Series DCX
SC1 & SC2 Modules
Reference Manual

STATUTORY NOTICES

CE

Case Technology Ltd declare that this product 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.

WARNING

The DCX 860 and 870 incorporate a panel in front of the plug-in modules. This panel may only be removed by suitably qualified personnel for installation or maintenance purposes, and must be replaced afterwards. Removal under any other circumstance would invalidate any RFI (Radio Frequency Interference) and Safety Type Approvals.

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Preface

This manual provides information for DCX network supervisors to install and configure SC modules. It forms part of the DCX System Documentation, and refers to other manuals in the series. It assumes that the supervisor will already have some knowledge of the DCX system, obtained either from the System Documentation or from a Case Technology training course.

The manual also provides information for users of terminals connected to SC modules, to enable them to change certain basic channel features.

Throughout this manual the SC1 and the SC2 module are described as 'the SC module' where features are common to both. Where features are specific to only one type of module, either SC1 or SC2 is stated.

For an explanation of terms used in this manual, see the Pocket Books of Telecommunications and Computer Communications.

Contents

Appendices

Figures

Tables

1 Introduction

1.1 The DCX SC Module

The DCX SC (Soft Channel) module is a menu-driven, software-configured low-speed channel (LSC) card for the DCX 833, 836, 840, 860 and 870 statistical multiplexers. The SC module supports the features of Cray LSC3, 3A, 4 and 4A modules. It can be used in combination with other SC or LSC modules.

There are three versions of SC1 module:

V.24 (CCITT V.24/V.28 and EIA RS-232-C compatible)
RS-422 (EIA RS-422 compatible)
CL20 (20mA current loop)

all of which are covered in this manual (they differ only in their port interfaces and related features).

The SC2 module is only available in a V.24 version. It is able to operate at double polling rates when used in conjunction with a BAT (buffer and Timing) module. Double polling increases the SC2 data throughput and is described fully in the Series DCX BAT, QEM and RES Modules reference manual, part no X840-313751. All other features are common to both the SC1 and SC2.

The status of SC modules can be viewed on channel and system menus displayed on any local or remote supervisor's video display terminal. Under password control, the supervisor mapped to an SC module can individually configure each of its channels. An extensive set of menu-driven diagnostics is available.

Channel selection, configuration, and diagnostics including error identification, are also available from the SC module front panel.*

* The DCX 860 and 870 are designed to be soft-configurable, and physical access to the plug-in cards is unnecessary. Full details are given in the DCX 860, 870 and NCAM manuals. Physical access is prevented by a panel, which may only be removed by suitably qualified personnel for installation and maintenance purposes.

2 SC Module Description

2.1 Introduction

The SC module has powerful features and options that apply to its channel circuits. These features are configured by the supervisor via a terminal mapped to the SC module. Channels are entirely independent with regard to most features and may be reconfigured without switching off the unit.

This section describes the functional aspects of the options, preceded by a summary of the differences between the different versions of SC modules.

2.2 SC Module Versions

The different versions of SC modules are basically similar but have a few differences in their options that relate to their different interfaces.

2.2.1 SC1/V.24 and SC2

All options are described in Section 2.3 and are selected from the screens displayed on the supervisor's terminal as described in Section 3.

2.2.2 SC1/RS-422

All options are described in Section 2.3 and are selected from the screens displayed on the supervisor's terminal as described in Section 3, except that the SC1/RS-422 will only support DTR and DSR as shown in Appendix B.3. All mention of other V.24 controls should therefore be ignored.

2.2.3 SC1/CL20

Most options for the SC1/CL20 are described in Section 2.3 and are selected from screens displayed on the supervisor's terminal, as described in Section 3. The one exception is the channel loop current (sink or source) selection. This option identifies the source of loop current applied to the receive and transmit paths in each channel. It also determines the channel connections on the port's 25-pin D connector. The SC1/CL20 does not, of course, support facilities that are V.24 orientated, and all mention of these should be ignored.

Current Loop Circuits

Some current loop devices require an external current source. These are said to act as 'sinks'. Others supply loop current and are identified as 'sources'. The SC1/CL20 can function as either a sink or a source on a per-channel basis. It can also operate on a split sink and source basis in any or all channels (such as sink receive, source transmit, or the reverse).

Current loop option selections should be based on the requirements of the DTE. These include identification of receive and transmit loop current sources, and whether the loops require a common return path (three-wire cable) or separate returns (four-wire cable).

The options selected determine which of these modes are established within the DCX for the receive and transmit paths of each channel. The selections (four transmit and four receive paths) are provided on eight switches, which are fully described in Appendix B.3.

2.3 Functional Description

2.3.1 Channel Speed/Code Options

Channel Speeds

Each channel circuit is individually configurable by the local or remote supervisor to a speed between 50 and 19200 bps (with slight restrictions applying to 'adjacent' channels as explained in Section 4.4.1).

Automatic Baud Rate (ABR)

ABR is normally used for terminals that operate over a dial-up modem link when the speed of the calling terminal can vary. ABR operates at speeds of 110, 134.5, 300, 600, 1200, 2400, 4800 and 9600 bps. In a typical application in which the remote host computer supports ABR, the local SC1 can be configured for ABR and the remote for Down Line Load.

The first character (which must be carriage return <CR>) input into the SC module channel sets up its speed, and is discarded after the detection routine. If the SC module is unable to determine the speed (due to wrong speed or first character received not being <CR>), it resets itself and awaits another character.

Note that excess input distortion can cause false operation of the detection routine. This is most critical at the lowest speeds.

If a host computer is unable to support ABR, the DCXs can perform the speed conversion by setting the port connected to the terminal ABR, and the port connected to the computer to a fixed speed. To avoid lost data, both computer and terminal must respond to the Buffer Overflow control signals generated from the DCXs.

Down Line Load (DLL)

DLL allows a channel to have its speed and character code loaded automatically from the remote DCX. DLL is a convenient method of setting and changing parameters at either end of a link using the one multiplexer channel to DLL its speed to the other end.

Placing both ends of a channel in DLL without centrally stored speeds results in an invalid condition since each multiplexer is looking for parameter setup signals not provided by the other unit.

Split Baud Rate (SBR)

Using SBR, a channel can be set to have different rates in the input and output directions to suit DTEs that have this feature. The input rate (from the DTE) is determined by the speed setting, and the output rate (to the DTE) is down line loaded from the remote DCX channel end (with SBR, only the speed is down line loaded, not the character code).

Normally, SBR would be used at both ends of the link (e.g. input/output at terminal end 75/1200, input/output at computer end 1200/75). However, DCXs themselves can, if required, provide a change of speed. This is done by setting SBR on at one end of the link and off at the other end (e.g. input/output at the terminal end 75/1200, input/output at the computer end 1200/1200).

Character Codes

The SC module allows the codes (with stop bits) shown in Table 2-1. The interpretation of these depends on the type of parity.

CHARACTER CODE + STOP BITS	DATA BITS	
	WITH PARITY: ODD, EVEN, MARK OR SPACE	WITH PARITY: AUTOPARITY OR TRANSPARENT
5+1.5	5	5
7+1	6	7
7+2	6	7
8+1	7	8
8+2	7	8
9+1	8	8

Table 2-1 Character Codes and Parity

The code 8+1 with Mark, Space, Odd, or Even parity means seven data bits, one parity bit and one stop bit. The code 8+1 with Transparent parity means 8 data bits and one stop bit.

AUTO (Autoparity) means that either odd or even parity is acceptable. To make autoparity work, set your DTE to 7+1, Odd or Even parity. Set the SC1 to 8+1 and Autoparity. Press RETURN to set the code and parity selections.

TRANS (Transparent) parity means that parity is ignored.

Terminals using the Baudot code normally require a 5-bit (5+1.5) code. ASCII and EBCDIC normally require an 8-bit code.

Some word processing and process control equipment use a nine-level character format of eight data bits and one parity bit. Nine-level designation refers to data plus parity bits, ignoring the start-stop character framing. The nine-level code option can be used with any other option except the HP 3000 Protocol Assistance option.

Transmitted data is parity checked by the local DCX before transmission across the DCX network. If a parity error is detected, the parity error character is transmitted along with the character believed to be incorrect.

Line Speed/Character Code Combinations

The SC module has no restrictions on line speed/character code combinations (but note that some combinations might cause problems at the distant end when set to Down Line Load).

2.3.2 V.24 Control Signals

Four V.24 control paths are provided in each direction in the SC1/V.24 and SC2. These are DTR, RTS, DRS and BO from the DTE, and DSR, CTS, DCD and RI to the DTE. They are normally used either:

a) to allow a pair of DCX units to emulate modems (e.g. passing a Request To Send input as a Carrier Detect output), or

b) to pass modem control signals (e.g. Ring Indicator, Data Set Ready) when the out-stationed DCX is used to terminate a number of dial-up lines.

Local Looping of RTS

When terminals or computers are directly connected at both ends, each channel's Request To Send (RTS) is normally used to raise Clear To Send (CTS) on the same interface. However this feature can be disabled if CTS is to be raised by the remote equipment, for instance to allow a true RTS-CTS delay for half-duplex working.

Control Timing

In order to preserve the timing relationships between control signals, the DCX family uses an encoding technique to ensure that the suppression of idle time (which is a feature of intelligent multiplexers) does not disturb those relationships.

Encoding of Controls

V.24 control signals are encoded as nine bit characters and passed into the buffer. The same method is used to send loopback set/reset commands and the channel validate function (described in Section 7).

2.3.3 Flyback Buffering

Some terminals may lose the first character on a line when connected to a statistical multiplexer. This occurs when terminals which require VDU flyback or carriage return delay, are provided by the CPU with a delay consisting of a continuous mark. Statistical multiplexers do not normally pass such pauses, and consequently there may be insufficient time for the flyback or carriage to return. A similar problem may be encountered with other control functions.

The SC module can obviate this problem by inserting a time delay after characters which usually result in a carriage return. This is known as 'flyback buffering'.

The characters detected are determined by the speed/code setting for each port. They are:

CR, LF, FF, HT and VT, in ASCII code (8- or 9-level)

CR, LF, NL and EOT, in BCD code (7-level).

2.3.4 Buffer Overflow Protection (BOP)

This selectable feature allows the buffer to be protected from overflowing, by controlling the data input from terminals which have flow control capability.

When the DCX buffer reaches 75% capacity, the DCX suspends transmission between the pair of ports that is contributing most to buffer buildup. It does this either by sending an X-OFF device control character to the port causing the overload or by lowering CTS. The method used depends on the requirements of the devices attached to the ports. If this does not reduce the buildup, the DCX suspends transmission between the next pair of ports contributing most to buffer buildup, and so on. When the buffer contents are lowered to 50% capacity, transmission is resumed for all affected ports.

(The threshold levels of 75% and 50% allow additional data to be input from terminals which do not respond immediately to flow control.)

2.3.5 System Message Option

The system monitors buffer overflow and composite link status, and transmits appropriate messages on low speed channels that have been selected to receive them. Messages are in ASCII code.

If terminals are unable to respond to the buffer overflow protection measures and buffer overflow occurs, data will be lost by the channel with the longest buffer queue. The message **DATA LOST** can be transmitted on the affected channel.

If the composite link fails, the message **LINK DOWN** is sent on each selected channel at each end of the link, and their V.24 controls are dropped. When the composite link is restored, the V.24 controls are reinstated, and the message **LINK UP** is sent.

2.3.6 Terminal Flow Control (TFC)

Some terminals and computers have features which allow the terminal to control transmission from the computer by sending X-ON/X-OFF control codes, or by using the Data Terminal Ready signal to stop and start data transmission. The TFC feature allows the same control to be used through the DCX link without losing the data which is temporarily stored in the DCX buffers. When a 'stop' command is received, the DCX:

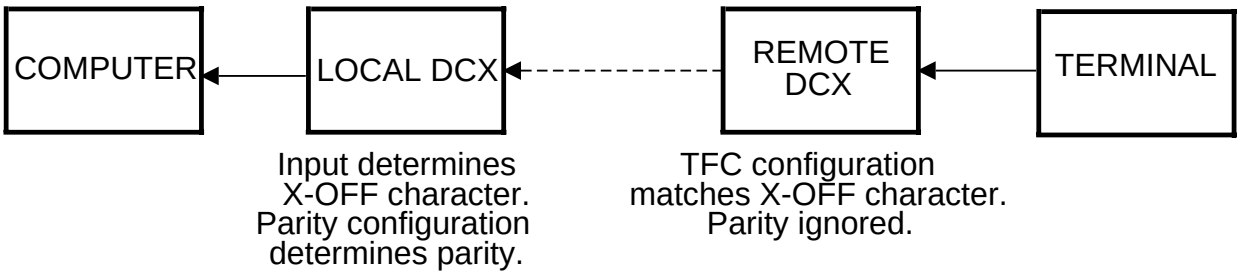
1. Stops transmission to the terminal immediately.
2. Passes the command to the CPU, which will stop transmitting.
3. Stores any characters received in the mean time until:
   a) the terminal sends a 're-start transmission' command, or
   b) the system is re-initialised, or
   c) the channel is reset.

The SC module allows selection from a wide range of control characters and signals to perform X-ON and X-OFF functions.

2.3.7 X-ON/X-OFF Control and Parity

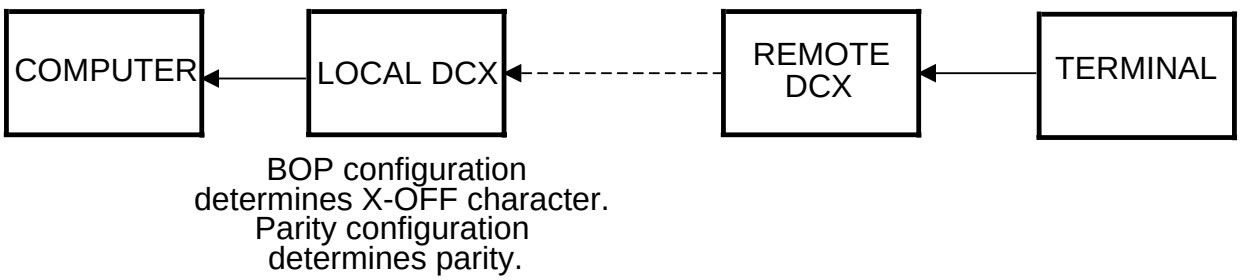
Two linked DCXs may use X-ON/X-OFF control with either the Terminal Flow Control (TFC) feature, or the Buffer Overflow Protection (BOP) feature or both. The X-ON feature can be any ASCII character in the range Hex (01 -1A); the X-OFF can also be any ASCII character in the range Hex (01-1A). DCX multiplexers can not only match the X-OFF of both the terminal at the remote site and the computer at the local site, but can also match the parity requirement for control characters output.

If only the TFC feature is used, the operation is:



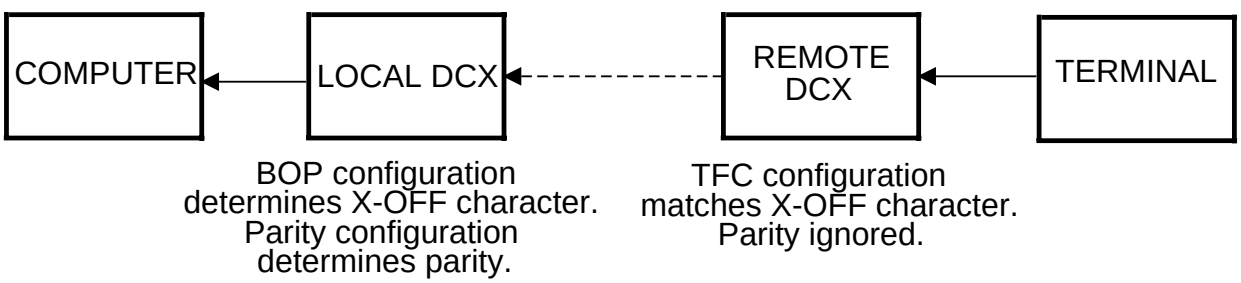
The remote DCX is matched to the X-OFF character to be input from the terminal by the channel TFC configuration (parity is ignored). When an X-ON or X-OFF character is received it results in the same character being output to the computer, with its parity determined by the channel's parity setting on the local DCX.

If only the BOP feature is used, the operation is:



The character output for X-OFF is determined by the channel BOP setting, and its parity is determined by the parity configuration on the local DCX.

If both features are selected, the operation is:



The remote DCX is matched to the X-OFF character to be input from the terminal by the channel TFC configuration (parity is ignored). The character output to the computer for X-OFF is determined by the BOP configuration on the local DCX both for BOP and for TFC (regardless of

which character is input at remote). Its parity is determined by the parity configuration on the local DCX.

Should there be a conflict between the two features, for example if the local buffer is in overload (X-OFF) when a TFC X-ON request is received from remote, the X-ON request will be delayed until the overload has cleared.

2.3.8 State of Clear To Send (CTS)

The state of the V.24 control signal CTS depends on several factors according to the options that have been selected. Table 2-2 shows these factors for all combinations of BOP and local/remote CTS selection.

		LOCAL END: CTS SOURCE	
		LOCAL	**REMOTE**
LOCAL END: BOP BUFFER OVERFLOW PROTECTION	**DISABLED**	1. Composite link state 2. LOCAL RTS state	1. Composite link state 2. REMOTE DRS state
	OUT OF BAND (CTS)	1. Composite link state 2. LOCAL RTS state 3. LOCAL buffer state 4. REMOTE terminal flow control state	1. Composite link state 2. LOCAL buffer state 3. REMOTE terminal flow control state
	IN-BAND (X-ON, X-OFF CHARS)	1. Composite link state 2. LOCAL RTS state	1. Composite link state 2. REMOTE DRS state

DRS = V.24 control Data Rate Select

Table 2-3 Factors Affecting CTS State

2.3.9 Port Reset

A 'port reset' enables a user to reset the channel at both ends of the DCX link. It resets the Terminal Flow Control state to 'enabled', and stores a port reset warning indicator on the affected port.

2.3.10 USO Connect/Disconnect Detection

This feature is for use in DCX networks where a USO (User Switching Option) is present.

The SC module monitors the incoming data and detects the selected USO connect character. The occurrence of the character causes a DCX control to be inserted after the USO connect character into the data for transmission to the remote DCX. The internal control code can subsequently be used as a Connection or Disconnection Event. The USO connect character is selectable in the range 14-1EH for each channel. The appropriate USO ports must be configured for <CTRL T> connection/ disconnection events.

2.3.11 HP 3000 Protocol Assistance

This feature allows DCXs to handle the HP 3000 block mode ENQ/ACK protocol.

When using this protocol, the CPU sends a block of data followed by an ENQ (ASCII 05) character to a terminal. When the terminal has processed the block, it responds with an ACK (ASCII 06) character to indicate that it can accept further data. This process is repeated indefinitely.

Problems occur when the protocol is running through a standard statistical multiplexer, because the ENQ and ACK can be subjected to long network delays, which increase the response time and reduce the channel throughput.

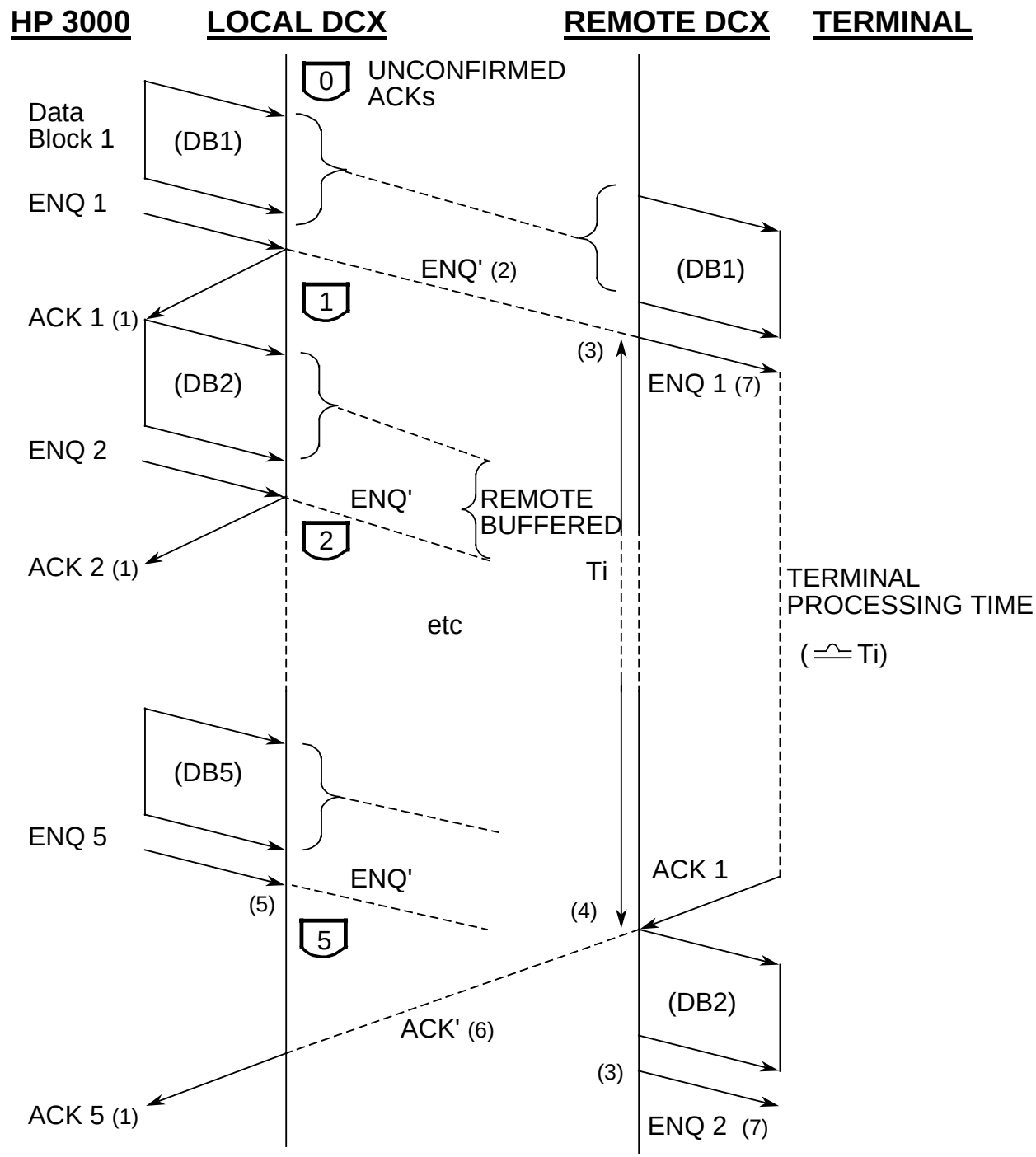
The DCX HP 3000 Protocol Assistance option overcomes these problems by responding to the CPU's ENQs with ACKs if the conditions are right to do so. Therefore it provides faster response and higher throughput when using HP's block mode protocol.

The following points should be considered before selecting this option:

HP 3000 support can only be enabled with channels configured for 8-level character code, otherwise an error indication will be reported.

