

Optimux-134, Optimux-125

Fiber Multiplexers for 16 E1/T1 and Ethernet



- Up to 16 E1/T1 links, full bandwidth 100 Mbps Ethernet traffic and high-speed data multiplexed into fiber optic uplink
- 34/25 Mbps or 134/125 Mbps operation modes
- Single-mode, multimode, single-mode over single fiber, SFP-based interfaces
- Range of up to 110 km (68 miles)
- Optional additional hot-swappable power supply and uplink for redundancy

High-speed TDM and
Ethernet services
multiplexed over fiber



Optimux-134 and Optimux-125 provide a simple, flexible, and cost-effective solution for transporting multiple E1/T1 links, high-speed data and Ethernet over an E3 copper or fiber link, to distances of up to 110 km (68 miles).

Each product features two license-activated operation modes:

- In 34/25-Mbps mode, the units multiplex up to 16 E1/T1 links, Ethernet traffic in granularity of 8/6 Mbps and high-speed data into a fiber optic or E3 uplink.
- In 134/125-Mbps mode, the units multiplex up to 16 E1/T1 links and 100 Mbps Ethernet traffic into a fiber optic uplink.

The fiber optic link is available with single-mode, multimode, and single-mode over single fiber interfaces.

In 34-Mbps device operation mode, the Optimux-134 uplink is compliant with E3 standards for coax interfaces and works with 3rd party devices. The Optimux-134/125 uplink with fiber interfaces is proprietary in both device operation modes.



data communications

The Access Company

Optimux-134, Optimux-125

Fiber Multiplexers for 16 E1/T1 and Ethernet

The unit multiplexes up to 16 E1/T1 links. In 34/25-Mbps operation mode, the data rate of the TDM ports can partially be replaced (user-selectable) by the 10/100BaseT user Ethernet traffic or by an optional high-speed data V.35 interface (see *Table 1*).

UPLINK INTERFACES

Various interfaces (based on SFP transceivers) are available for both the active and the backup uplinks (see *Table 1* and *Ordering Options*):

- Electrical via coax (SMB) connector (34 Mbps mode operation only)
- 1310 nm short or long-haul laser and 1550 nm long-haul laser interfaces for extended range over single-mode fiber
- Single fiber interface using WDM technology, with the laser transmit signal at a different wavelength than the receive signal (1310 nm and 1550 nm).

UPLINK REDUNDANCY

Upon link failure, the unit automatically switches to an optional second uplink as a backup.

E1/T1 INTERFACE

Optimux-134/125 multiplexes 16 E1/T1 channels. The E1/T1 interfaces comply with the ITU-T G.703. Line coding is HDB3 or B8ZS, respectively. A pair of LEDs monitors loss-of-signal and AIS on each E1/T1 receive line.

FAST ETHERNET INTERFACE

Optimux-134 and Optimux-125 feature fast Ethernet ports enabling a full 100-Mbps Ethernet connection in addition to the capacity of the 16 E1/T1 channels. The Optimux devices are supplied with a 10/100BaseT Ethernet USER port. This port is activated via a software key. The license can be purchased for 8/6-Mbps granularity to work in 34/25-Mbps operation mode, or for full bandwidth to work in 134/125-Mbps operation mode.

V.35 INTERFACE

The Optimux devices can be supplied with one V.35 (2048/1544 kbps) channel that replaces channel 16 by user activation. The V.35 interface can only be used in 34/25-Mbps operation mode.

TIMING

The Optimux devices transmit each E1/T1 channel separately so that the clock of each E1/T1 channel is independent.

Devices operating in 34/25 Mbps mode support internal and loopback timing modes. The 134/125-Mbps operation mode uses only internal timing.

