User Manual

DC1X00

www.metrodata.co.uk

Metrodata DC1X00 User Manual

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: support@metrodata.co.uk
website: www.metrodata.co.uk/support

Part No: 76-02-043E

CONTENTS

1 INTRODUCTION

1. 1 About the DC1X00

The DC1X00 is used to interface between a fractional E1 (2.048Mbit/s) service with a G.703 interface and an X.21 or V.35 port which connects to a bridge or router. The model DC1000 has an X.21 interface, and the model DC1200 has a V.35 interface. Both models are described in this manual. There is a choice of either BNC or RJ45 connectors for the E1 service on the rear panel of the unit. DC1X00's are used in pairs, one on either side of a WAN (Wide Area Network) link.

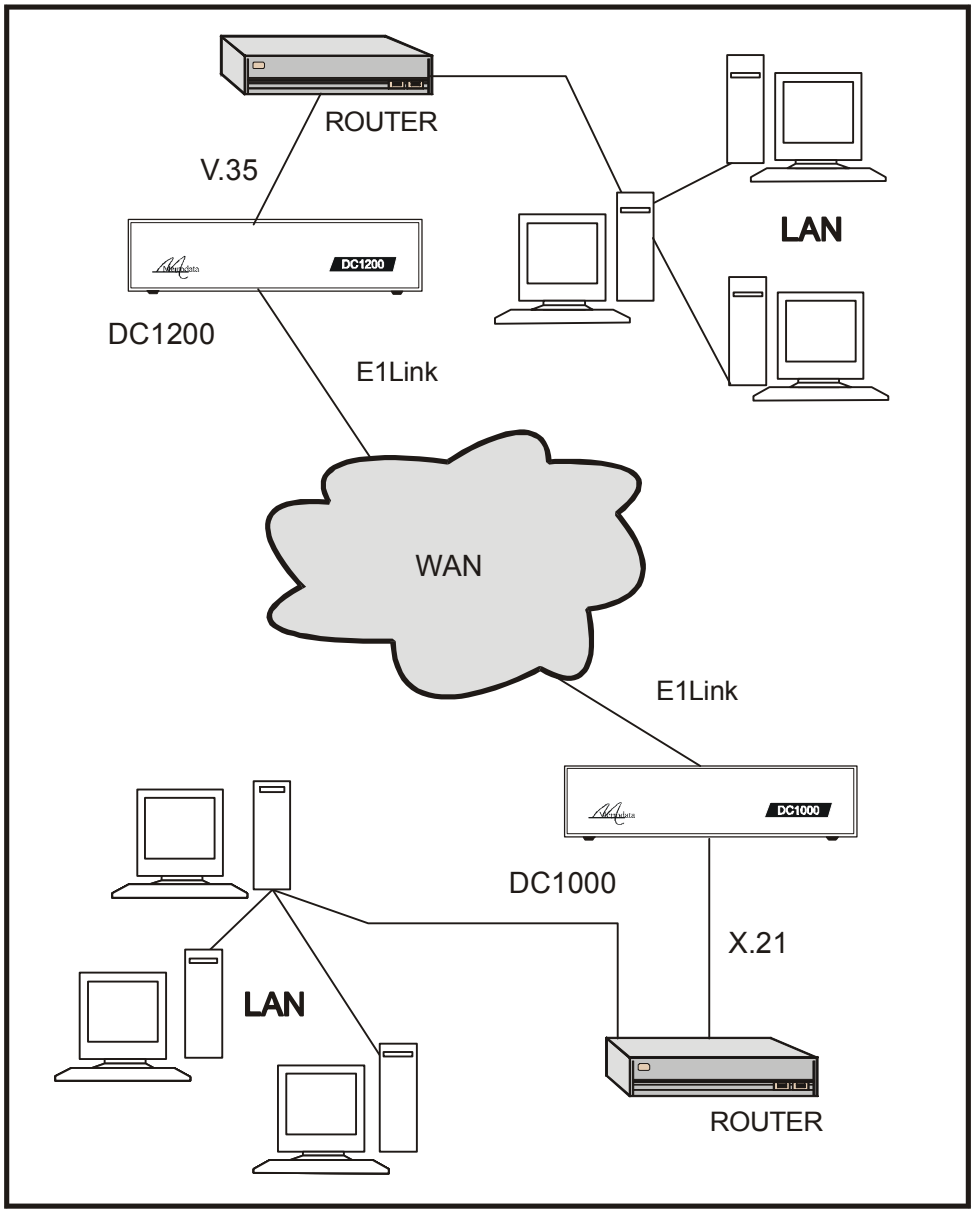

Figure 1.1 DC1X00 installation

1. 2 Safety

The DC1X00 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 port
V.35 port
E1 Line port (BNC or RJ45)
Alarm extension RJ45 port

These 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 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 EN50022 Declaration

The DC1X00 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. 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 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.

1. 6 Power Supply

The DC1X00 is powered by a mains power supply with an input voltage range 100-250 VAC/ 50-60 Hz, 30-12 mA. The input power consumption is approximately 3 watts.

An alternative -48V DC power supply unit is available. Connection details are given in Section3.

