

Megaplex-4100



Ethernet and TDM Central/Aggregation Solution

Gigabit Ethernet and/or STM-1/OC-3 uplinks

Ethernet over copper, fiber or DSL aggregator

STM-1/OC-3 ADM (add/drop multiplexer)

4/1/0 cross-connect

xDSL, E1/T1, DS0, sub-DS0, analog voice, data, fiber multiplexing, pseudowire connectivity and Ethernet services

Powerful protection including resilient ring topology and module redundancy at various levels



Megaplex-4100

RAD's Megaplex-4100 multiservice access node, a high-capacity, carrier-class multiservice concentrator, provides multiple TDM and next-generation services over fiber or copper over PDH/SDH/SONET or packet-switched networks (PSN) for large enterprises, including utilities, transportation and campuses. It is an STM-1/OC-3 add/drop multiplexer that transports Ethernet and traditional (TDM) traffic over SDH/SONET networks. When bandwidth granularity of the Ethernet channel is configured to $n \times \text{VC-12/VC-3}$ or $n \times 1.5/\text{STS-1}$, Megaplex-4100 utilizes the SDH/SONET infrastructure for cost-effective TDM and Ethernet connectivity. Megaplex-4100 offers a connection for packet-based Ethernet traffic via its GbE or Fast Ethernet links.

Accommodating up to 10 I/O modules, Megaplex-4100 is a flexible and scalable node offering a variety of user services, including E1, T1, IDSL, SHDSL, Fast Ethernet, Gigabit Ethernet, STM-1/OC-3, $n \times 64$ kbps high speed data, sub-DS0 low speed data, digital voice, analog voice, and ISDN.

The ability to handle a broad range of data and voice services and various network technologies in a single compact managed node makes Megaplex-4100 a versatile and cost-effective next-generation multiservice access node.

A powerful internal cross-connect matrix of up to 5120 DS0 per chassis (from DS0 or sub-DS0 to STM-1/OC-3 level) can cross-connect traffic directly from any tributary channel to any other channel.

These capabilities enable Megaplex-4100 to function as a service differentiation point at the central site, handing off traditional voice/data and advanced Ethernet services to the respective networks (see *Figure 1*).