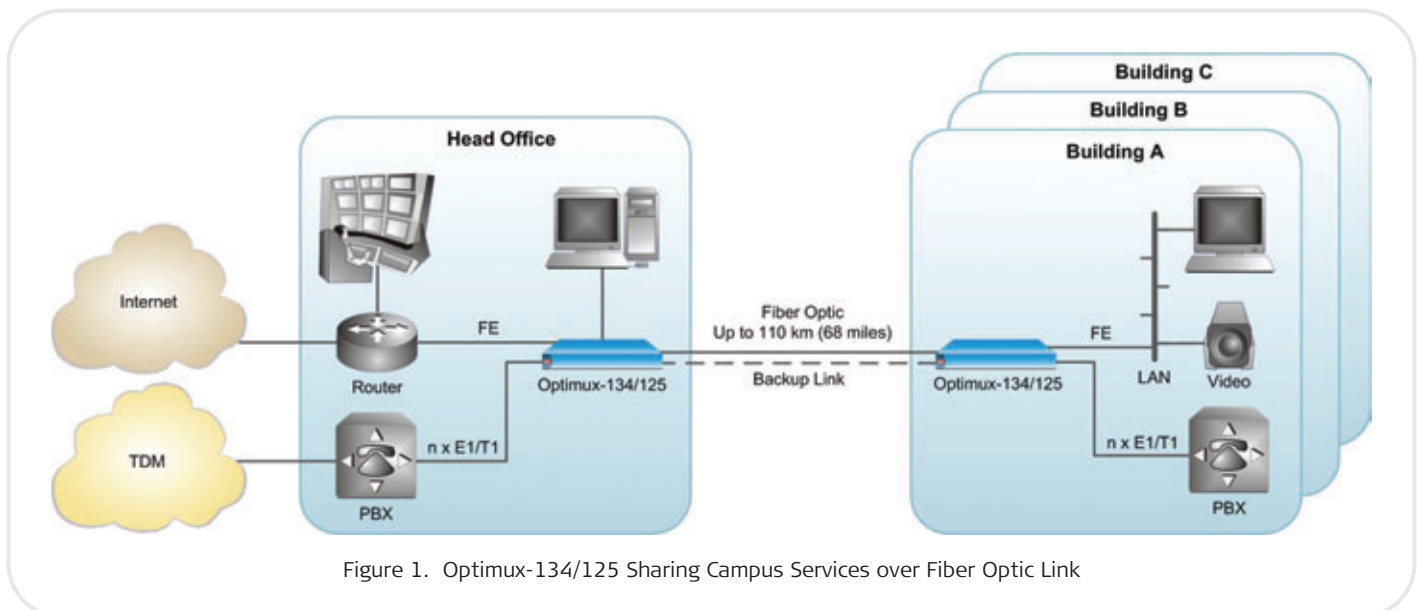


Figure 1. Optimux-134/125 Sharing Campus Services over Fiber Optic Link

TYPICAL APPLICATIONS

Private Networks

In private networks, Optimux-134/125 shares campus services such as Ethernet, voice, data and video in P2P (*Figure 1*) and Star topologies over dark fiber.

Optimux-134/125 establishes TDM and Ethernet connectivity between the remote branches and headquarters for educational, financial, military sectors.

Traffic Backhaul Application

Optimux-134/125 transparently backhauls TDM and Ethernet traffic over fiber or coax uplink (see *Figure 3*).

Optimux devices connect cellular base stations to controllers. This solution meets the requirements of cellular backhaul applications by providing TDM and Ethernet traffic for CDMA and GSM connectivity.

The Optimux units backhaul WiMAX traffic from remote locations over dark fiber links at a distance of up to 110 km (68.3 miles).

DIAGNOSTICS

Optimux features comprehensive test and diagnostic capabilities that include local and remote loopbacks on the uplink interface and on each E1/T1 port. A local loopback is also supported on the optional V.35 user port.

To ease system diagnostics, Optimux features LED status indicators and AIS alarm generation and recognition.

The devices also feature dry contact closure upon link failure. An optional alarm port is available with dry relay contacts for major and minor alarms.

MANAGEMENT

The Optimux units can be configured and monitored with a number of management and diagnostic tools. An ASCII terminal provides local management. Remote management and diagnostics can be performed via Telnet, a RAD Web-based management application or an SNMP-based management application. The products working in 34/25-Mbps operation mode can be managed by RADview, RAD's SNMP-based management application.

