2780 Remote Computer Systems

Operator's Guide

Order No. DEC-11-CRCSA-A-D
(Replaces DEC-11-CDC6A-A-D)

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VERSION 1

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PREFACE

The <u>2780 Remote Computer Systems Operator's Guide</u> provides operator
information including installation, loading, operating, and
termination procedures, plus the related commands and error messages.
Such information for the core 2780 RCS is contained in Chapter 2,
while the DOS/BATCH 2780 RCS is covered in Chapter 3. Other chapters
will be added to this manual as new systems are supported.

Appendix A presents a sample online RJE session, and printer format
control characters are summarized in Appendix B. Hardware supported by
the 2780 systems is described in Appendices D through I.

The loading procedures formerly contained in Appendix C are now
included in a new manual, <u>COMTEX-11 Program Loading Procedures</u>, Order
No.   DEC-11-CPLPA-A-D.

Associated Documents:

<u>COMTEX-11 Program Loading Procedures</u>, DEC-11-CPLPA-A-D

<u>2780 Remote Computer Systems Installation Notes</u>,
DEC-11-CINTA-B-D

<u>PDP-11 File Utility Package (PIP)</u>, DEC-11-UPUPA-B-D

<u>DOS/BATCH System Manager's Guide</u>, DEC-11-OMGRA-A-D

<u>DOS/BATCH Monitor Programmer's Manual</u>, DEC-11-OMPMA-A-D

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CHAPTER 1

INTRODUCTION TO THE 2780 REMOTE COMPUTER SYSTEMS

1.1   INTRODUCTION

The 2780 Remote Computer Systems (RCS) are designed to provide remote
users of IBM 360 and 370 systems with both on-site processing and
remote job entry compatible with the IBM 2780 Data Transmission
Terminal Model 1. The Remote Computer Systems are available in two
forms.

 ● A core-only PDP-11 2780 system for conventional card
   reader input and line printer output (see Chapter 2)

 ● A DOS/BATCH (hereafter called DOS) PDP-11 2780 system
   for transmission directly to and from mass storage
   devices as well as card reader input/line printer
   output (see Chapter 3)

Both systems are built around the 16-bit PDP-11 computer family and
COMTEX-11 software. Each RCS may include any PDP-11 family processor
and can be expanded with the full range of PDP-11 peripherals to
support a wide range of local processing applications.

1.2   CORE 2780 RCS

The core 2780 RCS performs three operations:

 ● Reads and transmits punched card information

 ● Receives and prints punched card information

 ● Lists punched card information on the line printer.

To the IBM OS/RJE, HASP/RJE, ASP/RJE, or DOS/Power subsystems, its
operation is indistinguishable from an actual 2780 Model 1. Its
communication conforms with IBM's binary synchronous communications
procedure for dial-up or point-to-point leased lines.

Features of the core 2780 RCS are listed below.

 ● 400-byte buffer
 ● Extended multiple-record feature (up to seven records
   per 400-byte block)
 ● Short record (EM) detection
 ● Card reader end-of-file (ETX punch) detection
   (in non-transparent mode)
 ● Support of 132-column line printer plus forms control and
   horizontal format control
 ● Extended automatic retransmission and retry feature
 ● Console selection of transmission code (EBCDIC and EBCDIC
   with full transparency)
 ● Automatic answer
 ● Offline card listing capability
 ● Terminal-to-terminal or terminal-to-CPU operation

1.3 DOS 2780 RCS

The user can build data files on disk, magnetic tape, or DECtape using DOS-11 EDIT, MACRO, PIP, or his own DOS-11 application programs. Then he can activate the DOS 2780 RCS program (using the standard DOS-11 RUN command) and transmit files to the remote facility using conventional DOS-11 file arguments. Data received from the remote facility can be delivered directly to the line printer or can be written to a bulk storage device in standard DOS-11 file format.

The DOS 2780 RCS provides two record transmission modes.

- 2780 mode - 80-character record blocking for transmission to a remote 360/370 facility

- General mode - up to 132-character record blocking for transmission to another remote DOS 2780 RCS

The DOS 2780 RCS supports all the features of the core 2780 RCS, plus the features described below.

- Transmits and receives DOS-11 linked files to and from a remote 360/370 facility running OS/RJE, HASP/RJE, ASP/RJP, or DOS/Power.

- Performs Offline List of DOS-11 linked files.

- Provides for specification of up to three datasets in a single transmit Transfer command.

- Provides several modes of receive file handling to enable specification of one or a combination of receive datasets.

CHAPTER 2

OPERATING PROCEDURES FOR CORE 2780 RCS

2.1 CONFIGURATION INFORMATION

Select the appropriate distribution medium for your system's configuration from the following list.

    DP11, with paper tape - DEC-11-CCDPA-A-PB
    DP11, with cassette   - DEC-11-CCDPA-A-TB

    DU11, with paper tape - DEC-11-CCDUA-A-PB
    DU11, with cassette   - DEC-11-CCDUA-A-TB

2.2 LOADING

Refer to the COMTEX-11 Program Loading Procedures manual, order number DEC-11-CPLPA-A-D, for details on the following loading procedures.

1. Verify that the bootstrap loader is properly loaded.

2. Load the absolute loader.

3, Ascertain that power is on for the card reader and line printer, and that no cards are in the reader.

4. Using the absolute loader, load the correct core 2780 RCS for your configuration.

When the program has been loaded, a program identification message and a * will be typed on the console. At this point, the core 2780 RCS is running in offline control mode, with a default selection of non-transparent EBCDIC code.

In the offline state, only the Offline List function can be performed (see 2.3).

In the online state (selected by the ONLI command described in Table 2-1 and indicated by ** being typed on the console), both receive and transmit operations can be performed (see 2.4).

In either online or offline control mode, a different transparency selection can be made by specifying one of the values given for this category in Table 2-1.

To determine the current state (offline or online), mode (control, transmit, or receive), and transparency selection (EBCDIC or EBCDIC transparency), the QUERY command (see Table 2-1) can be entered at any time.

The 2780 program can be restarted anytime by setting the HALT/ENABLE switch to HALT, loading the address to location 702, selecting ENABLE, and pressing START. If the 2780 RCS is restarted during an online transmit or receive operation, data is lost and the data link is disconnected. The system goes into offline control mode, with EBCDIC selected.

2.3 OPERATING IN THE OFFLINE STATE

The only operation that can be performed in the offline state is listing a card file or files on the line printer.

1. Place the cards to be listed into the card reader, face down, with column 1 to the operator's left.

2. Press the CR11 RESET button.

When the Offline List is complete (card reader hopper is empty), or if a card reader error halts operation, the system returns to offline control mode and a * is typed on the console.

If the line printer becomes NOT READY (see error messages in Table 2-2) during Offline List, the operator should correct the condition (e.g., reload the paper), make the line printer ready, reload the last three cards read into the hopper, and re-enable the card reader. The Offline List operation will resume.

2.4 OPERATING IN THE ONLINE STATE

In the online state, data can be sent from the card reader to the remote computer, and data sent from the remote computer is listed on the line printer.

Online procedures and conventions are outlined below. See Appendix A for a description of typical online operation.

1. Execute the Online (ONLI) command (see Table 2-1). When the 2780 RCS is online, ** will be typed on the console.

2. Establish a data connection (see Appendix I). When the connection is established, the 2780 RCS is ready for an RJE session.

3. The following conventions are applicable to online operation.

   ● All received data is automatically listed on the line printer with appropriate horizontal and vertical formatting. If a line printer error condition occurs (e.g., paper jam), the remote system is notified and the 2780 RCS returns to control mode. (See LP DEV NOT READY in Table 2-2 for recovery information.)

   ● Online card transmission can be initiated by loading the cards to be transmitted into the hopper and pressing the CR11 RESET button.

   ● The EM (End of Media) control character (11-1-8-9 punch) can be punched following the last data column in the card to indicate a short record when transmitting in non-transparent mode. (The EM code is ignored, and all 80 columns are transmitted in transparent text mode.) The 2780 RCS detects the EM code and processes the preceding data as an intermediate block record (ITB) or end block record (ETB). The EM code is not included in the

transmission record. EM codes embedded in receive
records are ignored.

- If cards are placed in the reader before a data
connection is made, the MD DEV NOT READY error
message is typed on the console. Transmission begins
when the data connection is made.

- Cards can be loaded in the card reader during a
receive operation, but transmission does not actually
begin until the receive operation is complete. (** is
typed on the console in the brief moment of control mode
between receive and transmit modes.)

- Current file transmission can be terminated in two ways.

    a. By coding an ETX (12-3-9 punch) in column 80 of
    the final card to be transmitted (valid only in
    non-transparent mode).

    b. By allowing the final card to be read (resulting in
    a CR DEV NOT READY console message), typing ENDT,
    replacing the final card in the hopper, and
    re-enabling the card reader. (This method is
    required in transparent mode.)

    In either case, the final card is transmitted followed by
    end of transmission and return to control mode.

- Jobs (if delimited by an ETX punch) should be separated
by a blank card. (Do not place any blank cards after the
final card to be transmitted.)

- A single card can be transmitted either by coding it with
an ETX punch (if not in transparency), or by typing ENDT
before placing the card in the hopper and enabling the
card reader.

- When the system returns to control mode after a receive
or transmit operation, ** is typed on the console.

- If operation becomes suspended in receive or transmit
mode, type TERM (see Table 2-1) to return the system to
control mode. After this procedure, the transmit or
receive operation generally resumes automatically.

2.5 CORE 2780 RCS COMMANDS

Table 2-1 summarizes the core 2780 RCS commands. Since commands are identified by the first four characters, these shortened versions are used in the table. However, as many as eight characters can be entered per command; e.g., EBCD or EBCDIC are two acceptable forms for non-transparency selection.

A CR (carriage return) is typed to complete each command.

An LF (line feed) can be typed to delete a command being typed.

2.6 ERROR AND EXCEPTIONAL CONDITION HANDLING

The core 2780 RCS is programmed to detect, identify, and recover from exceptional conditions or errors associated with the data-link, system components, or operator control procedure. Table 2-2 describes the possible error messages for the core 2780 RCS.

2.6.1 Fatal System Errors

If there is no response from the console, the operator should attempt to restart the program. If restart operations do not succeed, and a cause for system halt is not immediately apparent (e.g., program tape tattered, device unplugged (i.e., without power), or console terminal turned off), the operator can attempt restart by reloading (see 2.2). If reloading does not produce the desired results, a DEC Field Service representative should be notified.

Table 2-1
Core 2780 RCS Commands

Command	Resulting Action	Rules for Use
BELL (Remote Signal)	Transmits BELL control message. (Receipt of this message causes the system to send a BELL code to the remote terminal.)	Valid only in online control mode for 2780 RCS to 2780 RCS configurations Used to signal remote system operator.
DISC (Disconnect)	Transmits a disconnect control message, causing system to go into offline control mode and disconnect the data link.	Valid only in online control mode for 2780 RCS to 2780 RCS configurations.
ENDT (End Transmission)	Transmits ETX (end-of-text) terminator with next card read. System transmits EOT (end-of-transmission) and returns to control mode when the final transmission is acknowledged by the remote station.	Valid in online state only. Card reader must be NOT READY. Used to transmit single card or to transmit last card of deck when EBCDIC transparency is in effect. NOTE In non-transparent operation, transmission can be terminated by punching an ETX code (12-3-9) in column 80 of the last card in the deck. The ETX punch causes the ENDT action to occur automatically.
OFFL (Offline)	Places system in offline control mode (if it is not already), disconnects the data link, and terminates any pending or active transmit or receive operations. Prepares system to perform Offline List operation.	Valid in online state only; however, the user should be aware that data will be lost if issued during a transmit or receive operation.

Table 2-1 (Cont.)
Core 2780 RCS Commands

Command	Resulting Action	Rules for Use
ONLI (Online)	Places system in online control mode. Enables establishment of data link and prepares for receive and transmit operations.	Valid in control mode only.
QUER (Query) (Request System Status)	Prints system status on the console terminal, including: State: OFFLine or ONLIne Mode: CONTrol, RECEive, or TRANsmit Transparency Selection: EBCD (EBCDIC) or EXBC (EBCDIC transparency)	Valid at any time.
TERM (Terminate)	Transmits a control message causing system return to online control mode. Used to abort suspended receive or transmit operations, e.g., to abort following a nonrecoverable error condition.	Valid in online state only. Causes data loss if entered during an active receive or transmit operation.
Transparency Selection: EBCD (EBCDIC) (default) EXBC (EBCDIC transparency)	Selects transparency or non-transparency for online transmit and receive operations.	Valid in control mode only.

Table 2-2
Core 2780 RCS Error Messages

Message	Meaning
C?	Incorrect (misspelled, etc.) or invalid (see conditions below) command or mode switch mnemonic has been typed and ignored. Possible invalid conditions are listed below. • ONLI typed when not in control mode • OFFL typed when in offline state • Transparency selection made when not in control mode • ENDT typed when card reader not in NOT READY state • TERM typed when not in online state • DISC typed when not in online state
CR DEV NOT READY	Card reader has become NOT READY during an online transmit operation. The card being read when the condition occurs is not processed, and must be reread when the card reader becomes ready. If the last card contains an ETX punch, end-of-file is assumed, and the system performs the ENDT function; no CR DEV NOT READY message is reported. NOTE If the NOT READY condition is the result of a "pick check", it is not necessary to reinsert the last card, since no card passed the read sensors when the failure occurred. In Offline List, the system automatically returns to control mode when any card reader intervention condition occurs. The card being read when the condition occurs is printed.
LP DEV NOT READY	The system has entered online control mode and the line printer is NOT READY. OR The printer has become NOT READY during an Offline List or Online Receive operation. If this condition occurs during Online Receive, the system responds by aborting reception and ignoring subsequent receive selection attempts until the line printer is made ready. The remote CPU is responsible for restarting the print job at an appropriate checkpoint. If the line printer becomes NOT READY during Offline List, the printer should be made ready and the last three cards read should be reinserted in the hopper. Offline List resumes when the card reader is made ready.

Table 2-2 (Cont.)
Core 2780 RCS Error Messages

Message	Meaning
MD DEV NOT READY	The card reader has been made ready in online control mode, but there is no data connection. When the connection is made, transmission should begin. If there is still no transmission, check to see that the power is on. (See Appendix I.)
R1*	The system has received a data block without a legal, recognizable start character. If the system remains in receive mode (as determined by a QUERY command response), but no data is printed, the TERM command should be typed. This action causes the receive operation to resume.
R2*	The system has received a message with an abnormal termination; e.g., garbled end of block. OR Transmit operation has been aborted after eight consecutive attempts to transmit a message have failed, or after an illegal response to the transmit bid has been received. The system returns to online control mode.
T1	The system has received a request to terminate its transmission and prepare for reception. The system returns to control mode and awaits reception.

*Frequent R1 or R2 errors indicate marginal or faulty dataset, phone line, or communication interface operation. The core 2780 RCS maintains a binary count of Receive Block Check errors that have occurred since program load or restart. This count is maintained in location 700 (octal), and may be examined in offline control mode by halting the computer, loading the address to 700, examining the contents, and then continuing computer operation.

CHAPTER 3

OPERATING PROCEDURES FOR DOS 2780 RCS

3.1 CONFIGURATION INFORMATION

The DOS 2780 RCS is offered in several binary load module
versions: one with support of both the card reader and the line
printer, one with support of neither, and one that supports the line
printer, but not the card reader.

Distribution media are listed below according to input device. Select
the one that fits the configuration of your system.   (CR = card
reader; LP = line printer.)

