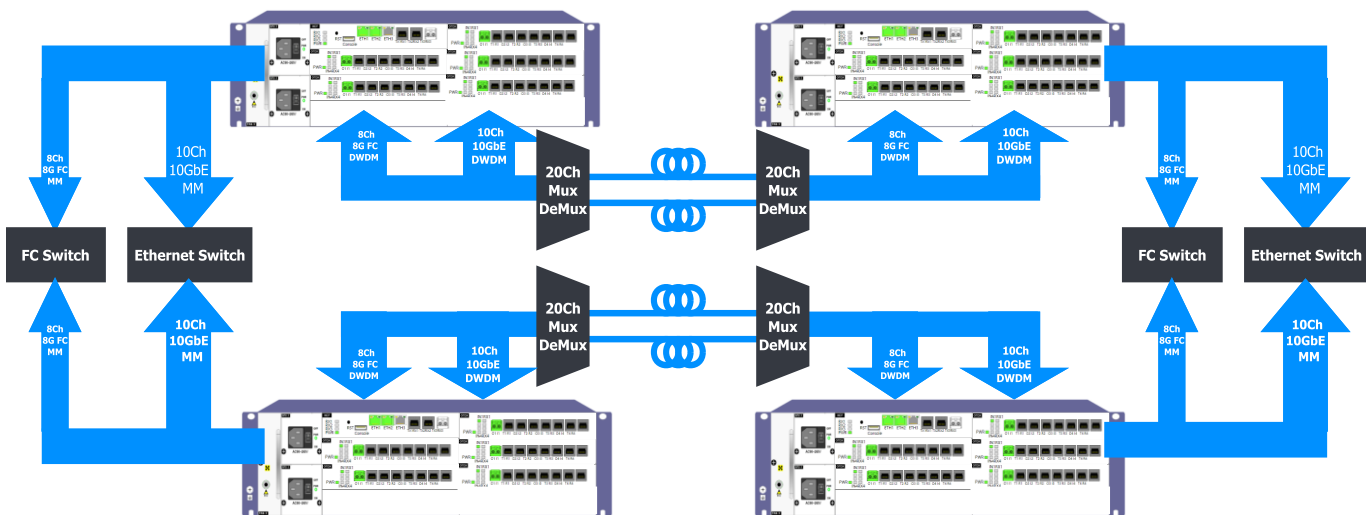


XenOpt

X8600 Transport System



Example of a system designed by XenOpt using X8600 Transport system

Catalogue of X8600 Transport System:

The **X8600 System** is a **cost-effective way** of connecting two locations. **Transponder** adds the ability to use third party or unsupported transceivers. **Muxponder** can transport multiple services over a single lambda. X8600 has option of Optical Amplifiers **EDFA** and **SOA** that can be used together with dispersion compensation modules – **DCM** to extend the reach beyond 80km for up to 400G QSFP-DD.



Online Catalogue

X8600-I II V –Transport System Chassis Range

X8600 transport systems can be integrated using three chassis systems that differ in size. Each chassis comes with two redundant hot swappable power supply modules and a hot swappable fan module. There is a wide range of transponder, optical amplifier and filter modules available for this platform, that enable integration of high performance WDM transport systems.

Features

- Chassis range support from 4 to 18 X8600 series modules
- 1U, 2U and 5U versions cover wide range of applications and system sizes.
- Unified management through X86-NCP Management module that is optionally delivered with chassis.
- Redundant hot swappable AC and DC power supplies
- Redundant hot swappable cooling fans
- Wide range of standard transponder modules available that cover Ethernet, Fiber channel, CPRI, and other services with speeds from 2Mb to 200Gb and aggregate speeds of several Tb
- Available range of passive optical multiplexers and OADM filter assemblies for single and dual fiber transport systems
- Range of Optical amplifiers that support building of long-distance transport systems.
- Typical power consumption 50W to 300W
- Operating temperature -10°C to +60°C

Applications

- L1 Transport system for wide range of services with 1Gb to Tb of aggregate speed
- CWDM and DWDM transport systems,
- Single and dual fiber transport systems
- Ethernet, Fiber Channel, CPRI and other services
- Passive and amplified systems

