

Megaplex-2100/2104

Modular Integrated Access Multiplexers



Sub-DS0 multiplexer
providing voice, data,
Ethernet, and other
unique services
(teleprotection,
omnibus)

- Multiple n x 64 kbps, SHDSL, E1/T1 or fractional E1/T1 main links, with combined TDM capacity of up to 8 Mbps (124 timeslots)
- 10/100-Mbps IP access link for transparent circuit extension over IP, using RAD's TDMoIP technology
- Ring topology features self-healing TDM E1/T1 rings and Resilient Fast Ethernet Ring (RFER) technology (under 50 msec switchover protection)
- Optional redundant configurations for critical applications
- Wide range of I/O modules supporting multiple channels:
 - up to 120 high speed data channels
 - up to 132 low speed data channels
 - up to 55 full BRI (2B+D) channels
 - up to 120 PCM voice channels
 - up to 44 Fast Ethernet ports

TDM^oIP
Driven®



data communications

Innovative Access Solutions

Megaplex-2100/2104

Modular Integrated Access Multiplexers

Megaplex-2100/2104 is a modular integrated access TDM multiplexer, which integrates multiple dedicated data, voice, ISDN and LAN channels over multiple main (network) links. Megaplex equipped with 8-port main link modules in conjunction with the 12-port high-speed module features a traffic payload capacity of up to 248 DS0 timeslots. The modules of version 11 and lower support up to 124 DS0 timeslots (8 Mbps).

The flexible, modular Megaplex with a wide choice of I/O (user interface) modules was designed for applications ranging from small campus networks to multi-site corporate networks or extensive carrier access solutions. Due to Megaplex's standards adherence, central office based cross-connect units (DACs) can separate voice and data, sending each to the appropriate carrier or service.

Megaplex enables carriers to successfully deploy bundled services, ISDN services and Internet access. The integration of a broad range of services makes Megaplex a cost-effective access device, with reduced deployment and maintenance costs.

Megaplex with TDMoIP technology provides a cost-effective, versatile and modular solution for transmitting legacy TDM traffic over IP networks. This is especially suitable for large corporations, utilities or power companies that are seeking a gradual migration to IP networks.

The equipment conforms to international standards, ensuring compatibility in multi-vendor environments worldwide.

