

2025



DWDM & OTN equipment

*unlock your fiber
optic network*

Equipment for DWDM & OTN Networks

Ein-Sof'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.

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

Reasons to Choose EIN-SOF



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, pay-as-you-grow architecture, network upgrades without service disruption, and guaranteed service level agreement (SLA).

Rich Feature Set

Integrated 1U 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 ROADM, all provide the flexibility to build a cost-effective, scalable, highly efficient optical network infrastructure.

Easy Deployment Life Cycle

Ein-Sof's LightWatch™ NMS and free 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 1U 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



Layer-1
encryption



Low power
consumption



1U rack mount



Multi operation
modes



Low latency
connectivity



High wavelength
utilization

Service	DCI			Metro			Long Haul		
800G	ES-8000G	T		ES-8000G	T		ES-8000G	T	
	ES-8000M	M		ES-8000M	M		ES-8000M	M	
400G	ES-4000T	T		ES-4000T	T		ES-4000T	T	
	ES-4000G	T							
100G	ES-2000T	T		ES-2000T	T		ES-2000T	T	
	ES-2000M	T		ES-2000M	T		ES-2000M	T	
	ES-4000G	T		ES-4000T	M		ES-4000T	M	
	ES-4000T	M		ES-4000M	M		ES-4000M	M	
	ES-4000M	M							
8/16/32G	ES-1000TE	T		ES-2000M	M		ES-2000M	M	
	ES-2000M	M		ES-4000M	M		ES-4000M	M	
	ES-4000M	M							
	ES-2000ADS	M	A						
10/25/40G	ES-1000TE	T		ES-1000TN	T		ES-1000TN	T	
	ES-2000M	M		ES-2000M	M		ES-2000M	M	
	ES-4000M	M		ES-4000M	M		ES-4000M	M	
	ES-2000ADS	M	A						
1-4G	ES-1000TE	T		ES-2000	A	M	ES-2000	A	M

T Transponder
M Muxponder
A ADM
Layer-1 Encryption

Infrastructure					
Diagnostics	ROADM	EDFA	Raman	Mux/Demux	DCM
ES-1000D	ES-1000RO	ES-1000IL	ES-1000R	ES-300	ES-300

NMS	Support
Ein-Sof LightWatch	ES-Care

Main Benefit

- High wavelength utilization
- Low latency connectivity
- Layer-1 encryption
- Simple to install and configure
- 1U form factor devices
- Network management system
- Integrated mux/demux, EDFA, optical switch, DCM (optional)
- Pay-as-you-grow architecture

Applications

- P&I& OM31MN /31MNO233MO1
- 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

ES-300 Passive Solutions

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

Features Overview

- Q Passive transparent any rate, any service multiplexing
- Q Compliant with all optical networking products (ITU grid)
- Q DWDM passive optical mux/demux supported configuration: 4/8/16/48/96 channels
- Q CWDM passive optical mux/demux supported configuration: 4/8/16 channels
- Q Integrates up to four DCMs
- Q OADM for 1-4 wavelengths
- Q Supports single and dual fiber operation
- Q Integrates with all Ein-Sof products
- Q Stackable solution for multiplexing optical services up to 200G each
- Q Supports full C-band and L-band
- Q Supports 100GHz and 50GHz
- Q 1U, 19" rack mount chassis
- Q Simple installation and modularity
- Q Optional TAP Monitoring Port

Maximize Fiber Utilization & Capacity

The ES-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 Ein-Sof's transponder, muxponder, amplifier and ROADM product lines, and third party WDM products, to form cost-effective high capacity DWDM and CWDM solutions.



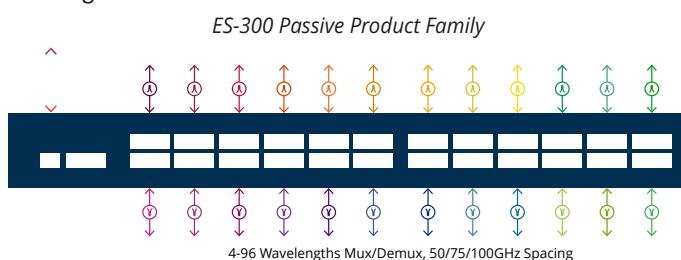
Main benefits

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

Flexibility in Services over the Same Fiber

The ES-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

- Q Expansion of existing fiber capacity regardless of service type
- Q Building scalable high capacity pay-as-you-grow optical networks
- Q Low cost fully passive optical layer solution, transparent to service rate and type
- Q Extending the fiber optical solution reach for 10G services with DCMs
- Q Building cost-effective add and drop networks
- Q Enables stackable solution of 100G/sub-100G products

