

Dual Line Interface Unit Operating Information

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STATUTORY NOTICES

APPROVALS

The approval number is NS/3660/12/H/452538.

The DTE241 Dual LIU, is approved for direct connection to G.703 2048kbit/s private circuits subject to the following conditions:

- 1) The Dual LIU is used in a Case Technology 2000 or 3000 series multiplexer chassis.
- 2) WARNING. Inter-connection directly, or by way of other apparatus, of ports marked:

"WARNING. CONNECT ONLY APPARATUS COMPLYING WITH BS6301 TO THIS PORT".

or

"WARNING. CONNECT ONLY APPARATUS COMPLYING WITH BS6301 TO THESE PORTS".

with ports not so marked may produce hazardous conditions on the network. Advice should be obtained from a competent engineer before such a connection is made.

- 3) All ports are marked as shown in para 1 and, other than those connected to Public Telecommunication Networks, may only have equipment complying with BS6301 connected to them.

The safety status of all ports is SELV.

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STATUTORY NOTICES

CE 168 X

Case Technology declares that this product when used with the 75ohm or 120ohm adaptor, conforms with the protection requirements of Council Directive 89/336/EEC on the approximation of the laws of the member states relating to electromagnetic protection.

This equipment has been tested using cables supplied by Case Technology Ltd. These cables, or equivalents, must be used to ensure compliance with this declaration

Case Technology Ltd. declare that this product conforms with the requirements of the Council Directive of 91/263/EEC on the approximation of the laws of the Member States concerning telecommunications terminal equipment, including the mutual recognition of their conformity covering the following ports types :-

Port	Public Telecommunications Network
2 Network Ports	Private Circuits using interfaces with G.703 (120 ohms) at 2048kBit/s unstructured

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.

NETWORK PLANNING

The Code of Practice for the Design of Private Telecommunication Networks requires that delay, gain and quantisation distortion for a complete branch network are within certain limits. The following information is provided to assist with network planning.

DTE241 Parameters

	DELAY	GAIN	QDU
	Note 1	Note 2	Note 3
PCM to Backplane	317µs	1	0
Backplane to PCM	141µs	1	0
PCM to PCM (Note 4)	192µs	1	0

Note 1 :Delay figure assumes maximum input buffer delay and worst case cross-connection delay.

Note 2: The gain of a VF channel is not affected by the Dual LIU.

Note 3: Figures for quantisation distortion units are as quoted in OTR/001 issue 1.

Note 4: For timeslots connected in Drop/Insert mode.

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Glossary Of Terms

- Line 0 - Refers to the signals on the multiplexer backplane
- Line 1 - Refers to the PCM stream connected to circuit 1
- Line 2 - Refers to the PCM stream connected to circuit 2
- in 0 - Refers to incoming data from the cross connect switch
- in 1 - Refers to incoming data from Line 1
- in 2 - Refers to incoming data from Line 2
- out 0 - Refers to outgoing data to the cross connect switch
- out 1 - Refers to outgoing data to Line 1
- out 2 - Refers to outgoing data to Line 2

Dual LIU Card

1. Introduction

The DTE241 consists of a DT310 Dual LIU card fitted with DT986 Dual LIU firmware and a DT995 management patchfield. If the card is used in a Series 3000 multiplexer, the DT995 patchfields provide access to network management data. Details of this facility can be found in the relevant Series 3000 multiplexer manual. A DT995E patchfield must be fitted if access and routing of the Remote Alarm bit3 is required, otherwise a DT995D must be used.

This manual applies to units fitted with DT986/6 firmware when fitted in Port 3 or Port 4 of the multiplexer.

The card has two modes of operation depending on where it is physically plugged into the multiplexer chassis.

Integrated Mode

When used in Port 1 or Port 2 of a Series 3000 multiplexer, the card will automatically act as a fully interactive card with the system controller. This mode is beyond the scope of this document and is discussed in Chapters 3 and 5 of the Series 3000 multiplexer manual. The card will not function in this mode when fitted to a Series 2000 multiplexer where it must *only* be fitted in a channel card position.

Channel Card Mode

In this mode of operation the card will act as a 'Smart' channel card. This mode is automatically invoked if the card is plugged into either Port 3 or Port 4 of a Series 3000 multiplexer or into any channel card position of a 2100 or 2400 multiplexer.

The card must not be fitted in the LIU slot of a Series 2000 multiplexer.

The Dual LIU provides an interface to two 2048kbit/s PCM lines. The PCM electrical signals comply to ITU-T recommendation G.703 as either unbalanced 75 ohms or balanced 120 ohms connections. The option of 75 ohms or 120 ohms operation is provided by a choice of I/O adaptor which is used in conjunction with the LIU.

The Dual LIU also provides an interface to a 2048kHz clock signal, the electrical characteristics of which comply with ITU-T G.703.

Clock Recovery and Selection

A recovered 2048kHz clock is available from each of the received PCM lines and also the G.703 external 2048kHz clock input signal. Any of these clock sources may be selected by the system controller on Series 3000 multiplexers as the system clock synchronising source. These clocks are monitored by the system controller only if they are allocated in the clock priority list. Synchronisation in Series 2000 multiplexers to a PCM line or the G.703 input on the card is not possible, as the card can not derive an 8kHz clock source.

Jitter Attenuation

Jitter attenuators are used on the PCM and clock inputs to reduce jitter on the recovered signals. This improves jitter transfer of the system if the clock is selected as the system timing source in Series 3000 multiplexers.

Signalling

The card supports Channel Associated Signalling (CAS) and 31 timeslot mode which is transparent to Common Channel Signalling (CCS). The signalling mode is selectable within the configuration. In 'Terminal' and 'Drop/Insert' modes it is possible to have one of the incoming PCM lines in CCS and the other in CAS.

G.703 Clock Output

The timing for the G.703 clock output is sourced from the system clock during normal operation.

Bypass

When the bypass relays are in the un-powered state, i.e. if the LIU is removed from the chassis or if bypass is enabled by software, the relay contacts on the I/O adaptor will be in the bypass position. If the links on the I/O adaptor LK1, LK2, LK3 and LK4 are in position 1-2 the PCM input on line 1 will be connected to the output of line 2 and the PCM input on line 2 will be connected to the output of line 1. If LK1, LK2, LK3 and LK4 are in position 2-3 this connection from line 1 to line 2 will not be made. In bypass mode the G.703 clock input is always connected to the G.703 clock output.

Timeslot Allocation

The card is capable of interfacing selected timeslots from any of the PCM lines to the multiplexer backplane. This can be achieved in several ways depending upon the mode of operation selected.

1.1 Control and Status Port Functions

For normal operation control port 1 should be set to FFH. The status port is only used to provide the card identity code for the 'Equipment map'. All other configuration settings and fault displays are made through 'Smart' menu commands.

2. Specification

The Dual LIU complies with:

ITU-T G.703, G.704, G.706, G.732, G.736 and G.823

Line Signal:

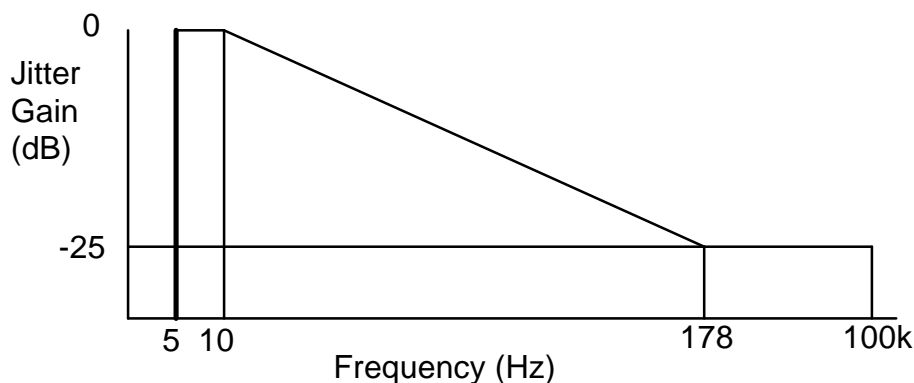
Line Rate	2048 kbit/s \pm 25ppm
Stability	\pm 25ppm over 5 years when free running
Line Code	HDB3
Output Signal Level	\pm 2.37V \pm 10% for 75 ohms operation \pm 3V \pm 10% for 120 ohms operation
Input Signal Level	0 to > 6dB line loss
Line Interface	75 ohms unbalanced: BNC 120 ohms balanced: 9 way 'D' type connector

Power Consumption

The card uses 8 Watts of power from the multiplexer PSU.

Jitter Transfer

When the Dual LIU recovered 2048kHz timing signal is selected as the system synchronisation source in a Series 3000 multiplexer, the jitter transfer from the input to the output does not exceed the following limits:



3. Operating Modes

Multipoint

In this mode of operation PCM line 1 will be connected straight through to PCM line 2 and vice versa. The user will then be capable of 'AND'ing timeslots from the multiplexer backplane with timeslots passing from one PCM line to the other.

