

Universal Data Card Operation Manual

Interface Card for the Series KMX 9000 Multiplexers

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STATUTORY NOTICES

CE 168 X

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UDC

Port Public Telecommunications Network(s)

8 Network Private Circuits at interfaces compatible at the physical layer with X.21(V.11).

All PCB assemblies contain Electrostatic Sensitive Devices (ESDs) which may be permanently damaged if incorrectly handled. This equipment must be handled in accordance with BS5783 code of practice for the handling of electrostatic sensitive devices.

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Published by Case Communications Technical Publications Department

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APPROVALS

The approval number is: NS/1282/1/T/605130

The UDC is approved for installation in approved, compatible enclosures in accordance with the instructions for use.

Details of approved interface connections can be found in Appendix A of this document.

The Safety status of all ports is SELV.

If the card(s) are not installed in a Case Communications Series KMX 9000 chassis the following conditions must be met to maintain their approval:

- Ensure that the power drawn by the card(s), together with the chassis and any auxiliary equipment drawing power from the chassis, is within the rating of the chassis power supply. (Refer to the Power Consumption Table in the Series KMX 9000 Multiplexer Reference Manual part number X729-300051.)
- Install the card so that, with the exception of the chassis bus connector, clearance and creepage distances shown in the table below are maintained between the module and all other parts of the chassis which use or generate a voltage shown in the table; the creepage distance shown in brackets applies where the local environment within the chassis is subject to conductive pollution or dry non-conductive pollution which could become conductive due to condensation.

Clearance (mm)	Creepage (mm)	Voltage used or generated by host or other cards
2.0	2.4 (3.8)	Up to 50 Vrms or Vdc
2.6	3.0 (4.8)	Up to 125 Vrms or Vdc
4.0	5.0 (8.0)	Up to 250 Vrms or Vdc
4.0	6.4 (10.0)	Up to 300 Vrms or Vdc

- For a chassis using or generating voltages greater than 300 V (rms or dc), you must obtain advice from a competent telecommunications safety engineer before installing the modules.

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Universal Data Card

1. Introduction

1.1 General Description

The UDC is a channel interface card for installation in the KMX 9000 range of TDM multiplexers. This manual assumes that the user is familiar with the control of the Series KMX 9000 multiplexers and installation procedures for channel cards. This manual applies to cards fitted in Series KMX 9000 multiplexers with TLM/QLM firmware Version 3.10 or later. Refer to the Series KMX 9000 multiplexer manual X729-300051 for further details.

1.2 Key Features

- Two versions of the card are available, one providing up to four channels and the other providing up to eight channels.
- Each card occupies a single slot within a 9220, 9241 or 9243 multiplexer.
- Each data channel is separately presented on its own high density connector.
- A range of plug-in modules and data cables are available to allow connection to most industry standard data communication interfaces.
- Channel data rates from 1200bps to 960kbps are supported.
- Channel data rates and clocking options are individually configurable.
- Channels can be individually mapped to separate remote channel targets.
- The card is fully compatible with existing Series KMX 9000 data cards. UDC data channels will inter-work with the SAC, HDC, ODC and DVC data channels, plus TLM/QLM midpoint and BERT channels.

2. Specifications

2.1 Channels

Supports 4 or 8 synchronous or asynchronous data channels individually configurable.

Electrical Interface

Interworking with V.10, V.11, V.28, V.35 and V.36 DTE and DCE data equipments is provided by a range of interface modules as described in Section 2.2, and by a range of cable types which present standard connector formats as described in Section 2.4.

Data Rate

The data rate used for each channel can be individually selected under software control. The list of available data rates is determined by the frequency PROM within the multiplexer link module (TLM or QLM). Refer to the Series KMX 9000 manual X729-300051 for details.

Note: The V.28 electrical interface is limited to 19.2kbps and the V.35 interface is limited to 48kbps. The V.11 and V.36 interfaces are limited to 960kbps. Operation at high data rates is dependent upon cable quality and length. See Section 2.5.

Receive Clock

Internal - derived from the trunk master clock.
External - provided by the attached equipment.

The external receive clock *must* be frequency locked to the selected trunk clock source.

Transmit Clock

Internal - derived from the aggregate master clock.
External - provided by the attached equipment.

