

WC-X.21 & WC-V.35

www.metrodata.co.uk

**Metrodata WAN-in-a-CAN
WC-X.21 & WC-V.35
LAN Extenders
Installation Guide**

Metrodata Ltd
Fortune House
Crabtree Office Village
Eversley Way
Egham
Surrey TW20 8RY
United Kingdom

tel: +44 (0) 1784 744700
fax: +44 (0) 1784 744730
email: sales@metrodata.co.uk
website: www.metrodata.co.uk

Part No: 76-02-056G

1 INTRODUCTION

1. 1 About the WC-X.21 and WC-V.35 (WC-XV)

This manual uses the term WC-XV as a generic name for the WC-X.21 and WC-V.35 units when describing features common to both types of DSU.

The Metrodata WC-XV DSU has a four port auto-sensing 10/100BaseT Ethernet Switch with a low speed serial X.21 or a V.35 serial port. 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.

Note that in Section 3 two types of Bit-switch arrays and labelling for setting up units are described. Section 3.1 describes early models, and Section 3.2 describes current (2010) models of the WC-XV.

The WC-XV 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. WC-XV'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 WC-XV can handle a traffic level of 38462 packets/second over its serial link at the maximum 20Mbps.

1. 3 Safety

The WC-XV 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:

X.21 or V.35 serial port (WAN or LINE 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 WC-XV 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 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.

