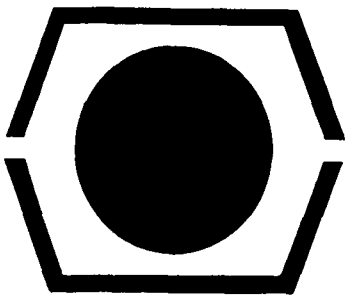

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DECUS NO. FOCAL8-11

TITLE EAE ROUTINES FOR FOCAL

EAE ROUTINES FOR FOCAL

DECUS Program Library Write-up DECUS No. FOCAL-11

Abstract

This patch replaces the floating-point system in FOCAL with one nearly identical to the standard EAE Floating-Point Package. A new floating-integer subroutine is included, as well as a multiplicative-congruential pseudorandom number generator.

General

The binary tape is to be loaded over FOCAL before or after the initial dialogue. Where possible, existing FOCAL routines have been left unchanged.

The listing supplied does not contain detailed comments for standard routines. These may be found in DEC-08-YQYA-D or DEC-08-25-F. The ALIGN, DMULT, DUBDIV, and DNORM routines are nearly identical to those in the standard EAE package. The others are similar to the standard non-EAE package.

Floating-Integer Conversion

The FITR routine in FOCAL has been replaced by one with the following properties:

a) Both the old and new routines test the low-order word of the mantissa to give the integer N as a result for arguments X where $N-\epsilon \leq x < N+1-\epsilon$ and where ϵ corresponds to a difference of $14_8 \times 2^{-23_{10}}$ in the mantissa.

b) The old routine will not convert negative arguments slightly more positive than powers of 2, that is, numbers for which the high-order mantissa is 4000. For example S A = FITR(-63.999) produces an error message. The new routine does not fault for these arguments.

c) The old routine results in 0 for arguments between approximately -0.5 and 0. The new one produces -1.

d) The old routine scales the floating accumulator right in triple precision, preserving low-order bits in location 47. The new one uses the

AC and MQ to shift right in double precision.

e) The standard routine takes 10.5μs for $|x|<.5$ and at most 546μs for $|x|>1024$. The new routine takes a minimum of 30μs for $0<|x|<.5$ and at most 72μs for $0.5<|x|<1$.

Pseudorandom Number Generation:

The statistically poor FRAN function has been replaced by a multiplicative-congruential algorithm (ref: R.P. Cahmbers, IEEE Spectrum, February, 1967, pp. 48-56). A double-precision odd integer is multiplied by 7775 and the low-order 24 bits are used as the random result, which has a flat distribution between -1 and 1. The sequence repeats after the routine has been called 4,194,304 times. It may be reset by placing an odd double-precision integer in locations 5776 and 5777 using the switch register. This routine takes 53μs versus 37.5 for the old one.

```
/EAE FLOATING POINT PACKAGE FOR FOCAL (4/29/68)
/MAY,1969; J.D. APLEVICH
/SEE DEC-8-25-F FOR DESCRIPTION OF ALIGN, DMULT,DUBDIV
/AND DNORM ROUTINES.
/ERROR MESSAGES: ?02.56, IMAG SQR ROOT; ?02.76, DIV BY 0;
/?02.;8, INTEGER TOO LARGE; ?03.97, NEGATIVE EXPONENT.
MUY=7405
DVI=7407
NMI=7411
SHL=7413
MQA=7501
ASR=7415
LSR=7417
MQL=7421
SCA=7441
CAM=7621
FPOW=0000
FADD=1000
FSUB=2000
FMPY=3000
FDIV=4000
FGET=5000
FPUT=6000
        FIXTAB
FNOR=7000
FEXT=0
C13=5
POINT=15
MASK5=24
MASK7=26
MASK3=31
REST=34
EX1=40
AC1H=41
AC1L=42
OVER1=43
EXP=44
HORD=45
LORD=46
OVER2=47
EXP1=50
INTEGER=52
MINS=53
M3=74
EFUN3I=106
POPA=TAD I 13
PUSHA=JMS I 111
PUSHF=JMS I 112
POPF=JMS I 113
ERROR2=JMS I 134
ERROR3=JMS I 135
COUNT=142
FSQRT=401
FLTONE=2366
```

```
                /PAGE 1
                        *FSQRT
0401    7463            SQROOT
                        *INTEGER
0052    7340            FINTEG
                        *MINS
0053    6600            ACMINS
                       *6400
6400    0000    FPNT,   0                       /INTERPRETER
6401    7300            CLA CLL
6402    1600            TAD I FPNT
6403    7450            SNA
6404    5600            JMP I FPNT              /QUICK EXIT
6405    3256            DCA JUMP
6406    1256            TAD JUMP
6407    0261            AND PAGENO
6410    7650            CLA SNA
6411    5214            JMP .+3
6412    1024            TAD MASK5
6413    0200            AND FPNT
6414    3260            DCA ADDR
6415    1026            TAD MASK7
6416    0256            AND JUMP
6417    1260            TAD ADDR
6420    3260            DCA ADDR
6421    1262            TAD INDRCT
6422    0256            AND JUMP
6423    7650            CLA SNA
6424    5227            JMP LOOP01
6425    1660            TAD I ADDR
6426    3260            DCA ADDR
6427    2200    LOOP01, ISZ FPNT
6430    1304            TAD TAG4
6431    3015            DCA POINT
6432    1074            TAD M3
6433    3142            DCA COUNT
6434    1260            TAD ADDR
6435    3257            DCA SAVE
6436    1657            TAD I SAVE
6437    3415            DCA I POINT
6440    2257            ISZ SAVE
6441    2142            ISZ COUNT
6442    5236            JMP .-4
6443    3043            DCA OVER1
6444    3047            DCA OVER2
6445    1256            TAD JUMP
6446    7106            CLL RTL
6447    7006            RTL
6450    0031            AND MASK3
6451    1263            TAD TABLE
6452    3257            DCA SAVE
6453    1657            TAD I SAVE
6454    3257            DCA SAVE
6455    5657            JMP I SAVE
```

```
                /PAGE 2
6456  0000  JUMP,   0
6457  0000  SAVE,   0
6460  0000  ADDR,   0
6461  0200  PAGENO, 0200
6462  0400  INDRCT, 0400
6463  7177  TABLE,  TOP
6464  7040  FLPT,   CMA              /FPUT=6
6465  1303           TAD TAG3
6466  5272           JMP .+4
6467  1303  FLGT,   TAD TAG3         /FGET=5
6470  3260           DCA ADDR
6471  1304           TAD TAG4
6472  3015           DCA POINT
6473  1074           TAD M3
6474  3142           DCA COUNT
6475  1415           TAD I POINT
6476  3660           DCA I ADDR
6477  2260           ISZ ADDR
6500  2142           ISZ COUNT
6501  5275           JMP .-4
6502  5201           JMP FPNT+1
6503  0044  TAG3,    EXP
6504  0037  TAG4,    EX1-1
6505  4771  FLSU,    JMS I OPMINS     /FSUB=2
6506  4774  FLAD,    JMS I ALGN       /FADD=1
6507  5201           JMP FPNT+1
6510  4775           JMS I UNORM
6511  7100           CLL
6512  1043           TAD OVER1
6513  1047           TAD OVER2
6514  3047           DCA OVER2
6515  7004           RAL
6516  1042           TAD AC1L
6517  1046           TAD LORD
6520  3046           DCA LORD
6521  7004           RAL
6522  1041           TAD AC1H
6523  1045           TAD HORD
6524  3045           DCA HORD
6525  4773  NORF,    JMS I NORM       /FNOR=7
6526  5201           JMP FPNT+1
6527  1200  FLEX,    TAD FPNT         /EXPONENT ROUTINE: X↑(+N)
6530  4511           PUSHA            /SAVE C(FPNT)
6531  4512           PUSHF            /SAVE ARGUMENT
6532  0044           EXP
6533  4407           JMS I 7
6534  5040           FGET EX1         /GET EXPONENT
6535  0000           FEXT
6536  4452           JMS I INTEGER    /CONVERT TO INTEGER
6537  1045           TAD HORD
6540  7510           SPA              /MUST BE POSITIVE
```

