1966 ok

OPL MANUSCRIPT

```
1.      A = 5
2       LET (F(X) = X + A
```

The intent of the first statement is to associate the value 5 with the identifier A in some symbol table, say S_o. We will soon see that it is important to give specific names to symbol tables because, as it will turn out, a number of symbol tables will be created and destroyed in the process of executing the example program.

A symbol table is necessarily an environment for pairs of objects, in our case, identifiers and their values. We may think of an identifier as an attribute and its value as the value of that attribute. This view suggests that a mechanization for a symbol table might well be the description list. The reader may be reminded that (in SLIP) a description list is an ordinary list that is attached to its host list, i.e., the list of which it is a description list, in a way such that the description list is not considered part of the structure of the host list. It consists generally of so-called attribute-value pairs. There are a number of operations (in SLIP) that facilitate the placement of such attribute-value pairs on the description lists of lists and that make the retrieval of the value of a specific attribute easy. We, therefore, choose to mechanize symbol tables as lists with associated description lists. Our representation of a host list with its associated description lists will be as shown in Figure 1.

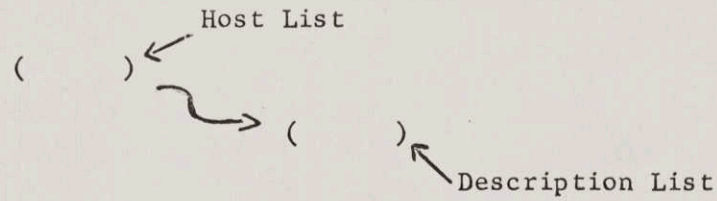
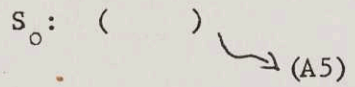


FIGURE 1.

We may now display the result of having executed the first statement by showing the state of symbol table S_o as below:



The intent of the next statement of the example program is to bring a function into existence. In this instance we are trying to associate the identifier F with the function seen in statement 2. Clearly what must happen is that the identifier F must be stored as an attribute in some symbol table together with its value. The question now arises as to what that value should be. Another way to put this question is to ask "What must one remember about some function, say F, in order to be able to execute it when the time comes?" It is clear that the body of the function, i.e., in this case, the expression "X+A" and, of course, the list of bound variables (or formal parameters) of the function must be remembered. But that is not sufficient in the most general case for the body of the function

in question may also reference variables (identifiers) that do not appear in its bound variables list. Such variables are called free variables. In the above example A is a free variable.

OPL

```
T0109        2531          D1          MAD FOR  T0109        2531        06/30
                N'S INTEGER                                                  C001
                I'E OPLCOM                                                   C002
                BOOLEAN LEMPTY. , CLOCK, STORE,FAST                          C003
                D'N S(2)                                                     C004
                FAST=0B                                                      C005
                INITAS.(0)                                                   C006
                BRKEY.(BREAK)                                                C007
                BREAK=0B                                                     C008
                FLOATING POINT FCOUNT,FREAR,FFRONT                           C009
                EQUIVALENCE (REAR,FREAR) , (FRONT,FFRONT)                    C010
                STORE=0B                                                     C011
                PRMESS.($OPL AT YOUR SERVICE$)                               C012
                TODAY.(LIST.(S(0)))                                          C013
                PRMESS.($DATE  $,TOP.(S(0)),$ TIME $,BOT.(S(0)))             C014
                MTLIST.(S(0))                                                C015
                F=0                                                          C016
                NEWTOP.($ARRAY$,S(0))                                        C017
                NEWVAL.($PART$,S(0),LIST.(VIRGIN))                           C018
                R=READER.(S(0))                                              C019
                LIST.(S(1))                                                  C020
                LIST.(S(2))                                                  C021
                ODDS=1                                                       C022
                COUNT=0                                                      C023
START           ODDS=ODDS-1                                                  C024
                W'R ODDS .E. 0, ODDS=2                                       C025
                IRALST.(S(ODDS))                                             C026
                W'R FAST .AND. .NOT. STORE                                   C027
                  ONELIN.(LIST.(S(ODDS)))                                    C028
                  T'O DOTEST                                                 C029
                E'L                                                          C030
                IRARDR.(R)                                                   C031
                COUNT=COUNT+1                                                C032
                FCOUNT=COUNT                                                 C033
                PRMESA.(SDBC.(COUNT))                                        C034
                R=READER.(RDLONL.(LIST.(S(ODDS))))                           C035
                W'R LEMPTY.(S(ODDS)), T'O EMPTY                              C036
                BOTTOM=ADVSEL.(R,F)                                          C037
                W'R BOTTOM .E. $IGNORE$, T'O EMPTY                           C038
                W'R BOTTOM .E. $FILE$                                        C039
12                REMOVE.(LPNTR.(R))                                         C040
                  NEWVAL.(FCOUNT,S(ODDS),S(0))                               C041
11                T'O START                                                  C042
                E'L                                                          C043
DOTEST          W'R TOP.(S(ODDS)) .NE. $.$, T'O PLAIN                        C044
10              POPTOP.(S(ODDS))                                             C045
                IT=TOP.(S(ODDS))                                             C046
9               W'R IT .E. $CLOCK$                                           C047
                  W'R BOT.(S(ODDS)) .E. $OFF$                                C048
8                   CLOCK = 0B                                               C049
                  O'E                                                        C050
7                   CLOCK=1B                                                 C051
                  E'L                                                        C052
6                 T'O EMPTY                                                  C053
                O'R IT .E. $STORE$                                           C054
5                 STORE=1B                                                   C055
                  T'O EMPTY                                                  C056
4               O'R IT .E. $FAST$                                            C057
                  FAST=1B                                                    C058
3                 T'O START                                                  C059
2
```

```
                O'R IT .E. $DELAY$                                                  C060
                  COUNT=COUNT+1                                                     C061
                  FAST = OB                                                         C062
                  T'O EMPTY                                                         C063
                O'R IT .E. $TRACE$                                                  C064
                  W'R BOT.(S(ODDS)) .E. $OFF$                                       C065
                    T1=OB                                                           C066
                  O'E                                                               C067
                    T1=1B                                                           C068
                  E'L                                                               C069
                  T'O EMPTY                                                         C070
                O'R IT .E. $SAVE$                                                   C071
                  PLACE=ODDS-1                                                      C072
                  W'R PLACE .E. 0, PLACE=2                                          C073
                  NEWVAL.(FCOUNT-1.0,S(PLACE),S(0))                                 C074
                  T'O START                                                         C075
                O'R IT .E. $ATTACH$                                                 C076
                  REAR=NTHTOP.(S(ODDS),2)                                           C077
                  FRONT=BOT.(S(ODDS))                                               C078
                  FREAR=REAR                                                        C079
                  FFRONT=FRONT                                                      C080
                  SOURCE=ITSVAL.(FRONT,S(0))                                        C081
                  W'R SOURCE .E. $ABSENT$                                           C082
                    FRONT=FFRONT                                                    C083
NOTFND              PRMESS.($STATEMENT $,SDBC.(FRONT),$ NOT FOUND$)                 C084
                    T'O START                                                       C085
                  E'L                                                               C086
                  W'R FREAR .E. FCOUNT - 1.0                                        C087
                    PLACE=ODDS-1                                                    C088
                    W'R PLACE .E. 0, PLACE = 2                                      C089
                    OTHER=S(PLACE)                                                  C090
                  O'E                                                               C091
                    OTHER=ITSVAL.(REAR,S(0))                                        C092
                  E'L                                                               C093
                  W'R OTHER .E. $ABSENT$                                            C094
                    FRONT=REAR                                                      C095
                    T'O NOTFND                                                      C096
                  E'L                                                               C097
                  NEWBOT.($,$,SOURCE)                                               C098
                  INLSTL.(OTHER,SOURCE)                                             C099
                  SD=LSTNAM.(SOURCE)                                                C100
                  OD=LSTNAM.(OTHER)                                                 C101
                  W'R OD .NE. 0 .AND. SD .NE. 0                                     C102
                    INLSTL.(OD,SD)                                                  C103
                  O'R OD .NE. 0 .AND. SD .E. 0                                      C104
                    MAKEDL.(OD,SOURCE)                                              C105
                  E'L                                                               C106
                  IRALST.(OTHER)                                                    C107
                  IMASS(1)=SOURCE                                                   C108
                  T'O START                                                         C109
                E'L                                                                 C110
PLAIN           W'R T1                                                              C111
                  SPACE=CNTSPC.(0)                                                  C112
                  PRMESS.($SPACE $, SDBC.(SPACE))                                   C113
                E'L                                                                 C114
                W'R STORE                                                           C115
                  STORE=OB                                                          C116
                  NEWVAL.(FCOUNT,S(ODDS),S(0))                                      C117
                  T'O START                                                         C118
                E'L                                                                 C119
                W'R CLOCK                                                           C120
```

```
                RSCLCK.                                                  0121
                EVAL.(S(ODDS))                                           0122
                STOPCL.(J)                                               0123
                PRMESS.($TIME $, SDBC.((J*1000)/60),$ MILLISECONDS$)     0124
              O'E                                                        0125
                EVAL.(S(ODDS))                                           0126
              E'L                                                        0127
              T'O START                                                  0128
EMPTY         W'R .NOT. FAST, COUNT=COUNT-1                              0129
              T'O START                                                  0130
              E'M                                                        0131
```

12
11
10
9
8
7
6
5
4
3
2

```
T0109        2531        EVAL          MAD FOR   T0109        2531      06/30
            EXTERNAL FUNCTION (EXPR)                                          C001
            PROGRAM COMMON IMASS,T1,CONTRL,ESTACK,RSTACK,OSTACK,              C002
           1NATLST,SSTACK,TSTACK,VIRGIN,BREAK                                 C003
            BOOLEAN T1,BREAK                                                  C004
            FLOATING POINT RESULT                                             C005
            DIMENSION IMASS(20)                                               C006
            EQUIVALENCE (RESULT,RSLT)                                         C007
            N'S INTEGER                                                       C008
            BOOLEAN LEMPTY. , FSIGN , LSTMRK.                                 C009
            FLOATING POINT  FF, SS                                            C010
            EQUIVALENCE (FF,FIRST), (SS,SECOND), (RSLT,IMASS(1))              C011
            STATEMENT LABEL THERE                                             C012
            EQUIVALENCE (PLATZ,THERE)                                         C013
            V'S ENTER=0                                                       C014
            V'S OPS= $=$,$+$,$-$,$/$,$*$,$,$,$.$                              C015
            V'S OPS2= $E$,$L$,$G$,$GE$,$NE$,$LE$,$OR$,$AND$                   C016
            V'S OPS1=$LET$,$DEFINE$,$LIST$,$SEQLR$,$SEQLL$,$LISTOF$,          C017
           1  $TYPE$,$READ$,$FORGET$,$ WHILE$,$AND$,$TRACE$,$ARRAY$          C018
           2     ,$ WHERE$,$EXISTS$,$COMMON$                                  C019
            D'N IFWORD(3),L(3),P(5)                                           C020
            V'S IFFY=$IF$,$WHILE$,$FOR$                                       C021
            V'S RV=$(X=EVAL(RDLCNL(II1234)),MTLIST(II1234))$                  C022
            E'O EVAL.                                                         C023
            W'R ENTER .NE. 0, T'O READY                                       C024
            NEWVAL.($II1234$,LIST.(9),VIRGIN)                                 C025
            NEWVAL.($ETREE$,VIRGIN,VIRGIN)                                    C026
            VCTLST.(RV,LIST.(IN))                                             C027
            NOW=VIRGIN                                                        C028
            LIST.(NATLST)                                                     C029
            LIST.(SSTACK)                                                     C030
            IMASS(2)=$READER$                                                 C031
            IMASS(4)=$FLAG$                                                   C032
            LIST.(CONTRL)                                                     C033
            LIST.(ESTACK)                                                     C034
            LIST.(TSTACK)                                                     C035
            LIST.(OSTACK)                                                     C036
            LIST.(RSTACK)                                                     C037
            LIST.(OUT)                                                        C038
            NEWTOP.($NOCR$,LIST.(NOCR))                                       C039
            ENTER=1                                                           C040
            FENCE=$ FENCE$                                                    C041
            BOOLEAN FAIL                                                      C042
READY       EXP=EXPR                                                          C043
            MTLIST.(TSTACK)                                                   C044
            NEWBOT.(FINI,CONTRL)                                              C045
           R                                                                  C046
           R     BEGIN EVALUATION OF EXPRESSION                               C047
           R                                                                  C048
E           W'R NAMTST.(EXP) .NE. 0                                           C049
              RSLT=FINDT.(EXP,0)                                              C050
              W'R GOOD, T'O FOUND1                                            C051
              W'R 77777K6 .A.(EXP) .E. 0                                      C052
                RESULT=EXP                                                    C053
              O'E                                                             C054
                RSLT=EXP                                                      C055
              E'L                                                             C056
FOUND1        NEWBOT.(RSLT,TSTACK)                                            C057
              T'O APPLY                                                       C058
            E'L                                                               C059
```

```
            R=SEQRDR.(EXP)                                          C060
            W'R LSTMRK.(EXP)                                        C061
           R                                                        C062
           R     IF THE LIST, I.E. THE EXPRESSION IS               C063
           R     ALREADY MARKED, THE EXPRESSION HAS BEEN           C064
           R     EVALUATED BEFORE AND NEED NOT BE SCANNED          C065
           R     FOR LABELS AND 'WHERE' AGAIN.                     C066
           R                                                       C067
              T'O TADV                                             C068
            O'E                                                    C069
           R                                                       C070
           R     SCAN THE EXPRESSION FOR 'WHERE' AND LABELS        C071
           R                                                       C072
              WORD=SEQLR.(R,F)          W'R TOP(EXP) .E. $LAMBDA$  C073
              W'R WORD .E. $LAMBDA$       SEQLR.(R,F)              C074
                BV=LIST.(9)                                        C075
                BO=LIST.(9)                                        C076
                POPTOP.(EXP)                                       C077
PLOOK           WORD=SEQLR.(R,F)                                   C078
                W'R WORD .NE. $.$, T'O PLOOK                       C079
                NULSTL.(EXP,(77777K6 .A. R) .RS. 18,BV)            C080
                NULSTR.(EXP,77777K .A. R,BO)                       C081
                MTLIST.(EXP)                                       C082
                MRKIND.(1,NEWTOP.($ LAMBD$,EXP))                   C083
                MANY.(EXP,BV,BO)                                   C084
                T'O ENDSRC                                         C085
              E'L                                                  C086
              T'O STARK                                            C087
LABSRC        WORD=SEQLR.(R,F)                                     C088
              W'R F .G. 0, T'O ENDSRC                              C089
JUNE          W'R WORD .E. $OWN$                                   C090
                P(0)=77777K .A. R                                  C091
                REMOVE.(LSPNTR.(R))                                C092
                MANY.(LIST.(NEWCON),NOW,NOW)                       C093
                MRKLST.(1,NEWCON)                                  C094
                LETVAL=NOW                                         C095
                HOST=NEWCON                                        C096
                NOW=NEWCON                                         C097
OWN1            TERM=SEQLR.(R,F)                                   C098
                W'R TERM .E. $AND$, T'O OWN1                       C099
                W'R F .E. 0                                        C100
                  S=SEQRDR.(TERM)                                  C101
                  NEWBOT.(OWN1,CONTRL)                             C102
                  T'O SPEC1                                        C103
                O'R F .G. 0                                        C104
                  NULSTR.(EXP,P(0),LIST.(RUNT))                    C105
                  IRALST.(RUNT)                                    C106
                  NEWVAL.($KNOT$,NOW,EXP)                          C107
                  MRKLST.(0,NOW)                                   C108
                  T'O ENDSRC                                       C109
                O'R TERM .E. $WHERE$                               C110
                  SUBST.($ WHERE$,LSPNTR.(R))                      C111
                  NEWVAL.($KNOT$,NOW,EXP)                          C112
                  NULSTR.(LSPNTR.(R),P(0),LIST.(RUNT))             C113
                  IRALST.(RUNT)                                    C114
                  T'O OWN3                                         C115
OWN2              TERM=SEQLR.(R,F)                                 C116
                  W'R TERM .E. $AND$, T'O OWN2                     C117
                  W'R F .E. 0                                      C118
                    S=SEQRDR.(TERM)                                C119
                    NEWBOT.(OWN2,CONTRL)                           C120
```

```
                    T'O SPEC1                                          C121
                  O'E                                                  C122
                    R=SEQRDR.(EXP)                                     C123
                    MRKLST.(0,NOW)                                     C124
                    T'O TADV                                           C125
                  E'L                                                  C126
                O'R TERM .E. $,$                                       C127
                  NEWVAL.($KNOT$,NOW,EXP)                              C128
                  MRKLST.(0,NOW)                                       C129
                  NULSTR.(LSPNTR.(R),P(0),LIST.(RUNT))                 C130
                  IRALST.(RUNT)                                        C131
                  T'O COMMA                                            C132
                E'L                                                    C133
              O'R WORD .E. $WHERE$                                     C134
                SUBST.($ WHERE$,LSPNTR.(R))                            C135
OWN3            MANY.(LIST.(NEWCON), NOW,NOW)                          C136
                MRKLST.(1,NEWCON)                                      C137
                LETVAL=NOW                                             C138
                W'R LETVAL .E. VIRGIN, LETVAL=0                        C139
                HOST=NEWCON                                            C140
                NOW=NEWCON                                             C141
                T'O OWN2                                               C142
              O'R WORD .E. $ WHERE$                                    C143
                T'O OWN3                                               C144
              E'L                                                      C145
              W'R WORD .NE. $,$ .AND. WORD .NE. $.$, T'O IFTEST        C146
COMMA         WORD=SEQLR.(R,F)                                         C147
              W'R F .G. 0, T'O ENDSRC                                  C148
STARK         W'R WORD .E. $*$, T'O STAR                               C149
                T'O JUNE                                               C150
STAR          HOST=EXP                                                 C151
              REMOVE.(LSPNTR.(R))                                      C152
              LABEL=SEQLR.(R,F)                                        C153
