UNIVERSITY OF CALIFORNIA

LICK OBSERVATORY TECHNICAL REPORTS

No. 12

DESCRIPTIONS AND LISTINGS OF LICK FOCAL FUNCTIONS

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Santa Cruz, California
April 1975

CONTENTS

FORWARD

The number of special commands, or "functions," available in Lick-Focal has expanded greatly in the past few years. This is primarily because the software associated with these commands can now be stored on any number of tape "overlays" and can then be temporarily read into the normal Lick-Focal structure during program execution (by use of the X NAME( ) command). This report presents an updated version of the Lick-Focal function list which appeared as Appendix Z in Lick Observatory Technical Report No. 1 ("The Lick Observatory PDP 8/I Computers" by Lloyd Robinson). Program listings of all of the new functions are also included; consult Lick Observatory Technical Report Nos. 3, 4, 7, 9 and 10 for other listings.

This report covers only Scanner and Microphotometer versions of Lick-Focal. Commands for AME-Focal can be found in Lick Observatory Technical Report No. 7. Scanner-Focal versions SCN 74-M and later incorporate all changes shown here, and have also been modified to work with either the Teletype or Silent 700 teleprinters. Microphotometer-Focal will work only with the Teletype.

(20)

Ken Nordstrom's Source Tape
File 9
20 August 1974

```
*
.PALP
*OUT-S:ETAP
*
*IN-S:CON0,S:XCON,S:ETAP
*
*
*
*OPT-T
```

NEW ETAP

```
ARG1    0050
ARG10   0061
ARG10H  0017

                /CON0
                XLIST
                PAUSE/
                /
                /XCON
                FIELD 1
                XLIST
                PAUSE/
                /
                /ETAP
                /ROUTINES TO EDIT DECTAPES.
                /X TACO(B,N,U,W1);X COTA(B,N,U,W1);READ OR WRITE AT BLOCK B.
                /N-NO. OF WORDS(MAX=2048);UNIT=0-7
                /W1-FIRST WORD IN CORE (W1=0 FOR LOC. 2000,FLD 0)
                /THESE ROUTINES USE SAME SPACE AS SCANNER CORE BUFFERS.
                /X CWRT(N1,C,M,I);CONTENTS OF N1,N2--N(C) TO:M,M+I,M+2I,ETC.
                /S D=FCRED(N) READS WORD N FROM CORE BUFFER.
                /X DSCO(B,N,0,W1);X CODS(B,N,0,W1)..DISC INSTEAD OF TAPE.
                /
                *KB1+68
0230  6442      TRED    /FORMER NAMES OF THESE FUNCTIONS.
0231  6447      TWRT
0232  6400      TMOD
0233  6432      FTAP
0234  6512      DSCR
0235  6517      DSCW
                *FNKB1+68
0734  3447      3447    /TACO
0735  0441      0441    /COTA
0736  1464      1444    /CWRT   (1444)
0737  0554      0554    /CRED
0740  1647      1647    /DSCO
0741  0263      0263    /CODS
                /
                *6400
6400  0000      TMOD,0  /CHANGE VALUE IN CORE
6401  1053              TAD ARG4
6402  7450              SNA
6403  7001              IAC
6404  7041              CIA
6405  3053              DCA ARG4        /WORD COUNT
6406  1052              TAD ARG3
6407  7510              SPA
6410  5310              JMP KILL        /PROTECT PROGRAM
6411  1231              TAD PFIRST
6412  3052              DCA ARG3
6413  1054      NEXT,   TAD ARG5
6414  3452              DCA I ARG3
```

add 499 to all numbers in ETAP

```
6415  2052            ISZ ARG3
6416  1052            TAD ARG3
6417  1230            TAD WTOP
6420  7700            SMA CLA
6421  5600            JMP I TMOD      /STOP AT 5777
6422  1055            TAD ARG6        /INCREMENT
6423  1054            TAD ARG5
6424  3054            DCA ARG5
6425  2053            ISZ ARG4        /ALL DONE?
6426  5213            JMP NEXT
6427  5600            JMP I TMOD
                /
6430  2000      WTOP,-6000
6431  2000      PFIRST,2000
                /
6432  0000      FTAP,0  /READ A WORD FROM CORE
6433  1052              TAD ARG3
6434  1231              TAD PFIRST
6435  3052              DCA ARG3
6436  1452              TAD I ARG3
6437  3051              DCA ARG2        /PASS IT TO FOCAL
6440  3050              DCA ARG1
6441  5632              JMP I FTAP
                /
6442  0000      TRED,0
6443  4257              JMS SETUP
6444  4421              JMP I DTAPX
6445  5243              JMP .-2 /ERROR
6446  5642              JMP I TRED
                /
6447  0000      TWRT,0
6450  4257      SETW, JMS SETUP
6451  1037              TAD P20
6452  4421              JMP I DTAPX     /ERROR
6453  5250              JMP SETW
6454  5647              JMP I TWRT
                /
6455  2000      CNMAX,-6000
6456  0201      P201,201
                /
6457  0000      SETUP,0
6460  1052              TAD ARG3
6461  4512              JMS I DCSETX    /DISC ADDRESS SET.
6462  1231              TAD PFIRST
6463  1055              TAD ARG6
6464  3023              DCA DDCORE
6465  1052              TAD ARG3
6466  3027              DCA DTBLOK
6467  1053              TAD ARG4
6470  7450              SNA             /AT LEAST 1 BLOCK
6471  1256              TAD P201
6472  7041              CIA
6473  3024              DCA DDWCNT
6474  1024              TAD DDWCNT
6475  7040              CMA
6476  7100              CLL
6477  1023              TAD DDCORE
6500  1255              TAD CNMAX
6501  7630              SZL CLA
6502  5310      JMP KILL            /DON'T READ PAST 5777
```

```
6503  1054            TAD ARGS
6504  7112            CLL RTR
6505  7012            RTR
6506  3030            DCA DTUNIT
6507  5657            JMP I SETUP
                /
6510  4530  KILL, JMS I CRLFX
6511  5532            JMP I KILALL      /STOP EVERYTHING
6512  0000  DSCR, 0
6513  4257            JMS SETUP
6514  4420            JMS I DISCX
6515  5313            JMP .-2 /ERROR
6516  5712            JMP I DSCR        /DISC READ.
                /
6517  0000  DSCW, 0
6520  4257            JMS SETUP
6521  1325            TAD P2
6522  4420            JMS I DISCX       /WRITE ON DISC
6523  5321            JMP .-2 /ERROR
6524  5717            JMP I DSCW
                /
6525  0002  P2, 2
```

File 3 Tape 13A
June 8/72

(23)

```
.PALP
*OUT-S:ETAP
*
*IN-S:CON0,S:XCON,S:ETAP
*
*
*
*OPT-T

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /XCON
                FIELD 1
                XLIST
                PAUSE/
                /
                /ETAP
                /ROUTINES TO EDIT DECTAPES.
                /X TRED(B,N,U,W1);READ OR WRITE AT BLOCK B
                /X TWRT(B,N,U,W1);U-UNIT 0-7;
                /N-NO. OF WORDS(MAX=12*129=1548);
                /W1-FIRST WORD IN CORE    = 525
                /X TMOD(N1,C,M,I);CONTENTS OF N1,N2--N(C) TO:M,M+I,M+2I,ETC
                /S D=FTAP(N) READS WORD N FROM CORE BUFFER.
                /X DSCR(B,N,0,W1);X DSCW(B,N,0,W1)..DISC INSTEAD OF TAPE.
                /
                *KB1+66
0226    6106    TRED
0227    6113    TWRT
0230    6044    TMOD
0231    6076    FTAP
0232    6156    DSCR
0233    6163    DSCW
                *FNKB1+66
0732    1554    1554    /TRED
0733    2444    2444    /TWRT
0734    1174    1174    /TMOD
0735    1730    1730    /TAP
0736    1652    1652    /DSCR
0737    1657    1657    /DSCW
                /
                *6044
6044    0000    TMOD,0  /CHANGE VALUE IN CORE
6045    1053      TAD ARG4
6046    7450      SNA
6047    7001      IAC
6050    7041      CIA
6051    3053      DCA ARG4        /WORD COUNT
6052    1052      TAD ARG3
6053    7510      SPA
6054    5354      JMP KILL        /PROTECT PROGRAM
6055    1275      TAD PFIRST
6056    3052      DCA ARG3
6057    1054    NEXT,TAD ARG5
6060    3452      DCA I ARG3
6061    2052      ISZ ARG3
6062    1052      TAD ARG3
6063    1274      TAD WTOP
```

1549 !!

starting at every beg of tape

Buff 0

XDSCW(1,1,0,525+1023)

6500

```
6064  7700   SMA CLA
6065  5644   JMP I TMOD        /STOP AT 5777
6066  1055   TAD ARG6          /INCREMENT
6067  1054   TAD ARG5
6070  3054   DCA ARG5
6071  2053   ISZ ARG4          /ALL DONE?
6072  5257   JMP NEXT
6073  5644   JMP I TMOD
/
6074  2000  WTOP,-6000
6075  2763  PFIRST,2763       + 15₈ = 13₁₀ = 300   ← 2000
/
6076  0000  FTAP,0   /READ A WORD FROM CORE
6077  1052   TAD ARG3
6100  1275   TAD PFIRST
6101  3052   DCA ARG3
6102  1452   TAD I ARG3
6103  3051   DCA ARG2          /PASS IT TO FOCAL
6104  3050   DCA ARG1
6105  5676   JMP I FTAP
/
6106  0000  TRED,0
6107  4323   JMS SETUP
6110  4421   JMS I DTAPX
6111  5307   JMP .-2           /ERROR
6112  5706   JMP I TRED
/
6113  0000  TWRT,0
6114  4323  SETW,JMS SETUP
6115  1037   TAD P20
6116  4421   JMS I DTAPX
6117  5314   JMP SETW          /ERROR
6120  5713   JMP I TWRT
/
6121  2000  CNMAX,-6000
6122  0201  P201,201
/
6123  0000  SETUP,0
6124  1052   TAD ARG3
6125  4512   JMS I DCSETX      /DISC ADDRESS SET.
6126  1275   TAD PFIRST
6127  1055   TAD ARG6
6130  3023   DCA DDCORE
6131  1052   TAD ARG3
6132  3027   DCA DTBLOK
6133  1053   TAD ARG4
6134  7450   SNA
6135  1322   TAD P201          /AT LEAST 1 BLOCK
6136  7041   CIA
6137  3024   DCA DDWCNT
6140  1024   TAD DDWCNT
6141  7041   CIA  ← CMA
6142  7100   CLL
6143  1023   TAD DDCORE
6144  1321   TAD CNMAX
6145  7630   SZL CLA
6146  5354   JMP KILL          /DON'T READ PAST 5777
6147  1054   TAD ARG5
6150  7112   CLL RTR
6151  7012   RTR
```

```
6152  3030    DCA DTUNIT
6153  5723    JMP I SETUP
              /
6154  4530  KILL, JMS I CRLFX
6155  5532    JMP I KILALL  /STOP EVERYTHING
6156  0000  DSCR, 0
6157  4323    JMS SETUP
6160  4420    JMS I DISCX
6161  5357    JMP .-2       /ERROR
6162  5756    JMP I DSCR    /DISC READ.
              /
6163  0000  DSCW, 0
6164  4323    JMS SETUP
6165  1371    TAD P2
6166  4420    JMS I DISCX   /WRITE ON DISC
6167  5365    JMP .-2       /ERROR
6170  5763    JMP I DSCW
              /
6171  0002  P2, 2
```

6171
44
6525

```
*OUT-S:FLIP
*
*IN-S:CON0,S:FLIP
*
*
*OPT-T

ARG1    0050

                /CON0
                XLIST
                PAUSE/X FLIP(B)
                /REVERSES CHAN. SEQUENCE IN BUFFER B
                *KB1+66
0226    6320      FLIP
                *FNKB1+66
0732    3030      3030
                *6320
6320    0000    FLIP,0
6321    1052      TAD ARG3
6322    7650      SNA CLA
6323    1370      TAD P2000
6324    1370      TAD P2000
6325    3363      DCA SMALL
6326    1363      TAD SMALL
6327    1367      TAD P1000
6330    3361      DCA HIGH
6331    4336      JMS LOOP      /FLIP LOW ORDER WORDS
6332    1361      TAD HIGH
6333    3363      DCA SMALL
6334    4336      JMS LOOP      /FLIP HIGH ORDER WORDS
6335    5720      JMP I FLIP
6336    0000    LOOP,0
6337    1363      TAD SMALL
6340    1366      TAD P777
6341    3362      DCA BIG
6342    1371      TAD M400
6343    3364      DCA CTR
6344    1762    NEXTCH,TAD I BIG
6345    3365      DCA TEMP
6346    1763      TAD I SMALL
6347    3762      DCA I BIG
6350    1365      TAD TEMP
6351    3763      DCA I SMALL
6352    7240      STA
6353    1362      TAD BIG
6354    3362      DCA BIG
6355    2363      ISZ SMALL
6356    2364      ISZ CTR
6357    5344      JMP NEXTCH
6360    5736      JMP I LOOP
6361    0000    HIGH,0
6362    0000    BIG,0
6363    0000    SMALL,0
6364    0000    CTR,0
6365    0000    TEMP,0
6366    0777    P777,777
6367    1000    P1000,1000
6370    2000    P2000,2000

6371    7400    M400,-400
```

5 Dec 1974
F.63, 13C

```
 PALP
*OUT-S:IBM5
*
*IN-S:CON0,S:ICON,S:IBM5
*
*
*
*OPT-T

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /ICON-CONSTANTS FOR IBM TAPE
                XLIST
                PAUSE/
                /
                /IBM4-WAIT FOR A GAP
                /SET BUFFER POINTERS
                /
                *GAPWT2
 6376.  6600    GAPWIT
                *GAPWT3
 6576   6600    GAPWIT
                *BFSET2
 6375   6635    BFSET
                *BFSET3
 6575   6635    BFSET
                /
                *6600
 6600   0000    GAPWIT,0
 6601   6704    GWAIT,IBSTAT
 6602   0233      AND PP200
 6603   7650      SNA CLA
 6604   5600      JMP I GAPWIT   /B.O.T.
 6605   6704      IBSTAT
 6606   0234      AND PP40
 6607   7640      SZA CLA
 6610   5201      JMP GWAIT      /WAIT FOR GAP
 6611   6704      IBSTAT
 6612   0037      AND P20
 6613   7650      SNA CLA
 6614   7144      CMA CLL RAL    /ERROR
 6615   3060      DCA STASAV
 6616   6704    GAPEND,IBSTAT
 6617   0234      AND PP40
 6620   7650      SNA CLA
 6621   5216      JMP GAPEND     /WAIT TILL GAP PULSE DONE
 6622   6706      SKFILE
 6623   5600      JMP I GAPWIT
 6624   1010      TAD ARG3H
 6625   7640      SZA CLA
 6626   5600      JMP I GAPWIT   /ADD 4096 TO ARG3 TO SUPRESS EOF MESSAGE.
 6627   4422      JMS I MESAGX
 6630   0517    TEXT /EO
 6631   0600    F/
 6632   5600      JMP I GAPWIT
                /
 6633   0200    PP200,200
```

```
6634  0040  PP40,40
            /
6635  0000  BFSET,0
6636  6201     CDF
6637  1305     TAD WRD0
6640  3716     DCA I IBMCA        /PREPARE PREAMBLE
6641  1312     TAD WRD6
6642  3014     DCA BUFR
6643  1054     TAD ARG5
6644  7450     SNA
6645  1317     TAD P1000
6646  3054     DCA ARG5
6647  1054     TAD ARG5
6650  7041     CIA
6651  3061     DCA COUNTR
6652  1061     TAD COUNTR
6653  1314     TAD M3
6654  7104     CLL RAL
6655  3715     DCA I IBMWC
6656  6211     CDF 10
6657  1054     TAD ARG5
6660  1320     TAD M1100
6661  7700     SMA CLA
6662  5532     JMP I KILALL       /TOO LONG
6663  7001     IAC                /DATA BYTES+4 TO BYTE 6
6664  1054     TAD ARG5
6665  7421     MQL
6666  7413     SHL
6667  0001     1
6670  3710     DCA I WRD3         /FIRST 24 BYTES IN 3 BYTE MODE
6671  7501     MQA                /(WRITE ONLY)
6672  3711     DCA I WRD4
6673  1711     TAD I WRD4         /DATA BYTES +8 TO BYTE 2(AND 1)
6674  1313     TAD P4
6675  7421     MQL
6676  1710     TAD I WRD3
6677  7413     SHL
6700  0007     7
6701  3706     DCA I WRD1
6702  7501     MQA
6703  3707     DCA I WRD2
6704  5635     JMP I BFSET
               /
6705  2571  WRD0,2571
6706  2572  WRD1,2572
6707  2573  WRD2,2573
6710  2574  WRD3,2574
6711  2575  WRD4,2575
6712  2577  WRD6,2577
6713  0004  P4,4
6714  7775  M3,-3
6715  7752  IBMWC,7752
6716  7753  IBMCA,7753
6717  1000  P1000,1000
6720  6700  M1100,-1100
               /
               /
               /ISOR(B,NB,IO)
               /I.D.SORTER---SHUFFLE CORE BUFFER 1, WORDS 64-127
               /TO OR FROM LAST 8 WORDS, DISC BLOCKS B,B+8,...
```

```
                /NB BLOCKS. IO NONZERO =CORE TO DISC;
                /IO=0 FOR DISC TO CORE.
                /
                /X CLER(1);X ISOR(15,8);X SAV(1,1);X PUTN(8,0,S,64)
                /
                / X PULL(1,1);X ISOR(15,8,1)
                /
                BCOUNT=ARG10
                BRANCH=ARG9
                CTR=ARG6
                WRD=ARG7
                BLOCK=ARG8
                /
6721  0000      ISOR,0
6722  1054        TAD ARG5
6723  7640        SZA CLA
6724  1370        TAD IDRDX
6725  1371        TAD IDWRTX
6726  3060        DCA BRANCH
6727  1052        TAD ARG3
6730  3057        DCA BLOCK
6731  1053        TAD ARG4
6732  7041        CIA
6733  3061        DCA BCOUNT
6734  1367        TAD P2100
6735  3056        DCA WRD
                  /
6736  1365      LOOP1,TAD M10   /GENERAL SETUP FOR BLOCK.
6737  3055        DCA CTR       /8 WORDS EACH BLOCK.
6740  1366        TAD P171
6741  3053        DCA ARG4
6742  1057        TAD BLOCK
6743  3052        DCA ARG3
6744  5460      IDLOOP,JMP I BRANCH
6745  2056        ISZ WRD
6746  2053        ISZ ARG4
6747  2057        ISZ BLOCK   /JMP 8 BLOCKS AT A TIME.
6750  2055        ISZ CTR
6751  5344        JMP IDLOOP
6752  2061        ISZ BCOUNT
6753  5336        JMP LOOP1
6754  5721        JMP I ISOR
                  /
6755  1456      IDREAD,TAD I WRD
6756  3051        DCA ARG2
6757  4520        JMS I PUTWRX
6760  5345        JMP IDLOOP+1
                  /
6761  4541      IDWRIT,JMS I GETWRX
6762  1051        TAD ARG2
6763  3456        DCA I WRD
6764  5345        JMP IDLOOP+1
                  /
6765  7770      M10,-10
6766  0171      P171,171
6767  2100      P2100,2100
6770  7774      IDRDX,IDREAD-IDWRIT
6771  6761      IDWRTX,IDWRIT
                  /
                  /
```

```
                *KB1+77
0237    6721      ISOR
                *FNKB1+77
0743    3012      3012    /ISOR
```

10 Oct '74
File 3, System Tape

No longer use DOFITX

FIND
FSIG

```
.PALP
*OUT-S:IND
*
*IN-S:CON0,S:XCON,S:IND,S:LOYD
*
*
*
*
*OPT-T

AHI     6544
ALO     6545

                /CON0
                XLIST
                PAUSE/
                /
                /XCON
                FIELD 1
                XLIST
                PAUSE/S D1=FIND(XL,B,N,XP,CT,CD,MW); S D2=FSIG(0)
                /   1ST MOMENT PEAK FIND
                / XL=STARTING CHAN (<4096), B=EXTENDED BUFFER,
                /N=# OF CHANS SEARCHED, XP=PEAK CHANNEL
                /CT=CONTINUUM, CD=THRESHOLD, MW=MIN WIDTH
                /  RETURNS  D1=SIGMA<(CHAN. #)*(CHAN. CONTENTS)>
                /           D2=SIGMA<(CHAN. CONTENTS)>
                /
                /  USE AS FOLLOWS:
                / S PK=FIND(XL,B,N,XP,CT,CD,MW);I (PK) ERROR;
                / S PK=PK/FSIG(0)+XL
                / 10 OCT. 1974 MOD.
                /
                ARG7H=14
                ARG8H=15
                CTR=ARG5
                MXP=ARG6
                MCDHI=12
                MCDLO=13
                CHAN=14
                SUM1LO=15
                SUM1HI=16
                MINWID=17
                *KB1+70
0230    6042      IND
0231    6551      SIG
               *FNKB1+70
0734    0564       564
0735    1717       1717
               *6042
6042    0000    IND,0
6043    1054       TAD ARG5
6044    7041       CIA
6045    3054       DCA CTR      /CTR=-N
6046    1056       TAD ARG7
6047    7100       CLL
6050    7041       CIA
6051    3714       DCA I MCTLOP
6052    1014       TAD ARG7H
6053    7040       CMA
6054    7430       SZL
6055    7001       IAC
6056    3715       DCA I MCTHIP    /MCT = -CT
```

```
6057  1057      TAD ARG8
6060  7100      CLL
6061  7041      CIA
6062  3013      DCA MCDLO
6063  1015      TAD ARG8H
6064  7040      CMA
6065  7430      SZL
6066  7001      IAC
6067  3012      DCA MCDHI     /MCD = -CD
6070  1055      TAD ARG6
6071  7041      CIA
6072  1052      TAD ARG3
6073  3055      DCA MXP       /MXP = -(XP-XL)
6074  1052      TAD ARG3
6075  3014      DCA CHAN
6076  1060      TAD ARG9
6077  7041      CIA
6100  3017      DCA MINWID    /= -MIN. WIDTH
6101  5702      JMP I INDP2
6102  6400  INDP2,IND2
6103  1056  IND3,TAD EXTEND   /BACK FROM LOOP ON OTHER PAGE.
6104  7650      SNA CLA       /CLOSE OUT EXTENDED BUFFER BUSINESS.
6105  5642      JMP I IND
6106  1461      TAD I NOWRUN
6107  7500      SMA
6110  1313      TAD PP4000
6111  3461      DCA I NOWRUN
6112  5642      JMP I IND
6113  4000  PP4000,4000
6114  6546  MCTLOP,MCTLO
6115  6547  MCTHIP,MCTHI
            *6400
6400  3240  IND2,DCA L
6401  3252      DCA L1        /CLEAR L, L1
6402  4357      JMS XCLEAR    /CEAR SUM1, SUM2, XD.
            /END OF SETUP.
6403  1014  LOOP,TAD CHAN
6404  3052      DCA ARG3
6405  4750      JMS I BFSETX  /LLOYD'S EXTENDED BUFFER ROUTINE.
6406  7300      CLA CLL
6407  1410  TAD I 10  /CONTAINS ADDRESS OF LOW CHAN.
6410  3345      DCA ALO
6411  1345      TAD ALO
6412  1013      TAD MCDLO
6413  7200      CLA
6414  1411      TAD I 11  /CONTAINS ADDRESS OF HIGH CHAN.
6415  3344      DCA AHI
6416  1344      TAD AHI
6417  7430      SZL
6420  7001      IAC
6421  1012      TAD MCDHI
6422  7710      SPA CLA   /TEST  COUNTS<CD
6423  5310      JMP SMALLA
6424  7100      CLL
6425  1345      TAD ALO
6426  1346      TAD MCTLO
6427  3345      DCA ALO
6430  7430      SZL
6431  7001      IAC
6432  1344      TAD AHI
```

```
6433  1347      TAD MCTHI
6434  3344      DCA AHI        / A = COUNTS-CT
6435  3342      DCA CARRY      /CLEAR CARRY
6436  1345      TAD ALO
6437  7425      MQL!MUY
6440  0000   L,  0
6441  3343      DCA TEMP
6442  7501      MQA
6443  7100      CLL
6444  1015      TAD SUM1LO
6445  3015      DCA SUM1LO
6446  7430      SZL
6447  2342      ISZ CARRY
6450  1344      TAD AHI
6451  7425      MQL!MUY
6452  0000   L1, 0
6453  7440      SZA
6454  5333      JMP ERROR
6455  7501      MQA
6456  7100      CLL
6457  1016      TAD SUM1HI
6460  7430      SZL
6461  5333      JMP ERROR
6462  1343      TAD TEMP
6463  7430      SZL
6464  5333      JMP ERROR
6465  1342      TAD CARRY
6466  7430      SZL
6467  5333      JMP ERROR
6470  3016      DCA SUM1HI   /SUM1 = SUM1+A*L
6471  1345      TAD ALO
6472  1340      TAD SUM2LO
6473  3340      DCA SUM2LO
6474  7430      SZL
6475  7001      IAC
6476  7100      CLL
6477  1344      TAD AHI
6500  7430      SZL
6501  5333      JMP ERROR
6502  1341      TAD SUM2HI
6503  7430      SZL
6504  5333      JMP ERROR
6505  3341      DCA SUM2HI     /SUM2=SUM2+A
6506  2337      ISZ XD         /INCREMENT XD
6507  5315      JMP INCRMT
6510  1240   SMALLA, TAD L
6511  1055      TAD MXP
6512  7740      SMA SZA CLA
6513  5322      JMP WINDUP     /L>XP, END OF PEAK.
6514  4357      JMS XCLEAR     /HAVEN'T GOTTEN INTO REAL PEAK YET,
                               /SO CLEAR SUMS.
6515  2240   INCRMT, ISZ L
6516  2252      ISZ L1
6517  2014      ISZ CHAN
6520  2054      ISZ CTR
6521  5203      JMP LOOP
6522  1337   WINDUP, TAD XD
6523  1017      TAD MINWID
6524  7710      SPA CLA
6525  5333      JMP ERROR    /IF PEAK IS TOO NARROW.
```

```
6526  1016      TAD SUM1HI
6527  3050      DCA ARG1
6530  1015      TAD SUM1LO
6531  3051      DCA ARG2    /PASS BACK SIGMA<A*L>
6532  5736      JMP I INDP3
6533  7240    ERROR,CLA CMA
6534  3050        DCA ARG1    /NEG. ANSWER IF OVERFLOW OR PEAK
6535  5736        JMP I INDP3  /TOO NARROW.
6536  6103    INDP3,IND3
6537  0000    XD,0
6540  0000    SUM2LO,0
6541  0000    SUM2HI,0
6542  0000    CARRY,0
6543  0000    TEMP,0
6544  0000    AHI,0
6545  0000    ALO,0
6546  0000    MCTLO,0
6547  0000    MCTHI,0
6550  6256    BFSETX,BUFSET    /DON'T USE BUFSTX--IT'S SUBJECT TO CHANGE!
6551  0000    SIG,0
6552  1341        TAD SUM2HI   /MICKEY MOUSE!!
6553  3050        DCA ARG1     /THIS FUNCTION PASSES BACK SIGMA<A>
6554  1340        TAD SUM2LO   / DIVISION OF SUM1/SUM2
6555  3051        DCA ARG2     /MUST BE PERFORMED IN FOCAL.
6556  5751        JMP I SIG
6557  0000    XCLEAR,0
6560  7200        CLA
6561  3015        DCA SUM1LO
6562  3016        DCA SUM1HI
6563  3340        DCA SUM2LO
6564  3341        DCA SUM2HI
6565  3337        DCA XD
6566  5757        JMP I XCLEAR
                  PAUSE/
                  /
                  /EDIT
                  /X EDIT(C,B+100R,M);S D=FCHAN(C,B+100R);CHANGES AND
                  /RECALLS CHANNEL C,BUFFER B .IF R>0 IT IS
                  /USED AS RUN 0,AND FOR C<4095,EXCHANGE BETWEEN
                  /512 CHANNEL CORE AND DISC IS AUTOMATIC.
                  /
                  /X SAV(R,B);X PULL(R,B) SAVE AND RECALL RUN R IN
                  /BUFFER B.
                  /
                  /X ERAS(C0,B+100R,N) CLEAR N CHANNELS,FROM C0;
                  /
                  *BUFSTX
0111  6256        BUFSET
                  /
                  NOWRUN=ARG10      /POINTS TO RBUFR0 OR 1
                  ROTEMP=ARG9       /TEMPORARY STORAGE
                  CNTEMP=ARG8
                  EXTEND=ARG7
                  /
                  *RBUFR0
0107  0000        0
0110  0000        0
                  /
                  *6135
6135  0000        CHANEL,0
```

```
6136  4511    JMS I BUFSTX
6137  1410    TAD I 10
6140  3051    DCA ARG2
6141  1411    TAD I 11
6142  3050    DCA ARG1
6143  5735    JMP I CHANEL
              /
6144  0000  PRESET,0
6145  1060    TAD RQTEMP      /RECORD REQUESTED
6146  7104    CLL RAL
6147  7006    RTL             /8 BLOCKS PER RECORD
6150  4512    JMS I DCSETX    /SET DISC ADDRESSES
6151  1047    TAD M2000
6152  3024    DCA DDWCNT
6153  1045    TAD BUFRDX
6154  3023    DCA DDCORE
6155  5744    JMP I PRESET
              /
6156  0000  SAVE,0
6157  4511    JMS I BUFSTX
6160  4362    JMS SAVIT
6161  5756    JMP I SAVE
              /
6162  0000  SAVIT,0
6163  4344    JMS PRESET
6164  7126    STL RTL
6165  4420    JMS I DISCX
6166  5364    JMP .-2         /DISC ERROR
6167  1461    TAD I NOWRUN
6170  0373    AND PP777
6171  3461    DCA I NOWRUN    /UPDATING SAVED.
6172  5762    JMP I SAVIT
              /
6173  0777  PP777,777
              /
              *6200
6200  0000  PULL,0
6201  4511    JMS I BUFSTX
6202  4204    JMS GETIT
6203  5600    JMP I PULL
              /
6204  0000  GETIT,0
6205  1060    TAD RQTEMP
6206  3461    DCA I NOWRUN    /CURRENT RECORD IN CORE
6207  4771    JMS I PRSETX
6210  4420    JMS I DISCX
6211  5207    JMP .-2
6212  5604    JMP I GETIT
              /
6213  0000  EDITOR,0
6214  4511    JMS I BUFSTX
6215  1054    TAD ARG5
6216  3410    DCA I 10
6217  6201    CDF
6220  1634    TAD I P45       /GET UPPER 12 BITS
6221  6211    CDF 10
6222  3411    DCA I 11
6223  1056    TAD EXTEND
6224  7650    SNA CLA
6225  5613    JMP I EDITOR    /ONLY PROTECT EXTENDED FUNCTIONS.
```

```
6226  1461      TAD I NOWRUN
6227  7500      SMA
6230  1233      TAD P4000
6231  3461      DCA I NOWRUN   /RECORD BUFFER UPDATED
6232  5613      JMP I EDITOR
                /
6233  4000    P4000,4000
6234  0045    P45,45
                /
6235  0000    ERASER,0
6236  1054      TAD ARG5
6237  7450      SNA
6240  1046      TAD P1000
6241  7041      CIA
6242  3012      DCA 12
6243  3054      DCA ARG5
6244  1052      TAD ARG3
6245  3067      DCA LOTEMP
6246  4213    NEXT,JMS EDITOR
6247  2067      ISZ LOTEMP
6250  1067      TAD LOTEMP
6251  3052      DCA ARG3
6252  2012      ISZ 12
6253  5246      JMP NEXT
6254  5635      JMP I ERASER
                /
6255  2000    P2000,2000
                /
6256  0000    BUFSET,0
6257  1373      TAD P10
6260  3026      DCA DSFELD
6261  1052      TAD ARG3
6262  0367      AND P777
6263  3057      DCA CNTEMP     /CHANNEL NO.
6264  1057      TAD CNTEMP
6265  3060      DCA RQTEMP     /RECORD NO. IF NON-EXTENDED.
6266  4537      JMS I BWRITX   /FORCE  CORE  TO DISC
6267  7240      CLA CMA
6270  3116      DCA BLOKIN     /FORCE DISC TO CORE LATER ON.
6271  1053      TAD ARG4
6272  7427      MQL!DVI
6273  0144      144            /DIVIDE BY 100 FOR EXTENDED ADDRESS.
6274  7701      CLA!MQA
6275  3056      DCA EXTEND     /FOR EXTENDED FUNCTINS.
6276  1053      TAD ARG4
6277  0366      AND P1         /SELECT BUFFER 1 OR 0
6300  7650      SNA CLA
6301  1255      TAD P2000
6302  1255      TAD P2000
6303  3045      DCA BUFRDX
6304  1053      TAD ARG4
6305  0366      AND P1
6306  1365      TAD RBUFRX
6307  3061      DCA NOWRUN
6310  1461      TAD I NOWRUN
6311  0367      AND P777
6312  3370      DCA NOWTEM
6313  1052      TAD ARG3
6314  7104      CLL RAL
6315  7006      RTL
```

```
6316  3052      DCA ARG3
6317  1056      TAD EXTEND
6320  7650      SNA CLA
6321  5337      JMP TESDIS      /NOT EXTENDED, STORE ANY UPDATING.
6322  1052      TAD ARG3
6323  7004      RAL
6324  0364      AND P7
6325  1056      TAD EXTEND
6326  3060      DCA RQTEMP      /RECORD NO. IF EXTENDED.
6327  1370      TAD NOWTEM
6330  7041      CIA
6331  1060      TAD RQTEMP
6332  7650      SNA CLA
6333  5340      JMP EXIT        /REQUIRED RECORD IN CORE
6334  4350      JMS OLDSAV
6335  4204      JMS GETIT
6336  5340      JMP EXIT
                /
6337  4350  TESDIS, JMS OLDSAV
6340  7240  EXIT, CLA CMA
6341  1057      TAD CNTEMP
6342  1045      TAD BUFRDX
6343  3010      DCA 10
6344  1010      TAD 10
6345  1046      TAD P1000
6346  3011      DCA 11
6347  5656      JMP I BUFSET
                /
6350  0000  OLDSAV, 0
6351  1461      TAD I NOWRUN
6352  7700      SMA CLA
6353  5750      JMP I OLDSAV    /NO UPDATE, NO SAVE.
6354  1060      TAD RQTEMP
6355  3372      DCA RQSAV
6356  1370      TAD NOWTEM
6357  3060      DCA RQTEMP
6360  4774      JMS I SAVITX
6361  1372      TAD RQSAV
6362  3060      DCA RQTEMP      /RESTORE DEMAND ADDRESS
6363  5750       JMP I OLDSAV
                /
6364  0007  P7, 7
                /
6365  0107  RBUFRX, RBUFR0
6366  0001  P1, 1
6367  0777  P777, 777
6370  0000  NOWTEM, 0
6371  6144  PRSETX, PRESET
6372  0000  RQSAV, 0
6373  0010  P10, 10
6374  6162  SAVITX, SAVIT
```

```
.PALP
*CUT-S:IRF
*
*IN-S:CON2,S:IR1,S:IR2,S:PATC,S:MEMF
*
*
*
*
*
*OPT-T

ADDATA 6460
ADDSKY 6545

                /CON0
                XLIST
                PAUSE/I.R. SPECTROMETER-FILE 2, ASCII TAPE,6.26.74
                /X INIT(GRATING STEPS, FILTER #, LAMP ON) E,SPEED)
                /
                /X IRF(G, S, C, M, D, A) E)
                /G=GAIN (0-7)
                /S=STAR FIRST
                /C= # CHOP CYCLES
                /M= # MUX CYCLES
                /D=MIRROR DELAY
                /A= # AMPS IN SYSTEM
                /E=ERROR CONDITION, >0 = # RETRYS BEFORE PRINTING ERROR MSG
                /       <0 = DECIMAL ASCII CHAR TO BE PRINTED.
                /       (-135 = BELL, -174 = ".")
                /
                INC=ISZ
                MUX=6350
                OKSKP=1
                DUNSKP=2
                DATARD=3
                FUNRD=4
                FLOAD=5
                DATLOD=7
                RELESE=6
                GRAB=3
                READ=10
                WRITE=20
                UNIT3=300
                DEV1=4000
                DEV5=5000
                PULSE1=4320     /DEV1,UNIT3,WRITE
                PULSE2=2320     /DEV2,UNIT3,WRITE
                LEVEL1=6320     /DEV3,UNIT3,WRITE
                LEVEL2=1320     /DEV4,UNIT3,WRITE
                J5=200
                J2=SA2000
                SYNC=6336
                SKY=6337
                STAR=6347
                MIRROR=ARG4
                CHOPNM=ARG5
                DLYNUM=ARG7
                FUNCP=ARG10
                MCOUNT=ARG9
                CNTEST=ARG2
                /
                *FNKB1+67
07 33   2234   2234     /INIT
```

