DCX S-Link2, 20
Reference Manual

(Level 2(0).x)

CE

Cray Communications 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.

LITHIUM BATTERY

The lithium used in the battery of this unit will react violently with water and most gases. Discharged batteries must not be crushed, incinerated or disposed of in the normal waste. Used batteries should be collected and disposed of in an approved land fill. The manufacturer and your local waste authority will provide more detailed information about their disposal.

Accidental charging and short circuiting of the battery may cause overheating and possible rupture.

Replace only with the same or equivalent type recommended by the equipment supplier.

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Preface

This manual provides information for network managers (supervisors) to configure, operate and test the Series DCX S-Link2 and S-Link20 modules. It forms part of the DCX Systems Documentation, and refers to other manuals in the series. It assumes that you will already have some knowledge of the DCX system, obtained either from the System Documentation or from a Cray training course.

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1 Introduction

1.1 The S-Link2,20 Transport System

The S-Link2 and S-Link20 Transport Systems provide a point-to-point or multipoint SDLC transport facility for the DCX 840/850/860/870 range of multiplexer.

The system consists of two units (DCX cards) that interface SDLC data into and out of the DCX network. Both units need to be basically identical (i.e. both S-Link2 or both S-Link20), but each is configured appropriately as a Primary Interface Unit (PIU), a Secondary Interface Unit (SIU), a Negotiable Interface Unit (NIU) or a Transparent Interface Unit (TIU). The NIU and TIU options are only available on S-Link20.

. A PIU is used to interface to an SDLC primary (for example an SNA PU4/5 node such as an IBM 3705/3725 Communications Controller).

. An SIU is used to interface to an SDLC secondary or secondaries (for example SNA PU2 nodes such as IBM 3274 Cluster Controllers).

. An NIU is used to interface to an SDLC primary or secondary (for example an SNA PU4 node where the link role is negotiable). This option is only available on S-Link20.

. A TIU is used to pass all frames transparently through to the remote end, and can be used in most SDLC links. This option is only available on S-Link20.

The two units must have compatible configurations to be able to communicate with each other. Compatible configurations are:

PIU ↔ SIU
NIU ↔ NIU (S-Link20 only)
TIU ↔ TIU (S-Link20 only)

The two units are interconnected through the DCX network via either a PMC (Permanently Mapped Channel) or a suitably configured IMP (Internally Mapped Channel). A simplified illustration is provided in Figure 1-1, showing a PIU interconnected to an SIU.

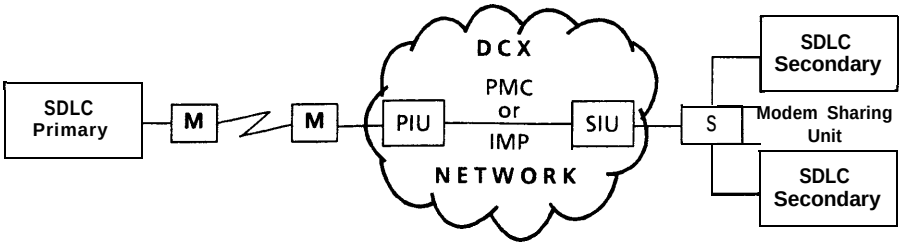


Figure I-l S-Link2,20 Block Diagram

S-Link2,20 has a range of clocking arrangements and cables for either modem connection (DTE working) or direct connection (DCE working) over the SDLC link.

Each unit contains its own configuration details accessed by a facility called the 'Manager'. The system supervisor can configure each S-Link2,20 unit by accessing its Manager facility via the Manager channel. Access can be via an LSC card located anywhere in the DCX network, by using a suitable asynchronous VDU terminal which at other times is free for any other use.

1.2 This Reference Manual

In Chapter 2, this manual provides a description of the S-Link2,20 system and its units.

Chapter 3 contains instructions for suitably qualified personnel to install S-Link2,20 cards in a DCX network.

Chapter 4 contains full information to enable the system supervisor initially to configure and subsequently to reconfigure the S-Link2,20 cards to suit the IBM and DCX environments.

Chapter 5 contains procedures that maybe used in the event of problems arising during configuration and operation of the equipment.

In order to appreciate fully the S-Link2.20 configuration and diagnostic facilities, the supervisor requires a general knowledge of the SDLC protocol (given in the IBM publication Synchronous Data Link Control - Concepts, reference number GA27-3093), and of the DCX 840/850/860/870 (given in the relevant DCX reference manual).

The majority of the text in this manual applies to both the S-Link2 and S-Link20 products. Where this is so, the simplified reference 'S-Link' is used. Where there is a difference, each type of unit is referred to separately.

1.3 Specification Summary

SDLC Interface

Single SDLC serial interface. S-Link2: V.24/V.28 operating at up to 19200 bps. S-Link20: V.24/V.28 operating at up to 19200 bps, or V.35/V.1 1 operating at up to 64 kbps.

Supports maximum of eight multidropped devices.

The link may operate full-duplex or half-duplex.

May be multidropped from the same line as other S-Link modules and/or real IBM devices, and/or DCX S-Gate modules.

Clocking may be either external (e.g. from a modem) or internally generated and available to the attached IBM device via a special cable. Split clocking (relevant clock signal supplied by the originator of the data) is also possible.

The SDLC interface can be configured for leased or switched line operation with either point-to-point or multipoint configuration. SDLC XID frames can either be emulated locally or passed through transparently.

Supervisor Channel

For configuring the S-Link unit, a 'Manager' Interface emulating a VTIOO, ADM3A, CIFER 2605, IBM 3101 or equivalent terminal is provided.

Trace Channel

An asynchronous SDLC line trace interface is provided.

DCX Interconnection

The S-Link2 or S-Link20 units are interconnected via either a DCX Permanently Mapped Channel (PMC) or a USO-configured Internally Mapped Channel (IMP). To the local DCX, each unit appears to be an ARQ connected to a remote DCX node.

2 System Description

2.1 S-Link2,20 in SNA Networks

The S-Link facility for passing SNA/SDLC data across DCX networks takes advantage of the DCX's ability to share ARQ line bandwidth between different devices dynamically. S-Link generates or absorbs polls independently and transmits user data only across the DCX network. By this means not only is the traffic on the network considerably reduced, but the two units may be separated by a number of intermediate nodes without protocol timeout difficulties.

In the example system in Figure 2-1, a single SDLC link from the Front End Processor (FEP) is multidropped to two PIUS via a Port Sharing Unit (PSU). The PIUs are mapped via DCX channels to the remote SIUs. One SIU supports a multidropped line via a Modem Sharing Unit (MSU) consisting of one 3274 Cluster Controller and a DCX S-Gate. The second SIU supports a 3275 on a point-to-point link using modems.

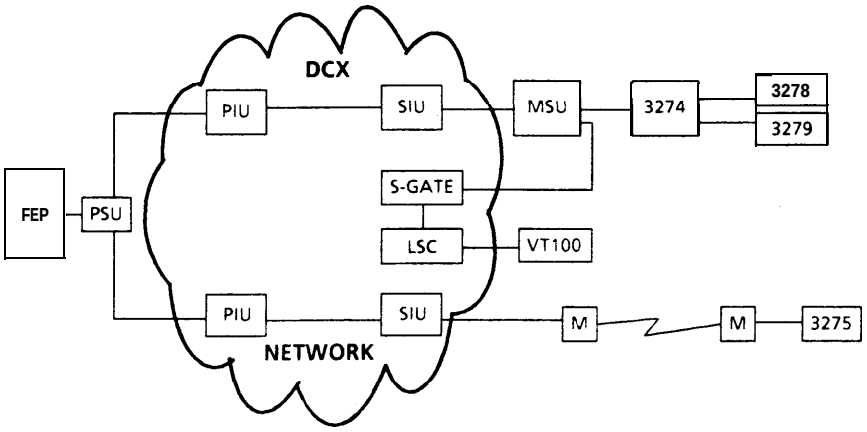


Figure 2-1 S-Link2,20 in SNA Network

2.2 S-Link2,20 Operation -

The two ends of S-Link operate almost independently and also have independent line configurations. When they have been configured and are online, the link is ready to operate. It then goes through a sequence of events before it is fully operational.

2.2.1 Synchronisation

The first event is the synchronisation of the two ends of S-Link. The ends maintain contact with each other over the DCX network by sending status messages, which also indicate the state of the transmitting end.

2.2.2 PIU/SIU Operation

Once the two ends are online and ready, the PIU then awaits a high DTR signal from the FEP. This event is passed onto the SIU which, if the Transparent DTR option has been selected, reflects this to the attached secondary device.

Next, the SIU attempts to contact each of the attached devices and begin polling. The initial poll is Receiver Not Ready (RNR) until the PIU has been contacted by the FEP. The polls then change to Receiver Ready (RR).

The PIU responds Disconnect Mode (DM) to the attached device while the SIU is awaiting response to its Set Normal Response Mode (SNRM) command. Once the SIU has received an Unnumbered Acknowledgement (UA), the PIU responds likewise and awaits polls from the attached device. The PIU responds to polls locally and does not pass them through the DCX network. The SIU, which autonomously generates polls, then transmits the data to the attached devices when appropriate.

The PIU forwards only complete frames with good checksum to the SIU, and does so as soon as possible, not waiting for the frame with the final bit set.

The SDLC address used by the primary to poll the PIU may be different from the SDLC address used by the SIU to poll the individual secondary device.

Should a secondary device be switched off at the SIU end, the SIU removes it from the poll list for a period of time and re-attempts contact on expiry of the timer. The PIU also stops responding to the polls for the particular device.

2.2.3 **NIU Operation** (S-Link20 only)

The NIU operation begins after the two ends of S-Link (both NIUs) have synchronised with each other. S-Link then enters a transparent mode of operation, where all SDLC frames received (except mode setting commands such as SNRM or SIM) are passed transparently through to the remote NIU. Each frame is then transmitted as it was received, including the frame address and control bytes. This transparent mode of operation continues until one end of S-Link receives a mode-setting command.

When an NIU receives an SDLC Set Normal Response Mode command (SNRM), it will automatically switch itself into a PIU mode of operation, and request the remote NIU to switch into an SIU mode of operation. From then on the NIUS operate as PIU and SIU respectively. The SNRM command will not be responded to until the remote NIU has received an Unnumbered Acknowledge response (UA) to its SNRM command. This mode of operation continues until an outage occurs such as receiving a Disconnect command (DISC) or Disconnect Mode response (DM), or there is a V.24 signal loss, expiry of timeout, etc. On occurrence of such an outage, S-Link reverts to the NIU mode of operation.

S-Link reacts to the receipt of a Set Initialisation Mode command (SIM) in the same manner as an SNRM. However, only one end of S-Link (the one configured as 'End A') will react to the SIM command, since the Request Initialisation Mode command (RIM) is exactly equivalent in format to an SIM command. The SIM or RIM command received at End B of S-Link is passed through transparently. The PIU/SIU mode of operation in Initialisation mode continues until one of the outages mentioned earlier, or the receipt of an Exchange Identification (XID) frame by either NIU. S-Link then reverts to the transparent mode of operation.

2.2.4 **TIU Operation (** S-Link20 only)

After the two ends of S-Link have synchronised with each other, it enters a transparent mode of operation, where **all** SDLC frames are received and passed transparently through to the remote end. Each end of S-Link transmits the frame as received by the remote TIU, including the frame address and control bytes. In this mode, **all** frames including Receiver Ready (RR,! and Receiver Not Ready (RNR) are passed through transparently. This transparent mode of operation continues until a V.24 signal loss outage occurs, when the TIUS restart the transparent mode of operation.

2.3 S-Link2,20 Interconnection via DCX

Each S-Link requires four DCX channels. A simplified illustration of these channels with S-Link is given in Figure 2-2.

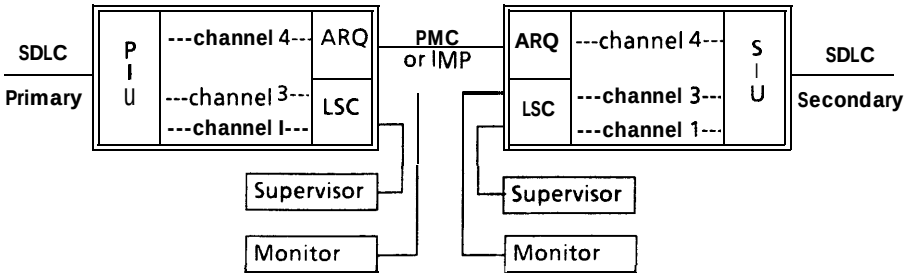


Figure 2-2 S-Link2,20 Interconnection

Channel 1 is the Manager channel, which maybe accessed by a supervisor terminal (at any LSC on the network) for carrying out the supervisor operations described in Chapter 4.