              W'R 77777K6 .A.(LABEL) .E. 0                             C154
                RESULT=LABEL                                           C155
                LABEL=RSLT                                             C156
              E'L                                                      C157
              REMOVE.(LSPNTR.(R))                                      C158
NEGR          W'R R .L. 0                                              C159
                SEQLR.(R,F)                                            C160
                REMOVE.(LSPNTR.(R))                                    C161
                T'O NEGR                                               C162
              E'L                                                      C163
              SEQLR.(R,F)                                              C164
              NEWVAL.(LABEL,R,HOST)                                    C165
              SEQLL.(R,F)                                              C166
              T'O LABSRC                                               C167
            E'L                                                        C168
IFTEST      W'R WORD .E. $IF$                                          C169
              SUBST.($ IF$,LSPNTR.(R))                                 C170
              IFWORD(0)=$IF$                                           C171
              IFWORD(1)=$THEN$                                         C172
              IFWORD(2)=$ELSE$                                         C173
              IFWORD(3)=$  $                                           C174
              T'O MO                                                   C175
            O'R WORD .E. $WHILE$                                       C176
              SUBST.($ WHILE$,LSPNTR.(R))                              C177
              IFWORD(0)=$WHILE$                                        C178
              IFWORD(1)=$REPEAT$                                       C179
              IFWORD(2)=$  $                                           C180
              IFWORD(3)=$  $                                           C181
```

```
                T'O MO                                                  C1820
              O'R WORD .E. $FOR$                                        C1830
                SUBST.($ FOR$,LSPNTR.(R))                               C1840
                IFWORD(0)=$FOR$                                         C1850
                IFWORD(1)=$STEP$                                        C1860
                IFWORD(2)=$UNTIL$                                       C1870
                IFWORD(3)=$DO$                                          C1880
MO              P(0)=LSPNTR.(R)                                         C1890
                P(1)=77777K .A. R                                       C1900
                LEVEL=1                                                 C1910
                I=1                                                     C1920
M1              WORD=SEQLR.(R,F)                                        C1930
                T'H M2, FOR J=0,1, J .G. 2                              C1940
                W'R IFFY(J) .E. WORD                                    C1950
                  LEVEL=LEVEL+1                                         C1960
                  T'O M1                                                C1970
                E'L                                                     C1980
M2              CONTINUE                                                C1990
                W'R WORD .E. IFWORD(I)                                  C2000
                W'R LEVEL .NE. 1, T'O M1                                C2010
                  POINTR=LSPNTR.(R)                                     C2020
                  W'R POINTR .E. P(I) , P(I)=NEWBOT.(0,P(I))            C2030
                  REMOVE.(POINTR)                                       C2040
                  P(I+1)=77777K .A. R                                   C2050
                  I=I+1                                                 C2060
                  T'O M1                                                C2070
                O'R WORD .E. $ $                                        C2080
                  LEVEL=LEVEL-1                                         C2090
                  W'R LEVEL .NE. 0, T'O M1                              C2100
                  POINTR=LSPNTR.(R)                                     C2110
                  W'R POINTR .E. P(I), P(I)=NEWBOT.(0,P(I))             C2120
                  REMOVE.(POINTR)                                       C2130
                  P(I+1)=77777K .A. R                                   C2140
                  T'O M3                                                C2150
                O'R F .G. 0                                             C2160
                  P(I+1)=EXP                                            C2170
                  T'O M3                                                C2180
                O'E                                                     C2190
                  T'O M1                                                C2200
                E'L                                                     C2210
M3              T'H M4, FOR J=1,1, J .G. I                              C2220
12              L(J)=NULSTR.(P(J+1),P(J),LIST.(9))                      C2230
M4              P(0)=NEWTOP.(L(J),P(0))                                 C2240
11              W'R P(J) .E. EXP, T'O ENDSRC                            C2250
                NEWTOP.($,$,P(0))                                       C2260
                R=CONT.(P(0))                                           C2270
10            E'L                                                       C2280
              T'O LABSRC                                                C2290
9   ENDSRC    MRKLST.(1,EXP)                                            C2300
              R=SEQRDR.(EXP)                                            C2310
8           R                                                           C2320
            R     BEGIN BASIC SCAN OF THE EXPRESSION                    C2330
7           R                                                           C2340
TADV          TERM=SEQLR.(R,F)                                          C2350
6             NEWBOT.(TADV,CONTRL)                                      C2360
              W'R F .L. 0                                               C2370
5           R                                                           C2380
            R     WHEN F IS LESS THAN ZERO, THE WORD                    C2390
4           R     ENCOUNTERED IN THE SCAN IS NOT A LIST                 C2400
            R     NAME.                                                 C2410
3           R                                                           C2420
2
```

```
RING            W'R R .L. 0                                                    02430
                  SEQLR.(R,F)                                                  02440
                  T'O RING                                                     02450
                E'L                                                            02460
                W'R 3K11 .A.R .E. 0                                            02470
          R                                                                    02480
          R       WHEN THE INDICATOR IS ZERO, THE WORD                         02490
          R       ENCOUNTERED IN THE SCAN IS NOT AN ALPHABETIC                 02500
          R       SYMBOL, HENCE NOT AN IDENTIFIER.  IT MAY                     02510
          R       BE AN INFIX OPERATOR OR A NUMBER                             02520
          R                                                                    02530
                T'H QUICK, FOR I=0,1, I .E. 5                                  02540
                W'R OPS(I) .E. TERM                                            02550
                  OP=I                                                         02560
                  T'O INOP(I)                                                  02570
                E'L                                                            02580
QUICK           CONTINUE                                                       02590
                T'O OTHER                                                      02600
INOP(0)         NEWBOT.(I,OSTACK)                                              02610
                T'O END                                                        02620
INOP(1)         RCOPY=R                                                        02630
                NEXTL=SEQLL.(RCOPY,F)                                          02640
                W'R F .G. 0, T'O END                                           02650
                T'H QUICK1, FOR INDX=0,1, INDX .E. 7                           02660
QUICK1          W'R OPS(INDX) .E. NEXTL, T'O END                               02670
                T'O STKTST                                                     02680
INOP(2)         RCOPY=R                                                        02690
                NEXTL=SEQLL.(RCOPY,F)                                          02700
                W'R F .G. 0, T'O ZERO                                          02710
                T'H QUICK2, FOR INDX=0,1, INDX .E. 7                           02720
                W'R OPS(INDX) .E. NEXTL                                        02730
ZERO              NEWBOT.(0,TSTACK)                                            02740
                  NEWBOT.(I,OSTACK)                                            02750
                  T'O END                                                      02760
                E'L                                                            02770
QUICK2          CONTINUE                                                       02780
INOP(3)         T'O STKTST                                                     02790
INOP(4)         W'R CONT.(77777K .A. R + 1) .E. $*$                            02800
                  NEWBOT.(5,OSTACK)                                            02810
                  SEQLR.(R,F)                                                  02820
                  T'O END                                                      02830
                E'L                                                            02840
STKTST          W'R BOT.(OSTACK) .E. FENCE .OR. LEMPTY.(OSTACK)                02850
                  NEWBOT.(I,OSTACK)                                            02860
                  T'O END                                                      02870
                O'E                                                            02880
                  BOTTOM=BOT.(OSTACK)                                          02890
                  W'R I .LE. BOTTOM .AND. BOTTOM .LE. 5                        02900
                    DOES.(POPBOT.(OSTACK))                                     02910
                    T'O STKTST                                                 02920
                  O'E                                                          02930
                    NEWBOT.(I,OSTACK)                                          02940
                    T'O END                                                    02950
                  E'L                                                          02960
                E'L                                                            02970
OTHER           W'R 77777K6 .A.(TERM) .E. 0                                    02980
                  RESULT=TERM                                                  02990
                  TERM=RSLT                                                    03000
                  SUBST.(TERM, LSPNTR.(R))                                     03010
                  T'O SIMPLE                                                   03020
                O'R TERM .E. $,$                                               03030
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                    W'R BOT.(OSTACK) .E. FENCE                                  C304
                      POPBOT.(CONTRL)                                           C305
                      T'O TADV                                                  C306
                    O'E                                                         C307
                      T'O APPLY                                                 C308
                    E'L                                                         C309
                  O'R TERM .E. $'$                                              C310
                    WORD=SEQLR.(R,F)                                            C311
                    MRKIND.((3K11.A.R).RS.34,NEWBOT.(WORD,TSTACK))              C312
ROUNDS              W'R R .L. 0                                                 C313
                      SEQLR.(R,F)                                               C314
                      T'O ROUNDS                                                C315
                    E'L                                                         C316
                    T'O END                                                     C317
                  O'R TERM .E. $.$                                              C318
                    RCOPY=R                                                     C319
                    RELATR=SEQLR.(RCOPY,FP)                                     C320
                    W'R SEQLR.(RCOPY,FP) .NE. $.$, T'O JUSTPR                   C321
                    T'H RELSRC, FOR I=0,1, I .G. 7                              C322
                    W'R OPS2(I) .E. RELATR                                      C323
                      R=RCOPY                                                   C324
                      I=I+12                                                    C325
STKT2                 W'R BOT.(OSTACK) .E. FENCE .OR. LEMPTY.(OSTACK)           C326
          1           .OR. BOT.(OSTACK) .E. 0                                   C327
                        NEWBOT.(I,OSTACK)                                       C328
                        T'O END                                                 C329
                      O'R I .G. BOT.(OSTACK) .AND. I .G. 11                     C330
                        DOES.(POPBOT.(OSTACK))                                  C331
                        BOTTOM=BOT.(TSTACK)                                     C332
                        W'R BOTTOM .E. 0 .AND. I .E. 19                         C333
ORSERC                    WORD=SEQLR.(R,F)                                      C334
                          W'R F .G. 0 .OR. WORD .E. $,$                         C335
ENDORS                       SEQLL.(R,F)                                        C336
                             T'O END                                            C337
                          E'L                                                   C338
                          W'R WORD .NE. $.$, T'O ORSERC                         C339
                          RCOPY=R                                               C340
                          WORD=SEQLR.(RCOPY,F)                                  C341
                          W'R F .G. 0, T'O ENDORS                               C342
                          W'R WORD .E. $CR$, T'O ORFIND                         C343
                          WORD=SEQLR.(RCOPY,F)                                  C344
12                        W'R WORD .E. $.$                                      C345
                            R=RCOPY                                             C346
11                          T'O ORSERC                                          C347
                          O'E                                                   C348
                            T'O ENDORS                                          C349
10                        E'L                                                   C350
ORFIND                    R=RCOPY                                               C351
9                         SEQLR.(R,F)                                           C352
                          I=18                                                  C353
8                         T'O STKT2                                             C354
                        E'L                                                     C355
7                       W'R BOTTOM .E. 1 .AND. I .E. 18, T'O SPEC(13)          C356
                        T'O STKT2                                               C357
6                     O'E                                                       C358
                        NEWBOT.(I,OSTACK)                                       C359
5                       T'O END                                                 C360
                      E'L                                                       C361
4                   E'L                                                         C362
RELSRC              CONTINUE                                                    C363
3   JUSTPR          SUBSBT.(GETOUT,CONTRL)                                      C364
2
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```
                    T'O APPLY                                          0365
GETOUT              W'R BOT.(ESTACK) .E. $SUBEXP$                      0366
                      RID.(OSTACK,FENCE)                               0367
                      POPBOT.(RSTACK)                                  0368
                      POPBOT.(ESTACK)                                  0369
                      POPBOT.(ESTACK)                                  0370
                      POPBOT.(CONTRL)                                  0371
                      OLDNCW=POPBOT.(CONTRL)                           0372
                      POPBOT.(CONTRL)                                  0373
                      SUBSBT.(GETOUT,CONTRL)                           0374
                      T'O C2                                           0375
                    O'R BOT.(ESTACK) .E. $FUNCTN$                      0376
                      T'O END                                          0377
                    O'E                                                0378
                      T'O END                                          0379
                    E'L                                                0380
                  E'L                                                  0381
SIMPLE            NEWBOT.(TERM,TSTACK)                                 0382
                  RSLT=TERM                                            0383
                O'E                                                    0384
                  W'R TERM .E. $GOTO$                                  0385
                    OP=$GOTO$                                          0386
                    TERM=SEQLR.(R,F)                                   0387
                    W'R F .L. 0                                        0388
RING9                 W'R R .L. 0                                      0389
                        SEQLR.(R,F)                                    0390
                        T'O RING9                                      0391
                      E'L                                              0392
                      LABEL=TERM                                       0393
                    O'E                                                0394
                      NEWBOT.(TRANSF,CONTRL)                           0395
                      T'O BEGINB                                       0396
TRANSF                LABEL=POPBOT.(TSTACK)                            0397
                    E'L                                                0398
                    T'O NXTEST                                         0399
                  E'L                                                  0400
            R                                                          0401
            R     THE SYMBOL ENCOUNTERED IS AN ALPHABETIC              0402
            R     SYMBOL.  IT MAY BE AN IDENTIFIER OR THE              0403
            R     NAME OF A FUNCTION                                   0404
            R                                                          0405
                  RCOPY=R                                              0406
                  NEXT=SEQLR.(RCOPY,F)                                 0407
RAANG             W'R RCOPY .L. 0                                      0408
                    SEQLR.(RCOPY,F)                                    0409
                    T'O RAANG                                          0410
                  E'L                                                  0411
                  W'R TERM .E. $ LAMBD$                                0412
                    NEWOP=LIST.(9)                                     0413
                    BVLIST=LSLCPY.(SEQLR.(R,F),LIST.(9))               0414
                    BODY=LSSCPY.(SEQLR.(R,F),NEWOP)                    0415
                    NEWVAL.($BVLIST$,BVLIST,BODY)                      0416
                    NEWVAL.($KNOT$,NOW,BODY)                           0417
                    NEWBOT.(NEWOP,TSTACK)                              0418
                    T'O END                                            0419
                  E'L                                                  0420
                  W'R F .E. 0                                          0421
            R                                                          0422
            R     WE HAVE THE 'F(X)' PATTERN                           0423
            R                                                          0424
                    T'H APEEK, FOR I=0, 1, I .G. 15                    0425
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APEEK       W'R TERM .E. OPS1(I), T'O SPEC(I)                    C0426
            NEWBOT.(TERM,OSTACK)                                 C0427
            TERM=SEQLR.(R,F)                                     C0428
            NEWBOT.(FEND,CONTRL)                                 C0429
            T'O BEGINB                                           C0430
FEND        OP=POPBOT.(OSTACK)                                   C0431
            T'O DOFN                                             C0432
          E'L                                                    C0433
          NEWBOT.(FINDT.(TERM,2),TSTACK)                         C0434
          W'R FSIGN, RSLT=BOT.(TSTACK)                           C0435
        E'L                                                      C0436
        T'O END                                                  C0437
      O'R F .E. 0                                                C0438
    R                                                            C0439
    R     THE TERM ENCOUNTERED IN THE BASIC                      C0440
    R     EXPRESSION SCAN (TADV) IS A LIST NAME,                 C0441
    R     I.E. A SUBEXPRESSION.                                  C0442
    R                                                            C0443
        RCOPY=R                                                  C0444
        NEXT=SEQLR.(RCOPY,F)                                     C0445
        W'R F .E. 0                                              C0446
    R                                                            C0447
    R     WE HAVE A '()()' PATTERN, I.E. WE ARE                  C0448
    R     TO APPLY THE VALUE OF ONE EXPRESSION                   C0449
    R     TO THE OTHER.                                          C0450
    R                                                            C0451
          MANY.(CONTRL,TERM,CANT)                                C0452
          R=RCOPY                                                C0453
          TERM=NEXT                                              C0454
          T'O BEGINB                                             C0455
CANT      TERM=POPBOT.(CONTRL)                                   C0456
          NEWBOT.(CAN,CONTRL)                                    C0457
          T'O BEGINB                                             C0458
CAN       OP=BOT.(TSTACK)                                        C0459
          MANY.(CONTRL,OP,COULD)                                 C0460
          POPBOT.(TSTACK)                                        C0461
          T'O EXCUT1                                             C0462
COULD     POPBOT.(CONTRL)                                        C0463
          T'O END                                                C0464
        E'L                                                      C0465
    R                                                            C0466
    R     'BEGINB' IS THE BASIC RECURSION LOOP                   C0467
    R     FOR SUBEXPRESSIONS.                                    C0468
    R                                                            C0469
BEGINB      MANY.(CONTRL,FENCE,NOW,B)                            C0470
            MANY.(ESTACK,EXP,$SUBEXP$)                           C0471
            NEWBOT.(FENCE,OSTACK)                                C0472
            NEWBOT.(R,RSTACK)                                    C0473
            EXP=TERM                                             C0474
             KNOT=ITSVAL.($KNOT$,EXP)                            C0475
             W'R KNOT .NE. 0                                     C0476
               MANY.(LIST.(NEWCON),NOW,KNOT)                     C0477
