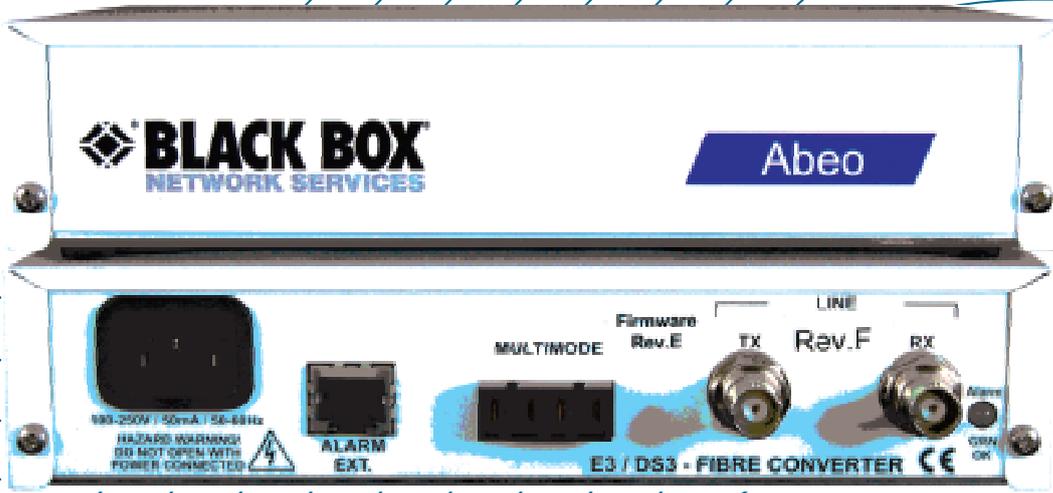


# Abeo/Opticon Fibre Converters



## **1.1 About the MTU9XXX product range**

The Black Box MTU9XXX range of Fibre Converters provide a simple economic way of converting from one type of transmission medium to another. Examples include: Electrical signals on copper to optical signals on fibre, and vice-versa. Single-mode optical fibre to multimode and vice-versa.

The MTU9XXX range of converters has been designed to be plug and go, conforming to appropriate standards, physically very compact, and rack mountable in sets of 2 using a dual face plate, or 18 units in a rack mount kit for large installations. MTU9XXX units often enable substantial savings to be made in cable costs by utilising the cheapest effective cable type without incurring the costs of additional router or switch interfaces. Black Box are continually developing new models, so if the interface combination required is not listed in this guide, please contact Black Box.

## **1.2 Safety**

Where electrical signal cabling is connected to MTU9XXX models, do not connect to cabling which would be required by BS6701 to be equipped with over-voltage protection. Electrical signal ports should only be connected to SELV ports on other equipment in accordance with EN60950 clause 2.3.

## **1.3 Electromagnetic Compatibility**

In order to ensure EMC compliance all electrical signal and data cables and connectors must use a screened connector shell with a screened cable. The cable screen must be terminated to the screened connector shell and not connected to any pins of the connector. Failure to use the correct connector may compromise EMC compliance.

## **1.4 EN55022 Declaration**

MTU9XXX units are a Class A product. In a domestic environment it may cause radio interference in which case the user may be required to take adequate measures.

## **1.5 FCC Declaration**

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at its own expense.

## 1.6 Regulatory Notice

The MTU9XXX range are powered by an internal mains-fed power supply. The mains input voltage is 100-250VAC, 50/400Hz. An alternative -48VDC power supply is available on all units as a custom order item. The power consumption of each model in the range is shown below, together with the current consumption over the operating voltage ranges..