Channel 2 is reserved for future use.

Channel 3 is the SDLC Line Trace channel, which maybe accessed by a supervisor terminal (at any LSC on the network) for monitoring the SDLC line.

Channel 4 is the S-Link interconnection channel. The two ends of S-Link are interconnected using either a DCX PMC or USO-configured IMP connection.

2.4 S-Link2,20 Cards

The S-Link cards are standard size and each occupies one slot in the DCX 840/850/860/870 frame (see page O-2 for a DCX 860/870).

2.4.1 Indicators

Each card has eight LED indicators with an overlay as shown in Figure 2-3. The OKY indicator is green, all others are red.

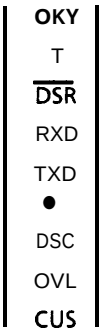


Figure 2-3 S-Link2,20 Indicators

OKY Indicator

This indicator is associated with the S-Link software and is lit to indicate normal operation.

T (Trap) Indicator

When this indicator is lit steadily, it indicates that a fault has occurred. If some of the status indicators are blinking in unison, the Trap indicates a severe malfunction. In this case the six status indicators used collectively show a trap code. Although resetting the unit may cure the fault, a note should be made of which indicators are lit, and your supplier should be informed. This will allow potential problems to be found and eliminated as quickly as possible.

If no status indicators are blinking in unison, this indicates that a fault has occurred and the relevant fault dump information has been recorded. The system should be functioning again. When the supervisor logs on to the Manager channel, a 'System Fault' screen is displayed, indicating the system fault number that was recorded.

The fault number should be recorded and your supplier informed in order to clear the fault dump record.

Status Indicators

When the T indicator is off, the six status indicators have the following meanings when lit.

DSR Data Set Ready Signal Absent. The modem is disconnected or switched off.

RXD Receive Data. Flashes when valid data frames are being received on the SDLC link.

TXD Transmit Data. Flashes when data is being transmitted on the SDLC link.

DSC Remote Disconnected. When lit steadily, the remote unit is not present. When blinking, the remote unit is present but unable to communicate fully. If the blinking continues for a prolonged period, it is likely that the remote unit is in cold start or reconfigure mode.

OVL S-Link Overload. The unit is running out of internal buffer space. When the condition is eased, the indicator will be extinguished.

Cus Configuration Unsuitable. When lit steadily, the unit is in cold start mode. When blinking, the Manager is in Offline mode, and the software is awaiting a new configuration. A configuration needs to be entered into the Manager before the rest of the software proceeds.

3 Installation

3.1 Introduction

Installation should be undertaken only by persons qualified in the configuration of the DCXS to be used.

Installation should take place in the sequence of instructions in this section.

3.1.1 The DCX Environment

S-Link is designed to operate in a DCX 840/850/860/870 frame provided that the minimum configuration requirements are met, namely:

840/850: STC in slot **17**
Master ARQ or TAC in slot **16**
BUF in slot **1**

860/870: STC in slot **20**
Master ARQ in slot **19**

The S-Link card occupies a single slot and maybe located in any position (excluding slot 16 in the 840/850 and slot 19 in the 860/870) which supports ARQ working (see the relevant DCX Reference Manual). More than one S-Link card may be present within the DCX frame.

WARNING: for installation in a DCX 860/870, see page O-2.

To enure the availability of all link speed functionality provided by S-Link20, the interconnect cable between the rear of the S-Link 20 card and the connector panel of the DCX frame mustbeoftypeX840-402911. It must be installed with the upper ribbon cable going to the upper connector (Port **1,** V.24) and the lower ribbon cable to the lower connector (Port 2, X.21).

ARQ Considerations

In almost all cases, the S-Link cards will be located in different nodes, with the SDLC data path between them a PMC or an IMP routed via

ARQs. The ARQs used should have sufficient bandwidth to accept the SDLC data, bearing in mind the maximum ARQ efficiency of 70%.

Should the ARQs not have enough available bandwidth, S-Link will still operate, albeit sluggishly. Should the fast primary route fail on an IMP, a slow fallback route may then be used.

BUF Considerations

The BUF card must be at least BUF3.

3.2 S-Link2 Option Switches and Straps

3.2.1 Switches

Each S-Link2 card must be configured by correctly setting a bank of four miniature switches. They are located behind the card puller, with Switch 1 at the top, as shown in Figure 3-1 or 3-2 (depending on version of card).

In normal operation Switches 3 and 4 should be closed, but when switching on for the first time Switch 3 should be open.

Switch 1 Unused.

Switch 2 OPEN - S-Link2 installed in DCX 836.
CLOSED - S-Link2 not installed in DCX 836.

Switch 3 OPEN - System cold starts on reset.
CLOSED - System warm starts on reset.

Switch 4 OPEN - TXD and RXD indicators are enabled.
CLOSED - TXD and RXD indicators are disabled.

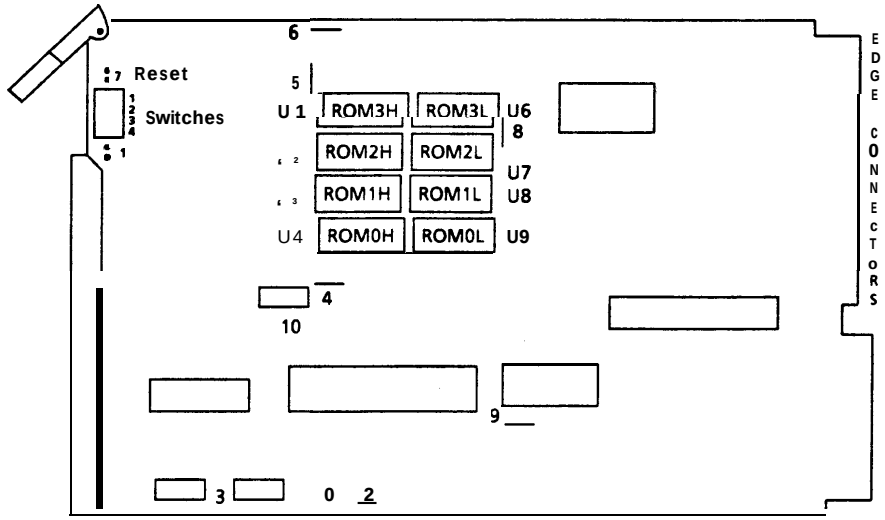


Figure 3-1 S-Link2 Switches and Straps (X840-603913)

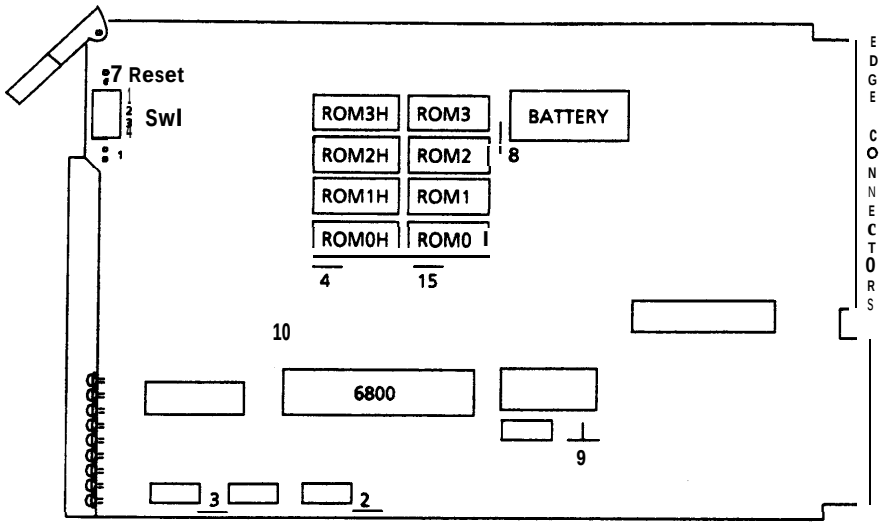


Figure 3-2 S-Link2 Switches and Straps (X840-$03915)

3.2.2 Straps

The S-Link2 cards have straps that are set to the correct positions at the factory. The state of these straps for normal operation is shown in Table **3-1** or **3-2** (depending on version of card).

STRAP NUMBER	STRAP NAME	NORMAL OPERATIONAL SETTING	
		CHOICE	STRAP POSITION
1	SFINT	ENABLED	NO STRAP
2	(PROM Size)	27256	STRAP RIGHT
3	WDOG	ENABLED	STRAP ON
4	BERR	ENABLED	STRAP ON
5	6264/6116	6264	STRAP LEFT
6	61 16/6264	6264	STRAP UP
7	RESET	ENABLED	NO STRAP
8	(Battery supply)	CONNECTED	STRAP UP
9	RAM/128 K/256K	256K	STRAP UP
10	BDS/BAS	BAS	STRAP RIGHT

Note that strap names shown in brackets are not marked on the card

Table 3-1 S-Link2 Strap States (X840-603913)

STRAP NUMBER	STRAP NAME	NORMAL OPERATIONAL SETTING	
		CHOICE	STRAP POSITION
1	SFINT	ENABLED	NO STRAP
2	(PROM Size)	OTHER	STRAP RIGHT
3	WDOG	ENABLED	STRAP ON
4	BERR	ENABLED	STRAP ON
7	RESET	ENABLED	NO STRAP
8	(Battery supply)	CONNECTED	STRAP UP
9	RAM/128 K/OTHER	OTHER	STRAP UP
10	BDS/BAS	BAS	STRAP RIGHT
15	512 K/OTHER	OTHER	STRAP RIGHT

Note that strap names shown in brackets are not marked on the card

Table 3-2 S-Link2 Strap States (X840-603915)

3.3 S-Link20 Option Switches

Each S-Link20 card must be configured by correctly setting a bank of eight miniature switches. They are located behind the card puller. With the card vertical, Switch 1 is located at the top. OPEN = right and CLOSED = left.

Switch 1 Unused.

Switch 2 OPEN - S-Link20 not installed in DCX 836.
CLOSED - S-Link20 installed in DCX 836.

Switch 3 OPEN - System will cold start on a reset.
CLOSED - System will warm start on a reset.

Switch 4 OPEN - TXD and RXD indicators are enabled.
CLOSED - TXD and RXD indicators are disabled.

Switch 5 Unused.

Switch 6 Unused.

Switch 7 Unused.

Switch 8 OPEN - Normal Operation.
CLOSED - Hold card in reset condition.

3.4 Installation Procedure

Check that the DCX to be used is in operational condition.

3.4.1 **Mapping the DCX**

In a DCX 840, set up the STC edit map via the MTP:

1. Set the size of the S-Link card to 4.
2. Map the S-Link card channel 1 (x.1) to the LSC channel that is to be the supervisor terminal.
3. Self-map the S-Link card channel 2 (**x.2**).
4. Map the S-Link card channel 3 (**x.3**) to the LSC to be used for the Line Trace channel (for use in installation, self-mapped in normal operation).
5. Map the S-Link card channel 4(**x.4**) to the corresponding port on the remote S-Link card.
6. Make this the active map.

In a DCX with a USO, channels 1 and 3 may be configured as UMPS, with the USO configuration:

ZUDIN 3/0/0/0/1

and channel 4 may be configured as an IMP, with the USO configuration:

ZIFIN *x.y*

where *x* is the node and y the port number of the other end.

3.4.2 **Fitting the Card**

Ensure that the mains power is off (**under no circumstances may an S-Link card be removed or inserted with mains power on at the DCX**). Plug in the S-Link card, and in the DCX install the interconnect cable at the rear of the frame.

3.4.3 Connecting the SDLC Link

Connect the modem or IBM device to the S-Link card port using the correct cable for the application (see Appendix B), and ensure that the equipment is switched on.

3.4.4 Configuring the LSC Channels

Check that the LSC supervisor and trace channels have Echo OFF, V.24 Controls ON, and are set to the correct speed for the terminal. The terminals themselves must have full V.24 controls (3-wire terminals are not supported). Connect the terminals.

3.5 Powering Up

Apply power to the DCX and observe the S-Link card LEDs.

At power-up a set of diagnostic routines is run as a basic check of the card. All LEDs are lit for a few seconds. The green OKY LED should then remain on permanently. The T LED will remain on until the DCX is ready, and then go off.

(If any LEDs are flashing then there is a problem with the card. Note the LED pattern and contact your supplier - the card may need a cold restart.)

The Terminal Type Menu should then appear at the supervisor terminal. Configure the device using the instructions given in Chapter 4. Should the menu fail to appear, check that the necessary V.24 signals (e.g. Data Terminal Ready) are asserted by the terminal.

4 Supervisor Procedures

4.1 Introduction

This chapter describes the procedures by which the supervisor configures the S-Link to suit the DCX and SDLC environments.

