

DWDM and OTN Equipment

Maximize Your Fiber Network



Equipment for DWDM and OTN Networks



PacketLight's carrier-grade DWDM and OTN equipment offers the flexibility to build a cost-effective, highly efficient optical transport network for a variety of industries such as carriers, finance, enterprises, broadcast companies, utilities, government organizations, education networks, as well as content service providers.

PacketLight products are tailored to meet your fiber optic network challenges, and are simple to install, deploy and manage, using PacketLight's NMS for the whole deployment lifecycle.

Reasons to Choose PacketLight



Carrier-class



Pay-as-you grow



Layer-1
encryption



Cost-saving small
footprint



Easy to manage
via NMS



Remote
management

Carrier-class Reliability

Reliable, carrier-grade devices ensure business and critical data links, while protecting your investment, with scalable, future-proof architecture, network upgrades without service disruption, and guaranteed service level agreement (SLA).

Rich Feature Set

Integrated architecture with a rich feature set, allowing scalability, manageability, and ease-of-use and maintenance, supporting any network infrastructure, from simple point-to-point, to metro access rings and linear add- and-drop networks.

Flexibility and Scalability

Transponders and muxponders that support a mix of data, storage and video services and standardized pluggable optics, optical amplification, and ROADMs, all provide the flexibility to build a cost-effective, scalable, highly efficient optical network infrastructure.












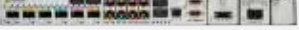







Streamlined Life Cycle

PacketLight LightWatch™ NMS and web-based management tools enable simple installation, remote configuration, performance monitoring, fault management, and administration capabilities that allow users to deploy the devices without lengthy training.

Solid Savings

Integrated with high port density, reducing OPEX by saving space and power consumption. The modular design enables true pay-as-you-grow architecture that significantly reduces CAPEX.

Our Range of Products

800G	PL-8000M 1.6T 2x800G Muxponder 	PL-8000G 8T 10x800G Transponder 	
400G	PL-4000M 600G 400G/2x300 Muxponder 	PL-4000T 1.6T 4x400G Transponder 	PL-4000G 4.8T 12x400G Transponder 
200G	PL-2000M 200G Muxponder 	PL-2000T 800G 4x200G Transponder 	
100G	PL-2000ADS 200G 2x100G Muxponder/ADM SH 	PL-2000GM 200G 2x100G Muxponder/ADM LH 	PL-2000FC 4x64G FC 4x100G OTU4 Transponder 
20G/10G	PL-2000 2x10G OTN Muxponder/ADM 	PL-1000TN 6x10G OTN Transponder 	PL-1000TE 8x10G Transponder 
Optical Infrastructure	PL-1000RO ROADM  PL-1000GRO 1:32 ROADM 	PL-1000GIL EDFA / OLP  PL-1000D Diagnostics 	PL-1000GR Raman Amplifier  PL-300 Passive Solutions 



Layer-1 encryption



Low power consumption



Multi operation modes



Low latency connectivity



High wavelength utilization

Main Benefits

- High wavelength utilization
- Low latency connectivity
- Layer-1 encryption
- Supports QKD/PQC
- Simple to install and configure
- Network management system
- Integrated mux/demux, EDFA, optical switch, DCM (optional)
- Future-proof architecture

Applications

- Data center interconnect
- AI and hyperscalers
- Alien wavelength
- Fiber monitoring and diagnostics
- Video transport
- Layer-1 encryption
- Single fiber applications
- DWDM over CWDM
- Multimode fiber solutions

Industries

- Carriers & ISPs
- Dark Fiber Providers
- Utilities
- Research & Education
- Enterprises
- Smart City
- Financial Institutions
- Government
- Broadcasters

For more information please contact us at www.packetlight.com

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PL-8000M 1.6T | 2x800G Muxponder

Dual 800G transport platform, for high capacity DCI and metro applications

Features Overview

- Pay-as-you-grow architecture based on standard pluggable coherent optical modules
- Dual 800G muxponders/transponder
- Supported services: 100GbE, 400GbE, 800GbE
- 800G uplink:
 - 800G OpenROADM CFP2-DCO
 - Tunable flex-grid
 - Modulation mode: 800G 16QAM
- Flexible client options per slice:
 - 8 x 100GbE QSFP28
 - 2 x 400GbE QSFPDD
 - 1 x 800GbE QSFPDD
- Supported client optics:
 - 100G QSFP28: LR4/SR4/CWM4/ER4/ZR4/DR1/LR1
 - 400G QSFPDD: LR8/SR8/FR4/DR4/DR+/LR4
 - 800G QSFPDD: DR8
- Layer-1 GCM-AES-256 encryption
- Elliptic Curve Diffie-Hellman key exchange
- Comprehensive line and service performance monitoring
- Integrated EDFAs, mux/demux and optical switch
- 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, hot-swappable parts:
 - Dual hot pluggable power supply units (AC/DC)
 - Fan unit

800G Muxponder/Transponder

The PL-8000M is a modular and cost-effective high capacity solution for rolling out 800GbE, 400GbE and 100GbE services, or increasing existing network capacity. The device has two 800G pluggable uplink optical modules, delivering up to 1.6T in a 1U chassis. The PL-8000M integrates mux/demux, EDFA and OSW, delivering the entire optical layer. This flexible solution enables pay-as-you-grow architecture.

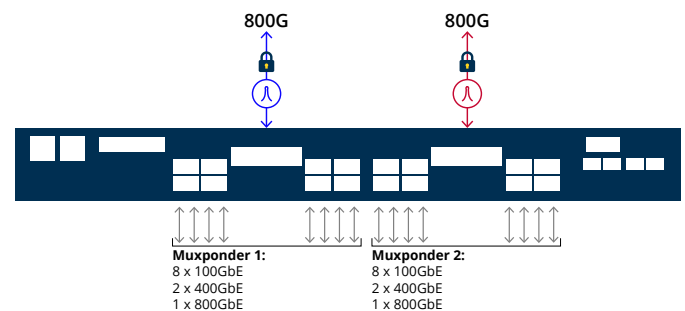


Main Benefits

- Reduces the power and cost per bit of the network
- Transport of 100/400/800GbE over single wavelength
- Dual 800G transponders/muxponders in 1U
- Embedded Layer-1 GCM-AES-256 encryption
- Integrated EDFA, mux/demux and optical switch in 1U
- Modular and flexible for future growth and maintenance

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

The PL-8000M 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 100/400/800GbE client services.



PL-8000 Muxponder Diagram

Recommended Applications

- Service provider managed optical transport demarcation device
- High capacity DCI for enterprise, AI applications, campus and cloud computing networks
- 800G wavelengths to bolster existing OTN/DWDM infrastructure
- Secured and encrypted communication for 100/400/800GbE services

Technical Specifications

Product Configurations

Muxponder: 8x100GbE or 2x400GbE client services per 800G slice

Transponder: 1x800GbE per 800G uplink

Optical Amplifiers: Up to two EDFA modules (optional)

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

Optical Switch:

- 1+1 optical switch
- 2 x 1+1 optical switches

Uplink Characteristics

Bit Rate: 800G

Optical Interface: 800G CFP2-DCO

Tunability range:

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

FEC Support: SDFEC

800G CFP2-DCO Tx power: -5dBm to 0dBm

OSNR Sensitivity 800G 16QAM: 27.2dB at Rx power -11dBm

Chromatic Dispersion Tolerance: 800G: 12,000ps/nm

Client Characteristics

Service Types:

- 100GbE
- 400GbE
- 800GbE (transponder)

Optical Interface:

- 100GbE QSFP28: LR4/SR4/CWM4/ER4/ZR4/DR1/LR1
- 400GbE QSFPDD: LR8/SR8/FR4/DR4/DR+/LR4
- 800GbE QSFPDD: DR8

FEC Support:

- 100GbE: RS(544,514)
- 400GbE: RS(544,514)
- 800GbE: RS(544,514)

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

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

Management Protocols:

- HTTP/HTTPS, CLI over RS-232 or CLI over Telnet/SSH, SNMPv2/3, Syslog, RADIUS, TACACS+, SNMP, 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 100/400/800GbE services
- OTN PM for section/path
- SDFEC PM
- 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 or -44 to -60 VDC, 50/60 Hz, 370W max

PSU Redundancy: Single/dual feeding, hot swappable

Cooling Unit: Hot swappable fan unit

Environmental

Operating Temperature:

0°C to 45°C (32°F to 113°F)

Humidity: 5% to 85% RH

Storage: 85°C

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:

- Layer-1 encryption per uplink
- Full transparency to the traffic with no degradation to the DWDM link
- Supports QKD/PQC

Compliance:

- 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

PL-4000M 600G | 400G / 2x300G Muxponder/ADM

Multi-protocol multi-rate optical transport solution for metro and long haul networks



Features Overview

- Flexible high capacity architecture based on 400G pluggable digital coherent optical modules
- Supported clients: 10/25/100Gb Ethernet, 16G/32G Fibre Channel, OTU2/2e/4
- Flexible mix of client services mapped into 100/200/300/400G DWDM wavelengths
- Supports oFEC on the line side
- Uplinks:
 - Dual 400G CFP2-DCO OpenROADM pluggable coherent modules
 - Single 400G Non-DWDM QSFP-DD
- Range of modulation modes: 16QAM, 8QAM, QPSK
- Clients:
 - Up to 6 x QSFP28 for 100GbE or OTU4
 - 24 x SFP+ / SFP28 for lower rate services
- Layer-1 GCM-AES-256 encryption
- Elliptic Curve Diffie-Hellman key exchange
- Comprehensive line and service performance monitoring
- Integrated pre-amp/booster EDFAs (optional)
- Facility protection using an integrated optical switch (optional)
- OTN SNCP 1+1 service protection for ring applications
- Remote management using in-band GCC or out-of-band OSC
- Remote management and fiber monitoring with OSC OTDR SFP
- Easy maintenance with field-replaceable parts:
 - Dual hot pluggable power supply units (AC/DC)
 - Fan unit

Muxponder/ADM Capabilities

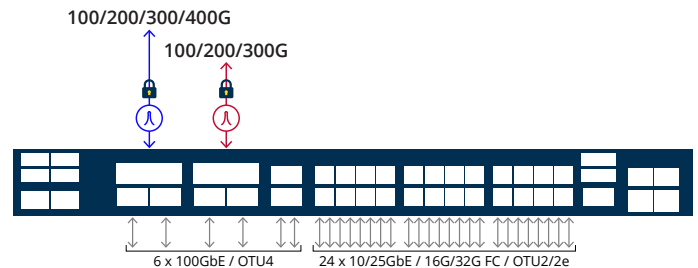
The PL-4000M is a cost-effective solution for rolling out multi-rate services, or increasing existing network capacity. The device delivers 600G using flexible cross connect matrix and dual 400G CFP2-DCO OpenROADM standard-based pluggable coherent modules for metro and long haul applications.

Main Benefits

- Cost-effective high capacity transport of 400G over single wavelength
- Supports flexible mix of client interface protocols
- Embedded Layer-1 GCM-AES-256 encryption
- Integrated EDFAs and optical switch
- User-configurable operation mode
- Supports 100/200/300G ring application
- Flexible OTN cross connect

Flexible Architecture, Facility Protection

The PL-4000M provides full demarcation point between the service and the OTN/DWDM network, and is interoperable with any third party switch or router. This provides full visibility and performance monitoring of both line optical transport layer (OTN) and the service interfaces.



PL-4000M Diagram

Recommended Applications

- 300G/400G metro / long haul applications
- 100G/200G long haul applications
- High capacity DCI
- 400G links to bolster existing OTN/DWDM infrastructure
- Secured and encrypted communication for 10/25/100GbE, and OTU2/2e/4 services

Technical Specifications

Product Configurations

Single 400G Muxponder: mix of client interfaces aggregated into a 400G uplink

Dual 100/200/300G Muxponder: mix of client interfaces aggregated into two 100/200/300G uplinks

Optical Amplifiers: Up to two EDFA modules (optional)

Optical Switch: 1+1 facility protection (optional)

DWDM Uplink Characteristics

Optical Interface:

Dual CFP2-DCO 400G uplinks

Tuneability Range:

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

FEC Support:

- oFEC

CFP2-DCO:

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

Rx Sensitivity at High OSNR (>36dB):

- 400G 16QAM: -20dBm
- 300G 8QAM: -23dBm
- 200G QPSK: -28dBm
- 100G DEQPSK: -31dBm

OSNR Sensitivity:

- 400G 16QAM: 24dB
- 300G 8QAM: 20.5dB
- 200G QPSK: 15.7dB
- 100G DEQPSK: 12.9dB

Chromatic Dispersion Tolerance:

- 400G: 24,000ps/nm
- 300G: 48,000ps/nm
- 200G: 48,000ps/nm
- 100G: 77,000ps/nm

Client Characteristics

Service Types:

- 10GbE, 25GbE, 100GbE
- 16G/32G Fibre Channel
- OTU2/2e/4

Optical Interface:

- QSFP28: LR4/ER4 (1310nm), SR4 (850nm), CWDM4
- SFP+: LR (1310nm), SR (850nm), ER (1550nm), ZR (1550nm), C/DWDM
- SFP28: LR (1310nm), SR (850nm)

Non-DWDM Uplink Characteristics

Optical Interface:

Single QSFP-DD FR4/LR4 uplink

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

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

Management Protocols:

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

NMS:

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

OAM:

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

Performance Monitoring:

- Optical PM for all optical ports
- OTN PM for uplink and OTU2/2e/4 services
- L1 PM for 10/25/100GbE and 16G/32G FC
- L2 PM for 10/25/100GbE

Visual Indicators: LED 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 or -44 to -60 VDC, 50/60 Hz, 240W max

PSU Redundancy: Single/dual feeding, hot swappable

Cooling Unit: Hot swappable fan unit

Environmental

Operating Temperature:

0°C to 45°C (32°F to 113°F)

Humidity: 5% to 85% RH

Storage: 85°C

Air Flow: Front to back

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 and 23"

Encryption

Functionality:

- Full speed, transparent Layer-1 optical encryption for selected services or for the OTUC4/OTUC3/OTUC2/OTUC1 uplink/s
- Supports QKD/PQC

Algorithms:

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

Authentication:

- Role-based user/password authentication

Certifications:

- FIPS 140-3 Level 2

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

PL-2000M 200G Muxponder

200G over a single wavelength coherent transport solution

Features Overview

- User-configurable muxponder and transponder operation modes
- Supported clients: 10GbE, 40GbE, 100GbE, 8G/16G/32G Fibre Channel, 12G-SDI, STM-64/OC-192, SONET/SDH, OTU2/OTU2e/OTU3/OTU4 OTN
- Aggregation of any mix of services over 200G uplink, for example: 20x10GbE, 2x100GbE, 1x100GbE + 10x10GbE, 4x40GbE + 4x10GbE
- Forward error correction (FEC)
- 200G pluggable CFP2 coherent (ACO) tunable DWDM line interface
- Operation modes:
 - 16QAM 200G metro ~650km
 - DP-QPSK 100G long haul ~4000km
- Layer-1 GCM-AES-256 encryption
- Diffie-Hellman key exchange
- Line and service performance monitoring
- Optional integrated EDFA, mux/demux and optical switch
- Facility protection using an optional integrated optical switch
- Remote management with in-band GCC or out-of-band OSC
- Remote management and fiber monitoring with OSC OTDR SFP
- Dual AC or DC pluggable power supply and pluggable fan unit
- Supports standard MSA pluggable modules: SFP+, SFP28, QSFP+, QSFP28 and CFP2
- Low power consumption

Data Center Interconnect and Metro Applications

The PL-2000M is an advanced 200G multi-protocol multi-rate solution for building high capacity optical transport networks. This flexible architecture enables the same device to be used in multiple applications and adapt to network growth and changes.



