



# BLACK BOX<sup>®</sup>

## NETWORK SERVICES

### CWDM MultiServicePlatform



#### Key Features

- ▶ 4/8 Channel Optical Multiplexer
- ▶ Protocol transparent
- ▶ Channel:
  - Δ Multimode, single mode
  - Δ 10 Mbit/s – 2.5 Gbit/s
  - Δ 850, 1300nm
  - Δ Channel module with BFX-1 or CCM-1
  - Δ Backup module with BFX-1
  - Δ Pre-concentrator with BTM 4-1
- ▶ Link:
  - Δ 1470 – 1610 nm; 20 nm spacing
  - Δ Optional backup link module with WDL-3
- ▶ Point to point, point to multipoint, ring and mesh topologies
- ▶ Up to 70 km (between ring nodes)
- ▶ Extensive built-in management

#### Highlights

The CWDM MultiServicePlatform enables the transmission of up to eight independent wavelengths over a single dark fiber. Costs for additional fiber is saved while gaining a flexible migration path with low initial costs. By using the wider channel spacing of 20 nm costs are saved due to the use of less expensive components compared to DWDM technology.

Various types of channel (wavelength) modules such as the BFX-1 Fiberoptic X-Connection Module, the CCM-1 CWDM Channel Module, or the BTM 4-1 Timultiplexer guarantee the best suitable integration in existing or planned fiber networks. The CWDM FiberPilot provides carriers the ability to create ring and meshed networks for the access environment.

The CWDM MultiServicePlatform combines new and unique functionality but at reduced cost. Less inventory and spare part costs are required due to its modular design and future investment is guaranteed by flexible migration capabilities.

#### Multiplexing

When many applications need to be transmitted over few fibers, the CWDM FiberPilot creates multiple channels by using up to eight independent wavelengths.

The channel modules such as BFX-1, CCM-1 or even the BTM 4-1 are connected to a passive filter module CFM. Eight high-speed applications (up to 2.5 Gbit/s) or 32 low-speed applications (up to 200 Mbit/s) are concentrated into a single fiber pair. By using the BTM 4-1 as a CWDM channel module the smallest 32 channel multiplexer is created. All modules are housed in the 19" chassis that measures only 3 units in height.

#### Point to Point Backup

The CWDM FiberPilot functions as a fully automatic channel backup system. The application data is internally duplicated and transmitted via two geographically dispersed fiber pairs. In the event of a primary link failure (even if caused by a laser failure) the far end selects and switches the transported applications to the secondary fiber.

The CWDM MultiServicePlatform delivers increased reliability and protection for transported applications both on a per channel or per link basis. Per channel protection is achieved through each channel module independently commanding the switching function.

No central management module is responsible for backup control even in multi-wavelength ring and mesh systems. All switching is reported to the network management and numerous statistics are gathered to allow for quality of service reporting.

When all applications require enhanced resilience the WDL-3 optical switch enables cost-effective protection of the entire CWDM data stream.

### Point to Multipoint (PON)

When data needs to be distributed to numerous destinations from a central point, a passive CWDM Filter Module can be positioned at an intermediate hub location. From the hub location individual fibers carrying single wavelengths are used to reach individual end points. At the end points small table top products are sufficient.

### Add/Drop

The Add/Drop functionality of the OFX-1 is ideal for ring topologies. Incoming data from the "westbound" link is "dropped" and fully 3R regenerated prior to being forwarded to the local application. The "added" data from the local application port is then converted to a CWDM wavelength and sent "eastbound". The bi-directional functionality of the OFX-1 allows the same Add/Drop performance for both "westbound" and "eastbound" data.

### Express (Pass Through)

Within multiple CWDM nodes each OFX-1 can be switched from Add/Drop to Express on the fly. In Express mode "eastbound" data is fully 3R recovered and forwarded "westbound" to create a transit node on the CWDM ring. Due to the full signal regeneration virtually unlimited ring circumferences are possible. Both, "Add/Drop" and "Express" setup, can be selected from a remote management station, which permits adding a customer on the fly and total flexibility in ring configuration (fast provisioning).

### Ring Backup

By using the OFX-1 as a channel module the CWDM FiberPilot functions as fully automatic channel backup system. The application data is internally duplicated and transmitted onto the "eastbound" and "westbound" fibers. In the event of a fiber cut or even a laser failure the far end automatically selects the alternative fiber. The CWDM FiberPilot delivers utmost flexibility and resilience for both point-to-point and ring topologies.

## Specifications

### Channel Modules

OFX-1, TDM 4-1 and CCM-1 may be used alternatively or in a mixture

### BFX-1

**Functions** — Two channel CWDM converter module, Add/Drop, Crossconnect, Express (3R), Backup, 1 slot

**User ports** — SFP (Small Form Factor Pluggable); Multimode, 850nm (VCSEL), 1000 – 1250 Mbit/s, LC connector; Single Mode, 1300nm, 1000 – 1250 Mbit/s, LC connector; Single Mode, 1550nm, 1000 – 1250 Mbit/s, LC connector

**Link ports** — SFP (Small Form Factor Pluggable); Single Mode, 1470, 1490, 1510, 1530, 1550, 1570, 1590 or 1610 nm, LC connector (for more details please refer to OFX-1 data sheet)

### BTM 4-1

**Functions** — Four channel Time Division Multiplexer, Backup, 1 slot

**User ports** — Multimode, 850nm, 100 – 155 Mbit/s, LC connector; Multimode, 1300nm, 100 – 200 Mbit/s, LC connector

**Link ports** — SFP (Small Form Factor Pluggable); Single Mode, 1470, 1490, 1510, 1530, 1550, 1570, 1590 or 1610 nm, LC connector (for more details please refer to TDM 4-1 data sheet)

### CCM-1

**Functions** — One channel CWDM converter module, 1 slot

**User port** — Multimode, 1300nm, 10 – 266 Mbit/s, SC connector; Multimode, 850nm, 10 – 155 Mbit/s, SC connector; Multimode, 1300nm, 100 – 622 Mbit/s, SC connector; Multimode, 850nm (VCSEL), 100 – 1250 Mbit/s, SC connector; Single Mode, 1300nm, 100 – 1250 Mbit/s, SC connector; Single Mode, 1300nm, 10 – 155 Mbit/s, SC connector; Single Mode, 1300nm, 1000 – 2488 Mbit/s, SC connector

