PRODUCT SPECIFICATION

REV LTR	REVISION ISSUE DATE	APPROVED BY	REVISIONS
E	1/09/79	*(signature)*	Changes for the Mark VIII.0 Release. 3-7 Updated PUNCH DECLARATION syntax.
F	4/09/79	*(signature)*	ADDED OPTIONAL SPO INPUT PARAGRAPH.

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GENERAL DESCRIPTION

The 1400 Interpreter Environment Program (IEP) is used to establish an environment file for virtual machine execution under the B1800/B1700 MCP. This environment file is used by the 1400 Interpreter in its processing. The environment describes such things as 1400 memory size, peripheral configuration, 1400 Interpreter special options and B1800/B1700 MCP information. Establishing an environment file parallels the compilation of a program except that no object code is produced. Input to the 1400 IEP consists of specifications which describe the 1400 system, as well as the handling of the peripheral devices with respect to the B1800/1700 MCP and system. The input is in free format and the IEP uses default characteristics whenever possible.

RELATED DOCUMENTATION

Name	Number
1400 Interpreter	P. S. 2212 5355
B1800/B1700 MCP II	P. S. Not Released
CREATE/VRTL 1311	P. S. 2212 5520
B1800/B1700 Software Operational Guide	1068731

SYNTAX NOTATION

Valid instructions for the 1400 IEP program are presented in railroad-syntax diagrams, a method which allows visual representation of syntactic units. A 1400 IEP instruction is constructed by following the main line of development from its beginning (>) to its point of termination (#). Where optional entries are concerned, the direction of flow proceeds down on the left-hand line and up on the right. Unless otherwise noted, optional entries are expected by the program in the order (top to bottom) in which they are presented.

Required entries occur on the main line of development; optional ones below the line. Required keywords appear in upper-case letters; variables in lower-case letters. Underlined portions of required keywords are acceptable abbreviations for the keywords.

Railroad syntax is further described in Appendix A.

IEP instructions are given in card columns 1 through 72, with 73-80 used for program identification (sequence numbers, etc.) since columns 73-80 are ignored by the IEP.

A percent sign (%) delimits the scanning of the card; text following the "%" (e.g., comments) is ignored.

1400 IEP instructions are constructed of letters, digits, special characters, and blanks. Alphanumeric items consist of letters, digits or periods (.).

KEYWORDS

Upper-case letters in the syntax diagrams indicate keywords which appear literally in the command.

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DELIMITERS

Delimiters consist of blanks, commas, equal signs, or semicolons.
Alphanumeric items must be separated by at least one delimiter.
Semicolons must appear where shown.   Commas may be used to
separate parameters of the declaration.

SYNTACTIC VARIABLES

Lower-case letters, words, or phrases within broken brackets (<>)
represent generic variables which must be supplied by the user.

NAMES

A name consists of one or more (maximum: 10) alphanumeric
characters,   and a file-identifier composed of one or more
(maximum: 3) names.   A slash must occur between the various
names when the file-identifier consists of more than one name.
Pack-name, multifile-id (abbreviation, mfid), file-name,   and
environment-name are all considered names and may not exceed 10
characters.

SYNTAX OF THE 1400 IEP

The following section defines the syntax of the 1400 IEP and
gives the default setting of each declaration.

MAIN SYNTAX

The main syntax consists of the memory, peripheral or optional
declarations. They may occur in any order.

```
>----------------------------------------------- FINI ; ------->#
            I                                        I
            I<----------  ;  ----------------I
            I-- <memory declaration> ------->I
            I-- <card reader declaration> -->I
            I-- <printer declaration> ------>I
            I-- <punch declaration> -------->I
            I-- <disk declaration> --------->I
            I-- <console declaration> ------>I
            I-- <tape declaration> --------->I
            I-- <optional declaration> ----->I
```

MEMORY SIZE DECLARATION

The memory size clause indicates the 1400 machine memory size.
Memory size may be 4K, 8K, 12K or 16K.

```
>-------- MEMORY.SIZE ------------- ----- 16K ---------- ; ---->#
                        |-- = -->|      |-- 12K -->|
                                        |-- 8K --->|
                                        |-- 4K --->|
```

Note: Non-specification defaults to 16K.