PHYSICAL

Optimux-125 is a compact, 1U-high unit. Optimux-134 is available in a 1U-high version with balanced E1 interface, and RJ-45 connectors, or a 2U-high version with unbalanced E1 interface, and BNC or IEC-169/13 connectors. The units with IEC-169/13 connectors are equipped with DIP switches to disconnect GND from the Rx signal).

All the units can be mounted in a 19-inch rack.

POWER

The wide-range AC/DC power supply can be connected to either an AC power source (90 to 260 VAC), or a DC power source (-40 to -125 VDC). The units can also be ordered with a +24 VDC (20 to 72 VDC) power supply.

A second power supply can be ordered for power redundancy.

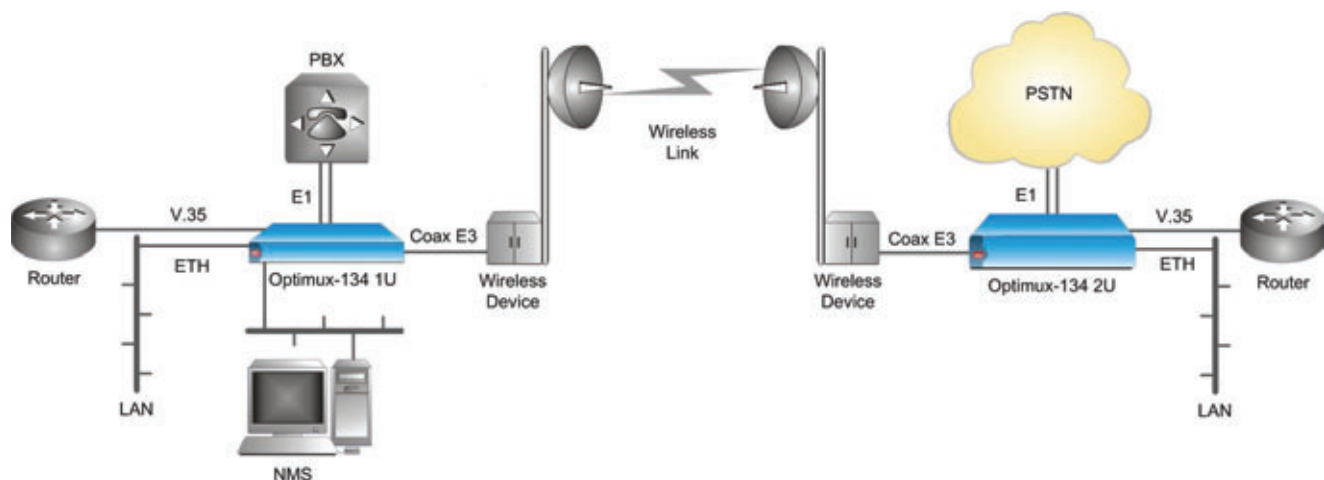


Figure 2. Wireless Service Extension with Standard E3 Coax Interface (34-Mbps Operation Mode)

Optimux-134, Optimux-125

Fiber Multiplexers for 16 E1/T1 and Ethernet

Specifications

LINK INTERFACES (MAIN AND BACKUP)

Data Rate

OP-134:

- 134-Mbps mode: 135.168 Mbps (RAD proprietary)
- 34-Mbps mode (E3): 34.368 Mbps

OP-125 (RAD proprietary):

- 125-Mbps mode: 127.38 Mbps
- 25-Mbps mode: 25.910 Mbps

Interface Options

See *Table 1*

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.

