

MEMORANDUM
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LIPL: LINEAR INFORMATION
PROCESSING LANGUAGE

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PREPARED FOR:
UNITED STATES AIR FORCE PROJECT RAND

The **RAND** *Corporation*
SANTA MONICA • CALIFORNIA

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PREFACE AND SUMMARY

This Memorandum is a supplement to the Information Processing Language-V Manual,^{*} detailing a new alternate format in which IPL routines and data can be represented. Specifically, LIPL (Linear IPL) is a horizontal, linear, parenthesis format. This Memorandum also describes a new IPL Basic Process, J164, for in-process loading of LIPL routines and data. J164 has been coded as an IPL routine, and, therefore, can be used on any IPL computer. A description and listing of this routine is included; card or tape copies of the routine can be obtained by writing The RAND Corporation.

LIPL, like the parent IPL languages, was developed at The RAND Corporation and Carnegie Institute of Technology. Since it packs more information per card than the standard IPL representation and since it does not have a fixed-column format, it should be especially valuable in card-reader-limited systems and in remote teletype operations.

The use of LIPL is detailed in the Introduction, which is followed by a Reference section arranged for quick look-up of information by the LIPL user. Section III describes the IPL-coded, in-process LIPL loader, J164; the Appendix gives a complete listing of this routine. Section III and the Appendix are included solely for the use of the systems programmer responsible for incorporating LIPL into a particular object machine.

^{*} Allen Newell, F. M. Tonge, E. A. Feigenbaum, B. F. Green, and G. H. Mealy (eds.), Information Processing Language-V Manual, 2nd ed., Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1964.

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I. INTRODUCTION

Linear IPL, LIPL, is an alternate mode for representing Information Processing Language-V routines and data in a horizontal, linear, parentheses format. J164 is a new basic process for in-process loading of routines and data represented in LIPL.

Consider the example of a J165 load deck, shown in Fig. 1. The described list L1 can be represented in LIPL as follows:

```
L1=(9-1 S1 S2) 9-1=(0 A1 V1)
```

Parentheses are used to delimit lists; an equal sign indicates that the object to its right is named by the symbol to its left. Alternatively, the sublist can be inserted directly into the list:

```
L1=(9-1=(0 A1 V1) S1 S2)
```

In this case, we need not name the sublist:

```
L1=((0 A1 V1) S1 S2)
```

J164 will automatically give the unnamed sublist a local name.

The data list L2 can be represented in LIPL as follows:

```
L2=(0 9-0 9-1 9-2 9-3) 9-0=+17 9-1=-73.2  
9-2=$HOUSE$ 9-3=/3077560
```


COMMENTS	T Y P E	N A M E	S I G N	P Q	S Y M B	L I N K
00000001111111112222222223333333333444444444555555555556666						
345678901234567890123456789012345678901234567890123456789012						
DATA HEADER DESCRIBED LIST	5	L1		01	9-1 S1 S2	
DESCRIPTION LIST		9-1			0	
DATA LIST		L2			A1 V1 0 9-0 9-1	
DECIMAL INTEGER 17 FLOATING POINT -73.2 ALPHANUMERIC 'HOUSE'		9-0 9-1 9-2		01 -11732 21HOUSE	9-2 9-3	17 2
OCTAL INTEGER 3077560 PRINT LIST		9-3 L3		31 0 9-1 9-2 9-3	3077560	
ROUTINE HEADER TEST IF SYMBOL (0) IS ON LIST (1)	5	R1		00	21THIS 21 IS L 21IPL	
TEST IF SYMBOL (0) IS ON LIST (1)		9-0			J50 J100 J30 J5	
TEST IF SYMBOL (0) IS ON LIST (1)		R2 9-1			J50 J60 709-2 12H0 11W0	J5
TYPE FIVE START CARD--START AT R0	5	9-2			J2 709-1 J30 R0	J8

Fig. 1— Example of a J165 load deck

A plus or a minus sign indicates that the number to its right is a numeric data term. If no decimal point occurs, it is loaded as an integer. If a decimal point does occur, it is loaded as a floating point number. The decimal point may also occur at the beginning or the end of the number (-.25 or +10.). Dollar signs are used to delimit alphanumeric data terms. A slash indicates an octal integer. Just as sublists may be placed directly inside their main lists, data terms may be placed directly inside the lists they are used on:

```
L2=(0 9-0=+17 9-1=-73.2 9-2=$HOUSE$ 9-3=/3077560)
```

The names of the data terms may now be dropped if desired:

```
L2=(0 +17 -73.2 $HOUSE$ /3077560)
```

The print list L3 can be represented in LIPL as follows:

```
L3=(0 $THIS$ $ IS L$ $IPL$)
```

If five or fewer columns separate the dollar signs, the characters are loaded left-justified and the data term is completed with blanks if necessary. This print list can also be represented in LIPL as follows:

```
L3=$THIS IS LIPL$
```

If more than five columns separate the dollar signs, J164 assembles a list of alphanumeric data terms. The head of

the list contains an internal zero and the data terms are given local names. Five characters are packed per data term, except that trailing blanks of one data term are repeated as leading blanks of the next data term. Trailing blanks are repeated since J157 suppresses them. Therefore, it is possible to enter a print list into a print line by simply generating its symbols using generator J100 with subprocess J157.

The routine R1 can be represented in LIPL as follows:

```
R1=(J50 109-0 J100 J30,J5) 9-0=(11W0 J2,J5)
```

A P and a Q may precede any basic element. A comma indicates that the next symbol is a link. This routine may also be represented as follows:

```
R1=(J50 10(11W0 J2,J5) J100 J30,J5)
```

The routine R2 can be represented in LIPL as follows:

```
R2=(J50,9-1 J60 709-2 12H0 11W0 J2 709-1,9-2 J30,J8)
```

When a link occurs in the middle of a list, it is also used as the name of the next cell.

The complete LIPL load deck is shown in Fig. 2, exactly as it might be key punched. Symbols and numeric data terms must not contain internal blanks and they must be terminated on the right with either a right parenthesis, an equal sign, a comma, or a blank. Blanks may not follow a P or a Q. Except for the above restrictions, blanks may

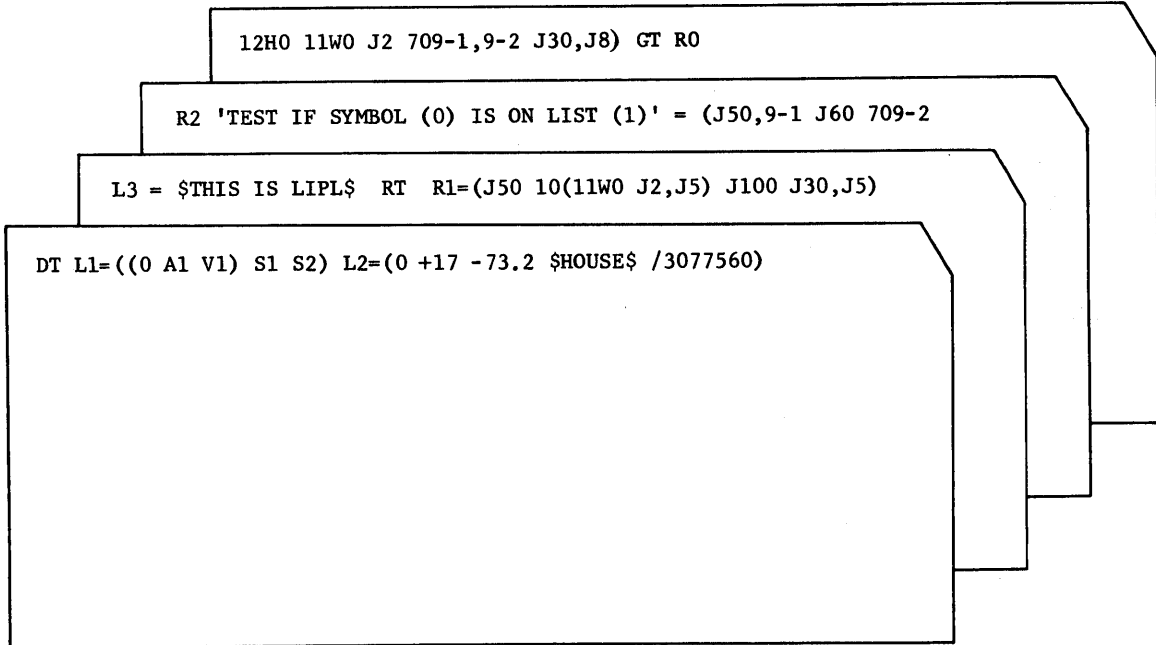


Fig. 2—Example of a J164 load deck

DT L1=((0 A1 V1) S1 S2) L2=(0 +17 -73.2 \$HOUSE\$ /3077560)	CARD 1
L3 = \$THIS IS LIPL\$ RT R1=(J50 10(11WO J2,J5) J100 J30,J5)	CARD 2
R2 'TEST IF SYMBOL (0) IS ON LIST (1)' = (J50,9-1 J60 709-2	CARD 3
12HO 11WO J2 709-1,9-2 J30,J8) GT RO	CARD 4
L1 02 501 504	CARD 1
501 04 0 502	
502 00 A1 503	
503 00 V1 0	
504 00 S1 505	
505 00 S2 0	
L2 04 0 507	
507 02 508 509 508 01 17	
509 02 510 511 510 11 .73200 +2	
511 02 512 513 512 21 HOUSE	
513 02 514 0 514 31 0003077560	
L3 04 0 516	CARD 2
516 02 517 518 517 21 THIS	
518 02 519 520 519 21 IS L	
520 02 521 0 521 21 IPL	
R1 00 J50 523	
523 10 524 526	
524 11 WO 525	
525 00 J2 J5	
526 00 J100 527	
527 00 J30 J5	
R2 00 J50 529	CARD 3
529 00 J60 530	
530 70 531 532	
532 12 HO 533	CARD 4
533 11 WO 534	
534 00 J2 535	
535 70 529 531	
531 00 J30 J8	

Fig. 3—Example of a J164 deck and assembly listing

be used freely to improve the readability of the deck. J164 assumes that a blank occurs between every card. Therefore, a symbol or a numeric data term must not be split across two cards. Alphanumeric data terms may be split across two or more cards. Comments may be inserted at any point at which blanks are permitted by enclosing them in quotes. The domain of definition of local symbols is from one unparenthesized regional list name to the next unparenthesized regional list name.

Three pseudo commands are shown in Fig. 2--DT, RT, and GT. DT, a mnemonic for data, is equivalent to a Type-5 card with a Q of 1; it indicates that data is to be loaded. RT, for routines, is equivalent to a Type-5 card with Q = 0, and indicates that routines are to be loaded. Since routines and data must be loaded differently, J164 contains a switch that may be set to either routines or data. These two pseudos are used to flip this switch. Initially, when J164 is fired, this switch is set to data. Therefore, the DT on the first card in Fig. 2 need not have been punched. Data terms may be freely used in routines since J164 recognizes them independently of the routine/data switch. The pseudo GT, for go-to, is equivalent to a final Type-5 card. It indicates the end of a load deck, and the symbol to its right, RO in the example, is taken as the name of the next routine to be interpreted. Alternately, the pseudo ND, for end, could have been used, in which case interpretation would continue with the instruction following J164. A complete list of pseudos is given in Sec. II. They may be used at any point in the load deck where blanks are permitted.

When J164 is fired, it will first list the load deck and give a sequence number to each card. It will then give an assembly listing that is cross-referenced with the load deck by means of the sequence numbers. An example of this listing is given in Fig. 3. The assembly listing may be suppressed by means of the pseudo NL, no listing.

Since all special characters are used in LIPL as punctuation, the special character regional symbols must be written in LIPL prefixed with an asterisk. Thus, the IPL symbols (5, \$18, and *30 are represented in LIPL as *(5, *\$18, and **30.

Several other types of symbols can be represented in LIPL--symbolic internal, absolute decimal internal, absolute octal internal, and mnemonic. These are described in Sec. II.

J164 will frequently be used to replace data structures and routines. Since the old structures and routines are no longer needed and would simply be using up available space, LIPL provides a mechanism for erasing them. Any symbol may be preceded by a period, in which case the symbol serves its normal contextual purpose and, in addition, the structure or routine named by the symbol (if any) is erased. A structure or a routine erase is used depending on the current setting of J164's routine/data switch.

Frequently, many data structures of the same form must be loaded. In LIPL, a copy of a structure may be represented by writing the name of the structure to be copied prefixed with two adjacent single quotes. An example of this feature is shown below:

L4=((0 S1 S2) (0 S1 S2)) L5=((0 S1 S2) (0 S1 S2))

L4=(9-0=(0 S1 S2) '9-0) L5='L4

Copies may be named or unnamed. An unnamed copy is given a local name if the structure copied had a local name; otherwise, the unnamed copy is given an internal name. Since J164 is a single-scan loader, only structures that are already in core or have been defined to the left can be copied.

II. REFERENCE

SYMBOLS

A decimal subscript is an unsigned decimal integer with no internal blanks.

An octal subscript is an unsigned octal integer with no internal blanks.

A regional symbol is

- 1) a letter, or
- 2) a letter immediately followed by a decimal subscript, or
- 3) a "*" immediately followed by any non-numeric character, or
- 4) a "*" immediately followed by any non-numeric character, immediately followed by a decimal subscript. (E.g., the IPL symbol "\$17" must be represented in LIPL as "*\$17".)

A local symbol is

- 1) a "9" immediately followed by a decimal subscript, or
- 2) a "9-" immediately followed by a decimal subscript.

J164 does not distinguish between the symbol "93" and "9-3". The domain of definition of local symbols is from one unparenthesized regional list name to the next unparenthesized regional list name.

A symbolic internal symbol is

- 1) an "8" immediately followed by a decimal subscript, or

- 2) an "8-" immediately followed by a decimal subscript.

A symbolic internal symbol is assigned an arbitrary equivalent from available space (1W34) when it first occurs, unless it is made synonomous (by naming) with another symbol. The internal symbol table may be reset at any time with the pseudo command RI. The internal symbol table may be printed with the pseudo command PI. J164 does not distinguish between the symbol "85" and "8-5".

An absolute internal symbol is

- 1) the digit zero, or
- 2) an "8." immediately followed by a decimal subscript, or
- 3) an "8/" immediately followed by an octal subscript.

The symbol stands for the absolute machine address specified by its subscript.

A mnemonic symbol is

- 1) two letters, or
- 2) two letters immediately followed by any number of letters and digits.

J164 looks only at the last five or fewer characters of a mnemonic symbol. Thus, although CAT, SECONDCELL, and THIRDCELL are all mnemonic symbols, J164 will not differentiate between the last two. A mnemonic symbol is assigned an arbitrary equivalent from available space (1W34) when it first occurs, unless it is made synonomous (by naming) with another symbol. The mnemonic symbol table may be reset at any time with the pseudo command RN. The mnemonic symbol table may be printed with the pseudo command PN.

An erase symbol is a "." immediately followed by a regional, internal, or mnemonic symbol. The symbol serves its normal contextual purpose and, in addition, the structure or routine named by the symbol (if any) is erased. The cell named by the symbol is cleared but not erased. A structure or routine erase is used depending on the current setting of J164's routine/data switch.

A copy symbol is a pair of single quotes immediately followed by a regional, local, internal, mnemonic, or erase symbol. The data structure named by this symbol is copied. The copied structure can be named by preceding the copy symbol with a name. An unnamed copy is given a local name if the structure copied had a local name; otherwise, the unnamed copy is given an internal name. Only structures that have been previously defined can be copied.

Symbols may not contain internal blanks. They must be terminated on the right with either a right parenthesis, an equal sign, a comma, or a blank. A symbol may not be split across two cards.

DATA TERMS

A sign is a "+" or a "-".

An integer data term is a sign immediately followed by a decimal integer.

A floating point data term is

- 1) a sign immediately followed by a decimal integer, immediately followed by a ".", or
- 2) a sign immediately followed by a decimal integer, immediately followed by a ".", immediately followed by a decimal integer, or

- 3) a sign immediately followed by a ".", immediately followed by a decimal integer.

An octal data term is a "/" immediately followed by an unsigned octal integer.

An alphanumeric data term is a "\$" followed by any number (including zero) of characters and blanks followed by another "\$". If five or fewer blanks and characters separate the dollar signs, a single left-justified data term is assembled. If six or more blanks and characters separate the dollar signs, then a list of alphanumeric data terms is assembled. The head of the list contains an internal zero and the data terms are given local names. Five characters are packed per data term except that trailing blanks of one data term are repeated as leading blanks of the next data term.

Numeric data terms must not contain internal blanks and must be terminated on the right with either a right parenthesis, a comma, or a blank. They may not be split over two cards. Alphanumeric data terms may be split over two or more cards.

LISTS

A name is a symbol followed by an equal sign, followed by the object being named. Lists, data terms, mnemonics, and copies may be named.

A basic element is

- 1) a symbol, or
- 2) a named mnemonic, or

- 3) a named copy, or
- 4) a data term, named or unnamed, or
- 5) a list, named or unnamed.

P and Q are octal digits.

An element is

- 1) a basic element, or
- 2) a Q immediately followed by a basic element, or
- 3) a P immediately followed by a Q, immediately followed by a basic element.

Blanks must not occur between P, Q, and the basic element.

A link is a comma followed by a symbol.

A list element is

- 1) an element, or
- 2) an element followed by a link.

A list is a "(" followed by one or more list elements, followed by a ")". Note that this definition is recursive.

LOAD DECKS

Blanks must not be embedded in symbols or numeric data terms. Blanks must not separate a P, Q, and a basic element. Except for these two restrictions, blanks may be used freely to improve the readability of the deck.

Pseudos are commands to the loader. They cause no code or data to be assembled. Pseudos may be inserted at any

point at which blanks are permitted. Pseudos must not contain internal blanks and they must be terminated on the right with a blank, a right parenthesis, or a comma. The complete set of LIPL pseudos is given below.

RT - routines

DT - data

Since the loader must handle data differently than routines, it must know which is being loaded. J164, therefore, has a routine/data switch which is set to data each time J164 is fired. This switch can be flipped with the RT and DT pseudos. The switch need not be flipped for data terms in routines, since the loader recognizes data terms independently of the switch. A Q preceding a basic element is effective both in routines and data. Thus, "29-1" is the local symbol "9-1" with Q = 2, regardless of the setting of the switch.

NL - no listing

This pseudo suppresses the assembly listing. The load deck is still listed, however.

RN - reset mnemonic table

RI - reset internal table

PN - print mnemonic table

PI - print internal table

ND - end

This pseudo causes loading to be terminated and interpretation to continue with the instruction following J164.

GT - go to

This pseudo causes loading to be terminated and interpretation to begin with the routine whose name occurs, after a blank, to the right of this pseudo.

Comments are delimited with quotes. They may be inserted at any point at which blanks are permitted.

A load deck consists of named lists, named data terms, comments, pseudos, named copies, erase symbols, and named mnemonics. It is punched on one or more cards using the full 80 columns of the card. The load deck is terminated with either the pseudo ND or GT.

