

Megaplex-4100

Next Generation Multiservice Access Node
Ver. 3.0



Hybrid Ethernet/TDM
Central Aggregation
Solution Platform for
Seamless and
Economical Migration
to Next-Generation
Communication

- Carrier-class multiservice platform: high speed, low speed, analog voice, data, fiber multiplexing, pseudowire connectivity and Ethernet services
- Central solution aggregating Ethernet and TDM services over fiber/copper from RAD CPEs towards SDH/SONET and/or PSN core networks
- High Capacity DS0 cross-connect with GbE and STM-1/STM-4/OC-3/OC-12 uplinks
- Powerful protection including resilient ring topology and module redundancy at various levels

Part of the ACCESS+ portfolio, multiservice access and first mile solutions, Megaplex-4100 is a carrier-class, high capacity multiservice access concentrator, for transporting legacy and next-generation services over any infrastructure.

Megaplex-4100 functions as a carrier-class TDM and Ethernet aggregator, as well as a high capacity DS0 cross connect and next generation multiservice access node,

Its ability to handle a broad range of Ethernet, data and voice services, as well as a large variety of network technologies in a single compact managed node, makes

ACCESS+

RAD

data communications

The Access Company

Megaplex-4100

Next Generation Multiservice Access

Megaplex-4100 an ideal core/edge solution for carriers and service providers. It also provides a perfect fit for large enterprises, utilities and transportation companies, that require an efficient way to transport and provision multiple legacy and next-generation services over their high capacity pipes.

MARKET SEGMENTS AND TYPICAL APPLICATIONS

Megaplex-4100 node can be used in the following applications:

- Multiservice access over SDH/SONET networks with a single box solution for U&T companies (see *Figure 1*).
- An aggregation access solution for carriers and service providers, to transport TDM and Ethernet traffic over copper and fiber, towards SDH/SONET or packet-switched networks (see *Figure 2*).

CARRIER-CLASS SERVICE PROVISIONING

Megaplex-4100 offers carrier-class provisioning features, including end-to-end path management, to ensure continuous service availability. Advanced SNMP management capabilities enable Megaplex-4100 to control and monitor all network elements: SDH/SONET access and ring units, as well as remote POP and first mile broadband access feeders and CPEs.

Megaplex-4100 can be managed by the SNMP-based RADview-EMS multiplatform Element Management System and RV-SC/TDM service management application. Alternatively, configuration and monitoring can be performed either via Telnet or an ASCII terminal using RAD command line interface (CLI).

One of the benefits of command line interface is that databases and scripts of commonly used commands can be easily created and applied to multiple units.

SMOOTH MIGRATION FROM TDM TO PSN

Megaplex-4100 can terminate TDM and Ethernet traffic carried over E1/T1 links, fiber or SHDSL, as well as over VCGs in STM-4/OC-12 and STM-1/OC-3 links. This traffic can then be switched either to a different PDH/TDM trunk or to the Gigabit Ethernet or Fast Ethernet ports.

Various users can benefit from this solution:

- SDH/SONET customers who need to continue using their network while maximizing bandwidth utilization
- Subscribers with mixed Ethernet and TDM services
- Subscribers looking for a future-proof migration path to IP connectivity
- Dual network owners using SDH/SONET for voice and packet for data.