The external transmit clock *must* be frequency locked to the selected trunk clock source.

Receive Data Buffer

An 8 ± 4 bit data buffer is provided for removing any 'bunching' effect caused by multiplexing and allowing the use of an external receive clock.

The buffer initialises to the centre when an underflow/overflow condition occurs.

Transmit Data Buffer

An 8 ±4 bit data buffer is provided for removing any 'bunching' effect caused by multiplexing and allowing the use of an external transmit clock. The buffer initialises to the centre when an underflow/overflow condition occurs, or on the positive edge of the V.24 control signal RTS in half duplex applications. This equates to 'Control' in V.11/X.21 operation.

Interface Control Signals

When using the V.28/V.24 and V.35 modules, two full duplex control signals per channel are transmitted within the TDM supervisory channel: these are DTR > DSR and RTS > DCD. At the local end the RTS input controls the CTS output.

When using the V.36 module, only one full duplex control signal is supported, RTS > DCD.

When using the V.11/X.21 module, only one full duplex control signal is supported, Control > Indicate.

Loopbacks

Individual bi-directional channel loopbacks, which loop Receive data back to Transmit data, can be activated from the front panel or network management platform. TDM Receive data is simultaneously looped back to the TDM Transmit data. V.54 loops are not supported.

MTBF

The MTBFs calculated to HRD4 are as follows:

UDC fitted with four interface modules: 24 Years

UDC fitted with eight interface modules: 20 Years

Power Consumption

The card uses a maximum of 15 Watts of power.

The following currents in mA are drawn from the KMX 9000 power unit:

	+5V	-5V	+12V	-12V
Base card, 4 channel	225	0	0	0
Base card, 8 channel	230	0	0	0
V.28S module	12.5	0	22	12.4
V.28A module	13	0	22	15.6
V.11 module	95	0	0	0
V.35 module	52	10	10	38
V.36 module	28	0	0	0

Environmental

Operating Temperature	+5°C to +40°C
Storage Temperature	-25°C to +55°C
Humidity	5 to 95% non-condensing

2.2 Modules

The following channel interface modules are available:

V.28S

This module provides a synchronous V.24/V.28 data circuit.

V.28A

This module provides a V.24/V.28 data circuit with software selectable synchronous or asynchronous operation.

V.11

This module provides a synchronous V.11/X.21 data circuit. 100 ohm terminations are fitted on all receivers.

V.35

This module provides a synchronous V.35 data circuit.

V.36

This module provides a synchronous V.36 data circuit. All circuits are V.11 balanced with no terminating resistors fitted.

Each module type makes differing use of the 15 pin contacts on the rear panel socket. Section 2.3 defines the connections for each module type.

All available modules provide electrical interface characteristics suitable for operation with either Data Terminal Equipment (DTE) or Data Circuit Equipment (DCE). A range of data interfacing cables is available to suit most DTE and DCE applications. Refer to Section 2.4 for details.

2.3 Interface Connections

Each data channel is equipped with a separate 15-way, high density, D-type socket. Connector pin assignment is dependent upon the interface module associated with the data channel. The connector shell is connected to Earth irrespective of the module type. Contact assignment maps are as follows:

V.11 Module

PIN No.	V.11/V36	DIRECTION	ITU-T No.
1	TXD A	IN	103
2	CONTROL A	IN	105
3	RXD A	OUT	104
4	INDICATE A	OUT	109
5	RXC A	OUT	114
6	TXD B	IN	103
7	CONTROL B	IN	105
8	RXD B	OUT	104
9	INDICATE B	OUT	109
10	RXC B	OUT	114
11	TXC A	OUT	115
12	TXC B	OUT	115
13	0V	-	102
14	ETC A	IN	113
15	ETC B	IN	113

V.36 Module

Pin connections when using the V.36 Module are the same as for the V.11 Module where 'Control' equates to RTS and 'Indicate' equates to DCD.