LIPL LOADER J164

J164 loads one load deck from unit 1W18. It lists the deck and the assembly on unit 1W20. Loading into a specific block of main storage is accomplished by the use of the safe storage cell W34. W34 holds the name of the available space list used by the loading processes (initial loading, J140, J164, and J165) and initially holds H2. To load into a specific block, it is necessary to make the cells of the block into a list with J172 and put the name of this list into the safe storage cell W34. The first cell of the block is never loaded into, since, like H2, it is the head of the available space list. If the list 1W34 becomes exhausted, H2 is placed in W34 without push-down and loading continues from H2. Since J164 uses the print line 1W24, the print line is unsafe over J164 and it must be at least 80 columns long. J164 is an in-process loader; a conventional initial load deck is still required containing all the Type-2 and Type-3 cards defining regional symbols, blocks, print lines, etc. Routines and data cannot be loaded into auxiliary storage with J164, but data can be loaded into main storage and then moved (by J106 or J107) into auxiliary storage.

J164 thru 9-11: Setup and clean up..... 17-19, 21-23

9-100 thru 9-179: Executive routine..... 19, 32-33

9-200 thru 9-233: Print lists.

9-200 "MNEMONIC TABLE".

9-210 "INTERNAL TABLE".

9-220 "ERROR--NO MORE CARDS".

9-300 thru 9-332: Pseudo subroutines.

9-311 ND--Stop..... 19

9-312 DT--Set routine/data switch plus..... 18

9-313 RT--Set routine/data switch minus..... 18

9-315 RN--Erase mnemonic table.

9-316 RI--Erase internal table.

9-317 PN--Set mnemonic print flag plus..... 18

9-318 PI--Set internal print flag plus..... 18

9-319 NL--Set listing desired flag minus..... 18

9-320 TR--Turn on full trace.

9-324 GT--Set link to cell, stop..... 17, 19

9-400 thru 9-419: Work cells, symbols, tables.

9-400 Mnemonic table..... 25

9-401 Pseudo table..... 25

9-402 Local table..... 26

9-403 Internal table..... 26

9-404 Copy flag--J3 or J4..... 24

9-405 Erase flag--J3 or J4..... 24

9-406 Assembly print list..... 20-21

9-407 Last cell of assembly print list..... 21

9-408 Pure symbol for data term..... 20-21

9-409 Pure symbol for beginning of sublist..... 20-21

9-410 Pure symbol for end of sublist..... 20-21

9-411 Routine/data switch--Loading data?..... 17-18

9-412 Pure symbol for new card..... 20-21

9-413 Integer card count..... 20

9-414 Did LW34 = H2 at start?..... 18, 23

9-415 Link to this routine when done..... 17

9-416 Cell in print list before last copy..... 24

9-417 Is an assembly listing desired?..... 18

9-418 Is a mnemonic table desired?..... 18

9-419 Is an internal table desired?..... 18

9-500 thru 9-799: Subroutines.

9-500 Find current character..... 19

9-510 Find next character..... 19

9-520 Create a cell in HO from LW34..... 18

9-530 Scan for next) , = or blank..... 23-24

9-540 Scan for next) , or blank..... 23-24

9-560 Put letter symbol or pseudo into (0)..... 25-26

9-580 Put local or internal symbol into (0)..... 26-28

9-600 Erase and/or copy (0), leave (0)..... 24-25

9-620 Set octal data in (0), leave (0)..... 28

9-630 Set decimal data in (0), leave (0)..... 28-29

9-650 Set alphanu data in (0), leave (0)..... 28, 29-30

9-680 Read and print a card..... 19

9-700 List and erase assembly print list..... 21

9-750 Skip comment or set copy flag..... 31

9-760 Add (0) to list LWO, set P and Q..... 31-32

9-770 Add an empty cell to list LWO..... 31

9-780 Erase the assembly print list..... 21

9-790 Print internal, mnemonic tables..... 23

9-800 thru 9-981: Integer constants.

9-8mn Negative integer data term -mn.

9-9mn Positive integer data term +mn.

W CELLS

W0 Current cell being assembled..... 31

W1 Is cell LWO empty?..... 31

W2 P or 9..... 31-32

W3 Q or 9..... 31-32

W4 Is program at top level?..... 32

W9 Current character..... 19

Fig. 4—Memory map and index

Routine	Sub-routines used	Cells & tables read	Cells & tables modified	Routine	Sub-routines used	Cells & tables read	Cells & tables modified	
J164	9-100		9-411	9-560	9-520		9-400	
	9-500		9-414		9-530		9-401	
	9-680		9-415		9-600		1W25	
	9-700		9-417	9-580	9-520		9-402	
	9-790		9-418		9-530		9-403	
			9-419		9-600		1W24	
			9-520				1W25	
			W0		9-600	9-520	9-411	9-404
			W1					9-405
			W2					9-406
			W3					9-407
			W4					9-416
			W21		9-620	9-540		1W25
			W22					9-406
			W25					9-407
		W30		9-630	9-540		9-406	
		W31					9-407	
		W34					1W25	
9-100	9-100	9-404	9-402				W30	
	9-500	9-416	9-405	9-650	9-520		9-406	
	9-510	W9	9-406		9-680		9-407	
	9-520		9-407				W25	
	9-560		W0				W30	
	9-580		W1	9-680			9-406	
	9-620		W2				9-407	
	9-630		W3				9-413	
	9-650		W4					
	9-750			9-700	9-780	9-417	9-406	
	9-760						9-407	
	9-770						W21	
9-311							1W24	
9-312			9-411				1W25	
9-313			9-411	9-750	9-510		9-404	
9-315			9-400		9-680		W9	
9-316			9-403				1W25	
9-317			9-418	9-760	9-520	9-411	9-406	
9-318			9-419				9-407	
9-319			9-417				W0	
9-324	9-500		9-415				W1	
	9-510						W2	
	9-560						W3	
	9-580			9-770	9-520		W0	
9-500			W9				W1	
9-510	9-680		1W25	9-780			9-406	
			W34				9-407	
9-520			W30				9-417	
9-530				9-790		9-400	9-418	
9-540						9-403	9-419	

Fig. 5 — Usage map

III. LIPL LOADER, J164

The LIPL loader, J164, has been coded as an IPL routine, and, therefore, can be used on any IPL computer; a complete listing of the deck is given in the Appendix. The deck is sequenced in cols. 76-80 and includes extensive comments. J164 is the only regional symbol occurring in a NAME field. All other names are local symbols and they usually occur in ascending order.

The routine has been coded to operate as fast as possible. Therefore, it incorporates no error checking. The only error that will stop it is the presence of an end-of-file on the input unit before an ND or GT pseudo has been detected. On the average, the routine requires 225 interpretative cycles to load the equivalent of one standard IPL input card.

A memory map of J164 and index of Sec. III is given in Fig. 4; this map and index may be folded out for continual reference while reading this section. A usage map is given in Fig. 5.

The main task of the highest-level routine in J164 is to set up data for the executive routine 9-100. J164 begins by putting J0 into 9-415. J164 executes 9-415 just before it quits. The pseudo command GT causes the J0 in 9-415 to be replaced by the symbol appearing to the right of the GT command.

J164 then puts J4 into 9-411 and 9-417 and J3 into 9-418 and 9-419. These cells always contain either J3 or J4. 9-411 is the routine/data switch. It contains J3 if routines are being loaded and J4 if data are being loaded.

The pseudo commands RT and DT change the contents of this cell. 9-417 indicates if an assembly listing is desired. The pseudo command NL places a J3 into this cell. 9-418 indicates whether the mnemonic table is to be printed. The pseudo command PN places a J4 into this cell. 9-419 indicates whether the internal table is to be printed. The pseudo command PI places a J4 into this cell.

J164 then preserves W21, W22, W25, W30, and W31. It puts an integer data term equal to 1 into the print column, print spacing, and entry column cells, and also puts a zero into W31 to suppress tracing.

J164 next sets routine 9-520 identical to 9-521. Whenever a cell is needed from 1W34, it is obtained by firing 9-520. 9-521 is a subroutine that removes the first list cell from list 1W34, clears the cell, and leaves its name in H0. However, if list 1W34 becomes exhausted, it stores the symbol H2 into W34 and sets 9-520 identical to J90 so that from then on the user's program is assembled into cells taken from H2.

Next, J164 tests if 1W34 = H2 and it stores the result of this test, 1H5, into 9-414. If the test comes out plus, J164 cuts off the last one-third of the available space list H2 and puts the name of this last third into W34. Since the tail end of H2 is usually in sequential order and since J164 loads sequentially into the cells of list 1W34, the assembly listing will usually come out in sequential order. If this were not done, the cell names in the assembly listing would occur in a random order and it would be difficult to locate a particular cell in a large listing.

J164 then clears the print line (setting the column pointer 1W25 to 1), preserves W9, executes 9-680, and then executes 9-500. 9-680 reads a line from the input unit by executing J180 and prints it by executing J155. It also does a few other tasks that will be discussed later. 9-500 checks if the character in the print line at column 1W25 is non-blank. If it is non-blank, this character, which is read by using J186, is placed into W9 (W9 always contains the so-called current character), and H5 is set plus. Otherwise, H5 is set minus and the routine advances 1W25 to the next non-blank column and puts the character at that column into W9. If the rest of the print line is blank, it reads and prints a card by executing 9-680 and tries again until it finds a non-blank column. Thus, the routine is used to find the current character. 9-510, which finds the next character, is identical to 9-500 except that it first advances 1W25 by one column.

J164 next preserves and sets up W0-W4 and fires the executive routine 9-100. 9-100 does all the actual assembling. It is executed recursively each time a left parenthesis is encountered. It is terminated when a right parenthesis, the pseudo ND, or the pseudo GT is encountered. 9-100 operates exactly the same when it is recursively assembling a sublist as when it is operating at the top level (except only in the latter case is the local symbol table reset when a regional list name is encountered). Therefore, it also assembles a list of all the unparenthesized symbols. In the example shown in Fig. 3, 9-100 would also have assembled the following list:

500	L1	506
506	L2	515
515	L3	522
522	R1	528
528	R2	0

This useless list is erased by routine 9-700, as we shall see.

Each time a cell is assembled, its name is added to the end of the assembly print list, or simply the print list, 9-406. This list is used by routine 9-700 to generate the assembly listing if requested. When a data term is assembled, the pure symbol (pure in the sense that the cell named by the symbol is never used for anything) 9-408 is put on the print list just before the name of the data term. This is necessary since the listing routine must interpret a data term differently than a list cell. When a new sublist is begun, the executive routine puts the pure symbol 9-409 on the print list just before the first cell of the sublist. When a sublist is terminated, the executive routine puts the pure symbol 9-410 on the print list just after the last cell of the sublist.

9-680 reads a card by executing J180. If there is no card present, it prints ERROR--NO MORE CARDS and does a J7. If there is a card, it adds one to the integer data term 9-413, the card count, and enters this number together with the word CARD into the print list. It then prints the line, blanks out the word CARD together with the number and adds the pure symbol 9-412 to the print list followed by a locally named copy of the integer card count 9-413.

Cell 9-407 always contains the name of the last cell on the print list. This means that each time we want to add something to the end of the print list, we don't have to go down the entire list. However, now we have the responsibility of keeping this cell updated.

Thus, the print list contains the names of the cells assembled, the pure symbols 9-408, 9-409, 9-410, and 9-412, and copies of the integer card count 9-413. Fig. 6 shows the complete print list generated by the load deck of Fig. 3.

We will discuss the executive routine 9-100 in greater detail later. Assume that it has now terminated and returned control to J164's setup routine. J164 then restores W0-W4 and executes 9-700. 9-700 checks cell 9-417 to see if an assembly listing is desired. If not, it links to 9-780, a subroutine that erases the print list, the useless list of unparenthesized symbols, and the card count data terms. If an assembly listing is desired, 9-700 generates and prints the assembled cells and at the same time erases the useless list of unparenthesized symbols and the card count data terms. Then, just before terminating, it erases the print list. The routine divides the page into four vertical strips, each 28 columns wide. A list is printed down a strip. The highest-level lists are printed down the left strip. Their sublists are interpolated and printed in the strip to the right of the superlist. All lists of depth 3 or greater are printed in the third strip from the left. Lists at the highest level and lists of depth 3 or greater are separated by printing one blank line before and after. Data terms at the highest level are printed in the left strip. If a data term is named in a list, it is printed on the same line as the cell that names

9-406	0		518	
	500		9-409	
	9-412		519	
	9- α		520	
	9-409		9-409	
	L1		521	
	9-409		9-410	
	501		522	
	502		9-409	
	503		R1	
	9-410		523	
	504		9-409	
	505		524	
	9-410		525	
	506		9-410	
	9-409		526	
	L2		527	
	507		9-410	
	9-408		9-412	
	508		9- ϕ	
	509		528	
	9-408		9-409	
	510		R2	
	511		529	
	9-408		530	
	512		9-412	
	513		9- θ	
	9-408		532	
	514		533	
	9-410		534	
	9-412		535	
	9- β		531	
	515		9-410	0
	9-409	9- α	+01	1
	L3	9- β	+01	2
	516	9- ϕ	+01	3
	9-409	9- θ	+01	4
	517			

Fig. 6—Assembly print list generated by load deck of Fig. 3

it. The name of a cell goes in col. 1, P in col. 8, Q in col. 10, the symbol in col. 12, and the link in col. 18--all modulo 28. Card numbers are printed as CARD n beginning at col. 111. They are printed on the same line as the first cell assembled by that card. If a card causes nothing to be assembled (as, for example, a card with nothing but comments), its card number is not printed. This routine is completely self-contained, except for subroutine 9-780.

After executing the listing routine 9-700, J164 next executes routine 9-790 which prints the mnemonic table if 9-418 contains J4, and prints the internal table if 9-419 contains J4. The internal format of these tables will be described later.

J164 then checks cell 9-414, which indicates if cell W34 contained H2 at the start. If W34 did contain H2 at the start and if it doesn't now, the list 1W34 (which originally was the last third of H2) is tacked onto the end of the available space list H2 (in effect, it is erased) and the symbol H2 is stored into W34. Finally, J164 restores W21, W22, W25, W30, and W31, and then terminates by linking to the routine named in cell 9-415.

We will now look at the subroutines used by the executive routine 9-100. There are two scan routines, 9-530 and 9-540. These routines have no inputs or outputs in H0. The only cell they modify (other than H5, which is unsafe over all subroutines) is W30, the field length cell. 9-530 puts an integer data term into W30 that is equal to the difference between column 1W25 and the first column to the right of 1W25 that contains either a right parenthesis, a

comma, an equal sign, or a blank. If 1W25 points to the first character of a LIPL symbol and 9-530 is executed, upon completion 1W30 will contain the width of that symbol since all LIPL symbols must terminate with one of these four characters. 9-540 is identical to 9-530 except that it does not scan for equal signs. 9-540 is used in reading numeric data terms since LIPL numeric data terms must always terminate with either a right parenthesis, a comma, or a blank.

9-404 and 9-405 are the copy flag and the erase flag. Normally these cells contain J3. However, whenever the executive routine 9-100 encounters a pair of adjacent quotes, it causes a J4 to be placed into 9-404; when it encounters a period, it causes a J4 to be placed into 9-405. The routines that read LIPL symbols from the print line (9-560 and 9-580) leave the symbol in H0 and link to routine 9-600. If the copy flag is on (contains J4), input (0) is copied. The method of copying is the same as that used by J74 except that the cells for the copy are taken from list 1W34 and the names of the cells are added to the print list 9-406. (Before the copy process is started, the name of the last cell on the assembly print list is stored into cell 9-416. This is used by the executive routine 9-100 to slightly fudge the print list.) If the erase flag is on, the structure or routine named by the original input (0) is erased. If the routine/data switch 9-411 is minus, indicating that routines are being loaded, the input (0) is erased as a routine; otherwise, the input is erased as a data structure, except that the head cell is simply cleared instead of being erased. In any case, upon exit both flags

are turned off, H5 is set plus, and (0) contains input (0) or, if the copy flag was on, the name of the copy.

The mnemonic table 9-400 and the pseudo table 9-401 have identical form. They have the form of description lists, except that the attributes are the names of alphanumeric data terms. This may be seen by looking at the pseudo table 9-401 in the program listing given in the Appendix, where the attributes are not the symbols occurring on the list but rather the data terms named by those symbols. Therefore, unfortunately, the IPL description list processes cannot be used on these "description lists."

Routine 9-560 is used to read regional and mnemonic LIPL symbols and pseudos from the print line. LW25 is assumed upon entry to point to the first character of the symbol (except in the case of a special character regional symbol which LIPL requires to be prefixed with an asterisk, in which case 9-560 assumes LW25 upon entry to point to the column after the asterisk). The routine first executes 9-530 which sets LW30 to the width of the symbol. It then checks to see if the symbol is a regional symbol. It is a regional symbol if the character in col. LW25+1 is a digit or if the width of the symbol is 1. If it is a regional symbol, it executes J181 which puts the symbol into H0 and it then links to 9-600 which copies and/or erases if required and sets H5 plus. If it is not regional, it reads the symbol into H0 as an alphanumeric data term by using J182. It then searches the pseudo table 9-401. If it is a pseudo, it puts the name of the equivalent pseudo subroutine into H0 and quits with H5 minus. If it is not a pseudo, it must be a mnemonic, so it searches the

mnemonic table; if found, it puts the equivalent symbol into H0 and links to 9-600. If it is not found in the mnemonic table, it creates an internal symbol, by using 9-520, makes this new symbol equivalent to the mnemonic symbol in the mnemonic table, leaves the new symbol in H0, and links to 9-600. Thus, upon completion H5 is minus and (0) contains the name of a pseudo subroutine, or H5 is plus and (0) contains either a regional symbol, a symbol equivalent to a mnemonic symbol, or the name of a copy if the copy flag was on. In any case, 1W25 now points to the first column after the LIPL symbol or pseudo.

The local symbol table 9-402 and the internal symbol table 9-403 are in the form of empty described lists. The attributes of their description lists are LIPL subscripts represented as absolute internal symbols, and their values are symbols obtained from 1W34 by means of routine 9-520. For example, if the LIPL local symbols 9-1 and 935 were assigned the equivalent IPL local symbols 1347 and 1409, the local symbol table might look like this:

9-402	02	1700	0
1700	04	0	
	04	1	
	02	1347	
	04	35	
	02	1409	0

Routine 9-580 is used to read local and internal LIPL symbols from the print line. It has one input in H0. If (0) is J3, the routine assumes that the character at col. 1W25 is the 8 at the beginning of an internal LIPL symbol; if (0) is a J4, it assumes that the character

at col. 1W25 is the 9 at the beginning of a local LIPL symbol. The routine saves input (0), advances 1W25 by one column, and branches on this next character. This character is either a minus sign, a period, a slash, or a digit. If the character is a period, indicating an absolute decimal symbol, it advances 1W25 by 1, executes 9-530 to set 1W30 to the width of the subscript, executes J181 to put the subscript, as an absolute internal symbol, into H0, makes this symbol local if the original input (0) was J4, and then links to 9-600 to copy and/or erase the symbol if required. If the character being branched on is a slash, indicating an absolute octal symbol, it advances 1W25 by 1, executes 9-530 to set 1W30 to the width of the subscript, executes J182 to put the subscript into H0 as an octal data term, executes J128 to convert this octal data term to a (decimal) integer data term, decrements 1W25 by 1, executes J159 to enter this integer into the print line right-justified, and then goes to the same point in the routine to which the character period branched. If the character being branched on is a minus sign or if it is a digit, both indicating local symbols, the routine does the same thing, except that in the case of the minus sign 1W25 is first advanced by one column. The routine then executes 9-530 to set 1W30 to the width of the subscript. It then puts the subscript as an absolute internal symbol into H0 by executing J181. It then uses J10 to find the equivalent symbol for this subscript on the local symbol table 9-402 (if input (0) was J4) or on the internal table 9-403 (if input (0) was J3). If found, this equivalent symbol is left in H0 and the routine links to 9-600; if not found, a new symbol is created by executing 9-520. This symbol

is made local or internal, depending on input (0), and it is assigned as the value of the subscript on the internal or local table. This new symbol is left in H0 and the routine links to 9-600. Thus, upon completion H5 is plus, (0) contains either an absolute symbol, the equivalent of a LIPL local or symbolic internal symbol, or the name of a copy, and 1W25 points to the first column after the LIPL symbol.