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CARD READER DECLARATION

The card reader declaration may be used to specify the
B1800/B1700 label card or to indicate an alternate
file-identifier and device for the card file input deck. The
default label card, with no parameters, implies a default
file-identifier of "CARDS.1400" and a default device of
"CARD.READER".

```
CARD.READER ------------------------------------------------------->>

  >>------------------------------------------------------------ ; -->#
       I                                                       I
       I<------------------------------  ,  ------------------I
       I<---------------------------------------------------I
       I                                                       I
       I--- NAME ----------------------->>                     I
       I          I-- = -->I                                   I
       I                                                       I
       I   >>------------------------------ <file-name> --->I
       I       I-- <mfid>/ -->I                               I
       I       I                                             I
       I       I-- <pack-name>/<mfid>/ ------------------->I
       I                            I-- <file-name> -->I  I
       I                                                       I
       I--- PACK.ID -------------------- <pack-id> ------->I
       I I- PID ----->I   I-- = ->I                         I
       I                                                       I
       I--- DEVICE ---------------- DISK ------------->I
                      I-- = ->I I- TAPE ---------->I
                              I- CARD.READER --->I
                              I- CRD ----------->I
                              I- DSK ----------->I
```

The file-identifier must appear on the B1800/B1700 DATA-card
(?DATA CARDS.1400) that precedes all card input to the
environment (i.e., object program or data). The card deck is
terminated by an END-card (?END).

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SYSIN DECLARATION

The SYSIN declaration may be used to specify the B1800/B1700
label card or filename and device for the SYSIN card file input
deck.   The default filename is "CARDS.1400".   The default device
is "CARD.READER".

```
>--- SYSIN ----------------------------------------------->>

  >>------------------------------------------------------ ; -->*
        I                                                    I
        I<-------------------   ,   --------------------I
        I<------------------------------------------------I
        I                                                    I
        I--- NAME ------------------------->>                I
        I          I-- = -->I                                I
        I                                                    I
        I  >>----------------------------- <file-name> ---->I
        I     I    I--- <mfid>/ -->I                         I
        I     I                                              I
        I     I-- <pack-name>/<mfid>/ -------------------->I
        I                                I-- <file-name> --->I
        I                                                    I
        I--- PACK.ID ------------------- <pack-id> ------>I
        I I- PID ----->I   I-- = -->I                        I
        I                                                    I
        I--- DEVICE ------------------- DISK ------------>I
                        I-- = -->I  I- TAPE ------------->I
                                    I- CARD.READER ------>I
                                    I- CRD -------------->I
                                    I- DSK -------------->I
```

This declaration can be invoked by using the INTOPT SYSIN
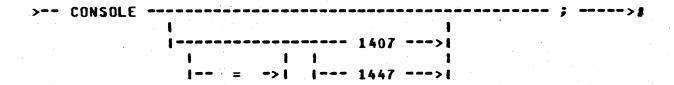specification.   See P.   S.   2212 5355, 1400 Interpreter, INTOPT
SYSIN.

CONSOLE DECLARATION

The console declaration can specify the type of console desired in the environment. The default type is the 1407, and the optional type is the 1447.

The basic differences between the two are as follows:

The 1407 will issue an accept communicate, then check if any target SPO input is present. If present, the message will be passed on to the user program. If not, the interpreter will wait until target SPO input is present.

The 1447 will work the same as the 1407, but if target SPO input is not present, it will continue on to the next instruction. The 1447 is used if polling the target SPO is the desired action.

```
 >-- CONSOLE -------------------------------------------------- ; ----->#
                    !                                    !
                    !----------------- 1407 --->!
                    !     !  !                          !
                    !--  =  ->!   !--- 1447 --->!
```

If CONSOLE is not specified, the default assignment is 1407. If CONSOLE=1447 is specified, but followed someplace later in the specifications by CONSOLE, then 1447 is still assigned. If only CONSOLE is specified, then the default is not changed.

PRINTER DECLARATION

The printer declaration can specify the unit name of the desired printer, the B1800/B1700 backup status, and the label type. The label type default is "STANDARD", which means print a B1800/B1700 label at the beginning and end of the 1400 printer output. The label type "UNLABELED" suppresses the label. UNIT.NAME or UNIT specifies which printer will be used when the system has multiple printers and a particular printer is desired.

```
>-- PRINTER ---------------------------------------------------- ; -->#
              |<--------------- , --------------------|
              |<------------------------------------------|
              |- <hardware declaration> ------------>|
              |- LABEL.TYPE ----------- UNLABELED ->|
              |                |- = ->| |- STANDARD -->|
              |                                        |
              |- UNIT.NAME ------------ LP<x> ----->|
              |- UNIT ----->| |- = ->|
```

Where <x> is replaced by the B1800/B1700 unit letter (e.g., LPA or LPB).