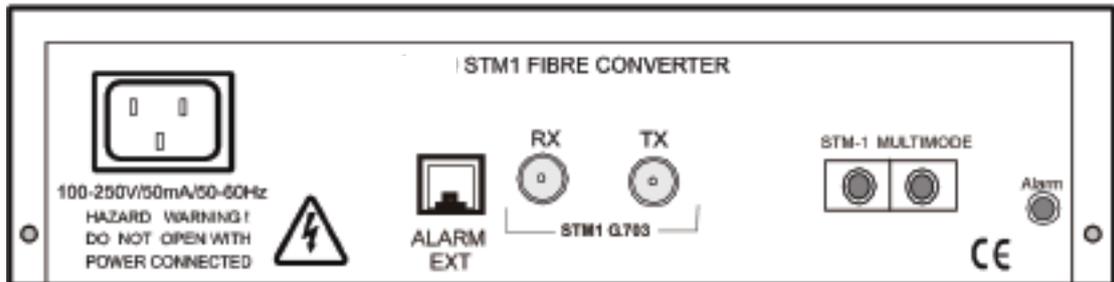
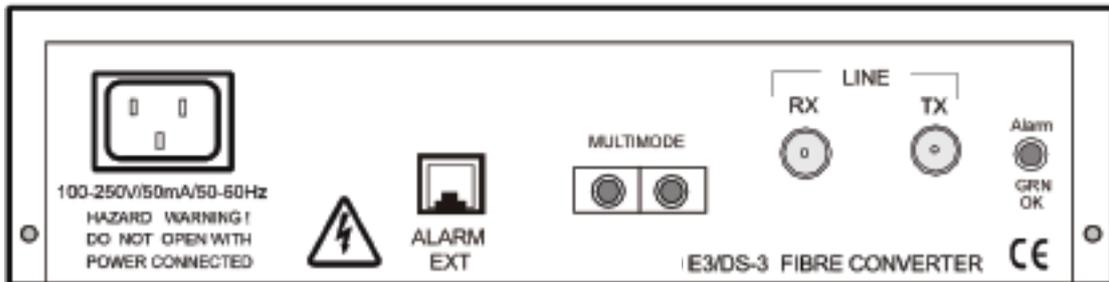
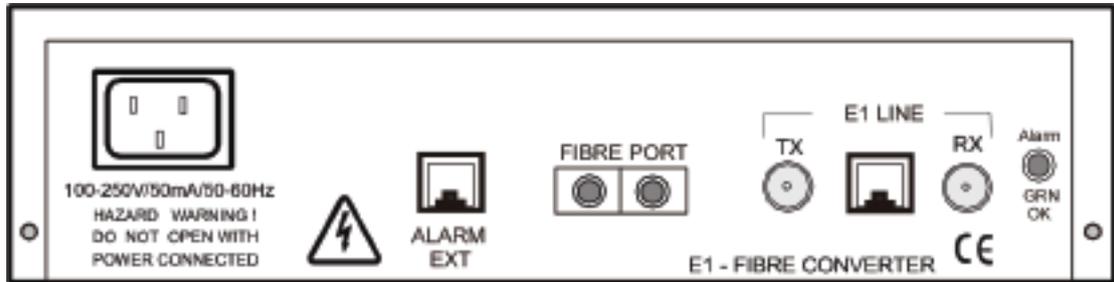
### Safety Instructions

Model	Watts Power Consumption	Current Range mA for 100-250 VAC	Current Range mA for -40 to -72 VDC
MTU9009	3.5	35 - 15	100 - 50
MTU9010	4.5	45 - 20	125 - 65
MTU9011	4.5	45 - 20	125 - 65
MTU9200	6.0	60 - 25	200 - 100
MTU9210	6.0	60 - 25	200 - 100
MTU9220	6.0	60 - 25	200 - 100
MTU9230	6.0	60 - 25	200 - 100

The MTU9XXX must be connected to mains safety earth for correct operation. The MTU9XXX power supply should be connected to a supply socket that is physically located close to the unit and is easily accessible.

**Safety Notes:** Excessive voltages are present inside the unit. There are no user serviceable parts inside the unit, and the cover should not be removed by unqualified personnel. The unit must not be exposed to damp or condensing conditions.

