POLYTRON®

powered by ASCENT Communication Technology

# Optical Network Solutions


Hospitals

Residential Areas

Cruise Liners

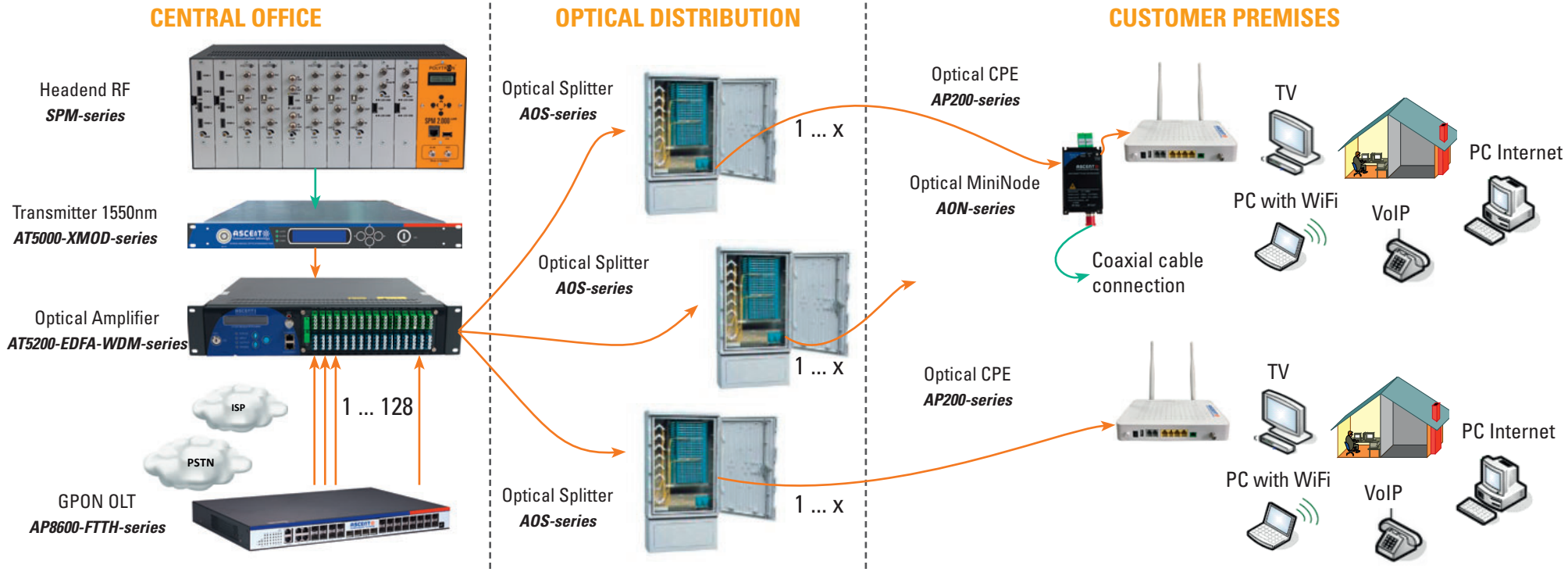
Hotels and Holiday Residences

# FTTx RF-Video-Overlay Solution

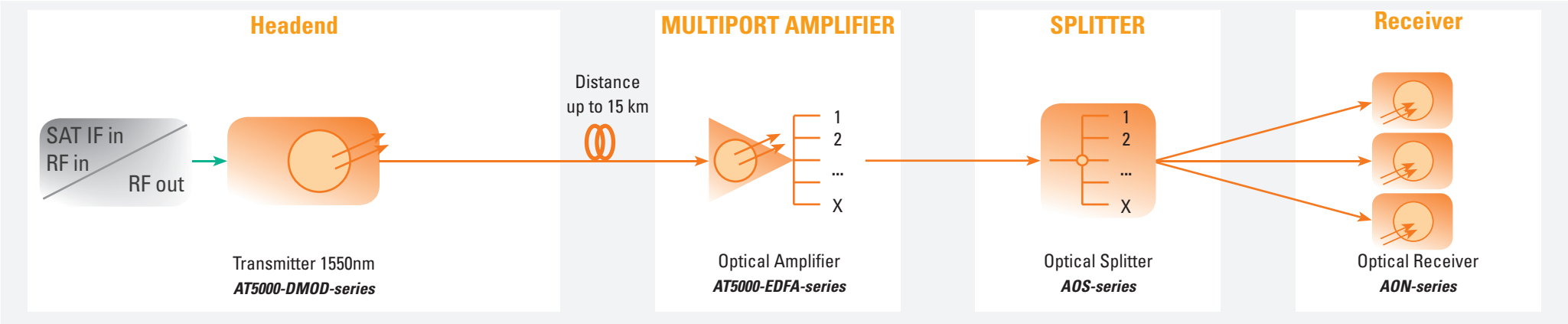
POLYTRON offers a full spectrum CATV video overlay solution for its customers. For these POLYTRON provides all key components, such as 1550nm transmitters, multiport optical amplifiers with WDM, optical splitters and CPEs (customer premises equipment) or CATV receivers. The integrated WDM and transmission options apply to both Point to Point (PtP) or Point to Multipoint (PtMP) FTTx deployment topologies. Via modular switch devices POLYTRON offers the integration of data access networks. The all in one FTTx solution enables a superior bandwidth capacity that meets today and tomorrow network requirements.