Main Benefits

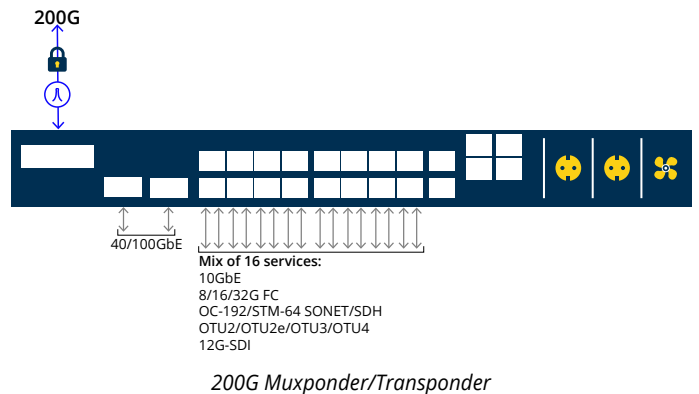
- Cost-effective 200G capacity over single wavelength
- Highly integrated solution
- Supports flexible mix of client services
- Embedded GCM-AES-256 encryption for all services
- User-configurable 100G/200G operation modes

Modular, Cost-effective Transport Solution

The PL-2000M provides a modular and cost-effective way of rolling out services or uplifting existing network capacity. It is low power consumption, saves rack space and reduces the overall solution CAPEX and OPEX by increasing the capacity of enterprise DCI and metro networks.

The PL-2000M can multiplex 2x100G clients into a single coherent CFP2 uplink, providing low cost high spectral efficiency.

The device seamlessly integrates with PacketLight's products to deliver carrier grade, high-end 200G solutions.



Recommended Applications

- 100G for alien wavelength applications
- Metro network applications ranging up to 1,000km
- High capacity DCI
- 200G links to bolster existing OTN/DWDM infrastructure
- Secured, encrypted communication for all services

Technical Specifications

Product Configurations

Muxponder: Aggregation of up to 20 multi-service, multi-rate, multi-protocol client interfaces: Ethernet, Fibre Channel, SONET/SDH, and OTN into a 200G uplink.

Dual 100G Transponder: 2x100GbE mapped into 1x200G uplink

100G Transponder and 10X10G Muxponder: 100GbE + 10x10GbE mapped into 1x200G uplink

Optical Amplifiers: Optional up to two EDFA modules

Mux/Demux: Optional 2ch mux/demux module

Optical Switch: 1+1 facility protection

Uplink Characteristics

Bit Rate:

- 200G OTUC2V2 - 2x132.2680Gbps
- 100G OTU4V2 - 131.1026Gbps

Optical Interface: CFP2 coherent (ACO)

Tuneability range:

- DWDM ITU-T G.694.1 grid
- C-band, with flex-grid support
- Channels 13-60.5, with 50GHz spacing

FEC Support:

- Standard ITU-T G.709 GFEC
- Enhanced HD-FEC, or SD-FEC

Optical Output Power:

- 100G: -2dBm to +3dBm
- 200G: -5dBm to 0dBm

OSNR:

- 100G: 12dB at 0.1nm
- 200G: 23dB at 0.1nm

Sensitivity:

- 100G: -21dBm
- 200G: -18dBm

Optical Monitoring: Tx and Rx power, dispersion, OSNR

Client Interfaces Characteristics

Service types:

- 10GbE, 40GbE, 100GbE,
- 8G/16G/32G Fibre Channel
- 12G-SDI
- STM-64/OC-192
- OTU2, OTU2e, OTU4

Optical Interface:

- SFP+: LR (1310nm), SR (850nm), ER (1550nm), ZR (1550nm), C/DWDM
- SFP28: LR (1310nm), SR (850nm)
- QSFP+: LR4 (1310nm), ER4 (1310nm), SR4 (850nm), LR PSM
- QSFP28: LR4 (1310nm), ER4 (1310nm), SR4 (850nm), CWDM4 (CWDM)

Amplifier

Applications: Booster, pre-amp

Output Power:

- Booster: +4 to +14dBm
- Pre-amp: +5dBm

Input Power:

- Booster: 0 to +10dBm
- Pre-amp: -25 to -9dBm

Gain:

- Booster: +4 to +14dB
- Pre-amp: +18dB

Operating Modes:

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

Network Management

Management Ports:

- 2xRJ-45 LAN port 10/100MBase-T
- 2xSFP MNG ports 100/1000MBase-X
- RJ-45 serial port
- RJ-45 external alarm port
- OTN in-band GCC channel

Management Protocols:

- SNMP, HTTP, HTTPS, CLI over RS-232 or CLI over Telnet/SSH, Syslog, RADIUS, TACACS+, Sntp, TFTP & FTP, REST, NETCONF

NMS:

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

OAM:

- Facility loopback (client and line interfaces), PRBS, event log, alarms
- Automatic laser shut-down (ALS)

Performance Monitoring:

- Layer-1 PM for all services (except for 32G FC)
- Layer-2 PM for Ethernet
- OTN PM for uplinks
- Optical power Rx levels for all optical ports

Visual Indicators: LED 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 or -36 to -60 VDC, 50/60 Hz, 220W max

PSU Redundancy: Single/dual feeding, hot swappable

Cooling Unit: Hot swappable fan unit

Environmental

Operating Temperature:

-5°C to 50°C (+23°F to +122°F)

Humidity: 5% to 85% RH

Physical Dimensions

Size:

- 1.77" (H) x 17.32" (W) x 11.22" (D)
- 45mm (H) x 440mm (W) x 285mm (D)

Weight: 8.5kg / 18.74lb (max)

Mounting: 19", ETSI and 23"

Encryption

Functionality:

- Full speed, transparent Layer-1 encryption for selected clients or for the OTU4 uplinks
- Supports QKD/PQC

Algorithms:

- Encryption/decryption: GCM-AES-256
- Message digest: SHA-384

Authentication:

- Role-based user/password authentication

Compliance:

- FIPS 140-2 Level 2 certified
- Common Criteria EAL2 certified
- CNSA Top Secret Suite B 2015 compliant

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

PL-2000ADS 200G | 2x100G Muxponder/ADM

Multi-protocol multi-rate 2x100G transport solution for short haul networks, with Layer-1 encryption



Features Overview

- Supports multiple, user-configurable, operation modes: muxponder, transponder, and ADM
- Supported clients:
 - 10Gb/40Gb/100Gb Ethernet
 - 8G/16G/32G Fibre Channel
 - 12G-SDI
 - STM-64/OC-192
 - OTU2/OTU2e, OTU4
- Forward error correction (FEC) - GFEC, SCFEC
- Layer-1 GCM-AES-256 encryption
- Low latency muxponder/transponder/ADM
- Comprehensive line and service performance monitoring
- OTN SNCP 1+1 service protection for ring applications
- Remote management with in-band or out-of-band OSC
- Remote management and fiber monitoring with OSC OTDR SFP
- Supports standard MSA pluggable modules:
 - SFP+ (8G/10G/16G/32G FC client)
 - SFP28 (32G FC client)
 - QSFP+ (40GbE client)
 - QSFP28 (100GbE client)
 - QSFP28 (100G uplink)
- Dual AC/DC pluggable power supply and pluggable fan unit

Muxponder/ADM Capabilities

The PL-2000ADS provides modular and cost-effective transport of up to 200G by aggregating multiple services into dual 100G OTU4 uplinks, and using flexible cross connect matrix. The solution is low power consumption and saves rack space, reducing overall CAPEX and OPEX, and enabling to easily and cost-effectively increase capacity of short haul networks.

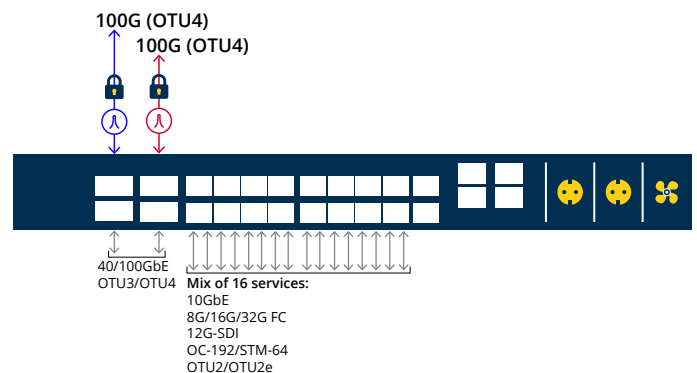
Main Benefits

- Easy deployment and management of dual 100G short haul / access networks
- Versatile solution, with very low power consumption
- Embedded GCM-AES-256 encryption for all protocols
- Encryption feeder in front of any third party OTU4 interface
- Flexible OTN cross connect

Security and Encryption for all Services

The PL-2000ADS is a cost-effective 200G solution for short haul and access networks, incorporating GCM-AES-256 Layer-1 encryption.

The unit can also function as a standalone 200G encryption machine for any mix of the featured client services.



Multiple Client Services Aggregate into Dual 100G OTU4 Uplink

Recommended Applications

- Last mile access/aggregation CPE for 10/40/100GbE managed service
- High capacity, short haul networks
- Dynamic add/drop of services in ring and linear add/drop topologies
- Feeder solution for third party OTU4 transponder card
- Layer-1 encryption solution for 10/40/100GbE services
- High bandwidth connectivity for data center and cloud computing

Technical Specifications

Product Configurations

Muxponder:

Aggregation of up to 20 multi-service, multi-rate, multi-protocol client interfaces: Ethernet, Fibre Channel, SONET/SDH, and OTN into 2xOTU4 uplinks

Dual 100G Transponder:

2x100GbE mapped into 2xOTU4 uplinks

100G Transponder and 10x10G Muxponder:

100GbE mapped into one OTU4 uplink and up to 10 multi-service 10GbE clients aggregated into a second OTU4 uplink

Uplink Characteristics

Bit Rate: 112Gbps (OTU4)

Optical Interface: 2xQSFP28

FEC Support: GFEC, SCFEC

Optical Reach: Up to 40km with ER4

Optical Output Power: 2dBm to -2dBm

Optical Monitoring: Tx and Rx power

Client Interfaces

Service types:

10GbE, 40GbE, 100GbE, 8G/16G/32G FC, 12G-SDI, STM-64/OC-192, OTU2, OTU2e, OTU3, OTU4

Optical Interface:

- SFP+: LR (1310nm), SR (850nm), ER (1550nm), ZR (1550nm), C/DWDM
- SFP28: LR (1310nm), SR (850nm)
- QSFP+: LR4 (1310nm), ER4 (1310nm), SR4 (850nm), LR PSM
- QSFP28: LR4 (1310nm), ER4 (1310nm), SR4 (850nm), CWDM4 (CWDM)
- QSFP28: DWDM

Management:

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

OAM:

- Facility loopback (client and line interfaces), PRBS, event log, external alarms (input and output)
- Automatic laser shut-down (ALS)

Network Management

Management Ports:

- 2xRJ-45 LAN port 10/100MBase-T
- 2xSFP MNG ports 100/1000MBase-X
- RJ-45 serial port
- RJ-45 external alarm port
- OTN in-band GCC channel

Management Protocols:

- SNMP
- v1/v2/v3 HTTP
- HTTPPS
- Telnet
- SSH
- Syslog
- RADIUS
- TACACS+
- SNTF
- TFTP & FTP

Performance Monitoring:

- Layer-1 PM for all services
- Layer-2 PM for Ethernet
- OTN PM for uplinks
- Optical power Rx levels for all optical ports
- Egress PM for all services

Visual Indicators: LED status indicators for: client and line ports, Management and LAN ports, system Critical/Major/Minor and Power Supply

Software Upgrade: Hitless traffic – dual image

Power Supply

AC/DC:

100 to 240 VAC or -36 to -60 VDC, 50/60 Hz, 180W max

PSU Redundancy:

Single/dual feeding, hot swappable

Cooling Unit:

Hot swappable fan unit

Environmental

Operating Temperature:

-5°C to 50°C (+23°F to +122°F)

Humidity: 5% to 85% RH

Dimensions

Size:

- 1.77" (H) x 17.32" (W) x 11.22" (D)
- 45mm (H) x 440mm (W) x 285mm (D)

Weight: 8.5kg / 18.74lb (max)

Mounting: 19", ETSI, 23"

Encryption

Functionality:

- Full speed, transparent Layer-1 encryption for selected clients or for the OTU4 uplinks
- Supports QKD/PQC

Algorithms:

- Encryption/decryption: GCM-AES-256
- Key exchange: ECC Cofactor Diffie-Hellman with P-384 curve
- Message digest: SHA-384

Authentication:

- Role-based user/password

Compliance:

- FIPS 140-2 Level 2 certified
- Common Criteria EAL2 certified
- CNSA Top Secret Suite B 2015 compliant

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

PL-2000GM 200G / 2x100G Muxponder/ADM

Multi-protocol multi-rate optical transport solution for metro and long haul networks

Features Overview

- Multiple user-configurable operation modes: muxponder, transponder and ADM
- Supported services:
 - 10GbE/40GbE/100GbE
 - 8G/16G/32G Fibre Channel
 - STM-64/OC-192 SDH/SONET
 - OTU2/OTU2e/OTU3/OTU4 OTN
- Forward error correction (FEC) - oFEC
- Dual pluggable CFP2 coherent tunable DWDM line interfaces
- Layer-1 GCM-AES-256 based encryption
- Comprehensive line and service performance monitoring
- Integrated EDFAs, mux/demux, and optical switch
- OTN SNCP 1+1 service protection for ring applications
- Remote management with in-band or out-of-band OSC
- Remote management and fiber monitoring with OSC OTDR SFP
- Supports standard MSA pluggable modules:
 - SFP+ (8G/16G FC client)
 - SFP28 (32G FC client)
 - QSFP+ (40GbE client)
 - QSFP28 (100GbE client)
 - CFP2 (uplink)
- Dual AC or DC pluggable power supply and pluggable fan unit

For Metro and Long Haul 200G Applications

The PL-2000GM delivers up to 200km/42dB without intermediate sites and 4,500km with inline sites. It is a powerful 200G muxponder/transponder/ADM solution for building high capacity optical transport networks. The PL-2000GM transports 200G over point-to-point networks, and dual 100G uplinks over ring topologies, using flexible cross connect matrix.



