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SDLC SUPPORT FOR SANGOMA CARDS

Hardware Interface Manual

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1. Introduction

The Sangoma cards are general co-processor communication adapters capable of supporting any communication protocol autonomously, and providing information transfer into PC work space.

This document describes the support of the SDLC protocol on the card, together with special enhancements implemented in the Sangoma SDLC code. The hardware/software solution handles the link level autonomously, without PC intervention. The PC accesses the system as required to configure and activate the stations, send or receive Information frames and to recover status and statistical data.

The implementation of the SDLC protocol on the S502 adapter corresponds to the specifications of the IBM document number GA27-3093-3: "Synchronous Data Link Control - Concepts", fourth edition (June 1986).

The Sangoma SDLC code includes the following features:

- Configurable as either a primary or secondary SDLC device.
- Up to 254 SDLC stations supported on a single adapter.
- NRZ and NRZi encoding.
- Switched or constant CTS/RTS.
- Information frame data fields up to 544 bytes in length.
- Different poll rates may be defined for each station.
- Detailed operational statistics on a per-station basis.
- A built in real-time data scope.

Conventions used in this manual

Programming conventions used are as follows:

Variables described with an **0x** prefix are hexadecimal values. All other variables are decimal.

For bit mapping, the **least significant** (**low**) bit is denoted as bit **0**.

2. Hardware

S503

This is a short 4 layer card, compatible with the ISA bus and it supports hardware interrupts as well as operating in a passive polled mode. The RS232 or V.35/X.21 interface is jumper selectable.

Clock speed:

This is factory set by Jumper **JP1**. Do not change without consulting your Sangoma dealer.

I/O port address:

This is set by Jumper **JP3**.

Pins 5-6	Pins 3-4	Pins 1-2	I/O Address Selection
Not Jumpered	Jumpered	Jumpered	250-252 (Hex)
Jumpered	Jumpered	Jumpered	254-256 (Hex)
Not Jumpered	Jumpered	Not Jumpered	300-302 (Hex)
Jumpered	Jumpered	Not Jumpered	304-306 (Hex)
Not Jumpered	Not Jumpered	Jumpered	350-352 (Hex)
Jumpered	Not Jumpered	Jumpered	354-356 (Hex)
Not Jumpered	Not Jumpered	Not Jumpered	360-362 (Hex)☎
Jumpered	Not Jumpered	Not Jumpered	364-366 (Hex)

☎Factory default.

IRQ Selection

The optional IRQ is set using **JP2**.

Pins 1-2	Pins 3-4	Pins 5-6	Pins 7-8	Pins 9-10	Selection
In	Out	Out	Out	Out	IRQ 2
Out	In	Out	Out	Out	IRQ 3
Out	Out	In	Out	Out	IRQ 4
Out	Out	Out	In	Out	IRQ 5
Out	Out	Out	Out	In	IRQ 7☎

☎Factory default.

Interface Level Selection

This is set by Jumper **JP3**.

Pins 9-10	Interface Level
Jumpered	RS-232
Not Jumpered	V.35

S514 PCI card

No jumpers need to be set on this card as it is configured by the PC BIOS.

S508 ISA Card

Jumpers **JP1** on the S508 define the card I/O address range as specified in Table 3-1. The specified card I/O addresses must not conflict with I/O addresses in use by any other hardware installed on the server. Use the **SNOOPER** utility if you are in any doubt as to hardware settings.

Note that **JP1-1** on the S508 is furthest to the left if the board is held such that the connectors are to the right. **JP1-4** is reserved.

The 8k (2000 Hex) byte shared memory address and the IRQ level are set in software for the S508.

Internal Line Clocking

For back-to-back connections, the cards can provide their own Transmit and Receive clock signals, which, with the appropriate cable, can also provide the clock for third party devices.

All cards are capable of generating the transmit and receive clocks as long as the appropriate back-to-back cable is used. The generated line speed is set by software.

However, the cards have a very large configurable range and therefore cannot easily be tabulated. When asked for the line speed during setup, you may specify any value in kbps from 1 to 2600. The actual generated line speed will be reasonably close the specified value, but will deviate more as the line speed increases.

S514 Port Pinouts

NB: Port PA is the Primary 4Mbps port
Port PB is the Secondary 512Kbps port.

PIN #	PA:RS232	PA:V.35	PB:RS232	PB:V.35
1	RTS		RTS	
2	CTS		CTS	
3	GND	GND	GND	GND
4	DCD		DCD	
5	DTR		DTR (V.10)	
6	TXD			
7	RXD			
8	TXC			
9	RXC			
10		RTS		RTS
11		CTS		CTS
12		DCD		DCD
13		DTR		DTR (V.10)

PIN #	PA:RS232	PA:V.35	PB:RS232	PB:V.35
14		TXD		
15		RXD		
16		TXC		
17		RXC		
18			TXA	
19			TXB	
20			RXA	
21			RXB	
22			TX Clock A	
23			TX Clock B	
24			RX Clock A	
25			RX Clock B	
26			DTR A (V.11)	
27			DTR B (V.11)	
28				TXA
29				TXB
30				RXA
31				RXB
32				TX Clock A
33				TX Clock B
34				RX Clock A
35				RX Clock B
36				DTR A (V.11)
37				DTR B (V.11)

S503/S508 Port Pinouts

RS232

Pin #	**Function**
2	TxD
3	RxD
7	GND
4	RTS
5	CTS
20	DTR
6	DSR
8	DCD
15	TxC
17	RxC
24	BxC

V.35/X.21

Pin #	**Function**
4	RTS
5	CTS
6	DSR
7	GND
8	DCD
10	TxA
9	TxB
12	RxA
11	RxB
19	Tx Clock A
20	DTR (V10 signal)
13	DTRA (V11 signal)
14	DTRB (V11 signal)
21	Tx Clock B
22	RI
23	Rx Clock A
25	Rx Clock B
18	Aux. Clock A (On board clock source)
16	Aux. Clock B (On board clock source)

3. The programmer's interface

Sangoma cards are operated by reading and writing structures to positions in the shared memory window. For details of moving the structures to/from the board under MS-DOS, see the code example later in this document.

The application program accesses the SDLC software by completing the required parameters within the control block defined below and then setting the OPP_FLAG. The SDLA processor will carry out the defined command and then update this control block with the required return code and, if applicable, the associated data buffer, data length etc. When the command has been completed, the OPP_FLAG will once again be reset.

There are two control block areas within this shared memory window:

- the SEND control block is at offset **0x0000** from the base address of the memory window and is used for all commands except the SDLC_READ command.
- the RECEIVE control block is at offset **0x230** from the base address of the memory window and is only used for the SDLC_READ command.

Both these control blocks are of the same format.

The shared memory control block structure is as follows:

Parameter	Off-set	Lgth	Remarks
OPP-FLAG	00H	1	A flag set by the application to inform the SDLA processor that a COMMAND is pending. This flag is in turn reset by the processor when the COMMAND has been completed.
COMMAND	01H	1	Command code.
BUFFER_ LENGTH	02H	2	Length of the data buffer associated with this call.
RETURN_ CODE	04H	1	Result of the previous command.
SDLC_ ADDRESS	05H	1	The SDLC address of the station associated with the given interface command.
PF_BIT	06H	1	The P/F bit setting.
POLL_ INTERVAL	07H	2	The NRM polling interval for this station.
GENERAL_ MAILBOX_ BYTE	09H	1	A general usage structure interface byte.
RESERVED	0AH	6	Reserved for later use.
DATA	10H	544	This is the transfer area for passing data to and from the application level.