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 8ch 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 48ch Mux/Demux	48	CH13-CH60		<11dB
	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	<4dB
	2 x Dual Fiber 16ch Mux/Demux	16	CH20-CH35	CH20-CH35	<11dB
	Single Fiber 8ch Mux	8	CH28-CH35		<2.5dB
	Single Fiber 16ch Mux	16	CH20-CH35		<6dB
	Single Fiber 48ch Mux	96	CH13-CH60.5		<6.5dB
	Single Fiber 96ch Mux	8	CH28-CH35	CH28-CH35	<3dB
	2 x Single Fiber 8ch Mux	16	CH20-CH35	CH20-CH35	<6dB
	2 x Single Fiber 8ch Mux	16	CH21-CH36	CH21-CH36	<12dB

DWDM Add/Drop Insertion Loss

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

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

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) operational

Physical Dimensions 1U:

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: 3.5kg / 7.7lb (max)

Approvals & Standards

RoHS, REACH, ETSI, Telcordia GR-12
NEBS ready

Standards: ITU G.671

ES-8000M 1.6T Muxponder

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

Features Overview

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

800G Muxponder/ Transponder

The ES-8000M is a modular and cost-effective high capacity solution for rolling out 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 ES-8000M integrates mux/demux, EDFA and OSW, delivering the entire optical layer. This flexible solution enables pay-as-you-grow architecture.

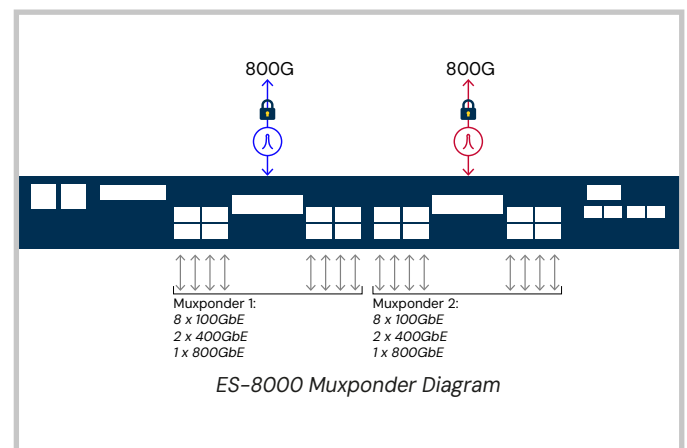


Main benefits

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

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

The ES-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.



Recommended Applications

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



Layer-1 encryption



1U rack mount



Cost-effective solution

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
- 4 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: 26dB 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:

- Ein-Sof 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
- 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, 50/60 Hz, -44 to -60 VDC, 300W max

PSU Redundancy: Single/dual feeding, hot swappable

Cooling Unit: Hot swappable fan unit

Environmental

Operating Temperature: -5°C to 45°C (+23°F to +113°F) operational

Humidity: 5% to 85% RH

Storage: 85°C

Physical Dimensions

1U:

- 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 quantum key distribution

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

ES-4000M 600G ADM/Muxponder/Transponder

600G multi-protocol multi-rate optical transport solution for metro and long haul networks

Features Overview

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

100/200/300/400G Long Haul & Metro Applications

The ES-4000M is a cost-effective solution for rolling out multi-rate 10/25/100GbE, 16G FC, OTU2/2e/4 services, or increasing existing network capacity. The device delivers 600G in a 1U chassis using dual 400G CFP2-DCO Open ROADM standard-based pluggable coherent modules for metro and long haul applications.