Three routines are used to assemble data terms: 9-620 assembles octal data terms; 9-630 assembles numeric data terms, both integers and floating point; and 9-650 assembles alphanumeric data terms and alphanumeric print lists. They all have one input (0), which they leave as output (0). They all assemble the LIPL data term beginning at col. 1W25 into cell (0), except 9-650 when it assembles a print list, in which case (0) becomes the name of the list. They assume that the character at col. 1W25 is a slash, a plus sign or a minus sign, or a dollar sign, respectively. When they assemble a data term, they add the pure symbol 9-408 and the name of the assembled cell to the assembly print list 9-406. In addition, when 9-650 assembles a print list, it adds the names of the cells of the print list to 9-406. They all terminate with 1W25 pointing to the next column after the LIPL data term.

9-620 first advances 1W25 by 1. It then executes 9-540 to set 1W30 to the width of the octal data term. Next, it executes J182 to put the octal data into cell (0), then it adds the pure symbol 9-408 and (0) to list 9-406 and quits.

9-630 begins by adding the pure symbol 9-408 and (0) to list 9-406. It then counts the number of columns to the next period, advances 1W25 by 1, and sets 1W30 to the width of the data term by executing 9-540. If the next period is beyond the end of the data term, it executes J182 to input the LIPL integer into cell (0), and quits. (This routine only forms the absolute value of a data term; the executive makes it negative if required.) If the next period occurs before the end of the data term, it forms two data terms, one for the integral part of the LIPL data term and the other for the fractional part of the data term, and places their sum into (0) and terminates. It forms the integral part by doing J182 with 1W30 set equal to the number of columns to the next period. It forms the fractional part by doing a J182 with 1W30 set equal to the number of columns between the period and the end of the data term and dividing this number repeatedly by 10, once for each column between the period and the end of the data term.

Routine 9-650, which assembles alphanumeric data, begins by making input (0) a blank alphanumeric data term. If a dollar sign occurs in col. 1W25+1, it advances 1W25 by 2, puts the pure symbol for a data term 9-408 and input (0) on the print list 9-406, and terminates. If a dollar sign occurs in the next six columns, but not in the very next column, the routine advances 1W25 by 1, sets the field width 1W30 to one less than the distance to the next dollar sign, inputs the alphanumeric data into cell (0) by executing J182, again advances 1W25 by 1 (just past the second dollar sign), puts the pure symbol for a data term 9-408

and input (0) on the assembly print list 9-406, and terminates. If the next dollar sign occurs further than six columns away, the routine advances 1W25 by 1, makes input (0) identical to an empty list, puts the pure symbol for the beginning of a sublist 9-409 and the input (0) on the assembly print list 9-406, and then begins a cycle. The cycle begins by checking if 1W25 is greater than 80. If greater than 80, 9-680 is executed to read and print a card and 1W25 is reset to 1. The cycle continues in any case by checking to see if col. 1W25 contains a dollar sign, in which case 1W25 is advanced by 1, the pure symbol for the end of a sublist, 9-410, is added to the assembly print list 9-406, and the routine terminates. Otherwise, the cycle continues by checking to see if the next four columns contain a dollar sign. If not, it creates two cells from list 1W34 by executing 9-520 twice. It puts the name of the second cell into the first cell and it adds the first cell to the end of list (0). It adds the name of the first cell, the pure symbol for a data term, 9-408, and the name of the second cell to the assembly print list 9-406. It then reads the alphanumeric data beginning at col. 1W25 with a field width 1W30 equal to 5 into the second cell by executing J182. Then 1W25 is decremented by the number of trailing blanks in the last data term assembled, and the routine recycles. If, at the start of the cycle, one of the next four columns contains a dollar sign, the same process occurs, except that the field width 1W30 is set to one less than the distance to the next dollar sign and instead of recycling, 1W25 is advanced by 1, the pure symbol for the end of a sublist, 9-410, is added to the assembly print list 9-406, and the routine is terminated.

Routine 9-750 is used to skip over comments or to set the copy flag 9-404. Each time the executive routine 9-100 encounters a quote, it executes 9-750. Column 1W25 always contains a quote when 9-750 is executed. The routine advances 1W25 by 1. If this next column contains another quote, the routine stores J4 into the copy flag 9-404 and links to 9-510. Otherwise, it advances 1W25 one column past the next quote and terminates. If there isn't another quote in this print line, the routine reads and prints a card by executing 9-680. It repeats this process until it finds the second quote and then it sets 1W25 one column beyond and terminates.

W0 always contains the name of the current cell being assembled. W1 contains J3 or J4. If cell 1W0 has not yet been assembled, it is considered empty and W1 contains J4. If the current cell 1W0 has been assembled, W1 contains J3. Lists are always assembled from the head cell down. Cell 1W0 is, therefore, the last cell of the list being currently assembled. And, according to standard IPL terminology, it is also a list in its own right--an empty list. Routine 9-770 adds an empty cell to list 1W0 (or cell 1W0, depending on how you want to view it) if W1 is minus. It does this by executing 9-520 which creates a new cell from 1W34, making the name of this cell the link of cell 1W0, putting the name of this new cell into W0, and setting W1 plus.

W2 and W3 normally contain the absolute internal symbol 9. Whenever the executive routine 9-100 encounters a P, it is stored in W2 as an absolute internal symbol. Whenever a Q is encountered, it is stored into W3 as an absolute internal symbol. Routine 9-760 adds the symbol (0) to list

1W0. If cell 1W0 is not empty ($1W1 \neq J4$), the routine adds an empty cell to 1W0 by doing the equivalent of 9-770. In any case, input symbol (0) is stored into cell 1W0 and 1W0 is added to the assembly print list 9-406. If 1W3 (Q) is not (the absolute internal symbol) 9, the Q of cell 1W0 is set to 1W3 by executing J195 and W3 is reset to 9. If 1W3 originally was 9 and if the routine/data switch 9-411 contains J3, indicating that routines are being loaded, the Q of cell 1W0 is set to 0. If 1W2 (P) is not (the absolute internal symbol) 9, the P of cell 1W0 is set to 1W2 by executing J194 and W2 is reset to 9. Finally, J3 is stored into W1, indicating that cell 1W0 has been assembled and is not empty.

W4 contains J4 if the executive routine 9-100 is operating at its top level; otherwise, it contains a J3. Its only function is to help in determining when to reset the local symbol table.

We have now described all the routines, tables, working cells, and symbols used by J164, except the executive routine 9-100. A detailed flowchart of the routine is given in Fig. 8. The executive routine, as the name implies, does little more than sequence subroutine calls. Most of this sequencing is accomplished by branching on the current character, which is always contained in W9. Branches on the current character are represented in the flowchart as hexagons. If the current character 1W9 is the character in a hexagon, program control moves along the horizontal arrow. Otherwise, it moves along the down arrow. This branching is usually accomplished by means of description lists. The characters in the hexagons appear

as attributes (in the form of regional symbols) on the description list and they have for values the name of the section of 9-100 to which control is to pass for this character. Thus, to branch on the current character, the program finds the value of attribute LW9 on a description list and then it links to J1.

When 9-100 is fired for the very first time, the set-up routine has already read the first card into the print line, preserved W0-W4 and W9, and placed an empty cell into W0, J4 into W1 and W4, the absolute internal symbol 9 into W2 and W3, and the first character into W9.

Suppose we did not have to worry about copy symbols, erase symbols, pseudos, the symbol 0, named mnemonics, Ps and Qs, or the order in which things are placed on the assembly print list. Then, a simplified flowchart for 9-100 would look like Fig. 7. From the simplified flowchart to the complete flowchart is just a matter of adding details.

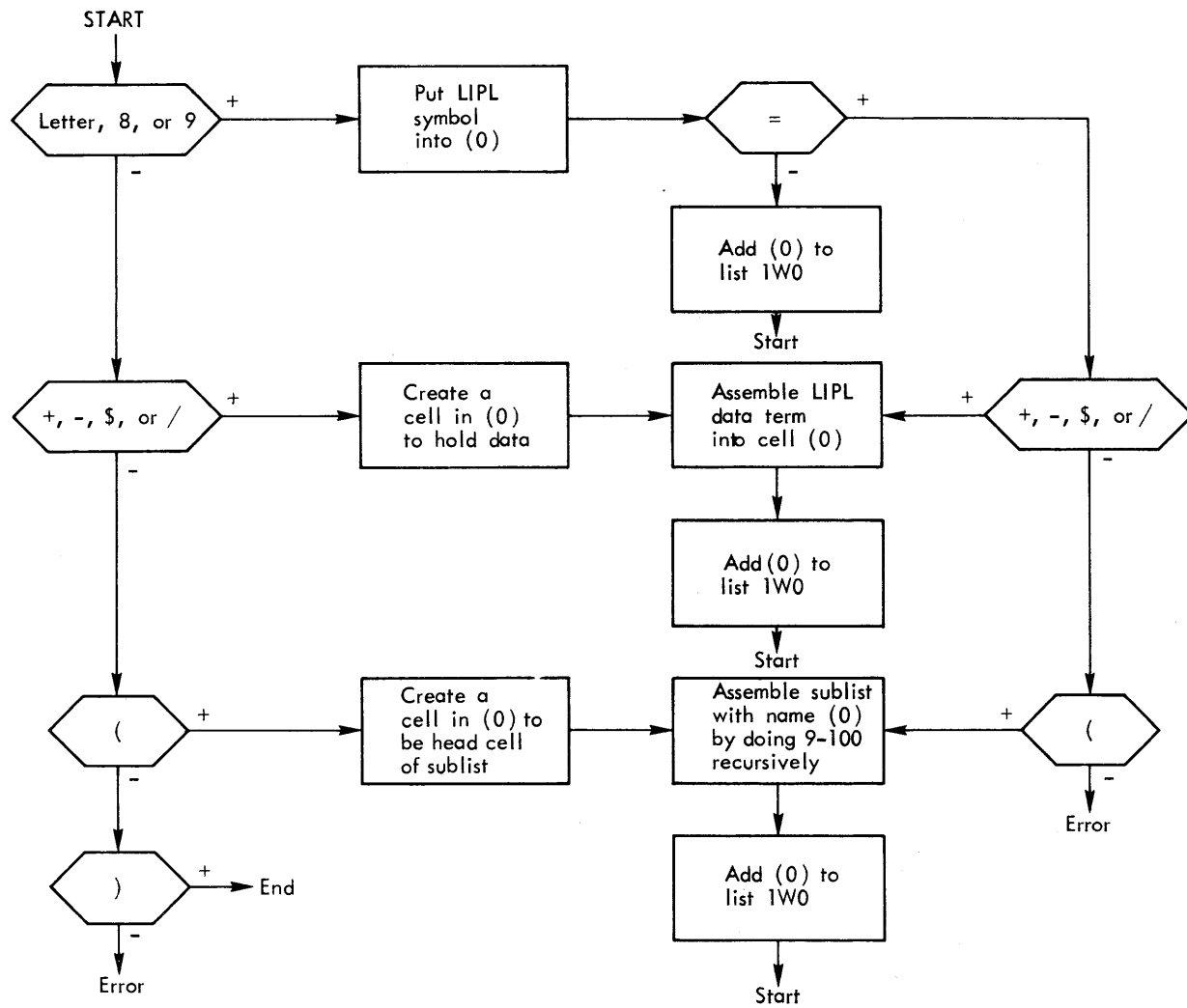
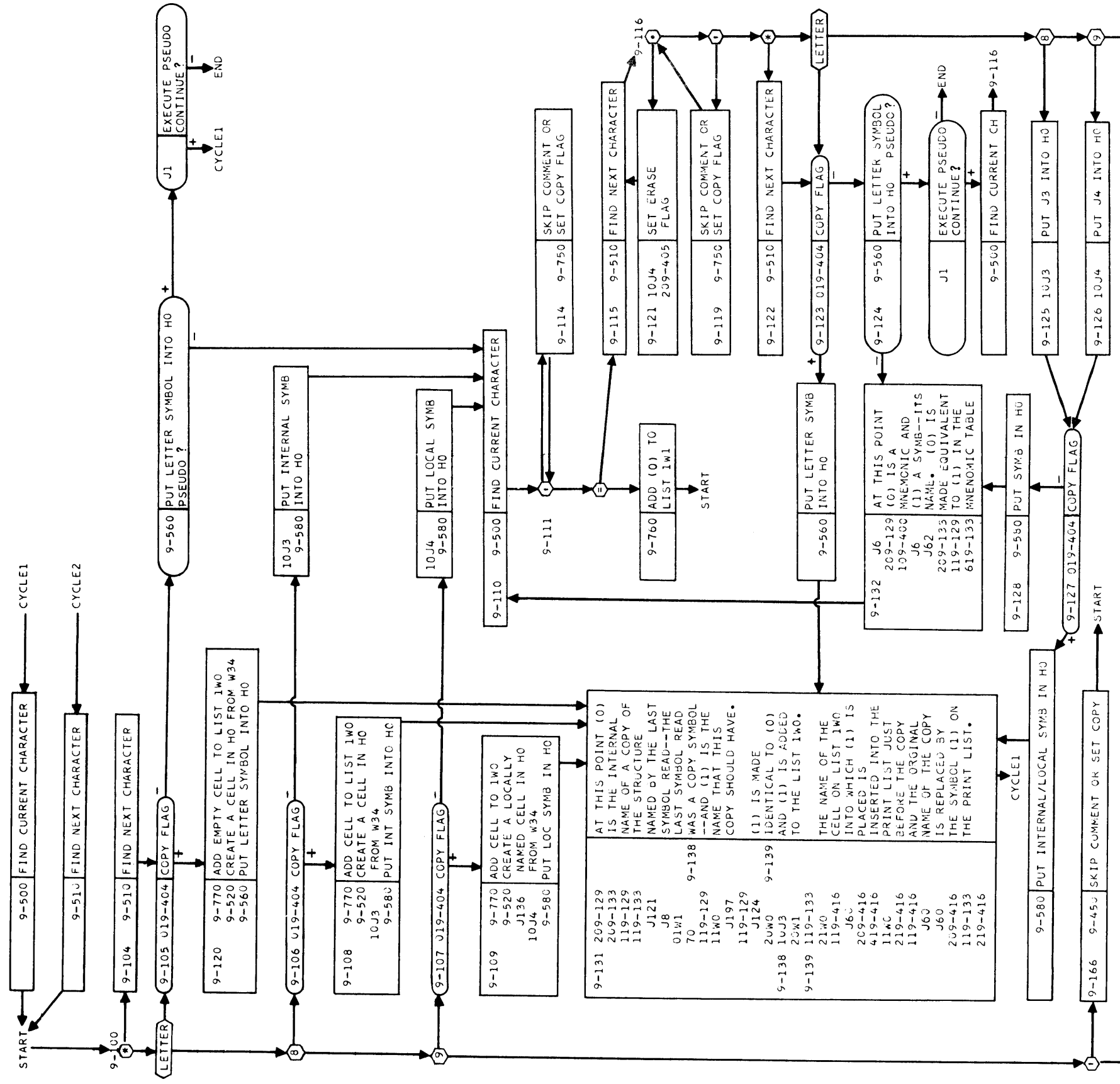


Fig. 7—Simplified flowchart of executive 9-100



AT THIS POINT (0) IS THE INTERNAL NAME OF A COPY OF THE STRUCTURE NAMED BY THE LAST SYMBOL READ--THE LAST SYMBOL READ --AND (1) IS THE NAME THAT THIS COPY SHOULD HAVE.