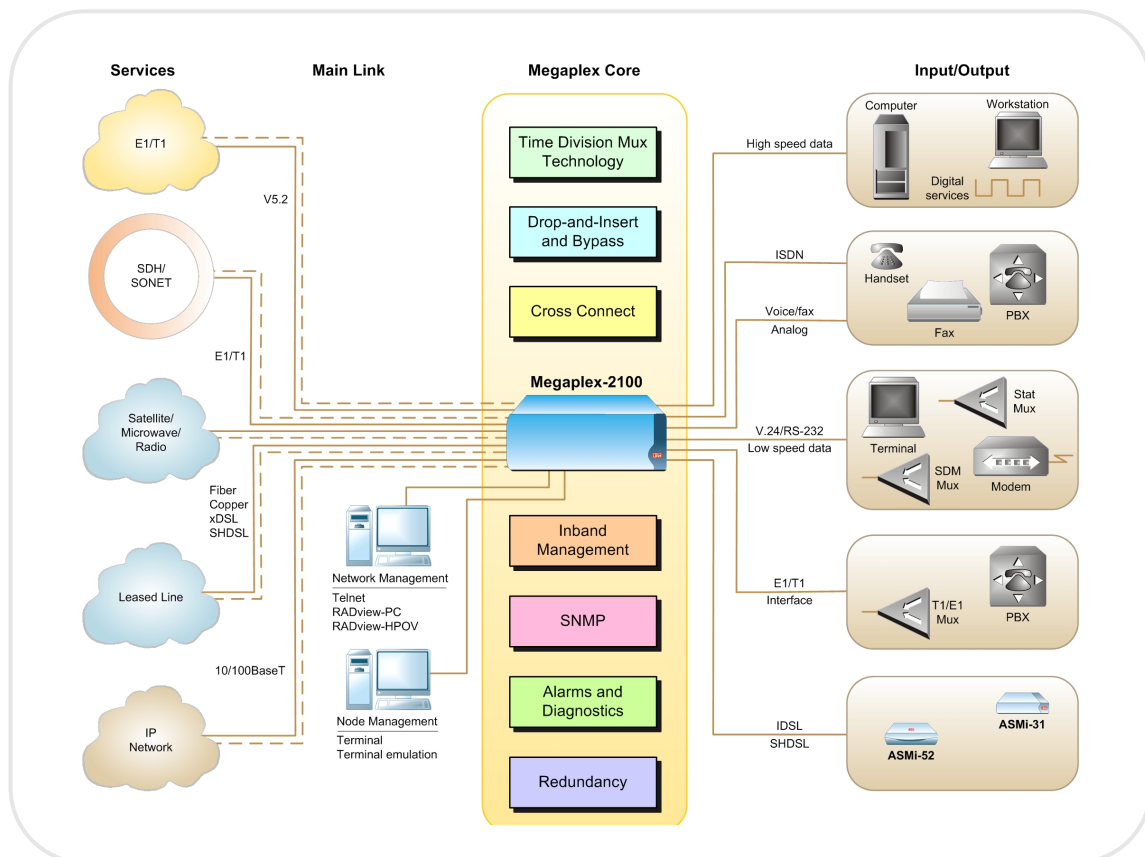
TDMoIP

Megaplex offers an optional IP main link module that transmits TDM traffic directly over IP networks. This TDMoIP access module converts user TDM traffic into IP packets transmitted on 10/100BaseT or 100BaseF Ethernet networks.

CHASSIS

The chassis is available in two basic variants:

- Megaplex-2100 (4U high) chassis providing slots for up to 12 main link and I/O modules
- Megaplex-2104 (2U high) chassis providing slots for up to 5 main link and I/O modules.



TIMING

Multiple system timing options are available:

- Internal crystal oscillator clock
- Clock received from any link (loopback)
- Clock from any high speed module channel
- External station (master) clock
- Adaptive timing received from any bundle (with ML-IP only).

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

SYSTEM REDUNDANCY

Megaplex's modular, distributed architecture enables redundancy at different levels of the network and provides a system with no single point of failure.

System hardware redundancy is attained by an optional redundant power supply and common logic module (MP-2100 chassis only).

1:1 protection switching on the main link modules protects against network or cable failure. Additional ML modules can be installed and interconnected via Y-cables to provide protection against ML hardware failures.

Bundle redundancy provides backup for IP transmissions (functions similarly to E1/T1 link "parallel TX" redundancy).

In case of link failure, Megaplex activates alternate routing. This is achieved by storing multiple configuration databases and flipping (switching) between them in case of any network event.

The Megaplex system also supports two RAD proprietary types of ring redundancy, provided by its main link modules:

- **E1/T1 Ring:** Similar to SDH, the E1/T1 ring features ring redundancy in a closed dual-ring topology: one path propagates data "clockwise" and the other "counterclockwise". Each Megaplex can receive data through two different paths, and selects only the signal received through one of the paths for processing. In case of failure, the failed segment is bypassed by

using the second path, providing self-healing in less than five seconds.

- **RFER:** The TDMoIP link module features RAD's Resilient Fast Ethernet Ring (RFER) technology for creating self-healing Ethernet ring networks. RFER reroutes traffic within 50 msec of a ring segment failure, providing fast redundancy performance similar to SDH networks. Survivability is further enhanced by RFER's scalable support for multiple rings. RFER can carry up to 40 E1 or 50 T1 links with no limit on the number of nodes.

The built-in, non-blocking, DS0 cross-connect matrix enables routing any channel's timeslots to any link. This allows Megaplex to maximize its efficiency by splitting voice and data channels and redirecting the traffic, via separate links, to the appropriate service.