4. COMMAND Codes

The valid commands are:

0x00 SDLC_READ
0x01 SDLC_WRITE
0x10 SET_SDLC_CONFIGURATION
0x11 READ_SDLC_CONFIGURATION
0x12 SET_ADAPTER_OPERATING_FREQUENCY
0x13 ENABLE_COMUNICATIONS
0x14 DISABLE_COMUNICATIONS
0x15 ADD_STATION
0x16 DELETE_STATION
0x17 ACTIVATE_STATION
0x18 DEACTIVATE_STATION
0x19 FLUSH_I_FRAME_BUFFERS
0x20 READ_STATION_STATUS
0x21 LIST_ADDED_STATIONS
0x22 LIST_STATIONS_IN_NRM
0x23 LIST_STATIONS_WITH_I_FRMS_AVAILABLE
0x24 READ_OPERATIONAL_STATISTICS
0x25 FLUSH_OPERATIONAL_STATISTICS
0x30 SEND_TEST_FRAME
0x31 SEND_SIM_RIM_FRAME
0x32 SEND_XID_RESPONSE_FRAME
0x33 SET_PRIMARY_STATION_XID_DATA_FIELD
0x34 LIST_PRI_STATIONS_ISSUING_XID_FRAMES
0x40 SET_MODEM_STATUS
0x41 READ_MODEM_STATUS
0x42 READ_COMMS_ERROR_STATISTICS
0x43 FLUSH_COMMS_ERROR_STATS
0x50 SET_INTERRUPT_TRIGGERS

0x51 READ_INTERRUPT_TRIGGERS

0x60 SET_TRACE_CONFIGURATION

0x61 READ_TRACE_DATA

0x62 READ_TRACE_STATISTICS

0x70 READ_CODE_VERSION

0x71 READ_EXCEPTION_CONDITION

0x72 DISCARD_INCOMMING_INFORMATION_FRAMES

0x73 BRIDGE_RECEIVER_AND_TRANSMITTER

SDLC_READ (0x00)

Receive a data message (Information frame) from the network.

Control Block values to be set on entry:

BUFFER_
LENGTH: Set to **0x00**.

SDLC_
ADDRESS: Set to the station address on which the Information frame is to be received.

Control block values set on return:

RETURN_
CODE:

0x00	Data has been received and is available for pick up in the DATA area of this control block.
0x01	Communications have not been enabled (by using the ENABLE_COMMUNICATIONS command) and so no data transfer is possible.
0x02	The SDLC address used is invalid.
0x03	The station has not been added (by using the ADD_STATION command).
0x04	The station is currently in the disconnected mode and no data transfer is possible.
0x05	No Information frames are is available for this station.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28

See Section "Notes on Return Codes" for further details.

BUFFER_

LENGTH: The length of the data message received.

(valid if a **RETURN_CODE** of **0x00** is received).

PF_BIT: The status of the SDLC Poll/Final bit in the received Information frame (valid if a **RETURN_CODE** of **0x00** is received). If this value is set to 0x00, the P/F-bit was reset in the frame, otherwise the P/F-bit was set.

DATA (valid if a **RETURN_CODE** of **0x00** is received):

The actual I-frame data that has been received at the station.

SDLC_WRITE (0x01)

Send a data message (Information frame) to the card for onward transmission to the network.

Control Block values to be set on entry:

BUFFER_

LENGTH: The length of the data message to be transmitted. The maximum data length is **544** bytes and is dependant on the maximum Information field length defined in the SET_SDLC_CONFIGURATION command.

PF_BIT: The status of the Poll/Final bit to be set in the SDLC header. If the Poll/Final bit is reset, then the SDLC code will automatically terminate a sequence of transmitted I-frames with an appropriate Supervisory frame with the Poll/Final bit set.

DATA: The actual Information frame data field to be transmitted.

Control Block values set on return:

RETURN_

CODE:

0x00 The data has been queued for transmission.

0x01 Communications have not been enabled (by using the ENABLE_COMMUNICATIONS command) and so no data transfer is possible.

0x02 The SDLC address used is invalid.

0x03 The station has not been added (by using the ADD_STATION command).

0x04 The station is currently in the disconnected mode and no data transfer is possible.

0x05 The length of the passed data buffer is invalid, i.e., either zero or greater than the maximum permitted data length defined in the SET_SDLC_CONFIGURATION command.

0x06 The data was not queued due to the fact that the transmit window is closed OR there are no transmit buffers currently available.

The application is attempting to send data to the SDLC network at a rate faster than the network is able to receive the data. **No data was sent to the adapter and this same data should be re-sent in its entirety after a short delay**.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28

See Section "Notes on Return Codes" for further details.

SET_SDLC_CONFIGURATION (0x10)

Set the SDLC configuration parameters.

This is the first command that must be used after downloading the SDLC code to the adapter. The SET_SDLC_CONFIGURATION re-initializes all

SDLC stations (deletes all added stations) and all operational statistics.

Control Block values to be set on entry:

BUFFER_

LENGTH: Set to **0x1F**.

DATA: This area contains the configuration parameters as follows:

Offset Within Mailbox Data Area	Lgth	Parameter
00H	1	The station configuration. 00H - secondary station 01H - primary station
01H	4	The baud rate to be generated (bps). Valid values are from 0 to 200000bps, where 0 denotes the use of external clocking.
05H	2	The maximum length of the data field in an Information frame. Valid values up to 544 bytes.
07H	2	Miscellaneous operational configuration bits as follows: If bit 0 is reset, then no CTS switching will occur. If this bit is set, then switched CTS/RTS protocol will be used at a secondary SDLC station. If bit 1 is reset, then the line idle condition is mark. If this bit is set, then the line idle state is SDLC flags. If bit 4 is reset, then NRZ line encoding is used. If this bit is set, then the NRZI encoding is used. If bit 5 is set, then FM0 encoding is used. If bit 8 is reset, then the exception conditions numbers 0x20 to 0x30 are passed to the application when the application performs any interface command. If this bit is set, then the application must use the READ_EXCEPTION_CONDITION command to access SDLC exception conditions. If bit 9 is set, then the receiver will be disabled while frames are being transmitted. This will prevent possible protocol feedback errors on bad lines.

Offset Within Mailbox Data Area	Lgth	Parameter
09H	2	Miscellaneous SDLC protocol configuration bits as follows: If bit 0 is reset, then a primary station will automatically issue a DISC command if an RD frame is received from a secondary station while in the NRM. If bit 0 is set, then the application will be notified of the reception of an RD frame by an exception condition return code, but the application is responsible for issuing a DISC frame (by using the DEACTIVATE_STATION command). If bit 1 is reset, then a primary station will automatically issue a SIM command if a RIM frame is received from a secondary station. If bit 1 is set, then the application will be notified of the reception of an RIM frame by an exception condition return code, but the application is responsible for issuing a SIM frame (by using the SEND_SIM_RIM_FRAME command). If bit 2 is reset, then a secondary station will not timeout while in the NRM, however slowly or erratically the device is polled by the primary station. If bit 2 is set, then a secondary station will automatically declare itself inactive and enter the NDM if it is not polled by the station at a period less than or equal to the poll timer value set in the ADD_STATION command. If bit 3 is reset, then a secondary station will respond positively to SNRM frames and re-enter the NRM after being disconnected by the primary. If bit 3 is set, then a secondary station will permanently enter the NDM on reception of a DISC frame, i.e. a DM will be issued in response to a received SNRM until the application issues an ACTIVATE_STATION command. If bit 4 is reset, then a primary station does not automatically attempt to re-activate the link on reception of a DM frame from the secondary station while in the NRM. If bit 4 is set, then a primary station automatically attempts to re-activate the link by issuing SABM commands on reception of a DM frame from the secondary station while in the NRM. If bit 5 is reset, then a primary station automatically issues SNRM commands on reception of a FRMR frame.

