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NODISC FOCAL

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NODISC FOCAL

A special version of Lick Scanner Focal is now available for emergency use in case the disc should fail. This language is called "NODISC FOCAL". Nodisc focal will work if there is a mechanical failure of the disc which forces the disc moter to be shut off. (This is by far the most likely type of failure.) An electronics failure in the disc interface may or may not disable Nodisc Focal.

An abbreviated version of the Scanner Data Taking system written in Nodisc Focal is available on Mt. Hamilton. This tape is strictly for emergency use and will allow only the basic operations necessary for data aquisition. The programs which are available are used in the same way as in the regular Data Taking System. The programs which can be called from switch (1,1) are Precession, Memory Test, Start Data Taking, Continue Data Taking, Set Sweeps, and Set Up Offsets. Precession, Memory Test and Set Up Offsets are used in exactly the same way as in the regular system. Set Sweeps is the same except that the left slit channel offset is no longer stored on tape and must be reentered during a fast sweep load. The Data Taking programs now respond only to switches (3,8), (3,9) and (3,10) (Stop, Reset, and Start), to switch (1,7) (dwell time) and to switch (3,4) (pause). The other functions, such as adding into the sum buffer or displaying on the CRT, have been dropped. Labeling information (hour angle, dwell, etc.) cannot be stored on the data tapes.

Command Summary --- Nodisc Focal

1. Nodisc Focal is read into core by the usual bootstrap routine.

2. All of the   regular   Focal commands and functions are

   available:

ASK	IF	FEXP( )
COMMENT	SET	FSIN( )
CONTINUE	TYPE	FCOS( )
DO	LOAD	FLOG( )
ERASE	FSQT( )	
FOR	FABS( )	
GO	FSGN( )	
GOTO	FITR( )	

3. The following Lick Scanner Focal functions are available.

X GO( )	X MEMC( )
X DO( )	X MEME( )
X CALL( )	X MEMR( )
X FILE( )	X MEMW( )
X END( )	X MEMX( )
X MGET( )	X MEMY( )
X MSAV( )	
S CRT( )	X LOOK( )
FCHAN( )	X PAUS( )
X EDIT( )	

These have the same arguements as in regular Scanner Focal. (see

Robinson, L. B., "The Lick Observatory PDP 8/I Computers", L. O. T. R. No. 1).

There is, however, only one 512 channel core buffer available for scanner data in the Nodisc System, instead of the usual two buffers. The arguements for "buffer" are now dummy entries in all of these functions (enter "∅"). X MEMR(∅) will now read 512 channels of data instead of 1024.

4. Four extra functions have been added:

X MASH(2) --- Compress 512 channels in the core data buffer into 256 channels.

[Channel (2X) + Channel (2X+1) → Channel (X)]

X CPUT(W,X) Read or write single precision integer X
S D=FCTAK(W) into word W of a special core buffer
(0 ≤ W ≤ 127). This special core buffer is not written over during the bootstrap operation, and can be used as a protected area for storing flags, etc.

X BCON(X,L,H) --- Writes constant X into lower precision words of channels L through H of the core data buffer ($|X| < 4096$). The upper precision words are not cleared, so this function should normally be preceeded by X CLER(∅).

Programmers' Notes

The regular version of Lick Scanner Focal is heavily dependent on the disc because most of the added functions are stored on disc and overlayed into core as they are used (see L.O.T.R. Nos. 1, 3 and 9 for details). In Nodisc Focal, the added functions permanently reside in core locations 14000-17251, which is the area that normal Scanner Focal uses for buffer Ø, for the disc overlay in use in core, and for the basic disc access routines. The chaining table used by X CALL has been moved from 17150-17225. All jumps to the disc access routines have (hopefully) been removed. The bootstrap routine (FAST) has been altered to bypass loading the disc overlays, and the interrupt routine (FLAGS) no longer checks the disc flag.

Nodisc Focal has been tested by turning off the disc motor and also with the "daisy chain" cables leading to the disc interface disconnected. Turning the knob on the front panel of the disc interface to a position other than Ø will wipe out Nodisc Focal because the interrupt signal gets set and causes Focal to get trapped in its interrupt handling routine.

NODISC FOCAL

CORE MAP FOR FOCAL FUNCTIONS
(Field 1)

4000-4174	Chain (+ field $\emptyset$)
4200-4320	NCRT, part 2
4322-4365	LOOK, part 2
4400-4572	NCRT, part 1
4600-4755	MEMF, part 1
5000-5142	CRT (=STAT), part 1
5150-5172	BCON
5200-5365	CRT, part 2)
5400-5431	GOTO (+ field $\emptyset$) (=GO,DO)
5435-5474	STAP
5477-5777	SWEP
6044-6343	LIST (used by CRT)
6345-6364	LOOK, part 1
6371-6377	PAUS
6400-6453	MEMF, part 2
6460-6520	MASH
6525-6570	EDIR (CLER,EDIT,CHAN)
6600-6772	SWIT, part 2
7000-7154	SWIT, part 1
7200-7225	Chain nest buffer
7230-7251	CPUT (=CPUT, CTAK)

APPENDIX A

No-disc Focal Functions - Assembly Language Listings*

*Note - the functions PAUS, GOTO and LIST are not listed
here. They are exactly as shown in L.O.T.R. No. 9,
except that PAUS now starts at location 16371 and GOTO
now starts at 15400.