**Link port** — Single Mode, 1470, 1490, 1510, 1530, 1550, 1570, 1590 or 1610 nm, SC connector

### Filter Modules

**CFM 4-1 Mux:** 4 channel multiplexer, SC connector, 1 slot (demux at remote side required)

**CFM 4-1 Demux:** 4 channel demultiplexer, SC connector, 1 slot (mux at remote side required)

**CFM 8-1 Mux:** 8 channel multiplexer, LC connector, 1 slot (demux at remote side required)

**CFM 8-1 Demux:** 8 channel demultiplexer, LC connector, 1 slot (mux at remote side required)

**CFM 4-2 Mux/Demux:** 4 channel multiplexer and demultiplexer, LC connector, 1 slot (under development)

**CFM 8-2 Mux/Demux:** 8 channel multiplexer and demultiplexer, LC connector, 1 slot (under development)

### Backup Module

**WDL – 3** (optional): Common Link Backup Module, automatic backup switching (Individual Channel backup with OFX-1 or TDM 4-1. Use WDL-3 to backup entire CWDM datalink.)

### MultiServicePlatform Rack

19" chassis, including one Power Supply, 11 active plus 1 passive slots

**Dimensions** (H x W x D)

**Rack** — 134 x 482 x 370 mm (3 HU)

**Module** — 129 x 25 x 190 mm

Designed to be mounted in 19" cabinet

**Power Supply**

Slide-in supply with integrated fan (2nd PS recommended)

**Input** — 115 – 230 V AC, 50/60 Hz, Power Factor Correction

**Fuse** — EU: 250 V/4 A (slow)

**Output** — 5 V/ 40 A (200 W)

**Fan Unit**

External 19" unit (1 HU), including Power Supply (one required per FiberPilot)

**NMS-1**

(optional Network Management Module)

**Functions** — SNMP interface, integrated webserver, 10BaseT access via RJ45

Network Management Module

### Patch Cables

Interconnection between Channel Modules and Filter Modules (one per channel required)

9/125 Single Mode, duplex, SC–SC, 1m;

9/125 Single Mode, duplex, SC–LC, 1m;

9/125 Single Mode, duplex, LC–LC, 1m

### Environment

#### Temperature

**Operating** — 0– 40 °C, non condensing

**Storage** — 0 – 70 °C

**Data Rates** 10 Mbit/s – 2.5 Gbit/s

**Typical Protocols** ESCON, ATM, Fibre Channel, FICON, SDH, SONET, Fast Ethernet, Gigabit Ethernet

**Typical Applications** SAN, IBM Host, Data Save, LAN, Carrier Access, Broadcasting

**Safety and Relevant Standards** CE conform, FCC part 15, DOC, CDRH 21 CFR 1040, Laser Class I Product, (UL, cUL listing pending)

## Ordering information

### ITEM

### CODE

#### MSP-Rack, 11 Slot, 19"

230VAC .....LHS800AE

48VDC .....LHS800AE-48

#### Optional BMS-1 Management-Card

SNMP/Web Management- and LAN-interface .....LHS800C-NMS

#### Optional BFM 2/4/8-2 CWDM-Cards, passiv Mux/Demux-Card, 1 Slot

2-Channel, (1530 and 1550nm SFP required) .....LHS808C-4

4-Channel, (1510, 1530, 1550 and 1570 nm SFP required) .LHS808C-4

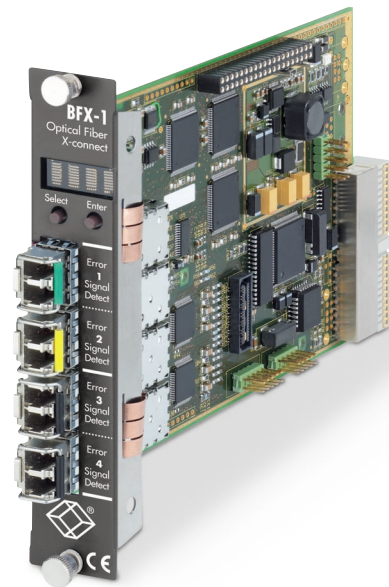
8-Channel, (1470, 1490, 1510, 1530, 1550, 1570, 1590 and 1610 nm

SFP required) .....LHS808C-8

# BFX-1 Fiberoptic X-Connection

## Key Features

- ▶ Optical Cross Connect Module
  - △ Converter, Booster, Backup, Repeater
  - △ Double CWDM channel module,
  - △ Add/Drop module, Express channel
- ▶ Dynamic switching via NMS
- ▶ Application and link ports:
  - △ Small Form Factor LC (pluggable)
  - △ Multimode, single mode
  - △ 850, 1300, CWDM: 1470 – 1610 nm
  - △ 10 Mbit/s – 1,25 Gbit/s
- ▶ Bandwith control function
- ▶ 3R function for extended distances
- ▶ Point to point, point to multipoint, ring and mesh topologies
- ▶ Up to 70 km (between ring nodes)
- ▶ Table Top, Rack version
- ▶ Dot matrix function display
- ▶ Extensive built-in management



## Highlights

The BFX-1 Optical Fiber X-Connection is a multifunctional module for the MultiServicePlatform. Its four optical interfaces can be interconnected via network management enabling various individual functions. Optional 3R regeneration functionality can extend data transmission over long distances and facilitate the deployment of ring topologies with multiple nodes.

New features, such as Priority Backup, Drop and Continue and dynamic switching from Add/Drop mode to Express mode provide new and unique opportunities for optical networking. Current costly functions, mainly known in the WAN environment, are supported by the BFX-1 and are now available for access applications.

The BFX-1 combines new and unique functionality but at reduced cost. Less inventory and spare part costs are required and future investment is guaranteed by flexible migration capabilities.

## Double Converter, CWDM Channel

The four optical interfaces allow the BFX-1 to be used as a dual channel single mode to multimode converter.

Two independent multimode applications are converted to any wavelength individually. The field upgradable pluggable laser modules allow, short reach, long reach or even CWDM selected wavelengths to be specified. The optional 3R function optimises the optical signals prior to forwarding to the application and allows maximum distances to be achieved.