Terminal

In this mode of operation both PCM lines will be terminated on the card. The user will be capable of selecting timeslots from either PCM line to be cross-connected in duplex to timeslots on the multiplexer backplane.

Drop/Insert

In this mode of operation PCM line 1 will be connected straight through to PCM line 2 and vice versa. The lines maybe in different signalling modes with the option to shift the CCS signalling channel of one line into timeslot 17 of the other line. Individual timeslots may be cross-connected in duplex to the multiplexer backplane from either PCM line, the through connection path for those timeslots will be broken.

A/B Switching

When selected, this mode provides a route protection scheme for the line signal, i.e. if the active line fails the inactive line will take over. Data is transmitted out on both lines and the best incoming line will be automatically selected for routing to the multiplexer backplane.

4. Multiplexer Firmware Compatibility

Series 3000

Series 3000 firmware DT981/6 fully supports the DTE241 Build 6 facilities.

2400 Operation

2400 firmware must be DT910/3 or later. When used in conjunction with DT910/4 or later, the software will allow the smart card to activate the system controller alarm relays via the smart interface.

2100 Operation

2100 firmware must be DT915/1 or later. When used in conjunction with DT915/2, or later, the software will allow the smart card to activate the system controller alarm relays via the smart interface.

5. Smart Operation

The menu selections are accessed from the top menu of the system control card through the 'Smart' menu option where the user will be prompted for the card position in the multiplexer chassis.

5.1 Menu Selections

Commands are accessed in the same manner as the main system control card menu structure. The upper case letter in a menu should be entered to gain access to lower menus and commands.

Special control characters.

There are three special control characters which are available to the user as follows:

- ! This character will exit a command and return the user to the 'Root' level menu of the smart card.

- ESC The ESCape key will exit any command and present the current menu selections from which the command was called. If the user is already at a menu level, then the entry of the ESCape character will exit the current menu and present the next higher menu level. If the user is at the root menu of the smart card then control of the card will cease and the system control card root menu will be displayed.

- CTRL X Control+X will exit the control of the Smart channel card at any time.

Through the menu selections available, the user can configure the differing modes of operation and access various fault and maintenance options.

5.2 Configuration of a Smart Channel Card

There are four configuration fields available plus a default field. All modifications are undertaken in an edit buffer which can be loaded from any valid configuration or the default configuration. The default configuration is ROM based and therefore cannot be altered. The procedure for using the 'Edit' 'Load' 'Save' 'Modify' and 'Display' commands is exactly the same as for the main multiplexer.

Smart channel cards have no battery-backed memory, a copy of all configurations should be backed up to the system controller card in order

to ensure configurations are not lost when the card is powered down. Smart channel cards will only backup their configurations to the system controller when requested to do so by the user via the Backup command. When using the Save command, the smart card only saves the configuration to local volatile memory.

From a power up condition, the system controller will initialise all smart channel cards and download any configurations previously saved to the card. When the user loads a configuration, this is from the local volatile memory only and not from the battery-backed memory on the system control card.

5.3 Default Configuration

The Default configuration is:

- a) Channel Associated Signalling on both PCM lines
- b) Line signal clock loss option = PCM loss
- c) Multipoint mode of operation
- d) Data F code = FFH for all lines
- e) Signalling F code = FH for all lines
- f) Low Error rate threshold = 10^{-5}
- g) Bypass is disabled
- h) TS0 Not Frame Word routing mode = Normal
- i) G.703 clock output enabled when the multiplexer is free running

5.4 Running a Configuration

The running of a configuration is determined from the system controller main configuration and is dependent upon in which multiplexer the card is fitted.

In a Series 3000 multiplexer, the configuration to be run by the Smart card is determined by the configuration on the system control card. The user will be given a choice of four Smart configurations to be run for each of the Smart cards fitted on a per configuration basis. If the system controller instructs the card to run a configuration which is corrupt, the card will automatically run the default configuration.

In a 2100 or 2400 multiplexer, whenever the system controller is instructed to run a configuration, the same command is sent to any smart channel cards in the chassis. Running configuration 1 on the system

controller will run configuration 1 on the smart channel cards and 2 will run 2 etc. On the Dual LIU there are only 4 configurations and running configurations 5 to 8 on the 2100 or 2400 will cause configurations 1 to 4 respectively to be run on the Dual LIU card.

5.5 Fault Monitoring

Fault monitoring is undertaken on the card, and the user has the ability to list and clear faults in the same manner as the system control card fault log. All fault information from smart channel cards is passed back to the system control card which, if it is in logging mode, will be displayed to the user as 'Smart' faults. Fault tables for all faults are shown in Section 9.2.

Receive attention of specific faults can be carried out on the card using the 'Rx att' command or by using the 'Received attention' command sent from the system control card. This command will log these faults as 'RxAtt' and prevent them from generating alarm relay responses. The LEDs will still report the fault. These faults will only become active again if they clear and then re-occur; the relays will then act normally.

5.6 Restart

There are two types of restart which can occur on the card:

- When power is applied to the card for the first time, the card will enter the self test routine which will take ten seconds to complete. On successfully completing the self test, the card will run either the configuration number passed by the system controller, if valid, or the default configuration.
- When either the power fails for a fraction of a second or a watchdog occurs. In this case the card will restart without carrying out the self test and will raise the 'System restart' fault.

5.7 Self Test

The card will carry out a self test on power up or when requested to do so by the user. Self test applies a local loop to the LIU PCM lines and checks for PCM faults as follows :

- a) Framing errors
- b) Frame sync loss
- c) Multiframe sync loss

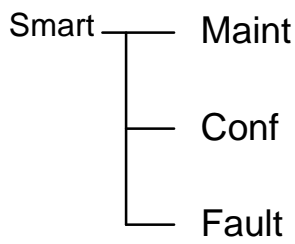
If the self test fails, the card will raise a fault message and set the system, prompt and service alarm relays in the alarm condition. During self test the card will operate bypass relays for the external PCM lines. If the LIU is in self test mode and one of the PCM lines fails self test, then that line will be placed in local loop, and the other line will be connected as normal to the multiplexer.

5.8 Watchdog

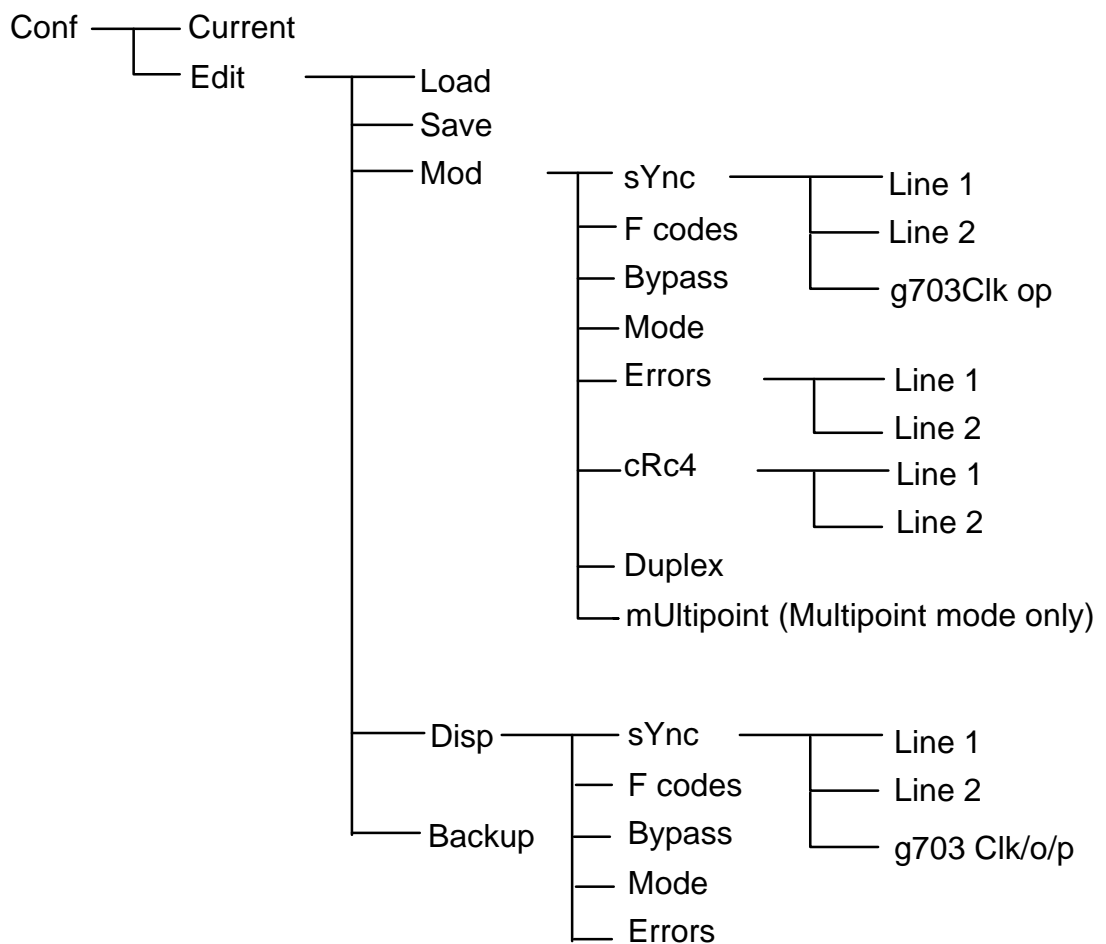
The card has a watchdog facility provided to prevent the microprocessor from running invalid software. If this condition was to occur a restart would be initiated as detailed above.