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. The DC1X00 must be connected to safety earth for correct operation.

1. 7 Technical Overview

The DC1X00 is used on unstructured E1/G.703, digital services.

1 . 7. 1 G.703 Signal Transmission

The signal is transmitted on 75 Ohm unbalanced coax or 120 Ohm twisted pair. The signal has alternate mark inversion (AMI) characteristics in accordance with G.703. A mark is transmitted as a 0.5 unit interval (UI) wide pulse of amplitude 2.37V on 75 ohm coax, or 3.0 V on 120 ohm twisted pair. Alternate marks have opposing polarity so that '111' is transmitted as a positive pulse, a negative one and then another positive one. The pulses have a duration of 50% so that strings of '1s' can be identified as a series of pulses. This is because clocking information is derived from the transmitted signal. In addition, strings of zeros are replaced with high-density binary 3 (HDB3) code words to ensure pulse density (and therefore clocking information) and an average DC potential of 0V.

The transmission rate is 2.048 Mbps. The worst case delay through the DC1X00 is 10 microseconds, and the worst case round trip delay is 40 microseconds.

1. 8 Payload

The DC1X00 with a DTE port has a data rate of 2.048Mbps. Data from the DTE is carried on the E1 aggregate as unstructured payload.

2 DC1X00 DESCRIPTION OF PARTS

2. 1 Rear panel

All connections into and out of the DC1X00 are made through the rear panel. The rear panels are shown in schematic form below.

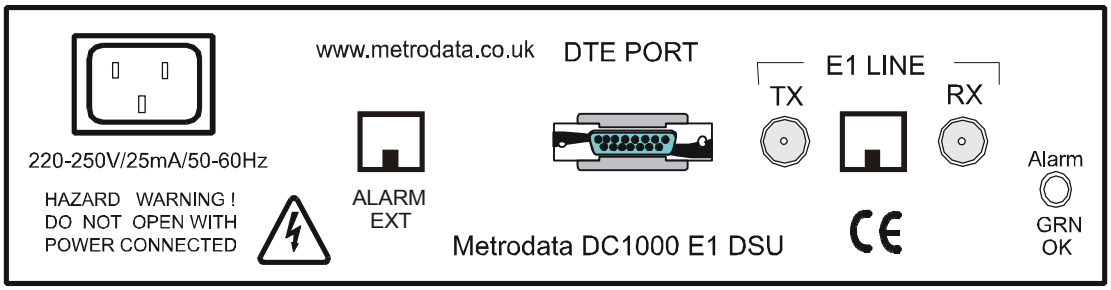

Figure 2.1 DC1000 rear panel (100-250VAC supply)