V.35 Module

PIN No.	V.35	DIRECTION	ITU-T No.
1	TXD A	IN	103
2	RTS	IN	105
3	RXD A	OUT	104
4	-	-	-
5	RXC A	OUT	114
6	TXD B	IN	103
7	CTS	OUT	106
8	RXD B	OUT	104
9	DTR	IN	108
10	RXC B	OUT	114
11	DSR	OUT	107
12	DCD	IN	105
13	0V	-	102
14	ETC A	OUT	113
15	ETC B	OUT	113

V.28S and V.28A Modules

PIN No.	V.28	DIRECTION	ITU-T No.
1	-	-	-
2	TXD	IN	103
3	RXD	OUT	104
4	RTS	IN	105
5	CTS	OUT	106
6	DSR	OUT	107
7	-	-	-
8	DCD	OUT	109
9	DTR	IN	108
10	-	-	-
11	TXC	OUT	115
12	RXC	OUT	114
13	0V	-	102
14	-	-	-
15	ETC	IN	113

2.4 Cable Assemblies

The following cable assemblies are available from your supplier for connection to the rear panel sockets.

Feature	Description
CA/V28/DTE/2M	UDC to V.24/V.28 DTE High Density 15-way D-type plug to D-type 25-way socket. (DCE configured) Length 2M Connects to a DTE.
CA/V28/DTE/5M	As above but 5 metres in length.
CA/V28/DTE/10M	As above but 10 metres in length.
CA/V28/DCE/2M	UDC to V.24/V.28 DCE High Density 15-way D-type plug to D-type 25-way plug (DTE configured) Length 2M Connects to a DCE.
CA/V28/DCE/5M	As above but 5 metres in length.
CA/V28/DCE/10M	As above but 10 metres in length.
1570	UDC to V.24/V.28 (9-way) DTE High Density 15-way D-type plug to D-type 9-way socket Length 2M.
CA/V11/DTE/2M	UDC to X.21/V.11 DTE High Density 15-way D-type plug to D-type 15-way socket. (DCE configured) Length 2M Connects to a DTE port.
CA/V11/DTE/5M	As above but 5 metres in length.
CA/V11/DTE/10M	As above but 10 metres in length.
CA/V11/DCE/2M	UDC to X.21/V.11 DCE (NTU) High Density 15-way D-type plug to D-type 15-way plug. (DTE configured) Length 2M Connects to a DCE port.

CA/V11/DCE/5M	As above but 5 metres in length.
CA/V11/DCE/10M	As above but 10 metres in length.
1573	UDC to V.36 DTE High Density 15-way D-type plug to D-type 37-way socket. (DCE configured) Length 2M. Connects to a DTE.
1574	UDC to V.36 DCE High Density 15-way D-type plug to D-type 37-way plug. (DTE configured) Length 2M. Connects to a DTE.
CA/V35/DTE/2M	UDC to V.35 DTE High Density 15-way D-type plug to MRAC34 way socket. (DCE configured) Length 2M Connects to a DTE port.
CA/V35/DTE/5M	As above but 5 metres in length.
CA/V35/DTE/10M	As above but 10 metres in length.
CA/V35/DCE/2M	UDC to V.35 DCE High Density 15-way D-type plug to MRAC34 way plug. (DTE configured) Length 2M Connects to a DCE.
CA/V35/DCE/5M	As above but 5 metres in length.
CA/V35/DCE/10M	As above but 10 metres in length.

2.5 Cable Lengths

The following maximum cable lengths may be used by the indicated interface:

V.35		100 metres Un-terminated
		1000 metres Terminated
V.28		15 metres
V.11/V.36	64kbps	100 metres Un-terminated
		1000 metres Terminated
	256kbps	30 metres Un-terminated
		300 metres Terminated
	960kbps	10 metres Un-terminated
		100 metres Terminated

3. Hardware Configuration

The UDC can be installed within any Series KMX 9000 multiplexer.

Before installing the card into the multiplexer, it is necessary to pre-adjust the 'hard configured' features, i.e. those features which are not under soft control from the front panel or network management platform.

3.1 Interface Modules

The data interface for each circuit is individually selected by fitting an 'Interface Module' for the port to be configured. A list of available modules and specifications can be found in Section 2.2.

Electrostatic precautions must be observed whilst handling the UDC and interface modules.

The module must be fitted the right way round into the socket for the port to be configured. Position the UDC circuit board on a flat, clean and static protected substantial surface. Check that the pins on the module are not bent. Align the pins on the module with the socket into which it is to be inserted. Align the module's locating pillar with the hole in the base-board. Carefully press the module into the socket and the snap-lock pillar into the base-board.