POLYTRON provides in cooperation with the partner company ASCENT a comprehensive product portfolio for optical networks. Based on the co-operation POLYTRON has also access to the HFC, FTTx and RFoG knowledge and the long time expierence of ASCENT in design and development. With these we address the needs and challenges of scalable, reliable and cost effective product solutions and services.

## RF-Video-Overlay with GPON application



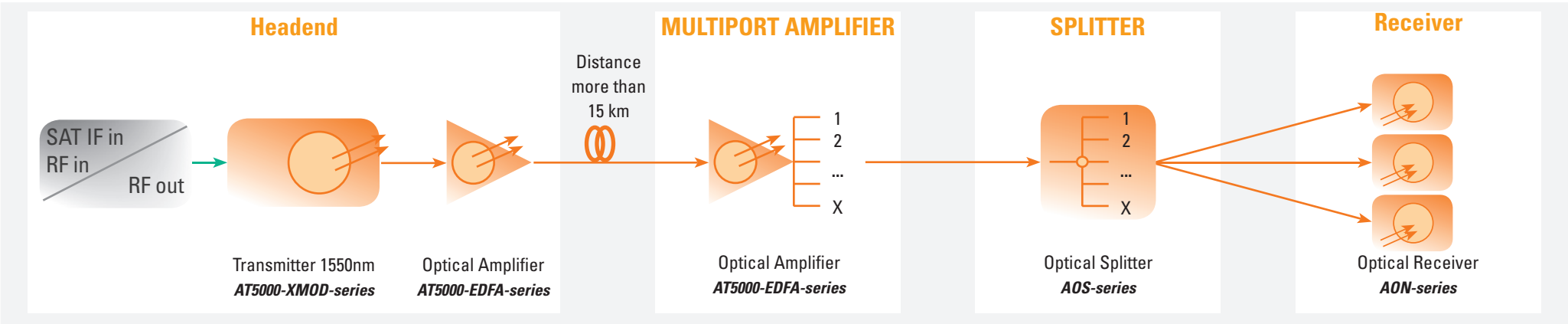
## RF-Video-Overlay application for up to 15 km distance




### Products

1550nm direct modulated transmitter, optical amplifier with output multiports, splitters for distribution to the optical receivers/mini nodes

## RF-Video-Overlay application for longer distances




### Products

1550nm external modulated transmitter, optical amplifier with output multiports, splitters for distribution to the optical receivers/mini nodes

# Products

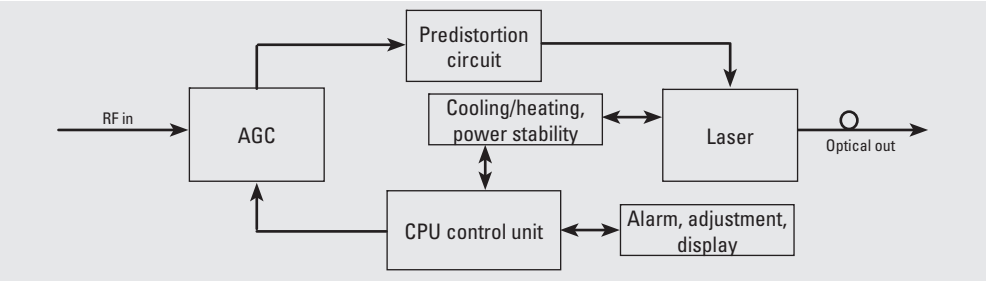
## Direct modulated transmitter 1550 nm


The AT5000 1RU 1550 nm direct modulated (DMOD) laser transmitter offers a flexible and scalable optical transmission for high quality video in short and medium distance CATV networks. It was designed with high linearity and low chirp DFB laser, with built-in pre-distortion compensation and AGC close loop control for improved performance.