Paper Tape: DP11
                    with CR and LP   DEC-11-CDDPA-A-PB
                    without CR or LP   DEC-11-CLDPA-A-PB
                    without CR, with LP   DEC-11-CNDPA-A-PB

                 DU11
                    with CR and LP   DEC-11-CDDUA-A-PB
                    without CR or LP   DEC-11-CLDUA-A-PB
                    without CR, with LP   DEC-11-CNDUA-A-PB

Cassette: DP11   DEC-11-CDPPA-A-TB
                    with CR and LP   filename DDP278.LDA
                    without CR or LP   filename LDP278.LDA
                    without CR, with LP   filename NDP278.LDA

                 DU11   DEC-11-CDUUA-A-TB
                    with CR and LP   filename DDU278.LDA
                    without CR or LP   filename LDU278.LDA
                    without CR, with LP   filename NDU278.LDA

Magnetic Tape (7-track):   DEC-11-CDUPA-A-MB7
                 DP11
                    with CR or LP   filename DDP278.LDA
                    without CR or LP   filename LDP278.LDA
                    without CR, with LP   filename NDP278.LDA

                 DU11
                    with CR and LP   filename DDU278.LDA
                    without CR or LP   filename LDU278.LDA
                    without CR, with LP   filename NDU278.LDA

Magnetic Tape (9-track):   DEC-11-CDUPA-A-MB9
                                               (filenames same as
                                               for 7-track tape)

DECtape: DEC-11-CDUPA-A-UB
                                               (filenames same as
                                               for 7-track tape)

Disk: DEC-11-CDUPA-A-DB
                                               (filenames same as
                                               for 7-track tape)

To run the system described in this manual, the user requires
DOS/BATCH Version 8.08 or later.

3.2   INSTALLATION AND LOADING

3.2.1   Installation Procedures

The following steps need be performed just once for each system.

1. Load DOS according to the procedure described in the DOS/BATCH System Manager's Guide.

2. Bootstrap the system, if necessary. (See the DOS/BATCH System Manager's Guide.)

3. Log in by typing LO [uic], e.g., LO 1,1.

4. Operator input is now solicited by a $ printed on the console. Use PIP (see PDP-11 File Utility Package (PIP), Order No. DEC-11-UPUPA-B-D) to transfer the DOS 2780 program from the distribution medium to the system device. Under PIP, operator input is solicited by a # printed on the console.

    <u>$RUN PIP)</u>   ;RUN PIP
    <u>PIP-11 V8A00</u>

    E.g.: <u>#D2780.LDA<PR:/FB)</u> ;LOAD THE PROGRAM ON PAPER TAPE TO
                                 ;THE SYSTEM DEVICE AND CALL IT
                                 ;D2780.LDA

3.2.2   Loading Procedures

The following steps must be performed each time the DOS 2780 program is run.

1. Verify that power is on for the line printer and card reader (if included in the configuration).

2. Run the DOS 2780 program by typing <u>$RUN D2780)</u>.

NOTE

The above command sequence must not be replaced by a <u>$GET D2780</u> followed by a BEGIN. This sequence results in a fatal DOS error.

The extension code need not be typed, as LDA is the default extension code for filenames used with the RUN command.

When the program starts executing, its identification name, version number, and an * print out on the console.

The system is now running in offline control mode, with a default selection of non-transparent EBCDIC code.

Operator input is solicited by a single * in the offline state, and by ** in the online state.

3. Now any of the following operations can be performed.

Offline List - Listing of data from the card reader or a DOS device to the line printer (see 3.3 and 3.6.1.1).

Online Transmit - Transmission of data from the card reader or a DOS device to a remote station (see 3.4 and 3.6.1.1).

Online Receive - Reception of data sent from a remote station to the line printer or a DOS device (see 3.4 and 3.6.1.2).

3.3   OPERATION IN THE OFFLINE STATE

The only operation that can be performed in the offline state is listing a file or files on the line printer. Input can be from the card reader or from a DOS device.

3.3.1   Input From a Card Reader

1. Place the cards to be listed into the card reader, face down, with column 1 to the operator's left.

2. Press the CR11 RESET button.

3. Cards are read and listed until the card reader is empty, whereupon the system automatically reverts to offline control mode.

3.3.2   Input From a DOS Device

1. Perform any input device preparation; e.g., mount magnetic tape.

2. Execute the transmit Transfer command (see 3.6.1.1).

3. The system returns to control mode when the Offline List operation completes due to an end-of-file detection.

3.4 OPERATING IN THE ONLINE STATE

1. Prior to going online, it may be desirable to execute a receive Transfer command (see 3.6.1.2) so that if there is an immediate receive selection upon entering the online state, received data will go to the desired device.

2. Execute the Online (ONLI) command (see Table 3-1).

3. Establish a data connection (see Appendix I).

4. Sign on to the system and enter the job according to the procedures outlined in Appendix A.

5. Perform the desired operations, using the commands described in Table 3-1. The following conventions are applicable to online operation.

   • All received data is automatically listed on the line printer with appropriate horizontal and vertical formatting, unless another device is specified. If a line printer error condition occurs (e.g., paper jam), the remote system is notified and the system returns to control mode. (See w365 in Table 3-2 for recovery information.)

   • Online card transmission can be initiated by loading the cards to be transmitted into the hopper and pressing the CR11 RESET button.

   • The EM (End of Media) control character (11-1-8-9 punch) can be punched following the last data column in the card to indicate a short record when transmitting in non-transparent mode. (The EM code is ignored, and all 80 columns are transmitted in transparent text mode.) The 2780 RCS detects the EM code and processes the preceding data as an intermediate block record (ITB) or end block record (ETB). The EM code is not included in the transmission record. EM codes embedded in receive records are ignored.

   • If cards are placed in the reader before a data connection is made, the W370 000000 error message is typed on the console. Transmission begins when the data connection is made.

   • Cards can be loaded in the card reader during a receive operation, but transmission does not actually begin until the receive operation is complete. (** is typed on the console in the brief moment of control mode between receive and transmit modes.)

- Current file transmission can be terminated in two ways.

    a. By coding an ETX (12-3-9 punch) in column 80 of
       the final card to be transmitted (valid only in
       non-transparent mode).

    b. By allowing the final card to be read (resulting in
       a w367 console message), typing ENDT, replacing the
       final card in the hopper, and re-enabling the card
       reader. (This method is required in transparent
       mode.)

    In either case, the final card is transmitted followed by
    end of transmission and return to control mode.

- Jobs (if delimited by an ETX punch) should be separated
  by a blank card. (Do not place any blank cards after the
  final card to be transmitted.)

- A single card can be transmitted either by coding it with
  an ETX punch (if not in transparency), or by typing ENDT
  before placing the card in the hopper and enabling the
  card reader.

- When the system returns to control mode after a receive
  or transmit operation, ** is typed on the console.

- If operation becomes suspended in receive or transmit
  mode, type TERM (see Table 3-1) to return the system to
  control mode. After this procedure, the transmit or
  receive operation generally resumes automatically.

3.5 TERMINATING THE DOS 2780 PROGRAM

1. If the system is in the online state, enter the Offline
   (OFFL) command (see Table 3-1).

2. Type CTRL C (echoes as ↑C) KILL. This action returns the
   system to the point prior to step 2 for loading (see 3.2.2),
   leaving the user free to run any program he wishes.

3.6 DOS 2780 RCS COMMANDS

Table 3-1 summarizes the DOS 2780 RCS commands. The Transfer commands
are discussed in greater detail following the table.

Since commands are identified by the first four characters, these
shortened versions are used in the table. However, as many as eight
characters can be entered per command; e.g., EBCD or EBCDIC are two
acceptable forms for non-transparency selection.

CR (carriage return) is typed to complete each command.

DEL (RUBOUT) is typed to delete a character.

CTRL U (echoed as ↑U) is typed to delete a line.

Table 3-1
DOS 2780 RCS Commands

Command	Resulting Action	Rules for Use
BELL (Remote Signal)	Transmits BELL control message. (Receipt of this message in online control mode causes the system to send a BELL code to the remote terminal.)	Valid only in online control mode for 2780 RCS to 2780 RCS configurations. Used to signal remote system operator.
DISC (Disconnect)	Transmits a disconnect control message, causing system to go into offline control mode, disconnect the data link, and terminate any pending or active transmit or receive operation. Also releases any DOS datasets.	Valid only in online control mode for 2780 RCS to 2780 RCS configurations.
ENDT (End Transmission) (Applicable to CR11 only)	Transmits ETX (end-of-text) terminator with next card read. System transmits EOT (end-of-transmission) and returns to control mode when the final transmission is acknowledged by the remote station.	Valid in online state only. Card reader must be NOT READY. Used to transmit single card or to transmit last card of deck when EBCDIC transparency is in effect. NOTE In non-transparent operation, transmission can be terminated by punching an ETX code (12-3-9) in column 80 of the last card in the deck. The ETX punch causes the ENDT action to occur automatically. The ENDT command is not required for transmission of DOS-11 files. Instead, the ENDT action is caused by detection of end-of-file for a dataset flagged with a /E switch (see 3.6.1.1).

Table 3-1 (Cont.)
DOS 2780 RCS Commands

Command	Resulting Action	Rules for Use
OFFL (Offline)	Places system in offline control mode (if it is not already), disconnects the data link, terminates any transmit or receive operations, and returns receive dataset specifier to default of LP:. Prepares system to accept Offline List Transfer Commands.	Valid in online state only; however, the user should be aware that data will be lost if issued during a transfer operation.
ONLI/2 ONLI/G (Online)	Places system in online control mode. Enables establishment of data link and prepares for receive and transmit operations. Selects one of two possible record blocking modes for transmit operations.	Valid in control mode only. /2 (or default) = 2780 record blocking format. All transmit records are forced into 80-character card-image records. Records exceeding 80 chars. are truncated and data is lost; records with fewer than 80 chars. are expanded to full size. 2780 record blocking format is necessary for operation with most IBM remote job entry systems. CRl1 transmission always is in /2 format, regardless of ONLI specification. /G = General record blocking format. The system transmits records of variable length up through 132 chars. Records exceeding 132 chars. are transmitted as two or more consecutive transmission records, with no loss of data. This mode is designed for non-conventional RCS operation such as 2780 RCS to 2780 RCS telecommunication.

Table 3-1 (Cont.)
DOS 2780 RCS Commands

Command	Resulting Action	Rules for Use
QUER (Query) (Request System Status)	Prints system status on the console terminal, including: State: OFFline or ONLIne Mode: CONTrol, RECEive, or TRANsmit Transparency Selection: EBCD (EBCDIC) or EXBC (EBCDIC transparency) Device, filename, and extension code for active receive operation or, if in CONT mode, for selected receive operation (LP is default)	Valid at any time. Examples of responses: ONLI RECE EBCD DK :AT2 001 Active online receive operation to disk file AT2, extension 001, in EBCDIC. ONLI CONT EBCD DK :AT2 002 Control mode; next receive operation selected to disk, file AT2, extension 002, in EBCDIC. ONLI CONT EBCD LP : Control mode; next receive operation defaults to line printer in EBCDIC.
TERM (Terminate)	Transmits an EOT control message, causing local and remote system to return to online control mode. Used to abort suspended receive or transmit operations, e.g., to abort following a nonrecoverable error condition.	Valid in online state only. Causes data loss if entered during an active receive or transmit operation.
Transfer Commands	See 3.6.1.	See 3.6.1.1 (Transmit) and 3.6.1.2 (Receive).
Transparency Selection: EBCD (EBCDIC) (default) EXBC (EBCDIC transparency)	Selects transparency or non-transparency for online transmit and receive operations.	Valid in control mode only.

3.6.1 Transfer Command

The Transfer command can be used to perform three functions.

        Offline List (Offline Transmit)

        Online Transmit

        Online Receive

Offline List mode reads cards from the card reader or records from a specified DOS dataset and prints the data on the line printer using ASCII record processing in general record blocking format (see ONLI/G in Table 3-1).

Online transmit and receive modes transfer data to or from the remote facility in the specified transparency, record processing, and record blocking selections.

Online Transmit or Offline List from the card reader can be performed without a transmit Transfer command simply by placing the cards to be transmitted or listed into the reader and pressing the CR11 RESET button.

Received data is listed on the line printer if no receive Transfer command has been entered or if a receive operation has completed and file chain mode has not been specified (see extension code for receive Transfer command (3.6.1.2)).

3.6.1.1 Transfer Command Format for Offline List and Online Transmit

A transmit Transfer command is accepted only under certain circumstances, as described below.

If issued during:	The result is:
Offline Control Online Control	The command is accepted and performed immediately.
Online Receive	The command is accepted immediately and is performed when the current receive operation has completed.
Offline List Online Transmit	The command is rejected, and a C? message is typed.

3-9

Format: RT:<dataset spec(,dataset spec(,dataset spec))

RT = mnemonic for remote terminal

dataset spec = dataset specifier (up to three datasets can
                 be specified) in the form:

                 device:filename.ext[uic]/B/E

                 device=2-character mnemonic for input device

Mnemonic	Device
DC	RC11 Disk
DF	RF11 Disk
DK	RK11 Disk
DP	RP11 Disk
DT	DECtape
MT	Magnetic Tape
PR	High-Speed Paper Tape Reader
SY	System Residence Device (DC, DF, DK, or DP)

                 Restrictions on certain devices are
                 discussed in Section 3.8.

                 If there is more than one device of
                 the same type, a third character may
                 be added to indicate unit number,
                 e.g., MT0, MT1.

                 Default: SY for the first dataset,
                            and the previously used
                            device for the second or
                            third dataset.

filename = filename of up to six alphanumeric
            characters. filename.ext[uic] need
            not be specified for a non-file-
            structured device, e.g., paper tape.

ext =   filename extension code of up to three
            alphanumeric characters

            Default: RJE

[uic] =   optional user identification code in
            the form: [group no.,user no.]

/B =   binary record processing (see 3.7.2)

            /B is not valid for Offline List and
            is ignored if entered.

            Default (absence of /B): ASCII record
            processing (see 3.7.1)

The record processing selection (/B or
no /B) appearing in the first dataset
specifier remains in effect for all of
the datasets in the command; i.e.,
ASCII and binary files cannot be mixed
in one transmission. If /B is
specified, /E has no effect.

NOTE

For transmission of true binary files,
EXBC (transparency) code must be
selected to avoid data errors that
could eventually abort transmission.

/E =   ENDT actions are to be performed when
an EOF is detected. /E is automatic
for the last dataset. /E is ignored
if /B has been specified.

Default (absence of /E): ENDT actions
are not performed on detection of an
EOF unless it is the last dataset.

Examples: RT:<SIGNON/E,PR:,SY:STATUS

File SIGNON (RJE extension assumed) is to be sent from
the system device (SY default); next the file on the
paper tape reader is to be sent; lastly, file STATUS
on the system device (SY specified) is to be sent. All
are processed as ASCII files, and ENDT action is taken
following transmission of the SIGNON file and the
STATUS file.

RT:<PROG1A.LDA/B,PROG1B.LDA,PROG1C.LDA

All three programs are to be transmitted from the
system device (by default) as one contiguous message
block in binary mode (/B).

NOTE

For transmission of true binary files,
EXBC (transparency) code must be
selected to avoid data errors that
could eventually abort transmission.

RT:<DT:JOB1,MT0:JOB2/E,JOB3

File JOB1.RJE from DECtape and file JOB2.RJE from
magnetic tape are to be sent as one contiguous message
transmission. JOB3.RJE is to be sent from the same
tape drive as a separate transmission. All three files
are processed as ASCII files.

3.6.1.2 Transfer Command Format for Online Receive

The receive Transfer command conditions the DOS 2780 RCS for receive operation. Receive activity does not start until the remote terminal is ready to transmit. Because this command prepares for, rather than performs, the receive activity, it can be issued at any time, with the following results.

If issued during:	The result is:
Offline Control Offline List	The system conditions itself for reception, but cannot be selected for receive activity until it is put into the online state. Then it can receive whenever the remote station is ready to send data.
Online Control	The system conditions itself for reception, and can begin receiving whenever the remote terminal is ready to send data. Any previously issued receive Transfer command is cancelled. If a previous command has specified a file device (e.g., disk), the cancelled receive filename cannot be respecified until it has been deleted with PIP.
Online Transmit	The system conditions itself for reception, but cannot begin receiving until the current transmission is complete. Then it can receive whenever the remote terminal is ready to send data.
Online Receive	The system completes the current receive operation before it conditions itself according to the new command. After conditioning, it can receive whenever the remote terminal is ready to send data.

The above information provides the basis for the following hints for use of the receive Transfer command.