               NOW=NEWCON                                        C0478
             E'L                                                 C0479
            T'O E                                                C0480
B           R=POPBOT.(RSTACK)                                    C0481
            POPBOT.(ESTACK)                                      C0482
            EXP=POPBOT.(ESTACK)                                  C0483
            OLDNOW=POPBOT.(CONTRL)                               C0484
            W'R BOT.(CONTRL) .E. FENCE, POPBOT.(CONTRL)          C0485
C2          W'R OLDNOW .NE. NOW                                  C0486
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                NEWCON=POPTOP.(NOW)                                    0487
                IRALST.(NOW)                                           0488
                NOW=NEWCON                                             0489
                T'O C2                                                 0490
              E'L                                                      0491
              T'O END                                                  0492
            O'E                                                        0493
SPEC(13)      W'R BOT.(OSTACK) .E. FENCE                               0494
                POPBOT.(OSTACK)                                        0495
                POPBOT.(CONTRL)                                        0496
                T'O END                                                0497
              O'E                                                      0498
                TERM=$.$                                               0499
                POPBOT.(CONTRL)                                        0500
                T'O APPLY                                              0501
              E'L                                                      0502
            E'L                                                        0503
          R                                                            0504
          R      THE FOLLOWING SECTION APPLIES THE OPERATIONS          0505
          R      STACKED DURING THE SCANNING OF THE EXPRESSION         0506
          R      TO THEIR PROPER OPERANDS                              0507
          R                                                            0508
APPLY     W'R BOT.(OSTACK).E.FENCE                                     0509
            W'R TERM .NE. $.$, T'O END                                 0510
            POPBOT.(OSTACK)                                            0511
            T'O END                                                    0512
          O'R BOT.(OSTACK) .E. 0                                       0513
            W'R TERM .NE. $.$ .AND. TERM .NE. $,$, T'O END             0514
            DOES.(POPBOT.(OSTACK))                                     0515
            T'O APPLY                                                  0516
          O'R LEMPTY.(OSTACK)                                          0517
            T'O END                                                    0518
          E'L                                                          0519
          OP=POPBOT.(OSTACK)                                           0520
          W'R 77777K6 .A.(OP) .NE. 0, T'O DOFN                         0521
          DOES.(OP)                                                    0522
          T'O APPLY                                                    0523
          R                                                            0524
          R      THE FOLLOWING SECTION ASSUMES THAT THE                0525
          R      SUBEXPRESSION OF THE FORM 'F(SUBEXPR)' HAS            0526
          R      BEEN EVALUATED.  WE NOW CONSIDER THE FUNCTION         0527
          R      NAMED .                                               0528
          R                                                            0529
DOFN      W'R OP .E. $ IF$                                             0530
            CLUE=POPBOT.(TSTACK)                                       0531
            FIRST=SEQLR.(R,F)                                          0532
            SECOND=SEQLR.(R,F)                                         0533
            W'R F .G. 0 .OR. SECOND .E. $,$                            0534
              SECOND=$ NEXT$                                           0535
              SEQLL.(R,F)                                              0536
            E'L                                                        0537
            W'R CLUE .E. 1                                             0538
              LABEL=FIRST                                              0539
            O'E                                                        0540
              LABEL=SECOND                                             0541
            E'L                                                        0542
            W'R LABEL .NE. $ NEXT$                                     0543
              TERM=LABEL                                               0544
              T'O BEGINB                                               0545
            O'E                                                        0546
              T'O NXTSEQ                                               0547
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                E'L                                                    0548
NXTEST          W'R T1                                                 0549
                  PRMESA.($TRANSFER$,OP,$ $)                           0550
                  W'R NAMTST.(LABEL) .E. 0                             0551
                    TXTPRT.(LABEL,0)                                   0552
                  O'E                                                  0553
                    PRMESS.(LABEL)                                     0554
                  E'L                                                  0555
                E'L                                                    0556
                W'R LABEL .E. $NEXT$.OR. LABEL .E. $ NEXT$             0557
NXTSEQ            WORD=SEQLR.(R,F)                                     0558
                    W'R F .G. 0                                        0559
                      SEQLL.(R,F)                                      0560
                      T'O END                                          0561
                    E'L                                                0562
                  W'R WORD .NE. $,$ .AND. WORD .NE. $.$, T'O NXTSEQ    0563
                  W'R LABEL.E.$ NEXT$.AND.WORD.E.$.$,SEQLL.(R,F)       0564
                  T'O END                                              0565
                O'R NAMTST.(LABEL) .E. 0                               0566
                  NEWBOT.(LABCOM,CONTRL)                               0567
                  TERM=LABEL                                           0568
                  T'O BEGINB                                           0569
LABCOM            LABEL= POPBOT.(TSTACK)                               0570
                  T'O NXTEST                                           0571
                E'L                                                    0572
FURTHR          R=ITSVAL.(LABEL,EXP)                                   0573
                W'R R .E. 0                                            0574
                  W'R BOT.(ESTACK) .E. $SUBEXP$                        0575
                    POPBOT.(ESTACK)                                    0576
                    EXP=POPBOT.(ESTACK)                                0577
                    RID.(OSTACK,FENCE)                                 0578
                    POPBOT.(RSTACK)                                    0579
                    RID.(CONTRL,FENCE)                                 0580
                    T'O FURTHR                                         0581
                  E'L                                                  0582
                  PRMESS.($LABEL $,LABEL,$ NOT FOUND$)                 0583
                  F'N                                                  0584
                O'E                                                    0585
                  SEQLL.(R,F)                                          0586
                  T'O END                                              0587
                E'L                                                    0588
12            O'R OP .E. $EVAL$                                        0589
                TERM=POPBOT.(TSTACK)                                   0590
11              T'O BEGINB                                             0591
              O'R OP .E. $ FOR$                                        0592
FORC            RAT=R                                                  0593
10              INIT=TOP.(CONT.(LSPNTR.(R)+1))                         0594
9               INCR=SEQLR.(RAT,F)                                     0595
                W'R NTHTOP.(INCR,2) .NE. $=$                           0596
8                 NEWTOP.($+$,INCR)                                    0597
                  MRKIND.(1,NEWTOP.(INIT,INCR))                        0598
7                 NEWTOP.($=$,INCR)                                    0599
                  MRKIND.(1,NEWTOP.(INIT,INCR))                        0600
6               E'L                                                    0601
                CONDS=SEQLR.(RAT,F)                                    0602
                BODY=SEQLR.(RAT,F)                                     0603
5               TERM=CONDS                                             0604
                NEWBOT.(FOR1,CONTRL)                                   0605
4               NEWBOT.(FENCE,TSTACK)                                  0606
                T'O BEGINB                                             0607
3               RID.(TSTACK,FENCE)                                     0608
FOR1
2
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                W'R RSLT .E. 1                                          C0609
                  R=RAT                                                 C0610
                  T'O END                                               C0611
                O'E                                                     C0612
                  TERM=BODY                                             C0613
                  NEWBOT.(FOR2,CONTRL)                                  C0614
                  NEWBOT.(FENCE,TSTACK)                                 C0615
                  T'O BEGINB                                            C0616
FOR2              RID.(TSTACK,FENCE)                                    C0617
                  RAT=R                                                 C0618
                  TERM=SEQLR.(RAT,F)                                    C0619
                  NEWBOT.(FOR3,CONTRL)                                  C0620
                  NEWBOT.(FENCE,TSTACK)                                 C0621
                  T'O BEGINB                                            C0622
FOR3              RID.(TSTACK,FENCE)                                    C0623
                  T'O FORO                                              C0624
                E'L                                                     C0625
              E'L                                                       C0626
CODES         SEQLL.(R,F)                                               C0627
            R                                                           C0628
            R       LET'S SEE IF WE CAN FIND THE DESIRED                C0629
            R     FUNCTION AMONG THE IDENTIFIERS                        C0630
            R                                                           C0631
             CODE=FINDT.(OP,0)                                          C0632
             SEQLR.(R,F)                                                C0633
             W'R CODE .E. 0                                             C0634
               T'O NOTLAM                                               C0635
             O'R NAMIST.(CODE) .E. 0                                    C0636
               W'R TOP.(CODE) .E. $ARRAY$                               C0637
                 W'R BOT.(CODE) .NE. $ARRAY$                            C0638
                   FLOATING POINT COEF                                  C0639
                   COEF=1.0                                             C0640
                   FIRST=POPBOT.(TSTACK)                                C0641
                   DIM=SEQRDR.(CODE)                                    C0642
                   RSLT=SEQLL.(DIM,F)                                   C0643
APRIL              NEXT=SEQLL.(DIM,F)                                   C0644
                   W'R NEXT .NE. $ARRAY$                                C0645
                     COEF=RESULT*COEF                                   C0646
                     SECOND=POPBOT.(TSTACK)                             C0647
                     FF=FF+(SS-1.0)*COEF                                C0648
                     RSLT=NEXT                                          C0649
12                   T'O APRIL                                          C0650
                   O'E                                                  C0651
11                   NEWBOT.(FIRST,TSTACK)                              C0652
                   E'L                                                  C0653
10               E'L                                                    C0654
                 RCOPY=R                                                C0655
9                NEXT=SEQLR.(RCOPY,F)                                   C0656
                 W'R NEXT .E. $=$                                       C0657
8                  NEWBOT.(POPBOT.(TSTACK),CODE)                        C0658
                   NEWBOT.(CODE,TSTACK)                                 C0659
7                  NEWBOT.(0,OSTACK)                                    C0660
                   R=RCOPY                                              C0661
6                  T'O END                                              C0662
                 O'E                                                    C0663
5                  RSLT=ITSVAL.(POPBOT.(TSTACK),CODE)                   C0664
                   NEWBOT.(RSLT,TSTACK)                                 C0665
4                  T'O END                                              C0666
                 E'L                                                    C0667
3              E'L                                                      C0668
               OPNAME=OP                                                C0669
2
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                OP=CODE                                                  C6700
                T'O EXCUT1                                               C6710
              O'E                                                        C6720
                W'R T1, PRMESS.($INTERMEDIATE OP $,CODE)                 C6730
                OP=CODE                                                  C6740
                T'O CODES                                                C6750
              E'L                                                        C6760
            R                                                            C6770
            R     PERHAPS THE FUNCTION IS ONE OF THE                     C6780
            R     BUILT IN ONES, E.G. 'SQRT'.                            C6790
            R                                                            C6800
NOTLAM      CODE=INSTRC.(OP)                                             C6810
            W'R CODE .NE. 0                                              C6820
              W'R T1                                                     C6830
                W'R OP .E. $PRINT$ .OR. OP .E. $LPRINT$                  C6840
            1   .OR. OP .E. $TXTPRT$                                     C6850
                  T1=OB                                                  C6860
                  TRACE=1                                                C6870
                O'E                                                      C6880
                  PRMESA.($OP$,OP,$ $)                                   C6890
                E'L                                                      C6900
              E'L                                                        C6910
              COUNT=(77777K6 .A.(CODE)).RS.18                            C6920
              OPER=SEQRDR.(TSTACK)                                       C6930
              T'H PLACE, FOR J=COUNT,-1, J .E. 0                         C6940
              WORD=SEQLL.(OPER,F)                                        C6950
              W'R T1, OEPRNT.($ARG$,WORD)                                C6960
PLACE         IMASS(J)=WORD                                              C6970
              RSLT=OBEY.(CODE,IMASS(1),IMASS(2),IMASS(3),IMASS(4))       C6980
              W'R T1, OEPRNT.($RSLT$,RSLT)                               C6990
              T'H POPT, FOR J=1,1, J .G. COUNT                           C7000
POPT          POPBOT.(TSTACK)                                            C7010
              NEWBOT.(RESULT,TSTACK)                                     C7020
              W'R TRACE .E. 1                                            C7030
                TRACE=0                                                  C7040
                T1=1B                                                    C7050
              E'L                                                        C7060
              T'O END                                                    C7070
            E'L                                                          C7080
            R                                                            C7090
            R     FUNCTION NOT FOUND.  PERHAPS IT WAS                    C7100
            R     SIMPLY MISSPELLED (THE 'TRY' GIMMICK)                  C7110
            R     OR IT WILL BE DEFINED ON LINE.                         C7120
            R                                                            C7130
              PRMESS.($OPERATION $,OP,$ NOT RECOGNIZED$)                 C7140
DEFNTN        RDLONL.(LIST.(INPUT))                                      C7150
              W'R TOP.(INPUT) .E. $TRY$                                  C7160
                POPTOP.(INPUT)                                           C7170
                OP=TOP.(INPUT)                                           C7180
                IRALST.(INPUT)                                           C7190
                T'O CODES                                                C7200
              O'R BOT.(BOT.(INPUT)) .E. $IGNORE$                         C7210
                IRALST.(INPUT)                                           C7220
                PRMESS.($SORRY ABOUT THAT, TRY AGAIN$)                   C7230
                T'O DEFNTN                                               C7240
              E'L                                                        C7250
              NEWBOT.(R,RSTACK)                                          C7260
              R=SEQRDR.(INPUT)                                           C7270
              TERM=SEQLR.(R,F)                                           C7280
              NEWBOT.(GUEST,CONTRL)                                      C7290
              W'R TERM .E. $DEFINE$                                      C7300
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            T'O SPEC(1)                                                    C7310
           O'R TERM .E. $LET$                                              C7320
            T'O SPEC(0)                                                    C7330
           E'L                                                             C7340
GUEST      OP=IT                                                           C7350
           R=POPBOT.(RSTACK)                                               C7360
           IRALST.(INPUT)                                                  C7370
          W'R NAMTST.(OP) .NE. 0, T'O CODES                                C7380
         R                                                                 C7390
         R     WE NOW HAVE A FUNCTION TO APPLY TO                          C7400
         R     ARGUMENTS PRESUMABLY STORED ON THE                          C7410
         R     BOTTOM OF THE 'TSTACK'.  WE NOW HAVE                        C7420
         R     TO SAVE THE CURRENT EXPRESSION, THE                         C7430
         R     POINTER 'R' THAT TELLS US WHERE TO GO                       C7440
         R     ON WHEN WE CONTINUE TO SCAN THAT                            C7450
         R     EXPRESSION ONCE MORE, AND WE WANT TO PUT                    C7460
         R     A 'FENCE' ON THE OSTACK SO THAT WE DON'T                    C7470
         R     EVALUATE TOO FAR.  THEN ESTABLISH A NEW                     C7480
         R     ENVIRONMENT (TEMPORARILY CALLED 'NEWCON'                    C7490
         R     BUT SOON CALLED 'NOW').  FINALLY                            C7500
         R     PICK UP BOUND VARIABLES, ETC.                               C7510
         R                                                                 C7520
EXCUT1    CONTINUE                                                         C7530
          W'R T1                                                           C7540
            PRMESS.($FUNCTION $,OPNAME)                                    C7550
          E'L                                                              C7560
          ITIS=ITSVAL.($BVLIST$,OP)                                        C7570
          S=SEQRDR.(ITIS)                                                  C7580
          MANY.(ESTACK,FENCE,EXP,$FUNCTN$)                                 C7590
          MANY.(CONTRL,NOW,C)                                              C7600
          NEWBOT.(FENCE,OSTACK)                                            C7610
          NEWBOT.(R,RSTACK)                                                C7620
          POINTR=ITSVAL.($KNOT$,OP)                                        C7630
          LIST.(NEWCON)                                                    C7640
          NEWBOT.(NOW,NEWCON)                                              C7650
          W'R POINTR .NE. 0                                                C7660
            NEWBOT.(POINTR,NEWCON)                                         C7670
          O'E                                                              C7680
            NEWBOT.(VIRGIN,NEWCON)                                         C7690
          E'L                                                              C7700
          NOW=NEWCON                                                       C7710
12        IDENT=SEQLL.(S,F)                                                C7720
          W'R F .L. 0                                                      C7730
11          W'R IDENT .E. $,$, T'O ISCAN                                   C7740
            IVALUE=BOT.(TSTACK)                                            C7750
10          NEWVAL.(IDENT,IVALUE,NOW)                                      C7760
            POPBOT.(TSTACK)                                                C7770
9           W'R T1                                                         C7780
              DEPRNT.(IDENT,IVALUE)                                        C7790
8           E'L                                                            C7800
            T'O ISCAN                                                      C7810
7         O'R F .E. 0                                                      C7820
            NAMRDR=READER.(IDENT)                                          C7830
6           VALRDR=READER.(POPBOT.(TSTACK))                                C7840
AGAIN       NIT=ADVSER.(NAMRDR,F)                                          C7850
5           W'R NIT .E. $,$, T'O AGAIN                                     C7860
            LEVEL=LCNTR.(NAMRDR)                                           C7870
4           W'R F .G. 0, T'O NAMEND                                        C7880
ADDVAL      VIT=ADVSWR.(VALRDR,F)                                          C7890
3           W'R LEVEL .NE. LCNTR.(VALRDR) .OR. VIT .E. $,$, T'O ADDVAL     C7900
            NEWVAL.(NIT,VIT,NOW)                                           C7910
2
```

MANY.(CONTRL,NOW,NEWCON,C)
MAKEDL.(LIST,(9),NEWCON)

```
PLAT        W'R LEMPTY.(VIT) .OR. F .NE. 0, T'O AGAIN                    0792
            VIT=ADVSWL.(VALRDR,F)                                        0793
            T'O PLAT                                                     0794
NAMEND      IRARDR.(NAMRDR)                                              0795
            IRARDR.(VALRDR)                                              0796
            T'O ISCAN                                                    0797
          E'L                                                            0798
          NEWBOT.(FENCE,TSTACK)                                          0799
          EXP=OP                                                         0800
          T'O E                                                          0801
        R                                                                0802
        R     WE HAVE FINISHED APPLYING THE FUNCTION.                    0803
        R     WE MUST NOW RESTORE OLD CONDITIONS -                       0804