File #2

OVERLAY #8
IRF & MEMF
modified XINIT

1.17.75

No longer works. Must put in an argument (eg. 0) to fill the space.

```
0734  0626  0626      /IRF
0735  1177  1177      /MEMW
              *KB1+67
0227  6044  INIT      /INITIALIZE I.R. MULTIPLEXER
0230  6147  IRF       /RUN I.R. MULTIPLEXER
0231  6604  MEMW      /WRITE N WORDS
              /
              *NORMAL
0075  7232  7232
              /
              *6044
              /
6044  0000  INIT,     0
              /
              /GET BOTH LEVEL 1'S
6045  7326  GTFILT,   SA2       /MIDDLE DIGIT
6046  0053            AND ARG4
6047  7640            SZA CLA
6050  7332            J2
6051  3321            DCA TEMP
              /
6052  7240  GTLAMP,   SAM1
6053  1054            TAD ARG5
6054  7700            SMA CLA
6055  1700            TAD I IJ5         /J5
6056  1321            TAD TEMP
6057  4767            JMS I IXMT
6060  6320            LEVEL1
6061  4302            JMS WAIT          /FOR LAMP
              /
              /GET BOTH LEVEL 2'S
6062  7201            SA1       /RIGHT DIGIT
6063  0053            AND ARG4
6064  7640            SZA CLA
6065  1700            TAD I IJ5         /J5
6066  3321            DCA TEMP
              /
6067  7307            SA4       /LEFT DIGIT
6070  0053            AND ARG4
6071  7640            SZA CLA
6072  7332            J2
6073  1321            TAD TEMP
6074  4767            JMS I IXMT
6075  1320            LEVEL2
6076  4701            JMS I ICKERR
6077  5644            JMP I INIT        /BACK TO FOCAL
6100  6300  IJ5,      JJ5
6101  6122  ICKERR,   CHKERR
              /
              /DELAY= AC * 25 MICROSEC
6102  0000  WAIT,     0
6103  7040            CMA
6104  3321            DCA TEMP
6105  4311  WAIT1,    JMS WAIT2
6106  2321            ISZ TEMP
6107  5305            JMP WAIT1
6110  5702            JMP I WAIT
              /
              /FIXED 20 MICROSEC DELAY
6111  0000  WAIT2,    0
```

```
6112  7200            CLA
6113  1320            TAD MM4
6114  3031            DCA TEMPS0
6115  2031            ISZ TEMPS0
6116  5315            JMP .-1
6117  5711            JMP I WAIT2
6120  7777  MM4,       -1
6121  0000  TEMP,      0
                /
                /
6122  0000  CHKERR,   0
6123  7200            CLA
6124  1345            TAD P2000       /TRY 20 TIMES
6125  7041            CIA
6126  3346            DCA COUNT       /SKIP ON TRANS DONE FLAG
6127  6352  CONT,     MUX DUNSKP
6130  5341            JMP RETRY
6131  6351            MUX OKSKP
6132  5343            JMP MUXERR      /READS FUNC INTO AC.
6133  6354            MUX FUNRD
6134  7041            CIA             /FUNC SENT
6135  1777            TAD LEVEL2
6136  7640            SZA CLA
6137  5343            JMP MUXERR
6140  5722            JMP I CHKERR
                /
6141  2346  RETRY,    ISZ COUNT
6142  5327            JMP CONT
6143  4527  MUXERR,   JMS I TYPEX
6144  5722            JMP I CHKERR
                /
6145  0020  P2000,    20
6146  0000  COUNT,    0
                /
                /GET GAIN FROM ARG3 (0-7)
6147  0000  IRF,      0
6150  6353            MUX GRAB
6151  7300  GTGAIN,   CLA CLL
6152  1052            TAD ARG3
6153  0372            AND P7000
6154  7012            RTR
6155  7012            RTR
6156  3373            DCA GAIN
                /
                /GET # CHOP CYCLES FROM ARG5
6157  1054            TAD ARG5
6160  7041            CIA
6161  3054            DCA CHOPNM
                /
                /GET # MUX CYCLES FROM ARG6(20 HZ)
6162  1055  GTMUX,    TAD ARG6
6163  7041            CIA
6164  3371            DCA MUXNUM
                /
6165  5770            JMP I IGTMIR
6166  5747  EXIT,     JMP I IRF       /EXIT TO FOCAL
                /
6167  6340  IXMT,     XMT
6170  6200  IGTMIR,   GTMIR
6171  0000  MUXNUM,   0
```

```
6172  0007   P7000,  7
6173  0000   GAIN,   0
6177  1320

          PAUSE*6200
          /I.R. SPECTROMETER, PART 2
          /
          /GET STAR FIRST--SKY FIRST
6200  1053  GTMIR,  TAD ARG4
6201  3053          DCA MIRROR
          /
          /GET MIRROR DELAY
6202  1056          TAD ARG7
6203  3273          DCA IDLYNM
          /INITIALIZE AMPS
6204  6342          6342    /RUN CHOPPER FROM COMP.
6205  7201          CLA IAC /SET AC TO -1
6206  0053          AND MIRROR      /STAR OR SKY?
6207  3053          DCA MIRROR
6210  1053          TAD MIRROR
6211  7640          SZA CLA
6212  4311          JMS SETSTR
6213  4306          JMS SETSKY      /SET SKY
6214  4676  RUN,    JMS I IMPSET    /SET TO FIRST AMP
6215  1315          TAD STRLOW      /SET UP BUFFER POINTERS
6216  3317          DCA LOWPTR
6217  1316          TAD STRHIH
6220  3320          DCA HIHPTR
6221  1300  NEXTCH, TAD JJ5
6222  4340          JMS XMT
6223  4320          PULSE1  /STARTS ADC ON J5
6224  4702          JMS I IMPADV    /AMP ADVANCE
6225  1703          TAD I ICTRLW
6226  4340          JMS XMT
6227  5330          5330    /READ ADC ON J5, SEND AMP# ON J15
6230  7201          CLA IAC /SET AC TO 1
6231  4674          JMS I IWAIT     /WAIT FOR DATA TRANSMISSION
6232  7300          CLA CLL /THE FOLLOWING DEPOSITS DATA
6233  6353          MUX DATARD      /READS DATA INTO AC
6234  7040          CMA
6235  7100          CLL
6236  1717          TAD I LOWPTR
6237  3717          DCA I LOWPTR
6240  7430          SZL
6241  2720          ISZ I HIHPTR
6242  7000          NOP
6243  1317          TAD LOWPTR
6244  1304          TAD P10
6245  3317          DCA LOWPTR
6246  1320          TAD HIHPTR
6247  1304          TAD P10
6250  3320          DCA HIHPTR
6251  2337          ISZ NUMAMP      /LAST AMP?
6252  5221          JMP NEXTCH      /NO
6253  6336          SYNC    /YES.   OSCILLOSCOPE SYNC.
6254  2672          ISZ I IMXNUM    /CHANGE MIRROR POS.?
6255  5214          JMP RUN         /NO. RESET BUFFER POINTERS AND AMP
6256  4675          JMS I IDDATA    /ADD THE DATA
6257  1055          TAD ARG6        /MUX CYCLES
6260  7041          CIA
6261  3672          DCA I IMXNUM
```

```
6262  1273            TAD IDLYNM      /WAIT FOR THE MIRROR
6263  4674            JMS I IWAIT
6264  2054            ISZ CHOPNM      /END OF RUN?
6265  5214            JMP RUN         /NO. GO AGAIN
6266  6341            6341            /YES. FREE THE CHOPPER
6267  6356            MUX RELESE
6270  4705            JMS I IMKBAR    /REPEAT THE DATA
6271  5701            JMP I XIRF      /EXIT TO FOCAL
                /
6272  6171  IMXNUM,  MUXNUM
6273  0000  IDLYNM,  0
6274  6102  IWAIT,   WAIT
6275  6460  IDDATA,  ADDATA
6276  6321  IMPSET,  AMPSET
6277  4000  P4000,   4000
6300  0200  JJ5,     J5
6301  6166  XIRF,    EXIT
6302  6353  IMPADV,  AMPADV
6303  6336  ICTRLW,  CTRLWD
6304  0004  P10,     4
6305  6400  IMKBAR,  MAKBAR
6306  0000  SETSKY,  0
6307  6337            SKY     /6337
6310  5706            JMP I SETSKY
                /
6311  0000  SETSTR,  0
6312  6347            STAR    /6347
6313  2311            ISZ SETSTR
6314  5711            JMP I SETSTR
                /
6315  2000  STRLOW,  2000
6316  3000  STRHIH,  3000
6317  0000  LOWPTR,  0
6320  0000  HIHPTR,  0
                /
                /
6321  0000  AMPSET,  0
6322  7200            CLA
6323  1735            TAD I IGAIN     /GET GAIN
6324  3336            DCA CTRLWD
6325  1057            TAD ARG8
6326  7041            CIA
6327  3337            DCA NUMAMP      /RESET AMP COUNTER
6330  1336            TAD CTRLWD
6331  4340            JMS XMT
6332  5320            5320    /WRITE,UNIT3,DEV5
6333  7200            CLA
6334  5721            JMP I AMPSET
                /
6335  6173  IGAIN,   GAIN
6336  0000  CTRLWD,  0
6337  0000  NUMAMP,  0
                /
6340  0000  XMT,     0
6341  7000            NOP     /DELAY
6342  3352            DCA XDATA       /SAVES DATA
6343  1740            TAD I XMT       /GETS FUNC
6344  6355            MUX FLOAD       /LOADS FUNC
6345  7200            CLA
6346  1352            TAD XDATA
```

```
                        MUX DATLOD      /LOADS DATA AND SENDS
6347  6357              ISZ XMT
6350  2340              JMP I XMT
6351  5740
                  /
6352  0000    XDATA,    0
                  /
6353  0000    AMPADV,   0
6354  7200              CLA
6355  1336              TAD CTRLWD
6356  0363              AND AMPMSK      /UP TO 63 DETECTORS
6357  7001              IAC
6360  1735    SETWRD,   TAD I IGAIN
6361  3336              DCA CTRLWD
6362  5753              JMP I AMPADV
                  /
6363  0077    AMPMSK,   77
                  /
                  *6400
6400  0000    MAKBAR,   0
6401  7200              CLA
6402  1245              TAD M2  /-2
6403  3247              DCA ALLEND
6404  1246              TAD M3  /-3.  MAKES BARS 4 CH. WIDE, FOR 60 CH. MAX.
6405  3250              DCA BARPTR
6406  1255              TAD PS3000
6407  3252              DCA DPTR1
6410  1057    AGAIN,    TAD ARG8
6411  7041              CIA
6412  3251              DCA ENDPTR
6413  1252              TAD DPTR1
6414  0257              AND SCREEN      /=7000
6415  1253              TAD PS1000
6416  3252              DCA DPTR1
6417  1252              TAD DPTR1
6420  1256              TAD P357        /357
6421  3254              DCA DPTR2
6422  1652    MORE,     TAD I DPTR1
6423  2252              ISZ DPTR1
6424  3652              DCA I DPTR1
6425  1652              TAD I DPTR1     /START IN CH. 240
6426  2254              ISZ DPTR2
6427  3654              DCA I DPTR2
6430  2250              ISZ BARPTR      /DONE?
6431  5222              JMP MORE        /NO
6432  1654              TAD I DPTR2
6433  2254              ISZ DPTR2
6434  3654              DCA I DPTR2
6435  1246              TAD M3  /-3
6436  3250              DCA BARPTR
6437  2252              ISZ DPTR1
6440  2251              ISZ ENDPTR      /DONE?
6441  5222              JMP MORE        /NO
6442  2247              ISZ ALLEND
6443  5210              JMP AGAIN
6444  5600              JMP I MAKBAR
                  /
6445  7776    M2,       -2
6446  7775    M3,       -3
6447  0000    ALLEND,   0
6450  0000    BARPTR,   0
```

```
6451  0000  ENDPTR, 0
6452  0000  DPTR1,  0
6453  1000  PS1000, 1000
6454  0000  DPTR2,  0
6455  3000  PS3000, 3000
6456  0357  P357,   357
6457  7000  SCREEN, 7000
            PAUSE/
            /
            /I.R. SPECTROMETER, PART2 CONTINUED
6460  0000  ADDATA, 0
6461  4774          JMS I XAMPST     /SET TO FIRST AMP
6462  1773          TAD I IMIROR
6463  3377          DCA SAVMIR
6464  2773          ISZ I IMIROR     /SWITCH THE MIRROR
6465  7201          CLA IAC
6466  0773          AND I IMIROR
6467  3773          DCA I IMIROR
6470  1773          TAD I IMIROR
6471  7640          SZA CLA
6472  4775          JMS I ISTSTR     /SWITCH TO STAR
6473  4776          JMS I ISTSKY     /SWITCH TO SKY
6474  1371          TAD PS2000
6475  3364          DCA LOPTR1
6476  1255          TAD PS3000
6477  3366          DCA HIPTR1
6500  1057          TAD ARG8         /# OF CHANNELS
6501  7041          CIA
6502  3370          DCA COUNTR
6503  1364  GOTAD,  TAD LOPTR1
6504  1371          TAD PS2000
6505  3365          DCA LOPTR2       /LOWER SUM BUFFER
6506  1366          TAD HIPTR1
6507  1371          TAD PS2000
6510  3367          DCA HIPTR2       /UPPER SUM BUFFER
6511  1377          TAD SAVMIR
6512  7640          SZA CLA
6513  4345          JMS ADDSKY
6514  4331          JMS ADDSTR
6515  7200          CLA
6516  3764          DCA I LOPTR1
6517  3766          DCA I HIPTR1     /CLEARS BUFFER 1
6520  1364          TAD LOPTR1
6521  1372          TAD PFOUR
6522  3364          DCA LOPTR1       /ADVANCE THE POINTER
6523  1366          TAD HIPTR1
6524  1372          TAD PFOUR
6525  3366          DCA HIPTR1       /ADVANCE THE POINTER
6526  2370          ISZ COUNTR       /DONE?
6527  5303          JMP GOTAD        /NO.
6530  5660          JMP I ADDATA     /YES.
            /
6531  0000  ADDSTR, 0
6532  7100          CLL
6533  1764          TAD I LOPTR1
6534  1765          TAD I LOPTR2
6535  3765          DCA I LOPTR2     /ADDS TO EXISTING DATA
6536  7430          SZL
6537  2767          ISZ I HIPTR2     /CARRY
6540  7000          NOP
```

```
6541  1766            TAD I HIPTR1
6542  1767            TAD I HIPTR2
6543  3767            DCA I HIPTR2     /ADDS TO EXISTING DATA
6544  5731            JMP I ADDSTR
                      /
6545  0000  ADDSKY,    0
6546  7100            CLL
6547  1764            TAD I LOPTR1
6550  7041            CIA
6551  1765            TAD I LOPTR2
6552  3765            DCA I LOPTR2     /SUBTRACTS FROM EXISTING DATA
6553  7430            SZL
6554  2767            ISZ I HIPTR2     /CARRY
6555  7000            NOP
6556  1766            TAD I HIPTR1
6557  7040            CMA
6560  1767            TAD I HIPTR2
6561  3767            DCA I HIPTR2     /SUBTRACTS FROM EXISTING DATA
6562  2345            ISZ ADDSKY
6563  5745            JMP I ADDSKY
                      /
6564  0000  LOPTR1,    0
6565  0000  LOPTR2,    0
6566  0000  HIPTR1,    0
6567  0000  HIPTR2,    0
6570  0000  COUNTR,    0
6571  2000  PS2000,    2000
6572  0004  PFOUR,     4
6573  0053  IMIROR,    MIRROR
6574  6321  XAMPST,    AMPSET
6575  6311  ISTSTR,    SETSTR
6576  6306  ISTSKY,    SETSKY
6577  0000  SAVMIR,    0
                      PAUSE*6600
                      /
                      /MEMF
                      /X MEMW(W,N,OR)  WRITE  N WORDS
                      /STARTING AT WORD W
6600  5226  FUNCWL,    5226          /FUNCWH=5252
6601  5232  FUNCR,     5232
6602  5232  MEMCPU,    5232
6603  3232  NORM0,     3232
                      /
6604  0000  MEMW,      0
6605  4301            JMS MSETUP
6606  4234            JMS PASWOR
6607  1010            TAD 10
6610  1046            TAD P1000
6611  3011            DCA 11           /SET AUTO INDEX REGISTER
6612  1271            TAD WRITIT
6613  3225            DCA WRITER
6614  1054            TAD ARG5
6615  7650            SNA CLA
6616  5221            JMP LOW
6617  2225            ISZ WRITER       /HI PART
6620  1270            TAD P24
6621  1200  LOW,      TAD FUNCWL
6622  7040            CMA
6623  6453            FUNLOD
6624  7200  XWRITE,   CLA
```

```
6625  1410  WRITER, TAD I 10 /OR TAD I 11 FOR HI PART
6626  7040        CMA
6627  6454      MCSTEP
6630  2060      ISZ MCOUNT
6631  5224            JMP XWRITE
6632  4243      JMS MRESET
6633  5604      JMP I MEMW
                /
                /
6634  0000  PASWOR, 0
6635  2265      ISZ DCOUNT
6636  7410      SKP
6637  5634      JMP I PASWOR
6640  6454      MCSTEP
6641  5235      JMP .-4
6642  5634      JMP I PASWOR
                /
6643  0000  MRESET, 0
6644  7330      CLA STL RAR
6645  1203      TAD NORM0      /NORMAL SWEEP MODE TO END CYCLE
6646  7040            CMA
6647  6453      FUNLOD
6650  6452      SYNSKP
6651  5250      JMP .-1
6652  7200      CLA
6653  1051      TAD CNTEST
6654  7650      SNA CLA
6655  6455      SCOUNT         /REENABLE COUNTING
6656  1075      TAD NORMAL
6657  7040            CMA
6660  6453      FUNLOD         /SELECTED SWEEP MODE
6661  7300      CLA CLL
6662  3050      DCA ARG1
6663  5643      JMP I MRESET
                /
6664  0777  P777, 777
6665  0000  DCOUNT, 0
6666  0002  P2, 2
6667  2000  XP2000, 2000
6670  0024  P24, 24
6671  1410  WRITIT, TAD I 10
                /
6672  0000  XSYNC, 0
6673  6452      SYNSKP
6674  5273      JMP .-1
6675  6452      SYNSKP
6676  7410      SKP
6677  5275      JMP .-2        /WAIT TILL 50 USEC. PAST
6700  5672            JMP I XSYNC
                /
6701  0000  MSETUP, 0
6702  6002      IOF    /PROGRAM IS ENTERED WITH INT. ON
6703  1053      TAD ARG4
6704  0264      AND P777
6705  7450      SNA
6706  1046      TAD P1000
6707  7041      CIA
6710  3060      DCA MCOUNT
6711  1267            TAD XP2000
6712  3045      DCA BUFRDX     /ALWAYS USE BUFFER 1
```

```
6713  7240      CLA CMA
6714  1045      TAD BUFRDX
6715  3010      DCA 10
6716  1052      TAD ARG3
6717  7040      CMA
6720  3265      DCA DCOUNT
                      JMS XSYNC
6721  4272      CONSKP
6722  6462      IAC
6723  7001      DCA CNTEST      /1 FOR NOT COUNTING
6724  3051      MSTOP           /DON'T COUNT WHILE READING
6725  6456      TAD MEMCPU      /INHIBIT 1 USEC CLOCK
6726  1202            CMA
6727  7040      FUNLOD
6730  6453      CLA CLL
6731  7300      JMP I MSETUP
6732  5701
```

```
*1
*OPT-
.PALP
*OUT-S:LOGB
*
*IN-S:CONØ,S:LOGB
*
*
*OPT-T

ARG1    ØØ5Ø

                /CONØ
                XLIST
                PAUSE/
                /X LOGB(B,L,U)
                /CONVERTS CHANNELS L THRU U OF BUFF. B
                /TO LOG FORM. RETURNS 1ØØØØ*LOG1Ø
                /NEG. #S,Ø ARE SET TO Ø. TRUNCATION ERRORS ARE -5 < ERROR.
                NMI=7411
                SCA=7441
                LOW=ARG6
                HIGH=ARG7
                CHAN=ARG8
                FOUR=ARG9
                COEFF=ARG1Ø
                *KB1+67
 0227   6200      LOGB
                *FNKB1+67
 Ø733   1272      1272
                *6200
 6200   ØØØØ    LOGB,Ø
 6201   1Ø52      TAD ARG3      /ARG3=BUFFER
 6202   7650      SNA CLA
 6203   1363      TAD P2ØØØ
 6204   1363      TAD P2ØØØ
 6205   1Ø53      TAD ARG4      /ARG4=LOW CHAN
 6206   3Ø55      DCA LOW
 6207   1Ø55      TAD LOW
 6210   1364      TAD P1ØØØ
 6211   3Ø56      DCA HIGH
 6212   1Ø54      TAD ARG5      /ARG5=HIGH CHAN
 6213   7550      SPA SNA
 6214   1362      TAD P511
 6215   7Ø4Ø      CMA           /   -(HIGH CHAN+1)
 6216   1Ø53      TAD ARG4
 6217   3Ø57      DCA CHAN
 6220   1455    CHLOOP,TAD I LOW
 6221   7100      CLL
 6222   7450      SNA
 6223   7120      STL
 6224   7421      MQL
 6225   1456      TAD I HIGH
 6226   7540      SMA SZA
 6227   5240      JMP POSTIV
 6230   7440      SZA
 6231   5234      JMP .+3
 6232   7420      SNL
 6233   5240      JMP POSTIV
 6234   7200      CLA
 6235   3456      DCA I HIGH
 6236   3455      DCA I LOW
```

```
6237  5351     JMP WINDUP
6240  7411  POSTIV,NMI
6241  3265     DCA FRAC
6242  7441     SCA
6243  7041     CIA
6244  1365     TAD P22
6245  3366     DCA FRONT        /CHARACTERISTIC FOR LOG, BASE 2.
6246  1265     TAD FRAC
6247  7413     SHL
6250  0001     1
6251  3265     DCA FRAC
6252  1265     TAD FRAC
6253  3367     DCA SUM
6254  1372     TAD COEFF1
6255  3061     DCA COEFF
6256  1370     TAD PM4
6257  3060     DCA FOUR
6260  1265     TAD FRAC
6261  3272     DCA NFRAC
6262  3371     DCA SWITCH
6263  1272  SMLOOP,TAD NFRAC
6264  7425     MQL!MUY
6265  0000   FRAC,0
6266  3272     DCA NFRAC
6267  2061     ISZ COEFF
6270  1461     TAD I COEFF
6271  7425     MQL!MUY
6272  0000   NFRAC,0
6273  2371     ISZ SWITCH    /SWITCH WAS 0 FOR -, -1 FOR +
6274  7041     CIA
6275  1367     TAD SUM
6276  3367     DCA SUM
6277  1371     TAD SWITCH
6300  7041     CIA
6301  3371     DCA SWITCH
6302  2060     ISZ FOUR
6303  5263     JMP SMLOOP
6304  1367     TAD SUM      /SUM=MANTISSA*4096*LN<2>/A1
6305  7425     MQL!MUY
           DECIMAL
6306  3362     1778      /=A1*4096/2.3
6307  3367     DCA SUM
6310  1366     TAD FRONT
6311  7425     MQL!MUY
6312  2321   LOG2,1233     /LOG10<2>*4096
6313  3456     DCA I HIGH
6314  7300     CLL CLA
6315  7501     MQA
6316  1367     TAD SUM
6317  7421     MQL
6320  7430     SZL
6321  7001     IAC
6322  1456     TAD I HIGH   /WE NOW HAVE 4096*LOG10
6323  7413     SHL
6324  0007     7
6325  3456     DCA I HIGH
6326  7405     MUY
6327  4704     2500              /CONVERTING TO 10000*LOG10
6330  3455     DCA I LOW
6331  1456     TAD I HIGH
```

```
6332  7425     MQL!MUY
6333  4704     2500
6334  3456     DCA I HIGH
6335  7501     MQA
6336  7100     CLL
6337  1455     TAD I LOW
6340  7421     MQL
6341  7430     SZL
6342  7001     IAC
6343  1456     TAD I HIGH
6344  7417     LSR
6345  0005     5
6346  3456     DCA I HIGH
6347  7501     MQA
6350  3455     DCA I LOW
6351  2056  WINDUP,ISZ HIGH
6352  2055     ISZ LOW
6353  2057     ISZ CHAN
6354  5220     JMP CHLOOP
6355  5600     JMP I LOGB
6356  3740  A2,2016
6357  2242  A3,1186
6360  1056  A4,558
6361  0204  A5,132
6362  0777  P511,511
            OCTAL
6363  2000  P2000,2000
6364  1000  P1000,1000
6365  0026  P22,26
6366  0000  FRONT,0
6367  0000  SUM,0
6370  7774  PM4,7774
6371  0000  SWITCH,0
6372  6355  COEFF1,A2-1
```