6. Menus

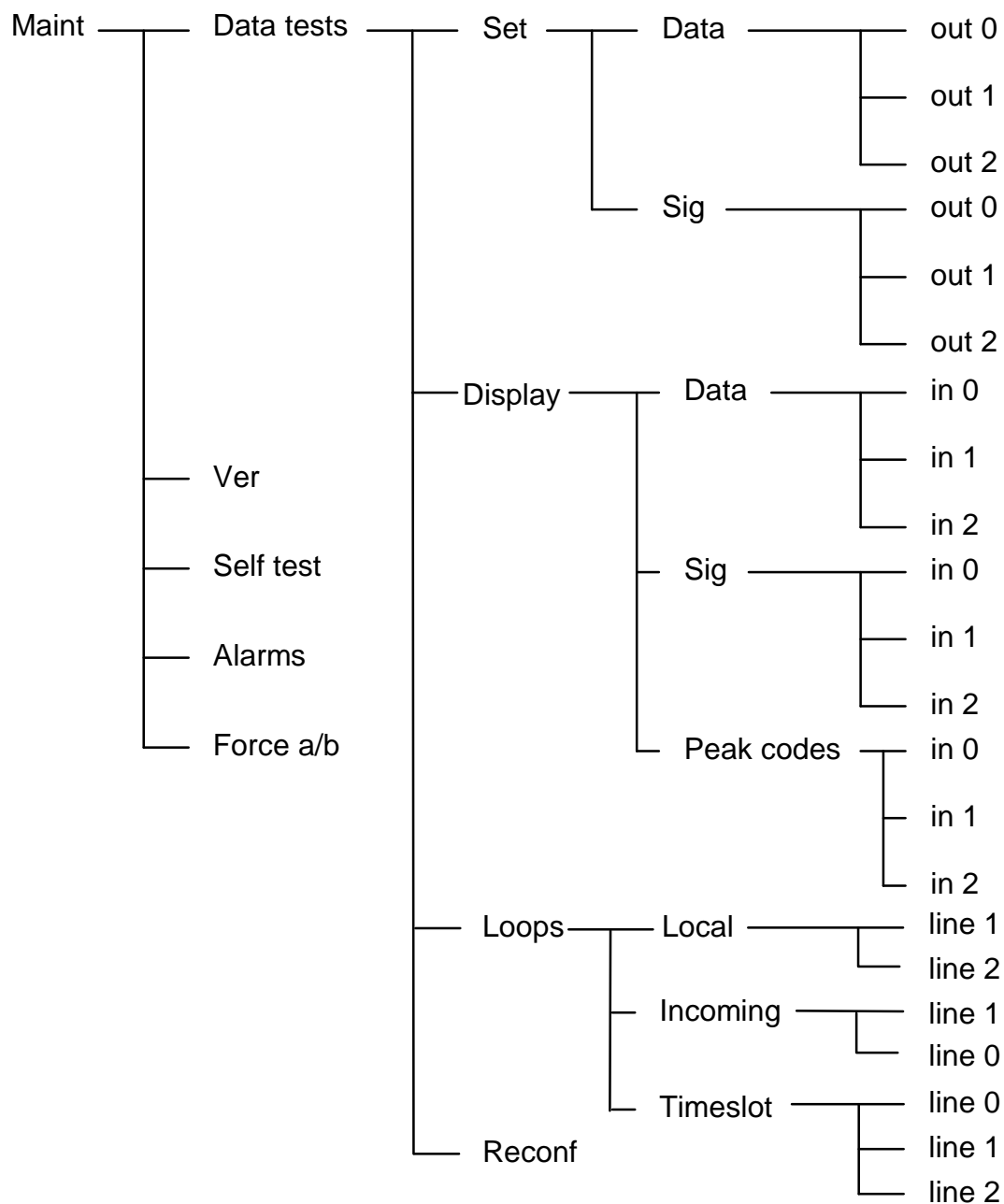
6.1 Root Menu



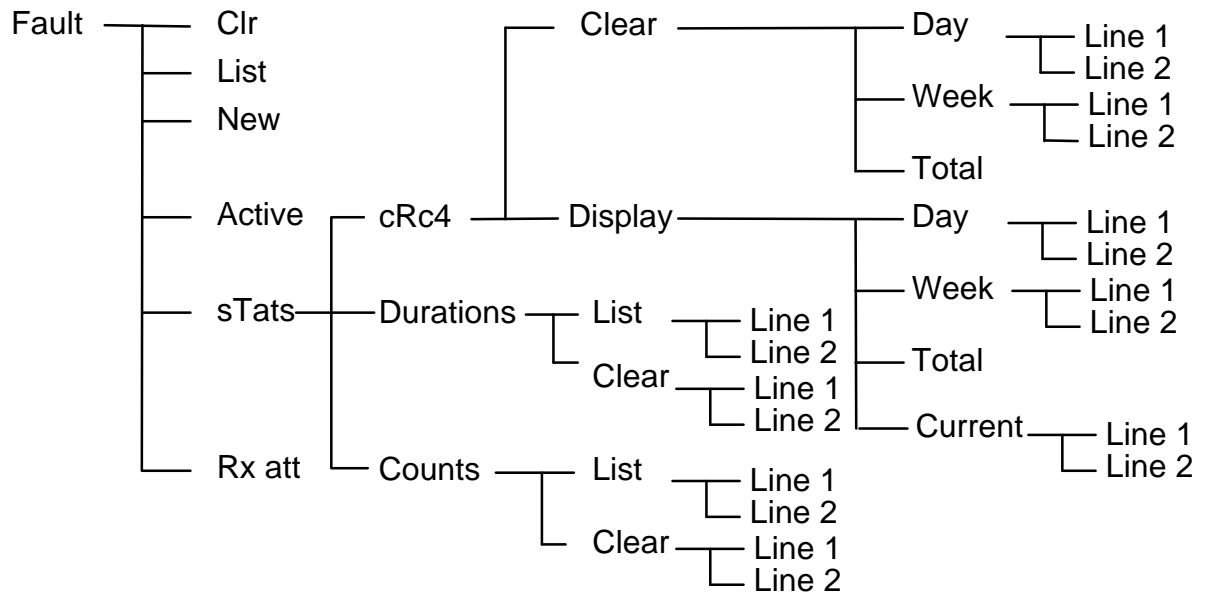
6.2 Configuration Menu



6.3 Maintenance Menu



6.4 Fault Menu



7. Management Patchfields

The management patchfields on the Dual LIU can only be used when the card is fitted in a Series 3000 multiplexer chassis. The switches on S1 are used to select the required patchfield when the card is fitted in ports 3 or 4. The switches are disregarded when the card is fitted in Ports 1 and 2 and should be left all closed. Management patchfield selection will only be set up from the switch positions of S1 at power up. Details of the operation of the patchfields are given in the Series 3000 users manual.

S1-1)

S1-2) Management patchfields for line 1

S1-3)

S1-4)

S1-5) Management patchfields for line 2

S1-6)

S1-7 and S1-8 should always be CLOSED

Switch	1/4	2/5	3/6	Management patchfield selected	
	1	1	1	1	
	0	1	1	2	
	1	0	1	3	
	0	0	1	4	0= Open
	1	1	0	5	1= Closed
	0	1	0	6	
	1	0	0	7	
	0	0	0	8	Test purposes only <i>Do not select</i>

7.1 TS0 Not Frame Word Routing

The facility to connect the TS0 'Not Frame alignment word' to the cross-connect switch for routing through the system or to the management patchfield is provided for use in Series 3000 multiplexers. The following modes of operation are available, and these are selected when configuring the mode of operation for the card.

Modes 2,3,4,6 and 7 of this option require the installation of management patchfield DT995/E in the Dual LIU to gain access to the Remote Alarm bit 3.

Not Frame Words which are dropped/inserted to port timeslots 0 and 1, may be cross connected to any other timeslots using the normal cross connect facilities of the multiplexer.