The method of configuring the unit at each end of S-Link is the same: you are presented with a series of displays, most of which are menus displaying parameters and a number of command options. The diagrams in this chapter show default parameters.

After power-up, the first display to appear is the Terminal Type Menu. This requires you to enter your terminal type before the Logon banner is displayed.

The Logon banner requires you to enter the correct password to gain access to the configuration menus. Correct password entry will display the Interface Unit Selection Menu, from which the following menus can be accessed:

Main Menu
General Menu
Link Parameters Menu
SDLC Parameters Menu
Timeouts Menu
Line Trace Menu
Statistics Menu
Status Menu

Menus have up to six areas:

The Header	One line identifying the Manager, Product and Software Version, and the S-Link status. A second line identifying the current menu.
The Parameters	A display of current parameter settings.
The Commands	A list of executable commands.

The Transitions	A list of other menus that can be accessed.
The Selection Line	A line inviting entry of a two-character command or transition.
The Message Line	A line where system information maybe displayed.

In each menu you can view the relevant parameters, change the parameters by means of the commands displayed, choose a transition to another menu, or log out. Certain commands and transitions depend upon the mode of the Manager and other configuration parameters, and will only be displayed if valid. From the logout screen, you can log in by pressing **RETURN** or switching your terminal off and on again.

The S-Link unit has three states: Cold Start, Online and Offline.

During initial installation or following a cold start, the unit is placed automatically in Cold Start state, with a default configuration. At other times the unit will automatically be put in Online state. In Online state you can view any of the screens, and change non-system options such as the Line Trace, but you cannot change options which affect the system configuration. To change these options you must first put the unit into the Offline state using the OFFline command. This will interrupt and terminate all link operation.

4.1.1 Using the Menus

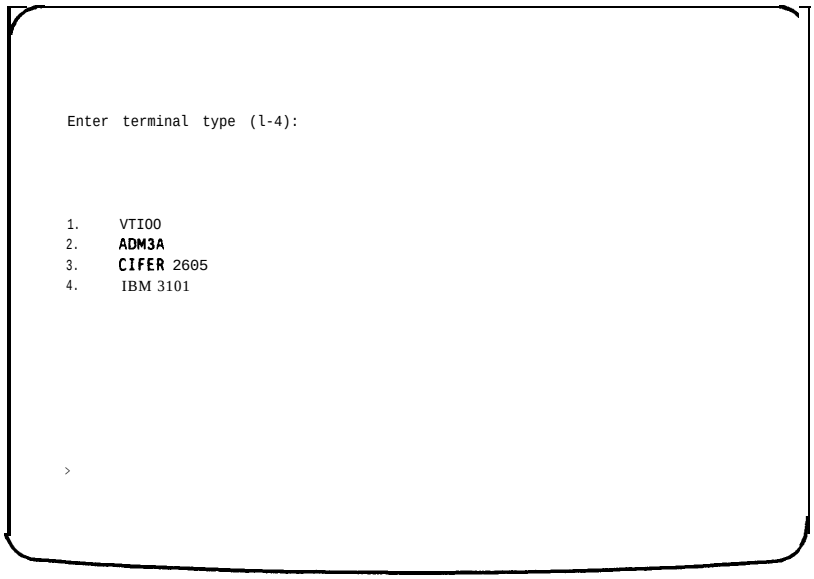
To initiate a command or transition it is only necessary to enter two (occasionally one or three) characters of its title (shown in upper case characters on the command display) in either upper or lower case, followed by **RETURN.**

If you make a mistake, an error message will be displayed after pressing **RETURN,** and you may then try again.

4.2 Logging In

4.2.1 Terminal Type Menu

The Terminal Type Menu is displayed automatically when a terminal is connected (DTR raised). It appears as :



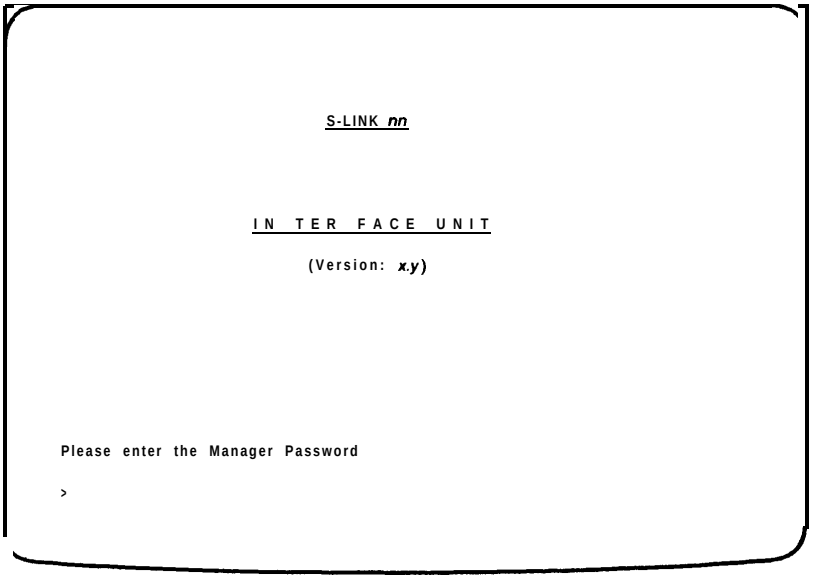
Enter the appropriate number to notify the system of your terminal type so that it can present the correct interface:

1 - Selects VTIOO compatible interface.
2 - Selects ADM3A compatible interface.
3 - Selects Cifer 2605 compatible interface.
4 - Selects IBM 3101 compatible interface.

When a terminal type has been selected, the Logon banner will be displayed.

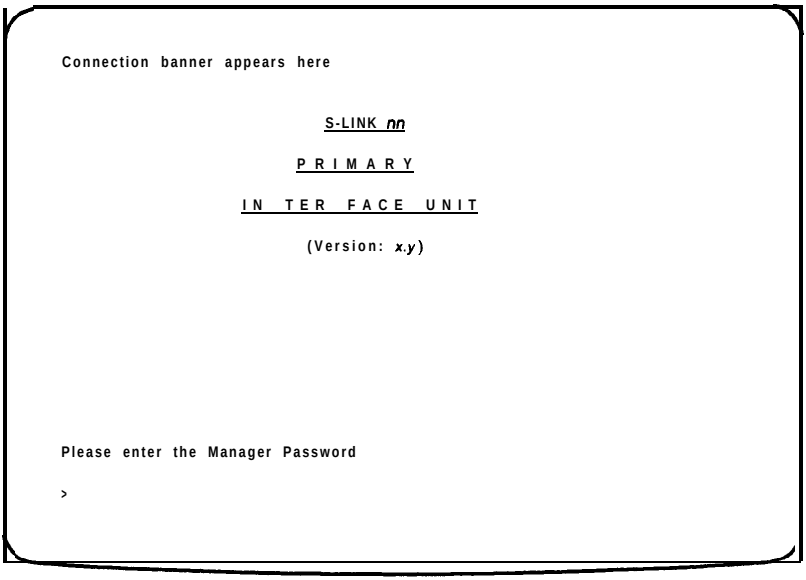
4.2.2 Logon Banner

The Logon banner appears after selection of a valid terminal type, or after pressing RETURN from the logout display. On a cold start the banner will look like this:



where *nn* is the S-Link product identity (either **2** or **20**) and *x.y* is the software version of the card.

If the Interface Unit type has already been configured, or on a warm start, a connection banner will appear at the position indicated below if one has been configured, and the banner will also display the type of Interface Unit, e.g. for a PIU (Primary Interface Unit) the menu will look like this:

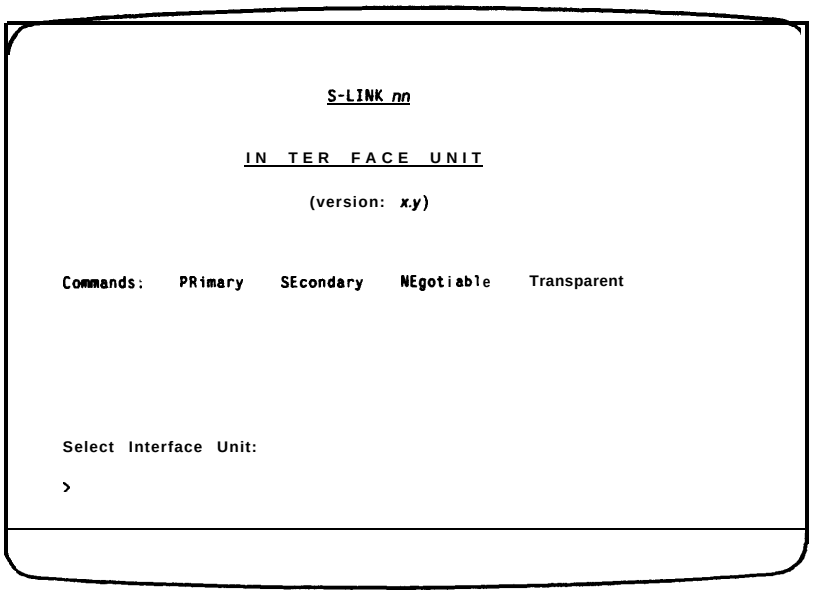


The only way to access the rest of the menus is to enter the correct Manager login password. The default password is just the RETURN key.

On a cold start, the next menu displayed will be the Interface Unit Menu (Section 4.3), whereas if the Interface Unit has already been configured, the next menu will be the Main Menu (Section 4.4).

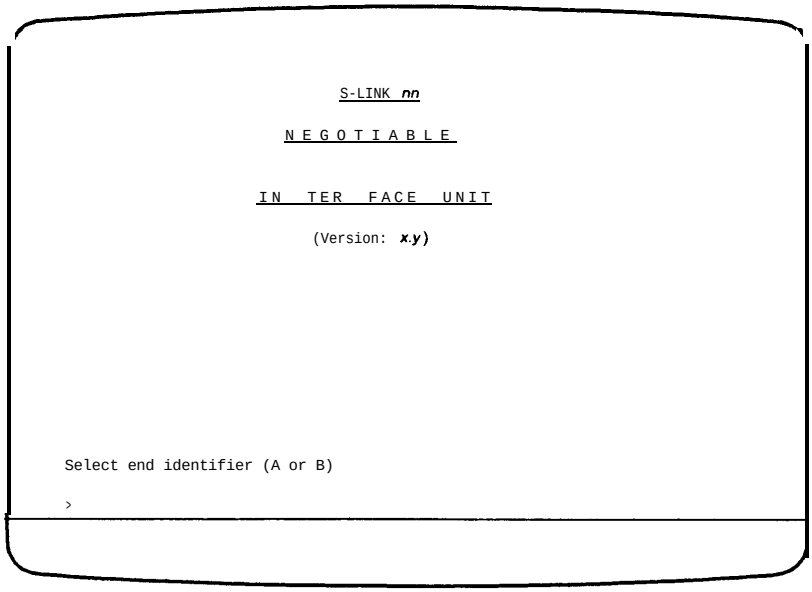
4.3 Interface Unit Menu

As the S-Link software is identical in the units at both ends of the link, each end needs to be configured to the appropriate Interface Unit type. The types selectable are Primary (PIU), Secondary (SIU), Negotiable (NIU) or Transparent (TIU). (The NIU and TIU are only available on S-Link20.) An S-Link configured as a PIU at one end of a link must have an SIU configured at the other end. An NIU will communicate only with an NIU, and a TIU only with a TIU.



Selection of either Primary or Secondary displays the Main Menu (Section 4.4).

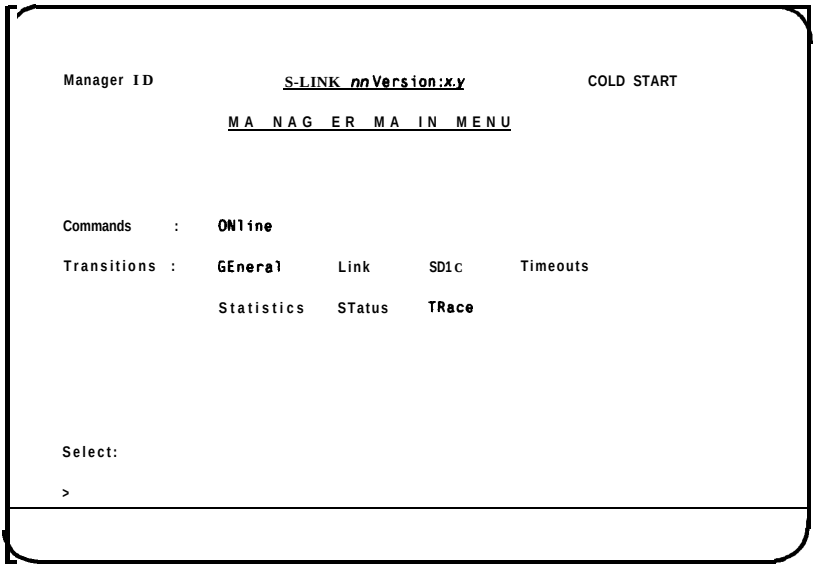
Selection of Negotiable or Transparent (S-Link20 only) additionally requires an S-Link end identifier, and hence the following menu is displayed. Note that the configured Interface Unit type is now displayed.



