IDENTIFICATION

Product Code:	DEC-12-ZR1A-D
Product Name:	DIAL-MS Assembler Program Description
Date Created:	July 1, 1970
Maintainer:	Software Services

LAP6-DIAL is an editor, filing system and assembler for use with the PDP-12 computer. The editor and filing portions are derived from the basic LINC program LAP6[1] by Mary Allen Wilkes of Washington University. The assembly portion is derived from several programs used for the PDP-8 computer including PAL-D[2].

The Digital Equipment Corporation wishes to express to the author, Mary Allen Wilkes (Clark), and the Computer Research Laboratory of Washington University, St. Louis, Missouri, its appreciation for the development set forth in LAP6 as well as its thanks for permission to use parts of the LAP6 program.

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[1]M. A. Wilkes, LAP6 Handbook, Computer Research Laboratory Tech. Rep. No. 2, Washington University, St. Louis, May 1, 1967.

[2]PAL-D Assembler Programmer's Reference Manual DEC-D8-ASAA-D.

1.0 PROGRAM OVERVIEW

The DIAL Assembler is a bilingual assembler which can assemble program which have been edited by the DIAL editor or entered by PIP.

Additional features to the assembler are:

1. Ability to save and load parts of the symbol table
2. Conditional assembly of various lines
3. Listing between line numbers
4. A "quick list" entry point which removes comments and line numbers and replaces tabs by blanks
5. Listing on disk or tape
6. Chaining between source files.

This assembler is based on PAL-D which, in turn, was based on MACRO-8. Most of the routines in the DIAL Assembler will be found and described in the PAL-D or MACRO-8 system description.

2.0 ENVIRONMENT

The Assembler leaves its binary output in the Working Area on tape 1 (blocks 37Ø-427), and the header block in 447. The Assembler itself (including necessary scratch blocks) resides in blocks 324-345 of tape Ø.

2.1 LOADER MAP

ØØØØ-Ø177	Page Ø: Common literals and pointers
Ø2ØØ-Ø377	Bank Check Routine; Symbol Search Routine
Ø4ØØ-Ø577	Symbol Table Getter Routine
Ø6ØØ-Ø777	Routine to get a symbol from Symbol Table (or add on). Ring buffering routines
1ØØØ-1177	General Recursive Expression Evaluator
12ØØ-1377	Recursive Address Evaluator
14ØØ-1577	Central Processing Loop, Main Start of Assembler after Initialization
16ØØ-1777	Text Processor, Current Line Tester, plus Minor Support Routines
2ØØØ-2177	An Input Character Scanner Routine, the output buffer routine and tab routine
22ØØ-2377	Number Conversions, Type Checks
24ØØ-2577	Symbol Sort for Output, Teletype Routine
26ØØ-2777	Symbol Output and Value Routine, Octal Print Routine, Field Change Routine, and Work Area
3ØØØ-3177	Output List Routine, 8K Pseudo Op Initialization (destroyed and never used) Work Area
32ØØ-3377	Error Message Processor, Type Evaluator, System Symbol Table Swapper, Fairly Low Level Character Getter, and Routine to Skip if Not Pass 2 or Not in List Mode
34ØØ-3577	Input Character Convertor to Internal Form, Plus Page Checkers, Other Little Routines
36ØØ-3777	Internal to External Character Convertor, Symbol Table Type Getters and Setters
	Low Level Character Getter, Ccmment Processor, List and No List Processors
4ØØØ-4177	General Tape I/O Call Routines, Initialization for Tape Routines, Other Short Routines
42ØØ-4377	More Tape I/O Routines, Pseudo Op Processor, and Loader Core Map
44ØØ-4777	Input Buffer and Swapped In and Out Work Area for SAVSYM and LODSYM
5ØØØ-5377	Output Buffer, plus Initialization for Entire Assembler after it is first loaded in

5400-5777	Pseudo-Op Processor
6000-6377	Line Printer Checker and Basic Line Printer Routine. Ring buffer
6400-6777	Listape Buffer
7000-7777	DIAL-MS routines
10000-16777	User defined symbols
17000-17377	System Mode Symbols (L-mode or P-mode)
17400-17577	Pseudo Ops and Special Character Table

3.0 THE PSEUDO OP PROCESSOR

After the desired pseudo op is found in the table by "EXPR", it then JMPs to an ISZ chain. The ISZ chain is a group of sequential ISZs of location "OPL". After falling through the ISZs, OPL contains the desired pseudo op number; the routine then JMSs to it with the desired operation number in the AC.

4.0 SYMBOL TABLE ORGANIZATION

A symbol table entry is composed of four words. The first three words are the name and the last is the value. If the symbol is a pseudo-op, then the last word contains a pointer to the routine which will process the pseudo op and the rest of the statement.

The name is composed of six characters. These characters are usually the 26 alphabetic letters plus 10 numbers plus a null character if less than six letters long, permitting 45 octal possible characters for the left or the right half of

a word. If six bit notation were used, 23 possible positions on the character would be wasted; therefore, six bit is not used. The first character of a name must be a letter, thus leaving only 32 octal combinations for the first character. If the left characters of a word are multiplied by 45, there are two free bits in the first word of a name (32*45 < 2000 octal). These two left bits are used as follows:

ØØ:	Special Character
Ø1:	Undefined
1Ø:	Defined
11:	Pseudo operation

5.0 SUBROUTINES

1. Initialization

NAME:	SETORG
FUNCTION:	Called at the beginning of each pass to initialize counters, pointers, and tables. Sets origin to SEGMNT 2.
INPUT:	Clear AC.
OUTPUT:	Clear AC.
MAJOR REGISTERS CHANGED:	AADR, APAGE, EVAL, ABANK

NAME:	RESET
FUNCTION:	Called when a new page is to be started to initialize pointers.
INPUT:	Clear AC.
OUTPUT:	Clear AC.
MAJOR REGISTERS CHANGED:	APAGE.

2. Input

NAME: GETIN

FUNCTION: Gets an 8-bit character from GETCHR. Saves it in ITEM. Also scans off comments if in QUICK LIST mode.

MAJOR REGISTERS CHANGED: ITEM

3. Input Conversion

NAME: BIT6

FUNCTION: Translates the 8-bit ASCII character in ITEM to its 6-bit internal code.

INPUT: Clear AC

OUTPUT: 6-bit internal code in AC

MAJOR REGISTERS CHANGED: None

4. Output

NAME: PUNONE

FUNCTION: Outputs the contents of EVAL (the generated binary).

1. PASS 1 - no operation
2. Save word in correct core location. If correct block not in core, it calls NOTBC1 to load it in.

INPUT: Clear AC when EVAL contains assembled binary.

OUTPUT: Clear AC.

MAJOR REGISTERS CHANGED: CUNADD.

Output (cont.)

NAME:	OPS
FUNCTION:	This is the octal print routine. It converts the binary word in the AC to 4 octal characters (8-bit ASCII code) and calls TYPO to output them..
INPUT:	Value to be output in AC.
OUTPUT:	Clear AC.
MAJOR REGISTERS CHANGED:	None.

NAME:	EMPTY
FUNCTION:	Outputs the contents of the symbolic buffer via TYPO during optional PASS 2. It then calls TYCAR to output a carriage return/line feed.
INPUT:	Clear AC.
OUTPUT:	Clear AC.
MAJOR REGISTERS CHANGED:	CHARAC - the buffer counter/pointer.

NAME:	TYCAR
FUNCTION:	Outputs a carriage return and a line feed in 8-bit ASCII code via two calls to TYPO.
INPUT:	Clear AC.

Output (cont.)

OUTPUT:	Clear AC
MAJOR REGISTERS CHANGED:	None.

NAME:	UNTRAN
FUNCTION:	Converts the 6-bit internal code character in the AC to 8-bit ASCII and then calls TYPO to output it.
INPUT:	Internal code character in AC.
OUTPUT:	Clear AC.
MAJOR REGISTERS CHANGED:	TYCAR - symbol character counter.

NAME:	OX
FUNCTION:	Used to decode a word of a symbol table entry by dividing by 45_8 and then calling UNTRAN twice to output the two characters that are now in 6-bit internal code.
INPUT:	Word to be decoded in AC.
OUTPUT:	Clear AC.
MAJOR REGISTERS CHANGED:	LWC, HIC, MPI

Output (cont.)

NAME:	OSYM
FUNCTION:	Outputs the symbol in TEM1A-TEM1A+2. It initializes the symbol character counter, TYCAR, and then calls OX once for each word of the symbol.
INPUT:	Clear AC.
OUTPUT:	Clear AC.
MAJOR REGISTERS CHANGED:	TYCAR

NAME:	OSANDV
FUNCTION:	Outputs a symbol via OSYM and its value via OPS. It calls SKIP2 to output spaces for format and TYCAR for a terminating carriage return/line feed.
INPUT:	Clear AC.
OUTPUT:	Clear AC.
MAJOR REGISTERS CHANGED:	None.

NAME:	SKIP2
FUNCTION:	Outputs spaces (8-bit ASCII) for formatting purposes via TYPO.
INPUT:	2's complement of number of spaces in AC.

Output (cont.)

OUTPUT: Clear AC.

MAJOR REGISTERS CHANGED: None.

NAME: ALPHA

FUNCTION: Called at the end of PASS 2 to output an alphanumeric ordered symbol table print of all the defined symbols and their values. It uses the following "lower level" output routines to accomplish this: LT2, TYPE, TYCAR and OSANDV.
It also uses

MOVE - the triple precision moving routine,

TRIPLE - the triple precision comparison routine.

and GETYPE - to determine the type of the symbol currently being ordered.

INPUT: Clear AC.

OUTPUT: Clear AC.

MAJOR REGISTERS CHANGED: SADR, auto-index 16_8, TEM1-TEM3, TEM1A-TEM1A+2, and VAL.

NAME: ONEREG

FUNCTION: This routine is entered with the AC containing the value that is to be loaded into the location now pointed

Output (cont.)

	at by AADR (the current address counter) when the assembled program is to be run. This value is output via PUNONE.
INPUT:	Value to be output in AC.
OUTPUT:	Clear AC.
MAJOR REGISTERS CHANGED:	EVAL AADR - incremented by 1. TYPINST+page number - this contains the highest instruction address +1 and was changed if the value just output was the highest instruction so far on this page.

NAME:	ERROR
FUNCTION:	Called to output error message (8-bit ASCII) via TYPO corresponding to error number in the AC. The error address is either relative to a symbolic tag or absolute depending on whether or not a tag has been encountered since the last origin setting.
INPUT:	Error number in AC.
OUTPUT:	Clear AC.
MAJOR REGISTERS CHANGED:	None.

5. Pseudo-Instruction Processors

NAME:	PAGEC
FUNCTION:	Handles the PAGE pseudo-op. Calls EXPR to see if a page number follows PAGE. If so, the origin is set to the beginning of that page. If no number is specified, the origin is set to the beginning of the next page. PUNORG is called to punch the new origin.
INPUT:	Clear AC.
OUTPUT:	Clear AC.
MAJOR REGISTERS CHANGED:	AADR, EVAL

NAME:	PERIOD
FUNCTION:	Handles the "." pseudo instruction. Combines the value of the current address counter, AADR, with the value already accumulated according to the last operator received. If in LMODE, AADR is ANDed with 1777.
INPUT:	Clear AC.
OUTPUT:	Clear AC.
MAJOR REGISTERS CHANGED:	CON (indirectly).

Pseudo-Instruction Processors (cont.)

NAME:	H
FUNCTION:	Handles the "!" pseudo instruction. The indirect indicator register is set to 400_8 and the scanning for the rest of the expression resumes at A+1.
INPUT:	Clear AC.
OUTPUT:	Clear AC.
MAJOR REGISTERS CHANGED:	H+3

NAME:	ORGIC
FUNCTION:	Handles the "*" pseudo instruction. EXPR is called to get the address of the new origin which follows the *. PUNORG is called to punch the new origin.
INPUT:	Clear AC.
OUTPUT:	Clear AC.
MAJOR REGISTERS CHANGED:	AADR

NAME:	STRING
FUNCTION:	This handles the TEXT pseudo-instruction. It uses calls to GETIN

to input the beginning delimiter, the string of characters, and the terminating delimiter in 6-bit DIAL code. It then uses calls to ONEREG to output two string characters per register in 6-bit DIAL code.

INPUT: Clear AC.

OUTPUT: Clear AC.

MAJOR REGISTERS CHANGED: VAL, EVAL, ITEM.

NAME: FIELDM

FUNCTION: Handles the FIELD pseudo-instruction. EXPR is called to pick up the bank designation which follows FIELD. This memory bank designator is output (pass 2 only) via TYPO2 in a format acceptable to the binary loader.

INPUT: Clear AC.

OUTPUT: Clear AC.

MAJOR REGISTERS CHANGED: None.

NAME: DECIM

FUNCTION: Handles the DECIMAL pseudo-instruction. Calls the subroutine DECIMS, which by

setting a switch in the MT10 subroutine, effects all subsequent numbers to be considered in the decimal radix.

INPUT: Clear AC.

OUTPUT: Clear AC.

MAJOR REGISTERS CHANGED: MTSW - the switch register.

NAME: OCT

FUNCTION: Handles the OCTAL pseudo-instruction. Calls the subroutine OCTS, which by setting a switch in the MT10 subroutine, effects all subsequent numbers to be considered in the octal radix.

INPUT: Clear AC.

OUTPUT: Clear AC.

MAJOR REGISTERS CHANGED: MTSW - the switch register.

6. Symbol Table Routines

NAME: SEARCH

FUNCTION: Searches the symbol table for the symbol found in TEM1, TEM2, and TEM3.

INPUT: Clear AC.

Symbol Table Routines (cont.)

OUTPUT:	Clear AC.
MAJOR REGISTERS CHANGED:	SADR, Autoindex 16_8, INST, VAL, VADR, ANY, TYPE

NAME:	GETYPE
FUNCTION:	Extracts the type from the left hand 2 bits of the 1st word and the left hand bit of the second word of the current symbol and places it in TYPE.
INPUT:	Clear AC.
OUTPUT:	Clear AC.
MAJOR REGISTERS CHANGED:	TYPE.

NAME:	TYPADD
FUNCTION:	Change or add the type of the symbol pointed at by SADR.
INPUT:	Clear AC.
OUTPUT:	Clear AC.
MAJOR REGISTERS CHANGED:	TYPE, 1st 2 words of symbol table entry.

Symbol Table Routines (cont.)

NAME:	CURREN
FUNCTION:	Handles the special character ",". It defines the symbol preceding the comma as equal to the current address counter.
INPUT:	Clear AC.
OUTPUT:	Clear AC.
MAJOR REGISTERS CHANGED:	TEM1A-TEM1A+2, VADR, VAL1A

NAME:	ENTS
FUNCTION:	Enter a symbol in the symbol table with type equal to the parameter following the call. The symbol to be entered is in TEM1-TEM3 and the value in VAL.
INPUT:	Clear AC.
OUTPUT:	Clear AC.
MAJOR REGISTERS CHANGED:	SEND, SADR, VADR, TYPE.

NAME:	ERR7
FUNCTION:	This routine is called by CURREN to determine whether the symbol to be defined has already been defined and, if so, whether the new definition agrees with the old.

Symbol Table Routines (cont.)

INPUT:	Clear AC.
OUTPUT:	Clear AC.
MAJOR REGISTERS CHANGED:	None.

NAME:	SAVE
FUNCTION:	Called by SEARCH to save the pointers (SADR, TYPE, VADR) of the previous symbol, in case the current symbol is a definition character (, or =) or a macro escape character.
INPUT:	Clear AC.
OUTPUT:	Clear AC.
MAJOR REGISTERS CHANGED:	REPUN, RESTOR-1, VADR1

NAME:	RESTOR
FUNCTION:	Restores the registers saved by SAVE. CURREN, the "," processing routine, is one place where RESTOR is called to allow definition of the symbol preceding the ",".
INPUT:	Clear AC.
OUTPUT:	Clear AC.

Symbol Table Routines (cont.)

MAJOR REGISTERS CHANGED:	SADR, TYPE, VADR
NAME:	LDT
FUNCTION:	Used in the assembling of a symbol. If the character is alphanumeric, exit is made with it in the AC after having incremented IN and called IDX for the next character. If non-alphanumeric, CHARX is cleared to effect immediate exit from LDT in subsequent calls.
INPUT:	Clear AC.
OUTPUT:	Alphanumeric character of 0 in AC.
MAJOR REGISTERS CHANGED:	NUPAGE (for temporary storage), IN -- alphanumeric character counter, CHARX.
NAME:	AlW
FUNCTION:	Used in the assembling of a symbol. It makes two calls to LDT and adds the output of the 2nd to 45_8 times the 1st. This gains type bits in the 1st two words of the symbol table entry.
INPUT:	Clear AC.

Symbol Table Routines (cont.)

OUTPUT:	Word of symbol in AC.
MAJOR REGISTERS CHANGED:	NUPAGE (for temporary storage), VAL.

NAME:	AAS
FUNCTION:	Assembles a 3 word symbol by calling AlW three times. By calls to LDT, it causes all letter/digits beyond 6 to be ignored.
INPUT:	Clear AC.
OUTPUT:	Clear AC.
MAJOR REGISTERS CHANGED:	TEM1, TEM2, TEM3.

NAME:	ANYY
FUNCTION:	Control comes here from the SEARCH routine. If the type of the symbol found is defined or undefined, ANY is indexed to indicate something valid was assembled for this line.
INPUT:	Clear AC.
OUTPUT:	Clear AC.
MAJOR REGISTERS CHANGED:	ANY

Symbol Table Routines (cont.)

NAME:	GETASY
FUNCTION:	Calls AAS to get a symbol and then SEARCH to see if it is already in the symbol table. If it is not in the table, it is entered as undefined by calling ENTS.
INPUT:	Non-zero AC when called by GETSYM; otherwise clear AC.
OUTPUT:	Non-zero AC if symbol undefined and pass is 1; otherwise clear AC.
MAJOR REGISTERS CHANGED:	IN, VAL, TRUBL.

NAME:	TRIPLE
FUNCTION:	Triple precision comparison routine used by ALPHA to order its output. It exits with the link on if the symbol in WORK-WORK+2 is greater than the symbol in TEM1 - TEM1+2.
INPUT:	Clear AC.
OUTPUT:	Clear AC; link on or off.
MAJOR REGISTERS CHANGED:	MOVE (for temporary storage)

Symbol Table Routines (cont.)

NAME:	GETADR
FUNCTION:	Called by EXPR when a defined or undefined symbol is terminated by a space. Its job is to get the address portion of this expression. Because it calls EXPR to accomplish this, it must save its own exit point for possible recursion. It will call CONC to generate a link when the address is an out-of-page reference.
INPUT:	Clear AC.
OUTPUT:	Clear AC.
MAJOR REGISTERS CHANGED:	ADR, NUPAGE (for temporary storage).

7. Numeric Routines

NAME:	DECIMS
FUNCTION:	Sets a switch in MT10 to effect decimal radix for all subsequent numbers.
INPUT:	Clear AC.
OUTPUT:	Clear AC.
MAJOR REGISTERS CHANGED:	MTSW (the switch address).

Numeric Routines (cont.)

NAME:	OCTS
FUNCTION:	Sets a switch in MT10 to effect octal radix for all subsequent numbers.
INPUT:	Clear AC.
OUTPUT:	Clear AC.
MAJOR REGISTERS CHANGED:	MTSW (the switch address).

NAME:	MT10
FUNCTION:	Uses calls to MTRL (which shifts LWC left 1 place) and calls to MTAD (which adds the contents of TIC to the pseudo accumulator, LWC) to combine the number in MTDG, according to the currently declared radix, with the previously accumulated value, LWC.
INPUT:	Clear AC.
OUTPUT:	Clear AC.
MAJOR REGISTERS CHANGED:	TIC.

NAME:	DRCV
FUNCTION:	Numeric input and conversion routine. It calls IDX for input and MT10 for conversion to the currently declared radix. A non-numeric character will stop processing.

Numeric Routines (cont.)

INPUT:	Clear AC.
OUTPUT:	AC non-zero.
MAJOR REGISTERS CHANGED:	ANY, HIC, LWC, RTDIG, SIGN, DPN, MTDG.

8. Miscellaneous Routines

NAME:	RADD
FUNCTION:	Add the value in the AC to the accumulated value, CON, and store the result in CON.
INPUT:	Value to be added to CON in AC.
OUTPUT:	Clear AC.
MAJOR REGISTERS CHANGED:	CON.

NAME:	RSUB
FUNCTION:	Subtract the value in the AC from the accumulated value, CON, and store the result in CON.
INPUT:	Value to be subtracted from CON in AC.
OUTPUT:	Clear AC.
MAJOR REGISTERS CHANGED:	CON.

Miscellaneous Routines (cont.)

NAME:	RAND
FUNCTION:	AND the value in the AC with the accumulated value, CON, and store the result in CON.
INPUT:	Value to be ANDed with CON in AC.
OUTPUT:	Clear AC.
MAJOR REGISTERS CHANGED:	CON.

NAME:	RIOR
FUNCTION:	OR the value in the AC with the accumulated value, CON, and store the result in CON.
INPUT:	Value to be OR'd with CON in AC.
OUTPUT:	Clear AC.
MAJOR REGISTERS CHANGED:	CON, VAL (for temporary storage).

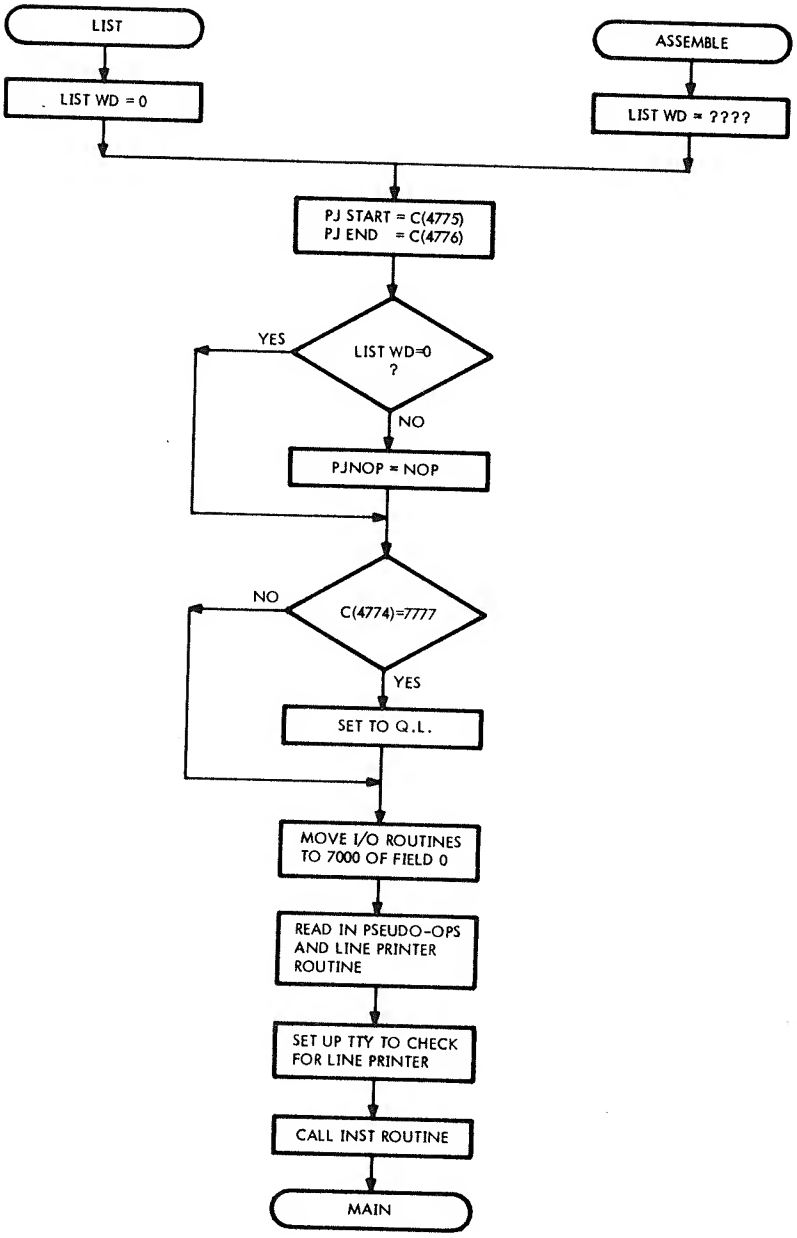
NAME:	UNDERR
FUNCTION:	Channels the error printout number, which is in the AC, to ERROR if the current pass is not 1. It suppresses error printouts during pass 1.

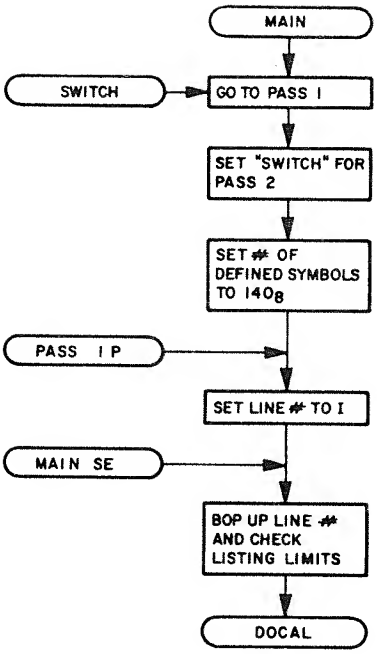
Miscellaneous Routines (cont.)

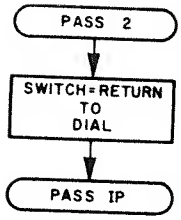
INPUT:	Error printout number in AC.
OUTPUT:	Pass 1 - error printout number in AC. Not pass 1 - clear AC.
MAJOR REGISTERS CHANGED:	None.

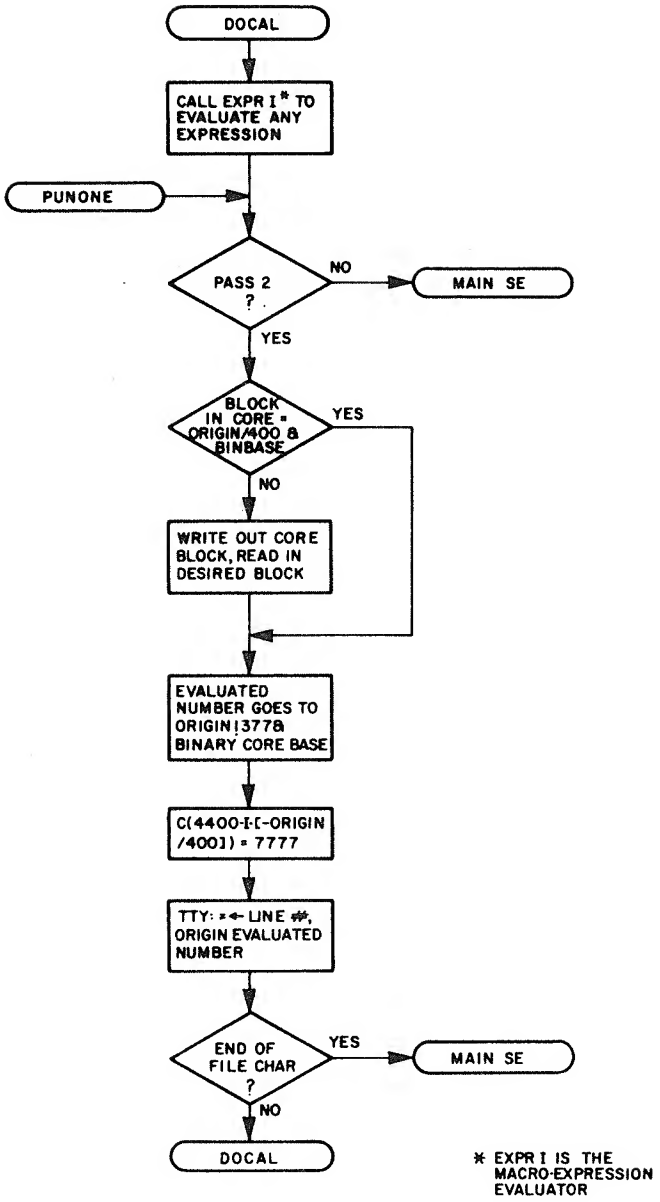
NAME:	PUSH2
FUNCTION:	Enters the contents of the AC into the push down list.
INPUT:	Entry for push down list in AC.
OUTPUT:	Clear AC.
MAJOR REGISTERS CHANGED:	POINT, PACK (for temporary storage).

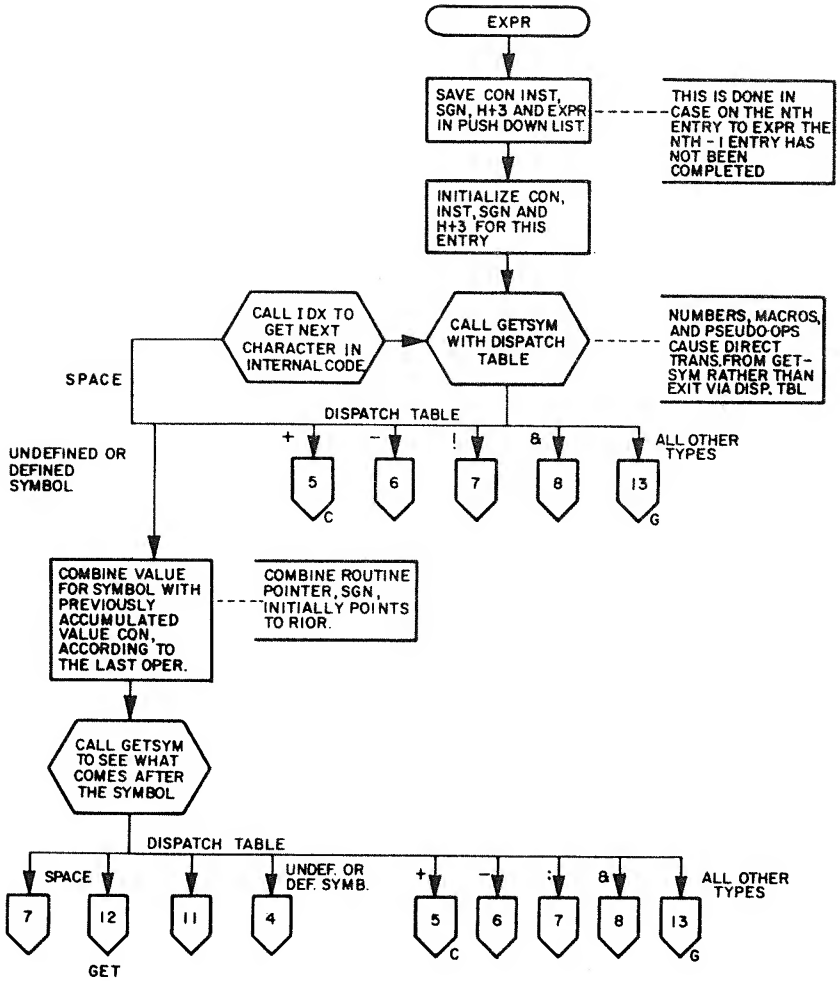
NAME:	POPUP1
FUNCTION:	Retrieves the last entry from push down list.
INPUT:	Clear AC.
OUTPUT:	Entry in AC.
MAJOR REGISTERS CHANGED:	POINT.

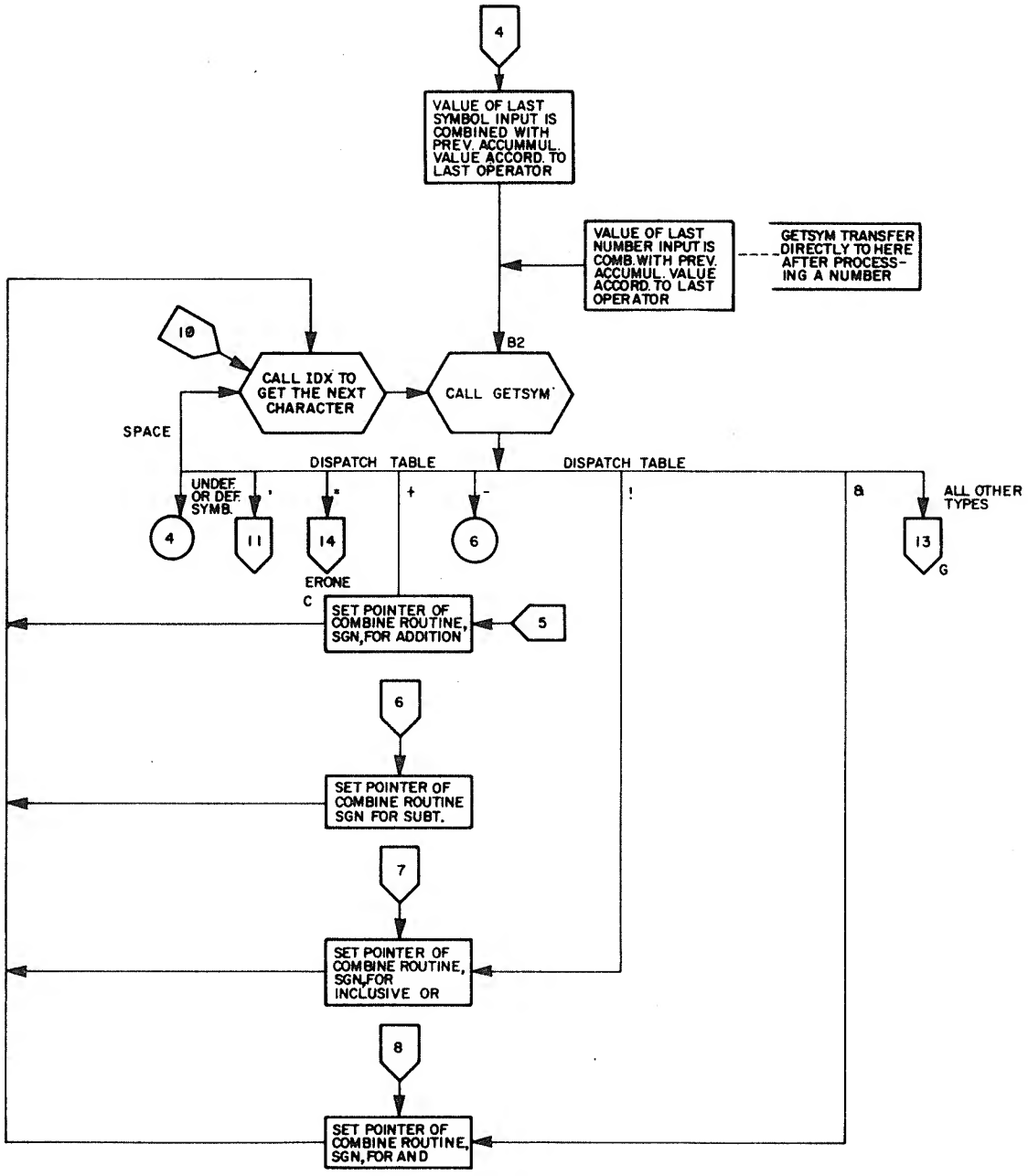

LIST
LIST WD = 0
ASSEMBLE
LIST WD = ????
PJ START = C(4775)
PJ END = C(4776)
YES
LIST WD=0
?
NO
PJNOP = NOP
NO
C(4774)=7777
YES
SET TO Q.L.
MOVE I/O ROUTINES
TO 7000 OF FIELD 0
READ IN PSEUDO-OPS
AND LINE PRINTER
ROUTINE
SET UP TTY TO CHECK
FOR LINE PRINTER
CALL INST ROUTINE
MAIN

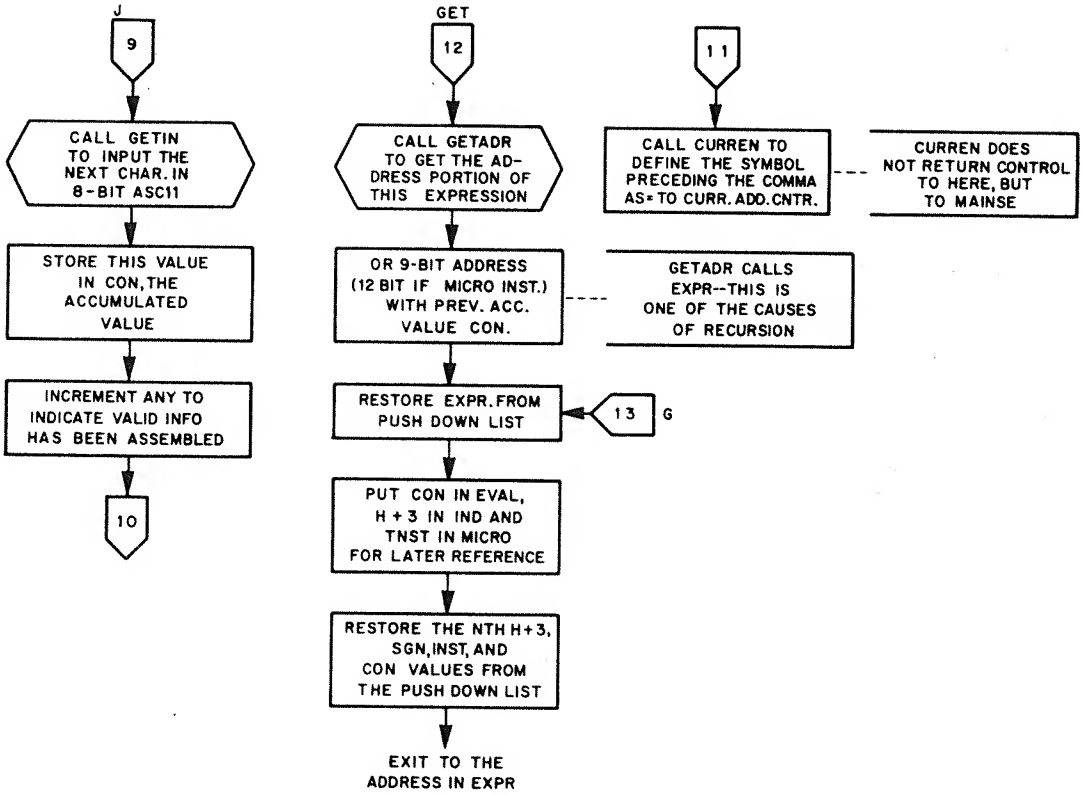

MAIN
SWITCH
GO TO PASS 1
SET "SWITCH" FOR PASS 2
SET # OF DEFINED SYMBOLS TO 140₈
PASS 1 P
SET LINE # TO I
MAIN SE
BOP UP LINE # AND CHECK LISTING LIMITS
DOCAL

