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PDP 8 MICROPHOTOMETER PROGRAM SYSTEM
and Machine Language Listings

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Machine Language Programming for the Lick Computer-Controlled Microphotometer

Introduction

This booklet contains listings of the special machine language sub-systems used to enable the Lick FOCAL language to operate the microphotometer and its peripherals. A list of available FOCAL commands, with an explanation of the arguments of each command, is given, followed by a sheet showing the core memory taken up by the machine language programs. These programs normally reside on the disk memory and are loaded into core memory when needed.

In the appendix, an example of a FOCAL program used to operate the microphotometer is given. This program should serve only as an example, as some parts of it have not been adequately debugged.

Note that the program overlays to create "LICK FOCAL" from Digital Equipment Corp.'s FOCAL-69 are printed in L.O.T.R. 3, and a general description of the system is given in L.O.T.R. 1.

FUNCTION LIST: "LICK FOCAL" SUMMARY

Set D = FITR(N)	integer value of N. (D is set equal to integer value of N)
Set D = FLOG(N)	log N (D is set equal to log N to the base e)
Set D = FSIN(N)	sine N
Set D = FCOS(N)	cosine N
Set D = FEXP(N)	exponential e^N
Set D = FSGN(N)	sign of N
Set D = FABS(N)	absolute value of N
Set D = FSQT(N)	square root of N
Set D = FTAK(B,W)	get single precision value of word W in disk block B.**
Set D = FASK(B,W)	get 10 digit floating format variable starting at disk word W, block B. (4 words used) - See X STOR( )

A special command "X" (execute) can be used for functions which need not return a number to FOCAL:

X PUT(B,W,I)	Store integer I* in disk word W, block B.**
X STOR(B,W;V)	Store variable V starting at disk word W (Note semicolon).
X GO(S,L) X DO(S,L)	Like ordinary GO,DO but with computed arguments. (Subroutine S, line L.)
X FILE(N)	File program N on DECtape.
X CALL(N,S,Q)	Call program N, start at subroutine S (if S>0). If Q = 1, calls can be nested to 10 levels. Nesting list is cleared for Q = 0.
X CALL(N,S*128 + L)	Start at line L, subroutine S , Program N.
X CALL(N)	Call program N, don't start.
X END(Ø)	Return to calling program; next line.
X SHFT(B,N)	Move disk block B to an address N words higher. $N<2048$
X PEN(X,Y)	Move chart recorder X steps, then move pen to Y.
X SHFT(B,-N)	Move disk block B to an address N words lower. $N<2048$

X MPUT(D,T,N,U) — Copies from Disk to Tape
- D: First disk block
- T: First tape block
- N: Number of blocks to transfer
- U: Tape Unit # (Ø and 8 are the same unit)

X MTAK(D,T,N,U) — Copies from Tape to Disk

Disk blocks 213 to 225 are changed. Atempts to treat disk blocks above block 210 will produce a diagnostic "DISK END" with these 2 instructions.

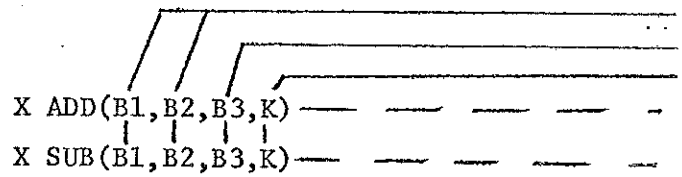
**If B=W=Ø, the previously used disk address will be incremented and taken as the current disk address.

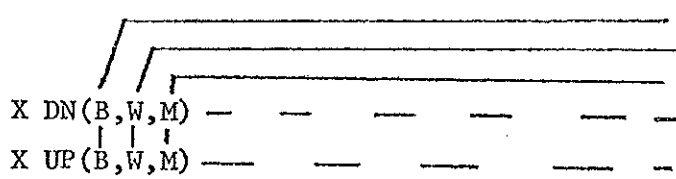
*Integers can have values $0 \leq I \leq 4095$

CALCOMP PLOTTER

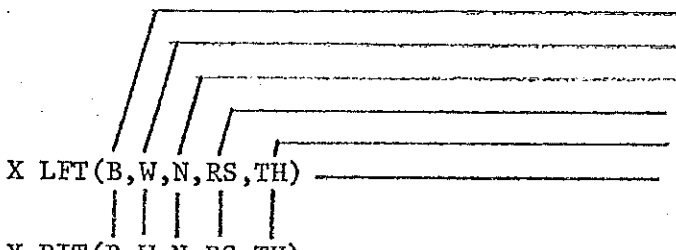
X COMP(X,Y,D)	Move a distance Y, then a distance X. Move diagonally if D = 1.
X CPEN(P,T)	P = 0: Pen Up. P = 1: Pen Down. Pause for time ~ 10*T msec. Pen motion needs about 100msec, which can be used for computation, or by the pause.
Set D = ZCOM(Y)	D becomes equal to the current Y location of the Calcomp pen. Location record is reset to Y.
X DIS(X,Y)	Store a dot on the CRT at location X,Y. (Full scale 1023)
X STAT(X,Y,S)	X origin ≠ 0 Y origin ≠ 0 Letter size Direct all future printing to the CRT. Redirect printing to teletype if X = -1 or for CTRL-C, or for any error diagnostic. (See Appendix G)
X SWIT(-1)	Erase CRT. (Wait for 0.5 sec before trying to write anything)
X SWIT(Ø,L)	Load lamps L. Lamps are coded 1,2,4,---32.
S D = FSWIT(N,S,Ø,Ø,M)	Read switch N,S to D. Set M = 4095 to read all group N at once. (M = 9 to read switch 1 & 8, weighted, etc.) M = 0 to read only switch N,S.
S D = FSWIT(3,11,X,Y)	Display joystick marker at X,Y. When switch 3,11 is pushed, return 1024*X1 + Y1 where X1,Y1 is final marker location. See Appendix J.
X NAME(N)	Replace disk overlay program #6 with a special user generated machine language program, #N.
X WHAT(M,N)	Type the names of N+1 user generated overlay programs as found on a program DECtape. (See Appendix N) Starting at Program M.
X PUTN(B,W,D,N,I)	First block First word First word content Word count Data increment for successive words Load disk with linear data.
X ICRT (o)	(Exchange X and Y axes for CRT plot command. Useful for drawing vertical lines.)

ADDITIONAL FOCAL COMMANDS FOR MICROPHOTOMETER





Move M steps of 4.5 micron each, record digitized amplifier output at each step in successive disk words. Full scale amplifier output is 1023.

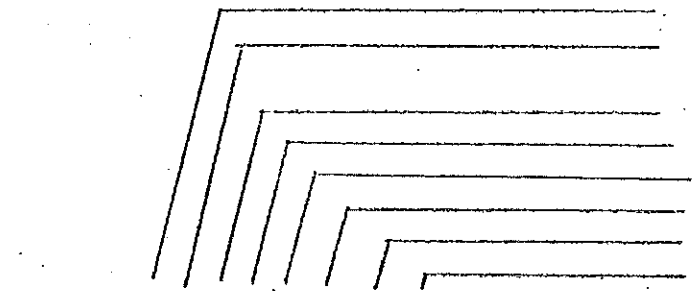


Set D = FUNC(B,W,K)

D becomes a function of disk word W in block B. Function tables are preset by X SET(A,Z). K/3096 is the fraction used of the second table. (interpolates between the two tables.) See Appendix F

X SET(A,Z) (A,Z nonzero)

Loads two 129 word function tables from blocks A,Z for use of FUNC( ), X PLOT( ), X IFIX( ).



Applies FUNC conversion to each data point, and outputs result to CRT or chart recorder.

If L = 0; output is on strip chart.
If ND = 0; direct readings from the disk are plotted, without use of the function tables.

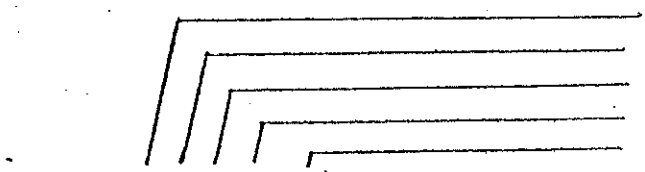
Switch 3,7 will select Calcomp plotter.
Switch 3,4 will pause for pen change, etc.

*See footnote next page.

*X IFIX(B,O,S,1,N,ND,NF,OF)

Used exactly like X PLOT( ), but output replaces original data on the disk, instead of going to CRT or recorder.

See Appendix H.



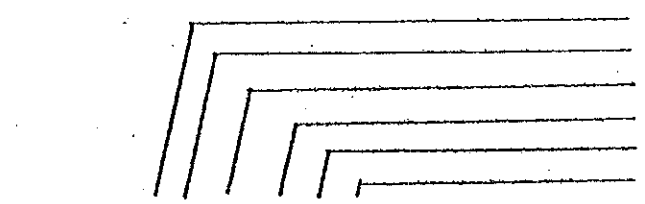
Multiplies N words on the disk by a number which varies linearly from G1/1000 to G2/1000, as it goes from the first to the last word.

X PUTL(B,W,N)

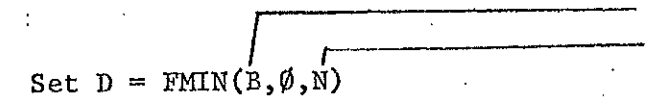
Stores double precision values of N ($N \leq 2^{23} (\sim 8 \times 10^6)$) on disk words W, W+1, block B.

Set D = F TAKL(B,W)

Retrieves double precision data from disk.



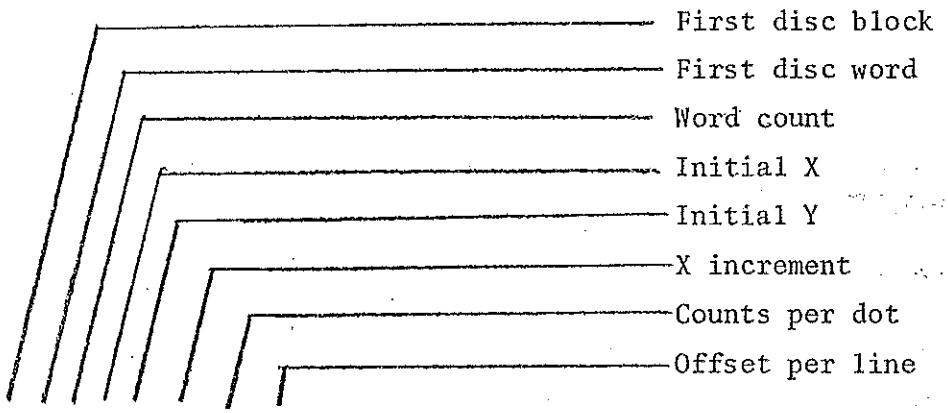
Converts 129 double precision variables. V1 = V/D + A.



Returns the minimum value found in N blocks of the disk. (Single precision data)

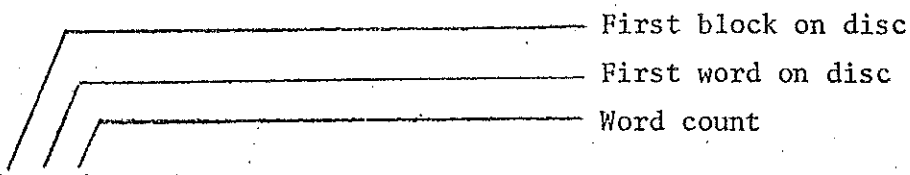
---

*USE X STAT(1,1) to initialize X,Y location
USE X SET(A,Z) to initialize function tables from disk blocks A,Z which represent the calibration at the ends of the 24 block data segments on the disk.

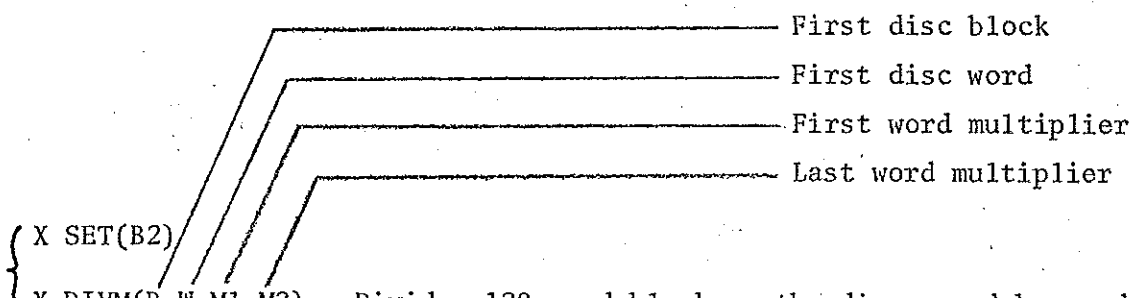


X SHOW(B,W,N,X,Y,DX,DZ,OF) - Z axis display from disc

Brightens one spot for each occurrence of DZ counts (to display a spectrum in optical format).



Set D=FTOTL(B,W,N) - Adds up N words from the disc



X SET(B2)

X DIVM(B,W,M1,M2) - Divides 129 word block on the disc, word by word, by the contents of block B2. The multipliers are interpolated across the block, and allow precision to be kept in the result.

(7)

Microphotometer Core Allocation - Feb/74 - Field 1

MIC 73-D

0-5 FOCAL 6-7 CONØ 20-44 CONØ 76-77 50-61 ARG 62-74 MCON 76-77 CONØ 112-130 CONØ 132-137 140-237 KB1	1000-1177 GODO 560-2567 TEXT 5000-5077 PUTL 5100-5300 BUFERC } XTRA! 5400-5567 CONV } 15000-5577; 5577-5777 BUFERA 6000-6041 ENTR Load LABL after all else!
6042-6154 DATU (1) 6200-6310 DATU 6400-6533 STAG 6545-6577 MINM 6600-6661 MULT 6676-6777 DIVM	6044-6065 PUTN (4) 6066-6110 FSET 6112-6140 TOTL 6167-6342 PLAT ~~6350-6370 TAPO~~ 6470-6577 COMP 6600-6773 PLAT
6044-6112 SHOW (2) 6113-6144 GOTO 6150-6370 TAPO ~~6263-6376 COMP~~ 6422-6772 SWIT (6422-6772)	6112-6146 SHIF (5) 6200-6377 NAME 6520-6576 ADER 6600-6775 CHAIN
6044-6343 LIST (3) 6400-6542 CRT 6545-6576 SAV4 6600-6765 (CRT) 6770-6777 (SAV4)	(Use FNKB1+66--77 (6) for routines in program 6)

.FAST
.XTRA
.SET1
.TAPE
.MFOC
.STEN

} Builds Focal from Source Tape

Start at 12000 to create a 'FAST' tape.

COMMAND CROSS INDEX Feb 1/74

	Command	Program Listing
X	ADD	ADER
	ASK	SAV4
	CALL	CHAIN
	COMP	COMP
	CONV	PUTL
	CPEN	COMP
	DIS	PLAT
	DIVM	DIVM
	DO	GOTO
	DN	STAG
	END	CHAIN
	FILE	CHAIN
	GO	GOTO
	ICRT	PLAT
	IFIX	PLAT
	LFT	DATU
	MIN	MINM
	MPUT	TAPO
	MTAK	TAPO
	MULT	MULT
	NAME	NAME
	PEN	PLAT
	PUTN	PUTN
	PUTL	PUTL
	PLOT	PLAT
	RIT	DATU

	Command	Program Listing
X	STAT	CRT
	SET	FSET
	SHFT	SHIF
	SHOW	SHOW
	STOR	SAV4
	SUB	ADER
	SWIT	SWIT
	TAKL	PUTL
	TOTL	TOTL
	(F)UNC	CONV
	UP	STAG
	WHAT	NAME
	ZCOM	PLAT

(9)

Tape 10P
Nov. 28/72.

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

ADCV    6532

                /CON0
                XLIST
                PAUSE/
                /
                /MCON
                XLIST
                PAUSE/
                /
                /ADER
                /ADDS AND SUBTRACTS DISC BLOCKS. LOADS BUFFER A.
                /X ADD(NA,NB,NC,K) :BLOCK NC=NA+NB+K (WORD FOR WORD)
                /X SUB(NA,NB,NC,K)  :NC=NA-NB+K
                /
                *KB1+43
0203    6520    ADD
0204    6525.   SUB
                *FNKB1+43
0707    3444    3444     /ADD
0710    2052    2052     /SUB
                /
                *6520
6520    0000    ADD,0
6521    1320        TAD ADD
6522    3325        DCA SUB
6523    1375        TAD SETOPR
6524    5327        JMP AFSET
6525    0000    SUB,0
6526    1376        TAD SETCIA
6527    3361    AFSET,DCA ARFUNC
6530    4537        JMS I BWRITX /PROTECT CORE BUFFER
6531    1052        TAD ARG3
6532    3116        DCA BLOKIN
6533    7100        CLL
6534    4524        JMS I MVBUFX /READ TO BUFFER A
6535    5577    BUFAX,BUFERA
6536    1053        TAD ARG4
6537    3116        DCA BLOKIN
6540    7100        CLL          /READ TO BUFFER B
6541    4524        JMS I MVBUFX
6542    7577    BUFBX,BUFERB
6543    1054        TAD ARG5
6544    7650        SNA CLA
6545    5725        JMP I SUB    /EXIT IF NO OUTPUT BLOCK GIVEN
6546    7240        CLA CMA
6547    1335        TAD BUFAX
6550    3010        DCA 10
6551    7240        CLA CMA
6552    1342        TAD BUFBX
6553    3011        DCA 11
6554    1011        TAD 11
```

```
6555  3012      DCA 12
6556  1032      TAD M201
6557  3017      DCA 17
6560  1411  ARITH,TAD I 11
6561  7000  ARFUNC,OPR
6562  1410      TAD I 10
6563  1055      TAD ARG6
6564  3412      DCA I 12
6565  2017      ISZ 17
6566  5360      JMP ARITH
6567  1054      TAD ARG5
6570  3116      DCA BLOKIN
6571  7120      STL  /WRITE RESULTANT
6572  4524      JMS I MVBUFX
6573  7577      BUFERB
6574  5725      JMP I SUB
                /
6575  7000  SETOPR,OPR
6576  7041  SETCIA,CIA
```

(11)

Tape 14C
Nov. 3/72

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

ALSET  6660

            /CON0
            XLIST
            PAUSE/
            /
            /CHAIN-CHAINING PROGRAM
            /X FILE(N) TO STORE PROGRAM N
            /X CALL(N,SB,Q) TO CALL PROGRAM N,SUBROUTINE SB
            /X END(0) WILL THEN CONTINUE ORIGINAL PROGRAM.
            /IF Q IS >0 CALLS CAN BE NESTED.
            /
            /PROGRAMS START AUTOMATICALLY IF SB IS NON-ZERO.
            /LINE AB.XY CAN BE CALLED BY SB=128*AB+XY
            /
            CHBUFR=7150
            ERR2=2726
            /
            *PGRETN
0135  7150  CHBUFR
            *KB1+2
0142  6616  CHACAL
0143  6671  CHAPUT
0144  6750  XEND
            /
            *FNKB1+2
0646  2554  2554     /CALL
0647  2545  2545     /FILE
0650  0164  164      /END
            /
            FIELD 0
            *3120    /ENTERED FROM ALSET
3120  3060  LINFIN,DCA BUFR /NEW END OF TEXT
3121  7501     MQA
3122  7450    SNA
3123  5177    JMP 177        /NO LINENO,DON'T START.
3124  3067     DCA LINENO    /NEW FIRST LINE NO.
3125  4555    FINDLN
3126  7000     OPR  /LINE NOT FOUND
3127  6774     DTLB /SET FIELD 0 FOR MONITOR IN CASE ARG4 IS 0
3130  7001    IAC
3131  3065    DCA NAGSW      /ALL TEXT
3132  6001    ION
3133  4540    PUSHJ
3134  0606    606            /GO, AFTER FINDLN
3135  5736    JMP I .+1
3136  0273    273
            /
            FIELD 1
            *6600
6600  0000  CHAIN,0
6601  1052     TAD ARG3
```

```
6602  7106      CLL RTL
6603  7004      RAL           /8 BLOCKS PER PROGRAM
6604  1044      TAD FSPROG    /FIRST BLOCK USED
6605  3027      DCA DTBLOK
6606  1006      TAD CLENGT    /CHAIN LENGTH
6607  3024      DCA DDWCNT
6610  3030      DCA DTUNIT    /TAPE 8
6611  1121      TAD LINPNT    /START OF TEXT (BFTEMP)
6612  3023      DCA DDCORE
6613  1346      TAD P10
6614  3026      DCA DSFELD
6615  5600      JMP I CHAIN
                /
6616  0000  CHACAL,0
6617  1054    TAD ARG5
6620  7640    SZA CLA
6621  5224    JMP NEST
6622  1372  FIXT,TAD PZERO
6623  3135    DCA PGRETN
6624  6203  NEST,CIF!CDF
6625  1135    TAD PGRETN
6626  1374    TAD MINMAX
6627  7700    SMA CLA
6630  4771    JMS I ERRORP  /TOO MANY NESTED CALLS
6631  1773    TAD I PCX     /SAVE PC
6632  6213    CDF!CIF 10
6633  3016    DCA 16
6634  1416    TAD I 16      /PC POINTS TO CURRENT LINENO
6635  7001    IAC           /X END(0) WILL RETURN TO NEXT LINE
6636  2135    ISZ PGRETN
6637  3535    DCA I PGRETN
6640  1042    TAD PGLAST
6641  2135    ISZ PGRETN
6642  3535    DCA I PGRETN
6643  4200  CDO,JMS CHAIN
6644  4421      JMS I DTAPX
6645  5243      JMP .-2     /TAPE ERROR
6646  1052    TAD ARG3      /RETURNS HERE WITH INTERRUPT OFF.
6647  3042    DCA PGLAST    /NEW PROGRAM NO.
6650  1053      TAD ARG4
6651  7421      MQL
6652  7501      MQA
6653  0266      AND P7600
6654  7640      SZA CLA
6655  5260      JMP ALSET   /GROUP NUMBER FOUND
6656  7413      SHL
6657  0006      6           /LESS THAN 200,CHANGE TO A GROUP NO.
6660  7200  ALSET,CLA
6661  1522      TAD I L0TPNT /L0TEMP
6662  3747      DCA I L0PNT  /LINE0
6663  1521      TAD I LINPNT /BFTEMP
6664  6203      CDF CIF
6665  5667      JMP I LINFIX
                /
                /BFTEMP STORES "BUFR". L0TEMP STORES C(LINE0)
                /
6666  7600  P7600,7600
6667  3120  LINFIX,LINFIN
6670  0060  BUFPNT,BUFR
                /
```

```
6671  0000  CHAPUT,0          /STORE FROM C(LINPNT) FOR 2010 WORDS
6672  4422     JMS I MESAGX
6673  0275  TEXT /B=
6674  6100  1/
6675  6201     CDF
6676  1670     TAD I BUFPNT
6677  6211     CDF 10
6700  3521     DCA I LINPNT /BFTEMP
6701  1521     TAD I LINPNT
6702  4536     JMS I OCTPNX /PRINT LAST TEXT ADDRESS
6703  4200     JMS CHAIN
6704  2053     ISZ ARG4     /FORCE GETWRX (NEEDS NON-ZERO)
6705  4541    JMS I GETWRX
6706  2116    ISZ BLOKIN    /IN CASE BLOKIN=ARG3
6707  4541    JMS I GETWRX  /SAVES DISK BUFFER AND SETS POINTERS.
6710  7240     CLA CMA
6711  3116     DCA BLOKIN   /DISC BUFFER TO BE ERASED
6712  4421     JMS I DTAPX  /READ FIRST BLOCK BEFORE CHANGING IT
6713  5312     JMP .-1      /TAPE ERROR
6714  1666     TAD I P7600  /SECOND BUFFER WORD IS L0TEMP
6715  7650     SNA CLA
6716  5336     JMP OK       /TAPE UNUSED
6717  1042     TAD PGLAST
6720  7041     CIA
6721  1052     TAD ARG3
6722  7650     SNA CLA
6723  5336     JMP OK       /SAME PROGRAM JUST CALLED FROM TAPE
6724  4422     JMS I MESAGX
6725  1713  TEXT /OK
6726  7700  ?/
6727  6002    IOF
6730  6031     KSF
6731  5330     JMP .-1
6732  6036     KRB
6733  1345     TAD M331     /TYPE Y TO STORE ANYWAY
6734  7640     SZA CLA
6735  5532     JMP I KILALL
6736  4200  OK,JMS CHAIN
6737  1747     TAD I L0PNT
6740  3522     DCA I L0TPNT /SETS LINE0 EXIT
6741  1037  CHWRIT,TAD P20  /WRITE IT
6742  4421     JMS I DTAPX
6743  5341     JMP .-2      /TAPE ERROR
6744  5671     JMP I CHAPUT
            /
6745  7447  M331,-331
6746  0010  P10,10
6747  0540  L0PNT,LINE0
            /
6750  0000  XEND,0
6751  1535    TAD I PGRETN
6752  3052    DCA ARG3
6753  7040    CMA
6754  1135    TAD PGRETN
6755  3135    DCA PGRETN
6756  1535    TAD I PGRETN
6757  3053    DCA ARG4
6760  7040    CMA
6761  1135    TAD PGRETN
6762  3135    DCA PGRETN
```

```
                /
6763  1135      TAD PGRETN
6764  7041      CIA
6765  1372      TAD PZERO
6766  7700      SMA CLA
6767  5222      JMP FIXT        /PGRETN =PZERO;INCREASE IT
6770  5243      JMP CDO
                /
6771  2726    ERRORP,ERR2
6772  7147    PZERO,CHBUFR-1
6773  0022    PCX,PC
6774  0603    MINMAX,-7175
```