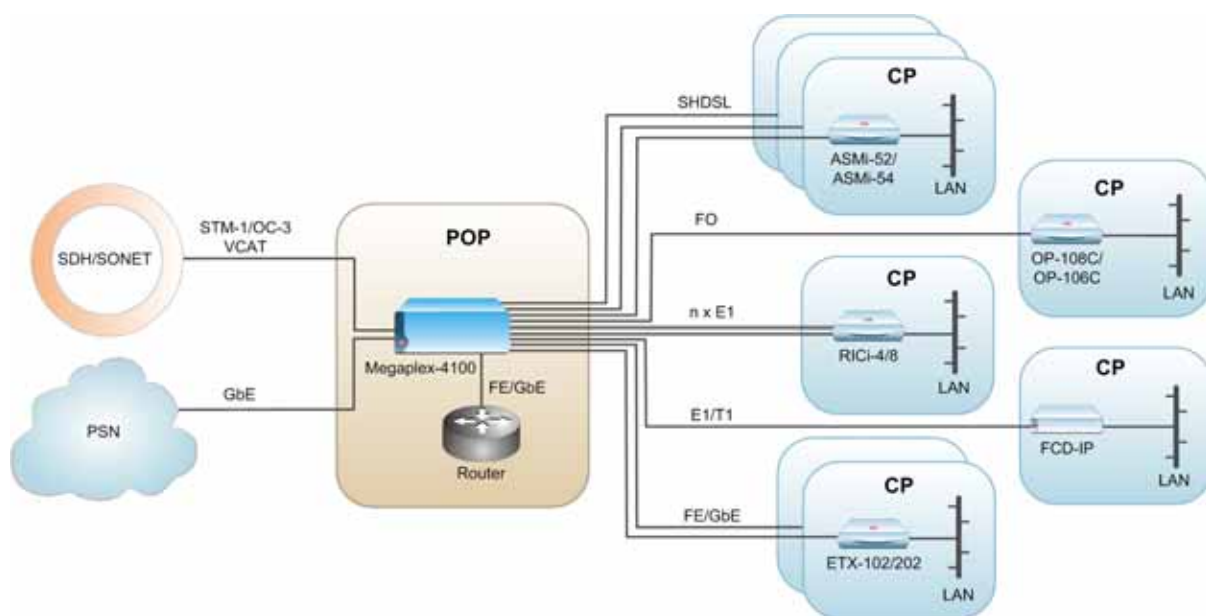


Figure 1. Megaplex-4100 as an Ethernet over Copper, Fiber or DSL Aggregator

At the remote point-of-presence (POP) or customer premises, Megaplex-4100 may also be deployed to effectively fan out multiple voice and data services.

Located at the carrier POP, Megaplex-4100 can extend user services in the Last Mile over E1, T1, ISDN, or SHDSL/SHDSL.bis lines, copper or fiber, by working with dedicated customer-located equipment such as RAD's FCD, ASMi, Optimux, RIC-E1/8E1 or DXC.

Megaplex-4100 eliminates the need for two separate units (ADM and multiplexer) for private networks where voice, Ethernet and data services are required (see *Figure 2*).