The cross-connect matrix also enables routing timeslots from any link to any other link. This facilitates drop insert, bypass or broadcast multi-link applications.

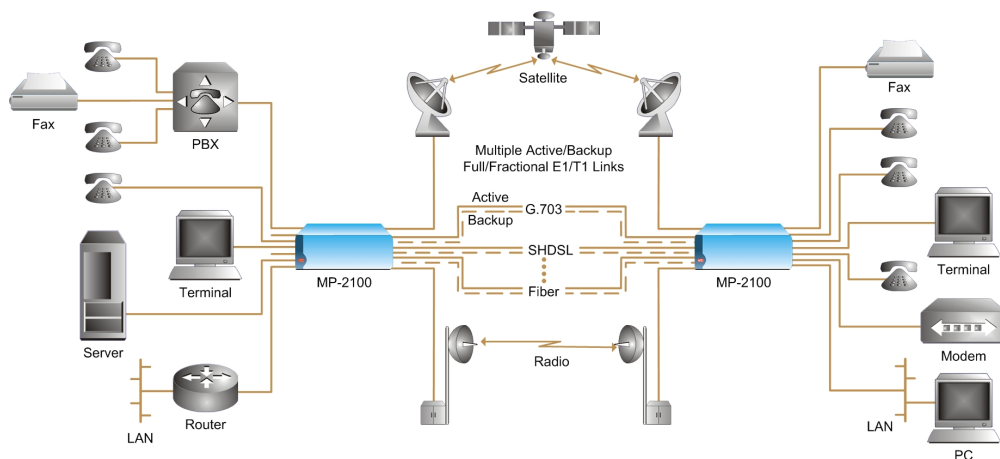


Figure 1. Point-to-Point Topology

Megaplex is suitable for integrating all the traffic requirements between two sites, over a wide variety of E1/T1 links: leased lines, fiber optic, SHDSL, radio or satellite.

Multiple fractional or full E1/T1 links provide load sharing between the links, as well as automatic backup, with prioritization of voice and data services. Link redundancy is supported, providing 1:1 protective switching between any two links (within 50 msec between dual links of same ML module).

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A total of 124 timeslots can be allocated, either for transmission of I/O channels or for bypassing timeslots between links of different modules.

R2 SIGNALING

Main Link (ML) modules support R2 signaling with transparent MFC/DECADIC, so that Megaplex can be placed between an older R2-PBX and a digital (E1-CAS) PBX. The MFC/DECADIC signaling is not terminated by Megaplex, but passed on to the PBX. In addition to the ITU-T standard R2 protocol, several predefined national PTT protocols, as well as user-defined variations, are also supported. Since the R2 signaling support is provided by the ML, all voice module types support R2.

COMMON LOGIC MODULES

The Common Logic (CL) module controls the Megaplex operation and is the interface for its configuration and management. It stores the application software and up to 10 configuration databases (depending on complexity) for multiple independent configurations. The CL also stores all system event information. Flash EPROM for software download is provided.

Two dedicated ports are provided on the CL module for management purposes. One port has a 9-pin DCE interface for direct connection of a management terminal or PC. The other is ordered with one of the following interface options:

- Ethernet 10BaseT (UTP)
- Ethernet 10Base2 (BNC)
- V.24/RS-232 DTE.

An input voltage detector, intended for sensing external events (coming from temperature alarm sensors etc), generates internal alarms, which are sent to the NMS station and reported to the user.

Two outbound relays can be assigned to be triggered by any user-selected major or minor alarm, for routing of Megaplex alarms to outside indicators, such as buzzers and bells.