Nov 27/72

(135)

```
.PALP
*OUT-S:CRT
*
*IN-S:CON0,S:MCON,S:CRT1,S:CRT2
*
*
*
*
*OPT-T

ACFULL 6606

                /CON0
                XLIST
                PAUSE/
                /
                /MCON
                XLIST
                PAUSE/
                /
                /CRT1
                /LETTERING PROGRAM FOR MEM. SCOPE
                /X STAT(X,Y,S) SETS X,Y ORIGIN
                /SETS CRT OUTPUT FOR +VE X,TELETYPE OUTPUT FOR -VE X
                /S IS LETTER SIZE;   TYPE "C&" TO RESET PAGE
                /
                *KB1+37 /SEE LETPNT
0177   6400     SETCRT
                *FNKB1+37
0703   0734     734      /STAT
                /
                *CRTGOL+600-6200        /IN FUNCTION LIST TABLE
0770   0000     CRTGET,0         /MOVED TO FIELD 0 BY GODO
0771   7450        SNA
0772   1066        TAD CHAR
0773   6213        CDF!CIF 10
0774   4776        JMS I LETSEX
0775   5770     LETBAK,JMP I CRTGET      /RETURN HERE FROM SPRIN
0776   7425     LETSEX,LETSET
                /
                *7425
7425   0000     LETSET,0         /ALWAYS IN CORE
7426   7450        SNA
7427   1234        TAD LETPNT    /JUNK IF NO CODE
7430   3017        DCA 17        /TEMP STORE****
7431   1234        TAD LETPNT
7432   3050        DCA ARG1      /NEEDED TO TEST CRT IN CORE
7433   5514        JMP I DISPAX  /ENTRY TO LFOC
7434   0040     LETPNT,40        /SETS KB1+37 FOR LFOC
                /
                *6400
6400   0000     SETCRT,0
6401   1017        TAD 17        /TEMP STORE****
6402   7440        SZA
6403   4742        JMS I SPRINX  /FOCAL LETTER ENTRY
6404   1052        TAD ARG3
6405   7700        SMA CLA
6406   5212        JMP SETOK
6407   1260        TAD PXOUT     /SWITCH TO TTY OUT
6410   6201        CDF
6411   5234        JMP SETGO
6412   1052     SETOK,TAD ARG3
```

```
6413  7450      SNA
6414  5221      JMP G04
6415  3062      DCA XBASE
6416  1062      TAD XBASE
6417  3064      DCA XLOC      /PRESET X POSITION
6420  3074      DCA XMAX
6421  1053  G04,TAD ARG4
6422  7450      SNA
6423  5227      JMP G05
6424  3063      DCA YBASE
6425  1063      TAD YBASE
6426  3065      DCA YLOC
6427  1054  G05,TAD ARG5
6430  7040      CMA
6431  3073      DCA SCALE
6432  4237      JMS TELTST
6433  1255  DOIT,TAD CRTXIT
6434  3657  SETGO,DCA I PRINGO       /CHANGE TYPE OUTPUT
6435  6211      CDF 10
6436  5600      JMP I SETCRT
                /
6437  0000  TELTST,0
6440  6201  TELTRY,CDF
6441  6002      IOF
6442  1656      TAD I TELSWX /TYPING IN PROGRESS?
6443  7650      SNA CLA
6444  5637      JMP I TELTST
6445  6001      ION
6446  5240      JMP TELTRY
                /
                /
                /
6447  4237  ENDIT,JMS TELTST         /SETS DATA FIELD 0!!
6450  1260      TAD PXOUT
6451  3657      DCA I PRINGO         /RESTORE OUTPUT TO TYPER
6452  1262      TAD P277
6453  4527      JMS I TYPEX
6454  5661      JMP I GETOTX
                /
6455  6370  CRTXIT,CRTGOL
6456  0016  TELSWX,TELSW
6457  0063  PRINGO,OUTDEV
6460  2676  PXOUT,XOUTL      /FOCAL OUT TO TELETYPE
6461  6672  GETOTX,GETOUT
6462  0277  P277,277
                /
6463  0000  DOT,0
6464  1730      TAD I COUN7X /COUNT7
6465  1331      TAD P7
6466  4332      JMS SCALEM
6467  7104      CLL RAL
6470  1065      TAD YLOC
6471  6063      DYL
6472  3325      DCA YTEMP
6473  1064  XSET,TAD XLOC
6474  4727      JMS I SCTESX
6475  6053      DXL
6476  6054      DIX
6477  3324      DCA XTEMP
6500  1073      TAD SCALE
```

```
6501  3031  DCA TEMPS0       /COUNTER
6502  1073  YLINE, TAD SCALE
6503  7104     CLL RAL       /DOUBLE Y SCALE
6504  3326     DCA SCOUN
6505  1325     TAD YTEMP
6506  7001  SPREDY, IAC
6507  6063     DYL           /FILL IN YLINE
6510  6054     DIX
6511  2326     ISZ SCOUN
6512  5306     JMP SPREDY
6513  7300     CLA CLL
6514  1324     TAD XTEMP
6515  7001     IAC
6516  4727     JMS I SCTESX /TEST EDGR OF SCREEN
6517  6053     DXL
6520  3324     DCA XTEMP
6521  2031     ISZ TEMPS0
6522  5302     JMP YLINE
6523  5663     JMP I DOT
              /
6524  0000  XTEMP, 0
6525  0000  YTEMP, 0
6526  0000  SCOUN, 0
6527  6735  SCTESX, SCTEST
6530  6761  COUN7X, COUNT7
6531  0007  P7, 7
              /
6532  0000  SCALEM, 0
6533  3031     DCA TEMPS0
6534  1073     TAD SCALE
6535  3326     DCA SCOUN
6536  1031     TAD TEMPS0    /MULTIPLY BUT SAVE MQ
6537  2326     ISZ SCOUN
6540  5336     JMP .-2
6541  5732     JMP I SCALEM
              /
6542  6600  SPRINX, SPRIN
              PAUSE/
              /
              /CRT2
              FIELD 1
              /LETTER DECODE AND DISPLAY
              /
              PAGE
6600  0000  SPRIN, 0
6601  1357     TAD P101
6602  7450     SNA
6603  5744     JMP I ENDITX /FOUND ERROR CODE '7677'
6604  1351     TAD M101
6605  0365     AND P377
6606  1352  ACFULL, TAD M246 /&
6607  7450     SNA
6610  5300     JMP SRESET
6611  1355     TAD P6
6612  7500     SMA
6613  5220     JMP LETTER
6614  1356     TAD P23
6615  7650     SNA CLA
6616  5313     JMP CR
6617  5315     JMP LF
```

```
                /
6620  7421  LETTER,MQL
6621  7405     MUY
6622  0003     3              /3 WORDS PER CHARACTER
6623  7701     CLA!MQA
6624  1364     TAD LSBASE
6625  3363     DCA POINT      /CHARACTER DESCRIPTOR
6626  1345  INIT,TAD M5
6627  3360     DCA COUNT5
6630  1346     TAD M7
6631  3361     DCA COUNT7
6632  1350  WORDON,TAD M14
6633  3362     DCA COUN12
6634  1763     TAD I POINT
6635  7421     MQL            /DESCRIPTOR WORD
6636  2363     ISZ POINT
6637  7413  BITEST,SHL
6640  0000     0              /SHIFT HIGHEST BIT TO AC
6641  7640     SZA CLA
6642  4676     JMS I DOTEX    /A '1'
6643  2361  TESTON,ISZ COUNT7
6644  5310     JMP TEST12
6645  1073     TAD SCALE      /ONE COLUMN DONE
6646  7041     CIA
6647  1064     TAD XLOC
6650  4335     JMS SCTEST
6651  3064     DCA XLOC
6652  1346     TAD M7
6653  3361     DCA COUNT7
6654  2360     ISZ COUNT5
6655  5310     JMP TEST12
6656  1353  FINISH,TAD P3
6657  4677  EXIT,JMS I SCALEX
6660  1064     TAD XLOC
6661  4335     JMS SCTEST     /AVOID WRAP AROUND
6662  3064  NOWGO,DCA XLOC
6663  1074  NOWGO2,TAD XMAX
6664  7041     CIA
6665  1064     TAD XLOC
6666  7710     SPA CLA
6667  5272     JMP GETOUT
6670  1064     TAD XLOC
6671  3074     DCA XMAX
6672  6203  GETOUT,CDF!CIF
6673  6001     ION
6674  5675     JMP I LETBAX
6675  6375  LETBAX,LETBAK+6200-600   /ALWAYS RETURN TO FOCAL PRINT
                /
6676  6463  DOTEX,DOT
6677  6532  SCALEX,SCALEM
                /
6700  1063  SRESET,TAD YBASE
6701  3065     DCA YLOC
6702  1355     TAD P6
6703  3062     DCA XBASE
6704  3074     DCA XMAX
6705  6362     ERASE
6706  1062     TAD XBASE
6707  5262     JMP NOWGO
                /
```

```
                /
6710  2362  TEST12, ISZ COUN12
6711  5237      JMP BITEST
6712  5232      JMP WORDON    /12 BIT WORD FINISHED
                /
6713  1062  CR, TAD XBASE
6714  5262      JMP NOWGO
                /
6715  7300  LF, CLA CLL
6716  1347      TAD M24
6717  4677      JMS I SCALEX
6720  1065      TAD YLOC
6721  4335      JMS SCTEST
6722  3065      DCA YLOC
6723  7420      SNL
6724  5263      JMP NOWGO2
6725  1353      TAD P3          /END OF PAGE COLUMN
6726  4677      JMS I SCALEX
6727  1074      TAD XMAX
6730  3062      DCA XBASE
6731  1063      TAD YBASE
6732  3065      DCA YLOC
6733  1062      TAD XBASE
6734  5262      JMP NOWGO
                /
6735  0000  SCTEST, 0
6736  7104      CLL RAL
6737  7530      SZL SPA
6740  7340      CLA CLL CMA   /SET 3777 IF >1777
6741  7010      RAR
6742  5735      JMP I SCTEST
                /
6743  0066  CHARAC, CHAR       /FOCAL'S CHARACTER BUFFER
6744  6447  ENDITX, ENDIT
                /
6745  7773  M5, -5
6746  7771  M7, -7
6747  7754  M24, -24
6750  7764  M14, -14
6751  7677  M101, -101
6752  7532  M246, -246
6753  0003  P3, 3
6754  0005  P5, 5
6755  0006  P6, 6
6756  0023  P23, 23
6757  0101  P101, 101
6760  0000  COUNT5, 0
6761  0000  COUNT7, 0
6762  0000  COUN12, 0
6763  0000  POINT, 0
6764  6044  LSBASE, LISLET    /START OF LETTER LIST
6765  0377  P377, 377
```

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

ADCV    6532

                /CON0
                XLIST
                PAUSE/
                /
                /MCON
                XLIST
                PAUSE/
                /
                /COMP
                /PUT IN SAME OVERLAY WITH 'PLAT',WHICH USES IT!
                /
                /X COMP(X,Y,D) DRAWS LINE Y,THEN X.DIAGONAL IF D NON-ZERO.
                /X CPEN(P,T) RAISES OR LOWERS PEN FOR P=0 OR 1.
                /DELAYS A TIME 10*T MSEC.
                /
                *FNKB1+32
0676    0370    370     /COMP
                *FNKB1+53
0717    0366    366     /CPEN
                *KB1+32
0172    6470    CALCOM
                *KB1+53
0213    6546    CPEN
                /
                PLSF=6501       /KILLS 6511,6521
                PLCF=6502
                PLPD=6524
                PLPU=6504
                PLPR=6511
                PLPL=6521
                PLDU=6512
                PLDD=6514
                /
                *6470
6470    0000    CALCOM,0
6471    1052      TAD ARG3
6472    7700      SMA CLA
6473    7126      STL RTL       /PLDD-PLDU=2
6474    1370      TAD UPSET
6475    3344      DCA XMOV
6476    1052      TAD ARG3
6477    7510      SPA
6500    1375      TAD M1
6501    7500      SMA
6502    7040      CMA
6503    3052      DCA ARG3
6504    1053      TAD ARG4
6505    7710      SPA CLA
6506    1371      TAD RITDIF    /-VE Y
6507    1372      TAD LEFSET
```

(20)

Tape 10 Q
Mar. 2 1/74

```
6510  3327     DCA YMOV
6511  1053     TAD ARG4
6512  7510     SPA
6513  1375     TAD M1
6514  7500     SMA
6515  7040     CMA
6516  3053     DCA ARG4
6517  5334     JMP XGO
6520  2053  YGO, ISZ ARG4
6521  5327     JMP YMOV
6522  3327     DCA YMOV
6523  2054     ISZ ARG5
6524  1344     TAD XMOV
6525  7650  ENTEST, SNA CLA
6526  5670     JMP I CALCOM
6527  0000  YMOV, 0
6530  1376     TAD M1500
6531  3010     DCA 10
6532  2010     ISZ 10
6533  5332     JMP .-1          /DELAY A BIT LESS THAN SPEC!
6534  1054  XGO, TAD ARG5
6535  7650     SNA CLA
6536  5320     JMP YGO
6537  2052     ISZ ARG3
6540  5344     JMP XMOV
6541  3344     DCA XMOV
6542  1327     TAD YMOV
6543  5325     JMP ENTEST
6544  0000  XMOV, 0
6545  5320     JMP YGO
              /
6546  0000  CPEN, 0
6547  1052  PENMOV, TAD ARG3
6550  7640     SZA CLA
6551  1374     TAD PENDIF
6552  1373     TAD PENUP
6553  3354     DCA PENOP
6554  7000  PENOP, OPR
6555  1053     TAD ARG4
6556  7040     CMA
6557  3010     DCA 10
6560  5365     JMP CTEST
6561  1377  WAIT, TAD P4000
6562  3011     DCA 11
6563  2011     ISZ 11
6564  5363     JMP .-1
6565  2010  CTEST, ISZ 10
6566  5361     JMP WAIT
6567  5746     JMP I CPEN
              /
6570  6512  UPSET, PLDU
6571  7770  RITDIF, PLPR-PLPL
6572  6521  LEFSET, PLPL
6573  6504  PENUP, PLPU
6574  0020  PENDIF, PLPD-PLPU
6575  7777  M1, -1
              /
6576  6300  M1500, -1500
6577  4000  P4000, 4000
```

Tape 10P
Nov. 27/72

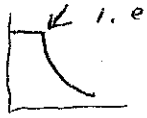
(22)

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

ADCV    6532

                /CON0
                XLIST
                PAUSE/
                /
                /MCON
                XLIST
                PAUSE/
                /
                /CONV
                /FUNC(B,W,F)--WITH TWO FUNCTIONS Y=F(X) ON
                /DISC BLOCKS A,C  (Y STORED FOR X=0,8,16--128)
                /INITIALIZE BY X SET(A,C)
                /NOW :S D=FUNC(B,W,F) WILL INTERPOLATE BETWEEN THE TWO
                /FUNCTIONS A,C WHERE X IS TAKEN FROM WORD W,D
                /--F/3096 GIVES FRACTION OF FUNCTION C USED.
                /3096=24 X 129)
                /
                /
                *KB1+22
0162    5400    CONVER
                *FNKB1+22
0666    2163    2163    /UNC
                /
                *5400
5400    0000    CONVER,0
5401    1054    TAD ARG5
5402    7041      CIA
5403    1351      TAD P3096     /SINGLE FUNCTION IF ARG5=0
5404    3341      DCA FMULR
5405    3054      DCA ARG5
5406    3357      DCA FTEMPR    /INITIALIZE
5407    4541      JMS I GETWRX
5410    7421      MQL           /CLEAR MQ
5411    1051      TAD ARG2      /RESULT FROM GETWRD
5412    7417      LSR
5413    0002      2             /INTERPOLATER=0--7 IN MQ
5414    1367    TAD BUFRAX
5415    4241      JMS FCALC
5416    3360      DCA FTEMPM    /RESULT FROM FUNCTION A
5417    1341      TAD FMULR
5420    7041      CIA
5421    1351      TAD P3096
5422    3341      DCA FMULR
5423    7421      MQL
5424    1051      TAD ARG2
5425    7417      LSR
5426    0002      2
5427    1366      TAD BUFRCX
5430    4241      JMS FCALC
5431    1360      TAD FTEMPM
```

Note that this program can't stand discontinuities



```
5432  3051      DCA ARG2      /OUTPUT TO FOCAL
5433  1357      TAD FTEMPR
5434  1355      TAD M1548     /HALF OF DIVISOR
5435  7700      SMA CLA
5436  2051      ISZ ARG2      /ROUNDOFF
5437  7000      OPR
5440  5600      JMP I CONVER
                /
                / Y=BX+CX*X..128Y=Y2(32X-2X*X)+Y3(X*X-8X)
                /
5441  0000    FCALC,0
5442  1361      TAD M1        /FOR AUTO INDEX
5443  3010      DCA 10
5444  1410      TAD I 10
5445  3363      DCA YZERO     /BASE VALUE FOR Y
5446  1363      TAD YZERO
5447  7141      CIA CLL
5450  1410      TAD I 10
5451  7510      SPA
5452  7041      CIA
5453  3304      DCA Y2        /SECOND POINT-BASE
5454  7010      RAR           /L=1 FOR +
5455  3362      DCA SIGN
5456  1363      TAD YZERO
5457  7041      CIA
5460  1410      TAD I 10
5461  7510      SPA
5462  7041      CIA           /EXPECT A MONATONIC INCREASE OR DECR.
5463  3320      DCA Y3        /THIRD POINT-YBASE
5464  7417      LSR  /GET INTERPOLATOR
5465  0010      10
5466  7501      MQA
5467  3271      DCA X
5470  7405      MUY
5471  0000    X,0
5472  7701      CLA!MQA
5473  3365      DCA XSQUAR
5474  1271      TAD X
5475  7106      CLL RTL
5476  7006      RTL           /X 16
5477  7041      CIA
5500  1365      TAD XSQUAR
5501  7041      CIA
5502  7104      CLL RAL
5503  7425      MQL!MUY       /Y2(32X-2X*X)
5504  0000    Y2,0            /CALCULATING 128*Y
5505  7407      DVI
5506  0100      100           /DIVIDE BY 64
5507  7701      CLA!MQA
5510  3364      DCA YTEMP -
5511  1271      TAD X
5512  7106      CLL RTL
5513  7004      RAL           /8 X
5514  7041      CIA
5515  1365      TAD XSQUAR
5516  7041      CIA           /NEGATIVE FOR 1<X<8
5517  7425      MQL!MUY
5520  0000    Y3,0            /Y3(X*X-8X)
5521  7407      DVI
5522  0100      100           /DIVIDE BY 64
```

$y^3(8x-x^2)$

```
5523  7300      CLA CLL
5524  1362      TAD SIGN
5525  7004      RAL
5526  7501      MQA
5527  7041      CIA             /FIX FOR NEG.MULTIPLIER
5530  1364      TAD YTEMP
5531  7430      SZL
5532  7041      CIA             /ALLOW FOR NEGATIVE DIFFERENCES
5533  7440      SZA             /AVOID CHANGED LINK
5534  7010      RAR             /DIVIDED BY 2*64
5535  7430      SZL
5536  7001      IAC             /ROUNDOFF
5537  1363      TAD YZERO       /FINAL RESULT
5540  7425      MQL!MUY
5541  0000    FMULR,0           /SET FOR FRACTION OF A OR C
5542  3031      DCA TEMPS0
5543  7501      MQA
5544  1357      TAD FTEMPR      /GET PREVIOUS REMAINDER
5545  7421      MQL
5546  7004      RAL
5547  1031      TAD TEMPS0
              DECIMAL
5550  7407      DVI
5551  6030    P3096,3096
5552  3357      DCA FTEMPR      /REMAINDER
5553  7501      MQA
5554  5641      JMP I FCALC
              /
5555  4764    M1548,-1548
5556  7776    M2,-2
5557  0000    FTEMPR,0
5560  0000    FTEMPM,0
5561  7777    M1,-1
5562  0000    SIGN,0
5563  0000    YZERO,0
5564  0000    YTEMP,0
5565  0000    XSQUAR,0
5566  5100    BUFRCX,BUFERC
5567  5577    BUFRAX,BUFERA
```

Tape 10 P
Dec. 1/72.

