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John L. Casey, Project Leader
Software Documentation
Santa Barbara Plant

**Burroughs Corporation** 🅱

BUSINESS MACHINES GROUP
SMALL SYSTEMS PLANT

RJE/DATA COMM HANDLER

# PRODUCT SPECIFICATION

## REVISIONS

| REV LTR | REVISION ISSUE DATE | PAGES REVISED ADDED DELETED OR CHANGE OF CLASSIFICATION | PREPARED BY | APPROVED BY |
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| A | 10/01/75 | Original Issue | S. M. B. | |
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GENERAL MANAGER
SANTA BARBARA PLANT

# TABLE OF CONTENTS:

GENERAL
-------


The B1700 Remote Job  Entry/Data  Comm  Handler  (RJE/DCH)  program
enables a B1700 system to interface with any other Burroughs system
(small,  medium,  or large) in the  Remote  Job  Entry  (RJE)  mode.
RJE/DCH performs two essential functions for the REMOTE B1700:

    1)   Establishing,    or re-establishing, communication with  the
         HOST system.

    2)   Allowing  the user program to exert control over data   comm
         line activity (i.e., I/O).


RJE/DCH  allows the REMOTE console program or I/O program(s),   each
using  queue files, to control the flow of activity between  REMOTE
and HOST systems.


When a B1700 (REMOTE) is on-line with a B1700 (HOST),  RJE  standard
line discipline is used for communication. When a B1700 (REMOTE) is
on-line  to a medium-(B2700/3700/4700) or large-system (B6700/7700)
HOST,  the console and the I/O programs must conform to RJE message
format conventions (See INTERFACE MESSAGE FORMAT below).


This  product specification describes the various line and  program
standards  required by RJE/DCH; and sample programs, complete in in
themselves, are to be found in appendix B (Section 10).

RELATED DOCUMENTATION
---------------------


            NAME                                              NUMBER

B6700 Remote Job Entry System Information Manual              5000300
B2700/3700/4700 Remote Job Entry System Information Manual
B1700 NDL Information Manual                                  1073715
B1700 System Software Operation Guide                        1068731
B1700 Data Comm Audit (Revision A)               (P.S.)   2212 5421
B1700 NDL (BNF Version) (Revision A)             (P.S.)   2212 5223
B1700 NDL Library (Revision B)                   (P.S.)   2212 5215
B1700 RJE/Terminal (NDL) (Revision A)            (P.S.)   2212 5249

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B1700 RJE/Terminal (SDL) (Revision A)

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## FUNCTIONAL DESCRIPTION
----------------------

The data comm line discipline is conversational and the message format is well defined. The line discipline is completely symmetrical and therefore two B1700s may communicate with each other using RJE/DCH. RJE/DCH may be used with sync, async, direct connect, leased or switched lines. Transmission rates from 1200 bps to 9600 bps have been qualified.

The user written I/O program can direct RJE/DCH to perform five functions to control the data comm line activity. They are:

1. To stop all line activity and terminate itself
2. To wait for notification of connection from the remote computer
3. To re-establish communication
4. To display a summary of line exception conditions
5. To start or stop auditing line activity

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I/O PROGRAM INTERFACE
------------------------

The user written I/O program interfaces with RJE/DCH through queue
files.   To send a message to the remote computer, the I/O program
must write to a queue; to receive a message from the remote system,
the I/O program must read from one of two queues. A fourth queue is
used for sending control commands to RJE/DCH.


    INTERFACE MESSAGE FORMAT
    ----------------------------


The format of all messages transferred between the I/O program  and
RJE/DCH  are identical. Each message has  a  10-byte  header  which
contains information about the message. Before sending a message to
RJE/DCH, the I/O program must set the three fields in the header to
the  appropriate values, and  conversely  RJE/DCH  sets  the  three
fields  to the correct value before sending  messages  to  the  I/O
program.   All data transferred  between  the  two  programs  is  in
EBCDIC. The format of the message is:

```
    01  MESSAGE.FORMAT,
        02  MESSAGE.HEADER,
            03  STATION.ID             CHARACTER (3),
            03  TEXT.LENGTH            CHARACTER (4),
            03  TYPE                   CHARACTER (3),
        02  MESSAGE.TEXT               CHARACTER (400),
```

```
0               3              7      10
-----------------------------------------------------------------
ISTATION ID     ITEXT LENGTH      ITYPE  ITEXT MAX OF 400 CHAR  I
-----------------------------------------------------------------
```


STATION.ID is a three character field that is used to identify  the
message.   The value of STATION.ID must be in the range 000 to  099.
If  communicating with the B6700/B7700 or B2700/3700/4700  standard
RJE, the value must be in the range of 000 to 003.

TEXT.LENGTH is a four-character EBCDIC field that defines the  size
of text in characters. The text length may not exceed 400.


TYPE is used to identify control commands for RJE/DCH  and  is  not
applicable  for messages to be transmitted to the remote  computer.


Applicable values of TYPE are:

| TYPE | VALUE OF STATION.ID | CONTROL FUNCTION |
|------|---------------------|------------------|
| 999  | 000                 | STOP RJE/DCH |
| 998  | 000                 | DISPLAY LOG |
| 997  | 000                 | RE-ESTABLISH CONNECTION |
| 996  | 000                 | WAIT FOR RING |
| 994  | 000                 | STARTS OR STOPS AUDITING OF DATA COMM I/O ACTIVITY |

MESSAGE.TEXT may  contain  any  EBCDIC  character  string  that  is
translatable  into  non-control  ASCII  characters  as  defined  in
Appendix  A.  RJE/DCH does not support transparent transmission  and
therefore the character set is limited to the EBCDIC counterpart of
the  ASCII character set. RJE/DCH expects EBCDIC messages from  the
I/O  program and translates them into ASCII before transmission  to
the  remote system, and conversely all incoming ASCII messages  are
translated into EBCDIC.

### QUEUE FILES

RJE/DCH maintains four queues for interfacing with the I/O program.
The labels and functions of these four queues are:

| QUEUE LABELS | FUNCTION |
|--------------|----------|
| RJE/DATA.COMM | Any  message inserted  by  the  I/O program  in  this  queue  will  be transmitted  by RJE/DCH to  the remote  computer.  The STATION.ID must be 000, 001, 002 or 003. |

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RJE/PRINT.OUT

Messages received from the remote computer are inserted in the queue by RJE/DCH. Only messages with STATION.ID of 002 or 003 are inserted in this queue.

RJE/SPO.OUT

Messages received from the remote computer are queued here if the STATION.ID is 000 or 001. The I/O program should read this queue.

DATA.COMM/CONTROL

Control commands (if TYPE = 994 to 999) for RJE/DCH should be written to this queue. Messages inserted in this queue will not be transmitted to the remote computer.

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SYSTEM FLOW
-----------

```
                         +-----------------------------------+
                         |                                   |
                         |         B1700 MCP II              |
                         |                                   |
+--------+               |                                   |
|OUTPUT  |               |  ********         ********        |
|DEVICE  |<------    |   *      *  RJE/DATA.COMM  *      *    |
+--------+         |   *      *  --------------------->*      *    |
                         |   *      *                 *      *    |
+--------+         |   *      *  DATA.COMM/CONTROL *      *    |
|INPUT   |         |   *      *  --------------------->*      *<---------- |
|DEVICE  |------->  *  I/O  *                 *  RJE/ *    |          /
+--------+         |   * PROG.*  RJE/PRINT.OUT     * DCH  *    |     ---------->
                         |   *      *  <-----------------   *      *    |
                         |   *      *  RJE/SPO.OUT       *      *    |
                         |   *      *  <-----------------   *      *    |
                         |   *      *                 *      *    |
                         |   *      *                 ********    |
                         |   ********                          |
                         |    /1                               |
                         |     |   COMMON QUEUE NAME           |
                         |     | <--------------------         |
                         |     |/                              |
                         |   **********                        |
+--------+         |   *        *                       |
|CONSOLE |               |   *CONSOLE*                       |
|PRINTER |<------>* PROG.  *                       |
+--------+         |   *        *                       |
                         |   **********                        |
                         +-----------------------------------+
```

Figure 3.1 I/O Interface

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SYSTEM REQUIREMENTS
-------------------

In addition to the basic Memory required for  RJE/DCH  (7K  Bytes),
MCPII (34K Bytes), and the user programs, the following hardware is
needed:

    1)   B1700 single line control or multi-line control

    2)   B1700 standard synchronous, asynchronous or two wire direct
        connect adapter

    3)   Leased, switched or direct connection with appropriate data
        sets and cables

Note:   An  adapter timeout period of 2.5 seconds at the B1700 and 3
       seconds at the remote computer is standard.


The B1700 RJE/DCH requires Mark V.0 level MCP II and the  following
level of host system software:

    B 4700 MCP V   ASR 5.3 or higher
    B 6700 MCP    Mark II.5 or higher

CONTROL COMMANDS & ERROR MESSAGES
-------------------------------------


This section contains an explanation of control commands and  error
messages.


CONTROL COMMANDS:
-----------------

1.  STOP (TYPE = 999)

    This command terminates  the   current   session  by  instructing
    RJE/DCH  to cease all line activity and  to   terminate   itself.
    All queued messages are lost.

2.  DISPLAY LOG (TYPE = 998)

    This command causes RJE/DCH'S summary of line exceptions to  be
    displayed.  The error fields  are  then  re-initialized.  These
    totals  are an indication of the rate of error activity on  the
    line. The format of this summary is:

        "<NUMBER>  NAKS SENT BECAUSE OF PARITY ERRORS"

        "<NUMBER>  NAKS SENT BECAUSE OF NO BUFFERS"

        "<NUMBER>  TIMEOUTS IN READ OPERATIONS"

        "<NUMBER>  TIMEOUTS IN WRITE OPERATIONS"

        "<NUMBER>  OTHER EXCEPTIONS IN READ OPERATIONS"

        "<NUMBER>  OTHER EXCEPTIONS IN WRITE OPERATIONS"

3.  RE-ESTABLISH CONNECTION (TYPE = 997)

    This command will force RJE/DCH to try to re-establish the line
    connection  with the remote  computer.  Any  message  currently
    being   transmitted will be lost. When the connection has  been
    re-established, the message

                        "ONLINE"

    will be displayed. The RETRIES-UP error message indicates   that
    the  current buffer being sent to the remote  computer  is   not
    being  received. This command  may  be  used  to  discard  this

buffer, thereby allowing transmission to proceed.

4.  WAIT FOR RING (TYPE = 996)

Instructs RJE/DCH to cease all line activity and wait to answer
a call from the remote computer. RJE/DCH will issue a TEST-OP
for data set ready. When control returns to RJE/DCH,
indicating the phone has rung and been answered, RJE/DCH will
display the message:

                    "PHONE RINGING"


5.  AUDIT (TYPE = 994)

Instructs RJE/DCH to stop or start auditing of data comm I/O
activity. The first time RJE/DCH receives this command,
auditing is started. The next time RJE/DCH receives this
command, auditing is stopped. Auditing may be stopped or
started any number of times while RJE/DCH is running.

## ERROR MESSAGES

For certain error conditions, RJE/DCH will display messages which
may require action by the operator while RJE/DCH is attemping to
recover on its own.

1. "LOSS OF DATA.SET.READY"

   This error was caused during the last I/O sequence because the
   data set or the line went down. The error is recoverable, but
   the data set should be checked. If switched lines are being
   used, RJE/DCH will disconnect (if a connection had been
   established); connection must be re-dialed for
   re-establishment.

2. "LOSS OF CLEAR TO SEND"

   Indicates a data set problem occured during the last attempt to
   transmit by the RJE/DCH. Recovery can be made, but the data
   set should be checked.

3. "MEMORY PARITY ERROR"

   While attempting to send a message to the remote computer, a
   parity error occurred while transmitting the message from the
   B1700. This is an irrecoverable error.

4. "RETRIES-UP"

   Indicates that the current buffer being sent to the remote
   computer is not being acknowledged, either due to the remote
   computer naking the message or because of line problems. After
   fifty attempts at transmission, the RETRIES-UP message is
   displayed by RJE/DCH. RJE/DCH then continues trying to
   transmit the buffer either until it is acknowledged by the
   remote computer or until the re-establish connection command
   is received from the I/O program whereupon the buffer is
   discarded and a new one obtained.

5. "ESTABLISHMENT RETRIES UP"

   After 50 attempts to establish a link with the remote computer,
   and if no link was established, RJE/DCH will display this
   message. If switched lines are being used, RJE/DCH will
   disconnect and the connection must be re-dialed, otherwise
   RJE/DCH will continue attempting to establish a link with the
   remote system.

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6.   ""WAIT" IGNORED ADAPTER NOT SWITCHED"

When a control command requesting a wait for ring (TYPE = 996)
is   sent to RJE/DCH and   switched   lines   are   not   being   used
RJE/DCH   will display this message. RJE/DCH   will   then   ignore
this command and continue.

7.   ""HOST TERMINATING" RECEIVED"

When   "HOST TERMINATING" is received from the remote   computer,
it   indicates that the   remote   computer   is   going   down.   If
switched   lines are being used by RJE/DCH, it will   disconnect
the   line and wait for the connection to be re-dialed.   RJE/DCH
will   then attempt to reestablish   the   link   with   the   remote
computer regardless of the type of lines used.

8.   "FILE "DC/AUDIT.FILE" LOCKED"

When the control command (TYPE = 994) requests RJE/DCH to start
auditing   line activity and DC/AUDIT is already being used   by
another   data   comm   handler   (i.e.,   file   "LOCKED"),   RJE/DCH
displays this message and the new command is ignored.

9.   "INVALID RESPONSE"

At   BOJ time, when RJE/DCH requests entry of the port,   channel
and   adapter number   from   the   console   printer,   and   if   the
response   entered   is   invalid   (non-numeric),   RJE/DCH   will
display   this message and request   the   operator   to   enter   it
again.

10.   "ERROR: CONTROL NOT PRESENT"

This message is displayed by   RJE/DCH   at   BOJ   time   when   the
proper   control was not present at the address supplied by   the
operator.   RJE/DCH will   then send a "00" control message to the
I/O   program indicating that the RJE/DCH is   going   to   end   of
job.

11.   "ERROR: INVALID ADAPTER TYPE"

If RJE/DCH finds that no adapter or invalid adapter is   present
at   the address provided by the operator, RJE/DCH will   display
this   message and send   a   "00"   control   command   to   the   I/O
program indicating the RJE/DCH is going to end of job.

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OPERATING PROCEDURES
-------------------


ESTABLISHMENT
-------------


RJE/DCH when executed will display the following message:

        **** B1700 RJE NN.N (DATE)  (TIME) ****

where NN.N is the current RJE level.


RJE/DCH then displays a message requesting that the port, channel
and adapter numbers be supplied in response to an accept. These
parameters are dependent on the specific hardware configuration of
the B1700 system. The operator response required is:

        <MIX INDEX>AXPPCCAA


where:  PP is two numeric digits specifying the SLC or MLC port #.

        CC is two numeric digits specifying the SLC or MLC channel #.

        AA is two numeric digits specifying the SLC or MLC adapter #.