Whenoneendof S-Link is configured asend'A',theother endmustbe configured as end 'B'. S-Link will not communicate ifbothendsare configured the same. Refer to Chapter 6 for details of configuration considerations.

4.4 Main Menu (M from other menus)

The Main Menu is the first menu to be displayed once the Interface Unit type has been configured. The initial version is shown below.



The available **commands** depend on the state of the unit and are:

ON This command is available only if the unit is in Cold Start or Offline state. Changes status of the unit from Offline to Online.

OFF This command is available only if the unit is in Online state. Changes status of unit from Online to Offline.

Change State to Online (ON)

This command is available only when the unit is in either the initial Cold Start or the Offline state. The ONline command is used to confirm the unit configuration and enter the Online state. The message **System going ONLINE. Please wait!!** will be output on the screen. S-Link will not respond to any commands during this time.

Change State to Offline (OFF)

Once in the Online state, the OFFline command is used to return the unit to the Offline state. However, before entering the Offline state, the unit prompts for the Offline password. The message **System going OFFLINE. Please wait! !** will be output on the screen. S-Link will not respond to any commands during this time.

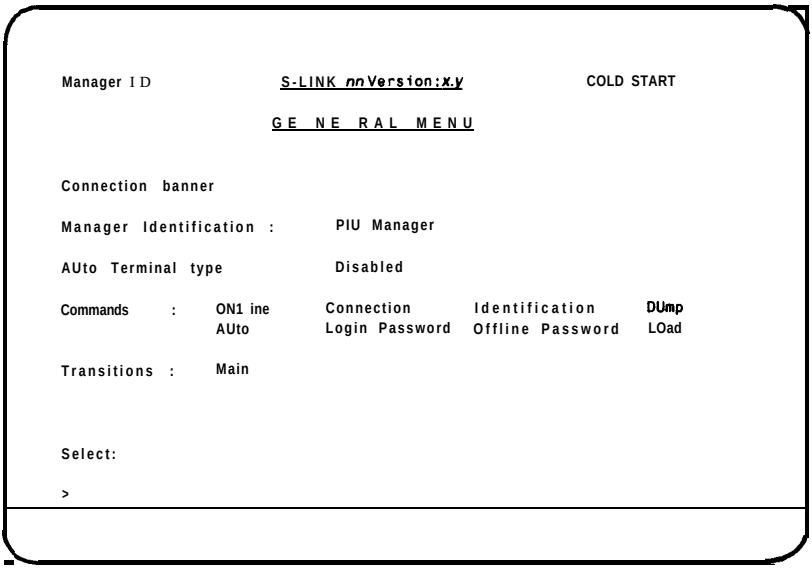
This Offline password may be different from the Manager Login password. Its purpose is to prevent unauthorised alteration of the S-Link configuration. The default is the RETURN key. Successful entry of the password results in entering the Offline state. **Note that all communication on the attached link will be stopped when Offline state is entered.** In this state, any of the unit's parameters can be reconfigured. The ONline command is used to return to the Online state.

Transitions

You can go to any of the menus listed by entering the appropriate code.

4.5 General Menu (GE from Main Menu)

This menu has a number of system configuration options, including passwords and banners. A unit configuration Load or Dump may also be carried out from this menu.



Thecommandsare:

ON	Change stateof unit to Online
OFF	Changestateofunit to Offline
co	Configure the Connection banner
ID	Configurethe Manager Identification
LP	Configure the Login password
OP	Configure the Offline password
DU	Dumpthecurrent unit configuration
LO	Load in a unit configuration
AU	Enable/DisableAuto Terminal

Change State (ON orOFF)

As explained infection 4.4.

connection Banner (CO)

The Connection banner appears at the top of the Logon banner screen (Section 4.2.2). Thedefault banner is blank.

The banner may be changed without entering Reconfigure mode. To change it, enter CO. The unit will prompt for the new text to be entered. A string of up to 45 printable characters may be entered. Then press RETURN to update the menu. To delete the banner and leave it blank, press RETURN after the New Text prompt.

Manager Identification (ID)

The Manager identification appears at the top left corner of all major menu displays. The fault depends on the Interface Unit type selected. For a Primary, the ID will be **PIU Manager**; for a Secondary, it will be **SIU Manager.**

The option may be changed without entering Reconfigure mode. To alter the ID, enter **ID** and the unit will prompt for the new text to be entered. A string of up to 25 printable characters may be entered. Then press RETURN to update the menu. To delete the ID and leave it blank, press RETURN after the New Text prompt.

Login Password (LP)

The Login password prevents unauthorised entry to the Manager. It is the password requested after you select the Terminal Type (Section 4.2.2). The default password is the **RETURN key.**

To change the password, enter **LP** and the unit will prompt for the current password (to prevent unauthorised changing of the password). Incorrect entry displays an error message and returns to the General Menu. Correct entry will prompt you to enter the new password. The password may be up to 8 printable characters, which will not be echoed as you type them. As typing errors may occur, you are requested to re-enter the new password for verification. If the second entry matches the first. the Login password will be updated; otherwise an error message will be displayed. The default password is restored on either a cold start or a Configuration Load.

Offline Password (OP)

The Offline password prevents unauthorised entry to the Offline state and subsequent alteration of the unit's configuration. This is the password

requested when executing the Offline command when in Online state (Section 4.4). The default password is the RETURN key.

To change the password, enter **OP** and the unit will prompt for the current password (to prevent unauthorised changing of the password). Incorrect entry displays an error message and returns to the General Menu. Correct entry will prompt you to enter the new password. The password may be up to 8 printable characters, which will not be echoed as you type them. As typing errors may occur, you are requested to re-enter the new password for verification. If the second entry matches the first, the Offline password will be updated; otherwise an error message will be displayed. The default password is restored on either a cold start or a Configuration Load.

Dump Configuration (DU)

This option may be used without entering Reconfiguration mode. It enables the unit's configuration to be 'dumped' to a suitable external device in the form of Motorola S-records. An IBM PC with suitable communications software such as XTALK is suitable for this purpose. The configuration dumped may be saved as a file and subsequently 'loaded' back into the unit using the Load command.

On selecting the Dump command the screen is cleared, and the following is displayed:

Enter <CR> to dump data, or <ESC> for attention :

At this stage the dump maybe started by entering RETURN or aborted by entering the Escape (**ESC)** character. Any changes in the DTR signal at the Manager channel are ignored between selecting the Dump command and completion of the dump. This is to allow other devices such as a Tape Streamer to be attached during the dump.

The dump is in the form of Motorola S-records consisting of a header record (SO), followed by one or more data records (S2), a 'record count' record (S5), and finally a termination record (S8), as shown below.

```
S00600004141631 4
S22400131 FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFC9
S224OOI33FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFA9
S224OOI47FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF68
S224OOI49FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFOO5OOOF5
S224OOI4ClOF03FFOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOF5
S22400156E3A9801 OOOOO2O1O1OOOOO7O1OFOOOOO3OO32OOO3OOO1 FFFFOOOFOO05E7
S22400158E012COO0500320001 012CFAOO0300FFFFOOOOOOOOOOOOOOOOOOOOO093
S224OOI6B84IOIO4FFOO39O6O3OOOOOD2COEFFO3OOOOOOOOOOOOOOFFFFOOO3OOOO3C
S224OOI6DBOD2COFFOOO3OOOOOOOOOFO8OOO3OOOOOOOOOOOOFFFFOOO3OOOOOOO8I
S5030009E3
S804000000FB
```

Whenthedump is complete, entering an Escape (ESC) character displays theresultofthe operation:

Dump Status: Dump operation completed

Enter <ESC> to returnto Manager menu:

Enteringafurther Escape character returns totheGeneral Menu.

LoadConfiguration (LO)

Thisoptionenables apreviously 'dumped' and savedS-Link2 ,20unit configuration intheformof Motorola S-records to be 'loaded' back into the S-Link unit from asuitableexternal device. An IBMPC withsuitable communications software such asXTALKis suitableforthis.

Onselectingthe Loadcommandthe screeniscleared andthefollowing displayed:

AwaitingLOAD data . . . (enter <ESC> to abort):

The configuration datamustnowbe transmittedtothe unit, or an Escape (ESC) character may beenteredtoabort theload.

When the termination of the load has been detected by the unit, it displays the result of the operation:

Load Status : Load completed successfully

Enter < ESC > for attention :

Enter <CR> to restart card, or <ESC> to return to Manager menu :

An Escape (**ESC**) character is required to complete the load.

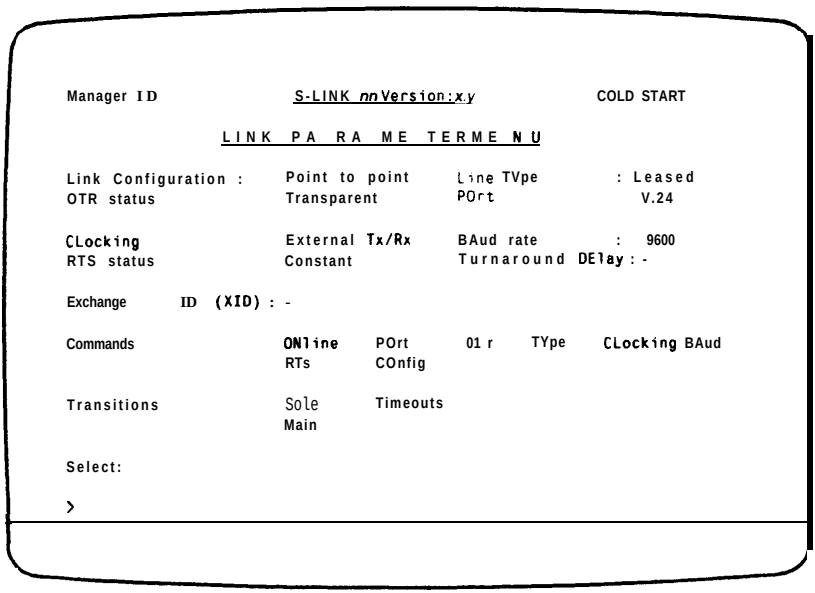
At this stage the configuration loaded can either be accepted by entering RETURN or aborted by entering the Escape character. Accepting the configuration will warm start the card and automatically enter the Online state. The display will be returned to the General Menu.

Auto Terminal Type (AU)

As explained in Section **4.2,** the Terminal Type Menu is the first menu displayed when a terminal is connected to the Manager channel. If all subsequent connections to the Manager channel are to be made using the same terminal type, this menu can be bypassed for every connection. The AUto command either enables or disables the facility, depending on the current (displayed) state.

4.6 **Link** Parameters Menu (Ll from other menus)

This menu can be accessed from the Main Menu or from other related menus, SDLC Parameters or Timeouts Menu. The menu is used to view and alter the various link parameters. Although all link parameters are displayed, only the commands that are available (dependent on Manager mode and other system parameters) are displayed. The default menu is:



The commands are:

ON	Change state of unit to Online
OFF	Change state of unit to Offline
Po	Select Port interface for link
DT	Select Constant or Transparent DTR status
TY	Select Leased or Switched line type
c o	Select Point-to-point or Multipoint configuration
CL	Select Clock source and Link speed
BA	Select Baud Rate
RT	Select Constant or Switched RTS status
DE	Configure a Turnaround Delay
xl	Configure Transparent or a local XID

Note: as the default configuration is 'Leased' line type and 'Constant' RTS status, the Delay and XID commands do not appear on the command line.

Change State (ON or OFF)

As explained in Section 4.4.

Port (PO)

This command allows the selection of the port interface for the SDLC link. (S-Link2 provides a single port only (V.24) and hence this command is not available on S-Link2.) S-Link20 provides a V.24, V.35 or V.11 port interface. See Section 3.1.2 for interconnect details, and Appendix B (S-Link2) or C (S-Link20) for cable details.

DTR Status (DT)

This command enables the status of the Data Terminal Ready V.24 signal to be set for Transparent or Constant condition. When set for Constant, DTR output from S-Link is always held high. When set for Transparent, any changes in DSR input at the remote end of S-Link are passed on 'transparently' as DTR output at the local end of S-Link.

Line Type (TY)

This command enables the selection of either Leased or Switched line type. For Leased line type, no XID frames will be accepted or transmitted, whereas for Switched line type, XID frames will be recognised and responded to. If set for Switched line type, the use of XID frames is mandatory.