(237)

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

ADCV   6532

                /CON0
                XLIST
                PAUSE/
                /
                /MCON
                XLIST
                PAUSE/
                /
                /DATU
                /SUBROUTINE TO TAKE AND STORE DATA
                /X LFT(B,W,N,RS,K)..X RIT(  )..SET D=FLFT( )
                /TO MOVE STAGE LEFT OR RIGHT,AND STORE DATA FOR N BLOCKS
                /STARTING AT BLOCK B,WORD W.
                /FINAL READING IS PUT INTO D
                /WAITS FOR READING ABOVE K.
                /RS IS NO. OF CLOCK PULSES SKIPPED PER READING
                /
                *KB1+16
0156   6200     LFT
0157   6205     DATAKE  /MOVING RIGHT
                *FNKB1+16
0662   1004     1004    /LFT
0663   1634     1634    /RIT
                /
                *DREADX
0071   6142     DAREAD
                *LISMVX
0066   6055     LISMOV
                *LSCLRX
0070   6121     LISCLR
                *LSBEGX
0067   6131     LSBEGN
                *PUTLSX
0072   6042     PUTLST
                /
                *6042
6042   0000     PUTLST,0
6043   3714        DCA I LISTIN
6044   2314        ISZ LISTIN
6045   1314        TAD LISTIN
6046   7141        CIA CLL
6047   1320        TAD LISEND
6050   7630        SZL CLA
6051   5642        JMP I PUTLST
6052   1317        TAD LISBEG
6053   3314        DCA LISTIN
6054   5642        JMP I PUTLST
                /
                /DATA SAVED IN LIST IS TRANSFERRED TO DISC BUFFER
                /
```

```
6055  0000  LISMOV,0
6056  1313    TAD LISBAK
6057  3125    DCA WAITX       /SO ANY DISC IO RETURNS AT ONCE TO LISEXT.
6060  1315     TAD LISOUT
6061  7161     CIA CLL CML
6062  1314     TAD LISTIN
6063  7650     SNA CLA
6064  5307     JMP LISEXT     /LIST EMPTY
6065  1316     TAD LSTEST
6066  7640     SZA CLA
6067  5307     JMP LISEXT     /BUFFER OR LIST BUSY
6070  2316     ISZ LSTEST     /SET LIST BUSY
6071  1715     TAD I LISOUT
6072  3051     DCA ARG2       /LOW ORDER 12 BITS
6073  2315     ISZ LISOUT
6074  1315     TAD LISOUT
6075  7141     CIA CLL
6076  1320     TAD LISEND
6077  7630     SZL CLA
6100  5303     JMP LISGO
6101  1317     TAD LISBEG
6102  3315     DCA LISOUT     /END OF LIST,GO TO BEGINNING
6103  4520  LISGO,JMS I PUTWRX       /PUT ARG2 IN DISK BUFFER.
6104  3316    DCA LSTEST      /LIST FREE
6105  3052     DCA ARG3
6106  3053     DCA ARG4       /FUTURE DATA STORED SEQUENTIALLY
6107  6002  LISEXT,IOF        /FLAGX MUST NOT BE INTERUPTED!
6110  4523    JMS I FLAGX     /ALLOW DISC TO FINISH,OR SEE CTRL-C
6111  5655     JMP I LISMOV
              /
6112  0000  WXTEMP,0
6113  6107  LISBAK,LISEXT
              /
6114  5577  LISTIN,BUFERA
6115  5577  LISOUT,BUFERA
6116  0000  LSTEST,0
6117  5577  LISBEG,BUFERA
6120  5777  LISEND,BUFERA+200
              /
6121  0000  LISCLR,0
6122  4466  LSWAIT,JMS I LISMVX
6123  1316    TAD LSTEST
6124  7640    SZA CLA
6125  5322    JMP LSWAIT      /WAIT TILL LIST IS EMPTY.
6126  1312    TAD WXTEMP
6127  3125    DCA WAITX       /RESTORE DISC EXIT.
6130  5721     JMP I LISCLR
              /
6131  0000  LSBEGN,0
6132  1125    TAD WAITX
6133  3312    DCA WXTEMP      /FOR LATER RESTORATION.
6134  3316     DCA LSTEST
6135  1317     TAD LISBEG
6136  3315     DCA LISOUT
6137  1317     TAD LISBEG
6140  3314     DCA LISTIN
6141  5731     JMP I LSBEGN /LIST INITIALIZED
              /
              /
6142  0000  DAREAD,0
```

```
6143  6002    IOF   /ADC IS UNKNOWN TO INTERRUPT  SYS.
6144  6532    ADCV
6145  6531    ADSF
6146  5345    JMP .-1
6147  6534    ADRB
6150  7152    CLL CMA RTR
6151  0354    AND P1777     /10 BITS ONLY
6152  7100    CLL           /NEEDED AT DATOK
6153  5742    JMP I DAREAD
              /
6154  1777    P1777,1777
              /
              *6200
6200  0000    LFT,0
6201  1200    TAD LFT
6202  3205    DCA DATAKE
6203  6314    MVLEFT
6204  5207    JMP DATGO
6205  0000    DATAKE,0
6206  6315    MVRIHT
6207  1054    DATGO,TAD ARG5
6210  7040    CMA
6211  3054    DCA ARG5
6212  3061    DCA ARG10     /SET 1/4 SEC. DELAY
6213  1310    TAD M14
6214  3031    DCA TEMPS0
6215  2061    DAWAIT,ISZ ARG10
6216  5215    JMP .-1
6217  2031    ISZ TEMPS0
6220  5215    JMP DAWAIT    /WAIT TILL MOTOR TRANSIENT IS DONE
6221  4523    DATTRY,JMS I FLAGX      /ALLOW CTRL-C
6222  4471    JMS I DREADX
6223  7040    CMA
6224  1056    TAD ARG7
6225  7700    SMA CLA
6226  5221    JMP DATTRY    /WAIT FOR DATA THRESHOLD
6227  4467    JMS I LSBEGX /INITIALIZE LIST
6230  6136    CCEC          /CLOCK ON,NO INTERRUPT.
6231  5273    JMP DBKSET    /PRESET CLKCNT
6232  3266    DPOINT,DCA DCOUNT
6233  1055    TAD ARG6
6234  7040    CMA
6235  3307    DCA PRECIS
6236  3306    DCA DATLOW
6237  3305    DCA DATOVF
6240  2266    DAREPT,ISZ DCOUNT       /WILL STOP IF ARG6 TOO BIG
6241  7410    SKP
6242  5277    JMP DASTOP
6243  4471    JMS I DREADX
6244  1306    DATOK,TAD DATLOW
6245  3306    DCA DATLOW
6246  7430    SZL
6247  2305    ISZ DATOVF
6250  1304    TAD DARETN
6251  3007    DCA CLOKGO
6252  7240    CLA CMA
6253  3113    DCA CLKCNT    /TIMER
6254  4466    JMS I LISMVX
6255  5240    JMP DAREPT
6256  0000    CLKNEX,0      /FLAGS GIVES JMS I CLOKGO FOR CLOCK FLAG.
```

OK, Interrupt off

```
6257  7000     OPR
6260  2307      ISZ PRECIS
6261  5240      JMP DAREPT
6262  1306      TAD DATLOW
6263  7421      MQL
6264  1305      TAD DATOVF
6265  7407      DVI
6266  0000   DCOUNT,0
6267  7701      CLA!MQA
6270  4472      JMS I PUTLSX /SAVE A DATA POINT
6271  2200      ISZ LFT
6272  5232      JMP DPOINT
6273  1032   DBKSET,TAD M201 /SET 129 WORD BLOCK
6274  3200      DCA LFT
6275  2054      ISZ ARG5
6276  5232      JMP DPOINT
6277  6316   DASTOP,MVSTOP    /END OF REQUIRED COUNT
6300  6132      CCFF          /CLOCK OFF
6301  4470      JMS I LSCLRX /EMPTY THE LIST
6302  3050      DCA ARG1      /SO ARG2 GIVES LAST DATA TO FOCAL
6303  5605      JMP I DATAKE /EXIT
              /
6304  6256   DARETN,CLKNEX
6305  0000   DATOVF,0
6306  0000   DATLOW,0
6307  0000   PRECIS,0
              /
6310  7764   M14,-14 /-6 NEVER FAILS AT GAIN 10EXP8,TH=40.
```

Tape 18 P
Nov. 22/72

(29)

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

ADCV   6532

            /CON0
            XLIST
            PAUSE/
            /
            /MCON
            XLIST
            PAUSE/
            /
            /DIVM
            /X DIVM(B,W,M1,M2);FOLLOWING X SET(A). DIVIDES 129 WORDS
            /FROM BLOCK B,WORD W BY BLOCK A,WORD BY WORD.
            /MULTIPLIES RESULT BY M1----M2;STORES IT IN B,W ....
            /
            LOTEM=ARG10
            WCOUNT=ARG9
            DWORD=ARG8
            /
            *FNKB1+30
0674  0675   675     /DIVM
            *KB1+30
0170  6676  DIVIDE
            /
            *6676
6676  0000  DIVIDE,0
6677  1377    TAD BUFPNT
6700  3057    DCA DWORD
6701  1327    TAD P128
6702  3310    DCA N1
6703  3316    DCA N2
6704  1376    TAD M129
6705  3060    DCA WCOUNT
6706  1054  NEXT, TAD ARG5
6707  7425    MQL!MUY
6710  0000  N1,0
6711  3345    DCA MULTER      /CALCULATING THE MULTIPLIER
6712  7501    MQA
6713  3061    DCA LOTEM
6714  1055    TAD ARG6
6715  7425    MQL!MUY
6716  0000  N2,0
6717  1345    TAD MULTER
6720  3345    DCA MULTER
6721  7501    MQA
6722  1061    TAD LOTEM
6723  7421    MQL
6724  7004    RAL             /GET CARRY
6725  1345    TAD MULTER
6726  7407     DVI
6727  0200  P128,200
6730  7044    CMA RAL
```

```
6731  1327    TAD P128        /TEST ROUNDOFF
6732  7710    SPA CLA
6733  7120    STL
6734  7501    MQA
6735  7430    SZL
6736  7001    IAC             /> 0.5
6737  3345    DCA MULTER      /(M1*N1+M2*N2)/129...N1+N2=129.
6740  1457    TAD I DWORD
6741  3347    DCA DIVER
6742  4541     JMS I GETWRX
6743  1051    TAD ARG2
6744  7425    MQL!MUY
6745  0000  MULTER,0
6746  7407    DVI
6747  0000  DIVER,0
6750  7430    SZL
6751  5374    JMP OVERFL
6752  7045    CIA RAL
6753  1347    TAD DIVER
6754  7710    SPA CLA
6755  7120    STL
6756  7501    MQA
6757  7430    SZL
6760  7001    IAC
6761  3051  SAVIT,DCA ARG2
6762  4520    JMS I PUTWRX    /SAVE RESULT ON DISK
6763  2057    ISZ DWORD
6764  2053    ISZ ARG4
6765  2316    ISZ N2
6766  7240    CLA CMA
6767  1310    TAD N1
6770  3310    DCA N1
6771  2060    ISZ WCOUNT
6772  5306    JMP NEXT
6773  5676    JMP I DIVIDE
            /
6774  7240  OVERFL,CLA CMA
6775  5361    JMP SAVIT
            /
6776  7577  M129,-201
6777  5577  BUFPNT,BUFERA
```

File 3 Tape 10
Mar 23/82

(31)

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

ADCV    6532

                /CON0
                XLIST
                PAUSE/
                /
                /MCON
                XLIST
                PAUSE/
                /
                /FSET
                /LOADS BUFFER A AND BUFFER C FROM DISC
                /X SET(A,C). IF C=0 OR MISSED,ONLY LOAD BUFFER A
                /
                *KB1+21
0161    6066    SET
                *FNKB1+21
0665    1674    1674    /SET
                /
                *6066
6066    0000    SET,0
6067    1053        TAD ARG4
6070    3310        DCA STEMP
6071    3053        DCA ARG4
6072    4537        JMS I BWRITX /BE SURE BUFFER B IS ON DISC
6073    4541        JMS I GETWRX /SET BLOKIN
6074    7100        CLL
6075    4524        JMS I MVBUFX
6076    5577    BUFRAX,BUFERA   /READ TO BUFFER A
6077    1310        TAD STEMP
6100    7450        SNA
6101    5666        JMP I SET   /EXIT IF C=0
6102    3052        DCA ARG3
6103    4541        JMS I GETWRX /SET BLOKIN
6104    7100        CLL
6105    4524        JMS I MVBUFX
6106    5100    BUFRCX,BUFERC
6107    5666        JMP I SET
                /
6110    0000    STEMP,0

.
```

- should be redone to allow Block 0

(32)

Tape 10P
Nov. 22/72

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

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /GOTO
                /X GO(S,L) WILL START SUBROUTINE
                /S AT L;X DO(S,L) WILL DO A LINE OR SUBROUTINE.
                /
                *KB1+56
0216    6113    GOTO
0217    6136    DO
                *FNKB1+56
0722    3407    3407    /GO
0723    3357    3357    /DO
                /
                *6113
6113    0000    GOTO,0
6114    1342      TAD P604
6115    7421    SETIT,MQL
6116    1052      TAD ARG3
6117    7106      CLL RTL
6120    7006      RTL
6121    7006      RTL
6122    7004      RAL
6123    6201      CDF
6124    1053      TAD ARG4
6125    3743      DCA I LINENX
6126    1053      TAD ARG4
6127    7640      SZA CLA
6130    7130      STL RAR         /SET FOR ONE LINE(4000)
6131    3744      DCA I NAGSWX    /0 FOR GROUP
6132    6203      CDF!CIF
6133    7501      MQA             /GET ENTRY ADDRESS
6134    5735      JMP I .+1
6135    1553      GOPUSH
                /
6136    0000    DO,0
6137    1341      TAD P421
6140    5315      JMP SETIT       /RETURN IS VIA 'EXIT'
                /
6141    0421    P421,421          /ENTRY TO DO ROUTINE
6142    0604    P604,604          /ENTRY TO GO ROUTINE
6143    0067    LINENX,LINENO
6144    0065    NAGSWX,NAGSW
                /
                FIELD 0                          by GOTØ in STEN.
                *1553   /THIS IS LOADED TO FIELD Ø ~~MANUALLY NOW~~
1553    3357    GOPUSH,DCA GODO
1554    6001      ION
1555    4545      GETC  /BYPASS ')'
```

```
1556   4540     PUSHJ
1557   0000   GODO,0   /421 OR 604
1560   5761   EXIT, JMP I .+1
1561   0273     273    /THIS SEEMS TO CARRY ON CLEANLY(INPUTX+2)
```

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

ADCV    6532

                /CON0
                XLIST
                PAUSE/
                /
                /MCON
                XLIST
                PAUSE/
                /LABL
                FIELD 1
                *550
0550    4015    4015        / M
0551    1103    1103        /IC
0552    6764    6764        /74
0553    5502    5502        /-B
                /
                /
                /
                *DISEND
0040    7067    -711        /END OF DISC DATA AREA
                *FSPROG
0044    0500    500         /FIRST DATA BLOCK
                *FSPROG
0044    0160    160         /FIRST PROG. BLOCK
                /
                /LOAD OVER MFOC TO LABEL EACH NEW VERSION.
                /MUST BE LOADED AFTER ALL ELSE. OTHERWISE X CALL FAILS!

.
```

(34)

File 3 Tape 10 Q
MAR 2/74

Tape 10 P
Nov. 27/72

(35)

```
.PALP
*OUT-S:LIST
*
*IN-S:MCON,S:LIST
*
*
*OPT-T

ADCV    6532

                /
                /
                /MCON
                XLIST
                PAUSE/
                /
                /LIST=LIST OF CHARACTER CODES FOR CRT LETTERING
                /
                FIELD 1
                *LISLET
6044    0000    SPACE,0
6045    0000    0
6046    0000    0
6047    0000    0
6050    1170    1170
6051    0000    0           /!=241
6052    0001    0001
6053    6000    6000
6054    3400    3400        /"
6055    1237    1237
6056    6247    6247
6057    7450    7450        /#
6060    2322    2322
6061    3774    3774
6062    4542    4542        /$
6063    4154    4154
6064    6106    6106
6065    3302    3302        /%
6066    0000    0
6067    0000    0
6070    0000    0
6071    0000    0000
6072    0070    0070
6073    0000    0000        /'
6074    1610    1610
6075    5014    5014
6076    0400    0400        /(
6077    0020    0020
6100    3012    3012
6101    1070    1070        /)
6102    0412    0412
6103    4342    4342
6104    5020    5020        /*
6105    0402    0402
6106    0760    0760
6107    4020    4020        /+
6110    0020    0020
6111    1603    1603
6112    4000    4000
6113    0002    0002
```

```
6114  0100  0100
6115  4020  4020    /-
6116  0030  0030
6117  1400  1400
6120  0000  0000    /.
6121  6016  6016
6122  0160  0160
6123  1400  1400    / /=257
                /
6124  3724  3724
6125  3114  3114
6126  2574  2574    /0
6127  0020  0020
6130  5774  5774
6131  0000  0000    /1
6132  4130  4130
6133  3214  3214
6134  4614  4614    /2
6135  2120  2120
6136  3114  3114
6137  4554  4554    /3
6140  1405  1405
6141  0227  0227
6142  7440  7440    /4
6143  2361  2361
6144  3052  3052
6145  2461  2461    /5
6146  3722  3722
6147  3114  3114
6150  4540  4540    /6
6151  0070  0070
6152  2710  2710
6153  6406  6406    /7
6154  3322  3322
6155  3114  3114
6156  4554  4554    /8
6157  0322  0322
6160  3114  3114
6161  4574  4574    /9
                /
6162  0000  0000
6163  0241  0241
6164  2000  2000    /:
6165  4031  4031
6166  0640  0640
6167  0000  0000    /;
6170  0405  0405
6171  0424  0424
6172  0400  0400    /<
6173  0005  0005
6174  0241  0241
6175  2050  2050    /=
6176  0020  0020
6177  2421  2421
6200  2020  2020    />
6201  0100  0100
6202  3310  3310
6203  4414  4414    /?
6204  0000  0
6205  0000  0
```

```
6206  0000  0       /0
            /
6207  7604  7604
6210  4211  4211
6211  1370  1370    /A
6212  7762  7762
6213  3114  3114
6214  4554  4554    /B
6215  3720  3720
6216  3014  3014
6217  0504  0504    /C
6220  7760  7760
6221  3012  3012
6222  1070  1070    /D
6223  7762  7762
6224  3114  3114
6225  0602  0602    /E
6226  7742  7742
6227  2110  2110
6230  0402  0402    /F
6231  3720  3720
6232  3215  3215
6233  0504  0504    /G
6234  7742  7742
6235  0100  0100
6236  4376  4376    /H
6237  0020  0020
6240  3774  3774
6241  0400  0400    /I
6242  1010  1010
6243  1002  1002
6244  0076  0076    /J
6245  7743  7743
6246  0222  0222
6247  0600  0600    /K
6250  7760  7760
6251  1004  1004
6252  0200  0200    /L
6253  7741  7741
6254  4300  4300
6255  3376  3376    /M
6256  7741  7741
6257  4103  4103
6260  0376  0376    /N
6261  3720  3720
6262  3014  3014
6263  0574  0574    /O
6264  7742  7742
6265  2110  2110
6266  4414  4414    /P
6267  3720  3720
6270  3216  3216
6271  0774  0774    /Q
6272  7742  7742
6273  2312  2312
6274  4614  4614    /R
6275  6322  6322
6276  3114  3114
6277  4546  4546    /S
6300  0040  0040
```

```
6301   3770   3770
6302   0402   0402     /T
6303   3760   3760
6304   1004   1004
6305   0176   0176     /U
6306   0754   0754
6307   1003   1003
6310   0036   0036     /V
6311   7754   7754
6312   0143   0143
6313   0376   0376     /W
6314   6145   6145
6315   0101   0101
6316   2306   2306     /X
6317   0141   0141
6320   1700   1700
6321   2006   2006     /Y
6322   6066   6066
6323   3114   3114
6324   6606   6606     /Z
               /
6325   7760   7760
6326   3010   3010
6327   0000   0000     /SQUARE OPEN BRACKET
6330   0041   0041
6331   6347   6347
6332   4200   4200     /BACK SLASH
6333   0000   0000
6334   1030   1030
6335   0776   0776     /SQUARE CLOSE BRACKET
6336   0200   0200
6337   5770   5770
6340   1010   1010     /↑
6341   0407   0407
6342   0520   0520
6343   4020   4020     /BACK ARROW
```

File 2, Type 10P
Nov. 22/72

(39)

```
/
/
/MCON
XLIST
/
CSCF=6133
CCEC=6136
ADCV=6532
ADSF=6531
ADRB=6534
MVLEFT=6314
MVRIHT=6315
STEPUP=6311
STEPDN=6312
PLSTEP=6317
REDBUF=6353
ERASE=6362
LODBF1=6351
/
BUFERA=5577
BUFERC=5100
/
XBASE=62
YBASE=63
XLOC=64
YLOC=65
LISMVX=66
LSBEGX=67
LSCLRX=70
DREADX=71
PUTLSX=72
SCALE=73
XMAX=74 /NOTE DIFFERENT FROM XCON
/
CRTGOL=6370      /SEE FOC4
LISLET=6044      /LETTERING LIST
TELSW=16
OUTDEV=63
XOUTL=2676
XLIST
PAUSE

*
```

(40)

Aug 5/73
Tape 10 @

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

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /MINM
                /S D=FMIN(B,0,N) GETS MINIMUM VALUE FROM
                /N BLOCKS, STARTING AT BLOCK B
                /
                *FNKB1+50
0714    1126    1126    /MIN
                *KB1+50
0210    6545    MINIM
                /
                BLKCNT=ARG10
                LWORD=ARG9
                WCNT=ARG8
                /
                *6545
6545    0000    MINIM,0
6546    1054      TAD ARG5
6547    7041      CIA
6550    3061      DCA BLKCNT      /BLOCK COUNTER
6551    7240      CLA CMA
6552    3060      DCA LWORD
6553    3053    BLOCK, DCA ARG4
6554    1377      TAD M129
6555    3057      DCA WCNT
6556    4541    WORD, JMS I GETWRX
6557    1051      TAD ARG2
6560    7140      CLL CMA
6561    1060      TAD LWORD
6562    7620      SNL CLA
6563    5366      JMP OVER        /NEW WORD IS BIGGER
6564    1051      TAD ARG2
6565    3060      DCA LWORD
6566    2053    OVER, ISZ ARG4
6567    2057      ISZ WCNT
6570    5356      JMP WORD
6571    2052      ISZ ARG3
6572    2061      ISZ BLKCNT
6573    5353      JMP BLOCK
6574    1060      TAD LWORD
6575    3051      DCA ARG2
6576    5745      JMP I MINIM
                /
6577    7577    M129,-201

.
```