        EXAMPLE:  2AX071200


RJE/DCH will establish communication with the remote computer
system.  For switched lines, it is necessary to manually dial the
remote computer system. A message is displayed to indicate remote
computer connection, either

        "ONLINE"  or  "HOST ESTABLISHING"

depending upon which system sees the other establishment first.

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PRIORITES
---------

RJE/DCH  for normal operation, have a higher priority than the  I/O
program.

TERMINATION
-----------

RJE/DCH can be terminated with the STOP command (TYPE = 999) defined
in the previous section. If an abnormal condition causes a DS or DP
condition  for RJE/DCH, a Clear/Start should be performed to insure
that no I/O operations are left pending.

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## RJE STANDARD LINE DISCIPLINE
-----------------------------------

### LINE PROTOCOL
---------------

A contention mode protocol is employed. The main features of this protocol are as follows:

A.  If the receiver has a message, the message is returned as an acknowledgment, thus reducing line turnarounds per message.

B.  If the receiver does not have a message, an ACK is returned as an acknowledgment, thus minimizing the length of time the line is tied up.

The line code used is 7 bit ASCII plus one parity bit. The B1700 data comm adapter translates outgoing code from EBCDIC to ASCII and incoming code from ASCII to EBCDIC. See Appendix A for translation table of ASCII to EBCDIC.

Parity is even for asynchronous and direct connect, and is odd for synchronous transmission.

The following two page illustration describes the Burroughs line discipline.

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```
                                        B1700 SYSTEM (HOST)

FROM ESTABLISHMENT->
--NEXT MESSAGE--->  I
 I                  I I
 I  --REPEAT----->  I I
 I  I               I I I  (1.B)
 I  I  --REPEAT->   I I I
 I  I  I            I I I I
 I  I  I            V V V V
 I  I  I       --------------------------------------
 I  I  I       SOH,ARM,TN,STX,DA1,DA2,....,ETX,BCC
 I  I  I       --------------------------------------
 I  I  I                                                       (TO REMOTE)
 I  I  I                 I
 I  I  I                 V------------------>------------------------------------>
 I  I  I
 I  I  I
 I  I  I
 I  I  I
 I  I  I
 I  I  I
 I  I  I
 I  I  I                                                       (FROM REMOTE)
 I  I  I
 I  I  I<------------------------------------<------------------------------------<
 I  I
 I  I
 I  I<------------------------------------<------------------------------------<
 I
 I<------------------------------------<------------------------------------<
     I          (2.B)              I                   I           I
     V                             V (1.A)             V (2.A)     V (5)
    ---        --------------------------------------  ---         ----------
    ARM        SOH,ARM,TN,STX,DA1,DA2,....,ETX,BCC     NAK         GARBAGE OR
    ACK        --------------------------------------  ---         NO REPLY
    ---                            I                   I           ----------
     I                             I                   I              I
     I                             I                   I              V--------->
     I                             I                   V------------------------->
     I                             I
     V------------------------------V---------->------------------------------->
```

Figure 6.1 Line-discipline Message Flow

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```
                                   B1700    REMOTE

                                       I<--FROM ESTABLISHMENT
                                       I I<--NEXT MESSAGE----------I
                                       I I                         I
                                       I I  I<-REPEAT------------I I
                          (1.B)        I I  I                    I I
                                       I I  I I<-REPEAT--------I I I
                                       I I  I I                I I I
         (5)          (2.A)            I I  I I        (2.B)    I I I
                                       I I  I I                 I I I
     (FRJM SYSTEM)                     V V  V V                 I I I
     >------------------------------------->-------------->      I I I
         I               I                  I I I I          I   I I I
         V               V          (1.A) V V V V V          V   I I I
     --------        ---     ----------------------------   ---  I I I
     GARBAGE OR      NAK     SOH,ARM,TN,STX,DA1,DA2,...,ETX,BCC ARM  I I I
     NO REPLY        ---     ---------------------------------- ACK  I I I
     ----------        I              I                      I  ---  I I I
     <-----V           I              I                      I    I  I I I
                       I              I                      I    I  I I I
     (TO SYSTEM)       I              I                      I    I  I I I
     <----------------V              I                      I    I  I I I
                                      I                      I       I I I
     <-----------------------------------V--<---------------------V  I I I
```

                    Figure 6.1 (Cont.) Line-discipline Message Flow

## NOTES FOR FIGURE 6.1

The following notes refer to the preceding diagram of the flow of the RJE line protocol given in Figure 6.1. The parenthesized numbers in that figure relate portions of the diagram to the following notes. Also, the terms "system" and "remote" may be interchanged without affecting the accuracy of the text.

### MESSAGE RESPONSE

Initially, the system is transmitting a message to the remote; in response to this transmission, the system may expect a number of responses transmitted by the remote.

1.      If the receiving terminal has data to transmit to the system after it has received the message from the system, it will positively or negatively acknowledge the receipt of the message in one of the following manners:

   A.   If the message received was found to have parity errors or an invalid format, then the Transmission Number (TN) character from the last valid message received will be returned in the "ARM" field of the message transmitted to the system.

   B.   If the message received was found to be valid, then the TN character from the received message will be returned in the "ARM" field of the message transmitted to the system.

2.      If the remote has no data to transmit to the system after it has received the message from the system, it will positively or negatively acknowledge the receipt of the message in one of the following manners:

   A.   If the message received was found to be invalid, then a single "NAK" control character will be transmitted to the system.

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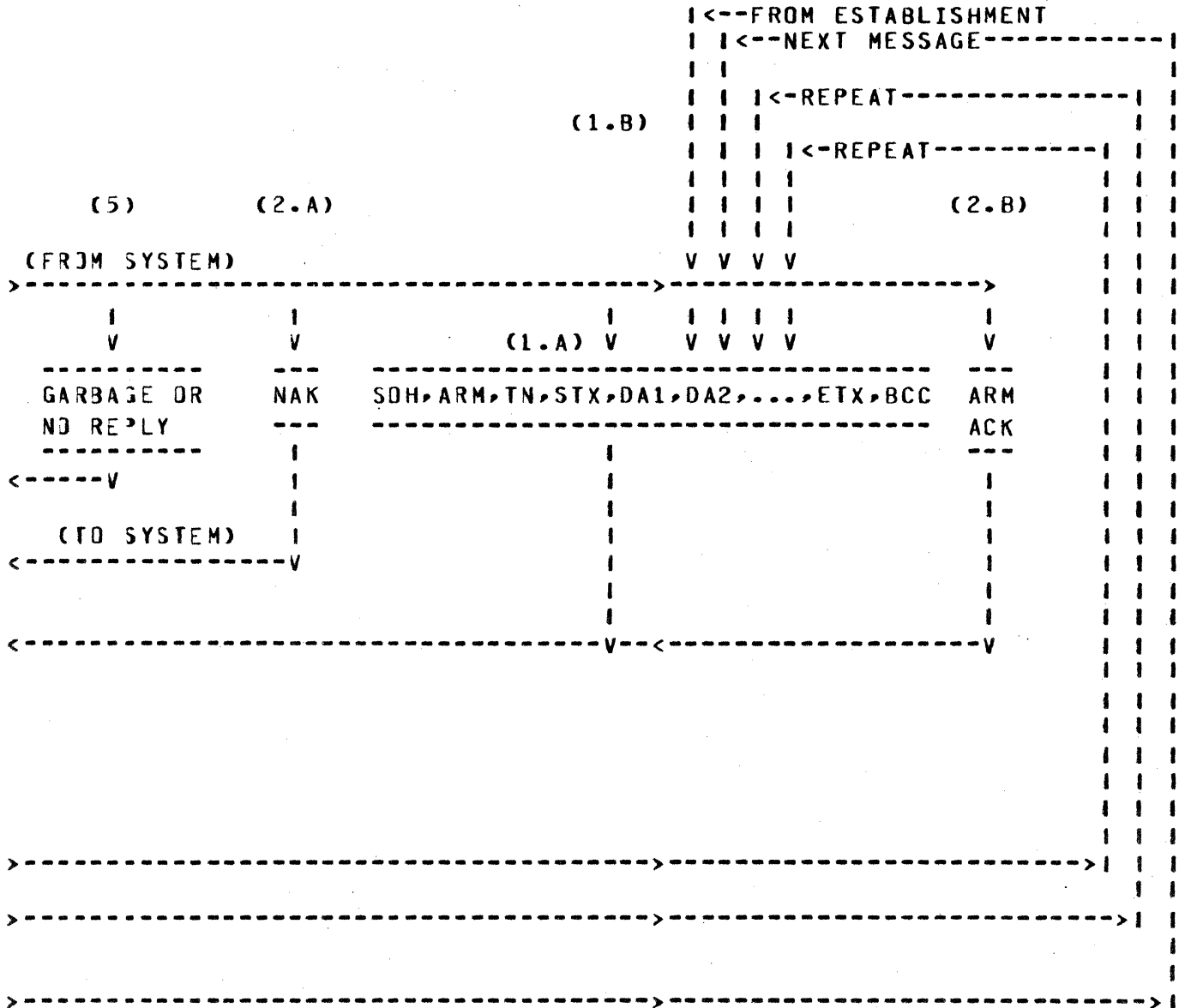
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B.   If  the message received was found  to  be  valid,  then  a
     two-character  message consisting of the TN character  from
     the received message followed by an "ACK" control character
     will be transmitted to the system.

The  system must respond to these acknowledgment messages from  the
terminal in the following manner:

3.     If a "NAK" character was received from the remote (Case 2.A)
       or   if the remote responded with a message containing  text
       (Case  1.A) with an "ARM" character which does not match the
       last  TN character sent, then the system must retransmit the
       last   message sent without changing the TN character.  Data
       may still be received from the remote; the system positively
       or negatively      acknowledges      response      messages       by
       appropriately      setting      the      "ARM"      character      of      the
       retransmitted  message to the TN character of the last valid
       message  received from the remote. A null "ARM" indicates an
       invalid message was received.

4.     If  the ARM field of the message received  from  the  remote
       matches   the TN character of the  last  transmitted  message
       (Cases  1.B and 2.B), then the system must increment its  TN
       character   and transmit the next message to be sent to  the
       remote.

5.     If   the   response   given   by   the   remote   is   totally
       unrecognizable  by the system, the  system  assumes  that  a
       negative  acknowledgment has been received, which leads to a
       retransmission of the last message sent; the TN character is
       not   changed. If the remote had been  trying  to  positively
       acknowledge  the last message it received,  it  must  ignore
       this   retransmitted   message   but   also   issue   another
       acknowledgment.

6.     If  the remote has not responded to the last message sent by
       the system within a pre-specified timeout period, the system
       retransmits  the message without changing the TN  character.
       Thus,  the cycle reverts back to step (1). It is recommended
       that   the communicating systems have different timeouts;  a
       timeout  of 2.5 seconds for the B1700 and three seconds  for
       the remote system is suggested.

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## MESSAGE FORMAT
----------------

As with the line  protocol,  the  message  format  adheres  to  the
criteria  of maximizing line throughput and detection and  recovery
of  errors. The format of the message is in ASCII-67 character code
(Appendix A) and is as follows:

```
S A    S D D                                        E B
     T
O R    T A A - - - - - - TEXT - - - - - - T C
     N
H M    X 1 2                                        X C
```

The individual  characters  in  this  message  format  function  as
follows:

A.  SOH  - This is  the  standard  ASCII  SOH  character  which
    indicates that data is being transmitted.

B.  ARM - This "ACKNOWLEDGE RECEIVED MESSAGE" character is used
    to  indicate positive or  negative  acknowledgment  of  the
    previous  message received with respect to message  parity
    and  message transmission number (TN). The ARM character is
    initialized  to a nul character  during  the  establishment
    phase  of the protocol. When an ARM sequence (SOH-ARM)  is
    received,  it is compared with the last transmission number
    sent. If the ARM agrees with that TN, the last message sent
    has been positively acknowledged.

    If the characters do not agree, the previously sent message
    is being negatively acknowledged and must be retransmitted.
    When  a valid text message is  received,  the  transmission
    number  contained in that message is stored for use as  the
    next ARM character transmitted.

C.  TN  - This  character  is  regarded  as  the  "TRANSMISSION
    NUMBER" portion of the message which is used for  purposes
    of  positively or negatively acknowledging a message.  Each
    end  of  the  data  comm  line  uses  only  two  alternating
    characters  as  transmission  numbers.  The  transmission

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numbers selected for implementation by RJE/DCH are "F" and "U".

D. STX - This is the standard ASCII STX character which serves as the delimiter between the preceding header portion and the text portion of the message.

E. DA1 and DA2 - These two "DEVICE ADDRESS" characters serve to identify a message. The low-order two bytes of the STATION.ID field defined in section 3 correspond with DA1 and DA2. This is applicable to both incoming and outgoing messages. These characters must be numeric or RJE/DCH will treat the message as invalid.

F. TEXT - This is the text field. The RJE line discipline is insensitive to the contents of this field (excluding control characters).

G. ETX - This is the standard ASCII ETX character which serves to indicate the end of the text of a message.

H. BCC - This "BLOCK CHECK CHARACTER" is the longitudinal parity character of the message. It represents the exclusive-or of all characters in the message following the SOH character up to and including the ETX character. The purpose of the BCC character is to ensure proper receipt of messages. Messages containing incorrect BCC characters are negatively acknowledged.

RJE/DCH removes all control characters from incoming messages and transfers the text portion of the message to the I/O program. The STATION.ID and TEXT.LENGTH are set to the correct values. Conversely, messages coming from the I/O program have control characters appended before being transmitted to the remote system.

RJE MESSAGE CONVENTIONS
-------------------------

This section describes the message conventions required for interfacing with Burroughs 6700/B7700 or B2700/3700/4700 host RJE. There are two types of messages transferred between the host system and the remote system. They are:

1.  UNIT RECORD MESSAGE: These are messages that have originated from or are destined for unit record devices (card reader, card punch, printer and console printer).

2.  RJE system messages are used for transfer of system information between the host and the remote.


UNIT RECORD MESSAGES
----------------------

The format of unit record messages is as follows:

```
S A   S D D   - C -               -   - C -                   -   E B
  T         |   |                | R |   |                   |
O R   T A A | C |  <UNIT RECORD> |   | C | <UNIT RECORD> |...T C
  N         |   |                | S |   |                   |
H M   X 1 2 - 1 -               -   - 2 -                   -   X C
```

Where each column of capital letters indicates a single character, the brackets ([ ]) indicate an optional element (as discussed in the following paragraphs), and ... indicates possible repetitions of the preceding optional element.


DA1 and DA2 - These characters are used to define the device designation.

| DA1 | DA2 | DEVICE DESIGNATION |
|-----|-----|--------------------|
| 0   | 0   | SYSTEM CONTROL     |
| 0   | 1   | TO/FROM CONSOLE    |

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| | | |
|---|---|---|
| 0 | 2 | TO CARD PUNCH FROM CARD READER |
| 0 | 3 | TO LINE PRINTER |

The I/O program controls device designation by setting the appropriate values in the STATION.ID field. The following tables define acceptable values for STATION.ID and the associated queues.