HP 3000 support must be enabled at both ends of a connection. No error indications will be reported if one end does not have the option enabled (but under this condition ENQ and ACK control characters may be lost).

The following paragraphs discuss normal operation, timeout recovery, port reset/data lost recovery, and loopback recovery. Figure 2-1 gives a sequence chart of the protocol assistance.



NOTES:
(1) Parity of ACK according to local system option
(2) ENQ' = DCX control code representing ASCII ENQ
(3) HP X-OFF state entered
(4) HP X-ON state entered
(5) 5 unconfirmed ACKs, therefore no local response to CPU's ENQ
(6) ACK' = DCX control code representing ASCII ACK
(7) Parity of ENQ according to remote system option

Figure 2-1 HP 3000 Protocol Assistance

Normal Operation

During normal operation, the DCX channel connected to the CPU responds to the CPU's ASCII ENQ with an ASCII ACK (with appropriate parity). Meanwhile it translates the ENQ into a DCX control code and forwards it to the remote channel.

On receipt of the control code, the remote channel transmits an ASCII ENQ (with appropriate parity) to the terminal, and enters the HP X-OFF state. Any subsequently received information (from the network) will be held by the remote buffer.

When the terminal responds to the ASCII ENQ with an ASCII ACK, the remote channel will re-enter the HP X-ON state and data transmission to the terminal will resume. The terminal's ACK will then be translated into a DCX control code and returned to the local channel. (Note that this control code will not be re-translated into an ASCII ACK and will not be sent to the CPU (as the ASCII ACK has already been returned); it is merely used as a confirmation of the receipt of the terminal's ACK in response to the CPU's ENQ.)

To prevent possible remote buffer overload a maximum of five unconfirmed ACKs is allowed, hence the local channel will respond to the CPU's ASCII ENQ with an ASCII ACK if the number of unconfirmed ACKs is less than five. When the unconfirmed ACKs count reaches five, the local channel will not respond to the CPU's ASCII ENQ until an ACK DCX control code (confirmation ACK) is received.

To avoid situations such as the terminal failing to respond to the ENQ with ACK (when the remote channel is in HP X-OFF state), the DCX goes into the Timeout Recovery procedure.

Timeout Recovery

A ten second timeout is activated automatically upon receipt of an ENQ DCX control code. This timeout mechanism will only be suspended if either an ASCII ACK is received from the attached DTE or the timeout has expired.

When the timeout expires on a channel, the DCX auto-confirms the missing ASCII ACK by returning an ACK DCX control code to the remote channel, forcing the channel to re-enter the HP X-ON state.

The purpose of this is threefold:

a) To prevent erroneous data occupying the remote buffer.

b) To allow simple (single-ended) test procedures.

c) To prevent (unattended) remote channels remaining in the X-OFF state.

Port Reset/Data Lost Recovery

When a port reset (see Section 2.3.9) is initiated by the supervisor, the count of the number of unconfirmed ACKs is reset to zero at both ends of the connection. This is done to ensure that the HP Protocol Assistance will always start from a known state whenever a port reset occurs.

Whenever data loss occurs on a channel, whether due to buffer overflow on the local or the remote DCX, the count of the number of unconfirmed ACKs will be reset to zero (on that channel only), since data lost may include ENQ/ACK DCX control codes. It is also required for DCX USO connections where re-routing of IMPs can lead to data (including ACK confirmations) being lost.

Local/Remote Loopback Recovery

The count of the number of unconfirmed ACKs is reset to zero at both ends of a connection whenever the supervisor activates/de-activates the local/remote loopback test function.

The loopback testing operation for the HP protocol function is based upon the timeout recovery procedure, therefore it is necessary to ensure that the protocol starts from a known state when the loopback test is enabled or disabled.

2.3.12 Tandem T-pause Support

This feature allows DCXs to support Tandem systems with the T-pause feature. These systems use a special variant of out-of-band flow control where pin 12 on the V.24 interface is used as the control flag. Pin 12 is set to the OFF condition when it can accept data. When set to ON, the DCX will stop transmission.

In addition the system uses a block mode of operation: once the block has begun the DCX cannot flow-control the device until the end of block (half-duplex front end software). However, the block size is fixed at 261 bytes, so normal buffering within the DCX is able to cope with the situation.

The DCX Tandem T-pause feature can only be enabled if either out-of-band terminal flow control or buffer overflow protection is enabled.

The terminal generates RTS (pin 4) and looks for CTS (pin 5), DSR (pin 6), and DCD (pin 8). Loss of DSR (pin 6) will disconnect a circuit.

Suitable cables need to be used to enable operation between tandem host and tandem terminal, or tandem host and alien terminal, using conventional out-of-band flow control to work to the tandem host. These are detailed in Appendix B.

2.3.13 Wang 2200 Flow Control Support

This DCX feature provides a special flow control to support Wang 2200 Computer systems. These systems operate with a CRT, either as a standalone device or with any Wang printer slaved to it. The Wang CPU recognises the difference by receipt of special 9-level code X-ON/X-OFF characters from each device. To X-OFF the CPU, the CRT issues the FA hex character, the printer FB; and to X-ON the CPU, the CRT issues F8, the printer F9.

In a typical configuration, the SC module Wang flow control submenu setting of DTE determines the terminal end of a Wang 2200 system, and selection of Host determines the CPU end. Selecting host provides the BOP function, whereas selecting DTE provides the TFC function. Note that the standard BOP and TFC options must be disabled when using Wang flow control. See Figure 2-2 for a typical configuration.

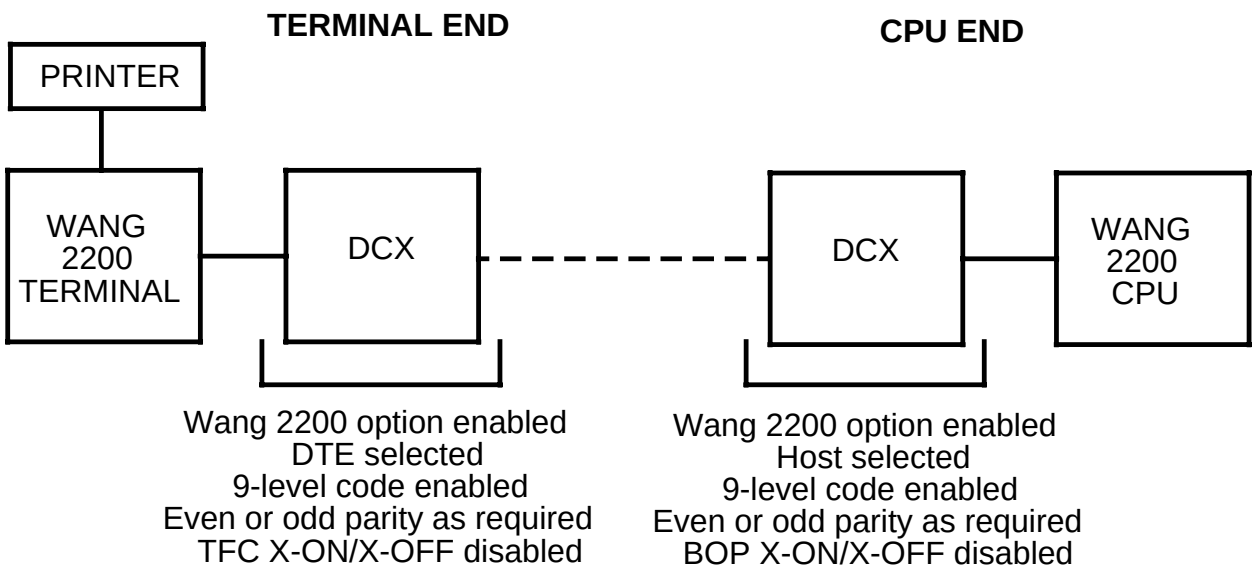


Figure 2-2 Configuration for Wang 2200 Support

Receipt of either a CRT or printer X-OFF by the DCX at the terminal end causes entry into the normal TFC X-OFF state (see Section 2.3.7 for action taken). However, the normal TFC X-ON state is only re-entered when both the CRT and printer are ready to receive data. This means that if both CRT and printer X-OFF characters are received, then the DCX only restarts transmission when both CRT and printer X-ON characters are received.

At the CPU end, in response to the TFC X-OFF/X-ON from the terminal end or for BOP X-OFF/X-ON, the DCX always transmits both the CRT and printer X-OFF/X-ON characters to the CPU regardless of whether a printer is remotely attached or not. This may result in a lock-up if the remote operator requests output to the printer (which is not attached). However the system can recover by initiating a 'soft reset' at the terminal.

The Wang 2200 terminal also uses a transparent mode of working. This allows the flow control characters (F8, F9, FA, and FB) to be sent as data by preceding each character by the FC hex character. When an FC character is received, the DCX ignores the next character received from a flow control point of view.

The Wang 2200 terminal also sends X-ON characters to the CPU at approximately four-second intervals as a 'keep-alive' indication and to inform the CPU of the CRT/printer configuration. To avoid any unnecessary overheads, the DCX does not pass these X-ON characters across the DCX network; instead they are regenerated by the DCX at the CPU end.

2.3.14 Inactivity Timeout

In a DCX 860 or 870 network a user may sometimes 'log off' from a process without physically disconnecting from the computer port. When contending for ports this may drastically reduce the number of free ports available to legitimate users.

Enabling the inactivity timeout feature prevents this situation arising. On recognition of a special DCX control code from the USO, the SC module starts a timer running. The timeout value is configurable for each channel by the supervisor to expire after a time between 5 and 30 minutes. Either transmit or receive data activity resets this timer, but V.24 signal status has no effect.

If the timer expires, the action taken by the SC module depends upon the level of USO in the system. For USOs 1, 2 and 3 the SC module sends a control code to the USO which results in a disconnection, but only if the USO port is configured for disconnect event number 5 (CONTROL T). For all other USOs, the SC module sends a different code to the USO, which results in a disconnection regardless of the disconnect event configured for that port.

2.3.15 User Escape Character

For any channel using an 8- or 9-bit code, the supervisor may specify a 'user escape character'. The SC module monitors the incoming data for that character. If the character is encountered the SC module outputs the Supervisor Logon banner to the port. This allows the user to customise that channel by changing any of the following: Local Echo, System Messages, Parity, and Special Flow Control (the user procedures are explained in Section 5).

2.3.16 Local Echo

Simple terminals that do not provide automatic error correction often use echoplex as a substitute. In the echoplex mode, characters keyed in at a local terminal must be echoed back by the remote computer for visual checking by the operator. However, where long delays are present (as in satellite circuits), on poor communications lines requiring frequent retransmissions, or on overloaded circuits, the echoes are delayed, resulting in operator inconvenience.

With the SC module Local Echo option selected, most outgoing characters are echoed locally by the DCX before transmission across the network. The characters echoed are governed by the character code employed (see Table 2-3). Characters having system significance (e.g. <X-ON>, <X-OFF>, <CR> etc) are not echoed.

When using the Local Echo option, the following points should be considered:

- <CR> and <LF> are echoed without combining as <CR/LF> pairs.
- User applications that echo data but not passwords can be compromised since the local echo option cannot distinguish between data and passwords.

- Loopback tests and self-mapped channels cause double echoes of input characters (i.e. cause each character to be echoed twice).
- When used within a USO network, the port configuration must be set with echo disabled to prevent a double echo of input characters.

CODE	CHARACTERS ECHOED
5-level Baudot	All
7-level BCD	All
8-level ASCII (7 data bits)	All printing characters and cursor controls BS, HT, LF, VT, FF and CR
9-level ASCII (ISD) most significant bit off	Same as 8 level ASCII
9-level ASCII/User most significant bit on	All

Table 2-3 Local Echo Characters

2.4 Physical Description

The SC module is a single standard size card occupying one slot in the DCX master or extension frame.

The SC module stores its current configuration details in battery-backed memory on the card. The battery has a 10-year life, allowing the card to be removed for storage or relocated without loss of configuration details.

2.4.1 Front Panel

The front panel contains indicators and controls, and is illustrated and described in Section 6.

2.4.2 Reset Pins

A pair of reset pins is located on the card behind the card release lever. They are intended for use by Cray Communications personnel. They disrupt data and should not be used except under supervision.

2.4.3 Channel Ports

The connector on the rear of all versions of SC modules is connected by cable to four 25-way D-type sockets at the back of the parent DCX. Full details of these ports and the cables required to connect them are given in Appendix B.

3 Installation

3.1 Introduction

This section describes the SC module physical installation details; the 'soft' configuration procedures are described in Section 4. Port interfaces and cables to connect ports to customer-provided equipment are described in Appendix B.

An SC module may be used either to provide additional DCX channels, or to replace an existing LSC module.

All SC modules are shipped from the factory with their board-mounted jumpers set for normal operation. They are used only by the factory or Cray Communications service technicians and should not be changed. (Note that installation of the cards with the jumper removed from the BRAM connect/disconnect pins will result in damage to the BRAM.) The SC1/CL20 modules have a set of switches that must be changed if the factory settings are not suitable. Full details are given in Appendix B.3.

When the SC module is used as a replacement for an installed LSC, simply exchange the modules in the card slot and set the options to match. Option features, cable connections and channel assignments are identical. (There are a few minor adjustments relating to adjacent channel speeds that might require attention. These adjustments are explained in Section 4.4.1.)

If the SC module is to add new channels to the DCX, a new card slot must be selected, a new ribbon cable installed, new external equipment connected, and the device and channel maps expanded if necessary (see Section 3.2).

If the parent unit is a DCX 860 or 870, refer to the warning on page 0-2 of this manual.

3.2 Adding an Additional Card

3.2.1 Ribbon Cable Installation

The LSC ribbon cable mounts inside the DCX frame connecting from the rear of the SC module to four new ports on the rear panel of the DCX. The cable includes a single large connector at one end for the SC module connection, and a small panel with four port connectors on the other end for the DCX rear panel.

To install the ribbon cable, select the next available (unused) LSC card slot in the card cage. Release the two top rear panel fasteners and hinge down the rear panel.

Place the cable assembly inside the DCX card cage with the single connector end under the parent board and in line with the selected LSC slot, oriented with the connector pin 1 at the top. Install the connector with the hardware supplied, using the adjacent LSC connector as a guide.

Dress the ribbon cable carefully through the rear of the cabinet and mount the end with the four connectors on the cabinet rear panel in the next sequential four-channel LSC position.

3.2.2 Installing the Card

Carefully push the card home in the slot.

3.2.3 Mapping Requirements

To accommodate new LSC channels, the size of Device 0 in the DCX 840/860/870 Device Map must be increased by four, and the DCX Channel Map must be re-entered to route the new channels. For a DCX 860 or 870, the new channels may be configured as ports or mapped as Permanently Mapped Channels (PMCs). Refer to the DCX manuals for these procedures.

3.3 Powering Up the SC Module

When the SC module is powered up, it goes into a self diagnostic routine of seven sequential tests. If the tests are completed satisfactorily, the 7-segment indicator flashes P three times. The card then displays 1 on the 7-segment indicator, and the LEDs indicate the conditions on the Channel 1 interface. The SC module is then ready to be configured by the procedures in Chapter 4.

If a test fails, the letter F is displayed, alternating with an error code, and all the LEDs go out. Refer to Chapter 7 Test Procedures and Appendix C Diagnostic Fault Codes.

4 Supervisor Procedures

4.1 Introduction

This section describes the supervisor's control and operational capabilities when accessing the SC module from a locally attached terminal, or from a terminal mapped to it across the network, or from an NCAM device. These are divided into five major areas:

- **Channel Configuration:**
  You are provided with an extensive set of options and their variations for each channel.
- **Status Display:**
  You can display on a single screen the current status of all loopbacks and eight V.24 control pins on each of the four LSC channels.
- **Channel Diagnostics:**
  You are provided with a complete set of loopback, validate, channel reset and default controls in software. Hardware and software issue numbers and checksums can also be examined.
- **Administration:**
  You can dump or load channel configurations, change or revert to the default password, and allow or deny access by a remote supervisor.
- **Supervisor Configuration:**
  You can separately select your supervisor channel's printer handling, line feed/carriage return, and terminal flow control features.

4.1.1 Configuration Defaults

The SC module is shipped from the factory with a permanent set of configuration defaults in software. The defaults are shown in the example Configuration menu in Section 4.4.

4.1.2 Conventions Used in this Manual

Alpha characters may be entered in either upper or lower case, but in this manual are shown in upper case.

The carriage return character is shown as <CR>. This is usually generated with the terminal's RETURN key. The space character is shown as <SP>.

The CONTROL key is shown as ^ . For example to enter ^A hold down the CONTROL key and press the letter A.

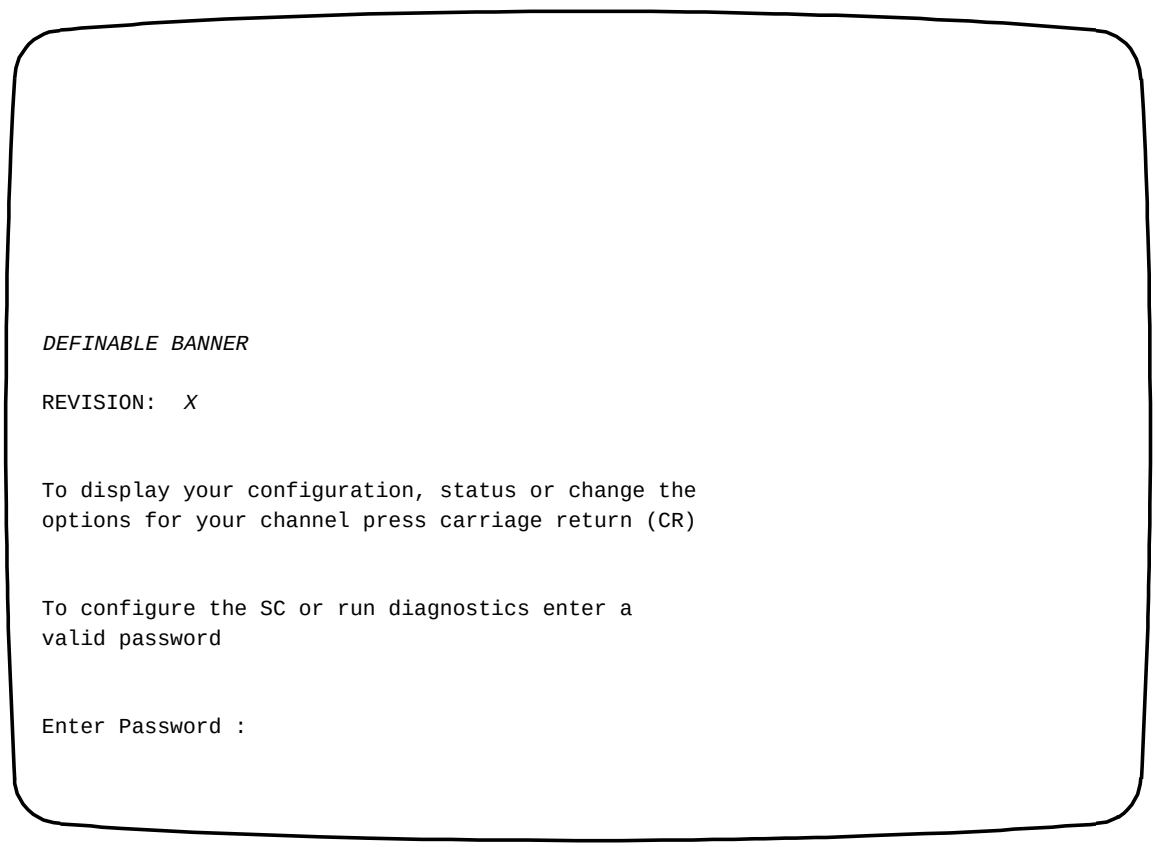
4.2 Accessing the SC Module

To prevent command conflicts, the SC module is designed to permit only one person at a time to access the module's software, on a first come, first served basis. There is also a fixed 5-minute inactivity timeout on software access.

To contact the SC module:

1) Ensure that the terminal you intend to use conforms to the requirements for a supervisor terminal in Appendix A.
2) Connect your terminal directly to a channel on the SC module and power up all equipment. (Alternatively, you can access the SC module remotely by mapping your terminal to one of its channels.)
3) Log on by entering <CR> followed by the user escape character (default character is ^A).

The SC module should respond with an introductory screen intended for both the user and the supervisor. The screen text provides the next instructions.



(The Definable Banner can be set in the Administration Menu.)

To access the Supervisor Menu, enter the current password (this will either be the default password, LOGON, or the password that was last configured in the Administration menu), followed by <CR>.

The screen should then display:

Local or remote access L/R:

If you intend to access the SC module connected to your terminal, enter L for Local, followed by <CR>. If you wish to configure another SC module, whether at your node or remote, ensure that the channel to which you are locally connected is mapped to a channel on the desired SC module, then enter R<CR>. If you are logged on as Remote Supervisor, all menus are preceded by the word **REMOTE**. The Supervisor menu should then be displayed.

The logon sequence and main menus are shown in Figure 4-1.

