

WC3445



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**Metrodata WAN-in-a-CAN
WC3445 LAN Extender
Installation Guide**

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1 INTRODUCTION

1. 1 About the WC3445

The Metrodata WC3445 is a four port auto sensing 10/100BaseT Ethernet Switch with a bit-switch selectable E3/DS3 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 WC3445 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. WC3445's are used in pairs, one on either side of a WAN link.

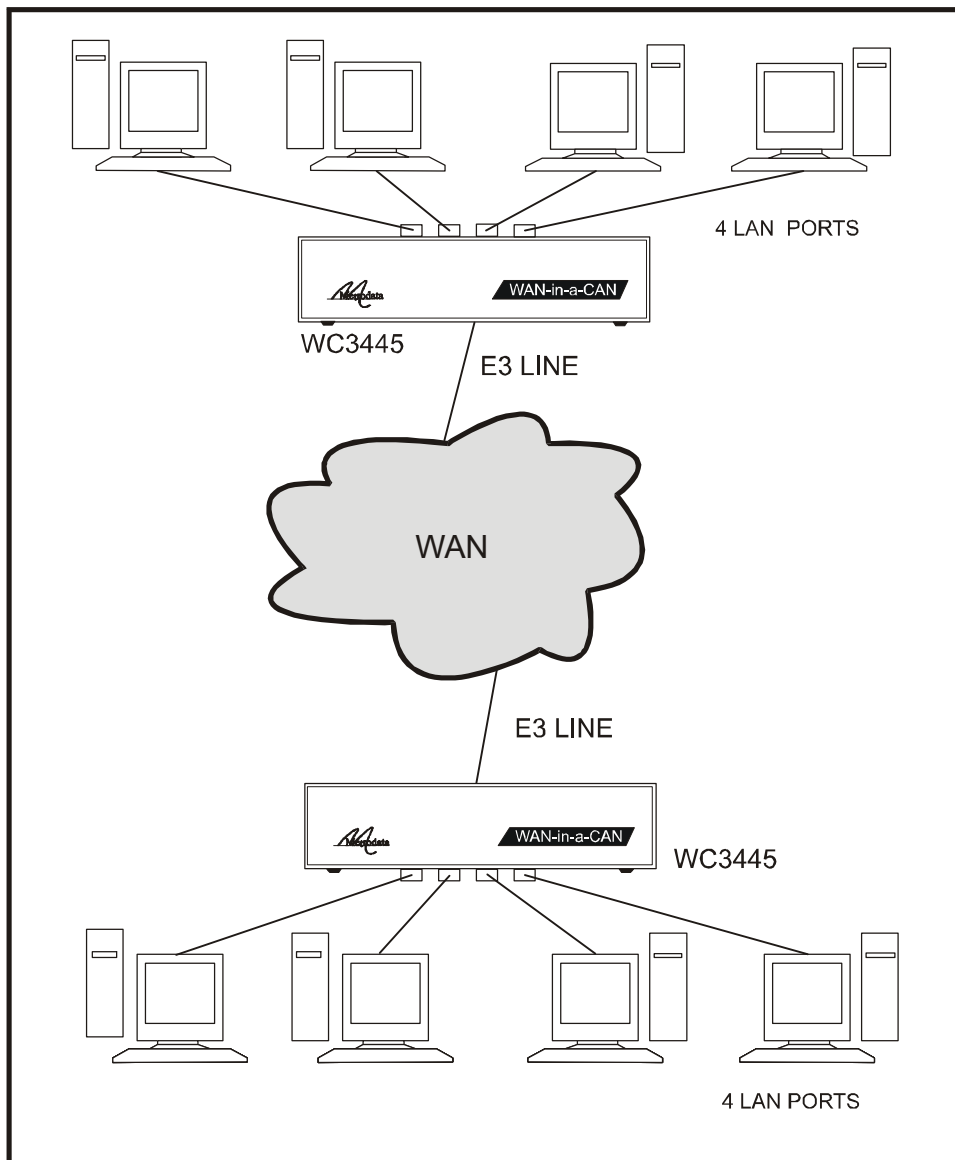


Figure 1. 1 WC3445 installation

1. 2 Performance

Switching and filtering is performed at wirespeed: 148810 packets/second.

