PL-4000T 1.6T | 4x400G Transponder/Muxpo-

Transport of 4 x 200G/300G/400G wavelengths, for high capacity ultra-long-haul applications

Features Overview

- Pay-as-you-grow architecture based on standard pluggable coherent optical modules
- 4 slices of up to 200G/300G/400G
- Supported services: 100GbE, 400GbE, OTU4
- Supported line FEC:
  - CFEC (OIF-ZR standard)
  - oFEC (OpenROADM/Open ZR+ standards)
  - SD-FEC (FlexO-4e standard)
- Range of modulation modes: 16QAM, 8QAM, QPSK, MPCS
- Client options per slice:
  - 400GbE QSFPDD
  - 4 x 100GbE QSFP28
  - 4 x OTU4 QSFP28
- Supported 400G QSFPDD client optics: LR8/SR8/FR4/DR4/DR+/LR4
- Uplink options per slice:
  - 400G CFP2-DCO
  - 400G QSFPDD-DCO
- Layer-1 GCM-AES-256 encryption
- Elliptic Curve Diffie-Hellman key exchange
- Comprehensive line and service performance monitoring
- Integrated EDFA, mux/demux and up to 4 optical switches (optional)
- Facility protection using integrated optical switches (optional)
- Remote management with in-band GCC or out-of-band OSC
- Remote management and fiber monitoring with OSC OTDR SFP
- Easy maintenance with field-replaceable and hot-swappable parts:
  - Dual pluggable power supply units (AC/DC)
  - Fan unit

400G Muxponder/Transponder

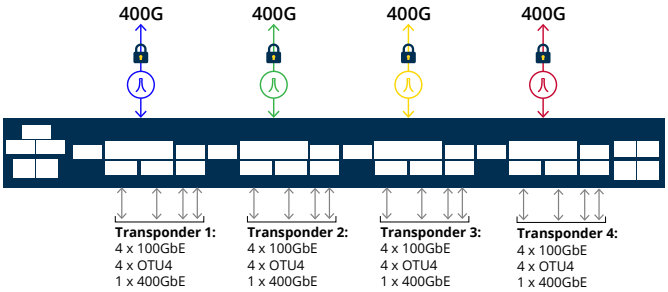
The PL-4000T has four 400G pluggable uplink optical modules, delivering up to 1.6T capacity for long haul and ultra-long haul networks. It is a modular and cost-effective high-capacity solution for rolling out 400GbE and 100GbE services, or increasing existing network capacity. The PL-4000T integrates mux/demux, EDFA and OSW to deliver the entire optical layer. This flexible solution enables pay-as-you-grow architecture.

Main Benefits

- **Cost-effective high capacity transport of 200G/300G/400G over single wavelength**
- **Up to 4x400G transponders/muxponders**
- **Embedded Layer-1 GCM-AES-256 encryption**
- **Integrated EDFA, mux/demux and optical switch**
- **Modular and cost-effective for future growth and maintenance**

Flexible Pay-as-you-grow Architecture, with Redundancy

The solution provides full demarcation point between the service and the DWDM network, and is interoperable with any third party switch or router. This provides full visibility and performance monitoring of both the optical transport layer (OTN) and the services.



PL-4000T Transponder/Muxponder Diagram

Recommended Applications

- Long-haul, and ultra-long-haul networks of up to 4,000 km
- High capacity DCI networks
- 400G wavelengths to bolster existing OTN/DWDM infrastructure
- Secured and encrypted communication for 100/400GbE services

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Technical Specifications

Product Configurations

Muxponder: 4x100G clients per 200G/300G/400G slice

Transponder: 1x400G per 400G

Optical Amplifiers: Up to two EDFA modules (optional)

Mux/Demux: 4ch mux/demux module (optional)

Optical Switch:

- 1+1 optical switch
- 4 x 1+1 optical switches

Uplink Characteristics

Line Side Mode:

- 200G/300G/400G OpenROADM
- 200G/300G/400G OpenZR+
- 400G FlexO-4e

Optical Interface: CFP2-DCO or QSFPDD-DCO 400G uplink

Tunability Range:

- DWDM ITU-T G.694.1 grid
- C-band, with flex-grid support

FEC Support:

- oFEC
- CFEC
- SD-FEC

CFP2-DCO:

Tx power 400G: -8dBm to +3dBm

Rx Sensitivity at High OSNR (>36):