## Priority Backup

Priority Backup is a variation of the regular backup function. Using the fourth port of the BFX-1 a second application can be transmitted over the backup path allowing the normally unused backup fiber to become a data channel. Upon a failure of the primary link the secondary application is terminated in lieu of the main application. If the backup path fails an alarm is generated but the secondary application is not recovered, leaving the main application up and running.

## Cross Connect

The BFX-1 may be used for point-to-multipoint operation.

When data are transported to various destinations from a central point the BFX-1 is configured in the double converter mode. In case data need to change their destination the BFX-1 operates as a cross and interlinks the opposite interfaces.

## Drop and Continue

This mode is suitable when unidirectional data need to be multicasted to many receivers.

The network is setup as a linear open ring. Application data that enters the network is made available (dropped) at every intermediate node and is also fully 3R reshaped and forwarded to the next node. A typical application for this mode is video broadcasting, whereby many base stations are fed with the same video signal.

## Add/Drop Function

The Add/Drop functionality is ideal for ring topologies. Incoming data from the "westbound" link is "dropped" and fully 3R regenerated prior to being forwarded to the local application.

The "added" data from the local application port is then converted to a CWDM wavelength and sent "eastbound". The bi-directional functionality of the BFX-1 allows the same Add/Drop performance for both "westbound" and "eastbound" data.

## Express Channel

Each BFX-1 can be switched from Add/drop to Express on the fly. In Express mode "eastbound" data are fully 3R recovered and forwarded "westbound" to create a transit node on the ring. Due to the full signal regeneration virtually unlimited ring circumferences are made possible.

Both, "Add/Drop" and "Express" setup, can be selected from a remote management station, which permits adding a customer on the fly and total flexibility in ring configuration (fast provisioning).

## Backup Function

The BFX-1 functions as a fully automatic backup system when equipped with three or four interfaces.

The application data is internally duplicated and transmitted onto two geographically dispersed dark fibers. In the event of a primary link failure (even if caused by a laser failure) the far end selects a secondary fiber.

Switching is autonomously controlled by each BFX-1 providing low latency and increased reliability. No central manager is responsible for backup control, even in multi-wavelength ring and mesh systems. All switching is reported to the network management and numerous statistics are gathered to allow for quality of service reporting. The BFX-1 delivers utmost flexibility and resilience for both point-to-point and ring topologies.

# Specifications

## Optional Interfaces

SFP (Small Form Factor Pluggable)

### SFP MM/LC/850/1250

Multimode, 850 nm (VCSEL), 1000 – 1250 Mbit/s, LC connector;  
Tx Power - 9 dBm min/- 4 dBm max;  
Rx Sensitivity- 17 dBm/Saturation- 3 dB

### SFP SM/LC/1300/1250/S

Single Mode, 1300 nm, 1000 – 1250 Mbit/s, LC connector, (typ. 10 km);  
Tx Power - 11dBm min/- 3 dBm max;  
Rx Sensitivity- 20 dBm/Saturation- 3 dB

### SFP SM/LC1300/1250/L

Single Mode, 1300 nm, 1000 – 1250 Mbit/s, LC connector, (typ. 30 km); Tx Power - 4 dBm min/+ 1dBm max; Rx Sensitivity - 20 dBm/Saturation -3 dB

### SFP SM/LC/1550/1250/V

Single Mode, 1550 nm, 1000 – 1250 Mbit/s, LC connector, (typ. 70 km);  
Tx Power - 3 dBm min/+ 2 dBm max;  
Rx Sensitivity- 23 dBm/Saturation- 3 dB

### SFP SM/LC/1xxx/1250/V

Single Mode, 1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610 nm, 1250 Mbit/s, LC connector, (typ. 70 km);  
Tx Power - 3 dBm min/2 dBm max;  
Rx Sensitivity- 23 dBm/Saturation- 3 dB

### Data Rates

10 Mbit/s - 1.25Gbit/s

### Typical Protocols

ESCON, ATM, Fibre Channel, FICON, SDH, SONET, Fast Ethernet, Gigabit Ethernet

### Typical Applications

SAN, IBM Host, Data Save, LAN, Carrier Access, Broadcasting

## Test Function

independent Loop function for all interfaces via front panel or Windows Manager with automatic Time Out  
Loss of Signal for all interfaces

### Power Supply Table Top

**Input** — 100 - 240 V AC, 50/60 Hz, 60 - 72 VA

**Output** — 5 V DC, 4A (typ. Current below 2 A)

### Power Supply Rack

Slide-in supply with integrated fan

**Input** —115 - 230 V AC, 50/60 Hz, Power Factor Correction

**Fuse** —EU: 250 V / 4A (slow)

**Output** — 5 V / 4A (200 W)

## Environment

### Temperature

**Operating** — 0– 40 °C, non condensing

**Storage** — 0 – 70 °C

### Dimensions (H x W x D)

**Table Top Unit** — 37 x 103 x 170 mm

**Rack Module** — 129 x 25 x 190 mm

### Complete Rack

— 134 x 482 x 370 mm,  
Designed to be mounted in 19" cabinet.

### Safety and relevant Standards

CE conform, FCC part 15, DOC, CDRH 21 CFR 1040, Laser Class I Product (UL, cUL listing pending)

## Ordering information

### ITEM

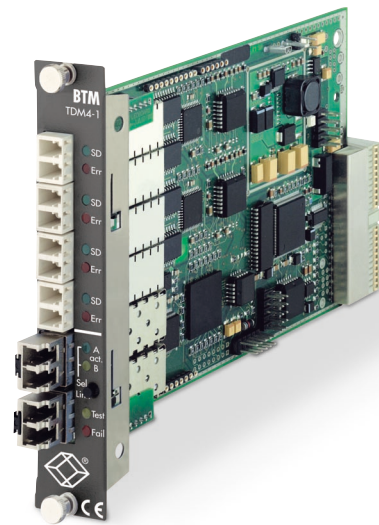
### CODE

|  |             |
|--|-------------|
| <b>BFX-1 Fiberoptic X-Connection (SFPs not incl.) 4 x SFP, up to 2.5 Gbps</b>                                  |             |
| Table Top .....  | LHS802AE    |
| MSP-Rack Card .....  | LHS802C     |
| <b>BFX-1/3r Fiberoptic X-Connection with 3R-Function (SFPs not incl.) 4 x SFP, up to 2.5 Gbps, 3R-Function</b> |             |
| Table Top .....  | LHS802AE-3R |
| MSP-Rack Card .....  | LHS802C-3R  |