Mode 1 (Default)	The incoming NFW from the relevant line is written to the relevant patchfield with the Remote Alarm bit set to a 1. The outgoing NFW is read from the patchfield and the Remote Alarm bit will be set to a 0. This allows the use of patchfield 995/D
Mode 2	This is the same as mode 1 except that the Remote Alarm bit is not masked and all bits may be used by the patchfield to give TS0 transparency.
Mode 3	Line 1 - TS0 outgoing will be read from port X TS0. TS0 incoming will be written port X TS0 Line 2 - will be set as mode 2
Mode 4	Line 1 - will be set as mode 2 Line 2 - TS0 outgoing will be read from port X TS0 . TS0 incoming will be written to port X TS0
Mode 5	Line 1 - TS0 outgoing will be read from port X TS0. TS0 incoming will be written to port X TS0. Line 2 - TS0 outgoing will be read from port X TS1. TS0 incoming will be written to port X TS1
Mode 6	Line 1 - TS0 outgoing will be read from port X TS0. TS0 incoming will be written to port X TS0 Line 2 - will be set as mode 2
Mode 7	Line 1 - will be set as mode 2 Line 2 - TS0 outgoing will be read from port X TS0 . TS0 incoming will be written to port X TS0
Mode 8	Line 1 - TS0 outgoing will be read from port X TS0. TS0 incoming will be written to port X TS0. Line 2 - TS0 outgoing will be read from port X TS1. TS0 incoming will be written to port X TS1

Notes:

1. X = P1, P2, P3 or P4
2. In modes 3 to 8, the outgoing TS0 Frame bit 2 is masked to a 1.
3. In modes 3 to 8, the outgoing Remote Alarm bit consists of port X TS0 Remote Alarm bit logically 'OR'ed with the Remote Alarm bit derived from the state of the incoming line signal.
4. In modes 3 to 8, the incoming TS0 NFW read from the line signal and written to the port timeslot will not be masked or added to.
5. In modes 6 to 8, bit 1 (international signalling bit) is forced to a 1 on the outgoing line signal for use with DT585.

8. Maintenance Commands

(S) Maint | Conf | Fault >M

(SM) Data tests | Ver | Self test | Alarms | Force a/b >

8.1 Data Tests

From this menu option, the user can set data in any timeslot, display data in any timeslot, set loops and re-configure the equipment after one of the above has been implemented. Line (in, out) 0 refers to backplane data and lines (in, out) 1 and 2 refer to the PCM lines 1 and 2 respectively.

(SM) Data tests | Ver | Self test | Alarms | Force a/b >D

(SMD) Set | Display | Loops | Reconf >

This command will set a fixed data pattern and/or signalling data in any timeslot (except timeslot zero) of either outgoing line from the card, or to the multiplexer:

8.1.1 Set (Data and Signalling)

(SMD) Set | Display | Loops | Reconf >S

(SMDS) Data | Sig >

Data

This command will set fixed data in any timeslot of the selected line output signal on the card. For example setting the data in line 1 timeslot 17 to 34H would be carried out as follows:

(SMDSD) out 0 | out 1 | out 2 >1

timeslot,data >17,34H

(SMDSD) out 0 | out 1 | out 2*>

Signalling (Sig)

This command will set a signalling fixed code for any timeslot of the selected line signals on the card provided they are in CAS signalling mode. For example setting the signalling code for line 1 timeslot 18 to 5H (normal busy code) would be carried out as follows:

(SMDSS) out 0 | out 1 | out 2 >1

timeslot,data >18,5H

(SMDSS) out 0 | out 1 | out 2*>

8.1.2 Display (Data and Signalling)

The card can monitor incoming the data or signalling code from either incoming line, or the multiplexer backplane.

(SMD) Set | Display | Loops | Reconf >D

(SMDD) Data | Sig | Peak codes >

Data

The data will be displayed in Hexadecimal format (the 'H' suffix is not displayed) if it is stable for at least 0.5 seconds or ** will be displayed if it is unstable. This will continue until any character is received from the control terminal. For example displaying the data in timeslot 12 line 1 would be carried out as follows:

(SMDD) Data | Sig | Peak codes >D

(SMDDD) in 0 | in 1 | in 2 >1

timeslot >12

**,3C,

Signalling (Sig)

The signalling will be displayed in Hexadecimal format if it is stable for at least 0.5 seconds or ** will be displayed if it is unstable. This will continue until any character is received from the control terminal. For example displaying the signalling code carried in TS16 associated with timeslot 12 line 1 would be carried out as follows:

(SMDD) Data | Sig | Peak codes >S

(SMDDS) in 0 | in 1 | in 2 >1

timeslot >12

**,0D,

8.1.3 Peak Codes

This command will display the maximum and minimum quantisation levels and the power, in dBm0, for a given sine-wave appearing on a given line stream, in a given timeslot. The coding must be to ITU-T recommendation G.711 'A' Law. The display will be updated every five seconds with a resolution for the power in 1dB steps.

For example displaying the Peak Codes in timeslot 12 line 1 is carried out as follows:

(SMDD) Data | Sig | Peak codes >P
(SMDDP) in 0 | in 1 | in 2 >1
timeslot >12

min,	max	power (dBm0)
-121,	+121,	+1
-121,	+121,	+1
-121,	+121,	+1

8.2 Loops

From this command you can set various loops on the card.

(SMDL) Local | Incoming | Timeslot >

8.2.1 Local Loop

This command will apply a loop such that data on the selected output line signal is looped back to the input of the same line signal. When the command is run, a message will be displayed telling you that the recovered clock is no longer valid. The command will require either a number from 1 to 255, I, or a carriage return to be entered. The number will represent the time in seconds which the loop will remain active. If an 'I' is entered, then an indefinite loop is selected and a warning message will be displayed and confirmation requested, in this case the loop must be removed by using the 'Reconf' command. If only a carriage return is entered, the loop will exist for 10 seconds.

If a local loop is active, setting the same line for an incoming loop will cancel the local loop and cause a warning message to be displayed. The reverse will also be true for an active incoming loop if a local loop is set.

If a local loop is set on an active path when A/B Switching is enabled the unit will not switch over to the other path.

8.2.2 Incoming Loop

This command will apply a loop such that data arriving on the selected line signal at the input is looped back to itself. When this command is run it will require either a number from 1 to 255, 'I' or a carriage return to be entered. The number will represent the time in seconds which the loop will remain active for. If an I is entered then an indefinite loop is selected and a warning message will be displayed and confirmation requested, in this case the loop must be removed by using the 'Reconf' command. If only a carriage return is entered, the loop will exist for 10 seconds.

8.2.3 Timeslot Loop

This command will apply a loop to a specific incoming timeslot on either Line 0, Line 1 or Line 2, the data will also be passed on to the original destination. The loop will remain active until either a configuration is run or the re-configure (Reconf) command is selected.

```
(SMDL) Local | Incoming | Timeslot >T  
(SMDLT) line 0 | line 1 | line 2 >1  
timeslot >12  
(SMDLT) line 0 | line 1 | line 2 *>
```

8.2.4 Reconfigure

This command runs the current configuration again. All loops and set data will be cleared and in A/B mode 'path A' will be selected.

```
(SMD) Set | Display | Loops | Reconf >R  
(SMD) Set | Display | Loops | Reconf *>
```

8.3 Force A/B

This command will only be relevant in A/B mode of operation. When this command is used, the currently active line will become inactive and the inactive line will become active. If the changeover occurs from a good line to a bad line, the card will automatically change back after the hold delay period has expired. This delay is set in the configuration menu. The currently selected path will be displayed in the active fault log as a zero level fault.

```
(SM) Data tests | Ver | Self test | Alarms | Force a/b > F  
(SM) Data tests | Ver | Self test | Alarms | Force a/b *>
```

8.4 Version

This command will display the firmware version.

```
(SM) Data tests | Ver | Self test | Alarms | Force a/b >V  
DT986/60  
(SM) Data tests | Ver | Self test | Alarms | Force a/b *>
```

8.5 Self Test

This command is used to initiate a self test. The self test carried out will be the same as that carried out on power up. See section 5.7.

8.6 Alarms

This command will turn on all LED indicators for 5 seconds before they resume normal operation.

9. Fault Reporting

The card monitors the status of the two incoming PCM Lines, the card status, reports faults via the smart interface and logs faults on the card. The following commands are available to control fault logging:

(SF) Clr | List | New | Active | sTats | Rx att >

Clear (Clr)

This command may be used to clear out the fault store.

List

This command may be used to list all the faults in the fault store. The newest faults will be displayed last. A maximum of 64 faults are stored after which time the oldest faults will be lost.

New

This command is used to list any faults in the fault store since the last time the 'New' command was used.

Active

This command is used to display any active faults.

Stats

This option will display the CRC4 information.

Rx att

The effect of this command will be to log all active faults as having received attention which will prevent them from generating alarm relay responses. The LEDs will still report the fault. The relay responses will only become active again if the fault clears and then re-occurs, in which case the alarm relays will act normally.