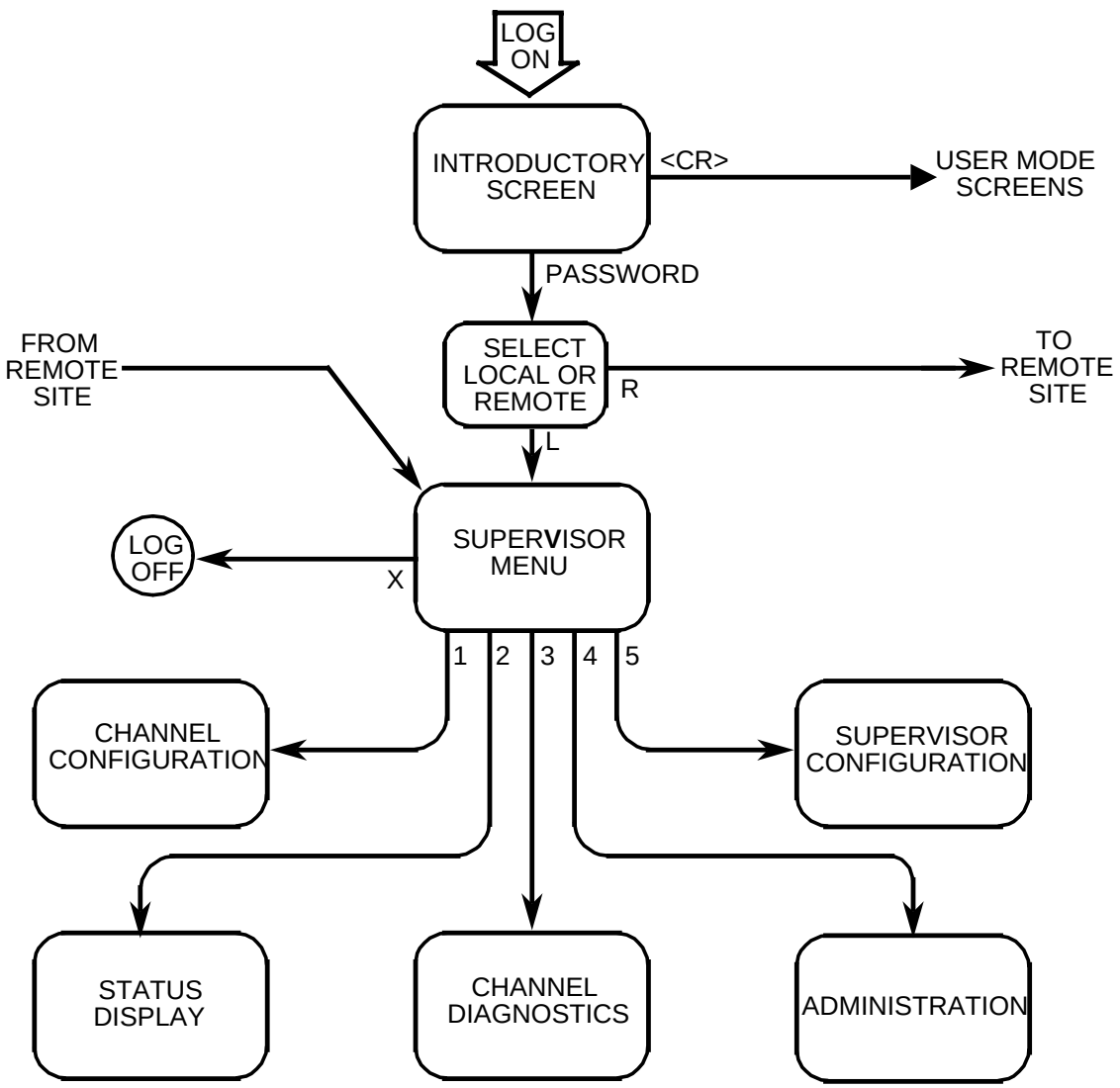
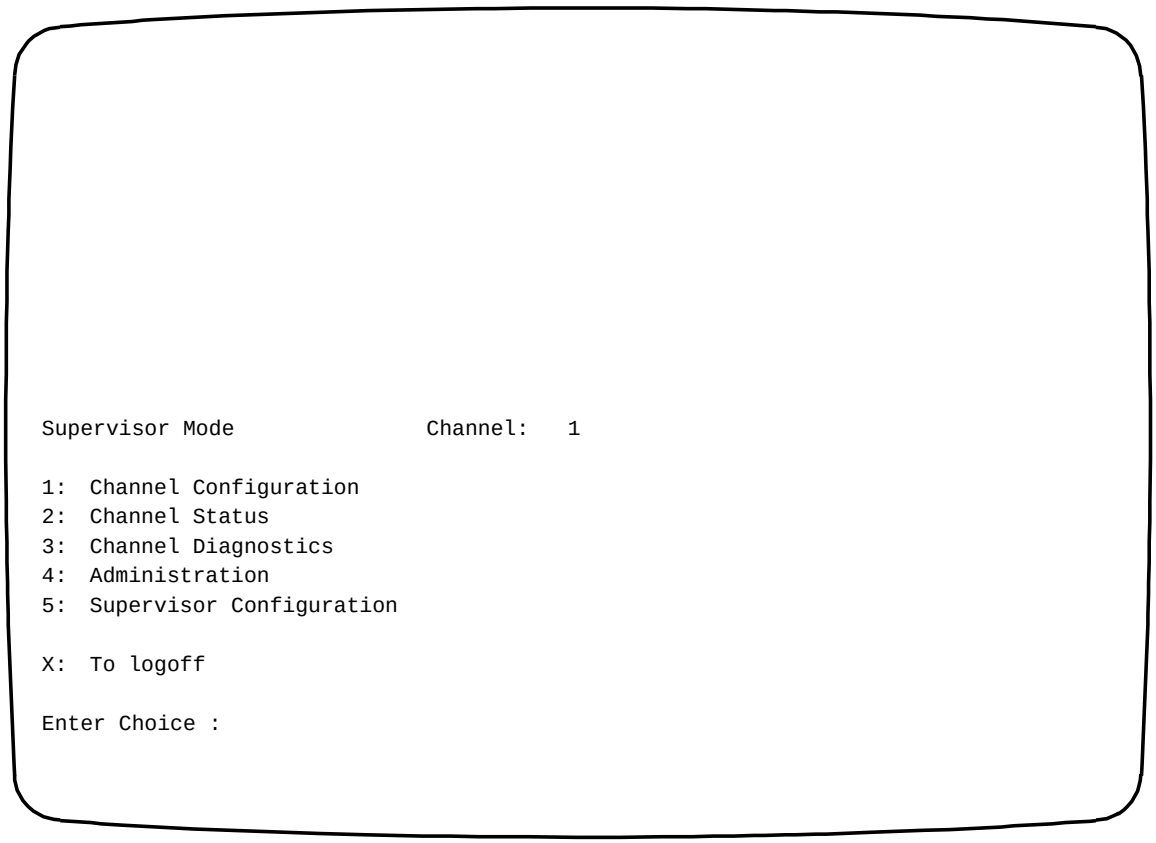


Figure 4-1 Supervisor Menu Map

4.3 The Supervisor Menu



The Supervisor menu indicates the channel you are using at the top of the menu, then lists five major functions. Select the function you require followed by the channel of interest. You are then guided into the relevant option submenus.

To return from a function menu to the Supervisor menu, press X (as indicated by the prompt at the bottom of the screen) followed by <CR>.

From option submenus, you must enter a selection to escape. If no change in the menu is desired, enter X. If a change is desired, enter the new value. Follow either entry with <CR>.

On some options you are requested to confirm your entry, whether a change has been selected or not. Entering Y<CR> effects the change if one was selected, or retains the status quo if not, and in either case returns you to the Supervisor menu. Entering N<CR> returns you to the submenu to reselect.

At all prompts, enter the desired selection, followed by <CR>. If an error is entered, press BACKSPACE and enter the correct selection.

The SC module provides error messages, advisories and prompts. Error messages explain the error and usually include the advice 'press RETURN to continue'. In all cases <CR> returns you to a previous screen to make a new selection.

4.4 Channel Configuration Menu (Supervisor Menu: 1)

In answer to the prompt requesting the number of the channel to be configured, enter the desired channel number (1 to 4). The channel's Configuration menu will then be displayed.

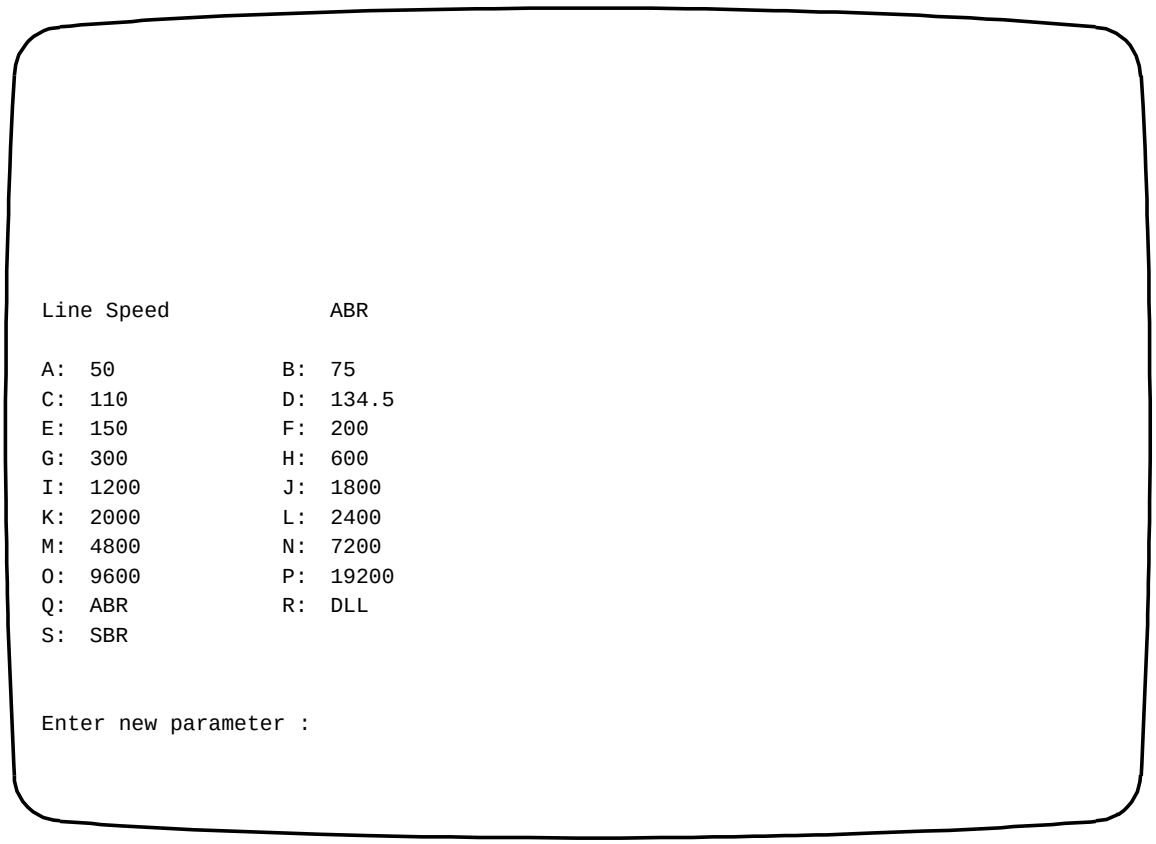
```
Channel Configuration         Channel:  1

A:  Line Speed                      ABR    B:   Local Echo                    OFF
C:  Character Code                  8+1    D:   USO Connect Character         OFF
E:  System Messages                 OFF    F:   Parity                      TRANS
G:  Term. Flow Control X-ON         DC1    H:   Term.  Flow Control X-OFF     DC3
I:  Flyback Buffering               OFF    J:   Buff. Overflow Prot X-ON      OFF
K:  Buff.  Overflow Prot X-OFF      OFF    L:   CTS to follow RTS              ON
M:  Special Flow Control           NONE    N:   User Escape Character          ^A
O:  Inactivity Timer                OFF    P:   Parity Error Character          *
Q:  Host ABR (for DLL)              OFF    R:   Host Control Monitor          OFF
S:  Setup Pins                             T:   Disconnect Sequence
U:  Data Escape Character           OFF    V:   Data Escape Count               2
W:  Data Escape Mode               DATA

1.  Configure all Parameters
2.  Copy Options to another Channel
3.  Copy to all Channels
4.  Load default settings

X:  For previous menu

Enter Choice :
```

This menu offers several alternative procedures:

- Configure one or more options individually (selections A to W), one channel at a time.
- Configure all parameters on one channel by sequencing through them (selection 1, near the bottom of the menu).
- Copy one channel's configuration to another channel on the same SC module (selection 2).
- Copy one channel's configuration to all channels on the same SC module (selection 3).

To select a procedure, enter the identifying letter or number in the space following the Enter Choice: prompt (followed by <CR>).

4.4.1 **Line Speed** (Channel Configuration Menu: A)



Select a line speed suitable for the channel, subject to the adjacent channel restrictions discussed below (these restrictions are only minor, affecting little-used speed combinations).

Adjacent Channel Line Speeds

Speeds of adjacent channels must be compatible. Adjacent channels are defined by the hardware as channels 1/2, and channels 3/4.

There are two speed tables, shown in Table 4-1. To determine compatible speeds for adjacent channels, select speeds from **one** of the speed tables (the speeds may be identical or different).

This requirement applies regardless of each channel's application.

For example speeds for channels 1 and 2 could be 200 and 300 bps, or 200 and 2400 bps. They could not be 200 and 150 bps.

The recommended maximum aggregate input for the SC module when using flow control is 38.4 kbps. If no channels use BOP the maximum

SPEED TABLE 1 (bps)	SPEED TABLE 2 (bps)
50	75
110	110
134.5	134.5
200	150
300	300
600	600
1200	1200
2400	1800
4800	2000
7200	2400
9600	4800
	9600
	19200

Table 4-1 Adjacent Channel Line Speed Tables

aggregate input is 9.6 kbps. This however can be exceeded in certain applications.

Line Speed Facilities

ABR, **DLL** and **SBR** are explained in Section 2.3.1.

Configuring SBR

Option S at the Line Speed submenu takes you to an SBR Line Speed submenu where you can configure the transmit and receive rates at both ends of the channel.

The Receive and Transmit Speeds are those of your local DTE. The Reported Receive speed is that which is reported to the distant DTE or USO.

To change a speed, select the appropriate letter to display the speed submenu, then enter the letter adjacent to the desired speed. After entering the letter on the first screen, you are returned to the SBR Line Speed menu automatically. Continue the process until all speeds are entered.

4.4.2 Local Echo (Channel Configuration Menu: B)

The Local Echo menu allows you to switch local echo on (A) or off (B). The significance of Local Echo is explained in Section 2.3.16.

4.4.3 **Character Code** (Channel Configuration Menu: C)

The Character Code submenu displays codes according to code size plus the number of stop bits. Enter the letter for the appropriate code. See Section 2.3.1. Note that the default setting is 8+1 transparent parity, which should be used with a terminal set initially for 8 bits no parity, or 7 bits space parity.

Terminals using the Baudot code normally require the 5-bit code. (Note that 5-bit code is incompatible with User Escape character selection, and an appropriate warning message is generated.) BCD codes require the 7-bit code. ASCII and EBCDIC codes require the 8-bit code.

Only odd parity can be selected for nine-level codes. The DCX 850/860 USO can support a terminal using a nine-level code provided all the characters used during call setup have their most significant bit off.

4.4.4 **USO Connect Character** (Channel Configuration Menu: D)

The USO Connect/Disconnect character is a control code which, when entered at the terminal by a user, either connects that user to the network or, if already connected, disconnects that user. Select the code appropriate to each channel. (The USO must be configured for ^T connect character, but the SC1 makes the necessary translation).

4.4.5 **System Messages (**Channel Configuration Menu: E)

You may select or inhibit system messages. System messages are described in Section 2.3.5.

4.4.6 **Parity** (Channel Configuration Menu: F)

At the Parity submenu, enter the letter beside the desired option.

Set the parity of each SC module channel to match the parity of the device connected to it. The parity of the device at one end of the communications link does not have to match the parity of the device at the remote site; the SC module makes the necessary translations. Transmitted parity is replaced with the parity that matches the receiving device.

4.4.7 **Terminal Flow Control** (TFC)
(Channel Configuration Menu: G (X-ON), H (X-OFF))

Either selection takes you to a submenu at which you enter the letter

beside the desired option. Terminal Flow Control is explained in Sections 2.3.6 and 2.3.7.

4.4.8 Flyback Buffering (Channel Configuration Menu: I)

At the Flyback Buffering submenu enter the letter beside the desired option. Flyback buffering is explained in Section 2.3.3.

Flyback buffering should be off unless leading characters on each line are being lost during transmission.

4.4.9 Buffer Overflow Protection (BOP) (Channel Configuration Menu: J (X-ON), K (X-OFF))

Either selection takes you to a submenu at which you enter the letter beside the desired option. Buffer Overflow Protection is explained in Section 2.1.4.

4.4.10 CTS to Follow RTS (Channel Configuration Menu: L) (V24 version only)

This option allows the CTS state to follow the state of RTS according to Table 2-2, or to remain off.

For devices which use out-of-band X-ON and X-OFF flow control, set CTS to follow RTS off. For those which use in-band X-ON and X-OFF controls, set this feature on.

4.4.11 Special Flow Control (Channel Configuration Menu: M)

This menu allows you to choose the HP3000, Wang or Tandem special flow control options.

They are explained in Section 2.3.11, 2.3.13 and 2.3.12 respectively.

4.4.12 User Escape Character (Channel Configuration Menu: N)

The User Escape Character is a control code which allows a user to escape from data mode and go to the User Mode SC module screens. This menu allows you to select a suitable user escape code. User operation is explained in Section 5.

Note that it is not meaningful to select User Escape character with 5-bit code, and an appropriate warning message is therefore generated.

4.4.13 Inactivity Timer (Channel Configuration Menu: O)

The inactivity timer is used in DCX 860/870 networks. It disconnects the user from the user's selected destination channel if the selected timeout has expired. This feature is explained in Section 2.3.14.

4.4.14 Parity Error Character (Channel Configuration Menu: P)

The Parity Error Character is the character inserted in the data stream in place of the detected corrupt character when the SC module indicates a parity error. If you do not wish a character to be inserted, select **OFF**.

4.4.15 Host ABR (for DLL) (Channel Configuration Menu: Q)

The Host ABR character option allows the DCX to send a predefined character to the host each time a new connection is made. This is required by a host that resets to ABR on user disconnection and needs a specific character to allow it to detect the speed of each new connection. The character used to set the speed of the host can be either <CR> or<LF>.

4.4.16 Host Control Monitor (Channel Configuration Menu: R)

This feature is inoperative and should be set to off.

4.4.17 Setup Pins (Channel Configuration Menu: S)

This submenu allows you to set individual V24 pins to normal, on or off. This feature is useful in accommodating DTEs that are unable to set the needed pins themselves. NORMAL means that the pin is free to change state. If CTS BOP is set, the state of CTS will always obey the rules specified in Table 2-2. It is valid to set DTR high and also set Terminal Flow Control to DTR. In this situation the terminal flow control will operate normally at the local channel but changes in the state of DTR will not appear at the remote side of the connection.

4.4.18 Disconnect Sequence (Channel Configuration Menu: T)

This option lets you configure a unique disconnect message, which is output whenever a USO user disconnection or data inactivity disconnection occurs on that channel.

The message may be up to 40 characters in length, where each of the characters can be any ASCII character other than !, <DELETE> or NULL. Control characters, for example, <CR> and <ESC>, are also valid characters within this string.

Input of the appropriate string is terminated by a ! character. The string can be deleted by entering <SPACE>!.

4.4.19 Data Escape Character

The data escape character is a control code which is inserted into the data stream by the user to inform the SC module to pass the next 'N' characters through without any internal (e.g. XON/XOFF) processing. Where 'N' is the Data Escape Count.

4.4.20 Data Escape Count

This is a value between 1 and 5 which determines how many characters following the Data Escape Character will be passed through without any internal processing.

4.4.21 Data Escape Mode

This option determines whether the Data Escape Character itself is passed to the remote unit (ALL mode) or whether the Data Escape Character is stripped from the data stream (DATA mode).

4.4.22 Configure All Parameters (Channel Configuration Menu: 1)

This option allows you to configure all channel parameters at once. The SC module takes you through the submenus for all parameters in the order listed on the Configuration menu. At any screen, enter the letter beside the desired option. To leave the present setting unchanged, enter the letter for the current selection, displayed at the top of the submenu.

Any changes you make take effect immediately if you are not using the selected channel. If you are using that channel as the supervisor's channel, then the changes take effect when you return to the Supervisor menu.

4.4.23 Copy Options to Another Channel (Channel Configuration Menu: 2)

This option allows you to copy the configuration of one channel to another channel on the same SC module. You are prompted for the new channel number. Enter a number (1 to 4) for that channel. You are then prompted for confirmation. Enter Y to proceed with copying. Enter N to stop the process and return to the Configuration menu.

4.4.24 **Copy to All Channels** (Channel Configuration Menu: 3)

This option allows you to copy the configuration of one channel to the other three channels on the same SC module. You are prompted for confirmation. Enter Y to proceed with copying (current users are interrupted) or enter N to return to the configuration menu.

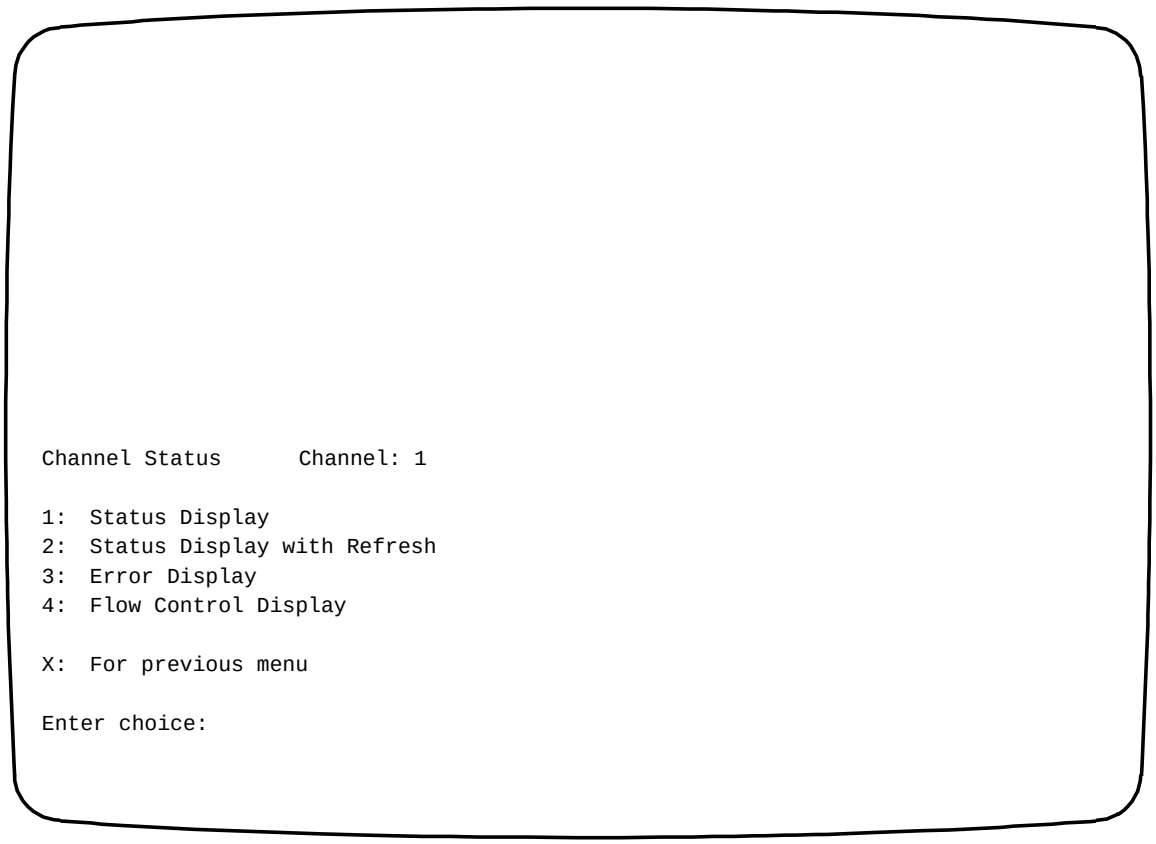
4.4.25 **Load Default Settings** (Channel Configuration Menu: 4)

This option initiates the selected channel's reversion to the default parameters shown in Section 4.4. Before confirming the selection, make sure that your terminal can continue to communicate with the SC module after the defaults are restored.

4.5 Channel Status Menu (Supervisor Menu: 2)

The Channel Status Menu allows you to choose status displays that show the status of eight V.24 control pins, loopbacks, errors and flow control states, on all four channels.

