SDS TECHNICAL INFORMATION

SDS 900 SERIES SYMBOL TECHNICAL MANUAL

SDS 900688A March 1965

SCIENTIFIC DATA SYSTEMS

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INTRODUCTION

This manual contains operating instructions, technical descriptions, flow charts, and listings for the 900 Series Computer SYMBOL Assembler. This material supplements the SYMBOL and META-SYMBOL Reference Manual and provides information for possible modification and maintenance of the assembler.

To use this assembler with maximum efficiency, the programmer should be conversant with the machine instructions described in the reference manual for the applicable SDS 900 Series Computer.

Input may be from paper tape, cards, magnetic tape, or typewriter keyboard.

SDS PROGRAM LIBRARY
PROGRAM DESCRIPTION

 Catalog No. 012008

IDENTIFICATION: SDS 900 Series SYMBOL System Description

AUTHOR: SDS

ACCEPTED: January 21, 1965

COMPUTER CONFIGURATION: Any SDS 900 series computer with at least 4,096 words of magnetic core memory, a typewriter, and an output device (punched paper tape or cards and/or buffered line printer).

PURPOSE: To assemble source programs written in the SYMBOL assembly language.

USE:

1.0 General

SYMBOL is a two-pass assembly program for the SDS 900 series and 9300 computers. It is designed to operate on a minimal 4K computer with at least one symbolic input device and at least one output device.

The assembler proper consists of three parts and requires a total of

Part I:	01463
Part II:	02102
Part III:	00725
	04512 words

To this total must be added the load origin (00366 for the 910/925, 00233 for the 920 and 00161 for the 9300), the length of the I/O subroutines to be loaded, and the length of the mnemonic table. All remaining memory is used for working storage, irrespective of the computer size. While available space is thus variable, there is in general space for approximately 300 symbols (literals, external references, OPDs and POPDs) on a computer with 4K memory. An additional nK memory will provide space for nK/3 additional items.

USE: (Cont)

During the first pass, source lines are read and a location counter is maintained which is used for defining labels. All labels are defined in pass 1. Except for label fields, only directive lines are processed during pass 1. Other lines may cause the location counter to be incremented by the operand field of such lines are not processed. Consequently, no literals or external references are processed during pass 1.

At the conclusion of pass 1, all labels which have been designated as external labels are output. No further entries can be made in the mnemonic table or in the symbol table. During pass 2, all lines are completely processed and both object code and a listing are generated. Literals are inserted in the literal table and references are inserted in the reference table. At the conclusion of pass 2, the literals are output and finally the references are output.

At this point, another assembly may be started without reloading the assembler. Before doing the assembly, SYMBOL will clear the mnemonic command table of any programmer defined entries left over from the previous assembly.

2.0 SYMBOL Paper Tape (Card Deck) System

A SYMBOL system consists of the following segments:

1. SYMBOL Loader (Cat. No. 012012). The SYMBOL loader consists of an absolute bootstrap, a preloader and a loader.

2. Input/Output Subroutines

   a. Paper Tape/Typewriter Input Subroutine (Cat. No. 020024)

   b. Card Reader Input Subroutine (Cat. No. 030009)

USE: (Cont)

c. Magnetic Tape Input Subroutine (Cat. No. 040007)

d. Paper Tape Punch Binary Output Subroutine (Cat. No. 020025)

e. Card Punch Binary Output Subroutine (Cat. No. 030008)

f. Typewriter Listing Output Subroutine (Cat. No. 020023)

g. Line Printer Listing Output Subroutine (Cat. No. 062002)

3. SYMBOL Part I (Cat. No. 012005)

4. SYMBOL Part II (Cat. No. 012009)

5. SYMBOL Part III (Cat. No. 012010)

6. SYMBOL Mnemonic Table

a. 900 Series SYMBOL 910 Mnemonic Table (Cat. No. 012006)

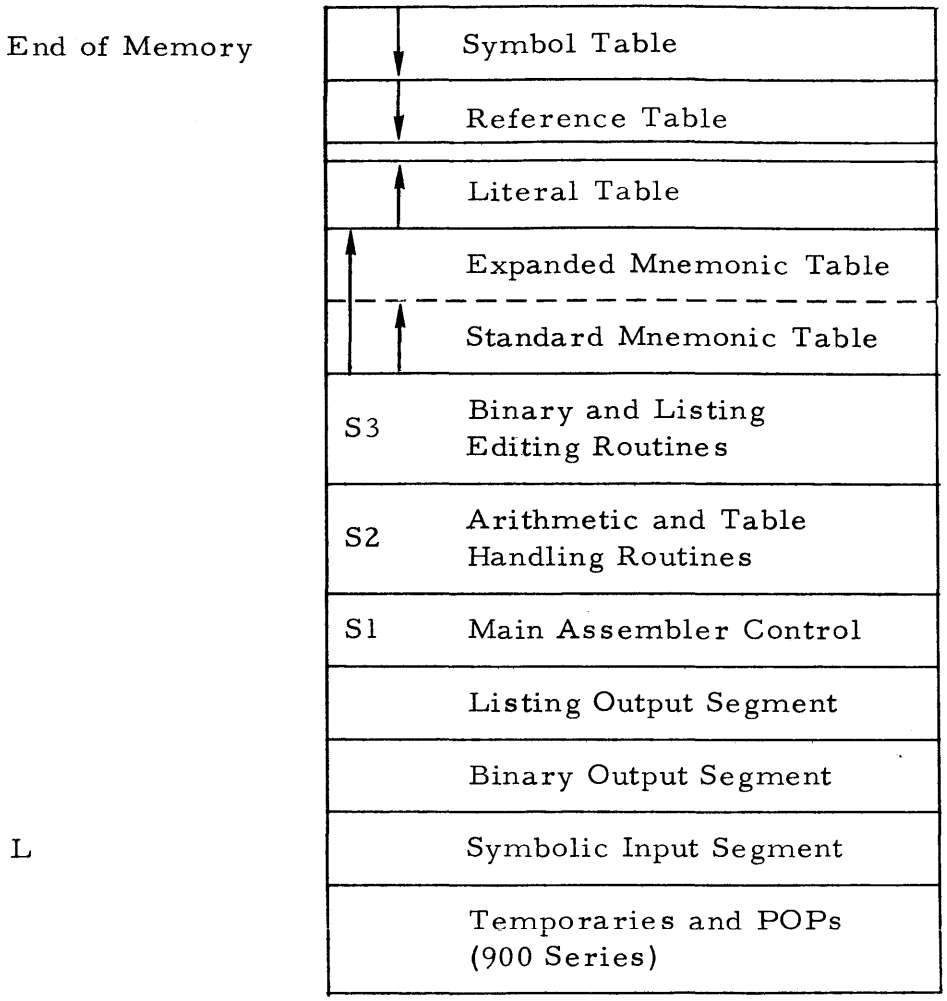
b. 900 Series SYMBOL 920 Mnemonic Table (Cat. No. 012011)

c. 900 Series SYMBOL 9300 Mnemonic Table (Cat. No. 012007)

As stated in the SYMBOL Loader description, the order and number of the I/O subroutines is unimportant. Similarly, the internal ordering of the SYMBOL Parts I, II and III is unimportant. There must be only one of the above mentioned mnemonic tables included in a system.

The SYMBOL paper tape system may be updated, or put together originally by reproducing each segment onto one continuous paper tape, through the use of the SYMBOL Reproduce and Update routine (Cat. No. 012014).

USE: (Cont) 3.0 Memory Allocation



910, 925: L = 00366

920, 930: L = 00233

9300 L = 00161

During pass 1, OPD and FORM definitions are added to the Standard Op Table to form the Mnemonic Table. A flag is set in such entries to enable them to be extracted before a new assembly is started.

USE: (Cont)

The SYMBOL table starts at the end of memory and new entries cause the table to be expanded downward (to lower numbered locations). Entries are made in this table only during pass 1.

During pass 2, literals are processed and cause entries to be inserted in the literal table. The literal table begins at the (high) end of the mnemonic table and new entries cause the table to be expanded upwards.

Also during pass 2, external references are processed and cause entries to be inserted in the reference table. The reference table begins at the (low) end of the symbol table and new entries cause the table to be expanded downwards.

4.0 Tables

Mnemonic Table Entries

Bits	Word	
0-23	1	First four characters of symbol
0-11	2	Fifth and sixth characters of symbol
12, 20	2	I/O command with unit and channel to be supplied (e.g., RPT)
13	2	Programmed operator
16	2	Not used
17	2	Duplicate Flag
18	2	Programmer defined entry (OPD, FORM, POPD or external POP)
19	2	Instruction, octal address
20	2	Instruction, I/O command with channel specified (e.g., RPTW)
21	2	Directive, special label definition
22	2	Directive, normal label definition
23	2	Form

USE: (Cont)

If bits 12, 21, 22 and 23 are off, the third word contains the data word without parameters.

The third word of directive entries (bit 21 or 22 on) contains the starting address of the lines of instructions which process the directive line encountered.

The third word of a form item (bit 23 on) contains a form pattern word; i.e., a word with a one in the leading bit position of each field, and zeros elsewhere.

The third word of a programmed operator entry (bit 13) has the following format:

Bits 0-1	Type (0 internal definition, 1 external reference, 2 external definition)
Bits 2-7	Programmed operator number (assigned at end of pass 1)
Bit 8	Relocation bit (if definition)
Bits 9-23	Address of programmed operator interpretive code

Symbol Table Entries

Bits	Word	
0-23	1	First four characters of symbol
0-11	2	Fifth and sixth characters of symbol
17	2	Duplicate flag
22	2	Relocatable flag
23	2	External flag
0-23	3	Value

USE: (Cont)

Reference Table Entries

Bits	Word	
0-23	1	First four characters of symbol
0-11	2	Fifth and sixth characters of symbol
0-23	3	Location of last data word to reference this symbol

Literal Table Entries

Bits	Word	
0-23	1	Literal value
22	2	Relocatable flag
0-8	3	Literal sequence
9-23	3	Location literal will occupy in the object program

5.0 Operation

1. Load SYMBOL Loader by a FILL procedure.

2. Type Loader control message to provide for selective loading of I/O routines (see SYMBOL loader writeup for syntax and other details).

3. Ready input.

4. Clear the halt.

5. After pass 1, the computer will perform the following action:

   Paper Tape/Typewriter : Halt. In order to continue, reposition input and clear the halt.

   Cards : The computer will remain in a CRT, BRU $-1 loop until the card reader is again made ready.

USE: (Cont)

Magnetic Tape : No operator intervention required.

6. After pass 2, the computer will halt prepared to under take an additional assembly.

6.0 Diagnostics

SYMBOL provides the user with an unusual degree of error detection, which is conveyed by the appearance of up to four single-character diagnostic flags in columns 1-4 of the output listing. These flags and their meanings are explained below.

Flag	Error	Action
D	Duplicate	Duplicate symbol definition or reference. References to duplicate symbols take the value of the first definition.
E	Expression	Illegal expression in operand field. Operand interpretation is terminated.
I	Instruction	Instruction mnemonic not defined. Treated as HLT for 9300 and as implicit POP reference for 900 series.
L	Label	Illegal symbol in label field.
P	Parentheses	Too many parentheses levels or unequal number of left and right parentheses. Operand interpretation is terminated.
R	Relocation	Operand expression involves illegal use of one or more relocatable items. The correct (but non-relocatable) value of the expression is determined and output.

USE: (Cont)	T	Truncation	Significant bits were lost due to left-hand truncation in inserting a value into a specified field. If the field size is n, the result is the value of the expression modul 2^n.
	*	External	An external address reference has been made which may or may not be in error.
	U	Undefined	A reference has been made to an undefined symbol in other than the address field. Zero is substituted for the undefined value.
	O	Overflow	The assembler's symbol table has overflowed, but assembly continues. Recovery is possible only by reducing the number of symbols through elimination or through program segmentation.

SDS PROGRAM LIBRARY
PROGRAM DESCRIPTION

 Catalog No. 012012

IDENTIFICATION: 900 Series SYMBOL Loader

AUTHOR: SDS

ACCEPTED: January 21, 1965

COMPUTER CONFIGURATION: Any SDS 900 Series computer with at least 4,096 words of memory, a typewriter and either a paper tape or a card reader.

PURPOSE: To load the SYMBOL assembler.

To load selectively the input/output routines for SYMBOL as specified by the operator.

To determine memory size for SYMBOL.

To load the appropriate Programmed Operators (900 series only).

STORAGE:

00000 - 00161	:	Read Buffer, READ, LOAD and END Routines
04000 - 04264	:	Control Message Processor
(X-00210)-X	:	Main Loader Logic, where X = highest address in the computer

After the control message has been received and processed, and the I/O routines have been loaded, the control message processor is overlaid.

In addition to the above, a Programmed Operator Package is loaded for the 900 Series SYMBOL which extends from 00161 to 00233 for the 920, 930 (00161 to 00366 for the 910, 925).

USE: The SYMBOL Loader is preceded by an absolute bootstrap (Cat. No. 020020 for paper tape, Cat. No. 030006B for cards), and a pre-loader which computes memory size and relocates it into upper memory. It is loaded by the normal FILL procedure. Upon completion of loading, the Loader addresses the console keyboard to permit the operator to specify the I/O media appropriate to the current assembly.

USE: (Cont)

The operator should in addition set Breakpoint 1 if the Loader is to load SYMBOL from cards. After SYMBOL has been loaded, a halt will occur (in a location whose value depends upon the machine and upon the length of the I/O routines loaded. At this time the operator has only to ready the symbolic input and clear the halt. This is the only halt present in the assembler.

Following the first assembly, SYMBOL will reinitialize itself and halt in the same location, ready to process another program. It is not necessary to reload the assembler unless different I/O media are required.

The loading process may be reinitialized at any time prior to the reading of the first record by the execution of a branch to location 1.

Control Message Syntax

A control message consists of the character Δ followed by from one to three of the characters M, P, T, C, L, N and terminated by a carriage return. These characters have the following significance:

1st character	:	Symbolic Input Device
2nd character	:	Binary Output Device
3rd character	:	Listing Output Device
M	:	Magnetic Tape
P	:	Paper Tape
T	:	Typewriter
C	:	Cards
L	:	Line Printer
N	:	None

A control message may be cancelled at any time preceding the carriage return by typing a virgule (/).

Characters absent from the control message are considered equivalent to trailing N's.

USE: (Cont)

Examples

Δ C P T ↵	:	SI = Cards, BO = Paper Tape, LO = Typewriter
Δ P P ↵	:	SI = Paper Tape, BO = Paper Tape, LO = None
Δ M R/Δ M C L ↵	:	SI = Magnetic Tape, BO = Cards, LO = Line Printer

Halts

00120 : Input error: buffer error, checksum error or card feed error. To recover, reread the offending record.

07643 : Loader's symbol table has overflowed. This halt cannot occur during loading the standard SDS 910/925, 920/930 or 9300 assemblers, but can occur when loading the 910/925 assembler with the 920/930 op table on a minimal (4K) 910/925. It could also occur in the event that the user replaced the standard I/O subroutines with ones that were more space consuming.

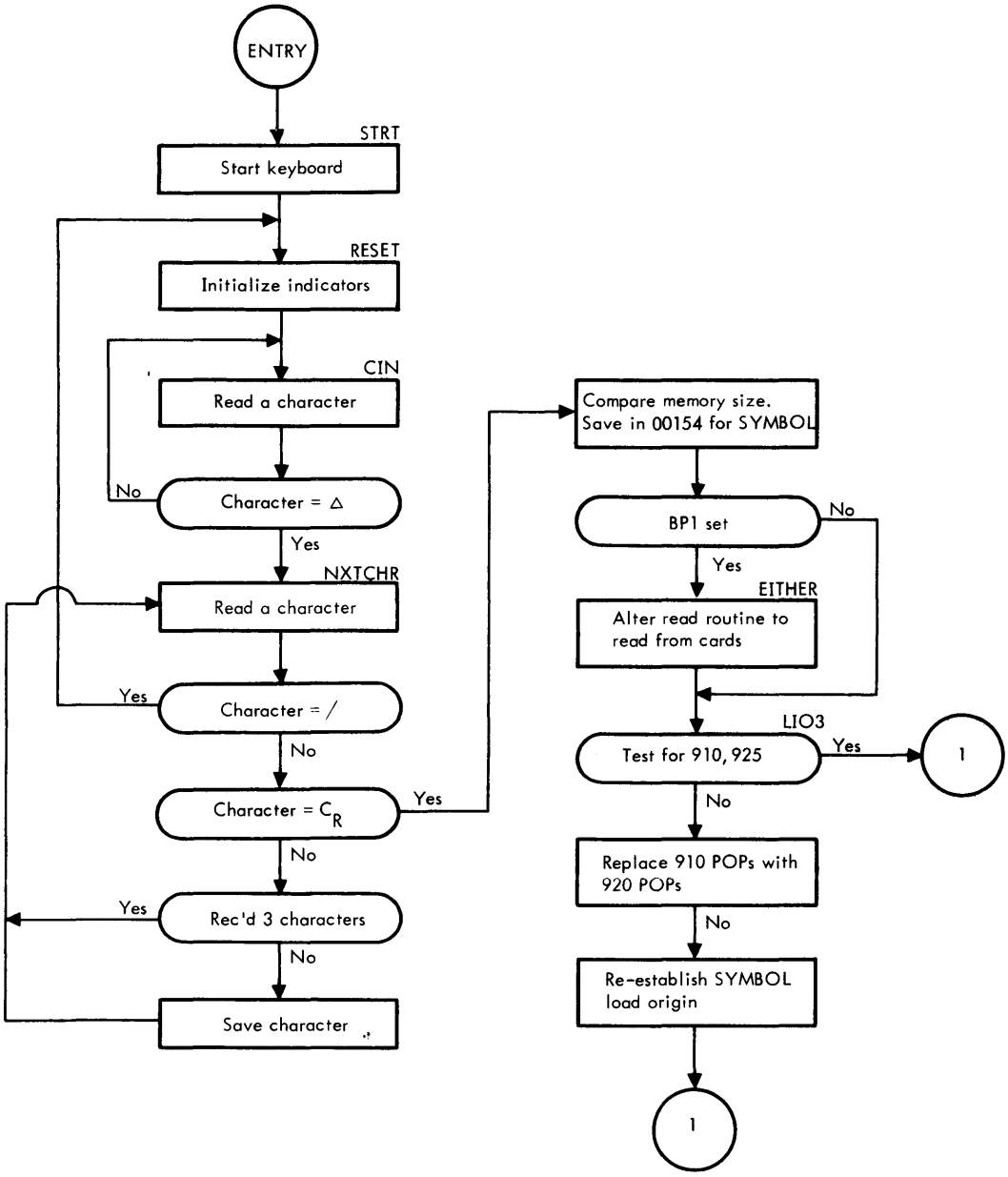
METHOD:

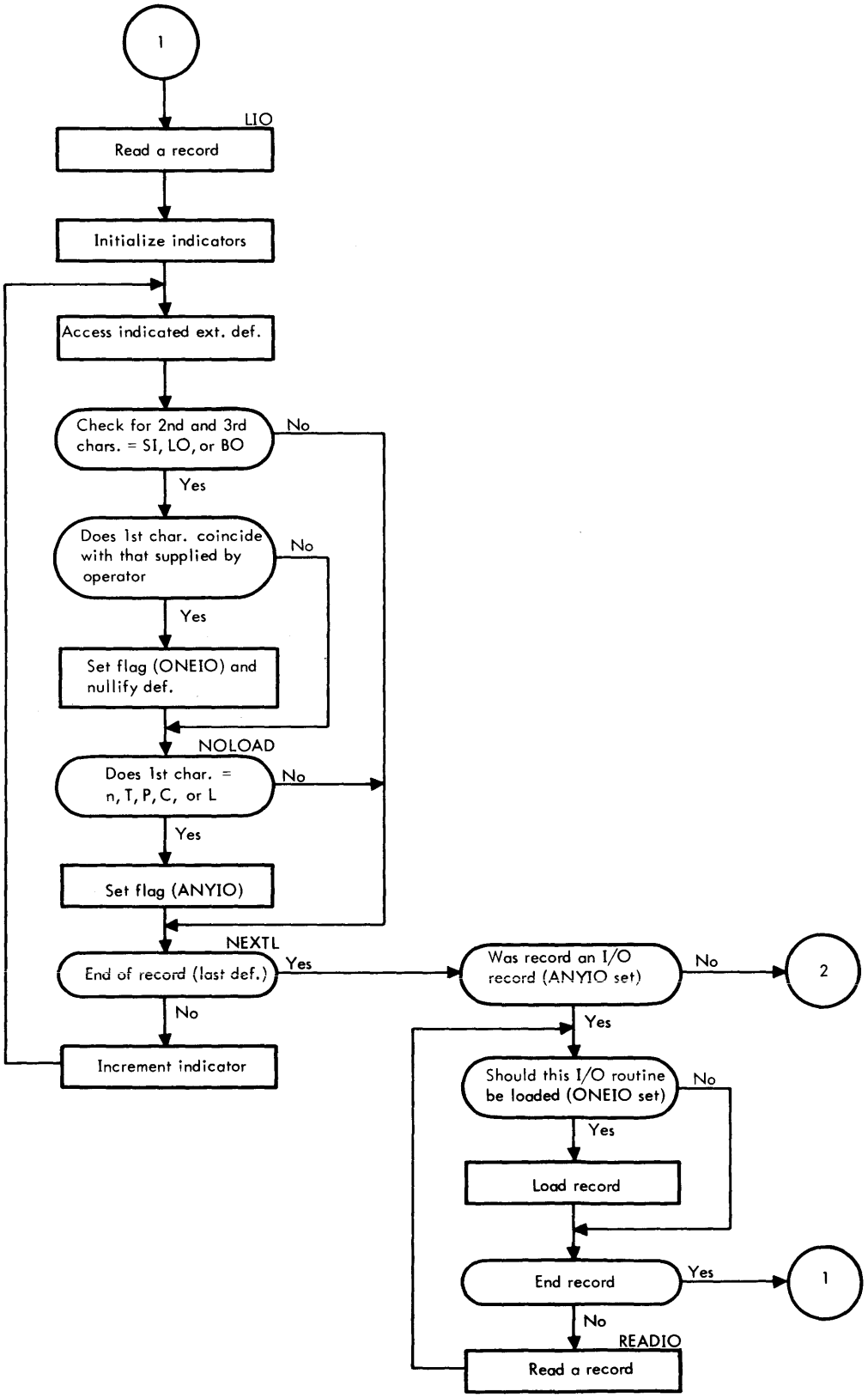
After addressing the keyboard, the Loader ignores all characters until a Δ has been read, and then accumulates up to three characters until a carriage return is received. The first character is associated with symbolic input, the second with binary output, and the third with listing output. Thus, if the characters C, P and T have been input, the associations CSI, PBO and TLO are made.

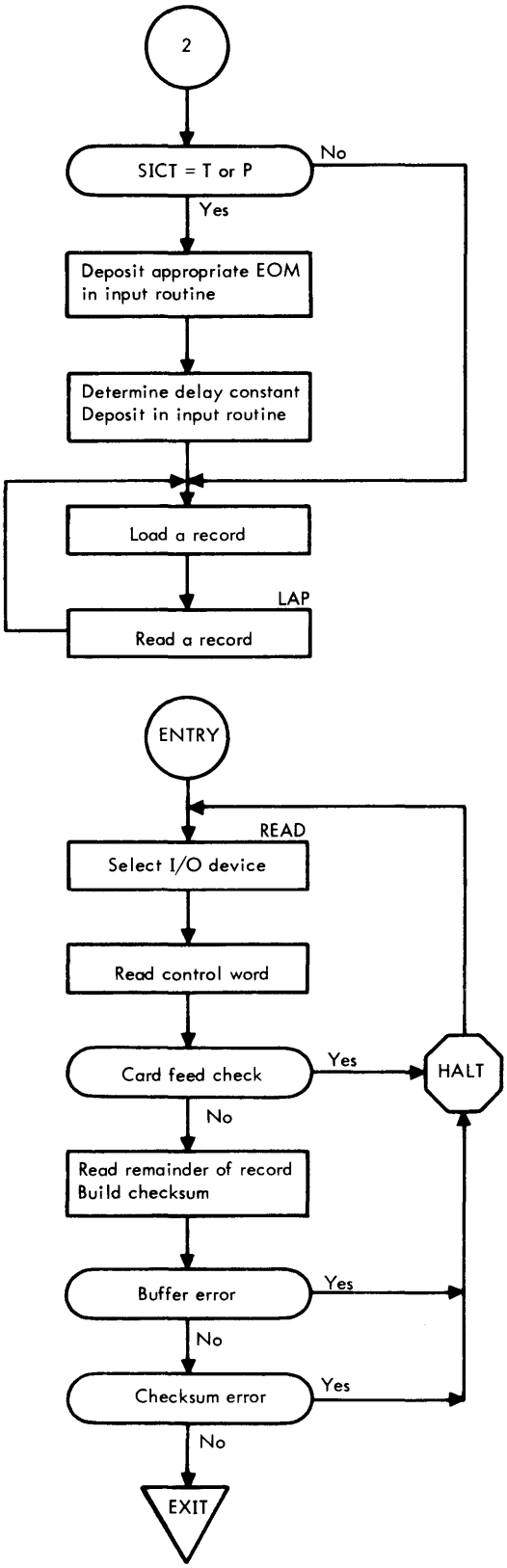
Next an input record is read and scanned for an external definition coinciding with CSI, PBO or TLO. If coincidence is detected, all records are read and accepted until an END record is encountered. If coincidence is not detected, the input record is scanned for the appearance of any legitimate I/O external definition (such as PSI, LLO, etc.). If one is found, the record is known to herald an I/O routine, the Loader reads but ignores all records up to and including the END record, and the above process is repeated. If however none is found, the I/O routines are exhausted and the Loader

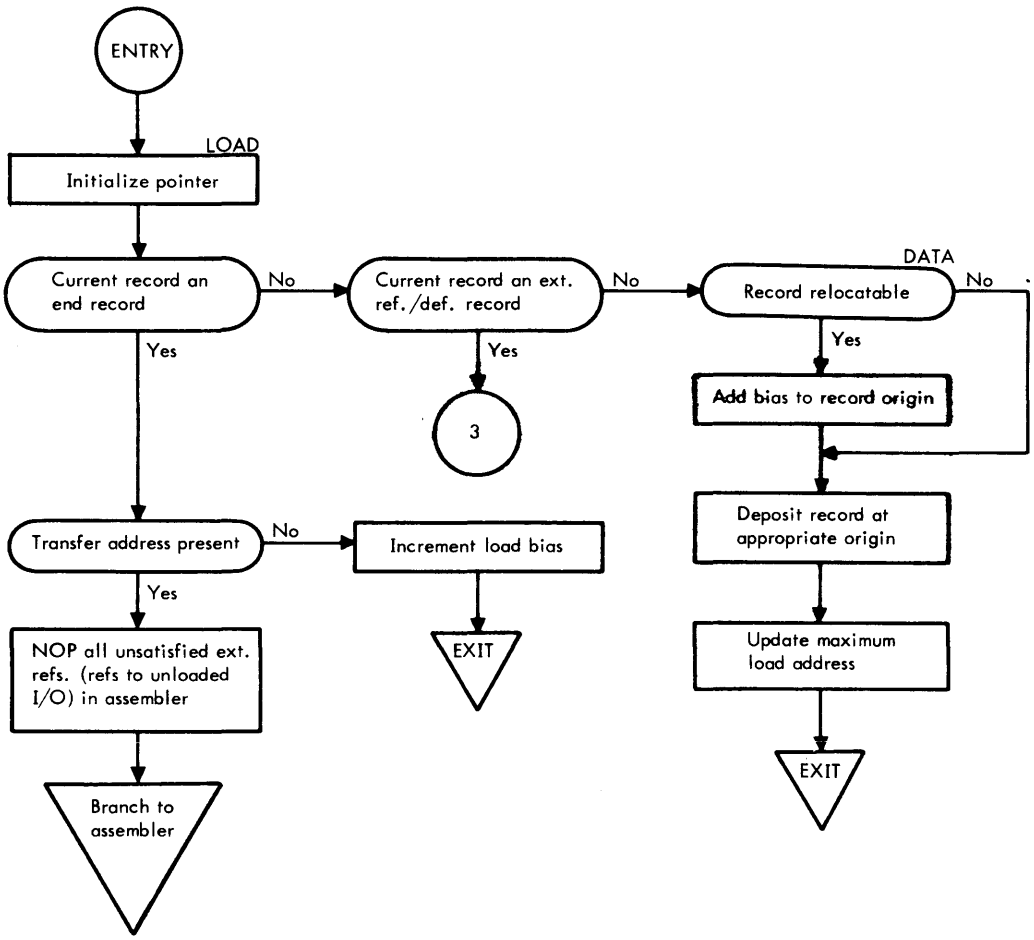
METHOD: (Cont) abandons search mode for load mode. All records are now read until an end record with transfer address is encountered.

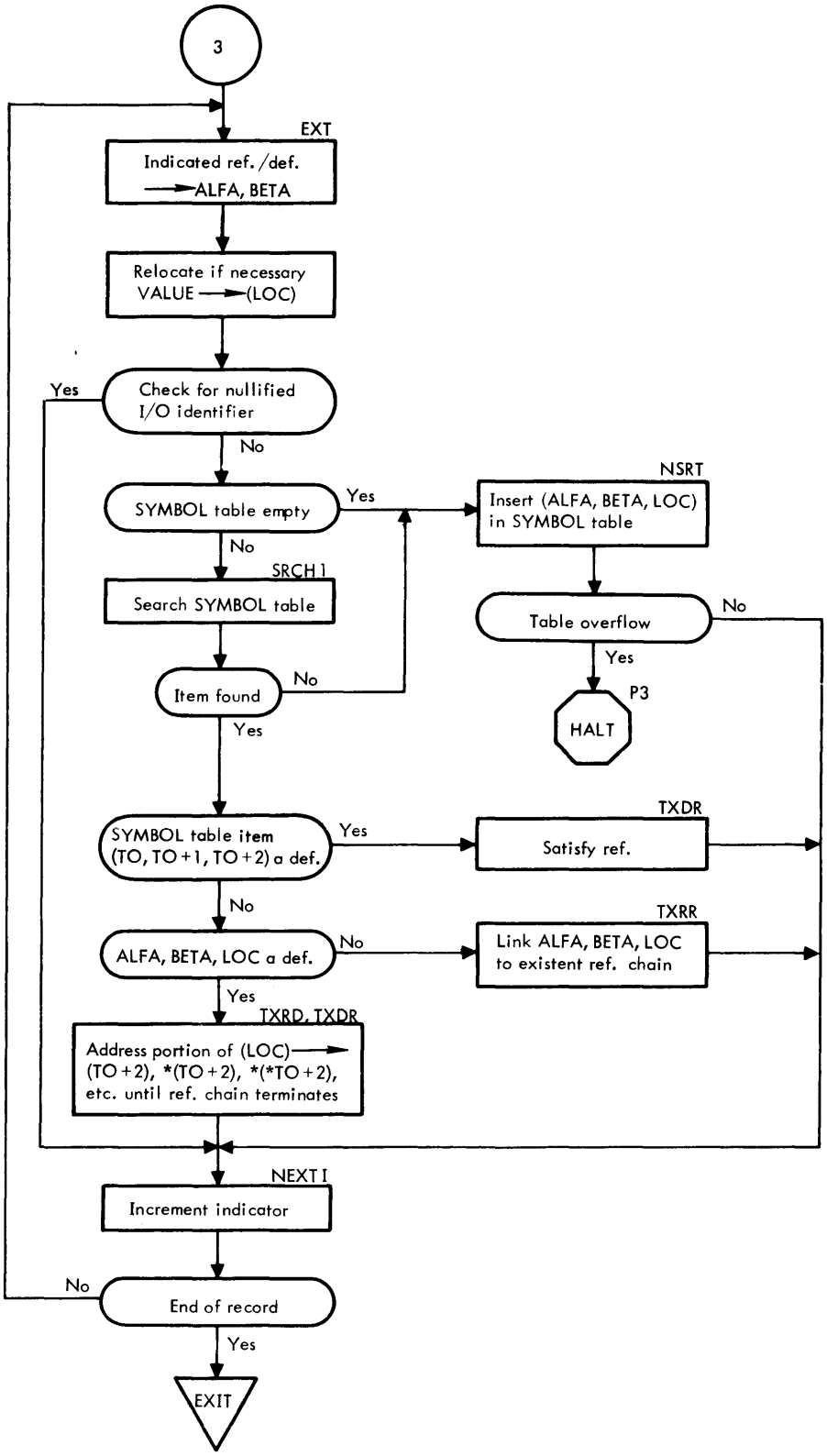
By adhering to these conventions, the user may at will add additional I/O routines to correspond to non-standard peripheral devices. While the order and number of I/O routines is unimportant, they must all be grouped together between the loader and the assembler. Similarly, the three assembler parts may be in any order but the mnemonic table must be loaded last.


ENTRY
STRT
Start keyboard
RESET
Initialize indicators
CIN
Read a character
No
Character = Δ
Yes
NXTCHR
Read a character
Yes
Character = /
No
Character = C_R
Yes
No
Rec'd 3 characters
Yes
No
Save character
Compare memory size.
Save in 00154 for SYMBOL
BP1 set
No
Yes
EITHER
Alter read routine to
read from cards
LIO3
Test for 910, 925
Yes
1
No
Replace 910 POPs with
920 POPs
No
Re-establish SYMBOL
load origin
1


1
LIO
Read a record
Initialize indicators
Access indicated ext. def.
Check for 2nd and 3rd chars. = SI, LO, or BO
No
Yes
Does 1st char. coincide with that supplied by operator
No
Yes
Set flag (ONEIO) and nullify def.
NOLOAD
Does 1st char. = n, T, P, C, or L
No
Yes
Set flag (ANYIO)
NEXTL
End of record (last def.)
Yes
No
Increment indicator
Was record an I/O record (ANYIO set)
No
2
Yes
Should this I/O routine be loaded (ONEIO set)
No
Yes
Load record
End record
Yes
1
No
READIO
Read a record


2
SICT = T or P
No
Yes
Deposit appropriate EOM in input routine
Determine delay constant Deposit in input routine
Load a record
LAP
Read a record
ENTRY
READ
Select I/O device
Read control word
Card feed check
Yes
HALT
No
Read remainder of record Build checksum
Buffer error
Yes
No
Checksum error
Yes
No
EXIT


ENTRY
LOAD
Initialize pointer
Current record an end record
No
Yes
Current record an ext. ref./def. record
No
Yes
3
DATA
Record relocatable
No
Yes
Add bias to record origin
Deposit record at appropriate origin
Update maximum load address
EXIT
Transfer address present
No
Yes
Increment load bias
EXIT
NOP all unsatisfied ext. refs. (refs to unloaded I/O) in assembler
Branch to assembler


3
EXT
Indicated ref./def. →ALFA, BETA
Relocate if necessary VALUE →(LOC)
Yes
Check for nullified I/O identifier
No
NSRT
SYMBOL table empty
Yes
Insert (ALFA, BETA, LOC) in SYMBOL table
No
SRCH1
Search SYMBOL table
Table overflow
No
Yes
Item found
No
P3
HALT
Yes
TXDR
SYMBOL table item (TO, TO+1, TO+2) a def.
Yes
Satisfy ref.
No
TXRR
ALFA, BETA, LOC a def.
No
Link ALFA, BETA, LOC to existent ref. chain
Yes
TXRD, TXDR
Address portion of (LOC)→ (TO+2), *(TO+2), *(*TO+2), etc. until ref. chain terminates
NEXTI
Increment indicator
No
End of record
Yes
EXIT

```
Δ      ASSIGN SI CR EI CR L0 LP E0 CP B0 CP S MT0 X1 MT1 X2 MT2.
ΔASSIGN SI=CR,EI=CR,E0=CP,B0=PP,L0=LP.
Δ METASYM SI,L0,B0.
 03000                          1          A0RG    03000
        00000000                2 S9300    EQU     0
        00000000                3 X0       EQU     S9300
        00000002                4 X2       EQU     2-S9300
        00000000                5 CH       EQU     0
        00000001                6 U        EQU     1
 03000  0 75 0 03121            7 START    LDB     =-1                    C0MPUTE MAXIMUM MEM0RY ADDRESS
 03001  0 76 0 03122            8          LDA     =040000*/S9300+2047
 03002  0 54 0 03123            9 L00P1    SUB     =04000
 03003  0 35 0 03113           10          STA     BIAS
 03004  0 35 1 03113           11          STA     *BIAS
 03005  0 70 1 03113           12          SKM     *BIAS
 03006  0 01 0 03002           13          BRU     L00P1
 03007  0 54 0 03124           14          SUB     =4095                  SUBTRACT 07777
 03010  0 35 0 03113           15          STA     BIAS                   BIAS=MEM0RY SIZE-4K
 03011  0 40 21000             16 BPT     BRTW
 03012  0 01 0 03011           17          BRU     BPT
 03013  0 40 20400             18          BPT     1
 03014  0 01 0 03017           19          BRU     CARDS
 03015  0 02 0 02604           20          RPT     CH,U,4
 03016  0 01 0 03022           21          BRU     READ
 03017  0 40 12006             22 CARDS   CRT     CH,U
 03020  0 01 0 03017           23          BRU     CARDS
 03021  0 02 0 03606           24          RCB     CH,U,4
 03022  0 32 0 03114           25 READ    WIM     CW                     C0NTR0L W0RD
 03023  0 76 0 03114           26          LDA     CW
 03024  0 02 20001             27          R0V
 03025  0 6700 003             28          LSH     3                      END RECORD TURNS 0N 0VERFL0W
 03026  0 6600 022             29          RSH     18
 03027  0 35 0 03116           30          STA     C0UNT                  W0RD C0UNT
 03030  0 40 21000             31          BRTW                           CHECK F0R CARD FEED ERR0R
 03031  0 01 0 03033           32          BRU     $+2                    N0
 03032  0 01 0 03111           33          BRU     ERR0R                  YES
 03033  0 32 0 03115           34          WIM     L0C                    RECORD 0RIGIN
 03034  0 76 0 03115           35          LDA     L0C
```

```
03035  0 72 0 03125        36          SKA     =01700000       IS RECORD RELOCATABLE
03036  0 55 0 03113        37          ADD     BIAS            YES
03037  0 40 20001          38          OVT                     NO. CHECK FOR END RECORD
03040  0 76 0 03112        39          LDA     BRUX*           YES
03041  0 35 0 03117        40          STA     T1              T1,T2 NOW POINT EITHER TO RECORD
03042  0 35 0 03120        41          STA     T2              ORIGIN OR TO EXIT
03043  0 76 0 03115        42          LDA     LOC
03044  0 6600 023          43          RSH     19              (A)=1 IF REL WORD PRESENT
03045  0 55 0 03126        44          ADD     =00200001       COMPUTE XREG CONSTANT CORRESPONDING
03046  0 54 0 03116        45          SUB     COUNT           TO NUMBER OF DATA WORDS TO READ
03047  0 35 0 03116        46          STA     COUNT
03050  0 76 0 03114        47          LDA     CW              BEGIN CHECKSUM
03051  0 17 0 03115        48          EOR     LOC
03052  0 71 0 03116        49          LDX     COUNT,XO
03053  0 01 0 03057        50          BRU     BRX1
03054  0 32 1 03117        51 LOOP2    WIM     *T1             READ RECORD
03055  0 17 1 03117        52          EOR     *T1
03056  0 61 0 03117        53          MIN     T1
03057  0 41 0 03054        54 BRX1     BRX     LOOP2,XO
03060  0 32 0 03114        55          WIM     REL             READ IN REL WORD IF ANY
03061  0 17 0 03114        56          EOR     REL
03062  0 40 20400          57          BPT     1
03063  0 02 0 12006        58          SRC     CH,U
03064  0 40 20010          59          BETW                    CHECK FOR BUFFER ERROR
03065  0 01 0 03111        60          BRU     ERROR
03066  0 35 0 03115        61          STA     CS              FOLD CHECKSUM
03067  0 6600 014          62          RSH     12
03070  0 17 0 03115        63          EOR     CS
03071  0 75 0 03111        64          LDB     ERROR
03072  0 70 0 03111        65          SKM     ERROR
03073  0 01 0 03111        66          BRU     ERROR           CHECKSUM FAILS
03074  0 71 0 03116        67          LDX     COUNT,XO
03075  0 75 0 03114        68          LDB     REL
03076  0 01 0 03107        69          BRU     BRX2
03077  0 36 0 03117        70 LOOP3    STB     T1              RELOCATION LOOP
03100  0 76 1 03120        71          LDA     *T2
03101  0 55 0 03113        72          ADD     BIAS
03102  0 53 0 03117        73          SKN     T1
03103  0 01 0 03105        74          BRU     MIN
```

```
03104  0 35 1 03120          75          STA     *T2
03105  0 61 0 03120          76  MIN     MIN     T2
03106  0 6700 001            77          LSH     1
03107  0 41 0 03077          78  BRX2    BRX     LOOP3.XO
03110  0 01 0 03011          79  EXIT    BRU     BPT
03111  0 00 0 07777          80  ERROR   HLT     07777
03112  0 01 0 03110          81  BRUX    BRU     EXIT
03113                        82  BIAS    RES     1
03114                        83  CW      RES     1
03115                        84  LOC     RES     1
03116                        85  COUNT   RES     1
03117                        86  T1      RES     1
03120                        87  T2      RES     1
       00003114              88  REL     EQU     CW
       00003115              89  CS      EQU     LOC
       00003000              90          END     START
03121  77777777
03122  00043777
03123  00004000
03124  00007777
03125  01700000
03126  00200001
```

```
                        *                 SYMBOL LOADER
                        *
04000                            ABRG     04000
         00000000       S9300    EQU      0                  1 FOR 900 SERIES
         00000000       X0       EQU      S9300
         00000002       X2       EQU      2-S9300
                        CAB      OPD      04600004
                        CBA      OPD      04600010
                        CAX      OPD      04600400
                        CXA      OPD      04600200
                        CBX      OPD      04600020
                        CNA      OPD      04601000
                        SKE      OPD      05000000
                        SKR      OPD      06000000
                        MUL      OPD      06400000
                        DIV      OPD      06500000
                        ADM      OPD      06300000
                        XMA      OPD      06200000
04000                   SICT     RES      1
04001                   BOCT     RES      1
04002                   LOCT     RES      1
04003                   ONEIO    RES      1
04004                   ANYIO    RES      1
04005                   SIC      RES      1
04006    00000000       PC       DATA     0
04007    00000000       PLC      DATA     0
04010    00000061       VCHR     DATA     '/'
04011    00000057       DCHR     DATA     'Δ'
04012    00177775       M3       DATA     00200000-3
04013    00177772       M6       DATA     00200000-6
04014    00004000       LSICT    DATA     SICT
04015    00004002       LLOCT    DATA     LOCT
04016    00000052       CR       DATA     052
04017    00000000       CHR      DATA     0
04020    00000044       DEVICE   DATA     'M','T','P','C','L'
04021    00000063
```

```
04022  00000047
04023  00000023
04024  00000043
04025  62316060          36 FNCS   DATA   'SI  ','B0  ','L0  '
04026  22466060
04027  43466060
04030  0 40 21000        37 STRT   BRTW
04031  0 01 0 04030      38        BRU    STRT
04032  0 02 0 02001      39        RKB    0,1,1
04033  0 76 0 00160      40 RESET  LDA    Z                    CLEAR I/O INDICATORS
04034  0 35 0 04000      41        STA    SICT
04035  0 35 0 04001      42        STA    B0CT
04036  0 35 0 04002      43        STA    L0CT
04037  0 35 0 00044      44        STA    ML0C
04040  0 76 0 04014      45        LDA    LSICT
04041  0 35 0 04006      46        STA    PC                   INITIALIZE POINTER
04042  0 75 0 00146      47        LDB    P63
04043  0 32 0 04017      48 CIN    WIM    CHR
04044  0 76 0 04017      49        LDA    CHR
04045  0 70 0 04011      50        SKM    DCHR                 WAIT FOR DELTA
04046  0 01 0 04043      51        BRU    CIN
04047  0 32 0 04017      52 NXTCHR WIM    CHR
04050  0 76 0 04017      53        LDA    CHR
04051  0 70 0 04010      54        SKM    VCHR                 RESET UPON SLASH
04052  0 01 0 04054      55        BRU    $+2
04053  0 01 0 04033      56        BRU    RESET
04054  0 70 0 04016      57        SKM    CR                   FINISH UPON CARRIAGE RETURN
04055  0 01 0 04057      58        BRU    $+2
04056  0 01 0 04067      59        BRU    L0ADI0
04057  0 14 0 00146      60        ETR    P63
04060  0 46 20005        61        ABC
04061  0 76 0 04006      62        LDA    PC
04062  0 73 0 04015      63        SKG    LL0CT
04063  0 36 1 04006      64        STB    *PC
04064  0 61 0 04006      65        MIN    PC
04065  0 75 0 00146      66        LDB    P63
04066  0 01 0 04047      67        BRU    NXTCHR               GET NEXT CHARACTER
04067  0 02 00000        68 L0ADI0 DSC    0
04070  0 75 0 00162      69        LDB    M1                   COMPUTE MEMORY SIZE
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04071  0 76 0 04263        70          LDA     BIGADR          18K FOR 900 SERIES, 34K FOR 9300
04072  0 54 0 04264        71 M2K      SUB     B12             SUBTRACT
04073  0 35 0 00154        72          STA     HIGH            2K
04074  0 35 1 00154        73          STA     *HIGH
04075  0 70 1 00154        74          SKM     *HIGH           SKIP WHEN FINISHED
04076  0 01 0 04072        75          BRU     M2K
04077  0 40 20400          76          BPT     1
04100  0 01 0 04102        77          BRU     EITHER
                           78 *        BPT     2               REMOVE ASTERISK FROM MAG TAPE LOAD
                           79 *        BRU     EITHER          REMOVE ASTERISK FOR MAG TAPE LOAD
04101  0 01 0 04113        80          BRU     LI03
04102  0 76 0 04106        81 EITHER   LDA     SETUP
04103  0 40 20200          82          BPT     2
                           83 *        ADD     P5              REMOVE ASTERISK FROM MAG TAPE LOAD
04104  0 35 0 04106        84          STA     SETUP
04105  0 71 0 04250        85          LDX     M4,X0
04106  2 76 0 04242        86 SETUP    LDA     CARDS+4,X2
04107  2 35 0 00062        87          STA     READY+4,X2
04110  0 41 0 04106        88          BRX     SETUP,X0
04111  0 76 1 04106        89          LDA     *SETUP
04112  0 35 0 00111        90          STA     BERROR
04113  0 60 0 04252        91 LI03     SKR     NEG
04114  0 01 0 04126        92          BRU     LI0             910
04115  0 71 0 04251        93          LDX     LENGTH,X0
04116  2 76 0 00435        94          LDA     END920,X2
04117  2 35 0 00233        95          STA     END920-D,X2
04120  0 41 0 04116        96          BRX     $-2,X0
04121  0 76 0 04253        97          LDA     NEWEND
04122  0 60 0 04255        98          SKR     COMP93          TEST FOR 9300
04123  0 76 0 04262        99          LDA     ORG93           YES. ORIGIN I/O AT 3164
04124  0 35 0 00051       100          STA     BIAS            NO.  ORIGIN I/O AT 0233
04125  0 35 0 04254       101          STA     NWBIAS
04126  0 43 0 00055       102 LI0      BRM     READ            READ ONE RECORD (1ST EXTERNAL DEFS)
04127  0 76 0 00153       103          LDA     N1              RESET LOADING INDICATORS
04130  0 35 0 04003       104          STA     ONEI0
04131  0 35 0 04004       105          STA     ANYI0
04132  0 76 0 07773       106          LDA     LDW1            INITIALIZE POINTER
04133  0 35 0 00050       107          STA     WD1
04134  0 76 0 00042       108          LDA     CT
```

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04135  0 35 0 04006      109          STA     PC
04136  0 71 0 00050      110 LOOK     LDX     WD1,X0
04137  2 76 0 00000      111          LDA     0,X2          ACESS EXTERNAL DEF
04140  2 75 0 00001      112          LDB     1,X2
04141  0 6600 022        113          RSH     18
04142  0 14 0 00146      114          ETR     P63           MOST SIGNIFICANT CHARACTER IN A
04143  0 46 00014        115          XAB                   2ND,3RD CHARACTERS LEFT JUST. IN A
04144  0 71 0 04250      116          LDX     M4,X0
04145  0 36 0 04017      117          STB     CHR
04146  0 75 0 00153      118          LDB     N1
04147  0 41 0 04151      119          BRX     $+2,X0        EXHAUST CHECK AFTER 3 ATTEMPTS
04150  0 01 0 04171      120          BRU     NEXTL
04151  2 70 0 04030      121          SKM     FNCS+3,X2     CHECK FOR SI,BO OR LO.
04152  0 01 0 04147      122          BRU     $-3           NO
04153  0 76 0 04017      123          LDA     CHR           YES
04154  2 70 0 04003      124          SKM     SICT+3,X2     CHECK FOR COINCIDENCE OF 1ST CHAR
04155  0 01 0 04163      125          BRU     NOLOAD        NO
04156  0 76 0 00160      126          LDA     Z             YES
04157  0 71 0 00050      127          LDX     WD1,X0        DEF HAS SERVED ITS PURPOSE
04160  2 35 0 00000      128          STA     0,X2          CLEAR
04161  0 61 0 04003      129          MIN     ONEIO         FLAG TO LOAD
04162  0 76 0 04017      130          LDA     CHR
04163  0 71 0 04013      131 NOLOAD   LDX     M6,X0         DETERMINE WHETHER 1ST CHAR COINCIDES
04164  0 41 0 04166      132          BRX     $+2,X0        WITH ANY LEGITIMATE 1ST CHAR
04165  0 01 0 04171      133          BRU     NEXTL
04166  2 70 0 04025      134          SKM     DEVICE+5,X2
04167  0 01 0 04164      135          BRU     $-3
04170  0 61 0 04004      136          MIN     ANYIO         IF SO, MAKE INDICATOR POSITIVE
04171  0 76 0 07642      137 NEXTL    LDA     P3            ADVANCE POINTER TO NEXT EXTERNAL DEF
04172  0 55 0 00050      138          ADD     WD1
04173  0 35 0 00050      139          STA     WD1
04174  0 76 0 04006      140          LDA     PC            CHECK FOR END OF RECORD
04175  0 54 0 07642      141          SUB     P3
04176  0 35 0 04006      142          STA     PC
04177  0 73 0 00160      143          SKG     Z
04200  0 01 0 04202      144          BRU     $+2           YES
04201  0 01 0 04136      145          BRU     LOOK          NO. ACCESS NEXT DEF
04202  0 53 0 04004      146          SKN     ANYIO         IF ANYIO STILL NEG, RECORD NOT I/O
04203  0 01 0 04206      147          BRU     $+3           STILL I/O
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04204  0 01 0 04214      148          BRL     FINIO
04205  0 43 0 00055      149 READIO   BRM     READ
04206  0 53 0 04003      150          SKN     ONEIO              DO NOT LOAD IF ONEIO STILL NEGATIVE
04207  0 43 0 00123      151          BRM     LOAD
04210  0 76 0 00002      152          LDA     CW                 CHECK FOR END RECORD
04211  0 72 0 00152      153          SKA     P2B21
04212  0 01 0 04126      154          BRU     LIO
04213  0 01 0 04205      155          BRU     READIO             NO
04214  0 76 0 04000      156 FINIO    LDA     SICT
04215  0 70 0 04021      157          SKM     DEVICE+1           T
04216  0 01 0 04220      158          BRU     $+2                CHECK FOR PAPER TAPE
04217  0 01 0 04224      159          BRU     STEOM              OR TYPEWRITER INPUT
04220  0 70 0 04022      160          SKM     DEVICE+2           P
04221  0 01 0 00053      161          BRU     LAP+1
04222  0 76 0 04256      162          LDA     RPT
04223  0 01 0 04225      163          BRU     $+2
04224  0 76 0 04257      164 STEOM    LDA     RKB
04225  0 35 1 04254      165          STA     *NWBIAS
04226  0 61 0 04254      166          MIN     NWBIAS
04227  0 76 0 07774      167          LDA     P2                 DETERMINE CYCLE TIME OF MACHINE
04230  0 6600 100        168          RSH     64                 FOR PAPER TAPE READ DELAY
04231  0 75 0 04261      169          LDB     SLOW
04232  0 73 0 00160      170          SKG     Z
04233  0 75 0 04260      171          LDB     FAST
04234  0 36 1 04254      172          STB     *NWBIAS
04235  0 01 0 00053      173          BRU     LAP+1
04236  0 40 12006        174 CARDS    CRT     0,1
04237  0 01 0 00056      175          BRU     READY
04240  0 20 0 00000      176          NOP
04241  0 02 0 03606      177          RCB     0,1,4
04242  0 01 0 00121      178          BRU     P1
04243  0 40 10410        179          TRT     0,0
04244  0 40 21000        180          BRTW
04245  0 01 0 00056      181          BRU     READY
04246  0 02 0 03610      182          RTB     0,0,4
                         183 *        BRU     RECOV              REMOVE ASTERISK FOR MAG TAPE LOAD
04247  00000005          184 P5       DATA    5
04250  00177774          185 M4       DATA    00200000-4
04251  00177731          186 LENGTH   DATA    00200000-END920+PUP920
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04252  77777777              187 NEG     DATA    -1
04253  0 00 0 00233          188 NEWEND  HLT     END920-D
04254  0 00 0 00366          189 NWBIAS  HLT     ENDP0P
04255  0 00 0 00000          190 C0MP93  HLT     S9300
04256  0 02 0 02004          191 RPT     RPT     0,1,1
04257  0 02 0 02001          192 RKB     RKB     0,1,1
04260  00140000              193 FAST    DATA    00140000
04261  00170000              194 SL0W    DATA    00170000
04262  0 00 0 00161          195 0RG93   HLT     Z+1
04263  00043777              196 BIGADR  DATA    040000*/S9300+2047
04264  00004000              197 B12     DATA    2048
00001                        198         A0RG    1
00001  0 01 0 04030          199         BRU     STRT
00002                        200 CW      RES     1
00003                        201 DW1     RES     26
00035                        202 TMP1    RES     1
00036                        203 IWD     RES     1
00037                        204 RCTR    RES     1
00040                        205 CTR     RES     1
00041                        206 WDCT    RES     1
00042                        207 CT      RES     1
00043                        208 L0C     RES     1
00044                        209 ML0C    RES     1
00045                        210 ALFA    RES     1
00046                        211 BETA    RES     1
00047                        212 CHAIN   RES     1
00050                        213 WD1     RES     1
00051  0 00 0 00366          214 BIAS    HLT     ENDP0P
00052  0 43 0 00055          215 LAP     BRM     READ
00053  0 43 0 00123          216         BRM     L0AD
00054  0 01 0 00052          217         BRU     LAP
                             218 *               READ 0NE RECORD FR0M PAPER TAPE AND VERIFY
                             219 *
00055  0 00 0 00000          220 READ    HLT                     ENTRY
                             221 *       LDX     M10,X0          REM0VE ASTERISK FR0M MAG TAPE L0AD
                             222 *       STX     WD1,X0          REM0VE ASTERISK FR0M MAG TAPE L0AD
00056  0 20 0 00000          223 READY   N0P
00057  0 20 0 00000          224         N0P
00060  0 20 0 00000          225         N0P
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00061  0 02 0 02604      226          RPT     0,1,4
00062  0 32 0 00002      227          WIM     CW                  READ RECORD CONTROL WORD
00063  0 40 21000        228          BRTW
00064  0 01 0 00066      229          BRU     $+2
00065  0 01 0 00111      230          BRU     BERROR
00066  0 76 0 00002      231          LDA     CW
00067  0 6600 017        232          RSH     15
00070  0 14 0 00146      233          ETR     P63
00071  0 54 0 07774      234          SUB     P2
00072  0 35 0 00041      235          STA     WDCT                STORE WORD COUNT LESS 2
00073  0 35 0 00042      236          STA     CT
00074  0 76 0 07773      237          LDA     LDW1
00075  0 35 0 07775      238          STA     WDAD
00076  0 76 0 00002      239          LDA     CW
00077  0 32 1 07775      240 READ3    WIM     *WDAD               READ ONE WORD
00100  0 17 1 07775      241          EOR     *WDAD               ACCUMULATE CHECKSUM
00101  0 60 0 00041      242          SKR     WDCT
00102  0 61 0 07775      243          MIN     WDAD
00103  0 53 0 00041      244          SKN     WDCT
00104  0 01 0 00077      245          BRU     READ3
00105  0 32 0 00035      246          WIM     TMP1                EXHAUST RECORD
00106  0 40 21000        247          BRTW
00107  0 01 0 00105      248          BRU     $-2
00110  0 40 20010        249          BETW
00111  0 01 0 00121      250 BERROR   BRU     P1
00112  0 35 0 00035      251          STA     TMP1
00113  0 6600 014        252          RSH     12
00114  0 17 0 00035      253          EOR     TMP1
00115  0 75 0 07772      254          LDB     07777
00116  0 70 0 00041      255          SKM     WDCT
00117  0 01 0 00111      256          BRU     BERROR
00120  0 51 0 00055      257          BRR     READ
                         258 *REINSTATE FOLLOWING CODE FOR MAG TAPE LOAD
                         259 *RECOV   TRT     0,0
                         260 *        BRTW
                         261 *        BRU     $-2
                         262 *        SRB     0,0,4
                         263 *        BRTW
                         264 *        BRU     $-1
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                                    265 *       LDX     WD1,X0
                                    266 *       BRX     READ+1,X0
00121   0 00 0 00001                267 P1      HLT     1                   *STOP*AW BUFFER ERROR
00122   0 01 0 00056                268         BRU     READ+1              REREAD
                                    269 *M10    DATA    00200000-10         REMOVE ASTERISK FOR MAG TAPE
                                    270 *               PROCESS VERIFIED RECORDS
00123   0 00 0 00000                271 LOAD    HLT                         ENTRY
00124   0 76 0 07773                272         LDA     LDW1
00125   0 35 0 00050                273         STA     WD1
00126   0 76 0 00002                274         LDA     CW
00127   0 72 0 00152                275         SKA     P2B21
00130   0 01 0 00134                276         BRU     END
00131   0 72 0 00151                277         SKA     P1B21
00132   0 01 0 07661                278         BRU     EXT
00133   0 01 0 07571                279 LTO     BRU     DATA                USED AS CONSTANT
00134   0 76 0 00042                280 END     LDA     CT
00135   0 72 0 00153                281         SKA     N1                  TRANSFER ADDRESS
00136   0 01 0 07747                282         BRU     NOPS                YES
00137   0 76 0 00003                283         LDA     DW1                 NO
00140   0 72 0 00147                284         SKA     P1B15
00141   0 55 0 00051                285         ADD     BIAS
00142   0 14 0 00155                286         ETR     MADR
00143   0 35 0 00043                287         STA     LOC                 MAX LOCATION+1, CURRENT PROGRAM
00144   0 35 0 00051                288         STA     BIAS
00145   0 51 0 00123                289         BRR     LOAD
00146   00000077                    290 P63     DATA    077
00147   00100000                    291 P1B15   DATA    0100000
00150   02000000                    292 P2B18   DATA    02000000
00151   10000000                    293 P1B21   DATA    010000000
00152   20000000                    294 P2B21   DATA    020000000
00153   77777777                    295 N1      DATA    077777777
        00037777                    296 ADDR    EQU     1*/(14+S9300)-1
00154                               297 HIGH    RES     1                   MUST BE AT ASME LOC(0154) AS FOR ASSM
00155   00037777                    298 MADR    DATA    ADDR
00156   77740000                    299 MRDA    DATA    -1--ADDR
00157   00177775                    300 TL      DATA    00200000-3
00160   00000000                    301 Z       DATA    0
00161   40000000                    302 B0      DATA    040000000
00162   77777777                    303 M1      DATA    -1
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00163  77777751                 304 M23     DATA    -23
                                305 MM8     BPD     06000000
00164                           306 P8P910  RES     0
00164  0 01 0 00200             307         BRU     CAB
00165  0 01 0 00202             308         BRU     CBA
00166  0 01 0 00320             309         BRU     CAX
00167  0 01 0 00315             310         BRU     CXA
00170  0 01 0 00323             311         BRU     CBX
00171  0 01 0 00325             312         BRU     CNA
00172  0 01 0 00342             313         BRU     SKF
00173  0 01 0 00351             314         BRU     SKR
00174  0 01 0 00204             315         BRU     MUL
00175  0 01 0 00225             316         BRU     DIV
00176  0 01 0 00337             317         BRU     ADM
00177  0 01 0 00330             318         BRU     XMA
00200  0 35 0 00361             319 CAB     STA     T
00201  0 01 0 00347             320         BRU     SKE1
00202  0 36 0 00361             321 CBA     STB     T
00203  0 01 0 00316             322         BRU     CXA1
00204  0 75 0 00160             323 MUL     LDB     Z
00205  0 43 0 00257             324         BRM     SIGN
00206  0 46 20005               325         ABC
00207  0 6620 001               326 MUL1    RCY     1
00210  0 35 0 00363             327         STA     T+2
00211  0 6720 001               328         LCY     1
00212  0 53 0 00363             329         SKN     T+2
00213  0 01 0 00215             330         BRU     $+2
00214  0 55 0 00362             331         ADD     T+1
00215  0 6600 001               332         RSH     1
00216  0 14 0 00357             333         ETR     RSL4
00217  0 41 0 00207             334         BRX     MUL1
00220  0 53 0 00360             335         SKN     S
00221  0 01 0 00223             336         BRU     MUL2
00222  0 43 0 00300             337         BRM     DPN
00223  0 71 0 00361             338 MUL2    LDX     T
00224  0 51 0 00000             339         BRR     0
00225  0 43 0 00257             340 DIV     BRM     SIGN
00226  0 73 0 00362             341         SKG     T+1
00227  0 01 0 00231             342         BRU     $+2
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00230  4 51 0 00230        343          BRR     $.4
00231  0 6720 001          344 DIV2     LCY     1
00232  0 54 0 00362        345          SUB     T+1
00233  0 17 0 00161        346          EOR     B0
00234  0 72 0 00161        347          SKA     B0
00235  0 01 0 00240        348          BRU     DIV1
00236  0 17 0 00161        349          EOR     B0
00237  0 55 0 00362        350          ADD     T+1
00240  0 41 0 00231        351 DIV1     BRX     DIV2
00241  0 6720 001          352          LCY     1
00242  0 36 0 00362        353          STB     T+1
00243  0 14 0 00357        354          ETR     RSL4
00244  0 6600 031          355          RSH     25
00245  0 76 0 00362        356          LDA     T+1
00246  0 53 0 00360        357          SKN     S
00247  0 01 0 00223        358          BRU     MUL2
00250  0 17 0 00162        359          EOR     M1
00251  0 54 0 00162        360          SUB     M1
00252  0 46 00014          361          XAB
00253  0 17 0 00162        362          EOR     M1
00254  0 54 0 00162        363          SUB     M1
00255  0 46 00014          364          XAB
00256  0 01 0 00223        365          BRU     MUL2
00257  0 00 0 00000        366 SIGN     HLT     0
00260  0 35 0 00363        367          STA     T+2
00261  0 17 1 00000        368          EOR     *0
00262  0 35 0 00360        369          STA     S
00263  0 17 0 00363        370          EOR     T+2
00264  0 53 1 00000        371          SKN     *0
00265  0 01 0 00270        372          BRU     SIGN1
00266  0 17 0 00162        373          EOR     M1
00267  0 54 0 00162        374          SUB     M1
00270  0 35 0 00362        375 SIGN1    STA     T+1
00271  0 76 0 00363        376          LDA     T+2
00272  0 53 0 00363        377          SKN     T+2
00273  0 01 0 00275        378          BRU     SIGN2
00274  0 43 0 00300        379          BRM     DPN
00275  0 37 0 00361        380 SIGN2    STX     T
00276  0 71 0 00163        381          LDX     M23
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```
00277  0 51 0 00257          382          BRR     SIGN
00300  0 00 0 00000          383 DPN      HLT     0
00301  0 46 00014            384          XAB
00302  0 17 0 00162          385          EOR     M1
00303  0 54 0 00162          386          SUB     M1
00304  0 35 0 00364          387          STA     T+3
00305  0 36 0 00365          388          STB     T+4
00306  0 46 20005            389          ABC
00307  0 76 0 00162          390          LDA     M1
00310  0 72 0 00364          391          SKA     T+3
00311  0 01 0 00313          392          BRU     DPN1
00312  0 76 0 00160          393          LDA     Z
00313  0 54 0 00365          394 DPN1     SUB     T+4
00314  0 51 0 00300          395          BRR     DPN
00315  0 37 0 00361          396 CXA      STX     T
00316  0 76 0 00361          397 CXA1     LDA     T
00317  0 51 0 00000          398          BRR     0
00320  0 35 0 00361          399 CAX      STA     T
00321  0 71 0 00361          400 CAX1     LDX     T
00322  0 51 0 00000          401          BRR     0
00323  0 36 0 00361          402 CBX      STB     T
00324  0 01 0 00321          403          BRU     CAX1
00325  0 17 0 00162          404 CNA      EOR     M1
00326  0 54 0 00162          405          SUB     M1
00327  0 51 0 00000          406          BRR     0
00330  0 35 0 00362          407 XMA      STA     T+1
00331  0 76 1 00000          408          LDA     *0
00332  0 35 0 00361          409          STA     T
00333  0 76 0 00362          410          LDA     T+1
00334  0 35 1 00000          411 XMA1     STA     *0
00335  0 76 0 00361          412          LDA     T
00336  0 51 0 00000          413          BRR     0
00337  0 35 0 00361          414 ADM      STA     T
00340  0 55 1 00000          415          ADD     *0
00341  0 01 0 00334          416          BRU     XMA1
00342  0 36 0 00361          417 SKE      STB     T
00343  0 75 0 00162          418          LDB     M1
00344  0 70 1 00000          419          SKM     *0
00345  0 01 0 00347          420          BRU     $+2
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00346  0 61 0 00000          421          MIN     0
00347  0 75 0 00361          422  SKE1    LDB     I
00350  0 51 0 00000          423          BRR     0
00351  0 60 1 00000          424  SKR     MMØ     *0
00352  0 20 0 00000          425          NØP     0
00353  0 53 1 00000          426          SKN     *0
00354  0 51 0 00000          427          BRR     0
00355  0 61 0 00000          428          MIN     0
00356  0 51 0 00000          429          BRR     0
00357  37777777              430  RSL4    DATA    037777777
00360                        431  S       RES     1
00361                        432  T       RES     5
00366                        433  ENDPØP  RES     0
00366                        434  PØP920  RES     0
       00000202              435  D       EQU     PØP920-PØP910
00366  0 01 0 00200          436          BRU     CAB920-D
00367  0 01 0 00202          437          BRU     CBA920-D
00370  0 01 0 00204          438          BRU     CAX920-D
00371  0 01 0 00206          439          BRU     CXA920-D
00372  0 01 0 00210          440          BRU     CBX920-D
00373  0 01 0 00212          441          BRU     CNA920-D
00374  0 01 0 00214          442          BRU     SKE920-D
00375  0 01 0 00220          443          BRU     SKR920-D
00376  0 01 0 00223          444          BRU     MUL920-D
00377  0 01 0 00225          445          BRU     DIV920-D
00400  0 01 0 00227          446          BRU     ADM920-D
00401  0 01 0 00231          447          BRU     XMA920-D
00402  0 46 0 00004          448  CAB920  CAB
00403  0 51 0 00000          449          BRR     0
00404  0 46 0 00010          450  CBA920  CBA
00405  0 51 0 00000          451          BRR     0
00406  0 46 0 00400          452  CAX920  CAX
00407  0 51 0 00000          453          BRR     0
00410  0 46 0 00200          454  CXA920  CXA
00411  0 51 0 00000          455          BRR     0
00412  0 46 0 00020          456  CBX920  CBX
00413  0 51 0 00000          457          BRR     0
00414  0 46 0 01000          458  CNA920  CNA
00415  0 51 0 00000          459          BRR     0
```