**2. 1 MTU9XXX rear panels**

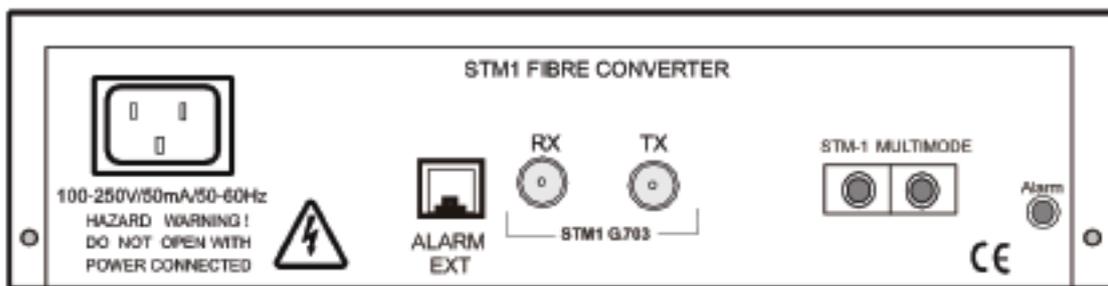


## 2.2 Unpack and inspect the equipment.

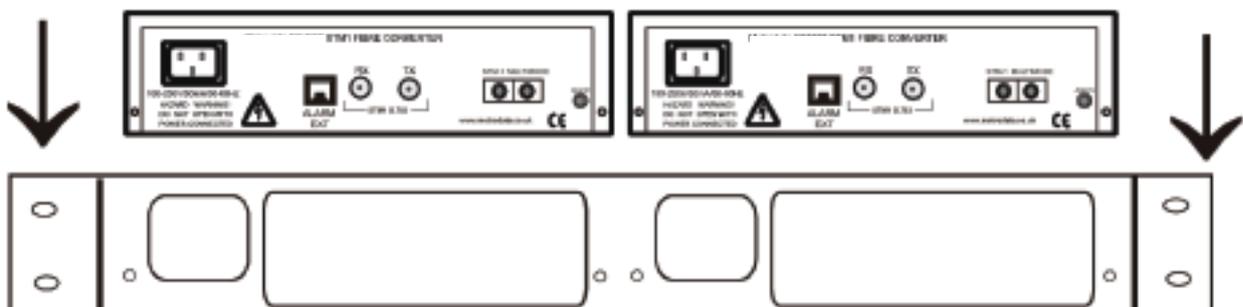
The carton should contain a single Black Box MTU9XXX model and a power cable. If there is any visible damage, do not attempt to connect the device. Contact us for advice and assistance. The rear panels of typical MTU9XXX units are shown on the previous page. Note that the current rating shown on the rear panel label is the maximum current, which corresponds to the lowest input voltage.

## 2.3 Optional rackmounting procedure

A Rackmounting kit may be used to mount two MTU9XXX units side by side in a 19" rack. First remove the two rear panel screws securing each unit's lid. Fasten the two MTU9XXX units to the rack mount adaptor plate using the screws that you have removed, as shown in the illustrations below.



Then secure the rack mounting plate complete with the two MTU9XXX units to the 19" rack using the locating holes at the ends of the adaptor plate. The recessed twin unit rack will accept either AC or DC MTU9XXX models.



If you wish to use the optional 18 unit mounting rack, instructions are provided with the rack.

## 2.4 Power up the MTU9XXX

The unit requires 100-250 VAC, 50-60 Hz AC supply. An alternative -48VDC power supply is available for all models. See Section 1 for further details on power consumption.

Plug an IEC mains cable into the back of the MTU9XXX and switch on. Check that the Alarm LED on the rear panel is illuminated red or green, flashing or steady. If the LED is off, mains power is not being supplied to the unit.

## 2.5 Connect the Customer and Network Ports

When the ports are connected, the Alarm LED should give a steady Green display. See Section 3 for set-up information for the various models in the MTU9XXX range.

## 2.6 Optionally connect the alarm relay

The unit requires 100-250 VAC, 50-60 Hz AC supply. An alternative -48VDC power supply is available for all models. See Section 1 for further details on power consumption.

