

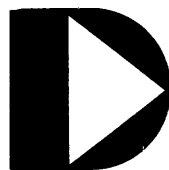
IBM 3780 EMULATOR EM3780 Users Guide

Version 3

June, 1975

Model Code No. 50058

DATAPoint CORPORATION



**The Leader in
Dispersed Data Processing**

IBM 3780 EMULATOR
EM3780

User's Guide

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PREFACE

This user guide is intended for use with all versions of the EM3780 emulator. The versions included are EM3780B, EM3780C and EM3780T.

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CHAPTER 1. INTRODUCTION

1.1 Description of the IBM 3780

The IBM 3780 Data Communication Terminal is not a computer but rather a remote input/output device which can be connected to a central CPU via telephone lines, thus giving remote sites access to the computing power of the large mainframe. The 3780 communicates at 1200, 2000, 2400, or 4800 baud over a voice-band network or a private line using half-duplex synchronous transmission. It can be used for remote job entry to a computer or for communication with another IBM 3780 or certain compatible terminals.

The IBM 3780 uses the Binary Synchronous Communications (BSC) line discipline with either the EBCDIC or USASCII transmission code. This transmission method is a general purpose line control discipline for executing half-duplex, digital, serial, synchronous (by bit by character) communication between two or more stations on a point to point or multipoint communication lines. The line control characters control the contention for the line, transmission of data, and termination of transmission.

A 16 bit cyclic redundancy check character is accumulated serially by bit on all data transmitted and received. For correct transmission of a record, the redundancy accumulation must match at both ends of the communications line or retransmission is automatically initiated. Message formats are rigidly screened through the synchronous line discipline so that communication is orderly and accurate. All messages that are transmitted and received are counted odd-even-odd-even etc. by the transmitting and receiving side. The counts must match at the end of each message or retransmission is automatically initiated.

The 3780 corrects some of the inefficiency problems associated with the 2780. The extra cost special features used to increase efficiency in the 2780 were eliminated.

The end of media option is replaced with an intermediate record separator which is placed in the last non-blank position of each logical record. This eliminates the trailing blanks in the buffer and decreases the time spent transmitting. The horizontal tab function was retained so that programs written for the 2780

could be used on the 3780 but a better scheme for eliminating consecutive blanks was also provided. Under switch control, the 3780 removes consecutive blanks from input data and reinserts them into the output data at the receiving station.

Finally, the 3780 will fill the entire buffer until there is less than 82 positions left and then the buffer will be transmitted. Because of the use of the intermediate record separator, a greater number of logical records can be packed into each buffer before it is transmitted which decreased the line turn around time and increases the throughput time. However, buffers can still be transmitted when they are half empty. This occurs because all blanks are counted as occupying positions in the buffer even though they have been compressed.

The IBM 3780 can communicate with any device compatible with the IBM Binary Synchronous Communications line discipline. Such devices include the IBM 360, 370, SYSTEM/3, and 1130 computers (when interfaced with the appropriate adaptors and features, the IBM 2770 Data Communications System, and the UNIVAC 1108 computer.

The following IBM publications describe in detail the line discipline and the functional characteristics peculiar to the IBM 3780 terminal:

- GA27-3004 General Information/Binary Synchronous Communications
- GA27-3063 Component Information: IBM 3780 Data Communication Terminal

1.2 Description of the Datapoint 3780 Emulator

There are two versions of the Datapoint 3780 emulator. The only difference between the versions is the amount of memory required and the I/O devices supported. Both versions will operate with a minimum I/O configuration consisting of a synchronous communications adaptor and a compatible RS232 synchronous modem.

EM3780B (12K) supports cassettes, crt screen, keyboard, local or servo printer, 9 track mag tape and card reader.

EM3780C (16K) supports cassettes, crt screen, keyboard, local or servo printer, 9 track mag tape, card reader and disk.

EM3780T (12K) 3780 Diagnostic trace.

The 3780 is a program written to be run on a Datapoint processor. Interrupts are enabled and all I/O is done in the foreground with the exception of the disk. The 3780 emulator is meant to be plug-to-plug compatible with an existing IBM 3780 terminal. The emulator is self-contained outside of the modem, so that the point of replacement is the connection between the modem and the terminal.

The goal of the emulator is to be completely compatible with both the IBM Binary Synchronous Communications line discipline and the end-to-end control characters used by the IBM 3780 so that the emulator can communicate with any system with which a standard IBM 3780 will communicate, and the system will be unaware that any substitution has been made.

Access methods which support the IBM 3780 under the IBM BSC line discipline include BTAM (Basic Telecommunications Access Method), QTAM (Queued Telecommunications Access Method), TCAM (Telecommunications Access Method), and POWER RJE (Priority Output Writers, Execution Processors and Input Readers Remote Job Entry under any of several operating systems. Operating system extensions which support the IBM 3780 under the IBM BSC line discipline include ASP (Attached Support Processor) and HASP (Houston Automatic Spooling Priority). The 3780 emulator can communicate with any of these access methods or operating system extensions.

1.3 Special Features / Restrictions of the Emulator

The following is a list of the special features incorporated into the emulator. Some are extra cost features on the IBM 3780.

- Horizontal tab
- Primary or secondary terminal
- Normal and transparent transmission
- Extended ENQ retry
- Space Compression
- Terminal ID
- Diagnostic trace
- Multiple cassette transmission
- Multiple cassette reception
- Keyboard facility for SIGNON, SIGNOFF and RJE commands
- Crt screen display for replies
- Multipoint network or point to point
- Two and 4 wire operation
- Software VFU

The following are not implemented in this version:

USASCII transmission code
Any World Trade Features

CHAPTER 2. INSTALLATION

2.1 Equipment

The emulator requires a Datapoint processor, a synchronous communications adaptor, a universal I/O cable, and a RS232 compatible modem.

The Synchronous Communications Adaptor is connected to the modem by the EIA (Electronic Industries Association) Communications Adaptor to Modem Cable (2200-434). The modem must be RS232 compatible at the interface to the Synchronous Communications Adaptor. In particular, it must provide bit clocking.

The printer is optional, but it must be either the local printer or the servo printer. If one of these printers is used, it is connected to the 1100 or 2200, via the Synchronous Communications Adaptor by a Universal I/O Cable (2200-160).

2.2 Set-Up

The 1100 and 2200 and the printer have power cords. Some printers have a power socket carrying line current. If available, it is recommended that this be used to reduce the number of power connections in the wall to one, in order to minimize ground loop problems.

The Synchronous Communications Adaptor (SCA) is connected to the 1100 or 2200 by a Universal I/O Cable. This cable is plugged into the only data socket on the back of the 1100 or 2200, and into socket J1 on the SCA. Even if other components are to be connected to the 1100 or 2200, it is recommended that the SCA be the 'first' component on the 'daisy chain', in order to minimize potential problems with voltage drop. Figure 1 is a schematic of an installation with a Datapoint 1100 or 2200, a printer, card reader, magnetic tape drive, and a disk drive. Although the schematic pictures every I/O device that the 3780 emulator supports, the only required device is the synchronous communications adaptor.

The EIA RS232 compatible modem is connected to the

Synchronous Communications Adaptor by the EIA (Electronic Industries Association) Communications Adaptor to Modem Cable. The modem must present an EIA RS232 interface to this cable. The cable is plugged into socket J3 of the Synchronous Communications Adaptor, and into the appropriate socket of the modem. In addition, if the modem being used is not an AT&T modem, it will have to be interfaced to the telephone line by a DAA (Data Access Arrangement), and a cable between the modem and the DAA will be necessary.

The printer is connected to the Synchronous Communications Adaptor (SCA) by a Universal I/O Cable. This cable is plugged into socket J2 of the SCA and into socket J1 of the next device. Each additional I/O device can then be daisy chained in a similar fashion.

Installation cannot be considered complete until diagnostics have been performed on all the hardware components. The 2200 and the Synchronous Communications Adaptor (SCA) are normally delivered with diagnostic programs, and it should be verified that they have both been subjected to diagnostic testing and have both passed it. The following is a list of the diagnostic programs available and the devices which they test: 2200 - TSTALL; SCA - TSTSCA; local printer - TSTLP; servo printer - TSTSP; mag tape - EXRIBM; card reader - TSTCRD; disk - TSTDBM. Tapes and listings are available for each of these diagnostics.