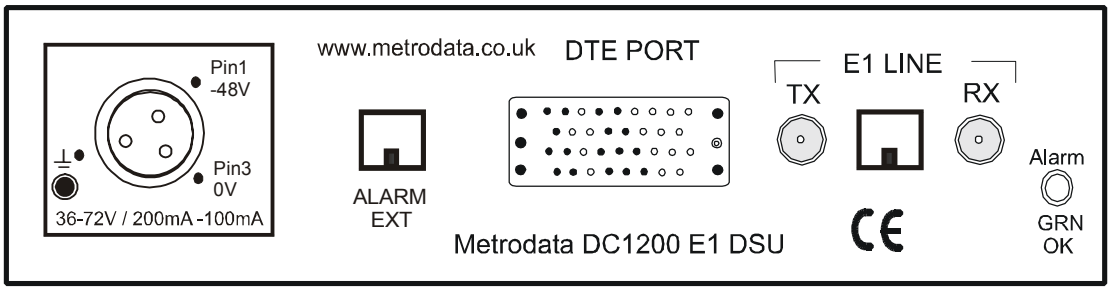

Figure 2.2 DC1200 rear panel (-48VDC supply)

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
Red steady	LOS Alarm
Red/Off flashing	LOS and DTE Alarm
Green/Off flashing	DTE Alarm
Green steady	Status OK

Figure 2.3 Rear panel status LED

2. 3 Power Supply

The DSU is powered by a mains supply with an input voltage of 100-250VAC, 50-60Hz, 30 - 12 mA. The input power consumption is approximately 3 watts. The DC1X00 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 votage and current ranges are minus 36 to minus 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 DC1X00.

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 DSU must be connected to mains safety earth for correct operation.

2. 4 Unbalanced E1 Line port (BNC)

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

Pin	Function
Tip	Signal
Ring	Shield

Figure 2.5 BNC connection

Cable lengths should be restricted to those defined below:

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

Figure 2.6 Cable lengths

Note: 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.

2. 5 Balanced RJ45 E1 Line (Network) Port

The layout of the female RJ45 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

Figure 2.7 RJ45 network port layout

2 . 5. 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

Figure 2.8 Connection from DSU to terminal device

2 . 5. 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

Figure 2.9 Connection from DSU to network device

2 . 5. 3 RJ45 Connector layout

Figure 2.4 shows both the plug and socket head on so that any connecting wires are behind the connector. The connector numbering is shown.