Link Configuration (CO)

This command enables the selection of either a Point-to-point or a Multipoint configuration. The SDLC Parameters Menu will only permit the configuration of one address unless this parameter has first been set to Multipoint configuration.

Clocking and Speed (CL)

This command is in two stages and permits the selection of the clock source followed by the selection of link speed. The clock source may be Internal (S-Link provides both receive and transmit clocks), External (external device provides both receive and transmit clocks) or Split (the

originator of the data supplies the relevant clock: S-Link supplies transmit clock, and receive clock is supplied by the external device). Both Internal and Split clocking options require special cables as detailed in Appendix B or C. The link speed maybe selected from 1200 to 19200 bps for S-Link2, or 1200 to 64000 bps for S-Link20.

Baud Rate (BA)

This command allows selection of the link speed. Although it forms part of the clocking command (above) it is used simply to alter the link speed, without altering the clock source.

RTS Status (RT)

This command enables the selection of constant or switched Request To Send V.24 signal, permitting full-or half-duplex mode of operation (this does not refer to the SDLC protocol).

Turnaround Delay (DE)

This command is only available for switched RTS mode of operation (see above) and permits the configuration of a turnaround delay. The delay in milliseconds starts when DCD from the attached device drops, and RTS will only be raised at the expiry of that delay. A delay of between 1 and 255 milliseconds may be selected. The default is zero.

Exchange Identification (XID)

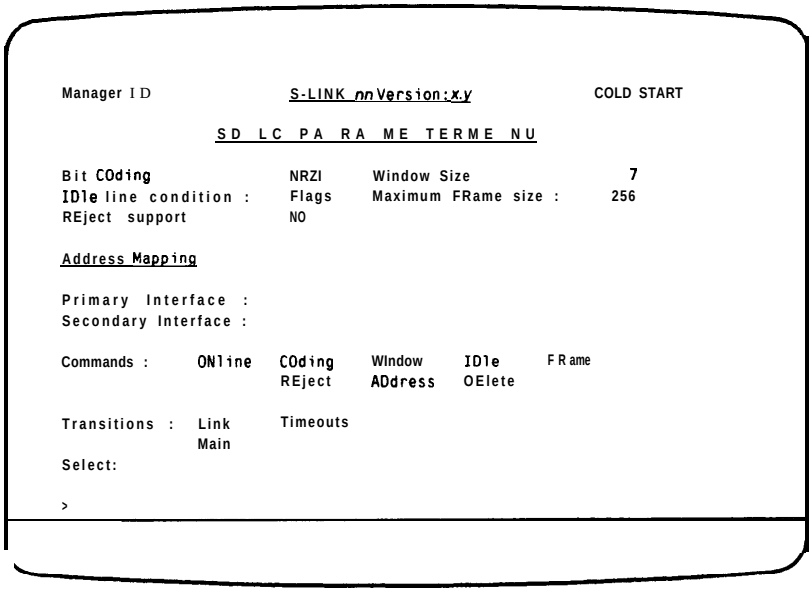
This command permits the selection of the source of the XID frame, either locally generated by S-Link or transported transparently from the remote device.

If local, up to 50 bytes of the XID information field may then be configured within S-Link. The PIU will respond with this frame when polled for an XID frame. The SIU will use this information in the XID poll or compare against it depending on the XID format. Note: this is available for switched line type and point-to-point configuration only. Where XID frames are used in other configurations, they will default to the transparent mode. The locally generated XID facility is not available for the Negotiable and Transparent modes of operation.

As a transparent XID source, the XID polls at the SIU, and the XID responses at the PIU, will be the XID frames received at the remote end of S-Link and transported across S-Link.

4.7 SDLC Parameters Menu (SD from other menus)

This menu can be accessed from the Main Menu or from other related menus, Link Parameters or Timeouts Menu. It is used to view and alter the various SDLC parameters. The default menu is:



The commands are:

ON	Change state of unit to Online
OFF	Change state of unit to Offline
CO	Select NRZ or NRZI bit coding
RE	Enable or disable use of SDLC REJ command
WI	Configure outgoing SDLC window size
FR	Select maximum SDLC frame size
ID	Select idle line condition
AD	Add station address to list
DE	Delete station address from list

Change State (ON or OFF)

As explained in Section 4.4.

Bit Coding (CO)

This command allows the selection of either NRZ or NRZI bit coding to be used on the link.

Reject Command Support (RE)

S-Link can be configured either to use the SDLC 'REJ' command or disable its use. Certain SDLC devices do not support the 'REJ' command.

SDLC Window Size (WI)

The size of the outgoing SDLC window (the number of frames that can be sent in one batch without requiring an acknowledgement) can be configured from 1 to 7. (The size of the incoming window is always a maximum of 7 and is not affected by this parameter.)

Maximum Frame Size (FR)

This command configures the maximum frame size that will be received by S-Link from the attached device. The frame size can be configured from 256 to 7680 bytes.

Idle Line Condition (ID)

This command selects the line condition in the Idle State to be either continuous Flags or continuous 1's (Mark).

Add SDLC Address (AD)

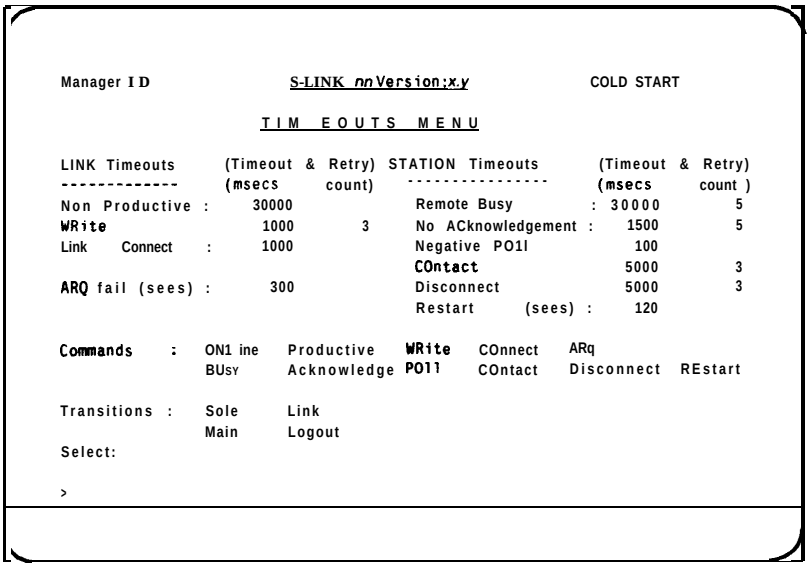
Each end of S-Link can support a maximum of eight SDLC devices on a multidrop configuration. In order to accept and respond to these devices only, a list of their SDLC addresses is maintained by S-Link. (In the case of a point-to-point configuration, only one address is permitted.) This command permits the addition of an address to the list. However, each address (any value between hex 1 and FF) is mapped onto an equivalent address to be used at the remote end of S-Link. The first address (the SDLC address used at the PIU) is the address to be used between the PIU and its attached device. The second address (the SDLC address used at the SIU) is the address to be used between the SIU and its attached device. In most cases both addresses are the same, in which case a RETURN must be entered as the second address. The same address pair must be configured at both ends of S-Link. S-Link uses these addresses in a different manner when configured as an NIU (see Section 6.2.2).

Delete SDLC Address (DE)

This command enables the removal of an SDLC address from the SDLC address list (see above). Only one address of a pair needs to be specified when deleting from the list; this is the PIU address.

4.8 Timeouts Menu (TI from other menus)

This menu can be accessed from the Main Menu or from other related menus, SDLC Parameters or Link Parameters Menu. The menu is used to view and alter the various timeout parameters relating to the operation of S-Link. The default menu is:



Thecommandsare:

ON Change state ofunittoOnline
OFF Change state ofunitto Offline
PR Configure the Non Productive timeout and retry limit
WR Configure theWritetimeout andretrylimit
CO Configure the Link Connect timeout and retry limit
AR Configurethe unit's ARQFailtimeout
BU ConfiguretheRemote Busy timeout andretrylimit
AC ConfiguretheNoAcknowledgement timeout andretrylimit
PO Configure the Negative Poll timeout and retry limit
CON Configure the Contact timeout andretrylimit
DI Configure the Disconnect timeoutand retry limit
RE Configure the Station Restarttimer

The timeouts are divided into either Link timeouts or Station timeouts. Link timeouts refer to the activity on the link between S-Link and the attached SDLC device, whereas Station timeouts refer to individual stations addressed on the link. However, the Station timeouts cannot be set differently for each individual station.

Each timeout consists of a timeout value in milliseconds and a retry count (the number of times a fault is indicated and recovery action taken). The timeout value can be from 100 to 32700 milliseconds or an infinite time. The retry count can be from 1 to 32700 or an infinite value. The ARQ Fail timeout is configured in seconds and does not have a retry count. The default settings will in general not require alteration. The No Acknowledgement, Negative Poll, Contact and Disconnect timeouts are only valid for an SIU.

Change State (ON or OFF)

As explained in Section 4.4.

Non Productive Timeout (PR)

This is the maximum time allowed between sending/receiving a frame with the poll/final bit set, and receiving/sending a frame with the poll/final bit set.

Write Timeout (WR)

This is the maximum time allowed for transmitting a frame. Hence the timeout should be increased for links at lower speeds.

Link Connect Timeout (CO)

This is the time between successive checks for the DSR signal to go high after the DTR signal is set high.

ARQ Fail Timeout (AR)

This is the only timeout configured in seconds and does not have a retry count. This timeout relates to the ARQ link in the DCX network between the two ends of S-Link. During normal operation, each end of the link maintains contact with the remote end every ten seconds. If no such contact message is received, e.g. if the ARQ link fails, the end of S-Link which loses contact starts a timer. At this stage no Information frames are accepted from the attached device and Receiver Not Ready frames are

exchanged with it. This timeout is the maximum time that S-Link allows for recovery from such a situation. If the timeout expires and no remote end is detected, S-Link will terminate the session and attempt to recover by restarting the link. The ARQ timeout value can be configured from 10 to 10000 seconds.

Remote Busy Timeout (BU)

This is the maximum time that S-Link allows for the attached device to remain in the busy condition (i.e. Receiver Not Ready frames received from it by S-Link).

No Acknowledgement Timeout (AC)

This timeout is the maximum time the SIU waits for a response to a frame transmitted by it. This timeout includes the time taken to transmit the frame by the SIU, and receipt of the complete response frame. On expiry of the timer, the retry count is decremented and timer restarted. After the maximum number of retries, the Station Restart timer (see below) is started. S-Link imposes a restriction on the retry count, which ensures that is is always greater than any of the retry counts for the timers described below.

Negative Poll Timeout (PO)

This is the timeout between successive polls by the SIU of the attached secondary station when no information frames are received from it.

Contact Timeout (CON)

This is the timeout between successive transmissions of the SNRM or XID frames sent by the SIU while attempting to establish contact with the secondary station. The retry count is the maximum number of such frames that will be transmitted. After the maximum number of retries, the Station Restart timer (see below) is started.

Disconnect Timeout (DI)

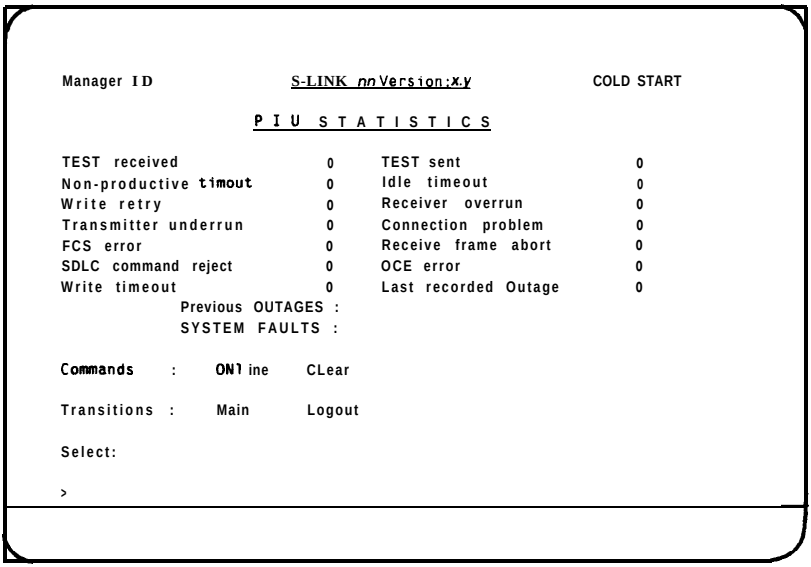
This is the timeout between successive DISC frames sent by the SIU while attempting to disconnect the secondary station. The retry count is the maximum number of DISC frames that will be transmitted.