9.1 CRC4 performance display

The facility is provided to display or clear the results of the CRC4 performance information. CRC tests are carried out over a 15 minute period after which time a new check is started. Results are displayed for the following:

Errored Seconds
Severely Errored Seconds
Unavailable Time
CRC Count

CRC4 Errored Seconds should be counted as Severely Errored Seconds when the Errored Seconds exceed a certain threshold. In the Series 3000 multiplexer the Severely Errored Second limit may be set in the multiplexer Install menu (refer to the Series 3000 Multiplexer manual). In the Series 2000 multiplexer this limit is fixed at 815 CRC4 errors per second. If PCM loss, or Service Loss persist for less than 10 seconds, then this will also be counted as Severely Errored Seconds.

If Severely Errored Seconds condition, PCM loss, or Service Loss persist for more than 10 seconds, then this time will be counted as unavailable time.

The display can show the information for the following individually selectable periods:

- a) **Day:** This will be for the previous 24 hours and will show the total for each 15 minute count plus the current check.
- b) **Week:** This will be the total on a daily basis for the previous seven days plus the status of the current check at the time of selection.
- c) **Total:** This will be the total count since the CRC store was last cleared.
- d) **Current:** This is an active display of the current check. If the display is left active it will start a new line for the next and subsequent 15 minute CRC checks.

9.2. Fault Tables

9.2.1 Multipoint and Drop/Insert Mode Fault Table

FAULT	RELAYS S P S Y S	INDICATORS						CIRCUIT 1		CIRCUIT 2		N C S	SMART FAULT No.
		1	2	3	4	5	6	M A 1 S T R F I 6 I S S A G	M A 1 S T R F I 6 I S S A G				
LINE 1 GROUP													
Line loss 1	* *					6	* *	* *			7	1	
AIS 1	*					6	* *	* *			8	2	
F sync loss 1	* *					6	* *	* *			9	3	
Filt err 10 ³ 1	* *					6	* *	* *			9	4	
Frame slip 1	* *					6					10	8	
MF sync loss 1	* *					6	*	*			10	6	
Tslt 16 AIS 1	*					6	*	*			10	5	
Low err rate 1	*					6					15	10	
Remote Alarm 1	*				5						16	9	
MF Remote alm 1	*			4				*			16	7	
TS mismatch 1	*					6					16	11	
Line O/P fail 1	* *					6					7	13	
Local loop 1	*					6	*				12	15	
Incoming loop 1	*					6		* *			12	16	
Recov clk bad 1											14	12	
CRC Reframe 1	* *					6					9	14	
LINE 2 GROUP													
Line loss 2	* *			3					* *	* *	7	32	
AIS 2	*			3					* *	* *	8	33	
F sync loss 2	* *			3					* *	* *	9	34	
Filt err 10 ³ 2	* *			3					* *	* *	9	35	
Frame Slip 2	* *			3					*	*	10	39	
MF sync loss 2	* *			3					*	*	10	37	
Tslt 16 AIS 2	*			3							10	36	
Low err rate 2	*			3							15	41	
Remote Alarm 2	*			2							16	40	
MF Remote alm 2	*		1						*		16	38	
TS mismatch 2	*			3							16	42	
Line O/P fail 2	* *			3							7	44	
Local loop 2	*			3					*		12	46	
Incoming loop 2	*			3					* *		12	47	
Recov clk bad 2											14	43	
CRC Reframe 2	* *			3							9	45	
MISC GROUP													
System restart	* * *			3		6					5	31	
Unconfigured	* * *			3		6	* *	* *	* *	* *	5	30	
Conf RX fail	* * *			3		6					5	29	
Conf TX fail	* * *			3		6					5	28	
Timeslot loop	*			3		6					15	27	
Self Test fail	* * *			3		6	*	* *	*	* *	6	25	
RX attention											0	24	
Bypass	*			3		6					12	23	
Config 1											0	63	
Config 2											0	62	
Config 3											0	61	
Config 4											0	60	
Config 1 Corrupt	* * *			3		6					5	59	
Config 2 Corrupt	* * *			3		6					5	58	
Config 3 Corrupt	* * *			3		6					5	57	
Config 4 Corrupt	* * *			3		6					5	56	

9.2.2 Terminal and A/B Mode Fault Table

FAULT	RELAYS	INDICATORS	CIRCUIT 1	CIRCUIT 2	N C S	SMART FAULT No.
	S P S Y S	1 2 3 4 5 6	MA 1 S T R F I 6 I S S A G	MA 1 S T R F I 6 I S S A G		
LINE 1 GROUP						
Line loss 1	* *	6	* * *		7	1
AIS 1	*	6	* * * *		8	2
F sync loss 1	* *	6	* * * *		9	3
Filt err 10^3 1	* *	6	* * * *		9	4
Frame slip 1	* *	6			10	8
MF sync loss 1	* *	6	* *		10	6
Tslt 16 AIS 1	*	6	* *		10	5
Low err rate 1	*	6			15	10
Remote Alarm 1	*	5			16	9
MF Remote alm 1	*	4		*	16	7
TS mismatch 1	*	6			16	11
Line O/P fail 1	* *	6			7	13
Local loop 1	*	6	*		12	15
Incoming loop 1	*	6		* *	12	16
Recov clk bad 1		6			14	12
CRC Reframe 1	* *	6			9	14
LINE 2 GROUP						
Line loss 2	* *	3		* * *	7	32
AIS 2	*	3		* * * *	8	33
F sync loss 2	* *	3		* * * *	9	34
Filt err 10^3 2	* *	3		* * * *	9	35
Frame Slip 2	* *	3			10	39
MF sync loss 2	* *	3		* *	10	37
Tslt 16 AIS 2	*	3		* *	10	36
Low err rate 2	*	3			15	41
Remote Alarm 2	*	2			16	40
MF Remote alm 2	*	1		*	16	38
TS mismatch 2	*	3			16	42
Line O/P fail 2	* *	3			7	44
Local loop 2	*	3		*	12	46
Incoming loop 2	*	3		* *	12	47
Recov clk bad 2		3			14	43
CRC Reframe 2	* *	3			9	45
MISC GROUP						
System restart	* * *	3 6			5	31
Unconfigured	* * *	3 6	* * * *	* * * *	5	30
Conf RX fail	* * *	3 6			5	29
Conf TX fail	* * *	3 6			5	28
Timeslot loop	*	3 6			15	27
Self Test fail	* * *	3 6	* * *	* * *	6	25
RX attention		3 6			0	24
Bypass	*	3 6			12	23
Config 1					0	63
Config 2					0	62
Config 3					0	61
Config 4					0	60
Path A selected					0	55
Path B selected					0	54
Config 1 Corrupt	* * *	3 6			5	59
Config 2 Corrupt	* * *	3 6			5	58
Config 3 Corrupt	* * *	3 6			5	57
Config 4 Corrupt	* * *	3 6			5	56

Key to fault tables:

* Action taken.

- P Sets the Prompt alarm relay.
- S Sets the Service alarm relay.
- SYS Sets the System alarm relay.
- R Sends a Remote alarm (bit3 in TS0).
- MF Sends a remote Multiframe alarm in TS16.
- AIS Sends an Alarm Indication Signal.
- 16A Sends an Alarm Indication Signal in TS16 only.
- SIG Signalling 'Fcodes' set to the multiplexer backplane.
- TS Data 'Fcodes' set to multiplexer backplane + TS0 spare bits set to 1
- NCS Network management alarm level.

Low error rate will be defined by the user in the configuration menu and will be either 10^{-4} , 10^{-5} or 10^{-6} .

The relay information for both line 1 and 2 are combined together and sent to the system control card for activation of the alarm relays.

When looking from the front, Indicator 1 is at the top, and indicator 6 is at the bottom. Indicators 1, 2, and 3 refer to line 2, and indicators 4, 5, and 6 refer to line 1.

10. Configuration

The configurations for the card are modified in the card's local memory via the Smart menus. These configurations should be backed-up to the system controller for saving, otherwise these configurations will be lost when the card is powered down. They will be passed back to the channel card from the system controller using the Smart protocol every time the unit is powered up.

Note: It is possible to produce configurations in which the cross-connection set-ups do not match the backed timeslot assignments. These will raise the timeslot mismatch fault only when the configuration is run.

10.1 Configuration Commands.

The format of the configuration menu commands is the same as the multiplexer commands, using 'Edit', 'Load', 'Save', 'Modify' and 'Display'. If a configuration is saved on the card, it will also require backing up to the multiplexer system control card, which has battery backed RAM, via the smart interface. There are 4 configurations available for modification.

(SC) Current | Edit >E

(SCE) Load | Save | Mod | Disp | Backup >

10.1.1 Current

This command will display the current configuration running on the card i.e. Default, 1, 2, 3 or 4

10.1.2 Edit

This will allow the user to 'Load', 'Save', 'Modify', 'Display' or 'Backup' configurations for the card.

10.1.3 Load

This command allows the user to load any configuration held on the card, i.e. Default, 1, 2, 3 or 4 into the edit buffer for modification or re-saving in to another configuration. If the user selects the currently running configuration, the following message will be displayed:

WARNING CONFIG IS CURRENT

Loading the current configuration will not cause any disruption to service.