### Features

- Suitable for short and medium distance FTTH applications
- Suitable for long distance 1550 nm QAM overlay applications, up to 70 km
- Optimized models for analog and digital signal up to 15 km
- High linearity and low chirp DFB laser
- Built-in pre-distortion compensation and AGC closed loop control
- Dual redundant hot-swappable AC power supplies (DC upon request)
- Stimulated Brillouin Scattering (SBS) suppression for optimized CSO
- Front-panel LCD for local monitoring of transmitter status
- Local or remote monitoring and configuration
- SNMP/HTTP monitoring, management and control

### Block diagram




### Technical Specifications

| Type | AT-51-DMOD-10 |
|---|---|
| Order number | 9418010 |
| **RF Specifications** | |
| RF Bandwidth | 47 - 1002 MHz |
| RF Flatness | ±0.75 dB @ 47 to 862 MHz |
| RF Input Level | 20 ±2 dBmV |
| **Link Performance** | |
| CNR | 50 dB (60 channels PAL, 15 km fibre, -1 dBm receive) |
| CTB | -63 dBc |
| CSO | -57 dBc |
| MER | 39 dB (80 QAM 256 channels within 47 - 1002 MHz) |
| **Optical Specifications** | |
| Wavelenght | 1550nm ±5 nm and ITU channels |
| Optical output power | 10 dBm |
| Optical connector | SC/APC |
| Number of optical outputs | 1 |
| SBS Suppression | ≥17 dBm |
| **General Specifications** | |
| Management Interface | RJ45 Web & SNMP, RS232 |
| Operating Temperature | -5 - 65 °C |
| Operating relative humidity | 5 - 95 % (non-condensing) |
| Power supply | dual redundant hot plug AC supplies (DC upon request) |
| Power supply specification | 90 - 265 VAC |
| Power consumption | ≤50 W (single power supply) |
| Dimensions (WxDxH) | 483 x 254 x 44 mm |

**Note:** Measured in a typical system configuration for the nominated channel numbers and nominated fibre lenghts for each model at 25 °C ambient temperature.

* other versions upon request / * for further specifications www.polytron.de

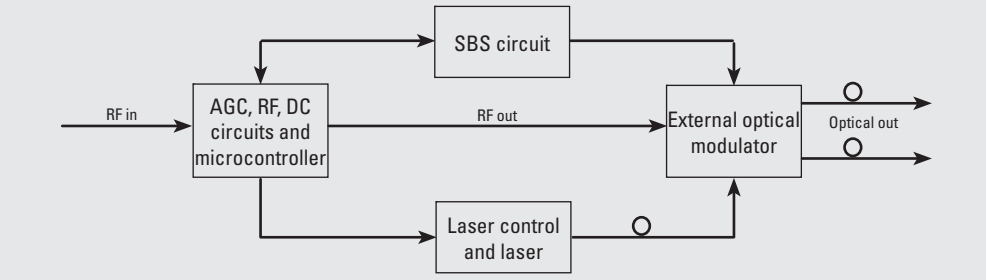
# External modulated transmitter 1550 nm


The AT5000 1RU Dual Output 1550nm externally modulated (XMOD) laser transmitter offers a flexible, medium and long distance and scalable optical transmission for high quality analog and digital video in CATV networks. It was designed with a low noise DFB continuous wave laser to reduce the dispersion effect and improve performance.

## Features

- High performance on CSO, CTB with RF pre-distortion circuit
- Dual optical output power up to 10dBm
- Suitable for long distance 1550 nm DWDM Video transmission applications
- Suitable for short and medium distance FTTH applications
- Low noise DFB continuous wave laser, reduce the dispersion effect
- Dual redundant hot-swappable AC (DC upon request)
- Field-adjustable Stimulated Brillouin Scattering (SBS) suppression for optimized CSO
- Front-panel LCD for local monitoring of transmitter status
- Local or remote monitoring and configuration
- SNMP/HTTP monitoring, management and control

## Block diagram




## Technical Specifications

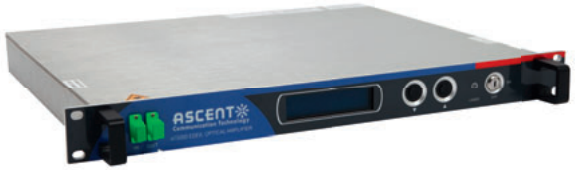
| Type | AT-51-XMOD2-07 | AT-51-XMOD2-09 | AT-51-XMOD2-10 |
|---|---|---|---|
| Order number | 9418000 | 9418001 | 9418002 |
| **RF Specifications** | | | |
| RF Bandwidth | 47 - 1002 MHz | | |
| RF Flatness | ±0.75 dB @ 47 to 862 MHz / ±1.5 dB @ 47 to 1003 MHz | | |
| RF Input Level | 18 - 28 dBmV | | |
| **Link Performance** | | | |
| CNR | 53 dB (59 ch PAL-D, TX to RX, 0 dBm receive)<br>51.5 dB (59 ch PAL-D, 65 km fibre, TX with 16 dBm EDFA to RX, 0 dBm) | | |
| CTB | -65 dBc | | |
| CSO | -65 dBc | | |
| **Optical Specifications** | | | |
| Wavelenght | 1550nm ±5 nm and ITU channels | | |
| Optical output power | 7 dBm | 9 dBm | 10 dBm |
| Optical connector | SC/APC | | |
| Number of optical outputs | 2 | | |
| SBS Suppression | 13 dB to 18 dBm field-adjustable | | |
| **General Specifications** | | | |
| Management Interface | RJ45 Web & SNMP | | |
| Operating Temperature | 0 - 50 °C | | |
| Operating relative humidity | 5 - 95 % (non-condensing) | | |
| Power supply | dual redundant hot plug AC supplies (DC upon request) | | |
| Power supply specification | 90 - 265 VAC | | |
| Power consumption | <50 W (single power supply) | | |
| Dimensions (WxDxH) | 483 x 254 x 44 mm | | |

