully compatible with regional and national SDH networks. It can be managed by the RADview network management system, together with other RAD Multiservice Access Platform (MAP) and Last Mile products, as well as ADMs such as R-STM-1 and R-STM-1E.

Cross connect, groomer and broadcast

The DXC-STM-1 allows maximum flexibility between ports. A user-programmable connection table connects any incoming 56/64 kbps timeslot to any outgoing 56/64 kbps timeslot. The ports can be any of the DXC modules. Support is provided for cross connect functions such as drop-and-insert.

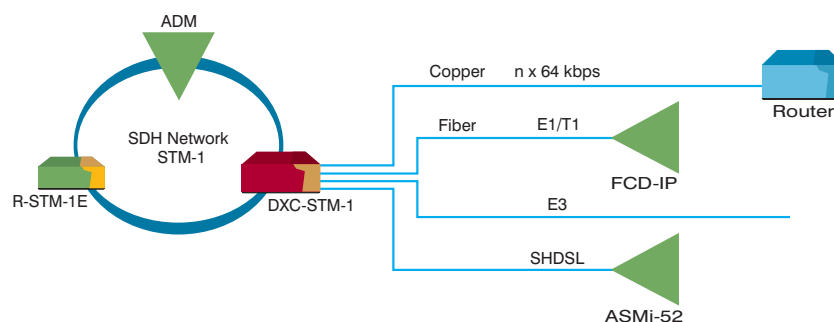
The DXC-STM-1 grooms fractional traffic from the user side into fuller trunks such as E1/T1, E3/T3 or STM-1 links, for connection to the network. Grooming and bandwidth maximization is achieved by packing the n x 56/64 kbps data channels into an E1 or T1 frame (including internal E1/T1 of the E3, T3 or T3/747 modules, or VC-12 containers of the STM-1 module), using only the required number of timeslots. This provides fractional CSU/DSU functionality.

The SDH terminal component of the DXC-STM-1 grooms E1, E3 and T3 links over an STM-1 main link.

DXC-STM-1 can broadcast any traffic combination from a single input to numerous destinations. Channel relocating and half duplex conferencing are also supported.

DE3, DT3, DT3/747 multiplexer modules

On the DS1 level, these expansion modules provide full channelized multiplexing and demultiplexing of up to 63 E1, three E3 or three T3 trunks onto the STM-1 trunk.



On the DS0 level, these modules provide fully channelized multiplexing and demultiplexing of up to 16 independent E1/FE1 channels to and from an E3 interface; 28 independent T1/FT1 channels to and from a T3 interface; or 30 independent E1/FE1 or 48 T1/FT1 channels to and from an STM-1 interface. In addition, an optional G.747-compliant T3 interface supports standard multiplexing of 21 independent E1 lines into a T3 frame. Grooming and bandwidth maximization are implemented by programming any timeslot from any of the DXC ports directly into the internal E1 or T1 frame of the E3, T3 or T3/747 modules.

Redundancy

The DXC-STM-1 provides maximum redundancy and protection flexibility to accommodate each user's needs and help minimize service downtime. The timeslot groomer offers partial or full redundancy that can be added at any time. The module's link protection is user-programmable and can be added at any time. ADM system redundancy is optional as well. STM-1 protection complies with the SDH transmission standards.

Basic unit

The DXC-STM-1 incorporates the R-STM-1E multiplexer and the DXC-30 digital cross connect in a 7U high chassis, combining in a single, integrated unit the capabilities of an STM-1 terminal multiplexer or ADM with DXC I/O cross connect.

The DACS component of the basic DXC-STM-1 unit includes one power supply, one common logic module (system redundancy is optional) and 15 I/O slots for the plug-in interface modules (for more information see pages 4–7). The SDH terminal or ADM component includes 21 E1 ports, one power supply and an STM-1 fiber interface supporting up to 63 E1, three E3 or three T3 lines (see page 36).

Setup, control and diagnostics can be performed via RV-EINM-SW, the UNIX-based Element and Network Manager with integrated management for RAD's MAP products, or via RV-EEM-SW, the PC-based Element Manager for ADMs.

Management

The DXC-STM-1 facilitates centralized management of the access network by combining the powerful RADview network management application in the SDH transmission layer with the access equipment manager of a specific application. The access equipment manager uses embedded management channels for communication with remote access equipment. Centralized management enables the building of flexible, responsive and optimized SDH access networks to fit any customer's requirements.

