

Abeo G.703 LAN Extenders



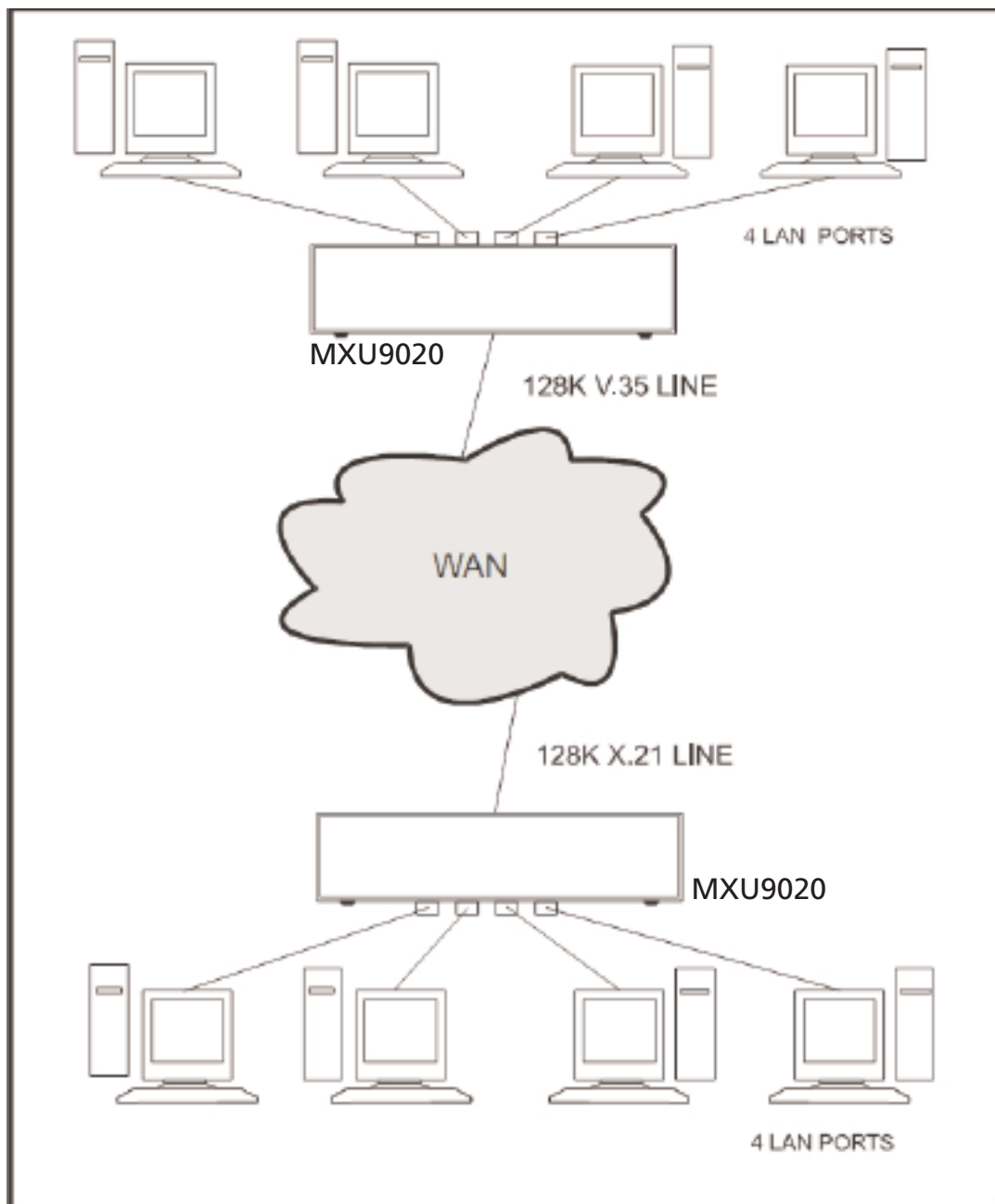
**Manual and
Installation guide**

Chapter 1	Introduction		
	1.1	About the unit	2
	1.2	Performance	3
	1.3	Safety	3
	1.4	Electromagnetic Compatibility	3
	1.5	EN55022 Declaration	3
	1.6	FCC Declaration	3
Chapter 2	Description of parts		
	2.1	Rear Panels	4
	2.2	Status Display - Rear Panel	4
	2.3	Status Display - LAN ports	4
	2.4	Power Supply	5
	2.5	Unbalanced BNC E1 Line Port	5
	2.6	Balanced RJ-45 E1 Line Port	6
	2.6.1	Connecting to a terminal device	6
	2.6.2	Connecting to a network device	7
	2.6.3	RJ-45 Connector layout	7
	2.6.4	Cable lengths and types	8
	2.7	LAN Ports	9
Chapter 3	Installation and Set-up		
	3.1	Setting-up the bit switches	10
	3.1.1	Bit switch definitions	10
	3.1.2	Timing	11
	3.1.3	E1 Port select RJ-45/BNC	11
	3.1.4	Loopback test	11
	3.1.5	LAN mode	11
	3.1.6	Auto MDI/MDI-X	11
	3.1.7	E1 Line Port	11
Chapter 5	Specifications		
	5.1	Unit Specifications	15

1.1 About the MXU9020

The Black Box MXU9020 is a four port auto-sensing 10/100BASE-T Ethernet Switch with an E1 Uplink. The product can be used to extend four LAN ports across a WAN link to a remote site. Each LAN port may be connected to a single LAN workstation or to a hub or switch supporting multiple workstations. The exact configuration will depend upon the user's network design and workload characteristics.