Messages sent by I/O program to RJE/DCH are:

| VALUE OF STATION.ID | TYPE | QUEUE | REMOTE SOURCE |
|---|---|---|---|
| 000 | 000 | RJE/DATA.COMM | SYSTEM CONTROL |
| 001 | 000 | RJE/DATA.COMM | SPO |
| 002 | 000 | RJE/DATA.COMM | READER |

| VALUE OF STATION.ID | TYPE | QUEUE | COMMAND DEFINITION |
|---|---|---|---|
| 000 | 999 | DATA.COMM/CONTROL | STOP RJE/DCH |
| 000 | 998 | DATA.COMM/CONTROL | DISPLAY LOG |
| 000 | 997 | DATA.COMM/CONTROL | RE-ESTABLISH CONNECTION |
| 000 | 996 | DATA.COMM/CONTROL | WAIT FOR RING |
| 000 | 994 | DATA.COMM/CONTROL | START AND STOP AUDITING |

STATION.IDS and type fields other than those described above are invalid.

The user should note that the value of STATION.ID or type is associated with queues and should conform to the protocol.

Messages sent by RJE/DCH to I/O programs are:

| VALUE OF STATION.ID | TYPE | QUEUE | REMOTE DESTINATION |
|---|---|---|---|
| 000 | 000 | RJE/SPO.OUT | RJE SYSTEM MESSAGE |
| 001 | 000 | RJE/SPO.OUT | SPO |

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```
      002            000         RJE/PRINT.OUT    PUNCH
      003            000         RJE/PRINT.OUT    PRINTER
```

A value of STATION.ID greater than 3 is invalid.


CC1  - This "CARRIAGE CONTROL" character is meaningful only when  a
remote   output device such as a line printer is designated as  the
recipient of the message. This character indicates carriage control
to  be performed by the remote computer according to the  following
convention.

```
          CC1                        MEANING
          ---                        -------
           0                 PRINT NO SPACE
           1                 PRINT AND SINGLE SPACE
           2                 PRINT AND DOUBLE SPACE
           A                 PRINT AND SKIP TO CHANNEL 1 (TO TOP OF PAGE)
           B                 PRINT AND SKIP TO CHANNEL 2
           C                 PRINT AND SKIP TO CHANNEL 3
           D                 PRINT AND SKIP TO CHANNEL 4
           E                 PRINT AND SKIP TO CHANNEL 5
           F                 PRINT AND SKIP TO CHANNEL 6
           G                 PRINT AND SKIP TO CHANNEL 7
           H                 PRINT AND SKIP TO CHANNEL 8
           I                 PRINT AND SKIP TO CHANNEL 9
           J                 PRINT AND SKIP TO CHANNEL 10
           K                 PRINT AND SKIP TO CHANNEL 11
           L                 PRINT AND SKIP TO CHANNEL 12
```

UNIT RECORD - This may be any one of the following:

    1.   One line of print (132 characters)
    2.   One card image from the reader (80 characters)
    3.   One card image to be punched (80 characters)
    4.   One line of console printer input or output (72 characters)


Unit records from different devices may not be intermixed within the
same message. All unit record data (except console printer input or
output) may be compressed using the following technique:

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The ASCII control character, ESC, followed by two characters representing a two digit decimal number replaces a string of blanks whose length is given by that decimal number. Consecutive repetitions of this ESC convention must be used to represent strings of more than 100 blanks. For example, the following character string appearing in the text portion of a message would represent 104 consecutive blank characters:

```
            E  E
            S99S05
            C  C
```

RS - This is the standard ASCII RS character which serves to separate records within a single message. Two adjacent RS characters or two RS characters separated by a CC1 character (if the device is a line printer) indicate a blank record.


## RJE SYSTEM MESSAGES
--------------------


All RJE system messages have the following format:

```
S A T S D D C C         E B
O R N T A A D D  DATA    T C
H M   X 1 2 1 2          X C
```

Where DA1, DA2 are always "00".


CD1, CD2 identify the different messages as follows:

| CD1, CD2 | DEFINITION |
|----------|------------|
| -------- | ---------- |

00     (RJE/DCH TERMINATION)

A local system message sent to the I/O program indicating RJE/DCH has gone to end of job because of an error condition, the I/O program and console program should do likewise.

01      (LOGGED ON)

Sent by the host system to the remote terminal to inform the
terminal that the operator using the terminal has been
logged on, and that the host will now accept operator
messages and input data.

02DDD   (BUFFER SIZE REQUEST)

Sent from the host system requesting a change in the length
of messages being assembled for transmission; "DDD" is a
three character data field containing the requested message
length in decimal notation (200 means a maximum message size
of two hundred characters).

A buffer size request message is always answered with a
buffer size reply (04) message.

It is important to note that the absolute maximum length of
messages which will be accepted on input is 400.

03      (LOGGED OFF)

Sent from the host to the remote informing the remote
terminal that it is no longer logged in to the host system,
and that operator messages and input data will no longer be
accepted.

04DDD   (BUFFER SIZE REPLY)

Sent from the remote system as a reply to a BUFFER SIZE
REQUEST (02) message; "DDD" is as defined for buffer size
request. RJE/DCH will reply to a BUFFER SIZE REQUEST message
with a BUFFER SIZE REPLY message containing the maximum
length of messages that it will henceforth assemble.

SUGGESTIONS FOR CODING I/O PROGRAMS
-----------------------------------


The I/O program may be written in COBOL or UPL. Both languages
interface with queues through queue file declarations and
read/write functions. The COBOL "VALUE OF ID" and UPL "LABEL" for
the queues should be set to the correct values.


In an RJE environment, the I/O program is expected to perform
functions such as read and compress cards, and transmit to the host
system. It may also be required to unpack received data and write
to several peripherals.


The interface between the console printer program and the I/O
program need not conform to the RJE/DCH message formating
conventions.


If the user desires to read B1700 control cards, then the STREAM and
TERMINATE control statements must be used. If a ?STREAM card
precedes a deck of cards then all cards with invalid punches in
column 1 are read as normal data cards. If an invalid character
occurs in any other column, the MCP requests a re-read of the card.
When the MCP detects a ?TERMINATE card it exits from this mode of
operation.


All communication between the I/O program and RJE/DCH should be in
EBCDIC. The I/O program is expected to set the correct values for
STATION.ID, TEXT.LENGTH, and TYPE fields in the message header.

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## APPENDIX A
----------

### 1967 ASCII AND EBCDIC CHARACTER ASSIGNMENTS
------------------------------------------------

| 1967 ASCII | EBCDIC | EBCDIC GRAPHIC | EBCDIC PUNCH CODE |
|------------|--------|----------------|-------------------|
| 00 | 00 | NUL | 12-0-9-8-1 |
| 01 | 01 | SOH | 12-9-1 |
| 02 | 02 | STX | 12-9-2 |
| 03 | 03 | ETX | 12-9-3 |
| 04 | 37 | EOT | 9-7 |
| 05 | 2D | ENQ | 0-9-8-5 |
| 06 | 2E | ACK | 0-9-8-6 |
| 07 | 2F | BEL | 0-9-8-7 |
| 08 | 16 | BS | 11-9-6 |
| 09 | 05 | HT | 12-9-5 |
| 0A | 25 | LF | 0-9-5 |
| 0B | 0B | VT | 12-9-8-3 |
| 0C | 0C | FF | 12-9-8-4 |
| 0D | 0D | CR | 12-9-8-5 |
| 0E | 0E | SO | 12-9-8-6 |
| 0F | 0F | SI | 12-9-8-7 |
| 10 | 10 | DLE | 12-11-9-8-1 |
| 11 | 11 | DC1 | 11-9-1 |
| 12 | 12 | DC2 | 11-9-2 |
| 13 | 13 | DC3 | 11-9-3 |
| 14 | 3C | DC4 | 11-8-4 |
| 15 | 3D | NAK | 9-8-5 |
| 16 | 32 | SYN | 9-2 |
| 17 | 26 | ETB | 0-9-6 |
| 18 | 18 | CAN | 11-9-8 |
| 19 | 19 | EM | 11-9-8-1 |
| 1A | 3F | SUB | 9-8-7 |
| 1B | 27 | ESC | 0-9-7 |
| 1C | 1C | FS | 11-9-8-4 |
| 1D | 1D | GS | 11-9-8-5 |
| 1E | 1E | RS | 11-9-8-6 |
| 1F | 1F | US | 11-9-8-7 |

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| | | | NO PUNCHES |
|------|------|------|-------------|
| 20 | 40 | SP | 12-8-7 |
| 21 | 4F | ! | 8-7 |
| 22 | 7F | " | 8-3 |
| 23 | 7B | # | 11-8-3 |
| 24 | 5B | $ | 0-8-4 |
| 25 | 6C | % | 12 |
| 26 | 50 | & | 8-5 |
| 27 | 7D | ' | 12-8-5 |
| 28 | 4D | ( | 11-8-5 |
| 29 | 5D | ) | 11-8-4 |
| 2A | 5C | * | 12-8-6 |
| 2B | 4E | + | 0-8-3 |
| 2C | 6B | , | 11 |
| 2D | 60 | - | 12-8-3 |
| 2E | 4B | . | 0-1 |
| 2F | 61 | / | |
| | | | |
| 30 | F0 | 0 | 0 |
| 31 | F1 | 1 | 1 |
| 32 | F2 | 2 | 2 |
| 33 | F3 | 3 | 3 |
| 34 | F4 | 4 | 4 |
| 35 | F5 | 5 | 5 |
| 36 | F6 | 6 | 6 |
| 37 | F7 | 7 | 7 |
| 38 | F8 | 8 | 8 |
| 39 | F9 | 9 | 9 |
| 3A | 7A | : | 8-2 |
| 3B | 5E | ; | 11-8-6 |
| 3C | 4C | < | 12-8-4 |
| 3D | 7E | = | 8-6 |
| 3E | 6E | > | 0-8-6 |
| 3F | 6F | ? | 0-8-7 |
| | | | |
| 40 | 7C | @ | 8-4 |
| 41 | C1 | A | 12-1 |
| 42 | C2 | B | 12-2 |
| 43 | C3 | C | 12-3 |
| 44 | C4 | D | 12-4 |
| 45 | C5 | E | 12-5 |
| 46 | C6 | F | 12-6 |
| 47 | C7 | G | 12-7 |
| 48 | C8 | H | 12-8 |

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| | | | |
|---|---|---|---|
| 49 | C9 | I | 12-9 |
| 4A | D1 | J | 11-1 |
| 4B | D2 | K | 11-2 |
| 4C | D3 | L | 11-3 |
| 4D | D4 | M | 11-4 |
| 4E | D5 | N | 11-5 |
| 4F | D6 | O | 11-6 |
| | | | |
| 50 | D7 | P | 11-7 |
| 51 | D8 | Q | 11-8 |
| 52 | D9 | R | 11-9 |
| 53 | E2 | S | 0-2 |
| 54 | E3 | T | 0-3 |
| 55 | E4 | U | 0-4 |
| 56 | E5 | V | 0-5 |
| 57 | E6 | W | 0-6 |
| 58 | E7 | X | 0-7 |
| 59 | E8 | Y | 0-8 |
| 5A | E9 | Z | 0-9 |
| 5B | 4A | [ | 12-8-2 |
| 5C | E0 | \ | 0-8-2 |
| 5D | 5A | ] | 11-8-2 |
| 5E | 5F | CARET | 11-8-7 |
| 5F | 6D | - | 0-8-5 |

SMALL
LETTERS

| | | | |
|---|---|---|---|
| 61 | 81 | A | 12-0-1 |
| 62 | 82 | B | 12-0-2 |
| 63 | 83 | C | 12-0-3 |
| 64 | 84 | D | 12-0-4 |
| 65 | 85 | E | 12-0-5 |
| 66 | 86 | F | 12-0-6 |
| 67 | 87 | G | 12-0-7 |
| 68 | 88 | H | 12-0-8 |
| 69 | 89 | I | 12-0-9 |
| 6A | 91 | J | 12-11-1 |
| 6B | 92 | K | 12-11-2 |
| 6C | 93 | L | 12-11-3 |
| 6D | 94 | M | 12-11-4 |
| 6E | 95 | N | 12-11-5 |
| 6F | 96 | O | 12-11-6 |

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| | | | |
|---|---|---|---|
| 70 | 97 | P | 12-11-7 |
| 71 | 98 | Q | 12-11-8 |
| 72 | 99 | R | 12-11-9 |
| 73 | A2 | S | 11-0-2 |
| 74 | A3 | T | 11-0-3 |
| 75 | A4 | U | 11-0-4 |
| 76 | A5 | V | 11-0-5 |
| 77 | A6 | W | 11-0-6 |
| 78 | A7 | X | 11-0-7 |
| 79 | A8 | Y | 11-0-8 |
| 7A | A9 | Z | 11-0-9 |
| 7B | C0 | LEFT BRACE | 12-0 |
| 7C | 6A | | 12-11 |
| 7D | D0 | RIGHT BRACE | 11-0 |
| 7E | A1 | DIFFERENCE | 11-0-1 |
| 7F | 07 | DEL | 12-9-7 |

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APPENDIX B
----------

## SAMPLE COBOL CONSOLE PROGRAM
--------------------------------

```
000100 IDENTIFICATION DIVISION.          CONSOLE-PROGRAM.
000200 PROGRAM-ID.                       BURROUGHS CORP.
000300 AUTHOR.                           07/24/74.
000500 DATE-WRITTEN.
000600 DATE-COMPILED.
000800 ENVIRONMENT DIVISION.
000900 CONFIGURATION SECTION.
001000 OBJECT-COMPUTER.                  B-1700.
001100 SOURCE-COMPUTER.                  B-1700.
001200 INPUT-OUTPUT SECTION.
001300 FILE-CONTROL.
001400      SELECT SPO-QUE-FD            ASSIGN TO QUEUE.
001500 I-O-CONTROL.
001600 DATA DIVISION.
001700 FILE SECTION.
001800 FD   SPO-QUE-FD
001900      RECORD CONTAINS 73 CHARACTERS
002000      VALUE OF ID IS "RJE"/"SPO.IN".
002100 01   SPO-QUE.
002200      05   SPO-INFO.
002300           10   STOP-MESS          PIC     X(5).
002400           10   FILLER             PIC     X(55).
002500      05   SPO-ETX                 PIC     X.
002600      05   FILLER                  PIC     X(12).
002700 WORKING-STORAGE SECTION.
002800 01   WORK-AREA.
002900      05   ETX                     PIC     99  COMP    VALUE 2032.
003000      05   ETX-CHAR REDEFINES ETX  PIC     X.
003100      05   RJE-UP PIC X(25) VALUE   "EX RJEC/IOC CG 87870 PR 7".
003200 PROCEDURE DIVISION.
003400 START-PROGRAM.
003500      ZIP RJE-UP.
003600      OPEN OUTPUT SPO-QUE-FD.
003700      DISPLAY "ENTER SPO COMMANDS" UPON SPO.
003800 ACCEPT-LOOP.
003900      MOVE  SPACE TO  SPO-QUE.
004000      ACCEPT  SPO-INFO  FROM  SPO.
004100      MOVE  ETX-CHAR  TO   SPO-ETX.
```

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```
004200      WRITE SPO-QUE.
004300      IF  STOP-MESS  = ".STOP" OR ".ST  "
004400          GO TO STOP-PROGRAM.
004500      GO TO ACCEPT-LOOP.
004600 STOP-PROGRAM.
004700      CLOSE SPO-QUE-FD.
004800      STOP RUN.
```