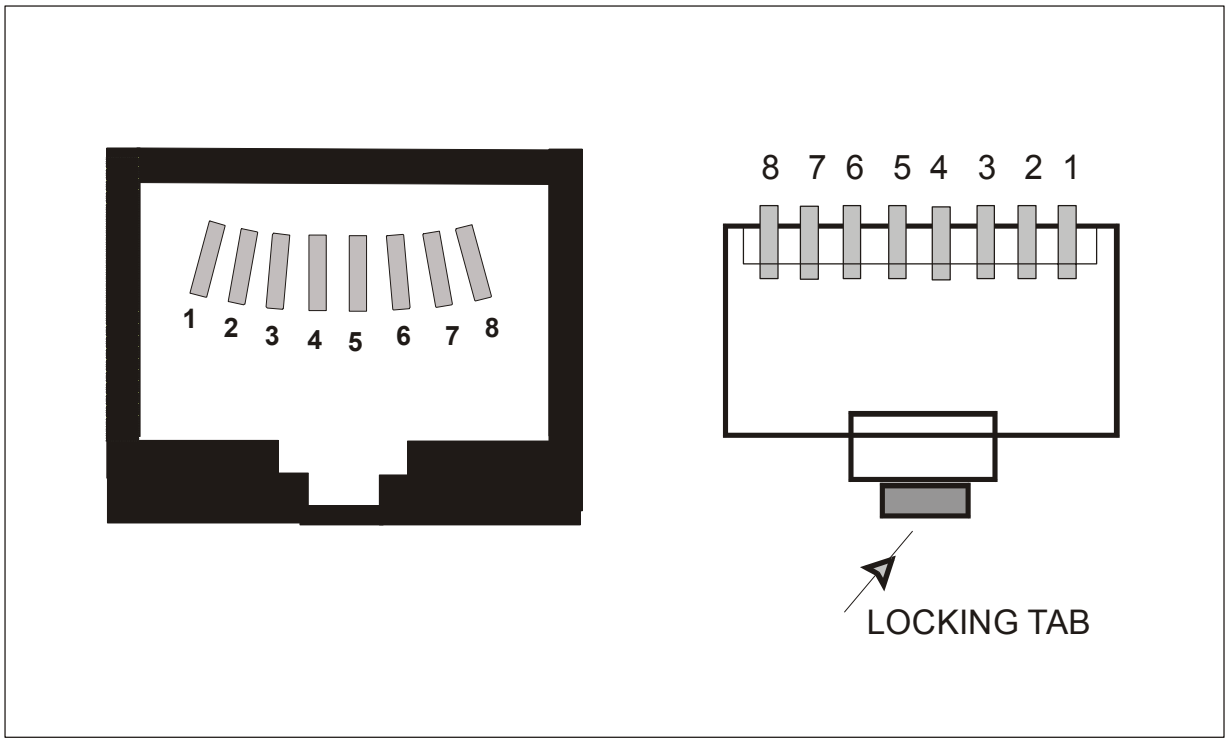

Figure 2.10 RJ45 layout

2 . 5. 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

Figure 2.11 Cable lengths

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. 6 Alarm Extension (RJ45)

The alarm extension is an RJ45 female socket mounted on the rear panel of the unit. It allows the connection of major and minor alarm relay contacts to a remote indicator such as a bell or a lamp. The alarm relay port is regarded as a SELV port within the scope of EN41003. Mains power failure is registered via Normally closed contacts as a major alarm.

Pin	Function
1	Major Normally Closed
2	Major Normally Open
3	Major common
4	Not connected
5	Minor Normally Open
6	Minor Normally Closed
7	Minor common
8	Ground

Figure 2.12 RJ45 alarm extension layout

2. 7 X.21 DTE Port

The X.21 DTE port is equipped with a 15-way female 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)	Signal timing (A)	115
7	TT(A)	Terminal 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)	Signal timing (B)	115
14	TT(B)	Terminal timing (B)	113
15	Not connected		

Figure 2.13 X.21 DTE port connector layout

2. 8 V.35 DTE Port

The V.35 DTE port is equipped with a 34-way M rack female connector in accordance with ISO 4903. The connections are shown below.
Note: The V.35 port is 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	DCD	Data 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
U	XClk(A)	Terminal timing(A)	113
V	RxClk(A)	Receive timing(A)	115
W	XClk(B)	Terminal timing(B)	113
X	RxClk(B)	Receive timing(B)	115
Y	TxClk(A)	Transmit timing(A)	114
AA	TxClk(B)	Transmit timing(B)	114

Figure 2.14 V.35 DTE port connector layout

3 INSTALLATION & SET-UP

3. 1 Setting-up the Bit-switches

It is recommended that the bit-switches on the base of the unit are 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.