Selecting Status Display brings up the following menu:



4.5.1 Status Display (with Refresh) (Channel Status Menu: 1 or 2)

You can select either a fixed display that can be refreshed by pressing <CR>, or a display that is refreshed automatically every 15 seconds (it will automatically timeout after 5 minutes if left in refresh mode). The format for both displays is the same; see the following example:

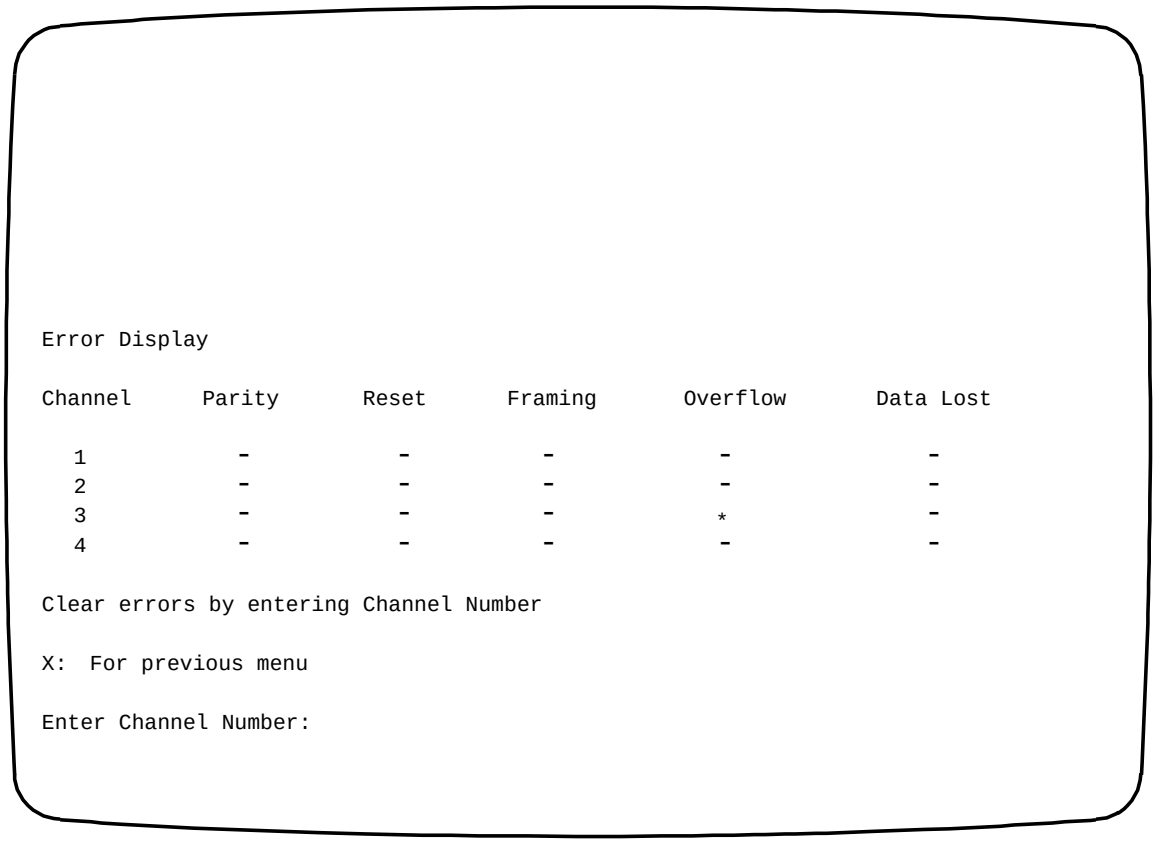
```
Status Display

Interface Type:  Interface type

Channel          Input Signals          Output Signals          Loopbacks
              DRS  BO   RTS  DTR     CTS  RI   DCD  DSR     Local     Remote

   1           *    *    -    -       *    -    -    -        -         -
   2           *    *    *    *       *    -    -    -        -         -
   3           *    *    *    *       -    -    -    -        -         -
   4           *    *    *    *       -    -    -    -        -         -

X:  For previous menu

Press RETURN to continue :
```

The Status Display uses two symbols to report status on the channels:

- * Indicates that a signal is on, or a loopback is set
- - Indicates that a signal is off, or a loopback is not set

4.5.2 **Error Display** (Channel Status Menu: 3)

The Error Display allows you to note and clear channel error indications, for example:



Parity: Character parity error detected.

Reset: Remote channel reset.

Framing: Channel receiver out of sequence with the transmitting device. Usually caused by misconfiguration of the character code.

Overflow: Channel receiver missed reception of a character.

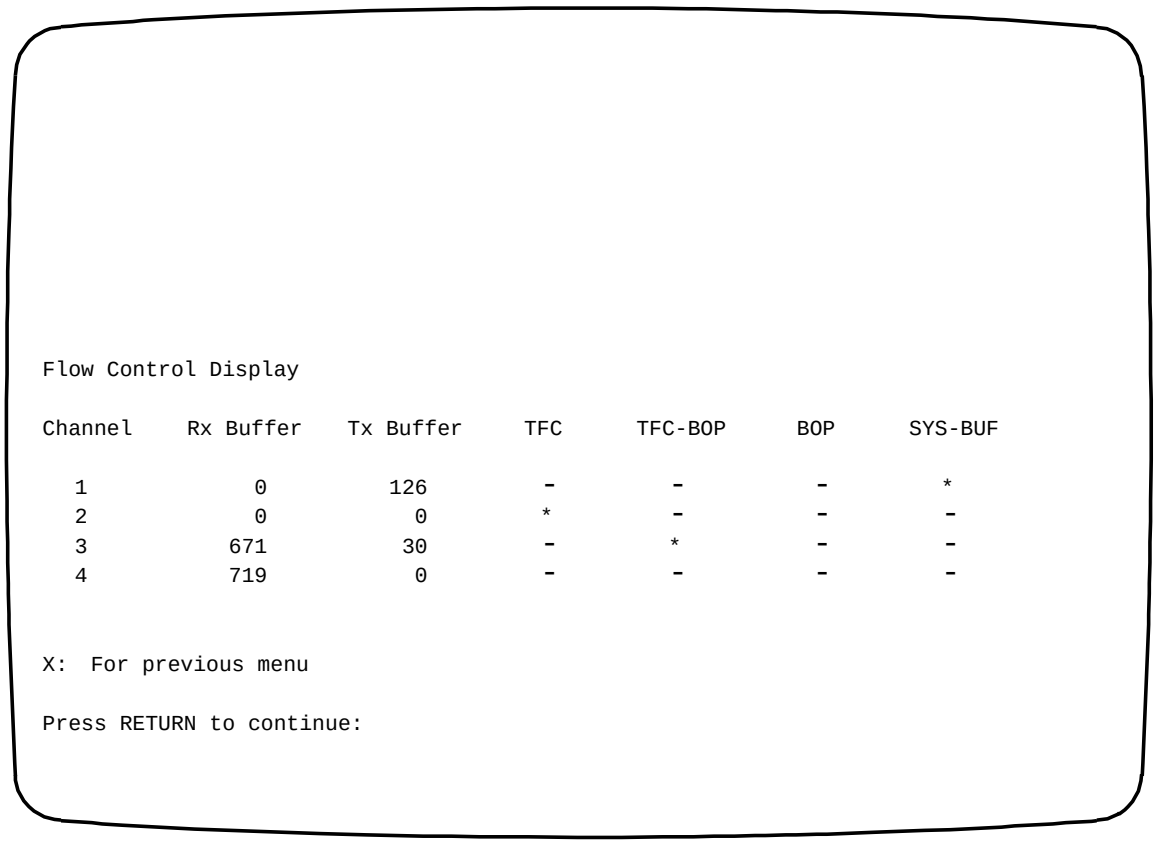
Data Lost: Receive or transmit character memory buffer overflow. This is usually caused by a lack of effective data flow control.

***** Indicates that one (or more) of the above errors has occurred.

- Indicates no errors.

4.5.3 **Flow Control Display** (Channel Status Menu: 4)

This display provides a snapshot inspection of the flow control status on all channels, for example:



```
Flow Control Display

Channel     Rx Buffer    Tx Buffer     TFC      TFC-BOP      BOP      SYS-BUF

   1             0          126         -          -          -         *
   2             0            0         *          -          -         -
   3           671           30         -          *          -         -
   4           719            0         -          -          -         -


X:  For previous menu

Press RETURN to continue:
```

Rx Buffer: Reports the number of characters received by the card and awaiting transmission to the buffer.

Tx Buffer: Reports the number of characters awaiting transmission to the terminal attached to the channel.

TFC: *= Local terminal flow control preventing data from being transmitted to the connected device.

TFC-BOP:*= Remote terminal flow control preventing data transmission to the remote device.

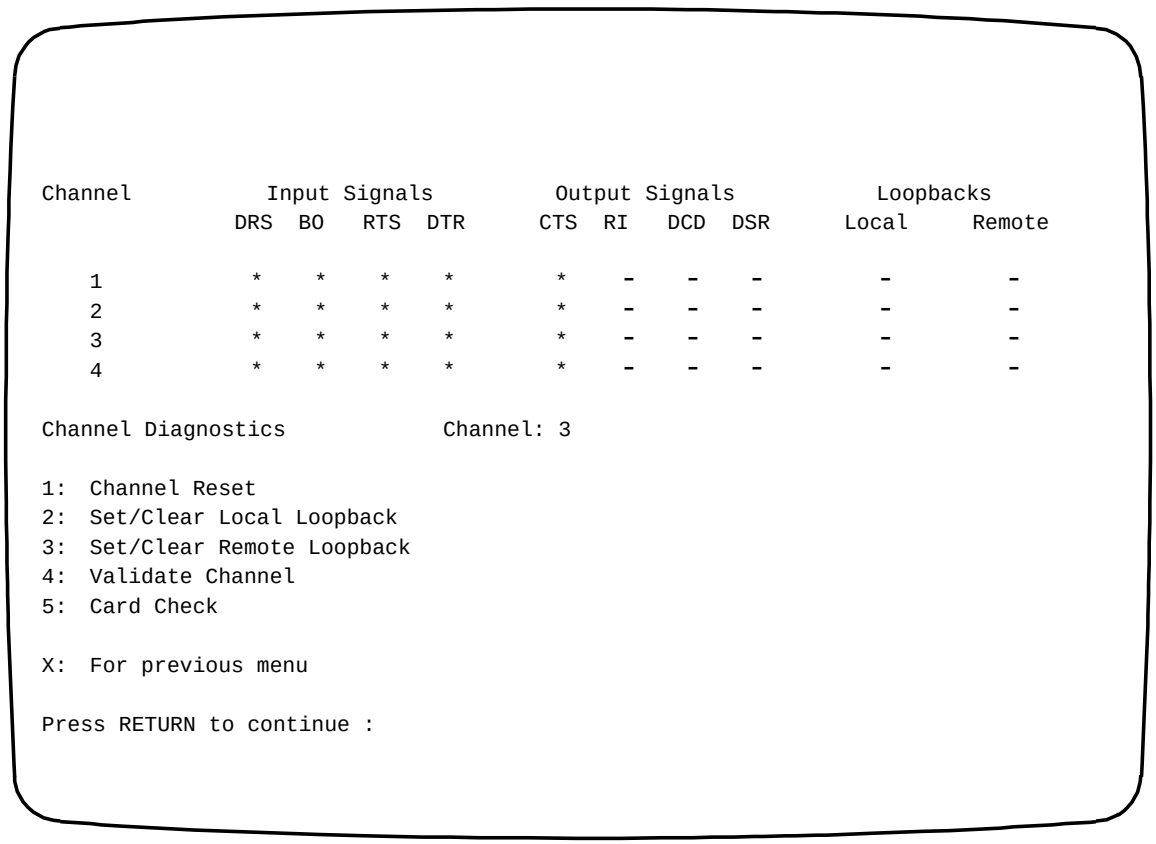
BOP: *= SC module's internal memory buffer overflow protection preventing reception of data from the locally connected device.

SYS-BUF:*= System buffer in overload preventing LSC passing data to it.

4.6 Channel Diagnostics (Supervisor Menu: 3)

The Channel Diagnostics menu allows you to select a channel and carry out a number of functions to diagnose and deal with problems.

With the exception of Validation, all channel diagnostics interrupt data flow. All selections on the Diagnostics menu request confirmation before becoming active.



- ***** Indicates that a signal is on, or a loopback is set
- **-** Indicates that a signal is off or a loopback is not set

A blank field indicates that the signal is not configured.

4.6.1 Channel Reset (Channel Diagnostics: 1)

Channel Reset restarts the software at both ends of the selected channel and displays a channel reset code on the 7-segment indicator at the remote site.

4.6.2 **Set/Clear Local Loopback** (Channel Diagnostics: 2)

Local loopback is a bidirectional loopback established within the local SC module. The use of this test is explained in Section 7.2.2.

4.6.3 **Set/Clear Remote Loopback** (Channel Diagnostics: 3)

Remote loopback is identical to Local Loopback except that the signals are turned around at the remote site. The use of this test is explained in Section 7.2.3. You can check whether the loopback was set successfully by monitoring the top of the Channel Diagnostics menu (should show SET for the appropriate channel).

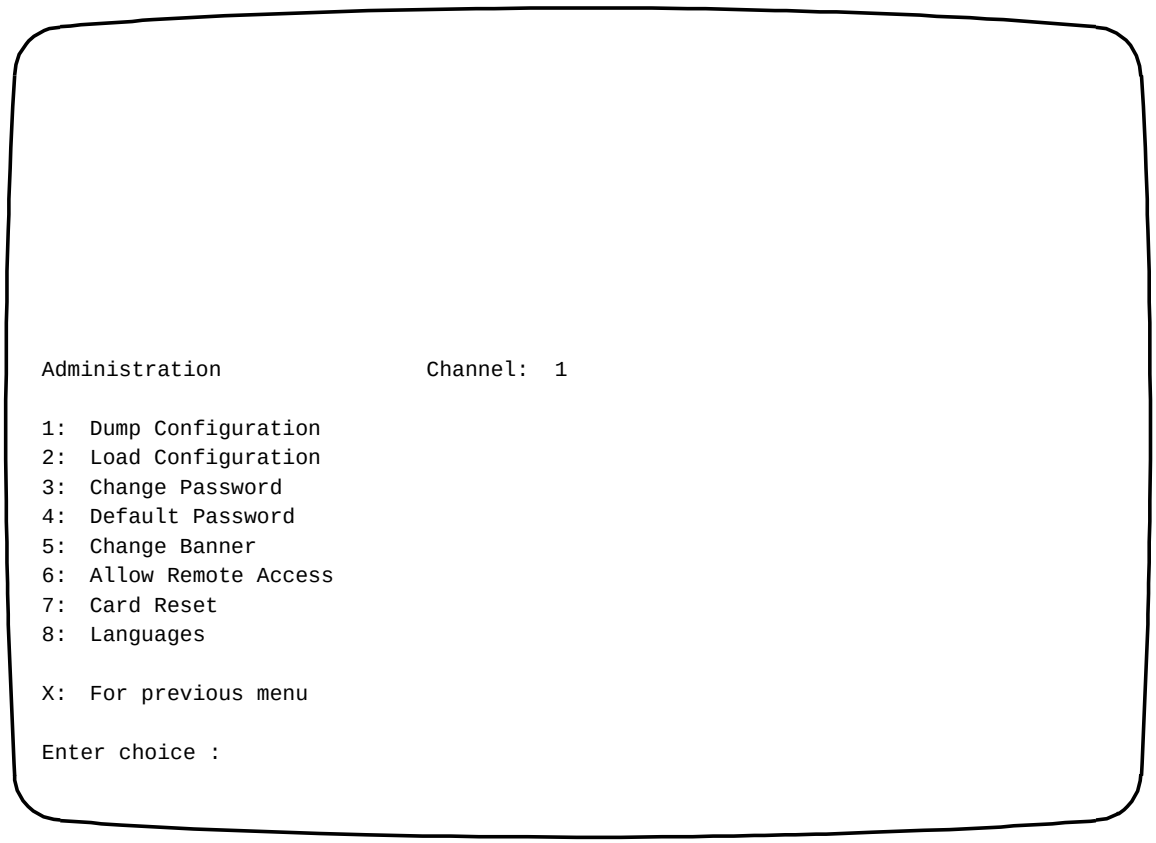
4.6.4 **Validate Channel** (Channel Diagnostics: 4)

The Validate channel test is explained in Section 7.2.1.

4.6.5 **Card Check** (Channel Diagnostics: 5)

This menu displays the local and remote card issue numbers, and the checksum values.

4.7 Administration Menu (Supervisor Menu: 4)



4.7.1 Dump Configuration (Administration Menu: 1)

This option allows you to set up an intelligent storage device (e.g. a PC) and receive the configuration of all four channels of an SC module for future use with a Load function.

At the prompt Confirm action Y/N answer Y. The SC module will then start to output dots (1 per sec) across the screen. When the dots start to appear, set the storage device to capture. You can now either wait 30 seconds or press any key (except X) to start the dump process. Entering X will abort the dump. At the end of the dump, dots will again appear on the screen. Now turn the storage device off. Either wait for the Dump Completed prompt to appear, or press any key to continue. Dots will again appear on the screen. Either wait for the Administration menu to appear or press any key to display it.

4.7.2 Load Configuration (Administration Menu: 2)

This option allows you to download a previously dumped configuration to any SC module.

At the prompt Confirm action Y/N answer Y. The SC module will then start to output dots (1 per second) across the screen.

When the dots are being displayed set up the Load device. The dumped configuration can be sent at any time the dots are being output. After the dump has been sent and accepted an Overwrite Password? Confirm Y/N message is output. If the current password is to be retained enter N. If the password that was in use at the time the configuration was dumped is to be used enter Y. Dots will again appear on the screen. Either wait 30 seconds for the Load Complete message or press any key for it. Dots will again appear on the screen. Press any key or wait for all the dots to be output, to enter the Administrative menu. Disconnect the load device.

If the load fails an error message is displayed followed by Please wait ..... The screen will then display the Administration menu after about 30 seconds.

4.7.3 Change Password (Administration Menu: 3)

The password can be changed to any desired string of characters within the following constraints: ASCII; 12 characters maximum; upper, lower, or mixed case; no control codes; carriage return is not permitted within password.

First, you must enter the existing password (default = LOGON). Then, you have to enter the new one (followed by <CR>), and repeat it.

4.7.4 Restore Default Password (Administration Menu: 4)

This selection restores the Default Password (LOGON) but requires you to enter the current password prior to returning to the default password.

4.7.5 Change Banner (Administration Menu: 5)

This refers to the banner that appears on the supervisor and user introductory screens.

When prompted for a new banner, enter a maximum of 41 characters, which may be any printable characters.

Alternatively, enter <CR> if you do not wish to change it, or <SP><CR> if you wish to delete it.

4.7.6 Remote Access (Administration Menu: 6)

Access to the local SC module from a remote site can be allowed or disallowed (NCAM is always allowed to logon as supervisor).

4.7.7 Card Reset (Administration Menu: 7)

A card reset will effectively re-start the card software with the last saved configuration. WARNING - data may be disrupted.

This selection prompts you to confirm your request. If you do, the card will be reset when you log off from supervisor mode.

4.7.8 Languages (Administration Menu: 8)

This option allows you to configure all output text to be displayed in either English or French.

4.8 Supervisor Configuration Menu (Supervisor Menu: 5)

All four channels on the SC module are configured for normal use from the Channel Configuration menu (Section 4.4).

The Supervisor Configuration menu allows a supervisor logged on to a channel to set certain features to different settings on a temporary basis. These selections remain in effect only while the supervisor is using the channel; options previously selected from the Channel Configuration menu are reasserted after logging off.

4.8.1 Printer Handling (Supervisor Configuration: A)

The Printer Handling feature allows the printer to ignore scrolling commands in use at video terminals. It inhibits the multiple line-feed signals that may cause the printer to spill paper.

4.8.2 LF to Follow CR (Supervisor Configuration: B)

In this option you can select Line Feed to be added to Carriage Returns, or Carriage Returns to be sent by themselves. This option defaults to ON when you log off. It is not available to channel users.

4.8.3 Terminal Flow Control
(Supervisor Configuration: C (X-ON), D (X-OFF))

Terminal Flow Control X-ON and X-OFF characters can be selected on the two submenus to be different from the port settings for the duration of the supervisor operation. The feature is explained in Section 2.3.6.

4.9 Logging Off

When you have finished, **be sure to log off**. You can log off at the Monitor menu screen by entering X at the prompt. There is a 5 minute timeout that automatically logs you off if you forget, but your data sessions could be delayed.

Following log-off, the Goodbye message will be displayed.

5 User Facilities

5.1 Introduction

This section describes control and monitoring facilities available to users connected to SC module channels. These facilities allow you to change channel or operating requirements between sessions. Passwords and extensive technical knowledge are not required, and you perform all work at your terminal.

The process involves logging on to the SC module, selecting the screen displays of interest, determining the existing channel operating features, changing these features as required, and logging off at the end of the work. This is all summarised in Figure 5-1.