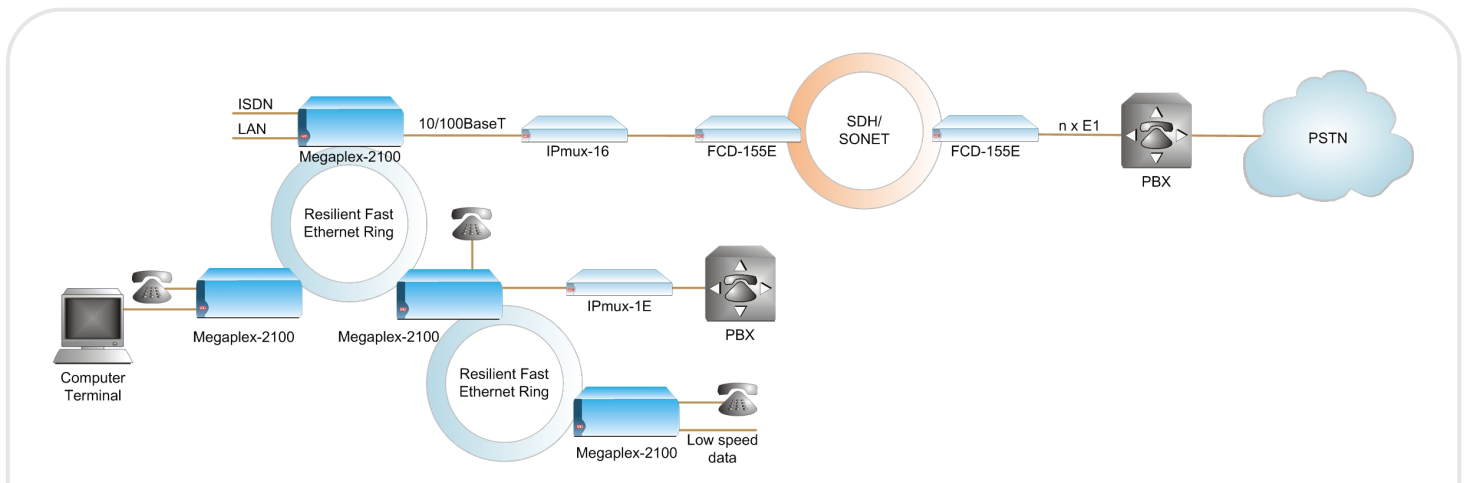


Figure 2. Resilient Fast Ethernet Ring (RFER) Provides 50-msec Self-Healing IP Networks

Megaplex ML-IP with RAD's RFER technology, enables corporations, campuses, utilities, and transportation companies to create highly reliable IP networks with 50-msec link protection switching, using dark fiber or copper wire in a ring topology.

MAIN LINK MODULES

E1/T1 Main Links

Megaplex TDM E1/T1 main link modules allow direct connection to a wide range of services, eliminating the need for external equipment. Multiple active links can operate in each chassis. Additional modules can also be installed for link redundancy.

The various ML modules can be configured for a broad range of applications: from single link non-redundant operation, to multiple full or fractional E1/T1 link applications requiring drop & insert and broadcast.

E1/T1 link modules with built-in fiber optic modems (range up to 100 km/62 miles) or E1 link modules with xDSL modems (range up to 10.6 km/6.6 miles) are available. These special links reduce the cost of local loop solutions by lowering equipment deployment and maintenance costs.

The dual-trunk main link modules increase efficiency and provide 1:1 protective switching between the two links within 50 msec.

The high-density 8-port E1, T1 and SHDSL modules increase the Megaplex TDM capacity up to 16 Mbps.

TDMoIP Main Link

The unique ML-IP main link module converts the TDM bit stream delivered over the internal Megaplex back plane into IP packets, for transmission over IP networks. ML-IP features three Ethernet ports, with 10/100BaseT or 100BaseF interfaces. The module conforms to IEEE 802.3 and 802.3u and provides reliable, high quality of service (QoS), including VLAN tagging and priority labeling (ToS).

ML-IP places TDM timeslots into IP bundles with VLAN tagging required by point-to-multipoint applications. Duplicate bundles can be transmitted simultaneously on different paths for redundancy.