1. The receive device can never be changed during a receive operation; i.e., a new receive Transfer command cannot take effect until the current receive operation is complete. For this reason, it is wise to issue a receive Transfer command in offline mode prior to going online, unless the line printer is desired as the default device. Otherwise, as soon as the system goes online, it could begin to receive data before a receive Transfer command could be issued to specify a device other than the line printer. Once online operation has been initiated, it is not necessary to return to the offline state to change the receive device.

2. Since it is not possible to determine what data is about to be received, and therefore direct certain information to certain devices (unless the selective receive option (see /S in the command description) is specified), it is generally the best practice to direct all received data to the same

device using the file chain receive option (see ext in the command description). Later the files can be accessed using PIP or a specialized, user-developed, utility program.

3. A receive Transfer command specification is applicable only to the next received job, unless the file chain receive option is in effect. Any jobs following the first are sent to the line printer by default unless another receive Transfer command is issued.

4. Unless the system is operating in online receive mode, a receive Transfer command takes effect immediately in conditioning the system to the new specifications. thus negating any previous commands; i.e., no matter how many commands are made to the system, only the most recent command is valid when the receive operation commences. (NOTE: A cancelled receive filename cannot be respecified on the same device until it has been deleted with PIP.)

Format: dataset spec<RT:

RT = mnemonic for remote terminal

dataset spec = dataset specifier (only one dataset can be specified) in the form:

device:filename.ext[uic]/B/S

device = 2-character mnemonic for receive device

Mnemonic	Device
DC	RC11 Disk
DF	RF11 Disk
DK	RK11 Disk
DT	DECtape
LP	Line Printer
MT	Magnetic Tape
SY	System Residence Device (DC, DF, or DK)

See Section 3.8 for restrictions on certain devices.

If there is more than one device of the same type, a third character may be added, e.g., DT0, DT1.

Default: SY

Default if no receive Transfer command is entered: LP. If LP is the receive device by default or specification, the system closes any existing write files and delivers receive records to the line printer.

filename = filename of up to six alphanumeric
characters

ext = filename extension code of up to
three alphanumeric characters or a
single * to specify file chain
receive mode. (1)

Default: RJE

[uic] = Optional user identification code
in the form: [group no. user no.]

/B = binary record processing (see
3.7.2)

Default (absence of /B): ASCII
record processing (see 3.7.1)

/S = selective receive option is in
effect, whereby only those records
that are directed to the 2780 punch
device are written to the device
specified in the command. All
other records (e.g., "job accept"
and "system status" messages) are
sent to the line printer.

Default (or /N): Selective receive
option is not in effect.

Examples: MT: ILE04<RT:

The first file received is put on magnetic tape unit 0
as FILE04.RJE. Any files following that go to the line
printer until a new receive Transfer command is
specified.

MT:FILE02.*<RT:

A dataset named FILE02.000 is established on magnetic
tape unit 0 for the first file. When an EOT is
received, the first dataset is closed and a second is
established as FILE02.001. The extension code is
incremented by one for each file that is received.

----
(1)In file chain receive mode, an initial file is established as
filename.000. As each reception completes, the current file is closed
and a new file is established with the extension code incremented by
one. When 1000 files have been written (extension code 999 has been
used), the system reports the condition with a W366 000001 message
(see Table 3-2) and prepares to deliver subsequent received data to
the line printer until a new receive Transfer command is issued. File
chain receive mode can be cancelled at any time by issuing another
receive Transfer command.

FILE06.*/S<RT:

Several files directed to the 2780 punch are expected.
All such files are to be written to the system device
(default device) with filename FILE06.nnn (000 for the
first, 001 for the second, etc.). Any records without
an ESC 4 sequence are sent to the line printer.

FILE06/S<RT:

One file (designated by an ESC 4 record identification
sequence) is intended for the system device. Any other
files are sent to the line printer.

FILE.LDA/B<RT:

The next dataset to be received is to be processed in
binary record format. This condition occurs in 2780
RCS to 2780 RCS operation. The transmitting station
operator should call the receiving station and advise
the operator that a binary load module is about to be
transmitted. The receiving station operator then
enters a receive Transfer command with /B designated,
as above. The transmitting station operator selects
EXBC (transparency), goes online, establishes a data
connection, and specifies a transmit Transfer command
with /B.

3.7   TRANSMIT/RECEIVE RECORD PROCESSING

As indicated in the Transfer command descriptions, there are two types
of record processing: ASCII (by default) and binary (by specification
of the /B parameter).

In online mode, datasets can be read as ASCII or binary records, as
specified in the Transfer command (see /B parameter). The transfer
format can be 2780 record blocking (ONLI/2) or general record blocking
(ONLI/G).

In Offline List mode, datasets are read in general record ASCII format
and are listed on the line printer.

3.7.1 ASCII Record Processing

ASCII record processing is appropriate for any datasets containing
only 7-bit ASCII data. Thus, it should be used when transmitting or
receiving datasets generated by DOS-11 EDIT, PIP, or a user program
that writes ASCII datasets.

When ASCII record processing is specified, data is translated to the
selected transmission code for actual transmission. Received data is
translated into ASCII from the selected transmission code.

3.7.2 Binary Record Processing

Binary record processing is provided for the transfer of datasets
containing data other than ASCII. It should be specified when
transferring datasets generated by MACRO or a user program that writes
binary datasets.

When binary record processing is specified, data is transmitted and/or
received in native mode (i.e., is not translated). The transparency
selection (EBCD, or EXBC for transparency) defines the code to be
used. Transmission block size is 80 bytes (/2 mode) or 131 bytes (/G
mode), except for the last block, which is of variable length (1 <
block size < 80 or 131).

<u>NOTE</u>

EXBC (for EBCDIC transparency) must be
selected for transmission of true binary
data such as a PDP-11 load module.

3.8 SPECIAL DEVICE CONSIDERATIONS AND RESTRICTIONS

Some devices having restrictions or special considerations that must
be observed when running with the DOS 2780 RCS are discussed in the
following paragraphs.

3.8.1 DECtape Restriction

Because of the tape movement required to examine and update the
directory block, and position to the next available data block,
DECtape should not be used for file chain receive operations (see
3.6.1.2, extension code *). During this tape positioning time
interval, DOS locks out the COMTEX-11 2780 Emulator Application
Program, leading to buffer overruns resulting from repeated selection
attempts by the remote station.

3.8.2 High-Speed Paper Tape Punch Restriction

The high-speed paper tape punch is not supported because the motor
startup delay consistently results in acknowledge timeouts and aborted
transmission. Specification of device code PP causes a syntax error
(S?) and rejection of the Transfer command.

3.8.3 LS11 Line Printer Restriction

Because of its slow speed, the LS11 Line Printer should be used in
offline mode to print datasets that have already been received on
another device.

3.8.4 Magnetic Tape Restriction

A single magnetic tape unit cannot be used concurrently for transmit and receive operations.

3.9 ERROR AND EXCEPTIONAL CONDITION HANDLING

Most error and exceptional conditions detected by the DOS 2780 RCS are reported through the DOS Error Report facility. DOS 2780 RCS operation resumes after the message is reported, except for Axxx and Fxxx messages. Table 3-2 describes the possible error messages.

Table 3-2

DOS 2780 RCS Error Messages

Type Code	Additional Information	Meaning
C?		Command illegal for circumstances has been typed and ignored. Possible invalid conditions are listed below. ● ONLI typed when not in control mode. ● OFFL typed when in offline state. ● Transparency selection made when not in control mode. ● ENDT typed when card reader not in NOT READY state. ● TERM typed when not in online state. ● DISC typed when not in online state. ● Transmit Transfer command issued while another transfer operation is in effect.
S?		Command illegal in syntax has been typed and ignored, e.g., colon omitted after device mnemonic, illegal device mnemonic, left arrow omitted, etc.
A360	nnn001 nnn=000 = UIB overflow nnn≠000 = SIB overflow	SIB or UIB buffer overflow. Type Continue to resume system control operation. (This condition usually occurs when a device is powered up or connected to the system.)
F370	nnn003	Fatal LINIT error indicating a bad load module or hardware malfunction. (nnn is a LINIT error code of no significance to the operator.)
F370	000002	Illegal UIB entry line number or illegal UIB type code indicating a bad load module or hardware malfunction.
W360	nnnnnn	Receive operation complete: A file consisting of nnnnnn octal records has been received. 000000 prints out if a file is closed before any data has been received.

Table 3-2 (Cont.)
DOS 2780 RCS Error Messages

Type Code	Additional Information	Meaning
W361*	000000	Receive operation active: a message without a legal starting character has been received. If the system remains in receive mode, but no receive activity is observed, the operator can type TERM to reset the system to control mode. Receive activity should then resume.
W361	000001	BELL code has been received.
W362*	000000	Receive operation active: A message without a legal termination character has been received. The receive operation should continue.
W363	000000 = bid message 00000n = data message, where n identifies active dataset (i.e., 1, 2, or 3)	Transmit operation has been aborted after eight consecutive attempts to transmit a message have failed, or after an illegal response to the transmit bid has been received. The system returns to online control mode.
W364	000000 = Data has not yet been transmitted. 00000n = Identifies data-set active in transmis-sion (n = 1, 2, or 3)	Transmission has been terminated by the remote site; i.e., RVI (reverse interrupt) response to message transmission has been received. The system returns to control mode and can be prepared to receive.

* Frequent W361 000000 or W362 errors indicate a marginal or faulty dataset, phone line, or communication interface operation. The DOS 2780 RCS maintains a binary count of Receive Block Check errors that have occurred since program load or restart. This count is maintained in location 30700 (octal), and may be examined in offline control mode by using the MODIFY command (see the DOS/BATCH Monitor Programmer's Manual, DEC-11-OMPMA-A-D).

Table 3-2 (Cont.)

DOS 2780 RCS Error Messages

Type Code	Additional Information	Meaning
W365	000000	Online receive operation active: Dataset or line printer has become not ready (EOF or EOM); e.g., disk is full. System aborts receive operation and defaults to line printer for subsequent receive operations (until a new receive Transfer command is issued). OR Offline List operation active: Line printer became not ready. System waits for line printer to become ready. When the printer is ready again, the last three cards read should be replaced in the hopper and read again. For other devices, the whole file should be reprinted.
W366	000000 = initial preparation (i.e., file already exists) 000001 = during receive file chain (i.e., 1000 files have been generated)	Receive transfer preparation: Dataset cannot be prepared (INIT or OPEN) for write. System defaults to line printer for subsequent receive operations (until a new receive Transfer command is issued).
W367		Transmit operation active: Dataset or card reader became not ready before the end-of-file was detected. If the problem is with the modem, either put the device into a ready state or type TERM to abort the transmission. If the problem is with the card reader, the card being read when the condition occurred must be reread when the reader becomes ready. If the last card contains an ETX punch, end-of-file is assumed, and the system performs the ENDT function. no message is reported.
W370	000000 = modem not ready 00000n = dataset at fault (n = 1, 2, or 3)	Online transmit transfer preparation: Transmission cannot be initiated because the modem is not in data mode, or the dataset cannot be prepared for a read (INIT or OPEN); e.g., the specified file does not exist. OR Offline List: Dataset cannot be prepared for read (e.g., the specified file does not exist), or line printer is not ready.

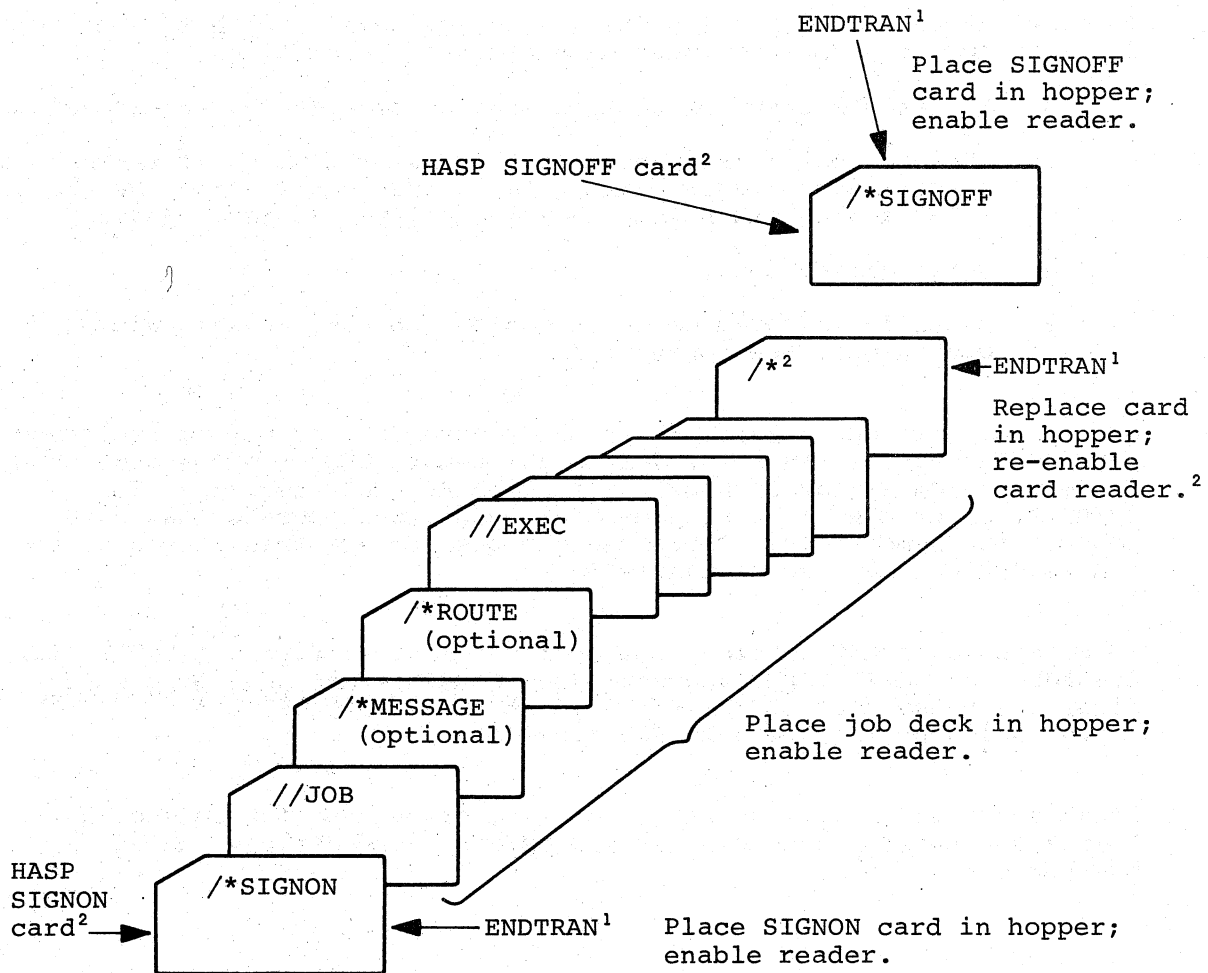# APPENDIX A

SAMPLE ONLINE RJE SESSION

To initiate an online RJE (remote job entry) session with the core or
DOS 2780 RCS, the operator must make certain preparations.

- Select the appropriate transmission code (EBCDIC is default).

- (For DOS only) Issue a receive Transfer command if there is a
  possibility of data waiting to be transmitted from the CPU to
  a DOS device other than the line printer (default device).

- Enter online mode.

- Establish a modem data connection (point-to-point switched
  operation). See Appendix I.

Before jobs can be transmitted to the remote CPU, or before processed
job results can be transmitted from the remote CPU, the operator must
perform a SIGNON (for OS/HASP) or an RJSTART LOGON sequence (for
OS/RJE). After a successful SIGNON or LOGON, the operator can enter
jobs to the remote CPU. Processed job results are transmitted by the
remote CPU as they become available.