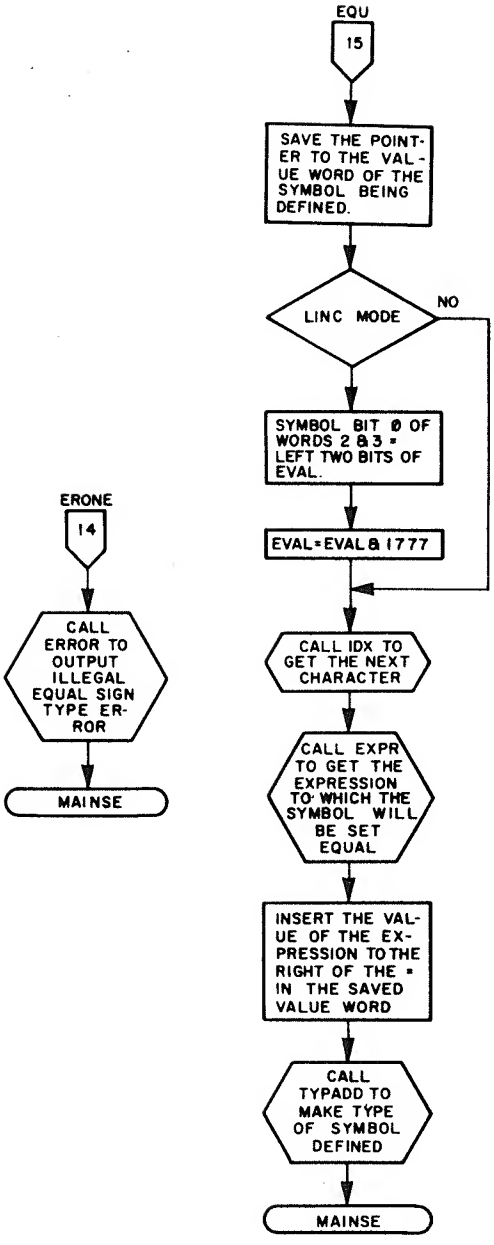

PASS 2
SWITCH=RETURN TO DIAL
PASS IP

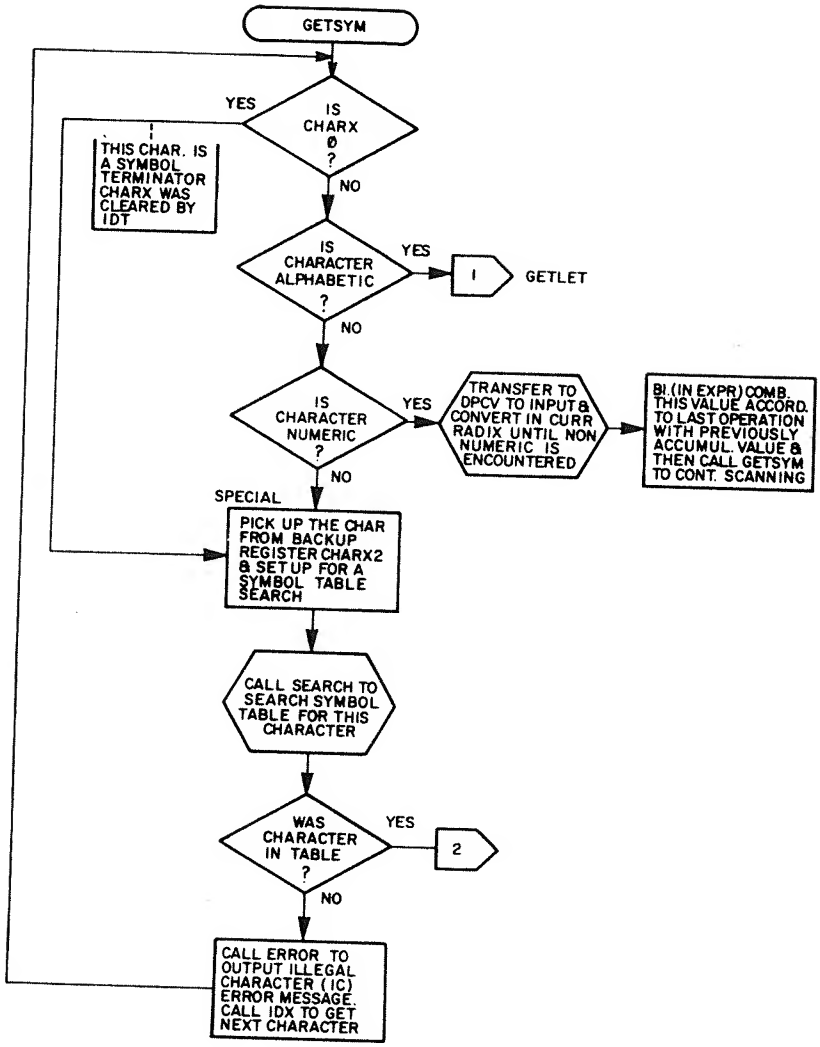

DOCAL
CALL EXPR I * TO EVALUATE ANY EXPRESSION
PUNONE
PASS 2 ?
NO
MAIN SE
YES
BLOCK IN CORE = ORIGIN/400 & BINBASE
YES
NO
WRITE OUT CORE BLOCK, READ IN DESIRED BLOCK
EVALUATED NUMBER GOES TO ORIGIN!3778 BINARY CORE BASE
C(4400-I-[-ORIGIN /4001) = 7777
TTY: =← LINE #, ORIGIN EVALUATED NUMBER
END OF FILE CHAR ?
YES
MAIN SE
NO
DOCAL
* EXPR I IS THE MACRO-EXPRESSION EVALUATOR

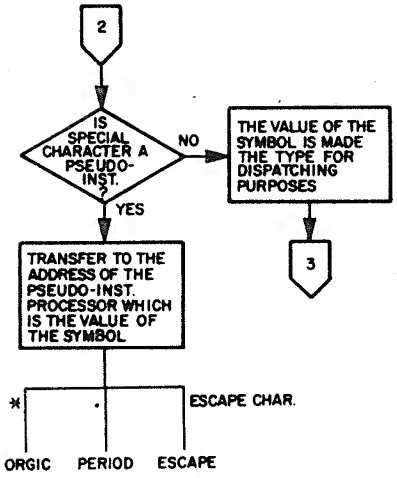

EXPR
SAVE CON INST, SGN, H+3 AND EXPR IN PUSH DOWN LIST.
THIS IS DONE IN CASE ON THE NTH ENTRY TO EXPR THE NTH - 1 ENTRY HAS NOT BEEN COMPLETED
INITIALIZE CON, INST, SGN AND H+3 FOR THIS ENTRY
CALL IDX TO GET NEXT CHARACTER IN INTERNAL CODE
CALL GETSYM WITH DISPATCH TABLE
NUMBERS, MACROS, AND PSEUDO-OPS CAUSE DIRECT TRANS. FROM GET-SYM RATHER THAN EXIT VIA DISP. TBL
SPACE
DISPATCH TABLE
+
-
!
&
ALL OTHER TYPES
UNDEFINED OR DEFINED SYMBOL
5
C
6
7
8
13
G
COMBINE VALUE FOR SYMBOL WITH PREVIOUSLY ACCUMULATED VALUE CON, ACCORDING TO THE LAST OPER.
COMBINE ROUTINE POINTER, SGN, INITIALLY POINTS TO RIOR.
CALL GETSYM TO SEE WHAT COMES AFTER THE SYMBOL
DISPATCH TABLE
SPACE
UNDEF. OR DEF. SYMB.
+
-
:
&
ALL OTHER TYPES
7
12
GET
11
4
5
C
6
7
8
13
G


4
VALUE OF LAST SYMBOL INPUT IS COMBINED WITH PREV. ACCUMMUL. VALUE ACCORD. TO LAST OPERATOR
VALUE OF LAST NUMBER INPUT IS COMB. WITH PREV. ACCUMUL. VALUE ACCORD. TO LAST OPERATOR
GETSYM TRANSFER DIRECTLY TO HERE AFTER PROCESSING A NUMBER
10
B2
CALL IDX TO GET THE NEXT CHARACTER
CALL GETSYM
SPACE
DISPATCH TABLE
DISPATCH TABLE
UNDEF. OR DEF. SYMB.
'
*
+
-
!
&
ALL OTHER TYPES
4
11
14
6
13
G
ERONE
C
SET POINTER OF COMBINE ROUTINE, SGN, FOR ADDITION
5
6
SET POINTER OF COMBINE ROUTINE SGN FOR SUBT.
7
SET POINTER OF COMBINE ROUTINE, SGN, FOR INCLUSIVE OR
8
SET POINTER OF COMBINE ROUTINE, SGN, FOR AND


J
9
CALL GETIN TO INPUT THE NEXT CHAR. IN 8-BIT ASC11
STORE THIS VALUE IN CON, THE ACCUMULATED VALUE
INCREMENT ANY TO INDICATE VALID INFO HAS BEEN ASSEMBLED
10
GET
12
CALL GETADR TO GET THE ADDRESS PORTION OF THIS EXPRESSION
OR 9-BIT ADDRESS (12 BIT IF MICRO INST.) WITH PREV. ACC. VALUE CON.
GETADR CALLS EXPR--THIS IS ONE OF THE CAUSES OF RECURSION
RESTORE EXPR. FROM PUSH DOWN LIST
13
G
PUT CON IN EVAL, H+3 IN IND AND TNST IN MICRO FOR LATER REFERENCE
RESTORE THE NTH H+3, SGN, INST, AND CON VALUES FROM THE PUSH DOWN LIST
EXIT TO THE ADDRESS IN EXPR
11
CALL CURREN TO DEFINE THE SYMBOL PRECEDING THE COMMA AS = TO CURR. ADD. CNTR.
CURREN DOES NOT RETURN CONTROL TO HERE, BUT TO MAINSE


EQU
15
SAVE THE POINTER TO THE VALUE WORD OF THE SYMBOL BEING DEFINED.
LINC MODE
NO
SYMBOL BIT 0 OF WORDS 2 & 3 = LEFT TWO BITS OF EVAL.
EVAL=EVAL&1777
CALL IDX TO GET THE NEXT CHARACTER
CALL EXPR TO GET THE EXPRESSION TO WHICH THE SYMBOL WILL BE SET EQUAL
INSERT THE VALUE OF THE EXPRESSION TO THE RIGHT OF THE = IN THE SAVED VALUE WORD
CALL TYPADD TO MAKE TYPE OF SYMBOL DEFINED
MAINSE
ERONE
14
CALL ERROR TO OUTPUT ILLEGAL EQUAL SIGN TYPE ERROR
MAINSE


GETSYM
IS CHARX Ø ?
YES
THIS CHAR. IS A SYMBOL TERMINATOR CHARX WAS CLEARED BY IDT
NO
IS CHARACTER ALPHABETIC ?
YES
1
GETLET
NO
IS CHARACTER NUMERIC ?
YES
TRANSFER TO DPCV TO INPUT & CONVERT IN CURR RADIX UNTIL NON NUMERIC IS ENCOUNTERED
BI (IN EXPR) COMB. THIS VALUE ACCORD. TO LAST OPERATION WITH PREVIOUSLY ACCUMUL. VALUE & THEN CALL GETSYM TO CONT. SCANNING
NO
SPECIAL
PICK UP THE CHAR FROM BACKUP REGISTER CHARX2 & SET UP FOR A SYMBOL TABLE SEARCH
CALL SEARCH TO SEARCH SYMBOL TABLE FOR THIS CHARACTER
WAS CHARACTER IN TABLE ?
YES
2
NO
CALL ERROR TO OUTPUT ILLEGAL CHARACTER (IC) ERROR MESSAGE. CALL IDX TO GET NEXT CHARACTER

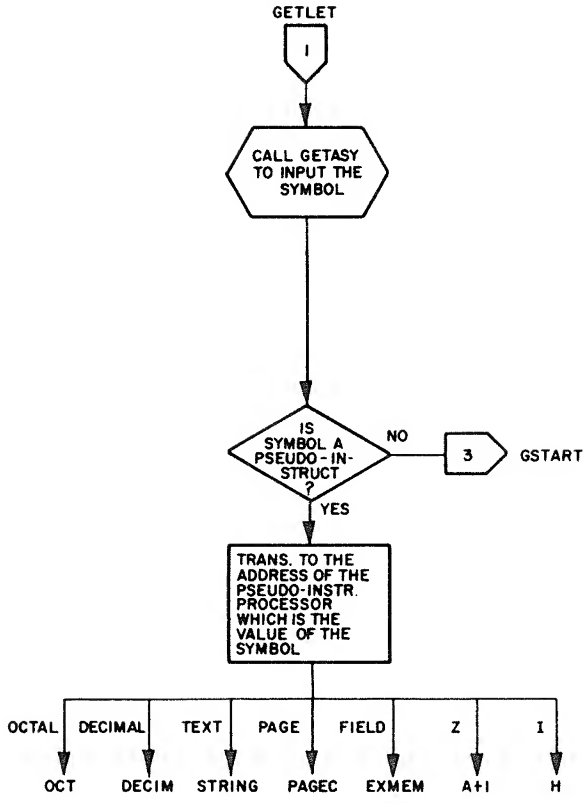


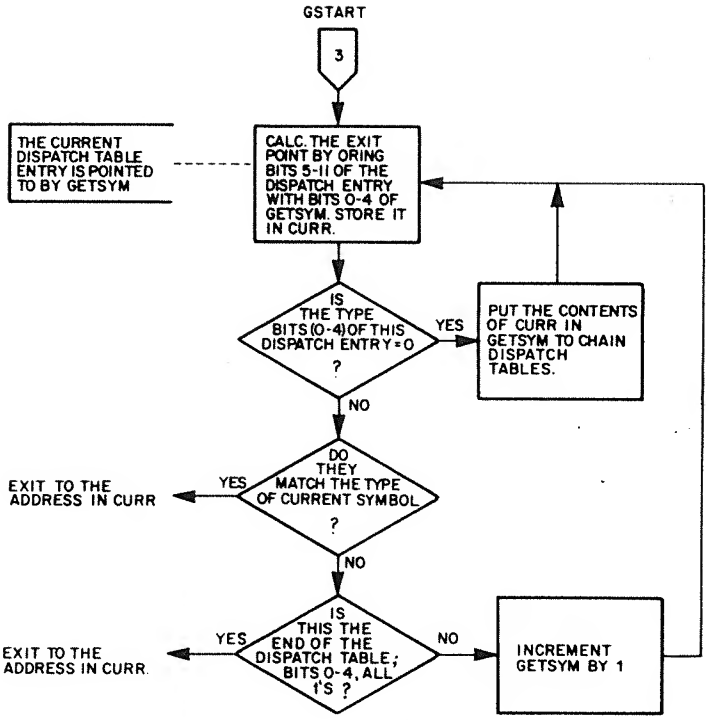
possibilities:

a

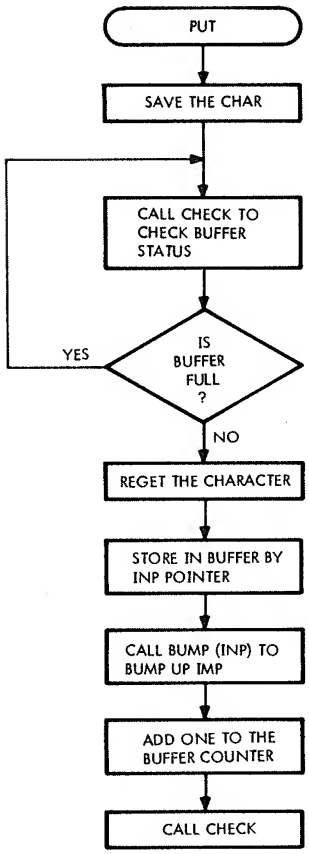
:

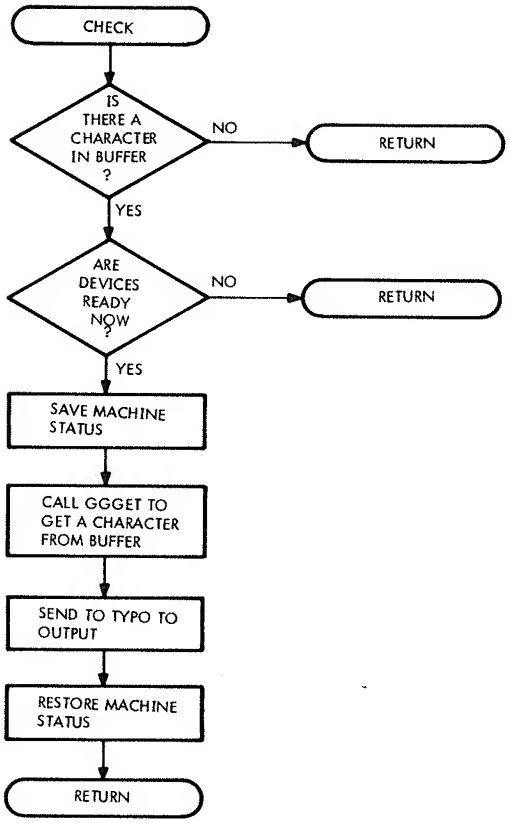
: SPACE

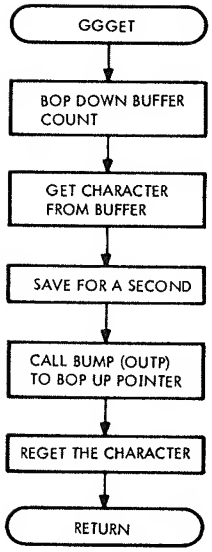


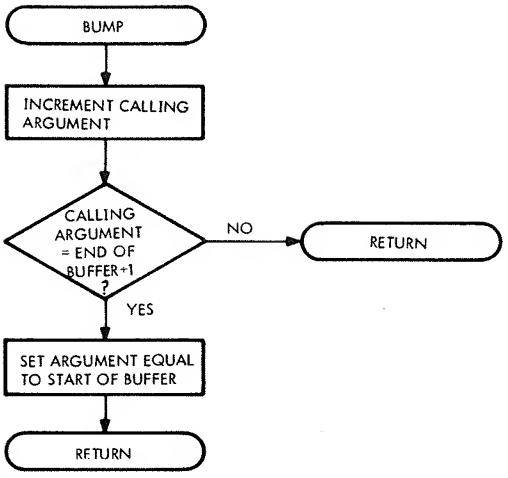

GSTART
3
THE CURRENT DISPATCH TABLE ENTRY IS POINTED TO BY GETSYM
CALC. THE EXIT POINT BY ORING BITS 5-11 OF THE DISPATCH ENTRY WITH BITS 0-4 OF GETSYM. STORE IT IN CURR.
IS THE TYPE BITS (0-4) OF THIS DISPATCH ENTRY = 0 ?
YES
PUT THE CONTENTS OF CURR IN GETSYM TO CHAIN DISPATCH TABLES.
NO
DO THEY MATCH THE TYPE OF CURRENT SYMBOL ?
YES
EXIT TO THE ADDRESS IN CURR
NO
IS THIS THE END OF THE DISPATCH TABLE; BITS 0-4, ALL 1'S ?
YES
EXIT TO THE ADDRESS IN CURR.
NO
INCREMENT GETSYM BY 1

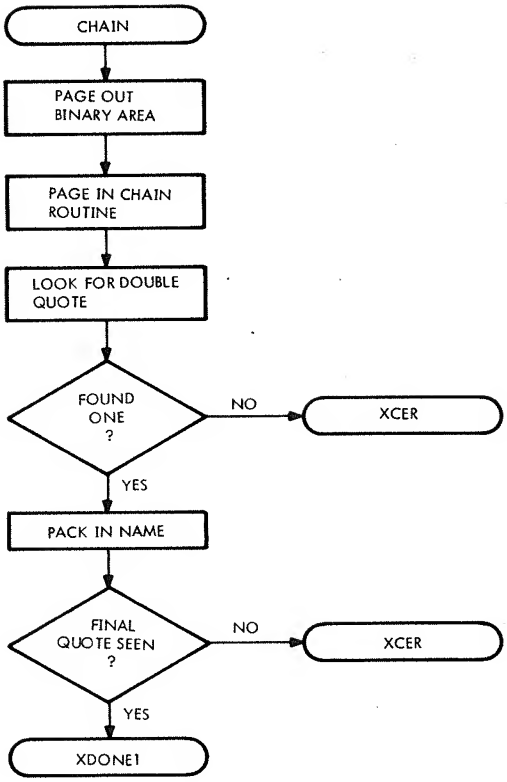
(DECOUT)

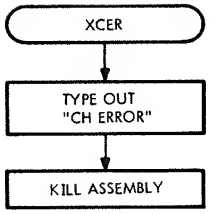

PUT
SAVE THE CHAR
CALL CHECK TO CHECK BUFFER STATUS
IS BUFFER FULL ?
YES
NO
REGET THE CHARACTER
STORE IN BUFFER BY INP POINTER
CALL BUMP (INP) TO BUMP UP IMP
ADD ONE TO THE BUFFER COUNTER
CALL CHECK

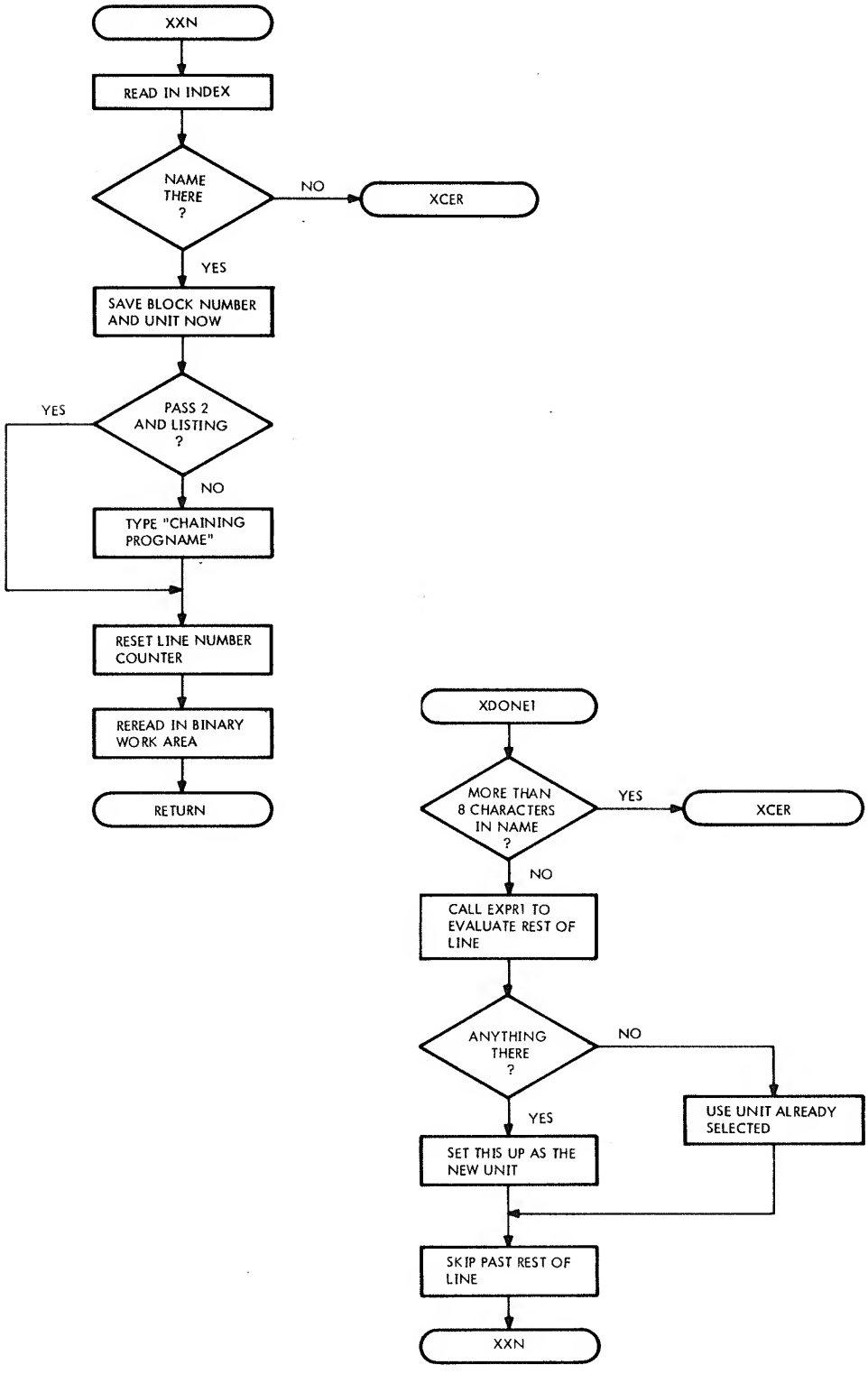

CHECK
IS THERE A CHARACTER IN BUFFER ?
NO
RETURN
YES
ARE DEVICES READY NOW ?
NO
RETURN
YES
SAVE MACHINE STATUS
CALL GGGET TO GET A CHARACTER FROM BUFFER
SEND TO TYPO TO OUTPUT
RESTORE MACHINE STATUS
RETURN


GGGET
BOP DOWN BUFFER COUNT
GET CHARACTER FROM BUFFER
SAVE FOR A SECOND
CALL BUMP (OUTP) TO BOP UP POINTER
REGET THE CHARACTER
RETURN


BUMP
INCREMENT CALLING ARGUMENT
CALLING ARGUMENT = END OF BUFFER+1 ?
NO
RETURN
YES
SET ARGUMENT EQUAL TO START OF BUFFER
RETURN


CHAIN
PAGE OUT BINARY AREA
PAGE IN CHAIN ROUTINE
LOOK FOR DOUBLE QUOTE
FOUND ONE ?
NO
XCER
YES
PACK IN NAME
FINAL QUOTE SEEN ?
NO
XCER
YES
XDONE1


XCER
TYPE OUT "CH ERROR"
KILL ASSEMBLY


XXN
READ IN INDEX
NAME THERE ?
NO
XCER
YES
SAVE BLOCK NUMBER AND UNIT NOW
YES
PASS 2 AND LISTING ?
NO
TYPE "CHAINING PROGNAME"
RESET LINE NUMBER COUNTER
REREAD IN BINARY WORK AREA
RETURN
XDONE1
MORE THAN 8 CHARACTERS IN NAME ?
YES
XCER
NO
CALL EXPR1 TO EVALUATE REST OF LINE
ANYTHING THERE ?
NO
USE UNIT ALREADY SELECTED
YES
SET THIS UP AS THE NEW UNIT
SKIP PAST REST OF LINE
XXN

```
0005                    /
0006                    /                    D I A L   A S S E M B L E R   - - -   V E R S I O N   2
0007                    /
0010                    /COPYRIGHT 1969, DIGITAL EQUIPMENT CORPORATION, MAYNARD MASSACHUSSETS,  01754
0011                    /
0012                    /PDP-12 DISK DIAL ASSEMBLER
0013                    /
0014                    /
0015                    /               THIS ASSEMBLER REQUIRES THE STANDARD DISK DIAL HARDWARE
0016                    /
0017                    /
0020                    /
0021                    /       LATEST ASSEMBLER <5/14/70>, INCLUDES CHAINING.
0022                    /
0023                    /
0024                    /
0025                            EJECT
-
```

internal code (at least that used by MACRO-8)

A-Z	1-32	$	60
0-9	33-44	%	61
:	45	&	62
;	46	'	63
<	47	(	64
=	50	)	ignored
>	51	*	66
?	52	+	67
@	53	,	70
[	54	-	71
!	55	.	72
"	56	/	73
#	57	[	74
		\	75
		]	ignored