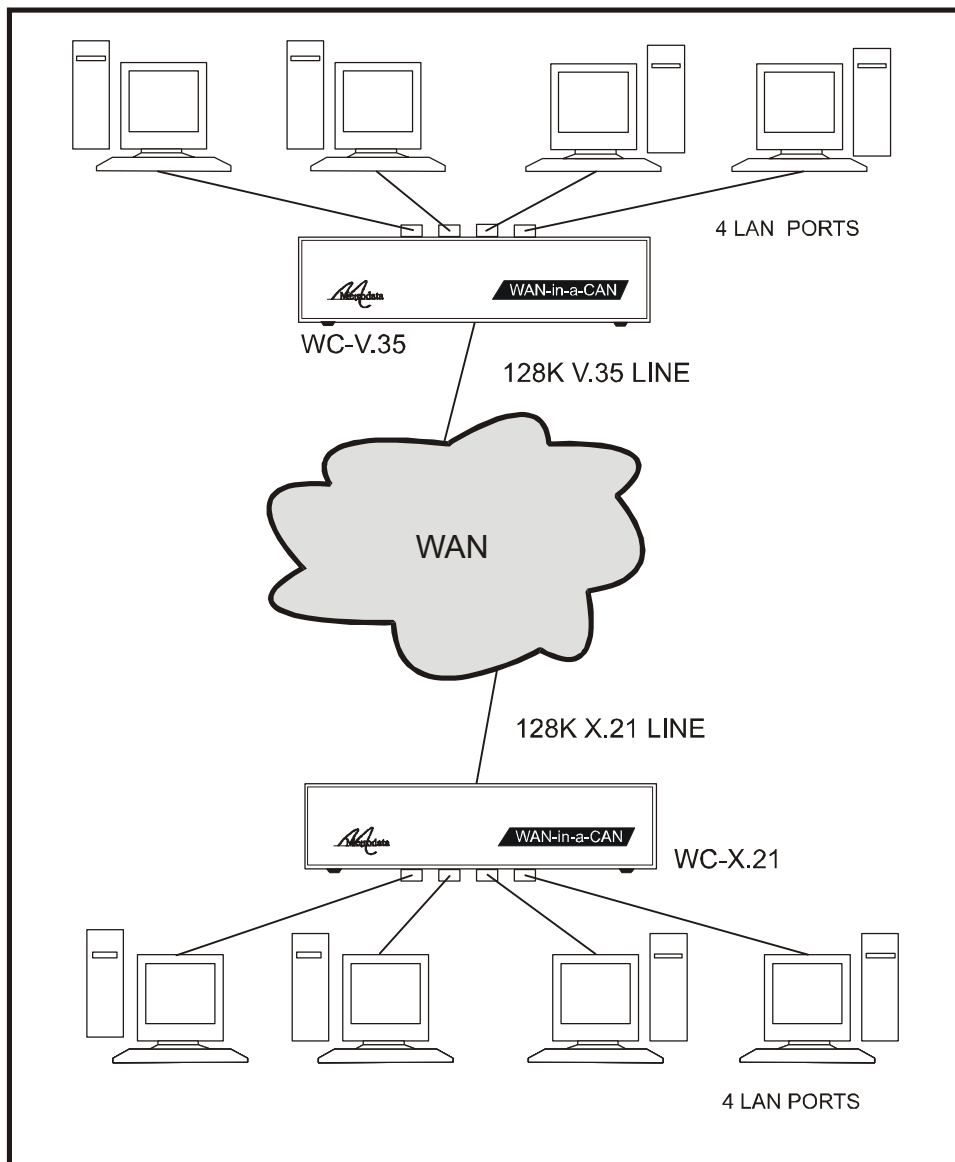


Figure 1. 1 WC-X.21 & WC-V.35 installations

2 WC-XV DESCRIPTION OF PARTS

2.1 Rear panels

All connections into and out of the WC-XV are made through the rear panel. The schematics below show AC and DC supplied WC-X.21 panels, and a WC-V.35 AC unit.

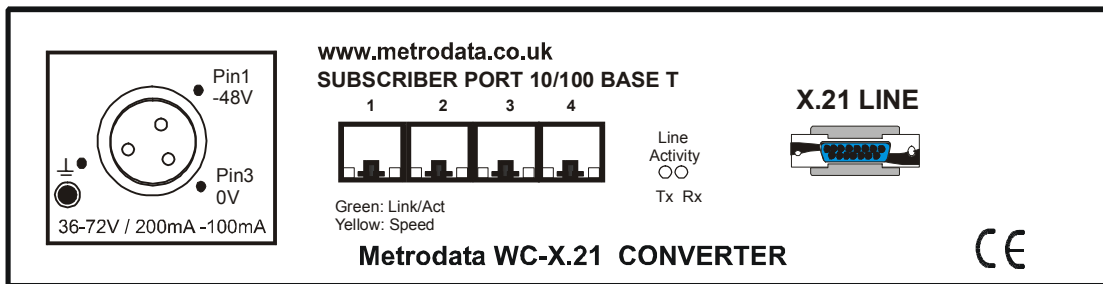
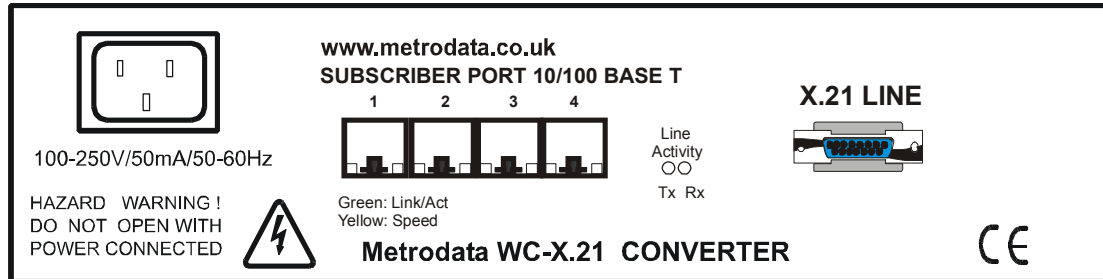