Connectors

SFP interfaces with LC connectors

Standards

OP-134: ITU G.703, G.742, G.751, G.823, G.955, IEEE 802.3

OP-125: ITU G.703, G.824, G.955, IEEE 802.3

FAST ETHERNET INTERFACES

Activated via a software key:

34 Mbps mode: 8 Mbps granularity

25 Mbps mode: 6 Mbps granularity

134/125 Mbps mode: full bandwidth

Type

10/100BaseT

Connectors

RJ-45

E1/T1 INTERFACE

Number of Channels

16

Data Rate

E1: 2048 kbps

T1: 1544 kbps

Impedance

E1 balanced: 120Ω

E1 unbalanced: 75Ω

T1 balanced: 100Ω

Connectors

E1 balanced: RJ-45

E1 unbalanced: BNC or IEC-169/13 (in 2U unit)

Note: For balanced and unbalanced channels in the same unit, order a 1U-high unit and one CBL-RJ45/BNC/E1/X adaptor cable for each pair of BNC connectors.

T1 balanced: RJ-45

HIGH-SPEED INTERFACE

Type

V.35

Connector

DB-25 (ISO-2110 or Telebras pinout)

CONTROL PORT

Type

RS-232 DCE asynchronous

Data Rate

9.6, 19.2, 38.4, 57.6, 115.2 kbps

Connector

9-pin D-type female

ALARM PORT

Type

Dry relay contacts for major and minor alarms

Connector

9-pin D-type female

INDICATORS

Power

Off – Not powered

On (green) – Normal operation

On (red) – Power malfunction

System

TST (yellow) –

On: Diagnostic loop is performed or power-up

Flashes: Autobaud detect process

FLT (red) – Power-up

Link SFP (per port)

SYNC LOSS (red) – Signal loss or frame loss detected on uplink

AIS (yellow) – AIS detected on uplink (relevant only in 34/25-Mbps operation mode)

User Ethernet Port

LINK/ACT (yellow) –

On: LAN status is up

Flashes: LAN traffic transfer

100 (green) –

On: 100-Mbps operation

Off: 10-Mbps operation

E1/T1 Interface (per port)

SYNC LOSS (red) – Signal loss detected on E1/T1 link

AIS (yellow) – AIS detected on E1/T1 link

Management Port

LINK/ACT (yellow) –

On: LAN status is up

Flashes: LAN traffic transfer

100 (green) –

On: 100-Mbps operation

Off: 10-Mbps operation

GENERAL

Diagnostics

Local and remote loopbacks on uplink and on each E1/T1 port

Local loopback on optional V.35 user port (34/25-Mbps operation mode only)

Timing

Uplink: internal, loopback (34/25-Mbps operation mode only)

E1/T1 port: transferred transparently, independent for each channel

V.35 port: internal, external, loopback

Power

Wide range power supply:

AC: 90 to 260 VAC

DC: -48 VDC (-40 to -125 VDC)

24 VDC (20 to 72 VDC)

Power Consumption

Wide range power supply:

AC: 36 VA max

DC: 14W max

24 VDC power supply:

12W max

Physical

1U-high

Height: 4.4 cm (1.8 in)

Width: 44 cm (17 in)

Depth: 24 cm (9 in)

Weight: 3.5 kg (8 lb)

2U-high (Optimum-134 only)

Height: 8.8 cm (3.5 in)

Width: 44 cm (17 in)

Depth: 24 cm (9 in)

Weight: 4.0 kg (9 lb)

Environment

Temperature: 0°–55°C (32°–131°F)

Extended temperature range (with SFP-2H or SFP-3H only): -20° to 65°C (-4° to 149°F)