Station Restart Timer (RE)

This timer is started after the No Acknowledgement timeout and/or the Contact timout has expired and the retry count exhausted. During this time, both ends of S-Link will place the station on a hold queue and ignore all commands/responses for the station. On expiry of the timer, both ends of S-Link will attempt to restart the station, triggering the No Acknowledgement and Contact timers.

4.9 Statistics Menu (ST from the Main Menu)

This menu displays the system statistics gathered since either the last cold start of the unit or clearance of the statistics counters.



The statisticshave the following meanings:

TEST received	NumberofSDLC TESTframesreceived bytheunit
TESTsent	NumberofSDLC TESTframessent by the unit
Non Productive timeout	Numberoftimes noframesreceived with poll/final bitsetwithinthe predefinedtime limit
Idle timeout	Not used
Write retry	Numberofattempts totransmitframe after write timeout exceeded thewriteretry limit
Receiver overrun	Numberoftimes one ormorereceive characters overlaid
Transmitter underrun	Numberoftimes ithasnot beenpossible to complete transmission ofa frame

Connection problem	Number of times more than 20 successive XID frames were received and number of times frame retransmitted more than 20 times
FCS error	Number of frames received with bad Frame Check Sum
Receive frame abort	Number of times frame aborted during receive
SDLC command reject	Number of times frames rejected because frame too long or frame had invalid N(r) or frame was invalid
DCE error	Number of times V.24 signal failures detected
Write timeout	Number of times frame transmission not completed within predefine time
Last Recorded Outage	Code giving the cause of the most recent line outage (see Appendix D)
Previous OUTAGES	Last five link outages displayed in sequence
System FAULTS	Last four system faults causing restart, displayed in sequence

The commands are:

ON Change state of unit to Online
OFF Change state of unit to Offline
CL Clear and reset all the statistics counters

Change State (ON or OFF)

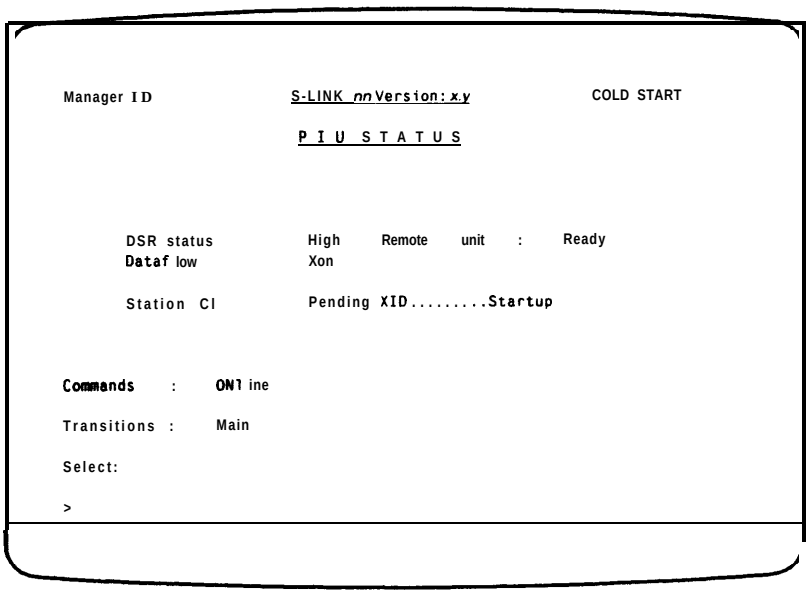
As explained in Section 4.4.

Clear Statistics (CL)

This command enables the entire set of statistics counters to be reset and cleared to zeros.

4.10 **Status** Menu (**STA** from Main Menu)

This menu displays the complete System Status, as seen at the local end of S-Link. The default display is:



Thestatusfields displayedhavethe following meanings:

DSR Status

This field displays thestatusofthe incomingDSRsignal fromthedevice attached to the local link. This is displayed aseither **LoworHigh.**

Remote unit

This field displays thestatusofthe remote endofS-Link. Initially the display will show Notpresentindicating that the local end hasnotdetected thepresence oftheremoteend. Once a valid remote end has been detected, the display will show either NotReady or Ready dependingonthe state oftheremote end of the link. Whenever theDCX channel between thetwoendsofthe link hasbeen XOFF'd, this field will display the reason fortheXOFF. Ifasingle condition causedtheXOFF, it will be displayed as **Remote xoff, Buffer xoff** or **Link xoff** for example; otherwise it will be displayed as **Multiple xoff.**

Dataflow

This field displays the data flow condition within S-Link. The name of a buffer pool will be displayed if buffer low XOFF condition occurred. However, **Multiple buffer low** will be displayed if more than one buffer pool was low. Conditions such as XOFF caused by the inter-S-Link DCX channel will be indicated as **TPDxoff**. XOFF conditions caused by the inter-DCX channel protocol will be displayed as either **Window full** or **OutQ full.** Under normal conditions **Xon** will be displayed.

Station status

This field indicates the status of the particular station (device). The station is identified by its address, configured using the SDLC Address Menu. The status itself is a text string made up of two halves. The first half displays the current status. The second half, usually only present if the station is or has recently been inactive, displays the reason for the inactivity. The status display strings and their meanings shown below are in a sequence which each station usually goes through.

Closed	S-Link is in Startup procedure
Pending DSR	Link not up, awaiting DSR from device
Pending XID	Link not up, awaiting XID from device
Disconnected	Link up, Station inactive
Pending Contact	Link up, awaiting SNRM command or response
Info transfer (xoff)	Link up, Station XOFF'd
Info transfer (xon)	Link up, Station XON, and ready
Disconnecting	Link up, awaiting DISC command or response
Transparent mode	S-Link is operating in Transparent mode

The commands are:

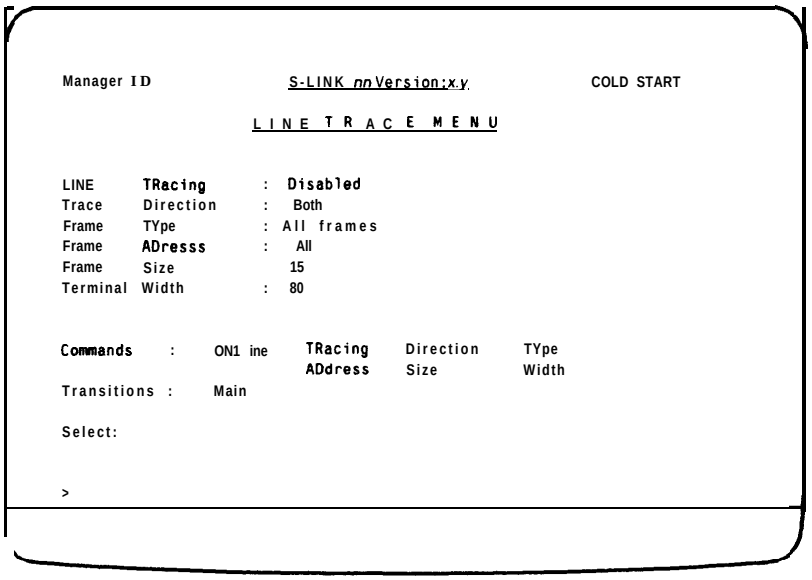
ON Change state of unit to Online
OFF Change state of unit to Offline

Change State (ON or OFF)

As explained in Section 4.4.

4.11 Trace Menu (TR from Main Menu)

This menu provides a line trace feature designed for use under controlled conditions. The default menu is:



Thecommands are:

ON Change state ofunittoOnline
OFF Change state ofunittoOffline
TR Enableordisable the line trace
WI Configure the width ofthetracedisplay
AD Configure theSDLCaddressto betraced
TY Selecttheframe typetobetraced
SI Configurethe size oftheframetobe traced
DI Select thedirection of data for the trace

Change State (ON orOFF)

As explained infection 4.4.

Enable/Disable Trace (TR)

This command either enables or disables the line tracing function. The current state is as displayed in the parameter setting.

Trace Display Width (WI)

This command may be used to configure the trace display width to a value from **1** to **132** to allow for different terminals attached to the trace channel.

Trace Address (AD)

This command enables either frames with only one of the configured addresses, or frames with any of the configured addresses, to be traced. Note that configured addresses are the addresses configured in the unit list using the SDLC Parameters Menu.

Frame Type (TY)

The type of frames to be traced can be selected with this command. The option is either all frames including poll frames, or information frames only.

Frame Size (SI)

The size of the frame to be traced can be configured with this command. This can be any value from 2 (Address and Control byte) to 15.

Direction of Trace (DI)

This command is used to select the direction of the frames to be traced. The choices are **REceive, TRansmit or BOth.**

4.12 **Logout Display** (L from any menu)

The display below appears if you logout from any menu using the Logout command. It will also be displayed on automatic logout after ten minutes of inactivity at the Manager terminal, including during **Configuration** Load or Dump.

MANAGER LOGGED OUT

To regain entry to the Manager, press **RETURN** (if **PMC'd** or **IMP'd** to Manager channel).

5 Testing Procedures

5.1 Introduction

Any problems in using S-Link are most likely to be due to line faults or protocol incompatibilities on the SDLC line at either end.

There are two main facilities available to aid diagnosis: DCX loopback and line tracing.

If there are problems with the cards themselves, there are facilities for resetting the software.

5.2 DCX Loopback

The channels of the S-Link respond to LSC loopback controls from the MTP front panel or via NCAM, so that the basic connections to the DCX can be tested in this way. Composite loopback may be used from the ARQ cards for testing the data channel.

5.3 Line Tracing

S-Link has a line trace channel to help in diagnosing problems in the system. It can be enabled and disabled in the Trace Menu (Section 4.11).

Operation of the trace facilities is described in Appendix A.

5.4 Resetting the S-Link2,20 Card

To reset the card, momentarily short together the **RESET** pins (strap 7), located behind the card puller above the miniature DIL switchbank (see Figure 3-l). This action will reset the card hardware and restart the software. The card will then behave as if it had just been powered up.

Normally a card should only be reset under your supplier's advice.

5.4.1 Cold and Warm **Starts**

When the card is reset or powered up, the software will perform a cold or warm start depending on the position of Switch 3. Whenever the software is replaced by a new version, the card will automatically perform a cold start.

Cold Start. (Switch **3** open.) The existing configuration is completely reset to the default values. This may need to be undertaken if the password has been forgotten. It may then be necessary to reconfigure the card by the procedure in Chapter 4.

Warm Start. (Switch **3** closed.) The existing configuration remains intact. This is the usual method of reset. However, if a valid configuration cannot be detected, a cold start is performed automatically. --

6 Configuration Considerations

6.1 Introduction

The flexibility of the S-Link software permits it to be configured for a number of different environments.

It is important to have the correct configuration for a particular environment. This chapter details switched multidrop environments.

6.2 PU4 to PU4 Link (S-Link20 only)

In the case of a PU4 to PU4 environment, the following configuration options must be considered carefully.

6.2.1 **Interface Unit Type**

Each end of S-Link must be configured as a Negotiable Interface Unit type, with one end as End A, and the other as End B. This permits the S-Link software to adapt to the link roles specified during the XID negotiation phase.

In general there is no difference between NIU End A and NIU End B; however there is one major difference in environments where a PU4 node (e.g. a 3720) requires an Initial Program Load (IPL) from a remote PU4 node (e.g. a 3725) prior to the XID negotiation phase. In this environment the nodes must be configured correctly. The NIU at the load-originating end (3725) must be configured as End A, and the NIU at the load-destination end (3720) as End B. NIU End A will accept an SDLC SIM command and respond to it; at the same time it will instruct NIU End B to issue an SIM command to the load destination. NIU End B will transport transparently any RIM commands it may receive. Hence remote IPL may only be initiated from the PU4 attached to End A: the IPL information frames will then be passed to the remote PU4. During the IPL phase, it should be noted that NIU End A will adapt as an S-Link PIU, and End B as an S-Link SIU. At the end of the IPL phase, both ends will revert to the NIU mode ready for the XID negotiation phase. The SDLC frame address used throughout the IPL phase will be the address in the SDLC UA frame received by NIU End B in response to its SDLC SIM command. Refer to Section 2.2.2 for further details of Negotiation phase.

6.2.2 **SDLC Frame Address**

The SDLC address mapping for a PU4 to PU4 link operates differently from the mapping explained in Section 4.7. The Primary Interface address is the address in the receive frame expected by the S-Link end that adapts as a PIU, as well as the address in the transmit frame at the S-Link end that adapts as an SIU. The Secondary address is the equivalent address in the opposite direction, i.e. the address in the receive frame expected by the SILT, as well as the address in the transmit frame at the PIU. Hence, unlike the address mapping explained in Section 4.7, in the case of a PU4 to PU4 environment, both addresses are used at both ends of S-Link. During the IPL phase, the SDLC frame address is different from

the above addresses and is explained in Section 6.2.1. Note thatthe line trace facility of S-Link will display the expected address inthereceive frame. The transmit frame address will redisplayed astransmitted.