```
00416  0 50 1 00000          460 SKE920  SKE     *0
00417  0 51 0 00000          461         BRR     0
00420  0 61 0 00000          462 SKIP2   MIN     0
00421  0 51 0 00000          463         BRR     0
00422  0 60 1 00000          464 SKR920  SKR     *0
00423  0 51 0 00000          465         BRR     0
00424  0 01 0 00216          466         BRU     SKIP2-D
00425  0 64 1 00000          467 MUL920  MUL     *0
00426  0 51 0 00000          468         BRR     0
00427  0 65 1 00000          469 DIV920  DIV     *0
00430  0 51 0 00000          470         BRR     0
00431  0 63 1 00000          471 ADM920  ADM     *0
00432  0 51 0 00000          472         BRR     0
00433  0 62 1 00000          473 XMA920  XMA     *0
00434  0 51 0 00000          474         BRR     0
00435                        475 END920  RES     0
07567                        476         RORG    07567
07566                        477         RORG    07566
                             478 F       FORM    3,6,15
07566  71606060              479         TEXT    8,Z
07567  60606060
07570  4 00 00160            480         F       4,0,Z
07571                        481 T0      RES     0
                             482 *               PROCESS DATA RECORD
07571  0 71 0 00042          483 DATA    LDX     CT,X0
07572  0 46 30003            484         CLR
07573  0 76 0 00003          485         LDA     DW1
07574  0 72 0 00150          486         SKA     P2B18
07575  2 75 0 00003          487         LDB     DW1,X2
07576  0 72 0 00150          488         SKA     P2B18
07577  0 60 0 00042          489         SKR     CT                  SUBTRACT RELOCATION WORD
07600  0 72 0 00147          490         SKA     P1B15
07601  0 55 0 00051          491         ADD     BIAS
07602  0 14 0 00155          492         ETR     MADR
07603  0 35 0 00043          493         STA     LOC                 STORE MODIFIED LOAD ADDRESS
                             494 *               PROCESS DATA WORDS
07604  0 60 0 00042          495         SKR     CT                  (CT) = NO. DATA WORDS - 1
07605  0 76 0 07776          496         LDA     LDW2
07606  0 35 0 00036          497         STA     IWD                 INDIRECT ADDRESS OF 1ST DATA WORD
```

```
                                    498 *
07607   0 76 1 00036                499 LLDA    LDA     *IWD                (A) = CURRENT DATA WORD
07610   0 36 0 00045                500         STB     ALFA
07611   0 53 0 00045                501         SKN     ALFA
07612   0 01 0 07614                502         BRU     $+2
07613   0 55 0 00051                503         ADD     BIAS
07614   0 35 1 00043                504         STA     *LOC
07615   0 61 0 00043                505         MIN     LOC                 INCREMENT LOAD ADDRESS
07616   0 61 0 00036                506         MIN     IWD                 INCREMENT DATA WORD ADDRESS
07617   0 60 0 00042                507         SKR     CT
07620   0 6700 001                  508         LSH     1
07621   0 53 0 00042                509         SKN     CT
07622   0 01 0 07607                510         BRU     LLDA
                                    511 *
07623   0 76 0 00044                512         LDA     MLOC
07624   0 73 0 00043                513         SKG     LOC
07625   0 76 0 00043                514         LDA     LOC
07626   0 35 0 00044                515         STA     MLOC                STORE CURRENT MAXIMUM LOAD ADDRESS +1
07627   0 51 0 00123                516         BRR     LOAD                EXIT
                                    517 *
                                    518 *               ROUTINES FOR PROCESSING EXTERNAL REFS AND DEFS
                                    519 *               (RECORD TYPE 1)
                                    520 *               MATCHING TABLE ENTRY WAA A DEF
07630   0 76 0 00045                521 SRCH2   LDA     ALFA
07631   0 41 0 07632                522 SRCH3   BRX     $+1,X0
07632   0 41 0 07677                523         BRX     SRCH1,X0
07633   0 76 0 00157                524 NSRT    LDA     TL
07634   0 54 0 07642                525         SUB     P3
07635   0 35 0 00157                526         STA     TL
07636   0 71 0 00157                527         LDX     TL,X0
07637   0 55 0 00133                528         ADD     LT0
07640   0 14 0 00155                529         ETR     MADR
07641   0 73 0 00044                530         SKG     MLOC
07642   00000003                    531 P3      DATA    3
07643   0 76 0 00045                532         LDA     ALFA
07644   2 35 0 07571                533         STA     T0,X2
07645   0 75 0 00046                534         LDB     BETA
07646   2 36 0 07572                535         STB     T0+1,X2
07647   0 76 0 00043                536         LDA     LOC
```

```
07650  2 35 0 07573      537          STA     T0+2,X2
07651  0 76 0 07642      538 NEXTI    LDA     P3
07652  0 55 0 00050      539          ADD     WD1
07653  0 35 0 00050      540          STA     WD1
07654  0 76 0 00042      541          LDA     CT
07655  0 54 0 07642      542          SUB     P3
07656  0 35 0 00042      543          STA     CT                  REDUCE WORD COUNT
07657  0 73 0 00160      544          SKG     Z                   SKIP IF AT LEAST 3 MORE WORDS
07660  0 51 0 00123      545          BRR     LOAD                EXIT
                         546 *
                         547 *                PROCESS NEXT ITEM, HEREAFTER CALLED 'C'
07661  0 71 0 00050      548 EXT      LDX     WD1,X0              (X0) = LOC. OF 1ST WORD OF LABEL
07662  2 76 0 00002      549          LDA     2,X2                (B) = CHAIN WORD OR VALUE WORD
07663  0 72 0 00147      550          SKA     P1B15
07664  0 55 0 00051      551          ADD     BIAS
07665  0 35 0 00043      552          STA     LOC
07666  2 76 0 00000      553          LDA     0,X2
07667  0 72 0 00162      554          SKA     M1                  TEST FOR SPECIAL I/O IDENTIFIER
07670  0 01 0 07672      555          BRU     $+2                 NO
07671  0 01 0 07651      556          BRU     NEXTI               YES, IGNORE
07672  2 75 0 00001      557          LDB     1,X2                (AB) = 8 CHAR LABEL OF C
                         558 *
                         559 *                PROCESS EXTERNAL DEF OR REF
07673  0 71 0 00157      560          LDX     TL,X0               SEARCH SYMBOL TABLE
07674  0 35 0 00045      561          STA     ALFA
07675  0 36 0 00046      562          STB     BETA
07676  0 75 0 00153      563          LDB     N1
07677  2 70 0 07571      564 SRCH1    SKM     T0,X2
07700  0 41 0 07631      565          BRX     SRCH3,X0            NO MATCH
07701  0 76 0 00046      566          LDA     BETA                TENTATIVE MATHC
07702  2 70 0 07572      567          SKM     T0+1,X2
07703  0 41 0 07630      568          BRX     SRCH2,X0
07704  0 76 0 00043      569          LDA     LOC
07705  2 53 0 07573      570          SKN     T0+2,X2
07706  0 01 0 07710      571          BRU     $+2
07707  0 01 0 07715      572          BRU     IXDR                X IS A DEF
07710  0 53 0 00043      573          SKN     LOC
07711  0 01 0 07731      574          BRU     IXRR                C IS A REF
07712  2 75 0 07573      575          LDB     T0+2,X2
```

```
07713  0 46 00014          576          XAB
07714  2 36 0 07573        577          STB     T0+2,X2
07715  0 14 0 00155        578 TXDR     ETR     MADR
07716  0 35 0 00047        579 TXRD1    STA     CHAIN                ADDR OF A REF
07717  0 76 1 00047        580          LDA     *CHAIN
07720  2 17 0 07573        581          EOR     T0+2,X2
07721  0 14 0 00156        582          ETR     MRDA
07722  2 17 0 07573        583          EOR     T0+2,X2
07723  0 75 1 00047        584          LDB     *CHAIN
07724  0 46 00014          585          XAB
07725  0 36 1 00047        586          STB     *CHAIN
07726  0 72 0 00155        587          SKA     MADR
07727  0 01 0 07715        588          BRU     TXDR
07730  0 01 0 07651        589          BRU     NEXTI                EXIT 1
                            590 *               X AND C ARE BOTH REFS
07731  0 14 0 00155        591 TXRR     ETR     MADR                 ADDRESS OF 1ST REF IN NEW CHAIN
07732  0 35 0 00047        592 TXRR1    STA     CHAIN
07733  0 76 1 00047        593          LDA     *CHAIN
07734  0 14 0 00155        594          ETR     MADR
07735  0 72 0 00155        595          SKA     MADR
07736  0 01 0 07732        596          BRU     TXRR1
07737  0 76 0 00043        597          LDA     LOC                  NEW 1ST LINK
07740  2 75 0 07573        598          LDB     T0+2,X2
07741  0 46 00014          599          XAB
07742  2 36 0 07573        600          STB     T0+2,X2
07743  0 14 0 00155        601          ETR     MADR                 REMOVE REF FLAG FROM OLD 1ST LINK
07744  0 55 1 00047        602          ADD     *CHAIN
07745  0 35 1 00047        603          STA     *CHAIN
07746  0 01 0 07651        604          BRU     NEXTI                EXIT 3
07747  0 20 0 00000        605 NOPS     NOP
07750  0 75 0 07747        606          LDB     NOPS
07751  0 71 0 00157        607          LDX     TL,X0                BE TO I/O ROUTINES
07752  2 77 0 00002        608          EAX     2,X2
07753  2 53 0 07571        609 POINT    SKN     T0,X2
07754  0 01 0 07757        610          BRU     $+3                  REF
07755  0 41 0 07752        611 ADV      BRX     NOPS+3,X0            DEF
07756  0 01 0 00004        612          BRU     CW+2                 FINISHED. BRANCH TO START
07757  0 76 0 07753        613          LDA     POINT
07760  0 35 0 00045        614          STA     ALFA
```

```
07761   0 35 0 00046      615 STEP    STA     BETA        NOP REF CHAIN
07762   0 76 1 00046      616         LDA     *BETA
07763   0 14 0 00155      617         ETR     MADR
07764   0 35 0 00045      618         STA     ALFA
07765   0 36 1 00046      619         STB     *BETA
07766   0 76 0 00045      620         LDA     ALFA
07767   0 72 0 00155      621         SKA     MADR        CHECK FOR END OF CHAIN
07770   0 01 0 07761      622         BRU     STEP        NO
07771   0 01 0 07755      623         BRU     ADV         YES
07772   00007777          624 07777   DATA    07777
07773   0 00 0 00003      625 LDW1    HLT     DW1
07774   00000002          626 P2      DATA    2
07775   0 00 0 00003      627 WDAD    HLT     DW1
07776   0 00 0 00004      628 LDW2    HLT     DW1+1
        00004030          629         END     STRT
```

SDS PROGRAM LIBRARY
PROGRAM DESCRIPTION

 Catalog No. 020024

IDENTIFICATION: 900 Series SYMBOL Paper Tape Reader or Typewriter Symbolic Input Subroutine - PSI, TSI

AUTHOR: SDS

ACCEPTED: January 7, 1965

COMPUTER CONFIGURATION: Any SDS 900 series computer with Paper Tape Reader (Typewriter).

PURPOSE: To read one symbolic input record from the paper tape reader (typewriter).

PROGRAMMED OPERATORS: None

STORAGE: 0101 locations including constants

TIMING: N/A

USE: The subroutine is selectively loaded by the SYMBOL Loader under operator control.

The subroutine has two entry points:

INPUT	Read one BCD symbolic input record into the area beginning at CBFE.
ENDSI	End of symbolic input action subroutine. The computer halts to facilitate the reloading of paper tape.

Buffer and unit independence is an easily modified assembly parameter.

Because of the similarity of paper tape and typewriter input, the same subroutine is used in both cases. The determination of the appropriate device EOM (RPT or RKB)

USE: (Cont) is made by the SYMBOL Loader and conveyed to the input subroutine together with an appropriate delay constant (for delay between reading symbolic input records).

RECOVERY: Upon detection of a buffer error, the subroutine will halt in relative location 032. In order to continue, one can branch to relative location 025 (P-6); to reread the record, one must reposition the paper tape and branch to relative location 3 (P-030).

```
                                    1 *       AP
00000                               2 $PSI    RES     0
00000                               3 $TSI    RES     0
                                    4 *               SUBROUTINE TO READ SYMBOLIC INPUT FROM PAPER TAPE
        00000000                    5 S9300   EQU     0                    1 FOR 900 SERIES
        00000000                    6 X0      EQU     S9300
        00000002                    7 X2      EQU     2-S9300
        00000000                    8 CH      EQU     0
        00000001                    9 U       EQU     1
                                   10 MM0     OPD     06000000
                                   11 EDF     FORM    9,15
00000   00000000                   12 EOM     DATA    0                    READ EOM AND DELAY DETERMINED BY
00001   00000000                   13 DELAY   DATA    0                    LOADER AND STORED HERE
00002                              14 $INPUT  RES     0
00002   0 00 0 00000               15 RDPT    PZE     0
00003   0 71 0 00072               16         LDX     =00200000-20,X0
00004   0 75 0 00073               17         LDB     =060606060
00005   2 36 0 00000               18 RDPT1   STB     CBFE,X2              CLEAR LINE IMAGE
00006   0 41 0 00005               19         BRX     RDPT1,X0
00007   0 71 0 00001               20         LDX     DELAY,X0
00010   0 41 0 00010               21         BRX     $,X0
00011   0 76 0 00061               22         LDA     EDWL
00012   0 35 0 00066               23         STA     TEMP+1
00013   0 76 0 00060               24         LDA     LCBUF
00014   0 43 0 00000               25 RDPT10  BRM     EDS                  SET EDIT FIELD
00015   0 23 0 00000               26         EXU     EOM
00016   0 32 0 00000               27 RPT2    WIM     CHR
00017   0 76 0 00016               28         LDA     CHR
00020   0 14 0 00031               29         ETR     077
00021   0 40 20010                 30         BETW
00022   0 01 0 00030               31         BRU     DSC
00023   0 75 0 00031               32         LDB     077
00024   0 70 0 00074               33         SKM     =052
00025   0 01 0 00032               34         BRU     RPT5
00026   0 02 00000                 35 RPT4    DSC     CH
00027   0 51 0 00002               36         BRR     RDPT
00030   0 02 00000                 37 DSC     DSC     CH
00031   0 00 0 00077               38 077     HLT     077                  AND HALT
```

```
00032  0 70 0 00075          39 RPT5   SKM     =012          CONVERT 012 TO 060
00033  0 01 0 00035          40        BRU     $+2
00034  0 17 0 00076          41        EOR     =072
00035  0 70 0 00076          42        SKM     =072
00036  0 01 0 00046          43        BRU     RPT8
00037  0 76 1 00066          44        LDA     *TEMP+1
00040  0 73 0 00077          45        SKG     =0
00041  0 01 0 00016          46        BRU     RPT2
00042  0 61 0 00066          47        MIN     TEMP+1
00043  0 55 0 00060          48        ADD     LCBUF
*      00044  0 43 0 00014   49        BRM     EDS
00045  0 01 0 00016          50        BRU     RPT2
*      00046  0 76 0 00000   51 RPT8   LDA     EDW           STA CHR
00047  0 75 0 00100          52        LDB     =077777
00050  0 70 0 00057          53        SKM     DLY1P
00051  0 01 0 00053          54        BRU     $+2
00052  0 01 0 00016          55        BRU     RPT2
*      00053  0 76 0 00017   56        LDA     CHR
00054  0 14 0 00031          57        ETR     077
*      00055  0 43 0 00000   58        BRM     EDC
00056  0 01 0 00016          59        BRU     RPT2
*      00057  0 00 0 00000   60 DLY1P  HLT     DLY1
*      00060  0 00 0 00000   61 LCBUF  PZE     CBUF
00061  0 00 0 00062          62 EDWL   HLT     EDWP
00062  003 00001             63 EDWP   EDF     3,1
00063  003 00003             64        EDF     3,3
00064  003 00010             65        EDF     3,8
00065  00000000              66 TEMP   DATA    0,0
00066  00000000
00067  0 00 0 00000          67 $ENDSI PZE     0
00070  0 00 0 00000          68        HLT
00071  0 51 0 00067          69        BRR     ENDSI
                             70        END

00072  00177754
00073  60606060
00074  00000052
00075  00000012
00076  00000072
00077  00000000
```

```
00100  00077777
00005                    CBFE
00044                    EDS
00053                    CHR
00046                    EDW
00055                    EDC
00057                    DLY1
00060                    CBUF
```

SDS PROGRAM LIBRARY
PROGRAM DESCRIPTION

 Catalog No. 030009

IDENTIFICATION: 900 Series SYMBOL Card Reader Symbolic Input Subroutine - CSI

AUTHOR: SDS

ACCEPTED: January 7, 1965

COMPUTER CONFIGURATION: Any SDS 900 series computer with card reader

PURPOSE: To read one BCD symbolic input record from the card reader.

PROGRAMMED OPERATORS: None

STORAGE: 020 locations including constants

TIMING: N/A

USE: The subroutine is selectively loaded by the SYMBOL Loader under operator control.

The subroutine has two entry points:

INPUT	Read one BCD symbolic input record into the area beginning at CBFE.
ENDSI	End of symbolic input action subroutine. For card input, this is effectively a NOP.

Buffer and unit dependence is an easily modified assembly parameter.

RECOVERY: The subroutine will halt upon either a feed error or a validity check error. In the former case, the offending card is in the hopper; in the latter it is in the stacker. Clearing the halt will cause the misread to be ignored and another card to be read.

```
ΔMETASYM SI,EI,L0,E0,B0.

                                        1 *       ΔC
     00000                              2 $CSI    RES     0
            C0000000                    3 S9300   EQU     0
            C0000000                    4 X0      EQU     S9300
            C0000002                    5 X2      EQU     2-S9300
            C0000000                    6 CH      EQU     0
            C0000001                    7 U       EQU     1
     00000                              8 $INPUT  RES     0
     00000  C 00 0 00000                9 CARD    PZE     0
     00001  C 40 12006                 10 CKSK    CRT     CH,U
     00002  C 01 0 00001                11         BRU     CKSK
     00003  C 02 0 02606                12         RCD     CH,U,4
     00004  C 71 0 00017                13         LDX     =00200000-20,X0
*    00005  2 32 0 00000                14 CWIM    WIM     CBFE,X2          ((CBFE,2):=(W)
     00006  C 40 21000                 15         BRTW
     00007  C 41 0 00005                16         BRX     CWIM,X0
     00010  C 40 20010                 17         BETW
     00011  C 01 0 00013                18         BRU     CSKSE
     00012  C 51 0 00000                19         BRR     CARD             EXIT**
     00013  C 00 0 00000                20 CSKSE   HLT                      HALT ON MIS-READ
     00014  C 01 0 00001                21         BRU     CKSK
                                        22 *
                                        23 *
     00015  C 00 0 00000                24 $ENDSI  PZE     0
     00016  C 51 0 00015                25         BRR     ENDSI
                                        26         END

     00017  C0177754
     00005                                 CBFE
```

SDS PROGRAM LIBRARY
PROGRAM DESCRIPTION

 Catalog No. 040007

IDENTIFICATION: 900 Series SYMBOL Magnetic Tape Symbolic Input Subroutine - MSI

AUTHOR: SDS

ACCEPTED: January 7, 1965

COMPUTER CONFIGURATION: Any SDS 900 series computer with Magnetic Tape Unit.

PURPOSE: To read one BCD symbolic input record from magnetic tape unit 1.

PROGRAMMED OPERATORS: None

STORAGE: 061 locations including constants

TIMING: N/A

USE: The subroutine is selectively loaded by the SYMBOL Loader under operator control.

The subroutine has two entry points:

INPUT	Read one BCD symbolic input record into the area beginning at CBFE.
ENDSI	End of symbolic input action subroutine. The magnetic tape unit is backspaced by the number of input records.

Buffer and unit dependence is an easily modified assembly parameter.

RECOVERY: Input records are required to be card images (20 words). A premature termination is treated as equivalent to an end-of-file. One end-of-file mark is allowed to separate input files on a tape reel, and is ignored by the assembler

RECOVERY: (Cont)

at the beginning of the first pass. An additional end-of-file or one occurring after the first symbolic line but before the END line will cause a halt in relative location 050. Clearing the halt will cause a branch to location 1 which reinitiates the assembly process.

In the case of tape read errors, ten recovery attempts are made after which a halt will occur in relative location 021. Clearing the halt will cause the record to be accepted.

```
                                        1 *       AM
00000                                   2 $MSI    RES     0
                                        3 *               MAGNETIC TAPE SOURCE INPUT ROUTINE
        00000000                        4 S9300   EQU     0
        00000000                        5 X0      EQU     S9300
        00000002                        6 X2      EQU     2-S9300
        00000000                        7 CH      EQU     0
        00000001                        8 U       EQU     1
                                        9 MM0     OPD     06000000
00000                                  10 $INPUT  RES     0
00000   0 00 0 00000                   11 RDTP    PZE     0
00001   0 71 0 00060                   12         LDX     =00200000-10,X0
00002   0 46 30003                     13         CLR
00003   0 35 0 00021                   14         STA     E0FCNT
00004   0 37 0 00026                   15 RREAD   STX     RFCT,X0
00005   0 43 0 00053                   16         BRM     DELAY
00006   0 02 0 02611                   17 E0M     RTD     CH,U,4
00007   0 71 0 00061                   18         LDX     =00200000-20,X0
00010   2 32 0 00000                   19 RDTP1   WIM     CBFE,X2
00011   0 40 21000                     20         BRTW
00012   0 40 20010                     21         BETW
00013   0 01 0 00042                   22         BRU     RE0F
00014   0 41 0 00010                   23         BRX     RDTP1,X0
00015                                  24 REXIT   RES     0
00015   0 61 0 00000                   25         MIN     LN
00016   0 51 0 00000                   26         BRR     RDTP
                                       27 *
00017   0 71 0 00026                   28 RTERR   LDX     RFCT,X0
00020   0 41 0 00023                   29         BRX     $+3,X0
00021   0 00 0 00000                   30 E0FCNT  HLT     0
00022   0 01 0 00015                   31         BRU     REXIT
00023   0 43 0 00053                   32         BRM     DELAY
00024   0 02 0 06631                   33         SRD     CH,U,4
00025   0 01 0 00004                   34         BRU     RREAD
00026   00000012                       35 RFCT    DATA    012
00027                                  36 TEMP    RES     1
00030   0 00 0 00000                   37 $ENDSI  PZE     0
00031   0 43 0 00053                   38         BRM     DELAY
```

```
00032  0 01 0 00035      39          BRU     $+3
00033  0 02 0 06631      40 ALPH     SRD     CH,U,4
00034  0 32 0 00000      41          WIM     0
00035  0 60 0 00015      42          MM0     LN
00036  0 20 0 00000      43          N0P
00037  0 53 0 00035      44          SKN     LN
00040  0 01 0 00033      45          BRU     ALPH
00041  0 51 0 00030      46          BRR     ENDSI
00042  0 40 20010        47 RE0F     BETW
00043  0 01 0 00017      48          BRU     RTERR
00044  0 76 0 00021      49          LDA     E0FCNT
00045  0 55 0 00037      50          ADD     LN
00046  0 61 0 00021      51          MIN     E0FCNT
00047  0 73 0 00051      52          SKG     HLT
00050  0 01 0 00005      53          BRU     RREAD+1
00051  0 00 0 00000      54 HLT      HLT     0
00052  0 01 0 00001      55          BRU     1
00053  0 00 0 00000      56 DELAY    PZE     0
00054  0 40 10411        57          TRT     CH,U
00055  0 40 21000        58          BRTW
00056  0 01 0 00054      59          BRU     $-2
00057  0 51 0 00053      60          BRR     DELAY
                         61          END

00060  00177766
00061  00177754
00010                        CBFE
00045                        LN
```

SDS PROGRAM LIBRARY
PROGRAM DESCRIPTION

 Catalog No. 020025

IDENTIFICATION:	900 Series SYMBOL Paper Tape Punch Binary Output Subroutine - PBO
AUTHOR:	SDS
ACCEPTED:	January 5, 1965
COMPUTER CONFIGURATION:	Any SDS 900 series computer with Paper Tape Punch
PURPOSE:	To output on the paper tape punch one binary output record.
PROGRAMMED OPERATORS:	None
STORAGE:	027 locations including constants
TIMING:	N/A
USE:	The subroutine is selectively loaded by the SYMBOL Loader under operator control.

The subroutine has two entry points:

WRITR	Punch the record whose origin is CW and whose length is specified in DWC
WEOF	Feed blank tape (approximately 48 frames)

Buffer and unit dependence is an easily modified assembly parameter.

```
$METASYM SI,EI,L0,E0,B0.
                                        1 *       $XP
     00000                              2 $PB0    RES     0
           C0000000                     3 S9300   EQU     0
           C0000000                     4 X0      EQU     S9300
           C0000002                     5 X2      EQU     2-S9300
           C0000000                     6 CH      EQU     0
           C0000001                     7 U       EQU     1
                                        8 MM0     OPD     06000000
                                        9 *               PAPER TAPE PUNCH OUTPUT SUBROUTINE
     00000  C 00 0 00000                10 $WRITR PZE     0
     00001  C 76 0 00015                11        LDA     LCW
*    00002  C 35 0 00000                12        STA     ICW                    INITIALIZE 'MIW' ADDRESS
     00003  C 02 0 00644                13 WE0M   PTL     CH,U,4
*    00004  C 12 1 00002                14        MIW     *ICW
*    00005  C 60 0 00000                15        MM0     DWC
*    00006  C 61 0 00004                16        MIN     ICW
*    00007  C 53 0 00005                17        SKN     DWC
     00010  C 01 0 00004                18        BRU     WE0M+1
     00011  C 02 14000                  19        TOP     CH
     00012  C 40 21000                  20        BRTW
     00013  C 01 0 00012                21        BRU     $-1
     00014  C 51 0 00000                22        BRR     WRITR                  EXIT
*    00015  C 00 0 00000                23 LCW    PZE     CW
     00016  C 00 0 00000                24 $WE0F  PZE     0
     00017  C 71 0 00026                25        LDX     =00200000-4,X0
     00020  C 02 0 00644                26 PZ     PTL     CH,U,4
     00021  C 02 14000                  27        TOP     CH
     00022  C 40 21000                  28        BRTW
     00023  C 01 0 00022                29        BRU     $-1
     00024  C 41 0 00020                30         BRX    PZ,X0
     00025  C 51 0 00016                31        BRR     WE0F
                                        32        END

     00026  C0177774
     00006                                 ICW
     00007                                 DWC
     00015                                 CW
```

SDS PROGRAM LIBRARY
PROGRAM DESCRIPTION

 Catalog No. 030008

IDENTIFICATION: 900 Series SYMBOL Card Punch Binary Output Subroutine - CBO

AUTHOR: SDS

ACCEPTED: January 5, 1965

COMPUTER CONFIGURATION: Any SDS 900 series computer with Card Punch (Buffered or Unbuffered) and Binary Coupler

PURPOSE: To output on the card punch one binary output record.

PROGRAMMED OPERATORS: None

STORAGE: 052 locations including constants

TIMING: N/A

USE: The subroutine is selectively loaded by the SYMBOL Loader under operator control.

The subroutine has two entry points:

WRITR	Punch the record whose origin is CW and whose length is specified in DWC.
WEOF	Feed two blank cards.

Buffer and unit dependence is an easily modified assembly parameter.

```
ΔMETASYM SI,EI,LO,EO,BO.
                                   *       ΔXC
00000                              $CB0    RES     0
      C0000000                     S9300   EQU     0
      C0000000                     X0      EQU     S9300
      C0000002                     X2      EQU     2-S9300
      C0000000                     CH      EQU     0
      C0000001                     U       EQU     1
00000 C 00 0 00000                 $WRITR  PZE     0                    ENTRY
00001 C 76 0 00044                         LDA     =-12                 LOAD REPEAT COUNT
00002 C 40 14046                           CPT     CH,U
00003 C 01 0 00002                         BRU     $-1
00004 C 40 12046                           PBT     CH,U
00005 C 46 30003                           CLR                          BUFFERED, SET REPEAT COUNT TO 0
00006 C 35 0 00032                         STA     PETEC                SAVE REPEAT COUNT
00007 C 40 21000                   PETEL1  BRTW                         WAIT FOR BUFFER TO BE READY
00010 C 01 0 00007                         BRU     $-1
00011 C 02 0 03646                         PCB     CH,U,4
00012 C 76 0 00035                         LDA     PETECW
00013 C 35 0 00033                         STA     PETEA                INIALIZE BUFFER ADDRESS
00014 C 71 0 00045                         LDX     =00200000-40,X0
00015 C 75 0 00034                         LDB     PETEO
00016 C 76 0 00000                         LDA     DWC                  A = RECORD SIZE - 1
00017 C 72 0 00046                 PETEL2  SKA     =040000000           IS A NEGATIVE
00020 C 36 0 00033                         STB     PETEA                YES, SET ADDRESS = ADDRESS OF 0
00021 C 12 1 00033                         MIW     *PETEA               OUTPUT WORD
00022 C 61 0 00033                         MIN     PETEA                INCREMENT ADDRESS
00023 C 54 0 00047                         SUB     =1                   DECREMENT COUNT
00024 C 41 0 00017                         BRX     PETEL2,X0
00025 C 02 14000                           TOP     CH
00026 C 61 0 00032                         MIN     PETEC                INCREMENT REPEAT COUNT
00027 C 53 0 00032                         SKN     PETEC                IS ALL TRANSMISION COMPLETE
00030 C 51 0 00000                         BRR     WRITR                YES, EXIT
00031 C 01 0 00007                         BRU     PETEL1               NO, LOOP AGAIN
                                   *
00032                              PETEC   RES     1                    SAVE LOCATION FOR REPEAT COUNT
00033                              PETEA   RES     1                    SAVE LOCATION FOR ADDRESS
00034 C 00 0 00050                 PETEO   PZE     =0                   ADDRESS OF A ZERO CONSTANT
```

```
*    00035  C 00 0 00000          38 PETECW PZE      CW
     00036  C 00 0 00000          39 $WEOF  PZE      0
     00037  C 76 0 00051          40        LDA      =-1
*    00040  C 35 0 00016          41        STA      DWC
     00041  C 43 0 00000          42        BRM      WRITR
     00042  C 43 0 00000          43        BRM      WRITR
     00043  C 51 0 00036          44        BRR      WEOF
                                  45        END

     00044  77777764
     00045  C0177730
     00046  40000000
     00047  C0000001
     00050  C0000000
     00051  77777777
     00040                          DWC
     00035                          CW
```

SDS PROGRAM LIBRARY
PROGRAM DESCRIPTION

 Catalog No. 020023

IDENTIFICATION: 900 Series SYMBOL Typewriter Listing Subroutine - TLO

AUTHOR: SDS

ACCEPTED: January 5, 1965

COMPUTER CONFIGURATION: Any SDS 900 series computer with typewriter

PURPOSE: To output on the typewriter one line of the SYMBOL output listing

PROGRAMMED OPERATORS: None

STORAGE: 0154 locations including constants

TIMING: N/A

USE: The subroutine is selectively loaded by the SYMBOL Loader under operator control.

The subroutine has two entry points:

PRNT	Type the line whose origin is LBUF and whose length is specified in EDCT. If the line exceeds 80 characters, the subroutine types the remainder on the succeeding line, preceded by a carriage return and tab.
HOME	Skip to top of page. This subroutine is entered by PRNT when the line count exceeds 50 and by the assembler upon encountering a PAGE directive.

Buffer and unit dependence is an easily modified assembly parameter.

```
ΔMETASYM SI,EI,LO,EO,BO.
                                        1 *       ΔXXT
    00000                               2 $ILO    RES      0
           C0000000                     3 S9300   EQU      0
           C0000000                     4 X0      EQU      S9300
           C0000002                     5 X2      EQU      2-S9300
           C0000000                     6 CH      EQU      0
           C0000001                     7 U       EQU      1
                                        8 MMO     OPD      06000000
    00000  C 00 0 00000                 9 $PRNT   PZE      0
    00001  C 76 0 00136                10         LDA      =060606060
    00002  C 75 0 00137                11         LDB      =-1
*   00003  C 60 0 00000                12 TYP     MMO      EDCT
*   00004  C 71 0 00003                13         LDX      EDCT,X0
*   00005  C 53 0 00004                14         SKN      EDCT
*   00006  2 70 0 00000                15         SKM      LBUF,X2
    00007  C 01 0 00011                16         BRU      TYPL1
    00010  C 01 0 00003                17         BRU      TYP
    00011  C 43 0 00107                18 TYPL1   BRM      LNCT             INCREMENT AND TEST LINE COUNT
    00012  C 76 0 00137                19         LDA      =-1
*   00013  C 54 0 00005                20         SUB      EDCT
*   00014  C 35 0 00013                21         STA      EDCT
    00015  C 73 0 00140                22         SKG      =-20
    00016  C 76 0 00140                23         LDA      =-20
    00017  C 35 0 00133                24         STA      TTMP
    00020  C 76 0 00134                25         LDA      LLBUF
    00021  C 43 0 00050                26         BRM      TYPE
*   00022  C 76 0 00014                27         LDA      EDCT
    00023  C 35 0 00133                28         STA      TTMP
*   00024  C 53 0 00022                29         SKN      EDCT
    00025  C 01 0 00035                30         BRU      PRN2
                                       31 * TYPE LAST N-75 CHARACTERS ON NEXT LINE
    00026  C 61 0 00131                32 TYP2    MIN      CTR              INCREMENT LINE COUNTER
    00027  C 76 0 00141                33         LDA      =052000000
    00030  C 43 0 00077                34         BRM      TYCC             TYPE CARRIAGE RETURN
    00031  C 76 0 00142                35         LDA      =072000000
    00032  C 43 0 00077                36         BRM      TYCC             TYPE TAB
    00033  C 76 0 00135                37         LDA      LTBFE
```

```
00034  C 43 0 00050          38          BRM     TYPE                    TYPE LAST N-75 CHARS OF LINE
00035  C 71 0 00143          39 PRN2     LDX     =00200000-8,X0
00036  C 76 0 00136          40          LDA     ='    '
*  00037  2 35 0 00000       41          STA     CBUF,X2
00040  C 41 0 00037          42          BRX     $-1,X0
*  00041  C 77 0 00006       43          EAX     LBUF,X0
*  00042  C 37 0 00000       44          STX     EDW,X0
00043  C 76 0 00144          45          LDA     =8
*  00044  C 35 0 00024       46          STA     EDCT
00045  C 76 0 00141          47          LDA     =052000000
00046  C 43 0 00077          48          BRM     TYCC
00047  C 51 0 00000          49          BRR     PRNT
                             50 *
                             51 * TYPE N CHARACTERS
00050  C 00 0 00000          52 TYPE     PZE                             ENTRY
*  00051  C 35 0 00042       53          STA     EDW                     ADDRESS OF 1ST CHAR TO TYPE
*  00052  C 76 1 00051       54 TMIW     LDA     *EDW
00053  C 75 0 00145          55          LDB     =077
00054  C 54 0 00146          56 TMIW1    SUB     =060
00055  C 72 0 00145          57          SKA     =077
00056  C 55 0 00147          58          ADD     =046
00057  C 55 0 00150          59          ADD     =012
00060  C 6620 006            60          RCY     6
00061  C 72 0 00151          61          SKA     =077777700
00062  C 01 0 00054          62          BRU     TMIW1
00063  C 36 0 00132          63          STB     TMP                     STORE DATUM
00064  C 02 0 02641          64          TYP     CH,U,4
00065  C 12 0 00132          65          MIW     TMP
00066  C 02 14000            66          TOP     CH
00067  C 40 21000            67 TBRT     BRTW
00070  C 01 0 00067          68          BRU     TBRT
*  00071  C 61 0 00052       69          MIN     EDW
*  00072  C 61 0 00044       70          MIN     EDCT
00073  C 61 0 00133          71          MIN     TTMP
00074  C 53 0 00133          72          SKN     TTMP
00075  C 51 0 00050          73          BRR     TYPE
00076  C 01 0 00052          74          BRU     TMIW
                             75 * TYPE CONTROL CHARACTER
00077  C 00 0 00000          76 TYCC     PZE                             ENTRY
```

```
00100  C 35 0 00132          77          STA     TMP
00101  C 02 0 02041          78 TYC1     TYP     CH,U,1
00102  C 12 0 00132          79          MIW     TMP
00103  C 02 14000            80          TBP     CH
00104  C 40 21000            81 TYSS     BRTW
00105  C 01 0 00104          82          BRU     TYSS
00106  C 51 0 00077          83          BRR     TYCC                EXIT
                             84 *
                             85 * LINE COUNT AND PAGE EJECT SUBROUTINE
00107  C 00 0 00000          86 LNCT     PZE
00110  C 61 0 00131          87          MIN     CTR
00111  C 76 0 00131          88          LDA     CTR
00112  C 73 0 00152          89          SKG     =50
00113  C 51 0 00107          90          BRR     LNCT
00114  C 43 0 00116          91          BRM     THOME               HOME PAGE
00115  C 51 0 00107          92          BRR     LNCT                EXIT
00116                        93 $HOME    RES     0
00116  C 00 0 00000          94 THOME    PZE     0
00117  C 76 0 00131          95          LDA     CTR                 LINES TYPED
00120  C 55 0 00153          96          ADD     =00200000-66
00121  C 35 0 00131          97          STA     CTR
00122  C 71 0 00131          98          LDX     CTR,X0
00123  C 76 0 00141          99 NPG      LDA     =052000000
00124  C 43 0 00077         100          BRM     TYCC
00125  C 41 0 00123         101          BRX     NPG,X0
00126  C 46 30003           102          CLR
00127  C 35 0 00131         103          STA     CTR
00130  C 51 0 00116         104          BRR     THOME
                            105 *
00131  C0000000             106 CTR      DATA    0
00132  C 00 0 00000         107 TMP      PZE
00133  C 00 0 00000         108 TTMP     PZE
*      00134  C 00 0 00041  109 LLBUF    PZE     LBUF
**     00135  C 00 0 00000  110 LTBFE    PZE     TTBFE
                            111          END

00136  60606060
00137  77777777
00140  77777754
00141  52000000
```

```
00142   72000000
00143   C0177770
00144   C0000010
00145   C0000077
00146   C0000060
00147   C0000046
00150   C0000012
00151   77777700
00152   C0000062
00153   C0177676
00072                    EDCT
00134                    LBUF
00037                    CBUF
00071                    EDW
00135                    TBFE
```

SDS PROGRAM LIBRARY
PROGRAM DESCRIPTION

 Catalog No. 062002

IDENTIFICATION: 900 Series SYMBOL Line Printer Listing Subroutine - LLO

AUTHOR: SDS

ACCEPTED: January 4, 1965

COMPUTER CONFIGURATION: Any SDS 900 series computer with Buffered Line Printer

PURPOSE: To output on the printer one line of the SYMBOL output listing.

PROGRAMMED OPERATORS: None

STORAGE: 061 locations including constants

TIMING: N/A

USE: The subroutine is selectively loaded by the SYMBOL Loader under operator control.

The subroutine has two entry points:

PRNT	Skip to channel 0. Then print the line whose origin is LBUF and whose length is specified in EDCT.
HOME	Skip to channel 1.

In the event of a printer fault, the subroutine will halt in relative location 023.

```
                                    1 *       AXXL
00000                               2 $LL0    RES     0
          C0000000                  3 S9300   EQU     0
          C0000000                  4 X0      EQU     S9300
          C0000002                  5 X2      EQU     2-S9300
00000   C 00 0 00000                6 $PRNT   PZE     0
00001   C 40 0 12060                7 PRN1    SKS     012060          SKIP IF BUFFERED PRINTER READY
00002   C 01 0 00001                8         BRU     PRN1
00003   C 02 0 10460                9         EOM     010460          STEP ONE LINE BEFORE PRINTING
00004   C 43 0 00021               10 PRST    BRM     LINEP           PRINT VARIABLE LENGTH LINE
00005   C 40 20010                 11         BETW
00006   C 01 0 00020               12         BRU     PERRP
00007   C 71 0 00055               13 PRN2    LDX     =00200000-8,X0
00010   C 76 0 00056               14         LDA     =060606060
00011   2 35 0 00000               15 SBLK    STA     CBUF,X2         STORE BLANKS IN 1ST 32 POSNS
00012   C 41 0 00011               16         BRX     SBLK,X0
00013   C 77 0 00000               17         EAX     LBUF,X0
00014   C 37 0 00000               18         STX     EDW,X0
00015   C 76 0 00057               19         LDA     =8
00016   C 35 0 00000               20         STA     EDCT
00017   C 51 0 00000               21         BRR     PRNT            *EXIT*
                                   22 *
                                   23 *
00020   C 00 0 00000               24 PERRP   HLT
                                   25 * REPLACE PREVIOUS LINE WITH RESTART PROCEDURE
                                   26 *                PRINT ONE VARIABLE LENGTH LINE
00021   C 00 0 00000               27 LINEP   PZE                     ENTRY
00022   C 40 0 11060               28         SKS     011060          SKIP IF NO PRINTER FAULT
```

```
00023  C 00 0 00000          29          HLT                         **HALT-PRINTER FAULT**
*00024  C 76 0 00016          30          LDA     EDCT                NUMBER OF WORDS TO PRINT
 00025  C 55 0 00042          31          ADD     DPTWI               PLUS ORIGIN OF PRINT BUFFER
 00026  C 35 0 00043          32          STA     DPTW                INDEXED INDIRECT ADDRESS WORD
 00027  C 76 0 00060          33          LDA     =00200000
*00030  C 54 0 00024          34          SUB     EDCT
**00031  C 35 0 00030          35          STA     EDCT
**00032  C 71 0 00031          36          LDX     EDCT,X0
 00033  C 02 0 02660          37          EOM     02660
 00034  C 12 1 00043          38          MIW     *DPTW
 00035  C 41 0 00034          39          BRX     $-1,X0
 00036  C 02 14000            40          TOP
 00037  C 40 21000            41          BRTW
 00040  C 01 0 00037          42          BRU     $-1
 00041  C 51 0 00021          43          BRR     LINEP
                              44  *
**00042  2 00 0 00013          45  DPTWI   PZE     LBUF,X2
**00043  2 00 0 00042          46  DPTW    PZE     LBUF,X2
                              47  *
                              48  *               HOME PAPER SUBROUTINE
 00044  C 00 0 00000          49  $HOME   PZE     0
 00045  C 40 0 12060          50          SKS     012060              SKIP IF BUFFERED PRINTER READY
 00046  C 01 0 00045          51          BRU     $-1
 00047  C 02 0 11460          52          EOM     011460              RESTORE PAGE OR "HOME" PAPER
 00050  C 02 0 02660          53          EOM     02660               START BUFFERED PRINTER NR 1
 00051  C 02 0 14000          54          EOM     014000
 00052  C 40 21000            55          BRTW
 00053  C 01 0 00052          56          BRU     $-1
 00054  C 51 0 00044          57          BRR     HOME                EXIT
                              58          END

 00055  C0177770
 00056  60606060
 00057  C0000010
 00060  C0200000
 00011                          CBUF
 00043                          LBUF
 00014                          EDW
 00032                          EDCT
```

SDS PROGRAM LIBRARY
PROGRAM DESCRIPTION

 Catalog No. 012005

IDENTIFICATION:	900 Series SYMBOL Part I
AUTHOR:	SDS
ACCEPTED:	January 12, 1965
COMPUTER CONFIGURATION:	Any SDS 900 series computer with at least a 4K memory.
PURPOSE:	To provide main SYMBOL control.
PROGRAMMED OPERATORS:	CAB, CBA, CAX, CXA, CBX, CNE, SKE, SKR, MUL, DIV, ADM, XMA
STORAGE:	01462 locations including constants
TIMING:	N/A
USE:	SYMBOL consists of three parts (separately assembled programs) plus a mnemonic table plus I/O subroutines.

Part I is the main control portion of SYMBOL and is entered by the execution of a branch to location 1. After initialization, a halt occurs in relative location 0234. This halt, which precedes pass 1, allows input to be readied in the appropriate peripheral unit. When batched assemblies are desired (as when files are sequentially located on magnetic tape) the halt may be replaced by a NOP.

Following the second pass of the assembly, SYMBOL reinitializes in preparation for another assembly.

In addition to its executive functions, Part I performs the processing for all directives. These include EQU, OPD, FORM, PAGE, AORG, RORG, RES, DATA, DED, BCD, TEXT and END.

USE: (Cont) Subroutines:

DLBL Define label

```
BRM   DLBL

return
```

If LBL1 contains zero, these subroutines will do nothing. Otherwise the contents of LBL1 and the first two characters of LBL1+γ are considered a label, and this label will be equated to the current value of the location counter and inserted in the symbol table. The item will be relocatable if the location counter was relocatable.

LXL Process external labels

```
BRM   LXL   with item at LBL1

return
```

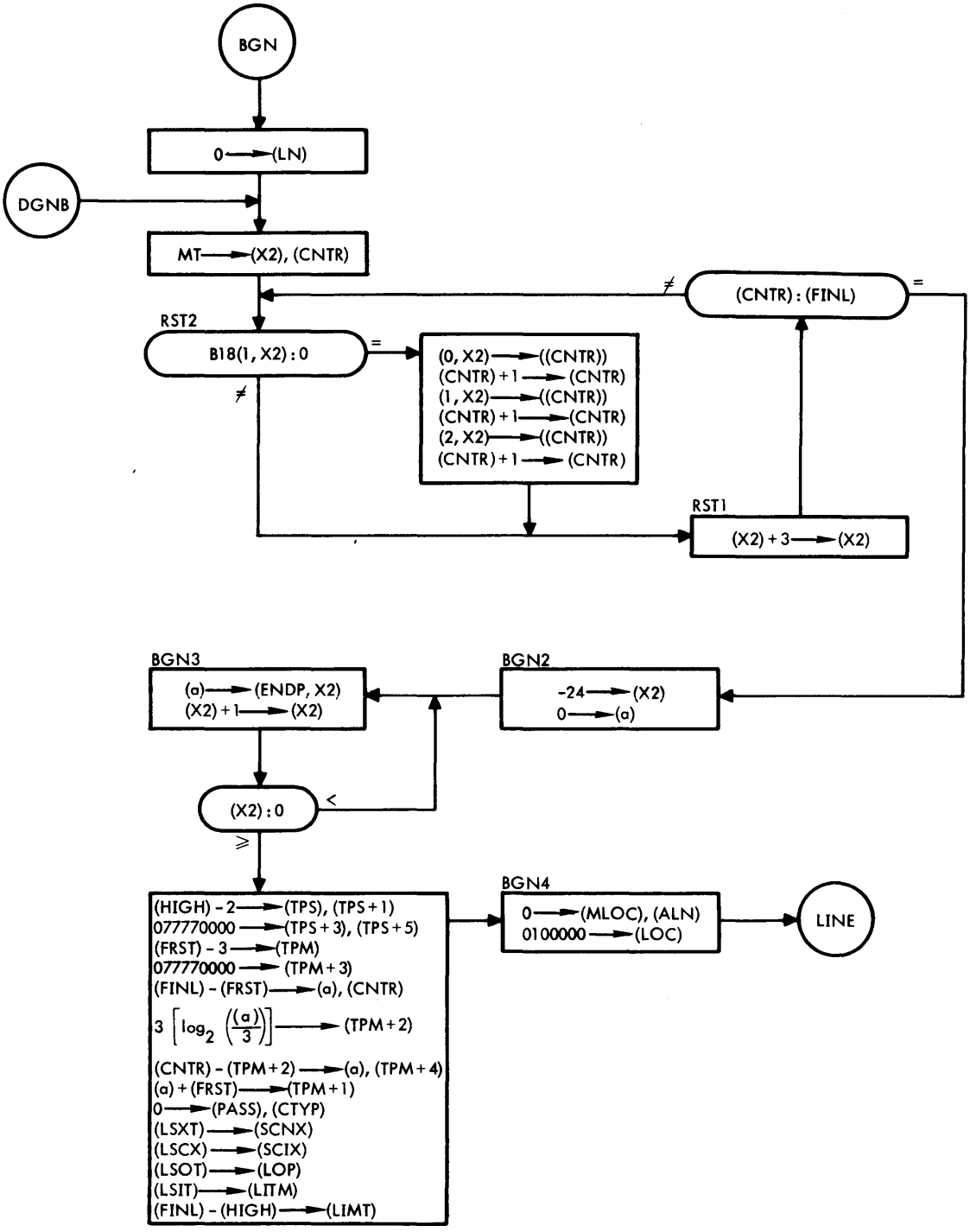
If item at LBL1 is found in the symbol table, this table item is made external.

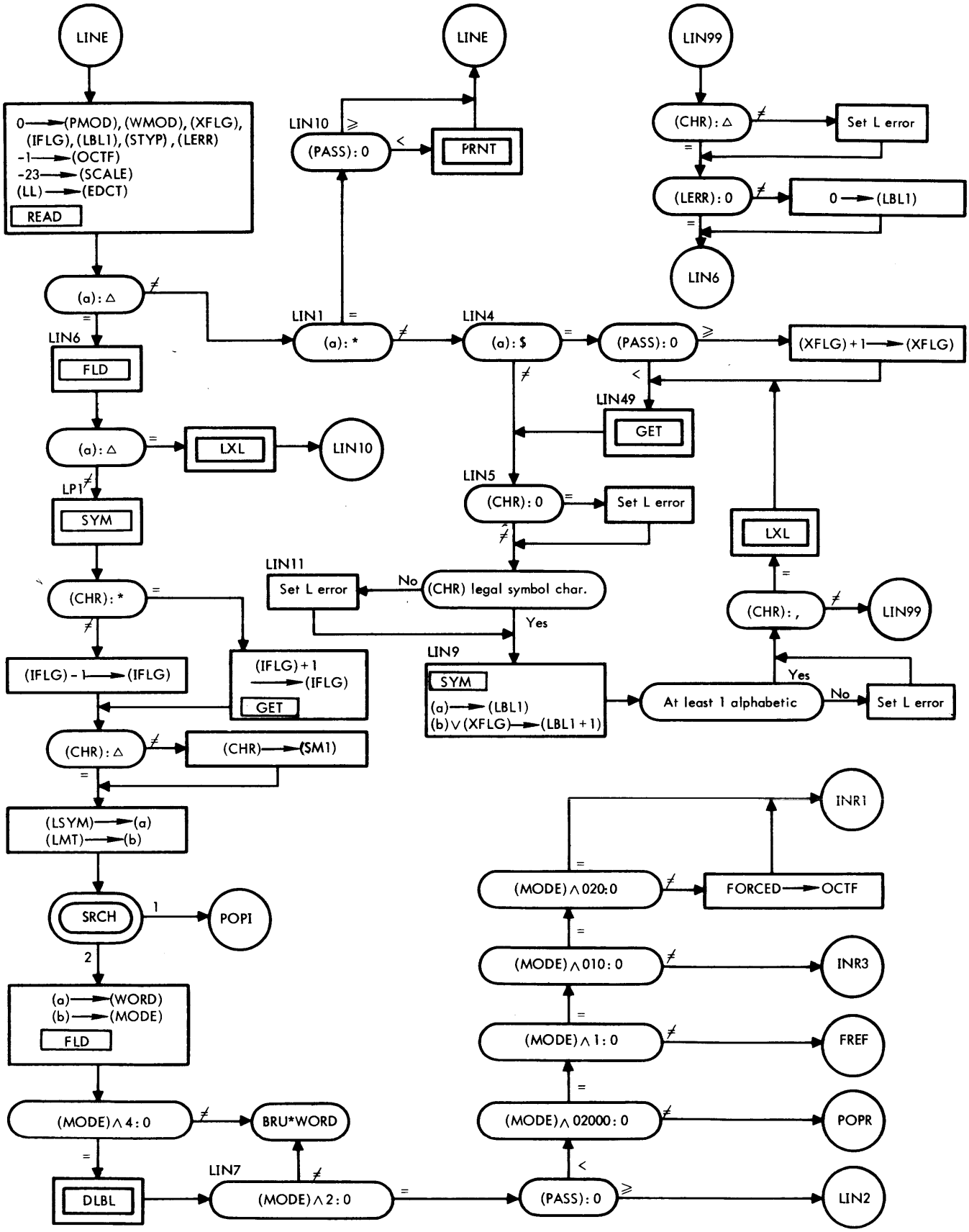
ILOC Increment location counter

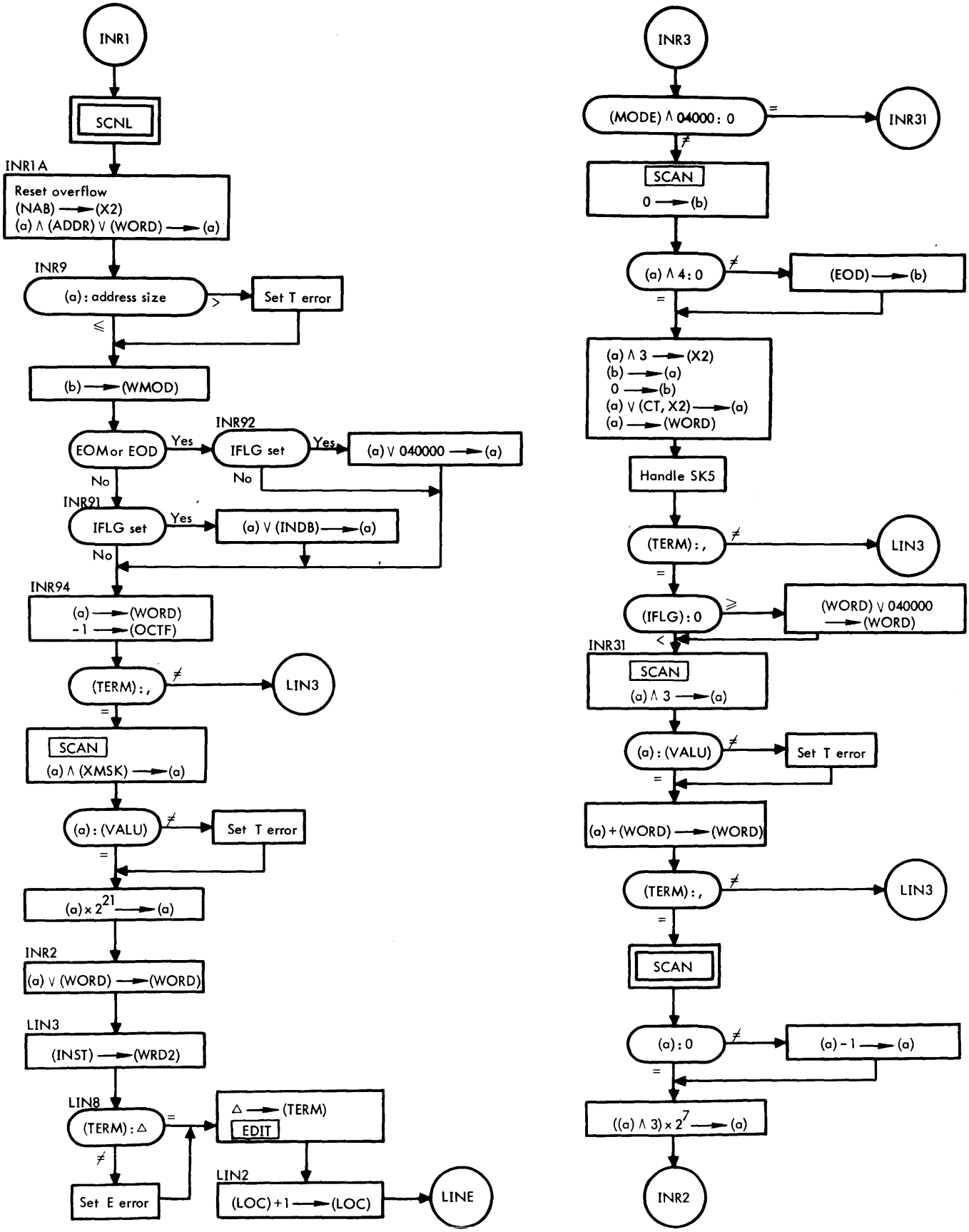
```
BRM   ILOC  with base to be incremented
            in A