Figure 2.1 WC-X.21 AC & DC rear panels

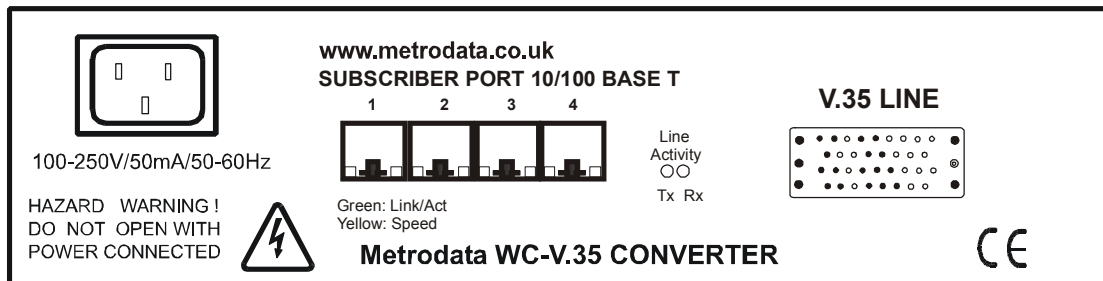


Figure 2.2 WC-V.35 AC rear panel

2.2 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.

2.3 Power Supply

The WC-XV 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 AC mains input voltage. The WC-XV 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 WC-XV.

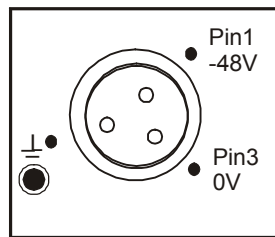


Figure 2.3 Buccaneer socket -48VDC

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 2.4 -48VDC connections

Note: The WC-XV 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. 4 V.35 DTE Port (WC-V.35 units only)

The V.35 DTE port is equipped with a 34 way female M-rack connector in accordance with ISO 2593. The pins that are connected are described below.

Note: The V.35 port is regarded as a SELV port within the scope of EN 41003.

Pin	Function	Definition	CCT No.
A	Chassis	Chassis ground	101
B	Ground	Signal ground	102
C	RTS	Request to send	105
D	CTS	Clear to send	106
E	DSR	Data set ready	107
F	CD	Carrier detect	109
H	DTR	Data terminal ready	108.2
P	Tx(A)	Transmit data(A)	103
R	Rx(A)	Receive data(A)	104
S	Tx(B)	Transmit data(B)	103
T	Rx(B)	Receive data(B)	104
V	RxCIk(A)	Receive timing(A)	115
X	RxCIk(B)	Receive timing(B)	115
Y	TxCIk(A)	Transmit timing(A)	114
AA	TxCIk(B)	Transmit timing(B)	114

Figure 2. 5 WC-V.35 port connector layout

2. 5 X.21 DTE Port (WC-X.21 units only)

The WC-X.21 DTE port is equipped with a 15 way male D-type connector in accordance with ISO 4903. The connections are shown below:

Note: The X.21 port is regarded as a SELV port within the scope of EN 41003.

Pin No	Function	Definition	CCT No.
1	Chassis	Shield	101
2	Tx(A)	Transmit (A)	103
3	C(A)	Control (A)	107
4	Rx(A)	Receive (A)	104
5	I(A)	Indication (A)	109
6	RT(A)	Receive timing (A)	115
7*	ST(A)	Send timing (A)	113
8	Ground	Ground	102
9	Tx(B)	Transmit (B)	103
10	C(B)	Control (B)	107
11	Rx(B)	Receive (B)	104
12	I(B)	Indication (B)	109
13	RT(B)	Receive timing (B)	115
14*	ST(B)	Send timing (B)	113
15	Not connected		

Figure 2. 6 WC-X.21 port connector layout

Note * : These two pins 7* and 14* should only be connected if Dual Clock (EIA-530 mode) has been selected.

2.6 WC-X.21 to EIA-530 DCE cable specification

A cable is required to connect the WC-X.21 to an EIA-530 DCE equipment such as a satellite modem. The cable layout is shown in the table below.