## SAMPLE UPL CONSOLE PROGRAM
-----------------------------

```
    FILE  RJESPO.IN        (LABEL="RJE"/"SPO.IN",DEVICE=QUEUE,BUFFERS=1,
             RECORDS=73,OPEN.OPTION=OUTPUT);
   DECLARE
             SPO.INFO CHARACTER (73);
%
         ZIP "EX RJEC/IOU CG 87870 PR 7";
         DO  ACCEPT.LOOP  FOREVER;
             ACCEPT  SPO.INFO , END.OF.TEXT;
             WRITE  RJESPO.IN (SPO.INFO);
             IF  SUBSTR (SPO.INFO,0,5)  =  ".STOP"  OR
                 SUBSTR (SPO.INFO,0,3)  =  ".ST"
                 THEN  UNDO  ACCEPT.LOOP;
         END  ACCEPT.LOOP;
         STOP;
   FINI;
```

SAMPLE COBOL INPUT/OUTPUT PROGRAM
------------------------------------

```
000010 IDENTIFICATION DIVISION.
000020 PROGRAM-ID.                I/O-PROGRAM.
000030 AUTHOR.                    BURROUGHS CORP.
000050 DATE-WRITTEN.              08/05/74.
000060 DATE-COMPILED.
000080 REMARKS.
000090 ENVIRONMENT  DIVISION.
000100 CONFIGURATION SECTION.
000110 OBJECT-COMPUTER.           B-1700.
000120 SOURCE-COMPUTER.           B-1700
000130*                           SEGMENT-LIMIT IS 09
000140                            .
000150 INPUT-OUTPUT SECTION.
000160
000170 FILE-CONTROL.
000180
000190     SELECT  CARDS              ASSIGN TO READER.
000200     SELECT  RJE-PRINT          ASSIGN TO PRINTER.
000210     SELECT  RJE-PUNCH          ASSIGN TO PUNCH.
000220
000230     SELECT  RJE-PRINT-OUT      ASSIGN TO QUEUE.
000240     SELECT  RJE-SPO-OUT        ASSIGN TO QUEUE.
000250     SELECT  RJE-DATA-COMM      ASSIGN TO QUEUE.
000260     SELECT  RJE-SPO-IN         ASSIGN TO QUEUE.
000270     SELECT  DATA-COMM-CONTROL  ASSIGN TO QUEUE.
000280
000290 I-O-CONTROL.
000300/
000310 DATA DIVISION.
000320 FILE SECTION.
000330
000340 FD  CARDS
000350     RECORD CONTAINS 80 CHARACTERS
000360     VALUE OF ID "RJE"/"CARDS".
000370
000380 01  CARDS-DETAIL.
000390     05  FILLER               PIC     X(80).
000400
000410 FD  RJE-PRINT
000420     RECORD CONTAINS 132 CHARACTERS
000430     VALUE OF ID "RJE"/"PRINT".
000440
```

```
000450 01   PRINT-DETAIL.
000460      05  FILLER                    PIC     X(132).
000470
000480 FD   RJE-PUNCH
000490      RECORD CONTAINS 80 CHARACTERS
000500      VALUE OF ID "RJE"/"PUNCH".
000510
000520 01   PUNCH-DETAIL.
000530      05  FILLER                    PIC     X(80).
000540
000550 FD   RJE-PRINT-OUT
000560      RECORD CONTAINS 411 CHARACTERS
000570      VALUE OF ID "RJE"/"PRINT.OUT".
000580
000590 01   RJEPRINT-DETAIL.
000600      05  FILLER                    PIC     X(411).
000610
000620 FD   RJE-SPO-OUT
000630      RECORD CONTAINS 80 CHARACTERS
000640      VALUE OF ID "RJE"/"SPO.OUT".
000650
000660 01   RJESPOOUT-DETAIL.
000670      05  FILLER                    PIC     X(80).
000680
000690 FD   RJE-DATA-COMM
000700      RECORD CONTAINS 411 CHARACTERS
000710      VALUE OF ID "RJE"/"DATA.COMM".
000720
000730 01   RJEDATACOMM-DETAIL.
000740      05  FILLER                    PIC     X(411).
000750
000760 FD   RJE-SPO-IN
000770      RECORD CONTAINS  73 CHARACTERS
000780      VALUE OF ID "RJE"/"SPO.IN".
000790
000800 01   RJESPOIN-DETAIL.
000810      05  FILLER                    PIC     X(73).
000820
000830 FD   DATA-COMM-CONTROL
000840      RECORD CONTAINS 10 CHARACTERS
000850      VALUE OF ID "DATA.COMM"/"CONTROL".
000860
000870 01   DATACOMMCONTROL-DETAIL.
000880      05  FILLER                    PIC     X(10).
000890
000900/
000910 WORKING-STORAGE SECTION.
```

```
000920 01   WORK-AREA.
000930      05   HOLD-CONTROL-CHARACTERS.
000940           10   ESC-CHAR          PIC     X           VALUE "0".
000950           10   ETX-CHAR          PIC     X           VALUE "0".
000960           10   RS-CHAR           PIC     X           VALUE "0".
000970           10   NULL-CHAR         PIC     X           VALUE "0".
000980           10   SPO-RETURN        PIC     X           VALUE "0".
000990
001000      05   HCC-RED REDEFINES HOLD-CONTROL-CHARACTERS.
001010           10   ESC               PIC     99  COMP.
001020           10   ETX               PIC     99  COMP.
001030           10   RS                PIC     99  COMP.
001040           10   NULL              PIC     99  COMP.
001050           10   SPO-RET           PIC     99  COMP.
001060
001070      05   HOLD-COUNTERS    COMP.
001080           10   OUT-BUFF-PNTR     PIC     9(8)        VALUE 0.
001090           10   CARD-COL-PNTR     PIC     9(8)        VALUE 0.
001100           10   IN-BUFF-PNTR      PIC     9(8)        VALUE 0.
001110           10   LINE-PNTR         PIC     9(8)        VALUE 0.
001120           10   PNTR              PIC     9(8)        VALUE 0.
001130           10   BUFFER-SIZE       PIC     9(8)        VALUE 401.
001140           10   SPO-LENGTH        PIC     9(8)        VALUE 0.
001150           10   CNTR-NUM          PIC     99          VALUE 0.
001160           10   CN-RED REDEFINES CNTR-NUM.
001170                15   CNTR   OCCURS 2 TIMES PIC 9.
001180           10   BUFFER-WORK       PIC     9(8)        VALUE 0.
001190           10   SPO-PNTR          PIC     9(8)        VALUE 0.
001200           10   HOLD-CC           PIC     99          VALUE 0.
001210           10   SUB-1             PIC     9(8)        VALUE 0.
001220           10   SUB-2             PIC     9(8)        VALUE 0.
001230           10   SUB-3             PIC     9(8)        VALUE 0.
001240           10   K-1               PIC     9           VALUE 1.
001250           10   K-2               PIC     9           VALUE 2.
001260
001270           10   SUB-TOTALS.
001280                15   CARD-CT      PIC     9(8)        VALUE 0.
001290                15   PRINT-CT     PIC     9(8)        VALUE 0.
001300                15   PUNCH-CT     PIC     9(8)        VALUE 0.
001310
001320                15   PRINT-BUFF   PIC     9(8)        VALUE 0.
001330                15   PRINT-CHAR   PIC     9(8)        VALUE 0.
001340                15   PUNCH-BUFF   PIC     9(8)        VALUE 0.
001350                15   PUNCH-CHAR   PIC     9(8)        VALUE 0.
001360                15   CARD-BUFF    PIC     9(8)        VALUE 0.
001370                15   CARD-CHAR    PIC     9(8)        VALUE 0.
001380
```

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```
001390                  15   SPO-1700          PIC      9(8)          VALUE 0.
001400                  15   SPO-1700-CHAR     PIC      9(8)          VALUE 0.
001410                  15   SPO-HOST          PIC      9(8)          VALUE 0.
001420                  15   SPO-HOST-CHAR     PIC      9(8)          VALUE 0.
001430
001440          05   HOLD-SWITCHES.
001450                  10   LOGGED-ON         PIC      X             VALUE SPACE.
001460                  10   FLAG-SET          PIC      X             VALUE SPACE.
001470                  10   BUFFER-FLAG-SET   PIC      X             VALUE SPACE.
001480                  10   EOJ-SW            PIC      X             VALUE SPACE.
001490                  10   PRINT-FLAG        PIC      X             VALUE SPACE.
001500                  10   PUNCH-FLAG        PIC      X             VALUE SPACE.
001510
001520          05   LOCAL-COMMAND.
001530                  10   LC-OCCURS   OCCURS   5   TIMES.
001540                       15   LOCAL-CHAR                PIC      X.
001550
001560          05   BUFFER-IN.
001570                  10   BUFFER-IN-HEAD.
001580                       15   STATION-IN       PIC    999          VALUE 0.
001590                       15   MESSAGE-IN-LENGTH PIC   9999         VALUE 0.
001600                       15   TYPE             PIC    999          VALUE 0.
001610                  10   PRINT-OUTPUT.
001620                       15   SPO-IMAGE.
001630                            20   SPO-CHAR    PIC    99           VALUE 0.
001640                            20   SPO-BUFFER  PIC    999          VALUE 0.
001650                            20   SPO-AREA    PIC    X(67)        VALUE SPACE.
001660                       15   FILLER          PIC    X(333)       VALUE SPACE.
001670
001680                  10   PO-RED REDEFINES PRINT-OUTPUT.
001690                       15   PRINT-OUT-RED OCCURS 405 TIMES PIC X.
001700
001710          05   BUFFER-OUT.
001720
001730                  10   BUFFER-OUT-HEAD.
001740                       15   STATION-OUT      PIC    999          VALUE 0.
001750                       15   MESSAGE-OUT-LENGTH PIC  9999         VALUE 0.
001760                       15   MESSAGE-OUT-TYPE PIC    999          VALUE 0.
001770                  10   CARD-BUFFER-OUT.
001780                       15   CARD-BUFFER   OCCURS 405 PIC X.
001790
001800          05   OUTPUT-LINES.
001810                  10   PRINT-LINE OCCURS 133 TIMES PIC X.
001820
001830          05   OL-REDS REDEFINES OUTPUT-LINES.
001840                  10   CARRIAGE-CONTROL   PIC    X.
001850                  10   LINE-CHAR          PIC    X(132).
```

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```
001860
001870       05   INPUT-LINES.
001880            10   CARD OCCURS 81 TIMES.
001890                 15   COLUMN          PIC     X.
001900       05   ZIP-DCH                   PIC     X(25)      VALUE
001910                 "EX RJEC/DCH CG 87870 PR 9".
001920/
001930 PROCEDURE DIVISION.
001940
001950 DECLARATIVES.
001960 ON-EXCEPTION-CARD-READER   SECTION 0.
001970
001980       USE AFTER STANDARD ERROR PROCEDURE ON CARDS.
001990
002000 SET-DUMP-SWITCH.
002010       MOVE  1   TO   SW1.
002020 END-DUMP-SWITCH.
002030 END DECLARATIVES.
002040 START-PROGRAM            SECTION 01.
002050 START-SECTION.
002060
002070       PERFORM INITIALIZE-RTN.
002080
002090 MAIN-LOOP.
002100
002110       READ RJE-SPO-IN INTO INPUT-LINES
002120            AT END GO TO CHECK-CARD-FILE.
002130       PERFORM ACCEPT-SPO.
002140
002150       IF  EOJ-SW  =   "X"
002160           GO TO END-RJE-IO.
002170
002180 CHECK-CARD-FILE.
002190
002200       IF  BUFFER-FLAG-SET  =   " "
002210           GO TO CHECK-SPO-OUT.
002220
002230       PERFORM PACK-AND-SEND-CARDS.
002240
002250 CHECK-SPO-OUT.
002260
002270       READ RJE-SPO-OUT INTO BUFFER-IN AT END GO TO CHECK-PRINT-OUT.
002280       IF  STATION-IN = 000   OR   001
002290           PERFORM SPO-PRINT.
002300
002310 CHECK-PRINT-OUT.
002320
```

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```
002330      READ RJE-PRINT-OUT INTO BUFFER-IN AT END GO TO MAIN-LOOP.
002340      IF  STATION-IN = 002 OR 003
002350          PERFORM LINE-PRINT.
002360      GO TO MAIN-LOOP.
002370
002380 END-RJE-IO.
002390      PERFORM DISPLAY-COUNTERS.
002400      STOP RUN.
002410 START-EXIT.
002420/
002430 ACCEPT-SPO               SECTION 50.
002440 ASIS-SECTION.
002450
002460      ADD   K-1  TO   SPO-1700.
002470      MOVE  01   TO   SPO-LENGTH.
002480      MOVE  001  TO   STATION-IN.
002490      MOVE  000  TO   TYPE.
002500      MOVE  0000   TO   MESSAGE-IN-LENGTH.
002510      IF  COLUMN (1) NOT = ".".
002520          GO TO DETERMINE-LENGTH-AND-SEND.
002530*
002540* LOCAL COMMANDS FOR DCH OR IO PROGRAM
002550*
002560      MOVE  0  TO SPO-LENGTH.
002570      MOVE 01 TO SPO-PNTR.
002580      MOVE SPACE TO LOCAL-COMMAND.
002590
002600 LOOP-C.
002610
002620      IF  SPO-PNTR  =   72 OR
002630          COLUMN (SPO-PNTR) = "="  OR
002640          COLUMN (SPO-PNTR) = ETX-CHAR OR
002650          SPO-LENGTH = 5
002660              GO TO SET-LOCAL-FLAG.
002670      IF  COLUMN (SPO-PNTR) = " " NEXT SENTENCE ELSE
002680          ADD K-1 TO SPO-LENGTH
002690          MOVE  COLUMN (SPO-PNTR) TO LOCAL-CHAR (SPO-LENGTH).
002700      ADD K-1   TO  SPO-PNTR.
002710      GO TO LOOP-C.
002720
002730 SET-LOCAL-FLAG.
002740
002750      IF  LOCAL-COMMAND   =  ".RE " OR
002760          LOCAL-COMMAND   =  ".READ"
002770          OPEN INPUT CARDS
002780          MOVE "X" TO  BUFFER-FLAG-SET
002790      ELSE
```

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```
002800        IF  LOCAL-COMMAND = ".LOG "
002810            PERFORM DISPLAY-COUNTERS
002820            MOVE  998  TO  TYPE
002830            GO TO    WRITE-DATA-CONTROL
002840        ELSE
002850        IF  LOCAL-COMMAND  =  ".ST " OR
002860            LOCAL-COMMAND  =  ".STOP"
002870            MOVE  "X"  TO  EOJ-SW
002880            MOVE  999  TO  TYPE
002890            GO TO    WRITE-DATA-CONTROL
002900        ELSE
002910        IF  LOCAL-COMMAND  =  ".WT " OR
002920            LOCAL-COMMAND  =  ".WAIT"
002930            MOVE  996  TO  TYPE
002940            GO TO    WRITE-DATA-CONTROL
002950        ELSE
002960        IF  LOCAL-COMMAND = ".EST "
002970            MOVE 997  TO  TYPE
002980            GO TO    WRITE-DATA-CONTROL
002990        ELSE
003000        IF  LOCAL-COMMAND  =  ".CL " OR
003010            LOCAL-COMMAND  =  ".CLOS"
003020            CLOSE RJE-PRINT WITH LOCK
003030            CLOSE RJE-PUNCH WITH LOCK
003040            MOVE " " TO  PRINT-FLAG, PUNCH-FLAG
003050        ELSE
003060        IF  LOCAL-COMMAND = ".CLLP"
003070            CLOSE RJE-PRINT WITH LOCK
003080            MOVE  " "  TO  PRINT-FLAG
003090        ELSE
003100        IF  LOCAL-COMMAND = ".CLCP"
003110            CLOSE  RJE-PUNCH WITH LOCK
003120            MOVE  " "  TO   PUNCH-FLAG
003130        ELSE
003140        IF  LOCAL-COMMAND = ".AUDI"
003150            MOVE  994  TO  TYPE
003160            GO TO WRITE-DATA-CONTROL
003170        ELSE
003180            SUBTRACT K-1 FROM SPO-1700
003190          DISPLAY LOCAL-COMMAND, " ERROR INVALID OPERATOR " UPON SPO.
003200        GO TO ASI-EXIT.
003210
003220 WRITE-DATA-CONTROL.
003230        ADD 10 TO SPO-1700-CHAR.
003240        MOVE 10 TO MESSAGE-IN-LENGTH.
003250        MOVE ETX-CHAR TO PRINT-OUTPUT.
003260
```