Tape 10P
Nov. 27/72

(41)

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

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /MULT
                /X MULT(B,W,N,G1,G2) MULTIPLIES N WORDS,STARTING AT B
                /BY G1/1000 FOR 1ST TO G2/1000 FOR LAST BLOCK.
                /
                COUNTR=ARG10
                HIGH=ARG9
                LOW=ARG8
                /
                /
                *FNKB1+63
0727    3164      3164  /MULT
                *KB1+63
0223    6600    MULPLY
                /
                *6600
6600    0000    MULPLY,0
6601    1054      TAD ARG5
6602    3230      DCA DIVM
6603    1054      TAD ARG5
6604    3210      DCA MULR1
6605    3216      DCA MULR2
6606    1055    WORD, TAD ARG6
6607    7425      MQL!MUY
6610    0000    MULR1,0
6611    3060      DCA HIGH
6612    7501      MQA
6613    3057      DCA LOW
6614    1056      TAD ARG7
6615    7425      MQL!MUY
6616    0000    MULR2,0
6617    1060      TAD HIGH
6620    3060      DCA HIGH
6621    7501      MQA
6622    7100      CLL
6623    1057      TAD LOW
6624    7421      MQL
6625    7004      RAL   /GET CARRY
6626    1060      TAD HIGH
6627    7407      DVI
6630    0000    DIVM,0
6631    7701      CLA!MQA
6632    3236      DCA MULTER
6633    4541      JMS I GETWRX
6634    1051      TAD ARG2
6635    7425      MQL!MUY
6636    0000    MULTER,0
```

```
6637  7407     DVI
6640  1750  P1750,1750        /BY 1000
6641  7045     CIA RAL
6642  1240     TAD P1750
6643  7710     SPA CLA
6644  7001     IAC   /ROUND-OFF
6645  3051     DCA ARG2
6646  7501     MQA
6647  1051     TAD ARG2
6650  3051     DCA ARG2
6651  4520     JMS I PUTWRX
6652  2053     ISZ ARG4
6653  7240     CLA CMA
6654  1210     TAD MULR1
6655  7450     SNA
6656  5600     JMP I MULPLY
6657  2216     ISZ MULR2
6660  3210     DCA MULR1
6661  5206     JMP WORD
```

(43)

File 4 Tape 12N
June 19/73.

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

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /NAME
                /X NAME(N) REPLACES DISC OVERLAY#6 FROM TAPE 8.
                /N=0 GIVES ORIGINAL SYSTEM OVERLAY.
                /X WHAT(G,N) TYPES I.D. FOR N OVERLAYS,STARTING AT G
                /
                POUT=10
                PIN=11
                COUNT=ARG5
                /
                /
                *NOWNAM
0134    0000    0
                *FNKB1+40
0704    1555    1555    /NAME
0705    3334    3334    /WHAT
                *KB1+40
0200    6224    NAME    /THIS LOC IS USED BY PCAL (CALCOMP LETTERS.)
0201    6327    WHAT
                /
                *6172
6172    1377    PATCH,TAD P710
6173    3026      DCA DSFELD
6174    3030      DCA DTUNIT
6175    5776      JMP I .+1
6176    6203    BACK,OVER
6177    0710    P710,710
                /
                *6200
6200    0000    GTAPE,0 /READ FROM TAPE
6201    5602      JMP I .+1
6202    6172      PATCH
6203    1323    OVER,TAD M1065
6204    3024      DCA DDWCNT
6205    1052      TAD ARG3
6206    7450      SNA
6207    5220      JMP RESTOR    /GET ORIGINAL
6210    7106      CLL RTL       /X 4 BLOCKS
6211    1326      TAD OVBLOK
6212    3027      DCA DTBLOK
6213    1325      TAD P4066
6214    3023    GODOIT,DCA DDCORE
6215    4421      JMS I DTAPX   /GET NEW OVERLAY
6216    5215      JMP .-1
6217    5600      JMP I GTAPE
6220    1324    RESTOR,TAD P65  /PART OF INITIAL OVERLAY
6221    3027      DCA DTBLOK
```

```
6222  7330    CLA STL RAR    /4000,PART OF BLOCK IS UNUSED.
6223  5214    JMP GODOIT
              /
6224  0000  NAME,0
6225  1052    TAD ARG3
6226  7041    CIA
6227  1134    TAD NOWNAM
6230  7650    SNA CLA        /IS IT ALREADY ON DISK?
6231  5624    JMP I NAME     /YES
6232  4200    JMS GTAPE
6233  1052    TAD ARG3
6234  7650    SNA CLA
6235  5244    JMP OK         /DON'T TEST ORIGINAL,NO 1234 THERE.
6236  1725    TAD I P4066
6237  1317    TAD M1234
6240  7650    SNA CLA
6241  5244    JMP OK
6242  4530    JMS I CRLFX    /SO ERROR PRINT IS SEEN
6243  5532    JMP I KILALL   /MAGIC WORD WRONG
6244  1315  OK,TAD KB65
6245  3010    DCA POUT
6246  1321    TAD M12
6247  3054    DCA COUNT
6250  1267    TAD P60
6251  3410    DCA I POUT     /RESETTING DISPATCH TABLE.
6252  2054    ISZ COUNT
6253  5250    JMP .-3
6254  1316    TAD P4101      /KB1+66
6255  3023    DCA DDCORE
6256  1320    TAD M752
6257  3024    DCA DDWCNT
6260  1322    TAD P7026      /OVERLAY 6 ADDRESS ON DISC
6261  3025    DCA DISADD
6262  6002    IOF
6263  3126    DCA INTRUP     /MUST GO TO COMPLETION
6264  3041    DCA DTEST      /ALLOW SYSTEM REWRITE
6265  7326    CLA STL RTL    /2 IN AC TO WRITE
6266  4420    JMS I DISCX    /REWRITE DISC
6267  0060  P60,60          /DISC ERROR-NEVER GETS HERE!
6270  2041    ISZ DTEST      /RESTORE PROTECTION.
6271  1052    SETNAM,TAD ARG3
6272  7650    SNA CLA
6273  1313    TAD DIFREN     /NAMES #0 AT END OF OVERLAY
6274  1325    TAD P4066
6275  3011    DCA PIN
6276  1314    TAD FTAB65
6277  3010    DCA POUT
6300  1321    TAD M12
6301  3054    DCA COUNT
6302  1411  NEXNAM,TAD I PIN
6303  6201    CDF
6304  3410    DCA I POUT     /CHANGING NAME TABLE
6305  6211    CDF 10
6306  2054    ISZ COUNT
6307  5302    JMP NEXNAM
6310  1052    TAD ARG3
6311  3134    DCA NOWNAM     /RECORD CURRENT OVERLAY.
6312  5624    JMP I NAME
              /
6313  0764  DIFREN,5052-4066
```

```
6314  6331  FTAB65,FLETER+65
6315  0225  KB65,KB1+65
6316  4101  P4101,4101
6317  6544  M1234,-1234
6320  7026  M752,-752
6321  7766  M12,-12
6322  7026  P7026,7026
6323  6713  M1065,-1065
6324  0065  P65,65
6325  4066  P4066,4066
6326  0130  OVBLOK,134-4
            /
6327  0000  WHAT,0
6330  1053    TAD ARG4
6331  7041    CIA
6332  3054    DCA COUNT       /NAME COUNT
6333  4200  LOADIT,JMS GTAPE
6334  1725    TAD I P4066
6335  1317    TAD M1234
6336  7640    SZA CLA
6337  5357    JMP NEXT        /NOT AN OVERLAY
6340  4530    JMS I CRLFX     /LINE FEED BEFORE NO.
6341  1052    TAD ARG3
6342  7427    MQL!DVI
6343  0144    144
6344  4371    JMS DIGIT
6345  7427    MQL!DVI
6346  0012    12
6347  4371    JMS DIGIT
6350  1370    TAD P260
6351  4527    JMS I TYPEX
6352  1363    TAD MESDO
6353  3766    DCA I P5050
6354  1364    TAD RETRN1
6355  3767    DCA I P5071
6356  4765    JMS I P5047
6357  2052  NEXT,ISZ ARG3
6360  2054    ISZ COUNT
6361  5333    JMP LOADIT
6362  5727   JMP I WHAT
            /
6363  4422  MESDO,JMS I MESAGX
6364  5647  RETRN1,5647     /JMP I 5047(SUBROUTINE EXIT)
6365  5047  P5047,5047
6366  5050  P5050,5050
6367  5071  P5071,5071
6370  0260  P260,260
            /
6371  0000  DIGIT,0
6372  3061    DCA ARG10
6373  7501    MQA
6374  1370    TAD P260
6375  4527    JMS I TYPEX
6376  1061    TAD ARG10
6377  5771    JMP I DIGIT
```

Feb 24/74

(46)

```
.PALP
*OUT-S:PLAT
*
*IN-S:CON0,S:MCON,S:IFIX,S:PEN,S:PLAT
*
*
*
*
*
*OPT-T

ADCV    6532

                /CON0
                XLIST
                PAUSE/
                /
                /MCON
                XLIST
                PAUSE/
                /
                /IFIX
                /X IFIX(N,0,S,0,K,U,D,OF)  USES 'PLAT' TO CONVERT
                /DATA ON THE DISC VIA FUNCTION TABLE.
                /N IS FIRST BLOCK;USES FUNC UNLESS U=0;SCALE IS S/16
                /
                PUTWRX=KB1
                SAVEIN=KB1+35    /SEE PLAT
                /
                *KB1+23
0163    6200    CONINT
                *KB1+36
0176    6167    ONEDIS
                *FNKB1+36
0702    0033    33       /DIS
                *FNKB1+23
0667    1240    1240     /IFIX
                /
                *6167
6167    0000    ONEDIS,0
6170    1052      TAD ARG3
6171    6053      DXL
6172    7200      CLA
6173    1053      TAD ARG4
6174    6063      DYL
6175    7200      CLA
6176    6054      DIX
6177    5767      JMP I ONEDIS
                /
                *6200
6200    0000    CONINT,0
6201    3053       DCA ARG4      /ALWAYS TO PLOTTER
6202    1221       TAD STORIX
6203    3620       DCA I PLTGOX /SWITCH PLOTTER TO STORIT
6204    4575       JMS I SAVEIN
6205    1223       TAD PLTFIX    /ALL DONE,RESTORE PLOTTER
6206    3620       DCA I PLTGOX
6207    5600       JMP I CONINT
                /
6210    0000    STORIT,0
6211    7421       MQL
6212    7240       CLA CMA
6213    1622       TAD I DBUFRX
```

```
6214  3622      DCA I DBUFRX          /REUSE THE SAME WORD
6215  7501      MQA
6216  4540      JMS I PUTWRX
6217  5610      JMP I STORIT
                /
6220  6761    PLTGOX,PLOTGO
6221  7756    STORIX,STORIT-CRTDIS
6222  7123    DBUFRX,7123      /ADDRESS I GWRD
6223  0034    PLTFIX,PLOTTER-CRTDIS
                /
                HERE=.
                PAUSE/
                /
                /PEN
6224  0000    SCTEST,0         /SET 1777 IF >1777
6225  7104      CLL RAL
6226  7530      SPA SZL
6227  7350      CLL CLA CMA RAR       /TOO BIG
6230  7010      RAR
6231  5624      JMP I SCTEST
                /
6232  0000    CRTDIS,0         /ENTER WITH Y IN AC
6233  4224      JMS SCTEST
6234  6063    Y,DYL
6235  7200      CLA
6236  1064      TAD XLOC
6237  4224      JMS SCTEST
6240  6053    X,DXL
6241  6054      DIX
6242  7200      CLA
6243  5632      JMP I CRTDIS
                /
6244  0000    ICRT,0
6245  1234      TAD Y
6246  7421      MQL
6247  1240      TAD X
6250  3234      DCA Y
6251  7501      MQA
6252  3240      DCA X
6253  5644      JMP I ICRT
                /
6254  0000    PEN,0
6255  1052      TAD ARG3
6256  7040      CMA
6257  3244      DCA ICRT         /TEMP STORE
6260  1053      TAD ARG4
6261  6063      DYL
6262  4326      JMS STEPIT
6263  2244      ISZ ICRT
6264  5262      JMP .-2
6265  5654      JMP I PEN
                /
6266  0000    PLOTTER,0
6267  4224      JMS SCTEST
6270  6063      DYL
6271  3031      DCA TEMPS0
6272  1322      TAD P3
6273  6361      6361   /CODLOD
6274  6362      6362   /READSW
6275  0076      AND P100
```

```
6276  7650     SNA CLA
6277  5314     JMP PAUSEX
6300  1325     TAD COMLOC
6301  7041     CIA
6302  1031     TAD TEMPS0
6303  3053     DCA ARG4        /Y MOTION FOR CALCOMP
6304  1031     TAD TEMPS0
6305  3325     DCA COMLOC      /CURRENT Y LOCATION OF PEN
6306  7001     IAC
6307  3052     DCA ARG3        /X MOTION =1
6310  4572     JMS I KB1+32    /COMP
6311  3052     DCA ARG3
6312  3053     DCA ARG4        /DON'T UPSET DISC ADDRESSING
6313  7410     SKP
6314  4326  PAUSEX, JMS STEPIT
6315  6362  PAUSER, 6362       /READSW
6316  0324     AND P10
6317  7640     SZA CLA
6320  5315     JMP PAUSER      /SWITCH 3,4 HELD
6321  5666     JMP I PLOTTER
               /
6322  0003  P3, 3
6323  0004  P4, 4
6324  0010  P10, 10
6325  0000  COMLOC, 0
               /
6326  0000  STEPIT, 0
6327  1335     TAD TIME
6330  3010     DCA 10
6331  2010     ISZ 10
6332  5331     JMP .-1
6333  6317     PLSTEP
6334  5726     JMP I STEPIT
               /
6335  6000  TIME, -2000        /-1400 SKIPPED ON X=10,10"/MIN
               /
               HERE=.
               /
               /X ZCOM(N) SETS CALCOMP ZERO IN PLAT TO N.
               /
               *FNKB1+52
0716  2005  2005    /ZCOM
               *KB1+52
0212  6336  ZCOM
               *HERE
6336  0000  ZCOM, 0
6337  1052     TAD ARG3
6340  3742     DCA I CALZER
6341  5736     JMP I ZCOM
               /.
6342  6325  CALZER, COMLOC
               HERE=.
               /
               PAUSE/
               /
               /PLAT
               /DRIVES CRT OR PLOTTER
               /
               /
               /
```

```
                /X PLOT(N,NL,SC,X,K,D,F,YB)...N=FIRST BLK TO BE PLOTTED
                /NL=NO. OF LINES (PLOTTER IF ZERO)
                /K=NO. BLKS TO BE PLOTTED
                /D=TOTAL NO. OF DATA BLOCKS; F IS FIRST DATA BLK. NO.
                /SC/16 IS SCALE MULTIPLIER
                /X STEPS PER POINT...YB IS DATA OFFSET.
                /INITIALIZE LOCATION BY X SET(NC,NC);X STAT(X,Y)
                /X ICRT REVERSES X AND Y CRT AXES
                /
                /D=0 TO HAVE DIRECT (NO FUNC) PLOT
                /
                *KB1+31
0171    6244    ICRT
                /
                *KB1+34
0174    6254    PEN
0175    6600    PLOT
                /
                *FNKB1+31
0675    1044    1044    /ICRT
                /
                *FNKB1+34
0700    1366    1366    /PEN
0701    1114    1114    /PLOT
                /
                *6600
6600    0000    PLOT,0
6601    7000        OPR             /AVOID RETYPING FOR NOW
6602    1057        TAD ARG8
6603    7650        SNA CLA
6604    1357        TAD DIRECT
6605    1360        TAD FUNCON
6606    3320        DCA DATCAL      /FUNCTION OR DIRECT
6607    1053        TAD ARG4
6610    7650        SNA CLA
6611    1361        TAD PLOTGO      /PLOT IF ARG4=0
6612    1362        TAD CRTDO
6613    3356        DCA GODO
6614    1053        TAD ARG4
6615    7450        SNA
6616    7001        IAC
6617    3226        DCA DIVTEM
6620    1226        TAD DIVTEM
6621    7106        CLL RTL         /ALLOW 1/16 FRACTIONS FOR SCALE MULTIPLIER
6622    7006        RTL
6623    3330        DCA DIVER       /NORMALIZE IF SEVERAL LINES
6624    7332        CLA STL RTR     /SET 2000
6625    7427        MQL!DVI
6626    0000    DIVTEM,0
6627    7701        CLA!MQA
6630    3365        DCA YSTEP       /LINE SPACE
6631    1053        TAD ARG4
6632    7650        SNA CLA
6633    3365        DCA YSTEP       /NO STEP FOR 0
6634    3053        DCA ARG4        /FOR SUCCESSIVE WORDS
6635    1056        TAD ARG7
6636    7041        CIA
6637    3373        DCA BLKCNT
6640    1372        TAD M129
6641    3363        DCA WCOUNT
```

```
6642  1057      TAD ARG8
6643  3271      DCA BLKDF1
6644  1057      TAD ARG8
6645  3301      DCA BLKDF2
6646  1060      TAD ARG9
6647  7041      CIA
6650  1052      TAD ARG3      /RELATIVE BLOCK N0.
6651  3366      DCA NBLOK
6652  1054      TAD ARG5
6653  7450      SNA
6654  7001      IAC
6655  3326      DCA MULTER    /SCALE EXPANSION
6656  5265      JMP INTMOV
6657  1365  ENDLIN,TAD YSTEP        /START NEXT LINE
6660  1065      TAD YLOC
6661  4771      JMS I SCTESX
6662  3065      DCA YLOC
6663  1062  ALINE,TAD XBASE
6664  3064      DCA XLOC
6665  1366  INTMOV,TAD NBLOK
6666  7425      MQL!MUY
6667  6030  D3096,6030
6670  7407      DVI
6671  0000  BLKDF1,0
6672  3367      DCA REMAIN
6673  7501      MQA
6674  3054      DCA ARG5      /FOR INTERPOLATOR
6675  1370      TAD NWORD
6676  7425      MQL!MUY
6677  0030  D24,30
6700  7407      DVI
6701  0000  BLKDF2,0
6702  1367      TAD REMAIN
6703  7145      CLL CIA RAL
6704  1301      TAD BLKDF2    /TEST 1/2 OR MORE
6705  7710      SPA CLA
6706  2054      ISZ ARG5      /ROUND-OFF
6707  7501      MQA
6710  1054      TAD ARG5
6711  3054      DCA ARG5
6712  2370      ISZ NWORD
6713  1055      TAD ARG6
6714  7450      SNA
6715  7001      IAC
6716  7041      CIA
6717  3364      DCA XWIDTH    /X STEP WIDTH
6720  0000  DATCAL,0         /JMS GETWRD OR CONVER
6721  3052      DCA ARG3      /TO GET SUCCESSIVE WORDS
6722  1051  PLPINT,TAD ARG2 /RESULT OF DATCAL
6723  7510      SPA
6724  7200      CLA           /AVOID NEGATIVE WRAP AROUND
6725  7425      MQL!MUY
6726  0000  MULTER,0          /EXPAND SCALE
6727  7407      DVI
6730  0000  DIVER,0           /FOR MULTIPL LINES
6731  7701      CLA!MQA
6732  1065      TAD YLOC      /ADD CURRENT BASELINE
6733  1061      TAD ARG10     /DATA OFFSET
6734  4756  GOSHOW,JMS I GODO       /PLOTTER OR CRTDIS
6735  2064      ISZ XLOC
```

```
6736  2364      ISZ XWIDTH
6737  5322      JMP PLPINT    /SAME Y, STEP X
6740  2363      ISZ WCOUNT
6741  5351      JMP CONTIN
6742  1372      TAD M129
6743  3363      DCA WCOUNT
6744  3370      DCA NWORD
6745  2366      ISZ NBLOK
6746  2373      ISZ BLKCNT
6747  7410      SKP
6750  5600      JMP I PLOT
6751  1064  CONTIN, TAD XLOC
6752  7104      CLL RAL
6753  7730      SPA SZL CLA
6754  5257      JMP ENDLIN    /X OVERFLOW
6755  5265      JMP INTMOV
                /
6756  0000  GODO, 0  /PLOTTER OR CRTDIS
6757  7757  DIRECT, GETWRX-KB1-22
6760  4562  FUNCON, JMS I KB1+22      /FUNC (CONVER)
6761  0034  PLOTGO, PLOTTER-CRTDIS
6762  6232  CRTDO, CRTDIS
6763  0000  WCOUNT, 0
6764  0000  XWIDTH, 0
6765  0000  YSTEP, 0
6766  0000  NBLOK, 0
6767  0000  REMAIN, 0
6770  0000  NWORD, 0
6771  6224  SCTESX, SCTEST
6772  7577  M129, -201
6773  0000  BLKCNT, 0
                /
```

File 3 Tape 10H
Jan. 4/72

(52)

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

ADCV    6532

                /CON0
                XLIST
                PAUSE/
                /
                /MCON
                XLIST
                PAUSE/
                /
                /PUTL
                /X PUTL(B,W,N) STORES 24 BITS OF N IN W,W+1
                /X TAKL(B,W) RETRIEVES IT FROM DISC WORD W,BLOCK B.
                /X CONV(B,W,B1,W1,D,A) CONVERTS 129 WORDS STARTING
                /AT BLOCK B,WORD W;DIVIDES EACH BY D,AND ADDS 'A'
                /TO EACH RESULTANT WORD..STORES AT B1,W1.
                /
                POINT=16
                COUNTR=ARG10
                TEMP=ARG9
                /
                *FNKB1+60
0724    2254    2254    /PUTL
0725    3544    3544    /TAKL
0726    0406    406     /CONV
                /
                *KB1+60
0220    5000    PUTL
0221    5015    TAKL
0222    5027    CONV
                /
                *5000
5000    0000    PUTL,0
5001    1054      TAD ARG5
5002    3060      DCA TEMP
5003    6201      CDF
5004    1626      TAD I P45
5005    6211      CDF 10
5006    3051      DCA ARG2
5007    4520      JMS I PUTWRX
5010    2053      ISZ ARG4
5011    1060      TAD TEMP
5012    3051      DCA ARG2
5013    4520      JMS I PUTWRX   /LOW PART
5014    5600      JMP I PUTL
                /
5015    0000    TAKL,0
5016    4541      JMS I GETWRX
5017    1051      TAD ARG2
5020    3060      DCA TEMP
5021    2053      ISZ ARG4
5022    4541      JMS I GETWRX
```

(double words)