The WC3445 can handle a traffic level of 64120 packets/second over the E3 link and 82236 packets/second over the DS3 link.

1. 3 Safety

The WC3445 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:

E3/DS3 Line (or WAN port)
4 x 10/100 BaseT 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 WC3445 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 its own expense.

2 WC3445 DESCRIPTION OF PARTS

2.1 Rear panel

All connections into and out of the WC3445 are made through the rear panel which is shown in schematic form below for both AC and DC powered models.

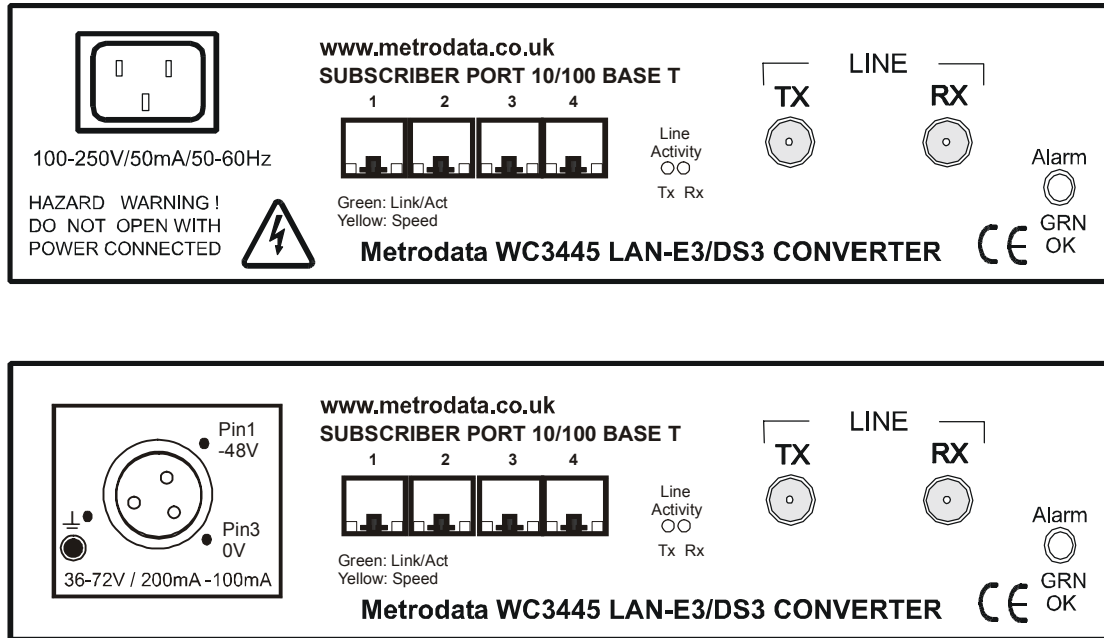


Figure 2.1 WC3445 rear panels for AC & DC models

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
Flashing Green	PRBS test in progress
Flashing Red	PRBS errors detected
On Green	Status OK
On Red	E3/DS3 WAN port LOS Alarm

Figure 2.2 Rear panel status LED

2.3 Status display - LAN ports

Each LAN port RJ45 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 WC3445 is powered by a mains supply with an input voltage of 100-250VAC 50-60Hz and with an input current of 60 to 24 mA, depending upon the input voltage. Power consumption is approximately 6 watts. The WC3445 is provided ex-factory with a 250mA internal fuse. AC 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 WC3445.

On some units, an additional Ground stud may be located on the rear panel to permit a separate Ground connection to be made.