Modules

The DXC-STM-1 supports all of the features and I/O modules supported by the DXC, namely: DE1B, D4E1, D8E1, DT1B, D4T1, D8T1, DE3, DT3, DFSTM-1, DHL, DIM, D8U, DHS, D8SL (see pages 4–7). It also supports the R-STM-1E expansion modules (see page 36).

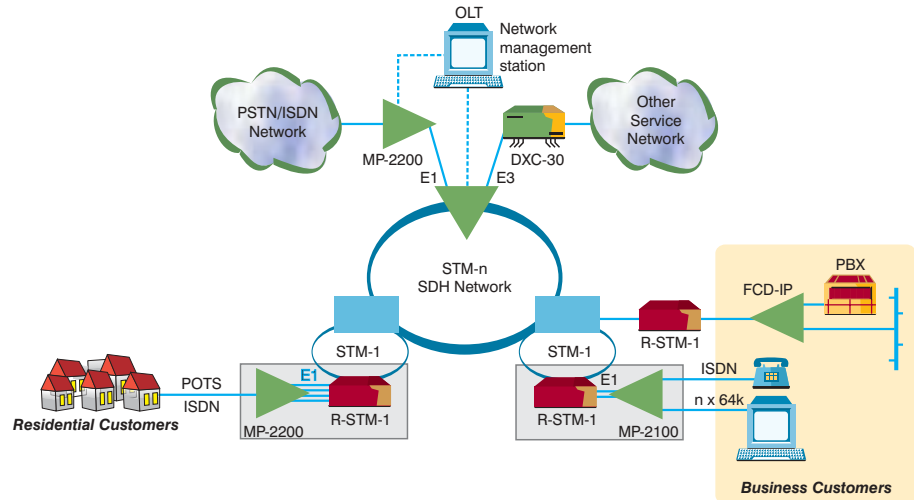
Applications

In addition to the typical DXC applications (see pages 4–7), the DXC-STM-1 also serves as a transmission solution for SDH access networks.

R-STM-1, R-STM-1E

STM-1 Synchronous Digital Multiplexers

- SDH transmission solution for access networks
- Flexible STM-1 terminal or ADM configuration
- Coax or fiber optic network interface for range of up to 60 km (37 miles)
- Flexible user interface configurations include:
 - 21 E1 basic configuration
 - 63 E1 (with 42 E1 expansion cards)
 - Three E3 with expansion card
 - Three T3 with expansion card
- Low power consumption and high reliability
- Optimized for installation in outdoor cabinets
- Optimized for NTU applications
- Path protection switching in a ring topology
- Supports centralized management, including configuration, service, performance, security and fault management
- Integrated management system supporting RAD's Multiservice Access Platform (MAP) equipment
- Accurate timing transfer to access equipment



R-STM-1 and R-STM-1E are multiplexers based on Synchronous Digital Hierarchy (SDH) transmission cores for the Local Loop, supporting up to 63 E1s or a mix of E1/E3 or E1/T3 tributary interfaces.

The units can be deployed in access nodes as a terminal multiplexer (TM) or add-drop multiplexer (ADM). They enable expansion of the Local Loop to 60 km (37 miles), creating a transmission layer fully compatible with regional and national SDH networks. From this transmission layer, the full range of multiservice access solutions can be deployed to provide cost-effective and quick service deployment.

SDH transmission supports a full range of access systems, including Remote Subscriber Units (RSUs), Digital Line Carriers (DLCs), digital cross connect (DXC 1/0) and service multiplexers.

Both devices are fully compatible with 34/45 Mbps PDH signals, SDH microwave radio relays and existing SDH infrastructure. They

support the following range of SDH network topologies:

- point-to-point
- chain
- STM-1 ring/folded ring
- STM-4/16 ring, STM-1 structured ring-star and ring-ring

R-STM-1 is available with standard G.703 or optical short or long haul aggregate modules for network connectivity and 21 x 2 Mbps tributary interfaces.

The R-STM-1E is an extended version enabling tributary expansion up to:

- 63 x 2 Mbps
- 3 x 34 Mbps
- 3 x 45 Mbps

The compact size and low power consumption of R-STM-1 and R-STM-1E allow easy rack or wall installation at the customer premises, in telecommunications buildings or in outdoor cabinets.