•

```
 PALP
*OUT-S:FILT
*
*IN-S:CONØ,S:FILT
*
*
*OPT-T

ARG1    0050

                /CONØ
                XLIST
                PAUSE/X FILT(M)
                /DIGITAL FILTER--APPLIES MOVING AVERAGE ACROSS 2*M-1
                /CHANNELS. SGL. PREC. DATA IN BUFF. 1, RESULT IN
                /BUFF. Ø LOW, COEFFS. IN BUFF. Ø HIGH.
                /
                CTR1=ARG10
                CTR2=ARG9
                CHAN1=ARG8
                CHAN2=ARG7
                NEG=ARG6
                LOW1=ARG5
                LOW2=ARG4
                *KB1+69
 0231   6600     FILT
                *FNKB1+69
 0735   2564     2564
                *6600
 6600   0000   FILT,Ø
 6601   1052     TAD ARG3
 6602   7041     CIA
 6603   7001     IAC
 6604   3061     DCA CTR1
 6605   1307     TAD P4000
 6606   3057     DCA CHAN1
 6607   1310     TAD P5000
 6610   3056     DCA CHAN2
 6611   1456   MOVEM,TAD I CHAN2  /MOVE M-1 CHANS FROM B.Ø HI TO B.Ø LO
 6612   3457     DCA I CHAN1
 6613   2057     ISZ CHAN1
 6614   2056     ISZ CHAN2
 6615   2061     ISZ CTR1
 6616   5211     JMP MOVEM
 6617   1312     TAD PM1000
 6620   3060     DCA CTR2
 6621   1311     TAD P2000
 6622   3054     DCA LOW1
 6623   1052     TAD ARG3
 6624   1052     TAD ARG3
 6625   7041     CIA
 6626   7001     IAC
 6627   3315     DCA TWOM1
 6630   1315     TAD TWOM1
 6631   1306     TAD P6000
 6632   3057     DCA CHAN1   /CHAN1=6000-(2*M-1)
 6633   3314   CHLOOP,DCA SUM
 6634   1315     TAD TWOM1
 6635   3061     DCA CTR1    /CTR1=-(2*M-1)
 6636   1054     TAD LOW1
```

```
6637  3053     DCA LOW2
6640  1057     TAD CHAN1
6641  3056     DCA CHAN2
6642  1313  SMLOOP, TAD PM2
6643  3055     DCA NEG
6644  1456     TAD I CHAN2
6645  7500     SMA
6646  5251     JMP .+3
6647  7041     CIA
6650  2055     ISZ NEG
6651  3261     DCA MULT
6652  1453     TAD I LOW2
6653  7500     SMA
6654  5257     JMP .+3
6655  7041     CIA
6656  2055     ISZ NEG
6657  7000     NOP
6660  7425     MQL!MUY
6661  0000  MULT, 0
6662  2055     ISZ NEG
6663  5265     JMP .+2
6664  7041     CIA
6665  1314     TAD SUM
6666  3314     DCA SUM
6667  2053     ISZ LOW2
6670  2056     ISZ CHAN2
6671  2061     ISZ CTR1
6672  5242     JMP SMLOOP
6673  7240     STA
6674  1311     TAD P2000
6675  1052     TAD ARG3
6676  1054     TAD LOW1
6677  3261     DCA MULT
6700  1314     TAD SUM
6701  3661     DCA I MULT   /LOAD SUM INTO BUFF. 0 LOW
6702  2054     ISZ LOW1
6703  2060     ISZ CTR2
6704  5233     JMP CHLOOP
6705  5600     JMP I FILT
6706  6000  P6000, 6000
6707  4000  P4000, 4000
6710  5000  P5000, 5000
6711  2000  P2000, 2000
6712  7000  PM1000, 7000
6713  7776  PM2, 7776
6714  0000  SUM, 0
6715  0000  TWOM1, 0
```

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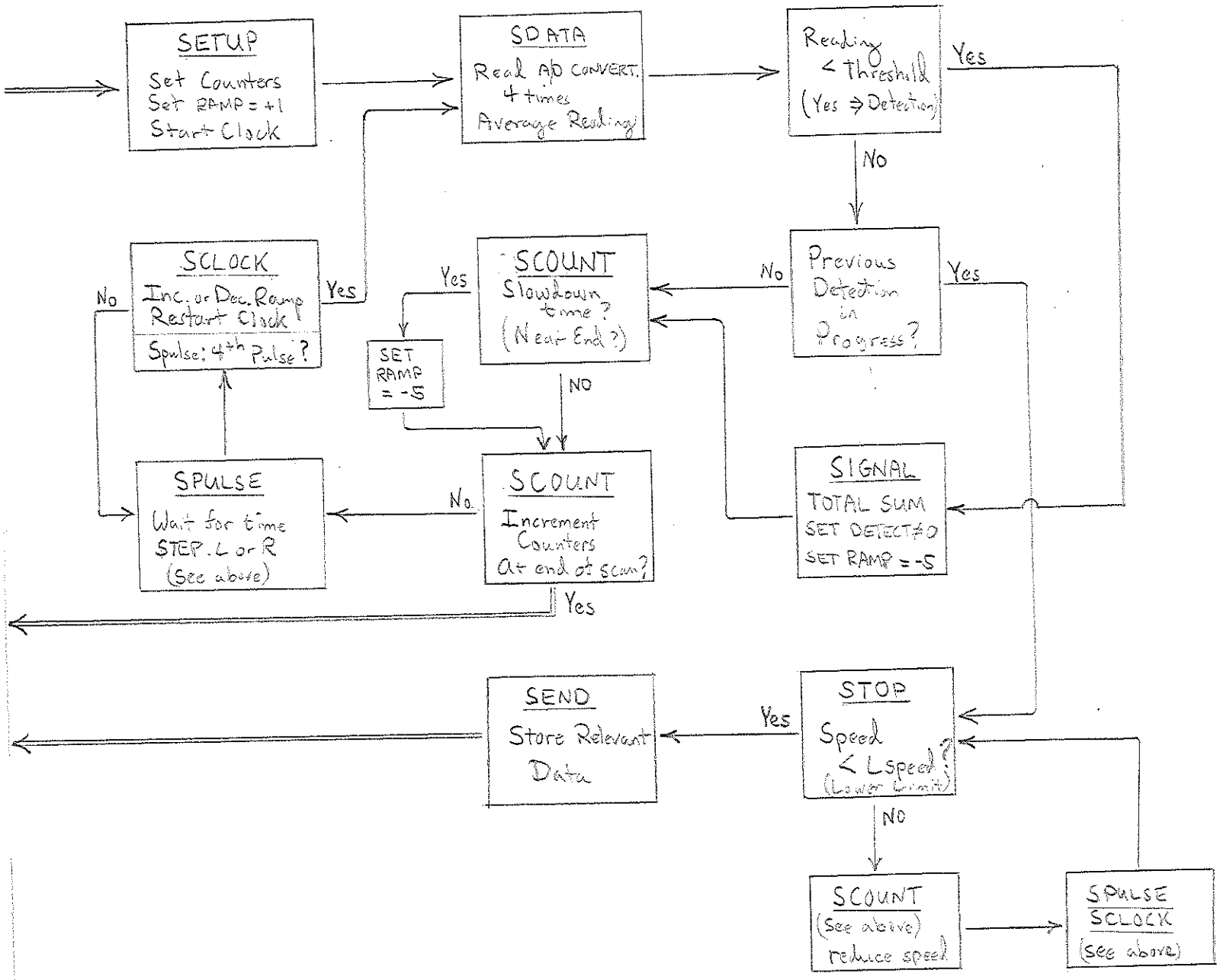
```
PALP
*OUT-S:FIND

*IN-S:CCN0,S:FIND,S:CLOCK
*
*
*
*OPT-T

ADCV    6532

                /CCN0
                XLIST
                PAUSE   /LENG(STEPS,THRESHOLD,SPEED)
                        /RFND
                        /
                /PROGRAM TO STEP MICROPHOTOMETER UP TO 16 MILLION STEPS
                /OF 20 MICRONS EACH AND RETURN TO FOCAL IF A SIGNAL WITH
                /TRANSMISSION LESS THAN THRESHOLD IS DETECTED.  RETURNS
                /WITH NUMBER OF STEPS REMAINING IN ARG1 AND ARG2
                /(DOUBLE PRECISION).    THE AVERAGE TRANSMISSION IS
                /STORED IN DISC BLOCK 10, WORD 0. THE NUMBER OF
                /STEPS OVER WHICH A READING WAS FOUND IS
                /STORED IN DISC BLOCK 10, WORD 1.
                /
                /
                *KB1+67
                        FINDLF  /LFND
0227    6200            FINDRT  /RFND
0230    6204
                *FNKB1+67
                        0264
0733    0264            2264
0734    2264
                *6200
6200    0000    FINDLF, 0
6201    1346            TAD STPLPZ
6202    3760            DCA I STEPA
6203    5211            JMP SETUP
6204    0000    FINDRT, 0
6205    1347            TAD STPRTZ
6206    3760            DCA I STEPA
6207    1204            TAD FINDRT
6210    3200            DCA FINDLF
6211    1362    SETUP,  TAD SDATAD
6212    3763            DCA I PAITX
6213    1010            TAD ARG3M
6214    7040            CMA
6215    3353            DCA STEPM
6216    1052            TAD ARG3
6217    7041            CIA
6220    3354            DCA STEPL               /INITIALIZE
6221    3350            DCA DETECT              /RAMP
6222    3061            DCA ARG10
6223    7201            CLA IAC                 /RAMP INCREMENT
6224    3017            DCA ARG10M              /INITIAL CLOCK START
6225    4751            JMS I XCLOCK
6226    4764    SDATA,  JMS I XREAD             /AVERAGE 4 READINGS
6227    1055            TAD ARG6
6230    7110            CLL RAR
6231    7110            CLL RAR
6232    3055            DCA ARG6
6233    1055            TAD ARG6
```

```
6234  7040          CMA
6235  1053          TAD ARG4
6236  7700          SMA CLA          /THRESHOLD EXCEEDED?
6237  5244          JMP SIGNAL
6240  1350          TAD DETECT
6241  7640          SZA CLA          /DETECTION IN PROGRESS?
6242  5334          JMP STOP
6243  5311          JMP SCOUNT
6244  2050  SIGNAL, ISZ ARG1
6245  7300          CLA CLL
6246  1055          TAD ARG6
6247  1056          TAD ARG7
6250  3056          DCA ARG7         /TOTAL DATA SUM
6251  7430          SZL              /OVERFLOW?
6252  2014          ISZ ARG7H
6253  1356          TAD P10
6254  3350          DCA DETECT
6255  1355          TAD M5
6256  3017          DCA ARG10H       /RAMP DOWN
6257  3054          DCA ARG5         /ENABLE SLOW DOWN
6260  5311          JMP SCOUNT
6261  1050  SEND,   TAD ARG1
6262  3267          DCA DIVID
6263  1056          TAD ARG7
6264  7421          MQL
6265  1014          TAD ARG7H
6266  7407          DVI
6267  0000  DIVID, 0
6270  7501          MQA              /AVERAGE TRANSMISSION SAVED FOR DISC
6271  3051          DCA ARG2
6272  1356          TAD P10
6273  3052          DCA ARG3         /BLOCK 10, WORD 0
6274  3053          DCA ARG4         /SAVE ON DISC
6275  4520          JMS I PUTWRX
6276  1267          TAD DIVID        /SAVE DELTA 4 ON DISC
6277  3051          DCA ARG2         /BLOCK 10,WORD 1
6300  2053          ISZ ARG4
6301  4520          JMS I PUTWRX
6302  1353          TAD STEPH
6303  7040          CMA
6304  3050          DCA ARG1
6305  1354          TAD STEPL
6306  7041          CIA
6307  3051          DCA ARG2
6310  5600          JMP I FINELP
6311  7300  SCOUNT, CLA CLL
6312  1353          TAD STEPH
6313  7040          CMA
6314  7640          SZA CLA
6315  5325          JMP .+8
6316  1354          TAD STEPL
6317  1366          TAD SLOWDN
6320  7640          SZA CLA
6321  5325          JMP .+4
6322  1355          TAD M5
6323  3017          DCA ARG10H       /SLOWDOWN
6324  3054          DCA ARG5
6325  2354          ISZ STEPL
6326  5765          JMP I XPULSE
6327  2353          ISZ STEPH
```

```
6330  5765              JMP I XPULSE
6331  3050              DCA ARG1
6332  3051              DCA ARG2
6333  5600              JMP I FINELF
6334  7300    STOP,     CLA CLL
6335  1061              TAD ARG10
6336  1357              TAD LSPEED
6337  7710              SPA CLA                 /SPEED BELOW 100?
6340  5261              JMP SEND
6341  2050              ISZ ARG1                /EXTRA STEPS FOR        SLOWIN
6342  2050              ISZ ARG1
6343  1352              TAD STOPAD
6344  3763              DCA I EXITA
6345  5311              JMP SCOUNT
6346  6332    STPLFZ,   6332
6347  6331    STPRTZ,   6331
6350  0000    DETECT,   0
6351  6400    XCLOCK,   SCLOCK
6352  6334    STOPAD,   STOP
6353  0000    STEPH,    0
6354  0000    STEPL,    0
6355  7773    M5,       7773
6356  0012    P10,      0012
6357  7640    LSPEED,   7640
6360  6425    STEPX,    STEP
6361  6461    YDATA,    XDATA
6362  6226    SDATAD,   SDATA
6363  6462    EXITA,    EAIT
6364  6433    XREAD,    SREAD
6365  6421    XPULSE,   SPULSE
6366  0030    SLOWIN,   30
                /
                /
                /
                *6400
6400  0000    SCLOCK,   0
                CLA CLL
6401  7300              TAD ARG5
6402  1054              CLA
6403  7041              TAD ARG10               /RAMP
6404  1061              SNA CLA
6405  7650              JMP .+6
6406  5214              TAD ARG10
6407  1061              TAD ARG10H              /RAMP UP OR DOWN
6410  1017              SPA
6411  7510              CLA IAC
6412  7201              DCA ARG10
6413  3061              TAD ARG10
6414  1061              CMA
6415  7040              6334                    /LOAD COUNTER
6416  6334              6335                    /START CLOCK
6417  6335              JMP I SCLOCK
6420  5600
6421  1257    SPULSE,   TAD M4
6422  3260              DCA REPEAT              /SKIP ON TIME
6423  6336              6336
6424  5223              JMP .-1
6425  0000    STEP,     0                       /RESTART CLOCK
6426  4200              JMS SCLOCK
6427  2260              ISZ REPEAT
6430  7610              SKP CLA
```

```
6431  5662            JMP I EXIT
6432  5223            JMP SPULSE+2
6433  0000  SREAD,     0
6434  7300            CLA CLL
6435  1257            TAD M4
6436  3255            DCA READ          /READ A/D CONVERTER 4 TIMES
6437  3055            DCA ARG6
6440  6002            6002              /IOP
6441  6532            ADCV
6442  6531            ADSF
6443  5242            JMP .-1
6444  6534            ADRB
6445  7152            CLL CMA RTR
6446  0256            AND P1777
6447  7100            CLL
6450  1055            TAD ARG6
6451  3055            DCA ARG6
6452  2255            ISZ READ
6453  5240            JMP SREAD+5
6454  5633            JMP I SREAD
6455  0000  READ,     0
            ADCV=6532
            ADSF=6531
            ADRB=6534
6456  1777  P1777,    1777
6457  7774  M4,       7774
6460  0000  REPEAT,   0
6461  6226  XDATA,    SDATA
6462  6226  EXIT,     SDATA
```

FIND


SETUP
Set Counters
Set RAMP = +1
Start Clock
SDATA
Read A/D CONVERT.
4 times
Average Reading
Reading < Threshold
(Yes ⇒ Detection)
Yes
No
Previous Detection in Progress?
No
Yes
SCOUNT
Slowdown time?
(Near End?)
Yes
SET RAMP = -5
NO
SCLOCK
Inc. or Dec. Ramp
Restart Clock
Spulse: 4th Pulse?
No
Yes
SPULSE
Wait for time
STEP. L or R
(See above)
SCOUNT
Increment Counters
At end of scan?
No
Yes
SIGNAL
TOTAL SUM
SET DETECT≠0
SET RAMP = -5
SEND
Store Relevant Data
STOP
Speed < Lspeed?
(Lower Limit)
Yes
NO
SCOUNT
(See above)
reduce speed
SPULSE
SCLOCK
(see above)

FOCAL

File 2 Tape 22A
24 Sept 1974
Accn; front of Tape 22A

```
*↑
*OPT-
.PALP
*OUT-S:LED
*
*IN-S:CONØ,S:LED
*
*
*OPT-T

ARG1    0050

                /CONØ
                XLIST
                PAUSE/
                / X LED(X,L1,NL,B,O,M)
                /
                /LED DISPLAY OF QUANTITY X, START AT LAMP L1, USE
                /NL LAMPS. M NON-ZERO TO SUPRESS NEG. # CHECK.
                /O NON-ZERO TO SUPRESSS OVERFLOW WARNING.
                /B NON-ZERO TO DISPLAY BLANKS.
                /
                LAMPNO=ARG9
                ARG3H=10
                TEMP=12
                CTR=11
                SYMBOL=13
                NEG=ARG10
                *KB1+5
0145    6042      LED
                *FNKB1+5
0651    0754      754    /LED
                *6042
6042    0000    LED,Ø
6043    1055      TAD ARG6
6044    7640      SZA  CLA
6045    1363      TAD BLANK    /TO DISPLAY BLANKS.
6046    3013      DCA SYMBOL
6047    1054      TAD ARG5
6050    7041      CIA
6051    3054      DCA ARG5
6052    1057      TAD ARG8
6053    7640      SZA CLA    /CHECK FOR MINUS SUPRESS.
6054    5276      JMP DISPLA
6055    1010      TAD ARG3H    /DBL. PREC. CIA ARG3H,ARG3.
6056    7700      SMA CLA
6057    5276      JMP DISPLA
6060    1010    TAD ARG3H
6061    7040      CMA
6062    3010      DCA ARG3H
6063    1052      TAD ARG3
6064    7100      CLL
6065    7041      CIA
6066    3052      DCA ARG3
6067    7430      SZL
6070    2010      ISZ ARG3H
6071    7000      NOP
6072    2054      ISZ ARG5
6073    5275      JMP .+2
6074    5642      JMP I LED
6075    2061      ISZ NEG     /SET NEG=1
6076    1053    DISPLA,TAD ARG4
```

```
6077  3303     DCA SHIFT
6100  7421     MQL
6101  1364     TAD P4
6102  7413     SHL
6103  0000  SHIFT,0
6104  3060     DCA LAMPNO
6105  1054     TAD ARG5
6106  3011     DCA CTR
6107  1013  LOOP,TAD SYMBOL
6110  7440     SZA
6111  5325     JMP BUFLOD
6112  1010     TAD ARG3H
6113  7427     MQL!DVI
6114  0012  MINUS,12
6115  3012     DCA TEMP
6116  7501     MQA
6117  3010     DCA ARG3H
6120  1052     TAD ARG3
6121  7421     MQL
6122  1012     TAD TEMP
6123  7407     DVI
6124  0012     12
6125  1060  BUFLOD,TAD LAMPNO
6126  6366     6366      /LOAD LED DISPLAY BUFFERS.
6127  7701     CLA!MQA
6130  3052     DCA ARG3
6131  1060     TAD LAMPNO
6132  7104     CLL RAL
6133  3060     DCA LAMPNO
6134  2011     ISZ CTR
6135  5307     JMP LOOP
           /
6136  1061     TAD NEG
6137  7650     SNA CLA
6140  5344     JMP ERRCHK
6141  1314     TAD MINUS
6142  1060     TAD LAMPNO
6143  6366     6366        / DISPLAY MINUS SIGN.
6144  7200  ERRCHK,CLA
6145  1056     TAD ARG7
6146  7640     SZA CLA
6147  5642     JMP I LED
6150  1052     TAD ARG3
6151  7640     SZA CLA
6152  5356     JMP OVRFLW
6153  1010     TAD ARG3H
6154  7650     SNA CLA
6155  5642     JMP I LED
6156  1314  OVRFLW,TAD MINUS
6157  3013     DCA SYMBOL
6160  7001     IAC
6161  3056     DCA ARG7
6162  5276     JMP DISPLA
6163  0017  BLANK,17
6164  0004  P4,4
```