Offset Within Mailbox Data Area	Lgth	Parameter
0BH	2	The configuration for the reporting of exception conditions as follows: If bit 0 is set, then no exception condition will be generated when a station goes active and enters the NRM. If bit 1 is set, then no exception condition will be generated when a station goes inactive and enters the NDM. If bit 4 is set, then no exception condition will be generated when a poll timeout occurs while the station is in the NRM. If bit 5 is set, then no exception condition will be generated when a primary station receives a RD frame from a secondary device while in the NRM. If bit 6 is set, then no exception condition will be generated when a primary station receives a DM frame from a secondary device while in the NRM. If bit 7 is set, then no exception condition will be generated when a primary station receives a RIM frame from a secondary device. If bit 8 is set, then no exception condition will be generated when an XID frame is available for the application. If bit 9 is set, then no exception condition will be generated when a TEST frame is available for the application. If bit 10 is set, then no exception condition will be generated when a FRMR condition is generated. If bit 11 is set, then no exception condition will be generated at a secondary station if a SNRM frame is received from the primary while the link is in the NRM. If bit 15 is set, then no exception condition will be generated if a modem error occurs.

Offset Within Mailbox Data Area	Lgth	Parameter
0DH	2	Miscellaneous modem configuration bits as follows: If bit 0 is reset, then DTR and RTS (if CTS/RTS switching is not enabled) will be automatically raised when the application performs an ENABLE_COMMUNICATIONS command. If bit 0 is set, then the application must use the SET_MODEM_STATUS command to raise DTR and/or RTS.
0FH	2	Miscellaneous statistic format configuration bits as follows: All bits currently reserved for later use.
11H	2	The slow poll interval to be set for a primary station (in milliseconds). The primary station will poll a secondary device at this defined rate under the following conditions: When attempting to activate or deactivate the secondary station. When issuing TEST or XID frames. Valid values for this parameter are from 1 to 60000 milliseconds, with a recommended value being 5000 milliseconds.
13H	2	The secondary station timeout to be set for a primary station (in milliseconds). When the primary station issues a frame with the P-bit set, the station expects a response within this specified timeout period (otherwise a non-response condition will be registered). Note that this timeout should include: The propagation time to the secondary station. The time for secondary station processing. The propagation time from the secondary station. Valid values for this parameter are from 1 to 15000 milliseconds, with a recommended value being no less than 300 milliseconds.
15H	2	The number of consecutive secondary station timeouts while in the NRM before a primary station attempts to reinitialize the link by issuing a SNRM. Valid values are from 0 to 200.

Offset Within Mailbox Data Area	Lgth	Parameter
17H	2	The maximum data field length in an XID frame to be issued by a primary station. Valid values are from 0 to 255 bytes.
19H	2	Used if the transmitted is configured to idle mark and is the number of additional bit times to use when issuing flags before transmitting the first character in a frame. If this value is set to 0, then a single opening flag will be issued. Valid values are between 0 to 200 bit times.
1BH	2	This parameter is only used when switching CTS and RTS and is the additional bit delay after transmitting the closing flag of a frame before RTS is dropped. Valid values are between 0 and 200 bit times.
1DH	2	This parameter is only used when switching CTS and RTS and is the permitted delay for the modem to raise CTS in response to RTS being raised before frame transmission. Valid values are between 10 and 2000 milliseconds.

Control Block values set on return:

RETURN_
CODE: 0x00 The action was performed successfully.

0x01 The passed configuration data was invalid.

The 'buffer_length' parameter will indicate the offset within the data area of the invalid parameter.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28

See Section "Notes on Return Codes" for further details.

BUFFER_
LENGTH: (valid if on return code of 0x01)

The offset within the data area of the invalid configuration parameter.

READ_SDLC_CONFIGURATION (0x11)

Return the SDLC configuration set by the SET_SDLC_CONFIGURATION command. The configuration data is of the same format as that used when setting the configuration, with two exceptions:

The selected baud rate may have been adjusted to accurately reflect the actual baud generated by the adapter.

The adapter operating frequency is returned to the application.

Control Block values to be set on entry:

BUFFER_
LENGTH: Set to 0x00.

Control Block values set on return:

RETURN_
CODE: 0x00 The action was performed successfully.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28
See Section "Notes on Return Codes" for further details.

BUFFER_
LENGTH: Set to 0x23.

DATA: The SDLC configuration as defined in the SET_SDLC_CONFIGURATION command, with the following addition:

Offset 0x1F to 0x22 contains the adapter operating frequency.

SET_ADAPTER_OPERATING_FREQUENCY (0x12)

This command should only be used when instructed by your Sangoma representative.

ENABLE_COMMUNICATIONS (0x13)

Enable the transmitter and receiver and permit SDLC frames to be
transferred.
This command should be performed after the initial SET_SDLC_CONFIGURATION command.

Control Block values to be set on entry:

BUFFER_
LENGTH: Set to 0x00.

Control Block values set on return:

RETURN_
CODE: 0x00 The action was performed successfully.

0x01 The SDLC configuration must be set before communications are enabled.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28
See Section "Notes on Return Codes" for further details.

DISABLE_COMMUNICATIONS (0x14)

Disable the transmitter and receiver. The state of the configured SDLC stations is unchanged, but no SDLC frames may be transferred.

Control Block values to be set on entry:

BUFFER_
LENGTH: Set to 0x00.

Control Block values set on return:

RETURN_
CODE: 0x00 The action was performed successfully.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28
See Section "Notes on Return Codes" for further details.

ADD_STATION (0x15)

Add and configure an SDLC station.

If the device is configured as a secondary, then the station will respond to incoming commands with a DM frame, thereby indicating to the primary that the link is currently disconnected.

If a primary wishes to issue XID commands with the broadcast address 0xFF, then the station should be added with the SDLC address set to 0xFF.

Control Block values to be set on entry:

BUFFER_
LENGTH: Set to 0x00.

SDLC_
ADDRESS: The SDLC address of the station to be added.
Valid values are from 0x01 to 0xFF for a primary station and 0x01 to 0xFE for a secondary station.

POLL_
INTERVAL: For a primary station, this value is the minimum delay between consecutive polls issued to the secondary station.
For a secondary station, this value is the maximum permitted time between polls issued by a primary station while in the NRM before the secondary station becomes disconnected (if this feature has been enabled).
The maximum permitted poll interval is 60000 milliseconds.

Control Block values set on return:

RETURN_
CODE: 0x00 The action was performed successfully.

0x01 An initial SET_SDLC_CONFIGURATION must be performed before adding stations.

0x02 The SDLC address used is invalid.