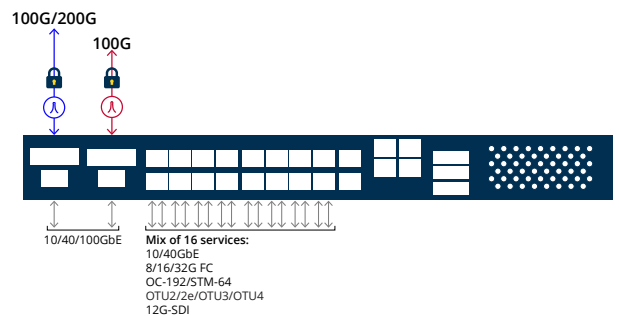
Main Benefits

- **Dynamic mix of services**
- **Embedded encryption for all protocols**
- **Highly integrated 1U solution**
- **Supports 200G PtP or 100G ring network topologies**
- **Flexible OTN cross connect**

Secured and Encrypted Communication for all Services

The flexible architecture of the PL-2000GM enables the same device to be used in multiple applications and adapt to network growth and changes. It supports and aggregates a flexible mix of Ethernet, Fibre Channel, Video, SDH/SONET and OTN client services into a 200G uplink or two 100G uplinks.

The platform supports various client services, allowing easy migration from current to future services without replacing the unit. The product supports standards-based Layer-1 encryption, configurable per service or per uplink.



Multiple Client Services Aggregated into 100G/200G Uplinks

Recommended applications

- 100G/200G long haul applications up to 4,500km
- High capacity DCI for enterprise, campus and cloud computing networks
- 200G links to bolster existing OTN/DWDM infrastructure
- Dynamic add/drop of services in ring and linear add/drop topologies
- Last mile access/aggregation CPE for 100GbE managed services
- Secured, encrypted communication for 8/16/32G FC, 10/40/100GbE, and OTU2/2e/4 services

Technical Specifications

Product Configurations

200G Muxponder:

Mix of services mapped into a 200G OTUC2 uplink.

Dual 100G ADM: Mix of services mapped into 2x100G OTU4 uplinks, and OTN cross-connect.

Optical Amplifiers: Optional up to two EDFA modules

Mux/Demux: Optional 2ch mux/demux module

Optical Switch: 1+1 facility protection

Uplink Characteristics

Optical Interface: CFP2 coherent (DCO)

Tunability Range: DWDM ITU-T G.694.1 GRID channels 17-60.5, with 50/100GHz spacing and flexgrid

FEC Support: oFEC

Optical Reach: Up to 4,500km with standard inline EDFAs

Optical Output Power: -10dBm to +3dBm, configurable

OSNR Sensitivity:

- 200G QPSK: 15.7dB
- 100G DEQPSK: 12.9dB

Optical Monitoring: Tx and Rx power, dispersion, OSNR

Client Interfaces

Service type: 10GbE, 40GbE, 100GbE, 8G/16G/32G FC, STM-64/OC-192, OTU2, OTU2e, OTU3, OTU4

Optical Interface:

- SFP+: LR (1310nm), SR (850nm), ER (1550nm), ZR (1550nm), C/DWDM
- SFP28: LR (1310nm), SR (850nm)
- QSFP+: LR4 (1310nm), ER4 (1310nm), SR4 (850nm), LR PSM
- QSFP28: LR4 (1310nm), ER4 (1310nm), SR4 (850nm), CWDM4 (CWDM)

Amplifier

Applications: Booster, pre-amp

16ch red PreAmp:

- **Pin:** -40dBm to +7dBm
- **Pout:** -10dBm to +20dBm
- **Gain:** +13dB to +30dB, configurable (flat gain +10dB to +22dB)

16ch red Booster:

- **Pin:** -24dBm to +10dBm
- **Pout:** -10dBm to +20dBm
- **Gain:** +5dB to +22dB, configurable (flat gain +10dB to +22dB)

Operating Modes:

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

Network Management

Management Ports:

- 2xRJ-45 LAN port 10/100MBase-T
- 2xSFP MNG ports 1000MBase-X
- RJ-45 serial port
- RJ-45 external alarm port
- OTN in-band GCC channel

Protocols: SNMP, HTTP, HTTPS, Telnet, SSH, Syslog, RADIUS, TACACS+, SNMP, TFTP & FTP, REST and NETCONF

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:

- Automatic laser shut-down (ALS)
- Facility loopback (client and line interfaces)
- PRBS (client side)
- Event log alarms

Performance Monitoring:

- Layer-1 PM for all services
- Layer-2 PM for Ethernet
- OTN PM for uplinks
- Optical power Rx levels for all optical ports
- RX, TX and OSNR

Visual Indicators: LED 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 or -44 to -60 VDC, 50/60 Hz, 190W max

PSU Redundancy: Single/dual feeding, hot swappable

Cooling Unit: Hot swappable fan unit

Environmental

Operating Temperature:

0°C to 45°C (32°F to 113°F)

Humidity: 5% to 90% RH

Air Flow: Front to back

Physical Dimensions

1U:

- 1.77" (H) x 17.32" (W) x 13.78" (D)
- 45mm (H) x 440mm (W) x 350mm (D)

Weight: 8.5kg / 18.74lb (max)

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

Encryption

Functionality:

- Full speed, transparent Layer-1 encryption for selected clients or for the 100G uplinks
- Supports QKD/PQC

Certifications:

- FIPS 140-3 Level 2 compliant
- Common Criteria EAL2 compliant
- CNSA Top Secret Suite B 2015 compliant

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

PL-2000 2x10G Muxponder/ADM

Multi-protocol multi-rate muxponder with flexible uplink aggregation, capacity of up to 20G

Features Overview

- Single or dual configurable 10G muxponders
- Up to 16 multi-protocol and multi-rate services aggregation over single or dual OTU2 uplinks
- Service types supported:
 - Fast Ethernet
 - GbE
 - 1/2/4G FC/FICON
 - STM-1/OC-3, STM-4/OC-12, STM-16/OC-48
 - Video protocols such as DVB-ASI, SD-SDI, HD-SDI, 3G-SDI
- Dual standard-based optical transport network (OTN) OTU2 uplinks supporting multiple forward error correction (GFEC/I.4/I.7) types
- 1+1 facility protection
- OTN SNCP 1+1 service protection for ring applications
- Low latency
- Supports standard MSA SFPs (client), XFPs (uplink), and C-band tunable XFPs
- Supports line and service performance monitoring
- Remote management optical supervisory channel (OSC)
- Remote management and fiber monitoring with OSC OTDR SFP
- Optional integrated EDFA, mux/demux, DCM and optical switch
- Dual AC or DC pluggable power supply and pluggable fan unit
- Web-based GUI and SNMP EMS management
- Low power consumption

Muxponder/ADM Capabilities

The PL-2000 provides an efficient and flexible aggregation layer of multi-protocol multi-rate sub-10G services, delivering two 10G OTU2 uplinks using flexible cross connect matrix. The PL-2000 increases the spectral efficiency of WDM networks by reducing the number of wavelengths needed for a sub-10G solution by a factor of 8 on average.



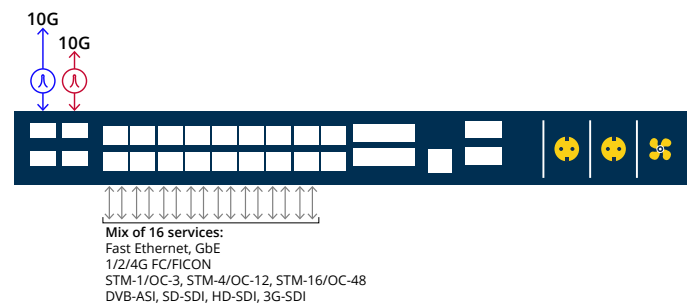
Main Benefits

- **Sub-10G gateway for 10/100G OTN networks, supporting LR and tunable DWDM uplink modules**
- **Multiplexes up to 16 client services into single or dual independent 10G OTU2 wavelengths**
- **Aggregates SDH/SONET, Ethernet, Fibre Channel and video services**
- **Flexible OTN cross connect**

A Flexible Platform

The PL-2000 reduces the solution cost and operation complexity by increasing fiber utilization and spectral efficiency. Each of the 10G OTU2 uplinks can simultaneously aggregate SDH/SONET, Ethernet, Fibre Channel and video services, providing a perfect access platform for multiple clients, and enables to merge legacy and new services transparently.

Together with PacketLight LightWatch NMS the system provides A-to-Z provisioning. The PL-2000 Incorporates forward error correction suitable for long distance amplified DWDM network.



PL-2000 Product Diagram 2 x 10G OTU2 Uplinks

Recommended Applications

- 10G ring applications
- Sub-10G gateway for 10G/100G OTN networks
- Multi-service access platform for service providers
- Transporting multi-services over long haul networks
- Upgrading legacy infrastructure with new services
- Efficient aggregation of multiple native video streams over DWDM and OTN infrastructure

Technical Specifications

System

Topology: Point-to-point, ring or linear add/drop

Transport Network Medium: Access/metro CWDM/DWDM or dark fiber

Protection: 1+1 facility per service

Product Configurations

Dual 10G OTU2 Muxponder: Up to 16 multi-service & rate clients mapped over two independent OTU2 uplinks

Single protected 10G OTU2 uplink: Up to 16 multi-service & rate clients mapped over protected OTU2 uplink

EDFA: Optional EDFA module

Mux/Demux: Optional mux/demux module

Amplifier

Output Power: 14, 17, 20 or 23dBm

Input Power: -36dBm up to 16dBm

Gain: 8dB to 22dB

Operating Modes:

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

Eye Safety: Automatic laser power reduction upon fiber cut or disconnection

Mux/Demux

Channels: 2/4/8 CWDM or DWDM

Spacing: 50/100GHz (for DWDM)

Muxponder Uplink

Bit Rate: 10.7092G (OTU2)

Optical Interface: Pluggable XFP transceiver

OTN support:

- ODU1 VCAT mapping to OTU2
- Supported FEC types:
 - G.709 GFEC (RS)
 - G.975.1 I.4
 - G.975.1 I.7

Muxponder Service

Service Type:

- Optical or copper GbE
- FC/FICON 1G, 2G or 4G
- Optical or copper Fast Ethernet
- STM-1, STM-4, STM-16
- OC-3, OC-12, OC-48

Bit Rate: 100Mbps to 4.25Gbps

Optical/copper Interface: Pluggable SFP transceiver

Network Management

Management Ports:

- RJ-45 LAN port 10/100MBase-T
- 2xSFP MNG ports 100/1000MBase-X
- RS-232 serial port
- DB9 external alarm port

Management Protocols:

- SNMP, HTTP, HTTPS, CLI over RS-232 or CLI over Telnet/SSH, Telnet, SSH, Syslog, RADIUS, TACACS+, SNMP, RSTP, TFTP & FTP

NMS:

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

OAM: Facility loopback (client & line interfaces), PRBS, event logger, alarms, ALS

Performance Monitoring: Layer-1 PM for all services, optical power Tx, Rx levels for all optical ports, Layer-2 PM for the data services 1G & 10G LAN

Visual Indicators: LED: 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 or -36 to -60 VDC, 50/60 Hz, 68W max

PSU Redundancy: Single/dual feeding, hot swappable

Cooling Unit: Hot swappable fan unit

Environmental

Operating Temperature: -5°C to 50°C (+23°F to +122°F)

Humidity: 5% to 85% RH

Physical Dimensions

Size:

- 1.77" (H) x 17.32" (W) x 9.05" (D)
- 45mm (H) x 440mm (W) x 230mm (D)

Weight: 5.5kg / 12.13lb (max)

Mounting: 19", ETSI and 23"

Approvals & Standards

- CE, FCC, RoHS, REACH
- NEBS ready

PL-8000G 10 x 800G Transponder

Mix of 800GbE/400GbE/100GbE over 800G wavelengths for high capacity DCI applications

Features Overview

- Pay-as-you-grow architecture
- Up to 10 x 800G transponders
- Uplinks: 10 x 800G OSFP-DCO
- User-configurable transponder options:
 - 1 x 800GbE
 - 2 x 400GbE (breakout cable)
 - 8 x 100GbE (breakout cable)
- Supported services: 100GbE, 400GbE, 800GbE
- Client optics:
 - 800G QSFPDD DR8
 - 800G QSFPDD FR8
 - 2 x 400G QSFPDD DR4/FR4
- Comprehensive line and service performance monitoring
- Integrated mux/demux, EDFA and optical switch (optional)
- Facility protection against fiber cut
- Remote management with out-of-band OSC
- Remote management and fiber monitoring with OSC OTDR SFP
- Easy maintenance with field-replaceable parts:
 - Dual hot pluggable power supply units (AC/DC)
 - Fan unit

100GbE/400GbE/800GbE Transponder

The PL-8000G is a modular and cost-effective high capacity solution for rolling out 100/400/800GbE services, or increasing existing network capacity. The device has 10 x 800G pluggable uplink optical modules, delivering up to 8T in a 1U chassis. The PL-8000G integrates mux/demux, as well as EDFA and OSW to overcome fiber attenuation and provide protection against fiber cut. This flexible solution enables pay-as-you-grow architecture, without the need to add licenses.

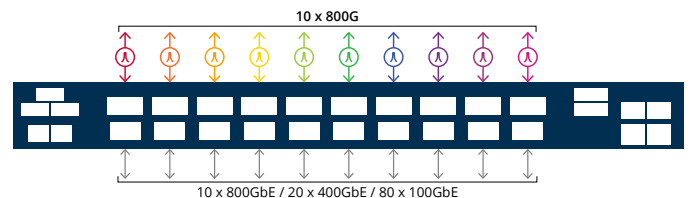


Main Benefits

- Cost-effective high capacity 8T transport solution
- Significantly reduces rack space and power consumption per bit
- Modular and cost-effective for future growth and ease of maintenance
- Supports mix of 100/400/800GbE client services
- OpenZR+ standard enables cost/performance balance, based on the application requirements.
- Integrates EDFA and optical switch in 1U

Full Demarcation

The device 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 and 100/400/800GbE service interfaces.