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


ARG1      0050

                 /CON0
                 XLIST
                 PAUSE/ X BCON(X,L,H)
                 /WRITE SNGL PREC. CONSTANT X IN BUFFER 1,
                 /CHANNELS L THROUGH H. DOES NOT CLEAR HIGH ORDER WORD,
                 /SO USE XCLER(1) FIRST.
                 /    ***NODISC FOCAL ONLY***
                 /
                 CTR=ARG6
                 *KB1+30
  0170   5150      BCON
                 *FNKB1+30
  0674   2006      2006    /BCON
                 *5150
  5150   0000    BCON,0
  5151   1371      TAD P1777
  5152   1053      TAD ARG4
  5153   3014      DCA ARG7H
  5154   1054      TAD ARG5
  5155   7040      CMA
  5156   1053      TAD ARG4
  5157   3055      DCA CTR
  5160   1014    LOOP,TAD ARG7H
  5161   1372      TAD M2777
  5162   7700      SMA CLA       /TEST FOR END OF BUFFER.
  5163   5750      JMP I BCON
  5164   1052      TAD ARG3
  5165   3414      DCA I ARG7H     /AUTO INDEX
  5166   2055      ISZ CTR
  5167   5360      JMP LOOP
  5170   5750      JMP I BCON
  5171   1777    P1777,1777
  5172   5001    M2777,-2777
```

16 July 1979

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

ALSET   0460
ARG1    0450


            /CON0
            XLIST
            PAUSE/
            /
            /CHAIN-CHAINING PROGRAM
            /X FILE(N) TO STORE PROGRAM N
            /X CALL(N,SB,0) TO CALL PROGRAM N, SUBROUTINE SB
            /X END(0) WILL THEN CONTINUE ORIGINAL PROGRAM.
            /IF 0 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
            /
            /MODIFIED FOR NODISC SYS.
            /
            CHBUFR=7200
            ERR2=2726
            /
            *PG5RETN
0135  7200   CHBUFR
            *KB1+2
0142  4016   CHACAL
0143  4071   CHAPOT
0144  4150   XEND
            /
            *FNKB1+2
0646  2554   2554    /CALL
0647  2545   2545    /FILE
0650  0164   164     /END
            /
            FIELD 0
            *3120   /ENTERED FROM ALSET
3120  3464   LINFIN,DCA BUFR /NEW END OF TEXT
3121  7541     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  6401     ION
3133  4540     PUSHJ
3134  0606     606       /GO, AFTER FINDLN
3135  5736     JMP I .+1
3136  0273     273
            /
            FIELD 1
```

```
                    *4000
4000    0000    CHAIN,0
4001    1052        TAD ARG3
4002    7106        CLL RTL          /8 BLOCKS PER PROGRAM
4003    7004        RAL              /FIRST BLOCK USED
4004    1044        TAD FSPROG
4005    3027        DCA DTBLOK
4006    1046        TAD CLENGT       /CHAIN LENGTH
4007    3024        DCA DDWCNT
4010    3030        DCA DTUNIT       /TAPE 8
4011    1121        TAD LINPNT       /START OF TEXT (BFTEMP)
4012    3023        DCA DDCORE
4013    1344        TAD P10
4014    3026        DCA DSFELD
4015    5600        JMP I CHAIN
                /
4016    0000    CHACAL,0
4017    1054        TAD ARG5
4020    7640        SZA CLA
4021    5224        JMP NEST
4022    1372    FIXT,TAD PZERO
4023    3135        DCA PGRETN
4024    6203    NEST,CIF!CDF
4025    1135        TAD PGRETN
4026    1374        TAD MINMAX
4027    7700        SMA CLA
4030    4771        JMS I ERRORP     /TOO MANY NESTED CALLS
4031    1773        TAD I PCX        /SAVE PC
4032    6213        CDF!CIF 10
4033    3016        DCA 16
4034    1416        TAD I 16         /PC POINTS TO CURRENT LINENO
4035    7001        IAC              /X END(0) WILL RETURN TO NEXT LINE
4036    2135        ISZ PGRETN
4037    3535        DCA I PGRETN
4040    1042        TAD PGLAST
4041    2135        ISZ PGRETN
4042    3535        DCA I PGRETN
4043    4200    CDO,JMS CHAIN
4044    4421        JMS I DTAPX
4045    5243        JMP .-2          /TAPE ERROR
4046    1052        TAD ARG3         /RETURNS HERE WITH INTERRUPT OFF.
4047    3042        DCA PGLAST       /NEW PROGRAM NO.
4050    1053        TAD ARG4
4051    7421        MQL
4052    7501        MQA
4053    0266        AND P7600
4054    7640        SZA CLA
4055    5260        JMP ALSET        /GROUP NUMBER FOUND
4056    7413        SHL              /LESS THAN 200,CHANGE TO A GROUP NO.
4057    0006        6
4060    7200    ALSET,CLA
4061    1522        TAD I L0TPNT     /L0TEMP
4062    3745        DCA I L0PNT      /LINE0
4063    1521        TAD I LINPNT     /BFTEMP
4064    6203        CDF CIF
4065    5667        JMP I LINFIX
                /
                /BFTEMP STORES "BUFR", L0TEMP STORES C(LINE0)
                /
4066    7600    P7600,7600
```

```
4067   3120   LINFIX,LINFIN
4070   0060   BUFPNT,BUFE
               /
4071   0000   CHAPUT,0              /STORE FROM C(LINPNT) FOR 2010 WORDS
4072   4422       JMS I MESAGX
4073   0275       TEXT /B=
4074   6100       1/
4075   6201       CDF
4076   1670       TAD I BUFPNT
4077   6211       CDF 14
4100   3521       DCA I LINPNT   /BFTEMP
4101   1521       TAD I LINPNT
4102   4536       JMS I OCTPNX   /PRINT LAST TEXT ADDRESS
4103   4200       JMS CHAIN
4104   1346       TAD P2000      /NODISC SYS. PATCH
4105   3423       DCA DDCORE     /READ 1ST BLOCK INTO CORE DATA BUFFER.
4106   1032       TAD M201
4107   3424       DCA DDWCNT
4110   4421       JMS I DTAPX    /READ FIRST BLOCK BEFORE CHANGING IT
4111   5310       JMP .-1        /TAPE ERROR
4112   1747       TAD I P2001    /NODISC PATCH--2ND BUFFER WRD IS LOTEMP.
4113   7650       SNA CLA
4114   5334       JMP OK         /TAPE UNUSED
4115   1042       TAD PGLAST
4116   7041       CIA
4117   1052       TAD ARG3
4120   7650       SNA CLA
4121   5334       JMP OK         /SAME PROGRAM JUST CALLED FROM TAPE
4122   4422       JMS I MESAGX
4123   1713       TEXT /OK
4124   7700       ?/
4125   6002       IOF
4126   6031       KSF
4127   5326       JMP .-1
4130   6436       KRB
4131   1343       TAD M331        /TYPE Y TO STORE ANYWAY
4132   7640       SZA CLA
4133   5532       JMP I KILALL
4134   4200   OK,JMS CHAIN
4135   1745       TAD I LOPNT
4136   3522       DCA I LOTPNT   /SETS LINE0 EXIT
4137   1037   CHWRIT,TAD P20     /WRITE IT
4140   4421       JMS I DTAPX
4141   5337       JMP .-2        /TAPE ERROR
4142   5671       JMP I CHAPUT
               /
4143   7447   M331,-331
4144   0010   P14,10
4145   0540   LOPNT,LINE0
4146   2000   P2000,2000
4147   2001   P2001,2001
               /
4150   0000   KEND,0
4151   1535       TAD I PGRETN
4152   3052       DCA ARG3
4153   7040       CMA
4154   1135       TAD PGRETN
4155   3135       DCA PGRETN
4156   1535       TAD I PGRETN
4157   3053       DCA ARG4
```

```
4160    7040        CMA
4161    1135        TAD PGRETN
4162    3135        DCA PGRETN
                /
4163    1135        TAD PGRETN
4164    7041        CIA
4165    1372        TAD PZERO
4166    7700        SMA CLA             /PGRETN =PZERO; INCREASE IT
4167    5222        JMP FIXT
4170    5243        JMP GDO
                /
4171    2726        ERRORP, ERR2
4172    7177        PZERO, CHBUFN-1
4173    0022        PCX, PC
4174    0553        MINMAX, -25-CHBUFR
```

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

```
ARG1     0050
ARG10    0061
ARG10H   0017
```

```
              /CON0
              XLIST
              PAUSE/
              /X CPUT(W,X); S D=FCTAK(W)
              /
              /READ D, WRITE X IN CORE LOCATION 7600+W, FIELD 1.
              /7600-7777 IS NOT WRITTEN OVER BY BOOTSTRAP.
              /NODISC SYS. ONLY.
              /
              *KB1
0140   7240     CPUT
0141   7230     CTAK
              *FNKB1
0644   0574       574   /CPUT
0645   0723       723   /CTAK
              *7230
7230   0000   CTAK,0
7231   1052     TAD ARG3
7232   0250     AND P177    /PROTECT REST OF CORE.
7233   1251     TAD P7600
7234   3052     DCA ARG3
7235   1452     TAD I ARG3
7236   3051     DCA ARG2
7237   5630     JMP I CTAK
7240   0000   CPUT,0
7241   1052     TAD ARG3
7242   0250     AND P177
7243   1251     TAD P7600
7244   3052     DCA ARG3
7245   1053     TAD ARG4
7246   3452     DCA I ARG3
7247   5640     JMP I CPUT
7250   0177   P177,177
7251   7600   P7600,7600
```

