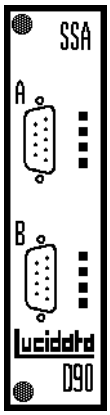
D90-IB8 MODULE

For synchronous IBM 2780/3780 BSC connections to asynchronous devices



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Introduction

Like all Lucidata Diplomat data communications products, the D90-IB8 has been designed to be easy to use in most normal applications whilst retaining a large degree of flexibility.

It is Lucidata's policy to try and find out as much about the intended application of its products before shipment so that the unit can be pre-configured at the factory for easy installation. In this case you may skip many sections of this manual. If the application changes with time then you will need to refer to those sections to reconfigure the unit.

In the event of difficulty, please contact Lucidata's technical staff who will be able to guide you through the process.

The configuration switches are not normally changed once a unit is installed and it is outside the scope of this manual to describe the behaviour of the module for every combination of switches in all circumstances.

This first part of this manual restricts itself to the functional characteristics of the D90-IB8. A fuller description will be found under the heading *Operation in Detail.*

Description

The D90-IB8 module runs on an SSA hardware module which is fitted with two 9 pin D-type connectors labelled Port A and Port B. It can perform symetrically as a primary or secondary station in a point to point BSC link.

Port A is connected to the synchronous host or modem (DCE) and Port B is connected to an asynchronous device (DTE) enabling data transfer between the two devices.

Within the module there is an EPROM which contains the program (Firmware) for emulating the IBM 2780 or 3780 protocols. The firmware also contains the various communication parameter defaults (speed, parity etc) which are set when the module is powered up. These defaults can only be changed by inserting new firmware or by means of a Diplomat Network Monitor (DNM) if one is present in the rack. The defaults for these parameters will be found in the *Customer Specification* section of this manual which is specific to each customer.

The functional characteristics are controlled by certain parameters which can be changed by means of the Configuration Byte and Control Codes which are described later in this section.

Data Communications

Each module has two 9 pin D-type connectors on the front which are labelled A and B. Signalling levels are RS232. The use of screened cable with the outer conductor grounded to the connector shell is recommended when making connections to the SSA module in order to guarantee immunity to external electromagnetic interference. Ensure that the cables are securely fixed to the screwlock pillars.

Synchronous Port A
(Male 9-pin D-Type)

Port A is configured as synchronous DTE and is connected either directly or remotely via a modem or line driver. The following table gives the pinouts.

PIN NO.		
1	CD	Carrier Detect controlled by DCE
2	RXD	Received Data - SSA receives data on this pin
3	TXD	Transmitted Data - SSA transmits data on this pin
4	DTR	Data Terminal Ready - controlled by SSA
5	SG	Signal Ground
6	TXC	Transmit Clock supplied by DCE (can be supplied by SSA)*****
7	RTS	Request to Send - controlled by SSA
8	CTS	Clear to Send - controlled by DCE
9	RXC	Receive Clock supplied by DCE (can be supplied by SSA)*****

**Note: The internal clock can be made available on pin 6 by inserting link TXC and on pin 9 by inserting link RXC on the module's PCB*

Asynchronous Port B
(Female 9-pin D-Type)

Port B is configured as asynchronous DCE and is normally connected to a terminal or other asynchronous peripheral. These pin assignments are compatible with the COM port of an IBM PC. Connecting other devices may require rewiring the connecting plugs. Details of the pin assignments are given below.

PIN NO.		
1	CD	Carrier Detect controlled by SSA
2	RXD	Received Data - SSA transmits data on this pin
3	TXD	Transmitted Data - SSA receives data on this pin
4	DTR	Data Terminal Ready - DTE enables SSA transmitter
5	SG	Signal Ground
6	DSR	Held high by SSA as long as D90 powered up
7	RTS	Request to Send - controlled by DTE
8	CTS	Clear to Send - controlled by SSA
9	RI	Ring Indicator - not used

LED Indicators

There are three Red(R) and one Yellow(Y) light emitting diodes for Port A and three Red and one Green(G) for Port B. When they are illuminated, the following conditions are true.

A	O	(R) RTS Request To Send asserted (SSA)(Pin 7 high)
	O	(R) CTS Clear To Send asserted (Host)(Pin 8 high)
	O	(R) DCD Data Carrier Detect (Host)(Pin 1 high)
	O	(Y) Synchronised frame detected
B	O	(R) Port B enabled (SSA)(Pin 1 high)
	O	(R) Device on Port B present (Pin 4 and 7 high)
	O	(R) Data received by Port B (Pin 3 toggling)
	O	(G) Dialogue with another module (eg: DNM)

Configuration Options

There are no mechanical switches in D90 modules. Configuration is accomplished by setting "silicon switches" that are programmed into the *Configuration Bytes*. There is one *Configuration Byte* for each port and this section is a summary of the options available. Please refer to the paragraph headed *Configuration Menu* later in this section for how to set them up with the menu driven screens and for a description of how they affect the operation of the unit.

Note: Reading the bits from left to right on the screen corresponds to reading the tables below from top to bottom. By convention, the bits are numbered 1-8 from left to right so switch A2(1) denotes EBCDIC host code.

Port A (Synchronous)

Configuration Byte A

Report Exceptions	1	0	Do not Report Exceptions
EBCDIC Host code	1	0	ASCII Host code
3780 Protocol	1	0	2780 Protocol
Record length 132 chars	1	0	Record length 80 chars
Reserved			
Pad to Record length	1	0	Do not pad to record length
DTR controlled by codes	1	0	DTR follows DTR on Port B
Drop DTR for 2 secs after EOT sent	1	0	Do not drop DTR

Report Exceptions — Certain error conditions will be reported to a DNM module, if one is present in the rack. Otherwise the module endeavours to recover from the situation, ignoring it or ultimately initiating a soft restart. Usually not selected in normal operation.