```
5023  1060     TAD TEMP
5024  3050     DCA ARG1
5025  5615     JMP I TAKL
               /
5026  0045   P45,45
               /
5027  0000   CONV,0
5030  1277     TAD POINTR
5031  3016     DCA POINT
5032  1276     TAD M129
5033  3061     DCA COUNTR
5034  1056     TAD ARG7
5035  3247     DCA DIVER
5036  4215   WORD,JMS TAKL
5037  2053     ISZ ARG4
5040  1247     TAD DIVER
5041  7110     CLL RAR          /FIXING FOR ROUNDOFF
5042  1051     TAD ARG2
5043  7421     MQL
5044  7004     RAL              /GET CARRY
5045  1050     TAD ARG1
5046  7407     DVI
5047  0000   DIVER,0
5050  7701     CLA!MQA
5051  7430     SZL
5052  7240     CLA CMA          /DIVIDE OVERFLOW
5053  3416     DCA I POINT
5054  2061     ISZ COUNTR
5055  5236     JMP WORD
5056  1277   DONE,TAD POINTR
5057  3016     DCA POINT
5060  1276     TAD M129
5061  3061     DCA COUNTR
5062  1054     TAD ARG5
5063  3052     DCA ARG3
5064  1055     TAD ARG6
5065  3053     DCA ARG4
5066  1416   PUTBAK,TAD I POINT
5067  1057     TAD ARG8         /ADDITIVE CONSTANT.
5070  3051     DCA ARG2
5071  4520     JMS I PUTWRX
5072  2053     ISZ ARG4
5073  2061     ISZ COUNTR
5074  5266     JMP PUTBAK
5075  5627     JMP I CONV
               /
5076  7577   M129,-201
5077  5777   POINTR,BUFERA-1
```

```
.PALP
*CUT-S:PUTN
*
*IN-S:CON0,S:MCON,S:PUTN
*
*
*
*OPT-T

ADCV   6532

                /CON0
                XLIST
                PAUSE/
                /
                /MCON
                XLIST
                PAUSE/
                /
                /PUTN
                /X PUTN(B,W,N0,CN,IN)
                /LOADS CN SUCCESSIVE DISC WORDS,STARTING AT BLOCK B,
                /WORD W,WITH NUMBERS: N0,N0+IN,N0+2*IN ETC.
                /
                *KB1+33
0173   6044     PUTTER
                *FNKB1+33
0677   2256     2256     /PUTN
                /
                *6044
6044   0000     PUTTER,0
6045   4540        JMS I KB1      /"PUT" IN GWRD
6046   3052        DCA ARG3
6047   3053        DCA ARG4
6050   1055        TAD ARG6
6051   7450      SNA
6052   5644      JMP I PUTTER
6053   7041       CIA
6054   3055       DCA ARG6
6055   5262     JMP TEST
6056   1054     NEXT,TAD ARG5
6057   1056        TAD ARG7
6060   3054        DCA ARG5
6061   4540        JMS I KB1
6062   2055     TEST,ISZ ARG6
6063   5256        JMP NEXT
6064   4537      JMS I BWRITX  /FORCE LAST BLOCK ONTO DISK
6065   5644        JMP I PUTTER

.
```

File 4 Tape 12C
Aug 23/71

(55)

```
.PALP
*OUT-S:SAV4
*
*IN-S:CON0,S:SAV4
*
*
*OPT-T

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /SAV4
                /STORE AND RETRIEVE FLOATING VARIABLES FROM DISC-3 OR 4 WOR
                /X STOR(B,W;V) STORES VARIABLE V STARTING
                /AT WORD W OF BLOCK B.  S D=FASK(B,W) PUTS IT IN D
                /
                *KB1+6
0146    6546    FSTORE
0147    6562    FDISC
                /
                *FNKB1+6
0652    1112    1112    /STOR
0653    3643    3643    /ASK
                /
                *6770
6770    0000    FLSET,0
6771    7240        CLA CMA
6772    1035        TAD FLACR
6773    3016        DCA 16
6774    1377        TAD M4
6775    3017        DCA 17
6776    5770        JMP I FLSET
6777    7774    M4,-4
                /
                *6545
6545    6770    FLSETG,FLSET
6546    0000    FSTORE,0
6547    4745        JMS I FLSETG
6550    6201    FONEXT,CDF
6551    1416        TAD I 16
6552    6211        CDF 10
6553    3051        DCA ARG2
6554    4520        JMS I PUTWRX
6555    3052        DCA ARG3
6556    3053        DCA ARG4        /0 IS USED TO SELECT NEXT ADDRESS
6557    2017        ISZ 17
6560    5350        JMP FONEXT
6561    5746        JMP I FSTORE
                /
6562    0000    FDISC,0             /VARIABLE FROM DISC
6563    4745        JMS I FLSETG
6564    4541    FINEXT,JMS I GETWRX
6565    1051        TAD ARG2
6566    6201        CDF
6567    3416        DCA I 16
6570    6211        CDF 10
6571    3052        DCA ARG3
```

```
6572  3053      DCA ARG4      /GET SEQUENTIAL ADDRESSES
6573  2017      ISZ 17
6574  5364      JMP FINEXT
6575  2362      ISZ FDISC     /SO LFOC DOESN'T CHANGE FLAC
6576  5762      JMP I FDISC
```

/

•

File 3 Tape 10K
Mar. 23/72.

(37)

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

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /SHIF                                          ±
                / X SHFT(NB,NS) SHIFTS BLOCK NB UPWARD BY NS WORDS
                /START FROM LOWEST BLOCK IF NS IS -VE;HIGHEST IF NS IS +VE
                /
                *KB1+20
0160    6112    SHIFTR
                *FNKB1+20
0664    3404    3404    /SHFT
                /
                *6112
6112    0000    SHIFTR,0
6113    4537        JMS I BWRITX /PROTECT CORE BUFFER
6114    1052        TAD ARG3
6115    3116        DCA BLOKIN
6116    7100        CLL
6117    4524        JMS I MVBUFX
6120    7577        BUFERB
6121    1053        TAD ARG4
6122    7100        CLL
6123    1025        TAD DISADD
6124    3025        DCA DISADD
6125    7420        SNL
6126    5332        JMP DWRITE
6127    1345        TAD P100
6130    1026        TAD DSFELD
6131    3026        DCA DSFELD   /HIGH PART OF DISC ADDRESS
6132    1053    DWRITE,TAD ARG4
6133    7710        SPA CLA
6134    1346        TAD M100
6135    1026        TAD DSFELD
6136    3026        DCA DSFELD
6137    7326        CLL CML CLA RTL
6140    4420        JMS I DISCX  /REWRITE BUFFER IN NEW SPOT
6141    7000        OPR          /IGNORE DISC ERRORS
6142    7330        CLL CML CLA RAR
6143    3116        DCA BLOKIN           /FORCE DISC BUFFER INITIALIZE
6144    5712        JMP I SHIFTR
                /
6145    0100    P100,100
6146    7700    M100,-100

.
```

Note that version on AMÉ 6 SCN is a bit different

Aug 17/72
File 3 Tape 10 M

(58)

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

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /X SHOW(B,W,N,X,Y,DX,DZ,OF)
                /Z AXIS DISPLAY FROM DISK.
                /N WORDS,FROM BLOCK B,WORD W;AT X,Y ON CRT.
                /PLOTS A SPOT FOR DZ COUNTS,STEPS X BY DX EACH WORD.
                /OF  IS ADDED EACH TIME.
                /
                *KB1+42                    Makes a streak for very bright points
0202    6044    SHOW                          c(w)  >> DZ
                *FNKB1+42
0706    3517    3517    /SHOW
                /
                *6044
6044    0000    SHOW,0
6045    1054      TAD ARG5
6046    7040      CMA
6047    3054      DCA ARG5
6050    1060      TAD ARG9
6051    7041      CIA
6052    3060      DCA ARG9        /SUBTRACT DY
6053    3312      DCA TOTAL
6054    1056    NEXT,TAD ARG7
6055    6063      DYL
6056    7200      CLA
6057    1055      TAD ARG6
6060    6053      DXL
6061    1057      TAD ARG8
6062    3055      DCA ARG6        /READY CRT
6063    4541      JMS I GETWRX
6064    3052      DCA ARG3
6065    3053      DCA ARG4        /GET SUCCESSIVE WORDS
6066    1061      TAD ARG10
6067    7004      RAL
6070    7200      CLA   /SAVE SIGN IN LINK
6071    1051      TAD ARG2        /OUT FROM DISC
6072    1312      TAD TOTAL
6073    1061      TAD ARG10       /ADD(-)OF TO TOTAL
6074    7430      SZL
6075    7200      CLA   /OVERFLOW OR UNDERFLOW.
6076    3312      DCA TOTAL
6077    7100      CLL
6100    1312      TAD TOTAL
6101    1060      TAD ARG9
6102    7420      SNL
6103    5306      JMP OVER
6104    3312      DCA TOTAL       /DECREMENT TOTAL BY DZ
6105    6054      DIX             /DISPLAY 1 POINT
```

```
6106   7200   OVER, CLA
6107   2054     ISZ ARG5
6110   5254     JMP NEXT
6111   5644     JMP I SHOW
                /
6112   0000   TOTAL, 0
```

Tape 10P
Nov 26/72

(60)

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

ADCV    6532

                /CON0
                XLIST
                PAUSE/
                /
                /MCON
                XLIST
                PAUSE/
                /
                /STAGE
                /ROUTINE TO STEP AND READ ,STORE AVERAGE IN
                /DISC TABLE,STARTING BLOCK NB,WORD NW.REPEAT N TIMES.
                /CALL: X UP(NB,NW,N)  ..OR..SET D=FUP(NB,NW,N)
                / X DN(..  OR..   SET D=FDN(NB,NW,N) :MOVE DOWN
                /D IS SET TO LAST READING
                /MOTOR SPEED IS RAISED FROM 300 PER SEC. TO 700/SEC
                /
                /N.B.  NEEDS LIST FROM 'DATU'
                /
                *KB1+14
0154    6405    STEPPR
0155    6400    DN
                *FNKB1+14
0660    3570    3570    /UP
0661    3356    3356    /DN
                /
                *6400
6400    0000    DN,0
6401    1200        TAD DN
6402    3205        DCA STEPPR
6403    1331        TAD STDWNZ
6404    5207        JMP STPSET
6405    0000    STEPPR,0
6406    1330    STUP,TAD STPUPZ
6407    3302    STPSET,DCA STFUNC
6410    4467        JMS I LSBEGX /INITIALIZE LIST
6411    1054        TAD ARG5
6412    7041        CIA
6413    3320        DCA STEPCN
6414    1323        TAD STXTRA    /EXTRA PERIOD TO WIND UP MOTER
6415    3324        DCA WINDUP
6416    3322    STMAIN,DCA DATOVF
6417    3321        DCA DATSUM
6420    3241        DCA SAVCNT
6421    4523    DANEXT,JMS I FLAGX      OK, IOF in DREAD!
6422    4466        JMS I LISMVX /MOVE DATA FROM LIST TO DISC BUFFER
6423    4466        JMS I LISMVX /CATCH UP AFTER DISC WRITING
6424    4260    FLBACK,JMS STCYCL       /NORMAL RETURN FROM FLAGS
6425    1320        TAD STEPCN
6426    1333        TAD ENDTST
6427    7630        SZL!CLA
```

```
6430  1325     TAD WINLES
6431  7041     CIA
6432  7106     CLL RTL
6433  1324     TAD WINDUP
6434  3324     DCA WINDUP    /SLOW DOWN IF NEAR END
6435  1321     TAD DATSUM    /AVERAGE LAST  READINGS
6436  7421     MQL
6437  1322     TAD DATOVF
6440  7407     DVI
6441  0000  SAVCNT,0
6442  7701     CLA!MQA
6443  4472     JMS I PUTLSX /SAVE AVERAGE IN LIST
6444  2320     ISZ STEPCN
6445  5216     JMP STMAIN
6446  1327  STQUIT,TAD KILDEL
6447  3320     DCA STEPCN
6450  2317  STWAIT,ISZ STEMP
6451  5250     JMP .-1       /DELAY FOR MOTOR STOPPING
6452  2320     ISZ STEPCN
6453  5250     JMP STWAIT
6454  4470     JMS I LSCLRX /EMPTY OUT THE LIST
6455  3050     DCA ARG1      /SO ARG2 GIVES LAST READING TO FOCAL
6456  6313    XPOWER         /SHUT OFF MOTOR SUPPLY
6457  5605     JMP I STEPPR
      /
6460  0000  STCYCL,0
6461  1315     TAD STIME1    /COUNT IN AC REDUCES PERIOD
6462  7500     SMA
6463  5271     JMP SDATA
6464  3317     DCA STEMP
6465  2317     ISZ STEMP
6466  5265     JMP .-1       /MOTOR STEP DELAY
6467  1316     TAD M5
6470  3317     DCA STEMP     /SEVERAL  READINGS PER STEP
6471  7300  SDATA,CLA CLL
6472  2241     ISZ SAVCNT    /DIVISOR
6473  4471     JMS I DREADX /READ ADC (SEE 'DATU')
6474  1321     TAD DATSUM
6475  3321     DCA DATSUM
6476  7430     SZL
6477  2322     ISZ DATOVF
6500  2317     ISZ STEMP
6501  5271     JMP SDATA
6502  7000  STFUNC,OPR       /STEPUP OR STEPDN
6503  1325     TAD WINLES    /REDUCE WINDUP
6504  1324     TAD WINDUP    /EXTRA DELAY TO START
6505  7510     SPA
6506  3324     DCA WINDUP
6507  7300     CLA CLL
6510  1324     TAD WINDUP
6511  3317     DCA STEMP
6512  2317     ISZ STEMP
6513  5312     JMP .-1
6514  5660     JMP I STCYCL
      /
6515  7360  STIME1,7360      /WORKS AT 7420,FAILS AT 7440
6516  7773  M5,-5
6517  0000  STEMP,0
6520  0000  STEPCN,0
6521  0000  DATSUM,0
```

```
6522  0000  DATOVF,0
6523  7300  STXTRA,7300      /WORKS AT 7600,NOT AT 7700
6524  0000  WINDUP,0
6525  0002  WINLES,2
6526  0003  P3,3
6527  7770  KILDEL,-10       /SLIDES AT -5
6530  6311  STPUPZ,STEPUP
6531  6312  STDWNZ,STEPDN
6532  6424  FLBAKP,FLBACK
6533  0006  ENDTST,6         /SLIPS AT 3
            /
```

File 4 Tape 1217
Jan 10/73

(63)

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

APOINT 6554

            /CON0
            XLIST
            PAUSE/
            /
            /SWIT
            /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
            /
            *6422
6422  0000  SWITCH,0
6423  1052     TAD ARG3
6424  7700     SMA CLA
6425  5231     JMP OK
6426  1325     TAD P16
6427  6361     CODLOD        /SET GATE FOR ERASE
6430  6362    ERASE
6431  1053  OK,TAD ARG4
6432  7450     SNA
6433  7001     IAC           /ALLOW 0 SHIFT READOUT FOR SH=0
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  4300     JMS SWTRED
6446  3051     DCA ARG2
6447  5622     JMP I SWITCH
            /
6450  1053  LIGHTS,TAD ARG4
6451  6367     LITSET
6452  7200     CLA
```

```
6453  5622      JMP I SWITCH
                /
6454  3051  JOYCAL,DCA ARG2 /INITIAL MARK LOCATION
6455  1057      TAD ARG8
6456  7650      SNA CLA
6457  4300      JMS SWTRED
6460  7640      SZA CLA
6461  5257      JMP .-2         /WAIT TILL SWITCH OFF UNLESS ARG8 SET
6462  4727  JOYTES,JMS I JOYSTX
6463  4300      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  7417      LSR
6473  0001      1
6474  3050      DCA ARG1
6475  7501      MQA
6476  3051      DCA ARG2
6477  5622      JMP I SWITCH
                /
6500  0000  SWTRED,0
6501  1052      TAD ARG3
6502  6361      CODLOD          /SELECT SWITCH GROUP
6503  7041      CIA
6504  3017      DCA 17
6505  1326      TAD P17
6506  7110  MVMASK,CLL RAR  /GENERATE MASK
6507  2017      ISZ 17
6510  5306      JMP MVMASK
6511  3324      DCA MASK        /3 BITS FOR 1,2 FOR 2,1 FOR 3
6512  1056      TAD ARG7
6513  7440      SZA
6514  3324      DCA MASK
6515  6362      READSW
6516  7417      LSR
6517  0000  SHIFT,0
6520  7413      SHL
6521  0001      1
6522  0324      AND MASK
6523  5700      JMP I SWTRED
                /
6524  0000  MASK,0
6525  0016  P16,16
6526  0017  P17,17
6527  6600  JOYSTX,JOYSTK
                PAUSE/
                /
                /JOY1
                /
6530  0000  ARMAKE,0          /DRAW A DIAMOND
6531  3372      DCA XTEMP
6532  1375      TAD P2
6533  3370      DCA XMOVE
6534  1375      TAD P2
6535  3371      DCA YMOVE
6536  4351      JMS DIAGON
6537  1373      TAD M2
```

```
6540  3371      DCA YMOVE
6541  4351      JMS DIAGON
6542  1373      TAD M2
6543  3370      DCA XMOVE
6544  4351      JMS DIAGON
6545  1375      TAD P2
6546  3371      DCA YMOVE
6547  4351      JMS DIAGON
6550  5730      JMP I ARMAKE
                /
6551  0000    DIAGON,0
6552  1376      TAD M4
6553  3374      DCA COUNTA
6554  1372    APOINT,TAD XTEMP
6555  1370      TAD XMOVE
6556  6053      DXL
6557  3372      DCA XTEMP
6560  7501      MQA
6561  1371      TAD YMOVE
6562  6063      DYL
6563  7421      MQL
6564  6362      BRITEN
6565  2374      ISZ COUNTA
6566  5354      JMP APOINT
6567  5751      JMP I DIAGON
                /
6570  0000    XMOVE,0
6571  0000    YMOVE,0
6572  0000    XTEMP,0
6573  7776    M2,-2
6574  0000    COUNTA,0
6575  0002    P2,2
6576  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  1273      TAD P26       /SET BRITEN
6602  6361      CODLOD
6603  7200      CLA
6604  6363      XJOY
6605  1050      TAD ARG1
6606  4305      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  4277      JMS JSETUP
6616  1050      TAD ARG1
6617  4247      JMS LINER
6620  7450      SNA
6621  5223      JMP XDISP
6622  4772      JMS I ARMAKX /X IN AC,Y IN MQ
6623  6364  XDISP,YJOY
6624  1051      TAD ARG2
6625  4305      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  4277      JMS JSETUP
6635  1051      TAD ARG2
6636  4247      JMS LINER
6637  7450      SNA
6640  5246      JMP ENDIT
6641  1275      TAD P6
6642  7421      MQL
6643  1050      TAD ARG1
6644  1271      TAD M10
6645  4772      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  6362      BRITEN
6655  1276      TAD PP3
6656  2060      ISZ COUNTM
6657  5252      JMP MLINE
6660  7200      CLA
6661  1061      TAD SIGN
6662  7450      SNA
6663  5647      JMP I LINER
6664  7700      SMA CLA
6665  1270      TAD P110
6666  1031  AROCAL,TAD TEMPS0
6667  5647      JMP I LINER
              /
6670  0110  P110,110
6671  7770  M10,-10
6672  7744  M34,-34
6673  0026  P26,26
6674  7726  M52,-52
6675  0006  P6,6
6676  0003  PP3,3
              /
6677  0000  JSETUP,0
6700  7421      MQL
6701  1272      TAD M34
6702  3060      DCA COUNTM
6703  1274      TAD M52
6704  5677      JMP I JSETUP
              /
```