Carefully peel the appropriate self adhesive label for the configured interface from the labels provided with the card. Apply the label to the appropriate channel identifier box on the UDC rear panel.

It is recommended that once the modules have been fitted, they should be left in position. A module can however be removed, if it is required to change the interface, by carefully pulling it out of the socket. This will require considerable pressure and care must be taken to avoid damage to the printed circuit boards.

3.2 Jumper Settings

The card has one on-board configuration jumper link, JP1.

This single jumper link, which operates in asynchronous mode only, selects basic (BAS) or extended (EXT) signalling to cope with underspeed or overspeed terminal equipment. The percentage tolerance to overspeed or underspeed is:

Basic	=	-2.5% to +1%
Extended	=	-2.5% to +2.3%

3.3 LED Indicators

The eight channel UDC has nine LEDs. The right hand LED is green and is used to indicate that the card is a Universal Data card i.e. UD. This LED will illuminate if the power up self test has passed. The other LEDs are yellow. One LED is used to indicate activity on transmit or receive data for each channel. The LEDs are illuminated when space polarity data is present in either the transmit or receive data stream. Only yellow LEDs D1 to D4 are fitted on the four channel UDC.

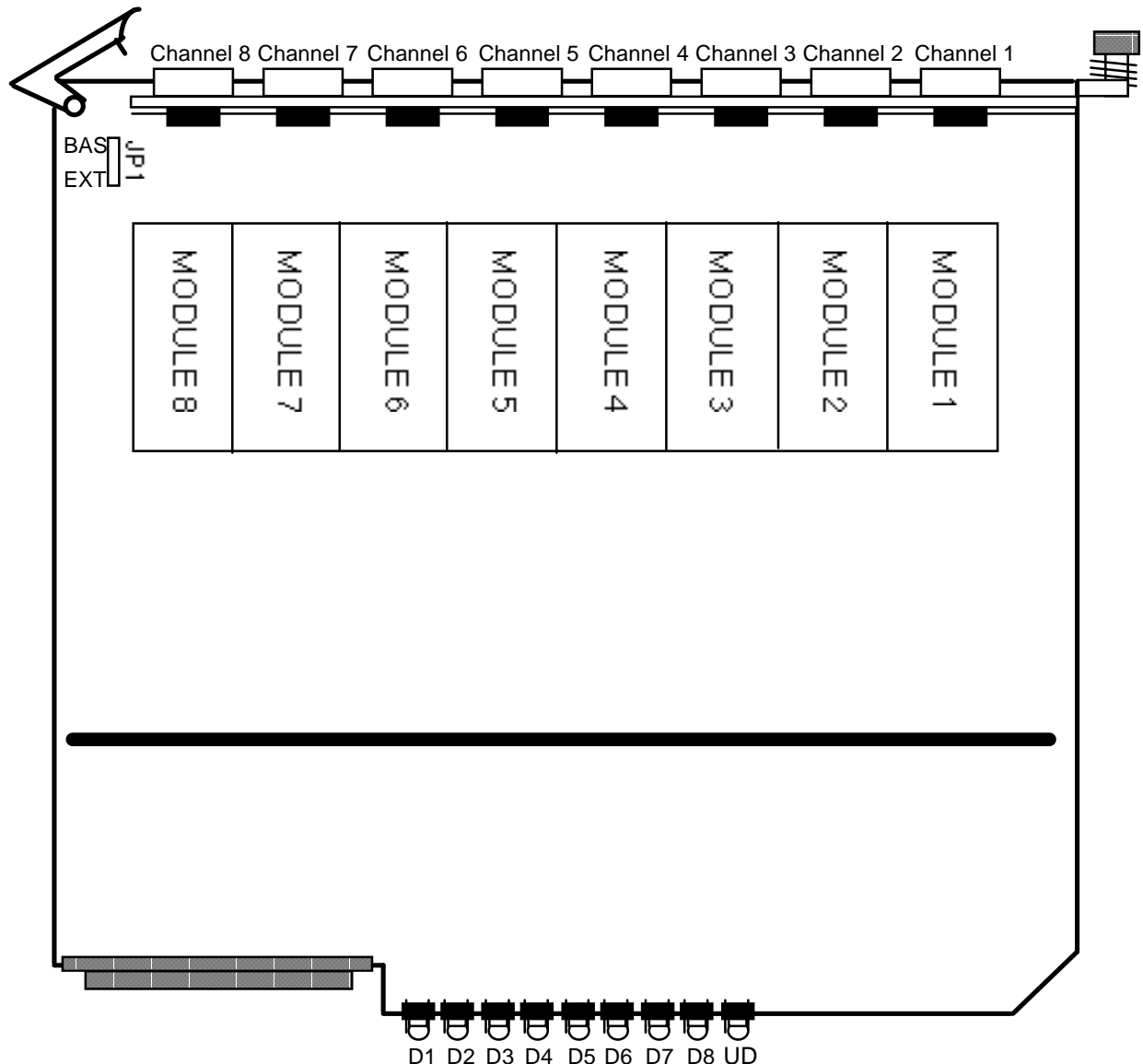


Figure 1 Universal Data Card Board Layout

4. Software Configuration

4.1 Software Requirements

User control of the soft configured features is achieved using the TLM/QLM control facilities. The configuration detail in this manual describes the procedure using the key-pad and LCD provided on the front panel of any Series KMX 9000 multiplexer. User commands, which are entered through the key-pad, are interpreted by the associated trunk module and advanced to the UDC.

The card may also be configured using 'Domainview', the Case Communications network management platform, and users of this should consult the Domainview manual for configuration instructions.

Front panel commands to configure the card channels are as follows:

4.2 Selection of Synchronous or Asynchronous Operation

Each UDC data channel can be individually configured for either synchronous or asynchronous operation.