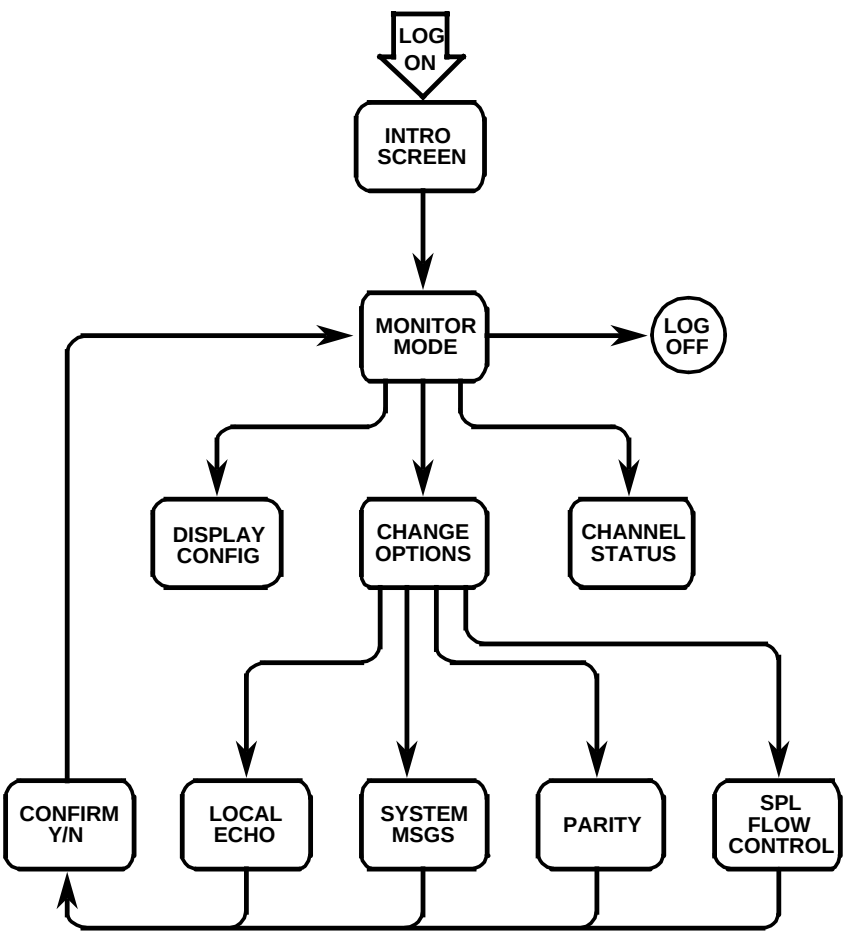
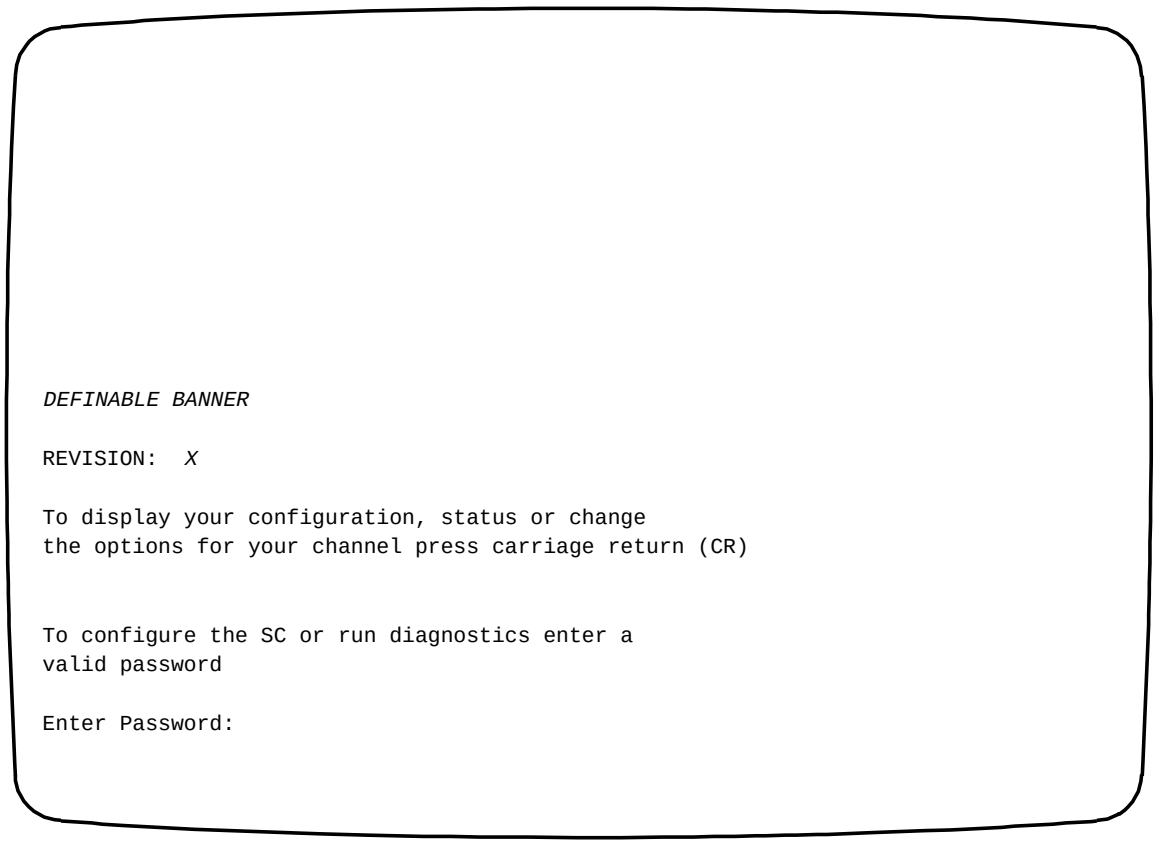


Figure 5-1 User Facilities Summary

5.2 Accessing the User Screens

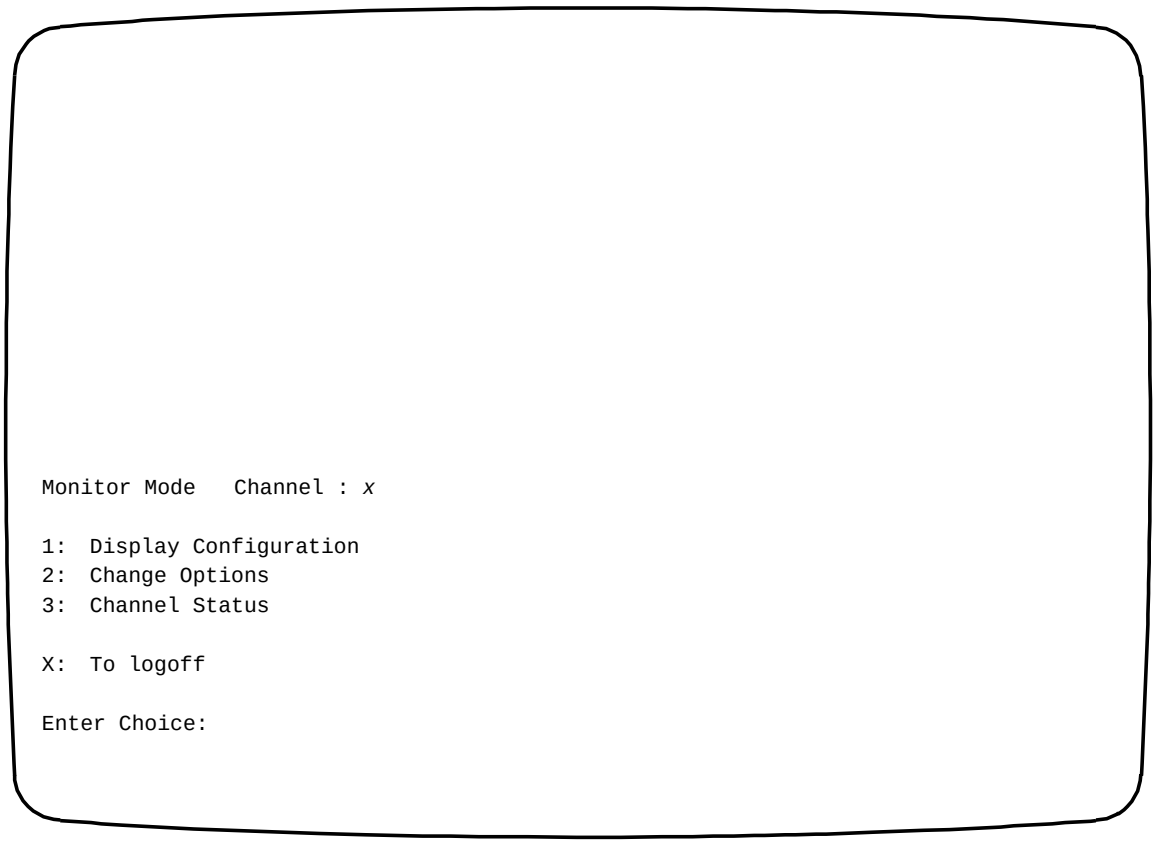
To access the user screens, key in the 'user escape' character that has been advised to you by your supervisor.

After logging on, an introductory screen is displayed that is intended for both you and your supervisor.



All you need to do is enter a carriage return character <CR>, which is usually the RETURN or ENTER key. This should display the Monitor menu.

5.3 Monitor Menu



The Monitor menu offers you three selections, or allows you to log off. These are described in Sections 5.4 to 5.7.

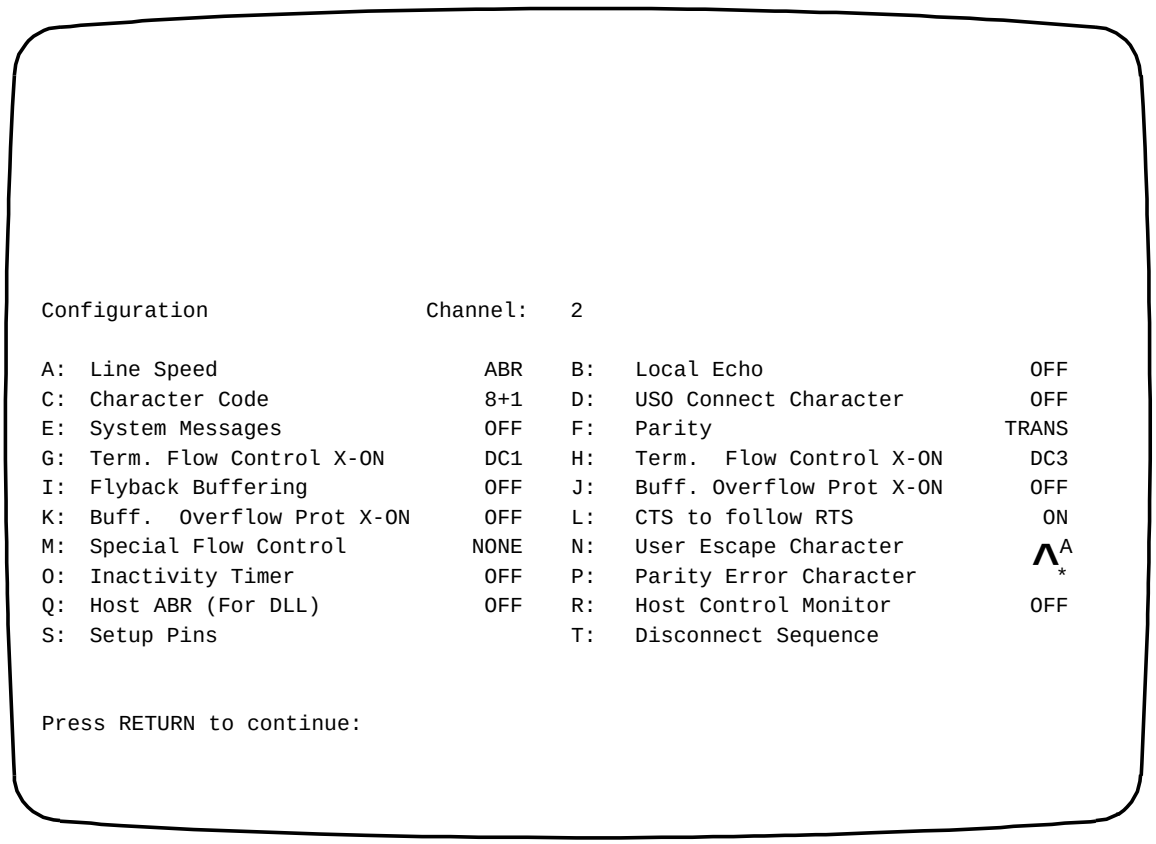
At all prompts such as Enter choice: and Enter new parameter: , enter the desired selection followed by <CR>. If you enter a wrong character before the <CR>, just press BACKSPACE and enter the correct selection.

The SC module has error messages, advisories and prompts to help you. Error messages explain the error and usually include the prompt Press RETURN to continue: . In all cases <CR> returns you to a previous screen to make a new selection.

Once you are in the menu structure, entering choice X returns you to the previous (higher level) menu (or logs you off from the Monitor menu).

5.4 Channel Configuration Menu (Monitor Menu: 1)

Pressing <1> followed by <CR> from the Monitor menu displays your channel's configuration list of optional features, and the current status of each. An example display is shown below (the options on your screen will, of course, reflect those set for your channel).



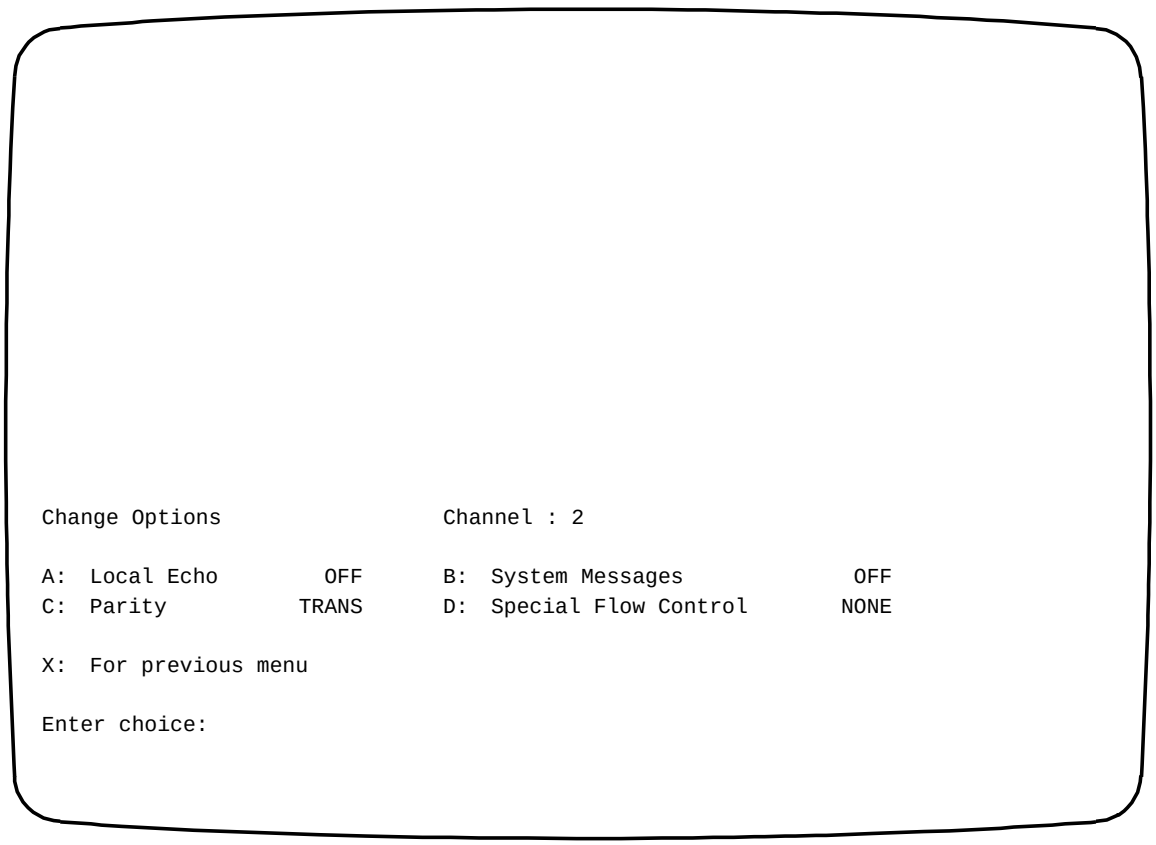
```
Configuration                Channel:   2

A:  Line Speed                    ABR    B:   Local Echo                   OFF
C:  Character Code                8+1    D:   USO Connect Character        OFF
E:  System Messages               OFF    F:   Parity                     TRANS
G:  Term. Flow Control X-ON       DC1    H:   Term.  Flow Control X-ON     DC3
I:  Flyback Buffering             OFF    J:   Buff. Overflow Prot X-ON     OFF
K:  Buff.  Overflow Prot X-ON     OFF    L:   CTS to follow RTS             ON
M:  Special Flow Control         NONE    N:   User Escape Character        ^A
O:  Inactivity Timer              OFF    P:   Parity Error Character        *
Q:  Host ABR (For DLL)            OFF    R:   Host Control Monitor         OFF
S:  Setup Pins                           T:   Disconnect Sequence

Press RETURN to continue:
```

Note that option N shows your user escape character.

You can change four of the options on the Configuration menu; the rest can only be changed by your supervisor. The options you can change are: Local Echo, System Messages, Parity and Special Flow Control. To change these, you must first return to the Monitor menu by entering <CR>, then enter 2 and follow the sequence in Section 5.5.

5.5 Change Options Menu (Monitor Menu: 2)

An example of the Change Options menu is shown below.



You are invited to select one of the four options to revise. Select the option you want by its letter designation.

Each of the options displays a separate menu where you can select ON or OFF, or in the case of Special Flow Control, which computer type to support. Enter the character for the option state you want or the supported computer if selecting Special Flow Control. You are then asked to confirm the selection with a yes or no (Y or N). After confirmation, you are returned to the Monitor menu.

5.5.1 Local Echo (Change Options Menu: A)

A local echo can be generated at the multiplexer. If you need an echo on your terminal, you can turn on the multiplexer echo at this menu. However, if your terminal generates its own local echo and the multiplexer local echo is also turned on, you could receive double or even triple echoes.

5.5.2 **System Messages** (Change Options Menu: B)

System messages report system problems and their resolution. The messages include LINK DOWN, DATA LOST and LINK UP. If you do not want them embedded in your recorded data, turn them off here. They are only valid for channels which are set to the 8+1 character code.

5.5.3 **Parity** (Change Options Menu: C)

If parity of data is changing from the last session to the next one, you should be advised of this. However, if it changes without your knowledge, you can try changing to Autoparity or Transparent.

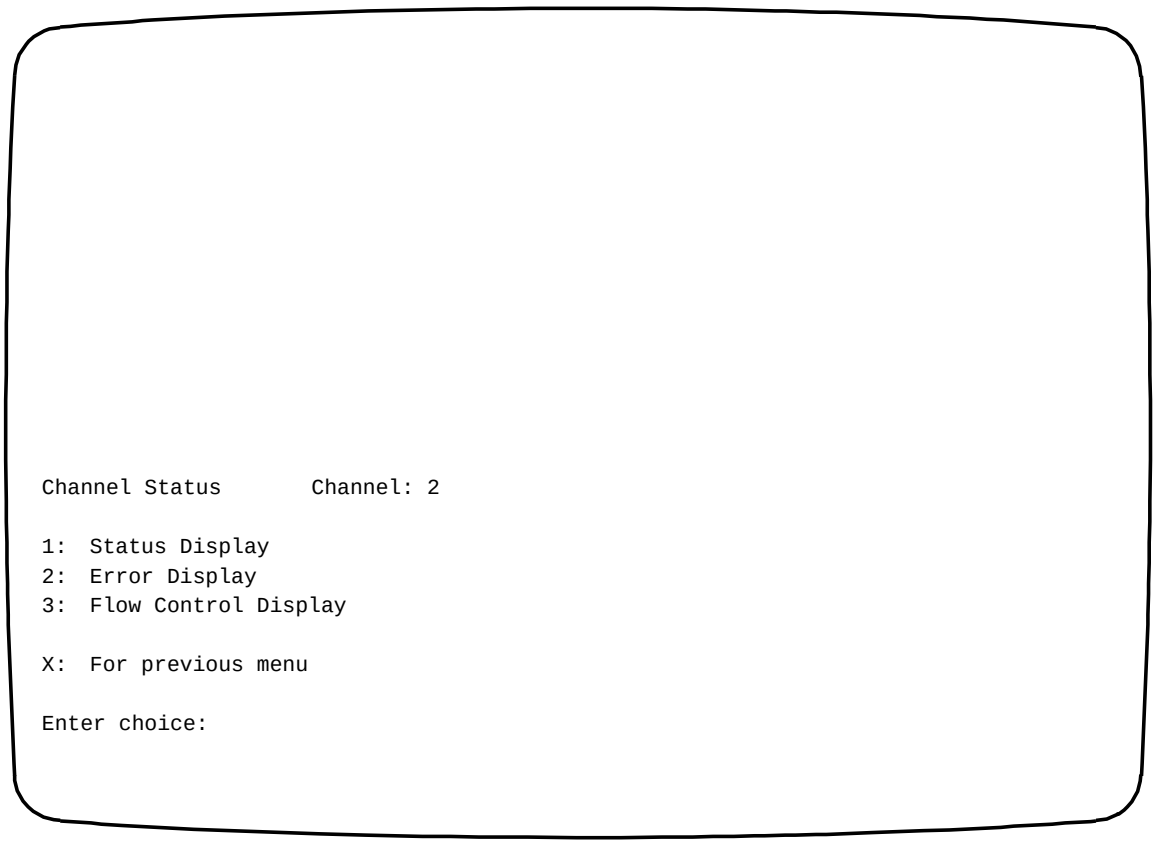
5.5.4 **Special Flow Control** (Change Options Menu: D)

Special Flow Control provides support for the Hewlett-Packard HP3000 protocol.

5.6 Channel Status Menu (Monitor Menu: 3)

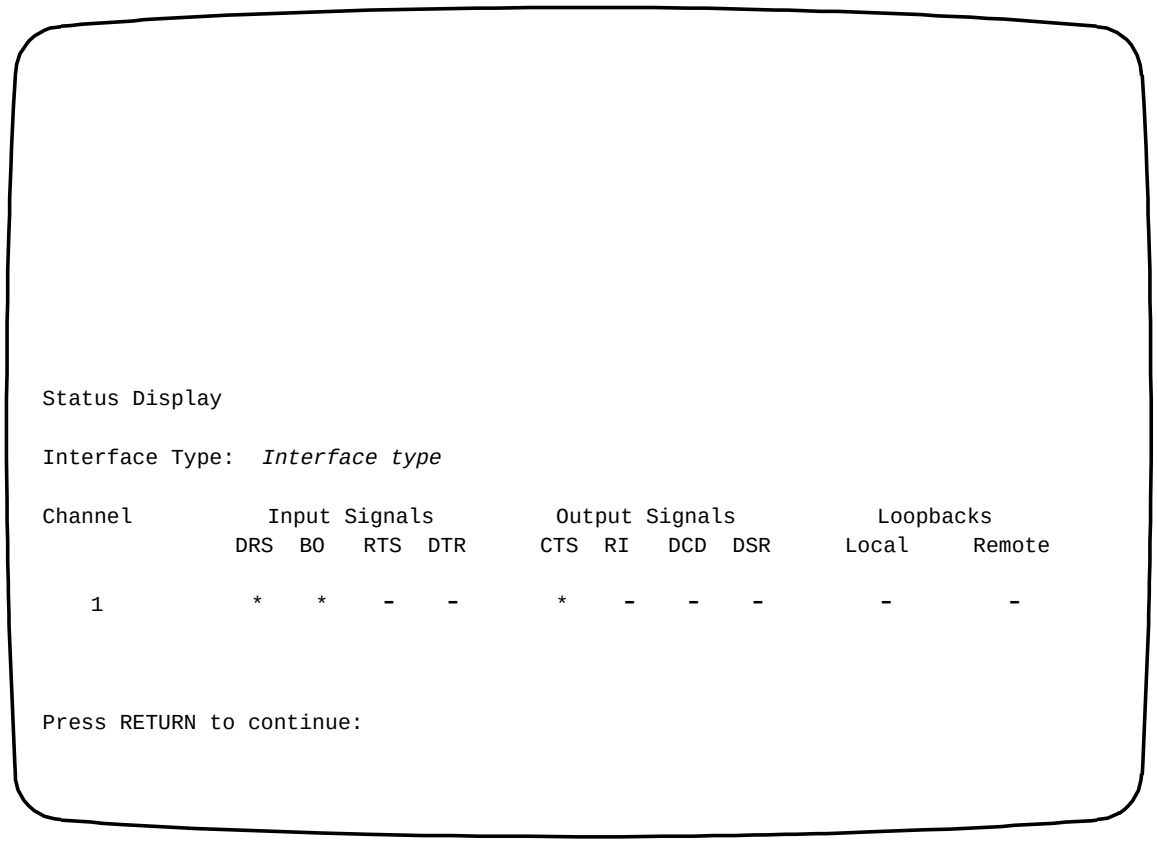
The Channel Status Menu allows you to choose status displays that show the status of eight V.24 control pins, loopbacks, errors and flow control states, on your channel.