DB15 Female WC-X.21	Definition	CCT No.	Direction	DB25 Male DCE
1	Chassis ground	101		1
2	Transmit (A)	103	To DCE	2
3	Control (A)	107	To DCE	4
4	Receive (A)	104	From DCE	3
5	Indication (A)	109	From DCE	5
6	Receive timing (A)	115	From DCE	17
7 (Note 1)	Send timing(A)	114	From DCE	15
7 (Note 1)	Terminal timing (A)	113	To DCE	24
8	Signal Ground	102		7
9	Transmit (B)	103	To DCE	14
10	Control (B)	107	To DCE	19
11	Receive (B)	104	From DCE	16
12	Indication (B))	109	From DCE	13
13	Receive timing(B)	115	From DCE	9
14 (Note 1)	Send timing(B)	114	From DCE	12
14 (Note 1)	Terminal timing (B)	113	To DCE	11
15	No connection			6, 8, 10, 18, 20-23, 25

Note 1:

A twisted pair is used to connect pins 15 and 12 on the DB25 connector from pins 7 and 14 on the DB15 connector.

A twisted pair is used to connect pins 24 and 11 on the DB25 connector to pins 7 and 14 on the DB15 connector.

This means that pairs are used from/to the DB15 end rather than looping at the DB25 end.

2.7 LAN ports

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

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 WC-XV 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. When connecting to a Fixed router port, bit-switch 7 should be used to select the *100M FD 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 2.7 LAN port connector layout

The pin numbering for the connector is shown below:

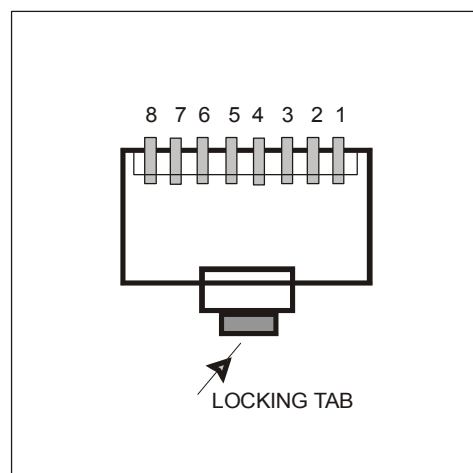



Figure 2.8 RJ45 connector layout

3 INSTALLATION & SET-UP

3.1 Setting-up early models of WC-XV

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. The figure below is for early models - if your unit does not resemble this, turn to section 3.2.



Metrodata Ltd
 TW20 8RY UK
 Tel +44 (0) 1784 744700
 Fax +44 (0) 1784 744730


For product manual
 and other information:-
www.metrodata.co.uk

WC / X.21
LAN / X.21 CONVERTER (AC)
 Part Number 80-05-545


Serial No:


Bitswitch	Control	ON	OFF
1		Normal	
2	Rx Clk	Normal	Inverted
3	Tx Clk	Normal	Inverted
4	Data	Normal	Inverted
5	Clock Mode	X.21	EIA-530
6		Normal	
7	LAN Mode	100M FD	Auto-negotiate
8	Auto MDI / MDI-X	Disabled	Enabled

1 2 3 4 5 6 7 8




OFF





ON

17-08-327A



Metrodata Ltd
 TW20 8RY UK
 Tel +44 (0) 1784 744700
 Fax +44 (0) 1784 744730

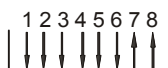
For product manual
 and other information:-
www.metrodata.co.uk

WC / V.35
LAN / V.35 CONVERTER (DC)
 Part Number 80-05-546


Serial No:


Bitswitch	Control	ON	OFF
1		Normal	
2	Rx Clk	Normal	Inverted
3	Tx Clk	Normal	Inverted
4	Data	Normal	Inverted
5		Normal	
6		Normal	
7	LAN Mode	100M FD	Auto-negotiate
8	Auto MDI / MDI-X	Disabled	Enabled