It is presumed that the equipment attached to the card will not be continuously switching between synchronous and asynchronous data transfer modes. For this reason, the selection of synchronous or asynchronous channel operation is the same for all TDM configurations.

Log in and enter the standard menu:

```
MODIFY CHANNEL  
CONFIGURATION
```

Press the front panel RETURN key. The display should now read:

```
INSP/MOD CONFIG
```

Press the front panel UP key. The display should now read:

```
MODIFY CHANNEL  
TYPE
```

Press the front panel RETURN key. The display should now read:

```
CHAN nn? = SYNC
```

where nn is the first known UDC channel location, and SYNC is the default mode for previously un-configured channels

Use the UP and DOWN keys to select the channel which you wish to configure.

Press the RETURN key to accept the selected channel. The display should now read:

```
CHAN nn = SYNC?
```

Use the UP and DOWN keys to select SYNC or ASYN for the selected channel.

Press the RETURN key to accept the appropriate mode for the selected channel.

Now use the UP and DOWN keys to select the next channel which you wish to configure.

Having completed all necessary SYNC/ASYN configuration use the ESCAPE key to escape back to the higher level display:

```
MODIFY CHANNEL  
TYPE
```

4.3 Adding a UDC Channel to a TDM Configuration

Log in and obtain the root menu display:

```
MODIFY CHANNEL  
CONFIGURATION
```

Select the TDM configuration which you wish to modify (i.e. A, B, C,M, N, O or P) and then obtain the display:

```
ADD NEW CHANNEL  
FREE B/WIDTH xx%
```

Press the front panel RETURN key. The display should now read:

```
CH TYPE RATE RCH  
nn wxyz
```

where 'nn' is the channel address and 'wxyz' is the channel type.

Use the UP and DOWN keys to select the channel which you wish to configure.

Press the RETURN key to accept the channel selection.

Having now selected the channel to be configured, continue as follows.

4.4 Selecting the Channel Rate

The display should now read:

CH nn RATE: kk

where 'nn' is the channel address and 'kk' is the presently selected data rate. The rate will be reported as zero, '0k (DELETE CHANNEL)' if the channel is not presently configured.

Use the UP and DOWN keys to select the appropriate data rate for the selected channel.