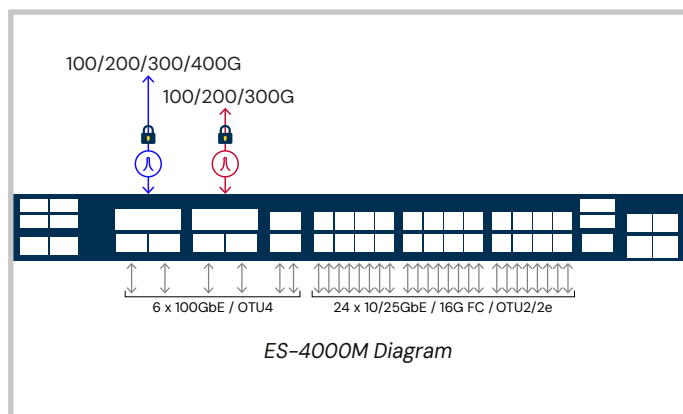


Main Benefits

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

Flexible Architecture, Facility Protection

The ES-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 10/25/100GbE, 16G FC, and OTU2/2e/4 service interfaces



Recommended Applications

- Q 300G/400G metro / long haul applications
- Q 100G/200G long haul applications
- Q High capacity DCI for enterprise, campus and cloud computing networks
- Q 400G links to bolster existing OTN/DWDM infrastructure
- Q Last mile access/aggregation CPE for 100GbE managed services
- Q Secured and encrypted communication for 10/25/100GbE, and OTU2/2e/4 services



Layer-1 encryption



1U rack mount



Cost-effective solution

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)

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 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)

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:

- Ein-Sof 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 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, 50/60 Hz, -44 to -60 VDC, 300W max

PSU Redundancy: Single/dual feeding, hot swappable

Cooling Unit: Hot swappable fan unit

Environmental

Operating Temperature: -5°C to 45°C (+23°F to +113°F) operational

Humidity: 5% to 85% RH

Storage: 85°C

Physical Dimensions

1U:

- 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 quantum key distribution

Algorithms:

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

Authentication:

- Role-based user/password authentication

Compliance:

- 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

ES-2000M 200G Muxponder/Transponder

200G over a single wavelength coherent transport solution

Features Overview

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

Data Center Interconnect and Metro Applications

The ES-2000M is an advanced 200G multi-protocol multi-rate solution for building high capacity optical transport networks. This 1U platform with flexible architecture enables the same device to be used in multiple applications and to adapt to network growth and changes.



Main Benefits

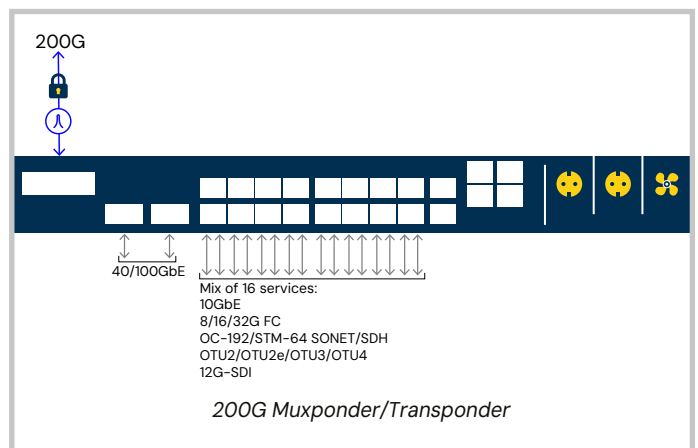
- Q Cost-effective 200G capacity over single wavelength
- Q Highly integrated 1U muxponder and transponder
- Q Supports flexible mix of client interface protocols
- Q Embedded GCM-AES-256 encryption for all protocols
- Q User-configurable 100G/200G operation mode

Modular, Cost-effective 200G Transport Solution

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

The device seamlessly integrates with Ein-Sof products to deliver carrier grade, high-end 200G solutions.



Reccomended Applications

- Q 100G for alien wavelength applications
- Q Metro network applications ranging up to 1,000km
- Q High capacity DCI for enterprise, campus and cloud computing networks
- Q 200G links to bolster existing OTN/DWDM infrastructure
- Q Last mile access/aggregation CPE for 10G/40G/100G managed services
- Q Secured, encrypted muncunation for all protocols



Layer-1 encryption



Low power consumption



1U rack mount



Multi operation modes

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 OTUC2/V2 – 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+, SNMP, TFTP & FTP, REST, NETCONF

NMS:

- Ein-Sof 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, 50/60 Hz, –36 to –60 VDC, 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) operational

Humidity: 5% to 85% RH

Physical Dimensions

1U:

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

Weight: 8.5kg / 18.75lb (max)

Mounting: 19", ETSI and 23"

Encryption

Functionality:

- Full speed, transparent Layer-1 encryption for selected clients or for the OTU4 uplinks
- Supports quantum key distribution

Algorithms:

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

Authentication:

- Role-based user/password authentication

Compliance:

- FIPS 140–2 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

ES-2000ADS 200G ADM/Muxponder/Transponder

Multi-protocol multi-rate 200G 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
- * Standards-based forward error correction (FEC) for short haul applications
- * Dual pluggable QSFP28 interfaces for uplink and client
- * Layer-1 GCM-AES-256 based encryption
- * Low latency muxponder/transponder/ADM
- * Comprehensive line and service performance monitoring
- * Remote management with in-band or out-of-band optical supervisory channel (OSC)
- * Supports standard MSA pluggable:
 - * SFP+ (8G/10G/16G/32G FC client)
 - * SFP28 (32G FC client)
 - * QSFP+ (40GbE client)
 - * QSFP28 (100GbE client)
 - * QSFP28 (100GbE uplink)
- * Dual AC or DC pluggable power supply and pluggable fan unit

Short Haul 200G Applications

The ES-2000ADS provides modular and cost-effective high transport capacity of up to 200G by aggregating multiple services into dual 100G OTU4 uplinks. 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.



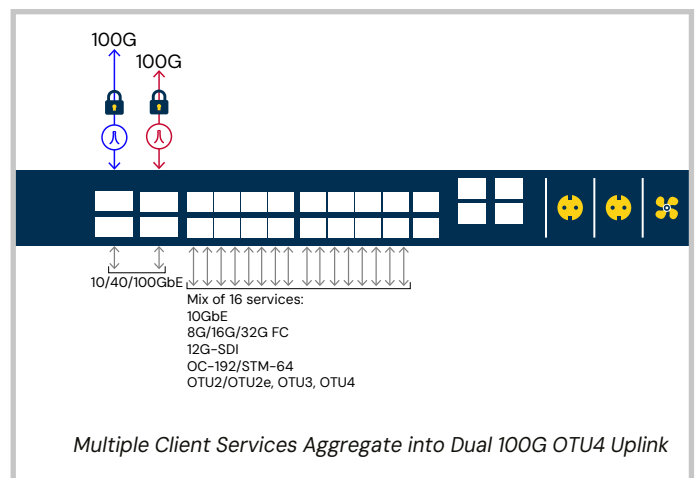
Main Benefits

- * Easy deployment and management of dual 100G short haul / access networks
- * Versatile 1U chassis platform, with very low power consumption
- * Embedded GCM-AES-256 encryption for all protocols
- * Encryption feeder in front of any third party OTU4 interface

Security and Encryption for all Services

The ES-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.



Recommended Applications

- * Last mile access/aggregation CPE for 10/40/100GbE managed service
- * High capacity, short haul enterprise and campus networks
- * Dynamic add/drop of services in ring and linear add/drop topologies
- * Feeder solution for third party OTU4 transponder card
- * Up to 200G Layer-1 encryption solution for 10/40/100GbE services
- * High bandwidth connectivity for data center and cloud computing



Layer-1 encryption



Low power consumption



1U rack mount



Multi operation modes

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: Standard ITU-T G.709 GFEC

Optical Reach: Up to 40km with ER4

Optical Output Power: 2dBm to -2dBm

Optical Monitoring: Tx and Rx power

Client Interfaces

Service type: 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)

Management:

- Web browser over HTTP/HTTPS,
- Ein-Sof 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, HTTPS, Telnet, SSH, Syslog, RADIUS, TACACS+,SNTP, 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, 50/60 Hz, -36 to -60 VDC, 170W 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

1U:

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

Weight: 8.5kg / 18.75lb (max)

Mounting: 19", ETSI, 23"

Encryption

Functionality:

- Full speed, transparent Layer-1 encryption for selected clients or for the OTU4 uplinks
- Supports quantum key distribution

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 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

ES-2000 20G ADM/Muxponder

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

Features Overview

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

Sub-10G Multi-protocol Multi-rate ADM/Muxponder

The ES-2000 provides an efficient and flexible aggregation layer of multi-protocol multi-rate sub-10G services into a 10G OTU2 uplink trunk, reducing the number of wavelengths needed for a sub-10G solution by a factor of 8 on average. The ES-2000 increases the spectral efficiency of WDM networks.