X8600 Chassis systems available:

	X8600-I	X8600-II	X8600-V
Chassis Height	1U – 44mm	2U – 88mm	5U – 220mm
Number of slots	4	8	16 (AC-PS), 18 (DC-PS)
Power supply	2x 120W, 90 to 264VAC Hot pluggable inserted from back side	2x 180W, 90 to 264VAC Hot pluggable inserted from front side	2x 450W, 90 to 260VAC Hot pluggable inserted from front side
Fan module	Hot pluggable module inserted from front side		
Management Module	X68-NCP module inserted in slot 1 (Optional)		

X86-NCP – Network Management Card

NCP is a network module that provides management, monitoring and alarm functions in X8600 chassis-based transport systems. It is compatible with all types of X8600 chassis and occupies one slot in the chassis. It enables users to view and modify all parameters of the transponder and amplifier X86 series modules. Web based (html5) graphical interface is the primary means of user level management. It can be accessed through any modern web browser like Chrome, Firefox or MS Edge. It also supports SNMP management and alarming through SNMP trap generation.

NCP module is based on advanced highly reliable ARM based single board computer with Linux based operating system. Management module includes 6-port switch with 3 copper and 3 optical gigabit ports. Optical ports are equipped with SFP based optical interfaces that enable insertion of coloured SFP transceivers and allow implementation of independent out of band management network without adding any additional active components. Optical ports allow use of any XenOpt SFP 1Gb transceiver or any other standard transceiver.

Management module does not store transport module parameters and thus allows hot swap module replacement and/or FW upgrade without affecting the state of any other module in the X8600 chassis.

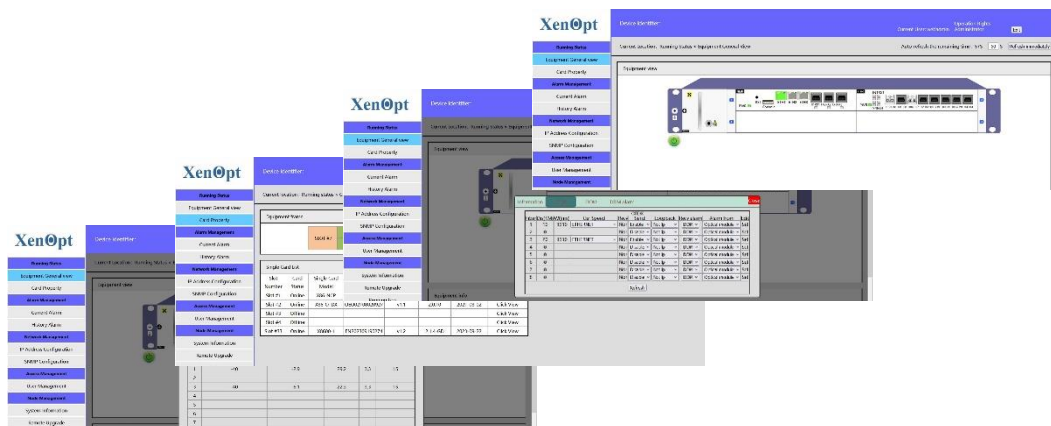
Features

- Provides management, monitoring and alarming functions to all types of XenOpt X8600 series chassis
- Based on highly reliable ARM computer with Linux OS
- Communication switch with SFP optical interfaces included
- Web based html 5 graphical user interface
- SNMP management
- Optical transceiver interfaces and onboard switch allow implementation of out of band (OSC) management network without additional external active components
- Network management module supports hot plug replacement without affecting normal operation of transponder and amplifier cards
- Extended Operating Temperature range -10°C to +60°C

Applications

- X8600 series chassis management
- Web and SNMP management of transport system

Web interface



X86-OTDX – 4 Channels 10G Transponder

X86-OTDX is a 4-channel transponder card. All ports have SFP+ interface on line and network side that allows insertion of SFP and SFP+ standard pluggable devices that support transmission speed from 1.25Gbit/s to 11.3Gbit/s. The transponder provides 3R signal regeneration (reamplification, reshaping, retiming). The module can provide loopback function on all 8 ports. Error threshold levels can be user defined. Loopback function can be used for diagnostics and to create up to 8 channel unidirectional transceiver for special applications like video distribution.

