

Optical Media Converter

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FTTX (Fibre To The X) services have been established which use optical fibre to connect LANs (Local Area Networks) used in the home or office, as well as remote offices, to an external network, such as the Internet. Optical media converters are one of the devices that has been used in this build up stage. An optical media converter connects different transmission media (optical fibres and metal cable) so that signals can be converted from optical to electrical, and vice versa. With this device, it is possible to overcome the distance limits of metal cables used in LANs, such as UTP (Unshielded Twisted Pair cables), and achieve transmission over long distances. In other words, it provides a means of linking each user to a carrier via optical fibres.

At Oki, we are helping to achieve low-cost FTTH (Fibre To The Home) systems having excellent maintainability, through our offer of an optical media converter which combines features, such as high density port mountability (space saving), high expandability of transmission capacity, wide service area coverage

through flexible network construction, remote fault monitoring functions, and so on. It is possible to achieve FTTX capable of high-speed transmission and excellent maintainability at low cost by means of a "stand alone type optical media converter" provided for each user, or an "integrated type optical media converter", or "built-in layer-2 switch integrated type optical media converter" installed at the carrier. Moreover, by providing an "outdoor-installed layer-2 switch" between each user and the carrier, it is possible to build a distributed network and cover a very wide service area.

Let us now look at a technical overview of this group of products.

Overview of access networks

Fig. 1 illustrates current access network technology and Fig. 2 shows the state of optical access networks. As shown in Fig. 2, in broad terms, current optical

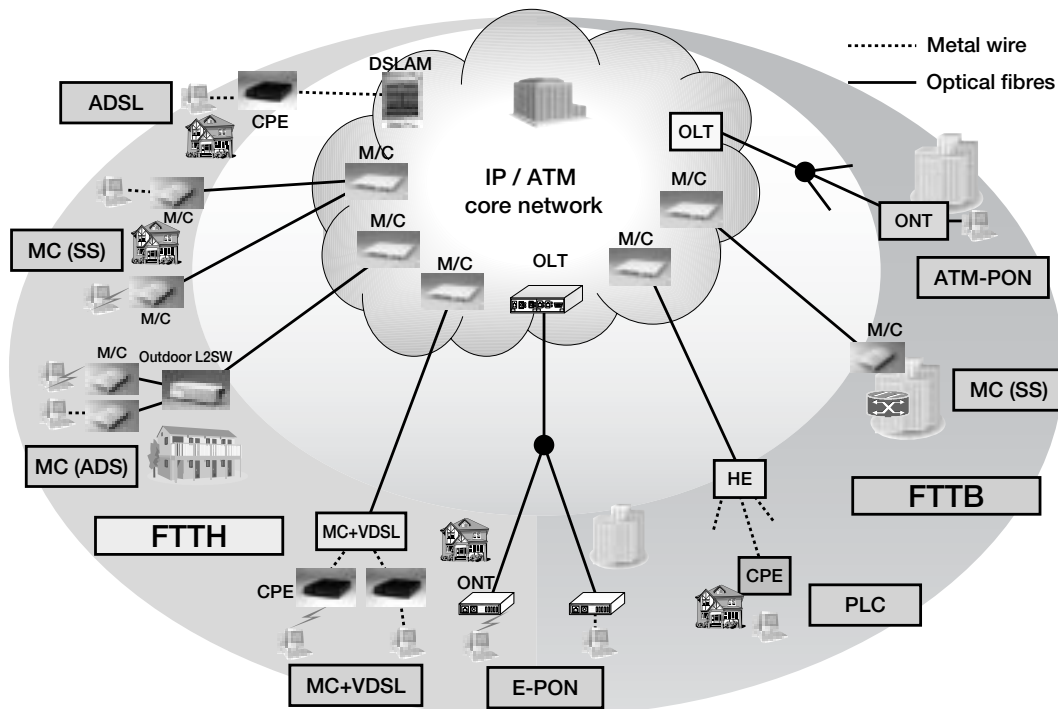


Fig. 1 Bird's eye view of access network

access network technology comprises a configuration, known as SS (Single Star), in which users and carriers are connected in a point to point fashion, or a configuration involving point to multi-point connections. Sub-categories of point to multi-point architecture include the PDS (Passive Double Star) which uses passive components, and the ADS (Active Double Star) which performs concentration or traffic concentration after first converting signals to electrical signals. A series of product groups have been developed to meet the needs of these different configurations.

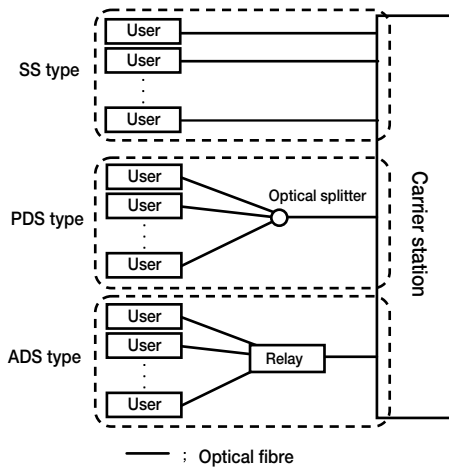


Fig. 2 Configuration of optical access network

Standard equipment for maintenance functions

Since an optical media converter connects users to a carrier via fibre-optic links, it requires a maintenance function used in a WAN. Oki has been involved in developing transmission and exchange equipment groups for a long time, and we have built up a whole store of maintenance functions on the basis of this development experience.