File 3 Tape 220
Sept 20/74

```
.PALP
*OUT-S:MEMF
*
*IN-S:CON0,S:XCON,S:MEMF
*
*
*
*OPT-T

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /XCON
                FIELD 1
                XLIST
                PAUSE/
                /
                /MEMF
                /X MEMW(W,N,OR)  WRITE  N WORDS
                /STARTING AT WORD W
                /X MEMR(W,0,H) READ 1024 WORDS,STARTING AT W.
                /READS LOW 12 BITS IF H>0.SETS D IF COUNTING (IN S D=FMEMR..
                /IN EXTERNAL MEMORY TO OR FROM CORE DATA BUFFER #1
                /OR IS NON-ZERO TO WRITE HI 12 BIT PART
                /X MEME(0) ERASE
                /X MEMC(N) SET COUNTING TIME N CYCLES(<2↑23)
                /RETURNS REMAINING COUNTING TIME. STOPS IF N=0
                /DOESN'T LOAD IF ALREADY COUNTING.
                /
                *FNKB1+67
0733    1177    1177     /MEMW
0734    1172    1172     /MEMR
                *FNKB1+73
0737    1155    1155     /MEME
0740    1153    1153     /MEMC
                /
                *KB1+67
0227    6204    MEMW
0230    6234    MEMR
                *KB1+73
0233    6401    MEME
0234    6414    MEMC
                /
                *NORMAL
0075    7232    7232
                /
                FUNCP=ARG10
                MCOUNT=ARG9
                CNTEST=ARG2
                /
                *6200
6200    5226    FUNCWL,5226      /FUNCWH=5252
6201    5232    FUNCR,5232
6202    5232    MEMCPU,5232
```

```
6206  4262      JMS PASWOR
6207  1010      TAD 10
6210  1046      TAD P1000
6211  3011      DCA 11        /SET AUTO INDEX REGISTER
6212  1315      TAD WRITIT
6213  3225      DCA WRITER
6214  1054      TAD ARG5
6215  7650      SNA CLA
6216  5221      JMP LOW
6217  2225      ISZ WRITER    /HI PART
6220  1314      TAD P24
6221  1200  LOW,TAD FUNCWL
6222  7040      CMA   /HARDWARE COMPLEMENTS IT
6223  6453      FUNLOD
6224  7200  WRITE,CLA
6225  1410  WRITER,TAD I 10 /OR TAD I 11 FOR HI PART
6226  7040      CMA   /HARDWARE INVERSION
6227  6454      MCSTEP
6230  2060      ISZ MCOUNT
6231  5224      JMP WRITE
6232  4271      JMS MRESET
6233  5604      JMP I MEMW
                /
6234  0000  MEMR,0
6235  1054      TAD ARG5
6236  7640      SZA CLA
6237  1312      TAD P2        /READ LOW PART ONLY:SAVE TIME
6240  1261      TAD READAL
6241  3256      DCA READER
6242  4335      JMS MSETUP
6243  1010      TAD 10
6244  1313      TAD P2000
6245  3011      DCA 11        /CHANGE TO 1024 WORD FORMAT
6246  1047      TAD M2000
6247  3060      DCA MCOUNT
6250  4262      JMS PASWOR
6251  6465  READ,READHI
6252  3411      DCA I 11
6253  6464      READLO        /TRIGGERS MCSTEP
6254  3410      DCA I 10
6255  2060      ISZ MCOUNT
6256  5251  READER,JMP READ /OR JUMP READ+2
6257  4271      JMS MRESET
6260  5634      JMP I MEMR
                /
6261  5251  READAL,JMP READ
                /
6262  0000  PASWOR,0
6263  2311      ISZ DCOUNT
6264  7410      SKP
6265  5662      JMP I PASWOR
6266  6454      MCSTEP
6267  5263      JMP .-4
6270  5662      JMP I PASWOR
                /
```

```
6276  6452      SYNSKP
6277  5276      JMP .-1
6300  1051      TAD CNTEST
6301  7650      SNA CLA
6302  6455      SCOUNT          /REENABLE COUNTING
6303  1075      TAD NORMAL
6304  7040      CMA
6305  6453      FUNLOD          /SELECTED SWEEP MODE
6306  3050      DCA ARG1
6307  5671      JMP I MRESET
                /
6310  0777    P777,777
6311  0000    DCOUNT,0
6312  0002    P2,2
6313  2000    P2000,2000
6314  0024    P24,24
6315  1410    WRITIT,TAD I 10
                /
6316  0000    SYNC,0
6317  3334      DCA TEMP
6320  6452    WAITS,SYNSKP
6321  5326      JMP TESTCL
6322  6452      SYNSKP
6323  7410      SKP
6324  5322      JMP .-2         /WAIT TILL 50 USEC. PAST
6325  5716      JMP I SYNC
6326  2334    TESTCL,ISZ TEMP
6327  5320      JMP WAITS
6330  1075      TAD NORMAL      /NO RESPONSE FROM MEM.BOX
6331  7040      CMA
6332  6453      FUNLOD          /TRY TO START CLOCK
6333  5320      JMP WAITS
6334  0000    TEMP,0
                /
6335  0000    MSETUP,0
6336  6002      IOF   /PROGRAM IS ENTERED WITH INT. ON
6337  1053       TAD ARG4
6340  0310       AND P777
6341  7450       SNA
6342  1046       TAD P1000
6343  7041       CIA
6344  3060       DCA MCOUNT
6345  1313       TAD P2000
6346  3045       DCA BUFRDX     /ALWAYS USE BUFFER 1
6347  7240       CLA CMA
6350  1045       TAD BUFRDX
6351  3010       DCA 10
6352  1052       TAD ARG3
6353  7040       CMA
6354  3311       DCA DCOUNT
6355  4316      JMS SYNC
6356  6462       CONSKP
6357  7001       IAC
6360  3051       DCA CNTEST     /1 FOR NOT COUNTING
6361  6456       MSTOP          /DON'T COUNT WHILE READING
```

```
                PAGE
6400    6316    SYNCX,SYNC
                /
                /
6401    0000    MEME,0  /ERASE MEMORY
6402    4600      JMS I SYNCX
6403    1213       TAD ERASR
6404    7040      CMA
6405    6453       FUNLOD
6406    4600      JMS I SYNCX
6407    1075       TAD NORMAL
6410    7040      CMA
6411    6453       FUNLOD
6412    5601       JMP I MEME
                /
6413    7202    ERASR,7202
                RDTIML=6451
                RDTIMH=6461
                /
6414    0000    MEMC,0  /LOAD COUNTING TIME
6415    3050       DCA ARG1
6416    3051      DCA ARG2
6417    1010      TAD ARG3H
6420    1052       TAD ARG3
6421    7640       SZA CLA
6422    5225       JMP CTEST
6423    6456       MSTOP
6424    5240       JMP EXITS
6425    6462   CTEST,CONSKP
6426    5230       JMP FREE      /NOT COUNTING
6427    5244       JMP EDITC
6430    1052   FREE,TAD ARG3
6431    6452       SYNSKP
6432    5231       JMP .-1
6433    6457       TIMELO
6434    7330     CLA STL RAR    /BIT 0 TO ENABLE COUNTING
6435    1010     TAD ARG3H
6436    6467       TIMEHI
6437    6455       SCOUNT
6440    7300   EXITS,CLA CLL
6441    3050     DCA ARG1
6442    3051     DCA ARG2
6443    5614       JMP I MEMC
                /
6444    6451   EDITC,RDTIML
6445    7040     CMA
6446    3051     DCA ARG2
6447    6461     RDTIMH
6450    7040     CMA
6451    1254     TAD P4000
6452    3050     DCA ARG1       /REMAINING COUNTING TIME
6453    5614     JMP I MEMC
                /
6454    4000    P4000,4000
```

```
*OUT-S:MULT
*
*IN-CONØ
.PALP
*OUT-S:MULT
*
*IN-S:CONØ,S:MULT
*
*
*OPT-T

ARG1    ØØ5Ø
ARG1Ø   ØØ61
ARG2    ØØ51

                /CONØ
                XLIST
                PAUSE/
                /X MULT(R,B)
                /MULTIPLIES BUFFER B BY SINGLE PRECISION RUN R.
                /RUN R MUST NOT CONTAIN NEG. NUMBERS.
                /
                LOW=ARG1Ø
                HIGH=ARG9
                COUNTR=ARG8
                NFLAG=ARG7
                *KB1+68
Ø23Ø   64ØØ       FASMUL
                *FNKB1+68
Ø734   3164       3164
                *64ØØ
64ØØ   ØØØØ    FASMUL,Ø
6401   1053       TAD ARG4
6402   7650       SNA CLA
6403   1307       TAD P2ØØØ
6404   1307       TAD P2ØØØ
6405   3061       DCA LOW
6406   1061       TAD LOW
6407   1310       TAD P1ØØØ
641Ø   3060       DCA HIGH
6411   1311       TAD PM512
6412   3057       DCA COUNTR
6413   3053       DCA ARG4
6414   1052       TAD ARG3
6415   7106       CLL RTL
6416   7ØØ4       RAL
6417   3052       DCA ARG3
642Ø   4541    GETNEX,JMS I GETWRX
6421   3052       DCA ARG3
6422   3053       DCA ARG4
6423   1051       TAD ARG2
6424   3235       DCA MULT1
6425   1051       TAD ARG2
6426   3244       DCA MULT2
6427   7240       STA
643Ø   3056       DCA NFLAG
6431   1460       TAD I HIGH
6432   7510       SPA
6433   4270       JMS COMP      /COMPLEMENT NEG. #S
```

```
6440  7501     MQA
6441  3460     DCA I HIGH
6442  1461     TAD I LOW
6443  7425     MQL!MUY
6444  0000   MULT2,0
6445  1460     TAD I HIGH
6446  7430     SZL
6447  5304     JMP OVRFLW
6450  3460     DCA I HIGH
6451  1460     TAD I HIGH
6452  7004     RAL
6453  7430     SZL
6454  5304     JMP OVRFLW
6455  7701     CLA!MQA
6456  3461     DCA I LOW
6457  1460     TAD I HIGH
6460  2056     ISZ NFLAG        /-1 FOR POS. #
6461  4270     JMS COMP
6462  7200   WINDUP,CLA
6463  2060     ISZ HIGH
6464  2061     ISZ LOW
6465  2057     ISZ COUNTR
6466  5220     JMP GETNEX
6467  5600     JMP I FASMUL
6470  0000   COMP,0
6471  7140     CMA CLL
6472  3460     DCA I HIGH
6473  3056     DCA NFLAG
6474  1461     TAD I LOW
6475  7041     CIA
6476  7450     SNA
6477  2460     ISZ I HIGH
6500  7000     NOP
6501  3461     DCA I LOW
6502  1460     TAD I HIGH
6503  5670     JMP I COMP
6504  7350   OVRFLW,CLL STA RAR
6505  3460     DCA I HIGH
6506  5262     JMP WINDUP
6507  2000   P2000,2000
6510  1000   P1000,1000
6511  7000   PM512,7000
```

```
.PALP
*OUT-S:NUDG
*
*IN-S:CON0,S:NUDG,S:NUD2
*
*
*
*OPT-T

ARG1    0050
ARG10   0061

            /CON0
            XLIST
            PAUSE/ X NUDG(R1,N,4096*S,R2);  R1=1ST DATA RECORD,
            /S=SHIFT BY S CHANNELS    -512<S<+512
            / N=# CHANNELS, R2=OVERFLOW RECORD
            S=ARG5H
            LFH=ARG10H
            LFL=ARG9H
            INLO=ARG6
            OUTLO=ARG7
            INHI=ARG8
            OUTHI=ARG9
            OUTBLK=ARG10
            *KB1+75
0235  6400    SHOV
            *FNKB1+75
0741  0047    47   /NUDG
            *6400
6400  0000  SHOV,0
6401  1052    TAD ARG3
6402  7106    CLL RTL
6403  7004    RAL
6404  3343    DCA R18         /8*R1
6405  1055    TAD ARG6
6406  7106    CLL RTL
6407  7004    RAL
6410  3061    DCA OUTBLK
6411  1053    TAD ARG4
6412  7450    SNA
6413  5600    JMP I SHOV
6414  3352    DCA N
6415  1012    TAD ARG5H
6416  7510    SPA
6417  1356    TAD P512      /NEG SHIFT=512-S
6420  0344    AND P777      /511.9999... MAX SHIFT.
6421  3012    DCA S
6422  1054    TAD ARG5
6423  3746    DCA I FRACTX
6424  3017    DCA LFH       /CLEAR LAST FRACTION BUFFER
6425  3016    DCA LFL
6426  1012    TAD ARG5H     /NOW CHECK FOR S=0
6427  7640    SZA CLA
6430  5234    JMP .+4
6431  1054    TAD ARG5
6432  7650    SNA CLA
```

```
6437  7041     CIA
6440  3342     DCA CTR
6441  1350     TAD PP3777
6442  3056     DCA OUTLO
6443  1351     TAD PP4777
6444  3060     DCA OUTHI
6445  4323     JMS ZERO
6446  1343     TAD R18
6447  3741     DCA I IINBLK
6450  1352     TAD N
6451  7041     CIA
6452  3342     DCA CTR
6453  1350     TAD PP3777
6454  3055     DCA INLO
6455  2055  SHOVER, ISZ INLO
6456  2057     ISZ INHI
6457  1055     TAD INLO
6460  1353     TAD M3000
6461  7700     SMA CLA
6462  4740     JMS I READ1
6463  2056     ISZ OUTLO
6464  2060     ISZ OUTHI
6465  1056     TAD OUTLO
6466  1354     TAD M5000
6467  7700     SMA CLA
6470  4737     JMS I WRITE1
6471  4745  JMS I SHIFTX
6472  2342     ISZ CTR
6473  5255     JMP SHOVER
6474  1012     TAD S
6475  1355     TAD M512
6476  3342     DCA CTR
6477  4323     JMS ZERO
6500  1055     TAD INLO
6501  1357     TAD MM2000
6502  7750     SPA SNA CLA
6503  5321     JMP WINDUP
6504  2055  NOSHFT, ISZ INLO
6505  2057     ISZ INHI
6506  2056     ISZ OUTLO
6507  2060     ISZ OUTHI
6510  1055     TAD INLO
6511  1353     TAD M3000
6512  7700     SMA CLA
6513  5321     JMP WINDUP
6514  1455     TAD I INLO
6515  3456     DCA I OUTLO
6516  1457     TAD I INHI
6517  3460     DCA I OUTHI
6520  5304     JMP NOSHFT
6521  4737  WINDUP, JMS I WRITE1
6522  5600     JMP I SHOV
6523  0000  ZERO, 0
6524  2056     ISZ OUTLO
6525  2060     ISZ OUTHI
6526  1056     TAD OUTLO
6527  1354     TAD M5000
6530  7700     SMA CLA
6531  4737     JMS I WRITE1
6532  3456     DCA I OUTLO
```

```
6533  3460     DCA I OUTHI
6534  2342     ISZ CTR
6535  5324     JMP ZERO+1
6536  5723     JMP I ZERO
6537  6600  WRITE1,WRITE
6540  6634  READ1,READ
6541  6673  IINBLK,INBLK
6542  0000  CTR,0
6543  0000  R18,0
6544  0777  P777,777
6545  6042  SHIFTX,SHFTIT
6546  6165  FRACTX,FRACTN
6547  6667  FLAG,FLGR28
6550  3777  PP3777,3777
6551  4777  PP4777,4777
6552  0000  N,0
6553  5000  M3000,5000
6554  3000  M5000,3000
6555  7000  M512,7000
6556  1000  P512,1000
6557  6000  MM2000,6000
            *6600
6600  0000  WRITE,0
6601  1061    TAD OUTBLK
6602  3052    DCA ARG3
6603  3053    DCA ARG4
6604  1263    TAD M2000
6605  3264    DCA CORECT
6606  1265    TAD P4000
6607  3266    DCA CORE
6610  1666  OUTLP,TAD I CORE
6611  3054    DCA ARG5
6612  4540    JMS I KB1
6613  3052    DCA ARG3
6614  2266    ISZ CORE
6615  2264    ISZ CORECT
6616  5210    JMP OUTLP
6617  2267    ISZ FLGR28
6620  5224    JMP .+4
6621  1670    TAD I IR18
6622  3061    DCA OUTBLK
6623  5227    JMP .+4
6624  1061    TAD OUTBLK
6625  1271    TAD P8
6626  3061    DCA OUTBLK
6627  1265    TAD P4000
6630  3056    DCA OUTLO
6631  1272    TAD P5000
6632  3060    DCA OUTHI
6633  5600    JMP I WRITE
6634  0000  READ,0
6635  1273    TAD INBLK
6636  3052    DCA ARG3
6637  3053    DCA ARG4
6640  1263    TAD M2000
6641  3264    DCA CORECT
6642  1274    TAD P2000
6643  3266    DCA CORE
6644  4541  INLP,JMS I GETWRX
6645  3052    DCA ARG3
```

```
6646  1051     TAD ARG2
6647  3666     DCA I CORE
6650  2266     ISZ CORE
6651  2264     ISZ CORECT
6652  5244     JMP INLP
6653  1273     TAD INBLK
6654  1271     TAD P8
6655  3273     DCA INBLK
6656  1274     TAD P2000
6657  3055     DCA INLO
6660  1275     TAD P3000
6661  3057     DCA INHI
6662  5634     JMP I READ
6663  6000   M2000,6000
6664  0000   CORECT,0
6665  4000   P4000,4000
6666  0000   CORE,0
6667  0000   FLGR28,0
6670  6543   IR18,R18
6671  0010   P8,8
6672  5000   P5000,5000
6673  0000   INBLK,0
6674  2000   P2000,2000
6675  3000   P3000,3000
             *6042
6042  0000   SHFTIT,0        /SHIFT BY WHOLE OR PARTIAL CHANNELS.
6043  7200     CLA
6044  3360     DCA NEGFLG
6045  1017     TAD LFH     /OUT = LF (TEMPORARILY).
6046  3460     DCA I OUTHI
6047  1016     TAD LFL
6050  3456     DCA I OUTLO
6051  3362     DCA T1L
6052  1457     TAD I INHI
6053  7500     SMA
6054  5271     JMP POSTIV
6055  7040     CMA             /CONVERT NEGITIVE INPUT TO POSITIVE.
6056  3361     DCA T1H      /PUT ABS(IN) INTO T1
6057  7100     CLL
6060  1455     TAD I INLO
6061  7041     CIA
6062  3362     DCA T1L
6063  7430     SZL
6064  2361     ISZ T1H
6065  7000     NOP
6066  7001     IAC
6067  3360     DCA NEGFLG
6070  1361     TAD T1H
6071  4363   POSTIV, JMS MULT  / LF = ABS(IN)*FRACTN
6072  3017     DCA LFH
6073  7501     MQA
6074  3016     DCA LFL
6075  1360     TAD NEGFLG
6076  7710     SNA CLA          7650
6077  1455     TAD I INLO
6100  1362     TAD T1L    /STILL ZERO IF INPUT WAS POSITIVE.
6101  4363     JMS MULT
6102  7100     CLL
6103  1016     TAD LFL
6104  3016     DCA LFL     /TRUNCATE
```

```
6105  7430     SZL
6106  2017     ISZ LFH
6107  7000     NOP
6110  1360     TAD NEGFLG
6111  7650     SNA CLA
6112  5325     JMP OUTPUT
6113  1017     TAD LFH       /CONVERT LF TO NEG IF REQUIRED.
6114  7040     CMA
6115  3017     DCA LFH
6116  1016     TAD LFL
6117  7100     CLL
6120  7041     CIA
6121  3016     DCA LFL
6122  7430     SZL
6123  2017     ISZ LFH
6124  7000     NOP
               PAUSE/
               /
6125  1017     OUTPUT, TAD LFH       /T1 = IN - LF
6126  7040       CMA
6127  1457       TAD I INHI
6130  3361       DCA T1H
6131  7100       CLL
6132  1016       TAD LFL
6133  7041       CIA
6134  7430       SZL
6135  2361       ISZ T1H
6136  7000       NOP
6137  7100       CLL
6140  1455       TAD I INLO
6141  3362       DCA T1L
6142  7430       SZL
6143  2361       ISZ T1H
6144  7000       NOP
6145  1361       TAD T1H    / OUT = OUT + T1
6146  1460       TAD I OUTHI
6147  3460       DCA I OUTHI
6150  7100       CLL
6151  1362       TAD T1L
6152  1456       TAD I OUTLO
6153  3456       DCA I OUTLO
6154  7430       SZL
6155  2460       ISZ I OUTHI
6156  7000       NOP
6157  5642       JMP I SHFTIT
6160  0000     NEGFLG, 0
6161  0000     T1H, 0
6162  0000     T1L, 0
               /
6163  0000     MULT, 0
6164  7425       MQL!MUY
6165  0000     FRACTN, 0
6166  5763       JMP I MULT
```

File 2
Apr. 13, 1973

```
PALP
*OUT-S:POLY
*
*IN-S:CON0,S:POLY,S:POL2,S:POL3
*
*
*
*
*OPT-T

ARG1    0050

                /CON0
                XLIST
                PAUSE/POLY(BL,W,O,B,L,U)
                /GENERATES A POLYNIMIAL OF ORDER O ON CONTENTS
                /OF CHANS L THRU U , BUFFER B. COEFFICIENTS ARE
                /ENTERED USING X STOR, C0 STARTS AT BLOCK BL, WORD W.
                /WORKS IN DBL. PREC. FLOATING PT., CONVERTS BACK
                /TO INTEGER AT END. OVERFLOWS ARE SET TO 2↑23-1.
                SAM2=7344
                NMI=7411
                SCA=7441
                T3EXP=ARG4
                T3LO=ARG6
                T3HI=ARG7
                T2EXP=ARG8
                HIGH=ARG9
                LOW=ARG10
                T1HI=ARG1
                T1LO=ARG2
                T1EXP=ARG3
                *KB1+67
0227  6042        POLY
                *FNKB1+67
0733  1371        1371
                *6042
6042  0000    POLY,0
6043  1054        TAD ARG5
6044  7550        SPA SNA
6045  5642        JMP I POLY
6046  1317        TAD M6
6047  7700        SMA CLA
6050  5642        JMP I POLY      /BAIL OUT UNLESS 0<O<6
6051  1054        TAD ARG5
6052  7001        IAC             /4*(# OF COEFFS)
6053  7106        CLL RTL
6054  7041        CIA
6055  3326        DCA CTR1
6056  1325        TAD COEFF1
6057  3327        DCA CTR2
6060  4541    GETNEX,JMS I GETWRX
6061  3052        DCA ARG3
6062  3053        DCA ARG4
6063  1051        TAD ARG2
6064  3727        DCA I CTR2
6065  2327        ISZ CTR2
6066  2326        ISZ CTR1
6067  5260        JMP GETNEX
6070  1055        TAD ARG6
6071  7650        SNA CLA
6072  1320        TAD P2000
```

```
6073  1320      TAD P2000
6074  1056      TAD ARG7
6075  3061      DCA LOW
6076  1061      TAD LOW
6077  1321      TAD P1000
6100  3060      DCA HIGH
6101  1057      TAD ARG8
6102  7550      SPA SNA
6103  1322      TAD P511      /512 CHANS IS DEFAULT
6104  7040      CMA
6105  1056      TAD ARG7
6106  3333      DCA CHAN
6107  4716      JMS I REST1
6110  5642      JMP I POLY
6111  0000    SETEXP,0
6112  7441      SCA
6113  7041      CIA
6114  1323      TAD P23
6115  5711      JMP I SETEXP
6116  6400    REST1,REST
6117  7772    M6,-6
6120  2000    P2000,2000
6121  1000    P1000,1000
6122  0777    P511,777
6123  0027    P23,27
6124  7777    PM1,-1
6125  6130    COEFF1,C1
6126  0000    CTR1,0
6127  0000    CTR2,0
6130  0000    C1,0
6131  0000    C2,0
6132  0000    C3,0
6133  0000    CHAN,0
6134  0000    C5,0
6135  0000    C6,0
6136  0000    C7,0
6137  0000    C8,0
6140  0000    C9,0
6141  0000    C10,0
6142  0000    C11,0
6143  0000    C12,0
6144  0000    C13,0
6145  0000    C14,0
6146  0000    C15,0
6147  0000    C16,0
6150  0000    C17,0
6151  0000    C18,0
6152  0000    C19,0
6153  0000    C20,0
6154  0000    C21,0
6155  0000    C22,0
6156  0000    C23,0
6157  0000    C24,0
              PAUSE*6600
              /DBL. PREC. FLOATING PT. MULT., T3=T1*T2
              /OUTPUT OF (DBL. PREC.)*(DBL. PREC.) IS (QUAD. PREC.)
              /IGNORE LOWEST ORDER, KEEP NEXT ORDER FOR CARRIES, THEN DR
              /OUTPUT IS <T3HI,T3LO,TT3,IGNORED>  PLUS  T3EXP.
              /INPUT IS <T1HI,T1LO>, <T2HI,T2LO>  PLUS  T1EXP,T2EXP.

 6600  0000   FLTMLT,0
```

```
6601  3347    DCA MUL1
6602  7344    SAM2
6603  3353    DCA NEGFLG   /STARTS AT -2, IS INCREMENTED FOR
6604  3354    DCA TT1      /EACH NEG. NUMBER.
6605  3355    DCA TT2
6606  3055    DCA T3LO
6607  3056    DCA T3HI
6610  1347    TAD MUL1
6611  7510    SPA   /TEST FOR T2<0.
6612  4361    JMS NEGTIV  /MAKES # POSITIVE, INCREMENTS NEGFLG.
6613  3360    DCA T2HI
6614  7501    MQA
6615  3357    DCA T2LO
6616  1051    TAD T1LO
6617  7421    MQL
6620  1050    TAD T1HI
6621  7510    SPA   /TEST FOR T1<0.
6622  4361    JMS NEGTIV
6623  3050    DCA T1HI
6624  7501    MQA
6625  3051    DCA T1LO
6626  1051    TAD T1LO    /T1LO*T2LO
6627  3347    DCA MUL1
6630  1357    TAD T2LO
6631  4345    JMS MULT
6632  7200    CLA    /TOSS OUT LOWEST ORDER.
6633  1347    TAD MUL1
6634  3356    DCA TT3
6635  1051    TAD T1LO    /T1LO*T2HI
6636  3347    DCA MUL1
6637  1360    TAD T2HI
6640  4345    JMS MULT
6641  7100    CLL
6642  1356    TAD TT3
6643  3356    DCA TT3
6644  7430    SZL
6645  2055    ISZ T3LO
6646  1347    TAD MUL1
6647  7100    CLL
6650  1055    TAD T3LO
6651  3055    DCA T3LO
6652  7430    SZL
6653  2056    ISZ T3HI
6654  1050    TAD T1HI    /T1HI*T2LO
6655  3347    DCA MUL1
6656  1357    TAD T2LO
6657  4345    JMS MULT
6660  7100    CLL
6661  1356    TAD TT3
6662  3356    DCA TT3
6663  7430    SZL
6664  2055    ISZ T3LO
6665  5267    JMP .+2
6666  2056    ISZ T3HI
6667  7100    CLL
6670  1347    TAD MUL1
6671  1055    TAD T3LO
6672  3055    DCA T3LO
6673  7430    SZL
6674  2056    ISZ T3HI
```

```
6675  1050      TAD T1HI    /T1HI*T2HI
6676  3347      DCA MUL1
6677  1360      TAD T2HI
6700  4345      JMS MULT
6701  7100      CLL
6702  1055      TAD T3LO
6703  3055      DCA T3LO
6704  7430      SZL
6705  2056      ISZ T3HI
6706  1347      TAD MUL1
6707  1056      TAD T3HI
6710  3056      DCA T3HI
6711  1356      TAD TT3
6712  7710      SPA CLA    /ROUND OFF T3LO ACCORDING TO TT3.
6713  2055      ISZ T3LO
6714  5316      JMP .+2
6715  2056      ISZ T3HI
6716  7000      NOP
6717  1055      TAD T3LO
6720  7421      MQL
6721  1056      TAD T3HI
6722  2353      ISZ NEGFLG
6723  5325      JMP .+2    /NEGFLG=-1 MEANS NEG. ANSWER.
6724  4361      JMS NEGTIV    /MAKE T3 NEGATIVE.
6725  7411      NMI
6726  7100      CLL
6727  7450      SNA
6730  7120      STL
6731  3056      DCA T3HI
6732  7501      MQA
6733  3055      DCA T3LO
6734  7430      SZL
6735  5343      JMP .+6    /IF T3=0, SET T3EXP=0.
6736  7441      SCA      /THIS SECTION CALCULATES THE NEW EXPONENT.
6737  7041      CIA
6740  1052      TAD T1EXP
6741  1057      TAD T2EXP
6742  7001      IAC
6743  3053      DCA T3EXP
6744  5600      JMP I FLTMLT
6745  0000    MULT,0
6746  7425      MQL!MUY
6747  0000    MUL1,0
6750  3347      DCA MUL1
6751  7501      MQA
6752  5745      JMP I MULT
6753  0000    NEGFLG,0
6754  0000    TT1,0
6755  0000    TT2,0
6756  0000    TT3,0
6757  0000    T2LO,0
6760  0000    T2HI,0
6761  0000    NEGTIV,0
6762  3375      DCA DMY1
6763  7501      MQA
6764  7141      CLL CIA
6765  7421      MQL
6766  1375      TAD DMY1
6767  7040      CMA
6770  7430      SZL
```

```
6771  7001     IAC
6772  2353     ISZ NEGFLG
6773  7000     NOP
6774  5761     JMP I NEGTIV
6775  0000   DMY1,0
             PAUSE*6200
6200  0000   FLTADD,0     /SUM=SUM+T3, DBL. PREC. FLOATING PT. ADD
6201  1311     TAD SUMEXP
6202  7041     CIA
6203  1053     TAD T3EXP
6204  7510     SPA
6205  5220     JMP BIGSUM
6206  7450     SNA
6207  5217     JMP SAMEXP
6210  3277     DCA DEXP1     /T3>SUM
6211  1053     TAD T3EXP
6212  3311     DCA SUMEXP
6213  1304     TAD WT3
6214  3307     DCA WBIG
6215  1303     TAD WSUM
6216  5225     JMP DOIT
6217  7200   SAMEXP,CLA      /SAME EXPONENTS
6220  7041   BIGSUM,CIA    /SUM>T3
6221  3277     DCA DEXP1
6222  1303     TAD  WSUM
6223  3307     DCA WBIG
6224  1304     TAD WT3
6225  3306   DOIT,DCA WSMALL
6226  1306     TAD WSMALL
6227  3310     DCA WMOVE
6230  4265     JMS MOVER     /SHIFT BY 1+(DIFF. IN EXPS)
6231  3706     DCA I WSMALL
6232  3277     DCA DEXP1
6233  1307     TAD WBIG
6234  3310     DCA WMOVE
6235  4265     JMS MOVER    /SHIFT BY 1
6236  7100     CLL
6237  1706     TAD I WSMALL
6240  7421     MQL
6241  7430     SZL
6242  7001     IAC
6243  1313     TAD SUMHI
6244  1056     TAD T3HI
6245  7411     NMI
6246  3313     DCA SUMHI
6247  7501     MQA
6250  3312     DCA SUMLO
6251  7441     SCA
6252  7041     CIA
6253  7001     IAC
6254  1311     TAD SUMEXP    /CONTAINS LARGER EXP
6255  3311     DCA SUMEXP
6256  5600     JMP I FLTADD
6257  1707   BUNGLE,TAD I WBIG      /SHIFT > 23
6260  3312     DCA SUMLO
6261  2307     ISZ WBIG
6262  1707     TAD I WBIG
6263  3313     DCA SUMHI
6264  5600     JMP I FLTADD
6265  0000   MOVER,0      /ALIGNS DEC. PT.
```

```
6266  1277     TAD DEXP1
6267  1305     TAD MM23
6270  7700     SMA CLA
6271  5257     JMP BUNGLE
6272  1710     TAD I WMOVE
6273  7421     MQL
6274  2310     ISZ WMOVE
6275  1710     TAD I WMOVE
6276  7415     ASR
6277  0000   DEXP1,Ø
6300  3710     DCA I WMOVE
6301  7501     MQA
6302  5665     JMP I MOVER
6303  6312     WSUM,SUMLO
6304  0055     WT3,T3LO
6305  7751   MM23,-27
6306  0000   WSMALL,Ø
6307  0000   WBIG,Ø
6310  0000   WMOVE,Ø
6311  0000   SUMEXP,Ø
6312  0000   SUMLO,Ø
6313  0000   SUMHI,Ø
             *6400
6400  0000   REST,Ø
6401  3764   CHLOOP,DCA I SUMHI1
6402  3763     DCA I SUMLO1
6403  3762     DCA I SUMEX1          /CLEAR SUM
6404  1461     TAD I LOW
6405  7421     MQL
6406  1460     TAD I HIGH       /ASSUME NMI WILL HANDLE ZERO
6407  7411     NMI
6410  7450     SNA
6411  5276     JMP WINDUP
6412  3460     DCA I HIGH
6413  4751     JMS I SETEX1      /SETS AC=23-SC
6414  3325     DCA NEXP
6415  7501     MQA
6416  3461     DCA I LOW        /CHAN. CONTENTS NOW FLOATING POINT
6417  7132     STL RTR
6420  3366     DCA PHI
6421  3367     DCA PLO
6422  7001     IAC
6423  3370     DCA PEXP      /P=1
6424  1054     TAD ARG5
6425  7041     CIA
6426  3371     DCA CTR3
6427  1354     TAD COEFF2
6430  3372     DCA COEFF
6431  1460   SUMUP,TAD I HIGH
6432  3050     DCA T1HI
6433  1461     TAD I LOW
6434  3051     DCA T1LO
6435  1325     TAD NEXP
6436  3052     DCA T1EXP
6437  1370     TAD PEXP
6440  3057     DCA T2EXP
6441  1367     TAD PLO
6442  7421     MQL
6443  1366     TAD PHI
6444  4752     JMS I FLTML1
```

```
6445  1056      TAD T3HI
6446  3366      DCA PHI
6447  1055      TAD T3LO
6450  3367      DCA PLO
6451  1053      TAD T3EXP
6452  3370      DCA PEXP
6453  1772      TAD I COEFF
6454  2372      ISZ COEFF
6455  3052      DCA T1EXP
6456  1772      TAD I COEFF
6457  2372      ISZ COEFF
6460  3050      DCA T1HI
6461  1772      TAD I COEFF
6462  2372      ISZ COEFF
6463  2372      ISZ COEFF        /IGNORE LOWEST ORDER WORD IN COEFFICIENTS
6464  3051      DCA T1LO
6465  1370      TAD PEXP
6466  3057      DCA T2EXP
6467  1367      TAD PLO
6470  7421      MQL
6471  1366      TAD PHI
6472  4752      JMS I FLTML1
6473  4753      JMS I FLTAD1
6474  2371      ISZ CTR3
6475  5231      JMP SUMUP
6476  1755  WINDUP,TAD I CC1        /ADD IN C0
6477  3053      DCA T3EXP
6500  1756      TAD I CC2
6501  3056      DCA T3HI
6502  1757      TAD I CC3
6503  3055      DCA T3LO
6504  4753      JMS I FLTAD1
6505  1762      TAD I SUMEX1
6506  7550      SPA SNA
6507  5336      JMP ZERO
6510  1361      TAD M23
6511  7540      SMA SZA
6512  5344      JMP OVRFLW
6513  7700      SMA CLA
6514  5340      JMP NOSHFT
6515  1762      TAD I SUMEX1
6516  7041      CIA
6517  1360      TAD P22
6520  3325      DCA NEXP
6521  1763      TAD I SUMLO1
6522  7421      MQL
6523  1764      TAD I SUMHI1
6524  7415      ASR      /CONVERT TO INTEGER
6525  0000  NEXP,0
6526  3460  FINIS,DCA I HIGH
6527  7501      MQA
6530  3461      DCA I LOW
6531  2060      ISZ HIGH
6532  2061      ISZ LOW
6533  2765      ISZ I CHAN1
6534  5201      JMP CHLOOP
6535  5600      JMP I REST
6536  7621  ZERO,CLA!MQL        /ANSWER IS <1
6537  5326      JMP FINIS
6540  1763  NOSHFT,TAD I SUMLO1
```

```
6541  7421     MQL
6542  1764     TAD I SUMHI1
6543  5326     JMP FINIS
6544  7340  OVRFLW,CLL CLA CMA
6545  7421     MQL
6546  7501     MQA
6547  7010     RAR
6550  5326     JMP FINIS
6551  6111  SETEX1,SETEXP
6552  6600  FLTML1,FLTMLT
6553  6200  FLTAD1,FLTADD
6554  6134  COEFF2,C5
6555  6130  CC1,C1
6556  6131  CC2,C2
6557  6132  CC3,C3
6560  0026  P22,26
6561  7751  M23,-27
6562  6311  SUMEX1,SUMEXP
6563  6312  SUMLO1,SUMLO
6564  6313  SUMHI1,SUMHI
6565  6133  CHAN1,CHAN
6566  0000  PHI,0
6567  0000  PLO,0
6570  0000  PEXP,0
6571  0000  CTR3,0
6572  0000  COEFF,0
```