        R     PARTICULARLY REESTABLISH THE OLD                           0805
        R     ENVIRONMENT, EXPRESSION, POINTERS, ETC.                    0806
        R                                                                0807
C         OLDNOW=POPBOT.(CONTRL)                                         0808
          W'R BOT.(TSTACK) .NE. FENCE                                    0809
            RSLT=POPBOT.(TSTACK)                                         0810
UNSTAK      POPS=POPBOT.(TSTACK)                                         0811
            W'R POPS .NE. FENCE, T'O UNSTAK                              0812
            NEWBOT.(RSLT,TSTACK)                                         0813
          O'E                                                            0814
            POPBOT.(TSTACK)                                              0815
          E'L                                                            0816
C1        NEWCON=POPTOP.(NOW)                                            0817
          IRALST.(NOW)                                                   0818
          NOW=NEWCON                                                     0819
          W'R NOW .NE. OLDNOW, T'O C1                                    0820
          POPBOT.(ESTACK)                                                0821
          EXP=POPBOT.(ESTACK)                                            0822
          POPBOT.(ESTACK)                                                0823
          R=POPBOT.(RSTACK)                                              0824
END       W'R BREAK                                                      0825
            TXTPRT.(EXP,0)                                               0826
            T1=0B                                                        0827
            BREAK=CB                                                     0828
INTRP1      PRMESA.($TYPE 'ABORT' OR 'TRACE' OR 'NORMAL' OR 'HOLD'  $)   0829
            RDFLXC.(COMAND,6)                                            0830
            W'R COMAND .E. $ABORT$                                       0831
              MTLIST.(CONTRL)                                            0832
              MTLIST.(TSTACK)                                            0833
              MTLIST.(RSTACK)                                            0834
              MTLIST.(OSTACK)                                            0835
CLEAR1        W'R NOW .NE. VIRGIN                                        0836
                NEWCON=POPTOP.(NOW)                                      0837
                IRALST.(NOW)                                             0838
                NOW=NEWCON                                               0839
                T'O CLEAR1                                               0840
              E'L                                                        0841
              F'N                                                        0842
            O'R COMAND .E. $TRACE$                                       0843
              T1=1B                                                      0844
            O'R COMAND .E. $HOLD$                                        0845
              NEWBOT.(FENCE,TSTACK)                                      0846
              RDLONL.(LIST.(TERM))                                       0847
              NEWBOT.(INTRP2,CONTRL)                                     0848
              T'O BEGINB                                                 0849
INTRP2        RID.(TSTACK,FENCE)                                         0850
              IRALST.(TERM)                                              0851
              T'O INTRP1                                                 0852
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                E'L                                                    0853
              E'L                                                      0854
              PLATZ=POPBOT.(CONTRL)                                    0855
              T'O THERE                                                0856
FINI          F'N IMASS(1)                                             0857
             R                                                         0858
             R      THE ' LET' MECHANISM                               0859
             R                                                         0860
SPEC(0)       TERM=SEQLR.(R,F)                                         0861
              S=SEQRDR.(TERM)                                          0862
              MANY.(LIST.(NEWCON),NOW,NOW)                             0863
              LETVAL=NOW                                               0864
              NOW=NEWCON                                               0865
              HOST=NOW                                                 0866
              T'O SPEC1                                                0867
             R                                                         0868
             R      THE 'DEFINE' MECHANISM                             0869
             R                                                         0870
SPEC(1)       HOST=VIRGIN                                              0871
               LETVAL=0                                                0872
              S=SEQRDR.(SEQLR.(R,F))                                   0873
SPEC1         NAME=SEQLR.(S,F)                                         0874
RADNG         W'R S .L. 0                                              0875
                SEQLR.(S,F)                                            0876
                T'O RADNG                                              0877
              E'L                                                      0878
              BVLIST=SEQLR.(S,F)                                       0879
              W'R BVLIST .E. $=$                                       0880
                NEWVAL.(NAME,FINDT.(NAME,0),NOW)                       0881
                T'O BEGINB                                             0882
              O'R F .G. 0                                              0883
                NEWVAL.(NAME,0,NOW)                                    0884
                T'O END                                                0885
              E'L                                                      0886
              IT=LIST.(9)                                              0887
              NEWVAL.(NAME,IT,HOST)   <-- WEAK = NOW                   0888
              W'R LETVAL .NE. 0                                        0889
                  WEAK=LIST.(9)                                        0890
                  NEWBOT.(BOT.(HOST),WEAK)                             0891
             R                                                         0892
             R      *     *     *     *     *                         0893
             R      THE 'WEAK POINTER' DEVICE                         0894
             R      THE 'ID' OF THE HEADER OF THE LIST THAT           0895
             R      IS TO BE MADE A 'WEAK' SUBLIST OF ANOTHER         0896
             R      LIST IS TEMPORARILY CHANGED TO ZERO.  THIS        0897
             R      ASSURES THAT THE COUNTER OF THE SUBJECT LIST      0898
             R      IS NEITHER COUNTED UP WHEN THIS PLACEMENT         0899
             R      IS MADE, NOR COUNTED DOWN WHEN THE HOST           0900
             R      LIST FINALLY DISAPPEARS.                          0901
             R                                                        0902
                NEWVAL.(NAME,WEAKN.(IT),WEAK)                          0903
                STRENG.(IT)                                            0904
             R      *     *     *     *     *                         0905
             R                                                        0906
              E'L                                                      0907
              NEWVAL.($BVLIST$,BVLIST,IT)                              0908
              NEWVAL.($KNOT$, WEAK,IT)                                 0909
              SEQLR.(S,F)                                              0910
PUTSY         WORD=SEQLR.(S,F)                                         0911
              W'R  F .G. 0, T'O END                                    0912
              THAT=NEWBOT.(WORD,IT)                                    0913
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                W'R S .L. 0, MRKNEG.(THAT)                                      C914
                MRKIND.((3K11.A.S).RS.34,THAT)                                  C915
                T'O PUTSY                                                       C916
               R                                                                C917
               R     THE 'LIST', 'SEQLR', AND 'SEQLL'                           C918
               R     MECHANISMS                                                 C919
               R                                                                C920
    SPEC(2)     CONTINUE                                                        C921
    SPEC(3)     CONTINUE                                                        C922
    SPEC(4)     DATUM=TOP.(SEQLR.(R,F))                                         C923
                W'R DATUM .E. 0                                                 C924
                  NEWBOT.(LIST.(9),TSTACK)                                      C925
                  T'O END                                                       C926
                E'L                                                             C927
                DATE=FINDT.(DATUM,0)                                            C928
                W'R GOOD                                                        C929
                  WOLIST=WO                                                     C930
                O'E                                                             C931
                  WOLIST=NOW                                                    C932
                E'L                                                             C933
                T'O FN(I-2)                                                     C934
    FN(0)       INTERN=LIST.(9)                                                 C935
                NEWVAL.(DATUM,INTERN,WOLIST)                                    C936
                NEWBOT.(INTERN,TSTACK)                                          C937
                T'O END                                                         C938
    FN(1)       INTERN=SEQLR.(DATE,F)                                           C939
    FN1         NEWBOT.(INTERN,TSTACK)                                          C940
                NEWVAL.(DATUM,DATE,WOLIST)                                      C941
                T'O END                                                         C942
    FN(2)       INTERN=SEQLL.(DATE,F)                                           C943
                T'O FN1                                                         C944
    SPEC(5)             TERM=SEQLR.(R,F)                                        C945
    SPEC5               NEWBOT.(FENCE,TSTACK)                                   C946
                        NEWBOT.(LISTOF,CONTRL)                                  C947
                        T'O BEGINB                                              C948
    LISTOF              HOSTEL=LIST.(9)                                         C949
                        S=SEQRDR.(TSTACK)                                       C950
    OFLIST              W'R BOT.(TSTACK) .NE. FENCE                             C951
                          WORD=SEQLL.(S,F)                                      C952
                          MRKIND.((3K11 .A.S).RS.34,NEWTOP.(WORD,HOSTEL))       C953
                          POPBOT.(TSTACK)                                       C954
                          T'O OFLIST                                            C955
                        O'E                                                     C956
                          SUBSBT.(HOSTEL,TSTACK)                                C957
                          RSLT=BOT.(TSTACK)                                     C958
                          T'O END                                               C959
                        E'L                                                     C960
    SPEC(6)     TERM=SEQLR.(R,F)                                                C961
                OUTS=SEQRDR.(TERM)                                              C962
    BEGOUT      MTLIST.(OUT)                                                    C963
    MOROUT      WORD=SEQLR.(OUTS,OUTF)                                          C964
                W'R WORD .NE. $,$ .AND. OUTF .LE. 0                             C965
                  W'R WORD .E. $'$                                              C966
                    W'R LEMPTY.(OUT)                                            C967
                      NEWTOP.(WORD,OUT)                                         C968
                      T'O MOROUT                                                C969
                    O'E                                                         C970
                      POPTOP.(OUT)                                              C971
                      TXTPRT.(OUT,NOCR)                                         C972
                      MTLIST.(OUT)                                              C973
                      WORD=SEQLR.(OUTS,OUTF)                                    C974
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                    W'R OUTF .G. 0, T'O END                                  0975
                    W'R WORD .E. $,$, T'O MOROUT                             0976
                    MRKIND.(INDCTR.(OUTS),NEWBOT.(WORD,OUT))                 0977
                    SEQLR.(OUTS,OUTF)                                        0978
                    T'O OUTEVL                                               0979
                  E'L                                                        0980
                O'R WORD .E. $TAB$ .OR. WORD .E. $TABS$                      0981
                  TI=POPBOT.(OUT)                                            0982
                  T'H TAB, FOR TABS=1,1, TABS .G. TI                         0983
TAB               PRMESA.(725757575757K)                                     0984
                  T'O MOROT1                                                 0985
                O'R WORD .E. $LINE$ .OR. WORD .E. $LINES$                    0986
                  TI=POPBOT.(OUT)                                            0987
                  T'H LINE, FOR TABS=1,1, TABS .G. TI                        0988
LINE              PRMESS.(575757575757K)                                     0989
MOROT1            SEQLR.(OUTS,OUTF)                                          0990
                  T'O MOROT2                                                 0991
                E'L                                                          0992
                  ADDS=NEWBOT.(WORD,OUT)                                     0993
                  W'R OUTS .L. 0, MRKNEG.(ADDS)                              0994
                  W'R OUTS .A. 2K11 .NE. 0, MRKIND.(1,ADDS)                  0995
                  T'O MOROUT                                                 0996
              O'E                                                            0997
                TXTPRT.(OUT,NOCR)                                            0998
OUTEVL          TERM=OUT                                                     0999
                NEWBOT.(OUTYPE,CONTRL)                                       1000
                T'O BEGINB                                                   1001
OUTYPE          OEPRNT.($ $,POPBOT.(TSTACK))                                 1002
MOROT2          W'R OUTF .L. 0 , T'O BEGOUT                                  1003
                MTLIST.(OUT)                                                 1004
                T'O END                                                      1005
              E'L                                                            1006
SPEC(7)       TERM=SEQLR.(R,F)                                               1007
              R7=SEQRDR.(TERM)                                               1008
RM7           WORD=SEQLR.(R7,F)                                              1009
              W'R F .G. 0, T'O END                                           1010
              W'R WORD .E. $,$, T'O RM7                                      1011
              POPTOP.(IN)                                                    1012
              W'R TOP.(IN) .NE. $=$, POPTOP.(IN)                             1013
              NEXT=SEQLR.(R7,F)                                              1014
              W'R F .NE. 0                                                   1015
                SEQLL.(R7,F)                                                 1016
              O'E                                                            1017
                WORD1=WORD                                                   1018
                TERM=NEXT                                                    1019
                PRMESA.(WORD)                                                1020
                NEWBOT.(RM71,CONTRL)                                         1021
                T'O SPEC5                                                    1022
RM71            TXTPRT.(RSLT,NOCR)                                           1023
                PRMESA.($  =  $)                                             1024
                NEWTOP.(RSLT,IN)                                             1025
                POPBOT.(TSTACK)                                              1026
                MRKIND.(1,NEWTOP.(WORD1,IN))                                 1027
                T'O RM72                                                     1028
              E'L                                                            1029
              MRKIND.(1,NEWTOP.(WORD,IN))                                    1030
              PRMESA.(WORD,$=$)                                              1031
RM72          NEWBOT.(RM7,CONTRL)                                            1032
              TERM=IN                                                        1033
              T'O BEGINB                                                     1034
SPEC(8)       FR=SEQRDR.(SEQLR.(R,F))                                        1035
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FR1         WORD=SEQLR.(FR,F)                                                    1036
            W'R F .G. 0                                                          1037
              W'R NOW.E.VIRGIN.OR..NOT.LEMPTY.(LSTNAM.(NOW)),T'O END              1038
              NEWCON=NOW                                                         1039
              NOW=TOP.(NOW)                                                      1040
              IRALST.(NEWCON)                                                    1041
              T'O END                                                            1042
            O'R WORD .E. $,$                                                     1043
              T'O FR1                                                            1044
            O'E                                                                  1045
              CURRNT=NOW                                                         1046
FR2           W'R ITSVAL.(WORD,CURRNT) .NE. 0                                    1047
                NOATVL.(WORD,CURRNT)                                             1048
                T'O FR3                                                          1049
              O'E                                                                1050
                W'R CURRNT .E. VIRGIN, T'O FR3                                   1051
                CURRNT=TOP.(CURRNT)                                              1052
                T'O FR2                                                          1053
              E'L                                                                1054
FR3           W'R FR .L. 0                                                       1055
                SEQLR.(FR,F)                                                     1056
                T'O FR3                                                          1057
              O'E                                                                1058
                T'O FR1                                                          1059
              E'L                                                                1060
            E'L                                                                  1061
UNTO        UNTLST=SEQLR.(R,F)                                                   1062
            RPTLST=SEQLR.(R,F)                                                   1063
            TERM=UNTLST                                                          1064
            MANY.(CONTRL,UNTLST,RPTLST,UNT1)                                     1065
            T'O BEGINB                                                           1066
UNT1        RSLT=POPBOT.(TSTACK)                                                 1067
            W'R RSLT .E. FALSE                                                   1068
              POPBOT.(CONTRL)                                                    1069
              POPBOT.(CONTRL)                                                    1070
              T'O END                                                            1071
            O'E                                                                  1072
              TERM=BOT.(CONTRL)                                                  1073
              NEWBOT.(UNT2,CONTRL)                                               1074
              T'O BEGINB                                                         1075
            E'L                                                                  1076
12  UNT2    TERM=NTHBOT.(CONTRL,2)                                               1077
            NEWBOT.(UNT1,CONTRL)                                                 1078
11          T'O BEGINB                                                           1079
SPEC(9)     FALSE=0                                                              1080
10          T'O UNTO                                                             1081
SPEC(10)    TERM=SEQLR.(R,F)                                                     1082
9           MRKLST.(1,NOW)                                                       1083
            W'R TERM .E. $,$                                                     1084
8             MRKLST.(0,NOW)                                                     1085
              T'O END                                                            1086
7           E'L                                                                  1087
            S=SEQRDR.(TERM)                                                      1088
6           LETVAL=BOT.(NOW)                                                     1089
            HOST=NOW                                                             1090
5           NEWBOT.(SPEC(10),CONTRL)                                             1091
            T'O SPEC1                                                            1092
SPEC(11)    TERM=SEQLR.(R,F)                                                     1093
4           W'R TOP.(TERM) .E. $OFF$                                             1094
3             T1=OB                                                              1095
            O'E                                                                  1096
2
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                T1=1B                                                    1097
              E'L                                                        1098
              T'O END                                                    1099
SPEC(12)      NEWBOT.(SPEC12,CONTRL)                                     1100
              T'O SPEC(5)                                                1101
SPEC12        NEWTOP.($ARRAY$,BOT.(TSTACK))                              1102
              T'O END                                                    1103
SPEC(14)      FINDT.(TOP.(SEQLR.(R,F)),0)                                1104
              NEWBOT.(GOOD,TSTACK)                                       1105
              T'O END                                                    1106
SPEC(15)      S=SEQRDR.(SEQLR.(R,F))                                     1107
              VI=LSTNAM.(VIRGIN)                                         1108
SPEC15        TERM=SEQLR.(S,F)                                           1109
              W'R F .G. 0, T'O END                                       1110
              W'R S .L. 0 .OR. TERM .E. $,$, T'O SPEC15                  1111
              W'R VALUE.(TERM,VI) .E. $ABSENT$                           1112
                NEWTOP.(0,VI)                                            1113
                NEWTOP.(TERM,VI)                                         1114
              E'L                                                        1115
              T'O SPEC15                                                 1116
              INTERNAL FUNCTION(WHAT,HOW)                                1117
              BOOLEAN GOOD                                               1118