**Note:** Measured in a typical system configuration for the nominated channel numbers and nominated fibre lenghts for each model at 25 °C ambient temperature.

* other versions upon request / * for further specifications www.polytron.de

# Products

## Optical amplifier EDFA 1550 nm

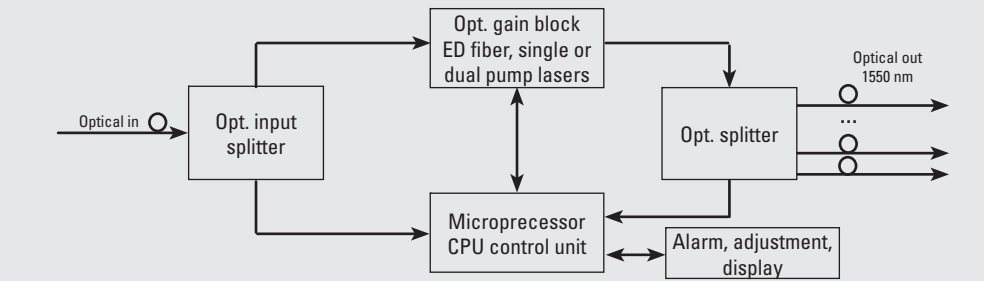



The AT5000 1RU Erbium-Doped Fiber Amplifier (EDFA) offers a flexible and scalable optical amplification for high quality video transmission in CATV networks. Together with AT 5000 1RU 1550nm transmitter, the AT5000 EDFA provides an ideal video overlay solution in high density FTTX networks to bring the video services to business, home and hotel premises.

### Features

- Low noise, high performance
- Suitable for analog and digital CATV systems, DOCSIS, FTTH and more applications
- Suitable for 1550 nm DWDM applications for multiple wavelengths on single fibre
- Nominal output powers from 13dBm to 26dBm per port
- Adjustable output power
- Extend analog and digital CATV to suit long distance feeders or larger FTTH distribution systems
- Dual redundant hot-swappable AC power supplies (DC upon request)
- Local or remote monitoring and configuration
- SNMP/HTTP monitoring, management and control

### Block diagram




### Technical Specifications

| Type | AT-50-EDFA-13-x | AT-50-EDFA-16-x | AT-50-EDFA-20-x |
|---|---|---|---|
| Optical output power | 13 dBm | 16 dBm | 20 dBm |
| Optical input power | -20 dBm - +10 dBm | | |
| Gain flatness | -1.0 dBm - +1.0 dBm | | |
| Wavelength | 1530 nm - 1560 nm | | |
| Output stability | ≤0.2 dB | | |
| Bias oscillation sensitivity | <0.2 dB | | |
| Bias oscillation dispersion | <0.5 PS | | |
| Optical return loss | ≥45 dB | | |
| Optical connector | SC/APC | | |
| Noise ratio | <4.5 dB (0 dBm input) | | |
| **General Specifications** | | | |
| Management Interface | RJ45 Web & SNMP, RS232, RS485 | | |
| Operating Temperature | -20 - 65 °C | | |
| Power supply | dual redundant hot plug AC supplies (DC upon request) | | |
| Power supply specification | 110 - 240 VAC | | |
| Power consumption | 50 W | | |
| Dimensions (WxDxH) | 483 x 381 x 44 mm | | |

### Type selection

| Type | Order number | Number of outputs | Optical output power |
|---|---|---|---|
| AT-50-EDFA-13-1 | 9418020 | 1 | **13 dBm** |
| AT-50-EDFA-13-2 | 9418021 | 2 | **13 dBm** |
| AT-50-EDFA-13-4 | 9418022 | 4 | **13 dBm** |
| AT-50-EDFA-16-1 | 9418023 | 1 | **16 dBm** |
| AT-50-EDFA-16-2 | 9418024 | 2 | **16 dBm** |
| AT-50-EDFA-16-4 | 9418025 | 4 | **16 dBm** |
| AT-50-EDFA-20-1 | 9418026 | 1 | **20 dBm** |
| AT-50-EDFA-20-2 | 9418027 | 2 | **20 dBm** |
| AT-50-EDFA-20-4 | 9418028 | 4 | **20 dBm** |
| AT-50-EDFA-20-8 | 9418029 | 8 | **20 dBm** |

* other versions upon request / * for further specifications www.polytron.de

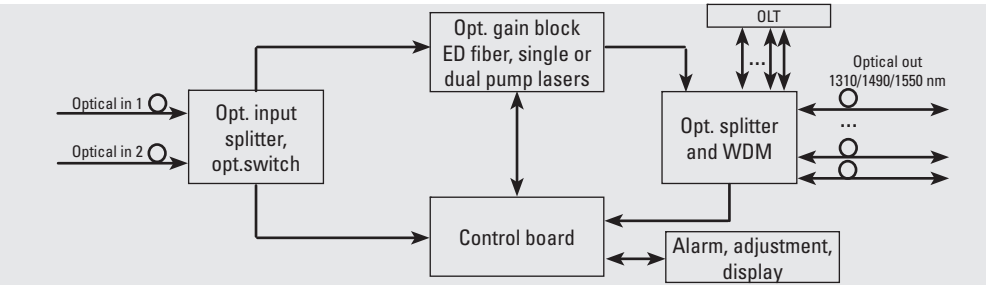
# Optical amplifier EDFA with WDM 1550 nm

The AT5200 2RU Erbium-Doped Fiber Amplifier (EDFA) offers a flexible and scalable optical amplification for high quality video transmission in CATV networks. Together with AT5000 series 1550nm transmitter, the AT5200 EDFA provides an ideal video overlay solution in high density FTTX networks to bring the video services to business, home and hotel premises.

## Features

- Low noise, high performance with JDSU & IPG pump laser
- FTTP high power multi-ports optical amplifier, gain spectrum band within 1540 to 1563 nm
- Built-in WDM to connect PON OLT Uplink and Combined PON + CATV output
- Suitable for analog and digital CATV systems, DOCSIS, FTTH and more applications
- Suitable for 1550 nm DWDM applications for multiple wavelengths on single fibre
- Nominal output powers from 13dBm to 26dBm per port
- Laser cooling: Thermoelectric Cooler (TEC)
- Extend analog and digital CATV to suit long distance feeders or larger FTTH systems
- Dual redundant hot-swappable AC power supplies (DC upon request)
- Local or remote monitoring and configuration
- SNMP/HTTP monitoring, management and control

## Block diagram




## Technical Specifications

| Type | AT-52-EDFA-xx-xx |
|---|---|
| Wavelength | 1540 nm - 1563 nm |
| OLT pass wavelength | 1310 / 1490 nm (signal pass-through) WDM optional |
| CATV pass wavelength loss | 0.8 dB |
| OLT pass wavelength loss | 0.8 dB |
| Optical input power | -10 dBm - +10, 3 dBm typical, -6 dBm - 8 dBm (constant output) |
| Output power stability | ±0.5 dB |
| Port isolation (CATV & OLT) | 40dB |
| Noise figure (PIN = 0 dBm) | <5 dB |
| Build-in WDM for PON | PON signal pass-through when EDFA is off |
| Optical connector | LC/APC |
| Insertion loss | Transmission band ≤0.8 dB, Reflection band ≤0.6 dB |
| Polarization dependence loss | 0.1 dB |
| Polarization dependence gain | 0.4 dB |
| Input / output isolation | 40 dB |
| **General Specifications** | |
| Management Interface | RJ45 Web & SNMP, RS232 |
| Operating Temperature | -5 - 65 °C |
| Power supply | dual redundant hot plug AC supplies (DC upon request) |
| Power supply specification | 90 - 265 VAC |
| Power consumption | max. 150 W |
| Dimensions (WxDxH) | 1 RU: 483 x 400 x 44 mm / 2 RU: 483 x 368 x 88 mm |

## Type selection

| Type | Order number | Number of outputs | Optical output power |
|---|---|---|---|
| AT-52-EDFA-18-08 | 9418030 | 8 | **18 dBm** |
| AT-52-EDFA-18-16 | 9418031 | 16 | **18 dBm** |
| AT-50-EDFA-20-32 | 9418033 | 32 | **20 dBm** |
| AT-50-EDFA-19-64 | 9418032 | 64 | **19 dBm** |

* other versions upon request / * for further specifications www.polytron.de

# Products

## FTTx GPON OLT


The AP8608B and 8616B GPON series are scalable multi-service devices with a 1RU high performance OLT (optical line terminal) platform featuring high density 10G switching functionality, which provides Network Operators and Services Providers with a flexible and central management point for GPON services in Fiber to The Home/Business (FTTH & FTTB) networks.