# BTM 2/4-1 and BET-1/-1E Timemultiplexer

## Key Features

- ▶ 2 Channel High Speed Multiplexer
  - △ 1 G FC, FICON, GbE, TDM 4-1 link
- ▶ 4 Channel Low Speed Multiplexer
  - △ Fast Ethernet, ATM, SDH, SONET, ESCON
- ▶ Standalone or pre-concentrator
- ▶ Application and link:
  - △ Small Form Factor LC
  - △ Multimode, single mode
  - △ 850, 1300, 1550 nm, CWDM ITU grid
  - △ Optional automatic link backup
- ▶ Up to 90 km
- ▶ Table Top, Rack version
- ▶ In-band management
- ▶ TDM 2-1 supports GbE jumbo frames



## Highlights

The Timemultiplexer range enables the creation of highly cost-effective and flexible optical transport solutions. Time Division Multiplexing (TDM) is used to aggregate application protocols such as Fast Ethernet, ESCON, Fibre Channel or Gigabit Ethernet together into a single wavelength that can either be extended or feed into Dense Wave (DWDM) or Coarse Wave (CWDM) Division Multiplexer systems. The combination of cost-effective multiplexing technology with support of diverse application protocols and hot-swappable transceivers enables Timemultiplexer to deliver uniquely flexible optical transport solutions. Timemultiplexer BTM 4-1 multiplexes four low-speed application protocols (100 Mbit/s – 200 Mbit/s) including Fast Ethernet, FDDI, STM-1 and ESCON. Timemultiplexer BTM 2-1 multiplexes two high-speed application protocols (1.062 Gbit/s – 1.25 Gbit/s) including Fibre Channel, FICON and Gigabit Ethernet. Timemultiplexer BTM 2-1 also includes an in-band management function that enables access to the remote unit without need for external network access. Optional protection switching from the primary fiber to a secondary fiber is supported through a field upgradeable backup port that can be enabled with a software key and an additional transceiver. Both Timemultiplexer versions are designed to operate as standalone devices or pre-concentrators for DWDM or CWDM systems. Through the

availability of CWDM specific hot-swappable transceivers the Timemultiplexer is also able to become a channel module for CWDM MultiServicePlatform.

### Pre-Concentrator

In some circumstances it is necessary to extend low-speed application protocols (100 Mb/s – 200 Mb/s) such as ESCON or Fast Ethernet with a Gigabit Ethernet application to a remote site. The BTM 4-1 pre-concentrates up to four low-speed applications and feeds into one port of the BTM 2-1.

The Gigabit Ethernet is connected to the remaining BTM 2-1 port and extended with the BTM 4-1 data to the remote site. Due to the ability to cost-effectively support diverse protocols the Timemultiplexer is able to flexibly enhance various networks and topologies.

### Gigabit TDM

When high-speed application connectivity using two different fiber paths is required the BTM 2-1 can be used in combination with CWDM to combine applications and transmit them over diverse fiber paths.

In providing increased reliability higher service levels can be guaranteed. The optional backup function switches each link individually in event of a link failure.

### Ring Backup

Each TDM has a backup port that can be equipped with a hot-swappable transceiver and enabled via software key. By using CWDM specific transceivers together with a CWDM filter the TDM becomes a CWDM channel module.

The application data is internally duplicated and transmitted via two geographically dispersed dark fibers. In the event of a primary link failure (even if caused by a laser failure) the far end selects the secondary fiber path. Protection switching is autonomously controlled by each Timemultiplexer providing low latency and increased reliability. No central manager is responsible for backup control, even in multi-wavelength systems. All switching is reported to the network management and numerous statistics are gathered to allow for quality of service reporting.

### Network Management

The Timemultiplexer provide full manageability through the NMS b1 View. b1 View provides a powerful and intuitive operator interface for all products. b1 View enables access to each individual module and reads information stored on the microprocessor in each card. Management access is available via 10BaseT LAN interface, Web browser, SNMP, ISDN S0, modem or serial connection.

# Specifications

## Time Multiplexer

Time Division Multiplexer  
Multirate, Automatic Link Backup (via software key), Jumbo Frame Support at TDM 2-1

## BTM 2-1/x

### -A/SFP -B/SFP -L/SFP

2 Channel TDM with two application ports, link port and backup link port  
Applications: Fibre Channel, FICON, Gigabit Ethernet, TDM 4-1 Link  
For port specifications refer to section Pluggable Optical Interfaces

## BTM 4-1/x

### S-A/MM/LC/1300/200 -L/SFP

4 Channel TDM with four application ports, link port and backup link port  
Applications: Fast Ethernet, ATM OC-3, SDH STM-1, ESCON  
Multimode, 1300 nm, 100 – 200 Mbit/s, LC connector  
Tx Power - 19 dBm min/- 14 dBm max  
Rx Sensitivity - 30 dBm/Saturation - 14 dB

## BTM 4-1/R/ES

### -A/MM/LC/1300/200 -L/SFP

4 Channel ESCON TDM with four application ports, link port and backup link port; Multimode, 1300 nm, 200 Mbit/s, LC connector; Tx Power - 19 dBm min/- 14 dBm max; Rx Sensitivity - 30 dBm/Saturation - 14 dB

## Pluggable Optical Interface

SFP (Small Form Factor Pluggable)

## SFP MM/LC/850/1250

Multimode, 850 nm (VCSEL), 1000 – 1250 Mbit/s, LC connector;  
Tx Power - 9 dBm min/- 4 dBm max;  
Rx Sensitivity- 18 dBm/Saturation- 3 dB

## SFP SM/LC/1300/1250/S

Single Mode, 1300 nm, 1000 – 1250 Mbit/s, LC connector, (typ. 10 km)\*;  
Tx Power - 9 dBm min/- 3 dBm max;  
Rx Sensitivity- 20 dBm/Saturation- 3 dB

## SFP SM/LC/1300/1250/L

Single Mode, 1300 nm, 125 – 1250 Mbit/s, LC connector, (typ. 30 km)\*;  
Tx Power - 4 dBm min/+ 1 dBm max;  
Rx Sensitivity- 21 dBm/Saturation- 3 dB

## SFP SM/LC/1550/1250/V

Single Mode, 1550 nm, 50 – 1250 Mbit/s, LC connector, (typ. 70 km)\*;  
Tx Power - 3 dBm min/+ 2 dBm max;  
Rx Sensitivity- 23 dBm/Saturation- 3 dB