car. ret.	46
tab	54

```
0026                    /                       4 K   L O A D E R   M A P
0027                    /
0030                    /
0031                    /
0032                    /0000-0177              PAGE 0: COMMON LITERALS AND POINTERS,
0033                    /0200-0377              BANK CHECK ROUTINE; SYMBOL SEARCH ROUTINE
0034                    /0400-0577              SYMBOL TABLE GETTER ROUTINE
0035                    /0600-0777              ROUTINE TO GET A SYMBOL FROM SYMBOL TABLE( OR ADD ON),
0036                    /                       SDEC04 IS ACTIVE, SDEC08 IS NOT USED,
0037                    /                       SDEC04 USES 6777-6000 FOR USER SYMBOLS,
0040                    /                       5400-5777 IS USED FOR USER SYMBOLS AND FOR A SWAPPING BUFFER/
0041                    /                       IF MORE THEN 300 SYMBOLS .  EXTRA SYMBOLS GO OUT ON UNIT 1,
0042                    /1000-1177              GENERAL RECURSIVE EXPRESION EVALUATOR,
0043                    /1200-1377              RECURSIVE ADDRESS EVALUATOR,
0044                    /1400-1577              /CENTRAL PROCESSING LOOP, MAIN START OF ASSEMBLER AFTER INITILIZATION,
0045                    /1600-1777              /TEXT PROCESSOR,CURRENT LINE TESTER, PLUS MINOR SUPPORT ROUTINES,
0046                    /2000-2177              AN INPUT CHARACTER SCANNER ROUTINE, THE PRINTER BUF ROUTINE, AND TAB ROUTINE,
0047                    /2200-2377              NUMBER CONVERSIONS, TYPE CHECKS,
0050                    /2400-2577              SYMBOL SORT FOR OUTPUT, TTY ROUTINE,
0051                    /2600-2777              SYMBOL OUTPUT AND VALUE ROUTINE, OCTAL PRINT ROUTINE, FIELD CHANGE ROUTINE, AND WORK
                         AREA,
0052                    /3000-3177              OUTPUT LIST ROUTINE, 8K PSEUDO OP INITIALIZATION(DESTROYED AND NEVER UESED), WORK AR
                        EA,
0053                    /3200-3377              ERROR MESSAGE PROCESSOR, TYPE EVALUATOR, SYSTEM SYMBOL TABLE SWAPPER,
0054                    /                       FAIRLY LOW LEVEL CHARACTER GETTER, AND ROUTINE TO SKIP IF NOT PASS2 OR NOT IN LIST M
                        ODE,
0055                    /3400-3577              INPUT CHARACTER CONVERTOR TO INTERNAL FORM, PLUS PAGE CHECKERS, OTHER
0056                    /                       LITTLE ROUTINES,
0057                    /3600-3777              INTERNAL TO EXTERNAL CHARACTER CONVERTOR, SYMBOL TABLE TYPE GETTERS AND SETTERS,
0060                    /                       LOW LEVEL CHARACTER GETTER, COMMENT PROCESSOR, LIST AND NOLIST PROCESSORS,
0061                    /
0062                    /
0063                    /T HE FOLLOWING LOCATIONS ARE IN     A S S E M T W O !
0064                    /
0065                    /
0066                    /4000-4177              GENERAL TAPE   IO CALL ROUTINES, INITILIAZTION FOR TAPE ROUTINES, PLUS EXTRA LITTLE
                        STUFF,
0067                    /4200-4377              MORE TAPE I/O ROUTINES, PSEUDO OP PROCESSOR(FOR  PAGED IN PSEUDO OPS), AND LOADER CO
                        RE MAP,
0070                    /4400-4777              INPUT BUFFER+SWAPPED IN AND OUT WORK AREA FOR SAVSYM AND LODSYM,
0071                    /5000-5377              OUTPUT BUFFER, PLUS INITIALIZATION FOR ENTIRE ASSEMBLER AFTER IT S  FIRST LOADED IN
0072                    /                       AND THIS ALSO CONTAINS THE SWAPPED IN PSEUDO OP PROCESSOR.  NOTE: WHEN THINGS ARE SW
                        APPED IN,
0073                    /                       THE PREVIOUS CONTENTS OF THE LOCATIONS ARE FIRST SWAPPED OUT TO PRESERVE THEM,
0074                    /5400-5777              USER SYMBOLS IF < 300 SYMBOLS, ELSE IT S BUFFER AREA FOR SWAPPING SYMBOLS FROM TAP
                        1,
0075                    /6000-6777              USER SYMBOLS(FIRST 200 OF THEM ANYWAY),
0076                    /7000-7377              MODE SYMBOLS(EITHER PMODE OR LMODE TABLE, DEPENDING ON MODE,).
0077                    /7400-7577              PSEUDO OP TABLE PLUS SPECIAL CHARACTER DEFINITION TABLE,
0100                    /7600-7777              SUPPOSEDLY UNUSED, BUT WHEN PSEUDO OP TABLE IS LOADED, IT S  LENGTH
0101                    /                       OF 400 WORDS OVERLAYS IT,
0102                    /
0103                    /
0104                    /
0105                    /****-****      E N D   O F   4 K   M A P
0106                    /
0107                    /
0110                    /
0111                            EJECT
-
```

```
0112            /                       8 K   L O A D E R    M A P
0113            /
0114            /
0115            /THIS MAP SHOWS ONLY CHANGES TO 4K MAP.
0116            /
0117            /
0120            /
0121            /
0122            /0600-0777              SDEC08 IS NOW ACTIVE AND SDEC04 IS PASSIVE. SDEC08 USES THE UPPER 4K OF CORE
0123            /                       FOR THE SYMBOL TABLE. THUS IT STORES NO USER SYMBOLS ON UNIT1(EXCEPT IF A SAVSYM IS
                GIVEN).
0124            /5000-5377              PSEUDO OP TABLE IS NO LINGER PAGED IN HERE. SEE 7000-7377.
0125            /5400-5777              OVERLAPPED READ ROUTINES FOR READING WHILE CALCULATING.
0126            /6000-6177              LINE PRINTER CHECKER AND BASIC LINE PRINTER ROUTINE.
0127            /6200-6377              OVERLAPPED TAPE OUTPUT ROUTINES PLUS COMMON READ-WRITE ROUTINES.
0130            /6400-6777              INPUT BUFFER NO .2
0131            /7000-7377              RESIDENT PSEUDO OP PROCESSOR. NOTE THAT IT CAN RESIDE IN TWO SEPERATE PAGES(FOR 4 OR
                 8K).
0132            /7400-7777              INPUT BUFFER NO.1 FOR TAPE.
0133            /
0134            /
0135            /               F I E L D   1   R E F E R E N C E S
0136            /
0137            /
0140            /10000-16777            USER DEFINED SYMBOLS.
0141            /17000-17377            SYSTEM MODE SYMBOLS(LMODE OR PMODE).
0142            /17400-17577            PSEUDO OPS AND SPECIAL CHARACTER TABLE.
0143            /
0144            /
0145            /
0146            /
0147            /                       E N D   O F   8 K   M A P
0150            /
0151            /
0152                    EJECT
-
```

```
0153                    /               T H E   P S E U D O   O P   P R O C E S S O R
0154                    /
0155                    /
0156                    /
0157                    /
0160                    /               THE PSEUDO OP PROCESSOR IS A 400 LOCATION ROUTINE WHICH IS PAGED IN ON THE 4K MODE AND RESID
                    ENT IN THE 8K MODE.
0161                    /AFTER THE DESIRED PSEUDO OP IS FOUND IN THE TABLE BY "EXPR" IT THEN JMPS TO AN ISZ CHAIN
0162                    /THE ISZ CHAIN IS A BUNCH OF SEQUENTIAL ISZ S  OF LOCATION "OP1", AFTER FALLING THROUGH THE ISZ S OP1 CONTAI
                    NS
0163                    / THE DESIRED PSEUDO OP NUMBER, THE ROUTINE THEN PAGES IN THE PSEUDO OP PROCESSOR(IF 4K, ELSE IT S RESIDENT)
                    , THEN JMS
0164                    / TO IT WITH THE DESIRED OPERATION NUMBER IN THE AC, WHEN FINISHED THE PSEUDO OP PROCESSOR RETURNS AND IT S
                    SWAPPED BAC
0165                    /K OUT, IN THE 8K VERSION IT S  RESIDENT AND IS NOT SWAPPED IN OR OUT.
0166                    /
0167                    /
0170                    /
0171                    /
0172                    /
0173                            EJECT
-
```

```
0174                /              S Y M B O L   T A B L E   O R G A N I Z A T I O N
0175                /
0176                /
0177                /
0200                /A SYMBOL TABLE ENTRY IS COMPOSED OF 4 WORDS, THE FIRST THREE ARE THE NAME AND THE LAST IS THE VALUE
0201                /IF THE SYMBOL IS A PSEUDO OP THEN THE LAST WORD CONTAINS A POINTER TO THE ROUTINE WHICH WILL PROCESS
0202                /THE PSEUDO OP AND THE REST OF THE STAATEMENT.
0203                /
0204                /
0205                /THE NAME IS COMPOSED OF SIX CHARACTERS,
0206                /THESE CHARACTERS ARE USUALLY THE 26 LETTERS PLUS 10 NUMBERS PLUS A NULL CHARACTER IF LESS THEN 6 LETTERS LO
                    NG,
0207                /THIS GIVES YOU 45 OCTAL POSSIBLE CHARACTERS FOR THE LEFT OR THE RIGHT HALF OF A WORD.
0210                /IF YOU USE SIXBIT NOTATION, YOU LL WASTE 23 POSSIBLE POSITIONS ON THE CHARACTER. THEREFORE, SIXBIT IS NOT U
                    SED.
0211                /NOW, SINCE THE FIRST CHARACTER OF A NAME MUST BE A LETTER, THIS LEAVES ONLY 32 OCTAL
0212                /CONBINATIONS FOR THE FIRST CHARACTER. THUS IF WE MULTIPLY THE LEFT
0213                /CHARACTERS OF A WORD BY 45, WE WILL HAVE 2 FREE BITS IN THE FIRST WORD OF A NAME./
0214                /(32*45+45<2000 OCTAL), THESE TWO LEFT BITS ARE USED AS FOLLOWS:
0215                /
0216                /
0217                /
0220                /                       00:     SPECIAL CHARACTER
0221                /                       01:     UNDEFINED
0222                /                       10:     DEFINED
0223                /                       11:     PSEUDO OPERATION
0224                /
0225                /
0226                /
0227                        EJECT
```

```
0230                    /
0231                    /
0232                    /
0233                    /
0234                    /
0235                            VERSION=17              /THIS IS USED IN CHECKING TAPE 1.
0236                    /
0237                    /
0240                    /EVERY TIME YOU ASSEMBLE AND CHANGE THE MAJOR SYMBOL LOCATIONS, UP THIS BY 1.
0241                    /
0242                    /
0243                    /
0244                    UNITAS=4777             /PLACE TO GET UNIT FROM
0245                    E7=0
0246                    D6=300
0247                    D7=370
0250                    D8=410
0251                    D9=446
0252                    PTHREE=7325             /CLA CLL CML IAC RAL
0253                                                    /GENERATES A +3 IN AC WHEN EXECUTED
0254                    MTWO=7344               /CLA CLL CMA RAL
0255                                            /GENERATES A -2 IN AC WHEN EXECUTED.
0256                    MTHREE=7346             /CLA CLL CMA RTL
0257                                                    /GENERATES A -3 IN AC WHEN EXECUTED.
0260                    /
0261                    /
0262                    /
0263                    /
0264                    /
0265                    /
0266                    TERMC=00                        /SET TERMC TO 44 IF DOLLAR SIGN IS THE END OF FILE CHAR.
0267                    /
0270                    /
0271                    /
0272                    /
0273                            EJECT
-
```

```
0274                    /PDP-12 ASSEMBLER PAGE 0
0275                    PMODE
0276                    *1
0277        0001  0710  DECOUT, PUT
0300        0002  0000  ERTOT,  0
0301        0003  0000  LISTWD, 0
0302        0004  2353  CNTLPI, CNTRLP
0303        0005  0000  MICROB, 0
0304        0006  7777  EQRETI, 7777
0305        0007  0000  TEMP,   0
0306                    /VARIABLES
0307                    *10
0310        0010  2400  BINPTR, 2000+D7+10
0311        0011  0000  BINBLK, 0
0312        0012  0000  CURLIN, 0
0313        0013  7740  M40,    -40
0314        0014  0000  TYPEA,  0
0315        0015  0011  P11,    11
0316                    /16 AND 17 ARE USED
0317                    /FOR AUTO-INDEXING.
0320                    *20
0321        0020  0000  ANY,    0       /WAS THIS AN INSTRUCTION
0322        0021  0000  TYPE,   0       /HOLDS TYPE OF CURRENT SYMBOL
0323        0022  0000  VADR,   0       /VALUE OF CURRENT SYMBOL
0324        0023  0000  SADR,   0       /POINTER OF FIRST WORD OF CURRENT SYMBOL
0325        0024  0000  VAL,    0       /VALUE OF CURRENT SYMBOL
0326        0025  0000  VALK,   0
0327        0026  0000  SCURR,  0       /CURRENT SYMBOL NUMBER
0330        0027  0141  SEND,   141     /POINTER TO FIRST FREE REGISTER AFTER SYMBOL TABLE
0331        0030  0000  AADR,   0       /ACTUAL CURRENT ADDRESS
0332        0031  0000  APAGE,  0       /ORIGIN OF CURRENT PAGE - ACTUAL
0333        0032  0141  PERMA,  141     /FIRST REGISTER AFTER PERMANENT SYMBOL TABLE
0334        0033  0000  EVAL,   0       /HOLDS ADDRESS PORTION DURING CALCULATION
0335        0034  0000  SGN,    0
0336        0035  0000  PASS,   0       /7777 IF PASS 2
0337        0036  0000  FLDWD,  0       /7777 IF EXTENDED MEMORY
0340        0037  0000  MODE,   0       /7777 IF PDP-8; 0 IF LINC
0341        0040  0000  TEM1A,  0
0342        0041  0000          0
0343        0042  0000          0
0344        0043  0000  CURR,   0
0345        0044  0000  CHARX,  0
0346        0045  0000  CHARX2, 0
0347        0046  0000  ABANK,  0
0350        0047  0000  POINT,  0       /PUSH DOWN LIST
0351        0050  0000  IN,     0       /TELLS WHETHER SYMBOL WAS ACCEPTED
0352        0051  0000  ITEM,   0
0353        0052  0000  HIC,    0
0354        0053  0000  LWC,    0
0355        0054  0000  MICROL, 0
0356        0055  0000  INST,   0       /-  IF SYMBOLIC A MICRO INST.
0357        0056  0000  MICRO,  0
0360        0057  0000  CHARAC, 0
0361        0060  4013  INIT1,  INIT
0362                    /POINTERS
0363        0061  2054  EMPTY1, EMPTY
0364        0062  2661  SOPS,   OPS
0365        0063  3663  RESET1, RESETL
0366        0064  3400  BIT6A,  BIT6
0367        0065  3355  PASSEK, PASSER
0370        0066  2520  CURSKA, CURSKP
0371        0067  3317  GETCHR, SYSIN
0372        0070  3524  CHEKER, PAGSET
```

```
0373    0071  1454  SYMLST, LSTSYM
0374    0072  1400  MAINEX, MAIN
0375    0073  1547  INAS,   CJMP1
0376    0074  0524  MOVE1,  MOVE8
0377    0075  0764  SKIP,   SKIP2
0400    0076  3201  ERR1,   ERROR
0401    0077  1000  EXPR1,  EXPR
0402    0100  2510  TYCAR1, TYCAR
0403    0101  1411  MAIN1,  MAINSE
0404    0102  1551  PAGE1,  RESET
0405    0103  1046  B21,    B2
0406    0104  2037  IDX1,   IDX
0407    0105  2341  PUSH1,  PUSH2
0410    0106  4307  POPU1,  POPUP1
0411    0107  0400  GETSY1, GETSYM
0412    0110  3242  GETAS1, GETASY
0413    0111  0622  TYPAD1, TYPADD
0414    0112  0600  SDEC01, SDEC08
0415    0113  4201  SRITIC, SWRC
0416    0114  1503  SYB,    SYMBU
0417    0115  4275  SRD1,   SREAD1
0420    0116  4051  RET1,   RETURN
0421    0117  4101  MON,    MONIT
0422    0120  3001  PUNON1, PUNONE
0423    0121  7000  M1000,  -1000
0424    0122  7735  M43,    -43
0425    0123  7745  M33,    -33
0426    0124  0400  P400,   400
0427    0125  7733  M45,    -45
0430    0126  7711  M67,    -67
0431    0127  0076  P76,    76
0432    0130  1706  LINENO, JBTEST
0433    0131  3777  P3777,  3777
0434    0132  2132  SCLEAR, CLEARR
0435    0133  7731  M47,    -47
0436    0134  0240  P240,   240
0437    0135  7774  M4,     -4
0440    0136  6000  P6000,  6000
0441    0137  3662  PM60A,  M60A
0442    0140  0000  LOWTMP, 0          /MAY BE USED ONLY FOR IMM, TEMP, NEVER USED IF YOU LEAVE ROUTINE.
0443    0141  0740  PCHECK, CHECK
0444    0142  5000  P5000,  5000
0445    0143  0300  P300,   300
0446    0144  1777  P1777,  1777
0447    0145  0177  P177,   177
0450    0146  7600  P7600,  7600
0451    0147  0200  P200,   200
0452    0150  4000  P4000,  4000
0453    0151  7563  M215,   -215
0454    0152  2000  P2000,  2000
0455    0153  0212  P212,   212
0456    0154  0215  P215,   215
0457    0155  7400  P7400,  7400
0460    0156  0777  P777,   777
0461    0157  0007  P7,     7
0462    0160  0077  P77,    77
0463    0161  0000  TEM1,   0        /FIRST
0464    0162  0000  TEM2,   0        /SECOND
0465    0163  0000  TEM3,   0        /THIRD WORD OF CURRENT SYMBOL
0466    0164  0000  CON,    0        /HOLDS ACCUMULATED VALUE OF WORD
0467    0165  0000  ADR,    0        /HOLD FULL 12 BIT ADDRESS
0470    0166  0000  IND,    0        /400 IF INDIRECT OTHERWISE 0
0471    0167  0000  ERRCNT, 0
-
```

```
0472    0170  0000  SWITCH, 0
0473    0171  0000  SNUM,   0
0474    0172  0000  EMPTRA, 0
0475    0173  0000  SPCUNT, 0              /LINE CHARACTER SPACE COUNTER,
0476    0174  3102  SY,     SYMBUF
0477    0175  0000  TBCONT, 0
0500    0176  2370  BINTAB, 2000+D7
0501    0177  4321  SETINU, UBITS                /POINTS TO THE ROUTINE TO TURN ON THE HEADER BLOCK BITS
0502                /
0503                /
0504                /
0505                /
0506                /
0507                      EJECT
-
```

```
0510                    /PDP-12 ASSEMBLER PAGE 1
0511                    *200
0512      0200  4477  BANKCH, JMS I EXPR1
0513      0201  1020          TAD ANY
0514      0202  7640          SZA CLA
0515      0203  5220          JMP BANKEM
0516      0204  7040          CMA
0517      0205  1030          TAD AADR
0520      0206  1152          TAD P2000
0521      0207  0136          AND P6000
0522      0210  3030          DCA AADR
0523      0211  4463  BANKHR, JMS I RESET1
0524      0212  4502          JMS I PAGE1
0525      0213  1030          TAD AADR
0526      0214  3033          DCA EVAL
0527      0215  4465          JMS I PASSEK
0530      0216  4466          JMS I CURSKA
0531      0217  5501          JMP I MAIN1
0532      0220  7307  BANKEM, CLA CLL IAC RTL       /+4
0533      0221  0033          AND     EVAL
0534      0222  3036          DCA FLOWD
0535      0223  1033          TAD     EVAL
0536      0224  7012          RTR
0537      0225  7010          RAR
0540      0226  5207          JMP BANKHR-2
0541                    /
0542      0227  0000  CURREN, 0
0543      0230  4663          JMS I RESTO1
0544      0231  2260          ISZ     COMMAN      /CHECK FOR TOO MANY COMMAS,
0545      0232  3171          DCA     SNUM        /YEP, A BADDY
0546      0233  4661          JMS I   PSTCHK
0547      0234  4662          JMS I MOVEAA
0550      0235  1037          TAD     MODE
0551      0236  7004          RAL                 /PLACE SIGN BIT INTO THE LINK
0552      0237  7200          CLA
0553      0240  1030          TAD     AADR
0554      0241  7420          SNL
0555      0242  0144          AND     P1777
0556      0243  6211          6211
0557      0244  3422          DCA I VAOR
0560      0245  6201          6201
0561      0246  7430          SZL
0562      0247  5253          JMP     PDP8ER
0563      0250  1030          TAD     AADR
0564      0251  0136          AND     P6000
0565      0252  7112          CLL RTR
0566      0253  1150  PDP8ER, TAD     P4000
0567      0254  3256          DCA     .+2
0570      0255  4511          JMS I TYPAD1
0571      0256  0000          0
0572      0257  5664          JMP I MAIN1A
0573                    /
0574      0260  7777  COMMAN, -1                   /RESET IRREGULARLY,
0575      0261  3757  PSTCHK, STOCHK
0576      0262  2275  MOVEAA, ERR2
0577      0263  1751  RESTO1, RESTOR
0600      0264  1416  MAIN1A, MAINSF
0601                    /
0602      0265  1736  SAVE1,  SAVE
0603                    /
0604      0266  0000  SEARCH, 0
0605      0267  4665          JMS I SAVE1
0606      0270  3026          DCA SCURR
-
```

/ searches the symbol table

/ set symbol # = 0

Search starts at top of symbol table (#2600) and works down

```
0271  6211                  6211          /current symbol number
0272  1026       SEARC1,    TAD SCURR
0273  4512                  JMS I SDECO1  /pointer to 1st word of current symbol
0274  7240                  CLA CMA
0275  1023                  TAD SADR
0276  3016                  DCA 16
0277  1416                  TAD I 16
0300  0144                  AND P1777
0301  7041                  CIA
0302  1161                  TAD TEM1
0303  7640                  SZA CLA
0304  5370                  JMP IND1
0305  1416                  TAD I 16
0306  0131                  AND P3777
0307  7041                  CIA
0310  1162                  TAD TEM2
0311  7640                  SZA CLA
0312  5370                  JMP IND1
0313  1416                  TAD I 16
0314  0131                  AND P3777
0315  7041                  CIA
0316  1163                  TAD TEM3
0317  7640                  SZA CLA
0320  5370                  JMP IND1                   /NO MATCH,
0321  1367       TAD TOP
0322  7041                  CIA
0323  1023                  TAD SADR
0324  7700                  SMA CLA
0325  5334                  JMP PSUD
0326  1032                  TAD PERMA
0327  7041                  CIA
0330  1026                  TAD SCURR
0331  7510                  SPA
0332  3055                  DCA INST           /- IF INSTRUCTION
0333  7300                  CLA CLL
0334  1416       PSUD,      TAD I 16
0335  3025                  DCA VALK
0336  1016                  TAD 16
0337  3022                  DCA VADR
0340  7346                  MTHREE
0341  1016                  TAD      16
0342  3016                  DCA 16
0343  1416                  TAD I 16
0344  0150                  AND P4000
0345  3007                  DCA TEMP
0346  1416                  TAD I 16
0347  0150                  AND P4000
0350  7110                  RAR CLL
0351  1007                  TAD TEMP
0352  1025                  TAD VALK
0353  3024                  DCA VAL
0354  1037                  TAD MODE
0355  7700                  SMA CLA
0356  4764                  JMS I IND1B
0357  4765                  JMS I GETYE   /get type of current symbol
0360  2266                  ISZ SEARCH
0361  4766                  JMS I IND1C
0362  6201       TAABA,     6201          /Return here if nothing assembled for this line
0363  5666                  JMP I SEARCH  /Return here if something found
0364  1560       IND1B,     LNINST        /LINC instruction does
0365  3623       GETYE,     GETYPE
0366  2367       IND1C,     ANYY
0367  7374       TOP,       7374
-
```

If ST3 loc is below 7400 then it's a perm. symb. If above, a pseudo-op

PERMA = 141 = 141st symbol slot, ⇒ first symbol after permanent symbols.

00 = special char
01 = undefined
10 = defined
11 = pseudo-op

```
0706    0370  2026  IND1,   ISZ SCURR
0707    0371  1026          TAD SCURR
0710    0372  7041          CIA
0711    0373  1027          TAD SEND
0712    0374  7640          SZA CLA
0713    0375  5272          JMP SEARC1
0714    0376  2020          ISZ ANY
0715    0377  5362          JMP TAABA
0716                        EJECT
```

Increment symbol table pointer

gets in the next item, whatever it is - a symbol, #, or character then dispatch according to list following the call to this routine

```
                    /PDP-12 ASSEMBLER PAGE 2
                    *400
0400   0000  GETSYM, 0
0401   1044          TAD CHARX
0402   7450          SNA
0403   5216          JMP SPECAL
0404   1123          TAD M33
0405   7510          SPA
0406   5241          JMP GETLET
0407   1214          TAD M12A
0410   7700          SMA CLA
0411   5216          JMP SPECAL
0412   4615          JMS I DPCVOP          /DIGIT
0413   5634          JMP I B11
0414   7766  M12A,   -12
0415   2200  DPCVOP, DPCV
0416   1045  SPECAL, TAD CHARX2
0417   3163          DCA TEM3
0420   3162          DCA TEM2
0421   3161          DCA TEM1
0422   4633          JMS I SCH1
0423   5235          JMP B11+1
0424   1021          TAD TYPE
0425   1152          TAD P2000
0426   7650          SNA CLA
0427   5424          JMP I VAL
0430   1024          TAD VAL
0431   3021          DCA TYPE
0432   5246          JMP GSTART
0433   0266  SCH1,   SEARCH
0434   1041  B11,    B1
0435   7325          PTHREE
0436   4476          JMS I ERR1
0437   4504          JMS I IDX1
0440   5201          JMP GETSYM+1
0441   4510  GETLET, JMS I GETAS1      /GET SYMBOL
0442   1021          TAD TYPE
0443   1152          TAD P2000
0444   7650          SNA CLA
0445   5424          JMP I VAL         /PSEUDO OP.
0446   1600  GSTART, TAD I GETSYM
0447   0145          AND P177
0450   3043          DCA CURR
0451   1200          TAD GETSYM
0452   0146          AND P7600
0453   1043          TAD CURR
0454   3043          DCA CURR
0455   1600          TAD I GETSYM
0456   0146          AND P7600
0457   7440          SZA
0460   5264          JMP GTYPOT
0461   1043          TAD CURR
0462   3200          DCA GETSYM
0463   5246          JMP GSTART
0464   7041  GTYPOT, CIA
0465   1021          TAD TYPE
0466   7650          SNA CLA
0467   5443          JMP I CURR
0470   1600          TAD I GETSYM
0471   0146          AND P7600
0472   1147          TAD P200
0473   7650          SNA CLA
0474   5443          JMP I CURR
```

Handwritten notes beside the listing:

/ get 1st char. (beside 0722)

/ 1st char = letter ⇒ symbol (beside 0726)

/handle special characters here (beside 0737)

/call search routine (beside 0743)

/ if TYPE = 6000 undefined (beside 0750)

get ~~char code~~ branch addr. (beside 0770)

/ fix up ptr. to routine (beside 0775)

/ get char. code (beside 0776–0777)

i.e., new 1st (above the next note)

single exit so we go to new place if char code = 0 (beside 1002)

/ match what we have? (beside 1005)

/ yes - go to correct service routine (beside 1007–1010)

/ get char code again (beside 1011)

/ also go if this works out (beside 1014–1015)

Handwritten sketch below the listing:

~~branch~~ addr. | ~~char code~~ branch addr. offset

char. code

```
1016      0475  2507          ISZ I GETSY1
1017      0476  5246          JMP GSTART
1020      0477  4477  PAGEC,  JMS I EXPR1
1021      0500  1020          TAD ANY
1022      0501  7640          SZA CLA
1023      0502  5316          JMP PAGEM
1024      0503  7040          CMA
1025      0504  1030          TAD AADR
1026      0505  1147          TAD P200
1027      0506  0146          AND P7600
1030      0507  3030          DCA AADR
1031      0510  4502  PAGHER, JMS I PAGE1
1032      0511  1030          TAD AADR
1033      0512  3033          DCA EVAL
1034      0513  4465          JMS I PASSEK
1035      0514  4466          JMS I CURSKA
1036      0515  5501          JMP I MAIN1
1037      0516  1033  PAGEM,  TAD EVAL         /MULTIPLY BY 200
1040      0517  7012          RTR
1041      0520  7012          RTR
1042      0521  7012          RTR
1043      0522  5306          JMP PAGHER-2
1044      0523  7777  M1,-1
1045      0524  0000  MOVE8,  0
1046      0525  1323          TAD M1
1047      0526  3016          DCA 16
1050      0527  7040          CMA
1051      0530  1724          TAD I MOVE8
1052      0531  3017          DCA 17
1053      0532  2324          ISZ MOVE8
1054      0533  1724          TAD I MOVE8
1055      0534  2324          ISZ MOVE8
1056      0535  3345          DCA MOVA
1057      0536  1156          TAD P777
1060      0537  3007          DCA TEMP
1061      0540  1007  MOVB,   TAD TEMP
1062      0541  7124          CLL CML RAL
1063      0542  3007          DCA TEMP
1064      0543  7430          SZL
1065      0544  5724          JMP I MOVE8
1066      0545  0000  MOVA,   0
1067      0546  1416          TAD I 16
1070      0547  0007          AND TEMP
1071      0550  0131          AND P3777
1072      0551  6201          6201
1073      0552  3417          DCA I 17
1074      0553  5340          JMP MOVB
1075                /
1076      0554  7610  DOLIST, CLA SKP          /LIST ENTRY PSEUDO,
1077      0555  7240  PLIST,  CLA CMA          /NOLIST PSEUDO,
1100      0556  3324          DCA     MOVE8           /IN TEMPORARY,
1101      0557  1035          TAD     PASS            /IS THIS PASS2?
1102      0560  7650          SNA     CLA
1103      0561  5367          JMP     DOPOUT          /NO, IGNORE IT,
1104      0562  1324          TAD     MOVE8           /0=LIST,7777=NOLIST
1105      0563  3770          DCA I   JJSTART         /FUDGE JBTEST PARAMS,
1106      0564  1324          TAD     MOVE8
1107      0565  7040          CMA
1110      0566  3771          DCA I   JJEND           /SET UP LINE NUMBER LIMITS,
1111      0567  5503  DOPOUT, JMP I   621             /CLEAN UP SYSTEM,
1112      0570  1733  JJSTART,        JSTART
1113      0571  1734  JJEND,  JEND
1114                /
-
```

```
1115                    /
1116                    /
1117                    /
1120                    /
1121                    /
1122                    /
1123                    /
1124    0572    0000    VRSTR,  0                       /THIS ROUTINE RESTORE 6400 FROM THE SCRATCH AREA
1125    0573    4776            JMS I   VRSTRR          /CALL THE READ ROUTINE
1126    0574    4331            VSAVE                   /POINTER TO THE SAVE AREA
1127    0575    5772            JMP I   VRSTR           /RETURN TO THE CALLER
1130                    /
1131                    /
1132                    /
1133                    /
1134    0576    7774    VRSTRR, READ                    /POINTER TO THE READ ROUTINE
1135                    /
1136                    /
1137                    /
1140                    /
1141                    /
1142                    /
1143                    /
1144                    /
1145                            EJECT
-
```

```
1146                    /PDP-12 ASSEMBLER PAGE 3
1147                    *600
1150                    /SYMBOL NUMBER DECODER
1151    0600    0000    SDEC08, 0                       /CONVERT A SYMBOL NUMBER TO AN ADDRESS
1152    0601    3171            DCA SNUM                /SAVE THE NUMBER
1153    0602    1171            TAD SNUM
1154    0603    0136            AND P6000
1155    0604    7640            SZA CLA
1156    0605    5674            JMP I   ERSY            /TOO MANY SYMS
1157    0606    1171            TAD SNUM
1160    0607    7106            CLL RTL
1161    0610    7041            CIA
1162    0611    1275            TAD STAB                /STAB IS TOP OF SYMBOL TABLE
1163    0612    3023            DCA SADR                /ADDRESS OF FIRST WORD OF SYMBOL
1164    0613    7325            PTHREE
1165    0614    1023            TAD     SADR
1166    0615    3022            DCA VADR                /POINTS TO SYMBOL VALUE
1167    0616    1360            TAD     COUNT           /GET THE NUMBER OF CHARACTERS IN THE OUTPUT BUFFER
1170    0617    7640            SZA  CLA                /IF NON-ZERO, SEE IF ITS OK TO PRINT ONE,
1171    0620    4340            JMS     CHECK           /BY CALLING THE CHECK ROUTINE.
1172    0621    5600            JMP I SDEC08
1173    0622    0000    TYPADD, 0                       changes type of symbol pointed
1174    0623    7200            CLA                     to by SADR
1175    0624    1622            TAD I TYPADD
1176    0625    3014            DCA TYPEA
1177    0626    1014            TAD TYPEA
1200    0627    3021            DCA TYPE
1201    0630    6211            6211
1202    0631    1423            TAD I SADR
1203    0632    0144            AND P1777
1204    0633    3423            DCA I SADR
1205    0634    1021            TAD TYPE                /change 1st word
1206    0635    0136            AND P6000
1207    0636    1423            TAD I SADR
1210    0637    3423            DCA I SADR
1211    0640    2023            ISZ SADR
1212    0641    1423            TAD I SADR
1213    0642    0131            AND P3777               /change 2nd word
1214    0643    3423            DCA I SADR
1215    0644    1021            TAD TYPE
1216    0645    7006            RTL
1217    0646    0150            AND P4000
1220    0647    1423            TAD I SADR
1221    0650    3423            DCA I SADR              /change 3rd word
1222    0651    2023            ISZ SADR                /Point back to 1st word
1223    0652    1423            TAD I SADR
1224    0653    0131            AND P3777
1225    0654    3423            DCA I SADR
1226    0655    1021            TAD TYPE
1227    0656    7006            RTL
1230    0657    7004            RAL
1231    0660    0150            AND P4000
1232    0661    1423            TAD I SADR
1233    0662    3423            DCA I SADR
1234    0663    7344            MTWO
1235    0664    1023            TAD     SADR
1236    0665    3023            DCA SADR
1237    0666    1021            TAD TYPE
1240    0667    0136            AND P6000
1241    0670    3021            DCA TYPE
1242    0671    6201            6201
1243    0672    2222            ISZ TYPADD
1244    0673    5622            JMP I TYPADD
-
```

```
1245    0674  1175  ERSY,STEXD
1246    0675  7600  STAB,   7600                    /SET TO POINT TO END OF THE SYMBOL TABLE
1247                /
1250                /
1251                /
1252                /
1253                /
1254                /
1255                /
1256                /
1257                /
1260                /                               BUFFERED TTY AND LPT ROUTINE
1261                /
1262    0676  0000  GGGET,  0                       /GETS A CHARACTER FROM THE BUFFER
1263    0677  7240        CLA CMA                   /DECREMENT COUNT BY 1
1264    0700  1360        TAD     COUNT
1265    0701  3360        DCA     COUNT
1266    0702  1705        TAD I   OUTP              /GET THE CHARACTER
1267    0703  3140        DCA     LOWTMP            /SAVE FOR A SECOND
1270    0704  4326        JMS     BUMP              /BUMP THE RING POINTER NOW
1271    0705  6110  OUTP,   FIRST                   /POINTS TO THE NEXT GET FROM SPOT IN THE BUFFER
1272    0706  1140        TAD     LOWTMP            /REGET THE CHARACTER
1273    0707  5676        JMP I   GGGET             /AND EXIT
1274                /
1275                /
1276                /
1277                /
1300                /
1301    0710  0000  PUT,    0
1302    0711  3222        DCA     TYPADD            /SAVE THE CHAR IN ANOTHER TEMP LOC
1303    0712  4541        JMS I   PCHECK            /CHECK TO STATUS OF THE DEVICES,
1304    0713  1360        TAD     COUNT             /GET THE COUNT
1305    0714  1361        TAD     PLTST             /COMPARE AGAINST THE MAXIMUM NUMBER ALLOWED
1306    0715  7650        SNA CLA
1307    0716  5312        JMP     PUT+2             /BUFFER IS FULL, WAIT
1310    0717  1222        TAD     TYPADD            /RECALL THE DESIRED CHARACTER
1311    0720  3722        DCA I   INP               /STASH IN THE BUFFER
1312    0721  4326        JMS     BUMP              /BUMP THE BUFFER POINTER
1313    0722  6110  INP,    FIRST                   /THE BUFFER POINTER
1314    0723  2360        ISZ     COUNT             /BOP UP THE COUNT
1315    0724  4541        JMS I   PCHECK            /SEND OUT ANOTHER CHAR IF ALL IS WELL
1316    0725  5710        JMP I   PUT               /AND EXIT
1317                /
1320                /
1321                /
1322                /
1323    0726  0000  BUMP,   0                       /THIS BUMPS THE RING BUFFER POINTER
1324    0727  2726        ISZ I   BUMP
1325    0730  1726        TAD I   BUMP
1326    0731  1362        TAD     PLOVR             /TEST FOR WRAP AROUND
1327    0732  7650        SNA CLA                   /?
1330    0733  1361        TAD     PLTST             /GET MINUS END +START
1331    0734  1726        TAD I   BUMP              /NOW READJUST POINTER IF NECESSARY
1332    0735  3726        DCA I   BUMP
1333    0736  2326        ISZ     BUMP
1334    0737  5726        JMP I   BUMP
1335                /
1336                /
1337                /
1340                /
1341                /
1342    0740  0000  CHECK,  0                       /THIS CHECKS THE OUTPUT STATUS
1343    0741  1360        TAD     COUNT             /GET THE NUMBER OF CHARS IN THE BUFFER
```

```
1344    0742  7650          SNA CLA
1345    0743  5740          JMP I   CHECK       /RETURN IF NO CHARS IN THE BUFFER
1346    0744  6041          TSF                 /KEYBOARD OK???
1347    0745  5740          JMP I   CHECK       /NOPE, RETURN NOW
1350    0746  6661          LSD                 /HOW ABOUT THE LINE PRINTER
1351    0747  5740  CNOP,   JMP I   CHECK       /IF NO LINE PRINTER THIS GETS ZAPPED
1352    0750  6214          RDF                 /READ IN THE PRESENT DATA FIELD
1353    0751  1353          TAD     CCDF        /SAVE IT AWAY
1354    0752  3356          DCA     .+4         /SAVE IT AWAY FOR A SECOND
1355    0753  6201  CCDF,   CDF     0           /RESET THE DATA FIELD TO FIELD ZERO
1356    0754  4276          JMS     GGGET       /GET A CHAR FROM THE BUFFER
1357    0755  4763          JMS I   CTYPO       /NOW OUTPUT IT RIGHT AWAY,
1360    0756  0000          0000                /RETURN CDF GOES HERE
1361    0757  5740          JMP I   CHECK       /NOW RETURN TO THE CALLER
1362                  /
1363                  /
1364                  /
1365                  /
1366                  /
1367                  /
1370    0760  0000  COUNT,  0                   /NUMBER OF CHARACTERS NOW IN THE BUFFER
1371    0761  7510  PLTST,  -BAD+FIRST
1372    0762  1400  PLOVR,  -BAD               /-UPPER LIMIT
1373    0763  2527  CTYPO,  TYPO                /ADDRESS OF THE ACTUAL PUTTER
1374                  /
1375                  /
1376                  /
1377                  /
1400                  /
1401                  /
1402                  /
1403                  /
1404    0764  0000  SKIP2,  0
1405    0765  3200          DCA     SDEC08      /SAVE SKIP COUNT
1406    0766  1134          TAD     P240
1407    0767  4401          JMS I   DECOUT
1410    0770  2200          ISZ     SDEC08
1411    0771  5366          JMP     .-3
1412    0772  5764          JMP I   SKIP2
1413                  /
1414                  /
1415                  /
1416                  /
1417                  /
1420                  /
1421                  /
1422                  /
1423                  /
1424                  /
1425                  /
1426                  /
1427    0773  0000  VPRSRV, 0                   /THIS ROUTINE PRESERVES LOCATIONS 6400-67777
1430    0774  4777          JMS I   VPRSRW      /IN THE SCRATCH AREA. CALL THE WRITE ROUTINE
1431    0775  4331          VSAVE
1432    0776  5773          JMP I   VPRSRV      /AND RETURN TO THE CALLER.
1433                  /
1434                  /
1435                  /
1436                  /
1437    0777  7775  VPRSRW, WRITE               /POINTER TO THE WRITE ROUTINE.
1440                  /
1441                  /
1442                  /
-
```

```
1443                    /
1444                    /
1445                    /
1446                    /
1447                    /
1450                    /
1451                    /
1452                    /
1453                            EJECT
-
```

```
                        *1000
                   SCOLON=200
                   COMMA=600
                   SYMB=4000
                   EQUALS=1400
                   USYMB=2000
                   EXCLAM=2200
                   ANDS=3400
                   PLUS=4600
                   MINUS=5200
                   SPACE=5600
                   ALL=7600
                   /PDP-12 ASSEMBLER  PAGE 4
1000  0000  EXPR,  0
1001  1164         TAD CON
1002  4505         JMS I PUSH1
1003  3164         DCA CON
1004  1055         TAD INST
1005  4505         JMS I PUSH1
1006  3055         DCA INST
1007  1054         TAD MICROL
1010  4505         JMS I PUSH1
1011  3054         DCA MICROL
1012  1034         TAD SGN
1013  4505         JMS I PUSH1
1014  1365         TAD CRIOR          /OR
1015  3034         DCA SGN
1016  1275         TAD H6
1017  4505         JMS I PUSH1
1020  3275         DCA H6
1021  1200         TAD EXPR
1022  4505         JMS I PUSH1
1023  7410         SKP
1024  4504  A,     JMS I IDX1
1025  4507         JMS I GETSY1
1026  2076         B-1000+USYMB
1027  4076         B-1000+SYMB
1030  5624         A-1000+SPACE
1031  4655         C-1000+PLUS
1032  5260         C+3-1000+MINUS
1033  2262         C+5-1000+EXCLAM
1034  0313         G-1000+SCOLON
1035  3464         C+7-1000+ANDS
1036  7713         G-1000+ALL
1037  1024         TAD VAL
1040  5243         JMP .+3
1041  7200  B1,    CLA
1042  1053         TAD LWC
1043  4434         JMS I SGN
1044  7410         SKP
1045  4504         JMS I IDX1
1046  4507  B2,    JMS I GETSY1
1047  5662         C+5-1000+SPACE
1050  0707         GET-1-1000+COMMA
1051  4037         B1-2-1000+SYMB
1052  2037         B1-2-1000+USYMB
1053  1540         ERONE-1000+EQUALS
1054  0031         A+5-1000
1055  1366  C,     TAD CRIOR+1        /PLUS
1056  3034         DCA SGN
1057  5245         JMP B2-1
1060  1367         TAD CRIOR+2        /MINUS
1061  5256         JMP C+1
```

expression processor (recursive)

/save accumulated value

/save last operator address

- set up initially to do an IOR

/save indirect bit

/save exit

/IE error

5Bit Branch ADDR + 7bit char code
B -1000 + USYMB

```
1553    1062  1365          TAD CRIOR              /OR
1554    1063  5256          JMP C+1
1555    1064  1370          TAD CRIOR+3      /AND
1556    1065  5256          JMP C+1
1557    1066  1037  H,      TAD MODE
1560    1067  7700          SMA CLA
1561    1070  5304          JMP LINKI
1562    1071  1124          TAD P400
1563    1072  1275          TAD H6
1564    1073  3275          DCA H6
1565    1074  5225          JMP A+1
1566    1075  0000  H6,     0
1567    1076  1024  B,      TAD VAL
1570    1077  4434          JMS I SGN
1571    1100  4507          JMS I GETSY1
1572    1101  1542          EQU=1000+EQUALS
1573    1102  5710          GET=1000+SPACE
1574    1103  0047          B2+1-1000
1575    1104  1373  LINKI,  TAD P10
1576    1105  1373  UN,     TAD P10
1577    1106  5272          JMP H+4
1600    1107  4774          JMS I DEFIN1
1601    1110  4772  GET,    JMS I GETAD1
1602    1111  1165          TAD ADR
1603    1112  4765          JMS I CRIOR
1604    1113  4506  G,      JMS I POPU1
1605    1114  3200          DCA EXPR
1606    1115  1164          TAD CON
1607    1116  3033          DCA EVAL
1610    1117  1275          TAD H6
1611    1120  3166          DCA IND
1612    1121  4506          JMS I POPU1
1613    1122  3275          DCA H6
1614    1123  4506          JMS I POPU1
1615    1124  3034          DCA SGN
1616    1125  1054          TAD MICROL
1617    1126  3005          DCA MICROB
1620    1127  4506          JMS I POPU1
1621    1130  3054          DCA MICROL
1622    1131  1055          TAD INST
1623    1132  3056          DCA MICRO
1624    1133  4506          JMS I POPU1
1625    1134  3055          DCA INST
1626    1135  4506          JMS I POPU1
1627    1136  3164          DCA CON
1630    1137  5600          JMP I EXPR
1631                  /
1632    1140  5741  ERONE,  JMP I   .+1
1633    1141  3766          EQUERR
1634                  /
1635    1142  1771  EQU,    TAD I REPUN1
1636    1143  3364          DCA CRIOR-1
1637    1144  3006          DCA EQRETI
1640    1145  4504          JMS I IDX1
1641    1146  4477          JMS I EXPR1
1642    1147  7240          CLA CMA
1643    1150  3006          DCA EQRETI
1644    1151  1364          TAD CRIOR-1
1645    1152  4512          JMS I SDECO1
1646    1153  1033          TAD EVAL
1647    1154  6211          6211
1650    1155  3422          DCA I VADR
1651    1156  6201          6201
-
```

check what follows a symbol

restore exit

restore indirect bit

restore last operator

save current symbol type

restore previous symbol type

routine to handle "="