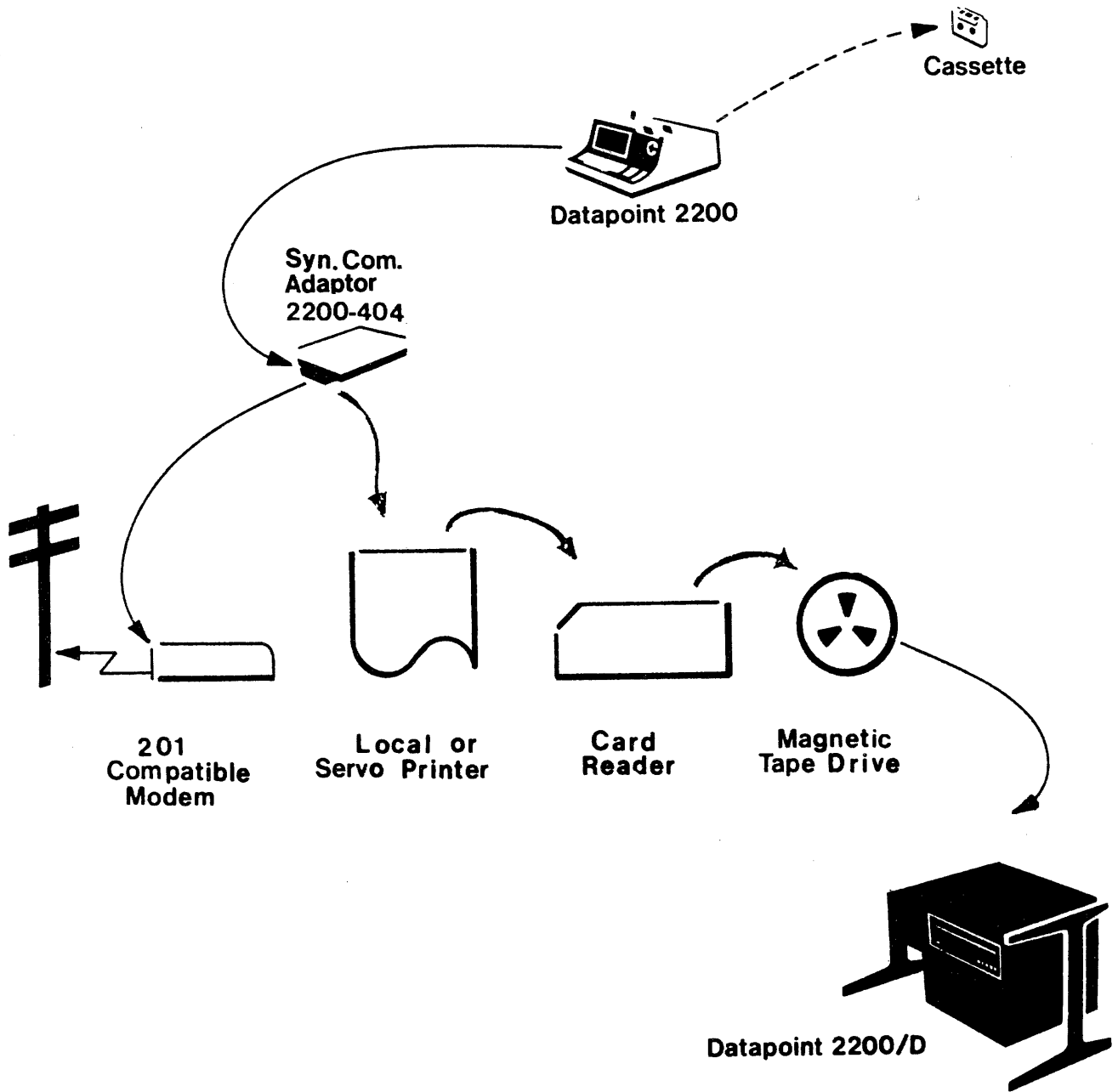


FIGURE 1.

A = TRANSMIT NORMAL	READER:	PRINTER:	PUNCH: 3780
B = TRANSMIT TRANSPARENT	*F=REAR DECK	K=FRONT DECK	*P=FRONT DECK
C = RECEIVE	G=KEYBOARD	*L=PRINTER	Q=MAG TAPE
D = READER TO PRINTER	H=MAG TAPE	M=CRT SCREEN	R=DISK
E = EOF IS ENABLED	I=CARD RDR	N=MAG TAPE	
	J=DISK	O=DISK	

CURRENT MODE:
ERROR MESSAGES:
ENTER COMMAND:

FIGURE 2. THE SCREEN DISPLAY FOR EM3780C

CHAPTER 3. OPERATION

3.1 The Screen Display

Figure 2 shows the display as it should appear on the screen. In the top right most corner, the version number is displayed. The display has four columns: column 1 lists the available functions; column 2 lists the devices that can be assigned to the reader; column 3 lists the devices that can be assigned to the printer; and column 4 lists the devices that can be assigned to the punch.

The letters A through R are used as commands to the emulator and they invoke the function to their immediate right. The commands can be broken up into two groups; 1) commands 'A' through 'E' which perform a specified function 2) commands 'F' through 'R' which configure various input/output devices. An asterisk to the left of the letter indicates that the device has been selected. To execute a command, the operator presses the letter that is associated with the command followed by the ENTER key.

The emulator is always executing in one of four modes;

- 1) TRANSMIT mode
- 2) RECEIVE mode
- 3) OFF-LINE mode
- 4) COMMAND mode

After the emulator is first loaded, it automatically goes into the command mode. The emulator will display which mode it is in on line 7.

Any of the operational modes can be terminated by pressing the KEYBOARD key and the letter 'I' until the machine clicks. This will cause the emulator to interrupt the current operation and go back into the command mode. When the program is in the transmit mode and the operator causes an interrupt, the program generates a false end of file on the reader which will cause the transmit routine to send an EOT and go back into the command mode. When the program is in the receive mode and the operator causes an interrupt, the program will send an EOT after the buffers are emptied. Then on line 9, the cursor will be turned on, and the

operator can type in a command. While the emulator is in the command mode, it continually monitors the communications line looking for a ENQ. If an ENQ is received while in the command mode, the emulator will click and send a NAK to indicate that it is not ready to receive. When the operator hears the click, he should type in a receive command and receive whatever data the other end has to send.

Any error messages which occur when the emulator is running will be displayed on line 8.

3.2 Commands

3.2.1 Operation Commands

The commands in the left most column of the screen display cause a specific operation to be performed as described below:

A = TRANSMIT NORMAL

This command causes the device assigned to the reader to be read and transmitted. All data will be transmitted as normal text. Immediately after this command is executed, the emulator will display "TRANSMIT" on line 7 to indicate the current mode. After permission to transmit has been received from the other end, the emulator will display "TRANSMITTING" as the current mode. After transmission is completed, the emulator automatically goes into into the receive mode and displays the message "RECEIVE" on the crt. Once the emulator goes into the receive mode it will stay in the receive mode except for the following exceptions: 1) the operator presses the KEYBOARD which causes an interrupt. 2) The emulator receives a disconnect command (DLE-EOT). In either of these cases, the emulator will return to command mode.

B = TRANSMIT TRANSPARENT

This command works exactly as the above command except that all data is transmitted in the transparent mode. The only devices which can transmit EBCDIC transparent data are the card reader and the 9 track magnetic tape. When the card reader or 9 track magnetic tape are assigned to the reader, the emulator transmits the data as it is read unless a "DLE" is found in which case two DLE's are transmitted as specified in the BI-SYNC line discipline.

All other devices pass ASCII data to the emulator, which is translated to EBCDIC and then transmitted. This translation precludes the transmission of a full transparent code set.

C = RECEIVE

This command causes the emulator to go into the receive mode and wait for a line bid from the transmitter. Immediately after this command is executed, the emulator will display "RECEIVE" on line 7 to indicate the current mode. After the emulator has received a request to transmit and given permission to transmit, the message "RECEIVING" will be displayed as the current mode.

If no telephone connection has been made, then the 3780 emulator will go into the automatic answer mode and wait for the telephone to ring or for the operator to make the connection. The transmitter determines whether the printer or the punch will be selected for the received data. This is accomplished through the use of device selection characters for the printer and punch. When this command is issued, the emulator assumes that the printer will be the first device selected and if no device selection characters are received, then all received data will go to the printer. Received data will go to the punch only if the punch selection characters (ESC 4) are received. When in the receive mode, the emulator will accept either text data or transparent data. All received data is translated to ASCII unless the printer or punch is assigned to the 9 track magnetic tape in which case the received data is written as it was received without translation.

When the program receives escape sequences for the printer, they are converted into one of the extended ANS carriage control characters. As the program builds a print line, the first character of each print line is reserved for a carriage control character. For media other than a printer or crt, the first character is treated as data. When the print line is sent to the printer, the first character in the print line is used to perform a carriage control function. The following is a list of the carriage control characters used.

Extended ANS carriage control characters used:

blank	Space one line before printing
0	Space two lines before printing
-	Space three lines before printing
+	Suppress space before printing

1	Skip to top of form
2	Skip to channel 2
3	Skip to channel 3
4	Skip to channel 4
5	Skip to channel 5
6	Skip to channel 6
7	Skip to channel 7
8	Skip to channel 8
9	Skip to channel 9
A	Skip to channel 10
B	Skip to channel 11
C	Skip to channel 12 (used for page overflow)

D = READER TO PRINTER

Puts the emulator into an off-line mode and copies the reader to the printer. IF the user enters the upper case letter 'D', the program will copy the reader to the printer while suppressing carriage control. If the lower case letter 'd' is entered, the program will copy the reader to the printer and retain carriage control information. When the lower case letter 'd' is used, the program assumes that the first byte of every record contains one of the extended ANS carriage control characters. If the user receives any data on cassettes, disk, or magnetic tape, these media should be printed offline using the lower case letter 'd' command. If the lower case 'd' is used, the first character of every print line is used for carriage control information. If the upper case 'D' is used, the first character of every print line is regarded as data and will be printed as such. After this command is given, the emulator will display "OFFLINE" as the current mode of operation. Any device assigned to the reader can be copied to the device assigned to the printer.

E = EOF IS ENABLED

This is a special command which is useful for dealing with multiple input files, which could be from different devices. It can be used to concatenate files from the same device or different devices.

Normally, when the emulator is reading input from the device assigned to the reader, an end of file condition terminates the operation. As long as the crt screen display reads "EOF IS ENABLED", the emulator will terminate an operation when it detects end of file. However, at times the operator may want to transmit

data from another device when an end of file condition is detected rather than terminate the operation. This is the purpose of the "E" command. When the operator presses the letter "E", the screen display will be changed to read "E = EOF IS DISABLED". The screen display always reflects the current status of the end of file switch which can be disabled or enabled.

An example will help show how this functions. Suppose an operator had to transmit a cassette followed by one control card followed by another cassette. The first thing the operator would have to do is disable end of file by pressing the letter "E". The end of file would be disabled when the screen reads "E = EOF IS DISABLED". After a cassette is mounted, the transmit command could be given. After the emulator has transmitted the cassette, the message "SUBMIT INPUT" will be displayed. The operator can now assign the reader to the keyboard, give the transmit command again, and type the message in on the keyboard. After the emulator has transmitted the message from the keyboard, the message "SUBMIT INPUT" will be displayed again. This message is always displayed when the end of file is detected and the end of file switch has been disabled. Because the operator only has one more cassette to submit, the letter "E" must be pressed to enable end of file. This tells the emulator to terminate the operation when it detects end of file. Now the operator can give the transmit command again and after the emulator has transmitted the second cassette, the operation will be terminated and the emulator will go into the receive mode.

The same method will work for off-line operations. If an operator had to copy two files from disk to the printer, the end of file could be disabled, the disk could be assigned to the reader, and the off-line command could be given. After the emulator displayed "SUBMIT INPUT", the operator could enable the end of file, and give another off-line command. The off-line operation would be terminated after the listing was complete.

3.2.2 Configuration Commands

The 3780 emulator supports various input/output devices which correspond in function to the three physical input/output devices (card reader, printer, and punch) supported by the IBM 3780. Although the 3780 emulator can use a variety of physical input/output devices, the system in communication with the emulator will be unaware of any substitution. However, when another device is substituted for the reader, the logical record length cannot exceed the logical record length which a IBM 3780 can read, in this case 80 characters for a card image. The same

holds true for the printer, any record received to the printer cannot exceed the maximum record size which an IBM 3780 can handle. For the printer, this length is 140 characters.

To assign I/O devices to the reader, printer, or punch, the operator uses the commands listed in columns 2, 3, and 4 of the screen display. Column 2 lists the devices that can be assigned to the reader; Column 3 lists the devices that can be assigned to the printer; Column 4 lists the devices that can be assigned to the punch. When a configuration command is executed, the physical I/O device that is associated with that command is assigned to either the reader, printer, or punch depending on which column the command is located. The words READER: PRINTER: and PUNCH: are located at the top of column's 2, 3, and 4 respectively.

The letters F through R are used as configuration commands to the emulator and they assign the device to their immediate right as the READER, PRINTER, or PUNCH depending on which column the command is located. An asterisk to the left of the letter indicates that the device has been selected. A list of the configuration commands and an explanation of the commands follow.

READER:

Transmission always proceeds from the device which is assigned to the reader. Below is the list of commands which can be used to assign I/O devices to the reader.

F = REAR DECK

This command will cause the rear cassette deck to be assigned to the reader. The emulator is set up to handle GEDIT and DATABUS6 records but it can handle any standard NUMERIC records. When the reader is assigned to the rear deck, the cassette will be automatically rewound when an operation command is given. If the emulator cannot find a file marker zero, or a record exceeds the maximum allowable record size, the message "FORMAT ERR" is displayed. If a parity error occurs while reading the cassette the message "PARITY ERR" is displayed. In either case, the emulator will generate a end of file condition and proceed to terminate reading the cassette.

G = KEYBOARD

This command assigns the keyboard to the reader. After a transmit command or the off-line command has been given, the message "ENTER MESSAGE" will be displayed and a column counter will be displayed on the bottom line of the screen. The cursor will flash on line 10 and the operator can enter characters by typing on the keyboard. When the ENTER key is pressed, the characters entered from the keyboard will be transmitted (or copied if off-line). If the cancel key is pressed, the line will be erased and the operator will be allowed to re-enter that line. If the backspace key is pressed, the cursor will be backed up one position and the operator will be allowed to re-enter that character.

Using the keyboard as the reader is most useful in submitting signon, signoff, and other RJE commands to the system the 3780 emulator is communicating with.

H = MAG TAPE

This command causes the 9 track magnetic tape to be assigned to the reader. When the mag tape is used as the reader, the operator is responsible for rewinding the mag tape. This can be done by pressing the REWIND button on the mag tape drive. The emulator will read unlabeled tapes which are blocked one logical record per physical record. Logical records cannot exceed the maximum length which an IBM 3780 can handle (80 characters).

I = CARD RDR

This command causes the reader to be assigned to the card reader. Once an off-line or transmit command has been given, the emulator will turn on the card reader motor and begin reading cards.

The emulator does NOT assume end of file when the hopper becomes empty. A special card is required to indicate the end of file condition to the emulator. This end of file card consists of a card with rows 1 through 9 punched in column 1. This card will not be transmitted and is used only for indicating end of file to the emulator. It is suggested that

one or more blank cards be placed behind the EOF card to aid in card picking.

When reading cards from the card reader, the following messages may or may not be displayed. "CLEAR READER ERROR" is displayed when the emulator detects that the card reader is not ready to read cards. When this message is displayed, the operator must press the RESET button on the card reader and the emulator will continue reading cards. "REREAD LAST CARD" is displayed when an error has been detected. If this message is displayed, the operator should take the last card in the output stacker and insert it as the first card in the input stacker. After the operator has pressed the RESET button, the emulator will continue reading cards.

J = DISK

This command is implemented in EM3780C and causes the disk to be assigned to the reader.

When the transmit or off-line command is entered, the message "ENTER FILE NAME:" is displayed on line 9 of the screen display. The operator should then enter the file specification, of the form: filename[/extension][:DRn] (elements in brackets are optional), on the same line. The file is assumed to have an extension of "TXT" unless specified otherwise. All online drives will be searched for the file unless a specific drive number is given. Absolute files cannot be read. If the file exists, the complete file specification is displayed on line 7 of the screen display below column two, labeled READER.

Files may span multiple volumes only if the extension is 'TXT' or 'TXn' where 'n' is a number between 1 and 9. When the disk reader is reading a file and detects end of file (six zeros followed by a three), the extension will be examined for the 'TXT' format. If found, the extension is changed to 'TX1' and a search of all online drives will be made for the file. If the file is located, it will be read. When end of file is encountered again, the extension will be checked for the 'TXn' format. If the 'TXn' format is found, 'n' will be incremented unless it is '9', in which case end of file will be assumed. The disk reader will then use the same file name with the extension of 'TXn+1' and search all online drives for the file. If a file is not found with the extension of 'TXn+1', end of file will be assumed. If it is found, the file specification on

the screen display will be updated to indicate the extension and drive number of the current file being read. The file will be opened and the program will continue reading from the file.

When true end of file is encountered, the file specification below column two will be removed after the file is closed.

PRINTER:

K = FRONT DECK

This command causes the front cassette deck to be assigned to the printer. When the system communicating with the 3780 emulator selects the printer and transmits data, it will be written to the front cassette using the GEDIT format unless the option byte is set for Write Edit. When the emulator receives some data which is to be written to cassette, it will display the message "MOUNT SCRATCH TAPE". The operator must remove any cassette in the front deck and mount a scratch tape before the emulator will continue.

Before actually writing the data to the cassette, the emulator will write a standard CTOS file marker containing a file number of zero. Before writing the text to tape, all blanks are compressed and any horizontal tabs are converted to compressed blanks. The first character of each record will contain a carriage control character as described under the 'RECEIVE' command. After receiving the data to the cassette, the operator can disconnect the telephone and print the data off-line, saving telephone line charges.

When the cassette is 75 percent filled, the message "MOUNT SCRATCH TAPE" will be displayed on line 7 of the screen display. The operator then has to remove the tape from the front deck and mount a fresh scratch tape. After mounting the tape, no operator intervention is required and the emulator will automatically continue to receive data and write the received data to tape.

L = PRINTER

This command causes the local printer to be assigned to the printer. When the system communicating with the 3780 emulator selects the printer and transmits data, it will be printed on the local printer using the IBM 3780 standard carriage controls as specified in COMPONENT DESCRIPTION: IBM 3780 DATA COMMUNICATION TERMINAL.

If the emulator does not detect a status of "WRITE READY" from the printer within 10 seconds, the message "PRINTER NOT READY" is displayed. An EOT will then be sent as a block check response to the message received for the printer.

M = CRT SCREEN

This command causes the crt screen to be assigned as the printer. When the system communicating with the 3780 emulator selects the printer and transmits data, it will be displayed on the crt screen on lines 10, 11, and 12. If the line to be displayed is longer than 80 characters, it will be truncated. If more than 3 lines of data are received, the emulator will write over lines 10, 11 and 12 until all received data is displayed.

During the time that the emulator is displaying the received data on the screen, the display may be temporarily halted by holding down the DISPLAY KEY. When the DISPLAY KEY is released, the emulator will continue to display the received data at the point at which it left off.

N = MAG TAPE

This command causes the 9 track magnetic tape to be assigned to the printer. When the system communicating with the 3780 emulator selects the printer and transmits data, it will be written to the mag tape. When the mag tape is assigned to the printer, the operator is responsible for rewinding the mag tape. This can be done by pressing the REWIND button on the mag tape drive.

When the mag tape is used as a printer, the emulator will create unlabeled tapes which are blocked one logical record per

physical record. When receiving data to a mag tape, no translation is done and the EBCDIC character which are received from the line are written to the mag tape. This allows EBCDIC transparent data to be received to the mag tape. The first character of each record will contain a carriage control character as described under the 'RECEIVE' command. If a parity error persists after 5 retries, or end of tape is detected, the emulator will display "PARITY ERROR" and terminate reception of data.

Q = DISK

When either the 'receive' or 'off-line' command is given, a disk file will be opened and the data written to it using either the standard DOS EDIT or WRITE EDIT format as defined in Part IV of the DOS User's Guide. The first character of each record will contain a carriage control character as described under the 'RECEIVE' command. The name of the file written to disk is always 'PRINTnnn/TXT' where 'nnn' is a number between 001 and 999. The emulator will attempt to begin with PRINT001/TXT by searching all on-line drives for an existing file by that name. If the file name is in use, it will increment nnn by 1 and repeat the process. When it finds a file name not in use, it will open the file on the lowest numbered drive which has space available. The file specification to be used will be displayed on line 8, below column three, labeled PRINTER.

If the disk being written upon, or the file's RIB (Retrieval Information Block) should become full, an attempt to continue will be made by creating a multiple volume file. If the condition should occur, a message will be displayed on line 7 informing the operator that a multi-volume file is being created. The record which was currently being written to disk will be saved in memory. The file will then be backspaced and that record will also be save in memory. The disk writer will then close the file 'PRINTnnn/TXT'. Using the same file name, PRINTnnn, a new extension of 'TX1' will be used. The new file will be opened on the first availble drive and the two records that had been saved in memory will be written to it. The emulator will then continue to write additional records to the file until either all data will be written or the file becomes full again. If the file should become full again, the extension will be examined for the multiple volume file format of 'TXn', n being a number between 1 and 9. If n is 9, or there is no more space available on the on-line disk drives, a

error message indicating that all space is used will be displayed and the "printer not ready" flag will be set. Otherwise n will be incremented and the file name 'PRINTnnn/TXn+1' will be used and the entire process repeated. The entire file, filename/TXT, TX1, TX2, ..., TX9, can be printed or transmitted by using only one reader configuration command and one operation command.

PUNCH:

P = FRONT DECK Q = MAG TAPE R = DISK

The above commands work exactly like the corresponding emulator commands which assign the front deck, mag tape, and disk to the printer. The one exception is that when the disk is assigned to the punch, the 3780 emulator creates files with the name "PUNCHnnn" which works similar to the "PRINTnnn" files. Any restrictions which apply to the corresponding printer commands also apply to the punch commands.

ADDITIONAL COMMANDS

\$ = RETURN TO DOS

This command is implemented in EM3780C and causes the emulator to re-load the DOS and transfer control to it.

3.3 Messages

3.3.1 Status Messages

The current operating mode of the emulator is displayed on line 7. The following is a list of the messages which may be displayed on line 7. Explanations appear to the right.

TRANSMIT	The emulator is in the transmit mode and is trying to get permission to transmit.
RECEIVE	The emulator is in the receive mode and is waiting to give permission to transmit.
TRANSMITTING	The emulator is transmitting.
RECEIVING	The emulator is receiving.
OFF-LINE	The emulator is in an off-line mode and is copying the READER to the PRINTER.
COMMAND	The emulator is in the command mode and waiting for the operator to type in another command.
SUBMIT INPUT	An end of file condition has been detected on the device assigned to the reader but the end of file has been disabled. The operator must submit more input.

3.3.2 Error Messages

The emulator reports errors by displaying the following messages on line 8. Explanations appear to the right.

NAK LIMIT EXCEEDED	Retransmission failed after the set number (NAKLIM) of attempts.
ENQ LIMIT EXCEEDED	Failed to get valid block check after the set number (ENQLIM) of tries.
RVI RECEIVED	Reverse interrupt received, transmission discontinued. After the program has received the data, transmission will continue from where it left off.

FORMAT ERR	File zero could not be found when reading cassette or a logical record exceeded the maximum allowable length.
PARITY ERR	Parity error on device assigned to reader after 5 retries. May also occur when writing to 9 track magnetic tape or disk.
PRINTER NOT READY	The emulator has not received a status of "WRITE READY" for over ten seconds. The emulator will send an EOT as a block check response.
MOUNT SCRATCH TAPE	<p>This message is displayed whenever the emulator has some data to write to the front cassette. The operator should remove the cassette from the front deck (if there is a cassette mounted), mount a scratch tape, and the emulator will continue once the scratch tape has been mounted.</p> <p>This message is also displayed if data is being written to the mag tape as either print or punch data and the first reel has been filed. The operator should rewind and remove the tape volume presently in use and mount a scratch tape in its place. The emulator will wait for the new tape to be mounted and be positioned to the load point.</p>
CLEAR READER ERROR	The emulator is waiting for the operator to press the RESET button on the card reader to clear a card reader error.
REREAD LAST CARD	The last card read from the card reader was in error. The operator should remove the last card in the output stacker and insert it as the first card in the input stacker, push the RESET button on the card reader and the emulator will continue.

TAPE DECK NOT IN SERVICE	The magnetic tape deck is not in an on-line condition.
CANNOT FIND filename	The disk reader attempted to open the specified file, but could not find it on the online drives.
BAD FORMAT filename	The disk reader encountered an error in the format of the file specification given.
NO ABS FILES	Only text files can be read by the disk reader.
CREATING MULTI-VOLUME filename	A multiple volume disk file is being created for the indicated PRINTnnn or PUNCHnnn file.
DISK SPACE FULL	All space has been used on all on-line disk drives.
ABORTED	The program is transmitting and receives an EOT as a block check response. When this message is displayed and EOF is DISABLED, it is the operator's responsibility to reset EOF and clear any error indications before attempting to resume any operation, or unpredictable results may occur.

CHAPTER 4. CONFIGURABLE OPTIONS

4.1 Introduction

Certain constants may be changed in the emulator. Since the program is released as an LGO tape, the changes would have to be made with the FIX program. Below is a list and detailed description of the constants which can be modified. The name of the constant is given, followed by its location. Since EM3780C uses different memory locations from EM3780B, the locations for EM3780C are given in parenthesis. Then, in double quotes, the current value is given. This is followed by a paragraph explaining the use of the constant. NOTE: All memory locations and values are given in OCTAL.

4.2 TERMID - Terminal Identification

TERMID	1004	(6001)	"000"
	1005	(6002)	"000"
	1006	(6003)	"000"
	1007	(6004)	"000"
	1010	(6005)	"000"

This feature provides the 3780 with the capability of transmitting a five character identification when it transmits first after a connection has been made on a switched-network line. For further information regarding use and assignment of the terminal identification, see page 27 of Componet Information for the IBM 3780 Data Communication Terminal.

4.3 NAKLIM - NAK Limit

NAKLIM	1011	(6006)	"020"
--------	------	--------	-------

A NAK character serves as a negative reply to the last message block or a not-ready-to-receive signal if the terminal is in receive mode. Standard 3780 operation calls for a maximum of 3 NAK's before an EOT is sent and the operation aborted. The emulator is set at 16 NAK's before the EOT is sent.

4.4 ENQLIM - ENQ Limit

ENQLIM 1012 (6007) "020"

A block check response other than ACK0, ACK1, NAK, EOT, or RVI causes a transmitting 3780 to send an ENQ (ENQUIRY) character. The ENQ character is also transmitted if no response is received to a message block within three seconds. The ENQ serves as a request to the other end to repeat the last block check response. Standard 3780 operation calls for a maximum of 3 retry ENQ characters and failure to receive a valid response after 3 ENQ's causes the 3780 to send an EOT and end the transmission. When a 3780 is communicating with a system that is in turn communicating with many other 3780's, there may be difficulty in meeting the 12 second time out period. The 3780 emulator is set to the 48 second timeout period thus providing it with the EXTENDED ENQ RETRY feature.

4.5 ORG - Time Between Successive Line Bids

ORG 1013 (6010) "0350"
1014 (6010) "003"

Two terminals, in a ready to transmit condition and using the same communications line, can bid for the line simultaneously. When this contention for the communications line occurs, neither terminal is aware of the request of the other. Therefore, timeout controls are provided by the synchronous line discipline. These timeout controls are used to establish priority when a contention-for-the-line condition exists. This prevents the communications line from being tied up unnecessarily under certain adverse conditions. To avoid repetitive simultaneous bids from both ends, one terminal is designated the primary terminal and the other the secondary terminal. ORG contains the time between successive line bids. When communicating with a CPU, the terminal is considered the primary station. Primary stations are set at 1000, secondary stations at 2000. The emulator is set at 1000. The values to set ORG for a secondary terminal are "072" and "006" respectively. For further explanation, see page 11 of the Component Information for the IBM 3780 Data Communication Terminal.

4.6 ADDRES - Multipoint Terminal Address

```
ADDRES 1015 (6012) "000"  
        1016 (6013) "000"
```

ADDRES is used to contain the address of the terminal when it is used on a multipoint network. These fields must be set to zero when operating on a point to point basis.

Multipoint operation allows a number of 3780's to share the same communication facility (leased line) and operate with a CPU. The multipoint feature is available only on non-switched communication facilities. The CPU is considered the centralized master terminal and controls the operation of all the 3780's. Because there are multiple 3780's on the same leased line, there must be a way for the CPU to identify which one it wants to transmit or receive to. Thus, each terminal is assigned a terminal address by the system designer and each terminal will only respond when it "sees" that address in a polling or selection sequence. If the Datapoint 3780 emulator is to operate on a multipoint network, then the address of the 3780 emulator must be placed in this field. To set the proper address, the first byte must contain an upper case letter to be used as the polling address. The second byte must contain the same letter in lower case which is used as a selection address.

Under multipoint operation, the enquiry mode is not supported. Multipoint Data Link Control (MPLC) with component selection is supported as described on page 28.1 of Component Information for the IBM 3780 Data Communication Terminal.

4.7 WRFORM - Write Format

```
WRFORM 1017 (6014) "000"
```

WRFORM is used to control the type of format used when writing to cassette tapes or disk files. When WRFORM is zero, GEDIT format will be written and all blanks will be compressed. When WRFORM is non-zero, write edit format is used. When using GEDIT format, the emulator is able to empty the buffers faster than a 2000 BPS line is capable of filling them, thus providing faster throughput. GEDIT format is also compatible with the EDITOR, ASSEMBLER, SCRIBE, DATABUS, and most other software produced by DATAPOINT. When WRFORM is one, the Write Edit format will be used. No space compression will be performed and each

record will begin in a new physical block. This format requires more space to contain the data but each record can be located, edited or deleted directly, without affecting the surrounding data records.

4.8 FM - File Mark

```
FM      1020  (6015)  "000"
```

Magnetic tape file mark option. If this option is set to zero, the emulator will begin each file on mag tape with data and terminate it with two file marks. If this option is set to one, the emulator will begin each file on mag tape with a file mark, followed by data, and terminated by two file marks. This format is normally referred to as Multiple File Format. When more than one file is written to the same tape without the operator repositioning the tape, the following will occur. The first file will start with a file mark, followed by data, followed by two file marks. The emulator then backspaces over the last file mark. If more data is to be written, the last file mark is written over by data, and again followed by two file marks. As a result, the tape will begin with a file mark, have data files separated by one file mark, and the end of the tape terminated by two file marks.

4.9 PTYPE - Printer Type

```
PTYPE   1021  (6016)  "000"
```

This option specifies the printer type. If it is set to zero, the emulator will use the local printer driver. If it is set to one, the servo printer driver will be used.

4.10 PLEN - Print Line Length

```
PLEN    1022  (6017)  "170"
```

This field indicates to the emulator the length of the print line to be used. The length can be either 120 ("170" octal), or 140 ("214" octal) characters. The default is for 120 characters long.

4.11 AUTO - Auto Receive

AUTO 1023 (6020) "000"

This option specifies whether the auto receive option will be used. After each operation, the emulator goes into the receive mode unless the operator interrupted it by pressing the keyboard key. As long as AUTO is set to zero, the emulator will go into the receive mode after each operation. If AUTO is set to one, the emulator will go into the command mode after each operation. This is most useful when using DOS CHAIN and the operator wants to create a chain file to control all the operations which the emulator will perform.

4.12 AUTOA - Auto Answer

AUTOA 1024 (6021) "000"

This options indicates whether the auto answer feature will be used. Auto answer enables the emulator to automatically answer incoming calls from the CPU. The emulator will automatically go into receive mode, waiting for data to be received. If no data is received within twenty seconds, a timeout will occur. If the emulator was in receive mode, the line will be disconnected. If the emulator was in transmit mode and the reader is ready, data will be transmitted, otherwise the line will be disconnected. The Auto Answer feature cannot be interrupted and later resumed without first reloading the emulator.

CHAPTER 5. EM3780 SUPPORT PROGRAMS

5.1 EM3780T 3780 Diagnostic Trace

In addition to the error messages put out by the Datapoint 3780 emulator, an additional aid in the form of a TRACE program is provided to help solve any unusual problems that might arise during installation and use of the 3780 emulator. When ordering EM3780B, EM3780T should also be ordered to facilitate solving any potential communications problems that might arise when installing the 3780 emulator. The 3780 diagnostic trace is meant to be used when the Datapoint 3780 emulator fails to communicate properly with another system. The 3780 DIAGNOSTIC TRACE program is released on a LGO tape and is called EM3780T. The TRACE program actually works in 2 steps. First, the Datapoint 3780 emulator must be loaded and run, and after the emulator has communicated with another system or attempted to communicate with another system, the DIAGNOSTIC TRACE program can be loaded and run. After the TRACE program is loaded, it will display a heading message and version number. The TRACE listing can be output to the local printer, servo printer, or the crt screen. To specify which output device the trace program should use, the operator can enter L for local printer, S for servo printer, or C for crt screen. The TRACE program will then print a EBCDIC to ASCII translation table which can be used to interpret the trace listing. All characters will be printed in EBCDIC.

The DIAGNOSTIC TRACE program prints a sequential record (referred to as a trace) of all characters that the Datapoint 3780 emulator transmitted and received over the communications line. The DIAGNOSTIC TRACE program is capable of printing this trace record because the Datapoint 3780 emulator stores all characters transmitted and received in a trace table. The size of the trace table depends on the amount of memory not being used by the emulator. For EM3780B, the size of the trace table is 2K. EM3780C does not have sufficient memory left for a trace table. When the 3780 emulator reaches the end of the table, the pointers are wrapped around to the beginning of the table and the previously stored characters are overstored. This means that when using the TRACE program to list the trace, it is possible that only a portion of what was transmitted or received will be printed. The TRACE program can be most useful in verifying that

both ends of the communications line are adhering to the proper line discipline as specified in IBM's SRL GA27-3004-2 General Information - Binary Synchronous Communications.

5.2 EM3780xV - VFU SUPPORT

VFU support in the 3780 emulators is provided in the software. This allows all printers to perform VFU operations even if they do not have any channel skipping capability.

VFU support was implemented by using a 64 byte table to store channel numbers for 128 lines. Only channels 2 through 11 are stored in the table. Channel 1 is always used for top of form and channel 12 is always used for overflow. Channel 12 defaults to line 62 but can be changed by using a set VFU command. When the program receives a skip to channel 2 - 11, it starts at the current location in the table and searches through the table until it finds that channel. For each line position where a channel is not found, a carriage return/line feed is printed.

When the program is released, the VFU table is set to all zeroes. This is the equivalent of having a VFU tape with no holes punched for channels 2 through 11. If channels 2 through 11 are going to be used, there are several ways for the operator to set the VFU table to the desired VFU settings.

If an escape sequence accompanies the last record received, the record is printed. The escape sequence is converted to the ANS carriage control character, is held over and becomes the first carriage control character for the next file. Also, if the printer is at top of form, and a top of form escape sequence is received, the page will be advanced to the next top of form.

CHANGING THE VFU TABLE WITH EM3780

A special program was written which allows the VFU table to be changed at any time when the 3780 emulator is loaded. This program is called the VFU loader. The VFU loader is an overlay which resides in the 3780 buffers and allows loading the VFU table from the keyboard, cassette, or disk. After the overlay has been executed, it goes back to the 3780 command handler which puts the program back into 3780 command mode.

Because the buffers reside at different locations in the various versions of the 3780 emulator, there is a VFU loader for each version. The following is a list of the 3780 emulators and the name of the VFU loader which must be used for each one.

EM3780B EM3780BV
EM3780C EM3780C/OV3

EM3780 is release on a LGO tape. To invoke the VFU loader, the 3780 emulator must be loaded first. Then EM3780BV must be placed in the rear deck and the RESTART key must be pressed. This causes the VFU loader to be loaded into the buffer area of the 3780 emulator. The VFU loader must be loaded by pressing the RESTART key because EM3780B uses the system loader area for buffer space. EM3780C/OV3 can be invoked by pressing the # (pound sign) while EM3780C is in the command mode.

After the VFU loader has been loaded, the following messages may be displayed.

DO YOU WANT TO LOAD THE VFU THROUGH THE KEYBOARD OR CASSETTE?

This question gives the operator the option of selecting the keyboard or cassette as the input device to the VFU loader. The operator can select the keyboard by entering the letter 'K'. The letter 'C' is used to select the cassette. If the cassette is selected, the operator must have a cassette that contains VFU commands. The cassette must be created by GEDIT.

IS THE VFU TAPE MOUNTED IN THE REAR DECK?

The operator must enter the letter 'Y' after mounting a cassette in the rear deck. The cassette must contain valid VFU commands. The cassette must be created by GEDIT.

DO YOU WANT TO LOAD THE VFU THROUGH THE KEYBOARD OR DISK?

This message is displayed when the VFU loader is invoked through EM3780C. The letter 'D' will select the disk as the input device and the letter 'K' will select the keyboard as the input device. If the disk is selected, the operator must have a file named VFUx/TXT which contains the VFU commands. This file must be created by GEDIT.

ENTER THE VFU FILE SUFFIX (0 through 9)

This message will be displayed only if the operator selects the disk as the input device. All disk files which are to be used as input to the VFU loader must have a file spec of VFUx/TXT where x is a number between 0 and 9. When the above message is displayed, the operator can select the VFU file he wants loaded by giving the appropriate suffix number.

LOADING VFU

This message is displayed when the VFU loader is reading from cassette or disk and loading the VFU table.

VFU LOADED

This message is displayed after the VFU table has been loaded. Immediately after displaying this message, the VFU loader will go back to the 3780 command handler which will put the program in the command mode.

VFU FORMAT ERROR

This message is displayed when the VFU loader cannot continue because of a fatal error. Possible causes are: File mark 0 not found on the cassette, the disk file containing the VFU commands was not found, invalid VFU command found on disk or cassette, or invalid VFU command format.

ENTER VFU COMMAND

This message is displayed when the keyboard is selected as the input device to the VFU loader.

VALID VFU COMMANDS

The following section describes the format used to set the VFU table. When VFU commands are entered from cassette or disk, each VFU command must be on a separate line. There is no limit to the number of VFU commands which can be given.

VFU COMMAND FORMAT: CC=LLL

The letters 'CC' represent the channel number and the letters 'LLL' represent the line number where that particular channel number should skip to. 'CC' must be between 2 and 12 while 'LLL' can be between 1 and 128. Any number outside of the above ranges will cause a VFU format error. A missing equal sign or a line number (LLL) not terminated by the ENTER key will also give a VFU format error. Examples of VFU commands follow.

```
2=15 skip to line 15 for channel 2
5=40 skip to line 40 for channel 5
8=45 skip to line 45 for channel 8
2=50 skip to line 50 for channel 2
```

CHAPTER 6. RJE (REMOTE JOB ENTRY) SUPPLEMENT

The 3780 emulator is often used to communicate with a large mainframe that has a Remote Job Entry capability. This section on RJE (Remote Job Entry) is intended for those operators who have not had the experience of using a 3780 compatible terminal or emulator to signon and submit jobs to a central CPU thru RJE. It is not intended to be a complete guide to RJE. However, it should be of some assistance in giving the operator an understanding of what RJE is, what it does, and how to signon and utilize the various facilities that RJE offers.

6.1 Introduction to Remote Job Entry

RJE is an extension to or an integral part of a large CPU's operating system which allows users at remote locations to submit jobs over communications lines to the central CPU. Jobs submitted by remote sites are passed on to the operating system for scheduling and execution. When the output resulting from these jobs becomes available, it is returned to the remote site as requested -- either immediately or upon command.

RJE controls the flow of data (from remote sites) going into and out of the operating system queues. Once a job has been entered into the operating system input queue thru RJE, execution of the job proceeds under supervision of the operating system. Data entered from remote sites is the primary input to the RJE system and consists of jobs to be executed and RJE commands. Thru the use of the RJE commands the operator at the remote site can make full use of the RJE facilities and determine what is going on at the central site.

6.2 RJE Facilities

The operator can direct the RJE system to perform the following actions thru the use of RJE commands.

- 1) List the jobs currently being executed
- 2) List the jobs waiting to be executed
- 3) Hold execution of a job

- 4) Release a job from hold
- 5) Cancel a job
- 6) Restart the job currently being printed
- 7) Repeat the job currently being printed
- 8) Route the output of a job to the central site or another remote site
- 9) Send a message to the central site or another remote site

6.3 HASP (Houston Automatic Spooling Priority)

HASP is an extension to IBM's O/S operating system which provides an efficient means of gathering jobs, scheduling their execution, and returning the output to the submitter of the job. The process of gathering the card images which constitute a job, and saving the job's output for later printing or punching, is called spooling. While HASP is reading or printing at a remote site, it may be simultaneously reading, printing, or punching on card readers and printers next to the central CPU and on all other remote card readers, printers, and punches.

6.4 HASP RJE (HASP Remote Job Entry)

Remote job entry (RJE) is a feature in the HASP system which allows remote sites to send jobs to the central CPU for execution and receive back their printed and punched output. Jobs to be submitted from a remote site use exactly the same JOB CONTROL LANGUAGE as jobs that are submitted directly at the central CPU. The output produced from the job is routed back to the remote site unless special RJE commands specify differently. Detailed examples of HASP RJE commands will be used here to facilitate explanation of basic RJE concepts. Although the specific HASP RJE commands used will not work on other RJE systems, they serve to illustrate functions that are common to all RJE systems.