EBCDIC/ASCII — Set according to what code the Host computer is using.

3780/2780 — Sets the unit to operate as an IBM2780 or IBM3780 station.

Record Length — Either 132 or 80 characters is set as the default record length.

Pad to Record Length — Controls whether space padding and/or expansion of compression codes is performed.

DTR — This switch selects whether the state of DTR on Port A is determined by the state of DTR on Port B, or whether by control codes and/or conditions existing in the data.

Drop DTR — If DTR is not being controlled by Port B, then setting this switch will cause Port A to signal that it has finished sending an EOT frame, by dropping its DTR line for 2 seconds.

Note: Configuration Byte A controls the function of Port A and Configuration Byte B the function of Port B, with the exception that switch B8 is used by Port A.

Port B (Asynchronous)

Configuration Byte B

Turbo Mode	1	0	Normal Mode
Translate between ASCII & EBCDIC	1	0	Do not Translate
Filter translated data	1	0	Do not Filter
EOF Text Message	1	0	EOF CTRL/Z character
Expand CR to CRLF if filtering	1	0	Do not expand CR
Echo input to DTE	1	0	Do not echo input
Add LF to Echoed CR	1	0	Do not add LF
Drop DCD for 2 secs after EOT	1	0	Do not drop DCD

Turbo/Normal Mode

If the switch is set to Normal and the unit detects that the synchronous interface is running with constant DCD, a turnaround delay between 30 and 40mS is introduced to avoid loss of acknowledgement by slower host systems. In addition, when the IB8 is bidding for control of the line, the first ENQ frame is preceded by 100 SYN characters, again for the benefit of older systems. If Turbo mode is selected, there is zero turnaround delay and only six SYN characters are used in the first ENQ frame. (See Appendix 3 for performance considerations).

Translate

It is assumed the host code is either EBCDIC or ASCII. If the host code is EBCDIC, and this switch is set, the data will be translated to ASCII. If the switch is not set, the host code will be left unchanged.

Filter

The data stream can be passed with minimal modification, or it can be filtered to provide a simpler structure. The details of filtering depend on the protocol and the code and are described in detail in the *Operation in Detail* section.

EOF Text Message

On receipt of the last frame (ETX) of a file the text *** END OF DATA *** is sent if the switch is set. Otherwise, a single SUB (CTRL/Z ASCII value 26) will be sent.

Expand CR

If filtering is active and this switch is set, any CR found in the output data to Port B will have a LF appended.

Echo

If a simple terminal is acting as DTE on port B, it is usual to enable the echo of input characters back to the terminal. But echo should be disabled if the DTE is a program controlled computer port.

Add LF

This switch enables the automatic addition of a LF to a CR which is being echoed back to the terminal.

Drop DCD

If this switch is set DCD on Port B will be dropped for 2 seconds after the last character received has been output to the DTE. This gives the only physical indication that an incoming transfer has completed in the case of a binary file.

IBM 2780 and IBM 3780

In IBM terminology the D90-IB8 can act as a Primary (Master) station or a Secondary (Slave) station using either the IBM 2780 or IBM 3780 Binary Synchronous Protocol (BSC) operating in Point to Point Data Link Mode. In the following sections it can be assumed that any description applies equally to 2780 or 3780 unless indicated to the contrary.

ASCII and EBCDIC

The BSC protocol is defined for both EBCDIC and ASCII code sets although the most usual one found in practise is EBCDIC. The data transported by the protocol can be either printable characters and selected control codes taken from the same code as the BSC envelope, or encoded as Transparent (Binary) Data. Thus ASCII coded data may be transported within an EBCDIC envelope by sending it in Transparent mode and vice versa. The communications code used for control on the asynchronous side (Port B) of the D90-IB8 is always ASCII but this does not preclude the transport of any type of binary data. However because EBCDIC uses 8 bits to represent its code set while ASCII only uses 7 bits it is necessary to operate Port B in 8 data bit mode if EBCDIC codes are to be handled.

Control Codes

There are a limited set of control codes that may be transported within the BSC envelope when operating in plain Text mode. These are shown in *Table 1* for both protocols. The D90-IB8 has freely utilized the remaining control codes to implement the various control features described later. This does not prevent the sending of these codes across the link but they have to be sent in Transparent mode. The action taken by the D90-IB8 in response to these codes is summarised in *Table 2*.

CR and SUB

The two most important codes are CR (ASCII value 13) and SUB (ASCII value 26) as these cause the D90-IB8 to try to transmit a data frame over the link. The CR is used to terminate each line or block of characters input from Port B and results in a BSC envelope terminated with an ETB character. The SUB is used to terminate the last data block and causes a BSC envelope terminated with an ETX character to be sent. The D90-IB8 will then give up the link by issuing an EOT frame.

Note: In the following descriptions, the symbol CRLF means the CR (ASCII value 13) character by itself if switch B4 is clear, B4(0), or followed by the LF (ASCII value 10) character if B4 is set, B4(1).

Normal Operation

The simplest application is when the BSC link is operating in EBCDIC and the D90-IB8 has been configured to Translate but not Filter. This sets the unit to Text mode when it is master. Assuming direct connections on both Port A and B the system will remain idle with no traffic flowing over either interface. There are two situations that can now occur.

Slave State (Receiving)

The system on the other end of the BSC link bids to become Master of the link and the D90-IB8, being idle, acknowledges the bid and enters the Slave state. As each data block is extracted from a correctly received BSC envelope the characters are translated into ASCII code and sent to the output buffer of Port B. Where there is no valid 7 bit ASCII code for a received EBCDIC character, a code value is generated which is greater than 128. The exceptions are given below. Refer to the Appendix at the end of this section for the complete translation table.

The attached DTE can control the rate it receives data using XON/XOFF flow control ie sending DC1/DC3 (ASCII value 17,19) characters.

Newline

The EBCDIC Newline (NL) character (EBCDIC value 21) is converted to CRLF.

ITB in 2780 Mode

In 2780 mode the Intermediate Text Block (ITB) symbol (EBCDIC value 31) is removed thus concatenating the text to either side of it.

GS in 3780 Mode

In 3780 mode the Space Compression (GS) code (EBCDIC value 29) is translated to ASCII and the following space count character recomputed and output as its ASCII equivalent.

EOF Text Message

When the last data frame arrives with its terminating ETX (EBCDIC value 3) character it is followed by a SUB (ASCII value 26, CTRL/Z) character or the text string - “*** END OF DATA ***”, dependant on the setting of switch B5. The master station will then logically drop the line by sending an EOT (EBCDIC value 55) frame. What happens next depends on switch B1. If it is not set, B1(0), then the link becomes idle and any data in the Port B output buffer continues to transfer until the buffer is empty. If switch B1 is set, B1(1), then the D90-IB8 monitors the output buffer of Port B until it is empty or has stopped emptying, and then drops the DCD signal (pin 1) on Port B for 2 seconds. If data still remains in the output buffer it is preserved. The D90-IB8 returns to the idle state.

Master State (Transmitting)

ASCII characters are input to Port B from an asynchronous device and terminated with a CR or SUB character. The first termination character causes the D90-IB8 to bid to become link master. It will bid 15 times before logically dropping the line with an EOT frame and then freshly discover that it has data to send and start bidding again. This process will repeat for ever or until some control action is taken via Port B. When it receives an acknowledgement from the remote system the D90-IB8 enters the Master state. All characters that are not interpretted as commands by the D90-IB8 are translated into EBCDIC code and packaged up in BSC envelopes for transmission over the link. Care should be taken not to include characters that would interfere with the operation of the BSC protocol.

When the input buffer of port B has only 100 bytes left in it, the D90-IB8 will send a DC3 (ASCII value 19) character for every character received while the condition persists. If characters continue to be received so that the buffer becomes full, the D90-IB8 will send a BEL (ASCII value 7) character for every character received while the condition persists. The sending application should recognise that data will have been lost if it receives BEL characters and take appropriate action. When the input buffer empties to such an extent that there is room for at least 500 characters, the D90-IB8 will send a single DC1 (ASCII value 17) character.

The following special cases exist in this mode of operation.

Newline

An FS (ASCII value 28) character is translated to the EBCDIC Newline (NL) character.

ITB in 2780 Mode

In 2780 mode an ITB (ASCII value 31) character is translated to EBCDIC but then causes the D90-IB8 to follow it with the currently computed CRC value prior to resetting the CRC and placing further characters onto the link.

GS in 3780 Mode

In 3780 mode the Space Compression (GS) code (ASCII value 29) is translated to EBCDIC and the following space count character recomputed before being sent as its EBCDIC equivalent.

The last block of data is terminated with a SUB (ASCII value 26) character which causes the D90-IB8 to terminate the last BSC frame with an ETX (EBCIDIC value 3) character. The D90-IB8 then logically drops the line by issuing an EOT (EBCIDIC value 55) frame. If switch A1 is set, A1(1), then the D90-IB8 drops the DTR signal (pin 4) on Port A for 2 seconds before returning to the idle state. If switch A1 is unset, A1(0), then the D90-IB8 returns directly to the idle state.

Filtering the Data Stream

If switch B7 is set, B7(1), the data stream is modified by various filters. The process is asymetric and is designed to simplify the processing of the data stream by the recipient of the data. When the D90-IB8 is in the Master state the data stream from Port B is filtered to pass only the printing characters and the control characters listed in Table 1.

When the D90-IB8 is in the Slave state the data removed from the BSC envelope is examined for control characters. The characters listed in the first part of Table 1 are passed on directly but the rest are processed in the following manner.

Escape sequences

ESC followed by '/','S', or 'T' are converted into 1, 2, or 3 CRLF characters and ESC followed by 'A' is converted to the Form Feed (FF) character (ASCII value 12)

Device control

Codes DC1, DC2, DC3 and DC4 (EBCDIC values 17, 18, 19, 60) are removed from the data stream as is the NUL (value 0) character.

2780 Mode

In 2780 mode the ITB (EBCIDIC value 31) character is converted to CRLF as are all other unrecognized codes.

The frame terminating character ETB (EBCDIC value 23) is also converted to a CRLF to delineate transmission blocks.

3780 Mode

In 3780 mode the RS (EBCDIC value 30) character is converted to CRLF as are ITB (EBCDIC value 31) and EM (EBCDIC value 25) characters. If switch A3 is set, A3(1), then the Space Compression sequence GS (EBCDIC value 29) 'count' is expanded to spaces. If switch A3 is clear, A3(0), then the Space Compression (GS) code (EBCDIC value 29) is translated to ASCII and the following space count character recomputed and output as its ASCII equivalent.

Transparent Mode

If both switches A7 and A6 are clear the D90-IB8 operates in Transparent mode. In the Slave state all data characters enclosed within the BSC envelope are delivered unchanged with nothing added and nothing taken away. In fact there is no indication possible of the End of File being reached other than by knowledge of the structure of the data stream or the possible dropping of DCD (see later).

In the Master state the D90-IB8 will still react to control codes that have meaning to its operation such as CR and SUB and consume them from the data stream coming from Port B. If it is required to include a character value in the data stream which could be confused with an ASCII control code (ie less than 32) then it should be preceeded by the DLE (value 16) character.

As an example, if it was required to include a record separator in Transparent 3780 mode then the EBCDIC coded input to Port B would be DLE, DLE, DLE, RS. This would appear on the BSC link as DLE, RS.

Reverse Interrupt (RVI)

If the link slave has an urgent message to send, the link master may be temporarily forced to give up its control of the link by sending it an RVI message. This is treated as a positive acknowledgement of the last block received and the link master is expected to issue an EOT frame to show its compliance. The sender of the RVI then bids for link mastership, sends its urgent message (usually an error message) and gives up the line by sending an EOT frame. The original link master then bids to re-establish its mastership and continues its transfer from where it left off. The D90-IB8 responds to a received RVI in this way and is also able to generate RVI messages itself. An ETB (ASCII value 23) character input on Port B will initiate the RVI sequence at an appropriate time in the BSC handshake. The urgent data to be sent should follow immediately after the ETB and the last block of urgent data should be terminated with a SUB (ASCII value 26) character.

Program Control

Extensive control of the operation of the D90-IB8 can be exercised thorough the asynchronous Port B. Some control features are conditioned by switch settings.

There are two basic types of devices that might be found connected to Port B; a dumb terminal or a computer. When a computer is connected it is normal that echoing of input data back to the computer is disabled. If a dumb terminal, or equivalent, is connected then echo back is usually desirable. If switch B3 is set, B3(1), then echo is enabled and so are some limited editing functions.

Editing

BS (ASCII value 8) and DEL (ASCII value 127) both delete the last character in the input buffer. This can only be repeated until the beginning of the current line as the previous line may well have been sent already.

CAN (ASCII value 24 or CTRL/X) deletes all characters from the input buffer up to the start of the current line. The D90-IB8 then outputs a CR character and if B2 is set, a LF character as well.

Select 2780 or 3780

The D90-IB8 can be forced to operate in a mode other than that determined by switch A6 by the following two command characters.

SI (ASCII value 15) forces the D90-IB8 into IBM 2780 mode.

SO (ASCII value 14) forces the D90-IB8 into IBM 3780 mode.

As these commands take effect immediately care should be taken to ensure that the unit is idle at the time of issuing the command.

Soft Reset

The D90-IB8 can be forced into doing a soft reset where all buffers are flushed and the interfaces are re-initialized but no configuration values are changed. It takes immediate effect and can cause a transmission to be chopped in mid stream.

DC2 (ASCII value 18) force the D90-IB8 to perform a soft restart.

Interrogate Port A Output Buffer

The D90-IB8 has significant output buffers and it is necessary for the sending device on Port B to be sure that all the data has been sent over the link before doing anything dramatic. The following mechanism allows this check to be made.

SYN (ASCII value 22) enquires as to whether there are still data to be transmitted over the link. A response of the single character ACK (ASCII value 6) signifies that the output buffer of Port A is empty. The character NAK (ASCII value 21) signifies there is still more data to be sent.

Control of DTR on Port A

Provided that software control of DTR has been selected, A2(1), then the state of the DTR signal on Port A may be controlled as follows.

ACK (ASCII value 6) will force the DTR signal (pin 4) on Port A high.

NAK (ASCII value 21) will force the DTR signal (pin 4) on Port A low.

Data Link Abort Command

It is necessary to be able to generate the Data Link Abort sequence DLE, EOT on the link to force physical disconnection. When executing this command the D90-IB8 waits for the completion of the current transmit or receive up to a maximum 3 seconds before sending the DLE, EOT. The DCD signal (pin 1) on Port B will always be dropped for 2 seconds after the frame has been sent. If switch A2 is also set then the DTR signal (pin 4) on Port A will also be dropped for 2 seconds. Any modem on Port A would be forced to drop the line.

EOT (ASCII value 4) forces the D90-IB8 to send a Data Link Abort frame.

Invoke Configuration Menu

ENQ (ASCII value 5 or CTRL/E) brings up the interactive configuration menu described later.

Poll and Select Frame Generation

The IBM2780/3780 protocol provides for Poll and Select information to be included in the frame immediately after the SYN characters. It also allows a Terminal ID string of up to seven graphic characters to be sent prior to an ENQ and a response of up to fifteen characters to appear before an ACK or NAK. The D90-IB8 supports both these features in a similar way. If a string of between 2 and 7 printable characters are terminated with an SOH character (ASCII value 1 or CTRL/A)

A,B,C,D,E,F,SOH

they are immediately transmitted from the Host Port(A) in the following format:

SYN SYN SYN SYN EOT SYN SYN SYN SYN A B C D E F ENQ $FF

If translation is selected they will be translated to EBCDIC prior to transmission.
A Terminal ID will be returned in the following format:

SYN SYN SYN SYN Terminal ID ACK0 $FF

This Terminal ID will be translated if required and sent to the Terminal Port(B). It may or may not have an appended CR (CR/LF) dependant on switch settings.
If a General Poll frame is generated by sending space space SOH to the Terminal Port then the poll generated in an EBCDIC environment will be

SYN SYN SYN SYN EOT SYN SYN SYN SYN $40 $40 ENQ $FF

If the remote device has data to send it will carry on by sending it otherwise it will simply respond with an EOT frame

SYN SYN SYN SYN EOT

If a select frame is generated the data to be sent should follow immediately after the SOH character is input to the Terminal Port(B).

Generate an RVI

When the D90-IB8 is in slave state, it is possible to temporarily gain control of the link by using a Reverse Interupt Command to the remote system.

ETB (ASCII value 23) causes the sending of an RVI.

It should be immediately followed by the urgent data which must be terminated with a SUB (ASCII value 26) character.

Table 1. Legal Control Codes

Symbol	ASCII value	EBCDIC value	2780 mode	3780 mode
BEL	7	47	✔	✔
HT	9	5	✔	✔
VT	11	11	✔	✔
FF	12	12	✔	✔
EM	25	25	✔	
ESC	27	39	✔	✔
FS Newline	28	21	✔	✔
GS	29	29		✔
RS	30	30		✔
US	31	31	✔	✔

Table 2. Summary of Command Codes

Symbol	ASCII value	Action
CR	13	Terminate and send block of text
SUB	26	Terminate and send last block of text
DLE	16	Prefix control codes to be ignored
BS	8	Remove last character in current line
DEL	127	Remove last character in current line
CAN	24	Delete current line and issue new line
SI	15	Switch to IBM 2780 mode
SO	14	Switch to IBM 3780 mode
SYS	22	Interrogate Port A output buffer
DC2	18	Force soft reset
ENQ	5	Enter interactive configuration menu
EOT	4	Force Link Abort to be sent
SOH	1	Terminate a Poll or Select address
ACK	6	Force Port A DTR high
NAK	21	Force Port A DTR low
ETB	23	Send RVI command if in slave state

Changing Configuration

Connect a terminal to Port B of the module and type CTRL/E. The following *Main Menu* should appear on the screen.

```
Lucidata Diplomat C 1990-98
Model D90-IB8 rev 1.12:921

Type Single Char to Select <CR> to Exit


<A> Set Port A Configuration Byte
<B> Set Port B Configuration Byte
<D> Enter Diagnostics Menu
<S> Report Collected Statistics
<R> Restart Module

Select < >
```

Configuration Bytes

These are “silicon switches” used to select various parameters. Refer to *Configuration Options* earlier in this manual for a description of the meaning of each switch.

To modify the Configuration Bytes, select <A> or <B> from the Main Menu. The following display will appear. If any changes are made, the *D90-IB8 module* will perform a “soft restart” when you exit from the *Main Menu.*

If a DNM module is present in the rack, the selections can be permanently saved in the DNM's Battery Backed RAM (BBRAM).

```
Value of Configuration Byte A 11101110
Overlay
```

The bits are numbered 1 to 8 counting from right to left . Hit the space bar until the cursor is underneath the bit you want to change. Then type 1 or 0 as required. The backspace key will move the cursor backwards and the RETURN or ENTER key will return you to the *Main Menu.*

Note: Backspacing beyond the start of the line or forward spacing past the end will also cause a return to the Main Menu.

Diagnostics

The diagnostics package is not available in the current version of the firmware.

Statistics

If <S> is selected at the Main Menu, the following screen is presented.

```
Lucidata Diplomat C 1990-98
Model D90-IB8 rev 1.12:921
Collected Statistics since last Reset

False Starts              :        0
Hardware Errors           :        0
Communication Aborts      :        0
Received Text Blocks      :        0
Blocks in Error           :        0
WACKs sent by us          :        0
Number of RVIs received   :        0
Files Received            :        0
Transmitted Text Blocks   :        0
Repeat requests received  :        0
TTDs sent by us           :        0
Files Transmitted         :        0
Asynchronous RX errors    :        0
Port B drops of RTS       :        0

Type Single Character to Select, <CR> to Exit
```

This is a selection of statistics collected by the D90-IB8 since the last soft or hard reset was performed.

Restart Module

This option causes a hard restart of the module that is equivalent to an initial power up. Any local changes made to the configuration will be lost. If a DNM module is present in the rack, the values held in BBRAM will be re-loaded.

Tips

When automatically reconfiguring the D90-IB8 from a computer program, the following suggestions are offered:

1. Precede the configuration string with DC3 (ASCII value 19) to prevent the display text being output.
2. Specify all 8 bits of a Configuration Byte to avoid having to remember whether to issue a CR or not.
3. Pause for at least 1 second after the final CR to allow time for the soft reset to finish. All data in the buffers will have been flushed.

Example string DC3,ENQ,A11100010B11111000CR (Pause)

Continue with normal operation.

ASCII	EBCDIC
0	0
1	1
2	2
3	3
4	55
5	45
6	46
7	47
8	22
9	5
10	37
11	11
12	12
13	13
14	14
15	15
16	16
17	17
18	18
19	19
20	60
21	61
22	50
23	38
24	24
25	25
26	63
27	39
28	21
29	29
30	30
31	31
32	64
33	90
34	127
35	123
36	91
37	108
38	80
39	125
40	77
41	93
42	92
43	78
44	107
45	96
46	75
47	97
48	240
49	241

ASCII	EBCDIC
50	242
51	243
52	244
53	245
54	246
55	247
56	248
57	249
58	122
59	94
60	76
61	126
62	110
63	111
64	124
65	193
66	194
67	195
68	196
69	197
70	198
71	199
72	200
73	201
74	209
75	210
76	211
77	212
78	213
79	214
80	215
81	216
82	217
83	226
84	227
85	228
86	229
87	230
88	231
89	232
90	233
91	77
92	224
93	93
94	95
95	109
96	121
97	129
98	130
99	131

ASCII	EBCDIC
100	132
101	133
102	134
103	135
104	136
105	137
106	145
107	146
108	147
109	148
110	149
111	150
112	151
113	152
114	153
115	162
116	163
117	164
118	165
119	166
120	167
121	168
122	169
123	192
124	106
125	208
126	161
127	7

EBCDIC	ASCII
0	0
1	1
2	2
3	3
4	0
5	9
6	0
7	127
8	0
9	0
10	0
11	11
12	12
13	13
14	14
15	15
16	16
17	17
18	18
19	19
20	0
21	6
22	8
23	0
24	24
25	25
26	0
27	0
28	0
29	29
30	30
31	31
32	0
33	0
34	28
35	0
36	0
37	10
38	23
39	27
40	0
41	0
42	0
43	0
44	0
45	5
46	6
47	7
48	0
49	0

EBCDIC	ASCII
50	22
51	0
52	0
53	30
54	0
55	4
56	0
57	0
58	0
59	0
60	20
61	21
62	0
63	26
64	32
65	163
66	164
67	165
68	166
69	167
70	168
71	248
72	170
73	171
74	163
75	46
76	60
77	40
78	43
79	124
80	38
81	186
82	187
83	192
84	193
85	189
86	188
87	196
88	197
89	198
90	33
91	36
92	42
93	41
94	59
95	152
96	45
97	47
98	199
99	200

EBCDIC	ASCII
100	201
101	208
102	209
103	210
104	211
105	212
106	153
107	44
108	37
109	95
110	62
111	63
112	213
113	154
114	155
115	156
116	157
117	224
118	226
119	227
120	228
121	96
122	58
123	35
124	64
125	39
126	61
127	34
128	181
129	97
130	98
131	99
132	100
133	101
134	102
135	103
136	104
137	105
138	161
139	230
140	231
141	232
142	233
143	240
144	241
145	106
146	107
147	108
148	109
149	110

EBCDIC	ASCII
150	111
151	112
152	113
153	114
154	242
155	243
156	244
157	245
158	246
159	247
160	160
161	126
162	115
163	116
164	117
165	118
166	119
167	120
168	121
169	122
170	173
171	194
172	172
173	235
174	174
175	175
176	176
177	177
178	178
179	179
180	180
181	94
182	182
183	183
184	184
185	185
186	249
187	195
188	169
189	93
190	190
191	191
192	123
193	65
194	66
195	67
196	68
197	69
198	70
199	71

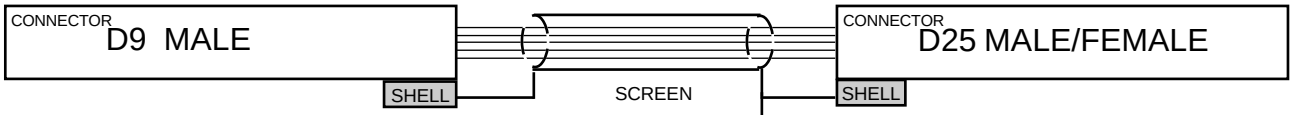
EBCDIC	ASCII
200	72
201	73
202	202
203	203
204	204
205	205
206	206
207	207
208	125
209	74
210	75
211	76
212	77
213	78
214	79
215	80
216	81
217	82
218	158
219	159
220	220
221	221
222	222
223	223
224	92
225	225
226	83
227	84
228	85
229	86
230	87
231	88
232	89
233	90
234	234
235	235
236	236
237	237
238	238
239	239
240	48
241	49
242	50
243	51
244	52
245	53
246	54
247	55
248	56
249	57

EBCDIC	ASCII
250	250
251	251
252	252
253	253
254	254
255	255

DESCRIPTION
DIRECT CONNECTION ASYNCHRONOUS

FROM
D90-SSA Port B

TO
DUMB TERMINAL



DCD	Data Carrier Detect	1	1	Protective Ground	PROT
RXD	Received Data	2	2	Transmitted Data	TXD
TXD	Transmitted Data	3	3	Received Data	RXD
DTR	Data Terminal Ready	4	4	Request To Send	RTS
SG	Signal Ground	5	5	C lear To Send	CTS
DSR	Data Set Ready	6	6	Data Set Ready	DSR
RTS	Request To Send	7	7	Signal Ground	SG
CTS	Clear To Send	8	8	Data Carrier Detect	DCD
RI	Ring Indicator	9	9		
			10		
			11		
			12		
			13		
			14		
			15		
			16		
			17		
			18		
			19		
			20	Data Terminal Ready	DTR
			21		
			22		
			23		
			24		
			25		

DESCRIPTION
DIRECT CONNECTION SYNCHRONOUS

FROM
D90-SSA Port A

TO
MODEM

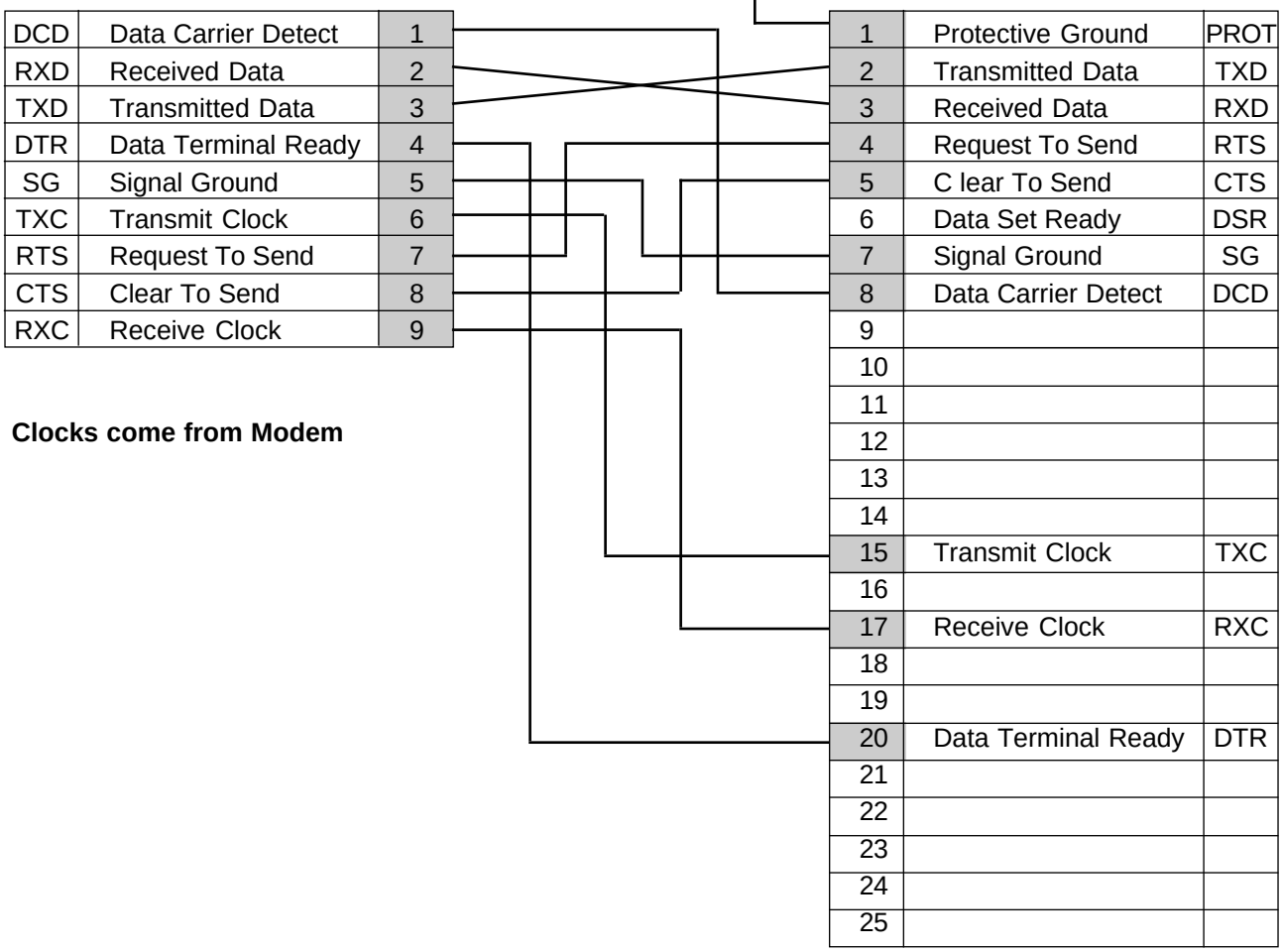
CONNECTOR
D9 FEMALE

SHELL

SCREEN

CONNECTOR
D25 MALE

SHELL



DCD	Data Carrier Detect	1	1	Protective Ground	PROT
RXD	Received Data	2	2	Transmitted Data	TXD
TXD	Transmitted Data	3	3	Received Data	RXD
DTR	Data Terminal Ready	4	4	Request To Send	RTS
SG	Signal Ground	5	5	C lear To Send	CTS
TXC	Transmit Clock	6	6	Data Set Ready	DSR
RTS	Request To Send	7	7	Signal Ground	SG
CTS	Clear To Send	8	8	Data Carrier Detect	DCD
RXC	Receive Clock	9	9		
			10		
			11		
			12		
			13		
			14		
			15	Transmit Clock	TXC
			16		
			17	Receive Clock	RXC
			18		
			19		
			20	Data Terminal Ready	DTR
			21		
			22		
			23		
			24		
			25		

Clocks come from Modem

DESCRIPTION
CROSS-OVER SYNCHRONOUS

FROM
D90-SSA Port A

TO
HOST or FEP

CONNECTOR
D9 FEMALE

SHELL

SCREEN

CONNECTOR
D25 FEMALE

SHELL

DCD	Data Carrier Detect	1	1	Protective Ground	PROT
RXD	Received Data	2	2	Transmitted Data	TXD
TXD	Transmitted Data	3	3	Received Data	RXD
DTR	Data Terminal Ready	4	4	Request To Send	RTS
SG	Signal Ground	5	5	C lear To Send	CTS
TXC	Transmit Clock	6	6	Data Set Ready	DSR
RTS	Request To Send	7	7	Signal Ground	SG
CTS	Clear To Send	8	8	Data Carrier Detect	DCD
RXC	Receive Clock	9	9		
			10		
			11		
			12		
			13		
			14		
			15	Transmit Clock	TXC
			16		
			17	Receive Clock	RXC
			18		
			19		
			20		
			21		
			22		
			23		
			24		
			25		

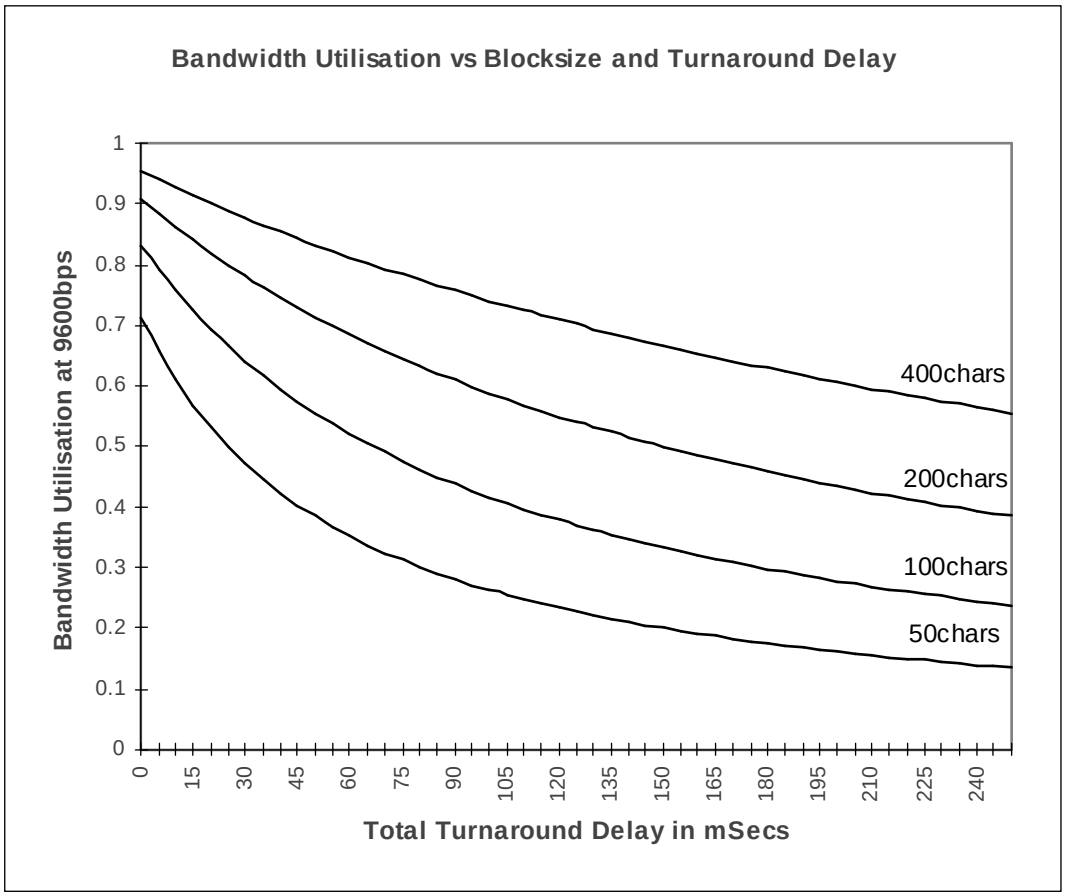
D90-SSA jumpered to provide clocking on pins 6 and 9

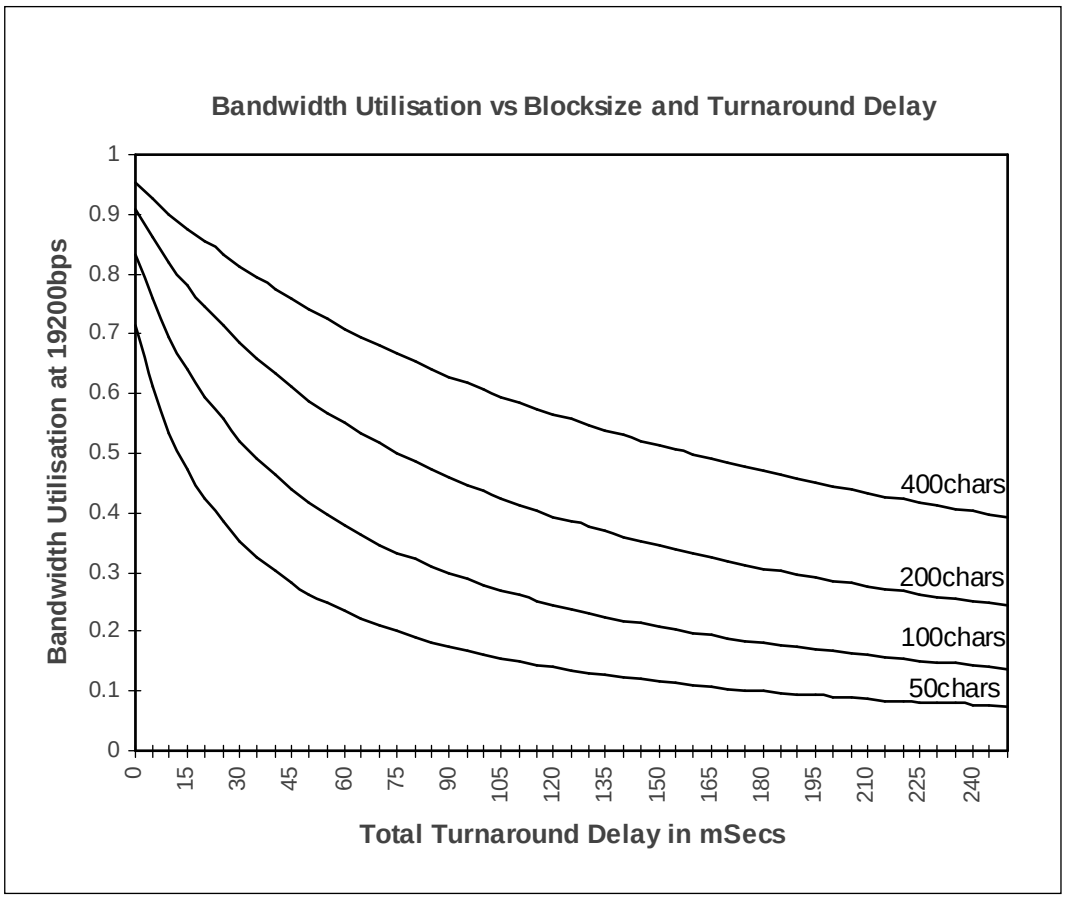
Performance Considerations

The actual data throughput achieved on a 2780/3780 BSC link depends not only on the communication line speed but very sensitively on two other factors: data block size and turnaround delay time.

Block size is important because of the overhead of the protocol, i.e. SYN characters, ACK frames and other control characters. Turnaround delay time is literally wasted time and has a more dramatic effect when trying to use higher speed lines.

The following two graphs show the maximum utilisation of the available bandwidth of a communications line as a function of the average block size and the total turnaround delay present at both ends of the link. The IB8 provides the facility to turn off an enforced 40mS turnaround delay when the link is being operated in constant carrier mode. See page 6.


Bandwidth Utilisation vs Blocksize and Turnaround Delay
Bandwidth Utilisation at 9600bps
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
400chars
200chars
100chars
50chars
0
15
30
45
60
75
90
105
120
135
150
165
180
195
210
225
240
Total Turnaround Delay in mSecs


Bandwidth Utilisation vs Blocksize and Turnaround Delay
Bandwidth Utilisation at 19200bps
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
400chars
200chars
100chars
50chars
0
15
30
45
60
75
90
105
120
135
150
165
180
195
210
225
240
Total Turnaround Delay in mSecs