```
6705  0000  MOVER,0
6706  3277     DCA JSETUP    /TEMPORARY STORE
6707  7240     CLA CMA
6710  3061     DCA SIGN
6711  7330     CLA STL RAR
6712  7450  TIME1,SNA
6713  5320     JMP ZEROED
6714  7010     RAR
6715  6365     SKPJOY
6716  5312     JMP TIME1     /MEASURING TIME DELAY
6717  5330     JMP DONE
6720  3061  ZEROED,DCA SIGN
6721  7004  TIME2,RAL
6722  7510     SPA
6723  7050     CMA RAR
6724  6365     SKPJOY
6725  5321     JMP TIME2
6726  3061     DCA SIGN
6727  1061     TAD SIGN
6730  7450  DONE,SNA
6731  3061     DCA SIGN
6732  7100     CLL
6733  1705     TAD I MOVER
6734  3705     DCA I MOVER
6735  7430     SZL
6736  5345     JMP STEP
6737  1705     TAD I MOVER
6740  1367     TAD M400
6741  7700     SMA CLA
6742  5345     JMP STEP
6743  2305  LEAVE,ISZ MOVER
6744  5365     JMP EXIT
              /
6745  3705  STEP,DCA I MOVER        /CLEAR ADDER
6746  2305     ISZ MOVER
6747  1061     TAD SIGN
6750  7710     SPA CLA
6751  7144     CLL CMA RAL  /-2
6752  7001     IAC  /+ OR -1 TO ARG1 OR ARG2 IF ADDER OVERFLOWS
6753  1277     TAD JSETUP
6754  7510     SPA
6755  7200     CLA
6756  3277  SAVIT,DCA JSETUP        /MOVE MARK CENTER
6757  1277     TAD JSETUP
6760  0371     AND P6000
6761  7650     SNA CLA
6762  5365     JMP EXIT
6763  1370     TAD P1777
6764  5356     JMP SAVIT
6765  1277  EXIT,TAD JSETUP
6766  5705     JMP I MOVER
              /
6767  7400  M400,-400
6770  1777  P1777,1777
6771  6000  P6000,6000
6772  6530  ARMAKX,ARMAKE
              /
```

(68)

Tape 10 Q
Mar 2/74.

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

ADDRES 6150

                /CON0
                XLIST
                PAUSE/
                /
                /TAPO
                /COPIES  TO TAPE FROM DISC AND BACK
                /X MPUT(D,T,N,U) COPIES N BLOCKS DISC TO TAPE  STARTING
                /AT DISC BLOCK D AND TAPE BLOCK T,UNIT U.
                /X MTAK(D,T,N,U) TAPE TO DISC!
                /USES TAPE FROM BLOCK 500
                /DISC BLOCKS 213-225 ARE LOST
                /
                /
                *KB1+64
0224   6200     MPUT
0225   6212     MTAK
                /
                *FNKB1+64
0730   2574     2574     /MPUT
0731   2723     2723     /MTAK
                /
                *6150
6150   0000     ADDRES,0          /FOR SAVING FIELD 0
6151   3024       DCA DDWCNT      /WORD COUNT IN AC.
6152   1363        TAD P600
6153   3026        DCA DSFELD
6154   1362        TAD P5655
6155   3025        DCA DISADD
6156   1764      TAD I P200X
6157   3023        DCA DDCORE
6160   3041      DCA DTEST         /ALLOW WRITING IN PROTECTED AREA
6161   5750       JMP I ADDRES
                /
6162   5655     P5655,5655        /SAVES 6300 WORDS FOR OVERLAY+3617 HERE.
6163   0600     P600,600
6164   6333     P200X,P200
                /
6165   0000     WAIT,0
6166   6002       IOF
6167   6201       CDF
6170   1776       TAD I TELSWX    /PROTECTING AGAINST 'TYPE' TURNING  ION.
6171   6211       CDF 10
6172   7650       SNA CLA
6173   5765       JMP I WAIT
6174   6001       ION
6175   5366       JMP WAIT+1
                /
6176   0016     TELSWX,TELSW
                /
                /
```

```
          PAGE
6200  0000  MPUT,0
6201  4226    JMS READY
6202  4311  WXFER,JMS SETLNG
6203  4420  DISRED,JMS I DISCX
6204  5203     JMP .-1        /DISC ERROR
6205  1037     TAD P20
6206  4421     JMS I DTAPX
6207  5203     JMP DISRED     /TAPE ERROR
6210  4274     JMS ADVANCE
6211  5202     JMP WXFER
          /
6212  0000  MTAK,0
6213  1212     TAD MTAK
6214  3200     DCA MPUT
6215  4226     JMS READY
6216  4311  RXFER,JMS SETLNG
6217  4421  DISWRT,JMS I DTAPX
6220  5217     JMP .-1
6221  1335     TAD P2         /NOW WRITE DISK
6222  4420     JMS I DISCX
6223  5217     JMP DISWRT     /ERROR
6224  4274     JMS ADVANCE
6225  5216     JMP RXFER
          /
6226  0000  READY,0
6227  4770    JMS I TWAITX   /FINISH TYPING.
6230  4537    JMS I BWRITX   /BE SURE LAST BLOCK IS ON DISK
6231  1132     TAD KILALL
6232  3342     DCA KILSAV
6233  1344     TAD KILTMX
6234  3132     DCA KILALL     /SET TEMPORARY EXIT FOR ERROR
6235  3126    DCA INTRUP     /LOCK INTERRUPT OFF
6236  1332    TAD M3617
6237  4745     JMS I ADRESX
6240  1335     TAD P2
6241  4420     JMS I DISCX    /SAVE FIELD 0
6242  5240     JMP .-2        /ERROR
6243  2041    ISZ DTEST      /RESTORE DISK PROTECT.
6244  1331     TAD P500
6245  1053     TAD ARG4
6246  3027     DCA DTBLOK
6247  1055     TAD ARG6
6250  7112     CLL RTR
6251  7012     RTR
6252  3030     DCA DTUNIT
6253  1052    TAD ARG3
6254  4512    JMS I DCSETX   /SETS DISC ADDRESS
6255  7352    CLL CLA CMA RTR
6256  3116    DCA BLOKIN     /DISK MAY GET CHANGED.
6257  1040    TAD DISEND
6260  3343    DCA DISTEM
6261  1040    TAD DISEND
6262  1340    TAD P104
6263  3040    DCA DISEND     /PROTECT EXTRA 2K FOR FIELD 0
6264  1026     TAD DSFELD
6265  0341     AND P700
6266  3026     DCA DSFELD     /FIELD 0
6267  1332     TAD M3617      /17 OCTAL BLOCKS
6270  3024     DCA DDWCNT
```

```
6271  1333    TAD P200
6272  3023     DCA DDCORE
6273  5626     JMP I READY
              /
6274  0000  ADVANCE,0
6275  7300     CLL CLA
6276  1025     TAD DISADD
6277  1334     TAD P3617
6300  3025     DCA DISADD
6301  7430     SZL
6302  1076     TAD P100
6303  1026     TAD DSFELD
6304  3026     DCA DSFELD
6305  1337     TAD P17
6306  1027     TAD DTBLOK
6307  3027     DCA DTBLOK
6310  5674     JMP I ADVANCE
              /
6311  0000  SETLNG,0
6312  1054     TAD ARG5
6313  7450     SNA
6314  5353     JMP EXIT      /ALL DONE
6315  1336     TAD M17
6316  7510     SPA
6317  5322     JMP LAST
6320  3054  EXSET, DCA ARG5
6321  5711     JMP I SETLNG
6322  1337  LAST, TAD P17
6323  7425     MQL!MUY
6324  0201     201
6325  7701     CLA!MQA
6326  7041     CIA
6327  3024     DCA DDWCNT
6330  5320     JMP EXSET
6331  0500  P500,500
6332  4161  M3617,-3617
6333  0200  P200,200
6334  3617  P3617,3617
6335  0002  P2,2
6336  7761  M17,-17
6337  0017  P17,17
6340  0104  P104,104         /PROTECTS DISC AFTER BLOCK 209
6341  0700  P700,700
6342  0000  KILSAV,0
6343  0000  DISTEM,0
              /
6344  6346  KILTMX,KILTEM
6345  6150  ADRESX,ADDRES
              /
6346  6601  KILTEM, DCMA
6347  1030    TAD DTUNIT
6350  6766    DTCA!DTXA      /KILL FLAGS
6351  4355    JMS RECOVR
6352  5532     JMP I KILALL
              /
6353  4355  EXIT, JMS RECOVR
6354  5600     JMP I MPUT
              /
6355  0000  RECOVR,0
6356  1332    TAD M3617
```

```
6357  4745      JMS I ADRESX
6360  1343      TAD DISTEM
6361  3040      DCA DISEND    /NORMAL DISC AREA AGAIN
6362  4420      JMS I DISCX   /RESTORE FIELD Ø
6363  5362      JMP .-1
6364  2041     ISZ DTEST      /RESTORE DISC PROTECT.
6365  1342      TAD KILSAV
6366  3132      DCA KILALL
6367  5755      JMP I RECOVR
               /
6370  6165   TWAITX,WAIT
               /
```

File 2 Type 109
July 22/73.

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```
.PALP
*OUT-S:TOTL
*
*IN-S:CONG,S:TOTL
*
*
*OPT-T

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /TOTL
                /S D=FTOTL(B,W,N)-TOTALS WORDS ON THE DISC
                /FOR MICROPHOTOMETER.
                /
                TEMPL=ARG10
                TEMPH=ARG9
                /
                *KB1+51
0211    6112    TOTAL
                *FNKB1+51
0715    1454    1454    /TOTL
                *6112
6112    0000    TOTAL,0
6113    1054      TAD ARG5
6114    7041      CIA
6115    3054      DCA ARG5
6116    3060      DCA TEMPH
6117    3061      DCA TEMPL
6120    4541    NEXT,JMS I GETWRX
6121    3052      DCA ARG3
6122    3053      DCA ARG4        /GET SUCCESSIVE WORDS
6123    7300      CLL CLA
6124    1051      TAD ARG2
6125    1061      TAD TEMPL
6126    3061      DCA TEMPL
6127    7004      RAL             /GET CARRY
6130    1060      TAD TEMPH
6131    3060      DCA TEMPH
6132    2054      ISZ ARG5
6133    5320      JMP NEXT
6134    1061      TAD TEMPL
6135    3051      DCA ARG2
6136    1060      TAD TEMPH
6137    3050      DCA ARG1
6140    5712      JMP I TOTAL
```

Appendix A

Explanation: Programs 0 through 9 are a preliminary attempt at writing a general purpose system for operation of the microphotometer. There may still be some errors in the programs, but they will serve as an example of the kind of program sequences that can be carried out using the computer-controlled microphotometer.

The programs use the memory oscilloscope for most communication, and allow the operator to select a number of options using the teletype keyboard. Each "program", 0 --28, is stored separately on Dectape. Programs chain from one to another. All variables and constants are common to all programs, and are stored in floating point, with 9 digit precision.

To start, bootstrap the program tape "Robinson, Microphotometer Demonstrator". Type "Go" (Return), and Program 0 will be started automatically.

List of Options

(from CRT display)

```
 0..... PLOTTER SCALE:TEST AND ADJUST
 1..... COUDE 20 INCH
 2..... COUDE 40 INCH
 3..... COUDE 80 INCH
 4.....
 5..... MT. WILSON PLATE (AFTER APR.1956)
 6..... IMAGE TUBE
 7.....
 8..... SPECIAL PLATE FORMAT
 9..... GET CALIBRATION FROM TAPE
10..... DISPLAY CALIBRATION
11..... DISPLAY GENERAL INSTRUCTIONS*******!!!!!!!
12.....
13..... SELECT CALIBRATION STRIPS MANUALLY
14.....
15..... CONTINUE WITH CURRENT CALIBRATION-SAME SLIT
16..... SAME CALIBRATION BUT NEW SLIT SIZE
17.....  2-D SCAN.
18..... ADD 2D SCANS.
```

- The program can be restarted at any point by pressing CTRL and C at the same time, and then typing "GO" again

Prog. 0

Lists options; erases variables and initializes some constants, starts a selected option in Prog. 2. (Statement 1.94.)

Prog. 1

Selects special options for scanning and plotting spectra from a plate. (Not all options have been properly debugged.) Statements 10.01, etc. call the successive segments of program needed to calculate a calibration and read and plot a spectrum.

Prog. 2

Initializes constants for specific plate formats.

Prog. 3

Reads the transmission of calibration strip whose location has been already found by Prog. 5.

Prog. 4

Calculates an H and D calibration curve (linear) for the plate, using readings from Prog. 3.

Prog. 5

Scans across the plate to determine location of the calibration strips.

Prog. 6

Measures slit width and amplifier gain, to allow proper normalization of the calibration curve.

Prog. 7

Reads the spectrum, storing digital data on the disk in the form of transmission.

- Displays on CRT as intensity, allows scale selection, plots on chart recorder.

Prog. 8

Displays the H and D curve, allows the operator to modify it, stores it on the DISC.

Prog. 9

Extension of Prog. 8, which was too long to fit into memory.

Prog. 25

Allows calibration to be calculated and stored on tape using numerical data, or using a plate with a special arrangement of calibration spots or strips.

Prog. 26

Extension of Prog. 25.

Note that after storing a calibration curve on the DEC tape, any number of plates may be rapidly scanned and plotted using the same calibration.

Notes

The program numbers define the storage location on the tape, not the order in which programs are used.

- When using the microphotometer, the amplifier indicator meter should read between 700 and 900 when the slit is exposed to "clear" plate.
- When scanning the calibration strips, the length of the slit must be shorter than the width of the strips. The slit can be quite wide. The length and width of the slit is readjusted to accomodate the spectrum width and resolution, just before the spectrum is read. The computer records clear plate before and after the slit is readjusted, and normalizes both the calibration and the spectrum readings as though clear plate readings were always 800.

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```
        W
C:LICK FOCAL MIC74-B  T@S4

01.01 C-PROG.0 MICR.1974
01.02 X STAT(-1);T !"SEE CRT"
01.08 D 6
01.13 X STAT(50,1023,1);X SWIT(-1);F J=0,100;S A=A
01.14 T !"OPTIONS";T !;F J=0,40;T "-"
01.15 F J=0,18;T !%2 J,"......"
01.16 X STAT(200,1020,1)
01.20 T !!!"PLOTTER SCALE:TEST AND ADJUST"
01.21 T !"COUDE 20 INCH"
01.22 T !"COUDE 40 INCH"
01.23 T !"COUDE 80 INCH"
01.25 T !!"MT. WILSON PLATE (AFTER APR.1956)"
01.26 T !"IMAGE TUBE"
01.28 T !!"SPECIAL PLATE FORMAT",!"GET CALIBRATION FROM TAPE"
01.29 T !"DISPLAY CALIBRATION",!"DISPLAY GENERAL INSTRUCTIONS*******!!!T
01.31 T !!"SELECT CALIBRATION STRIPS MANUALLY"
01.32 T !!"CONTINUE WITH CURRENT CALIBRATION-SAME SLIT"
01.33 T !"SAME CALIBRATION BUT NEW SLIT SIZE"
01.36 T !" 2-D SCAN."
01.38 T !"ADD 2D SCANS."
01.60 X STAT(100,100,1)
01.64 F J=0,15;T "  *"
01.65 T !"---TYPE DESIRED OPTION NO.,THEN PRESS 'RETURN'KEY."
01.72 T !;DO 1.64
01.85 X STAT(-1);A !!"OPTION NO.",J
01.86 X PUT(0,2,J)
01.92 IF (19-J)1.99;IF (15-J)1.93,30.01
01.93 E
01.94 S GR=800;S B=16;S NC=2;S AN=16;S J=FTAK(0,2);X CALL(2,J+10)
01.99 X STAT(-1);T !"ILLEGAL!";G 1.13

06.01 C-INTRODUCTION
06.02 IF (FSWIT<3,2>) 6.04,6.04,6.9
06.04 X SWIT(-1);F J=0,50;S A=A
06.10 X STAT(200,900,4);T "INTRODUCTION"
06.14 X STAT(-1);T " ";C-BELL
06.20 X STAT(100,800,1)
06.25 T !"  BELL WILL RING EACH TIME A NEW MESSAGE APPEARS HERE."
06.30 T !"PLEASE RESPOND TO QUESTIONS BY TYPING ON THE TELETYPE."
06.35 T !"COMPLETE EACH RESPONSE BY PRESSING THE SPACE BAR."
06.40 T !!"  ERASE AN ERROR BY PRESSING THE LEFT ARROW "
06.45 T !"      BEFORE PRESSING THE SPACE BAR."
06.50 X STAT(050,400,2)
06.60 T !!"  PRESS ALT MODE KEY WHEN YOU ARE",!"        READY TO PROCEED"
06.65 X STAT(100,100,1)
06.66 T "ELIMINATE UNNEEDED MESSAGES LIKE THIS ONE BY LEAVING"
06.67 T !"    SWITCH 3,2 SET."
06.70 X STAT(-1);A J;DO 6.04
06.90 R

30.01 X CALL(7,8)

31.98 W
31.99 X END(0)
*
```

```
X CALL(1)
```

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```
*W
C:LICK FOCAL MIC74-B  PEKK

01.01 C-PROG. 1
01.02 X CALL(0,1)

03.01 C-PLATE OPTIONS
03.04 IF (-FSWIT(3,2))3.5
03.06 X SWIT(-1)
03.08 F J=0,40;S A=A
03.10 T " ";C-BELL
03.14 X STAT(100,980,1)
03.16 T !"  PLEASE ENTER THE FOLOWING INFORMATION"
03.20 T !!!!!!!"A--SHOULD I USE THE U(PPER),L(OWER),OR B(OTH)"
03.22 T !"    SETS OF CALIBRATION STRIPS?"
03.24 T !
03.26 T !!"C--TYPE NO.OF SEGMENTS FOR THIS PLATE(MAX=12)."
03.30 T !!!"D--TYPE CODE NO. (1-900) UNDER WHICH"
03.32 T !"THE FIRST INCOMING CALIBRATION SHOULD BE SAVED."
03.36 T !!"  IF CALIBRATIONS ARE TO BE SAVED,SET TAPE 8"
03.40 T !"TO WRITE ENABLED.IF CALIBRATION IS NOT TO BE SAVED,"
03.45 T !"    RESPOND WITH CODE NO.=0."
03.50 X STAT(-1)
03.54 A !"STRIPS(U,L,B)",J
03.56 IF (J-0B)3.57,3.7
03.57 IF (J-0U)3.58,3.61
03.58 IF (J-0L)3.54,3.60,3.54
03.60 S HI=0;G 3.7
03.61 S LO=0
03.70 A !"CALIB. STORAGE CODE",CC;IF (CC-900)3.9,3.9;T  " ILLEGAL";G 3.7
03.90 R

09.10 IF (CS)9.2,9.2,10.14
09.20 DO 3;G 10.01

10.01 C-DO THE PROGRAM
10.04 X CALL(5,2);C-FIND THE STRIPS
10.06 X CALL(3,3);C-READ STRIPS
10.10 X CALL(4,4);C-CALCULATE CALIBRATION
10.14 X CALL(6,7);C-ADJUST SLIT
10.20 IF (-CS)10.46
10.26 X CALL(8,4);C-ADJUST CALIB. CURVE
10.30 IF (CC)10.46,10.46;X MPUT(NC,CC+199,1);S CC=CC+1
10.31 C-NOTE THAT CALIB. WRITES OVER PROG.50 FF.
10.46 X CALL(7,8);C-READ SPECTRUM AND PLOT
10.99 Q

31.98 W
31.99 X END(0)
*
```

```
W
C:LICK FOCAL MIC74-B  TXE0

01.01 C-PROG. 2
01.02 X CALL(0,1)

03.10 X STAT(-1)
03.15 S CS=1
03.20 T !"CALIBRATION MUST BE ON THE DISC!"
03.30 A !"TYPE OPTION CODE FOR PLATE TYPE",J
03.40 X GO(J+10,10)

04.01 C-20" COUDE
04.10 S I(1)=800;S I(3)=400;S I(5)=200
04.12 S I(7)=98.5;S I(9)=48;S I(11)=22;S I(13)=8
04.14 S I(2)=565;S I(4)=285;S I(6)=143
04.16 S I(8)=70.5;S I(10)=33.5;S I(12)=18;S I(14)=7
04.20 S HI=1550;S LO=1050;C  =HI-SW
04.24 S LN=30;S DS=122;S SW=500
04.26 F N=1,14;S I(N)=I(N)*0.8
04.30 S NY=17;S AN=16
04.99 R

05.01 C-40" COUDE
05.20 S HI=3100;S LO=2850
05.24 S LN=120;S DS=240;S SW=450
05.26 D 4.1;D 4.12;D 4.14;D 4.16
05.30 S NY=13;S AN=8
05.90 R

06.01 C-80" COUDE
06.10 D 4.1
06.14 S I(7)=102;S I(9)=52.5;S I(11)=27;S I(13)=14
06.20 D 4.14;S I(6)=144
06.24 S I(8)=71.5;S I(10)=35;S I(12)=19;S I(14)=7.5
06.30 S LO=1550;S HI=1550
06.34 S LN=30;S DS=126;S SW=400;S AN=4
06.40 S NY=17
06.99 R

08.01 C-IMAGE TUBE PLATES
08.10 D 4;S RV=1
08.20 S DS=112;S SW=420
08.90 R

09.01 C-MT WILSON AFTER APR. 10/56.
09.10 S I(1)=998;S I(3)=498;S I(5)=247.1
09.12 S I(7)=126.2;S I(9)=71.8;S I(11)=33.6
09.14 S I(2)=703;S I(4)=351;S I(6)=173.4
09.16 S I(8)=90.2;S I(10)=51.05;S I(12)=26.2
09.20 S HI=1200;S LO=1200
09.24 ;S LN=20;S DS=72;S SW=400
09.30 S NY=17;S RV=1
09.40 F J=1,12;S I(J)=I(J)*0.8
09.90 R

10.01 C-PLOTTER TEST
10.20 F J=1,100;X PEN(1,100)
10.30 F J=1,100;X PEN(1,900)
10.40 F J=0,50,1000;X PEN(50,J)
10.50 G 10.1
```

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Prog. 2 - Cont'd

```
11.10 D 4;G 30.1

12.10 DO 5;G 30.1

13.10 D 6;G 30.1

14.10 G 31.1

15.10 D 9;G 30.1

16.10 D 8;G 30.1

17.10 G 31.1

18.10 G 31.1

19.10 CAL. FROM TAPE
19.20 X CALL(15,10,1)
19.90 G

20.10 X CALL(6,20)

21.10 G 31.1

22.10 G 31.1

23.01 C-MANUAL CALIB.
23.10 D 4
23.20 X CALL(15,2,1)
23.90 G

24.10 G 31.1

25.10 G 31.1

26.10 G 3.1

27.01 C-3 D SCANNING
27.10 X CALL(24,2,1)
27.90 G

28.10 X CALL(20,128+3,1)
28.20 G

29.10 G 31.1

30.10 X CALL(1,9)

31.10 T !!"FUNCTION NOT AVAILABLE..SORRY."
31.12 G
31.98 W
31.99 X END(0)
*
```

*

(81)

```
W
C:LICK FOCAL MIC74-B  TWE;

01.01 C-PROG. 3
01.10 X CALL(0,1)

03.01 C-READ STRIPS
03.02 S M=100;S PY=0;S N=1;IF (-HI) 3.05
03.03 S MV=SW;DO 5.20;DO 4.10;DO 4.30
03.04 S GR(2)=K/100;S GR(1)=K/100;G 3.50
03.05 X DN(B,0,HI);S PY=HI
03.08 S M=P(1)
03.12 DO 4.10;DO 6
03.17 S GR(1)=K/100
03.20 S MV=P(1)
03.24 DO 5.30
03.28 S TR(N)=K/100;S N=N+2;S M=M+DS
03.30 IF (NY-N) 3.44
03.32 S MV=DS;DO 5.10
03.40 DO 3.28;G 3.24
03.44 S GR(2)=TR(N-2)
03.46 IF (-LO) 3.50;IF (-PY) 3.47,3.48;X DN(B,0,-PY);G 3.48
03.47 X UP(B,0,PY)
03.48 S MV=SW;DO 5.30;DO 4.10;DO 4.40
03.49 S GR(3)=K/100;S GR(4)=K/100;G 3.74
03.50 C-LOWER SIDE
03.51 S M=P(3)-SW
03.52 S N=2;DO 13
03.54 S PY=-P(3)+3*DS;S MV=DS
03.56 DO 5.10;S GR(3)=K/100
03.57 DO 4.30;C-DOUBLE SPACE
03.58 DO 5.30
03.60 DO 3.28
03.61 IF (NY-N) 3.68
03.62 DO 5.10;DO 3.28;GO 3.58
03.68 S GR(4)=TR(N-2)
03.70 C-NORMALIZE TRANSMISSION READINGS
03.72 X DN(B,0,-PY)
03.74 F N=1,2,NY;S D=<GR(1)*(NY-N)+GR(2)*N>/NY;S TR(N)=TR(N)/D
03.76 F N=2,2,NY;S D=<GR(3)*(NY-N)+GR(4)*N>/NY;S TR(N)=TR(N)/D
03.78 S GR=<GR(2)+GR(3)>/2;CLEAR PLATE FOR SPECTRUM
03.82 F J=1,4;IF (GR<J>/GR-0.8) 3.86
03.83 GO 3.90
03.86 X STAT(-1);T ! "CLEAR PLATE VERY DENSE "
03.87 F J=0,5;T %5.01 GR(J)
03.90 F J=1,4;IF (1000-GR<J>) 3.94
03.93 G 3.99
03.94 T !"AMPLIFIER IS OFF SCALE FOR CLEAR PLATE"
03.95 QUIT
03.99 X STAT(0,0);X END(0)
```

Prog. 3 · Cont'd.