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```
003270        WRITE DATACOMMCONTROL-DETAIL    FROM BUFFER-IN.
003280        MOVE  000  TO  TYPE.
003290        GO TO ASI-EXIT.
003300
003310 DETERMINE-LENGTH-AND-SEND.
003320        IF  COLUMN (SPO-LENGTH) = ETX-CHAR OR RS-CHAR
003330            GO TO FIND-NONBLANK.
003340        IF  SPO-LENGTH = 73
003350            GO TO FIND-NONBLANK.
003360        ADD  K-1  TO SPO-LENGTH.
003370        GO TO DETERMINE-LENGTH-AND-SEND.
003380
003390 FIND-NONBLANK.
003400
003410        SUBTRACT K-1 FROM SPO-LENGTH.
003420        IF  SPO-LENGTH < 01 OR
003430            COLUMN (SPO-LENGTH) NOT = " "
003440            GO TO GOT-NONBLANK.
003450        GO TO FIND-NONBLANK.
003460
003470 GOT-NONBLANK.
003480
003490        ADD K-1  TO  SPO-LENGTH.
003500        MOVE SPO-LENGTH  TO  SPO-1700-CHAR.
003510        MOVE  SPO-LENGTH  TO  MESSAGE-IN-LENGTH.
003520 PUT-ETX-IN.
003530        ADD K-1 TO SPO-LENGTH.
003540        MOVE  ETX-CHAR  TO  COLUMN (SPO-LENGTH).
003550        MOVE  INPUT-LINES TO PRINT-OUTPUT.
003560        WRITE RJEDATACOMM-DETAIL  FROM BUFFER-IN.
003570 ASI-EXIT.
003580/
003590 PACK-AND-SEND-CARDS    SECTION 55.
003600 PSC-SECTION.
003610        MOVE  "0"  TO  FLAG-SET.
003620
003630 READ-A-CARD.
003640
003650        READ CARDS INTO INPUT-LINES AT END GO TO TEST-LAST-BUFFER.
003660        IF  COLUMN (1) = "?"
003670            MOVE  NULL-CHAR  TO  COLUMN(1).
003680        MOVE  00  TO  CARD-COL-PNTR.
003690        MOVE  00  TO  PNTR.
003700        ADD K-1 TO CARD-CT.
003710
003720 COMPRESS-CARD.
003730
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```
003740        ADD   K-1   TO   CARD-COL-PNTR, PNTR.
003750        MOVE   CARD-COL-PNTR   TO   SUB-1, SUB-2, SUB-3.
003760        ADD K-1   TO SUB-2.
003770        ADD K-2   TO   SUB-3.
003780        IF   COLUMN (SUB-1) = " " AND
003790             COLUMN (SUB-2) = " " AND
003800             COLUMN (SUB-3) = " "
003810             PERFORM PACK-CARD.
003820
003830 LAST-3-CHAR.
003840
003850        IF   CARD-COL-PNTR NOT > 77
003860             GO TO BUILD-CARD-IMAGE.
003870        IF   CARD-COL-PNTR > 80
003880             PERFORM PUT-IN
003890             IF   FLAG-SET = "1"
003900                  MOVE "0"   TO FLAG-SET
003910                  GO TO PSC-EXIT
003920             ELSE
003930                  GO TO READ-A-CARD.
003940
003950        MOVE   COLUMN (CARD-COL-PNTR) TO COLUMN (PNTR).
003960        ADD   K-1   TO   CARD-COL-PNTR, PNTR.
003970        GO TO LAST-3-CHAR.
003980
003990 BUILD-CARD-IMAGE.
004000
004010        IF PNTR NOT = CARD-COL-PNTR
004020             MOVE   COLUMN (CARD-COL-PNTR) TO COLUMN (PNTR).
004030        GO TO COMPRESS-CARD.
004040 TEST-LAST-BUFFER.
004050
004060        MOVE   " "   TO   BUFFER-FLAG-SET.
004070        IF   OUT-BUFF-PNTR > 0
004080             PERFORM SEND-A-BUFFER.
004090        CLOSE CARDS WITH RELEASE.
004100        MOVE "0"   TO   FLAG-SET.
004110 PSC-EXIT.
004120
004130/
004140 PUT-IN                     SECTION 55.
004150 PI-SECTION.
004160        SUBTRACT OUT-BUFF-PNTR FROM BUFFER-SIZE   GIVING   BUFFER-WORK.
004170        SUBTRACT   K-1 FROM   BUFFER-WORK.
004180        IF   PNTR NOT < BUFFER-WORK
004190             PERFORM   SEND-A-BUFFER.
004200        MOVE RS-CHAR   TO   COLUMN (PNTR).
```

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```
004210      MOVE  00  TO  SUB-1.
004220
004230 PUT-RECORD-IN-SEND-BUFFER.
004240
004250      ADD  K-1  TO  SUB-1, OUT-BUFF-PNTR.
004260      MOVE  COLUMN (SUB-1)  TO  CARD-BUFFER (OUT-BUFF-PNTR).
004270      IF  SUB-1  NOT  =  PNTR
004280          GO TO PUT-RECORD-IN-SEND-BUFFER.
004290 PI-EXIT.
004300/
004310 SEND-A-BUFFER            SECTION 55.
004320 SAB-SECTION.
004330      ADD K-1 TO CARD-BUFF.
004340      MOVE 000 TO MESSAGE-OUT-TYPE.
004350      MOVE 002 TO STATION-OUT.
004360      MOVE  OUT-BUFF-PNTR   TO  MESSAGE-OUT-LENGTH.
004370      ADD  MESSAGE-OUT-LENGTH  TO  CARD-CHAR.
004380      ADD  K-1  TO OUT-BUFF-PNTR.
004390      MOVE  ETX-CHAR  TO  CARD-BUFFER (OUT-BUFF-PNTR).
004400      MOVE  "1"  TO  FLAG-SET.
004410      WRITE  RJEDATACOMM-DETAIL  FROM  BUFFER-OUT.
004420      MOVE  0  TO  OUT-BUFF-PNTR.
004430 SAB-EXIT.
004440/
004450 PACK-CARD               SECTION 55.
004460 PC-SECTION.
004470*
004480* THIS ROUTINE PACKS MORE THEN 3 SPACES IN A ROW
004490*
004500      MOVE  03 TO CNTR-NUM.
004510      ADD  3  TO  CARD-COL-PNTR.
004520
004530 STILL-A-BLANK.
004540
004550      IF  CARD-COL-PNTR < 81 AND
004560          COLUMN (CARD-COL-PNTR) = " "
004570          ADD  K-1  TO  CNTR-NUM, CARD-COL-PNTR,
004580          GO TO STILL-A-BLANK.
004590      MOVE ESC-CHAR  TO  COLUMN (PNTR).
004600      ADD  K-1  TO PNTR.
004610      MOVE  CNTR (1)  TO  COLUMN (PNTR).
004620      ADD  K-1  TO  PNTR.
004630      MOVE  CNTR (2)  TO  COLUMN (PNTR).
004640      ADD  K-1  TO  PNTR.
004650 PC-EXIT.
004660/
004670 SPO-PRINT               SECTION 60.
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```
004680 SPO-SECTION.
004690      ADD K-1 TO SPO-HOST.
004700      ADD MESSAGE-IN-LENGTH  TO  SPO-HOST-CHAR.
004710   IF  PRINT-OUT-RED (MESSAGE-IN-LENGTH) NOT = ETX-CHAR
004720          ADD K-1 TO MESSAGE-IN-LENGTH
004730          MOVE ETX-CHAR TO PRINT-OUT-RED (MESSAGE-IN-LENGTH).
004740   IF  STATION-IN  =   001
004750      DISPLAY SPO-IMAGE UPON SPO
004760      IF  LOGGED-ON  =   "0"
004770          DISPLAY "XXXXXXXXXXXXXXXXXXXX" UPON SPO
004780              GO TO SPO-EXIT.
004790*
004800*  STATION-IN = 000 FOR SYSTEM CONTROL MESSAGE
004810*  STATION-IN = 001 FOR DISPLAY UPON SPO
004820*
004830      IF  STATION-IN = 000 NEXT SENTENCE ELSE
004840          GO TO SPO-EXIT.
004850      IF  SPO-CHAR > 03 OR
004860          SPO-CHAR < 01
004870              GO TO SPO-EXIT.
004880      IF  SPO-CHAR = 01
004890          MOVE "1" TO LOGGED-ON
004900          GO TO SPO-EXIT.
004910      IF  SPO-CHAR = 03
004920          MOVE  "1"  TO  LOGGED-ON
004930          GO TO SPO-EXIT.
004940*
004950*  SPO-CHAR = 02 TO CHANGE BUFFER SIZE.
004960*
004970      IF SPO-BUFFER > 401
004980          MOVE  401  TO  BUFFER-SIZE
004990      ELSE
005000          IF  SPO-BUFFER < 132
005010              MOVE  132  TO  BUFFER-SIZE
005020          ELSE
005030              MOVE  SPO-BUFFER  TO  BUFFER-SIZE.
005040
005050 SPO-EXIT.
005060/
005070 LINE-PRINT              SECTION 65.
005080 LP-SECTION.
005090      IF  PRINT-OUT-RED (MESSAGE-IN-LENGTH) = ETX-CHAR
005100          SUBTRACT K-1 FROM MESSAGE-IN-LENGTH.
005110      IF  STATION-IN = 002
005120          ADD K-1 TO PUNCH-BUFF
005130          ADD MESSAGE-IN-LENGTH TO PUNCH-CHAR
005140      ELSE
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005150          ADD K-1 TO PRINT-BUFF
005160          ADD MESSAGE-IN-LENGTH TO PRINT-CHAR.
005170     MOVE K-1  TO  IN-BUFF-PNTR, LINE-PNTR.
005180     MOVE SPACE TO OUTPUT-LINES.
005190
005200 CREATE-OUTPUT-LINE.
005210
005220     IF  PRINT-OUT-RED (IN-BUFF-PNTR) = ETX-CHAR
005230         GO TO CHECK-LINE-PNTR.
005240     IF  PRINT-OUT-RED (IN-BUFF-PNTR) = ESC-CHAR
005250         PERFORM   PUT-BLANKS
005260         GO TO CHECK-DEVICE-LIMIT.
005270     IF  PRINT-OUT-RED (IN-BUFF-PNTR) = RS-CHAR
005280         PERFORM WRITE-LINE
005290         GO TO CREATE-OUTPUT-LINE.
005300     MOVE  PRINT-OUT-RED (IN-BUFF-PNTR) TO
005310          PRINT-LINE (LINE-PNTR).
005320     ADD   K-1  TO   LINE-PNTR, IN-BUFF-PNTR.
005330
005340 CHECK-DEVICE-LIMIT.
005350
005360     IF  STATION-IN = 002 AND
005370         LINE-PNTR > 80
005380         PERFORM   WRITE-LINE,
005390     ELSE
005400     IF  STATION-IN  =  003 AND
005410         LINE-PNTR > 133
005420         PERFORM WRITE-LINE.
005430     IF  PRINT-OUT-RED (IN-BUFF-PNTR) = ETX-CHAR OR
005440         IN-BUFF-PNTR > MESSAGE-IN-LENGTH OR
005450         IN-BUFF-PNTR > BUFFER-SIZE
005460         GO TO CHECK-LINE-PNTR.
005470     GO TO CREATE-OUTPUT-LINE.
005480
005490 CHECK-LINE-PNTR.
005500
005510     IF  LINE-PNTR > 1
005520         PERFORM   WRITE-LINE.
005530
005540 LP-EXIT.
005550/
005560 PUT-BLANKS                  SECTION  65.
005570 PB-SECTION.
005580
005590     ADD   K-1  TO  IN-BUFF-PNTR.
005600     MOVE  PRINT-OUT-RED (IN-BUFF-PNTR) TO CNTR (1).

005610     ADD   K-1  TO   IN-BUFF-PNTR.
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005620        MOVE   PRINT-OUT-RED (IN-BUFF-PNTR) TO   CNTR (2).
005630        ADD   CNTR-NUM   TO   LINE-PNTR.
005640        ADD   K-1   TO   IN-BUFF-PNTR.
005650 PB-EXIT.
005660/
005670 WRITE-LINE                SECTION 65.
005680 WL-SECTION.
005690
005700        IF   STATION-IN = 003 AND
005710             PRINT-FLAG   =   " "
005720             OPEN OUTPUT RJE-PRINT
005730             MOVE  "X"  TO   PRINT-FLAG.
005740        IF   STATION-IN  =   002   AND
005750             PUNCH-FLAG = " "
005760             OPEN OUTPUT RJE-PUNCH
005770             MOVE "X"  TO   PUNCH-FLAG.
005780        IF   STATION-IN  =   002
005790             ADD K-1 TO PUNCH-CT
005800             WRITE  PUNCH-DETAIL FROM OUTPUT-LINES
005810             GO TO RECORD-WRITTEN.
005820        ADD K-1 TO PRINT-CT.
005830
005840 CHECK-CARRIAGE-CONTROL.
005850
005860        IF   CARRIAGE-CONTROL = "0" MOVE   00   TO   HOLD-CC ELSE
005870        IF   CARRIAGE-CONTROL = "1" MOVE   01   TO   HOLD-CC   ELSE
005880        IF   CARRIAGE-CONTROL = "2" MOVE   02   TO   HOLD-CC.
005890        IF   HOLD-CC   NOT =   99
005900            WRITE PRINT-DETAIL FROM LINE-CHAR BEFORE ADVANCING HOLD-CC
005910                                                    LINES
005920            GO TO RECORD-WRITTEN.
005930
005940        IF   CARRIAGE-CONTROL = "A" MOVE 01 TO HOLD-CC ELSE
005950        IF   CARRIAGE-CONTROL = "B" MOVE 02 TO HOLD-CC ELSE
005960        IF   CARRIAGE-CONTROL = "C" MOVE 03 TO HOLD-CC ELSE
005970        IF   CARRIAGE-CONTROL = "D" MOVE 04 TO HOLD-CC ELSE
005980        IF   CARRIAGE-CONTROL = "E" MOVE 05 TO HOLD-CC ELSE
005990        IF   CARRIAGE-CONTROL = "F" MOVE 06 TO HOLD-CC ELSE
006000        IF   CARRIAGE-CONTROL = "G" MOVE 07 TO HOLD-CC ELSE
006010        IF   CARRIAGE-CONTROL = "H" MOVE 08 TO HOLD-CC ELSE
006020        IF   CARRIAGE-CONTROL = "I" MOVE 09 TO HOLD-CC ELSE
006030        IF   CARRIAGE-CONTROL = "J" MOVE 10 TO HOLD-CC ELSE
006040        IF   CARRIAGE-CONTROL = "K" MOVE 11 TO HOLD-CC ELSE
006050        IF   CARRIAGE-CONTROL = "L" MOVE 12 TO HOLD-CC ELSE
006060            DISPLAY "CARRIAGE CONTROL CHARACTER INVAILD" UPON SPO
006070
006080            MOVE "1"  TO   CARRIAGE-CONTROL
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006090              GO TO CHECK-CARRIAGE-CONTROL.
006100        WRITE PRINT-DETAIL FROM LINE-CHAR BEFORE ADVANCING CHANNEL
006110                                                     HOLD-CC.
006120
006130 RECORD-WRITTEN.
006140
006150        MOVE  99  TO  HOLD-CC.
006160        MOVE 01  TO  LINE-PNTR.
006170        ADD K-1 TO IN-BUFF-PNTR.
006180        MOVE SPACE TO OUTPUT-LINES.
006190
006200 WL-EXIT.
006210/
006220 INITIALIZE-RTN          SECTION 99.
006230 IR-SECTION.
006240
006250        MOVE a27a TO ESC.
006260        MOVE a03a TO ETX.
006270        MOVE a1Ea TO RS.
006280        MOVE a00a TO NULL.
006290        MOVE  SPACE   TO   CARD-BUFFER-OUT,
006300                           OUTPUT-LINES,
006310                           LOCAL-COMMAND,
006320                           INPUT-LINES.
006330
006340        OPEN     INPUT
006350                           RJE-SPO-OUT
006360                           RJE-PRINT-OUT,
006370                           RJE-SPO-IN
006380                 OUTPUT
006390                           RJE-DATA-COMM
006400                           DATA-COMM-CONTROL.
006410        ZIP ZIP-DCH.
006420 IR-EXIT.
006430/
006440 DISPLAY-COUNTERS        SECTION 15.
006450 DS-SECTION-98.
006460        DISPLAY CARD-CT, " TOTAL CARDS READ" UPON SPO.
006470        DISPLAY PRINT-CT, " TOTAL LINES PRINTED" UPON SPO.
006480        DISPLAY PUNCH-CT, " TOTAL CARDS PUNCHED" UPON SPO.
006490        DISPLAY "****** BUFFER COUNTS ******" UPON SPO.
006500        DISPLAY CARD-BUFF, " CARDS" UPON SPO.
006510        DISPLAY PRINT-BUFF, " PRINTER" UPON SPO.
006520        DISPLAY PUNCH-BUFF, " PUNCH" UPON SPO.
006530        DISPLAY "****** CHARACTER COUNT ******" UPON SPO.
006540        DISPLAY CARD-CHAR, " CARDS" UPON SPO.
006550        DISPLAY PRINT-CHAR, " PRINTER" UPON SPO.
```