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                /PAGE 3
6541  4535              ERROR3
6542  7040              CMA               /-(N+1)
6543  3376              DCA NCT           /SET COUNTER
6544  4513              POPF              /PUT ARGUMENT INTO
6545  7554  ITER,       ITER1             /       WORKING LOCATION
6546  4512              PUSHF             /PUT 1.0 INTO FLTG AC
6547  2366              FLTONE
6550  4513              POPF
6551  0044              EXP
6552  2376              ISZ NCT           /DONE?
6553  5357              JMP .+4           /NO
6554  1413              POPA              /RESTORE C(FPNT)
6555  3200              DCA FPNT
6556  5201              JMP FPNT+1        /EXIT
6557  4407              JMS I 7
6560  3745              FMPY I ITER       /MULTIPLY
6561  0000              FEXT
6562  5352              JMP ITER+5
6563  7201  FLMY,       CLA IAC           /FMPY=3
6564  1040              TAD EX1
6565  1044              TAD EXP
6566  3044              DCA EXP
6567  4772              JMS I MULT
6570  5201              JMP FPNT+1
6571  7207  OPMINS,     MINUS2
6572  7020  MULT,       DMULT
6573  7400  NORM,       DNORM
6574  6620  ALGN,       ALIGN
6575  7171  UNORM,      DUNORM
6576  0000  NCT,        0
                      *6600
6600  0000  ACMINS,     0                 /ROUTINE TO NEGATE FLTG AC
6601  7300              CLA CLL
6602  1047              TAD OVER2
6603  7041              CMA IAC
6604  3047              DCA OVER2
6605  1046              TAD LORD
6606  7040              CMA
6607  7430              SZL
6610  7101              CLL IAC
6611  3046              DCA LORD
6612  1045              TAD HORD
6613  7040              CMA
6614  7430              SZL
6615  7101              CLL IAC
6616  3045              DCA HORD
6617  5600              JMP I ACMINS
6620  0000  ALIGN,      0                 /EAE ALIGN ROUTINE
6621  1045              TAD HORD
6622  7640              CLA SZA
6623  5227              JMP .+4
6624  1046              TAD LORD
6625  7650              CLA SNA
6626  5354              JMP NOHERE
```

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                /PAGE 4
6627  1041      TAD AC1H
6630  7640      CLA SZA
6631  5235      JMP .+4
6632  1042      TAD AC1L
6633  7650      CLA SNA
6634  5620      JMP I ALIGN
6635  1040      TAD EX1
6636  7041      CMA IAC
6637  1044      TAD EXP
6640  7450      SNA
6641  5330      JMP DONE
6642  7510      SPA
6643  7041      CMA IAC
6644  3366      DCA AMOUNT
6645  1366      TAD AMOUNT
6646  1367      TAD TEST2
6647  7710      CLA SPA
6650  5256      JMP .+6
6651  4333      JMS OUTGO
6652  7430      SZL
6653  1374      TAD TAG2
6654  1373      TAD TAG1
6655  5342      JMP NOGO
6656  4333      JMS OUTGO
6657  7420      SNL
6660  1374      TAD TAG2
6661  1373      TAD TAG1
6662  3370      DCA TEST3
6663  1366      TAD AMOUNT
6664  1770      TAD I TEST3
6665  3770      DCA I TEST3
6666  2370      ISZ TEST3
6667  1370      TAD TEST3
6670  3371      DCA TEST4
6671  2371      ISZ TEST4
6672  1371      TAD TEST4
6673  3372      DCA TEST5
6674  2372      ISZ TEST5
6675  7240      CLA CMA
6676  1366      TAD AMOUNT
6677  3304      DCA SHIFT3
6700  1771      TAD I TEST4
6701  7421      MQL
6702  1770      TAD I TEST3
6703  7415      ASR
6704  0000 SHIFT3, 0000
6705  3304      DCA SHIFT3
6706  7501      MQA
6707  3333      DCA OUTGO
6710  1366      TAD AMOUNT
6711  1332      TAD MIN15
6712  7510      SPA
6713  5357      JMP LESS15
```