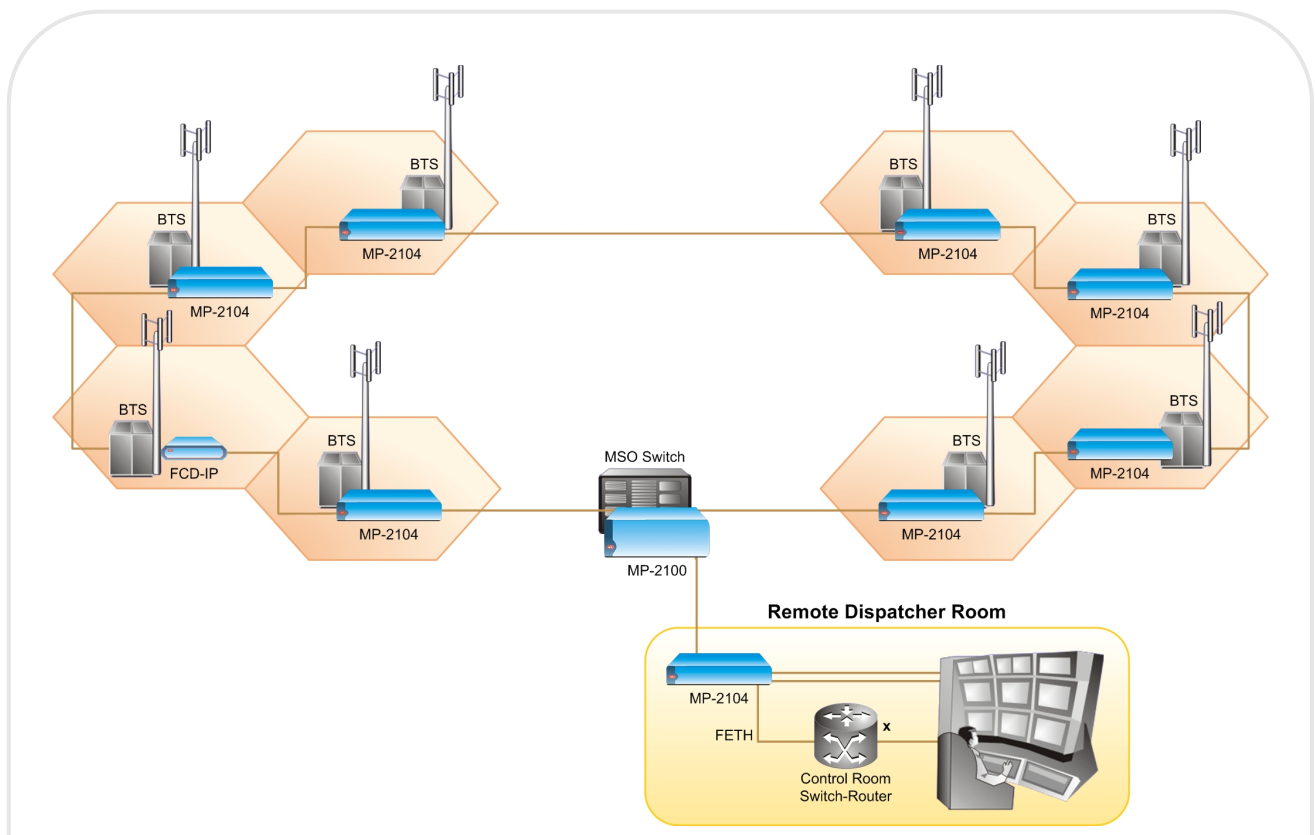


Figure 3. Megaplex-2100 in a Tetra Ring

RAD's DXC (Digital Cross-connect) DACS complements Megaplex's own cross-connect capabilities, to provide a comprehensive network solution. DXC flexibly routes timeslots between different Megaplex and other E1/T1 sites. The equipment in all the sites is easily controlled and monitored by an integrated network management system.