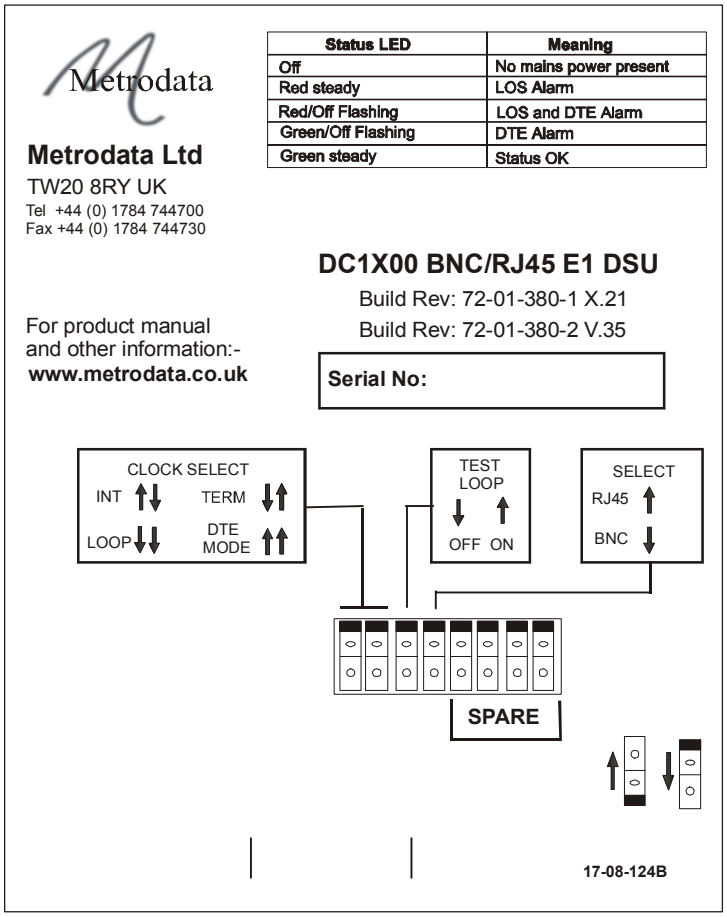

Figure 3.1 DC1X00 Base Panel label

Parameter	Label	Unit	Options
E1 Line connector	Select	Up Down	RJ45 BNC
Timing	Clock select	Position	Internal, Terminal, Loop or DTE Mode
Test	Test Loop	On Off	Run Test Loop No test

Figure 3.2 Bit-switch definitions

3 . 1. 1 Select RJ45/BNC

This single switch is used to select which type of connector (RJ45 or BNC) is to be used to connect the E1 line.

3 . 1. 2 Timing

TIMING determines the source for the *LINE E1* transmit clock, and is set by two bit-switches. The options are *INT* (*INTERNAL), TERM (TERMINAL), LOOP* or *DTE MODE.*

With *INTERNAL* timing selected, the E1 transmit clock is derived from the DC1X00's own internal oscillator.

With *TERMINAL* timing selected, the E1 transmit clock is slaved to DTE circuit 113 timing.

With *LOOP* timing selected, the E1 transmit clock is derived from the E1 LINE receive clock.

With *DTE MODE* timing selected, the E1 transmit clock is slaved to CCT113 and the X.21 port operates as a 'true' DTE with the X.21 receive data being timed off DTE Circuit 113.

The recommended timing mode for the DC1X00 pair at either side of the WAN is **Internal** at one end of the link and **Loop** at the other end.

3 . 1. 3 Test Loop

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

3. 2 E1 Line port

No configuration of the E1 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).

3. 3 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 DC1X00 is housed in a convenient 1U table top enclosure.

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: DTE
Connect the DC1X00 to the DTE using either the 15-way X.21 connector (DC1000) or the 34 way M-rack connector (DC1200) labelled *DTE PORT* on the rear panel. The DSU should ideally be placed close to the DTE, with no more than 2m of cable connecting the two.

Step 3: E1 LINE (WAN)
Connect the WAN by means of either the two BNC bayonet connectors labelled E1 LINE Rx and E1 LINE Tx, or the single RJ45 connector located between the two BNC connectors. remember to set the *SELECT* bit-switch to the correct connector type before connecting.

Step 4: Power Supply
Finally, 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 DC1X00 to excessive voltages. Read the safety information before continuing.

4 ALARMS, TROUBLESHOOTING & TESTING

4. 1 Alarms

The Status LED on the DC1X00 rear panel shows a variety of alarm conditions as shown in the table below.

Status LED	Meaning
Off	No mains power present
Red steady	LOS
Red/Off flashing	LOS and DTE Alarm
Green/Off flashing	DTE Alarm
Green steady	Status OK

Figure 4.1 Rear panel LED alarms

The definitions of each alarm and the unit's reponse to them is tabulated below.