## SFP SM/LC/1300/2500/S

Single Mode, 1300 nm, 155 – 2500 Mbit/s, LC con., (typ. 10 km, 2 km OC-48)\*;  
Tx Power - 9 dBm min/- 3 dBm max;  
Rx Sensitivity - 20 dBm (2G)/ - 18 dBm (2.5G)/Saturation - 3 dB

## SFP SM/LC/C1xxx/2500/V

Single Mode, CWDM: 1470, 1490, 1510, 1530, 1550, 1570, 1610 nm, 125 – 2500 Mbit/s, LC connector, (typ. 70 km)\*;  
Tx Power + 0 dBm min/+ 5 dBm max;  
Rx Sensitivity - 23 dBm (1 G)/- 21 dBm (2.5 G)/Saturation + 0 dB

## MultiServicePlatform Rack

Required for TimePilot rack version, common rack for all rack modules  
Includes Power Supply and Network Termination module for serial access

## Network Management Module

SNMP interface, integrated webserver, 10BASE-T access via RJ45

## Power Supply Table Top

Input — 100 - 240 V AC, 50/60 Hz, 60 - 72 VA

Output — 5 V DC, 4A (typ. Current below 2 A)

## Power Supply Rack

Slide-in supply with integrated fan  
Input — 115 - 230 V AC, 50/60 Hz, Power Factor Correction

Fuse — EU: 250 V / 4A (slow)

Output — 5 V / 4A (200 W)

## Dimensions (H x W x D)

Table Top Unit — 37 x 103 x 170 mm

Rack Module — 129 x 25 x 190 mm

Complete Rack —

134 x 482 x 370 mm (3 HU),

Designed to be mounted in 19" cabinet.

## Safety and relevant Standards

CE conform, FCC part 15, DOC, CDRH 21 CFR 1040, Laser Class I Product (UL, cUL listing pending) 47

## Ordering information

### ITEM

### CODE

#### BTM 4-1 TDM (SFPs not incl.), 4x Applicationsport MM 1300nm LC, 1+1x Linkport SFP

Table Top .....LHS803AE

MSP-Rack Card, 1 Slot .....LHS803C

#### BTM 2-1 Highspeed-TDM (SFPs not incl.), 2x Entryport SFP, 1+1x Linkport SFP

Table Top .....LHS804AE

MSP-Rack Card, 1 Slot .....LHS804C

#### BET-1, 4x Entryport RD45, 1 x Linkport SFP

Table Top .....LHS805AE

MSP-Rack Card, 1 Slot .....LHS805C

#### BET-1E, 5x Entryport RJ45, 1x Entryport RJ11, 1x Linkport SFP

MSP-Rack Card, 1 Slot .....LHS806C

# BFC-2 FiberopticConverter



## Key Features

- ▶ Optical Fiber Converter
  - △ Multimode, single mode
  - △ 850, 1300, 1550nm and CWDM
- ▶ Optical Repeater & Booster
  - △ Clock recovery function (3R)
- ▶ 50 Mbit/s - 2.67 Gbit/s
- ▶ Pluggable transceivers
- ▶ Up to 120 km
- ▶ Bandwith control function
- ▶ Test loop
- ▶ Table Top, Rack version
- ▶ Extensive built-in management

## Highlights

The FiberopticConverter (BFC-2) enables cost-effective and scalable deployment of metropolitan networking solutions for various application protocols (50 Mbit/s - 2.67 Gbit/s) to distances of 120km. The BFC-2 is available as a compact tabletop or rack module and delivers a wide variety of functions that include multimode to single mode or single mode to single mode wavelength conversions. The addition of an external WDM multiplexing cable enables the BFC-2 to support single fibre solution requirements.

The BFC-2 features modular SFP transceivers that increase flexibility and reduce Operational Expenditure (OPEX) by minimizing spare part inventory and stock levels. Hot swappable SFP transceivers provide future proofed investment protection by enabling an easy upgrade path for new requirements

including CWDM solutions. Integrated management featuring extensive test and diagnostic functions enables permanent monitoring while optional 3R clock recovery guarantees signal quality at any bit rate with remote bandwidth control. The BFC-2 is a cost-effective, adaptable and manageable solution for metropolitan networking.

# Specifications

## Optical Interface

SFP (Small form Factor Pluggable)  
(for detailed optical data please refer to SFP technical Information)

### SFP MM/LC/1300/266

Multimode, 1300 nm, 50 – 266 Mbit/s, LC connector;

### SFP MM/LC/1300/622

Multimode, 1300 nm, 50 - 700 Mbit/s, LC connector

### SFP SM/LC/1300/266/S

Singlemode, 1300 nm, 50 – 266 Mbit/s, LC connector, (typ. 15 km)\*

### SFP SM/LC/1300/622/S

Single Mode, 1300 nm, 50 – 700 Mbit/s, LC connector, (typ. 2 km)\*

### SFP SM/LC/1550/1250/L

Single Mode, 1550 nm, 50 – 1300 Mbit/s, LC connector, (typ. 40 km)\*

### SFP SM/LC/1550/1250/V

Single Mode, 1550 nm, 50 – 1300 Mbit/s, LC connector, (typ. 70 km)\*

### SFP SM/LC/1300/2125

Singlemode, 1300 nm, 1000 – 2125 Mbit/s, LC connector (typ. 10km)

### SFP MM/LC/850/2125

Multimode, 850 nm, 1000 – 2125 Mbit/s, LC connector

### SFP SM/LC/1300/2500/S

Single Mode, 1300 nm, 155 – 2670 Mbit/s, LC connector, (typ. 10 km, 2km OC-48)\*

### SFP SM/LC/C1xxx/1250/V

Single Mode, CWDM, 50 - 1300 Mbit/s, LC connector, (typ. 70 km)\*

### SFP SM/LC/C1xxx/2500/V

Single Mode, CWDM, 125 – 2670 Mbit/s, LC connector, (typ. 70 km)\*

### SFP SM/LC/C1xxx/2500/U

Single Mode, CWDM, 125 – 2670 Mbit/s, LC connector, (typ. 90 km)\*

## Data Rates

50 Mbit/s - 2.5 Gbit/s (2.488 Gbit/s requires 3R function)

## Typical Protocols

SDH, SONET, ATM, Gigabit Ethernet, Fast Ethernet, Fibre Channel, FICON

## Typical Applications

Carrier Access, LAN Extension, SAN, Broadcasting, Data Save

## Diagnostic Functions

Laser failure of every port, temperature and operating voltage status Optical power levels, Traps and statistics Loop setting Connection to Network Management System (Terminal or SEEmiles)