PL-8000G Transponder Diagram

Recommended Applications

- High capacity DCI for AI, Internet exchange, and research and education networks
- 800G links for enabling deployments of new services, such as connectivity for GPU as a service
- Last mile access/aggregation CPE for 100/400/800GbE managed services

Technical Specifications

Product Configurations

Per Transponder:

- 1 x 800GbE over 800G uplink
- 2 x 400GbE over 800G uplink
- 8 x 100GbE over 800G uplink

Optical Amplifiers: Up to two EDFA modules (optional)

Optical Switch: 1+1 facility protection (optional)

Uplink Characteristics

Optical Interface:

- 800G OSFP-DCO

Tunability range:

- C-band with flex-grid support

FEC Support:

SD-FEC

Tx Power:

- 800G 16QAM: 1dBm to -9dBm
- 400G 16QAM: 1dBm to -9dBm

Rx Sensitivity at High OSNR (>36dB):

- 800G 16QAM: -20.5dBm
- 400G 16QAM: -24.5dB

OSNR Sensitivity:

- 800G 16QAM: 24.7dB @-9dBm
- 400G 16QAM: 21.2dB @-12dBm

Chromatic Dispersion Tolerance:

- 800G 16QAM: 24,000ps/nm
- 400G 16QAM: 75,000ps/nm

Client Characteristics

Supported Services:

- 800GbE/8x100GbE (breakout cable) - QSFP-DD 800 DR8
- 800GbE/8x100GbE (breakout cable) - QSFP-DD 800 FR8
- 2x400GbE (breakout cable) - QSFP-DD 2x400 DR4

Optical Interface: QSFP-DD

FEC Support:

800GbE: KP4-FEC RS (544,514)

Amplifier

Applications: Booster, pre-amp

Output Power:

- Booster: up to 20dBm
- Pre-amp: up to 20dBm
- Pre-amp Full C-band: up to 20dBm
- Booster VGA: up to 23dBm

Input Power:

- Booster: -24dBm to +10dBm
- Pre-amp: -36dBm to -10dBm
- Pre-amp Full C-band: -36dBm to -10dBm
- Booster VGA: -24dBm to +13dBm

Gain:

- Booster: 5dB to 22dB
- Pre-amp: 13dB to 22dB
- Pre-amp Full C-band: 20dB
- Booster VGA: 8dB to 22dB

Operating Modes:

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

Mux/Demux

Number of Channels: 10 + OSC 1510nm

Channel Spacing: 150GHz

Insertion Loss: 6dB per side, 12dB link loss

Connectors:

- COM - LC UPC
- Channels - MPO with Breakout cable

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

Management Protocols:

- SNMP v1/v2/v3, HTTP/HTTPS, CLI over RS-232 or over Telnet/SSH, Syslog, RADIUS, TACACS+, SNMP, 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 100/400/800GbE services
- FEC Corrected/Uncorrected errors
- 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 or -44 to -60 VDC, 50/60 Hz, 640W max

PSU Redundancy:

Single/dual feeding, hot swappable

Cooling Unit:

Hot swappable fan unit

Environmental

Operating Temperature:

0°C to 40°C (32°F to 104°F)

Humidity: 5% to 85% RH

Storage: 85°C

Air Flow: Front to back

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", 21", 23"

Approvals & Standards

- CE, FCC, RoHS, REACH
- NEBS ready

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.

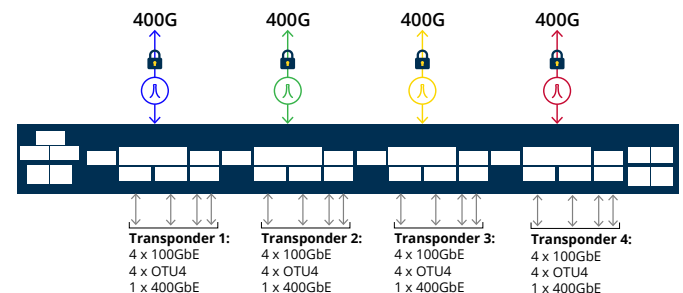


Main Benefits

- 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

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+, SNMP, 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 or -44 to -60 VDC, 50/60 Hz, 380W max

PSU Redundancy: Single/dual feeding, hot swappable

Cooling Unit: Hot swappable fan unit

Environmental

Operating Temperature:

0°C to 45°C (32°F to 113°F)

Humidity: 5% to 85% RH

Storage: 85°C

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

PL-4000G 4.8T | 12x400G Transponder

Mix of 400GbE and 100GbE over 400G wavelengths for high-capacity ultra-long-haul applications

Features Overview

- Pay-as-you-grow architecture based on standard pluggable coherent optical modules
- Operation modes:
 - 12 x 400GbE transponder
 - 48 x 100GbE transponder
- Supported services: 100GbE, 400GbE
- Supported line FEC:
 - CFEC (OIF-ZR standard)
 - oFEC (OpenROADM/Open ZR+ standards)
 - SD-FEC (FlexO-4e standard)
- Standard MSA pluggable modules:
 - 12 x 400GbE QSFP-DD-DR4/DR4+/FR4/LR8/FR8 clients
 - 48 x 100GbE QSFP-DD-DR4/DR4+/FR4 clients
- 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 out-of-band OSC
- Remote management and fiber monitoring with OSC OTDR SFP
- Easy maintenance with field-replaceable parts:
 - Dual hot pluggable power supply units (AC/DC)
 - Fan unit

100GbE/400GbE Transponder

The PL-4000G has twelve 400G uplinks, supporting pluggable optical modules, and delivering up to 4.8T, in 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. PL-4000G integrates mux/demux, EDFA and OSW to deliver the entire optical layer. This flexible solution enables pay-as-you-grow architecture.

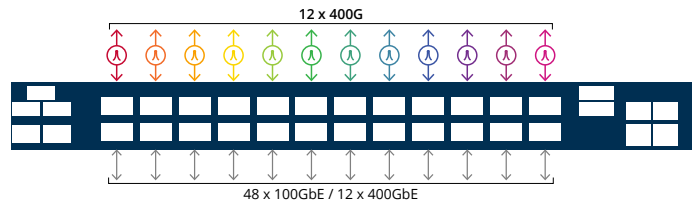


Main Benefits

- Cost-effective high capacity transport mix of 100GbE and 400GbE client services
- Up to 12 x 400GbE transponders
- Up to 48 x 100GbE transponders
- Integrates EDFA, mux/demux and optical switch
- Modular and cost-effective for future growth and maintenance
- Low power consumption, high density device ports

Open Interoperability

The device provides full demarcation point between the service and the DWDM network. It is interoperable with any third party switch or router, providing full visibility and performance monitoring of both the optical transport layer and the service interfaces.



PL-4000G Transponder Diagram

Recommended Applications

- Long-haul, and ultra-long-haul networks of up to 4,000 km
- High capacity networks
- 400G links to bolster existing DWDM infrastructure
- Last mile access/aggregation CPE for 100/400GbE managed services

Technical Specifications

Product Configurations

Transponder:

- Up to 12 x 400GbE
- Up to 48 x 100GbE

Optical Amplifiers: Up to two EDFA modules (optional)

Mux/Demux: 12ch module (optional)

Optical Switch: 1+1 facility protection (optional)

Uplink Characteristics

Line Side Mode:

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

Optical Interface:

- QSFP-DD-DCO

Tunability range:

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

QSFP-DD-DCO OpenROADM:

FEC Support: oFEC, CFEC and SD-FEC

Tx Power:

- 400G ULH: 1.5dBm to -8.5dBm
- 400G 16QAM: 1dBm to -9dBm
- 300G 8QAM: 1dBm to -9dBm
- 200G 8QAM: 1dBm to -9dBm
- 200G QPSK: 1dBm to -9dBm
- 100G QPSK: 1dBm to -9dBm

Rx Sensitivity at High OSNR (>36dB):

- 400G ULH QPSK: -27dBm
- 400G 16QAM: -20dB (FlexO - oFEC)
- 300G 8QAM: -23dBm
- 200G 8QAM: -28dBm
- 200G QPSK: -28dBm
- 100G QPSK: -32dBm

OSNR Sensitivity:

- 400G ULH: 16.9dB @-12dB
- 400G 16QAM: 23.5dB @-14dBm
- 300G 8QAM: 18dB @-16dBm
- 200G 8QAM: 17.5dB @-16dBm
- 200G QPSK: 15.7dB @-18dBm
- 100G QPSK: 12dB @-20dBm

Chromatic Dispersion Tolerance:

- 400G ULH: 58,000ps/nm
- 400G 16QAM: 12,000ps/nm
- 300G 8QAM: 48,000ps/nm
- 200G 8QAM: 48,000ps/nm
- 200G QPSK: 48,000ps/nm
- 100G QPSK: 80,000ps/nm

QSFP-DD-DCO ZR:

- **FEC Support:** CFEC
- **Tx power:** -8dBm
- **Rx power:** 13dBm to -23dBm
- **400G 16QAM CFEC OSNR Tolerance at -12dBm Rx Power:** typical 26dB
- **Rx sensitivity at high OSNR (>36dB):** 400G 16QAM/CFEC -20dBm
- **Chromatic Dispersion Tolerance:** 400G OIF ZR: 2,400ps/nm

Client Characteristics

Service Types:

- 400Gb Ethernet
- 100Gb Ethernet

Optical Interface:

- 400GbE: QSFP-DD-DR4/FR4/LR8/FR8
- 100GbE: QSFP-DD-DR4/DR4+/FR4

FEC Support:

- 400GbE: KP4-FEC RS(544,514)
- 100GbE: KR4-FEC RS(528,514) or no-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

Management Protocols:

- SNMP v1/v2/v3, HTTP/HTTPS, CLI over RS-232 or over Telnet/SSH, Syslog, RADIUS, TACACS+, SNMP, 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
- FEC Corrected/Uncorrected errors
- 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 or -44 to -60 VDC, 50/60 Hz, 570W max

PSU Redundancy: Single/dual feeding, hot swappable

Cooling Unit: Hot swappable fan unit

Environmental

Operating Temperature:

0°C to 45°C (32°F to 113°F)

Humidity: 5% to 85% RH

Storage: 85°C

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"

Approvals & Standards

- FIPS 140-3 Level 2 compliant
- CE, FCC, RoHS, REACH
- NEBS ready

PL-2000FC 4x64G Fibre Channel Transponder

Transport of 4x64G FC over 4x100G OTU4 uplinks for DCI and metro networks

Features Overview

- Supported service: 64G Fibre Channel
- Forward error correction (FEC) - GFEC
- Comprehensive line and service performance monitoring
- Remote management with in-band or out-of-band OSC
- Remote management and fiber monitoring with OSC OTDR SFP
- GCC based In-band
- Loopbacks
- Idle/NOS insertion
- PRBS
- Supports standard MSA pluggable modules:
 - Service - SFP56 SR 64G FC
 - Uplink - QSFP28 100G OTU4, QSFP28-DCO 100G OTU4
- Integrated device with up to two EDFAs, mux/demux, OSW
- Easy maintenance with field-replaceable and hot-swappable parts:
 - Dual pluggable power supply units (AC/DC)
 - Fan unit

Compact Design, Practical Solution

The PL-2000FC is a solution for transporting 4x64G FC over 4x100G OTU4 standard protocol uplinks, for dark fiber and DWDM/OTN networks.

The device integrates EDFAs, 4-channel mux/demux, and an optical switch, providing a compact 1U design - a practical solution for organizations looking to deliver Fibre Channel connectivity while maintaining low cost, monitoring and management.



Full Demarcation Point

The device provides the full demarcation point between the service and uplink. It encapsulates 64G FC client service into OTU4 uplinks, enabling seamless connectivity and interoperability with any 3rd party standard transport device or OTN network (Figure 1). In addition, it serves as a DWDM transponder, transmitting 64G FC over dark fiber and DWDM/OTN network (Figure 2).

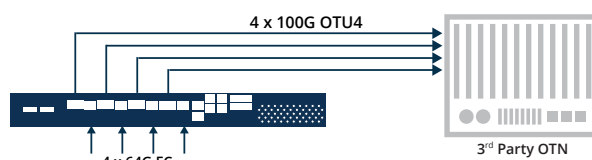


Figure 1: 64G Fibre Channel mapped into OTU4 service

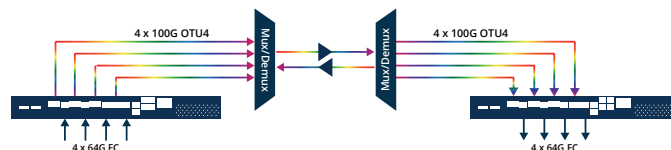


Figure 2: PL-2000FC transponder with integrated mux/demux

Recommended Applications

- Transport of 64G FC over OTN networks
- Transport of 64G FC over dark fiber networks

Technical Specifications

Product Configurations

100G Muxponder/Transponder/ADM:
64G FC mapped onto OTU4 uplinks

Optical Amplifiers:
Up to two EDFA modules - optional

Mux/Demux:
4ch mux/demux module - optional

Optical Switch:
1+1 facility protection

Uplink Characteristics (DWDM)

Optical Interface: QSFP28 coherent

Tunability Range: DWDM ITU-T G.694.1
GRID channels 17-60.5, with 50/100GHz
spacing

FEC Support: DPDQPSK modulation and
Staircase FEC

Optical Reach: Up to 300km with
standard inline EDFAs

Optical Output Power: 0dBm

OSNR Sensitivity:
100G DQPSK SC: 16.5dB
100G DQPSK RS: 21.5dB

Optical Monitoring:
Tx and Rx power, dispersion, OSNR

Client Interfaces

Service type:

64G Fibre Channel

Optical Interface: SFP56 SR, SFP56 LR

Amplifier

Applications: Booster, pre-amp

16ch red PreAmp:

- **Pin:** -40dBm to +7dBm
- **Pout:** -10dBm to +20dBm
- **Gain:** 13dB to 22dB, configurable
(flat gain 10dB to 22dB)

16ch red Booster:

- **Pin:** -24dBm to +10dBm
- **Pout:** -10dBm to +20dBm
- **Gain:** 5dB to 22dB, configurable
(flat gain 10dB to 22dB)

Operating Modes:

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

Network Management

Management Ports:

- CLI via USB type C
- 2xRJ45 10/100/1000M LAN
- 2xOSC 100Base-FX/1000Base-X
- RJ45 external alarms

Protocols:

- SNMP
- HTTP
- HTTPS
- Telnet
- SSH
- Syslog
- RADIUS
- TACACS+
- SNTP
- TFTP & FTP
- REST
- NETCONF

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:

- Automatic laser shut-down (ALS)
- Facility loopback (client and line
interfaces)
- PRBS (client side)
- Event log alarms

Performance Monitoring:

- Layer-1 PM
- OTN PM for uplinks
- FEC corrected/uncorrected
- Optical PMs

Visual Indicators:

LED 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 or -44 to -60 VDC,
50/60 Hz, 180W max

PSU Redundancy:

Single/dual feeding, hot swappable

Cooling Unit: Hot swappable fan unit

Environmental

Operating Temperature:

-5°C to 45°C (+23°F to +113°F)

Humidity: 5% to 90% RH

Physical Dimensions

1U:

- 1.77" (H) x 17.32" (W) x 13.78" (D)
- 45mm (H) x 440mm (W) x 350mm (D)

Weight: 8.5kg / 18.74lb (max)

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

Approvals & Standards

- CE, FCC, RoHS, REACH
- NEBS ready

PL-2000T 800G | 4x200G Transponder

Transport platform for high capacity applications

Features Overview

- Pay-as-you-grow architecture based on pluggable 200G digital coherent optical modules
- Operation modes: QPSK 100G long haul and 8/16 QAM 200G metro
- Supported clients: 100Gb Ethernet, OTU4
- Supported FEC modes:
 - **Line:** SD-FEC for metro and long haul applications, or oFEC
 - **OTU4 service:** ITU G.709 GFEC, or Zero FEC
 - **100GbE service:** IEEE Clause BJ-FEC
- Standard MSA pluggable:
 - CFP2 DCO tunable DWDM for 100G/200G line interface
 - QSFP28 SR4/LR4/ER4/CWDM4 for 100G client interface
- 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
- Remote management and fiber monitoring with OSC OTDR SFP
- Easy maintenance with field-replaceable parts:
 - Dual hot pluggable power supply units AC/DC
 - Fan unit

200G Metro and 100G Long Haul Applications

The PL-2000T is a modular and cost-effective solution for rolling out 100G services or increasing existing network capacity. The device has four 200G pluggable optical modules, delivering up to 800G, and enabling pay-as-you-grow architecture.