R-STM-1E is also available with an integrated 1/0 cross connect in the DXC-STM-1, which features both DXC 1/0 cross connect and SDH ADM capabilities (see DXC, pages 4–7).

R-STM-1 and R-STM-1E facilitate centralized management of the access network, combining RADview and the SDH transmission layer network management applications. The centralized network management application uses embedded management channels for communication with remote access equipment. They enable the building of flexible, responsive and optimized SDH access networks to fit any customer's needs.

The 2 Mbps output signals can be resynchronized by the multiplexer clock and pointer justification events can be filtered out, eliminating phase hits. This creates an accurate signal, clear of phase hits and suitable for synchronization of access equipment. Since the SDH network is usually synchronized by the national synchronization network, this accurate timing is transferred to the access equipment.

IMX-4E1, IMX-4T1

8/6 Mbps Inverse Multiplexers

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R-STM-1, R-STM-1E • IMX-4E1, IMX-4T1
Inverse Multiplexers

- Connects one high speed data channel over up to four E1/T1 links
- IMX-4E1: supports data rates from 1.92 Mbps to 7.68 Mbps
- IMX-4T1: supports data rates from 1.472 Mbps to 5.888 Mbps
- DTE port interface options: V.35, V.36, X.21, RS-530/422, HSSI
- Integrated 10/100 Ethernet bridge option with VLAN support
- E1 complies with ITU Rec. G.703, G.704 and G.823
- T1 complies with ITU Rec. G.703, G.704, AT&T TR-62411, ANSI T1.403 and with AT&T ACCUNET Fractional T45 service



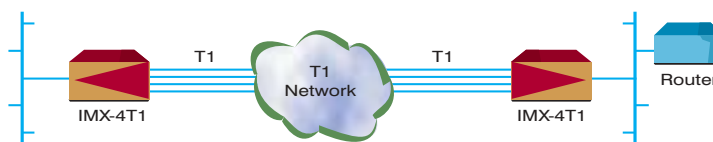
High speed data over n x E1 lines

The IMX-4E1 and IMX-4T1 inverse multiplexers transmit a 6/8 Mbps channel over multiple E1 or T1 links. They bridge the gap between E1/T1 and E3/T3, allowing bridges and routers to operate at their fastest rates. They also provide high speed access to SDH/SONET backbones where the only access services available are E1/T1 lines.

The IMX-4E1 and IMX-4T1 provide immediate connection to installed applications. DTE interfaces are V.35, RS-530, X.21 and HSSI. The rate can be any multiple of 1.472 Mbps up to a total of 5.888 Mbps in the IMX-4T1 and any multiple of 1.92 Mbps up to a total of 7.68 Mbps in the IMX-4E1.

The IMX-4E1 and IMX-4T1 have a built-in 10/100 Ethernet bridge with VLAN support for LAN-to-LAN applications over four E1 or four T1 links.

Load sharing over redundant links is performed to improve the resilience of high speed connections. If a T1 or E1 link fails, the communication link still remains open, but at a reduced speed (automatic rate fallback to lower speeds is supported).



Native LAN over n x T1 lines

Timing options include:

- internal clock: internal oscillator is the source for E1/T1 links
- loopback timing: E1/T1 transmit clock is derived from E1/T1 receive clock
- station clock: source for E1/T1 transmit clock is framed/unframed all 1s or G.703 compatible

Diagnostic loopbacks available include local DTE loopback, local E1/T1 loopback on all links and BERT V.52 through the remote IMX-4E1 and IMX-4T1.

The IMX-4T1 supports T1 network loopback per AT&T 62411 (in-band code activated).

Full statistical diagnostics capability is according to AT&T PUB 54016 for both E1 and T1.

Local control and diagnostics are available via the front panel LCD or via an ASCII terminal. Call out upon alarm and remote Telnet control are also supported.

The IMX-4E1 and IMX-4T1 are compact 1U high standalone units, with optional hardware for mounting in a 19" rack.