              E'O FINDT.                                                 1119
              THAT=WHAT                                                  1120
              WO=NOW                                                     1121
              W'R LSTMRK.(WO)                                            1122
                W'R CONT.(77777K .A. R+1) .NE. $=$                       1123
MRKTST            WO=BOT.(WO)                                            1124
                  W'R LSTMRK.(WO), T'O MRKTST                            1125
                O'E                                                      1126
                  NEWVAL.(THAT,0,WO)                                     1127
                E'L                                                      1128
              E'L                                                        1129
              WOL=LSTNAM.(WO)                                            1130
              W'R WOL .E. 0                                              1131
                WO=BOT.(NOW)                                             1132
                T'O FIND1                                                1133
              O'E                                                        1134
                T'O FIND2                                                1135
              E'L                                                        1136
FIND1         WOL=LSTNAM.(WO)                                            1137
FIND2         IT=VALUE.(THAT,WOL)                                        1138
              W'R IT .E. $ABSENT$                                        1139
                W'R WO .NE. VIRGIN                                       1140
MRKT2             WO=BOT.(WO)                                            1141
                  W'R LSTMRK.(WO), T'O MRKT2                             1142
                  T'O FIND1                                              1143
                O'E                                                      1144
                  GOOD=0B                                                1145
                E'L                                                      1146
              O'E                                                        1147
                GOOD=1B                                                  1148
              E'L                                                        1149
              W'R CONT.(77777K .A. R+1) .E. $=$                          1150
                FSIGN=0B                                                 1151
                W'R GOOD                                                 1152
                  F'N 77777K .A. CONT.(ATRADR.(THAT,WOL))                1153
                O'E                                                      1154
                  F'N THAT                                               1155
                E'L                                                      1156
              E'L                                                        1157
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                FSIGN=1B                                                    1158
                W'R GOOD, F'N IT                                            1159
                T'O FIND(HOW)                                               1160
FIND(0)         F'N 0                                                       1161
FIND(1)         NEWVAL.(THAT,0,NOW)                                         1162
                F'N 0                                                       1163
FIND(2)         PRMESS.($IDENTIFIER $,THAT, $ UNDEFINED$)                   1164
                RDLONL.(LIST.(NEWTER))                                      1165
                MANY.(CONTRL,THAT,FIND3)                                    1166
                TERM=NEWTER                                                 1167
                T'O BEGINB                                                  1168
FIND3           IT=POPBOT.(TSTACK)                                          1169
                THAT=POPBOT.(CONTRL)                                        1170
                NEWVAL.(THAT,IT,NOW)                                        1171
                IRALST.(NEWTER)                                             1172
                F'N IT                                                      1173
                E'N                                                         1174
                INTERNAL FUNCTION(STACKS,WORDY)                             1175
                E'O RID.                                                    1176
                RIDDER=SEQRDR.(STACKS)                                      1177
RID1            SEQWRD=SEQLL.(RIDDER,FRID)                                  1178
                W'R FRID .G. 0, F'N                                         1179
                W'R SEQWRD .E. WORDY                                        1180
                  POPBOT.(STACKS)                                           1181
                  F'N                                                       1182
                O'E                                                         1183
                  POPBOT.(STACKS)                                           1184
                  T'O RID1                                                  1185
                E'L                                                         1186
                E'N                                                         1187
                INTERNAL FUNCTION(OPER)                                     1188
                E'O DOES.                                                   1189
                FIRST=POPBOT.(TSTACK)                                       1190
                W'R LEMPTY.(TSTACK)                                         1191
                  SECOND=FIRST                                              1192
                  FIRST=IMASS(1)                                            1193
                O'E                                                         1194
                  SECOND=POPBOT.(TSTACK)                                    1195
                E'L                                                         1196
                MM=OPER                                                     1197
                T'O DO(MM)                                                  1198
RSLPLA          NEWBOT.(RESULT,TSTACK)                                      1199
                W'R T1                                                      1200
                  W'R OPER .GE.  12                                         1201
                    PRMESS.($OP$,OPS2(OPER-12))                             1202
                  O'E                                                       1203
                    PRMESS.($OP$,OPS(OPER))                                 1204
                  E'L                                                       1205
                  OEPRNT.($FIRST$,FF)                                       1206
                  OEPRNT.($SECOND$,SS)                                      1207
                  OEPRNT.($RESULT$,RESULT)                                  1208
                E'L                                                         1209
                F'N                                                         1210
DO(C)           W'R NAMTST.(SECOND) .E. 0                                   121
                  W'R TOP.(SECOND) .E. $ARRAY$                              121
                    NEWVAL.(POPBOT.(SECOND),FIRST,SECOND)                   121
                    RSLT=FIRST                                              121
                    T'O RSLPLA                                              121
                  E'L                                                       121
                E'L                                                         121
                W'R 77777K6 .A. SECOND .E. 0                                121
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                SUBST.(FIRST,SECOND)                                    1219
              O'E                                                       1220
                NEWVAL.(SECOND,FIRST,NCW)                               1221
              E'L                                                       1222
              IMASS(1)=FIRST                                            1223
              W'R .NOT. LEMPTY.(OSTACK) .AND. BOT.(OSTACK) .NE. FENCE   1224
                NEWBOT.(FIRST,TSTACK)                                   1225
              E'L                                                       1226
              F'N                                                       1227
DO(1)         RESULT=SS+FF                                              1228
              T'O RSLPLA                                                1229
DO(2)         RESULT=SS-FF                                              1230
              T'O RSLPLA                                                1231
DO(3)         RESULT=SS/FF                                              1232
              T'O RSLPLA                                                1233
DO(4)         RESULT=SS*FF                                              1234
              T'O RSLPLA                                                1235
DO(5)         W'R FF .E. 2.0                                            1236
                RESULT= SS*SS                                           1237
              O'R FF .E. 3.0                                            1238
                RESULT=SS*SS*SS                                         1239
              O'E                                                       1240
                RESULT=SS .P. FF                                        1241
              E'L                                                       1242
              T'O RSLPLA                                                1243
DO(19)        RSLT=FIRST .A. SECOND                                     1244
              T'O RSLPLA                                                1245
DO(18)        RSLT=FIRST .V. SECOND                                     1246
              T'O RSLPLA                                                1247
DO(12)        W'R FF .E. SS                                             1248
RONE            RSLT=1                                                  1249
              O'E                                                       1250
RZERO           RESULT=0                                                1251
              E'L                                                       1252
              T'O RSLPLA                                                1253
DO(13)        W'R SS .L. FF, T'O RONE                                   1254
              T'O RZERO                                                 1255
DO(14)        W'R SS .G. FF, T'O RONE                                   1256
              T'O RZERO                                                 1257
DO(15)        W'R SS .GE. FF, T'O RONE                                  1258
              T'O RZERO                                                 1259
DO(16)        W'R SS .NE.  FF, T'O RONE                                 1260
              T'O RZERO                                                 1261
DO(17)        W'R SS.LE. FF, T'O RONE                                   1262
              T'O RZERO                                                 1263
              E'N                                                       1264
              E'N                                                       1265
            R                                                           1266
            R     THE SECTION 'INTERN' CONTAINS THE                     1267
            R     FOLLOWING INTERNAL FUNCTIONS -                        1268
            R     FINDT.(WHAT,HOW)                                      1269
            R     RID.(STACKS,WORDY)                                    1270
            R     DOES.(OPER)                                           1271
            R     THE LAST PERFORMS ALL INFIX OPERATIONS                1272
            R                                                           1273
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PRINT   D1   MAD  EVAL   MAD    D1   MAD  EVAL   MAD                    T0109
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NEWALP  FAP 06/17/67 0914.3     301         00000
        ENTRY   LETTER
        ENTRY   SEPER
        ENTRY   ALPHA
ALPHA   CLA     BLANKA          BLANK LOOKS LIKE ALPHA-CHAR
        STO     BLANK
        TRA     LETTER+2
SEPER   CLA     BLANKC
        STO     BLANK
        TRA     LETTER+2
LETTER  CLA     BLANKB          BLANK HAS 'NINE CODE'
        STO     BLANK
        LDQ*    1,4
        CRQ     TABLE,,6
        XCA
        TRA     2,4
TABLE   SYN     *
        DUP     1,10
        VFD     6/12,15/0,15/TABLE      INTEGERS 0 THROUGH 9
        VFD     6/9,15/0,15/TABLE MISSING CHARACTER OCTAL 12
        VFD     6/1,15/0,15/TABLE EQUAL SIGN (13)
        VFD     6/14,15/0,15/TABLE      APOSTROPHE (14)
        DUP     1,3
        VFD     6/9,15/0,15/TABLE MISSING CHARACTERS (15-17)
        VFD     6/3,15/0,15/TABLE + (20)
        DUP     1,9
        VFD     6/4,15/0,15/TABLE LETTERS A THROUGH I (21-31)
        VFD     6/9,15/0,15/TABLE (32)
        VFD     6/5,15/0,15/TABLE PERIOD (33)
        VFD     6/6,15/0,15/TABLE ) (34)
        VFD     6/17,15/0,15/TABLE      COLON
        DUP     1,2
        VFD     6/9,15/0,15/TABLE BACKSPACE,CARRIAGE RETURN ( CODE 9)
        VFD     6/2,15/0,15/TABLE MINUS SIGN (42)
        DUP     1,9
        VFD     6/4,15/0,15/TABLE THE LETTERS J THROUGH R (41-51)
        VFD     6/9,15/0,15/TABLE MISSING (52)
        VFD     6/7,15/0,15/TABLE DOLLAR SIGN (53)
        VFD     6/8,15/0,15/TABLE * (54)
        DUP     1,2
        VFD     6/9,15/0,15/TABLE
        VFD     6/18,15/0,15/TABLE      NULL
BLANK   PZE
        VFD     6/11,15/0,15/TABLE      SLASH (61)
        DUP     1,8
        VFD     6/4,15/0,15/TABLE S-Z (62-71)
        VFD     6/9,15/0,15/TABLE
        VFD     6/13,15/0,15/TABLE      COMMA
        VFD     6/10,15/0,15/TABLE      LEFT PAREN (74)
        DUP     1,2
        VFD     6/9,15/0,15/TABLE
        VFD     6/15,15/0,15/TABLE      (77)
BLANKA  VFD     6/4,15/0,15/TABLE
BLANKB  VFD     6/9,15/0,15/TABLE
BLANKC  VFD     6/16,15/0,15/TABLE
```

```
          END
```

```
 LOGIC    FAP 10/01/66 1755.0       42          00000
          ENTRY    AND
          ENTRY    OR
          ENTRY    NOT
AND       CAL*     1,4
          ANA*     2,4
          TRA      3,4
OR        CAL*     1,4
          ORA*     2,4
          TRA      3,4
NOT       CLA*     1,4
          COM
          ANA      =0000000000001
          TRA      2,4
          END
```

```
   SEQ    FAP 06/17/67 0914.3      116          00000
          ENTRY    SEQRDR
          ENTRY    SEQLR
          ENTRY    SEQLL
SEQRDR    CLA*     1,4
          STA      *+1
          CLA      **
          TRA      2,4
SEQLR     CLA*     1,4
          STA      LINK
          TRA      START
SEQLL     CLA*     1,4
          ARS      18
          STA      LINK
START     SXA      SAVE,1
LINK      AXC      **,1
          CLA      2,4
          STA      FLAG
          CLA      1,4
          STA      *+2
          CLA      0,1
          STO      **
          ANA      =0700000
          ARS      15
          SUB      =1
FLAG      STO      **
          CAS      =1
          TRA      *+5
          TRA      *+2
          TRA      *+3
          CLA      NIL
          TRA      SAVE
          CLA      1,1
SAVE      AXT      **,1
          TRA      3,4
NIL       BCI      1,NIL
          END
```

```
SUB    EAP 08/20/66 1332.4      209          00000
       ENTRY   SUBST
       ENTRY   SUBSTP
       ENTRY   SUBSBT
SUBSTP SXA     FOUR,4
       SXA     TWO,2
       CLA*    1,4
       STO     DATUM
       CLA*    2,4
       PAC     ,2
       CLA     ,2
       TRA     START
SUBSBT SXA     FOUR,4
       SXA     TWO,2
       CLA*    1,4
       STO     DATUM
       CLA*    2,4
       PAC     ,2
       CLA     ,2
       ARS     18
       TRA     START
SUBST  SXA     FOUR,4
       SXA     TWO,2
       CLA*    1,4
       STO     DATUM
       CLA*    2,4
START  PAC     ,2
       CLA     1,2
       STO     PRESNT
       CLA     ,2
       ANA     =0700000
       CAS     =0100000
       TRA     *+2
       TRA     NAME
TEST   TSX     $NAMTST,4
       TXH     DATUM
       TNZ     NOLIST
       CLA     =0100000
       STT     ,2
       CLA     DATUM
       PAC     ,4
       CLA     1,4
       ADD     =1
       STO     1,4
NOLIST CLA     DATUM
       STO     1,2
       CLA     PRESNT
FOUR   AXT     **,4
TWO    AXT     **,2
       TRA     3,4
NAME   TSX     $NUCELL,4
       TXH     DATUM
       PAC     ,4
       STA     CELL
       CLA     ,2
       STO     ,4
       CLA     PRESNT
```

```
            STO     1,4                                          01820
            TSX     $RCELL,4                                     01830
            TXH     CELL                                         01840
            ZAC                                                  01850
            STT     ,2                                           01860
            TRA     TEST                                         01870
PRESNT      PZE                                                  01880
CELL        PZE                                                  01890
DATUM       PZE                                                  01900
            END                                                  01910
                                                                 01920
                                                                 01930
                                                                 01940
                                                                 01950
  HASH   FAP 08/20/66 1332.4      72          00000              01960
            ENTRY   HASH                                         01970
            ENTRY   HASH1                                        01980
HASH        CLA     =0                                           01990
            STO     CNSTNT                                       02000
            TRA     START                                        02010
HASH1       CLA     =1                                           02020
            STO     CNSTNT                                       02030
START       LDQ*    1,4                                          02040
            CLA*    2,4                                          02050
            STA     SHIFT                                        02060
            ARS     1                                            02070
            STA     *+2                                          02080
            MPY*    1,4                                          02090
            LLS     **                                           02100
            STA     TEMP                                         02110
            LDQ     =0777777777777                               02120
            ZAC                                                  02130
SHIFT       LLS     **                                           02140
            ANA     TEMP                                         02150
            ADD     CNSTNT                                       02160
            TRA     3,4                                          02170
TEMP        PZE                                                  02180
CNSTNT      PZE                                                  02190
            END                                                  02200
                                                                 02210
                                                                 02220
                                                                 02230
                                                                 02240
   VAL   FAP 08/20/66 1332.4      115         00000              02250
            ENTRY   VALUE                                        02260
VALUE       SXA     X2,2                                         02270
            CLA*    1,4                                          02280
            STO     ATBUT                                        02290
            CLA*    2,4                                          02300
            STA     *+1                                          02310
            CAL     **                                           02320
            STO     HEADER                                       02330
TRY         PAC     ,2                                           02340
            CLA     ,2                                           02350
            STO     NEXT                                         02360
            CAS     HEADER                                       02370
            TRA     *+2                                          02380
            TRA     FAIL                                         02390
            CLA     1,2                                          02400
            CAS     ATBUT                                        02410
            TRA     *+2                                          02420
```

```
                TRA     FOUND                                          02430
                CLA     NEXT                                           02440
                STA     *+1                                            02450
                CLA     **                                             02460
                CAS     HEADER                                         02470
                TRA     TRY                                            02480
                TRA     FAIL                                           02490
                TRA     TRY                                            02500
FOUND           CLA     NEXT                                           02510
                PAC     ,2                                             02520
                CLA     1,2                                            02530
X2              AXT     ,2                                             02540
                TRA     3,4                                            02550
FAIL            CLA     ABSENT                                         02560
                TRA     X2                                             02570
HEADER          PZE                                                    02580
NEXT            PZE                                                    02590
ATBUT           PZE                                                    02600
ABSENT          BCI     1,ABSENT                                       02610
                END                                                    02620
                                                                       02630
                                                                       02640
                                                                       02650
                                                                       02660
PRIMIT  FAP 08/20/66 1332.4     261             00000                  02670
                ENTRY   SETDIR                                         02680
                ENTRY   MADOV                                          02690
                ENTRY   MRKPOS                                         02700
                ENTRY   MRKNEG                                         02710
                ENTRY   LNKR                                           02720
                ENTRY   LNKL                                           02730
                ENTRY   ID                                             02740
                ENTRY   STRIND                                         02750
                ENTRY   SETIND                                         02760
                ENTRY   CONT                                           02770
                ENTRY   INDCTR                                         02780
                ENTRY   MRKIND                                         02790
LNKL            CAL*    1,4                                            02800
                ANA     =077777000000                                  02810
                ARS     18                                             02820
12              TRA     2,4                                            02830
LNKR            CAL*    1,4                                            02840
11              ANA     =077777                                        02850
                TRA     2,4                                            02860
ID      10      CAL*    1,4                                            02870
                ANA     =0700000                                       02880
                ARS     15                                             02890
9               TRA     2,4                                            02900
STRIND  8       CLA*    2,4                                            02910
                STA     *+2                                            02920
7               CLA*    1,4                                            02930
                STO     **                                             02940
6               TRA     3,4                                            02950
SETDIR          CLA     4,4                                            02960
AAA     5       STA     A                                              02970
                STA     C                                              02980
4               STA     E                                              02990
                CLA*    1,4                                            03000
3               TMI     B                                              03010
                ALS     15                                             03020
A       2       STT     **                                             03030
```

```
B       CLA*    2,4                                                     03040
        TMI     D                                                       03050
        ALS     18                                                      03060
C       STD     **                                                      03070
D       CLA*    3,4                                                     03080
        TMI     F                                                       03090
E       STA     **                                                      03100
F       CLA*    *-1                                                     03110
        TRA     5,4                                                     03120
SETIND  CLA*    4,4                                                     03130
        TRA     AAA                                                     03140
CONT    CLA*    1,4                                                     03150
        STA     *+1                                                     03160
        CLA     **                                                      03170
        TRA     2,4                                                     03180
MADOV   CAL     1,4                                                     03190
        ANA     =077777                                                 03200
        TRA     2,4                                                     03210
MRKPOS  CLA*    1,4                                                     03220
        STA     *+2                                                     03230
        STA     *+3                                                     03240
        CLA     **                                                      03250
        SSP                                                             03260
        STO     **                                                      03270
        TRA     2,4                                                     03280
MRKNEG  CLA*    1,4                                                     03290
        STA     *+2                                                     03300
        STA     *+3                                                     03310
        CLA     **                                                      03320
        SSM                                                             03330
        STO     **                                                      03340
        TRA     2,4                                                     03350
INDCTR  CAL*    1,4                                                     03360
        ARS     34                                                      03370
        TRA     2,4                                                     03380
MRKIND  CLA*    1,4                                                     03390
        ALS     34                                                      03400
        SLW     PREF                                                    03410
        CLA*    2,4                                                     03420
        STA     *+2                                                     03430
        STA     *+3                                                     03440
        CAL     **                                                      03450
        ORA     PREF                                                    03460
        SLW     **                                                      03470
        TRA     3,4                                                     03480
PREF    PZE                                                             03490
        END                                                             03500
                                                                        03510
                                                                        03520
                                                                        03530
                                                                        03540
ABANDN   FAP 08/20/66 1332.4       35          00000                    03550
        ENTRY   ABANDN                                                  03560
ABANDN  SXA     FOUR,4                                                  03570
        CLA*    1,4                                                     03580
        PAC     ,4                                                      03590
        CLA     1,4                                                     03600
        SUB     =1                                                      03610
        STA     1,4                                                     03620
FOUR    AXT     **,4                                                    03630
        CLA*    1,4                                                     03640
```

```
            TRA     2,4                                                 03650
            END                                                         03660
                                                                        03670
                                                                        03680
                                                                        03690
                                                                        03700
    INIT    FAP 06/17/67 0914.3     1596            00000               03710
     *****LINE-MARK ERROR
                                                                        03720
                                                                        03730
                                                                        03740
                                                                        03750
    MAKEDL    FAP 08/20/66 1332.4       95            00000             03760
            ENTRY MAKEDL                                                03770
    MAKEDL  SXA     TWO,2                                               03780
            SXA     FOUR,4                                              03790
            CLA*    1,4                                                 03800
            STO     DNAME                                               03810
            PAC     ,2                                                  03820
            CLA*    2,4                                                 03830
            PAC     ,4                                                  03840
            CLA     1,4                                                 03850
            STO     LHEAD                                               03860
            ARS     18                                                  03870
            STO     OLDLST                                              03880
            TNZ     NOTMT                                               03890
    MT      SCD     LHEAD,2                                             03900
            CLA     LHEAD                                               03910
            STO     1,4                                                 03920
            CLA     1,2                                                 03930
            ADD     =1                                                  03940
            STA     1,2                                                 03950
    FOUR    AXT     **,4                                                03960
            CLA*    2,4                                                 03970
    TWO     AXT     **,2                                                03980
            TRA     3,4                                                 03990
    NOTMT   TSX     $IRALST,4                                           04000
            TXH     OLDLST                                              04010
            TRA     MT                                                  04020
    OLDLST  PZE                                                         04030
    DNAME   PZE                                                         04040
    LHEAD   PZE                                                         04050
            END                                                         04060
                                                                        04070
                                                                        04080
                                                                        04090
                                                                        04100
    WRFLXB    FAP 08/20/66 1333.5       38            00000             04110
            ENTRY   WRFLXB                                              04120
    WRFLXB  SXA     SV4,4                                               04130
            CLA     1,4                                                 04140
            STA     WORD                                                04150
            CLA*    2,4                                                 04160
            ALS     18                                                  04170
            STD     WORD                                                04180
            TSX     $WRFLX,4                                            04190
    WORD    PZE     **                                                  04200
    SV4     AXT     **,4                                                04210
            TRA     3,4                                                 04220
            END                                                         04230
                                                                        04240
```

```
                                                                        04250
                                                                        04260
                                                                        04270
 LSTMT   FAP 08/20/66 1333.5      49          00000                     04280
         ENTRY   LISTMT                                                 04290
LISTMT   CLA*    1,4                                                    04300
         STA     *+1                                                    04310
         CLA     **                                                     04320
         STO     HEAD                                                   04330
         STA     *+1                                                    04340
         CLA     **                                                     04350
         CAS     HEAD                                                   04360
         TRA     NOT                                                    04370
         TRA     YES                                                    04380
NOT      CLA     =1                                                     04390
         TRA     2,4                                                    04400
YES      CLA     =0                                                     04410
         TRA     2,4                                                    04420
HEAD     PZE                                                            04430
         END                                                            04440
                                                                        04450
                                                                        04460
                                                                        04470
                                                                        04480
MADATR   FAP 06/17/67 0914.3     245         00000                     04490
         ENTRY   ATRADR                                                 04500
         ENTRY   MADATR                                                 04510
         ENTRY   MADOBJ                                                 04520
MADOBJ   SXA     OUT,2          SAVE B-BOX 2                           04530
         CLA*    2,4            GET LIST NAME                          04540
         STA     *+1                                                   04550
         CLA     **             GET LIST HEADER                        04560
         PAC     ,2             PLACE LINK TO TOP IN B2                04570
         CAL*    1,4            GET ATTRIBUTE                          04580
         SLW     ATBUTE         AND STORE                              04590
LOOK     CAL     ,2             GET LINK TO NEXT WORD                  04600
         STA     NXTLNK         PREPARE FOR NEXT TIME AROUND           04610
         ANA     =0700000       EXTRACT ID FIELD                       04620
         CAS     =0200000       SEE IF WE HAVE HEADER                  04630
         TRA     *+2                                                   04640
12       TRA     FAIL           IF HEADER, GET OUT                     04650
         CAL     1,2            GET DATUM                              04660
11       LAS     ATBUTE         SEE IF ITS WHAT WE NEED                04670
         TRA     *+2            IF NOT, DO MORE                        04680
10       TRA     FOUND          IF YES, HURRAY                         04690
         CLA     NXTLNK         PICK UP NEXT LINK                      04700
9        PAC     ,2             PLACE IN B2                            04710
         TRA     LOOK           LOOK SOME MORE                         04720
ATRADR   SXA     OUT,2                                                 04730
8        CLA*    2,4                                                   04740
         TRA     GETLST                                                04750
MADATR   SXA     OUT,2                                                 04760
6        CLA*    2,4                                                   04770
         PAC     ,2                                                    04780
5        CLA     1,2                                                   04790
         ARS     18                                                    04800
         TZE     FAIL                                                  04810
4        STA     *+1                                                   04820
GETLST   CLA     **                                                    04830
3        PAC     ,2                                                    04840
         CAL*    1,4                                                   04850
2
```

```
          SLW     ATBUTE                                          04860
NXTWRD    CAL     ,2                                              04870
          STA     NXTLNK                                          04880
          ANA     =0700000                                        04890
          CAS     =0200000                                        04900
          TRA     *+2                                             04910
          TRA     FAIL                                            04920
          CAL     1,2                                             04930
          LAS     ATBUTE                                          04940
          TRA     *+2                                             04950
          TRA     FOUND                                           04960
NXTLNK    CLA     **                                              04970
          PAC     ,2                                              04980
          ANA     =0700000                                        04990
          CAS     =0200000                                        05000
          TRA     NXTWRD                                          05010
          TRA     FAIL                                            05020
          TRA     NXTWRD                                          05030
FOUND     PCA     ,2                                              05040
OUT       AXT     **,2                                            05050
          TRA     3,4                                             05060
FAIL      ZAC                                                     05070
          TRA     OUT                                             05080
ATBUTE    PZE                                                     05090
          END                                                     05100
                                                                  05110
                                                                  05120
                                                                  05130
                                                                  05140
   PUT    FAP 08/20/66 1333.5      169          00000             05150
          ENTRY   NEWTOP                                          05160
          ENTRY   NEWBOT                                          05170
NEWTOP    CLA*    2,4                                             05180
          STA     *+1                                             05190
          CLA     **                                              05200
          STA     AA                                              05210
          STA     AB                                              05220
          TRA     START                                           05230
NEWBOT    CLA*    2,4                                             05240
          STA     AA                                              05250
12        STA     AB                                              05260
START     SXA     SV1,1                                           05270
11        SXA     SV4,4                                           05280
          CLA*    1,4                                             05290
10        STO     DATUM                                           05300
          STA     DA                                              05310
9         TSX     $NUCELL,4                                       05320
          TXH     *                                               05330
8         STA     *+1                                             05340
          AXC     **,1                                            05350
7         STA     NEW                                             05360
AA        CLA     **                                              05370
6         ANA     =077777000000                                   05380
          STD     0,1                                             05390
5         ARS     18                                              05400
          STA     LL                                              05410
4         CLA     AA                                              05420
          STA     0,1                                             05430
3         CLA     NEW                                             05440
LL        STA     **                                              05450
2         ALS     18                                              05460
```

```
AB      STD     **                                              05470
        TSX     $NAMTST,4                                       05480
        TXH     DATUM                                           05490
        TNZ     DONE                                            05500
        CLA     =0100000                                        05510
        STT     0,1                                             05520
        CLA     DA                                              05530
        ADD     =1                                              05540
        STA     *+2                                             05550
        STA     *+3                                             05560
        CLA     **                                              05570
        ADD     =1                                              05580
        STO     **                                              05590
DONE    CLA     DATUM                                           05600
        STO     1,1                                             05610
        CLA     NEW                                             05620
SV1     AXT     **,1                                            05630
SV4     AXT     **,4                                            05640
        TRA     3,4                                             05650
DATUM   PZE                                                     05660
NEW     PZE                                                     05670
DA      PZE                                                     05680
        END                                                     05690
                                                                05700
                                                                05710
                                                                05720
                                                                05730
ADVNC   FAP 08/20/66 1333.5     493         00000               05740
        ENTRY   ADVLNR                                          05750
        ENTRY   ADVLER                                          05760
        ENTRY   ADVLWR                                          05770
        ENTRY   ADVLNL                                          05780
        ENTRY   ADVLEL                                          05790
        ENTRY   ADVLWL                                          05800
        ENTRY   ADVSNR                                          05810
        ENTRY   ADVSER                                          05820
        ENTRY   ADVSWR                                          05830
        ENTRY   ADVSNL                                          05840
        ENTRY   ADVSEL                                          05850
        ENTRY   ADVSWL                                          05860
ADVLWR  STI     SVI                                             05870
        LDI     =01011                                          05880
        TRA     START                                           05890
ADVLER  STI     SVI                                             05900
        LDI     =01001                                          05910
        TRA     START                                           05920
ADVLNR  STI     SVI                                             05930
        LDI     =01010                                          05940
        TRA     START                                           05950
ADVLWL  STI     SVI                                             05960
        LDI     =01111                                          05970
        TRA     START                                           05980
ADVLEL  STI     SVI                                             05990
        LDI     =01101                                          06000
        TRA     START                                           06010
ADVLNL  STI     SVI                                             06020
        LDI     =01110                                          06030
        TRA     START                                           06040
ADVSWR  STI     SVI                                             06050
        LDI     =00011                                          06060
        TRA     START                                           06070
```

```
ADVSER  STI     SVI                                             06080
        LDI     =00001                                          06090
        TRA     START                                           06100
ADVSNR  STI     SVI                                             06110
        LDI     =00010                                          06120
        TRA     START                                           06130
ADVSWL  STI     SVI                                             06140
        LDI     =00111                                          06150
        TRA     START                                           06160
ADVSEL  STI     SVI                                             06170
        LDI     =00101                                          06180
        TRA     START                                           06190
ADVSNL  STI     SVI                                             06200
        LDI     =00110                                          06210
        TRA     START                                           06220
START   SXA     SV4,4                                           06230
        SXA     SV2,2                                           06240
        CAL*    1,4                                             06250
        PAC     ,4                                              06260
        CAL     1,4                                             06270
        SLW     LIST                                            06280
        CAL     0,4                                             06290
        SLW     CELL                                            06300
        PDC     ,4                                              06310
        CAL     0,4                                             06320
        SLW     CAND                                            06330
        ANA     =0700000                                        06340
        STO     ID                                              06350
        LAS     =0100000                                        06360
        TRA     ADV                                             06370
        TRA     XXX                                             06380
ADV     CAL     CAND                                            06390
ADV1    RNT     0100                                            06400
        ALS     18                                              06410
        STD     CELL                                            06420
        PDC     ,4                                              06430
        CAL     0,4                                             06440
        SLW     CAND                                            06450
        ANA     =0700000                                        06460
        STO     ID                                              06470
        LAS     =0100000                                        06480
        TRA     HEAD                                            06490
        TRA     NAME                                            06500
ELEM    RFT     0001                                            06510
        TRA     OKEXIT                                          06520
        TRA     ADV                                             06530
HEAD    RFT     1000                                            06540
        TRA     OKEXIT                                          06550
        LXA     LEVEL,4                                         06560
        TXL     OKEXIT,4,0                                      06570
        LXA     NEXTR,2                                         06580
        LAC     NEXTR,4                                         06590
        CAL     0,4                                             06600
        SLW     CELL                                            06610
        CAL     1,4                                             06620
        SLW     LIST                                            06630
        SXA     X,2                                             06640
        TSX     $RCELL,4                                        06650
        TXH     X                                               06660
        LDC     CELL,4                                          06670
        CAL     0,4                                             06680
```

```
                TRA     ADV1                                    06690
NAME            RFT     0010                                    06700
                TRA     OKEXIT                                  06710
XXX             RFT     1000                                    06720
                TRA     ADV                                     06730
                TSX     $NUCELL,4                               06740
                TXH     *                                       06750
                PAC     ,4                                      06760
                PAX     ,2                                      06770
                CLA     CELL                                    06780
                STO     0,4                                     06790
                CAL     LIST                                    06800
                SLW     1,4                                     06810
                ADD     =1                                      06820
                STA     LEVEL                                   06830
                SXA     NEXTR,2                                 06840
                LDC     CELL,4                                  06850
                CAL     1,4                                     06860
                STD     LIST                                    06870
                PDC     ,4                                      06880
                CAL     0,4                                     06890
                TRA     ADV1                                    06900
CELL            SYN     *                                       06910
NEXTR           SYN     *                                       06920
                PZE     ,3                                      06930
LIST            SYN     *                                       06940
LEVEL           SYN     *                                       06950
                PZE                                             06960
CAND            PZE     **                                      06970
SVI             PZE     **                                      06980
SV4             SYN     *                                       06990
OKEXIT          AXT     **,4                                    07000
                CLA     ID                                      07010
                ARS     15                                      07020
                SUB     =1                                      07030
                STO*    2,4                                     07040
                CAL*    1,4                                     07050
                PDC     ,2                                      07060
                CLA     CELL                                    07070
                STO     0,2                                     07080
                CLA     LIST                                    07090
                STO     1,2                                     07100
                LDC     CELL,2                                  07110
                CAL     0,2                                     07120
                ANA     =0400000000000                          07130
                TZE     POS                                     07140
                ORS*    1,4                                     07150
                TRA     DONE                                    07160
POS             CLA     =0377777777777                          07170
                ANS*    1,4                                     07180
DONE            CLA     1,2                                     07190
SV2             AXT     **,2                                    07200
                LDI     SVI                                     07210
                TRA     3,4                                     07220
ID              PZE     **                                      07230
Z               PZE     0                                       07240
X               PZE     ,,**                                    07250
                END                                             07260
                                                                07270
                                                                07280
                                                                07290
```

```
NOTETP   FAP 08/20/66 1333.5      248          00000
         ENTRY   NOTETP
         ENTRY   NOTEBT
NOTETP   CLA*    2,4
         STO     HOST
         STA     *+1
         CLA     **
         STA     AA
         STA     AB
         TRA     START
NOTEBT   CLA*    2,4
         STO     HOST
         STA     AA
         STA     AB
START    SXA     SV1,1
         SXA     SV4,4
         CLA*    1,4
         STO     DATUM
         STA     DA
         TSX     $NUCELL,4
         TXH     *
         STA     HOST
         STA     *+1
         AXC     **,1
         STA     NEW
AA       CLA     **
         ANA     =077777000000
         STD     0,1
         ARS     18
         STA     LL
         CLA     AA
         STA     0,1
         CLA     NEW
LL       STA     **
         ALS     18
AB       STD     **
         TSX     $NAMTST,4
         TXH     DATUM
         TNZ     DONE
         CLA     =0100000
         STT     0,1
         TSX     $ITSVAL,4
         TXH     MEMBER
         TXH     DATUM
         TZE     NOTYET
         STO     VALUE
PLACE    TSX     $NEWBOT,4
         TXH     HOST
         TXH     VALUE
         TRA     COUNT
NOTYET   TSX     $LIST,4
         TXH     NINE
         STO     VALUE
         TSX     $NEWVAL,4
         TXH     MEMBER
         TXH     VALUE
         TXH     DATUM
         TRA     PLACE
MEMBER   BCI     1,MEMBER
HOST     PZE
```

```
VALUE   PZE     **                                                      07910
NINE    DEC     9                                                       07920
COUNT   CLA     DA                                                      07930
        ADD     =1                                                      07940
        STA     *+2                                                     07950
        STA     *+3                                                     07960
        CLA     **                                                      07970
        ADD     =1                                                      07980
        STO     **                                                      07990
DONE    CLA     DATUM                                                   08000
        STO     1,1                                                     08010
        CLA     NEW                                                     08020
SV1     AXT     **,1                                                    08030
SV4     AXT     **,4                                                    08040
        TRA     3,4                                                     08050
DATUM   PZE                                                             08060
NEW     PZE                                                             08070
DA      PZE                                                             08080
        END                                                             08090
                                                                        08100
                                                                        08110
                                                                        08120
                                                                        08130
NEWVAL   FAP 06/17/67 0914.3      261          00000                    08140
        ENTRY   NEWVAL                                                  08150
        ENTRY   ITSVAL                                                  08160
        ENTRY   NOATVL                                                  08170
NEWVAL  SXA     FOUR,4                                                  08180
        SXA     TWO,2                                                   08190
        CLA*    1,4                                                     08200
        STO     ATBUTE                                                  08210
        CLA*    2,4                                                     08220
        STO     VALUE                                                   08230
        CLA*    3,4                                                     08240
        PAC     ,2                                                      08250
        STA     HEADER                                                  08260
        CLA     1,2                                                     08270
        ARS     18                                                      08280
        TZE     NODLST                                                  08290
        STA     DNAME                                                   08300
        TSX     $ATRADR,4                                               08310
        TXH     ATBUTE                                                  08320
        TXH     DNAME                                                   08330
        TZE     NOATRB                                                  08340
        PAC     ,2                                                      08350
        CLA     ,2                                                      08360
        STA     VALADR                                                  08370
        TSX     $SUBST,4                                                08380
        TXH     VALUE                                                   08390
        TXH     VALADR                                                  08400
FOUR    AXT     **,4                                                    08410
TWO     AXT     **,2                                                    08420
        TRA     4,4                                                     08430
NODLST  CLA     HEADER                                                  08440
        ADD     =1                                                      08450
        STA     HEADER                                                  08460
        TSX     $LIST,4                                                 08470
        TXH     DNAME                                                   08480
HEADER  STD     **                                                      08490
NOATRB  TSX     $NEWTOP,4                                               08500
        TXH     VALUE                                                   08510
```

```
                TXH     DNAME                                   08520
                TSX     $NEWTOP,4                               08530
                TXH     ATBUTE                                  08540
                TXH     DNAME                                   08550
                ZAC                                             08560
                TRA     FOUR                                    08570
        ITSVAL  SXA     F,4                                     08580
                CLA*    1,4                                     08590
                STO     ATBUTE                                  08600
                CLA*    2,4                                     08610
                STO     DNAME                                   08620
                TSX     $MADATR,4                               08630
                TXH     ATBUTE                                  08640
                TXH     DNAME                                   08650
                TZE     F                                       08660
                PAC     ,4                                      08670
                CLA     ,4                                      08680
                PAC     ,4                                      08690
                CLA     1,4                                     08700
        F       AXT     **,4                                    08710
                TRA     3,4                                     08720
        NOATVL  SXA     FA,4                                    08730
                CLA*    1,4                                     08740
                STO     ATBUTE                                  08750
                CLA*    2,4                                     08760
                STO     DNAME                                   08770
                TSX     $MADATR,4                               08780
                TXH     ATBUTE                                  08790
                TXH     DNAME                                   08800
                TZE     FA                                      08810
                STA     FIRST                                   08820
        FIRST   CLA     **                                      08830
                STA     SECOND                                  08840
                TSX     $REMOVE,4                               08850
                TXH     FIRST                                   08860
                TSX     $REMOVE,4                               08870
                TXH     SECOND                                  08880
        FA      AXT     **,4                                    08890
                TRA     3,4                                     08900
        SECOND  PZE                                             08910
        ATBUTE  PZE                                             08920
        VALUE   PZE                                             08930
        DNAME   PZE                                             08940
        VALADR  PZE                                             08950
                END                                             08960
                                                                08970
                                                                08980
                                                                08990
                                                                09000
        ERASEL    FAP 08/20/66 1333.5     115         00000     09010
                ENTRY   IRALST                                  09020
                ENTRY   ERASEL                                  09030
        ERASEL  SYN     *                                       09040
        IRALST  SXA     TWO,2                                   09050
                SXA     FOUR,4                                  09060
                CLA*    1,4                                     09070
                STO     NAME                                    09080
                PAC     ,2                                      09090
                CLA     1,2                                     09100
                STA     COUNTR                                  09110
                STD     DNAME                                   09120
```

```
                CLA     COUNTR                                          09130
                TZE     ZERO                                            09140
                SUB     =1                                              09150
                STA     1,2                                             09160
                TZE     ZERO                                            09170
OUT             CLA     NAME                                            09180
TWO             AXT     **,2                                            09190
FOUR            AXT     **,4                                            09200
                TRA     2,4                                             09210
ZERO            TSX     $MTLIST,4                                       09220
                TXH     NAME                                            09230
                NZT     DNAME                                           09240
                TRA     RETURN                                          09250
                CLA     =0100000                                        09260
                STT     ,2                                              09270
                CLA     DNAME                                           09280
                ARS     18                                              09290
                STA     1,2                                             09300
RETURN          TSX     $RCELL,4                                        09310
                TXH     NAME                                            09320
                TRA     OUT                                             09330
NAME            PZE                                                     09340
DNAME           PZE                                                     09350
COUNTR          PZE                                                     09360
                END                                                     09370
                                                                        09380
                                                                        09390
                                                                        09400
                                                                        09410
 PNTRS    FAP 08/20/66 1334.7      98          00000                    09420
                ENTRY   LPNTR                                           09430
                ENTRY   LSPNTR                                          09440
                ENTRY   SEQPTR                                          09450
                ENTRY   LSTNAM                                          09460
                ENTRY   LCNTR                                           09470
SEQPTR          SYN     *                                               09480
LPNTR           SYN     *                                               09490
LSPNTR          CLA*    1,4                                             09500
                STA     *+1                                             09510
                CLA     **                                              09520
                ARS     18                                              09530
                ANA     =077777                                         09540
                TRA     2,4                                             09550
LSTNAM          SXA     TWO,2                                           09560
                CLA*    1,4                                             09570
                PAC     ,2                                              09580
                CLA     1,2                                             09590
                STD     RESULT                                          09600
                ARS     18                                              09610
                STA     RESULT                                          09620
                CLA     RESULT                                          09630
TWO             AXT     **,2                                            09640
                TRA     2,4                                             09650
RESULT          PZE                                                     09660
LCNTR           SXA     TWO,2                                           09670
                CLA*    1,4                                             09680
                PAC     ,2                                              09690
                CLA     1,2                                             09700
                ANA     =077777                                         09710
                TRA     TWO                                             09720
                END                                                     09730
```

```
                                                                        09740
                                                                        09750
                                                                        09760
                                                                        09770
SECURE   FAP 08/20/66 1334.7      31          00000                     09780
         ENTRY    SECURE                                               09790
SECURE   SXA      TWO,2                                                09800
         CLA*     1,4                                                  09810
         PAC      ,2                                                   09820
         CLA      1,2                                                  09830
         ADD      =1                                                   09840
         STA      1,2                                                  09850
TWO      AXT      **,2                                                 09860
         TRA      2,4                                                  09870
         END                                                           09880
                                                                        09890
                                                                        09900
                                                                        09910
                                                                        09920
  CALL   FAP 06/17/67 0914.3      213          00000                    09930
*  GENERATE MAD CALLING SEQUENCE FROM SLIP LIST OF ARGS                 09940
*                                                                       09950
*       VALUE=CALL.(FUNCT.,ARGLST)                                      09960
*                                                                       09970
* GENERATES AND EXECUTES THE INSTRUCTIONS                               09980
*                                                                       09990
*       TSX      $FUNCT,4                                             10000
*       TXH      ARG1                                                 10010
*       TXH      ARG2                                                 10020
*       ...                                                           10030
*       TXH      ARGN                                                 10040
*                                                                       10050
* WHERE ARG1 ... ARGN ARE THE MACHINE ADDRESSES OF                      10060
*     DATA ON THE LIST 'ARGLST'.                                        10070
         SPACE    3                                                    10080
         ENTRY    CALL                                                 10090
         SPACE    2                                                    10100
MAXNUM   EQU      40              MAX NO. OF ARGS                      10110
         SPACE    1                                                    10120
CALL     SXA      X2,2                                                 10130
12       SXA      X4,4                                                 10140
         CAL*     1,4                                                  10150
11       STA      FUNCT                                                10160
         CAL*     2,4                                                  10170
10       PAC      ,2              XR 2 IS SEQRDR                       10180
         SXD      T1,2            SET UP END TEST                      10190
9        TXI      *+1,2,-1                                             10200
         SXD      T2,2                                                 10210
8        PAC      ,2                                                   10220
         SPACE    1                                                    10230
7        LDQ      CTXH                                                 10240
         AXT      MAXNUM,4                                             10250
6        CAL      0,2                                                  10260
         PAC      ,2                                                   10270
5        TXH      MORE,2,**                                            10280
T2       TXL      MORE,2,**                                            10290
4        TRA      END                                                  10300
MORE     STQ      CALSEQ+MAXNUM+1,4                                    10310
3        ADD      =1                                                   10320