9-131	209-129	9-138	01W1
209-133	119-129	9-139	20W0
119-133	J121		10J3
J8	J124		23W1
70	119-129		21W0
119-129	J197		119-416
11W0	J124		J60
J197	209-416		419-416
119-129	119-416		119-416
J124	J60		119-416
20W0	J60		J60
10J3	209-416		209-416
23W1	119-133		119-133
9-139	119-133		219-416

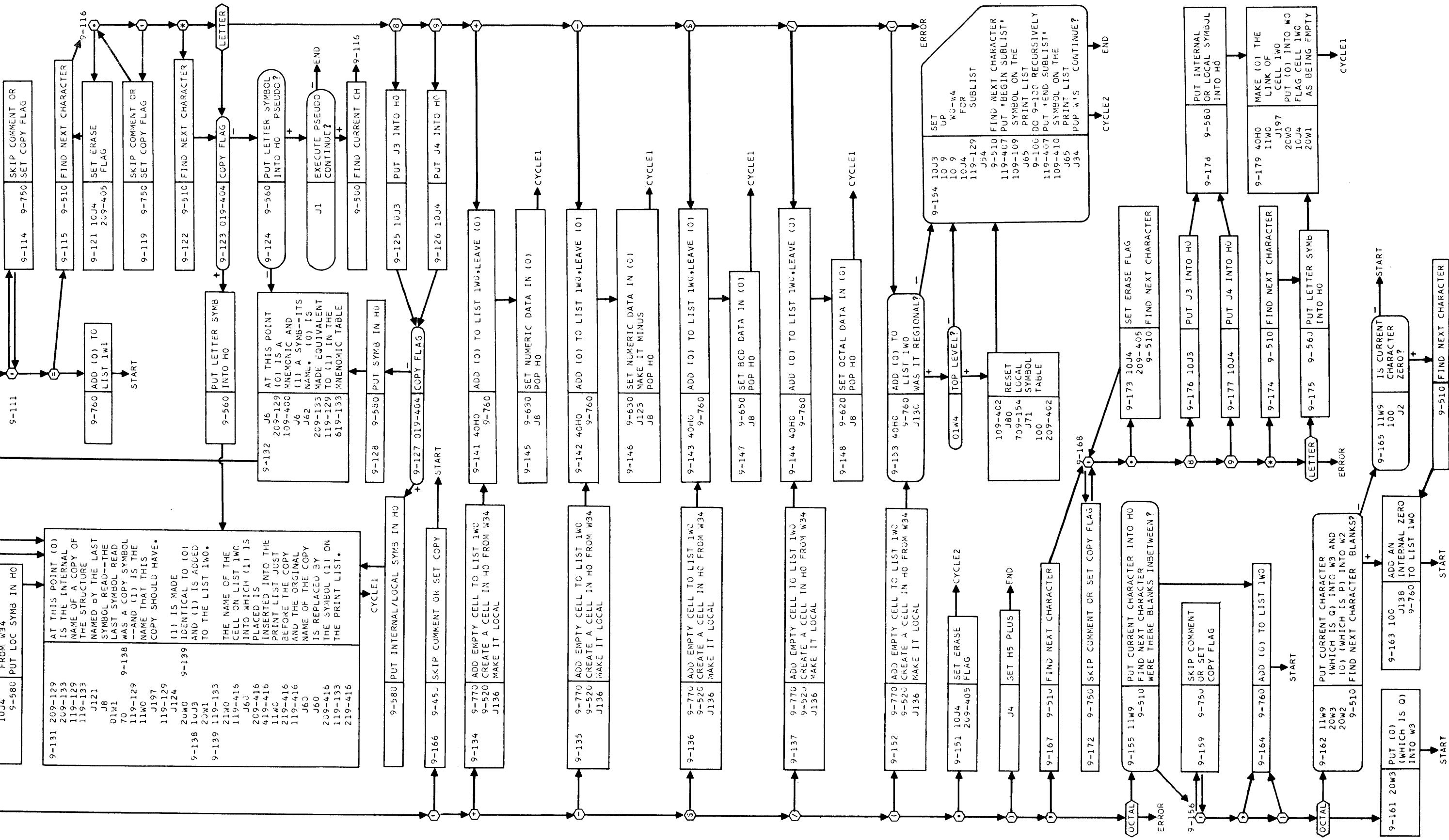


Fig. 8—Flowchart of executive 9-100

Appendix

J164 LISTING

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                    5
100 SET UP, CLEAN UP***** J164 10J0 04 LIPL SET UP 0010
                                * 209-415 LIPL SET UP 0020
                                * 10J4 LIPL SET UP 0030
                                * 609-417 LIPL SET UP 0040
                                * 209-411 LIPL SET UP 0050
                                * 10J3 LIPL SET UP 0060
                                * 609-418 LIPL SET UP 0070
                                * 209-419 LIPL SET UP 0080
                                * 40W31 LIPL SET UP 0090
                                * 109-900 LIPL SET UP 0100
                                * 20W31 LIPL SET UP 0110
                                * 43W21 LIPL SET UP 0120
                                * 109-10 LIPL SET UP 0130
                                * 20W21 LIPL SET UP 0140
                                * 40W22 LIPL SET UP 0150
                                * 109-901 LIPL SET UP 0160
                                * 20W22 LIPL SET UP 0170
                                * 40W25 LIPL SET UP 0180
                                * 109-11 LIPL SET UP 0190
                                * 20W25 LIPL SET UP 0200
                                * 40W30 LIPL SET UP 0210
***** * 109-521 LIPL SET UP 0220
* MEMORY MAP * * 109-520 LIPL SET UP 0230
*-----* * J121 LIPL SET UP 0240
* W CELLS * * 51W34 LIPL SET UP 0250
W0 CURRENT CELL BEING ASSEMBLED* * 10H2 LIPL SET UP 0260
W1 IS 1W0 EMPTY Y/N * * J2 LIPL SET UP 0270
W2 P * * 11H5 LIPL SET UP 0280
W3 Q * * 209-414 LIPL SET UP 0290
W4 IS PROGRAM AT TOP LEVEL Y/N* * 709-1 LIPL SET UP 0300
W9 CURRENT CHARACTER * * 10H2 LIPL SET UP 0310
* 0-99 SET UP, CLEAN UP * * J126 LIPL SET UP 0320
* 100-199 EXECUTIVE * * 40H0 LIPL SET UP 0330
* 200-299 PRINT LISTS * * 109-902 LIPL SET UP 0340
200 'NEUMONIC TABLE' * * J6 LIPL SET UP 0350
210 'INTERNAL TABLE' * * J112 LIPL SET UP 0360
220 'ERROR--NO MORE CARDS' * * 109-903 LIPL SET UP 0370
* 400-499 WORK CELLS, SYMBOLS* * J6 LIPL SET UP 0380
400 NEUMONIC TABLE * * 40H0 LIPL SET UP 0390
401 PSEUDO TABLE * * J113 LIPL SET UP 0400
402 LOCAL TABLE * * 40H0 LIPL SET UP 0410
403 INTERNAL TABLE * * 10H2 LIPL SET UP 0420
404 COPY FLAG * * J6 LIPL SET UP 0430
405 ERASE FLAG * * J200 LIPL SET UP 0440
406 PRINT LIST * * J6 LIPL SET UP 0450
407 LAST CELL OF PRINT LIST * * J9 LIPL SET UP 0460
408 SYMBOL 4 DATA TERM * * J75 LIPL SET UP 0470
409 SYMBOL 4 BEGINNING OF SUBLST* * 20W34 LIPL SET UP 0480
410 SYMBOL 4 END OF SUBLIST * * 9-1 J154 LIPL SET UP 0490
411 DATA MODE FLAG * * 40W9 LIPL SET UP 0500
412 SYMBOL FOR NEW CARD * * 9-680 LIPL SET UP 0510
413 INTEGER CARD COUNT * * 9-500 LIPL SET UP 0520
414 W32=H2 AT START Y/N * * 10J4 LIPL SET UP 0530
415 LINK TO THIS ROUTINE * * 10 9 LIPL SET UP 0540
416 CELL IN PRINT LIST JUST * * 10 9 LIPL SET UP 0550
* BEFORE LAST COPY WAS MADE * * 10J4 LIPL SET UP 0560
417 LISTING DESIRED Y/N * * J90 LIPL SET UP 0570
418 NEUMONIC TABLE DESIRED Y/N * * J54 LIPL SET UP 0580
419 INTERNAL TABLE DESIRED Y/N * *

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* 500-799 SUBROUTINES * *
500 FIND CURRENT CHARACTER * * 9-100 LIPL SET UP 0600
510 FIND NEXT CHARACTER * * J34 LIPL SET UP 0610
520 CREAT A CELL IN HO * * 30W9 LIPL SET UP 0620
530 SCAN FOR NEXT ) , = OR BLANK * * J154 LIPL SET UP 0630
540 SCAN FOR NEXT ) , OR BLANK * * J155 LIPL SET UP 0640
560 PUT SYMBOL IN HO--LETTER * * 9-700 LIPL SET JP 0650
580 PUT SYMBOL IN HO--8-,9+ * * J154 LIPL SET UP 0660
600 ERASE, COPY IF REQUIRED * * J155 LIPL SET UP 0670
620 SET OCTAL DATA IN (0) * * 9-790 LIPL SET UP 0680
630 SET NUMERIC DATA IN (0) * * J154 LIPL SET UP 0690
650 SET BCD DATA IN (0) * * J155 LIPL SET UP 0700
680 READ, PRINT A CARD * * 019-414 LIPL SET UP 0710
700 PRINT, ERASE PRINT LIST * * 709-2 LIPL SET JP 0720
750 SKIP COMMENT OR SET COPY FLG * * 11W34 LIPL SET UP 0730
760 AD 2 LIST 1W0, SET P, Q * * 10H2 LIPL SET UP 0740
770 AD AN EMPTY CELL 2 LIST 1W0 * * J2 LIPL SET UP 0750
780 ERASE PRINT LIST * * 70 9-2 LIPL SET UP 0760
790 PRINT INTERNAL, NEUMONIC TBL * * 11W34 LIPL SET UP 0770
* 800-899 NEGATIVE INTEGERS * * 10H2 LIPL SET UP 0780
* 900-999 POSITIVE INTEGERS * * J61 LIPL SET UP 0790
***** J197 LIPL SET UP 0800
***** 10H2 LIPL SET UP 0810
***** 20W34 LIPL SET UP 0820
* 9-2 30W21 LIPL SET UP 0830
* 30W22 LIPL SET UP 0840
* 30W25 LIPL SET UP 0850
* 30W30 LIPL SET UP 0860
* 30W31 LIPL SET UP 0870
***** 119-415 J1 LIPL SET UP 0880
**END** 9-10 +01 1 LIPL SET UP 0890
***** 9-11 +01 1 LIPL SET UP 0900
9-100 BRANCH ON CURRENT CHARACTER 9-100 1C9-101 LIPL 9-100 0910
* 11W9 LIPL 9-100 0920
* J10 LIPL 9-100 0930
IF LETTER GO TO 9-105 * 70 J1 LIPL 9-100 0940
IF 8 GO TO 9-106 * 11W9 LIPL 9-100 0950
IF 9 GO TO 9-107 * J130 LIPL 9-100 0960
IF + GO TO 9-134 * 709-155 9-105 LIPL 9-100 0970
IF - GO TO 9-135 * 9-101+ 9-102 0 LIPL 9-100 0980
IF $ GO TO 9-136 * 9-102+ 0 LIPL 9-100 0990
IF / GO TO 9-137 * 9-103+ * LIPL 9-100 1000
IF . GO TO 9-151 * + 9-104 LIPL 9-100 1010
IF ( GO TO 9-152 * + + LIPL 9-100 1020
IF , GO TO 9-167 * + 9-134 LIPL 9-100 1030
IF ' GO TO 9-166 * + - LIPL 9-100 1040
IF ) GO TO J4 * + 9-135 LIPL 9-100 1050
IF OCTAL GO TO 9-155 * + . LIPL 9-100 1060
* + 9-151 LIPL 9-100 1070
* + , LIPL 9-100 1080
NOTE--IT IS IMPOSSIBLE * + 9-167 LIPL 9-100 1090
FOR THE CURRENT * + $ LIPL 9-100 1100
CHARACTER TO BE AN * + 9-135 LIPL 9-100 1110
'=' AT THIS POINT * + ) LIPL 9-100 1120
IN THE PROGRAM. * + J4 LIPL 9-100 1130
* + ( LIPL 9-100 1140
* + 9-152 LIPL 9-100 1150
* + ' LIPL 9-100 1160
* + 9-166 LIPL 9-100 1170
* + / LIPL 9-100 1180
* + 9-137 LIPL 9-100 1190

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	*		+	8		LIPL	9-100	1200	
	*		+	9-106		LIPL	9-100	1210	
	*		+	9		LIPL	9-100	1220	
	**		+	9-107	0	LIPL	9-100	1230	
104	FIND NEXT CHARACTER		9-104	9-510		LIPL	9-100	1240	
105	IF COPY FLAG IS ON,		9-105	019-404		LIPL	9-100	1250	
	GO TO 9-120			70	9-120	LIPL	9-100	1260	
	PUT SYMBOL IN H0			9-560		LIPL	9-100	1270	
	IF NOT A PSEUDO, GO TO 9-110			70	9-110	LIPL	9-100	1280	
	EXECUTE PSEUDO			J1		LIPL	9-100	1290	
	STOP IF PSEUDO LEAVES H5 -			70 0		LIPL	9-100	1300	
	FIND CURRENT CHARACTER,GO 9-100			9-500	9-100	LIPL	9-100	1310	
120	ADD AN EMPTY CELL TO LIST 1W0		9-120	9-770		LIPL	9-100	1320	
	CREAT A CELL IN H0			9-520		LIPL	9-100	1330	
	PUT SYMBOL IN H0, GO TO 9-131			9-560	9-131	LIPL	9-100	1340	
106	IF COPY FLAG IS ON,		9-106	019-404		LIPL	9-100	1350	
	GO TO 9-108			70	9-108	LIPL	9-100	1360	
	PUT J3 IN H0			10J3		LIPL	9-100	1370	
	PUT SYMBOL IN H0, GO TO 9-110			9-580	9-110	LIPL	9-100	1380	
107	IF COPY FLAG IS CN,		9-107	019-404		LIPL	9-100	1390	
	GO TO 9-109			70	9-109	LIPL	9-100	1400	
	PUT J4 IN H0			10J4		LIPL	9-100	1410	
	PUT SYMBOL IN H0			9-580	9-110	LIPL	9-100	1420	
108	ADD AN EMPTY CELL TO LIST 1W0		9-108	9-770		LIPL	9-100	1430	
	CREAT A CELL IN H0			9-520		LIPL	9-100	1440	
	PUT J3 IN H0			10J3		LIPL	9-100	1450	
	PUT SYMBOL IN H0, GO TO 9-131			9-580	9-131	LIPL	9-100	1460	
109	ADD AN EMPTY CELL TO LIST 1W0		9-109	9-770		LIPL	9-100	1470	
	CREAT A CELL IN H0			9-520		LIPL	9-100	1480	
	MAKE IT LOCAL			J136		LIPL	9-100	1490	
	PUT J4 IN H0			10J4		LIPL	9-100	1500	
	PUT SYMBOL IN H0, GO TO 9-131			9-580	9-131	LIPL	9-100	1510	
110	FIND CURRENT CHARACTER		9-110	9-500		LIPL	9-100	1520	
111	BRANCH ON CURRENT CHARACTER****		9-111	109-112		LIPL	9-100	1530	
				11W9		LIPL	9-100	1540	
	IF ' GO TO 9-114			J10		LIPL	9-100	1550	
	IF = GO TO 9-115			70	J1	LIPL	9-100	1560	
				9-760	9-100	LIPL	9-100	1570	
	ELSE ADD (0) TO LIST		9-112+	9-113	0	LIPL	9-100	1580	
	AND GO TO 9-100		9-113+	0		LIPL	9-100	1590	
				+	'	LIPL	9-100	1600	
				+	9-114	LIPL	9-100	1610	
				+	=	LIPL	9-100	1620	
				+	9-115	0	LIPL	9-100	1630
114	SKIP COMMNT OR SET COPY, 9-111		9-114	9-750	9-111	LIPL	9-100	1640	
115	FIND NEXT CHARACTER		9-115	9-510		LIPL	9-100	1650	
116	BRANCH ON CURRENT CHARACTER****		9-116	109-117		LIPL	9-100	1660	
				11W9		LIPL	9-100	1670	
	IF LETTER GO TO 9-123			J10		LIPL	9-100	1680	
	IF ' GO TO 9-119			709-123	J1	LIPL	9-100	1690	
	IF + GO TO 9-141		9-117+	9-118	0	LIPL	9-100	1700	
	IF - GO TO 9-142		9-118+	0		LIPL	9-100	1710	
	IF \$ GO TO 9-143			+	'	LIPL	9-100	1720	
	IF / GO TO 9-144			+	9-119	LIPL	9-100	1730	
	IF 8 GO TO 9-125			+	.	LIPL	9-100	1740	
	IF 9 GO TO 9-126			+	9-121	LIPL	9-100	1750	
	IF * GO TO 9-122			+	+	LIPL	9-100	1760	
	IF (GO TO 9-153			+	9-141	LIPL	9-100	1770	
	IF . GO TO 9-121			+	-	LIPL	9-100	1780	

NOTE--IT IS IMPOSSIBLE	*	+	9-142		LIPL	9-100	1790
FOR THE CURRENT	*	+	\$		LIPL	9-100	1800
CHARACTER TO BE AN	*	+	9-143		LIPL	9-100	1810
OCTAL, AN '=', A	*	+	/		LIPL	9-100	1820
'), OR A ', AT	*	+	9-144		LIPL	9-100	1830
THIS POINT IN THE	*	+	8		LIPL	9-100	1840
PROGRAM.	*	+	9-125		LIPL	9-100	1850
	*	+	9		LIPL	9-100	1860
	*	+	9-126		LIPL	9-100	1870
	*	+	*		LIPL	9-100	1880
	*	+	9-122		LIPL	9-100	1890
	*	+	(LIPL	9-100	1900
	**	+	9-153	0	LIPL	9-100	1910
119 SKIP COMMNT OR SET COPY, 9-116		9-119	9-750	9-116	LIPL	9-100	1920
121 SET ERASE FLAG		9-121	10J4		LIPL	9-100	1930
GO TO 9-115			209-405	9-115	LIPL	9-100	1940
122 FIND NEXT CHARACTER		9-122	9-510		LIPL	9-100	1950
123 IF COPY FLAG IS NOT ON,		9-123	019-404		LIPL	9-100	1960
GO TO 9-124			709-124		LIPL	9-100	1970
PUT SYMBOL IN H0, GO TO 9-131.			9-560	9-131	LIPL	9-100	1980
124 PUT SYMBOL IN H0		9-124	9-560		LIPL	9-100	1990
IF NOT A PSEUDO, GO TO 9-132			70	9-132	LIPL	9-100	2000
EXECUTE PSEUDO			J1		LIPL	9-100	2010
STOP IS PSEUDO LEAVES H5 -			70 0		LIPL	9-100	2020
FIND CURRENT CHARACTER,GO 9-116			9-500	9-116	LIPL	9-100	2030
125 PUT J3 IN H0, GO TO 9-127		9-125	10J3	9-127	LIPL	9-100	2040
126 PUT J4 IN H0		9-126	10J4		LIPL	9-100	2050
127 IF COPY FLAG IS NOT ON		9-127	019-404		LIPL	9-100	2060
GO TO 9-128			709-128		LIPL	9-100	2070
PUT SYMBOL IN H0, GO TO 9-131			9-580	9-131	LIPL	9-100	2080
128 PUT SYMBOL IN H0, GO TO 9-132		9-128	9-580	9-132	LIPL	9-100	2090
129 WORK CELL		9-129+	0	0	LIPL	9-100	2100
131	*****	9-131	209-129		LIPL	9-100	2110
AT THIS POINT IN THE	*		209-133		LIPL	9-100	2120
PROGRAM (0) IS THE	*		119-129		LIPL	9-100	2130
INTERNAL NAME OF A.	*		119-133		LIPL	9-100	2140
COPY OF THE STRUCTURE	*		J121		LIPL	9-100	2150
NAMED BY THE LAST	*		J8		LIPL	9-100	2160
SYMBOL READ. (1) IS THE	*		01W1		LIPL	9-100	2170
2ND LAST SYMBOL READ--	*		70	9-138	LIPL	9-100	2180
THE 'NAME' THE USER	*		119-129		LIPL	9-100	2190
WANTS THE COPY TO HAVE.	*		11W0		LIPL	9-100	2200
(1) IS MADE IDENTICAL	*		J197		LIPL	9-100	2210
TO (0) AND (1) IS ADDED	*		119-129		LIPL	9-100	2220
TO THE LIST 1W0. THE	*		J124		LIPL	9-100	2230
CELL ON LIST 1W0 INTO	*		20W0	9-139	LIPL	9-100	2240
WHICH (1) IS PLACED	*	9-138	10J3		LIPL	9-100	2250
IS INSERTED INTO THE	*		20W1		LIPL	9-100	2260
PRINT LIST JUST BEFORE	*	9-139	119-133		LIPL	9-100	2270
THE COPY AND THE	*		21W0		LIPL	9-100	2280
ORIGINAL NAME	*		119-416		LIPL	9-100	2290
OF THE COPY IS REPLACED	*		J60		LIPL	9-100	2300
BY THE SYMBOL (1) ON THE	*		209-416		LIPL	9-100	2310
PRINT LIST.	*		419-416		LIPL	9-100	2320
	*		11W0		LIPL	9-100	2330
THEN THE CURRENT	*		219-416		LIPL	9-100	2340
CHARACTER IS FOUND	*		119-416		LIPL	9-100	2350
AND THE PROGRAM LINKS	*		J60		LIPL	9-100	2360
TO 9-100.	*		J60		LIPL	9-100	2370
	*		209-416		LIPL	9-100	2380