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```
006560        DISPLAY PUNCH-CHAR, " PUNCH" UPON SPO.
006570        DISPLAY "****** SPO COUNTS ******" UPON SPO.
006580        DISPLAY SPO-1700, " B-1700 SPO ENTRIES" UPON SPO.
006590        DISPLAY SPO-HOST, " SPO FROM HOST ENTRIES" UPON SPO.
006600        DISPLAY SPO-1700-CHAR, " B-1700 CHARACTERS" UPON SPO.
006610        DISPLAY SPO-HOST-CHAR, " HOST CHARACTERS" UPON SPO.
```

```
%                                                                      %
%      PROCEDURE: PACK.CARD                                            %
%                                                                      %
%      THIS PROCEDURE IS REFERENCED ONLY BY THE PROCEDURE              %
%      "READ.PACK.AND.SEND.CARDS"                                      %
%                                                                      %
%      THIS PROCEDURE HANDLES THE PACKING OF ALL CARD IMAGES FOR THE   %
%      PROGRAM. THE PROCEDURE "PACK.BLANKS" IS REFERENCED BY THIS      %
%      PROCEDURE. SINCE ALL PACKED CARD IMAGES WILL NEVER BE LONGER THAN %
%      THE ORIGINAL CARD IMAGE, ALL PACKED CARD IMAGES ARE FORMED WITHIN %
%      THE VARIABLE WHICH HOLDS THE ORIGINAL CARD IMAGE ("CARD"). THE  %
%      VARIABLE "CARD.COL.POINTER" IS USED HERE AS THE POINTER FOR THE %
%      UNPACKED CARD, WHILE THE VARIABLE "PNTR" IS USED AS THE POINTER FOR%
%      THE PACKED CARD IMAGE. THESE VARIABLES ARE INITIALISED AT THE START%
%      OF THE PROCEDURE. A LOOP IS THEN ENTERED AND IF THE END OF THE CARD%
%      IS NOT ABOUT TO BE REACHED, THE NEXT THREE CHARACTERS ARE EXAMINED %
%      TO SEE IF A BLANK FIELD HAS BEEN FOUND. IF SO, THE FIELD IS     %
%      COMPRESSED BY A CALL TO "PACK.BLANKS". THEN IF WE AGAIN ARE NOT AT %
%      THE END OF THE CARD THE NEXT CHARACTER (WHICH WILL ALWAYS BE A  %
%      NON-BLANK OR PART OF A FIELD OF BLANKS NOT LARGE ENOUGH TO BE   %
%      COMPRESSED) WILL BE PACKED. THIS LOOP CONTINUES UNTIL THE END OF %
%      THE CARD IS REACHED WHEREUPON THE PROCEDURE IS EXITED WITH THE  %
%      PACKED CARD IMAGE PRESENT IN THE VARIABLE "CARD", DELIMITED BY THE %
%      VARIABLE "PNTR".                                                %
%                                                                      %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                                      %
PROCEDURE PACK.CARD;
     PNTR | CARD.COL.POINTER | 0;
     DO COMPRESSION.LOOP FOREVER;
          IF CARD.COL.POINTER LEQ (CARD.SIZE - 3)
               THEN IF SUBSTR(CARD,CARD.COL.POINTER,3) EQL "   "
                         THEN PACK.BLANKS;
          IF CARD.COL.POINTER LSS CARD.SIZE
               THEN DO PACK.CHARACTER;
                         IF PNTR NEQ CARD.COL.POINTER
                              THEN COLUMN(PNTR) | COLUMN(CARD.COL.POINTER);
                         BUMP PNTR;
                         BUMP CARD.COL.POINTER;
                    END PACK.CHARACTER;
          IF CARD.COL.POINTER GEQ CARD.SIZE
               THEN RETURN;
     END COMPRESSION.LOOP;
END PACK.CARD;
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
& PAGE
%                                                                      %
```

```
%    HEADER IS FIRST CLEARED AND THE STATION VALUE SET TO "002" (SEE    %
%    DOCUMENTATION). THE LENGTH FIELD OF THE HEADER OF THE OUTPUT BUFFER%
%    IS THEN SET AND THE BUFFER QUEUED. THE BUFFER IS THEN CLEARED (IT'S%
%    POINTER RE-INITIALISED) AND A FLAG SET TO INDICATE THAT A BUFFER   %
%    WAS TRANSMITTED. (NOTE: ALL PACKED CARD IMAGES WHEN PLACED IN THE  %
%    BUFFER HAVE AN "RS" CHARACTER ATTACHED AT THEIR END, AND THEREFORE,%
%    WHEN THE LENGTH FIELD IN THE HEADER OF THE BUFFER IS SET, THE VALUE%
%    IS ONE LESS THAN THE CURRENT BUFFER POINTER VALUE SO THAT THIS LAST%
%    "RS" CHARACTER WILL NOT BE TRANSMITTED. SEE DOCUMENTATION)         %
%                                                                       %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                                       %
PROCEDURE TRANSMIT.BUFFER;
    OUTPUT.BUFFER.HEADER I "0000000000";
    OUTPUT.BUFFER.STATION I "002";
    OUTPUT.BUFFER.LENGTH I DECIMAL(OUTPUT.BUFFER.POINTER - 1,4);
    WRITE DATA.COMM.QUEUE(OUTPUT.BUFFER);
    OUTPUT.BUFFER.POINTER I 0;
    BUFFER.WAS.TRANSMITTED I 1;
END TRANSMIT.BUFFER;
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                                       %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                                       %
%    PROCEDURE: PACK.AND.SEND.BUFFER                                    %
%                                                                       %
%    THIS PROCEDURE IS REFERENCED ONLY BY THE PROCEDURE                 %
%    "READ.PACK.AND.SEND.CARDS"                                         %
%                                                                       %
%    ALL PACKED CARD IMAGES ARE ENTERED INTO A BUFFER IN THIS PROCEDURE.%
%    UPON ENTRY INTO THE PROCEDURE, THE LENGTH OF THE CURRENT BUFFER    %
%    BEING FORMED IS CHECKED AND IF THERE IS NOT ENOUGH ROOM IN THE     %
%    BUFFER FOR THE CURRENT CARD IMAGE THE BUFFER IS TRANSMITTED AND    %
%    THEN CLEARED VIA A CALL TO THE PROCEDURE "TRANSMIT.BUFFER". THE    %
%    CARD IMAGE IS THEN ENTERED IN THE CLEARED BUFFER AND THE BUFFER    %
%    POINTER UPDATED APPROPRIATELY.                                     %
%                                                                       %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                                       %
PROCEDURE PACK.AND.SEND.BUFFER(PACKED.CARD);
    FORMAL PACKED.CARD                              CHAR VARYING;
    IF (BUFFER.SIZE - OUTPUT.BUFFER.POINTER) LSS
                LENGTH(SUBSTR(PACKED.CARD,0))
        THEN DO TRANSMIT.CURRENT.BUFFER;
                TRANSMIT.BUFFER;
            END TRANSMIT.CURRENT.BUFFER;