System-B
File 2
31 Oct. 1974

```
.PALP
*OUT-S:POSN
*
*IN-S:JCON,S:POSN,S:SPC2,S:SPC3
*
*
*
*
*OPT-T

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /POSN(N,U,C)
                /TELESCOPE POSITION READOUT.
                / N: <0 = H.A., 0 = R.A., >0 = DEC
                / U=UNIT+CABLE CODE (FROM TERRY'S BLUEPRINT EL-331-2D3.
                / C=CABLE CODE.
                / U,C MUST BE IN DECIMAL. DEFAULTS ARE CABLE 1, UNIT 1.
                /
                MESAGX=22
                BYEBYE=6303
                EXIT=6277
                SGNTST=ARG7
                MUX=6350
                OKSKIP=1
                DUNSKP=2
                DAREAD=3
                FREAD=4
                FLOAD=5
                LAMOFF=6
                DLOAD=7
                GRAB=4
                TEMP1=ARG8
                COMMND=ARG9
                CTR=ARG10
                COMMIN=15
                TEMP2=13
                DATA=14
                ARG5H=12
                MASK=10
                TESTR=11
                TEMP=16
                *KB1+72
0232    6600      POSN
                *FNKB1+72
0736    1446      1446    /POSN
                /
                *6600
6600    0000    POSN,0
6601    3050      DCA ARG1
6602    3051      DCA ARG2
6603    4712      JMS I GRABER    /GRAB MUX
6604    1053      TAD ARG4
6605    7450      SNA
6606    1304      TAD P4200     /DEFAULT=CABLE 1, UNIT 1.
6607    3053      DCA ARG4
6610    1054      TAD ARG5
6611    7450      SNA
6612    1305      TAD P4000     /DEFAULT=CABLE 1
```

```
6613  3054      DCA ARG5
6614  1306      TAD P6022
6615  4337      JMS PULSE   /SET LEVEL 3 TO 1.
6616  1307      TAD P2020
6617  4337      JMS PULSE   /SEND CLEAR PULSE (PULSE 2)
6620  1335      TAD P7      /SET HA MASK
6621  3754      DCA I NSHFTX
6622  1052      TAD ARG3
6623  7540      SMA SZA
6624  5232      JMP DEC
6625  7650      SNA CLA
6626  5252      JMP RA
6627  1310      TAD HASGN
6630  3056      DCA SGNTST
6631  5237      JMP HADEC
6632  7200  DEC,CLA    /SET UP DEC MASK, SHIFT.
6633  1336        TAD P3
6634  3754        DCA I NSHFTX
6635  1311        TAD DECSGN
6636  3056        DCA SGNTST
6637  1321  HADEC,TAD MM3
6640  3061        DCA CTR
6641  4713  LOOP1,JMS I X6
6642  4714        JMS I X10
6643  2061        ISZ CTR
6644  5241        JMP LOOP1
6645  4715        JMS I READER
6646  0056        AND SGNTST
6647  7650        SNA CLA
6650  5322        JMP NEGTIV
6651  5275        JMP EXITP
6652  1317  RA,TAD M7
6653  3061        DCA CTR
6654  4716  LOOP2,JMS I CLOCK1    /7 DUMMY CLOCK PULSES.
6655  2061        ISZ CTR
6656  5254        JMP LOOP2
6657  4713        JMS I X6
6660  4714        JMS I X10
6661  4713        JMS I X6
6662  1320        TAD M6
6663  3061        DCA CTR
6664  1336        TAD P3        /SET DEC MASK
6665  3754        DCA I NSHFTX
6666  4716  LOOP3,JMS I CLOCK1     /6 DUMMY PULSES.
6667  2061        ISZ CTR
6670  5266        JMP LOOP3
6671  4714        JMS I X10
6672  4713        JMS I X6
6673  4714        JMS I X10
6674  4714        JMS I X10
6675  1054  EXITP,TAD ARG5    /NOW TURN OFF LEVEL 3.
6676  7106        CLL RTL    /NORMALLY SETS LEVEL 1 ON CABLE 12, UNIT 1 !!!
6677  3054        DCA ARG5
6700  1306        TAD P6022
6701  4337        JMS PULSE
6702  6356        MUX LAMOFF
6703  5600        JMP I POSN
                  /
6704  4200  P4200,4200
6705  4000  P4000,4000
```

```
6706  6022  P6022,6022
6707  2020  P2020,2020
6710  0400  HASGN,400
6711  1000  DECSGN,1000
6712  6515  GRABER,GRABX
6713  6200  X6,X6X
6714  6204  X10,X10X
6715  6247  READER,READRX
6716  6265  CLOCK1,CLOC1X
6717  7771  M7,-7
6720  7772  M6,-6
6721  7775  MM3,-3
            /
            /
6722  1050  NEGTIV,TAD ARG1
6723  7040     CMA
6724  3050     DCA ARG1
6725  7100     CLL
6726  1051     TAD ARG2
6727  7041     CIA
6730  3051     DCA ARG2
6731  7430     SZL
6732  2050     ISZ ARG1
6733  7000     NOP
6734  5275     JMP EXITP
6735  0007  P7,7
6736  0003  P3,3
            /
6737  0000  PULSE,0
6740  3016     DCA TEMP
6741  1053     TAD ARG4
6742  0351     AND P310
6743  1016     TAD TEMP
6744  3752     DCA I FUNCX
6745  1054     TAD ARG5
6746  4753     JMS I SENDRX
6747  7200     CLA
6750  5737     JMP I PULSE
6751  0310  P310,310
6752  6262  FUNCX,FUNC
6753  6260  SENDRX,SENDER
6754  6226  NSHFTX,NSHFT
            /
            /
            *6200
6200  0000  X6X,0
6201  1245     TAD P6
6202  4210     JMS MULT
6203  5600     JMP I X6X
6204  0000  X10X,0
6205  1244     TAD P12
6206  4210     JMS MULT
6207  5604     JMP I X10X
6210  0000  MULT,0
6211  3242     DCA MULPLY
6212  1050     TAD ARG1
6213  4240     JMS MULT1
6214  7701     CLA!MQA
6215  3050     DCA ARG1
6216  1051     TAD ARG2
```

```
6217  4240      JMS MULT1
6220  1050      TAD ARG1
6221  3050      DCA ARG1
6222  7501      MQA
6223  3051      DCA ARG2
6224  4247      JMS READRX
6225  7417      LSR
6226  0000    NSHFT,0
6227  0246      AND P17
6230  7100      CLL
6231  1051      TAD ARG2
6232  3051      DCA ARG2
6233  7430      SZL
6234  2050      ISZ ARG1
6235  7000      NOP
6236  4265      JMS CLOC1X
6237  5610      JMP I MULT
                /
6240  0000    MULT1,0
6241  7425      MQL IMUY
6242  0000    MULPLY,0
6243  5640      JMP I MULT1
6244  0012    P12,12
6245  0006    P6,6
6246  0017    P17,17
                /
6247  0000    READRX,0
6250  7200      CLA
6251  1053      TAD ARG4
6252  1257      TAD P10
6253  3262      DCA FUNC
6254  4260      JMS SENDER
6255  7040      CMA
6256  5647      JMP I READRX
6257  0010    P10,10
                /
6260  0000    SENDER,0
6261  4664      JMS I XMITZ
6262  0000    FUNC,0
6263  5660      JMP I SENDER
6264  6120    XMITZ,XMITX
                /
6265  0000    CLOC1X,0
6266  7200      CLA
6267  1272      TAD P4020
6270  4673      JMS I PULSEX    /PULSE 1=CLOCK PULSE
6271  5665      JMP I CLOC1X
6272  4020    P4020,4020
6273  6737    PULSEX,PULSE
                /
                PAUSE*6044
                                /EXPECTS SNGL PREC. BINARY < 1000 IN AC
6044  0000    BINBC0,0
6045  7421      MQL
6046  1353      TAD M3
6047  3061      DCA CTR
6050  3057      DCA TEMP1
6051  3013      DCA TEMP2
6052  7407    DIVD,DVI
6053  0012      12
6054  1057      TAD TEMP1
```

```
6055  7120    CLL CML
6056  2013    ISZ TEMP2
6057  7100    CLL       /KEEP TRACK OF LINK DURING ROTATION.
6060  7012    RTR
6061  7012    RTR
6062  3057    DCA TEMP1
6063  7430    SZL
6064  7040    CMA
6065  3013    DCA TEMP2
6066  2061    ISZ CTR
6067  5252    JMP DIVD
6070  1057    TAD TEMP1
6071  7010    RAR
6072  5644    JMP I BINBC0      /RETURNS BCD WORD IN AC.
              /
6073  0000  BCDBI0,0          /EXPECTS 3 DIGIT BCD WORD IN AC.
6074  3057    DCA TEMP1
6075  1057    TAD TEMP1
6076  0305    AND LDIGIT    /THIS ROUTINE WAS LIFTED FROM A
6077  4307    JMS ROT       /JOHN SWEENY PROGRAM. I'LL BE DAMNED
6100  3057    DCA TEMP1     /IF I KNOW HOW IT WORKS.
6101  1057    TAD TEMP1
6102  0306    AND MDIGIT
6103  4307    JMS ROT
6104  5673    JMP I BCDBI0  /RETURNS BINARY WORD IN AC.
6105  7400  LDIGIT,7400
6106  7760  MDIGIT,7760
              /
6107  0000  ROT,0
6110  7112    CLL RTR
6111  3013    DCA TEMP2
6112  1013    TAD TEMP2
6113  7010    RAR
6114  1013    TAD TEMP2
6115  7041    CIA
6116  1057    TAD TEMP1
6117  5707    JMP I ROT
              /
6120  0000  XMITX,0
6121  3014    DCA DATA      /DATA IN AC, FUNCTION IN NEXT WORD OF
6122  1366    TAD M100      /CALLING PROGRAM.
6123  3013    DCA TEMP2
6124  1720  TRY,TAD I XMITX
6125  6355    MUX FLOAD
6126  7200    CLA
6127  1014    TAD DATA
6130  6357    MUX DLOAD
6131  7200    CLA
6132  4354    JMS DELAY
6133  2013    ISZ TEMP2
6134  5342    JMP TEST
6135  4422    JMS I MESAGX      /PRINT ERROR MESSAGE AND ABORT AFTER 64 TE
6136  1525  TEXT "MU
6137  3077  X?
6140  0000  "
6141  5351    JMP MUSTDO
6142  6354  TEST,MUX FREAD
6143  7041    CIA
6144  1720    TAD I XMITX
6145  7640    SZA CLA
```

```
6146  5324     JMP TRY      /TRANSMISSION ERROR. TRY AGAIN!
6147  6353     MUX DAREAD
6150  7040     CMA
6151  2320  MUSTDO, ISZ XMITX
6152  5720     JMP I XMITX
               /
6153  7775  M3, -3
               /
6154  0000  DELAY, 0      / PROVIDES ABOUT AC X 38 USEC DELAY.
6155  7040     CMA
6156  3016     DCA TEMP
6157  1377  DELOOP, TAD MM10    /38 USEC LOOP.
6160  3057     DCA TEMP1
6161  2057     ISZ TEMP1
6162  5361     JMP .-1          /4.5 USEC LOOP, 8 LAPS.
6163  2016     ISZ TEMP
6164  5357     JMP DELOOP
6165  5754     JMP I DELAY
6166  7700  M100, -100
               /
6167  1060  MOVOFF, TAD COMMND
6170  0376     AND P3777        /TURN OFF MOVE ENABLE.
6171  4320     JMS XMITX
6172  5130     5130
6173  7200     CLA
6174  5775     JMP I BYEBYX
6175  6303  BYEBYX, BYEBYE
6176  3777  P3777, 3777
6177  7770  MM10, -10
               /
               *6400
6400  7640  SLIDES, SZA CLA     /ROUTINE TO HANDLE DARK, CORRECTOR SLIDES.
6401  5231     JMP CORREC
6402  1015     TAD COMMIN
6403  0271     AND PP30
6404  7112     CLL RTR
6405  7010     RAR
6406  7450     SNA
6407  5310     JMP MOVING
6410  1264     TAD MM2
6411  7540     SZA SMA
6412  5310     JMP MOVING
6413  7041     CIA
6414  3051     DCA ARG2
6415  1053     TAD ARG4
6416  7650     SNA CLA
6417  5676     JMP I EXITY      /NO MOVE
6420  1060     TAD COMMND
6421  0273     AND PP7757
6422  1267     TAD PP400
6423  3060     DCA COMMND
6424  1054     TAD ARG5
6425  7650     SNA CLA
6426  1263     TAD PP20
6427  1060     TAD COMMND
6430  5254     JMP SLDSET       /SET UP TO TEST FOR 10 OR 20.
               /
6431  1015  CORREC, TAD COMMIN
6432  0272     AND PP6
6433  7450     SNA
```

```
6434  5240      JMP BLUE
6435  1265      TAD MM5
6436  7510      SPA
6437  7240      CLA CMA
6440  3051   BLUE,DCA ARG2
6441  1053      TAD ARG4
6442  7650      SNA CLA
6443  5676      JMP I EXITY      /NO MOVE
6444  1060      TAD COMMND
6445  0266      AND PP7577
6446  1267      TAD PP400
6447  3060      DCA COMMND
6450  1054      TAD ARG5
6451  7640      SZA CLA
6452  1270      TAD PP200
6453  1060      TAD COMMND
6454  4674   SLDSET,JMS I XMITR
6455  5130        5130        /READ AND WRITE COMMAND BUFFER.
6456  7200        CLA
6457  1055   OUT,TAD ARG6
6460  7640        SZA CLA
6461  5675        JMP I SPECX    /NO WAIT=DON'T RELEASE MUX.
6462  5676        JMP I EXITY
                 /
6463  0020   PP20,20
6464  7776   MM2,-2
6465  7773   MM5,-5
6466  7577   PP7577,7577
6467  0400   PP400,400
6470  0200   PP200,200
6471  0030   PP30,30
6472  0006   PP6,6
6473  7757   PP7757,7757
6474  6120   XMITR,XMITX
6475  6304   SPECX,BYEBYE+1
6476  6303   EXITY,BYEBYE
                 /
                 PAUSE/SPC3
6477  4422   LIMIT,JMS I MESAGX
6500  2320   TEXT "SP
6501  0503   EC
6502  5614   .L
6503  1115   IM
6504  1124   IT
6505  0000   "
6506  5707   JMP I ERRORX
6507  6167   ERRORX,MOVOFF
                 /
6510  7240   MOVING,CLA CMA
6511  3050        DCA ARG1
6512  7040        CMA
6513  3051        DCA ARG2    /RETURN -1
6514  5676        JMP I EXITY  /RELEASE MUX
                 /
6515  0000   GRABX,0
6516  1273        TAD PP7757
6517  6355        MUX FLOAD
6520  6354        MUX FREAD
6521  7041        CIA
6522  1273        TAD PP7757
```

```
6523  7640      SZA CLA
6524  5316      JMP GRABX+1
6525  5715      JMP I GRABX
```

(86)

Dec 7, 1973

IMPROVED DEADTIME CORRECTION ROUTINE

Fig 4

```
.
.
.PALP
*OUT-S:PPUL
*
*IN-S:CON0,S:PPUL
*
*
*OPT-T

ADDER  6766

                /CON0
                XLIST
                PAUSE/
                //
                /  X DTIM(T,D,B)
                /  DEADTIME CORRECTION (DWELL TIME, 1/(131072*DEADTIME),B)
                / FINDS COUNTS+COUNTS*X/(1-X)
                /  X=<COUNTING RATE>*<DEADTIME>
                *KB1+66
0226   6600       DEDTIM
                *FNKB1+66
0732   2025       2025
                *6600
6600   0000    DEDTIM,0
6601   1054       TAD ARG5          /ARG5=BUFFER
6602   7650       SNA CLA
6603   1364       TAD P2000
6604   1364       TAD P2000
6605   3356       DCA LOW
6606   1356       TAD LOW
6607   1363       TAD P1000
6610   3355       DCA HIGH
6611   1365       TAD M512
6612   3357       DCA CHAN
6613   1053       TAD ARG4          /ARG4=1/(131072*DEADTIME<SEC>)
6614   3223       DCA RESULT
6615   1052       TAD ARG3          /ARG3=DWELL TIME <SEC>
6616   3232       DCA DT
6617   1756    LOOP,TAD I LOW          /RATIO=COUNTS/(D*T)
6620   7421       MQL
6621   1755       TAD I HIGH
6622   7407       DVI
6623   0000    RESULT,0
6624   7430       SZL
6625   5344       JMP OVRFLW
6626   7200       CLA
6627   7413       SHL               /TO PUT DEC. AT L. OF MQ0
6630   0006       6
6631   7407       DVI
6632   0000    DT,0
6633   7430       SZL
6634   5344       JMP OVRFLW
6635   7701        CLA!MQA
6636   7450       SNA
6637   5350       JMP WINDUP
6640   3362       DCA RATIO  /=4096*X, X=<COUNTING RATE>*<DEADTIME>
6641   3361       DCA FLG1
6642   7421       MQL
6643   1362       TAD RATIO
6644   7041       CIA
```

```
6645  3252      DCA SUM
6646  1362      TAD RATIO
6647  7417      LSR    /DIVIDE BY 2 TO PREVENT OVERFLOWS IN DVI.
6650  0000      Ø
6651  7407      DVI     /FINDS 2048*X/(1-X)
6652  0000    SUM,Ø
6653  7430      SZL
6654  5344      JMP OVRFLW
6655  7004      RAL
6656  7701      CLA!MQA
6657  7430      SZL
6660  7001      IAC         /ROUND OFF
6661  7100      CLL
6662  7430      SZL
6663  5344      JMP OVRFLW
6664  7004      RAL     /*2
6665  7430      SZL
6666  2361      ISZ FLG1   /=1 IF X/(1-X) >1
6667  3275      DCA MULT1    /MULTIPLY  <SGL.PREC.+(1)>*<DBL.PREC.>
6670  1275      TAD MULT1    / MULT1=4096*X/(1-X)
6671  3314      DCA MULT2
6672  3360      DCA CARRY
6673  1756      TAD I LOW    /START FORMING LOWER PREC. RESULT
6674  7425      MQL!MUY
6675  0000    MULT1,Ø
6676  3275      DCA MULT1
6677  7413      SHL
6700  0000      Ø
6701  3252      DCA SUM      / ROUND OFF
6702  1275      TAD MULT1
6703  4366      JMS ADDER
6704  1756      TAD I LOW
6705  4366      JMS ADDER
6706  1361      TAD FLG1
6707  7640      SZA CLA
6710  1756      TAD I LOW   /   IF X/(X-1)>1
6711  4366      JMS ADDER
6712  1755      TAD I HIGH
6713  7425      MQL!MUY
6714  0000    MULT2,Ø
6715  3314      DCA MULT2
6716  7501      MQA
6717  4366      JMS ADDER
6720  1252      TAD SUM
6721  3756      DCA I LOW
6722  1360      TAD CARRY   /START FORMING UPPER PREC. RESULT.
6723  3252      DCA SUM
6724  3360      DCA CARRY
6725  1314      TAD MULT2
6726  4366      JMS ADDER
6727  1755      TAD I HIGH
6730  4366      JMS ADDER
6731  1361      TAD FLG1
6732  7640      SZA CLA
6733  1755      TAD I HIGH   / IF X/(1-X)>1
6734  4366      JMS ADDER
6735  1252      TAD SUM
6736  7510      SPA
6737  5344      JMP OVRFLW
6740  3755      DCA I HIGH
```

```
6741  1360     TAD CARRY
6742  7450     SNA
6743  5350     JMP .+5
6744  7350  OVRFLW, CLL STA RAR     /SETS CHAN. CONTENTS TO 2↑23-1
6745  3755     DCA I HIGH
6746  7240     STA
6747  3756     DCA I LOW
6750  2356  WINDUP, ISZ LOW
6751  2355     ISZ HIGH
6752  2357     ISZ CHAN
6753  5217     JMP LOOP
6754  5600     JMP I DEDTIM
6755  0000  HIGH, 0
6756  0000  LOW, 0
6757  0000  CHAN, 0
6760  0000  CARRY, 0
6761  0000  FLG1, 0
6762  0000  RATIO, 0
6763  1000  P1000, 1000
6764  2000  P2000, 2000
6765  7000  M512, -1000
6766  0000  ADDER, 0       /SUBROUTINE TO ADD TO SUM,
6767  7100     CLL          /  ADD OVERFLOWS INTO CARRY.
6770  1252     TAD SUM
6771  3252     DCA SUM
6772  7430     SZL
6773  2360     ISZ CARRY
6774  5766     JMP I ADDER
```

.

```
*PALP
*OUT-S:SCAN
*
*IN-S:CONM,S:SCAN,S:POLS,S:SLIS
*
*
*
*
*OPT-T

ADCV    6532

                /CONM
                XLIST           LSTP, RSTP
                PAUSE   /       [illegible] (B,W,N,RS,S,1,Z)
                /
                /STEP: PROGRAM TO MOVE MICROPHOTOMETER LEFT OR RIGHT
                /VIA STEPPING MOTOR, AND SAVE DATA ON DISC. OPTIONS
                /TO CONVERT READINGS TO INTENSITIES, CORRECT ZERO
                /POINT ERROR. NOTE SCAN LEFT RECORDS DATA BACKWARDS
                /ON THE DISC.
                *RB1+66
0226    6241            STEPLF          /LSTP
0227    6200            STEPRT          /RSTP
                *PNKB1+66
0732    2060            2060
0733    0060            0060
                *6200
6200    0000            STEPRT, 0
6201    1366                    TAD STPRTA
6202    3773                    DCA I STEPA
6203    4760                    JMS I SETLSK
6204    7240                    CLA CMA
6205    3770                    DCA I XBINCR
6206    7240                    CLA CMA
6207    3771                    DCA I XLINCR
6210    1055                    TAD ARG6
6211    3216                    DCA MUL
6212    1055                    TAD ARG6
6213    3234                    DCA DVL2
6214    1350                    TAD P129
6215    7425                    MQL! MUY
6216    0000            MUL,    0
6217    7501                    MQA
6220    3225                    DCA DVD1
6221    1054                    TAD ARG5
6222    7421                    MQL
6223    1012                    TAD ARG5H
6224    7407                    DVI
6225    0000            DVD1,   0
6226    3014                    DCA ARG7H
6227    7501                    MQA
6230    1052                    TAD ARG3
6231    3052                    DCA ARG3
6232    1014                    TAD ARG7H
6233    7427                    MQL! DVI
6234    0000            DVD2,   0
6235    7501                    MQA
6236    1053                    TAD ARG4
6237    3754                    DCA I YWORD
6240    5257                    JMP START
6241    0000            STPPLF, 0
```

```
6242  7240          CLA CMA
6243  3015          LCA ARG8H          /INDICATES DIRECTION
6244  4762          JMS I SETLSZ
6245  1053          TAD ARG4
6246  3754          DCA I YWORD
6247  7201          CLA IAC
6250  3770          DCA I ASINCR
6251  7201          CLA IAC
6252  3771          DCA I ALINCR
6253  1241          TAD STEPLP
6254  3200          DCA STEPRT
6255  1365          TAD STPLP2
6256  3773          LCA I STEPX
6257  4763  START,  JMS I SETPLA
6260  1055          TAD ARG6
6261  7041          CIA
6262  3344          DCA RES            /SET UP RESOLUTION INDEX
6263  1055          TAD ARG6
6264  3335          DCA DIVIS
6265  4761          JMS I SETLSY
6266  3345          DCA DATSUM
6267  3346          DCA SUMDAT
6270  5753          JMP I ACLOCA       /START CLOCA
6271  7300  SDATA,  CLA CLL
6272  1347          TAD M4
6273  3351          DCA READ
6274  7300  SREAD,  CLA CLL            /TURN OFF INTERRUPT
6275  6002          6002               /READS A/D INTO ACCUMULATION
6276  6532          ADCV
6277  6531          ADSF
6300  5277          JMP .-1
6301  6534          ADRB
6302  7152          CLL CMA RTR
6303  0367          AND P1777
6304  7100          CLL
6305  1345          TAD DATSUM         /DATA
6306  3345          DCA DATSUM
6307  2351          ISZ READ
6310  5274          JMP SREAD
6311  1345          TAD DATSUM         /AVERAGE 4 READINGS
6312  7110          CLL RAR
6313  7110          CLL RAR            /ZERO POINT CORRECTION
6314  1060          TAD ARG9           /DATA
6315  3051          DCA ARG2
6316  3345          DCA DATSUM
6317  1057          TAD ARG8           /INTENSITIES?
6320  7440          SZA
6321  4752          JMS I ARUNC
6322  7300  RESOLV, CLA CLL
6323  1451          TAD ARG2
6324  1346          TAD SUMDAT
6325  3346          DCA SUMDAT         /RESOLUTION ELEMENT TEST
6326  2344          ISZ RES
6327  5755          JMP I ACONT
6330  1055          TAD ARG6
6331  7041          CIA
6332  3344          DCA RES            /RESET RES. TEST
6333  1346          TAD SUMDAT
6334  7427          MQL! LAI           /AVERAGE
6335  0000  DIVIS,  0
```

```
6336  7701
6337  4756
6340  7300
6341  3346
6342  3345
6343  5755
6344  0000
6345  0000
6346  0000
6347  7774
6350  0201
6351  0000
6352  6151
6353  6042
6354  6564
6355  6060
6356  6400
6357  0177
6360  6520
6361  6531
6362  6544
6363  6116
6364  0000
6365  6332
6366  6331

6367  1777
6370  6560
6371  6561
6372  0000
6373  6114

*6042

6042  1356
6043  7041
6044  1342
6045  7450
6046  5253
6047  7300
6050  1343
6051  1342
6052  3342
6053  1342
6054  7040
6055  6334
6056  6335
6057  5744
6060  2372
6061  5312
6062  1345
6063  7650
6064  5277
6065  2373
6066  5312
6067  7240
6070  3343
6071  3345
6072  1356
6073  7041

        CLA! AOA
        JMS I LISTX
        CLO CLL
        LCA SUMDAT      /REINITIALIZE
        DCA DATSUM
        JMP I ACONT
RES,    0
DATSUM, 0
SUMDAT, 0
M4,     7774
P129,   201
READ,   0
XFUNC,  FUNCON
XCLOCK, SCLOCK
YWORD,  SWORD
XCONT,  SCONT
LISTX,  SLIST
P177,   177
SETLSX, SETLS1
SETLSY, SETLS2
SETLSZ, SETLS3
SETPLX, SETPUL
STPULS, 0
STPLPZ, 6332
STPRTZ, 6331
ATCV=6532
ALSF=6531
ALRB=6534
P1777,  1777
XBINCR, BINCR
XLINCR, LINCR
XDLS,   2
STEPX,  STEP

SCLOCK, TAD ARG7
        CLO
        TAD RAMP        /INCREASE RAMP UNTIL SPEED
        SNA
        JMP SET
        CLA CLL
        TAD INCR        /RAMP UP OR RAMP DOWN
        TAD RAMP
        DCA RAMP
SET,    TAD RAMP
        CMA             /LOAD COUNTER
        6334            /START CLOCK
        6335
        JMP I ADATE
SCONT,  ISZ COUNT1      /CONTINUE
        JMP SPULSE
        TAD LAST
        SNA CLA
        JMP SEND
        ISZ COUNT2      /CONTINUE
        JMP SPULSE
SLOWDN, CLA CMA
        DCA INCR        /LAST TIME THROUGH
        DCA LAST
        TAD ARG7
        CIA
```

```
6074  3372
6075  2056
6076  5312
6077  6313
6100  1053
6101  3771
6102  1746
6103  3747
6104  1364
6105  3770
6106  1015
6107  7650
6110  2017
6111  5756
6112  6336
6113  5312
6114  0000
6115  5242
6116  0000
6117  7201
6120  3343
6121  3342
6122  1364
6123  3345
6124  3770
6125  1060
6126  7041
6127  3060
6130  1012
6131  7040
6132  3373
6133  1054
6134  7141
6135  1056
6136  7430
6137  2373
6140  3372
6141  5716
6142  0000
6143  0001
6144  6271
6145  1111
6146  6200
6147  6400
6150  6407
6151  0000
6152  1364
6153  3766
6154  7421
6155  1051
6156  7417
6157  0002
6160  1367
6161  4765
6162  3051
6163  5751
6164  6030
6165  5441
6166  5541
6167  5100
```

```
                DCA COUNT1          /RAMP DOWN
                ISZ ARG7
                JMP SPULSE
SEND,           6313                /SHUT OFF POWER
                TAD ARG4
                DCA I XWORD
                TAD I STEPRX
                DCA I LISTY
                TAD P3096
                DCA I STOP
                TAD ARG8H           /MOVING LEFT OR RIGHT?
                SNA CLA             /CORRECT LAST SLOCK ADDRESS
                ISZ ARG10H          /STORE LAST READING5
                JMP I XSTORE        /SKIP ON TIME
SPULSE,         6336
                JMP .-1             /PULSE TO STEPPER
STEP,           0                   /CONTINUE
                JMP SCLOCK
SETPOL,         0
                CLA IAC
                DCA INCR
                DCA RAMP
                TAD P3096
                DCA LAST
                DCA I STOP
                TAD ARG9
                CIA                 /ZERO POINT CORRECTION
                DCA ARG9            /STEPS IN DSL. PRECISION
                TAD ARG5H
                CMA
                DCA COUNT2
                TAD ARG5
                CIA CLL             /CORRECTS FOR SLOWDOWN RAMP
                TAD ARG7
                SZL
                ISZ COUNT2
                DCA COUNT1
                JMP I SETPOL
RAMP,           0
INCR,           0001
XDATA,          SDATA
LAST,           1111
STEPRX,         STEPRT
LISTY,          SLIST
XSTORE,         STORE
FUNCON,         0                   /USE ONLY ONE FUNCTION
                TAD P3096
                DCA I XMULR         /CLEAR MQ
                MQL                 /LOTO INPUT
                TAD ARG2
                LSR
                2
                TAD BUFBCX
                JMS I XFCALC
                DCA ARG2
                JMP I FUNCON
P3096,          6030
XFCALC,         5441
XMULR,          5541
BUFBCX,         5100
```

```
6170  6572            STOPX,  STOPX
6171  6564            SWORD,  SWORD
6172  0000            COUNT1, 0
6173  0000            COUNT2, 0
                *6400
6400  0000  SLIST,    0           /ENTER WITH DATA IN ACC.
6401  3763            DCA I INDEX     /SAVE DATA IN LIST
6402  1361            TAD LINCR       /NEXT LOCATION
6403  1363            TAD INDEX
6404  3363            DCA INDEX
6405  2362            ISZ CNTRX       /LIST FULL?
6406  5600            JMP I SLIST
6407  1372  STORE,    TAD STOPX
6410  7650            SNA CLA
6411  5217            JMP WCONT
6412  1362            TAD CNTRX
6413  7041            CIA
6414  1365            TAD M129
6415  7650            SNA CLA
6416  5303            JMP SHALT
6417  1016  WCONT,    TAD ARG9H
6420  7640            SZA CLA
6421  5224            JMP .+3
6422  6622                        /DFSC   PREVIOUS WRITE COMPLETE?
6423  5222            JMP .-1
6424  1362            TAD CNTRX
6425  7041            CIA
6426  3013            DCA ARG6L
6427  1015            TAD ARG6H
6430  7640            SZA CLA
6431  3013            DCA ARG6H       /CORRECTS STARTING ADDRESS OF
6432  1362            TAD CNTRX       /INCOMPLETE BLOCK WRITING
6433  7041            CIA
6434  1365            TAD M129        /RESET COUNTER
6435  3362            DCA CNTRX
6436  1366            TAD FLIP
6437  7640            SZA CLA
6440  5311            JMP SWITCH
6441  1365            TAD M129
6442  3366            DCA FLIP
6443  1353            TAD LIST2       /SWITCH LISTS
6444  3363            DCA INDEX
6445  1354            TAD SLIST1
6446  1013            TAD ARG6H
6447  3367            DCA BUFFER      /LOCATION OF DATA
6450  1362  SWRITE,   TAD CNTRX
6451  6201            CDF
6452  3770            DCA I DISWC
6453  6211            CDF 10
6454  7240            CLA CMA
6455  1367            TAD BUFFER
6456  6201            CDF
6457  3771            DCA I DISCA
6460  6211            CDF 10
6461  1017            TAD ARG10H
6462  7425            MQL! MUY
6463  0201            201
6464  7106            CLL RTL
6465  7106            CLL RTL
6466  7106            CLL RTL
```