6.2.3 **Maximum BLU Size**

The S-Link software does not impose a limit on the size of the SDLC frame, other than the limit imposed by the availability of free buffers. S-Link will continue to accept information frame data as long as free buffer space is available to receive it. If free buffer space is not available, the frame will not be accepted. In general S-Link will accept frames up to a maximum size of 7.5K bytes. The ability of S-Link to accept large frames is also governed by the SDLC window size, and a smaller window is recommended for larger frames to avoid buffer overflow.

6.2.4 SDLC Window Size

S-Link will operate with a maximum window size of 7 and will not operate with extended window size of 128.

6.2.5 Timeouts

It must be noted that certain timeouts will need to be extended if large frames are being handled by S-Link. Two in particular, the Write timeout and the No Acknowledgement timeout, will need altering if frames larger than **265** bytes are being transported by S-Link. A low value for the No Acknowledgement timeout will cause the primary end of S-Link to time out while receiving a large frame, and hence cause it unnecessarily to poll the attached PU4 node. These timeouts default to the required values when NIU mode of operation is selected in the Interface Type menu.

6.3 5250 Environment

The S-Link software may be configured for switched multidrop environments, e.g. the 5250. In this case each secondary device attached tothe S-Link SIUwill becapable ofresponding toan XID request. Hence all XID frames received and transmitted by S-Link will have the relevant secondary station address contained within them, in contrast to the broadcast address used by non-5250 environments.

6.4 Transparent Mode (S-Link20 only)

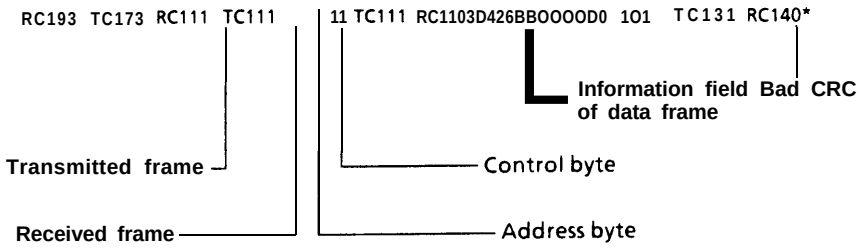
When S-Link is configured to operate as a Transparent Interface Unit, all frames including idle polls (RR/RNR) and their responses will be transported across S-Link. This could lead to problems if the timeouts on the host are of short values. This mode must only be used when the timeouts have been configured with large values.

Appendix A SDLC Line Trace

Line faults and protocol incompatibilities on the SDLC link may cause S-Link to stop functioning normally. To aid diagnosis in this area, line traces of the SDLC link can be generated by S-Link via the Manager facility (Section **4.11).**

The trace is an ASCII indication of data transmitted and received on the link in chronological order and, as far as possible, in real time. The facility must be enabled by the supervisor (see Section 4.7), but must be used with caution as its use will slow down throughput on the line. Bear in mind that a line trace of a fast line to a slow terminal can cause buffer overload at the local node. The use of a 9600 bps terminal for tracing is recommended.

Example of a line trace:



Note that when an information field of a frame is displayed, only the first fifteen bytes of data (inluding the address and control bytes) will be displayed. This is to minimise the effect of tracing on the throughput.

Appendix B S-Link2 Interconnections

B.1 V.24/V.28 Interface Signals

The S-Link2 interface terminates in a 25-way D-type plug at the rear of the DCX. The interface signals conform to CCITT V.24/V.28 and EIA RS-232-C and are listed in Table B-1.

PIN NO.	CCITT CCT. NO.	SIGNAL	MNEMONIC
2	103	Transmitted Data	TxD
3	104	Received Data	RxD
4	105	Request To Send	RTS
5	106	Clear To Send	CTS
6	107	Data Set Ready	DSR
7	102	Signal Ground	SG
8	109	Data Carrier Detect	DCD
15	114	Transmitter Clock	TxC
17	115	Receiver Clock	RxC
20	108/2	Data Terminal Ready	DTR
24	113	External Transmit Clock	XTXC

Table B-1 S-Link2 V.24/V.28 Interface

B.2 Clocking

External Clock	S-Link2 expects to be provided with a synchronous clock for bothTransmitted andReceived Data , from an external source such as a modem or modem eliminator, on pins 15 and 17.
Internal Clock, Tx + Rx	S-Link2 canprovide a clock which is used internallyto clock both Received and Transmitted Data, and is made available to external devices via pin 24 of the Bisync interface. The internal clock speed is set by the supervisor to 1200,2400,4800, 7200, 9600 or 19200 bps.
Internal Clock, Tx only	The synchronous line is driven on the principle that the originator of data in each direction also provides the clock for it. The S-Link2 expects to receive a clock for Received Data, and provides a clock for Transmitted Data ('split clock'). The internal clock speed is set by the supervisor to 1200,2400,4800,7200, 9600 or 19200 bps.

B.3 V.24/V.28 Cables

If a modem connection is to be used, then a straight-through cable is required (e.g. part number X840-40091 1 as in Figure B-l), to route the modem clock to the S-Link2.

If the connection is direct to the IBM equipment, the cable needs to both cross over the signals and distribute the clocks. The cable connections depend on the clocking arrangements. If Tx and Rx internal clocks are to be used, then cable part number X840-404411 as in Figure B-2 is suitable. If the clock is generated with the data (split clocking, i.e. each end generates a transmit clock), part number X840-405011 as in Figure B-3 may be suitable.

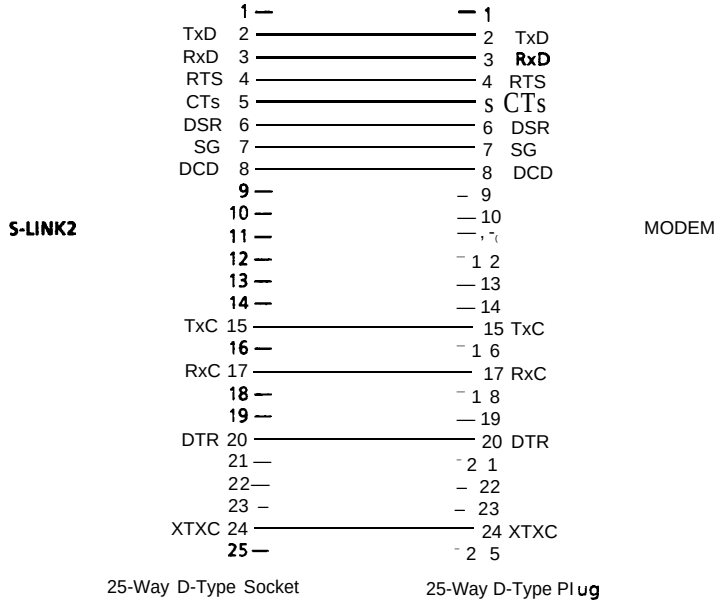


Figure B-1 Cable X840-40091 1

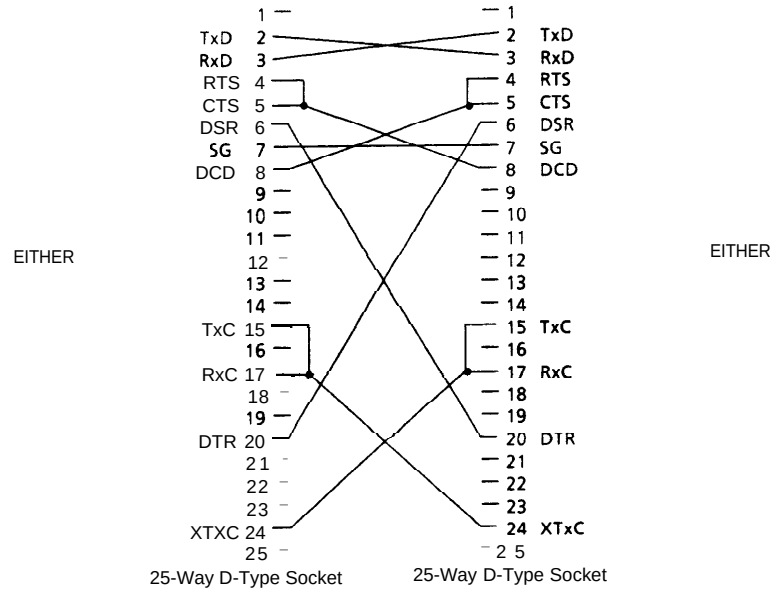


Figure B-2 Cable X840-404411

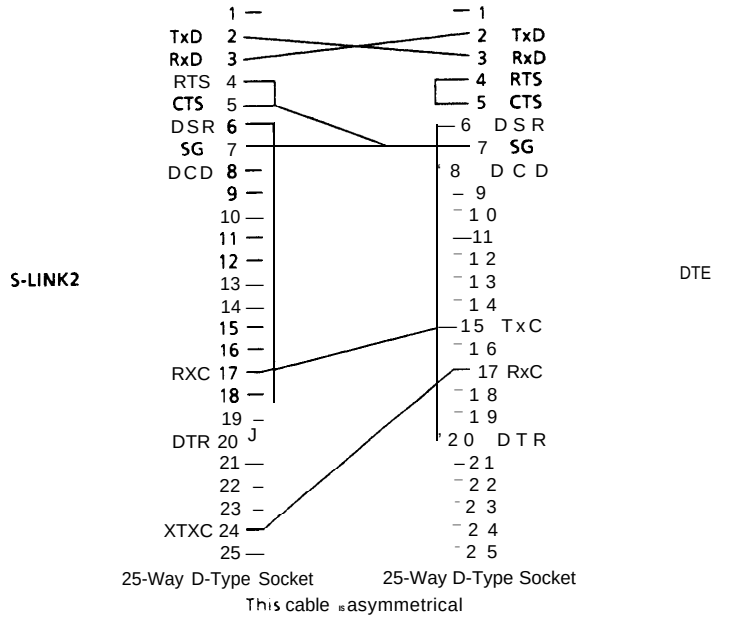


Figure B-3 Cable X840-40501 1

Appendix C S-Link20 Interconnections

The S-Link20 card has two 25-way D-type ports, either of which can be used for the line connection.

Port 1 (the upper connector, see Section 3.1.1) is used for V.24 communications.

Port 2 (the lower connector, see Section 3.1.1) is used for X.21, or for V.35 using an external interface adapter box.

C.1 Port Interface Signals

C.1.1 Port 1, V.24 Interface

The interface signals are listed in Table C-1. They conform to CCITT V.24/V.28 and EIA RS-232-C.

PIN NO	CCITT CCT NO	SIGNAL	MNEMONIC
1		Protective Ground	Gnd
2	103	Transmitted Data	TxD
3	104	Received Data	RxD
4	105	Request To Send	RTS
5	106	Clear To Send	CTS
6	107	Data Set Ready	DSR
7	102	Signal Ground	SG
8	109	Data Carrier Detect	DCD
15	114	Transmitter Clock	TxC
17	115	Receiver Clock	RxC
20	108/2	Data Terminal Ready	DTR
24	113	External Transmit Clock	XTXC

Table C-1 S-Link20 V.24 Interface

C.1.2 Port 2, X.21 Interface

The interface signals are listed in Table C-2.

PIN	NAME	DIRECTION	DESCRIPTION
1	Ov		Signal Ground
2	Ov		Signal Ground
3	V28 CTS1	input	Clear To Send
4	V11 CLKA	output	Internal Clock (A)
5	VII CA	output	X.21 Control (A)
6	V11 TA	output	X.21 Transmit Data (A)
7	Ov		Signal Ground
8	V28 DSR 1	input	tData Set Ready
9	+ 12V	output	Power Supply
10	V11 RXCA	input	Receive Clock (A)
11	V11 SA	input	X.21 Clock (A)
12	V11 RA	input	X.21 Receive Data (A)
13	V11 1A	input	X.21 Indication (A)
14	V11 RTSB	output	Request To Send (B)
15	·		Not connected
16	V28 RI1	input	Ring Indicator
17	V11 CLKB	output	Internal Clock (B)
18	C11 CB	output	X.21 Control (B)
19	V11 TB	output	X.21 Transmit Data (B)
20	V11 RTSA	output	Request To Send (A)
21	-12V	output	Power Supply
22	V11 RXCB	input	Receive Clock
23	V11 IB	input	X.21 Indication (B)
24	V11 SB	input	x.21 Clock (B)
25	V11 RB	input	X.21 Receive Data (B)

Table C-2 S-Link20 X.21 Interface

C.1.3 Port 2, V.35 Interface

A V.35 interface can be provided by connecting a Cray UIA/V.35 Interface Adapter to Portl. Full installation instructions and interface information are given in its Reference Manual X840-306851.