The MTU9XXX offers an Alarm relay to provide an external warning of problems which may arise. The interface is presented on an RJ45 connector, and offers both normally open and normally closed contacts. Maximum contact rating is 1.5 Amp at 125 VDC. Normal is the powered up, non-alarmed state. The connections are shown in the table below:

Pin	Contact
1	Normally Closed
2	Normally Open
3	Common
4	Not Connected
5	Not Connected
6	Not Connected
7	Not Connected
8	Not Connected

## 2.7 Alarm LED Status

<b>MTU9009 Fibre/Fibre LED Status</b>	<b>Indication</b>
Off	No mains power present
Red Steady	SM Alarm
Red/Off Flashing	Both MM and SM Alarms
Green/Off Flashing	MM Alarms
Green Steady	Status OK

<b>MTU9010/9011 Fibre/BNC LED Status</b>	<b>Indication</b>
Off	No mains power present
Red Steady	BNC Alarm
Red/Off Flashing	BNC and Fibre Alarms
Green/Off Flashing	Fibre Alarm
Red/Green Flashing	CMI errors
Green Steady	Status OK

<b>MTU9200/9210/9220 LED Status</b>	<b>Indication</b>
Off	No mains power present
Red Steady	E1 Alarm
Red/Off Flashing	E1 and Fibre Alarms
Green/Off Flashing	Fibre Alarms
Green Steady	Status OK

<b>MTU9230 LED Status</b>	<b>Indication</b>
Off	No mains power present
Red Steady	E3/DS-3 Alarm
Red/Off Flashing	E3/DS-3 and Fibre Alarms
Green/Off Flashing	Fibre Alarm
Green Steady	Status OK

### 3.1 MTU9200/9210/9220 set-up

The base panel bit-switches must be set for RJ45 or BNC connection of the E1 line and to enable the test loops which apply Outside Loop tests to both ports simultaneously.

Black Box Network Services (UK) Ltd  
Tel: +44 (0) 118 965 5100  
Fax: +44 (0) 118 965 5001  
support@blackbox.co.uk  
Manufactured in the UK

Status LED	Meaning
Off	No mains power present
Red steady	E1 Alarm
Red/Off Flashing	E1 and Fibre Alarm
Green/Off Flashing	Fibre Alarm
Green steady	Status OK

**Part No. MTU9200**  
E1 (BNC/RJ45) to Multimode Fibre Converter AC PSU

Serial No: 0

The diagram shows the base panel of the MTU9200 unit. It features a 'TEST LOOP' section with 'OFF' and 'ON' positions, a 'SELECT' section with 'RJ45' (up) and 'BNC' (down) positions, and two 'SPARE' sections. Below these are several bit-switches and a small component labeled '17-88-013A 16-05-47288'.

### 3.2 Unbalanced BNC E1 G.703 Network port

The network is connected to the BNC connectors at the rear of the unit.

Pin	Function
Tip	Shield
Ring	Shield

Cable lengths should be restricted to those defined below.

Cable	Max Length (metres)
UR202	720
RG59U	600
BT2002	650
BT2003	680

**Note:** The total maximum attenuation of each of the cables attached to the BNC (network) port must not exceed 6dB when measured at 1.024 MHz. The frequency/attenuation characteristic of the cables attached to this port shall follow a root frequency law.

## 3.3 Balanced RJ-45 E1 G.703 Network Port

Pin	Function
1	Tx tip
2	Tx ring
3	Tx shield
4	Rx tip
5	Rx ring
6	Rx ring
7	Not connected
8	Not connected

### 3.3.1 Connecting to a terminal device

A connecting cable from the network port to a terminal port such as a router or a PABX is straight through. Connections are defined in the table below.

DSU port pin	DSU port function	Terminal port pin	Terminal port function
1	Tx tip	1	Rx tip
2	Tx ring	2	Rx ring
3	Tx shield	3	Rx shield
4	Rx tip	4	Tx tip
5	Rx ring	5	Tx ring
6	Rx shield	6	Tx shield
7	Not connected	Not connected	Not connected
8	Not connected	Not connected	Not connected