PUNCH DECLARATION

The punch declaration specifies the unit name of the desired
punch, the B1800/B1700 backup status, and the B1800/B1700 label
card name. The default name is "CARDS.1400".

```
>-- PUNCH ------------------------------------------------------------ ; -->#
   I-STACKER.1-->I  I<------------------- , ---------------------I
   I-STACKER.2-->I  I<-----------------------------------------------I
                    I-- <hardware declaration> ----------------->I
                    I- NAME ------------- <mfid> --------------->I
                    I          I- = ->I  I-- <mfid>/<file-name> --->I
                    I                                             I
                    I--- PACK.ID ---------------- <PACK.ID> ---->I
                    I I- PID ------>I I- = ->I                   I
                    I--- DEVICE -------------- DISK ---------->I
                                             I- TAPE ---------->I
                                             I- PCH ----------->I
                                             I- CARD.PUNCH ---->I
```

HARDWARE DECLARATION

The hardware declarations specify the backup status of the printer or punch file. If backup disk is allowed by the system's operator when the program is executed, the B1800/B1700 system option, PBD, is set. When no printer or punch is available, the printer or punch file goes automatically to B1800/B1700 disk backup. If backup tape is allowed by the system's operator when the program is executed, backup disk is not allowed (such as "PBD" being reset), and no hardware is available, then the printer or punch file will go automatically to B1800/B1700 tape backup. Specifying "HARDWARE" allows the output to go to the printer or punch automatically if a printer or punch is available. Specifying "BACKUP.DISK" or "BACKUP.TAPE" sends the file, if to backup, to disk or tape respectively. Specifying "FORMS" prevents the printing of the file until the operator intervenes, allowing special forms to be mounted on the printer or punch. A "NO" or "NOT" before any option negates that option (i.e., "NO HARDWARE" prevents printing or punching of the file, allowing it to go only to backup).

The default is set to hardware, with backup not allowed and special forms not set.

```
>----------------------------------------------------------------->#
            |-- NO --->|   |<---------- , -------|
            |-- NOT --->|  |<-------------------|
                          |-- HARDWARE ----->|
                          |-- BACKUP ------->|
                          |-- BACKUP.DISK -->|
                          |-- BACKUP.TAPE -->|
                          |-- FORMS -------->|
```

DISK DECLARATION

The disk declaration is used to specify each 1311 disk drive that
is attached to   the   1400   system.   Each   1311   disk   drive   is
considered   to   be   a   B1800/B1700   disk file by the MCP,   and is
treated as such.   The specifications in   the   disk   declarations
pertain   to the way the B1800/B1700 MCP treats the file,   and its
file-name.   The default B1800/B1700 file-name is "1400/1311.<n>"
where <n> is a digit (0, 2, 4, 6, or 8) which specifies the 1311
drive number.   FILE.TYPE   indicates   which   mode   of   character
representation   is   to   be   used   for   the disk storage.   EBCDIC
indicates that it will be stored in 8-bit   EBCDIC   format.   BCD
indicates   that storage will be in 6-bit format for Move mode and
7-bit format for Load mode.   EBCDIC   disk   files   are   somewhat
larger,   but   no   character   translation is necessary between the
1400 interpreter internal and the disk   file   formats,   so   disk
operations are faster.   BCD files are smaller, but a translation
is necessary.   To   be   compatible   with   the   B1800/B1700   1400
free-standing emulator,   BCD should be used.   BCD files require a
special B1800/B1700 file format,   so they must first   be   created
using   the special program called "CREATE/VRTL 1311" (See Related
Documentation).

The default FILE.TYPE is EBCDIC.   Specifying NEW   forces   a   new
(EBCDIC   only)   file to be created, LOCK saves the file on the
B1800/1700 disk after End-of-Job.   OLD is the default.   A NO or
NOT   before   OLD,   NEW   or LOCK causes the opposite action to be
taken.   Creating a 1311 disk file on the B1800/B1700   disk   does
not   initialize   1311   addresses;   that   operation   should   be
performed with the appropriate 1400 utility.