.

```
.PAL?
*OUT-S:CRT
*
*IN-S:CON4,S:XCON,S:CRT1,S:CRT2
*
*
*
*
*OPT-T
```

NODISC FOCAL
FRONT, TAPE 62-A.

```
ACFULL  5206
ARG1    0050

                /CON4
                XLIST
                PAUSE/
                /
                /XCON
                FIELD 1
                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
                /
                /MODIFIED FOR NODISC SYS.
                /
                *KB1+37
0177    5000    SETCRT
                *FNKB1+37
0703    0734    734     /STAT
                /
                *CRT6OL+600-6200                /IN FUNCTION LIST TABLE
                                /MOVED TO FIELD 0 BY GODO
0770    0000    CRTGET,0
0771    7450      SNA
0772    1066      TAD CHAR
0773    6213      CDFICIF 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
                /
                *5000
5000    0000    SETCRT,0
5001    1017      TAD 17       /TEMP STORE****
5002    7440      SZA
5003    4742      JMS I SPRINX  /FOCAL LETTER ENTRY
5004    1052      TAD ARG3
5005    7700      SMA CLA
5006    5212      JMP SETOK
```

```
                              TAD PXOUT        /SWITCH TO TTY OUT
5007    1260              CDF
5010    6201              JMP SETGO
5011    5234          SETOK,TAD ARG3
5012    1052              SNA
5013    7450              JMP GO4
5014    5221              DCA XBASE
5015    3062              TAD XBASE          /PRESET X POSITION
5016    1062              DCA XLOC
5017    3064              DCA XMAX
5020    3072          GO4,TAD ARG4
5021    1053              SNA
5022    7450              JMP GO5
5023    5227              DCA YBASE
5024    3063              TAD YBASE
5025    1063              DCA YLOC
5026    3065          GO5,TAD ARG5
5027    1054              CMA
5030    7440              DCA SCALE
5031    3466              JMS TELTST
5032    4237          DOIT,TAD CRTXIT         /CHANGE TYPE OUTPUT
5033    1255          SETGO,DCA I PRINGO
5034    3657              CDF 10
5035    6211              JMP I SETCRT
5036    5600              /
5037    0000          TELTST,0
5040    6201          TELTRY,CDF
5041    6402              10F
5042    1656              TAD I TELSWX   /TYPING IN PROGRESS?
5043    7650              SNA CLA
5044    5637              JMP I TELTST
5045    6001              ION
5046    5240              JMP TELTRY
                          /
                          /
                          /                    /SETS DATA FIELD 0!!
5047    4237          ANDIT,JMS TELTST
5050    1260              TAD PXOUT            /RESTORE OUTPUT TO TYPER
5051    3657              DCA I PRINGO
5052    1262              TAD P277
5053    4527              JMS I TYPEX
5054    5661              JMP I GETOTX
                          /
5055    6370          CRTXIT,CRTCOL
5056    0016          TELSWX,TELSW
5057    0063          PRINGO,OUTDEV          /FOCAL OUT TO TELETYPE
5060    2676          PXOUT,XOUTL
5061    5272          GETOTX,GETOUT
5062    0277          P277,277
                          /
5063    0000          DOT,0
5064    1730              TAD I COIN7X /COINT7
5065    1331              TAD P7
5066    4332              JMS SCALEM
5067    7104              CLL RAL
5070    1065              TAD YLOC
5071    6063              DYL
5072    3325              DCA YTEMP
5073    1064          XSET,TAD XLOC
5074    4727              JMS I SCTESX
```

```
5075    6053            DXL
5076    6054            DIX
5077    3324            DCA XTEMP
5100    1066            TAD SCALE
5101    3031        DCA TEMPS0          /COUNTER
5102    1066        YLINE,TAD SCALE
5103    7104            CLL RAL          /DOUBLE Y SCALE
5104    3326            DCA SCOUN
5105    1325            TAD YTEMP
5106    7001        SPREDY,IAC
5107    6063            DYL              /FILL IN YLINE
5110    6054            DIX
5111    2326            ISZ SCOUN
5112    5306            JMP SPREDY
5113    7300            CLA CLL
5114    1324            TAD XTEMP
5115    7001            IAC
5116    4727            JMS I SCTESX /TEST EDGE OF SCREEN
5117    6053            DXL
5120    3324            DCA XTEMP
5121    2031            ISZ TEMPS0
5122    5302            JMP YLINE
5123    5663            JMP I DOT
                    /
5124    0000        XTEMP,0
5125    0000        YTEMP,0
5126    0000        SCOUN,0
5127    5335        SCTESX,SCTEST
5130    5361        COIN7X,COUNT7
5131    0007        P7,7
                    /
5132    0000        SCALEM,0
5133    3031            DCA TEMPS0
5134    1066            TAD SCALE
5135    3326            DCA SCOUN
5136    1031            TAD TEMPS0       /MULTIPLY BUT SAVE MQ
5137    2326            ISZ SCOUN
5140    5336            JMP .-2
5141    5732            JMP I SCALEM
                    /
5142    5200        SPRINX,SPRIN
                    PAUSE/
                    /
                    /CRT2
                    FIELD 1
                    /LETTER DECODE AND DISPLAY
                    /
                    PAGE
5200    0000        SPRIN,0
5201    1357            TAD P101
5202    7450            SNA
5203    5744            JMP I ENDITX /FOUND ERROR CODE '7677'
5204    1351            TAD M101
5205    0365            AND P377
5206    1352        ACFULL,TAD M246  /&
5207    7450            SNA
5210    5300            JMP SPRESET
5211    1355            TAD P6
5212    7500            SMA
5213    5220            JMP LETTER
```

```
5214   1356        TAD P23
5215   7650        SNA CLA
5216   5313        JMP CR
5217   5315        JMP LF
                   /
5220   7421   LETTER,MQL
5221   7405        MUY
5222   0003        3                    /3 WORDS PER CHARACTER
5223   7701        CLA!MQA
5224   1364        TAD LSBASE
5225   3363        DCA POINT            /CHARACTER DESCRIPTOR
5226   1345   INIT,TAD M5
5227   3360        DCA COUNT5
5230   1346        TAD M7
5231   3361        DCA COUNT7
5232   1350   WORDON,TAD M14
5233   3362        DCA COUNT12
5234   1763        TAD I POINT
5235   7421        MQL                  /DESCRIPTOR WORD
5236   2363        ISZ POINT
5237   7413   BITEST,SHL               /SHIFT HIGHEST BIT TO AC
5240   0000        0
5241   7640        SZA CLA
5242   4676        JMS I DOTEX          /A '1'
5243   2361   TESTON,ISZ COUNT7
5244   5310        JMP TEST12
5245   1066        TAD SCALE            /ONE COLUMN DONE
5246   7041        CIA
5247   1064        TAD XLOC
5250   4335        JMS SCTEST
5251   3064        DCA XLOC
5252   1346        TAD M7
5253   3361        DCA COUNT7
5254   2360        ISZ COUNT5
5255   5310        JMP TEST12
5256   1353   FINISH,TAD P3
5257   4677   EXIT,JMS I SCALEX
5260   1064        TAD XLOC
5261   4335        JMS SCTEST           /AVOID WRAP AROUND
5262   3064   NOWGO,DCA XLOC
5263   1072   NOWGO2,TAD XMAX
5264   7041        CIA
5265   1064        TAD XLOC
5266   7710        SPA CLA
5267   5272        JMP GETOUT
5270   1064        TAD XLOC
5271   3072        DCA XMAX
5272   6203   GETOUT,CDF!CIF
5273   6001        ION
5274   5675        JMP I LETBAX
5275   6375   LETBAX,LETBAK+6200-600    /ALWAYS RETURN TO FOCAL PRINT
                   /
5276   5063   DOTEX,DOT
5277   5132   SCALEX,SCALEM
                   /
5300   1063   SRESET,TAD YBASE
5301   3065        DCA YLOC
5302   1355        TAD P6
5303   3062        DCA XBASE
5304   3072        DCA XMAX
```

```
5305    6362        ERASE
5306    1462        TAD XBASE
5307    5262        JMP NOWGO
                /
                /
5310    2362    TEST12,ISZ COUN12
5311    5237        JMP BITEST
5312    5232        JMP WORDON      /12 BIT WORD FINISHED
                /
5313    1662    CR,TAD XBASE
5314    5262        JMP NOWGO
                /
5315    7300    LF,CLA CLL
5316    1347        TAD M27
5317    4677        JMS I SCALEX
5320    1065        TAD YLOC
5321    4335        JMS SCTEST
5322    3065        DCA YLOC
5323    7420        SNL
5324    5263        JMP NOWGO2
5325    1353        TAD P3              /END OF PAGE COLUMN
5326    4677        JMS I SCALEX
5327    1072        TAD XMAX
5330    3062        DCA XBASE
5331    1063        TAD YBASE
5332    3065        DCA YLOC
5333    1062        TAD XBASE
5334    5262        JMP NOWGO
                /
5335    0000    SCTEST,0
5336    7104        CLL RAL
5337    7530        SZL SPA
5340    7340        CLA CLL CMA     /SET 3777 IF >1777
5341    7010        RAR
5342    5735        JMP I SCTEST
                /
5343    4066    CHARAC,CHAR         /FOCAL'S CHARACTER BUFFER
5344    5047    ENDITX,ENDIT
                /
5345    7773    M5,-5
5346    7771    M7,-7
5347    7754    M24,-24
5350    7764    M14,-14
5351    7677    M101,-101
5352    7532    M246,-246
5353    0003    P3,3
5354    0005    P5,5
5355    0006    P6,6
5356    0023    P23,23
5357    0101    P101,101
5360    0000    COUNT5,0
5361    0000    COUNT7,0
5362    0000    COUN12,0
5363    0000    POINT,0
5364    6044    LSBASE,LISLET       /START OF LETTER LIST
5365    0377    P377,377
```

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

ARG1     0050
ARG10    0061

                 /CON0
                 XLIST
                 PAUSE/
                 /
                 /XCON
                 FIELD 1
                 XLIST
                 PAUSE/
                 /X CLER(1);X EDIT(C,1,X);S X=FCHAN(C)
                 /SPECIAL NODISC SYS. VERSIONS
                 /
                 *KB1+22
0162    6540       CHANEL
                 *KB1+26
0166    6554       EDITOR
                 *KB1+16
0156    6525       CLEAR
                 *FNKB1+16
0662    3772     3772    /CLER
                 *FNKB1+22
0666    3326     3326   /CHAN
                 *FNKB1+26
0672    1034     1034   /EDIT
                 /
                 *6525
6525    0000     CLEAR,0
6526    1336       TAD P1777
6527    3010       DCA 10
6530    1047       TAD M2000
6531    3053       DCA ARG4
6532    3410     LOOP,DCA I 10   /AUTOINDEX REGISTER.
6533    2053       ISZ ARG4
6534    5332       JMP LOOP
6535    5725       JMP I CLEAR
6536    1777     P1777,1777
6537    2000     P2000,2000
                 /
6540    0000     CHANEL,0
6541    1052       TAD ARG3
6542    1337       TAD P2000
6543    3052       DCA ARG3
6544    1452       TAD I ARG3
6545    3051       DCA ARG2
6546    1052       TAD ARG3
6547    1046       TAD P1000
6550    3052       DCA ARG3
6551    1452       TAD I ARG3
6552    3050       DCA ARG1
6553    5740       JMP I CHANEL
```