SGN holds the address of the routine which handles the operation indicated by the last operator.

```
1652      1157  4511          JMS I TYPAD1
1653      1160  4000          SYMB
1654      1161  4465          JMS I PASSEK
1655      1162  4466          JMS I CURSKA
1656      1163  5501          JMP I MAIN1
1657      1164  0000          0
1660      1165  1600  CRIOR,  RIOR
1661      1166  4235          RADD
1662      1167  4211          RSUB
1663      1170  3713          RAND
1664      1171  1747  REPUN1, RESTOR-2
1665      1172  1200  GETAD1, GETADR
1666      1173  0010          P10,    10
1667      1174  0227  DEFIN1, CURREN
1670      1175  1157  STEXD,TAD P7
1671      1176  4476  JMS I ERR1
1672      1177  5517  JMP I MON
1673                          EJECT
-
```

```
                   /PDP-12 ASSEMBLER  PAGE 5        /assembles address portion of word
                   *1200
1200  0000  GETADR, 0
1201  4504          JMS I IDX1
1202  1200          TAD GETADR
1203  4505          JMS I PUSH1                     /get expression for address
1204  4477          JMS I EXPR1
1205  1037          TAD MODE
1206  7700          SMA CLA
1207  5250          JMP LNKOR                       /if LINC mode
1210  1056          TAD MICRO
1211  7700          SMA CLA
1212  5222          JMP CHKLA
1213  1164          TAD CON
1214  7106          CLL RTL
1215  7006          RTL
1216  0157          AND P7
1217  1261          TAD M6A
1220  7700          SMA CLA
1221  5257          JMP LEVEL+1
1222  1033  CHKLA,  TAD EVAL
1223  0146          AND P7600
1224  7450          SNA
1225  5242          JMP AWAY+1                      /if page 0
1226  7041          CIA
1227  1031          TAD APAGE
1230  7650          SNA CLA
1231  5241          JMP AWAY
1232  7001          IAC
1233  4662          JMS I NUPAGE                    /II error
1234  5236          JMP LEAVE
1235  3165          DCA ADR                         /restore exit
1236  4506  LEAVE,  JMS I POPU1
1237  3200          DCA GETADR
1240  5600          JMP I GETADR                    /assemble addr.
1241  1147  AWAY,   TAD P200
1242  3007          DCA TEMP
1243  1033          TAD EVAL
1244  0145          AND P177
1245  1007          TAD TEMP
1246  1166          TAD IND
1247  5235          JMP LEAVE-1
1250  1005  LNKOR,  TAD MICROB
1251  7700          SMA CLA
1252  5264          JMP CHKL
1253  1033          TAD EVAL
1254  0144          AND P1777
1255  1166          TAD IND
1256  3033  LEVEL,  DCA EVAL                        /if not MRI
1257  1033          TAD EVAL
1260  5235          JMP LEAVE-1
1261  7772  M6A,    -6
1262  2317  NUPAGE, UNDERR
1263  0000          0
1264  1014  CHKL,   TAD TYPEA                       /check if LINC mode def.
1265  7006          RTL
1266  0136          AND P6000                       ← TAD TYPEA / AND P 1400 / SZA CLA
1267  7640          SZA CLA
1270  5253          JMP LEVEL-3                     /yes, LINC MODE
1271  1033          TAD EVAL                        /NO, NOT LINC MODE
1272  1166          TAD IND
1273  5256          JMP LEVEL
1274  0000  LDT,    0
```

```
1773    1275  1044          TAD CHARX
1774    1276  7450          SNA
1775    1277  5674          JMP I LDT
1776    1300  3263          DCA NUPAGE+1
1777    1301  1263          TAD NUPAGE+1
2000    1302  1125          TAD M45
2001    1303  7700          SMA CLA
2002    1304  5311          JMP NOTLDT
2003    1305  2050          ISZ IN  /LETTER OR DIGIT
2004    1306  4504          JMS I IDX1
2005    1307  1263          TAD NUPAGE+1
2006    1310  5674          JMP I LDT
2007    1311  3044  NOTLDT, DCA CHARX
2010    1312  5674          JMP I LDT
2011    1313  0000  A1W,     0
2012    1314  4274          JMS LDT
2013    1315  3263          DCA NUPAGE+1
2014    1316  1263          TAD NUPAGE+1
2015    1317  7106          CLL RTL
2016    1320  3024          DCA VAL           /CHR, *4
2017    1321  1024          TAD VAL
2020    1322  7006          RTL
2021    1323  7004          RAL               /CHR, *32
2022    1324  1024          TAD VAL
2023    1325  1263          TAD NUPAGE+1      /CHR *1
2024    1326  3024          DCA VAL
2025    1327  4274          JMS LDT
2026    1330  1024          TAD VAL
2027    1331  5713          JMP I A1W
2030    1332  0000  AAS,     0
2031    1333  4313          JMS A1W
2032    1334  3161          DCA TEM1
2033    1335  4313          JMS A1W
2034    1336  3162          DCA TEM2
2035    1337  4313          JMS A1W
2036    1340  3163          DCA TEM3
2037    1341  4274          JMS LDT
2040    1342  7650          SNA CLA
2041    1343  5732          JMP I AAS
2042    1344  5341          JMP .-3
2043    1345  4504  ORGIC,  JMS I IDX1
2044    1346  4477          JMS I EXPR1
2045    1347  1037          TAD MODE
2046    1350  7700          SMA CLA
2047    1351  5370          JMP LINKIC
2050    1352  1033          TAD EVAL
2051    1353  3030          DCA AADR
2052    1354  1033          TAD EVAL
2053    1355  0146          AND P7600
2054    1356  7041          CIA
2055    1357  1031          TAD APAGE
2056    1360  7650          SNA CLA
2057    1361  5365          JMP LNRT
2060    1362  4502          JMS I PAGE1
2061    1363  1030          TAD AADR
2062    1364  3033          DCA EVAL
2063    1365  4465  LNRT,   JMS I PASSEK
2064    1366  4466          JMS I CURSKA
2065    1367  5501          JMP I   MAIN1
2066    1370  1033  LINKIC, TAD EVAL
2067    1371  0144          AND P1777
2070    1372  1046          TAD ABANK
2071    1373  3030          DCA AADR
-
```

```
2072        1374  5365          JMP LNRT
2073                            EJECT
-
```

```
2074                /
2075                /
2076                /
2077                /
2100                /
2101                /
2102                /
2103                /
2104                /
2105                /
2106                /
2107                /
2110                /
2111                /
2112                /
2113                /
2114                /
2115                /
2116                /
2117                /
2120                /
2121                /
2122                /           E N D   O F   A S S E M O N E ! ! ! ! ! ! ! ! ! ! !
2123                /
2124                /
2125                /
2126                /
2127                /
2130                /
2131                /
2132                /
2133                /
2134                /
2135                /
2136                /
2137                /
2140                        CHAIN   "ASSEM2"        /GO GET THE SECOND PART NOW.
```

```
0000                    *20
0001                            PMODE
0002                    /
0003                    /
0004                    /
0005                    /
0006                    /
0007                    /
0010                    /
0011                    /
0012                    /
0013                    /
0014                    /
0015                    /
0016                    /
0017                    /       BEGINNING OF ASSEMTWO.
0020                    /
0021                    /
0022                    /
0023                    /
0024                    /
0025                    /
0026                    /
0027                    /
0030                    /
```

```
0031                    /
0032                    /
0033                    /
0034                    /
0035                    /
0036                    /
0037                    /
0040                    /
0041                    /
0042                            EJECT
-
```

```
0043                    /
0044                    /
0045                    /
0046                    /
0047                    /
0050                    /PDP-12 ASSEMBLER PAGE 6
0051                    /
0052                            *1400
0053                    /
0054    1400    5201    MAIN,   JMP PASS1               /SWITCH
0055    1401    1032    PASS1,  TAD PERMA               / erase all but perm. symbols.
0056    1402    3027            DCA SEND
0057    1403    3035            DCA PASS
0060    1404    3037            DCA MODE
0061    1405    4320            JMS SETORG
0062    1406    1350            TAD CJMP1+1
0063    1407    3200    PASS1P, DCA MAIN
0064    1410    4735            JMS I OCTS1             /SET TADIX TO OCTAL
0065    1411    4530    MAINSE, JMS I   LINENO
0066    1412    7240            CLA CMA                 /RESET THE COMMA SWITCH,
0067    1413    3777            DCA I   PTOCMC          main loop, passed thru
0070    1414    4404            JMS I CNTLPI            each time a terminator
0071    1415    4653            JMS I CLENUP            found.
0072    1416    4504    MAINSF, JMS I   IDX1
0073    1417    1376            TAD     M60
0074    1420    3173            DCA     SPCUNT
0075    1421    1357            TAD LIST1
0076    1422    3047            DCA POINT
0077    1423    3020            DCA ANY
0100    1424    3166            DCA IND
0101    1425    5775            JMP I   PSINTER
0102    1426    4477    DOCAL,  JMS I   EXPR1
0103    1427    1020            TAD ANY
0104    1430    7650            SNA CLA
0105    1431    5304            JMP MAINSA              /NOTHING TO BE ASSEMBLED
0106    1432    1033            TAD EVAL
0107    1433    4236            JMS ONEREG
0110    1434    4461    TACK,   JMS I EMPTY1
0111    1435    5211            JMP MAINSE              / output one word (bin)
0112    1436    0000    ONEREG, 0
0113    1437    3033            DCA EVAL
0114    1440    4520            JMS I PUNON1
0115    1441    2030            ISZ AADR
0116    1442    1037            TAD MODE
0117    1443    7700            SMA CLA
0120    1444    5252            JMP LNKREG
0121    1445    1030            TAD AADR
0122    1446    0145            AND P177
0123    1447    7640            SZA CLA
0124    1450    5636            JMP I ONEREG
0125    1451    4502            JMS I PAGE1             /END OF PAGE
0126    1452    5636    LNKREG, JMP I ONEREG
0127    1453    2132    CLENUP, CLEARR
0130                    /SYMBOLIC ASSEMBLY SAVE ROUTINE
0131    1454    0000    LSTSYM, 0
0132    1455    1003            TAD LISTWD
0133    1456    7710            SPA CLA
0134    1457    5654            JMP I LSTSYM
0135    1460    1051            TAD ITEM
0136    1461    1122            TAD M43
0137    1462    7650            SNA CLA
0140    1463    5654            JMP I LSTSYM
0141    1464    1051            TAD ITEM
```

```
0142    1465  2356          ISZ SWOT
0143    1466  5274          JMP DOLEFT
0144    1467  1703          TAD I SYMBU
0145    1470  3703          DCA I SYMBU
0146    1471  2303          ISZ SYMBU
0147    1472  2057  LSRTE,   ISZ CHARAC
0150    1473  5654          JMP I LSTSYM
0151    1474  7106  DOLEFT,  CLL RTL
0152    1475  7006          RTL
0153    1476  7006          RTL
0154    1477  3703          DCA I SYMBU
0155    1500  7040          CMA
0156    1501  3356          DCA SWOT
0157    1502  5272          JMP LSRTE
0160    1503  3102  SYMBU,   SYMBUF
0161    1504  1035  MAINSA,  TAD     PASS
0162    1505  7650          SNA CLA
0163    1506  5211          JMP     MAINSE
0164    1507  1003          TAD LISTWD
0165    1510  7710          SPA CLA
0166    1511  5211          JMP MAINSE
0167    1512  1167          TAD ERRCNT
0170    1513  7640          SZA CLA
0171    1514  5234          JMP TACK
0172    1515  4465          JMS I PASSEK
0173    1516  4466          JMS I CURSKA
0174    1517  5211          JMP MAINSE
0175    1520  0000  SETORG,  0
0176    1521  1150          TAD P4000
0177    1522  3030          DCA AADR
0200    1523  1150          TAD P4000
0201    1524  3031          DCA APAGE
0202    1525  1150          TAD P4000
0203    1526  3033          DCA EVAL
0204    1527  1150          TAD P4000
0205    1530  3046          DCA ABANK
0206    1531  3002          DCA ERTOT
0207    1532  3036          DCA FLOWD
0210    1533  3167          DCA ERRCNT
0211    1534  5720          JMP I SETORG
0212    1535  2235  OCTS1,   OCTS
0213    1536  3002          PUNONE+1
0214    1537  7240  PASS2,   CLA CMA
0215    1540  3035          DCA PASS
0216    1541  1121          TAD M1000
0217    1542  3736          DCA I   OCTS1+1
0220    1543  4320          JMS SETORG
0221    1544  4460          JMS I INIT1
0222    1545  1347          TAD CJMP1
0223    1546  5207          JMP PASS1P
0224    1547  5201  CJMP1,   JMP PASS1
0225    1550  5337          JMP PASS2
0226    1551  0000  RESET,   0
0227    1552  1030          TAD AADR
0230    1553  0146          AND P7600
0231    1554  3031          DCA APAGE
0232    1555  5751          JMP I   RESET
0233    1556  0000  SWOT,    0
0234    1557  2731  LIST1,   LISTA
0235    1560  0000  LNINST,  0
0236    1561  1055          TAD     INST
0237    1562  7700          SMA     CLA
0240    1563  5372          JMP     .+7
-
```

/initialize origins

/set up for pass 2

/see if symbol is perm. or user
/user

```
0241    1564  1024          TAD     VAL
0242    1565  0136          AND     P6000
0243    1566  7650          SNA CLA
0244    1567  5372          JMP     .+3
0245    1570  7040          CMA
0246    1571  3054          DCA     MICROL
0247    1572  1025          TAD     VALK
0250    1573  3024          DCA     VAL
0251    1574  5760          JMP I   LNINST
0252    1575  1426  PSINTER,DOCAL
0253    1576  7716  M60,    -62
0254    1577  0260  PTOCMC, COMMAN
0255                /
0256                /
0257                /
0260                EJECT
-
```

/instruction

/set value of symbol

```
0261                    /PDP-12 ASSEMBLER PAGE 7
0262                    *1600
0263    1600  0000      RIOR,   0
0264    1601  3024              DCA     VAL
0265    1602  1164              TAD     CON
0266    1603  7040              CMA
0267    1604  0024              AND     VAL
0270    1605  1164              TAD     CON
0271    1606  3164              DCA     CON
0272    1607  5600              JMP I   RIOR
0273                    /
0274                    /
0275    1610  4703      STRING, JMS I   GENINI
0276    1611  7041              CIA
0277    1612  3024              DCA     VAL
0300    1613  4241              JMS     STGET
0301    1614  5273              JMP     STNODUMP
0302    1615  5224              JMP     STINTO
0303    1616  4241      STLOOP, JMS     STGET
0304    1617  5267              JMP     STDUMP
0305    1620  1033              TAD     EVAL
0306    1621  4704              JMS I   ONEREI
0307    1622  4465              JMS I   PASSEK
0310    1623  4500              JMS I   TYCARI
0311    1624  1051      STINTO, TAD     ITEM
0312    1625  0160              AND     P77
0313    1626  7106              CLL RTL
0314    1627  7006              RTL
0315    1630  7006              RTL
0316    1631  3033              DCA     EVAL
0317    1632  4241              JMS     STGET
0320    1633  5267              JMP     STDUMP
0321    1634  1051              TAD     ITEM
0322    1635  0160              AND     P77
0323    1636  1033              TAD     EVAL
0324    1637  3033              DCA     EVAL
0325    1640  5216              JMP     STLOOP
0326                    /
0327    1641  0000      STGET,  0
0330    1642  4703              JMS I   GENINI
0331    1643  1024              TAD     VAL
0332    1644  7640              SZA CLA
0333    1645  2241              ISZ     STGET
0334    1646  1122              TAD     M43
0335    1647  1051              TAD     ITEM
0336    1650  7640              SZA CLA
0337    1651  5261              JMP     STNOT
0340    1652  4465              JMS I   PASSEK
0341    1653  4466              JMS I   CURSKA
0342    1654  4532              JMS I   SCLEAR
0343    1655  1705              TAD I   SPTO60
0344    1656  3173              DCA     SPCUNT
0345    1657  4530              JMS I   LINENO
0346    1660  5641              JMP I   STGET
0347    1661  1051      STNOT,  TAD     ITEM            /GET THE CHAR.
0350                            ASMIFZ  TERMC-44        /DO WE WANT A DOLLAR SIGN AT THE END.
0351                            TAD     STM44           /YEP.  ADD IT IN.
0352    1662  7640              SZA CLA
0353    1663  5641              JMP I   STGET
0354    1664  4702              JMS I   SQERR
0355    1665  4702              JMS I   SQERR
0356    1666  5517              JMP I   MON
0357                    /
-
```

DO Inclusive OR

/Text pseudo-op

```
0360    1667  1033  STDUMP, TAD     EVAL
0361    1670  4704          JMS I   ONEREI
0362    1671  4465          JMS I   PASSEK
0363    1672  4500          JMS I   TYCARI
0364    1673  1051  STNODUMP,TAD    ITEM
0365    1674  1122          TAD     M43
0366    1675  7650          SNA CLA
0367    1676  5701          JMP I   SQFDRT
0370    1677  4703          JMS I   GENINI
0371    1700  5274          JMP     STNODUMP+1
0372                /
0373                /
0374                /
0375                          ASMIFZ  TERMC-44        /DO WE WANT THE LITTERAL IN???
0376                STM44,    -44                     /YEP, ASSEMBLE IT IN.
0377    1701  2714  SQFDRT, FDRT
0400    1702  3201  SQERR,  ERROR
0401    1703  3670  GENINI, GETIN
0402    1704  1436  ONEREI, ONEREG
0403    1705  1576  SPTO60, M60
0404                /
0405    1706  0000  JBTEST, 0
0406    1707  2012  JBMSTR, ISZ     CURLIN          /THIS IS MADE A NOP FOR THE SEMI-COLON FUDGE
0407    1710  7300          CLA CLL
0410    1711  7240          CLA CMA
0411    1712  3003          DCA     LISTWD
0412    1713  1332          TAD     JBSMF           /RESET THE FUDGE SWITCH
0413    1714  3307          DCA     JBMSTR          /BY REPLACING THE ISZ
0414    1715  1012          TAD     CURLIN
0415    1716  7421          7421                    /THIS CODE DISPLAYS THE LINE NUMBER BEING
0416    1717  7501          7501                    /ASSEMBLED IN THE MQ.
0417    1720  7161          CLL CML CMA IAC
0420    1721  1333          TAD     JSTART
0421    1722  7660          SNL SZA CLA
0422    1723  5706          JMP I   JBTEST
0423    1724  1334          TAD     JEND
0424    1725  7161          CLL CML CMA IAC
0425    1726  1012          TAD     CURLIN
0426    1727  7670          SZL SNA CLA
0427    1730  3003  JNOP,   DCA     LISTWD
0430    1731  5706          JMP I   JBTEST
0431                /
0432                /
0433    1732  2012  JBSMF,  ISZ     CURLIN
0434    1733  0000  JSTART, 0
0435    1734  7777  JEND,   7777
0436    1735  7777  M1A,    -1
0437                /
0440                /
0441                /
0442                /
0443                /
0444                /
0445                /
0446                /
0447    1736  0000  SAVE,   0
0450    1737  1026          TAD SCURR
0451    1740  3347          DCA RESTOR-2
0452    1741  1014          TAD TYPEA
0453    1742  3346          DCA RESTOR-3
0454    1743  1021          TAD TYPE
0455    1744  3350          DCA RESTOR-1
0456    1745  5736          JMP I SAVE
```

If so we can look back 1 symbol

```
0457    1746  0000          0
0460    1747  0000          0
0461    1750  0000          0
0462    1751  0000  RESTOR, 0
0463    1752  1347          TAD RESTOR-2
0464    1753  4512          JMS I SDEC01
0465    1754  1346          TAD RESTOR-3
0466    1755  3014          DCA TYPEA
0467    1756  1350          TAD RESTOR-1
0470    1757  3021          DCA TYPE
0471    1760  5751          JMP I RESTOR
0472                /
0473                /
0474                /
0475                /
0476                          EJECT
-
```

restore pointers saved by same

JMS ENTS
TYPE
return

/enter a symbol in table

```
0477                    /PDP-12 ASSEMBLER  PAGE 8
0500                    *2000
0501    2000    0000    ENTS,   0                       / pointer to 1st free loc.
0502    2001    1027            TAD SEND
0503    2002    4512            JMS I SDECO1
0504    2003    6211            6211
0505    2004    1024            TAD VAL
0506    2005    3422            DCA I VADR
0507    2006    1161            TAD TEM1
0510    2007    3423            DCA I SADR
0511    2010    2023            ISZ SADR
0512    2011    1162            TAD TEM2
0513    2012    3423            DCA I SADR
0514    2013    2023            ISZ     SADR
0515    2014    1163            TAD TEM3
0516    2015    3423            DCA I SADR
0517    2016    6201            6201                    /RESET TO FIELD 0.
0520    2017    7344            MTWO                    /BACK UP SADR TO FIRST WORD OF NAME
0521    2020    1023            TAD     SADR
0522    2021    7450            SNA                     /IS IT ZERO?
0523    2022    5633            JMP I   SADROV          /YES, TO MANY SYMBOLS, ABORT WITH ERROR
0524    2023    3023            DCA     SADR            /OK, RESTORE SADR NOW.
0525    2024    1600            TAD I ENTS              get type
0526    2025    3227            DCA ,+2
0527    2026    4511            JMS I TYPAD1
0530    2027    0000            0
0531    2030    2200            ISZ ENTS
0532    2031    2027            ISZ SEND
0533    2032    5600            JMP I ENTS
0534                    /
0535    2033    1175    SADROV, STEXD                   /POINTER TO TOO MANY SYMBOLS ERROR.
0536    2034    7721    M57,    -57
0537    2035    3670    GETS,   GETIN
0540    2036    3701    COMS,   COMMEN
0541                    /
0542    2037    0000    IDX,    0
0543    2040    4635            JMS I GETS
0544    2041    1234            TAD M57
0545    2042    7650            SNA CLA
0546    2043    5636            JMP I COMS
0547    2044    1051            TAD ITEM
0550                            ASMIFZ  TERMC-44        /IS END OF FILE CHAR A 44??
0551                            TAD     M44             /YEP, ASSEMBLE IT IN NOW.
0552    2045    7650            SNA CLA
0553    2046    5773            JMP I FINEND
0554    2047    4464    BIT,    JMS I BIT6A
0555    2050    3044            DCA CHARX
0556    2051    1044            TAD CHARX
0557    2052    3045            DCA CHARX2
0560    2053    5637            JMP I IDX
0561    2054    0000    EMPTY,  0
0562    2055    1003            TAD     LISTWD          /GET THE LISTING WORD
0563    2056    7040            CMA                     /NEGATE IT,
0564    2057    0035            AND     PASS            /AND WITH THE PASS,
0565    2060    7650            SNA CLA                 /LISTING AND PASS2?
0566    2061    5654            JMP I   EMPTY           /NOPE, DONT PRINT ANYTHING
0567    2062    1057            TAD CHARAC
0570    2063    7450            SNA
0571    2064    5330            JMP EMLEVE
0572    2065    7041            CIA
0573    2066    3057            DCA CHARAC
0574    2067    3175            DCA TBCONT
0575    2070    1174            TAD SY
```

```
0576    2071  3172          DCA EMPTRA
0577    2072  7410          SKP
0600    2073  2172  TWOCHR, ISZ EMPTRA
0601    2074  1572          TAD I EMPTRA
0602    2075  7012          RTR
0603    2076  7012          RTR
0604    2077  7012          RTR
0605    2100  0160          AND P77
0606    2101  3007          DCA TEMP
0607    2102  7040          CMA
0610    2103  3170          DCA SWITCH
0611    2104  1007          TAD TEMP
0612    2105  1133          TAD M47
0613    2106  7650          SNA CLA
0614    2107  5356  NOTAB1, JMP     OUTTAB
0615    2110  4347          JMS OUTTP
0616    2111  2057  DRHT,   ISZ CHARAC
0617    2112  5314          JMP .+2
0620    2113  5330          JMP EMLEVE
0621    2114  4746          JMS I LNCKA
0622    2115  1572          TAD I EMPTRA
0623    2116  0160          AND P77
0624    2117  3007          DCA TEMP
0625    2120  3170          DCA SWITCH
0626    2121  1007          TAD TEMP
0627    2122  1133          TAD M47
0630    2123  7650          SNA CLA
0631    2124  5356  NOTAB2, JMP     OUTTAB          /REPLACED BY A TAD M7
0632    2125  4347          JMS OUTTP
0633    2126  2057  DLFT,   ISZ CHARAC
0634    2127  5344          JMP TWOCH
0635    2130  4500  EMLEVE, JMS I TYCARI
0636    2131  5654          JMP I EMPTY
0637    2132  0000  CLEARR, 0
0640    2133  3057          DCA CHARAC
0641    2134  3772          DCA I SWOTA
0642    2135  1167          TAD ERRCNT
0643    2136  1002          TAD ERTOT
0644    2137  3002          DCA ERTOT
0645    2140  3167          DCA ERRCNT
0646    2141  1174          TAD SY
0647    2142  3514          DCA I SYB
0650    2143  5732          JMP I CLEARR
0651    2144  4746  TWOCH,  JMS I  LNCKA
0652    2145  5273          JMP TWOCHR
0653    2146  3737  LNCKA,  LNCK
0654    2147  0000  OUTTP,  0
0655    2150  1007          TAD TEMP
0656    2151  4755          JMS I ONVRT
0657    2152  4401          JMS I DECOUT
0660    2153  2175          ISZ TBCONT
0661    2154  5747          JMP I OUTTP
0662    2155  3600  ONVRT,  CONVRT
0663    2156  1175  OUTTAB, TAD TBCONT
0664    2157  1371          TAD M10
0665    2160  7500          SMA
0666    2161  5357          JMP .-2
0667    2162  4770          JMS I KLUG2
0670    2163  4475          JMS I   SKIP
0671    2164  3175          DCA TBCONT
0672    2165  2170          ISZ SWITCH
0673    2166  5326          JMP DLFT
0674    2167  5311          JMP DRHT
-
```

```
0675        2170  3744  KLUG2,   SPACK
0676        2171  7770  M10,     -10
0677        2172  1556  SWOTA,   SWOT
0700        2173  3717  FINEND,  ENDMS
0701        2174  7771  M7TWO,   -7
0702                            EJECT
-
```

```
0703                    /PDP-12 ASSEMBLER  PAGE 9
0704                    *2200
0705      2200  0000    DPCV,   0
0706      2201  2020            ISZ ANY
0707      2202  3052            DCA HIC         /CLEAR HIGH AND LOW PARTS
0710      2203  3053            DCA LWC
0711      2204  1045            TAD CHARX2      / GET THE NEXT CHARACTER
0712      2205  1126            TAD M67
0713      2206  7450            SNA
0714      2207  5212            JMP DPCS
0715      2210  1242            TAD     DPCVM2
0716      2211  7650            SNA CLA
0717      2212  4504    DPCS,   JMS I IDX1      /INDEX CHARACTER POINTER
0720      2213  1045            TAD CHARX2
0721      2214  1125            TAD M45
0722      2215  7500            SMA
0723      2216  5600            JMP I DPCV
0724      2217  1241            TAD P12         /IF LESS OR EQUAL TO 9 CHECK FOR GR
0725      2220  7510            SPA             /EQ, ZERO
0726      2221  5600            JMP I DPCV      /LESS THAN ZERO, EXIT NOT DIGIT
0727      2222  3273            DCA MTDG
0730      2223  4243            JMS MT10
0731      2224  5212            JMP DPCS
0732      2225  4231    DECIM,  JMS DECIMS
0733      2226  5503            JMP I B21
0734      2227  4235    OCT,    JMS OCTS
0735      2230  5503            JMP I B21
0736      2231  0000    DECIMS, 0
0737      2232  1255            TAD MTSW+4
0740      2233  3251            DCA MTSW
0741      2234  5631            JMP I DECIMS
0742      2235  0000    OCTS,   0
0743      2236  1121            TAD M1000
0744      2237  3251            DCA MTSW
0745      2240  5635            JMP I OCTS
0746      2241  0012    P12, 12
0747      2242  7776    DPCVM2, -2
0750                    /MULTIPLY LWC BY 10,
0751      2243  0000    MT10,   0
0752      2244  1053            TAD LWC
0753      2245  0156            AND P777
0754      2246  3274            DCA TIC
0755      2247  4257            JMS MTRL
0756      2250  4257            JMS MTRL
0757      2251  4265    MTSW,   JMS MTAD                /NOP FOR OCTAL, JMS MTAD FOR DECIMAL
0760      2252  4257            JMS MTRL
0761      2253  1273            TAD MTDG
0762      2254  3274            DCA TIC
0763      2255  4265            JMS MTAD
0764      2256  5643            JMP I MT10
0765                    /ROTATE  LWC LEFT 1
0766      2257  0000    MTRL,   0
0767      2260  7300            CLL CLA
0770      2261  1053            TAD LWC
0771      2262  7004            RAL
0772      2263  3053            DCA LWC
0773      2264  5657            JMP I MTRL
0774                    /ADD LWC TO TIC
0775      2265  0000    MTAD,   0
0776      2266  7300            CLL CLA
0777      2267  1053            TAD LWC
1000      2270  1274            TAD TIC
1001      2271  3053            DCA LWC
-
```

```
2272  5665          JMP I MTAD
               /SOME DATA STORAGE
2273  0000   MTDG,    0
2274  0000   TIC,     0
2275  0000   ERR2,    0
2276  1021            TAD TYPE
2277  1136            TAD P6000
2300  7650            SNA CLA
2301  5675            JMP I ERR2
2302  1014            TAD TYPEA
2303  7106            CLL RTL
2304  0136            AND P6000
2305  6211            6211
2306  1422            TAD I VADR
2307  6201            6201
2310  7041            CIA
2311  1030            TAD AADR
2312  7650            SNA CLA
2313  5675            JMP I ERR2
2314  7326            CLA CLL CML RTL
2315  4476            JMS I ERR1
2316  5675            JMP I ERR2
2317  0000   UNDERR,  0
2320  2035            ISZ PASS
2321  5332            JMP EQCHK
2322  3007   DCA TEMP
2323  7040   CMA
2324  3035   DCA PASS
2325  1007   TAD TEMP
2326  4476   JMS I ERR1
2327  7240            CLA CMA
2330  3035            DCA PASS
2331  5717            JMP I UNDERR
2332  1135   EQCHK,   TAD M4
2333  7650            SNA CLA
2334  4740            JMS I EQCHKI
2335  7240            CLA CMA
2336  3006            DCA EQRETI
2337  5330   JMP EQCHK-2
2340  3366   EQCHKI,  EQUCHK
2341  0000   PUSH2,   0
2342  3275            DCA ERR2
2343  1142            TAD P5000
2344  1047            TAD POINT
2345  7700            SMA CLA
2346  5364            JMP ERR12
2347  1275            TAD ERR2
2350  3447            DCA I POINT
2351  2047            ISZ POINT
2352  5741            JMP I PUSH2
2353  0000   CNTRLP,  0
2354  6031            KSF
2355  5753            JMP I CNTRLP
2356  6036            KRB
2357  1151            TAD M215
2360  7650            SNA CLA
2361  5763            JMP I   CNTMON          /RETURN TO KILL BUFFER MONITOR RESTART
2362  5753            JMP I CNTRLP
               /
2363  4075   CNTMON,  KILBUF
               /
2364  1015   ERR12,   TAD P11
2365  4476            JMS I ERR1
-
```

/is symbol defined?

/NO — yes — does old def = new def?

/get old val.

/get new val.

/ = 2   ID error

/ if pushdown overflow

/check for car. ret to terminate assembly

00 = spec. char.
01 = undefined
10 = defined
11 = pseudo-op

```
1101    2366  5517          JMP I MON
1102    2367  0000  ANYY,   0
1103    2370  1021          TAD TYPE
1104    2371  1136          TAD P6000
1105    2372  7450          SNA
1106    2373  2020          ISZ ANY
1107    2374  1136          TAD P6000
1110    2375  7650          SNA CLA
1111    2376  2020          ISZ ANY
1112    2377  5767          JMP I ANYY
1113                        EJECT
-
```

// anything assembled on current line "ANYY" is indexed

outputs symbols in alphabetical order

```
1114                    /PDP-12 ASSEMBLER PAGE 10
1115                    *2400
1116    2400    0000    ALPHA,  0
1117    2401    4500            JMS I TYCARI
1120    2402    3307    SYMBLP, DCA     FOUND
1121    2403    1032            TAD     PERMA
1122    2404    3026            DCA     SCURR
1123    2405    7350            CLA CMA CLL RAR
1124    2406    3040            DCA     TEM1A
1125    2407    7350            CLA CLL CMA RAR
1126    2410    3041            DCA     TEM1A+1
1127    2411    7350            CLA CMA CLL RAR
1130    2412    3042            DCA     TEM1A+2
1131    2413    1026    NXCAND, TAD     SCURR
1132    2414    7041            CIA
1133    2415    1027            TAD     SEND
1134    2416    7650            SNA CLA
1135    2417    5274            JMP     PRSYMB
1136    2420    1026            TAD     SCURR
1137    2421    4512            JMS I   SDECO1
1140    2422    6211            6211
1141    2423    1423            TAD I   SADR
1142    2424    7104            CLL RAL
1143    2425    7020            CML
1144    2426    7530            SZL SPA
1145    2427    5270            JMP     REJECT
1146    2430    7070            RAR CMA CML
1147    2431    1040            TAD     TEM1A
1150    2432    7040            CMA
1151    2433    7640            SZA CLA
1152    2434    5252            JMP     JUDGE
1153    2435    2023            ISZ     SADR
1154    2436    7350            CLA CLL CMA RAR
1155    2437    0423            AND I   SADR
1156    2440    7040            CMA
1157    2441    1041            TAD     TEM1A+1
1160    2442    7040            CMA
1161    2443    7640            SZA CLA
1162    2444    5252            JMP     JUDGE
1163    2445    2023            ISZ     SADR
1164    2446    7350            CLA CLL CMA RAR
1165    2447    0423            AND I   SADR
1166    2450    7160            CMA CLL CML
1167    2451    1042            TAD     TEM1A+2
1170    2452    7630    JUDGE,  SZL CLA
1171    2453    5270            JMP     REJECT
1172    2454    6201            CDF     0
1173    2455    1026            TAD     SCURR
1174    2456    4512            JMS I   SDECO1
1175    2457    1023            TAD     SADR
1176    2460    4474            JMS I   MOVE1
1177    2461    0040            TEM1A
1200    2462    6211            6211
1201    2463    6211            6211
1202    2464    1416            TAD I   16
1203    2465    3024            DCA     VAL
1204    2466    1023            TAD     SADR
1205    2467    3307            DCA     FOUND
1206    2470    7200    REJECT, CLA
1207    2471    6201            CDF     0
1210    2472    2026            ISZ     SCURR
1211    2473    5213            JMP     NXCAND
1212                    /
-
```

```
1213    2474  1307  PRSYMB, TAD      FOUND
1214    2475  7450          SNA
1215    2476  5600          JMP I    ALPHA
1216    2477  3023          DCA      SADR
1217    2500  7240          CLA CMA
1220    2501  6211          6211
1221    2502  3707          DCA I    FOUND
1222    2503  6201          CDF      Ø
1223    2504  4706          JMS I    POSANDV
1224    2505  5202          JMP      SYMBLP
1225                /
1226                /
1227                /
1230    2506  2600  POSANDV,OSANDV
1231    2507  0000  FOUND,   Ø
1232                /
1233                /
1234                /
1235                /
1236    2510  0000  TYCAR,   Ø
1237    2511  1154          TAD      P215
1240    2512  4401          JMS I    DECOUT
1241    2513  1153          TAD      P212
1242    2514  4401          JMS I    DECOUT
1243    2515  4470          JMS I    CHEKER
1244    2516  4404          JMS I    CNTLPI          /TEST FOR CARRAGE RETURN
1245    2517  5710          JMP I    TYCAR
1246    2520  0000  CURSKP, Ø
1247    2521  1012          TAD CURLIN
1250    2522  4462          JMS I SOPS
1251    2523  1335          TAD M22
1252    2524  4475          JMS I SKIP
1253    2525  4461          JMS I EMPTY1
1254    2526  5720          JMP I CURSKP
1255    2527  0000  TYPO,   Ø
1256    2530  6041          TSF
1257    2531  5330          JMP .-1
1260    2532  6046          TLS
1261    2533  7200          CLA
1262    2534  5727          JMP I TYPO
1263    2535  7756  M22,    -22
1264                TEMPA=TYCAR
1265                /
1266                /
1267                /
1270                /
1271                /
1272                /
1273                /
1274    2536  4747  XCHAIN, JMS I    OXWRIT
1275    2537  2555          XPSEU
1276    2540  4746          JMS I    OXREAD
1277    2541  2551          XINIT
1300    2542  4750          JMS I    XPP
1301    2543  4746          JMS I    OXREAD
1302    2544  2555          XPSEU
1303    2545  5501          JMP I    MAIN1
1304                /
1305                /
1306                /
1307                /
1310    2546  7774  OXREAD, 7774
1311    2547  7775  OXWRIT, 7775
-
```

```
1312    2550  5000  XPP,    XXXX
1313    2551  0100  XINIT,  DIALUNIT
1314    2552  0012          12
1315    2553  0024          BCHAIN
1316    2554  0001          1
1317                  /
1320                  /
1321    2555  0100  XPSEU,  DIALUNIT
1322    2556  0012          12
1323    2557  0025          SCRATCH
1324    2560  0001          1
1325                  /
1326                  /
1327                  /
1330                  /
1331                  /
1332                  /
1333                  /
1334                  /
1335                  /
1336                  /
1337                  /
1340    2561  0000  SEMITX, 0
1341    2562  1375          TAD     XM13
1342    2563  7450          SNA
1343    2564  5367          JMP     .+3
1344    2565  1376          TAD     XP46
1345    2566  5761          JMP I   SEMITX
1346    2567  1373          TAD     SEMFDG          /REPLACE LINE BOPPER BY A NOP
1347    2570  3774          DCA I   SEMPTF
1350    2571  1376          TAD     XP46
1351    2572  5761          JMP I   SEMITX
1352                  /
1353                  /
1354                  /
1355    2573  7000  SEMFDG, NOP
1356    2574  1707  SEMPTF, JBMSTR                  /POINTER TO THE ISZ,
1357    2575  7765  XM13,   -13
1360    2576  0046  XP46,   46
1361                  /
1362                  /
1363                  /
1364                  /
1365                  /
1366                  /
1367                  EJECT
```

```
1370                    /PDP-12 ASSEMBLER PAGE 11
1371                    /OUTPUT A SYMBOL AND ITS VALUE
1372                    *2600
1373    2600  0000      OSANDV, 0
1374    2601  4213              JMS OSYM          /OUTPUT SYMBOL
1375    2602  1175              TAD TBCONT
1376    2603  1302              TAD M7
1377    2604  4475              JMS I SKIP        /OUTPUT TAB
1400    2605  4624              JMS I LINK8
1401    2606  1024              TAD VAL
1402    2607  4261              JMS OPS           /OUTPUT NUMBER
1403    2610  4500              JMS I TYCARI
1404    2611  4404      JMS I CNTLPI
1405    2612  5600              JMP I OSANDV
1406    2613  0000      OSYM,   0
1407    2614  3175              DCA TBCONT
1410    2615  1040              TAD TEM1A
1411    2616  4225              JMS OX
1412    2617  1041              TAD TEM1A+1
1413    2620  4225              JMS OX
1414    2621  1042              TAD TEM1A+2
1415    2622  4225              JMS OX
1416    2623  5613              JMP I OSYM
1417    2624  3551      LINK8,  LINK8A
1420    2625  0000      OX,     0
1421    2626  3053              DCA LWC
1422    2627  3052              DCA HIC
1423    2630  1053              TAD LWC
1424    2631  7450              SNA
1425    2632  5613              JMP I OSYM
1426    2633  1125              TAD M45
1427    2634  7510              SPA
1430    2635  5240              JMP DV3
1431    2636  2052              ISZ HIC
1432    2637  5233              JMP .-4
1433    2640  1301      DV3,    TAD P45
1434    2641  3053              DCA LWC
1435    2642  1052              TAD HIC
1436    2643  4247              JMS UNTRAN
1437    2644  1053              TAD LWC
1440    2645  4247              JMS UNTRAN
1441    2646  5625              JMP I OX
1442    2647  0000      UNTRAN, 0
1443    2650  7450              SNA
1444    2651  5613              JMP I OSYM
1445    2652  1123              TAD M33
1446    2653  7510              SPA
1447    2654  1303              TAD P53
1450    2655  1304              TAD P260
1451    2656  4401              JMS I DECOUT
1452    2657  2175              ISZ TBCONT
1453    2660  5647              JMP I UNTRAN
1454                    /OCTAL PRINT SUBROUTINE
1455    2661  0000      OPS,    0
1456    2662  3213              DCA OSYM
1457    2663  1135              TAD M4
1460    2664  3175              DCA TBCONT
1461    2665  1213              TAD OSYM
1462    2666  7006              RTL
1463    2667  7004              RAL
1464    2670  3213              DCA OSYM
1465    2671  1213              TAD OSYM
1466    2672  7004              RAL
-
```