Note 1: Synchronous mode supports any channel speed which is available from the aggregate module frequency PROM, up to a maximum of 960kbps. Some rates will not be available if aggregate bandwidth is limited. It is recommended that the selected data rate should be limited to 96kbps when inter-working with external equipments which are not employing balanced data exchange interfaces

Note 2: Asynchronous mode supports the following data rates, providing they are supported by the aggregate module frequency PROM:

1200bps

2400bps

4800bps

9600bps

19200bps

38400bps

Not all of the listed asynchronous data rates will be available if aggregate bandwidth is limited.

Press the RETURN key to accept the appropriate rate for the selected channel.

4.5 Selecting the Remote Channel Destination

The display should now read:

```
CH nn REMOTE  
ADDRESS mm
```

where 'nn' is the local channel address, and 'mm' is the potential remote address.

Use the UP and DOWN keys to select the appropriate remote channel address for the selected channel. The total range of remote channel addresses is A1 to H8, plus midpoint channels 65 to 96.

Press the RETURN key to accept the selected remote channel.

4.6 Configuring the Channel Interface Data Control Lines

The display should now read:

```
CHnn TX CONTROLS  
C1x C2y
```

where 'x' and 'y' are the presently configured control modes for C1 and C2 respectively. Note, C1 (Control 1) corresponds to the first data control output, which is normally referred to as 'DCD' when operating as an un-balanced, ITU-T V.24, interface circuit, or as 'Indicate' when operating as a balanced, ITU-T X.21, interface circuit. Similarly, C2 (Control 2) corresponds to the UDC's second data control output, which is normally referred to as 'DSR', and is only applicable when this signal is operating as an un-balanced ITU-T V.24 interface circuit.

Press return, the display should now read:

```
CHnn TX CONTROLS  
C1x? C2y
```

Use the UP and DOWN keys to select the appropriate operating mode for C1 which has four modes of operation:

- H (high): DCD (Indicate) permanently forced true.
- L (low): DCD (Indicate) permanently forced false.
- P (pass): DCD (Indicate) passes remote RTS (Control) input.
- F (fast): DCD (Indicate) follows receive data activity.

In Fast mode, Carrier Detect (DCD/Indicate) is asserted 15 bits before any receive data transition, and is held for 30 bits after any receive data transition. Receive data (RXD) in this context is data output from the card which is normally a DCE.

Press the RETURN key to accept the selected C1 mode. The display should now read:

```
CHnn TX CONTROLS
C1x C2y?
```

Use the UP and DOWN keys to select the appropriate operating mode for C2 which has three modes of operation:

H (high); DSR permanently forced true.

L (low); DSR permanently forced false.

P (pass); DSR passes remote DTR input.

Press the RETURN key to accept the selected C2 mode.

If the channel is set for asynchronous mode, the front panel display will now move on to the menu for configuration of the asynchronous character length (see Section 4.7). If the channel is set for synchronous mode, the display will now move on to the menu for configuration of the data clocking mode (see Section 4.8).

4.7 Selection of Asynchronous Character Length

This sub-menu will only appear for channels which are configured for asynchronous operation.

The display should now read:

```
CH nn
BITS/CHAR = bb
```

where 'nn' is the channel under configuration, and 'bb' is the presently configured number of bits per asynchronous character.

Use the UP and DOWN keys to select either 8, 9, 10, or 11 data bits per character, this is inclusive of 1 start, 1 stop and a possible parity bit.

Press the RETURN key to accept the selected number of data bits.

Now go to Section 4.9. Section 4.8 is not relevant when configuring asynchronous channels.

4.8 Configuring the Data Clocking Mode

This sub-menu will only appear for channels which are configured for synchronous operation.

The display should now read:

```
CH nn CLOCKS
TX ttt RX rrr
```

where 'nn' is the channel under configuration, 'ttt' is the presently configured transmit data clocking mode, and 'rrr' is the presently configured receive data clocking mode. The available modes are:

```
TX INT  RX INT
TX EXT  RX EXT
TX EXT  RX INT
```

Use the UP and DOWN keys to select the appropriate clocking mode. 'INT' clocking mode allows data to be clocked by the internal multiplexer sourced timing; 'EXT' clocking mode allows data to be clocked by a timing source originating within the equipment which is attached to the data channel.

Press the RETURN key to accept the selected clocking mode.