```
            /
6554   0000   EDITOR,0
6555   1052      TAD ARG3
6556   0371      AND P777
6557   1337      TAD P2000
6560   3052      DCA ARG3
6561   1054      TAD ARG5
6562   3452      DCA I ARG3
6563   1052      TAD ARG3
6564   1046      TAD P1000
6565   3052      DCA ARG3
6566   1012      TAD ARG5H
6567   3452      DCA I ARG3
6570   5754      JMP I EDITOR
6571   0777   P777,777
```

```
.PALP
*OUT-S:FAST
*
*IN-S:CON0,S:FAST,S:FAS2
*
*
*
*OPT-T


ARG1      0050


                   /CON0
                   XLIST
                   PAUSE/
                   /
                   /FAST
                   /SYSTEM TO BOOTSTRAP FOCAL BETWEEN TAPE AND CORE
                   /BLOCKS: 0-BOOTSTRAP,1-FIELD 1,40-DISC
                   /72 TO 131-FIELD 0
                   /LOAD COPE,COPG,FAST,F700;SAVE FAST!11200-2777;
                   /
                   /NOTE THAT BOOT AT 2227(7627) IS USED BY COPG!
                   /
                   /MODIFIED FOR NODISC SYS.
                   /
                   FIELD 1
                   *2000
2000   7300        BUILD,CLA CLL       /STORE DISC AND CORE SYSTEM ON TAPE
2001   4246           JMS SETDIS
2002   1356           TAD BOOTS
2003   3023           DCA DDCORE
2004   1271           TAD M200
2005   3024           DCA DDWCNT
2006   1270           TAD P10
2007   3026           DCA DSFELD
2010   3027           DCA DTBLOK       /LOAD BOOTSTRAP IN BLOCK 0
2011   3030           DCA DTUNIT
2012   1037           TAD P20
2013   4421           JMS I DTAPX      /WRITE TAPE
2014   5200           JMP BUILD        /TAPE ERROR
2015   3024           DCA DDWCNT       /NOW SAVE ALL OF FIELD 1
2016   3023           DCA DDCORE
2017   7001           IAC
2020   3027           DCA DTBLOK
2021   1037           TAD P20
2022   4421           JMS I DTAPX
2023   5200           JMP BUILD        /TAPE ERROR
2024   1132           TAD KILALL
2025   3346           DCA KILTEM
2026   1370           TAD RECOVR
2027   3132           DCA KILALL       /READ FIELD 0 WHEN DONE!
2030   1267           TAD BKSTAR
2031   3027           DCA DTBLOK
2032   3026           DCA DSFELD
2033   1037           TAD P20
2034   4421           JMS I DTAPX      /SAVE FIELD 0
2035   5233           JMP .-2          /TAPE ERROR
2036   5340        DISCR,JMP FELD0+2   /PATCH FOR NODISC SYS.
2037   4420           JMS I DISCX
2040   5236           JMP DISCR        /DISC ERROR
2041   4753           JMS I NAMSVX
```

```
2042   1037        TAD P20
2043   4421        JMS I DTAPX      /STORE DISC OVERLAY ON TAPE
2044   5236        JMP DISCR        /TAPE ERROR
2045   5336        JMP FELD0        /RECOVER FIELD 0 FOR RESTART
                   /
2046   0000    SETDIS,0
2047   6201        CDF
2050   3766        DCA I TELSWX     /ALLOW USE OF 'TYPE'
2051   6211        CDF 10
2052   1354        TAD P500
2053   3023        DCA DDCORE
2054   1275        TAD M6277
2055   3024        DCA DDWCNT
2056   1272        TAD P1500
2057   3025        DCA DISADD
2060   1274        TAD P700
2061   3026        DCA DSFELD
2062   1266        TAD BKDISC
2063   3027        DCA DTBLOK       /SET ADDRESSES FOR DISC OVERLAY XFER
2064   3126        DCA INTRUP       /NO INTERRUPT DURIN 'FAST'
2065   5646        JMP I SETDIS
                   /
2066   0040    BKDISC,40
2067   0072    BKSTAR,72
2070   0010    P10,10
2071   7600    M200,-200
2072   1500    P1500,1500
2073   0000    COUNT,0
2074   0700    P700,700
2075   1501    M6277,-6277
                   /
                   /
                   /
                   /
                   /
                   /FIELD 1 PART OF BOOTSTRAP USES FOCAL DISC,TAPE ROUTINES.
                   /
2076   7300    READIS,CLA CLL       /CODING TO XFER DISC OVERLAY
2077   4246        JMS SETDIS       /FROM TAPE BACK TO DISC
2100   1132        TAD KILALL
2101   3346        DCA KILTEM
2102   1347        TAD ERTYPE
2103   3132        DCA KILALL
2104   4421        JMS I DTAPX      /OVERLAY FROM TAPE
2105   5304        JMP .-1          /TAPE ERROR
2106   3041    STORIM,DCA DTEST             /DISABLE DISC PROTECT
2107   1357        TAD P2
2110   4420        JMS I DISCX
2111   5306        JMP STORIM       /DISC ERROR
2112   7001        IAC
2113   3041        DCA DTEST        /ENABLE DISC PROTECT
2114   3026    DISTES,DCA DSFELD            /TEST AND REWRITE BAD DISC SEGMENTS
2115   3025        DCA DISADD       /(STOLEN FROM GODO)
2116   1355        TAD M20
2117   3273        DCA COUNT
2120   1351        TAD M3777
2121   3024        DCA DDWCNT
2122   4420    TEST,JMS I DISCX
2123   7000        OPR
2124   7100        CLL
```

```
2125   1025        TAD DISADD
2126   1350        TAD P3777
2127   3025        DCA DISADD
2130   7430        SZL
2131   1076        TAD P100
2132   1026        TAD DSFELD
2133   3026        DCA DSFELD
2134   2273        ISZ COUNT
2135   5322        JMP TEST
2136   1346   FELD0,TAD KILTEM
2137   3132        DCA KILALL
2140   3023        DCA DDCORE    /NOW READ FIELD 0
2141   3026        DCA DSFELD
2142   1352        TAD M7600
2143   3024        DCA DDWCNT
2144   1267        TAD BKSTAR
2145   5767        JMP I READ0X
               /
2146   0000   KILTEM,0
2147   2160   ERTYPE,ERRORD
2150   3777   P3777,3777
2151   4001   M3777,-3777
2152   0200   M7600,-7600
2153   2544   NAMSVX,NAMSAV
2154   0500   P500,500
2155   7760   M20,-20
2156   2200   BOOTS,BEG1
2157   0002   P2,2
               /
2160   1357   ERRORD,TAD P2      /COMES HERE FOR DISC ERROR
2161   4420        JMS I DISCX   /REWRITE IT
2162   7000        OPR
2163   1026        TAD DSFELD
2164   4536        JMS I OCTPNX
2165   5314        JMP DISTES
               /
2166   0016   TELSWX,TELSW
2167   2570   READ0X,READ0
               /
2170   2136   RECOVR,FELD0
               PAUSE/
               /
               /FAS2
               /BLOCK 0 BOOTSTRAP GETS READ BACK TO FIELD 0
               /ASSEMBLED IN FIELD 1,USED IN FIELD 0
               /***NODISC FOCAL VERSION (NOV '74)***
               /
               *2200
2200   5227   BEG1,JMP BOOT
2201   6211        CDF 10
2202   1624        TAD I TEST1
2203   7041        CIA
2204   1226        TAD TEST0     /BE SURE SYSTEM IS STILL THERE
2205   7640        SZA CLA
2206   5177        JMP 177       /RESTART FOCAL
2207   1625        TAD I TEST2
2210   7041        CIA
2211   1226        TAD TEST0
2212   7640        SZA CLA
2213   5177        JMP 177
```

```
2214    1623        TAD I P1200
2215    7041        CIA
2216    1226        TAD TEST0
2217    7640        SZA CLA
2220    5177        JMP 177
2221    6213        CDF!CIF 10
2222    5623        JMP I P1200        /SEE COPE
                    /
2223    1200        P1200,1200
2224    2000        TEST1,2000
2225    1200        TEST2,1200
2226    7300        TEST0,CLA CLL
                    /                   /USED BY BOOTSTRAP AND BY COPG
2227    7300        BOOT,CLA CLL
2230    4236        JMS DECTAP         /TAPE ERROR
2231    5200        JMP BEG1           /MONITOR ENTRIES  NOW RESTART FOCAL
2232    3200        DCA BEG1
                    /
2233    6213        CDF!CIF 10
2234    5635        JMP I .+1
2235    2140        FELD0+2    /(NODISC FOCAL MOD)
                    /
2236    0000        DECTAP,0           /SET FIELD 0
2237    6774        DTBEGN,DTLB        /SEARCH BLK TO WORD 0
2240    3355        DCA BEG1+155 /SEARCH BLK TO WORD 0
2241    1324        DTSRCH,TAD P614
2242    6766        DTCA!DTXA          /SEARCH BACK
2243    4274        DTBACK,JMS DTFLAG
2244    7001        IAC
2245    7700        SMA CLA
2246    5243        JMP DTBACK
2247    1323        DTFRNT,TAD P214
2250    6766        DTCA!DTXA
2251    4274        DTFORW,JMS DTFLAG
2252    7450        SNA
2253    5257        JMP DTGO
2254    7700        SMA CLA
2255    5237        JMP DTBEGN          /MISSED IT
2256    5251        JMP DTFORW
2257    1327        DTGO,TAD PP10       /READ TO FIELD 1
2260    6774        DTLB
2261    7240        CLA CMA
2262    3355        DCA BEG1+155 /DATA ADDRESS=0
2263    1331        TAD MM7600         /(NODISC)
2264    3354        DCA BEG1+154 /(NODISC WORDCOUNT =7600; PROTECT BUFFER)
2265    1322        TAD PP130
2266    6764        DTXA                /CHANGE SEARCH TO READ OR WRITE
2267    4274        JMS DTFLAG         /NO ERRORS
2270    2236        ISZ DECTAP
2271    7200        DTEXIT,CLA          /CLEAR FLAGS
2272    6766        DTCA!DTXA
2273    5636        JMP I DECTAP
                    /
2274    0000        DTFLAG,0
2275    6771        DTSF
2276    5275        JMP .-1
2277    6772        DTRB
2300    7700        SMA CLA
2301    5314        JMP DTTEST
2302    6761        DTRA
```

```
2303    0325        AND P400
2304    7650        SNA CLA
2305    5312        JMP DTERRO      /ERROR MOVING FORWARD
2306    6772        DTRB
2307    0326        AND PP1000
2310    7640        SZA CLA
2311    5247        JMP DTFRNT      /END OF TAPE
2312    6766    DTERRO, DTCA!DTXA           /ERROR, STOP TAPE
2313    5271        JMP DTEXIT
2314    6764    DTTEST, DTXA        /ACKNOWLEDGE FLAG
2315    1000        TAD 0
2316    7421        MQL             /DISPLAY BLOCK NO.
2317    7240        CLA CMA         /LOOK FOR BLOCK 1
2320    1000        TAD 0
2321    5674        JMP I DTFLAG
                /
2322    0130    PP130, 130
2323    0214    P214, 214
2324    0614    P614, 614
2325    0400    P400, 400
2326    1000    PP1000, 1000
2327    0010    PP10, 10
2330    0212    P212, 212
2331    0200    MM7600, -7600
                /
            CNT2=DTFLAG
                /2332
            *2330       /GOES TO 7730
2330    0000    LFDELY, 0                   /SEE P700 FOR ENTRY
2331    1330        TAD P212            /DO THE LINE FEED
2332    6046        TLS
2333    7200        CLA
2334    1344        TAD MM11
2335    3345        DCA CNT1
2336    2274    WAITR, ISZ CNT2
2337    5336        JMP .-1
2340    2345        ISZ CNT1
2341    5336        JMP WAITR       /135 MS DELAY FOR SILENT 700 CR
2342    6213    EXIT, CIF!CDF 10 /RETURN TO FIELD 1
2343    5730        JMP I LFDELY
                /
2344    7767    MM11, -11
2345    0000    CNT1, 0
                /
            *2544
2544    0000    NAMSAV, 0
2545    1364        TAD NAM65       /SAVE NAMES FOR X NAME(0)
2546    3010        DCA 10
2547    1365        TAD P6777
2550    3011        DCA 11
2551    1367        TAD M12
2552    3012        DCA 12
2553    1410    MOVNAM, TAD I 10
2554    6201        CDF
2555    3411        DCA I 11
2556    6211        CDF 10
2557    2012        ISZ 12
2560    5353        JMP MOVNAM
2561    1366        TAD M6432
2562    3024        DCA DDWCNT      /SAVE FULL 32 BLOCKS
```

```
2563    5744        JMP  I  NAMSAV
                /
2564    0731    NAM65,FNKB1+65
2565    6777    P6777,6777
2566    1346    M6432,-6432
2567    7766    M12,-12
                /
2570    3027    READ0,DCA  DTBLOK               /CONTINUE CALL FIELD 0
2571    3030        DCA  DTUNIT
2572    4421        JMS  I  DTAPX
2573    5370        JMP  READ0         /TAPE ERROR
                /
2574    5775        JMP  I  .+1
2575    2600        2600               /ENTER THE SILENT 700 FIXER
```

```
 LOAD
*IN-S:COPE,S:COPG,S:FAST
*
*
*
ST=
↑↑↑↑
.SAVE FAST!11200-2575;
.PUTT
SET TAPE 8 TO WRITE ENABLED.
FILE NO.(0-4):2
 FILE 2 FULL.TYPE Y TO REUSE IT :Y
DONE!
.PIP
*OPT-S

*OUT-D0:FAST
*
*IN-S:FAST
*↑
*OPT-
.GETT
SET TAPE 8 TO WRITE LOCK.
FILE NO.(0-4):3
.PIP
*OPT-S

*OUT-S:FAST
*
*IN-D0:FAST
*↑
*OPT-
.PUTT
SET TAPE 8 TO WRITE ENABLED.
FILE NO.(0-4):3
 FILE 3 FULL.TYPE Y TO REUSE IT :Y
DONE!
 .
```

14 Dec '74

62A, file 3

NO DISC

```
.PALP
*OUT-S:F700
*
*IN-S:CON0,S:F700
*
*
*OPT-T

ARG1    0050
ARG10   0061


                /CON0
                XLIST
                PAUSE/
                /
                /F700
                /ALLOW USE OF 30CPS PRINTER WITH 200MS CARR. RET.
                / XTRA DELAYS OR MULTI CR IF FINDS3 30CPS AT BOOTSTRAP
                *2600
2600    7200    TESTER,CLA     /SET PROPER DELAY TIME FOR CARRAIGE RETURN.
2601    3373        DCA CTR1
2602    1273        TAD P215
2603    6046        TLS       /PRINT CARRAIGE RETURN.
2604    2373    TIMER,ISZ CTR1    /.01775 MSEC LOOP TO TIME PRINTER CLOCK.
2605    5207        JMP .+2
2606    5235        JMP TTYP
2607    7200        CLA
2610    0273        AND P215       /DUMMY STATEMENTS
2611    0273        AND P215       /TO SLOW DOWN LOOP.
2612    6041        TSF
2613    5204        JMP TIMER
2614    1267        TAD FASTCR     /SHORT DELAY-SET SILENT 700
2615    3010        DCA 10
2616    1353        TAD FAST       /FOR FOCAL ENTRIES
2617    3014        DCA 14
2620    1376        TAD CRETPX     /FOR CRET XFER(OUT-POINTER)
2621    3011        DCA 11
2622    1374        TAD FOC6P      /FOR CRET XFER(IN POINTER)
2623    3016        DCA 16
2624    1375        TAD COUNTF
2625    3012        DCA 12
2626    1416    MOVEF,TAD I 16   /XFER CRET TO 7515,FIELD 0
2627    6201        CDF
2630    3411        DCA I 11
2631    6211        CDF 10
2632    2012        ISZ 12
2633    5226        JMP MOVEF
2634    5241        JMP MOVEX
2635    1345    TTYP,TAD SLOW     /LONG DELAY-SET FOR NORMAL CR
2636    3014        DCA 14
2637    1275        TAD SLOWCR
2640    3010        DCA 10         /READY FOR LATER XFERS
2641    1372    MOVEX,TAD M5
2642    3012        DCA 12
2643    1130        TAD CRLFX
2644    1371        TAD PP2
2645    3011        DCA 11         /SET UP CRLF (LFOC) MODS.
2646    1410    MOVCRL,TAD I 10
2647    3411        DCA I 11
2650    2012        ISZ 12
```

```
2651    5246        JMP MOVCRL
2652    1337        TAD FPOINT          /NOW SET FOCAL CRLF ENTRIES
2653    3017        DCA 17
2654    1372        TAD M5
2655    3012        DCA 12
2656    1417    MOVEP,TAD I 17
2657    3373        DCA CTR1
2660    1414        TAD I 14
2661    6201        CDF
2662    3773        DCA I CTR1
2663    6211        CDF 10
2664    2012        ISZ 12
2665    5256        JMP MOVEP
2666    5361        JMP GOFOC
                /
2667    2667    FASTCR,.
2670    6203        CDF!CIF             /NEW CODES FOR CRLF
2671    4647        4647                /ASSUME CRLF STILL AT 240 IN LFOC
2672    5640        5640
2673    0215        P215,215            /CR CODE
2674    7732        LOC2,7732           /SEE LFDELY AT 2332 IN 'FAST' (NODISC MOD)
                /
2675    2675    SLOWCR,.
2676    1247        1247     /SEE LFOC-CRLF
2677    4527        4527     /GOES TO 244 FIELD 1
2700    5640        5640     /245
2701    0215        215      /246
2702    0212        212      /247
                /
                *2715   /THIS MOVES TO 7515
2715    0000    CRET,0
2716    2315        ISZ CRET
2717    1077        TAD 77
2720    4463        4463                /JMS I OUTDEV IN FIELD 0
2721    1063        TAD 63              /OUTDEV
2722    1336        TAD M2676           /TEST TTY OUTPUT?
2723    7640        SZA CLA
2724    5715        JMP I CRET          /CRT,NOT TTY.
2725    7001        IAC                 /NON-PRINTING CHAR.
2726    4463        4463
2727    7001        IAC
2730    4463        4463
2731    7001        IAC                 /THESE CHARS. USE UP REST OF 195 MS.
2732    4463        4463
2733    7001        IAC
2734    4463        4463
2735    5715    LAST,JMP I CRET
2736    5102    M2676,-2676             /OUTDEV POINTER FOR TTY.
                /
2737    2737    FPOINT,.
2740    1246        1246     /ADDRESSES IN FOCAL FIELD 0
2741    1247        1247
2742    2476        2476
2743    2477        2477
2744    7002        7002
                /
2745    2745    SLOW,.
2746    1077        1077     /NORMAL CODES FOR FOCAL AT THESE ADDRESSES
2747    4463        4463
2750    1077        1077
```

```
2751   4463      4463
2752   0375       375        /ALT-MODE CODE.
                  /
2753   2753    FAST,.
2754   4647       4647   /SPECIAL CODES FOR FOCAL AT THESE ADDRESSES
2755   7515       CRET-2600+7400
2756   4677       4677
2757   7515       CRET-2600+7400
2760   0233       233        /SUBSTITUTE ESCAPE FOR ALT MODE.
                  /
2761   6041    GOFOC,TSF
2762   5361       JMP .-1
2763   4530       JMS I CRLFX
2764   6041       TSF
2765   5364       JMP .-1
2766   6203       CDF!CIF
2767   5770       JMP I .+1
2770   0177       177        /START FOCAL!!!!!!!!!!!
                  /
2771   0002    PP2,2
2772   7773    M5,-5
2773   0000    CTR1,0
2774   2714    FOC6P,CRET-1
2775   7756    COUNTF,CRET-LAST-2
2776   7514    CRETPX,CRET-2600+7400-1
```

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

ARG 1    0050


                  /CON0
                  XLIST
                  PAUSE/
                  /7 DEC 1974, NODISC FOCAL.
                  /LABL
                  FIELD 1
                  *550
0550   4016   4016     / N
0551   1704   1704      /OD
0552   2303   2303     /SC
0553   5502   5502     /-B
                  /
                  *CLENGT
0006   6555   -1223    /CHAIN LENGTH=1777-555+1
                  *BUFEMD
0036   6002   -1776    /-1777+1
                  *DISEND
0040   7067   -711     /END OF DISC DATA AREA
                  *FSDATA
0043   0500   500      /FIRST DATA BLOCK
                  *FSPROG
0044   0160   160      /FIRST PROG. BLOCK
                  /
                  /LOAD OVER XFOC TO LABEL NEW VERSION.
                  /AND TO PRESET DISC AND TAPE CONSTANTS
```

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

ARG1     0050
```

NODISC FOCAL
FRONT OF TAPE 62-A

```
                /CON0
                XLIST
                PAUSE/
                /
                /XCON
                FIELD 1
                XLIST
                PAUSE/
                /
                /LOOK
                /X LOOK(X,Y,ST,N,SC,CH)   FOR MAPPING: PLOTS N VERTICAL LINES
                /OF VARYING DENSITY,STARTING AT X,Y;X SPACING ST,INTENSITY
                /SCALE FACTOR SC,STARTING AT CHANNEL CH.
                /
                /MODIFIED FOR NODISC SYS---USES BUFFER 0.
                /
                POINT=ARG10
                YSTEP=ARG9
                /
                *FNKB1+47
0713    1403    1403     /LOOK
                *KB1+47
0207    6345    LOOK
                /
                *6345
6345    0000    LOOK,0
6346    1055        TAD ARG6
6347    7040        CMA
6350    3055        DCA ARG6        /COUNT
6351    1365        TAD P2000       /BUFFER 0
6352    1057        TAD ARG8
6353    3061        DCA POINT
6354    1056        TAD ARG7
6355    3764        DCA I SCALRX
6356    2061    NEXTP,ISZ POINT
6357    4763        JMS I CHANLX
6360    2055        ISZ ARG6
6361    5356        JMP NEXTP
6362    5745        JMP I LOOK
                /
6363    4322    CHANLX,CHANL
6364    4331    SCALRX,SCALER
6365    2000    P2000,2000
                /
                *4322
4322    0000    CHANL,0
4323    1052        TAD ARG3
4324    6053        DXL
4325    1054        TAD ARG5
4326    3052        DCA ARG3        /NEXT X POSITION
```

```
4327    1461        TAD I POINT
4330    7427        MQL!DVI
4331    0000    SCALER,0
4332    7701        CLA!MQA
4333    7450        SNA
4334    5722        JMP I CHANL
4335    3340        DCA DVISOR
4336    1364        TAD PLUS
4337    7427        MQL!DVI
4340    0000    DVISOR,0
4341    7701        CLA!MQA
4342    7450        SNA
4343    7001        IAC
4344    3060        DCA YSTEP
4345    3363        DCA YADD
4346    1363    DOT,TAD YADD
4347    1060        TAD YSTEP
4350    3363        DCA YADD
4351    1365        TAD MINUS
4352    1363        TAD YADD
4353    7700        SMA CLA
4354    5722        JMP I CHANL
4355    1363        TAD YADD
4356    1053        TAD ARG4
4357    6063        DYL
4360    7200        CLA
4361    6054        DIX
4362    5346        JMP DOT
                /
4363    0000    YADD,0
4364    0020    PLUS,20
4365    7757    MINUS,-21
```

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


ARG1    0050


                /CON0
                XLIST
                PAUSE/
                /X MASH(2)
                /COMPRESS 512 CHANS IN BUFFER 1 INTO 256 CHANS.
                /ARGUMENT IS DUMMY.
                /NODISC SYS. ONLY.
                /
                CHANL=ARG3
                CHANH=ARG4
                OCHANL=ARG5
                OCHANH=ARG6
                *KB1+46
0206    6460        MASH
                *FNKB1+46
0712    0640        640    /MASH
                *6460
6460    0000    MASH,0
6461    1315        TAD P2000
6462    3052        DCA CHANL
6463    1316        TAD P3000
6464    3053        DCA CHANH
6465    1315        TAD P2000
6466    3054        DCA OCHANL
6467    1316        TAD P3000
6470    3055        DCA OCHANH
6471    1317        TAD M400
6472    3320        DCA CTR
6473    7100    LOOP,CLL
6474    1452        TAD I CHANL
6475    2052        ISZ CHANL
6476    1452        TAD I CHANL
6477    3454        DCA I OCHANL
6500    7530        SZL CLL
6501    7001        IAC
6502    1453        TAD I CHANH
6503    2053        ISZ CHANH
6504    1453        TAD I CHANH
6505    3455        DCA I OCHANH
6506    2052        ISZ CHANL
6507    2053        ISZ CHANH
6510    2054        ISZ OCHANL
6511    2055        ISZ OCHANH
6512    2320        ISZ CTR
6513    5273        JMP LOOP
6514    5660        JMP I MASH
6515    2000    P2000,2000
6516    3000    P3000,3000
6517    7400    M400,-400
6520    0000    CTR,0
```

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

 ARG1      0050


                  /CONO
                  XLIST
                  PAUSE/
                  /
                  /XCON
                  FIELD 1
                  XLIST
                  PAUSE/
                  /
                  /MEMF
                  /X MEMW(W,N,OR)   WRITE  N WORDS
                  /STARTING AT WORD W
                  /X MEMR(W,0,H) READ 1024 WORDS,STARTING AT W.
                  /READS LOW 12 BITS IF H>0.SETS D IF COUNTING (IN S D=FMEMR..
                  /IN EXTERNAL MEMORY TO OR FROM CORE DATA BUFFER #1
                  /OR IS NON-ZERO TO WRITE HI 12 BIT PART
                  /X MEME(0) ERASE
                  /X MEMC(N) SET COUNTING TIME N CYCLES(<2^23)
                  /RETURNS REMAINING COUNTING TIME. STOPS IF N=0
                  /DOESN'T LOAD IF ALREADY COUNTING.
                  /***NODISC FOCAL MODS***
                  /
                  *FNKB1+67
0733   1177      1177       /MEMW
0734   1172      1172       /MEMR
                  *FNKB1+73
0737   1155      1155       /MEME
0740   1153      1153       /MEMC
                  /
                  *KB1+67
1227   4604      MEMW
1230   4634      MEMR
                  *KB1+73
1233   6401      MEME
1234   6414      MEMC
                  /
                  *NORMAL
0075   7232      7232
                  /
                  FUNCP=ARG10
                  MCOUNT=ARG9
                  CNTEST=ARG2
                  /
                  *4600      /(NODISC MOD)
 00   5226      FUNCWL,5226         /FUNCWH=5252
 01   5232      FUNCR,5232
 02   5232      MEMCPU,5232
 03   3232      NORM0,3232
                  /
 04   0000      MEMW,0
```