	*	119-133	LIPL	9-100	2390		
	*	219-416	LIPL	9-100	2400		
	**	9-500	9-100	LIPL	9-100	2410	
132 (0) IS A NEUMONIC AND	*****	9-132	J6	LIPL	9-100	2420	
(1) IS A SYMBOL. (0)	*	209-129	LIPL	9-100	2430		
IS MADE EQUIVALENT TO	*	109-400	LIPL	9-100	2440		
(1) IN THE NEUMONIC	*	J6	LIPL	9-100	2450		
TABLE. THE PROGRAM	*	J62	LIPL	9-100	2460		
THEN LINKS TO 9-110.	*	209-133	LIPL	9-100	2470		
	*	119-129	LIPL	9-100	2480		
	**	619-133	9-110	LIPL	9-100	2490	
133 WORKING CELL	9-133+	0	0	LIPL	9-100	2500	
134 ADD AN EMPTY CELL TO LIST 1W0	9-134	9-770	LIPL	9-100	2510		
CREAT A CELL IN HO		9-520	LIPL	9-100	2520		
MAKE IT LOCAL, GO TO 9-141		J136	9-141	LIPL	9-100	2530	
135 ADD AN EMPTY TO LIST 1W0	9-135	9-770	LIPL	9-100	2540		
CREAT A CELL IN HO		9-520	LIPL	9-100	2550		
MAKE IT LOCAL, GO TO 9-142		J136	9-142	LIPL	9-100	2560	
136 ADD EN EMPTY CELL TO LIST 1W0	9-136	9-770	LIPL	9-100	2570		
CREAT A CELL IN HO		9-520	LIPL	9-100	2580		
MAKE IT LOCAL, GO TO 9-143		J136	9-143	LIPL	9-100	2590	
137 ADD AN EMPTY CELL TO LIST 1W0	9-137	9-770	LIPL	9-100	2600		
CREAT A CELL IN HO		9-520	LIPL	9-100	2610		
MAKE IT LOCAL, GO TO 9-144		J136	9-144	LIPL	9-100	2620	
141 ADD (0) TO LIST 1W0,	9-141	40HO	LIPL	9-100	2630		
LEAVE (0), GO TO 9-145		9-760	9-145	LIPL	9-100	2640	
145 ADD (0) TO LIST 1W0,	9-142	40HO	LIPL	9-100	2650		
LEAVE (0), GO TO 9-146		9-760	9-146	LIPL	9-100	2660	
143 ADD (0) TO LIST 1W0,	9-143	40HC	LIPL	9-100	2670		
LEAVE (0), GO TO 9-147		9-760	9-147	LIPL	9-100	2680	
144 ADD (0) TO LIST 1W0,	9-144	40HO	LIPL	9-100	2690		
LEAVE (0), GO TO 9-148		9-760	9-148	LIPL	9-100	2700	
145 SET NEUMERIC DATA IN (0)	9-145	9-630	LIPL	9-100	2710		
POP HO, GO TO 9-149		J8	9-149	LIPL	9-100	2720	
146 SET NEUMERIC DATA IN (0)	9-146	9-630	LIPL	9-100	2730		
MAKE (0) NEGATIVE-		J123	LIPL	9-100	2740		
POP HO, GO TO 9-149		J8	9-149	LIPL	9-100	2750	
147 SET BCD DATA IN (0)	9-147	9-650	LIPL	9-100	2760		
POP HO, GO TO 9-149		J8	9-149	LIPL	9-100	2770	
148 SET OCTAL DATA IN (0)	9-148	9-620	LIPL	9-100	2780		
POP HO, GO TO 9-149		J8	9-149	LIPL	9-100	2790	
149 FIND CURRENT CHARACTER,GO	9-100	9-149	9-500	9-100	LIPL	9-100	2800
151 SET ERASE FLAG	9-151	10J4	LIPL	9-100	2810		
		209-405	LIPL	9-100	2820		
FIND NEXT CHARACTER,GO TO	9-100	9-510	9-100	LIPL	9-100	2830	
152 ADD EN EMPTY CELL TO LIST 1W0	9-152	9-770	LIPL	9-100	2840		
CREAT A CELL IN HO		9-520	LIPL	9-100	2850		
MAKE IT LOCAL		J136	LIPL	9-100	2860		
153	9-153	609-129	LIPL	9-100	2870		
ADD (0) TO LIST 1W0		9-760	LIPL	9-100	2880		
		119-129	LIPL	9-100	2890		
IF (0) IS NOT REGIONAL,		J130	LIPL	9-100	2900		
GO TO 9-154		709-154	LIPL	9-100	2910		
IF NOT AT THE TOP LEVEL,		01W4	LIPL	9-100	2920		
GO TO 9-154		709-154	LIPL	9-100	2930		
RESET LOCAL SYMBOL TABLE	*****	109-402	LIPL	9-100	2940		
	*	J80	LIPL	9-100	2950		
	*	709-154	LIPL	9-100	2960		
	*	J71	LIPL	9-100	2970		


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*           10 0           LIPL 9-100   2980
**          209-402       LIPL 9-100   2990
154 SET UP W0-W4 FOR SUBLIST ***** 9-154 10J3       LIPL 9-100   3000
*           10 9           LIPL 9-100   3010
*           10 9           LIPL 9-100   3020
*           10J4          LIPL 9-100   3030
*           119-129       LIPL 9-100   3040
**          J54           LIPL 9-100   3050
FIND NEXT CHARACTER          9-510       LIPL 9-100   3060
PUT 'BEGIN SUBLIST' SYMBOL ON 119-407     LIPL 9-100   3070
PRINT LIST                  109-409     LIPL 9-100   3080
J65                          LIPL 9-100   3090
DO 9-100 RECURSIVELY        9-100       LIPL 9-100   3100
PUT 'END SUBLIST' SYMBOL ON 119-407     LIPL 9-100   3110
PRINT LIST                  109-410     LIPL 9-100   3120
J65                          LIPL 9-100   3130
POP W0-W4                   J34        LIPL 9-100   3140
STOP IF H5 -                 70 0        LIPL 9-100   3150
FIND NEXT CHARACTER,GO TO 9-149 9-510 9-149 LIPL 9-100   3160
155 PUT CURRENT CHARACTER IN HO 9-155 11W9       LIPL 9-100   3170
FIND NEXT CHARACTER          9-510       LIPL 9-100   3180
IF BLANK(S), GO TO 9-164     709-164     LIPL 9-100   3190
156 BRANCH ON CURRENT CHARACTER**** 9-156 109-157     LIPL 9-100   3200
*           11W9          LIPL 9-100   3210
IF OCTAL GO TO 9-162        *           J10        LIPL 9-100   3220
IF ' GO TO 9-159           *           70         J1        LIPL 9-100   3230
IF , GO TO 9-164           *           11W9       LIPL 9-100   3240
IF ) GO TO 9-164           *           J130       LIPL 9-100   3250
*           709-162 9-161 LIPL 9-100   3260
ELSE GO TO 9-161           *           9-157+ 9-158 0 LIPL 9-100   3270
*           9-158+ 0       LIPL 9-100   3280
*           + '         LIPL 9-100   3290
*           + 9-159     LIPL 9-100   3300
*           + ,         LIPL 9-100   3310
*           + 9-164     LIPL 9-100   3320
*           + )         LIPL 9-100   3330
*           + 9-164     LIPL 9-100   3340
*           + 8         LIPL 9-100   3350
*           + 9-161     LIPL 9-100   3360
*           + 9         LIPL 9-100   3370
**          + 9-161 0     LIPL 9-100   3380
159 SKIP COMMNT OR SET COPY, 9-116 9-159 9-750 9-156 LIPL 9-100   3390
161 PUT (0) IN W3 (Q), GO TO 9-100 9-161 20W3 9-100 LIPL 9-100   3400
162 PUT CURRENT CHARACTER IN W3 (Q) 9-162 11W9       LIPL 9-100   3410
AND (0) IN W2 (P)          20W3       LIPL 9-100   3420
                          20W2       LIPL 9-100   3430
FIND NEXT CHARACTER          9-510       LIPL 9-100   3440
IF NO BLANK(S), GO TO 9-165 70         9-165 LIPL 9-100   3450
163 PUT AN INTERNAL ZERO IN HO 9-163 10 0       LIPL 9-100   3460
J138                         LIPL 9-100   3470
164 ADD (0) TO LIST 1W0,GO TO 9-100 9-164 9-760 9-100 LIPL 9-100   3480
165 IS CURRENT CHARACTER ZERO 9-165 11W9       LIPL 9-100   3490
                          10 C       LIPL 9-100   3500
                          J2         LIPL 9-100   3510
IF NOT, GO TO 9-100        709-100     LIPL 9-100   3520
IF SO, FIND NEXT CHAR, GO 9-163 9-510 9-163 LIPL 9-100   3530
166 SKIP COMMNT OR SET COPY, 9-116 9-166 9-750 9-100 LIPL 9-100   3540
167 FIND NEXT CHARACTER     9-167 9-510     LIPL 9-100   3550
168 BRANCH ON CURRENT CHARACTER**** 9-168 109-169     LIPL 9-100   3560
*           11W9          LIPL 9-100   3570

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IF LETTER GO TO 9-175	*	J10		LIPL 9-100	3580
IF 8 GO TO 9-176	*	709-175	J1	LIPL 9-100	3590
IF 9 GO TO 9-177	*	9-169+	9-171 0	LIPL 9-100	3600
IF ' GO TO 9-172	*	9-171+	0	LIPL 9-100	3610
IF . GO TO 9-173	*	+	'	LIPL 9-100	3620
IF * GO TO 9-174	*	+	9-172	LIPL 9-100	3630
	*	+	8	LIPL 9-100	3640
NOTE--IT IS IMPOSSIBLE	*	+	9-176	LIPL 9-100	3650
FOR THE CURRENT	*	+	9	LIPL 9-100	3660
CHARACTER TO BE AN	*	+	9-177	LIPL 9-100	3670
OCTAL, AN '=', A '('	*	+	.	LIPL 9-100	3680
A ')', A '+', A '-',	*	+	9-173	LIPL 9-100	3690
A '/', OR A '\$' AT THIS	*	+	*	LIPL 9-100	3700
POINT IN THE PROGRAM.	**	+	9-174 0	LIPL 9-100	3710
172 SKIP COMMNT OR SET COPY, 9-168		9-172	9-750 9-168	LIPL 9-100	3720
173 SET ERASE FLAG		9-173	10J4	LIPL 9-100	3730
			209-405	LIPL 9-100	3740
FIND NEXT CHARACTER,GO TO 9-168			9-510 9-168	LIPL 9-100	3750
174 FIND NEXT CHARACTER		9-174	9-510	LIPL 9-100	3760
175 PUT SYMBOL IN H0, GO TO 9-179		9-175	9-560 9-179	LIPL 9-100	3770
176 PUT J3 IN H0, GO TO 9-178		9-176	10J3 9-178	LIPL 9-100	3780
177 PUT J4 IN H0		9-177	10J4	LIPL 9-100	3790
178 PUT SYMBOL IN H0		9-178	9-580	LIPL 9-100	3800
179 SET LINK OF CELL 1W0 TO (0)		9-179	40H0	LIPL 9-100	3810
			11W0	LIPL 9-100	3820
			J197	LIPL 9-100	3830
PUT (0) INTO W0			20W0	LIPL 9-100	3840
SET W1 (EMPTY FLAG) TO PLUS			10J4	LIPL 9-100	3850
			20W1	LIPL 9-100	3860
FIND CURRENT CHARACTER,GO 9-100			9-500 9-100	LIPL 9-100	3870
200 'NEUMONIC TABLE'		9-200+	0	LIPL PRINT LTS3880	
		+	9-202	LIPL PRINT LTS3890	
		+	9-203	LIPL PRINT LTS3900	
		9-201+	9-204	LIPL PRINT LTS3910	
		+	9-205 0	LIPL PRINT LTS3920	
			9-202+21NEUM	LIPL PRINT LTS3930	
			9-203+21ONIC	LIPL PRINT LTS3940	
			9-204+21 TAB	LIPL PRINT LTS3950	
			9-205+21LE	LIPL PRINT LTS3960	
210 'INTERNAL TBLE'		9-210+	0	LIPL PRINT LTS3970	
		+	9-211	LIPL PRINT LTS3980	
		+	9-212 9-201	LIPL PRINT LTS3990	
			9-211+21INTE	LIPL PRINT LTS4000	
			9-212+21RNAL	LIPL PRINT LTS4010	
			9-221+21ERROR	LIPL PRINT LTS4020	
			9-222+21--NO	LIPL PRINT LTS4030	
			9-223+21 MORE	LIPL PRINT LTS4040	
			9-224+21 CARD	LIPL PRINT LTS4050	
			9-225+21S ON	LIPL PRINT LTS4060	
			9-226+21 UNIT	LIPL PRINT LTS4070	
			9-227+21 1W18	LIPL PRINT LTS4080	
			9-228+21--LIP	LIPL PRINT LTS4090	
			9-229+21L REA	LIPL PRINT LTS4100	
			9-230+21D GRO	LIPL PRINT LTS4110	
			9-231+21UP IN	LIPL PRINT LTS4120	
			9-232+21COMPL	LIPL PRINT LTS4130	
			9-233+21ETE	LIPL PRINT LTS4140	
220 'ERROR--NO MORE CARDS'		9-220+	0	LIPL PRINT LTS4150	
		+	9-221	LIPL PRINT LTS4160	

				+	9-222		LIPL PRINT	LTS4170
				+	9-223		LIPL PRINT	LTS4180
				+	9-224		LIPL PRINT	LTS4190
				+	9-225		LIPL PRINT	LTS4200
				+	9-226		LIPL PRINT	LTS4210
				+	9-227		LIPL PRINT	LTS4220
				+	9-228		LIPL PRINT	LTS4230
				+	9-229		LIPL PRINT	LTS4240
				+	9-230		LIPL PRINT	LTS4250
				+	9-231		LIPL PRINT	LTS4260
				+	9-232		LIPL PRINT	LTS4270
				+	9-233	0	LIPL PRINT	LTS4280
300 PSEUDOS		9-300		+	9-301		LIPL PSEUDOS	4290
				+	9-311		LIPL PSEUDOS	4300
				+	9-302		LIPL PSEUDOS	4310
				+	9-312		LIPL PSEUDOS	4320
				+	9-303		LIPL PSEUDOS	4330
				+	9-313		LIPL PSEUDOS	4340
				+	9-304		LIPL PSEUDOS	4350
				+	9-324		LIPL PSEUDOS	4360
				+	9-305		LIPL PSEUDOS	4370
				+	9-315		LIPL PSEUDOS	4380
				+	9-306		LIPL PSEUDOS	4390
				+	9-316		LIPL PSEUDOS	4400
				+	9-307		LIPL PSEUDOS	4410
				+	9-317		LIPL PSEUDOS	4420
				+	9-308		LIPL PSEUDOS	4430
				+	9-318		LIPL PSEUDOS	4440
				+	9-309		LIPL PSEUDOS	4450
				+	9-319		LIPL PSEUDOS	4460
				+	9-310		LIPL PSEUDOS	4470
				+	9-320	0	LIPL PSEUDOS	4480
					9-301+21ND		LIPL PSEUDOS	4490
					9-302+21DT		LIPL PSEUDOS	4500
					9-303+21RT		LIPL PSEUDOS	4510
					9-304+21GT		LIPL PSEUDOS	4520
					9-305+21KN		LIPL PSEUDOS	4530
					9-306+21RI		LIPL PSEUDOS	4540
					9-307+21PN		LIPL PSEUDOS	4550
					9-308+21PI		LIPL PSEUDOS	4560
					9-309+21NL		LIPL PSEUDOS	4570
					9-310+21TR		LIPL PSEUDOS	4580
311 PSEUDO 'ND'--STOP PROGRAM		9-311	J3	0			LIPL PSEUDOS	4590
312 PSEUDO 'DT'--SET DATA MODE FLG+		9-312	10J4				LIPL PSEUDOS	4600
			209-411	J4			LIPL PSEUDOS	4610
313 PSEUDO 'RT'--SET DATA FLG MODE-		9-313	10J3				LIPL PSEUDOS	4620
			209-411	J4			LIPL PSEUDOS	4630
315 PSEUDO 'KN'--ERASE NEUMONIC TBL		9-315	109-400				LIPL PSEUDOS	4640
		9-321	J60				LIPL PSEUDOS	4650
			709-322				LIPL PSEUDOS	4660
			12HC				LIPL PSEUDOS	4670
			J9				LIPL PSEUDOS	4680
			J60	9-321			LIPL PSEUDOS	4690
		9-322	509-400				LIPL PSEUDOS	4700
			J75				LIPL PSEUDOS	4710
			J71	J4			LIPL PSEUDOS	4720
316 PSEUDO 'RI'--ERASE INTERNAL TBL		9-316	109-403				LIPL PSEUDOS	4730
			J15	J4			LIPL PSEUDOS	4740
317 PSEUDO 'PN'--SET FLAG 9-418 +		9-317	10J4				LIPL PSEUDOS	4750
			209-418	J4			LIPL PSEUDOS	4760