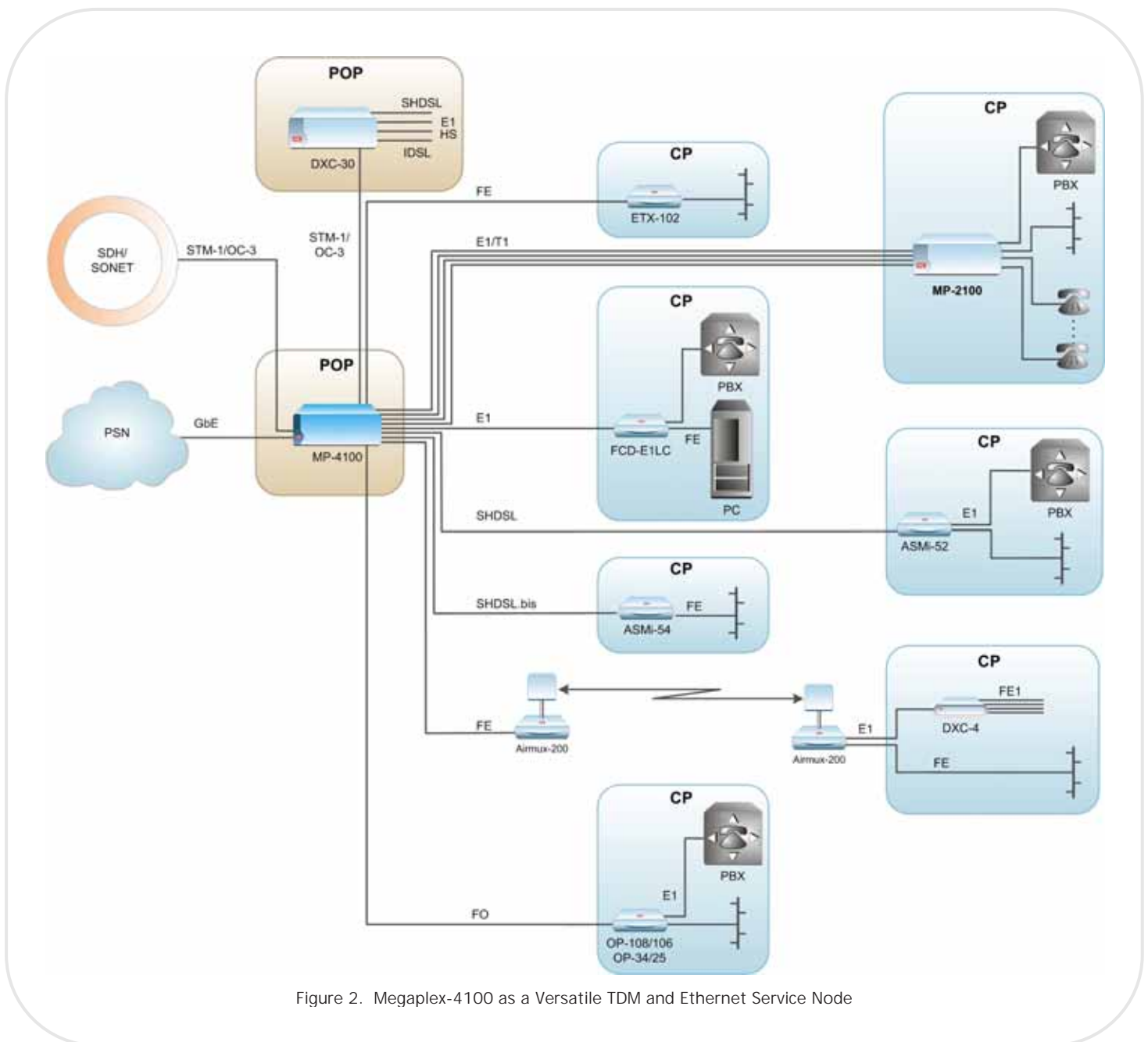


Figure 2. Megaplex-4100 as a Versatile TDM and Ethernet Service Node

Megaplex-4100

On top of the SDH/SONET ADM capabilities, Megaplex-4100 can form E1, T1 or SHDSL protection rings. It can also bridge between several rings.

The modular, distributed architecture of the Megaplex-4100 chassis enables redundancy at different levels of the network and provides a resilient system with no single point of failure. Each combined common logic and cross-connect matrix module (CL.1) provides STM-1/OC-3 links with automatic switchover between the two links within 50 msec for 1+1 protection against network or cable failure.

Figure 3 shows Megaplex-4100 in a 155-Mbps private network ring application providing multiple user services with access and differentiation of services between Internet, PSTN and SDH/SONET networks.

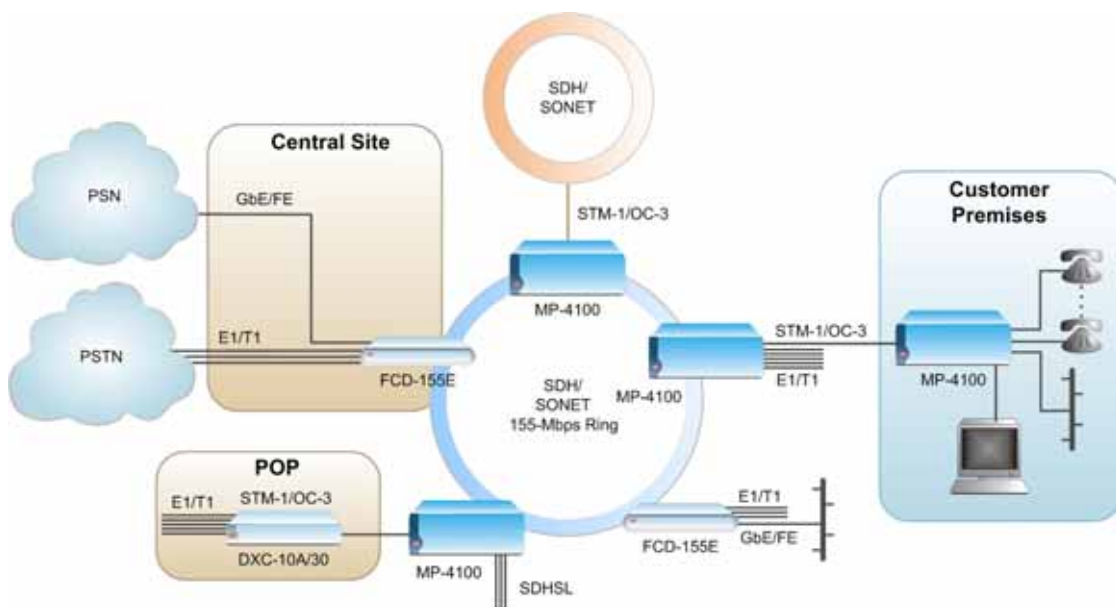


Figure 3. Single Node for Campus Ring and TDM Multiservice Solutions

CHASSIS

Megaplex-4100 is available as a 4U-high chassis providing slots for up to 2 common logic and 10 I/O modules.