0x03 The SDLC station has already been added.

0x04 The passed poll interval is invalid.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28

See Section "Notes on Return Codes" for further details.

DELETE_STATION (0x16)

Delete a previously added station.

Control Block values to be set on entry:

BUFFER_
LENGTH: Set to 0x00.

SDLC_
ADDRESS: The SDLC address of the station to be deleted.

Control Block values set on return:

RETURN_
CODE: 0x00 The action was performed successfully.

0x03 The SDLC station has not been added.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28
See Section "Notes on Return Codes" for further details.

ACTIVATE_STATION (0x17)

Activate an SDLC station.

If the device is configured as a primary, then the station will attempt to activate the link by issuing SNRM frames.

If the device is configured as a secondary, then the station will respond to an incoming SABM frame with a UA frame, thereby entering the NRM.

Control Block values to be set on entry:

BUFFER_
LENGTH: Set to 0x00.

SDLC_
ADDRESS: The SDLC address of the station to be activated.

Control Block values set on return:

RETURN_
CODE: 0x00 The action was performed successfully.

0x03 The SDLC station has already been added.

0x04 The SDLC station is already active.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28
See Section "Notes on Return Codes" for further details.

DEACTIVATE_STATION (0x18)

Deactivate an SDLC station.

If the device is configured as a primary, then the station will deactivate the link by issuing DISC commands.

If the device is configured as a secondary, then the station will request a link disconnect by issuing a RD frame.

Control Block values to be set on entry:

BUFFER_
LENGTH: Set to 0x00.

SDLC_
ADDRESS: The SDLC address of the station to be deactivated.

Control Block values set on return:

RETURN_
CODE: 0x00 The action was performed successfully.

0x03 The SDLC station has already been added.

0x04 The SDLC station is not currently active.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28
See Section "Notes on Return Codes" for further details.

FLUSH_I_FRAME_BUFFERS (0x19)

Discard any queued incoming or outgoing Information frames currently stored on the adapter.

Control Block values to be set on entry:

BUFFER_
LENGTH: Set to 0x00.

SDLC_
ADDRESS: Set to 0x00 to flush the Information buffers for all configured SDLC stations or set to a specific address to flush the buffers for a particular station.

Control Block values set on return:

RETURN_
CODE: 0x00 The action was performed successfully.

0x03 The SDLC station has not been added.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28
See Section "Notes on Return Codes" for further details.

READ_STATION_STATUS (0x20)

Read the current status of an SDLC station.

Control Block values to be set on entry:

BUFFER_
LENGTH: Set to 0x00.

SDLC_
ADDRESS: Set to 0x00 to read the global status or set to a specific SDLC address to read the status of a selected station.

Control Block values set on return:

RETURN_
CODE: 0x00 The action was performed successfully.

0x03 The SDLC station has not been added.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28
See Section "Notes on Return Codes" for further details.

BUFFER_
LENGTH: Valid for a return code of 0x00.
Set to 0x05 if the SDLC address was set to 0x00, otherwise set to 0x03.

DATA: Valid for a return code of 0x00.

For a global status command, the data is as follows:

Offset Within Mailbox Data Area	Lgth	Parameter
00H	1	A flag indicating whether or not communications have been enabled: 00H - communications disabled. 01H - communications enabled.
01H	1	The number of received Information frames currently queued on the adapter.
02H	3	Reserved.

For a status command on a non-zero SDLC address, the data is as follows:

Offset Within Mailbox Data Area	Lth	Parameter
00H	1	A flag indicating whether or not the link is in the NRM. 00H - the link is in the NDM. 01H - the link is in the NRM.
01H	1	The number of received I-frames for this station currently queued on the adapter for passing to the application.
02H	1	The number of I-frames for this station currently queued on the adapter for transmission.

LIST_ADDED_STATIONS (0x21)

Return a list of stations which have been previously added by using the ADD_STATION command.

Control Block values to be set on entry:

BUFFER_
LENGTH: Set to 0x00.

Control Block values set on return:

RETURN_
CODE: 0x00 The action was performed successfully.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28
See Section "Notes on Return Codes" for further details.

BUFFER_
LENGTH: Valid for a return code of 0x00.
Set to the number of stations that have been added.

DATA: Valid for a return code of 0x00.
A list of the SDLC addresses of the added stations. Each station is represented by a one byte, hexadecimal value.

LIST_STATIONS_IN_NRM (0x22)

Return a list of stations which are currently in the NRM.

Control Block values to be set on entry:

BUFFER_
LENGTH: Set to 0x00.

Control Block values set on return:

RETURN_
CODE: 0x00 The action was performed successfully.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28
See Section "Notes on Return Codes" for further details.

BUFFER_
LENGTH: Valid for a return code of 0x00.
Set to the number of stations currently in the NRM.

DATA: Valid for a return code of 0x00.
A list of the SDLC addresses of the stations currently in the NRM. Each station is represented by a one byte, hexadecimal value.

LIST_STATIONS_WITH_I_FRMS_AVAILABLE (0x23)

Return a list of stations which currently have Information frames available for reception by the application (by using the SDLC_READ command).

Control Block values to be set on entry:

BUFFER_
LENGTH: Set to 0x00.

Control Block values set on return:

RETURN_
CODE: 0x00 The action was performed successfully.

0x05 There are no Information frames available for reception by the application.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28
See Section "Notes on Return Codes" for further details.

BUFFER_
LENGTH: Valid for a return code of 0x00.
Set to the number of stations with queued I-frames.

DATA: Valid for a return code of 0x00.
A list of the SDLC addresses of the stations which have
I-frames available for reception by the application. Each station is represented by a one byte, hexadecimal value.
A SDLC_READ command should be performed for each station listed so as to pass this queued data to the application for processing.

READ_OPERATIONAL_STATISTICS (0x24)

Read the operational statistics for a specified SDLC station or read the global operational statistics.

Control Block values to be set on entry:

BUFFER_
LENGTH: Set to 0x00.

SDLC_
ADDRESS: Set to 0x00 to read the global operational statistics or set to a specific address to read the statistics of a particular station.

Control Block values set on return:

RETURN_
CODE: 0x00 The action was performed successfully.

0x03 The SDLC station has not been added.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28
See Section "Notes on Return Codes" for further details.

BUFFER_
LENGTH: Valid for a return code of 0x00.
Set to 0x2A if the SDLC address was set to 0x00, otherwise set to 0x13.

DATA: Valid for a return code of 0x00.

For a global statistics command, the data is as follows:

Offset Within Mailbox Data Area	Lgth	Parameter
00H	4	The total number of frames received.
04H	4	The total number of Information frames received and stored.
08H	4	The total number of frames transmitted.
0CH	4	The total number of Information frames transmitted and acknowledged by the remote stations.
10H	2	The number of frames received with an invalid SDLC address (an address of 0x00 or 0xFF).
12H	2	The number of frames received on stations which were unconfigured (no ADD_STATION command had been performed for this device).
14H	2	The number of frames received which were less than two bytes in length (excluding CRC bytes).
16H	2	The number of frames received with control fields not implemented by this station.
18H	2	The number of frames received with a control field incompatible with the configuration of this station (e.g., a SNRM received by a primary station).
1AH	2	The number of frames received with a control field incompatible with the current SDLC state of the station.
1CH	2	The number of received XID frames discarded due to buffering constraints.
1EH	2	The number of received TEST frames discarded due to buffering constraints.
20H	2	The number of received FRMR frames discarded due to buffering constraints.