## BFC-2 Versions

- Table Top standard version
- Table Top version with 3R function (for 2.488 Gbit/s or long distances)
- Rack standard version
- Rack version with 3R function (for 2.488 Gbit/s or long distances)

## MultiServicePlatform

Required for BFC-2 rack version, common rack for all rack modules Includes Power Supply and Network Termination module for serial access

## Network Management Module

SNMP interface, integrated webserver, 10BASE-T access via RJ45

## Power Supply Table Top

**Input** — 100 - 240 V AC, 50/60 Hz, 60 - 72 VA

**Output** — 5 V DC, 4A (typ. Current below 2 A)

## Power Supply Rack

Slide-in supply with integrated fan

**Input** — 115 - 230 V AC, 50/60 Hz, Power Factor Correction

**Fuse** —EU: 250 V / 4A (slow)

**Output** — 5 V / 4A (200 W)

## Dimensions (H x W x D)

**Table Top Unit** — 37 x 103 x 170 mm

**Rack Module** — 129 x 25 x 190 mm

## Complete Rack —

134 x 482 x 370 mm (3 HU),

Designed to be mounted in 19" cabinet.

## Safety and relevant Standards

CE conform, FCC part 15, DOC, CDRH 21 CFR 1040, Laser Class I Product (UL, cUL listing pending)

## Ordering information

### ITEM

### CODE

#### BFC-2 FiberopticConverter (SFPs not incl.), 2 x SFP

Table Top .....LHS801AE

MSP-Rack Card, Slot .....LHS801C

#### BFC-2/3-3R FiberopticConverter with 3R-Function (SFPs not incl.), 2 x SFP, 3R-Function

Table Top .....LHS801AE-3R

MSP-Rack Card, Slot .....LHS801C-3R



# BCM-4/8 Compact Multiplexer



## Key Features

- ▶ Optical Fiber Converter
  - Δ Multimode, single mode
  - Δ 850, 1300, 1550nm and CWDM
- ▶ Optical Repeater & Booster
  - Δ Clock recovery function (3R)
- ▶ 50 Mbit/s - 2.67 Gbit/s
- ▶ Pluggable transceivers
- ▶ Up to 120 km
- ▶ Bandwidth control function
- ▶ Test loop
- ▶ Table Top, Rack version
- ▶ Extensive built-in management

## Highlights

The BCM-4/8 Compact Multiplexer complements Black Box successful FiberPilot optical multiplexer series with an extremely compact form factor. The LightPilot is ideal suited for highly cost sensitive applications or when the high flexibility of the standard FiberPilot is not required.

The BCM-4/8 Compact Multiplexer concentrates any optical application between 100 Mbit/s - 2.5 Gbit/s onto a single fiber pair. Consequent use of pluggable optics, inside and outside permits high flexibility to changing user requirements.

The BCM-4/8 Compact Multiplexer contains a complete optical multiplexer system. This includes optical filter, CWDM laser and receiver, internal optical wiring, fan cooling, management interfaces and redundant power supplies.

The power supplies can be exchanged from the front. The CWDM logic module is also accessible from the front to enable fast servicing or upgrades. The unit performs 2R data re-amplification. Optionally, 3R clock recovery can be installed or field upgraded.

Typically the BCM-4/8 Compact Multiplexer is used in point-to-point topologies. Alternatively, a passive optical ring configuration is supported whereby LightPilots in a ring add and drop individual optical channels. The BCM-4/8 Compact Multiplexer interope-

rates with the MultiServicePlatform for utmost flexibility in network design.

The BCM-4/8 Compact Multiplexer is managed through SEEmiles, the universal management solution. Access via serial port as well as through Ethernet is available. The BCM-4/8 Compact Multiplexer is a full featured member of the Black Box management structure.

# Specifications

## **Optical Interface user side**

SFP (Small form Factor Pluggable)  
(for detailed optical data please refer to SFP technical Information)

### **SFP MM/LC/1300/266**

Multimode, 1300 nm, 50 – 266 Mbit/s, LC connector;

### **SFP MM/LC/1300/622**

Multimode, 1300 nm, 50 - 700 Mbit/s, LC connector

### **SFP SM/LC/1300/266/S**

Singlemode, 1300 nm, 50 – 266 Mbit/s, LC connector, (typ. 15 km)\*

### **SFP SM/LC/1300/622/S**

Single Mode, 1300 nm, 50 – 700 Mbit/s, LC connector, (typ. 2 km)\*

### **SFP MM/LC/850/1250**

Multimode, 850 nm (VCSEL), 1000 – 1250 Mbit/s, LC connector

### **SFP SM/LC/1300/1250/S**

Single Mode, 1300 nm, 1000 – 1250 Mbit/s, LC connector, (typ. 10 km)\*

### **SFP MM/LC/850/2125**

Multimode, 850 nm, 1000 – 2125 Mbit/s, LC connector

### **SFP SM/LC/1300/2500/S**

Single Mode, 1300 nm, 155 – 2670 Mbit/s, LC connector, (typ. 10 km, 2km OC-48)\*

### **Optical CWDM Interfaces Inside**

(premium version)  
SFP (Small Form Factor Puggable)

### **SFP SM/LC/C1xxx/1250/V**

Single Mode, CWDM: 1470, 1490, 1510, 1530, 1550, 1570, 1610nm, 50 - 1300 Mbit/s, LC connector, (typ. 50 km with filter loss)\*; Tx ower -3dBm min/ +2 dBm max, Rx Sensibility -23dBm/ Saturation -3dB

### **SFP SM/LC/C1xxx/2500/V**

Single Mode, CWDM: 1470, 1490, 1510, 1530, 1550, 1570, 1610 nm, 125 – 2670 Mbit/s, LC connector, (typ. 50 km wit filter loss)\*, Tx Power +0 dBm min/ +5 dBm max, Rx Sensitivity -21 dBm/ Saturation +0 dB