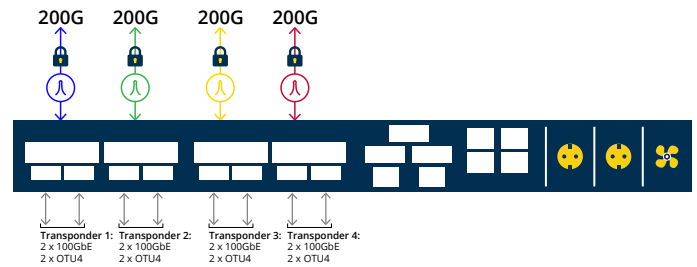


Main Benefits

- **Integrated EDFA, mux/demux and optical switch**
- **High transport capacity of 800G with configurable modulation scheme**
- **Embedded Layer-1 optical encryption**
- **Managed service platform**
- **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 uplink DWDM side and is interoperable with any third party switch or router. This provides full visibility and performance monitoring of both line optical transport layer (OTN) and 100G LAN/OTU4 service interfaces.



PL-2000T Transponder Diagram

Recommended Applications

- Metro network applications ranging up to 1,000km
- High capacity DCI networks
- 200G links to bolster existing OTN/DWDM infrastructure
- Secured and encrypted communication for 100G protocols

Technical Specifications

Product Configurations

Transponder: 4x200G metro or 4x100G long haul

Optical Amplifiers: Optional up to two EDFA modules

Mux/Demux: Optional 4ch mux/demux module

Optical Switch: Optional 1+1 facility protection

Uplink Characteristics

Optical Interface: CFP2 coherent (DCO)

Tunability range:

- DWDM ITU-T G.694.1 grid
- C-band, with flex-grid support
- C-band, with 100GHz/50GHz spacing

FEC Support:

- Standard ITU-T G.709 GFEC
- SD-FEC
- oFEC

Tx Power:

- **200G 8/16QAM:**
-0.5 to -10dBm, or -8dBm, ±2dB
- **100G DP-QPSK:**
-0.5 to -5dBm, or 4dBm, ±2dB

Rx Sensitivity at High OSNR (>35dB):

- **200G 16QAM:** -22dBm or -23dBm
- **200G 8QAM:** -24dBm or -28dBm
- **100G DP-QPSK:** -29dBm or -31dBm

OSNR Sensitivity:

- **200G 16QAM:**
19.8dB @-18dBm or 20dB @-15dBm
- **200G 8QAM:**
18.1dB @-18dBm or 17.5dB @-16dBm
- **100G DP-QPSK:**
11.4dB @-18dBm or 12.9 @-20dBm

Chromatic Dispersion

- **200G 16QAM:**
16,000ps/nm or 25,000ps/nm
- **200G 8QAM:**
20,000ps/nm or 48,000ps/nm
- **100G DP-QPSK:**
40,000ps/nm or 77,000ps/nm

Client Characteristics

Service types:

- 100G LAN
- OTU4

Optical Interface:

- SM QSFP28 - LR4/ER4 (1310nm)
- MM QSFP28 - SR4 (850nm)

FEC Support:

- **OTU4:** Standard ITU-T G.709 GFEC or Zero FEC
- **100G LAN:** BJ-FEC or no-FEC

Amplifier

Applications: Booster, pre-amp

Output Power:

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

Input Power:

- **Booster:** -24 to +10dBm
- **Pre-amp:** -36 to -9dBm

Gain:

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

Operating Modes:

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

Network Management

Management Ports:

- 2xRJ-45 LAN port 10/100MBase-T
- 2xSFP MNG ports 100/1000MBase-X
- RJ-45 serial port
- RJ-45 external alarm port
- OTN in-band GCC channel

Management Protocols:

- SNMPv1/v2/v3, HTTP/HTTPS, CLI over RS-232 or CLI over Telnet/SSH, Syslog, RADIUS, TACACS+, SNTP, TFTP & FTP/SFTP, REST, NETCONF

NMS:

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

OAM:

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

Performance Monitoring:

- Layer-1/2 PM for 100G LAN services
- 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: Dual image, hitless swap

Power Supply

AC/DC: 100 to 240 VAC or -36 to -60 VDC, 50/60 Hz, 250W max

PSU Redundancy: Single/dual feeding, hot swappable

Cooling Unit: Hot swappable fan unit

Environmental

Operating Temperature:

-5°C to 50°C (+23°F to +122°F)

Humidity: 5% to 85% RH

Physical Dimensions

Size:

- 1.77" (H) x 17.32" (W) x 11.22" (D)
- 45mm (H) x 440mm (W) x 285mm (D)

Weight: 8.5kg / 18.74lb (max)

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

Encryption

Functionality:

- Full speed transparent Layer-1 encryption for OTU4 uplinks
- Supports QKD/PQK

Algorithms:

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

Authentication:

Role-based user/password authentication

Compliance:

- CNSA Top Secret Suite B 2015

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

PL-1000TN 6 x 10G OTN Transponder

Multi-protocol multi-rate OTN transponders, with total capacity of 60G

Features Overview

- 6 independent ITU G.Sup43 standard-based multi-rate 8/10G OTN transponders
- Supported clients:
 - 10Gb/40Gb Ethernet
 - 8G/10G Fibre Channel (FC)
 - STM-64/OC-192
 - OTU2/2e
- Three FEC types: ITU G.709 GFEC, G.975.1 EFEC I.4 and UFEC I.7 for enhanced performance
- Supports full C-band tunable DWDM on line side optics
- Supports multi-rate client interfaces over a common OTN infrastructure
- 1+1 facility and optical switch line protection
- Comprehensive performance monitoring and full OTN managed layer
- Optional integrated EDFAs, DCM, mux/demux and optical switch modules
- Remote management with in-band GCC or out-of-band OSC
- Remote management and fiber monitoring with OSC OTDR SFP
- Cost-effective platform with low power consumption
- Supports standard MSA pluggable modules:
 - SFP+ (client)
 - XFP (uplink)
- Dual AC or DC pluggable power supply and pluggable fan unit
- Operates on single or dual fiber networks

Multi-protocol 10G OTN Transponders

The PL-1000TN holds up to 6 multi-protocol transponders for mapping 8G/10G services over OTU2/2e/2f OTN. It is a highly integrated solution for unified transport of different protocols over a common optical transport layer.



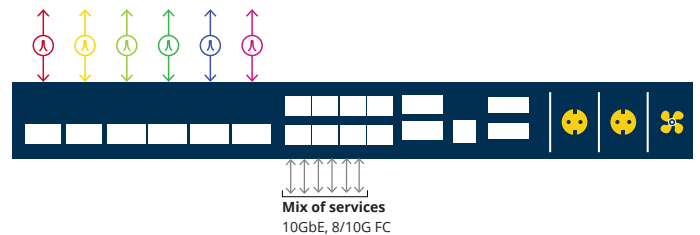
Main Benefits

- Long haul connectivity for up to 52dB
- Integrated transport solution, saving rack space
- Enhanced forward error correction
- Reduces backbone cost by cutting the number of regenerators

Integrated OTU2 Transponder

The PL-1000TN meets market demands for low power consumption and rack space savings, reducing the overall solution CAPEX and OPEX.

The device provides the entire optical solution, integrating EDFAs, mux/demux and DCM with the OTN transponders.



PL-1000TN Multi-rate Transponder Diagram

Recommended Applications

- Building efficient DWDM OTN networks for enterprises over common long distance OTN
- Building robust packet optical network infrastructure
- Multi-rate OTN transponder for ROADM-based applications
- CPE device for end-to-end managed services over carrier backbone
- Upgrading SONET/SDH backbones to OTN
- OTU2e OTN regenerator

Technical Specifications

System

Transport Network Medium: Access/metro CWDM, DWDM or dark fiber / long distance optical fiber networks / OTN backbone networks

Protection: 1+1 facility

Product Configurations

Transparent OTU2 Transponder:

- **Non-protected:** Up to 6 independent client signals mapped into corresponding OTU2 line protocols
- **1+1 protected:** Up to 3 dual independent client signals mapped into corresponding 10G OTU2/2e/2f line protocols

EDFA: Up to two EDFA modules

Mux/Demux: Up to two mux/demux modules

Optical Switch: 1+1 facility protection <50Ms switch time optical module

Optical Amplifier

Output Power: 14, 17, 20 or 23dBm

Input Power: -36dBm up to 16dBm

Gain: 8dB to 22dB

Operating Modes:

- Automatic Gain Control (AGC)
- Automatic Power Control (APC)

Eye Safety: Automatic laser power reduction upon fiber cut or disconnection

Mux/Demux

Channels: 4/8 CWDM or DWDM channels

Spacing: 50/100GHz (for DWDM)

Line (Uplink)

Protocols:

- OTU2 (10.709)
- OTU2e (11.095) as per G.Sup43
- OTU2f (11.317)

FEC Types: G.709 GFEC (RS), G.975.1 EFEC I.4, G.975.1 UFEC I.7

Optical Interface:

- Up to 6 pluggable XFP transceivers
- DWDM, tunable DWDM
- CWDM

Client Service

Client Protocols:

- 10G/40G LAN (10.3125G/4x10.3125G)
- 8G/10G FC (8.5G/10.518)
- STM-64/OC-192 (9.953)
- OTU2, OTU2e

Optical Interface:

- Up to 6 pluggable SFP+ transceivers
- 850nm multimode
- 1310nm single mode

Network Management

Management Ports:

- RJ-45 LAN port 10/100MBase-T
- 2xSFP MNG ports 100/1000MBase-X
- RJ-45 serial port
- RJ-45 external alarm port
- OTN in-band GCC channel

Management Protocols:

- SNMP, HTTP, HTTPS, CLI over RS-232 or CLI over Telnet/SSH, Syslog, RADIUS, TACACS+, SNTP, TFTP & FTP

NMS:

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

OAM:

- Facility loopback (client and line interfaces), PRBS, event log, alarms
- Automatic laser shut-down (ALS)

Performance Monitoring:

- Layer-1 PM for all services
- Layer-2 PM for Ethernet
- OTN PM for uplinks
- Optical power Rx levels for all optical ports

Visual Indicators: LED 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: 90 to 246 VAC or -36 to -60 VDC, 50/60 Hz, 70W max

PSU Redundancy: Single/dual feeding, hot swappable

Cooling Unit: Hot swappable fan unit

Environmental

Operating Temperature:

-5°C to 50°C (+23°F to +122°F)

Operational Humidity: 5% to 85% RH

Physical Dimensions

Size:

- 1.77" (H) x 17.32" (W) x 9.05" (D)
- 45mm (H) x 440mm (W) x 230mm (D)

Weight: 5.5kg / 12.13lb (max)

Mounting: 19", ETSI and 23"

Configuration

License-based: 4, 6 transponders

Approvals & Standards

- CE, FCC, RoHS, REACH
- NEBS ready

PL-1000TE 8 x 10G Transponder

Multi-rate multi-protocol transponders, supporting Layer-1 encryption

Features Overview

- Multi-rate and multi-protocol mix of 8 transponders, configurable from 622M up to 40G
- Supported services:
GbE, 10GbE, 40GbE, 2G/4G/8G/10G/16G FC, STM-4/OC-12, STM-16/OC-48, STM-64/OC-192, HD-SDI, 3G-SDI (PAL and NTSC), SD-SDI
- Low latency connectivity, ideal for data center interconnect applications
- Encryption algorithm: GCM- AES-256 Layer-1 data encryption. Periodical Diffie Hellman key exchange. Complies with NIST FIPS-140-2 and CNSA Top Secret Suite B 2015 requirements
- Supported Layer-1 Encryption services:
GbE/10Gb/40Gb Ethernet
- Remote management and topology discovery for the optical network
- Remote management and fiber monitoring with OSC OTDR SFP
- Pluggable SFP/SFP+ interfaces for both service and WDM channels
- Supports full C-band tunable DWDM on the line side (SFP+)
- Optional integrated EDFAs, mux/demux, DCM and optical switch
- Supports 1+1 facility protection
- Bi-directional performance monitoring
- Dual AC or DC pluggable power supply and pluggable fan unit
- Supports single and dual fiber networks

Low Latency 1G-16G WDM Transponder

The PL-1000TE/PL-1000TE Crypto is a CWDM/DWDM solution for connecting two data centers or back up sites. The device is an advanced, all-in-one optical transport solution, supporting up to 8 transponders with a flexible mix of industry-standard-protocols. The product integrates a rich and cost-effective feature set with low power consumption.

The PL-1000TE Crypto supports innovative Layer-1 optical encryption capability for 1G/10G/40G Ethernet LAN and 4G/8G/16G FC storage services.

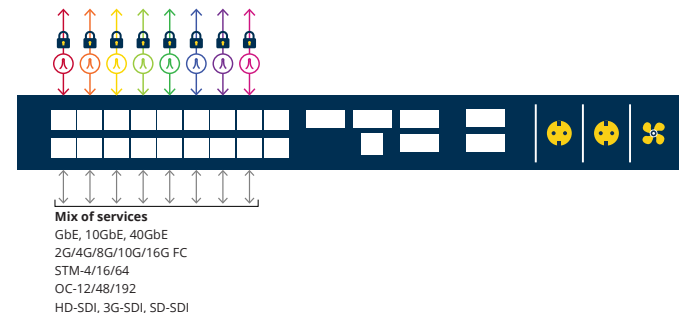


Main Benefits

- Flexible mix of services provides transparent migration capability from <10G to 10G services with no downtime
- Layer-1 encryption prevents disclosure of information to unauthorized parties with 100% throughput
- Maximum flexibility and scalability

Standards-based Layer-1 Encryption

The PL-1000TE/PL-1000TE Crypto allows easy upgrade or expansion of the required services by simply adding pluggable optic modules (SFP/SFP+) into the available slots or by implementing PacketLight's multi-chassis stackable solution. This architecture provides true scalability at a minimum cost.