Furthermore, on 23rd May 2002, the TTC standard, TS-1000, was established with the aim of liberalizing access terminal equipment relating to bi-directional transmission by two wavelengths in a single fibre (namely, single-core single-mode fibres).¹⁾ This standard uses the reference points illustrated in Fig. 3 below, and designates specifications for the physical layer and maintenance signals on the station side and

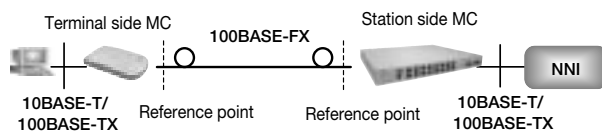


Fig. 3 TTC standard TS-1000 reference points

terminal side, in such a manner that it ensures interconnectability between optical media converters from different manufacturers.

The Oki product group introduced here conforms to this TTC standard TS-1000, and hence provides excellent maintainability.

Overview of optical media converter products

10 Mbps and 100 Mbps transmission rates are offered for user access. This product group enables 100 Mbps transmission between carrier and user over approximately 20 km in a single-core single-mode fibre, by use of two-wavelength WDM (wavelength division multiplexing).

(1) Stand alone type optical media converter



Fig. 4 External appearance of BBM 1000A

This stand alone optical media converter performs 100Base-FX and 10Base-T/100Base-TX media conversion. The functions and features of this device are listed below.

■ Maintenance functions

The converter has the following maintenance functions in associated connections with integrated optical media converters.

- Loop-back test function
- Link status reporting function (sends stand alone operational status and user/optical link status, as maintenance signals)
- Power supply interruption reporting function

■ Auto setting functions

- 10Base-T/100Base-TX
- Full duplex / half duplex and MDI / MDI-X

■ Fixed setting functions using manual switches

- 10Base-T/100Base-TX
- Full duplex / half duplex

■ Cable accommodation functions

- Fixing of tension members for aerial drop cable
- By mounted splice tray, accommodation for welded point, mechanical connected point and extra cable
- Direct connection of SC cable

(2) Integrated type optical media converter

The integrated optical media converter is installed with a 100 Base-Tx and 100Base-FX media converting function for 16 ports. The functions and features of this converter are listed below.



Fig. 5 External appearance of BBM 3016A

■ **Device management port**

- RS-232C console interface
- 10Base-T/100Base-TX (outbound)

■ **Maintenance functions**

Loop back testing is available via the CLI (serial port), and continuity confirmation testing can be performed easily when starting up the service. Moreover, all of the ports are fitted to the front of the device, which means that maintenance tasks can be performed via the front panel (except for power supply cabling). The converter also has SNMP compatibility and can be controlled by the NMS.

- Loop-back test function
- “Stand alone optical media converter” link status receiving function
- “Stand alone optical media converter” power supply interruption receiving function
- “Integrated optical media converter” link status reporting function
- “Outdoor-installed layer-2 switch” remote reset function

■ **19 inch-width rack mountability**

- The rear side exhaust means that no rack clearance is necessary

■ **High accommodation efficiency**

- Height of 1U (44.5 mm), capable of accommodating 16 ports

(3) **Built-in layer-2 switch integrated type optical media converter**



Fig. 6 External appearance of BBM 4116A

This built-in layer-2 switch integrated type optical media converter is installed with 1 x10Base-T/100Base-TX port, 16 x 100Base-FX ports, and expansion slots. Its main functions and features are described below.

■ **Uplink port expansion**

By installing a slot-in expansion module (option : BBM 9001 series), uplink port expansion is possible.

- BBM9001-T: 10/100/1000Base-T x 2 ports
- BBM9001-S: 1000Base-SX x 2 ports
- BBM9001-L: 1000Base-LX x 2 ports

■ **Device management ports**

- RS-232C console interface
- When using uplink port (inbound)
- 10Base-T/100Base-TX (outbound)

■ **Maintenance functions**

Loop back testing is available via the CLI (serial port), and continuity confirmation testing can be performed easily when starting up the service. Moreover, all of the ports are fitted to the front of the device, which means that maintenance tasks can be performed via the front panel (except for power supply cabling). The converter also has SNMP compatibility and can be controlled by the NMS.

