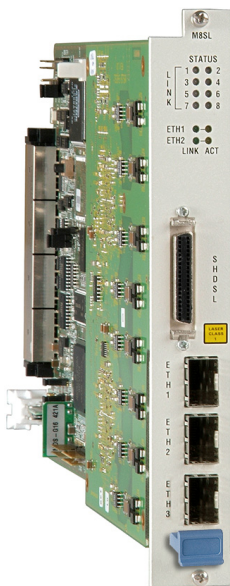Megaplex-4100 Module

M8SL

8-Port SHDSL E1 Module

- Up to 2048 kbps payload per port over 2-wire copper cables
- Up to three 10/100BaseT Ethernet ports, copper or fiber
- Integral L2 Ethernet switch with full VLAN support
- Range of up to 10.6 km (6.6 miles) over 26 AWG 2-wire cable
- Remote or Central functionality programmable per channel
- Inband management (EOC) according to G.991.2 or dedicated TS

Extension of E1 and Ethernet traffic over SHDSL copper lines

The Megaplex M8SL module employs Single-pair High speed Digital Subscriber Line (SHDSL) technology, as standardized by ITU-T Rec. G.991.2. This SHDSL E1 module offers 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.

In addition to providing SHDSL interfaces for Megaplex-4100 units, M8SL modules enable packet-based Fast Ethernet services.

M8SL modules have two types of external ports:

- Eight SHDSL independently configurable external ports for SHDSL services
- Three 10/100 Mbps Ethernet ports, for packet-based services.

TDM SERVICES

Each M8SL port is a multirate SHDSL modem operating at user-selectable data rates which are multiples of 64 kbps, starting from 192 kbps up to 2048 kbps (32 timeslots). Data rates and distances are adaptive: as the data rate increases, the range decreases. *Table 1* lists typical ranges versus the payload data rates.

The M8SL module is user-configurable for operation in accordance with the following standards:

- ITU-T Rec. G.991.2. Annex B (for compatibility with European or similar networks)
- Annex A (for compatibility with North American or similar networks).

The module can operate as a Central (STU-C) or Remote (STU-R) SHDSL Terminal Unit (programmable per module channel) opposite RAD's ASMi-52, DXC, FCD-IP, FCD-IPM devices, another M8SL module or Megaplex-2100/2104 MSL-8 module.

ETHERNET SERVICES

The Ethernet services are provided by means of an internal Layer-2 Ethernet switch that fully complies with the IEEE 802.3/Ethernet V.2 standards, and has full VLAN support. The total Ethernet traffic per module (from 1, 2 or 3 ports) is up to 100 Mbps.

RAD
data communications
The Access Company

The 3-port 10/100BaseT interface includes a built-in flow classification engine that performs single or double VLAN tagging according to IEEE 802.1Q and 802.1p. The interface features autonegotiation for plug-and-play Ethernet connectivity and complies with IEEE 802.3/Ethernet V.2 standards.

The external Ethernet ports can be ordered with two types of interfaces:

- 10/100BaseTx interfaces terminated in RJ-45 connectors.

- Sockets for SFP Fast Ethernet transceivers. RAD offers several types of SFPs with optical interfaces, for meeting a wide range of operational requirements (SFPs with copper interfaces are also available).

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 Ethernet switch switches traffic between the module Ethernet ports and the CL module Ethernet subsystem (for connection via the CL GbE ports to a packet-switched network, or for transmission through the SDH network via virtually concatenated groups (VCGs)), and between module Ethernet ports and bundles.

The processing and switching of Ethernet traffic over TDM (SHDSL) links is configured by means of bundles using HDLC as the Layer-2 protocol. An HDLC bundle is always defined on a single SHDSL port, and its bandwidth depends on the port framing mode:

- In framed mode, the user can configure the assigned bandwidth by specifying the timeslots included in the bundle. In this case, each port supports up to four HDLC bundles. Up to 32 bundles can be configured per M8SL module.

- In unframed mode, the full E1 port bandwidth (2048 kbps) is automatically assigned to the HDLC bundle.

DIAGNOSTICS

Diagnostic capabilities include local and remote loopbacks on the SHDSL ports and local and remote loopback per timeslot on internal E1 ports.

Performance statistics for the SHDSL and Ethernet ports may be obtained and analyzed via the Megaplex management system.