BUFFERS OPTION

The BUFFERS option allows users to optimize the   speed   of   their
disk accesses.   Since all types of 1311 disk files are RANDOM to
the Interpreter,   it cannot take advantage of buffer   usages   for
sequential   or   serial files.   As of the Mark VI.1 release,   the
Interpreter will take advantage of DELAYED.RANDOM,   a   new   disk
access   method.   When   DELAYED.RANDOM is used,   blocks are only
written to disk (an actual I/O) when the buffer is   required   for
storage of a different block.   In the original implementation of
RANDOM access,   an I/O was   initiated   whenever   the   Interpreter
performed a WRITE communicate.

The number of buffers assigned by the MCP to each virtual disk file is dynamically left up to the user. The default is only one buffer, but the user may specify up to fifteen. It is not necessarily true that a program will run faster if more buffers are allocated; but, depending on the type of disk activity, an additional buffer may make substantial amounts of improvement.

For example:

An AUTOCODER assembly will run substantially faster with two buffers than with one, but three will not make any difference at all.

A DISK-to-DISK transfer, which is sequential, would not gain from having more than one buffer for each virtual disk. A transfer from one place to another on the same disk, on the other hand, would definitely benefit from having at least two buffers (one for read, and one for write, which would alternate).

The more RANDOM that the user's program accesses the disk, the less benefit that can be derived from multiple buffers. Conversely, the more areas of relatively serial data that are accessed, the more reason to have multiple buffers.

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```
>-- 1311.<n> ------------------------------------------------>>

    >>------------------------------------------------------->#
        I<-------------------------- , -----------------------I
        I<----------------------------------------------------I
        I-- NAME ----------- <pack-name>/<mfid>/<file-name> -->I
        I           I- = ->I  I- <pack-name>/<mfid>/ ------------>I
        I                      I- <mfid>/<file-name> -------------->I
        I                      I- <mfid> ----------------------------->I
        I                                                          I
        I-- PACK.ID --------- <pack-name> -------------------->I
        I           I- = ->I                                    I
        I                                                       I
        I-- FILE.TYPE ------------- BCD ---------------------->I
        I              I- = ->I  I-- EBCDIC -->I               I
        I                                                       I
        I--------------------- OLD---------------------------->I
            I  I-- NO -->I  I- NEW  ->I                        I
            I  I-- NOT ->I  I- LOCK ->I                        I
            I                                                  I
            I-- BUFFERS ------------ <number.of.buffers> ---->I
                      I-- = ->I
```

Where <n> is a digit, 0, 2, 4, 6 or 8 only, which represents that
drive on which the 1311 file would normally reside on the 1400
system.

Where <number.of.buffers> is a number between one and fifteen,
and of not more than two digits.

TAPE DECLARATION

The tape declaration is used to specify each 1400 tape drive that
is attached to the system.   The device   clause   indicates   which
type of tape drive, 7-track, 9-track, 9-track NRZ, 9-track PE, or
that all types of tape are allowed.   Default is any tape.   The
UNIT.NAME specifies which B1800/B1700 tape station to use, (e.g.,
MTA).   The UNIT.NAME overrides the device type; for example, if
it is assigned to a specific drive, it uses that specific drive.
If UNIT.NAME is omitted, a scratch tape on an allowed tape drive
(such as a 9-track if the device is specified as TAPE.9) is used.
If one cannot be found, the B1800/B1700 MCP asks the operator for
an   assignment   to a drive.   A discussion of tape assignment via
the B1800/B1700 MCP messages "UL"   or   "OU"   or   by   the   MODIFY,
EXECUTE   and   DYNAMIC   statements can be found in the B1800/B1700
System Operational Guide, form 1068731.

```
>-- TAPE<n> ------------------------------------------------ ; ->#
            |<-----------------  ,  -----------------------|
            |<--------------------------------------------|
            |- DEVICE ---------- TAPE ----------------->|
            |        |- = ->||-- TAPE.7 --->|           |
            |                  |-- TAPE.9 --->|          |
            |                  |-- TAPE.PE -->|          |
            |                  |-- TAPE.NRZ ->|          |
            |                                            |
            |- UNIT.NAME ---------- MT<unit.letter> -->|
            |- UNIT ----->||- = ->|
```

Where <n> represents the 1400 drive number on which the emulated
program expects to find that tape (e.g., TAPE1, TAPE2 ...
TAPE6).   The <unit.letter> is the B1800/B1700 tape drive that
will represent this particular 1400 drive (e.g., MTA, MTC or
MTH).

OPTIONAL DECLARATIONS

Optional declarations are for specifying special 1400 Interpreter operations, as well as the tape buffer size. Tape buffer size is specified as the number of characters of the largest tape block read or written (odd or even parity, and LOAD mode). If the tape buffer is too small, the interpreter is not able to execute the tape instruction. Specifying a tape buffer too large wastes memory on the B1800/B1700 system. If a tape buffer size is omitted, and tape units are included in the environment, then the tape buffer size is set to 4000 characters.