Selecting Status Display brings up the following menu:



5.6.1 **Status Display** (Channel Status Menu: 1)

The format is as shown in the following example:



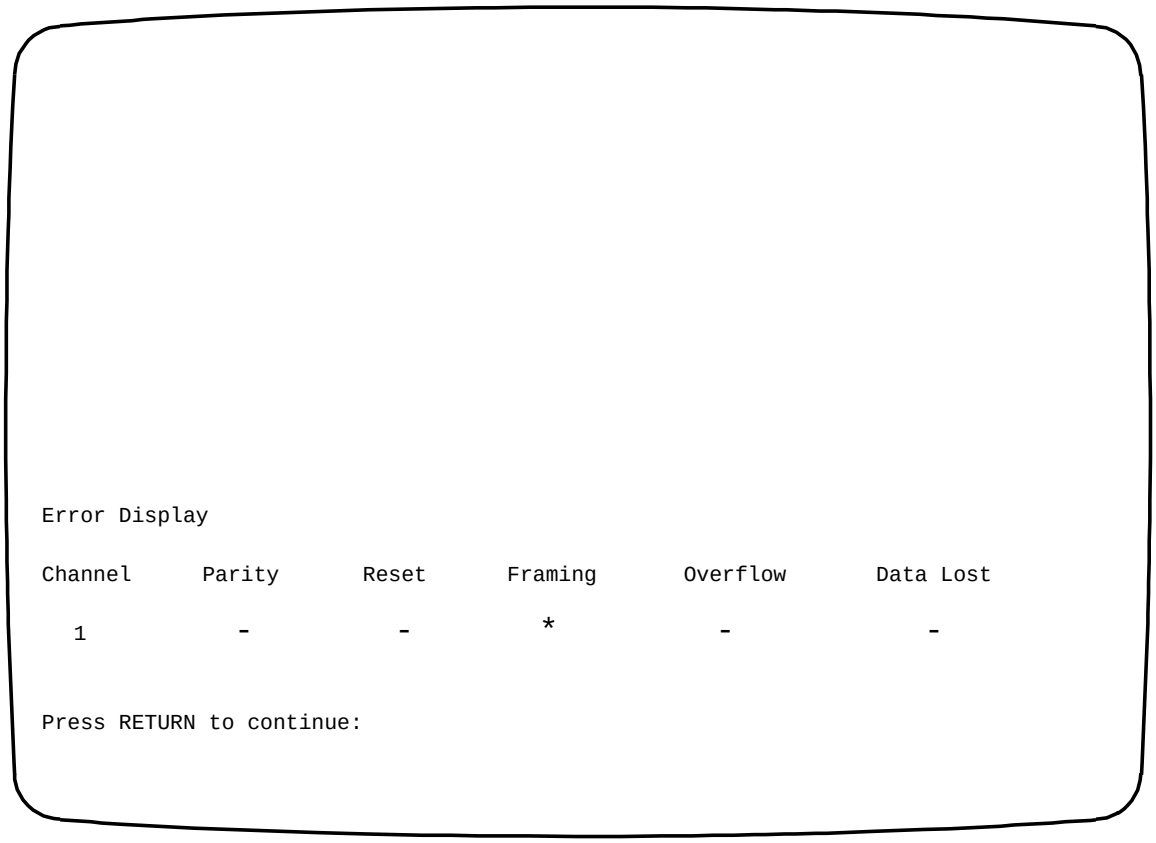
```
Status Display

Interface Type:  Interface type

Channel          Input Signals         Output Signals          Loopbacks
              DRS  BO   RTS  DTR     CTS  RI   DCD  DSR     Local     Remote

   1           *    *    -    -       *    -    -    -        -         -


Press RETURN to continue:
```

The Status Display uses two symbols to report status on the channels:

- * Indicates that a signal is on, or a loopback is set
- - Indicates that a signal is off, or a loopback is not set

5.6.2 **Error Display** (Channel Status Menu: 2)

The Error Display allows you to note and clear channel error indications, for example:



Parity: Character parity error detected.

Reset: Remote channel reset.

Framing: Channel receiver out of sequence with the transmitting device. Usually caused by the misconfiguration of the character code, or the DTE being turned off and on.

Overflow: Channel receiver missed reception of a character.

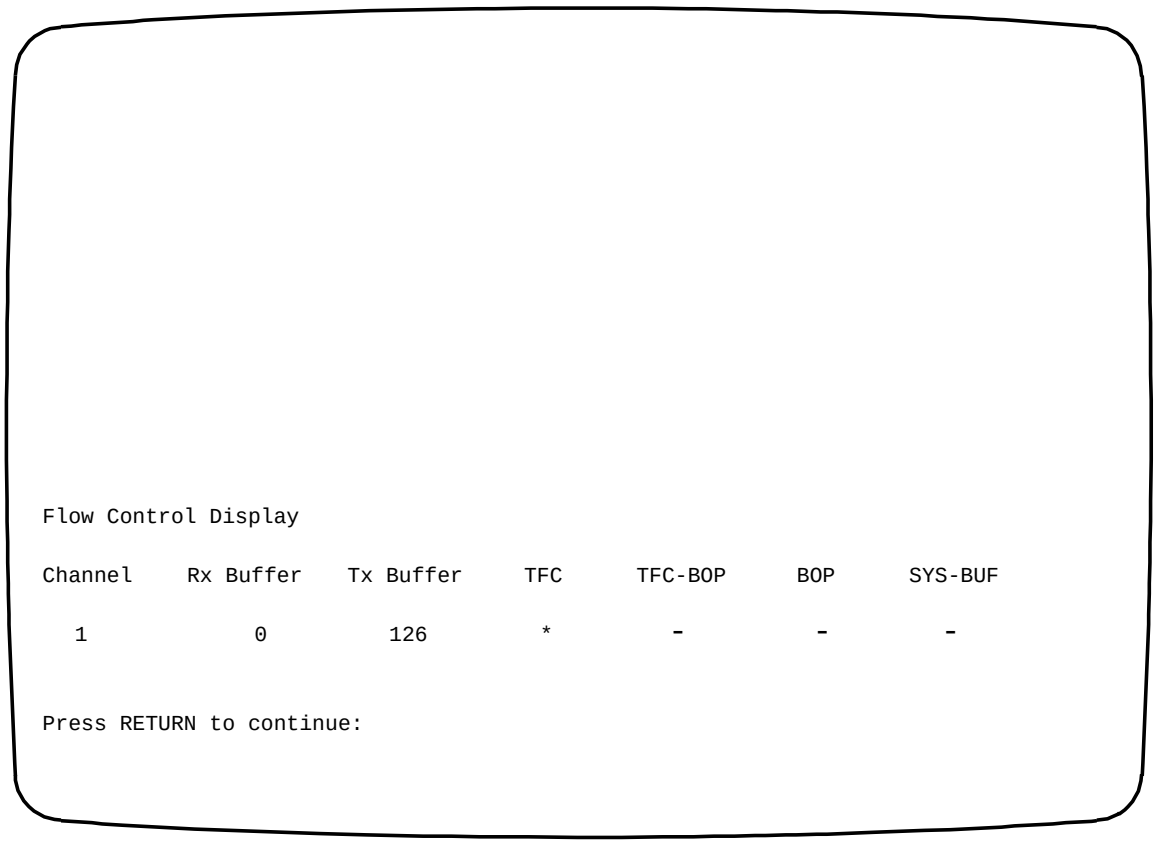
Data Lost: Receive or transmit character memory buffer overflow. This is usually caused by a lack of effective data flow control.

***** Indicates that one of the above errors has occurred.

- Indicates no errors.

5.6.3 **Flow Control Display** (Channel Status Menu: 3)

This display provides a snapshot inspection of the flow control status on all channels.



Rx Buffer: Reports the number of characters received by the card and awaiting transmission to the buffer.

Tx Buffer: Reports the number of characters awaiting transmission to the terminal attached to the channel.

TFC: *= Local terminal flow control prevents data from being transmitted to the connected device.

TFC-BOP:*= Remote terminal flow control prevents data transmission to the remote device.

BOP: *= SC1's internal memory buffer overflow protection prevents reception of data from the locally connected device.

SYS-BUF:*= System buffer in overload preventing LSC passing data to it.

5.7 Logging Off

When you have finished, **be sure to log off**. You can log off at the Monitor menu screen by entering X at the prompt. There is a 5 minute timeout that automatically logs you off if you forget, but your data sessions could be delayed.

Following log-off, the Goodbye message will be displayed.

6 Front Panel Features

6.1 Introduction

The SC2 front panel controls and indicators are shown in Figure 6-1.

Note that the SC1 front panel is exactly the same.

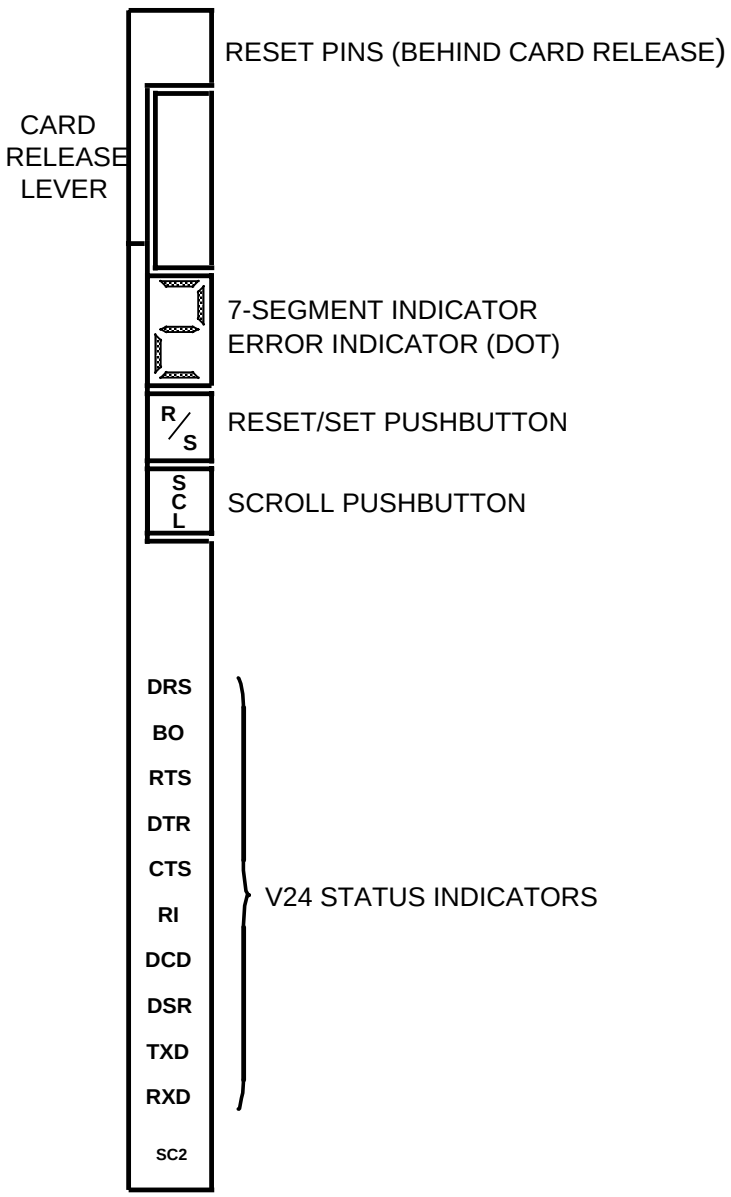


Figure 6-1 SC2 Module Front Panel

These controls and indicators allow the supervisor to perform configuration, control, monitoring and diagnostics functions. From the front panel you can:

- Reset channel configurations and the password to default values.
- Monitor port control and data signal states.
- Validate and perform loopback tests.
- Identify and clear local errors on the card.

Front panel operation is provided primarily for use on the DCX 836 and 840. The DCX 860 and 870, being soft-configurable, have a panel in front of the cards which must not be removed except for installation and maintenance by trained engineers.

6.1.1 Controls and Indicators

The SCL (Scroll) and R/S (Reset/Set) pushbuttons are single step switches that are used in various sequences to step through the monitoring, control and diagnostics functions available on the panel.

The term 'press' is used to mean depressing and releasing the button once. 'Pulse' is used to mean depressing and releasing the button a number of times until the stated result occurs.

Progress through the sequences and the status of the functions is monitored on the 7-segment indicator. Additionally, this indicator has a dot in its lower right corner to indicate loopbacks and errors on the card.

Front panel controls and indicators are disabled whenever a supervisor logs on from a terminal. This is indicated by the 7-segment indicator displaying S.

6.2 Front Panel Operation

There are four main indications on the 7-segment indicator that can be scrolled through in a continuous loop with the SCL pushbutton. These indications can be considered as gateways to the functions they represent:

C Channel, the gateway to channel monitoring, loopback, validation and port reset.

E Error, the gateway to error location, identification and elimination.

P Password Reset, the gateway to password reset.

d Default Configuration Reset, the gateway to default value resets.

In the DCX 836 and 840, the front panel controls depend on the multiplexer keyswitch position. With the mode key in the **SLAVE** position, only Channel and Error functions are available. The key must be in the **LOCAL** or **MASTER** position (**ARMED** on DCX 836) to use the Password and Default Configuration Reset functions.

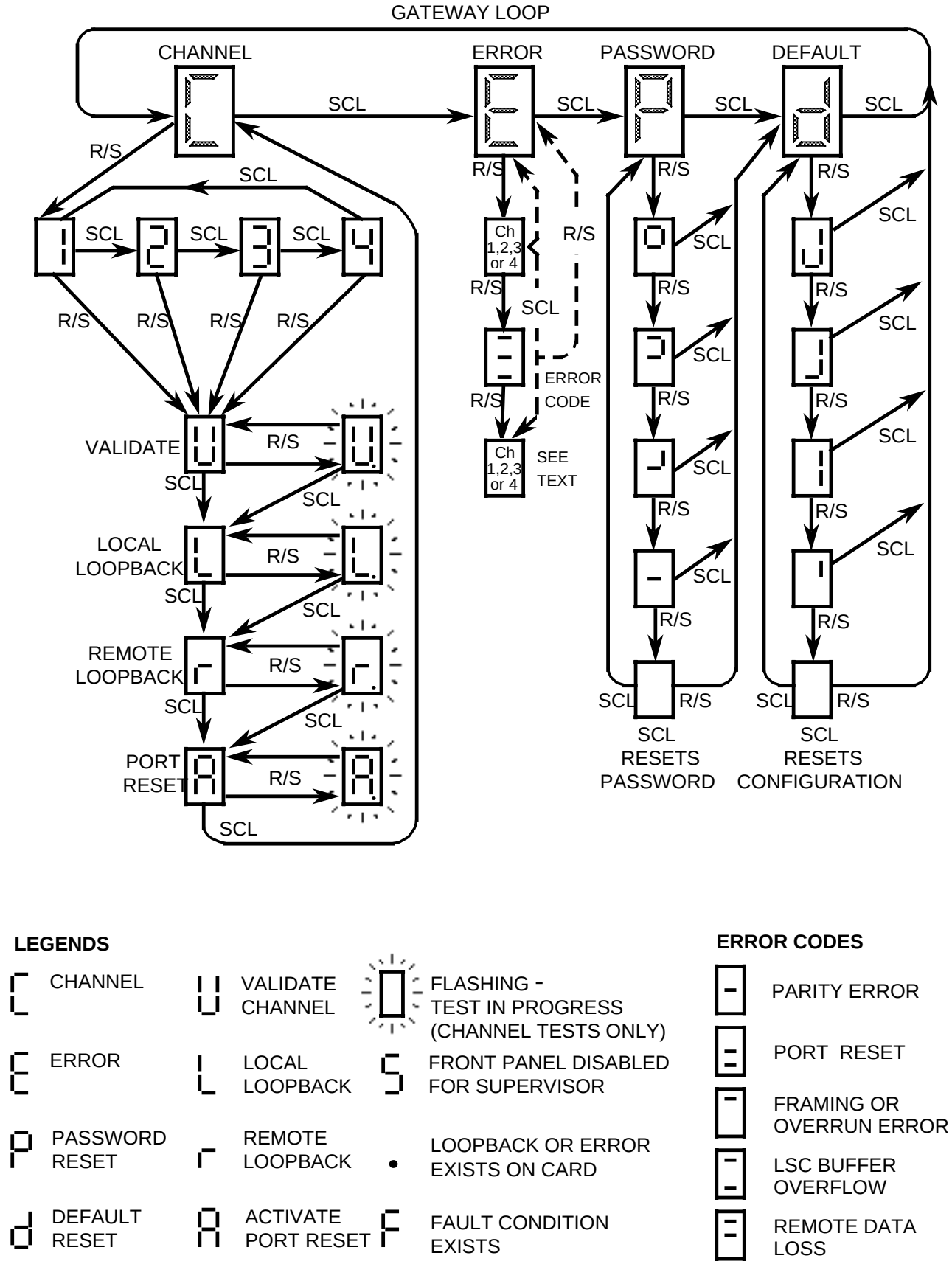
In the DCX 860 and 870, front panel control is not required (and is prevented by the cover).

A route map to front panel operation state, showing the action of the SCL and R/S pushbuttons on the 7-segment indicator, is given in Figure 6-2.

The following indications, when present, cannot be scrolled off the display:

S Supervisor logged on. When the SC module is accessed by a supervisor attached or mapped to one of the channels, the front panel controls are locked out. If these controls are in use when a supervisor logs on, front panel operations are suspended for the duration of the supervisor access. Unless they were modified by the logged-on supervisor, the front panel operations are restored to their previous state when the supervisor logs off.

F Fault exists on the card. If this should occur, refer to Section 7.



LEGENDS

- CHANNEL
- ERROR
- PASSWORD RESET
- DEFAULT RESET
- VALIDATE CHANNEL
- LOCAL LOOPBACK
- REMOTE LOOPBACK
- ACTIVATE PORT RESET
- FLASHING - TEST IN PROGRESS (CHANNEL TESTS ONLY)
- FRONT PANEL DISABLED FOR SUPERVISOR
- LOOPBACK OR ERROR EXISTS ON CARD
- FAULT CONDITION EXISTS

ERROR CODES

- PARITY ERROR
- PORT RESET
- FRAMING OR OVERRUN ERROR
- LSC BUFFER OVERFLOW
- REMOTE DATA LOSS

Figure 6-2 SC Module Front Panel Route Map

6.2.1 Finding Your Way

When the SC module is powered up, the indicator will show 1, which is channel 1. In normal operation it will probably indicate a channel number, 1, 2, 3 or 4.

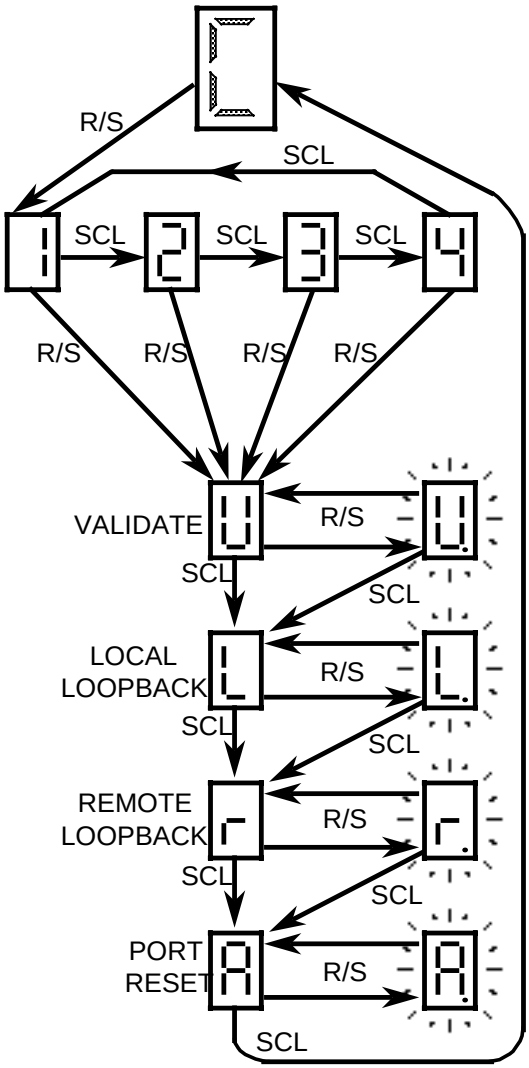
Reference to Figure 6-2 shows that to carry out a function on the displayed channel, you first press R/S (displays U, validate) then pulse SCL to obtain L, r or A. Alternatively, to access another channel, pulse SCL first.

To obtain C, the channel gateway, press SCL from A.

From C you can pulse SCL to obtain E, P or d, and from any of them press R/S to access their functions.

Remember that a display of S means that the front panel operations are suspended because a supervisor is logged on to the SC module.

6.3 Channel Functions



By reference to Figure 6-2, find your way to C on the 7-segment indicator. Press R/S, then if necessary pulse SCL, to select the channel of interest.

6.3.1 Monitoring a Channel (V.24 version only)

With a channel number displayed, the ten individual LEDs on the lower half of the front panel indicate the selected channel's low speed data and interface control conditions. The LED designations are defined in Table 6-1. Output signal LEDs are amber, input signal LEDs are red.

Indications on the monitored channel update automatically as conditions change.

LED	MEANING WHEN LIT
DRS	Data Rate Select is on from local DTE
BO	Busy Out is on from local DTE
RTS	Request To Send is on from local DTE
DTR	Data Terminal Ready is on from local DTE
CTS	Clear To Send is on to local DTE
RI	Ring Indicator is on to local DTE
DCD	Data Carrier Detect is on to local DTE
DSR	Data Set Ready is on to local DTE
TXD	Transmitted Data is on from local DTE
RXD	Received Data is on to local DTE

Table 6-1 Channel Status LED Indicators

6.3.2 Validation Test

The use of this test is explained in Section 7.2.1.

1) Select the channel of interest, then press R/S to display U (the nearest to V for Validate).

2) Press R/S once to set validation. The SC module transmits a character and monitors its return. If it is returned correctly, the U will flash. If not, it will remain on.

3) You can exit the test by pressing R/S which will return you to the steady U state, or by pressing SCL which will take you to L.

6.3.3 Local Channel Loopback Test

This test interrupts data transmission on the selected channel.

The use of this test is explained in Section 7.2.2.

1) Select the channel of interest, then press R/S followed by SCL to display L. (if L flashes, loopback on the local SC1 is already set).

2) Press R/S to set the loopback. This will cause L to flash and the dot to be displayed.

3) You can exit the test by pressing R/S which will remove the loopback and return you to a steady L, or by pressing SCL which will leave the loopback on (dot displayed) and take you to r.

6.3.4 Remote Channel Loopback Test

This test interrupts data transmission of the selected channel.

The use of this test is explained in Section 7.2.3.

1) Select the channel of interest, then press R/S and pulse SCL to display r (if r flashes, loopback on the remote channel is already set).

2) Press R/S to set the loopback. This will cause r to flash and the dot to be displayed.

3) You can exit the test by pressing R/S which will remove the loopback and return you to a steady r, or by pressing SCL which will leave the loopback on (dot displayed) and take you to A.