SHDSL Access to SDH/SONET Networks
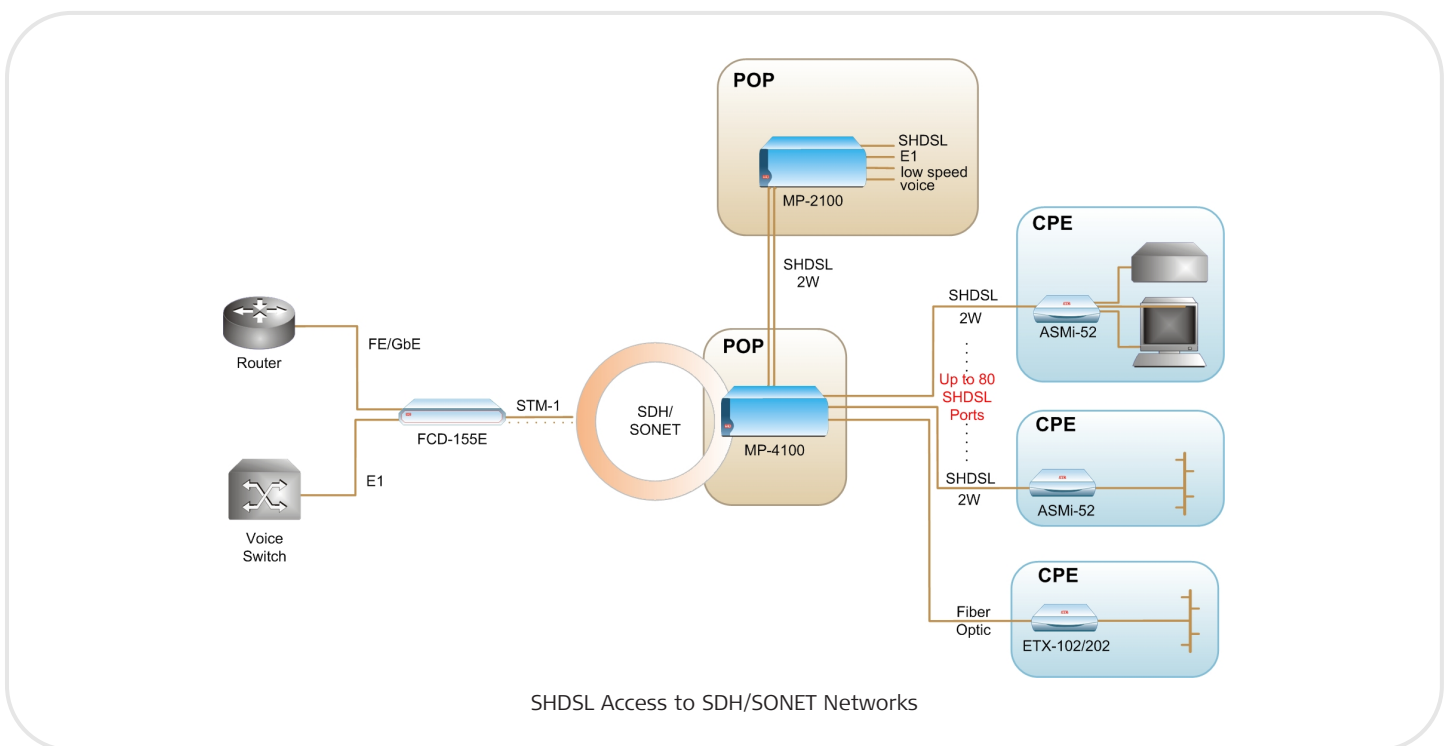
Specifications

SHDSL PORTS

Number of Ports per Module
8

Compliance
ITU-T G.991.2 Annex A/B
(SHDSL Standard)

Line Power
Up to 16.8 dBm

Signal Format
TC-PAM

Transmission Line
Single unconditioned twisted pair

Impedance
135Ω

Connector
SCSI-40, convertible to 8 RJ-45 connectors via adaptor cable

Typical Ranges
Depend on the data rate and the cable diameter. For 26 AWG (0.4mm) cable with 13.5 dBm line power, see *Table 1.*

SFP Characteristics
For full details, see the *SFP Transceivers data sheet* at www.rad.com