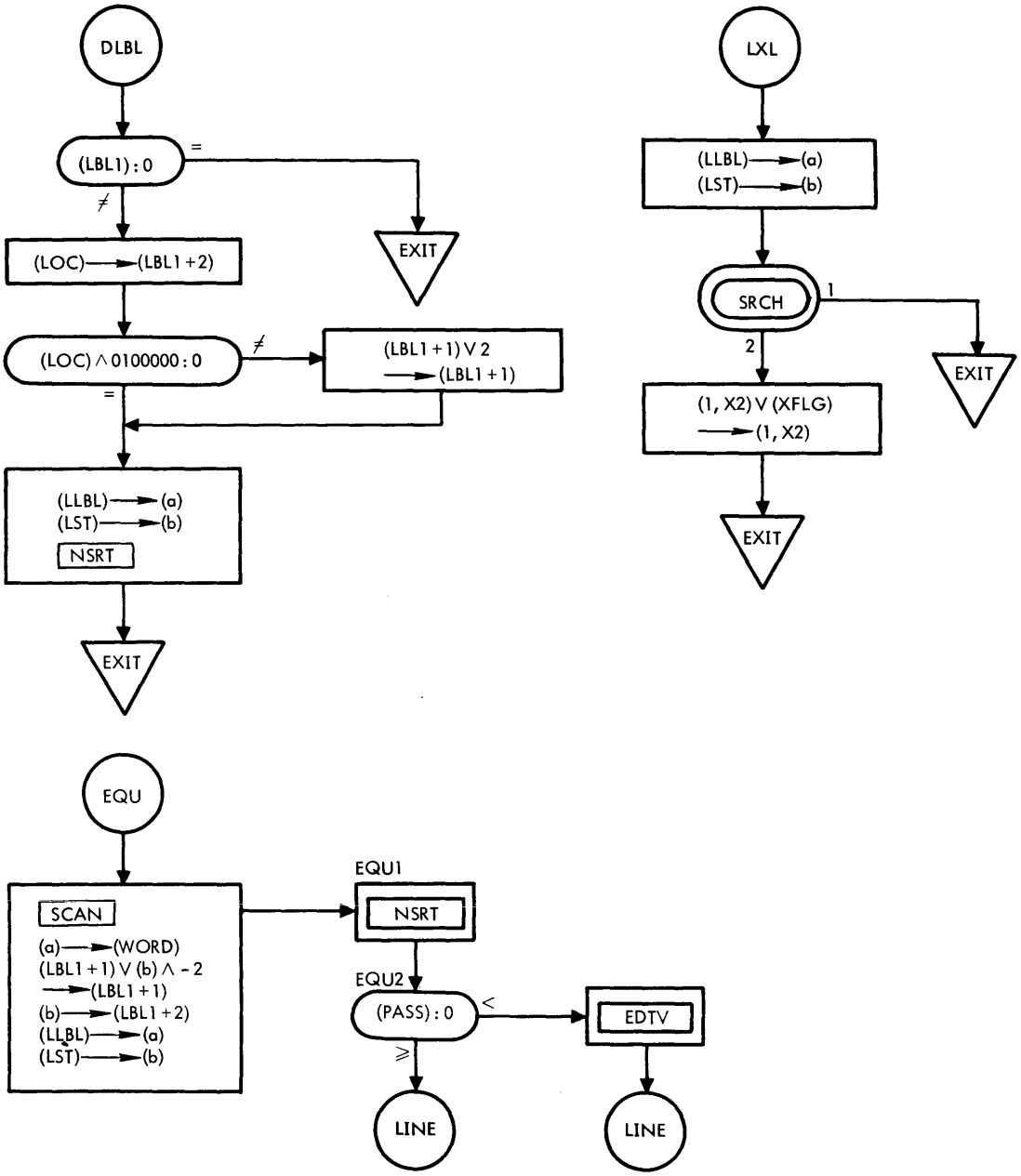
return with new location counter value in
A and LOC1
```

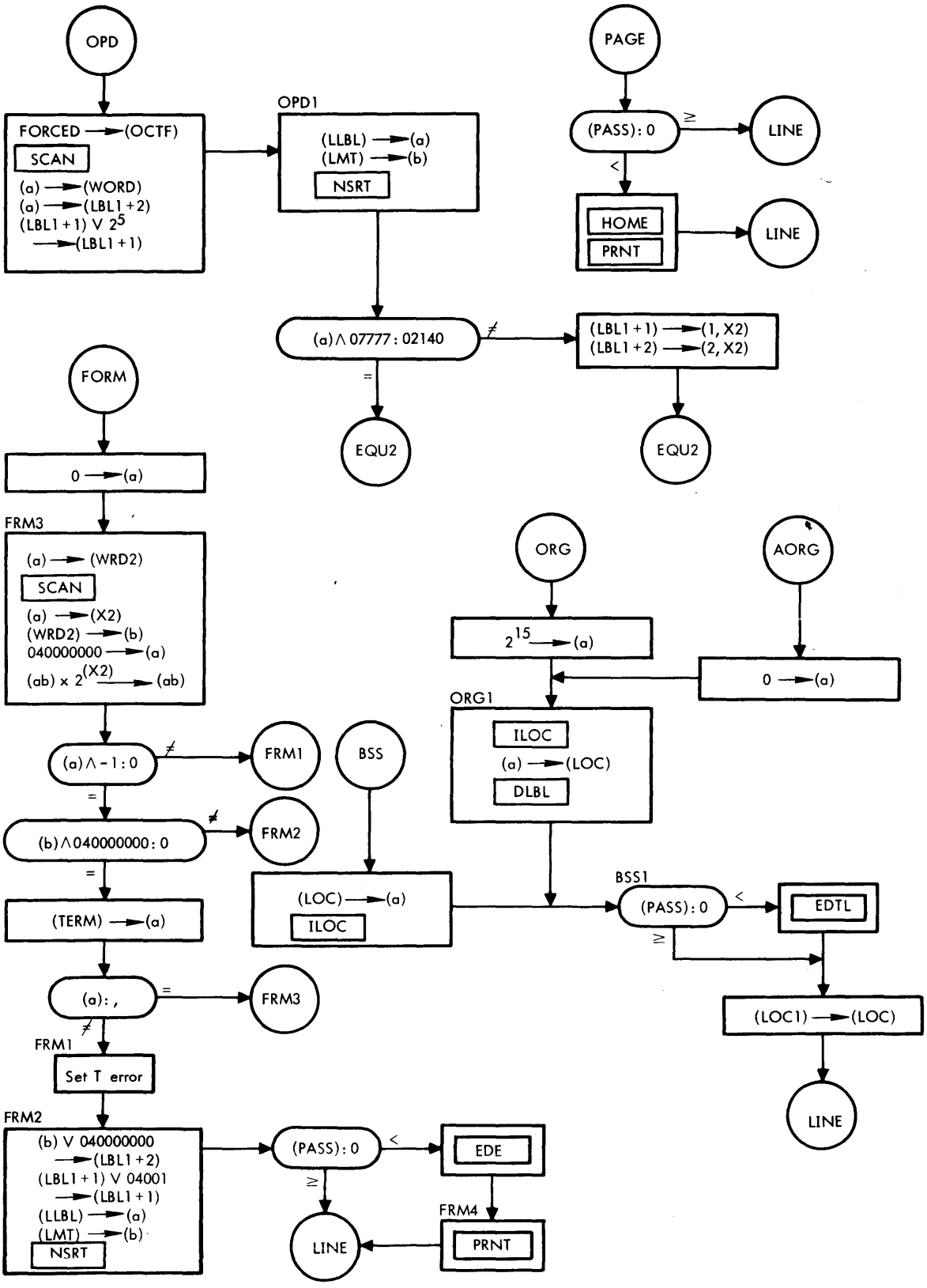
Computes maximum location counter value, then increments location counter. Uses MAXL and SCAN subroutines.

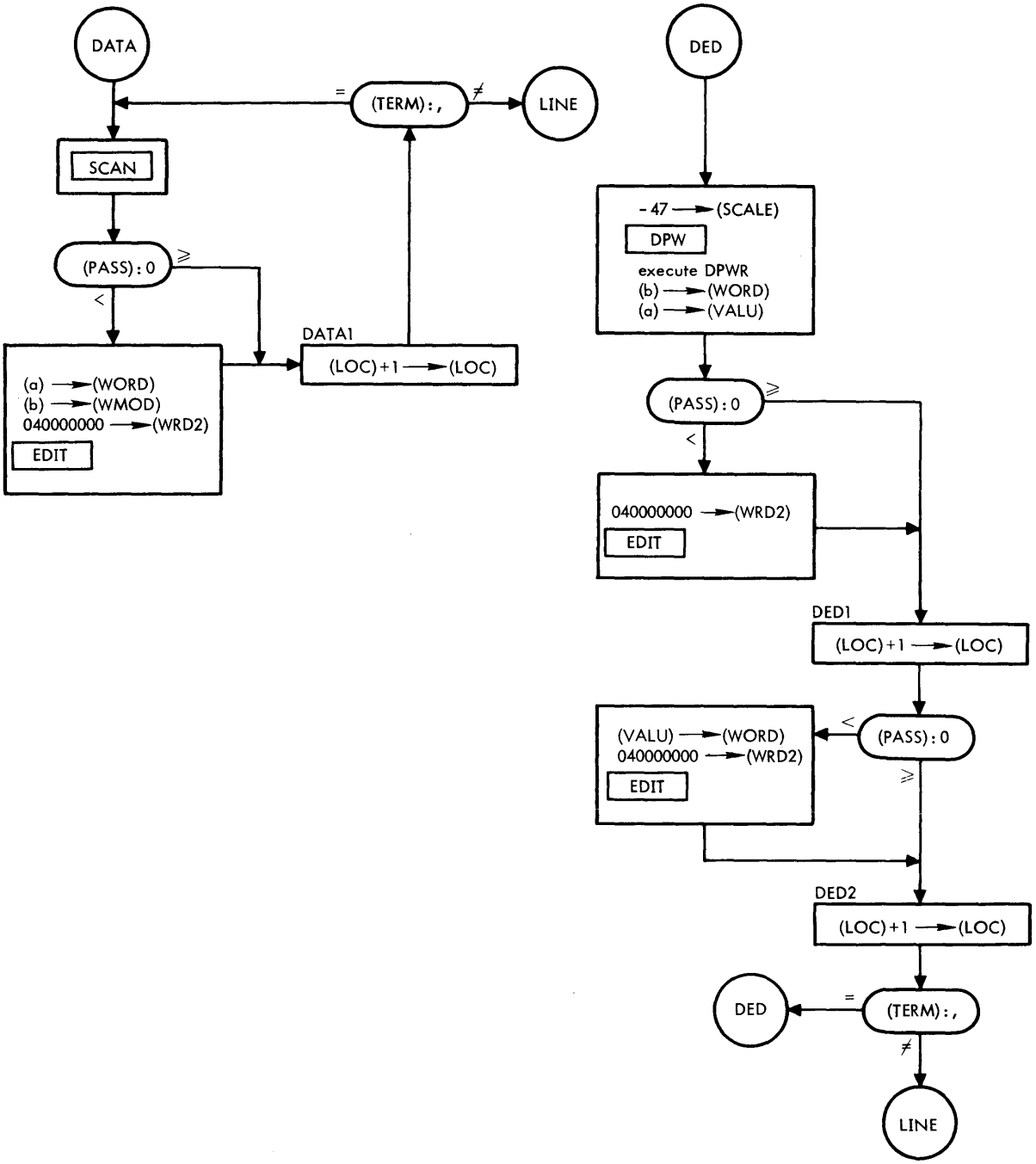

BGN
0 → (LN)
DGNB
MT → (X2), (CNTR)
≠
(CNTR) : (FINL)
=
RST2
B18(1, X2) : 0
=
(0, X2) → ((CNTR))
(CNTR) + 1 → (CNTR)
(1, X2) → ((CNTR))
(CNTR) + 1 → (CNTR)
(2, X2) → ((CNTR))
(CNTR) + 1 → (CNTR)
≠
RST1
(X2) + 3 → (X2)
BGN3
(a) → (ENDP, X2)
(X2) + 1 → (X2)
BGN2
-24 → (X2)
0 → (a)
(X2) : 0
<
≥
BGN4
(HIGH) - 2 → (TPS), (TPS + 1)
077770000 → (TPS + 3), (TPS + 5)
(FRST) - 3 → (TPM)
077770000 → (TPM + 3)
(FINL) - (FRST) → (a), (CNTR)
3 [log2 ((a)/3)] → (TPM + 2)
(CNTR) - (TPM + 2) → (a), (TPM + 4)
(a) + (FRST) → (TPM + 1)
0 → (PASS), (CTYP)
(LSXT) → (SCNX)
(LSCX) → (SCIX)
(LSOT) → (LOP)
(LSIT) → (LITM)
(FINL) - (HIGH) → (LIMT)
0 → (MLOC), (ALN)
0100000 → (LOC)
LINE

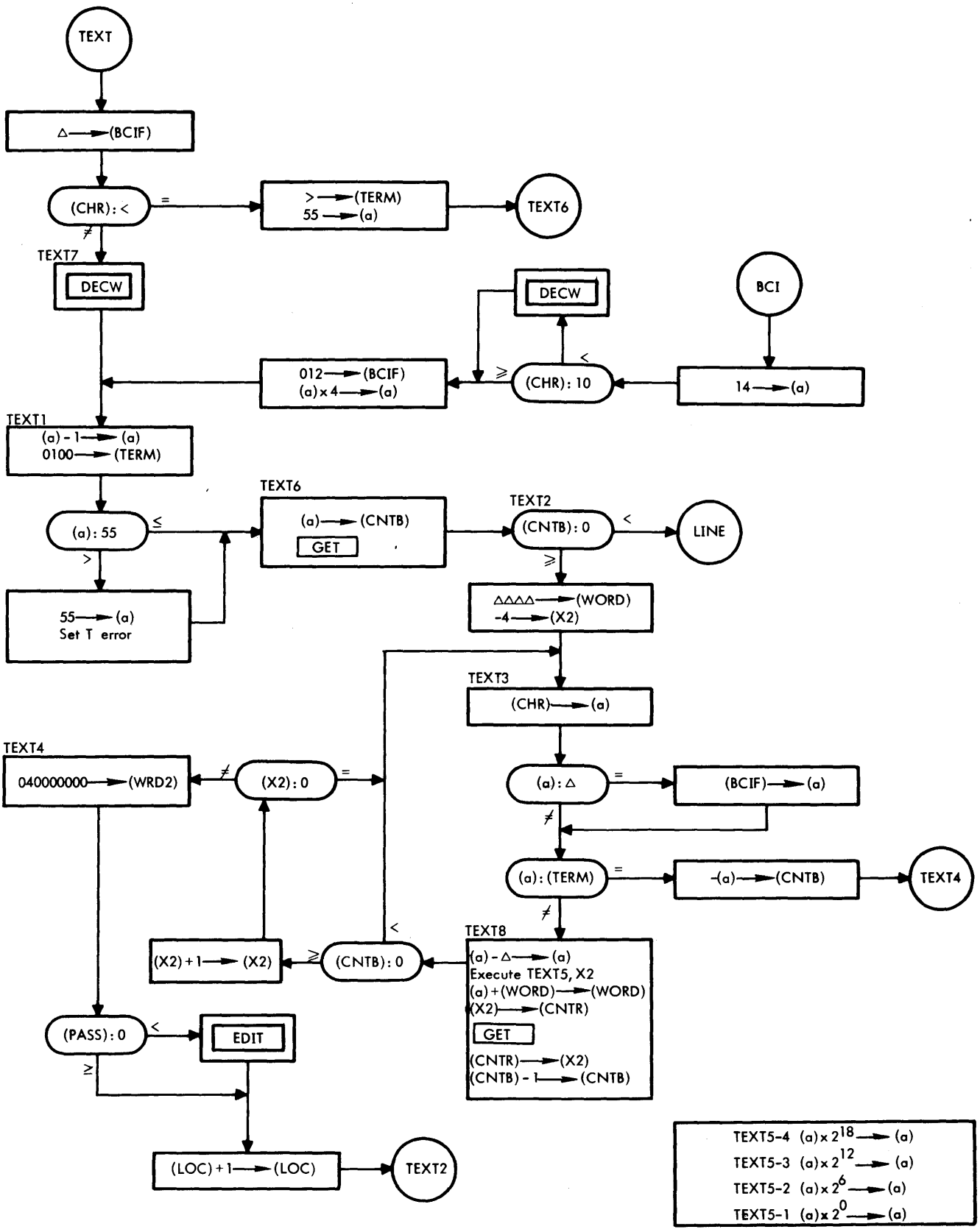

LINE
0 → (PMOD), (WMOD), (XFLG), (IFLG), (LBL1), (STYP), (LERR)
-1 → (OCTF)
-23 → (SCALE)
(LL) → (EDCT)
READ
(a): Δ
LIN6
FLD
(a): Δ
LXL
LIN10
LP1
SYM
(CHR): *
(IFLG) - 1 → (IFLG)
(CHR): Δ
(CHR) → (SM1)
(LSYM) → (a)
(LMT) → (b)
SRCH
1
POP1
2
(a) → (WORD)
(b) → (MODE)
FLD
(MODE) ∧ 4: 0
BRU*WORD
DLBL
LIN7
(MODE) ∧ 2: 0
LINE
LIN10
(PASS): 0
PRNT
LIN1
(a): *
LIN4
(a): $
(PASS): 0
(XFLG) + 1 → (XFLG)
LIN49
GET
LIN5
(CHR): 0
Set L error
LIN11
Set L error
No
(CHR) legal symbol char.
Yes
(IFLG) + 1 → (IFLG)
GET
LIN9
SYM
(a) → (LBL1)
(b) ∨ (XFLG) → (LBL1 + 1)
LIN99
(CHR): Δ
Set L error
(LERR): 0
0 → (LBL1)
LIN6
LXL
(CHR): ,
LIN99
Yes
At least 1 alphabetic
No
Set L error
INR1
(MODE) ∧ 020: 0
FORCED → OCTF
(MODE) ∧ 010: 0
INR3
(MODE) ∧ 1: 0
FREF
(MODE) ∧ 02000: 0
POPR
(PASS): 0
LIN2

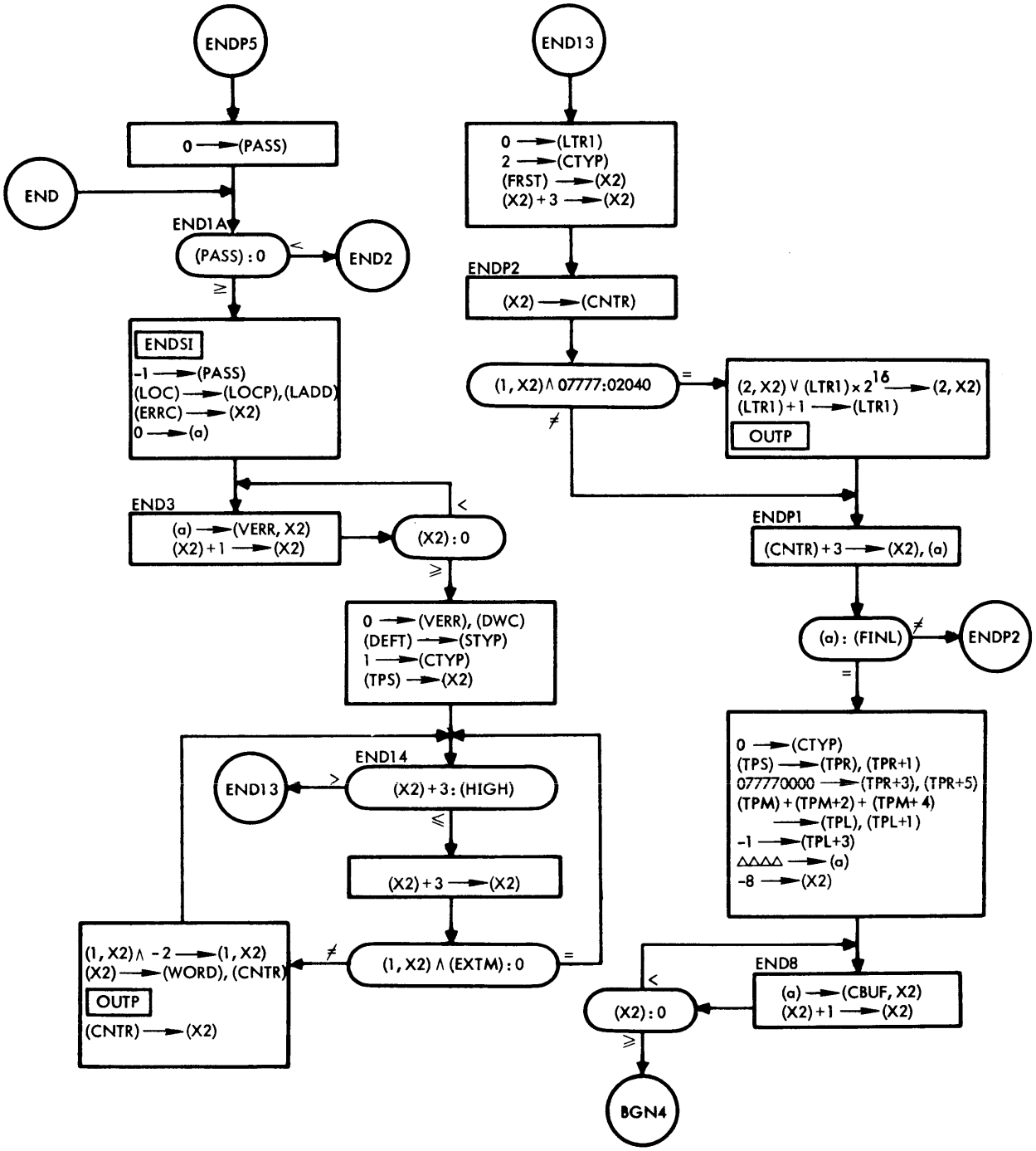

INR1
SCNL
INR1A
Reset overflow
(NAB) → (X2)
(a) ∧ (ADDR) ∨ (WORD) → (a)
INR9
(a) : address size
>
Set T error
≤
(b) → (WMOD)
EOM or EOD
Yes
INR92
IFLG set
Yes
(a) ∨ 040000 → (a)
No
No
INR91
IFLG set
Yes
(a) ∨ (INDB) → (a)
No
INR94
(a) → (WORD)
-1 → (OCTF)
(TERM) : ,
≠
LIN3
=
SCAN
(a) ∧ (XMSK) → (a)
(a) : (VALU)
≠
Set T error
=
(a) x 2^21 → (a)
INR2
(a) ∨ (WORD) → (WORD)
LIN3
(INST) → (WRD2)
LIN8
(TERM) : Δ
=
Δ → (TERM)
EDIT
≠
Set E error
LIN2
(LOC) + 1 → (LOC)
LINE
INR3
(MODE) ∧ 04000 : 0
=
INR31
≠
SCAN
0 → (b)
(a) ∧ 4 : 0
≠
(EOD) → (b)
=
(a) ∧ 3 → (X2)
(b) → (a)
0 → (b)
(a) ∨ (CT, X2) → (a)
(a) → (WORD)
Handle SK5
(TERM) : ,
≠
LIN3
=
(IFLG) : 0
≥
(WORD) ∨ 040000
→ (WORD)
<
INR31
SCAN
(a) ∧ 3 → (a)
(a) : (VALU)
≠
Set T error
=
(a) + (WORD) → (WORD)
(TERM) : ,
≠
LIN3
=
SCAN
(a) : 0
≠
(a) - 1 → (a)
=
((a) ∧ 3) x 2^7 → (a)
INR2

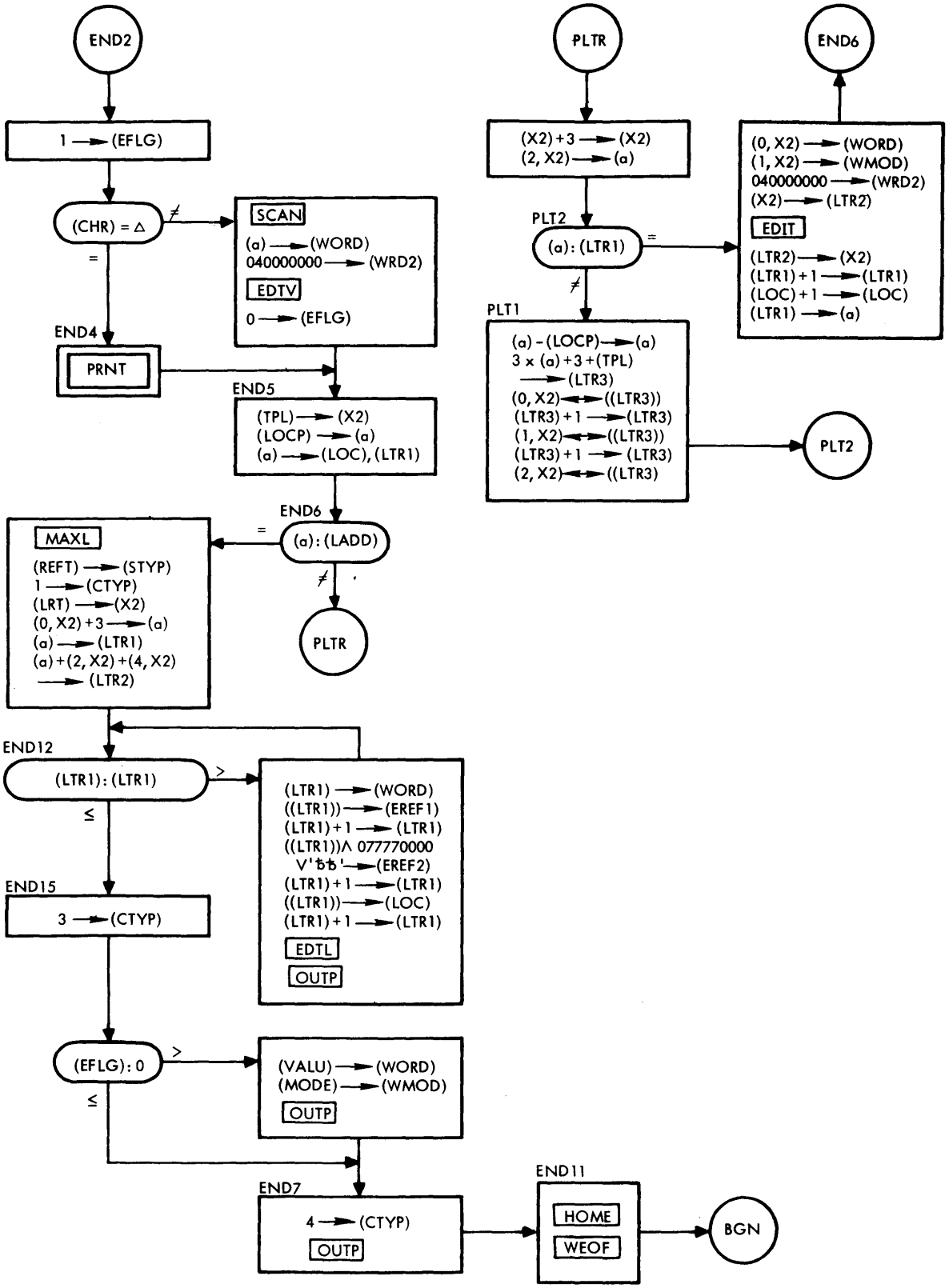

DLBL
(LBL1) : 0
=
≠
EXIT
(LOC) → (LBL1 + 2)
(LOC) ∧ 0100000 : 0
≠
(LBL1 + 1) V 2
→ (LBL1 + 1)
=
(LLBL) → (a)
(LST) → (b)
NSRT
EXIT
LXL
(LLBL) → (a)
(LST) → (b)
SRCH
1
2
EXIT
(1, X2) V (XFLG)
→ (1, X2)
EXIT
EQU
SCAN
(a) → (WORD)
(LBL1 + 1) V (b) ∧ - 2
→ (LBL1 + 1)
(b) → (LBL1 + 2)
(LLBL) → (a)
(LST) → (b)
EQU1
NSRT
EQU2
(PASS) : 0
<
≥
EDTV
LINE
LINE

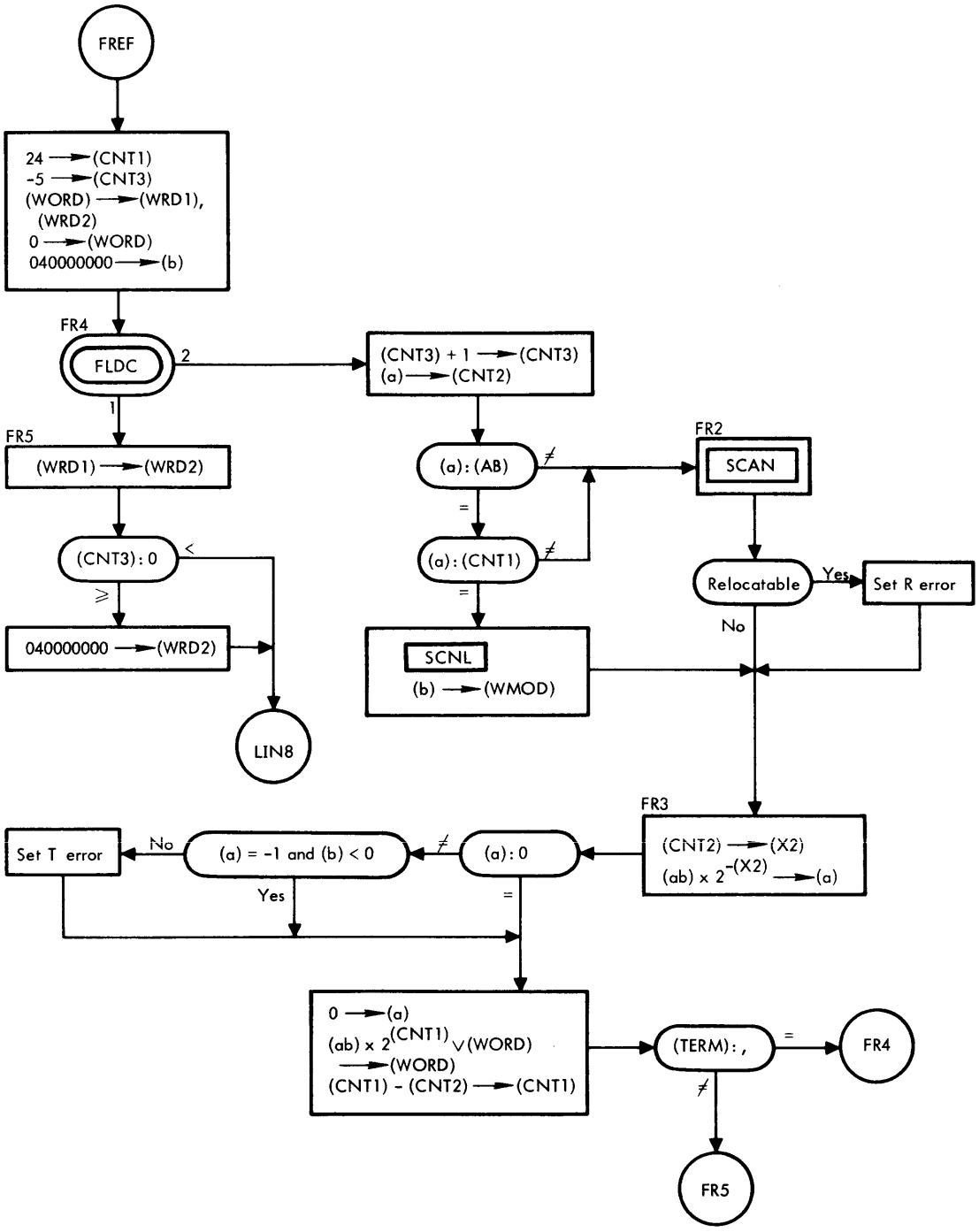

OPD
FORCED → (OCTF)
SCAN
(a) → (WORD)
(a) → (LBL1 + 2)
(LBL1 + 1) V 2^5 → (LBL1 + 1)
OPD1
(LLBL) → (a)
(LMT) → (b)
NSRT
PAGE
(PASS): 0
≥
LINE
<
HOME
PRNT
LINE
(a) ∧ 07777 : 02140
≠
(LBL1 + 1) → (1, X2)
(LBL1 + 2) → (2, X2)
=
EQU2
EQU2
FORM
0 → (a)
FRM3
(a) → (WRD2)
SCAN
(a) → (X2)
(WRD2) → (b)
040000000 → (a)
(ab) x 2^(X2) → (ab)
ORG
2^15 → (a)
AORG
0 → (a)
ORG1
ILOC
(a) → (LOC)
DLBL
(a) ∧ -1 : 0
≠
FRM1
BSS
=
(b) ∧ 040000000 : 0
≠
FRM2
=
(TERM) → (a)
(LOC) → (a)
ILOC
BSS1
(PASS): 0
<
EDTL
≥
(LOC1) → (LOC)
LINE
(a) : ,
=
FRM3
≠
FRM1
Set T error
FRM2
(b) V 040000000 → (LBL1 + 2)
(LBL1 + 1) V 04001 → (LBL1 + 1)
(LLBL) → (a)
(LMT) → (b)
NSRT
(PASS): 0
<
EDE
≥
FRM4
LINE
PRNT


DATA
(TERM):,
=
≠
LINE
SCAN
(PASS):0
≥
<
(a) → (WORD)
(b) → (WMOD)
040000000 → (WRD2)
EDIT
DATA1
(LOC)+1 → (LOC)
DED
-47 → (SCALE)
DPW
execute DPWR
(b) → (WORD)
(a) → (VALU)
(PASS):0
≥
<
040000000 → (WRD2)
EDIT
DED1
(LOC)+1 → (LOC)
(VALU) → (WORD)
040000000 → (WRD2)
EDIT
<
(PASS):0
≥
DED2
(LOC)+1 → (LOC)
DED
=
(TERM):,
≠
LINE


TEXT
Δ→(BCIF)
(CHR): <
=
>→(TERM)
55→(a)
TEXT6
≠
TEXT7
DECW
DECW
BCI
012→(BCIF)
(a)x4→(a)
≥
(CHR): 10
<
14→(a)
TEXT1
(a) - 1→(a)
0100→(TERM)
TEXT6
(a): 55
≤
(a)→(CNTB)
GET
TEXT2
(CNTB): 0
<
LINE
>
55→(a)
Set T error
≥
ΔΔΔΔ→(WORD)
-4→(X2)
TEXT3
(CHR)→(a)
TEXT4
040000000→(WRD2)
≠
(X2): 0
=
(a): Δ
=
(BCIF)→(a)
≠
(a): (TERM)
=
-(a)→(CNTB)
TEXT4
≠
TEXT8
(X2) + 1→(X2)
≥
(CNTB): 0
<
(a) - Δ→(a)
Execute TEXT5, X2
(a) + (WORD)→(WORD)
(X2)→(CNTR)
GET
(CNTR)→(X2)
(CNTB) - 1→(CNTB)
(PASS): 0
<
EDIT
≥
(LOC) + 1→(LOC)
TEXT2
TEXT5-4 (a)x2^18→(a)
TEXT5-3 (a)x2^12→(a)
TEXT5-2 (a)x2^6→(a)
TEXT5-1 (a)x2^0→(a)


ENDP5
0 → (PASS)
END
END1A
(PASS) : 0
<
END2
≥
ENDSI
-1 → (PASS)
(LOC) → (LOCP), (LADD)
(ERRC) → (X2)
0 → (a)
END3
(a) → (VERR, X2)
(X2) + 1 → (X2)
(X2) : 0
<
≥
0 → (VERR), (DWC)
(DEFT) → (STYP)
1 → (CTYP)
(TPS) → (X2)
END14
END13
>
(X2) + 3 : (HIGH)
≤
(X2) + 3 → (X2)
(1, X2) ∧ -2 → (1, X2)
(X2) → (WORD), (CNTR)
OUTP
(CNTR) → (X2)
≠
(1, X2) ∧ (EXTM) : 0
=
END13
0 → (LTR1)
2 → (CTYP)
(FRST) → (X2)
(X2) + 3 → (X2)
ENDP2
(X2) → (CNTR)
(1, X2) ∧ 07777:02040
=
≠
(2, X2) ∨ (LTR1) × 2^16 → (2, X2)
(LTR1) + 1 → (LTR1)
OUTP
ENDP1
(CNTR) + 3 → (X2), (a)
(a) : (FINL)
≠
ENDP2
=
0 → (CTYP)
(TPS) → (TPR), (TPR+1)
077770000 → (TPR+3), (TPR+5)
(TPM) + (TPM+2) + (TPM+4)
→ (TPL), (TPL+1)
-1 → (TPL+3)
ΔΔΔΔ → (a)
-8 → (X2)
END8
(a) → (CBUF, X2)
(X2) + 1 → (X2)
(X2) : 0
<
≥
BGN4


END2
1 → (EFLG)
(CHR) = Δ
≠
=
SCAN
(a) → (WORD)
040000000 → (WRD2)
EDTV
0 → (EFLG)
END4
PRNT
END5
(TPL) → (X2)
(LOCP) → (a)
(a) → (LOC), (LTR1)
END6
(a): (LADD)
=
≠
PLTR
MAXL
(REFT) → (STYP)
1 → (CTYP)
(LRT) → (X2)
(0, X2) + 3 → (a)
(a) → (LTR1)
(a) + (2, X2) + (4, X2)
→ (LTR2)
END12
(LTR1): (LTR1)
>
≤
(LTR1) → (WORD)
((LTR1)) → (EREF1)
(LTR1) + 1 → (LTR1)
((LTR1)) ∧ 077770000
V'bb' → (EREF2)
(LTR1) + 1 → (LTR1)
((LTR1)) → (LOC)
(LTR1) + 1 → (LTR1)
EDTL
OUTP
END15
3 → (CTYP)
(EFLG): 0
>
≤
(VALU) → (WORD)
(MODE) → (WMOD)
OUTP
END7
4 → (CTYP)
OUTP
END11
HOME
WEOF
BGN
PLTR
(X2) + 3 → (X2)
(2, X2) → (a)
PLT2
(a): (LTR1)
=
≠
PLT1
(a) - (LOCP) → (a)
3 x (a) + 3 + (TPL)
→ (LTR3)
(0, X2) ↔ ((LTR3))
(LTR3) + 1 → (LTR3)
(1, X2) ↔ ((LTR3))
(LTR3) + 1 → (LTR3)
(2, X2) ↔ ((LTR3)
PLT2
END6
(0, X2) → (WORD)
(1, X2) → (WMOD)
040000000 → (WRD2)
(X2) → (LTR2)
EDIT
(LTR2) → (X2)
(LTR1) + 1 → (LTR1)
(LOC) + 1 → (LOC)
(LTR1) → (a)


FREF
24 → (CNT1)
-5 → (CNT3)
(WORD) → (WRD1), (WRD2)
0 → (WORD)
040000000 → (b)
FR4
FLDC
2
1
(CNT3) + 1 → (CNT3)
(a) → (CNT2)
FR5
(WRD1) → (WRD2)
(CNT3) : 0
<
≥
040000000 → (WRD2)
LIN8
(a) : (AB)
≠
=
(a) : (CNT1)
≠
=
SCNL
(b) → (WMOD)
FR2
SCAN
Relocatable
Yes
Set R error
No
FR3
(CNT2) → (X2)
(ab) x 2^-(X2) → (a)
(a) : 0
≠
=
(a) = -1 and (b) < 0
No
Yes
Set T error
0 → (a)
(ab) x 2^(CNT1) ∨ (WORD) → (WORD)
(CNT1) - (CNT2) → (CNT1)
(TERM) : ,
=
≠
FR4
FR5

```
                                    1 *       S1
                                    2 *
                                    3 CAB     OPD     016400000
                                    4 CBA     OPD     016500000
                                    5 CAX     OPD     016600000
                                    6 CXA     OPD     016700000
                                    7 CBX     OPD     017000000
                                    8 CNA     OPD     017100000
                                    9 SKE     OPD     017200000
                                   10 SKR     OPD     017300000
                                   11 MUL     OPD     017400000
                                   12 DIV     OPD     017500000
                                   13 ADM     OPD     017600000
                                   14 XMA     OPD     017700000
          00000000                 15 S9300   EQU     0
          00000000                 16 XO      EQU     S9300
          00000002                 17 X2      EQU     2-S9300
          00000001                 18 IN      EQU     1
          00000002                 19 OUT     EQU     2
00001                              20         ORG     1
00001     0 01 0 00127             21         BRU     BGN             RESTART
00042                              22         ORG     34
00042                              23 SXT     RES     4
00046                              24 SCXT    RES     4
00052                              25 $SOT    RES     16
00072                              26 SIT     RES     16
00112                              27 TPM     RES     6
00120                              28 TPS     RES     6
00126                              29 TPR     RES     6
00134                              30 $TPL    RES     6
00142                              31 ENDP    RES     0
00142                              32 $LOC    RES     1
00143                              33 $PMOD   RES     1
00144                              34 $WMOD   RES     1
00145                              35 $WORD   RES     1
00146                              36 $WRD2   RES     1
00147                              37 $WRD1   RES     1
00150                              38 $TERM   RES     1
```

```
00151                39 $CTYP   RES     1
00152                40 $STYP   RES     1
00153                41 $PASS   RES     1
00154                42 HIGH    RES     1
00155                43 $LIMT   RES     1
00156                44 LOC1    RES     1
00157                45 LOCP    RES     1
00000                46         ORG     0
00000                47 $LADD   RES     1
00001                48 $OCTF   RES     1
00002                49 XFLG    RES     1
00003                50 $IFLG   RES     1
00004                51 EFLG    RES     1
00005                52 $LTR1   RES     1
00006                53 $LTR2   RES     1
00007                54 $LTR3   RES     1
00010                55 $MODE   RES     1
00011                56 $VALU   RES     1
00012                57 $XERR   RES     1
00013                58 $OERR   RES     1
00014                59 $DERR   RES     1
00015                60 $EERR   RES     1
00016                61 IERR    RES     1
00017                62 LERR    RES     1
00020                63 $PERR   RES     1
00021                64 $RERR   RES     1
00022                65 $TERR   RES     1
00023                66 $UERR   RES     1
00024                67 $VERR   RES     1
00025                68 $CNTR   RES     1
00026                69 CNT1    RES     1
00027                70 CNT2    RES     1
00030                71 CNT3    RES     1
00031                72 CNTB    RES     1
00032                73 $LN      RES    1
00033                74 BCIF    RES     1
00034                75 $LBL1   RES     1
00035                76 $LBL1P1 RES     1
00036                77 $LBL1P2 RES     1
```

```
00037                    78 I0C     RES     1
00040                    79 $X      RES     1
00041                    80 Z       RES     0
00041 00000000           81 CT      DATA    000000000
00042 00000100           82         DATA    000000100
00043                    83 B1      RES     0
00043 20000000           84         DATA    020000000
00044 20000100           85         DATA    020000100
00045                    86 B3      RES     0
00045 04000000           87         DATA    004000000
00046 0 00 0 00120       88 $LST    HLT     TPS
00047 0 00 0 00112       89 LMT     HLT     TPM     LOCATION OF MNEMONIC TABLE PACKET
00050 0 00 0 00126       90 $LRT    HLT     TPR
00051 0 00 0 00042       91 $LSXT   HLT     SXT
00052 0 00 0 00046       92 LSCX    HLT     SCXT
00053 0 00 0 00052       93 LS0T    HLT     S0T     LOCATION OF SCAN CONECTER
00054 0 00 0 00072       94 LSIT    HLT     SIT     LOCATION OF SCAN ITEM
00055 0 00 0 00034       95 LLBL    HLT     LBL1    LOCATION OF LBL
00056 0 00 0 00000       96 FRST    HLT     MT      1ST MNEMONIC TABLE LOCATION
00057 0 00 0 00000       97 FINL    HLT     MTE     FINAL MNEMONIC TABLE LOCATION
00060 0000006C           98 $RCHR   DATA    060
00061 00000073           99 $CCHR   DATA    073
00062 00000053          100 DCHR    DATA    053
00063 00000054          101 $SCHR   DATA    054
00064 00000007          102 $A7     DATA    07
00065 00000777          103 A57     DATA    0777
00066 40000000          104 B0      DATA    040000000
00067 02000000          105 B4      DATA    02000000
00070 01000000          106 B5      DATA    01000000
00071 00400000          107 B6      DATA    0400000
00072 00200000          108 B7      DATA    0200000
00073 00100000          109 $B8     DATA    0100000
00074 00010000          110 B11     DATA    010000
00075 00004000          111 B12     DATA    04000
00076 00002000          112 B13     DATA    02000
00077 00001000          113 B14     DATA    01000
00100 00000200          114 B16     DATA    0200
00101 00000100          115 B17     DATA    0100
00102 00000040          116 B18     DATA    040
```

```
00103  00000020          117 B19    DATA    020
00104  00000010          118 B20    DATA    010
00105  00000004          119 B21    DATA    04
00106  00000002          120 B22    DATA    2
00107  00000001          121 B23    DATA    1
00110  00000077          122 C3     DATA    077
00111  77770000          123 C01    DATA    077770000
00112  00000102          124 P66    DATA    66
00113  00000030          125 P24    DATA    24
00114  00000016          126 P14    DATA    016
00115  00000012          127 P10    DATA    10
00116  00000003          128 P3     DATA    3
00117  77777777          129 M1     DATA    -1
00120  77777776          130 M2     DATA    -2
00121  77777773          131 M5     DATA    -5
00122  77777751          132 M23    DATA    -23
00123  77777721          133 M47    DATA    -47
00124  30000000          134 MC     DATA    030000000
00125  00000740          135 BPM    DATA    0740
00126  00000034          136 LL     DATA    034
       00000045          137 $IC    EQU     B3
       00000067          138 $CC    EQU     B4
       00000070          139 LC     EQU     B5
       00000071          140 $SC    EQU     B6
       00000072          141 $DC    EQU     B7
       00000073          142 $BC    EQU     B8
       00000100          143 $REFM  EQU     B16
       00000101          144 $DUPM  EQU     B17
       00000106          145 $RELM  EQU     B22
       00000107          146 EXTM   EQU     B23
       00000115          147 SPAC   EQU     P10
       00000107          148 REFT   EQU     B23
       00000106          149 DEFT   EQU     B22
00127                    150 BGN    RES     0
00127  0 46 30003        151        CLR
00130  0 35 0 00032      152         STA    LN
00131                    153 BGNB   RES     0
00131  0 71 0 00056      154        LDX     FRST,X0
00132  2 77 0 00003      155        EAX     3,X2
```

```
00133  0 37 0 00025        156          STX     CNTR,X0
00134  2 76 0 00001        157 RST2     LDA     1,X2
00135  0 72 0 00102        158          SKA     B18          TEST ASSEMBLER DEFINED
00136  0 01 0 00150        159          BRU     RST1         DONT SAVE PROGRAMMER DEFINED
00137  2 75 0 00000        160          LDB     0,X2
00140  0 36 1 00025        161          STB     *CNTR        SAVE 1ST WORD
00141  0 61 0 00025        162          MIN     CNTR
00142  2 75 0 00001        163          LDB     1,X2
00143  0 36 1 00025        164          STB     *CNTR        SAVE 2ND WORD
00144  0 61 0 00025        165          MIN     CNTR
00145  2 75 0 00002        166          LDB     2,X2
00146  0 36 1 00025        167          STB     *CNTR        SAVE 3RD WORD
00147  0 61 0 00025        168          MIN     CNTR
00150  2 77 0 00003        169 RST1     EAX     3,X2         ADDRESS OF NEXT FROM WORD
00151  0 76 0 00025        170          LDA     CNTR         ADDRESS OF NEXT TO WORD
00152  1 72 0 00057        171          SKE     FINL         TEST FOR END OF COMMAND TABLE
00153  0 01 0 00134        172          BRU     RST2
00154  0 71 0 01445        173 BGN2     LDX     =00200000-24,X0
00155  0 76 0 00041        174          LDA     Z
00156  2 35 0 00142        175 BGN3     STA     ENDP,X2      CLEAR ALL PACKETS
00157  0 41 0 00156        176          BRX     BGN3,X0
00160  0 76 0 00154        177          LDA     HIGH         HIGHEST LOCATION
00161  0 54 0 00116        178          SUB     P3
00162  0 35 0 00120        179          STA     TPS          BASE OF SYMBOL TABLE
00163  0 35 0 00121        180          STA     TPS+1
00164  0 76 0 00111        181          LDA     C01
00165  0 35 0 00123        182          STA     TPS+3
00166  0 35 0 00125        183          STA     TPS+5
00167  0 76 0 00056        184          LDA     FRST
00170  0 54 0 00116        185          SUB     P3
00171  0 35 0 00112        186          STA     TPM          BASE OF MNEMONIC TABLE
00172  0 76 0 00111        187          LDA     C01
00173  0 35 0 00115        188          STA     TPM+3
00174  0 76 0 00057        189          LDA     FINL
00175  0 54 0 00056        190          SUB     FRST
00176  0 71 0 00113        191          LDX     P24,X0
00177  0 35 0 00025        192          STA     CNTR         NO. OF WORDS IN TABLE
00200  0 6710 030          193          NOD     24
00201  0 14 0 00124        194          ETR     MC
```

```
00202  0 54 0 00045          195          SUB     B3
00203  0 72 0 00043          196          SKA     B1
00204  0 55 0 00045          197          ADD     B3
00205  0 46 20005            198          ABC
00206  2 6700 000             199          LSH     0,X2
00207  0 35 0 00114          200          STA     TPM+2
00210  0 76 0 00025          201          LDA     CNTR
00211  0 54 0 00114          202          SUB     TPM+2
00212  0 35 0 00116          203          STA     TPM+4
00213  0 55 0 00056          204          ADD     FRST
00214  0 35 0 00113          205          STA     TPM+1
00215  0 76 0 00041          206          LDA     Z
00216  0 35 0 00153          207          STA     PASS        SET PASS1
00217  0 35 0 00151          208          STA     CTYP
00220  0 76 0 00051          209          LDA     LSXT
*00221  0 35 0 00000          210          STA     SCNX        SET SCAN EXIT
00222  0 76 0 00052          211          LDA     LSCX
*00223  0 35 0 00000          212          STA     SCIX
00224  0 76 0 00053          213          LDA     LSCT
*00225  0 35 0 00000          214          STA     LCP         SET SCAN CONNECTER
00226  0 76 0 00054          215          LDA     LSIT
*00227  0 35 0 00000          216          STA     LITM        SET SCAN ITEM
00230  0 76 0 00057          217          LDA     FINL        1ST AVAILABLE CELL
00231  0 54 0 00154          218          SUB     HIGH
00232  0 35 0 00155          219          STA     LIMT        MINUS NO. OF CELLS AVAILABLE
00233  0 00 0 00000          220          HLT
00234  0 76 0 00041          221  BGN4    LDA     Z
*00235  0 35 0 00000          222          STA     MLOC        0 TO MAX LOC
*00236  0 35 0 00000          223          STA     ALN
00237  0 76 0 00073          224          LDA     B8
00240  0 35 0 00142          225          STA     LOC
00241  0 76 0 00041          226  LINE    LDA     Z
00242  0 35 0 00143          227          STA     PMOD
00243  0 35 0 00144          228          STA     WMOD        0 TO MODE
00244  0 35 0 00002          229          STA     XFLG        RESET EXTERNAL FLAG
00245  0 35 0 00003          230          STA     IFLG        RESET INDIRECT FLAG
00246  0 35 0 00034          231          STA     LBL1        RESET LABEL
00247  0 35 0 00152          232          STA     STYP
00250  0 35 0 00017          233          STA     LERR
```

```
  00251 0 76 0 00117              LDA   M1
  00252 0 35 0 00031              STA   OCTF            RESET OCTAL FLAG
  00253 0 76 0 00122              LDA   M23
* 00254 0 35 0 00000              STA   SCALE
  00255 0 76 0 00126              LDA   LL
* 00256 0 35 0 00000              STA   EDCT
* 00257 0 43 0 00000              BRM   READ            READ LINE
  00260 1 72 0 00060              SKE   BCHR            TEST FOR BLANK LABEL
  00261 0 01 0 00434              BRU   LIN1            PROCESS LABEL FIELD
* 00262 0 43 0 00000     LIN6     BRM   FLD             SKIP TO OPERATION
  00263 1 72 0 00060              SKE   BCHR
  00264 0 01 0 00267              BRU   LP1
  00265 0 43 0 00550              BRM   LXL
  00266 0 01 0 00436              BRU   LIN10
* 00267 0 43 0 00000     LP1      BRM   SYM
* 00270 0 76 0 00000              LDA   CHR
  00271 1 72 0 00063              SKE   SCHR            TEST FOR *
  00272 1 73 0 00003              SKR   IFLG
  00273 0 61 0 00003              MIN   IFLG            SET I FLAG
  00274 1 72 0 00063              SKE   SCHR
  00275 0 53 0 00117              SKN   M1              ALWAYS SKIP
* 00276 0 43 0 00000              BRM   GET             SKIP *
  00277 1 72 0 00060              SKE   BCHR            TEST FOR BLANK
* 00300 0 35 0 00000              STA   SM1             UNDEFINED COMMAND
* 00301 0 76 0 00000              LDA   LSYM
  00302 0 75 0 00047              LDB   LMT
* 00303 0 43 0 00000              BRM   SRCH            LOOK UP MNEMONIC
* 00304 0 01 0 00000              BRU   POPI
  00305 0 35 0 00145     $POPIRT  STA   WORD
  00306 0 36 0 00010              STB   MODE            SAVE TYPE
* 00307 0 43 0 00262              BRM   FLD             SKIP TO OPERAND FIELD
  00310 0 76 0 00010              LDA   MODE
  00311 0 72 0 00105              SKA   B21
  00312 0 01 1 00145              BRU   *WORD
  00313 0 43 0 00315              BRM   DLBL            DEFINE LABEL
  00314 0 01 0 00335              BRU   LIN7
  00315 0 00 0 00000     DLBL     HLT   0
  00316 0 76 0 00034              LDA   LBL1
  00317 1 72 0 00041              SKE   Z
```

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00320  1 72 0 00034        273          SKE     LBL1
00321  0 51 0 00315        274          BRR     DLBL          EXIT
00322  0 76 0 00035        275          LDA     LBL1+1
00323  0 75 0 00142        276          LDB     L0C
00324  0 36 0 00036        277          STB     LBL1+2
00325  0 43 0 01432        278          BRM     SKB
00326  0 00 0 00073        279          HLT     B8
00327  0 16 0 00106        280          MRG     B22
00330  0 35 0 00035        281          STA     LBL1+1
00331  0 76 0 00055        282          LDA     LLBL
00332  0 75 0 00046        283          LDB     LST
*00333  0 43 0 00000        284          BRM     NSRT          INSERT IN SYMBOL TABLE
00334  0 51 0 00315        285          BRR     DLBL          EXIT LABEL DEFINE
00335  0 76 0 00010        286 LIN7     LDA     MODE
00336  0 72 0 00106        287          SKA     B22
00337  0 01 1 00145        288          BRU     *WORD
00340  0 53 0 00153        289          SKN     PASS
00341  0 01 0 00432        290          BRU     LIN2          1ST PASS
00342  0 72 0 00076        291          SKA     B13
*00343  0 01 0 00000        292          BRU     POPR
00344  0 72 0 00107        293          SKA     B23
00345  0 01 0 01343        294          BRU     FREF
00346  0 72 0 00104        295          SKA     B20
00347  0 01 0 00442        296          BRU     INR3
00350  0 75 0 00117        297          LDB     M1
00351  0 72 0 00103        298          SKA     B19
*00352  0 75 0 00000        299          LDB     FORCE0
00353  0 36 0 00001        300          STB     0CTF          OCTAL ADDRESS
*00354  0 43 0 00000        301 INR1     BRM     SCNL          GET INSTRUCTION ADDRESS
00355  0 02 20001          302 INR1A    ROV
*00356  0 71 0 00000        303          LDX     NAB,X0
00357  2 6700 000          304          LSH     0,X2
00360  2 6600 000          305          RSH     0,X2
*00361  0 14 0 00000        306          ETR     ADDR
00362  0 16 0 00145        307          MRG     WORD
00363  0 40 20001          308 INR9     0VT
00364  0 61 0 00022        309          MIN     TERR          SET T ERROR
00365  0 36 0 00144        310          STB     WMOD
00366  0 75 0 01446        311          LDB     =07700000
```

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*  00367  0 70 0 00000          312          SKM   EØD
   00370  0 01 0 00372          313          BRU   INR93
   00371  0 01 0 00374          314          BRU   INR92
*  00372  0 70 0 00000          315 INR93    SKM   EØM
   00373  0 01 0 00404          316          BRU   INR91
   00374  0 53 0 00003          317 INR92    SKN   IFLG
   00375  0 16 0 01447          318          MRG   =040000
   00376  0 01 0 00406          319          BRU   INR94
   00377  0 53 0 00153          320 $PZE     SKN   PASS
   00400  0 01 0 00432          321          BRU   LIN2
*  00401  0 43 0 00354          322          BRM   SCNL
   00402  0 36 0 00144          323          STB   WMØD
   00403  0 14 0 01450          324          ETR   =077777
   00404  0 53 0 00003          325 INR91    SKN   IFLG
*  00405  0 16 0 00000          326          MRG   INDB    SET INDIRECT BIT
   00406  0 35 0 00145          327 INR94    STA   WØRD
   00407  0 76 0 00117          328          LDA   M1
   00410  0 35 0 00001          329          STA   ØCTF    RESET ØCTAL FLAG
   00411  0 76 0 00150          330          LDA   TERM
   00412  1 72 0 00061          331          SKE   CCHR
   00413  0 01 0 00423          332          BRU   LIN3
*  00414  0 43 0 00000          333          BRM   SCAN    GET INDEX
*  00415  0 14 0 00000          334          ETR   XMSK    MASK X FIELD
   00416  1 72 0 00011          335          SKE   VALU
   00417  0 61 0 00022          336          MIN   TERR    SET TRUNCATION ERRØR
   00420  0 6700 025            337          LSH   21      PØSITIØN X FIELD
   00421  0 16 0 00145          338 $INR2    MRG   WØRD
   00422  0 35 0 00145          339          STA   WØRD    INSERT INDEX
*  00423  0 76 0 00000          340 $LIN3    LDA   INST
   00424  0 35 0 00146          341          STA   WRD2    INSTRUCTIØN FØRM
   00425  0 76 0 00060          342 LIN8     LDA   BCHR
   00426  1 72 0 00150          343          SKE   TERM    TEST FØR BLANK
   00427  0 61 0 00015          344          MIN   EERR    SET ERRØR
   00430  0 35 0 00150          345          STA   TERM
*  00431  0 43 0 00000          346          BRM   EDIT    EDIT INSTRUCTIØN
   00432  0 61 0 00142          347 $LIN2    MIN   LØC     L+1 TØ L
   00433  0 01 0 00241          348          BRU   LINE
   00434  1 72 0 00063          349 LIN1     SKE   SCHR    TEST FØR *
   00435  0 01 0 00510          350          BRU   LIN4
```

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00436                          351 $NOP0   RES     0
00436  0 53 0 00153             352 LIN10   SKN     PASS
00437  0 01 0 00241             353         BRU     LINE                SKIP IF 1ST PASS
*00440 0 43 0 00000             354         BRM     PRNT                PRINT COMMENTS LINE
00441  0 01 0 00241             355         BRU     LINE
00442  0 76 0 00010             356 INR3    LDA     MODE
00443  0 72 0 00075             357         SKA     B12
00444  0 01 0 00446             358         BRU     $+2
00445  0 01 0 00467             359         BRU     INR31
*00446 0 43 0 00414             360         BRM     SCAN
00447  0 75 0 00041             361         LDB     Z
00450  0 72 0 00105             362         SKA     B21
*00451 0 75 0 00367             363         LDB     EOD
00452  0 14 0 00116             364         ETR     P3
00453  1 66 0 00000             365         CAX
00454  0 46 10012               366         BAC
00455  2 16 0 00041             367         MRG     CT,X2
00456  0 16 0 00145             368         MRG     WORD
00457  0 75 0 01446             369         LDB     =07700000
*00460 0 70 0 00000             370         SKM     SKSEOD
00461  0 01 0 00463             371         BRU     $+2
*00462 0 17 0 00000             372         EOR     EODI
00463  0 35 0 00145             373         STA     WORD
00464  0 76 0 00150             374         LDA     TERM
00465  1 72 0 00061             375         SKE     CCHR
00466  0 01 0 00423             376         BRU     LIN3
00467  0 76 0 01447             377 INR31   LDA     =040000
00470  0 53 0 00003             378         SKN     IFLG
00471  1 76 0 00145             379         ADM     WORD
*00472 0 43 0 00446             380         BRM     SCAN
00473  0 14 0 00110             381         ETR     C3
00474  1 72 0 00011             382         SKE     VALU
00475  0 61 0 00022             383         MIN     TERR
00476  1 76 0 00145             384         ADM     WORD                INSERT UNIT
00477  0 76 0 00150             385         LDA     TERM
00500  1 72 0 00061             386         SKE     CCHR
00501  0 01 0 00423             387         BRU     LIN3                NO CHARACTER COUNT
*00502 0 43 0 00472             388         BRM     SCAN                GET CHAR/WORD
00503  1 72 0 00041             389         SKE     Z
```

```
00504  0 54 0 00107        390          SUB     B23
00505  0 14 0 00116        391          ETR     P3
00506  0 6700 007          392          LSH     7          POSITION CHAR/WORD
00507  0 01 0 00421        393          BRU     INR2
00510  1 72 0 00062        394 LIN4     SKE     DCHR       TEST FOR $
00511  0 01 0 00515        395          BRU     LIN5
00512  0 53 0 00153        396          SKN     PASS
00513  0 61 0 00002        397          MIN     XFLG       SET EXTERNAL FLAG
*00514 0 43 0 00276        398 LIN49    BRM     GET
00515  0 75 0 00071        399 LIN5     LDB     SC         CHECK FOR LABEL CHARACTER
00516  0 73 0 00041        400          SKG     Z
00517  0 61 0 00017        401          MIN     LERR       1ST CHAR = 0
00520  0 43 0 01432        402          BRM     SKB
*00521 2 00 0 00000        403          HLT     CTT,X2
00522  0 01 0 00524        404          BRU     LIN9
00523  0 61 0 00017        405 LIN11    MIN     LERR       SET LABEL FIELD ERROR FLAG
*00524 0 43 0 00267        406 LIN9     BRM     SYM
00525  0 35 0 00034        407          STA     LBL1       SAVE
00526  1 65 0 00000        408          CBA
00527  0 16 0 00002        409          MRG     XFLG       SET EXTERNAL MODE
00530  0 35 0 00035        410          STA     LBL1+1
00531  0 16 0 00034        411          MRG     LBL1
*00532 0 72 0 00000        412          SKA     DLY1       TEST FOR AT LEST 1 ALPHABETEC
00533  0 53 0 00117        413          SKN     M1         ALWAYS SKIP
00534  0 61 0 00017        414          MIN     LERR       ALL NUMERIC
*00535 0 76 0 00270        415          LDA     CHR
00536  1 72 0 01451        416          SKE     =','
00537  0 01 0 00542        417          BRU     LIN99
00540  0 43 0 00550        418          BRM     LXL
00541  0 01 0 00514        419          BRU     LIN49
00542  1 72 0 00060        420 LIN99    SKE     BCHR
00543  0 61 0 00017        421          MIN     LERR       ILLEGAL CHARACTER IN LABEL
00544  0 76 0 00041        422          LDA     Z
00545  1 72 0 00017        423          SKE     LERR       TEST FOR LABEL ERROR
00546  0 35 0 00034        424          STA     LBL1       DONT ENTER LABEL
00547  0 01 0 00262        425          BRU     LIN6
00550  0 00 0 00000        426 LXL      HLT     0
00551  0 76 0 00055        427          LDA     LLBL
00552  0 75 0 00046        428          LDB     LST
```

```
*  00553  0 43 0 00303        429          BRM     SRCH
   00554  0 51 0 00550        430          BRR     LXL
   00555  1 65 0 00000        431          CBA
   00556  0 16 0 00002        432          MRG     XFLG
   00557  2 35 0 00001        433          STA     1,X2
   00560  0 51 0 00550        434          BRR     LXL
*  00561  0 43 0 00502        435 $EQU     BRM     SCAN        GET VALUE
   00562  0 35 0 00145        436          STA     WORD
   00563  0 46 00014          437          XAB
   00564  0 14 0 00120        438          ETR     M2
   00565  1 76 0 00035        439          ADM     LBL1+1
   00566  0 36 0 00036        440          STB     LBL1+2
   00567  0 76 0 00055        441          LDA     LLBL
   00570  0 75 0 00046        442          LDB     LST
*  00571  0 43 0 00333        443 EQU1     BRM     NSRT        INSERT IN SYMBOL TABLE
   00572  0 53 0 00153        444 EQU2     SKN     PASS
   00573  0 01 0 00241        445          BRU     LINE
*  00574  0 43 0 00000        446          BRM     EDTV        PRINT
   00575  0 01 0 00241        447          BRU     LINE
*  00576  0 76 0 00352        448 $OPD     LDA     FORCEO
   00577  0 35 0 00001        449          STA     OCTF        SET OCTAL FLAG
*  00600  0 43 0 00561        450          BRM     SCAN        GET VALUE
   00601  0 35 0 00145        451          STA     WORD
   00602  0 35 0 00036        452          STA     LBL1+2
   00603  0 76 0 00102        453          LDA     B18
   00604  1 76 0 00035        454          ADM     LBL1+1
   00605  0 76 0 00055        455 OPD1     LDA     LLBL
   00606  0 75 0 00047        456          LDB     LMT
*  00607  0 43 0 00571        457          BRM     NSRT
   00610  0 14 0 01452        458          ETR     =07777
   00611  1 72 0 01453        459          SKE     =02140
   00612  0 01 0 00572        460          BRU     EQU2
   00613  0 76 0 00035        461          LDA     LBL1+1
   00614  2 35 0 00001        462          STA     1,X2
   00615  0 76 0 00036        463          LDA     LBL1+2
   00616  2 35 0 00002        464          STA     2,X2
   00617  0 01 0 00572        465          BRU     EQU2
   00620  0 46 30003          466 $FORM    CLR
   00621  0 36 0 00146        467 FRM3     STB     WRD2        STORE FORM WORD
```

```
00622  0 43 0 00600          468          BRM     SCAN      GET FIELD LENGTH
00623  1 66 0 00000          469          CAX
00624  0 75 0 00146          470          LDB     WRD2
00625  0 76 0 00066          471          LDA     B0
00626  2 6720 000            472          LCY     0,X2      INSERT NEW FIELD
00627  0 72 0 00117          473          SKA     M1
00630  0 01 0 00640          474          BRU     FRM1      MORE THAN 24 BITS
00631  0 43 0 01432          475          BRM     SKP
00632  0 00 0 00066          476          HLT     B0
00633  0 01 0 00641          477          BRU     FRM2      END OF FORM
00634  0 76 0 00150          478          LDA     TERM
00635  1 72 0 00061          479          SKE     CCHR
00636  0 01 0 00640          480          BRU     FRM1      LESS THAN 24 BITS
00637  0 01 0 00621          481          BRU     FRM3      PROCESS NEST FIELD
00640  0 61 0 00022          482 FRM1     MIN     TERR      SET TRUNCATION ERROR
00641  1 65 0 00000          483 FRM2     CBA
00642  0 16 0 00066          484          MRG     B0
00643  0 35 0 00036          485          STA     LBL1+2
00644  0 76 0 00107          486          LDA     B23
00645  0 55 0 00102          487          ADD     B18
00646  1 76 0 00035          488          ADM     LBL1+1
00647  0 76 0 00055          489          LDA     LLBL
00650  0 75 0 00047          490          LDB     LMT
*00651  0 43 0 00607          491          BRM     NSRT      INSERT FORM ITEM
00652  0 53 0 00153          492          SKN     PASS
00653  0 01 0 00241          493          BRU     LINE      SKIP IF PASS 1
*00654  0 43 0 00000          494          BRM     EDE       EDIT ERRORS
*00655  0 43 0 00440          495 FRM4     BRM     PRNT
00656  0 01 0 00241          496          BRU     LINE
00657  0 53 0 00153          497 $PAGE    SKN     PASS
00660  0 01 0 00241          498          BRU     LINE      DONT EJECT IF PASS 1
*00661  0 43 0 00000          499          BRM     HOME      EJECT TO NEXT PAGE
*00662  0 43 0 00655          500          BRM     PRNT
00663  0 01 0 00241          501          BRU     LINE
00664  0 46 30003            502 $AORG    CLR
00665  0 01 0 00667          503          BRU     ORG1
00666  0 76 0 00073          504 $ORG     LDA     B8
00667  0 43 0 00673          505 ORG1     BRM     ILOC      GET NEW LOC
00670  0 35 0 00142          506          STA     LOC
```

```
  00671 0 43 0 00315   507        BRM   DLBL      DEFINE LABEL
  00672 0 01 0 00704   508        BRU   BSS1
  00673 0 00 0 00000   509 ILOC   HLT   0
  00674 0 35 0 00156   510        STA   LOC1
* 00675 0 43 0 00000   511        BRM   MAXL      SET MAXIMUM LOC
* 00676 0 43 0 00622   512        BRM   SCAN      GET INCREMENT
  00677 0 55 0 00156   513        ADD   LOC1
  00700 0 35 0 00156   514        STA   LOC1      SAVE RESULT
  00701 0 51 0 00673   515        BRR   ILOC      EXIT
  00702 0 76 0 00142   516 $BSS   LDA   LOC       OLD LOC
  00703 0 43 0 00673   517        BRM   ILOC      GET NEW LOC
  00704 0 53 0 00153   518 BSS1   SKN   PASS      TEST PASS
  00705 0 53 0 00117   519        SKN   M1        DONT PRINT IF 1ST PASS
* 00706 0 43 0 00000   520        BRM   EDTL      PRINT LOCATION
  00707 0 76 0 00156   521        LDA   LOC1      NEW LOCATION
  00710 0 35 0 00142   522        STA   LOC
  00711 0 01 0 00241   523        BRU   LINE
* 00712 0 43 0 00676   524 $DATA  BRM   SCAN
  00713 0 53 0 00153   525        SKN   PASS
  00714 0 01 0 00722   526        BRU   DATA1
  00715 0 35 0 00145   527        STA   WORD
  00716 0 36 0 00144   528        STB   WMOD
  00717 0 76 0 00066   529        LDA   BO
  00720 0 35 0 00146   530        STA   WRD2
* 00721 0 43 0 00431   531        BRM   EDIT
  00722 0 61 0 00142   532 DATA1  MIN   LOC
  00723 0 76 0 00150   533        LDA   TERM
  00724 1 72 0 00061   534        SKE   CCHR
  00725 0 01 0 00241   535        BRU   LINE
  00726 0 01 0 00712   536        BRU   DATA
  00727 0 76 0 00123   537 $DED   LDA   M47       SCALE
* 00730 0 35 0 00254   538        STA   SCALE
* 00731 0 43 0 00000   539        BRM   DPW       GET DOUBLE PRECISION WORD
* 00732 0 23 0 00000   540        EXU   DPWR      TO EXCHANGE OR NOT TO EXCHANGE
  00733 0 36 0 00145   541        STB   WORD
  00734 0 35 0 00011   542        STA   VALU
  00735 0 53 0 00153   543        SKN   PASS
  00736 0 01 0 00742   544        BRU   DED1
  00737 0 76 0 00066   545        LDA   BO
```

```
00740  0 35 0 00146          546          STA     WRD2
*00741  0 43 0 00721          547          BRM     EDIT
00742  0 61 0 00142          548 DED1     MIN     L0C
00743  0 53 0 00153          549          SKN     PASS
00744  0 01 0 00752          550          BRU     DED2
00745  0 76 0 00011          551          LDA     VALU
00746  0 35 0 00145          552          STA     W0RD
00747  0 76 0 00066          553          LDA     B0
00750  0 35 0 00146          554          STA     WRD2
*00751  0 43 0 00741          555          BRM     EDIT
00752  0 61 0 00142          556 DED2     MIN     L0C
00753  0 76 0 00150          557          LDA     TERM
00754  1 72 0 00061          558          SKE     CCHR
00755  0 01 0 00241          559          BRU     LINE
00756  0 01 0 00727          560          BRU     DED
00757                        561 $BCD     RES     0
00757  0 75 0 00115          562          LDB     SPAC
00760  0 01 0 00762          563          BRU     $+2
00761                        564 $TEXT    RES     0
00761  0 75 0 00060          565          LDB     BCHR
00762  0 36 0 00033          566          STB     BCIF
*00763  0 76 0 00535          567          LDA     CHR
00764  1 72 0 01454          568          SKE     ='<'
00765  0 01 0 00772          569          BRU     TEXT7
00766  0 76 0 00114          570          LDA     P14
00767  0 35 0 00150          571          STA     TERM
00770  0 76 0 01455          572          LDA     =55
00771  0 01 0 01002          573          BRU     TEXT6
*00772  0 43 0 00000          574 TEXT7    BRM     DECW
00773  0 54 0 00107          575 TEXT1    SUB     B23
00774  0 75 0 00101          576          LDB     B17
00775  0 36 0 00150          577          STB     TERM
00776  0 73 0 01455          578          SKG     =55
00777  0 01 0 01002          579          BRU     TEXT6
01000  0 76 0 01455          580          LDA     =55
01001  0 61 0 00022          581          MIN     TERR
01002  0 35 0 00031          582 TEXT6    STA     CNTB
*01003  0 43 0 00514          583          BRM     GET
01004  0 53 0 00031          584 TEXT2    SKN     CNTB
```

```
  01005  0 53 0 00117               SKN    M1                 ALWAYS SKIP
  01006  0 01 0 00241               BRU    LINE               DONE
  01007  0 76 0 00033               LDA    BCIF
  01010  1 74 0 01456               MUL    =01010101
  01011  0 6700 027                 LSH    23
  01012  0 35 0 00145               STA    WORD               SET WORD TO BLANKS
  01013  0 71 0 01457               LDX    =00200000-4,X0
* 01014  0 76 0 00763       TEXT3   LDA    CHR
  01015  1 72 0 00060               SKE    BCHR
  01016  0 01 0 01020               BRU    $+2
  01017  0 76 0 00033               LDA    BCIF
  01020  1 72 0 00150               SKE    TERM
  01021  0 01 0 01025               BRU    TEXT8
  01022  1 71 0 00000               CNA
  01023  0 35 0 00031               STA    CNTB
  01024  0 01 0 01036               BRU    TEXT4
  01025  0 54 0 00033       TEXT8   SUB    BCIF
  01026  0 75 0 00041               LDB    Z
  01027  2 23 0 01051               EXU    TEXT5,X2           EXECUTE SHIFT
  01030  1 76 0 00145               ADM    WORD               ADD CHARACTER TO WORD
  01031  0 37 0 00025               STX    CNTR,X0
* 01032  0 43 0 01003               BRM    GET
  01033  0 71 0 00025               LDX    CNTR,X0
  01034  1 73 0 00031               SKR    CNTB
  01035  0 41 0 01014               BRX    TEXT3,X0
  01036  0 76 0 00066       TEXT4   LDA    B0
  01037  0 35 0 00146               STA    WRD2
  01040  0 53 0 00153               SKN    PASS
  01041  0 53 0 00117               SKN    M1                 YES
* 01042  0 43 0 00751               BRM    EDIT               EDIT ALPHA-NUMERIC WORD
  01043  0 61 0 00142               MIN    LOC                L+1 TO L
  01044  0 01 0 01004               BRU    TEXT2
  01045  0 6700 022                 LSH    18
  01046  0 6700 014                 LSH    12
  01047  0 6700 006                 LSH    6
  01050  0 20 0 00000               NOP    0
  01051                     TEXT5   RES    0
  01051  0 76 0 00041       ENDPS   LDA    Z
  01052  0 35 0 00153               STA    PASS               FORCE END OF PASS 1
```

```
01053                          624 $END    RES     0
01053  0 53 0 00153            625 END1A   SKN     PASS
01054  0 01 0 01056            626         BRU     END1            END PASS 1
01055  0 01 0 01173            627         BRU     END2
01056                          628 END1    RES     0
*01056 0 43 0 00000            629          BRM    ENDSI
01057  0 76 0 00117            630         LDA     M1
01060  0 35 0 00153            631         STA     PASS            CHANGE PASS
01061  0 76 0 00142            632         LDA     LOC
01062  0 35 0 00157            633         STA     LOCP            SET LITERAL ORIGIN
01063  0 35 0 00000            634         STA     LADD            SET 1ST LITERAL ADDRESS
*01064 0 71 0 00000            635         LDX     ERRC,XO
01065  0 76 0 00041            636         LDA     Z
01066  2 35 0 00024            637 END3    STA     VERR,X2         CLEAR ERROR FLAGS
01067  0 41 0 01066            638         BRX     END3,XO
01070  0 35 0 00024            639         STA     VERR
*01071 0 35 0 00000            640         STA     DWC
01072  0 76 0 00106            641         LDA     DEFT
01073  0 35 0 00152            642         STA     STYP
01074  0 76 0 00107            643         LDA     B23
01075  0 35 0 00151            644         STA     CTYP
01076  0 71 0 00120            645         LDX     TPS,XO
01077  1 67 0 00000            646 END14   CXA
01100  0 55 0 00116            647         ADD     P3
01101  0 73 0 00154            648         SKG     HIGH
01102  0 53 0 00117            649         SKN     M1
01103  0 01 0 01120            650         BRU     END13
01104  1 66 0 00000            651         CAX
01105  2 76 0 00001            652         LDA     1,X2
01106  0 72 0 00107            653         SKA     EXTM
01107  0 53 0 00117            654         SKN     M1
01110  0 01 0 01077            655         BRU     END14
01111  0 14 0 00120            656         ETR     M2
01112  2 35 0 00001            657         STA     1,X2
01113  0 37 0 00145            658         STX     WORD,XO
01114  0 37 0 00025            659         STX     CNTR,XO
*01115 0 43 0 00000            660         BRM     OUTP
01116  0 71 0 00025            661         LDX     CNTR,XO
01117  0 01 0 01077            662         BRU     END14
```

```
01120  0 76 0 00041          663 END13   LDA     Z
01121  0 35 0 00005          664         STA     LTR1
01122  0 76 0 00106          665         LDA     B22
01123  0 35 0 00151          666         STA     CTYP
01124  0 76 0 00112          667         LDA     TPM
01125  0 55 0 00114          668         ADD     TPM+2
01126  0 55 0 00116          669         ADD     TPM+4
01127  0 35 0 00134          670         STA     TPL          ORIGIN OF LIETERL TABLE
01130  0 71 0 00056          671         LDX     FRST,X0
01131  2 77 0 00003          672         EAX     3,X2
01132  0 37 0 00025          673 ENDP2   STX     CNTR,X0
01133  2 76 0 00001          674         LDA     1,X2
01134  0 75 0 01452          675         LDB     =07777
01135  0 70 0 01460          676         SKM     =02040
01136  0 01 0 01146          677         BRU     ENDP1
01137  2 76 0 00002          678         LDA     2,X2
01140  0 6620 020            679         RCY     16
01141  0 16 0 00005          680         MRG     LTR1
01142  0 6720 020            681         LCY     16
01143  2 35 0 00002          682         STA     2,X2
01144  0 61 0 00005          683         MIN     LTR1
*01145  0 43 0 01115          684         BRM     OUTP
01146  0 71 0 00025          685 ENDP1   LDX     CNTR,X0
01147  2 77 0 00003          686         EAX     3,X2
01150  1 67 0 00000          687         CXA
01151  1 72 0 00134          688         SKE     TPL
01152  0 01 0 01132          689         BRU     ENDP2
01153  0 76 0 00041          690         LDA     Z
01154  0 35 0 00151          691         STA     CTYP
01155  0 76 0 00120          692         LDA     TPS
01156  0 35 0 00126          693         STA     TPR          ORIGIN OF REFERENCE TABLE
01157  0 35 0 00127          694         STA     TPR+1
01160  0 76 0 00111          695         LDA     C01
01161  0 35 0 00131          696         STA     TPR+3
01162  0 35 0 00133          697         STA     TPR+5
01163  0 35 0 00135          698         STA     TPL+1
01164  0 76 0 00117          699         LDA     M1
01165  0 35 0 00137          700         STA     TPL+3
*01166  0 76 0 00532          701         LDA     DLY1
```

```
01167  0 71 0 01461          702          LDX   =00200000-R,XO
*01170  2 35 0 00000          703 END8     STA   CBUF,X2        CLEAR PRINT LINE
01171  0 41 0 01170          704          BRX   END8,XO
01172  0 01 0 00234          705          BRU   BGN4
01173  0 76 0 00107          706 END2     LDA   B23
01174  0 35 0 00004          707          STA   EFLG
*01175  0 76 0 01014          708          LDA   CHR
01176  1 72 0 00060          709          SKE   BCHR
01177  0 53 0 00117          710          SKN   M1             ALWAYS SKIP
01200  0 01 0 01210          711          BRU   END4           NO TRANSFER
*01201  0 43 0 00712          712          BRM   SCAN           GET TRANSFER ADDRESS
01202  0 35 0 00145          713          STA   WORD
01203  0 76 0 00066          714          LDA   BO
01204  0 35 0 00146          715          STA   WRD2
*01205  0 43 0 00574          716          BRM   EDTV           EDTT
01206  1 73 0 00004          717          SKR   EFLG           SET TRANSFER FLAG
01207  0 01 0 01211          718          BRU   END5
*01210  0 43 0 00662          719 END4     BRM   PRNT           PRINT
01211  0 71 0 00134          720 END5     LDX   TPL,XO         LIT TABLE ORIGIN
01212  0 76 0 00157          721          LDA   LOCP
01213  0 35 0 00142          722          STA   LOC
01214  0 35 0 00005          723          STA   LTR1           0 TO SEQUENCE
01215  1 72 0 00000          724 END6     SKE   LADD
01216  0 01 0 01275          725          BRU   PLTR           LITERAL TO OUTPUT
*01217  0 43 0 00675          726          BRM   MAXL           MAXIMUM LOCATION
01220  0 76 0 00107          727          LDA   REFT
01221  0 35 0 00152          728          STA   STYP
01222  0 76 0 00107          729          LDA   B23
01223  0 35 0 00151          730          STA   CTYP
01224  0 71 0 00050          731          LDX   LRT,XO         1ST WORD OF REF TABLE
01225  2 76 0 00000          732          LDA   0,X2
01226  0 55 0 00116          733          ADD   P3
01227  0 35 0 00005          734          STA   LTR1
01230  2 55 0 00002          735          ADD   2,X2
01231  2 55 0 00004          736          ADD   4,X2
01232  0 35 0 00006          737          STA   LTR2           END OF REF TABLE
01233  0 76 0 00006          738 END12    LDA   LTR2
01234  0 73 0 00005          739          SKG   LTR1
01235  0 01 0 01256          740          BRU   END15          NO MORE REFS
```

```
01236  0 76 0 00005          741          LDA     LTR1
01237  0 35 0 00145          742          STA     WORD
01240  0 76 1 00005          743          LDA     *LTR1
*01241 0 35 0 00000          744          STA     EREF1
01242  0 61 0 00005          745          MIN     LTR1
01243  0 76 1 00005          746          LDA     *LTR1
01244  0 14 0 00111          747          ETR     CO1
01245  0 16 0 01462          748          MRG     =' '
*01246 0 35 0 00000          749          STA     EREF2
01247  0 61 0 00005          750          MIN     LTP1
01250  0 76 1 00005          751          LDA     *LTR1
01251  0 61 0 00005          752          MIN     LTR1
01252  0 35 0 00142          753          STA     LOC
*01253 0 43 0 00706          754          BRM     EDTL
*01254 0 43 0 01145          755          BRM     OUTP          OUTPUT REF
01255  0 01 0 01233          756          BRU     END12
01256  0 76 0 00116          757 END15    LDA     P3
01257  0 35 0 00151          758          STA     CTYP          END CARD TYPE
01260  1 73 0 00004          759          SKR     EFLG
01261  0 01 0 01267          760          BRU     END7          NO TRANSFER
01262  0 76 0 00011          761          LDA     VALU
01263  0 35 0 00145          762          STA     WORD          ADDRESS
01264  0 76 0 00010          763          LDA     MODE
01265  0 35 0 00144          764          STA     WMOD
*01266 0 43 0 01254          765          BRM     OUTP          OUTPUT TRANSFER CARD
01267  0 76 0 00105          766 END7     LDA     B21
01270  0 35 0 00151          767          STA     CTYP
*01271 0 43 0 01266          768          BRM     OUTP          CLEAR CARDS
01272                        769 END11    RES     0
*01272 0 43 0 00661          770          BRM     HOME
*01273 0 43 0 00000          771          BRM     WEOF
01274  0 01 0 00127          772          BRU     BGN
01275  1 67 0 00000          773 PLTR     CXA
01276  0 55 0 00116          774          ADD     P3            CURRENT SEQUENCE
01277  1 66 0 00000          775          CAX
01300  2 76 0 00002          776          LDA     2,X2
01301  1 72 0 00005          777 PLT2     SKE     LTR1
01302  0 01 0 01320          778          BRU     PLT1          OUT OF SEQUENCE
01303  2 76 0 00000          779          LDA     0,X2
```

```
01304  0 35 0 00145          780          STA     WORD          VALUE
01305  2 76 0 00001          781          LDA     1,X2
01306  0 35 0 00144          782          STA     WMOD          MODE
01307  0 76 0 00066          783          LDA     BO
01310  0 35 0 00146          784          STA     WRD2
01311  0 37 0 00006          785          STX     LTR2,XO
*01312  0 43 0 01042          786          BRM     EDIT
01313  0 71 0 00006          787          LDX     LTR2,XO       RESTORE
01314  0 61 0 00005          788          MIN     LTR1          INCREMENT SEQUENCE
01315  0 76 0 00005          789          LDA     LTR1
01316  0 61 0 00142          790          MIN     LOC
01317  0 01 0 01215          791          BRU     END6
01320  0 54 0 00157          792 PLT1     SUB     LOCP
01321  0 35 0 00025          793          STA     CNTR
01322  0 55 0 00025          794          ADD     CNTR
01323  0 55 0 00025          795          ADD     CNTR          3 * SEQUENCE
01324  0 55 0 00116          796          ADD     P3
01325  0 55 0 00134          797          ADD     TPL
01326  0 35 0 00007          798          STA     LTR3          CORRECT POSITION
01327  2 76 0 00000          799          LDA     0,X2
01330  1 77 1 00007          800          XMA     *LTR3         EXCHANGE LITERALS
01331  2 35 0 00000          801          STA     0,X2
01332  0 61 0 00007          802          MIN     LTR3
01333  2 76 0 00001          803          LDA     1,X2
01334  1 77 1 00007          804          XMA     *LTR3
01335  2 35 0 00001          805          STA     1,X2
01336  0 61 0 00007          806          MIN     LTR3
01337  2 76 0 00002          807          LDA     2,X2
01340  1 77 1 00007          808          XMA     *LTR3
01341  2 35 0 00002          809          STA     2,X2
01342  0 01 0 01301          810          BRU     PLT2
01343  0 76 0 00113          811 FREF     LDA     P24
01344  0 35 0 00026          812          STA     CNT1          NO. OF BITS LEFT
01345  0 76 0 00121          813          LDA     M5
01346  0 35 0 00030          814          STA     CNT3          SET FIELD COUNT
01347  0 76 0 00145          815          LDA     WORD
01350  0 35 0 00147          816          STA     WRD1          SAVE FORM FOR EDIT
01351  0 35 0 00146          817          STA     WRD2
01352  0 76 0 00041          818          LDA     Z
```

```
01353  0 35 0 00145          819          STA     WORD        0 TO DATA
01354  0 75 0 00066          820          LDB     B0
*01355  0 43 0 00000          821 FR4      BRM     FLDC        COUNT BITS IN FIELD
01356  0 01 0 01415          822          BRU     FR5         NO MORE FIELDS
01357  0 61 0 00030          823          MIN     CNT3
01360  0 35 0 00027          824          STA     CNT2        FIELD SIZE
*01361  1 72 0 00000          825          SKE     AB          ADDRESS BITS
01362  0 01 0 01370          826          BRU     FR2         NOT ADDRESS SIZE
01363  1 72 0 00026          827          SKE     CNT1        BITS LEFT
01364  0 01 0 01370          828          BRU     FR2         NOT ADDRESS FIELD
*01365  0 43 0 00401          829          BRM     SCNL
01366  0 36 0 00144          830          STB     WMOD
01367  0 01 0 01374          831          BRU     FR3
*01370  0 43 0 01201          832 FR2      BRM     SCAN        GET NON-ADDRESS FIELD
01371  0 43 0 01432          833          BRM     SKB
01372  0 00 0 00106          834          HLT     RELM
01373  0 61 0 00021          835          MIN     RERR        SET R FLAG
01374  0 75 0 00041          836 FR3      LDB     Z
01375  0 71 0 00027          837          LDX     CNT2,X0
01376  2 6600 000            838          RSH     0,X2        LEFT ADJUST IN B
01377  1 72 0 00041          839          SKE     Z
01400  0 01 0 01423          840          BRU     FR6
01401  0 76 0 00041          841 FR1      LDA     Z
01402  0 71 0 00026          842          LDX     CNT1,X0
01403  2 6700 000            843          LSH     0,X2
01404  0 16 0 00145          844          MRG     WORD        INSERT FIELD IN WORD
01405  0 35 0 00145          845          STA     WORD
01406  0 76 0 00026          846          LDA     CNT1
01407  0 54 0 00027          847          SUB     CNT2        DECREMENT BITS LEFT
01410  0 35 0 00026          848          STA     CNT1
01411  0 76 0 00150          849          LDA     TERM
01412  1 72 0 00061          850          SKE     CCHR        TEST FOR COMMA
01413  0 01 0 01415          851          BRU     FR5         END OF REFERENCE
01414  0 01 0 01355          852          BRU     FR4         PROCESS NEXT FIELD
01415  0 76 0 00147          853 FR5      LDA     WRD1
01416  0 35 0 00146          854          STA     WRD2        SET FORM FOR PRINTING
01417  0 76 0 00066          855          LDA     B0
01420  0 53 0 00030          856          SKN     CNT3
01421  0 35 0 00146          857          STA     WRD2        TOO MANY FIELDS TO EDIT
```

```
01422  0 01 0 00425          858          BRU     LIN8
01423  1 72 0 00117          859 FR6      SKE     M1
01424  0 61 0 00022          860          MIN     TERR
01425  0 43 0 01432          861          BRM     SKB
01426  0 00 0 00066          862          HLT     B0
01427  0 53 0 00117          863          SKN     M1
01430  0 61 0 00022          864          MIN     TERR
01431  0 01 0 01401          865          BRU     FR1
01432  0 00 0 00000          866 $SKB     HLT
01433  1 77 0 01432          867          XMA     SKB
01434  0 55 0 01444          868          ADD     IND1
01435  1 77 0 01432          869          XMA     SKB
01436  0 46 00014            870          XAB
01437  0 72 1 01432          871          SKA     *SKB
01440  0 01 0 01442          872          BRU     $+2
01441  0 61 0 01432          873          MIN     SKB
01442  0 46 00014            874          XAB
01443  0 51 0 01432          875          BRR     SKB
01444  0 00 1 00001          876 IND1     HLT     *1
                             877 $M1,LINE,B0,P14,BCIF,SPAC,TEXT1,M23
                             878 $IERR,INR1,DLBL,FRM4,XFLG,OPD1
                             879 $B11,C3
                             880          END
01445  00177750
01446  07700000
01447  00040000
01450  00077777
01451  00000073
01452  00007777
01453  00002140
01454  00000036
01455  00000067
01456  01010101
01457  00177774
01460  00002040
01461  00177770
01462  00006060
00056                        MT
00057                        MTE
```

00221	SCNX
00223	SCIX
00225	LØP
00227	LITM
00235	MLØC
00236	ALN
00730	SCALE
00256	EDCT
00257	READ
00307	FLD
00524	SYM
01175	CHR
01032	GET
00300	SM1
00301	LSYM
00553	SRCH
00304	PØPI
00651	NSRT
00343	PØPR
00576	FØRCEØ
01365	SCNL
00356	NAB
00361	ADDR
00451	EØD
00372	EØM
00405	INDB
01370	SCAN
00415	XMSK
00423	INST
01312	EDIT
01210	PRNT
00460	SKSEØD
00462	EØDI
00521	CTT
01166	DLY1
01205	EDTV
00654	EDE
01272	HØME
01217	MAXL

```
01253                          EDTL
00731                          DPW
00732                          DPWR
00772                          DECW
01056                          ENDSI
01064                          ERRC
01071                          DWC
01271                          OUTP
01170                          CBUF
01241                          EREF1
01246                          EREF2
01273                          WEOF
01355                          FLDC
01361                          AP
```

SDS PROGRAM LIBRARY
PROGRAM DESCRIPTION

 Catalog No. 012009

IDENTIFICATION: 900 Series SYMBOL Part II

AUTHOR: SDS

ACCEPTED: January 15, 1965

COMPUTER CONFIGURATION: Any SDS 900 series computer with at least 4K memory.

PURPOSE: Perform search, insert and scan (and evaluate) the operand field of a SYMBOL line.

PROGRAMMED OPERATORS: CAB, CBA, CAX, CXA, CBX, CNA, SKE, SKR, MUL, DIV, ADM, XMA

STORAGE: 02103 locations including constants

TIMING: N/A

USE: SYMBOL consists of three parts (separately assembled programs) plus a mnemonic table plus I/O subroutines.

Part II performs the table manipulative functions (search, insert and move) for the four item tables: mnemonics, symbols, references and literals. In addition, Part II scans and evaluates operand field expressions.

Subroutines:

The following subroutines are documented in the order of their appearance within SYMBOL Part II.

CNVRT	GNF	SCI
DECW	MAXL	SCNL
DPA	MOVE	SCNM
DPMT	NSRT	SCNR
DPNM	OCTW	SRCH
DPSS	SCAN	SSIGN
DPW	SCC	SYM

USE: (Cont)

SCNL Scan literal

BRM SCNL with same conditions as SCAN

return with same conditions as SCAN

Scans address field. Will accept literal or reference as result. Uses SCAN, SCNM, SCNR and GET subroutines.

SCNM Insert literal

BRM SCNM with literal in A, B

return with address of literal in A if pass two

If pass two and literal is not in table, the literal will be inserted. Uses SRCH subroutine and uses MOVE if literal has to be inserted.

SCNR Scan reference

BRM SCNR with same conditions as SCAN

return with same condition as SCAN

If pass two, and address consisted of one symbol which was not found (VERR contains non-zero) and no connectors were present (CHR1 contains zero), address is considered to be an external reference. If reference was not previously in table, it will be inserted. Uses SCAN and if reference uses SRCH and if new reference, uses MOVE.

SCAN Evaluates symbolic expression

BRM SCAN with first character of expression in CHR return with value of expression in A and in VALU and mode of expression in B and in MODE.

USE: (Cont)

Upon exit from SCAN, the character following the character which terminated the expression will be in CHR. The character which terminated the expression will be in TERM.

The SCAN routine uses the subroutines:

SCI	unless first character of expressor terminates expression
SCC	unless first character of expressor terminates expression

If a connector (other than a terminator) was encountered, CHR1 will be nonzero.

SCI Evaluates an item

BRM SCI with first character of item in X2

return with value of item in A, mode of item in B

Upon exit from SCI, the first character following the item is in CHR.

The SCI routines uses the following subroutines:

GET	
TCHR	
CNVRT	if the item is octal or decimal
SRCH	if the item is symbolic
SCAN	if the item is subexpression

SCC Evaluates a connector

BRM SCC with first character of connector in X2

return with code for connector in A (MODE is merged to A)

USE: (Cont)

Upon exit the first character following connector is in CHR. SCC uses the GET subroutine.

The following code is used for connectors:

Operations	Terminators
10 ++	00 Δ
11 --	01 ,
22 **	02)
33 +	
34 -	
45 *	
46 /	
47 //	
50 *+	
51 */	

SYM Collects a symbol

BRM SYM with first character of symbol in CHR

return with first word of symbol in SM1 and A, second word of symbol in SM2 and B

Upon exit from SYM, the character following the symbol is in CHR. Sym uses the TCHR subroutines.

SRCH Search table for item

BRM SRCH with location if key in A, location of table packet

(see MOVE subroutine description) in B

return if no match is found

return if found

USE: (Cont)

If item is found the location of the item is in X2, the second word of the item is in B and the third word of the item is in A. If item is not found the location of the item with the largest key less than the key given is in X2.

NSRT Insert label subroutine

NSRT is used to insert an item in the mnemonic table (for FORM and OPD labels), the symbol table, the reference table, or the literal table. First the item is searched for and one of the following is done:

1. If pass 1 and the item was not found, the item is inserted by using the MOVE subroutine.

2. If pass 1 and the item was found and is not identical to the item to be inserted, the duplicate flag is set and the new item is discarded.

3. If pass 2 and the item was not found, there was a program or machine error.

4. If pass 2 and the item was found, the duplicate flag is checked and if set, the duplicate error is set.

NSRT is entered with the location of the item in A and the location of the table packet (see MOVE subroutine description) in B. The SRCH and MOVE subroutines are used.

Calling sequence is:

```
BRM   NSRT   with A and B as specified

return
```

USE: (Cont) MOVE Move item into table subroutine

Tables are described by a six-word packet as follows:

Packet Origin	B	Base of table = location of first item in table minus 3.
+1	F	Location of first item to be compared when doing binary search.
+2	m	Initial increment for binary search.
+3	M	Mask for masking second word when searching.
+4	n	If there are k entries in the table, n = 3k - m.
+5	T	Type + 0 if table expands up, -1 if table expands down.

If there are k entries in the table:

$$m = 3*2^{\left\lfloor \log_2 k \right\rfloor}$$

n = 3*k-m

F = B+n+3

There is a packet for each table, specifically:

TPM	Mnemonic command table packet (up from S5)
TPS	Symbol table packed (down from end of memory)
TPR	Reference table packet (down from end of symbol table)
TPL	Literal table packet (up from end of mnemonic command table)

USE: (Cont)

All items are three words. MOVE is entered with the location of the item to be inserted in LKI, the location of the packet for the table in which to insert in LKT and the location of the item which is to precede the item being inserted in X. MOVE will move part of the table up or down (depending on T), insert the item, and modify the packet as required.

Calling sequence is:

```
BRM   MOVE   with X as specified

return
```

CNVRT Convert 4 characters

```
BRM   CNVRT  with 4 six bit characters
             in A

return with binary integer in A
```

The conversion will be from decimal if X2 contains 0, and from octal if X2 contains 3.

SSIGN Set sign

```
BRM   SSIGN  with possible sign character
             in CHR

return
```

If CHR contains a minus sign, SIGN will be set to -1. Otherwise, SIGN will contain zero. If contents of CHR was "+" or "-", this character will be skipped. Uses GET subroutine if CHR contains "+" or "-".

DPMT Double precision multiply by ten

```
BRM   DPMT   with multiplicand in A, B

return with product in A, B
```

USE: (Cont)

DPA Double precision add

BRM DPA with addend in A, B and original in WRD1, WRD2

return with sum in A, B

DPNM Double precision normalized multiply

BRM DPNM with multiplicand in WRD1, WRD2 and multiplier in MULT1, MULT2

return with product in A, B and WRD1, WRD2

Operands must be normalized and result will be normalized. DPNM uses the DPA subroutine.

DPW Double precision word

BRM DPW with first character of constant in CHR

return with result in A, B and in WRD1, WRD2

This subroutine computes a fixed or floating constant. The contents of SCALE determine the implied binary scaling (in case of no B or */). Upon exit from DPW, the character which terminated the constant is in TERM, and the next character is in CHR. Subroutines used are GET, SCI, TCHR, DPA, SSIGN, DPMT, SPNM, GNF, DPSS.

DPSS Double precision set sign

BRM DPSS with argument in A, B

return with result in A, B

If the contents of DPSIGN is negative, this subroutine puts the negative of the argument in A, B.

USE: (Cont)

OCTW Evaluates an octal item

```
BRM   OCTW   with first character in CHR

return with value in VALU
```

Upon exit the character following the item is in CHR. OCTW uses the GET, SSIGN, GNF, and TCHR subroutines.

DECW Evaluates a decimal item

```
BRM   DECW   with first character in CHR

return with value in VALU
```

Upon exit the character following the item is in CHR. DECW uses the SSIGN and TCHR subroutines.

GNF Get next field

```
BRM   GNF

return with blank or comma in CHR
```

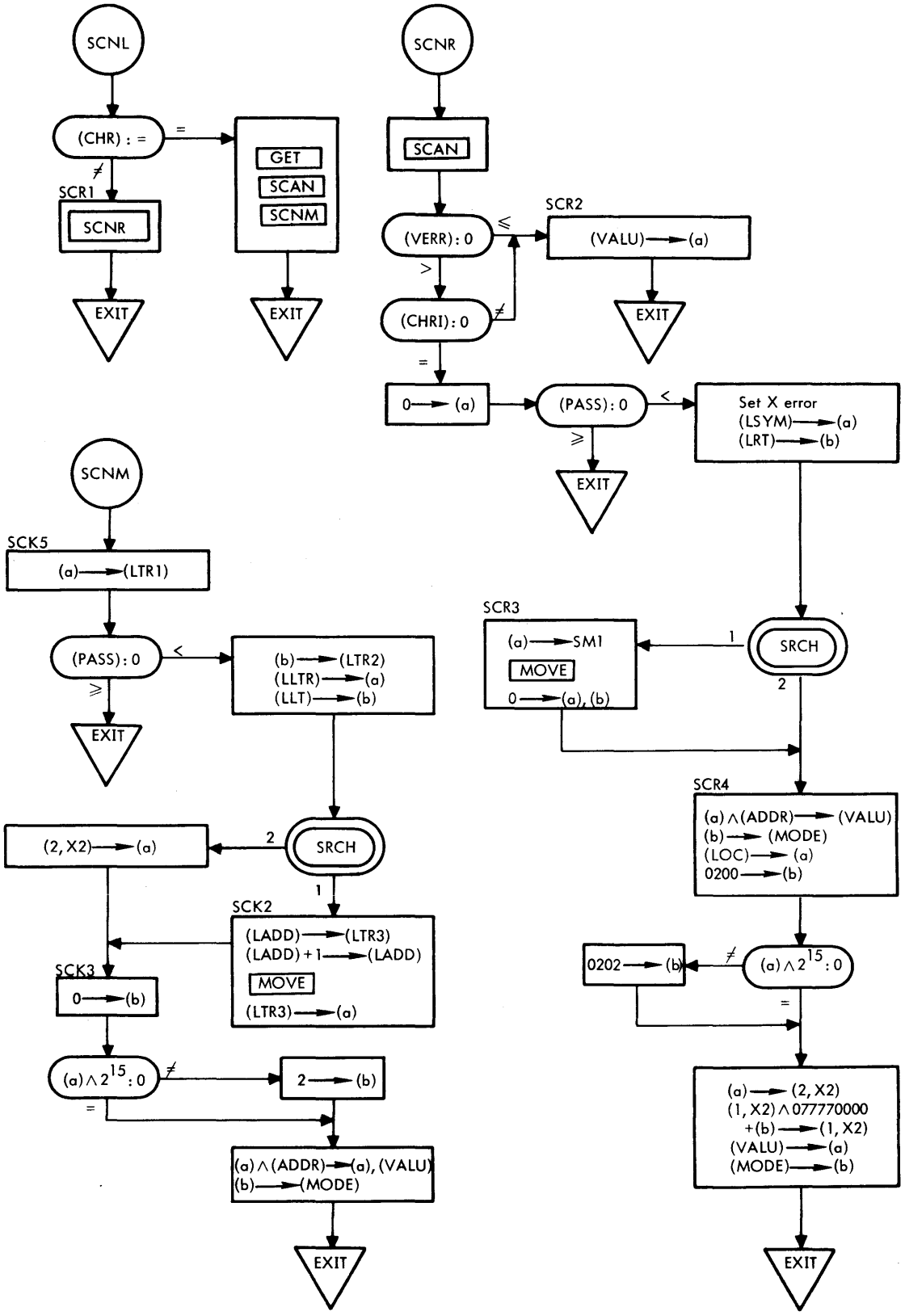
This subroutine will skip characters until a blank or comma is encountered. If the initial contents of CHR is not a blank or comma, the E error flag will be set.

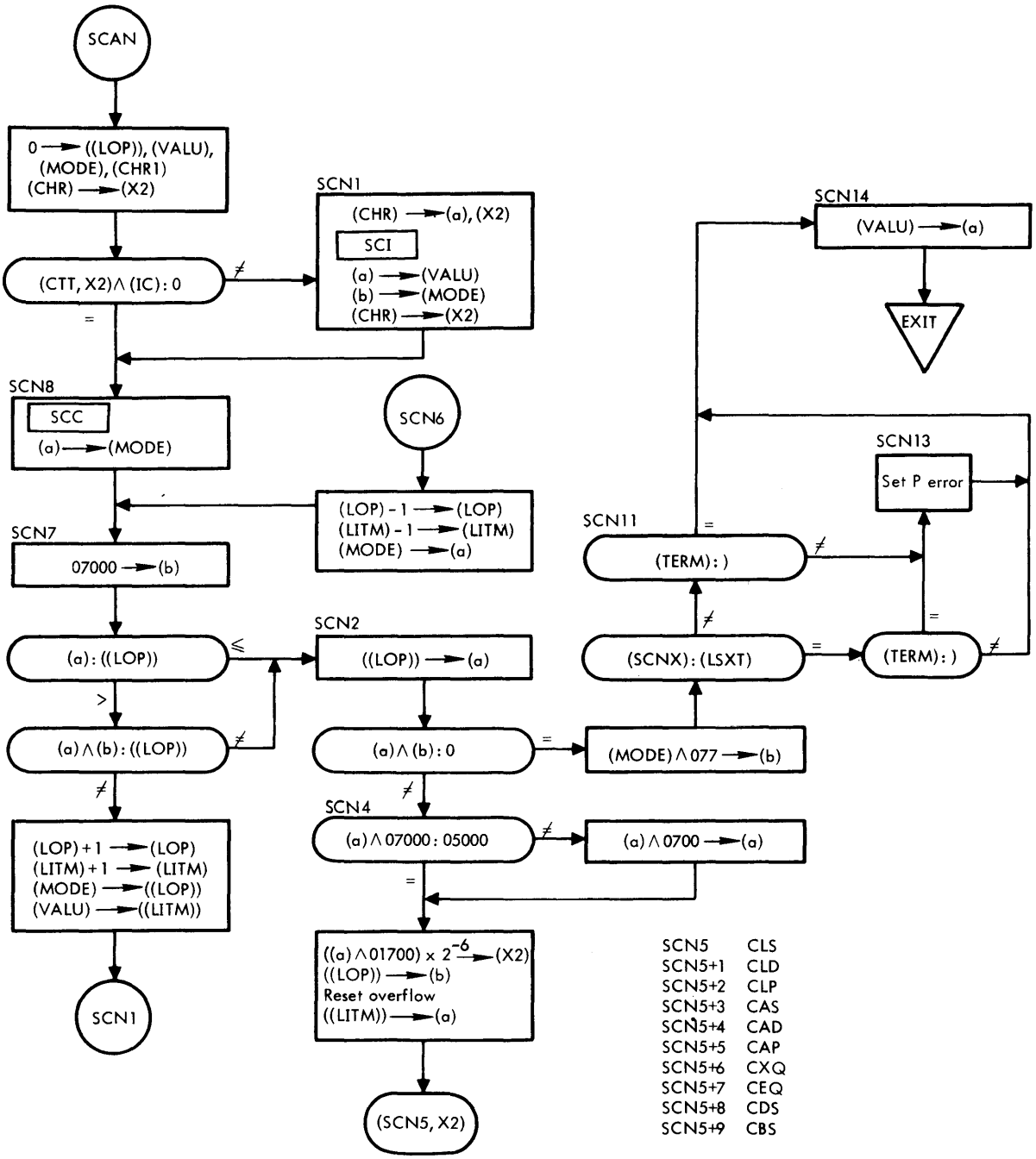
MAXL Compute maximum location counter value

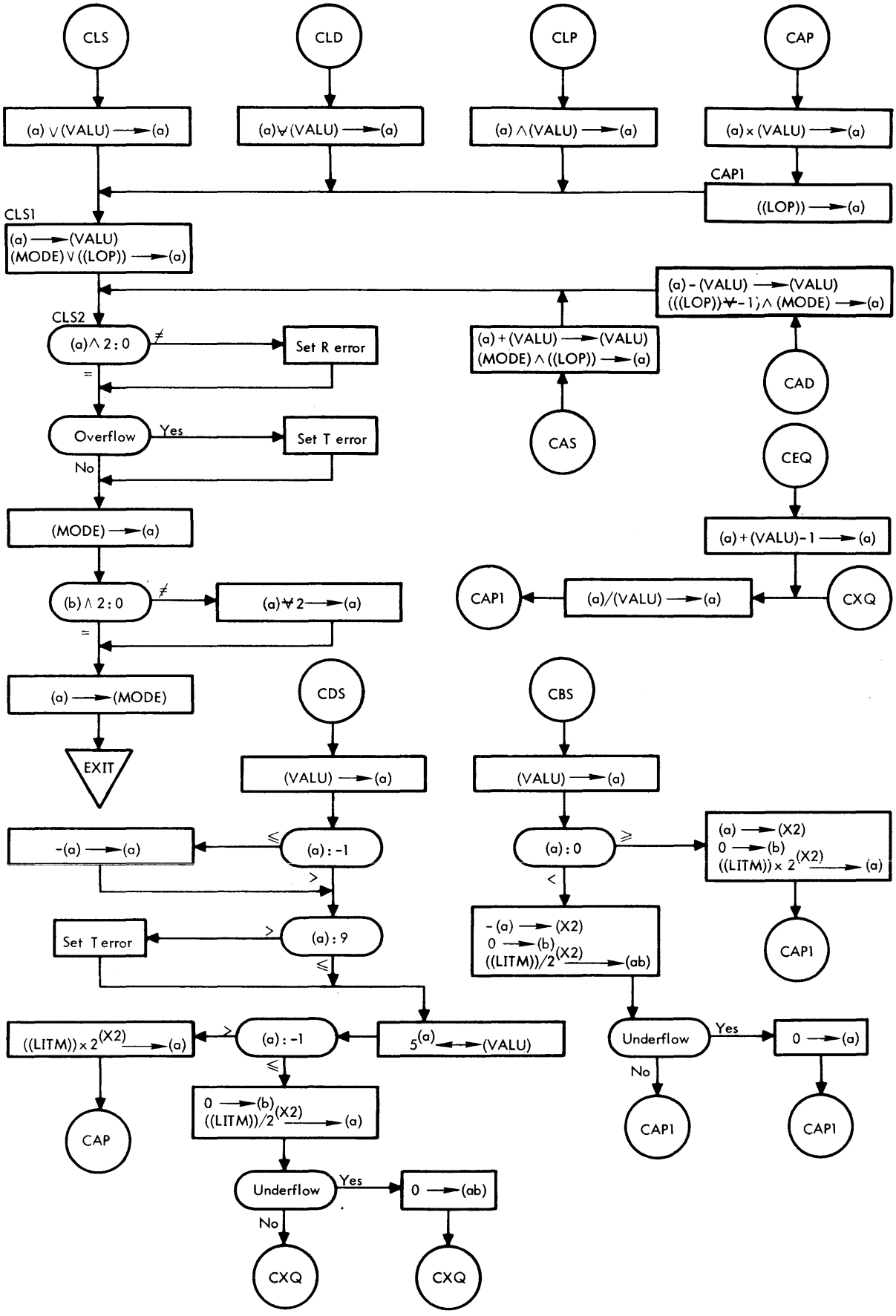
```
BRM   MAXL

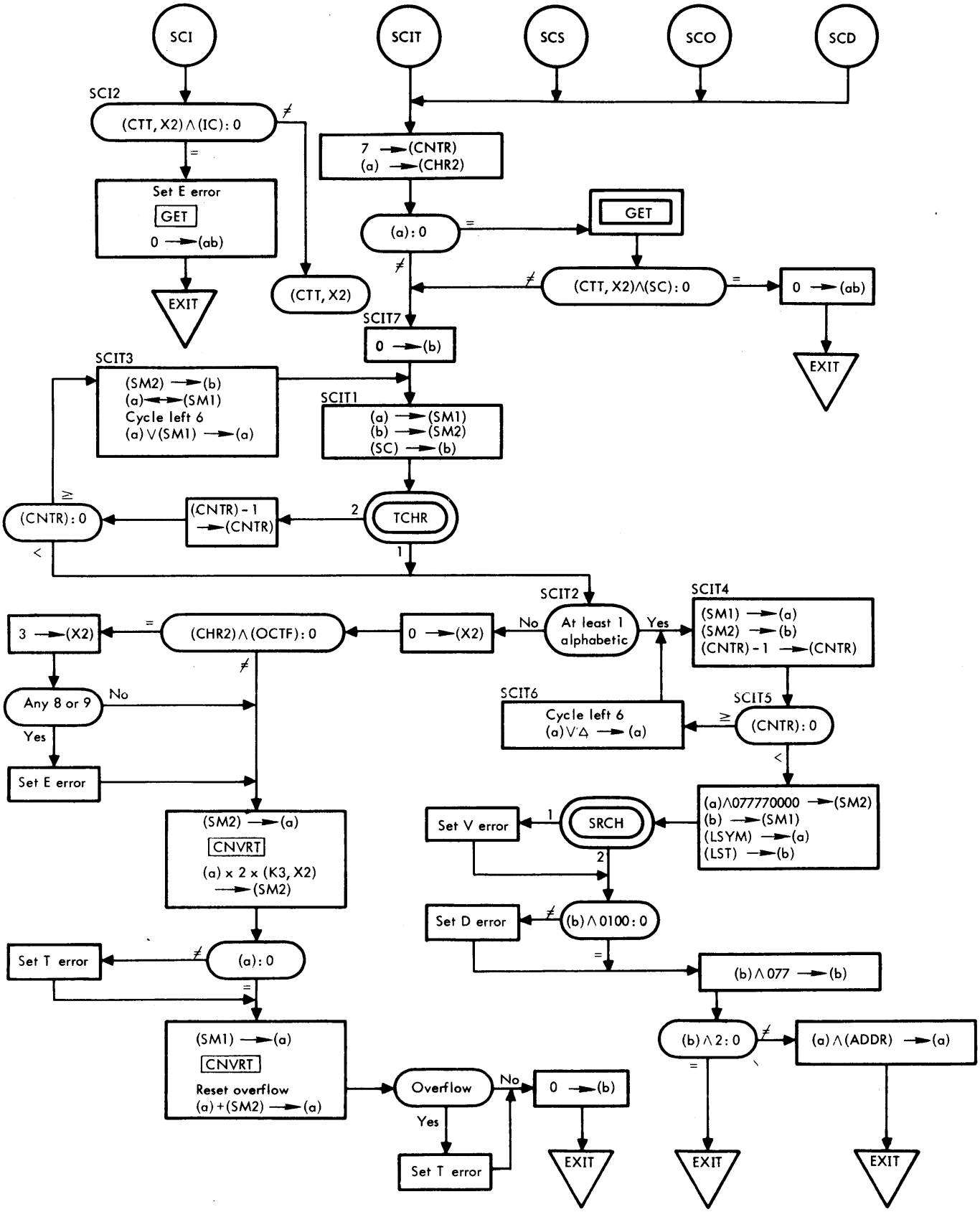
return
```

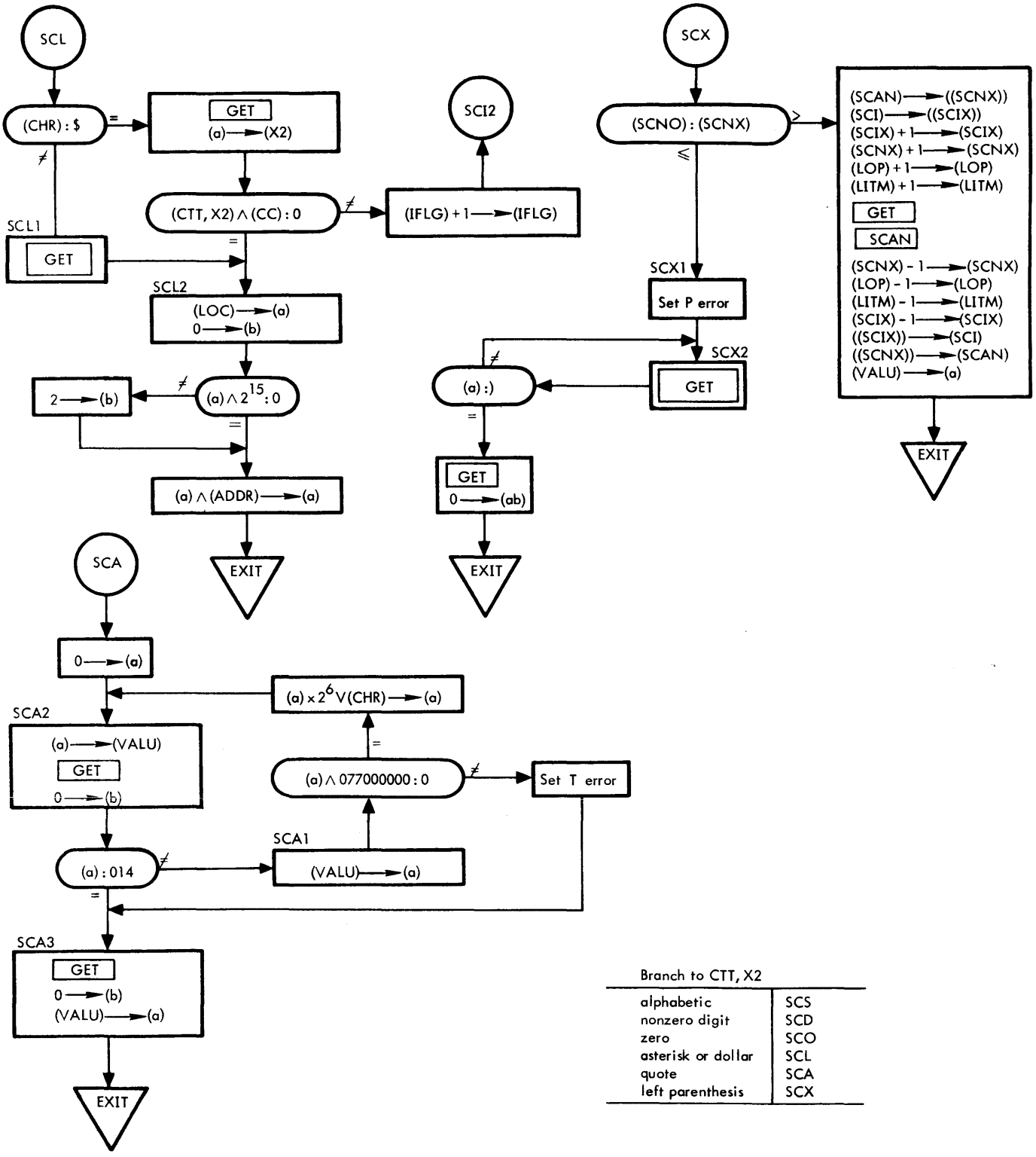
If the contents of LOC is greater than the contents of MLOC, the contents of LOC replaces the contents of MLOC.


SCNL
(CHR) : =
=
≠
SCR1
SCNR
EXIT
GET
SCAN
SCNM
EXIT
SCNR
SCAN
(VERR): 0
≤
SCR2
(VALU)→(a)
EXIT
>
(CHRI): 0
≠
=
0→(a)
(PASS): 0
<
Set X error
(LSYM)→(a)
(LRT)→(b)
≥
EXIT
SCNM
SCK5
(a)→(LTR1)
(PASS): 0
<
(b)→(LTR2)
(LLTR)→(a)
(LLT)→(b)
≥
EXIT
SCR3
(a)→SM1
MOVE
0→(a), (b)
1
SRCH
2
SCR4
(a)∧(ADDR)→(VALU)
(b)→(MODE)
(LOC)→(a)
0200→(b)
(2, X2)→(a)
2
SRCH
1
SCK2
(LADD)→(LTR3)
(LADD)+1→(LADD)
MOVE
(LTR3)→(a)
SCK3
0→(b)
0202→(b)
≠
(a)∧2^15 : 0
=
(a)∧2^15 : 0
≠
2→(b)
=
(a)∧(ADDR)→(a), (VALU)
(b)→(MODE)
EXIT
(a)→(2, X2)
(1, X2)∧077770000
+(b)→(1, X2)
(VALU)→(a)
(MODE)→(b)
EXIT

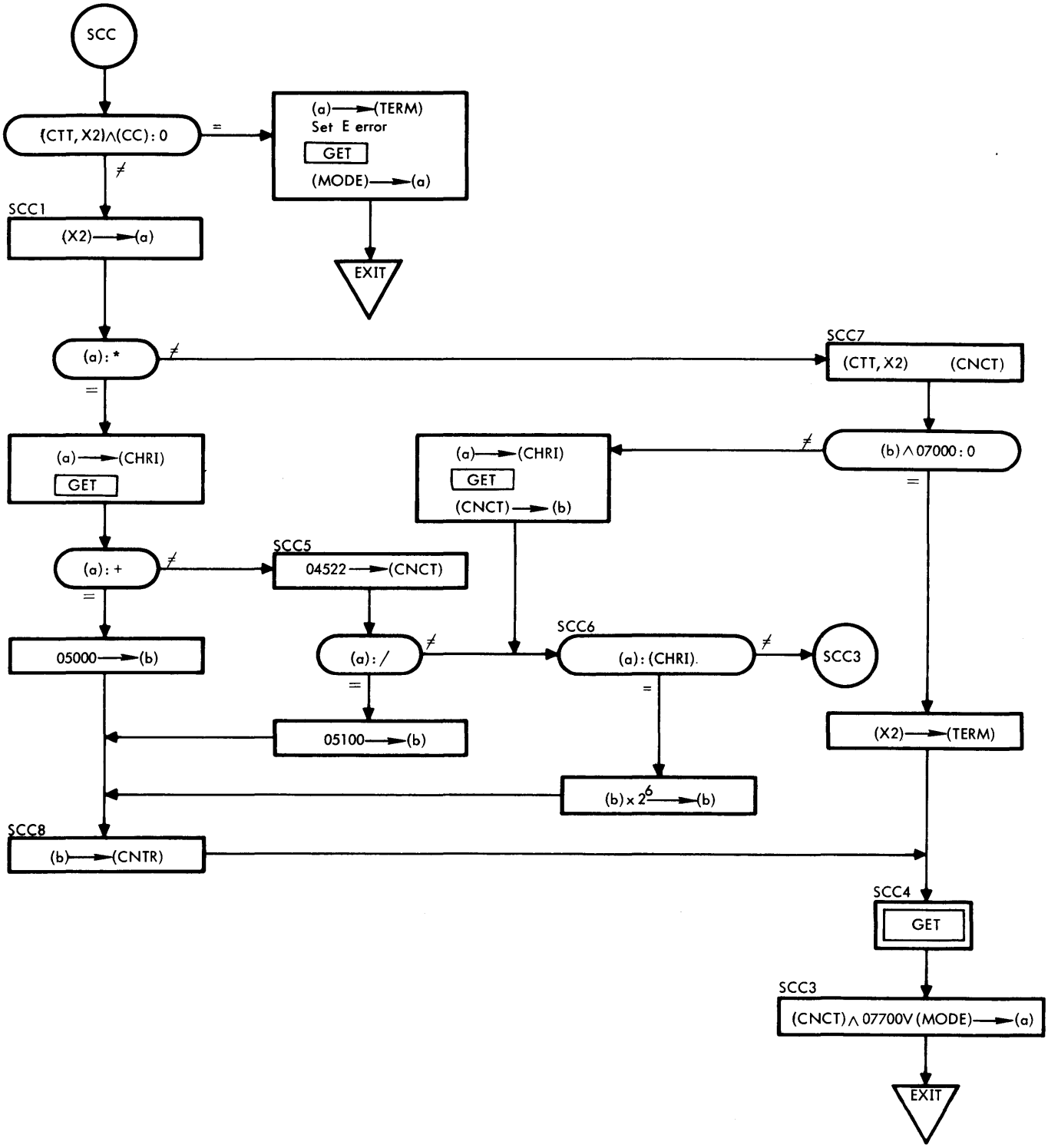

SCAN
0 → ((LOP)), (VALU), (MODE), (CHR1)
(CHR) → (X2)
(CTT, X2) ∧ (IC): 0
≠
=
SCN1
(CHR) → (a), (X2)
SCI
(a) → (VALU)
(b) → (MODE)
(CHR) → (X2)
SCN8
SCC
(a) → (MODE)
SCN6
(LOP) - 1 → (LOP)
(LITM) - 1 → (LITM)
(MODE) → (a)
SCN7
07000 → (b)
(a): ((LOP))
≤
>
(a) ∧ (b): ((LOP))
≠
≠
(LOP) + 1 → (LOP)
(LITM) + 1 → (LITM)
(MODE) → ((LOP))
(VALU) → ((LITM))
SCN1
SCN2
((LOP)) → (a)
(a) ∧ (b): 0
=
≠
SCN4
(a) ∧ 07000: 05000
≠
=
((a) ∧ 01700) x 2^-6 → (X2)
((LOP)) → (b)
Reset overflow
((LITM)) → (a)
(SCN5, X2)
(MODE) ∧ 077 → (b)
(a) ∧ 0700 → (a)
SCN11
(TERM):)
≠
=
(SCNX): (LSXT)
=
≠
SCN13
Set P error
(TERM):)
=
≠
SCN14
(VALU) → (a)
EXIT
SCN5 CLS
SCN5+1 CLD
SCN5+2 CLP
SCN5+3 CAS
SCN5+4 CAD
SCN5+5 CAP
SCN5+6 CXQ
SCN5+7 CEQ
SCN5+8 CDS
SCN5+9 CBS

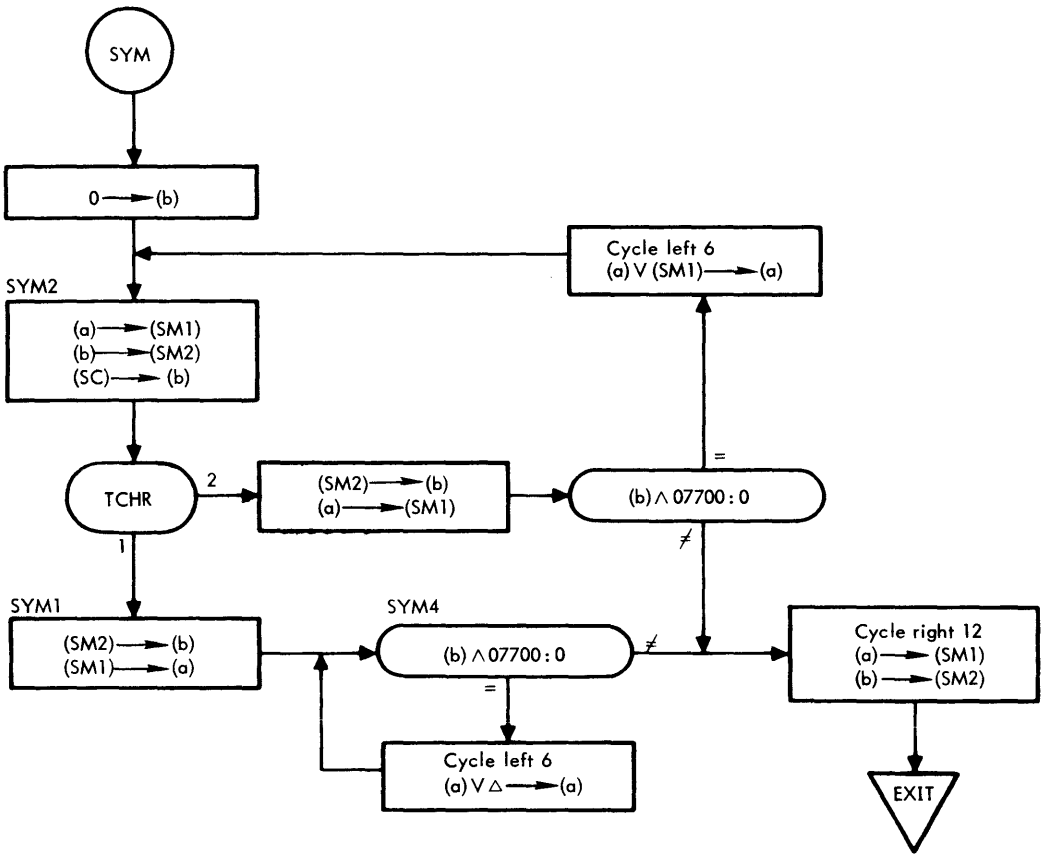

CLS
CLD
CLP
CAP
(a) ∨ (VALU) → (a)
(a) ∀ (VALU) → (a)
(a) ∧ (VALU) → (a)
(a) × (VALU) → (a)
CAP1
((LOP)) → (a)
CLS1
(a) → (VALU)
(MODE) ∨ ((LOP)) → (a)
(a) - (VALU) → (VALU)
(((LOP)) ∀ -1) ∧ (MODE) → (a)
CLS2
(a) ∧ 2 : 0
≠
Set R error
=
(a) + (VALU) → (VALU)
(MODE) ∧ ((LOP)) → (a)
CAD
Overflow
Yes
Set T error
No
CAS
CEQ
(MODE) → (a)
(a) + (VALU) - 1 → (a)
(b) ∧ 2 : 0
≠
(a) ∀ 2 → (a)
CAP1
(a) / (VALU) → (a)
CXQ
=
(a) → (MODE)
CDS
CBS
EXIT
(VALU) → (a)
(VALU) → (a)
-(a) → (a)
≤
(a) : -1
(a) : 0
≥
(a) → (X2)
0 → (b)
((LITM)) × 2^(X2) → (a)
>
<
Set T error
>
(a) : 9
≤
-(a) → (X2)
0 → (b)
((LITM))/2^(X2) → (ab)
CAP1
((LITM)) × 2^(X2) → (a)
>
(a) : -1
5^(a) ↔ (VALU)
Underflow
Yes
0 → (a)
≤
No
CAP
0 → (b)
((LITM))/2^(X2) → (a)
CAP1
CAP1
Underflow
Yes
0 → (ab)
No
CXQ
CXQ

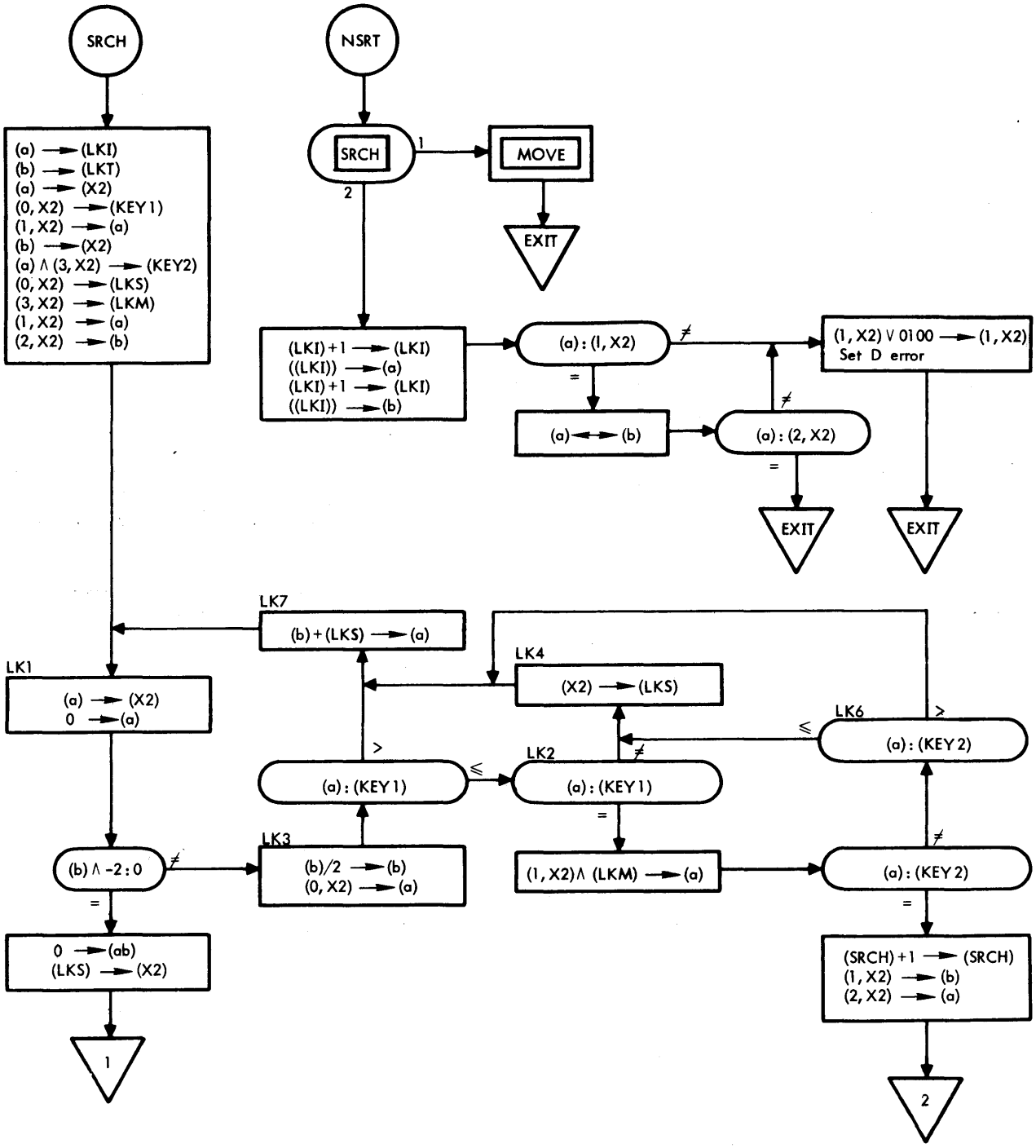

SCI
SCIT
SCS
SCO
SCD
SCI2
(CTT, X2) ∧ (IC) : 0
≠
=
Set E error
GET
0 → (ab)
EXIT
(CTT, X2)
7 → (CNTR)
(a) → (CHR2)
(a) : 0
=
GET
≠
(CTT, X2) ∧ (SC) : 0
=
0 → (ab)
EXIT
SCIT7
0 → (b)
SCIT3
(SM2) → (b)
(a) ↔ (SM1)
Cycle left 6
(a) ∨ (SM1) → (a)
SCIT1
(a) → (SM1)
(b) → (SM2)
(SC) → (b)
≥
(CNTR) : 0
<
(CNTR) - 1 → (CNTR)
2
TCHR
1
SCIT2
No
At least 1 alphabetic
Yes
SCIT4
(SM1) → (a)
(SM2) → (b)
(CNTR) - 1 → (CNTR)
3 → (X2)
=
(CHR2) ∧ (OCTF) : 0
0 → (X2)
≠
Any 8 or 9
No
Yes
Set E error
SCIT6
Cycle left 6
(a) ∨ Δ → (a)
SCIT5
≥
(CNTR) : 0
<
(a) ∧ 077770000 → (SM2)
(b) → (SM1)
(LSYM) → (a)
(LST) → (b)
Set V error
1
SRCH
2
(SM2) → (a)
CNVRT
(a) x 2 x (K3, X2) → (SM2)
Set D error
≠
(b) ∧ 0100 : 0
=
(b) ∧ 077 → (b)
Set T error
≠
(a) : 0
=
(b) ∧ 2 : 0
≠
(a) ∧ (ADDR) → (a)
=
(SM1) → (a)
CNVRT
Reset overflow
(a) + (SM2) → (a)
Overflow
No
Yes
0 → (b)
Set T error
EXIT
EXIT
EXIT

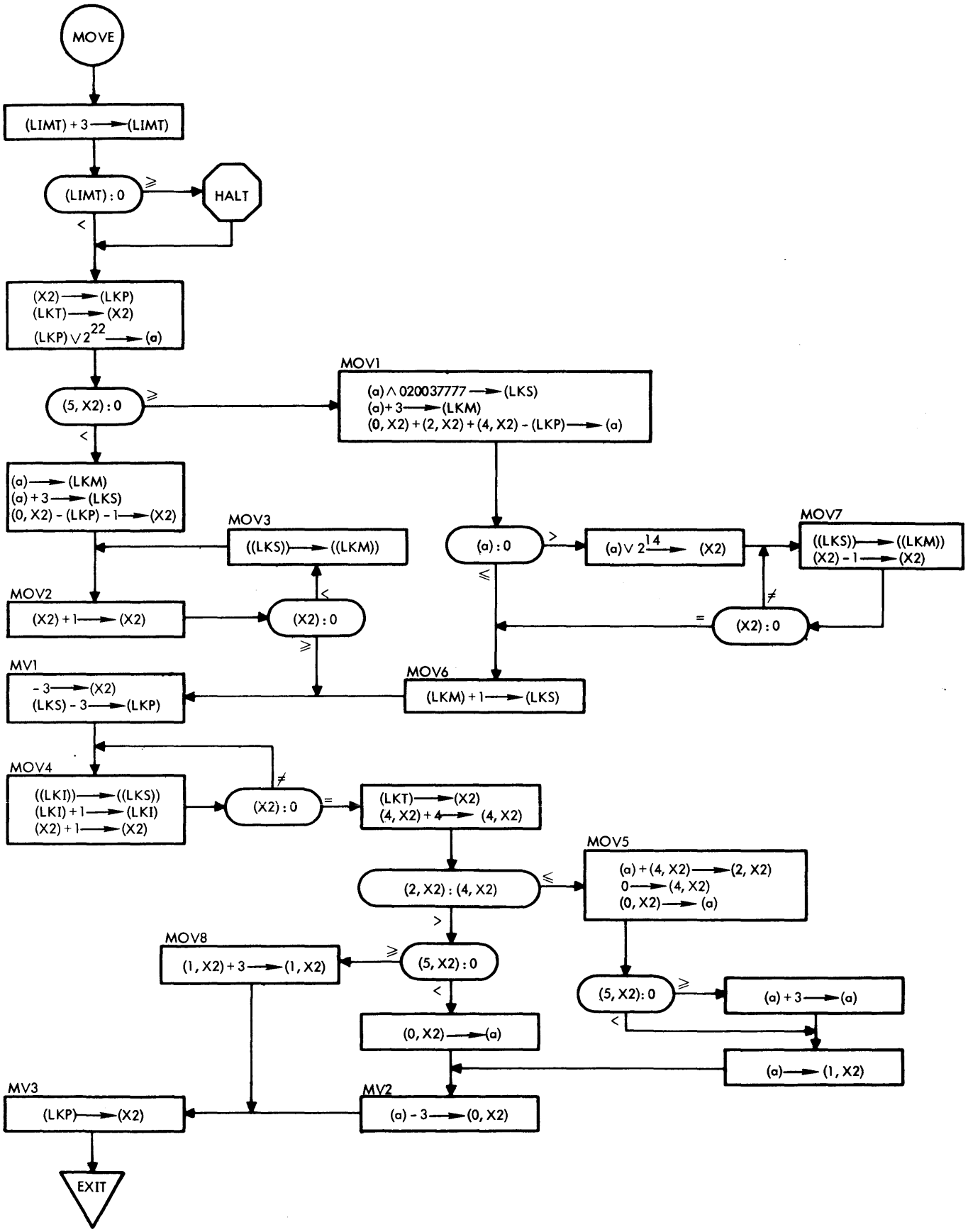


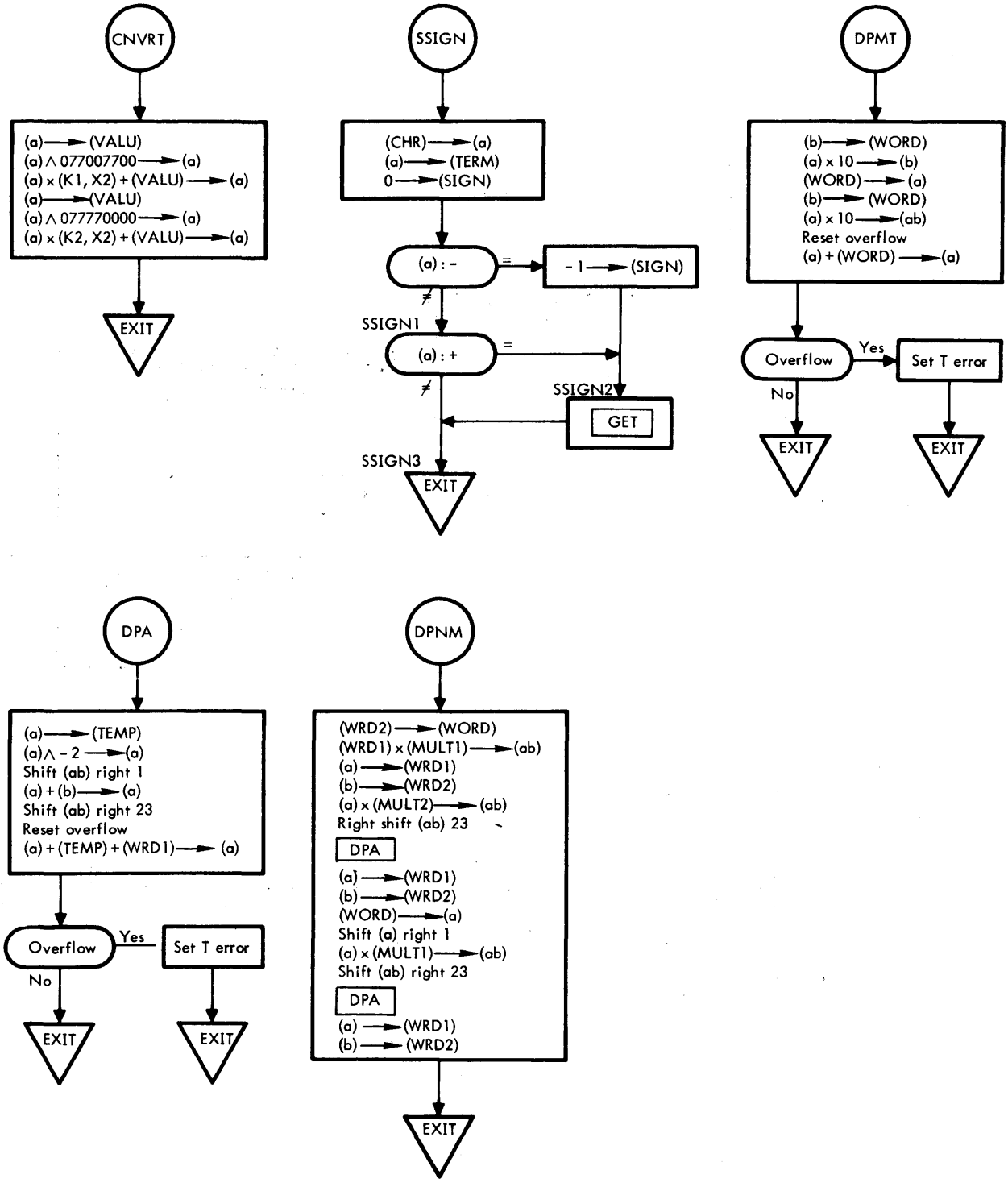
Branch to CTT, X2	
alphabetic	SCS
nonzero digit	SCD
zero	SCO
asterisk or dollar	SCL
quote	SCA
left parenthesis	SCX

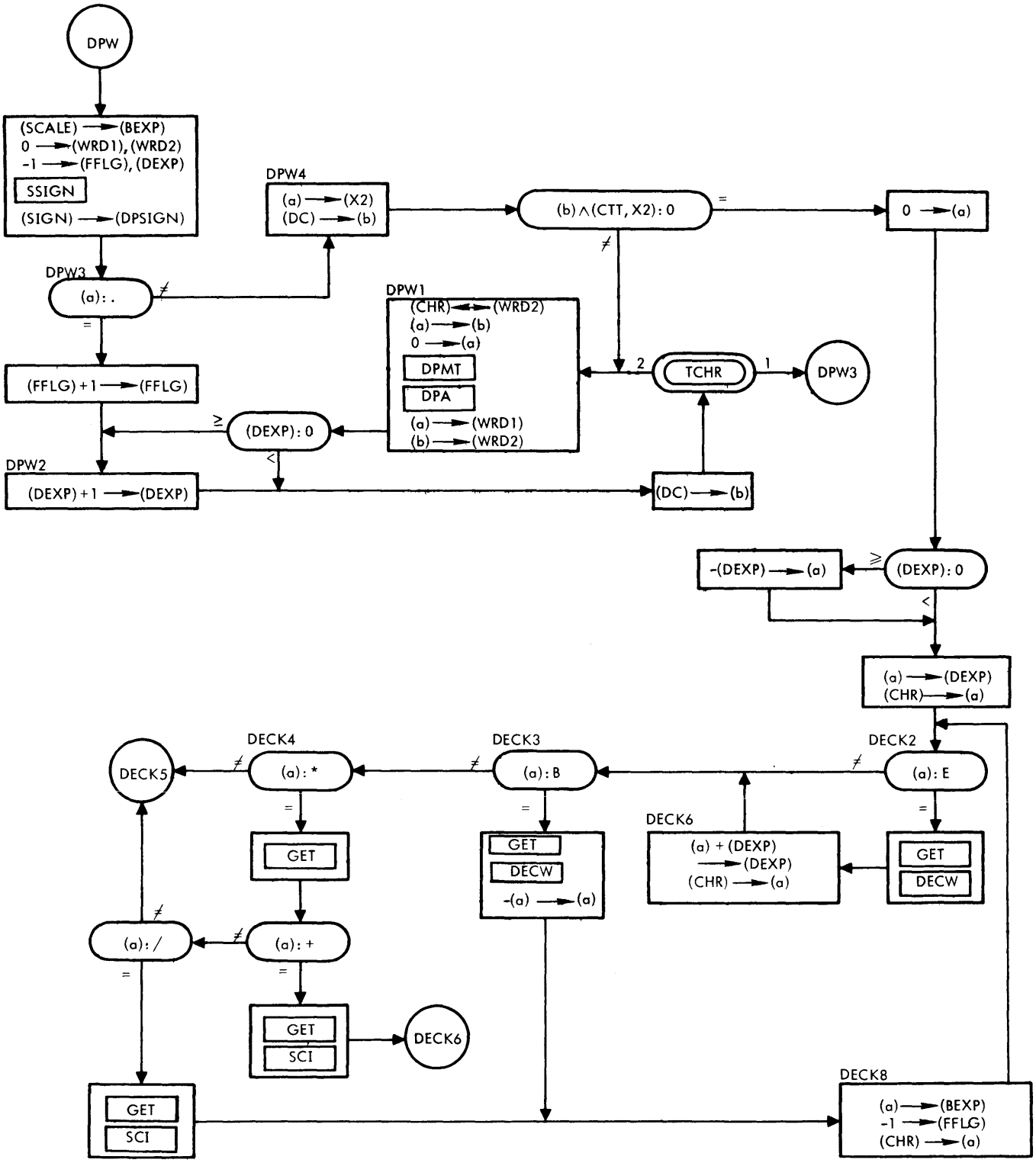

SCC
(CTT, X2)∧(CC): 0
=
(a)→(TERM)
Set E error
GET
(MODE)→(a)
EXIT
≠
SCC1
(X2)→(a)
(a): *
≠
SCC7
(CTT, X2) (CNCT)
=
(a)→(CHRI)
GET
(a)→(CHRI)
GET
(CNCT)→(b)
≠
(b)∧07000: 0
=
(a): +
≠
SCC5
04522→(CNCT)
=
05000→(b)
(a): /
≠
SCC6
(a): (CHRI).
≠
SCC3
=
=
05100→(b)
(X2)→(TERM)
(b)×2^6→(b)
SCC8
(b)→(CNTR)
SCC4
GET
SCC3
(CNCT)∧07700V (MODE)→(a)
EXIT

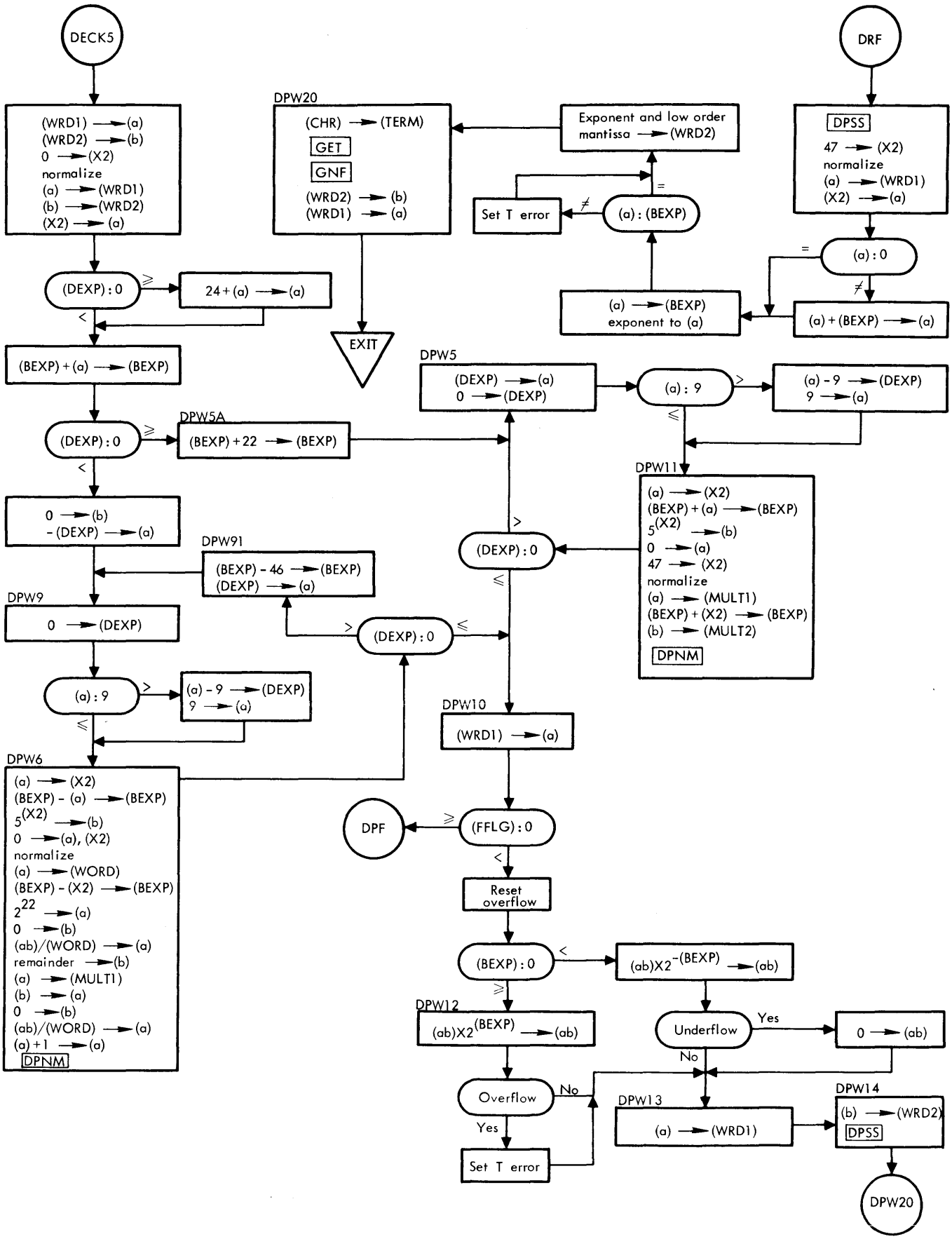

SYM
0 → (b)
Cycle left 6
(a) V (SM1) → (a)
SYM2
(a) → (SM1)
(b) → (SM2)
(SC) → (b)
TCHR
2
(SM2) → (b)
(a) → (SM1)
(b) ∧ 07700 : 0
=
≠
1
SYM1
(SM2) → (b)
(SM1) → (a)
SYM4
(b) ∧ 07700 : 0
≠
=
Cycle right 12
(a) → (SM1)
(b) → (SM2)
Cycle left 6
(a) V Δ → (a)
EXIT

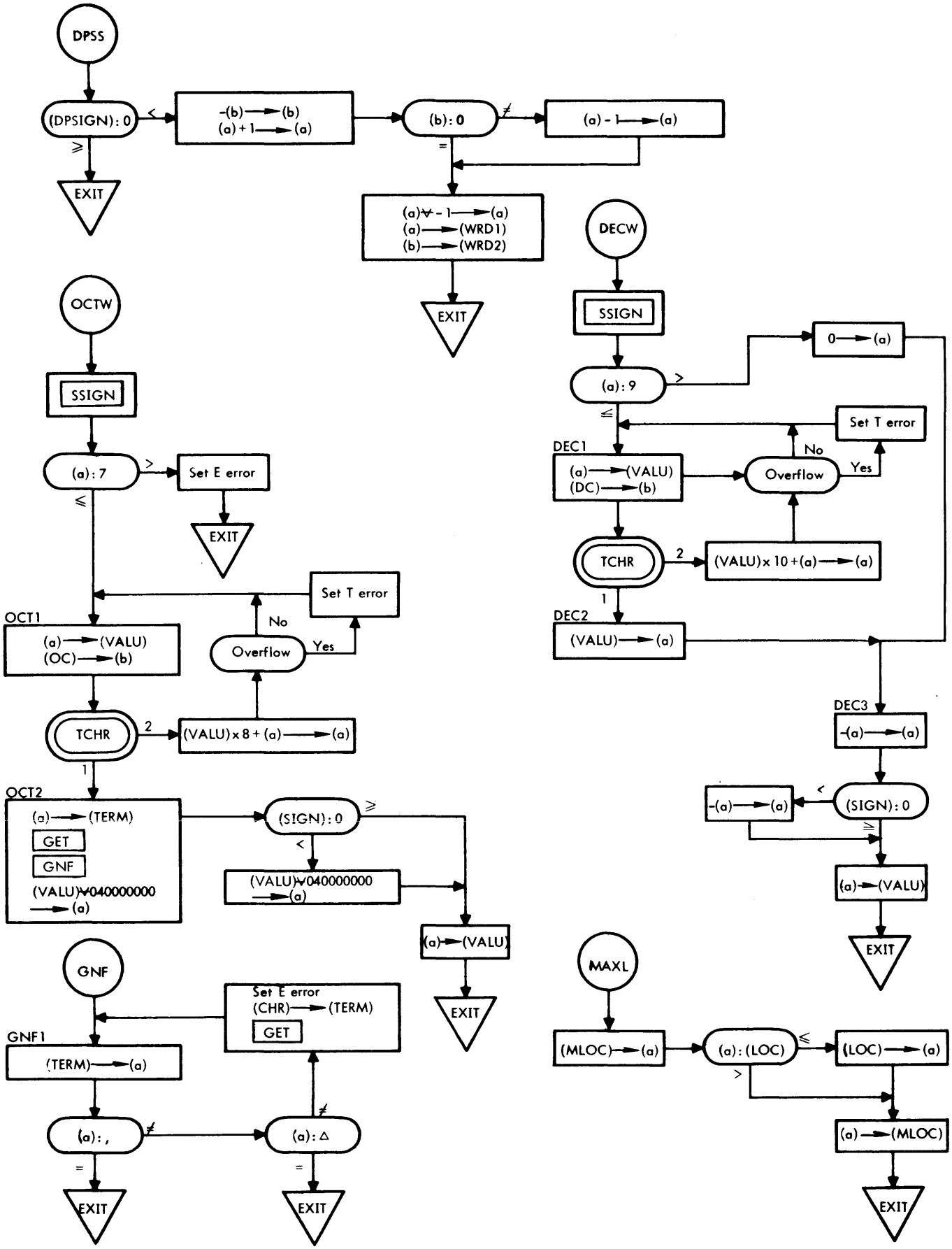

SRCH
(a) → (LKI)
(b) → (LKT)
(a) → (X2)
(0, X2) → (KEY1)
(1, X2) → (a)
(b) → (X2)
(a) ∧ (3, X2) → (KEY2)
(0, X2) → (LKS)
(3, X2) → (LKM)
(1, X2) → (a)
(2, X2) → (b)
NSRT
SRCH
1
2
MOVE
EXIT
(LKI)+1 → (LKI)
((LKI)) → (a)
(LKI)+1 → (LKI)
((LKI)) → (b)
(a) : (1, X2)
≠
=
(1, X2) ∨ 0100 → (1, X2)
Set D error
(a) ↔ (b)
(a) : (2, X2)
≠
=
EXIT
EXIT
LK7
(b) + (LKS) → (a)
LK1
(a) → (X2)
0 → (a)
LK4
(X2) → (LKS)
LK6
≤
>
(a) : (KEY2)
>
(a) : (KEY1)
≤
LK2
(a) : (KEY1)
≠
=
(b) ∧ -2 : 0
≠
=
LK3
(b)/2 → (b)
(0, X2) → (a)
(1, X2) ∧ (LKM) → (a)
(a) : (KEY2)
≠
=
0 → (ab)
(LKS) → (X2)
(SRCH)+1 → (SRCH)
(1, X2) → (b)
(2, X2) → (a)
1
2


MOVE
(LIMT) + 3 → (LIMT)
(LIMT) : 0
≥
HALT
<
(X2) → (LKP)
(LKT) → (X2)
(LKP) ∨ 2^22 → (a)
MOV1
(5, X2) : 0
≥
(a) ∧ 020037777 → (LKS)
(a) + 3 → (LKM)
(0, X2) + (2, X2) + (4, X2) - (LKP) → (a)
<
(a) → (LKM)
(a) + 3 → (LKS)
(0, X2) - (LKP) - 1 → (X2)
MOV3
((LKS)) → ((LKM))
(a) : 0
>
(a) ∨ 2^14 → (X2)
MOV7
((LKS)) → ((LKM))
(X2) - 1 → (X2)
≤
≠
=
MOV2
(X2) + 1 → (X2)
(X2) : 0
<
≥
(X2) : 0
MV1
- 3 → (X2)
(LKS) - 3 → (LKP)
MOV6
(LKM) + 1 → (LKS)
MOV4
((LKI)) → ((LKS))
(LKI) + 1 → (LKI)
(X2) + 1 → (X2)
≠
(X2) : 0
=
(LKT) → (X2)
(4, X2) + 4 → (4, X2)
MOV5
(2, X2) : (4, X2)
≤
(a) + (4, X2) → (2, X2)
0 → (4, X2)
(0, X2) → (a)
>
MOV8
(1, X2) + 3 → (1, X2)
≥
(5, X2) : 0
<
(5, X2): 0
≥
(a) + 3 → (a)
<
(0, X2) → (a)
(a) → (1, X2)
MV3
(LKP) → (X2)
MV2
(a) - 3 → (0, X2)
EXIT


CNVRT
(a) → (VALU)
(a) ∧ 077007700 → (a)
(a) x (K1, X2) + (VALU) → (a)
(a) → (VALU)
(a) ∧ 077770000 → (a)
(a) x (K2, X2) + (VALU) → (a)
EXIT
SSIGN
(CHR) → (a)
(a) → (TERM)
0 → (SIGN)
(a) : -
=
- 1 → (SIGN)
≠
SSIGN1
(a) : +
=
≠
SSIGN2
GET
SSIGN3
EXIT
DPMT
(b) → (WORD)
(a) x 10 → (b)
(WORD) → (a)
(b) → (WORD)
(a) x 10 → (ab)
Reset overflow
(a) + (WORD) → (a)
Overflow
Yes
Set T error
No
EXIT
EXIT
DPA
(a) → (TEMP)
(a) ∧ - 2 → (a)
Shift (ab) right 1
(a) + (b) → (a)
Shift (ab) right 23
Reset overflow
(a) + (TEMP) + (WRD1) → (a)
Overflow
Yes
Set T error
No
EXIT
EXIT
DPNM
(WRD2) → (WORD)
(WRD1) x (MULT1) → (ab)
(a) → (WRD1)
(b) → (WRD2)
(a) x (MULT2) → (ab)
Right shift (ab) 23
DPA
(a) → (WRD1)
(b) → (WRD2)
(WORD) → (a)
Shift (a) right 1
(a) x (MULT1) → (ab)
Shift (ab) right 23
DPA
(a) → (WRD1)
(b) → (WRD2)
EXIT


DPW
(SCALE) → (BEXP)
0 → (WRD1), (WRD2)
-1 → (FFLG), (DEXP)
SSIGN
(SIGN) → (DPSIGN)
DPW4
(a) → (X2)
(DC) → (b)
(b) ∧ (CTT, X2): 0
=
0 → (a)
≠
DPW3
(a): .
≠
=
DPW1
(CHR) ↔ (WRD2)
(a) → (b)
0 → (a)
DPMT
DPA
(a) → (WRD1)
(b) → (WRD2)
2
TCHR
1
DPW3
(FFLG) + 1 → (FFLG)
≥
(DEXP): 0
<
DPW2
(DEXP) + 1 → (DEXP)
(DC) → (b)
-(DEXP) → (a)
≥
(DEXP): 0
<
(a) → (DEXP)
(CHR) → (a)
DECK4
DECK3
DECK2
DECK5
≠
(a): *
≠
(a): B
≠
(a): E
=
=
=
GET
GET
DECW
-(a) → (a)
DECK6
(a) + (DEXP) → (DEXP)
(CHR) → (a)
GET
DECW
≠
(a): /
≠
(a): +
=
=
GET
SCI
DECK6
GET
SCI
DECK8
(a) → (BEXP)
-1 → (FFLG)
(CHR) → (a)


DECK5
(WRD1) → (a)
(WRD2) → (b)
0 → (X2)
normalize
(a) → (WRD1)
(b) → (WRD2)
(X2) → (a)
(DEXP) : 0
≥
24 + (a) → (a)
<
(BEXP) + (a) → (BEXP)
(DEXP) : 0
≥
DPW5A
(BEXP) + 22 → (BEXP)
<
0 → (b)
- (DEXP) → (a)
DPW91
(BEXP) - 46 → (BEXP)
(DEXP) → (a)
DPW9
0 → (DEXP)
(a) : 9
>
(a) - 9 → (DEXP)
9 → (a)
≤
DPW6
(a) → (X2)
(BEXP) - (a) → (BEXP)
5^(X2) → (b)
0 → (a), (X2)
normalize
(a) → (WORD)
(BEXP) - (X2) → (BEXP)
2^22 → (a)
0 → (b)
(ab)/(WORD) → (a)
remainder → (b)
(a) → (MULT1)
(b) → (a)
0 → (b)
(ab)/(WORD) → (a)
(a) + 1 → (a)
DPNM
DPW20
(CHR) → (TERM)
GET
GNF
(WRD2) → (b)
(WRD1) → (a)
EXIT
Exponent and low order mantissa → (WRD2)
Set T error
≠
(a) : (BEXP)
=
(a) → (BEXP) exponent to (a)
DRF
DPSS
47 → (X2)
normalize
(a) → (WRD1)
(X2) → (a)
=
(a) : 0
≠
(a) + (BEXP) → (a)
DPW5
(DEXP) → (a)
0 → (DEXP)
(a) : 9
>
(a) - 9 → (DEXP)
9 → (a)
≤
DPW11
(a) → (X2)
(BEXP) + (a) → (BEXP)
5^(X2) → (b)
0 → (a)
47 → (X2)
normalize
(a) → (MULT1)
(BEXP) + (X2) → (BEXP)
(b) → (MULT2)
DPNM
>
(DEXP) : 0
≤
>
(DEXP) : 0
≤
DPW10
(WRD1) → (a)
DPF
≥
(FFLG) : 0
<
Reset overflow
(BEXP) : 0
<
(ab)X2^-(BEXP) → (ab)
≥
DPW12
(ab)X2^(BEXP) → (ab)
Underflow
Yes
0 → (ab)
No
Overflow
No
Yes
Set T error
DPW13
(a) → (WRD1)
DPW14
(b) → (WRD2)
DPSS
DPW20


DPSS
(DPSIGN): 0
-(b)→(b)
(a)+1→(a)
(b): 0
(a)-1→(a)
EXIT
(a)∀-1→(a)
(a)→(WRD1)
(b)→(WRD2)
EXIT
OCTW
SSIGN
(a): 7
Set E error
EXIT
OCT1
(a)→(VALU)
(OC)→(b)
Overflow
No
Yes
Set T error
TCHR
2
(VALU)x 8 + (a)→(a)
1
OCT2
(a)→(TERM)
GET
GNF
(VALU)∀040000000
→(a)
(SIGN): 0
(VALU)∀040000000
→(a)
(a)→(VALU)
EXIT
GNF
Set E error
(CHR)→(TERM)
GET
GNF1
(TERM)→(a)
(a): ,
(a): Δ
EXIT
EXIT
DECW
SSIGN
0→(a)
(a): 9
Set T error
DEC1
(a)→(VALU)
(DC)→(b)
Overflow
No
Yes
TCHR
2
(VALU)x 10 + (a)→(a)
1
DEC2
(VALU)→(a)
DEC3
-(a)→(a)
-(a)→(a)
(SIGN): 0
(a)→(VALU)
EXIT
MAXL
(MLOC)→(a)
(a): (LOC)
(LOC)→(a)
(a)→(MLOC)
EXIT

```
                                    1 *       S2
          00000000                  2 S9300   EQU     0
          00000000                  3 X0      EQU     S9300
          00000002                  4 X2      EQU     2-S9300
                                    5 CAB     BPD     016400000
                                    6 CBA     BPD     016500000
                                    7 CAX     BPD     016600000
                                    8 CXA     BPD     016700000
                                    9 CBX     BPD     017000000
                                   10 CNA     BPD     017100000
                                   11 SKE     BPD     017200000
                                   12 SKR     BPD     017300000
                                   13 MUL     BPD     017400000
                                   14 DIV     BPD     017500000
                                   15 ADM     BPD     017600000
                                   16 XMA     BPD     017700000
00000     0 00 0 00035             17 $LSYM   HLT     SM1
00001                              18 $MLOC   RES     1
00002                              19 $SCNX   RES     1
00003                              20 $LOP    RES     1
00004                              21 $LITM   RES     1
00005                              22 $SCIX   RES     1
00006     23305101                 23 CHR1    TEXT    4,CHR1
00007     23305102                 24 CHR2    TEXT    4,CHR2
00010                              25 LREF    RES     1
00011     23452363                 26 CNCT    TEXT    4,CNCT
00012                              27 TEMP    RES     2
*  00014  0 00 0 00000             28 LLT     HLT     TPL     LOCATION OF LITERAL TABLE PACKET
*  00015  0 00 0 00000             29 LLTR    HLT     LTR1    LOCATION OF LTR1
*  00016  0 00 0 00000             30 SCNO    HLT     SOT     SCAN STORAGE LIMIT
00017                              31 B1      RES     0
00017     20000000                 32 B1      DATA    020000000
00020     70000000                 33 A0      DATA    070000000
00021     00007000                 34 A4      DATA    07000
00022     00000700                 35 A5      DATA    0700
00023     00040000                 36 B9      DATA    040000
00024     77000000                 37 C0      DATA    077000000
00025     00007700                 38 C2      DATA    07700
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00026  77007700             39 C02     DATA    077007700
00027  00000105             40 P69     DATA    69
00030  00000057             41 P47     DATA    47
00031  00000011             42 P9      DATA    011
00032  00000005             43 P5      DATA    5
00033  00000202             44 RRM     DATA    0202
00034  2 00 0 37777         45 XADR    HLT     -1,X2
00035                       46 $SM1    RES     1
00036  62440260             47 SM2     TEXT    4,SM2
00037  62440360             48 SM3     TEXT    4,SM3
00040  42257001             49 KEY1    TEXT    4,KEY1
00041  42257002             50 KEY2    TEXT    4,KEY2
00042  43423160             51 LKI     TEXT    4,LKI
00043  43424460             52 LKM     TEXT    4,LKM
00044  43424760             53 LKP     TEXT    4,LKP
00045  43426260             54 LKS     TEXT    4,LKS
00046  43426360             55 LKT     TEXT    4,LKT
00047                       56 SIGN    RES     1
00050                       57 DPSIGN  RES     1
00051                       58 BEXP    RES     1
00052                       59 $SCALE  RES     1
00053                       60 DEXP    RES     1
00054                       61 FFLG    RES     1
00055                       62 MULT1   RES     1
00056                       63 MULT2   RES     1
00057  0 00 0 04522         64 AP      HLT     PCON                PRODUCT CONNECTER
                            65 KF1     FORM    7,17
                            66 KF2     FORM    13,11
00060  112 000000           67 K1      KF1     10-0100,0
00061  10144 0000           68 K2      KF2     100-010000,0
00062  00011610             69 K3      DATA    5000
00063  110 000000           70         KF1     010-0100,0
00064  10100 0000           71         KF2     0100-010000,0
00065  00004000             72         DATA    010000/2
00066                       73 B23     RES     0
00066                       74 ONE     RES     0
00066  00000001             75 FIVES   DATA    1
00067  00000005             76         DATA    5
00070  00000031             77         DATA    25
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00071  00000175          78          DATA   125
00072  00001161          79          DATA   625
00073  00006065          80          DATA   3125
00074  00036411          81          DATA   15625
00075  00230455          82          DATA   78125
00076  01372741          83          DATA   390625
00077  07346545          84          DATA   1953125
00100                    85 M2       RES    0
00100  77777776          86 L0M      DATA   077777776
00101  00000777          87 FEM      DATA   0777
00102  77777000          88 FMM      DATA   077777000
00103  00C07777          89 MK12     DATA   07777
00104  00770077          90 MK6      DATA   0770077
00105  07070707          91 MK3      DATA   07070707
                         92 XYZ      0PD    06000000
                         93 ITM      0PD    04000000    ITEM
                         94 C0N      0PD    02000000    CONNECTER
                         95 STM      0PD    05400000    SYMB0L,LABEL,ITEM
                         96 DTM      0PD    04600000    DECIMAL,SYMB0L,ITEM
                         97 0TM      0PD    04700000    0CTAL,DECIMAL,SYMB0L,ITEM
00106                    98 $CTT     RES    0
00106  0 47 0 00443      99          0TM    SC0         0 00
00107  0 47 0 00443     100          0TM    SCD         1 01
00110  0 47 0 00443     101          0TM    SCD         2 02
00111  0 47 0 00443     102          0TM    SCD         3 03
00112  0 47 0 00443     103          0TM    SCD         4 04
00113  0 47 0 00443     104          0TM    SCD         5 05
00114  0 47 0 00443     105          0TM    SCD         6 06
00115  0 47 0 00443     106          0TM    SCD         7 07
00116  0 46 0 00443     107          DTM    SCD         8 10
00117  0 46 0 00443     108          DTM    SCD         9 11
00120  0 00 0 00000     109 Z        HLT    0
00121  0 00 0 00077     110 C3       HLT    077
00122  0 40 0 00577     111          ITM    SCA         * 14
00123  40000000         112 B0       DATA   040000000
00124  0 00 0 00002     113 B22      HLT    2
00125  0 00 0 00030     114 P24      HLT    24
00126  0 20 0 03310     115          C0N    SC0N        + 20
00127  0 54 0 00443     116          STM    SCS         A 21
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00130  0 54 0 00443        117          STM     SCS          B 22
00131  0 54 0 00443        118          STM     SCS          C 23
00132  0 54 0 00443        119          STM     SCS          D 24
00133  0 54 0 00443        120          STM     SCS          E 25
00134  0 54 0 00443        121          STM     SCS          F 26
00135  0 54 0 00443        122          STM     SCS          G 27
00136  0 54 0 00443        123          STM     SCS          H 30
00137  0 54 0 00443        124          STM     SCS          I 31
00140  0 00 0 00013        125 ECHR     HLT     '='
00141  0 00 0 00040        126 MCHR     HLT     '-'          ( 33
00142  0 20 0 00200        127          CON     RCON         ) 34
00143  0 00 0 00007        128 A7       HLT     7
00144  0 00 0 00003        129 P3       HLT     3
00145  0 00 0 00100        130 B17      HLT     0100
00146  0 20 0 03411        131          CON     DCON         - 40
00147  0 54 0 00443        132          STM     SCS          J 41
00150  0 54 0 00443        133          STM     SCS          K 42
00151  0 54 0 00443        134          STM     SCS          L 43
00152  0 54 0 00443        135          STM     SCS          M 44
00153  0 54 0 00443        136          STM     SCS          N 45
00154  0 54 0 00443        137          STM     SCS          O 46
00155  0 54 0 00443        138          STM     SCS          P 47
00156  0 54 0 00443        139          STM     SCS          Q 50
00157  0 54 0 00443        140          STM     SCS          R 51
00160  0 00 0 00020        141 PLUS     HLT     '+'
00161  0 40 0 00555        142          ITM     SCL          $ 53
00162  0 60 0 00555        143          XYZ     SCL          * 54
00163  0 00 0 00033        144 PCHR     HLT     '.'
00164  0 00 0 00014        145 QCHR     HLT     014
00165  0 00 0 00034        146 RCHR     HLT     ')'
00166  0 20 0 00000        147          CON     BCON           60
00167  0 20 0 04647        148          CON     QCON         / 61
00170  0 54 0 00443        149          STM     SCS          S 62
00171  0 54 0 00443        150          STM     SCS          T 63
00172  0 54 0 00443        151          STM     SCS          U 64
00173  0 54 0 00443        152          STM     SCS          V 65
00174  0 54 0 00443        153          STM     SCS          W 66
00175  0 54 0 00443        154          STM     SCS          X 67
00176  0 54 0 00443        155          STM     SCS          Y 70
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00177  0 54 0 00443        156          STM     SCS          Z 71
00200  0 00 0 00000        157          HLT     0
00201  0 20 0 00100        158          CØN     CCØN         , 73
00202  0 40 0 00621        159          ITM     SCX          ( 74
00203  0 00 0 00022        160 HB       HLT     'B'
00204  0 00 0 00025        161 HE       HLT     'E'
00205  2 00 0 00000        162 X2W      HLT     0,X2
00206  0 00 0 00000        163 $SCNL    HLT     0
*00207  0 76 0 00000        164          LDA     CHR
00210  1 72 0 00140        165          SKE     ECHR         TEST FØR =
00211  0 01 0 00245        166          BRU     SCR1         NØT LITERAL
*00212  0 43 0 00000        167          BRM     GET          SKIP =
00213  0 43 0 00315        168          BRM     SCAN
00214  0 43 0 00216        169          BRM     SCNM
00215  0 51 0 00206        170          BRR     SCNL         EXIT SCNL
00216  0 00 0 00000        171 $SCNM    HLT     0
*00217  0 35 0 00015        172 SCK5     STA     LTR1
*00220  0 53 0 00000        173          SKN     PASS
00221  0 51 0 00216        174          BRR     SCNM         EXIT
00222  0 76 0 00015        175          LDA     LLTR
*00223  0 36 0 00000        176          STB     LTR2         STØRE LITERAL
00224  0 75 0 00014        177          LDB     LLT
00225  0 43 0 01103        178          BRM     SRCH         SEARCH FØR LITERAL
00226  0 01 0 00237        179          BRU     SCK2         NØT IN TABLE
00227  2 76 0 00002        180          LDA     2,X2         LØCATIØN ØF LITERAL
00230  0 75 0 00120        181 SCK3     LDB     1
*00231  0 72 0 00000        182          SKA     B8
*00232  0 75 0 00000        183          LDB     RELM
*00233  0 14 0 00000        184          ETR     ADDR
*00234  0 35 0 00000        185          STA     VALU
*00235  0 36 0 00000        186          STB     MØDE
00236  0 51 0 00216        187          BRR     SCNM         EXIT SCNM
*00237  0 76 0 00000        188 SCK2     LDA     LADD
*00240  0 35 0 00000        189          STA     LTR3
*00241  0 61 0 00237        190          MIN     LADD         INCREMENT LITERAL LØCATIØN
00242  0 43 0 01205        191          BRM     MØVE         INSERT LITERAL IN TABLE
*00243  0 76 0 00240        192          LDA     LTR3         LØCATIØN ØF LITERAL
00244  0 01 0 00230        193          BRU     SCK3
00245  0 43 0 00247        194 SCR1     BRM     SCNR         GET EXPRESSIØN ØR REFERENCE
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00246  0 51 0 00206        195          BRR     SCNL
00247  0 00 0 00000        196 SCNR     HLT     0
00250  0 43 0 00315        197          BRM     SCAN          GET EXPRESSION
*00251  0 76 0 00000        198          LDA     VERR          UNDEFINED FLAG
00252  0 73 0 00120        199          SKG     Z
00253  0 01 0 00313        200          BRU     SCR2          ALL SYMBOL DEFINED
00254  0 76 0 00006        201          LDA     CHR1
00255  1 72 0 00120        202          SKE     Z             TEST FOR NO CONNECTERS
00256  0 01 0 00313        203          BRU     SCR2          UNDEFINED ITEM
00257  0 76 0 00120        204          LDA     Z             REFERENCE
*00260  0 53 0 00220        205          SKN     PASS
00261  0 51 0 00247        206          BRR     SCNR
*00262  0 35 0 00251        207          STA     VERR          RESET UNDEFINED FLAG
*00263  0 61 0 00000        208          MIN     XERR          SET EXTERNAL FLAG
00264  0 76 0 00000        209          LDA     LSYM
*00265  0 75 0 00000        210          LDB     LRT
00266  0 43 0 01103        211          BRM     SRCH          SEARCH FOR REFERENCE
00267  0 01 0 00307        212          BRU     SCR3          NOT IN TABLE
*00270  0 14 0 00233        213 SCR4     ETR     ADDR
*00271  0 35 0 00234        214          STA     VALU
*00272  0 36 0 00235        215          STB     MODE
*00273  0 76 0 00000        216          LDA     LOC
*00274  0 75 0 00000        217          LDB     REFM
*00275  0 72 0 00231        218          SKA     B8
00276  0 75 0 00033        219          LDB     RRM
00277  2 35 0 00002        220          STA     2,X2
00300  2 76 0 00001        221          LDA     1,X2
00301  0 14 0 02064        222          ETR     =077770000
00302  2 36 0 00001        223          STB     1,X2
00303  3 76 0 00001        224          ADM     1,X2
*00304  0 76 0 00271        225          LDA     VALU
*00305  0 75 0 00272        226          LDB     MODE
00306  0 51 0 00247        227          BRR     SCNR          EXIT
00307  0 35 0 00037        228 SCR3     STA     SM3           NO PREVIOUS REF
00310  0 43 0 01205        229          BRM     MOVE          INSERT REFERENCE
00311  0 46 30003          230          CLR
00312  0 01 0 00270        231          BRU     SCR4
*00313  0 76 0 00304        232 SCR2     LDA     VALU          NO REF OR LIT
00314  0 51 0 00247        233          BRR     SCNR          EXIT
```

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00315  0 00 0 00000        234 $SCAN  HLT    0
00316  0 46 30003          235        CLR
00317  0 35 1 00003        236        STA   *LOP          0 TO BASE CONECTER
* 00320  0 35 0 00313      237        STA    VALU         0 TO VALUE
* 00321  0 35 0 00305      238        STA    MODE         0 TO  MODE
00322  0 35 0 00006        239        STA    CHR1         RESET
* 00323  0 71 0 00207      240        LDX    CHR,X0
00324  2 75 0 00106        241        LDB    CTT,X2
* 00325  0 43 0 00000      242        BRM    SKB
* 00326  0 00 0 00000      243        HLT    IC
00327  0 01 0 00337        244        BRU    SCN1         NOT CONECTER
00330  0 01 0 00345        245        BRU    SCN8
00331  0 61 0 00003        246 SCN3   MIN    LOP          INCR OP
00332  0 61 0 00004        247        MIN    LITM         INCR ITEM
* 00333  0 76 0 00321      248        LDA    MODE
00334  0 35 1 00003        249        STA   *LOP          STORE OP
* 00335  0 76 0 00320      250        LDA    VALU
00336  0 35 1 00004        251        STA   *LITM         STORE ITEM
* 00337  0 76 0 00323      252 SCN1   LDA    CHR
00340  1 66 0 00000        253        CAX
00341  0 43 0 00431        254        BRM    SCI          GET NEXT ITEM
* 00342  0 35 0 00335      255        STA    VALU
* 00343  0 36 0 00333      256        STB    MODE
* 00344  0 71 0 00337      257        LDX    CHR,X0
00345  0 43 0 00660        258 SCN8   BRM    SCC          GET NEXT CONECTER
* 00346  0 35 0 00343      259        STA    MODE
00347  0 75 0 00021        260 SCN7   LDB    A4           HIERARCHY MASK
00350  0 73 1 00003        261        SKG   *LOP          MODE IS IN A
00351  0 01 0 00354        262        BRU    SCN2         LEVEL NOT GREATER
00352  0 70 1 00003        263        SKM   *LOP
00353  0 01 0 00331        264        BRU    SCN3         LEVEL GREATER
00354  0 76 1 00003        265 SCN2   LDA   *LOP          LAST CONECTER
00355  0 70 0 00120        266        SKM    Z            TEST FOR TERMINATER
00356  0 01 0 00400        267        BRU    SCN4         DO OPERATION
* 00357  0 76 0 00346      268        LDA    MODE
00360  0 14 0 00121        269        ETR    C3           MASK MODE
00361  1 64 0 00000        270        CAB                 MODE TO B
00362  0 76 0 00002        271        LDA    SCNX
* 00363  1 72 0 00000      272        SKE    LSXT         TEST P LEVEL
```

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  00364  0 01 0 00371                 BRU    SCN11        NOT O
  00365  0 76 0 00165                 LDA    RCHR
* 00366  1 72 0 00000                 SKE    TERM         ERRORIF )
  00367  0 01 0 00376                 BRU    SCN12
  00370  0 01 0 00373                 BRU    SCN13
  00371  0 76 0 00165         SCN11   LDA    RCHR
* 00372  1 72 0 00366                 SKE    TERM
* 00373  0 61 0 00000         SCN13   MIN    PERR         SET P ERROR
* 00374  0 76 0 00342         SCN14   LDA    VALU
  00375  0 51 0 00315                 BRR    SCAN         EXIT SCAN
  00376  0 43 0 02041         SCN12   BRM    GNF          SKIP TO NEXT FIELD
  00377  0 01 0 00374                 BRU    SCN14
  00400  0 75 0 00021         SCN4    LDB    A4
  00401  0 70 0 02065                 SKM    =05000
  00402  0 14 0 00022                 ETR    A5
  00403  0 14 0 02066                 ETR    =01700
  00404  0 6600 006                   RSH    6
  00405  1 66 0 00000                 CAX                 OP NUMBER TO X
  00406  0 75 1 00003                 LDB    *LOP
  00407  0 02 20001                   ROV
  00410  0 76 1 00004                 LDA    *LITM
  00411  2 01 1 00412                 BRU    *SCN5,X2     BRANCH TO OP CODE
  00412  0 01 0 00734         SCN5    BRU    CLS          LOGICAL SUM
  00413  0 01 0 00752                 BRU    CLD          LOGICAL DIFFERENCE
  00414  0 01 0 00754                 BRU    CLP          LOGICAL PRODUCT
  00415  0 01 0 00756                 BRU    CAS          ARITHMETIC SUM
  00416  0 01 0 00762                 BRU    CAD          ARITHMETIC DIFFERENCE
  00417  0 01 0 00770                 BRU    CAP          ARITHMETIC PRODUCT
  00420  0 01 0 00776                 BRU    CXQ          EXCLUSIVE QUOTIENT
  00421  0 01 0 00774                 BRU    CEQ          INCLUSIVE QUOTIENT
  00422  0 01 0 01001                 BRU    CDS
  00423  0 01 0 01025                 BRU    CBS
* 00424  0 76 0 00000         SCN6    LDA    M1
  00425  1 76 0 00003                 ADM    LOP          DECR OP
  00426  1 76 0 00004                 ADM    LITM         DECR ITEM
* 00427  0 76 0 00357                 LDA    MODE
  00430  0 01 0 00347                 BRU    SCN7         TEST PREVIOUS OP
  00431  0 00 0 00000         SCI     HLT    0
* 00432  0 75 0 00326         SCI2    LDB    IC
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*  00433  0 43 0 00325        312          BRM     SKB
   00434  2 00 0 00106        313          HLT     CTT,X2
   00435  0 01 0 00442        314          BRU     SCI1
*  00436  0 61 0 00000        315          MIN     EERR          SET E FLAG
*  00437  0 43 0 00212        316          BRM     GET           SKIP CHAR
   00440  0 46 30003          317          CLR
   00441  0 51 0 00431        318          BRR     SCI           EXIT
   00442  2 01 1 00106        319 SCI1     BRU     *CTT,X2
          00000443            320 SCS      EQU     $
          00000443            321 SC0      EQU     $
          00000443            322 SCD      EQU     $
   00443  0 75 0 00143        323 SCIT     LDB     A7
*  00444  0 36 0 00000        324          STB     CNTR          MAX CHARACTER COUNT
   00445  0 35 0 00007        325          STA     CHR2          SAVE LEAD CHAR
   00446  1 72 0 00120        326          SKE     Z
   00447  0 01 0 00457        327          BRU     SCIT7
*  00450  0 43 0 00437        328          BRM     GET           SKIP 0
*  00451  0 75 0 00000        329          LDB     SC
*  00452  0 43 0 00433        330          BRM     SKB
   00453  2 00 0 00106        331          HLT     CTT,X2
   00454  0 01 0 00457        332          BRU     SCIT7         VALID SYMBOL CHARACTER
   00455  0 46 30003          333          CLR
   00456  0 51 0 00431        334          BRR     SCI           EXIT WITH ZERO
   00457  0 75 0 00120        335 SCIT7    LDB     Z
   00460  0 01 0 00465        336          BRU     SCIT1
   00461  0 75 0 00036        337 SCIT3    LDB     SM2
   00462  1 77 0 00035        338          XMA     SM1
   00463  0 6720 006          339          LCY     6
   00464  0 16 0 00035        340          MRG     SM1           INSERT NEW CHARACTER
   00465  0 35 0 00035        341 SCIT1    STA     SM1
   00466  0 36 0 00036        342          STB     SM2
*  00467  0 75 0 00451        343          LDB     SC
*  00470  0 43 0 00000        344          BRM     TCHR          TEST FOR ALPHANUMERIC
   00471  0 01 0 00474        345          BRU     SCIT2         END OF SYMBOLIC ITEM
*  00472  1 73 0 00444        346          SKR     CNTR          TEST FOR MAX SIZE
   00473  0 01 0 00461        347          BRU     SCIT3
   00474  0 76 0 00035        348 SCIT2    LDA     SM1
   00475  0 16 0 00036        349          MRG     SM2
*  00476  0 72 0 00000        350          SKA     DLY1          TEST ZONE BITS
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```
00477  0 01 0 00526      351          BRU     SCIT4          SYMBOL
00500  0 71 0 00120      352          LDX     Z,X0
00501  0 75 0 00007      353          LDB     CHR2
*  00502  0 43 0 00452      354          BRM     SKB
*  00503  0 00 0 00000      355          HLT     0CTF
00504  0 01 0 00510      356          BRU     SCIT21
00505  0 71 0 00144      357          LDX     P3,X0
00506  0 72 0 02067      358          SKA     =010101010
*  00507  0 61 0 00436      359          MIN     EERR
00510  0 76 0 00036      360 SCIT21   LDA     SM2            HIGH ORDER HALF
00511  0 43 0 01321      361          BRM     CNVRT          CONVERT
00512  3 74 0 00062      362          MUL     K3,X2          TIMES BASE TO THE 4TH
00513  0 36 0 00036      363          STB     SM2            PARTIAL RESULT
00514  1 72 0 00120      364          SKE     Z
*  00515  0 61 0 00000      365          MIN     TERR           SET TRUNCATION ERROR
00516  0 76 0 00035      366          LDA     SM1            LOW ORDER HALF
00517  0 43 0 01321      367          BRM     CNVRT          CONVERT
00520  0 02 20001        368          ROV
00521  0 55 0 00036      369          ADD     SM2
00522  0 40 20001        370          OVT
*  00523  0 61 0 00515      371          MIN     TERR           SET TRUNCATION ERROR
00524  0 75 0 00120      372          LDB     Z              0 TO MODE
00525  0 51 0 00431      373          BRR     SCI            EXIT
00526  0 76 0 00035      374 SCIT4    LDA     SM1
00527  0 75 0 00036      375          LDB     SM2
00530  0 01 0 00533      376          BRU     SCIT5
00531  0 6720 006        377 SCIT6    LCY     6              ADJUST
*  00532  0 16 0 00000      378          MRG     BCHR           INSERT BLANK
*  00533  1 73 0 00472      379 SCIT5    SKR     CNTR           TEST FOR SYMBOL ADJUSTED
00534  0 01 0 00531      380          BRU     SCIT6
00535  0 14 0 02064      381          ETR     =077770000
00536  0 35 0 00036      382          STA     SM2   C5 C6
00537  0 36 0 00035      383          STB     SM1   C1 C2 C3 C4
00540  0 76 0 00000      384          LDA     LSYM           LOCATION OF SYMBOL
*  00541  0 75 0 00000      385          LDB     LST            LOCATION OF SYMBOL TABLE
00542  0 43 0 01103      386          BRM     SRCH           SEARCH
*  00543  0 61 0 00262      387          MIN     VERR           NOT FOUND
00544  0 46 00014        388          XAB
00545  0 72 0 00145      389          SKA     B17
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*  00546  0 61 0 00000      390          MIN     DERR
   00547  0 14 0 00121      391          ETR     C3              SAVE MODE
   00550  0 46 00014        392          XAB
*  00551  0 43 0 00502      393          BRM     SKB
*  00552  0 00 0 00232      394          HLT     RELM
*  00553  0 14 0 00270      395          ETR     ADDR
   00554  0 51 0 00431      396          BRR     SCI             EXIT
*  00555  0 76 0 00344      397 SCL      LDA     CHR
*  00556  1 72 0 00000      398          SKE     SCHR            TEST FOR *
   00557  0 01 0 00570      399          BRU     SCL1            $ IS ALWAYS LOCATION COUNTER
*  00560  0 43 0 00450      400          BRM     GET
   00561  1 66 0 00000      401          CAX
*  00562  0 75 0 00000      402          LDB     CC
*  00563  0 43 0 00551      403          BRM     SKB
   00564  2 00 0 00106      404          HLT     CTT,X2
   00565  0 01 0 00571      405          BRU     SCL2
*  00566  0 61 0 00000      406          MIN     IFLG
   00567  0 01 0 00432      407          BRU     SCI2
*  00570  0 43 0 00560      408 SCL1     BRM     GET
*  00571  0 76 0 00273      409 SCL2     LDA     LOC
   00572  0 75 0 00120      410          LDB     Z
*  00573  0 72 0 00275      411          SKA     B8
*  00574  0 75 0 00552      412          LDB     RELM
*  00575  0 14 0 00553      413          ETR     ADDR
   00576  0 51 0 00431      414          BRR     SCI             EXIT
   00577  0 76 0 00120      415 SCA      LDA     Z
   00600  0 01 0 00610      416          BRU     SCA2
*  00601  0 76 0 00374      417 SCA1     LDA     VALU
   00602  0 72 0 00024      418          SKA     C0
*  00603  0 61 0 00523      419          MIN     TERR
   00604  0 72 0 00024      420          SKA     C0
   00605  0 01 0 00615      421          BRU     SCA3
   00606  0 6700 006        422          LSH     6
*  00607  0 16 0 00555      423          MRG     CHR             INSERT NEW CHAR
*  00610  0 35 0 00601      424 SCA2     STA     VALU
*  00611  0 43 0 00570      425          BRM     GET             GET CHAR
   00612  0 75 0 00120      426          LDB     Z
   00613  1 72 0 00164      427          SKE     QCHR            TEST FOR QUOTE
   00614  0 01 0 00601      428          BRU     SCA1            ALF CHAR
```

```
*  00615  0 43 0 00611      429 SCA3   BRM     GET
   00616  0 75 0 00120      430        LDB     Z
*  00617  0 76 0 00610      431        LDA     VALU
   00620  0 51 0 00431      432        BRR     SCI             EXIT
   00621  0 76 0 00016      433 SCX    LDA     SCN0
   00622  0 73 0 00002      434        SKG     SCNX
   00623  0 01 0 00651      435        BRU     SCX1            T00 MANY LEVELS
   00624  0 76 0 00315      436        LDA     SCAN
   00625  0 35 1 00002      437        STA     *SCNX           SAVE EXIT
   00626  0 76 0 00431      438        LDA     SCI
   00627  0 35 1 00005      439        STA     *SCIX
   00630  0 61 0 00005      440        MIN     SCIX
   00631  0 61 0 00002      441        MIN     SCNX            INCR
   00632  0 61 0 00003      442        MIN     L0P
   00633  0 61 0 00004      443        MIN     LITM
*  00634  0 43 0 00615      444        BRM     GET             SKIP (
   00635  0 43 0 00315      445        BRM     SCAN            GET SUB-EXPRESSION
*  00636  0 76 0 00424      446        LDA     M1
   00637  1 76 0 00002      447        ADM     SCNX            DECR
   00640  1 76 0 00003      448        ADM     L0P
   00641  1 76 0 00004      449        ADM     LITM
   00642  1 76 0 00005      450        ADM     SCIX
   00643  0 76 1 00005      451        LDA     *SCIX
   00644  0 35 0 00431      452        STA     SCI
   00645  0 76 1 00002      453        LDA     *SCNX
   00646  0 35 0 00315      454        STA     SCAN            RESTORE EXIT
*  00647  0 76 0 00617      455        LDA     VALU
   00650  0 51 0 00431      456        BRR     SCI             EXIT
*  00651  0 61 0 00373      457 SCX1   MIN     PERR            SET P FLAG
*  00652  0 43 0 00634      458 SCX2   BRM     GET
   00653  1 72 0 00165      459        SKE     RCHR
   00654  0 01 0 00652      460        BRU     SCX2            SKIP SUB-EXPRESSION
*  00655  0 43 0 00652      461        BRM     GET             SKIP )
   00656  0 46 30003        462        CLR
   00657  0 51 0 00431      463        BRR     SCI             EXIT
   00660  0 00 0 00000      464 SCC    HLT     0
*  00661  0 75 0 00562      465        LDB     CC
*  00662  0 43 0 00563      466        BRM     SKB
   00663  2 00 0 00106      467        HLT     CTT,X2
```

```
00664  0 01 0 00672        468        BRU     SCC1
*00665  0 35 0 00372        469        STA     TERM
*00666  0 61 0 00507        470        MIN     EERR        SET E FLAG
*00667  0 43 0 00655        471        BRM     GET         SKIP CHAR
*00670  0 76 0 00427        472        LDA     MODE
00671  0 51 0 00660        473        BRR     SCC         EXIT
00672  1 67 0 00000        474 SCC1   CXA
*00673  1 72 0 00556        475        SKE     SCHR        CONECTER IS AP IF *
00674  0 01 0 00711        476        BRU     SCC7
00675  0 35 0 00006        477        STA     CHR1
*00676  0 43 0 00667        478        BRM     GET
00677  1 72 0 02070        479        SKE     =*+*
00700  0 01 0 00703        480        BRU     SCC5
00701  0 75 0 02065        481        LDB     =05000
00702  0 01 0 00732        482        BRU     SCC8
00703  0 75 0 00057        483 SCC5   LDB     AP
00704  0 36 0 00011        484        STB     CNCT
00705  1 72 0 02071        485        SKE     =*/*
00706  0 01 0 00727        486        BRU     SCC6
00707  0 75 0 02072        487        LDB     =05100
00710  0 01 0 00732        488        BRU     SCC8
00711  2 75 0 00106        489 SCC7   LDB     CTT,X2
00712  0 36 0 00011        490        STB     CNCT        SAVE CONECTER
*00713  0 43 0 00662        491        BRM     SKB
00714  0 00 0 00021        492        HLT     A4
00715  0 01 0 00724        493        BRU     SCC2        NOT TERMINATER
*00716  0 37 0 00665        494        STX     TERM,X0     SAVE TERMINATER
*00717  0 43 0 00676        495 SCC4   BRM     GET         POSITION AT NEXT CHAR
00720  0 76 0 00011        496 SCC3   LDA     CNCT
00721  0 14 0 00025        497        ETR     C2          EXTRACT CONNECTER
*00722  0 16 0 00670        498        MRG     MODE
00723  0 51 0 00660        499        BRR     SCC         EXIT
00724  0 35 0 00006        500 SCC2   STA     CHR1        SAVE CHAR
*00725  0 43 0 00717        501        BRM     GET         GET NEXT CHAR
00726  0 75 0 00011        502        LDB     CNCT
00727  1 72 0 00006        503 SCC6   SKE     CHR1
00730  0 01 0 00720        504        BRU     SCC3
00731  0 6700 006          505        LSH     6           USE ALTERNATE CONNECTER
00732  0 36 0 00011        506 SCC8   STB     CNCT
```

```
      00733  0 01 0 00717        507          BRU     SCC4
*     00734  0 16 0 00647        508 CLS      MRG     VALU        V = L++V
*     00735  0 35 0 00734        509 CLS1     STA     VALU
*     00736  0 76 0 00722        510          LDA     MODE
      00737  0 16 1 00003        511          MRG     *LOP        ERROR IF EITHER ARE REL
*     00740  0 72 0 00574        512 CLS2     SKA     RELM
*     00741  0 61 0 00000        513          MIN     RERR
      00742  0 40 20001          514          OVT
*     00743  0 61 0 00603        515          MIN     TERR        SET TRUNCATION ERROR
*     00744  0 76 0 00736        516          LDA     MODE
*     00745  0 17 0 00740        517          EOR     RELM
      00746  0 46 00014          518          XAB
*     00747  0 72 0 00745        519          SKA     RELM
*     00750  0 36 0 00744        520          STB     MODE
      00751  0 01 0 00424        521          BRU     SCN6
*     00752  0 17 0 00735        522 CLD      EOR     VALU        V=L--V
      00753  0 01 0 00735        523          BRU     CLS1
*     00754  0 14 0 00752        524 CLP      ETR     VALU        V=L**V
      00755  0 01 0 00735        525          BRU     CLS1
*     00756  1 76 0 00754        526 CAS      ADM     VALU        V=L+V
*     00757  0 76 0 00750        527          LDA     MODE
      00760  0 14 1 00003        528          ETR     *LOP        ERROR IF BOTH ARE REL
      00761  0 01 0 00740        529          BRU     CLS2
*     00762  0 54 0 00756        530 CAD      SUB     VALU
*     00763  0 35 0 00762        531          STA     VALU        V=L-V
      00764  0 76 1 00003        532          LDA     *LOP
*     00765  0 17 0 00636        533          EOR     M1           COMPLEMENT OF U MODE
*     00766  0 14 0 00757        534          ETR     MODE        ERROR IF V REL AND U NOT
      00767  0 01 0 00740        535          BRU     CLS2        ERROR IF V IS REL
*     00770  1 74 0 00763        536 CAP      MUL     VALU
      00771  0 6700 027          537          LSH     23          V=L*V
      00772  0 75 1 00003        538 CAP1     LDB     *LOP        RESTORE B
      00773  0 01 0 00735        539          BRU     CLS1
*     00774  0 55 0 00765        540 CEQ      ADD     M1
*     00775  0 55 0 00770        541          ADD     VALU        L+V-1
      00776  0 6600 027          542 CXQ      RSH     23
*     00777  1 75 0 00775        543          DIV     VALU        L/V OR (L+V-1)/V
      01000  0 01 0 00772        544          BRU     CAP1
*     01001  0 76 0 00777        545 CDS      LDA     VALU
```

```
*  01002  0 73 0 00774        546          SKG     M1
   01003  1 71 0 00000        547          CNA
   01004  0 73 0 00031        548          SKG     P9
   01005  0 01 0 01007        549          BRU     $+2
*  01006  0 61 0 00743        550          MIN     TERR
   01007  1 66 0 00000        551          CAX
   01010  0 75 0 00120        552          LDB     Z
   01011  0 02 20001          553          ROV
   01012  2 76 0 00066        554          LDA     FIVES,X2
   01013  2 6700 000          555          LSH     0,X2
   01014  0 40 20001          556          OVT
*  01015  0 61 0 01006        557          MIN     TERR
*  01016  1 77 0 01001        558          XMA     VALU
*  01017  0 73 0 01002        559          SKG     M1
   01020  0 01 0 01023        560          BRU     CDS1
   01021  0 76 1 00004        561          LDA     *LITM
   01022  0 01 0 00770        562          BRU     CAP
   01023  0 76 1 00004        563 CDS1     LDA     *LITM
   01024  0 01 0 00776        564          BRU     CXQ
*  01025  0 76 0 01016        565 CBS      LDA     VALU
*  01026  0 53 0 01025        566          SKN     VALU
   01027  0 01 0 01043        567          BRU     CBS1
   01030  1 71 0 00000        568          CNA
   01031  1 66 0 00000        569          CAX
   01032  0 75 0 00120        570          LDB     Z
   01033  0 76 1 00004        571          LDA     *LITM
   01034  2 6600 000          572          RSH     0,X2
*  01035  0 43 0 00713        573          BRM     SKB
*  01036  0 00 0 01017        574          HLT     M1
   01037  0 73 1 00004        575          SKG     *LITM
   01040  0 01 0 00772        576          BRU     CAP1
   01041  0 55 0 00066        577          ADD     ONE
   01042  0 01 0 00772        578          BRU     CAP1
   01043  1 66 0 00000        579 CBS1     CAX
   01044  0 75 0 00120        580          LDB     Z
   01045  0 76 1 00004        581          LDA     *LITM
   01046  2 6700 000          582          LSH     0,X2
   01047  0 01 0 00772        583          BRU     CAP1
   01050  0 00 0 00000        584 $SYM     HLT     0
```

```
  01051  0 75 0 00120    585         LDB    Z
  01052  0 35 0 00035    586  SYM2   STA    SM1
  01053  0 36 0 00036    587         STB    SM2
* 01054  0 75 0 00467    588         LDB    SC
* 01055  0 43 0 00470    589         BRM    TCHR             TEST FOR SYMBOL CHAR
  01056  0 01 0 01067    590         BRU    SYM1             END SYMBOL
  01057  0 75 0 00036    591         LDB    SM2
  01060  1 77 0 00035    592         XMA    SM1
* 01061  0 43 0 01035    593         BRM    SKB
  01062  0 00 0 00025    594         HLT    C2
  01063  0 01 0 01077    595         BRU    SYM3
  01064  0 6720 006      596         LCY    6
  01065  0 16 0 00035    597         MRG    SM1
  01066  0 01 0 01052    598         BRU    SYM2
  01067  0 75 0 00036    599  SYM1   LDB    SM2
  01070  0 76 0 00035    600         LDA    SM1
* 01071  0 43 0 01061    601  SYM4   BRM    SKB
  01072  0 00 0 00025    602         HLT    C2
  01073  0 01 0 01077    603         BRU    SYM3
  01074  0 6720 006      604         LCY    6
* 01075  0 16 0 00532    605         MRG    BCHR
  01076  0 01 0 01071    606         BRU    SYM4
  01077  0 6620 014      607  SYM3   RCY    12
  01100  0 35 0 00035    608         STA    SM1
  01101  0 36 0 00036    609         STB    SM2
  01102  0 51 0 01050    610         BRR    SYM              EXIT
  01103  0 00 0 00000    611  $SRCH  HLT    0
  01104  0 35 0 00042    612         STA    LKI              SAVE ITEM LOC
  01105  0 36 0 00046    613         STB    LKT              SAVE PACKET LOC
  01106  1 66 0 00000    614         CAX                     LOC OF ITEM
  01107  2 76 0 00000    615         LDA    0,X2
  01110  0 35 0 00040    616         STA    KEY1
  01111  2 76 0 00001    617         LDA    1,X2
  01112  1 70 0 00000    618         CBX
  01113  2 14 0 00003    619         ETR    3,X2
  01114  0 35 0 00041    620         STA    KEY2             STORE KEY
  01115  2 76 0 00000    621         LDA    0,X2             T = END OF TABLE
  01116  0 35 0 00045    622         STA    LKS              S = T
  01117  2 76 0 00001    623         LDA    1,X2             F = LOC OF 1ST ITEM
```

```
01120  2 75 0 00003        624          LDB     3,X2
01121  0 36 0 00043        625          STB     LKM          MASK FOR 2ND KEY WORD
01122  2 75 0 00002        626          LDB     2,X2         I = INITIAL INCR
01123  0 01 0 01132        627          BRU     LK1
01124  0 6600 001          628 LK3      RSH     1
01125  2 76 0 00000        629          LDA     0,X2         K(X)
01126  0 73 0 00040        630          SKG     KEY1         COMPARE WITH K(L)
01127  0 01 0 01142        631          BRU     LK2          K(L) GREATER OR EQUAL
01130  1 65 0 00000        632 LK7      CBA
01131  0 55 0 00045        633          ADD     LKS
01132  1 66 0 00000        634 LK1      CAX
01133  0 76 0 00120        635          LDA     Z
*01134  0 43 0 01071        636          BRM     SKB
01135  0 00 0 00100        637          HLT     M2
01136  0 01 0 01124        638          BRU     LK3
01137  0 46 30003          639          CLR                  NOT FOUND
01140  0 71 0 00045        640          LDX     LKS,X0
01141  0 01 0 01153        641          BRU     LK5
01142  1 72 0 00040        642 LK2      SKE     KEY1
01143  0 01 0 01155        643          BRU     LK4          KEYS NOT EQUAL
01144  2 76 0 00001        644          LDA     1,X2         2ND WORD OF KEY
01145  0 14 0 00043        645          ETR     LKM          MASK OUT MODE
01146  1 72 0 00041        646          SKE     KEY2         TEST FOR EQUAL KEYS
01147  0 01 0 01154        647          BRU     LK6          KEYS NOT EQUAL
01150  0 61 0 01103        648          MIN     SRCH         TAPE FOUND EXIT
01151  2 75 0 00001        649          LDB     1,X2         MODE
01152  2 76 0 00002        650          LDA     2,X2         VALUE
01153  0 51 0 01103        651 LK5      BRR     SRCH         EXIT
01154  0 73 0 00041        652 LK6      SKG     KEY2         COMPARE 2ND WORDS
01155  0 37 0 00045        653 LK4      STX     LKS,X0       K(L) GREATER, S = X
01156  0 01 0 01130        654          BRU     LK7
01157  0 00 0 00000        655 $NSRT    HLT     0
01160  0 43 0 01103        656          BRM     SRCH         SEARCH FOR ITEM
01161  0 01 0 01201        657          BRU     NS3          NOT FOUND
01162  0 61 0 00042        658          MIN     LKI
01163  0 76 1 00042        659          LDA     *LKI
01164  0 61 0 00042        660          MIN     LKI
01165  0 75 1 00042        661          LDB     *LKI
01166  3 72 0 00001        662          SKE     1,X2
```

```
01167  0 01 0 01174        663        BRU    NS1          1ST WORD NOT EQUAL
01170  0 46 00014          664        XAB
01171  3 72 0 00002        665        SKE    2,X2
01172  0 01 0 01174        666        BRU    NS1          2ND WORDS NOT EQUAL
01173  0 51 0 01157        667        BRR    NSRT         EXIT
*  01174  0 76 0 00000     668 NS1    LDA    DUPM
01175  2 16 0 00001        669        MRG    1,X2         SET DUP FLAG
01176  2 35 0 00001        670        STA    1,X2
*  01177  0 61 0 00546     671        MIN    DERR         SET DUP ERROR
01200  0 51 0 01157        672        BRR    NSRT         EXIT
01201  0 43 0 01205        673 NS3    BRM    MOVE         MOVE ITEM TO TABLE
01202  0 51 0 01157        674        BRR    NSRT         EXIT
*  01203  0 61 0 00000     675 OFLO   MIN    OERR
01204  0 51 0 01205        676        BRR    MOVE
01205  0 00 0 00000        677 MOVE   HLT    0
01206  0 76 0 00144        678        LDA    P3
*  01207  1 76 0 00000     679        ADM    LIMT         -(M-3) TO M
*  01210  0 53 0 01207     680        SKN    LIMT
01211  0 01 0 01203        681        BRU    OFLO
01212  0 37 0 00044        682        STX    LKP,XO       SAVE P
01213  0 71 0 00046        683        LDX    LKT,XO       PACKET LOCATION
01214  0 76 0 00205        684        LDA    X2W          CONSTRUCTION INDIRECT WORD
01215  0 16 0 00044        685        MRG    LKP          P,X2
01216  2 53 0 00005        686        SKN    5,X2         TYPE (UP OR DOWN)
01217  0 01 0 01274        687        BRU    MOV1         MOVE UP
01220  0 35 0 00043        688        STA    LKM          P,X2 (TO)
01221  0 55 0 00144        689        ADD    P3           P+3,X2 (FORM)
01222  0 35 0 00045        690        STA    LKS          P+3,X2 (FORM)
01223  2 76 0 00000        691        LDA    0,X2         B
01224  0 54 0 00044        692        SUB    LKP          NO. OF WORDS TO MOVE
01225  0 55 0 02073        693        ADD    =0177777
01226  1 66 0 00000        694        CAX
01227  0 01 0 01232        695        BRU    MOV2
01230  0 76 1 00045        696 MOV3   LDA    *LKS
01231  0 35 1 00043        697        STA    *LKM         MOVE ONE WORD DOWN 3
01232  0 41 0 01230        698 MOV2   BRX    MOV3,XO
01233  0 71 0 02074        699 MV1    LDX    =00200000-3,XO
01234  0 76 0 00045        700        LDA    LKS
01235  0 54 0 00144        701        SUB    P3
```

```
01236  0 35 0 00044      702          STA    LKP          LOCATION OF INSERTED ITEM
01237  0 76 1 00042      703 MOV4     LDA    *LKI
01240  0 35 1 00045      704          STA    *LKS         INSERT NEW ITEM
01241  0 61 0 00042      705          MIN    LKI
01242  0 41 0 01237      706          BRX    MOV4,XO
01243  0 71 0 00046      707          LDX    LKT,XO       PACKET LOCATION
01244  0 76 0 00144      708          LDA    P3
01245  3 76 0 00004      709          ADM    4,X2         N+3 TO N
01246  2 76 0 00002      710          LDA    2,X2         M
01247  2 73 0 00004      711          SKG    4,X2         M:N
01250  0 01 0 01263      712          BRU    MOV5         M=N
01251  2 53 0 00005      713          SKN    5,X2         TYPE
01252  0 01 0 01257      714          BRU    MOV8         UP TABLE
01253  2 76 0 00000      715          LDA    0,X2
01254  0 54 0 00144      716 MV2      SUB    P3
01255  2 35 0 00000      717          STA    0,X2         B-3 TO B
01256  0 01 0 01261      718          BRU    MV3
01257  0 76 0 00144      719 MOV8     LDA    P3
01260  3 76 0 00001      720          ADM    1,X2         F+3 TO F
01261  0 71 0 00044      721 MV3      LDX    LKP,XO       LOCATION OF INSERTED ITEM
01262  0 51 0 01205      722          BRR    MOVE         EXIT
01263  0 75 0 00120      723 MOV5     LDB    Z
01264  2 55 0 00004      724          ADD    4,X2         M+N TO M
01265  2 35 0 00002      725          STA    2,X2
01266  2 36 0 00004      726          STB    4,X2         0 TO N
01267  2 76 0 00000      727          LDA    0,X2         B
01270  2 53 0 00005      728          SKN    5,X2
01271  0 55 0 00144      729          ADD    P3           B + 3 TO B
01272  2 35 0 00001      730          STA    1,X2         B TO F
01273  0 01 0 01254      731          BRU    MV2
01274  0 55 0 00124      732 MOV1     ADD    B22
01275  0 14 0 00034      733          ETR    XADR         CONSTRUCT INDIRECT WORD
01276  0 35 0 00045      734          STA    LKS          P+2,X2 (FROM)
01277  0 55 0 00144      735          ADD    P3
01300  0 35 0 00043      736          STA    LKM          P+5,X2 (TO)
01301  2 76 0 00000      737          LDA    0,X2         B
01302  2 55 0 00002      738          ADD    2,X2         B+M
01303  2 55 0 00004      739          ADD    4,X2         B+M+N
01304  0 54 0 00044      740          SUB    LKP          B+M+N-P
```

```
01305  0 73 0 00120        741          SKG     Z                NO. OF WORDS TO MOVE
01306  0 01 0 01315        742          BRU     MOV6             0 WORDS
01307  0 16 0 02075        743          MRG     =040000*/S9300
01310  1 66 0 00000        744          CAX
01311  0 76 1 00045        745 MOV7     LDA     *LKS
01312  0 35 1 00043        746          STA     *LKM             MOVE ONE WORD UP 3
01313  2 77 0 37776        747          EAX     -2,X2
01314  0 41 0 01311        748          BRX     MOV7,X0
01315  0 76 0 00043        749 MOV6     LDA     LKM              P+5,X2
01316  0 55 0 00066        750          ADD     B23              P+6,X2
01317  0 35 0 00045        751          STA     LKS
01320  0 01 0 01233        752          BRU     MV1
01321  0 00 0 00000        753 CNVRT    HLT     0
*01322  0 35 0 01026        754          STA     VALU
01323  0 14 0 00026        755          ETR     C02              MASK 1ST AND 3RD CHARACTERS
01324  3 74 0 00060        756          MUL     K1,X2            TIMES BASE - 64
*01325  0 55 0 01322        757          ADD     VALU
*01326  0 35 0 01325        758          STA     VALU
01327  0 14 0 02064        759          ETR     =077770000
01330  3 74 0 00061        760          MUL     K2,X2            TIMES BASE SQUARED - 4096
*01331  0 55 0 01326        761          ADD     VALU             RESULT
01332  0 51 0 01321        762          BRR     CNVRT            EXIT
01333  0 00 0 00000        763 SSIGN    HLT     0
*01334  0 76 0 00607        764          LDA     CHR
*01335  0 35 0 00716        765          STA     TERM
01336  0 75 0 00120        766          LDB     Z
01337  0 36 0 00047        767          STB     SIGN.            + TO SIGN
01340  1 72 0 00141        768          SKE     MCHR             TEST FOR -
01341  0 01 0 01345        769          BRU     SSIGN1
*01342  0 75 0 01036        770          LDB     M1
01343  0 36 0 00047        771          STB     SIGN             - TO SIGN
01344  0 01 0 01347        772          BRU     SSIGN2
01345  1 72 0 00160        773 SSIGN1   SKE     PLUS             TEST FOR +
01346  0 01 0 01350        774          BRU     SSIGN3
*01347  0 43 0 00725        775 SSIGN2   BRM     GET              SKIP + OR -
01350  0 51 0 01333        776 SSIGN3   BRR     SSIGN            EXIT
01351  0 00 0 00000        777 DPMT     HLT     0
*01352  0 36 0 00000        778          STB     WORD             LOW
01353  1 74 0 00032        779          MUL     P5               10*HOW TO B
```

```
*  01354  0 76 0 01352         LDA   WORD        LOW
*  01355  0 36 0 01354         STB   WORD
   01356  0 6620 001           RCY   1           MJL CLEARS B23
   01357  1 74 0 02076         MUL   =10
   01360  0 02 20001           ROV
*  01361  0 55 0 01355         ADD   WORD        10*HIGH + CARRY
   01362  0 40 20001           OVT
*  01363  0 61 0 01015         MIN   TERR        SET TRUNCATION ERROR
   01364  0 51 0 01351         BRR   DPMT        EXIT
   01365  0 00 0 00000   DPA   HLT   0
   01366  0 35 0 00012         STA   TEMP
*  01367  0 76 0 00000         LDA   WRD2
   01370  0 14 0 00100         ETR   M2
   01371  0 6600 001           RSH   1
   01372  0 14 0 02077         ETR   =037777777
   01373  0 36 0 00013         STB   TEMP+1
   01374  0 55 0 00013         ADD   TEMP+1
   01375  0 6600 027           RSH   23
   01376  0 14 0 00066         ETR   ONE
   01377  0 02 20001           ROV
   01400  0 55 0 00012         ADD   TEMP
*  01401  0 55 0 00000         ADD   WRD1
   01402  0 40 20001           OVT
*  01403  0 61 0 01363         MIN   TERR        SET TRUNCATION ERROR
   01404  0 51 0 01365         BRR   DPA         EXIT
   01405  0 00 0 00000   DPNM  HLT   0
*  01406  0 76 0 01401         LDA   WRD1
*  01407  0 75 0 01367         LDB   WRD2
*  01410  0 36 0 01361         STB   WORD        X2
   01411  1 74 0 00055         MUL   MULT1
*  01412  1 77 0 01406         XMA   WRD1        X1 TO A, SAVE H
*  01413  0 36 0 01407         STB   WRD2        SAVE L
   01414  1 74 0 00056         MUL   MULT2
   01415  0 6600 027           RSH   23
   01416  0 14 0 00066         ETR   ONE
   01417  0 43 0 01365         BRM   DPA         AB + HL TO AB
*  01420  0 35 0 01412         STA   WRD1        SAVE H
*  01421  0 36 0 01413         STB   WRD2        SAVE L
*  01422  0 76 0 01410         LDA   WORD        X2
```

```
01423  0 6600 001          819          RSH    1
01424  0 14 0 02077        820          ETR    =037777777
01425  1 74 0 00055        821          MUL    MULT1
01426  0 6600 027          822          RSH    23
01427  0 14 0 00066        823          ETR    ONE
01430  0 43 0 01365        824          BRM    DPA          AB+HL TO AB
*01431 0 35 0 01420        825          STA    WRD1
*01432 0 36 0 01421        826          STB    WRD2
01433  0 51 0 01405        827          BRR    DPNM         EXIT
01434  0 00 0 00000        828 $DPW     HLT    0
01435  0 76 0 00052        829          LDA    SCALE
01436  0 35 0 00051        830          STA    BEXP         SCALING (IF NOT SPECIFIED
01437  0 75 0 00120        831          LDB    Z
*01440 0 36 0 01431        832          STB    WRD1         CLEAR HOW
*01441 0 36 0 01432        833          STB    WRD2         CLEAR LOW
*01442 0 75 0 01342        834          LDB    M1
01443  0 36 0 00054        835          STB    FFLG         RESET FLOATING FLAG
01444  0 36 0 00053        836          STB    DEXP         -1 TO DECIMAL EXPONNET
01445  0 43 0 01333        837          BRM    SSIGN        SET SIGN
01446  0 75 0 00047        838          LDB    SIGN
01447  0 36 0 00050        839          STB    DPSIGN       SET DP SIGN
01450  1 72 0 00163        840 DPW3     SKE    PCHR         TEST FOR .
01451  0 01 0 01472        841          BRU    DPW4
01452  0 61 0 00054        842          MIN    FFLG         SET FLOAT FLAG
01453  0 01 0 01465        843          BRU    DPW2
*01454 0 55 0 01334        844 DPW1     ADD    CHR          2*CHR TO A
*01455 1 77 0 01441        845          XMA    WRD2         2*CHR TO L
01456  0 46 20005          846          ABC                 L TO B
*01457 1 77 0 01440        847          XMA    WRD1         H TO A, 0 TO H
01460  0 43 0 01351        848          BRM    DPMT         10*AB TO AB
01461  0 43 0 01365        849          BRM    DPA          10*AB+CHR TO AB
*01462 0 35 0 01457        850          STA    WRD1         SAVE H
*01463 0 36 0 01455        851          STB    WRD2         SAVE L
01464  0 53 0 00053        852          SKN    DEXP         SKIP UNLESS PERIOD SEEN
01465  0 61 0 00053        853 DPW2     MIN    DEXP         INCR DECIMAL EXPONENT
*01466 0 75 0 00000        854          LDB    DC
*01467 0 43 0 01055        855          BRM    TCHR         TEST FOR DECIMAL DIGIT
01470  0 01 0 01450        856          BRU    DPW3
01471  0 01 0 01454        857          BRU    DPW1
```

```
01472  1 66 0 00000        858 DPW4   CAX
*01473  0 75 0 01466        859        LDB     DC
*01474  0 43 0 01134        860        BRM     SKB
 01475  2 00 0 00106        861        HLT     CTT,X2
 01476  0 01 0 01454        862        BRU     DPW1
 01477  0 76 0 00120        863        LDA     Z
 01500  0 53 0 00053        864        SKN     DEXP          TEST FOR PERIOD
 01501  0 54 0 00053        865        SUB     DEXP          DECIMAL EXPONENT
 01502  0 35 0 00053        866        STA     DEXP
*01503  0 76 0 01454        867        LDA     CHR
 01504  1 72 0 00204        868 DECK2  SKE     HE
 01505  0 01 0 01512        869        BRU     DECK3
*01506  0 43 0 01347        870        BRM     GET
 01507  0 43 0 02007        871        BRM     DECW
 01510  1 76 0 00053        872 DECK6  ADM     DEXP
*01511  0 76 0 01503        873        LDA     CHR
 01512  1 72 0 00203        874 DECK3  SKE     HB
 01513  0 01 0 01524        875        BRU     DECK4
*01514  0 43 0 01506        876        BRM     GET
 01515  0 43 0 02007        877        BRM     DECW
 01516  1 71 0 00000        878        CNA
 01517  0 35 0 00051        879 DECK8  STA     BEXP
*01520  0 76 0 01442        880        LDA     M1
 01521  0 35 0 00054        881        STA     FFLG
*01522  0 76 0 01511        882        LDA     CHR
 01523  0 01 0 01504        883        BRU     DECK2
 01524  1 72 0 02100        884 DECK4  SKE     ="*"
 01525  0 01 0 01543        885        BRU     DECK5
*01526  0 43 0 01514        886        BRM     GET
 01527  1 72 0 02070        887        SKE     ="+"
 01530  0 01 0 01535        888        BRU     DECK7
*01531  0 43 0 01526        889        BRM     GET
 01532  0 43 0 00431        890        BRM     SCI
 01533  1 76 0 00053        891        ADM     DEXP
 01534  0 01 0 01503        892        BRU     DECK2-1
 01535  1 72 0 02071        893 DECK7  SKE     ="/"
 01536  0 01 0 01543        894        BRU     DECK5
*01537  0 43 0 01531        895        BRM     GET
 01540  0 43 0 00431        896        BRM     SCI
```

```
01541  0 55 0 00051        897          ADD    BEXP
01542  0 01 0 01517        898          BRU    DECK8
*01543  0 76 0 01462        899 DECK5    LDA    WRD1
*01544  0 75 0 01463        900          LDB    WRD2
01545  0 71 0 00120        901          LDX    Z,X0
01546  0 6710 056          902          NOD    46              NORMALIZE
*01547  0 35 0 01543        903          STA    WRD1
*01550  0 36 0 01544        904          STB    WRD2
01551  1 67 0 00000        905          CXA
01552  0 6720 011          906          LCY    9
01553  0 6600 011          907          RSH    9
01554  0 73 0 02101        908          SKG    =-46
01555  0 76 0 02101        909          LDA    =-46
01556  0 53 0 00053        910          SKN    DEXP
01557  0 55 0 00125        911          ADD    P24
01560  1 76 0 00051        912          ADM    BEXP            MODIFY BINARY EXPONENT
01561  0 53 0 00053        913          SKN    DEXP            TEST SIGN OF DECIMAL EXPONENT
01562  0 01 0 01655        914          BRU    DPW5A
01563  0 46 30003          915          CLR
01564  0 54 0 00053        916          SUB    DEXP
01565  0 01 0 01571        917          BRU    DPW9
01566  0 76 0 02101        918 DPW91    LDA    =-46
01567  1 76 0 00051        919          ADM    BEXP
01570  0 76 0 00053        920          LDA    DEXP
01571  0 75 0 00120        921 DPW9     LDB    Z
01572  0 36 0 00053        922          STB    DEXP            0 TO D
01573  0 73 0 00031        923          SKG    P9              TEST RANGE
01574  0 01 0 01600        924          BRU    DPW6
01575  0 54 0 00031        925          SUB    P9
01576  0 35 0 00053        926          STA    DEXP            D-9 TO D
01577  0 76 0 00031        927          LDA    P9
01600  1 66 0 00000        928 DPW6     CAX
01601  1 71 0 00000        929          CNA
01602  1 76 0 00051        930          ADM    BEXP            MODIFY BINARY EXPONENT
01603  2 75 0 00066        931          LDB    FIVES,X2        POWER OF 5
01604  0 76 0 00120        932          LDA    Z
01605  0 71 0 00120        933          LDX    Z,X0
01606  0 6710 056          934          NOD    46              NORMALIZE POWER OF FIVE
*01607  0 35 0 01422        935          STA    WORD
```

```
01610  1 67 0 00000          936          CXA
01611  0 6720 011            937          LCY     9
01612  0 6600 011            938          RSH     9
01613  1 71 0 00000          939          CNA
01614  1 76 0 00051          940          ADM     BEXP            BINARY EXPONENT
01615  0 76 0 00017          941          LDA     B1
01616  0 75 0 00120          942          LDB     Z
*01617  1 75 0 01607          943          DIV     WORD
01620  0 35 0 00055          944          STA     MULT1           1ST WORD OF RECIPRICAL
01621  0 46 10012            945          BAC
*01622  1 75 0 01617          946          DIV     WORD
01623  0 55 0 00066          947          ADD     ONE
01624  0 35 0 00056          948          STA     MULT2           2ND WORD OF RECIPRICAL
01625  0 43 0 01405          949          BRM     DPNM            DATA TIMES POWER OF 5
01626  0 76 0 00053          950          LDA     DEXP
01627  1 72 0 00120          951          SKE     Z               TEST FOR DECIMAL SCALING DONE
01630  0 01 0 01566          952          BRU     DPW91
*01631  0 76 0 01547          953 DPW10    LDA     WRD1
01632  0 53 0 00054          954          SKN     FFLG            TEST FOR FLOATING POINT
01633  0 01 0 01706          955          BRU     DPF
01634  0 02 20001            956          ROV
01635  0 71 0 00051          957          LDX     BEXP,X0
01636  0 53 0 00051          958          SKN     BEXP
01637  0 01 0 01646          959          BRU     DPW12
01640  1 77 0 00051          960          XMA     BEXP
01641  1 71 0 00000          961          CNA
01642  1 77 0 00051          962          XMA     BEXP
01643  0 71 0 00051          963          LDX     BEXP,X0
01644  2 6600 000            964          RSH     0,X2
01645  0 01 0 01651          965          BRU     DPW13
01646  2 6700 000            966 DPW12    LSH     0,X2
01647  0 40 20001            967          OVT
*01650  0 61 0 01403          968          MIN     TERR            SET TRUNCATION ERROR
*01651  0 35 0 01631          969 DPW13    STA     WRD1
*01652  0 36 0 01550          970 DPW14    STB     WRD2
01653  0 43 0 01737          971          BRM     DPSS            COMPLEMENT IF NEG
01654  0 01 0 01730          972          BRU     DPW20
01655  0 76 0 02102          973 DPW5A    LDA     =22
01656  1 76 0 00051          974          ADM     BEXP
```

```
01657  0 75 0 00120        975 DPW5   LDB    Z
01660  0 76 0 00053        976        LDA    DEXP
01661  0 36 0 00053        977        STB    DEXP          0 TO B
01662  0 73 0 00031        978        SKG    P9            TEST RANGE
01663  0 01 0 01667        979        BRU    DPW11
01664  0 54 0 00031        980        SUB    P9
01665  0 35 0 00053        981        STA    DEXP
01666  0 76 0 00031        982        LDA    P9
01667  1 66 0 00000        983 DPW11  CAX
01670  1 76 0 00051        984        ADM    BEXP          MODIFY BINARY EXPONENT
01671  2 75 0 00066        985        LDB    FIVES,X2      PWER OF 5
01672  0 76 0 00120        986        LDA    Z
01673  0 71 0 00030        987        LDX    P47,X0
01674  0 6710 056          988        NOD    46
01675  0 35 0 00055        989        STA    MULT1         NORMALIZED POWER OF 5
01676  1 67 0 00000        990        CXA
01677  1 76 0 00051        991        ADM    BEXP          MODIFY B
01700  0 36 0 00056        992        STB    MULT2         CLEAR LOW ORDER WORD
01701  0 43 0 01405        993        BRM    DPNM          DATA TIMES POWER OF 5
01702  0 76 0 00053        994        LDA    DEXP
01703  0 73 0 00120        995        SKG    Z
01704  0 01 0 01631        996        BRU    DPW10         FINISHED
01705  0 01 0 01657        997        BRU    DPW5
01706  0 43 0 01737        998 DPF    BRM    DPSS          COMPLEMENT IF NEG
01707  0 71 0 00030        999        LDX    P47,X0
01710  0 6710 057         1000        NOD    47
*01711  0 35 0 01651       1001        STA    WRD1
01712  1 67 0 00000       1002        CXA
01713  0 72 0 00102       1003        SKA    FMM
01714  0 76 0 00120       1004        LDA    Z
01715  1 72 0 00120       1005        SKE    Z
01716  0 55 0 00051       1006        ADD    BEXP          MODIFY BINARY EXPONENT
01717  0 35 0 00051       1007        STA    BEXP
01720  0 6700 017         1008        LSH    15
01721  0 6600 017         1009        RSH    15
01722  1 72 0 00051       1010        SKE    BEXP
*01723  0 61 0 01650       1011        MIN    TERR          SET TRUNCATION ERROR
01724  0 6720 017         1012        LCY    15
01725  1 64 0 00000       1013        CAB
```

```
  01726  0 6620 017             RCY   15
* 01727  0 36 0 01652           STB   WRD2
* 01730  0 76 0 01522    DPW20  LDA   CHR
* 01731  0 35 0 01335           STA   TERM        SET TERMINATIR
* 01732  0 43 0 01537           BRM   GET         SKIP ,
  01733  0 43 0 02041           BRM   GNF
* 01734  0 75 0 01727           LDB   WRD2
* 01735  0 76 0 01711           LDA   WRD1
  01736  0 51 0 01434           BRR   DPW         EXIT
  01737  0 00 0 00000    DPSS   HLT   0
  01740  0 53 0 00050           SKN   DPSIGN      TEST DP SIGN
  01741  0 51 0 01737           BRR   DPSS        EXIT
  01742  0 46 00014             XAB
* 01743  0 17 0 01520           EØR   M1
* 01744  0 54 0 01743           SUB   M1
  01745  0 46 00014             XAB
* 01746  0 55 0 01744           ADD   M1
* 01747  0 43 0 01474           BRM   SKB
* 01750  0 00 0 01746           HLT   M1
* 01751  0 54 0 01750           SUB   M1
* 01752  0 17 0 01751           EØR   M1
* 01753  0 35 0 01735           STA   WRD1
* 01754  0 36 0 01734           STB   WRD2
  01755  0 51 0 01737           BRR   DPSS        EXIT
  01756  0 00 0 00000    $ØCTW  HLT   0
  01757  0 43 0 01333           BRM   SSIGN       SET SIGN
  01760  0 73 0 00143           SKG   A7
  01761  0 01 0 01764           BRU   ØCT1
* 01762  0 61 0 00666           MIN   EERR        NØT ØCTAL CHAR
  01763  0 51 0 01756           BRR   ØCTW        EXIT
* 01764  0 35 0 01331    ØCT1   STA   VALU
* 01765  0 75 0 00000           LDB   ØC
* 01766  0 43 0 01467           BRM   TCHR        TEST FØR ØCTAL CHAR
  01767  0 01 0 01776           BRU   ØCT2
  01770  0 6600 003             RSH   3
* 01771  0 76 0 01764           LDA   VALU
  01772  0 72 0 00020           SKA   A0
* 01773  0 61 0 01723           MIN   TERR
  01774  0 6700 003             LSH   3           INSERT NEW CHAR
```

```
  01775  0 01 0 01764              BRU     θCT1      TRY NEXT CHAR
* 01776  0 35 0 01731   θCT2       STA     TERM
* 01777  0 43 0 01732              BRM     GET
  02000  0 43 0 02041              BRM     GNF
* 02001  0 76 0 01771              LDA     VALU
  02002  0 17 0 00123              EθR     B0
  02003  0 53 0 00047              SKN     SIGN      TEST FθR PRECEDING MINUS
  02004  0 17 0 00123              EθR     B0        Nθ PRECEDING MUNUS
* 02005  0 35 0 02001              STA     VALU      RESULT
  02006  0 51 0 01756              BRR     θCTW      EXIT
  02007  0 00 0 00000   $DECW      HLT     0
  02010  0 43 0 01333              BRM     SSIGN     SET SIGN
  02011  0 73 0 00031              SKG     P9
  02012  0 01 0 02015              BRU     DEC1
  02013  0 76 0 00120              LDA     Z
  02014  0 01 0 02034              BRU     DEC3
* 02015  0 35 0 02005   DEC1       STA     VALU
* 02016  0 75 0 01473              LDB     DC
* 02017  0 43 0 01766              BRM     TCHR
  02020  0 01 0 02033              BRU     DEC2
* 02021  0 76 0 02015              LDA     VALU
  02022  0 75 0 00120              LDB     Z
  02023  0 02 20001                RθV
  02024  0 6700 002                LSH     2
* 02025  0 55 0 02021              ADD     VALU
  02026  0 6700 001                LSH     1
* 02027  0 55 0 01730              ADD     CHR
  02030  0 40 20001                θVT
* 02031  0 61 0 01773              MIN     TERR      SET TRUNCATIθN ERRθR
  02032  0 01 0 02015              BRU     DEC1
* 02033  0 76 0 02025   DEC2       LDA     VALU
  02034  1 71 0 00000   DEC3       CNA
  02035  0 53 0 00047              SKN     SIGN      TEST FθR PRECEDING MINUS
  02036  1 71 0 00000              CNA               -A Tθ A
* 02037  0 35 0 02033              STA     VALU      RESULT
  02040  0 51 0 02007              BRR     DECW      EXIT
  02041  0 00 0 00000   GNF        HLT     0
* 02042  0 76 0 01776   GNF1       LDA     TERM
* 02043  1 72 0 00000              SKE     CCHR      TEST FθR CθMMA
```

```
*  02044  0 53 0 01752      1092          SKN     M1          ALWAYS SKIP
   02045  0 51 0 02041      1093          BRR     GNF         EXIT
*  02046  1 72 0 01075      1094          SKE     BCHR        TEST FOR BLANK
*  02047  0 53 0 02044      1095          SKN     M1          ALWAYS SKIP
   02050  0 51 0 02041      1096          BRR     GNF         EXIT IF BLANK
*  02051  0 61 0 01762      1097          MIN     EERR        ILLEGAL CHARACTER
*  02052  0 76 0 02027      1098          LDA     CHR
*  02053  0 35 0 02042      1099          STA     TERM
*  02054  0 43 0 01777      1100          BRM     GET         SKIP CHARACTER
   02055  0 01 0 02042      1101          BRU     GNF1
   02056  0 00 0 00000      1102 $MAXL    HLT     0
   02057  0 76 0 00001      1103          LDA     MLOC        OLD MAX
*  02060  0 73 0 00571      1104          SKG     LOC
*  02061  0 76 0 02060      1105          LDA     LOC
   02062  0 35 0 00001      1106          STA     MLOC        NEW MAX
   02063  0 51 0 02056      1107          BRR     MAXL
          00000000          1108 BCON      EQU     0          BLANK CONNECTER CODE
          00000100          1109 CCON      EQU     0100       . CONNECTER CODE
          00000200          1110 RCON      EQU     0200       ) CONNECTER CODE
          00003310          1111 SCON      EQU     03310      + ++ CONNECTER CODES
          00003411          1112 DCON      EQU     03411      - -- CONNECTER CODES
          00004522          1113 PCON      EQU     04522      * ** CONNECTER CODES
          00004647          1114 QCON      EQU     04647      / // CONNECTER CODES
                            1115          END
   02064  77770000
   02065  00005000
   02066  00001700
   02067  10101010
   02070  00000020
   02071  00000061
   02072  00005100
   02073  00177777
   02074  00177775
   02075  00040000
   02076  00000012
   02077  37777777
   02100  00000054
   02101  77777722
   02102  00000026
```

```
00014 TPL
00217 LTR1
00016 S0T
02052 CHR
02054 GET
00260 PASS
00223 LTR2
00573 B8
00747 RELM
00575 ADDR
02037 VALU
00766 M0DE
00241 LADD
00243 LTR3
00543 VERR
00263 XERR
00265 LRT
02061 L0C
00274 REFM
01747 SKB
00432 IC
00363 LSXT
02053 TERM
00651 PERR
02047 M1
02051 EERR
00533 CNTR
01054 SC
02017 TCHR
00476 DLY1
00503 0CTF
02031 TERR
02046 BCHR
00541 LST
01177 DERR
00673 SCHR
00661 CC
00566 IFLG
00741 RERR
```

```
01174                   DUPM
01203                   0ERR
01210                   LIMT
01622                   W0RD
01754                   WRD2
01753                   WRD1
02016                   DC
01765                   0C
02043                   CCHR
```

SDS PROGRAM LIBRARY
PROGRAM DESCRIPTION

 Catalog No. 012010

IDENTIFICATION: 900 Series SYMBOL Part III

AUTHOR: SDS

ACCEPTED: January 12, 1965

COMPUTER CONFIGURATION: Any SDS 900 series computer with at least 4K memory.

PURPOSE: Perform input/output editing for SYMBOL.

PROGRAMMED OPERATORS: CAB, CBA, CAX, CXA, CBX, CNA, SKE, SKR, MUL, DIV, ADM, XMA

STORAGE: 0725 locations including constants

TIMING: N/A

USE: SYMBOL consists of three parts (separately assembled programs) plus a mnemonic table plus I/O subroutines.

Part III performs the following functions:

1. Edit the symbolic input line.
2. Edit the listing output image.
3. Set up the binary output record and checksum.
4. Flush the output records.

The following subroutines are documented in the order of their appearance within SYMBOL Part II.

EDC	
EDE	ELN
EDF	FLD
EDIT	FLDC
EDL	FLUSH

USE: (Cont)

EDR	GET
EDS	OUTP
EDTL	RESET
EDTV	TCHR

EDC Edit character subroutine

Inserts the character in A into the line image. Steps the line image character position. The current position in the line image is specified by:

EXW	contains location of current word
EDCX	contains current character

Calling sequence:

```
BRM   EDC   with character in A return
```

EDS Edit set

```
BRM   EDS   with initialization word in A

return
```

This subroutine sets the EDC subroutine to put the next character at a particular place. Bits 9 through 23 of A indicate the word position and bits 6 through 7 indicate the character position (0 for first character, etc.).

ELN Edit line number

```
BRM   ELN

return
```

This subroutine adds one (alphabetically) to the alphabetic line number. The line number is stored in the line number field of the print image.

USE: (Cont)

OUTP Output

```
BRM   OUTP   with word in WORD, mode
             in WMOD

return
```

Put word in output buffer. If buffer or if card type is changed (specified by contents of CTYP) empty buffer first. Uses FLUSH and RESET subroutines.

FLUSH Empty punch buffer

```
BRM   FLUSH

return
```

Outputs current object record. Uses WRITR subroutine.

RESET Reset output buffer

```
BRM   RESET

return
```

Initializes output buffer after initially or after buffer has been emptied.

FLD Position to next field

```
BRM   FLD

return
```

This subroutine skips up to eight blanks. If a non-blank is encountered, the subroutine will exit.

GET Get next character

```
BRM   GET

return with next input character in A, X2,
and CHR
```

USE: (Cont)

TCHR Test character

BRM TCHR with character type mask in B

return if next character is not of proper type

return if next character is of proper type

Reads next character. This character is used as index to mask an entry in CTT (character translation table) with the contents of B. The GET subroutine is used.

EDIT Edit form and print subroutine

This subroutine edits the errors, location and the word in WORD according to the form in WRD 2 and prints the line image. The word is also placed in the punch buffer.

The following subroutines are used:

EDS
EDE
EDL
EDR
PRNT
OUTP

Calling sequence:

BRM EDIT

return

EDTV Edit value and print subroutine

This subroutine edits the error flags and the word in WORD and prints the line image.

USE: (Cont) The following subroutines are used:

EDS
EDE
EDF
PRNT

Calling sequence:

```
BRM   EDTV

return
```

EDTL Edit location and print subroutine

This location edits the error flags and the location counter and prints the line image. The punch buffer is emptied.

The following subroutines are used:

EDE
EDL
PRNT

Calling sequence:

```
BRM   EDTL

return
```

EDE Edit errors subroutine

The error characters are inserted in the line image if the corresponding flag is set (nonzero). Position is specified in EDWE. ERCC contains minus the number of flags. The flags are reset. The error characters precede ERRC (one character per word). The flags corresponding to the characters precede VERR.

The EDC and EDS subroutines are used.

Calling sequence:

```
BRM   EDE

return
```

EDL Edit location subroutine

This subroutine edits the location counter. Position is specified in EDWL.

The subroutines EDF and EDS are used.

Calling sequence:

```
BRM   EDL

return
```

EDR Edit form reference subroutine

The word in WRD1 is edited according to the form word given in WRD2 with blanks inserted between fields and the last word filled with blanks.

The subroutines EDF, EDC and FLDC are used.

Calling sequence:

```
BRM   EDR

return
```

EDF Edit field subroutine

Edits the field given in AB. The first character is in A and the remainder of the field is left justified in B and the count of the number of characters in B (if any) is in CNTR. The number in B is binary and is edited in octal.

The EDC subroutine is used.

USE: (Cont) Calling sequence is:

```
        BRM   EDF    with first character in A,
                     remainder of field in B

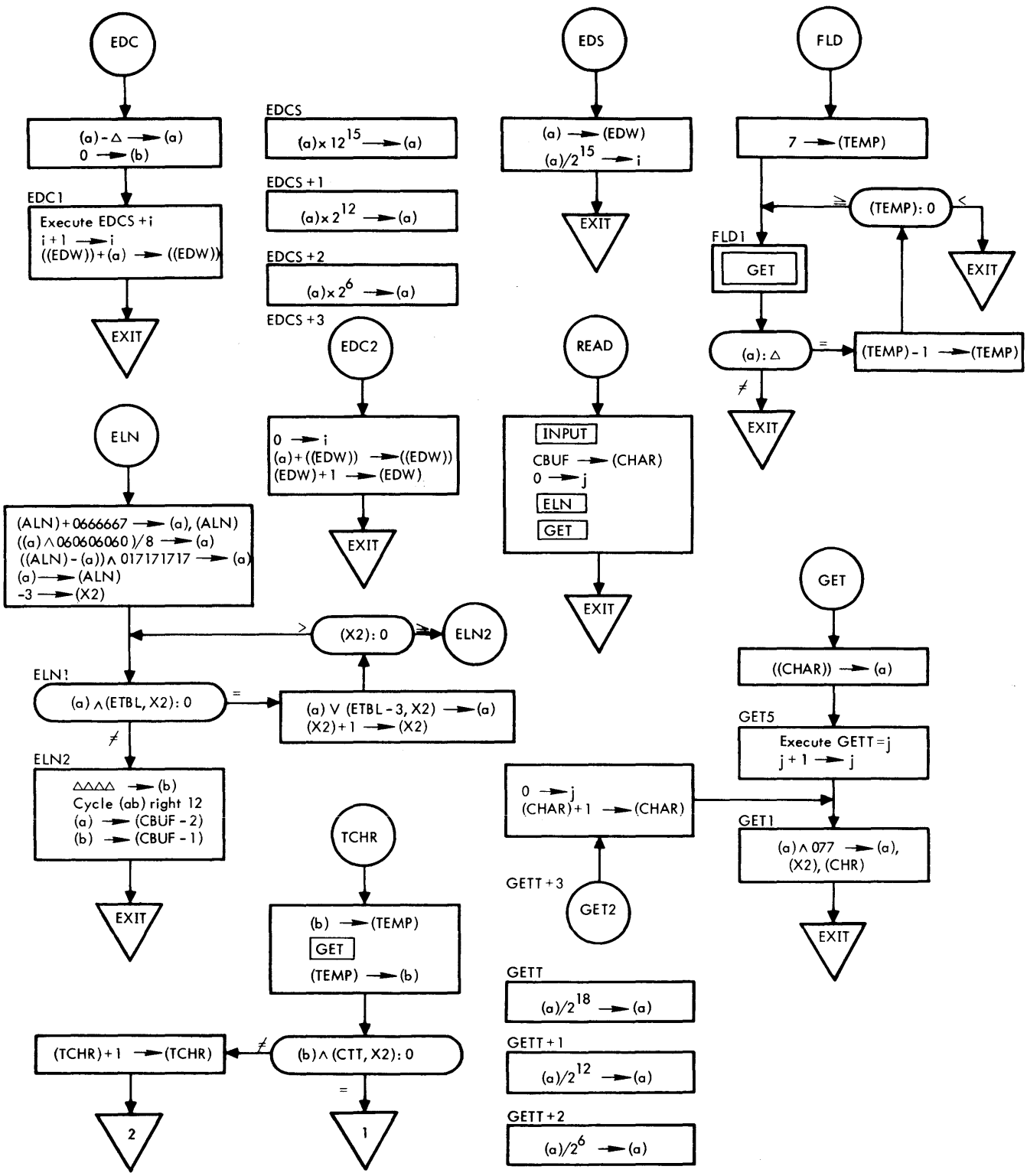
        return

FLDC    Field count

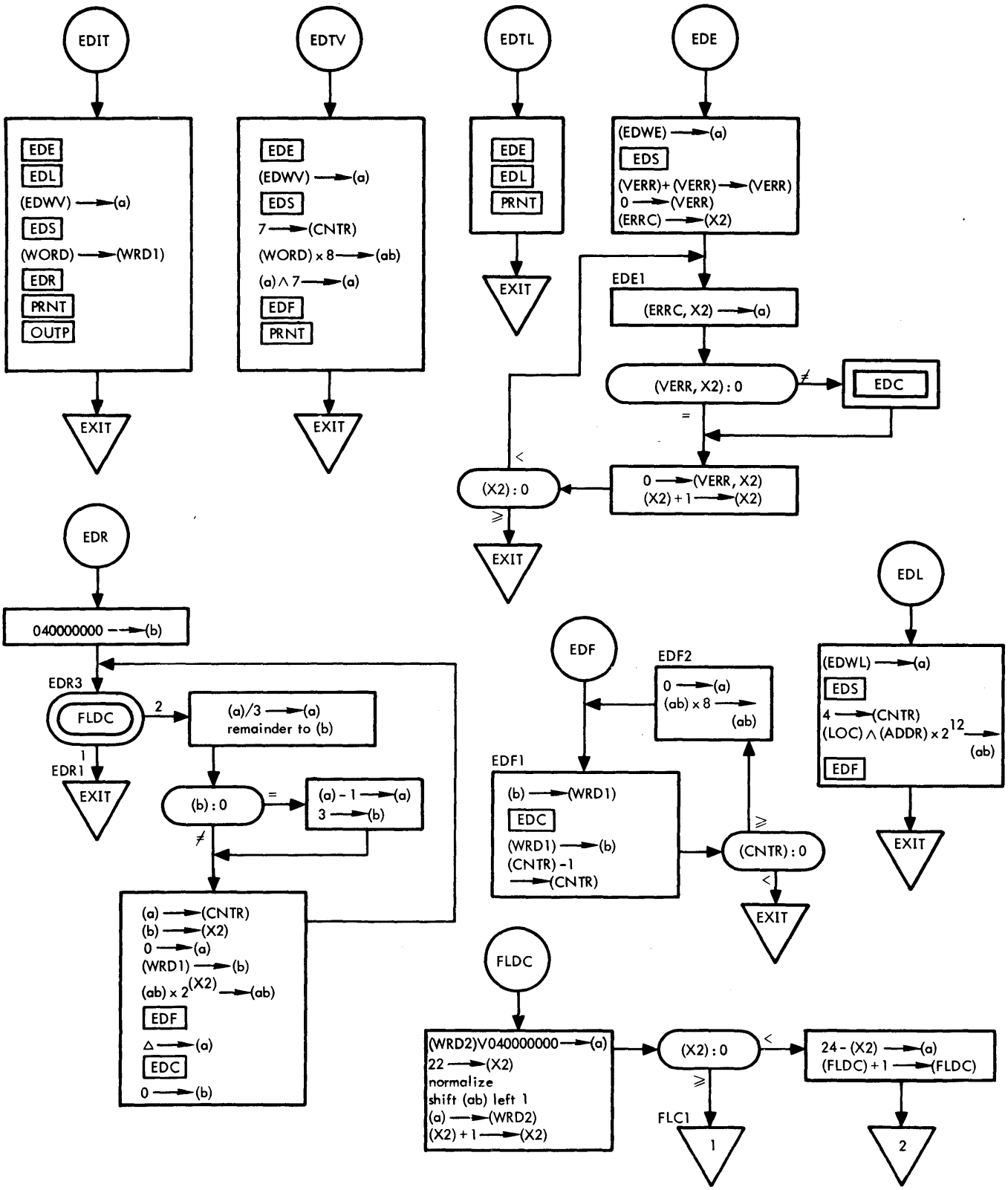
        BRM   FLDC   with form word in WRD2

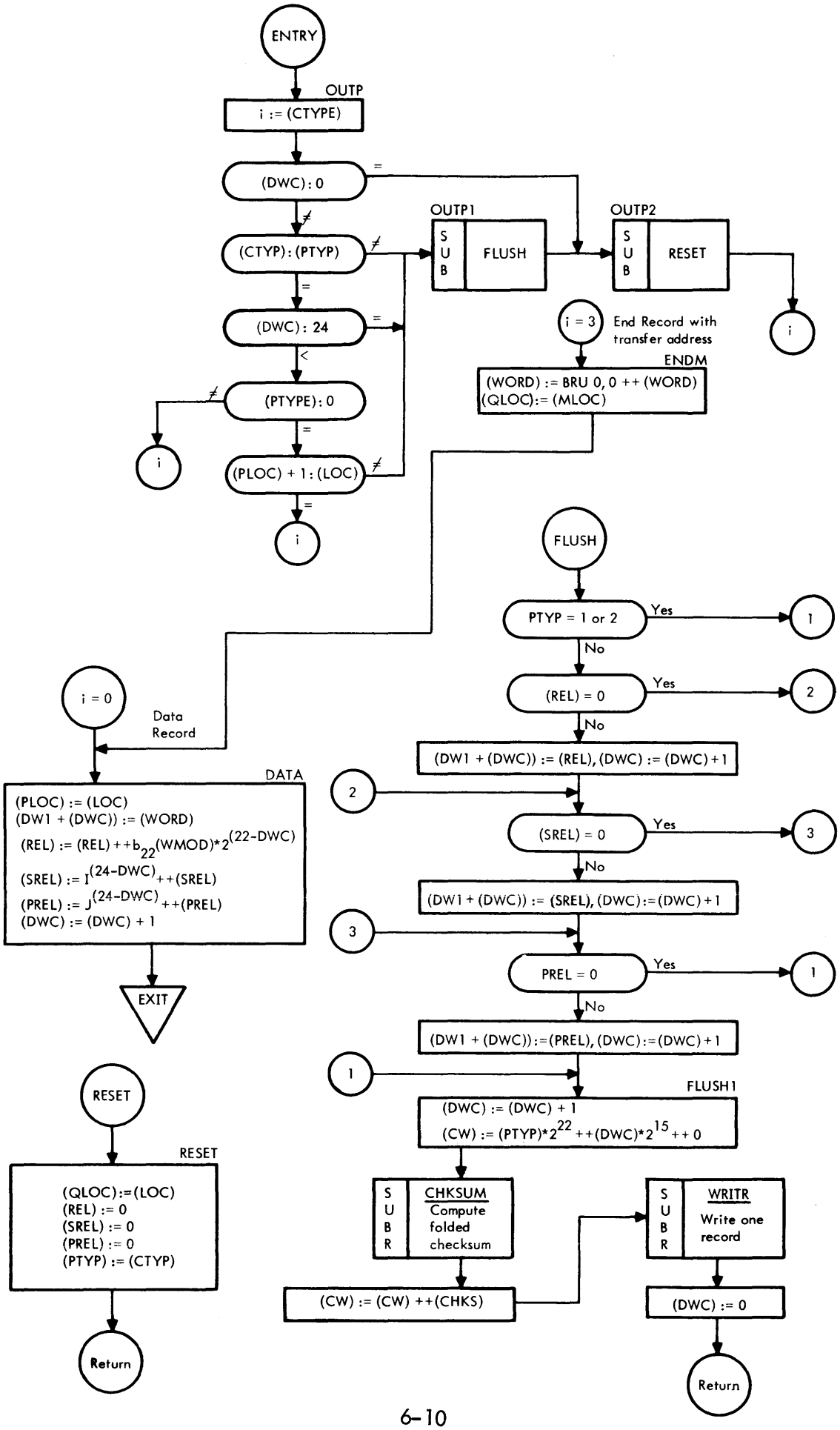
        return if no more fields

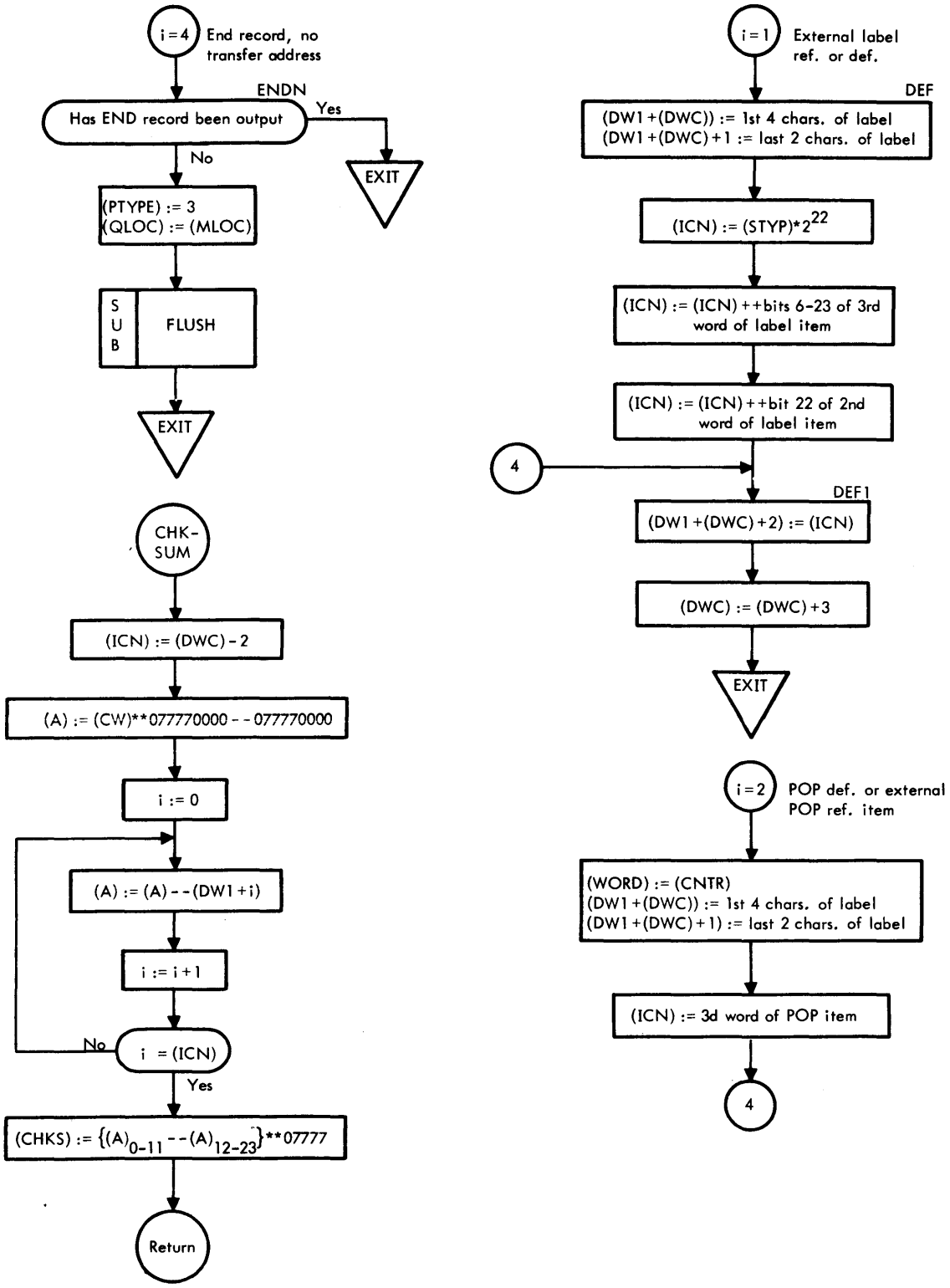
        return with field count (in bits) in A and
        new form in WRD2.
```


EDC
(a) - Δ → (a)
0 → (b)
EDC1
Execute EDCS + i
i + 1 → i
((EDW)) + (a) → ((EDW))
EXIT
EDCS
(a) x 12^15 → (a)
EDCS + 1
(a) x 2^12 → (a)
EDCS + 2
(a) x 2^6 → (a)
EDCS + 3
EDC2
0 → i
(a) + ((EDW)) → ((EDW))
(EDW) + 1 → (EDW)
EXIT
EDS
(a) → (EDW)
(a)/2^15 → i
EXIT
FLD
7 → (TEMP)
(TEMP): 0
FLD1
GET
(a): Δ
(TEMP) - 1 → (TEMP)
EXIT
ELN
(ALN) + 0666667 → (a), (ALN)
((a) ∧ 060606060)/8 → (a)
((ALN) - (a)) ∧ 017171717 → (a)
(a) → (ALN)
-3 → (X2)
READ
INPUT
CBUF → (CHAR)
0 → j
ELN
GET
EXIT
(X2): 0
ELN2
ELN1
(a) ∧ (ETBL, X2): 0
(a) V (ETBL - 3, X2) → (a)
(X2) + 1 → (X2)
GET
((CHAR)) → (a)
GET5
Execute GETT = j
j + 1 → j
GET1
(a) ∧ 077 → (a),
(X2), (CHR)
EXIT
ELN2
ΔΔΔΔ → (b)
Cycle (ab) right 12
(a) → (CBUF - 2)
(b) → (CBUF - 1)
EXIT
TCHR
(b) → (TEMP)
GET
(TEMP) → (b)
(b) ∧ (CTT, X2): 0
(TCHR) + 1 → (TCHR)
2
1
0 → j
(CHAR) + 1 → (CHAR)
GETT + 3
GET2
GETT
(a)/2^18 → (a)
GETT + 1
(a)/2^12 → (a)
GETT + 2
(a)/2^6 → (a)

900 SERIES SYMBOL PART III (cont.)




ENTRY
OUTP
i := (CTYPE)
(DWC): 0
=
≠
(CTYP): (PTYP)
≠
OUTP1
SUB
FLUSH
OUTP2
SUB
RESET
=
(DWC): 24
=
<
≠
(PTYPE): 0
=
i
(PLOC) + 1: (LOC)
≠
=
i
i = 3
End Record with transfer address
ENDM
(WORD) := BRU 0, 0 ++ (WORD)
(QLOC):= (MLOC)
i
i = 0
Data Record
DATA
(PLOC) := (LOC)
(DW1 + (DWC)) := (WORD)
(REL) := (REL) ++b22(WMOD)*2(22-DWC)
(SREL) := I(24-DWC) ++(SREL)
(PREL) := J(24-DWC) ++(PREL)
(DWC) := (DWC) + 1
EXIT
RESET
RESET
(QLOC):=(LOC)
(REL) := 0
(SREL) := 0
(PREL) := 0
(PTYP) := (CTYP)
Return
FLUSH
PTYP = 1 or 2
Yes
1
No
(REL) = 0
Yes
2
No
(DW1 + (DWC)) := (REL), (DWC) := (DWC) + 1
2
(SREL) = 0
Yes
3
No
(DW1 + (DWC)) := (SREL), (DWC) := (DWC) + 1
3
PREL = 0
Yes
1
No
(DW1 + (DWC)) := (PREL), (DWC) := (DWC) + 1
1
FLUSH1
(DWC) := (DWC) + 1
(CW) := (PTYP)*2^22 ++(DWC)*2^15 ++ 0
SUBR
CHKSUM
Compute folded checksum
(CW) := (CW) ++(CHKS)
SUBR
WRITR
Write one record
(DWC) := 0
Return


i=4
End record, no transfer address
ENDN
Has END record been output
Yes
No
EXIT
(PTYPE) := 3
(QLOC) := (MLOC)
SUB
FLUSH
EXIT
CHK-SUM
(ICN) := (DWC) - 2
(A) := (CW)**077770000 - - 077770000
i := 0
(A) := (A) - - (DW1 + i)
i := i + 1
No
i = (ICN)
Yes
(CHKS) := {(A)0-11 - - (A)12-23}**07777
Return
i=1
External label ref. or def.
DEF
(DW1 + (DWC)) := 1st 4 chars. of label
(DW1 + (DWC) + 1 := last 2 chars. of label
(ICN) := (STYP)*2^22
(ICN) := (ICN) + + bits 6-23 of 3rd word of label item
(ICN) := (ICN) + + bit 22 of 2nd word of label item
4
DEF1
(DW1 + (DWC) + 2) := (ICN)
(DWC) := (DWC) + 3
EXIT
i=2
POP def. or external POP ref. item
(WORD) := (CNTR)
(DW1 + (DWC)) := 1st 4 chars. of label
(DW1 + (DWC) + 1) := last 2 chars. of label
(ICN) := 3d word of POP item
4

GLOSSARY OF TERMS AND SYMBOLS

(α) = contents of register whose label is α
(CTYP) = record type for current data word or symbolic item
(WORD) = current data word or address of current symbolic item
(LOC) = location (to be) of (WORD) at object time
$(WMOD)_{22}$ = 1 if (WORD) is load relocatable, 0 if not
(PMOD) = POP reference indicator for (WORD)
J = 1 if (PMOD) $\neq$ 0 (means $(WORD)_{2-8} > 77_8$)
J = 0 if (PMOD) = 0
(STYP) = if (CTYP) = 0, then (STYP) is special I/O relocation indicator
I = 1 if (STYP) < 0
I = 0 if (STYP) $\geqslant$ 0
if (CTYP) > 0, then (STYP) = item type code (see description of Universal Binary Object Program format)
(PLOC) = value of (LOC) on previous entry to OUTP
(DWC) = number of data words in current record
(MLOC) = 1 + maximum value attained by location counter
(QLOC) = load address for first word of current data record
(ICW) = location of current word in current record
(PTYP) = value of (CTYP) on previous entry to OUTP
(CHKS) = current checksum value
(A) = contents of the A register
(REL) = current load relocaction modifier word
(SREL) = current special I/O relocation modifier word
(PREL) = current POP relocation modifier word
(CW) = control word for current record
(DW1) = 1st data word of current record (DW1 = CW + 1)

Permissible values of (CTYP)

Binary Value	Meaning in OUTP
000	= Data Record item
001	= external (label) reference or definition item
010	= POP definition or external POP reference item
011	= End Record with transfer address
(100	= End Record with no transfer address)*

*Converted to 011 on output.

```
               00000000        *       S3
               00000000        S9300   EQU       0
               00000000        XO      EQU       S9300
               00000002        X2      EQU       2-S9300
               16400000        CAB     OPD       016400000
               16500000        CBA     OPD       016500000
               16600000        CAX     OPD       016600000
               16700000        CXA     OPD       016700000
               17000000        CBX     OPD       017000000
               17100000        CNA     OPD       017100000
               17200000        SKE     OPD       017200000
               17300000        SKR     OPD       017300000
               17400000        MUL     OPD       017400000
               17500000        DIV     OPD       017500000
               17600000        ADM     OPD       017600000
               17700000        XMA     OPD       017700000
00002                                  AORG      2
00002                          $CW     RES       1
00003                          DW1     RES       31
00000                                  ORG       0
00000                          $CHR    RES       1
00001                          $EDCT   RES       1
00002                          $ALN    RES       1
00003                          $DWC    RES       1
00004                          CHAR    RES       1
                               IFRM    FORM      3,6,1,14
00005          0 00 00022      EDWE    HLT       LBUF
00006          0 01 00023      EDWL    BRU       LBUF+1
00007          0 00 00025      EDWV    HLT       LBUF+3
00010                          $EDW     RES      1
00011                          TEMP    RES       1
00012                          PTYP    RES       1
00013                          PLOC    RES       1
00014                          QLOC    RES       1
00015                          $ICW     RES      1
00016                          CHKS    RES       1
00017                          REL     RES       1
00020                          SREL    RES       1
```

```
00021                          39  PREL    RES     1
00022                          40  $LBUF   RES     0
00022                          41          RES     3
00025                          42  $EREF1  RES     0
00025                          43          RES     1
00026                          44  $EREF2  RES     0
00026                          45          RES     4
00032                          46  $CBUF   RES     0
00032                          47          RES     12
00046                          48  $TBFE   RES     0
00046                          49          RES     8
00056                          50  $CBFE   RES      0
00056  60606060                51  $DLY1   DATA    060606060
00057  00000054                52  ERRA    DATA    054
00060  00000046                53          DATA    'F'
00061  00000024                54          DATA    024
00062  00000025                55          DATA    025
00063  00000031                56          DATA    031
00064  00000043                57          DATA    043
00065  00000047                58          DATA    047
00066  00000051                59          DATA    051
00067  00000063                60          DATA    063
00070  00000064                61          DATA    064
00071  00177766                62  $ERRC   DATA    ERRA-ERRC+0200000
00072  60000000                63          DATA    060000000
00073  00600000                64          DATA    0600000
00074  00006000                65          DATA    06000
00075  17000000                66          DATA    017000000
00076  00170000                67          DATA    0170000
00077  00001700                68          DATA    01700
00100                          69  ETBL    RES     0
00100  0 00 00000              70  $EDC    HLT     0
00101  0 54 00676              71          SUB     =060
00102  0 75 00000              72          LDB     Z
00103  0 23 00107              73  EDC1    EXU     EDCS            EXECUTE SHIFT
00104  0 61 00103              74          MIN     EDC1            STEP SHIFT
00105  1 76 40010              75          ADM     *EDW            ADD CHARACTER TO MEMORY
00106  0 51 00100              76          BRR     EDC             EXIT
00107  0 67 00022              77  EDCS    LSH     18              1ST CHAR
```

```
00110  0 67 00014      78          LSH     12                      2ND CHAR
00111  0 67 00006      79          LSH     6                       3RD CHAR
00112  0 01 00113      80          BRU     EDC2                    LAST CHAR IN WORD
00113  0 75 00120      81  EDC2    LDB     EDCX                    RESET EXC
00114  0 36 00103      82          STB     EDC1
00115  1 76 40010      83          ADM     *EDW                    STORE LAST CHAR
00116  0 61 00010      84          MIN     EDW                     STEP WORD
00117  0 51 00100      85          BRR     EDC                     EXIT
00120  0 23 00107      86  EDCX    EXU     EDCS
00121  0 00 00000      87  $EDS    HLT     0
00122  0 35 00010      88          STA     EDW                     WORD POSITION
00123  0 66 00017      89          RSH     15
00124  0 55 00120      90          ADD     EDCX
00125  0 35 00103      91          STA     EDC1                    CHAR POSITION
00126  0 51 00121      92          BRR     EDS                     EXIT
00127  0 00 00000      93  ELN     HLT     0
00130  0 76 00002      94          LDA     ALN                     ALPHABETIC LINE NO.
00131  0 55 00677      95          ADD     =0666667
00132  0 35 00002      96          STA     ALN
00133  0 14 00056      97          ETR     DLY1
00134  0 66 00003      98          RSH     3
00135  1 71 00000      99          CNA
00136  0 55 00002     100          ADD     ALN                     SUBTRACT ZONE FROM NON-ZONEBITS
00137  0 14 00700     101          ETR     =017171717
00140  0 35 00002     102          STA     ALN                     SAVE ALPHANUMERIC LINE NUMBER
00141  0 71 00701     103          LDX     =00200000-3,X0
00142  2 72 00100     104  ELN1    SKA     ETBL,X2                 TEST FOR 0
00143  0 01 00146     105          BRU     ELN2
00144  2 16 00075     106          MRG     ETBL-3,X2               REPLACE 0 WITH BLANK
00145  0 41 00142     107          BRX     ELN1,X0
00146  0 75 00056     108  ELN2    LDB     DLY1
00147  0 66 20014     109          RCY     12
00150  0 35 00030     110          STA     CBUF-2
00151  0 36 00031     111          STB     CBUF-1
00152  0 51 00127     112          BRR     ELN                     EXIT
                      113  *               RELOCATABLE BINARY OUTPUT
                      114  *
00153  0 00 00000     115  $OUTP   HLT     0
*00154  0 71 00000     116          LDX     CTYP,X0
```

```
00155  0 76 00003      117          LDA     DWC
00156  0 14 00702      118          ETR     =077777
*00157  0 73 00102      119          SKG     Z
00160  0 01 00200      120          BRU     0UTP2          (DWC) = 0, RESET 0NLY
00161  1 67 00000      121          CXA
00162  1 72 00012      122          SKE     PTYP
00163  0 01 00177      123          BRU     0UTP1          TYPE CHANGE, FLUSH AND RESET
00164  0 76 00703      124          LDA     =24
00165  0 73 00003      125          SKG     DWC
00166  0 01 00177      126          BRU     0UTP1          (DWC) = 24, FLUSH AND RESET
00167  0 76 00012      127          LDA     PTYP
*00170  1 72 00157      128          SKE     Z
00171  2 01 40434      129          BRU     *TYP,X2        (PTYP) > 0
00172  0 76 00013      130          LDA     PL0C           (PTYP) = 0
00173  0 55 00704      131          ADD     =1
*00174  1 72 00000      132          SKE     L0C
00175  0 01 00177      133          BRU     0UTP1          (PL0C)+1 N0T = (L0C), FLUSH AND RESET
00176  2 01 40434      134          BRU     *TYP,X2        (PL0C)+1 = (L0C)
00177  0 43 00241      135 0UTP1    BRM     FLUSH
00200  0 43 00354      136 0UTP2    BRM     RESET
00201  2 01 40434      137          BRU     *TYP,X2
*00202  0 76 00000      138 ENDM     LDA     W0RD
00203  0 14 00702      139          ETR     =077777
00204  0 16 00441      140          MRG     L0RU
*00205  0 35 00202      141          STA     W0RD           (W0RD):= 'BRU 0,0'++(W0RD)
*00206  0 76 00000      142          LDA     ML0C
00207  0 35 00014      143          STA     QL0C           (QL0C) := (ML0C)
                        144 *
00210  0 71 00003      145 DATA     LDX     DWC,X0
*00211  0 76 00174      146          LDA     L0C
00212  0 35 00013      147          STA     PL0C           (PL0C) := (L0C)
*00213  0 76 00205      148          LDA     W0RD
00214  2 35 00004      149          STA     DW1+1,X2       (DW1(DWC+1)) := (W0RD)
*00215  0 76 00000      150          LDA     WM0D
00216  0 14 00705      151          ETR     =2
*00217  0 75 00170      152          LDB     Z
00220  2 66 00002      153          RSH     2,X2           B22(WM0D)*2**(22-(DWC))
00221  1 65 00000      154          CBA
00222  0 16 00017      155          MRG     REL
```

```
00223  0 35 00017      156          STA     REL             (REL) :=(REL)++(A)
00224  0 53 00000      157          SKN     STYP            SKIP IF SPECIAL I/O WORD
00225  0 01 00232      158          BRU     $+5
00226  0 75 00704      159          LDB     =1
00227  0 76 00217      160          LDA     Z
00230  2 66 20000      161          RCY     0,X2
00231  1 76 00020      162          ADM     SREL            (SREL) := I**(24-DWC)++(SREL)
00232  0 46 30003      163          CLR
00233  1 72 00000      164          SKE     PMOD
00234  0 75 00704      165          LDB     =1
00235  2 66 20001      166          RCY     1,X2
00236  1 76 00021      167          ADM     PREL
00237  0 61 00003      168          MIN     DWC             (DWC):=(DWC)+1
00240  0 51 00153      169          BRR     OUTP            EXIT
                        170  *
00241  0 00 00000      171  FLUSH   HLT                     ENTRY
00242  0 76 00012      172          LDA     PTYP            RECORD TYPE OF RECORD BEING FLUSHED
00243  0 73 00227      173          SKG     Z
00244  0 01 00247      174          BRU     $+3             (PTYP) = 0
00245  1 72 00706      175          SKE     =3
00246  0 01 00306      176          BRU     FLUSH1          (PTYP) = 1 OR 2
00247  0 61 00003      177          MIN     DWC             INCLUDE LOAD-ADDRESS WORD IN COUNT
00250  0 76 00014      178          LDA     QLOC
00251  0 35 00003      179          STA     DW1             STORE LOAD ADDRESS
00252  0 71 00003      180          LDX     DWC,X0
00253  0 76 00017      181          LDA     REL
00254  1 72 00243      182          SKE     Z
00255  0 01 00257      183          BRU     $+2
00256  0 01 00264      184          BRU     FLSH2
00257  2 35 00003      185          STA     DW1,X2          STORE RELOCATION INDICATOR WORD
00260  2 77 00001      186          EAX     1,X2
00261  0 61 00003      187          MIN     DWC             INCLUDE LOAD-RELOCATION WORD IN COUNT
00262  0 76 00707      188          LDA     =02000000
00263  1 76 00003      189          ADM     DW1             (M) := 1, (RELOCATION WORD PRESENT)
00264  0 76 00020      190  FLSH2   LDA     SREL
00265  1 72 00254      191          SKE     Z
00266  0 01 00270      192          BRU     $+2
00267  0 01 00275      193          BRU     FLSH3
00270  2 35 00003      194          STA     DW1,X2
```

```
00271  2 77 00001      195          EAX     1,X2
00272  0 61 00003      196          MIN     DWC                    INCLUDE SPECIAL RELOC WORD IN COUNT
00273  0 76 00710      197          LDA     =020000000
00274  1 76 00003      198          ADM     DW1                    (M) := 8+ (M)
00275  0 76 00021      199  FLSH3   LDA     PREL
*      00276  1 72 00265      200          SKE     Z
00277  0 01 00301      201          BRU     $+2
00300  0 01 00306      202          BRU     FLUSH1
00301  2 35 00003      203          STA     DW1,X2
00302  2 77 00001      204          EAX     1,X2
00303  0 61 00003      205          MIN     DWC
00304  0 76 00711      206          LDA     =010000000
00305  1 76 00003      207          ADM     DW1
                        208  *               FORM RECORD CONTROL WORD
00306  0 76 00012      209  FLUSH1  LDA     PTYP                   RECORD TYPE
*      00307  0 75 00276      210          LDB     Z
00310  0 67 00006      211          LSH     6
00311  0 55 00704      212          ADD     =1                   INCLUDE CONTROL WORD IN COUNT
00312  0 55 00003      213          ADD     DWC                    NR OF WORDS IN RECORD
00313  0 67 00017      214          LSH     15
00314  0 16 00712      215          MRG     =050000              RECORD MODE (BINARY)
00315  0 35 00002      216          STA     CW
                        217  *               COMPUTE CHECKSUM AND WRITE RECORD
00316  0 43 00325      218          BRM     CHKSUM                 COMPUTE FOLDED CHECKSUM
00317  0 16 00002      219          MRG     CW                     INSERT CHECKSUM IN CONTROL WORD
00320  0 35 00002      220          STA     CW                     STORE COMPLETED RECORD CONTROL WORD
*      00321  0 43 00000      221          BRM     WRITR                  WRITE ONE RECORD
*      00322  0 76 00307      222          LDA     Z
00323  0 35 00003      223          STA     DWC                    (DWC) := 0
00324  0 51 00241      224          BRR     FLUSH                  EXIT
                        225  *
                        226  *               SUBROUTINE TO COMPUTE FOLDED CHECKSUM
00325  0 00 00000      227  CHKSUM  HLT                            ENTRY
00326  0 76 00002      228          LDA     CW
00327  0 66 00017      229          RSH     15
00330  0 14 00713      230          ETR     =077                 (A) = NR WORDS IN RECORD
00331  0 54 00705      231          SUB     =2
00332  0 35 00353      232          STA     ICN
00333  0 76 00706      233          LDA     =DW1                 ADDRESS OF 2D WORD
```

```
00334  0 35 00015      234          STA     ICW
00335  0 76 00002      235          LDA     CW
00336  0 14 00714      236          ETR     =077770000          EXIRACT CHECKSUM
00337  0 17 00714      237          EOR     =077770000          ODD PARITY CHECKSUM
00340  0 17 40015      238          EOR     *ICW
00341  0 61 00015      239          MIN     ICW                  INCREMENT ADDRESS
00342  1 73 00353      240          SKR     ICN
00343  0 01 00340      241          BRU     $-3
00344  0 75 00322      242          LDB     Z                    (A) = 24-BIT CHECKSUM OF WORDS 1 THRU
00345  0 67 20014      243          LCY     12
00346  0 36 00016      244          STB     CHKS
00347  0 75 00344      245          LDB     Z
00350  0 66 20014      246          RGY     12
00351  0 17 00016      247          EOR     CHKS                 (A) = COMPLETED 12-BIT CHECKSUM
00352  0 51 00325      248          BRR     CHKSUM               EXIT
00353  00000000        249  ICN     DATA    0
                       250  *
                       251  *
                       252  *
00354  0 00 00000      253  RESET   HLT                          ENTRY
00355  0 76 00211      254          LDA     LOC
00356  0 35 00014      255          STA     QLOC                 (QLOC):=(LOC)
00357  0 76 00347      256          LDA     Z
00360  0 35 00017      257          STA     REL                  (REL) := 0
00361  0 35 00020      258          STA     SREL                 (SREL) := 0
00362  0 35 00021      259          STA     PREL
00363  0 71 00154      260          LDX     CTYP,XO
00364  0 37 00012      261          STX     PTYP,XO
00365  0 51 00354      262          BRR     RESET                EXIT
                       263  *
00366  0 76 00357      264  ENDN    LDA     Z
00367  0 75 00002      265          LDB     CW
00370  0 67 00003      266          LSH     3
00371  1 72 00706      267          SKE     =3
00372  0 01 00374      268          BRU     $+2
00373  0 51 00153      269          BRR     OUTP
00374  0 76 00706      270          LDA     =3
00375  0 35 00012      271          STA     PTYP
00376  0 76 00206      272          LDA     MLOC
```

```
00377  0 35 00014      273          STA     QLOC
00400  0 43 00241      274          BRM     FLUSH
00401  0 51 00153      275          BRR     OUTP
                        276  *
                        277  *               INSERT 3 WORD REF OR DEF ITEM IN CURRENT OUTPUT RECORD
00402  0 71 00003      278  DEF     LDX     DWC,X0                  ENTRY
*00403  0 76 40213      279          LDA     *WORD
 00404  2 35 00003      280          STA     DW1,X2                  STORE 1ST 4 CHARS OF LABEL
*00405  0 61 00403      281          MIN     WORD
*00406  0 76 40405      282          LDA     *WORD
 00407  0 14 00714      283          ETR     =077770000
 00410  0 16 00715      284          MRG     =06060
 00411  2 35 00004      285          STA     DW1+1,X2                STORE LAST .2 CHARS OF LABEL
*00412  0 75 00366      286          LDB     Z
*00413  0 76 00224      287          LDA     STYP
 00414  0 67 00026      288          LSH     22
 00415  0 35 00353      289          STA     ICN
*00416  0 76 40406      290          LDA     *WORD
 00417  0 14 00705      291          ETR     =2
 00420  0 46 00014      292          XAB
*00421  0 61 00416      293          MIN     WORD
*00422  0 76 40421      294          LDA     *WORD
 00423  0 14 00702      295          ETR     =077777
*00424  0 43 00000      296          BRM     SKB
 00425  0 00 00705      297          HLT     =2
 00426  0 16 00716      298          MRG     =0100000                SET ADDRESS RELOCATION FLAG
 00427  0 16 00353      299          MRG     ICN                     SET SUB-TYPE
 00430  2 35 00005      300  DEF1    STA     DW1+2,X2
 00431  0 76 00706      301          LDA     =3
 00432  1 76 00003      302          ADM     DWC                     (DWC) := (DWC)+3
 00433  0 51 00153      303          BRR     OUTP                    EXIT
                        304  *
        00000402        305  REF     EQU     DEF
                        306  *               CURRENT RECORD IMAGE
 00434  0 00 00210      307  TYP     HLT     DATA
 00435  0 00 00402      308          HLT     DEF                     EXTERNAL REF OR DEF
 00436  0 00 00442      309          HLT     POP
 00437  0 00 00202      310          HLT     ENDM
 00440  0 00 00366      311          HLT     ENDN
```

```
00441  0 01 00000      312  LBRU   BRU    0
00442  0 71 00003      313  P&P    LDX    DWC,X0
00443  0 76 00000      314         LDA    CNTR
00444  0 35 00422      315         STA    W&RD
00445  0 76 40444      316         LDA    *W&RD
00446  2 35 00003      317         STA    DW1,X2
00447  0 61 00445      318         MIN    W&RD
00450  0 76 40447      319         LDA    *W&RD
                       320
00451  0 14 00714      321         ETR    =077770000
00452  0 16 00715      322         MRG    =' '
00453  2 35 00004      323         STA    DW1+1,X2
00454  0 61 00450      324         MIN    W&RD
00455  0 76 40454      325         LDA    *W&RD
00456  0 01 00430      326         BRU    DEF1
00457  0 00 00000      327  $READ  HLT    0
00460  0 43 00000      328          BRM   INPUT
00461  0 76 00717      329         LDA    =CBUF
00462  0 35 00004      330         STA    CHAR          SET BEGINNING OF LINE
00463  0 76 00521      331         LDA    GETX
00464  0 35 00503      332         STA    GETS          SET BEGINNING OF W&RD
00465  0 43 00127      333         BRM    ELN
00466  0 43 00501      334         BRM    GET           GET 1ST CHARACTER OF LINE
00467  0 51 00457      335         BRR    READ          EXIT
00470  0 00 00000      336  $FLD   HLT    0
00471  0 76 00720      337         LDA    =7
00472  0 35 00011      338         STA    TEMP
00473  0 43 00501      339  FLD1   BRM    GET
00474  1 72 00676      340         SKE    =' '
00475  0 51 00470      341         BRR    FLD
00476  1 73 00011      342         SKR    TEMP
00477  0 01 00473      343         BRU    FLD1
00500  0 51 00470      344         BRR    FLD           EXIT
00501  0 00 00000      345  $GET   HLT    0
00502  0 76 40004      346         LDA    *CHAR         LOAD CHARACTER
00503  0 23 00511      347  GETS   EXU    GETT          EXECUTE SHIFT
00504  0 61 00503      348         MIN    GETS
00505  0 14 00713      349  GET1   ETR    =077
00506  0 35 00000      350         STA    CHR
```

```
00507  1 66 00000      351            CAX
00510  0 51 00501      352            BRR     GET
00511  0 66 00022      353  GETT      RSH     18          1ST CHAR
00512  0 66 00014      354            RSH     12          2ND CHAR
00513  0 66 00006      355            RSH     6           3RD CHAR
00514  0 01 00515      356            BRU     GET2        END WORD
00515  0 75 00521      357  GET2      LDB     GETX
00516  0 36 00503      358            STB     GETS        RESET EXU
00517  0 61 00004      359            MIN     CHAR        STEP WORD
00520  0 01 00505      360            BRU     GET1
00521  0 23 00511      361  GETX      EXU     GETT
00522  0 00 00000      362  STCHR     HLT     0
00523  0 36 00011      363            STB     TEMP
00524  0 43 00501      364            BRM     GET         GET CHAR bits 18-23
00525  0 75 00011      365            LDB     TEMP
00526  0 43 00424      366            BRM     SKB
00527  2 00 00000      367            HLT     CTT,X2      TEST FOR MATCH
00530  0 61 00522      368            MIN     TCHR        CHARACTER IS O.K.
00531  0 51 00522      369            BRR     TCHR        EXIT
00532  0 00 00000      370  $EDIT     HLT     0
00533  0 43 00566      371            BRM     EDE         EDIT ERRORS
00534  0 43 00606      372            BRM     EDL         EDIT LOCATION
00535  0 76 00007      373            LDA     EDWV
00536  0 43 00121      374            BRM     EDS
00537  0 76 00455      375            LDA     WORD
00540  0 35 00000      376            STA     WRD1        DATA WORD
00541  0 43 00620      377            BRM     EDR         EDIT BY FORM
00542  0 43 00000      378            BRM     PRNT        PRINT LINE
00543  0 43 00153      379            BRM     OUTP        OUTPUT WORD
00544  0 51 00532      380            BRR     EDIT        EXIT
00545  0 00 00000      381  $EDTV     HLT     0
00546  0 43 00566      382            BRM     EDE         EDIT ERRORS
00547  0 76 00007      383            LDA     EDWV        VALUE WORD POSITON
00550  0 43 00121      384            BRM     EDS
00551  0 76 00720      385            LDA     =7
00552  0 35 00443      386            STA     CNTR        7 CHARACTERS LEFT IN B
00553  0 76 00587      387            LDA     WORD        DATA
00554  0 66 00025      388            RSH     21          LEAVE 1ST CHAR IN A
00555  0 14 00720      389            ETR     =7
```

B6

```
  00556 0 43 00646           BRM   EDF            EDIT FIELD
* 00557 0 43 00542           BRM   PRNT           PRINT LINE
  00560 0 51 00545           BRR   EDTV           EXIT
  00561 0 00 00000    $EDTL  HLT   0
  00562 0 43 00566           BRM   EDE            EDIT ERRORS
  00563 0 43 00606           BRM   EDL            EDIT LOCATION
* 00564 0 43 00557           BRM   PRNT           PRINT LINE
  00565 0 51 00561           BRR   EDTL           EXIT
  00566 0 00 00000    $EDE   HLT   0
  00567 0 76 00005           LDA   EDWE           ERROR WORD POSITION
  00570 0 43 00121           BRM   EDS
* 00571 0 76 00412           LDA   Z
* 00572 1 77 00000           XMA   VERR           RESET V ERROR FLAG
* 00573 1 76 00000           ADM   UERR           U SET IF V SET
  00574 0 71 00071           LDX   ERRC,X0        ERROR COUNT
  00575 2 76 00071    EDE1   LDA   ERRC,X2        ERROR LISTING CHAR
* 00576 2 75 00572           LDB   VERR,X2
* 00577 0 43 00526           BRM   SKB
* 00600 0 00 00000           HLT   M1
  00601 0 43 00100           BRM   EDC            INSERT ERROR CODE
* 00602 0 75 00571           LDB   Z
* 00603 2 36 00576           STB   VERR,X2        RESET FLAG
  00604 0 41 00575           BRX   EDE1,X0        TEST NEXT FLAG
  00605 0 51 00566           BRR   EDE            EXIT
  00606 0 00 00000    EDL    HLT   0
  00607 0 76 00006           LDA   EDWL           LOC WORD POSITION
  00610 0 43 00121           BRM   EDS
  00611 0 76 00721           LDA   =4
* 00612 0 35 00552           STA   CNTR           4 MORE CHARACTERS IN B
* 00613 0 76 00355           LDA   LOC
* 00614 0 14 00000           ETR   ADDR
  00615 0 66 00014           RSH   12
  00616 0 43 00646           BRM   EDF            EDIT LOC
  00617 0 51 00606           BRR   EDL            EXIT
  00620 0 00 00000    EDR    HLT   0
  00621 0 75 00722           LDB   =040000000
  00622 0 43 00660    EDR3   BRM   FLDC           COUNT BITS FIELD
  00623 0 01 00645           BRU   EDR1           NO MORE FIELDS
  00624 0 66 00027           RSH   23
```

```
00625  1 75 00706      429          DIV     =3
*00626  0 43 00577      430          BRM     SKB
00627  0 00 00706      431          HLT     =3
00630  0 01 00633      432          BRU     EDR2
00631  0 54 00704      433          SUB     =1
00632  0 75 00706      434          LDB     =3
*00633  0 35 00612      435  EDR2    STA     CNTR        OCTAL CHARACTERS IN FIELD
00634  1 70 00000      436          CBX                 BITS IN 1ST CHAR
*00635  0 76 00602      437          LDA     Z
*00636  0 75 00540      438          LDB     WRD1        DATA WORD
00637  2 67 00000      439          LSH     0,X2        1ST CHAR IN A
00640  0 43 00646      440          BRM     EDF         EDIT FIELD
00641  0 76 00676      441          LDA     =060
00642  0 43 00100      442          BRM     EDC         INSERT TRAILING BLANK
*00643  0 75 00635      443          LDB     Z
00644  0 01 00622      444          BRU     EDR3        DO NEXT FIELD
00645  0 51 00620      445  EDR1    BRR     EDR         EXIT
00646  0 00 00000      446  EDF     HLT     0
00647  0 01 00652      447          BRU     EDF1
*00650  0 76 00643      448  EDF2    LDA     Z
00651  0 67 00003      449          LSH     3           NEW OCTAL CHAR
*00652  0 36 00636      450  EDF1    STB     WRD1
00653  0 43 00100      451          BRM     EDC         INSERT CHAR IN IMAGE
*00654  0 75 00652      452          LDB     WRD1
*00655  1 73 00633      453          SKR     CNTR        TEST FOR END FIELD
00656  0 01 00650      454          BRU     EDF2
00657  0 51 00646      455          BRR     EDF         EXIT
00660  0 00 00000      456  $FLDC   HLT     0
*00661  0 76 00000      457          LDA     WRD2        FORM WORD
00662  0 17 00722      458          EOR     =040000000
00663  0 71 00723      459          LDX     =22,X0
00664  0 67 10030      460          NOD     24          COUNT BITS IN FIELD
00665  0 67 00001      461          LSH     1
*00666  0 35 00661      462          STA     WRD2        NEW FORM WORD
*00667  0 37 00655      463          STX     CNTR,X0
00670  0 76 00724      464          LDA     =23
*00671  0 54 00667      465          SUB     CNTR
00672  0 14 00702      466          ETR     =077777
00673  0 73 00703      467          SKG     =24
```

```
00674  0 61 00660      468          MIN     FLDC
00675  0 51 00660      469  FLC1    BRR     FLDC                    EXIT
                        470          END
00676  00000060
00677  00666667
00700  17171717
00701  00177775
00702  00077777
00703  00000030
00704  00000001
00705  00000002
00706  00000003
00707  02000000
00710  20000000
00711  10000000
00712  00050000
00713  00000077
00714  77770000
00715  00006060
00716  00100000
00717  00000032
00720  00000007
00721  00000004
00722  40000000
00723  00000026
00724  00000027
00613  L0C
00600  M1
00376  ML0C
00233  PM0D
00564  PRNT
00626  SKB
00413  STYP
00573  UERR
00603  VERR
00215  WM0D
00553  W0RD
00654  WRD1
00666  WRD2
```

```
00321  WRITR
00650  Z
00614  ADDR
00671  CNTR
00527  CTT
00363  CTYP
00460  INPUT
```

SDS PROGRAM LIBRARY
PROGRAM DESCRIPTION

 Catalog No. 012006

IDENTIFICATION: 900 Series SYMBOL 910 Mnemonic Table

AUTHOR: SDS

ACCEPTED: January 14, 1965

COMPUTER CONFIGURATION: Any SDS 900 series computer with at least 4,096 words of memory.

PURPOSE: To provide SYMBOL with the mnemonic table of the target machine.

To localize other assembler features which are oriented specifically to the target machine.

PROGRAMMED OPERATORS: None

STORAGE: 01116 locations

TIMING: N/A

USE: SYMBOL consists of three parts (separately assembled programs) plus a mnemonic table plus I/O subroutines.

By exchanging mnemonic tables, one can assemble SYMBOL programs for the SDS 910, 920, 925, 930 or 9300 on any of these machines.

METHOD: The mnemonic table consists of three-word entries beginning at the location labeled $MT and ending at the location labeled $MTE. The format of the mnemonic table is described below.

During pass 1 of the assembly, entries are added to the mnemonic table for all symbol defined on OPD, FORM, or POPD lines. These entries are flagged by bit 18 of the second word in order to permit their being purged in

METHOD: (Cont) between batched assemblies. Expansion of the mnemonic table as opposed to the building of a separate table allows fast table searching but precludes the use of literals within this portion of the SYMBOL.

For the 910 and 920 mnemonic tables, complete compatibility has been maintained with respect to the SYMBOL 4 mnemonics, with the result that there is some redundancy in the device EOM mnemonics (such as RPTW, RPTY and RPT). Also, certain of the SYMBOL 4 mnemonics are recognized but ignored (such as FORT, LIST, etc.). The user may add to or delete from the SDS - supplied mnemonic table by reassembly.

MNEMONIC TABLE ENTRY FORMAT

Bits	Word	
0-23	1	First four characters of symbol
11	2	Fifth and sixth characters of symbol
12, 20	2	I/O command with unit and channel to be supplied (e.g., RPT)
13	2	Programmed operator
16	2	Not used
17	2	Duplicate flag
18	2	Programmer defined entry (OPD, FORM, POPD or external POP)
19	2	Instruction, octal address
20	2	Instruction, I/O command with channel specified (e.g., RPTW)
21	2	Directive, special label definition
22	2	Directive, normal label definition
23	2	Form

METHOD: (Cont)

If bits 12, 21, 22 and 23 are off, the third word contains the data word without parameters.

The third word of directive entries (bit 21 or 22 on) contains the starting address of the lines of instructions which process the directive line encountered.

The third word of a form item (bit 23 on) contains a form pattern word; i.e., a word with a one in the leading bit position of each field, and zeros elsewhere.

The third word of a programmed operator entry (bit 13) has the following format:

Bits 0-1	Type (0 internal definition, 1 external reference, 2 external definition)
Bits 2-7	Programmed operator number (assigned at end of pass 1)
Bit 8	Relocation bit (if definition)
Bits 9-23	Address of programmed operator interpretive code

```
                                    1  *       S5C
          00000000                  2  S9300   EQU     0
          00000000                  3  X0      EQU     S9300
          00000002                  4  X2      EQU     2-S9300
00000     17600000                  5  C176    DATA    017600000
00001     77770000                  6  C7777   DATA    077770000
00002     77777776                  7  M2      DATA    -2
00003     00002040                  8  C2040   DATA    02040
00004     0 61 00000                9  $P0PR   MIN     PM0D
00005     0 76 00000               10          LDA     W0RD
00006     0 14 00000               11          ETR     C176
00007     0 16 00161               12          MRG     B1
00010     0 66 00001               13          RSH     1
00011     0 35 00005               14          STA     W0RD
00012     0 61 00000               15          MIN     IERR
00013     0 01 00000               16          BRU     INR1
00014     0 61 00012               17  P0PI    MIN     IERR
                                   18  $P0PI
00015     0 43 00000               19          BRM     DLBL
00016     0 46 30003               20          CLR
00017     0 35 00011               21          STA     W0RD
00020     0 53 00000               22          SKN     PASS
00021     0 01 00023               23          BRU     $+2
00022     0 01 00013               24          BRU     INR1
00023     0 61 00000               25          MIN     L0C
00024     0 76 00161               26          LDA     B1
00025     0 35 00000               27          STA     LBL1P2
00026     0 71 00000               28          LDX     LSYM,X0
00027     2 76 00000               29          LDA     0,X2
00030     0 35 00000               30          STA     LBL1
00031     2 76 00001               31          LDA     1,X2
00032     0 14 00001               32          ETR     C7777
00033     0 35 00000               33          STA     LBL1P1
00034     0 01 00053               34          BRU     P0PD1
00035     0 53 00020               35  P0PD    SKN     PASS
00036     0 01 00040               36          BRU     $+2
00037     0 01 00000               37          BRU     FRM4
00040     0 76 00023               38          LDA     L0C
```

```
00041  0 35 00025        39          STA     LBL1P2
00042  0 76 00033        40          LDA     LBL1P1
00043  0 14 00002        41          ETR     M2
00044  0 35 00042        42          STA     LBL1P1
00045  0 76 00172        43          LDA     Z
00046  0 75 00000        44          LDB     M1
00047  0 70 00000        45          SKM     XFLG
00050  0 76 00000        46          LDA     B0
00051  0 55 00041        47          ADD     LBL1P2
00052  0 35 00051        48          STA     LBL1P2
00053  0 76 00003        49  P0PD1   LDA     C2040
00054  0 55 00044        50          ADD     LBL1P1
00055  0 35 00054        51          STA     LBL1P1
00056  0 01 00000        52          BRU     0PD1
00057  0 46 30003        53  B00L    CLR
00060  0 35 00000        54          STA     0CTF
00061  0 01 00000        55          BRU     EQU
00062  0 46 30003        56  B0RG    CLR
00063  0 35 00060        57          STA     0CTF
00064  0 01 00000        58          BRU     0RG
00065  0 43 00000        59  0CT     BRM     0CTW
00066  0 76 00000        60          LDA     VALU
00067  0 75 00172        61          LDB     Z
00070  0 43 00075        62          BRM     0CTDEC
00071  0 01 00065        63          BRU     0CT
00072  0 43 00000        64  DEC     BRM     DPW
00073  0 43 00075        65          BRM     0CTDEC
00074  0 01 00072        66          BRU     DEC
00075  0 00 00000        67  0CTDEC  HLT     0
00076  0 53 00035        68          SKN     PASS
00077  0 01 00112        69          BRU     0D1
00100  0 36 00017        70          STB     W0RD
00101  0 54 00046        71          SUB     M1
00102  0 72 00101        72          SKA     M1
00103  0 01 00105        73          BRU     $+2
00104  0 53 00100        74          SKN     W0RD
00105  0 55 00102        75          ADD     M1
00106  0 35 00104        76          STA     W0RD
00107  0 76 00050        77          LDA     B0
```

```
*  00110  0 35 00000        78          STA     WRD2
*  00111  0 43 00000        79          BRM     EDIT
*  00112  0 61 00040        80  0D1     MIN     L0C
*  00113  0 76 00000        81          LDA     TERM
*  00114  0 75 00105        82          LDB     M1
   00115  0 70 00163        83          SKM     CCHR
*  00116  0 01 00000        84          BRU     LINE
   00117  0 51 00075        85          BRR     0CTDEC
*  00120  0 76 00000        86  BCI     LDA     P14
*  00121  0 75 00000        87          LDB     DC
*  00122  0 71 00000        88          LDX     CHR,X0
*  00123  0 43 00000        89          BRM     SKB
*  00124  2 00 00000        90          HLT     CIT,X2
*  00125  0 43 00000        91          BRM     DECW
*  00126  0 75 00000        92          LDB     SPAC
*  00127  0 36 00000        93          STB     BC1F
   00130  0 67 00002        94          LSH     2
*  00131  0 01 00000        95          BRU     TEXT1
*  00132  0 53 00076        96  BPT     SKN     PASS
*  00133  0 01 00000        97          BRU     LIN2        IGNORE IF 1ST PASS
   00134  0 76 00160        98          LDA     SKSB
*  00135  0 35 00106        99          STA     W0RD        INSTRUCTION
*  00136  0 43 00000       100  BPT1    BRM     SCAN        GET BREAK-POINT
   00137  0 76 00161       101          LDA     B1
*  00140  0 71 00066       102          LDX     VALU,X0
   00141  2 66 00015       103          RSH     13,X2       POSITION BREAKPOINT BIT
   00142  0 14 00162       104          EIR     BPM         MASK
   00143  0 73 00172       105          SKG     Z           TEST RANGE
*  00144  0 61 00000       106          MIN     TERR        SET TRUNCATION ERROR
*  00145  0 55 00135       107          ADD     W0RD
*  00146  0 35 00145       108          STA     W0RD
*  00147  0 76 00113       109          LDA     TERM
*  00150  0 75 00114       110          LDB     M1
   00151  0 70 00163       111          SKM     CCHR
*  00152  0 01 00000       112          BRU     LIN3        LAST BREAKPOINT
   00153  0 01 00136       113          BRU     BPT1        GET NEXT BREAKPOINT
   00154  00600000         114  $E0D    DATA    0600000
   00155  00200000         115  $E0M    DATA    0200000
   00156  04600000         116  $SKSE0D DATA    04600000
```

FLPT ECXHANGE 0PERAT0R. XAB F0R 9300

```
00157  00640000        117  $E0DI   DATA     0640000
00160  04020000        118  SKSB    DATA     04020000
00161  20000000        119  B1      DATA     020000000
00162  00000740        120  BPM     DATA     0740
00163  00000073        121  CCHR    DATA     073
00164  0 20 00000      122  $DPWR   N0P      0
00165  44040000        123  $INST   DATA     044040000
00166  00040000        124  $IND8   DATA     040000
00167  00000016        125  $AB     DATA     016
00170  00000011        126  $NAB    DATA     9
00171  0 00 37777      127  $ADDR   HLT      037777
00172                  128  $F0RCE9 RES      0
00172  00000000        129  Z       DATA     0
00173  00000007        130  $XMSK   DATA     07
       00000020        131  INS1    EQU      020
       00000010        132  INS2    EQU      010
       00004010        133  INS9    EQU      04010
       00000004        134  DIR1    EQU      4
       00000002        135  DIR2    EQU      2
       60600000        136  NEM     0PD      060600000
                       137  HAF     F0RM     12,12
                       138  P       F0RM     9,15
00174                  139  $MT     RES      0
00174  43237060        140          TEXT     4,LCY
00175  6 06 00000      141          NEM      0
00176  06720000        142          DATA     006720000
00177  43242160        143          TEXT     4,LDA
00200  6 06 00000      144          NEM      0
00201  07600000        145          DATA     007600000
00202  43242260        146          TEXT     4,LDB
00203  6 06 00000      147          NEM      0
00204  07500000        148          DATA     007500000
00205  43246760        149          TEXT     4,LDX
00206  6 06 00000      150          NEM      0
00207  07100000        151          DATA     007100000
00210  43314360        152          TEXT     4,LIL
00211  6 06 00002      153          NEM      DIR2
00212  0 00 00000      154          HLT      N0P0
00213  43316263        155          TEXT     4,LIST
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00214  6 06 00002      156          NEM     DIR2
00215  0 00 00212      157          HLT     N0P0
00216  43623060        158          TEXT    4,LSH
00217  6 06 00000      159          NEM     0
00220  06700000        160          DATA    006700000
00221  44242560        161          TEXT    4,MDE
00222  6 06 00000      162          NEM     0
00223  06000000        163          DATA    06000000
00224  44314560        164          TEXT    4,MIN
00225  6 06 00000      165          NEM     0
00226  06100000        166          DATA    006100000
00227  44316660        167          TEXT    4,MIW
00230  6 06 00000      168          NEM     0
00231  01200000        169          DATA    001200000
00232  44317060        170          TEXT    4,MIY
00233  6 06 00000      171          NEM     0
00234  01000000        172          DATA    001000000
00235  44512760        173          TEXT    4,MRG
00236  6 06 00000      174          NEM     0
00237  01600000        175          DATA    001600000
00240  44646260        176          TEXT    4,MUS
00241  6 06 00000      177          NEM     0
00242  06400000        178          DATA    06400000
00243  45462460        179          TEXT    4,N0D
00244  6 06 00000      180          NEM     0
00245  06710000        181          DATA    006710000
00246  45464760        182          TEXT    4,N0P
00247  6 06 00000      183          NEM     0
00250  02000000        184          DATA    002000000
00251  46236360        185          TEXT    4,0CT
00252  6 06 00002      186          NEM     DIR2
00253  0 00 00065      187          HLT     0CT
00254  46472460        188          TEXT    4,0PD
00255  6 06 00004      189          NEM     DIR1
00256  0 00 00000      190          HLT     0PD
00257  46512760        191          TEXT    4,0RG
00260  6 06 00004      192          NEM     DIR1
00261  0 00 00064      193          HLT     0RG
00262  46656360        194          TEXT    4,0VT
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00263  6 06 00000      195          NEM     0
00264  04020001        196          DATA    04020001
00265  47212725        197          TEXT    4,PAGE
00266  6 06 00002      198          NEM     DIR2
00267  0 00 00000      199          HLT     PAGE
00270  47226360        200          TEXT    4,PBT
00271  6 06 04010      201          NEM     INS9
00272  04012045        202          DATA    04012045
00273  47232260        203          TEXT    4,PCB
00274  6 06 04010      204          NEM     INS9
00275  0 02 03045      205          EOM     003045
00276  47232460        206          TEXT    4,PCD
00277  6 06 04010      207          NEM     INS9
00300  0 02 02045      208          EOM     002045
00301  47314560        209          TEXT    4,PIN
00302  6 06 00000      210          NEM     0
00303  03300000        211          DATA    003300000
00304  47464724        212          TEXT    4,POPD
00305  6 06 00004      213          NEM     DIR1
00306  0 00 00035      214          HLT     POPD
00307  47466360        215          TEXT    4,POT
00310  6 06 00000      216          NEM     0
00311  01300000        217          DATA    001300000
00312  47476360        218          TEXT    4,PPT
00313  6 06 04010      219          NEM     INS9
00314  0 02 02043      220          EOM     02043
00315  47476366        221          TEXT    4,PPTW
00316  6 06 00010      222          NEM     INS2
00317  00202043        223          DATA    00202043
00320  47476370        224          TEXT    4,PPTY
00321  6 06 00010      225          NEM     INS2
00322  00202143        226          DATA    00202143
00323  47634360        227          TEXT    4,PTL
00324  6 06 04010      228          NEM     INS9
00325  0 02 00043      229          EOM     043
00326  47634366        230          TEXT    4,PTLW
00327  6 06 00010      231          NEM     INS2
00330  00200043        232          DATA    00200043
00331  47634370        233          TEXT    4,PTLY
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00332  6 06 00010      234          NEM     INS2
00333  00200143        235          DATA    00200143
00334  47712560        236          TEXT    4,PZE
00335  6 06 00002      237          NEM     DIR2
00336  0 00 00000      238          HLT     PZE
00337  51232260        239          TEXT    4,RCB
00340  6 06 04010      240          NEM     INS9
00341  0 02 03005      241          EOM     03005
00342  51232266        242          TEXT    4,RCBW
00343  6 06 00010      243          NEM     INS2
00344  00203005        244          DATA    00203005
00345  51232270        245          TEXT    4,RCBY
00346  6 06 00010      246          NEM     INS2
00347  00203105        247          DATA    00203105
00350  51232460        248          TEXT    4,RCD
00351  6 06 04010      249          NEM     INS9
00352  0 02 02005      250          EOM     02005
00353  51232466        251          TEXT    4,RCDW
00354  6 06 00010      252          NEM     INS2
00355  00202005        253          DATA    00202005
00356  51232470        254          TEXT    4,RCDY
00357  6 06 00010      255          NEM     INS2
00360  00202105        256          DATA    00202105
00361  51233060        257          TEXT    4,RCH
00362  6 06 00020      258          NEM     INS1
00363  04600000        259          DATA    004600000
00364  51237060        260          TEXT    4,RCY
00365  6 06 00000      261          NEM     0
00366  06620000        262          DATA    006620000
00367  51254360        263          TEXT    4,REL
00370  6 06 00002      264          NEM     DIR2
00371  0 00 00215      265          HLT     NOP0
00372  51256260        266          TEXT    4,RES
00373  6 06 00002      267          NEM     DIR2
00374  0 00 00000      268          HLT     BSS
00375  51256660        269          TEXT    4,REW
00376  6 06 04010      270          NEM     INS9
00377  0 02 14010      271          EOM     014010
00400  51256666        272          TEXT    4,REWW
```

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00401  6 06 00010      273          NEM      INS2
00402  0 02 14010      274          EOM      014010
00403  51422260        275          TEXT     4,RKB
00404  6 06 04010      276          NEM      INS9
00405  0 02 02000      277          EOM      02000
00406  51422266        278          TEXT     4,RKBW
00407  6 06 00010      279          NEM      INS2
00410  00202000        280          DATA     00202000
00411  51422270        281          TEXT     4,RKBY
00412  6 06 00010      282          NEM      INS2
00413  00202100        283          DATA     00202100
00414  51465127        284          TEXT     4,RORG
00415  6 06 00002      285          NEM      DIR2
00416  0 00 00261      286          HLT      ORG
00417  51466560        287          TEXT     4,ROV
00420  6 06 00000      288          NEM      0
00421  0 02 20001      289          EOM      020001
00422  51476360        290          TEXT     4,RPT
00423  6 06 04010      291          NEM      INS9
00424  0 02 02003      292          EOM      02003
00425  51476366        293          TEXT     4,RPTW
00426  6 06 00010      294          NEM      INS2
00427  00202003        295          DATA     00202003
00430  51476370        296          TEXT     4,RPTY
00431  6 06 00010      297          NEM      INS2
00432  00202103        298          DATA     00202103
00433  51623060        299          TEXT     4,RSH
00434  6 06 00000      300          NEM      0
00435  06600000        301          DATA     006600000
00436  51632260        302          TEXT     4,RTB
00437  6 06 04010      303          NEM      INS9
00440  0 02 03010      304          EOM      03010
00441  51632266        305          TEXT     4,RTBW
00442  6 06 00010      306          NEM      INS2
00443  00203010        307          DATA     00203010
00444  51632270        308          TEXT     4,RTBY
00445  6 06 00010      309          NEM      INS2
00446  00203110        310          DATA     00203110
00447  51632460        311          TEXT     4,RTD
```

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00450  6 06 04010      312          NEM      INS9
00451  0 02 02010      313          EOM      02010
00452  51632466        314          TEXT     4,RTDW
00453  6 06 00010      315          NEM      INS2
00454  00202010        316          DATA     00202010
00455  51632470        317          TEXT     4,RTDY
00456  6 06 00010      318          NEM      INS2
00457  00202110        319          DATA     00202110
00460  51636260        320          TEXT     4,RTS
00461  6 06 04010      321          NEM      INS9
00462  0 02 14000      322          EOM      014000
00463  52262260        323          TEXT     4,SFB
00464  6 06 04010      324          NEM      INS9
00465  0 02 03030      325          EOM      03030
00466  52262266        326          TEXT     4,SFBW
00467  6 06 00010      327          NEM      INS2
00470  00203030        328          DATA     00203030
00471  62262460        329          TEXT     4,SFD
00472  6 06 04010      330          NEM      INS9
00473  0 02 02030      331          EOM      02030
00474  62422160        332          TEXT     4,SKA
00475  6 06 00000      333          NEM      0
00476  07200000        334          DATA     007200000
00477  62422760        335          TEXT     4,SKG
00500  6 06 00000      336          NEM      0
00501  07300000        337          DATA     007300000
00502  62424460        338          TEXT     4,SKM
00503  6 06 00000      339          NEM      0
00504  07000000        340          DATA     007000000
00505  62424560        341          TEXT     4,SKN
00506  6 06 00000      342          NEM      0
00507  05300000        343          DATA     005300000
00510  62426260        344          TEXT     4,SKS
00511  6 06 00020      345          NEM      INS1
00512  04000000        346          DATA     004000000
00513  52512260        347          TEXT     4,SRB
00514  6 06 04010      348          NEM      INS9
00515  0 02 07030      349          EOM      07030
00516  52512266        350          TEXT     4,SRBW
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00517  6 06 00010      351          NEM      INS2
00520  00207030        352          DATA     00207030
00521  62512360        353          TEXT     4.SRC
00522  6 06 04010      354          NEM      INS9
00523  0 02 12005      355          EOM      012005
00524  62512460        356          TEXT     4.SRD
00525  6 06 04010      357          NEM      INS9
00526  0 02 06030      358          EOM      06030
00527  62632160        359          TEXT     4.STA
00530  6 06 00000      360          NEM      0
00531  03500000        361          DATA     003500000
00532  62632260        362          TEXT     4.STB
00533  6 06 00000      363          NEM      0
00534  03600000        364          DATA     003600000
00535  62636760        365          TEXT     4.STX
00536  6 06 00000      366          NEM      0
00537  03700000        367          DATA     003700000
00540  62642260        368          TEXT     4.SUB
00541  6 06 00000      369          NEM      0
00542  05400000        370          DATA     005400000
00543  63232460        371          TEXT     4.TCD
00544  6 06 00002      372          NEM      DIR2
00545  0 00 00371      373          HLT      NOP0
00546  63256763        374          TEXT     4.TEXT
00547  6 06 00002      375          NEM      DIR2
00550  0 00 00000      376          HLT      TEXT
00551  63464760        377          TEXT     4.TOP
00552  6 06 04010      378          NEM      INS9
00553  0 02 14000      379          EOM      014000
00554  63464766        380          TEXT     4.TOPW
00555  6 06 00000      381          NEM      0
00556  0 02 14000      382          EOM      014000
00557  63464770        383          TEXT     4.TOPY
00560  6 06 00000      384          NEM      0
00561  0 02 14100      385          EOM      014100
00562  63516360        386          TEXT     4.TRT
00563  6 06 04010      387          NEM      INS9
00564  04010410        388          DATA     04010410
00565  63704760        389          TEXT     4.TYP
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00566  6 06 04010      390          NEM     INS9
00567  0 02 02040      391          EOM     02040
00570  63704766        392          TEXT    4,TYPW
00571  6 06 00010      393          NEM     INS2
00572  00202040        394          DATA    00202040
00573  63704770        395          TEXT    4,TYPY
00574  6 06 00010      396          NEM     INS2
00575  00202140        397          DATA    00202140
00576  64454331        398          TEXT    4,UNLI
00577  6263 0002       399          HAF     'ST',DIR2
00600  0 00 00545      400          HLT     NOPO
00601  66314460        401          TEXT    4,WIM
00602  6 06 00000      402          NEM     0
00603  03200000        403          DATA    003200000
00604  66632260        404          TEXT    4,WTB
00605  6 06 04010      405          NEM     INS9
00606  0 02 03050      406          EOM     03050
00607  66632266        407          TEXT    4,WTBW
00610  6 06 00010      408          NEM     INS2
00611  00203050        409          DATA    00203050
00612  66632270        410          TEXT    4,WTBY
00613  6 06 00010      411          NEM     INS2
00614  00203150        412          DATA    00203150
00615  66632460        413          TEXT    4,WTD
00616  6 06 04010      414          NEM     INS9
00617  0 02 03150      415          EOM     02050
00620  66632466        416          TEXT    4,WTDW
00621  6 06 00010      417          NEM     INS2
00622  00202050        418          DATA    00202050
00623  66632470        419          TEXT    4,WTDY
00624  6 06 00010      420          NEM     INS2
00625  00202150        421          DATA    00202150
00626  67212260        422          TEXT    4,XAB
00627  6 06 00000      423          NEM     0
00630  04600014        424          DATA    004600014
00631  70314460        425          TEXT    4,YIM
00632  6 06 00000      426          NEM     0
00633  03000000        427          DATA    003000000
00634  21222360        428          TEXT    4,ABC
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00635  6 06 00000      429          NEM     0
00636  04620005        430          DATA    04620005
00637  21242460        431          TEXT    4,ADD
00640  6 06 00000      432          NEM     0
00641  05500000        433          DATA    05500000
00642  21315160        434          TEXT    4,AIR
00643  6 06 00000      435          NEM     0
00644  0 02 20020      436          EOM     020020
00645  21432360        437          TEXT    4,ALC
00646  6 06 04010      438          NEM     INS9
00647  00250000        439          DATA    0250000
00650  21465127        440          TEXT    4,AORG
00651  6 06 00004      441          NEM     DIR1
00652  0 00 00000      442          HLT     AORG
00653  21622360        443          TEXT    4,ASC
00654  6 06 04010      444          NEM     INS9
00655  0 02 12000      445          EOM     012000
00656  22212360        446          TEXT    4,BAC
00657  6 06 00000      447          NEM     0
00660  04610012        448          DATA    04610012
00661  22232460        449          TEXT    4,BCD
00662  6 06 00002      450          NEM     DIR2
00663  0 00 00000      451          HLT     BCD
00664  22233160        452          TEXT    4,BCI
00665  6 06 00002      453          NEM     DIR2
00666  0 00 00120      454          HLT     BCI
00667  22256366        455          TEXT    4,BETW
00670  6 06 00000      456          NEM     0
00671  04020010        457          DATA    04020010
00672  22256370        458          TEXT    4,BETY
00673  6 06 00000      459          NEM     0
00674  04020020        460          DATA    04020020
00675  22434260        461          TEXT    4,BLK
00676  6 06 00002      462          NEM     DIR2
00677  0 00 00600      463          HLT     NOP0
00700  22464643        464          TEXT    4,BOOL
00701  6 06 00004      465          NEM     DIR1
00702  0 00 00057      466          HLT     BOOL
00703  22465127        467          TEXT    4,BORG
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00704  6 06 00004      468          NEM     DIR1
00705  0 00 00062      469          HLT     BORG
00706  22476360        470          TEXT    4,BPT
00707  6 06 00002      471          NEM     DIR2
00710  0 00 00132      472          HLT     BPT
00711  22514460        473          TEXT    4,BRM
00712  6 06 00000      474          NEM     0
00713  04300000        475          DATA    04300000
00714  22515160        476          TEXT    4,BRR
00715  6 06 00000      477          NEM     0
00716  05100000        478          DATA    05100000
00717  22516366        479          TEXT    4,BRTW
00720  6 06 00000      480          NEM     0
00721  04021000        481          DATA    04021000
00722  22516370        482          TEXT    4,BRTY
00723  6 06 00000      483          NEM     0
00724  04022000        484          DATA    04022000
00725  22516460        485          TEXT    4,BRU
00726  6 06 00000      486          NEM     0
00727  0 01 00000      487          BRU     0
00730  22516760        488          TEXT    4,BRX
00731  6 06 00000      489          NEM     0
00732  04100000        490          DATA    04100000
00733  22626260        491          TEXT    4,BSS
00734  6 06 00002      492          NEM     DIR2
00735  0 00 00374      493          HLT     BSS
00736  22636360        494          TEXT    4,BTT
00737  6 06 04010      495          NEM     INS9
00740  04012010        496          DATA    04012010
00741  23216360        497          TEXT    4,CAT
00742  6 06 04010      498          NEM     INS9
00743  04014000        499          DATA    04014000
00744  23256360        500          TEXT    4,CET
00745  6 06 04010      501          NEM     INS9
00746  04011000        502          DATA    04011000
00747  23266360        503          TEXT    4,CFT
00750  6 06 04010      504          NEM     INS9
00751  04011005        505          DATA    04011005
00752  23316360        506          TEXT    4,CIT
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00753  6 06 04010      507          NEM     INS9
00754  04010400        508          DATA    04010400
00755  23435160        509          TEXT    4,CLR
00756  6 06 00000      510          NEM     0
00757  04630003        511          DATA    04630003
00760  23476360        512          TEXT    4,CPT
00761  6 06 04010      513          NEM     INS9
00762  04014045        514          DATA    04014045
00763  23516360        515          TEXT    4,CRT
00764  6 06 04010      516          NEM     INS9
00765  04012005        517          DATA    04012005
00766  23716360        518          TEXT    4,CZT
00767  6 06 04010      519          NEM     INS9
00770  04012000        520          DATA    04012000
00771  24216321        521          TEXT    4,DATA
00772  6 06 00002      522          NEM     DIR2
00773  0 00 00000      523          HLT     DATA
00774  24252360        524          TEXT    4,DEC
00775  6 06 00002      525          NEM     DIR2
00776  0 00 00072      526          HLT     DEC
00777  24252460        527          TEXT    4,DED
01000  6 06 00002      528          NEM     DIR2
01001  0 00 00000      529          HLT     DED
01002  24315160        530          TEXT    4,DIR
01003  6 06 00000      531          NEM     0
01004  0 02 20004      532          DIR
01005  24316260        533          TEXT    4,DIS
01006  6 06 00000      534          NEM     0
01007  06500000        535          DATA    06500000
01010  24316266        536          TEXT    4,DISW
01011  6 06 00000      537          NEM     0
01012  0 02 00000      538          EOM     0
01013  24316270        539          TEXT    4,DISY
01014  6 06 00000      540          NEM     0
01015  0 02 00100      541          EOM     0100
01016  24622360        542          TEXT    4,DSC
01017  6 06 04010      543          NEM     INS9
01020  0 02 00000      544          EOM     0
01021  25216760        545          TEXT    4,EAX
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01022  6 06 00000      546          NEM     0
01023  07700000        547          DATA    07700000
01024  25266360        548          TEXT    4,EFT
01025  6 06 04010      549          NEM     INS9
01026  0 02 03070      550          EOM     03070
01027  25315160        551          TEXT    4,EIR
01030  6 06 00000      552          NEM     0
01031  0 02 20002      553          EIR
01032  25452460        554          TEXT    4,END
01033  6 06 00002      555          NEM     DIR2
01034  0 00 00000      556          HLT     END
01035  25462460        557          TEXT    4,EOD
01036  6 06 00020      558          NEM     INS1
01037  00600000        559          DATA    0600000
01040  25464460        560          TEXT    4,EOM
01041  6 06 00020      561          NEM     INS1
01042  00200000        562          DATA    0200000
01043  25465160        563          TEXT    4,EOR
01044  6 06 00000      564          NEM     0
01045  01700000        565          DATA    01700000
01046  25506460        566          TEXT    4,EQU
01047  6 06 00004      567          NEM     DIR1
01050  0 00 00061      568          HLT     EQU
01051  25516360        569          TEXT    4,ERT
01052  6 06 04010      570          NEM     INS9
01053  0 02 07070      571          EOM     07070
01054  25635160        572          TEXT    4,ETR
01055  6 06 00000      573          NEM     0
01056  01400000        574          DATA    01400000
01057  25636360        575          TEXT    4,ETT
01060  6 06 04010      576          NEM     INS9
01061  04011010        577          DATA    04011010
01062  25636660        578          TEXT    4,ETW
01063  6 06 00010      579          NEM     INS2
01064  00203070        580          DATA    00203070
01065  25676460        581          TEXT    4,EXU
01066  6 06 00000      582          NEM     0
01067  02300000        583          DATA    02300000
01070  26236360        584          TEXT    4,FCT
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01071  6 06 04010      585          NEM     INS9
01072  04014005        586          DATA    04014005
01073  26465144        587          TEXT    4,FORM
01074  6 06 00004      588          NEM     DIR1
01075  0 00 00000      589          HLT     FORM
01076  26465163        590          TEXT    4,FORT
01077  6 06 00002      591          NEM     DIR2
01100  0 00 00677      592          HLT     NOP0
01101  26476360        593          TEXT    4,FPT
01102  6 06 04010      594          NEM     INS9
01103  04014010        595          DATA    04014010
01104  30436360        596          TEXT    4,HLT
01105  6 06 00000      597          NEM     0
01106  00000000        598          DATA    0
01107  31246360        599          TEXT    4,IDT
01110  6 06 00000      600          NEM     0
01111  04020004        601          DATA    04020004
01112  31256360        602          TEXT    4,IET
01113  6 06 00000      603          NEM     0
01114  04020002        604          DATA    04020002
01115                  605  $MTE    RES     1
       00000001        606          END     1
00055  LBL1P1
00052  LBL1P2
00030  LBL1
00133  LIN2
00152  LIN3
00116  LINE
00112  LOC
00026  LSYM
00150  M1
01100  NOP0
00063  OCTF
00065  OCTW
00056  OPD1
00256  OPD
00416  ORG
00120  P14
00267  PAGE
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00132 PASS
00004 PMOD
00336 PZE
00136 SCAN
00123 SKB
00126 SPAC
00147 TERM
00144 TERR
00550 TEXT
00131 TEXT1
00140 VALU
00146 WORD
00110 WRD2
00047 XFLG
00652 ABRG
00107 BO
00663 BCD
00127 BCIF
00735 BSS
00122 CHR
00124 CTT
00773 DATA
00121 DC
00125 DECW
01001 DED
00015 DLBL
00072 DPW
00111 EDIT
01034 END
01050 EQU
01075 FORM
00037 FRM4
00014 IERR
00022 INR1
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INDEX OF ROUTINES

INDEX OF ROUTINES (cont.)

SDS PROGRAM LIBRARY
PROGRAM DESCRIPTION

 Catalog No. 012014

IDENTIFICATION: SYMBOL Reproduce and Update Routine

AUTHOR: Ken Brown, SDS

ACCEPTED: April 16, 1965

COMPUTER CONFIGURATION: Any 900 series computer.

PURPOSE: To edit a binary paper tape consisting of multiple Standard Binary programs. Editing is performed at the file level.

PROGRAMMED OPERATORS: None

STORAGE: 666

TIMING: N/A

SOURCE LANGUAGE: SYMBOL

LOADING PROCEDURE: Standard Fill Procedure

USE: The program is designed to copy or skip a number of files (standard binary programs) on paper tape as specified by typewriter inputs. These inputs are as follows:

1. ΔCOPY BOOT. (Main use is to up-date paper tape version of SYMBOL) This will cause the Bootstrap Loader, Pre-loader, and Loader to be copied. If breakpoint 2 is set, only the Bootstrap Loader and Pre-loader will be copied.

2. ΔCOPY n FILES. ($0 < n \leq 89$)
Will copy n files (standard binary programs) as specified. Labels of External Definition Items and External Programmed Operator Definitions of those files copied will be typed.

USE: (Cont.)

3. ΔCOPY name 1 THRU name 2
Name 1 and name 2 are labels from one to eight alphanumeric characters which must be contained in a type 1 or type 2 record. The tape will be searched until the first label is found. The file containing that label (name 1) will be reproduced as will the following files up to an including the file containing name 2.

4. ΔSKIP n FILES. ($0 < n \leq 89$)
Will skip n files.

Typewriter Inputs:

Any typewriter inputs preceeding the "Δ" will be ignored. A period or carriage return is used as a terminator. A typewriter input message may be deleted by typing /.

Example: To replace the third file on a SYMBOL System Tape.

With System tape on photo reader type:

1. ΔCOPY BOOT.
(Copies Boot, Pre-loader, and Loader)

2. ΔCOPY 2 FILES
(Copies 2 files, printing the labels of the External Definition Items)

3. Place file to be inserted in photo reader and type:
ΔCOPY 1 FILE

4. Replace system tape in photo reader and type:
ΔSKIP 1 FILE
(Skips the file being replaced)

5. ΔCOPY n FILES
(n is the remaining number of files on the system tape.)

Example: To replace LOG on 920 POP Tape:

Place POP Tape in photo reader and type:

1. ΔCOPY BDD THRU DIB.
(POP Tape will be copied from BDD through DIB with labels typed out.)

USE: (Cont.)

2. Place new LOG routine in photo reader and type:
ΔCOPY 1 FILE.
(This will copy new LOG routine.)

3. Place POP tape back in reader and type:
ΔSKIP 1 FILE.
ΔCOPY n FILES.
(n is the remaining files on the POP Tape.)

Note: If the number of files on a tape to be copied is unknown, a number larger than the actual number of files on the tape may be used. In this case, the tape being copied will spin off its reel after all files have been copied.

Example: ΔCOPY 75 FILES.

Error Messages:

1. COPY INSTRUCTION NOT FOUND

Cause: 1. First word following "Δ" is not a "COPY" or a "SKIP".

2. A space follows the "Δ".

2. RECORD NOT IN SYMBOL FORMAT.

Cause: Record type is not a 0, 1, 2, or 3.

3. RECORD NOT IN BINARY FORMAT.

Cause: Last record read was not in Standard Binary format.

4. ILLEGAL BOOT FORMAT ON TAPE READ

Cause: First record read after "COPY BOOT" type-in is not a standard bootstrap loader.

```
00001                          AORG   01
00001  0 01 0 00200            BRU    0200
00200                          AORG   0200
00200  0 76 0 01335    BEGIN   LDA    REMOD          REPLACE INSTRUCTION WHICH
00201  0 35 0 01171            STA    INMFY                  HAS BEEN MODIFIED
00202  0 71 0 01321            LDX    M24
00203  0 76 0 01230            LDA    ZERO           REINITIALIZE STORAGE LOCATIONS
00204  2 35 0 01245            STA    PARAM1+20,2      AND INSTRUCTIONS WHICH HAVE
00205  0 41 0 00204            BRX    $-1                 BEEN MODIFIED
00206  0 76 0 01334            LDA    RESET
00207  0 35 0 00360            STA    CHTK0+1
00210  0 76 0 01336            LDA    RESET2
00211  0 35 0 00633            STA    CKINP
00212  0 35 0 01022            STA    THUP
00213  0 35 0 01047            STA    LBLCK3
00214  0 35 0 01131            STA    RECADR
00215  0 71 0 01316            LDX    M6
00216  0 76 0 01331            LDA    BLNKS
00217  2 35 0 01263            STA    FIRST+6,2
00220  0 41 0 00217            BRX    $-1            END    OF   REINITIALIZATION
00221  0 43 0 00777            BRM    BUFTS
00222  0 02 0 02001            RKBW   1,1
00223  0 32 0 01231            WIM    CHBUF
00224  0 75 0 01307            LDB    CHMSK
00225  0 76 0 01231            LDA    CHBUF
00226  0 70 0 01323            SKM    DELTA          HAS CONTROL CHARACTER BEEN TYPED
00227  0 01 0 00223            BRU    $-4
00230  0 71 0 01315            LDX    M4             YES --- BEGIN EDIT OF KEY-INS
00231  0 02 0 02001    TYPE    RKBW   1,1
00232  0 32 0 01231            WIM    CHBUF
00233  0 75 0 01307            LDB    CHMSK          00000077
00234  0 76 0 01231            LDA    CHBUF
00235  0 70 0 01310            SKM    BLANK          00000012
00236  0 01 0 00240            BRU    $+2
00237  0 01 0 00253            BRU    NXCAR          PACK WORD AND GET NEXT CHARACTER
00240  0 70 0 01311            SKM    PERID          00000033
00241  0 01 0 00243            BRU    $+2
00242  0 01 0 00264            BRU    ENDIN          TERMINATE INPUT MESSAGE
```

```
00243  0 70 0 01312        39          SKM     CARET       00000052
00244  0 01 0 00246        40          BRU     $+2
00245  0 01 0 00264        41          BRU     ENDIN
00246  0 70 0 01313        42          SKM     KYERR       DELETE KEY-IN
00247  0 01 0 00251        43          BRU     $+2
00250  0 01 0 00335        44          BRU     DELETE
00251  2 35 0 01255        45          STA     NAME1+4,2
00252  0 41 0 00232        46          BRX     TYPE+1      NO - BRANCH IF<4 CHARACTERS KEYED IN
00253  0 43 0 01153        47 NXCAR    BRM     WORDX       GO TO ROUTINE TO PACK 4CHAR/WORD
00254  0 75 0 01307        48          LDB     CHMSK
00255  0 32 0 01231        49          WIM     CHBUF
00256  0 76 0 01231        50          LDA     CHBUF       ONE CHARACTER BUFFER
00257  0 70 0 01310        51          SKM     BLANK
00260  0 01 0 00262        52          BRU     $+2         CHARACTER NOT A BLANK - ACCEPT IT
00261  0 01 0 00255        53          BRU     $-4
00262  0 71 0 01315        54          LDX     M4
00263  0 01 0 00236        55          BRU     TYPE+5
00264  0 02 00000          56 ENDIN    DISW                INPUT TERMINATOR HAS BEEN TYPED
00265  0 43 0 01140        57          BRM     CR
00266  0 43 0 01153        58          BRM     WORDX
00267  0 75 0 01342        59          LDB     SEVENS
00270  0 76 0 01255        60          LDA     FIRST       INTIAL WORD KEYED IN
00271  0 70 0 01357        61          SKM     SKIP
00272  0 01 0 00274        62          BRU     $+2         DO NOT SKIP FILES
00273  0 01 0 00731        63          BRU     SKPRC       GO TO ROUTINE TO SKIP FILES
00274  0 70 0 01356        64          SKM     COPY
00275  0 01 0 01211        65          BRU     CTERR       ILLEGAL INSTRUCTION
00276  0 76 0 01256        66          LDA     FIRST+1     CHECK SECOND WORD INPUT
00277  0 70 0 01355        67          SKM     BOOT        IS BOOT COPY DESIRED
00300  0 01 0 00302        68          BRU     $+2
00301  0 01 0 00430        69          BRU     BOOT1       YES - GO TO BOOT COPY ROUTINE
00302  0 43 0 00606        70          BRM     SERCH       NOT BOOT - CHECK COPY PARAMETERS
00303  0 43 0 00305        71          BRM     STCNT       NO INPUT PARAMETERS  SET UP FILE CNT.
00304  0 01 0 00340        72          BRU     RDPTE
00305  0 00 00000          73 STCNT    PZE     0           ROUTINE TO CONVERT DECIMAL INPUTS
00306  0 75 0 01342        74          LDB     SEVENS              TO OCTAL NUMBER
00307  0 76 0 01257        75          LDA     FIRST+2
00310  0 70 0 01361        76          SKM     FILE        INSURE THAT KEYIN IS LEGAL
00311  0 01 0 01201        77          BRU     NOTYP       INPUT IS OBVIOUSLY FOULED UP
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00312  0 75 0 01417          78          LDB     =0770000
00313  0 76 0 01256          79          LDA     FIRST+1         WORD CONTAINING BCD VALUE OF N FILES
00314  0 70 0 01420          80          SKM     =0600000        UNITS OR TENS COUNT
00315  0 01 0 00317          81          BRU     $+2             TENS
00316  0 01 0 00330          82          BRU     DIGIT           UNITS
00317  0 6720 002            83          LCY     2
00320  0 75 0 01230          84          LDB     ZERO
00321  0 6620 024            85          RCY     20                      TENS INTO A REG  -- UNITS IN
00322  0 35 0 01233          86          STA     XTOTEN
00323  0 71 0 01233          87          LDX     XTOTEN
00324  0 76 0 01230          88          LDA     ZERO
00325  0 6720 006            89          LCY     6               BRING UNITS INTO A REG
00326  2 55 0 01344          90          ADD     TENS,2          ADD TENS COLUMN
00327  0 01 0 00332          91          BRU     $+3
00330  0 75 0 01230          92 DIGIT    LDB     ZERO
00331  0 6620 022            93          RCY     18              UNITS COLUMN ONLY
00332  0 35 0 01256          94          STA     FIRST+1         OCTAL EQUIVALENT OF DECIMAL INPUT
00333  0 60 0 01256          95          SKR     FIRST+1
00334  0 51 0 00305          96          BRR     STCNT
00335  0 02 00000            97 DELETE   DISW                    IGNORE KEY-INS - RESTART
00336  0 43 0 01140          98          BRM     CR
00337  0 01 0 00200          99          BRU     BEGIN
00340  0 76 0 01230         100 RDPTE    LDA     ZERO
00341  0 35 0 01241         101          STA     NOREC
00342  0 43 0 00777         102          BRM     BUFTS
00343  0 76 0 01421         103          LDA     =02000          STARTING ADDRESS OF TAPE INPUT BUFFER
00344  0 35 0 01225         104          STA     STRGE
00345  0 02 0 02604         105          RPTW    1,4
00346  0 32 1 01225         106          WIM     *STRGE
00347  0 61 0 01226         107          MIN     CONST           WORD COUNT
00350  0 61 0 01225         108          MIN     STRGE
00351  0 40 21000           109          BRTW
00352  0 01 0 00346         110          BRU     $-4
00353  0 02 00000           111          DISW
00354  0 60 0 01226         112          SKR     CONST           ADJUST FOR FREE WIM
00355  0 60 0 01225         113          SKR     STRGE
00356  0 43 0 00761         114          BRM     CKEOF
00357  0 76 0 01226         115 CHTKO    LDA     CONST
00360  0 35 0 01263         116          STA     REF1            NUMBER OF WORDS IN THIS RECORD
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00361  0 61 0 00360      117          MIN     $-1          SET ADDRESS TO STORE WRDS IN NXT RECD
00362  0 61 0 01241      118          MIN     NOREC        KEEP COUNT OF TYPE 1 AND 2 RECORDS
00363  0 76 0 01225      119          LDA     STRGE
00364  0 54 0 01226      120          SUB     CONST
00365  0 35 0 01235      121          STA     RADR         ADDRESS OF FIRST WORD OF TAPE RECORD
00366  0 43 0 00502      122          BRM     CKZERO       BRM TO CHECK RECORD TYPE
00367  0 76 0 01230      123          LDA     ZERO
00370  0 35 0 01226      124          STA     CONST
00371  0 01 0 00345      125          BRU     RDPTE+5      LAST RECORD WAS TYPE 1 OR 2  REPEAT
00372  0 00 00000        126 PNCH     PZE     0
00373  0 43 0 00777      127          BRM     BUFTS
00374  0 61 0 01241      128          MIN     NOREC        ADJUST RECORD COUNT FOR FIRST PASS
00375  0 71 0 01422      129          LDX     =040000
00376  0 60 0 01241      130          SKR     NOREC
00377  0 76 0 01241      131          LDA     NOREC
00400  0 75 0 01342      132          LDB     SEVENS
00401  0 70 0 01230      133          SKM     ZERO         IF NOREC=0, ALL RECORDS HAVE BEEN
00402  0 01 0 00406      134          BRU     AGAIN          PUNCHED - IF NOT, PUNCH NEXT RECORD
00403  0 76 0 01334      135          LDA     RESET        RESTORE MODIFIED INSTRUCTION
00404  0 35 0 00360      136          STA     CHTK0+1
00405  0 51 0 00372      137          BRR     PNCH
00406  0 76 0 00360      138 AGAIN    LDA     CHTK0+1
00407  0 54 0 01241      139          SUB     NOREC
00410  0 35 0 01240      140          STA     TEMP
00411  0 76 1 01240      141          LDA     *TEMP        NUMBER OF WORDS IN THIS RECORD
00412  0 35 0 01226      142          STA     CONST
00413  0 02 0 00644      143          PTLW    1,4
00414  0 60 0 01226      144 LOOP     SKR     CONST
00415  0 20 0 00000      145          NOP
00416  0 53 0 01226      146          SKN     CONST        SKIP IF COMPLETE RECORD HAS BEEN PNCH
00417  0 01 0 00421      147          BRU     $+2
00420  0 01 0 00423      148          BRU     $+3
00421  2 12 0 02000      149          MIW     02000,2
00422  0 41 0 00414      150          BRX     LOOP
00423  0 02 14000        151          TOPW
00424  0 76 0 01230      152          LDA     ZERO
00425  0 35 0 01226      153          STA     CONST
00426  0 43 0 00777      154          BRM     BUFTS
00427  0 01 0 00376      155          BRU     PNCH+4       PUNCH ANOTHER RECORD
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00430  0 76 0 01421        156 BOOT1   LDA     =02000
00431  0 35 0 01225        157         STA     STRGE
00432  0 02 0 02604        158         RPTW    1,4             READ BOOT ONL
00433  0 32 1 01225        159         WIM     *STRGE
00434  0 61 0 01226        160         MIN     CONST
00435  0 61 0 01225        161         MIN     STRGE
00436  0 40 21000          162         BRTW
00437  0 01 0 00433        163         BRU     $-4
00440  0 02 00000          164         DISW                    BOOTSTRAP HAS BEEN READ
00441  0 60 0 01226        165         SKR     CONST
00442  0 76 0 02000        166         LDA     02000           FIRST WORD OF BOOTSTRAP
00443  0 75 0 01342        167         LDB     SEVENS
00444  0 70 0 01343        168         SKM     WIM3            CHECK FOR LEGAL BOOTSTRAP   03200003
00445  0 01 0 00447        169         BRU     $+2             ILLEGAL BOOT
00446  0 01 0 00460        170         BRU     PNHBT
00447  0 43 0 00777        171         BRM     BUFTS
00450  0 71 0 01320        172         LDX     M9
00451  0 02 0 02641        173         TYPW    1,4             TYPE ILLEGAL BOOT MESSAGE
00452  2 12 0 01401        174         MIW     MSG2+8,2
00453  0 41 0 00452        175         BRX     $-1
00454  0 02 14000          176         TOPW
00455  0 43 0 00777        177         BRM     BUFTS
00456  0 43 0 01140        178         BRM     CR
00457  0 01 0 00200        179         BRU     BEGIN
00460  0 43 0 00777        180 PNHBT   BRM     BUFTS
00461  0 71 0 01422        181         LDX     =040000
00462  0 02 0 00644        182         PTLW    1,4             PUNCH BOOT RECORD ONLY
00463  0 60 0 01226        183 LOOP1   SKR     CONST
00464  0 20 0 00000        184         NOP
00465  0 53 0 01226        185         SKN     CONST
00466  0 01 0 00470        186         BRU     $+2
00467  0 01 0 00472        187         BRU     $+3
00470  2 12 0 02000        188         MIW     02000,2
00471  0 41 0 00463        189         BRX     LOOP1
00472  0 02 14000          190         TOPW
00473  0 76 0 01230        191         LDA     ZERO
00474  0 35 0 01226        192         STA     CONST
00475  0 40 20200          193         BPT     2               IS LOADER WANTED
00476  0 01 0 00500        194         BRU     $+2             NO PUNCH BOOT AND PRE-LOADER ONLY
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00477  0 76 0 01423      195          LDA     =01
00500  0 35 0 01256      196          STA     FIRST+1          SET TO PUNCH PRE-LOADER + LOADER
00501  0 01 0 00340      197          BRU     RDPTE
00502  0 00 00000        198 CKZERO   PZE     0
00503  0 76 1 01235      199          LDA     *RADR            FIRST WORD OF RECORD JUST READ
00504  0 75 0 01325      200          LDB     TYPMSK
00505  0 70 0 01246      201          SKM     RTYPE+1          TYPE1
00506  0 01 0 00510      202          BRU     $+2
00507  0 51 0 00502      203          BRR     CKZERO
00510  0 70 0 01247      204          SKM     RTYPE+2          TYPE2
00511  0 01 0 00513      205          BRU     $+2
00512  0 51 0 00502      206          BRR     CKZERO
00513  0 70 0 01250      207          SKM     RTYPE+3
00514  0 01 0 00516      208          BRU     $+2
00515  0 01 0 00520      209          BRU     $+3
00516  0 70 0 01245      210          SKM     RTYPE            TYPE 0  DATA RECORD
00517  0 01 0 01201      211          BRU     NOTYP
00520  0 53 0 01224      212          SKN     FLAG1
00521  0 01 0 00523      213          BRU     $+2
00522  0 43 0 00676      214          BRM     CKLAST
00523  0 53 0 01224      215          SKN     FLAG1
00524  0 53 0 01223      216          SKN     FLAG             IF SET - PARAMETERS ARE NEEDED
00525  0 01 0 00527      217          BRU     $+2
00526  0 43 0 00633      218          BRM     CKINP
00527  0 43 0 01032      219          BRM     LBLCK1
00530  0 43 0 01003      220          BRM     CKBIN            TEST FOR BINARY RECORDS
00531  0 43 0 00372      221          BRM     PNCH             RECORDS ARE OK - PUNCH THEM
00532  0 43 0 00534      222          BRM     RDPTE2           READ REMAINING BLOCKS ON RECORD
00533  0 01 0 00200      223          BRU     BEGIN
00534  0 00 00000        224 RDPTE2   PZE     0
00535  0 76 0 01421      225          LDA     =02000           ROUTINE TO PUNCH BY BLOCKS
00536  0 35 0 01225      226          STA     STRGE
00537  0 43 0 00777      227          BRM     BUFTS
00540  0 02 0 02604      228          RPTW    1,4
00541  0 32 1 01225      229          WIM     *STRGE
00542  0 61 0 01226      230          MIN     CONST
00543  0 61 0 01225      231          MIN     STRGE
00544  0 40 21000        232          BRTW
00545  0 01 0 00541      233          BRU     $-4
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00546  0 02 00000          234          DISW
00547  0 60 0 01226        235          SKR     CONST          ADJUST FOR FREE WIM
00550  0 76 0 02000        236          LDA     02000
00551  0 75 0 01424        237          LDB     =070000
00552  0 70 0 01322        238          SKM     BINRY          SI RECORD BINARY
00553  0 01 0 00717        239          BRU     NTBIN          NO-ILLEGAL FORMAT
00554  0 43 0 00777        240          BRM     BUFTS
00555  0 71 0 01422        241          LDX     =040000
00556  0 02 0 00644        242          PTLW    1,4
00557  0 60 0 01226        243 LOOP2    SKR     CONST
00560  0 20 0 00000        244          NOP
00561  0 53 0 01226        245          SKN     CONST          HAVE ALL WORDS BEEN PUNCHED
00562  0 01 0 00564        246          BRU     $+2            NO
00563  0 01 0 00566        247          BRU     $+3            YES
00564  2 12 0 02000        248          MIW     02000,2
00565  0 41 0 00557        249          BRX     LOOP2
00566  0 02 14000          250          TOPW
00567  0 76 0 01230        251          LDA     ZERO
00570  0 35 0 01226        252          STA     CONST
00571  0 76 0 02000        253 LOOP3    LDA     02000
00572  0 75 0 01325        254          LDB     TYPMSK
00573  0 70 0 01250        255          SKM     RTYPE+3        END RECORD TEST
00574  0 01 0 00535        256          BRU     RDPTE2+1
00575  0 43 0 01140        257          BRM     CR
00576  0 53 0 01223        258          SKN     FLAG           IF SET CHECK FOR LAST PARAMETER
00577  0 01 0 00601        259          BRU     $+2               IF NOT  CHECK FOR FILE COUNT
00600  0 01 0 00624        260          BRU     SERCH1+2
00601  0 60 0 01256        261          SKR     FIRST+1
00602  0 20 0 00000        262          NOP
00603  0 53 0 01256        263          SKN     FIRST+1        ARE THERE MORE RECORDS
00604  0 01 0 00340        264          BRU     RDPTE
00605  0 51 0 00534        265          BRR     RDPTE2
00606  0 00 00000          266 SERCH    PZE     0
00607  0 76 0 01257        267          LDA     FIRST+2
00610  0 70 0 01360        268          SKM     THRU           IF TRUE - 1ST PARAMETER IS < 5 CHAR
00611  0 01 0 00614        269          BRU     $+3
00612  0 43 0 00625        270          BRM     LIMITS
00613  0 01 0 00622        271          BRU     SERCH1
00614  0 76 0 01260        272          LDA     FIRST+3
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```
00615  0 70 0 01360      273          SKM     THRU
00616  0 51 0 00606      274          BRR     SERCH          NO COPY PARAMETERS USED
00617  0 61 0 00630      275          MIN     LIMITS+3       FIRST PARAMETER > 4 CHARACTERS
00620  0 43 0 00625      276          BRM     LIMITS
00621  0 60 0 00630      277          SKR     LIMITS+3       RESTORE TO INITIAL VALUE
00622  0 76 0 01342      278 SERCH1   LDA     SEVENS
00623  0 35 0 01223      279          STA     FLAG           SET FLAG INDICATING USE OF PARAMETERS
00624  0 01 0 00340      280          BRU     RDPTE
00625  0 00 00000        281 LIMITS   PZE     0              SET
00626  0 76 0 01256      282          LDA     FIRST+1          PARAM 1 AND PARAM2
00627  0 35 0 01221      283          STA     PARAM1                 TO CORRECT
00630  0 76 0 01260      284          LDA     FIRST+3                     PARAMETERS
00631  0 35 0 01222      285          STA     PARAM2                        DETERMINED BY
00632  0 51 0 00625      286          BRR     LIMITS                          VALUES KEYED IN
00633  0 00 00000        287 CKINP    PZE     0              ROUTINE TO FIND 1ST PARAMETER
00634  0 76 0 01241      288          LDA     NOREC          NUMBER OF RECORDS
00635  0 35 0 01244      289          STA     BINCK
00636  0 76 0 01421      290          LDA     =02000
00637  0 35 0 01243      291          STA     FRSTWD
00640  0 76 0 01263      292 CKINP1   LDA     REF1
00641  0 35 0 01240      293          STA     TEMP
00642  0 76 1 01243      294 CKINP2   LDA     *FRSTWD
00643  0 75 0 01342      295          LDB     SEVENS
00644  0 70 0 01221      296          SKM     PARAM1         CHECK FOR INPUT PARAMETER
00645  0 01 0 00647      297          BRU     $+2
00646  0 01 0 00671      298          BRU     SETF1
00647  0 61 0 01243      299          MIN     FRSTWD
00650  0 60 0 01240      300          SKR     TEMP           REDUCE WORD COUNT
00651  0 76 0 01240      301          LDA     TEMP
00652  0 70 0 01230      302          SKM     ZERO           HAVE ALL WORDS OF THIS RECORD
00653  0 01 0 00642      303          BRU     CKINP2                              BEEN CHECK
00654  0 61 0 00640      304          MIN     CKINP1         YES
00655  0 60 0 01244      305          SKR     BINCK          REDUCE TEMP RECORD COUNT
00656  0 76 0 01244      306          LDA     BINCK
00657  0 70 0 01230      307          SKM     ZERO           HAVE ALL RECORDS BEEN CHECKED
00660  0 01 0 00640      308          BRU     CKINP1         NO
00661  0 76 0 01336      309          LDA     RESET2         YES -RESTORE
00662  0 35 0 00640      310          STA     CKINP1                PGM VALUES
00663  0 53 0 01224      311          SKN     FLAG1
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00664  0 01 0 00666      312          BRU     $+2
00665  0 51 0 00633      313          BRR     CKINP          LAST PARAMETER NOT FOUND
00666  0 76 0 01230      314          LDA     ZERO
00667  0 35 0 01226      315          STA     CONST
00670  0 01 0 00732      316          BRU     SKPRC+1
00671  0 76 0 01342      317 SETF1    LDA     SEVENS
00672  0 35 0 01224      318          STA     FLAG1
00673  0 76 0 01336      319          LDA     RESET2
00674  0 35 0 00540      320          STA     CKINP1
00675  0 51 0 00633      321          BRR     CKINP          PARAMETER HAS BEEN FOUND
00676  0 00 00000        322 CKLAST   PZE     0
00677  0 76 0 01337      323          LDA     MOD            MODIFY SEARCH ROUTINE
00700  0 35 0 00644      324          STA     CKINP2+2          TO SEARCH FOR LAST PARAMETERS
00701  0 76 0 01340      325          LDA     MOD2
00702  0 35 0 00671      326          STA     SETF1
00703  0 43 0 00633      327          BRM     CKINP
00704  0 53 0 01224      328          SKN     FLAG1          IF NEG. LAST FILE NOT FOUND
00705  0 01 0 00707      329          BRU     $+2
00706  0 51 0 00676      330          BRR     CKLAST
00707  0 76 0 01230      331          LDA     ZERO           LAST FILE HAS BEEN FOUND
00710  0 35 0 01223      332          STA     FLAG                 RESTORE
00711  0 35 0 01256      333          STA     FIRST+1                VALUE OF INITIAL CONT
00712  0 76 0 00622      334          LDA     SERCH1                       AND PUNCH LAST
00713  0 35 0 00671      335          STA     SETF1                                  FILE
00714  0 76 0 01341      336          LDA     MOD3
00715  0 35 0 00644      337          STA     CKINP2+2
00716  0 51 0 00676      338          BRR     CKLAST
00717  0 43 0 00777      339 NTBIN    BRM     BUFTS          ROUTINE TO PUNCH NOT BINARY FORMAT
00720  0 71 0 01317      340          LDX     M7                   MESSAGE
00721  0 02 0 02641      341          TYPW    1,4
00722  2 12 0 01417      342          MIW     MSG4+7,2
00723  0 41 0 00722      343          BRX     $-1
00724  0 02 14000        344          TOPW
00725  0 43 0 00777      345          BRM     BUFTS
00726  0 43 0 01140      346          BRM     CR
00727  0 00 0 00000      347          HLT
00730  0 01 0 00200      348          BRU     BEGIN
00731  0 43 0 00305      349 SKPRC    BRM     SICNT          SKIP FILE ROUTINE
00732  0 76 0 01421      350          LDA     =02000
```

```
00733  0 35 0 01225        351          STA     STRGE
00734  0 43 0 00777        352          BRM     BUFTS
00735  0 02 0 02604        353          RPTW    1,4
00736  0 32 1 01225        354          WIM     *STRGE
00737  0 61 0 01225        355          MIN     STRGE
00740  0 40 21000          356          BRTW
00741  0 01 0 00736        357          BRU     $-3
00742  0 02 00000          358          DISW
00743  0 76 0 02000        359          LDA     02000
00744  0 75 0 01325        360          LDB     TYPMSK
00745  0 70 0 01250        361          SKM     RTYPE+3
00746  0 01 0 00732        362          BRU     SKPRC+1
00747  0 53 0 01223        363          SKN     FLAG                IS SKIP NORMAL OR SEARCH
00750  0 01 0 00754        364          BRU     $+4
00751  0 76 0 01334        365          LDA     RESET
00752  0 35 0 00360        366          STA     CHTK0+1
00753  0 01 0 00624        367          BRU     SERCH1+2            SEARCH TYPE SKIP
00754  0 60 0 01256        368          SKR     FIRST+1
00755  0 20 0 00000        369          NOP
00756  0 53 0 01256        370          SKN     FIRST+1
00757  0 01 0 00732        371          BRU     SKPRC+1             MORE FILES REMAIN TO BE SKIPPED
00760  0 01 0 00200        372          BRU     BEGIN
00761  0 00 00000          373 CKEOF    PZE     0                   CHECK FOR EOF RECORD
00762  0 76 0 01226        374          LDA     CONST
00763  0 75 0 01342        375          LDB     SEVENS
00764  0 70 0 01423        376          SKM     =1                  IS RECORD ONE WORD
00765  0 51 0 00761        377          BRR     CKEOF               NO
00766  0 76 0 02000        378          LDA     02000
00767  0 70 0 01425        379          SKM     =017170000          YES-IS IT AN EOF
00770  0 51 0 00761        380          BRR     CKEOF               NO
00771  0 43 0 00777        381          BRM     BUFTS               YES PUNCH EOF
00772  0 02 0 00644        382          PTLW    1,4
00773  0 12 0 02000        383          MIW     02000
00774  0 02 14000          384          TOPW
00775  0 43 0 00777        385          BRM     BUFTS
00776  0 01 0 00200        386          BRU     BEGIN
00777  0 00 00000          387 BUFTS    PZE     0
01000  0 40 21000          388          BRTW
01001  0 01 0 01000        389          BRU     $-1
```

```
01002  0 51 0 00777      390          BRR     BUFTS
01003  0 00 00000        391 CKBIN    PZE     0
01004  0 76 0 01241      392          LDA     NOREC      NUMBER OF RECORDS READ
01005  0 35 0 01244      393          STA     BINCK
01006  0 76 0 01421      394          LDA     =02000
01007  0 35 0 01243      395          STA     FRSTWD
01010  0 76 1 01243      396 RECIM    LDA     *FRSTWD    IMAGE OF FIRST WORD OF RECORD
01011  0 75 0 01424      397          LDB     =070000    MASK OF BINARY CODE POSITION
01012  0 70 0 01322      398          SKM     BINRY      IF RECORD IN BINARY FORMAT
01013  0 01 0 00717      399          BRU     NTBIN      NOT BINARY FORMAT
01014  0 60 0 01244      400          SKR     BINCK      REDUCE RECORD COUNT
01015  0 75 0 01426      401          LDB     =077777777
01016  0 76 0 01244      402          LDA     BINCK
01017  0 70 0 01230      403          SKM     ZERO       ARE THERE MORE RECORDS TO CHECK
01020  0 01 0 01022      404          BRU     $+2        YES
01021  0 01 0 01027      405          BRU     RESET1     NO
01022  0 76 0 01263      406 THUP     LDA     REF1
01023  0 55 0 01243      407          ADD     FRSTWD
01024  0 35 0 01243      408          STA     FRSTWD     STARTING ADDRESS OF NEXT RECORD
01025  0 61 0 01022      409          MIN     THUP
01026  0 01 0 01010      410          BRU     RECIM
01027  0 76 0 01336      411 RESET1   LDA     RESET2
01030  0 35 0 01022      412          STA     THUP
01031  0 51 0 01003      413          BRR     CKBIN
01032  0 00 00000        414 LBLCK1   PZE     0
01033  0 76 0 01241      415          LDA     NOREC      NUMBER OF RECORDS
01034  0 35 0 01244      416          STA     BINCK
01035  0 76 0 01421      417          LDA     =02000
01036  0 35 0 01243      418          STA     FRSTWD
01037  0 76 1 01243      419 LBLCK2   LDA     *FRSTWD    FIRST WORD OF RECORD
01040  0 75 0 01325      420          LDB     TYPMSK
01041  0 70 0 01230      421          SKM     ZERO       IF RECORD TYPE 0  RESTORE AND EXIT
01042  0 01 0 01047      422          BRU     LBLCK3
01043  0 76 0 01336      423 RESET3   LDA     RESET2     EXIT
01044  0 35 0 01047      424          STA     LBLCK3
01045  0 35 0 01131      425          STA     RECADR
01046  0 51 0 01032      426          BRR     LBLCK1
01047  0 76 0 01263      427 LBLCK3   LDA     REF1       NUMBER OF WORDS IN RECORD
01050  0 35 0 01234      428          STA     RCLNTH             TO BE CHECKED
```

```
01051  0 61 0 01047      429          MIN     LBLCK3
01052  0 76 0 01243      430 LBLCK    LDA     FRSTWD
01053  0 55 0 01427      431          ADD     =03
01054  0 35 0 01236      432          STA     RADR1          WORD CONTAINING ITEM TYPE
01055  0 53 1 01236      433          SKN     *RADR1         SHOULD LABEL BE TYPED
01056  0 01 0 01113      434          BRU     NXLABL
01057  0 76 0 01236      435          LDA     RADR1
01060  0 54 0 01430      436          SUB     =02
01061  0 35 0 01237      437          STA     RADR2          FIRST LABEL WORD
01062  0 02 0 02041      438          TYPW    1,1
01063  0 71 0 01315      439          LDX     M4
01064  0 76 1 01237      440 LATYP    LDA     *RADR2
01065  0 75 0 01327      441          LDB     LAMSK
01066  0 70 0 01331      442          SKM     BLNKS          60 BLANKS
01067  0 01 0 01075      443          BRU     LAOUT
01070  0 12 0 01326      444          MIW     TBLNK          OUTPUT 12 BLANK
01071  0 6720 006        445          LCY     6
01072  0 41 0 01065      446          BRX     LATYP+1
01073  0 61 0 01237      447          MIN     RADR2          SECOND LABEL WORD
01074  0 01 0 01103      448          BRU     CKADR
01075  0 35 0 01242      449 LAOUT    STA     LAROT
01076  0 12 0 01242      450          MIW     LAROT          OUTPUT CHARACTER
01077  0 6720 006        451          LCY     6              GET NEXT CHARACTER
01100  0 35 0 01242      452          STA     LAROT
01101  0 41 0 01065      453          BRX     LATYP+1
01102  0 61 0 01237      454          MIN     RADR2
01103  0 76 0 01236      455 CKADR    LDA     RADR1
01104  0 75 0 01330      456          LDB     MSKAD          MASK ADDRESS FIELD
01105  0 70 0 01237      457          SKM     RADR2
01106  0 01 0 01063      458          BRU     LATYP-1        GET  2ND WORD OF LABEL
01107  0 02 14000        459 LADNE    TOPW
01110  0 76 0 01324      460          LDA     ADRR
01111  0 35 0 01064      461          STA     LATYP          SET TO INITIAL ADDRESS
01112  0 43 0 01140      462          BRM     CR
01113  0 76 0 01234      463 NXLABL   LDA     RCLNTH         LENGTH OF RECORD REMAINING
01114  0 54 0 01427      464          SUB     =03                        TO BE
01115  0 35 0 01234      465          STA     RCLNTH                        CHECKED
01116  0 75 0 01342      466          LDB     SEVENS
0111 7 0 53 0 01234      467          SKN     RCLNTH
```

```
01120  0 01 0 01122        468          BRU     $+2
01121  0 01 0 01124        469          BRU     $+3
01122  0 70 0 01423        470          SKM     =01                 HAVE ALL WORDS BEEN CHECKED
01123  0 01 0 01136        471          BRU     NEXT3               NO
01124  0 60 0 01244        472          SKR     BINCK
01125  0 76 0 01244        473          LDA     BINCK               YES
01126  0 70 0 01230        474          SKM     ZERO                ARE THERE MORE RECORDS TO BE CHECKED
01127  0 01 0 01131        475          BRU     $+2                 YES
01130  0 01 0 01043        476          BRU     RESET3              NO
01131  0 76 0 01263        477 RECADR   LDA     REF1
01132  0 55 0 01243        478          ADD     FRSTWD
01133  0 35 0 01243        479          STA     FRSTWD              FIRST WORD OF NEXT RECORD
01134  0 61 0 01131        480          MIN     RECADR
01135  0 01 0 01037        481          BRU     LBLCK2
01136  0 76 0 01236        482 NEXT3    LDA     RADR1
01137  0 01 0 01053        483          BRU     LBLCK+1
01140  0 00 00000          484 CR       PZE     0
01141  0 71 0 01431        485          LDX     =-6500
01142  0 41 0 01142        486          BRX     $
01143  0 43 0 00777        487          BRM     BUFTS
01144  0 02 0 02041        488          TYPW    1,1
01145  0 12 0 01432        489          MIW     =052000000
01146  0 02 14000          490          TAPW
01147  0 43 0 00777        491          BRM     BUFTS
01150  0 71 0 01431        492          LDX     =-6500
01151  0 41 0 01151        493          BRX     $
01152  0 51 0 01140        494          BRR     CR
01153  0 00 00000          495 WORDX    PZE     0                   FORM WORD FROM KEYED INPUTS
01154  0 71 0 01315        496          LDX     M4                  SET TO PACK WORDS
01155  2 76 0 01255        497          LDA     NAME1+4,2
01156  0 6720 022          498          LCY     18
01157  0 75 0 01230        499          LDB     ZERO
01160  0 6620 022          500          RCY     18
01161  2 35 0 01255        501          STA     NAME1+4,2
01162  0 41 0 01155        502          BRX     $-5
01163  0 71 0 01314        503          LDX     M3
01164  0 75 0 01230        504          LDB     ZERO
01165  2 76 0 01254        505          LDA     NAME1+3,2
01166  0 6700 006          506          LSH     6
```

```
01167  2 55 0 01255        507          ADD     NAME1+4,2
01170  0 41 0 01166        508          BRX     $-2
01171  0 35 0 01255        509 INMFY    STA     FIRST
01172  0 61 0 01171        510          MIN     $-1
01173  0 71 0 01315        511          LDX     M4
01174  0 76 0 01331        512          LDA     BLNKS
01175  2 35 0 01255        513          STA     NAME1+4,2
01176  0 41 0 01175        514          BRX     $-1
01177  0 02 20001          515          R0V
01200  0 51 0 01153        516          BRR     W0RDX
01201  0 43 0 01140        517 N0TYP    BRM     CR
01202  0 71 0 01317        518          LDX     M7
01203  0 02 0 02641        519          TYPW    1,4
01204  2 12 0 01371        520          MIW     MSG1+7,2
01205  0 41 0 01204        521          BRX     $-1
01206  0 02 14000 ~        522          T0PW
01207  0 43 0 01140        523          BRM     CR
01210  0 01 0 00200        524          BRU     BEGIN
01211  0 43 0 01140        525 CTERR    BRM     CR
01212  0 71 0 01317        526          LDX     M7
01213  0 02 0 02641        527          TYPW    1,4
01214  2 12 0 01410        528          MIW     MSG3+7,2
01215  0 41 0 01214        529          BRX     $-1
01216  0 02 14000          530          T0PW
01217  0 43 0 01140        531          BRM     CR
01220  0 01 0 00200        532          BRU     BEGIN
01221  0 00 00000          533 PARAM1   PZE     0
01222  0 00 00000          534 PARAM2   PZE     0
01223  0 00 00000          535 FLAG     PZE     0
01224  0 00 00000          536 FLAG1    PZE     0
01225  0 00 00000          537 STRGE    PZE     0
01226  0 00 00000          538 C0NST    PZE     0
01227  0 00 00000          539 C0UNT    PZE     0
01230  0 00 00000          540 ZER0     PZE     0
01231  0 00 00000          541 CHBUF    PZE     0
01232  0 00 00000          542 MEM      PZE     0
01233  0 00 00000          543 XT0TEN   PZE     0
01234  0 00 00000          544 RCLNTH   PZE     0
01235  0 00 00000          545 RADR     PZE     0
```

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01236  0 00 00000          546 RADR1   PZE     0
01237  0 00 00000          547 RADR2   PZE     0
01240  0 00 00000          548 TEMP    PZE     0
01241  0 00 00000          549 NOREC   PZE     0
01242  0 00 00000          550 LAROT   PZE     0
01243  0 00 00000          551 FRSTWD  PZE     0
01244  0 00 00000          552 BINCK   PZE     0
01245  0 00 00000          553 RTYPE   PZE     0
01246  10000000            554         DATA    010000000
01247  20000000            555         DATA    020000000
01250  30000000            556         DATA    030000000
01251                      557 NAME1   RES     4
01255                      558 FIRST   RES     6
01263                      559 REF1    RES     20
01307  00000077            560 CHMSK   DATA    000000077
01310  00000012            561 BLANK   DATA    000000012
01311  00000033            562 PERID   DATA    000000033
01312  00000052            563 CARET   DATA    000000052
01313  00000061            564 KYERR   DATA    000000061
01314  00077775            565 M3      DATA    000077775
01315  00077774            566 M4      DATA    000077774
01316  00077772            567 M6      DATA    000077772
01317  00077771            568 M7      DATA    077771
01320  00077770            569 M9      DATA    000077770
01321  00077754            570 M24     DATA    077754
01322  00050000            571 BINRY   DATA    000050000
01323  00000057            572 DELTA   DATA    057
01324  0 76 1 01237        573 ADRR    LDA     *RADR2
01325  70000000            574 TYPMSK  DATA    070000000
01326  12000000            575 TBLNK   DATA    012000000
01327  77000000            576 LAMSK   DATA    077000000
01330  00077777            577 MSKAD   DATA    077777
01331  60606060            578 BLNKS   DATA    060606060
01332  0 00 0 00000        579 ERROR   HLT                 KEY ERROR TO BE COMPLETED
01333  0 76 0 01261        580 TEST    LDA     FIRST+4
01334  0 35 0 01263        581 RESET   STA     REF1        REINITIALIZE STORAGE LOCATION
01335  0 35 0 01255        582 REMOD   STA     FIRST
01336  0 76 0 01263        583 RESET2  LDA     REF1
01337  0 70 0 01222        584 MOD     SKM     PARAM2
```

```
01340  0 76 0 01230        585 MOD2   LDA     ZERO
01341  0 70 0 01221        586 MOD3   SKM     PARAM1
01342  77777777            587 SEVENS DATA    077777777
01343  03200003            588 WIM3   DATA    003200003
01344  00000000            589 TENS   DATA    0
01345  00000012            590        DATA    012
01346  00000024            591        DATA    024
01347  00000036            592        DATA    036
01350  00000050            593        DATA    050
01351  00000062            594        DATA    062
01352  00000074            595        DATA    074
01353  00000106            596        DATA    0106
01354  00000120            597        DATA    0120
01355  22464663            598 BOOT   TEXT    <BOOT>
01356  23464770            599 COPY   TEXT    <COPY>
01357  62423147            600 SKIP   TEXT    <SKIP>
01360  63305164            601 THRU   TEXT    <THRU>
01361  26314325            602 FILE   TEXT    <FILE>
01362  51252346            603 MSG1   TEXT    <RECORD NOT IN SYMBOL FORMAT.>
01363  51241245
01364  46631231
01365  45126270
01366  44224643
01367  12264651
01370  44216333
01371  31434325            604 MSG2   TEXT    <ILLEGAL BOOT FORMAT ON TAPE READ>
01372  27214312
01373  22464663
01374  12264651
01375  44216312
01376  46451263
01377  21472512
01400  51252124
01401  12234647            605 MSG3   TEXT    < COPY INSTRUCTION NOT FOUND.>
01402  70123145
01403  62635164
01404  23633146
01405  45124546
01406  63122646
```

```
01407  64452433
01410  51252346          606 MSG4    TEXT     <RECORD NOT IN BINARY FORMAT.>
01411  51241245
01412  46631231
01413  45122231
01414  45215170
01415  12264651
01416  44216333
       00000200          607         END      0200
01417  00770000
01420  00600000
01421  00002000
01422  00040000
01423  00000001
01424  00070000
01425  17170000
01426  77777777
01427  00000003
01430  00000002
01431  77763234
01432  52000000
```