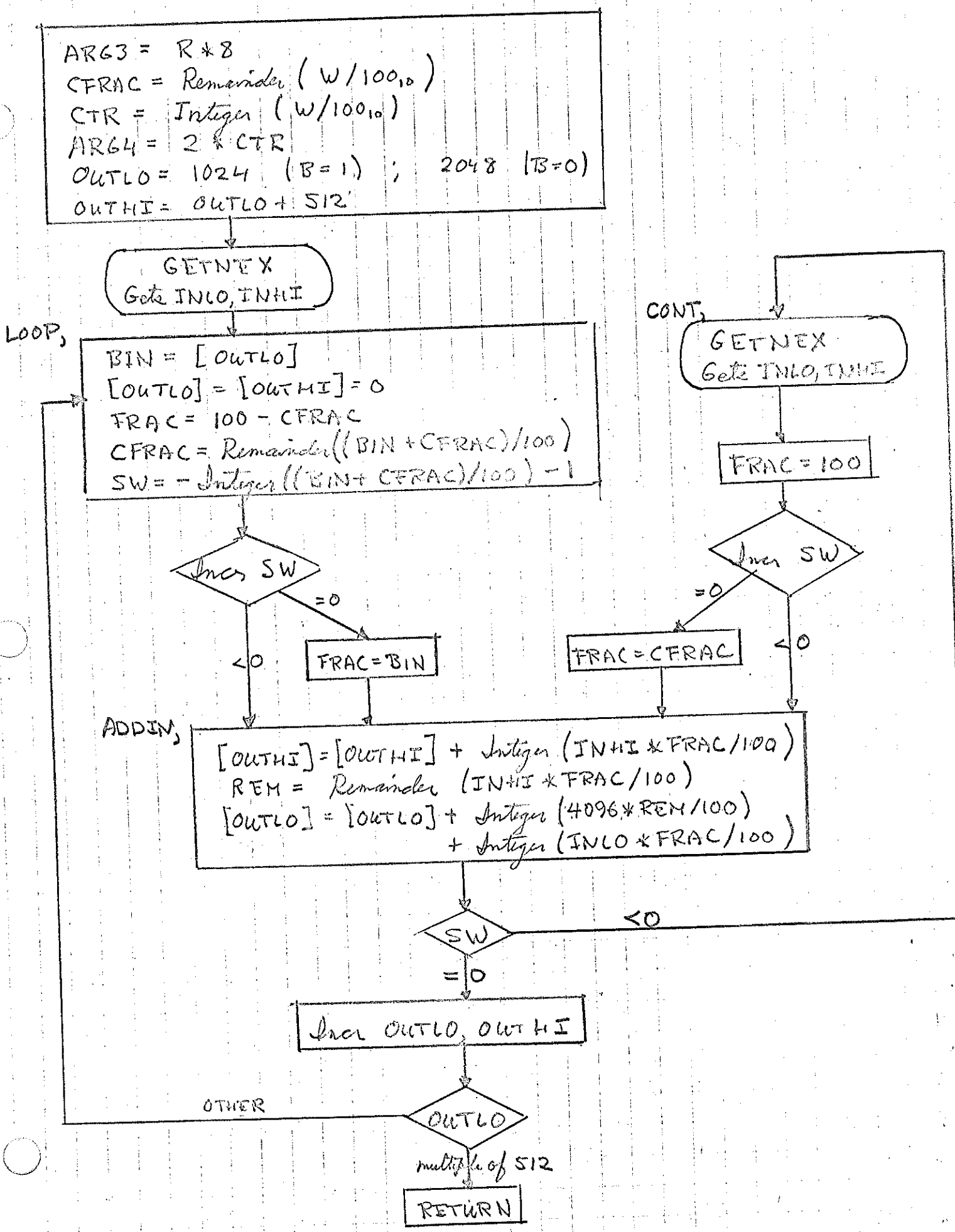
```
6467  1373          TAD P10
6470  6615          6615    /DEAL
6471  7701          CLA! MQA
6472  1364          TAD SWORD
6473  6605          6605    /DMAW WRITE1
6474  1017          TAD ARG10H      /BLOCK ADDRESS
6475  1360          TAD BINCR
6476  3017          DCA ARG10H      /UPDATE
6477  3016          DCA ARG9H       /WRITE ACCOMPLISHED
6500  1372          TAD STOPX
6501  7650          SNA CLA
6502  5600          JMP I SLIST     /DFSC   DISC FINISHED
6503  6622  SHALT,  6622
6504  5303          JMP .-1         /DFSE   DISC ERROR?
6505  6621          6621
6506  5132          JMP KILALL      /DCMA (CLEAR)
6507  6601  DSEXIT, 6601
6510  5600          JMP I SLIST
6511  1352  SWITCH, TAD LIST1
6512  3363          DCA INDEX
6513  1355          TAD BLIST2
6514  1013          TAD ARG6H
6515  3367          DCA BUFFER
6516  3366          DCA FLIP
6517  5250          JMP SWRITE
6520  0000  SETLS1, 0
6521  1356          TAD ELIST1
6522  3352          DCA LIST1
6523  1357          TAD ELIST2      /SET UP REVERSE LISTING
6524  3353          DCA LIST2
6525  7240          CLA CMA
6526  1052          TAD ARG3
6527  3052          DCA ARG3
6530  5720          JMP I SETLS1
6531  0000  SETLS2, 0
6532  1365          TAD M129        /SET UP LIST COUNTER
6533  3362          DCA CNTRX       /PREPARE TO USE LIST1
6534  1352          TAD LIST1
6535  3363          DCA INDEX
6536  1052          TAD ARG3        /BLOCK ADDRESS
6537  3017          DCA ARG10H
6540  3372          DCA STOPX
6541  1373          TAD P10
6542  3016          DCA ARG9H
6543  5731          JMP I SETLS2
6544  0000  SETLS3, 0
6545  1354          TAD BLIST1
6546  3352          DCA LIST1
6547  1355          TAD BLIST2
6550  3353          DCA LIST2
6551  5744          JMP I SETLS3
6552  6577  LIST1, 6577
6553  7577  LIST2, 7577
6554  6577  BLIST1, 6577
6555  7577  BLIST2, 7577
6556  6777  ELIST1, 6777
6557  7777  ELIST2, 7777
6560  0001  BINCR, 0001
6561  0001  LINCR, 0001
6562  0000  CNTRX, 0
```

```
6563  0000        INDEX,  0
6564  0000        SWORD,  0
6565  7577        M129,   7577
6566  0000        FLIP,   0
6567  0000        BUFFER, 0
6570  7750        DISWC,  7750
6571  7751        DISCA,  7751
6572  0000        STORX,  0
6573  0010        P10,    10
```

```
.PALP
*OUT-S:SCRN
*
*IN-S:CON0,S:SCRN
*
*
*OPT-T

ADDHI   6362

                /CON0
                XLIST
                PAUSE/X SCRN(R,W,B)
                /SCRUNCHES SCANNER DATA IN DISK RECORDS R,R+1... INTO A
                /512 WORD TABLE OF BIN SIZES IN BUFFER B. DISK RECORDS
                /MUST BE IN DOUBLE PRECISION PAIRED FORMAT: HIGH(0),
                /LOW(0),HIGH(1),LOW(1),...,HIGH(511),LOW(511). W SPECIFIES
                /THE POSITION IN THE UNSCRUNCHED DATA OF THE LEFT EDGE OF
                /BIN 0, TIMES 100: FOR INSTANCE THE MIDDLE OF CHANNEL 1
                /HAS W=150. THE BIN SIZE TABLE CONTAINS THE NUMBER OF UN-
                /SCRUNCHED CHANNELS, TIMES 100, IN EACH SCRUNCHED CHANNEL
                /(SINGLE PRECISION ONLY, AND >0 OR =0).
                /
                INLO=ARG2
                BIN=ARG6
                CFRAC=ARG7
                CTR=ARG8
                OUTLO=ARG9
                OUTHI=ARG10
                INHI=ARG6H
                REM=ARG7H
                SW=ARG8H
                /
                *FNKB1+67
0733    3036    3036
                *KB1+67
0227    6200    SCRN
                *6200
6200    0000    SCRN,0
6201    7300            CLA CLL /SET UP DISK POINTERS AND WORD COUNTER
6202    1053            TAD ARG4
6203    7421            MQL
6204    1011            TAD ARG4H
6205    7407            DVI
6206    0144    P144,144
6207    3056            DCA CFRAC
6210    7407            DVI
6211    1000    P1000,1000
6212    3057            DCA CTR
6213    1057            TAD CTR
6214    7004            RAL
6215    3053            DCA ARG4
6216    7501            MQA
6217    1052            TAD ARG3
6220    7104            CLL RAL
6221    7106            CLL RTL
6222    3052            DCA ARG3
6223    1054            TAD ARG5        /SET UP BUFFER ADDRESSES
6224    7650            SNA CLA
6225    1370            TAD P2000
```

```
6226  1370          TAD P2000
6227  3060          DCA OUTLO
6230  1060          TAD OUTLO
6231  1211          TAD P1000
6232  3061          DCA OUTHI
6233  4324          JMS GETNEX      /GET FIRST UNSCRUNCHED CHANNEL
6234  1460  LOOP,   TAD I OUTLO     /LOOP FOR EACH BIN
6235  3055          DCA BIN /GET BIN SIZE
6236  3460          DCA I OUTLO
6237  3461          DCA I OUTHI
6240  1056          TAD CFRAC
6241  7041          CIA
6242  1206          TAD P144
6243  3346          DCA FRAC        /FRACTION OF FIRST UNSCRUNCHED CH.
6244  1055          TAD BIN
6245  1056          TAD CFRAC
6246  7421          MQL
6247  7407          DVI
6250  0144          144
6251  3056          DCA CFRAC       /FRACTION OF LAST UNSCRUNCHED CH.
6252  7501          MQA
6253  7040          CMA
6254  3015          DCA SW  /COUNTER WITHIN BIN LOOP
6255  2015          ISZ SW
6256  5261          JMP ADDIN
6257  1055          TAD BIN
6260  3346          DCA FRAC
6261  1013  ADDIN,  TAD INHI  /ADD INTO BIN
6262  7510          SPA
6263  7040          CMA
6264  4343          JMS MULT
6265  3014          DCA REM
6266  4362          JMS ADDHI
6267  7421          MQL
6270  4362          JMS ADDHI
6271  1014          TAD REM
6272  7407          DVI
6273  0144          144
6274  4352          JMS ADDLO       /REMAINDER OF HIGH ORDER WORD
6275  1051          TAD INLO
6276  7421          MQL
6277  4771          JMS I NEGLOX
6300  4343          JMS MULT
6301  4352          JMS ADDLO       /LOW ORDER WORD
6302  1015          TAD SW
6303  7710          SPA CLA
6304  5314          JMP CONT
6305  2060          ISZ OUTLO       /GO TO NEXT BIN
6306  2061          ISZ OUTHI
6307  1060          TAD OUTLO
6310  0367          AND P777
6311  7640          SZA CLA
6312  5234          JMP LOOP
6313  5600          JMP I SCRN      /QUIT IF OUTLO A MULTIPLE OF 512
6314  4324  CONT,   JMS GETNEX /CONTINUE BIN LOOP
6315  1206          TAD P144
6316  3346          DCA FRAC
6317  2015          ISZ SW
6320  5261          JMP ADDIN
6321  1056          TAD CFRAC
```

```
6322  3346            DCA FRAC
6323  5261            JMP ADDIN
6324  0000  GETNEX,0
6325  4541            JMS I GETWRX     /GET UNSCRUNCHED WORD FROM DISK
6326  1051            TAD ARG2
6327  3013            DCA INHI
6330  2053            ISZ ARG4
6331  4541            JMS I GETWRX
6332  2053            ISZ ARG4
6333  2057            ISZ CTR
6334  1057            TAD CTR
6335  0367            AND P777
6336  7640            SZA CLA
6337  5724            JMP I GETNEX
6340  3053            DCA ARG4         /IF DISK WORD COUNTER A MULTIPLE
6341  2052            ISZ ARG3         /OF 512,GO TO NEXT RECORD
6342  5724            JMP I GETNEX
6343  0000  MULT,0    /WORD TIMES FRAC OVER 100
6344  7421            MQL
6345  7405            MUY
6346  0000  FRAC,0
6347  7407            DVI
6350  0144            144
6351  5743            JMP I MULT
6352  0000  ADDLO,0   /ADD INTO LOW ORDER BIN WORD
6353  4771            JMS I NEGLOX
6354  1460            TAD I OUTLO
6355  3460            DCA I OUTLO
6356  7430            SZL
6357  2461            ISZ I OUTHI      /CARRY 1
6360  7100            CLL
6361  5752            JMP I ADDLO
6362  0000  ADDHI,0   /ADD INTO HIGH ORDER BIN WORD
6363  4772            JMS I NEGHIX
6364  1461            TAD I OUTHI
6365  3461            DCA I OUTHI
6366  5762            JMP I ADDHI
6367  0777  P777,777
6370  2000  P2000,2000
6371  6150  NEGLOX,NEGLO
6372  6165  NEGHIX,NEGHI
            *6150
6150  0000  NEGLO,0   /CHECK SIGN FOR LOW ORDER WORD
6151  7300            CLL CLA
6152  1013            TAD INHI
6153  7710            SPA CLA
6154  7120            STL
6155  7501            MQA
6156  7430            SZL
6157  7061            CML CIA
6160  5750            JMP I NEGLO
            *6165
6165  0000  NEGHI,0   /CHECK SIGN FOR HIGH ORDER WORD
6166  7300            CLL CLA
6167  1013            TAD INHI
6170  7710            SPA CLA
6171  7120            STL
6172  7501            MQA
6173  7430            SZL
6174  7060            CMA CML
6175  5765            JMP I NEGHI
```


ARG3 = R*8
CFRAC = Remainder (W/100₁₀)
CTR = Integer (W/100₁₀)
ARG4 = 2*CTR
OUTLO = 1024 (B=1) ; 2048 (B=0)
OUTHI = OUTLO + 512
GETNEX
Get INLO, INHI
LOOP,
BIN = [OUTLO]
[OUTLO] = [OUTHI] = 0
FRAC = 100 - CFRAC
CFRAC = Remainder((BIN + CFRAC)/100)
SW = - Integer((BIN + CFRAC)/100) - 1
Incr SW
=0
<0
FRAC = BIN
CONT,
GETNEX
Get INLO, INHI
FRAC = 100
Incr SW
=0
<0
FRAC = CFRAC
ADDIN,
[OUTHI] = [OUTHI] + Integer (INHI*FRAC/100)
REM = Remainder (INHI*FRAC/100)
[OUTLO] = [OUTLO] + Integer (4096*REM/100)
+ Integer (INLO*FRAC/100)
SW
<0
=0
Incr OUTLO, OUTHI
OUTLO
OTHER
multiple of 512
RETURN

NAME(4)

(ENAP → 6400
KB1+68)

Received from K. Nordsieck
April 25, 1973

```
.ALP
*OUT-S:PAIR
*
*IN-S:CON0,S:PAIR
*
*
*OPT-T

ADR     6112
ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /X PAIR(N,B)
                /TAKES N LOW ORDER WORDS AND N HIGH ORDER WORDS FROM
                /BUFFER B, STARTING WITH CHANNEL 0, AND PAIRS THEM
                /IN THE ORDER   HIGH(0),LOW(0),HIGH(1),LOW(1) ... .
                /RESULT IS IN THE OTHER BUFFER, WITH BUFFER B
                /UNAFFECTED. DEFAULT: IF N <0, =0, OR >512, SETS
                /N = 512.
                /
                OUT=10
                INLO=11
                INHI=12
                /
                *FNKB1+66
0732    3532    3532
                *KB1+66
0226    6042    PAIR
                *6042
6042    0000    PAIR,0
6043    7200            CLA
6044    1052            TAD ARG3
6045    7540            SMA SZA
6046    5251            JMP .+3
6047    7200            CLA
6050    1305            TAD P1000
6051    1306            TAD M1000
6052    7540            SMA SZA
6053    7200            CLA
6054    1305            TAD P1000
6055    7041            CIA
6056    3303            DCA CTR
6057    1312            TAD ADR
6060    3304            DCA BUF
6061    1053            TAD ARG4
6062    7640            SZA CLA
6063    2304            ISZ BUF
6064    1704            TAD I BUF
6065    3310            DCA OUT
6066    2304            ISZ BUF
6067    1704            TAD I BUF
6070    3311            DCA INLO
6071    1311            TAD INLO
6072    1305            TAD P1000
6073    3312            DCA INHI
6074    1412    LOOP,TAD I INHI
6075    3310            DCA I OUT
6076    1411            TAD I INLO
```

```
6077  3410            DCA I OUT
6100  2303            ISZ CTR
6101  5274            JMP LOOP
6102  5642            JMP I PAIR
6103  0000  CTR,0
6104  0000  BUF,0
6105  1000  P1000,1000
6106  7000  M1000,-1000
6107  1777  P1777,1777
6110  3777              3777
6111  1777              1777
6112  6107  ADR,P1777
```

(102)

File 3
Sept. 1973

```
.PALP
*OUT-S:SEEK
*
*IN-S:CON0,S:SEEK
*
*
*OPT-T


ARG1    0050
ARG10   0061

                /CON0
                XLIST
                PAUSE/  S D=FSEEK(THRESHOLD,REPLACE?,DEFAULT,L,U)
                /
                /  COARSE PEAK FINDER AND WILD POINT DESTROYER. LOOKS IN
                /BUFF. 0 FOR VALUES > THRESHOLD (DBL. PREC.). RETURNS CHANNE
                / NUMBER OF CENTER OF PEAK TO BUFF. 1 (DOES THIS FOR ALL
                /PEAKS). IF 'REPLACE' IS NON-ZERO, THE PEAK IS REPLACED
                /BY 'DEFAULT' (DBL. PREC.). RUNS FROM CHANNEL L TO U.
                /# OF PEAKS FOUND IS RETURNED AS D, CHAN. 0, BUFF. 1.
                /
                ARG3H=10
                ARG5H=12
                *KB1+67
0227  6200        SEEK
                *FNKB1+67
0733  3063        3063
                *6200
6200  0000    SEEK,0
6201  1344        TAD P2000       /CLEAR BUFF. 1
6202  7041        CIA
6203  3350        DCA CHANCT
6204  1344        TAD P2000
6205  3352        DCA LOW
6206  3752    CLEAR,DCA I LOW
6207  2352        ISZ LOW
6210  2350        ISZ CHANCT
6211  5206        JMP CLEAR
6212  1056        TAD ARG7        /SET # OF CHANS.
6213  7450        SNA             /0 DEFAULT=512 CHANS.
6214  1347        TAD P511
6215  7040        CMA
6216  1055        TAD ARG6
6217  3350        DCA CHANCT
6220  1055        TAD ARG6        /SET 1ST CHAN.
6221  1345        TAD P4000
6222  3352        DCA LOW
6223  1352        TAD LOW
6224  1343        TAD P1000
6225  3351        DCA HIGH
6226  1344        TAD P2000       /START IN CHAN 1 OF BUFF 1
6227  3353        DCA OUTCHN
6230  7100        CLL             /CIA THRESHOLD
6231  1052        TAD ARG3
6232  7041        CIA
6233  3052        DCA ARG3
6234  1010        TAD ARG3H
6235  70$0        CMA
6236  7430        SZL
```

change to 6600 ← NOW STARTS AT 6600

```
6237  7001     IAC
6240  3010     DCA ARG3H
6241  3354     DCA CHECK    /CLEAR CHECK
6242  1351  LOOP, TAD HIGH  /TEST FOR CHAN>511
6243  1344     TAD M6000
6244  7700     SMA CLA
6245  5321     JMP WINDUP
6246  7100     CLL
6247  1752     TAD I LOW
6250  1052     TAD ARG3
6251  7200     CLA
6252  1751     TAD I HIGH
6253  1010     TAD ARG3H
6254  7430     SZL
6255  7001     IAC
6256  7710     SPA CLA
6257  5301     JMP LITTLE      /IF NUMBER<THRESHOLD
6260  1053     TAD ARG4
6261  7650     SNA CLA
6262  5267     JMP TSTCHK
6263  1054     TAD ARG5        /SET CHANNEL TO DEFAULT
6264  3752     DCA I LOW
6265  1012     TAD ARG5H
6266  3751     DCA I HIGH
6267  1354  DSTCHK,TAD CHECK
6270  7640     SZA CLA
6271  5315     JMP INCRMT
6272  7001     IAC
6273  3354     DCA CHECK
6274  2353     ISZ OUTCHN
6275  1352     TAD LOW
6276  1345     TAD M4000
6277  3753     DCA I OUTCHN  /1ST CHAN. # OF PEAK TO BUFF.1
6300  5315     JMP INCRMT
6301  1354  LITTLE,TAD CHECK
6302  7650     SNA CLA
6303  5314     JMP CHKSET
6304  1753     TAD I OUTCHN
6305  7041     CIA
6306  1352     TAD LOW
6307  1345     TAD M4000
6310  7100     CLL
6311  7010     RAR      /HALF WIDDH OF PEAK
6312  1753     TAD I OUTCHN
6313  3713     DCA I OUTCHN    /MIDPOINT OF PEAK
6314  3354  CHKSET,DCA CHECK   /CLEARS CHECK
6315  2352  INCRMT,ISZ LOW
6316  2351     ISZ HIGH
6317  2350     ISZ CHANCT
6320  5242     JMP LOOP
6321  1354  WINDUP,TAD CHECK
6322  7650     SNA CLA
6323  5334     JMP FINALE
6324  1753     TAD I OUTCHN  /THIS SECTION IF FINAL PEAK
6325  7041     CIA           /RUNS OFF END OF BUFFER.
6326  1352     TAD LOW
6327  1345     TAD M4000
6330  7100     CLL
6331  7010     RAR
6332  1753     TAD I OUTCHN
```

```
6333  3753      DCA I OUTCHN
&334  1353  FINALE,TAD OUTCHN  /PASS BACK # OF PEAKS FOUND.
6335  1346      TAD M2000
6336  3744      DCA I P2000
6337  1744      TAD I P2000
6340  3051      DCA ARG2
6341  3050      DCA ARG1
6342  5600      JMP I SEEK
6343  1000  P1000,1000
6344  2000  P2000,2000
6345  4000  M4000,4000
6346  6000  M2000,-2000
6347  0777  P511,777
6350  0000  CHANCT,0
6351  0000  HIGH,0
6352  0000  LOW,0
6353  0000  OUTCHN,0
6354  0000  CHECK,0
            P4000=M4000
            M6000=P2000
```

```
 PALP
*OUT-S:SHOV
*
*IN-S:CON0,S:SHOV
*
*
*OPT-T

ARG1    0050

                /CON0
                XLIST
                PAUSE/ X SHOV(R1,N,S,R2);  R1=1ST DATA RECORD,
                /S=SHIFT BY S CHANNELS    -512<S<+512
                / N=# CHANNELS, R2=OVERFLOW RECORD
                INLO=ARG6
                OUTLO=ARG7
                INHI=ARG8
                OUTHI=ARG9
                OUTBLK=ARG10
                *KB1+67  75
0227  6400        SHOV
                *FNKB1+67 75
0733  3516        3516
                *6400
6400  0000      SHOV,0
6401  1052        TAD ARG3
6402  7106        CLL RTL
6403  7004        RAL                 /8*R1
6404  3350        DCA R18
6405  1055        TAD ARG6
6406  7106        CLL RTL
6407  7004        RAL
6410  3061        DCA OUTBLK
6411  1053        TAD ARG4
6412  7450        SNA
6413  5600        JMP I SHOV
6414  3355        DCA N
6415  1054        TAD ARG5
6416  7450        SNA
6417  5600        JMP I SHOV          /RETURN IF S=0
6420  7510        SPA
6421  1361        TAD P512
6422  3351        DCA S
6423  1351        TAD S
6424  7550        SPA SNA
6425  5600        JMP I SHOV
6426  7041        CIA
6427  1361        TAD P512
6430  7750        SPA SNA CLA         /RETURN IF ABS(S)>511
6431  5600        JMP I SHOV
6432  7240        STA
6433  3752        DCA I FLAG
6434  1351        TAD S
6435  7041        CIA
6436  3347        DCA CTR
6437  1353        TAD PP3777
6440  3056        DCA OUTLO
6441  1354        TAD PP4777
6442  3060        DCA OUTHI
```

```
6443  4326      JMS ZERO
6444  1350      TAD R18
6445  3746      DCA I IINBLK
6446  1355      TAD N
6447  7041      CIA
6450  3347      DCA CTR
6451  1353      TAD PP3777
6452  3055      DCA INLO
6453  2055    SHOVER,ISZ INLO
6454  2057      ISZ INHI
6455  1055      TAD INLO
6456  1356      TAD M3000
6457  7700      SMA CLA
6460  4745      JMS I READ1
6461  2056      ISZ OUTLO
6462  2060      ISZ OUTHI
6463  1056      TAD OUTLO
6464  1357      TAD M5000
6465  7700      SMA CLA
6466  4744      JMS I WRITE1
6467  1455      TAD I INLO
6470  3456      DCA I OUTLO
6471  1457      TAD I INHI
6472  3460      DCA I OUTHI
6473  4523      ~~JMS I FLAGX~~ OPR
6474  7200      CLA
6475  2347      ISZ CTR
6476  5253      JMP SHOVER
6477  1351      TAD S
6500  1360      TAD M512
6501  3347      DCA CTR
6502  4326      JMS ZERO
6503  1055      TAD INLO
6504  1362      TAD MM2000
6505  7750      SPA SNA CLA
6506  5324      JMP WINDUP
6507  2055    NOSHFT,ISZ INLO
6510  2057      ISZ INHI
6511  2056      ISZ OUTLO
6512  2060      ISZ OUTHI
6513  1055      TAD INLO
6514  1356      TAD M3000
6515  7700      SMA CLA
6516  5324      JMP WINDUP
6517  1455      TAD I INLO
6520  3456      DCA I OUTLO
6521  1457      TAD I INHI
6522  3460      DCA I OUTHI
6523  5307      JMP NOSHFT
6524  4744    WINDUP,JMS I WRITE1
6525  5600      JMP I SHOV
6526  0000    ZERO,0
6527  2056      ISZ OUTLO
6530  2060      ISZ OUTHI
6531  1056      TAD OUTLO
6532  1357      TAD M5000
6533  7700      SMA CLA
6534  4744      JMS I WRITE1
6535  3456      DCA I OUTLO
6536  3460      DCA I OUTHI
```

```
6537  4523      ~~JMS I FLAGX~~ OPR
6540  7200      CLA
6541  2347      ISZ CTR
6542  5327      JMP ZERO+1
6543  5726      JMP I ZERO
6544  6600    WRITE1,WRITE
6545  6636    READ1,READ
6546  6677    IINBLK,INBLK
6547  0000    CTR,0
6550  0000    R18,0
6551  0000    S,0
6552  6673    FLAG,FLGR28
6553  3777    PP3777,3777
6554  4777    PP4777,4777
6555  0000    N,0
6556  5000    M3000,5000
6557  3000    M5000,3000
6560  7000    M512,7000
6561  1000    P512,1000
6562  6000    MM2000,6000
              *6600
6600  0000    WRITE,0
6601  1061      TAD OUTBLK
6602  3052      DCA ARG3
6603  3053      DCA ARG4
6604  1267      TAD M2000
6605  3270      DCA CORECT
6606  1271      TAD P4000
6607  3272      DCA CORE
6610  1672    OUTLP,TAD I CORE
6611  3054      DCA ARG5
6612  4540      JMS I KB1
6613  3052      DCA ARG3
6614  4523      ~~JMS I FLAGX~~ OPR
6615  7200      CLA
6616  2272      ISZ CORE
6617  2270      ISZ CORECT
6620  5210      JMP OUTLP
6621  2273      ISZ FLGR28
6622  5226      JMP .+4
6623  1674      TAD I IR18
6624  3061      DCA OUTBLK
6625  5231      JMP .+4
6626  1061      TAD OUTBLK
6627  1275      TAD P8
6630  3061      DCA OUTBLK
6631  1271      TAD P4000
6632  3056      DCA OUTLO
6633  1276      TAD P5000
6634  3060      DCA OUTHI
6635  5600      JMP I WRITE
6636  0000    READ,0
6637  1277      TAD INBLK
6640  3052      DCA ARG3
6641  3053      DCA ARG4
6642  1267      TAD M2000
6643  3270      DCA CORECT
6644  1300      TAD P2000
6645  3272      DCA CORE
6646  4541    INLP,JMS I GETWRX
```

```
6647  3052      DCA ARG3
6650  1051      TAD ARG2
6651  3672      DCA I CORE
6652  4523      ~~JMS I FLAGX~~ OPR
6653  7200      CLA
6654  2272      ISZ CORE
6655  2270      ISZ CORECT
6656  5246      JMP INLP
6657  1277      TAD INBLK
6660  1275      TAD P8
6661  3277      DCA INBLK
6662  1300      TAD P2000
6663  3055      DCA INLO
6664  1301      TAD P3000
6665  3057      DCA INHI
6666  5636      JMP I READ
6667  6000    M2000,6000
6670  0000    CORECT,0
6671  4000    P4000,4000
6672  0000    CORE,0
6673  0000    FLGR28,0
6674  6550    IR18,R18
6675  0010    P8,8
6676  5000    P5000,5000
6677  0000    INBLK,0
6700  2000    P2000,2000
6701  3000    P3000,3000
```

System B
File 2
31 Oct. 1974

```
.PALP
*OUT-S:SPEC
*
*IN-S:JCON,S:SPEC,S:SPC2,S:SPC3
*
*
*
*
*OPT-T

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /  S D=FSPEC(DEVICE,MOVE ENABLE,SETTING,NOWAIT)
                /
                /RETURNS DEVICE SETTING OR -1=MOVING.
                /DEVICES ARE: 0=TILT, 1=GR.SEL., 2=L.FILT., 3=U.FILT.,
                /4=DUMMY, 5=COLL., 6=DECKER, 7=SLIT, 8=DK SLD, 9=CORR.
                /
                /DK SLIDE: 0=IN, CORR: 0=BLUE, TILT=5 DIGITS,
                /DEVICES 1-7=3 DIGITS.
                /
                /MOVE ENABLE = 0 FOR NO MOVE,  = 1 FOR MOVE.
                /NOWAIT = 0 TO WAIT FOR COMPLETION,  = -1 TO NOT
                /WAIT AND NOT RELEASE MUX.
                /
                MUX=6350
                OKSKIP=1
                DUNSKP=2
                DAREAD=3
                FREAD=4
                FLOAD=5
                LAMOFF=6
                DLOAD=7
                GRAB=4
                TEMP1=ARG8
                COMMND=ARG9
                CTR=ARG10
                COMMIN=15
                TEMP2=13
                DATA=14
                ARG5H=12
                MASK=10
                TESTR=11
                TEMP=16
                /
                /
                *KB1+71
0231    6200      SPEC
                *FNKB1+71
0735    0353      0353      /SPEC
                *6200
6200    0000    SPEC,0
6201    3060      DCA COMMND
6202    4776      JMS I GRABIT    /GRAB MULTIPLEXER
6203    4774      JMS I XMIT      /READ COMMAND
6204    5110      5110
6205    7040      CMA
6206    3015      DCA COMMIN
6207    1015      TAD COMMIN
```

```
6210  0353      AND P0201
6211  7440      SZA
6212  5773      JMP I LIMITX   /TYPE ERROR MESSAGE.
6213  1015      TAD COMMIN
6214  0354      AND P4         /SET UP CORR SLD BIT.
6215  7106      CLL RTL
6216  7006      RTL
6217  7004      RAL
6220  3060      DCA COMMND
6221  1015      TAD COMMIN     /SET UP DK SLD BIT.
6222  0037      AND P20
6223  1060      TAD COMMND
6224  3060      DCA COMMND
6225  1052      TAD ARG3       /SET UP DEVICE CODE.
6226  1355      TAD M10
6227  7500      SMA
6230  5775      JMP I SLIDE    /DK SLIDE OR CORR SLIDE.
6231  7200       CLA
6232  1052      TAD ARG3
6233  1357      TAD DEVCD0
6234  3057      DCA TEMP1
6235  1457      TAD I TEMP1    /LOOK-UP TABLE.
6236  1060      TAD COMMND
6237  3060      DCA COMMND
6240  1053      TAD ARG4       /SET UP MOVE ENABLE
6241  7640      SZA CLA
6242  1356      TAD P4000
6243  1060      TAD COMMND
6244  3060      DCA COMMND
6245  1060      TAD COMMND
6246  4774      JMS I XMIT
6247  5130      5130           /SEND COMMAND WORD.
                /
                /
6250  7200       CLA
6251  1052      TAD ARG3
6252  7650      SNA CLA
6253  5305      JMP TILT
6254  1054      TAD ARG5
6255  4770      JMS I BINBCD
6256  4774      JMS I XMIT
6257  7130      7130           /ADC
6260  4771      JMS I BCDBIN
6261  3051      DCA ARG2
6262  1055      TAD ARG6
6263  7640      SZA CLA        /TEST FOR NO WAIT.
6264  5600      JMP I SPEC      /NOWAIT.
6265  1053      TAD ARG4
6266  7650      SNA CLA
6267  5277      JMP EXIT              /NEVER WAIT IF NOT MOVE ENABLED.
6270  1377  WAIT, TAD DLYSET
6271  4772      JMS I DELAYX      /LONG DELAY (100 MSEC OR SO).
6272  1060  WAITLP, TAD COMMND
6273  4774      JMS I XMIT
6274  5110      5110            /READ ONLY.
6275  7700      SMA CLA         / TEST FOR MOVE COMPLETE.
6276  5272      JMP WAITLP
6277  1377  EXIT, TAD DLYSET
6300  4772      JMS I DELAYX        /TIME TO SETTLE DOWN.
6301  5702      JMP I MOVOFX
```

```
6302  6167  MOVOFX,MOVOFF
6303  6356  BYEBYE,MUX LAMOFF
6304  5600    JMP I SPEC
              /
              /
6305  1054  TILT,TAD ARG5
6306  7421    MQL
6307  1012    TAD ARG5H
6310  7407    DVI
6311  1750    1750    / = 1000 BASE 10
6312  4770  JMS I BINBCD
6313  4774    JMS I XMIT
6314  3130    3130          /ENCODER
6315  4771    JMS I BCDBIN
6316  3051    DCA ARG2
6317  1054    TAD ARG5
6320  7421    MQL
6321  1012    TAD ARG5H
6322  7407    DVI
6323  0144    144         / = 100 BASE 10.
6324  7701    CLA!MQA
6325  4770    JMS I BINBCD
6326  4774    JMS I XMIT
6327  7130    7130        / ADC
6330  0352    AND P7760   /DROP LOWEST BCD DIGIT.
6331  4771    JMS I BCDBIN
6332  7425    MQL!MUY
6333  0144    144
6334  3050    DCA ARG1
6335  7100    CLL
6336  7501    MQA
6337  1051    TAD ARG2
6340  3051    DCA ARG2
6341  7430    SZL
6342  2050    ISZ ARG1
6343  1055    TAD ARG6
6344  7640    SZA CLA         /TEST FOR NOWAIT.
6345  5600    JMP I SPEC
6346  1053    TAD ARG4
6347  7650    SNA CLA
6350  5277    JMP EXIT    /DON'T WAIT IF NOT MOVE ENABLED.
6351  5270    JMP WAIT
              /
6352  7760  P7760,7760
6353  0201  P0201,0201
6354  0004  P4,4
6355  7770  M10,-10
6356  4000  P4000,4000
6357  6360  DEVCD0,DEVCD0+1
6360  0000  P0,0              /START OF DEVICE CODE TABLE.
6361  2000  P2000,2000
6362  1000  P1000,1000
6363  3000  P3000,3000
6364  0400  P400,400
6365  2400  P2400,2400
6366  1400  P1400,1400
6367  3400  P3400,3400    /END OF TABLE.
6370  6044  BINBCD,BINBC0
6371  6073  BCDBIN,BCDBI0
6372  6154  DELAYX,DELAY
```

```
6373  6477  LIMITX,LIMIT
6374  6120  XMIT,XMITX
            /
            /
6375  6400  SLIDE,SLIDES
            /
6376  6515  GRABIT,GRABX
6377  7777  DLYSET,7777
            /
            PAUSE*6044
6044  0000  BINBC0,0    /EXPECTS SNGL PREC. BINARY < 1000 IN AC
6045  7421    MQL
6046  1353    TAD M3
6047  3061    DCA CTR
6050  3057    DCA TEMP1
6051  3013    DCA TEMP2
6052  7407  DIVD,DVI
6053  0012    12
6054  1057    TAD TEMP1
6055  7120    CLL CML
6056  2013    ISZ TEMP2
6057  7100    CLL       /KEEP TRACK OF LINK DURING ROTATION.
6060  7012    RTR
6061  7012    RTR
6062  3057    DCA TEMP1
6063  7430    SZL
6064  7040    CMA
6065  3013    DCA TEMP2
6066  2061    ISZ CTR
6067  5252    JMP DIVD
6070  1057    TAD TEMP1
6071  7010    RAR
6072  5644    JMP I BINBC0      /RETURNS BCD WORD IN AC.
            /
6073  0000  BCDBI0,0         /EXPECTS 3 DIGIT BCD WORD IN AC.
6074  3057    DCA TEMP1
6075  1057    TAD TEMP1
6076  0305    AND LDIGIT    /THIS ROUTINE WAS LIFTED FROM A
6077  4307    JMS ROT       /JOHN SWEENY PROGRAM. I'LL BE DAMNED
6100  3057    DCA TEMP1     /IF I KNOW HOW IT WORKS.
6101  1057    TAD TEMP1
6102  0306    AND MDIGIT
6103  4307    JMS ROT
6104  5673    JMP I BCDBI0  /RETURNS BINARY WORD IN AC.
6105  7400  LDIGIT,7400
6106  7760  MDIGIT,7760
            /
6107  0000  ROT,0
6110  7112    CLL RTR
6111  3013    DCA TEMP2
6112  1013    TAD TEMP2
6113  7010    RAR
6114  1013    TAD TEMP2
6115  7041    CIA
6116  1057    TAD TEMP1
6117  5707    JMP I ROT
            /
6120  0000  XMITX,0
6121  3014    DCA DATA      /DATA IN AC, FUNCTION IN NEXT WORD OF
6122  1366    TAD M100      /CALLING PROGRAM.
```

```
6123  3013     DCA TEMP2
6124  1720  TRY, TAD I XMITX
6125  6355     MUX FLOAD
6126  7200     CLA
6127  1014     TAD DATA
6130  6357     MUX DLOAD
6131  7200     CLA
6132  4354     JMS DELAY
6133  2013     ISZ TEMP2
6134  5342     JMP TEST
6135  4422     JMS I MESAGX      /PRINT ERROR MESSAGE AND ABORT AFTER 64 TE
6136  1525  TEXT "MU
6137  3077  X?
6140  0000  "
6141  5351     JMP MUSTDO
6142  6354  TEST, MUX FREAD
6143  7041     CIA
6144  1720     TAD I XMITX
6145  7640     SZA CLA
6146  5324     JMP TRY       /TRANSMISSION ERROR. TRY AGAIN!
6147  6353     MUX DAREAD
6150  7040     CMA
6151  2320  MUSTDO, ISZ XMITX
6152  5720     JMP I XMITX
               /
6153  7775  M3, -3
               /
6154  0000  DELAY, 0      / PROVIDES ABOUT AC X 38 USEC DELAY.
6155  7040     CMA
6156  3016     DCA TEMP
6157  1377  DELOOP, TAD MM10    /38 USEC LOOP.
6160  3057     DCA TEMP1
6161  2057     ISZ TEMP1
6162  5361     JMP .-1          /4.5 USEC LOOP, 8 LAPS.
6163  2016     ISZ TEMP
6164  5357     JMP DELOOP
6165  5754     JMP I DELAY
6166  7700  M100, -100
               /
6167  1060  MOVOFF, TAD COMMND
6170  0376     AND P3777        /TURN OFF MOVE ENABLE.
6171  4320     JMS XMITX
6172  5130     5130
6173  7200     CLA
6174  5775     JMP I BYEBYX
6175  6303  BYEBYX, BYEBYE
6176  3777  P3777, 3777
6177  7770  MM10, -10
               /
               *6400
6400  7640  SLIDES, SZA CLA     /ROUTINE TO HANDLE DARA, CORRECTOR SLIDES.
6401  5231     JMP CORREC
6402  1015     TAD COMMIN
6403  0271     AND PP30
6404  7112     CLL RTR
6405  7010     RAR
6406  7450     SNA
6407  5310     JMP MOVING
6410  1264     TAD MM2
6411  7540     SZA SMA
```

```
6412  5310     JMP MOVING
6413  7041     CIA
6414  3051     DCA ARG2
6415  1053     TAD ARG4
6416  7650     SNA CLA
6417  5676     JMP I EXITY    /NO MOVE
6420  1060     TAD COMMND
6421  0273     AND PP7757
6422  1267     TAD PP400
6423  3060     DCA COMMND
6424  1054     TAD ARG5
6425  7650     SNA CLA
6426  1263     TAD PP20
6427  1060     TAD COMMND
6430  5254     JMP SLDSET     /SET UP TO TEST FOR 10 OR 20.
               /
6431  1015  CORREC, TAD COMMIN
6432  0272     AND PP6
6433  7450     SNA
6434  5240     JMP BLUE
6435  1265     TAD MM5
6436  7510     SPA
6437  7240     CLA CMA
6440  3051  BLUE, DCA ARG2
6441  1053     TAD ARG4
6442  7650     SNA CLA
6443  5676     JMP I EXITY     /NO MOVE
6444  1060     TAD COMMND
6445  0266     AND PP7577
6446  1267     TAD PP400
6447  3060     DCA COMMND
6450  1054     TAD ARG5
6451  7640     SZA CLA
6452  1270     TAD PP200
6453  1060     TAD COMMND
6454  4674  SLDSET, JMS I XMITR
6455  5130     5130        /READ AND WRITE COMMAND BUFFER.
6456  7200     CLA
6457  1055  OUT, TAD ARG6
6460  7640     SZA CLA
6461  5675     JMP I SPECX    /NO WAIT=DON'T RELEASE MUX.
6462  5676     JMP I EXITY
               /
6463  0020  PP20, 20
6464  7776  MM2, -2
6465  7773  MM5, -5
6466  7577  PP7577, 7577
6467  0400  PP400, 400
6470  0200  PP200, 200
6471  0030  PP30, 30
6472  0006  PP6, 6
6473  7757  PP7757, 7757
6474  6120  XMITR, XMITX
6475  6304  SPECX, BYEBYE+1
6476  6303  EXITY, BYEBYE
               /
               PAUSE/SPC3
6477  4422  LIMIT, JMS I MESAGX
6500  2320  TEXT "SP
6501  0503  EC
```

```
6502  5614  .L
6503  1115  IM
6504  1124  IT
6505  0000  "
6506  5707  JMP I ERRORX
6507  6167  ERRORX,MOVOFF
              /
6510  7240  MOVING,CLA CMA
6511  3050    DCA ARG1
6512  7040    CMA
6513  3051    DCA ARG2    /RETURN -1
6514  5676    JMP I EXITY  /RELEASE MUX
              /
6515  0000  GRABX,0
6516  1273    TAD PP7757
6517  6355    MUX FLOAD
6520  6354    MUX FREAD
6521  7041    CIA
6522  1273    TAD PP7757
6523  7640    SZA CLA
6524  5316    JMP GRABX+1
6525  5715    JMP I GRABX
```

28 March '75
12-05
front

```
.PALP
*OUT-S:SWEP
*
*IN-S:CON0,S:XCON,S:SWP1,S:SWP2

*
*
*
*OPT-T

ARG1    0050
ARG10   0061

                /CON0
                XLIST
                PAUSE/
                /
                /XCON
                FIELD 1
                XLIST
                PAUSE/
                /
                /SWP1
                /X MCEN(D) OFFSETS CENTER BY + OR - D
                /S D=FMEMX(N,C,R,S,P,K,B);X MEMY(0,C,R-->--LOAD SWEEPS
                /MUX NO. IS 3;OR S IF NON-ZERO...P=1 TO BYPASS ERROR PRINT.
                /N=1 FOR NORMAL SWEEP..R=1 TO READ,0 TO SEND.
                /.K=1 TO BYPASS 4K SCANNER MEMORY.
                /C IS SWEEP CENTER
                /NON-ZERO B FOR BIAS DISABLE.
                /INPUT CABLE 7;OUTPUT CABLE 18.
                /
                /ASSUMES MUX CYCLE TIME<20 MICROSEC.
                /WILL HANG IN XMIT IF ARG7 SET AND MUX DISABLED.
                /
                DATA=ARG10
                FUNCP=ARG10H
                COUNT8=ARG9
                FUNC=ARG9H
                COUNT=ARG8H
                UNIT=ARG7H
                BYPASS=ARG6H
                /
                MUX=6350
                OKSKIP=1
                DUMSKP=2
                DAREAD=3
                FREAD=4
                FLOAD=5
                LAMOFF=6
                DLOAD=7
                GRAB=4
                /
                SYNSKP=6452
                FUNLOD=6453
                /
                *FNKB1+71
0735    1200    1200        /MEMX
0736    1201    1201        /MEMY
                *FNKB1+75
0741    0666    666         /MCEN
                *KB1+75
```

```
0235  6461  CENTER
            *KB1+71
0231  6477  MEMX
02    6520  MEMY
            /
            *6461
6461  0000  CENTER,0
6462  1052    TAD ARG3
6463  3053    DCA ARG4
6464  1075    TAD NORMAL
6465  4733    JMS I SETUPX
6466  5661  CENGO,JMP I CENTER       /THIS ROUTINE SETS CENTER COUNTER ONLY
            /
6467  0300  UNIT0,300
6470  0200  UNIT1,200
6471  0100  UNIT2,100
6472  0300  UNIT3,300
6473  0040  UNIT4,40
6474  0240  UNIT5,240
6475  0140  UNIT6,140
6476  0340  UNIT7,340
6477  0000  MEMX,0
6500  1052    TAD ARG3
6501  7440    SZA
6502  7330    STL CLA RAR    /4000
6503  1334    TAD NORM0
6504  3075    DCA NORMAL
6505  1060    TAD ARG9     /NON-ZERO FOR BIAS DISABLE.
65    7640    SZA CLA
65    7132    STL RTR
6510  1075    TAD NORMAL
6511  3075    DCA NORMAL
6512  1054    TAD ARG5
6513  7640    SZA CLA
6514  1327    TAD XREAD      /READ,NOT WRITE
6515  1331    TAD FUNCX
6516  4733    JMS I SETUPX
6517  5677    JMP I MEMX
            /
6520  0000  MEMY,0
6521  1054    TAD ARG5
6522  7640    SZA CLA
6523  1330    TAD YREAD      /READ,NOT WRITE
6524  1332  TAD FUNCY
6525  4733    JMS I SETUPX
6526  5720    JMP I MEMY
            /
6527  0400  XREAD,1000-400  /CHANGE WRITE TO READ
6530  0100  YREAD,200-100
6531  6630  FUNCX,6630
6532  7131  FUNCY,7131
6533  6644  SETUPX,SETUP
6534  3230  NORM0,3230
            /
65    0000  SFUNL,0          /PUT FUNCTION IN SWEEP BOX
6536  7421  SETIN,MQL
6537  1777    TAD PORT10     /CABLE SELECT
6540  4776    JMS XMIT
6541  5336    JMP SETIN      /ERROR
6542  1775    TAD CABLE7
```

```
6543  7421    MQL
6544  7330    CLA STL RAR    /4000 FOR PULSE 1
6545  4776    JMS XMIT
6546  5336    JMP SETIN      /ERROR
6547  5735    JMP I SFUNL
              /
6550  0000  DELAY,0 /LENGTH IN AC=12+N*4.5 MICRO SEC
6551  3031    DCA TEMPS0
6552  2031    ISZ TEMPS0
6553  5352    JMP .-1
6554  5750    JMP I DELAY
              /
6555  0000  SYNC,0
6556  3373    DCA TEMP
6557  6452  WAITS,SYNSKP
6560  5365    JMP TESTCL
6561  6452    SYNSKP         /WAIT FOR 4K MEM. CYCLE
6562  7410    SKP
6563  5361    JMP .-2
6564  5755    JMP I SYNC
6565  2373  TESTCL,ISZ TEMP
6566  5357    JMP WAITS
6567  1075    TAD NORMAL
6570  7040    CMA
6571  6453    FUNLOD         /TRY TO START THE 1 MHZ CLOCK
6572  5357    JMP WAITS
6573  0000  TEMP,0
              /
6574  6771
6576  6600
6577  6766
              *6600
6600  0000  XMIT,0
6601  1037    TAD P20        /SEND
6602  1014    TAD UNIT
6603  6355    MUX FLOAD      /FUNCTION
6604  3016    DCA FUNC
6605  6354    MUX FREAD
6606  7041    CIA
6607  1016    TAD FUNC       /BE SURE CORRECT CODE LOADED
6610  7450    SNA
6611  5214    JMP GO
6612  4536    JMS I OCTPNX   /IF PDP 8 IO BAD PRINTS DELTA
6613  5231    JMP FAULT
6614  7501  GO,MQA
6615  6357    MUX DLOAD      /"DATA" AND TRANSMIT
6616  7344    CLA CMA CLL RAL        /-2 IN AC FOR 21 USEC.
6617  4775    JMS I DELAYX
6620  6352    MUX DUNSKP
6621  5231    JMP FAULT
6622  6354    MUX FREAD
6623  7041    CIA
6624  1016    TAD FUNC
6625  6351    MUX OKSKIP
6626  7240    CLA CMA        /ERROR
6627  7650    SNA CLA
6630  5242    JMP OK
6631  1013  FAULT,TAD BYPASS
6632  1056    TAD ARG7
6633  7640    SZA CLA
```

```
6634  5600     JMP I XMIT     /BYPASS ERROR MESSAGE
6635  4422     JMS I MESAGX
66??  1525   TEXT /MU
66..  3077   X?
6640  0000   /
6641  5600     JMP I XMIT
6642  2200   OK,ISZ XMIT
6643  5600     JMP I XMIT
           PAUSE/
           /
           /SWP2
6644  0000   SETUP,0
6645  3017     DCA FUNCP
6646  6002     IOF
6647  6354     MUX GRAB       /STOP OTHER COAX USER
6650  7350     CLA CMA CLL RAR        /SET A LONG DELAY
6651  4775     JMS I DELAYX  /WAIT FOR SPECTRGRAPH CONTROL TO FINISH
6652  1055     TAD ARG6
6653  0374     AND P7
6654  1365     TAD LIST
6655  3031     DCA TEMPS0
6656  1431     TAD I TEMPS0
6657  3014     DCA UNIT
6660  2013   TEST,ISZ BYPASS /SET ERROR PRINT BYPASS
6661  2015     ISZ COUNT
6662  7410     SKP
6663  5266     JMP GOSYNC
6664  4200   INIT,JMS XMIT    /PUTS MPX IN PHASE,WITH NO ERROR PRINT
66    5260     JMP TEST
6666  3013   GOSYNC,DCA BYPASS        /CLEAR ERROR PRINT BYPASS
6667  1057     TAD ARG8
6670  7650     SNA CLA
6671  4776     JMS I  SYNCX  /WAIT FOR 4K SCANNER MEMORY CYCLE
6672  1017     TAD FUNCP
6673  0363     AND P5777      /MEM. CLOCK OFF
6674  7040     CMA
6675  6453     FUNLOD         /STOP 4K MEM.
6676  1017     TAD FUNCP
6677  4764     JMS I SFUNLX
6700  1372     TAD M1000
6701  3015     DCA COUNT
6702  7332     CLA STL RTR    /CORE BUFFER 1,ADDRESS 2000
6703  3061     DCA DATA
6704  1244     TAD SETUP
6705  1377     TAD CENTES     /CHECK FOR CENTERING ONLY
6706  7650     SNA CLA
6707  5342     JMP GETOUT     /YES
6710  1373   NEXT,TAD M10
6711  3060     DCA COUNT8
6712  1054     TAD ARG5
6713  7650     SNA CLA
6714  5327     JMP PUTING     /SETTING SWEEPS(SEND)
6715  6454   STEPRD,MCSTEP
67    2060     ISZ COUNT8
6717  5315     JMP STEPRD
6720  1373   GET,TAD M10      /CHANGE SEND TO RECEIVE
6721  1367     TAD PORT7
6722  4200     JMS XMIT
6723  5320     JMP GET        /ERROR
6724  6353     MUX DAREAD     /READ 12 BIT WORD
```

```
6725  3461     DCA I DATA
6726  5337     JMP DNGO
6727  1461   PUTING,TAD I DATA
67    7421     MQL
67?1  1366     TAD PORT18
6732  4200     JMS XMIT
6733  5327     JMP PUTING      /ERROR
6734  6454   STEPW,MCSTEP
6735  2060     ISZ COUNT8
6736  5334     JMP STEPW       /8 PULSES PER STEP
6737  2061   DNGO,ISZ DATA
6740  2015     ISZ COUNT
6741  5310     JMP NEXT
6742  1075   GETOUT,TAD NORMAL
6743  4764     JMS I SFUNLX
6744  1053   SETIT,TAD ARG4
6745  7421     MQL
6746  1366     TAD PORT18      /SETTING 'CENTER' FOR SWEEPS
6747  4200     JMS XMIT
6750  5344     JMP SETIT       /ERROR
6751  1370     TAD CABL18
6752  7421     MQL
6753  7330     CLA STL RAR     /4000 FOR PULSE1
6754  4200     JMS XMIT
6755  5344     JMP SETIT       /ERROR
6756  1075     TAD NORMAL
6757  7040     CMA    /FOR HARDWARE INVERSION
6760  6453     FUNLOD
67    6356     MUX LAMOFF
67__  5644     JMP I SETUP
               /
6763  5777   P5777,5777
6764  6535   SFUNLX,SFUNL
6765  6467   LIST,UNIT0
6766  0400   PORT18,400        /CABLE FOR DATA
6767  7000   PORT7,7000
6770  0020   CABL18,20         /CABLE FOR PULSES
6771  0040   CABLE7,40
6772  7000   M1000,-1000
6773  7770   M10,-10
6774  0007   P7,7
6775  6550   DELAYX,DELAY
6776  6555   SYNCX,SYNC
               /
               /
6777  1312   CENTES,-CENGO
```

```
*OPT-
.PALP
*OUT-S:SWIT
*
*IN-S:CON0,S:SWIT,S:JOY1,S:JOY2
*
*
*
*
*OPT-T

APOINT 6555
ARG1   0050

                /CON0
                XLIST
                PAUSE/
                /
                /SWIT--FOR MEM. SCOPE 613
                /S D=FSWIT(SW,SH,X,Y,M,Q);IF SW -VE,ERASE CRT
                /IF SW 0,LOAD LIGHTS FROM SH
                /..FSWIT(3,10,X,Y,0,Q) RETURNS 1024*X+Y WHEN SWITCH
                /3,10 IS PUSHED. IF Q NON ZERO,SWITCH CAN
                /BE HELD ON FOR FAST REPETITION
                /M IS A MASK IF NON-ZERO
                /
                /
                CODLOD=6361
                READSW=6362
                LITSET=6367
                ERASE=6362
                /
                *KB1+12
0152   6422     SWITCH
                *FNKB1+12
0656   1334     1334     /SWIT
                /
                XMOVE=17
                YMOVE=16
                XTEMP=15
                MASK=ARG9
                /
                *6171
6171   7417     JOYPG,LSR
6172   0001       1
6173   3050       DCA ARG1
6174   7501       MQA
6175   3051       DCA ARG2
6176   5777       JMP I BYEBYE
6177   6453     BYEBYE,JMPOUT
                /
                *6775
6775   0007     MASK1,7    /MASK TABLE
6776   0003     3
6777   0001     1
                /
                *6422
6422   0000     SWITCH,0
6423   1052        TAD ARG3
6424   7700        SMA CLA
6425   5231        JMP OK
6426   1327        TAD P16
6427   6361        CODLOD        /SET GATE FOR ERASE
```

```
6430  6362    ERASE
6431  1053  OK,TAD ARG4
6432  7450     SNA
6433  7001     IAC            /ALLOW Ø SHIFT READOUT FOR SH=Ø
6434  3317     DCA SHIFT
6435  1054     TAD ARG5
6436  3050     DCA ARG1
6437  1055     TAD ARG6
6440  7440     SZA
6441  5254     JMP JOYCAL
6442  1052     TAD ARG3
6443  7650     SNA CLA
6444  5250     JMP LIGHTS
6445  4274     JMS SWTRED
6446  3051     DCA ARG2
6447  5622     JMP I SWITCH
              /
6450  1053  LIGHTS,TAD ARG4
6451  6367     LITSET
6452  7200     CLA
6453  5622   JMPOUT,JMP I SWITCH
              /
6454  3051  JOYCAL,DCA ARG2 /INITIAL MARK LOCATION
6455  1057    TAD ARG8
6456  7650    SNA CLA
6457  4274    JMS SWTRED
6460  7640    SZA CLA
6461  5257    JMP .-2         /WAIT TILL SWITCH OFF UNLESS ARG8 SET
6462  4730  JOYTES,JMS I JOYSTX
6463  4274     JMS SWTRED
6464  7650     SNA CLA
6465  5262     JMP JOYTES     /SWITCH NOT CLOSED
6466  1051     TAD ARG2       /CONVERT TO 1024*X+Y
6467  7106     CLL RTL        /FROM 4096*X+Y
6470  7421     MQL
6471  1050     TAD ARG1
6472  5673    JMP I .+1
6473  6171  JOYPG
              /
6474  0000  SWTRED,Ø
6475  1052     TAD ARG3
6476  6361     CODLOD         /SELECT SWITCH GROUP
6477  0326    AND P3
6500  7440    SZA
6501  5307    JMP DOIT
6502  1053    TAD ARG4
6503  7001    IAC
6504  0325    AND P1Ø
6505  7112    CLL RTR
6506  7001    IAC      /3=TOGGLE, 1=ROTARY
6507  1324  DOIT,TAD MSKTBL
6510  3060    DCA MASK
6511  1056    TAD ARG7
6512  7450    SNA
6513  1460    TAD I MASK
6514  3060    DCA MASK
6515  6362     READSW
6516  7417     LSR
6517  0000  SHIFT,Ø
6520  7413     SHL
```

```
6521  0001      1
6522  0060      AND MASK
6523  5674      JMP I SWTRED
                /
6524  6774    MSKTBL,MASK1-1
6525  0010    P10,10
6526  0003    P3,3
6527  0016    P16,16
6530  6600    JOYSTX,JOYSTK
              PAUSE/
              /
              /JOY1
              /
6531  0000    ARMAKE,0          /DRAW A DIAMOND
6532  3015        DCA XTEMP
6533  1376        TAD P2
6534  3017        DCA XMOVE
6535  1376        TAD P2
6536  3016        DCA YMOVE
6537  4352        JMS DIAGON
6540  1374        TAD M2
6541  3016        DCA YMOVE
6542  4352        JMS DIAGON
6543  1374        TAD M2
6544  3017        DCA XMOVE
6545  4352        JMS DIAGON
6546  1376        TAD P2
6547  3016        DCA YMOVE
6550  4352        JMS DIAGON
6551  5731        JMP I ARMAKE
              /
6552  0000    DIAGON,0
6553  1377        TAD M4
6554  3375        DCA COUNTA
6555  1015    APOINT,TAD XTEMP
6556  1017        TAD XMOVE
6557  6053        DXL
6560  3015        DCA XTEMP
6561  7501        MQA
6562  1016        TAD YMOVE
6563  6063        DYL
6564  7421        MQL
6565  6014        RFC
6566  6014        RFC
6567  6014        RFC    /DELAY FOR SCOPE SETTLING
6570  6362        BRITEN
6571  2375         ISZ COUNTA
6572  5355         JMP APOINT
6573  5752         JMP I DIAGON
              /
6574  7776    M2,-2
6575  0000    COUNTA,0
6576  0002    P2,2
6577  7774    M4,-4
              PAUSE/
              /
              /JOY2
              /MOVES A MARKER FOR THE JOYSTICK
              /
              CODLOD=6361
```

```
                BRITEN=6362
                XJOY=6363
                YJOY=6364
                SKPJOY=6365
                /
                COUNTM=ARG9
                SIGN=ARG10
                *6600
6600  0000      JOYSTK,0
6601  1275          TAD P26       /SET BRITEN
6602  6361          CODLOD
6603  7200          CLA
6604  6363          XJOY
6605  1050          TAD ARG1
6606  4307          JMS MOVER     /READ JOYSTICK
6607  0000      XADDER,0
6610  3050          DCA ARG1      /X TO ARG1,Y TO ARG2
6611  1233          TAD XSET
6612  3252          DCA MLINE
6613  1051          TAD ARG2
6614  6063      YSET,DYL
6615  4301          JMS JSETUP
6616  1050          TAD ARG1
6617  4247          JMS LINER
6620  7450          SNA
6621  5223          JMP XDISP
6622  4774          JMS I ARMAKX /X IN AC,Y IN MQ
6623  6364      XDISP,YJOY
6624  1051          TAD ARG2
6625  4307          JMS MOVER
6626  0000      YADDER,0
6627  3051          DCA ARG2
6630  1214          TAD YSET
6631  3252          DCA MLINE
6632  1050          TAD ARG1
6633  6053      XSET,DXL
6634  4301          JMS JSETUP
6635  1051          TAD ARG2
6636  4247          JMS LINER
6637  7450          SNA
6640  5246          JMP ENDIT
6641  1277          TAD P6
6642  7421          MQL
6643  1050          TAD ARG1
6644  1273          TAD M10
6645  4774          JMS I ARMAKX
6646  5600      ENDIT,JMP I JOYSTK
                /
6647  0000      LINER,0
6650  3031          DCA TEMPS0
6651  1031          TAD TEMPS0
6652  0000      MLINE,0           /DYL OR DXL
6653  6014          RFC           /DELAY
6654  6014          RFC
6655  6014          RFC   /FAST PAPER TAPE IOT-UNUSED!
6656  1300          TAD PP3
6657  6362          BRITEN
6660  2060          ISZ COUNTM
6661  5252          JMP MLINE
6662  7200          CLA
```

```
6663  1061      TAD SIGN
6664  7450      SNA
6665  5647      JMP I LINER
6666  7700      SMA CLA
6667  1272      TAD P110
6670  1031  AROCAL, TAD TEMPS0
6671  5647      JMP I LINER
              /
6672  0110  P110, 110
6673  7770  M10, -10
6674  7744  M34, -34
6675  0026  P26, 26
6676  7726  M52, -52
6677  0006  P6, 6
6700  0003  PP3, 3
              /
6701  0000  JSETUP, 0
6702  7421      MQL
6703  1274      TAD M34
6704  3060      DCA COUNTM
6705  1276      TAD M52
6706  5701      JMP I JSETUP
              /
6707  0000  MOVER, 0
6710  3301      DCA JSETUP    /TEMPORARY STORE
6711  7240      CLA CMA
6712  3061      DCA SIGN
6713  7330      CLA STL RAR
6714  7450  TIME1, SNA
6715  5322      JMP ZEROED
6716  7010      RAR
6717  6365      SKPJOY
6720  5314      JMP TIME1     /MEASURING TIME DELAY
6721  5332      JMP DONE
6722  3061  ZEROED, DCA SIGN
6723  7004  TIME2, RAL
6724  7510      SPA
6725  7050      CMA RAR
6726  6365      SKPJOY
6727  5323      JMP TIME2
6730  3061      DCA SIGN
6731  1061      TAD SIGN
6732  7450  DONE, SNA
6733  3061      DCA SIGN
6734  7100      CLL
6735  1707      TAD I MOVER
6736  3707      DCA I MOVER
6737  7430      SZL
6740  5347      JMP STEP
6741  1707      TAD I MOVER
6742  1371      TAD M400
6743  7700      SMA CLA
6744  5347      JMP STEP
6745  2307  LEAVE, ISZ MOVER
6746  5367      JMP EXIT
              /
6747  3707  STEP, DCA I MOVER          /CLEAR ADDER
6750  2307      ISZ MOVER
6751  1061      TAD SIGN
6752  7710      SPA CLA
```

```
6753  7144      CLL CMA RAL  /-2
6754  7001      IAC  /+ OR -1 TO ARG1 OR ARG2 IF ADDER OVERFLOWS
6755  1301      TAD JSETUP
6756  7510      SPA
6757  7200      CLA
6760  3301  SAVIT,DCA JSETUP          /MOVE MARK CENTER
6761  1301      TAD JSETUP
6762  0373      AND P6000
6763  7650      SNA CLA
6764  5367      JMP EXIT
6765  1372      TAD P1777
6766  5360      JMP SAVIT
6767  1301  EXIT,TAD JSETUP
6770  5707      JMP I MOVER
                /
6771  7400  M400,-400
6772  1777  P1777,1777
6773  6000  P6000,6000
6774  6531  ARMAKX,ARMAKE
                /
```