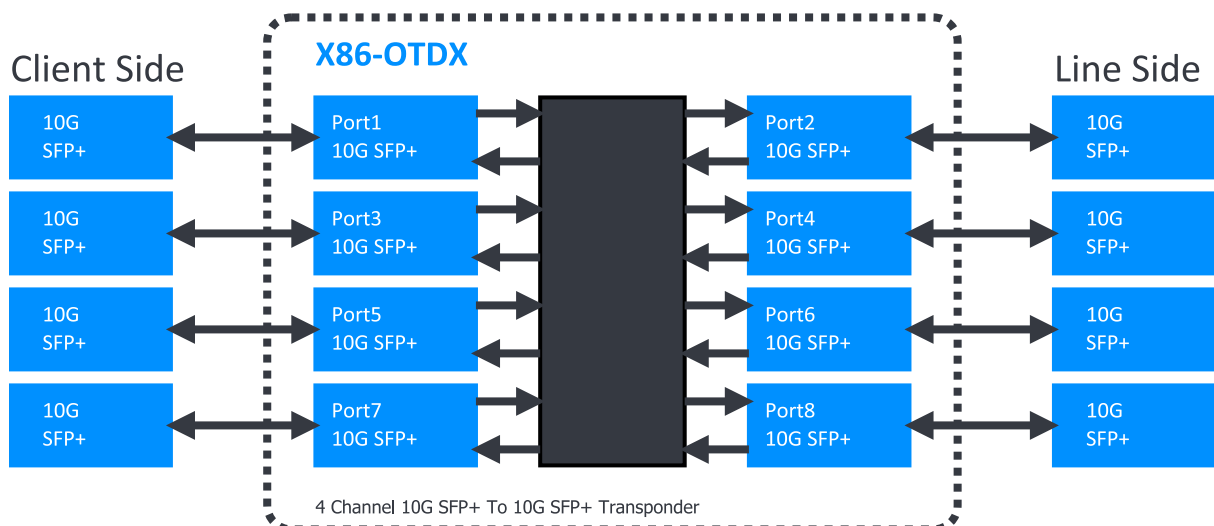
Features

- 4 channel bidirectional transponder card
- With data rate from 1.25Gbit/s to 11.3Gbit/s
- Provides 3R regeneration of signals that pass the transponder
- Provides Loopback testing mode
- Converts wide band optical signals to standard DWDM/CWDM wavelengths
- Supports wide range of services like: 1GbE, 10GbE, STM-16/64, FC 1G/2G/4G/8G/10G, FICON, FICON Express, ESCON, CPRI: 1.23/2.46/6, 14/9.83 Gbit/s, OTN: OTU2, OTU2V

Applications

- Conversion and regeneration of signals for 1GbE to 10GbE services in WDM transport systems

Functional diagram



X86-OTDQ3 – 3 Channels 100G Transponder

X86-OTDQ3 is a 3 x 40 Gbit/s or 3 x 100 Gbit/s signal Optical-Electrical-Optical – OEO (Photoelectric Optical Relay) amplifying card that regenerates four roads optical signal. Signal amplification and purification can also perform single-mode and multi-mode optical signal conversion.

Transponder provides 3R signal regeneration (reamplification, reshaping, retiming). The module can provide loopback function on all 6 ports. Error threshold levels can be user defined and laser can be shut down on demand.