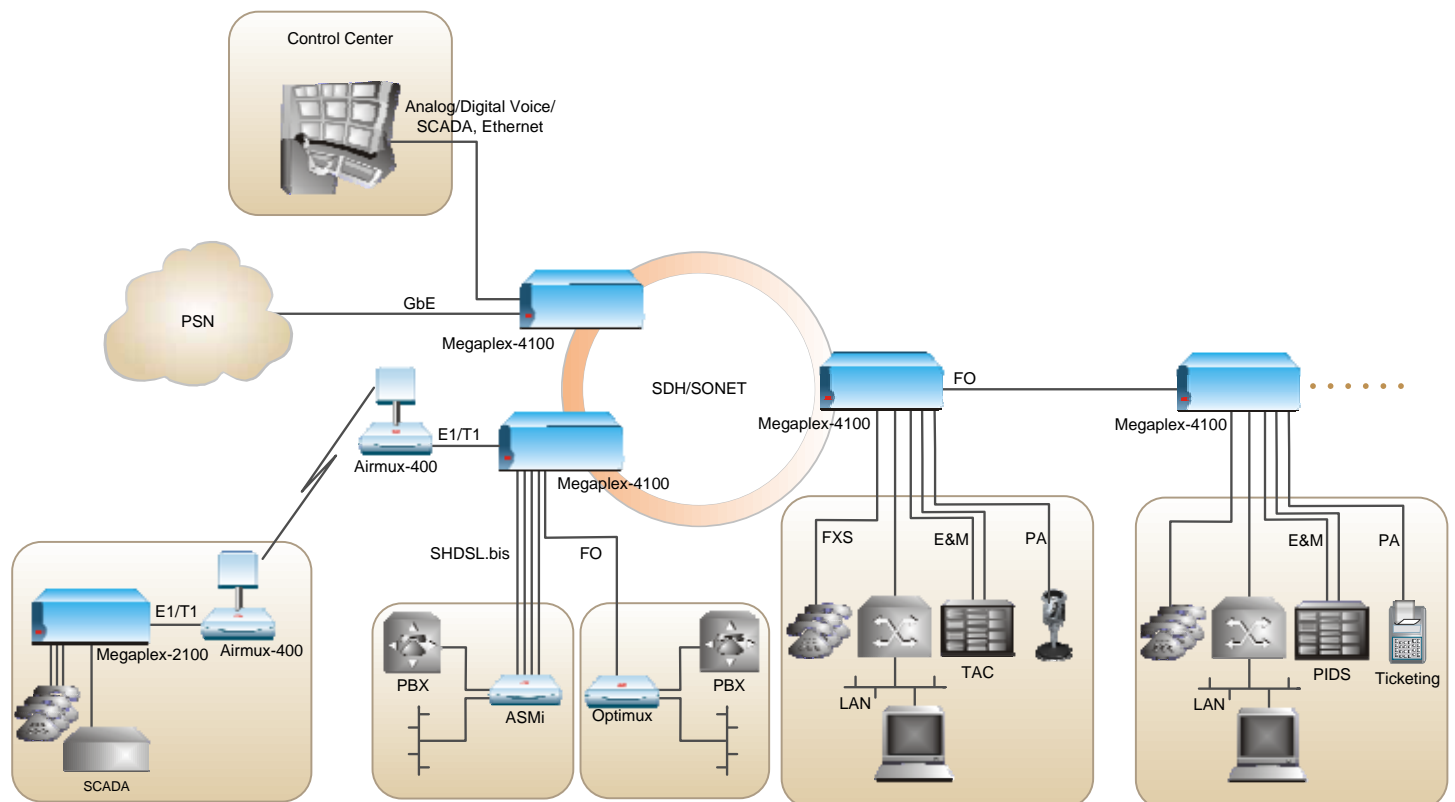


Figure 1. Megaplex-4100 as Multiservice Platform with Diverged Interfaces and Access Topologies for U&T Market Segment

Megaplex-4100 provides legacy services over packet switched networks, using a dedicated module to convert data stream from other modules to Ethernet, IP or MPLS packets with TDMoIP, CEsOPSN, SAToP, and HDLCoPSN pseudowire technologies. The device's hardware-based architecture provides a robust pseudowire solution with minimal processing delay.

NEXT-GENERATION ADM

Megaplex-4100 performs STM-4/OC-12 and STM-1/OC-3 add/drop multiplexing for grooming LAN and TDM traffic over SDH/SONET networks. It eliminates the need for separate ADM and multiplexer units for private networks where voice, Ethernet and data services are required.

By implementing VCAT protocols to carry Ethernet traffic efficiently and minimize wasted bandwidth, Megaplex-4100 brings Ethernet economics and packet switching efficiency to existing SDH/SONET infrastructure. It enables both OpEx and CapEx reduction, leveraging existing equipment to support clear channel data streams and the latest high bandwidth services.