PL-1000TE Diagram - Multi-rate Transponder Layer-1 Encryption

Recommended Applications

- High capacity, low latency, secure data center interconnect (DCI)
- Efficient connectivity for campus, ISP and enterprise networks
- Upgrade of existing WDM networks to support 10/40Gb Ethernet and 16G FC services
- Trading applications and synchronous data center replication requiring low latency
- Distance extension for 40G data networks up to 120km

Technical Specifications

System

Topology: Point-to-point, ring, linear ADM, dual or single fiber

Transport Network Medium: Metro CWDM, DWDM and dark fiber

Encryption

Algorithm: GCM-AES-256

Key Management: ECC Cofactor Diffie-Hellman with P-384 curve

Message Authentication: SHA-384

Crypto Services:

- Data: GbE/10G/40G Ethernet
- Storage: 4G/8G/10G/16G FC

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

Product Options

Transponder: 850/1310nm to C/DWDM, 3R

Mux/Demux: 2x4 / 1x8 wavelengths

Amplifier: 1/2 EDFA (booster/pre-amp)

DCM: Up to 200km

Optical Switch: 1+1 facility protection

CWDM Link

Wavelength: ITU-T G.694.2 1270-1610nm, 20nm spacing

DWDM Link

Wavelength: ITU-T G.694.1 channels 15-60, 100GHz spacing, optional tunable SFP+ with 50GHz spacing

OSC: 1490nm, 1510nm

Optical Reach: 400km for 1.25Gbps, 200km for 2.66Gbps, 80km for 4.25/8.5/10Gbps, 40km for 16G FC

Optical Output Power:

- Sub-10G: 0dBm (min) to +4dBm (max)
- 8G/10G: -1dBm (min) to +2dBm (max)

Sensitivity:

- Up to 2.66Gbps: -28dBm APD
- 4G/8G/10G: -24dBm APD, -14dBm PIN

Optical Monitoring: Tx & Rx power

Link Attenuation: <4dB (mux + demux)

Service Side

Interface Rates: 1.25G to 10.51875G

Optical Interface: 850nm, 1310nm, 1550nm

Non Crypto Services:

1G/2G/4G/8G/10G/16G FC, 1G/10G LAN, STM-4/OC-12, STM-16 /OC-48, STM-64/OC-192, CPRI 1-7, Video HD-SDI, 3G-SDI

Copper Services: 1000MBase-T

Amplifier

Applications: Booster, pre-amp

Output Power: Booster: +17dBm, +20dBm, 23dBm, pre-amp: +14dBm

Input Power: Booster: -24 to +16dBm, pre-amp: -36dBm up to 0dBm

Gain: Booster: +8dB to +22dB, pre-amp: +20dB

Operating Modes: Automatic gain control (AGC), automatic power control (APC)

Eye Safety: Automatic laser power reduction upon fiber cut or disconnection

Network Management

Management Ports:

- RJ-45 LAN port 10/100MBase-T
- 2xSFP MNG ports 100/1000MBase-X
- RS-232 serial port
- DB9 external alarm port

Management Protocols:

- SNMP, HTTP, HTTPS, CLI over RS-232 or CLI over Telnet/SSH, Syslog, RADIUS, TACACS+, SNTP, RSTP, TFTP and FTP

NMS:

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

OAM: Facility loopback (client and line interfaces), PRBS, event logger, alarms, ALS

Performance Monitoring: Layer-1 PM for all services, Layer-2 PM for Ethernet, optical power Tx, Rx levels for all optical ports, 1G & 10G

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

Software Upgrade: Hitless traffic – dual image

Optical Switch

Topology: Protected point-to-point

Switching time: Less than 50ms

Signal WL: C-band and L-band

Max input power: 27dBm

Insertion loss: Transmit side 3.8dB, Receive side 1.2dB

Power Supply and Fans

AC/DC:

100 to 240 VAC or -38 to -60 VDC, 50/60Hz, 120W max

PSU Redundancy: Single/dual feeding, hot swappable

Cooling Unit: Hot swappable fan unit

Environmental

Operating Temperature:

-5°C to 50°C (+23°F to +122°F)

Humidity: 5% to 85% RH

Size:

Size:

- 1.77" (H) x 17.32" (W) x 9.05" (D)
- 45mm (H) x 440mm (W) x 230mm (D)

Weight: 5.5kg / 12.13lb (max)

Mounting: 19", 23" and ETSI

Approvals & Standards

- CE, FCC, RoHS, REACH
- NEBS ready
- CNSA Top Secret Suite B 2015 compliant

PL-1000RO/GRO ROADM

Flexible add/drop wavelength routing, up to 32 ports, Flex Grid ROADM

Features Overview

- Flexible add/drop of wavelengths
- 4/8/32-degree ROADM
- Flex Grid
- Supports a mix of 10G/100G/200G/400G/800G and 1.6T wavelengths
- C-band 4.8Thz optical spectrum
- Up to 96 C-band add/drop wavelengths (configurable)
- WDM spacing - 50/75/100/150GHz or Flex Grid
- Supports automatic channel restoration
- Power monitoring on all channels - add and drop
- Optical power equalization between all channels
- Embedded OSC for remote management and optional OTDR
- Remote management and fiber monitoring with OSC OTDR SFP
- A-to-Z provisioning of wavelengths and protection through NMS system
- Supports optional embedded EDFA booster/pre-amp
- Dual AC or DC pluggable power supplies and pluggable fan unit

Colorless, Directionless, Directionless Flex Grid

The PL-1000RO/GRO offers ROADM functionality based on advanced next generation wavelength-selective switch (WSS) technology.

The device offers highly flexible wavelength routing capabilities for mesh, ring, linear add/drop, core and edge network topologies. This CDC-F ROADM - colorless, directionless, contentionless, and a mix of 50GHz grid, 75GHz grid, 100GHz grid or 150GHz grid wavelength bandwidths over the fiber using Flex Grid. All grid options are user-configurable.

Full Wavelength Management

The PL-1000RO/GRO is configured to dynamically add/drop selected wavelengths at any node in the network and can seamlessly change the network node capacity as needed. The device automatically equalizes and balances the power of the added and bypassed wavelengths.

The device simplifies network management and reduces operation costs (OPEX) by allowing fast deployment of new wavelengths remotely.



Main Benefits

- Flexible, fully managed and monitored ring and mesh network backbone infrastructure
- Fast delivery of wavelengths and capacity
- Visibility and records of all network wavelengths
- Mix of 100G/200G/400G/800G over the same fiber
- Supports 3rd party wavelengths - no need for license
- Power monitoring on all channels and automatic power balancing of the wavelengths
- User-friendly NMS to deploy new services, control and monitor the network

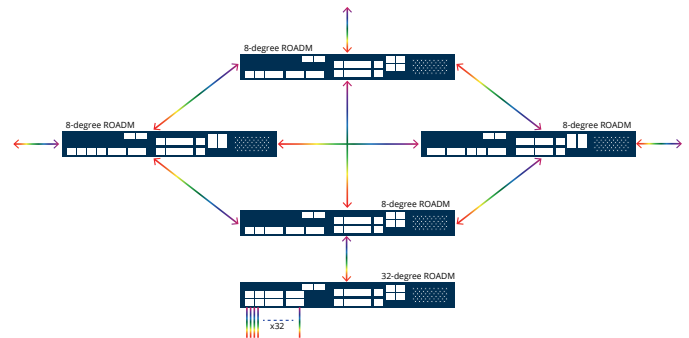


Diagram of ROADM Network

Recommended Applications

- Wavelength routing and management for mesh, ring, linear add/drop, core and edge network topologies
- Wavelength power balancing in amplified links
- Multiple data center connectivity for delivering high bandwidth and services connectivity
- Building flexible metro network between multiple colocations
- Infrastructure for building multi-site, private DCI network

Technical Specifications

	4 degree		8 degree		32 degree		Unit	Notes
	Min	Max	Min	Max	Min	Max		
Insertion Loss	13	14	8	10	5	8.5	dB	All ports
Channel Range	191.25	196.1	191.25	196.1	191.25	196.1	THz	Full C-band, 1528.77 to 1567.13nm
Channel Count	32/48/64/96 or Flex Grid		32/48/64/96 or Flex Grid		32/48/64/96 or Flex Grid		Channels	50/75/100/150GHz spacing ITU grid (CH13-CH60) or Flex Grid
PMD	-0.2	0.2		1.2		1.2	ps/nm	In passband
VOA Range	0	15	0	15	0	15	dB	

Full C-band Amplifier

Output Power:

- Pre-amp 20dBm
- Booster 23dBm

Input Power:

- Pre-amp 20dB
- Booster 8-22dB

Gain: 8dB to 38dB

Operating Modes:

Automatic gain control (AGC)

Eye Safety:

Automatic laser power reduction upon fiber cut or disconnection

Physical Dimensions

Size:

PL-1000RO:

- 1.77" (H) x 17.32" (W) x 9.05" (D)
- 45mm (H) x 440mm (W) x 230mm (D)

PL-1000GRO:

- 1.77" (H) x 17.32" (W) x 13.78" (D)
- 45mm (H) x 440mm (W) x 350mm (D)

Weight:

PL-1000RO: 5.5kg / 12.13lb (max)

PL-1000GRO: 8.5kg / 18.74lb (max)

Mounting: 19", 21" and 23"

Network Management

Management Ports

- 2xRJ-45 LAN port 10/100/1000MBase-T
- 2xSFP MNG ports 1000MBase-X
- 8xSFP MNG ports 100MBase-X
- RJ45 serial port
- RJ45 external alarm port

Management Protocols:

SNMP, HTTP, HTTPS, CLI over RS-232 or CLI over Telnet/SSH, Syslog, RADIUS, TACACS+, SNMP, TFTP and SFTP

NMS:

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

Performance Monitoring:

- Layer-1 PM for all wavelengths
- OCM for input and output directions

Visual Indicators:

LED status indicators for: Management and LAN ports, amplifier/s, system Critical/Major/Minor and Power Supply

Software Upgrade:

Hitless traffic – dual image

Power Supply

AC/DC:

PL-1000RO:

100 to 240 VAC or -44 to -60 VDC, 50/60 Hz, 78W max

PL-1000GRO:

100 to 240 VAC or -44 to -60 VDC, 50/60 Hz, 120W max

PSU Redundancy:

Single/dual feeding, hot swappable

Cooling Unit:

Hot swappable fan unit

Environmental

Operating Temperature:

0°C to 45°C (32°F to 113°F)

Humidity:

5% to 85% RH

Approvals & Standards

- CE, FCC, RoHS, REACH
- NEBS ready

PL-1000D Diagnostics and Monitoring Solution

Diagnostic device using OTDR to detect fiber quality and cut, and OSA for spectrum and OSNR analysis

Features Overview

- Monitoring up to 16 fibers simultaneously, 8 by the OTDR and 8 by the OSA
- Controlled with PacketLight web application or PacketLight's Lightwatch™ NMS
- Main Metro OTDR features:
 - Integrates 1:8 optical switch, OTDR, OADMs
 - 24dB fiber loss
 - Integrated with third party GIS tools
- Main Regional OTDR features:
 - Integrates 1:8 optical switch, OTDR, OADMs
 - 32dB fiber loss
 - Integrated with third party GIS tools
- Main OSA features:
 - Integrates 1:8 optical switch, OSA, splitters
 - Supports full C-band 50GHz/100GHz ITG grid
 - Measures the power, frequency and OSNR of the optical channels in the fiber
- 1U footprint 19"
- Dual redundant AC/DC power suppliers
- Hot swappable fan unit
- Low power consumption

How the PL-1000D Works

The PL-1000D consists of two technologies for non-intrusive monitoring live fiber optic networks. The OTDR locates fiber cut by sending high-powered diagnostic optical pulses into the fiber and creating Rayleigh back-reflections. The returning signals are measured and calculated, indicating the accurate location and intensity of the fault. The OSA presents for each fiber the optical spectrum and the OSNR of each wavelength, providing the operator with a full, accurate and detailed picture of the fiber.

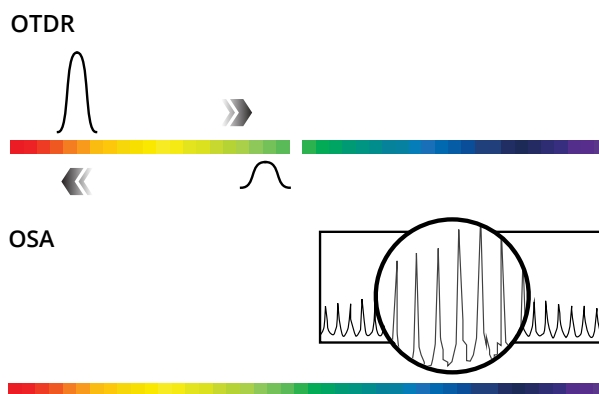


Main Benefits

- Simultaneous OTDR diagnostics of up to 8 fibers
- OSA monitoring of up to 8 fibers
- In-service fiber monitoring
- Operates over dark fiber or over third party network
- Detection of fiber degradation
- Raises alarm when trace events are changed
- Graphical display of the OTDR and OSA in any browser

Full Fiber Diagnostic Device

The PL-1000D conducts full non-disruptive monitoring and analysis of the network's fiber. The OTDR monitors up to 8 fibers simultaneously, identifying a break or degradation in each fiber and where the break is. The embedded OSA provides the full optical DWDM spectrum and OSNR of up to 8 fibers simultaneously. The solution provides high-level visibility of the fiber characterization and operating wavelengths and saves network managers time and OPEX expenses associated with identifying and repairing faults.