```
4605   4336        JMS MSETUP
4606   4263        JMS PASWOR
4607   1010        TAD 10
4610   1046        TAD P1000
4611   3011        DCA 11          /SET AUTO INDEX REGISTER
4612   1316        TAD WRITIT
4613   3225        DCA WRITER
4614   1054        TAD ARG5
4615   7650        SNA CLA
4616   5221        JMP LOW
4617   2225        ISZ WRITER    /HI PART
4620   1315        TAD P24
4621   1200   LOW,TAD FUNCWL
4622   7040        CMA    /HARDWARE COMPLEMENTS IT
4623   6453         FUNLOD
4624   7200   WRITE,CLA
4625   1410   WRITER,TAD I 10 /OR TAD I 11 FOR HI PART
4626   7040        CMA    /HARDWARE INVERSION
4627   6454         MCSTEP
4630   2060         ISZ MCOUNT
4631   5224         JMP WRITE
4632   4272         JMS MRESET
4633   5604         JMP I MEMW
                 /
4634   0000   MEMR,0
4635   1054        TAD ARG5
4636   7640        SZA CLA
4637   1313        TAD P2          /READ LOW PART ONLY:SAVE TIME
4640   1262        TAD READAL
4641   3257        DCA READER
4642   4336        JMS MSETUP
4643   1010        TAD 10
4644   1046        TAD P1000       /(NODISC FOCAL MOD)
4645   3011        DCA 11          /CHANGE TO 1024 WORD FORMAT
4646   1046        TAD P1000       /(NODISC)
4647   7041        CIA             /(NODISC)
4650   3060        DCA MCOUNT
4651   4263        JMS PASWOR
4652   6465   READ,READHI
4653   3411        DCA I 11
4654   6464        READLO          /TRIGGERS MCSTEP
4655   3410        DCA I 10
4656   2060        ISZ MCOUNT
4657   5252   READER,JMP READ /OR JUMP READ+2
4660   4272        JMS MRESET
4661   5634        JMP I MEMR
                 /
4662   5252   READAL,JMP READ
                 /
4663   0000   PASWOR,0
4664   2312        ISZ DCOUNT
4665   7410        SKP
4666   5663        JMP I PASWOR
4667   6454        MCSTEP
4670   5264        JMP .-4
4671   5663        JMP I PASWOR
                 /
4672   0000   MRESET,0
4673   7330   TESTS,CLA STL RAR
4674   1203        TAD NORM0       /NORMAL FOR REST OF 4096 WORDS
```

```
4675    7040        CMA                     /FOR HARDWARE INVERSION
4676    6453        FUNLOD
4677    6452          SYNSKP
4700    5277          JMP .-1
4701    1051          TAD CNTEST
4702    7650          SNA CLA
4703    6455          SCOUNT              /REENABLE COUNTING
4704    1075          TAD NORMAL
4705    7040          CMA
4706    6453          FUNLOD              /SELECTED SWEEP MODE
4707    3050          DCA ARG1
4710    5672          JMP I MRESET
                    /
4711    0777        P777,777
4712    0000        DCOUNT,0
4713    0002        P2,2
4714    2000        P2000,2000
4715    0024        P24,24
4716    1410        WRITIT,TAD I 10
                    /
4717    0000        SYNC,0
4720    3335          DCA TEMP
4721    6452        WAITS,SYNSKP
4722    5327          JMP TESTCL
4723    6452          SYNSKP
4724    7410          SKP
4725    5323          JMP .-2             /WAIT TILL 50 USEC. PAST
4726    5717          JMP I SYNC
4727    2335        TESTCL,ISZ TEMP
4730    5321          JMP WAITS
4731    1075          TAD NORMAL          /NO RESPONSE FROM MEM.BOX
4732    7040          CMA
4733    6453          FUNLOD              /TRY TO START CLOCK
4734    5321          JMP WAITS
4735    0000        TEMP,0
                    /
4736    0000        MSETUP,0
4737    6002          IOF    /PROGRAM IS ENTERED WITH INT. ON
4740    1053          TAD ARG4
4741    0311          AND P777
4742    7450          SNA
4743    1046          TAD P1000
4744    7041          CIA
4745    3060          DCA MCOUNT
4746    1314          TAD P2000
4747    3045          DCA BUFRDX          /ALWAYS USE BUFFER 1
4750    7240          CLA CMA
4751    1045          TAD BUFRDX
4752    3010          DCA 10
4753    1052          TAD ARG3
4754    7040          CMA
4755    3312          DCA DCOUNT
4756    4317          JMS SYNC
4757    6462          CONSKP
4760    7001          IAC
4761    3051          DCA CNTEST    /1 FOR NOT COUNTING
4762    6456          MSTOP         /DON'T COUNT WHILE READING
4763    1202          TAD MEMCPU    /INHIBIT 1 USEC CLOCK
4764    7040          CMA
4765    6453          FUNLOD        /ALSO CLEARS ACC.
```

```
4766    5736        JMP I MSETUP
                /
    .           *6400      /(NODISC)
6400    4717    SYNCX,SYNC
                /
                /
6401    0000    MEME,0  /ERASE MEMORY
6402    4600      JMS I SYNCX
6403    1213       TAD ERASR
6404    7040       CMA
6405    6453        FUNLOD
6406    4600      JMS I SYNCX
6407    1075       TAD NORMAL
6410    7040       CMA
6411    6453        FUNLOD
6412    5601       JMP I MEME
                /
6413    7202    ERASR,7202
                RDTIML=6451
                RDTIMH=6461
                /
6414    0000    MEMC,0  /LOAD COUNTING TIME
6415    3050       DCA ARG1
6416    3051       DCA ARG2
6417    1010       TAD ARG3H
6420    1052       TAD ARG3
6421    7640       SZA CLA
6422    5225       JMP CTEST
6423    6456       MSTOP
6424    5240       JMP EXITS
6425    6462    CTEST,CONSKP
6426    5230       JMP FREE        /NOT COUNTING
6427    5244       JMP EDITC
6430    1052    FREE,TAD ARG3
6431    6452       SYNSKP
6432    5231       JMP .-1
6433    6457       TIMELO
6434    7330      CLA STL RAR     /BIT 0 TO ENABLE COUNTING
6435    1010      TAD ARG3H
6436    6467       TIMEHI
6437    6455       SCOUNT
6440    7300    EXITS,CLA CLL
6441    3050      DCA ARG1
6442    3051      DCA ARG2
6443    5614       JMP I MEMC
                /
6444    6451    EDITC,RDTIML
6445    7040      CMA
6446    3051      DCA ARG2
6447    6461      RDTIMH
6450    7040      CMA
6451    1254      TAD P4000
6452    3050      DCA ARG1        /REMAINING COUNTING TIME
6453    5614      JMP I MEMC
                /
6454    4000    P4000,4000
.
```

.PALP
*OUT-S:NCRT
*
*IN-S:CON0,S:XCON,S:NCRT,S:NCR2
*
*
*
*
*OPT-T

ARG1   0050

                    /CON0
                    XLIST
                    PAUSE/
                    /
                    /XCON
                    FIELD 1
                    XLIST
                    PAUSE/
                    /
                    /NCRT
                    /X CRT(SC,N,X1,B,SW,OF,P,D)-P=CALC. SCALE;D=DOTS.
                    /DISPLAYS FOR SW SWEEPS: N POINTS,STARTING AT X1,
                    /FULL SCALE IS SC X 1024 OFFSET=OF.
                    /IF N=0,DISPLAY 512 POINTS
                    /IF I=0,USE 1 SWEEPS
                    /STOP PLOTTING IF STOP (3,10) SWITCH IS PRESSED.
                    /
                    /MODIFIED FOR NODISC SYS.
                    /ONLY USES BUFFER 0.
                    /
                    PENUP=6504
                    DDOWN=6514
                    PDOWN=6524
                    XPOINT=ARG3
                    /
                    *KB1+10
    0150   4400   GRAPH   /FOCAL FUNCTION FGRA
                    *FNKB1+10
    0654   0044   44   /CRT
                    /
                    *4400
                    GRAPH,0 /DISPLAY SEQUENCE OF POINTS
    4400   0000   GRAPH,0 /DISPLAY SEQUENCE OF POINTS
    4401   1060   TAD ARG9
    4402   7640   SZA CLA
    4403   1370   TAD PLOPNT
    4404   1371   TAD DISP
    4405   3372   DCA FUNC
    4406   1056   TAD ARG7
    4407   7040   CMA
    4410   3056   DCA ARG7   /SWEEP COUNTER
    4411   3327   DCA SHIFTR
    4412   1052   TAD ARG3
    4413   7421   MQL
    4414   1010   TAD ARG3H
    4415   7450   NEXTD,SNA
    4416   5223   JMP DIVOK
    4417   7417   LSR   /SHIFT OVER UNTIL <4095
    4420   0000   0
    4421   2327   ISZ SHIFTR
    4422   5215   JMP NEXTD