Decode a word of symbol by ÷45₈

convert from 6 bit internal to ASCII

```
1467      2673  0157            AND P7
1470      2674  1304            TAD P260
1471      2675  4401            JMS I DECOUT
1472      2676  2175            ISZ TBCONT
1473      2677  5265            JMP OPS+4
1474      2700  5661            JMP I OPS
1475      2701  0045  P45,      45
1476      2702  7771  M7,       -7
1477      2703  0053  P53,      53
1500      2704  0260  P260,     260
1501      2705  4477  FLDUP,    JMS I EXPR1
1502      2706  1037            TAD MODE
1503      2707  7700  SMA CLA
1504      2710  5314  JMP FORT
1505      2711  1020            TAD ANY
1506      2712  7640            SZA CLA
1507      2713  5317            JMP FIELDM
1510      2714  4465  FORT,     JMS I PASSEK
1511      2715  4466            JMS I CURSKA
1512      2716  5501            JMP  I MAIN1
1513      2717  1033  FIELDM,   TAD EVAL
1514      2720  7710            SPA CLA
1515      2721  5314            JMP FORT
1516      2722  7344            MTWO
1517      2723  1033            TAD     EVAL
1520      2724  7700            SMA CLA
1521      2725  5314            JMP FORT
1522      2726  1033            TAD EVAL
1523      2727  3036            DCA FLDWD
1524      2730  5314            JMP FORT
1525                    LISTA*,
1526                            EJECT
-
```

outputs contents of EVAL (the generated binary)

```
1527                    /PDP-12 ASSEMBLER PAGE 12
1530                    *3000
1531    3000    2661            OPS
1532    3001    0000    PUNONE, 0
1533    3002    5601            JMP I PUNONE    /NOP FOR PASS 2
1534    3003    1030            TAD AADR
1535    3004    0155            AND P7400
1536    3005    7106            CLL RTL
1537    3006    7006            RTL
1540    3007    7004            RAL
1541    3010    1176            TAD  BINTAB
1542    3011    3010            DCA BINPTR
1543    3012    1036            TAD FLDWD
1544    3013    7650            SNA CLA
1545    3014    5220            JMP BINCK
1546    3015    1010            TAD BINPTR
1547    3016    1300            TAD P20
1550    3017    3010            DCA BINPTR
1551    3020    1010    BINCK,  TAD BINPTR
1552    3021    7041            CIA
1553    3022    1011            TAD BINBLK
1554    3023    7640            SZA CLA
1555    3024    4676            JMS I NOTBL1
1556    3025    4577            JMS I   SETINU          /SET BITS NOWWIN HEADER BLOCK
1557    3026    1030            TAD AADR
1560    3027    0277            AND P377
1561    3030    1142            TAD P5000
1562    3031    3140            DCA     LOWTMP
1563    3032    1033            TAD EVAL
1564    3033    3540            DCA I   LOWTMP
1565    3034    1003            TAD LISTWD
1566    3035    7710            SPA CLA
1567    3036    5601            JMP I PUNONE
1570    3037    1167            TAD ERRCNT
1571    3040    7640            SZA CLA
1572    3041    5246            JMP NONER
1573    3042    1012    ABNOP1, TAD     CURLIN
1574    3043    4600    ABNOP2, JMS I   PUNONE-1
1575    3044    1301    ABNOP3, TAD     M6
1576    3045    4475    ABNOP4, JMS I   SKIP
1577    3046    1037    NONER,  TAD MODE
1600    3047    7700            SMA CLA
1601    3050    5262            JMP LNKA
1602    3051    1030            TAD AADR
1603    3052    4600    AADRL,  JMS I PUNONE-1
1604    3053    7344            MTWO
1605    3054    4475            JMS I SKIP
1606    3055    1033            TAD EVAL
1607    3056    4600            JMS I PUNONE-1
1610    3057    7344            MTWO
1611    3060    4475            JMS I SKIP
1612    3061    5601            JMP I   PUNONE
1613    3062    1030    LNKA,   TAD AADR
1614    3063    0136            AND P6000
1615    3064    7041            CIA
1616    3065    1046            TAD ABANK
1617    3066    7650            SNA CLA
1620    3067    5273            JMP SAMES
1621    3070    1030            TAD AADR
1622    3071    0131            AND P3777
1623    3072    5252            JMP AADRL
1624    3073    1030    SAMES,  TAD AADR
1625    3074    0144            AND P1777
-
```

```
1626       3075  5252            JMP  AADRL
1627       3076  3616  NOTBL1,   NOTBLK
1630       3077  0377  P377,     377
1631       3100  0020  P20,      20
1632       3101  7772  M6,       -6
1633                   SYMBUF=,
1634                   /
1635                   /
1636                   /
1637                   /
1640                   /
1641                   /
1642                   /
1643                   /
1644                   /
1645                   /
1646                   /
1647                           EJECT
-
```

```
1650                    /PDP-12 ASSEMBLER PAGE 13
1651                            *3200
1652                    /
1653                    /
1654        3200  3271          TABLE
1655                    /
1656        3201  0000  ERROR,   0
1657        3202  1200          TAD ,-2
1660        3203  3237          DCA UNREF-1
1661        3204  4465          JMS I   PASSEK          /CHECK FOR LISTING AND PASS2.
1662        3205  1167          TAD     ERRCNT
1663        3206  7640          SZA CLA
1664        3207  4500          JMS I   TYCARI
1665        3210  1012          TAD CURLIN
1666        3211  4462          JMS I SOPS
1667        3212  7344          MTWO
1670        3213  4475          JMS I SKIP
1671        3214  1637          TAD I UNREF-1
1672        3215  0160          AND P77
1673        3216  1143          TAD P300
1674        3217  4401          JMS I DECOUT
1675        3220  1637          TAD I UNREF-1
1676        3221  7012          RTR
1677        3222  7012          RTR
1700        3223  7012          RTR
1701        3224  0160          AND P77
1702        3225  1143          TAD P300
1703        3226  4401          JMS I DECOUT
1704        3227  7344          MTWO
1705        3230  4475          JMS I SKIP
1706        3231  2167          ISZ ERRCNT
1707        3232  7000          NOP
1710        3233  4465          JMS I   PASSEK
1711        3234  7410          SKP
1712        3235  4500          JMS I TYCARI
1713        3236  5601          JMP I ERROR
1714                    /
1715        3237  0000          0
1716        3240  2317  UNREF,  UNDERR
1717        3241  1332          AAS
1720        3242  0000  GETASY, 0
1721        3243  7200          CLA
1722        3244  3050          DCA IN
1723        3245  4641          JMS I GETASY-1
1724        3246  1050          TAD IN
1725        3247  7650          SNA CLA
1726        3250  5642          JMP I GETASY
1727        3251  4670          JMS I SEAR1
1730        3252  7610          SKP CLA
1731        3253  5262          JMP CKUN                /FOUND
1732        3254  3024          DCA VAL
1733        3255  4667          JMS I ENTS1
1734        3256  2000          USYMB
1735        3257  7307          CLA CLL IAC RTL /4      /US
1736        3260  4640          JMS I GETASY-2
1737        3261  5642          JMP I GETASY
1740        3262  1021  CKUN,    TAD TYPE
1741        3263  1136          TAD P6000
1742        3264  7640          SZA CLA
1743        3265  5642          JMP I GETASY
1744        3266  5257          JMP CKUN-3
1745        3267  2000  ENTS1,   ENTS
1746        3270  0266  SEAR1,   SEARCH
-
```

```
1747                    /TABLE OF ERROR MESSAGES
1750        3271  0511  TABLE,  0511      /IE  ILLEGAL EQUALS
1751        3272  2211          2211      /IR  ILLEGAL REFERENCE
1752        3273  0411          0411      /ID  ILLEGAL REDEFINITION
1753        3274  0311          0311      /IC  ILLEGAL CHARACTER
1754        3275  2325          2325      /US  REFERENCE TO UNDEFINED SYMBOL
1755        3276  1503          1503      /CM  COMMA USED INCORRECTLY
1756        3277  1003          1003      /CH  CHAINING ERROR,
1757        3300  0523          0523      /SE  SYSBOL TABLE EXCEEDED
1760        3301  0127          0127      /WA WORKING AREA EXCEEDED
1761        3302  2320          2320      /PS PUSH DOWN LIST EXCEEDED
1762        3303  7610  LNKMOD, CLA SKP
1763        3304  7240  PDP8MD, CLA CMA
1764        3305  3037          DCA     MODE
1765        3306  1037          TAD     MODE
1766        3307  1316          TAD     P6321
1767        3310  3375          DCA     INSYM
1770        3311  4772          JMS I   SYREAD
1771        3312  3373          SYCRAP                  /SWAP THE CORRECT SYMBOL TABLE IN NOW
1772        3313  4463          JMS I RESET1
1773        3314  4502          JMS I PAGE1
1774        3315  5503          JMP I   B21             /CLEAN UP THE SYSTEM, WE RE DONE WITH THIS ONE,
1775        3316  0042  P6321,  D6+42-300
1776        3317  0000  SYSIN,  0
1777        3320  7300          CLA CLL
2000        3321  2351          ISZ WDHALF
2001        3322  5340          JMP LEFTHF
2002        3323  1752          TAD I PTBUFP
2003        3324  0160          AND P77
2004        3325  3007          DCA TEMP
2005        3326  2352          ISZ PTBUFP
2006        3327  2354          ISZ CHRC
2007        3330  5336          JMP RTHFT
2010        3331  1155          TAD P7400
2011        3332  3354          DCA CHRC
2012        3333  1353          TAD PTBUFF
2013        3334  3352          DCA PTBUFP
2014        3335  4750          JMS I BUFI
2015        3336  1007  RTHFT,  TAD TEMP
2016        3337  5717          JMP I SYSIN
2017        3340  7040  LEFTHF, CMA
2020        3341  3351          DCA WDHALF
2021        3342  1752          TAD I PTBUFP
2022        3343  7012          RTR
2023        3344  7012          RTR
2024        3345  7012          RTR
2025        3346  0160          AND P77
2026        3347  5717          JMP I SYSIN
2027        3350  4006  BUFI,   BUFIN
2030        3351  0000  WDHALF, 0
2031        3352  0000  PTBUFP, 0
2032        3353  4400  PTBUFF, 4400
2033        3354  0000  CHRC,   0
2034        3355  0000  PASSER, 0
2035        3356  1003          TAD LISTWD
2036        3357  7710          SPA CLA
2037        3360  5364          JMP .+4
2040        3361  1035          TAD PASS
2041        3362  7710          SPA CLA
2042        3363  5755          JMP I PASSER
2043        3364  2355          ISZ PASSER
2044        3365  5755          JMP I PASSER
2045        3366  0000  EQUCHK,0
-
```

```
2046      3367  2006  ISZ EQRETI
2047      3370  4476  JMS I ERR1
2050      3371  5766  JMP I EQUCHK
2051      3372  7774  SYREAD, READ
2052                  /
2053                  /
2054                  /
2055                  /
2056                  /
2057                  /
2060      3373  0100  SYCRAP, DIALUNIT
2061      3374  0036        36
2062      3375  0000  INSYM,  0
2063      3376  0001        1
2064                  /
2065                  /
2066                  /
2067                  /
2070                  /
2071                  /
2072                  /
2073                  /
2074                  /
2075                        EJECT
-
```

```
2076                    /PDP-12 ASSEMBLER PAGE 14
2077                    /
2100                    /
2101                            *3400
2102    3400    0000    BIT6,   0
2103    3401    1051            TAD ITEM
2104    3402    1013            TAD M40
2105    3403    7510            SPA
2106    3404    5225            JMP P1TO37
2107    3405    1254            TAD M20
2110    3406    7510            SPA
2111    3407    5212            JMP P40T57
2112    3410    4640            JMS I   SEMITE
2113    3411    5600            JMP I BIT6
2114    3412    1015    P40T57, TAD P11
2115    3413    7450            SNA
2116    3414    5241            JMP TABA
2117    3415    1256            TAD P2
2120    3416    7450            SNA
2121    3417    5250            JMP P367A
2122    3420    1256            TAD P2
2123    3421    7450            SNA
2124    3422    5243            JMP CARET
2125    3423    1257            TAD P57
2126    3424    5600            JMP I BIT6
2127    3425    7200    P1TO37, CLA
2130    3426    1051            TAD ITEM
2131    3427    1123            TAD M33
2132    3430    7510            SPA
2133    3431    5245            JMP ALPHAB
2134    3432    1262            TAD     BIT6M3
2135    3433    7700            SMA CLA
2136    3434    5250            JMP P367A
2137    3435    1051            TAD ITEM
2140    3436    1260            TAD P41
2141    3437    5600            JMP I BIT6
2142                    /
2143                    /
2144    3440    2561    SEMITE, SEMITX
2145                    /
2146                    /
2147    3441    1255    TABA,   TAD P54
2150    3442    5600            JMP I BIT6
2151    3443    1261    CARET,  TAD P46
2152    3444    5600            JMP I BIT6
2153    3445    7200    ALPHAB, CLA
2154    3446    1051            TAD ITEM
2155    3447    5600            JMP I BIT6
2156    3450    7325    P367A,  PTHREE
2157    3451    4476            JMS I ERR1
2160    3452    5653            JMP I .+1
2161    3453    2040            IDX+1
2162    3454    7760    M20,    -20
2163    3455    0054    P54,    54
2164    3456    0002    P2,     2
2165    3457    0057    P57,    57
2166    3460    0041    P41,    41
2167    3461    0046    P46, 46
2170    3462    7775    BIT6M3, -3
2171    3463    0000    DISRET, 0
2172    3464    4500            JMS I   TYCARI          /GIVE A CARRIAGE RETURN BEFORE THE SYMBOL TABLE
2173    3465    1002            TAD     ERTOT           /GET THE TOTAL NUMBER OF ERRORS
2174    3466    7450            SNA                     /ZERO?
```

```
2175    3467  5277          JMP     LWD             /YEP, PRINT OUT MESSAGE WITH "NO" PREFIX
2176    3470  7110          CLL RAR                 /JUST 1 ERROR?
2177    3471  7450          SNA
2200    3472  3320          DCA     MESSS           /REMOVE THE FINAL S NOW
2201    3473  7004          RAL
2202    3474  4462          JMS I   SOPS            /OUTPUT THE OCTAL NUMBER OF ERRORS
2203    3475  2277          ISZ     LWD             /PUSH PAST THE "NO" PART OF THE MESSAGE
2204    3476  2277          ISZ     LWD
2205                  /
2206    3477  1310  LWD,    TAD     MESS            /GET A WORD OF THE MESSAGE
2207    3500  7450          SNA                     /ZERO??
2210    3501  5304          JMP     LWDE            /YEP, THATS ALL
2211    3502  4401          JMS I   DECOUT          /OUTPUT THE LETTER
2212    3503  5276          JMP     LWD-1           /GET THE NEXT CHARACTER NOW
2213                  /
2214    3504  1322  LWDE,   TAD     PCONT           /OVERLAYED INSTRUCTION.
2215    3505  3322          DCA     PCONT
2216    3506  5663          JMP I   DISRET          /AND RETURN TO CALLER
2217                                                /SYSTEM WILL GIVE THE EXTRA CRLF AFTER
2220                                                /DECIDING IF THERES ANY BINARY,
2221                  /
2222                  /
2223                  /
2224    3507  7677  LWDEFD, 7677                   /MAGIC NUMBER FOR FORM FEED PROBLEM AT SYMBOL TABLE TIME.
2225                  /
2226                  /
2227                  /
2230                  /
2231                  /
2232    3510  0316  MESS,   316                     /"NO"
2233    3511  0317          317
2234    3512  0240          240                     /" ERRORS"
2235    3513  0305          305
2236    3514  0322          322
2237    3515  0322          322
2240    3516  0317          317
2241    3517  0322          322
2242    3520  0323  MESSS,  323                     /FINAL OPTIONAL S
2243    3521  0000          0000                    /TERMINATING ZERO WORD
2244                  /
2245                  /
2246                  /
2247                  /
2250                  /
2251    3522  7777  PCONT,  7777
2252    3523  0043  P43,    43
2253    3524  0000  PAGSET, 0
2254    3525  2322          ISZ PCONT
2255    3526  5341          JMP COSA
2256    3527  1135          TAD M4
2257    3530  3016          DCA 16
2260    3531  1323          TAD P43
2261    3532  1153  TATA,   TAD P212
2262    3533  4401          JMS I DECOUT
2263    3534  1154          TAD     P215
2264    3535  4401          JMS I DECOUT
2265    3536  2016          ISZ 16
2266    3537  5332          JMP TATA
2267    3540  5724          JMP I PAGSET
2270    3541  1322  COSA,   TAD PCONT
2271    3542  7041          CIA
2272    3543  1127          TAD P76
2273    3544  7640          SZA CLA
```

```
2274    3545  5724          JMP I PAGSET
2275    3546  7240          CLA CMA
2276    3547  3322          DCA PCONT
2277    3550  5724          JMP I PAGSET
2300    3551  0000  LINK8A, 0
2301    3552  6211          6211
2302    3553  4767          JMS I GYP
2303    3554  6201          6201
2304    3555  1014          TAD TYPEA
2305    3556  0144          AND P1777
2306    3557  7650          SNA CLA
2307    3560  5751          JMP I LINK8A
2310    3561  1014          TAD TYPEA
2311    3562  7106          RTL CLL
2312    3563  0136          AND P6000
2313    3564  1024          TAD     VAL
2314    3565  3024          DCA VAL
2315    3566  5751          JMP I LINK8A
2316    3567  3623  GYP,    GETYPE
2317    3570  7300  THOU, CLA CLL
2320    3571  1053          TAD LWC
2321    3572  7012          RTR
2322    3573  7012          RTR
2323    3574  3164          DCA CON
2324    3575  5776          JMP I C1A
2325    3576  1055  C1A,    C
2326                /
2327                /
2330                /
2331                /
2332                EJECT
```

If line mode, add on the two word bits for printout

```
2333                    /PDP-12 ASSEMBLER PAGE 15
2334                    /
2335                    /
2336                            *3600
2337                    /
2340    3600    0000    CONVRT, 0
2341    3601    0160            AND P77
2342    3602    1013            TAD M40
2343    3603    7510            SPA
2344    3604    1351            TAD P100
2345    3605    1134            TAD P240
2346    3606    5600            JMP I CONVRT
2347                    /
2350                    /
2351                    /
2352                    /
2353    3607    0000    UPLN,   0
2354    3610    4500            JMS I   TYCARI
2355    3611    1261            TAD     M26
2356    3612    4475            JMS I   SKIP
2357    3613    1262            TAD     M60A
2360    3614    3173            DCA     SPCUNT
2361    3615    5607            JMP I   UPLN
2362    3616    0000    NOTBLK, 0
2363    3617    1011            TAD BINBLK
2364    3620    4513            JMS I SRITIC
2365    3621    4253            JMS SETUSE
2366    3622    5616            JMP I NOTBLK
2367    3623    0000    GETYPE, 0
2370    3624    1423            TAD I SADR
2371    3625    0136            AND P6000
2372    3626    3014            DCA TYPEA
2373    3627    2023            ISZ SADR
2374    3630    1423            TAD I SADR
2375    3631    0150            AND     P4000
2376    3632    7112            CLL RTR
2377    3633    1014            TAD TYPEA
2400    3634    3014            DCA TYPEA
2401    3635    2023            ISZ SADR
2402    3636    1423            TAD I SADR
2403    3637    7012            RTR
2404    3640    7010            RAR
2405    3641    0124            AND P400
2406    3642    1014            TAD TYPEA
2407    3643    3014            DCA TYPEA
2410    3644    1014            TAD TYPEA
2411    3645    0136            AND P6000
2412    3646    3021            DCA TYPE
2413    3647    7344            MTWO
2414    3650    1023            TAD     SADR
2415    3651    3023            DCA SADR
2416    3652    5623            JMP I GETYPE
2417    3653    0000    SETUSE, 0
2420    3654    1010            TAD BINPTR
2421    3655    4515            JMS I SRD1
2422    3656    1010            TAD BINPTR
2423    3657    3011            DCA BINBLK
2424    3660    5653            JMP I SETUSE
2425    3661    7752    M26,    -26
2426    3662    7716    M60A,   -62
2427    3663    0000    RESETL, 0
2430    3664    1030            TAD AADR
2431    3665    0136            AND P6000
-
```

get 1st word, current symbol

get type of symbol & place in "TYPE"