1 2 3 4 5 6 7 8



OFF





ON

17-08-330A

Figure 3.1 WC-XV Base panel labels - early models

3.1.1 Bit-switch definitions

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

Bit-switch	Control	On	Off
1		Normal	
2	Rx Clock	Normal	Inverted
3	Tx Clock	Normal	Inverted
4	Data	Normal	Inverted
5	Clock Mode	X.21	EIA-530
6		Normal	
7	LAN Mode	100M FD	Auto-negotiate
8	Auto MDI / MDI-X	Disabled	Enabled

Figure 3.2 Bit-switch definitions

3.1.2 Rx CLK Invert

Bit-switch *ON*: Normal Mode, sample the Received data on the Falling Edge

Bit-switch *OFF*: Inverted Mode, sample the Received data on the Rising Edge

3.1.3 Tx CLK Invert

Bit-switch *ON*: Normal Mode, Output the Transmit Data on the Rising Edge

Bit-switch *OFF*: Inverted Mode, Output the Transmit Data on the Falling Edge

3.1.4 Data Invert

Bit-switch *ON*: Normal Mode,

Bit-switch *OFF*: Inverted Mode

3.1.5 Clock mode

This option is fitted only on X.21 units

Bit-switch *ON*: X.21 Mode

The Receive timing signal is used for both Receive and Transmit clocks.

Bit-switch *OFF*: EIA-530 Mode

This is a Dual clock mode, in which separate Receive and Transmit clocks are used, thus enabling asynchronous operation.

3.1.6 LAN Mode

Bit-switch *ON*: 100 Maps 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

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

Older WC-XV units used bit-switch 7 to enable the transmission of the MAC FCS. This function has now been disabled and bit-switch 7 has been reassigned to *LAN MODE*.

3.2 Setting up later models of WC-XV

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.



Metrodata Ltd
 TW20 8RY UK
 Tel +44 (0) 1784 744700
 Fax +44 (0) 1784 744730

For product manual
 and other information:-
www.metrodata.co.uk

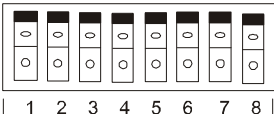
WC / V.35
LAN / V.35 CONVERTER (DC)

Part Number 80-21-546


Serial No:

Bitswitch	Control	ON	OFF
1	Data	Normal*	Inverted
2	TxCk	Normal*	Inverted
3	RxCk	Normal*	Inverted
4	UNUSED	Normal*	
5	Frame Size	1536*	1518/1522
6	Speed	100M*	10M
7	Duplex	Full*	Half
8	Auto Negotiate	Enabled*	Disabled


Bold* characters = Factory Default




OFF



ON



17-08-330C



Metrodata Ltd
 TW20 8RY UK
 Tel +44 (0) 1784 744700
 Fax +44 (0) 1784 744730

For product manual
 and other information:-
www.metrodata.co.uk

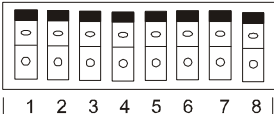
WC - X.21
LAN / X.21 CONVERTER (AC)

Part Number 80-05-545


Serial No:

Bitswitch	Control	ON	OFF
1	Data	Normal*	Inverted
2	TxCk	Normal*	Inverted
3	RxCk	Normal*	Inverted
4	Clock Mode	X.21 Mode*	EIA-530 Mode
5	Frame Size	1536*	1518/1522
6	Speed	100M*	10M
7	Duplex	Full*	Half
8	Auto Negotiate	Enabled*	Disabled


Bold* characters = Factory Default



OFF



ON



17-08-327B(Ai)

Figure 3.3 WC-XV Base panel labels- later models

3.2.1 Bit-switch definitions

The default settings of the bit-switches on the base panel are shown in bold. Note that Bit-switch number 4 is Unused on WC-V.35 models. The base labels for the X.21 and V.35 models are shown separately in the figures below.