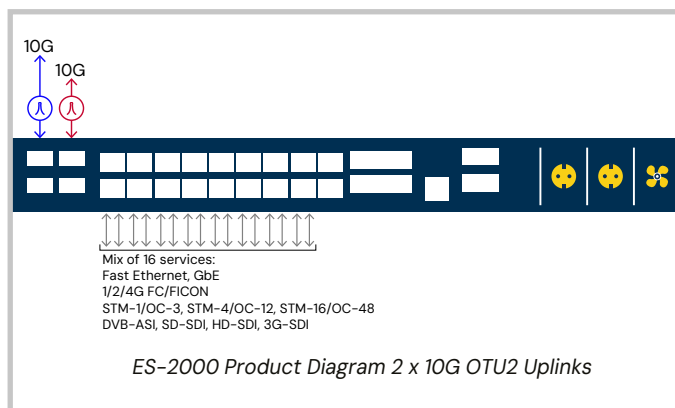
Main Benefits

- Q Provides a sub-10G gateway for 10/100G OTN networks supporting LR and tunable DWDM uplink modules
- Q Transparently multiplexes up to 16 client services into single or dual independent 10G OTU2 wavelengths
- Q Simultaneously aggregates SDH/SONET, Ethernet, Fibre Channel and video services

A Flexible Platform

The ES-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 Ein-Sof LightWatch NMS the system provides A-to-Z provisioning. The ES-2000 incorporates forward error correction suitable for long distance amplified DWDM network.



Recommended Applications

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



Low power consumption



1U rack mount



Multi operation modes

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 Configuration

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:

- Ein-Sof 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, 50/60 Hz, -36 to -60 VDC, 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) operational

Humidity: 5% to 85% RH

Physical Dimensions

1U:

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

Weight: 5.5kg / 12.1lb (max)

Mounting: 19", ETSI and 23"

Approvals & Standards

- CE, FCC, RoHS, REACH
- NEBS ready

ES-4000T 1.6T Muxponder / Transponder

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

Features Overview

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

400G Muxponder/Transponder

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

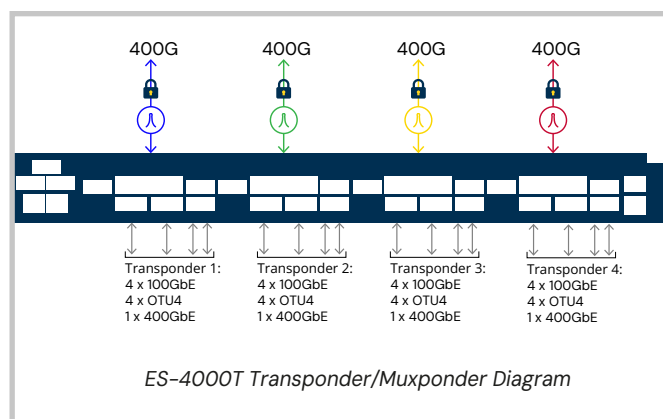


Main Benefits

- Q Cost-effective high capacity transport of 200G/300G/400G over single wavelength
- Q Up to 4x400G transponders/muxponders in 1U
- Q Embedded Layer-1 GCM-AES-256 encryption
- Q Integrated EDFA, mux/demux and optical switch in 1U
- Q 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 100GbE/400GbE/OTU4 service interfaces.



Recommended Applications

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



Layer-1 encryption



1U rack mount



Cost-effective solution

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

Bit Rate:

- 200G/300G/400G OpenROADM
- 200G/300G/400G OpenZR+

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

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: + 1dBm to -9dBm

Rx sensitivity at high OSNR (>36dB):

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

OSNR Sensitivity:

- 400G: 23.5dB @ -14dB
- 300G: 18dB @ -16dB
- 200G: 15.7dB @ -18dB

Chromatic Dispersion Tolerance:

- 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

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+, SNTP, TFTP & SFTP, REST, NETCONF

NMS:

- Ein-Sof LightWatch™ NMS, or third party NMS over SNMP

OAM:

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

Performance Monitoring:

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

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

Software Upgrade:

Hitless traffic – dual image

Power Supply

AC/DC: 100 to 240 VAC, 50/60 Hz, -44 to -60 VDC, 300W 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) operational

Humidity: 5% to 85% RH

Storage: 85°C

Physical Dimensions

1U:

- 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:

- Full speed transparent Layer-1 encryption for selected 100GbE/400GbE/OTU4 services / 400G uplinks
- Supports quantum key distribution