### Features

- Meets ITU-T G.984/G.988 standards
- Maximum 1:128 coupling ratio
- Supports 8/16 × GPON ports
- Supports 4 × gigabit Combo ports, 4 gigabit SFP ports and 4 × 10G SFP+ ports
- 205 G backplane bandwidth
- Maximum 1:128 coupling ratio
- Compact 1 RU standard size
- Low power consumption and low operating cost
- Dual power supply slots standard AC (DC upon request)
- SNMP, Telnet, CLI remote management

### Type selection

| Type | Order number | Number of PON ports | Description |
|---|---|---|---|
| AP8608B-48G-AC | 9418060 | 8 | **GPON 1RU switch** |
| AP8616B-48G-AC | 9418061 | 16 | **GPON 1RU switch** |
| AP8600B-PWR-AC | 9418062 | / | **AC power supply 220 V** |
| AP8600-NMS-1K | 9418063 | / | **NMS for 1000 subscribers** |
| SFP-GG-SP-4931 | 9418050 | / | **SFP plug-in** |

### Technical Specifications

| Type | AP8608B-48G-CH | AP8616B-48G-CH |
|---|---|---|
| Maximum coupling ratio | 1:128 | |
| Backplane bandwidth | 205 Gbit | |
| MAC table capacity | 16K | |
| Attributes PON interface | Downlink 2.5 Gbps / Uplink 1.25 Gbps | |
| Standards | ITU-T G.984/G.988 / IEEE 802.1D, Spanning Tree / IEEE 802.1Q, VLAN / IEEE 802.1w, RSTP / IEEE 802.3ad physical link static/dynamic aggregation (LACP) / Ethernet - II | |
| QoS | Backpressure flow control (half duplex) / IEEE 802.3x flow control (full duplex) / IEEE 802.1p, CoS / WRR, SP and FIFO queue schedule / Limiting the uplink/downlink rate based on each ONU / DBA and SLA | |
| V-LAN | Port-based VLAN / QinQ and flexible QinQ | |
| Multicast | L2 multicast / IGMP Snooping / MLD Snooping | |
| Layer 3 routing functions | Static routing, RIP and OSFP, OSFP/OSPFv3 | |
| Reliability | Unidirectional Link Detection (UDLD) / Hot swap of the GPON optical module on the expanded slot / Optical path protection of GPON (b/c, hand-in-hand) / Abnormal luminescence ONU detection such as long luminescence | |
| Network Security | Limiting the maximum number of users on each port / Port isolation / Packet storm control / Flow-based ACL access control function / Transmission data encryption on the PON interface | |
| **General Specifications** | | |
| Management Interface | CLI, SNMP, Telnet / Conducting software upgrade through TFTP debug output | |
| Operating Temperature | 0 - 45 °C | |
| Power supply | dual redundant hot plug AC supplies (DC upon request) | |
| Power supply specification | 90 - 240 VAC | |
| Dimensions (WxDxH) | 442.5 x 304 x 44 mm | |

* other versions upon request / * for further specifications www.polytron.de

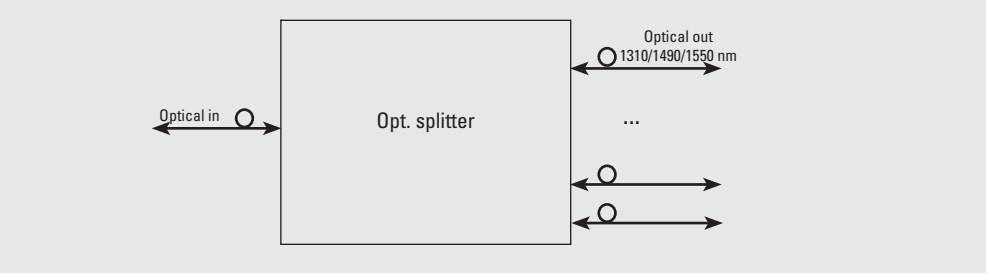
# Optical splitters

The AOS optical splitters series offers a balanced splitting ratio for high quality video transmission in CATV networks. Together with AT 5000 1RU 1550nm transmitter and the AT5200 EDFA with WDM, the AOS series provides an ideal video overlay solution in high density FTTX networks to bring the video services to business, home and hotel premises.