File 4
28 Jan '74

```
PALP
*OUT-S:TMUL
!
*IN-S:CONG,S:TMUL
;
;
*OPT-T

ADD02  6764
ADD021 6571

               /CONG
               XLIST
               PAUSE/DMUL(C,B,N,D)
               /DBL. PREC. MULTIPLIES BUFF.0*BUFF.1, FOR N CHANNELS
               /STARTING AT CHAN. C. OUTPUT GOES TO BUFF. B.
               /DIVIDES BY D (SNGL. PREC.) TO PREVENT OVERFLOWS.
               /DEFAULT FOR D IS 1.
               SAM2=7344
               B1LO=ARG3
               B1HI=ARG5
               B0LO=ARG6
               B0HI=ARG7
               OUTLO=ARG8
               OUTHI=ARG9
               Q1=10     /ARG3H
               Q2=11     /ARG4H
               Q3=12     /ARG5H
               *AB1+~~66~~ 76
0230   6600      DMUL
               *FNAB1+~~66~~ 76
0734   1264      1264
               *6600
6600   0002    DMUL,0
6601   1354      TAD ARG5     /512 CHANS IS DEFAULT
6602   7450      SNA
6603   1362      TAD P1000
6604   7041      CIA
6605   3361      DCA CHANCT
6606   1052      TAD ARG3     /TEST FOR C+N>512
6607   7041      CIA
6610   1361      TAD CHANCT
6611   1362      TAD P1000
6612   7040      CMA
6613   7510      SPA
6614   7200      CLA
6615   1361      TAD CHANCT
6616   3361      DCA CHANCT
6617   1055      TAD ARG6
6620   7450      SNA
6621   7001      IAC
6622   3301      DCA D1
6623   1301      TAD D1
6624   3315      DCA D2
6625   1363      TAD P2000    /SET UP ADDRESSES
6626   1052      TAD ARG3
6627   3052      DCA B1LO
6630   1362      TAD P1000
6631   1052      TAD B1LO
6632   3054      DCA B1HI
```

```
6633  1054    TAD B1HI
6634  1362    TAD P1000
6635  3055    DCA B0LO
6636  1055    TAD B0LO
6637  1362    TAD P1000
6640  3056    DCA B0HI
6641  1053    TAD ARG4
6642  7650    SNA CLA
6643  1363    TAD P2000
6644  1052    TAD B1LO
6645  3057    DCA OUTLO
6646  1057    TAD OUTLO
6647  1362    TAD P1000
6650  3060    DCA OUTHI
6651  7344  CALLOOP, SAM2    /-2
6652  3360    DCA NEGFLG
6653  1452    TAD I B1LO
6654  7421    MQL         /MAKE BOTH #S POSITIVE
6655  1454    TAD I B1HI
6656  7510    SPA
6657  4344    JMS NEGTIV
6660  3454    DCA I B1HI
6661  7501    MQA
6662  3452    DCA I B1LO
6663  1455    TAD I B0LO
6664  7421    MQL
6665  1456    TAD I B0HI
6666  7510    SPA
6667  4344    JMS NEGTIV
6670  3456    DCA I B0HI
6671  7501    MQA
6672  3455    DCA I B0LO
6673  5674    JMP I DCITI
6674  6527  DCITI, DOIT
6675  1011  DIVIDE, TAD Q2  /THIS SECTION DIVIDES B1 D
6676  7421    MQL
6677  1012    TAD Q3
6700  7407    DVI
6701  0000  D1, 0
6702  7430    SZL
6703  5337    JMP OVRFLW    /DIVIDE GAVE DBL PREC ANSWER
6704  3012    DCA Q3        /REMAINDER
6705  7501    MQA
6706  7510    SPA
6707  5337    JMP OVRFLW    /OUTPUT > 2↑23-1
6710  3011    DCA Q2
6711  1010    TAD Q1
6712  7421    MQL
6713  1012    TAD Q3    /DIVIDE (REMAINDER,Q1) TO GET OUTLO
6714  7407    DVI
6715  0000  P2, 0
6716  7200    CLA         /TRUNCATE
6717  1011    TAD Q2
6720  2360    ISZ NEGFLG   /NEGFLG=-1 ; NEG ANSWER
6721  5323    JMP .+2
6722  4344    JMS NEGTIV
6723  3460  WINDUP, DCA I OUTHI
6724  7501    MQA
6725  3457    DCA I OUTLO
6726  2060    ISZ OUTHI
```

```
6727   2057      ISZ OUTLO
6730   2052      ISZ B1LO
6731   2054      ISZ B1HI
6732   2055      ISZ B0LO
6733   2056      ISZ B0HI
6734   2361      ISZ CHANCT
6735   5251      JMP CHLOOP
6736   5600      JMP I DMUL
6737   7340   OVRFLW, CLL CLA CMA
6740   7421      MQL
6741   7501      MQA
6742   7010      RAR
6743   5323      JMP JINDUP
6744   0000   NEGTIV, 0
6745   3012      DCA Q3
6746   7501      MQA
6747   7141      CLL CIA
6750   7421      MQL
6751   1012      TAD Q3
6752   7040      CMA
6753   7430      SZL
6754   7001      IAC
6755   2360      ISZ NEGFLG
6756   7000      NOP
6757   5744      JMP I NEGTIV
6760   0000   NEGFLG, 0
6761   0000   CHANCT, 0
6762   1000   P1000, 1000
6763   2000   P2000, 2000
6764   0000   ADD02, 0
6765   7501      MQA
6766   7100      CLL
6767   1011      TAD Q2
6770   3011      DCA Q2
6771   7430      SZL
6772   2012      ISZ Q3
6773   5375      JMP .+2
6774   5337      JMP OVRFLW
6775   5764      JMP I ADD02
                 *6527
 6527  1452   DOIT, TAD I B1LO
 6530  3374      DCA MULT1
 6531  1455      TAD I B0LO
 6532  4372      JMS MULT
 6533  3011      DCA Q2
 6534  7501      MQA
 6535  3010      DCA Q1     /B1LO*B0LO
 6536  1456      TAD I B0HI
 6537  4372      JMS MULT      /B1LO*B0HI
 6540  3012      DCA Q3
 6541  4771      JMS I ADD02
 6542  1454      TAD I B1HI
 6543  3374      DCA MULT1
 6544  1455      TAD I B0LO
 6545  4372      JMS MULT    /B1HI*B0LO
 6546  7100      CLL
 6547  1012      TAD Q3
 6550  3012      DCA Q3
 6551  7430      SZL
 6552  5770      JMP I OVRFL1
```

```
6553  4771      JMS I ADDQ21
6554  1456      TAD I B0HI
6555  4372      JMS MULT      /B1HI*B0HI
6556  7440      SZA
6557  5770      JMP I OVRFL1
6560  7501      MQA
6561  7100      CLL
6562  1612      TAD Q3
6563  3012      DCA Q3
6564  7430      SZL
6565  5770      JMP I OVRFL1
6566  5767      JMP I DIVID1
6567  6675  DIVID1,DIVIDE
6570  6737  OVRFL1,OVRFLW
6571  6764  ADDQ21,ADDQ2
6572  0000  MULT,0
6573  7425      MQL!MQY
6574  0000  MULT1,0
6575  5772      JMP I MULT
```

X TINC (131) July 5, 1973
Pg 4

```
.PALP
*OUT-S:TNC2
*
*IN-S:CON0,S:TNC2
*
*
*OPT-T

ARG1    0050

                /CON0
                XLIST
                PAUSE/ X TINC(Z)     JULY 1973 VERSION
                / MULTIPLIES BUFF. 0 CONTENTS BY EXP(X)
                / X=K*Z,  Z=256*AIR MASS, K=4096*<EXTINCTION COEFF.>
                / K(LAMBDA) IS TAKEN FROM BUFF. 1
                / WORKS FOR X<16, TO  .1% ACCURACY.
                / OVERFLOWS ARE SET TO 0.
                SA4=7307
                CHANHI=ARG10
                CHANLO=ARG9
                T1HI=ARG8
                T1LO=ARG7
                XHI=ARG6
                XLO=ARG5
                CTR2=ARG4
                ZHI=ARG1
                ZLO=ARG2
                *KB1+67
0227    6200      XTINC
                *FNKB1+67
0733    0563      0563
                *6200
6200    0000    XTINC,0
6201    1052      TAD ARG3    /TURN Z INTO DBL. PREC., DEC. PT. BETWEEN WORDS
6202    7421      MQL
6203    7413      SHL
6204    0003      3
6205    3050      DCA ZHI
6206    7501      MQA
6207    3051      DCA ZLO
6210    1351      TAD P2000     /NOW LOAD UP THE CHANNEL COUNTERS.
6211    3344      DCA KLO
6212    1351      TAD P2000
6213    1350      TAD P1000
6214    3343      DCA KHI
6215    1343      TAD KHI
6216    1350      TAD P1000
6217    3060      DCA CHANLO
6220    1060      TAD CHANLO
6221    1350      TAD P1000
6222    3061      DCA CHANHI
6223    1347      TAD M512
6224    3341      DCA CTR1
6225    1744    LOOP, TAD I KLO     /LOOP FOR 512 CHANS.
6226    3056      DCA T1LO          /FIRST, FIND X=K*Z
6227    1743      TAD I KHI
6230    3057      DCA T1HI
6231    1051      TAD ZLO
6232    7421      MQL
```

```
6233  1050     TAD ZHI
6234  4761     JMS I MULT1
6235  1057     TAD T1HI
6236  3055     DCA XHI
6237  1056     TAD T1LO
6240  3054     DCA XLO
6241  1054     TAD XLO          /INITIALIZE POWER SERIES.
6242  3270     DCA XPOW
6243  7001     IAC
6244  3057     DCA T1HI
6245  3056     DCA T1LO
6246  7307     SA4
6247  7041     CIA
6250  3053     DCA CTR2
6251  1352     TAD COEFF0
6252  3342     DCA COEFF     /FIND E↑X FROM 4.2.46, ABRAMOWITZ & STEGUN.
6253  2342  SERIES, ISZ COEFF    /T1=1+C1*X+C2*X↑2+C3*X↑3+C4*X↑4
6254  1742     TAD I COEFF
6255  3260     DCA T4
6256  1270     TAD XPOW
6257  7425     MQL!MUY
6260  0000  T4, 0
6261  7100     CLL
6262  1056     TAD T1LO
6263  3056     DCA T1LO
6264  7430     SZL
6265  2057     ISZ T1HI
6266  1054     TAD XLO
6267  7425     MQL!MUY
6270  0000  XPOW, 0
6271  3270     DCA XPOW
6272  2053     ISZ CTR2
6273  5253     JMP SERIES
6274  1056     TAD T1LO       /NOW SQUARE T1
6275  7421     MQL
6276  1057     TAD T1HI
6277  4761     JMS I MULT1
6300  1055     TAD XHI        /IF X>1, MULT BY E, XHI TIMES,
6301  7450     SNA            /EXCEPT IF XHI>7, MULT BY E↑7 NOW, MORE LATER
6302  5312     JMP SMALLX
6303  7041     CIA
6304  1345     TAD P7         / 7-XHI
6305  7510     SPA
6306  5314     JMP BIGX
6307  1346     TAD M7
6310  3053     DCA CTR2
6311  4760     JMS I EMULT1
6312  4757  SMALLX, JMS I DOIT1     /TAKES COUNTS*EXP<X>
6313  5324     JMP WINDUP
6314  3055  BIGX, DCA XHI
6315  1346     TAD M7
6316  3053     DCA CTR2
6317  4760     JMS I EMULT1
6320  4757     JMS I DOIT1
6321  1055     TAD XHI
6322  3053     DCA CTR2
6323  4760     JMS I EMULT1
6324  1056  WINDUP, TAD T1LO
6325  3460     DCA I CHANLO
6326  1057     TAD T1HI
```

```
6327  7510      SPA
6330  5762      JMP I OVRFL1
6331  3461      DCA I CHANHI          /INCREMENT EVERYBODY, LOOP BACK.
6332  2061      ISZ CHANHI
6333  2060      ISZ CHANLO
6334  2343      ISZ KHI
6335  2344      ISZ KLO
6336  2341      ISZ CTR1
6337  5225      JMP LOOP
6340  5600      JMP I XTINC
6341  0000    CTR1,0
6342  0000    COEFF,0
6343  0000    KHI,0
6344  0000    KLO,0
6345  0007    P7,7
6346  7771    M7,-7
6347  7000    M512,7000
6350  1000    P1000,1000
6351  2000    P2000,2000
6352  6352    COEFF0,COEFF0
              DECIMAL
6353  3776    2046
6354  1013    523
6355  0106    70
6356  0022    18
6357  6504    DOIT1,DOIT
6360  6472    EMULT1,EMULT
6361  6400    MULT1,MULT
6362  6464    OVRFL1,OVRFLW
              OCTAL
              *6400
6400  0000    MULT,0                /FINDS <T1HI,T1LO>=<T1HI,T1LO>*<AC,MQ>
6401  3212      DCA T2HI            /RETURNS WORDS B,C FROM <A,B,C,D>.
6402  7501      MQA
6403  3206      DCA T2LO
6404  1056      TAD T1LO
6405  7425      MQL!MUY
6406  0000    T2LO,0
6407  3230      DCA T3LO
6410  1056      TAD T1LO
6411  7425      MQL!MUY
6412  0000    T2HI,0
6413  3270      DCA T3HI
6414  7501      MQA
6415  7100      CLL
6416  1230      TAD T3LO
6417  3056      DCA T1LO
6420  7430      SZL
6421  2270      ISZ T3HI
6422  5224      JMP .+2
6423  5264      JMP OVRFLW
6424  1206      TAD T2LO
6425  3230      DCA T3LO
6426  1057      TAD T1HI
6427  7425      MQL!MUY
6430  0000    T3LO,0
6431  7100      CLL
6432  1270      TAD T3HI
6433  3270      DCA T3HI
6434  7430      SZL
```

```
6435  5264     JMP  OVRFLW
6436  7501     MQA
6437  7100     CLL
6440  1056     TAD  T1LO
6441  3056     DCA  T1LO
6442  7430     SZL
6443  2270     ISZ  T3HI
6444  5246     JMP  .+2
6445  5264     JMP  OVRFLW
6446  1212     TAD  T2HI
6447  3252     DCA  T5
6450  1057     TAD  T1HI
6451  7425     MQL!MUY
6452  0000  T5,  0
6453  7440     SZA
6454  5264     JMP  OVRFLW
6455  7501     MQA
6456  7100     CLL
6457  1270     TAD  T3HI
6460  3057     DCA  T1HI
6461  7430     SZL
6462  5264     JMP  OVRFLW
6463  5600     JMP  I  MULT
6464  7200  OVRFLW, CLA
6465  3057     DCA  T1HI
6466  3056     DCA  T1LO
6467  5671     JMP  I  WINDP1
6470  0000  T3HI, 0
6471  6324  WINDP1, WINDUP
6472  0000  EMULT, 0
6473  1303     TAD  ELO
6474  7421     MQL
6475  1302     TAD  EHI
6476  4200     JMS  MULT
6477  2053     ISZ  CTR2
6500  5273     JMP  EMULT+1
6501  5672     JMP  I  EMULT
              DECIMAL
6502  0002  EHI, 2
6503  5576  ELO, 2942
6504  0000  DOIT, 0
6505  1460     TAD  I  CHANLO
6506  7421     MQL
6507  1461     TAD  I  CHANHI
6510  4200     JMS  MULT
6511  5704     JMP  I  DOIT
```

Tom's ASCII Tape
file 3

```
.PALP
*OUT-S:TTT9
*
*IN-S:CON0,S:TTT9,S:DIC3,S:UUU4
*
*
*
*
*OPT-T

A       6267
AA      6414

                /CON0
                XLIST
                PAUSE/TTTT
                /ROUTINES TO TRANSFER CHARACTERS TYPEWRITER, CORE, DISC,
                /PACK AND UNPACK, MOVE, AND COMPARE
                /TYCC RETURNS 1,2,3 IN ARG2 IF FIRST CHAR IS RET,=,#
                /WITHOUT ECHOING. ECHOS ZEROS IF FIRST CHAR IS RET
                /RETURNS 4 IF FIRST CHAR IS ALT MODE
                /OTHERWISE STANDARD BEHAVIOR.
                /CCTY RETURNS AMT OF UNUSED SPACE.
                /
                /
                /
                TELSW=16   /ORIGINAL FOCAL TTY BUFFER FLAG.
                /
                *KB1+66
0226    6044    CMPR
0227    6077    MOVV
0230    6200    TYCC
0231    6400    CCTY
0232    6466    DICC
0233    6434    CCLI
0234    6600    PACC
0235    6650    UNPA
                *FNKB1+66
0732    0222    0222 /CMPR
0733    2506    2506 /MOVV
0734    2447    2447 /TYCC
0735    0471    0471 /CCTY
0736    0447    0447 /DICC
0737    0251    0251 /CCLI
0740    3433    3433 /PACC
0741    2313    2313 /UNPA
                /
                /
                +6044
6044    0000    CMPR,0
6045    7300      CLA CLL
6046    3050      DCA ARG1
6047    3051      DCA ARG2
6050    1054    TAD ARG5
6051    7041      CIA
6052    3054      DCA ARG5
6053    1452    A1,TAD I ARG3
6054    7041      CIA
6055    1453      TAD I ARG4
6056    7440      SZA
6057    5265      JMP AA
6060    2052      ISZ ARG3
```

```
6061  2053      ISZ ARG4
6062  2054      ISZ ARG5
6063  5253      JMP A1
6064  5644      JMP I CMPR
6065  7500  A2, SMA
6066  5273      JMP A3
6067  7200      CLA
6070  1377      TAD C1
6071  3051      DCA ARG2
6072  5644      JMP I CMPR
6073  7200  A3, CLA
6074  1376      TAD C2
6075  3051  DCA ARG2
6076  5644  JMP I CMPR
6077  0000  MOVV, 0
6100  7300  CLA CLL
6101  1054      TAD ARG5
6102  7041      CIA
6103  3054      DCA ARG5
6104  1452  B1, TAD I ARG3
6105  3453  DCA I ARG4
6106  2052      ISZ ARG3
6107  2053      ISZ ARG4
6110  2054      ISZ ARG5
6111  5304      JMP B1
6112  5677      JMP I MOVV
              /
6176  0002
6177  0001
              *6200
              /
              /
6200  0000  TYCO, 0
6201  6201      CIF
6202  1742      TAD I TELSW1   /WAIT FOR TTY SUPPER TO CLEAR
6203  7640      SZA CLA
6204  5202      JMP .-2
6205  6211      CDF 10
6206  6002      IOF
6207  7300          CLA CLL
6210  3126      DCA INTRUP
6211  3050          DCA ARG1
6212  3051      DCA ARG2
6213  1052          TAD ARG3
6214  7041          CIA
6215  3052          DCA ARG3
              /
6216  6031          KSF
6217  5216          JMP .-1
6220  6036          KRB
6221  3453          DCA I ARG4
6222  1453          TAD I ARG4
6223  1377      TAD C-375   /ALT MODE
6224  7450      SNA
6225  5300      JMP 4
6226  1376      TAD C375
6227  1375      TAD C-233    /ESCAPE
6230  7450      SNA
6231  5300      JMP 4
6232  1374      TAD C233
```

```
                /                       /RET
6233    1373            TAD (-215
6234    7450            SNA
6235    5267            JMP A
                /                       /#
6236    1372    TAD (-26
6237    7450    SNA
6240    5273            JMP B
                /                       /=
6241    1371            TAD (-32
6242    7450            SNA
6243    5314            JMP C
                /
6244    1370    TAD (275        /RESTORE
6245    1367    G, TAD (-377
6246    7450            SNA
6247    5321            JMP D
                /
6250    1366    TAD (162        /RETURN
6251    7450    SNA
6252    5334    JMP E
6253    1365     TAD (215
6254    4304            JMS ECHO
6255    2053            ISZ ARG4
6256    2052            ISZ ARG3
6257    5261    JMP F
6260    5600            JMP I TYCO
6261    6031    F, KSF
6262    5261            JMP .-1
6263    6036            KRB
6264    3453            DCA I ARG4
6265    1453            TAD I ARG4
6266    5245            JMP G
                /
                /
6267    7200    A, CLA
6270    1364            TAD (1
6271    3051            DCA ARG2
6272    5334    JMP E
                /
                /
6273    4304    B, JMS ECHO
6274    7200            CLA
6275    1363    TAD (3
6276    3051            DCA ARG2
6277    5600            JMP I TYCO
                /
6300    7200    H, CLA
6301    1362    TAD (4
6302    3051    DCA ARG2
6303    5600    JMP I TYCO
                /
6304    0000    ECHO, 0
6305    7200            CLA
6306    1453            TAD I ARG4
6307    4523    JMS I FLAGX
6310    7200    CLA
6311    1453    TAD I ARG4
6312    4527    JMS I TYPEX
6313    5704            JMP I ECHO
```

```
                    /
                    /
6314    4304    C, JMS  ECHO
6315    7200            CLA
6316    1361            TAD (2
6317    3051            DCA ARG2
6320    5600            JMP I TYCO
                    /
                    /
6321    1360    D, TAD (334
6322    3453            DCA I ARG4
6323    4304            JMS ECHO
6324    7200            CLA
6325    1053            TAD ARG4
6326    1357            TAD (-1
6327    3053            DCA ARG4
6330    1052            TAD ARG3
6331    1357            TAD (-1
6332    3052            DCA ARG3
6333    5261            JMP F
                    /
                    /
6334    7200    E, CLA
6335    3453            DCA I ARG4
6336    2053            ISZ ARG4
6337    2052            ISZ ARG3
6340    5334            JMP E
6341    5600            JMP I TYCO
                    /
6342    0016    TELSW1, TELSW
                    /
                    /
6357    7777
6360    0334
6361    0002
6362    0004
6363    0003
6364    0001
6365    0215
6366    0162
6367    7401
6370    0275
6371    7746
6372    7752
6373    7563
6374    0233
6375    7545
6376    0375
6377    7403
                    PAGE
                    /
6400    0000    CCTY, 0
6401    6201      CDF
6402    1633      TAD I TELSW2
6403    7640      SZA CLA
6404    5202      JMP .-2     /WAIT FOR TTY BUFFER TO CLEAR.
6405    6211      CDF 10
6406    7300    CLA CLL
6407    3050      DCA ARG1
6410    3051      DCA ARG2
```

```
6411  1052            TAD ARG3
6412  7041            CIA
6413  3052            DCA ARG3
                      /
6414  7200  AA, CLA
6415  4523    JMS I FLAGX
6416  7200    CLA
6417  1453    TAD I ARG4
6420  7450    SNA
6421  5227    JMP BB
6422  4527    JMS I TYPEX
6423  2053    ISZ ARG4
6424  2052    ISZ ARG3
6425  5214    JMP AA
6426  5600    JMP I COTY
6427  1052  BB, TAD ARG3
6430  7041    CIA       /RETURN AMT OF ZEROED SPACE.
6431  3051    DCA ARG2
6432  5600    JMP I COTY
                      /
6433  0016  TELSW2, TELSW
                      /
                      /
                      /
                      PAUSE/
6434  0000  COD1, 0
6435  7300            CLA CLL
6436  1054            TAD ARG5
6437  7041            CIA
6440  3054    DCA ARG5
                      /
6441  7200  BBBBBB, CLA
6442  1455            TAD I ARG6
6443  3051            DCA ARG2
6444  4520            JMS I PUTWRX
6445  2055            ISZ ARG6
6446  2053            ISZ ARG4
6447  7200            CLA
6450  1053            TAD ARG4
6451  1377            TAD (-201
6452  7510            SPA
6453  5263            JMP AAAAAA
6454  7200    CLA
6455  1052    TAD ARG3
6456  1056    TAD ARG7
6457  3052    DCA ARG3
6460  7200            CLA
6461  1057    TAD ARG8
6462  3053            DCA ARG4
6463  2054  AAAAAA, ISZ ARG5
6464  5241            JMP BBBBBB
6465  5634            JMP I COD1
                      /
                      /
6466  0000  DICO, 0
6467  7300  CLA CLL
6470  1054            TAD ARG5
6471  7041            CIA
6472  3054            DCA ARG5
6473  4541  BBBBB, JMS I GETWRX
```

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6474  7200            CLA
6475  1051            TAD ARG2
6476  3455            DCA I ARG6
6477  3051            DCA ARG2
6500  2055            ISZ ARG6
6501  2053            ISZ ARG4
6502  7200            CLA
6503  1053            TAD ARG4
6504  1377            TAD (-201
6505  7510            SPA
6506  5316            JMP AAAAA
6507  7200      CLA
6510  1052      TAD ARG3
6511  1056      TAD ARG7
6512  3052      DCA ARG3
6513  7200            CLA
6514  1057      TAD ARG5
6515  3053            DCA ARG4
6516  7200    AAAAA, CLA
6517  2054            ISZ ARG5
6520  5273            JMP BBBBB
6521  5666      JMP I DICC
                /
              /
              PAUSE/
6577  7577
              *6600
              /
6600  0000    PACC, 0
6601  7300            CLA CLL
6602  1052            TAD ARG3
6603  7041            CIA
6604  3052            DCA ARG3
6605  1053            TAD ARG4
6606  3054            DCA ARG5
6607  7300    BBB, CLA CLL
6610  1453            TAD I ARG4
6611  7450            SNA
6612  5222            JMP CCC
6613  1377            TAD (-300
6614  7510            SPA
6615  1376            TAD (100
6616  7100            CLL
6617  7006            RTL
6620  7006            RTL
6621  7006            RTL
6622  3454    CCC, DCA I ARG5
6623  2052            ISZ ARG3
6624  5231            JMP AAA
6625  7200            CLA
6626  1454            TAD I ARG5
6627  3454            DCA I ARG5
6630  5600            JMP I PACC
6631  2053    AAA, ISZ ARG4
6632  7200            CLA
6633  1453            TAD I ARG4
6634  7450            SNA
6635  5241            JMP EDD
6636  1377            TAD (-300
6637  7510            SPA
```

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6640   1376            TAD (100
6641   1454   DDD,TAD I ARG5
6642   3454            DCA I ARG5
6643   2054            ISZ ARG5
6644   2053            ISZ ARG4
6645   2052            ISZ ARG3
6646   5207            JMP BBB
6647   5600   JMP I PACC
               /
               /
               /
6650   0000   UNPK,0
6651   7300            CLA CLL
6652   1053            TAD ARG4
6653   1052            TAD ARG3
6654   3060            DCA ARG9
6655   1060            TAD ARG9
6656   3054            DCA ARG5
6657   1052            TAD ARG3
6660   7041            CIA
6661   3057            DCA ARG8
6662   1057            TAD ARG8
6663   3052            DCA ARG3
6664   1053            TAD ARG4
6665   3056            DCA ARG7
6666   1456   BBBB,TAD I ARG7
6667   3460            DCA I ARG9
6670   2056            ISZ ARG7
6671   2060            ISZ ARG9
6672   2057            ISZ ARG8
6673   5266            JMP BBBB
6674   7200   CCCC,CLA
6675   1454            TAD I ARG5
6676   4316            JMS AAAA
6677   2053            ISZ ARG4
6700   7200            CLA
6701   1454            TAD I ARG5
6702   7104            CLL RAL
6703   7104            CLL RAL
6704   7104            CLL RAL
6705   7104            CLL RAL
6706   7104            CLL RAL
6707   7104            CLL RAL
6710   4316            JMS AAAA
6711   2053            ISZ ARG4
6712   2054            ISZ ARG5
6713   2052            ISZ ARG3
6714   5274            JMP CCCC
6715   5650            JMP I UNPK
6716   0000   AAAA,0
6717   7110            CLL RAR
6720   7110            CLL RAR
6721   7110      CLL RAR
6722   7110      CLL RAR
6723   7110      CLL RAR
6724   7110      CLL RAR
6725   7450      SNA
6726   5333      JMP DDDD
6727   1375      TAD (-40
6730   7510      SPA
```

```
6731   1376     TAD (100
6732   1374     TAD (245
6733   3453   DDDD, DCA I AR+4
6734   5716     JMP I AAAA
                /
                /
                /
6774   3240
6775   7740
6776   0100
6777   7500
```