Dual-Color Indicator (per link)
Lights steadily in green when the port is connected and carries traffic
Flashes in red during handshaking between the M8SL port and the remote unit
Flashes in green when the port is connected and is the standby port in a redundancy pair
Lights in red during local loss of synchronization or red alarm
Off when not connected

ETHERNET PORTS

Number of Ports
3 fiber-optic or 3 UTP

Data Rate
10/100 Mbps (Fast Ethernet)
Autonegotiation

Total Bandwidth per Module
100 Mbps per module

Maximum Frame Size
1600 bytes

Connectors
3 x RJ-45, shielded
3 x SFP socket (for transceivers, see *Ordering*)

Indicators (ports ETH1, ETH2)
LINK (green) – LAN link integrity
ACT (yellow) – LAN data activity

Table 1. Typical Ranges

Data Rate	Range	
[kbps]	[km]	[ft]
192	10.6	35.000
256	8.2	27.000
768	6.5	21.500
1544	4.9	16.200
2048	4.0	13.000

DIAGNOSTICS

Performance Monitoring
Per ITU-T Rec G.991.2, G.826

Loopbacks
Local and remote loopback on each SHDSL port
Local and remote loopback per timeslot on each internal E1 port

GENERAL

Power Consumption
13.7W

Environment
Operating temperature: -10°C to 50°C (14°F to 122°F)
Storage temperature: -20°C to +70°C (-4°F to +158°F)
Humidity: up to 95%, non-condensing

Ordering

STANDARD CONFIGURATIONS

MP-4100M-8SL/3XUTP

SPECIAL CONFIGURATIONS

MP-4100M-8SL/#

Legend

Interface and Connectors:

3XUTP 3 UTP (RJ-45 connectors)

3XNULL 3 SFP sockets without SFP transceivers

3XSFPa 3 SFP sockets including SFP transceivers (see below for **a**)

a SFP transceivers

Ethernet 100BaseFx Interface

1 Fast Ethernet/STM-1, 1310 nm, multimode, LED, 2 km (1.2 miles)

1D Fast Ethernet/STM-1, DDM, internal calibration, 1310 nm, multimode, LED, 2 km (1.2 miles)

2 Fast Ethernet/STM-1, 1310 nm, single mode, laser, 15 km (9.3 miles)

2D Fast Ethernet/STM-1, DDM, internal calibration, 1310 nm, single mode, laser, 15 km (9.3 miles)

3 Fast Ethernet/STM-1, 1310 nm, single mode, laser, 40 km (24.8 miles)

3D Fast Ethernet/STM-1, DDM, internal calibration, 1310 nm, single mode, laser, 40 km (24.8 miles)

10a Fast Ethernet/STM-1, Tx - 1310 nm, Rx - 1550 nm, single mode (single fiber), laser (WDM), 20 km (12.4 miles)

10b Fast Ethernet/STM-1, Tx - 1550 nm, Rx - 1310 nm, single mode (single fiber), laser (WDM), 20 km (12.4 miles)

18a STM-1/OC-3, Tx - 1310 nm, Rx - 1550 nm, 9/25 single mode (single fiber), laser (WDM), 40 km (24.8 miles)

18b STM-1/OC-3, Tx - 1550 nm, Rx - 1310 nm, 9/25 single mode (single fiber), laser (WDM), 40 km (24.8 miles)

19a STM-1/OC-3, Tx - 1490 nm, Rx - 1570 nm, 9/25 single mode (single fiber), laser (WDM), 80 km (49.7 miles)

19b STM-1/OC-3, Tx - 1570 nm, Rx - 1490 nm, 9/25 single mode (single fiber), laser (WDM), 80 km (49.7 miles)

Ethernet 100BaseTx (Electrical) Interface

9F* Fast Ethernet, RJ-45 connector, 100m (238 ft)

***** Order this option only if an SFP electrical transceiver is needed. Otherwise we recommend the lower-cost 3xUTP option for Fast Ethernet interface.

Notes:

- *For the complete list of SFPs, refer to the SFP Transceivers data sheet.*

- *It is strongly recommended to order M8SL 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 M8SL units using non-RAD SFPs.*

OPTIONAL ACCESSORIES

CBL-MSL8-SCS40/RJ45
Cable for splitting the M8SL single 40-pin SCSI connector to 8 x RJ-45 connectors. Cable length is 2m (6 ft).