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I/O MODULES

Up to 11 I/O modules of any kind can be placed in an MP-2100 chassis (up to 4 I/O modules in an MP-2104). If more I/O modules are required, Megaplex units can be cascaded.

High-Speed Data Modules

High speed data interface modules provide leased line data services, operating at multiples of 56 or 64 kbps, up to 2.048 Mbps, connecting routers, bridges, front-end processors, etc.

E1 interface modules with built-in xDSL modems enable cost-effective long-range deployment of high speed services over 2- or 4-wire copper lines. Range is up to 4.0 km.

ISDN BRI ("U" or "S") modules extend ISDN services over non-ISDN facilities, supporting data, voice and Ethernet applications. The "U" interface modules employ IDSL technology for "last mile" applications.

An IEEE C37.94-compliant n x 64 fiber data module is provided for transporting teleprotection data.

Low Speed Data Modules

Sub-rate multiplexer modules for low speed (2.4 to 19.2 kbps) synchronous and asynchronous data channels employ standard X.50, X.58 or SDM (DS0-B) multiplexing techniques.

Low-speed modules with sync/async V.24/RS-232 channels, with independent channel rates of up to 64 kbps are available. End-to-end control signals are supported.

Voice/Fax and Voice Compression Modules

Voice/fax modules transmit voice at toll quality using standard PCM (ITU-T G.711), as well as ADPCM (G.726), MPMLQ (G.723.1), or P-CELP 4.8 kbps compression. Standard analog interfaces are available for direct connection to POTS, public payphones, LB (local battery) field phones, PBX extensions or 2/4-wire E&M trunks. Alternatively, voice compression modules with E1 and T1 digital PBX interfaces are available. Loop, wink and ground-start signaling are also supported.

Digital voice compression modules connect PBX trunks with greater bandwidth utilization (compression ratio of up to 10:1). The modules employ a choice of high quality voice compression methods, including G.723.1 at 6.4 kbps per channel, or G.729A at 8 kbps. The modules support Group III fax and modem relay, at user-selectable standard rates of up to 14.4 kbps, featuring transparent timeslot transfer, voice activity detection, silence suppression, and comfort noise generation. Module versions are offered with single/dual T1 (up to 24/48 channels), or single/dual E1 (up to 30/60 channels) interfaces.

A special "omnibus" module provides four toll-quality voice channels to support applications (see *Figure 4*) where a master site needs to communicate with multiple remote stations simultaneously (such as to broadcast an important message).

LAN Modules

Ethernet router/bridge modules enable LAN to LAN extension over E1/T1 services, offering various L2 capabilities.

MANAGEMENT

Megaplex can be fully configured locally, using an ASCII terminal. It can also be managed remotely via Telnet, SNMP element management applications, or end-to-end path management application.

Megaplex communicates with the management station by means of its SNMP agent (via a SLIP/PPP or TCP/IP connection). Network management applications provide centralized control of all network nodes, including interface configuration, connection setup, alarms and monitoring.

The user-friendly GUI-based RADview network management applications facilitate management of both individual units and entire networks.

The RADview-SC/TDM application enables end-to-end path management of MAP devices, providing physical and logical graphic views of all network links and service paths of the system.

The management connection can be established by the following methods:

- Out-of-band, using the Ethernet management port. This simple and efficient method takes advantage of IP bandwidth on demand, while saving link bandwidth for user traffic
- Inband over a dedicated timeslot, supporting standard PPP, FR encapsulation, and RIP2 protocols
- Over a modem link or over a FRAD, via the control port of the remote unit.