COMMON LOGIC

The Common Logic (CL.1) module controls the Megaplex's 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. CL.1 also stores all system event information. Flash EPROM for software download is provided, allowing switching between database configuration files.

CL.1 performs digital cross-connect at the DS0 level with a capacity of up to 160×32 DS0 between I/O cards. Up to 63 E1/84 T1 links can be aggregated from any I/O module on a DS0 level toward the STM-1/OC-3 link.

CL.1 provides Ethernet flow-based switching between I/O modules, GbE and SONET/SDH.

The CL.1 cross-connect matrix routes voice and data channels between all I/O modules installed in the chassis. The non-blocking full cross-connect enables flexible timeslot assignment and efficient utilization of E1/T1 bandwidth, and facilitates drop&insert and bypass applications.

The non-blocking (4/1/0) cross-connection can be established between any two links.

For direct connection to an SDH/SONET network, CL.1 features two standard network ports with a software-configurable STM-1/OC-3 interface. The dual ports on the CL.1 module can be used either for operation in parallel or for redundancy.

For direct connection to the packet-based networks, CL.1 has two SFP-based GbE ports. Also available is the copper GbE interface with autonegotiation speed detection capabilities.

PROTECTION

Hardware redundancy is provided through an optional redundant power supply and CL modules, with switchover to the backup CL links occurring within 50 msec of a detected failure. Eight-port E1/T1 and SHDSL links can also be configured for redundancy and can be hot-swapped, allowing continuous service provisioning.

The redundant CL.1 modules can be used either for operation in parallel or for redundancy.

Megaplex-4100 supports standard SDH/SONET ring topology, TDM traffic protected by path protection (SNCP) and Ethernet protected by LCAS.

Optional 1+1 link protection mechanism (unidirectional MSP/APS) is also available.



Figure 4. Megaplex-4100 Rear View

Megaplex-4100

SDH/SONET INTERFACE

The STM-1/OC-3 interfaces are user-configurable and provide a high-quality and high-availability link, as well as performance monitoring of the traffic path.

The STM-1/OC-3 link is supplied with an SFP socket (see *Ordering*). 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.

The user can define the following SDH/SONET clock sources:

Internal

Recovered from the STM-1/OC-3 interface, including automatic selection based on SSM (Synchronization Status Messaging)

Derived from the TDM subsystem.

GIGABIT ETHERNET INTERFACE

One or two optional Gigabit Ethernet ports connect each LAN port to eight virtual groups per CL.1 and groom Ethernet traffic from I/O modules to the GbE interface. Maximum frame length is 1.6 kB.

Ethernet traffic generated by CPE devices is transferred over TDM E1, T1 or SHDSL circuits, or comes directly from connected Fast Ethernet ports. These Ethernet ports can be either copper or fiber optic, optionally marked by double tagging and groomed to GbE ports on the CL.1 module, or towards SDH/SONET ports by using VCAT (VCG).

Ethernet traffic is mapped into SDH/SONET containers using VCAT and encapsulated with Generic Framing Procedure (ITU-T G.7041, ANSI T1-105.02, framed mode).

Each user's Ethernet traffic can be mapped into SDH/SONET via any of the following virtual containers:

Up to 63 × VC-12, or 84 × VT-1.5

3 × VC-3/STS-1

1 × VC-4.

Ethernet traffic can be switched to different bundles of virtually concatenated VCs (up to 8 bundles per CL.1 module) according to a predefined group.

Link Capacity Adjustment Scheme (LCAS) is supported in compliance with the G.7042 standard, to maintain the Ethernet flow in case of path failure or asymmetric VC/VT assignment.