Pin no	Connection
1	-48VDC
2	Ground
3	0VDC

Figure 2. 3 -48VDC connections

Note: The WC3445 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 E3/DS3 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

Figure 2.4 BNC connection

Cable lengths should be restricted to those defined below:

Cable	E3 Max Length (metres)	DS3 Max Length (metres)
UR202	180	155
RG59U	150	130
BT2002	160	140
BT2003	165	145

Figure 2.5 Cable lengths

Note: The total maximum attenuation of each of the cables attached to the network port must not exceed 6dB when measured at 17.184 MHz (E3) or 22.368 MHz (DS3). The frequency/attenuation characteristic of the cables attached to the network port shall follow a root frequency law.

2.6 LAN ports

The four LAN ports are supported by an array of four RJ45 female connectors mounted on the rear panel of the WC3445.

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 WC3445 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 RJ45 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 RJ45 socket is illuminated green when the link is active.

The RJ45 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

Figure 2.6 LAN port connector layout

The pin numbering for the connector is shown below:

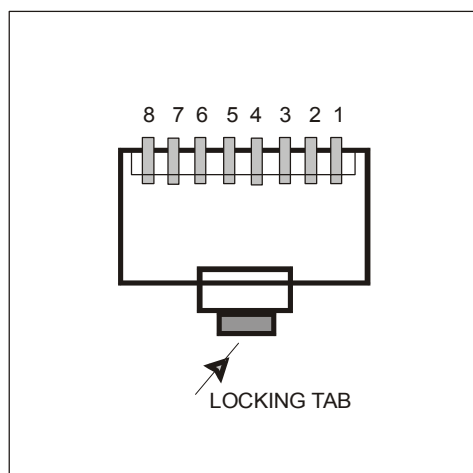


Figure 2.7 RJ45 connector layout

3 INSTALLATION & SET-UP

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.

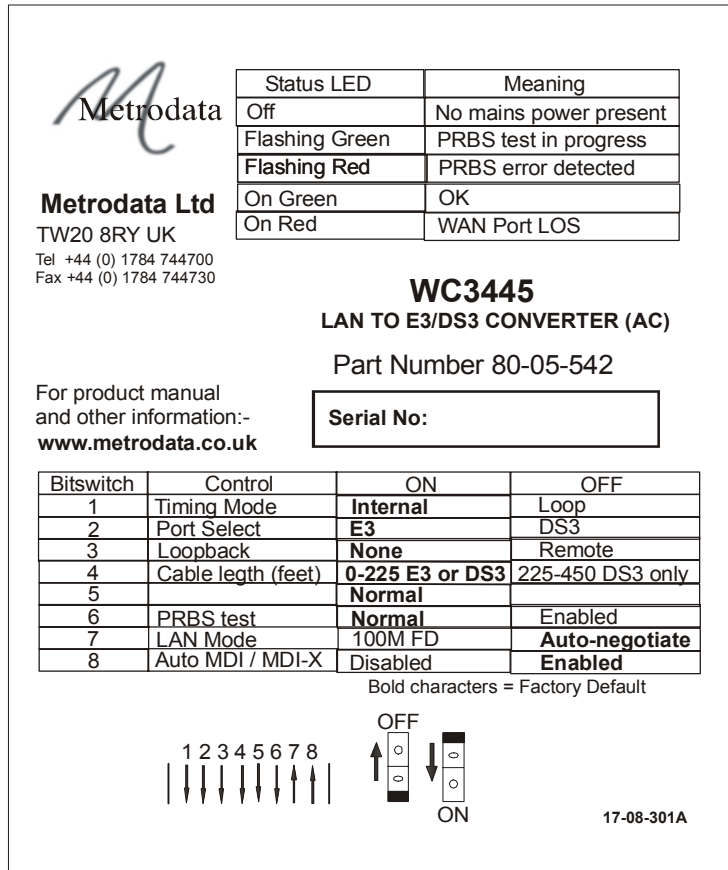


Figure 3.1 WC3445 Base panel label

3.1.1 Bit-switch definitions

The default settings of the bit-switches are shown in bold:

Bit-switch	Control	On	Off
1	Timing mode	Internal	Loop
2	Port select	E3	DS3
3	Loopback test	None	Remote
4	DS3 Cable	0-225 ft /E3 mode	225-450 ft
5		Normal	
6	PRBS test	Normal	Enabled
7	LAN Mode	100M FD	Auto-negotiate
8	Auto MDI/MDI-X	Disabled	Enabled

Figure 3.2 Bit-switch definitions

Note: On older units, bit-switch 7 enabled the transmission of the MAC FCS. This feature has now been removed.

3 . 1. 2 Timing

TIMING determines the source for the LINE transmit clock, and is set by bit-switch No1. The options are *ON* or *OFF*.

With the switch set to *ON*, the transmit clock is derived from the WC3445's own internal oscillator.

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

3 . 1. 3 E3/DS3 Port Select (BNC)

This single switch is used to select which type of interface (E3 or DS3) is to be used to connect the line.

With the switch set to *ON*, the E3 port is selected to give a G.703 75 ohm unbalanced 34.368 Mbps interface.

With the switch set to *OFF*, the DS3 port is selected to give a G.703 75 ohm balanced 44.736 Mbps 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 (NONE) of the unit without any loopbacks.

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

3 . 1. 5 Cable length

With switch set to *ON* the output is reduced for operation with shorter cables of length up to 225 feet (69 metres) .

With switch set to *OFF* higher power is used for longer cables of 225 - 450 feet. This applies to DS3 only.

3 . 1. 6 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) 100Mbps port.

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

3 . 1. 7 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-auto hubs

With switch set to *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 enabled the transmission of the MAC FCS. This feature has now been removed and the WC3445 always strips the MAC FCS from the ethernet packet. .

3 . 1. 9 E3 Line port

No configuration of the E3 Line port is required. Operation is unframed. The Line Coding setting is built into the unit (no bit-switch) and cannot be altered. It is HDB3 (High-Density Binary 3). The maximum line rate is 34.368 Mbps. The maximum corresponding packet rate is 64120 packets per second.

3 . 1. 10 DS3 Line port

No configuration of the DS3 Line port is required. Operation is unframed. The Line Coding setting is built into the unit (no bit-switch) and cannot be altered. It is B3ZS (Binary 3 zero suppression). The maximum line rate is 44.736 Mbps. The maximum corresponding packet rate is 82236 packets per second.

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 WC3445 is housed in a convenient 1U table top enclosure. 19 inch rack-mount 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 2: LAN ports

Connect the WC3445 to the LAN ports using the four labelled RJ45 ports on the rear panel.

Step 3: E3/DS3 Line (WAN)

Connect the WAN by means of the two BNC bayonet connectors labelled LINE Rx and LINE Tx. Remember to set the *PORT SELECT* bip-switch to the correct interface type before connecting.

Step 4: Power Supply

Finally, connect the mains power 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 WC3445 to excessive voltage. Read the safety information before continuing.

3.3 Optional rackmounting

Rackmounting kits may be used to mount two WC3445 units side by side in a 19" rack.

The first two of these kits have a flat mounting plate with separate cut-outs for power cables and signal cables. 80-05-252 is suitable for AC mains powered units, while 80-05-254 is suitable for units powered by -48VDC.

The third kit, Part no 80-05-256, 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 WC3445. The installation method is the same in all cases.

First remove the two rear panel screws securing each unit's lid. Fasten the two WC3445 units to the rackmount 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 WC3445 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 of the units before fixing them to the adaptor plate, check that the settings are still correct.