get 2nd word, current symbol

get 3rd word

reset to 1st word

```
2432    3666  3046          DCA     ABANK
2433    3667  5663          JMP I RESETL
2434    3670  0000  GETIN,  0               /GET A CHARACTER from input
2435    3671  4467          JMS I GETCHR
2436    3672  3051          DCA ITEM
2437    3673  1035          TAD PASS
2440    3674  7710  CONSKP, SPA CLA
2441    3675  4471          JMS I SYMLST
2442    3676  1051          TAD ITEM
2443    3677  5670          JMP I GETIN
2444    3700  7710  CONYES, SPA CLA
2445    3701  1300  COMMEN, TAD     CONYES          /SPA FOR NORMAL,SKP FOR ABBREVIATED!!
2446    3702  3274          DCA     CONSKP
2447    3703  4270          JMS     GETIN
2450    3704  1122          TAD M43
2451    3705  7640          SZA CLA
2452    3706  5301          JMP     COMMEN
2453    3707  1325          TAD     CONREG
2454    3710  3274          DCA     CONSKP
2455    3711  5712          JMP I   BITT
2456    3712  2047  BITT,   BIT
2457                /
2460                /
2461    3713  0000  RAND,   0               /Do "AND"
2462    3714  0164          AND     CON
2463    3715  3164          DCA     CON
2464    3716  5713          JMP I   RAND
2465                /
2466                /
2467                /
2470                /
2471    3717  1035  ENDMS,  TAD     PASS
2472    3720  7710          SPA CLA
2473    3721  5516          JMP I   RET1
2474    3722  5472          JMP I   MAINEX
2475                /
2476                /
2477                /
2500    3723  0000  PGJS,   0
2501    3724  1003          TAD     LISTWD
2502    3725  7710  CONREG, SPA CLA
2503    3726  5723          JMP I   PGJS
2504    3727  1736          TAD I   PCOT
2505    3730  1356          TAD     M77             /FINAL UPPER
2506    3731  3017          DCA     17
2507    3732  4500          JMS I   TYCARI
2510    3733  2017          ISZ     17
2511    3734  5332          JMP     .-2
2512    3735  5723          JMP I   PGJS
2513    3736  3522  PCOT,   PCONT
2514                /
2515                /
2516                /
2517    3737  0000  LNCK,   0
2520    3740  2173          ISZ     SPCUNT
2521    3741  5343          JMP .+2
2522    3742  4207          JMS UPLN
2523    3743  5737          JMP I LNCK
2524    3744  0000  SPACK,  0
2525    3745  3007          DCA TEMP
2526    3746  1007          TAD TEMP
2527    3747  7040          CMA                     /-(TEMP+1)
2530    3750  1173          TAD     SPCUNT
-
```

```
2531    3751  7500  P100,   SMA                     /TOO FAR???
2532    3752  7240          CLA CMA
2533    3753  3173          DCA     SPCUNT
2534    3754  1007          TAD TEMP
2535    3755  5744          JMP I SPACK
2536                /
2537    3756  7701  M77,    -77
2540                /
2541                /
2542                /
2543                /
2544                /
2545    3757  0000  STOCHK, 0
2546    3760  1171          TAD     SNUM
2547    3761  7040          CMA
2550    3762  1032          TAD     PERMA
2551    3763  7710          SPA CLA
2552    3764  5757          JMP I   STOCHK
2553    3765  1370          TAD     P5
2554                /
2555    3766  4476  EQUERR, JMS I   ERR1            /GIVE ERROR MESSAGE,
2556    3767  5771          JMP I   EDEFIN
2557                /
2560    3770  0005  P5,     5
2561    3771  1416  EDEFIN, MAINSF
2562                /
2563                /
2564                /
2565                /
2566                      EJECT
-
```

```
2567                    /
2570                    /
2571                    /
2572                    /
2573                    /
2574                            /ASSEMBLER PAGE16   !!!!
2575                            *4001           /4000 IS THE JMP RET STORE IN LMODE.
2576    4001    3463            DISRE,  DISRET
2577                            *4002
2600    4002    1370    FSBLK,  1000+D7
2601    4003    0000    FSUNIT, 0
2602    4004    2400    AALPHA, ALPHA
2603    4005    7774    LTREAD, READ
2604    4006    0000    BUFIN,  0               /GETS NEXT BUFFER FROM INPUT UNIT.
2605    4007    4605            JMS I   LTREAD
2606    4010    4175            BBLOCK
2607    4011    2377            ISZ     BUFINZ
2610    4012    5606            JMP I   BUFIN
2611    4013    0000    INIT,   0               /INITIALIZATION ROUTINE: CALLED AT BEGINNING OF EACH PASS.
2612    4014    4500            JMS I TYCARI
2613    4015    1202            TAD FSBLK
2614    4016    0374            AND     L777
2615    4017    3377            DCA BUFINZ
2616    4020    1203            TAD     FSUNIT
2617    4021    3375            DCA     BBLOCK
2620    4022    1241            TAD P2270
2621    4023    3010            DCA     BINPTR          /SET UP POINTER, SETUSE WILL SET BINBLK
2622    4024    4643            JMS I   TOUSE          /CALL SET USE NOW.
2623    4025    1155            TAD P7400
2624    4026    3645            DCA I CHO
2625    4027    3642            DCA I WDH
2626    4030    1246            TAD P4400
2627    4031    3647            DCA I PTB
2630    4032    4206            JMS     BUFIN
2631    4033    3037            DCA     MODE            /RESET TO LMODE AND READ IN SYMBOL TABLE.
2632    4034    4605            JMS I   LTREAD
2633    4035    4170            LTAB
2634    4036    7240            CLA CMA
2635    4037    3012            DCA CURLIN
2636    4040    5613            JMP I INIT
2637    4041    2400    P2270,  2000+D7+10
2640    4042    3351    WDH,    WDHALF
2641    4043    3653    TOUSE,  SETUSE
2642    4044    4337    USES,   USEDNO
2643    4045    3354    CHO,    CHRC
2644    4046    4400    P4400,  4400
2645    4047    3352    PTB,    PTBUFP
2646    4050    5737    OCHECK, CHECKO                  /POINTS TO THE NO-BINARYY CHECKER
2647    4051    1011    RETURN, TAD     BINBLK          /MAIN EXIT AFTER PASS2, WRITES OUT SYMBOLS, DUMPS BUFFERS, ETC.
2650    4052    4513            JMS I SRITIC
2651    4053    1244            TAD  USES
2652    4054    3016            DCA 16
2653    4055    1013            TAD M40
2654    4056    3017            DCA 17
2655    4057    3644            DCA I   USES
2656    4060    1416            TAD I 16
2657    4061    7710            SPA CLA
2660    4062    2644            ISZ I   USES
2661    4063    2017            ISZ 17
2662    4064    5260            JMP .-4
2663    4065    4763            JMS I   RWRITE
2664    4066    4164            BINHDR
2665    4067    4601            JMS I   DISRE
```

```
2666    4070  4650          JMS I   OCHECK          /CHECK FOR NO BINARY, ALSO GIVE CARRIAGE
2667                                                /RETURN AFTER ERROS MESSAGE, MUST GO
2670                                                /AFTER CALL TO DISRET
2671    4071  4604          JMS I   AALPHA
2672    4072  4674          JMS I   PSTS
2673    4073  5517          JMP I   MON
2674    4074  3723  PSTS,   PGJS
2675                /
2676                /
2677                /
2700                /
2701    4075  3733  KILBUF,  DCA I   PCOUNT         /ZERO THE COUNTER NOW
2702    4076  1731          TAD I   PINP            /POSITION THE INPUT POINTER TO PATCH
2703    4077  3732          DCA I   POUTP           /THE OUTPUT POINTER
2704    4100  3314          DCA     KLOOP           /RESET C.R, CHECKER AFTER C,R, ABORT
2705                /
2706                /
2707                /
2710                /
2711                /
2712    4101  4736  MONIT,  JMS I   MMMOVE
2713    4102  6201          CDF     0
2714    4103  7000          7000
2715    4104  6211          CDF     10
2716    4105  7000          7000
2717    4106  1000          1000
2720    4107  1334          TAD     PL215           /GIVE AN EXTRA C.R,L.F FOR GOOD MESSURE
2721    4110  4401          JMS I   DECOUT
2722    4111  1335          TAD     PL212
2723    4112  4401          JMS I   DECOUT
2724    4113  4401          JMS I   DECOUT          /GIVE A NULL CHARACTER IN CASE OF TAPE LIST OPTION
2725    4114  4404  KLOOP,  JMS I   CNTLPI          /CHECK FOR A C.R, TO TERMINATE THE OUTPUT
2726    4115  4541          JMS I   PCHECK
2727    4116  1733          TAD I   PCOUNT
2730    4117  7640          SZA CLA
2731    4120  5314          JMP     KLOOP           /WAIT UNTIL THE BUFFER IS EMPTY,
2732    4121  1330          TAD     PL17
2733    4122  6664          LPR
2734    4123  0000  0
2735    4124  2000          ISZ     0
2736    4125  4323          JMS     .-2             /WAIT FOR LPR TO TAPE EFFECT
2737    4126  6212          CIF     10
2740    4127  5730          JMP I   .+1
2741    4130  7777  PL17,   7777
2742                /
2743                /
2744    4131  0722  PINP,   INP
2745    4132  0705  POUTP,  OUTP
2746    4133  0760  PCOUNT, COUNT
2747    4134  0215  PL215,  215
2750    4135  0212  PL212,  212
2751    4136  7200  MMMOVE, 7200
2752                /
2753                /
2754                /
2755    4137  1030  NOS,    TAD AADR
2756    4140  0131          AND P3777
2757    4141  5347          JMP PDLK
2760    4142  2020  PERIOD, ISZ ANY
2761    4143  1037          TAD MODE
2762    4144  7700          SMA CLA
2763    4145  5352          JMP LINKDT
2764    4146  1030          TAD AADR
-
```

```
2765      4147  4434  PDLK,   JMS I SGN
2766      4150  4504          JMS I IDX1
2767      4151  5503          JMP I B21
2770      4152  1030  LINKDT, TAD AADR
2771      4153  0136          AND P6000
2772      4154  7041          CIA
2773      4155  1046          TAD ABANK
2774      4156  7640          SZA CLA
2775      4157  5337          JMP NOS
2776      4160  1030          TAD AADR
2777      4161  0144          AND P1777
3000      4162  5347          JMP PDLK
3001                  /
3002      4163  7775  RWRITE, WRITE
3003                  /
3004      4164  0111  BINHDR, DIALBINARY
3005      4165  0010          10
3006      4166  0057          D7*57-370
3007      4167  0001          1
3010                  /
3011      4170  0100  LTAB,   DIALUNIT
3012      4171  0036          36
3013      4172  0042          D6*42-300
3014      4173  0002          2
3015                  /
3016                  /
3017      4174  0777  L777,   777
3020                  /
3021      4175  0000  BBLOCK, 0
3022      4176  0011          11
3023      4177  0000  BUFINZ, 0
3024      4200  0001          1
3025                  /
3026                  /
3027                  EJECT
-
```

```
3030                            /ASSEMBLER PAGE 17
3031                    /
3032                    /
3033                    /
3034                    /
3035                            ASMIFM  ,-4200
3036                            *4200
3037                    /
3040                    /
3041    4201    0000    SWRC,   0
3042    4202    1305            TAD     SM370
3043    4203    0304            AND     SL777
3044    4204    3317            DCA     SWOUT
3045    4205    4610            JMS I   WWRITE
3046    4206    4315            SIT
3047    4207    5601            JMP I   SWRC
3050                    /
3051    4210    7775    WWRITE, WRITE           r(CON) - c(AC)
3052    4211    0000    RSUB,   0
3053    4212    3227            DCA SOMEW
3054    4213    1164            TAD CON
3055    4214    3232            DCA SUBCON
3056    4215    1037            TAD MODE
3057    4216    7700            SMA CLA
3060    4217    5225            JMP LNKSUB
3061    4220    1227            TAD SOMEW
3062    4221    7041            CIA
3063    4222    1164            TAD CON
3064    4223    3164    RSUBRT, DCA CON
3065    4224    5611            JMP I RSUB
3066    4225    6141    LNKSUB, LINC
3067                            LMODE
3070    0226    1020            LDA I
3071    0227    0000    SOMEW,  0
3072    0230    0017            COM
3073    0231    1120            ADA I
3074    0232    0000    SUBCON, 0
3075    0233    0002            MSC 2
3076                            PMODE
3077    4234    5223            JMP RSUBRT              c(CON) + c(AC)
3100    4235    0000    RADD,   0
3101    4236    3252            DCA WHERE
3102    4237    1164            TAD CON
3103    4240    3254            DCA ADDCON
3104    4241    1037            TAD MODE
3105    4242    7700            SMA CLA
3106    4243    5250            JMP LNKADD
3107    4244    1252            TAD WHERE
3110    4245    1164            TAD CON
3111    4246    3164    RADDRT, DCA CON
3112    4247    5635            JMP I RADD
3113    4250    6141    LNKADD, LINC
3114                            LMODE
3115    0251    1020            LDA I
3116    0252    0000    WHERE,  0
3117    0253    1120            ADA I
3120    0254    0000    ADDCON, 0
3121    0255    0002            MSC 2
3122                            PMODE
3123    4256    5246            JMP RADDRT
3124                    /
3125                    /
3126                    /                       PSEUDO OP SETTER AND PAGER
-
```

```
3127                    /
3130                    /               GIVEN PSEUDO FALLS THROUGH ISZ CHAIN. THIS SETS OP1 TO PSEUDO NUMBER.
3131                    /ROUTINE PAGES IN PSEUDO OP PROCESSOR WITH NUMBER IN AC, PROCESSOR DOES THE REST.
3132                    /FOR 8K,  PSNOPS ARE MADE INTO NOPS, AND PPSEUDO IS CHANGED,
3133                    /
3134    4257    2273    PSUDO7, ISZ     OP1
3135    4260    2273    PSUDO6, ISZ     OP1
3136    4261    2273    PSUDO5, ISZ     OP1
3137    4262    2273    PSUDO4, ISZ     OP1
3140    4263    2273    PSUDO3, ISZ     OP1
3141    4264    2273    PSUDO2, ISZ     OP1
3142    4265    7300    PSUDO1, CLA CLL
3143    4266    1273            TAD     OP1
3144    4267    4674            JMS I   PPSEUDO
3145    4270    3201    PAFTER, DCA     PSRET
3146    4271    3273            DCA     OP1
3147    4272    5601            JMP I   PSRET
3150    4273    0000    OP1,    0
3151                    PSRET=SWRC
3152    4274    5410    PPSEUDO,        PSEUDO          /PSEUDO + CORRECT ORIGIN
3153    4275    0000    SREAD1, 0
3154    4276    1305            TAD     SM370           /SUBTRACT OFF THE EXTRANEOUS CRAP
3155    4277    0304            AND     SL777
3156    4300    3317            DCA     SWOUT
3157    4301    4706            JMS I   WREAD
3160    4302    4315            SIT
3161    4303    5675            JMP I   SREAD1
3162                    /
3163    4304    0777    SL777,  777
3164    4305    7410    SM370,  -370
3165                    /
3166    4306    7774    WREAD,  READ
3167    4307    0000    POPUP1, 0               /PUT LAST ENTRY IN PUSH
3170    4310    7240            CLA CMA
3171    4311    1047            TAD POINT
3172    4312    3047            DCA POINT
3173    4313    1447            TAD I POINT
3174    4314    5707            JMP I POPUP1
3175                    /
3176    4315    0111    SIT,    DIALBINARY
3177    4316    0012            12
3200    4317    0000    SWOUT,  0
3201    4320    0001            1
3202                    /
3203                    /
3204                    /
3205                    /
3206                    /
3207                    /
3210                    /
3211    4321    0000    UBITS,  0                       /THIS ROUTINE SETS THE "IN USE" BITS IN THE HEADER BLOCK
3212    4322    1011            TAD     BINBLK          /GET THE IN USE BLOCK POINTER
3213    4323    1330            TAD     FACTOR          /CONVERT TO AN ABSOLUTE MEMORY ADDRESS
3214    4324    3007            DCA     TEMP            /STORE AWAY NOW
3215    4325    7240            CLA CMA                 /SET THE HEADER BLOCK BITS ALL ONE NOW
3216    4326    3407            DCA I   TEMP            /IN THEY GO
3217    4327    5721            JMP I   UBITS           /RETURN TO THE CALLER, ALL IS WELL
3220                    /
3221                    /
3222    4330    1750    FACTOR, BLKUSE-2000-D7          /CORE HEADER BLOCK MAPPER,
3223                    /
3224                    /
3225                    /
```

```
3226                    /
3227                    /
3230                    /
3231                    /
3232                    /
3233                    /
3234                    /
3235                    /
3236                    /
3237                    /
3240                    /
3241                    /
3242                    /
3243      4331  0100    VSAVE,  DIALUNIT                /THE ACTUAL DIAL AREA
3244      4332  0015            15                      /LOCATIONS 6400-6777
3245      4333  0025            SCRATCH                 /A SCRATCH AREA ON THE TAPE
3246      4334  0001            1                       /1 BLOCK IN OR OUT.
3247                    /
3250                    /
3251                    /
3252                    /
3253                    /
3254                    /
3255                    /
3256                    /
3257                    /
3260                    /
3261                    /
3262                    /
3263                    /
3264                    /
3265                    /
3266                    /
3267                    /
3270                    /
3271                    /
3272                    /
3273                    /
3274                    /
3275                    /
3276                    *4337
3277      4337  0000    USEDNO, 0
3300                    *4340
3301                    BLKUSE=.
3302      4340  0000    0
3303      4341  0000    0
3304      4342  0000    0
3305      4343  0000    0
3306      4344  0000    0
3307      4345  0000    0
3310      4346  0000    0
3311      4347  0000    0
3312      4350  0000    0
3313      4351  0000    0
3314      4352  0000    0
3315      4353  0000    0
3316      4354  0000    0
3317      4355  0000    0
3320      4356  0000    0
3321      4357  0000    0
3322      4360  0000    0
3323      4361  0000    0
3324      4362  0000    0
=
```

```
3325        4363   0000   0
3326        4364   0000   0
3327        4365   0000   0
3330        4366   0000   0
3331        4367   0000   0
3332        4370   0000   0
3333        4371   0000   0
3334        4372   0000   0
3335        4373   0000   0
3336        4374   0000   0
3337        4375   0000   0
3340        4376   0000   0
3341        4377   0000   0
3342                       /
3343                       /
3344                       /
3345                       /
3346                       /
3347                       /
3350                       /
3351                       /
3352                       /
3353                       /
3354                       /
3355                               EJECT
-
```

```
3356                /
3357                /
3360                /
3361                /
3362                /
3363                /
3364                /
3365                /
3366                /
3367                /
3370                /
3371                /
3372                /
3373                /
3374                /
3375                /
3376                /
3377                /
3400                /
3401                /
3402                /       END OF ASSEMTWO, FETCH ASSEM3.
3403                /
3404                /
3405                /
3406                /
3407                /
3410                /
3411                /
3412                /
3413                /
3414                /
3415                /
3416                        CHAIN   "ASSEM3"
```

```
0000                    *20
0001                            PMODE
0002                    /
0003                    /
0004                    /
0005                    /
0006                    /
0007                    /
0010                    /
0011                    /       BEGINNING OF ASSEMTHREE
0012                    /
0013                    /
0014                    /
0015                    /
0016                    /
0017                    /
0020                    /
0021                    /
0022                    /
0023                    /
0024                    /
0025                    /
0026                    /
0027                    /
0030                    /
0031                    /
0032                            EJECT
-
```

```
0033                    /     M A I N   I N I T I A L I Z A T I O N   O F   T H E   A S S E M B L E R
0034                    /
0035                    /
0036                    /
0037                    /
0040                    /
0041                    /
0042                            *5000
0043        5000  7200  BEGNLI, CLA                 /ENTRY IF LIST IS DESIRED.
0044        5001  7410          SKP
0045        5002  7240  BEGNAS, CLA CMA             /ENTRY IF JUST ASSEMBLY.
0046        5003  3003          DCA     LISTWD      /SAVE LIST STATUS CONDITION.
0047        5004  1621          TAD I   P4775       /4775 CONTAINS STARTING LINE NUM. OF LISTING
0050        5005  3620          DCA I   PJSTART
0051        5006  1622          TAD I   P4776       /4776 CONTAINS ENDING LINE NUM, STASH IT AWAY PERMANENTLY.
0052        5007  3617          DCA I   PJEND
0053        5010  1003          TAD     LISTWD
0054        5011  7650          SNA CLA
0055        5012  5216          JMP     .+4
0056        5013  1214          TAD     .+1
0057        5014  7000  JBNOP,  NOP
0060        5015  3637          DCA I   PJNOP       /IF NO LIST THEN FIX JBTEST SO IT CAN NEVER LIST OUT.
0061        5016  5240          JMP     PJNOP+1
0062        5017  1734  PJEND,  JEND
0063        5020  1733  PJSTART,        JSTART
0064        5021  4775  P4775,  4775
0065        5022  4776  P4776,  4776
0066        5023  4774  P4774,  4774
0067        5024  3042  BANOP1, ABNOP1
0070        5025  3043  BANOP2, ABNOP2
0071        5026  3044  BANOP3, ABNOP3
0072        5027  3045  BANOP4, ABNOP4
0073        5030  3700  BANOP5, CONYES
0074        5031  7610  BANDO,  SKP CLA
0075        5032  1374  BLTAD,  1200+M7TWO-ENTS
0076        5033  2107  BLTAD1, NOTAB1
0077        5034  2124  BLTAD2, NOTAB2
0100        5035  7770  BLM10,  -10
0101        5036  2535  BLPM22, M22
0102        5037  1730  PJNOP,  JNOP
0103        5040  2623          ISZ I   P4774       /4774=7777 IF QUICK LIST.
0104        5041  5262          JMP     LISREG      /NO QUICK LIST.
0105        5042  1214          TAD     JBNOP       /CHANGE LIST ROUTINE FOR QL BY ALL FOLLOWING CRAP.
0106        5043  3624          DCA I   BANOP1
0107        5044  1214          TAD     JBNOP
0110        5045  3625          DCA I   BANOP2
0111        5046  1214          TAD     JBNOP
0112        5047  3626          DCA I   BANOP3
0113        5050  1214          TAD     JBNOP
0114        5051  3627          DCA I   BANOP4
0115        5052  1231          TAD     BANDO
0116        5053  3630          DCA I   BANOP5
0117        5054  1232          TAD     BLTAD
0120        5055  3633          DCA I   BLTAD1
0121        5056  1232          TAD     BLTAD
0122        5057  3634          DCA I   BLTAD2
0123        5060  1235          TAD     BLM10
0124        5061  3636          DCA I   BLPM22
0125        5062  1473  LISREG, TAD I   INAS
0126        5063  3472          DCA I   MAINEX       /INITILIZE TO PASS1.
0127        5064  6141          LINC
0130                            LMODE
0131        1065  0641          LOF     1           /SET UP PRINTER CHECK
```

```
0132    1066  1020          LDA I                   /NOW CHANGING TTY ROUTINE TO CALL LINE PRINTER CHECK ROUTINE.
0133    1067  5731          TYPO+3202               /TYPE=2571+3202=5773(JMP I TYPO+2)
0134    1070  1040          STA
0135    1071  2530          TYPO+1
0136    1072  1020          LDA I
0137    1073  6244          LPTEST
0140    1074  1040          STA
0141    1075  2531          TYPO+2
0142    1076  0643          LDF     3
0143    1077  1000          LDA
0144    1100  0777          777
0145    1101  4003          STC     FSUNIT&1777
0146    1102  1000          LDA
0147    1103  0002          FSBLK&1777
0150    1104  1560          BCL I
0151    1105  7000          -777
0152    1106  4002          STC     FSBLK&1777
0153    1107  0002          PDP
0154                        PMODE
0155    5110  6212          CIF     10              /PREPARE TO MOVE DOWN THEREAD ROUTINES.
0156    5111  4730          JMS I   IMMOVE
0157    5112  6211          CDF     10
0160    5113  7000          7000
0161    5114  6201          CDF     0
0162    5115  7000          7000
0163    5116  1000          1000
0164    5117  4731          JMS I   IMREAD
0165    5120  5133          ITABIN
0166    5121  1072          TAD     MAINEX          /FAKE START OF ASSEMBLY BY PLACING
0167    5122  3460          DCA I   INIT1           /STARTING ADDRESS OF ASSEMBLER IN IT
0170    5123  1326          TAD     IM215           /GET A C,R, TO INITIALIZE THE SYSTEM
0171    5124  4727          JMS I   IMTYPO          /AND SEND IT DIRECTLY TO THE OUTPUTER
0172    5125  5732          JMP I   IMINIT          /AND BY JUMPING TO THE SECOND LOC OF INIT
0173                /START THE ASSEMBLER GOING RIGHT NOW...
0174                /
0175                /
0176                /
0177    5126  0215  IM215,  215                     /C,R,
0200    5127  2527  IMTYPO, TYPO
0201    5130  7200  IMMOVE, 7200
0202    5131  7774  IMREAD, READ
0203    5132  4014  IMINIT, INIT+1
0204                /
0205                /
0206                /
0207    5133  0100  ITABIN, DIALUNIT
0210    5134  0013          13
0211    5135  0026          FUDGE1
0212    5136  0002          2
0213                /
0214                /
0215                /
0216                /
0217                /
0220                        EJECT
-
```

```
0221                    /               PSEUDO OP PROCESSOR, IT REALLY IS ORIGINED AT
0222                    /       5000 FOR 4K, BUT IT WOULD THEN OVERLAY THE INITIALIZATION ROUTINE.(AT ASSEMBLY).
0223                    /THUS ITS ASSEMBLED AT 7000 BUT PFUDGE MAKES THE INTERPAGE REFERENCE LOOK LIKE IT S AT 5000.
0224                    / THE 8K VERSION IS REALLY ORIGINED AT 7000, I GENERALLY CHANGE THE INTERPAGE
0225                    /REFERENCES BY HAND(THERE S  ABOUT 6 ON THIS PAGE AND 3 ON THE NEXT PAGE.)
0226                    /ALL INTERBANK REFERENCE HAVE A
0227                    /TO THE DATA ITEMS.
0230                    /REMEMBER, THIS IS FINE AS IS FOR "FUDGE4". FOR FUDGE5 ADD 2000 TO INTERBAGE REFERENCES.
0231                    /
0232                    /
0233                    /
0234                    /
0235                    /
0236                    /
0237                    /
0240                            *5400           /NEW LOCATION OF PSEUDO PROCESSOR
0241                    /
0242                    /
0243                    /
0244                    /       MAIN PSEUDO OP PROCESSOR, PAGED IN!
0245                    /
0246                    /
0247                    /
0250    5400    1202    ACOUNT, 1202            /"JB" ON THE TAPE; IN CORE IT S A TEMPORARY
0251    5401    4377    GETVAL, 4360+VERSION            /VERSION NUMBER ON TAPE, IN CORE IT S
0252                                            /A SUBROUTINE ENTRY,
0253                                            /NO.7
0254                                            /  (CHECKS UNIT 1 TO SEE
0255                                            /IF PRESENT AND IF IT IS USES UNIT
0256                                            /1 TO READ IN THIS PAGE
0257                    /
0260    5402    4477            JMS I   EXPR1
0261    5403    1020            TAD     ANY
0262    5404    7650            SNA CLA
0263    5405    5303            JMP     ASSNO
0264    5406    1033            TAD     EVAL
0265    5407    5601            JMP I   GETVAL
0266                    /
0267                    /GETVAL EVALUATES THE EXPRESION TO THE RIGHT OF A PSEUDO OP,
0270                    /IF NO EXPRESSION THEN IT EXITS,
0271                    /BACK TO THE MAIN ASSEMBLER WITHOUT DOING ANYTHING,
0272                    /
0273                    /
0274                    /
0275                    /
0276                    /
0277    5410    4270    PSEUDO, PAFTER          /RETURN IF OVERLAYED BY ITSELF,
0300    5411    1214            TAD     PJMP
0301    5412    3213            DCA     .+1
0302    5413    5214            JMP     .+1             /OVERLAYED BY PSEUDO NO,
0303    5414    5215    PJMP,   JMP     .+1             /MAIN TABLE POINTER
0304    5415    5224            JMP     NASSIF          /EVIL IF SPELLED RIGHT
0305    5416    5225            JMP     ZASSIF
0306    5417    5226            JMP     MASSIF
0307    5420    5353            JMP     SYMLOD
0310    5421    5316            JMP     AEJECT
0311    5422    5333            JMP     SYMSAV
0312    5423    5235            JMP     SKIPAS
0313                    /
0314                    /
0315                    /END OF JUMP TABLE, PSEUDO WAS CALLED WITH PSEUDO OP NUMBER IN AC,
0316                    /
0317                    /
```

```
0320                    /
0321                    /
0322                    /
0323    5424    1305    NASSIF, TAD     AMM10
0324    5425    1013    ŻASSIF, TAD     M40
0325    5426    1320    MASSIF, TAD     L7710
0326    5427    3231            DCA     .+2             /STORE CORRECT SKP AFTER EVALUATING EXPR.
0327    5430    4201            JMS     GETVAL
0330    5431    0000            Ø
0331    5432    5303            JMP     ASSNO           /WRONG SKIP CONDITION. ASSEMBLE NEXT.
0332    5433    7240            CLA CMA         /DO AN ASMSKP 1.
0333    5434    5241            JMP     ASSYIN
0334    5435    4201    SKIPAS, JMS     GETVAL
0335    5436    7041            CIA
0336    5437    7450            SNA             /NUMBER TO BE SKKIPED. IF ŻERO EXIT.
0337    5440    5303            JMP     ASSNO
0340    5441    3200    ASSYIN, DCA     ACOUNT
0341    5442    1051            TAD     ITEM
0342    5443    1122            TAD     M43             /WAS DOLLAR TERMINATOR.
0343    5444    7640            SŻA CLA
0344    5445    7240            CLA CMA         /NO, ADD 1 TO SKIP BECAUSE OF END OF THIS STATEMENT.
0345    5446    1200            TAD     ACOUNT
0346    5447    3200            DCA     ACOUNT
0347    5450    1312            TAD     PACHECK
0350    5451    3711            DCA I   PSWITCH
0351    5452    1306            TAD     ASEND
0352    5453    3714            DCA I   PDOLLAR
0353    5454    1307            TAD     AMAINPS
0354    5455    3310            DCA     PMAINSA
0355    5456    5657            JMP I   .+1             /AFTER SETTING SWITHCES EXIT TO PICK UP NEXT STATEMENT.
0356    5457    2714    AFDRT,  FDRT
0357    5460    7300    ACHECK, CLA CLL
0360    5461    1051            TAD     ITEM
0361    5462    1122            TAD     M43
0362    5463    7650            SNA CLA
0363    5464    5267            JMP     ASPAST
0364    5465    4504            JMS I   IDX1
0365    5466    5261            JMP     .-5             /WAIT FOR END OF THIS LINE.
0366    5467    2200    ASPAST, ISŻ     ACOUNT
0367    5470    5710            JMP I   PMAINSA         /NOT DONE YET, PICK UP NEXT STATEMENT TO SKIP.
0370    5471    1313    ASSRST, TAD     PDOCAL
0371    5472    3711            DCA I   PSWITCH
0372    5473    1315            TAD     PENDMS
0373    5474    3714            DCA I   PDOLLAR
0374    5475    1310            TAD     PMAINSA
0375    5476    5610            JMP I   PSEUDO          /RESET SWITCHES AND EXIT.
0376    5477    7300    APAEND, CLA CLL
0377    5500    1315            TAD     PENDMS
0400    5501    3310            DCA     PMAINSA
0401    5502    5271            JMP     ASSRST          /END OF MANUSCRIPT
0402                    /
0403                    /
0404                    /
0405                    /
0406                    /
0407                    /
0410                    /
0411    5503    1257    ASSNO,  TAD     AFDRT
0412    5504    5610            JMP I   PSEUDO          /GENERAL EXIT.
0413                    /
0414                    /
0415                    /
0416                    /
-
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0417    5505  7770  AMM10,  -10
0420    5506  5477  ASEND,  APAEND
0421    5507  1504  AMAINPS,        MAINSA
0422    5510  1504  PMAINSA,        MAINSA
0423    5511  1575  PSWITCH,        PSINTER
0424    5512  5460  PACHECK,        ACHECK
0425    5513  1426  PDOCAL, DOCAL
0426    5514  2173  PDOLLAR,        FINEND
0427    5515  3717  PENDMS, ENDMS
0430                /
0431                /
0432                /
0433                /
0434    5516  4477  AEJECT, JMS I   EXPR1           /JUST TO SCAN TILL END OF LINE,
0435    5517  4465          JMS I   PASSEK          /GET THE PASS NO,
0436    5520  7710  L7710,  SPA CLA         /ALWAYS SKIPS BECAUSE AC=0
0437    5521  5303          JMP     ASSNO           /NOT LIST OR NOT PASS2
0440    5522  1537          TAD I   PM60A           /IF LP THEN M60=-140
0441    5523  1331          TAD     AEP62           /SEE IF GREATER THAN 62
0442    5524  7700          SMA     CLA             /IS PRINTER THERE???
0443    5525  5303          JMP     ASSNO           /NOPE. LINE PRINTER ISN T   THERE
0444    5526  7240          CLA CMA         /YES, SET PAGE POINTER TO EJECT,
0445    5527  3732          DCA I   AEPONT
0446    5530  5303          JMP     ASSNO
0447                /
0450                /
0451    5531  0062  AEP62,  62
0452    5532  3522  AEPONT, PCONT
0453                /
0454                /
0455                /
0456                /
0457                /
0460                /
0461    5533  4201  SYMSAV, JMS     GETVAL
0462    5534  1035          TAD     PASS
0463    5535  7010          RAR
0464    5536  7620          SNL     CLA
0465    5537  5303          JMP     ASSNO           /INCORRECT PASS NO,!!
0466    5540  4772          JMS I   VOUT            /SAVE 6400 FOR A SECOND,
0467    5541  1027          TAD     SEND            /NUMBER OF DEFINED SYMBOLS,
0470    5542  3751          DCA I   VL6777
0471    5543  4747          JMS I   YWRITE
0472    5544  5566          YP1
0473    5545  4773          JMS I   VIN             /RESTORE 6400 NOW,
0474    5546  5752          JMP I   PV8MOVE
0475                /
0476    5547  7775  YWRITE, WRITE
0477    5550  7774  YREAD,  READ
0500    5551  6777  VL6777, 6777
0501    5552  5600  PV8MOVE,        V8MOVE
0502    5553  1035  SYMLOD, TAD     PASS
0503    5554  7640          SZA CLA
0504    5555  5224          JMP     NASSIF          /DO NOT LOAD SYMBOLS IF PASS2
0505    5556  4772          JMS I   VOUT            /PRESERVE 6400 NOW
0506    5557  4750          JMS I   YREAD
0507    5560  5566          YP1
0510    5561  1751          TAD I   VL6777
0511    5562  3027          DCA     SEND            /GET NUMBER OF SAVED SYMBOLS
0512    5563  4773          JMS I   VIN             /NOW RESTORE 6400
0513    5564  5765          JMP I   VINIT           /NOW READ IN THE SYMBOL TABLE
0514    5565  5604  VINIT,  VVINIT
0515                /
-
```

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0516                    /
0517                    /
0520        5566  0111  YP1,    DIALBINARY
0521        5567  0015          15
0522        5570  0077          FUDGE2
0523        5571  0001          1
0524                    /
0525                    /
0526                    /
0527                    /
0530                    /
0531                    /
0532                    /
0533                    /
0534                    /
0535                    /
0536        5572  0773  VOUT,   VPRSRV                /POINTS TO THE PRESERVE ROUTINE
0537        5573  0572  VIN,    VRSTR                 /POINTS TO THE RESTORE ROUTINE
0540                    /
0541                    /
0542                    /
0543                    /
0544                    /
0545                    /
0546                    /
0547                    /
0550                    /
0551                    /
0552                    /
0553                    /
0554                    EJECT
-
```

```
0555                        *5600
0556                  /
0557      5600  4607  V8MOVE, JMS I   VWRITE
0560      5601  5611        VTAB
0561                  /
0562      5602  5603  VCLEAN, JMP I   VASSNO
0563                  /
0564      5603  5503  VASSNO, ASSNO
0565                  /
0566                  /
0567      5604  4610  VVINIT, JMS I   VREAD
0570      5605  5611        VTAB
0571      5606  5202        JMP       VCLEAN
0572                  /
0573                  /
0574                  /
0575      5607  7775  VWRITE, WRITE
0576      5610  7774  VREAD,  READ
0577                  /
0600                  /
0601                  /
0602      5611  0111  VTAB,   DIALBINARY
0603      5612  0020        20
0604      5613  0060        BOOUT
0605      5614  0016        16
0606                  /
0607                  /
0610                  /
0611                  /
0612                  /
0613                  /
0614                  /
0615                  /
0616                  /
0617                  /
0620      5615  4724  OUTPUT, JMS I   OGTVAL      /THIS ROUTINE ALLOWS OPTIONAL TAPE OUTPUT
0621      5616  3254        DCA       OPUT        /SAVE FOR A SECOND
0622      5617  1035        TAD       PASS        /GET THE PASS NUMBER
0623      5620  7640        SZA CLA               /IS IT 1
0624      5621  5725        JMP I     OASSNO      /NOPE, IGNORE
0625      5622  1254        TAD       OPUT        /REGET THE USERS VALUE,
0626      5623  7510        SPA                   /IF POSITIVE THEN OUTPUT
0627      5624  5306        JMP       OBSET       /IF NEGATIVE THEN READ IN BIT TABLE
0630      5625  0326        AND       OL17        /JUST GET THE UNIT NUMBER
0631      5626  3333        DCA       OUNIT
0632      5627  3335        DCA       OBLOCK      /CLEAR THE BLOCK  TO 0
0633      5630  1331        TAD       OL6400      /RESET THE LOCATION COUNTER TO 6400
0634      5631  3330        DCA       OLOC        /WHICH IS THE BUFFER AREA
0635      5632  7240        CLA CMA               /SET UP THE TEST TO FOLLOW
0636      5633  6141        LINC
0637                        LMODE
0640      1634  0460        SNS I     0           /TEST FOR BOTH
0641      1635  0441        SNS       1           /SWITCHES 0 AND 1 UP
0642      1636  0011        CLR
0643      1637  0462        SNS I     2           /AND SO ON DOWN THE LINE
0644      1640  0443        SNS       3
0645      1641  0011        CLR
0646      1642  0464        SNS I     4
0647      1643  0445        SNS       5
0650      1644  0011        CLR
0651      1645  0002        POP
0652                        PMODE
0653      5646  7040        CMA
-
```

```
0654    5647  7640          SZA CLA
0655    5650  5725          JMP I   OASSNO          /SWITCHES NOT UP, IGNORE REQUEST
0656    5651  1327          TAD     OPOINT          /RESET DECOUT TO POINT TO HERE
0657    5652  3001          DCA     DECOUT
0660    5653  5725          JMP I   OASSNO          /NOW RETURN TO THE USER,
0661                  /
0662                  /
0663                  /
0664                  /
0665    5654  0000  OPUT,    0
0666    5655  7450          SNA
0667    5656  5261          JMP     OEND
0670    5657  4267          JMS     OOPUT
0671    5660  5654          JMP I   OPUT
0672                  /
0673    5661  4267  OEND,    JMS     OOPUT           /PUT IN A ZERO WORD
0674    5662  1330          TAD     OLOC
0675    5663  0332          AND     OL377           /CHOP OFF THE HIGH BITS NOW, JUST LEAVE THE POSITION BITS.
0676    5664  7650          SNA CLA
0677    5665  5654          JMP I   OPUT
0700    5666  5261          JMP     OEND
0701                  /
0702                  /
0703                  /
0704                  /
0705    5667  0000  OOPUT,   0
0706    5670  3730          DCA I   OLOC
0707    5671  1330          TAD     OLOC
0710    5672  7001          IAC
0711    5673  0332          AND     OL377
0712    5674  1331          TAD     OL6400
0713    5675  3330          DCA     OLOC
0714    5676  1330          TAD     OLOC
0715    5677  0332          AND     OL377           /CHOP OFF THE BAD BITS,
0716    5700  7640          SZA CLA
0717    5701  5667          JMP I   OOPUT
0720    5702  4607          JMS I   VWRITE
0721    5703  5733          OUNIT
0722    5704  2335          ISZ     OBLOCK
0723    5705  5667          JMP I   OOPUT
0724                  /
0725                  /
0726                  /
0727                  /
0730                  /
0731                  /
0732                  /
0733    5706  7200  OBSET,   CLA                     /ALSO POINTS TO MOVE ROUTINE
0734    5707  4610          JMS I   VREAD           /READ IN THE OLD HEADER BLOCK
0735    5710  5720          OBIN
0736    5711  4706          JMS I   OBSET           /MOVE DOWN THE HEADER BLOCK NOW
0737    5712  6201          CDF     0
0740    5713  5337          5337
0741    5714  6201          CDF     0
0742    5715  4337          4337
0743    5716  0041          41
0744    5717  5725          JMP I   OASSNO          /AND RETURN TO THE USER
0745                  /
0746                  /
0747                  /
0750                  /
0751                  /
0752                  /
-
```

```
0753                    /
0754                    /
0755                    /
0756        5720  0111  OBIN,   111
0757        5721  0012          12
0760        5722  0057          447-370
0761        5723  0001          1
0762                    /
0763                    /
0764                    /
0765                    /
0766                    /
0767                    /
0770                    /
0771                    /
0772                    /
0773                    /
0774                    /
0775                    /
0776                    /
0777                    /
1000                    /
1001        5724  5401  OGTVAL, GETVAL
1002        5725  5503  OASSNO, ASSNO
1003        5726  0017  OL17,   17
1004        5727  5654  OPOINT, OPUT
1005        5730  6400  OLOC,   6400
1006        5731  6400  OL6400, 6400
1007        5732  0377  OL377,  377
1010                    /
1011        5733  0000  OUNIT,  0
1012        5734  0015          15                      /15=6400 FOR THE BUFFER AREA
1013        5735  0000  OBLOCK, 0
1014        5736  0001          1
1015                    /
1016                    /
1017                    /
1020                    /
1021                    /
1022                    /
1023                    /
1024                    /
1025                    /
1026                    /
1027                    /
1030                    /
1031                    /
1032        5737  0000  CHECKO, 0                       /THIS ROUTINE CHECKS FOR NO BINARY OUTPUT.
1033        5740  1776          TAD I   OCUSES          /GET THE NUMBER OF BLOCKS OF OUTPUT.
1034        5741  7640          SZA CLA                 /AND THERE?
1035        5742  5351          JMP     OCCRLF          /YEP, JUST GIVE A C,R,L,F AND RETURN TO THE CALLER
1036                    /
1037        5743  1353  OCDOIT, TAD     OCPNT           /GET A CHARACTER FROM THE MESSAGER.
1040        5744  7450          SNA                     /ZERO = THATS ALL FOLKS
1041        5745  5351          JMP     OCCRLF          /GIVE THE LINEFEED NOW
1042        5746  4401          JMS I   OECOUT          /OUT GOES THE CHARACTER NOW
1043        5747  2343          ISZ     OCDOIT          /BOP TO THE NEXT CHARACTER.
1044        5750  5343          JMP     OCDOIT          /GO GET THE NEXT CHARACTER
1045                    /
1046        5751  4500  OCCRLF, JMS I   TYCARI          /GIVE THE CARRIGE RETURN NOW
1047        5752  5737          JMP I   CHECKO          /RETURN TO THE CALLER NOW
1050                    /
1051                    /
-
```

```
1052                    /
1053                    /
1054        5753  0254  OCPNT,  254                 /,
1055        5754  0240          240                 /
1056        5755  0316          316                 /N
1057        5756  0317          317                 /O
1060        5757  0240          240                 /
1061        5760  0302          302                 /B
1062        5761  0311          311                 /I
1063        5762  0316          316                 /N
1064        5763  0301          301                 /A
1065        5764  0322          322                 /R
1066        5765  0331          331                 /Y
1067        5766  0240          240                 /
1070        5767  0317          317                 /O
1071        5770  0325          325                 /U
1072        5771  0324          324                 /T
1073        5772  0320          320                 /P
1074        5773  0325          325                 /U
1075        5774  0324          324                 /T
1076        5775  0000          0
1077                    /
1100                    /
1101                    /
1102        5776  4337  OCUSES, USEDNO               /POINTS TO THE NUMBER OF BINARY BLOCKS USED.
1103                    /
1104                    /
1105                    /
1106                    /
1107                    /
1110                    /
1111                    /
1112                    /
1113                    /
1114                    /
1115                    /
1116                    /
1117                    /
1120                    /
1121                    /
1122                    /
1123                    /
1124                    /
1125                    /
1126                    /
1127                    /
1130                    /
1131                            EJECT
```

```
1132                    /  LINE PRINTER ROUTINE
1133                    /
1134                    /
1135                    /
1136                    /
1137                            *6000           /THIS ROUTINE LOOKS
1140    6000    0000    PRINT,  0               /SORT OF LINE A TTY, TAD CHAR; JMS PRINT,
1141    6001    1151            TAD     M215            /IT HANDLES CR AND LF.
1142    6002    7450            SNA             /IS IT CARRIAGE RETURN,
1143    6003    5210            JMP     CRFOUND
1144    6004    1154            TAD     P215            /NO!
1145    6005    6661            LSD                     /WAIT FOR CLEAR SIGNAL,
1146    6006    5241            JMP     LPBACK          /LINE PRINTER IS BUSY, BACK SPACE 1 CHAR
1147    6007    5640            JMP I   PCLP
1150                    /
1151    6010    1235    CRFOUND,TAD     SW1
1152    6011    3201            DCA     PRINT+1
1153    6012    3306            DCA     NUM             /SET TOCHEC K  FOR LF
1154    6013    5600            JMP I   PRINT
1155    6014    3234    LFTEST, DCA     TEMP1
1156    6015    1234            TAD     TEMP1
1157    6016    1305            TAD     M212            /IS IT A LINEFFED.
1160    6017    7650            SNA CLA
1161    6020    5232            JMP     LFF
1162    6021    1234            TAD     TEMP1
1163    6022    1151            TAD M215
1164    6023    7650            SNA CLA
1165    6024    5233            JMP     LFF2
1166    6025    1236            TAD     SW2             /NOT AN LF OR CR, NEW LINE, OUTPUT LAST,
1167    6026    3201            DCA     PRINT+1
1170    6027    7240            CLA CMA
1171    6030    1306            TAD     NUM
1172    6031    5637            JMP I   PCFIG
1173                    /
1174    6032    2306    LFF,    ISZ     NUM             /LF, BOP UP LF COUNT,
1175    6033    5600    LFF2,   JMP I   PRINT
1176                    /
1177                    /
1200                    /
1201    6034    0000    TEMP1,  0
1202    6035    5214    SW1,    JMP     LFTEST
1203    6036    1151    SW2,    TAD     M215
1204                    /
1205                    /
1206                    /
1207                    /
1210                    /
1211                    /
1212    6037    6057    PCFIG,  ANLXE
1213    6040    6054    PCLP,   ANLXC
1214                    /
1215                    /
1216                    /
1217                    /
1220    6041    2700    LPBACK, ISZ I   LCOUNT          /INCREMENT THE COUNTER BY 1
1221    6042    7240            CLA CMA                 /-1 TO DECREMENT THE POINTER
1222    6043    1701            TAD I   LOUTP
1223    6044    3701            DCA I   LOUTP
1224    6045    1302            TAD     LFIRST          /COMPARE AGAINST LOWER LIMIT
1225    6046    1701            TAD I   LOUTP
1226    6047    7650            SNA CLA
1227    6050    1303            TAD     LBAD            /ITS TOO FAR, COMPENSTATE TO TOP OF BUFFER
1230    6051    1701            TAD I   LOUTP
```

```
1231    6052  3701          DCA I   LOUTP
1232    6053  5600          JMP I   PRINT
1233                /
1234                /
1235                /
1236                /
1237                /
1240    6054  6656  ANLXC,  LCF!LLB
1241    6055  7200          CLA
1242    6056  5600          JMP I   PRINT
1243                /
1244    6057  0157  ANLXE,  AND     P7
1245    6060  7640  M140,   SZA CLA
1246    6061  1157          TAD     P7
1247    6062  1304          TAD     L10
1250    6063  6652          LCF
1251    6064  6664          LPR
1252    6065  7200  LPRENT, CLA
1253    6066  3306          DCA     NUM
1254    6067  1234          TAD     TEMP1
1255    6070  5201          JMP     PRINT+1
1256                /
1257                /
1260    6071  6666  LP08C,  LPR!LCB
1261    6072  5255          JMP     ANLXC+1
1262                /
1263    6073  7640  LP08E,  SZA CLA
1264    6074  7305          CLA CLL IAC RAL
1265    6075  1153          TAD     P212
1266    6076  6666          LPR!LCB
1267    6077  5265          JMP     LPRENT
1270                /
1271                /
1272    6100  0760  LCOUNT, COUNT
1273    6101  0705  LOUTP,  OUTP
1274    6102  1671  LFIRST, -FIRST+1
1275    6103  0270  LBAD,   BAD-FIRST+1-1
1276                /
1277                /
1300    6104  0010  L10,    10
1301    6105  7566  M212,   -212
1302                /
1303                /
1304                /
1305                /
1306                /
1307                /
1310                /
1311                /
1312                /
1313    6106  0000  NUM,    0
1314    6107  0000  PRINIT, 0
1315                /
1316                /
1317                /
1320                /
1321                /
1322                /
1323                /
1324                /
1325                      FIRST=,               /DEFINE THE START OF THE BUFFER
1326                      BAD=6400              /AND THE END+1
1327                /
```

```
1330                    /
1331                    /
1332                    /
1333                    /
1334                            PAGE
1335                    /
1336                    /
1337                    /
1340                    /
1341                    /
1342                    /
1343    6200    1305    LOK,    TAD     L17             /LP IS THERE, EJECT TO START AS,
1344    6201    6652            LCF
1345    6202    6664            LPR
1346    6203    7200            CLA
1347    6204    1311            TAD     M154            /SET LINE COUNTER FOR 154 COLUMNS WIDE.
1350    6205    3706            DCA I   PC1
1351    6206    1706            TAD I   PC1
1352    6207    3707            DCA I   PC2
1353                    /
1354    6210    1335    LOK0,   TAD     SYMFIX
1355    6211    3736            DCA I   SYMOVR
1356                    /
1357    6212    1233    LOK1,   TAD     R1              /RESET TYPO TO LP OR TTY ROUTINE.
1360    6213    3626            DCA I   PR1
1361    6214    1235            TAD     R2
1362    6215    3627            DCA I   PR2
1363    6216    1237            TAD     R3
1364    6217    3630            DCA I   PR3
1365    6220    1241            TAD     R4
1366    6221    3631            DCA I   PR4
1367    6222    1243            TAD     R5
1370    6223    3632            DCA I   PR5
1371    6224    1154            TAD     P215
1372    6225    5626            JMP I   .+1
1373    6226    2530    PR1,    TYPO+1
1374    6227    2531    PR2,    TYPO+2
1375    6230    2532    PR3,    TYPO+3
1376    6231    2533    PR4,    TYPO+4
1377    6232    2534    PR5,    TYPO+5
1400    6233    4732    R1,     JMS I   LOK+TYPO-TYBASE+3
1401    6234    6041            TSF
1402    6235    7410    R2,     SKP
1403    6236    5330            JMP     LOK+TYPO-TYBASE+1
1404    6237    6000    R3,     PRINT
1405    6240    6046            TLS
1406    6241    5727    R4,     JMP I   LOK+TYPO-TYBASE
1407    6242    7200            CLA
1410    6243    5727    R5,     JMP I   LOK+TYPO-TYBASE
1411                    /
1412                    /
1413    6244    7300    LPTEST, CLA CLL
1414    6245    1135            TAD     M4              /WAIT FOR PRINTER TEST
1415    6246    3313            DCA     PT2
1416    6247    3312            DCA     PT1
1417    6250    6652            LCF
1420    6251    6662            LCB             /CLEAR BUFFER, IF LP THERE FLAG RAISES IN 300 MILLSEC.
1421    6252    6661    TEST,   LSD
1422    6253    7410            SKP
1423    6254    5200            JMP     LOK             /FLAG SI UP,  LP THERE,  WHAT A LUCKY BASTARD.
1424    6255    2312            ISZ     PT1
1425    6256    5252            JMP     TEST
1426    6257    2313            ISZ     PT2
-
```