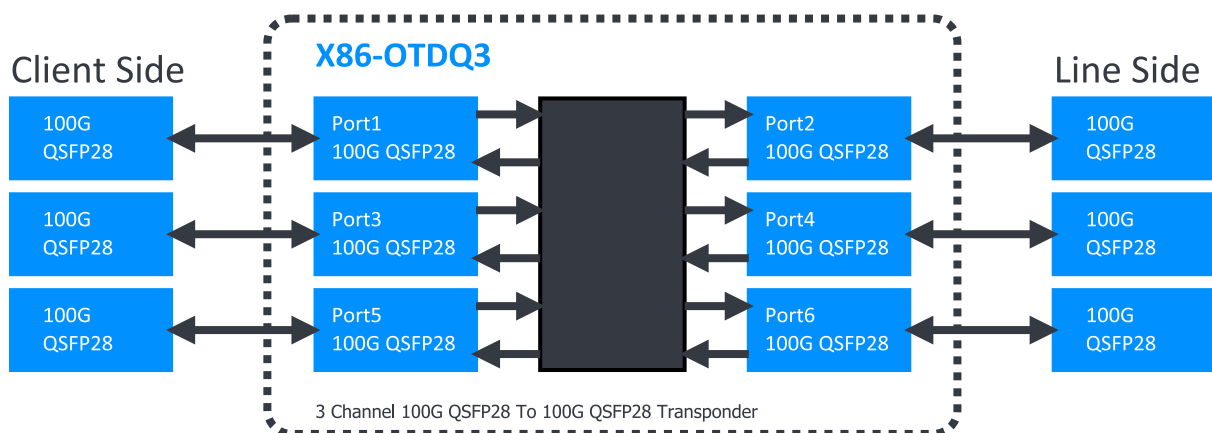
Features

- Three channels of 40G or 100G optical signal relay amplification
- Single-mode and multi-mode conversion of three channels of optical signal 40G or 100G Ethernet
- 3R function support - Re-amplifying, Re-timing, Re-shaping
- QSFP+ or QSFP28 support

Applications

- 40G or 100G Ethernet
- Operators and private networks

Functional diagram



X86-OTMT2 – 200G Muxponder

X86-OTMT2 is 200Gb muxponder multiplexing 2x 100 Gb client signals to single 200 Gb DWDM line side signal. It has DCO DWDM CFP2 pluggable socket on line side and two QSFP28 pluggable sockets on client side that are compatible with 100 Gb optical pluggable modules. Signals on client side may be either 100 Gb Ethernet or OTU4 formatted. Line side uses digital coherent DWDM CFP2 optical pluggable transceiver that uses either DP-8QAM or DP-16QAM modulation and exhibits high immunity to chromatic and polarization mode dispersion, enabling a reach of up to 800km without the need of Optical-Electrical-Optical – OEO regeneration. Line side CFP2 modules that can be supplied with the muxponder are tunable to all 96 channels in C-Band.

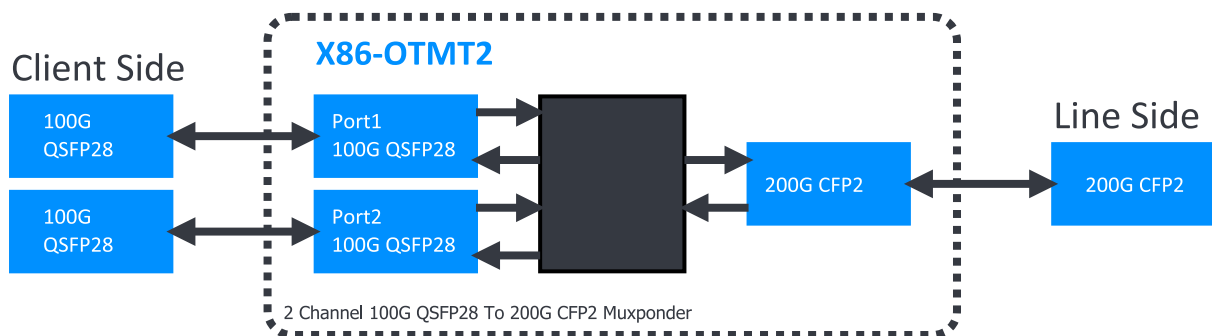
Features

- Line side signal occupies Single WDM channel
- Performs 2x100Gb to 1x200Gb signal multiplexing and demultiplexing
- Uses Dual Polarization 16QAM or 8QAM line side modulation
- Accepts QSFP28 and CFP2 pluggable modules
- With reach of up to 800km without requiring electrical regeneration.
- Can be tuned to any of 96 50GHz C-band DWDM channels
- Power consumption less than 30W

Applications

- 2-channel 100GbE or OTU4 to 200Gb OTN Muxponder

Functional diagram



X86-TDC – Tunable Dispersion Compensator

Tunable dispersion compensator card is used for dispersion compensation of high-speed transmission systems that are sensitive to chromatic dispersion like 10Gb to 40Gb transmission with NRZ signalling. X86-TDC allows the setting of precise chromatic dispersion correction in range up to ± 1200 ps/nm (80km of G.652 or G.657 fiber) and is therefore especially suitable for connections that require precise CD correction like PAM4 DWDM transceiver-based links but can still be used in any high speed DWDM system.