    SUBSTR(CARD.BUFFER,OUTPUT.BUFFER.POINTER) I SUBSTR(PACKED.CARD,0);
```

```
%     CARDS: LABELLED "RJE/CARDS", THIS CARD FILE HANDLES ALL INPUT CARDS%
%     ENTERED BY THE B1700 RJE USER. THIS FILE IS REFERENCED ONLY IN THE %
%     PROCEDURE NAMED "READ.PACK.AND.SEND.CARDS". (NOTE: IN ORDEF RO      %
%     OPEN AN RJE CARD FILE THE CONTROL SPO MESSAGE ".READ" MUST BE       %
%     ENTERED FROM THE SPO TO THE PROGRAM "RJE/SPO.TEST".)                %
%                                                                         %
%     PRINT: LABELLED "RJE/PRINT", THIS FILE HANDLES THE PRINTING OF ALL %
%     RECORDS FOR THIS PROGRAM. IT IS REFERENCED ONLY IN THE PROCECURE    %
%     "OUTPUT.LINE".                                                      %
%                                                                         %
%     PUNCH: LABELLED "RJE/PUNCH", THIS FILE HANDLES THE PUNCHING CF ALL %
%     RECORDS FOR THIS PROGRAM. IT IS REFERENCED ONLY IN THE PROCECURE    %
%     "OUTPUT.LINE".                                                      %
%                                                                         %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                                         %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
& PAGE
DEFINE
     CHAR                AS    #CHARACTER#,
     ESC                 AS    #ə27ə#,
     ETX                 AS    #ə03ə#,
     RS                  AS    #ə1Eə#,
     CARD.SIZE           AS    #80#,
     LINE.SIZE           AS    #132#,
     NUL                 AS    #ə00ə#;
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
FILE
     SPO.OUT.QUEUE(LABEL = "RJE"/"SPO.OUT", DEVICE = QUEUE,
             RECORDS = 411/1, OPEN.OPTION = INPUT),
     PRINT.OUT.QUEUE(LABEL = "RJE"/"PRINT.OUT", DEVICE = QUEUE,
             RECORDS = 411/1, OPEN.OPTION = INPUT),
     SPO.INPUT.QUEUE(LABEL = "RJE"/"SPO.IN", DEVICE = QUEUE,
             RECORDS = 80/1, OPEN.OPTION = INPUT),
     DATA.COMM.QUEUE(LABEL = "RJE"/"DATA.COMM", DEVICE = QUEUE,
             RECORDS = 411/1, OPEN.OPTION = OUTPUT),
     CONTROL.QUEUE(LABEL = "DATA.COMM"/"CONTROL", DEVICE = QUEUE,
             RECORDS = 411/1, OPEN.OPTION = OUTPUT),
     CARDS(LABEL = "RJE"/"CARDS", DEVICE = CARD, RECORDS = 80/1,
             OPEN.OPTION = INPUT),
     PRINT(LABEL = "RJE"/"PRINT", DEVICE = PRINTER OR BACKUP DISK,
             RECORDS = 132/1, OPEN.OPTION = OUTPUT, LOCK),
     PUNCH(LABEL = "RJE"/"PUNCH", DEVICE = PUNCH OR BACKUP DISK,
             RECORDS = 80/1, OPEN.OPTION = OUTPUT, LOCK);
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
SEGMENT(MAIN);
DECLARE
```

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### SAMPLE UPL INPUT/OUTPUT PROGRAM
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```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                                   %
%    PROGRAM : I/O.PROGRAM.                                         %
%                                                                   %
%    THIS PROGRAM INTERFACES WITH THE PROGRAMS "RJE/SPO.TEST" AND   %
%    "RJE/DCH".                                                     %
%                                                                   %
%    EXCEPT FOR THE ACCEPTING OF INPUT SPO MESSAGES, ALL B1700 INPUT %
%    AND OUTPUT FOR THE RJE SYSTEM IS HANDLED BY THIS PROGRAM.      %
%                                                                   %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                                   %
%    FILES:                                                         %
%                                                                   %
%    SEVEN FILES ARE MAINTAINED BY THE PROGRAM.                     %
%                                                                   %
%    SPO.OUT.QUEUE: LABELLED "RJE/SPO.OUT", THIS QUEUE FILE HANDLES ALL %
%    SPO AND CONTROL MESSAGES QUEUED BY THE PROGRAM "RJE/DCH". THIS FILE%
%    IS READ IN THE PROCEDURE "CONTROL.LOOP" AND THE RECEIVED MESSAGES  %
%    PROCESSED IN THE PROCEDURE "PROCESS.OUTPUT.SPO.MESSAGE".       %
%                                                                   %
%    PRINT.OUT.QUEUE: LABELLED "RJE/PRINT.OUT", THIS QUEUE FILE HANDLES %
%    ALL OUTPUT PRINT AND PUNCH RECORDS QUEUED BY THE PROGRAM "RJE/DCH".%
%    THIS QUEUE IS READ IN THE PROCEDURE "CONTROL.LOOP" AND THE RECEIVED%
%    MESSAGES PROCESSED IN THE PROCEDURES "PROCESS.PRINT.OR.PUNCH.BUFFER"%
%    AND "OUTPUT.LINE".                                             %
%                                                                   %
%    SPO.INPUT.QUEUE: LABELLED "RJE/SPO.IN", THIS QUEUE FILE HANDLES ALL%
%    INPUT SPO MESSAGES QUEUED BY THE PROGRAM "RJE/SPO.TEST". THIS   %
%    QUEUE IS READ IN THE PROCEDURE "CONTROL.LOOP" AND THE RECEIVED  %
%    MESSAGES PROCESSED IN THE PROCEDURE "PROCESS.INPUT.SPO.MESSAGE".%
%                                                                   %
%    DATA.COMM.QUEUE: LABELLED "RJE/DATA.COMM", THIS QUEUE FILE HANDLES %
%    ALL CARD AND SPO BUFFERS QUEUED BY THIS PROGRAM FOR THE PROGRAM %
%    "RJE/DCH". THIS QUEUE IS REFERENCED IN THE PROCEDURES          %
%    "TRANSMIT.BUFFER" AND "PROCESS.INPUT.SPO.MESSAGE".             %
%                                                                   %
%    CONTROL.QUEUE: LABELLED "DATA.COMM/CONTROL", THIS FILE HANDLES ALL %
%    CONTROL MESSAGES SENT BY THIS PROGRAM TO THE PROGRAM "RJE/DCH". %
%    THIS QUEUE IS REFERENCED ONLY IN THE PROCEDURE                 %
%    "PROCESS.INPUT.SPO.MESSAGE".                                   %
%                                                                   %
```

```
        01 CONTROL.BITS,
             02 CARD.FILE.PRESENT                   BIT(1),
             02 BUFFER.WAS.TRANSMITTED              BIT(1),
             02 LOGGED.ON                            BIT(1),
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
        01 POINTERS.AND.PARAMETERS,
             02 INPUT.BUFFER.POINTER                FIXED,
             02 OUTPUT.BUFFER.POINTER               FIXED,
             02 PRINT.LINE.POINTER                  FIXED,
             02 CARD.COL.POINTER                    FIXED,
             02 PNTR                                 FIXED,
             02 BUFFER.SIZE                          FIXED,
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
        01 INPUT.BUFFER,
             02 INPUT.BUFFER.HEADER                 CHAR(10),
                  03 INPUT.BUFFER.STATION           CHAR(3),
                  03 INPUT.BUFFER.LENGTH            CHAR(4),
                  03 INPUT.BUFFER.TYPE              CHAR(3),
             02 PRINT.BUFFER                        CHAR(401),
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
        01 OUTPUT.BUFFER,
             02 OUTPUT.BUFFER.HEADER                CHAR(10),
                  03 OUTPUT.BUFFER.STATION          CHAR(3),
                  03 OUTPUT.BUFFER.LENGTH           CHAR(4),
                  03 OUTPUT.BUFFER.TYPE             CHAR(3),
             02 CARD.BUFFER                         CHAR(401),
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
        01 OUTPUT.LINES,
             02 PRINT.LINE                          CHAR(133),
                  03 CARRIAGE                       BIT(8),
                  03 LINE                           CHAR(132),
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
        01 INPUT.LINES,
             02 CARD                                CHAR(80),
                  03 COLUMN(80)                     CHAR(1);
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
SEGMENT(CARD.INPUT);
%                                                                      %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                                      %
%    PROCEDURE: TRANSMIT.BUFFER                                        %
%                                                                      %
%    THIS PROCEDURE IS REFERENCED BY THE PROCEDURES                    %
%    "PACK.AND.SEND.BUFFER" AND "READ.PACK.AND.SEND.CARDS".            %
%                                                                      %
%    ALL CARD BUFFERS ARE SENT TO THE "RJE/DCH" PROGRAM VIA THIS       %
%    PROCEDURE. WHEN THE PROCEDURE IS ENTERED, THE TEN CHARACTER MESSAGE%
```

```
          BUMP OUTPUT.BUFFER.POINTER BY LENGTH(SUBSTR(PACKED.CARD,0));
END PACK.AND.SEND.BUFFER;
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
& PAGE
%                                                                  %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                                  %
%     PROCEDURE: PACK.BLANKS                                       %
%                                                                  %
%     THIS PROCEDURE IS REFERENCED ONLY BY THE PROCEDURE "PACK.CARD" %
%                                                                  %
%     WHEN PACKING CARD IMAGES, FIELDS OF THREE TO NINETY-NINE      %
%     CONSECUTIVE  BLANKS WILL BE PACKED INTO A THREE CHARACTER FIELD %
%     (SEE DOCUMENTATION), AN ESCAPE CHARACTER ("ESC") FOLLOWED BY TWO %
%     NUMERIC CHARACTERS INDICATING THE NUMBER OF BLANKS COMPRESSED. %
%     THEREFORE WHILE PACKING A CARD, WHEN A FIELD OF AT LEAST THREE %
%     BLANKS IS DETECTED, THIS PROCEDURE IS CALLED TO COUNT AND PACK THE %
%     ENTIRE BLANK FIELD. THE PROCEDURE CONSISTS OF A LOOP WHICH EXAMINES%
%     A CHARACTER AND BUMPS POINTERS UNTIL THE END OF THE CARD OR A  %
%     NON-BLANK CHARACTER IS FOUND, AT WHICH TIME THE LOOP IS EXITED AND %
%     THE THREE CHARACTER FIELD ADDED TO THE PACKED CARD IMAGE. THE  %
%     POINTER FOR THE PACKED CARD FIELD IS THEN UPDATED AND THE PROCEDURE%
%     EXITED.                                                       %
%                                                                  %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
PROCEDURE PACK.BLANKS;
     DECLARE COUNTER                                 FIXED;
     COUNTER I 3;
     BUMP CARD.COL.POINTER BY 3;
     DO COUNT.AND.PACK.BLANKS FOREVER;
          IF CARD.COL.POINTER LSS CARD.SIZE
               THEN IF COLUMN(CARD.COL.POINTER) EQL " "
                    THEN DO INCREMENT.VARIABLES;
                              BUMP COUNTER;
                              BUMP CARD.COL.POINTER;
                         END INCREMENT.VARIABLES;
                    ELSE UNDO COUNT.AND.PACK.BLANKS;
               ELSE UNDO COUNT.AND.PACK.BLANKS;    %
     END COUNT.AND.PACK.BLANKS;
     SUBSTR(CARD,PNTR,3) I ESC CAT DECIMAL(COUNTER,2);
     BUMP PNTR BY 3;
END PACK.BLANKS;
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
& PAGE
%                                                                  %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

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```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                                %
%     PROCEDURE: READ.PACK.AND.SEND.CARDS                        %
%                                                                %
%     THIS PROCEDURE IS REFERENCED ONLY BY THE PROCEDURE "CONTROL.LOOP".  %
%                                                                %
%     READING AND PACKING OF CARDS AND TRANSMITTING OF CARD BUFFERS IS    %
%     CONTROLLED BY THIS PROCEDURE. INITIALLY, THE VARIABLE       %
%     "BUFFER.WAS.TRANSMITTED" WHICH INDICATES WHEN A BUFFER HAS BEEN     %
%     TRANSMITTED IS CLEARED.  A LOOP IS THEN ENTERED AND A CARD IMAGE    %
%     READ. IF AN END-OF-FILE WAS DETECTED BY THE READ, THE CARD FILE IS  %
%     CLOSED, THE FLAG INDICATING A CARD FILE WAS PRESENT FOR THE PROGRAM %
%     RESET, THE CURRENT BUFFER (IF ANY) TRANSMITTED BY A CALL TO THE     %
%     PROCEDURE "TRANSMIT.BUFFER", AND THE PROCEDURE EXITED. IF AN        %
%     EXCEPTION CONDITION WAS NOTED DURING THE LAST READ AND A "?" IS IN  %
%     THE FIRST COLUMN OF THE CARD, INDICATING A CONTROL CARD WAS READ,   %
%     THE "?" IS CHANGED TO A NUL CHARACTER IN ACCORD WITH THE RJE        %
%     CONVENTIONS. THE CARD IMAGE JUST READ IS THEN PACKED BY A CALL TO   %
%     THE PROCEDURE "PACK.CARD". THE PACKED CARD IMAGE AND AN "RS"        %
%     CHARACTER IS THEN PLACED IN A BUFFER BY A CALL TO THE PROCEDURE     %
%     "PACK.AND.SEND.BUFFER". LASTLY THE VARIABLE INDICATING A BUFFER     %
%     HAS BEEN TRANSMITTED IS CHECKED AND IF A BUFFER HAS JUST BEEN       %
%     SENT THE PROCEDURE IS EXITED OTHERWISE THE LOOP CONTINUES UNTIL A   %
%     BUFFER IS TRANSMITTED.                                     %
%                                                                %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                                %
PROCEDURE READ.PACK.AND.SEND.CARDS;
    BUFFER.WAS.TRANSMITTED ! 0;
    DO READ.LOOP FOREVER;
        READ CARDS(CARD);
            ON EOF DO CLOSE.FILE;
                CLOSE CARDS RELEASE;
                CARD.FILE.PRESENT ! 0;
                IF OUTPUT.BUFFER.POINTER GTR 0
                    THEN TRANSMIT.BUFFER;
                RETURN;
            END CLOSE.FILE;
            ON EXCEPTION
                IF COLUMN(0) EQL "?"
                    THEN COLUMN(0) ! NUL;
        PACK.CARD;
        PACK.AND.SEND.BUFFER(SUBSTR(CARD,0,PNTR) CAT RS);
        IF BUFFER.WAS.TRANSMITTED
            THEN RETURN;
    END READ.LOOP;
END READ.PACK.AND.SEND.CARDS;
```

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```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
& PAGE
SEGMENT(OUTPUT.PRINT.OR.PUNCH);
%                                                                      %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                                      %
%     PROCEDURE: OUTPUT.LINE                                           %
%                                                                      %
%     THIS PROCEDURE IS REFERENCED ONLY BY THE PROCEDURE               %
%     "PROCESS.PRINT.OR.PUNCH.BUFFER".                                 %
%                                                                      %
%     WHEN THIS PROCEDURE IS ENTERED THERE EXISTS IN THE VARIABLE      %
%     "PRINT.LINE", A RECORD OF SIZE EQUAL TO THE VALUE OT THE VARIABLE %
%     "PRINT.LINE.POINTER". IF THE VALUE OF THE STATION IN THE BUFFER  %
%     HEADER IS "002" INDICATING THE RECORD IS A PUNCH RECORD THE RECORD %
%     IS PUNCHED, OTHERWISE THE RECORD IS ASSUMED TO BE A PRINT RECORD %
%     AND IS SO OUTPUT. FOLLOWING OUTPUTTING OF THE RECORD, THE POINTER %
%     FOR THE OUTPUT DATA AREA IS CLEARED, THE OUTPUT DATA AREA ITSELF %
%     RE-INITIALISED TO BLANKS, AND THE POINTER FOR THE CURRENT INPUT  %
%     BUFFER BEING UNPACKED INCREMENTED SO THAT THE "RS" DELIMITER FOR %
%     THE RECORD JUST OUTPUTTED MAY BE DISCARDED. (NOTE: NOT SHOWN IN  %
%     THIS PROCEDURE ARE CONSIDERATIONS FOR THE RJE CARRIAGE-CONTROL   %
%     CONVENTIONS. IF THIS PROGRAM WERE TO RUN UNDER RJE, WHEN A PRINT %
%     RECORD IS PRESENT, A CARRIAGE CONTROL VALUE FOR THE RECORD WOULD BE%
%     PRESENT IN THE VARIABLE "CARRIAGE". THE VALUE FOR THIS VARIABLE  %
%     WOULD HAVE TO BE DETERMINED AND THE APPROPRIATE WRITE STATEMENT  %
%     EXECUTED. THIS CARRIAGE CONTROL CHARACTER WOULD NOT BE OUTPUTTED, %
%     THE ACTUAL RECORD TO BE PRINTED WOULD BE PRESENT IN THE VARIABLE %
%     "LINE".(SEE DOCUMENTATION).                                      %
%                                                                      %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                                      %
PROCEDURE OUTPUT.LINE;
     IF INPUT.BUFFER.STATION EQL "002"
          THEN DO PUNCH.IT;
                    WRITE PUNCH(SUBSTR(PRINT.LINE,0,CARD.SIZE));
               END PUNCH.IT;
          ELSE DO PRINT.IT;
                    WRITE PRINT SINGLE(SUBSTR(PRINT.LINE,0,LINE.SIZE));
               END PRINT.IT;
     PRINT.LINE.POINTER I 0;
     BUMP INPUT.BUFFER.POINTER;
     PRINT.LINE I " ";
END OUTPUT.LINE;
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
& PAGE

%                                                                      %
```

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```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                                %
%     PROCEDURE: PROCESS.PRINT.OR.PUNCH.BUFFER                   %
%                                                                %
%     THIS PROCEDURE IS REFERENCED ONLY BY THE PROCEDURE "CONTROL.LOOP". %
%                                                                %
%     ALL UNPACKING OF OUTPUT BUFFERS ARE HANDLED BY THIS PROCEDURE. IT  %
%     IS CALLED WHENEVER A NEW PRINT OR PUNCH BUFFER IS RECEIVED. THE     %
%     POINTER FOR THE BUFFER IS THEREFORE RE-INITIALISED WHEN THE         %
%     PROCEDURE IS ENTERED. THE BUFFER IS THEN UNPACKED CHARACTER BY      %
%     CHARACTER UNTIL AN "RS" OR "ETX" CHARACTER IS FOUND AT WHICH TIME   %
%     THE PORTION OF THE BUFFER JUST UNPACKED IS OUTPUT.                  %
%     THE "DO" LOOP NAMED "PUT.BLANKS" IS USED TO UNPACK                  %
%     FIELDS OF COMPRESSED BLANKS WHILE THE LOOP "PUT.CHARACTER" IS USED  %
%     TO UNPACK SINGLE CHARACTERS.                                       %
%                                                                %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                                %
PROCEDURE PROCESS.PRINT.OR.PUNCH.BUFFER;
    INPUT.BUFFER.POINTER I 0;
    DO UNPACK.AND.OUTPUT FOREVER;
        IF SUBSTR(PRINT.BUFFER,INPUT.BUFFER.POINTER,1) EQL ESC
            THEN DO PUT.BLANKS;
                        BUMP INPUT.BUFFER.POINTER;
                        SUBSTR(PRINT.LINE,PRINT.LINE.POINTER,BINARY(
                            SUBSTR(PRINT.BUFFER,INPUT.BUFFER.POINTER,
                            2))) I " ";
                        BUMP PRINT.LINE.POINTER BY BINARY(SUBSTR(
                            PRINT.BUFFER,INPUT.BUFFER.POINTER,2));
                        BUMP INPUT.BUFFER.POINTER BY 2;
                END PUT.BLANKS;
            ELSE DO PUT.CHARACTER;
                        SUBSTR(PRINT.LINE,PRINT.LINE.POINTER,1) I
                            SUBSTR(PRINT.BUFFER,INPUT.BUFFER.POINTER,1);
                        BUMP PRINT.LINE.POINTER;
                        BUMP INPUT.BUFFER.POINTER;
                END PUT.CHARACTER;
        IF SUBSTR(PRINT.BUFFER,INPUT.BUFFER.POINTER,1) EQL RS
            THEN OUTPUT.LINE;
        IF SUBSTR(PRINT.BUFFER,INPUT.BUFFER.POINTER,1) EQL ETX
            THEN DO END.IT;
                        IF PRINT.LINE.POINTER GTR 0
                                THEN OUTPUT.LINE;
                        RETURN;
                END END.IT;
    END UNPACK.AND.OUTPUT;

END PROCESS.PRINT.OR.PUNCH.BUFFER;
```