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

ES-4000G 4.8T Transponder

Mix of 400GbE and 100GbE over 400G wavelengths for high capacity DCI applications, in integrated 1U

Features Overview

- Q Pay-as-you-grow architecture based on standard pluggable coherent optical modules
- Q Operation modes:
 - q 12 x 400GbE transponder
 - q 48 x 100GbE transponder
- Q Supported services: 100GbE, 400GbE
- Q Supports oFEC (OpenROADM standard) and CFEC (OIF-ZR standard) on the line side
- Q Standard MSA pluggable modules:
 - q 12 x 400GbE QSFP-DD-DR4/DR4+/FR4/LR8/FR8 clients
 - q 48 x 100GbE QSFP-DD-DR4/DR4+/FR4 clients
- Q Comprehensive line and service performance monitoring
- Q Integrated EDFA, mux/demux and optical switch (optional)
- Q Facility protection using an integrated optical switch (optional)
- Q Remote management with out-of-band OSC
- Q Easy maintenance with field-replaceable parts:
 - q Dual hot pluggable power supply units (AC/DC)
 - q Fan unit

100GbE/400GbE Transponder

The ES-4000G is a modular and cost-effective high capacity solution for rolling out 400GbE and 100GbE services, or increasing existing network capacity. The device has twelve 400G pluggable uplink optical modules, delivering up to 4.8T in a 1U chassis. The ES-4000G integrates mux/demux, EDFA and OSW and delivers the entire optical layer. This flexible solution enables pay-as-you-grow architecture.

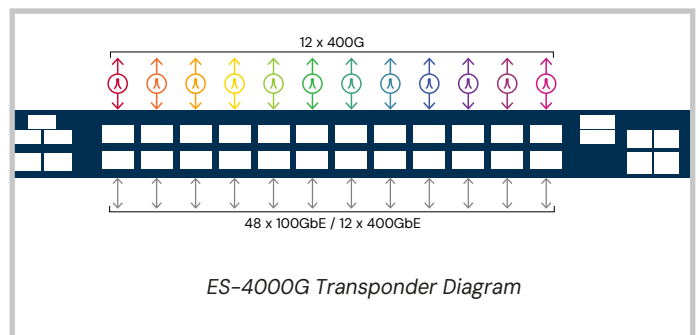


Main Benefits

- Q **Cost-effective high capacity transport mix of 100GbE and 400GbE client services**
- Q **Up to 12 x 400GbE transponders**
- Q **Up to 48 x 100GbE transponders**
- Q **Integrates EDFA, mux/demux and optical switch in 1U**
- Q **Modular and cost-effective for future growth and maintenance**
- Q Low power consumption, high density device ports

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 100GbE/400GbE service interfaces.



Recommended Applications

- Q High capacity DCI for Internet exchange and research and education networks
- Q 400G links to bolster existing DWDM infrastructure
- Q Last mile access/aggregation CPE for 100/400GbE managed services



Pay as you grow



1U rack mount



Cost-effective solution

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 mux/demux module (optional)

Optical Switch: 1+1 facility protection (optional)

Uplink Characteristics

Bit Rate:

- 400G OpenROADM/OIF ZR

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

Tx Power:

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

OSNR Sensitivity:

- 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 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:

- Ein-Sof 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, 50/60 Hz, -44 to -60 VDC, 250W 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) operational

Humidity: 5% to 85% RH

Storage: 85°C

Physical Dimensions

1U:

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

Weight: 8.3kg / 18.3lb (max)

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

Approvals & Standards

- CE, FCC, RoHS, REACH
- NEBS ready

ES-2000T 800G Transponder

800G Transport Platform for high capacity applications

Features Overview

- Q Pay-as-you-grow architecture based on pluggable 200G digital coherent optical modules
- Q Operation modes: QPSK 100G long haul and 8/16 QAM 200G metro
- Q Supported clients: 100Gb Ethernet, OTU4
- Q Supported FEC modes:
 - q **Line:** SD-FEC for metro and long haul applications, or oFEC
 - q **OTU4 service:** ITU G.709 GFEC, or Zero FEC
 - q **100GbE service:** IEEE Clause BJ-FEC
- Q Standard MSA pluggable:
 - q CFP2 DCO tunable DWDM for 100G/200G line interface
 - q QSFP28 SR4/LR4/ER4/CWDM4 for 100G client interface
- Q Layer-1 GCM-AES-256 encryption
- Q Elliptic Curve Diffie-Hellman key exchange
- Q Comprehensive line and service performance monitoring
- Q Optional integrated EDFA, mux/demux and optical switch
- Q Facility protection using an optional integrated optical switch
- Q Remote management with in-band GCC, or out-of-band OSC
- Q Easy maintenance with field-replaceable parts:
 - q Dual hot pluggable power supply units AC/DC
 - q Fan unit

200G Metro and 100G Long Haul Applications

The ES-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 in a 1U chassis, and enabling pay-as-you-grow architecture.