Humidity: Up to 90%, non-condensing

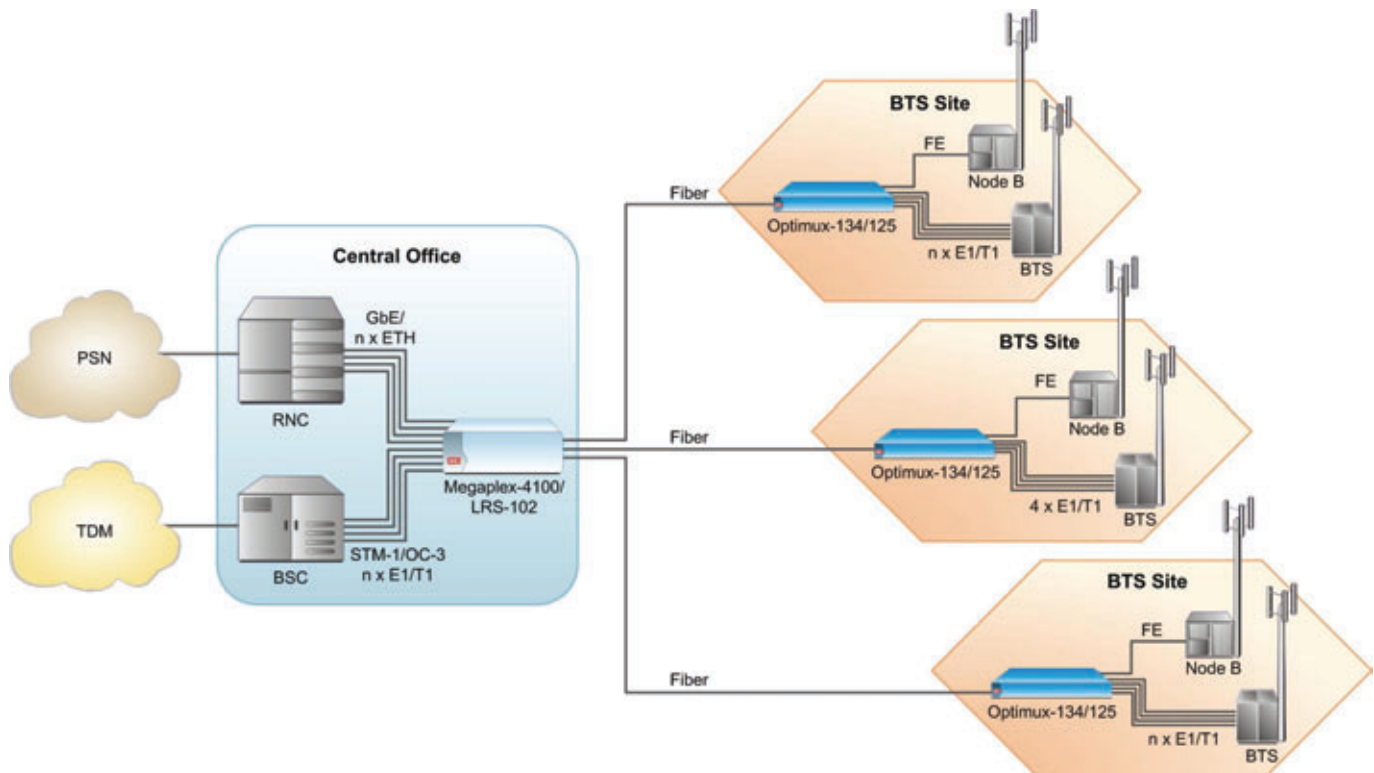


Figure 3. Cellular Backhaul Extending Services to Rural Areas (34/25-Mbps operation mode)

Optimux-134, Optimux-125

Fiber Multiplexers for 16 E1/T1 and Ethernet

Table 1. Uplink Interface Options

Module Name (Ordering Option)	Transmitter Type and Wavelength [nm]	Connector Type	Fiber Type	Typical Output Power [dBm]	Receiver Sensitivity		Typical Range for 34/25 Mbps Operation Mode		Typical Range for 134/125 Mbps Operation Mode	
					34/25 [dBm]	134/125 [dBm]	[km]	[miles]	[km]	[miles]
SFP-12 (Optimux-134 in 34 mode only)	-	SMB	Coax cable	-	-	-	(Per ITU-T G.703 standard)		-	
SFP-1	LED, 1310	LC	62.5/125 Multimode	-18	-31	-30	6.5	4.0	2	1.2
SFP-2	Laser, 1310	LC	9/125 Single mode	-12	-31	-28	38	23.6	15	9.3
SFP-2H	Laser, 1310	LC	9/125 Single mode	-12	-31	-28	38	23.6	15	9.3
SFP-3	Long haul laser, 1310	LC	9/125 Single mode	-2	-34	-34	70	43.4	40	24.8
SFP-3H	Long haul laser, 1310	LC	9/125 Single mode	-2	-34	-34	70	43.4	40	24.8
SFP-4	Long haul laser, 1550	LC	9/125 Single mode	-2	-34	-34	110	68.3	80	19.7
SFP-10A	Laser WDM, Transmit: 1310, Receive: 1550	LC	9/125 Single mode (single fiber)	-12	-30	-28	40	24.8	20	12.4
SFP-10B	Laser WDM, Transmit: 1550, Receive: 1310	LC	9/125 Single mode (single fiber)	-12	-30	-28	40	24.8	20	12.4
SFP-18A	Laser WDM, Transmit:1310 Receive:1550	LC	9/125 Single mode (single fiber)	-2	-30	-28	60	37.2	40	24.8
SFP-18B	Laser WDM, Transmit: 1550 Receive: 1310	LC	9/125 Single mode (single fiber)	-2	-30	-28	60	37.2	40	24.8
SFP-19A	Laser WDM, Transmit: 1490 Receive: 1570	LC	9/125 Single mode (single fiber)	+2	-32	-30	100	62.1	80	49.7
SFP-19B	Laser WDM, Transmit: 1570 Receive: 1490	LC	9/125 Single mode (single fiber)	+2	-32	-30	100	62.1	80	49.7
SFP-24	VCSEL, 850	LC	50/125 Multimode (134/125 mode only)	-8	-27	-25	3.5	2.3	2	1.2
			62.5/125 Multimode	-8	-27	-25	4.5	2.8	1	0.6

Note: 1. Typical ranges are calculated according to attenuation of 0.4 dB/km for 1310 nm, 0.25 dB/km for 1550 nm for single mode fiber.
2. H SFP versions are industrially hardened (-40° C to 85° C)

Ordering

STANDARD CONFIGURATIONS

OP-134/DCR/B/100M
 OP-134/PSR/B
 OP-134/PSR/U/A/100M
 OP-125/PSR/A/100M
 OP-125/DCR/A/100M

SPECIAL CONFIGURATIONS

OP-134/*/?/+/%/!/\$
 Fiber multiplexer for 16 E1 and Ethernet

OP-125/*/+/%/!/\$
 Fiber multiplexer for 16 T1 and Ethernet

Legend

- * Power supply (Default=one OP-125-134-PS wide range power supply):
 - PSR Dual wide range power supply (90–260 VAC, -40 to -125 VDC)
 - DC Single +24/-48 VDC
 - DCR Dual +24/-48 VDC
- ? E1 connector for Optimux-134:
 - B Balanced (RJ-45, 1U-high unit)
 - U Unbalanced (BNC, 2U-high unit)
 - UBR Unbalanced (IEC-169/13, 2U-high unit with DIP switches)
- + Alarm port (Default=no alarm port):
 - A Alarm port
- % V.35 user port (Default=no V.35 user port):
 - V35 DB-25 connector with ISO-2110 pinout
 - V35T DB-25 connector with Telebras pinout

- ! Activation key (Default=no activation key, the device will function with 16 E1/T1 ports only):
 - 6M Software key for activating the 10/100BaseT Ethernet port at 6 Mbps granularity (Optimux-125 only)
 - 8M Software key for activating the 10/100BaseT Ethernet port at 8 Mbps granularity (Optimux-134 only)
 - 100M Software key for activating the 10/100BaseT Ethernet USER port at 100 Mbps and 134/125 Mbps operation mode
- \$ Extended temperature support (Default=no extended temperature):
 - H With extended Temperature
 - Note: Extended temperature SFPs must be ordered with this option.*

Uplink Interface (SFP)

Table 1 specifies the uplink interface options. To order uplink interface from RAD, refer to the *SFP Transceivers Data Sheet* at www.rad.com.

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.

Notes: 1. When ordering redundant SFPs, they must be identical.