MULTISERVICE NODE

As a multiservice access node, Megaplex-4100 provides an efficient and cost-effective solution for integrating various interfaces, data rates and user services. The available interfaces and the maximum number of ports per chassis are as follows:

- 4 STM-4/OC-12 or STM-1/OC-3 ports (two ports per CL.2 module)
- 4 GbE ports (two ports per CL.2 module)
- 160 E1/T1 ports
- 80 SHDSL ports
- 20 fiber links for multiplexed TDM and Ethernet traffic
- 30 Fast Ethernet ports
- 120 n x 64 kbps
- 120 sub-DSO rate data ports
- 160 analog voice ports.

In addition, Megaplex-4100 can work with industry-specific devices such as Teleprotection and Omnibus units.

CENTRAL SOLUTION FOR RAD CPE DEVICES

MP-4100 offers a complete, end-to-end solution as a central aggregation platform for diverse CPE devices managed together under a single management platform. Megaplex-4100 is interoperable with MP-2100/2104, ASMi, Optimux, as well as

ETX, RICI, IPMUX, DXC and FCD devices.

Figure 3 illustrates Megaplex-4100 as a central site solution, Ethernet and TDM aggregator for SDH/SONET and PSN.

DSO CROSS-CONNECT

Megaplex-4100 features an internal DSO cross connect matrix of up to 8,384 DSO channels. Traffic from any channel can be cross-connected directly to any other channel.

Megaplex-4100 functions as a service differentiation point at the central office, handing off TDM voice and data services to the transport network. The device can also be deployed at remote locations or at the customer premises to effectively fan out multiple voice and data services.

SECURITY

The following security protocols are provided by MP-4100 to ensure client server communication privacy and correct user authentication:

- SNMPv3
- RADIUS (client authentication only)
- SSH for Secure Shell communication session.

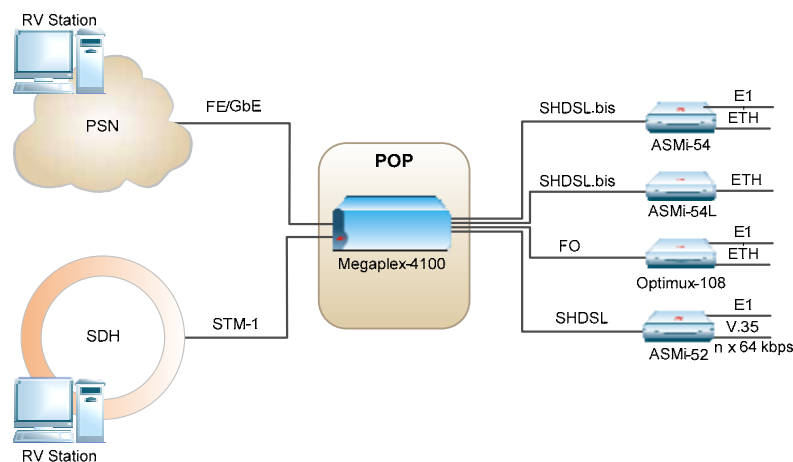


Figure 2. TDM/Ethernet Services over Copper and Fiber Infrastructure

Megaplex-4100

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CARRIER-CLASS RELIABILITY

The modular, distributed architecture of Megaplex-4100 enables redundancy at different levels of the network and provides a resilient system with no single point of failure. Hardware redundancy is provided through an optional redundant power supply and Common Logic modules, with switchover to the backup Common Logic links within 50 msec.

The SDH/SONET system employs APS 1+1 protection, as well as subnetwork connection protection (SNCP for SDH and UPSR for SONET) for path protection. The Ethernet GbE ports feature link protection mechanisms using LAG and VCG protection over SDH/SONET. In addition, any E1/T1 stream can be protected using various mechanisms over any interface.

In addition to connecting to standard SDH/SONET rings, Megaplex-4100 can be used to create E1, T1, TDM over SHDSL, TDM over Fiber, or a mix of ring topologies. Megaplex-4100 provides a perfect solution for combining low-rate service provisioning and ring protection.

MODULARITY AND FLEXIBILITY

Megaplex-4100 is available as a 4U-high chassis providing slots for up to 2 AC or DC power supplies, 2 common logic and 10 I/O modules. This allows for a “pay as you grow” approach and enables CapEx optimization.