- **400G 16QAM:** -20dBm
- **300G 8QAM:** -23dBm
- **200G QPSK:** -28dBm

OSNR Sensitivity:

- **400G 16QAM:** 24dB
- **300G 8QAM:** 20.5dB
- **200G QPSK:** 15.7dB

Chromatic Dispersion Tolerance:

- **400G:** 24,000ps/nm
- **300G:** 48,000ps/nm
- **200G:** 48,000ps/nm

QSFPDD-DCO:

Tx power 400G: +1.5dBm to -9dBm

Rx sensitivity at high OSNR (>36dB):

- **400G ULH QPSK:** -27dBm
- **400G 16QAM:** -20dBm
- **300G 8QAM:** -23dBm
- **200G QPSK:** -28dBm

OSNR Sensitivity:

- **400G ULH:** 16.9dB @-12dB
- **400G:** 23.5dB @-14dB
- **300G:** 18dB @-16dB
- **200G:** 15.7dB @-18dB

Chromatic Dispersion Tolerance:

- **400G ULH:** 58,000ps/nm
- **400G:** 12,000ps/nm
- **300G:** 48,000ps/nm
- **200G:** 48,000ps/nm

Client Characteristics

Service Types:

- 100Gb Ethernet
- 400Gb Ethernet
- OTU4

Optical Interface:

- 100GbE QSFP28 LR4/ER4/SR4/ZR/CWDM4/FR1/DR1
- 400GbE QSFPDD LR8/SR8/FR4/DR4/DR+/LR4

FEC Support:

- **100GbE:** RS-FEC or no-FEC
- **400GbE:** KP4-FEC
- **OTU4:** ITU-T G.709 G-FEC

Amplifier

Applications: Booster, pre-amp

Output Power:

- **Booster:** up to 20dBm
- **Pre-amp:** up to 5dBm

Input Power:

- **Booster:** -24dBm to +10dBm
- **Pre-amp:** -36dBm to -10dBm

Gain:

- **Booster:** 5dB to 22dB
- **Pre-amp:** 13dB to 22dB

Operating Modes:

- Automatic gain control (AGC)
- Automatic power control (APC)

Network Management

Ports:

- 2xRJ-45 LAN port 100/1000MBase-T
- 2xSFP MNG ports 100/1000MBase-X
- RJ-45 serial port
- RJ-45 external alarm port
- OTN in-band GCC channel

Protocols:

- HTTP/HTTPS, CLI over RS-232 or CLI over Telnet/SSH, SNMPv2/3, Syslog, RADIUS, TACACS+, SNTP, TFTP & SFTP, REST, NETCONF

NMS:

- PacketLight LightWatch™ NMS, or third party NMS over SNMP

OAM:

- Facility loopback (client and line interfaces), terminal loopback, PRBS, event log, alarms

Performance Monitoring:

- Layer-1/2 PM for 100/400GbE services
- FlexO PM
- OTN PM for uplink and OTU4 services
- Optical PM for optical ports

Visual Indicators: Status indicators for client and line ports, Management and LAN ports, amplifier/s, system Critical/Major/Minor and Power Supply

Software Upgrade:
Hitless traffic – dual image

Power Supply

AC/DC: 100 to 240 VAC, 50/60 Hz, -44 to -60 VDC, 400W max

PSU Redundancy: Single/dual feeding, hot swappable

Cooling Unit: Hot swappable fan unit

Environmental

Operating Temperature: -5ºC to 45ºC (+23ºF to +113ºF) operational

Humidity: 5% to 85% RH

Storage: 85ºC

Physical Dimensions

Size:

- 1.77" (H) x 17.32" (W) x 15.75" (D)
- 45mm (H) x 440mm (W) x 400mm (D)

Weight: 14kg / 30.9lb (max)

Mounting: 19", ETSI, 21", 23"

Encryption

Functionality:

- Transparent Layer-1 encryption for selected services and uplinks
- Supports QKD/PQC

Certification:

- FIPS 140-3 Level 2

Algorithms:

- Encryption/decryption: GCM-AES-256
- Key exchange: ECC CDH, Curve P-384
- Message digest: SHA-384

Authentication: Role-based user/password authentication

Note: For specific countries, models that include Layer-1 GCM-AES-256 based encryption will be marked with the suffix C.

Approvals & Standards

- CE, FCC, RoHS, REACH
- NEBS ready

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