6.3.5 Port Reset

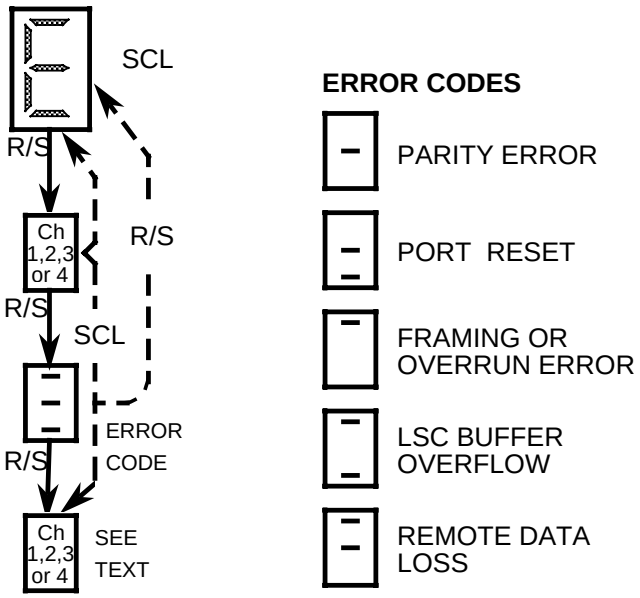
This facility resets the TFC and BOP status to X-ON and clears out any data stored on the card for that channel.

1) Select the channel (port) of interest, then press R/S and pulse SCL to display A.

2) Press R/S to reset the port.

3) You can exit by pressing R/S which will display A, or by pressing SCL which will display C.

6.4 Error Determination



Errors on the card are first reported by the dot on the 7-segment indicator. When lit, it indicates that either an error or a loopback exists on one or more channels. Errors include parity error, port resets, framing or overrun errors, LSC buffer overflow and data lost. The Error Gateway (E) provides access to the errors only. The loopbacks must be cleared from the Channel Diagnostics (C) gateway.

By pressing the SCL and R/S pushbuttons and observing the 7-segment indicator, the channels containing errors can be identified and the errors defined and cleared. The error types are reported in an error code using only the horizontal segments of the indicator. The procedure is partially outlined above. Details are difficult to illustrate because each time the sequence is used it is likely to be different. The following description should guide you through the process:

To determine and clear errors on all channels:

1) Pulse the SCL pushbutton to the Error (E) gateway.
2) Press the R/S pushbutton. The first Channel number containing an error is displayed.

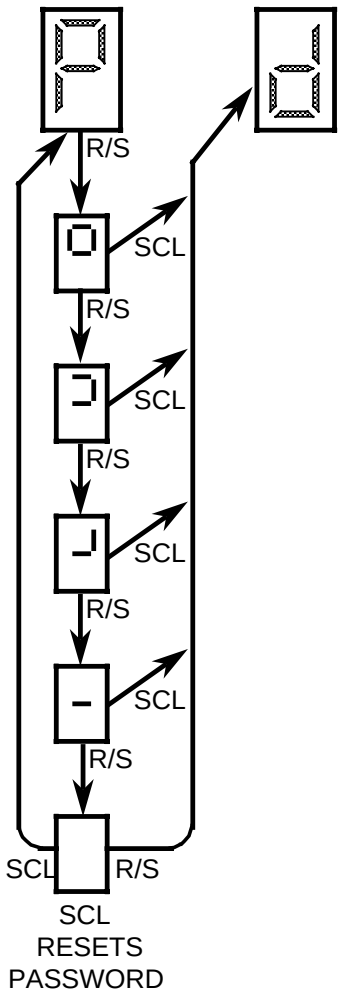
At this point you have a choice. You can:

- **Clear All Errors** If you continue to press R/S only, the display alternates between the channel numbers and their error codes. After an error code display, the next R/S pulse clears that error and advances you to the next error or channel. After the last channel error is cleared, you are returned to the E gateway.

- **Determine Channels With Errors** If you continue by pressing only the SCL pushbutton (after the initial R/S from the E gateway), you can scroll through with the SCL pushbutton and locate the channels with errors (their numbers displayed, with the dot) without identifying or clearing the errors.
- **Selectively Clear Errors** If you combine the R/S and SCL commands, you can selectively identify the errors and clear all or some of them. To see a channel's error codes, you must press R/S while that channel number is displayed. While the error code is displayed, pressing SCL leaves the error uncleared. Pressing R/S instead, clears the errror. In either case you advance to the next error on that channel, the next channel containing an error, or to the E gateway, depending on the error distribution on the card.

6.5 Password Reset

This function allows you to reset the supervisor password to LOGON. To access it on the DCX 836 or 840 the mode keyswitch must be at MASTER or LOCAL.

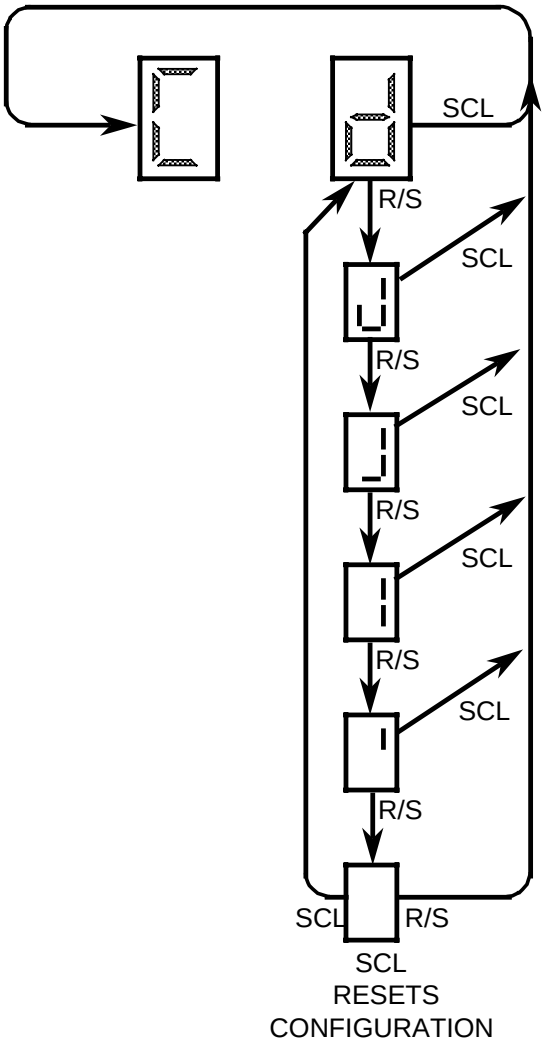


By reference to Figure 6-2 find your way to P on the 7-segment indicator.

Each time you then press R/S, one segment of the P will disappear, but no other action will result until the indicator is blank, when pressing SCL again will reset the password and display P. Pressing SCL before that stage will display d without changing the password.

6.6 Default Configuration Reset

This function allows you to reset the entire SC module configuration to the default values. To access it on the DCX 840 the mode keyswitch must be at MASTER or LOCAL, or ARMED on the DCX 836.



By reference to Figure 6-2, find your way to d on the 7-segment indicator.

Each time you then press R/S, one segment of the d will disappear but no other action will result.

When the final LED is extinguished, pressing SCL will return a complete d. This confirms the default reset. If the action returns C, then the default reset has failed and the configuration has not changed.

7 Test Procedures

7.1 Introduction

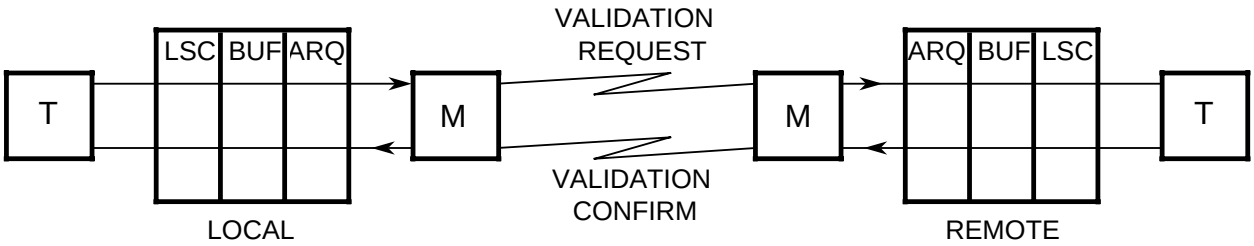
General procedures for locating faults within the DCX system and the DCX units are given in the DCX Fault Finding Guide and the DCX parent unit Reference Manuals.

Fault location can be assisted by the Validation, Local Loopback and Remote Loopback tests that can be set via the SC module. The procedures are described in Section 4.6 and Section 6.3 in this manual. The actions of the tests are described in Section 7.2.

If there is a fault within the SC module itself, the 7-segment indicator will show F. In this case, contact your supplier.

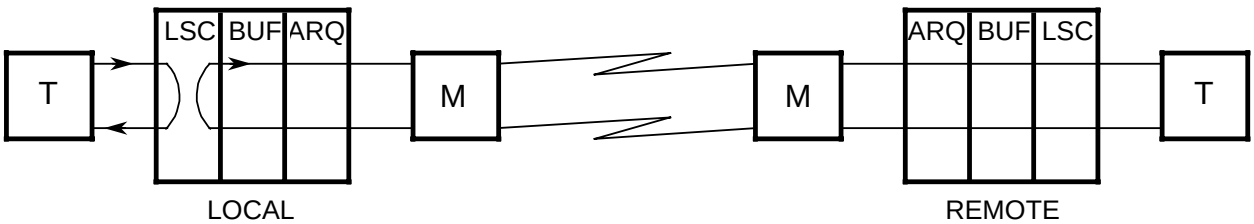
7.2 Tests

7.2.1 Validation Test



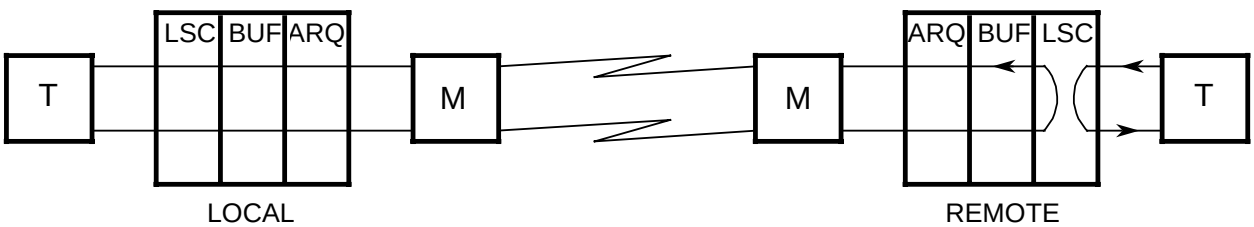
Validation establishes that the remote DCX has a functioning channel corresponding to the selected channel on the local SC (LSC) module, and that there is a path to and from it.

7.2.2 Local Loopback Test



This test sets a bilateral loopback on the selected channel at the local SC (LSC) module.

7.2.3 Remote Loopback Test



This test sets a bilateral loopback on the selected channel at the remote DCX.

Appendix A Specification Summary

General

Parent Unit	DCX 833, 836, 840, 850, 860, 870
Module Size	Single standard printed circuit board.
Compatibility	SC1 SC2 LSC1 LSC2 LSC3 LSC3A LSC4 LSC4A
Controls	SCROLL pushbutton RESET/SET pushbutton
Indicators	7-segment alphanumeric plus dot Eight V.24 control line LEDs.
Environmental Requirements	As parent unit

Low Speed Channels

Number of channels	Four
Type	Asynchronous
Interfaces	V.24 (CCITT V.24/V.28, EIA RS-232-C). RS-422 (EIA RS-422) (SC1 only). CL20 (20mA current loop) (SC1 only).
Aggregate Input	38,400 bps
Data Rates	50, 75, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 2000, 2400, 4800, 7200, 9600, 19200 bps.
Down Line Load	Channel speeds may be loaded from the remote DCX channels.

Automatic Baud Rate Detection	110, 134.5, 300, 600, 1200, 2400, 4800 and 9600 bps
Split Baud Rate	Different data rates may be set in transmit/receive directions (except 50 bps).
Data Codes (+ stop bits)	5 + 1.5 7 + 1 7 + 2 8 + 1 8 + 2 9 + 1
Intermix	Any channel may operate at any valid speed/code combination (with a few small restrictions on adjacent channels). If an SC2 channel set to 19200 bps is used (in a double polling BAT based system), to pass continuous full duplex data, the other channels should not be used, to avoid the possiblity of data loss.
V.24 Control Signals	Up to 4 full-duplex per channel
Flow Control	Any character from ^A to ^Z (X-ON and X-OFF), or DTR†, CTS*
Transparency	Full transparency is configurable for all speed/code combinations except 9 data +1 stop (parity bit locally generated). Fully transparent to all bit combinations including parity bits.
Distortion	Maximum acceptable on input is 45% Less than 2% distortion on output.
Terminal Flow Control	Output to a terminal can be controlled by DTR† or X-ON/X-OFF request by the terminal.
Buffer Overflow Protection	Under potential buffer overflow conditions, data input can be inhibited by CTS* or X-ON/X-OFF.
System Messages	Messages can be transmitted to terminals to report link down and data lost warnings.

Parity Selection	Parity on all DCX-generated characters can be odd, even, mark or space. Parity for 9 data +1 stop operation can be odd or even. * V.24 version only † V.24 and RS-422 versions only
Flyback Buffering	Delays required by carriage control characters can be supervisor-selectable from OFF to 512 ms.
CTS Source	The source of the CTS* control can be either the local RTS* or the remote DRS*.
Local Echo	Characters may be echoed back to the terminal following transmission.
HP3000 Support	Support is given for HP3000 block transmission protocol.
Tandem Support	Tandem systems using T-pause can be handled by any individual channel.
Wang 2200 Support	Wang 2200 flow control is supported.

USO Port Definition

Asynchronous Channels	Can be configured as: Internally Mapped Ports (IMPs), Automatically Mapped Ports (AMPs), User Mapped Ports (UMPs), or Permanently Mapped Channels (PMCs).

Supervisor Terminal Requirements

Type	Asynchronous, full-duplex.
Interface	Compatible with channel.
Data Rate	Any speed from the following set (bps): 100, 150, 300, 600, 1200, 2400, 3600, 4800, 9600.
Parity	Any
Code Type	ASCII 8 bit +1 stop
V.24 Control Outputs	CTS*, DCD*, DSR† held permanently high

V.24 Control Inputs	DTR† (if DTR flow control set)
Flow Control	DTR†, X-ON/X-OFF

* V.24 version only
† V.24 and RS-422 versions only

Port Default Configuration Settings

Parity	**Transparent** (SPACE or no parity on terminal required for initial conversation)
Parity Error Character	***** (asterisk)
Speed	Any ABR speed
Character Code	**8+1**
Host ABR (for DLL)	**Off**
Terminal Flow Control	
X-ON	**DC1**
X-OFF	**DC3**
Buffer Overflow Protection	
X-ON	**Off**
X-OFF	**Off**
System Messages	**Off**
Inactivity Timer	**Off**
Flyback Buffering	**Off**
Local Echo	**Off**
Special Flow Control	**Off**
Signal Handling (set V.24 pins on, off or normal)	**Normal** (for all pins)
USO Connect Character	**Off**
User Escape Character	**^A**
CTS to folllow RTS	**Off**
Host Control Monitor	**Off**
Data Escape Character	**Off**
Data Escape Count	**2**
Data Escape Mode	**DATA**

Supervisor Port Default Configuration Settings

Basic Settings	as port (above)
Printer Handling	**Off**
LF to Follow CR	**On**
Terminal Flow Control	
X-ON	**DC1**
X-OFF	**DC3**

Appendix B Port Interconnections

B.1 SC1/V.24 and SC2

B.1.1. Port Interfaces

The SC1/V.24 and SC2 terminates in four 25-way D-type sockets at the rear of the DCX. The interface signals on each of these conform to CCITT V.24/V.28 and EIA RS-232-C and are listed in Table B-1. The ports are normally configured as DCE devices.

PIN No	CCITT V.24 CCT	RS-232-C DESIG	SIGNAL NAME	MNEMONIC
2	103	BA	Transmitted Data	TxD
3	104	BB	Received Data	RxD
4	105	CA	Request to Send	RTS
5	106	CB	Clear to Send	CTS
6	107	CC	Data Set Ready	DSR
7	102	AB	Signal Ground	SG
8	109	CF	Data Carrier Detect	DCD
20	108/2	CD	Data Terminal Ready	DTR
22	125	CE	Ring Indicator	RI
23	111	CH/CI	Data Rate Select	DRS
25	-	-	Busy Out	BO

Table B-1 SC1/V.24 and SC2 Interface Connections

B.1.2 Cables

Note that the state of some of the signals at the SC module can be modified by the supervisor via the Configuration Menu (see Section 4.4.17).

If the port is to be connected by cable directly to a customer-provided DTE (e.g. computer or terminal), then the cable with the DTE may be adequate. If an extension cable is needed, then part number X840-400711, shown in Figure B-1, should be suitable. It is available in various lengths to 50 feet (15 metres).

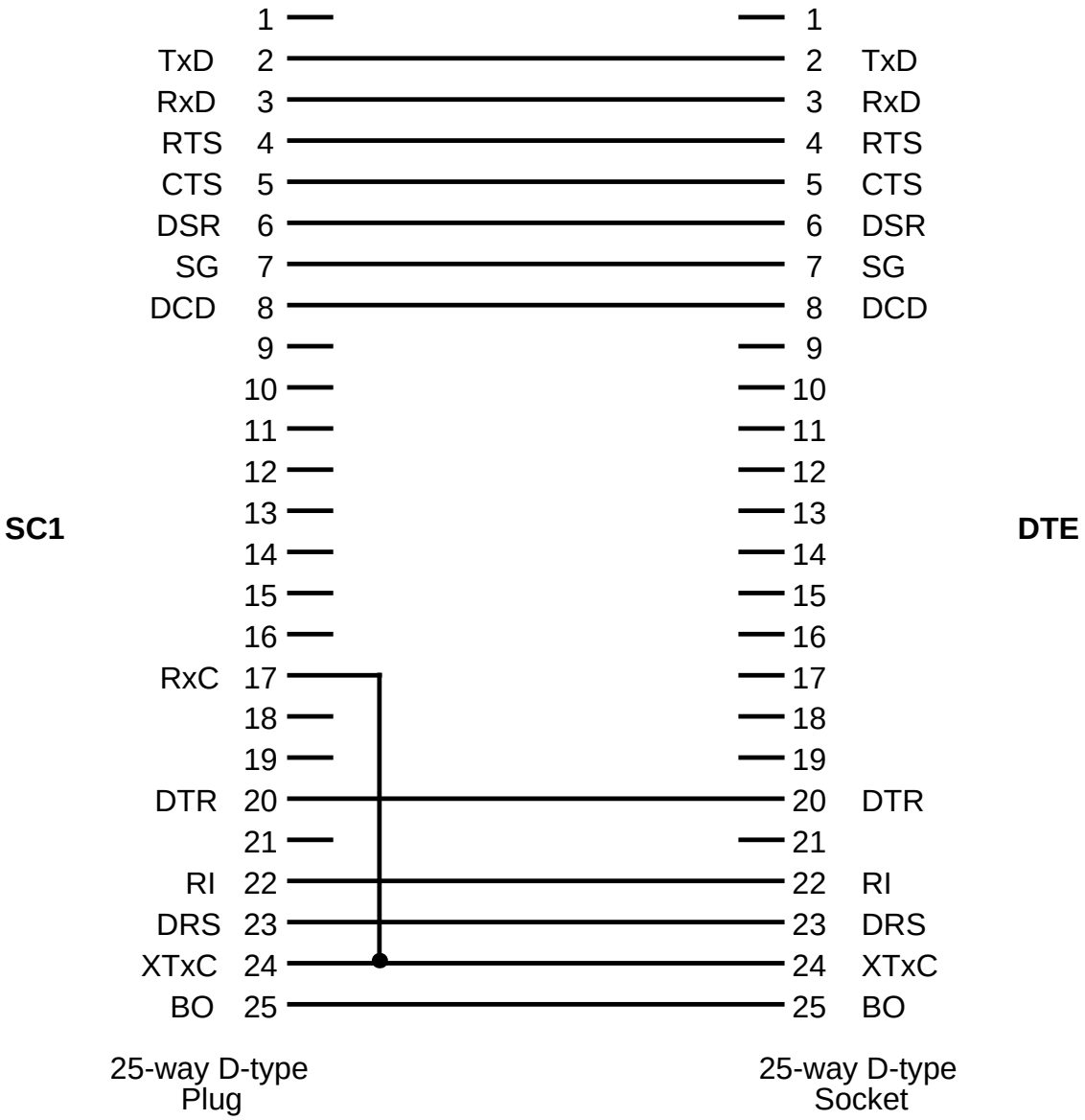


Figure B-1 V.24 Port Extension Cable X840-400711

If the port is to be connected to a DCE (e.g. onward-linked via a modem), then a crossover cable will be required, such as part number X840-400611, shown in Figure B-2. It is available in various lengths up to 50 feet (15 metres). Note that the cable is symmetrical, so can be connected either way round.

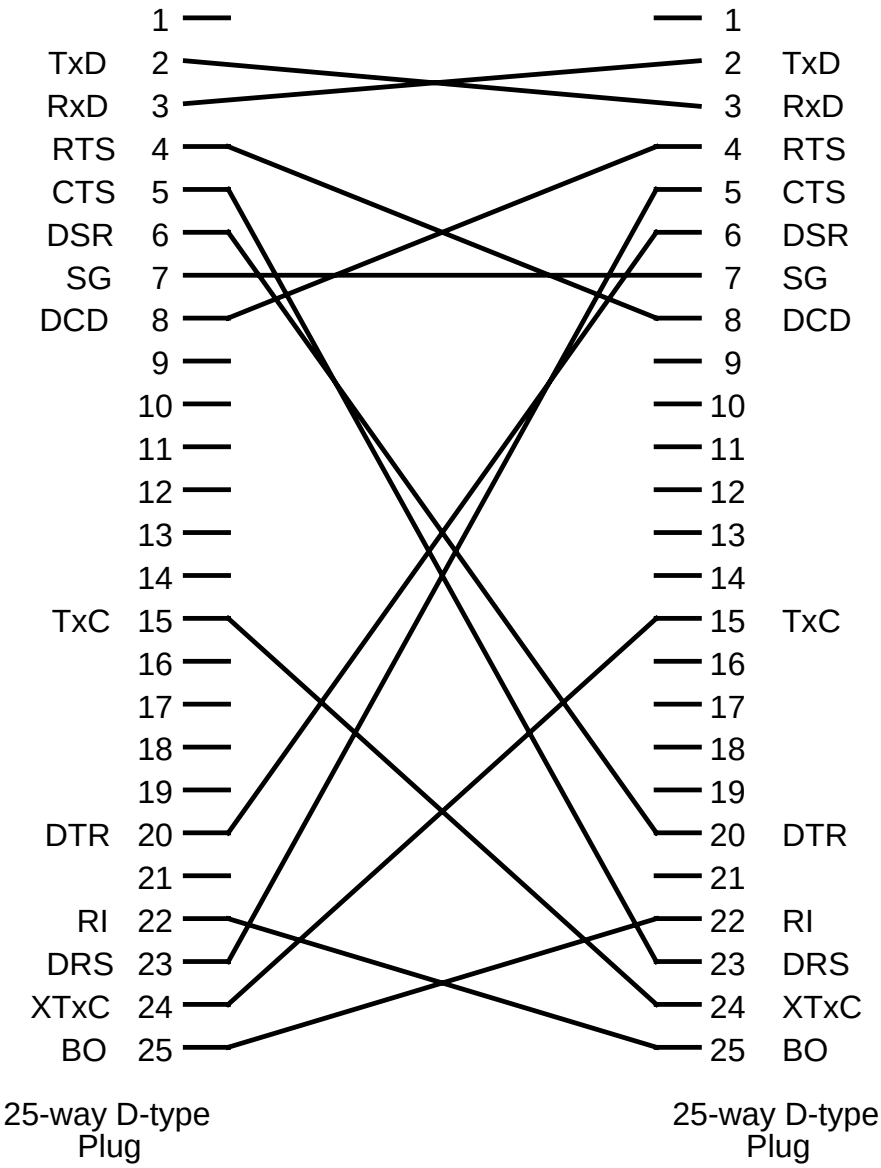


Figure B-2 V.24 Port Crossover Cable X840-400611

Connection of Tandem equipment is a special case. Examples of the connections required are given in Figures B-3 and B-4.