Offset Within Mailbox Data Area	Lgth	Parameter
22H	2	Valid at a primary station and is the number of XID responses to a broadcast XID command received on a pre-configured primary station.
24H	2	The number of incoming frames discarded at the interrupt level.
26H	2	If receiver-transmitter bridging has been enabled, then this statistic is the number of received I-frames which could not be transmitted due to transmit buffering constraints. .
28H	2	The number of times that the application did not service the IRQ within the defined timeout period.

For a statistics command for a specific SDLC station, the returned data is as follows:

Offset Within Mailbox Data Area	Lgth	Parameter
00H	2	The total number of Information frames received and stored for this station.
02H	1	Low 4 bits: the number of I- frames received out of sequence. High 4 bits: the number of I-frames received with a zero length data field.
03H	1	Low 4 bits: the number of frames received with a control field incompatible with the current SDLC state of the station. High 4 bits: reserved for later use.
04H	2	The total number of Information frames transmitted and acknowledged by the remote station.
06H	1	The number of I-frames retransmitted.

Offset Within Mailbox Data Area	Lgth	Parameter
07H	1	Low 4 bits: the number of RR frames transmitted. High 4 bits: the number of RR frames received.
08H	1	Low 4 bits: the number of RNR frames transmitted. High 4 bits: the number of RNR frames received.
09H	1	Low 4 bits: the number of REJ frames transmitted. High 4 bits: the number of REJ frames received.
0AH	1	Low 4 bits: the number of TEST frames transmitted. High 4 bits: the number of TEST frames received.
0BH	1	Low 4 bits: the number of XID frames transmitted. High 4 bits: the number of XID frames received.
0CH	1	Low 4 bits: the number of DISC (primary) or RD (secondary) frames transmitted. High 4 bits: the number of DISC (secondary) or RD (primary) frames received.
DH	1	Low 4 bits: the number of SNRM (primary) or UA (secondary) frames transmitted. High 4 bits: the number of SNRM (secondary) or UA (primary) frames received.
0EH	1	Low 4 bits: the number of DM frames received (primary) or transmitted (secondary). High 4 bits: the number of FRMR frames received (primary) or transmitted (secondary).
0FH	1	Low 4 bits: the number of SIM (primary) or RIM (secondary) frames transmitted. High 4 bits: the number of SIM (secondary) or RIM (primary) frames received.

Offset Within Mailbox Data Area	Lgth	Parameter
10H	1	Low 4 bits: the number of response timeouts on transmission of a SNRM frame (primary). High 4 bits: the number of response timeouts on transmission of a DISC frame (primary).
11H	1	Low 4 bits: the number of response timeouts on transmission of a Supervisory or I-frame (primary) or the number of poll timeouts while in the NRM (secondary). High 4 bits: the number of response timeouts on transmission of a SIM frame (primary).
12H	1	Low 4 bits: the number of response timeouts on transmission of a TEST frame (primary). High 4 bits: the number of response timeouts on transmission of an XID frame (primary).

Note that the statistics which are returned as four bit values and rotate from 0x00 up to 0x0F, i.e., they are initialized to zero, and are reset to 0x01 once the statistic has been incremented above 0x0F.

FLUSH_OPERATIONAL_STATISTICS (0x25)

Reset the global operational statistics or the operational statistics for a specified station.

Control Block values to be set on entry:

BUFFER_
LENGTH: Set to 0x00.

SDLC_
ADDRESS: Set to 0x00 to flush the global operational statistics or set to a specific address to flush the statistics of a particular station.

Control Block values set on return:

RETURN_
CODE: 0x00 The action was performed successfully.

0x03 The SDLC station has not been added.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28
See Section "Notes on Return Codes" for further details.

SEND_TEST_FRAME (0x30)

Send a TEST frame to a secondary station. Note that this command is only applicable to a station configured as a primary.

The application will be notified of the reception of a TEST frame response (if such a response occurs) by the generation of the appropriate exception condition return code (or interrupt).

Control Block values to be set on entry:

BUFFER_

LENGTH: Set to the length of the TEST frame data field.

Valid values are from 0 to 256 bytes.

SDLC_

ADDRESS: Set to the address on which the TEST frame is to be issued.

DATA: The TEST frame data field.

Control Block values set on return:

RETURN_

CODE: 0x00 The action was performed successfully.

0x03 The SDLC station has not been added.

0x05 The length of the TEST frame data field is greater than 256 bytes.

0x06 The command is invalid for a device configured as a secondary station.

0x07 There is insufficient buffering available to transmit the TEST frame. Retry after a short delay.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28

See Section "Notes on Return Codes" for further details.

SEND_SIM_RIM_FRAME (0x31)

Send a SIM frame if configured as a primary, or send a RIM frame if configured as a secondary.

Control Block values to be set on entry:

BUFFER_
LENGTH: Set to 0x00.

SDLC_
ADDRESS: Set to the address on which the SIM or RIM frame is to be issued.

Control Block values set on return:

RETURN_
CODE:

0x00 The action was performed successfully.

0x03 The SDLC station has not been added.

0x08 The command is invalid for the current SDLC state of the selected station.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28
See Section "Notes on Return Codes" for further details.

SEND_XID_RESPONSE_FRAME (0x32)

Send an XID frame to a primary station in response to a received XID command.

The application will be notified of the reception of an XID command sent by the primary station by the generation of the appropriate exception condition return code (or interrupt if enabled). The application should then issue an XID response. Note that this command is only applicable to a station configured as a secondary.

Control Block values to be set on entry:

BUFFER_
LENGTH: Set to the length of the XID frame data field.
Valid values are from 0 to 256 bytes.

SDLC_
ADDRESS: Set to the address on which the XID frame is to be issued.

DATA: The XID frame data field.

Control Block values set on return:

RETURN_
CODE:

0x00	The action was performed successfully.
0x03	The SDLC station has not been added.
0x05	The length of the XID frame data field is greater than 256 bytes.
0x06	The command is invalid for a device configured as a primary station.
0x07	There is insufficient buffering available to transmit the XID frame. Retry after a short delay.

0x08 No XID command has been received from the primary station.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28
See Section "Notes on Return Codes" for further details.

SET_PRIMARY_STATION_XID_DATA_FIELD (0x33)

Set the XID data field for a primary station.

XID command frames will be sent at the defined slow poll rate until the secondary station issues an XID response. At this stage, the application will be notified of the reception of the XID response by the generation of the appropriate exception condition return code (or interrupt if enabled) and XID frames will no longer be issued.

Control Block values to be set on entry:

BUFFER_

LENGTH: Set to the length of the XID frame data field.

Valid values are from 0 to 255 bytes, but is limited by the maximum permitted primary station XID data field length defined by the SET_SDLC_CONFIGURATION command.

SDLC_

ADDRESS: Set to the address on which the XID frame is to be issued.

If a primary wishes to issue XID commands with the broadcast address 0xFF, then the SDLC address should be set to 0xFF.

DATA: The XID frame data field.

Control Block values set on return:

RETURN_

CODE: 0x00 The action was performed successfully.

0x03 The SDLC station has not been added.

0x05 The length of the XID frame data field is greater than the defined maximum size.

0x06 The command is invalid for a device configured as a secondary station.