TDM SERVICES

TDM traffic is mapped into SDH/SONET VC-12/VC-11/VC-3 or SONET VT1.5/STS-1 containers that can be placed anywhere within the STM-1/OC-3 bandwidth.

Multiple system TDM timing options are available:

Internal crystal oscillator clock

Clock received from any SONET/SDH or PDH link (loopback)

Clock received from any PDH tributary inside SONET/SDH

Clock derived from the receive clock of a user port, internal DS1 port or pseudowire (Rx timing mode)

External station (master) clock.

Up to 10 primary clock sources can be set as fallback in the event of failure. If all the primary clock sources fail, up to 10 secondary clock sources can be set as fallback.

The SSM-based clock source selection mechanism assures the best quality timing for the system.

TDM E1/T1 MODULES

The Megaplex TDM E1/T1 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 protection in various redundancy modes (parallel TX, Y-cable or E1/T1 ring).

When a CL.1 module with the STM-1/OC-3 interface is installed in the chassis, the TDM modules allow mapping of E1/T1 links to the SONET/SDH network with DS0 granularity.

The M8E1/M16E1 and M8T1/M16T1 TDM modules connect Megaplex-4100 to up to 8/16 E1/T1 lines and to Ethernet links via 10/100BaseT ports with 3 SFP or UTP connectors. Up to 10 modules can be installed in a single chassis, providing Megaplex-4100 with up to 160 full E1/T1 non-blocking DS0 cross-connect capacity.

The tributary E1/T1 streams are locked to the nodal timing.

PSEUDOWIRE CAPABILITIES

Megaplex-4100 equipped with the MPW-1 module provides legacy services over packet-switched networks (PSN). The MPW-1 module converts the data stream from other modules in the MP-4100 chassis (E1/T1, SHDSL, data or voice ports) delivered by the Megaplex backplane via MPW-1's internal DS1 ports into IP or MPLS packets for transmission over Ethernet, IP or MPLS networks.

The M8SL module employs Single-pair High speed Digital Subscriber Line (SHDSL) technology, as standardized by ITU-T Rec. G.991.2. SHDSL modules offer a cost-effective solution for delivering digital data to customer premises over the existing copper cables of the distribution network while eliminating the need for repeaters. M8SL modules connect Megaplex-4100 to up to 8 SHDSL links and to Ethernet links via 10/100BaseT ports with 3 SFP or UTP connectors.

I/O MODULES

Table 1 lists the I/O modules available for Megaplex-4100 (see enclosed data sheets for detailed specifications).

MANAGEMENT

Configuration and monitoring can be performed via an ASCII terminal, Web, Telnet or RADview.

Remote units can be managed in the following ways:

Out-of-band, using the 10/100 Ethernet management port. This simple and efficient method takes advantage of IP bandwidth on demand, while saving link bandwidth for user traffic

Inband, using the IP/PPP over DCC, via the STM-1/OC-3 links

Inband, using the IP/PPP over a dedicated timeslot in any E1/T1 or SHDSL link

Network management station running RADview, RAD's SNMP element management application.

DIAGNOSTICS

Comprehensive diagnostic capabilities include:

Local and remote loopbacks per link and per DSO

Real-time alarms to alert the user of fault conditions

SDH/SONET link monitoring.

ALARMS

All alarms, including state and frequency of occurrence, are stored in the CL.1 alarm status buffer. The last 256 alarms are kept in a separate alarm history buffer.

Alarm status can be automatically read online by the management system from any node. User-set alarm masking, filtering and inversion, as well as 5-level prioritization are also supported.