### **SFP SM/LC/C1xxx/2500/U**

Single Mode, CWDM: 1470, 1490, 1510, 1530, 1550, 1570, 1610 nm, 125 – 2670 Mbit/s, LC connector, (typ. 70 km wit filter loss)\*, Tx Power +0 dBm min/ +5 dBm max, Rx Sensitivity -28 dBm/ Saturation -7 dB

## **Data Rates**

50 Mbit/s - 2.5 Gbit/s (for 2.488 Gbit/s 3R function recommended)

## **Typical Protocols**

SDH, SONET, ATM, Gigabit Ethernet, Fast Ethernet, Fibre Channel, FICON

## **Typical Applications**

Carrier Access, LAN Extension, SAN, Broadcasting, Data Save

## **Diagnostic Functions**

Signal Detect of every port, temperature and operating voltage status, Optical power levels (depending on optics used), Traps and statistics, Connection to Network Management System (Serial RS232 or Ethernet)

## **BCM-4/8 Versions**

- 4 channel standard veersion with built-in optics (up to 1,25 Gbit/s)
- 4 channel premium version witch pluggable CWDM SFP optics inside
- 8 channel standard version with built-in optics (up to 1,25 Gbit/s)
- 8 channel premium version with pluggable CWDM SFP optics inside
- Add/drop version witch add/drop optics, consult dealer for details

## **Power Supply Rack**

Slide-in supply

**Input** — 115 - 240 V AC, 50/60 Hz, Power Factor Correction

**Fuse** — EU: 250 V/1 A (slow)

**Output** — 5 V / 10 A (50 W)

## **Dimensions (H x W x D)**

**Complete Rack** —

45 x 482 x 305 mm (1 HU),

Designed to be mounted in 19" cabinet.

## **Safety and relevant Standards**

CE conform, FCC part 15, DOC, CDRH 21 CFR 1040, Laser Class I Product, UL (listing pending)

## **Ordering information**

### **ITEM**

### **CODE**

**Compact Multiplexer (SFPs not incl.), up to 2.67 Gbpx LC, 1 x Link Singlemode LC, 1 HU 19"**

BCM-4, 4-Ports .....LHS824AE  
BCM-8, 8-Ports .....LHS828AE

# Fiber-Loader

The Fiber-Loader (Multiplexing Solution) is the ideal and cost effective way to save fiber costs. Due to the use of CWDM technology a fiber can be used in multiple ways.

## BFL-1

### Key Features

- ▶ 1 channel CWDM over single fiber
- ▶ Versions:
  - △ Gigabit Ethernet, 1 G Fibre Channel, 2 G Fibre Channel
  - △ SDH and ATM (up to 2.488 Mbit/s)
- ▶ Highly space saving
- ▶ Compatible to FiberPilot platform
- ▶ Pluggable lasers (SFP)
- ▶ Up to 50 km
- ▶ Clock Recovery (3R)
- ▶ Extensive management
- ▶ Real „Plug-and-Play“ solution

### Highlights

The Fiber-Loader (Multiplexing Solution) is the ideal and cost effective way to save fiber costs. Due to the use of CWDM technology a fiber can be used in multiple ways. With different wavelengths data can be transmitted in parallel over a single fiber allowing the secondary fiber of a fiber pair to also be used for data transmission.

The various versions of the Fiber-Loader support a wide range of applications and services such as Gigabit Ethernet, SAN (Fibre Channel), ATM and SDH. A bidirectional application is transported over one single fiber up to 50km by using wavelength division multiplexing.

The BFL-2 devices of the Fiber-Loader support Network Management functionality and can be configured and monitored with a PC via the free Black Box GUI b1 View.

The use of pluggable lasers (SFP) enables flexible configuration of the devices. This flexibility supports bandwidth and application upgrades and the use together with further Black Box components.

It was never that easy to use CWDM technology. The devices are delivered preconfigured and ready for installation. An easy Getting Started Guide supports the installation.

Optional NMS software b1 View can be installed on a PC to monitor, configure and use extensive test functions of the devices via a comfortable graphical user interface.

### Specifications

#### SFP MM/LC/850/2125

Multimode, 850 nm, 1000 - 2125 Mbit/s, LC connector, Tx Power -9dBm min/ -4dBm max Rx Sensitivity -15 dBm

#### SFP MM/LC/1300/2500/S

Singlemode, 1300 nm, 155 - 2500 Mbit/s, LC connector;

#### SFP SM/LC/1300/2500/S

Multimode, 1300 nm, 50 - 700 Mbit/s, LC connector (typ. 10 km, 2 km at STM-16) Tx Power -9dBm min/ -3dBm max Rx Sensitivity -18dBm/ Saturation -3dB

#### Version Fibre Channel

Transmission over single mode fiber, SC connector, Optical budget (possible fiber attenuation): 17 dB (typ. 50 km)

#### Version SDH and ATM

Transmission over Singlemode fiber, SC connector, Optical budget (possible fiber attenuation): 17 dB (typ. 50 km)

#### Power Supply

**Input** — 100 - 240 V AC, 50/60 Hz, 60 - 72 VA

**Output** — 5 V DC, 4 A

#### Dimensions (H x W x D)

**Table Top unit** — 37 x 103 x 170 mm

#### Safety and relevant Standards

CE conform, FCC part 15, DOC, CDRH 21 CFR 1040, Laser Class I M Product

#### Delivery Package

##### Modules —

- 2 x WDM-1/C -A/LC/1530/1550/-L/SC/SINGLE (filter cable)
- 2 x CAB CON /RJ11/DB9F/2M (NMS connecotr cable)
- 1 x CD NMS Software SEEmiles, installation instruction and handbooks

## Ordering information

### ITEM

### CODE

#### BFL-1 Link-Packet Fiber-Loader 1, 1 x Entry

850 MM up to 1,125 Gbps over 1 SM up to 50 km . . . . . LHS811AE-G  
1300 SM up to 2,67 Gbps over 1 SM up to 50 km . . . . . LHS811AE-A

# BFL-2

## Key Features

- ▶ 2 channel CWDM over single fiber
- ▶ Versions:
  - △ Gigabit Ethernet, 1 G Fibre Channel, 2 G Fibre Channel
  - △ SDH and ATM (up to 2.488 Mbit/s)
- ▶ 3 HU 19" rack for up to 11 x MuXolutions
- ▶ Alternative table top for customer side
- ▶ Compatible to FiberPilot platform
- ▶ Up to 50 km to remote sides
- ▶ Extensive management
- ▶ Real „Plug-and-Play“ solution

### Highlights

The Fiber-Loader (Multiplexing Solution) is the ideal and cost effective way to save fiber costs. Due to the use of CWDM technology a fiber can be used in multiple ways. With different wavelengths data can be transmitted in parallel over a single fiber allowing the secondary fiber of a fiber pair to also be used for data transmission.