0x07 There is insufficient buffering available to transmit the XID frame. Retry after a short delay.

0x08 The link is currently in the NRM and no XID frames may be issued while the link is in this state.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28

See Section "Notes on Return Codes" for further details.

LIST_PRI_STATIONS_ISSUING_XID_FRAMES (0x34)

Return a list of primary stations which are currently issuing XID command frames to secondary stations.

Control Block values to be set on entry:

BUFFER_
LENGTH: Set to 0x00.

Control Block values set on return:

RETURN_
CODE: 0x00 The action was performed successfully.

0x06 The command is invalid for a device configured as a secondary station.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28
See Section "Notes on Return Codes" for further details.

BUFFER_
LENGTH: Valid for a return code of 0x00.
Set to the number of stations issuing XID frames.

GENERAL_
MAILBOX_
BYTE: Valid for a return code of 0x00.
Set to the total number of primary station XID buffers defined, i.e. the maximum number of primary stations which may be issuing XID commands at any one time.

DATA: Valid for a return code of 0x00.

A list of the SDLC addresses of the stations currently issuing XID commands. Each station is represented by a one byte, hexadecimal value.

SET_MODEM_STATUS (0x40)

Set the status of DTR and RTS.

Control Block values to be set on entry:

BUFFER_

LENGTH: Set to 0x01.

DATA: Offset 0x00 of the data field is set to indicate the required DTR and RTS setting as follows:

If bit 0 is reset, then DTR is to be set low.

If bit 0 is set, then DTR is to be set high.

If bit 1 is reset, then RTS is to be set low.

If bit 1 is set, then RTS is to be set high.

Control Block values set on return:

RETURN_

CODE: 0x00 The action was performed successfully.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28

See Section "Notes on Return Codes" for further details.

READ_MODEM_STATUS (0x41)

Read the current status of DCD and CTS.

Control Block values to be set on entry:

BUFFER_
LENGTH: Set to 0x00.

Control Block values set on return:

RETURN_
CODE: 0x00 The action was performed successfully.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28
See Section "Notes on Return Codes" for further details.

BUFFER_
LENGTH: Valid for a return code of 0x00.
Set to the 0x01.

DATA: Valid for a return code of 0x00.
The current DCD and CTS status as follows:

If bit 3 is set, then DCD is high.
If bit 5 is set, then CTS is high.

READ_COMMS_ERROR_STATISTICS (0x42)

Read the communication error statistics for the link.

Control Block values to be set on entry:

BUFFER_
LENGTH: Set to 0x00.

Control Block values set on return:

RETURN_
CODE: 0x00 The action was performed successfully.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28
See Section "Notes on Return Codes" for further details.

BUFFER_
LENGTH: Valid for a return code of 0x00.
Set to 0x0A.

DATA: Valid for a return code of 0x00.

The communication error statistics are as follows:

Offset Within Mailbox Data Area	Lgth	Parameter
00H	1	The number of receiver overrun errors.
01H	1	The number of receive CRC errors.
02H	1	The number of abort frames received.
03H	1	The number of frames received of excessive length.
04H	1	The number of transmit frames aborted.
05H	1	The number of transmitted underruns.
06H	1	The number of missed transmit underrun interrupts.
07H	1	The number of times that CTS did not respond to RTS in a switched CTS/RTS environment.
08H	1	The number of times that DCD changed state.
09H	1	The number of times that CTS changed state.

FLUSH_COMMS_ERROR_STATISTICS (0x43)

Reset the communications error statistics for the link.

Control Block values to be set on entry:

BUFFER_
LENGTH: Set to 0x00.

Control Block values set on return:

RETURN_
CODE: 0x00 The action was performed successfully.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28
See Section "Notes on Return Codes" for further details.

SET_INTERRUPT_TRIGGERS (0x50)

Set the occurrences which will cause the SDLA adapter to trigger a hardware interrupt on the PC.

Control Block values to be set on entry:

BUFFER_
LENGTH: Set to 0x03.

DATA: Offset 0x00 defines the interrupt triggers as follows:

Bit Number	Interrupt Trigger
0	The receive interrupt bit. If this bit is set, then an interrupt will be triggered if there is an incoming Information frame available for reception by the application. The application may perform a LIST_STATIONS_WITH_I_FRMS_AVAILABLE command to find out which stations have I-frames available, or the application may examine the station status interface bytes to establish the SDLC address to be used with a subsequent SDLC_READ command.
1	The transmit interrupt bit. The transmit interrupt may be used in two different ways: a) SDLC station specific transmit interrupt, where an interrupt will be triggered if an Information frame may be transmitted on a specific SDLC station. The SDLC address is specified in the SDLC_ADDRESS definition area of the mailbox. b) non-SDLC station specific transmit interrupt, where an interrupt will be triggered if at least one transmit buffer is available on the adapter. The SDLC_ADDRESS specified is 0x00.
2	Reserved for later use.

Bit Number	Interrupt Trigger
3	The ‘command complete’ interrupt bit. If this bit is set, then an interrupt will be triggered on completion of an interface command, i.e. when the 'opp_flag' has been reset.
4	The ‘exception condition’ interrupt bit. If this bit is set, then an interrupt will be triggered if an exception condition occurs. Use the READ_EXCEPTION_CONDITION command to establish the nature of this condition.
5	The ‘timer interrupt’ bit. If this bit is set, then an interrupt will be generated at a defined millisecond interval.

Offset 0x01 to 0x02 contains the millisecond timer interval used when enabling the timer interrupt. Valid values are from 0 to 60000 milliseconds.

SDLC_ ADDRESS: used in conjunction with transmit interrupts and is set to zero to enable non-station specific interrupts or is set to a specific SDLC address on which the Information frames are to be transmitted.

Control Block values set on return:

RETURN_ CODE:

0x00 The action has been performed successfully.

0x01 Set the SDLC configuration before enabling interrupts.

0x03 (only applicable when enabling transmit interrupts) - the SDLC station selection has not been added.

0x04 The timer interrupt interval defined is invalid.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28
See Section "Notes on Return Codes" for further details.

READ_INTERRUPT_TRIGGERS (0x51)

Read the current interrupt trigger configuration as set in the SET_INTERRUPT_TRIGGERS command.

Control Block values to be set on entry:

BUFFER_
LENGTH: Set to 0x00.

Control Block values set on return:

RETURN
_CODE: 0x00 The action has been performed successfully.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28
See Section "Notes on Return Codes" for further details.

BUFFER_
LENGTH: Valid for a return code of 0x00.
Set to 0x03.

DATA: The interrupt trigger configuration as defined in the SET_INTERRUPT_TRIGGERS command.

SET_TRACE_CONFIGURATION (0x60)

Set the line trace configuration.

Control Block values to be set on entry:

BUFFER_

LENGTH: Set to 0x02.

SDLC_

ADDRESS: If the SDLC is set to 0x00, then frames will be traced for all stations.

If the SDLC address is set to a value between 0x01 and 0xFE, then only the frames on this defined station will be traced.