10.1.4 Save

This command allows the user to save the configuration currently in the edit buffer into any local card configuration (1,2,3 or 4). If the chosen configuration is current the following message will be displayed:

```
warning conf is current - continue Yes | No >
```

If N (no) is selected the command will be aborted.

If Y (yes) is selected the configuration will be saved and immediately run effecting the changes.

10.1.5 Modify

This command allows the user to modify the following parameters.

- (i) Line signal failure options when used as a sync source
- (ii) Timeslot allocation
- (iii) F codes
- (iv) Mode of operation including signalling options
- (v) CRC4 operation
- (vi) Low Error rate detector threshold
- (vii) Bypass
- (viii) G.703 clock output (enable/disable) when the multiplexer is running from internal clock.

10.1.6 Display

This command allows the user to display the information that is currently in the edit buffer.

10.1.7 Back-up

This command allows the user to save the configurations from the card to the battery backed memory on the system control card. A check is made for identical configurations, if any are found these need only be sent once e.g.

sending 1, 3, 4

sending 2

In this example configurations 1,3 and 4 were the same.

Note: In exceptional circumstances, when the Smart link is busy with priority traffic, such as global time updates from the Network Management System, the backup may fail due to Smart Link Timeout. The card will issue a warning after sending the configuration message 'Failed - timed out', and raise the Conf TX fault.

Normally a second backup operation will succeed, and the Conf TX fault will clear.

10.2 Sync

This command allows you to select, for each line, the condition under which the recovered line clock is deemed to have failed before the 2048kHz clock for that specific line is disabled to the multiplexer. These options are :

- | | |
|-----------------------|--|
| 1 (Line loss) | If there is no line signal input to the specific line. |
| 2 (1 or Service loss) | If there is no line signal or an error rate of 1 in 10^{-3} or sync loss or an AIS is present on the line. |
| 3 (2 or Remote alarm) | As in 2 or a Remote (TS0 bit 3) alarm is received on the line. |
| 4 (1 or Remote alarm) | If there is no line signal or a Remote alarm is received on the line. |

You may also select if the G.703 clock output is disabled or enabled when the multiplexer is free running, i.e. clock source from internal clock.

```
(SCEMY) line 1 | line 2 | g703 Clk o/p >
```

```
G703 Clk o/p when free run 1=Enabled (0=disabled, 1= enabled)>0
```

```
(SCEMY) line 1 | line 2 | g703 Clk o/p > 1
```

```
1 (Line Loss)
```

```
2 (1 or Service Loss)
```

```
3 (2 or Remote Alarm)
```

```
4 (1 or Remote Alarm)
```

```
option =2> 1
```

```
SCEMY) line 1 | line 2 | g703 Clk o/p >C
```

Display Format

```
(SCEDY) line 1 | line 2 | g703 Clk o/p > C
```

```
G703 Clk o/p when free running 1 = Enabled
```

(SCEDY) line 1 | line 2 | g703 Clk o/p > 1
1 (Line Loss)

(SCEDY) line 1 | line 2 | g703 Clk o/p >

10.3 F Code Allocation

This command allows the user to define the 'F Codes' (fixed data codes) which will be used for a particular line signal. These codes are used in the outgoing line if the incoming line fails, or if the timeslot is not cross connected i.e. it has no source input.

(SCEM) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Duplex >F

Line 0, data FFH, Sig FH >

Line 1, data FFH, Sig FH >12H, AH

Line 2, data FFH, Sig FH >34H, 5H

(SCEM) sYnc | F code | Bypass | Mode | Errors | cRc4 | Duplex *>

Display Format

(SCED) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Channel assign >F

Line 0, data FFH, Sig FH

Line 1, data 12H, Sig AH

Line 2, data 34H, Sig 5H

(SCED) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Channel assign *>

10.4 Bypass

This command will enable the user to select bypass for a specific configuration i.e. 'Line 1 In' is connected to 'Line 2 Out' and vice versa.

(SCEM) sYnc | F codes | Bypass | Mode | Errors | Duplex >B

Bypass 0=Disabled (0=Disable,1=Enable) >1

(SCEM) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Duplex *>

Display Format

(SCED) sYnc | F codes | Bypass | Mode | Errors | Channel assign >B

Bypass 1=Enabled

(SCED) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Channel assign *>

10.5 Mode

There are several operating modes for the Dual LIU. On selection of a particular mode the user will be prompted for other inputs depending upon the mode selected.

10.5.1 Multipoint mode

All timeslots from Line 1 will be connected to Line 2 in duplex. The timeslots passing through the card may be 'AND'ed with timeslots from the multiplexer backplane.

After entering this mode the user will be requested for the signalling mode either CAS or CCS. This will set both line signals to the same signalling mode.

The next prompt will be for 'Multiframe linking'. If multiframe linking is selected, the delay between the multiframe received on line 1 and transmitted on line 2 will be minimised. Similarly, the delay between multiframe received on line 2 and transmitted on line 1 will be minimised.

The next prompt will be for selection of the TS0 NFW routing mode.

Note: Incoming frame slips will cause multiframe re-alignment and Multiframe Sync loss may occur momentarily.

```
(SCEM) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Duplex >M
```

```
1 Multipoint
```

```
2 Terminal
```

```
3 Drop/Insert
```

```
4 A/B Switching
```

```
mode = 1 >1
```

```
Signalling mode CAS (1=CAS, 2=CCS) >1
```

```
Multiframe Link 0=Disabled (0=Disable, 1=Enabled) >
```

```
1 Normal
```

```
2 Normal plus Remote Alarm
```

```
3 L1 to TS0
```

```
4 L2 to TS0
```

```
5 L1 to TS0, L2 to TS1
```

```
6 L1 to TS0 (DT585)
```

```
7 L2 to TS0 (DT585)
```

```
8 L1 to TS0 (DT585) , L2 to TS1 (DT585)
```

```
TS0 mode 1 >
```

```
(SCEM) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Duplex *>
```

Display Format

```
(SCED) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Channel Assign >M
```

```
Mode 1=Multipoint
```

Signalling mode 1=CAS

Multiframe Link 0=Disabled

TS0 mode 1 Normal

(SCED) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Channel Assign *>

10.5.2 Terminal mode

This command allows the user to terminate both line signals on the card and, by configuration, cross-connect timeslots to the multiplexer backplane. Note that there is no connection between line 1 and line 2 on the card in this mode. The line signals are not required to be in the same signalling mode. The configuration is made up of several requests for information as follows:

- a) Signalling Mode line 1. This will request the user for either CAS or CCS mode for line 1.
- b) Signalling Mode line 2. This will request the user for either CAS or CCS mode for line 2.
- c) Fault logging line 1 Enable/Disable. This allows the user to disable fault detection for line 1. The card will then no longer generate fault information or illuminate any LEDs for that specific line. All other operations for that line will remain functional i.e. F codes, Remote alarms etc.
- d) Fault logging line 2 Enable/Disable. As above but for line 2.
- e) TS0 Not Frame Word routing mode.

(SCEM) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Duplex >M

1 Multipoint

2 Terminal

3 Drop/Insert

4 A/B Switching

mode = 1 >2

Signalling mode line 1 CAS (1=CAS, 2=CCS) >1

Signalling mode line 2 CAS (1=CAS, 2=CCS) >2

Fault logging line 1 1=Enabled (0= Disable, 1=Enable) >1

Fault logging line 2 1=Enabled (0=Disable, 1=Enable) >1

1 Normal

2 Normal plus Remote Alarm

3 L1 to TS0

4 L2 to TS0

5 L1 to TS0, L2 to TS1

6 L1 to TS0 (DT585)

7 L2 to TS0 (DT585)

8 L1 to TS0 (DT585) , L2 to TS1 (DT585)

TS0 mode 1 >

(SCEM) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Duplex *>

Display Format

(SCED) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Channel Assign >M
mode 2=Terminal

Signalling mode line 1 1=CAS

Signalling mode line 2 2=CCS

Fault logging line 1 1=Enabled

Fault logging line 2 1=Enabled

TS0 mode 1 Normal

(SCED) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Channel Assign *>

10.5.3 Drop/Insert Mode

Normally, if no timeslots are dropped, all timeslots from Line 1 will be connected to Line 2 in duplex. The user may allocate timeslots to be dropped from either line to form a duplex connection with a timeslot on the backplane of the multiplexer. These dropped timeslots are not passed through from line 1 to line 2. The through connections are set to the F code for the specific line signal and if in CAS mode also the fixed signalling code. The line signals are not required to be in the same signalling mode.

On entry of this command the user will be able to select options as follows:

- a) Signalling mode for line 1. This requests the user for either CAS or CCS mode for line 1.
- b) Signalling mode for line 2. This requests the user for either CAS or CCS mode for line 2.
- c) CAS to CCS timeslot shift. This command will only appear if the signalling mode for line 1 has been set different to that for line 2. It will allow the user to shift timeslot 16 in the CCS line to timeslot 17 in the CAS line.
- d) Multiframe linking. If enabled, the delay between the multiframe received on line 1 and transmitted on line 2 will be minimised.