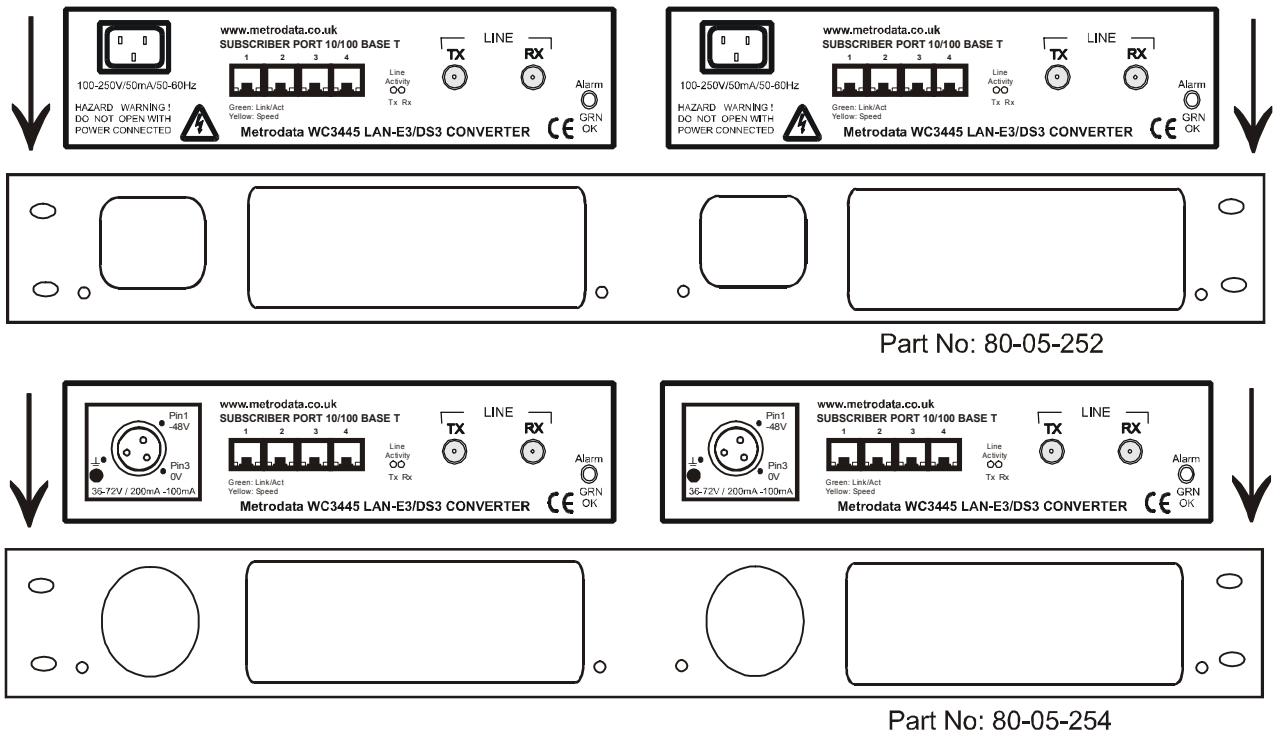


Figure 3.3 2-unit flush AC & DC rackmount schematics

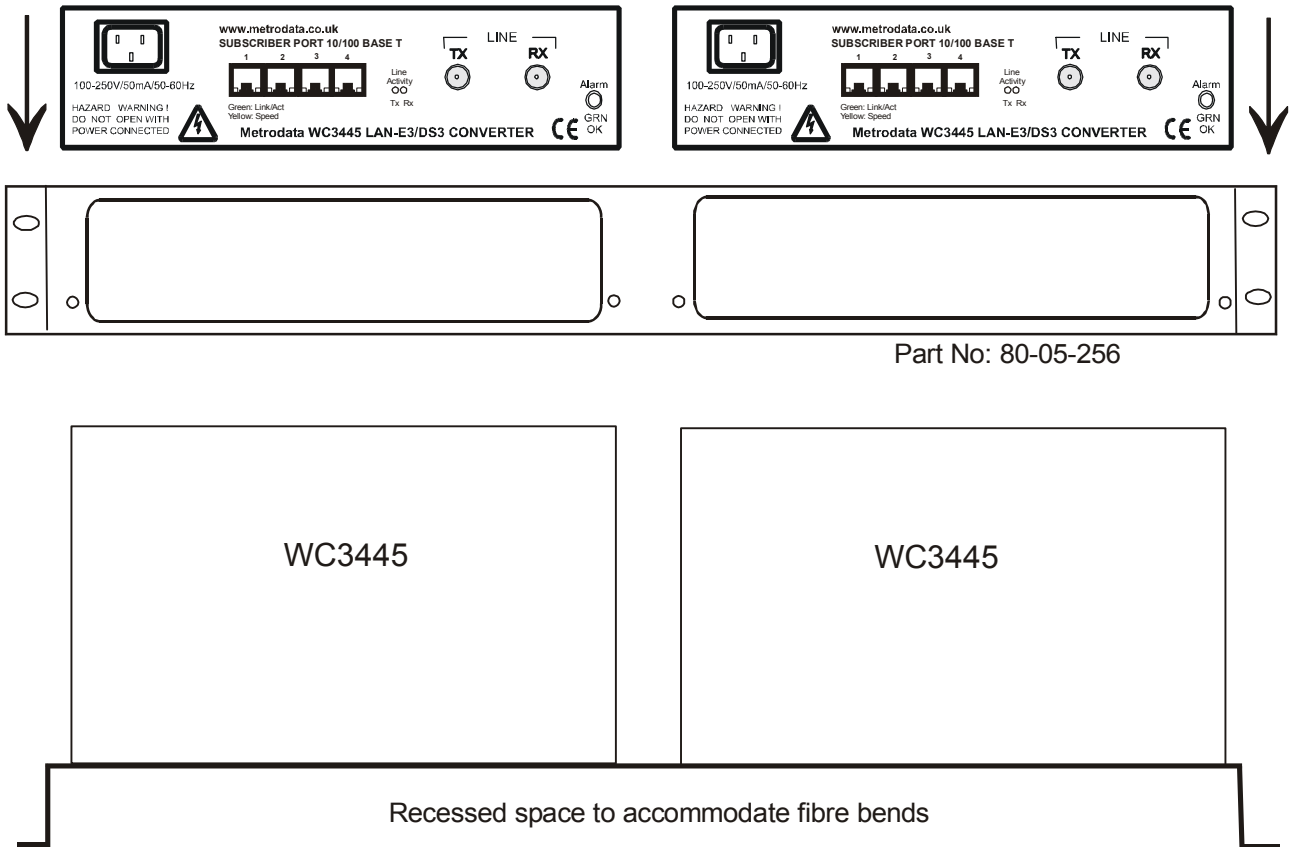


Figure 3.4 2-unit recessed rackmount plan & elevation

4 ALARMS, TROUBLESHOOTING & TESTING

4.1 Alarms

The Status LED on the WC3445 rear panel shows alarm conditions as shown below:

Status LED	Meaning
Off	No mains power present
Flashing Green	PRBS test in progress
Flashing Red	PRBS error detected
On Green	Status OK
On Red	WAN port LOS

Figure 4.1 Rear panel LED alarms

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 mains supply is satisfactory, we recommend that the unit be taken out of service and returned to a repair centre. Unqualified users should not open the WC3445.

Step 2 Establish and verify the LAN links

Connect up to 4 LAN cables to the LAN ports. If the LED on the bottom left hand corner of the RJ45 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 LED's 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 bit errors on the data lines, or no clocks present.

WC3445 with E3 interface - Step 3A

If the status LED is red, first check that the *PORT SELECT* bit-switch on the base panel is set to E3. If it is set correctly, try swapping the 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, then the external BNC cabling is faulty. Check for cable continuity and network connections, etc.

WC3445 with DS3 interface - Step 3B

If the status LED is red, first check that the *PORT SELECT* bit-switch is set to DS3. If it is set correctly, try swapping the 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, then the external BNC cabling is faulty. Check for cable continuity and network connections, etc.