## Features

- Full line of optical passives
- Several splitting ratios 1x4 / 1x8 / 1x16 / 1x32 / 1x64
- Balanced split ratios
- High port isolation
- Flexibility for customization
- Standard 19“ housing (others upon request)

## Block diagram




## Technical Specifications

| Type | AOS-S-1-04-R<br>AOS-S-1-08-R | AOS-S-1-16-R<br>AOS-S-1-32-R<br>AOS-S-1-64-R |
|---|---|---|
| Operating wavelength | 1260 -1650 nm | |
| Insertion loss | 1x4: 6.8 dB / 1x8: 10.2 dB | 1x16: 13.5 dB / 1x32: 16.9 dB / 1x64: 21.0 dB |
| Uniformity | 1x4: ≤0.6 dB / 1x8: ≤1.8 dB | 1x16: ≤1.2 dB / 1x32: ≤1.5 dB / 1x64: ≤2.5 dB |
| Directivity | ≥50 dB | ≥55 dB |
| Polarization dependent loss | ≤0.3 dB | ≤0.4 dB |
| Return loss | ≥55 dB | ≥55 dB (bare fiber or APC) |
| Connector | SC/APC | SC/APC |
| Fiber types | 900µm, 2mm, 3mm | 900µm, 2mm, 3mm |
| **General Specifications** | | |
| Operating Temperature | -20 - 70 °C | |
| Operating relative humidity | 5 - 95 % | |
| Housing | 19“<br>1 RU: AOS-S-1-04-R, AOS-S-1-08-R, AOS-S-1-16-R, AOS-S-1-32-R<br>2 RU: AOS-S-1-64-R | |
| Dimensions (WxDxH) | 483 x 250 x 44 mm | |

## Type selection

| Type | Order number | Number of outputs | splitting ratio |
|---|---|---|---|
| AOS-S-1-04-R | 9418070 | 4 | **balanced** |
| AOS-S-1-08-R | 9418071 | 8 | **balanced** |
| AOS-S-1-16-R | 9418072 | 16 | **balanced** |
| AOS-S-1-32-R | 9418073 | 32 | **balanced** |
| AOS-S-1-64-R | 9418074 | 64 | **balanced** |

* other versions upon request / * for further specifications www.polytron.de

# Products

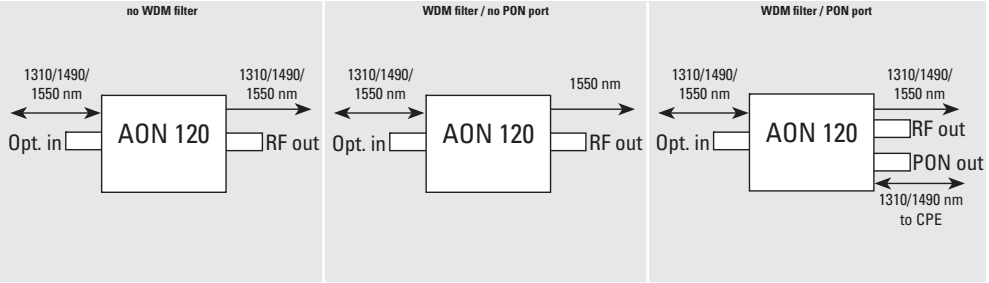
## Optical mini node

The AON120 series FTTH mini node supports Video Overlay application over FTTH optical fiber access network. It operates on 1002 MHz RF bandwidth, with high output power up to 82 dBµV (AGC). AON120 has a low power consumption and optional built-in WDM to support PON signal pass-through. It helps operators provide superior video services in a FTTH PON network architecture.

### Features

- Small form factor and low power consumption
- Low noise circuit (3.8 % modulate, -10 dBm receive, CNR ≥ 45 dB)
- High output power up to 82 dBµV for MDU application
- Excellent linearity at wider optical receiving range +3 dBm to -12 dBm
- Flatness less than ± 0.75 dB In the range of 47 to 862 MHz
- Metal shell, supply safeguards to opto-electrical sensing device
- Optional built-in WDM provides PON pass-through capability in a FTTH optical passive network
- Powered directly using the power adaptor
- The compact enclosure fits easily in CPE, ONU housing or network termination boxes

### Block diagram




### Technical Specifications

| Type | AON120-SC-74 | AON120-SC-82-WDM | AON120-SC-82-WDM-PON |
|---|---|---|---|
| Order number | 9418040 | 9418041 | 9418042 |
| Wavelength | 1200 - 1600 nm or 1540 to 1560 nm | | |
| Optical connector | SC/APC (others upon request) | | |
| Optical input power | -17 - 3 dBm (-7 - 3 dBm for analog TV signal) | | |
| Optical return loss | -55 dB | | |
| Channel isolation | ≥40 dB | | |
| Responsivity | ≥0.9 A/W @ 1550 nm | | |
| RF bandwidth | 47 - 1002 MHz | | |
| Output level | 74 dBµV @ -8 - 0 dBm (fix) / 82 dBµV @ -7 - 3dBm (AGC) | | |
| Output level adjustment | 0 - 20 dB | | |
| RF flatness | ±0.75 dB | | |
| RF return loss | ≥14 dB | | |
| RF input impedance | 75 Ω | | |
| RF connector | F-Female | | |
| **Link Performance** | | | |
| CNR | 48.0 dB (60 PAL-D, -8 dBm receive, 3.8 % OMI ) | | |
| CTB | -65 dBc | | |
| CSO | -65 dBc | | |
| HUM | -60 dB | | |
| **General Specifications** | | | |
| Operating Temperature | -20 - 50 °C | | |
| Operating humidity (relative) | 5 - 95 % | | |
| Power supply specification | +12 $V_{DC}$ | | |
| Dimensions (WxDxH) | 48 x 88 x 22 mm | | |