2. Single-fiber SFPs should always be used opposite the reciprocal single fiber SFP. For example, SFPs-10A should be used opposite SFP-10B.

3. RAD cannot guarantee full compliance to product specifications for units using non-RAD SFPs.

4. Optimux-134, Optimux-125 are supplied with two SFP sockets, the transceivers must be ordered separately.

SUPPLIED ACCESSORIES

AC/DC power cord

RM-34

Kit for mounting one 1U-high unit in a 19-inch rack (balanced units only)

RM-36

Kit for mounting one 2U-high Optimux-134 unit in a 19-inch rack (unbalanced units only)

CBL-SMB-BNC/M

SMB to BNC adapter cable for Optimux-134 (two cables supplied with each module of SFP-12)

Optimux-134, Optimux-125

Fiber Multiplexers for 16 E1/T1 and Ethernet

OPTIONAL ACCESSORIES

OP-134-LIC-ETH/!

OP-125-LIC-ETH/!

Software keys for activating the 10/100BaseT Ethernet port

Legend

! Capacity:

- 6M** License activation key for Ethernet at 6 Mbps granularity (for Optimux-125)
- 8M** License activation key for Ethernet at 8 Mbps granularity (for Optimux-134)
- 100M** License activation key for full Ethernet capacity and 134/125 Mbps operation mode

OP-134-PS

OP-125-PS

Wide range 90–260 VAC/-48 VDC power supply modules for adding a redundant power supply to an existing unit or replacing the original power supply module

OP-134-PS/DC

OP-125-PS/DC

+24/-48 VDC power supply modules for adding a redundant power supply to an existing unit or replacing the original power supply module

OP-134-PS-BP

OP-125-PS-BP

Blank panels for power supply modules

CBL-RJ45/2BNC/E1/X

RJ-45 to BNC adapter cross-cable (for use with 1U Optimux-134 chassis)

CBL-8H/M/1METER

V.35, DB-25 to M-34 cable for Optimux-134 and Optimux-125

CBL-DB9F-DB9M-STR

Control port cable

Table 2. Optimux Comparison Table

Feature	OP-108L	OP-108/106	OP-134/125	OP-1032/1025	OP-45/45L	OP-1551	OP-1553
Uplink	Fiber Optic	Fiber Optic	E3, Fiber Optic	Fiber Optic	T3, Fiber Optic	Copper, STM-1/OC-3	Copper, STM-1/OC-3
Bandwidth (Mbps)	108	108/106	34/25 or 134/125	Proprietary	45	155	155
Number of trunks	4 E1	4 E1/4 T1	16 E1/16 T1	16 E1/16 T1	21 E1/28 T1	21/42/63 E1 28/56/84 T1	3 E3/3 T3
Ethernet support	✓	✓	✓	✓	-	-	-
Special features	Reduced power consumption cost-effective	Redundant, hot-swappable uplinks	Full bandwidth, Ethernet license activation	3xGbE User interfaces	Ring support (Optimux-45)	Full redundancy	Full redundancy
Card version for LRS-102/MP-4100	Works with OP-108C	✓	Works with OP-34C/OP-25C	-	-	-	-

International Headquarters
 24 Raoul Wallenberg Street
 Tel Aviv 69719, Israel
 Tel. 972-3-6458181
 Fax 972-3-6498250, 6474436
 E-mail market@rad.com

North America Headquarters
 900 Corporate Drive
 Mahwah, NJ 07430, USA
 Tel. 201-5291100
 Toll free 1-800-4447234
 Fax 201-5295777
 E-mail market@radusa.com

www.rad.com

Order this publication by Catalog No. 803917



data communications
 The Access Company

329-100-03/11 (13.0) Specifications are subject to change without prior notice. © 1997-2011 RAD Data Communications Ltd. The RAD name, logo, logotype, and the terms EtherAccess, TDMoIP and TDMoIP Driven, and the product names Optimux and Pmux, are registered trademarks of RAD Data Communications Ltd. All other trademarks are the property of their respective holders.