:

Bit-switch	Control	On	Off
1	Data	Normal	Inverted
2	Rx Clock	Normal	Inverted
3	Tx Clock	Normal	Inverted
4	Clock Mode	Normal	Inverted
5	Frame Size	1536	1518/1522
6	Speed	100M*	10M
7	Duplex	Full*	Half
8	Auto Negotiate	Enabled*	Disabled

Figure 3.4 Bit-switch definitions WC-X.21

Bit-switch	Control	On	Off
1	Data	Normal	Inverted
2	Rx Clock	Normal	Inverted
3	Tx Clock	Normal	Inverted
4	UNUSED		
5	Frame Size	1536	1518/1522
6	Speed	100M*	10M
7	Duplex	Full*	Half
8	Auto Negotiate	Enabled*	Disabled

Figure 3.5 Bit-switch definitions WC-V.35

3.2.2 Data Invert

Bit-switch *ON*: Normal Mode,
 Bit-switch *OFF*: Inverted Mode

3.2.3 Rx CLK Invert

Bit-switch *ON*: Normal Mode, sample the Received data on the Falling Edge
 Bit-switch *OFF*: Inverted Mode, sample the Received data on the Rising Edge

3.2.4 Tx CLK Invert

Bit-switch *ON*: Normal Mode, output the Transmit Data on the Rising Edge
 Bit-switch *OFF*: Inverted Mode, output the Transmit Data on the Falling Edge

3.2.5 Clock mode - WC-X.21 only

This option is fitted only on X.21 units. On V.35 units, bit-switch position 4 is UNUSED.

Bit-switch *ON*: X.21 Mode (default).

The Receive timing signal is used for both Receive and Transmit clocks.

Bit-switch *OFF*: EIA-530 Mode

This is a Dual clock mode, in which separate Receive and Transmit clocks are used, thus enabling asynchronous operation.

3.2.6 Frame Size

Bit-switch *ON*: The 1536 byte Frame size allows support for protocols such as MPLS, Q in Q etc. (default).

Bit-switch *OFF*: This setting for 1518/1522 byte frames provides the standard Ethernet MAC framing.

3.2.7 Speed

Bit-switch *ON*: 100 Mbps operation (default).

Bit-switch *OFF*: 10 Mbps operation.

3.2.8 Duplex Mode

Bit-switch *ON*: Full Duplex operation (default).

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*: Half Duplex operation.

3.2.9 Auto Negotiate

Bit-switch *ON*: Auto-negotiation is Enabled.

Bit-switch *OFF*: Auto-negotiation is Disabled.

3.3 Connecting up the WC-XV

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 WC-XV 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. Use Section 3 of this manual to establish which type of product model you are setting-up.

Step 2: LAN ports

Connect the WC-XV to the LAN ports using the four labelled RJ45 ports on the rear panel.

Step 3: V.35 or X.21 WAN (LINE) port

Connect the WAN to the rear panel by means of the connectors mounted on the rear panel and labelled LINE:

- either: a) the 34-way M rack connector for WC-V.35
- or b) the 15-way D-type connector for WC-X.21

Step 4: Power Supply

Connect the main 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 WC-XV to excessive voltage. Read the safety information before continuing.

3.4 Optional rack mounting

Rack mounting kits may be used to mount two WC-XV 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 number 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 WC-XV. The installation method is the same in all cases.

First remove the two rear panel screws securing each unit's lid. Fasten the two WC-XV 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 WC-XV 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.