```
04.10 X LFT(B,0,1,5)
04.20 X RIT(B,0,1,5)
04.30 X UP(B,0,MV);S PY=PY-MV
04.40 X DN(B,0,MV);S PY=PY+MV

05.10 DO 4.30;DO 4.10;DO 6;C: UP,LFT,READ
05.20 DO 4.40;DO 4.20;DO 6;C: DN,RIT,READ
05.30 DO 4.30;DO 4.20;DO 6;C: UP,RIT,READ

06.04 S A=FITR(M/1024);S Y=1;IF (M-1000)6.1;S Y=512
06.10 S K=0;F J=20,119;S K=K+FTAK(B,J)
06.30 X PUTN(B-1,0,K/100,129);X STAT(M-25-A*1024,Y)
06.40 X PLOT(B-1,2,16,1,2)
06.50 X STAT(M-60-A*1024,K/200+A*512);T %4 K/100

13.10 S J=PY-3*DS+P<3>;S PY=3*DS-P(3)
13.12 IF (J) 13.3,13.4,13.5
13.30 X DN(B,0,-J)
13.40 R
13.50 X UP(B,0,J)
13.60 R

31.98 W
31.99 X END(0)
*
```

C:LICK FOCAL MIC74-B TMF+

(83)

```
01.01 C PROG 4
01.10 X CALL(0,1)

04.01 CALIBRATION CALCULATION
04.02 S KR=50
04.03 S A1=0;S A2=0;S H1=0;S H2=0
04.04 X STAT(-1)
04.05 S TD=0.1;A !"TYPE LOWEST TRANSMISSION RATIO<E.G. 0.1>",TD
04.10 IF (-HI)4.14;S GR(1)=0;G 4.18
04.14 S N=1;DO 13
04.16 S A1=A;S H1=H
04.17 IF (LO)4.30,4.30,4.18
04.18 S N=2;DO 13
04.20 S A2=A;S H2=H
04.22 IF (-HI)4.26,4.30,4.30
04.26 S A=(A1+A2)/2;S H=(H1+H2)/2
04.30 S H4=0.693*(H-A)+FLOG(KR)
04.32 X STAT(-1)
04.33 T !"CLEAR PLATE",%5.01 GR,"   ",GR(1),GR(2),GR(3),GR(4)
04.35 T !%5.04 "A1=",A1,"  H1=",H1,"  A2=",A2,"  H2=",H2
04.36 T !%5.04 "A=",A,"   H=",H,"   H4=",H4
04.38 X STAT(200,200,1);T !"ONE MOMENT PLEASE!" "WAIT A MOMENT PLEASE"
04.39 C PREPARE PLOTTING OF I(J) WITH THE NEW I SCALE
04.40 IF (-HI)4.42,4.44,4.44
04.42 S TR=TR(5);DO 4.50;S K=K/I(5);F J=1,2,15;S I(J)=K*I(J)
04.44 IF (-LO)4.46,4.99,4.99
04.46 S TR=TR(6);DO 4.50;S K=K/I(6);F J=2,2,16;S I(J)=K*I(J)
04.50 S K=FEXP(A*FLOG<1/TR>+H*FLOG<1-TR>+H4)
04.99 X END(0)

05.10 G 4.03;C-FOR VERTICAL SCALE CHANGE

13.01 CALCULATE A AND H
13.05 S S1=0;S S2=0;S S3=0;S S4=0;S S5=0
13.06 C-TEST TRANSMISSION GREATER THAN TD
13.08 IF (TR<N>-TD)13.14,13.20,13.20
13.10 CCOMPUTE COEFFICIENTS OF NORMAL EQUATIONS
13.14 S N=N+2; GOTO 13.08
13.20 S NS=N;S N=N+2
13.22 S V=FLOG(TR<NS>/TR<N>)
13.24 S W=FLOG((1-TR<N>)/(1-TR<NS>))
13.30 S S1=S1+V*V
13.31 S S2=S2+V*W
13.32 S S3=S3+W*W
13.34 S Z=FLOG(I<N>/I<NS>)
13.36 S S4=S4+V*Z
13.37 S S5=S5+W*Z
13.40 S N=N+2;IF (TR(N))13.44,13.44
13.41 IF (TR<N>-0.875) 13.22,13.45,13.45
13.44 C SOLVE NORMAL EQUATIONS
13.45 S DT=S1*S3-S2*S2
13.46 IF (DT) 13.47,13.22;C-INDETERMINATE SOLUTION
13.47 S A=(S4*S3-S2*S5)/DT
13.48 S H=(S1*S5-S2*S4)/DT
13.50 R

14.01 CALCULATE A,H;GIVEN N,M
14.10 S X1=FLOG(1/TR<N>-1);S Y1=FLOG(IN)
14.12 S X2=FLOG(1/TR<M>-1);S Y2=FLOG(IM)
14.20 S A=(Y1-Y2)/(X1-X2)
14.30 S H=(<Y1+Y2>-A*<X1+X2>)/2
14.99 R
```

```
15.01 DO 14;X END(0)

31.98 W
31.99 X END(0)
*
```

```
*W
C:LICK FOCAL MIC74-B  PSOL

01.01 C-PROGRAM 5
01.02 X CALL(0,1)

02.01 C-FIND STRIPS
02.02 X DN(B,0,10);S D=FUP(B,0,10);C-TEST SHUTTER
02.03 X SWIT(-1)
02.04 IF (D-5) 2.05,2.08,2.08
02.05 T !"SHUTTER?"
02.06 QUIT
02.08 IF (HI) 2.40,2.40
02.10 X DN(B,0,HI);X UP(B,0,HI)
02.12 S PY=HI
02.14 X STAT(1,1)
02.16 X PLOT(B,2,16,1,HI/129)
02.18 S W=40
02.20 S N=1;DO 12
02.24 S N=2;DO 12
02.26 T !
02.30 IF (FABS<P(1)-P(2)+DS>-DS/20) 2.40
02.34 X RIT(B,0,1);X STAT(-1)
02.36 T !"STRIP SPACE WRONG?",DS
02.38 T (P(2)-P(1));G 2.06
02.40 IF (LO) 2.70,2.70;X UP(B,0,SW);X UP(B,0,LO)
02.44 S PY=LO
02.46 X STAT(1,1)
02.48 X PLOT(B,2,16,1,LO/129)
02.50 S N=3;S W=40;DO 12
02.54 S N=4;DO 12;X DN(B,0,LO+SW)
02.55 T !
02.60 IF (FABS<P(3)-P(4)+DS>-DS/20) 2.70
02.64 DO 2.34
02.66 DO 2.36;T (P(4)-P(3));G 2.40
02.70 X STAT(1,950,1)
02.72 T "STRIP SPACING",!"EXPECT..FOUND"
02.76 T !%4 DS,P<2>-P<1>,P<4>-P<3>
02.80 S P(3)=P(3)+SW
02.99 X END(0)

12.01 C-FIND A STRIP
12.30 IF (PY/2-W) 12.88
12.34 S W=W+LN/5
12.38 S D=FTAK(B,W);S D2=FTAK(B,W+LN)
12.42 IF (0.7*D-D2) 12.30
12.46 S W=W+1;D 12.38
12.50 IF (D2-D) 12.46
12.54 S P(N)=W+LN/2-2;IF (N/2-FITR<N/2>) 12.80,12.80
12.56 S M=P(N);F J=0,6;DO 13;S M=M+DS
12.80 R
12.88 X STAT(-1)
12.90 T ! " STRIP NOT FOUND. STEPPING MOTOR OFF, OR SLIT TOO LONG?"
12.99 QUIT

13.10 S D=FTAK(B,M)/2;IF (M-1024)13.2;S D=D+512
13.20 F K=0,20;X DIS(M,D+K)
13.30 R

31.98 W
31.99 X END(0)
*
```

*H

(85)

```
C:LICK FOCAL MIC74-B  0↑FB

01.01 C-PROG 6
01.10 X CALL(0,1)

07.01 C-ADJUST SLIT WIDTH FOR SPECTRUM SCAN
07.04 X SWIT(-1)
07.10 X STAT(-1);T "       ";C-BELL
07.14 X STAT(30,800,2)
07.22 T !"ADJUST SLIT,SELECT CLEAR PLATE,",!"ADJUST AMPLIFIER GAIN"
07.26 T !"PRESS ALT MODE WHEN READY"
07.30 ASK Q
07.36 X LFT(B-2,0,2,4)
07.38 S K=FTOTL(B-2,50,200)
07.40 X PUTN(B,0,K/200,258)
07.42 X STAT(1,1);X PLOT(B-2,1,16,1,4)
07.44 C-NORMALIZE CLEAR PLATE READING
07.50 S M=K
07.51 X STAT(-1);T "";C-BELL
07.52 X STAT(1,200,2);T !"SET SECOND CLEAR PLATE POSITION"
07.53 A ! " THEN TYPE ALT MODE",Q
07.54 X RIT(B-2,0,2,4)
07.56 DO 7.38,DO 7.40;D0 7.42
07.58 S GS=FITR((M+K)/400);C-AVERAGE CLEAR PLATE VALUE
07.66 X STAT(-1);T !"CLEAR PLATE",%4 M/200,K/200," =",GS
07.67 X SWIT(-1);T "";X STAT(1,800,2)
07.68 T !"PRESET PLATE POSITION TO READ THE SPECTRUM"
07.72 T !!!"       THEN  WAIT A MOMENT FOR ME"
07.80 IF (1000-GS) 7.82,7.83,7.83
07.82 T !"AMPLIFIER IS OFF SCALE FOR CLEAR PLATE,READJUST SLIT";G 7.10
07.83 C
07.99 X END(0)

20.10 X SWIT(-1)
20.12 X PUTN(216,0,0,1023,1)
20.15 X SET(NC,NC);X STAT(1,1)
20.20 X PLOT(216,1,16,1,8,8,216)
20.30 X PUTN(225,0,0,129)
20.40 X STAT(1,1);X PLOT(225,1,16,8,1,0,0,100)
20.80 X STAT(700,800,1);A !"ALT MODE TO EXIT",Q
20.90 G

31.98 W
31.99 X END(0)
*
```

```
01.31 C-PROG. 7
01.10 X CALL(0,1)

08.01 C-READ SPECTRUM
08.02 X STAT(-1)
08.04 A !!"MM. TO BE READ",X,"RESOLUTION (X2.8 MICRONS)",RS
08.08 IF (RS)8.04,8.10;S RS=RS-1
08.10 S ND=K*1000/(<RS+1>*2.8*129)
08.20 IF (B+ND-204)8.35
08.30 T !"DISK WOULD OVERFLOW BY",%3.01 (B+ND-204)/2.04,"%"
08.31 G 8.04;C-ONLY 204 BLOCKS AVAILABLE
08.35 F J=0,300;S A=A
08.36 IF (RV)8.4,8.4,8.41
08.40 X LFT(B,0,ND,RS);G 8.44
08.41 X RIT(B,0,ND,RS)
08.44 X UP(B+ND-2,0,SW)
08.50 X RIT(B+ND-2,0,2,RS)
08.60 S ML=800000/GS;S N=20*129
08.70 F J=-2,20,ND;X MULT(B+J,0,N,ML,ML);C-NORMALIZE TO 800

09.01 C-DATA PLOT
09.02 X SWIT(-1);F J=0,50;S A=A
09.10 SET L=FITR(1+(ND+2)*129/1024);S SC=1
09.14 SET SC=1;SET OF=-100
09.15 X SET(NC,NC)
09.20 X PUTN(225,0,0,129)
09.22 X STAT(1,1);X PLOT(225,L,16,1023*L/129,1);C-BASELINES
0.23 X STAT(1,1);X PLOT(B-2,L,SC*16,1,ND+2,ND+2,B-2,OF/L)
09.24 S N=-1;S Y=2;S X=1
09.25 S N=N+1;X STAT(X,Y);T %3 B-2+N;IF (ND-N+1) 9.40,9.40
09.26 S X=X+129;IF (X-1023) 9.25;S Y=Y+1024/(L);S X=X-1023;G 9.25
09.40 X STAT(-1)
09.44 T !"TYPE LIMITS,THEN PRESS ALT MODE"
09.50 S N=1
09.60 S P(N)=0;ASK !P(N);IF (P(N))9.80,9.80;ASK P(N+1)
09.62 S N=N+2;GO 9.60
09.80 IF (N-2) 9.94
09.81 DO 9.94;DO 9.96;X STAT(1,1)
09.82 F J=1,2,N-.01;X SET(NC,NC);;DO 9.90
09.84 GO 10.10
09.90 X PEN(720,0);X PLOT(P<J>,0,SC*16,X,P<J+1>-P<J>,ND,B,OF)
09.94 DO 12
09.96 S X=.360*X*(RS+1)*2.8*AN;IF (-X) 9.97;S X=1
09.97 X STAT(1,1)
09.98 X SET(NC,NC);X PLOT(B-2,0,SC*16,X,ND+2,ND+2,B-2,OF)

10.10 X STAT(-1)
10.20 T !!"TURN PLOTTER OFF;TYPE 'GO 9.01' TO REPLOT;GO 8.04 TO REREAD."
0.30 QUIT

12.04 X STAT(-1)
12.10 ASK !"INCHES/ANGSTROM,Y MULTIPLIER,Y OFFSET",X,SC,OF
2.15 S OF=OF-SC*1
12.20 DO 9.22;DO 9023
12.25 X STAT(-1)
12.30 SET Q=0YES;ASK !"SCALE OK?",Q
12.35 X STAT(0,0)
12.40 IF (Q-0YES) 12.5,12.90,12.5
12.50 IF (Q-0Y)12.04,12.9,12.04
12.90 X STAT(-1);T !"TURN PLOTTER ON,PRESS ALT MODE";A Q
12.95 X PEN(360,100)
12.96 X PEN(360,900)
12.99 R

31.98 W
31.99 X END(0)
```

```
        W
C:LICK FOCAL MIC74-B  ULTI

01.01 C-PROG. 8
01.02 X CALL(0,1)

04.01 C-STORE AND DISPLAY CALIBRATION
04.03 S GR=800
04.05 S J=1;DO 5;C-FOR 0
04.06 F J=8,8,GR-1;DO 5
04.07 S L=FITR(GR/8);S M=FTAK(NC,L-2);S X=GR-8*(L-2)
04.08 S D=(M-100)*8/X
04.10 F J=L-1,129;S M=M-D;DO 13.1;X PUT(NC,J,M)
04.14 X PUTN(B+1,0,0,1023,1);C-DUMMY FILE
04.19 X SWIT(-1);F J=0,50;S A=A
04.20 X SET(NC,NC)
04.24 X PUTN(225,0,0,129)
04.26 X STAT(1,1);X PLOT(225,1,16,8,1,0,0,100);C-PLOT BASELINE
04.28 F J=50,5,200;X DIS(GR,J)
04.30 IF (HI) 4.34,4.34;F J=1,2,12;DO 16
04.34 IF (LO) 4.40,4.40;F J=2,2,13;DO 16
04.40 X CALL(9,17,1)
04.45 X STAT(1,1);X PLOT(B+1,1,16,1,8,8,B+1)
04.50 S N=0;X STAT(-1)
04.51 IF (MF)4.59
04.52 S J=1
04.53 A !!"VERTICAL MULTIPLIER<ALT MODE IF OK>",J;IF (J-1)4.54,4.59
04.54 S KR=KR*J;X CALL(4,5,1)
04.55 G 4.01
04.59 X STAT(-1);ASK !"FIRST POINT<0 IF OK>",N
04.60 IF (N) 4.99,4.99
04.62 ASK IN,!"SECOND POINT",M,IM;S MF=-1
04.63 IF (N-M) 4.64;S J=N;S N=M;S M=J;S J=IN;S IN=IM;S IM=J
04.64 T !%5.01 N,IN,M,IM
04.65 S J=0YES
04.66 ASK "   OK?",J;IF (J-0YES) 4.59,4.68,4.59
04.68 X CALL(4,15,1);C-CALCULATE NEW A,H
04.70 ASK !"FRACTION: T(OP),B(OTTOM),C(ENTER) OR A(LL)",J
04.72 S L=8*FITR(GR*TR(N)/8)
04.74 IF (J-0T) 4.80,4.76,4.80
04.76 F J=8,8,GR*TR(M);DO 7
04.77 GO 4.07
04.80 IF (J-0B) 4.84,4.81,4.84
04.81 F J=L,8,GR-1;DO 7;C-BOTTOM
04.82 GO 4.07
04.84 IF (J-0C) 4.88,4.85,4.88
04.85 F J=L,8,GR*TR(M);DO 7;CENTER
04.86 GO 4.07
04.88 IF (J-0A) 4.70,4.9,4.70;C-ALL
04.90 S J=1;DO 7
04.92 F J=8,8,GR-1;DO 7
04.94 G 4.07
04.99 X END(0)
```

Prog. 8- Cont'd.

```
05.01 C-FIRST CALIBRATION TO DISC
05.04 S K=FEXP(A*FLOG<GR/J>+H*FLOG<1-[J/GR]>+H4)
05.16 IF (-K)05.22;S K=1
05.22 IF (K-1947)5.28;S K=1947
05.28 X PUT(NC,J/8,K+100)
05.99 R

07.01 CALIBRATION TO DISC
07.04 S K=FEXP(A*FLOG(GR/J-1)+H)
07.16 IF (-K) 7.22;S K=1
07.22 IF (K-1947) 7.28;S K=1947
07.28 X PUT(NC,J/8,K+100)
07.99 R

13.10 IF (-M) 13.2;S M=1
13.20 R

16.01 C PLOT ONE STRIP POINT
16.10 X PUT(B,1,TR<J>*GR);S Y=I(J)+100
16.20 X STAT(TR<J>*GR-10,Y-6)
16.30 T " *",!%2 J
16.99 R

31.98 W
31.99 X END(0)
*
```

```
W
C:LICK FOCAL MIC74-B  KJKA

01.01 C-PROGRAM 9
01.10 X CALL(0,1)

17.01 CURVE CHANGE INFO
17.10 X STAT(300,980,1)
17.14 T "  TO CHANGE PART OF THE CURVE,"
17.16 T !"INDICATE POINTS TO BE FITTED"
17.20 T !!"   GIVE POINT NØ. ,THEN BEST INTENSITY VALUE"
17.22 T !"FIRST FOR UPPER ENDPOINT,THEN FOR LOWER ONE."
17.24 X STAT(400,0)
17.26 T !!"CALIBRATION STRIP INTENSITIES CALCULATED FOR THIS CURVE:"
17.28 T !"NO.  TRANSMISSION      I. CALCULATED"
17.29 T "      I. EXPECTED"
17.32 X SET(NC,NC);F J=1,16;DO 18
17.40 X STAT(0,0,1)
17.44 T !"PRESS ALT MODE WHEN SATISFIED"
17.99 X END(0)

18.04 X PUT(B,1,TR(J)*GR)
18.10 T !%2 J,". . . ",%5.04 TR(J),". . . . . .",%5 FUNC(B,1)-100
18.20 T "............"I(J)
18.99 R

31.98 W
31.99 X END(0)
*
```

*

(90)

W
C:LICK FOCAL MIC74-B G GP

```
01.01 C-PROG.10-DEMO OF JOYSTICK
01.10 S X=400;S Y=400
01.20 S D=FSWIT(3,11,X,Y)
01.30 S X=FITR(D/1024);S Y=D-1024*X
01.40 X STAT(X,Y,1);T %3 X,Y
01.50 G 1.2

02.10 D 1.1
02.20 D 1.2;D 1.3
02.30 X STAT(X,Y,1);T "*"
02.40 G 2.2
*
```

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```
W
C:LICK FOCAL MIC74-B  UWT]

01.01 C-PROG.15;MANUAL CALIBRATION ENTRY.
01.02 X CALL(0,1)

02.04 T " ";C-BELL
02.10 X SWIT(-1);X STAT(100,900,2)
02.20 F J=0,50;S A=A
02.22 T !"   MANUAL CALIBRATION.";X STAT(0,0,1)
02.30 T !!"AFTER EACH ITEM IS PRINTED:PRESS ALT MODE TO RETAIN IT."
02.40 T !"OR..ENTER A CORRECTED VALUE FROM KEYBOARD IF DESIRED,"
02.44 T !" THEN PRESS 'RETURN'."
02.50 T !!"TO READ AN IMPROVED TRANSMISSION VALUE FROM THE PLATE:"
02.52 T !"CENTER THE SLIT OVER DESIRED REGION;THEN PRESS '=' SIGN."
02.60 T !!"IF NO MORE READINGS ARE NEEDED,USE INT.=1;CLEAR PLATE."
02.90 X STAT(-1)

04.01 S LO=0;S HI=0
04.02 A !"1 OR 2 SETS OF STRIPS?",K
04.03 IF (K-2)4.05;S HI=1
04.05 S LO=1
04.10 T !" INTENSITY  TRANSMISSION(1000=FULL SCALE)"
04.15 G 4.3
04.20 D 4.99;T %3.02 I(N);D 6;DO 5;S TR(N)=K
04.30 IF (HI)4.32,4.32;F N=1,2,13;D 4.2
04.32 IF (LO)4.34,4.34;F N=2,2,13;DO 4.2
04.34 T !"CLEAR PLATE-SLIT UNCHANGED:FIRST";DO 5;S GR=K
04.38 T !"2ND";DO 5;S GR=(GR+K)/2
04.40 T !"CLEAR PLATE=",GR
04.42 X CALL(16,4,1);C-ALLOW CORRECTIONS
04.50 F N=1,13;S TR(N)=TR(N)/GR
04.55 X CALL(4,4,1)
04.57 X CALL(8,4,1)
04.60 A !!"SAVE THIS ON TAPE?",J
04.62 IF (J-0YES)4.64,4.7
04.64 IF (J-0NO)4.6,4.8,4.6
04.70 A !"TAPE STORAGE CODE NO.",J
04.72 X MPUT(NC,J+128,1);C-AFTER PROG. 40
04.80 X END(0)
04.99 T !"   "

05.10 A "  TR",K
05.14 IF (-K)5.99
05.20 X LFT(1,0,2,4);S K=0;F J=50,149;S K=K+FTAK(1,J)
05.30 S K=K/100
05.45 T %5.02 K
05.99 R
```

Prog. 15 - Cont'd

```
06.04 S K=I(N);A K;IF (K)6.1,6.89
06.10 IF <K-I(N)>6.2,6.9
06.20 S I(N)=K;G 6.99
06.89 S N=14;C-TERMINATE
06.90 T %3.02 I(N)
06.99 R

10.10 CALIB. FROM TAPE
10.12 X SWIT(-1)
10.13 X STAT(600,800,1);T !"EXIT BY TYPING '0'"
10.14 X STAT(-1)
10.20 A !"CALIBRATION CODE NO.",CG
10.21 IF (CG)10.9,10.9
10.24 S GR=800;T " ";C-BELL
10.30 X MTAK(NC,CG+199,1)
10.40 X PUTN(B+1,0,0,1023,1);C-DUMMY FILE
10.44 X SET(NC,NC)
10.48 X PUTN(B,0,0,129)
10.56 X STAT(1,1);X PLOT(B,1,16,8,1,0,0,0100);C-BASELINE
10.58 F J=50,5,200;X DIS(GR,J)
10.60 X STAT(1,1);X PLOT(B+1,1,16,1,8,8,B+1)
10.80 G 10.14
10.90 X END(0)

31.98 W
31.99 X END(0)
*
```