Alarm	Alarm Definition	Response
LOS	Loss Of Signal: No data and therefore no clocking information.	DC1000 Indication *NOT ASSERTED*. DC1200 DCD *NOT ASSERTED.*
DTE	DTE Control signal absent	No response

Figure 4.2 Alarm responses & definitions

Note: Some routers monitor the Indication/DCD line and will disable transmission of data when its state is *NOT ASSERTED.*

4. 2 Troubleshooting

Step 1: Establish and verify the E1 WAN link

Check the status LED on 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 DC1X00 .

DC1X00 with BNC connectors - Step 1A

If the status LED is red or flashing red/off, first check that the *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 or flashing red/off, try looping the BNC connections on the unit with a short piece of cable. If the status LED goes steady green or flashes green/off, then the external BNC cabling is faulty. Check for cable continuity and network connections, etc.

DC1X00 with RJ45 connectors - Step 1B

If the status LED is red or flashing red/off, first check that the SELECT bit-switch is set to RJ45. If it is set correctly, check the connections on the RJ45 cable. Check for cable continuity and network connections, etc.

Step 2 Establish and verify the DTE link

If the status LED flashes green/off, check that the local router port status is *UP* and that the local router cable is in place.

If problems persist, check the DTE cabling configuration. Running *TEST LOOPS* will help to isolate the problem area - see next section. Transmit and Receive data connections may be crossed, as may any of the handshaking and/or signalling lines.

Step 3: Bridge/Router configuration

As the DC1X00 is used in a variety of locations and with many different manufacturer's equipment it is impossible for us to cover all eventualities here, so please consult other manufacturer's operating manual for further information.

4. 3 Test Loop

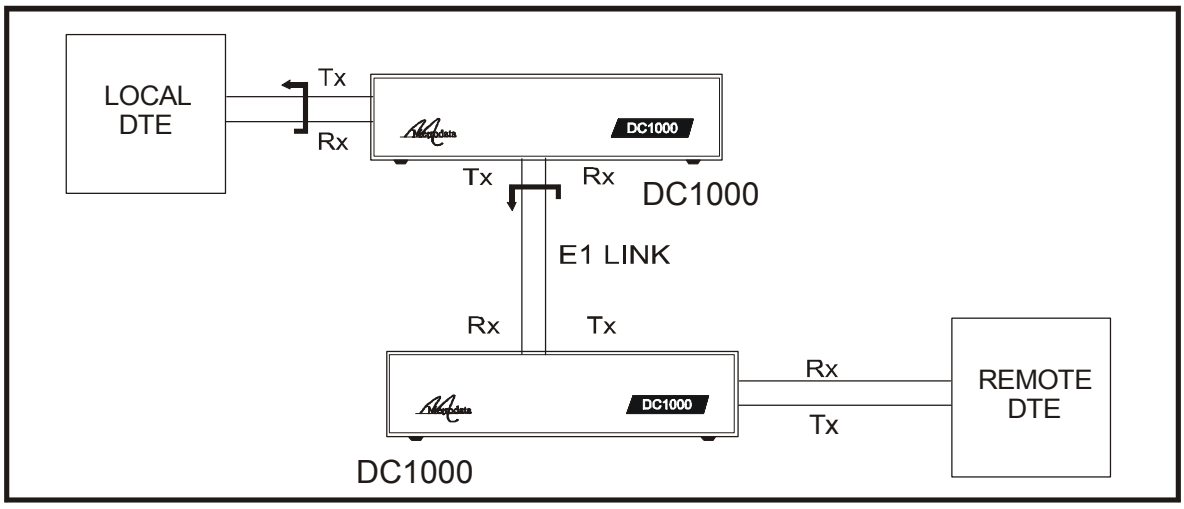

Figure 4.3 Test loop on local DC1X00

Set the local DC1X00 base panel bit-switch labelled *TEST LOOP* to the *ON* position. When the *TEST LOOP* is activated at the local DC1X00, the signal received at the E1 port is passed directly back to the link at the line interface. The signal from the DTE is looped adjacent to the DTE port. This effectively isolates the DC1X00 running the test and validates:

(a) the local DTE cable if the local DTE recognises its own transmissions.
(b) the remote DTE and its cable, the remote DC1X00 and the E1 link if the remote DTE recognises its own transmissions.