Table 1. Megaplex-4100 I/O Modules

Module	Description
ASMi-54C	SHDSL.bis module with 2 Ethernet ports
HS-6N, HS-12N	6- or 12-port n x 64 kbps high speed module
HS-703	4-channel Codirectional data module
HSF-2	2-port fiber optic teleprotection interface module
HS-RN	4-port sub-DSO low speed module
HS-S	4-channel ISDN "S"-interface module
HSU-6, HSU-12	6- or 12-port IDSL modules
LS-6N, LS-12	6- or 12-port low speed modules
M16E1, M16T1	16-port E1 or T1 modules
M8E1, M8T1	8-port E1 or T1 modules with 3 Ethernet ports (licence-based)
M8SL	8-port SHDSL E1 module with 3 Ethernet ports (licence-based)
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
VC-4/4A/8/8A/16	4/8/16-port FXS/FXO/E&M PCM and ADPCM analog voice modules
VC-4/OMNI	4-port PCM omnibus voice module
Note: For specific HW/SW versions of Megaplex-210x modules supported by the Megaplex-4100 chassis, please contact your local RAD partner.	

Specifications

STM-1/OC-3 MAIN LINK

Number of Ports

2 per CL.1 module (4 per chassis)

Bit Rate

155.52 Mbps ±20 ppm

Timing

Internal clock

Recovered from the STM-1/OC-3 interface

External clock from TDM interfaces

Compliance

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

SONET: GR-253-core

Framing

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

SONET: GR-253-core

Protection

1+1 unidirectional APS (G.842)

Line Code

NRZ

Connectors

SFP-based

SFP Interface Specifications

See *Table 2*

Note: For detailed specifications of the SFP transceivers, see the *SFP Transceivers data sheet*.

GBE INTERFACE

Number of Ports

2 per CL.1 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*)

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

STATION CLOCK

Bit Rate

1.544 Mbps (T1) (AMI)

2.048 Mbps (E1) (AMI)

2.048 MHz squarewave

Connector

RJ-45

DIAGNOSTICS

Tests

Local and remote loopbacks per link

Alarms

Time and date stamped

Last 256 alarms stored in RAM on CL

module, readable by management

system or terminal

Current alarms status

Statistics

Performance statistics for bundles and

Ethernet ports

SDH/SONET link monitoring

Table 2. SFP Transceivers for STM-1/OC-3 and GbE Interfaces

	Transceiver	Wavelength	Fiber Type	Transmitter Type	Connector Type	Input Power		Output Power		Typical Max. Range	
		[nm]	[μm]			(min)	(max)	(min)	(max)	[km]	[miles]
STM-1/OC-3 Link	SFP-1	1310	62.5/125 multimode	VCSEL	LC	-30	-14	-20	-14	2	1.2
	SFP-2	1310	9/125 single mode	Laser	LC	-28	-8	-15	-8	15	9.3
	SFP-3	1310	9/125 single mode	Laser	LC	-34	-10	-5	0	40	24.8
	SFP-4	1550	9/125 single mode	Laser	LC	-34	-10	-5	0	80	49.7
	SFP-11	Copper Link		Coaxial cable 75Ω impedance	–	mini-BNC	–	–	–	–	0.135*
GbE Link	SFP-5	850	50/125 multimode	VCSEL	LC	-17	0	-9.5	0	0.55	0.3
	SFP-6	1310	9/125 single mode	Laser	LC	-20	-3	-9.5	-3	10	6.2
	SFP-7	1550	9/125 single mode	Laser	LC	-22	-3	0	+5	80	49.7
	SFP-8D	1310	9/125 single mode	Laser	LC	-21	-3	0	-4	40	24.8

* Using RG59 B/U.

INDICATORS

Chassis

POWER SUPPLY A, B:

Green (on) – Corresponding PS modules on (if CL module is active)

SYSTEM TEST

Yellow (on) – System test in process

SYSTEM ALARM

Red (flashing) – Major and/or critical alarm in the system

CL.1 Module

ON LINE

Green (on) – Master (active) module is active

Yellow (on) – Master (active) module is being tested

Green (flashing slowly) – Standby

Green (flashing rapidly) – Software downloading

Yellow (flashing) – Software decompressing

ALM

Red (flashing) – Critical alarm in system, but highest alarm severity is minor or warning

CLOCK ON

Green (on) – Station clock port is configured as connected

CLOCK LOS

Red (on) – Loss-of-signal condition at the station clock port

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

ON LINE

Green (on) – Link is active

Green (flashing) – Link is on standby

Yellow (on) – Test is active

LOS

Red (on) – Loss of signal at the corresponding port

ETH, MNG, GbE Interface (per port)

LINK

Green (on) – Port is connected to an active Ethernet hub or switch

ACT

Yellow (on) – Port transmits and/or receives data

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 separate data sheets for individual modules.

