PL-4000T 4x400G Transponder/Muxponder

1.6T integrated device transporting 4 x 400G wavelengths, for high capacity metro and long haul applications

Features Overview

- Pay-as-you-grow architecture based on standard pluggable coherent optical modules
- Operation modes per slice:
  - 4 x 100G muxponder
  - 1 x 400G transponder
- Supported services: 100GbE, 400GbE, OTU4
- Supported line FEC:
  - C-FEC (for OIF-ZR standard)
  - O-FEC (for Open ROADM and Open ZR+)
- Client options:
  - Up to 16 x 100GbE/OTU4 QSFP28
  - Up to 4 x 400GbE QSFPDD
- Supported 400G QSFPDD client optics: LR8, FR8, SR8
- Uplink options:
  - Up to 4 x 400G CPF2-DCO
  - Up to 4 x 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 optical switch (optional)
- Facility protection using an integrated optical switch (optional)
- Remote management with in-band GCC, or out-of-band OSC
- Easy maintenance with field-replaceable parts:
  - Dual hot pluggable power supply units (AC/DC)
  - Fan unit

400G Muxponder/Transponder

The PL-4000T is a modular and cost-effective high capacity solution for rolling out 400GbE and 100GbE services, or increasing existing network capacity. The device has four 400G pluggable uplink optical modules, delivering up to 1.6T in a 1U chassis. The PL-4000T integrates mux/demux, EDFA and OSW and delivers the entire optical layer. This flexible solution enables pay-as-you-grow architecture.

Main Benefits

- **Cost-effective high capacity transport of 400G over single wavelength**
- **Up to 4 x 400G transponders/muxponders in a 1U chassis**
- **Embedded Layer-1 GCM-AES-256 optical encryption**
- **Integrated EDFA, mux/demux and optical switch in 1U**
- **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 uplink, 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 100GbE/400GbE/OTU4 service interfaces.
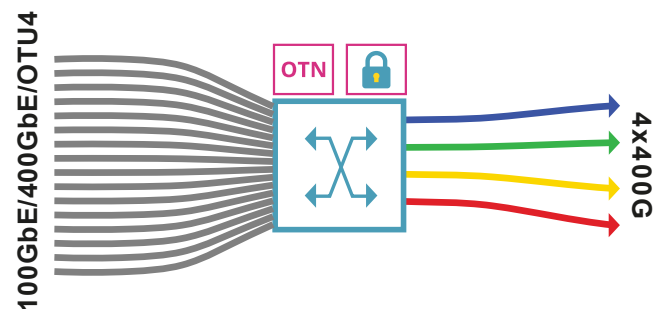
PL-4000T Transponder/Muxponder Diagram

Recommended applications:

- **Metro and long haul network applications ranging up to 1,000km**
- **High capacity DCI for enterprise, campus and cloud computing networks**
- **400G links to bolster existing OTN/DWDM infrastructure**
- **Last mile access/aggregation CPE for 100/400GbE managed services**
- **Secured and encrypted communication for 100/400GbE services**

Technical Specifications

Product Configurations

Muxponder: 4x100G per 400G
Transponder: 1x400G per 400G
Optical Amplifiers: Up to two EDFA modules (optional)
Mux/Demux: 4ch mux/demux module (optional)
Optical Switch: 1+1 facility protection (optional)

Uplink Characteristics

Bit Rate:
- 400G FlexO
- 200G FlexO

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:
- C-FEC
- O-FEC

CFP2-DCO:
- **Tx power 400G:** -10dBm to 0dBm
- **Rx power 400G:** -23dBm
- **400G 16QAM OSNR Tolerance at -12dBm Rx Power:** typical 21.8dB, min. 22.8dB
- **200G QPSK OSNR Tolerance at -17dBm Rx Power:** typical 13.9dB, min. 14.9dB
- **Rx Sensitivity at High OSNR:** 400G 16QAM -22.5dBm, 200G QPSK -30dBm

QSFPDD-DCO:
- **Tx power 400G:** -10dBm
- **Rx power 400G:** -20dBm
- **400G 16QAM O-FEC OSNR Tolerance at -12dBm Rx power:** typical 21.3dB, min. 22.3dB
- **400G 16QAM C-FEC OSNR Tolerance at -12dBm Rx power:** typical 24dB, min. 26dB
- **200G QPSK OSNR Tolerance at -17dBm Rx Power:** typical 13.7dB, min. 14.7dB
- **Rx sensitivity at high OSNR:** 400G 16QAM/O-FEC -23dBm, 400G 16QAM/C-FEC -20dBm, 200G QPSK -30dBm

Chromatic Dispersion Tolerance:
- 400G: 26,000ps/nm
- 200G: 50,000ps/nm

Client Characteristics

Service Types:
- 100Gb Ethernet
- 400Gb Ethernet
- OTU4

Optical Interface:
- 100GbE QSFP28 LR4/ER4/SR4
- 400GbE QSFPDD LR8/SR8/FR4/DR4

FEC Support:
- 100GbE: RS-FEC or no-FEC
- 400GbE: KP4-FEC
- OTU4: Standard 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: -24dB to +10dBm
- Pre-amp: -36dB to -10dBm

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

Operating Modes:
- Automatic gain control (AGC)
- Automatic power control (APC)

Network Management

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: SNMP v1/v2/v3, HTTP/HTTPS, Telnet/SSH, Syslog, RADIUS, SNTP, TFTP & SFTP

Management:
- Web browser over HTTP/HTTPS,
- PacketLight LightWatch™ NMS/EMS, or third party NMS over SNMP
- CLI over RS-232 or CLI over Telnet/SSH

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, 300W 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

1U:
- 1.77" (H) x 17.32" (W) x 15.75" (D)
- 45mm (H) x 440mm (W) x 400mm (D)

Weight: 8.4kg / 18.5lb (max)
Mounting: 19", ETSI, 21", 23"

Encryption

Functionality: Full speed transparent Layer-1 encryption for selected 100GbE/400GbE/OTU4 services / 400G uplinks

Compliance:
- FIPS 140-2 Level 2
- CNSA Top Secret Suite B 2015

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