Similarly, the delay between multiframes received on line 2 and transmitted on line 1 will be minimised.

e) TS0 Not Frame Word routing mode.

Note: Incoming frame slips will cause multiframe re-alignment and multiframe sync loss may occur momentarily.

(SCEM) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Duplex >M

1 Multipoint

2 Terminal

3 Drop/Insert

4 A/B Switching

mode = 1 >3

Signalling mode line 1 CAS (1=CAS, 2=CCS) >1

Signalling mode line 2 CAS (1=CAS, 2=CCS) >2

CAS to CCS timeslot shift 0=Disabled, (0=Disable,1=Enable) >1

Multiframe Link 0=Disabled, (0=Disable, 1=Enable) >

1 Normal

2 Normal plus Remote Alarm

3 L1 to TS0

4 L2 to TS0

5 L1 to TS0, L2 to TS1

6 L1 to TS0 (DT585)

7 L2 to TS0 (DT585)

8 L1 to TS0 (DT585) , L2 to TS1 (DT585)

TS0 mode 1 >

(SCEM) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Duplex *>

Display Format

SCED) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Channel assign >M
mode 3 = Drop/Insert

Signalling mode line 1 1=CAS

Signalling mode line 2 2=CCS

CAS to CCS timeslot shift 0=Enabled

Multiframe Link 0=Disabled

TS0 mode 1 Normal

(SCED) sYnc | F codes| Bypass | Mode | Errors | cRc4 | Channel assign *>

10.5.4 A/B Switching Mode

This mode is designed to switch all timeslots from either Line 1 or Line 2 to the multiplexer backplane upon a specific line failure. All timeslots for both outgoing line streams are sourced from the multiplexer backplane timeslots on a one for one basis i.e. the same information will be broadcast out on both lines.

The user can set the following options:

a) Signalling mode

This must be the same for both PCM lines, either CAS or CCS.

b) Fault Logging may be disabled for either line.

c) Change Over Delay

This delay parameter is used to inhibit change over of the input PCM source until the fault has been present for the delay period.

d) Hold Delay

This delay parameter is used to disable operation of the switch over facility immediately after a changeover. The facility will be re-enabled after the delay period has expired.

Faults on the inactive line must be cleared for the period before change-over can occur.

Time delays are selectable between 0 and 25 seconds in steps of 100ms.

Both the change-over delay timer and the Hold delay timers run in parallel and not consecutively. It is therefore necessary to set the hold delay period greater than the change-over delay period by the amount of hold delay required.

e) Dual Management Path

When enabled, management data will operate as follows:

- i) TS0 data from line 1 will be written to line 1 patchfield.
- ii) TS0 data from line 2 will be written to line 2 patchfield.
- iii) Data read from line 1 patchfield will be written to line 1 TS0.
- iv) Data read from line 2 patchfield will be written to line 2 TS0.

When disabled, management data will operate as follows:

- i) Data read from the active line signal will be written to the relevant active portion of the patchfield.
- ii) Data written to the inactive portion of the patchfield will be all 1's.
- iii) Data read from line 1 patchfield will be written to line 1 TS0.
- iv) Data read from line 2 patchfield will be written to line 2 TS0.

f) A/B sync tracking.

When disabled, switching between the two PCM inputs will not affect the synchronisation source unless the selected sync failure conditions are met. This is the normal mode of operation.

When enabled, the line 1 clock source output to the backplane will follow the currently active path i.e. if Path A is selected, the clock will be recovered from line 1, or if Path B is selected, the clock will be recovered from line 2. If the currently selected line meets it's sync failure criteria then the clock will be deemed to have failed.

g) TS0 Not Frame Word routing mode.

Note: Line 2 clock output should not normally be used as a sync source in the main multiplexer sync priority list when A/B sync tracking is enabled. Line 1 clock only should be used as the sync source. A/B sync tracking still operates in the same way if A/B change-over is initiated by menu command or a fault condition.

(SCEM) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Duplex >M

1 Multipoint
2 Terminal
3 Drop/Insert
4 A/B Switching
mode = 1 > 4

Signalling mode CAS (1=CAS, 2=CCS) >
Fault logging line 1 0=Disabled (0=Disable, 1=Enable) >1
Fault logging line 2 0=Disabled (0=Disable, 1=Enable) >1
Changeover delay 0 (0-250 in 100ms steps) >50
Hold delay 20 (0-250 in 100ms steps) >125
Dual management path 0=Disabled (0=Disable, 1=Enable) >
A/B sync source tracking 0=Disable (0=Disabled, 1=Enabled) >1
1 Normal
2 Normal plus Remote Alarm
3 L1 to TS0
4 L2 to TS0
5 L1 to TS0, L2 to TS1
6 L1 to TS0 (DT585)
7 L2 to TS0 (DT585)
8 L1 to TS0 (DT585) , L2 to TS1 (DT585)
TS0 mode 1 >
(SCEM) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Duplex *>

Display Format

SCED) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Channel assign >M
mode 4=A/B Switching
Signalling mode 1=CAS
Fault logging line 1 1=Enabled
Fault logging line 2 1=Enabled
Changeover delay =50 (*100ms)
Hold delay =125 (*100ms)
Dual management path 0=Disabled
A/B sync source tracking 1=Enabled
TS0 mode 1 Normal
(SCED) sYnc | F codes| Bypass | Mode | Errors | cRc4 | Channel assign *>

A/B Failure Conditions

The following faults are used to determine a line failure condition.

AIS

Loss of incoming PCM

Loss of frame alignment

Error ratio > 1 in 10^{-3}

TS16 AIS if set for CAS mode

Loss of multiframe alignment if set for CAS mode

Low error rate

Change-over Operation

The decision to switch or not switch will be made on the basis of the following table when the delay time expires. Faults which occur and clear within the switch over delay time will not be considered for the purposes of the decision table.

ACTIVE LINE	STANDBY LINE	ACTION
No fault	No fault	None
Low error rate	No fault	Switch
Low error rate	Any fault	None
Fault but not low error rate	Low error rate	Switch
Fault but not low error rate	Fault but not low error rate	None

A/B Faults

During failure conditions, PCM alarm responses will be set and reported as for normal PCM operation of the LIU.

If PCM Line 1 is selected the following fault message will be generated:

'Path A selected'

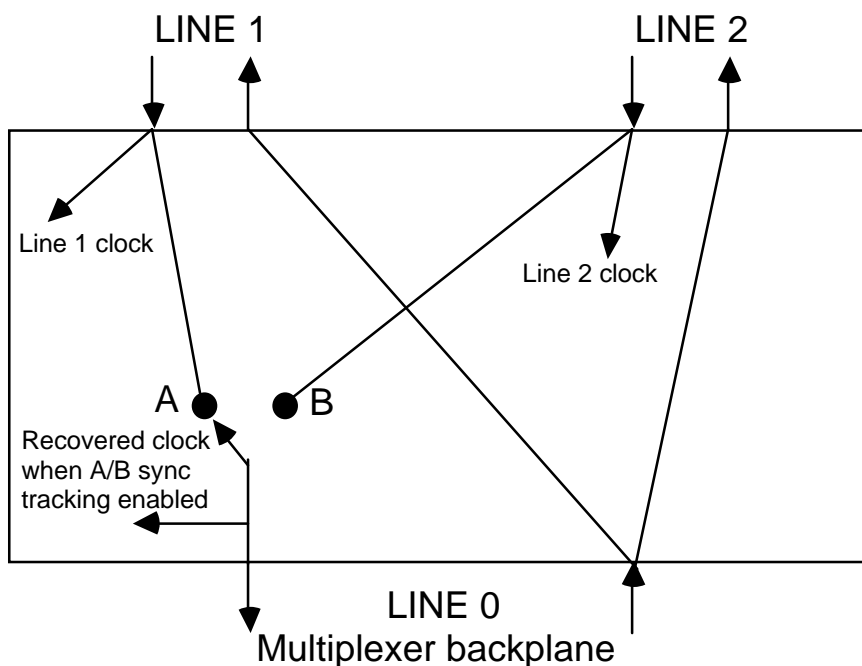
If PCM Line 2 is selected the following fault message will be generated:

'Path B selected'

These 'faults' are used as markers, and have a network fault level of zero and cause no relay or LED operation.

Fault Persistency

One fault may cause the change-over timer to start running, but that same fault need not be active when change-over occurs, another fault may take its place, e.g. PCM loss occurs which is then replaced by AIS. Only when all relevant faults have been cleared will the timer be reset.



10.7 Error Rate

This command enables the user to select the threshold for the low error rate detector and logged by each line. For example setting the low error rate option to 1 will result in the low error rate fault being raised if errors in the frame word exceed 1 in 10^4 frame alignment bits.

