Optimux-108, Optimux-106 Four-Channel E1/T1 and Ethernet Multiplexers



Any Traffic over Fiber



- Four E1 or T1 channels and Fast Ethernet link multiplexed over a fiber optic link
- Various fiber interfaces: multimode, single-mode (up to 120 km), and single-mode over single fiber
- Automatic link backup with optional hot-swappable second main link
- Card versions for up to 12 cards in an LRS-102 rack (24 remote units)
- Power redundancy with optional second wide-range power supply
- Management via ASCII terminal, dedicated Ethernet port, SNMP management station, or ConfiguRAD Web-based remote access terminal

The Optimux-108 and Optimux-106 multiplexers combine four E1 or T1 channels and an optional Ethernet link over a fiber optic uplink.

A pair of Optimux units provides a simple and low-cost solution for connectivity over distances of up to 120 km (74.5 miles). For transmission reliability, an optional modular second link provides automatic backup upon link failure. An optional second power supply provides power redundancy for failsafe operation.

Each of the four signals of the tributary interface is transmitted independently, so that each channel can be set to a different clock source.



STANDALONE UNITS

Main Link Interfaces

Optimux-108 and Optimux-106 support a variety of built-in optical uplink interfaces including:

- 850 nm VCSEL (Vertical Cavity Surface Emitting Laser) for multimode fiber
- 1310 nm LED for multimode fiber
- 1310/1550 nm laser diode or long haul laser diode for extended range over single-mode fiber
- Single fiber (SF1, SF2 options) using a 1310 nm and 1550 nm laser diode transmitter with WDM technology, which enables the laser to transmit the signal at a different wavelength than the receive signal
- Single fiber (SF3 option) using SC/APC (Angle-Polished Connector) technology, with a 1310 nm laser diode for single wavelength operation.

The basic models include a fiber optic uplink and four tributary E1/T1 links. The standalone units are supplied with balanced E1 and T1 interfaces. Optimux-108 can be ordered with unbalanced E1 interfaces.

DCE Interfaces

Optimux-108 can be ordered with an additional Ethernet or V.35 user port, and with redundant uplink or power supply. Optimux-108 can also be ordered with a V.35 interface in place of the Ethernet user port.

Diagnostics

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

To facilitate system diagnostics, Optimux -108 and Optimux -106 feature LED status indicators, AIS alarm generation and recognition, and dry contact closure upon link failure.

Management

Optimux-108 and Optimux-106 can be configured and monitored locally using an ASCII terminal connected to the control port or remotely via the Ethernet management port using:

- RADview-TDM running in a Windows or Unix environment
- ConfiguRAD Web-based remote
 access terminal
- Telnet.

Power

The power supply is a wide-range AC/DC power supply that can be connected to either an AC power source (100 to 240 VAC), or to a DC power source (-48 VDC).

Physical

Optimux-108 and Optimux-106 are compact standalone units. An optional rack mount adapter kit enables installation of one or two (side-by-side) units in a 19-inch rack.



CARD MODULES

The Optimux-108C and Optimux-106C multiplexers are cards designed for operation in the LRS-102 chassis. They combine up to eight E1 or T1 channels and two optional Ethernet links over two fiber optic links from two remote units (up to four E1/T1 and 100 Mbps Ethernet traffic from each remote unit).

The LRS-102 chassis can contain up to 12 cards (24 links). An Optimux link provides a simple and low-cost solution for connectivity over distances of up to 120 km (74.5 miles).

Main Link Interfaces

Pluggable SFP units provide the main link interfaces. A wide variety of optical interfaces are available for ordering as single, dual, or quad modules (see *Table 2* and *Ordering Options*).

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.

Redundancy

For transmission reliability, an optional modular second link provides automatic backup upon link failure. Each of the four E1/T1 signals (for each link) is transmitted independently, so that each E1/T1 channel can be set to a different clock source. LRS-102 provides power redundancy for nonstop operation.

Diagnostics

To facilitate system diagnostics, the card versions feature LED status indicators and AIS alarm generation and recognition.

Management

Setup, control, and diagnostics are performed via a supervisory port on the LRS-102 CL module using an ASCII terminal, or a dedicated 10/100BaseT Ethernet port for Ethernet connection to a management station. The same management options are available as for the standalone versions.



Optimux-108, Optimux-106

Four-Channel E1/T1 and Ethernet Multiplexers

Wavelength	Fiber Type	Transmitter Type	Typical Power Output	Receiver Sensitivity	Typical I	Max. Range	Connector Type
[nm]	[µm]		[dBm]	[dBm]	[km]	[miles]	
850	62.5/125 multimode	Laser (VCSEL)	-7	-34 (see <i>Note 2)</i>	6	3.7	ST, SC, FC/PC
1310	9/125 single mode	Laser	-12	-34	47	29.2	ST, SC, FC/PC
1310	62.5/125 multimode	LED	-18	-32	7	4.3	ST, SC
1550	9/125 single mode	Laser	-12	-34	76	47.2	ST, SC, FC/PC
1310	9/125 single mode	Laser (long haul)	-2	-34	72	44.7	ST, SC, FC/PC
1550	9/125 single mode	Laser (long haul)	-2	-34	120	74.5	ST, SC, FC/PC
Tx: 1310 Rx 1550	9/125 single mode	Laser WDM (SF1)	-12	-34	47	29.2	SC
Tx: 1550 Rx 1310	9/125 single mode	Laser WDM (SF2)	-12	-34	47	29.2	SC
Tx/Rx: 1310	9/125 single mode	Laser (SF3)	-12	-27	20	12.4	SC/APC

Table 1. Standalone Fiber Optic Interface Characteristics

Note 1. Typical ranges are calculated according to attenuation of 3.5 dB/km for 850 nm multimode fiber, 0.4 dB/km for 1310 nm single mode fiber, and 0.25 dB/km for 1550 nm single mode fiber.

Note 2. The Receiver Sensitivity for units with the Ethernet port is 32 dBm.

Module Name (Ordering	Wavelength	Fiber Type	Transmitter Type	Typical Output Power	Receiver Sensitivity	Typical N	lax Range	Connector Type
Option)	[nm]			[dBm]	[dBm]	[km]	[miles]	
SFP-1	1310	62.5/125 multimode	LED	-18	-31	6.5	4.0	LC
SFP-2	1310	9/125 single mode	Laser	-12	-31	38	23.6	LC
SFP-3	1310	9/125 single mode	Long haul laser	-2	-34	70	43.4	LC
SFP-4	1550	9/125 single mode	Long haul laser	-2	-34	120	74.5	LC
SFP-10a	Tx –1310, Rx –1550	9/125 single mode (single fiber)	Laser WDM	-12	-30	40	24.8	LC
SFP-10b	Tx –1550, Rx –1310	9/125 single mode (single fiber)	Laser WDM	-12	-30	40	24.8	LC
SFP-18A	Tx - 1310, Rx - 1550	9/125 single mode (single fiber)	Laser WDM	-2	-30	60	37.3	LC
SFP-18B	Tx - 1550, Rx - 1310	9/125 single mode (single fiber)	Laser WDM	-2	-30	60	37.3	LC
SFP-19A	Tx – 1490, Rx – 1550	9/125 single mode (single fiber)	Laser WDM	2	-30	80	49.7	LC
SFP-19B	Tx - 1550, Rx - 1490	9/125 single mode (single fiber)	Laser WDM	2	-30	80	49.7	LC
SFP-24	850	62.5/125 multimode	VCSEL	-7	-31	6.5	4.0	LC
Note: Typical ranges are calculated according to attenuation of 0.4 dB/km for 1310 nm single mode fiber and 0.25 dB/km for 1550 nm single mode fiber.								

Table 2. SFP Fiber Optic Interface Characteristics

Data Sheet

Specifications

TRIBUTARY INTERFACES

Number of Channels

Data Rate E1: 2048 kbps T1: 1544 kbps

Line Code E1: HDB3 T1: B8ZS

Impedance

120Ω, E1 balanced 100Ω, T1 balanced 75Ω, E1 unbalanced

Connectors

OP-108 E1 balanced: RJ-45 E1 unbalanced: two BNC OP-106 T1 balanced: RJ-45 OP-108C E1 balanced: DB-44 on the front module panel E1 unbalanced: two BNC connectors

for each E1 port on a special LRS-102 rack

OP-106C

T1 balanced: DB-44 on the front module panel

FIBER OPTIC INTERFACES

OP-108/OP-106: See *Table 1* OP-108C/OP-106C: See *Table 2*

MNG-ETH AND USER-ETH INTERFACES

Type 10/100BaseT

Connector Shielded RJ-45

USER-ETH Port Throughput 100 Mbps (OP-108) 75 Mbps (OP-106)

V.35 USER INTERFACE (E1 STANDALONE ONLY)

Type DCE

Connector Smart Serial

Throughput 2 Mbps

CONTROL PORT (STANDALONE UNITS ONLY)

Type RS-232 DCE asynchronous **Data Rate** 9.6, 19.2, 38.4, 57.6, 115.2 kbps

Connector Mini-USB 5

ALARM PORT (STANDALONE UNITS ONLY)