The MXU9020 Ethernet switch can switch between local LANs connected to its four ports, and the unit may thus reduce the need for local LAN hubs and switches. The Ethernet switch has full wirespeed filtering so that the WAN port carries only traffic destined for the remote WAN-linked site, and an efficient HDLC encapsulation of packets ensures maximum throughput over the WAN link. There is internal packet buffering to smooth out bursty traffic. MXU9020's are used in pairs, one on either side of a WAN link.



1.2 Performance

Switching and filtering is performed at wirespeed: 148810 packets/second
The MXU9020 can handle a traffic level of 4064 packets/second over the E1 link.

1.3 Safety

The MXU9020 should not be connected to cabling which would be required by BS6701 to be equipped with over-voltage protection. The following ports are designated SELV (Safety Extra Low Voltage) within the scope of EN41003:

E1 Line (or WAN) port (BNC or RJ45)
4 x 10/100BASE-T Ethernet ports

These ports should only be connected to SELV ports on other equipment in accordance with EN60950 clause 2.3.

1.4 Electromagnetic Compatibility

In order to ensure EMC compliance all 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.

1.5 EN55022 Declaration

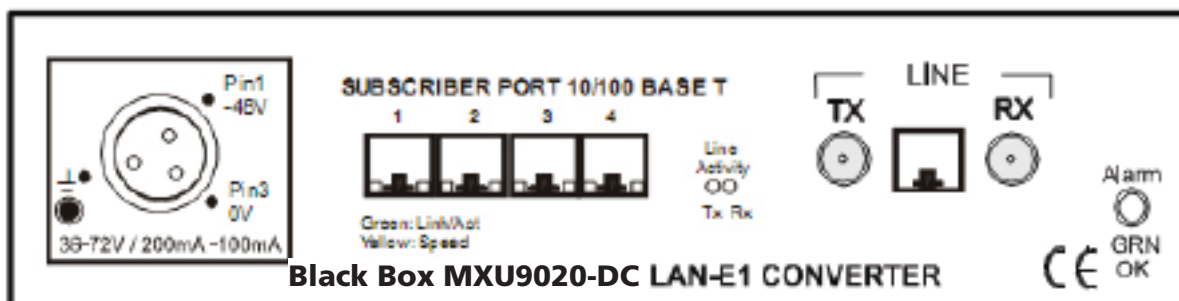
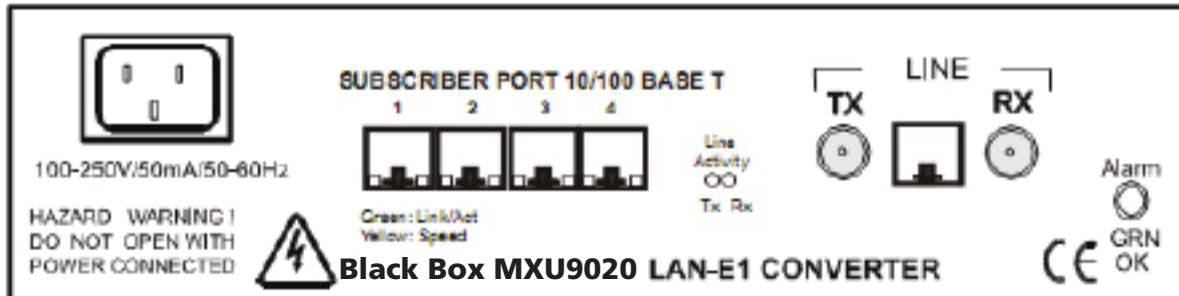
The MXU9020 is a Class A product. In a domestic environment it may cause radio interference in which case the user may be required to take adequate measures.

1.6 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 radiocommunications. 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 their own expense.

2.1 Rear Panel

All connections into and out of the MXU9020 are made through the rear panel which is shown in schematic form below for both AC and DC powered models.



2.2 Status Display - rear panel

There is a status LED on the right hand side of the rear panel which indicates the status of the unit as shown in the figure below.

Status LED	Meaning
Off	No mains power present
On Green	Status OK
On Red	E1 WAN port LOS Alarm

2.3 Status Display - LAN Ports

Each LAN port RJ-45 connector on the rear panel has two miniature LEDs mounted on it. The left hand (green) LED shows link activity, and the right hand (yellow) LED shows operation at 100Mbps when it is illuminated.

2.4 Power Supply

The MXU9020 is powered by a mains supply with an input voltage of 100-250VAC, 50-60Hz with an input current of 60 to 24mA, and an input consumption of 6 watts approximately. The MXU9020 is provided ex-factory with a 250mA internal fuse. Mains power is connected via the IEC inlet on the rear of the unit.

An alternative -48VDC powered unit is available. The input voltage and current ranges are -36 to -72 volts DC, 200-100mA. A Buccaneer type socket is fitted to the rear panel, and a plug is provided with the unit for the customer's own wiring. The connections are labelled on the rear panel of the MXU9020.

Pin No,	Connection
1	-48VDC
2	Ground
3	0VDC

Note: The MXU9020 must be connected to mains safety earth for correct operation. 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.

2.5 Unbalanced BNC E1 Line Port

The network is connected to the BNC connectors at the rear of the unit as shown below:

Pin	Function
Tip	Signal
Ring	Shield

Cable lengths should be restricted to those defined below. The total maximum attenuation of each of the cables 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.

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

2.6 Balanced RJ-45 E1 Line Port

The layout of the female RJ-45 line or network port mounted on the rear panel is shown below.

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

2.6.1 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

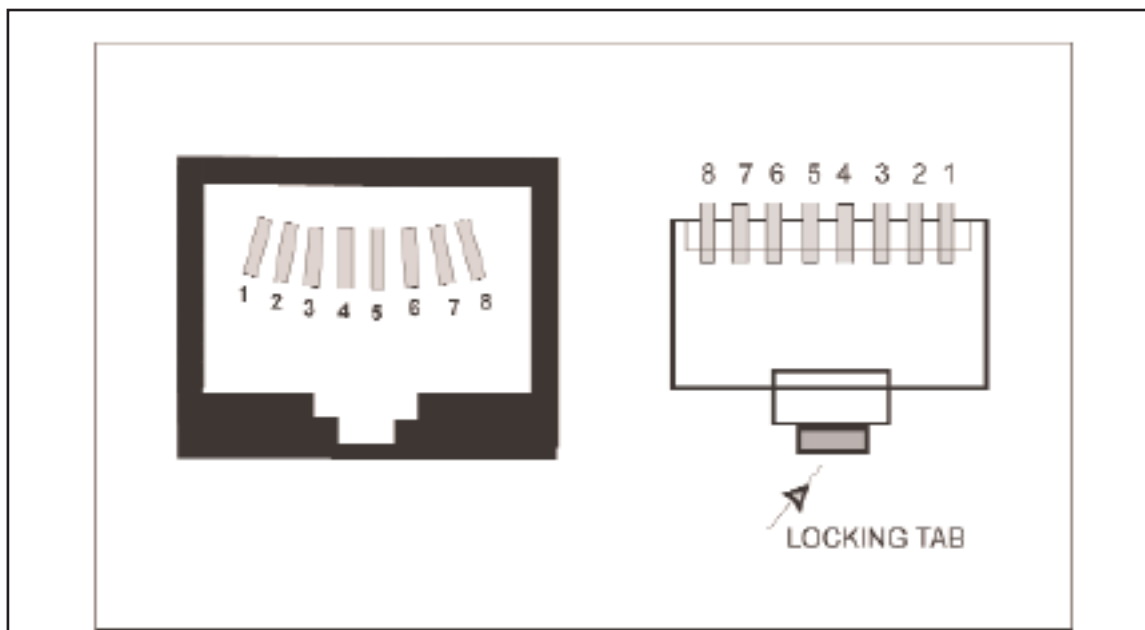
2.6.2 Connecting to a network device.

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

2.6.3 RJ-45 Connector layout.

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



2.6.4 Cable lengths and types

Cable lengths should be restricted to those defined below:

Pin	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.

2.7 LAN Ports

The four LAN ports are supported by an array of four RJ-45 female connectors mounted on the rear panel of the MXU9020.

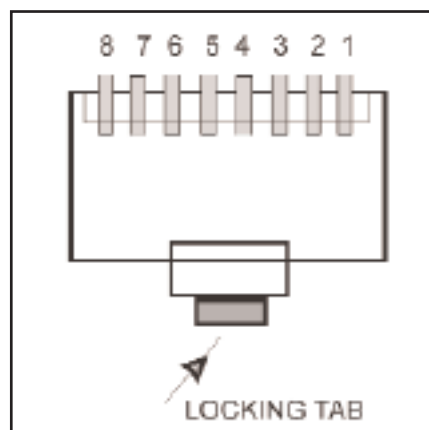
These ports automatically sense the LAN interface and switch between MDI and MDI-X configurations. This removes the potential requirement for Crossover cables when connecting LANs to the MTU9020 whatever LAN equipment is being used. The ports also automatically sense the LAN speed and operate at either 10 Mbps or 100 Mbps, and sense whether operation should be in full or half duplex mode.

There is a miniature LED on the lower right corner of each RJ-45 socket on the rear panel which is illuminated yellow when operation is at 100 Mbps. The miniature LED on the lower left corner of each RJ-45 socket is illuminated green when the link is active.

The RJ-45 connector layout for an auto-sensing MDI/MDI-X port is shown below.