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```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
& PAGE
SEGMENT(OUTPUT.SPO);
%                                                                       %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                                       %
%     PROCEDURE: PROCESS.OUTPUT.SPO.MESSAGE                             %
%                                                                       %
%     THIS PROCEDURE IS REFERENCED ONLY BY THE PROCEDURE "CONTROL.LOOP".%
%                                                                       %
%     ALL MESSAGES RECEIVED FROM THE PROGRAM "RJE/DCH" THROUGH THE QUEUE %
%     "RJE/SPO.OUT" ARE PROCESSED THROUGH THIS PROCEDURE. THE INPUT      %
%     BUFFERS RECEIVED FOR THIS PROCEDURE WILL HAVE VALUES OF EITHER     %
%     "000" OR "001" FOR THE VARIABLE "INPUT.BUFFER.STATION". IF THE     %
%     STATION VALUE IS "001", A SPO MESSAGE, THE MESSAGE IS DISPLAYED ON %
%     THE B1700 SPO. FOLLOWING THE DISPLAY IF THE VARIABLE "LOGGED.ON"   %
%     HAS NOT BEEN SET, AN ADDITIONAL DARKENED FIELD IS THEN DISPLAYED.  %
%     (WHEN RUNNING THIS PROGRAM IN AN RJE ENVIRONMENT, IT IS USUALLY    %
%     NECESSARY TO ENTER ONE'S USERCODE AND PASSWORD  WHEN STARTING UP AN%
%     RJE SESSION. THIS DARKENED FIELD IS PROVIDED AS A SECURITY MEASURE %
%     TO PROTECT A USER'S USERCODE AND PASSWORD. IT WILL NO LONGER BE    %
%     DISPLAYED ONCE A USER HAS SUCESSFULLY LOGGED ON WITH THE HOST.)    %
%    SHOULD THE BUFFER RECEIVED BE A CONTROL MESSAGE  (STATION EQUALS    %
%     "000") THEN DEPENDING UPON THE TYPE OF CONTROL MESSAGE RECEIVED, AN%
%     APPROPRIATE ACTION WILL BE TAKEN EITHER LOGGING ON (SETTING THE    %
%     VARIABLE "LOGGED.ON"), CHANGING BUFFER.SIZE (CHANGING THE VALUE OF %
%     THE VARIABLE "BUFFER.SIZE") OR LOGGING OFF (RESETTING THE VARIABLE %
%     "LOGGED.ON").                                                     %
%                                                                       %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                                       %
PROCEDURE PROCESS.OUTPUT.SPO.MESSAGE;
    IF INPUT.BUFFER.STATION EQL "001"
        THEN DO DISPLAY.MESSAGE;
                DISPLAY SUBSTR(PRINT.BUFFER,0,(BINARY(
                            INPUT.BUFFER.LENGTH) - 1));
                IF NOT LOGGED.ON
                    THEN DISPLAY aODa CAT "WWWWWWWWWWWWWWW" CAT
                                 aODa CAT "EEEEEEEEEEEEEEEE";
            END DISPLAY.MESSAGE;
        ELSE DO PROCESS.CONTROL.MESSAGE;
                CASE BINARY(SUBSTR(PRINT.BUFFER,0,2));
                    ;
                    LOGGED.ON I 1;
                    BUFFER.SIZE I BINARY(SUBSTR(PRINT.BUFFER,2,3));
                    LOGGED.ON I 0;
                END CASE;
```

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```
                    END PROCESS.CONTROL.MESSAGE;
END PROCESS.OUTPUT.SPO.MESSAGE;
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
& PAGE
SEGMENT(INPUT.SPO);
%                                                                  %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                                  %
%     PROCEDURE: PROCESS.INPUT.SPO.MESSAGE                         %
%                                                                  %
%     THIS PROCEDURE IS REFERENCED ONLY BY THE PROCEDURE  "CONTROL.LOOP".%
%                                                                  %
%     INPUT SPO MESSAGES ARE PROCESSED WITH THIS PROCEDURE. THESE ARE ALL%
%     MESSAGES RECEIVED FROM THE PROGRAM "RJE/SPO.TEST" VIA THE QUEUE    %
%     "RJE/SPO.IN". WHEN THE PROCEDURE IS ENTERED, THE OUTPUT BUFFER     %
%     HEADER IS CLEARED AND THE VALUE FOR THE STATION IN THE HEADER SET  %
%     TO "001" (OUTGOING SPO MESSAGE). THE FIRST CHARACTER OF THE MESSAGE%
%     RECEIVED IS THEN CHECKED AND SHOULD THE IT BE A "." IT IS ASSUMED  %
%     TO BE A CONTROL MESSAGE FOR THE B1700 RJE SYSTEM. FIVE CONTROL     %
%     MESSAGES ARE POSSIBLE. A ".READ" WILL CAUSE THE VARIABLE           %
%     "CARD.FILE.PRESENT" TO BE SET AND CARDS WILL BEGIN TO BE READ WITH %
%     THE NEXT PASS THROUGH THE PROGRAMS CONTROL LOOP. A ".STOP" WILL    %
%     CAUSE THE PROGRAM TO GO TO EOJ AS WELL AS INSTRUCT THE PROGRAM     %
%     "RJE/DCH" TO STOP ALSO (MESSAGE TYPE "999", SEE DOCUMENTATION). A  %
%     ".LOG" WILL CAUSE THE PROGRAM TO INSTRUCT "RJE/DCH" TO DISPLAY IT'S%
%     CURRENT ERROR SUMMARY (MESSAGE TYPE "999"). AN ".EST" WILL CAUSE   %
%     THE PROGRAM TO INSTRUCT "RJE/DCH" TO RE-ESTABLISH THE COMMUNICATION%
%     LINK WITH THE HOST SYSTEM (MESSAGE TYPE "997"). LASTLY A ".WAIT"   %
%     WILL CAUSE THE PROGRAM TO INSTRUCT "RJE/DCH" TO IDLE ITSELF AND    %
%     WAIT TO ANSWER A PHONE CALL FROM THE HOST. SHOULD THE CONTROL      %
%     MESSAGE RECEIVED NOT CONFORM TO ANY OF THESE CASES IT IS DISCARDED %
%     OTHERWISE THE APPROPRIATE ACTION MENTIONED ABOVE IS TAKEN. IF THE  %
%     MESSAGE RECEIVED FROM "RJE/SPO.TEST" NOT BE A CONTROL MESSAGE IT IS%
%     SENT OUT TO "RJE/DCH" FOR TRANSMISSION TO THE HOST  WHEN RECEIVED  %
%     BY THE PROGRAM "RJE/SPO.TEST" AN "ETX" CHARACTER WAS PLACED AT     %
%     THE END OF THE MESSAGE. BEFORE THEREFORE BEFORE RELEASING THE      %
%     MESSAGE TO "RJE/DCH", THE NUMBER OF CHARACTERS IN THE MESSAGE UP TO%
%     THE "ETX" CHARACTER ARE COUNTED SO THAT THE LENGTH FIELD IN THE    %
%     OUTPUT BUFFER HEADER MAY BE PROPERLY SET.                         %
%                                                                  %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                                  %
& PAGE
PROCEDURE PROCESS.INPUT.SPO.MESSAGE;
     CARD.COL.POINTER I 0;
     OUTPUT.BUFFER.HEADER I "0000000000";
     OUTPUT.BUFFER.STATION I "001";
```

```
        IF COLUMN(0) EQL "."
            THEN DO PROCESS.CONTROL.MESSAGE;
                    IF SUBSTR(CARD,1,4) EQL "READ"
                        THEN DO SET.READ.FLAG;
                                CARD.FILE.PRESENT I 1;
                                RETURN;
                            END SET.READ.FLAG;
                    IF SUBSTR(CARD,1,4) EQL "STOP"
                        THEN OUTPUT.BUFFER.TYPE I "999";
                    IF SUBSTR(CARD,1,3) EQL "LOG"
                        THEN OUTPUT.BUFFER.TYPE I "998";
                    IF SUBSTR(CARD,1,3) EQL "EST"
                        THEN OUTPUT.BUFFER.TYPE I "997";
                    IF SUBSTR(CARD,1,4) EQL "WAIT"
                        THEN OUTPUT.BUFFER.TYPE I "996";
                    IF OUTPUT.BUFFER.TYPE NEQ "000"
                        THEN WRITE CONTROL.QUEUE(OUTPUT.BUFFER);
                    IF OUTPUT.BUFFER.TYPE EQL "999"
                        THEN STOP;
                END PROCESS.CONTROL.MESSAGE;
            ELSE DO SEND.SPO.MESSAGE FOREVER;
                    IF COLUMN(CARD.COL.POINTER) EQL ETX OR
                            CARD.COL.POINTER EQL 72
                        THEN DO TRANSMIT.SPO.MESSAGE;
                                OUTPUT.BUFFER.LENGTH I DECIMAL(
                                    CARD.COL.POINTER,4);
                                SUBSTR(CARD.BUFFER,0,CARD.COL.POINTER
                                    ) I SUBSTR(CARD,0,CARD.COL.POINTER);
                                WRITE DATA.COMM.QUEUE(OUTPUT.BUFFER);
                                RETURN;
                            END TRANSMIT.SPO.MESSAGE;
                    ELSE BUMP CARD.COL.POINTER;
                END SEND.SPO.MESSAGE;
END PROCESS.INPUT.SPO.MESSAGE;
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
& PAGE
SEGMENT(MAIN);
%                                                                 %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                                 %
%    PROCEDURE: CONTROL.LOOP                                       %
%                                                                 %
%                                                                 %
%    THIS IS THE MAIN CONTROL LOOP FOR THE PROGRAM IT IS CALLED BY THE  %
%    MAIN PORTION OF THE PROGRAM.                                  %
%    THE MAIN FUNCTIONS OF THE PROGRAM ARE CONTROLLED WITH THIS    %

%    PROCEDURE. IT CONSISTS OF THREE "DO" LOOPS AND ONE "IF" STATEMENT  %
```

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```
%    NESTED WITHIN THE  PERMANENT CONTROL LOOP OF THE PROGRAM (THE LOOP %
%    NAMED "LOOP"). IN EACH "DO " LOOP ONE OF THE THREE INPUT QUEUE     %
%    FILES OF THE PROGRAM IS CHECKED. IN EACH LOOP FOLLOWING THE READ ON%
%    IT'S RESPECTIVE QUEUE, IF NO INCOMING MESSAGE WAS SEEN, THE EOF    %
%    CONDITION OF THE READ IS TRUE AND THE LOOP WILL BE EXITED ANC THE  %
%    NEXT LOOP OR IF STATEMENT CHECKED. IF A MESSAGE WAS PRESENT THEN   %
%    THE APPROPRIATE PROCEDURE CALL TO PROCESS THE MESSAGE IS EXECUTED  %
%    BEFORE THE LOOP IS EXITED. THE IF STATEMENT CHECKS THE VALUE OF THE%
%    BIT "CARD.FILE.PRESENT". IF TRUE, INDICATING THE PRESENCE CF AN    %
%    INPUT CARD FILE TO BE PACKED AND SENT, THE PROCEDURE               %
%    "READ.PACK.AND.SEND.CARDS IS CALLED TO READ AND PACK CARDS UNTIL   %
%    A BUFFER HAS BEEN FILLED AND TRANSMITTED (NOTE: A ".READ" INPUT SPO%
%    MESSAGE MUST HAVE BEEN RECEIVED BEFORE THE CARD FILE COULD HAVE    %
%    BEEN OPENED.). THIS LOOPING PROCESS WILL CONTINUE INDEFINITELY     %
%    UNTIL A ".STOP" INPUT SPO MESSAGE IS RECEIVED STOPPING THE PRCGRAM.%
%                                                                       %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                                       %
PROCEDURE CONTROL.LOOP;
    DO LOOP FOREVER;
        DO CHECK.SPO.INPUT.QUEUE;
            READ SPO.INPUT.QUEUE(CARD);
                ON EOF UNDO CHECK.SPO.INPUT.QUEUE;
            PROCESS.INPUT.SPO.MESSAGE;
        END CHECK.SPO.INPUT.QUEUE;
        DO CHECK.SPO.OUTPUT.QUEUE;
            READ SPO.OUT.QUEUE(INPUT.BUFFER);
                ON EOF UNDO CHECK.SPO.OUTPUT.QUEUE;
            PROCESS.OUTPUT.SPO.MESSAGE;
        END CHECK.SPO.OUTPUT.QUEUE;
        DO CHECK.PRINT.OUT.QUEUE;
            READ PRINT.OUT.QUEUE(INPUT.BUFFER);
                ON EOF UNDO CHECK.PRINT.OUT.QUEUE;
            PROCESS.PRINT.OR.PUNCH.BUFFER;
        END CHECK.PRINT.OUT.QUEUE;
        IF CARD.FILE.PRESENT
            THEN READ.PACK.AND.SEND.CARDS;
    END LOOP;
END CONTROL.LOOP;
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                                       %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
& PAGE
%                                                                       %
%    MAIN PROGRAM                                                       %
%                                                                       %
%    THIS PORTION OF THE PROGRAM IS EXECUTED ONLY ONCE. WHEN EXECUTED,  %
```

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```
%    THE PROGRAM HERE INITIALISES ALL VARIABLES FOR THE PROGRAM AND THEN%
%    ENTERS IT'S CONTROL LOOP BY CALLING THE PROCEDURE "CONTROL.LOOP"   %
%    AND NEVER RETURNS TO THIS MAIN PORTION OF THE PROGRAM.             %
%                                                                       %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%                                                                       %
     CONTROL.BITS I POINTERS.AND.PARAMETERS I INPUT.BUFFER I
          OUTPUT.BUFFER I INPUT.LINES I OUTPUT.LINES I 0;
     BUFFER.SIZE I 401;
     CONTROL.LOOP;
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
FINI
```

ALPHABETIC INDEX: