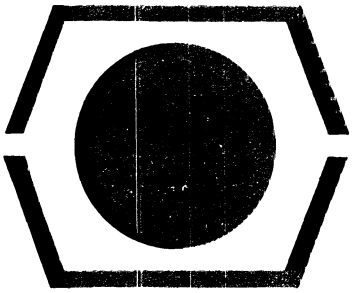
?1328 H.S. EQUIPMENT
?26. ME DELETE X-FUNCT.



DECUS
PROGRAM LIBRARY

DECUS NO. FOCAL8-52 LISTING

TITLE FOCAL 5/69

```
                        /****** FOCAL, 5/69 *********

                                EXPUNGE
                        /PROCESSOR INSTRUCTIONS
                        FIXMRI AND=0000
                        FIXMRI TAD=1000
                        FIXMRI ISZ=2000
                        FIXMRI DCA=3000
                        FIXMRI JMS=4000
                        FIXMRI JMP=5000
                        /FLOATING POINT INSTRUCTIONS
                        FIXMRI FPW=0000
                        FIXMRI FAD=1000
                        FIXMRI FSB=2000
                        FIXMRI FMY=3000
                        FIXMRI FDV=4000
                        FIXMRI FGT=5000
                        FIXMRI FPT=6000

          7000          FNR=7000
          0000          FEXT=0
          4407          FENT=JMS I 7
          7000          NOP=7000
          7200          CLA=7200
          7100          CLL=7100
          7040          CMA=7040
          7004          RAL=7004
          7020          CML=7020
          7010          RAR=7010
          7012          RTR=7012
          7006          RTL=7006
          7001          IAC=7001
          7500          SMA=7500
          7440          SZA=7440
          7510          SPA=7510
          7450          SNA=7450
          7420          SNL=7420
          7430          SZL=7430
          7410          SKP=7410
          7041          CIA=7041
          6001          ION=6001
          6002          IOF=6002
          6031          KSF=6031
          6036          KRB=6036
          6041          TSF=6041
          6042          TCF=6042
          6044          TPC=6044
          6046          TLS=6046
          6011          RSF=6011
          6012          RRB=6012
          6014          RFC=6014
                                FIXTAB
```

```
                                / * FOCAL * - BY RICK MERRILL - FOR THE FAMILY OF 8.
                                /REVISED BY EDWARD TAFT          5/69

                                /MISCELLANEOUS ITEMS
                        0001    *1
0001    5402                    JMP I .+1       /INTERRUPT PROCESSOR ENTRY
0002    2603                    INTRPT
0003    7477    MINUSA, -301    /CONSTANT
0004    0000    FNEGSW, 0       /USED FOR CALCULATING SIGNS
0005    0013    P13,    13      /CONSTANT
0006    0100    C100,   100     /CONSTANT
0007    6600                    FPNT    /ADDRESS OF FLOATING POINT INTERPRETER.

                                /AUTO-INDEX REGISTERS

0010    0000    AXIN,   0       /STORAGE INDEX
0011    0000    XRT,    0       /EXTRA XR
0012    0000    XRT2,   0       /EXTRA XR
0013    0000    PDLXR,  0       /PUSHDOWN LIST INDEX REGISTER.
0014    3377    FLTXR,  IOBUF-1 /XR15 FOR FLOATING POINT
0015    0200    C200,   200     /CONSTANT
0016    0000    XRT3,   0       /USED BY PUSHDOWN LIST CONTROLS

                        0017    TEXTP=. /TEXT POINTERS
0017    3430    AXOUT,  FRSTX   /OUTPUT INDEX
0020    0000    XCT,    0       /UNPACK SWITCH
0021    0000    GTEM,   0       /UNPACK STORAGE

                                /NUMBERS

0022    0256    PER;    256     /PERIOD
0023    7701    M77,    -77     /RIGHT MASK
0024    7600    P7600,  7600    /GROUP MASK
0025    7760    M20,    -20     /CONSTANT
0026    0177    P177,   177     /STEP MASK
0027    5577    BOTTOM, DBCONV-1/END OF TEXT BUFFER
        4430    FLOAT=  JMS I . /FLOAT C(AC) SUBROUTINE
0030    7332                    XFLOAT
0031    0017    P17,    17      /BCD MASK
0032    0277    P277,   277     /"?"
0033    0240    C240,   240     /SPACE
0034    7776    M2,     -2      /CONSTANT
0035    0002    P2,     2       /CONSTANT
0036    0260    C260,   260     /ASCII FOR ZERO
0037    0000    HINBUF, 0       /HIGH SPEED INPUT BUFFER
```

```
                                
                0040    FLOP=.  /FLOATING OPERAND STORAGE
0040    0000    FLOP0,  0
0041    0000    FLOP1,  0
0042    0000    FLOP2,  0
0043    0000    FLOP3,  0
                0044    FLAC=.  /FLOATING POINT ACCUMULATOR
0044    0000    FLAC0,  0
0045    0000    FLAC1,  0
0046    0000    FLAC2,  0
0047    0000    FLAC3,  0
                4450    NEGATE= JMS I . /NEGATE FLAC ROUTINE
0050    6676            NEGAC
0051    0010    TOTDIG, 10      /TOTAL DIGITS IN OUTPUT FIELD
                4452    FIX=    JMS I . /FIX FLAC ROUTINE
0052    7311            XFIX
0053    0000    TABCTR, 0       /CARRIAGE INDEX
                
                /CONSTANTS
                
                
                0054    LIST6=. /INPUT LIST FOR "SFOUND".
0054    0337    P337,   337     /LEFT ARR
0055    0214            214     /F.F.
0056    0207            207     /BELL
0057    0212    CLF,    212     /L.F.
                0060    LIST3=. /EXCRETION LIST
0060    0215    CCR,    215     /LIST BRANCHER.
0061    0000            0       /SEARCH CHARACTER (VARIABLE)
                
                0062    M100=.
0062    7700    P7700,  7700    /LEFT MASK
0063    7540    M240,   -240    /SPACE TEST
0064    7522    MPER,   -256    /PERIOD TEST
0065    7563    MCR,    -215    /C.R. TEST
                0066    MFLT=.  /3-WORD FLOATING POINT
0066    7775    M3,     -3
0067    7773    M5,     -5      /PAREN TEST
0070    7767    M11,    -11     /PAREN TEST
0071    0077    P77,    77      /RIGHT MASK
                
0072    6170    FOUTPUT;BDCONV  /FLOATING OUTPUT
0073    5600    FINPUT, DBCONV  /FLOATING INPUT
0074    2527    COMBUF, COMEIN  /COMMAND BUFFER START
0075    3420    CFRS,   FRST    /ADDRESS OF DUMMY LINE.
0076    3432    END,    BUFBEG  /FIRST LOCATION USED.
0077    3432    ENDT,   BUFBEG  /START OF STORAGE AREA **
                5500    RETURN= JMP I . /FUNCTION RETURN
0100    2056    EFUN3I, EFUN3
```

```
                        /NEW INSTRUCTIONS:
                
          4501  PUSHJ=JMS I .   /RECURSIVE SUBROUTINE CALL
0101      0523          XPUSHJ
          1413  POPA=IAC I PCLXR/RESTORE AC
          5502  POPJ=JMP I .    /SUBROUTINE RETURN
0102      1556          XPOPJ
          4503  PUSHA=JMS I .   /SAVE AC
0103      0501          XPUSHA
          4504  PUSHF=JMS I .   /SAVE GROUP OF DATA
0104      0532          PD2
          4505  POPF=JMS I .    /RESTORE GROUP
0105      0550          PD3
          4506  GETC=JMS I .    /UNPACK A CHARACTER
0106      2315          UTRA
          4507  PACKC=JMS I .   /PACK A CHARACTER
0107      3023          PACBUF
          4510  SORTJ=JMS I .   /SORT AND BRANCH ON AC OR CHAR
0110      1333          SORTR
          4511  SORTC=JMS I .   /SORT CHAR
0111      0733          XSORTC
          4512  PRINTC=JMS I .  /PRINT AC OR CHAR
0112      2477          OUT
          4513  READC=JMS I .   /READ ASR-33 INTO CHAR AND PRINT IT
0113      2463          CHIN
          4514  PRNTLN=JMS I .  /PRINT C(LINENO)
0114      6151          XPRNTLN
          4515  GETLN=JMS I .   /UNPACK AND FORM A LINENUMBER
0115      0312          XGETLN
          4516  FINDLN=JMS I .  /SEARCH FOR A GIVEN LINE
0116      2265          XFIND
          4517  ENDLN=JMS I .   /INSERT LINE POINTERS
0117      2417          XENDLN
          4520  RTL6=JMS I .    /ROTATE LEFT SIX
0120      0305          XRTL6
          4521  SPNOR=JMS I .   /IGNORE SPACES AND LEADING ZEROS
0121      1524          XSPNOR
          4522  TESTN=JMS I .   /PERIOD; OTHER; NUMBER
0122      1533          XTESTN
          4523  TSTLPR=JMS I .  /SKIP IF 5<SORTCN<= 11 (I.E. AN L-PAR)
0123      2077          LPRTST
          4524  TSTGPP=JMS I .  /SKIP IF G(AC) = G(LINENO)
0124      2451          GRPTST
          4525  TESTC=JMS I .   /TERM; NUMBER; FUNCTION; LETTER
0125      0713          XTESTC
          4526  ERROR=JMS I .   /GENERAL ERROR ROUTINE
0126      2736          ERR2
```

```


      Ø127  ØØØØ   SORTCN, Ø        /NUMBER IN TABLE FROM SORTC
      Ø13Ø  ØØØØ   LASTOP, Ø        /LAST OPERATION FOR EVAL
            Ø131   EFOP=.           /FUNCTION CODE.
      Ø131  ØØØØ   ATSW,   Ø        /ASK-TYPE SWITCH
      Ø132  776Ø   CNTR,   -2Ø      /DELETE AND ERROR COUNTER(USED BY F.P. ALSO)

      Ø133  ØØØ4   DECP,   4        /NUMBER OF DECIMAL POINTS

            Ø134   STARTV=.         /=END FOR 8K

      Ø134  3432   BUFR,   BUFBEG   /NEXT LOCATION IN BUFFER = LAST LOCATION OF TEXT.

      Ø135  ØØØØ   ADD,    Ø        /CHAR BUF INPUT
      Ø136  ØØØØ   XCTIN,  Ø        /PACK SWITCH
      Ø137  2675   OUTDEV, XOUTL    /OUTPUT SUBROUTINE
      Ø14Ø  2655   INDEV,  XI33     /INPUT SUBROUTINE

      Ø141  ØØØ1   NAGSW,  ØØØ1     /NOT ALL AND/OR GROUP SWITCH (4ØØØ=ONE;1=ALL;Ø=GROUP)
      Ø142  Ø215   CHAR,   215      /THE MOST IMPORTANT REGISTER
      Ø143  ØØØØ   LINENO, ØØØØ     /LINE NUMBER READ BY GETLN
      Ø144  ØØØ5   GINC,   5        /WORDS TO STORE 1 VARIABLE

      Ø145  1575   PC,     FLTZER   /PROGRAM COUNTER
      Ø146  ØØØØ   THISLN, Ø        /LINE POINTER FROM 'FINDLN'
      Ø147  ØØØØ   THISOP, Ø        /CURRENT 'EVAL' OPERATION
      Ø15Ø  ØØØØ   LASTLN, Ø        /BACK POINTER FROM 'FINDLN'
      Ø151  ØØØ1   DEBGSW, 1        /DEBUG SWITCH   ; NON-ZERO FOR LITERAL.
      Ø152  ØØØ1   DMPSW,  1        /=Ø FOR TRACE ON.
      Ø153  ØØØØ   PACKST, Ø        /RUBOUT PROTECTION
      Ø154  ØØØØ   PT1,    Ø        /VARIABLE POINTER
      Ø155  3432   LASTV,  BUFBEG   /ADDRESS OF LAST VARIABLE
      Ø156  ØØØØ   T1,     Ø        /TEMPORARY REGISTER - MAIN
      Ø157  ØØØØ   T2,     Ø        /TEMP REGISTER - FOR NEW INST. ROUTINES.
      Ø16Ø  2Ø34   FLARGP, FLARG    /DATA ADDRESS
      Ø161  2463   PTCH,   CHIN     /GENERAL CHARACTER INPUT ROUTINE.
                   /USED BY NEW FLOATING PT. PACKAGE
      Ø162  ØØØØ   TEMP1,  Ø
      Ø163  ØØØØ   TEMP2,  Ø
      Ø164  ØØØØ   TEMP3,  Ø
            4565   TSTERM= JMS I . /TEST FOR ,;CR
      Ø165  2514           XTSTERM /RETURNS: OTHER, ; OR CR, COMMA
            ØØØ6   DIGITS=6         /SIGNIFICANT DIGITS
```

```
                        /FOCAL'S COMMAND/INPUT DRIVER
                        /
                        /LOCATION 176 SET TO BEGIN FOR INITIALIZATION, THEN TO
                        /RECOVR+1 THEREAFTER, FOR CONSOLE START AT 0200
          0177          *177
0177  7610  START,  SKP CLA            /PROGRAM START FROM SELF
0200  5576          JMP I .-2         /CONSOLE START: SW=200.
0201  1227          TAD CFRSX         /(PC) => 0
0202  3145          DCA PC            /FOR COMMAND MODE
0203  3151          DCA DEBGSW        /ENABLE TRACE FOR INPUT OF (?).
0204  1226          TAD COMBOT        /PROTECT COMMAND BUFFER.
0205  3013          DCA PDLXR         /NO PATCH TEST.
0206  2152          ISZ DMPSW         /INIT UNPACK AND TRACE SWITCH.
0207  3061          DCA LIST3+1       /CLEAR SEARCH CHARACTER FOR INPUT.
0210  1054          TAD P337          /ANNOUNCE PRESENCE
0211  4512          PRINTC            /BY TYPING THE LEAD-IN CHARACTER
0212  1074  IBAR,   TAD COMBUF       /INITIALIZE COMMAND BUFFER
0213  3010          DCA AXIN          /FOR UNPACKING.
0214  3136          DCA XCTIN
0215  1074          TAD COMBUF        /RUBOUT PROTECTION
0216  3153          DCA PACKST
0217  4513  IGNOR,  READC            /READ COMMAND STRING
0220  4510          SORTJ
0221  0053                  LIST6-1
0222  0510                  INLIST-LIST6
0223  4507          PACKC             /SAVE STRING CHARACTER.
0224  5217          JMP IGNOR
                    /////
0225  4000  P4000,  4000              /LINE NUMBER TEST
0226  2612  COMBOT, COMOUT+12         /END OF COMMAND BUFFER,LESS PROTECTION COUNT.
0227  1575  CFRSX,  FLTZER           /POINTER FOR PC=COMMAND OR INPUT
                    /////
```

```
                        /COMMAND/INPUT PROCESSOR
                
0230  4507    IRETN,  PACKC           /START TO PACK C.R.
0231  4507            PACKC           /FINISH C.R.
0232  1074            TAD COMBUF      /INITIALIZE "TEXTP"
0233  3017    GONE,   DCA AXOUT       /SETUP CURRENT LINE
0234  3020            DCA XCT
0235  4506            GETC            /READ FIRST CHARACTER.
0236  1027            TAD BOTTOM      /INIT PUSH-DOWN-LIST
0237  3013            DCA PDLXR
0240  4521            SPNOR           /IGNORE LEADING BLANKS
0241  4522            TESTN           /DOES THE LINE BEGIN WITH 1-9?
0242  4526            ERROR4          /ILLEGAL GROUP ZERO USAGE
0243  5274            JMP INPUTX      /NO
0244  6002            IOF             /YES,STOP INPUT MOMENTARILY.
0245  2151            ISZ DEBGSW      /DISABLE TRACE FOR REPACKING
0246  4515            GETLN           /READ THIS LINE NUMBER
0247  1141            TAD NAGSW
0250  1225            TAD P4000       /TEST FOR SINGLE LINE
0251  7640            SZA CLA
0252  4526            ERROR3          /ILLEGAL LINE NUMBER ON INPUT
0253  1134            TAD BUFR        /SET POINTERS
0254  3010            DCA AXIN
0255  3136            DCA XCTIN
0256  1143            TAD LINENO      /SAVE LINE #
0257  3410            DCA I AXIN      /(X-MEM)
0260  4521            SPNOR           /IGNORE SPACES AFTER LINE NUMBER
0261  7410            SKP
0262  4506            GETC            /READ 1ST AFTER LINENO TERMINATOR.
0263  4507            PACKC           /SAVE TEXT AND RESTORE DATA FIELD
0264  1142            TAD CHAR        /TEST FOR END OF INPUT STRING
0265  1065            TAD MCR
0266  7640            SZA CLA
0267  5262            JMP .-5
0270  4501            PUSHJ           /REMOVE OLD LINE, IF ANY.
0271  2111                    DELETE
0272  4517            ENDLN           /INSERT NEW LINE
0273  5177            JMP START
                        /////
0274  4501    INPUTX, PUSHJ           /PROCESS IMMEDIATE COMMAND.
0275  0616                    PROC
0276  1545            TAD I PC        /CHECK NEXT LINE (X-MEM)
0277  7450            SNA             /END OF PROGRAM?
0300  5177            JMP START       /YES
0301  3145            DCA PC          /SAVE NEW LINE NO.
0302  1145            TAD PC          /START NEW LINE
0303  7001            IAC
0304  5233            JMP GONE        /PROCESS OTHER COMMANDS
                        /TEXT LINE BUFFER FORMAT:
                        /#1 : POINTER OR ZERO IN LAST
                        /#2 : LINENO
                        /#3 - #N+1 : TEXT
                        /#1 : C.R.
```

```
                                /
                                /PROCESS A LINE NUMBER - "GETLN"
0312  0000  XGETLN,  0
0313  4521            SPNOR
0314  1225            TAD P4000       /INITIALIZE TO SINGLE LINE
0315  3141            DCA NAGSW
0316  4511            SORTC           /TEST FOR A SIGN
0317  6114                    SNLIST-1
0320  5370            JMP EVLN        /EVALUATE IN FLOATING POINT
0321  4766            JMS I IFPINT    /FIXED POINT: GET GROUP
0322  4522            TESTN
0323  4506            GETC            /GO PAST . IF THERE
0324  4356            JMS GEG         /GET 1ST STEP DIGIT
0325  7106            CLL RTL         /MULTIPLY BY TEN
0326  1127            TAD SORTCN
0327  7004            RAL
0330  4356            JMS GEG         /GET 2ND STEP DIGIT
0331  1143            TAD LINENO      /COMBINE
0332  7450  GEXIT,    SNA
0333  3141            DCA NAGSW       /MUST BE GROUP
0334  3143            DCA LINENO      /SAVE STEP NUMBER
0335  1164            TAD DECNUM      /GROUP
0336  7450            SNA
0337  5347            JMP GTESTA      /GROUP 0: MUST BE "ALL"
0340  4520            RTL6            /CONSTRUCT LINE NUMBER
0341  7004            RAL
0342  1143            TAD LINENO
0343  3143            DCA LINENO
0344  1164            TAD DECNUM      /TEST FOR LEGAL GROUP
0345  0367            AND C7760
0346  5351            JMP .+3
0347  2141  GTESTA,   ISZ NAGSW       /SET TO "ALL"
0350  1143            TAD LINENO      /MAKE SURE LINE # IS ZERO
0351  7650            SNA CLA
0352  4522            TESTN           /OK; TEST FOR EXTRA DIGITS
0353  5361            JMP LNERR       /DOUBLE ., ILLEGAL G, 0, OR G,>15
0354  5712            JMP I XGETLN    /OK
0355  5361            JMP LNERR       /TOO MANY DIGITS
```

```
370
371     0356  0000    GEG,    0                       /GET A STEP DIGIT
372     0357  3143            DCA LINENO
373     0360  4522            TESTA
374     0361  4526    LNERR,  ERROR                   /DOUBLE PERIODS
375     0362  5331            JMP GEXIT-1             /NO DIGIT
376     0363  4506            GETC                    /DIGIT, PASS IT
377     0364  1127            TAD SORTCH              /EXIT WITH VALUE
378     0365  5756            JMP I GEG
379                   /////
380     0366  6010    INPINT, DECINT
381     0367  7760    C770M,  7760
382                   /////
383                   /EVALUATE A LINE NUMBER IN FLOATING POINT
384     0370  4501    EVLN,   PUSHJ                   /GET VALUE
385     0371  1001                    FVAL
386     0372  4452            FIX                     /GET GROUP #
387     0373  4503            PUSHA
388     0374  1045            TAD FLAG1
389     0375  7640            SZA CLA
390     0376  5361            JMP LNERR               /TOO BIG
391     0377  4407            FENT                    /GET STEP #
392     0400  7000            FNR
393     0401  2560            FSB I FLAGP             /THIS GIVES -(FRACTIONAL PART)
394     0402  3614            FMY I F10P
395     0403  3614            FMY I F10P
396     0404  2615            FSB I FP10P             /KILL ANY ROUNDOFF ERROR
397     0405  0000            FEXT
398     0406  4450            NEGATE
399     0407  1413            POPA                    /RESTORE GROUP
400     0410  3164            DCA DECNUM
401     0411  4452            FIX
402     0412  5613            JMP I .+1
403     0413  0332                    GEXIT
404                   /////
405     0414  5770    F10P,   FLTEN
406     0415  5773    FP10P,  FLPTEN
407
408                   /RANGE OF ACCEPTIBLE LINE NUMBERS = 1.01 TO 15.99
409
410                   /NAGSW:
411                   /GROUP=0000
412                   /LINE=4000
413                   /ALL=0001
```

```
414                     /RECURSIVE OPERATE, EXECUTE, OR CALL
415
416     0416  4515      DO,     GETLN           /EXECUTE ONE LINE, A GROUP,OR ALL
417     0417  1145              TAD PC          /SAVE ADDRESS
418     0420  4503              PUSHA           /OF CURRENT LINE
419     0421  4504              PUSHF           /SAVE REST OF THIS LINE
420     0422  0017                      TEXTP   /ADDRESS OF TEXT POINTERS
421     0423  4504      DGRP,   PUSHF           /SAVE NAGSW; CHAR; AND LINENO.
422     0424  0141                      NAGSW
423     0425  1141              TAD NAGSW       /CHECK DATA FROM GETLN.
424     0426  7710              SPA CLA         /SKIP IF GROUP OR ALL
425     0427  5254              JMP DOONE       /DO ONE LINE
426     0430  4516              FINDLN          /INIT FOR GROUP AND SET THISLN
427     0431  5273              JMP TGRP?
428     0432  4501      DGRP1,  PUSHJ           /EXECUTE OBJECT LINE AND SET PC.
429     0433  0613                      PROCESS-?
430     0434  4505              POPF            /RESTORE THE DATA
431     0435  0141                      NAGSW
432     0436  1545              TAD I PC        /CHECK FOR END OF TEXT (X-MEM)
433     0437  7450              SNA
434     0440  5262              JMP DCONT       /ALL DONE
435     0441  7001              IAC
436     0442  3154              DCA PT1         /SAVE POINTER TO LINENO
437     0443  1141              TAD NAGSW       /CHECK FOR GROUP
438     0444  7740              SMA SZA CLA
439     0445  5251              JMP .+4         /DO ALL
440     0446  1554              TAD I PT1       /TEST GROUP (X-MEM)
441     0447  4524              TSTGRP
442     0450  5262              JMP DCONT       /NOT IN GROUP
443     0451  1554              TAD I PT1       /READ NEXT LINE NO. (X-MEM)
444     0452  3143              DCA LINENO
445     0453  5223              JMP DGRP        /CONTINUE THE SUBROUTINE
446                     /////
447     0454  4516      DOONE,  FINDLN          /FIND THE LINE
448     0455  4526              ERROR2          /NO SUCH LINE NUMBER
449     0456  4501              PUSHJ           /EXECUTE IT
450     0457  0615                      PROCESS
451     0460  4505              POPF            /RESTORE CHAR
452     0461  0141                      NAGSW
453     0462  4505      DCONT,  POPF            /RESTORE TEXT POINTERS
454     0463  0017                      TEXTP
455     0464  1413              POPA            /RESTORE ADDRESS OF CURRENT LINE.
456     0465  3145              DCA PC
457     0466  4565              TSTERM          /GO TO TERMINATOR
458     0467  5266              JMP .-1
459     0470  5672              JMP I .+2       /END OF DO, CONTINUE PROCESSING
460     0471  5216              JMP DO          /COMMA, DO ANOTHER
461     0472  0616                      PROC
```

```
 462
 463    0473  1146    TGRP2,  TAD THISLN      /TEST FOR GOOD GROUP NUMBER.
 464    0474  3011            DCA XRT
 465    0475  1411            TAD I XRT
 466    0476  4524            TSTGRP
 467    0477  4526            ERROR2          /NO SUCH GROUP NUMBER
 468    0500  5232            JMP DGRP1
```

```
                        /PUSHDOWN LIST CONTROLS
                        /
0501  0000  XPUSHA, 0                 /PUSHDOWN THE AC - "PUSHA"
0502  3332          DCA PD2           /SAVE AC
0503  7040          CMA               /BACK UP POINTER
0504  4310          JMS PCHK          /CHECK CORE USAGE
0505  1332          TAD PD2
0506  3416          DCA I XRT3        /SAVE
0507  5701          JMP I XPUSHA
                        /////
0510  0000  PCHK,  0
0511  1013          TAD PDLXR         /INC IN AC
0512  3013          DCA PDLXR
0513  1013          TAD PDLXR
0514  3016          DCA XRT3          /DUPLICATE POINTER
0515  1013          TAD PDLXR
0516  7141          CLL CIA
0517  1155          TAD LASTV
0520  7630          SZL CLA
0521  4526          ERROR             /STORAGE FILLED BY PUSHDOWN LIST
0522  5710          JMP I PCHK
                        /////
0523  0000  XPUSHJ, 0                 /RECURSIVE SUBROUTINE CALL - "PUSHJ"
0524  7201          CLA IAC
0525  1323          TAD XPUSHJ        /SAVE RETURN
0526  4301          JMS XPUSHA        /(PUSHA)
0527  1723          TAD I XPUSHJ      /TO NEW ROUTINE
0530  3323          DCA XPUSHJ
0531  5723          JMP I XPUSHJ
                        /////
0532  0000  PD2,    0                 /SAVE A FLOATING PT NUMBER - "PUSHF"
0533  7240          CLA CMA           /COMPUTE ADDRESS
0534  1732          TAD I PD2
0535  3011          DCA XRT
0536  2332          ISZ PD2
0537  1066          TAD M3            /BACKUP THREE
0540  4310          JMS PCHK
0541  1411          TAD I XRT         /SAVE 3 WORDS
0542  3416          DCA I XRT3
0543  1411          TAD I XRT
0544  3416          DCA I XRT3
0545  1411          TAD I XRT
0546  3416          DCA I XRT3
0547  5732          JMP I PD2
```

```
                                /RESTORE A FLOATING PT # - "POPF"
0550 0607 7472  MF,     -370    /USED BY TESTC
```

```
                        /PRIMARY CONTROL AND TRANSFER
                        
0610  4515  GOTO,   GETLN           /READ THE LINE NUMBER REQUESTED
0611  4516          FINDLN          /LOCATE IT AND RESET TEXTP
0612  4526          ERROR2          /NOT THERE OR A TIGHT LOOP.
0613  1146          TAD THISLN      /SET PC
0614  3145          DCA PC
0615  4506  PROCESS;GETC            /TEST FOR END OF LINE
0616  4511  PROC,   SORTC           /FIRST CHARACTER READY = USE PROC
0617  0057           CCR-1
0620  5562  PC1;    POPJ            /EXIT "PROCESS"
0621  4511          SORTC           /IGNORE SPACE ; ,
0622  1140           GLIST-1
0623  5215          JMP PROCESS
0624  1142          TAD CHAR        /SAVE COMMAND CHARACTER
0625  4503          PUSHA
0626  4506          GETC            /GO TO TERMINATOR
0627  4511          SORTC
0630  2002                TERMS-4
0631  7410          SKP
0632  5226          JMP .-4
0633  4521          SPNOR
0634  1413          POPA
0635  4510          SORTJ           /GO DO COMMAND
                            COMLST-1
0636  0755                      COMGO-COMLST
0637  0206
0640  4526          ERROR2          /ILLEGAL COMMAND
                    /////
                    
      0620  COMMENTS=PC1    /ALSO IS CONTINUE
```

```
                        /OUTPUT COMMAND TEXT
                        
0641  4711  WRITE,  JMS I WTXS      /SAVE CHAR AND TEXT POINTERS
0642  4515          GETLN          /SET LINENO
0643  2151          ISZ DEBGSW     /DISABLE TRACE
0644  4516          FINDLN         /SEARCH FOR LINE NUMBER
0645  5274          JMP WTESTG     /NOT THERE OR GROUP
0646  1143          TAD LINENO
0647  7640          SZA CLA
0650  4514          PRNTLN         /PRINT LINE NUMBER AND A SPACE.
0651  4506          GETC
0652  4512          PRINTC         /PRINT TEXT OF A LINE.
0653  1142          TAD CHAR
0654  1065          TAD MCR
0655  7640          SZA CLA        /SKIP IF END OF LINE
0656  5251          JMP .-5
0657  1546          TAD I THISLN   /TEST FOR END OF TEXT (X-MEM)
0660  7450  WTEST2, SNA
0661  5303          JMP WEXIT      /WRITE FINISHED
0662  7001          IAC
0663  3154          DCA PT1        /SAVE POINTER TO LINENO OF NEXT (X-MEM)
0664  1141          TAD NAGSW
0665  7700          SMA CLA
0666  1554          TAD I PT1      /(X-MEM)
0667  4524          TSTGRP         /TRY NEXT LINENO FOR GROUP.
0670  5276          JMP WX
0671  1554  WALL,   TAD I PT1      /SET LINENO (X-MEM)
0672  3143          DCA LINENO
0673  5244          JMP WRITE+3
                    ///
0674  1146  WTESTG, TAD THISLN     /INIT GROUP PRINTOUT
0675  5260          JMP WTEST2
                    /////
0676  1141  WX,     TAD NAGSW
0677  7750          SPA SNA CLA    /SKIP IF ALL
0700  5303          JMP WEXIT
0701  4512          PRINTC  /PRINT C.R. AGAIN
0702  5271          JMP WALL
                    /////
0703  4712  WEXIT,  JMS I WTXR     /RESTORE CURRENT LINE
0704  3151          DCA DEBGSW     /RESTORE TRACE
0705  4565          TSTERM
0706  5305          JMP .-1
0707  5216          JMP PROC       /END OF WRITE
0710  5241          JMP WRITF      /COMMA, MORE TO WRITE
                    /////
0711  2435  WTXS;   TXTSAV
0712  2443  WTXR,   TXTRES
```

```
630
631    0713  0000    XTESTC, 0        /TEST THE NATURE OF THE NEXT ALPHANUMERIC - "TESTC"
632    0714  4521            SPNOR              /IGNORE SPACES
633    0715  4511            SORTC              /TEST THE VARIABLE TERMINATORS
634    0716  2005                    TERMS-1
635    0717  5713            JMP I XTESTC       /YES - SORTCN IS SET
636    0720  2313            ISZ XTESTC
637    0721  4522            TESTM
638    0722  5713            JMP I XTESTC       /. (PART OF NUMBER)
639    0723  7410            SKP                /OTHER
640    0724  5713            JMP I XTESTC       /NUMBER
641    0725  1142            TAD CHAR           /TEST FOR "F"
642    0726  1207            TAD MF
643    0727  7640            SZA CLA
644    0730  2313            ISZ XTESTC         /NO
645    0731  2313            ISZ XTESTC         /RETURNS:
646    0732  5713            JMP I XTESTC       /TERMINATOR;NUMBER;FUNCTION;OTHER
647                   /////
648    0733  0000    XSORTC, 0        /SORT CHAR AGAINST TABLE - "SORTC"
649    0734  1733            TAD I XSORTC
650    0735  3012            DCA XRT2           /1ST ARG IS LIST-1
651    0736  1412            TAD I XRT2
652    0737  7510            SPA                /LIST IS ENDED BY A NEGATIVE NUMBER
653    0740  5352            JMP SEXC           /2AND EXIT = NOT IN LIST
654    0741  7041            CIA
655    0742  1142            TAD CHAR
656    0743  7640            SZA CLA            /COMPARE
657    0744  5336            JMP .-6
658    0745  1733            TAD I XSORTC       /COMPUTE INCREMENT : 0 - N
659    0746  7040            CMA
660    0747  1012            TAD XRT2
661    0750  3127            DCA SORTCN
662    0751  7410            SKP                /1ST EXIT = YES
663    0752  2333    SEXC,   ISZ XSORTC
664    0753  2333            ISZ XSORTC
665    0754  7300            CLA CLL
666    0755  5733            JMP I XSORTC
667
```

```
668                     /COMMAND DECODING LIST
669     0756  0323    CMLST,  323     /SET
670     0757  0306            306     /FOR
671     0760  0311            311     /IF
672     0761  0304            304     /DO
673     0762  0307            307     /GOTO
674     0763  0303            303     /COMMENT OR CONTINUE
675     0764  0301            301     /ASK
676     0765  0324            324     /TYPE
677     0766  0314            314     /LIBRARY
678     0767  0305            305     /ERASE
679     0770  0327            327     /WRITE
680     0771  0315            315     /MODIFY
681     0772  0321            321     /QUIT
682     0773  0322            322     /RETURN
683     0774  0317            317     /OPTION
684     0775  0310            310     /HELLO
```

```
                        /CONDITIONAL TRANSFER PROCESS
                        / IF (EXP) A,B,C
Ø776   4511     IF,     SORTC           /LOOK FOR L-PAR
Ø777   1Ø22              PLPR-1
1ØØØ   741Ø             SKP
1ØØ1   4526             ERROR           /NO ( AFTER IF
1ØØ2   45Ø1             PUSHJ           /EVALUATE EXPRESSION
1ØØ3   16ØØ              EVAL-1
1ØØ4   45Ø6             GETC            /PASS )
1ØØ5   1Ø45             TAD FLAC1       /TEST FOR -,Ø,+
1ØØ6   771Ø             SPA CLA
1ØØ7   5622             JMP I PGOTO     /NEGATIVE, USE 1ST REF
1Ø1Ø   4565             TSTERM          /Ø OR POS, GET TO NEXT
1Ø11   521Ø             JMP .-1
1Ø12   57Ø3             JMP I PRCP      /; OR CR, CONTINUE SAME LINE
1Ø13   1Ø45             TAD FLAC1       /COMMA, SEE IF Ø OR POS
1Ø14   765Ø             SNA CLA
1Ø15   5622             JMP I PGOTO     /ZERO, USE 2ND REF
1Ø16   4565             TSTERM          /POSITIVE, GET TO NEXT
1Ø17   5216             JMP .-1
1Ø2Ø   57Ø3             JMP I PRCP      /; OR CR
1Ø21   5622             JMP I PGOTO     /COMMA, USE 3RD REF
1Ø22   Ø61Ø     PGOTO,  GOTO
1Ø23   Ø25Ø     PLPR,   25Ø
```

```
                        /ASSIGNMENT AND LOOP CONTROL
                1024    SET=.
1024    4501    FOR,    PUSHJ           /GET POINTER TO VAR.
1025    1404             GETARG
1026    4521            SPNOR
1027    4511            SORTC           /SEARCH FOR =
1030    2024             TERMS+17-1
1031    7410            SKP
1032    4526            ERROR           /LEFT OF = IN ERROR: "FOR" OR "SET"
1033    1154            TAD PT1         /SAVE VARIABLE POINTER
1034    3332            DCA PT2
1035    4501            PUSHJ           /EVALUATE INITIAL EXPRESSION
1036    1600             EVAL-1
1037    4407            FENT            /SAVE INITIAL VALUE
1040    6732            FPT I PT2
1041    0000            FEXT
1042    4565            TSTERM          /CHECK TERMINATOR
1043    4526            ERROR           /PROBABLY EXCESS R-PAR
1044    5703            JMP I PROP      /; OR CR: THIS IS A SET; CONTINUE
1045    1332            TAD PT2         /COMMA, SAVE LOOP VAR POINTER
1046    4503            PUSHA
1047    4501            PUSHJ           /EVALUATE SECOND EXPRESSION
1050    1601             EVAL
1051    4565            TSTERM          /CHECK TERMINATOR
1052    4526            ERROR           /EXCESS R-PAR OR BAD TERMINATOR
1053    5317            JMP ONEINC      /; OR CR, THAT'S ALL (INC=1)
1054    4504            PUSHF           /COMMA, SAVE INCREMENT
1055    2034             FLARG
1056    4501            PUSHJ           /EVALUATE FINAL EXPRESSION
1057    1601             EVAL
1060    4504    SFINAL, PUSHF           /SAVE FINAL VALUE
1061    2034             FLARG
1062    4724            JMS I FTXS      /SAVE CHAR AND TEXT POINTERS
1063    4430            FLOAT           /FLOAT A ZERO TO START
1064    4407    FCONT,  FENT            /COMPARE LOOP VAR TO FINAL
1065    1732            FAD I PT2       /LOOP VAR
1066    6732            FPT I PT2
1067    2560            FSB I FLARGP    /FINAL
1070    0000            FEXT
1071    1013            TAD PDLXR       /CHECK SIGN OF INCREMENT
1072    1322            TAD PINC
1073    3332            DCA PT2
1074    1732            TAD I PT2
1075    7710            SPA CLA
1076    4450            NEGATE          /BACKWARD COUNTING
1077    1045            TAD FLAC1
1100    7740            SMA SZA CLA
1101    5326            JMP FEND        /LIMIT REACHED OR EXCEEDED
```

```

1102  4501           PUSHJ              /NOT YET, DO OBJECT STATEMENTS
1103  0616  PROC,     PROC
1104  4725           JMS I FIXR         /RESET TO BEGINNING OF OBJ. STMT.
1105  4505           POPF               /RESTORE LIMIT
1106  2034            FLARG
1107  4505           POPF               /RESTORE INC
1110  0044            FLAC
1111  1413           POPA               /RESTORE LOOP VAR POINTER
1112  3332           DCA PT2
1113  1323           TAD M13            /PUSH DOWN ALL OF ABOVE
1114  1013           TAD PDLXR
1115  3013           DCA PDLXR
1116  5264           JMP FCONT
            /////
1117  4504  ONEINC, PUSHF              /NO INCREMENT GIVEN, SET TO 1
1120  1573            FLTONE
1121  5260           JMP SFINAL
            /////
1122  0011  PINC,    11
1123  7765  M13,     -13
1124  2435  FIXS,    TXTSAV
1125  2443  FIXR,    TXTRES
1126  1005  FEND,    TAD P13            /END OF LOOP
1127  1013           TAD PDLXR          /REMOVE VALUES FROM PUSHDOWN LIST
1130  3013           DCA PDLXR
1131  5502           POPJ
1132  0000  PT2,     0
            /////
            /ASK/TYPE SPECIAL CHARACTERS
1133  0246  ALIST,   246      /&
1134  0245           245      /%
1135  0242           242      /"
1136  0241           241      /!
1137  0243           243      /#
1140  0244           244      /$
1141  0240  GLIST,   240      /SPACE
1142  0254  TLIST,   254      /,
1143  0273           273      /;
1144  0215           215      /C.R.
```

```
 797                    /SET Y AND INTENSIFY THE POINT
 798    1145  4452      XDYS,   FIX
 799    1146  6063              6063    /DYL
 800    1147  7200              CLA
 801    1150  1361              TAD XX
 802    1151  6053              6053    /DXL DIX
 803    1152  7410              SKP
 804                    /
 805                    /SET X
 806    1153  4452      XXXS,   FIX
 807    1154  3361              DCA XX  /(DXL)
 808    1155  5530              RETURN
 809                    /
 810                    /TAKE THE INTEGER PART
 811    1156  4452      XINT,   FIX
 812    1157  7200              CLA
 813    1160  5530              RETURN
 814    1161  0000      XX,     0
 815                    /////
 816    1162  1252      TESTS,  TASK4   /"
 817    1163  1210              TASK    /U.R. - AUTOMATIC QUOTE MATCH
 818                    /COMMAND POINTERS
 819    1164  1024      COMGO,  SET
 820    1165  1024              FOR
 821    1166  0776              IF
 822    1167  0416              DO
 823    1170  0610              GOTO
 824    1171  0620              COMMENTS
 825    1172  1206              ASK
 826    1173  1207              TYPE
 827    1174  2735              LIBRARY
 828    1175  2226              ERASE
 829    1176  0641              WRITE
 830    1177  1273              MODIFY
 831    1200  0177              START
 832    1201  1554              RETRN
 833    1202  6446              OPTION
 834    1203  3274              HELLO
 835                    /////
 836    1204  3040      PACLS2, FGUES
 837    1205  3065              FUN1
```

```
                        /INPUT-OUTPUT STATEMENTS
                        
1206  7240  ASK,   CLA CMA          /REMEMBER WHICH CALL.
1207  3131  TYPE,  DCA ATSW
1210  3151  TASK,  DCA DEBGSW       /RE-ENABLE THE TRACE
1211  4510         SORTJ            /SPECIAL CHARACTER?
1212  1132                 ALIST-1
1213  0426                 ATLIST-ALIST
1214  2131         ISZ ATSW         /TEST QUOTE SWITCH
1215  5227         JMP TYPE2
1216  4501         PUSHJ            /DO ASK; SETUP PT1
1217  1404                 GETARG
1220  4636         JMS I TTXTS      /PROTECT TEXT
1221  1233         TAD COL          /TYPE COLON
1222  4512  TASKCL, PRINTC          /(CLA) TO SUPPRESS ":"
1223  4626         JMS I INTERP     /CALL INPUT CONVERSION ROUTINE
1224  4637         JMS I TTXTR      /RESTORE TEXT
1225  5206         JMP ASK          /CONTINUE PROCESSING
1226  3306  INTERP, INTASK
                        ////
1227  4501  TYPE2,  PUSHJ            /DO TYPE
1230  1601                 EVAL
1231  4505         TSTERM
1232  4526         ERROR            /BAD TERMINATOR IN "TYPE"
1233  0272  COL,   272
1234  4640         JMS I OUTS       /PRINT
1235  5207         JMP TYPE
                        /////
1236  2435  TIXTS, TXTSAV
1237  2443  TIXTR, TXTRES
1240  3365  OUTS,  OUTPT
```

```

1241  2151    TQUOT,  ISZ DEBGSW        /DISABLE TRACE
1242  4506            GETC              /TYPE LITERALS
1243  4510            SORTJ
1244  1404                    TLIST2-1
1245  7555                    TLIST3-TLIST2
1246  4512            PRINTC
1247  5242            JMP TQUOT+1
              //////
1250  1060    TCRLF,  TAD CCR           /SLASH=CR,LF.
1251  4512            PRINTC
1252  4506    TASK4,  GETC              /MOVE TO NEXT CHARACTER
1253  5210            JMP TASK
              ////
1254  1060    TCRLF2, TAD CCR           /SPLAT=CR
1255  4537            JMS I OUTDEV
1256  1015            TAD C200          /DELAY FOR C.R.
1257  5251            JMP TCRLF+1

              /IF DEBGSW=0 : ENABLE FLIP-FLOP "DMPSW"
              /       #0: DISABLE AND RETURN ALL"?" ' S.
              /IF DMPSW = 0: TRACE ON, IF ENABLED
              /       #0: TRACE OFF
              /IF BOTH = 0 : PRINT TRACE.


1260  4506    TINTR,  GETC              /PASS PERCENT SIGN
1261  4672            JMS I INTG        /READ FORMAT CONTROL: "%7.3"
1262  1164            TAD DECNUM        /INTEGER PART (TOTAL DIGITS)
1263  3051            DCA TOTDIG
1264  4522            TESTN             /GET PAST . IF ANY
1265  4506            GETC
1266  4672            JMS I INTG        /RIGHT-HAND PART (DECIMAL PLACES)
1267  1164            TAD DECNUM
1270  3133            DCA DECP
1271  5210            JMP TASK
1272  6010    INTG,   DECINT
```

```
906                     /SEARCH ROUTINES
907
908     1273  4515      MODIFY, GETLN           /READ LINE NO.
909     1274  4516              FINDLN          /LOOK IT UP NOW.
910     1275  4526              ERROR2          /NOT THERE = BAD COMMAND UNLESS ZERO.
911     1276  1134              TAD BUFR        /SET POINTERS
912     1277  3010              DCA AXIN        /FOR INPUT
913     1300  3136              DCA XCTIN
914     1301  1143              TAD LINENO      /COPY THE SAME LINE NUMBER.
915     1302  7450              SNA             /CHECK FOR ALL
916     1303  5275              JMP MODIFY+2    /ERROR IN ARG
917     1304  3410              DCA I AXIN      /(X-MEM)
918     1305  1010              TAD AXIN        /SAVE START OF NEW LINE
919     1306  3153              DCA PACKST
920     1307  4540      SCONT,  JMS I INDEV     /READ THE TELETYPE INPUT SILENTLY.
921     1310  3061              DCA LIST3+1     /SAVE SEARCH CHARACTER
922     1311  2151              ISZ DEBUGSW     /NO BREAKS.
923     1312  4506      SCHAR,  GETC            /TYPE*TEST-F.F.
924     1313  4512              PRINTC
925     1314  4510              SORTJ           /LOOK FOR MATCH
926     1315  0057                      LIST3-1
927     1316  1322                      LISTGO-LIST3
928     1317  4547              PACKC           /SAVE NEW LINE.
929     1320  5312              JMP SCHAR
930                     /////
931     1321  1134      SBAK,   TAD BUFR        /RESTART-B.A.
932     1322  7001              IAC
933     1323  3010              DCA AXIN        /SET POINTERS
934     1324  3136              DCA XCTIN
935     1325  4513      SFOUND, READC           /READ FROM KEYBOARD
936     1326  4510              SORTJ           /TEST
937     1327  0053                      LIST6-1
938     1330  1322                      SRNLST-LIST6
939     1331  4507      SGOT,   PACKC           /PACK CHAR.
940     1332  5325              JMP SFOUND      /MORE
```

```
941
942   1333  0000  SORTB,  0          /SORT AND BRANCH ROUTINE. - "SORTJ"
943   1334  7450          SNA
944   1335  1142          TAD CHAR    /ASSUME CHAR IF AC=0
945   1336  7041          CIA
946   1337  3157          DCA T2      /SAVE SORT ITEM
947   1340  1733          TAD I SORTB /FIRST ARG IS LIST LESS ONE
948   1341  2333          ISZ SORTB   /2AND IS INTRA-LIST LENGTH
949   1342  3012          DCA XRT2
950   1343  1412          TAD I XRT2
951   1344  7510          SPA         /**LISTS ENDED BY NEGATIVE NUMBERS**
952   1345  5357          JMP SEX     /READ EXIT
953   1346  1157          TAD T2      /FIND ADDRESS
954   1347  7640          SZA CLA
955   1350  5343          JMP .-5
956   1351  1012          TAD XRT2    /MATCH FOUND.
957   1352  1733          TAD I SORTB
958   1353  3333          DCA SORTB   /SETUP RETURN
959   1354  1733          TAD I SORTB
960   1355  3333          DCA SORTB
961   1356  7410          SKP
962   1357  2333  SEX,    ISZ SORTB   /MATCH NOT FOUND.
963   1360  7300          CLA CLL
964   1361  5733          JMP I SORTB /RETURN TO CALLING SEQUENCE.
```

```
965
966     1362  4501    TAB,    PUSHJ           /TABULATE TO A PARTICULAR COLUMN
967     1363  1600              EVAL-1
968     1364  4452            FIX             /GET COLUMN NUMBER
969     1365  7141            CLL CIA
970     1366  7001            IAC
971     1367  1053            TAD TABCTR
972     1370  7630            SZL CLA
973     1371  5210            JMP TASK        /ALREADY THERE OR PAST IT
974     1372  1033            TAD C24@
975     1373  4512            PRINTC
976     1374  1046            TAD FLAG2       /TEST AGAIN
977     1375  5365            JMP TAB+3
978             1376    SRNLST=.        /'MODIFY' CONTROL CHARACTER TABLE
979     1376  1321            SBAR    /B.A. = RESTART
980     1377  1312            SCHAR   /F.F. = CONTINUE
981     1400  1307            SCONT   /BELL = CHANGE SEARCH CHARACTER
982     1401  1310            SCONT+1 /L.F. = FINISH THE LINE AS BEFORE.
983                     /////
984     1402  0263    LISTGO, INPUTX-11       /C.R. - END THE MODIFIED LINE HERE
985     1403  1331            SGOT            /FOUND SEARCH CHARACTER
```

```
                        /FIND OR ENTER A VARIABLE IN THE LIST.
                        
1404  4525  GETARG, TESTC           /FIRST LETTER OF ARG
1405  0242  TEST2,  0242            /"
1406  0215            0215          /C.R. - FUNCTION OR NUMBER IS NOT AN ARG.
1407  4526            ERROR4        /BAD ARGUEMENT IN 'FOR', 'SET', OR 'ASK'
1410  7240            CLA CMA       /"GETARG" CAN CREATE NEW VAR.
1411  4503  GETVAR, PUSHA           /"GETVAR" WILL NOT
1412  3136            DCA XCTIN     /PACK INTO ADD.
1413  4507            PACKC
1414  4506            GETC          /SECOND LETTER
1415  4511            SORTC         /TERMINATOR?
1416  2005                    TERMS-1
1417  5222            JMP .+3       /YES
1420  1142            TAD CHAR      /NO
1421  0071            AND F77       /SAVE 2AND LETTER OF NAME
1422  1135            TAD ADD
1423  4503            PUSHA
1424  4511            SORTC         /IGNORE THE REST
1425  2005                    TERMS-1
1426  5231            JMP .+3
1427  4506            GETC
1430  5224            JMP .-4
1431  4523            TSTLPR        /LOOK FOR SUBSCRIPT VIA SORTCN
1432  5243            JMP GS1       /NOT SUBSCRIPTED BY L-PAR.
1433  1130            TAD LASTOP    /SAVE LAST OPERATION
1434  4503            PUSHA
1435  4521            PUSHJ         /MOVE PAST L-PAR AND
1436  1600                    EVAL-1  /EVALUATE THE SUBSCRIPT.
1437  4506            GETC          /MOVE PAST R-PAR
1440  1413            POPA
1441  3130            DCA LASTOP    /RECALL LAST OPERATION
1442  4452            FIX
1443  3524  GS1,     DCA SUBS       /SAVE SUBSCRIPT
1444  1413            POPA
1445  3135            DCA ADD       /RESTORE NAME
1446  1134            TAD STARTV    /SEARCH FOR VARIABLE
1447  3154  GS3,     DCA PT1
1450  1154            TAD PT1
1451  3011            DCA XRT
1452  1154            TAD PT1
1453  7041            CIA
1454  1155            TAD LASTV     /TEST FOR END OF LIST
1455  7750            SPA SNA CLA
1456  5267            JMP GS2       /END SEARCH
1457  1554            TAD I PT1     /GET TABLE ENTRY
1460  7041            CIA
1461  1135            TAD ADD
1462  7650            SNA CLA
1463  5612            JMP GEND1     /FOUND XX
```

```
1036
1037    1464  1154    GS4,    TAD PT1         /TRY NEXT ONE
1038    1465  1144            TAD GINC
1039    1466  5247            JMP GS3
1040    1467  2413    GS2,    ISZ I PDLXR     /VAR. NOT FOUND, CAN I MAKE ONE?
1041    1470  4526            ERROR           /UNDEFINED VAR. USED IN EXPRESSION
1042    1471  1155            TAD LASTV       /OK, ADD THE VARIABLE
1043    1472  1005            TAD F13         /TEST STORAGE LIMITS
1044    1473  7141            CIA CLL
1045    1474  1013            TAD PDLXR
1046    1475  7620            SNL CLA
1047    1476  4526            ERROR3
1048    1477  1155            TAD LASTV       /UPDATE THE LIST.
1049    1500  1144            TAD GINC
1050    1501  3155            DCA LASTV
1051    1502  1135            TAD ADD         /SAVE NAME
1052    1503  3554            DCA I PT1
1053    1504  1324            TAD SUBS        /SAVE SUBSCRIPT
1054    1505  3411            DCA I XRT
1055    1506  3411            DCA I XRT       /INITIALIZE VAR. TO ZERO
1056    1507  3411            DCA I XRT
1057    1510  3411            DCA I XRT
1058    1511  5320            JMP GS5         /EXIT
1059                  /////
1060    1512  1411    GEND1,  TAD I XRT       /FOUND NAME, TEST SUBSCRIPT
1061    1513  7041            CIA
1062    1514  1324            TAD SUBS
1063    1515  7640            SZA CLA
1064    1516  5264            JMP GS4         /WRONG SUBSCRIPT
1065    1517  2013            ISZ PDLXR
1066    1520  2154    GS5,    ISZ PT1         /SET POINTER TO DATA
1067    1521  2154            ISZ PT1
1068    1522  5502            POPJ
1069                  ////
1070    1523  1575    P0,     FLTZER
1071
```

```
1072                    /IGNORE LEADING SPACES - "SPNOR"
1073
1074            1524    SUBS=.
1075    1524    0000    XSPNOR, 0
1076    1525    1142            TAD CHAR
1077    1526    1063            TAD M240
1078    1527    7640            SZA CLA
1079    1530    5724            JMP I XSPNOR
1080    1531    4576            GETC
1081    1532    5325            JMP XSPNOR+1
1082                    /////
1083                    /SEE IF NEXT CHARACTER IS A NUMBER
1084    1533    0000    XTESTN, 0       /RETURNS: .; OTHER; NUMBER - "TESTN"
1085    1534    1142            TAD CHAR
1086    1535    1064            TAD MPER        /TEST FOR .
1087    1536    7440            SZA
1088    1537    2333            ISZ XTESTN      /NOT A .
1089    1540    1352            TAD MIST1       /COMPARE TO "9"
1090    1541    7500            SMA
1091    1542    5350            JMP MTEXIT      /TOO LARGE
1092    1543    1353            TAD MIST2       /COMPARE TO "0"
1093    1544    7510            SPA
1094    1545    5350            JMP MTEXIT      /TOO SMALL
1095    1546    3127            DCA SORTCV      /FOUND DIGIT, SAVE IT
1096    1547    2333            ISZ XTESTN
1097    1550    7300    MTEXIT, CLA CLL
1098    1551    5733            JMP I XTESTN
1099                    /////
1100    1552    7764    MIST1,  259-272
1101    1553    0012    MIST2,  272-260
```

```
1102                    /EXIT FROM A "DO" SUBROUTINE
1103
1104
1105    1554  1323      RETRN,  TAD P0  /(PC) => 0
1106    1555  3145              DCA PC
1107    1556  1413      XPOPJ,  TAD I PULXP     /RECURSIVE EXIT - "POPJ"
1108    1557  3157              DCA T2
1109    1560  5557              JMP I T2
1110
1111
1112                    /ASR-TYPE CONTROL CHARACTER TABLE
1113    1561  1362      AILIST, TAB     /& - TABULATION DELIMITER
1114    1562  1260              TINTR   /% - FORMAT DELIMITER
1115    1563  1241              TQUOT   /" - LITERAL DELIMITER
1116    1564  1250              TCRLF   /! - CARRIAGE RETURN AND LINE FEED
1117    1565  1254              TCRLF2  /# - CARRIAGE RETURN ONLY
1118    1566  3125              TDUMP   /$/- DUMP THE SYMBOL TABLE CONTENTS
1119    1567  1252              TASK4   /SP- TERMINATOR FOR NAMES
1120    1570  1252              TASK4   /, - TERMINATOR FOR EXPRESSIONS
1121    1571  0615              PROCESS /; - TERMINATOR FOR COMMANDS
1122    1572  0620              PC1     /C.R. - TERMINATOR FOR STRINGS
1123                    /////
1124    1573  0001      FLTONE, 0001
1125    1574  2000              2000
1126    1575  0000      FLTZER, 0000
1127    1576  0000              0000
1128    1577  0000              0000
```

```
1129                    /EVALUATE AN EXPRESSION WHICH
1130                    /TERMINATES WITH AN R-PAR,; OR C.R. AND
1131                    /LEAVE THE RESULT IN FLAC AND IN FLARG.
1132
1133
1134
1135
1136    1600  4506              GETC            /MOVE PAST EXTRA CHARACTER
1137    1601  3150    EVAL,     DCA LASTOP      /EVALUATION CONTROLLER (CHECKPOINT ?)
1138    1602  4525              TESTC           /TEST CHARACTER AND IGNORE SPACES
1139    1603  5215              JMP ETERM1      /TERMINATION
1140    1604  5332              JMP ENUM        /NUMBER
1141    1605  5342              JMP EFUN        /FUNCTION
1142    1606  4501              PUSHJ           /LETTER OF VARIABLE
1143    1607  1411                      GETVAR  /FIND OR CREATE VARIABLE;ALSO SET PT1.
1144    1610  4525    OPNEXT,   TESTC           /PT1=>ARG
1145    1611  5236              JMP ETERMN      /T
1146    1612  0212    ECHOLST;0212              /N-ERROR IN FORMAT
1147    1613  0377              0377            /F
1148    1614  4526              ERROR4          /L - MISSING OPERATOR
1149                    /////
1150    1615  4504    ETERM1,   PUSHF           /INITIALIZE RESULT TO ZERO.
1151    1616  1575                      FLTZER
1152    1617  4505              POPF
1153    1620  2034                      FLARG
1154    1621  1160              TAD FLARGP      /SET PT1.
1155    1622  3154              DCA PT1
1156    1623  1034              TAD M2          /TEST FOR UNARY OPERATIONS
1157    1624  1127              TAD SORTCN
1158    1625  7450              SNA
1159    1626  5241              JMP ETERM       /CREATE DUMMY FOR UNARY MINUS
1160    1627  7001              IAC
1161    1630  7650              SNA CLA
1162    1631  5323              JMP ARGNXT      /IGNORE UNARY PLUS
1163    1632  1127              TAD SORTCN      /TEST FOR NULL PARENS.
1164    1633  1070              TAD M11
1165    1634  7710              SPA CLA
1166    1635  5353              JMP FLPAR       /MIGHT BE AN L-PAR.
1167    1636  4523    ETERMN,   TSTLPR
1168    1637  7410              SKP
1169    1640  4526              ERROR4          /OPERATOR MISSING BEFORE PAREN
1170    1641  1127    ETERM,    TAD SORTCN      /SET FROM "TESTC"-"SORTC"
1171    1642  3147              DCA THISOP
1172    1643  1147              TAD THISOP
1173    1644  1070              TAD M11
1174    1645  7740              SPA CLA         /END?
1175    1646  3147              DCA THISOP      /"THISOP" EQUIV. TO END OF EXP.
```

```
1176
1177    1647  7201    ETERM2, CLA IAC          /COMPARE PRIORITIES
1178    1650  0147            AND THISOP       /PRIORITIES ARE: (↑),(*/),(+-),PUT
1179    1651  1147            TAD THISOP
1180    1652  7041            CIA
1181    1653  3274            DCA FLOPR
1182    1654  7001            IAC
1183    1655  0130            AND LASTOP
1184    1656  1130            TAD LASTOP
1185    1657  1274            TAD FLOPR
1186    1660  7710            SPA CLA
1187    1661  5310            JMP EPAR         /CONTINUE
1188    1662  1130            TAD LASTOP       /FIND OPERATION FROM TABLE
1189    1663  1331            TAD OPTARL
1190    1664  3274            DCA FLOPR
1191    1665  1674            TAD I FLOPR
1192    1666  3274            DCA FLOPR
1193    1667  1130            TAD LASTOP
1194    1670  7640            SZA CLA          /TEST FOR END OF DATA INTO FLOATING AC.
1195    1671  4505            POPF             /GET LAST DATA
1196    1672  0044                    FLAC
1197    1673  4407            FENT
1198    1674  0000    FLOPR,  00               /(FLOPR I PT1) +-*/↑
1199    1675  6560            FPT I FLARGP     /SAVE RESULT
1200    1676  0000            FEXT
1201    1677  1160            TAD FLARGP
1202    1700  3154            DCA PT1
1203    1701  1147            TAD THISOP
1204    1702  1130            TAD LASTOP       /=0?
1205    1703  7650            SNA CLA
1206    1704  5502            POPJ             /EXIT "EVAL"
1207    1705  1413            POPA             /GET PRIOR OP
1208    1706  3130            DCA LASTOP
1209    1707  5247            JMP ETERM2       /COMPARE THIS OP
1210                  /////
1211    1710  4523    EPAR,   TSTLPR           /TEST FOR SUB-EXPRESSION
1212    1711  7410            SKP
1213    1712  5355            JMP EPAR2        /GO EVALUATE EXPRESSION
1214    1713  1130            TAD LASTOP       /CONTINUE READING THE EXPRESSION
1215    1714  4503            PUSHA            /SAVE "LASTOP".
1216    1715  1154            TAD PT1
1217    1716  3320            DCA .+2
1218    1717  4504            PUSHF            /SAVE LAST ARGUMENT
1219    1720  0000                    0
1220    1721  1147            TAD THISOP       /MORE TO COME
1221    1722  3130            DCA LASTOP
1222    1723  4506    ARGNXT, GETC             /READ 1ST CHAR OF AN ARG.
1223    1724  4525            TESTC            /DO SPECIAL CHECK
1224    1725  5353            JMP ELPAR        /COULD BE LEFT PAREN
1225    1726  5332            JMP FNUM         /N
1226    1727  5342            JMP EFUN         /F
1227    1730  5246            JMP OPNEXT-2     /L
1228    1731  2026    OPTARL, OPTABS
1229                  /////
```

```
1230
1231    1732  4504    ENUM,   PUSHF           /TO PROCESS A NUMBER,SAVE AC
1232    1733  0044                    FLAC
1233    1734  1160            TAD FLARGP      /SET POINTER AS FOR A VARIABLE.
1234    1735  3154            DCA PT1
1235    1736  4473            JMS I FINPUT    /READ TEXT NUMBER => (FT1)
1236    1737  4505            POPF            /RESTORE THE AC
1237    1740  0044                    FLAC
1238    1741  5210            JMP OPNEXT      /CONTINUE
1239                  /////
1240    1742  3274    EFUN,   DCA FLOPP       /SET CODE
1241    1743  4500            GETC            /READ FUNCTION NAME.(1,2,OR 3 LETTERS)
1242    1744  4511            SORTC           /LOOK FOR TERMINATION CHARACTER.
1243    1745  2005                    TERMS-1
1244    1746  5364            JMP EFUN2       /YES
1245    1747  1274            TAD FLOPP       /NO
1246    1750  7104            CLL RAL         /MISH-MASH HASH CODE
1247    1751  1142            TAD CHAR
1248    1752  5342            JMP EFUN
1249    1753  4523    ELPAR,  TSTLPR
1250    1754  4526            ERROR4          /DOUBLE OPERATORS
1251    1755  1127    EPAR2,  TAD SORTCN      /LEFT PARENS FOUND.
1252    1756  4503            PUSHA
1253    1757  1130            TAD LASTOP      /SAVE DATA
1254    1760  4503            PUSHA
1255    1761  4501            PUSHJ           /EVALUATE THE EXPRESSION
1256    1762  1600                    EVAL-1
1257    1763  5500            JMP I EFUN3I
1258                  ///
1259    1764  1127    EFUN2,  TAD SORTCN      /SAVE 'SORTCN','LASTOP',AND FUNC CODE
1260    1765  4503            PUSHA
1261    1766  1130            TAD LASTOP
1262    1767  4503            PUSHA
1263    1770  1274            TAD FLOPP       /SAVE FUNCTION CODE.
1264    1771  4503            PUSHA
1265    1772  4523            TSTLPR
1266    1773  4526            ERROR4          /MUST BE FOLLOWED BY PARENS TO SET ARGUMENT
1267    1774  4501            PUSHJ           /YES
1268    1775  1600                    EVAL-1
1269    1776  1413            POPA            /BRANCH ON FUNCTION CODE:RETURN VIA EFUN3I.
1270    1777  4510            SORTJ
1271    2000  2207                    FNTABL-1
1272    2001  6361                    FNTABF-FNTABL
1273    2002  4526            ERROR2          /ILLEGAL FUNCTION NAME.
1274                  /////
```

```
1275
1276    2003  0241            241     /!
1277    2004  0242            242     /"
1278    2005  0256            256     /. -FOR INPUT NUMBERS
1279          2006  TERMS=.           /TERMINATOR TABLE FOR 'EVAL' AND 'GETVAR'
1280    2006  0240            240             /SPACE  0
1281    2007  0253            253             /+      1
1282    2010  0255            255             /-      2
1283    2011  0257            257             //      3
1284    2012  0252            252             /*      4
1285    2013  0336            336             /UP ARR 5
1286    2014  0250            250             /(      6 L-PARS
1287    2015  0333            333             /[      7
1288    2016  0274            274             /<      10
1289    2017  0251            251             /)      11 R-PARS
1290    2020  0335            335             /]      12
1291    2021  0276            276             />      13
1292    2022  0254            254             /,      14
1293    2023  0273            273             /;      15
1294    2024  0215            215             /C.R.   16
1295    2025  0275            275     /= TO END GETARG FROM 'SET'
1296    2026  5554  OPTABS, FGT I PT1
1297    2027  1554          FAD I PT1
1298    2030  2554          FSB I PT1
1299    2031  4554          FDV I PT1
1300    2032  3554          FMY I PT1
1301    2033  0554          FPW I PT1
1302                  /////
1303    2034  0000  FLARG,  0       /DATA TEMPORARY STORAGE
1304    2035  0000          0
1305    2036  0000          0
1306                  /////
1307                  /FOCAL TEXT FOR "HELLO" COMMAND
1308    2037  7056  HPT,    7056    /LT %] 8.4;
1309    2040  6473          6473
1310    2041  1740          1740    /OPTION K,T,I,F,:,S;
1311    2042  1354          1354
1312    2043  2454          2454
1313    2044  1154          1154
1314    2045  0554          0554
1315    2046  7254          7254
1316    2047  2373          2373
1317    2050  0540          0540    /ERASE ALL
1318    2051  0177          0177
1319    2052  1500          1500
1320                  /////
1321                  /ABSOLUTE VALUE FUNCTION
1322    2053  1045  XABS,   TAD FLAC1
1323    2054  7710          SPA CLA
1324    2055  4450          NEGATE
```

```
1325                    /CONTINUATION OF FUNCTION CALLS.
1326
1327    2056  1413      FRUN3,  POPA              /RESTORE LAST OPERATION
1328    2057  3130              DCA LASTOP
1329    2060  4407              FENT
1330    2061  7010              FNR               /NORMALIZE FUNCTION RETURN
1331    2062  6254              FPT FLARG
1332    2063  0000              FEXT
1333    2064  1160              TAD FLARGP        /SET POINTER
1334    2065  3154              DCA PT1
1335    2066  1413              POPA              /GET LAST PAREN CODE.
1336    2067  7041              CIA               /CHECK FOR PAREN MATCH.
1337    2070  1066              TAD M3
1338    2071  1127              TAD SORTCN        /(STILL SET FROM THE LAST "EVAL")
1339    2072  7640              SZA CLA           /SKIP IF MATCH
1340    2073  4526              ERROR4            /PAREN ERROR
1341    2074  4506              GETC              /MOVE PAST R-PAR, AND RETURN TO OPNEX.
1342    2075  5676              JMP I .+1         /FUNCTION RETURN IS OK
1343    2076  1610                      OPNEXT
1344                    ////
1345
1346    2077  0000      LPRTST, 0                 /SKIP IF LEFT PAREN. - 'TSTLPR'
1347    2100  1127              TAD SORTCN
1348    2101  1070              TAD M11
1349    2102  7700              SMA CLA
1350    2103  5677              JMP I LPRTST
1351    2104  1127              TAD SORTCN
1352    2105  1067              TAD M5
1353    2106  7740              SMA SZA CLA
1354    2107  2277              ISZ LPRTST
1355    2110  5677              JMP I LPRTST
1356
```

```
1357                    /THE DELETE A LINE ROUTINE
1358
1359    2111  4516      DELETE, FINDLN  /SETS "THISLN" AND "LASTLN".
1360    2112  5502              POPJ            /ALREADY GONE
1361    2113  2151              ISZ DEBUGSW     /DISABLE TRACE
1362    2114  4506              GETC            /MEASURE LENGTH
1363    2115  1142              TAD CHAR
1364    2116  1065              TAD MCR
1365    2117  7640              SZA CLA
1366    2120  5314              JMP .-4
1367    2121  1017              TAD AXOUT       /SAVE LAST ADDRESS
1368    2122  7040              CMA
1369    2123  1146              TAD THISLN
1370    2124  3132              DCA CNTR        /LENGTH < 0
1371    2125  1546              TAD I THISLN    /DISCONNECT
1372    2126  3550              DCA I LASTLN
1373    2127  1075              TAD CORS        /START LIST AT TOP
1374    2130  3157      DOK,    DCA T2          /EXAMINATION ADDRESS
1375    2131  1557              TAD I T2        /GET THE NEXT ADDR.
1376    2132  7450              SNA             /TEST FOR END
1377    2133  5346              JMP DONE        /YES-WRAP UP ALL.
1378    2134  3156              DCA T1          /SAVE NEXT ADDRESS.
1379    2135  1146              TAD THISLN      /COMPARE LINE POSITIONS
1380    2136  7141              CIA CLL
1381    2137  1156              TAD T1
1382    2140  7630              SZL CLA         /SKIP IF THISLN > X
1383    2141  1132              TAD CNTR        /CHANGE (X) TO ACCOUNT FOR
1384    2142  1156              TAD T1          /GARBAGE COLLECTION.
1385    2143  3557              DCA I T2
1386    2144  1156              TAD T1          /GET NEXT
1387    2145  5330              JMP DOK
1388                    /////
```

```
1389                    /GARBAGE COLLECTION
1390
1391    2146    7040    DONE,   CMA                 /BACKUP L FOR XR
1392    2147    1146            TAD THISLN
1393    2150    3011            DCA XRT
1394    2151    1132            TAD CNTR            /SETUP END OF HOSE
1395    2152    7040            CMA
1396    2153    1146            TAD THISLN
1397    2154    3012            DCA XRT2
1398    2155    1132            TAD CNTR            /CORRECT END OF BUFFER POINTER.
1399    2156    1134            TAD BUFR
1400    2157    3134            DCA BUFR
1401    2160    1010            TAD AXIN            /COMPUTE COUNT
1402    2161    7040            CMA
1403    2162    1012            TAD XRT2
1404    2163    3156            DCA T1
1405    2164    1010            TAD AXIN
1406    2165    1132            TAD CNTR
1407    2166    3010            DCA AXIN
1408    2167    1412            TAD I XRT2          /SIPHON LOWER PART.
1409    2170    3411            DCA I XRT
1410    2171    2156            ISZ T1
1411    2172    5367            JMP .-3
1412    2173    5311            JMP DELETE          /RESET 'LASTLN','THISLN', AND DATA FIELD.
1413                    /////
1414                    /OPTION TABLE
1415    2174    6457    OPTTBL, OPTK        /SWITCH TO KEYBOARD INPUT
1416    2175    6453            OPTR        /READER INPUT
1417    2176    3237            OPTT        /TTY OUTPUT
1418    2177    3234            OPTP        /PUNCH OUTPUT
1419    2200    3303            OPTI        /INTERPRETIVE/NUMERIC I/O
1420    2201    3302            OPTC        /SINGLE CHARACTER I/O
1421    2202    3244            OPTCOL      /PRINT ":" AT "ASK"
1422    2203    3243            OPTX        /SUPPRESS ":"
1423    2204    3252            OPTE        /ECHO KEYBOARD INPUT
1424    2205    3253            OPTN        /NO ECHO
1425    2206    3256            OPTS        /SET VARIABLE TERMINATOR
1426    2207    3271            OPTM        /START DISK MONITOR
1427
1428            2210    FNTABLE=.
1429    2210    2533            2533    /ABS
1430    2211    2650            2650    /SGN
1431    2212    2636            2636    /ITR
1432    2213    2565            2565    /DIS
1433    2214    2630            2630    /RAN
1434    2215    2623            2623    /DXS
1435    2216    2517            2517    /ADC
1436    2217    2572            2572    /ATN
1437    2220    2624            2624    /EXP
1438    2221    2625            2625    /LOG
1439    2222    2654            2654    /SIN    /LIST OF CODED FUNCTION NAMES
1440    2223    2575            2575    /COS
1441    2224    2702            2702    /SQT
1442    2225    2631            2631    /NEW
```

```
1443                        /ERASE SINGLE LINES, GROUPS, OR VARIABLES
1444    2226  1142  ERASE,  TAD CHAR          /SEE IF "ALL"
1445    2227  1003          TAD MINUSA
1446    2230  7640          SZA CLA
1447    2231  5240          JMP ERVX
1448    2232  1077          TAD ENDT          /YES, ERASE ALL TEXT
1449    2233  3134          DCA BUFR
1450    2234  3475          DCA I CERS
1451    2235  1134  ERV,    TAD STARTV        /ERASE VARIABLES
1452    2236  3155          DCA LASTV
1453    2237  5177          JMP START         /PROGRAM EXECUTION ENDS
1454                        /////
1455    2240  4515  ERVX,   GETLN            /GET LINE NUMBER
1456    2241  1143          TAD LINENO        /SEE OF ZERO OR NONE
1457    2242  7640          SZA CLA
1458    2243  5250          JMP ERL           /NO, ERASE LINES
1459    2244  1134          TAD STARTV        /YES, ERASE VARIABLES
1460    2245  3155          DCA LASTV
1461    2246  5647          JMP I .+1         /CONTINUE PROCESSING
1462    2247  0016          PROC
1463                        /////
1464    2250  1134  ERL,    TAD BUFR          /ERASE LINES
1465    2251  3010          DCA AXIN
1466    2252  4501  ERG,    PUSHJ             /EXTRACT ONE LINE
1467    2253  2111           DELETE
1468    2254  2146          ISZ THISLN
1469    2255  1141          TAD MAGSW
1470    2256  7700          SMA CLA
1471    2257  1546          TAD I THISLN
1472    2260  4524          TSTGRP            /IF GROUP, SEE IF END OF GROUP
1473    2261  5235          JMP ERV           /YES
1474    2262  1546          TAD I THISLN      /NO, CONTINUE ERASING GROUP
1475    2263  3143          DCA LINENO
1476    2264  5252          JMP ERG
```

```
1477                    /ROUTINE CALLED VIA "FINDLN":
1478
1479                    /SEARCH FOR A GIVEN LINE I.D. =[ "LINENO" ]
1480                    /1ST RETURN IF NOT FOUND,
1481                    /2AND IF FOUND,
1482                    /"THISLN" = FOUND LINE OR NEXT LARGER.
1483                    /"LASTLN" = LESSER AND/OR LAST.
1484                    /"TEXTP" IS SET
1485
1486    2265  0070      XFIND,  0
1487    2266  1075              TAD CFRS          /INITIALIZE POINTERS TO FIRST LINE
1488    2267  3150              DCA LASTLN
1489    2270  1075              TAD CFRS
1490    2271  3146      FINDN,  DCA THISLN        /SAVE THIS ONE
1491    2272  1146              TAD THISLN
1492    2273  3012              DCA XRT2
1493    2274  1143              TAD LINENO
1494    2275  7041              CIA
1495    2276  1412              TAD I XRT2        /LINENO=0 WILL ALSO BE FOUND
1496    2277  7450              SNA
1497    2300  2265              ISZ XFIND         /FOUND IT (2ND EXIT)
1498    2301  7700              SMA CLA
1499    2302  5310              JMP FEND3         /PAST IT.
1500    2303  1146              TAD THISLN        /MOVE POINTERS
1501    2304  3150              DCA LASTLN
1502    2305  1546              TAD I THISLN
1503    2306  7440              SZA               /SKIP IF END OF TEST
1504    2307  5271              JMP FINDN
1505    2310  1146      FEND3,  TAD THISLN
1506    2311  7001              IAC
1507    2312  3017              DCA AXOUT         /SET "TEXTP",
1508    2313  3020              DCA XCT
1509    2314  5665              JMP I XFIND
```

```
1510
1511    2315  0000    UTRA,   0               /UNPACK CHARACTER. - "GETC"
1512    2316  4351            JMS GET1
1513    2317  7710    UTF,    SPA CLA         /NORM & EXTEND
1514    2320  1046            TAD C100        /300-337 & 340-376
1515    2321  1377            TAD M137        /240-276 & 200-236
1516    2322  1142            TAD CHAR
1517    2323  7450            SNA
1518    2324  5337            JMP UTX         /"?" FOUND
1519    2325  1054            TAD F337
1520    2326  3142    UTD,    DCA CHAR
1521    2327  1151            TAD DEBGSW
1522    2330  1152            TAD DMPSW
1523    2331  7650            SNA CLA         /PRINT ONLY IF BOTH ARE ZERO.
1524    2332  4512            PRINTC
1525    2333  5715            JMP I UTRA
1526                  //////
1527    2334  4351    EXTN,   JMS GET1
1528    2335  7040            CMA
1529    2336  5317            JMP UTF
1530                  ///
1531    2337  1151    UTX,    TAD DEBGSW      /TEST FOR TRACE-ENABLED
1532    2340  7640            SZA CLA
1533    2341  5347            JMP .+6
1534    2342  1152            TAD DMPSW       /FLIP THE TRACE FLOP
1535    2343  7650            SNA CLA
1536    2344  7001            IAC
1537    2345  3152            DCA DMPSW
1538    2346  5316            JMP UTRA+1      /GET NEXT CHARACTER INSTEAD.
1539    2347  1032            TAD P277        /TRACE DISABLED = RETURN "?"
1540    2350  5326            JMP UTD
1541
1542    2351  0000    GET1,   0               /UNPACK 6-BITS
1543    2352  2020            ISZ XCT         /STARTS=0
1544    2353  5366            JMP GET3
1545    2354  1021            TAD GTEM
1546    2355  0071    GEND,   AND P77
1547    2356  3142            DCA CHAR        /SAVE
1548    2357  1142            TAD CHAR
1549    2360  1023            TAD M77
1550    2361  7650            SNA CLA
1551    2362  5334            JMP EXTN        /EXTENDED
1552    2363  1142            TAD CHAR
1553    2364  1376            TAD M40
1554    2365  5751            JMP I GET1
1555                  /////
```

```
1556
1557    2366  1417    GET3,   TAD I AXOUT     /(X-MEM)
1558    2367  3021            DCA GTEM
1559    2370  7040            CMA
1560    2371  3020            DCA XCT
1561    2372  1021            TAD GTEM
1562    2373  4520            RTL6
1563    2374  7004            RAL
1564    2375  5355            JMP GEND
1565    2376  7740    M40,    -40
1566    2377  7641    M137,   -137
1567                  /////
1568                  /OPTION LIST
1569    2400  0313    OPTLST, "K
1570    2401  0322            "R
1571    2402  0324            "T
1572    2403  0320            "P
1573    2404  0311            "I
1574    2405  0303            "C
1575    2406  0272            ":
1576    2407  0330            "X
1577    2410  0305            "E
1578    2411  0316            "N
1579    2412  0323            "S
1580    2413  0315            "M
1581                  /////
1582                  /ANALOG-DIGITAL CONVERSION
1583    2414  6004    XADC,   6004
1584    2415  3045            DCA FLAC1       /ARG MUST BE 0
1585    2416  5500            RETURN
```

```
1586
1587    2417  0000    XENDLN, 0       /TERMINATE THE BUFFERED LINE - "ENDLN"
1588    2420  1550            TAD I LASTLN    /SAVE OLD POINTER
1589    2421  3534            DCA I BUFR
1590    2422  1134            TAD BUFR        /POINT TO NEW LAST LINE
1591    2423  3550            DCA I LASTLN
1592    2424  1135            TAD AUD         /CHECK FOR EXTRA INFO
1593    2425  7440            SZA
1594    2426  3410            DCA I AXIN
1595    2427  1010            TAD AXIN        /COMPUTE NEW END OF BUFFER
1596    2430  7001            IAC
1597    2431  3134            DCA BUFR
1598    2432  1134            TAD STARTV      /RESET VARIABLE LIST
1599    2433  3155            DCA LASTV
1600    2434  5617            JMP I XENDLN
1601                  /////
1602    2435  0000    TXTSAV, 0               /SAVE CHAR AND TEXT POINTERS
1603    2436  4504            PUSHF
1604    2437  0017                    TEXTP
1605    2440  1142            TAD CHAR
1606    2441  4503            PUSHA
1607    2442  5635            JMP I TXTSAV
1608                  /
1609    2443  0000    TXTRES, 0               /RESTORE SAME
1610    2444  1413            POPA
1611    2445  3142            DCA CHAR
1612    2446  4505            POPF
1613    2447  0017                    TEXTP
1614    2450  5643            JMP I TXTRES
1615                  /////
1616    2451  0000    GRPTST, 0               /AC VS LINENO - "TSTGRP"
1617    2452  0024            AND P7600
1618    2453  7041            CIA
1619    2454  3157            DCA T2
1620    2455  1143            TAD LINENO
1621    2456  0024            AND P7600
1622    2457  1157            TAD T2
1623    2460  7650            SNA CLA
1624    2461  2251            ISZ GRPTST
1625    2462  5651            JMP I GRPTST
```

```
1626                    /I-O SUBROUTINES
1627
1628            2463    VAL=.
1629    2463    0000    CHIN,   0               /READ IN A CHARACTER SUBR. - "READC"
1630    2464    4540            JMS I INDEV
1631    2465    3142            DCA CHAR
1632    2466    4511            SORTC           /LINEFEED OR RUBOUT?
1633    2467    1611                    ECHOLST-1
1634    2470    5663            JMP I CHIN      /YES
1635    2471    4512    ECHO,   PRINTC
1636    2472    1142            TAD CHAR        /SEE IF 200 (L/T)
1637    2473    1024            TAD P7600
1638    2474    7640            SZA CLA
1639    2475    5663            JMP I CHIN      /NO, EXIT
1640    2476    5264            JMP CHIN+1      /YES, GET ANOTHER
1641                    /////
1642    2477    0000    OUT,    0               /OUTPUT A CHARACTER - "PRINTC"
1643    2500    7450            SNA             /USE (AC) OR (CHAR)
1644    2501    1142            TAD CHAR
1645    2502    1065            TAD MCR
1646    2503    7450            SNA
1647    2504    5310            JMP OUTCR
1648    2505    1060            TAD CCR
1649    2506    4537            JMS I OUTDEV
1650    2507    5677    OUTX,   JMP I OUT
1651                    /////
1652    2510    1060    OUTCR,  TAD CCR
1653    2511    4537            JMS I OUTDEV
1654    2512    1057            TAD CLF
1655    2513    5306            JMP OUTX-1
1656                    /////
1657                    /TEST FOR A COMMA, SEMICOLON, OR CR - "TSTERM"
1658                    /RETURNS: OTHER, ; OR CR, COMMA
1659                    /GETS NEXT CHARACTER AFTER COMMA OR OTHER
1660    2514    0000    XTSTER, 0
1661    2515    4511            SORTC           /LOOK FOR ,;CR
1662    2516    1141             TLIST-1
1663    2517    7410            SKP
1664    2520    5326            JMP .+6         /OTHER, GO PAST IT
1665    2521    1127            TAD SORTCN      /FOUND ONE, SEE WHAT IT IS
1666    2522    2314            ISZ XTSTER
1667    2523    7640            SZA CLA
1668    2524    5714            JMP I XTSTER    /; OR CR: 2ND EXIT
1669    2525    2314            ISZ XTSTER      /COMMA, 3RD EXIT
1670    2526    4506            GETC
1671    2527    5714            JMP I XTSTER
1672                    /////
1673
1674            2527    COMEIN=.-1      /COMMAND-INPUT BUFFER LIVES HERE.
1675
1676            2600    COMOUT=2600
```

```
1677           2600    *COMOUT
1678
1679                   /INTERRUPT PROCESSOR.
1680
1681    2600   0000    SAVAC,  0          /CONTENTS OF AC
1682    2601   0000    SAVLK,  0          /CONTENTS OF LINK
1683    2602   7575    MBREAK, -203       /CONTROL-C
1684    2603   3200    INTRPT, DCA SAVAC          /SAVE WORKING DATA
1685    2604   7010            RAR
1686    2605   3201            DCA SAVLK
1687    2606   6031            KSF                /CHECK FOR KEYBOARD FIRST
1688    2607   5225            JMP TINT
1689    2610   6036            KRB                /READ BUFFER AND CLEAR FLAG TO FETCH NEXT
1690    2611   0026            AND P177           /IGNORE PARITY BIT
1691    2612   1015            TAD C200
1692    2613   3306            DCA SIN
1693    2614   1306            TAD SIN
1694    2615   1202            TAD MBREAK         /MANUAL STOP?
1695    2616   7650            SNA CLA
1696    2617   5345            JMP RECOVR
1697    2620   1264            TAD INBUF          /ANY SPACE?
1698    2621   7640            SZA CLA
1699    2622   4526            ERROR2             /WILL WAIT FOR OUTPUT BUFFER
1700    2623   1306            TAD SIN
1701    2624   3264            DCA INBUF          /SAVE INPUT
1702    2625   6041    TINT,   TSF
1703    2626   5244            JMP EXIT
1704    2627   6042            TCF
1705    2630   3260            DCA TELSW          /TURN OFF THE IN-PROGRESS FLAG.
1706    2631   1663            TAD I OPTRI
1707    2632   7450            SNA
1708    2633   5244            JMP EXIT           /DONE
1709    2634   6044            TPC                /TYPE NEXT.
1710    2635   3260            DCA TELSW          /CLEAR AC AND TURN ON THE FLAG.
1711    2636   3663            DCA I OPTRI        /ZERO OUT THE DATA AREA
1712    2637   1263            TAD OPTRI
1713    2640   7001            IAC
1714    2641   0031            AND P17
1715    2642   1261            TAD OPTR0
1716    2643   3263            DCA OPTRI
1717    2644   6244    EXIT,   6244               /RESTORE MEMORY FIELD
1718    2645   6101            6101               /SMP
1719    2646   7000            NOP                /(HLT)-IF YOU HAVE MEMORY PARITY
1720    2647   6011            RSF                /TEST H.S. READER FLAG
1721    2650   5253            JMP .+3
1722    2651   6012            RRB                /READ BUFFER AND CLEAR FLAG
1723    2652   3037            DCA HINBUF         /SAVE CHARACTER
1724    2653   1201            TAD SAVLK
1725    2654   7104            RAL CLL
1726    2655   1200            TAD SAVAC
1727    2656   6001            ION
1728    2657   5400    EXITJ,  JMP I 0
```

```
1729
1730    2660  0001    TELSW,  1       /INPUT SWITCH
1731    2661  3400    OPTR0,  IOBUF   /OUTPUT POINTERS
1732    2662  3400    OPTR0,  IOBUF   /VARS
1733    2663  3400    OPTRI,  IOBUF
1734    2664  0000    INBUF,  0       /KEYBOARD BUFFER.
1735                  /////
1736    2665  0000    XI33,   0               /VIA (INDEV)
1737    2666  1264            TAD INBUF       /ANY INPUT?
1738    2667  7550            SPA SNA
1739    2670  5266            JMP .-2         /NO = WAIT
1740    2671  3275            DCA XOUTL
1741    2672  3264            DCA INBUF       /CLEAR INPUT BUFFER
1742    2673  1275            TAD XOUTL
1743    2674  5665            JMP I XI33
1744                  /////
1745    2675  0000    XOUTL,  0               /VIA (OUTDEV)
1746    2676  3265            DCA XI33        /SAVE CURRENT CHARACTER.
1747    2677  1265            TAD XI33        /IS IT A CR?
1748    2700  1065            TAD MCR
1749    2701  7650            SNA CLA
1750    2702  3053            DCA TABCTR      /YES, RESET CARRIAGE INDEX
1751    2703  1265            TAD XI33
1752    2704  4732            JMS I SKPNP     /SKIP IF A NON-PRINTING CHARACTER
1753    2705  2053            ISZ TABCTR      /PRINTING: INCREMENT INDEX
1754    2706  0000    SIN,    0
1755    2707  6001            ION             /BE SURE INTERRUPT IS ON.
1756    2710  1662            TAD I OPTR0     /ANY ROOM?
1757    2711  7640            SZA CLA         /A CHARACTER IS NON-ZERO
1758    2712  5310            JMP .-2         /NO = WAIT.
1759    2713  1260            TAD TELSW       /IN PROGRESS?
1760    2714  7640            SZA CLA
1761    2715  5322            JMP .+5
1762    2716  1265            TAD XI33        /NO
1763    2717  6046            TLS             /TYPE CHARACTER.
1764    2720  3260            DCA TELSW       /SET IN-PROGRESS FLAG.
1765    2721  5675            JMP I XOUTL     /RETURN
1766    2722  1265            TAD XI33        /SEND DATA
1767    2723  3662            DCA I OPTR0
1768    2724  1262            TAD OPTR0       /SET POINTERS
1769    2725  7001            IAC
1770    2726  0031            AND P17
1771    2727  1261            TAD OPTR0
1772    2730  3262            DCA OPTR0
1773    2731  5675            JMP I XOUTL
1774                  ///////
1775    2732  3014    SKPNP,  SKIPNP
```

```
1776            4526    ERROR2=ERROR; ERROR3=ERROR; ERROR4=ERROR
1777            4526
1778            4526
1779    2733    3225    WAITP,  OWAIT
1780    2734    3203    OPTDOP, OPTTDO
1781    2735    3336    ERROR5, DCA .+1         /ERROR CALLED FROM A TABLE
1782    2736    0000    FRR2,   0               /LIMIT EXCEEDED
1783    2737    7240            CLA CMA         /COMPUTE CALLING ADDRESS (ALSO "SPACE")
1784    2740    1336            TAD FRR2        /AND USE IT AS ERROR NUMBER.
1785    2741    3143            DCA LINENO      /SAVE ERROR CODE.
1786    2742    4733            JMS I WAITP     /WAIT FOR OUTPUT TO FINISH
1787    2743    6002            IOF             /DISABLE INTERRUPT FOR INITIALIZATIONS
1788    2744    5347            JMP .+3
1789    2745    1015    RECOVR, TAD C200
1790    2746    3143            DCA LINENO      /SAVE ERROR NUMBER
1791    2747    2260            ISZ TELSW       /TURN ON IN-PROGRESS SWITCH
1792    2750    1025            TAD M20         /SETUP INIT COUNT
1793    2751    3132            DCA CNTR
1794    2752    7040            CMA
1795    2753    1261            TAD OPTR0
1796    2754    3011            DCA XRT         /INIT I/O BUFFERS.
1797    2755    3411            DCA I XRT
1798    2756    2132            ISZ CNTR
1799    2757    5355            JMP .-2
1800    2760    3264            DCA INBUF       /INIT KEY-BUFR.
1801    2761    1261            TAD OPTR0       /INIT TTY POINTERS.
1802    2762    3263            DCA OPTRI
1803    2763    1261            TAD OPTR0
1804    2764    3262            DCA OPTRO
1805    2765    4734            JMS I OPTDOP    /SET TO TTY OUTPUT
1806    2766    1161            TAD PICH        /RESET "READC"
1807    2767    3113            DCA 113         /IF AN ERROR OCCURS.
1808    2770    7040            CMA             /PREPARE A STOP BIT FOR TTY
1809    2771    6046            TLS             /AND RAISE FLAG
1810    2772    7200            CLA
1811    2773    1060            TAD CCR         /PRINT A CR
1812    2774    4512            PRINTC
1813    2775    1032            TAD P277        /MAKE A ?
1814    2776    4512            PRINTC          /AND TURN ON THE INTERRUPT
1815    2777    4514            PRNTLN          /PRINT ERROR NUMBER AND,
1816    3000    2145            ISZ PC
1817    3001    1545            TAD I PC        /UNLESS IT IS ZERO, (X-MEM)
1818    3002    7450            SNA
1819    3003    5211            JMP .+6
1820    3004    3143            DCA LINENO
1821    3005    1062            TAD P7700
1822    3006    4512            PRINTC
1823    3007    4512            PRINTC          /PRINT SPACE AGAIN AND
1824    3010    4514            PRNTLN          /PRINT LINE OF ERROR.
1825    3011    1060            TAD CCR
1826    3012    4512            PRINTC
1827    3013    5177            JMP START       /INTERRUPT WILL BE RE-ENABLED SOON.
1828                    /////
```

```
1829                    /SKIP IE (AC) IS A NON-PRINTING CHARACTER
1830    3014  0000      SKIPNP, 0
1831    3015  4520              RTL6              /PRINTING CHARACTERS ARE 240-337
1832    3016  7710              SPA CLA
1833    3017  7020              CML
1834    3020  7420              SNL
1835    3021  2214              ISZ SKIPNP
1836    3022  5614              JMP I SKIPNP
1837                    /////
1838                    /PACK A CHARACTER INTO THE BUFFER - "PACKC"
1839    3023  0000      PACBUF, 0
1840    3024  4510              SORTJ             /LOOK FOR ? OR RUBOUT
1841    3025  3055               PACLST-1
1842    3026  6126               PACLS2-PACLST
1843    3027  1142              TAD CHAR
1844    3030  4214              JMS SKIPNP        /PRINTING CHARACTER?
1845    3031  5234              JMP .+3           /YES
1846    3032  1071              TAD P77           /NO, PACK 77 FIRST
1847    3033  4242              JMS PCK1
1848    3034  1142              TAD CHAR          /PACK 6-BIT CHARACTER
1849    3035  0071              AND P77
1850    3036  4242              JMS PCK1
1851    3037  5623              JMP I PACBUF
1852                    /////
1853    3040  1054      PUUES,  TAD P337          /USE 337 FOR ?
1854    3041  5235              JMP .-4
1855                    /////
1856                    /PACK ONE 6-BIT WORD
1857    3042  0000      PCK1,   0
1858    3043  2136              ISZ XCTIN
1859    3044  5260              JMP ROT           /PACK LEFT HALF
1860    3045  1135              TAD ADD           /PACK RIGHT HALF AND STORE
1861    3046  3410              DCA I AXIN
1862    3047  1013              TAD PULXR         /CHECK FOR SPACE
1863    3050  7141              CLL CIA
1864    3051  1005              TAD P13
1865    3052  1010              TAD AXIN
1866    3053  7650              SZL CLA
1867    3054  4526              ERROR             /BUFFER OR STORAGE OVERFLOW
1868    3055  5642              JMP I PCK1
1869                    /////
1870    3056  0277      PACLST, 277       /?
1871    3057  0377              377       /RUBOUT
1872                    /////
1873    3060  4520      ROT,    RTL6      /SAVE LEFT HALF
1874    3061  3135              DCA ADD
1875    3062  7040              CMA
1876    3063  3136              DCA XCTIN
1877    3064  5642              JMP I PCK1
```

```
1878                        /RUBOUT ONE CHARACTER
1879    3065  1010    RUB1,  TAD AXIN        /SAVE POINTER
1880    3066  3242           DCA PCK1
1881    3067  1136           TAD XCTIN       /CHARACTER IN ADD?
1882    3070  7640           SZA CLA
1883    3071  5277           JMP RUB2        /YES
1884    3072  1010           TAD AXIN        /NO, BEGINNING OF BUFFER?
1885    3073  7041           CIA
1886    3074  1153           TAD PACKST
1887    3075  7760           SMA CLA
1888    3076  5322           JMP PKZERO      /YES, IGNORE
1889    3077  1324    RUB2,  TAD SPLAT       /ECHO A BACKSLASH
1890    3100  4512           PRINTC
1891    3101  2136           ISZ XCTIN
1892    3102  5310           JMP RUB3        /BACKUP STORAGE
1893    3103  1642           TAD I PCK1      /KILL ADD AND CHECK FOR 77
1894    3104  0071           AND P77         /IN 2ND HALF OF LAST STORED WORD
1895    3105  1023           TAD M77
1896    3106  7640           SZA CLA
1897    3107  5322           JMP PKZERO      /NO, DONE
1898    3110  1642    RUB3,  TAD I PCK1      /KILL 2ND HALF OF LAST STORED WORD
1899    3111  0062           AND P7700
1900    3112  3135           DCA ADD
1901    3113  7040           CMA             /BACKUP POINTER
1902    3114  1010           TAD AXIN
1903    3115  3010           DCA AXIN
1904    3116  1135           TAD ADD         /TEST FOR 77 IN ADD
1905    3117  1006           TAD C100
1906    3120  7640           SZA CLA
1907    3121  7040           CMA
1908    3122  3136    PKZERO, DCA XCTIN
1909    3123  5623           JMP I PACBUF
1910    3124  0334    SPLAT,  334
```

```
1911                    /DUMP THE SYMBOL TABLE CONTENTS
1912    3125  4504      TDUMP,  PUSHF           /SAVE TEXT POINTERS
1913    3126  0017                      TEXTP
1914    3127  7040              CMA
1915    3130  1134              TAD STARTV      /START VARIABLE LIST
1916    3131  3014      TDLOOP, DCA FLTXR
1917    3132  1014              TAD FLTXR       /TEST FOR END OF LIST
1918    3133  7040              CMA
1919    3134  1155              TAD LASTV
1920    3135  7650              SNA CLA
1921    3136  5370              JMP TDEND       /END FOUND
1922    3137  1375              TAD TDTEXT      /NO, SET UP POINTERS
1923    3140  3017              DCA AXOUT
1924    3141  3020              DCA XCT
1925    3142  1414              TAD I FLTXR     /2 LETTERS OF VAR. NAME
1926    3143  3376              DCA TDTEXT+1
1927    3144  4501              PUSHJ           /PRINT NAME AND "("
1928    3145  1241                      TDOUT
1929    3146  1414              TAD I FLTXR     /GET AND PRINT SUBSCRIPT
1930    3147  4774              JMS I TDOUTP
1931    3150  4501              PUSHJ           /PRINT ")="
1932    3151  1241                      TDOUT
1933    3152  1005              TAD P13         /SPACE TO 11TH COLUMN
1934    3153  3046              DCA FLAC2
1935    3154  4501              PUSHJ
1936    3155  1374                      TAB+12
1937    3156  2014              ISZ FLTXR
1938    3157  4407              FENT            /PICK UP VALUE
1939    3160  5414              FGT I FLTXR     /(DOES NOT AUTOINDEX)
1940    3161  0000              FEXT
1941    3162  4472              JMS I FOUTPUT   /PRINT VALUE
1942    3163  1060              TAD CCR         /AND A C.R.
1943    3164  4512              PRINTC
1944    3165  1014              TAD FLTXR       /INCREMENT FOR NEXT VAR.
1945    3166  1035              TAD P2
1946    3167  5331              JMP TDLOOP
1947    3170  4505      TDEND,  POPF            /RESTORE TEXT POINTERS
1948    3171  0017                      TEXTP
1949    3172  5773              JMP I .+1
1950    3173  1252              TASK4
1951    3174  6100      TDOUTP, SIGOUT
1952    3175  3175      TDTEXT, .               /THE FOLLOWING IS FOCAL TEXT
1953    3176  0000              0       /VAR. NAME GOES HERE
1954    3177  5077              5077    /"(" AND C.R.
1955    3200  1551              1551    /")=" AND C.R.
1956    3201  7577              7577
1957    3202  1500              1500
```

```
1958                    /OPTION ROUTINES
1959                    /
1960                    /ROUTINE TO SET UP OUTPUT
1961    3203  0000      OPTTDO, 0
1962    3204  1220              TAD CTSF
1963    3205  3621              DCA I OPTTL       /TSF
1964    3206  1621              TAD I OPTTL
1965    3207  7001              IAC
1966    3210  3622              DCA I OPTTL+1     /TCF
1967    3211  1622              TAD I OPTTL+1
1968    3212  1035              TAD P2
1969    3213  3623              DCA I OPTTL+2     /TPC
1970    3214  1623              TAD I OPTTL+2
1971    3215  1035              TAD P2
1972    3216  3624              DCA I OPTTL+3     /TLS
1973    3217  5603              JMP I OPTTDO
1974    3220  6041      CTSF,   TSF
1975    3221  2625      OPTTL,  TINT
1976    3222  2627              TINT+2
1977    3223  2634              TINT+7
1978    3224  2717              SIN+11
1979                    /////
1980                    /ROUTINE TO WAIT UNTIL OUTPUT FINISHES
1981    3225  0000      OWAIT,  0
1982    3226  6001              ION               /(SWAP) - FOR 2+USER
1983    3227  1633              TAD I TSWP        /LOOK AT TELSW
1984    3230  7640              SZA CLA
1985    3231  5226              JMP .-3
1986    3232  5625              JMP I OWAIT
1987    3233  2660      TSWP,   TELSW
1988                    /////
1989    3234  4225      OPTP,   JMS OWAIT         /SET UP FOR PUNCH OUTPUT
1990    3235  1025              TAD M20           /CONVERT TO PSF; ETC.
1991    3236  7410              SKP
1992    3237  4225      OPTT,   JMS OWAIT         /SET UP FOR TTY OUTPUT
1993    3240  4203              JMS OPTTDO
1994    3241  5642      OPTXIT, JMP I .+1         /EXIT OPTIONS
1995    3242  6461              OPTRET
```

```
1996
1997    3243  1250    OPTX,   TAD OPTC1       /SUPPRESS ":" ON ASK
1998    3244  1247    OPTCOL, TAD CPRINT      /RESTORE ":"
1999    3245  3651            DCA I COLP
2000    3246  5241            JMP OPTXIT
2001    3247  4512    CPRINT, PRINTC
2002    3250  2466    OPTC1,  CLA-PRINTC
2003    3251  1222    COLP,   TASKCL
2004                    /////
2005    3252  1247    OPTE,   TAD CPRINT      /SET UP FOR KEYBOARD ECHO
2006    3253  3655    OPTN,   DCA I ECHP      /SUPPRESS ECHO
2007    3254  5241            JMP OPTXIT
2008    3255  2471    ECHP,   ECHO
2009                    /////
2010    3256  4506    OPTS,   GETC            /SET UP USER TERMINATOR FOR "ASK"
2011    3257  4511            SORTC
2012    3260  2003                    TERMS-3
2013    3261  7410            SKP
2014    3262  5256            JMP .-4
2015    3263  4501            PUSHJ           /GET CHARACTER
2016    3264  1601                    FVAL
2017    3265  4452            FIX
2018    3266  3670            DCA I USERTP
2019    3267  5241            JMP OPTXIT
2020    3270  6002    USERTP, USERT
2021                    /////
2022    3271  4225    OPTM,   JMS OWAIT       /EXIT TO DISK MONITOR
2023    3272  6002            IOF
2024    3273  5424            JMP I P7600
2025                    /////
2026                    /THIS IS THE INITIALIZATION COMMAND
2027    3274  1301    HELLO,  TAD HP
2028    3275  3017            DCA AXOUT
2029    3276  3020            DCA XCT
2030    3277  4501            PUSHJ           /START BY SETTING FORMAT
2031    3300  1260                    TINTR
2032                    /////
2033    3301  2036    HP,     HPT-1   /FOCAL TEXT "%8.4;D K,T,I,E,:,S;E A"
```

```
2034                        / I/O MODE OPTIONS
2035    3302  7240  OPTC,   CLA CMA
2036    3303  3305  OPTI,   DCA IOSW
2037    3304  5241          JMP OPTXIT
2038                        /////
2039    3305  0000  IOSW,   0
2040                        / I/O MODE:     "I" = 0000 = INTERPRETIVE INPUT, NUMERIC OUTPUT
2041                        /               "C" = 7777 = SINGLE CHARACTER I/O
2042                        /////
2043                        /"ASK" MASTER ROUTINE
2044    3306  0000  INTASK, 0
2045    3307  1154          TAD PT1         /SAVE VAR, POINTER
2046    3310  3225          DCA OWAIT
2047    3311  1305          TAD IOSW        /WHAT MODE OF INPUT?
2048    3312  7650          SNA CLA
2049    3313  5323          JMP STRING      /INTERPRETIVE
2050    3314  4513          READC           /SINGLE CHARACTER
2051    3315  1142          TAD CHAR        /CONVERT CHARACTER CODE TO FLOATING
2052    3316  4430          FLOAT           /POINT NUMBER
2053    3317  4407  ASKEND, FENT           /SAVE VALUE
2054    3320  6625          FPT I OWAIT
2055    3321  0000          FEXT
2056    3322  5706          JMP I INTASK
2057                        /INTERPRETIVE BUFFERED INPUT
2058    3323  1013  STRING, TAD PDLXR      /SAVE PUSHDOWN LIST POINTER
2059    3324  3203          DCA OPTTDO
2060    3325  1364          TAD BUFTOP      /PROTECT TOP OF ASKBUF
2061    3326  3013          DCA PDLXR
2062    3327  2151          ISZ DEBGSW      /DISABLE TRACE
2063    3330  1363  INBARR, TAD BUFBOT      /INITIALIZE ASKBUF
2064    3331  3010          DCA AXIN
2065    3332  3136          DCA XCTIN
2066    3333  1363          TAD BUFBOT
2067    3334  3153          DCA PACKST
2068    3335  4513          READC           /IGNORE SPACES
2069    3336  4511          SORTC
2070    3337  0032                  C240-1
2071    3340  5335          JMP .-3
2072    3341  4510          SORTJ           /SEARCH FOR TERMINATOR
2073    3342  5775                  ASKLST-1
2074    3343  0774                  ASKLS2-ASKLST
2075    3344  4507          PACKC           /PACK INTO BUFFER
2076    3345  4513  INGT,   READC
2077    3346  5341          JMP .-5
```

```
2078                    /TERMINATOR FOUND, PROCESS INPUT
2079    3347  1060      INTERM, TAD CCR           /PACK A.C.R.
2080    3350  3142              DCA CHAR
2081    3351  4507              PACKC
2082    3352  4507              PACKC
2083    3353  1203              TAD OPTTBU        /RESTORE PDLXR
2084    3354  3013              DCA PDLXR
2085    3355  1363              TAD BUFBOT        /INITIALIZE UNPACKING
2086    3356  3017              DCA AXOUT
2087    3357  3020              DCA XCT
2088    3360  4501              PUSHJ             /EVALUATE EXPRESSION
2089    3361  1600                      EVAL-1
2090    3362  5317              JMP ASKEND
2091                    /////
2092    3363  7550      BUFBOT, ASKBUF            /BOTTOM OF BUFFER
2093    3364  5212      BUFTOP, ASKBUF!177+13     /TOP+12 OF BUFFER
2094                    /////
2095                    /"TYPE" OUTPUT
2096    3365  0000      OUTPT,  0
2097    3366  1305              TAD IOSW          /WHAT KIND OF OUTPUT
2098    3367  7640              SZA CLA
2099    3370  5373              JMP COUTPT        /SINGLE CHARACTER
2100    3371  4472              JMS I FOUTPUT     /NUMERIC OUTPUT; PRINT VALUE
2101    3372  5765              JMP I OUTPT
2102                    /////
2103    3373  4452      COUTPT, FIX               /GET CODE FOR CHARACTER
2104    3374  7450              SNA               /MODULO 256
2105    3375  7130              CLL CML RAR       /TO ALLOW ZERO CODE TO BE PRINTED
2106    3376  4512              PRINTC
2107    3377  5765              JMP I OUTPT
2108                    /NOTE: "TDUMP" PRINTS ONLY IN NUMERIC MODE
```

```
2109            3400    IOBUF=.+400
2110                    /
2111            3420    .=IOBUF+20
2112    3420    0000    FRST,   0       /TEXT POINTER
2113    3421    0000            0000    /DUMMY LINE NO
2114    3422    0355            0355    / C-
2115    3423    0617            0617    / FO
2116    3424    0301            0301    / CA
2117    3425    1454            1454    / L,
2118    3426    4040            4040
2119    3427    6557            6557    / 5/
2120    3430    6671    FRSTX,  6671    / 69
2121    3431    7715            7715
2122            3432    BUFBEG=.
2123                    /////
2124            2735    LIBRARY=ERROR5  /COMMAND NOT AVAILABLE
```

```
2125                    PAUSE
```

```
2126                    /FOCAL INITIALIZATION ROUTINE
2127            0176    *START-1
2128    0176    3432            BEGIN
2129            3432    *BUFREG
2130    3432    7300    BEGIN,  CLA CLL
2131    3433    1377            TAD (RECOVR+1   /RESTORE RESTART
2132    3434    3176            DCA START-1
2133    3435    6002            IOF             /CLEAR FLAGS TO PREVENT INTERRUPT
2134    3436    6022            6022            /PCF
2135    3437    6032            6032            /KCC
2136    3440    6203            6203            /CDF CIF 00
2137    3441    6402            6402            /CLEAR PT00'S
2138    3442    6412            6412
2139    3443    6422            6422
2140    3444    6432            6432
2141    3445    6442            6442
2142    3446    6452            6452
2143    3447    6462            6462
2144    3450    6472            6472
2145    3451    6764            6764            /CLEAR DECTAPE
2146    3452    6772            6772
2147    3453    7200            CLA
2148    3454    6046            TLS             /START LOW SPEED OUTPUT
2149    3455    3414            DCA I FLTXR     /CLEAR OUTPUT BUFFER
2150    3456    2376            ISZ (-20
2151    3457    5255            JMP .-2
2152    3460    1027            TAD BOTTOM      /INITIALIZE PUSHDOWN LIST
2153    3461    3013            DCA PDLXR
2154    3462    6001            ION
2155    3463    4512            PRINTC          /CHAR IS A C.R
2156    3464    4512            PRINTC
2157    3465    4512            PRINTC
2158    3466    4501            PUSHJ           /TYPE FOCAL HEADING
2159    3467    0641                    WRITE
2160    3470    5671            JMP I .+1
2161    3471    2232                    ERV-3   /ERASE ALL
```

```
2162    3576  7760
2163    3577  2746
              5600    *5600
2164                  /DECIMAL TO BINARY CONVERSION 2/10/69
2165    5600  0000    DBCONV, 0
2166    5601  4430            FLOAT           /FLOAT A ZERO
2167    5602  3364            DCA DECEXP      /INITIALIZE
2168    5603  7040            CMA
2169    5604  3260            DCA PSWIT
2170    5605  1363            TAD C43 /35(10)
2171    5606  3044            DCA FLAC0
2172    5607  4755            JMS I SGNTST    /SIGN OF MANTISSA
2173    5610  3365            DCA INSIGN
2174    5611  5215            JMP NEWDIG+1
2175    5612  2260    PERIOD, ISZ PSWIT       /. FOUND, SEE IF FIRST
2176    5613  4526            ERROR           /DOUBLE PERIODS
2177    5614  4506    NEWDIG, GETC            /LOOK FOR A DIGIT
2178    5615  4522            TESTN
2179    5616  5212            JMP PERIOD      /. FOUND
2180    5617  5250            JMP NOTDIG      /NOT FOUND
2181    5620  1260            TAD PSWIT       /DECREMENT DECIMAL EXPONENT
2182    5621  7700            SMA CLA         /IF AFTER .
2183    5622  7040            CMA
2184    5623  1364            TAD DECEXP
2185    5624  3364            DCA DECEXP
2186    5625  4342            JMS MULT10      /MULTIPLY FLAC BY 10
2187    5626  1127            TAD SORTCN      /ADD NEW DIGIT
2188    5627  3043            DCA FLOP3
2189    5630  3042            DCA FLOP2
2190    5631  3041            DCA FLOP1
2191    5632  4313            JMS TRPLAD
2192    5633  1162    OVCHEK, TAD REMAIN      /CHECK FOR OVERFLOW
2193    5634  7640            SZA CLA
2194    5635  5241            JMP .+4
2195    5636  1045            TAD FLAC1
2196    5637  7700            SMA CLA
2197    5640  5214            JMP NEWDIG      /NO OVERFLOW
2198    5641  1361            TAD IOVRL       /OVERFLOW, ROTATE RIGHT
2199    5642  3760            DCA I IRARAC    /SET UP RETURN TO OVCHEK
2200    5643  1162            TAD REMAIN      /ROTATE REMAIN
2201    5644  7110            CLL RAR
2202    5645  3162            DCA REMAIN
2203    5646  1045            TAD FLAC1
2204    5647  5762            JMP I ROTRAC    /ROTATE REST OF FLAC
```

```
2205
2206    5650  4511    NOTDIG, SORTC           /TEST FOR LETTER E
2207    5651  6145             C305-1
2208    5652  5301            JMP EINPUT      /FOUND E
2209    5653  2365    DBTERM, ISZ INSIGN      /END OF INPUT, AFFIX SIGN
2210    5654  4450            NEGATE
2211    5655  1366            TAD CFNR        /SET UP TO NORMALIZE
2212    5656  3260    DBLOOP, DCA .+2
2213    5657  4407            FENT
2214    5660  7000    PSWIT,  FNR             /OR FMY BY 10 OR .10
2215    5661  6554            FPT I PT1       /SAVE RESULT
2216    5662  0000            FEXT
2217    5663  1364            TAD DECEXP      /CHECK DECIMAL EXPONENT
2218    5664  7450            SNA
2219    5665  5600            JMP I DBCONV    /DONE
2220    5666  7500            SMA
2221    5667  5273            JMP .+4
2222    5670  7001            IAC             /NEGATIVE, SET UP TO FMY BY .10
2223    5671  3364            DCA DECEXP
2224    5672  5277            JMP .+5
2225    5673  7240            CLA CMA         /POSITIVE, SET UP TO FMY BY 10
2226    5674  1364            TAD DECEXP
2227    5675  3364            DCA DECEXP
2228    5676  1066            TAD M3
2229    5677  1367            TAD FLINST      /INSTRUCTION FMY FLTEN OR FLPTEN
2230    5700  5256            JMP DBLOOP
2231    5701  4506    EINPUT, GETC            /FOUND "E"
2232    5702  4755            JMS I SGNTST    /TEST FOR SIGN
2233    5703  3040            DCA FLOP0
2234    5704  4757            JMS I DECIN1    /INPUT A DECIMAL INTEGER
2235    5705  1164            TAD DECNUM
2236    5706  2040            ISZ FLOP0       /CHECK SIGN
2237    5707  7041            CIA
2238    5710  1364            TAD DECEXP
2239    5711  3364            DCA DECEXP
2240    5712  5253            JMP DBTERM
```

```
2241                    /ADD FLOP TO FLAC TRIPLE PRECISION WITH OVERFLOW
2242    5713  0000      TRPLAD, 0
2243    5714  7300              CLA CLL
2244    5715  1043              TAD FLOP3
2245    5716  1047              TAD FLAC3
2246    5717  3047              DCA FLAC3
2247    5720  7004              RAL
2248    5721  1042              TAD FLOP2
2249    5722  1046              TAD FLAC2
2250    5723  3046              DCA FLAC2
2251    5724  7004              RAL
2252    5725  1041              TAD FLOP1
2253    5726  1045              TAD FLAC1
2254    5727  3045              DCA FLAC1
2255    5730  7004              RAL
2256    5731  1162              TAD REMAIN
2257    5732  3162              DCA REMAIN
2258    5733  5713              JMP I TRPLAD
2259                    /MULTIPLY FLAC BY 2
2260    5734  0000      MULT2,  0
2261    5735  4756              JMS I MULT2I
2262    5736  1162              TAD REMAIN
2263    5737  7004              RAL
2264    5740  3162              DCA REMAIN
2265    5741  5734              JMP I MULT2
2266                    /MULTIPLY FLAC BY 10
2267    5742  0000      MULT10, 0
2268    5743  4504              PUSHF             /FLAC=>FLOP
2269    5744  0045               FLAC1
2270    5745  4505              POPF
2271    5746  0041               FLOP1
2272    5747  3162              DCA REMAIN        /CLEAR OVERFLOW
2273    5750  4334              JMS MULT2         /FLAC*10 = (FLAC*2*2+FLAC)*2
2274    5751  4334              JMS MULT2
2275    5752  4313              JMS TRPLAD
2276    5753  4334              JMS MULT2
2277    5754  5742              JMP I MULT10
2278    5755  6030      SGNTST, TSTSGN
2279    5756  7037      MULT2I, RALAC
2280    5757  6010      DECIN1, DECINT
2281    5760  7251      IRARAC, RARAC
2282    5761  5633      IOVRL,  OVCHEK
2283    5762  7256      ROTRAC, RARAC+5
2284    5763  0043      C43,    43
2285    5764  0000      DECEXP, 0         /IMPLICIT DECIMAL EXPONENT
2286    5765  0000      INSIGN, 0         /SIGN OF MANTISSA
2287    5766  7000      CFNR,   FNR
2288    5767  3373      FLINST, FMY .+4
2289    5770  0004      FLTEM,  0004      /10(10) FLOATING
2290    5771  2406              2406
2291    5772  0000              0000
2292    5773  7775      FLPTEN, 7775      /.10(10) FLOATING
2293    5774  3146              3146
2294    5775  3147              3147
2295          0162      REMAIN=TEMP1
```

```
2296                    /CHARACTER LIST FOR "ASK"
2297    5776  0215      ASKLST, 215       /CR
2298    5777  0214              214       /FF
2299    6000  0337              337       /BA
2300    6001  0254              254       /COMMA
2301    6002  0000      USERT,  0         /USER-SELECTED CHARACTER
2302    6003  0212              212       /LF
```

```
2303                    /POWER OF 10 TABLE
2304    6004  6030      INTABL, -1750    /1000
2305    6005  7634              -144     /100
2306    6006  7766              -12      /10
2307    6007  7777              -1       /1
2308                    /INPUT A DECIMAL INTEGER <2048
2309    6010  0000      DECINT, 0
2310    6011  3164              DCA DECNUM
2311    6012  4522              TESTN             /GET A DIGIT
2312    6013  7000              NOP
2313    6014  5610              JMP I DECINT      /NONE FOUND
2314    6015  4506              GETC
2315    6016  1164              TAD DECNUM        /MULTIPLY PREV. # BY 10
2316    6017  7106              CLL RTL
2317    6020  7530              SPA SZL
2318    6021  5226              JMP .+5           /OVERFLOW (>2047)
2319    6022  1164              TAD DECNUM
2320    6023  7004              RAL
2321    6024  1127              TAD SORTCN        /ADD NEW DIGIT
2322    6025  7530              SPA SZL
2323    6026  4526              ERROR
2324    6027  5211              JMP DECINT+1
2325          0164      DECNUM=TEMP3
2326                    /TEST FOR A SIGN
2327    6030  0000      TSTSGN, 0
2328    6031  4521              SPNOR
2329    6032  3127              DCA SORTCN
2330    6033  4511              SORTC             /LOOK FOR + OR -
2331    6034  6114               SNLIST-1
2332    6035  4506              GETC              /SIGN FOUND
2333    6036  4521              SPNOR             /NOT FOUND
2334    6037  7240              CLA CMA
2335    6040  1127              TAD SORTCN        /SORTCN: 0=+, 1=-
2336    6041  5630              JMP I TSTSGN      /AC: 7777=+, 0=-
2337          0163      DIGIT=TEMP2
```

```
2338                    /PRINT A 2-4 DIGIT UNSIGNED DECIMAL INTEGER
2339                    /FIRST 2 LEADING ZEROES NOT PRINTED
2340    6042  0000      INTOUT, 0
2341    6043  3164              DCA DECNUM
2342    6044  1314              TAD INTPTR      /POWER OF 10 POINTER
2343    6045  3260              DCA INTSUB
2344    6046  3210              DCA DECINT      /DECINT=0 MEANS SKIP 0 OUTPUT
2345    6047  4255              JMS INTDO       /1ST DIGIT (1000S)
2346    6050  4255              JMS INTDO       /2ND DIGIT (100S)
2347    6051  2210              ISZ DECINT      /DECINT>0 MEANS PRINT 0S
2348    6052  4255              JMS INTDO       /3RD DIGIT (10S)
2349    6053  4255              JMS INTDO       /4TH DIGIT (UNITS)
2350    6054  5642              JMP I INTOUT
2351    6055  0000      INTDO,  0
2352    6056  3163              DCA DIGIT       /INITIALIZE
2353    6057  1164              TAD DECNUM
2354    6060  1204      INTSUB, TAD INTABL      /SUBTRACT A POWER OF 10
2355    6061  7510              SPA
2356    6062  5267              JMP INTNEG
2357    6063  3164              DCA DECNUM      /POSITIVE RESULT
2358    6064  2163              ISZ DIGIT       /NONZERO DIGIT, SO IGNORE NO
2359    6065  2210              ISZ DECINT      /FURTHER ZEROES
2360    6066  5257              JMP INTSUB+1
2361    6067  7300      INTNEG, CLA CLL         /NEGATIVE RESULT
2362    6070  2260              ISZ INTSUB      /SET UP NEXT POWER OF 10
2363    6071  1210              TAD DECINT      /IS IT A LEADING 0?
2364    6072  7650              SNA CLA
2365    6073  5655              JMP I INTDO     /YES, SKIP IT
2366    6074  1163              TAD DIGIT       /NO, PRINT DIGIT
2367    6075  1036              TAD C260
2368    6076  4512              PRINTC
2369    6077  5655              JMP I INTDO
2370                    /OUTPUT A SIGNED INTEGER IN AC
2371    6100  0000      SIGOUT, 0
2372    6101  3164              DCA DECNUM      /SAVE NUMBER
2373    6102  1164              TAD DECNUM
2374    6103  7710              SPA CLA
2375    6104  1035              TAD P2          /MAKE A -
2376    6105  1315              TAD C253        /MAKE A +
2377    6106  4512              PRINTC
2378    6107  1164              TAD DECNUM      /OUTPUT ABSOLUTE VALUE
2379    6110  7510              SPA
2380    6111  7041              CIA
2381    6112  4242              JMS INTOUT      /OUTPUT THE NUMBER
2382    6113  5700              JMP I SIGOUT
2383    6114  1204      INTPTR, TAD INTABL
2384          6115      SNLIST=.        /FOR SIGN TESTING
2385    6115  0253      C253,   253     /+
2386    6116  0255              255     /-
```

```
2387                    /E FORMAT OUTPUT ROUTINE
2388    6117  7200      XXX,    CLA             /CONVERT TO E FORMAT ON OVERFLOW
2389    6120  1051            TAD TOTDIG
2390    6121  7410            SKP
2391    6122  1133      FLOUT,  TAD DECP        /E FORMAT (%0) FLOATING OUTPUT
2392    6123  7041            CIA
2393    6124  7450            SNA
2394    6125  1347            TAD MDIG        /6 DIGITS IF 0 GIVEN
2395    6126  3164            DCA DECNUM      /DIGIT COUNTER
2396    6127  1022            TAD PER         /PERIOD
2397    6130  4512            PRINTC
2398    6131  1412      FLDIG,  TAD I XRT2      /NEXT DIGIT
2399    6132  2157            ISZ T2          /OUT OF SIG DIGITS?
2400    6133  5336            JMP .+3         /NO, PRINT DIGIT
2401    6134  7240            CLA CMA         /YES, RESET POINTER AND PRINT 0
2402    6135  3157            DCA T2
2403    6136  4750            JMS I OUTP
2404    6137  7410            SKP             /FIELD NOW FILLED, PRINT EXPONENT
2405    6140  5331            JMP FLDIG
2406                    /B-D CONV EXPONENT OUTPUT
2407    6141  1346            TAD C305        /PRINT LETTER E
2408    6142  4512            PRINTC
2409    6143  1156            TAD T1          /OUTPUT THE EXPONENT
2410    6144  4300            JMS SIGOUT
2411    6145  5770      BDEND,  JMP I BDCONV    /DONE
2412    6146  0305      C305,   305             /E
2413    6147  7772      MDIG,   -DIGITS
2414    6150  6437      OUTP,   OUTA
2415                    /PRINT A LINE NUMBER - "PRNTLN"
2416    6151  0000      XPRNTL, 0
2417    6152  1143            TAD LINENO
2418    6153  4520            RTL6
2419    6154  0071            AND P77
2420    6155  4242            JMS INTOUT      /2-DIGIT PART NUMBER
2421    6156  1022            TAD PER
2422    6157  4512            PRINTC          /DECIMAL POINT
2423    6160  1143            TAD LINENO
2424    6161  0026            AND P177        /2-DIGIT STEP NUMBER
2425    6162  4242            JMS INTOUT
2426    6163  1033            TAD C240        /SPACE
2427    6164  3142            DCA CHAR
2428    6165  4512            PRINTC
2429    6166  5751            JMP I XPRNTL
```

```
2430
2431    6167  0015    NEGSGN, 255-240
2432                  /BINARY TO DECIMAL CONVERSION AND OUTPUT
2433    6170  0000    BDCONV, 0
2434    6171  1045            TAD FLAC1       /CHECK SIGN
2435    6172  7700            SMA CLA
2436    6173  5376            JMP .+3
2437    6174  4450            NEGATE          /NEGATIVE, TAKE ABSOLUTE VALUE
2438    6175  1367            TAD NEGSGN      /MAKE A -
2439    6176  1033            TAD C240        /MAKE A SPACE
2440    6177  4512            PRINTC
2441    6200  7240            CLA CMA         /DECREMENT BINARY EXPONENT
2442    6201  1044            TAD FLAC0
2443    6202  3044            DCA FLAC0
2444    6203  3156    BDSCAL, DCA T1          /INITIALIZE DECIMAL EXPONENT
2445    6204  1044            TAD FLAC0       /START SCALING: -4<EXP<0?
2446    6205  7500            SMA
2447    6206  5220            JMP SDOWN       /TOO BIG, SCALE DOWN
2448    6207  1631            TAD I TENPT
2449    6210  7700            SMA CLA
2450    6211  5244            JMP SCALED      /WITHIN LIMITS, DONE
2451    6212  4407            FENT            /TOO SMALL, SCALE UP
2452    6213  3631            FMY I TENPT
2453    6214  0000            FEXT
2454    6215  7240            CLA CMA
2455    6216  1156            TAD T1          /DECREMENT DECIMAL EXPONENT
2456    6217  5203            JMP BDSCAL
2457    6220  4407    SDOWN,  FENT            /SCALE DOWN
2458    6221  3632            FMY I PTENPT
2459    6222  0000            FEXT
2460    6223  7001            IAC             /INCREMENT DECIMAL EXPONENT
2461    6224  5216            JMP .-6
2462                  /CONSTANTS
2463    6225  7771    DCOUNT, -DIGITS-1
2464    6226  7772    MDIGIT, -DIGITS
2465    6227  0007    RND2,   DIGITS+1
2466    6230  7766    M12,    -12
2467                  /POINTERS
2468    6231  5770    TENPT,  FLTEN
2469    6232  5773    PTENPT, FLPTEN
2470    6233  5734    MULT2P, MULT2
2471    6234  5742    MUL10P, MULT10
2472    6235  7544    BUFST,  DIGBUF-1
2473    6236  6122    FLOUTP, FLOUT
2474    6237  6117    XXXP,   XXX
2475                  /ROUTINE TO DECREMENT THE DIGIT POINTER
2476    6240  7040    DECR,   CMA
2477    6241  1040            TAD FLOP0
2478    6242  3040            DCA FLOP0
2479    6243  5351            JMP RET
```

```
2480                    /FINISHED SCALING, GENERATE DIGITS
2481    6244  4633      SCALED, JMS I MULT2P    /ROTATE FLAC LEFT
2482    6245  1235              TAD BUFST       /INITIALIZE DIGIT BUFFER
2483    6246  3012              DCA XRT2
2484    6247  4634              JMS I MUL10P    /MULTIPLY BY 10
2485    6250  1162              TAD REMAIN      /OVERFLOW
2486    6251  5266              JMP BDC1
2487    6252  7110      BDC0,   CLL RAR
2488    6253  3004              DCA ENEGSW      /TEMP STORAGE OF FIRST DIGIT
2489    6254  1045              TAD FLAC1       /ROTATE FLAC RIGHT
2490    6255  7010              RAR
2491    6256  3045              DCA FLAC1
2492    6257  1046              TAD FLAC2
2493    6260  7010              RAR
2494    6261  3046              DCA FLAC2
2495    6262  1047              TAD FLAC3
2496    6263  7010              RAR
2497    6264  3047              DCA FLAC3
2498    6265  1004              TAD ENEGSW      /PREV. OVERFLOW
2499    6266  2044      BDC1,   ISZ FLAC0       /CHECK ROTATE COUNT
2500    6267  5252              JMP BDC0
2501    6270  7440              SZA
2502    6271  5301              JMP BDC2
2503    6272  7240              CLA CMA         /FIRST DIGIT IS 0, IGNORE
2504    6273  1156              TAD T1          /DECREMENT DECIMAL EXPONENT
2505    6274  3156              DCA T1
2506    6275  1045              TAD FLAC1
2507    6276  7650              SNA CLA
2508    6277  3156              DCA T1          /EXP=0 IF MANTISSA=0
2509    6300  7410              SKP
2510    6301  3412      BDC2,   DCA I XRT2      /FIRST DIGIT WAS NOT 0
2511    6302  1225              TAD DCOUNT      /SET TO COUNT DIGITS
2512    6303  3044              DCA FLAC0
2513    6304  4634              JMS I MUL10P    /MULTIPLY BY 10
2514    6305  1162              TAD REMAIN
2515    6306  3412              DCA I XRT2      /SAVE DIGIT JUST GENERATED
2516    6307  2044              ISZ FLAC0
2517    6310  5304              JMP .-4
2518    6311  1235              TAD BUFST       /REINITIALIZE POINTER
2519    6312  3012              DCA XRT2
2520    6313  1225              TAD DCOUNT      /DIGITS AVAILABLE
2521    6314  3157              DCA T2
2522    6315  1051              TAD TOTDIG      /DIGITS WANTED
2523    6316  7450              SNA
2524    6317  5340              JMP R6          /E FORMAT, ROUND TO 6 PLACES
2525    6320  7041              CIA             /COMPUTE FIELD SIZES
2526    6321  1133              TAD DECP
2527    6322  7550              SPA SNA
2528    6323  5327              JMP .+4         /COMPARE DECP TO TOTDIG
2529    6324  7200              CLA             /MORE DECP THAN TOTAL DIGITS!
2530    6325  1051              TAD TOTDIG
2531    6326  3133              DCA DECP
2532    6327  1156              TAD T1          /COMPARE EXPONENT TO FIELD SIZE
2533    6330  7500              SMA
2534    6331  7200              CLA             /INTEGER FIELD >= EXPONENT
```

```
2535  6332  1051        TAD TOTDIG
2536  6333  7510        SPA
2537  6334  5362        JMP FPRNT-2       /NO ROUNDING NEEDED
2538  6335  1226        TAD MDIGIT        /ROUND TO DECP+EXP PLACES
2539  6336  7500        SMA
2540  6337  7200        CLA
2541  6340  1227  R6,   TAD RND2          /START ROUNDING
2542  6341  3004        DCA FNEGSW        /PLACES TO ROUND TO
2543  6342  1235        TAD BUFST         /ROUNDING START ADDRESS
2544  6343  1004        TAD FNEGSW        /SET UP ROUND COUNT
2545  6344  3040        DCA FLOP0
2546  6345  1004        TAD FNEGSW
2547  6346  7041        CIA
2548  6347  3004        DCA FNEGSW        /START ROUNDING PROCESS BY
2549  6350  1631        TAD I TENPT       /ADDING 4 TO FIRST DIGIT
2550  6351  2440  RET,  ISZ I FLOP0       /INCREMENT CURRENT DIGIT
2551  6352  1440        TAD I FLOP0
2552  6353  1230        TAD M12
2553  6354  7710        SPA CLA           /DIGIT>9?
2554  6355  5364        JMP FPRNT         /NO, END ROUNDING
2555  6356  3440        DCA I FLOP0       /YES, SET DIGIT TO 0 AND CARRY
2556  6357  2004        ISZ FNEGSW        /BEGINNING OF BUFFER?
2557  6360  5240        JMP DECR          /NO DECREMENT BUFFER ADDRESS
2558  6361  2440        ISZ I FLOP0       /YES, FAKE CARRY FROM FIRST DIGIT
2559  6362  2156        ISZ T1
2560  6363  7200        CLA
```

```
2561
2562    6364  1051    FPRNT,  TAD TOTDIG      /SET UP FIELD SIZES
2563    6365  7450            SNA
2564    6366  5636            JMP I FLOUTP    /E FORMAT OUTPUT
2565    6367  7041            CIA
2566    6370  3164            DCA DECNUM      /NUMBER OF PLACES TO PRINT
2567    6371  1164            TAD DECNUM
2568    6372  1156            TAD T1
2569    6373  7540            SMA SZA
2570    6374  5637            JMP I XXXP      /TOO BIG, PRINT F FORMAT
2571    6375  1133            TAD DECP        /OK, TEST DECIMAL PLACES
2572    6376  7500            SMA
2573    6377  7200            CLA             /ADJUST DECIMAL POINT
2574    6400  7041            CIA
2575    6401  1156            TAD T1
2576    6402  7141            CLL CIA
2577    6403  3004            DCA FNEGSW      /NUMBER OF INTEGER PLACES
2578    6404  7430            SZL
2579    6405  5222            JMP IN+4        /NO INTEGER PLACES
```

```
2580                    /START PRINTING
2581    6406  1156      BACK,   TAD T1
2582    6407  1004              TAD FNEGSW
2583    6410  7650              SNA CLA
2584    6411  5225              JMP DIG           /PRINT A DIGIT
2585    6412  1004              TAD FNEGSW
2586    6413  7001              IAC
2587    6414  7710              SPA CLA           /PRINT 0 IF ONE INTEGER PLACE LEFT
2588    6415  1025              TAD M20           /OTHERWISE A SPACE
2589    6416  4237      IN,     JMS OUTA          /PRINT A CHARACTER
2590    6417  5645              JMP I BDENDP      /FIELD FILLED, EXIT
2591    6420  2004              ISZ FNEGSW
2592    6421  5206              JMP BACK          /CONTINUE
2593    6422  1022              TAD PER           /DECIMAL POINT
2594    6423  4512              PRINTC
2595    6424  5206              JMP BACK
2596    6425  7040      DIG,    CMA
2597    6426  1156              TAD T1            /DECREMENT DECIMAL EXPONENT
2598    6427  3156              DCA T1
2599    6430  2157              ISZ T2            /CHECK SIG DIGIT COUNT
2600    6431  5235              JMP .+4           /SOME LEFT
2601    6432  7040              CMA               /ALL USED UP
2602    6433  3157              DCA T2
2603    6434  5216              JMP IN            /PRINT A 0
2604    6435  1412              TAD I XRT2        /PRINT A SIG DIGIT
2605    6436  5216              JMP IN
2606                    /DIGIT PRINT ROUTINE FOR BDCONV
2607    6437  0000      OUTA,   0
2608    6440  1036              TAD C260          /CONVERT TO ASCII
2609    6441  4512              PRINTC
2610    6442  2164              ISZ DECNUM        /FIELD FILLED?
2611    6443  2237              ISZ OUTA          /NO, GO TO SECOND RETURN
2612    6444  5637              JMP I OUTA
2613    6445  6145    BDENDP, BDEND
```

```
2614                    / "OPTION" PROCESSOR
2615    6446  4521      OPTION, SPNOP           /GET OPTION LETTER
2616    6447  4510              SORTJ
2617    6450  2377                    OPTLST-1
2618    6451  7574                    OPTTRL-OPTLST
2619    6452  4526              ERROR           /ILLEGAL OPTION NAME
2620                    /////
2621    6453  7240      OPTR,   CLA CMA         /SWAP INPUT TO HIGH SPEED READER
2622    6454  3037              DCA HINBUF
2623    6455  6014              RFC             /START READER
2624    6456  1317              TAD RESTR       /POINT TO "HREAD"
2625    6457  1161      OPTR,   TAD PTCH        /SWAP TO KEYBOARD IF CALLED HERE
2626    6460  3113              DCA 113
2627                    /////
2628    6461  4565      OPTRET, TSTERM          /MOVE TO ;:CR
2629    6462  5261              JMP .-1
2630    6463  5665              JMP I .+2       /END OF OPTIONS
2631    6464  5246              JMP OPTION      /CONTINUE PROCESSING OPTIONS
2632    6465  0616                    PROC
2633                    /////
2634                    /HIGH SPEED INPUT ROUTINE
2635    6466  0000      HREAD,  0
2636    6467  1067              TAD M5          /SET UP READ TIMER
2637    6470  3156              DCA T1
2638    6471  3157              DCA T2
2639    6472  6001      HREAD2, ION             /(SWAP) - FOR 2-USER
2640    6473  1037              TAD HINBUF      /WAIT FOR INPUT
2641    6474  7700              SMA CLA
2642    6475  5306              JMP HSGO        /CHARACTER READY
2643    6476  2157              ISZ T2          /NOT YET, CHECK TIMER
2644    6477  5272              JMP HREAD2
2645    6500  2156              ISZ T1
2646    6501  5272              JMP HREAD2
2647    6502  1161              TAD PTCH        /TIME'S UP, OUT OF TAPE
2648    6503  3113              DCA 113         /SWAP TO KEYBOARD INPUT
2649    6504  1054              TAD P337        /RETURN A R.A. TO KILL UNENDED LINE
2650    6505  5315              JMP RESTR-2     /OR SPURIOUS CHARACTER
2651                    /////
2652    6506  7040      HSGO,   CMA             /FOUND CHARACTER
2653    6507  3037              DCA HINBUF      /SET TO READ NEXT
2654    6510  6016              RRB RFC
2655    6511  0026              AND P177        /IGNORE PARITY AND BLANK
2656    6512  7450              SNA
2657    6513  5267              JMP HREAD+1
2658    6514  1015              TAD C200
2659    6515  3142              DCA CHAR
2660    6516  5666              JMP I HREAD
2661                    /////
2662    6517  4003      RESTR,  HREAD-CHIN
```

```
2663
2664           6600     PAGE
2665                    /FLOATING POINT PACKAGE
2666                    /ARITHMETIC INTERPRETER
2667     6600  0000     FPNT,   0
2668     6601  7300             CLA CLL
2669     6602  1600             TAD I FPNT        /FLOATING INSTRUCTION
2670     6603  7450             SNA
2671     6604  5600             JMP I FPNT        /FEXT
2672     6605  0015             AND C200          /GET PAGE BIT
2673     6606  7640             SZA CLA
2674     6607  1200             TAD FPNT          /CURRENT PAGE
2675     6610  0024             AND P7600
2676     6611  3231             DCA FLADDR        /START ADDRESS OF ADDRESSED PAGE
2677     6612  1600             TAD I FPNT        /GET ADDRESS BITS
2678     6613  0026             AND P177
2679     6614  1231             TAD FLADDR
2680     6615  3231             DCA FLADDR        /FULL 12-BIT ADDRESS
2681     6616  1600             TAD I FPNT
2682     6617  2200             ISZ FPNT
2683     6620  7106             CLL RTL           /OP BITS =>AC9-11
2684     6621  7006             RTL               /INDIRECT BIT =>LINK
2685     6622  0031             AND P17
2686     6623  1236             TAD DRECTR        /SET UP OP POINTER
2687     6624  3235             DCA DIRECT
2688     6625  1631             TAD I FLADDR      /INDIRECT?
2689     6626  7430             SZL
2690     6627  3231             DCA FLADDR        /YES
2691     6630  4504             PUSHF             /NO, GET OPERAND
2692     6631  0000     FLADDR,  0
2693     6632  4505             POPF
2694     6633  0040              FLOP
2695     6634  3043             DCA FLOP3         /CLEAR LOW ORDER OPERAND
2696     6635  5637     DIRECT, JMP I .+2         /OP DIRECT INSTRUCTION
2697     6636  5637     DRECTR, JMP I .+1         /OP TABLE
2698     6637  7406             FLPOW
2699     6640  6720             FLADD
2700     6641  6717             FLSUB
2701     6642  7077             FLMUL
2702     6643  7171             FLDIV
2703     6644  6647             FLGET
2704     6645  6653             FLPUT
2705     6646  6762             FLNOR
```

```
2706
2707    6647  4504    FLGET,  PUSHF           /OP 5: GET FLAC FROM STORAGE
2708    6650  0040             FLOP
2709    6651  1254            TAD .+3         /SET UP POINTER TO FLAC
2710    6652  5256            JMP .+4
2711    6653  4504    FLPUT,  PUSHF           /OP 6: PUT FLAC IN STORAGE
2712    6654  0044             FLAC
2713    6655  1231            TAD FLADDR      /SET UP POINTER TO STORAGE
2714    6656  3260            DCA .+2
2715    6657  4505            POPF
2716    6660  0000             0              /ADDRESS OF STORAGE LOCATION
2717    6661  5201            JMP FPNT+1
2718    6662  0000    NEGOP,  0               /ROUTINE TO NEGATE FLOP
2719    6663  1042            TAD FLOP2
2720    6664  7141            CLL CIA
2721    6665  3042            DCA FLOP2
2722    6666  7024            CML RAL
2723    6667  1041            TAD FLOP1
2724    6670  7041            CIA
2725    6671  3041            DCA FLOP1
2726    6672  1004            TAD FNEGSW      /FNEGSW IS COMPLEMENTED WHEN
2727    6673  7140            CLL CMA         /FLOP OR FLAC IS NEGATED
2728    6674  3004            DCA FNEGSW
2729    6675  5662            JMP I NEGOP
2730    6676  0000    NEGAC,  0               /ROUTINE TO NEGATE FLAC - "NEGATE"
2731    6677  7300            CLA CLL         /TRIPLE PRECISION
2732    6700  1047            TAD FLAC3
2733    6701  7041            CIA
2734    6702  3047            DCA FLAC3
2735    6703  7024            CML RAL
2736    6704  1046            TAD FLAC2
2737    6705  7041            CIA
2738    6706  3046            DCA FLAC2
2739    6707  7024            CML RAL
2740    6710  1045            TAD FLAC1
2741    6711  7041            CIA
2742    6712  3045            DCA FLAC1
2743    6713  1004            TAD FNEGSW
2744    6714  7140            CLL CMA
2745    6715  3004            DCA FNEGSW
2746    6716  5676            JMP I NEGAC
```

```
2747                    /ARITHMETIC OPERATIONS
2748                    /BOTH FLAC AND FLOP MUST BE NORMALIZED FOR
2749                    /+-*/↑ (FAD,FSU,FMY,FDV,FXP)
2750    6717  4262      FLSUB,  JMS NEGOP       /OP 2: SUBTRACT OP (NEGATE AND ADD)
2751    6720  1045      FLADD,  TAD FLAC1       /OP 1: ADD OP
2752    6721  7650              SNA CLA
2753    6722  5247              JMP FLGET       /RESULT=OPERAND IF FLAC=0
2754    6723  1041              TAD FLOP1
2755    6724  7650              SNA CLA
2756    6725  5201              JMP FPNT+1      /RESULT=FLAC IF FLOP=0
2757    6726  1040              TAD FLOP0       /COMPARE EXPONENTS
2758    6727  7041              CIA
2759    6730  1044              TAD FLAC0
2760    6731  7450              SNA
2761    6732  5357              JMP CMBINE      /EQUAL, GO ADD TOGETHER
2762    6733  7500              SMA             /NOT EQUAL, NEED SHIFTING
2763    6734  5346              JMP SHFLOP      /FLAC>FLOP, SHIFT FLOP
2764    6735  1365              TAD P27         /FLAC<FLOP, SHIFT FLAC
2765    6736  7510              SPA
2766    6737  5247              JMP FLGET       /TOO FAR TO SHIFT, TREAT AS IF FLAC=0
2767    6740  1364              TAD M27
2768    6741  3235              DCA DIRECT      /NUMBER OF PLACES TO SHIFT
2769    6742  4767              JMS I RAPAC1    /SHIFT FLAC 1 TO RIGHT
2770    6743  2235              ISZ DIRECT
2771    6744  5342              JMP .-2
2772    6745  5357              JMP CMBINE      /NUMBERS NOW ALIGNED
2773    6746  7041    SHFLOP,   CIA             /ROUTINE TO SHIFT FLOP
2774    6747  1365              TAD P27
2775    6750  7510              SPA
2776    6751  5201              JMP FPNT+1      /FLOP TOO SMALL, TREAT AS 0
2777    6752  1364              TAD M27
2778    6753  3235              DCA DIRECT
2779    6754  4766              JMS I RAROP1    /SHIFT FLOP 1 TO RIGHT
2780    6755  2235              ISZ DIRECT
2781    6756  5354              JMP .-2
2782    6757  4767    CMBINE,   JMS I RAPAC1    /NOW SHIFT BOTH TO PREVENT OVERFLOW
2783    6760  4766              JMS I RAROP1
2784    6761  4770              JMS I FLAD3     /ADD TRIPLE PRECISION
2785    6762  4771    FLNOR,    JMS I NORF      /OP 7: NORMALIZE FLAC
2786    6763  5201              JMP FPNT+1
2787    6764  7751    M27,      -27
2788    6765  0027    P27,      27
2789    6766  7271    RAROP1,   RAROP
2790    6767  7251    RAPAC1,   RAPAC
2791    6770  5713    FLAD3,    TRPLAD
2792    6771  7000    NORF,     FNORM
```

```
2793                    /DIRECTORY FOR INTERPRETIVE INPUT
2794    6772  3347      ASKLS2, INTERM  /CR, TERMINATOR
2795    6773  3347              INTERM  /FF, TERMINATOR
2796    6774  3330              INBARK  /^A, RESTART INPUT
2797    6775  3347              INTERM  /COMMA, TERMINATOR
2798    6776  3347              INTERM  /USER-SPECIFIED TERMINATOR
2799    6777  3345              INGT    /LF, IGNORE
```

```
2800
2801          7000    MULPLR=.
2802    7000  0000    FNORM,  0               /ROUTINE TO NORMALIZE FLAC
2803    7001  7340            CLL CLA CMA     /INITIALIZE SIGN SWITCH
2804    7002  3004            DCA FNEGSW
2805    7003  1045            TAD FLAC1       /TEST FOR ZERO
2806    7004  7450            SNA
2807    7005  1046            TAD FLAC2
2808    7006  7450            SNA
2809    7007  1047            TAD FLAC3
2810    7010  7650            SNA CLA
2811    7011  5232            JMP NOREND      /ZERO, NO NEED TO NORMALIZE
2812    7012  1045            TAD FLAC1
2813    7013  7710            SPA CLA
2814    7014  4450            NEGATE          /SIGN IS NEGATIVE
2815    7015  3255            DCA NORC        /SHIFT COUNTER
2816    7016  1045    NRLOOP, TAD FLAC1       /SHIFT NEEDED?
2817    7017  7104            CLL RAL
2818    7020  7710            SPA CLA
2819    7021  5225            JMP NMEXIT      /NO, BIT 1=1
2820    7022  4237            JMS RALAC
2821    7023  2255            ISZ NORC        /RECORD A SHIFT
2822    7024  5216            JMP NRLOOP
2823    7025  2004    NMEXIT, ISZ FNEGSW      /RESTORE SIGN
2824    7026  4450            NEGATE
2825    7027  1255            TAD NORC        /CORRECT EXPONENT
2826    7030  7041            CIA
2827    7031  1044            TAD FLAC0
2828    7032  3044    NOREND, DCA FLAC0
2829    7033  3047            DCA FLAC3       /NORMALIZED # IS 3 WORDS
2830    7034  5600            JMP I FNORM
2831    7035  6601    FLTPT,  FPNT+1
2832    7036  6662    NEGOP1, NEGOP
2833          7037    PROD1=.
2834    7037  0000    RALAC,  0               /ROUTINE TO ROTATE FLAC 1 TO LEFT
2835    7040  1047            TAD FLAC3
2836    7041  7104            CLL RAL
2837    7042  3047            DCA FLAC3
2838    7043  4245            JMS DRAL        /CALL DOUBLE RAL
2839    7044  5637            JMP I RALAC
2840    7045  0000    DRAL,   0               /ROTATE FLAC 1 LEFT, DOUBLE PRECISION
2841    7046  1046            TAD FLAC2
2842    7047  7004            RAL
2843    7050  3046            DCA FLAC2
2844    7051  1045            TAD FLAC1
2845    7052  7004            RAL
2846    7053  3045            DCA FLAC1
2847    7054  5645            JMP I DRAL
2848          7055    NORC=.
```

```
2849                    /ROUTINE TO TEST SIGNS OF FLAC AND FLOP,
2850                    /PLACE FLAC IN TEMP, FOR FLMUL AND FLDIV
2851    7055  0000      FIXSGN, 0
2852    7056  7340              CLL CLA CMA
2853    7057  3004              DCA FNEGSW
2854    7060  1045              TAD FLAC1       /TEST FLAC
2855    7061  7450              SNA
2856    7062  5655              JMP I FLTPT     /ZERO, NO OPERATION NEEDED
2857    7063  7710    SPACLA,   SPA CLA
2858    7064  4450              NEGATE          /TAKE ABS VAL OF FLAC
2859    7065  1045              TAD FLAC1       /TRANSFER TO TEMP
2860    7066  3162              DCA TEMP1
2861    7067  1046              TAD FLAC2
2862    7070  3163              DCA TEMP2
2863    7071  1041              TAD FLOP1
2864    7072  7710    SGNSWI,   SPA CLA         /SPA CLA FOR +, SMA CLA FOR -
2865    7073  4636              JMS I NEGOP1    /TAKE ABS VAL OF FLOP
2866    7074  1004              TAD FNEGSW
2867    7075  3157              DCA T2          /STORE SIGN OF RESULT
2868    7076  5655              JMP I FIXSGN
```

```
2869
2870    7077  1263    FLMUL,  TAD SPACLA      /OP 3: MULTIPLY BY OPERAND
2871    7100  3272            DCA SGNSWT      /WANT POSITIVE OPERAND HERE
2872    7101  4255            JMS FIXSGN
2873    7102  1042            TAD FLOP2
2874    7103  4333            JMS SUMULT      /MULTIPLY (TEMP1 TEMP2) BY FLOP2
2875    7104  7301            CLA CLL IAC     /IGNORE LOW ORDER RESULT
2876    7105  1044            TAD FLAC0       /ADD EXPONENTS
2877    7106  1040            TAD FLOP0
2878    7107  3044            DCA FLAC0
2879    7110  1272            TAD PROD2       /SAVE PARTIAL RESULTS
2880    7111  3047            DCA FLAC3
2881    7112  1237            TAD PROD1
2882    7113  3046            DCA FLAC2
2883    7114  1041            TAD FLOP1
2884    7115  4333            JMS SUMULT      /MULTIPLY (TEMP1 TEMP2) BY FLOP1
2885    7116  1047            TAD FLAC3
2886    7117  3047            DCA FLAC3       /COMBINE RESULTS OF MULTIPLICATIONS
2887    7120  7004            RAL
2888    7121  1272            TAD PROD2
2889    7122  1046            TAD FLAC2
2890    7123  3046            DCA FLAC2
2891    7124  7004            RAL
2892    7125  1237            TAD PROD1
2893    7126  3045            DCA FLAC1
2894    7127  4200            JMS FNORM       /NORMALIZE RESULTS
2895    7130  2157            ISZ T2          /CHECK SIGN OF RESULT
2896    7131  4450            NEGATE
2897    7132  5635            JMP I FLTPT
```

```
2898
2899    7133  0000    SUMULT, 0               /UNSIGNED MULTIPLY ROUTINE
2900    7134  3200            DCA MULPLR      /24 BY 12 BITS
2901    7135  3237            DCA PROD1
2902    7136  3272            DCA PROD2
2903    7137  1370            TAD M14
2904    7140  3255            DCA FIXSGN      /SET TO COUNT 12 MULTIPLICATIONS
2905    7141  7100            CLL
2906    7142  1200    SULOOP, TAD MULPLR      /NEW MULTIPLIER BIT INTO LINK
2907    7143  7010            RAR
2908    7144  3200            DCA MULPLR      /MULPLR ALSO ACCUMULATES LOW-ORDER
2909    7145  7420            SNL             /RESULTS
2910    7146  5355            JMP SUSHIFT
2911    7147  7100            CLL             /ADD MULTIPLIER IF BIT=1
2912    7150  1163            TAD TEMP2
2913    7151  1272            TAD PROD2
2914    7152  3272            DCA PROD2
2915    7153  7004            RAL
2916    7154  1162            TAD TEMP1
2917    7155  1237    SUSHIFT;TAD PROD1       /SHIFT PRODUCT ONE TO RIGHT
2918    7156  7010            RAR
2919    7157  3237            DCA PROD1
2920    7160  1272            TAD PROD2
2921    7161  7010            RAR
2922    7162  3272            DCA PROD2
2923    7163  2255            ISZ FIXSGN
2924    7164  5342            JMP SULOOP
2925    7165  1200            TAD MULPLR      /DONE, EXIT WITH LOW ORDER IN AC
2926    7166  7010            RAR
2927    7167  5733            JMP I SUMULT
2928          7072    PROD2=SGNSWT
2929    7170  7764    M14,    -14
```

```
2930
2931    7171  1041    FLDIV,  TAD FLOP1       /OP 4: DIVIDE BY OPERAND
2932    7172  7650            SNA CLA
2933    7173  4526            ERROR           /TRIED TO DIVIDE BY 0
2934    7174  1062            TAD P7700       /=SMA CLA
2935    7175  3272            DCA SGNSWT
2936    7176  4255            JMS FIXSGN
2937    7177  1040            TAD FLOP0       /SUBTRACT EXPONENTS
2938    7200  7041            CIA
2939    7201  1044            TAD FLAC0
2940    7202  7001            IAC
2941    7203  3044            DCA FLAC0
2942    7204  3045            DCA FLAC1       /ZERO FLAC FOR QUOTIENT
2943    7205  3046            DCA FLAC2
2944    7206  1314            TAD M30         /SET COUNTER
2945    7207  3271            DCA DIVCNT
2946    7210  5226            JMP DVLOOP
2947    7211  7420    DVSETQ, SNL             /LINK IS QUOTIENT BIT
2948    7212  5216            JMP ZERQUO
2949    7213  3162            DCA TEMP1
2950    7214  1164            TAD TEMP3       /RESTORE LOW ORDER RESULT
2951    7215  3163            DCA TEMP2
2952    7216  7200    ZERQUO, CLA             /SHIFT RESULT BIT INTO QUOTIENT
2953    7217  4647            JMS I DRALP     /ROTATE LEFT DOUBLE PRECISION
2954    7220  1163            TAD TEMP2       /SHIFT DIVIDEND
2955    7221  7004            RAL
2956    7222  3163            DCA TEMP2
2957    7223  1162            TAD TEMP1
2958    7224  7004            RAL
2959    7225  3162            DCA TEMP1
2960    7226  7100    DVLOOP, CLL
2961    7227  1042            TAD FLOP2       /SUBTRACT DIVISOR FROM DIVIDEND
2962    7230  1163            TAD TEMP2
2963    7231  3164            DCA TEMP3
2964    7232  7004            RAL
2965    7233  1041            TAD FLOP1
2966    7234  1162            TAD TEMP1
2967    7235  2271            ISZ DIVCNT
2968    7236  5211            JMP DVSETQ
2969    7237  7210            CLA RAR         /DONE, USE RESULT OF LAST SUBTRACTION
2970    7240  3047            DCA FLAC3       /AS EXTRA PRECISION
2971    7241  4650            JMS I NOR2
2972    7242  2157            ISZ T2
2973    7243  5646            JMP I FLOT1     /RESTORE SIGN
2974    7244  4450            NEGATE
2975    7245  5646            JMP I FLOT1
2976    7246  6601    FLOT1,  FPNT+1
2977    7247  7045    DRALP,  DRAL
2978    7250  7000    NOR2,   FNORM
```

```
2979
2980    7251  0000    RARAC,  0               /ROUTINE TO ROTATE FLAC 1 RIGHT
2981    7252  7300            CLA CLL
2982    7253  1045            TAD FLAC1
2983    7254  7510            SPA
2984    7255  7020            CML             /PROPOGATE SIGN BIT
2985    7256  7010            RAR             /SHIFT
2986    7257  3045            DCA FLAC1
2987    7260  1046            TAD FLAC2
2988    7261  7010            RAR
2989    7262  3046            DCA FLAC2
2990    7263  1047            TAD FLAC3
2991    7264  7010            RAR
2992    7265  3047            DCA FLAC3
2993    7266  2044            ISZ FLAC0       /ADJUST EXPONENT
2994    7267  5651            JMP I RARAC
2995    7270  5651            JMP I RARAC
2996          7271    DIVCNT=.
2997    7271  0000    RAROP,  0               /ROUTINE TO SHIFT FLOP 1 RIGHT
2998    7272  7300            CLA CLL
2999    7273  1041            TAD FLOP1
3000    7274  7510            SPA
3001    7275  7020            CML
3002    7276  7010            RAR
3003    7277  3041            DCA FLOP1
3004    7300  1042            TAD FLOP2
3005    7301  7010            RAR
3006    7302  3042            DCA FLOP2
3007    7303  1043            TAD FLOP3
3008    7304  7010            RAR
3009    7305  3043            DCA FLOP3
3010    7306  2040            ISZ FLOP0
3011    7307  5671            JMP I RAROP
3012    7310  5671            JMP I RAROP
```

```
3013                    /ROUTINE TO FIX FLAC - "FIX"
3014                    /REMOVE FRACTIONAL PART BUT LEAVE FLOATING
3015                    /FIXED NUMBER IN AC ON EXIT
3016    7311  0000      XFIX,   0
3017    7312  7300              CLA CLL
3018    7313  1044              TAD FLAC          /TEST EXPONENT
3019    7314  7750      M30;    SPA SNA CLA       /IF -1<#<1, CLEAR ENTIRELY
3020    7315  3044              DCA FLAC          /EXCEPT FOR SIGN BIT
3021    7316  1044              TAD FLAC
3022    7317  1331              TAD FIXC
3023    7320  3271              DCA DIVCNT
3024    7321  7430              SZL
3025    7322  5711              JMP I XFIX        /TOO BIG TO FIX
3026    7323  4251              JMS RARAC         /FIX BY ROTATING FRACTIONAL BITS
3027    7324  2271              ISZ DIVCNT        /OUT OF FLAC
3028    7325  5323              JMP .-2
3029    7326  3047              DCA FLAC+3        /CLEAR FRACTIONAL PART
3030    7327  1046              TAD FLAC+2
3031    7330  5711              JMP I XFIX
3032    7331  7751      FIXC,   -27
3033                    /ROUTINE TO FLOAT C(AC) AS FLOATING PT, INTEGER
3034                    /- "FLOAT"
3035    7332  0000      XFLOAT, 0
3036    7333  3045              DCA FLAC1         /SAVE NUMBER
3037    7334  3046              DCA FLAC2
3038    7335  3047              DCA FLAC3
3039    7336  1005              TAD P13           /INTEGER EXPONENT
3040    7337  3044              DCA FLAC0
3041    7340  4251              JMS RARAC         /IN CASE NUMBER WAS 4000
3042    7341  4650              JMS I NOR2        /NORMALIZE
3043    7342  5732              JMP I XFLOAT
```

```
3044
3045    7343  7037    RFLAC,  RALAC
3046    7344  5713    TFLAD,  TRPLAD
3047    7345  7774    M4,     -4
3048    7346  4421    RANDOM, 4421    /CURRENT RANDOM NUMBER
3049    7347  3040            3040
3050    7350  0001            0001
3051                  /STATISTICAL RANDOM NUMBER GENERATOR
3052                  /BASED ON DECUS 5-25, POWER RESIDUE METHOD
3053                  /NEW R=R*(2*17+3) MOD 36 BITS
3054    7351  4407    FRAN,   FENT
3055    7352  5346            FGT RANDOM      /R=OLD RANDOM NUMBER
3056    7353  0000            FEXT            /ALREADY SHIFTED LEFT 12 BITS
3057    7354  4504            PUSHF
3058    7355  7346             RANDOM
3059    7356  4505            POPF
3060    7357  0041             FLOP1
3061    7360  1345            TAD M4          /SHIFT 4 MORE TO GET R*2*16
3062    7361  3156            DCA T1
3063    7362  4743            JMS I RFLAC
3064    7363  2156            ISZ T1
3065    7364  5362            JMP .-2
3066    7365  4744            JMS I TFLAD     /+R = R*(2*16+1)
3067    7366  4743            JMS I RFLAC     /*2 = R*(2*17+2)
3068    7367  4744            JMS I TFLAD     /+R = R*(2*17+3)
3069    7370  4504            PUSHF
3070    7371  0045             FLAC1
3071    7372  4505            POPF
3072    7373  7346             RANDOM         /SAVE NEW RANDOM NUMBER
3073    7374  3047            DCA FLAC3
3074    7375  3044            DCA FLAC0       /MAKE IT A 2-WORD FRACTION
3075    7376  1045            TAD FLAC1       /CHECK SIGN
3076    7377  7700            SMA CLA
3077    7400  5500            RETURN          /POSITIVE
3078    7401  2046            ISZ FLAC2       /NEGATIVE, TAKE 1S COMPLEMENT
3079    7402  7410            SKP
3080    7403  2045            ISZ FLAC1
3081    7404  4450            NEGATE
3082    7405  5500            RETURN
```

```
3083
3084    7406  1407    FLPOW,  TAD I 7 /OP 0: RAISE FLAC TO POWER
3085    7407  4503            PUSHA   /SAVE FLOATING POINTER
3086    7410  4504            PUSHF   /SAVE FLAC
3087    7411  0044             FLAC
3088    7412  4505            POPF
3089    7413  7545             FLTEMP
3090    7414  4504            PUSHF   /GET FLOP
3091    7415  0040             FLOP
3092    7416  4505            POPF
3093    7417  0044             FLAC
3094    7420  4452            FIX     /FIX OPERAND
3095    7421  7710            SPA CLA
3096    7422  7001            IAC
3097    7423  1045            TAD FLAC1
3098    7424  7640            SZA CLA
3099    7425  4526            ERROR   /RAISING TO TOO HIGH A POWER
3100    7426  1046            TAD FLAC2
3101    7427  3350            DCA XFL
3102    7430  4407            FENT    /PUT 1. IN FLAC
3103    7431  5661            FGT I ONEP
3104    7432  0000            FEXT
3105    7433  1350            TAD XFL
3106    7434  7450            SNA
3107    7435  5255            JMP FLXEND      /X*0=1, DO NOT MULTIPLY
3108    7436  7500            SMA
3109    7437  5246            JMP RAISTP      /RAISE TO * POWER
3110    7440  4407            FENT            /RAISE TO - POWER
3111    7441  4345            FDV FLTEMP
3112    7442  6345            FPT FLTEMP
3113    7443  5661            FGT I ONEP
3114    7444  0000            FEXT
3115    7445  5250            JMP .+3
3116    7446  7041    RAISTP, CIA
3117    7447  3350            DCA XFL         /SET COUNTER
3118    7450  4407            FENT            /DO MULTIPLICATIONS
3119    7451  3345            FMY FLTEMP
3120    7452  0000            FEXT
3121    7453  2350            ISZ XFL
3122    7454  5250            JMP .-4
3123    7455  1413    FLXEND, POPA            /RESTORE FLOATING POINTER
3124    7456  3407            DCA I 7
3125    7457  5660            JMP I .+1
3126    7460  6001            FPNT+1
3127    7461  1573    ONEP,   FLTONE
```

```
3128                    /FLOATING SQUARE ROOT FUNCTION
3129    7462  1045      FSQT,   TAD FLAC1       /TEST SIGN
3130    7463  7510              SPA
3131    7464  4526              ERROR           /SQUARE ROOT OF NEG NUMBER
3132    7465  7650              SNA CLA
3133    7466  5500              RETURN          /ZERO, RESULT IS ZERO
3134    7467  1044              TAD FLAC0       /CONSTRUCT INITIAL APPROXIMATION
3135    7470  7510              SPA             /BY HALVING EXPONENT
3136    7471  7020              CML
3137    7472  7010              RAR
3138    7473  3044              DCA FLAC0
3139    7474  1334              TAD SQCON
3140    7475  3045              DCA FLAC1
3141    7476  4407    SQLOOP, FENT              /MAKE NEW APPROXIMATION
3142    7477  6345              FPT FLTEMP      /NEW X=(N/X+X)/2
3143    7500  5560              FGT I FLARGP    /ORIGINAL ARG
3144    7501  4345              FDV FLTEMP
3145    7502  1345              FAD FLTEMP
3146    7503  0000              FEXT
3147    7504  7040              CMA
3148    7505  1044              TAD FLAC0
3149    7506  3044              DCA FLAC0
3150    7507  1044              TAD FLAC0       /COMPARE OLD AND NEW APPROXIMATIONS
3151    7510  7041              CIA
3152    7511  1345              TAD FLTEMP
3153    7512  7640              SZA CLA
3154    7513  5276              JMP SQLOOP      /EXPONENTS NOT EQUAL
3155    7514  1045              TAD FLAC1
3156    7515  7041              CIA
3157    7516  1346              TAD FLTEMP+1
3158    7517  7640              SZA CLA
3159    7520  5276              JMP SQLOOP      /HIGH ORDER NOT EQUAL
3160    7521  1046              TAD FLAC2
3161    7522  7041              CIA
3162    7523  1347              TAD FLTEMP+2
3163    7524  7450              SNA             /COMPARE LOW ORDERS TO
3164    7525  5500              RETURN          /WITHIN PLUS OR MINUS ONE BIT
3165    7526  7500              SMA
3166    7527  7041              CIA
3167    7530  7001              IAC
3168    7531  7650              SNA CLA
3169    7532  5500              RETURN
3170    7533  5276              JMP SQLOOP
3171    7534  3015    SQCON,  3015
```

```
3172                    /FUNCTION TO EVALUATE SIGN PART OF FLAC
3173                    /RESULTS: -1 FOR NEGATIVE, 0 FOR ZERO, +1 FOR POSITIVE
3174    7535  1045      FSGN,   TAD FLAC1
3175    7536  7450              SNA
3176    7537  5343              JMP .+4             /ZERO, SET RESULT TO 0
3177    7540  7710              SPA CLA
3178    7541  1034              TAD M2              /NEGATIVE (-1)
3179    7542  7001              IAC                 /POSITIVE (+1)
3180    7543  4430              FLOAT               /FLOAT C(AC) = -1,0,1
3181    7544  5500              RETURN
3182          7545      DIGBUF=.                    /OUTPUT DIGIT BUFFER (8 WORDS)
3183    7545  0000      FLTEMP, 0                   /TEMPORARY REGISTERS
3184    7546  0000              0
3185    7547  0000              0
3186          7550      ASKBUF=.                    /"ASK" INPUT BUFFER (TO END OF PAGE)
3187    7550  0000      XFL,    0
3188                    $
```

```
1000  01111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
1100  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

1200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
1300  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

1400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
1500  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

1600  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
1700  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

2000  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
2100  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

2200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
2300  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

2400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
2500  11111111  11111111  11111111  00000000  00000000  00000000  00000000  00000000

2600  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
2700  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

3000  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
3100  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

3200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
3300  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

3400  00000000  00000000  11111111  11111111  11111111  11111111  11111111  11000000
3500  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000011

3600
3700
```

```
4000
4100

4200
4300

4400
4500

4600
4700


5000
5100

5200
5300

5400
5500

5600  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
5700  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111


6000  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
6100  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

6200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
6300  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

6400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
6500  11111111  11111111  00000000  00000000  00000000  00000000  00000000  00000000

6600  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
6700  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111


7000  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
7100  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

7200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
7300  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

7400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
7500  11111111  11111111  11111111  11111111  11111111  10000000  00000000  00000000

7600
7700
```

```
ADD     0135    COMOUT  2600    ERG     2252    FLOT1   7246
ALIST   1133    COUTPT  3373    ERL     2250    FLOUT   6122
ARGNXT  1723    CPRINT  3247    ERR2    2736    FLOUTP  6236
ASK     1206    CTSF    3220    ERROR   4526    FLPOW   7446
ASKBUF  7550    DBCONV  5600    ERROR2  4526    FLPTEN  5775
ASKEND  3317    DBLOOP  5656    ERROR3  4526    FLPUT   6653
ASKLS2  6772    DBTERM  5653    ERROR4  4526    FLSUB   6717
ASKLST  5776    DCONT   0462    ERROR5  2735    FLTEMP  7545
ATLIST  1561    DCOUNT  6225    ERV     2235    FLTEN   5772
ATSW    0131    DERGSW  0151    ERVX    2240    FLTOBE  1576
AXIN    0010    DECEXP  5764    ETERM   1641    FLTPT   7035
AXOUT   0017    DECIN1  5757    FTERM1  1615    FLTXR   0614
BACK    6406    DECINT  6010    FTERM2  1647    FLTZER  1575
BDC0    6252    DECNUM  0164    FTERMN  1636    FLXEND  7455
BDC1    6266    DECP    0133    EVAL    1601    FNEGSW  0004
BDC2    6301    DECR    6240    EVLN    0376    FNORM   7047
BDCONV  6170    DELETE  2111    EXIT    2644    FNTABF  6571
BDEND   6145    DGRP    0423    EXITJ   2657    FNTABL  2214
BDENDP  6445    DGRP1   0432    EXTR    2334    FOR     1024
BDSCAL  6203    DIG     6425    F10P    0414    FOUTPU  0272
BEGIN   3432    DIGBUF  7545    FCONT   1064    FP10P   0415
BOTTOM  0027    DIGIT   0163    FEND    1126    FPNT    6602
BUFBEG  3432    DIGITS  0006    FEND3   2316    FPRNT   6364
BUFBOT  3363    DIRECT  6635    FINDLN  4516    FRAN    7351
BUFR    0134    DIVCNT  7271    FINDN   2271    FRST    3420
BUFST   6235    DMPSW   0152    FINPUT  0073    FRSTX   3436
BUFTOP  3364    DO      0416    FIX     4452    FSGN    7535
C170    0006    DOK     2130    FIXC    7331    FSUT    7462
C200    0015    DONE    2146    FIXSGN  7055    FTXR    1125
C240    0033    DOONE   0454    FLAC    0044    FTXS    1124
C253    6115    DRAL    7045    FLAC0   0044    GEG     0356
C260    0036    DRALP   7247    FLAC1   0045    GEND    2353
C305    6146    DRECTR  6636    FLAC2   0046    GET1    2351
C43     5763    DVLOOP  7226    FLAC3   0047    GET3    2360