```
  >-- TAPE.BUFFER.SIZE ------------ <number.of.characters> -- ; ->#
                    |-- = ->|
```

Where <number.of.characters> is the maximum 1400 tape record size to be processed; from 0 to 32000. Note: Load mode data records require an extra character for wordmarks (word separator characters).

Inverted.Edit specifies that editing is done in reverse to the U.S. system, (i.e., comma is used as period and period as comma).

```
  >----------------- INVERTED.EDIT ---------------------- ; ---->#
```

SAMPLE COMPILE DECK

The 1400 IEP creates an environment file using the standard
B1800/B1700 compile control cards plus the specification cards.
Normally, this card deck contains the following cards: COMPILE,
DATA, SPECIFICATIONS, and END. The compile statement may be
entered on the B1800/B1700 console printer or on a card with an
invalid character punched in the first column.   The data card
normally follows the compile card, and it and the end card should
have invalid character punches in the first column.

The following is an example of a compile deck for a 1400
Interpreter environment called "1400/TEST" with the following
characteristics:

a.   12K memory
b.   A printer, allowed to go to B1800/B1700 backup
c.   A card punch, assigned to B1800/B1700 Card Punch A (CPA).
d.   A 1407 console printer


```
                    /-------------------------------------------
                    I?END
                  /-------------------------------------------
                  I FINI;
                /-------------------------------------------
                I CONSOLE = 1407;
              /-------------------------------------------
              I PUNCH UNIT.NAME = CPA;
            /-------------------------------------------
            I PRINTER BACKUP;
          /-------------------------------------------
          I MEMORY.SIZE 12K;
        /-------------------------------------------
        I?DATA CARDS
      /-------------------------------------------
      I?COMPILE 1400/TEST WITH 1400/IEP TO LIBRARY
```

OPTIONAL SPO INPUT

Since the 1400 IEP is a program that is run infrequently, and because it is necessary to have a one time special environment ocassionally, an optional SPO input instead of card input is available for 1400 specifications by setting SW0=1.

EX:

$$? \text{ CO <program name> WITH 8500/IEP SW0=1} \left\langle \begin{array}{l} \text{SYNTAX} \\ \text{LIBRARY} \\ \text{SAVE} \end{array} \right\rangle$$

ENVIRONMENT INTERFACE

The 1400 IEP places various flags in particular scratchpad
registers to be passed on to the 1400 Interpreter. The
interpreter reads those flags and interprets them as setting
on/off conditions, peripheral specifications, memory size, etc.

Currently the scratchpad assignments are as follows:

        S1B .. PERIPHERAL DESCRIPTIONS

        BITS...DEVICE PRESENCE
        ----   ----------------
        0   CARD.READER
        1   CARD.READER.2
        2   PUNCH
        3   PUNCH.2
        4   PRINTER
        5   PRINTER.2
        6   DISK.0
        7   DISK.2
        8   DISK.4
        9   DISK.6
        10   DISK.8
        11   CONSOLE.BACKUP
        12   TAPE1
        13   TAPE2
        14   TAPE3
        15   TAPE4
        16   TAPE5
        17   TAPE6
        18   READ.STACKER.1
        19   READ.STACKER.2
        20   BINARY.CARD.READER
        21   1447.CONSOLE (IF 1 THEN 1447, IF 0 THEN 1407)
        22   SPARE
        23   SPARE

S3A .. TAPE.BUFFER.ADDRESS

S3B .. TARGET.MEMORY.SIZE

S5B .. DISK.FILE.TYPE (EBCDIC = 1, BCD = 0)

BITS	DISK-REFERENCE
0-18	SPARE
19	DISK.FILE.0
20	DISK.FILE.2
21	DISK.FILE.4
22	DISK.FILE.6
23	DISK.FILE.8

S10B .. INDICATORS.AND.SWITCHES

BITS	RECEIVED FROM IEP
0-6	SPARE
7	INVERTED.EDIT
8	END.1401
9	EOJ.1700
10	EOJ.DUMP
11-16	SPARE
17-23	SENSE.SWITCHES

EXCEPTION CONDITIONS

WARNINGS

All warnings produced by the IEP are of the advisory capacity and can be overlooked by the user without adverse effects on the environment created.

ERRORS

Errors generated at "compile time" must be remedied in order to create an environment codefile. All error messages have been designed to make the necessary corrective actions obvious. For additonal assistance, refer to Section 3, SYNTAX OF THE 1400 IEP.

APPENDIX A

RAILROAD SYNTAX

In the example of railroad syntax given in figure A.1, the
following conditions are implied:

* The main line of development is from left to right,
  down on the left vertical line and up on the right. A
  loop or series of choices is shown by a return line
  with an arrow showing a flow to the left (<---------).

* An arrow shows the direction of progress from the point
  of origination (>---) to termination (#). A statement
  is not complete until it reaches a terminator (#).
  Where the syntax continues on another line, a double
  arrow (>>) is used, both to break the first line and to
  continue the second.   The continuation point   is
  indented.