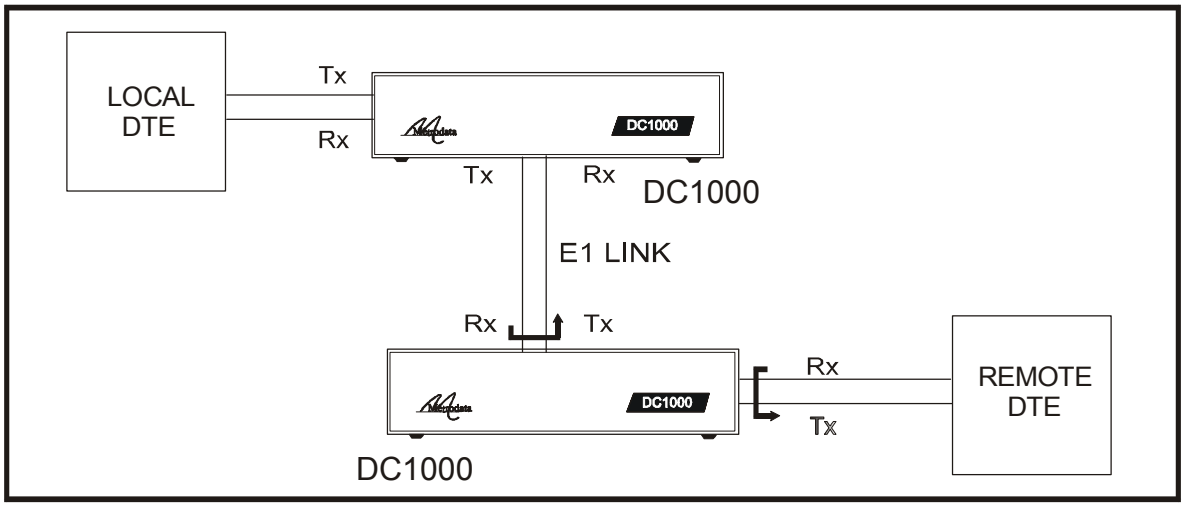

Figure 4.4 Test loop on remote DC1X00

Set the remote DC1X00 base panel bit-switch labelled *TEST LOOP* to the *ON* position. The test loop validates:

(a) the remote DTE cable if the remote DTE recognises its own transmissions.
(b) the local DTE and its cable, the local DC1X00 and the E1 link if the local DTE recognises its own transmissions.

5 DC1X00 SPECIFICATIONS

5. 1 DC1X00 Product Specification

Parameter	Definition
E1 LINE Interface	G.703 compliant, Sensitivity -10dB. Line coding HDB3. **Interface types:** 75 Ohm unbalanced coax (BNC) or 120 ohm balanced RJ45. Interface selected by bit-switch.
Jitter Tolerance	Per G.823.
Barrier	EN 41003 compliant barrier provided on the E1 interface.
DTE Interface	**X.21 :** 15 way female DA15 per ISO 4903 **V.35 :** 34 way female M-rack
Clocking options	**E1 Line:** Internal, Terminal: DTE TT(circuit 113), Loop: E1 line receive clock, DTE Mode: E1 transmit clock slaved to CCT113, with X.21 received data timed off CCT113.
Diagnostics	Loop Test initiated by bit-switch
General	**Definition**
Power supply	100-250 VAC, 50-60 Hz, 30-12 mA or -32 to -72 VDC, 100-50 mA
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