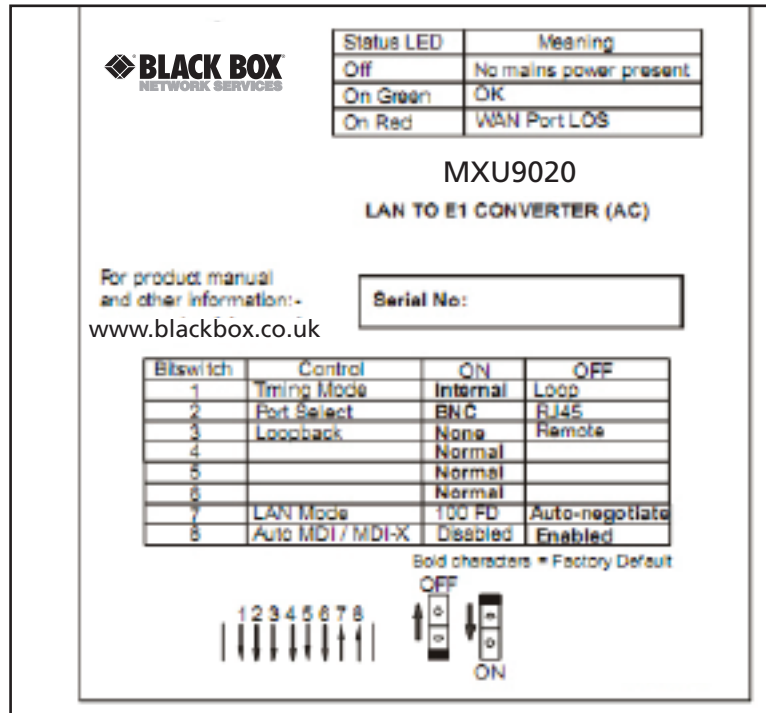
Pin No.	MDI Signal	MDI-X Signal
1	Tx Data +ve	Rx Data +ve
2	Tx Data -ve	Rx Data -ve
3	Rx Data +ve	Tx Data +ve
4	Not Connected	Not Connected
5	Not Connected	Not Connected
6	Rx Data -ve	Tx Data -ve
7*	Not Connected	Not Connected
8	Not Connected	Not Connected

The pin numbering for the connector is shown below:



3.1 Setting up the bit switches

The bit-switches on the base of the unit must be set-up before making any connections to the unit. There is an explanatory label on the unit's base which defines the bit-switch set-up options and alarms.



3.1.1 Bit-switch definitions

The default settings of the bit-switch are shown in bold.

Bit-switch	Control	On	Off
1	Timing mode	Internal	Loop
2	E1 Port select	BNC	RJ-45
3	Loopback test	None	Remote
4		Normal	
5		Normal	
6		Normal	
7	LAN Mode	100M FD	Auto-negotiate
8	Auto MDI/MDI-X	Disabled	Enabled

3.1.2 Timing

TIMING determines the source for the LINE E1 transmit clock, and is set by bit-switch no1. The options are *ON* or *OFF*.

With the switch set to *ON*, the E1 transmit clock is derived from the MXU9020's own internal oscillator.

With the switch set to *OFF*, the E1 transmit clock is derived from the LINE E1 receive clock.

3.1.3 E1 Port select RJ-45/BNC

This single switch is used to select which type of connector (RJ-45 or BNC) is to be used to connect the E1 line.

With the switch set to *ON*, the BNC ports are selected to give G.703 75 ohm unbalanced interface.

With the switch set to *OFF*, the RJ-45 port is selected to give G.703 120 ohm balanced interface.

3.1.4 Loopback test

This switch is used to initiate loop testing. It is fully described in the next section.

The switch is set to *ON* for normal operation of the unit without any loopbacks.

With the switch set to *OFF*, Loopback is applied, so that Transmit data = Received data on the E1 port.

3.1.5 LAN mode

Bit-switch *ON*: 100 Mbps Full Duplex operation.

Note that this option enables 100m full duplex connection to be implemented. Auto-negotiate does not distinguish between full versus half duplex modes when negotiating with a fixed (i.e. non-negotiating) 100 Mbps port.

Bit-switch *OFF*: Auto-negotiate Mode (default).

3.1.6 Auto MDI/MDI-X

With switch set to *ON*, the LAN ports are fixed as MDI-X for direct connection to a PC. This may be necessary for reliability when connecting some older non-autos hubs.

With switch set to *OFF*, the LAN ports automatically sense the interface and switch between MDI and MDI-X connections.

3.1.7 E1 Line Port

Bit-switch *ON*: The LAN ports are fixed as MDI-X for direct connection to a PC. This may be necessary for reliability when connecting some older non-auto hubs.

Bit-switch *OFF*: The LAN ports automatically sense the interface and switch between MDI and MDI-X connections.

3.1.8 MAC FCS

On older units, bit-switch 7 to enabled the transmission of the MAC FCS. This function has now been disabled and the MXU9020 always strips the MAC FCS from the Ethernet packet.