318 PSEUDO 'PI'--SET FLAG 9-419 +	9-318 10J4		LIPL PSEUDOS	4770
	209-419 J4		LIPL PSEUDOS	4780
319 PSEUDO 'NL'--SET FLAG 9-417 -	9-319 10J3		LIPL PSEUDOS	4790
	209-417 J4		LIPL PSEUDOS	4800
320 PSEUDO 'TR'--TRACE LIPL	9-320 109-901		LIPL PSEUDOS	4810
LIPL DEBUGGING AID	20W31		LIPL PSEUDOS	4820
TURNS ON FULL TRACE	03J4	0	LIPL PSEUDOS	4830
324 PSEUDO 'GT'--FIND NEXT	9-324 9-500		LIPL PSEUDOS	4840
SYMBOL, PUT IT IN 9-415,	109-326		LIPL PSEUDOS	4850
AND STOP PROGRAM	11W9		LIPL PSEUDOS	4860
	J10		LIPL PSEUDOS	4870
	70	J1	LIPL PSEUDOS	4880
	9-325 9-560		LIPL PSEUDOS	4890
	209-415 J3		LIPL PSEUDOS	4900
	9-326+ 9-327	0	LIPL PSEUDOS	4910
	9-327+ C		LIPL PSEUDOS	4920
	+ *		LIPL PSEUDOS	4930
	+ 9-328		LIPL PSEUDOS	4940
	+ 9		LIPL PSEUDOS	4950
	+ 9-329		LIPL PSEUDOS	4960
	+ 8		LIPL PSEUDOS	4970
	+ 9-331	0	LIPL PSEUDOS	4980
	9-328 9-510	9-325	LIPL PSEUDOS	4990
	9-329 10J4	9-332	LIPL PSEUDOS	5000
	9-331 10J3		LIPL PSEUDOS	5010
	9-332 9-580		LIPL PSEUDOS	5020
	209-415 J3		LIPL PSEUDOS	5030
MNEMONIC TABLE	9-400+ C	0	LIPL WORK CELS5040	
PSEUDO TABLE	9-401+ C	9-300	LIPL WORK CELS5050	
LOCAL TABLE	9-402+ C	C	LIPL WORK CELS5060	
INTERNAL TABLE	9-403+ C	C	LIPL WORK CELS5070	
COPY FLAG	9-404+ J3	C	LIPL WORK CELS5080	
ERASE FLAG	9-405+ J3	C	LIPL WORK CELS5090	
PRINT LIST	9-406+ C	C	LIPL WORK CELS5100	
LAST CELL OF PRINT LIST	9-407+ 9-406	0	LIPL WORK CELS5110	
DATA MODE FLAG	9-411+ J4	0	LIPL WORK CELS5120	
INTEGER CARD COUNT	9-413+01	0	LIPL WORK CELS5130	
W32=H2 AT START Y/N	9-414+ C	0	LIPL WORK CELS5140	
LINK TO THIS ROUTINE	9-415+ JC	0	LIPL WORK CELS5150	
CELL IN PRT LIST BEFORE LAST COPY	9-416+ C	C	LIPL WORK CELS5160	
LISTING DESIRED Y/N	9-417+ J4	C	LIPL WORK CELS5170	
MNEMONIC TABLE DESIRED Y/N	9-418+ J3	C	LIPL WORK CELS5180	
INTERNAL TABLE DESIRED Y/N	9-419+ J3	0	LIPL WORK CELS5190	
S/R--FIND CURRENT CHARACTER	9-500 11W25		LIPL9-500/510	5200
	109-981		LIPL9-500/510	5210
IF CHARACTER IN PRINT LINE 1W24	J115		LIPL9-500/510	5220
AT COLUMN 1W25 IS NON-BLANK,	709-511		LIPL9-500/510	5230
PUT IT IN W9 AND SET H5+.	J186		LIPL9-500/510	5240
IF BLANK, FIND NEXT NON-BLANK	709-501		LIPL9-500/510	5250
AND PUT IT IN W9 WITH H5-.	20W9	0	LIPL9-500/510	5260
READ AND PRINT CARDS IF NEEDED.	9-501 11W25		LIPL9-500/510	5270
	J184		LIPL9-500/510	5280
	J8		LIPL9-500/510	5290
	709-511		LIPL9-500/510	5300
	J186	9-512	LIPL9-500/510	5310
S/R--FIND NEXT CHARACTER	9-510 109-901		LIPL9-500/510	5320
IF CHARACTER IN PRINT LINE 1W24	J161	9-500	LIPL9-500/510	5330
AT 1W25 + 1 IS NON-BLANK,	9-511 9-680		LIPL9-500/510	5340
PUT IT IN W9 AND SET H5+.	J186		LIPL9-500/510	5350

IF BLANK, FIND NEXT NON-BLANK
AND PUT IT IN W9 WITH H5--.
S/R--CREATE A CELL

IF LIST 1W34 IS EMPTY, H2 IS
PUT INTO W34 AND 9-520 BECOMES
ROUTINE J90.
OTHERWISE IT REMOVES THE FIRST
LIST CELL, LEAVES IT IN H0,
AND MAKES ITS LINK THE LINK OF
1W34. THE CELL IS CLEARED.

THE SYMBOL CREATED IS NEITHER
LOCAL NOR INTERNAL.

S/R--SCAN FOR) OR , OR = OR BLANK

SET 1W30 TO THE NEXT OCCURANCE
OF) OR , OR = OR BLANK.
NO INPUTS OR OUTPUTS.

S/R--SCAN FOR) OR , OR BLANK

SET 1W30 TO THE NEXT OCCURANCE
OF) OR , OR BLANK.
NO INPUTS OR OUTPUTS.

	709-501		LIPL9-500/510	5360
9-512	20W9	J3	LIPL9-500/510	5370
9-520	9-521	0	LIPL 9-520	5380
9-521	11W34		LIPL 9-520	5390
	J60		LIPL 9-520	5400
	709-522		LIPL 9-520	5410
	40H0		LIPL 9-520	5420
	J193		LIPL 9-520	5430
	11W34		LIPL 9-520	5440
	J197	J124	LIPL 9-520	5450
9-522	50H2		LIPL 9-520	5460
	20W34		LIPL 9-520	5470
	10J90		LIPL 9-520	5480
	109-520		LIPL 9-520	5490
	J121		LIPL 9-520	5500
	J8	J90	LIPL 9-520	5510
9-530	109-556		LIPL9-530/540	5520
	J124		LIPL9-530/540	5530
	J183		LIPL9-530/540	5540
	109-557		LIPL9-530/540	5550
	J124		LIPL9-530/540	5560
	10,		LIPL9-530/540	5570
	J185		LIPL9-530/540	5580
	109-558		LIPL9-530/540	5590
	J124		LIPL9-530/540	5600
	10)		LIPL9-530/540	5610
	J185		LIPL9-530/540	5620
	109-559		LIPL9-530/540	5630
	J124		LIPL9-530/540	5640
	10=		LIPL9-530/540	5650
	J185		LIPL9-530/540	5660
	J116		LIPL9-530/540	5670
	709-532		LIPL9-530/540	5680
	J116		LIPL9-530/540	5690
	709-531		LIPL9-530/540	5700
	109-559		LIPL9-530/540	5710
	109-557		LIPL9-530/540	5720
	J116		LIPL9-530/540	5730
	709-554	9-552	LIPL9-530/540	5740
9-531	109-559		LIPL9-530/540	5750
	109-556		LIPL9-530/540	5760
	J116		LIPL9-530/540	5770
	709-554	9-551	LIPL9-530/540	5780
9-532	J116		LIPL9-530/540	5790
	709-533		LIPL9-530/540	5800
	109-558		LIPL9-530/540	5810
	109-557		LIPL9-530/540	5820
	J116		LIPL9-530/540	5830
	709-553	9-552	LIPL9-530/540	5840
9-533	109-558		LIPL9-530/540	5850
	109-556		LIPL9-530/540	5860
	J116		LIPL9-530/540	5870
	709-553	9-551	LIPL9-530/540	5880
9-540	109-556		LIPL9-530/540	5890
	J124		LIPL9-530/540	5900
	J183		LIPL9-530/540	5910
	109-557		LIPL9-530/540	5920
	J124		LIPL9-530/540	5930
	10)		LIPL9-530/540	5940
	J185		LIPL9-530/540	5950

	109-558		LIPL9-530/540	5960
	J124		LIPL9-530/540	5970
	10,		LIPL9-530/540	5980
	J185		LIPL9-530/540	5990
	J116		LIPL9-530/540	6000
	709-541		LIPL9-530/540	6010
	109-558		LIPL9-530/540	6020
	J115		LIPL9-530/540	6030
	709-553	9-551	LIPL9-530/540	6040
9-541	109-557		LIPL9-530/540	6050
	J115		LIPL9-530/540	6060
	709-552	9-551	LIPL9-530/540	6070
9-551	109-556	9-555	LIPL9-530/540	6080
9-552	109-557	9-555	LIPL9-530/540	6090
9-553	109-558	9-555	LIPL9-530/540	6100
9-554	109-559	9-555	LIPL9-530/540	6110
9-555	20W30	0	LIPL9-530/540	6120
9-556+01		0	LIPL9-530/540	6130
9-557+01		0	LIPL9-530/540	6140
9-558+01		0	LIPL9-530/540	6150
9-559+01		0	LIPL9-530/540	6160
S/R--OUTPUT SYMBOL GIVEN LETTER	9-560	9-530	LIPL 9-560	6170
	109-901		LIPL 9-560	6180
	J161		LIPL 9-560	6190
	J186		LIPL 9-560	6200
	109-801		LIPL 9-560	6210
	J161		LIPL 9-560	6220
	709-566		LIPL 9-560	6230
	J134		LIPL 9-560	6240
	70	9-566	LIPL 9-560	6250
	11W30		LIPL 9-560	6260
	109-901		LIPL 9-560	6270
	J114		LIPL 9-560	6280
	70	9-566	LIPL 9-560	6290
	109-568		LIPL 9-560	6300
	J182		LIPL 9-560	6310
	509-401		LIPL 9-560	6320
	J60	9-561	LIPL 9-560	6330
	709-563		LIPL 9-560	6340
	12H0		LIPL 9-560	6350
	109-568		LIPL 9-560	6360
	J114		LIPL 9-560	6370
	70	9-562	LIPL 9-560	6380
	J60	9-561	LIPL 9-560	6390
9-562	J81	J3	LIPL 9-560	6400
9-563	509-400		LIPL 9-560	6410
9-564	J60		LIPL 9-560	6420
	709-565		LIPL 9-560	6430
	12H0		LIPL 9-560	6440
	109-568		LIPL 9-560	6450
	J114		LIPL 9-560	6460
	70	9-567	LIPL 9-560	6470
	J60	9-564	LIPL 9-560	6480
9-565	40H0		LIPL 9-560	6490
	109-568		LIPL 9-560	6500
	J120		LIPL 9-560	6510
	J136		LIPL 9-560	6520
	J65		LIPL 9-560	6530
	9-520		LIPL 9-560	6540

THIS ROUTINE ASSUMES THERE IS A LETTER AT 1W25 AND THAT THE SYMBOL BEGINNING THERE IS TERMINATED BY) OR , OR = OR BLANK.
THE SYMBOL IS OUTPUT IN (0).
IF THE SYMBOL IS A PSEUDO H5

IS SET -.
OTHERWISE SUBROUTINE 9-600, WHICH TAKES CARE OF ERASE AND COPY, IS FIRED AND H5 IS SET +.
NEUMONIC LIST 9-400 IS USED.
PSEUDO LIST 9-401 IS USED.
SUBROUTINES 9-530 AND 9-600 ARE USED. ALSO 9-520.

S/R--OUTPUT SYMBOL GIVEN 8 OR 9

IF (0) = J3 IT ASSUMES THAT
 THERE IS AN 8 AT 1w25.
 IF (0) = J4 IT ASSUMES A 9.
 IN EITHER CASE IT ASSUMES THE
 SYMBOL IS TERMINATED BY) OR ;
 CR = OR BLANK.
 THE SYMBOL IS OUTPUT IN (0).
 SUBROUTINE 9-600, WHICH TAKES
 CARE OF COPY AND ERASE, IS
 FIRED AND H5 IS SET +.
 LOCAL LIST 9-402 IS USED.
 INTERNAL LIST 9-403 IS USED.
 SUBROUTINES 9-520, 9-530, AND
 9-600 ARE USED.

	J124		LIPL 9-560	6550
	J138		LIPL 9-560	6560
	609-569		LIPL 9-560	6570
	J65		LIPL 9-560	6580
	119-569	9-600	LIPL 9-560	6590
9-566	J181	9-600	LIPL 9-560	6600
9-567	J81	9-600	LIPL 9-560	6610
9-568+21			LIPL 9-560	6620
9-569+	0	0	LIPL 9-560	6630
9-580	209-594		LIPL 9-580	6640
	109-901		LIPL 9-580	6650
	J161		LIPL 9-580	6660
	109-581		LIPL 9-580	6670
	J186		LIPL 9-580	6680
	J10		LIPL 9-580	6690
	709-584	J1	LIPL 9-580	6700
9-581+	9-582	0	LIPL 9-580	6710
9-582+	0		LIPL 9-580	6720
	+ -		LIPL 9-580	6730
	+ 9-583		LIPL 9-580	6740
	+ .		LIPL 9-580	6750
	+ 9-589		LIPL 9-580	6760
	+ /		LIPL 9-580	6770
	+ 9-591	0	LIPL 9-580	6780
9-583	109-901		LIPL 9-580	6790
	J161		LIPL 9-580	6800
9-584	9-530		LIPL 9-580	6810
	019-594		LIPL 9-580	6820
	709-585		LIPL 9-580	6830
	109-402	9-586	LIPL 9-580	6840
9-585	109-403		LIPL 9-580	6850
9-586	J181		LIPL 9-580	6860
	609-596		LIPL 9-580	6870
	J10		LIPL 9-580	6880
	70	9-600	LIPL 9-580	6890
	019-594		LIPL 9-580	6900
	709-587		LIPL 9-580	6910
	109-402		LIPL 9-580	6920
	9-520		LIPL 9-580	6930
	J124		LIPL 9-580	6940
	J136	9-588	LIPL 9-580	6950
9-587	109-403		LIPL 9-580	6960
	9-520		LIPL 9-580	6970
	J124		LIPL 9-580	6980
	J138		LIPL 9-580	6990
9-588	609-595		LIPL 9-580	7000
	119-596		LIPL 9-580	7010
	J11		LIPL 9-580	7020
	119-595	9-600	LIPL 9-580	7030
9-589	109-901		LIPL 9-580	7040
	J161		LIPL 9-580	7050
	9-530		LIPL 9-580	7060
	J181		LIPL 9-580	7070
	019-594		LIPL 9-580	7080
	709-600		LIPL 9-580	7090
	J136	9-600	LIPL 9-580	7100
9-591	109-901		LIPL 9-580	7110
	J161		LIPL 9-580	7120
	9-530		LIPL 9-580	7130
	109-901		LIPL 9-580	7140

	109-599		LIPL 9-580	7150
	109-598		LIPL 9-580	7160
	J128		LIPL 9-580	7170
	J182		LIPL 9-580	7180
	J128		LIPL 9-580	7190
	109-801		LIPL 9-580	7200
	J161		LIPL 9-580	7210
	J159	9-589	LIPL 9-580	7220
9-594+	0	0	LIPL 9-580	7230
9-595+	0	0	LIPL 9-580	7240
9-596+	0	0	LIPL 9-580	7250
9-598+01		0	LIPL 9-580	7260
9-599+31			LIPL 9-580	7270
S/P--ERASE AND COPY IF REQUIRED	9-600 019-404		LIPL 9-600	7280
	70	9-602	LIPL 9-600	7290
IF COPY FLAG IS ON STRUCTURE	019-405		LIPL 9-600	7300
(0) IS COPIED AND THE NAME OF	70J4		LIPL 9-600	7310
THE COPY IS LEFT AS OUTPUT (0).	10J3		LIPL 9-600	7320
THE COPY IS PUT ON THE PRINT	209-405		LIPL 9-600	7330
LIST.	019-411		LIPL 9-600	7340
IF ERASE FLAG IS ON THEN (0) IS	40H0		LIPL 9-600	7350
ERASED AS A STRUCTURE OR ROUTNE	709-601		LIPL 9-600	7360
DEPENDING ON THE DATA MODE FLAG	J120		LIPL 9-600	7370
AND INPUT (0) IS OUTPUT (0).	J72		LIPL 9-600	7380
	109-618		LIPL 9-600	7390
	J6	J121	LIPL 9-600	7400
CELL (0) IS NOT ERASED. IT IS	9-601 J201	J4	LIPL 9-600	7410
CLEARED.	9-602 J50		LIPL 9-600	7420
	119-407		LIPL 9-600	7430
	J61		LIPL 9-600	7440
	209-416		LIPL 9-600	7450
IF THE COPY AND ERASE FLAGS ARE	10J3		LIPL 9-600	7460
BOTH ON THEN THE COPY IS MADE	209-404		LIPL 9-600	7470
AND THE ORIGINAL IS THEN ERASED.	11W0		LIPL 9-600	7480
IF NEITHER FLAG IS ON THEN	9-606		LIPL 9-600	7490
INPUT (0) IS OUTPUT (0).	11W0		LIPL 9-600	7500
IN ANY CASE H5 IS SET +.	J132		LIPL 9-600	7510
THE COPY AND ERASE FLAGS ARE	709-603		LIPL 9-600	7520
TURNED OFF.	J136	9-604	LIPL 9-600	7530
	9-603 J138		LIPL 9-600	7540
	9-604 119-619		LIPL 9-600	7550
	J71		LIPL 9-600	7560
	10 0		LIPL 9-600	7570
	209-619		LIPL 9-600	7580
	019-405		LIPL 9-600	7590
	709-605		LIPL 9-600	7600
	10J3		LIPL 9-600	7610
	209-405		LIPL 9-600	7620
	11W0		LIPL 9-600	7630
	J120		LIPL 9-600	7640
	J72		LIPL 9-600	7650
	109-618		LIPL 9-600	7660
	11W0		LIPL 9-600	7670
	J121		LIPL 9-600	7680
	J8	J30	LIPL 9-600	7690
9-605	J30	J4	LIPL 9-600	7700
9-606	40H0		LIPL 9-600	7710
	109-619		LIPL 9-600	7720
	J6		LIPL 9-600	7730

	J10		LIPL 9-600	7740
	709-607		LIPL 9-600	7750
	J6	J8	LIPL 9-600	7760
9-607	J42		LIPL 9-600	7770
	20W0		LIPL 9-600	7780
	109-619		LIPL 9-600	7790
	9-520		LIPL 9-600	7800
	60W1		LIPL 9-600	7810
	60W2		LIPL 9-600	7820
	11W0		LIPL 9-600	7830
	J11		LIPL 9-600	7840
	11W0		LIPL 9-600	7850
	J131		LIPL 9-600	7860
	709-608		LIPL 9-600	7870
	119-407		LIPL 9-600	7880
	109-408		LIPL 9-600	7890
	J65		LIPL 9-600	7900
	119-407		LIPL 9-600	7910
	11W1		LIPL 9-600	7920
	J65		LIPL 9-600	7930
	119-407		LIPL 9-600	7940
	J61		LIPL 9-600	7950
	209-407		LIPL 9-600	7960
	11W0		LIPL 9-600	7970
	11W1		LIPL 9-600	7980
	J136		LIPL 9-600	7990
	J121	J32	LIPL 9-600	8000
9-608	119-407		LIPL 9-600	8010
	109-409		LIPL 9-600	8020
	J65		LIPL 9-600	8030
9-609	119-407		LIPL 9-600	8040
	40H0		LIPL 9-600	8050
	11W1		LIPL 9-600	8060
	J65		LIPL 9-600	8070
	J61		LIPL 9-600	8080
	209-407		LIPL 9-600	8090
	12W0		LIPL 9-600	8100
	40H0		LIPL 9-600	8110
	J132		LIPL 9-600	8120
	709-611		LIPL 9-600	8130
	9-606		LIPL 9-600	8140
9-611	21W1		LIPL 9-600	8150
	11W0		LIPL 9-600	8160
	J60		LIPL 9-600	8170
	20W0		LIPL 9-600	8180
	709-612		LIPL 9-600	8190
	9-520		LIPL 9-600	8200
	40H0		LIPL 9-600	8210
	11W1		LIPL 9-600	8220
	J197		LIPL 9-600	8230
	20W1	9-609	LIPL 9-600	8240
9-612	10 0		LIPL 9-600	8250
	11W1		LIPL 9-600	8260
	J197		LIPL 9-600	8270
	119-407		LIPL 9-600	8280
	40H0		LIPL 9-600	8290
	109-410		LIPL 9-600	8300
	J65		LIPL 9-600	8310
	J60		LIPL 9-600	8320
	209-407		LIPL 9-600	8330

S/R--SET OCTAL DATA

(0) BECOMES OCTAL DATA TERM AT
1W25 AND TERMINATED BY , OR)
OR BLANK. IT LEAVES (0).
IT IS PUT ON THE PRINT LIST.
IT ASSUMES 1W25 IS A /.