- Loop-back test function
- “Stand alone optical media converter” link status receiving function
- “Built-in layer-2 switch integrated type optical media converter” link status reporting function
- “Stand alone optical media converter” power supply interruption receiving function

■ **Layer 2 switching functions**

- VLAN (port VLAN, tag VLAN, Asymmetric VLAN)
- Approx. 1 Mbps step bandwidth control, from 1 to 100 Mbps
- Flow control
- Load balance function
- IGMP (Internet Group Management Protocol) snooping function
- Spanning tree

■ **19 inch-width rack mountability**

- The rear side exhaust means that no rack clearance is necessary

■ **High accommodation efficiency**

- Height of 1U (44.5 mm), capable of accommodating 16 ports

(4) **Outdoor-installed layer-2 switch**



Fig. 7 External appearance of BBM 4012A

This is an outdoor-installed layer-2 switch comprising 12 x 100Base-FX (stand alone side) fibre ports and 1 x 100Base-FX (station side) fibre port. It has the functions and features listed below.

■ **Device management ports**

- RS-232C console interface
- Uplink port (inbound)

■ **Maintenance functions**

Loop back testing is available via the CLI (serial port), and continuity confirmation testing can be

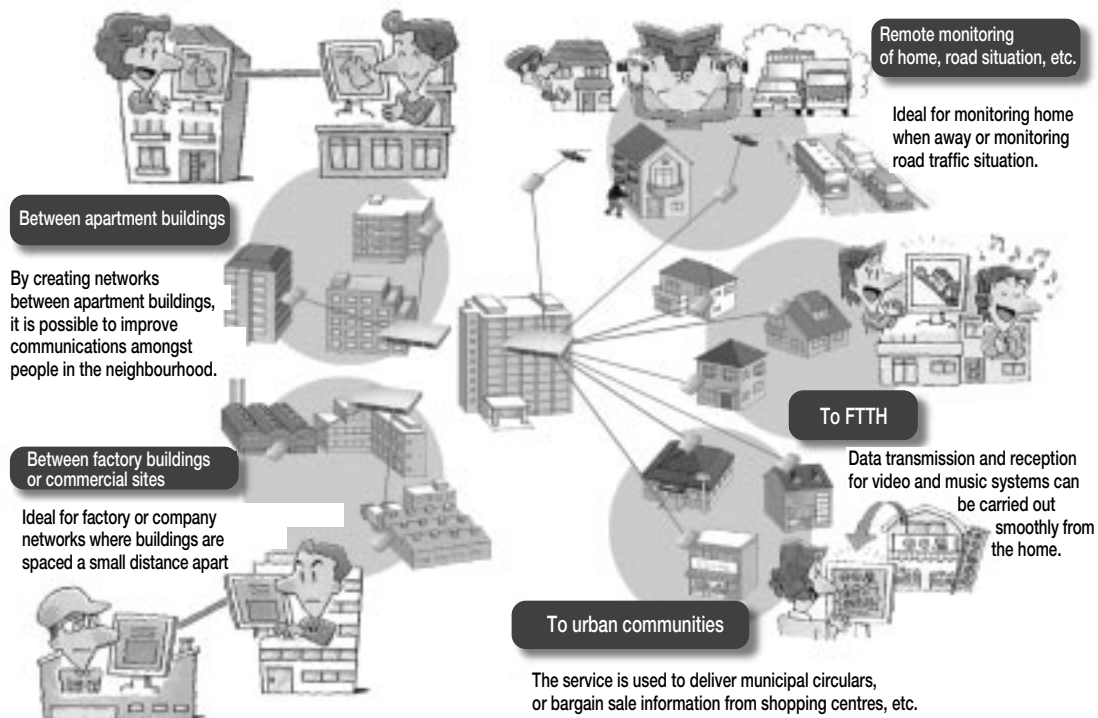


Fig. 8 Application example of optical media converter in access network

performed easily when starting up the service. The converter also has SNMP compatibility and can be controlled by the NMS.

- Loop-back test function
- "Stand alone optical media converter" link status receiving function
- "Built-in layer-2 switch integrated type optical media converter" link status reporting function
- "Stand alone optical media converter" power supply interruption receiving function

■ Layer 2 switching functions

- VLAN (port VLAN, tag VLAN, Asymmetric VLAN)
- Approx. 1 Mbps step bandwidth control, from 1 to 100 Mbps
- Flow control
- Load balance function
- IGMP (Internet Group Management Protocol) snooping function
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■ Waterproofing class

- JIS C 0920 Protection Class 5

■ Location

This switch can be located on a pole-mounted aerial cable (messenger wire) or within an aerial cable spacing (approx. 30 cm).

- Pole-mounted aerial cable (messenger wire)
- Spear metal fittings attached to telegraph pole

Application example of optical media converter

Fig. 8 shows an example of the application of the group of optical media converter products introduced above to an access system. This configuration allows control from a NOC (Network Operation Centre), and makes it possible to create a wide ranging FTTX service which comprises an SS type and ADS type access network as illustrated in Fig. 2.

At Oki, we plan to continue providing network solutions aimed at the creation of an "e-society" founded on broadband, upon the motto of "optical · IP · computer telecommunications". ◆◆

References

- 1) TTC specifications TS-1000 "Optical subscriber line interface – 100 Mbit/s in a single optical fibre core WDM system", The Telecommunication Technology Committee.

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