PL-1000D OTDR and OSA Solution

Recommended Applications

- Monitoring dark fibers service/infrastructure
- Monitoring lighted DWDM fibers
- In service OTDR measurements for DWDM networks
- In service OSA measurements for DWDM networks
- Detection of fiber degradation

Technical Specifications

Product Configurations

- Metro or Regional OTDR
- OSA

Metro OTDR

- Wavelength:** 1610nm
- Distance Range:** 120 km
- Dynamic Range:** 24dB
- Loss Measurement Accuracy:** ±0.1dB
- Max Optical Output Power:** 17dBm

Regional OTDR

- Wavelength:** 1610nm
- Distance Range:** 140 km
- Dynamic Range:** 32dB
- Loss Measurement Accuracy:** ±0.1dB
- Max Optical Output Power:** 20dBm

OSA

- Channel Spacing:** 50GHz or 100GHz ITG grid
- Frequency Window:** C-band
- Frequency Accuracy:** ±0.1GHz
- Slice Width:** 0.3125GHz
- Min Channel Width:** 312.5MHz
- Max Channel Width:** 4.875THz
- Input Channel Power (Pch):** -35dBm – 0dBm
- Channel Power Accuracy:** ±0.5dBm

Network Management

Management Protocols:

- SNMP, HTTP, HTTPS, CLI over RS-232 or CLI over Telnet/SSH, Syslog, RADIUS, TACACS+, SNMP, TFTP & FTP, SNMPv2/ SNMPv3

NMS:

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

Visual Indicators:

LED status indicators for Management and LAN ports, system Critical/Major/ Minor indicators, and Power Supply alarms

Software Upgrade:

Hitless traffic - dual image

Power Supply

AC/DC:

90 to 246 VAC or -36 to -60 VDC, 50/60 Hz, 60W max

PSU Redundancy:

Single/dual feeding, hot swappable

Cooling Unit:

Hot swappable fan unit

Environmental

Operating Temperature:

-5°C to 50°C (+23°F to +122°F)

Humidity:

5% to 85% RH

Physical Dimensions

Size:

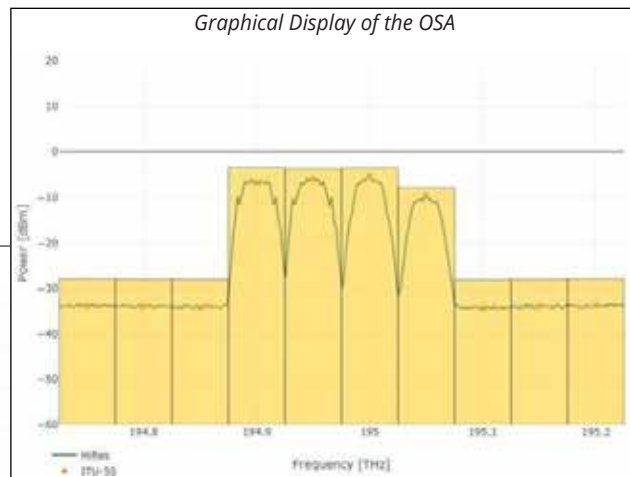
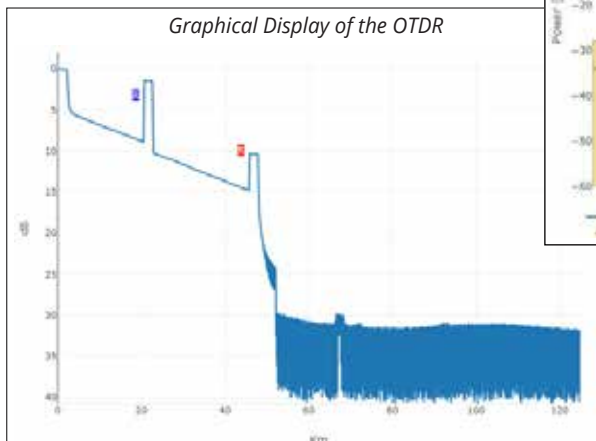
- 1.77" (H) x 17.32" (W) x 9.05" (D)
- 45mm (H) x 440mm (W) x 230mm (D)

Weight: 5.5kg / 12.13lb (max)

Mounting: 19", ETSI and 23"

Approvals & Standards

- CE, FCC, RoHS, REACH
- NEBS ready



PL-1000IL Optical Amplifiers

Versatile, cost-effective platform with single, dual or quad EDFA optical amplifiers

Features Overview

- Up to 4 amplifier modules in a 1U chassis
- Supports up to 96 wavelengths
- Supports AGC and APC operation modes
- Embedded OSC for remote management and topology detection
- Remote management and fiber monitoring with OSC OTDR SFP
- Optional optical switch for facility protection
- Integrated single/dual DCM for long distance 10G amplified links
- Supports single and dual fiber operation
- Supports optional up to 16 channel mux/demu
- Offers several EDFA types:
 - Booster
 - Inline
 - Pre-amplifiers
 - Midstage
- Low power consumption
- Built-in eye safety mechanism
- Monitoring on the input and output power and user configurable gain
- Dual AC or DC pluggable power supply and fan unit

Long Distance and Attenuation in the Network

The PL-1000IL is designed to cost-effectively extend the optical link power budget for building long distance DWDM solutions. It provides amplification for a range of optical solutions, from single wavelength, up to the full C-band, and incorporates several types of low-noise Erbium-doped fiber amplifiers (EDFAs): booster, inline, and pre-amplifier.



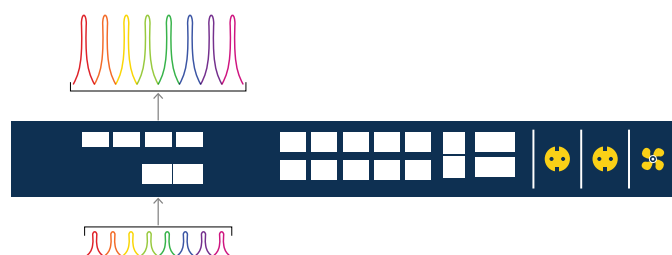
Main Benefits

- Fully managed via dedicated integrated OSC
- Full remote monitoring on the input and output power, and user-configurable gain
- Eye safety feature - automatically shuts down the EDFA in case of fiber interruption
- Fully integrated solution including mux/demux, amplifier, and DCM
- Integrates with PacketLight management platforms and transponder/muxponder products

Flexibility in Services over the Same Fiber

The PL-1000IL is fully managed, configured and monitored remotely as part of the network, via optical supervisory channel (OSC). The device supports AGC and APC operation modes. The EDFA gain is controlled, adjusted and monitored by the user, and APC operating mode allows to maintain constant output power.

The EDFA has high optical signal to noise ratio (OSNR), enabling to cascade several EDFAs to form an amplified OTN link over long distances, without the need for regenerators.



PL-1000IL Integrated Amplification Solution

Recommended applications:

- Extending the optical link power budget to meet distance and attenuation requirements of DWDM networks
- Upgrading the optical link budget to support 10G/40G/100G services
- Reducing the number of regenerators and sites along the fiber
- Overcoming high loss in old fiber infrastructure
- Facility protection for fiber redundancy solutions
- Inline, edge and unidirectional mid-stage applications

Technical Specifications

System

Topology: Point-to-point, ring, linear ADM, inline, edge or midstage

Transport Network Medium: Metro DWDM / dark fiber

Software Upgrade: Dual image, hitless swap

Booster

Output Power: Up to 23dBm

Input Power: -24dBm up to 16dBm

Gain: 8dB to 22dB

Inline

Output Power: Up to 23dBm

Input Power: -24dBm up to 13dBm

Gain: 5dB to 22dB

Pre-amplifier

Output Power: Up to 14dBm

Input Power: -36dBm up to 15dBm

Gain: 20dB

Midstage

Output Power: 8dBm per channel

Input Power: -36dBm up to 15dBm

Total Output Power: up to 23dBm

Gain: up to 40dB

General

Gain Flatness: +/-1dB

Noise Figure: 4-6dB

PMD: 0.3ps

PDL: 0.3 dB

Operating Modes:

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

Eye Safety: Automatic laser power reduction upon fibre cut or disconnection

Optional Optical Switch

Switching Time: <50ms

Max Input Power: 27dBm

Insertion Loss Transmit Side: 3.8dB

Receive side: 1.2dB

Network Management

Management Ports:

- RJ45 10/100Base-T
- 2xSFP 100Base-X
- RS-232 serial port
- DB9 alarm port
- 8xSFP 100Base-X MC ports

Management Protocols:

- SNMP, HTTP, HTTPS, CLI over RS-232 or CLI over Telnet/SSH, Syslog, RADIUS, TACACS+, SNTp

NMS:

- PacketLight LightWatch™ NMS or third party NMS over SNMP

OAM: Input/output power monitoring event logger and alarms

Management Channel: 2 x optical supervisory channel (OSC)

Visual Indicators: LED status indicators for EDFA ports, power and system

Software Upgrade: Hitless traffic - dual image

DCM

DCM Type : Tunable DCM or fixed DCM

Fibre Type: G.652

Fibre Span: 20-200km

Max insertion loss: <3dB

Standard: ITU G.671

Power Supply

AC/DC: 90 to 246 VAC or -36 to -60 VDC, 50/60 Hz, 60W max

PSU Redundancy: Single/dual feeding, hot swappable

Cooling Unit: Hot swappable fan unit

Physical Dimensions

Size:

- 1.77" (H) x 17.32" (W) x 9.05" (D)
- 45mm (H) x 440mm (W) x 230mm (D)

Weight: 5.5kg / 12.13lb (max)

Mounting: 19", ETSI and 23"

Environmental

Operating Temperature: -5°C to 50°C (+23°F to +122°F)

Humidity: 5% to 85% RH

Approvals & Standards

- CE, FCC, RoHS, REACH
- NEBS ready

PL-1000R Raman Amplifier

Counter-propagating Raman amplifier and hybrid Raman-EDFA

Features Overview

- Counter-propagating Raman amplifier with optionally embedded booster and preamp EDFAs in 1RU
- Detection of open connectors and/or broken fiber up to few tens of kilometers from the pump module
- High power connector safety switch cover
- Supports the following Raman configurations:
 - Counter-propagating Raman
 - Hybrid Raman-EDFA
- Up to 12dB average gain for G.652 fiber (2-pump)
- Gain flattening optimization based on fiber type and pump power
- Effective noise figure (NF) of -1dB
- Remote management with OSC
- Remote management and fiber monitoring with OSC OTDR SFP
- 1U footprint with low power consumption
- Dual AC or DC pluggable power supply and pluggable fan unit
- Web-based GUI and SNMP EMS management

Distributed Raman Amplification

The PL-1000R is designed for distributed Raman amplification applications, cost-effectively extending the optical link power budget and significantly improving OSNR for building long distance DWDM solutions. It provides amplification for a range of optical solutions and incorporates several configurations of Raman amplifier, including counter-propagating and hybrid Raman-EDFA.



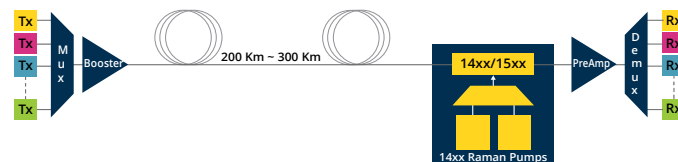
Main Benefits

- Acts as terminal Raman amplifier and as inline hybrid Raman-EDFA
- Full remote monitoring
- Eye safety feature - automatically shuts down the Raman in case of fiber interruption
- Detects fiber disruption or cut tens of kilometers from the pump
- Integrates with PacketLight management platforms and transponder/muxponder products

Laser Safety

The PL-1000R is fully managed, configured and monitored remotely as part of the network via optical supervisory channel (OSC). The Raman is controlled, adjusted and monitored by the user.

The Raman includes three eye safety mechanisms that shut down the unit in case of fiber link disruption, such as open connectors or broken fiber, even at a distance of a few tens of kilometers from the unit.



PL-1000R Raman Amplification Solution

Recommended Applications

- Long repeaterless links
- Low latency links (less FEC and O-E-O conversion)
- Storage area networks (SANs), remote locations, disaster recovery
- Security-sensitive applications
- Improving OSNR in long-haul and ultra-long haul links
- High capacity transmission and/or increasing channel count to 96 WDM channels

Technical Specifications

Optical Specifications - Raman

Wavelength Range: 1529-1565nm

Wavelength Range, OSC: 1500-1520nm

Input Power Range: -47dBm to -5dBm

Gain: 12dB

Maximum Pump Power: 550mW
(2 pumps)

Average Gain (G.652 fiber): 12dB
(typical for 2 pumps)

Operating Mode: Automatic power control (APC)

Gain Flatness: +/-0.6dB

Signal Insertion Loss: 2.9dB

Noise Figure: -1dB

PDG: 0.3dB

PMD: 0.6psec

Eye Safety: Automatic laser power reduction upon fibre cut or disconnection

Monitored Parameters

- Pump power
- Signal power
- Back-reflected power
- Operating temperature

Optical Specifications - Booster EDFA

Output Power: Up to 23dBm

Input Power: -24dBm up to 14.5dBm

Gain: 8dB to 22dB

Optical Specifications - PreAmp EDFA

Output Power: Up to 20dBm

Input Power: -36dBm up to -7dBm

Gain: 20dB

Network Management

Management Ports:

- RJ45 10/100Base-T
- 2xSFP 100Base-X
- RS-232 serial port
- DB9 alarm port
- 8xSFP 100Base-X MC ports

Management Protocols:

- SNMP, HTTP, HTTPS, CLI over RS-232 or CLI over Telnet/SSH, Syslog, RADIUS, TACACS+, Sntp

NMS:

- PacketLight LightWatch™ NMS or third party NMS over SNMP

OAM: Input/output power monitoring event logger and alarms

Management Channel: Optical supervisory channel (OSC)

Visual Indicators: LED status indicators for ports, eye safety, power and system

Software Upgrade: Dual image, hitless swap

Power Supply

AC/DC: 90 to 246 VAC or -36 to -60 VDC, 50/60 Hz, 60W max

PSU Redundancy: Single/dual feeding, hot swappable

Cooling Unit: Hot swappable fan unit

Physical Dimensions

Size:

- 1.77" (H) x 17.32" (W) x 9.05" (D)
- 45mm (H) x 440mm (W) x 230mm (D)

Weight: 5.5kg / 12.13lb (max)

Mounting: 19", ETSI and 23"

Environmental

Operating Temperature:

-5°C to 50°C (+23°F to +122°F)

Humidity: 5% to 85% RH

Approvals & Standards

- CE, FCC, RoHS, REACH
- NEBS ready

PL-300 Passive Solutions

Up to 96ch Mux/Demux, DCM, OADM in 1U



Features Overview

- Passive transparent any rate, any service multiplexing
- Compliant with all optical networking products (ITU grid)
- DWDM passive optical mux/demux supported configuration: 4/8/16/32/48/64/96 channels
- CWDM passive optical mux/demux supported configuration: 4/8/16 channels
- Integrates up to four DCMs
- OADM for 1-4 wavelengths
- Supports single and dual fiber operation
- Integrates with all PacketLight products
- Stackable solution for multiplexing multiple optical services
- Supports full C-band and L-band
- Supports 150GHz, 100GHz, 75GHz, and 50GHz
- Simple installation and modularity
- Optional TAP Monitoring Port

Maximize Fiber Utilization & Capacity

The PL-300 provides passive optical layer functions for 4-96 DWDM wavelengths mux/demux, 4-16 CWDM wavelengths mux/demux, optical dispersion compensation module (DCM), optical add and drop (OADMs), splitters and combiners.

The passive optical network products interconnect seamlessly with PacketLight's transponder, muxponder, amplifier and ROADM product lines, and third party WDM products, to form cost-effective high capacity DWDM and CWDM solutions.

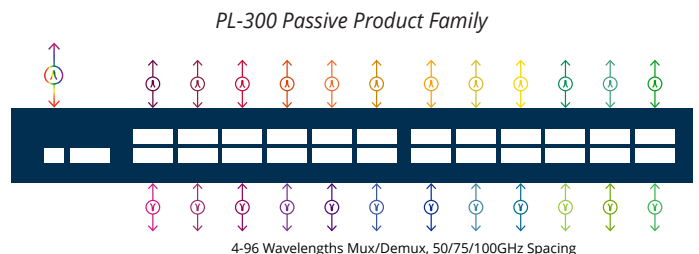
Main Benefits

- Customized per customer application requirements
- Standards-based and can integrate with third party solutions
- Scalable solution, allowing customers to expand as needed, saving operating costs and resources

Flexibility in Services over the Same Fiber

The PL-300 provides high granularity wavelength add and drop capabilities and offers a large set of passive optical modules that are tailored to the customers' network requirements.

The device supports a wide range of CWDM and DWDM mux/demux, OADMs and DCMs in various configurations, suitable for any type of CWDM, DWDM, OTN and ROADM network building block.