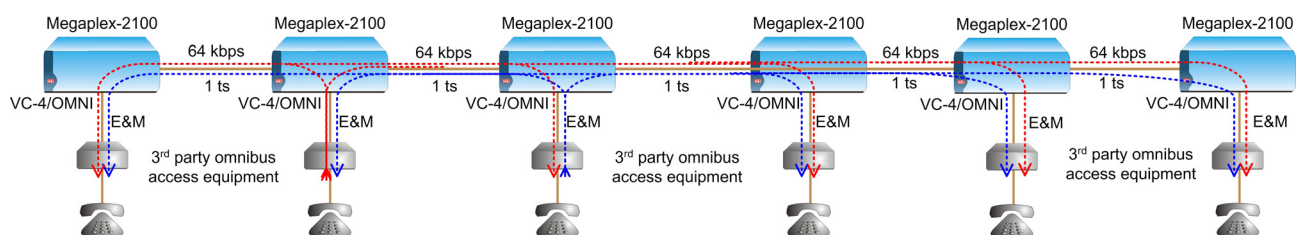


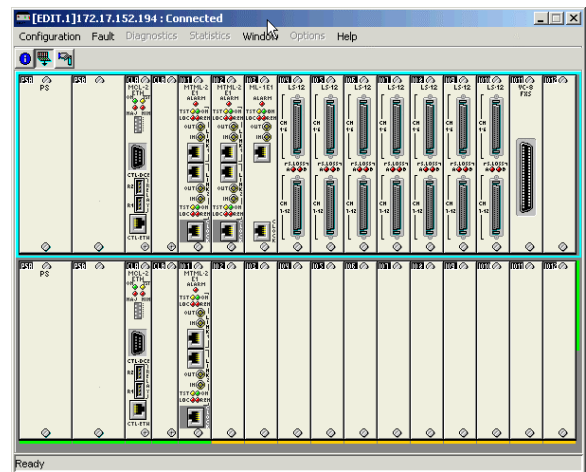
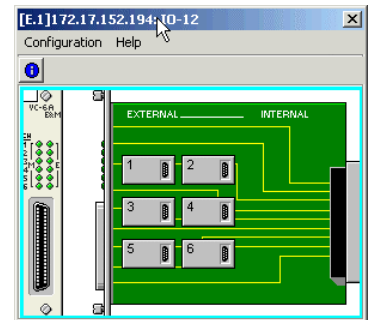
Figure 4. Typical Point-to-Multipoint (Omnibus) Connection

[E.1] 172.17.152.194 : Time Slots Table

Slot : IO-1 Port : External-1 Card Type : MTML-2(E)

TS Src	Slot	Port	Time Slot	Direction	TS Type
1	IO-4	Internal-1	NA	Both	Data
2	IO-7	Internal-1	NA	Both	Data
3	None	None	NA	NA	NC
4	IO-4	Internal-2	NA	Both	Data
5	None	None	NA	NA	NC
6	None	None	NA	NA	NC
7	None	None	NA	NA	NC
8	None	None	NA	NA	NC
9	None	None	NA	NA	NC
10	None	None	NA	NA	NC
11	None	None	NA	NA	NC
12	None	None	NA	NA	NC
13	None	None	NA	NA	NC
14	None	None	NA	NA	NC
15	None	None	NA	NA	NC
16	None	None	NA	NA	NC
17	None	None	NA	NA	NC
18	None	None	NA	NA	NC
19	None	None	NA	NA	NC
20	None	None	NA	NA	NC
21	None	None	NA	NA	NC
22	None	None	NA	NA	NC
23	None	None	NA	NA	NC
24	None	None	NA	NA	NC
25	None	None	NA	NA	NC

Add Replace... Remove Remove All Sequence... Expand Collapse Close



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PHYSICAL

MP-2100 (4U-high)

2 power supply module slots
 2 CL module slots
 12 slots for I/O and ML modules
 Height: 18 cm (7 in) (4U)
 Width: 44 cm (17 in)
 Depth: 33 cm (13 in)
 Weight: less than 17 kg (37 lb)

MP-2104 (2U-high)

Built-in power supply (optional built-in voice ringer or ISDN power feeder is available)
 1 CL module slot
 5 slots for I/O and ML modules
 Height: 9 cm (3.5 in) (2U)
 Width: 44 cm (17 in)
 Depth: 33 cm (13 in)
 Weight: less than 6 kg (13 lb)
(All weights are for fully loaded units)