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 WC3445 and a fixed (i.e. non-negotiating) LAN port, bit-switch 7 must be set to 100M FD. If this is not done, the WC3445 will operate at the correct speed, but in half duplex mode, and with a heavy error count.

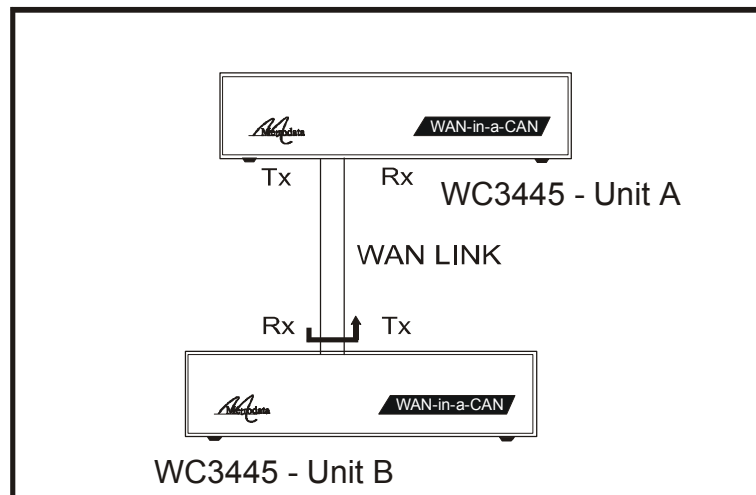
4. 3 Test Loop

Figure 4.2 Test loop on remote WC3445

Set the remote WC3445 base panel bit-switch labelled *LOOPBACK* to the *ON* position. When the *TEST LOOP* is activated at the remote WC3445, the signal received from the local Bit Error Rate Tester (BERT) unit at the WAN port is passed directly back to the BERT at the line interface.

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

5 WC3445 SPECIFICATIONS

E3 LINE	Definition
E3 LINE Interface	G.703 compliant, Sensitivity -10dB. Line coding HDB3. Interface: 75 ohm unbalanced coax (BNC) Interface selected by bit-switch
DS3 LINE Interface	G.703 compliant, Sensitivity -10dB. Line coding B3ZS. Interface: 75 ohm unbalanced coax (BNC) Interface selected by bit-switch
Jitter Tolerance	Per G.823.
Barrier	EN 41003 compliant barrier provided on the E3/DS3 interfaces
Framing	Unframed
Encapsulation	HDLC
Clocking options	E3/DS3 LINE port: Internal or Loop
Line Rate	E3: 34.368 Mbps DS3: 44.736Mbps
Maximum packet rate	E3: 64120 pps (packet per sec) DS3: 82236 pps (packet per sec)
LED Indicators	Tx/Rx Packet, Alarm
Alarms	E3/DS3 LOS
Diagnostics	External Loop Test initiated by bit-switch
Subscriber (LAN) Ports	Definition
LAN Interface	4 x RJ45, Auto switched MDI or MDI-X, or fixed MDI selected by bit-switch
Operating mode	Auto negotiated 10/100 Mbps, Full / Half Duplex, or 100M FD Fixed
Port filtering rate	148810 pps (packet per sec)
Port switching rate	148810 pps (packet per sec)
Switch mode	Any to Any
MAC address table	4096 entries
Min/Max Packet size	64 bytes / 1522 bytes
General	Definition
Power supply	100-250 VAC, 50-60 Hz, 50 mA or minus (36-72) VDC, 200-100mA
Dimensions	202 x 132 x 44 mm (w x d x h) Enclosure only 202 x 132 x 47 mm (w x d x h) Overall including feet
Environmental	Range
Ambient Temperature	0degC to +50degC
Storage Temperature	-20degC to +70degC
Relative Humidity	0% - 95% non condensing
Barometric Pressure	86 KPa - 106 KPa

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