Recommended Applications

- Expansion of existing fiber capacity regardless of service type
- Building scalable high capacity pay-as-you-grow optical networks
- Low cost fully passive optical layer solution, transparent to service rate and type
- Extending the fiber optical solution reach for 10G services with DCMs
- Building cost-effective add and drop networks
- Enables stackable solution

Technical Specifications

	Description	# MUX WLS	MUX 1 [nm]	MUX 2 [nm]	Insertion Loss (Mux + Demux)
CWDM	Dual Fiber 4ch Mux/Demux	4	1471-1531		<4dB
	Dual Fiber 8ch Mux/Demux	8	1471-1611		<4dB
	Dual Fiber 16ch Mux/Demux	16	1311-1611		<6dB
	2 x Dual Fiber 4ch Mux/Demux	4	1471-1531	1471-1531	<4dB
	2 x Dual Fiber 8ch Mux/Demux	8	1471-1611	1471-1611	<4dB
	2 x Dual Fiber 16ch Mux/Demux	16	1311-1611	1311-1611	<6dB
	Single Fiber 8ch Mux	8	1471-1611		<4dB
	Single Fiber 16ch Mux	16	1311-1611		<6dB
	2 x Single Fiber 8ch Mux	8	1471-1611	1471-1611	<4dB
	2 x Single Fiber 16ch Mux	16	1311-1611	1311-1611	<6dB
DWDM	Dual Fiber 4ch Mux/Demux	4	CH28-CH31		<4dB
	Dual Fiber 8ch Mux/Demux	8	CH28-CH35		<4dB
	Dual Fiber 16ch Mux/Demux	16	CH20-CH35		<11dB
	Dual Fiber 32ch Mux/Demux	32	1571.24-1610.49		<6
	Dual Fiber 32ch Mux/Demux	32	1529.358-1566.518		<6
	Dual Fiber 48ch Mux/Demux	48	CH13-CH60		<11dB
	Dual Fiber 64ch Mux/Demux	64	1529.3-1567.1		<12dB
	Dual Fiber 96ch Mux/Demux	96	CH13-CH60.5		<12dB
	2 x Dual Fiber 4ch Mux/Demux	4	CH28-CH31	CH28-CH31	<4dB
	2 x Dual Fiber 8ch Mux/Demux	8	CH28-CH35	CH28-CH35	<6dB
	2 x Dual Fiber 16ch Mux/Demux	16	CH20-CH35	CH20-CH35	<11dB
	Single Fiber 8ch Mux	8	CH28-CH35		<6dB
	Single Fiber 16ch Mux	16	CH20-CH35		<11dB
	Single Fiber 96ch Mux	96	CH13-CH60.5		<12dB
	2 x Single Fiber 8ch Mux	8	CH28-CH35	CH28-CH35	<6dB
	2 x Single Fiber 16ch Mux	16	CH20-CH35	CH20-CH35	<11dB
	2 x Single Fiber 8ch Mux Red/Blue	16	CH21-CH36	CH45-CH60	<12.5dB

DWDM Add/Drop Insertion Loss

Single ch.: Express 0.8dB, add/drop 1.5dB

Dual ch.: Express 1.3dB, add/drop 1.5 dB

Quad ch.: Express 2.5dB, add/drop 2.7dB

Splitters/Combiners Insertion Loss

DWDM: 1.5dB

CWDM: 0.8dB

1310nm: <1.5dB

DCM

Fibre Type: G.652 PMD: <1.2ps

Fibre Span: 20km-200km

Wavelength Range: 1527nm-1567nm

Residual Dispersion: <+/-2%

Max Insertion Loss: 3dB

Environmental

Operating Temperature:
-5°C to +50°C (+23°F to +122°F)

Physical Dimensions 1U:

Size

1U

- 1.77" (H) x 17.32" (W) x 9.05" (D)
- 45mm (H) x 440mm (W) x 220mm (D)

1.5U

- 2.65" (H) x 17.32" (W) x 9.05" (D)
- 66mm (H) x 440mm (W) x 220mm (D)

Weight: 5.5kg / 12.13lb (max)

Approvals & Standards

- RoHS, REACH, ETSI, Telcordia GR-12, NEBS ready
- Standards: ITU G.671

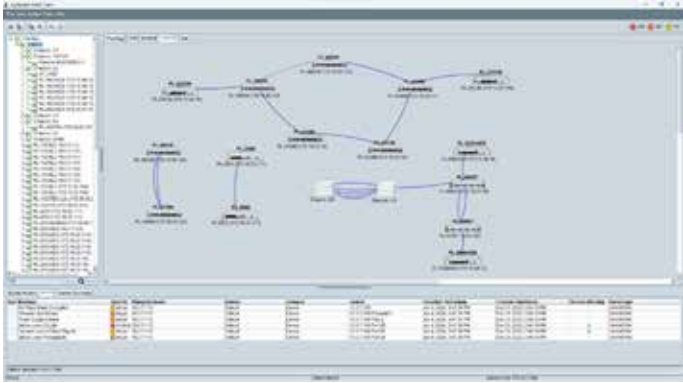
For more information please contact us at www.packetlight.com

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PacketLight LightWatch NMS

Multi-platform Java-based network management system (NMS)



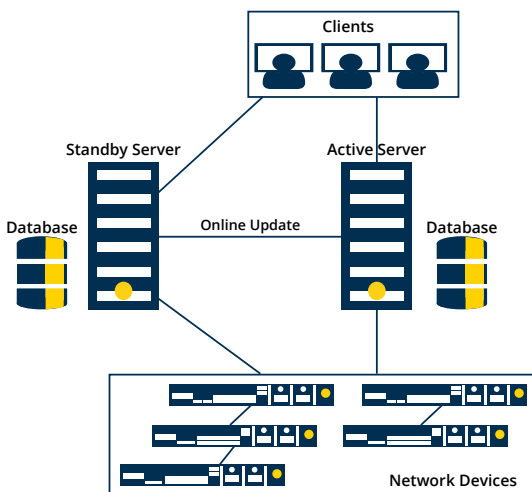
Overview

PacketLight LightWatch™ provides full fault management, configuration, accounting, performance, security (FCAPS) functionality and is compliant with telecommunications management network (TMN) standards.

LightWatch is built with a client-server architecture. It uses the MySQL™ database, and is built with modular client pay-as-you-grow offerings, scalable to 700 network elements and 20 clients.

For fast and complete recovery, LightWatch supports server redundancy and daily database backup.

LightWatch also provides centralized management of user accounts and several types of users with configurable access privileges: Administrators, NetAdmins, Technicians, Users.



Client-server Architecture

Technical Specifications

Hardware Requirements

Server:

Devices	CPU	RAM	Disk Space
200	6 cores @ 3Ghz	12Gb	HDD/SSD 400Gb
400	12 cores @ 3Ghz	24Gb	SSD 600Gb
700	16 cores @ 3.5Ghz	32Gb	SSD 800Gb

Client:

- CPU: Intel® Core I5 2.5Ghz or higher
- RAM: Minimum 8GB
- Hard Disk: 4GB free space

Software Requirements

Server:

- Windows Server 2019/2022
- Windows 10/11
- Linux Ubuntu 22.04/ 20.04.6

Client:

- Windows 10/11
- Linux Ubuntu 22.04/ 20.04.6
- macOS 14.1.1 Big Sur

Scalability

Network Elements: Up to 700

Clients: Up to 20

Management Protocols

Between Server to NE: SNMPv2c/v3

File Transfer Between Server to/from NE: TFTP/SFTP

Web Browser to NE: HTTP/HTTPS

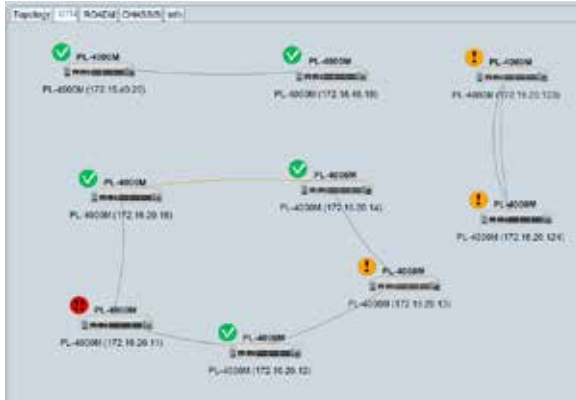
CLI to NE: Telnet/SSH

Syslog Messages from NE to the Server: Syslog

Highlights

- Hierarchical topology of the devices in the network
- NMS server resiliency
- Network fault management
- Network inventory management
- Task scheduling (upload/download)
- Collects and stores PM counters from all network elements
- Advanced A-Z service management

Topology



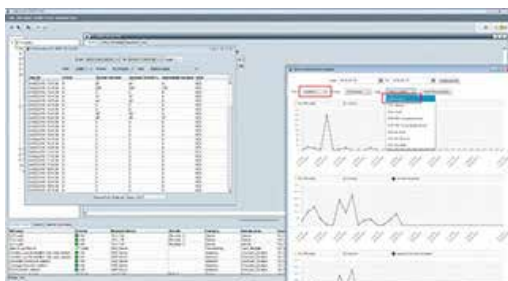
- Allows hierarchical domains in the network
- Automatic network topology discovery
- Manual drawing of the connections between nodes
- Multi-chassis management
- Allow definition of background map

Fault Management



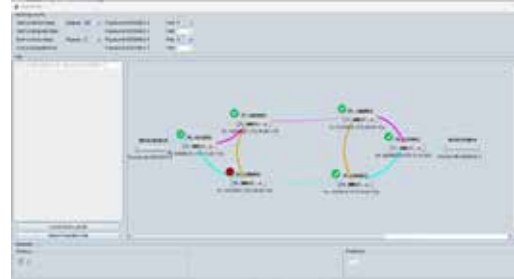
- Displays history of network events
- Shows current alarms
- Supports filtering events and alarms
- Keeps up to 30 days of event history
- Event forwarding to email
- Supports audible alarms

Performance Management



- Collects PM from all devices in the network
- Displays 30 days of history of 15-minute and Day PM data
- Supports configurable graphical view of PM data
- Supports export of PM information into an external file

SMM - Service Management Module



- Supports OTN and channel service provisioning.
- Supports ring, linear add/drop and multi degree topologies.
- Supports provisioning of unprotected, protected and restoration services.

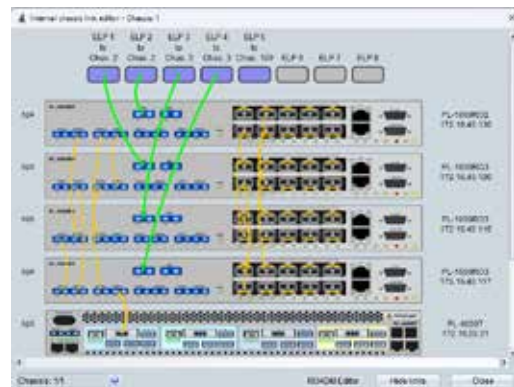
Task Scheduling

- Download of new SW version into groups of device elements
- Upload of configuration files from group of device elements
- Download of configuration files into group of devices
- Downloading license files into group of devices
- Uploading log files from group of devices

Inventory

- Displays inventory of group of network elements
- Filters network elements according to field values
- Supports export of inventory into an external file

Chassis Management



- Supports virtual chassis view with each device information
- Supports drawing the internal connections within the virtual chassis
- Supports full service awareness with advanced chassis service management module (CSMM)
- Automatic consistency check with other service provisioning wizards

PL-Care Support

Global Professional Services



PacketLight Care Center (PLCC)

PacketLight's optical network solutions are designed and engineered for smooth installation and uninterrupted service

PacketLight Care Center (PLCC) goals are to deliver exceptional support and consulting services to our customers, with the aim of ensuring successful operation and no disruptions to mission-critical operations.

Your Partners

- Our fiber optic professional team is your partner in design, planning, implementation and maintenance of your optical network.
- We are your consultants in optimizing optical networks in order to meet your business objectives and budgets.
- We are here to assist you every step of the way in building a reliable, scalable and cost-effective optical network.
- Our highly trained technical team is here to provide 24/7 support, and ensure your network is always up and running.

Expert Assistance

The PLCC team consists of highly trained support and engineering teams, and certified personnel that serve as the backbone for providing professional and quick resolution where required. We provide our customers with expert consulting and troubleshooting assistance, online tools, and a variety of training programs.

In addition, customers can take advantage of PLCC's tools that monitor and simulate their networks. The service team provides 24x7 support to customers worldwide, with mission critical services when needed.

PLCC Support Packages

PL-CARE1

PL-CARE1 covers initial hardware and software warranty for a period of one year after shipment.

The initial hardware warranty includes repair of faulty PacketLight equipment in accordance with the warranty agreement and PLCC's RMA guidelines.

The initial software warranty includes new software versions and access to the most updated maintenance versions for all PacketLight equipment.

PL-CARE2

PL-CARE2 package includes PL-CARE1 features, as well as a dedicated 24x7 call center for nonfunctioning or faulty PacketLight products, and any other issue that may arise.

PL-CARE3

PL-CARE3 package includes all PL-CARE1 and PL-CARE2 features, as well as spare parts dispatched from local offices or PacketLight headquarters, within the next business day (NBD).

Highlights

- Pre-sales consulting
- 24x7 technical support
- Worldwide training
- Turnkey projects
- Onsite installation

	Software Upgrades	Extended Warranty	8x5 Phone Support	24X7 Phone support	Spares - NBD Delivery
PL-CARE 1	●	●	●		
PL-CARE 2	●	●	●	●	
PL-CARE 3	●	●	●	●	●

Industry Leading Optical Networks Manufacturer

Established in 2000, PacketLight Networks offers a suite of leading CWDM and DWDM solutions for transport of data, storage, voice and video applications over dark fiber and WDM networks.

PacketLight provides the entire optical layer transport solution within a highly integrated compact platform of 1U devices, designed for maximum flexibility, easy maintenance and operation, with real pay-as-you-grow architecture, while maintaining a high level of reliability and low cost.

Our products are easy to install, enable fast network deployment, take up minimal rack space and have low power consumption, all of which significantly reduce OPEX and CAPEX.

Applications

- Carriers, service providers, and dark fiber providers
- Insurance and financial institutions
- Strategic government organizations
- Research and education
- Enterprises and manufacturers
- IT integrators and data center providers
- Utility companies such as railway and power companies

Packetlight Partners

PacketLight works with a worldwide network of resellers and partners to provide you with a complete set of network services.

Consultancy and network design

PacketLight's partners offer our clients the benefit of their optical networking expertise by providing consultancy services that enable enterprises to understand how to implement a fiber optic network that best fits their organization.

Installation and deployment services

Our partners bring a wealth of experience from the optical networking market and have successfully deployed hundreds of PacketLight solutions worldwide.

Many partners hold close relationships with local fiber providers and are able to source out dark fiber for our clients, providing a full end-to-end optical solution.

Managed services

PacketLight partners offer deployment services as well as network monitoring services, fully managed from their network operation center (NOC).