The various versions of the Fiber-Loader support a wide range of applications and services such as Gigabit Ethernet, SAN (Fibre Channel), ATM and SDH. Two bidirectional applications are transported over one single fiber up to 50km by using wavelength division multiplexing. The BFL-2 devices of the Fiber-Loader support Network Management functionality and can be configured and monitored with a PC via the free GUI b1 View. The use of pluggable lasers (SFP) enables flexible configuration of the devices. This flexibility supports bandwidth and application upgrades and the use together with further Black Box components. It was never that easy to use CWDM technology. The devices are delivered

preconfigured and ready for installation. An easy Getting Started Guide supports the installation.

Optional NMS software b1 View can be installed on a PC to monitor, configure and use extensive test functions of the devices via a comfortable graphical user interface.

## Specifications

### MultiServicePlatform Rack

Required for Black Box rack versions, includes Power Supply and Network Termination module for serial access

### Power Supply Table Top

**Input** — 100 - 240 V AC, 50/60 Hz, 60 - 72 VA

**Output** — 5 V DC, 4 A (typ. current below 2 A)

### Power Supply Rack

Slide-in supply with integrated fan  
**Input** — 115 - 230 V AC, 50/60 Hz, Power Factor Correction  
**Fuse** — EU: 250 / 4 A (slow)  
**Output** — 5 V, 40 A (200W)

### Dimensions (H x W x D)

**Table Top unit** — 37 x 103 x 170 mm  
**Rack module** — 129 x 25 x 190 mm  
**Complete Rack** — 134 x 482 x 370 mm (3HU), Designed to be mounted in 19" cabinet

### Safety and Standards

CE conform, FCC part 15, DOC, CDRH 21 CFR 1040, Laser Class I M Product

### Delivery Package

#### Modules —

- 2 x CFC 4-1 -A/LC/1510/1530/1550/1570/-L/SC/SINGLE (filter cable)
- 2 x CAB CON /RJ11/DB9F/2M (NMS connecotr cable)
- 1 x CD NMS Software SEEmiles, installation instruction and handbooks

#### Additional modules —

- 1 or 2 x MultiServicePlatform Rack

## Ordering information

### ITEM

### CODE

#### BFL-2 Link-Packet Fiber-Loader 2, 2 x Entry

850 MM up to 1,125 Gbps over 1 SM up to 50 km . . . . .LHS812AE-G  
1300 SM up to 2,67 Gbps over 1 SM up to 50 km . . . . .LHS812AE-A

# BFL-4L

## Key Features

- ▶ 4 channel TDM & CWDM over single fiber
- ▶ Supported applications:
  - △ Fast Ethernet
  - △ FDDI
  - △ ESCON®
  - △ SDH and ATM (155 Mbit/s)
- ▶ Highly space saving
- ▶ Compatible to FiberPilot platform
- ▶ Pluggable lasers (SFP)
- ▶ Up to 50 km
- ▶ Extensive management
- ▶ Real „Plug-and-Play“ solution

### Highlights

The Fiber-Loader (Multiplexing Solution) is the ideal and cost effective way to save fiber costs. Due to the combination of CWDM with the TDM technology a fiber can be used in multiple ways. With different wavelengths data can be transmitted in parallel over a single fiber allowing the secondary fiber of a fiber pair to also be used for data transmission. By using the time multiplex technology applications up to 200 Mbit/s can be preconcentrated and the fiber is used most effective.

The various versions of the Fiber-Loader support a wide range of applications and services such as Gigabit Ethernet, SAN (Fibre Channel), ATM and SDH. Four applications are transported over one

single fiber up to 50km by using time and wavelength division multiplexing.

The BTM 4-1 devices of the Fiber-Loader support Network Management functionality and can be configured and monitored with a PC via the free GUI b1 View. The use of pluggable lasers (SFP) enables flexible configuration of the devices. This flexibility supports bandwidth and application upgrades and the use together with further Black Box components.

It was never that easy to use multiplexing technology. The devices are delivered preconfigured and ready for installation. An easy Getting Started Guide supports the installation.

Optional NMS software b1 View can be installed on a PC to monitor, configure

and use extensive test functions of the devices via a comfortable graphical user interface.

## Specifications

### TDM 4-1/T -A/MM/LC/1300/200

Multimode, 1300 nm, 50-266 Mbit/s, LC connector

Tx Power -19 dBm min/ -14dBm max

Rx Sensitivity -30 dBm/ Saturation -14dB

### Fiber-Loader BFL-4L

Transmission over Singlemode fiber, SC connector, optical budget (possible fiber attenuation): 17 dB (typ.50 km)

### Power Supply

Slide-in supply with integrated fan

**Input** — 100 - 240 V AC, 50/60 Hz, 60 - 72 VA

**Output** — 5 V DC, 4 A

### Dimensions (H x W x D)

**Table Top unit** — 37 x 103 x 170 mm

### Safety and Standards

CE conform, FCC part 15, DOC, CDRH 21 CFR 1040, Laser Class I M Product

### Delivery Package

#### Modules —

- Fast Ethernet, FDDI, ATM OC-3, SDH STM-1 and ESCON with 1300 nm Multimode Interface
- 2 x TDM 4-1 -A/Mm/LC/1300/200 -L/SFP (Time Multiplexer)
- 2 x SFP SM/LC/C15xx/1250/V (pluggable transceiver for link)
- 2 x WDM-1/C -A/LC/1530/1550 -L/SC/SINGLE (Filter Cable)
- 2 x CAB CON /RJ11/DB9F/2M (NMS connecto cable)
- 1 x CD NMS Software SEEmiles, installation instruction and handbooks

## Ordering information

### ITEM

### CODE

**BFL-4L Link-Packet Fiber-Loader 4L, 4 x Entry**

1300 MM up to 200 Mbps over 1 SM up to 50 km . . . . . LHS814AE

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