(SCEM) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Duplex >E

(SCEME) line 1 | line 2 >1

1 = 10^4

2 = 10^5

3 = 10^6

option 3 = 10^6 >1

(SCEME) line 1 | line 2*>

Display Format

(SCED) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Channel assign >E

line 1,1 = 10^4

line 2,2 = 10^5

(SCED) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Channel assign *>

10.8 CRC4

CRC4 (Cyclic Redundancy Check) may be selected to be operational on either or both lines. It is important that if this facility is selected, the equipment at the far end of the link to which it is connected, is also selected for CRC4 otherwise re-framing will constantly occur resulting in loss of data and management control. If CRC4 is enabled, the option to

use the CRC data pattern for the Low error rate detector is provided. This will give quicker detection of errors than the normal TS0 frame word.

(SCEM) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Duplex >R

(SCEMR) line 1 | line 2 >1

CRC4 0=Disabled (0=Disabled, 1=Enabled)1

Low error rate Using CRC 0=Disabled (0=Disabled, 1=Enabled)1

(SCEMR) line 1 | line 2*>

Display Format

(SCED) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Channel assign >R

(SCEDR) line 1 | line 2 >1

CRC4 1=Enabled

Low error rate using CRC4 1=Enabled

(SCEDR) line 1 | line 2*>

10.9 Timeslot Allocation

The allocation of timeslots from lines 1 and 2 differ depending on the mode selected. When allocating timeslots, the destination timeslot which is the left hand column, is the timeslot on the multiplexer backplane i.e. line 0. To un-assign timeslots, 'U' should be entered.

The following examples assume that no timeslots have previously been allocated, if they have, the current allocation and mode will be displayed. This allocation will be overwritten when the new allocation is made.

10.9.1 Multipoint mode

In this mode, options are provided for both Multipoint operation and Drop/Insert operation so that some timeslots may be in Multipoint mode and some in Drop and Insert mode. All timeslots are automatically connected from line 1 to line 2 in duplex without user intervention.

Duplex

Using this option, the user is able to cross connect the timeslots from line signals 1 or 2 to timeslots on the multiplexer backplane. Any timeslots that are not connected by this command will be connected through from line 1 to line 2 in duplex. Those that are connected to the backplane will *not* be connected through.

```
(SCEM)sYnc | F codes | Bypass | Mode | Errors | cRc4 | Duplex | mUltipoint >D
first timeslot >29
(TS29,      ) from line, ts = , >1,1
(TS30,      ) from line, ts = , >1,2
(TS31,      ) from line, ts = , >2,1
(SCEM) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Duplex | mUltipoint*>
```

Multipoint

This command allows the user to cross connect timeslots from line signals 1 or 2 to timeslots on the multiplexer backplane whilst leaving them still connected through from line 1 to line 2, i.e. the data in the converging timeslots will be 'AND'ed together. This facility must only be used with special channel cards designed for multipoint operation otherwise data corruption will occur.

```
(SCEM)sYnc | F codes | Bypass | Mode | Errors | cRc4 | Duplex | mUltipoint >U
first timeslot >26
(TS26,      ) from line, ts = , >1,10
(TS27,      ) from line, ts = , >1,11
(TS28,      ) from line, ts = , >2,10
(TS29,      ) from line, ts = , >
(SCEM) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Duplex | mUltipoint*>
```

Display Format

```
(SCED) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Channel assign >C
first timeslot, last timeslot >26,31
(TS26,Multipoint) from line, ts = 1,10
(TS27,Multipoint) from line, ts = 1,11
(TS28,Multipoint) from line, ts = 2,10
(TS29,Duplex    ) from line, ts = 1,1
(TS30,Duplex    ) from line, ts = 1,2
(TS31,Duplex    ) from line, ts = 2,1
(SCED) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Channel assign *>
```

10.9.2 Terminal Mode

In this mode, the user is able to cross-connect from a timeslot on the multiplexer backplane to selected timeslots of either line. Any timeslots not cross connected will contain the 'F Code' for the specific line signal and if in CAS mode, the signalling 'F Code'. There is no connection between line 1 and line 2.

Duplex

(SCEM) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Duplex >D
first timeslot >28

(TS28,) from line, ts = , >1,1

(TS29,) from line, ts = , >2,1

(TS30,) from line, ts = , >

(SCEM) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Duplex *>

Display Format

(SCED) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Channel assign >C
first timeslot, last timeslot >28,31

(TS28,Duplex) from line, ts = 1,1

(TS29,Duplex) from line, ts = 2,1

(TS30,) from line, ts = ,

(TS31,) from line, ts = ,

(SCED) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Channel assign *>

10.9.3 Drop and Insert mode

In this mode the user will be able to cross connect the timeslots from line signals 1 or 2 to timeslots on the multiplexer backplane. Any timeslots that are not defined by this command will be connected in the following manner.

- a) If line signals 1 and 2 are both in CCS or both in CAS and the same timeslots on both line signals are not cross connected to the multiplexer, both timeslots will be connected together. If one timeslot is cross connected to the multiplexer then the other timeslot will contain the 'F Code' for that line signal.
- b) If one line signal is in CAS and the other is in CCS the above will still apply except that if the cross connect shift option is selected, timeslot 16 on the CCS line signal will be shifted to timeslot 17 in the CAS line signal.

(SCEM) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Duplex >D
first timeslot >30

(TS30,) from line, ts = , >1,14

(TS31,) from line, ts = , >1,15

(SCEM) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Duplex *>

Display Format

(SCED) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Channel assign >C
first timeslot, last timeslot >30,31

(TS30,Duplex) from line, ts = 1,14

(TS31,Duplex) from line, ts = 1,15

(SCED) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Channel assign *>

10.9.4 A/B Switching Mode

No allocation of timeslots is available in this mode since all timeslots are already connected as for A/B switching. The following message will be displayed if Duplex is selected.

(SCEM) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Duplex >D

Not available in this mode.

(SCEM) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Duplex *>

Display Format

(SCED) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Channel assign >C

Not available in this mode.

(SCED) sYnc | F codes | Bypass | Mode | Errors | cRc4 | Channel assign *>

11. Alarm Indicators

LED indicators are provided to indicate the following:

- | | | |
|-----------|--------|-----------------------------------|
| 1. Top | Yellow | Line 2 MF alarm |
| 2. | Yellow | Line 2 TS0 Remote Alarm |
| 3. | Red | Line 2 PCM or Miscellaneous Fault |
| 4. | Yellow | Line 1 MF alarm |
| 5. | Yellow | Line 1 TS0 Remote Alarm |
| 6. Bottom | Red | Line 1 PCM or Miscellaneous Fault |

The red LED for each line will illuminate to indicate a PCM fault for the following reasons:

- | | |
|-------------------------|----------------------|
| 1. PCM loss | 7. TS16 A.I.S |
| 2. A.I.S. | 8. Low error rate |
| 3. Frame sync loss | 9. Timeslot mismatch |
| 4. Error Rate 10^{-3} | 10. Line output fail |
| 5. Frame slip | 11. Local loop |
| 6. Multiframe sync loss | 12. Incoming loop |

Both red LEDs will be illuminated at the same time to indicate a miscellaneous fault for the following reasons:

1. System restart
2. Unconfigured
3. Config Rx fail (Transfer of data from the system controller)
4. Config Tx fail (Transfer of data to the system controller)
5. Self test fail
6. Card in bypass

12. Link Settings

TL1 and TL2 These must be set to position 1-2.

TL3 This must be fitted.

LK1-LK11 These links must be set to position 1-2

LK12 This must be set to position 2-3. (Middle).

All links are for factory use only.

13. QSN DLIU

The QSN has been designed for applications where transmission delays are required to be constant each time the multiplexer is powered up.

The QSN DLIU operates exactly as per a standard DLIU except the standard 18 μ s PCM jitter buffer has been disabled via a hardware modification.

Refer to factory for further details

14. Dual LIU I/O Adaptors

I/O adaptors must be used in conjunction with the Dual LIU. These include the isolation transformers and bypass links and relays (refer to Bypass in Chapter 1). The I/O adaptors provide the means of connection to the PCM lines and G.703 clock.

To ensure adequate earthing of the I/O adaptor it must be fitted to the chassis using the knurled screw provided.

14.1 DT315 75 Ohm Adaptor

This uses standard 75 ohm BNC sockets for connection to the two PCM lines and the G.703 clock. As standard the screens of the output connectors are connected to earth and the screens of the input connectors are isolated from earth by means of insulating washers fitted between the connectors and the mounting bracket. If it is required to earth the screen of the input connector instead of the output, then it is necessary to re-assemble the I/O adaptor with the insulating washer fitted to the input connector.

14.2 DT316 120 Ohm I/O Adaptor

The DT316 provides PCM connections via two 9-way D-type connectors. The transmitted signal is present on pins 5 and 9, and the received signal on pins 1 and 6. The cable screen should be connected to the body of the connector.

The clock signals are provided on a separate 9-way D-type connector with the transmit clock O/P on pins 4 and 8, and the receive clock I/P on pins 2 and 7. The cable screen should be connected to the body of the connector.