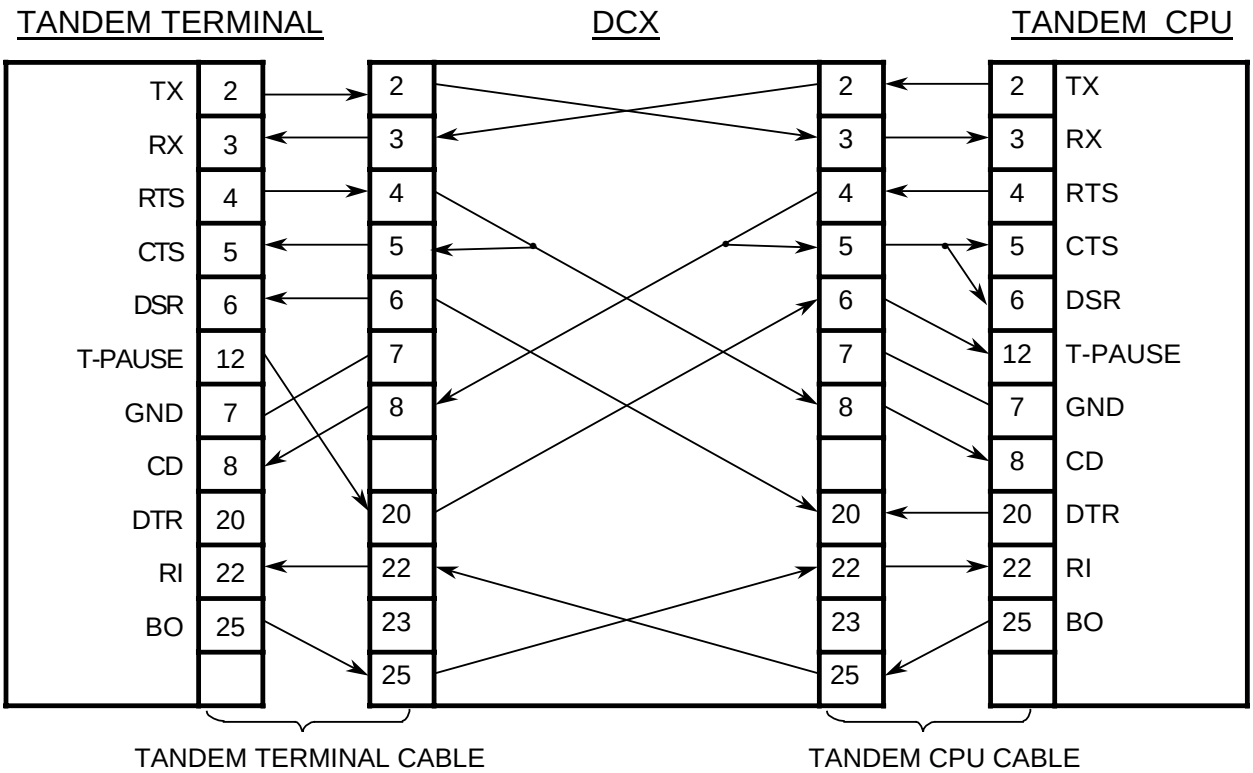


Figure B-3 Tandem Terminal to Tandem CPU Port Interconnections

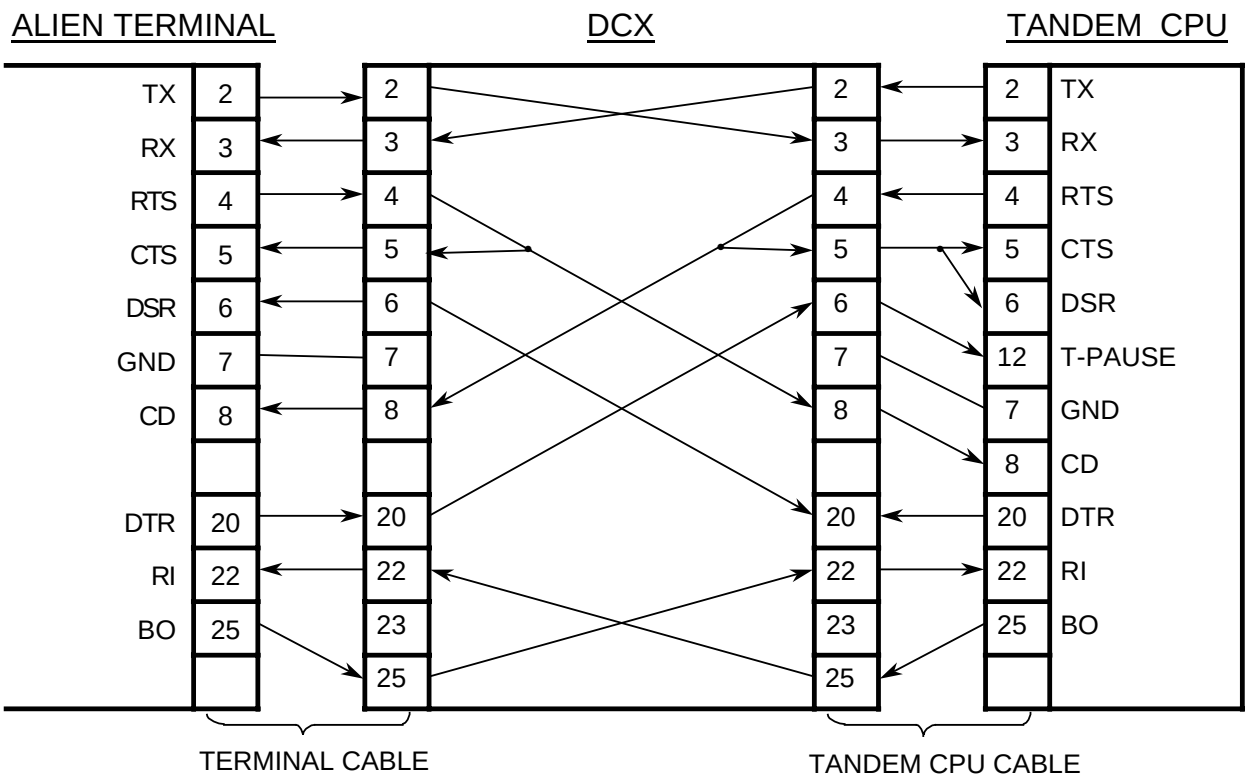


Figure B-4 Non-Tandem Terminal to Tandem CPU Port Interconnections

B.2 SC1/RS-422

B.2.1 Port Interfaces

The SC1/RS-422 terminates in four 25-way D-type sockets at the rear of the DCX. The interface signals on each of these conform to RS-422 and are listed in Table B-2, which also shows the normal DTE signals.

DCX 25-PIN LSC CHANNEL CONNECTOR DESCRIPTION			DTE 37-PIN CONNECTOR DESCRIPTION		
SIGNAL NAME (V.24)	PIN Nos		PIN Nos		SIGNAL NAME (RS-422-A)
	A,A[1] (+)	B,B[1] (-)	A,A[1] (+)	B,B[1] (-)	
Transmitted Data	2	3	4	22	Send Data (S)
Received Data (S)	22	23	6	24	Receive Data
Data Terminal Ready	8	20	12	30	Terminal Ready (S)
Data Set Ready (S)	6	5	11	29	Data Mode
Signal Ground	7		19		Signal Ground

Notes:
1. Interconnecting cable must connect pins of like polarity.
2. Unused or permanently set DCX V.24 control functions are not listed.
3. (S) = source of signals.

Table B-2 SC1/RS-422 Interface Connections

B.2.2 Cables

Cables will normally come with the DTE, or be made up locally. Remember that RS-422 uses balanced wires. It is therefore important that '+' pins are connected to '+' pins etc as indicated in Table B-2.

B.2.3 Loopback Plugs

All unused channels must be fitted with a loopback plug (as supplied) having the following connections: 2 - 22, 3 - 23, 8 - 20, 6 - 5. Failure to do this will prevent the supervisor from logging on.

B.3 SC1/CL20

B.3.1 Port Interfaces

The Current Loop version of SC1 has a switchbank S3 of eight switches used to select the four transmit and four receive paths for each channel described in Section 2.2.3. Its location is shown in Figure B-5 and the switch settings are shown in Table B-3.

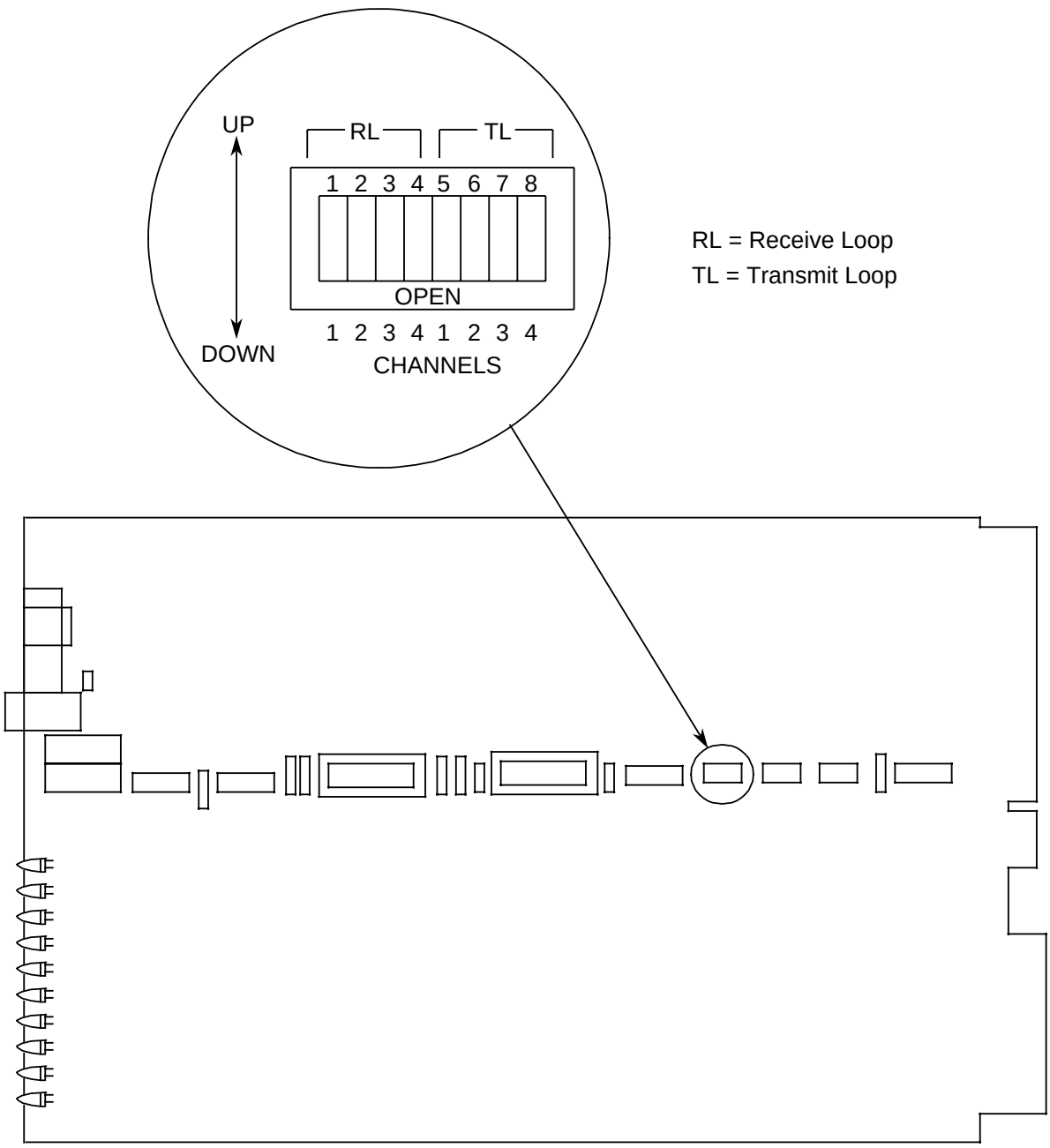


Figure B-5 Switch S3 on SC1/CL20 Card

CHANNEL No	SIGNAL PATH	LOOP CURRENT SOURCE	OPTION SWITCH POSITION	LSC CONNECTOR PIN No AND POLARITY	LEAD DESIG.
1	Receive Loop	DCX	S3-1U	3 + 25 −	RL RC
		DTE	■ S3-1D	5 + 22 −	RL RC
	Transmit Loop	DCX	S3-5U	2 + 23 −	TL TC
		DTE	■ S3-5D	4 + 20 −	TL TC
2	Receive Loop	DCX	S3-2U	3 + 25 −	RL RC
		DTE	■ S3-2D	5 + 22 −	RL RC
	Transmit Loop	DCX	S3-6U	2 + 23 −	TL TC
		DTE	■ S3-6D	4 + 20 −	TL TC
3	Receive Loop	DCX	S3-3U	3 + 25 −	RL RC
		DTE	■ S3-3D	5 + 22 −	RL RC
	Transmit Loop	DCX	S3-7U	2 + 23 −	TL TC
		DTE	■ S3-7D	4 + 20 −	TL TC
4	Receive Loop	DCX	S3-4U	3 + 25 −	RL RC
		DTE	■ S3-4D	5 + 22 −	RL RC
	Transmit Loop	DCX	S3-8U	2 + 23 −	TL TC
		DTE	■ S3-8D	4 + 20 −	TL TC

U= UP
■ D= DOWN

RL: RECEIVE LOOP +
TL: TRANSMIT LOOP +

RC: RECEIVE COMMON −
TC: TRANSMIT COMMON −

■ FACTORY SHIPPED POSITION

Table B-3 SC1/CL20 Current Loop Options

The SC1/CL20 module is shipped from the factory with all S3 option switches set in the up position. These settings, shown in Figure 2-2 as Circuit A for 4-wire cable, and B for 3-wire cable, place the DCX in the source mode on all loops and channels. If this mode can be used by all DTEs, use the card without modification. If the DTEs must provide current on one or more loops, then the option switches must be changed.

For example, an SC1 receive loop optioned to obtain loop current from the DCX (source mode) has its terminals on connector pins 3 and 25. If the SC1 is optioned to obtain loop current from the DTE (i.e. DCX in sink mode), the receive loop terminals move to pins 5 and 22. A similar change occurs with transmit loop connections.

You may find it useful to record the connections used on each channel to assist in determining which DTEs, SC1s and cables are interchangeable in an emergency. A suggested format is given in Figure B-7; you can make a copy and fill it in for each SC1/CL20.

The option switch S3 in the SC1 is identical in all respects to option switch S1 in the earlier LCS3A and LSC4A Optocoupled Current Loop Modules. Additionally, the four channel port connectors are wired the same on all current loop modules. The SC module can be interchanged with earlier Current Loop LSCs in the same DCX slot after all options are matched.

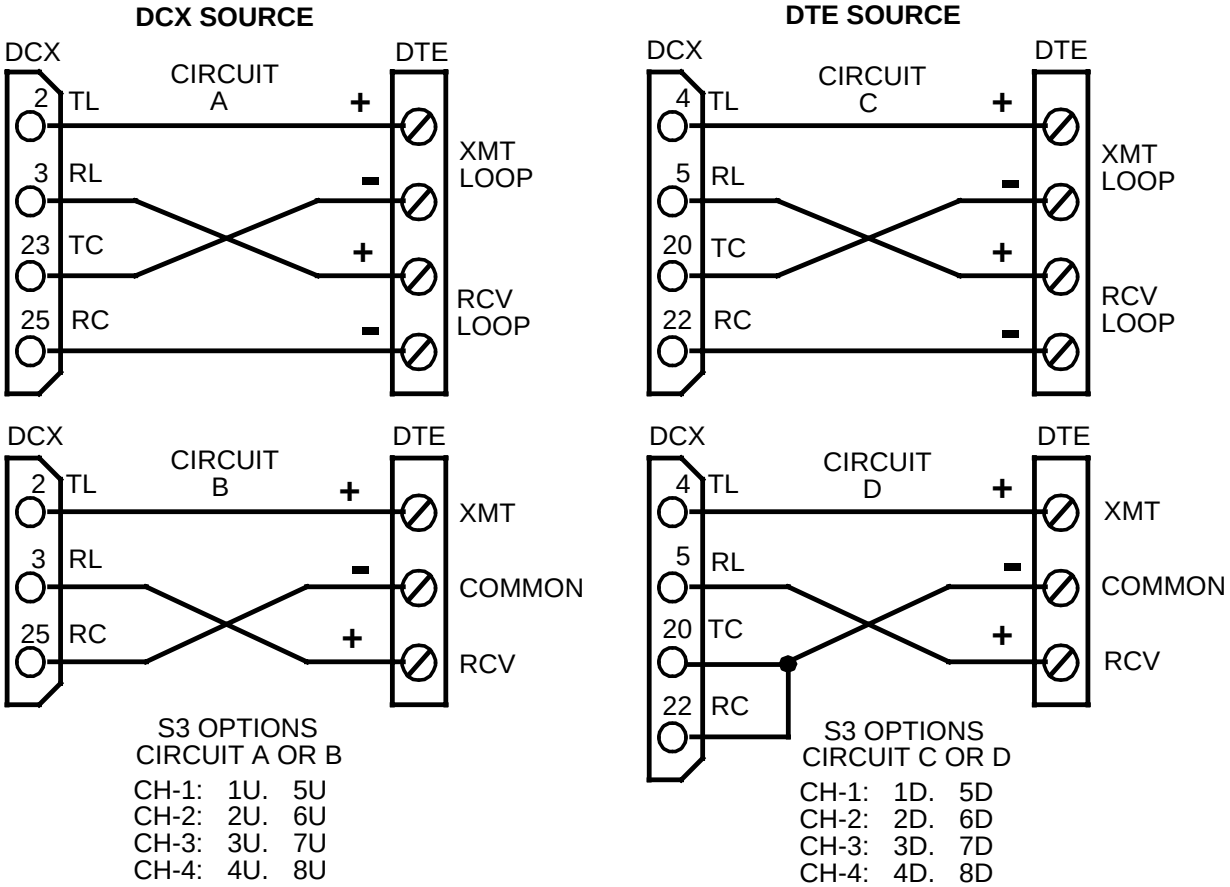
If the DCX option switches are changed at a later date, the interface cable might need rewiring, since the options and cable pair connections at the DCX are inter-related. Transmit and receive loop connections shift from one pin group to another, depending on the option selected; see Figure B-6.

B.3.2 Cables

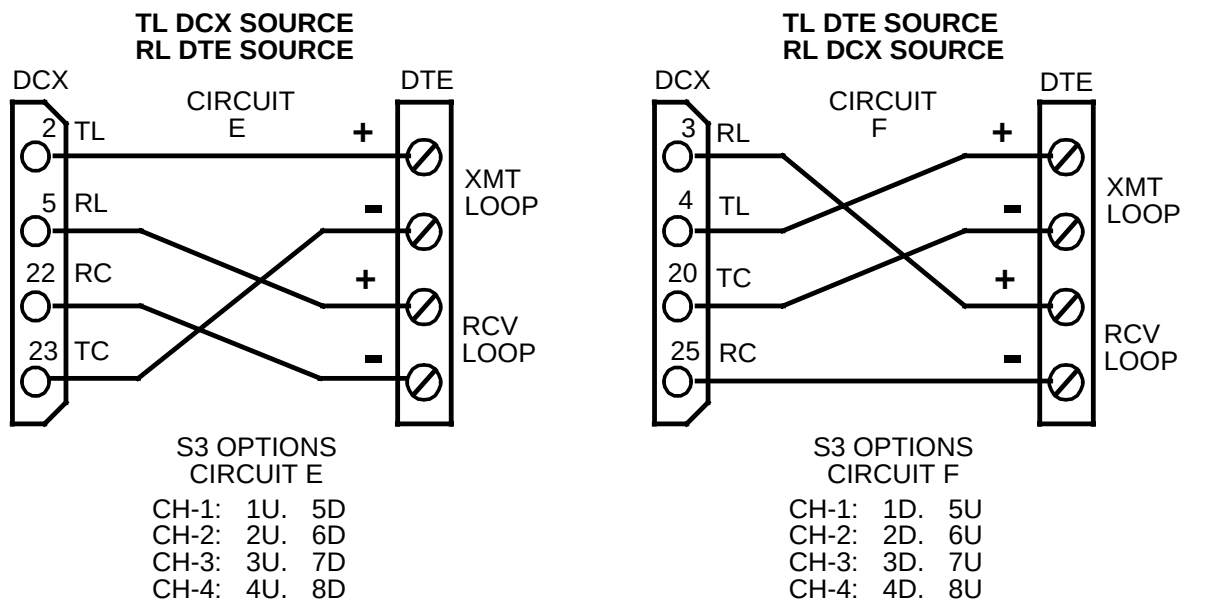
Cables will normally come with the DTE, or be made up locally.

B.3.3 Loopback Plugs

All unused channels must be fitted with a loopback plug (as supplied) having the following connection: 3 - 4, 20 - 25. Failure to do this will prevent the supervisor logging on.



RCV AND XMT LOOPS SAME CURRENT SOURCE



RCV AND XMT LOOPS SEPARATE CURRENT SOURCES

U: UP
D: DOWN

TL: TRANSMIT LOOP ALWAYS +
TC: TRANSMIT COMMON ALWAYS -

RL: RECEIVE LOOP ALWAYS +
RC: RECEIVE COMMON ALWAYS -

Figure B-6 Alternative DTE and Cable Connections

LOCATION:			SC ID:				
CHAN No	CIRCUIT TYPE (FIGURE B-6)						DTE
	A	B	C	D	E	F	
1							
2							
3							
4							

Figure B-7 Current Loop Configuration Record