	11W2		LIPL 9-600	8340
	J136	J32	LIPL 9-600	8350
9-618+	0	0	LIPL 9-600	8360
9-619+	0	0	LIPL 9-600	8370
9-620	109-901		LIPL 9-620	8380
	J161		LIPL 9-620	8390
	109-621		LIPL 9-620	8400
	J6		LIPL 9-620	8410
	J121		LIPL 9-620	8420
	9-540		LIPL 9-620	8430
	J182		LIPL 9-620	8440
	119-407		LIPL 9-620	8450
	109-408		LIPL 9-620	8460
	J65		LIPL 9-620	8470
40HC			LIPL 9-620	8480
119-407			LIPL 9-620	8490
	J6		LIPL 9-620	8500
	J65		LIPL 9-620	8510
	119-407		LIPL 9-620	8520
	J61		LIPL 9-620	8530
	209-407	0	LIPL 9-620	8540
9-621+31			LIPL 9-620	8550
9-630	J124		LIPL 9-630	8560
	209-649		LIPL 9-630	8570
	119-407		LIPL 9-630	8580
	109-408		LIPL 9-630	8590
	J65		LIPL 9-630	8600
	119-407		LIPL 9-630	8610
	119-649		LIPL 9-630	8620
	J65		LIPL 9-630	8630
	119-407		LIPL 9-630	8640
	J61		LIPL 9-630	8650
	209-407		LIPL 9-630	8660
	109-645		LIPL 9-630	8670
	J124		LIPL 9-630	8680
	10.		LIPL 9-630	8690
	J185		LIPL 9-630	8700
	109-901		LIPL 9-630	8710
	J161		LIPL 9-630	8720
	9-540		LIPL 9-630	8730
	11W30		LIPL 9-630	8740
	J116		LIPL 9-630	8750
	709-631		LIPL 9-630	8760
	119-649	J182	LIPL 9-630	8770
9-631	109-645		LIPL 9-630	8780
	40W30		LIPL 9-630	8790
	20W30		LIPL 9-630	8800
	109-646		LIPL 9-630	8810
	J182		LIPL 9-630	8820
	509-801		LIPL 9-630	8830
	J161		LIPL 9-630	8840
	109-801		LIPL 9-630	8850
	11W30		LIPL 9-630	8860
	40HC		LIPL 9-630	8870
	J110		LIPL 9-630	8880
	30W30		LIPL 9-630	8890
	11W30		LIPL 9-630	8900
	40HC		LIPL 9-630	8910
	J111		LIPL 9-630	8920

S/R--SET NUMERIC DATA

(0) BECOMES THE INTEGER OR
FLOATING POINT DATA TERM AT
1W25 AND TERMINATED BY , OR)
OR BLANK. IT LEAVES (0).
IT IS PUT ON THE PRINT LIST.
IT ASSUMES 1W25 IS + OR -.
THE NUMBER OUTPUT IS ALWAYS
POSITIVE.

	509-645		LIPL 9-630	8930
	J182		LIPL 9-630	8940
	109-647		LIPL 9-630	8950
	109-648		LIPL 9-630	8960
	J110		LIPL 9-630	8970
9-632	51W30		LIPL 9-630	8980
	109-901		LIPL 9-630	8990
	J114		LIPL 9-630	9000
	70	9-633	LIPL 9-630	9010
	109-910		LIPL 9-630	9020
	109-648		LIPL 9-630	9030
	40H0		LIPL 9-630	9040
	J113		LIPL 9-630	9050
	509-901		LIPL 9-630	9060
	11W30		LIPL 9-630	9070
	40H0		LIPL 9-630	9080
	J111	9-632	LIPL 9-630	9090
9-633	109-648		LIPL 9-630	9100
	109-646		LIPL 9-630	9110
	119-649	J110	LIPL 9-630	9120
9-645+0i		0	LIPL 9-630	9130
9-646+0l		0	LIPL 9-630	9140
9-647+110		0	LIPL 9-630	9150
9-648+110		0	LIPL 9-630	9160
9-649+ 0		0	LIPL 9-630	9170
9-650	109-801		LIPL 9-650	9180
	109-677		LIPL 9-650	9190
	J124		LIPL 9-650	9200
	10\$		LIPL 9-650	9210
	J185		LIPL 9-650	9220
	40H0		LIPL 9-650	9230
	J110		LIPL 9-650	9240
	709-653		LIPL 9-650	9250
	109-905		LIPL 9-650	9260
	J116		LIPL 9-650	9270
	70	9-654	LIPL 9-650	9280
	109-678		LIPL 9-650	9290
	J6		LIPL 9-650	9300
	J121		LIPL 9-650	9310
	109-677		LIPL 9-650	9320
	J122		LIPL 9-650	9330
	109-900		LIPL 9-650	9340
	J114		LIPL 9-650	9350
	709-651		LIPL 9-650	9360
	109-902		LIPL 9-650	9370
	J161	9-652	LIPL 9-650	9380
9-651	109-677		LIPL 9-650	9390
	20W30		LIPL 9-650	9400
	109-901		LIPL 9-650	9410
	J161		LIPL 9-650	9420
	J182		LIPL 9-650	9430
	109-901		LIPL 9-650	9440
	J161		LIPL 9-650	9450
9-652	119-407		LIPL 9-650	9460
	109-408		LIPL 9-650	9470
	J65		LIPL 9-650	9480
	40H0		LIPL 9-650	9490
	119-407		LIPL 9-650	9500
	J6		LIPL 9-650	9510
	J65		LIPL 9-650	9520

S/R--SET ALPHANUMERIC DATA

ASSUMES THERE IS A \$ AT 1W25.
IF THE NEXT \$ OCCURES IN THE
NEXT FIVE SPACES IT MAKES (0)
A BCD DATA TERM, PUTS IT ON
THE PRINT LIST, SETS H5 +, AND
LEAVES (0).
OTHERWISE IT MAKES (0) THE HEAD
OF A LIST OF LOCALLY NAMED
BCD DATA TERMS, PUTS THE LIST

AND DATA TERMS ON THE PRINT
LIST, SETS H5 -, AND LEAVES (0)
AND IT READS AND PRINTS CARDS
IF REQUIRED.

	119-407		LIPL 9-650	9530
	J61		LIPL 9-650	9540
	209-407	0	LIPL 9-650	9550
9-653	J8		LIPL 9-650	9560
9-654	109-901		LIPL 9-650	9570
	J161		LIPL 9-650	9580
	109-676		LIPL 9-650	9590
	J6		LIPL 9-650	9600
	J121		LIPL 9-650	9610
	609-679		LIPL 9-650	9620
	119-407		LIPL 9-650	9630
	109-409		LIPL 9-650	9640
	J65		LIPL 9-650	9650
	119-407		LIPL 9-650	9660
	119-679		LIPL 9-650	9670
	J65		LIPL 9-650	9680
	119-407		LIPL 9-650	9690
	J61		LIPL 9-650	9700
	209-407		LIPL 9-650	9710
9-655	9-675		LIPL 9-650	9720
	109-900		LIPL 9-650	9730
	J186		LIPL 9-650	9740
	709-656		LIPL 9-650	9750
	10\$		LIPL 9-650	9760
	J2		LIPL 9-650	9770
	70	9-669	LIPL 9-650	9780
	509-804		LIPL 9-650	9790
9-656	109-901		LIPL 9-650	9800
	J161		LIPL 9-650	9810
	J186		LIPL 9-650	9820
	709-657		LIPL 9-650	9830
	10\$		LIPL 9-650	9840
	J2		LIPL 9-650	9850
	70	9-663	LIPL 9-650	9860
	509-803		LIPL 9-650	9870
9-657	109-901		LIPL 9-650	9880
	J161		LIPL 9-650	9890
	J186		LIPL 9-650	9900
	709-658		LIPL 9-650	9910
	10\$		LIPL 9-650	9920
	J2		LIPL 9-650	9930
	70	9-664	LIPL 9-650	9940
	509-802		LIPL 9-650	9950
9-658	109-901		LIPL 9-650	9960
	J161		LIPL 9-650	9970
	J186		LIPL 9-650	9980
	709-659		LIPL 9-650	9990
	10\$		LIPL 9-650	0000
	J2		LIPL 9-650	0010
	70	9-665	LIPL 9-650	0020
	509-801		LIPL 9-650	0030
9-659	109-901		LIPL 9-650	0040
	J161		LIPL 9-650	0050
	J186		LIPL 9-650	0060
	709-661		LIPL 9-650	0070
	10\$		LIPL 9-650	0080
	J2		LIPL 9-650	0090
	70	9-667	LIPL 9-650	0100
	509-900		LIPL 9-650	0110

9-661	109-804		LIPL	9-650	0120
	J161		LIPL	9-650	0130
	109-905		LIPL	9-650	0140
	20W30		LIPL	9-650	0150
	9-520		LIPL	9-650	0160
	40H0		LIPL	9-650	0170
	119-679		LIPL	9-650	0180
	J197		LIPL	9-650	0190
	209-679		LIPL	9-650	0200
	109-678		LIPL	9-650	0210
	9-520		LIPL	9-650	0220
	J136		LIPL	9-650	0230
	J121		LIPL	9-650	0240
	J182		LIPL	9-650	0250
	219-679		LIPL	9-650	0260
	119-407		LIPL	9-650	0270
	119-679		LIPL	9-650	0280
	J65		LIPL	9-650	0290
	119-407		LIPL	9-650	0300
	109-408		LIPL	9-650	0310
	J65		LIPL	9-650	0320
	119-407		LIPL	9-650	0330
	129-679		LIPL	9-650	0340
	J65		LIPL	9-650	0350
	119-407		LIPL	9-650	0360
	J61		LIPL	9-650	0370
	209-407		LIPL	9-650	0380
	J161	9-655	LIPL	9-650	0390
9-663	509-901	9-668	LIPL	9-650	0400
9-664	509-902	9-668	LIPL	9-650	0410
9-665	509-903	9-668	LIPL	9-650	0420
9-667	509-904	9-668	LIPL	9-650	0430
9-668	60W30		LIPL	9-650	0440
	11W25		LIPL	9-650	0450
	40H0		LIPL	9-650	0460
	J111		LIPL	9-650	0470
	J8		LIPL	9-650	0480
	9-520		LIPL	9-650	0490
	40H0		LIPL	9-650	0500
	119-679		LIPL	9-650	0510
	J197		LIPL	9-650	0520
	209-679		LIPL	9-650	0530
	109-678		LIPL	9-650	0540
	9-520		LIPL	9-650	0550
	J136		LIPL	9-650	0560
	J121		LIPL	9-650	0570
	J182		LIPL	9-650	0580
	219-679		LIPL	9-650	0590
	119-407		LIPL	9-650	0600
	119-679		LIPL	9-650	0610
	J65		LIPL	9-650	0620
	119-407		LIPL	9-650	0630
	109-408		LIPL	9-650	0640
	J65		LIPL	9-650	0650
	119-407		LIPL	9-650	0660
	129-679		LIPL	9-650	0670
	J65		LIPL	9-650	0680
9-669	109-901		LIPL	9-650	0690
	J161		LIPL	9-650	0700
	119-407		LIPL	9-650	0710

109-410		LIPL 9-650	0720
J65		LIPL 9-650	0730
119-407		LIPL 9-650	0740
J61		LIPL 9-650	0750
209-407		LIPL 9-650	0760
10 C		LIPL 9-650	0770
119-679		LIPL 9-650	0780
J197	J3	LIPL 9-650	0790
9-675 11W25		LIPL 9-650	0800
109-981		LIPL 9-650	0810
J115		LIPL 9-650	0820
709-680	0	LIPL 9-650	0830
9-676+ C	0	LIPL 9-650	0840
9-677+01	0	LIPL 9-650	0850
9-678+21		LIPL 9-650	0860
9-679+ 0	0	LIPL 9-650	0870
9-680 J154		LIPL 9-680	0880
J180		LIPL 9-680	0890
709-681		LIPL 9-680	0900
109-688		LIPL 9-680	0910
J160		LIPL 9-680	0920
109-689		LIPL 9-680	0930
J157		LIPL 9-680	0940
109-687		LIPL 9-680	0950
J160		LIPL 9-680	0960
109-413		LIPL 9-680	0970
J125		LIPL 9-680	0980
J157		LIPL 9-680	0990
J155		LIPL 9-680	1000
119-407		LIPL 9-680	1010
109-412		LIPL 9-680	1020
J65		LIPL 9-680	1030
119-407		LIPL 9-680	1040
109-413		LIPL 9-680	1050
J120		LIPL 9-680	1060
J65		LIPL 9-680	1070
119-407		LIPL 9-680	1080
J61		LIPL 9-680	1090
209-407		LIPL 9-680	1100
109-688		LIPL 9-680	1110
11W25		LIPL 9-680	1120
J121		LIPL 9-680	1130
509-690		LIPL 9-680	1140
J157		LIPL 9-680	1150
109-690		LIPL 9-680	1160
J157		LIPL 9-680	1170
11W21		LIPL 9-680	1180
11W25		LIPL 9-680	1190
J121	J8	LIPL 9-680	1200
9-681 J154		LIPL 9-680	1210
J155		LIPL 9-680	1220
109-220		LIPL 9-680	1230
10J157		LIPL 9-680	1240
J100		LIPL 9-680	1250
J155	J7	LIPL 9-680	1260
9-687+01	115	LIPL 9-680	1270
9-688+01	109	LIPL 9-680	1280
9-689+21CARD		LIPL 9-680	1290
9-690+21		LIPL 9-680	1300

S/R--READ AND PRINT CARDS

CLEARs PRINT LINE AND READs A CARD. IF THERE IS NO CARD PRESENT IT PRINTs 'ERROR--NO CARD' AND IT THEN DOES A J7. IF THERE IS A CARD IT PUTs INTO THE PRINT LINE AT COLUMN 110 THE WORD 'CARD' FOLLOWED BY AN INTEGER CARD COUNT. IT THEN PRINTs THE PRINT LINE. IT ADDs THE SYMBOL 'NEW CARD' TO THE PRINT LIST FOLLOWED BY THE CARD NUMBER WHERE THE CARD NUMBER IS A LOCAL DATA TERM. 1W25 IS SET TO ONE.

S/R--PRINT AND ERASE PRINT LIST

THE PAGE IS DIVIDED INTO FOUR VERTICAL STRIPS, EACH 28 COLUMNS WIDE. A LIST IS PRINTED DOWN A STRIP. THE HIGHEST LEVEL LISTS ARE PRINTED DOWN THE LEFT STRIP. THERE SUBLISTS ARE INTERPOLATED AND PRINTED IN THE STRIP TO THE RIGHT OF THE SUPER-LIST. ALL LISTS OF DEPTH THREE OR GREATER ARE PRINTED IN THE THIRD STRIP FROM THE LEFT. LISTS AT THE HIGHEST LEVEL AND LISTS OF DEPTH THREE OR GREATER ARE SEPERATED BY PRINTING ONE BLANK LINE BEFORE AND AFTER. DATA TERMS AT THE HIGHEST LEVEL ARE PRINTED IN THE LEFT STRIP. IF A DATA TERM IS NAMED IN A SUBLIST IT IS PRINTED ON THE SAME LINE AS THE CELL THAT NAMES IT AND IN THE NEXT STRIP TO THE LEFT OF THE CELL THAT NAMES IT. THE NAME GOES IN COLUMN 1, P IN COLUMN 8, Q IN 10, SYMB IN 12, AND LINK IN 18-22, MOD 28. CARD NUMBERS ARE PRINTED AS 'CARD N' BEGINNING AT COLUMN 111. THEY ARE PRINTED ON THE SAME LINE AS THE FIRST THING ASSEMBLED BY THAT CARD. IF A CARD CAUSES NOTHING TO BE ASSEMBLED (AS FOR EXAMPLE A CARD WITH NOTHING BUT COMMENTS) THAT CARD NUMBER IS NOT PRINTED AT ALL. THE HIGHEST LEVEL CELLS ON THE PRINT LIST THAT ARE NOT DATA TERMS ARE NOT PART OF ANY LIST AND HENCE ARE ERASED. THE CARD NUMBERS IN THE PRINT LIST ARE ALSO ERASED. WHEN DONE, THE PRINT LIST IS ERASED AND THE NAME OF THE PRINT LIST IS PUT IN THE 'LAST CELL OF PRINT LIST' WORKING CELL. NO EXTERNAL SUBROUTINES ARE USED. , EXCEPT 9-780 IF NO LISTING IS REQUIRED.