3.2 Connecting up

Safety notice: Ports that are identified as SELV in this manual should only be connected to SELV ports on other equipment in accordance with EN 60950 clause 2.3.

Step 1: Mounting

The MXU9020 is housed in a convenient 1U table top enclosure. 19 inch rackmount options are also available, as well as rack nests for two or 18 units.

Step 2: Set up bit-switches

These switches are located on the base of the unit and are used to configure the unit.

Step 3: LAN ports

Connect the MXU9020 to the LAN ports using the four labelled RJ-45 ports on the rear panel.

Step 4: Power Supply

Finally, connect the mains power lead and re-check all connections for security. Then turn on the power supply. Check the rear panel status LED to ensure that it is continuously lit green.

Warning: Do not connect the MXU9020 to excessive voltage. Read the safety information before continuing

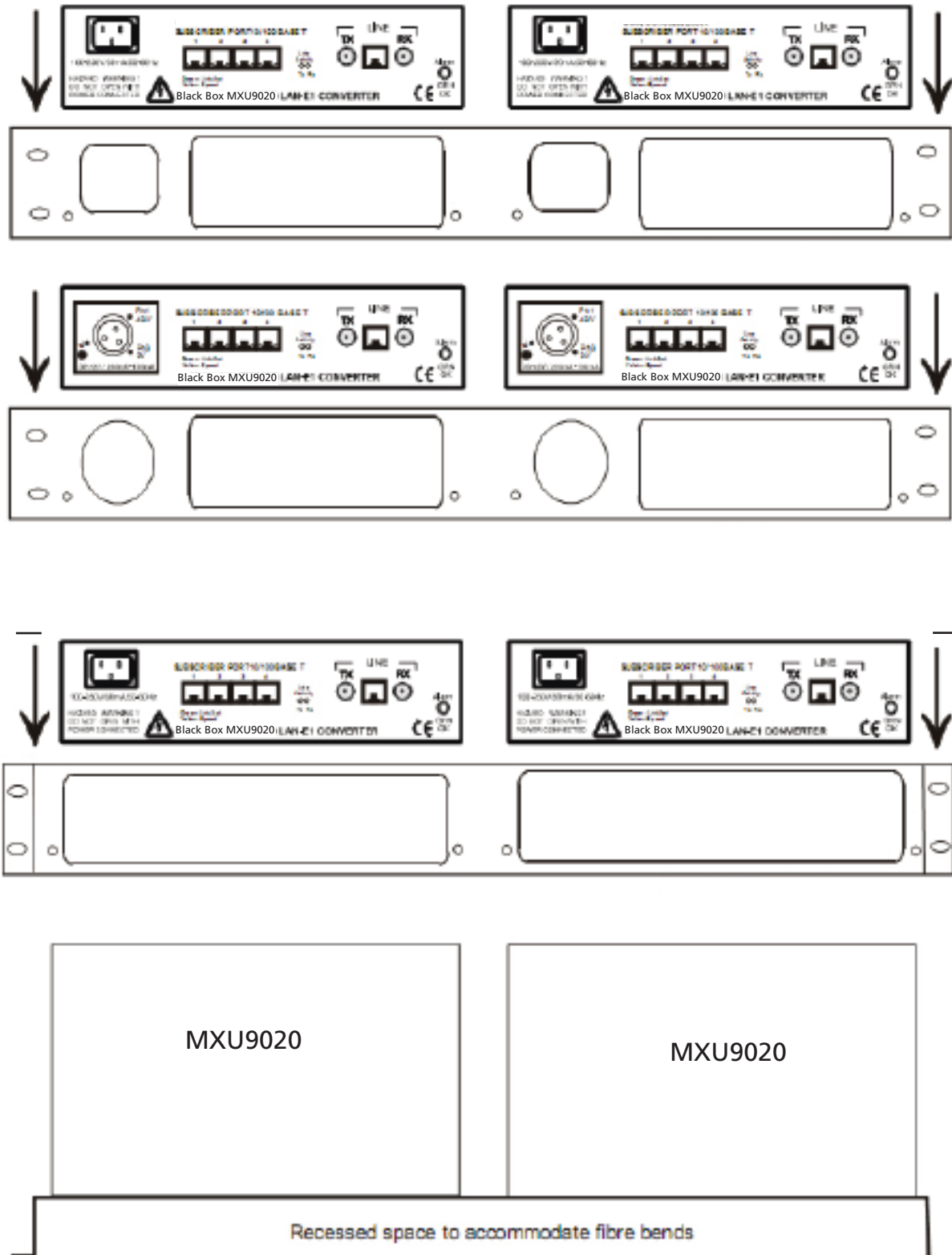
3.3 Optional rackmounting

Rackmounting kits may be used to mount two MXU9020 units side by side in a 19" rack.

The rackmount kit (MTU9000M-RACK) has a recessed plate to permit fibre bends to be made within the envelope of a 19" rack. It also has a single cut-out for all connections to the rear of the MXU9020. The installation method is the same in all cases.

First remove the two rear panel screws securing each unit's lid. Fasten the two MXU9020 units to the rackmount adaptor plate using the screws that you have removed, as shown in the illustrations on the next page.

Then secure the rack mounting plate complete with the two MXU9020 units to the 19" rack using the locating holes at the ends of the adaptor plate. If you have set the bit-switches on the base plate before fixing units to the adaptor plate, check that the settings are still correct.



4.1 Alarms

The Status LED on the MXU9020 rear panel shows alarm conditions as shown in the table:

Status LED	Meaning
Off	No mains power present