* Required syntax is presented on the main line of
  development; optional on a secondary line. Required
  keywords are presented in capital letters; variables
  in lower case.   Underlined portions of keywords are
  their allowable abbreviations.

* The /n\ shows the maximum number of times the line may
  be crossed.   The bridge /n*\ shows that the line must
  be crossed at least once.   Since required syntax is
  usually shown on the main line of development, the /n*\
  option, presumably, will not need to be used often.

* Abbreviations may be used for variables. A list of
  standard abbreviations may be presented in the
  introduction of the document or the list may
  immediately precede the figure. In either case, the
  abbreviation(s) should be as obvious as possible.

* Angle brackets (<>) and a space occur around variables;
  a space precedes and follows a required word.

* The pound sign (#) denotes a termination point for the
  syntax of the item being described.

* Continuation of a primary or secondary line of
  development can also be shown by a continuous line that
  returns   (<--------)   and   then   flows   forward
  (----------->) to a vertical line. The return line may
  contain an entry.   This format is helpful when an
  optional parameter contains several elements itself.

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*   A horizontal line between entries must be represented
by at least a dash (--) in order to clearly distinguish
the line from a hyphenated word.

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```
>-- PERFORM ------------------------- <input-file-id> -->>
>-- PFM ---->I I                            I
>-- COPY --->I I-- <routine-type> -->I


  >>-----------------------------------------------------------------># 
     I<--------------------------------------------------------------I
     I-/1\-- <input-rec-lgth> ------------------------------------->I
                               I-- <blocking-factor> -->I          I
     I                                                              I
     I-/1\-- TAG: <tag-file-id> ----------------------------------->I
     I                                                              I
     I-/1\-- <input-file-access-mode> ----------------------------->I
     I                                                              I
     I-/1\-- <output-file-id> ------------------------------------->I
     I                                                              I
     I-/1\------- <output-rec-lgth> --------->>                     I
     I                                                              I
     I   >>------------------------------------------------------->I
     I      I----- <blocking-factor> ------------------------->I
     I      I                            I                         I
     I      I<---- <blocks-per-area> ----I                         I
     I      I                                                      I
     I      I------------------------------------------------->I
     I          I-- <number-of-areas> --------------------->I
     I                                                              I
     I-/1\-- <output-file-access-mode> ---------------------------->I
     I                                                              I
     I-/1\-- VARIABLE --------------------------------------------->I
     I      I-- VARY --->I                                          I
     I                                                              I
     I-/1\-- SKIP <integer> --------------------------------------->I
     I                                                              I
     I-/1\--- SEARCH -- <start-posn> ---- <search-arg> -------->I
         I   ---                                                    I
         I-- SELECT ---- <start-posn> -- <search-arg> -------->I
         I   ---            I              I<-----------------I I   I
         I                  I              I-- <num-to-return> --->I I
         I-- EXCLUDE -->I                                          I
         I   ----                                                  I
         I-- KEY -- <start-posn> -----------------------------
                                   I--  <key-lgth> --->I    I      I
                                                            I      I
                 I<--- <search-op>------------------------I      I
                 I                                                I
                 I----- <search-arg> ---------------------------->I
                                   I-- <num-to-return> -->I
```

Figure A-1: Sample of Railroad Syntax

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Page	Changes to Rev. D (Additional VII.0 Updates)
2-1	First paragraph rewritten.
3-3	CARD.READER DECLARATION redefined; <pack> and <device> added.
3-4	SYSIN DECLARATION added.
A-1 to A-3	Appendix A added.

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