6.5 HASP RJE Operating Procedures From a Remote Site

6.5.1 Establishing a Communications Path

Before a remote site can transmit or receive from a central CPU, a communications path must be established. If the remote site is to be connected by ordinary switched telephone lines to the central CPU, the operator should follow the following steps after obtaining the telephone number of the central CPU.

- 1) Depress the TALK button on the dataphone
- 2) Dial the telephone number
- 3) Listen for the normal sound of ringing followed by the normal sound of answering. If you do not hear the telephone being answered, it could mean that the central CPU is down, or the operators at the central CPU have not started RJE. After the telephone is answered, you should hear a high pitched tone of about six seconds duration, followed by a short bleep.
- 4) When you hear the bleep, push the DATA button on the telephone and watch for the data light to become lit. When the DATA light becomes lit, you can hang up the phone. If the DATA light does not light up, examine all connections for a tight fit and go back to step 1.
- 5) You are now ready to transmit the SIGNON card.

If the remote site is connected to the central CPU thru leased lines, you may begin transmitting or receiving immediately after the central CPU operator has issued the "START LINE" command.

6.5.2 SIGNON

The ability of a central CPU to accept input automatically from remote sites, greatly increases the need for security protection and routing information. In the HASP RJE system, this function is performed thru the use of a SIGNON card which must be transmitted before anything else. The SIGNON card MUST be 80

characters in length and MUST be transmitted as a single file. The format of the SIGNON card is given below with card column numbers indicated above.

```
1           16           25
/*SIGNON    REMOTEnn PASSWORD
```

The nn following the word "REMOTE" is a one or two digit number between 1 and 99 which serves as a routing code. Leading zeroes are not allowed. HASP RJE will reject invalid SIGNON cards and disconnect the line without giving the operator any error messages. HASP RJE will also disconnect the line when it receives a VALID SIGNON card if there is another user signed on with the same REMOTE number, that is, if user 1 is signed on with REMOTE1, and user 2 attempts to signon with REMOTE1, HASP RJE will disconnect the line when user 2 attempts to signon. This will continue to happen until user 1 signs off.

To establish two way communication with another system, the signon card must be transmitted correctly. When an erroneous signon card is transmitted, the other system cannot transmit back to the system at which the signon is being attempted. Instead, an appropriate message is sent to the central CPU operator. If you cannot determine why the signon is not successful, contact the central CPU operator for help; the messages displayed on his console may help pinpoint the problem.

Do not enter a password unless one is required by the system that is going to communicate with the 3780.

Signing on to a HASP RJE system is greatly simplified when using the DATAPOINT 3780 emulator because of its keyboard facility. The operator merely assigns the keyboard to the reader, enters the signon card, and when the ENTER key is pressed, transmission of the signon card proceeds automatically.

At any given time, a signed-on 3780 is either transmitting a job, receiving printed or punched output from a job, or waiting for work. Often after an operator has transmitted a job, he will disconnect the line to save telephone charges and sign-on at a later time to receive his output. There will be printed output for every job submitted and punched output only if the job creates punched output. The amount of time required to receive output back from a RJE system, depends on the load the central CPU is

attempting to process. Hence, if an operator transmitted a job but there were already 100 jobs in the queue waiting to be executed, he could disconnect the phone and sign-on at a later time to receive the output back. In a later section we will cover the RJE commands that can be used to determine where a job is within the queue and how that information can be used to estimate the waiting time required to receive output back.

Thus, the normal cycle of a job submitted from a remote site is: transmitting the job from the reader, waiting for it to be executed, receiving its printed or punched output.

6.5.3 Transmitting to the Central CPU

The remote site can transmit jobs to the central CPU at one of three times:

- 1) Immediately after signing on
- 2) In the pause (about 10 seconds) after the remote site has received printed or punched output
- 3) When the remote site is signed on and waiting for work

You cannot transmit jobs or receive jobs unless you are correctly signed on. You cannot interrupt receiving to transmit. If power fails or some other abnormal condition occurs during transmission, then the connection must be re-established, signon must be completed, and the entire job must be transmitted again.

6.5.4 Waiting For The Job To Execute

After the remote site transmits a job to the central CPU, it is queued for execution. The operator can determine the status of the job and its place in the queue by using the RJE commands described in Appendix A, "HASP RJE REMOTE SITE COMMANDS".

6.5.5 Receiving From The Central CPU

As a job is executed in the central CPU, it may produce printed and punched output. HASP RJE saves this output and at the end of the job queues all the output along with a routing code. The routing code determines where the output will be printed or punched and can be changed with RJE commands. In most cases, no change will be necessary because the operator will want the output to be sent back to the site from which it was submitted. HASP RJE does this automatically by assigning a routing code when the job

is transmitted in and if the operator does not change it, then HASP RJE will use that routing code to send the output back to the site it came in from.

APPENDIX A. HASP RJE REMOTE SITE COMMANDS

The additional flexibility and control required by remote job entry is provided thru the use of RJE commands. Once the SIGNON command has been transmitted and accepted, any of the RJE commands can be given. Examples of the commands and the replies HASP RJE sends back are given in APPENDIX B. The following is a list of RJE commands which can be given by the remote site. Explanations appear to the right and the following abbreviations are used in the commands:

xxx = HASP assigned job number
nn = the REMOTE number used when signing on
mmm = a message

/*\$DA	List the jobs currently being executed.
/*\$DN	List the jobs waiting to be executed.
/*\$HJxxx	Hold the execution of a job.
/*\$AJxxx	Release a job from hold.
/*\$Cxxx	Cancel a job.
/*\$ERMx.PRx	Restart the job currently being printed.
/*\$NRMx.PRx	Repeat the job currently being printed.
/*\$RPUN,LOCAL,RMx.PUx	Route punch output back to remote site x.
/*\$DRMx mmm	Display a message to another remote site.

APPENDIX B. EXAMPLES OF HASP RJE COMMANDS AND RESPONSES

The following are examples of HASP RJE commands and the replies to those commands that HASP RJE sends back to the remote printer. First the command that is transmitted by the remote site is given followed by the reply that HASP RJE sends to the printer.

Remote site: /*\$DA

HASP RJE reply:

TIME	: JOB : NUMBER	: JOB : NAME	: CURRENT : STATUS	: JOB : PRIORITY:
\$*17.01.11	JOB 233	TURGER	EXECUTING F	PRIO 6
\$*17.01.11	JOB 166	REGUTR	EXECUTING B	PRIO 6

REMOTE SITE: /*\$DN

HASP RJE reply:

TIME	:JOB :NUMBER	:JOB : NAME	: CURRENT : STATUS	:ROUTING: :CODE	: PRIORITY:
\$*17.01.34	JOB 237	INCHR	AWAITING EXEC	T	PRIO 6
\$*17.01.34	JOB 239	CC306	AWAITING EXEC	3	PRIO 6
\$*17.01.34	JOB 105	TUREG	AWAITING PRINT	0	PRIO 10
\$*17.01.34	JOB 175	CLOTST	AWAITING PRINT	1	PRIO 7

By issuing the /*\$DA command, the operator can find out if the job submitted is executing. With the /*\$DN command, the operator can obtain a list of all the jobs in the queue which are awaiting execution and waiting to be printed.