POWER SUPPLIES

Power Supply Input

AC: 115 or 230 VAC
 DC: -24 VDC, 24 VDC with floating ground or -48 VDC

MP-2100 (without Ringer)

Maximum Output Power:
 • AC: 200W
 • DC: 200W
 Maximum Input Power:
 • AC: 250W
 • DC: 250W

MP-2104

Maximum Output Power
 • AC: 120W
 • DC: 120W
 • AC w/Ringer: 300W
 • DC w/Ringer: 290W
 Maximum Input Power:
 • AC: 160W
 • DC: 160W
 • AC w/Ringer: 300W
 • DC w/Ringer: 350W

GENERAL

Front Panel Indicators

ON LINE: Lights steadily when the corresponding PS module is on and the CL module is active
 TEST: Indicates that a test initiated by the local CL module is being performed
 ALARM: Lights steadily when an event or minor fault has been detected in the local MP-2100 system; flashes when a major and/or critical alarm has been detected

Configuration

- By ASCII Terminal or PC, connected to terminal interface or via Telnet
- Using RADview SNMP management system

Environment

Operating temperature: 0 to 45°C (32 to 113°F) (MP-2100 NEBS version: up to 55°C (+131°F))
 Storage temperature: -20 to +70°C (-4 to +160°F)
 Humidity: up to 90%, non-condensing

Megaplex Chassis

	MP-104	MP-204	MP-2104	MP-2100	MP-4100
Functionality	Voice channel bank	Voice channel bank	Modular multiservice access multiplexer	Modular multiservice access multiplexer	Modular digital access cross-connect and ADM
Dimensions	4.3*23.7*17 cm	4.3*43.5*24.3 cm	9*44*33 cm	18*44*33 cm	18*44*33 cm
Modularity	N	N	Y	Y	Y
I/O slots	N/A	N/A	5	12	10
Redundancy	N	N	Y	Y	Y
Services	Voice	Voice	LS, HS, Voice, ETH, TDMoIP	LS, HS, Voice, ETH, TDMoIP	LS, HS, Voice, E1/T1, xDSL, STM-1/OC-3
Capacity	512k	1M	8M	8M	160M

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Ordering

BASIC UNITS

Basic unit includes a chassis, single common logic module, single power supply and power supply cables. Main link and I/O modules are ordered separately (see separate module data sheets for details and ordering information).

MP-2100~/&/2#

4U-high chassis with 12 module slots and CL.2 common logic module

MP-2104~/+/2#

2U-high chassis with 5 module slots and CL.2 common logic module

Legend

- ~ Power supply input voltage:
 - 115** 115 VAC
 - 230** 230 VAC
 - 24** -24 VDC
 - 24/FLG** 24 VDC with floating ground
 - 48** -48 VDC
- & Redundancy (MP-2100 only)
 - R** full (2 x PS, 2 x CL)
 Default is for 1 x PS, 1 x CL
- + Built-in ringer for MP-2104
 - RI** Built-in ringer (only)
 Default is without ringer
- # CL second management port
(in addition to standard 9-pin DCE port)
 - UTP** Ethernet 10BaseT (UTP)
 - BNC** Ethernet 10Base2 (BNC)
 - V24** V.24/RS-232 DTE

SYSTEM MODULES

System modules can be ordered separately for redundancy or special requirements.

MP-2100M-PS/~

Power Supply Module for MP-2100

MP-2100M-CL.2/#

Common Logic Module

SUPPLIED ACCESSORIES

AC power cord (with AC power supply only)

DC adapter plug (with DC power supply only)

RM-MP-MX-23/19

Hardware kit for mounting one MP-2100 unit into both 19-inch and ETSI 23-inch racks

MP2104/RM

Hardware kit for mounting one MP-2104 unit into a 19-inch rack

OPTIONAL ACCESSORIES

CBL-DB9F-DB9M-STR

Standard DB-9 to DB-9 control port cable

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