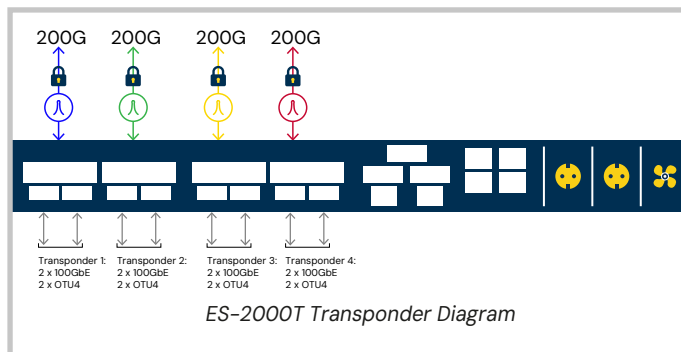


Main Benefits

- Q Integrated EDFA, mux/demux and optical switch in 1U
- Q High transport capacity of 800G with configurable modulation scheme
- Q Embedded Layer-1 optical encryption
- Q Managed service platform
- Q 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.



Recommended Applications

- Q Metro network applications ranging up to 1,000km
- Q High capacity DCI for enterprise, campus and cloud computing networks
- Q 200G links to bolster existing OTN/DWDM infrastructure
- Q Last mile access/aggregation CPE for 100G managed services
- Q Secured and encrypted communication for 100G protocols



Layer-1 encryption



1U rack mount



Cost-effective solution

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, ± 2 dB
- 100G DP-QPSK: -0.5 to -5dBm, or 4dBm, ± 2 dB

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:

- Ein-Sof 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, 50/60 Hz, -36 to -60 VDC, 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) operational

Humidity: 5% to 85% RH

Physical Dimensions

1U:

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

Weight: 8.5kg / 18.75lb (max)

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

Encryption

Functionality:

- Full speed transparent Layer-1 encryption for OTU4 uplinks
- Supports quantum key distribution

Algorithms:

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

Authentication:

Role-based user/password authentication

Compliance:

- FIPS 140-2
- 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

ES-1000TN 10G OTN Transponder

6x10G OTN multi-protocol multirate OTN transponders, with total capacity of 60G

Features Overview

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

Multi-protocol 10G OTN Transponders

The ES-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.



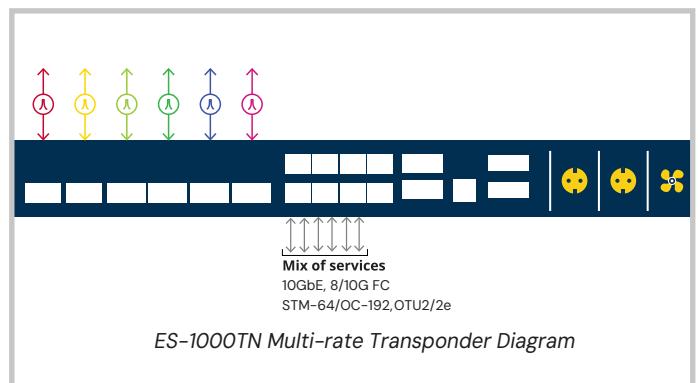
Main Benefits

- Q Long haul connectivity for up to 52dB using a single 1U device
- Q Smallest integrated transport solution of its kind, saving rack space
- Q Enhanced forward error correction
- Q Reduces backbone cost by cutting the number of regenerators

Integrated 1U OTU2 Transponder

The ES-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 in a 1U, integrating EDFAs, mux/demux and DCM with the OTN transponders.