DATA: The trace configuration as follows:

Offset Within Mailbox Data Area	Lth	Parameter
00H	1	Miscellaneous trace configuration bits as follows: If bit 0 is reset, then line tracing is disabled. If bit 0 is set, then line tracing is enabled. If bit 1 is set, then each traced frame will include a millisecond time stamp. This time stamp rotates between 0 and 65535 milliseconds. If bit 2 is reset, then trace data will be discarded if the trace data cannot be stored due to buffering limitations. If bit 2 is set, then the trace delay mode is activated and the actual SDLC protocol will be slowed down so that no trace data is lost if the application is not receiving trace data from the adapter at the required rate. If bit 3 is set, then the trace statistics are reset to zero. If bit 4 is set, the SDLC Information frames will be traced. If bit 5 is set, then SDLC Supervisory frames will be traced. If bit 6 is set, then SDLC Unnumbered frames will be traced. If bit 7 is set, then the current trace configuration will be returned to the application. Note that the trace configuration will not be set if this bit is enabled.
01H	1	The trace deactivation timer. This timer is used in conjunction with the trace delay mode and automatically deactivates the trace in the case where the application does not read trace frames from the adapter at least once per defined deactivation period. Valid values are from 1 to 8 seconds.

Control Block values set on return:

RETURN_
CODE: 0x00 The action was performed successfully.

0x01 Communications have not been enabled.

0x02 The trace passed configuration is invalid, as neither bits 4, 5 or 6 were set.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28
See Section "Notes on Return Codes" for further details.

BUFFER_
LENGTH: Valid for a return code of 0x00 and if the current trace configuration was requested. Set to 0x01.

DATA: Valid for a return code of 0x00 and if the current trace configuration was requested. The trace configuration bit settings as defined above.

READ_TRACE_DATA (0x61)

Read a traced frame from the SDLA adapter.

Control Block values to be set on entry:

BUFFER_
LENGTH: Set to 0x00.

Control Block values set on return:

RETURN_
CODE: 0x00 The action was performed successfully.

0x02 The tracing facility is not currently active.

0x05 No trace data is currently available.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28
See Section "Notes on Return Codes" for further details.

BUFFER_
LENGTH: Valid for a return code of 0x00.
Set to the length of the trace data.

SDLC_
ADDRESS: Represents the type of frame traced as follows:

SDLC_ ADDRESS setting,	Frame Type Definition
00H	The trace is of a incoming frame (no errors).
01H	The trace is of a transmitted frame (no error).
12H	The trace is of a received aborted frame.
22H	The trace is of a frame received with a CRC error.
32H	The trace is of a received frame with an overrun error.
42H	The trace is of a frame received of excessive length.
72H	The trace is of an aborted transmitted frame (missed transmit interrupt).
82H	The trace is of an aborted transmitted frame (missed transmit underrun interrupt).

POLL_

INTERVAL: The millisecond time stamp for the frame (if time stamping has been enabled). This time stamp rotates from 0 to 65535 milliseconds.

DATA: Valid for a return code of 0x00.

The actual contents of the traced frame. This includes all bytes in the frame, but excludes the opening and closing flags. For outgoing frames, the two CRC bytes are represented by the value 0xFFFF.

READ_TRACE_STATISTICS (0x62)

Read the trace statistics.

Control Block values to be set on entry:

BUFFER_
LENGTH: Set to 0x00.

Control Block values set on return:

RETURN_
CODE: 0x00 The action was performed successfully.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28
See Section "Notes on Return Codes" for further details.

BUFFER_
LENGTH: Valid for a return code of 0x00.
Set to 0x08.

DATA: The trace statistics as follows:

Offset Within Mailbox Data Area	Lgth	Parameter
00H	4	The total number of frames traced and buffered.
04H	4	The total number of trace frames discarded due to the limitation in trace buffering on t he adapter.

READ_CODE_VERSION (0x70)

Read the code version number of the SDLC code running on the adapter.

Control Block values to be set on entry:

BUFFER_
LENGTH: Set to 0x00.

Control Block values set on return:

RETURN_
CODE: 0x00 The action was performed successfully.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28
See Section "Notes on Return Codes" for further details.

BUFFER_
LENGTH: Valid for a return code of 0x00.
Set to 0x04.

DATA: Valid for a return code of 0x00.

Offset 0x00 to 0x03 contains the code version as an ASCII string of the format:

main-version.sub-version

For example, SDLC code version “2.01".

READ_EXCEPTION_CONDITION (0x71)

Read an exception condition from the adapter.

This command is used when the passing of exception conditions has been disabled in the SET_SDLC_CONFIGURATION command.

Control Block values to be set on entry:

BUFFER_
LENGTH: Set to 0x00.

Control Block values set on return:

RETURN_
CODE: 0x00 There are no current exception conditions to report to the application.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28
See Section "Notes on Return Codes" for further details.

DISCARD_INCOMMING_INFORMATION_FRAMES (0x72)

Discard all incoming Information frames.

The reception of the frame is acknowledged on the SDLC level, but the frame is not queued for reception by the application.

Control Block values to be set on entry:

BUFFER_
LENGTH: Set to 0x01.

DATA: If offset 0x00 of the data field is set to 0x01, then Information frames will be discarded.

If offset 0x00 of the data field is set to 0x00, then Information frames will be queued for reception by the application. This is the default condition on loading the SDLC code.

Control Block values set on return:

RETURN_
CODE: 0x00 The action was performed successfully.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28

See Section "Notes on Return Codes" for further details.

BRIDGE_RECEIVER_AND_TRANSMITTER (0x73)

This command allows the internal bridging of the receiver and transmitter as far as Information frames are concerned, i.e, all received Information frames will be immediately returned to the transmitting station and will not be made available for reception by the application.

Control Block values to be set on entry:

BUFFER_
LENGTH: Set to 0x01.

DATA: If offset 0x00 of the data field is set to 0x01, then the receiver and transmitted will be bridged.

If offset 0x00 of the data field is set to 0x00, then Information frames will be queued for reception by the application. This is the default condition on loading the SDLC code.

Control Block values set on return:

RETURN_
CODE: 0x00 The action was performed successfully.

0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28
See Section "Notes on Return Codes" for further details.

5. Notes on Return Codes

There are return codes common to specific commands which require additional discussion. These return codes (hexadecimal values) are:

Return Code	Description Of Return Code
20H	A station or a number of stations have become active or inactive. The mailbox BUFFER_LENGTH will be set to twice the number of stations which have changed state. The mailbox DATA area will include a list of the SDLC addresses which have changed state, together with a byte representing the new state of that station in the following format: Offset 0x00: SDLC address #1 Offset 0x01: new state, where 0x00 represents NDM and 0x01 represents NRM. Offset 0x00: SDLC address #2 Offset 0x01: new state, where 0x00 represents NDM and 0x01 represents NRM. . . . Offset 0x00: SDLC address #n Offset 0x01: new state, where 0x00 represents NDM and 0x01 represents NRM.
21H	A timeout occurred while the link was in the NRM.
22H	A RD frame was received while the link was in the NRM (primary).
23H	A DM frame was received while the link was in the NRM (primary).
24H	A SNRM frame was received while the link was in the NRM (secondary).

Return Code	Description Of Return Code
25H	A RIM frame was received (primary).
26H	A XID frame was received. The mailbox BUFFER_LENGTH indicates the length of the XID data field. The mailbox DATA area contains the actual XID frame data field.
27H	A TEST frame was received. The mailbox BUFFER_LENGTH indicates the length of the TEST data field. The mailbox DATA area contains the actual TEST frame data field.
28H	A FRMR frame was transmitted (secondary) or received (primary). The mailbox BUFFER_LENGTH indicates the length of the FRMR data field. The mailbox DATA area contains the actual FRMR frame data field.
30H	A changed has occurred in the status of DCD and/or CTS OR CTS failed to respond to RTS in a switched CTS/RTS configuration. The mailbox BUFFER_LENGTH is set to 0x01. The mailbox DATA area contains the details of the modem status change/CTS failure at offset 0x00 as follows: If bit 2 is set, then DCD has changed state. If bit 4 is set, then CTS has changed state. It bit 7 is set, then CTS failed to respond to RTS. Bit 3 indicates the current status of DCD - if this bit is set, then DCD is high, otherwise DCD is low. Bit 5 indicates the current status of CTS - if this bit is set, then CTS is high, otherwise CTS is low.

6. PC/SDLA Interface Bytes

There are a number of bytes within the shared PC/SDLA memory area which are useful for increasing program efficiency. The application may use these bytes, for example, to find out if there are received frames available for the application, instead of performing an SDLC_READ or LIST_STATIONS_WITH_I_FRMS_AVAILABLE command.

These bytes are:

The TOTAL_NUMBER_I_FRMS_FOR_APPLICATION_BYTE (offset 0xEE0 from the defined memory window base address).

This byte is set to the total number of received Information frames currently buffered on the adapter and available for reception by the application. If the TOTAL_NUMBER_I_FRMS_FOR_APPLICATION_BYTE is set to zero, then there is no need to perform a SDLC_READ or LIST_STATIONS_WITH_I_FRMS_AVAILABLE command.

The GLOBAL_TRANSMIT_BUFFER_STATUS_BYTE (offset 0xEE1 from the defined memory window base address).

This byte is set to 0x01 if there is storage space available for at least one outgoing Information frame in the transmit buffers on the adapter. If this byte is set to 0x00, then no more outgoing frames may be currently buffered on the adapter, and an SDLC_WRITE command will not be successful.

The EXCEPTION_CONDITION_WORD (offset 0xEE2 to 0xEE3 from the defined memory window base address).

This word indicates any current exception conditions on the adapter as follows:

Bit Set	Description Of Exception Condition
0	The state of a station or a number of stations has changed.
1	Reserved.
2	Reserved.

Bit Set	Description Of Exception Condition
3	Reserved.
4	A timeout occurred while the link was in the NRM.
5	A RD frame was received from a secondary station while the link was in the NRM (primary).
6	A DM frame was received from a secondary station while the link was in the NRM (primary).
7	A RIM frame was received from a secondary station (primary).
8	An XID frame has been received.
9	A TEST frame has been received.
10	A FRMR frame has been received (primary) or transmitted (secondary).
11	A SNRM frame was received from the primary station while the link was in the NRM (secondary).
15	A change of state has occurred in CTS and/or RTS OR CTS failed to respond to RTS in a switched CTS/RTS configuration.

The CURRENT_MODEM_STATUS_BYTE (offset 0xEE4 from the defined memory window base address).

This byte is indicates the current status of DCD and CTS as follows:

If bit 3 is set, then DCD is high.

If bit 5 is set, then CTS is high.

The TRACE_DATA_AVAILABLE_BYTE (offset 0xEE5 from the defined memory window base address).

This byte is only valid if line tracing has been enabled and is set to 0x01 if there is trace data available for the application and to 0x00 if the trace buffers are currently empty.

The STATION_STATUS_BYTES (offset 0xF01 to 0xFFE from the defined memory window base address).

These bytes indicate the status of each station, starting with SDLC address at offset 0xF01 and ending with SDLC address 0xFE at offset 0xFFE as follows:

Bit	Description
0	If reset, then the station is in the NDM. If set, then the station is in the NRM.
1	Reserved.
2	Reserved.
3	Reserved.
4	If reset, then there are no received Information frames queued on the adapter for this station. If set, then the application should perform an SDLC_READ command with the appropriate SDLC address to retrieve an Information frame queued on the adapter.
5	If reset, then the SDLC window is currently closed for this station and no more Information frames may be transmitted on this SDLC address. If set, then Information frames may be transmitted on this SDLC address by using the SDLC_WRITE command.

7. MS-DOS Modules

General

MS-DOS software support for SDLC on ISA cards consists of the following modules:

SDLC_LD.EXE loads the SDLC microcode onto the SDLA adapter, configures it, runs through a self test and starts the program.

SDLC.502 is the run time SDLC downloadable module loaded by SDLC_LD.EXE.

SDLA_TST.502 is a module used for testing the SDLA hardware before loading SDLC.502.

SDLC_LD.EXE

The SDLC code is loaded by using SDLC_LD.EXE, which has the following command line arguments:

SDLC_LD -c[SDLC CODE DOWNLOADABLE MODULE] -p[I/O PORT BASE ADDRESS]
-m[SHARED MEMORY WINDOW SEGMENT AND OFFSET]

For example:

SDLC_LD -c:\comms\sdlc.502 -p300 -mCA

The default arguments are:

SDLC CODE DOWNLOADABLE MODULE: "SDLC.502"
I/O PORT BASE ADDRESS: 360
SHARED MEMORY WINDOW SEGMENT AND OFFSET: D0

Valid I/O port selections are as follows:

For the S502 v 3.0 and S502E adapters:

250, 300, 350 and 360 (hexadecimal).

For the S503 adapter:

250, 254, 300, 304, 350 , 354, 360 and 364 (hexadecimal).

The first character of the shared memory window segment and offset

shared_memory_address specifies the 64K PC memory segment to be used. Valid values are A, C, D or E. The second character defines the 8k window within the selected 64K memory segment. Valid values are as follows:

8k Window Offset Value	PC Memory Window Address
0	0000 to 1FFF hexadecimal
2	2000 to 3FFF hexadecimal
4	4000 to 5FFF hexadecimal
6	6000 to 7FFF hexadecimal
8	8000 to 9FFF hexadecimal
A	A000 to BFFF hexadecimal
C	C000 to DFFF hexadecimal
E	E000 to FFFF hexadecimal

SDLC_LD will perform a system test, read the CODE file and load and configure the adapter. If SDLC_LD does not execute successfully, an error message will be displayed and an exit code will be returned. SDLC_LD may also display configuration warning messages. A description of these messages and corresponding exit codes are described in Section "Error Messages".

SDLC.502

This is the SDLC support code which is loaded onto the card and establishes the link level communications.

SDLC.502 is **NOT** a PC-DOS program and is not executable under DOS.

8. MS-DOS Error messages

If SDL_LD does not execute successfully, an error message will be displayed and an exit code will be returned. The error messages and corresponding exit codes (DOS ERRORLEVEL) are as follows:

"**A command line error was found when executing SDLC_LD**"

An invalid command line argument was used or the **CODEFILE** or **CONFIG** arguments were omitted (exit code of 1).

"**The file FILENAME was not found**"

A filename listed in the command line arguments was not found in the defined directory (exit code of 2).

"**The code running on the adapter is not the same as the original downloaded code**"

There is a memory or I/O port address conflict in your PC. Change the I/O port address and/or the memory segment and memory window parameters (exit code of 4).

"**The downloaded code is not running on the adapter**"

The SDLA CPU has halted. Contact your Sangoma representative (exit code of 5).

"**The S502 adapter is configured with the incorrect serial communications chip**"

Contact your Sangoma representative (exit code of 6).