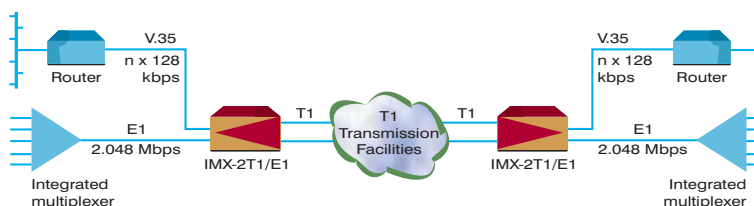
IMX-2T1/E1

T1 Inverse Multiplexer



- Converts any E1 frame into two T1 frames
- Complies with ITU Rec. G.703, G.704, AT&T TR-62411, ANSI T1.403
- Compensates for up to 64 msec differential delay
- Complies with AT&T TR-54019 (E1 Access over T1 Networks)
- Built-in BERT and loopbacks
- Compatible with DXC DIM module

The IMX-2T1/E1 enables E1 equipment to utilize two T1 transmission links by converting any E1 frame (2.048 Mbps) into two T1 frames (1.544 Mbps). The E1 frame (256 bits) is equally divided between both T1 frames. IMX-2T1/E1 is transparent to the E1 framing pattern. It can be ordered with or without CSUs. Optional drop-and-insert G.703 or $n \times 56/64$ kbps ports enable



full bandwidth utilization by using the remaining T1 timeslots for additional traffic.

The IMX-2T1/E1 compensates for any differential delay of up to 64 msec between the T1 lines, to properly reconstruct the original stream. The end-to-end delay is not more than the maximum differential delay between the links.

Diagnostic features include:

- local/remote DTE loopback
- local/remote T1 loopback
- built-in BERT V.52

In addition, the IMX-2T1/E1 supports the T1 network loopback per AT&T 62411 (in-band code activated), and statistical diagnostic capability according to AT&T PUB 54016.

The IMX-2T1/E1 complies with TR-54019 (E1 Access over T1 Networks).

The IMX-2T1/E1 is compatible with the DXC-M/DIM module.

Diagnostics can be initialized via the front panel or by using an ASCII terminal connected to the supervisory port.

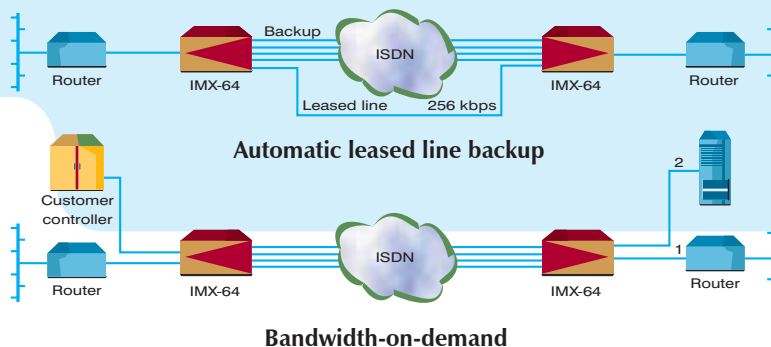
IMX-64

Inverse Multiplexer

- Supports up to six 64 kbps channels
- Bandwidth-on-demand
- ISDN backup of high speed leased lines (up to 256 kbps)
- Offers two separate connections – up to 384 kbps for both ports
- Supports BONDING protocol specification (modes 1, 2 and 3)
- Supports Euro-ISDN, 5ESS, National ISDN (Ni1), DMS-100 and NTT

The IMX-64 inverse multiplexer provides bandwidth-on-demand for applications such as image transmission, LAN internetworking and videoconferencing.

In addition, it enables automatic backup of high speed leased lines via switched digital services.



The IMX-64 can respond to an application's bandwidth requirements (by protocol monitoring, time-of-day or manual configuration) and automatic connect/disconnect channels, as required.

When a high speed link fails, the IMX-64 will automatically activate the necessary digital links to resume service to the DTE.

The IMX-64 connects to basic rate ISDN services, and supports all popular standards and S and U interfaces for switched services, as well as S leased line interface (S0).

It complies with the BONDING standard for

inverse multiplexers, allowing it to operate with other vendors' products.

The IMX-64 supports DTE data rates up to 384 kbps through either one or two ports. DTE interfaces can be V.35, V.24, X.21 or RS-530. Software upgrades can be performed by software download from a PC, via the supervisory port, using XMODEM protocol.

Command-driven software offers complete control of configuration, diagnostics and alarms via the front panel LCD and soft keys, or via a terminal connected to the supervisory port. SNMP over SLIP support is also available.