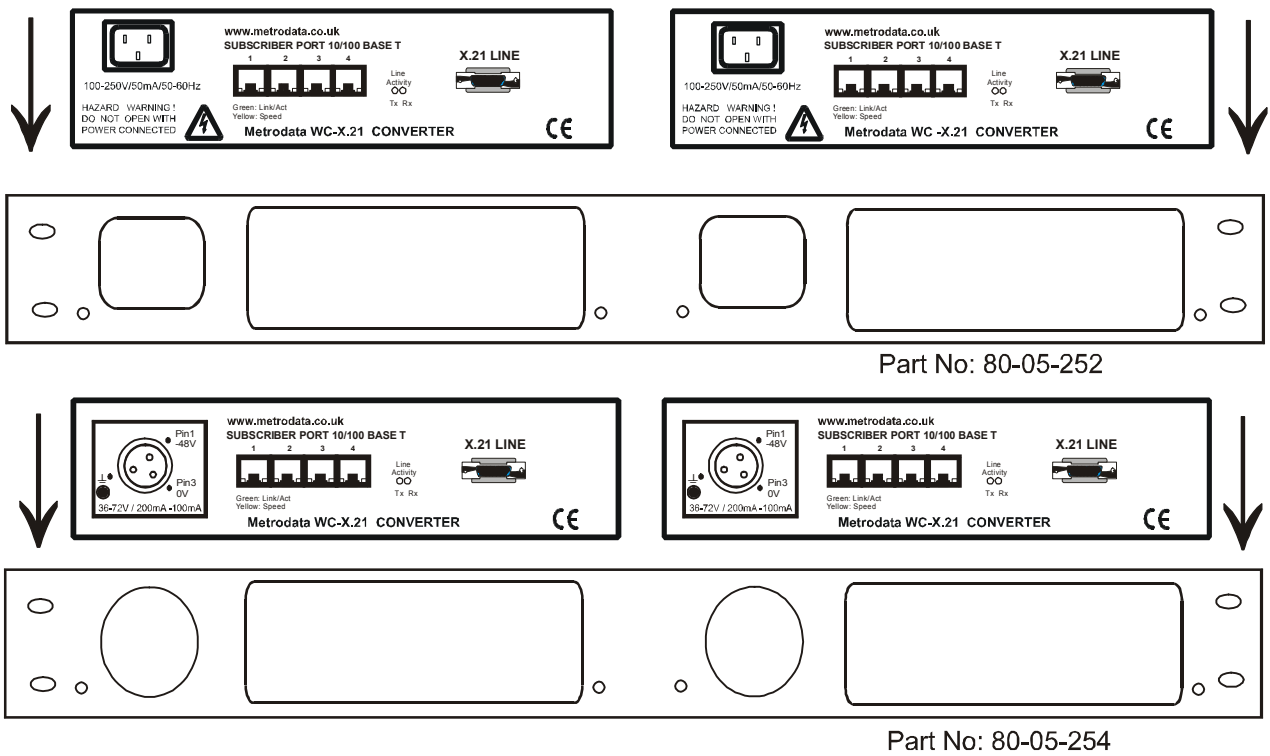


Figure 3.6 2-unit flush AC & DC rack mount schematics

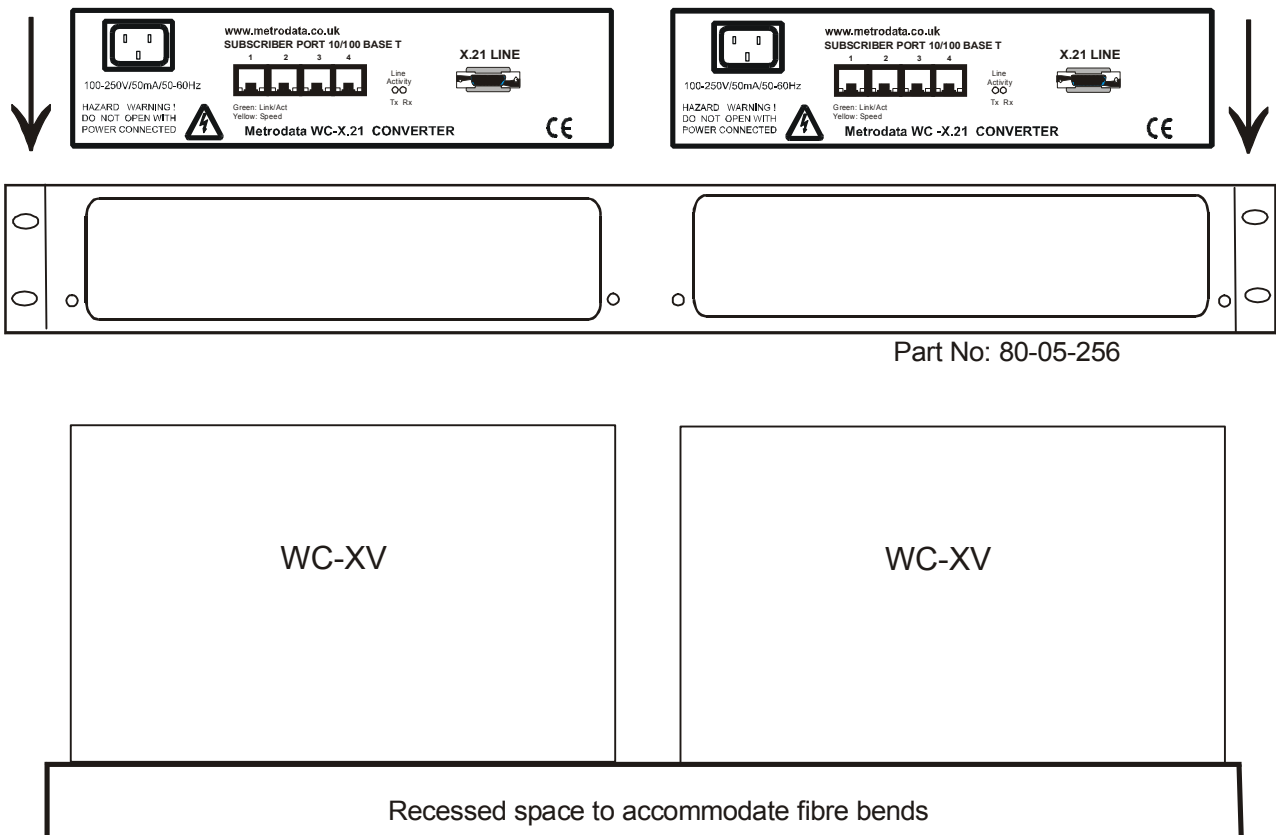


Figure 3.7 2-unit recessed rack mount plan & elevation

4 TROUBLESHOOTING

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 WC-XV.

Step 1 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 2 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.

Other steps - early models

On early models, 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.

For 100M full duplex operation between the WC-XV and a fixed (i.e. non-negotiating) LAN port, bit-switch no7 must be set to 100M FD. If this is not done, the WC-XV will operate at the correct speed, but in half duplex mode, and with a heavy error count.

Note that the WC-XV always strips the MAC FCS from the ethernet packet.

5. 1 WC-XV SPECIFICATIONS

Serial Line	Definition
DTE Interface:	DTE Interface provided depends upon model supplied: WC- X.21 : 15 way female DA15 per ISO 4903 WC-V.35 : 34 pin M-rack type female connector per ISO 2593
LED Indicators	Tx/Rx Packet
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 100Mbps 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 Frame size	64 bytes / 1536 bytes
General	Definition
Power supply	100-250 VAC, 50-60 Hz, 60 to 24 mA, or -36 to -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	0 degC to +50 degC
Storage Temperature	-20 degC to +70 degC
Relative Humidity	0% - 95% non condensing
Barometric Pressure	86 KPa - 106 KPa

Disclaimer

Metrodata Ltd makes no representations or warranties with respect to the contents hereof and specifically disclaims any implied warranties or merchantability or fitness for any particular purpose. Further, Metrodata Ltd reserves the right to revise this publication and to make changes from time to time in the content hereof without obligation of Metrodata 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.

Copyright © 2010 by Metrodata Ltd

All Rights Reserved