Recommended Applications

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



Low power consumption

1U

1U rack mount



Multi operation modes

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 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 L4 , G.975.1 UFEC L7

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

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:

- Ein-Sof 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, 50/60 Hz, -36 to -60 VDC, 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

1U:

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

Weight: 5.5kg / 12.1lb (max)

Mounting: 19", ETSI and 23"

Configuration

License-based: 4, 6 transponders

Approvals & Standards

- CE, FCC, RoHS, REACH
- NEBS ready

ES-1000TE 1G-16G Transponder

8 multi-rate multi-protocol transponders, supporting Layer-1 encryption, for high capacity DCI

Features Overview

- Q Multi-rate and multi-protocol mix of 8 transponders, configurable from 622M up to 40G
- Q 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
- Q Low latency connectivity, ideal for data center interconnect applications
- Q 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
- Q Supported Layer-1 Encryption services:
GbE/10Gb/40Gb Ethernet
- Q Remote management and topology discovery for the optical network
- Q Pluggable SFP/SFP+ interfaces for both service and WDM channels
- Q Supports full C-band tunable DWDM on the line side (SFP+)
- Q Optional integrated EDFAs, mux/demux, DCM and optical switch
- Q Supports 1+1 facility protection
- Q Bi-directional performance monitoring
- Q Dual AC or DC pluggable power supply and pluggable fan unit
- Q Supports single and dual fiber networks

Low Latency 1G-16G WDM Transponder

The ES-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 in a 1U chassis with low power consumption.

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

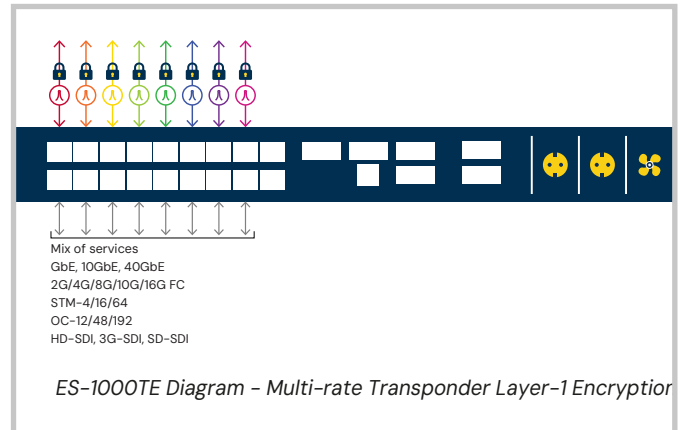


Main Benefits

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

Standards-based Layer-1 Encryption

The ES-1000TE/ES-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 Ein-Sof multi-chassis stackable solution. This architecture provides true scalability at a minimum cost.



Recommended Applications

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



Layer-1 encryption



Low power consumption



1U rack mount



Multi operation modes

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 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+, SNMP, RSTP, TFTP and FTP

NMS:

- Ein-Sof 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, 50/60Hz, -38 to -60 VDC, 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) operational

Humidity: 5% to 85% RH

Size:

1U:

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

Weight: 7kg / 15.4lb (max)

Mounting: 19", 23" and ETSI

Approvals & Standards

- CE, FCC, RoHS, REACH
- NEBS ready
- FIPS-140-2 compliant
- CNSA Top Secret Suite B 2015 compliant

ES-1000D Diagnostic and Monitoring Solution

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

Features Overview

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

How the ES-1000D Works

The ES-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.

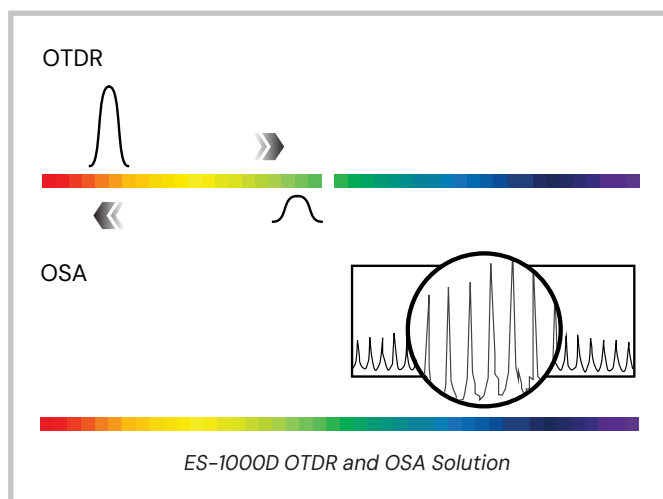


Full Fiber Diagnostic Device

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

Full Fiber Diagnostic Device

The ES-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.



Recommended Applications

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