**Note:** Measured in a typical system configuration for the nominated channel numbers.

* other versions upon request / * for further specifications www.polytron.de

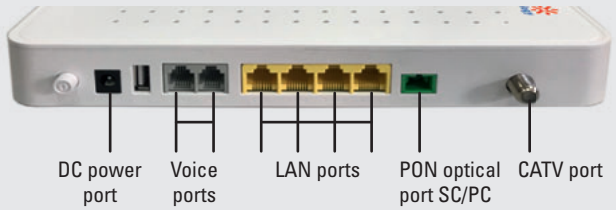
# GPON ONT/CPE

The AP224B series is a series of optical network units designed to meet the requirements of broadband access networks. They are ideal for FTTH/FTTO applications to provide data, voice and video services based on a GPON network. The AP224B series provides the reliability and performance expected for business services and is an attractive way to deliver residential services.

## Features

- Fully compatible with ITU-T G.984/988
- Supports two POTS ports / four GE auto-adapting Ethernet ports / one CATV output
- Supports one 802.11 n/b/g WiFi port
- Supports OMCI and TR069 for remote management / Web-based GUI for local management
- 2.5 Gbps downlink / 1.25 Gbps uplink
- 1:128 splitting ratio
- Secure service carrying ability
- Supports VLAN, STP, port isolation, ACL, QoS and broadcast storm control
- Supports advanced dynamic bandwidth distribution and accurate bandwidth limits
- Supports IGMP snooping

## Interface description




## Technical Specifications

| Type | AP224BWT-SC |
|---|---|
| Order number | 9418080 |
| User interface | 4x Gbit Ethernet ports (RJ45) / 2x FXS interfaces (RJ11) / 1x USB interface (USB 2.0) |
| CATV interface | 1x RF output / F connector female |
| WiFi Interface | 802.11b/g/n, external dual-antenna |
| **Performance parameters** | |
| PON wavelength | Tx: 1310 nm, Rx: 1490 nm |
| PON Optical power Tx | 0.5 - 5 dBm |
| PON Sensitivity Rx | -28 dBm |
| Network radius | 20 km |
| Data transmission parameters | Downstream: 2.5 Gbit/s / Upstream: 1.25 Gbit/s |
| Connector type | SC/APC |
| **CATV** | |
| Optical input power | -15 ... -5 dBm |
| RF output level | 70 dBµV |
| **General Specifications** | |
| Operating Temperature | 0 - 45 °C |
| Operating relative humidity | 10 - 90 % (non-condensing) |
| Power supply specification | external 12 V 1 A AC/DC power supply adapter |
| Power consumption | <9 W |
| Housing | plastic shell 200 x 140 x 33 mm (WxDxH) |

* other versions upon request / * for further specifications www.polytron.de

## Notes

### ABC of optical networks

***PON***
Passive optical network is a system that consists of unpowered fiber optic splitters to serve multiple end points.

***OLT***
Optical line terminal is the endpoint hardware device in the central office and sends the ethernet data to the ONU(bi-directional).

***ODN***
Optical distribution network provides the optical transmission medium for interconnection of OLT and ONTs.

***ONT/ONU***
Optical Network Terminal (at customer permises) /Optical Network Unit (located in distance of end useres permises) is the equipment which converts the optical signals to electrical.

***GPON***
Passive optical network for data rates up to 2.5 Gbit/s (downstream) and 1.25 Gbit/s (upstream).

***WDM***
Wavelength Division Multiplexing to combine different wavelengths on one optical fiber.

***FTTx***
Described different optical network structures - FTTC (fiber-to-the-curb), FTTB (fiber-to-the-building), FTTH (fiber-to-the-home)

***PtP/PtMP***
Point-to-Point one fiber connection between the central office and the endpoint hardware. Point-to-Multipoint connection from one central point to several endpoints.

## POLYTRON

For more than 50 years the POLYTRON-Vertrieb GmbH with head quarters in Bad Wildbad belongs to the leading companies in the field of TV- and radio signal processing.

The core of our philosophy is uncompromised quality. Innovative concepts, modern production processes and a strict quality control ensure that we can offer extraordinary quality at reasonable prices to our customers.

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