IMX-6L

6-Channel Inverse Multiplexer for Leased Lines

- Supports up to six 64 kbps leased lines
- Aggregate data rate up to 384 kbps
- Supports BONDING protocol specification (modes 1, 2 and 3)
- Differential delay of up to 512 msec
- Setup and control via a supervisory port

The IMX-6L inverse multiplexer transmits high speed data over two, four or six 64 kbps leased line channels (not switched), for applications such as channel connection, LAN internetworking and videoconferencing.

It is intended for applications where data transmission above 64 kbps is required, but higher rate lines are either not available or are prohibitively expensive.

The IMX-6L operates by dividing the total bandwidth among several 64 kbps circuits. A second unit restores the original signal by combining and synchronizing the 64 kbps links.

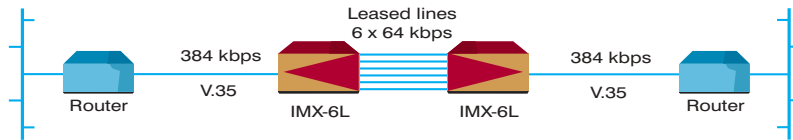
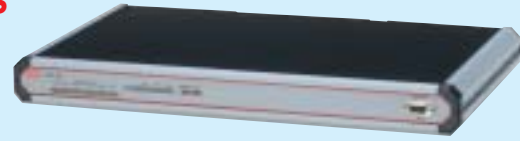
During the initial handshaking process, the sending unit measures the delay of each 64 kbps circuit. This enables both units to reconstruct the data after it has been spread across the six separate links, and to ensure that the data is delivered in the proper order. The maximum differential delay of 512 msec can support two satellite hops.

Interfaces include V.24 (network side only), V.35, RS-530, X.21, RS-530A, V.36, or G.703 codirectional (network side only).

The IMX-6L supports a DTE connection up to the maximum permissible aggregate bandwidth. It

complies with the BONDING standard (modes 1, 2 and 3) for inverse multiplexers, allowing it to operate with other vendors' products. Software upgrades can be performed by software download from a PC via the supervisory port, using XMODEM protocol.

The IMX-6L provides command-driven software control of configuration, diagnostics and alarms via a terminal connected to the supervisory port. SNMP over SLIP support is also available.



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Inverse Multiplexers

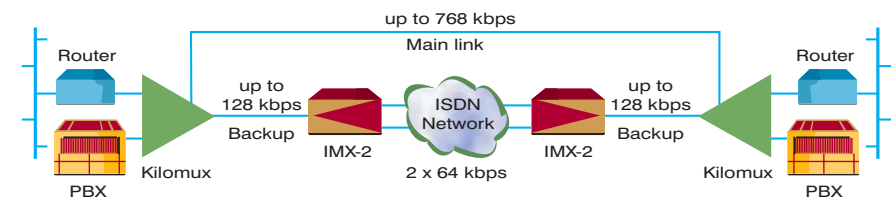
IMX-2T1/E1 • IMX-64 • IMX-6L • IMX-2

IMX-2

Inverse Multiplexer and Leased Line Backup Unit

- ISDN backup of leased lines and dynamic bandwidth allocation
- Provides bandwidth-on-demand (smart terminal adapter)
- Can operate over a combination of one or two switched B-channels and one leased line
- Integrated terminal adapter supports Euro-ISDN, 5ESS, National ISDN (Ni1), DMS-100 and NTT
- Supports BONDING protocol specification (modes 1, 2 and 3)
- Configuration via front panel or control port

The IMX-2 is an inverse multiplexer that splits incoming data between a leased line and an ISDN link, according to mode of operation, line availability and traffic load.



Typical applications for the IMX-2 include leased line backup, dynamic bandwidth allocation and bandwidth-on-demand.

The IMX-2 offers a large choice of interfaces on the network side as well as the data ports. It connects to basic rate ISDN (BRI) switched digital service and supports S and U interfaces, as well as S leased line interface (S0). It also supports one dedicated circuit (leased line) with all popular interfaces: V.35, V.36/RS-422, RS-530 or X.21.

For applications such as videoconferencing that require switched connections, the IMX-2 can act as a smart terminal adapter and call up to two B channels to provide 128 kbps aggregate bandwidth.

The IMX-2 provides command-driven software control of configuration, diagnostics and alarms via a terminal connected to the supervisory port. SNMP over SLIP support is also available.