To terminate an RJE session, the operator must perform a SIGNOFF (for
OS/HASP) or LOGOFF RJEND sequence (for OS/RJE). Any jobs processed
after the SIGNOFF or LOGOFF are held by the remote CPU for
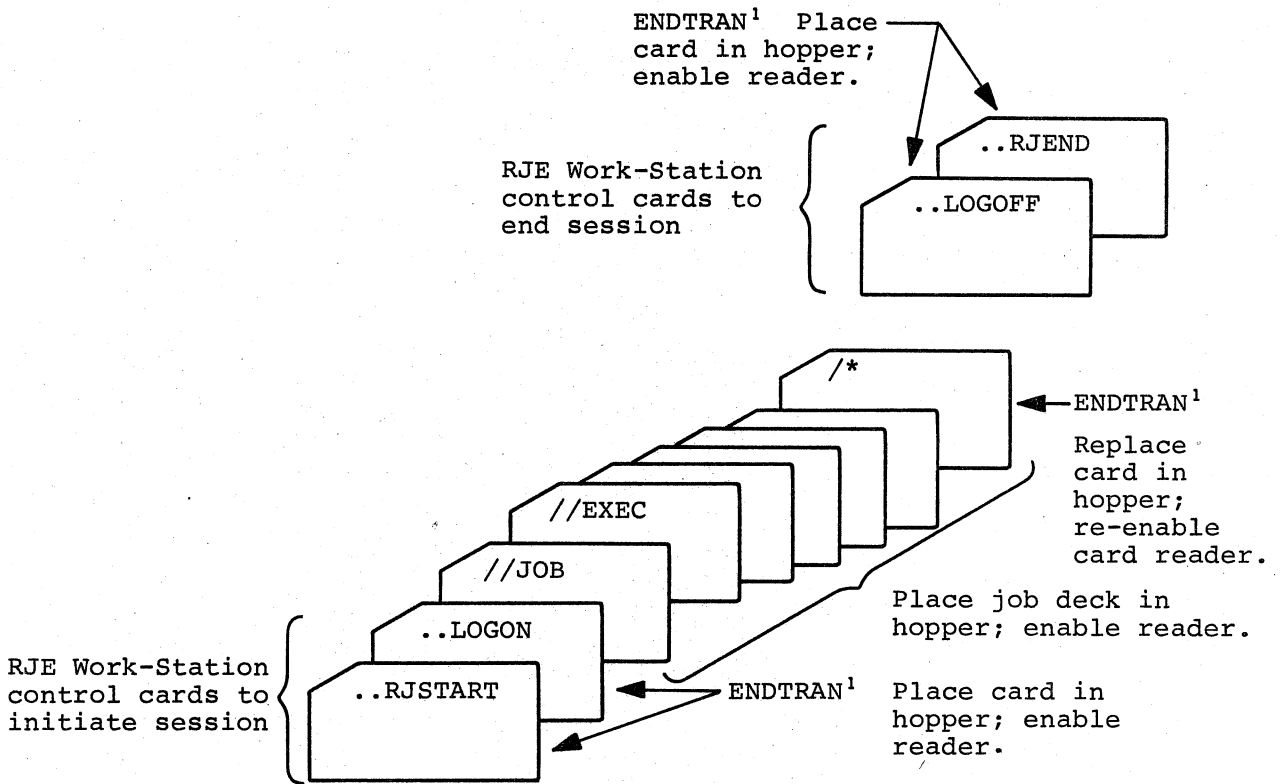transmission during the next RJE session.

Figures A-1 and A-2 illustrate the basic procedures for conducting an
online RJE session with OS/HASP and OS/RJE, respectively, using
punched cards.

ENDTRAN[1]

Place SIGNOFF
card in hopper;
enable reader.

HASP SIGNOFF card[2]

/*SIGNOFF

/*[2]

ENDTRAN[1]

Replace card
in hopper;
re-enable
card reader.[2]

//EXEC

/*ROUTE
(optional)

/*MESSAGE
(optional)

Place job deck in hopper;
enable reader.

//JOB

HASP
SIGNON
card[2]

/*SIGNON

ENDTRAN[1]   Place SIGNON card in hopper;
enable reader.

[1]Command valid only when card reader is NOT READY.

[2]When operating in non-transparent mode, the card can be coded
with an ETX (12,9,3 punch) in column 80 to eliminate the need
for the ENDTRAN command.

Figure A-1   Card Deck for OS/HASP RJE Session
(Core or DOS 2780 RCS)

ENDTRAN[1] Place
card in hopper;
enable reader.

RJE Work-Station
control cards to
end session

..RJEND

..LOGOFF

/*

ENDTRAN[1]

Replace
card in
hopper;
re-enable
card reader.

//EXEC

//JOB

..LOGON

Place job deck in
hopper; enable reader.

RJE Work-Station
control cards to
initiate session

..RJSTART

ENDTRAN[1] Place card in
hopper; enable
reader.

[1]The ENDTRAN mode switch is valid only when the reader is NOT READY.

NOTE: OS/RJE requires EBCDIC transparent mode (EXBC) operation.

Figure A-2   Card Deck for OS/RJE Session
            (Core or DOS 2780 RCS)

APPENDIX B

END-TO-END CONTROL CHARACTERS

The 2780 RCS supports all four end-to-end control characters defined for standard 2780 Model 1 terminals: EM, ESC, ESC HT, and BEL. All 2780 RCS (except core) support the punch selection sequence (ESC,4), normally associated with 2780 Model 2 terminals, in conjunction with the selective receive feature.

EM (End of Media)

ATTENTION: Check with your central site system programmer to see whether EM is supported by your remote CPU.

The EM control character (11-1-8-9 punch) can be punched following the last data column in the card to indicate a short record when transmitting in non-transparent mode.   (The EM code is ignored, and all 80 columns are transmitted in transparent text mode.)

The 2780 RCS detects the EM code and processes the preceding data as an intermediate block record (ITB) or end block record (ETB). The EM code is not included in the transmission record.

EM codes embedded in receive records are ignored.

ESC (Escape) - Printer Vertical Format Control

The ESC character and the following character are usually the first characters in each print record received by the 2780 RCS.   The 2-character combination provides printer vertical format control for data printing.   A default single space print operation is performed if no vertical format escape sequence is detected.

The 2-character ESC sequence provides carriage skipping information, which is performed via programmed instructions after all of the data following the ESC sequence is printed.   Double space, triple space, or skip operations are effective only for the record containing the associated ESC sequence.

The 2780 RCS interprets the following EBCDIC ESC codes:

ESC /	Single space
ESC S	Double space
ESC T	Triple space
ESC A	Skip to Channel 1 (head of form)
ESC B	Skip to Channel 2 (line 8)
ESC C	Skip to Channel 3 (line 16)
ESC D	Skip to Channel 4 (line 24)
ESC E	Skip to Channel 5 (line 32)
ESC F	Skip to Channel 6 (line 40)
ESC G	Skip to Channel 7 (line 48)
ESC H	Skip to Channel 8 (line 56)

ESC HT - Printer Horizontal Format Control

The 2-character sequence ESC HT at the beginning of a record signifies that the remainder of the record is a printer horizontal format control record. Subsequent HT characters encountered within the record cause the 2780 RCS to preset programmed tab stops to control horizontal formatting of subsequent records until a new horizontal format control record is detected.

The 2780 RCS utilizes default tab stop settings of 8-space intervals when operating with a remote CPU that does not use the printer horizontal format control record feature.

BEL - Terminal-to-Terminal Alarm Code

A BEL alarm code can be sent to a remote terminal (not remote CPU) when the 2780 RCS is in online control mode.

A BEL code received while in online control mode results in an audible signal on the console terminal.

APPENDIX C

PROGRAM LOADING PROCEDURES

The loading procedures formerly contained in Appendix C now
are included in a new manual, COMTEX-11 Program Loading
Procedures, Order No. DEC-11-CPLPA-A-D.

APPENDIX D

PROCESSOR OPERATING PROCEDURES

D.1 PDP-11 PROCESSOR

The operator uses the PDP-11 processor to load and start the core 2780 RCS program as described in the <u>COMTEX-11 Program Loading Procedures</u> manual. The following paragraphs describe the function of each indicator and switch on the processor panel illustrated in Figure D-1.
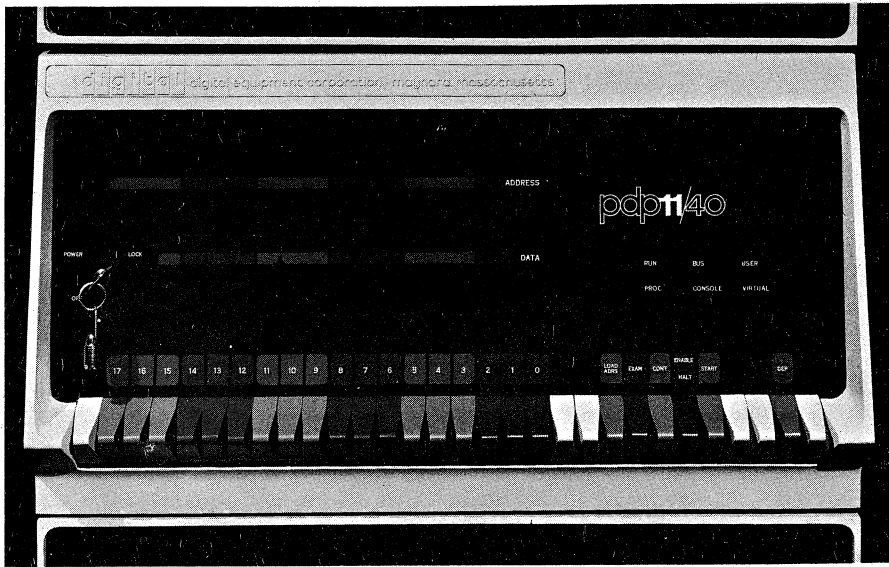
Figure D-1 The PDP-11 Processor Panel

D.1.1 Power Control Switch

The power control switch for the PDP-11 processor is a three-position switch located in the lower left-hand corner of the panel, and is operated by a key inserted into the switch.
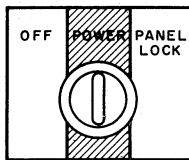
OFF	When the switch is turned to OFF, all power is removed from the processor.
POWER	When the switch is turned to POWER, primary power is applied to the processor.
PANEL LOCK	When the switch is turned to PANEL LOCK, primary power is applied to the processor, and the console control switches are disabled. (The key may be removed in this position.)

D.1.2 ADDRESS REGISTER and DATA Indicators

The ADDRESS REGISTER and DATA indicators lie in the upper-left corner
of the panel. During normal operations, the ADDRESS REGISTER displays
the address of a location in the processor's memory and the DATA
indicator displays the contents of that location.

ADDRESS REGISTER

○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

DATA

○ ○ ○ ○ ○ ○ ○ ○ | ○ ○ ○ ○ ○ ○ ○ ○
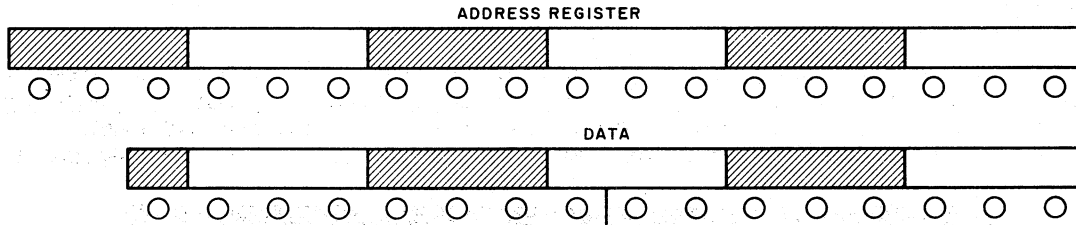
The ADDRESS REGISTER consists of a row of 18 lights divided into six
groups of three lights each. Each light position represents a binary
digit in an 18-bit word address. When a light is lit, it represents
the binary number 1; when a light is off, it represents the binary
number 0.

The DATA indicator consists of a row of 16 lights divided into six
sections, five sections containing three lights, and one section
containing only one light. Each light represents a binary digit:
lit=1, off=0.

The ADDRESS REGISTER and DATA indicators are subdivided into groups of
three digits so that the binary numbers they represent may be easily
read as octal numbers. Octal notation is more compact than binary
notation because a group of three binary digits corresponds to one
octal digit. As an example, suppose the ADDRESS REGISTER contains the
pattern of lights illustrated below:

● ● ○ ○ ○ ○ ● ○ ○ ● ● ● ● ● ● ● ● ●
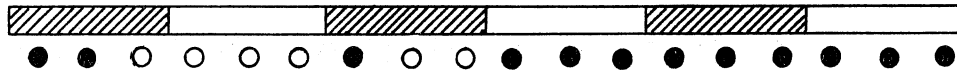
This pattern represents the binary number 001 111 011 000 000
000 (binary). If the binary number is divided into groups of three
digits, the equivalent octal value of each group would produce the
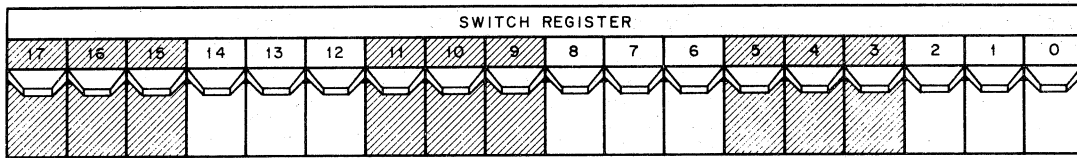octal number 173000.

$$001 \quad 111 \quad 011 \quad 000 \quad 000 \quad 000 \quad \text{binary}$$
$$1 \quad\;\; 7 \quad\;\; 3 \quad\;\; 0 \quad\;\; 0 \quad\;\; 0 \quad\;\; \text{octal}$$

This number is the address of the paper tape ROM for loading the
absolute loader.

D.1.3 SWITCH REGISTER

There are 18 key-type switches on most PDP-11 processors, and they are
located in the lower portion of the panel. They are used to manually
load an address or word of data into the processor's memory. Each

switch represents a binary digit. A switch in the up or "on" position represents the binary number 1; in the down or "off" position it represents the binary number 0.

```
┌────────────────────────────── SWITCH REGISTER ──────────────────────────────┐
│ 17 │ 16 │ 15 │ 14 │ 13 │ 12 │ 11 │ 10 │ 9 │ 8 │ 7 │ 6 │ 5 │ 4 │ 3 │ 2 │ 1 │ 0 │
└──────────────────────────────────────────────────────────────────────────────┘
```

If the positions of the switches in the SWITCH REGISTER represent the address of a location in memory, the address may be loaded into the processor's address register in memory by pressing the LOAD ADDRess switch (see D.1.4).

If the positions of the switches in the SWITCH REGISTER represent a word of data, the word may be deposited in the memory location whose address appears in the ADDRESS REGISTER indicator by pressing the DEPosit switch (see D.1.4).

The switch positions are selected on the basis of the binary or octal value assigned to the address or word of data that the operator wishes to load or deposit. For example, the address of the absolute loader for an 8K word size machine is 037500(octal). The illustration below shows the correspondence between the switch positions and the binary and octal representation.

switch position	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	DN	DN	DN	DN	UP	UP	UP	UP	UP	UP	DN	UP	DN	DN	DN	DN	DN	DN
binary value	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0

octal value	0	3	7	5	0	0

D.1.4   Manual Control Switches

The operator uses the manual control switches located just to the right of the SWITCH REGISTER to request the processor to perform specific operations. The most commonly-used switches are described in Table D-1.

```
┌──────┬──────┬──────┬────────┬────────┬───────┐   ┌──────┐
│ LOAD │ EXAM │ CONT │ ENABLE │ S-INST │ START │   │ DEP  │
│      │      │      │  HALT  │ S-CYCL │       │   │      │
└──────┴──────┴──────┴────────┴────────┴───────┘   └──────┘
```
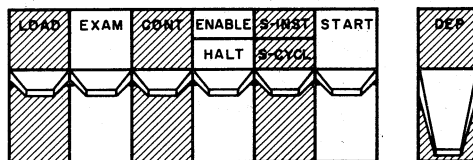
Table D-1
Processor Control Switches

Switch	Action	Use
LOAD	When the switch is pressed, the processor transfers the value represented in the SWITCH REGISTER to the processor's address register in memory. The processor displays the value of the address register in the ADDRESS REGISTER indicator on the panel.	The LOAD operation provides an address for the EXAM, DEPosit, and START functions.
EXAM	When the switch is pressed, the processor displays the contents of the processor's address register in the DATA indicator. The location of the data displayed is in the ADDRESS REGISTER indicator.	This switch may be used to examine the contents of a location in which data was just deposited. If the EXAM switch is pressed two or more times consecutively, the address register will be incremented sequentially. The operator may, therefore, examine sequential memory locations if no other switches are used between successive EXAM operations.
CONT	When the switch is pressed, the processor continues operations from the point at which it was stopped.	The ENABLE/HALT switch must be in the ENABLE position to continue processor operations under program control. If a program stops, this switch allows the operator to restart the program without clearing the processor.
ENABLE/HALT	When the switch is in the HALT position, it allows the operator to control processor operations using the control switches on the panel. When it is in the ENABLE position, the processor is allowed to run under program control.	The switch must be in the ENABLE position for continuous processor operation under program control. HALT is used to interrupt program control or clear the system.

Switch	Action	Use
START	If the ENABLE/HALT switch is in the ENABLE position and this switch is pressed, the processor clears its registers and begins operating under program control. If ENABLE/HALT is on HALT when this switch is pressed, the system is cleared but the processor does not start.	A LOAD operation provides the starting address for START.
DEP	When the operator presses this switch, the processor transfers the contents of the SWITCH REGISTER into the processor's memory in the location specified by the processor's internal address register. The deposited word will appear in the DATA indicator and the address of the word will appear in the ADDRESS REGISTER indicator.	This switch allows the operator to change the contents of memory or enter a starting address for program execution.

D.1.5 State Indicator Lights

STATE INDICATOR LIGHTS

RUN   BUS   FETCH EXEC

SOURCE DESTINATION   ADDRESS
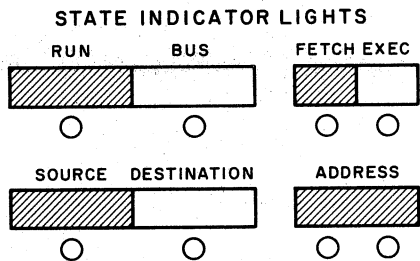
The state indicator lights in the upper right-hand portion of the panel flicker on and off during normal operations. When the ENABLE/HALT switch is in the ENABLE position, and the processor has been STARTed, the RUN light should appear to be on constantly.

APPENDIX E

CONSOLE OPERATING PROCEDURES

E.1 ASR-33 TELETYPE

The ASR-33 Teletype serves as the primary device for communication
between the operator and the system. The Teletype console includes a
printer for output from the system, a keyboard for operator input, and
a low-speed paper tape reader/punch. Figure E-1 shows the Teletype
console.

Figure E-1 Teletype Console

E.1.1 Power Control Knob

The power control knob is located on the right front of the Teletype
console, and is activated by turning the knob to the right or left.
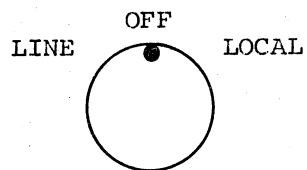
OFF   The Teletype does not have primary
         power.

LOCAL   The Teletype has primary power and any
         of the console elements may be used
         off-line under operator control.

LINE   The Teletype has primary power and is
         connected to the computer as an on-line
         I/O device.

E.1.2 Keyboard

The Teletype keyboard is similar to a typewriter keyboard in that the positions of upper-case alphabetic and numeric keys on a Teletype are identical to their positions on a typewriter.   Some common alphanumeric characters are also located on the shift register of the keyboard.   Special functions interpreted by the program during on-line operations are located on the upper portion of some keys and are transmitted as input by holding down the CTRL key while typing the desired key.

The standard Teletype keyboard is illustrated in Figure E-2.
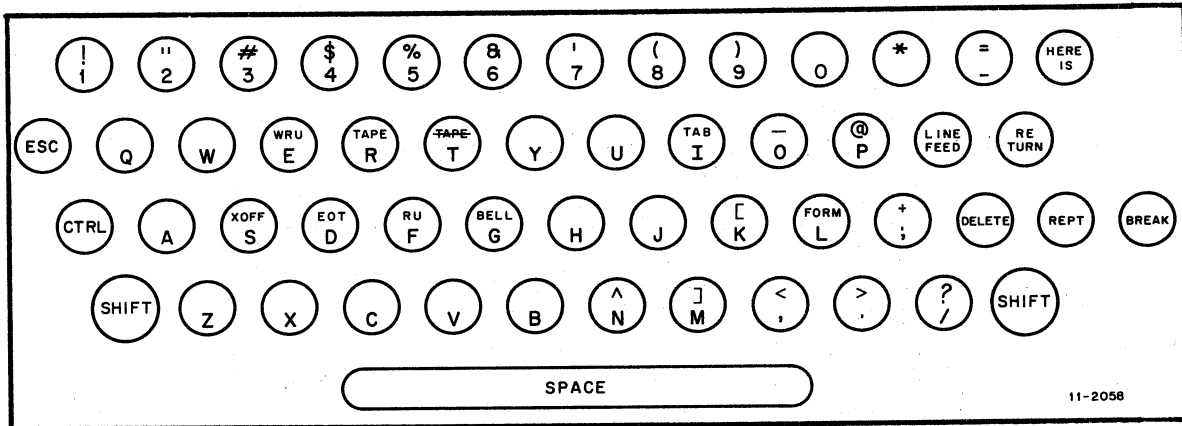
Figure E-2   Teletype Keyboard

Shift K prints as left square bracket ([).

Shift M prints as right square bracket (]).

Some Teletype keyboards may have different characters on a few of the keys.   Some differences may be:

- The ESC key may be labelled ALT MODE.

- Shift N (^) may be represented as an up-arrow (↑).

- Shift O (_) may be represented as a back-arrow (←).

- The DELETE key may be labelled RUBOUT.

E.1.3 Low-speed Paper Tape Reader

The paper tape reader controls are on the left side of the console
just below the paper tape punch control. The operator may use the
paper tape generated by the punch to input data through the Teletype
via the low-speed paper tape reader.

START	START	Activates the reader; the paper tape is read and input at a rate of 10 characters per second.
STOP	STOP	The reader is not activated.
FREE	FREE	The reader is not activated and the reader sprocket wheel is disengaged for loading.

The following steps describe the procedure for loading and starting
the low-speed paper tape reader.

STEP	PROCEDURE
1	Raise the tape retainer cover by releasing the catch on the right of the sprocket wheel.
2	Set the reader control to FREE.
3	Position the leader portion of the tape by placing the sprocket holes on the sprocket wheel. The line of sprocket holes should be to the left of the center of the paper tape.
4	Close the tape retainer cover. Pull the tape toward the front of the console to see that it moves freely.
5	Set the reader control to START.

E.2 LA30 DECWRITER

The LA30 DECwriter is a dot matrix impact printer and keyboard for use as a hard copy I/O terminal. It is capable of printing a set of 64 ASCII characters at a speed of up to 30 characters/second on continuous forms. Data entry and system control is accomplished from the keyboard, which is capable of generating either 97 or 128 characters.

The DECwriter is available in two models: the LA30S for serial operation and the LA30P for parallel operation.

E.2.1 Controls and Indicators

Controls and indicators for the LA30S are listed in Table E-1. The parallel version (LA30P) has only the READY lamp and the LOCAL LINE FEED switch.

Table E-1
LA30 Controls and Indicators

Control/Indicator	Function
READY	Lamp - Indicates power up on printer electronics and that the DECwriter is ready for use.
LOCAL LINE FEED	When depressed, causes a local line feed to be applied to the printer without a code being sent to the computer. This control will also disrupt printing, but no characters will be lost.
MODE/LOCAL/LINE	2-position switch - Selects either local or online operation.
BAUD RATE 110,150,300	3-position switch - Selects the baud rate clock frequencies for 110, 150, and 300 baud.
MOTOR POWER	Applies power to printer stepping motor electronics.
AC POWER	Applies AC current to the unit power supply.

E.2.2 Loading Paper

The following steps describe the procedure for loading paper.

STEP	PROCEDURE
1	Turn off AC power.
2	Open the cover of the DECwriter by pulling up on both sides of the front.
3	Raise the cam lever located on the left-hand side of the print bar assembly until it disengages and slide the assembly back.
4	Feed the paper from its box on the floor under the DECwriter up through the opening in the bottom of the base casting. Pull the fresh supply into the machine and discard any remnants of the old supply.
5	Make certain that the paper is feeding straight and re-engage the paper with its sprocket tractor pins.
6	Pull the assembly forward and re-engage it by pressing the cam lever down until it locks in place on its retainer stud. Adjust tractor width, using vernier knob. Tractor pins should not elongate holes in paper.
7	Advance the paper by rolling the knobs.
8	Feed end of paper through the smaller hole in the cover and close the cover, latching both ball studs to the base assembly.
9	Turn on AC power.

E.2.3 Changing the Ribbon

The steps below outline the procedure for changing the ribbon, which under normal operating conditions should be done every ten hours of continuous printing.

NOTE

Ribbons left in service for more than
16 hours of continuous printing may
function poorly with possible damage
to print head.

STEP	PROCEDURE
1	Wait until the present reel has completely emptied and is ready to reverse.
2	Turn off AC power.
3	Open lid and raise the cam lever on the left-hand side of the print bar assembly until it disengages. Slide the assembly back.
4	Remove ribbon from the idler rollers, the print head, and the direction-reversing sense arms.
5	Snap both reels off of their motor shafts, run the ribbon off of the most empty reel, and discard the full reel of ribbon.
6	Secure a new reel of ribbon and reel off approximately one foot. If the ribbon is not equipped with a hook at its end, skewer the ribbon on the arrow-shaped piece on the take-up reel.
7	Wrap the ribbon on the take-up reel beyond the direction-reversing rivet. NOTE If the rivet is not between the reel and the sensing arm, the ribbon will not reverse.
8	Snap both reels on their motor shafts and thread the ribbon through the sensing arms and over the idler rollers and printhead assembly.
9	Replace the printhead assembly, lower the lid, and turn on the AC power.

APPENDIX F

INPUT DEVICE OPERATING PROCEDURES

F.1 HIGH-SPEED PAPER TAPE READER

Input from the high-speed paper tape reader, pictured in Figure F-1, is under program control. The program reads data photoelectrically from 8-channel fan-folded, non-oiled perforated paper tape at a maximum rate of 300 characters per second. The reader panel consists of two paper tape bins, a reader station, and operator controls. The paper tape moves from the right bin across the reader station into the left bin.
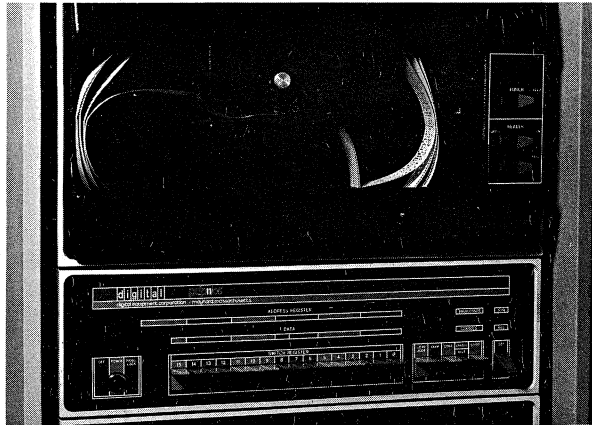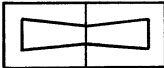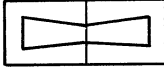
Figure F-1 High-Speed Paper Tape Reader/Punch (PC11)

The following paragraphs describe the controls and tape loading procedure for the reader.

F.1.1 Power Controls

Primary power to the paper tape reader is supplied when the processor power switch is on. The online and offline controls are located to the right of the tape bins on the reader panel.

OFF   The reader is offline. Read operations cannot occur.

On   The reader is online and read operations may occur under program control.

FEED   The operator may press this switch momentarily to feed tape through the reading station during the loading operation. The switch is operable when the reader is online or offline, but data will not be read when it is pressed.

F.1.2 Loading the Paper Tape Reader

The following steps describe the procedure for loading the reader.

STEP	PROCEDURE
1	Raise the tape retainer cover by turning the retainer switch (located above the read station) clockwise.
2	Put the tape in the right-hand bin and insert the leader portion of the tape between the tape retainer plate and the sprocket wheel. Channel 1 of the tape should be toward the inside wall of the bin, with the printed side of the tape up.
3	Ensure that the feed holes on the tape are firmly engaged in the teeth of the sprocket wheel. Close the tape retainer cover by turning the retainer switch counter-clockwise.
4.	Depress the FEED button until enough leader tape has passed over the reader station to ensure that the tape moves freely into the left-hand bin.
5	Check to see that the reader is online.

CAUTION

Oiled paper tape should not be used in
the high-speed reader because the oil
collects dust and dirt which will impair
reader operation.

F.2 TC11 DECTAPE DRIVE

Figure F-2 pictures the TC11 DECtape drive unit. Table F-1 shows the meaning of each indicator lamp and the function of each switch.
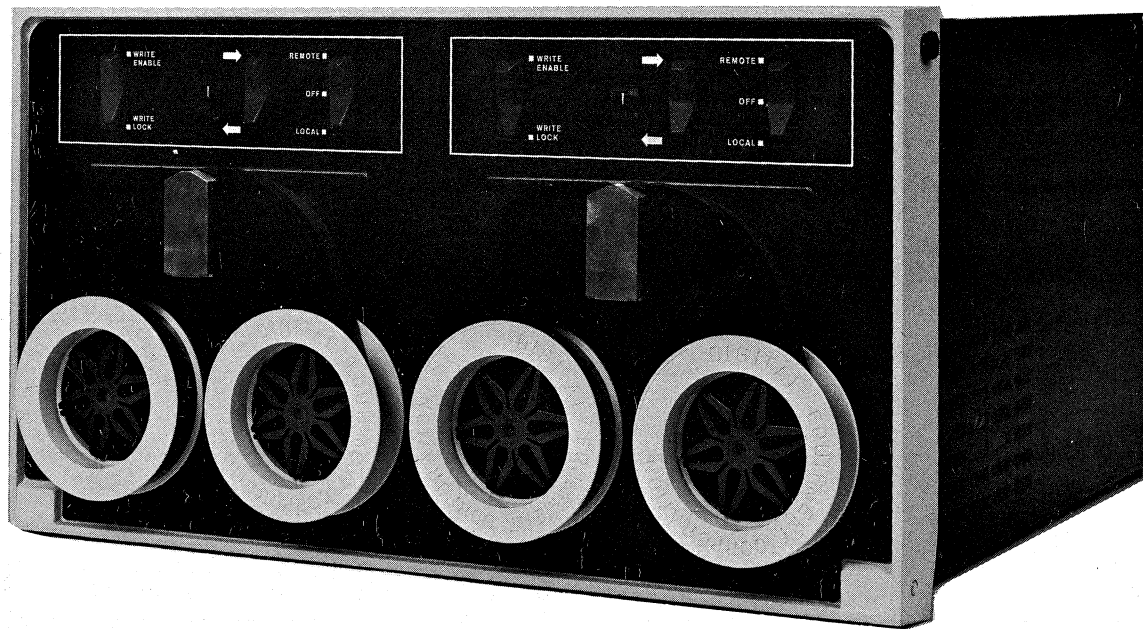
Figure F-2 TC11 DECtape Drive

Table F-1
DECtape Drive Indicators and Switches Function

Mode Selection Switch	Function
REMOTE	Provides primary power to the drive unit and places the unit under program control.
OFF	Turns off primary power to the unit.
LOCAL	Places unit under operator control.
REMOTE SELECT Indicator	Lights when the unit is selected by a program.
Unit Selector Switch	Determines the unit number (0-7) for this unit. Operator may change unit number by turning selector knob; unit number appears in window.
Direction Selector Forward (→) Rewind (←)	When the unit is in LOCAL operation, pressing this switch rewinds the tape or runs it fast forward.
WRITE ENABLE/ WRITE LOCK Selector Switch	Placing this switch in the WRITE ENABLE position allows the program to perform write operations on the unit. Placing this switch in the WRITE LOCK position disallows write operations on the unit.
WRITE Indicator	This indicator lights when the WRITE ENABLE/WRITE LOCK selector switch is in the WRITE ENABLE position.

F.2.1 Mounting a DECtape

To mount a DECtape on the TC11:

1. Move the LOCAL/REMOTE/OFF switch to the OFF position.

2. Mount a DECtape by centering it over the left-hand hub and pushing it firmly onto the spring loaded hub.

3. Wind sufficient tape to wrap around the recording head guides and the empty DECtape reel which should be mounted on the right-hand hub.

4. Take up a few inches of tape on the right-hand hub by hand.

5. Move the LOCAL/REMOTE/OFF switch to LOCAL position.

6. Depress the DECtape motion switch in the fast forward (→) position until about 6 feet of tape is on the right-hand hub.

7. Depress the WRITE PROTECT switch or WRITE ENABLE as appropriate.

8. Assure that the unit number showing for this drive does not show on any other drive.

9. Move the LOCAL/OFF/REMOTE switch to the REMOTE position.

F.2.2 Dismounting a DECtape

To dismount a DECtape from the TC11:

1. Move the LOCAL/OFF/REMOTE switch to the LOCAL position.

2. Depress the tape motion switch in the rewind direction (←) until all the tape is on the left-hand reel.

3. Move LOCAL/OFF/REMOTE switch to OFF position.

4. Pull the DECtape reel from the left-hand hub.

F.3 TU10 MAGNETIC TAPE DRIVE

The TU10 is a magnetic tape drive which may be a 7- or 9-track unit
and which will record data in densities of 200, 556, or 800 bits per
inch.

Figure F-3 shows the magnetic tape drive control panel and its
schematic representation. Table F-2 shows the meaning assigned to
each indicator light and Table F-3 explains the function of each
switch.
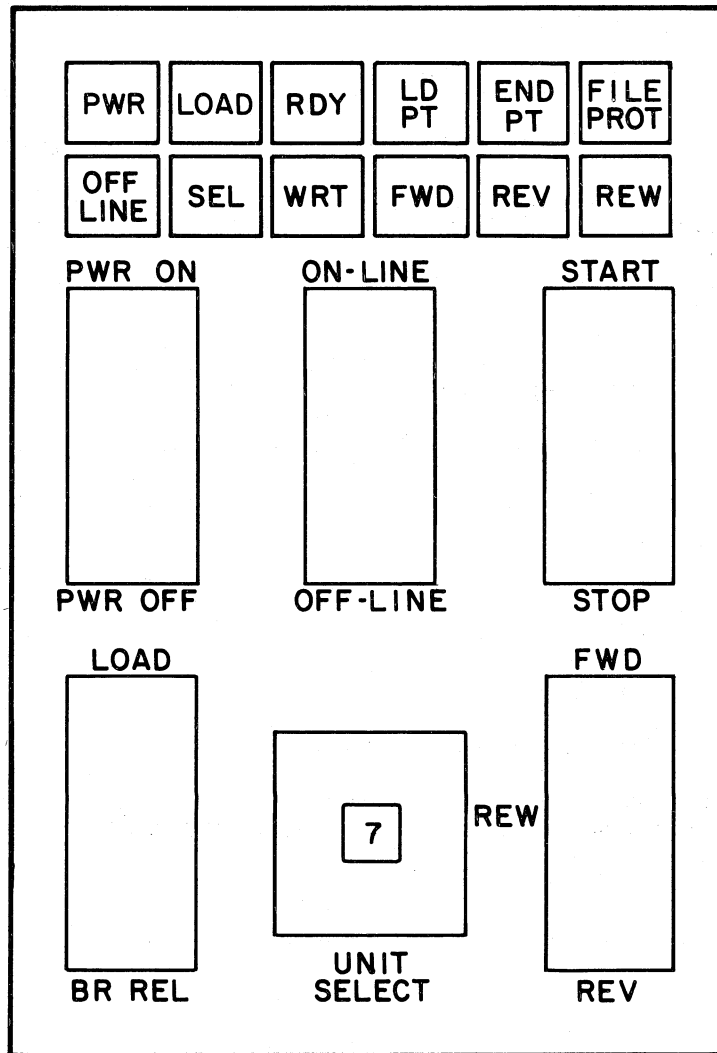
CP-0093

Figure F-3 Magnetic Tape Drive Control Panel

Indicator	Procedure
PWR	Indicates that power is being supplied to the drive unit.
OFF-LINE	Indicates local operation by the control box.
LOAD	Indicates that the vacuum system has been enabled and the unit is prepared to accept online or offline commands.
SEL	Indicates the tape transport has been selected by the controller (program).
RDY	Indicates that the drive is ready to accept requests for operation (provided the SEL light is also lit).
WRT	Indicates that the program has initiated a write operation in the tape transport.
LD PT	Indicates that the tape mounted on this unit is at its Load point (BOT marker is being sensed). REW command is disabled.
FWD	Indicates that a forward command has been issued.
END PT	Indicates that a tape mounted on this unit is at its end point (EOT marker is being sensed). FWD command is disabled.
REV	Indicates that a reverse command has been issued.
FILE PROT	Indicates that the tape may not be written on (no Write ring in tape reel).
REW	Indicates that a rewind command has been issued.

Table F-3
Switch Functions

Switch	Function
PWR ON/OFF	Controls power to the drive.
ONLINE/OFFLINE	Transfers drive control to processor (ONLINE) or enables local box control by operator (OFFLINE).
STOP/START	Initiates or terminates tape movement.
LOAD/BR REL	LOAD position causes tape to be drawn into vacuum columns. Center position applies reel motion brakes. BR REL position releases reel motion brakes.
UNIT SELECT	Assigns a logical unit number (zero through seven) to this drive.
FWD/REW/REV	Selects tape motion direction to be controlled by START/STOP switch. FWD position indicates transfer to take-up reel until EOT (end of tape) marker is sensed; REV position indicates transfer to file reel until BOT (beginning of tape) marker is sensed; REW position indicates transfer as in REV at a higher tape speed. When the tape stops at BOT, depressing the start switch again causes tape to unload.

F.3.1 Loading and Threading Tape

Use the following procedure to mount and thread the tape. Refer to Figure F-4 for a threading diagram.

STEP	PROCEDURE
1	Apply power to the transport by depressing PWR ON switch.
2	Ensure the LOAD/BR REL switch is in the center position (this applies the brakes).
3	Place a write enable ring in the groove on the file reel if data is to be written on the tape. Ensure that there is no ring in the groove if data on the tape is not to be erased or written over.
4	Mount the file reel onto the lower hub with the groove facing towards the back. Ensure that the reel is firmly seated against the flange of the hub.
5	Install the take-up reel (top) as described in Step 4.
6	Place LOAD/BR REL switch to the BR REL position.
7	Unwind tape from the file reel and thread the tape over the tape guides and head assembly as shown in Figure F-4.
8	Wind about five turns of tape onto the take-up reel.
9	Set the LOAD/BR REL switch to the LOAD position to draw tape into the vacuum columns.
10	Select FWD and press START to advance the tape to Load Point. When the BOT marker is sensed, tape motion stops, the FWD indicator goes out, and the LOAD PT indicator comes on. NOTE If tape motion continues for more than 10 seconds, press STOP, select REV (reverse) and press START. The tape should move to the BOT marker (Load Point) before stopping.
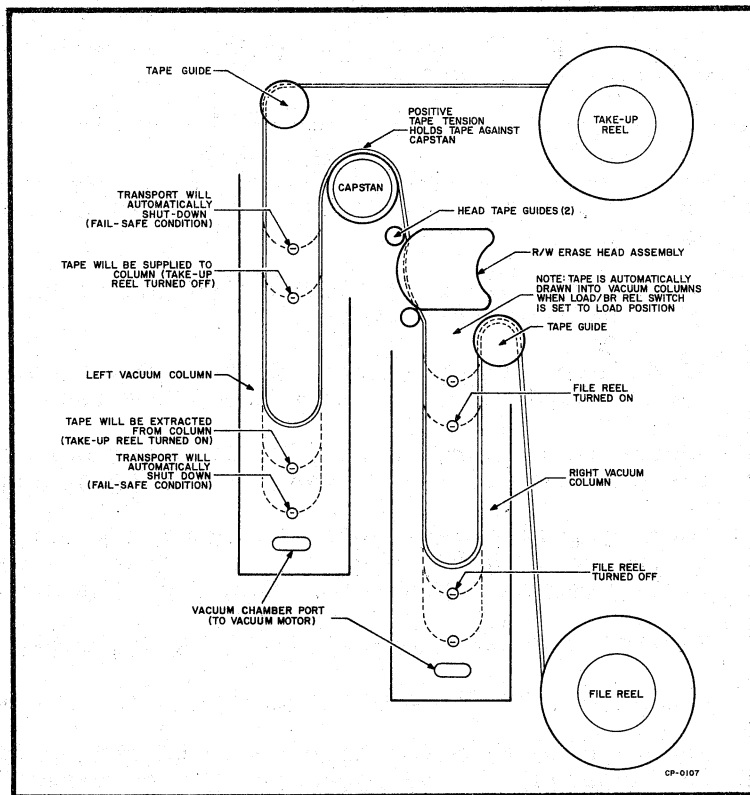
Figure F-4   Threading Diagram

F.3.2   Unloading Tape

To unload the tape, use the following procedures.

STEP	PROCEDURE
1	Press OFFLINE switch if the transport has been operating in the online mode.
2	Press STOP switch and select REW.
3	Press START switch. The tape should rewind.
4	Press the LOAD/BR REL switch to release the brakes.
5	Gently hand wind the file reel in a counter-clockwise direction until all of the tape is wound onto the reel. CAUTION When handwinding the tape, do not jerk the reel. This can stretch or compress the tape which could cause irreparable damage.
6	Remove the file reel from the hub assembly.

F-10

F.3.3 Restart After Power Failure

In the event of a power failure, the DEC magtape automatically shuts down and tape motion stops without damage to the tape. Return of power is indicated when the PWR indicator lights. To restart the transport proceed as follows:

STEP	PROCEDURE
1	Press the LOAD/BR REL switch to release the brakes.
2	Manually wind the reels to take up any slack in the tape.
3	Set the LOAD/BR REL switch to the LOAD position to draw tape into the vacuum columns.
4	Set ONLINE/OFFLINE switch to the desired position and continue operation.

F.3.4 Restart After Fail-Safe

If the tape loop in either buffer column exceeds the limits shown in Figure F-4, the vacuum system automatically shuts down and tape motion stops without damage to the tape. When this fail-safe condition occurs, the DEC magtape does not respond to online or offline commands. To restart the transport, perform Steps 1 through 4 in Section F.3.3.

F.3.5 Tape Handling

Observe the following precautions when handling magnetic tape:

1. Always handle a tape reel by the hub hole; squeezing the reel flanges can cause damage to the tape edges when winding or unwinding tape.

2. Never touch the portion of tape between the BOT and EOT markers. Oils from fingers attract dust and dirt. Do not allow the end of the tape to drag on the floor.

3. Never use a contaminated reel of tape. This spreads dirt to clean tape reels and can affect tape transport operation.

4. Always store tape reels inside their containers. Keep empty containers closed so dust and dirt cannot get inside.

5. Inspect tapes, reels, and containers for dust and dirt. Replace take-up reels that are old and damaged.

6. Do not smoke near the transport or tape storage area. Tobacco smoke and ash are especially damaging to tape.

7. Do not place the DEC magtape near a line printer or other device that produces paper dust.

APPENDIX G

CARD READER OPERATING PROCEDURES

G.1 CR11 CARD READER

The CR11 table-top card reader pictured in Figure G-1 reads 80-column punched cards at a maximum rate of 285 cards per minute.

The reader consists of an input hopper on the upper-right front, a reader station, an output hopper on the left front of the card reader, and front and rear control panels. The following paragraphs describe the front and rear control panels and the operating procedures for the reader.
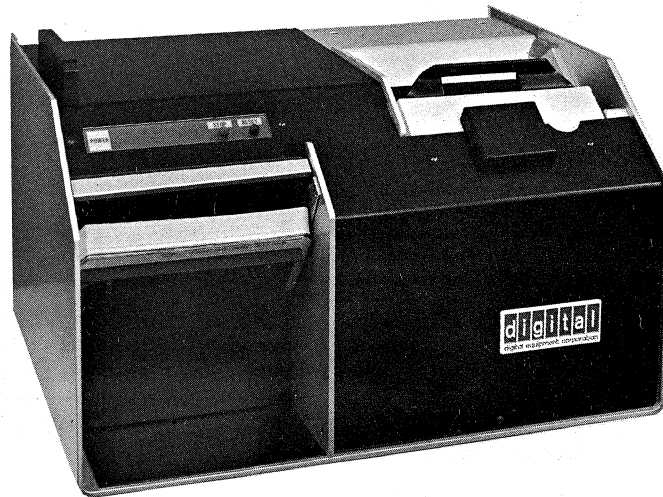
Figure G-1 CR11 Card Reader

G.1.1 Rear Panel Power Controls

Table G-1 below describes the functions of the switches located on the rear of the card reader illustrated in Figure G-2.
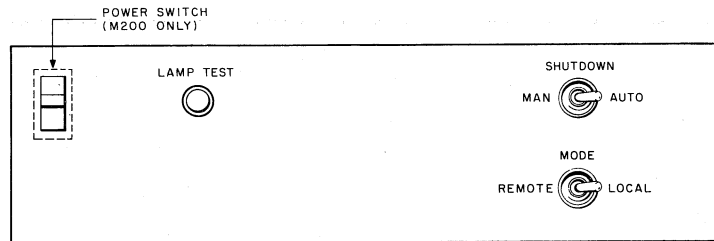
Figure G-2 Rear Control Panel

Table G-1
Rear Panel Control Switches

Switch	Function
POWER	Controls supply of primary power to card reader. When switch is raised, POWER indicator on front panel lights and reader receives primary power. If the switch is lowered, POWER indicator goes out and reader is inoperative.
LAMP TEST	When pressed, this switch illuminates all indicators on the front panel to check if lamps are faulty.
SHUTDOWN	Controls automatic operation of input hopper blower. MANual position--the blower operates continuously. AUTO position--the blower shuts off automatically whenever the input hopper becomes empty. Blower automatically restarts when the operator places cards in the input hopper and presses the RESET button on the front panel.
MODE	Permits selection of online or offline reader operation. LOCAL position--the operator may run the reader offline for testing purposes by using the RESET and STOP switches on the front panel. REMOTE position--reader operation is under program control when the operator presses the RESET button on the front panel.

G.1.2 Front Panel Control Indicators and Switches

The indicators and switches on the front panel of the card reader shown in Figure G-3 are used during normal operations to control the activity of the reader and to report error conditions. Table G-2 describes the control indicators and switches. Table G-3 (see section G.1.4) describes the error indicators, their meanings, and the operator's recovery procedures. Refer to paragraph G.1.3 for operating procedures.
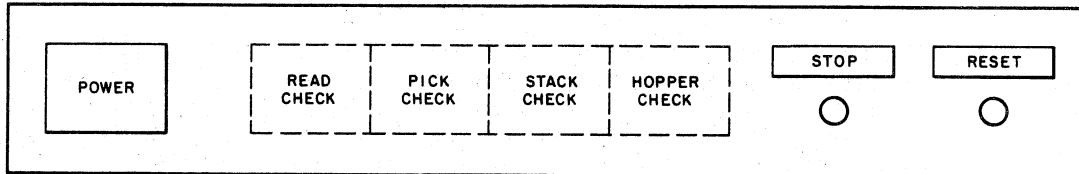
Figure G-3 Front Panel

Table G-2
Front Panel Control Indicators and Switches

Switch or Indicator	Function
POWER indicator light	When lit, indicates that the POWER switch on the rear panel is raised and that reader is on. When off, indicates that the reader does not have primary power.
RESET switch and green light	When pressed and released, this switch lights the READY indicator, and starts the blower mechanism if no error conditions are present.
STOP switch and red light	When depressed and released, this switch stops reading operations as soon as the card currently in the read station has been read. The READY indicator is extinguished. The switch does not turn off the card reader.

G.1.3 Operating Procedure

The following steps describe the recommended procedures for operating the card reader online.

STEP	PROCEDURE
1	Turn card reader power on by raising the switch on the rear control panel. Set MODE switch to REMOTE.
2	Empty output hopper if necessary.
3	Load input hopper by lifting the card weight and placing card in the hopper face down, column 1 to the left. Continue placing cards in the hopper until the hopper is loosely filled (approximately 600 cards). Do not pack the input hopper so full that the air from the blower can not riffle the cards properly.
4	Press RESET on the front control panel.

Notes:

1. Cards may continue to be loaded while the reader is operating provided tension is maintained on the front portion of the deck as cards are added to the rear. Additional cards should not be loaded, however, until the hopper is approximately 1/2 to 1/3 full. When maintaining tension on the deck, use just enough pressure to maintain the riffle action to prevent card damage and jamming of the reader.

2. The output hopper may be unloaded while the card reader is operating.

3. If the reader stops because of an error alarm, it can be started again by correcting the error and pressing the RESET button.

G.1.4 Front Panel Error Indicators and Error Conditions

The four error alarm indicators on the front control panel normally indicate a condition that can be corrected by operator intervention. These alarms, their causes, and the required operator actions are given in Table G-3.

Indicator	Meaning	Corrective Action
READ CHECK	When lit, indicates that the card that just went through the read station may have torn edges or punches in the 0 or 81st column. Reader stops and STOP indicator goes on.	Remove faulty card and press RESET. The faulty card was not read, and must now be re-read.
PICK CHECK	When lit, indicates that the card at the bottom of the input hopper failed to reach the read station. The card's leading edge may be torn, or there may be cards stapled together. Reader stops and STOP indicator goes on.	Remove faulty card and press RESET. If the card is not damaged, check the deck to see if it is excessively warped, or if there is an ink glaze built up on the picker face.
STACK CHECK	When lit, indicates that the card that just went through the read station may be badly mutilated or the cause of a card jam. The reader stops and the STOP indicator goes on.	Correct jam or remove mutilated card and press RESET. The card that went through the read station last was not read, and must be re-read.
HOPPER CHECK	When lit, indicates that 1. the input hopper is empty and no end-of file card was read, or 2. that the output hopper is full. The card reader stops and the STOP light goes on.	If the input hopper is empty, place the last card that went through the read station with more cards or an end-of-file card in the input hopper. If the output hopper is full, empty the hopper, taking the last card in the stack and inserting it at the bottom of the cards in the input hopper; then press RESET.

LINE PRINTER OPERATING PROCEDURES

H.1 LP11 LINE PRINTER

The following paragraphs describe the operator control panels and the procedures for ribbon installation and loading printer paper for the 132-column line printer.

This model line printer is shown in Figure H-1 below.

Figure H-1   LP11 Line Printer

H.1.1 Control Panel Switches and Indicators

Figure H-2 illustrates the control panel switches and indicators located on the top left of the printer cabinet. Table H-1 describes the function of each switch or indicator.

11-2060
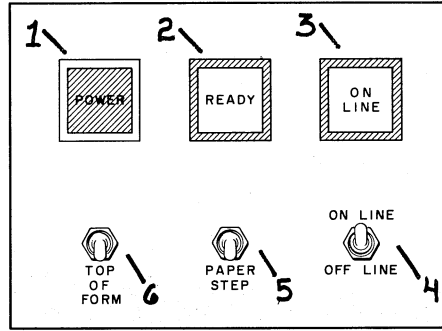
Figure H-2   Line Printer Control Panel

Table H-1
Control Panel Switch and Indicator Functions

Index No.	Control or Indicator	Function
1	POWER indicator	Lights when ac power is applied to printer.
2	READY indicator	Lights when printer power is on, interlocks are satisfied, and PRINT INHIBIT switch is off.
3	ON LINE indicator	Lights when printer is ON-LINE and PRINT INHIBIT switch is off.
4	ON LINE/OFF LINE switch	Selects mode of operation for printer. (Printer stays online following toggling of this switch until another switch (e.g., TOP-OF-FORM or PAPER STEP is toggled.)
5	PAPER STEP switch	Advances paper one line; disabled in master clear and ON-LINE modes.
6	TOP OF FORM switch	Advances tractors to top-of-form position; disabled in ON-LINE mode.

H.1.2 Maintenance Panel Switches and Indicators

The maintenance panel is located just above the control panel and is
accessed by lifting the maintenance panel cover. Figure H-3
illustrates the maintenance switches and indicators described in Table
H-2.
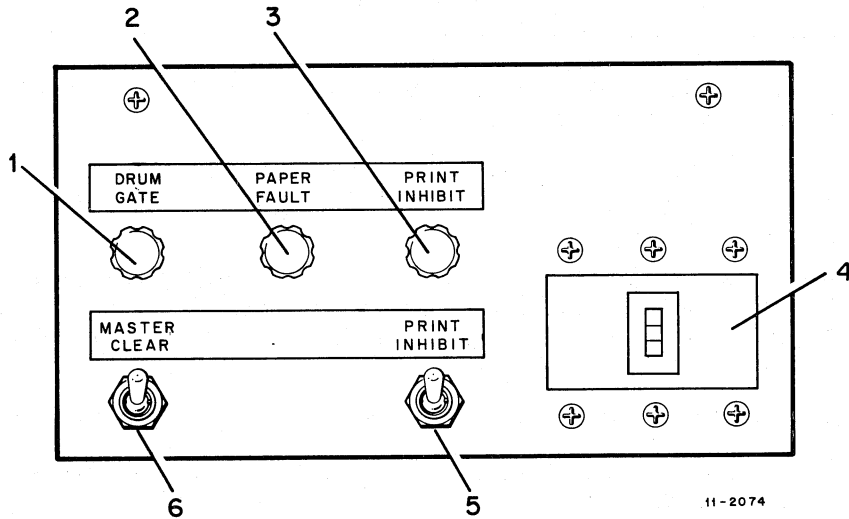
Figure H-3 Maintenance Panel

Table H-2
Maintenance Panel Controls and Indicators

Index No.	Control or Indicator	Function
1	DRUM GATE indicator	Lights when drum gate is unlatched.
2	PAPER FAULT indicator	Lights when paper is torn or missing.
3	PRINT INHIBIT indicator	Lights when PRINT INHIBIT switch is in ON position.
4	MAIN POWER switch	Applies AC power to printer.
5	PRINT INHIBIT switch	Inhibits hammer drivers during maintenance.
6	MASTER CLEAR switch	Initializes the printer to ensure that logic elements are in proper state.

H.1.3 Loading and Positioning Paper

The following steps describe the procedure for loading paper into the line printer. Refer to Table H-3 and Figure H-4 for the description and location of the mechanical controls and adjustments.

STEP	PROCEDURE
1	Ensure that the main power switch is on; check to see that the POWER indicator is lit. The PAPER FAULT indicator should also be on.
2	Lift the printer window; unlatch and open drum gate. The DRUM GATE indicator on the maintenance panel should light.
3	Set the TOP OF FORM switch to up position and release. (If the printer has stopped printing in the middle of a form and there remains more to be printed on the form, do not set TOP OF FORM and skip to step 5.)
4	Set COPIES CONTROL lever to number of copies desired.
5	Open the spring-loaded pressure plates on the right and left tractors.
6	Place paper on tractor pins. (If continuing forms, place new form under old form, and ensure that they are lined up with each other. Skip to step 9.)
7	If adjustment of tractors for paper width is required, loosen paper width adjustment lever, set tractors to correct paper width and tighten levers.
8	Align paper perforation to top-of-form indicators on hammer bank.
9	Close the pressure plates on both tractors.
10	Close and latch drum gate; ensure PAPER FAULT and DRUM GATE indicators go off.
11	Close printer window.

NOTE

When using lined paper, the printed
characters may be set to appear directly
on the print line by adjusting the
VERTICAL PAPER POSITION control.

Table H-3
Mechanical Controls and Adjustments

Control or Adjustment	Function
VERTICAL PAPER POSITION	Adjusts vertical alignment of printing form to plus or minus one line; can be adjusted during printing if desired.
COPIES CONTROL lever	Adjusts the distance between hammer bank and character drum for different numbers of print copy.
Right and left tractor paper width adjustment	Adjusts right and left tractors for various paper widths.
Tractor horizontal tension adjustment	Adjusts horizontal tension of paper.

DRUM GATE LATCH

COPIES CONTROL LEVER

TRACTOR HORIZONTAL TENSION ADJUSTMENT

VERTICAL PAPER POSITION

LEFT AND RIGHT PAPER WIDTH ADJUSTMENT

TRACTOR PRESSURE PLATES

TOP OF FORM INDICATORS
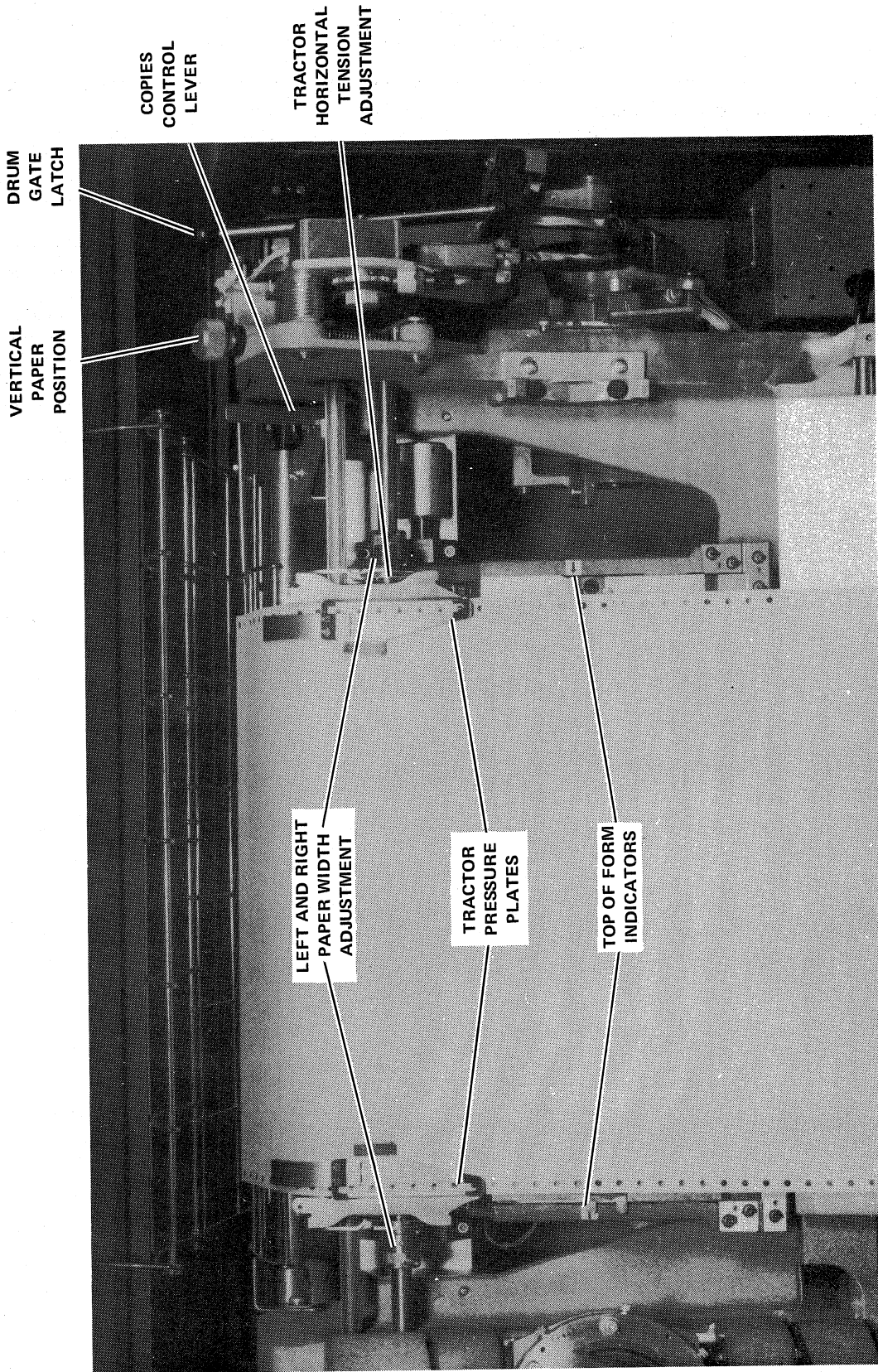
Figure H-4   Mechanical Controls

H.1.4 Loading and Changing the Ribbon

The following steps describe the procedure for installing a ribbon for the line printer. Refer to Figure H-5 to locate the controls.

NOTE

Use the plastic gloves supplied with the ribbon when installing or replacing ribbon.

STEP	PROCEDURE
1	Lift maintenance panel access covers and turn off the power switch.
2	Lift the printer window; move drum gate latch to left and back.
3	Swing drum gate fully open.
4	Unlatch paper guide by releasing catch on the left of the guide. Swing paper guide open.
5	Turn latches on each end of ribbon guide bars, release and lift off top retaining bar.
6	Remove old ribbon if installing replacement by pressing in floating holder springs.
7	Remove new ribbon from box by holding ribbon cores together.
8	Place fully-wound ribbon core over top floating ribbon holder.
9	Push against floating holder spring and place opposite core end over top fixed ribbon holder; ensure holder guide pin slips into slot on core end. Refer to Figure H-6.
10	Unwind second ribbon core and bring ribbon down over ribbon guide bar and character drum.
11	Place core on bottom ribbon holders as in step 9 for top holders.
12	Replace top ribbon guide bar and close paper guide.
13	Close drum gate and latch it. Close printer window. Turn power on.
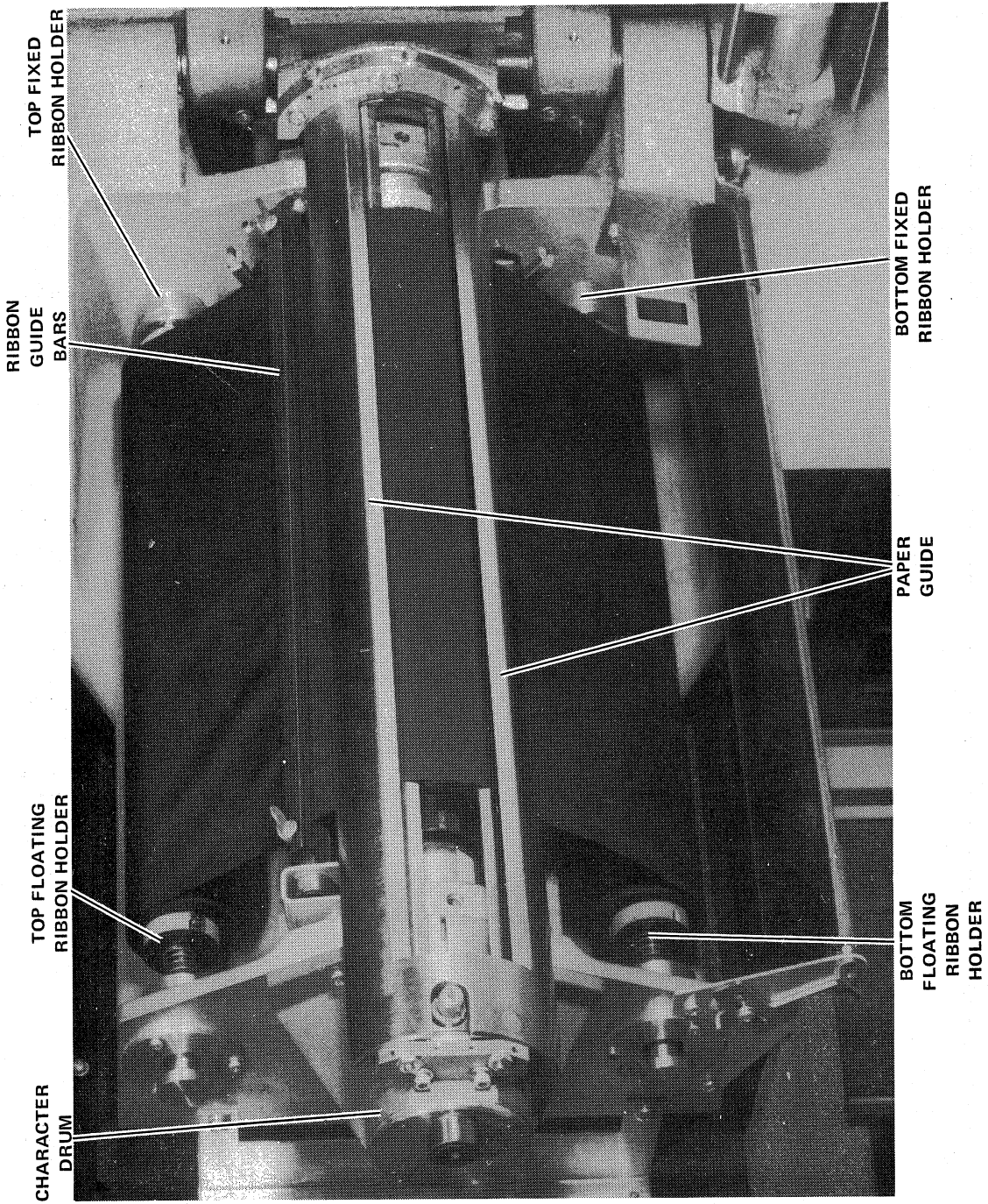
Figure H-5 Drum Gate Ribbon Installation

RIBBON

RIBBON CORE
(TYPICAL TWO PLACES)

FIXED RIBBON HOLDER
(TYPICAL TWO PLACES)

GUIDE PIN

RIBBON CORE SLOT

NOTE:
Top ribbon core & fixed holder shown

11-2075
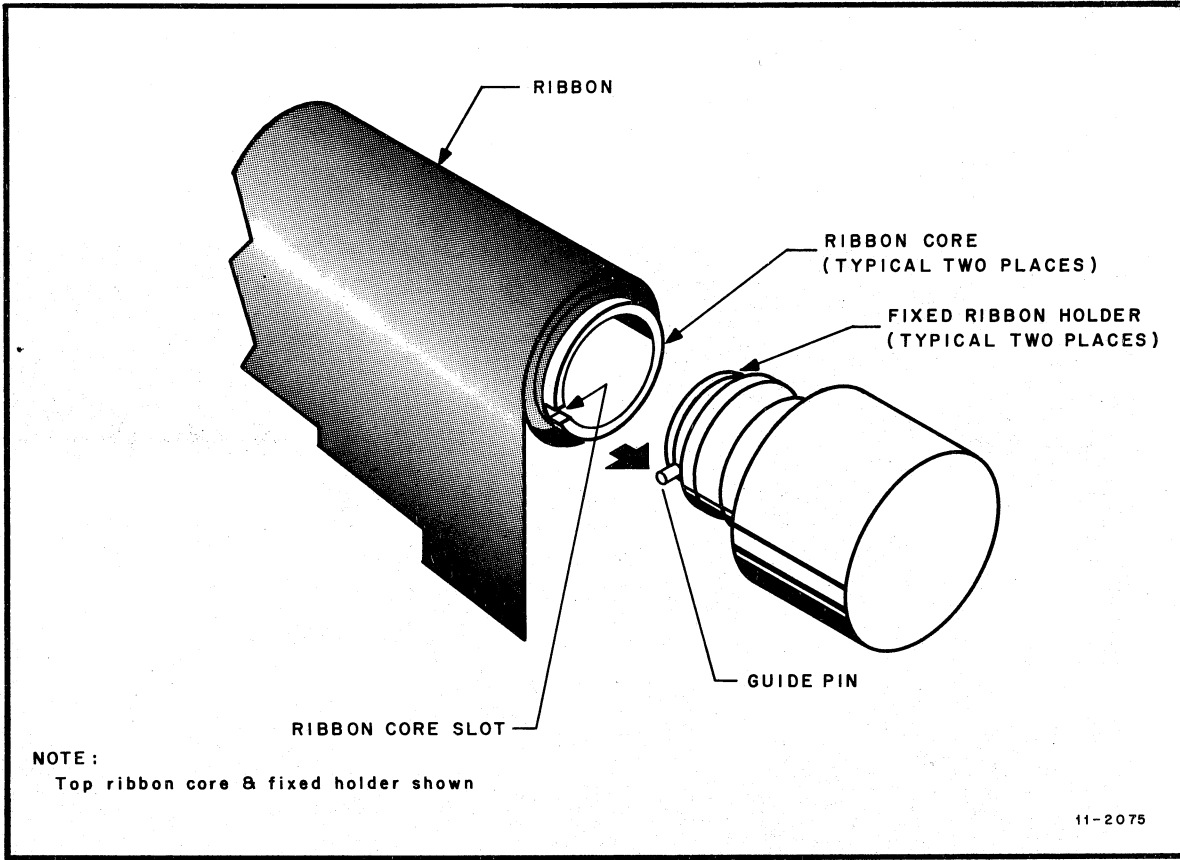
Figure H-6 Installation of Ribbon Core on Fixed Ribbon Holder

H.1.5 Online Operating Procedures

The following steps describe the start-up procedure for online printer operation.

STEP	PROCEDURE
1	Ensure that the power switch is on and the POWER and READY indicators are lit. (If the drum gate was open, it will take approximately 10 seconds for the READY light to go on.)
2	Ensure that the PRINT INHIBIT switch in the maintenance panel is down, and PRINT INHIBIT indicator is off.
3	Set the ON LINE/OFF LINE switch to ONLINE.
4	Observe printer operation; make paper adjustments if necessary.

H.2 LS11 LINE PRINTER

WARNING: The LS11 line printer can be used only in the OFFLINE state.

The LS11 line printer (see Figure H-7) prints at a rate of 165 characters per second, with as many as 132 characters per line. The unit is compact enough to sit on a small table.
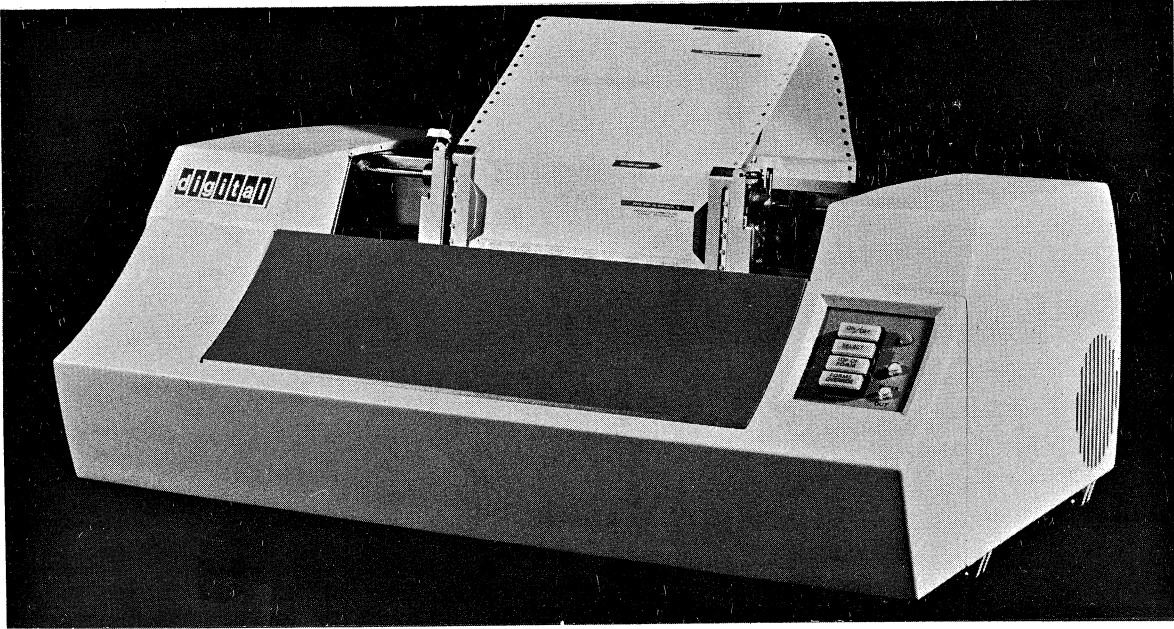
Figure H-7 LS11 Line Printer

Figure H-8 shows the LS11 operator panel. Functions of the various
keys and indicators are given in Table H-4.
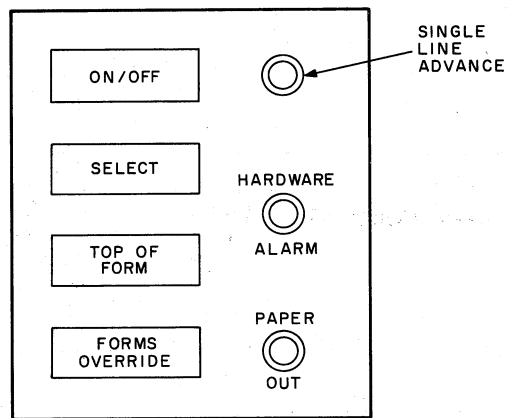
Figure H-8   LS11 Operator Panel

Table H-4
LS11 Operator Panel Functions

Control or Indicator	Function
ON/OFF	Turns printer on/off. When on, switch is illuminated.
SELECT	Enables/disables printer. When enabled, switch is illuminated,
TOP OF FORM	Causes paper to advance to top-of-form.
FORMS OVERRIDE	Overrides PAPER OUT condition by allowing printer to complete form being printed. (Switch must be pressed throughout print operation.)
SINGLE LINE ADVANCE	Advances the paper by one line.
HARDWARE ALARM	Lights when print head has moved beyond right or left limit.
PAPER OUT	Lights if no more paper or for paper-handling malfunction.

Table H-5 describes additional manual controls for forms insertion and
adjustment.

H-11

Table H-5
LS11 Manual Controls

Control	Function
Paper Advance Knob	A knob on the left side of the carriage provides manual forward and reverse paper positioning.
Paper Feed Lever	A lever on the rear, right top of the printer provides initial paper feed around the platen, allowing the operator to position the paper in the tractor feed mechanism.
Forms Thickness Control	This control provides adjustment of the clearance between the platen and the face of the print head. This clearance must be adjusted according to the thickness of the forms being used. A graduated scale provides the operator with ready reference points.
End Of Form Switch	This switch is located in the paper path to signal that forms have run out; the Paper Out light on the operator panel turns on in conjunction with an audio alarm.

Operation of the LS11 line printer should be conducted with regard for the following cautions.

- The printer should always be plugged into a 3-wired grounded outlet.

- Do not exceed paper thickness of more than five sheets (total thickness not to exceed 0.040 inch).

- Never operate printer without paper.

- Ensure that all covers are closed and secured during operation.

- If any malfunction occurs, notify qualified service personnel.

- Oil motor on annual PM schedule or every 200 hours of operation.

- Check for wear on Ribbon Holding Plates Rubber Pad.

- Check that both the Damper Piston and Right-hand Limit Piston have sufficient cushioning to prevent damage.

- Clean Timing Fence (Mylar strip) with dry rag to ensure proper horizontal print registration.

H.2.1 Ribbon Replacement Procedures

The following steps outline the procedures for replacing the line printer ribbon. The hardware involved is illustrated in Figure H-9.

STEP	PROCEDURE
1	Loosen Penetration Control Locking Knob.
2	Set head adjustment knob to 5.
3	Lift left-hand and right-hand covers.
4	Remove caps from ribbon reversing guides (shifts).
5	Swing ribbon tension arms clear of spools, and lift spools from axles.
6	Place empty spool (partially wound) on right-hand axle.
7	Insert ribbon through right-hand reversing guide and thread through idlers and ribbon guides.
8	Place full spool on left-hand axle, assuring that ribbon is inserted in left-hand ribbon reversing guide.
9	Replace ribbon reversing guide caps and right-hand and left-hand covers.
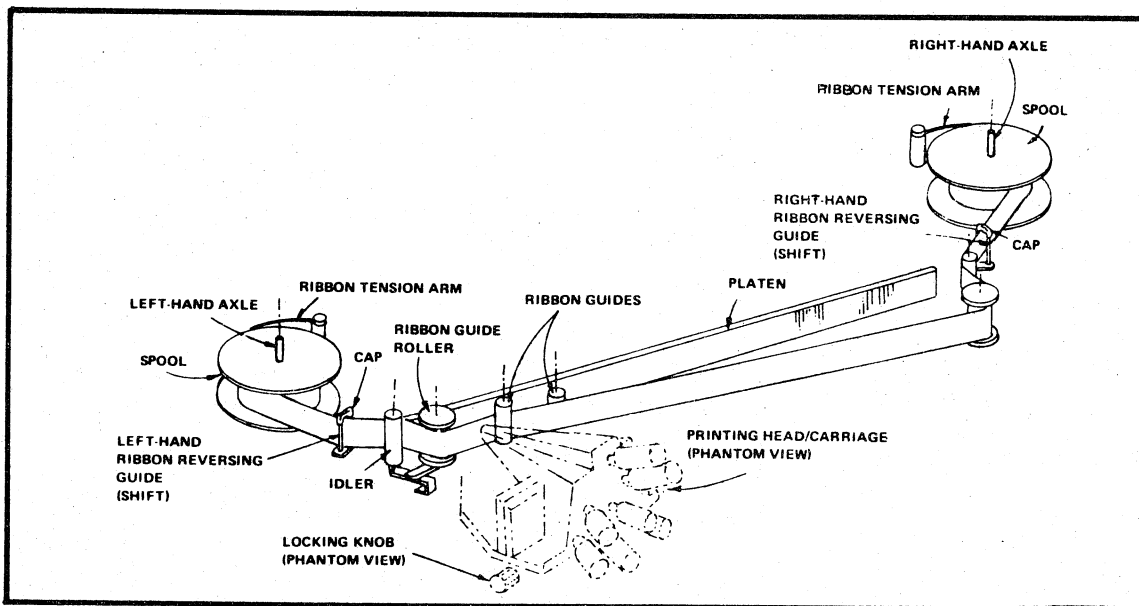
Figure H-9   Ribbon Replacement Mechanism

APPENDIX I

DATA-PHONE OPERATING PROCEDURES

The most common half-duplex switched line used for 2780 RCS
communication is a Bell System 201 type modem. The 2780 RCS operator
is provided with a calling number to contact the remote system. He
may also have a special number to talk directly with the operator at
the central system.

The following steps describe the calling procedure.

STEP	PROCEDURE
1	Place the 2780 RCS in online mode.
2	Lift the handset on the auxiliary 804A set and press the TALK button above the handset rest.
3	Dial the appropriate number. The phone will ring until the call is answered by the central system.
4	Approximately 1 - 1 1/2 seconds after the phone is answered, the central station will generate an answer-back tone lasting 2-5 seconds. When the tone stops, press the DATA button above the handset rest and hang up the handset. The DATA button should light. However, it will remain lit only if the 2780 RCS is in the online state.

If desired, the operator can enter talk mode by lifting the handset
and pressing the TALK button. The operator may re-establish data mode
by pressing the DATA button and hanging up the handset.

Figure I-1.   Bell System 201A Modem with 804A Auxiliary Set

READER'S COMMENTS

NOTE: This form is for document comments only. Problems
with software should be reported on a Software
Problem Report (SPR) form (see the HOW TO OBTAIN
SOFTWARE INFORMATION page).

Did you find errors in this manual? If so, specify by page.

_____
_____
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Did you find this manual understandable, usable, and well-organized?
Please make suggestions for improvement.

_____
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Is there sufficient documentation on associated system programs
required for use of the software described in this manual? If not,
what material is missing and where should it be placed?

_____
_____
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_____

Please indicate the type of user/reader that you most nearly represent.

☐ Assembly language programmer
☐ Higher-level language programmer
☐ Occasional programmer (experienced)
☐ User with little programming experience
☐ Student programmer
☐ Non-programmer interested in computer concepts and capabilities

Name_____ Date _____

Organization _____

Street _____

City_____ State_____ Zip Code_____
                                                        or
                                                     Country

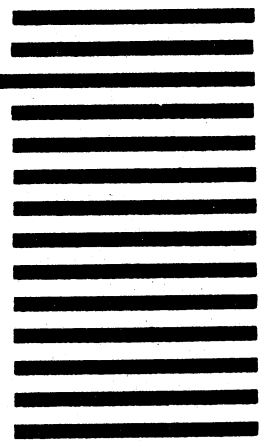If you do not require a written reply, please check here. ☐

-- **Fold Here** --

-- **Do Not Tear - Fold Here and Staple** --

digital