```
1427    6260  5252          JMP     TEST
1430                  /
1431    6261  1135          TAD     M4
1432    6262  3313          DCA     PT2
1433    6263  3312          DCA     PT1
1434    6264  1134          TAD     P240
1435    6265  6666          LCBILPR
1436    6266  7200          CLA
1437    6267  6661  TESTC2, LSD
1440    6270  7410          SKP
1441    6271  5314          JMP     LOKA2
1442    6272  2312          ISZ     PT1
1443    6273  5267          JMP     TESTC2
1444    6274  2313          ISZ     PT2
1445    6275  5267          JMP     TESTC2
1446                  /
1447    6276  2212          ISZ     LOK1            /TIME HAS RUN OUT, CHANGE TO SET UT  TTY MODE.
1450    6277  2214          ISZ     LOK1+2
1451    6300  2216          ISZ     LOK1+4
1452    6301  2220          ISZ     LOK1+6
1453    6302  3704          DCA I   CCNOP           /ZAP OUT THE LPTEST ON THE BUFFERING ROUTINE
1454    6303  5212          JMP     LOK1
1455                  /
1456    6304  0747  CCNOP,  CNOP
1457                  /
1460                  /
1461                  /
1462                  /
1463                  /
1464                  /
1465                  /
1466    6305  0017  L17,    17
1467    6306  1576  PC1,    M60
1470    6307  3662  PC2,    M60A
1471    6310  7706  M72,    -72
1472    6311  7624  M154,   -154
1473    6312  0000  PT1,    0
1474    6313  0000  PT2,    0
1475                  /
1476                  /
1477                  /
1500                  /
1501                  /
1502                  /
1503                  /
1504    6314  7305  LOKA2,  CLL CLA IAC RAL
1505    6315  1153          TAD     P212
1506    6316  6676          LCFILPR
1507    6317  7200          CLA
1510    6320  1310          TAD     M72
1511    6321  3706          DCA I   PC1
1512    6322  1310          TAD     M72
1513    6323  3707          DCA I   PC2
1514    6324  1331          TAD     PLP08C
1515    6325  3733          DCA I   PXL1
1516    6326  1332          TAD     PLP08E
1517    6327  3734          DCA I   PXL2
1520    6330  5210          JMP     LOK0
1521                  /
1522                  /
1523    6331  6071  PLP08C, LP08C
1524    6332  6073  PLP08E, LP08E
1525    6333  6040  PXL1,   PCLP
-
```

```
1526    6334  6037  PXL2,   PCFIG
1527    6335  1307  SYMFIX, TAD     LWDEFD&177+LOK
1530    6336  3504  SYMOVR, LWDE
1531                /
1532                /
1533                /
1534                /
1535                /
1536                /
1537                /
1540                /
1541                /
1542                /
1543                /
1544                /               SOME BASIC DEFINITIONS FOR THE ROUTINES
1545                /
1546                TYBASE=2400             /MAIN BASE FOR REFS,
1547                LLB=6654
1550                LCF=6652
1551                LSD=6661
1552                LCB=6662
1553                LPR=6664
1554                /
1555                /
1556                /
1557                /
1560                /
1561                /
1562                /
1563                /
1564                /
1565                /
1566                /
1567                /
1570                /
1571                        EJECT
```

```
1572                    /
1573                    /
1574                    /
1575                    /  S Y M B O L    T A B L E   ! ! ! !
1576                    /
1577                    /
1600                    /
1601                    /
1602                    /
1603                    /
1604                    /
1605                    /
1606                              *6400
1607        6400   7777   7777
1610        6401   7777   7777
1611        6402   7777   7777
1612        6403   7777   7777
1613        6404   7777   7777
1614        6405   7777   7777
1615        6406   7777   7777
1616        6407   7777   7777
1617        6410   7777   7777
1620        6411   7777   7777
1621        6412   7777   7777
1622        6413   7777   7777
1623        6414   5143   5143              /PSF
1624        6415   0336   0336
1625        6416   0000   0000
1626        6417   6021   6021
1627        6420   5123   5123              /PCF
1630        6421   0336   0336
1631        6422   0000   0000
1632        6423   6022   6022
1633        6424   5140   5140              /PPC
1634        6425   0157   0157
1635        6426   0000   0000
1636        6427   6024   6024
1637        6430   5134   5134              /PLS
1640        6431   1277   1277
1641        6432   0000   0000
1642        6433   6026   6026
1643        6434   5255   5255              /RCF
1644        6435   0336   0336
1645        6436   0000   0000
1646        6437   6011   6011
1647        6440   5254   5254              /RRB
1650        6441   0112   0112
1651        6442   0000   0000
1652        6443   6012   6012
1653        6444   5240   5240              /RFC
1654        6445   0157   0157
1655        6446   0000   0000
1656        6447   6014   6014
1657        6450   4170   4170    /CIF
1660        6451   0336   0336
1661        6452   0000   0000
1662        6453   6202   6202
1663        6454   4163   4163              /CDF
1664        6455   0336   0336
1665        6456   0000   0000
1666        6457   6201   6201
1667        6460   5243   5243              /RIB
1670        6461   0112   0112
-
```

```
1671      6462  0000  0000
1672      6463  6234  6234
1673      6464  5247  5247            /RMF
1674      6465  0336  0336
1675      6466  0000  0000
1676      6467  6244  6244
1677      6470  5243  5243            /RIF
1700      6471  0336  0336
1701      6472  0000  0000
1702      6473  6224  6224
1703      6474  5236  5236            /RDF
1704      6475  0336  0336
1705      6476  0000  0000
1706      6477  6214  6214
1707      6500  5360  5360            /TLS
1710      6501  1277  1277
1711      6502  0000  0000
1712      6503  6046  6046
1713      6504  5364  5364            /TPC
1714      6505  0157  0157
1715      6506  0000  0000
1716      6507  6044  6044
1717      6510  5347  5347            /TCF
1720      6511  0336  0336
1721      6512  0000  0000
1722      6513  6042  6042
1723      6514  5367  5367            /TSF
1724      6515  0336  0336
1725      6516  0000  0000
1726      6517  6041  6041
1727      6520  4651  4651            /KRB
1730      6521  0112  0112
1731      6522  0000  0000
1732      6523  6036  6036
1733      6524  4651  4651            /KRS
1734      6525  1277  1277
1735      6526  0000  0000
1736      6527  6034  6034
1737      6530  4632  4632            /KCC
1740      6531  0157  0157
1741      6532  0000  0000
1742      6533  6032  6032
1743      6534  4652  4652            /KSF
1744      6535  0336  0336
1745      6536  0000  0000
1746      6537  6031  6031
1747      6540  4534  4534            /IOF
1750      6541  0336  0336
1751      6542  0000  0000
1752      6543  6002  6002
1753      6544  4534  4534            /ION
1754      6545  1006  1006
1755      6546  0000  0000
1756      6547  6001  6001
1757      6550  4705  4705     /LINC
1760      6551  1011  1011
1761      6552  0000  0000
1762      6553  6141  6141
1763      6554  4173  4173/CLSK
1764      6555  1312  1312
1765      6556  0000  0
1766      6557  6131  6131
1767      6560  4173  4173/CLLR
-
```

```
1770      6561  0716  716
1771      6562  0000  0
1772      6563  6132  6132
1773      6564  4173  4173
1774      6565  0047  47
1775      6566  0000  0
1776      6567  6133  6133
1777      6570  4173  4173
2000      6571  0307  307
2001      6572  0000  0
2002      6573  6134  6134
2003      6574  4173  4173    /CLSA
2004      6575  1300  1300
2005      6576  0000  0
2006      6577  6135  6135
2007      6600  4173  4173    /CLCA
2010      6601  0160  160
2011      6602  0000  0
2012      6603  6137  6137
2013      6604  4173  4173    /CLBA
2014      6605  0113  113
2015      6606  0000  0
2016      6607  6136  6136
2017      6610  4417  4417            /GLK
2020      6611  0627  0627
2021      6612  0000  0000
2022      6613  7204  7204
2023      6614  5323  5323    /STL
2024      6615  0674  0674
2025      6616  0000  0000
2026      6617  7120  7120
2027      6620  5323  5323            /STA
2030      6621  0045  0045
2031      6622  0000  0000
2032      6623  7240  7240
2033      6624  4675  4675            /LAS
2034      6625  1277  1277
2035      6626  0000  0000
2036      6627  7604  7604
2037      6630  4170  4170            /CIA
2040      6631  0045  0045
2041      6632  0000  0000
2042      6633  7041  7041
2043      6634  4464  4464            /HLT
2044      6635  1344  1344
2045      6636  0000  0000
2046      6637  7402  7402
2047      6640  5076  5076            /OSR
2050      6641  1232  1232
2051      6642  0000  0000
2052      6643  7404  7404
2053      6644  5312  5312            /SKP
2054      6645  1120  1120
2055      6646  0000  0000
2056      6647  7410  7410
2057      6650  5331  5331            /SZL
2060      6651  0674  0674
2061      6652  0000  0000
2062      6653  7430  7430
2063      6654  5315  5315            /SNL
2064      6655  0674  0674
2065      6656  0000  0000
2066      6657  7420  7420
-
```

```
2067    6660  5315  5315          /SNA
2070    6661  0045  0045
2071    6662  0000  0000
2072    6663  7450  7450
2073    6664  5317  5317          /SPA
2074    6665  0045  0045
2075    6666  0000  0000
2076    6667  7510  7510
2077    6670  5331  5331          /SZA
2100    6671  0045  0045
2101    6672  0000  0000
2102    6673  7440  7440
2103    6674  5314  5314          /SMA
2104    6675  0045  0045
2105    6676  0000  0000
2106    6677  7500  7500
2107    6700  4516  4516          /IAC
2110    6701  0157  0157
2111    6702  0000  0000
2112    6703  7001  7001
2113    6704  5256  5256          /RTL
2114    6705  0674  0674
2115    6706  0000  0000
2116    6707  7006  7006
2117    6710  5233  5233          /RAL
2120    6711  0674  0674
2121    6712  0000  0000
2122    6713  7004  7004
2123    6714  5256  5256          /RTR
2124    6715  1232  1232
2125    6716  0000  0000
2126    6717  7012  7012
2127    6720  5233  5233          /RAR
2130    6721  1232  1232
2131    6722  0000  0000
2132    6723  7010  7010
2133    6724  4174  4174          /CML
2134    6725  0674  0674
2135    6726  0000  0000
2136    6727  7020  7020
2137    6730  4174  4174          /CMA
2140    6731  0045  0045
2141    6732  0000  0000
2142    6733  7040  7040
2143    6734  4173  4173          /CLL
2144    6735  0674  0674
2145    6736  0000  0000
2146    6737  7100  7100
2147    6740  4173  4173          /CLA
2150    6741  0045  0045
2151    6742  0000  0000
2152    6743  7200  7200
2153    6744  5025  5025          /NOP
2154    6745  1120  1120
2155    6746  0000  0000
2156    6747  7000  7000
2157    6750  4577  4577          /JMP
2160    6751  1120  1120
2161    6752  0000  0000
2162    6753  5000  5000
2163    6754  4577  4577          /JMS
2164    6755  1277  1277
2165    6756  0000  0000
```

```
2166      6757  4000  4000
2167      6760  4227  4227            /DCA
2170      6761  0045  0045
2171      6762  0000  0000
2172      6763  3000  3000
2173      6764  4540  4540            /ISZ
2174      6765  1702  1702
2175      6766  0000  0000
2176      6767  2000  2000
2177      6770  5345  5345            /TAD
2200      6771  0224  0224
2201      6772  0000  0000
2202      6773  1000  1000
2203      6774  4063  4063            /AND
2204      6775  0224  0224
2205      6776  0000  0000
2206      6777  0000  0
2207                        EJECT
-
```

```
2210                    /LINC SYM TABLE
2211                        *7000
2212                    /
2213                    /
2214      7000  5607    5607            /XOA
2215      7001  0045    0045
2216      7002  0000    0000
2217      7003  0021    0021
2220      7004  5201    5201    /QLZ
2221      7005  1702    1702
2222      7006  0000    0000
2223      7007  0455    0455
2224      7010  4352    4352    /FLO
2225      7011  1053    1053
2226      7012  0000    0000
2227      7013  0454    0454
2230      7014  4652    4652    /KST
2231      7015  1344    1344
2232      7016  0000    0000
2233      7017  0415    0415
2234      7020  5305    5305    /SFA
2235      7021  0045    45
2236      7022  0000    0
2237      7023  0024    24
2240      7024  4075    4075    /AXO
2241      7025  1053    1053
2242      7026  0000    0000
2243      7027  0001    0001
2244      7030  4314    4314    /ESF
2245      7031  0336    0336
2246      7032  0000    0000
2247      7033  0004    0004
2250      7034  4464    4464    /HLT
2251      7035  1344    1344
2252      7036  0000    0000
2253      7037  0000    0000
2254      7040  5166    5166    /QAC
2255      7041  0157    0157
2256      7042  0000    0000
2257      7043  0005    0005
2260      7044  4173    4173    /CLR
2261      7045  1232    1232
2262      7046  0000    0000
2263      7047  0011    0011
2264      7050  4071    4071    /ATR
2265      7051  1232    1232
2266      7052  0000    0000
2267      7053  0014    0014
2270      7054  5256    5256    /RTA
2271      7055  0045    0045
2272      7056  0000    0000
2273      7057  0015    0015
2274      7060  5025    5025    /NOP
2275      7061  1120    1120
2276      7062  0000    0000
2277      7063  0016    0016
2300      7064  4176    4176    /COM
2301      7065  0741    0741
2302      7066  0000    0000
2303      7067  0017    0017
2304      7070  5304    5304    /SET
2305      7071  1344    1344
2306      7072  0000    0000
-
```

```
2307      7073  0040  0040
2310      7074  5300  5300    /SAM
2311      7075  0741  0741
2312      7076  0000  0000
2313      7077  0100  0100
2314      7100  4235  4235    /DIS
2315      7101  1277  1277
2316      7102  0000  0000
2317      7103  0140  0140
2320      7104  5613  5613    /XSK
2321      7105  0627  0627
2322      7106  0000  0000
2323      7107  0200  0200
2324      7110  5251  5251    /ROL
2325      7111  0674  0674
2326      7112  0000  0000
2327      7113  0240  0240
2330      7114  5251  5251    /ROR
2331      7115  1232  1232
2332      7116  0000  0000
2333      7117  0300  0300
2334      7120  5302  5302    /SCR
2335      7121  1232  1232
2336      7122  0000  0000
2337      7123  0340  0340
2340      7124  5327  5327    /SXL
2341      7125  0674  0674
2342      7126  0000  0000
2343      7127  0400  0400
2344      7130  5315  5315    /SNS
2345      7131  1277  1277
2346      7132  0000  0000
2347      7133  0440  0440
2350      7134  5312  5312    /SKP(L)
2351      7135  1120  1120
2352      7136  0000  0000
2353      7137  0456  0456
2354      7140  4077  4077    /AZE
2355      7141  0271  0271
2356      7142  0000  0000
2357      7143  0450  0450
2360      7144  4065  4065    /APO
2361      7145  1053  1053
2362      7146  0000  0000
2363      7147  0451  0451
2364      7150  4726  4726    /LZE
2365      7151  0271  0271
2366      7152  0000  0000
2367      7153  0452  0452
2370      7154  4236  4236    /DJR
2371      7155  1232  1232
2372      7156  0000  0000
2373      7157  0006  0006
2374      7160  4705  4705    /LIF
2375      7161  0336  0336
2376      7162  0000  0000
2377      7163  0600  0600
2400      7164  4700  4700    /LDF
2401      7165  0336  0336
2402      7166  0000  0000
2403      7167  0640  0640
2404      7170  5236  5236    /RDC
2405      7171  0157  0157
-
```

```
2406      7172  0000  0000
2407      7173  0700  0700
2410      7174  5235  5235    /RCG
2411      7175  0403  0403
2412      7176  0000  0000
2413      7177  0701  0701
2414      7200  5236  5236    /RDE
2415      7201  0271  0271
2416      7202  0000  0000
2417      7203  0702  0702
2420      7204  4765  4765    /MTB
2421      7205  0112  0112
2422      7206  0000  0000
2423      7207  0703  0703
2424      7210  5545  5545    /WRC
2425      7211  0157  0157
2426      7212  0000  0000
2427      7213  0704  0704
2430      7214  5526  5526    /WCG
2431      7215  0403  0403
2432      7216  0000  0000
2433      7217  0705  0705
2434      7220  5545  5545    /WRI
2435      7221  0515  0515
2436      7222  0000  0000
2437      7223  0706  0706
2440      7224  4167  4167    /CHK
2441      7225  0627  0627
2442      7226  0000  0000
2443      7227  0707  0707
2444      7230  5300  5300    /SAE
2445      7231  0271  0271
2446      7232  0000  0000
2447      7233  1440  1440
2450      7234  5321  5321    /SRO
2451      7235  1053  1053
2452      7236  0000  0000
2453      7237  1500  1500
2454      7240  4115  4115    /BCL
2455      7241  0674  0674
2456      7242  0000  0000
2457      7243  1540  1540
2460      7244  4135  4135    /BSE
2461      7245  0271  0271
2462      7246  0000  0000
2463      7247  1600  1600
2464      7250  4115  4115    /BCO
2465      7251  1053  1053
2466      7252  0000  0000
2467      7253  1640  1640
2470      7254  4247  4247    /DSC
2471      7255  0157  0157
2472      7256  0000  0000
2473      7257  1740  1740
2474      7260  4051  4051    /ADD
2475      7261  0224  0224
2476      7262  0000  0000
2477      7263  2000  2000
2500      7264  5323  5323    /STC
2501      7265  0157  0157
2502      7266  0000  0000
2503      7267  4000  4000
2504      7270  4577  4577    /JMP
-
```

```
2505      7271  1120  1120
2506      7272  0000  0000
2507      7273  6000  6000
2510      7274  4764  4764    /MSC
2511      7275  0157  0157
2512      7276  0000  0000
2513      7277  0000  0000
2514      7300  4700  4700    /LDA
2515      7301  0045  0045
2516      7302  0000  0000
2517      7303  1000  1000
2520      7304  5323  5323    /STA
2521      7305  0045  0045
2522      7306  0000  0000
2523      7307  1040  1040
2524      7310  4051  4051    /ADA
2525      7311  0045  0045
2526      7312  0000  0000
2527      7313  1100  1100
2530      7314  4051  4051    /ADM
2531      7315  0741  0741
2532      7316  0000  0000
2533      7317  1140  1140
2534      7320  4675  4675    /LAM
2535      7321  0741  0741
2536      7322  0000  0000
2537      7323  1200  1200
2540      7324  4766  4766    /MUL
2541      7325  0674  0674
2542      7326  0000  0000
2543      7327  1240  1240
2544      7330  4700  4700    /LDH
2545      7331  0450  0450
2546      7332  0000  0000
2547      7333  1300  1300
2550      7334  5323  5323    /STH
2551      7335  0450  0450
2552      7336  0000  0000
2553      7337  1340  1340
2554      7340  5307  5307    /SHD
2555      7341  0224  0224
2556      7342  0000  0000
2557      7343  1400  1400
2560      7344  5345  5345    /TAC
2561      7345  0157  0157
2562      7346  0000  0000
2563      7347  0003  0003
2564      7350  5361  5361    /TMA
2565      7351  0045  0045
2566      7352  0000  0000
2567      7353  0023  0023
2570      7354  5124  5124    /PDP
2571      7355  1120  1120
2572      7356  0000  0000
2573      7357  0002  0002
2574      7360  5323  5323    /STD
2575      7361  0224  0224
2576      7362  0000  0000
2577      7363  0416  0416
2600      7364  4717  4717    /LSW
2601      7365  1523  1523
2602      7366  0000  0000
2603      7367  0517  0517
-
```

```
2604        7370  5255  5255    /RSW
2605        7371  1523  1523
2606        7372  0000  0000
2607        7373  0516  0516
2610        7374  4534  4534    /IOB
2611        7375  0112  0112
2612        7376  0000  0000
2613        7377  0500  0500
2614                            EJECT
-
```

```
2615                    /SPECIAL CHARACTERS AND PSEUDO-INSTRUCTIONS
2616                            *7400
2617                    /
2620        7400  6167          6167              /CHAIN
2621        7401  0056          0056
2622        7402  1006          1006
2623        7403  2536          XCHAIN
2624        7404  6705          6705              /LISTAPE
2625        7405  1323          1323
2626        7406  0065          0065
2627        7407  5615          OUTPUT
2630        7410  6303          6303              /EJECT
2631        7411  0274          0274
2632        7412  1344          1344
2633        7413  4261          PSUDO5            /PSEUDO OP 5
2634        7414  6070          6070              /ASMIFZ (I HAD IT ASSIFZ ORGINALLY BUT THE PRUDES THOUGHT IT WAS TOO
2635        7415  0752          0752              /SUGGESTIVE! ! ! ! ! ! ! ! ! !)
2636        7416  0354          0354
2637        7417  4265          PSUDO1            /PSEUDO OP 1
2640        7420  6070          6070              /ASMIFN
2641        7421  0752          0752
2642        7422  0370          0370
2643        7423  4264          PSUDO2            /PSEUDO OP 2
2644        7424  6070          6070              /ASMIFM
2645        7425  0752          0752
2646        7426  0353          0353
2647        7427  4263          PSUDO3            /PSEUDO OP 3
2650        7430  6070          6070              /ASMSKP
2651        7431  0764          0764
2652        7432  0647          0647
2653        7433  4257          PSUDO7            /PSEUDO OP 7
2654        7434  7300          7300              /SAVSYM
2655        7435  1501          1501
2656        7436  1652          1652
2657        7437  4260          PSUDO6            /PSEUDO OP 6
2660        7440  6347          6347              /FIELD
2661        7441  0305          0305
2662        7442  0224          0224
2663        7443  2705          FLDUP
2664        7444  7135          7135              /PMODE
2665        7445  1057          1057
2666        7446  0271          0271
2667        7447  3304          PDP8MD
2670        7450  6711          6711    /LMODE
2671        7451  1057          1057
2672        7452  0271          0271
2673        7453  3303          LNKMOD
2674        7454  7304          7304              /SEGMNT
2675        7455  0420          0420
2676        7456  1032          1032
2677        7457  0200          BANKCH
2700        7460  6713          6713              /LODSYM
2701        7461  0247          0247
2702        7462  1652          1652
2703        7463  4262          PSUDO4            /PSEUDO OP 4
2704        7464  0000          0000    /AND
2705        7465  0000          0000
2706        7466  0062          0062
2707        7467  3400          3400
2710        7470  7056          7056    /OCTAL
2711        7471  1345          1345
2712        7472  0674          0674
2713        7473  2227          OCT
-
```

```
2714    7474  6231        6231    /DECIMAL
2715    7475  0170        0170
2716    7476  0742        0742
2717    7477  2225        DECIM
2720    7500  7351        7351    /TEXT
2721    7501  1614        1614
2722    7502  0000        0
2723    7503  1610        STRING
2724    7504  7025        7025    /NOLIST
2725    7505  0705        0705
2726    7506  1323        1323
2727    7507  0555        PLIST
2730    7510  6705        6705    /LIST
2731    7511  1323        1323
2732    7512  0000        0000
2733    7513  0554        DOLIST
2734    7514  7121        7121    /PAGE
2735    7515  0410        0410
2736    7516  0000        0
2737    7517  0477        PAGEC
2740    7520  0000        0000    /SEMICOLON
2741    7521  0000        0000
2742    7522  0046        0046
2743    7523  0200        0200
2744    7524  0000        0000    /EXCLAMATION POINT
2745    7525  0000        0000
2746    7526  0055        0055
2747    7527  2200        2200
2750    7530  6000        6000    /STAR
2751    7531  0000        0000
2752    7532  0066        0066
2753    7533  1345        ORGIC
2754    7534  6000        6000    /POINT
2755    7535  0000        0
2756    7536  0072        0072
2757    7537  4142        PERIOD
2760    7540  6000        6000    //
2761    7541  0000        0000
2762    7542  0075        0075
2763    7543  3570        THOU
2764    7544  7411        7411    /U
2765    7545  0000        0000
2766    7546  0000        0000
2767    7547  1105        UN
2770    7550  0000        0000    /COMMA
2771    7551  0000        0000
2772    7552  0070        0070
2773    7553  0600        0600
2774    7554  0000        0000    /=
2775    7555  0000        0000
2776    7556  0050        0050
2777    7557  1400        1400
3000    7560  7702        7702    /Z
3001    7561  0000        0
3002    7562  0000        0
3003    7563  1025        A+1
3004    7564  6515        6515    /I
3005    7565  0000        0
3006    7566  0000        0
3007    7567  1066        H
3010    7570  0000        0000    /-
3011    7571  0000        0000
3012    7572  0071        0071
-
```

```
3013    7573  5200          5200
3014    7574  0000          0000    /+
3015    7575  0000          0000
3016    7576  0067          0067
3017    7577  4600          4600
3020    7600  0000          0000    /SPACE
3021    7601  0000          0000
3022    7602  0054          0054
3023    7603  5600          5600
3024                /
3025                /
3026                /
3027                /
3030                /
3031                /
3032                /
3033                /
3034                /
3035                /
3036                /
3037                      EJECT
-
```

```
3040                    /
3041                    /
3042                    /
3043                    /
3044                    /
3045                    /
3046                            FIELD   1               /THIS IS REALY IN 5000 OF FIELD 0.
3047                    /
3050                    /
3051                    /
3052                    /
3053                    /
3054                    /
3055                            *5000
3056                    /
3057                    /
3060                    /
3061                    /
3062                    /
3063                    /
3064                    /
3065                    /
3066    5000    0000    XXXX,   0
3067    5001    1754            TAD I   XBBLOCK
3070    5002    0353            AND     XL77
3071    5003    3366            DCA     XTHISBLOCK
3072    5004    4312            JMS     XRESET
3073    5005    7240            CLA CMA
3074    5006    4264            JMS     XPUT
3075    5007    5205            JMP     .-2
3076    5010    4312            JMS     XRESET
3077    5011    4322    XLOOP1, JMS     XGET
3100    5012    5334            JMP     XCER
3101    5013    5225            JMP     XOK1
3102    5014    1051            TAD     ITEM
3103    5015    1350            TAD     XM47
3104    5016    7650            SNA CLA
3105    5017    5211            JMP     XLOOP1
3106    5020    1051            TAD     ITEM
3107    5021    1346            TAD     XM40
3110    5022    7650            SNA CLA
3111    5023    5211            JMP     XLOOP1
3112    5024    5334            JMP     XCER
3113    5025    4322    XOK1,   JMS     XGET
3114    5026    5334            JMP     XCER
3115    5027    5334            JMP     XCER
3116    5030    5234            JMP     XINT01
3117    5031    4322    XLOOP2, JMS     XGET
3120    5032    5334            JMP     XCER
3121    5033    5244            JMP     XDONE1
3122    5034    1051    XINT01, TAD     ITEM
3123    5035    4765            JMS I   XCON
3124    5036    3764            DCA I   XXXP
3125    5037    2364            ISZ     XXXP
3126    5040    1051            TAD     ITEM
3127    5041    4264            JMS     XPUT
3130    5042    5231            JMP     XLOOP2
3131    5043    5334            JMP     XCER
3132                    /
3133    5044    7240    XDONE1, CLA CMA
3134    5045    4264            JMS     XPUT
3135    5046    7000            NOP
3136    5047    4322            JMS     XGET
```

```
3137    5050  5743          JMP I   XN
3140    5051  5334          JMP     XCER
3141    5052  3033          DCA     EVAL
3142    5053  3020          DCA     ANY
3143    5054  4477          JMS I   EXPR1
3144    5055  1020          TAD     ANY
3145    5056  7650          SNA CLA
3146    5057  5743          JMP I   XN
3147    5060  1033          TAD     EVAL
3150    5061  0353          AND     XL77
3151    5062  3366          DCA     XTHISBLOCK
3152    5063  5743          JMP I   XN
3153                  /
3154                  /
3155                  /
3156                  /
3157                  /
3160                  /
3161    5064  0000  XPUT,    0
3162    5065  2017          ISZ     17
3163    5066  5272          JMP     .+4
3164    5067  7200          CLA
3165    5070  2264          ISZ     XPUT
3166    5071  5664          JMP I   XPUT
3167    5072  0353          AND     XL77
3170    5073  3322          DCA     XGET
3171    5074  2355          ISZ     XHALF
3172    5075  5304          JMP     XRIGHT
3173    5076  1322          TAD     XGET
3174    5077  7106          CLL RTL
3175    5100  7006          RTL
3176    5101  7006          RTL
3177    5102  3356          DCA     XT
3200    5103  5664          JMP I   XPUT
3201                  /
3202    5104  7240  XRIGHT, CLA CMA
3203    5105  3355          DCA     XHALF
3204    5106  1356          TAD     XT
3205    5107  1322          TAD     XGET
3206    5110  3416          DCA I   16
3207    5111  5664          JMP I   XPUT
3210                  /
3211                  /
3212                  /
3213                  /
3214    5112  0000  XRESET, 0
3215    5113  7240          CLA CMA
3216    5114  3355          DCA     XHALF
3217    5115  1347          TAD     XM9
3220    5116  3017          DCA     17
3221    5117  1357          TAD     XP
3222    5120  3016          DCA     16
3223    5121  5712          JMP I   XRESET
3224                  /
3225                  /
3226                  /
3227    5122  0000  XGET,    0
3230    5123  4751          JMS I   XGETIN
3231    5124  1352          TAD     XM43
3232    5125  7450          SNA
3233    5126  5722          JMP I   XGET
3234    5127  2322          ISZ     XGET
3235    5130  7001          IAC
```

```
3236    5131  7640          SZA CLA
3237    5132  2322          ISZ     XGET
3240    5133  5722          JMP I   XGET
3241                  /
3242                  /
3243                  /
3244                  /
3245                  /
3246                  /
3247    5134  1344  XCER,    TAD     XL6
3250    5135  4476          JMS I   ERR1
3251    5136  4465          JMS I   PASSEK
3252    5137  4466          JMS I   CURSKA
3253    5140  4532          JMS I   SCLEAR
3254    5141  4530          JMS I   LINENO
3255    5142  5517          JMP I   MON
3256                  /
3257    5143  5202  XN,     XXN
3260    5144  0006  XL6,     6
3261    5145  0017  XL17,    17
3262    5146  7740  XM40,    -40
3263    5147  7767  XM9,     -9
3264    5150  7731  XM47,    -47
3265    5151  3670  XGETIN,  GETIN
3266    5152  7735  XM43,    -43
3267    5153  0077  XL77,    77
3270    5154  4175  XBBLOCK, BBLOCK
3271    5155  0000  XHALF,   0
3272    5156  0000  XT,      0
3273    5157  5157  XP,      .
3274    5160  0000  XXN1,    0
3275    5161  0000  XXN2,    0
3276    5162  0000  XXN3,    0
3277    5163  0000  XXN4,    0
3300    5164  5310  XXXP,    XNM1
3301    5165  3600  XCON,    CONVRT
3302                  /
3303                  /
3304                  /
3305                  /
3306                  /
3307    5166  7777  XTHISBLOCK,     -1
3310    5167  0036          36
3311    5170  0346          346
3312    5171  0002          2
3313                  /
3314                  /
3315                  /
3316                  /
3317                  /
3320                  /
3321                  /
3322    5172  5600  XXRET,   JMP I   XXXX
3323                  /
3324                  /
3325                  /
3326                  /
3327                  /
3330                  /
3331                  /
3332                          PAGE
3333                  /
3334                  /
```

```
3335                    /
3336                    /
3337                    /
3340        5200  4754  XXXR,   JMS I   XXGET
3341        5201  7410          SKP
3342        5202  1051  XXN,    TAD     ITEM
3343        5203  1341          TAD     XXM43
3344        5204  7640          SZA CLA
3345        5205  5200          JMP     XXXR
3346                    /
3347        5206  4736          JMS I   XREAD
3350        5207  5166          XTHISBLOCK
3351        5210  1337          TAD     XL6777
3352        5211  3016          DCA     16
3353        5212  1340          TAD     XM100
3354        5213  3202          DCA     XXN
3355        5214  1016  XXLOOP, TAD     16
3356        5215  7040          CMA
3357        5216  0342          AND     XL7770
3360        5217  7040          CMA
3361        5220  3016          DCA     16
3362        5221  1343          TAD     XXP
3363        5222  3017          DCA     17
3364        5223  1344          TAD     XM4
3365        5224  3203          DCA     XXN+1
3366        5225  6211  XXLP,   CDF     10
3367        5226  1416          TAD I   16
3370        5227  6201          CDF     0
3371        5230  7041          CIA
3372        5231  1417          TAD I   17
3373        5232  7640          SZA CLA
3374        5233  5327          JMP     XXY
3375        5234  2203          ISZ     XXN+1
3376        5235  5225          JMP     XXLP
3377        5236  6211          CDF     10
3400        5237  1416          TAD I   16
3401        5240  3204          DCA     XXN+2
3402        5241  1416          TAD I   16
3403        5242  6201          CDF     0
3404        5243  7710          SPA CLA
3405        5244  5327          JMP     XXY
3406        5245  4465          JMS I   PASSEK
3407        5246  4466          JMS I   CURSKA
3410        5247  4532          JMS I   SCLEAR
3411        5250  4530          JMS I   LINENO
3412        5251  1204          TAD     XXN+2
3413        5252  3745          DCA I   XXL
3414        5253  1346          TAD     XL7400
3415        5254  3750          DCA I   XX1
3416        5255  3751          DCA I   XX2
3417        5256  1347          TAD     XL4400
3420        5257  3752          DCA I   XX3
3421        5260  3037          DCA     MODE
3422        5261  1733          TAD I   XTH
3423        5262  3734          DCA I   XHT
3424        5263  4736          JMS I   XREAD
3425        5264  4170          LTAB
3426        5265  4465          JMS I   PASSEK
3427        5266  5321          JMP     XXFH
3430        5267  1335          TAD     XM26
3431        5270  4475          JMS I   SKIP
3432        5271  1277  XXT,    TAD     XXMESS
3433        5272  7450          SNA
-
```

```
3434    5273  5321          JMP     XXFH
3435    5274  4401          JMS I   DECOUT
3436    5275  2271          ISZ     XXT
3437    5276  5271          JMP     XXT
3440                  /
3441                  /
3442    5277  0303  XXMESS,  303
3443    5300  0310          310
3444    5301  0301          301
3445    5302  0311          311
3446    5303  0316          316
3447    5304  0311          311
3450    5305  0316          316
3451    5306  0307          307
3452                  /
3453    5307  0240          240
3454                  /
3455    5310  0000  XNM1,    0
3456    5311  0000          0
3457    5312  0000          0
3460    5313  0000          0
3461    5314  0000          0
3462    5315  0000          0
3463    5316  0000          0
3464    5317  0000          0
3465    5320  0000          0
3466                  /
3467                  /
3470    5321  4500  XXFH,    JMS I   TYCARI
3471    5322  7240          CLA CMA
3472    5323  3012          DCA     CURLIN
3473    5324  4753          JMS I   XBUFIN
3474    5325  5726          JMP I   .+1
3475    5326  5172          XXRET
3476                  /
3477                  /
3500                  /
3501                  /
3502                  /
3503                  /
3504                  /
3505    5327  2202  XXY,     ISZ     XXN
3506    5330  5214          JMP     XXLOOP
3507    5331  5732          JMP I   .+1
3510    5332  5134          XCER
3511                  /
3512                  /
3513                  /
3514                  /
3515                  /
3516                  /
3517                  /
3520                  /
3521                  /
3522                  /
3523    5333  5166  XTH,     XTHISBLOCK
3524    5334  4175  XHT,     BBLOCK
3525    5335  7752  XM26,    -26
3526    5336  7774  XREAD,   READ
3527    5337  6777  XL6777,  6777
3530    5340  7700  XM100,   -100
3531    5341  7735  XXM43,   -43
3532    5342  7770  XL7770,  7770
-
```

```
3533      5343  5157  XXP,     XP
3534      5344  7774  XM4,     -4
3535      5345  4177  XXL,     BUFINZ
3536      5346  7400  XL7400,  7400
3537      5347  4400  XL4400,  4400
3540      5350  3354  XX1,     CHRC
3541      5351  3351  XX2,     WDHALF
3542      5352  3352  XX3,     PTBUFP
3543      5353  4006  XBUFIN,  BUFIN
3544      5354  3670  XXGET,   GETIN
3545                  /
3546                  /
3547                  /
3550                  /
3551                  /
3552                  /
3553                  /
3554                  /
3555                  /
3556                  /
3557                  /
3560                  /
3561                  /
3562                  /
3563                  /
3564                        EJECT
```