APPENDIX C. EBCDIC TO ASCII TRANSLATE TABLE

<u>Character</u>	<u>EBCDIC</u>	<u>ASCII</u>
	000	040
	001	040
	002	040
	003	040
	004	040
	005	040
	006	040
	007	040
	010	040
	011	040
	012	040
	013	040
	014	040
	015	040
	016	040
	017	040
	020	040
	021	040
	022	040
	023	040
	024	040
	025	040
	026	040
	027	040
	030	040
	031	040
	032	040
	033	040
	034	040
	035	040
	036	040
	037	040
	040	040
	041	040
	042	040
	043	040
	044	040
	045	040
	046	040
	047	040

<u>Character</u>	<u>EBCDIC</u>	<u>ASCII</u>
	050	040
	051	040
	052	040
	053	040
	054	040
	055	040
	056	040
	057	040
	060	040
	061	040
	062	040
	063	040
	064	040
	065	040
	066	040
	067	040
	070	040
	071	040
	072	040
	073	040
	074	040
	075	040
	076	040
	077	040
Space	100	040
	101	040
	102	040
	103	040
	104	040
	105	040
	106	040
	107	040
	110	040
	111	040
~	112	136
.	113	056
<	114	074
(115	050
+	116	053
	117	174
&	120	046
	121	040
	122	040
	123	040

<u>Character</u>	<u>EBCDIC</u>	<u>ASCII</u>
	124	040
	125	040
	126	040
	127	040
	130	040
	131	040
!	132	041
\$	133	044
*	134	052
)	135	051
;	136	073
	137	176
_	140	055
/	141	057
	142	040
	143	040
	144	040
	145	040
	146	040
	147	040
	150	040
	151	040
	152	040
,	153	054
&	154	045
	155	137
>	156	076
?	157	077
	160	040
	161	040
	162	040
	163	040
	164	040
	165	040
	166	040
	167	040
	170	040
,	171	140
:	172	072
#	173	043
@	174	100
'	175	047
=	176	075
"	177	042
	200	040

<u>Character</u>	<u>EBCDIC</u>	<u>ASCII</u>
a	201	141
b	202	142
c	203	143
d	204	144
e	205	145
f	206	146
g	207	147
h	210	150
i	211	151
	212	040
	213	040
	214	040
	215	040
	216	040
	217	040
	220	040
j	221	152
k	222	153
l	223	154
m	224	155
n	225	156
o	226	157
p	227	160
q	230	161
r	231	162
	232	040
	233	040
	234	040
	235	040
	236	040
	237	040
	240	040
s	241	176
t	242	163
u	243	164
v	244	165
w	245	166
x	246	167
y	247	170
z	250	171
	251	172
	252	040
	253	040
	254	040

<u>Character</u>	<u>EBCDIC</u>	<u>ASCII</u>
[255	133
	256	040
	257	040
	260	040
	261	040
	262	040
	263	040
	264	040
	265	040
	266	040
	267	040
	270	040
	271	040
	272	040
	273	040
	274	040
]	275	135
	276	040
	277	040
{	300	173
A	301	101
B	302	102
C	303	103
D	304	104
E	305	105
F	306	106
G	307	107
H	310	110
I	311	111
	312	040
	313	040
	314	040
	315	040
	316	040
	317	040
}	320	175
J	321	112
K	322	113
L	323	114
M	324	115
N	325	116
O	326	117
P	327	120
Q	330	121
R	331	122

<u>Character</u>	<u>EBCDIC</u>	<u>ASCII</u>
	333	040
	334	040
	335	040
	336	040
	337	040
	341	040
	341	040
S	342	123
T	343	124
U	344	125
V	345	126
W	346	127
X	347	130
Y	350	131
Z	351	132
	352	040
	353	040
	354	040
	355	040
	356	040
	357	040
0	360	060
1	361	061
2	362	062
3	363	063
4	364	064
5	365	065
6	366	066
7	367	067
8	370	070
9	371	071
	372	040
	373	040
	374	040
	375	040
	376	040
	377	040

APPENDIX D. ASCII TO EBCDIC TRANSLATE TABLE

<u>Character</u>	<u>ASCII</u>	<u>EBCDIC</u>
	000	100
	001	100
	002	100
	003	100
	004	100
	005	100
	006	100
	007	100
	010	100
	011	100
	012	100
	013	100
	014	100
	015	100
	016	100
	017	100
	020	100
	021	100
	022	100
	023	100
	024	100
	025	100
	026	100
	027	100
	030	100
	031	100
	032	100
	033	100
	034	100
	035	100
	036	100
	037	100
Space	040	100
!	041	132
"	042	177
#	043	173
\$	044	133
%	045	154
&	046	120
'	047	175

<u>Character</u>	<u>ASCII</u>	<u>EBCDIC</u>
(050	115
)	051	135
*	052	134
+	053	116
,	054	153
-	055	140
.	056	113
/	057	141
0	060	360
1	061	361
2	062	362
3	063	363
4	064	364
5	065	365
6	066	366
7	067	367
8	070	370
9	071	371
:	072	172
;	073	136
<	074	114
=	075	176
>	076	156
?	077	157
@	100	174
A	101	301
B	102	302
C	103	303
D	104	304
E	105	305
F	106	306
G	107	307
H	110	310
I	111	311
J	112	321
K	113	322
L	114	323
M	115	324
N	116	325
O	117	326
P	120	327
Q	121	330
R	122	331
S	123	342
T	124	343

<u>Character</u>	<u>ASCII</u>	<u>EBCDIC</u>
U	125	344
V	126	345
W	127	346
X	130	347
Y	131	350
Z	132	351
[133	255
\	134	340
]	135	275
.	136	112
-	137	155
	140	171
a	141	201
b	142	202
c	143	203
d	144	204
e	145	205
f	146	206
g	147	207
h	150	210
i	151	211
j	152	221
k	153	222
l	154	223
m	155	224
n	156	225
o	157	226
p	160	227
q	161	230
r	162	231
s	163	242
t	164	243
u	165	244
v	166	245
w	167	246
x	170	247
y	171	250
z	172	251
{	173	300
	174	117
}	175	320
	176	241
Del	177	100

APPENDIX E. DECIMAL TO OCTAL CONVERSION TABLE

DECIMAL	OCTAL	DECIMAL	OCTAL
0	000	32	040
1	001	33	041
2	002	34	042
3	003	35	043
4	004	36	044
5	005	37	045
6	006	38	046
7	007	39	047
8	010	40	050
9	011	41	051
10	012	42	052
11	013	43	053
12	014	44	054
13	015	45	055
14	016	46	056
15	017	47	057
16	020	48	060
17	021	49	061
18	022	50	062
19	023	51	063
20	024	52	064
21	025	53	065
22	026	54	066
23	027	55	067
24	030	56	070
25	031	57	071
26	032	58	072
27	033	59	073
28	034	60	074
29	035	61	075
30	036	62	076
31	037	63	077

DECIMAL	OCTAL	DECIMAL	OCTAL
64	0100	96	0140
65	0101	97	0141
66	0102	98	0142
67	0103	99	0143
68	0104	100	0144
69	0105	101	0145
70	0106	102	0146
71	0107	103	0147
72	0110	104	0150
73	0111	105	0151
74	0112	106	0152
75	0113	107	0153
76	0114	108	0154
77	0115	109	0155
78	0116	110	0156
79	0117	111	0157
80	0120	112	0160
81	0121	113	0161
82	0122	114	0162
83	0123	115	0163
84	0124	116	0164
85	0125	117	0165
86	0126	118	0166
87	0127	119	0167
88	0130	120	0170
89	0131	121	0171
90	0132	122	0172
91	0133	123	0173
92	0134	124	0174
93	0135	125	0175
94	0136	126	0176
95	0137	127	0177

DECIMAL	OCTAL	DECIMAL	OCTAL
128	0200	160	0240
129	0201	161	0241
130	0202	162	0242
131	0203	163	0243
132	0204	164	0244
133	0205	165	0245
134	0206	166	0246
135	0207	167	0247
136	0210	168	0250
137	0211	169	0251
138	0212	170	0252
139	0213	171	0253
140	0214	172	0254
141	0215	173	0255
142	0216	174	0256
143	0217	175	0257
144	0220	176	0260
145	0221	177	0261
146	0222	178	0262
147	0223	179	0263
148	0224	180	0264
149	0225	181	0265
150	0226	182	0266
151	0227	183	0267
152	0230	184	0270
153	0231	185	0271
154	0232	186	0272
155	0233	187	0273
156	0234	188	0274
157	0235	189	0275
158	0236	190	0276
159	0237	191	0277

DECIMAL	OCTAL	DECIMAL	OCTAL
192	0300	224	0340
193	0301	225	0341
194	0302	226	0342
195	0303	227	0343
196	0304	228	0344
197	0305	229	0345
198	0306	230	0346
199	0307	231	0347
200	0310	232	0350
201	0311	233	0351
202	0312	234	0352
203	0313	235	0353
204	0314	236	0354
205	0315	237	0355
206	0316	238	0356
207	0317	239	0357
208	0320	240	0360
209	0321	241	0361
210	0322	242	0362
211	0323	243	0363
212	0324	244	0364
213	0325	245	0365
214	0326	246	0366
215	0327	247	0367
216	0330	248	0370
217	0331	249	0371
218	0332	250	0372
219	0333	251	0373
220	0334	252	0374
221	0335	253	0375
222	0336	254	0376
223	0337	255	0377