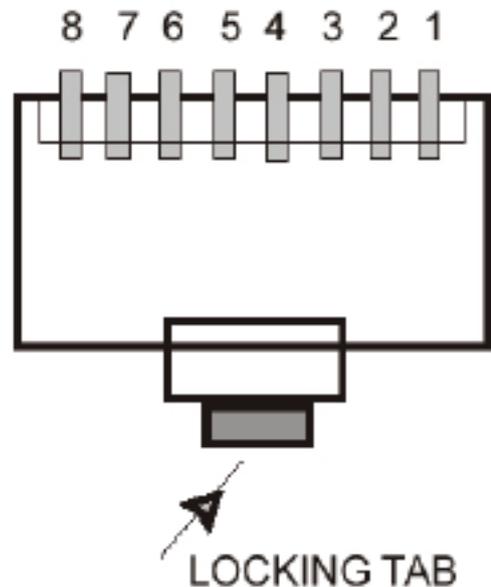
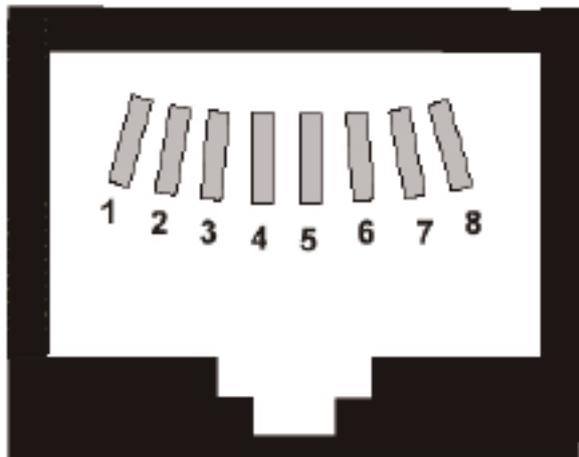
### 3.3.2 Connecting to a network device

A connection from the network port to a network device such as an E1 line or an NTU requires a crossover cable. Connections are defined in the table below.

DSU port pin	DSU port function	Terminal port pin	Terminal port function
1	Tx tip	1	Rx tip
2	Tx ring	2	Rx ring
3	Tx shield	3	Rx shield
4	Rx tip	4	Tx tip
5	Rx ring	5	Tx ring
6	Rx shield	6	Tx shield
7	Not connected	Not connected	Not connected
8	Not connected	Not connected	Not connected

### 3.3.3 RJ-45 Connector layout

The diagram below shows both the plug and socket head on so that any connecting wires are behind the connector. The connector numbering is shown.



### 3.3.4 Cable lengths and types

Cable lengths should be restricted to those defined below.

Cable	Max Length (metres)
Belden 8132 (28 AWG)	175
Belden 9841 (24 AWG)	300

**Note:** The total maximum attenuation of the cable attached to the network port must not exceed 6dB when measured at 1.024 MHz. The frequency/attenuation characteristic of the cables attached to the network port shall follow a root frequency law. This port type is approved to CTR12, CTR13.

**3.4 MTU9009 set-up**

There are no bit-switches to be set on the MTU9009, so the base label is abbreviated to basic product and serial number information together with LED status indication.

Black Box Network Services (UK) Ltd  
Tel: +44 (0) 118 965 5100  
Fax: +44 (0) 118 965 5001  
support@blackbox.co.uk  
Manufactured in the UK

Status LED	Meaning
Off	No mains power present
Red steady	SM Alarm
Red/Off Flashing	SM and MM Alarms
Green/Off Flashing	MM Alarm
Green steady	Status OK

**Part No. MTU9009**  
MM-SM SH FIBRE MEDIA  
CONVERTER (AC)

**Serial No: 0**

**3.5 MTU9230 set-up**

The base panel bit-switches must be set for E3 or DS-3 connection of the line and to enable the test loops which apply Outside Loop tests to both ports simultaneously.

Black Box Network Services (UK) Ltd  
Tel: +44 (0) 118 965 5100  
Fax: +44 (0) 118 965 5001  
support@blackbox.co.uk  
Manufactured in the UK

Status LED	Meaning
Off	No mains power present
Red steady	E3/DS3 Alarm
Red/Off Flashing	E3/DS3 and Fibre Alarm
Green/Off Flashing	Fibre Alarm
Green steady	Status OK

**Part No. MTU9230**  
E3/DS3 (BNC) to Multimode Fibre  
Converter AC PSU

**Serial No: 0**

**Bold Characters = Factory Default**

TEST LOOP: OFF ON  
SCRAMBLER: OFF ON

SELECT: DS3 E3

LINE BUILD OUT DS3 ONLY: >255 FT <255 FT

IT-22-251A  
45-22-251a

## 3.6 Unbalanced BNC E3/DS-3 G.703 Customer Port

The customer equipment is connected to the BNC connectors at the rear of the unit.