```
3565                /              M A J O R   T A P E   D E F I N I T I O N S
3566                /
3567                /
3570                /
3571                /
3572                        FUDGE1=326-300
3573                        FUDGE2=467-370
3574                        SCRATCH=325-300          /DEFINES A SCRATCH AREA FOR SAVSYM&LODSYM
3575                        BCHAIN=324-300
3576                        BOOUT=450-370
3577                /
3600                /
3601                /
3602                /
3603                /
3604                        DIALUNIT=100
3605                        DIALBINARY=111
3606                /
3607                /
3610                /
3611                /
3612                        READ=7774
3613                        WRITE=7775
3614                /
3615                /
3616                /
3617                /
3620                /
3621                /
3622                /
3623                /
3624                /
3625                        EJECT
-
```

```
3626                /              E N D   A S S E M T H R E E ! ! ! ! ! ! !
3627                /
3630                /
3631                /
3632                /
3633                /
3634                /
3635                /
3636                /
3637                /
3640                        EJECT
-
```

```
3641                    /
3642                    /
3643                    /
3644                    /
3645
```

NO ERRORS

```
SYMBOL  VALUE  DEF   REFERENCES

A       1024   1515  1521 1545 1565 3003
AADR    0030   0331  0517 0522 0525 0553 0563 1025 1030 1032 2051 2061 2071 0115 0121 0177 0227 1022 1534 1557 1602 1613 1621 1624
                     2430 2755 2764 2770 2776
AADRL   3052   1603  1623 1626
AALPHA  4004   2602  2671
AAS     1332   2030  2041 1717
ABANK   0046   0347  2070 0205 1616 2432 2773
ABNOP1  3042   1573  0067
ABNOP2  3043   1574  0070
ABNOP3  3044   1575  0071
ABNOP4  3045   1576  0072
ACHECK  5460   0357  0424
ACOUNT  5400   0250  0340 0345 0346 0366
ADDCON  4254   3120  3103
ADR     0165   0467  1602 1733
AEJECT  5516   0434  0310
AEPONT  5532   0452  0445
AEP62   5531   0451  0441
AFORT   5457   0356  0411
ALL     7600   1467  1527
ALPHA   2400   1116  1215 2602
ALPHAB  3445   2153  2133
AMAINP  5507   0421  0353
AMM10   5505   0417  0323
ANDS    3400   1463  1526
ANLXC   6054   1240  1213 1261
ANLXE   6057   1244  1212
ANY     0020   0321  0513 0714 1021 0077 0103 0706 1106 1111 1505 2760 0261 3142 3144
ANYY    2367   1102  0704 1112
APAEND  5477   0376  0420
APAGE   0031   0332  1725 2055 0201 0231
ASEND   5506   0420  0351
ASPAST  5467   0366  0363
ASSNO   5503   0411  0263 0331 0337 0437 0443 0446 0465 0564 1002
ASSRST  5471   0370  0401
ASSYIN  5441   0340  0333
AWAY    1241   1737  1723 1727
A1W     1313   2011  2027 2031 2033 2035
B       1076   1567  1517 1520
BAD     6400   1326  1371 1372 1275
BANDO   5031   0074  0115
BANKCH  0200   0512  2677
BANKEM  0220   0532  0515
BANKHR  0211   0523  0540
BANOP1  5024   0067  0106
BANOP2  5025   0070  0110
BANOP3  5026   0071  0112
BANOP4  5027   0072  0114
BANOP5  5030   0073  0116
BBLOCK  4175   3021  2606 2617 3270 3524
BCHAIN  0024   3575  1315
BEGNAS  5002   0045
BEGNLI  5000   0043
BINBLK  0011   0311  1553 2363 2423 2647 3212
BINCK   3020   1551  1545
BINHDR  4164   3004  2664
BINPTR  0010   0310  1542 1546 1550 1551 2420 2422 2621
BINTAB  0176   0500  1541
BIT     2047   0554  2456
BITT    3712   2456  2455
BIT6    3400   2102  0366 2113 2126 2141 2150 2152 2155
```

```
SYMBOL   VALUE  DEF   REFERENCES

BIT6A    0064  0366  0554
BIT6M3   3462  2170  2134
BLKUSE   4340  3301  3222
BLM10    5035  0100  0123
BLPM22   5036  0101  0124
BLTAD    5032  0075  0117 0121
BLTAD1   5033  0076  0120
BLTAD2   5034  0077  0122
BOOUT    0060  3576  0604
BUFI     3350  2027  2014
BUFIN    4006  2604  2027 2610 2630 3543
BUFINZ   4177  3023  2607 2615 3535
BUMP     0726  1323  1270 1312 1324 1325 1331 1332 1333 1334
B1       1041  1532  0755 1542 1543
B11      0434  0755  0734 0744
B2       1046  1537  0405 1550 1574
B21      0103  0405  1111 0733 0735 1774 2767
C        1055  1546  1522 1523 1524 1526 1540 1552 1554 1556 2325
CARET    3443  2151  2124
CCDF     0753  1355  1353
CCNOP    6304  1456  1453
CHARAC   0057  0360  0147 0567 0573 0616 0633 0640
CHARX    0044  0345  0722 1773 2007 0555 0556
CHARX2   0045  0346  0737 0557 0711 0720
CHECK    0740  1342  0443 1171 1345 1347 1351 1361
CHECKO   5737  1032  2646 1047
CHEKER   0070  0372  1243
CHKL     1264  1762  1750
CHKLA    1222  1720  1710
CHO      4045  2643  2624
CHRC     3354  2033  2006 2011 2643 3540
CJMP1    1547  0224  0375 0062 0222
CKUN     3262  1740  1731 1744
CLEARR   2132  0637  0434 0127 0650
CLENUP   1453  0127  0071
CNOP     0747  1351  1456
CNTLPI   0004  0302  0070 1244 1404 2725
CNTMON   2363  1075  1072
CNTRLP   2353  1064  0302 1066 1073
COMMA    0600  1456  1541
COMMAN   0260  0574  0544 0254
COMMEN   3701  2445  0540 2452
COMS     2036  0540  0546
CON      0164  0466  1472 1474 1606 1627 1711 0265 0270 0271 2323 2462 2463 3054 3063 3064 3102 3110 3111
CONREG   3725  2502  2453
CONSKP   3674  2440  2446 2454
CONVRT   3600  2340  0662 2346 3301
CONYES   3700  2444  2445 0073
COSA     3541  2270  2255
COUNT    0760  1370  1167 1264 1265 1304 1314 1343 2746 1272
CRFOUN   6010  1151  1143
CRIOR    1165  1660  1505 1546 1551 1553 1555 1603 1636 1644
CTYPO    0763  1373  1357
CURLIN   0012  0312  0406 0414 0425 0433 1247 1573 1665 2635 3472
CURR     0043  0344  0771 0774 0775 1002 1010 1015
CURREN   0227  0542  1667
CURSKA   0066  0370  0530 1035 1655 2064 0173 0341 1511 3252 3407
CURSKP   2520  1246  0370 1254
C1A      3576  2325  2324
DECIM    2225  0732  2717
DECIMS   2231  0736  0732 0741
DECOUT   0001  0277  1407 0657 1240 1242 1451 1471 1674 1703 2211 2262 2264 2721 2723 2724 0657 1042 3435
```

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SYMBOL   VALUE  DEF   REFERENCES

DEFIN1   1174   1667  1600
DIALBI   0111   3605  3004 3176 0520 0602
DIALUN   0100   3604  1313 1321 2060 3011 3243 0207
DISRE    4001   2576  2665
DISRET   3463   2171  2216 2576
DLFT     2126   0633  0673
DOCAL    1426   0102  0252 0425
DOLEFT   1474   0151  0143
DOLIST   0554   1076  2733
DOPOUT   0567   1111  1103
DPCS     2212   0717  0714 0731
DPCV     2200   0705  0736 0723 0726
DPCVM2   2242   0747  0715
DPCVOP   0415   0736  0733
DRHT     2111   0616  0674
DV3      2640   1433  1430
D6       0300   0246  1775 3013
D7       0370   0247  0310 0500 2600 2637 3006 3222
D8       0410   0250
D9       0446   0251
EDEFIN   3771   2561  2556
EMLEVE   2130   0635  0571 0620
EMPTRA   0172   0474  0576 0600 0601 0622
EMPTY    2054   0561  0363 0566 0636
EMPTY1   0061   0363  0110 1253
ENDMS    3717   2471  0700 0427
ENTS     2000   0501  0525 0531 0533 1745 0075
ENTS1    3267   1745  1733
EQCHK    2332   1043  1032 1050
EQCHKI   2340   1051  1045
EQRETI   0006   0304  1637 1643 1047 2046
EQU      1142   1635  1572
EQUALS   1400   1460  1544 1572
EQUCHK   3366   2045  1051 2050
EQUERR   3766   2555  1633
ERONE    1140   1632  1544
ERRCNT   0167   0471  0167 0210 0642 0645 1570 1662 1706
ERROR    3201   1656  0400 0400 1713
ERR1     0076   0400  0757 1671 1026 1037 1100 2047 2157 2555 3250
ERR12    2364   1077  1057
ERR2     2275   1006  0576 1012 1024 1027 1053 1060
ERSY     0674   1245  1156
ERTOT    0002   0300  0206 0643 0644 2173
EVAL     0033   0334  0526 0533 0535 1033 1037 1607 1646 1720 1741 1751 1754 1755 1767 2050 2052 2062 2066 0106 0113 0203 0305 0316
                      0323 0324 0360 1513 1517 1522 1563 1606 0264 3141 3147
EXCLAM   2200   1462  1524
EXPR     1000   1471  0401 1512 1605 1630
EXPR1    0077   0401  0512 1020 1641 1702 2044 0102 1501 0260 0434 3143
E7       0000   0245
FACTOR   4330   3222  3213
FDRT     2714   1510  0377 1504 1515 1521 1524 0356
FIELDM   2717   1513  1507
FINEND   2173   0700  0553 0426
FIRST    6110   1325  1271 1313 1371 1274 1275
FLDUP    2705   1501  2663
FLDWD    0036   0337  0534 0207 1523 1543
FOUND    2507   1231  1120 1205 1213 1221
FSBLK    4002   2600  2613 0147 0152
FSUNIT   4003   2601  2616 0145
FUDGE1   0026   3572  0211
FUDGE2   0077   3573  0522
G        1113   1604  1525 1527
```

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SYMBOL   VALUE  DEF   REFERENCES

GENINI   1703   0401  0275 0330 0370
GET      1110   1601  1541 1573
GETADR   1200   1676  1665 1700 1735 1736
GETAD1   1172   1665  1601
GETASY   3242   1720  0412 1723 1726 1736 1737 1743
GETAS1   0110   0412  0762
GETCHR   0067   0371  2435
GETIN    3670   2434  0401 0537 2443 2447 3265 3544
GETLET   0441   0762  0727
GETS     2035   0537  0543
GETSYM   0400   0721  0411 0761 0767 0772 0776 1003 1011
GETSY1   0107   0411  1016 1516 1537 1571
GETVAL   5401   0251  0265 0327 0334 0461 1001
GETYE    0365   0703  0675
GETYPE   3623   2367  0703 2316 2416
GGGET    0676   1262  1273 1356
GSTART   0446   0767  0753 1004 1017
GTYPOT   0464   1005  1001
GYP      3567   2316  2302
H        1066   1557  1577 3007
HIC      0052   0353  0707 1422 1431 1435
H6       1075   1566  1507 1511 1563 1564 1610 1613
IDX      2037   0542  0406 0560 2161
IDX1     0104   0406  0760 1515 1536 1640 1677 2004 2043 0072 0717 2766 0364
IMINIT   5132   0203  0172
IMMOVE   5130   0201  0156
IMREAD   5131   0202  0164
IMTYPO   5127   0200  0171
IM215    5126   0177  0170
IN       0050   0351  2003 1722 1724
INAS     0073   0375  0125
IND      0166   0470  1611 1744 1753 1770 0100
IND1     0370   0706  0622 0630 0636
IND1B    0364   0702  0674
IND1C    0366   0704  0677
INIT     4013   2611  0361 2636 0203
INIT1    0060   0361  0221 0167
INP      0722   1313  1311 2744
INST     0055   0356  0650 1475 1477 1622 1625 0236
INSYM    3375   2062  1767
ITABIN   5133   0207  0165
ITEM     0051   0352  0135 0141 0311 0321 0335 0347 0364 0547 2103 2130 2137 2154 2436 2442 0341 0360 3102 3106 3122 3126 3342
JBMSTR   1707   0406  0413 1356
JBNOP    5014   0057  0105 0107 0111 0113
JBSMF    1732   0433  0412
JBTEST   1706   0405  0432 0422 0430
JEND     1734   0435  1113 0423 0062
JJEND    0571   1113  1110
JJSTAR   0570   1112  1105
JNOP     1730   0427  0102
JSTART   1733   0434  1112 0420 0063
JUDGE    2452   1170  1152 1162
KILBUF   4075   2701  1075
KLOOP    4114   2725  2704 2731
KLUG2    2170   0675  0667
LBAD     6103   1275  1227
LCB      6662   1552  1260 1266 1420 1435
LCF      6652   1550  1240 1250 1344 1417 1506
LCOUNT   6100   1272  1220
LDT      1274   1772  1775 2006 2010 2012 2025 2037
LEAVE    1236   1734  1732 1745 1756
LEFTHF   3340   2017  2001
```

```
SYMBOL   VALUE  DEF   REFERENCES

LEVEL    1256   1754  1717 1766 1771
LFF      6032   1174  1161
LFF2     6033   1175  1165
LFIRST   6102   1274  1224
LFTEST   6014   1155  1202
LINENO   0130   0432  0065 0345 3254 3411
LINKDT   4152   2770  2763
LINKI    1104   1575  1561
LINKIC   1370   2066  2047
LINK8    2624   1417  1400
LINK8A   3551   2300  1417 2307 2315
LISREG   5062   0125  0104
LISTA    2731   1525  0234
LISTWD   0003   0301  0132 0164 0411 0427 0562 1565 2035 2501 0046 0053
LIST1    1557   0234  0075
LLB      6654   1547  1240
LNCK     3737   2517  0653 2523
LNCKA    2146   0653  0621 0651
LNINST   1560   0235  0702 0251
LNKA     3062   1613  1601
LNKADD   4250   3113  3106
LNKMOD   3303   1762  2673
LNKOR    1250   1746  1705
LNKREG   1452   0126  0120
LNKSUB   4225   3066  3060
LNRT     1365   2063  2057 2072
LOK      6200   1343  1400 1403 1406 1410 1423 1527
LOKA2    6314   1504  1441
LOK0     6210   1354  1520
LOK1     6212   1357  1447 1450 1451 1452 1454
LOUTP    6101   1273  1222 1223 1225 1230 1231
LOWTMP   0140   0442  1267 1272 1562 1564
LPBACK   6041   1220  1146
LPR      6664   1553  2733 1251 1260 1266 1345 1435 1506
LPRENT   6065   1252  1267
LPTEST   6244   1413  0137
LP08C    6071   1260  1523
LP08E    6073   1263  1524
LSD      6661   1551  1350 1145 1421 1437
LSRTE    1472   0147  0157
LSTSYM   1454   0131  0373 0134 0140 0150
LTAB     4170   3011  2633 3425
LTREAD   4005   2603  2605 2632
LWC      0053   0354  1533 0710 0752 0770 0772 0777 1001 1421 1423 1434 1437 2320
LWD      3477   2206  2175 2203 2204 2212
LWDE     3504   2214  2210 1530
LWDEFD   3507   2224  1527
L10      6104   1300  1247
L17      6305   1466  1343
L7710    5520   0436  0325
L777     4174   3017  2614
MAIN     1400   0054  0374 0063
MAINEX   0072   0374  2474 0126 0166
MAINSA   1504   0161  0105 0421 0422
MAINSE   1411   0065  0403 0111 0163 0166 0174
MAINSF   1416   0072  0600 2561
MAIN1    0101   0403  0531 1036 1656 2065 1303 1512
MAIN1A   0264   0600  0572
MASSIF   5426   0325  0306
MESS     3510   2232  2206
MESSS    3520   2242  2200
MICRO    0056   0357  1623 1706
```

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SYMBOL   VALUE  DEF   REFERENCES

MICROB   0005   0303  1617 1746
MICROL   0054   0355  1500 1502 1616 1621 0246
MINUS    5200   1465  1523
MMMOVE   4136   2751  2712
MODE     0037   0340  0550 0672 1557 1703 2045 0060 0116 1502 1577 1764 1765 2631 2761 3056 3104 3421
MON      0117   0421  1672 0356 1101 2673 3255
MONIT    4101   2712  0421
MOVA     0545   1066  1056
MOVB     0540   1061  1074
MOVEAA   0262   0576  0547
MOVE1    0074   0376  1176
MOVE8    0524   1045  0376 1051 1053 1054 1055 1065 1100 1104 1106
MTAD     2265   0775  0757 0763 1002
MTDG     2273   1004  0727 0761
MTHREE   7346   0256  0656
MTRL     2257   0766  0755 0756 0760 0773
MTSW     2251   0757  0737 0740 0744
MTWO     7344   0254  1234 0520 1516 1604 1610 1667 1704 2413
MT10     2243   0751  0730 0764
M1       0523   1044  1046
M1A      1735   0436
M10      2171   0676  0664
M1000    0121   0423  0216 0743
M12A     0414   0735  0730
M140     6060   1245
M154     6311   1472  1347
M20      3454   2162  2107
M212     6105   1301  1157
M215     0151   0453  1070 1141 1163 1203
M22      2535   1263  1251 0101
M26      3661   2425  2355
M33      0123   0425  0725 1445 2131
M4       0135   0437  1043 1457 2256 1414 1431
M40      0013   0313  2104 2342 2653 0324
M43      0122   0424  0136 0334 0365 2450 0342 0361
M45      0125   0427  2000 0721 1426
M47      0133   0435  0612 0627
M57      2034   0536  0544
M6       3101   1632  1575
M6A      1261   1757  1715
M60      1576   0253  0073 0403 1467
M60A     3662   2426  0441 2357 1470
M67      0126   0430  0712
M7       2702   1476  1376
M7TWO    2174   0701  0075
M72      6310   1471  1510 1512
M77      3756   2537  2505
NASSIF   5424   0323  0304 0504
NONER    3046   1577  1572
NOS      4137   2755  2775
NOTAB1   2107   0614  0076
NOTAB2   2124   0631  0077
NOTBLK   3616   2362  1627 2366
NOTBL1   3076   1627  1555
NOTLDT   1311   2007  2002
NUM      6106   1313  1153 1171 1174 1253
NUPAGE   1262   1760  1731 1776 1777 2005 2013 2014 2023
NXCAND   2413   1131  1211
OASSNO   5725   1002  0624 0655 0660 0744
OBIN     5720   0756  0735
OBLOCK   5735   1013  0632 0722
OBSET    5706   0733  0627 0736
```

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SYMBOL   VALUE  DEF   REFERENCES

OCCRLF   5751   1046  1035 1041
OCDOIT   5743   1037  1043 1044
OCHECK   4050   2646  2666
OCPNT    5753   1054  1037
OCT      2227   0734  2713
OCTS     2235   0742  0212 0734 0745
OCTS1    1535   0212  0064 0217
OCUSES   5776   1102  1033
OEND     5661   0673  0667 0700
OGTVAL   5724   1001  0620
OLOC     5730   1005  0634 0674 0706 0707 0713 0714
OL17     5726   1003  0630
OL377    5732   1007  0675 0711 0715
OL6400   5731   1006  0633 0712
ONEREG   1436   0112  0107 0124 0126 0402
ONEREI   1704   0402  0306 0361
ONVRT    2155   0662  0656
OOPUT    5667   0705  0670 0673 0717 0723
OPOINT   5727   1004  0656
OPS      2661   1455  0364 1402 1473 1474 1531
OPUT     5654   0665  0621 0625 0671 0677 1004
OP1      4273   3150  3134 3135 3136 3137 3140 3141 3143 3146
ORGIC    1345   2043  2753
OSANDV   2600   1373  1230 1405
OSYM     2613   1406  1374 1416 1425 1444 1456 1461 1464 1465
OUNIT    5733   1011  0631 0721
OUTP     0705   1271  1266 2745 1273
OUTPUT   5615   0620  2627
OUTTAB   2156   0663  0614 0631
OUTTP    2147   0654  0615 0632 0661
OX       2625   1420  1411 1413 1415 1441
OXREAD   2546   1310  1276 1301
OXWRIT   2547   1311  1274
PACHEC   5512   0424  0347
PAFTER   4270   3145  0277
PAGEC    0477   1020  2737
PAGEM    0516   1037  1023
PAGE1    0102   0404  0524 1031 2060 0125 1773
PAGHER   0510   1031  1043
PAGSET   3524   2253  0372 2267 2274 2277
PASS     0035   0336  1101 0057 0161 0215 0564 1031 1035 1041 2040 2437 2471 0462 0502 0622
PASSEK   0065   0367  0527 1034 1654 2063 0172 0307 0340 0362 1510 1661 1710 0435 3251 3406 3426
PASSER   3355   2034  0367 2042 2043 2044
PASS1    1401   0055  0054 0224
PASS1P   1407   0063  0223
PASS2    1537   0214  0225
PCFIG    6037   1212  1172 1526
PCHECK   0141   0443  1303 1315 2726
PCLP     6040   1213  1147 1525
PCONT    3522   2251  2214 2215 2254 2270 2276 2513 0452
PCOT     3736   2513  2504
PCOUNT   4133   2746  2701 2727
PC1      6306   1467  1350 1351 1511
PC2      6307   1470  1352 1513
PDLK     4147   2765  2757 3000
PDOCAL   5513   0425  0370
PDOLLA   5514   0426  0352 0373
PDP8ER   0253   0566  0562
PDP8MO   3304   1763  2667
PENDMS   5515   0427  0372 0377
PERIOD   4142   2760  2757
PERMA    0032   0333  0644 0055 1121 2550
```

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SYMBOL   VALUE  DEF   REFERENCES

PGJS     3723  2500  2503 2512 2674
PINP     4131  2744  2702
PJEND    5017  0062  0052
PJMP     5414  0303  0300
PJNOP    5037  0102  0060 0061
PJSTAR   5020  0063  0050
PLIST    0555  1077  2727
PLOVR    0762  1372  1326
PLP08C   6331  1523  1514
PLP08E   6332  1524  1516
PLTST    0761  1371  1305 1330
PLUS     4600  1464  1522
PL17     4130  2741  2732
PL212    4135  2750  2722
PL215    4134  2747  2720
PMAINS   5510  0422  0354 0367 0374 0400
PM60A    0137  0441  0440
POINT    0047  0350  0076 1055 1061 1062 3171 3172 3173
POPUP1   4307  3167  0410 3174
POPU1    0106  0410  1604 1612 1614 1620 1624 1626 1734
POSAND   2506  1230  1223
POUTP    4132  2745  2703
PPSEUD   4274  3152  3144
PRINIT   6107  1314
PRINT    6000  1140  1152 1154 1167 1175 1232 1242 1255 1404
PRSYMB   2474  1213  1135
PR1      6226  1373  1360
PR2      6227  1374  1362
PR3      6230  1375  1364
PR4      6231  1376  1366
PR5      6232  1377  1370
PSEUDO   5410  0277  3152 0375 0412
PSINTE   1575  0252  0101 0423
PSRET    4201  3151  3145 3147
PSTCHK   0261  0575  0546
PSTS     4074  2674  2672
PSUD     0334  0652  0643
PSUDO1   4265  3142  2637
PSUDO2   4264  3141  2643
PSUDO3   4263  3140  2647
PSUDO4   4262  3137  2703
PSUDO5   4261  3136  2633
PSUDO6   4260  3135  2657
PSUDO7   4257  3134  2653
PSWITC   5511  0423  0350 0371
PTB      4047  2645  2627
PTBUFF   3353  2032  2012
PTBUFP   3352  2031  2002 2005 2013 2021 2645 3542
PTHREE   7325  0252  0756 1164 2156
PTOCMC   1577  0254  0067
PT1      6312  1473  1416 1424 1433 1442
PT2      6313  1474  1415 1426 1432 1444
PUNONE   3001  1532  0422 0213 1533 1567 1574 1603 1607 1612
PUNON1   0120  0422  0114
PUSH1    0105  0407  1473 1476 1501 1504 1510 1513 1701
PUSH2    2341  1052  0407 1063
PUT      0710  1301  0277 1307 1316
PV8MOV   5552  0501  0474
PXL1     6333  1525  1515
PXL2     6334  1526  1517
P1TO37   3425  2127  2106
P10      1173  1666  1575 1576
```

```
SYMBOL   VALUE  DEF   REFERENCES

P100     3751  2531  2344
P11      0015  0315  1077 2114
P12      2241  0746  0724
P177     0145  0447  0770 1742 0122
P1777    0144  0446  0555 0616 1203 1752 2067 1625 2305 2777
P2       3456  2164  2117 2122
P20      3100  1631  1547
P200     0147  0451  1013 1026 1737
P2000    0152  0454  0520 0746 0764
P212     0153  0455  1241 2261 1265 1505
P215     0154  0456  1237 2263 1144 1371
P2270    4041  2637  2620
P240     0134  0436  1406 2345 1434
P260     2704  1500  1450 1470
P300     0143  0445  1673 1702
P367A    3450  2156  2121 2136
P377     3077  1630  1560
P3777    0131  0433  0624 0632 1071 1213 1224 1622 2756
P40757   3412  2114  2111
P400     0124  0426  1562 2405
P4000    0150  0452  0566 0662 0665 1217 1231 0176 0200 0202 0204 2375
P41      3460  2166  2140
P43      3523  2252  2260
P4400    4046  2644  2626
P45      2701  1475  1433
P46      3461  2167  2151
P4774    5023  0066  0103
P4775    5021  0064  0047
P4776    5022  0065  0051
P5       3770  2560  2553
P5000    0142  0444  1054 1561
P53      2703  1477  1447
P54      3455  2163  2147
P57      3457  2165  2125
P6000    0136  0440  0521 0564 1154 1206 1240 1764 0242 1010 1015 1104 1107 1614 1741 2312 2371 2411 2431 2771
P6321    3316  1775  1766
P7       0157  0461  1670 1714 1467 1244 1246
P7400    0155  0457  1535 2010 2623
P76      0127  0431  2272
P7600    0146  0450  0773 0777 1012 1027 1721 2053 0230
P77      0160  0462  0312 0322 0605 0623 1672 1701 2003 2025 2341
P777     0156  0460  1057 0753
RADD     4235  3100  1661 3112
RADDRT   4246  3111  3123
RAND     3713  2461  1663 2464
READ     7774  3612  1134 2051 2603 3166 0202 0477 0576 3526
REJECT   2470  1206  1145 1171
REPUN1   1171  1664  1635
RESET    1551  0226  0404 0232
RESETL   3663  2427  0365 2433
RESET1   0063  0365  0523 1772
RESTOR   1751  0462  0577 1664 0451 0453 0455 0463 0465 0467 0471
RESTO1   0263  0577  0543
RETURN   4051  2647  0420
RET1     0116  0420  2473
RIOR     1600  0263  1660 0272
RSUB     4211  3052  1662 3065
RSUBRT   4223  3064  3077
RTHFT    3336  2015  2007
RWRITE   4163  3002  2663
R1       6233  1400  1357
R2       6235  1402  1361
```

```
SYMBOL   VALUE  DEF   REFERENCES

R3       6237  1404  1363
R4       6241  1406  1365
R5       6243  1410  1367
SADR     0023  0324  0613 0641 1163 1165 1202 1204 1207 1210 1211 1212 1214 1220 1221 1222 1223 1225 1232 1233 1235 1236 0510 0511
                     0513 0514 0516 0521 0524 1141 1153 1155 1163 1165 1175 1204 1216 2370 2373 2374 2401 2402 2414 2415
SADROV   2033  0535  0523
SAMES    3073  1624  1620
SAVE     1736  0447  0602 0456
SAVE1    0265  0602  0605
SCH1     0433  0754  0743
SCLEAR   0132  0434  0342 3253 3410
SCOLON   0200  1455  1525
SCRATC   0025  3574  1323 3245
SCURR    0026  0327  0606 0610 0646 0706 0707 0450 1122 1131 1136 1173 1210
SDEC01   0112  0414  0611 1645 0464 0503 1137 1174
SDEC08   0600  1151  0414 1172 1405 1410
SEARCH   0266  0604  0676 0701 0754 1746
SEARC1   0272  0610  0713
SEAR1    3270  1746  1727
SEMFDG   2573  1355  1346
SEMITX   2561  1340  1345 1351 2144
SEMITZ   3440  2144  2112
SEMPTF   2574  1356  1347
SEND     0027  0330  0711 0056 0502 0532 1133 0467 0511
SETINU   0177  0501  1556
SETORG   1520  0175  0061 0211 0220
SETUSE   3653  2417  2365 2424 2641
SGN      0034  0335  1503 1506 1534 1547 1570 1615 2765
SIT      4315  3176  3046 3160
SKIP     0075  0377  0670 1252 1377 1576 1605 1611 1670 1705 2356 3431
SKIPAS   5435  0334  0312
SKIP2    0764  1404  0377 1412
SL777    4304  3163  3043 3155
SM370    4305  3164  3042 3154
SNUM     0171  0473  0545 1152 1153 1157 2546
SOMEW    4227  3071  3053 3061
SOPS     0062  0364  1250 1666 2202
SPACE    5600  1466  1521 1540 1573
SPACK    3744  2524  0675 2535
SPCUNT   0173  0475  0074 0344 2360 2520 2530 2533
SPECAL   0416  0737  0724 0732
SPTO60   1705  0403  0343
SQERR    1702  0400  0354 0355
SQFDRT   1701  0377  0367
SRD1     0115  0417  2421
SREAD1   4275  3153  0417 3161
SRITIC   0113  0415  2364 2650
STAB     0675  1246  1162
STDUMP   1667  0360  0304 0320
STEXD    1175  1670  1245 0535
STGET    1641  0327  0300 0303 0317 0333 0346 0353
STINTO   1624  0311  0302
STLOOP   1616  0303  0325
STNODU   1673  0364  0301 0371
STNOT    1661  0347  0337
STOCHK   3757  2545  0575 2552
STRING   1610  0275  2723
SUBCON   4232  3074  3055
SWITCH   0170  0472  0610 0625 0672
SWOT     1556  0233  0142 0156 0677
SWOTA    2172  0677  0641
SWOUT    4317  3200  3044 3156
```

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SYMBOL   VALUE  DEF   REFERENCES

SWRC     4201  3041  0415 3047 3151
SW1      6035  1202  1151
SW2      6036  1203  1166
SY       0174  0476  0575 0646
SYB      0114  0416  0647
SYCRAP   3373  2060  1771
SYMB     4000  1457  1520 1542 1653
SYMBLP   2402  1120  1224
SYMBU    1503  0160  0416 0144 0145 0146 0154
SYMBUF   3102  1633  0476 0160
SYMFIX   6335  1527  1354
SYMLOD   5553  0502  0307
SYMLST   0071  0373  2441
SYMOVR   6336  1530  1355
SYMSAV   5533  0461  0311
SYREAD   3372  2051  1770
SYSIN    3317  1776  0371 2016 2026
TAABA    0362  0700  0715
TABA     3441  2147  2116
TABLE    3271  1750  1654
TACK     1434  0110  0171
TATA     3532  2261  2266
TBCONT   0175  0477  0574 0660 0663 0671 1375 1407 1452 1460 1472
TEMP     0007  0305  0663 0667 1060 1061 1063 1070 1740 1743 0606 0611 0624 0626 0655 1033 1036 2004 2015 2525 2526 2534 3214 3216
TEMPA    2510  1264
TEMP1    6034  1201  1155 1156 1162 1254
TEM1     0161  0463  0620 0742 2032 0507
TEM1A    0040  0341  1124 1126 1130 1147 1157 1167 1177 1410 1412 1414
TEM2     0162  0464  0626 0741 2034 0512
TEM3     0163  0465  0634 0740 2036 0515
TERMC    0000  0266  0350 0375 0550
TEST     6252  1421  1425 1427
TESTC2   6267  1437  1443 1445
THOU     3570  2317  2763
TIC      2274  1005  0754 0762 1000
TOP      0367  0705  0637
TOUSE    4043  2641  2622
TWOCH    2144  0651  0634
TWOCHR   2073  0600  0652
TYBASE   2400  1546  1400 1403 1406 1410
TYCAR    2510  1236  0402 1245 1264
TYCARI   0100  0402  0310 0363 0635 1117 1403 1664 1712 2172 2354 2507 2612 1046 3470
TYPADD   0622  1173  0413 1175 1243 1244 1302 1310
TYPAD1   0111  0413  0570 1652 0527
TYPE     0021  0322  0745 0752 0763 1006 1200 1205 1215 1226 1237 1241 0454 0470 1007 1103 1740 2412
TYPEA    0014  0314  1176 1177 1762 0452 0466 1013 2304 2310 2372 2377 2400 2406 2407 2410
TYPO     2527  1255  1373 1262 0133 0135 0141 0200 1373 1374 1375 1376 1377 1400 1403 1406 1410
UBITS    4321  3211  0501 3217
UN       1105  1576  2767
UNDERR   2317  1030  1760 1042 1716
UNITAS   4777  0244
UNREF    3240  1716  1660 1671 1675
UNTRAN   2647  1442  1436 1440 1453
UPLN     3607  2353  2361 2522
USEDNO   4337  3277  2642 1102
USES     4044  2642  2651 2655 2660
USYMB    2000  1461  1517 1543 1734
VADR     0022  0323  0557 0655 1166 1650 0506 1017
VAL      0024  0325  0671 0750 0751 0766 1530 1567 2016 2017 2022 2024 2026 0241 0250 0264 0267 0277 0331 0505 1203 1401 1732 2313
                     2314
VALK     0025  0326  0653 0670 0247
VASSNO   5603  0564  0562
```

```
SYMBOL   VALUE  DEF   REFERENCES

VCLEAN   5602   0562  0571
VERSIO   0017   0235  0251
VIN      5573   0537  0473 0512
VINIT    5565   0514  0513
VL6777   5551   0500  0470 0510
VOUT     5572   0536  0466 0505
VPRSRV   0773   1427  1432 0536
VPRSRW   0777   1437  1430
VREAD    5610   0576  0567 0734
VRSTR    0572   1124  1127 0537
VRSTRR   0576   1134  1125
VSAVE    4331   3243  1126 1431
VTAB     5611   0602  0560 0570
VVINIT   5604   0567  0514
VWRITE   5607   0575  0557 0720
V8MOVE   5600   0557  0501
WDH      4042   2640  2625
WDHALF   3351   2030  2000 2020 2640 3541
WHERE    4252   3116  3101 3107
WREAD    4306   3166  3157
WRITE    7775   3613  1437 3002 3051 0476 0575
WWRITE   4210   3051  3045
XBBLOC   5154   3270  3067
XBUFIN   5353   3543  3473
XCER     5134   3247  3100 3112 3114 3115 3120 3131 3140 3510
XCHAIN   2536   1274  2623
XCON     5165   3301  3123
XDONE1   5044   3133  3121
XGET     5122   3227  3077 3113 3117 3136 3170 3173 3205 3233 3234 3237 3240
XGETIN   5151   3265  3230
XHALF    5155   3271  3171 3203 3216
XHT      5334   3524  3423
XINIT    2551   1313  1277
XINTO1   5034   3122  3116
XLOOP1   5011   3077  3105 3111
XLOOP2   5031   3117  3130
XL17     5145   3261
XL4400   5347   3537  3417
XL6      5144   3260  3247
XL6777   5337   3527  3351
XL7400   5346   3536  3414
XL77     5153   3267  3070 3150 3167
XL7770   5342   3532  3357
XM100    5340   3530  3353
XM13     2575   1357  1341
XM26     5335   3525  3430
XM4      5344   3534  3364
XM40     5146   3262  3107
XM43     5152   3266  3231
XM47     5150   3264  3103
XM9      5147   3263  3217
XN       5143   3257  3137 3146 3152
XNM1     5310   3455  3300
XOK1     5025   3113  3101
XP       5157   3273  3221 3533
XPP      2550   1312  1300
XPSEU    2555   1321  1275 1302
XPUT     5064   3161  3074 3127 3134 3165 3166 3200 3207
XP46     2576   1360  1344 1350
XREAD    5336   3526  3347 3424
XRESET   5112   3214  3072 3076 3223
XRIGHT   5104   3202  3172
```

```
SYMBOL   VALUE  DEF   REFERENCES

XT       5156  3272  3177 3204
XTH      5333  3523  3422
XTHISB   5166  3307  3071 3151 3350 3523
XXFH     5321  3470  3427 3434
XXGET    5354  3544  3340
XXL      5345  3535  3413
XXLOOP   5214  3355  3506
XXLP     5225  3366  3376
XXMESS   5277  3442  3432
XXM43    5341  3531  3343
XXN      5202  3342  3257 3354 3365 3375 3401 3412 3505
XXN1     5160  3274
XXN2     5161  3275
XXN3     5162  3276
XXN4     5163  3277
XXP      5343  3533  3362
XXRET    5172  3322  3475
XXT      5271  3432  3436 3437
XXXP     5164  3300  3124 3125
XXXR     5200  3340  3345
XXXX     5000  3066  1312 3322
XXY      5327  3505  3374 3405
XX1      5350  3540  3415
XX2      5351  3541  3416
XX3      5352  3542  3420
YP1      5566  0520  0472 0507
YREAD    5550  0477  0506
YWRITE   5547  0476  0471
ZASSIF   5425  0324  0305
```