Table 3. Megaplex Chassis Comparison

	MP-2104	MP-2100	MP-4100
			
Feature			
Functionality	Modular multiservice access multiplexer	Modular multiservice access multiplexer	Modular digital access cross-connect, Ethernet Aggregator and STM-1/OC-3 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-1/OC-3 + 1GbE
Management Interface	RAD proprietary CLI	RAD proprietary CLI	Menu-driven

GENERAL

Configuration

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

Physical

Chassis

2 power supply module slots
2 CL.1 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.1 Module

Height: 17.3cm (6.8 in)
Width: 4.5 cm (1.8 in)
Depth: 32.5 cm (12.8 in)
Max Weight: 630 g (1.3 lb)

Power Supply Input

AC: 115 or 230 VAC
DC: 24 or -48 VDC
Selectable ground reference or floating ground

Output Power (max)

250W

Power Consumption (per CL, max)

CL.1: 10W
CL.1/155: 16W
CL.1/155GbE: 30W
CL.1/GbE: 24W

Environment

Operating temperature: -10°C to 55°C
(14°F to 131°F)
Storage temperature: -20°C to +70°C
(-4°F to +158°F)
Humidity: up to 95%, non-condensing

Note: Actual operating temperature range is determined by the specific modules installed in the chassis, and might require special ordering options.

If you need -20°C to 55°C (-4°F to 131°F) operating temperature support, contact Technical Services Dept.

Ordering

STANDARD CONFIGURATIONS

MP-4100-1/115R/155R/2XSFP2
MP-4100-1/115R/GBEUTPR
MP-4100-1/230/155GBESFP/2XSFP2
MP-4100-1/230R
MP-4100-1/230R/R
MP-4100-1/48/155R/2XSFP3
MP-4100-1/48R/155GBESFPR/4XSFP2/4XSFP6
MP-4100-1/48R/155GBEUTPR/2XSFP2
MP-4100-1/48R/155R/2XSFP2
MP-4100-1/48R/GBEUTP
MP-4100-1/48R/GBEUTPR
MP-4100M-CL.1
MP-4100M-CL.1/155/2XSFP2
MP-4100M-CL.1/155GBESFP/2XSFP2/2XSFP6
MP-4100M-CL.1/155GBESFP/2XSFP3/2XSFP6
MP-4100M-CL.1/155GBEUTP/2XSFP2
MP-4100M-CL.1/GBEUTP

SPECIAL CONFIGURATIONS

MP-4100-MN

Megaplex-4100 chassis with no PS or CL.1 module

MP-4100-1/*/%/&/^

Megaplex-4100 chassis equipped with PS and CL.1 modules

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

Legend

* Power supply modules:

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

% Link option (Default=no links)

155	Single CL.1 module with dual STM-1/OC-3 links, SFP sockets
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GBEUTP	Single CL.1 module with dual GbE links, UTP connectors
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GBESFP	Single CL.1 module with dual GbE links, SFP sockets
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155GBEUTP	Single CL.1 module with STM-1/OC-3 and GbE links; SFP sockets for STM-1/OC-3, UTP connectors for GbE
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155GBESFP	Single CL.1 module with STM-1/OC-3 and GbE links; SFP sockets for both
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R	Two CL.1 modules, no link	^	Number and type of SFPb transceivers for GbE links (GBESFP/GBESFPR or 155GBESFP/155GBESFPR ordering options):
155R	Two CL.1 modules, each with dual STM-1/OC-3 links, SFP sockets		
GBEUTPR	Two CL.1 modules, each with dual GbE links, UTP connectors	SFPb	One SFP transceiver
GBESFPR	Two CL.1 modules, each with dual GbE links, SFP sockets	2xSFPb	2 SFPs on a single CL.1 or one SFP on each CL.1
155GBEUTPR	Two CL.1 modules, each with STM-1/OC-3 and GbE links; SFP sockets for STM-1/OC-3, UTP connectors for GbE	4xSFPb	2 SFPs on each CL.1
155GBESFPR	Two CL.1 modules each with STM-1/OC-3 and GbE links; SFP sockets for both	b	Type of GbE receiver
&	Number and type of SFPa transceivers for STM-1/OC-3 links (155/155R , 155GBEUTP/155GBEUTPR , or 155GBESFP/155GBESFPR ordering options):	5	GbE, 850 nm multimode VCSEL
		6	GbE, 1310 nm single mode laser (LX-SM)
		7	GbE, 1550 nm single mode laser, long haul LX-H (ZX)
		8D	GbE, 1310 nm single mode laser, long haul (LX-H)
		a	Type of STM-1/OC-3 receiver
		1	STM-1/OC-3, 1310 nm multimode VCSEL, LC connector
		2	STM-1/OC-3, 1310 nm single mode laser (S1.1), LC connector
		3	STM-1/OC-3, 1310 nm, single mode laser, long haul (L1.1), LC connector
		4	STM-1/OC-3, 1550 nm single mode laser, long haul (L1.2), LC connector
		11	STM-1/OC-3, electrical interface, mini-BNC coaxial connector

Notes:

- For the complete list of SFPs, refer to the SFP Transceivers data sheet.
- It is compulsory to order Megaplex-4100 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 Megaplex-4100 units using non-RAD SFPs.

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

Megaplex-4100

MP-4100M-CL.1/#/\$/@

CL.1 module with cross-connect and 10/100BaseT management port

Legend

- # Link option (Default=no links)
- 155** Single CL module with dual STM-1/OC-3 links, SFP sockets
- GBEUTP** Single CL module with dual GbE links, UTP connectors
- GBESFP** Single CL module with dual GbE links, SFP sockets
- 155GBEUTP** Single CL module with STM-1/OC-3 and GbE links; SFP sockets for STM-1/OC-3, UTP connectors for GbE
- 155GBESFP** Single CL module with STM-1/OC-3 and GbE links; SFP sockets for both
- \$ Number and type of SFP transceivers for STM-1/OC-3 links (**155**, **155GBEUTP**, or **155GBESFP** ordering options):
- SFPa** One SFP transceiver
- 2xSFPa** 2 SFPs on a single CL.1
- @ Number and type of SFP transceivers for GbE links (**GBESFP** or **155GBESFP** ordering options):
- SFPb** One SFP transceiver
- 2xSFPb** 2 SFPs on a single CL.1

Notes:

- The list of SFP transceivers (SFPa, SFPb) for ordering with CL.1 is the same as for ordering the Chassis package (see above).
- Unlike the SFPs listed under *Optional Accessories* below, the ordering string for transceivers coming with the Chassis/CL.1 does not include a hyphen. For example, to order an SFP-1 transceiver on a CL.1 module you should specify SFP1 and not SFP-1, as when ordering optional transceivers.

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 port cable

OPTIONAL ACCESSORIES**SFP Transceivers for the STM-1/OC-3 Link**

- SFP-1** STM-1/OC-3, 1310 nm multimode VCSEL, LC connector
- SFP-2** STM-1/OC-3, 1310 nm single mode laser (S1.1), LC connector
- SFP-3** STM-1/OC-3, 1310 nm, single mode laser, long haul (L1.1), LC connector
- SFP-4** STM-1/OC-3, 1550 nm single mode laser, long haul (L1.2), LC connector
- SFP-11** STM-1/OC-3, electrical interface, mini-BNC coaxial connector

SFP Transceivers for the GbE Link

- SFP-5** GbE, 850 nm multimode VCSEL
- SFP-6** GbE, 1310 nm single mode laser (LX-SM)
- SFP-7** GbE, 1550 nm single mode laser, long haul LX-H (ZX)
- SFP-8D** GbE, 1310 nm single mode laser, long haul (LX-H)

CBL-SP-9/SH

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

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