         STA      CALSEQ+MAXNUM+1,4                                    10330
         TIX      BUILD,4,1                                            10340
2
```

```
END     CAL     CTRA                                                    10350
        SLW     CALSEQ+MAXNUM+1,4                                       10360
CALSEQ  TSX     FUNCT,4                                                 10370
        DUP     1,MAXNUM                                                10380
        TXH     0                                                       10390
        SPACE   1                                                       10400
X2      AXT     **,2                                                    10410
X4      AXT     **,4                                                    10420
        TRA     3,4                                                     10430
        SPACE   2                                                       10440
CTXH    TXH     **                                                      10450
CTRA    TRA     X2                                                      10460
FUNCT   TRA     **                                                      10470
        SPACE   1                                                       10480
        END                                                             10490
                                                                        10500
                                                                        10510
                                                                        10520
                                                                        10530
 OBEY    FAP 06/17/67 0914.3     1081          00000                    10540
        ENTRY   INTPRT                                                  10550
        ENTRY   INTGER                                                  10560
        ENTRY   INSTRC                                                  10570
        ENTRY   OBEY                                                    10580
        ENTRY   KEYFND                                                  10590
        ENTRY   NUSCRP                                                  10600
        ENTRY   ABS                                                     10610
        ENTRY   WHTOPS                                                  10620
        REM                                                             10630
OBEY    SXA     FOUR,4                                                  10640
        CLA*    1,4                                                     10650
        STA     RATOR                                                   10660
        CLA     2,4                                                     10670
        STA     RATOR+1                                                 10680
        CLA     3,4                                                     10690
        STA     RATOR+2                                                 10700
        CLA     4,4                                                     10710
        STA     RATOR+3                                                 10720
        CLA     5,4                                                     10730
        STA     RATOR+4                                                 10740
RATOR   TSX     **,4                                                    10750
        TXH                                                             10760
        TXH                                                             10770
        TXH                                                             10780
        TXH                                                             10790
FOUR    AXT     **,4                                                    10800
        TRA     6,4                                                     10810
        REM                                                             10820
INSTRC  SYN     *                                                       10830
        SXA     SV1,1                                                   10840
        AXT     TABLE-SV1,1                                             10850
        CAL*    1,4                                                     10860
        LAS     TABLE,1                                                 10870
        TRA     *+2                                                     10880
        TRA     *+3                                                     10890
        TIX     *-3,1,1                                                 10900
        TRA     FAIL                                                    10910
        CLA     OPS,1                                                   10920
        TRA     OUT                                                     10930
BUFF    PZE                                                             10940
FAIL    PXD                                                             10950
```

```
OUT     LXA     SV1,1                                                   10960
        TRA     2,4                                                     10970
        REM                                                             10980
SV1     PZE                     TABLE OF KNOWN OPERATORS                10990
        BCI     1,ATEND                                                 11000
        BCI     1,ATOMIC                                                11010
        BCI     1,CONCAT                                                11020
        BCI     1,TODAY                                                 11030
        BCI     1,TIME                                                  11040
        BCI     1,REST                                                  11050
        BCI     1,HIRANK                                                11060
        BCI     1,CONS                                                  11070
        BCI     1,REPLAC                                                11080
        BCI     1,ABS                                                   11090
        BCI     1,RANSET                                                11100
        BCI     1,RANDOM                                                11110
        BCI     1,MODULO                                                11120
        BCI     1,XECOM                                                 11130
        BCI     1,ADDKEY                                                11140
        BCI     1,WASKEY                                                11150
        BCI     1,QUIT                                                  11160
        BCI     1,ARCCOS                                                11170
        BCI     1,ARCSIN                                                11180
        BCI     1,ARCTAN                                                11190
        BCI     1,COS                                                   11200
        BCI     1,SIN                                                   11210
        BCI     1,TAN                                                   11220
        BCI     1,COT                                                   11230
        BCI     1,TANH                                                  11240
        BCI     1,NTHTOP                                                11250
        BCI     1,NTHBOT                                                11260
        BCI     1,MAX                                                   11270
        BCI     1,MIN                                                   11280
        BCI     1,FIRST                                                 11290
        BCI     1,SECOND                                                11300
        BCI     1,SQRT                                                  11310
        BCI     1,LOG                                                   11320
        BCI     1,EXP                                                   11330
        BCI     1,MTLIST                                                11340
        BCI     1,MRKPOS                                                11350
        BCI     1,MRKNEG                                                11360
        BCI     1,INDCTR                                                11370
        BCI     1,MRKIND                                                11380
        BCI     1,SEQRDR                                                11390
        BCI     1,REMOVE                                                11400
        BCI     1,POPTOP                                                11410
        BCI     1,POPBOT                                                11420
        BCI     1,TOP                                                   11430
        BCI     1,BOT                                                   11440
        BCI     1,NEWTOP                                                11450
        BCI     1,NEWBOT                                                11460
        BCI     1,ATOM                                                  11470
        BCI     1,INTGER                                                11480
        BCI     1,INTPRT                                                11490
        BCI     1,INLSTL                                                11500
        BCI     1,INLSTR                                                11510
        BCI     1,LEMPTY                                                11520
        BCI     1,VALUE                                                 11530
        BCI     1,NEWVAL                                                11540
        BCI     1,ITSVAL                                                11550
        BCI     1,NOATVL                                                11560
```

```
        BCI     1,ATRADR                                        11570
        BCI     1,MADATR                                        11580
        BCI     1,MADOBJ                                        11590
        BCI     1,SUBST                                         11600
        BCI     1,SUBSTP                                        11610
        BCI     1,SUBSBT                                        11620
        BCI     1,LCNTR                                         11630
        BCI     1,LSTNAM                                        11640
        BCI     1,MAKEDL                                        11650
        BCI     1,RDLONL                                        11660
        BCI     1,DSKLST                                        11670
        BCI     1,DSKCLS                                        11680
        BCI     1,TXTPRT                                        11690
        BCI     1,LSTDIF                                        11700
        BCI     1,LSSCPY                                        11710
        BCI     1,LSLCPY                                        11720
        BCI     1,SEQPTR                                        11730
        BCI     1,NULSTL                                        11740
        BCI     1,NULSTR                                        11750
        BCI     1,NODLST                                        11760
        BCI     1,LPNTR                                         11770
        BCI     1,LINLST                                        11780
        BCI     1,STRLST                                        11790
        BCI     1,MATCH                                         11800
        BCI     1,ASSMBL                                        11810
        BCI     1,WRITEF                                        11820
        BCI     1,SCRIPT                                        11830
        BCI     1,KEY                                           11840
        BCI     1,NOT                                           11850
        BCI     1,OPNAMS                                        11860
TABLE   PZE                     TRANSFERS FOR EACH ENTRY        11870
        PZE     $ATEND,,1                                       11880
        PZE     $ATOMIC,,1                                      11890
        PZE     $CONCAT,,2                                      11900
        PZE     $TODAY,,1                                       11910
        PZE     $TIME,,1                                        11920
        PZE     $REST,,1                                        11930
        PZE     $HIRANK,,3                                      11940
        PZE     $CONS,,2                                        11950
        PZE     $REPLAC,,3                                      11960
        PZE     ABS,,1                                          11970
        PZE     $SETU,,1                                        11980
        PZE     $RANNO,,1                                       11990
        PZE     $MOD,,2                                         12000
        PZE     $CALLS,,1                                       12010
        PZE     $ADDKEY,1                                       12020
        PZE     $WASKEY,,2                                      12030
        PZE     $CHNCOM,,1                                      12040
        PZE     $ACOS,,1                                        12050
        PZE     $ASIN,,1                                        12060
        PZE     $ATAN,,1                                        12070
        PZE     $COS,,1                                         12080
        PZE     $SIN,,1                                         12090
        PZE     $TAN,,1                                         12100
        PZE     $COT,,1                                         12110
        PZE     $TANH,,1                                        12120
        PZE     $NTOP,,2                                        12130
        PZE     $NBOT,,2                                        12140
        PZE     $MAX,,2                                         12150
        PZE     $MIN,,2                                         12160
        PZE     $FIRST,,1                                       12170
```

```
                PZE     $SECOND,,1                                      12180
                PZE     $SQRT,,1                                        12190
                PZE     $LOG,,1                                         12200
                PZE     $EXP,,1                                         12210
                PZE     $MTLIST,,1                                      12220
                PZE     $MRKPOS,,1                                      12230
                PZE     $MRKNEG,,1                                      12240
                PZE     $INDCTR,,1                                      12250
                PZE     $MRKIND,,2                                      12260
                PZE     $SEQRDR,,1                                      12270
                PZE     $REMOVE,,1                                      12280
                PZE     $POPTOP,,1                                      12290
                PZE     $POPBOT,,1                                      12300
                PZE     $TOP,,1                                         12310
                PZE     $BOT,,1                                         12320
                PZE     $NEWTOP,,2                                      12330
                PZE     $NEWBOT,,2                                      12340
                PZE     $NAMTST,,1                                      12350
                PZE     INTGER,,1                                       12360
                PZE     INTPRT,,1                                       12370
                PZE     $INLSTL,,2                                      12380
                PZE     $INLSTR,,2                                      12390
                PZE     $LEMPTY,,1                                      12400
                PZE     $VALUE,,2                                       12410
                PZE     $NEWVAL,,3                                      12420
                PZE     $ITSVAL,,2                                      12430
                PZE     $NOATVL,,2                                      12440
                PZE     $ATRADR,,2                                      12450
                PZE     $MADATR,,2                                      12460
                PZE     $MADOBJ,,2                                      12470
                PZE     $SUBST,,2                                       12480
                PZE     $SUBSTP,,2                                      12490
                PZE     $SUBSBT,,2                                      12500
                PZE     $LCNTR,,1                                       12510
                PZE     $LSTNAM,,1                                      12520
                PZE     $MAKEDL,,2                                      12530
                PZE     $RDLONL,,1                                      12540
                PZE     $DSKLST,,3                                      12550
                PZE     $DSKCLS,,0                                      12560
                PZE     $TXTPRT,,2                                      12570
                PZE     $LSTEQL,,2                                      12580
                PZE     $LSSCPY,,2                                      12590
                PZE     $LSLCPY,,2                                      12600
                PZE     $SEQPTR,,1                                      12610
                PZE     $NULSTL,,3                                      12620
                PZE     $NULSTR,,3                                      12630
                PZE     $NODLST,,1                                      12640
                PZE     $LPNTR,,1                                       12650
                PZE     $LINLST,,2                                      12660
                PZE     $STRLST,,2                                      12670
                PZE     $YMATCH,,3                                      12680
                PZE     $ASSMBL,,3                                      12690
                PZE     $WRFLXB,,2                                      12700
                PZE     NUSCRP,,2                                       12710
                PZE     KEYFND,,3                                       12720
                PZE     $NOT,,1                                         12730
                PZE     WHTOPS,,0       PRINT OPERATIONS                12740
OPS             PZE                                                     12750
                REM                                                     12760
WHTOPS          SXA     X2,2            SAVE X2                         12770
                SXA     X1,1            ..                              12780
```

```
                SXA     X4,4            ..                                  12790
                LDQ     =0736057575757      COMMA BLANK                     12800
                AXT     TABLE-SV1,1     LTH OF TABLE IN X1                  12810
        GLP     AXT     14,2            14 WDS/LINE                         12820
        LP      CAL     TABLE+1,1       GET SUBROUTINE NAME                 12830
                SLW     BUF,2           STORE IN PRINT BUFFER               12840
                STQ     BUF+1,2         AND COMMA                           12850
                TXI     *+1,1,-1        INDEX TO NEXT SUBR.                 12860
                TXL     OUTX,1,1        SEE IF DONE                         12870
                TIX     LP,2,2          IF NOT, KEEP FILLING LINE           12880
                TSX     $WRFLX,4        LINE FULL. WRITE OUT                12890
                PZE     BUF-14,,14      ..                                  12900
                XIT     GLP             AND GO AROUND                       12910
        OUTX    LDQ     =H              ALL DONE. BLANK REST OF BUFFER      12920
                CAL     =H              ..                                  12930
                TRA     *+2             LEAVE LAST SUBR. NAME               12940
                SLW     BUF,2           BLANK BUFF                          12950
                STQ     BUF+1,2         ..                                  12960
                TIX     *-2,2,2         ..                                  12970
                TSX     $WRFLX,4        WRITE LAST LINE                     12980
                PZE     BUF-14,,14      ..                                  12990
        X2      AXT     **,2            RESTORE                             13000
        X1      AXT     **,1            ..                                  13010
        X4      AXT     **,4            ..                                  13020
                TRA     1,4             AND GO.                             13030
        BUF     BES     16              PRINT BUFFER. NOTE SLOP.            13040
                PZE                                                         13050
                REM                                                         13060
        NUSCRP  CLA*    1,4                                                 13070
                STA     RATOR+1                                             13080
                CLA     SCRIPT                                              13090
                CLA     *-1                                                 13100
                STA     RATOR+3                                             13110
                CAL     AN                                                  13120
                SLW     RATOR                                               13130
                TRA     RATOR                                               13140
                REM                                                         13150
        KEYFND  CLA*    2,4                                                 13160
                STA     RATOR+2                                             13170
                CAL     AF                                                  13180
                SLW     RATOR                                               13190
                TRA     RATOR                                               13200
        AN      TSX     $GETLIN,4                                           13210
        AF      TSX     $FNDKEY,4                                           13220
        SCRIPT  BCI     1,SCRIPT                                            13230
                REM                                                         13240
        ABS     CLA*    1,4                                                 13250
                SSP                                                         13260
                TRA     FOUR                                                13270
                REM                                                         13280
        INTGER  CLA*    1,4                                                 13290
                UFA     EXPO                                                13300
                ERA     EXPO                                                13310
                LLS     0                                                   13320
                TRA     FOUR                                                13330
                REM                                                         13340
        EXPO    OCT     233000000000                                        13350
                REM                                                         13360
        INTPRT  CLA*    1,4                                                 13370
                UFA     EXPO                                                13380
                ERA     EXPO                                                13390
```

```
        LLS     0                                                       13400
        ORA     EXPO                                                    13410
        FAD     EXPO                                                    13420
        TRA     FOUR                                                    13430
        END                                                             13440
                                                                        13450
                                                                        13460
                                                                        13470
                                                                        13480
 WEAKN   FAP 06/17/67 0914.3      50          00000                     13490
        ENTRY   WEAKN                                                   13500
        ENTRY   STRENG                                                  13510
WEAKN   CLA*    1,4                                                     13520
        STO     DATUM                                                   13530
        STA     *+2                                                     13540
        ZAC                                                             13550
PLACE   STT     **                                                      13560
        CLA     DATUM                                                   13570
        TRA     2,4                                                     13580
STRENG  CLA*    1,4                                                     13590
        STO     DATUM                                                   13600
        STA     PLACE                                                   13610
        CLA     =0200000                                                13620
        TRA     PLACE                                                   13630
DATUM   PZE                                                             13640
        END                                                             13650
```