5. 2 DC1X00 Clocking Diagram

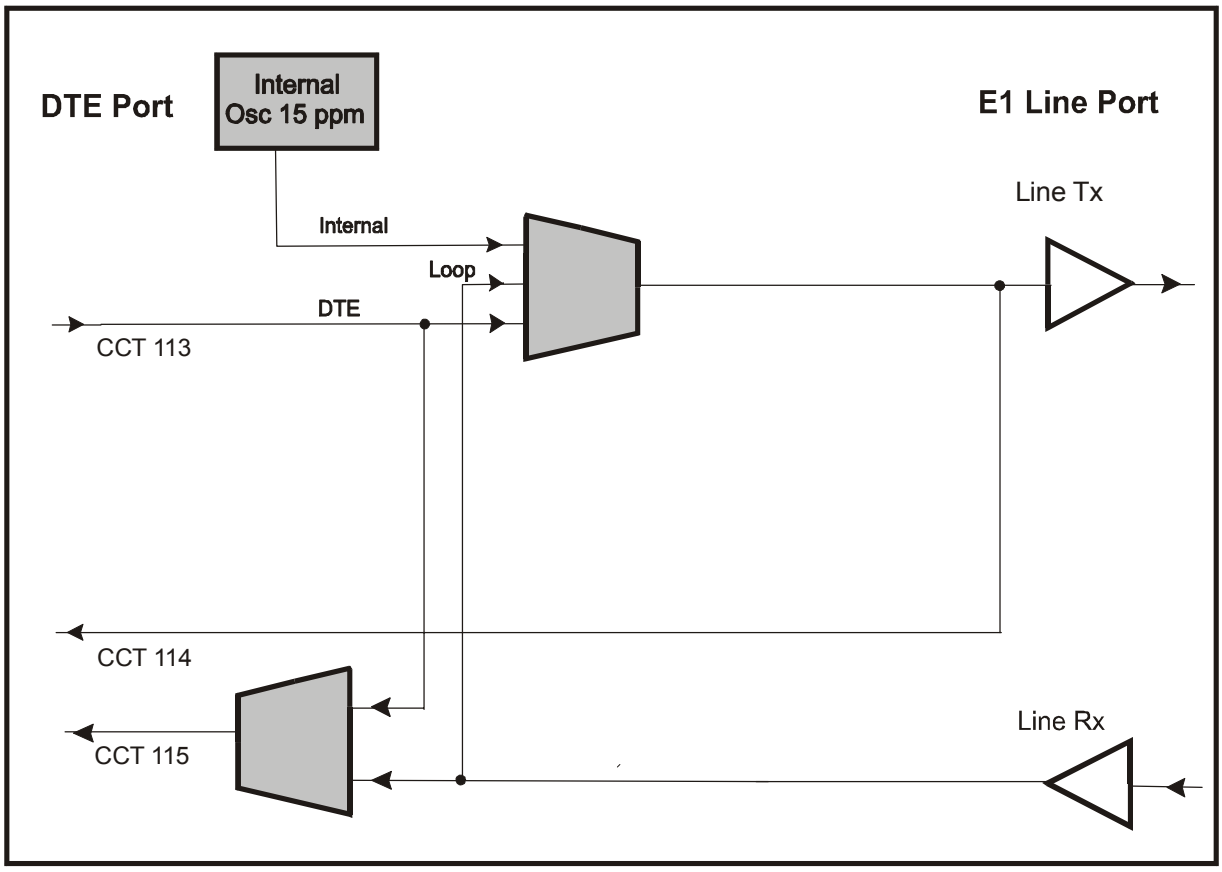

Figure 5.1 DC1X00 Clocking diagram

5. 3 Glossary

AIS	Alarm Indication signal	LAN	Local Area Network
AMI	Alternate Mark Inversion	LOF	Loss of Frame alarm
CRC	Cyclic Redundancy Check	LOS	Loss of Signal alarm
DSU	Data Service Unit	NFAS	Non Frame Alignment Signal
DTE	Data Terminal Equipment	RAI	Remote Alarm Indication
FAS	Frame Alignment Signal	SELV	Safety Extra Low Voltage
HDB3	High-Density Binary 3	T/S	Timeslot
		WAN	Wide Area Network