C.2 Clocking

There are three ways in which clocking for the SDLC link can be handled. The appropriate clock source must be selected in the Line Control menu, and a suitable cable must be used.

External Clock	S-Link20 expects to be provided with a synchronous clock for both Transmitted and Received Data, from an external source such as modem or modem eliminator, on pins 15 and 17 of the V.24 interface.
Internal Clock, Tx & Rx Modes	S-Link20 can provide a clock which is used internally to clock both Received and Transmitted Data, and is made available to external devices via pin 24 of the SDLC interface. The internal clock speed is set by the supervisor to 1200,2400,4800,7200, 9600, 14.4K, 19.2K, 56K or 64K bps.
Internal Clock, Tx only	The synchronous line is driven on the principle that the originator of the data in each direction also provides the clock for it. S-Link20 provides transmit clock and expects receive clock ('split clock'). The internal clock speed is set by the supervisor to 1200,2400,4800,7200, 9600, 14.4K, 19.2K, 56K or 64K.

C.3 Cables

C.3.1 V.24 Connection

Port 1 S-Link20 to modem	X840-400911 (Figure C-1)
Port 1 S-Link20 to IBM	X840-404411 (Figure C-2)
Port 1 S-Link20to IBM(TxC only)	X840-403911 (Figure C-3)

C.3.2 V.11 Connection

Port 2 S-Link20 to modem	X840-40271 1 (Figure C-4)
Port 2 S-Link20 to IBM	X840-407911 (Figure C-5)

C.3.3 V.35 Connection via Adapter Box

Port 2 S-Link20 to modem	X84 O-102711 UIA V.35 DTE
Port 2 S-Link20 to IBM	X84 O-103411 UIA V.35 DCE

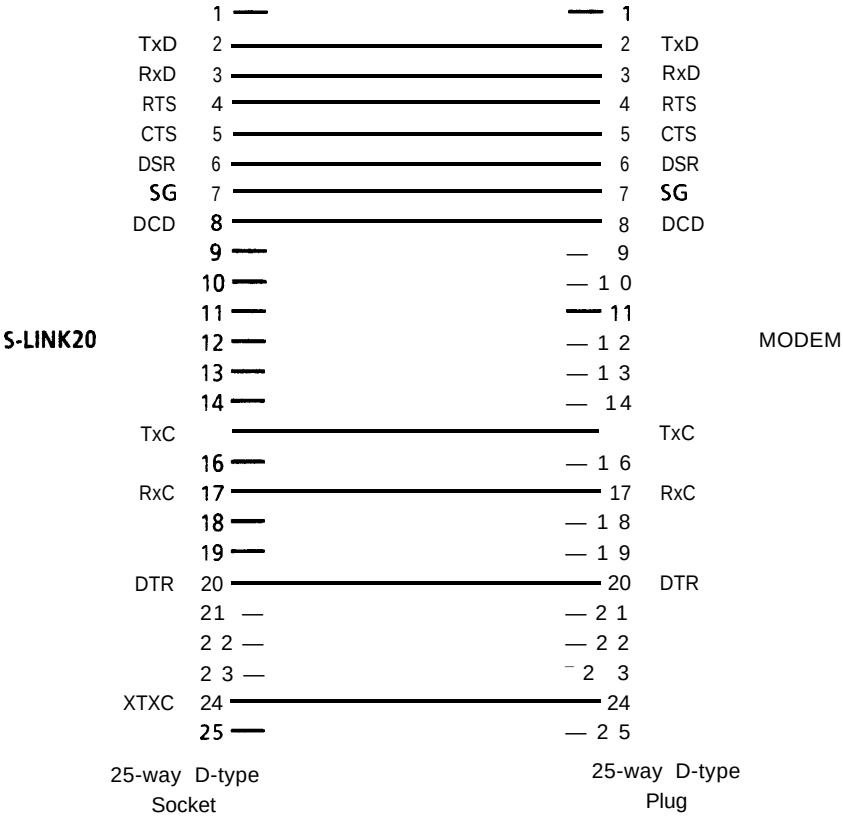


Figure C-1 Cable X840-40091 1

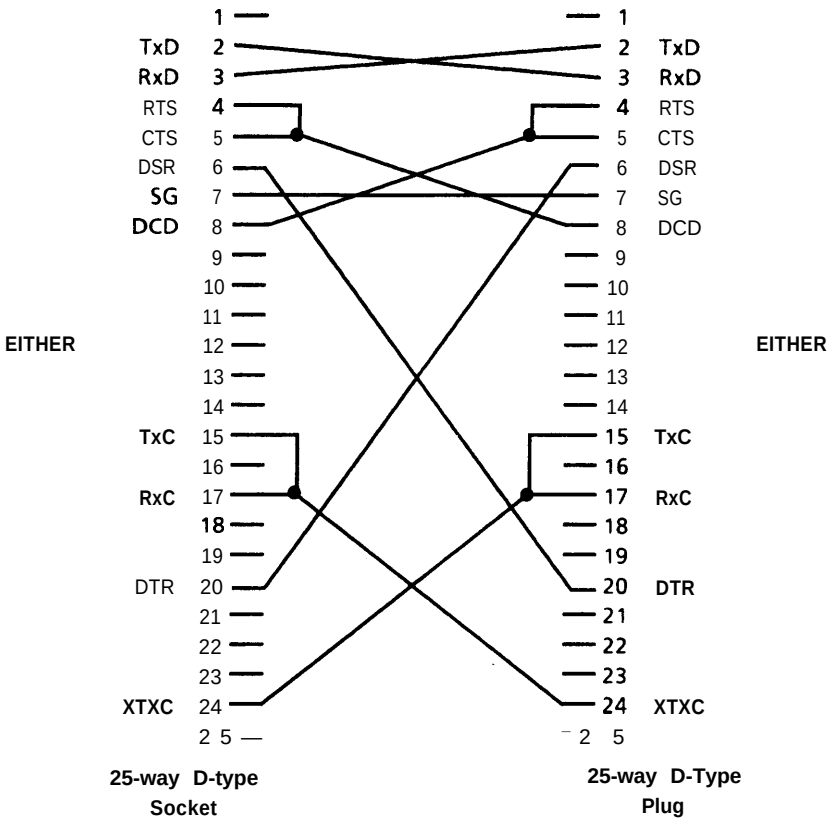


Figure C-2 Cable X840-40441 1

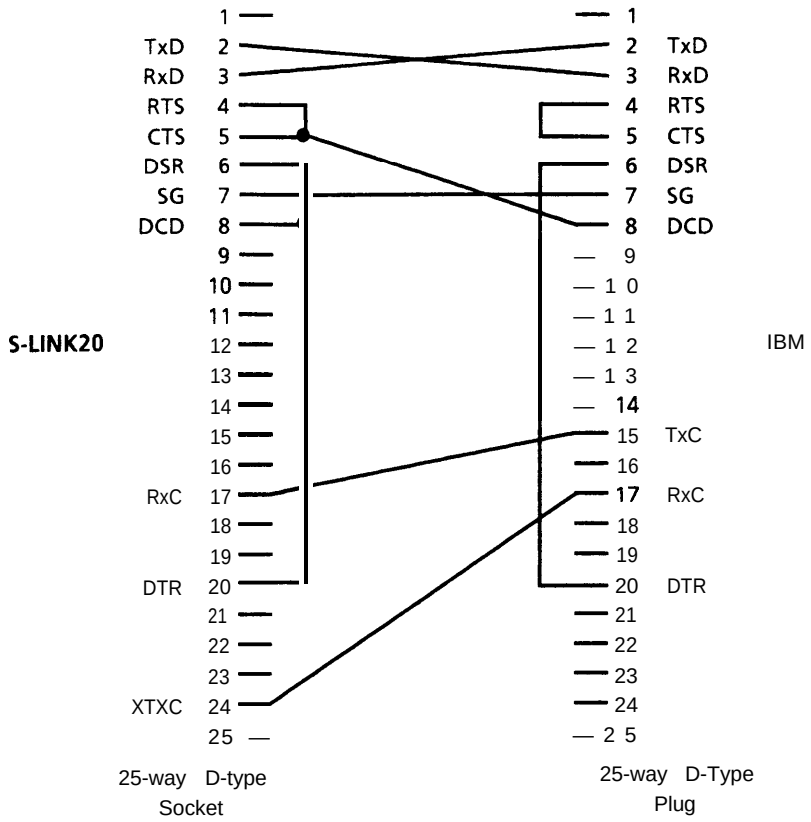
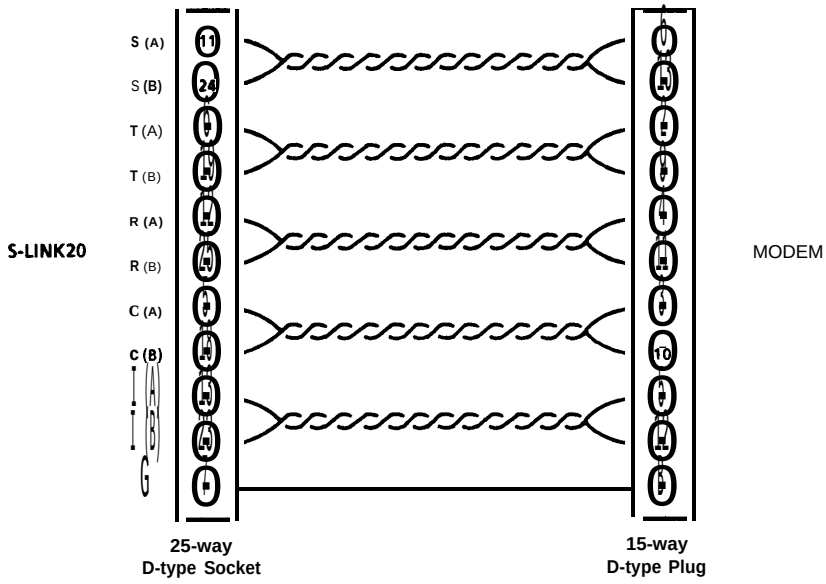


Figure C-3 Cable X840-40391 1



FigureC-4 Cable X840-402711

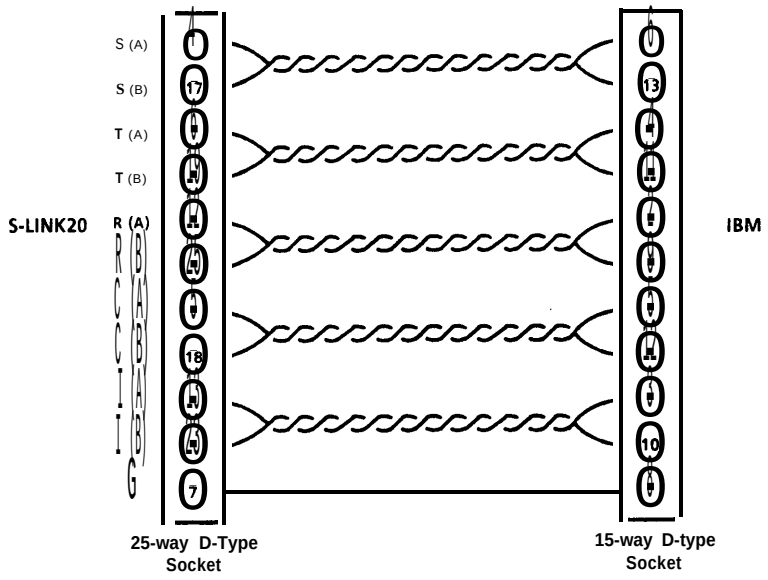


Figure C-5 Cable X840-407911

Appendix D Last Recorded Outage

The code given in the 'last recorded outage' of the Statistics Menu (Section 4.9) shows thelatest error tohavebefallen S-Link. Themeanings are:

17	DSR failure
18	CTS failure
20	DCD failure
21	DISC (disconnect) received by PIU
35	Receiver buffer overrun (frame too long)
36	Non-productive receive timeout
37	Idle timeout
41	Connection problem
44	Command rejected by PIU
45	Abnormal modem response
46	Write timeout
128	DM (in Disconnect Mode) received during data transfer
129	Disconnect retry limit exceeded
130	Contact retry limit exceeded
131	Negative poll retry limit exceeded
132	No response retry limit exceeded
133	Remote busy timeout
134	FRMR received (transmitted command rejected) by SIU
135	Invalid command or response received by SIU
136	RIM (Request Initialisation Mode) received by SIU
137	RD (Request Disconnect) received by SIU