Features

- The TDC provides dispersion compensation over the range of dispersion values
- Latency is less than 25ns
- Two versions of tunable dispersion compensators are available: with tuning range ± 800 ps/nm and ± 1200 ps/nm
- It can be used in 50GHz or 100GHz networks
- Does not change the optical signal
- Simple maintenance

Applications

- 50GHz or 100GHz networks
- G.652 or G.657 Standard Single-Mode Fiber Long Distance Communication System

X86-DCM FBG – Fiber Bragg Grating DCM

Fiber Bragg grating dispersion compensation modules (FBG DCM) are used for compensating the chromatic dispersion of a long span of transmission fiber where low attenuation is also needed.

Dispersion compensation modules are devices with negative dispersion coefficient optimized to provide dispersion slope compatible with G. G.652 or G.657 cable but can still be used with other types of optical cables. Fiber Bragg grating DCM modules prevent nonlinear dispersion impairments in optical DWDM transmission systems. They excel in linear continuous transfer characteristics, that can accommodate systems with adjustable channel bandwidth that channelized solutions cannot support. Used fiber exhibits low attenuation and high linearity. In addition to standard version that supports power levels of up to 6dBm we have available also high-power versions that can operate with to 23dBm of optical power without exhibiting nonlinear effects.

Features

- Wide band continuous Dispersion Compensation for DWDM System
- Optimized for G.652 fiber C-Band Slope Compensation
- Low Insertion Loss
- Low Polarization Mode Dispersion
- Performance indicators have passed Telcordia GR-1209-CORE standard authentication
- Reliability exceeds Telcordia GR-1221-CORE standard specification
- Various package styles, connector types and jumper lengths available

Applications

- G.652 or G.657 Standard Single-Mode Fiber Long Distance and Metropolitan Area Communication System
- DWDM Transmission System
- CATV System

X8600 EDFA – Optical Amplifier Family

X86 – Optical Amplifier Family is a family of cost-effective Erbium Doped Fiber optical Amplifiers – EDFA, that are compatible with X8600 XenOpt transport chassis that includes Booster, Line and Pre-amp versions. Each amplifier is a single height X8600 module. Each amplifier type is also available with an additional output voltage-controlled attenuator – VOA, that enables wider adjustment range of output levels.

Amplifiers can be managed through SNMP with ability to control gain and receive alarm conditions when selected optical parameters, temperature or current exceed set thresholds. For network-based management X8600 chassis must include X86-NMC management module. For installations that do not require remote management these optical amplifiers can also be managed through on-board serial interface.

All these amplifiers operate in standard version as constant gain mode – AGC – amplifying all signals for set amount. Some can be set to work in constant output power mode – APC – assuring output is at set power as long as input power is within specified range. Standard versions of X8600 Amplifier family amplifiers can cover most of C-Band range from 1529 to 1561nm. These amplifiers are also available in Extended version that covers extended C band range and can operate from 1528nm to 1568nm.

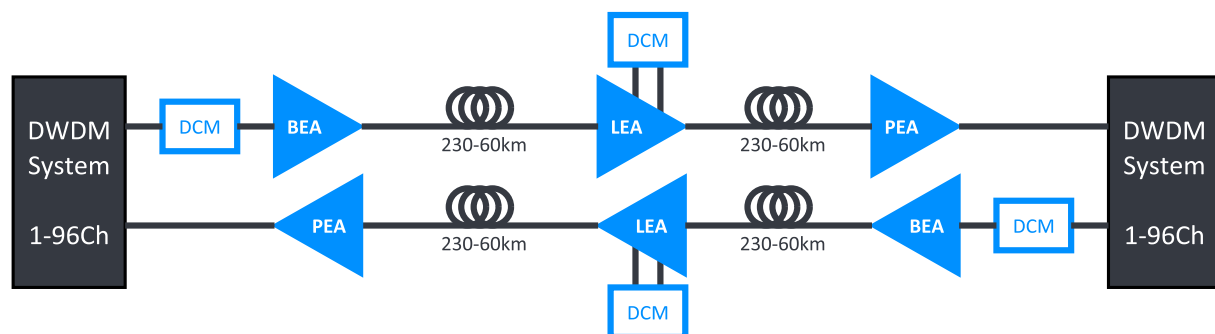
X8600-BEA is a single stage Booster EDFA Amplifier intended for amplifying transmission signals ether single channel or multiplexed multichannel. Saturated output optical power is 20dBm in standard version and up to 23dBm (200mW) in special versions. X8600-BEA is the most cost-effective solution for boosting optical signals.

X8600-LEA is a Line EDFA Amplifier that can be used at all locations of the network, especially where DCM, high gain and/or where adjustments in wider range is needed. It can work as booster or preamplifier, but is most effective as mid line amplifier located at Intermediate location(s) of a long track. It is two stage EDFA amplifier with optional mid-point connections for connecting additional CD correction modules – DCM.

X8600-PEA is a low noise single stage EDFA Preamplifier that is optimal for amplification of low-level signals at the end of an optical track. Due to its lower noise factor, it degrades OSNR less than alternative optical amplifiers.

Line and Booster Amplifiers can come in fixed gain version, that support only $\pm 1\text{dB}$ gain variations (typically 16-18dB) or in variable gain versions that allow higher gain adjustments from nominal gain value that can result in lower saturated power. Preamplifiers have fixed gain and operate in AGC mode only. Line and Booster models come in five different maximum power versions among these also 17, 20 and 23dBm. All of these amplifiers can optionally come with output voltage adjustable attenuator – VOA that can be controlled through management in range of 0 to -20dB.

Functional diagram



Features

- Booster, Line and Pre-amplifier type of optical amplifiers
- Amplification with Erbium doped optical fiber
- Up to 48CH/96CH DWDM channels in C-Band
- Automatic gain control (AGC) and Automatic Power Control (APC) operation
- Saturated output power with up to +23dBm
- Single or Two-stage amplification with optional mid-stage DCF
- Optional Built-in output VOA with automatic power control
- Network management through SNMP and Web GUI
- Low noise figure for Erbium Amplifiers
- Operating temperature range -10°C~+60°C

Applications

- Long haul DWDM transport systems
- Transport systems with large number of channels
- Transport Systems using transceivers that require external amplification, like PAM4 DWDM
- Data Center Interconnect systems

X8600 Typical EDFA available:

Part Number	X86- B2017N (V)	X86-L2025N(V)	X86-P1620N(V)
EDFA type	X86-BEA(V)	X86-LEA(V)	X86-PEA(V)
Minimum input power (typical)¹	-22 dBm	-30 dBm	-32 dBm
Maximum input power (typical)	+3 dBm	-5 dBm	-4 dBm
Saturation output² power (typical)	+20 dBm	+20 dBm	+16 dBm
Gain control in AGC mode (without VOA)³	16-18 dB	20-25 dB	20 dB

Other types of amplifiers are available on demand.

¹ Alarm threshold for Low input signal is settable from 0 to this value, standard versions disable operation, below these levels

² Special versions available with max saturated output power of up to +23 dBm (200mW)

³ Can be customized

X86-SOA – 1 or 2 Channel 40G & 100G SOA Amplifier

X86-SOA is an O-band semiconductor optical amplification board. Its main function is to amplify the optical signal in the range of 1260~1360 nm. The maximal supported rate is 160Gb/s. Its qualities are stable output power, low output noise and low polarization dependent gain. It's appropriate for the amplification of 40G or 100G small power signals.

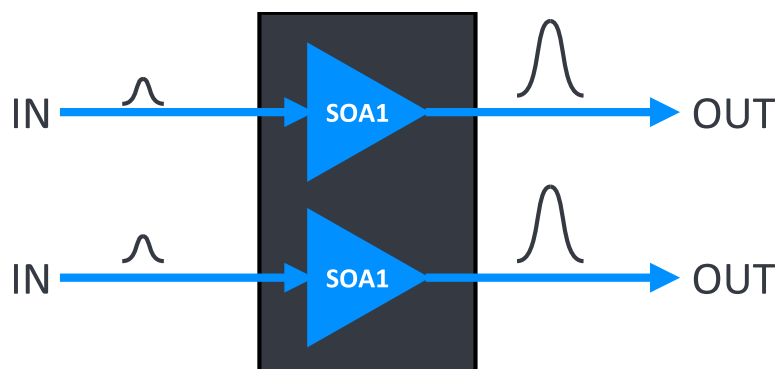
Features

- Amplification of optical signal in the range of 1260~1360 nm
- Maximum possible speed 160 Gb/s
- Low output noise
- Low polarization dependent gain

Applications

- Amplification of 40G or 100G signals

Functional diagram



X86-OLP – 1+1 Optical Line Protection Card

The OLP (Optical Line Protection) subsystem is based on advanced optical switch technology. This independent monitoring and protection system operates solely on the physical link of the optical cable, separate from the communication transmission system. When it detects a reduction or interruption in optical signal power in the working path, the system automatically switches the signal to the redundant optical fiber path. The state of the optical path is preserved during the power failure. This ensures the establishment of a highly reliable, secure, flexible, and disaster-resistant optical communication network. Two versions are available: OLPA is intended to protect fiber pair and OLPA-BiDi protects single fiber systems by measuring directional optical signal power.

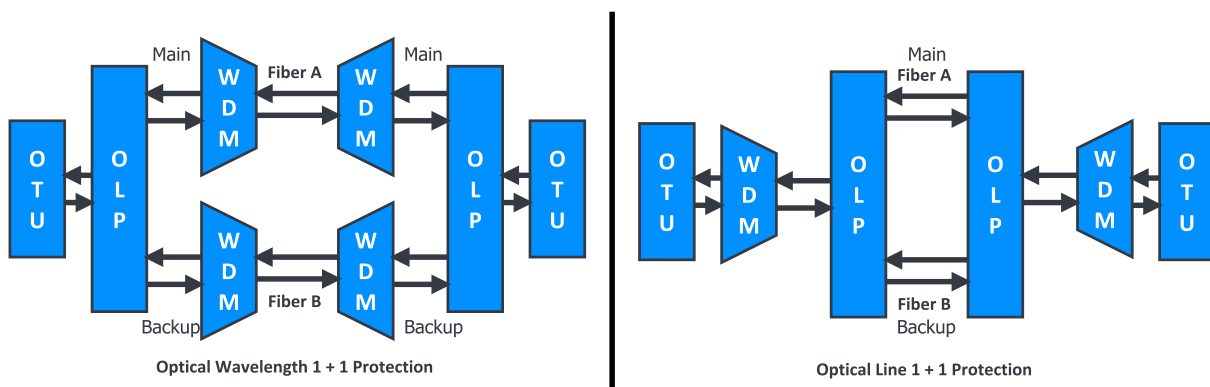
Features

- Line protection is supported for both dual fiber and single fiber lines
- Panel buttons selectable Automatic/ Manual modes
- Real-time monitoring of the main and backup optical power links
- Fast response time, with a switching time of less than 20ms
- It includes automatic non-return and automatic return functions, with adjustable return time for different application scenarios
- On-site operation without a management card is possible
- Path switch state is preserved during power failure, ensuring uninterrupted operation
- Replacement of the network management card does not affect the operation of OLP card
- Multiple network management options are available, such as SNMP and Web GUI
- The system supports both AC power (220V) and DC power (-48V), with 1+1 power input protection.
- Standard half height X8600 series module size. Up to 3 OLP modules + management card can be installed in 1U chassis

Applications

- Provides redundant communication over two optical lines based on optical power measurement

Functional diagram



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