Type Dry relay contacts for major and minor alarms

Connector RJ-45

GENERAL

Standards G.703, G.823 (E1), G.824 (T1), G.955, IEEE 802.3, G.742 (Optimux-108 without Ethernet ports)

Diagnostics Local and remote loopbacks on uplink and on each E1/T1 tributary link Local loopback on optional V.35 user port (OP-108 only)

Timing Uplink: internal E1/T1 tributary: transferred transparently, independent for each channel V.35: internal, external, loopback (OP-108 only)



STANDALONE INDICATORS

Front Panel

PWR

On (green): both power supplies OK On (red): power supply A fault On (yellow): power supply B fault Off: power supply fault

LINK A/B

On (red): Sync/Signal Loss on Link A/B On (yellow): AIS detected (products without Ethernet port only) Off: normal operation

CH1 to CH4

On (red): Signal Loss on channel On (yellow): AIS received on channel Off: normal operation

Rear Panel

Sig Link A/B (on the fiber optic module) On (green): signal exists on Link A/B Off: no signal on Link A/B

LINK/ACT

On (yellow): link is up Off: link is down Flashes: frames are transmitted

100

On (green): 100 Mbps mode Off: 10 Mbps mode

CARD INDICATORS

Front Panel

OP A/B LOSS

On (red): Sync/Signal Loss on OP A/B Off: Normal operation

OP A/B AIS

On (yellow): AIS detected (only for operating opposite Optimux-108/106 without Ethernet ports) Off: Normal operation

(OP A/B LOSS and AIS are on if the SFP is not inserted.)

OP A/B LINK/ACT

On (yellow): link is up Off: link is down Flashes: frames are transmitted

OP A/B 100

On (green): 100 Mbps mode Off: 10 Mbps mode

Power

- Standalone: wide range power supply
 - AC: 100 to 240 VAC
 - DC: -48 VDC (-40 to -72 VDC) Card: supplied by LRS-102

Power Consumption

Standalone:

- AC: 25 VA max
- DC: 9W max
- Card: DC, 9W max

Physical

Standalone: Height: 4.37 cm (1.7 in) Width: 21.7 cm (8.5 in) Depth: 17.0 cm (6.7 in) Weight: 0.5 kg (1.1 lb)

Card: fits into the LRS-102 rack

Environment

Temperature: $0^{\circ}-50^{\circ}C(32^{\circ}-122^{\circ}F)$ Humidity: Up to 90%, non-condensing



Ordering

STANDALONE UNITS

OP-108/^/%/!/#/+/* OP-106/%/!/#/+/*

OP-108-M/#/+ OP-106-M/#/+ Additional uplink module

Legend

- E1 connector:
 - B Balanced (RJ-45)
 - U Unbalanced (BNC)

% Optional power supply:

- R Redundant power supply (default is one power supply only)
- ! Optional user port:
 - ETH 10/100BaseT User Ethernet port
 - V35 V.35 interface (Optimux-108 only)
- # Uplink interface connector:
 - ST ST type connector
 - FC FC/PC type connector
 - SC SC type connector

Note: ST and *FC* connectors are not available for the single fiber options.

- + Fiber optic link interface:
- 85L 850 nm, multimode, VCSEL
 - 13 1310 nm, multimode, LED Note: Available with ST and SC connectors only
 - 13L 1310 nm, single mode, laser diode
 - **15L** 1550 nm, single mode, laser diode
 - 13LH 1310 nm, single mode, long-haul laser diode
 - **15LH** 1550 nm, single mode, long-haul laser diode
 - SF1 Transmit 1310 nm laser (WDM), receive 1550 nm
 - **SF2** Transmit 1550 nm laser (WDM), receive 1310 nm
 - **SF3** Transmit and receive at 1310 m laser diode
- * Optional uplink module:
 - D Second redundant uplink module (of same type as first uplink module). Default is a single uplink module

Note: For single fiber applications, a device with SF1 (SFP-10A) interface is always used opposite a device with SF2 (SFP-10B) interface, and vice versa. An SF3 interface works only opposite another SF3 interface.