On Green	Status OK
On Red	E1 WAN port LOS

4.2 Troubleshooting

Step 1: Verify the power supply

Check the status LED on the right hand side of the rear panel of the unit at both ends of the link. If either is OFF, power is not present on that unit. Check the mains connection to the unit. If the mains supply is satisfactory, we recommended that the unit be taken out of service and returned to a repair centre. Unqualified users should not open the MXU9020.

Step 2: Verify the power supply the LAN links

Connect up to 4 LAN cables to the LAN ports. If the LED on the bottom left hand corner of the RJ-45 socket goes green, or flashes green, then there is a LAN connection. If the LED remains dark, there is no LAN connection, and investigatory action should be taken on the LAN and/or its cables.

Step 3: Establish and verify the WAN links

If there is LAN activity, then check for WAN activity by observing the green Tx and Rx LEDs on the rear panel. If packets are being transmitted or received the LEDs will be ON. If they are dark, there is no traffic being forwarded over the WAN link, or there is a problem with the WAN link. This could be bits errors on the data lines, or no clocks present.

MXU9020 with BNC connectors - Step 3A

If the status LED is red, first check that the *PORT SELECT* bit-switch on the base panel is set to BNC. If it is set correctly, try swapping the E1 LINE BNC connections at that unit.

If the status LED remains red, try looping the BNC connections on the unit with a short piece of cable. If the status LED goes steady green, the the external BNC cabling is faulty. Check for cable continuity and network connections, etc...

MXU9020 with RJ-45 connectors - Step 3B

If the status LED is red, first check that the *PORT SELECT* bit-switch on the base panel is set to BNC. If it is set correctly, check the connections on the RJ-45 cable. Check for cable continuity and network connections.