Pin	Function
Tip	Signal
Ring	Shield

Cable lengths should be restricted to those defined below.

Cable	E3 Max Length (metres)	DS-3 Max Length (metres)
UR202	180	155
RG59U	150	130
BT2002	160	140
BT2003	165	140

**Note:** The total maximum attenuation of each of the cables attached to the BNC (network) port must not exceed 6dB when measured at 1.024 MHz. The frequency/attenuation characteristic of the cables attached to this port shall follow a root frequency law.

**3.7 MTU9010/9011 set-up**

There are no bit-switch settings for the unit's normal operation. The switches are used to set up Outside Loop tests for the unit. The User (port (STM1 BNC) and the Network port (STM 1 Fibre optical) can be selected separately (i.e. not at the same time) for test action. The Outside loop test loops the incoming signal at the interface and transmits it back upon itself to validate the line that feeds the port.

Black Box Network Services (UK) Ltd  
Tel: +44 (0) 118 985 5100  
Fax: +44 (0) 118 985 5001  
support@blackbox.co.uk  
Manufactured in the UK

Status LED	Meaning
Off	No mains power present
Red steady	BNC Alarm
Red/Off Flashing	Fibre and BNC Alarm
Green/Off Flashing	Fibre Alarm
Red/Green Flashing	CMi Errors
Green steady	Status OK

**Part No. MTU9010**  
STM1/OC3 (BNC) to Multimode Fibre Converter AC PSU

Serial No: 0

Bold Characters = Factory Default

17-00-023A, 80-08-01588

Two types of label may appear on a MTU9010/9011 unit. The bit-switch layout is different for each type of unit. There are no other functional differences between the two types of unit.

## 4.1 MTU9200/9210/9220 Product Specifications

Item	Description
E1 Interface	G.703 compliant, Sensitivity - 10dB. Line coding HDB3. Bit rate: 2.048 Mbps +/- 50ppm Interface types: 75 Ohm unbalanced coax (BNC) or 120 Ohm balanced RJ-45
Jitter Tolerance	Per G.823.
Barrier	EN 41003 compliant barrier provided on the E1 interface
Performance	PD7024 (NTR4)
Diagnostics	Loop Test initiated by the bit-switch
MTU9200 Fibre Interface	G.957, Dual SC Multimode 62.5/125 um Transmit power: -14 to -19 dBm Max Rx input power: -14 dBm Receive sensitivity: -14 to -30 dBm Optical loss budget: = -19 - (-30) = 11dB
MTU9210 Fibre Interface	G.957, Dual SC SH Single-mode 8/125 um (Short haul) Transmit power: -8 to -15 dBm Max Rx input power: -8 dBm Receive sensitivity: -8 to -31 dBm Optical loss budget: = -15 - (-31) = 16dB
MTU9220 Fibre Interface	G.957, Dual SC LH Single-mode 8/125 um (Long haul) Transmit power: 0 to -5 dBm Max Rx input power: -8 dBm Receive sensitivity: -8 to -34 dBm Optical loss budget: = -5 - (-34) = 29dB
Safety	EN41003, EN50082
EMC	EN55022, EN50082
Power Supply	100-250 VAC, 50-60Hz, 60mA to 25mA or -40 to -72VDC, 200mA to 100mA See Section 1 for detailed power consumption data
Dimensions	20.2(W) x 13.2(D) x 4.8(H) cm
Ambient Temperature	0°C to + 45°C
Storage Temperature	-20°C to + 70°C
Relative Humidity	0% - 95% non condensing