9-700	J154		LIPL	9-700	1310
	019-417		LIPL	9-700	1320
	709-780		LIPL	9-700	1330
	109-406		LIPL	9-700	1340
9-701	J60		LIPL	9-700	1350
	70	9-702	LIPL	9-700	1360
	509-406		LIPL	9-700	1370
	609-407		LIPL	9-700	1380
	J75	J71	LIPL	9-700	1390
9-702	12HC		LIPL	9-700	1400
	109-705		LIPL	9-700	1410
	J6		LIPL	9-700	1420
	J10		LIPL	9-700	1430
	709-703		LIPL	9-700	1440
	J1	9-701	LIPL	9-700	1450
9-703	12HC		LIPL	9-700	1460
	J9	9-701	LIPL	9-700	1470
9-705+	9-706	0	LIPL	9-700	1480
9-706+	0		LIPL	9-700	1490
	+ 9-408		LIPL	9-700	1500
	+ 9-711		LIPL	9-700	1510
	+ 9-409		LIPL	9-700	1520
	+ 9-729		LIPL	9-700	1530
	+ 9-412		LIPL	9-700	1540
	+ 9-707	0	LIPL	9-700	1550
9-707	109-746		LIPL	9-700	1560
	J160		LIPL	9-700	1570
	109-747		LIPL	9-700	1580
	J157		LIPL	9-700	1590
	109-901		LIPL	9-700	1600
	J161		LIPL	9-700	1610
	J60		LIPL	9-700	1620
	12HC		LIPL	9-700	1630
	J157		LIPL	9-700	1640
	12HC	J9	LIPL	9-700	1650
9-711	J60		LIPL	9-700	1660
	109-901		LIPL	9-700	1670
	J160		LIPL	9-700	1680
	12HC		LIPL	9-700	1690
	J156		LIPL	9-700	1700
	109-908		LIPL	9-700	1710
	J160		LIPL	9-700	1720
	12HC		LIPL	9-700	1730
	109-901		LIPL	9-700	1740
	J127		LIPL	9-700	1750
	70	9-712	LIPL	9-700	1760
	12HU		LIPL	9-700	1770
	109-741		LIPL	9-700	1780
	J127		LIPL	9-700	1790
	70	9-713	LIPL	9-700	1800
	12HU		LIPL	9-700	1810
	109-742		LIPL	9-700	1820
	J127		LIPL	9-700	1830
	70	9-714	LIPL	9-700	1840
	109-745	9-715	LIPL	9-700	1850
9-712	109-742	9-715	LIPL	9-700	1860
9-713	109-743	9-715	LIPL	9-700	1870
9-714	109-744	9-715	LIPL	9-700	1880
9-715	J157		LIPL	9-700	1890
	109-922		LIPL	9-700	1900

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*****
*          PRINT LIST FORMAT          *
*-----*
*   AS EACH CELL IS ASSEMBLED       *
*   ITS NAME IS PUT ON THE PRINT     *
*   LIST 9-406.                      *
*   WHEN A DATA TERM IS ASSEM-     *
*   BLED, THE SYMBOL 9-408 IS PUT    *
*   ON THE PRINT LIST JUST BEFORE    *
*   THE NAME OF THE DATA TERM.      *
*   THIS IS NECESSARY SINCE THE     *
*   LISTING ROUTINE 9-700 MUST      *
*   INTERPRETE A DATA TERM IN A    *
*   DIFFERENT MANNER THAN A LIST    *
*   CELL.                            *
*   WHEN A NEW LIST IS BEGUN,       *
*   THE EXECUTIVE ROUTINE PUTS      *
*   THE SYMBOL 9-409 ON THE PRINT    *
*   LIST JUST BEFORE THE FIRST      *
*   CELL OF THE LIST. WHEN A LIST   *
*   IS TERMINATED, THE EXECUTIVE    *
*   ROUTINE PUTS THE SYMBOL 9-410   *
*   JUST AFTER THE LAST CELL OF     *
*   THE LIST.                        *
*   WHEN A CARD IS READ BY         *
*   ROUTINE 9-680 (READ AND PRINT   *
*   A CARD), THIS ROUTINE PUTS THE  *
*   SYMBOL 9-412 ON THE END OF THE  *
*   PRINT LIST FOLLOWED BY A        *
*   LOCALLY NAMED COPY OF THE      *
*   INTEGER DATA TERM CARD COUNT,  *
*   9-413. THE LISTING ROUTINE     *
*   9-700 MUST OF COURSE ERASE     *
*   THIS DATA TERM.               *
*   THE EXECUTIVE ROUTINE           *
*   OPERATES AS IF THE ENTIRE READ  *
*   GROUP WAS A LIST TERMINATED BY  *
*   A 'ND' OR 'GT' INSTEAD OF A    *
*   ')'. AS A RESULT UNPARENTH-    *
*   IZED SYMBOLS (FOR EXAMPLE UN-  *
*   PARENTHIZED LIST NAMES, DATA  *
*   TERM NAMES, AND NEUMONIC ASSI- *
*   GNMENTS) ARE ASSEMBLED INTO     *
*   A LIST. THEREFORE THE LISTING   *
*   PROGRAM 9-700 (AND THE NO-LIST  *
*   SUBROUTINE 9-780) HAS THE       *
*   RESPONSIBILITY OF RETURNING     *
*   THE CELLS OF THIS LIST TO      *
*   AVAILBLE SPACE. THESE CELLS     *
*   ARE IDENTIFIED BY THE FACT      *
*   THAT THEY OCCURE ON THE PRINT   *
*   LIST WHERE THE LEVEL COUNT IS   *
*   ZERO. THE LEVEL COUNT IS       *
*   INIATIALY ZERO, THE SYMBOL      *
*   9-409 (BEGINNING OF SUBLIST)   *
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	J160		LIPL 9-700	1910
	12HC		LIPL 9-700	1920
	J159		LIPL 9-700	1930
	J155	J154	LIPL 9-700	1940
9-716	J6C		LIPL 9-700	1950
	12HC		LIPL 9-700	1960
	109-717		LIPL 9-700	1970
	J6		LIPL 9-700	1980
	J10		LIPL 9-700	1990
	70	J1	LIPL 9-700	2000
	109-901		LIPL 9-700	2010
	J160		LIPL 9-700	2020
	12HC		LIPL 9-700	2030
	J156		LIPL 9-700	2040
	109-908		LIPL 9-700	2050
	J160		LIPL 9-700	2060
	12HC		LIPL 9-700	2070
	J190		LIPL 9-700	2080
	J156		LIPL 9-700	2090
	109-910		LIPL 9-700	2100
	J160		LIPL 9-700	2110
	12HC		LIPL 9-700	2120
	J191		LIPL 9-700	2130
	J156		LIPL 9-700	2140
	109-912		LIPL 9-700	2150
	J160		LIPL 9-700	2160
	12HC		LIPL 9-700	2170
	J192		LIPL 9-700	2180
	J156		LIPL 9-700	2190
	109-918		LIPL 9-700	2200
	J160		LIPL 9-700	2210
	12HC		LIPL 9-700	2220
	J193		LIPL 9-700	2230
	J156		LIPL 9-700	2240
	40HC		LIPL 9-700	2250
	J81		LIPL 9-700	2260
	109-408		LIPL 9-700	2270
	J2		LIPL 9-700	2280
	70	9-720	LIPL 9-700	2290
	J155		LIPL 9-700	2300
	J154	9-716	LIPL 9-700	2310
9-717+	9-718	0	LIPL 9-700	2320
9-718+	0		LIPL 9-700	2330
	+ 9-408		LIPL 9-700	2340
	+ 9-721		LIPL 9-700	2350
	+ 9-409		LIPL 9-700	2360
9-719+	9-727		LIPL 9-700	2370
	+ 9-410		LIPL 9-700	2380
	+ JC		LIPL 9-700	2390
	+ 9-412		LIPL 9-700	2400
	+ 9-726	0	LIPL 9-700	2410
9-720	J60		LIPL 9-700	2420
9-721	J60		LIPL 9-700	2430
	109-929		LIPL 9-700	2440
	J160		LIPL 9-700	2450
	12HC		LIPL 9-700	2460
	J156		LIPL 9-700	2470
	109-936		LIPL 9-700	2480
	J160		LIPL 9-700	2490

* ADDS ONE TO THE LEVEL COUNT *
* AND THE SYMBOL 9-410 (END OF *
* SUBLIST) SUBTRACTS ONE FROM *
* THE LEVEL COUNT. *

	12H0		LIPL 9-700	2500
	109-901		LIPL 9-700	2510
	J127		LIPL 9-700	2520
	70	9-722	LIPL 9-700	2530
	12H0		LIPL 9-700	2540
	109-741		LIPL 9-700	2550
	J127		LIPL 9-700	2560
	70	9-723	LIPL 9-700	2570
	12H0		LIPL 9-700	2580
	109-742		LIPL 9-700	2590
	J127		LIPL 9-700	2600
	70	9-724	LIPL 9-700	2610
	109-745	9-725	LIPL 9-700	2620
9-722	109-742	9-725	LIPL 9-700	2630
9-723	109-743	9-725	LIPL 9-700	2640
9-724	109-744	9-725	LIPL 9-700	2650
9-725	J157		LIPL 9-700	2660
	109-950		LIPL 9-700	2670
	J160		LIPL 9-700	2680
	12H0		LIPL 9-700	2690
	J159		LIPL 9-700	2700
	J155		LIPL 9-700	2710
	J154	9-716	LIPL 9-700	2720
9-726	109-748		LIPL 9-700	2730
	11W25		LIPL 9-700	2740
	J121		LIPL 9-700	2750
	509-747		LIPL 9-700	2760
	J157		LIPL 9-700	2770
	109-901		LIPL 9-700	2780
	J161		LIPL 9-700	2790
	J60		LIPL 9-700	2800
	12H0		LIPL 9-700	2810
	J157		LIPL 9-700	2820
	12H0		LIPL 9-700	2830
	J9	9-716	LIPL 9-700	2840
9-727	40W21		LIPL 9-700	2850
	109-929		LIPL 9-700	2860
	20W21		LIPL 9-700	2870
	109-728		LIPL 9-700	2880
	209-719		LIPL 9-700	2890
	9-716		LIPL 9-700	2900
	30W21		LIPL 9-700	2910
	109-727		LIPL 9-700	2920
	209-719	9-716	LIPL 9-700	2930
9-728	40W21		LIPL 9-700	2940
	109-957		LIPL 9-700	2950
	20W21		LIPL 9-700	2960
	109-731		LIPL 9-700	2970
	209-719		LIPL 9-700	2980
	9-716		LIPL 9-700	2990
	30W21		LIPL 9-700	3000
	109-728		LIPL 9-700	3010
	209-719	9-716	LIPL 9-700	3020
9-729	J155		LIPL 9-700	3030
	J154		LIPL 9-700	3040
	9-716		LIPL 9-700	3050
	J155	J154	LIPL 9-700	3060
9-731	J155		LIPL 9-700	3070
	J154		LIPL 9-700	3080
	9-716		LIPL 9-700	3090

	J155		LIPL	9-700	3100
	J154	9-716	LIPL	9-700	3110
	9-741+11		LIPL	9-700	3120
	9-742+210	1	LIPL	9-700	3130
	9-743+211	1	LIPL	9-700	3140
	9-744+212	1	LIPL	9-700	3150
	9-745+213	1	LIPL	9-700	3160
	9-746+01	110	LIPL	9-700	3170
	9-747+21CARD		LIPL	9-700	3180
	9-748+01	111	LIPL	9-700	3190
S/R--SKIP COMS OR SET COPY	9-750	9-510	LIPL	9-750	3200
	709-751		LIPL	9-750	3210
IF 1W25 + 1 IS A ' SET COPY	11W9		LIPL	9-750	3220
FLAG AND FIND THE NEXT CHARACT	10'		LIPL	9-750	3230
ER AFTER 1W25 + 1.	J2		LIPL	9-750	3240
OTHERWISE SKIP OVER THE	709-752		LIPL	9-750	3250
COMMENTS, READING CARDS IF	10J4		LIPL	9-750	3260
NECESSARY, AND STOP AT THE	209-404	9-510	LIPL	9-750	3270
FIRST NON-BLANK CHARACTER AFTER	9-751 11W9		LIPL	9-750	3280
THE NEXT .	10'		LIPL	9-750	3290
	J2		LIPL	9-750	3300
	70	9-510	LIPL	9-750	3310
9-752	11W25		LIPL	9-750	3320
	10'		LIPL	9-750	3330
	J185		LIPL	9-750	3340
	J8		LIPL	9-750	3350
	70	9-510	LIPL	9-750	3360
	9-680		LIPL	9-750	3370
	J186		LIPL	9-750	3380
	709-752		LIPL	9-750	3390
	10'		LIPL	9-750	3400
	J2		LIPL	9-750	3410
	709-752	9-510	LIPL	9-750	3420
S/R--ADD (0) TO LIST	9-760 01W1		LIPL	9-760	3430
	70	9-761	LIPL	9-760	3440
	9-520		LIPL	9-760	3450
IF THE CURRENT CELL IS NON-	40HC		LIPL	9-760	3460
EMPTY A NEW CURRENT CELL IS	11WC		LIPL	9-760	3470
CREATED AND THE NAME OF THIS	J197		LIPL	9-760	3480
NEW CELL IS MADE THE LINK OF	20WC	9-762	LIPL	9-760	3490
THE OLD CELL.	9-761 10J3		LIPL	9-760	3500
IF THE CURRENT CELL IS EMPTY	20W1		LIPL	9-760	3510
THE EMPTY FLAG IS REVERSED.	9-762 119-407		LIPL	9-760	3520
IN ANY CASE THE CURRENT CELL IS	11WC		LIPL	9-760	3530
PUT ON THE PRINT LIST AND IF P	J65		LIPL	9-760	3540
AND/OR Q IS NOT NINE THEY ARE	119-407		LIPL	9-760	3550
RESET TO NINE AFTER THE CURRENT	J60		LIPL	9-760	3560
CELL'S P AND Q ARE SET. IF P	209-407		LIPL	9-760	3570
AND Q WERE NINE TO BEGIN WITH	21WC		LIPL	9-760	3580
	11W3		LIPL	9-760	3590
THEN (0) IS STORED WITH ITS	10 9		LIPL	9-760	3600
ORIGINAL SYMBOL TYPE, UNLESS	J2		LIPL	9-760	3610
DATA MODE FLAG IS -, IN	70	9-763	LIPL	9-760	3620
WHICH CASE Q IS SET ZERO.	11W3		LIPL	9-760	3630
	11WC		LIPL	9-760	3640
	J195		LIPL	9-760	3650
	10 9		LIPL	9-760	3660
	20W3		LIPL	9-760	3670
	11W2		LIPL	9-760	3680

	10 9		LIPL 9-760	3690
	J2		LIPL 9-760	3700
	70	0	LIPL 9-760	3710
	11W2		LIPL 9-760	3720
	11WC		LIPL 9-760	3730
	J194		LIPL 9-760	3740
	10 9		LIPL 9-760	3750
	20W2	0	LIPL 9-760	3760
9-763	019-411		LIPL 9-760	3770
	70	0	LIPL 9-760	3780
	10 0		LIPL 9-760	3790
	11WC	J195	LIPL 9-760	3800
S/R--ADD AN EMPTY CELL TO LIST IF CURRENT CELL IS EMPTY DO NOTHING. OTHERWISE A NEW CELL IS CREATED AND THE NAME OF THIS CELL IS MADE THE LINK OF THE OLD CELL	9-770 01W1		LIPL 9-770	3810
	70	0	LIPL 9-770	3820
	9-520		LIPL 9-770	3830
	40H0		LIPL 9-770	3840
	11WC		LIPL 9-770	3850
	J197		LIPL 9-770	3860
	10J4		LIPL 9-770	3870
	20W1		LIPL 9-770	3880
	20WC	0	LIPL 9-770	3890
AND THE EMPTY FLAG IS REVERSED. S/R--ERASE PRINT LIST	9-780 109-406		LIPL 9-780	3900
	10J9		LIPL 9-780	3910
	J50		LIPL 9-780	3920
	10J4		LIPL 9-780	3930
	209-417		LIPL 9-780	3940
9-781	J60		LIPL 9-780	3950
	70	9-782	LIPL 9-780	3960
	509-406		LIPL 9-780	3970
	609-407		LIPL 9-780	3980
	J75		LIPL 9-780	3990
	J71	J30	LIPL 9-780	4000
9-782	12H0		LIPL 9-780	4010
	109-785		LIPL 9-780	4020
	J6		LIPL 9-780	4030
	J10		LIPL 9-780	4040
	709-783		LIPL 9-780	4050
	J1	9-781	LIPL 9-780	4060
9-783	12H0		LIPL 9-780	4070
	01W0	9-781	LIPL 9-780	4080
9-785+	9-786	C	LIPL 9-780	4090
9-786+	C		LIPL 9-780	4100
	+ 9-408		LIPL 9-780	4110
	+ J60		LIPL 9-780	4120
	+ 9-409		LIPL 9-780	4130
	+ 9-788		LIPL 9-780	4140
	+ 9-410		LIPL 9-780	4150
	+ J30		LIPL 9-780	4160
	+ 9-412		LIPL 9-780	4170
	+ 9-787	0	LIPL 9-780	4180
9-787	J60		LIPL 9-780	4190
	12H0	J9	LIPL 9-780	4200
9-788	10J8	J50	LIPL 9-780	4210
S/R--PRINT NEUMONIC,INTERNAL TABLE	9-790 J154		LIPL 9-790	4220
	019-418		LIPL 9-790	4230
	709-791		LIPL 9-790	4240
	109-795		LIPL 9-790	4250
	209-418		LIPL 9-790	4260
	109-200		LIPL 9-790	4270
	10J157		LIPL 9-790	4280

	J100		LIPL 9-790	4290
9-791	019-419		LIPL 9-790	4300
	709-792		LIPL 9-790	4310
	109-797		LIPL 9-790	4320
	209-419		LIPL 9-790	4330
	109-960		LIPL 9-790	4340
	J160		LIPL 9-790	4350
	109-210		LIPL 9-790	4360
	10J157		LIPL 9-790	4370
	J100	9-793	LIPL 9-790	4380
9-792	10J0		LIPL 9-790	4390
	209-419		LIPL 9-790	4400
9-793	119-403		LIPL 9-790	4410
	109-400		LIPL 9-790	4420
	J51		LIPL 9-790	4430
	J155		LIPL 9-790	4440
	J154		LIPL 9-790	4450
9-794	019-418		LIPL 9-790	4460
	019-419		LIPL 9-790	4470
	70J31		LIPL 9-790	4480
	J155		LIPL 9-790	4490
	J154	9-794	LIPL 9-790	4500
9-795	11W0		LIPL 9-790	4510
	J81		LIPL 9-790	4520
	709-796		LIPL 9-790	4530
	J157		LIPL 9-790	4540
	109-908		LIPL 9-790	4550
	J160		LIPL 9-790	4560
	11W0		LIPL 9-790	4570
	J82		LIPL 9-790	4580
	J156		LIPL 9-790	4590
	11W0		LIPL 9-790	4600
	J60		LIPL 9-790	4610
	J60		LIPL 9-790	4620
	20W0	0	LIPL 9-790	4630
9-796	10J3		LIPL 9-790	4640
	209-418	0	LIPL 9-790	4650
9-797	109-960		LIPL 9-790	4660
	J160		LIPL 9-790	4670
	11W1		LIPL 9-790	4680
	J81		LIPL 9-790	4690
	709-798		LIPL 9-790	4700
	109-799		LIPL 9-790	4710
	J157		LIPL 9-790	4720
	J156		LIPL 9-790	4730
	109-968		LIPL 9-790	4740
	J160		LIPL 9-790	4750
	11W1		LIPL 9-790	4760
	J82		LIPL 9-790	4770
	J156		LIPL 9-790	4780
	11W1		LIPL 9-790	4790
	J60		LIPL 9-790	4800
	J60		LIPL 9-790	4810
	20W1	0	LIPL 9-790	4820
9-798	10J0		LIPL 9-790	4830
	209-419	J4	LIPL 9-790	4840
9-799+218-			LIPL 9-790	4850
9801	-01	01	LIPL CONSTANTS	4860
9802	-01	02	LIPL CONSTANTS	4870

9803	-01	03	LIPL	CONSTANTS4880
9804	-01	04	LIPL	CONSTANTS4890
9900	+01	00	LIPL	CONSTANTS4900
9901	+01	01	LIPL	CONSTANTS4910
9902	+01	02	LIPL	CONSTANTS4920
9903	+01	03	LIPL	CONSTANTS4930
9904	+01	04	LIPL	CONSTANTS4940
9905	+01	05	LIPL	CONSTANTS4950
9908	+01	08	LIPL	CONSTANTS4960
9910	+01	10	LIPL	CONSTANTS4970
9912	+01	12	LIPL	CONSTANTS4980
9918	+01	18	LIPL	CONSTANTS4990
9922	+01	22	LIPL	CONSTANTS5000
9929	+01	29	LIPL	CONSTANTS5010
9936	+01	36	LIPL	CONSTANTS5020
9950	+01	50	LIPL	CONSTANTS5030
9957	+01	57	LIPL	CONSTANTS5040
9960	+01	60	LIPL	CONSTANTS5050
9968	+01	68	LIPL	CONSTANTS5060
9981	+01	81	LIPL	CONSTANTS5070