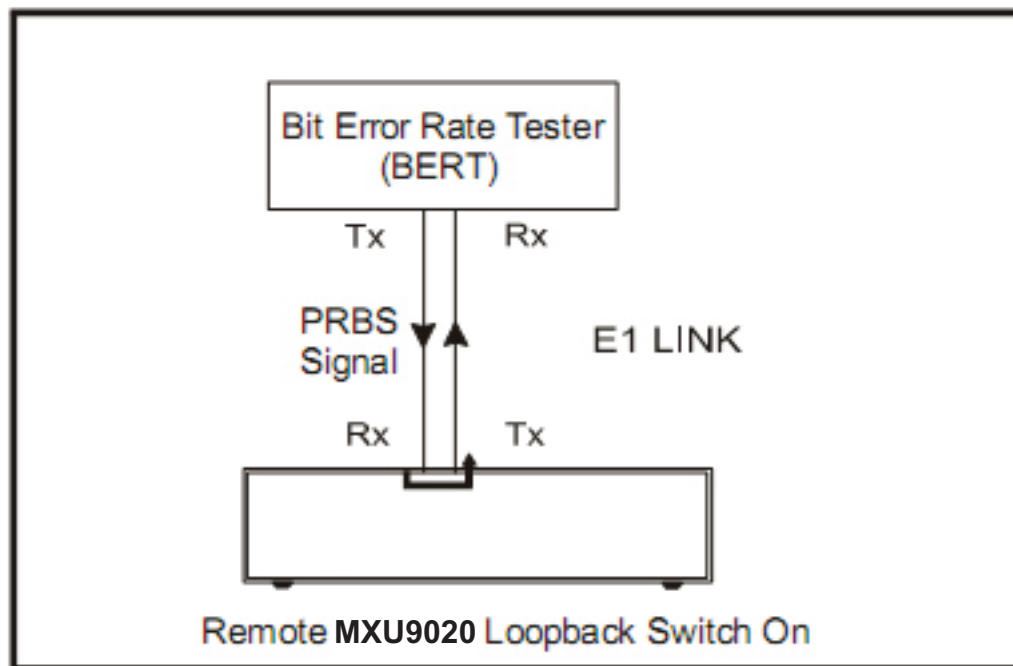
The MXU9020 provides a TE presentation for direct connection to the network equipment. If LOS is experienced, a cross-over cable may be required.

Other steps

It may be useful to set the AUTO MDI/MDI-X bit switch to DISABLED, in which case the port presents a fixed MDI-X interface to the LAN.

Note that for 100M full duplex operation between the MXU9020 and a fixed (i.e. non-negotiating) LAN port, Bit-switch 7 must be set to 100M FD. If this is not done, the MXU9020 will operate at the correct speed, but in half-duplex mode, and with a heavy error count.

4.3 Test Loop



Set the remote MXU9020 base panel bit-switch labelled *LOOPBACK* to the *ON* position. When the *TEST LOOP* is activated at the remote MXU9020, the signal received from the local Bit Error Rate Tester (BERT) unit at the E1 port is passed directly back to the BERT at the line interface.

If the local BERT recognises its own transmissions, then the E1 link has been validated.

5.1 Specifications

Serial Line	Definition
E1 Line Interface	G.703 compliant, Sensitivity -10dB. Line coding HDB3. Interface types: 75 ohm unbalanced coax (BNC) or 120 ohm balanced RJ-45. Interface selected by bit-switch
Jitter Tolerance	Per G.823.
Barrier	EN 41003 compliant barrier provided on the E1 interface
Framing	Unframed
Encapsulation	HDLC
Clocking options	E1 Line: Internal or Loop: E1 line receive clock
Line Rate	2.048 Mbps
Maximum packet rate	4064 pps (packet per second)
LED indicators	Tx/Rx Packet, Alarm
Alarms	E1 LOS
Diagnostics	External Loop Test initiated by bit-switch
Subscriber (LAN) Ports	Definition
LAN interface	(4) RJ-45, Auto switched MDI or MDI-X, or fixed MDI selected by bit-switch
Operating mode	Auto-negotiated 10/100 Mbps, Full/Half-duplex, or 100 Mbps FD Fixed
Port Filtering Rate	148810 pps (packet per second)
Port Switching Rate	148810 pps (packet per second)
Switch mode	Any to Any
MAC address table	4096 entries
Min/Max Packet Size	64 bytes/1522 bytes
General	Definition
Power Supply	100-250VAC, 50-60Hz, 60 to 24mA, or -36 to -72 VDC, 200-100mA
Dimensions	20.2(W) x 13.2(D) x 4.4(H) cm (Unit only) 20.2(W) x 13.2(D) x 4.8(H) cm (With feet)
Environmental	Range
Ambient Temperature	0°C to +45°C
Storage Temperature	-20°C to +70°C
Relative Humidity	0 to 95% non-condensing
Barometric Pressure	86 KPa - 106 KPa

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Customer Support Information:

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