SUPPLIED STANDALONE ACCESSORIES

AC power cord DC adapter plug

CBL-MUSB-DB9F

Control port cable

CBL-RJ45-DB9/F Alarm port cable

OPTIONAL STANDALONE ACCESSORIES

RM-33-2

Kit for mounting 1 or 2 units in a 19-inch rack

CBL-AMP-M34 Smart Serial (V.35) to M34 interface

CBL-AMP-DB25-ISO2110

Smart Serial (V.35) to ISO 2110 interface

CBL-AMP-DB25-TLBS

Smart Serial (V.35) to Telebras interface

Feature	Optimux-108	Optimux-106	Optimux-34	Optimux-25	Optimux-45/45L	Optimux-1551	Optimux- 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	81	34	25	45	155	155
Number of trunks	4 E1	4 T1	16 E1	16 T1	21 E1 28 T1	21/42/63 E1 28/56/84 T1	3 E3 3 T3
Ethernet support	\checkmark	✓	\checkmark	~	-	-	-
Special features	Redundant, hot-swappable uplinks Card version for LRS-102	Redundant, hot-swappable uplinks Card version for LRS-102	SFP-based uplinks	SFP-based uplinks	Ring support (Optimux-45)	Full redundancy	Full redundancy

Table 3. Optimux Comparison Chart

Optimux-108, Optimux-106

Four-Channel E1/T1 and Ethernet Multiplexers

CARD MODULES FOR LRS-102

OP-108C/^/!/+ OP-106C/!/+

Legend

- * E1 connector:
 - Balanced (RJ-45)
 U Unbalanced (BNC connectors on a special LRS-102 rack, E1 only)
- ! Optional Ethernet user port: (Default=no port)
 - ETH 10/100BaseT Ethernet port

+ SFP fiber optic link interface:

CED1	IED 1210 pm multimodo
SFPI	LED, 1310 IIII, IIIultimode,
	LC only
SFP2	Laser, 1310 nm, single
	mode. I C only
6502	Long houl locar 1210 nm
SFP3	Long-naul laser, 1310 nm,
	single mode, LC only
SFP4	Long-haul laser, 1550 nm,
	single mode, LC only
SED10A	$J_{\rm acor}$ WDM Ty = 1550 pm
JITIOA	
	RX – 1310 IIII, Single
	mode, single fiber, LC only
	(SF1)
SFP10B	Laser WDM, Tx – 1310 nm,
	Rx – 1550 nm. single
	mode single fiber I Conly
	(SE2)
SFP24	VSCEL, 850 nm,
	multimode, LC only
SFP18A	Laser WDM, Tx –1310 nm,
	Rx –1550 nm, single
	mode, single fiber, I C only
2LA19R	Laser WDIN, IX – 1550 nm,
	Rx – 1310 nm, single
	mode, single fiber, LC only

SFP19A	Laser WDM, Tx – 1310 nm, Rx – 1550 nm, single mode, single fiber, LC only			
SFP19B	Laser WDM, Tx –1550 nm,			
	Rx – 1310 nm, single			
2XSEP1	Dual SEP1 modules			
	Dual SEP2 modules			
	Dual SEP3 modules			
2X5FD/	Dual SEP/ modules			
2X5FP104	Dual SEP10A modules			
2XSEP10R	Dual SEP10B modules			
2XSFP184	Dual SEP184 modules			
2XSFP18R	Dual SEP188 modules			
2XSFP19A	Dual SFP19A modules			
2XSFP19B	Dual SFP19B modules			
2XSFP24	Dual SFP24 modules			
4XSFP1	Quad SFP1 modules			
4XSFP2	Quad SFP2 modules			
4XSFP3	Quad SFP3 modules			
4XSFP4	Quad SFP4 modules			
4XSFP10A	Quad SFP10A modules			
4XSFP10B	Quad SFP10B modules			
4XSFP18A	Quad SFP18A modules			
4XSFP18B	Quad SFP18B modules			
4XSFP19A	Quad SFP19A modules			
4XSFP19B	Quad SFP19B modules			
4XSFP24	Quad SFP24 modules			
Note: For single fiber applications, a device				
with SF1 (SFP-10A) interface is always used				
opposite a device with SF2 (SFP-10B)				
Interface, and vice versa. An SF3 Interface				
works only opposite another SF3 interface.				

OPTIONAL CARD ACCESSORIES

CBL-G703-8/RJ45

Splitter cable for splitting the 44-pin card connector to 8 E1 or 8 T1 balanced RJ-45 connectors

CBL-G703-8/RJ45/X

Splitter cross-cable for splitting the 44-pin card connector to 8 E1 or 8 T1 balanced RJ-45 connectors

CBL-G703-8/COAX

Splitter cable for splitting the 44-pin OP-108C card connector to 8 pairs of unbalanced BNC connectors

CBL-G703-8/OPEN/2M

Open-ended cable with DB-44 connector on the LRS-102 side for balanced E1 or T1 applications

All cables are 2m (6.6 ft) long.

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