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```
W
C:LICK FCCAL MIC74-B  QFJ"

01.01 C-PROG.16
01.02 X CALL(0,1)

04.08 S N=0
04.09 X SWIT(-1);F J=0,100;S N=0
04.10 DO 13
04.20 IF (N)4.09,4.6,4.09
04.60 T !"CLEAR PLATE=",GR
04.61 S GR=FITR(GR)
04.62 S J=GR;A "  NEW VALUE?<ALT MODE FOR NO CHANGE>",GR
04.70 IF (J-GR)4.6,4.9,4.6
04.90 X END(0)

13.10 X STAT(50,900,1)
13.20 T !"N     INTENSITY  TRANSMISSION"
13.25 IF (HI)13.3,13.3
13.27 F J=1,2,13;DO 15
13.30 IF (LO)13.4,13.4
13.32 F J=2,2,13;DO 15
13.40 T !"TO CHANGE TRANSMISSION,TYPE N,THEN NEW VALUE"
13.50 T !"PRESS ALT MODE WHEN SATISFIED."
13.60 S Q=1234;A !"N",Q;IF (Q-1234)13.7,13.8
13.70 S N=Q;S Q=1234;A " TR.",Q;IF (Q-1234)13.72,13.8
13.72 S TR(N)=Q;G 13.6
13.80 T !"TO CHANGE INTENSITY,TYPE N,THEN NEW VALUE."
13.82 S Q=1234;A !"N",Q;IF (Q-1234)13.86,13.99
13.86 S N=Q;S Q=1234;A " IN.",Q;IF (Q-1234)13.88,13.99
13.88 S I(N)=Q;G 13.82
13.99 R
                    TR(5) for GR
                    %6.03
15.10 T !%5 J,%5.01,I(J),TR(J)

20.01 C-MULTIPLE SCAN PLOTTING.
20.10 A !"FIRST SCAN NO.",SF,"SCANS PER PLOT",NS,"Y0",Y0
20.12 A !"SCALE",SC,"BLOCKS PER SCAN",ND,"NO. OF PLOTS",NP
20.14 A !"OFFSET PER PLOT",OF
20.16 S B1=16;S X=3
20.20 S TP=-300+SF*ND
20.22 X OPEN(0,10);X COMP(0,-1030);X COMP(0,53+Y0)
20.30 F CN=1,NP;DO 22
20.90 Q

21.04 S Y=FITR(Y/SC)
21.10 X COMP(X,<Y-YN>);S YN=Y

22.30 S YN=0
22.40 X MTAK(B1,TP+CN*ND,ND*NS,7)
22.50 X OPEN(0,10);S N=129*ND-1
22.55 X OPEN(1,10)
22.58 S Y=0
22.60 F J=0,N-1;DO 21;S Y=0;F K=0,NS-1;S Y=Y+FTAK(B1+K*ND,J)
22.65 X OPEN(0,10)
22.70 X COMP(-X*<N>,-YN+OF)
22.80 S TP=TP+NS*ND
22.99 R

31.98 W
31.99 X END(0)
*
```

The following programs were used to scan several plates in 2 dimensions, align the resultants, convert to intensity, and add. This was done to reduce the effects of sky noise, and to estimate relative intensities of galaxies in the field.

Prog. 20 - Convert transmissions to intensity, add to a Dectape holding the sum, after vertical and horizontal alignment

Prog. 21 - Locate a star image on a transmission tape, to provide alignment offset information.

Prog. 22 - Program used to scan the Shakhbazian I cluster of Galaxies, and store on Dectape.

Prog. 23 - Utility routines for scanning.

Prog. 27 - 2 Dimensional plotting with Calcomp.

Prog. 28 - Star intensity calculation. (not on the tape)

```
01.01 C-PROG. 20 ADDING 2D SCANS
01.02 X CALL(0,1)
01.04 X STAT(-1);T "SEE CRT";;X STAT(50,980,1)
01.05 T !"CALIB. SHOULD BE ON DISC",!!
01.10 T !"REMOVE PROGRAM TAPE,PUT SUM TAPE ON #6,SOURCE ON #7.
01.20 A !!"WHAT SHIFT IS REQUIRED ON SOURCE..SCAN #",J0," DX",W0
01.30 S ND=4
01.40 A !"HOW MANY BLOCKS PER SCAN?",ND
01.50 S NN=5*ND
01.60 S D1=B;S D2=NN+D1+10

03.04 S N=ND;S T1=-300;S T2=-300;C-T2 IS INPUT TAPE
03.07 DO 20;C-SKY=SK
03.10 IF (-J0)3.2,3.4,3.4
03.20 S NT=J0*ND;C-SHIFT SOURCE +VE
03.22 IF (NT-ND)3.3;C-ADDING SKY AT FRONT END
03.24 DO 10;S NT=NT-ND;S T1=T1+ND
03.27 G 3.22
03.30 IF (NT)3.99,3.41
03.32 C-FRONT OFFSET FIXED.
03.40 S T2=T2-J0*ND
03.41 S N=NN
03.42 DO 10;S T1=T1+N;S T2=T2+N
03.44 IF (-T1-N+1150)3.46,3.46
03.45 IF (T2+N-1150)3.42,3.42;S T2=T2-N;G 3.42;C-FILL OUT THE END
03.46 S N=1150-T1;IF (T2+N-1150)3.48,3.48;S N=1150-T2
03.48 X STAT(-1);DO 10;T !"ALL DONE"
03.99 T !"HELP";Q

10.01 C-ADDER
10.10 X MTAK(D1,T1,N,6);X MTAK(D2,T2,N,7)
10.20 DO 12;C-SHIFT IF ANY
10.25 DO 13;C-TRANS. TO INTENS.
10.30 S DF=D2-D1
10.40 F J=D1,D1+N-1;X ADD(J,J+DF,J)
10.50 X MPUT(D1,T1,N,6)
10.90 R

12.01 C-SHIFT DATA TO ALIGN GUIDE STAR
12.10 IF (W0)12.2,12.9,12.5
12.20 F K=D2,D2+NN-1;X SHFT(K,W0);C-SHIFT DOWN
12.22 G 12.9
12.50 F K=1,NN-1;X SHFT(D2+NN-K,W0);C-SHIFT UP
12.90 R

13.01 CONVERT TO INTENSITY
13.05 X MULT(D2,0,N*129,M1,M1)
13.10 X SET(NC,NC);X STAT(1,1)
13.20 X IFIX(D2,0,16*GR,1,N,N,D2)
13.90 R

20.10 A !"TYPE PLATE'S CLEAR/SKY RATIO",R
20.20 X MTAK(B,T2,20,7)
20.30 X STAT(0,0,2);T !"ONE MOMENT PLEASE."
20.40 S TL=0;S TM=0;F J=100,10,2000;S TL=TL+FTAK(B,J);S TM=TM+1
20.50 S SK=TL/TM
20.60 X MTAK(B,T2+1430,10,7);C-TOP OF PICTURE
20.70 DO 20.4;S SK=(SK+TL/TM)/2
20.80 S M1=1000*800/(R*SK)
20.82 X PUT(B,1,M1);X SET(NC,NC)
20.84 S D=FUNC(B,1);S GR=100/D
20.90 X STAT(-1);T !"TRANSMISSIONS WILL BE MULTIPLIED BY",%6.03 M1/1000
20.92 T !"INTENSITIES BY",GR
20.99 R

31.98 W
31.99 X END(0)
*
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(957)

M1 ?

M1

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01.01 C-PROG.21

02.01 C-STAR LOCATOR
02.10 DO 10
02.20 G 11.01

04.01 C-USED BY PROG.23
04.10 DO 10
04.20 X END(0)

10.01 C-LOCATE A STAR ON THE TRANSMISSION TAPE.
10.02 S B=10;S TP=-300;S ND=4;S DY=2;S Y0=200;S YS=Y0;S DX=2
10.10 A !"STARTING SCAN NO.",S0;X SWIT(-1)
10.20 X MTAK(B,S0*ND+TP,200,7)
10.30 S TL=0;F J=200,2,399;S TL=TL+FTAK(B,J)
10.32 S DZ=TL/100;S OF=-0.5*DZ
10.36 T "    WATCH THE CRT"
10.40 F J=B,ND,B+200;S YS=YS+DY;X SHOW(J,0,ND*128,1,YS,DX,DZ,OF)
10.42 T "  ";C-BELL
10.44 X STAT(1,980,1);S X=400;S Y=X
10.45 T !"PLEASE MARK THE STAR CENTER."
10.51 DO 30;S BC=B+ND*FITR<(Y-Y0)/DY>
10.52 S SC=S0+ND*FITR<(Y-Y0)/(ND*DY)>;S XC=(X-1)/DX
10.70 T !"STAR IS AT SCAN",%4 SC," CHANNEL",XC
10.99 R

11.01 C-LOCATE CENTER OF STAR BY MOMENTS.
11.10 S MN=FTAK(BC,XC)
11.20 S TH=(DZ+MN)/2
11.25 T "  DZ=",DZ,"  MN=",MN,"  TH=",TH
11.30 T !"MARK LOWER EDGE";DO 30
11.35 S LO=(Y-Y0)/DY
11.36 T %4 LO+S0,"          ",(X-1)/DX
11.40 T !"MARK UPPER EDGE";DO 30;S HI=(Y-Y0)/DY
11.42 T %4 HI+S0,"          ",(X-1)/DX
11.50 S TL=0;S MO=0;S W=XC
11.55 F J=B+LO*ND,B+HI*ND;DO 22
11.60 S J=MO/TL;S SM=S0+(J-B)/ND
11.70 S TL=0;S MO=0;S WD=HI-LO;S J0=B+4*(SC-S0)
11.80 F J=J0-1,J0+1;F W=XC-WD/2,XC+WD/2;DO 24
11.90 S XM=MO/TL
11.92 X STAT(-1)
11.98 T !"CENTROID AT SCAN",%5.01 SM,"  WORD",XM
11.99 Q

13.10 C-TEST
13.20 A !"B0,W0",B,W
13.30 F J=W,W+30;T %4 FTAK(B,J);IF (FITR<J/10>-J/10)13.4,13.5,13.4
13.40 R
13.50 T !
13.90 Q

22.10 S D=FTAK(J,W-1)+FTAK(0)+FTAK(0)-3*TH
22.20 IF (-D)22.9
22.30 S TL=TL+D;S MO=MO+J*D
22.90 R

24.10 S D=FTAK(J,W)-TH
24.20 IF (-D)24.9
24.30 S TL=TL+D;S MO=MO+W*D
24.90 R

29.10 C-REPEAT WITHOUT RECALL
29.20 X STAT(-1);DO 10.42;X STAT(0,0,1)
29.30 G 10.45
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30.10 S D=FSWIT(3,11,X,Y)
30.20 S X=FITR(D/1024);S Y=D-1024*X
30.30 R

31.98 W
31.99 X END(0)
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        W
C:LICK FOCAL MIC74-B  SWR$

01.01 C-PROG. 22-SHAKHBAZIAN SCANS.
01.20 T !"ALIGN THE PLATE;USE STARS A,B; STRAIGHT EDGE LEFT OF STAR C."
01.30 T !"THEN CENTER (IMAGE MOVING UP) ON STAR C."
01.40 A !!"PRESS RETURN WHEN READY!",J
01.50 A !"RESOLUTION IN MICRONS",RS
01.52 S RS=FITR(RS/2.8)
01.80 S B=20

02.10 X UP(B,0,500);X DN(B,0,100)
02.20 T !!"TURN OFF MAIN LIGHTS,SET TAPE 7 TO WRITE ENABLE."
02.30 A !"PRESS RETURN WHEN READY.",J
02.40 X RIT(B,W,10)
02.90 F J=0,300;S A=A

03.01 S DZ=0
03.02 S ND=4;S YS=0;X STAT(-1);C-382 SCANS,2.9 MM X 2.0 MM.
03.10 S Y=0;S TP=-300;C-FIRST TAPE BLOCK=-300.
03.20 X LFT(B-1,0,ND+1,RS-1,300)
03.30 X MPUT(B,TP,ND,7);S TP=TP+ND;C-SAVED ONE SCAN ON TAPE.
03.32 S YS=YS+3;IF (YS-1000)3.34;X SWIT(-1);S YS=0
03.34 IF (-DZ)3.37;S TL=0;F J=1,200;S TL=TL+FTAK(B,J)
03.35 S DZ=TL/200;S OF=-0.5*DZ
03.37 X SHOW(B,0,ND*128,1,YS,2,DZ,OF)
03.40 IF (1149-ND-TP)3.99,3.99
03.44 F J=0,100;S A=A
03.45 X RIT(B,0,ND+3,RS-1)
03.50 S Y=Y+2.8*<RS>;S J=FITR(Y/4.5)
03.52 X DN(B,0,J);S Y=Y-4.5*J;C-X STEP IS 2.8*RS,Y STEP IS 4.5*RS
03.60 F J=0,300;S A=A
03.70 G 3.2
03.99 Q

10.01 C-SUMS TO TAPE 7
10.10 A !"REDUCTION FACTOR",RF,"BLOCKS PER SCAN",BS,"OFFSET",OF
10.14 S B=1
10.20 T !"SET OUTPUT TAPE (#7) TO WRITE ENABLED,INPUT ON TAPE 8."
10.24 X PUTN(B,0,0,4095)
10.28 S B7=-300
10.30 F J=-300,BS*RF,1150-BS*RF;DO 11;S B7=B7+1

11.01 C-ADD, SQUEEZE SCANS.
11.10 X MTAK(B,J,BS*RF)
11.20 F L=B,RF+B-1;F K=L+BS,BS,L+BS*(RF-1);X ADD(L,K,L,OF)
11.30 C-ADDED RF SCANS
11.50 C-ASSUME RF<15 (2047/129)
11.59 S MV=BS*129+1
11.60 F L=0,RF-1;F K=L,BS,BS*(RF-1)+L-1;X SHFT(K+B,MV);C-1 WORD OFFSET
11.70 DO 11.2
11.79 S W=0;C-REPLACE INPUT WITH RF WORDS PER WORD
11.80 F L=RF,RF,BS*129;S D=FTAK(B,L);X PUT(B,W,D);S W=W+1
11.90 X MPUT(B,B7,FITR<BS/RF+.9>,7)
11.99 R

31.98 W
31.99 X END(0)
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W
C-LICK FOCAL MIC72-G  RKE0

01.01 C-PROG.23 MISC.

10.01 C-TRANSMISSION TAPE DISPLAY
10.10 S B=20;S ND=4;S DY=2;S TP=-300
10.20 S NG=ND*5;S Y=0
10.22 DO 11.1;S TL=0
10.23 F J=1,200;S TL=TL+FTAK(B,J)
10.24 S DZ=TL/200;T !"DZ=",%5 DZ;S OF=-0.5*DZ-50
10.30 F TP=-300,NG,1150-NG;DO 11
10.90 Q

11.10 X MTAK(B,TP,NG,7)
11.20 F J=0,ND,NG-2;DO 11.8;DO 11.9
11.30 R
11.80 X SHOW(B+J,0,ND*128,1,Y,2,DZ,OF)
11.90 S Y=Y+DY;IF (Y-1150)11.91;S Y=0;X SWIT(-1)
11.91 R

12.01 C-INDEX FINDER
12.02 S B=20;S W=0
12.04 C-SET CLEAR AT 800.START 1 MM FROM INDEX STAR.
12.10 X LFT(B,W,8,0,400)
12.12 X STAT(1,1)
12.14 X PLOT(B,1,16,1,8)
12.17 X STAT(100,900,1)
12.30 T !"B-LEFT CONTINUUM:"
12.32 D 30;S X0=X
12.36 T !"C-RIGHT LIMIT:"
12.38 DO 30;S XM=X;S Y0=Y
12.60 F X=X0,XM;X DIS(X,Y0)
12.61 C-DREW BACKGROUND LINE
12.70 S TL=0;S MO=0
12.72 F X=X0,XM;DO 29
12.75 S XP=MO/TL
12.78 F Y=10,2,Y0;X DIS(XP,Y)
12.80 X STAT(-1)
12.84 T !%8.02 XP
12.99 R

13.10 C-ERASE A TAPE
13.20 X STAT(-1);T !!"ERASING TAPE 6.PRESS RETURN WHEN READY!"
13.25 A 0
13.30 X PUTN(10,0,0,4095);X PUTN(40,0,0,3000)
13.40 F J=-300,40,1100);X MPUT(10,J,40,6)
13.45 X MTAK(10,-300,10,6)
13.50 T !"ALL DONE!"
13.60 Q
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Prog. 23 - Cont'd

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20.01 C-TEST
20.02 S Y=50;S DY=150
20.10 F J=0,ND,NG-2;D 11.9;X STAT(1,Y);X PLOT(B+J,6,16,2,ND)

23.10 X RIT(B,W,10)
23.20 F J=0,200;S A=A
23.30 DO 12
23.90 X END(0)

28.10 C-TEST
28.14 X STAT(-1)
28.15 S B=16
28.20 A !"SCAN",S;X SWIT(-1);X MTAK(B,-300+S*4,4,7)
28.30 X STAT(1,1);X PLOT(B,1,6,2,4)
28.90 G 28.1

29.10 S D=FTAK(B,X)-Y0
29.20 IF (-D)29.9
29.30 S TL=TL+D;S MO=MO+X*D
29.90 R
29.99 R

30.10 S D=FSWIT(3,11,400,400)
30.20 S X=FITR(D/1024);S Y=D-1024*X

31.98 W
31.99 X END(0)
*
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(100)

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 W
C:LICK FOCAL MIC74-B  05J.

01.01 C-PROG.27 PLOTTING 2D ON CALCOMP FROM TAPE.
01.02 X CALL(0,1)

10.01 C-REPEATED PLOTS
10.04 S SC=100
10.10 S TP=-300;S XS=2;S YS=2;S OF=610
10.40 X OPEN(0,10)
10.50 X COMP(1200,-1020)
10.60 X COMP(0,100)
10.70 DO 25
10.80 S SC=SC+50;GO 10.1

14.10 S K=FTAK(B,J)+K-OF
14.12 S XD=XD+3*XS
14.16 IF (K+FSQT<OF>)14.4
14.20 IF (K-SC)14.9;X COMP(XD,YD);D 15.1;S XD=0;S YD=0
14.22 IF (K-SC)14.9
14.24 X COMP(XS,YS);S XD=XD-XS;S YD=YD-YS;DO 15.1
14.26 IF (K-SC)14.9;S X=-XS;S Y=YS;DO 15
14.28 IF (K-SC)14.9;S X=2*XS;S Y=0;DO 15
14.30 IF (K-SC)14.9;S X=0;S Y=-2*YS;DO 15
14.32 IF (XS-2)14.4
14.34 IF (K-SC)14.9;S X=0;S Y=YS;DO 15
14.35 IF (K-SC)14.9;S X=-XS;DO 15
14.36 IF (K-SC)14.9;S Y=-YS;DO 15
14.37 IF (K-SC)14.9;S X=XS;DO 15
14.40 S K=0
14.90 R

15.02 X COMP(X,Y)
15.04 S XD=XD-X;S YD=YD-Y
15.10 X OPEN(1,10);X OPEN(0,10);S K=K-SC

24.01 C-PLOT FROM INTENSITY TAPE
24.10 A !"SENSITIVITY",SC,"BLOCKS PER SCAN",ND
24.12 A !"X SCALE",XS," Y SCALE",YS
24.13 A !"BACKGROUND",OF
24.14 T !"DATA ON UNIT 7,SET CALCOMP TO ORIGIN."
24.16 A !"FIRST SCAN NO.",SN;S TP=-300+SN*ND
24.20 DO 25
24.90 Q

25.20 S XD=0;S YD=0;S N=ND*129-1
25.30 X MTAK(B,TP,ND,7)
25.40 F J=1,N;D 14
25.50 X COMP(-3*XS*N+XD,YD+YS*3)
25.55 S K=SC*FSIN<FTAK(B,100)>;C-RANDOMIZE FIRST POINT
25.60 S TP=TP+ND;IF (TP-1146)25.2
25.70 R

31.98 W
31.99 X END(0)
*
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        W
C-LICK FOCAL MIC72-G  N:F8

01.01 C-PROG. 28 STAR CONTOURS
01.02 X CALL(0,1)

11.01 C-PRINT INTENSITY TABLE
11.10 X CALL(21,4)
11.13 S AV(1)=0;S TL(1)=0;S NP(1)=0
11.14 X STAT(-1)
11.18 T !" FOUND SCAN",%3 SC," X=",XC;A "  BEST VALUES",SC,XC
11.19 T !"FOUND SKY=",DZ;A "  NEW SKY",DZ
11.20 S XC=FITR(XC);S SC=FITR(SC)
11.21 S LL=1;S UL=300;S GL=0;S RL=600;C-ALLOW ALT MODE
11.22 A !"LIMITS--BOTTOM SCAN",LL
11.23 A "TOP",UL,"LEFT",GL,"RIGHT",RL
11.25 T !!"       TOTAL    NP ANNULUS  COUNTS"
11.26 T !"       COUNT        TOTAL   PER POINT"
11.30 F N=1,25;DO 20
11.90 Q

20.01 C-ADD INSIDE A CIRCLE
20.10 S BT=1;S TL=0;S NP=0
20.20 S B=SC-N;S T=SC+N
20.22 IF (B-LL)20.26,20.27,20.27
20.26 S B=LL
20.27 IF (T-UL)20.3;S T=UL
20.30 F S=B,T;DO 21
20.40 DO 24
20.90 R

21.01 S ST=S*ND
21.10 X MTAK(BT,ST-300,ND,7)
21.12 S DY=S-SC
21.20 S X=FITR<FSQT(N*N-DY*DY+.1)>;C +0.1 OR FITR(FSQT(1))=0
21.22 S L=XC-X;S R=XC+X
21.24 IF (L-GL)21.26,21.27,21.27
21.26 S L=GL
21.27 IF (R-RL)21.3;S R=RL
21.30 F J=L,R;S TL=TL+FTAK(BT,J)-DZ;S NP=NP+1
21.90 R

24.01 C-PRINTOUT
24.04 S AV=TL/NP
24.10 S AN=TL-TL(1);S TN=NP-NP(1)
24.12 S TL(1)=TL;S NP(1)=NP
24.20 T !%2  N,%7 TL,%4 NP,%5 AN,%5.01 AN/TN
24.30 S AV(1)=AV
24.90 R

31.98 W
31.99 X END(0)
*
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