Common Logic

The Common Logic (CL.2) module controls the Megaplex operation and is the interface for its configuration and management.

CL.2 features dual-star connection architecture with hybrid TDM-Ethernet modules. This allows native TDM and Ethernet traffic handling with minimal encapsulation delays and zero bandwidth overhead.

Supported I/O Modules

Megaplex-4100 supports a wide variety of I/O modules, providing a flexible and scalable platform that meets a variety of

user service requirements. Up to 10 I/O modules can be installed in the chassis. In addition to its own modules, Megaplex-4100 supports selected modules operating in the Megaplex-2100/2104 chassis. *Table 1* lists the system and I/O modules available for Megaplex-4100. For detailed I/O module specifications, see enclosed data sheets.

Specifications

STM-4/STM-1/OC-12/OC-3 INTERFACE

Number of Ports

2 per CL.2 module (4 per chassis)

Protection

1+1 unidirectional APS (G.842)

1+1 bidirectional APS (G.841, Clause 7.1).

1+1 bidirectional optimized APS (G.841

Annex B. Linear Multiplex Section (MSP))

Path Protection (Telecordia UPSR standard and ITU-T SNCP recommendation)

Line Code

NRZ

Connectors

SFP-based

SFP Transceivers

See the SFP Transceivers data sheet at www.rad.com. All SFPs listed for STM-4/OC-12 and STM-1/OC-3 are supported except those with external calibration

Note: *It is strongly recommended to order this device with **original RAD SFPs installed**. This will ensure that prior to shipping, RAD has performed comprehensive functional quality tests on the entire assembled unit, including the SFP devices. RAD cannot guarantee full compliance to product specifications for units using non-RAD SFPs.*

Bit Rate

STM-4/OC-12: 622.08 Mbps \pm 4.6 ppm

STM-1/OC-3: 155.52 Mbps \pm 4.6 ppm

Compliance

SDH: ITU-T G.957, G.783, G.798, G.783

SONET: ANSI T1.105-1995, GR-253-core

Framing

SDH: ITU-T G.707, G.708, G.709

SONET: GR-253-core

Ethernet over SDH/SONET

GFP (Generic Framing Procedure): ITU-T G.7041, ANSI T1-105.02, framed mode

LAPS (Links Access Procedure); X.86

LCAS (Link Capacity Adjustment Scheme): ITU-T G.7042

GBE INTERFACE

Number of Ports

2 per CL.2 module (4 per chassis)

Data Rate

10/100/1000 Mbps

Autonegotiation (copper interface only)

Connectors (per port)

RJ-45, shielded

SFP socket (for SFP transceivers, see *Ordering*)

SFP Transceivers

See the SFP Transceivers data sheet at www.rad.com. All SFPs listed for GbE are supported except those with external calibration and SGMII

Maximum Frame Size

9600 bytes (for max. frame sizes

supported by different I/O modules, see individual data sheets)

CONTROL PORT

Interface

RS-232/V.24 (DCE)

Connector

DB-9

Baud Rate

9.6, 19.2, 38.4, 57.6, 115.2

MANAGEMENT (ETH) PORT

Interface

10/100BaseT

Connector

RJ-45

MANAGEMENT

Remote units can be managed in the following ways:

- Out-of-band, using the 10/100 Ethernet management port

- Inband, using IP/PPP or IP/HDLC over DCC, via the STM-4/STM-1/OC-12/OC-3 links
- Inband, using IP/PPP or IP/FR over a dedicated timeslot in any E1/T1 or SHDSL link
- Inband via any of the user Ethernet ports
- Via a network management station running RADview, RAD's SNMP element management application.

STATION CLOCK

Bit Rate

- 1.544 Mbps (T1) (AMI)
- 2.048 Mbps (E1) (AMI)
- 2.048 MHz squarewave

Connector

RJ-45

INDICATORS

Chassis

POWER SUPPLY A, B (green):

On: PS modules is up (and one of CL modules is active)

Off: Power supply is off

SYSTEM TEST (yellow):

On: System test in process

Off: No active tests

SYSTEM ALARM (red):

Blinking: Major and/or critical alarm in the system

On: Minor alarm in the system

Off: No active alarms

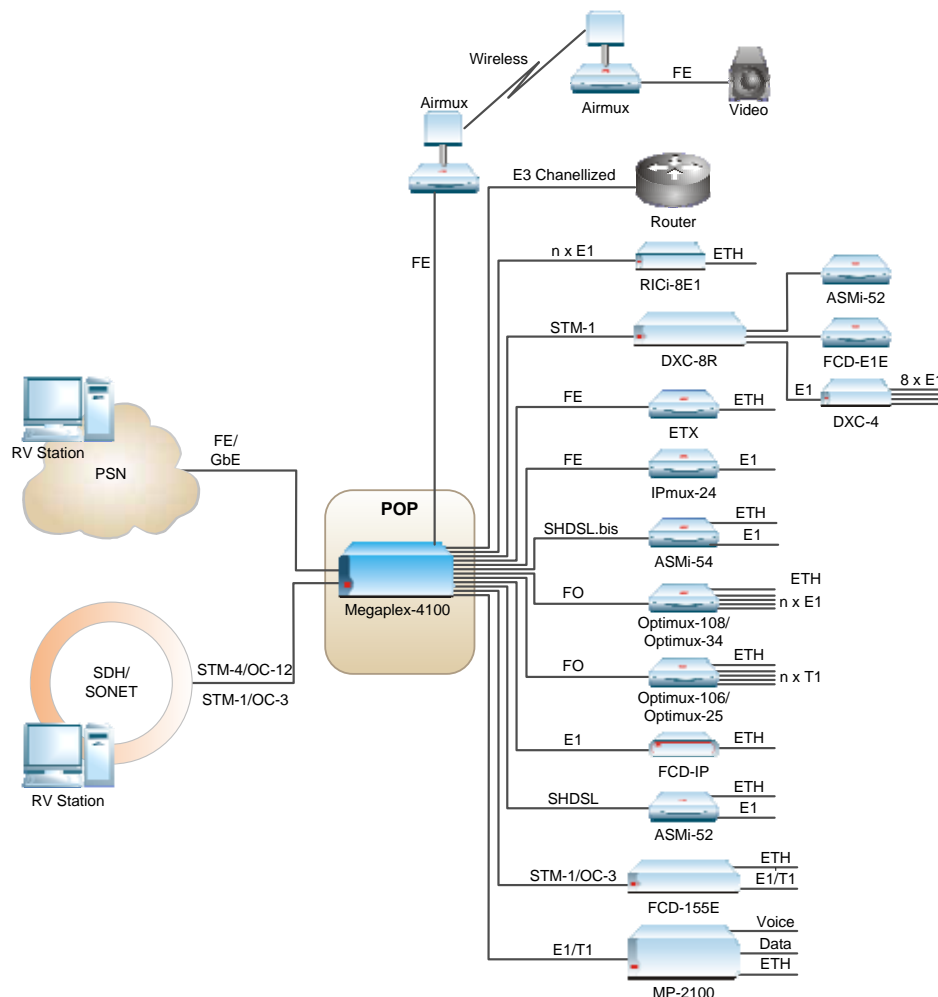


Figure 3. Megaplex-4100 as a Central Site Aggregator for different RAD CPEs, Ethernet and TDM Aggregator for SDH/SONET and PSN

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CL.2 Module

ON LINE (green/yellow):

Green On: CL module is active

Green Blinking: CL module is on standby

Yellow On: a test is being performed (active module only)

ALM (red):

On: alarms have been detected, but the highest alarm severity is minor or warning.

Blinking: a major and/or critical alarm has been detected

Off: No active alarms

STM-4/STM-1/OC-12/OC-3 Interface (per port)

ON LINE (green/yellow)

Green On: the port is active

Green Blinking – the port is in protection mode

Yellow On: a test is active on the port

Off: no traffic or test on the port

LOS (red)

On: loss-of-signal

Off: no loss-of-signal

GbE and Management Ethernet Ports

LINK (green):

On: the port is connected to an active Ethernet hub or switch

Off: Ethernet link is not detected

ACT (yellow):

On/Blinking: ETH frames are received or transmitted

Off: ETH frames are not received and transmitted

Station Clock Port

ON (green):

On: the station clock port is configured as “no shutdown”

Off: no traffic or test on the port

LOS (red)

On: loss-of-signal (when station clock port configured as connected)

Off: no loss-of-signal

Table 1. Megaplex-4100 I/O Modules

Name	Description	MP-2100/2104-compatible
System Modules		
CL.2	Common Logic module for system management and hybrid TDM and Ethernet processing with 2 STM-1/STM-4/OC-3/OC-12 ports for SDH/SONET services and 2 GbE ports for packet services	
PS	AC or DC power supply module	
I/O Modules (in alphabetical order of names)		
ACM	Alarm and diagnostics module with four outbound relays	Yes
ASMi-54C	8-port SHDSL.bis module with 2 Ethernet ports	
ASMi-54C/N	8-port SHDSL/SHDSL.bis module with 2 Ethernet ports and 8 E1 ports	
HS-6N, HS-12N	6- or 12-port n x 64 kbps high speed modules	Yes
HS-703	4-channel Codirectional data module	Yes
HS-RN	4-port sub-DSO low speed module	Yes
HS-S	4-channel ISDN “S”-interface module	Yes
HSF-2	2-port fiber optic teleprotection interface module	Yes
HSU-6, HSU-12	6- or 12-port IDSL modules	Yes
LS-6N, LS-12	6- or 12-port low speed modules	Yes
M16E1, M16T1	16-port E1 or T1 modules	
M8SL	8-port SHDSL E1 module with 3 Ethernet ports	
M8E1, M8T1	8-port E1 or T1 modules with 3 Ethernet ports	
MPW-1	TDM pseudowire access gateway with 3 Ethernet ports	
OP-108C, OP-106C	Dual 4 x E1/T1 and Ethernet multiplexer modules	
OP-34C, OP-25C	16 x E1/T1 and Ethernet multiplexer modules	
Ringer-2100R	DC power supply module for DC feed and up to 32 voice channel ring voltages	Yes
VC-4/4A/8/8A/16	4/8/16-port FXS/FXO/E&M PCM and ADPCM analog voice modules	Yes
VC-4/OMNI	4-port PCM omnibus voice module	Yes
<i>Note: For specific HW/SW versions of Megaplex-210x modules supported by the Megaplex-4100 chassis, please contact your local RAD partner.</i>		

TIMING

The user can define the following clock sources:

- Recovered from the STM-4/STM-1/OC-12/OC-3 interface, including automatic selection based on SSM (Synchronization Status Messaging)
- Internal crystal free-running oscillator-based clock
- Derived from the receive clock of a specified user port
- Adaptive clock recovered (ACR) from a pseudowire circuit
- External station clock.

ALARM RELAY PORT

1 inbound relay (dry contact)

2 outbound relays triggered by any user-selected Megaplex alarm

Operation: normally open, normally closed, using different pins

Connector: 9-pin, D-type, female

I/O MODULES

- See *Table 1* and accompanying data sheets

POWER SUPPLY

Number of Modules

2

Power Supply Input

AC:

110/115 VAC (allowed range: 85 to 150 VAC), 50/60 Hz

220/230 VAC (allowed range: 150 to 264 VAC), 50/60 Hz

DC:

48 VDC (allowed range: -36 to -57 VDC)

24 VDC (allowed range: 18 to 40 VDC)

Selectable ground reference or floating ground

Maximum Input Power

315W + power supplied for ring and feed voltage

Total Output Power

250W + power supplied for ring and feed voltage (drawn directly from external source)

Output Power (max)

250W

Power Consumption (per CL, max)

27.75 W

GENERAL

Physical

Chassis

2 power supply module slots

2 CL. 2 module slots

10 slots for I/O modules

Height: 18 cm (7 in) (4U)

Width: 44 cm (17 in)

Depth: 33 cm (13 in)

Weight: 15.3 kg/33.8 lb max. (fully loaded chassis)

CL.2 Module

Height: 17.3 cm (6.8 in)

Width: 4.5 cm (1.8 in)

Depth: 32.5 cm (12.8 in)

Max Weight: 630 g (1.3 lb)

Configuration

Performed by ASCII Terminal or PC, connected to terminal interface or via Telnet

Environment

Operating temperature: -10°C to 55°C (14°F to 131°F)




Storage temperature: -20°C to +70°C (-4°F to +160°F)

Humidity: up to 95%, non-condensing

Note: Actual operating temperature range is determined by the specific modules installed in the chassis.

For extended operating temperature range of -20°C to 55°C (-4°F to 131°F), contact Technical Services Dept.

Table 2. Megaplex Chassis

	MP-2104	MP-2100	MP-4100
			
Functionality	Modular multiservice access multiplexer	Modular multiservice access multiplexer	Modular digital access cross-connect, Ethernet Aggregator and STM-1/STM-4/OC-3/OC-12 ADM
Dimensions [cm]	9*44*33	18*44*33	18*44*33
Modularity	Yes	Yes	Yes
I/O slots	5	12	10
Redundancy	Yes	Yes	Yes
Services	LS, HS, Voice, ETH, TDMoIP	LS, HS, Voice, ETH, TDMoIP	LS, HS, Voice, E1/T1, xDSL, STM-1/OC-3, GbE, Fast Ethernet, fiber multiplexing, pseudowire
Capacity	4 x E1/5 x T1	4 x E1/5 x T1	STM-4/OC-12 + 1 GbE

Megaplex-4100

Next Generation Multiservice Access Node

Ordering

STANDARD CONFIGURATIONS

MP-4100-2/230R/622GBESFP

MP-4100M-CL.2/622GBESFP

MP-4100M-CL.2/622GBEUTP

MP-4100M-CL.2/622GBEUTP/155SK

SPECIAL CONFIGURATIONS

MP-4100-MN

Megaplex-4100 chassis with no PS or CL.2 module

MP-4100-2/*/%

Megaplex-4100 chassis equipped with dual PS and CL.2 modules

Note. I/O modules are ordered separately (see separate module data sheets for details and ordering information).

Legend

* Power supply modules:

115R	Dual, 115 VAC
230R	Dual, 230 VAC
24R	Dual, +24 VDC
48R	Dual, -48 VDC

% Link option (link connectors are always supplied with SFP sockets)

622GBEUTP	Single/dual CL.2 modules
622GBEUTPR	with STM-4/STM-1/OC-12/OC-3 optical links and GbE links with UTP connectors
622GBESFP	Single/dual CL.2 modules
622GBESFPR	with STM-4/STM-1/OC-12/OC-3 optical links and GbE links with SFP sockets

622GBEUTP /155SK Single/dual CL.2 modules with STM-1/OC-3 optical links and GbE links with UTP connectors, SW key activation for STM-4/OC-12

622GBESFP /155SK Single/dual CL.2 modules with STM-1/OC-3 optical links and GbE links with SFP sockets, SW key activation for STM-4/OC-12

MP-4100M-PS/~

Power supply module

Legend

~ Power supply modules:

115	Single, 115 VAC
230	Single, 230 VAC
24	Single, +24 VDC
48	Single, -48 VDC

MP-4100M-CL.2/#

CL.2 module

Legend

Link option (link connectors are always supplied with SFP sockets)

622GBEUTP	STM-4/STM-1/OC-12/OC-3 optical links and GbE links with UTP connectors
622GBESFP	STM-4/STM-1/OC-12/OC-3 optical links and GbE links with SFP sockets
622GBEUTP /155SK	STM-1/OC-3 optical links and GbE links with UTP connectors, SW key activation for STM-4/OC-12

622GBESFP /155SK STM-1/OC-3 optical links and GbE links with SFP sockets, SW key activation for STM-4/OC-12

MP-4100-LIC/622SK

License key activation from STM-1/OC-3 to STM-4/OC-12 (per CL module)

SUPPLIED ACCESSORIES

RM-MP-MX-23/19

Hardware kit for mounting one MP-4100 unit into both 19-inch and 23-inch racks

MP-2100-RM-ETSI/19

Hardware kit for mounting one MP-4100 unit into an ETSI rack (fits also 19-inch rack)

CBL-DB9F-DB9M-STR

Standard DB-9 to DB-9 control cable

OPTIONAL ACCESSORIES

CBL-SP-9/SH

Dual DB-9 to single DB-9 control port cable

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