4.9 Selection of RTS to CTS Delay Timing

The display should now read:

```
SELECTED RTS/CTS
DELAY =    dms
```

where 'dms' is the presently configured RTS>CTS delay. CTS is asserted in response to RTS, and the RTS>CTS 'ON' delay can be individually configured for one of the following:

0ms
4ms
16ms
32ms
64ms
128ms
256ms
1024ms

These settings are within +0 and -1ms

[The RTS>CTS 'OFF' delay will be a constant 0ms.]

Use the UP and DOWN keys to select the appropriate CTS delay.

Press the RETURN key to accept the selected delay.

If all is well, the display should now read:

```
CHAN nn CONFIG c  
ACCEPTED
```

where 'nn' is the channel under configuration, 'c' is the presently selected TDM configuration.

Further channels can now be configured as described in the text given above.

4.10 Modification of Remote Channel Configuration

It is essential that both ends of any data channel are manually configured. The multiplexer will not automatically copy the channel parameters of the local circuit to those of the remote circuit. This facility allows the user to program asymmetrical channel configurations as would be necessary if, for example, the clocking arrangements at each end were to be different.

Select remote mode and configure the distant channel as described in the text given above.

5. Channel Loopbacks

Channel loopbacks are soft controlled, and can be accessed via the standard DIAGNOSTICS menu.

The card provides a bi-directional loopback.

The channel interface transmit data is looped back to the channel interface receive data, thus providing a local digital loop. An async to sync and sync to async conversion will be performed within the local digital loop if the channel is configured for asynchronous operation.

Simultaneously, the TDM receive data is looped back to the TDM transmit data, thus providing a remote digital loop to data originating from the distant channel. This loop facility can be used for self-testing of the multiplexer system.

A 511 BERT channel, originating from the distant aggregate card, can be looped back to itself by configuring appropriate data paths and subsequently using a bi-directional channel loopback.

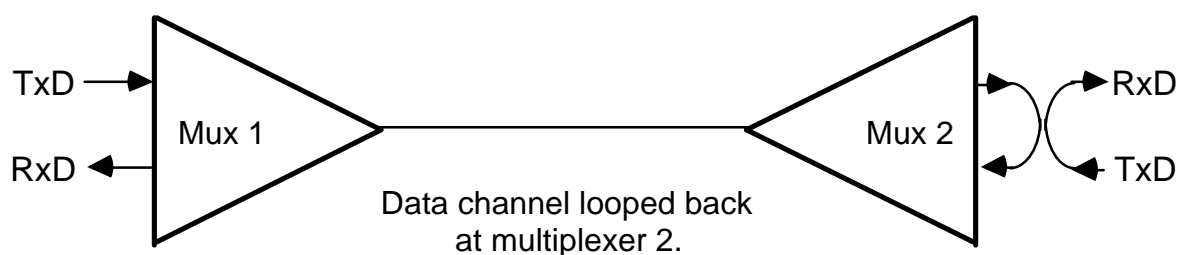


Figure 2 Data Channel Loopback

A.1 General

When delivered from the factory for use in the UK, the physical interfaces of ports which can be connected to Private Circuits are given in Table A-1.

INTERFACE TYPE	PIM TYPE	LINE SPEED	CONNECTOR TYPE	CABLE PART NUMBER
V.24	V.28	< 19200bps	1x25 WAY D-TYPE MALE 1x15 WAY HIGH DENSITY D-TYPE MALE	X729-401511
X.21	V.11	< 64kbps	1x15 WAY D-TYPE MALE 1x15 WAY HIGH DENSITY D-TYPE MALE	X729-401811
V.35	V.35	< 64 kbps	1x15 WAY HIGH DENSITY D-TYPE MALE 1x34 WAY MRAC CONNECTOR MALE	X729-402211

Table 1 Permissible UK Private Circuit Connections

Connection to Private Circuit NTUs must be made with the cables specified in Table A-1, and they must be installed by a competent engineer.

A.2 NET1 Considerations

The X.21 interfaces on the Universal Data Card do not provide 'DTE Uncontrolled NOT READY'.

V.24, X.21 and V.35 interfaces are approved for direct connection to digital networks using the cables specified in Table A-1.

The V.24 interface is for connection to PTO Service Category 1.

The V.35 interface is for connection to PTO Service Category 2.