C7760   0367    DVSETU  7211    FLAD3   6770    GETNEG  1174
CCR     0060    ECHO    2471    FLADD   6720    GETS    4030
CFNR    5766    ECHOLS  1612    FLADDR  6631    GETLN   4515
CFRS    0075    ECHP    3255    FLARG   2034    GETVAR  1411
CFRSX   0227    EFOP    0131    FLARGP  0160    GEXIT   0332
CHAR    0142    EFUN    1742    FLDIG   6131    GFND1   1512
CHIN    2463    EFUN2   1764    FLDIV   7171    GINC    0144
CLF     0057    EFUN3   2056    FLGET   6647    GLIST   1361
CMBINE  6757    EFUN31  0100    FLINST  5767    GOE     1276
CNTR    0132    FINPUT  5701    FLMUL   7077    GOTO    1211
COL     1233    FLPAR   1753    FLNOR   6762    GRPIST  2451
COLP    3251    FND     0076    FLOAT   4436    GS1     1443
COMBOT  0226    FNDLN   4517    FLOP    0040    GS2     1447
COMBUF  0074    FNDT    0477    FLOP0   0040    GS3     1447
COMEIN  2527    FNUM    1732    FLOP1   0041    GS4     1444
COMGO   1164    FPAR    1710    FLOP2   0042    GS5     1523
COMLST  0756    FPAR2   1755    FLOP3   0043    GTES    1321
COMMEN  0620    ERASE   2226    FLOPR   1674    GTESTA  0547
```

```
HELLO   3274    M20     0025    OPTION  6446    PER     6424
HINBUF  0037    M240    0063    OPTK    6457    PERIOD  5612
HP      3301    M27     6764    OPTLST  2400    PGOTO   1424
HPT     2037    M3      0066    OPTM    3271    PING    1122
HREAD   6466    M30     7314    OPTN    3253    PKZERO  3122
HREAD2  6472    M4      7345    OPTP    3234    PLPR    1023
HSGO    6506    M40     2376    OPTR    6453    POPA    1413
IBAR    0212    M5      0067    OPTR0   2661    POPF    4515
IF      0776    M77     0023    OPTRET  6461    POPJ    5574
IGNOR   0217    MBREAK  2002    OPTRI   2663    PQUES   3545
IN      6416    MCR     0065    OPTRO   2662    PRCP    1143
INBARR  3330    MDIG    6147    OPTS    3256    PRINTC  4514
INBUF   2664    MDIGIT  6226    OPTT    3237    PRTLN   4514
INDEV   0140    MF      0007    OPTTBL  2174    PRUC    6410
INGT    3345    MFLT    0066    OPTTDO  3203    PRUCES  6012
INLIST  0564    MINUSA  0003    OPTTL   3221    PROD1   7437
INPINT  0366    MODIFY  1273    OPTX    3243    PROD2   7472
INPUTX  0274    MPER    0064    OPTXIT  3241    PSWIT   5671
INSIGN  5765    MUL10P  6234    OUT     2477    PT1     6154
INTABL  6004    MULPLR  7000    OUTA    6437    PT2     1132
INTASK  3306    MULT10  5742    OUTCR   2510    PTCH    6161
INTDO   6055    MULT2   5734    OUTDEV  0137    PTENPT  6232
INTERM  3347    MULT2I  5756    OUTP    6150    PUSHA   4503
INTERP  1226    MULT2P  6233    OUTPT   3365    PUSHF   4504
INTG    1272    NAGSW   0141    OUTS    1240    PUSHJ   4501
INTNEG  6067    NEGAC   6676    OUTX    2507    R6      6642
INTOUT  6042    NEGATE  4450    OVCHEK  5633    RAISTP  7446
INTPTR  6114    NEGOP   6662    OWAIT   3225    RALAC   7437
INTRPT  2603    NEGOP1  7036    P0      1523    RANDOM  7345
INTSUB  6060    NEGSGN  6167    P13     0005    RARAC   7251
IOBUF   3400    NEWDIG  5614    P17     0031    RARAC1  6767
IOSW    3305    NMEXIT  7025    P177    0026    RARUP   7271
IOVRL   5761    NOR2    7250    P2      0035    RARUP1  6766
IRARAC  5760    NORC    7055    P27     6765    READC   4513
IRETN   0230    NOREND  7032    P277    0032    RECOVR  2745
LASTLN  0150    NORF    6771    P337    0054    REMAIN  0162
LASTOP  0130    NOTDIG  5650    P4000   0225    RESTR   6517
LASTV   0155    NRLOOP  7016    P7600   0024    RET     6351
LIBRAR  2735    NTEXIT  1550    P77     0071    RETRN   1554
LINENO  0143    NTST1   1552    P7700   0062    RETURN  5541
LIST3   0060    NTST2   1553    PACBUF  3023    RFLAC   7443
LIST6   0054    ONEINC  1117    PACKC   4507    RKP2    6227
LISTGO  1402    ONFP    7461    PACKST  0153    ROT     3161
LNERR   0361    OPNEXT  1610    PACLS2  1204    ROTRAC  5762
LPRTST  2077    OPTARL  1731    PACLST  3056    RTL6    4520
M100    0062    OPTARS  2026    PC      0145    RUP1    3165
M11     0070    OPTC    3302    PC1     0620    RUP2    3177
M12     6230    OPTC1   3250    PCHK    0510    RUP3    311
M13     1123    OPTCOL  3244    PCK1    3042    SAVAC   2041
M137    2377    OPTDOP  2734    PD2     0532    SAVLK   2541
M14     7170    OPTE    3252    PD3     0550    SBAR    1321
M2      0034    OPTI    3303    PDLXR   0013    SCALED  6214
```

SCHAR	1312	TENPT	6231	XFIND	2265
SCONT	1307	TERMS	2006	XFIX	7311
SDLOOP	7142	TESTC	4525	XFL	7556
SDMULT	7133	TESTN	4522	XFLOAT	7332
SDOWN	6220	TEXTP	0017	XGETLN	0312
SDSHIF	7155	TFLAD	7344	XI33	2665
SET	1024	TGRP2	0473	XINT	1156
SEX	1357	THISLN	0146	XOUTL	2675
SEXC	0752	THISOP	0147	XPOPJ	1556
SFINAL	1060	TINT	2625	XPRNTL	6151
SFOUND	1325	TINTR	1260	XPUSHA	0501
SGNSWT	7072	TLIST	1142	XPUSHJ	0523
SGNTST	5755	TLIST2	1405	XRT	0011
SGOT	1331	TLIST3	1162	XRT2	0012
SHFLOP	6746	TOTDIG	0051	XRT3	0016
SIGOUT	6100	TQUOT	1241	XRTL6	0305
SIN	2706	TRPLAD	5713	XSORTC	0733
SKIPNP	3014	TSTERM	4565	XSPNOR	1524
SKPNP	2732	TSTGRP	4524	XTESTC	0713
SNLIST	6115	TSTLPR	4523	XTESTN	1533
SORTB	1333	TSTSGN	6030	XTSTER	2514
SORTC	4511	TSWP	3233	XXX	6117
SORTCN	0127	TTXTR	1237	XXXP	6237
SORTJ	4510	TTXTS	1236	ZERQUO	7216
SPACLA	7063	TXTRFS	2443		
SPLAT	3124	TXTSAV	2435		
SPNOR	4521	TYPE	1207		
SQCON	7534	TYPE2	1227		
SQLOOP	7476	USERT	6002		
SRNLST	1376	USERTP	3270		
START	0177	UTE	2317		
STARTV	0134	UTO	2326		
STRING	3323	UTRA	2315		
SUBS	1524	UTX	2337		
T1	0156	VAL	2463		
T2	0157	WAITP	2733		
TAB	1362	WALL	0671		
TABCTR	0053	WEXIT	0703		
TASK	1210	WRITE	0641		
TASK4	1252	WTEST2	0660		
TASKCL	1222	WTFSTG	0674		
TCRLF	1250	WTXR	0712		
TCRLF2	1254	WTXS	0711		
TDEND	3170	WX	0676		
TDLOOP	3131	X0	1161		
TDOUTP	3174	XABS	2053		
TDTEXT	3175	XADC	2414		
TDUMP	3125	XCT	0020		
TELSW	2660	XCTIN	0136		
TEMP1	0162	XDXS	1153		
TEMP2	0163	XDYS	1145		
TEMP3	0164	XENDLN	2417		

ERRORS DETECTED: 0

LINKS GENERATED: 0

RUN-TIME: 28 SECONDS

3K CORE USED

```
                /FOCAL 5/69     EDWARD TAFT     6/10/69
                /EXTENDED FUNCTION PACKAGE
                /
                /FSIN:  SIN(X)          X IN RADIANS
                /FCOS:  COS(X)          X IN RADIANS
                /FATN:  ARC TAN(X)      RESULT IN RADIANS
                /FEXP:  EXP(X)
                /FLOG:  LN(X)
                /////
                /DEFINITIONS
                FIXMRI FAD=1000
                FIXMRI FSB=2000
                FIXMRI FMY=3000
                FIXMRI FDV=4000
                FIXMRI FGT=5000
                FIXMRI FPT=6000
        7000    FNR=7000
        4407    FENT=4407
        0000    FEXT=0
                        FIXTAB
                /////
        4450    NEGATE= 4450
        1045    GETSGN= 1045
        5500    RETURN= 5500
        0010    SN=     10
        4452    FIX=    4452
        4503    PUSHA=  4503
        1413    PUPA=   1413
        0044    FLAC=   44
        7545    FLTEMP= 7545
        1573    FLTONE= 1573
        0013    PULXR=  13
        4526    ERROR=  4526
        4430    FLOAT=  4430
        0571    FNTAPE= 571
        0027    BOTTOM= 27
        1164    COMGO=  1164
        4510    SORTJ=  4510
        0067    M5=     67
        0132    CNTR=   132
        0010    AXIN=   10
        4565    TSTERM= 4565
        0616    PROC=   616
        2735    ERROR5= 2735
        5600    DBCONV= 5600
```

```
                0027    *BOTTOM
0027    5112            FCOS-1          /TOP OF TEXT
                0600    *FNTABF+7
0600    5335            FATN            /POINTERS TO EXTENDED FUNCTIONS
0601    5262            FEXP
0602    5454            FLOG
0603    5117            FSIN
0604    5113            FCOS
                /////
                /ENABLE A "LIBRARY DELETE" COMMAND
                /WHICH WILL DELETE THE EXTENDED FUNCTIONS AND
                /FREE MORE FOR USER AREA.
                1174    *COMGO+10
1174    6556            LIBRARY
                6555    *6555
6555    0364    LIBLST, "D
                /////
6556    4510    LIBRARY;SORTJ           /"LIBRARY" - EXPANDABLE COMMAND
6557    6554                    LIBLST-1
6560    0022                    LIBGO-LIBLST
6561    4526            ERROR           /ILLEGAL LIBRARY COMMAND
                /////
6562    1067    LIBD,   TAD M5          /DELETE THE EXTENDED FUNCTIONS
6563    3132            DCA CNTR
6564    1375            TAD EXTAB
6565    3016            DCA AXIN
6566    1175            TAD PERROR
6567    3410            DCA I AXIN      /SET ERRORS POINTERS
6570    2132            ISZ CNTR
6571    5366            JMP .-3
6572    1376            TAD DTOP
6573    3027            DCA BOTTOM      /MOVE TOP POINTER UP
6574    5261            JMP 6461        /OPTRET (TO REACH END OF COMMAND)
                /////
6575    0577    EXTAB,  FNTABF+6
6576    5577    DTOP,   DBCONV-1
6577    6562    LIBGO,  LIBD
                0175    *175
0175    2735    PERROR, ERRORS
```

```
                        /FOCAL EXTENDED FUNCTIONS
                5113    *5113
                        /       COSINE
5113    4450    FCOS,   NEGATE          /COS(X)=SIN(PI/2-X)
5114    4407            FENT
5115    1772            FAD I PI2
5116    0000            FEXT
                        /////
                        /       SINE
5117    1045    FSIN,   GETSGN
5120    7450            SNA
5121    5500            RETURN          /SIN(0)=0
5122    7710            SPA CLA
5123    4771            JMS I NEG2      /SIN(-X)=-SIN(X)
5124    3010            DCA SN
5125    4407            FENT
5126    4374            FDV TWOPI       /REDUCE MODULO 2 PI
5127    6773            FPT I X2
5130    0000            FEXT
5131    4452            FIX
5132    4450            NEGATE
5133    4407            FENT
5134    7000            FNR
5135    1773            FAD I X2
5136    3374            FMY TWOPI
5137    6773            FPT I X2
5140    2377            FSB PI
5141    0000            FEXT
5142    1045            GETSGN          /X<PI?
5143    7710            SPA CLA
5144    5353            JMP PCHECK      /YES
5145    4407            FENT            /NO, SIN(X-PI)=-SIN(X)
5146    6773            FPT I X2
5147    0000            FEXT
5150    1010            TAD SN
5151    7040            CMA
5152    3010            DCA SN
5153    4407    PCHECK, FENT            /X<PI/2?
5154    5773            FGT I X2
5155    2772            FSB I PI2
5156    0000            FEXT
5157    1045            GETSGN
5160    7710            SPA CLA
5161    5367            JMP PALGO       /YEQ
5162    4407            FENT            /NO, SIN(X)=SIN(PI-X)
5163    5377            FGT PI
5164    2773            FSB I X2
5165    6773            FPT I X2
5166    0000            FEXT
5167    5770    PALGO,  JMP I .+1       /PERFORM POWER SERIES EXPANSION
5170    5540                    PALG
```

```

5171  5321  NEG2,   FNEG
5172  5413  PI2,    PIOT
5173  5325  X2,     X
5174  0003  TWOPI,  0003
5175  3110          3110
5176  3761          3761
5177  0002  PI,     0002
5200  3110          3110
5201  3761          3761
            /       EXPONENTIAL
5202  1045  FEXP,   GETSGN          /TAKE ABSOLUTE VALUE
5203  7710          SPA CLA
5204  4321          JMS FNEG
5205  3010          DCA SN
5206  4407          FENT
5207  3272          FMY LG2E
5210  6325          FPT X
5211  0000          FEXT
5212  4452          FIX
5213  4563          PUSHA           /SAVE INTEGER PART
5214  4450          NEGATE
5215  4407          FENT
5216  7000          FNR
5217  1325          FAD X           /RETAIN FRACTIONAL PART
5220  6325          FPT X
5221  3325          FMY X
5222  6330          FPT XSQR
5223  1267          FAD DF
5224  6733          FPT I TP
5225  5264          FGT CF
5226  4733          FDV I TP
5227  2325          FSB X
5230  1256          FAD AF
5231  6733          FPT I TP
5232  5261          FGT PF
5233  3330          FMY XSQR
5234  1733          FAD I TP
5235  6733          FPT I TP
5236  5325          FGT X
5237  4733          FDV I TP
5240  3275          FMY TWO
5241  1734          FAD I ONEPT
5242  0000          FEXT
5243  1413          POPA
5244  1044          TAD FLAC
5245  3044          DCA FLAC
5246  2010          ISZ SN          /EXP(-X)=1/EXP(X)
5247  5500          RETURN
5250  4407          FENT
5251  6325          FPT X
5252  5734          FGT I ONEPT
5253  4325          FDV X
5254  0000          FEXT
5255  5500          RETURN
```

```
                        /EXP AND ARCTANGENT CONSTANTS
5256  0004    AF,       0004
5257  2372              2372
5260  1402              1402
5261  7774    BF,       7774
5262  2157              2157
5263  5157              5157
5264  0012    CF,       0012
5265  5454              5454
5266  0343              0343
5267  0007    DF,       0007
5270  2566              2566
5271  5341              5341
5272  0001    LG2E,     0001
5273  2705              2705
5274  2435              2435
5275  0002    TWO,      0002
5276  2000              2000
5277  0000    BET1,     0000
5300  2427              2427
5301  2323              2323
5302  7775    BET2,     7775
5303  3427              3427
5304  7052              7052
5305  0000    BET3,     0000
5306  2437              2437
5307  1646              1646
5310  7773    ALF2,     7773
5311  3306              3306
5312  5454              5454
5313  7777    ALF1,     7777
5314  3304              3304
5315  4434              4434
5316  0000    ALF3,     0000
5317  2437              2437
5320  1643              1643
                        /////
                        /ROUTINE TO NEGATE FLAC AND RETURN WITH AC=7777
5321  0000    FNEG,     0
5322  4450              NEGATE
5323  7040              CMA
5324  5721              JMP I FNEG
                        /VARIABLES
5325  0000    X,        0
5326  0000              0
5327  0000              0
5330  0000    XSQR,     0
5331  0000              0
5332  0000              0
                        /POINTERS
5333  7545    TP,       FLTEMP
5334  1573    ONEPT,    FLTONE
```

```
                                /       ARC TANGENT
5335  1045    FATN,   GETSGN          /TAKE ABSOLUTE VALUE
5336  7710            SPA CLA
5337  4321            JMS FNEG
5340  3010            DCA SN
5341  4407            FENT
5342  6325            FPT X
5343  5325            FGT X
5344  2734            FSB I ONEPT
5345  0000            FEXT
5346  1045            GETSGN
5347  7710            SPA CLA
5350  5357            JMP GO
5351  4407            FENT
5352  5734            FGT I ONEPT
5353  4325            FDV X
5354  6325            FPT X
5355  0000            FEXT
5356  7040            CMA
5357  4503    GO,     PUSHA           /SIGN FLAG
5360  4407            FENT
5361  5325            FGT X
5362  3325            FMY X
5363  6330            FPT XSQR
5364  3302            FMY BET2
5365  1277            FAD BET1
5366  3330            FMY XSQR
5367  1305            FAD BET2
5370  6733            FPT I TP
5371  5310            FGT ALF2
5372  3330            FMY XSQR
5373  1313            FAD ALF1
5374  3330            FMY XSQR
5375  1316            FAD ALF2
5376  3325            FMY X
5377  4733            FDV I TP
5400  0000            FEXT
5401  2413            ISZ I PDLXR     /CHECK SIGN FLAG
5402  5207            JMP EXIT2
5403  4450            NEGATE          /SUBTRACT FROM PI/2
5404  4407            FENT
5405  1213            FAD PIOT
5406  0000            FEXT
5407  2010    EXIT2,  ISZ SN          /ARC TAN(-X)=-ARC TAN(X)
5410  5500            RETURN
5411  4450            NEGATE
5412  5500            RETURN
```

```
290                     /ARCTANGENT AND LOG CONSTANTS AND POINTERS
291     5413  0001      PIOT,   0001    /PI/2
292     5414  3110              3110
293     5415  3761              3761
294     5416  7771      L8,     7771
295     5417  4544              4544
296     5420  1735              1735
297     5421  7774      L7,     7774
298     5422  2236              2236
299     5423  4304              4304
300     5424  7775      L6,     7775
301     5425  4746              4746
302     5426  0771              0771
303     5427  7776      L5,     7776
304     5430  2535              2535
305     5431  3301              3301
306     5432  7776      L4,     7776
307     5433  4113              4113
308     5434  7211              7211
309     5435  7777      L3,     7777
310     5436  2517              2517
311     5437  0307              0307
312     5440  7777      L2,     7777
313     5441  4000              4000
314     5442  4100              4100
315     5443  0000      L1,     0000
316     5444  3777              3777
317     5445  7742              7742
318     5446  0000      LOGE2,  0000
319     5447  2613              2613
320     5450  4414              4414
321     5451  7545      TP1,    FLTEMP
322     5452  1573      ONEP2,  FLTONE
323     5453  5325      X1,     X
```

```
324                     /       LOGARITHM
325     5454    1045    FLOG,   GETSGN
326     5455    7550            SPA SNA
327     5456    4526            ERROR           /ZERO OR NEGATIVE ARGUMENT
328     5457    4407            FENT
329     5460    6651            FPT I TP1
330     5461    2652            FSB I ONEP2
331     5462    0000            FEXT
332     5463    1045            GETSGN
333     5464    7450            SNA
334     5465    5336            JMP ZERO        /LOG(1)=0
335     5466    7700            SMA CLA
336     5467    5276            JMP STARTL
337     5470    4407            FENT            /LOG(X)=-LOG(1/X)
338     5471    5652            FGT I ONEP2
339     5472    4651            FDV I TP1
340     5473    6651            FPT I TP1
341     5474    0000            FEXT
342     5475    7040            CMA
343     5476    3010    STARTL, DCA SN
344     5477    7040            CMA
345     5500    1651            TAD I TP1
346     5501    4430            FLOAT
347     5502    4407            FENT
348     5503    3246            FMY LOGE2
349     5504    6653            FPT I X1
350     5505    0000            FEXT
351     5506    7001            IAC
352     5507    3651            DCA I TP1
353     5510    4407            FENT
354     5511    5651            FGT I TP1
355     5512    2652            FSB I ONEP2
356     5513    6651            FPT I TP1
357     5514    3216            FMY L8
358     5515    1221            FAD L7
359     5516    3651            FMY I TP1
360     5517    1224            FAD L6
361     5520    3651            FMY I TP1
362     5521    1227            FAD L5
363     5522    3651            FMY I TP1
364     5523    1232            FAD L4
365     5524    3651            FMY I TP1
366     5525    1235            FAD L3
367     5526    3651            FMY I TP1
368     5527    1240            FAD L2
369     5530    3651            FMY I TP1
370     5531    1243            FAD L1
371     5532    3651            FMY I TP1
372     5533    1653            FAD I X1
373     5534    0000            FEXT
374     5535    5207            JMP EXIT2
375     5536    4430    ZERO,   FLOAT
376     5537    5500            RETURN
```

```
377                     /CONTINUATION OF SINE ROUTINE
378     5540  4407      PALG,   FENT
379     5541  5653              FGT I X1
380     5542  4213              FDV PIOT
381     5543  6653              FPT I X1
382     5544  3653              FMY I X1
383     5545  6651              FPT I TP1
384     5546  3361              FMY C9
385     5547  1364              FAD C7
386     5550  3651              FMY I TP1
387     5551  1367              FAD C5
388     5552  3651              FMY I TP1
389     5553  1372              FAD C3
390     5554  3651              FMY I TP1
391     5555  1213              FAD PIOT
392     5556  3653              FMY I X1
393     5557  0000              FEXT
394     5560  5207              JMP EXIT2
395                     /SINE CONSTANTS
396     5561  7764      C9,     7764
397     5562  2366              2366
398     5563  5735              5735
399     5564  7771      C7,     7771
400     5565  5466              5466
401     5566  6317              6317
402     5567  7775      C5,     7775
403     5570  2431              2431
404     5571  5053              5053
405     5572  0000      C3,     0000
406     5573  5325              5325
407     5574  0420              0420
408                     $
```

```
0100  00000000  00000000  00000001  00000000  00000000  00000000  00000000  00000000
0100  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000100

0200
0300

0400
0500

0600  11111000  00000000  00000000  00000000  00000000  00000000  00000000  00000000
0700  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000


1000  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000
1100  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000

1200
1300

1400
1500

1600
1700


2000
2100

2200
2300

2400
2500

2600
2700


3000
3100

3200
3300

3400
3500

3600
3700
```

```
4000
4100

4200
4300

4400
4500

4600
4700

5000  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000
5100  00000000  00011111  11111111  11111111  11111111  11111111  11111111  11111111

5200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
5300  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

5400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
5500  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

5600
5700

6000
6100

6200
6300

6400  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000
6500  00000000  00000000  00000000  00000000  00000000  00000111  11111111  11111111

6600
6700

7000
7100

7200
7300

7400
7500

7600
7700
```

AF	5256	M5	0067
ALF1	5313	NEG2	5171
ALF2	5310	NEGATE	4450
ALF2	5316	ONEP2	5452
AXIN	0010	ONEPT	5334
BET1	5277	PALG	5540
BET2	5302	PALGO	5167
BET2	5305	PCHECK	5153
BF	5261	PDLXR	0013
BOTTOM	0027	PERROR	0175
C3	5572	PI	5177
C5	5567	PI2	5172
C7	5564	PIOT	5413
C9	5561	POPA	1413
CF	5264	PROC	0616
CNTR	0132	PUSHA	4503
COMGO	1164	RETURN	5500
DBCONV	5600	SN	0010
DF	5267	SORTJ	4510
DTOP	6576	STARTL	5476
ERROR	4526	TP	5333
ERROR5	2735	TP1	5451
EXIT2	5407	TSTERM	4565
EXTAB	6575	TWO	5275
FATN	5335	TWOPI	5174
FCOS	5113	X	5325
FEXP	5202	X1	5453
FIX	4452	X2	5173
FLAC	0044	XSQR	5330
FLOAT	4430	ZERGO	5536
FLOG	5454		
FLTEMP	7545		
FLTONE	1573		
FNEG	5321		
FNTABF	0571		
FSIN	5117		
GETSGN	1045		
GO	5357		
L1	5443		
L2	5440		
L3	5435		
L4	5432		
L5	5427		
L6	5424		
L7	5421		
L8	5416		
LG2E	5272		
LIBD	6562		
LIBGO	6577		
LIBLST	6555		
LIBRAR	6556		
LOGE2	5446		

```
ERRORS DETECTED: 0
LINKS GENERATED: 0
RUN-TIME:  4 SECONDS
2K CORE USED
```