## 4.2 MTU9009 Product Specifications

Item	Description
Customer Interface	G.957, Dual SC Multimode 62.5/125 um Bit rate: up to 155Mbps Transmit power: -14 to -19 dBm Max Rx input power: -14 dBm Receive sensitivity: -14 to -30 dBm Optical loss budget: = -19 - (-30) = 11dB
MTU9009 Short Haul Line Interface	G.957, Dual SC Single-mode 8/125 um) Bit rate: up to 155Mbps Transmit power: -8 to -15 dBm Max Rx input power: -8 dBm Receive sensitivity: -8 to -31 dBm Optical loss budget: = -15 - (-31) = 16dB
Safety	EN41003, EN50082
EMC	EN55022, EN50082
Power Supply	100-250 VAC, 50-60Hz, 35mA to 15mA or -40 to -72VDC, 100mA to 50mA See Section 1 for detailed power consumption data
Dimensions	20.2(W) x 13.2(D) x 4.8(H) cm
Ambient Temperature	0°C to + 45°C
Storage Temperature	-20°C to + 70°C
Relative Humidity	0% - 95% non condensing

## 4.3 MTU9230 Product Specifications

Item	Description
STM-1 Electrical Interface	Per G.823.
Barrier	EN 41003 compliant barrier provided on the E1 interface
Performance	PD7024 (NTR4)
Diagnostics	Loop Test initiated by the bit-switch
MTU9200 Fibre Interface	G.957, Dual SC Multimode 62.5/125 um Transmit power: -14 to -19 dBm Max Rx input power: -14 dBm Receive sensitivity: -14 to -30 dBm Optical loss budget: = -19 - (-30) = 11dB
MTU9210 Fibre Interface	G.957, Dual SC SH Single-mode 8/125 um (Short haul) Transmit power: -8 to -15 dBm Max Rx input power: -8 dBm Receive sensitivity: -8 to -31 dBm Optical loss budget: = -15 - (-31) = 16dB
MTU9220 Fibre Interface	G.957, Dual SC LH Single-mode 8/125 um (Long haul) Transmit power: 0 to -5 dBm Max Rx input power: -8 dBm Receive sensitivity: -8 to -34 dBm Optical loss budget: = -5 - (-34) = 29dB
Safety	EN41003, EN50082
EMC	EN55022, EN50082
Power Supply	100-250 VAC, 50-400Hz, 60mA to 25mA or -40 to -72VDC, 200mA to 100mA See Section 1 for detailed power consumption data
Dimensions	20.2(W) x 13.2(D) x 4.8(H) cm
Ambient Temperature	0°C to + 45°C
Storage Temperature	-20°C to + 70°C
Relative Humidity	0% - 95% non condensing

## 4.3 MTU9010/9011 Product Specifications

Item	Description
STM-1 Electrical Interface	G.703, 750 Ohm BNC, Line coding CMI, Bit rate: 155.52Mbps +/- 15ppm Barrier: Fully barriered per EN41003
MTU9010 Multimode Line Interface	G.957, Dual SC Multimode 62.5/125 um Bit rate: up to 155Mbps Transmit power: -14 to -19 dBm Max Rx input power: -14 dBm Receive sensitivity: -14 to -30 dBm Optical loss budget: = -19 - (-30) = 11dB
MTU9011 Short Haul Line Interface	G.957, Dual SC Single-mode 8/125 um Bit rate: up to 155Mbps Transmit power: -8 to -15 dBm Max Rx input power: -8 dBm Receive sensitivity: -8 to -31 dBm Optical loss budget: = -15 - (-31) = 16dB
Safety	EN60950
EMC	EN55022, EN50082
Power Supply	100-250 VAC, 50-60Hz, 45mA to 20mA or -40 to -72VDC, 200mA to 100mA See Section 1 for detailed power consumption data
Dimensions	20.2(W) x 13.2(D) x 4.8(H) cm
Ambient Temperature	0°C to + 45°C
Storage Temperature	-20°C to + 70°C
Relative Humidity	0% - 95% non condensing
Barometric Pressure	86 kPa - 106 kPa

### Disclaimer

Black Box Network Services (UK) Ltd makes no representations or warranties with respect to the contents hereof and specifically dis-claims any implied warranties or merchantability or fitness for any particular purpose. Further, BBNS (UK) Ltd reserves the right to revise this publication and to make changes from time to time in the content hereof without obligation of BBNS (UK) Ltd to notify any person of such revision or changes.

### Trademarks

The Trademarks of other Corporations which may be used in this manual are hereby acknowledged.