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                /PAGE 5
6714  3321              DCA SHIFT2
6715  1771              TAD I TEST4
6716  7421              MQL
6717  1770              TAD I TEST3
6720  7417              LSR
6721  0000  SHIFT2,     0000
6722  7701              CLA MQA
6723  3772              DCA I TEST5
6724  1304              TAD SHIFT3
6725  3770              DCA I TEST3
6726  1333              TAD OUTGO
6727  3771              DCA I TEST4
6730  2220  DONE,       ISZ ALIGN
6731  5620              JMP I ALIGN
6732  7763  MIN15,      -15
6733  0000  OUTGO,      0
6734  1040              TAD EX1
6735  7041              CMA IAC
6736  1044              TAD EXP
6737  7004              RAL
6740  7200              CLA
6741  5733              JMP I OUTGO
6742  3370  NOGO,       DCA TEST3
6743  1770              TAD I TEST3
6744  3044              DCA EXP
6745  2370              ISZ TEST3
6746  1770              TAD I TEST3
6747  3045              DCA HORD
6750  2370              ISZ TEST3
6751  1770              TAD I TEST3
6752  3046              DCA LORD
6753  5620              JMP I ALIGN
6754  1040  NOHERE,     TAD EX1
6755  3044              DCA EXP
6756  5330              JMP DONE
6757  7240  LESS15,     CLA CMA
6760  1366              TAD AMOUNT
6761  3321              DCA SHIFT2
6762  1772              TAD I TEST5
6763  7421              MQL
6764  1771              TAD I TEST4
6765  5320              JMP SHIFT2-1
6766  0000  AMOUNT,     0
6767  7747  TEST2,      -31
6770  0000  TEST3,      0
6771  0000  TEST4,      0
6772  0000  TEST5,      0
6773  0044  TAG1,       EXP
6774  7774  TAG2,       EX1-EXP
                      *7000
7000  0000  DIV1,       0                  /SCALE FLTG AC 1 RIGHT
7001  7300              CLA CLL
7002  1045              TAD HORD
```

```
                /PAGE 6
7003  7510              SPA
7004  7020              CML
7005  7010              RAR
7006  3045              DCA HORD
7007  1046              TAD LORD
7010  7010              RAR
7011  3046              DCA LORD
7012  1047              TAD OVER2
7013  7010              RAR
7014  3047              DCA OVER2
7015  2044              ISZ EXP
7016  5600              JMP I DIV1
7017  5600              JMP I DIV1
7020  0000  DMULT,       0                    /EAE MULTIPLY
7021  7300              CLA CLL
7022  4327              JMS SIGN
7023  1042              TAD AC1L
7024  3227              DCA D
7025  1046              TAD LORD
7026  7425              MQL MUY
7027  0000  D,          0000
7030  3047              DCA OVER2
7031  1045              TAD HORD
7032  3235              DCA KEEP
7033  1042              TAD AC1L
7034  7425              MQL MUY
7035  0000  KEEP,       0000
7036  3227              DCA D
7037  7501              MQA
7040  1047              TAD OVER2
7041  3047              DCA OVER2
7042  7004              RAL
7043  1227              TAD D
7044  3227              DCA D
7045  1041              TAD AC1H
7046  3251              DCA .+3
7047  1046              TAD LORD
7050  7425              MQL MUY
7051  0000              0000
7052  3235              DCA KEEP
7053  7501              MQA
7054  1047              TAD OVER2
7055  3047              DCA OVER2
7056  7004              RAL
7057  1235              TAD KEEP
7060  1227              TAD D
7061  3227              DCA D
7062  7004              RAL
7063  3235              DCA KEEP
7064  1045              TAD HORD
7065  3270              DCA .+3
7066  1041              TAD AC1H
7067  7425              MQL MUY
```

```
                /PAGE 7
7070  0000              0000
7071  3045              DCA HORD
7072  7501              MQA
7073  1227              TAD D
7074  3046              DCA LORD
7075  7004              RAL
7076  1045              TAD HORD
7077  1235              TAD KEEP
7100  3045              DCA HORD
7101  4746              JMS I NORMF
7102  3047              DCA OVER2
7103  2350              ISZ SGN
7104  5620              JMP I DMULT
7105  4453              JMS I MINS
7106  5620              JMP I DMULT
7107  1041  FLDV,       TAD AC1H          /FDIV=4
7110  7640              CLA SZA
7111  5315              JMP .+4
7112  1042              TAD AC1L
7113  7650              CLA SNA
7114  4534              ERROR2            /DIVISION BY 0
7115  1040              TAD EX1
7116  7041              CMA IAC
7117  1044              TAD EXP
7120  3044              DCA EXP
7121  4327              JMS SIGN
7122  4747              JMS I DIVIDE
7123  1326              TAD .+3
7124  3220              DCA DMULT
7125  5301              JMP FLDV-6
7126  6401              FPNT+1
7127  0000  SIGN,       0                 /TEST SIGN FOR MULT AND DIV
7130  1034              TAD REST
7131  3350              DCA SGN
7132  1045              TAD HORD
7133  7700              CLA SMA
7134  5337              JMP .+3
7135  4453              JMS I MINS
7136  2350              ISZ SGN
7137  1041              TAD AC1H
7140  7700              CLA SMA
7141  5727              JMP I SIGN
7142  4751              JMS I MINS2
7143  2350              ISZ SGN
7144  5727              JMP I SIGN
7145  5727              JMP I SIGN
7146  7400  NORMF,      DNORM
7147  7227  DIVIDE,     DUBDIV
7150  0000  SGN,        0
7151  7207  MINS2,      MINUS2
7152  0000  DIV2,       0                 /SCALE OPERAND 1 RIGHT
7153  7300              CLA CLL
7154  1041              TAD AC1H
```

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                /PAGE 8
7155  7510              SPA
7156  7120              CLL CML
7157  7010              RAR
7160  3041              DCA AC1H
7161  1042              TAD AC1L
7162  7010              RAR
7163  3042              DCA AC1L
7164  1043              TAD OVER1
7165  7010              RAR
7166  3043              DCA OVER1
7167  7100              CLL
7170  5752              JMP I DIV2
7171  0000  DUNORM,     0                   /SCALE BOTH ARGUMENTS RIGHT
7172  4200              JMS DIV1
7173  4352              JMS DIV2
7174  2040              ISZ EX1
7175  5771              JMP I DUNORM
7176  5771              JMP I DUNORM
7177  6527  TOP,        FLEX                /INTERPRETER TABLE
7200  6506              FLAD
7201  6505              FLSU
7202  6563              FLMY
7203  7107              FLDV
7204  6467              FLGT
7205  6464              FLPT
7206  6525              NORF
7207  0000  MINUS2,     0                   /NEGATE OPERAND
7210  7300              CLA CLL
7211  1043              TAD OVER1
7212  7041              CMA IAC
7213  3043              DCA OVER1
7214  1042              TAD AC1L
7215  7040              CMA
7216  7430              SZL
7217  7101              CLL IAC
7220  3042              DCA AC1L
7221  1041              TAD AC1H
7222  7040              CMA
7223  7430              SZL
7224  7101              CLL IAC
7225  3041              DCA AC1H
7226  5607              JMP I MINUS2
7227  0000  DUBDIV,     0                   /EAE DIVIDE ROUTINE
7230  3340              DCA DVFLG
7231  1042              TAD AC1L
7232  7104              CLL RAL
7233  3252              DCA DV3
7234  1041              TAD AC1H
7235  7004              RAL
7236  3273              DCA DV4
7237  1273              TAD DV4
7240  3245              DCA DV2
7241  1046              TAD LORD
```

```
                /PAGE 9
7242  7421            MQL
7243  1045            TAD HORD
7244  7407            DVI
7245  0000  DV2,     0000
7246  3245            DCA DV2
7247  7501            MQA
7250  3045            DCA HORD
7251  7405            MUY
7252  0000  DV3,     0000
7253  7141            CLL CMA IAC
7254  1245            TAD DV2
7255  7450            SNA
7256  5300            JMP DV5
7257  7420            SNL
7260  5310            JMP DV6
7261  3252            DCA DV3
7262  7040            CMA
7263  3340            DCA DVFLG
7264  7501            MQA
7265  7141            CLL CMA IAC
7266  7421            MQL
7267  7420            SNL
7270  7040            CMA
7271  1252            TAD DV3
7272  7407            DVI
7273  0000  DV4,     0000
7274  7701            CLA MQA
7275  7120            CLL CML
7276  2340            ISZ DVFLG
7277  7141            CLL CMA IAC
7300  3046  DV5,     DCA LORD
7301  7420            SNL
7302  7040            CMA
7303  1045            TAD HORD
7304  7510            SPA
7305  5330            JMP DV7
7306  3045            DCA HORD
7307  5627            JMP I DUBDIV
7310  7041  DV6,     CMA IAC
7311  3245            DCA DV2
7312  1273            TAD DV4
7313  7141            CLL CMA IAC
7314  1245            TAD DV2
7315  7420            SNL
7316  5323            JMP .+5
7317  3245            DCA DV2
7320  7040            CMA
7321  1045            TAD HORD
7322  3045            DCA HORD
7323  7200            CLA
7324  1245            TAD DV2
7325  7440            SZA
7326  5272            JMP DV4-1
```

```
                /PAGE 10
7327   5277             JMP DV5-1
7330   7110   DV7,      CLL RAR
7331   3045             DCA HORD
7332   1046             TAD LORD
7333   7010             RAR
7334   3046             DCA LORD
7335   2044             ISZ EXP
7336   5627             JMP I DUBDIV
7337   5627             JMP I DUBDIV
7340   0000   FINTEG,   0                    /EAE FLOATING-INTEGER CONVERSION
7341   7301             CLA CLL IAC
7342   1046             TAD LORD
7343   1005             TAD C13              /ADD 14 TO LORD
7344   7210             CLA RAR
7345   3273             DCA DV4              /STORE LINK
7346   1044             TAD EXP
7347   7510             SPA                  /EXP < 0?
7350   5370             JMP OUT              /YES
7351   1376             TAD M13
7352   7540             SMA SZA              /EXP < 14?
7353   5366             JMP OUT-2            /NO, ERROR
7354   7440             SZA                  /EXP = 13?
7355   4777             JMS I ROTAT          /NO, SCALE RIGHT
7356   1273             TAD DV4
7357   7710             SPA CLA              /WAS LORD > 7763?
7360   2045             ISZ HORD             /YES, INCREMENT
7361   7410             SKP
7362   5740             JMP I FINTEG
7363   7130             CLL CML RAR
7364   1045             TAD HORD
7365   7650             SNA CLA              /HORD = 4000?
7366   4534             ERROR2               /YES, ERROR EXIT
7367   5740             JMP I FINTEG
7370   7200   OUT,      CLA
7371   1045             TAD HORD
7372   7710             SPA CLA              /HORD < 0?
7373   7040             CMA                  /YES, MAKE IT -1
7374   3045             DCA HORD
7375   5740             JMP I FINTEG
7376   7765   M13,      -13
7377   7564   ROTAT,    FINT1
               DVFLG=FINTEG
                      *7400
7400   0000   DNORM,    0                    /EAE NORMALIZE ROUTINE
7401   7320             CLA CLL CML
7402   1045             TAD HORD
7403   7710             CLA SPA
7404   4453             JMS I MINS
7405   7430             SZL
7406   7040             CMA
7407   3260             DCA SIGN1
7410   1045             TAD HORD
7411   7640             CLA SZA
7412   5225             JMP LOP
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                /PAGE 11
7413  1046              TAD LORD
7414  7510              SPA
7415  5226              JMP LOP+1
7416  3045              DCA HORD
7417  1047              TAD OVER2
7420  3046              DCA LORD
7421  3047              DCA OVER2
7422  1261              TAD FOURTN
7423  1044              TAD EXP
7424  3044              DCA EXP
7425  1046  LOP,        TAD LORD
7426  7421              MQL
7427  1045              TAD HORD
7430  7411              NMI
7431  7450              SNA
7432  3044              DCA EXP
7433  3045              DCA HORD
7434  7441              SCA
7435  7450              SNA
7436  5255              JMP EXIT1
7437  7041              CMA IAC
7440  1044              TAD EXP
7441  3044              DCA EXP
7442  7441              SCA
7443  1262              TAD ONE
7444  3251              DCA SHIFT
7445  1047              TAD OVER2
7446  7421              MQL
7447  1046              TAD LORD
7450  7413              SHL
7451  0000  SHIFT,      0000
7452  3046              DCA LORD
7453  7501              MQA
7454  3047              DCA OVER2
7455  2260  EXIT1,      ISZ SIGN1
7456  4453              JMS I MINS
7457  5600              JMP I DNORM
7460  0000  SIGN1,      0
7461  7764  FOURTN,     -14
7462  7777  ONE,        -1
7463  4407  SQROOT,     JMS I 7          /FLOATING SQUARE ROOT
7464  6360              FPUT FPAC1
7465  0000              FEXT
7466  1045              TAD HORD
7467  7710              CLA SPA
7470  4534              ERROR2           /NEGATIVE ARGUMENT
7471  1044              TAD EXP
7472  7100              CLL
7473  7510              SPA
7474  7020              CML
7475  7010              RAR
7476  3354              DCA ITER1
7477  7430              SZL
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7501  7000              NOP
7502  1353              TAD SQCON1
7503  3355              DCA ITER1+1
7504  3356              DCA ITER1+2
7505  1361              TAD FPAC1+1
7506  7640              CLA SZA
7507  5313              JMP CLCU
7510  1361              TAD FPAC1+1
7511  7650              CLA SNA
7512  5351              JMP SQEND
7513  4407  CLCU,       JMS I 7
7514  5360              FGET FPAC1
7515  4354              FDIV ITER1
7516  1354              FADD ITER1
7517  0000              FEXT
7520  7240              CLA CMA
7521  1044              TAD EXP
7522  3044              DCA EXP
7523  1044              TAD EXP
7524  7041              CMA IAC
7525  1354              TAD ITER1
7526  7640              CLA SZA
7527  5345              JMP ROOTGO
7530  1045              TAD HORD
7531  7041              CMA IAC
7532  1355              TAD ITER1+1
7533  7640              CLA SZA
7534  5345              JMP ROOTGO
7535  1046              TAD LORD
7536  7041              CMA IAC
7537  1356              TAD ITER1+2
7540  7500              SMA
7541  7041              CMA IAC
7542  7001              IAC
7543  7700              CLA SMA
7544  5506              JMP I EFUN3I
7545  4407  ROOTGO,     JMS I 7
7546  6354              FPUT ITER1
7547  0000              FEXT
7550  5313              JMP CLCU
7551  3044  SQEND,      DCA EXP
7552  5506              JMP I EFUN3I
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7557  0000              0
7560  0000  FPAC1,      0
7561  0000              0
7562  0000              0
7563  0000              0
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7565  7040          CMA
7566  3373          DCA .+5
7567  1046          TAD LORD
7570  7421          MQL
7571  1045          TAD HORD
7572  7415          ASR                 /SCALE RIGHT DOUBLE PRECISION
7573  0000          0000
7574  3045          DCA HORD
7575  7501          MQA
7576  3046          DCA LORD
7577  5764          JMP I FINT1
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                    *5753
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5754  7425          MQL MUY             /WITH PERIOD = 2↑22
5755  7775          7775
5756  3045          DCA HORD
5757  7501          MQA
5760  3377          DCA RL
5761  1376          TAD RH
5762  7425          MQL MUY
5763  7775          7775
5764  7701          CLA MQA
5765  1045          TAD HORD
5766  3376          DCA RH
5767  1376          TAD RH
5770  3045          DCA HORD
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5772  3046          DCA LORD
5773  3044          DCA EXP
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5775  5506          JMP I EFUN3I
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5777  0005  RL,     5                   /ODD INTEGER IN THESE LOCATIONS.
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