```
4423  7501  DIVOK,MQA
4424  3331      DCA  SCALEG
4425  1053  GRAN,TAD  ARG4
4426  7450      SNA
4427  1046      TAD  P1000
4430  3234      DCA  XDIV
4431  1306      TAD  P2000
4432  7421      MQL
4433  7407      DVI
4434  0000  XDIV,0
4435  7701      CLA!MQA
4436  3305      DCA  XSTEP
4437  7201  SWEEP,CLA  IAC
4440  7650      SNA  CLA
4441  1306      TAD  P2000
4442  1306      TAD  P2000
4443  1054      TAD  ARG5        /START  A  DISPLAY  SWEEP
4444  3310      DCA  DATLOW
4445  1310      TAD  DATLOW
4446  1046      TAD  P1000
4447  3311      DCA  DATHI
4450  3052      DCA  XPOINT
4451  1234      TAD  XDIV
4452  7141      CIA  CLL
4453  3304      DCA  XCOUNT
4454  4313  PCYCLE,JMS  GETPNT
4455  4772      JMS  I  FUNC
4456  1305  NOTEN,TAD  XSTEP
4457  1052      TAD  XPOINT
4460  3052      DCA  XPOINT
4461  2310      ISZ  DATLOW
4462  2311      ISZ  DATHI
4463  1311      TAD  DATHI
4464  1303      TAD  M4000
4465  7650      SNA  CLA
4466  5274      JMP  HALF2
4467  2304  ONGO,ISZ  XCOUNT
4470  5254      JMP  PCYCLE
4471  2056      ISZ  ARG7
4472  5237      JMP  SWEEP
4473  5600      JMP  I  GRAPH
            /
4474  1046  HALF2,TAD  P1000
4475  1310      TAD  DATLOW
4476  3310      DCA  DATLOW
4477  1046      TAD  P1000
4500  1311      TAD  DATHI
4501  3311      DCA  DATHI
4502  5267      JMP  ONGO
            /
4503  4000  M4000,-4000
            /
4504  0000  XCOUNT,0
4505  0000  XSTEP,0
4506  2000  P2000,2000
4507  6000  P6000,6000
4510  0000  DATLOW,0
4511  0000  DATHI,0
4512  0000  SETHI,0
            /
```

```
4513   0000   GETPNT,0
4514   7240     CLA CMA
4515   3360     DCA DSIGN
4516   1711     TAD I DATHI
4517   7710     SPA CLA
4520   5361     JMP NEG
4521   1710      TAD I DATLOW              /DISPLAY A POINT
4522   7421      MQL
4523   1711      TAD I DATHI
4524   7413   DIVIDE,SHL            /SHIFT LEFT ONCE,SINCE MIN. RIGHT
4525   0000     0                   /SHIFT IS 1.
4526   7417     LSR
4527   0000   SHIFTR,0
4530   7407     DVI
4531   0000   SCALEG,0
4532   7630     SZL CLA
4533   5354     JMP TOOBIG          /DIVIDE OVERFLOW
4534   1360     TAD DSIGN
4535   3031     DCA TEMPS0
4536   7100     CLL
4537   7701      CLAIMQA
4540   2360     ISZ DSIGN
4541   7061     CIA CML
4542   1057     TAD ARG8
4543   7420     SNL
4544   5347     JMP POSIT
4545   7200     CLA
4546   1031     TAD TEMPS0          /OVER OR UNDER FLOW
4547   7421   POSIT,MQL
4550   7501     MQA
4551   0307      AND P6000
4552   7650     SNA CLA
4553   5713     JMP I GETPNT
4554   7350   TOOBIG,CLA CMA CLL RAR
4555   7110     CLL RAR             /SET 1777
4556   7421     MQL     /OVERFLOW
4557   5713     JMP I GETPNT
              /
4560   0000   DSIGN,0
              /
4561   3360   NEG,DCA DSIGN
4562   1710      TAD I DATLOW
4563   7041     CIA
4564   7421     MQL
4565   1711     TAD I DATHI
4566   7040     CMA
4567   5324     JMP DIVIDE          /NEGATIVE NUMBERS ARE CONVERTED,THEN DIVIDED
              /
4570   7676   PLOPNT,PLOT-ONEPNT
4571   4302   DISP,ONEPNT
4572   4302   FUNC,ONEPNT
              PAUSE/
              /
              /NCR2
              /CALCOMP.PART OF IT.
              CODLOD=6361
              READSW=6362
              *4200
4200   7000   PLOT,OPR               /Y VALUE IN MQ
4201   7501      MQA
```

```
4202    7041        CIA
4203    1106        TAD COMLOC
4204    7100        CLL
4205    7500        SMA
4206    7061        CIA CML
4207    3200        DCA PLOT
4210    1276        TAD LEFT
4211    7430        SZL
4212    1275        TAD RIGHTD
4213    3225        DCA COMPY
4214    1061        TAD ARG10       /DOT TEST
4215    7650        SNA CLA
4216    5222        JMP YDO
4217    6504        PENUP
4220    1301        TAD P24
4221    4252        JMS DELAY
4222    1200    YDO, TAD PLOT
4223    7650        SNA CLA
4224    5233        JMP COMP
4225    0000    COMPY, 0
4226    4252        JMS DELAY
4227    2200    YTEST, ISZ PLOT
4230    5225        JMP COMPY
4231    7501        MQA
4232    3106        DCA COMLOC
4233    1060    COMP, TAD ARG9
4234    7041        CIA
4235    3200        DCA PLOT
4236    6514    COMPX, DDOWN        /X MOTION LAST
4237    4252        JMS DELAY
4240    2200        ISZ PLOT
4241    5236        JMP COMPX
4242    1061    DONE, TAD ARG10
4243    7650        SNA CLA
4244    5651        JMP I RETN
4245    6524        PDOWN           /DOTS
4246    1301        TAD P24
4247    4252        JMS DELAY
4250    5651        JMP I RETN
                /
4251    4456    RETN, NOTEN
                /
4252    0000    DELAY, 0
4253    7040        CMA
4254    3277        DCA TEMP1
4255    1320        TAD P3
4256    6361        CODLOD          /READ SWITCHES
4257    6362        READSW
4260    0046        AND P1000       /TEST STOP SWITCH
4261    7450        SNA
4262    5265        JMP GOOK
4263    3051        DCA ARG2        /TELL FOCAL
4264    5651        JMP I RETN
4265    1274    GOOK, TAD TIME
4266    3300        DCA TEMP2
4267    2300    WAIT, ISZ TEMP2
4270    5267        JMP .-1
4271    2277        ISZ TEMP1
4272    5265        JMP GOOK
4273    5652        JMP I DELAY
```

```
4274    6400    TIME,-1400
4275    7770    RIGHTD,-10
4276    6521    LEFT,6521
4277    0000    TEMP1,0
4300    0000    TEMP2,0
4301    0024    P24,24
                /
4302    0000    ONEPNT,0
4303    7501       MQA
4304    6063    SHOWL,DYL
4305    7300       CLA CLL
4306    1052       TAD XPOINT
4307    6053       DXL
4310    7300       CLA CLL
4311    1317       TAD M6
4312    3010       DCA 10
4313    2010       ISZ 10
4314    5313       JMP .-1          /DELAY FOR MEMORY SCOPE
4315    6054       DIX
4316    5702       JMP I ONEPNT
4317    7772    M6,-6
4320    0003    P3,3
```

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


ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /XCON
                FIELD 1
                XLIST
                PAUSE/
                /
                /STAPE-READS AND WRITES SCANNER RUNS TO DECTAPE
                /
                /X MSAV(R,B,T) PUT BUFFER B ON TAPE T AS RUN R
                /X MGET(R,B,T) SET BUFER B TO CONTENT OF TAPE T RUN R
                /
                /MODIFIED FOR NODISC SYS.
                /
                *KB1+14
0154    5435    TSAVE
0155    5443    TGET
                *FNKB1+14
0660    2636    2636    /MSAV
0661    1274    1274    /MGET
                /
                *5435
5435    0000    TSAVE,0
5436    4250        JMS TSETUP
5437    1037        TAD P20
5440    4421        JMS I DTAPX
5441    5237        JMP .-2      /TAPE ERROR
5442    5635        JMP I TSAVE
                /
5443    0000    TGET,0
5444    4250        JMS TSETUP
5445    4421        JMS I DTAPX
5446    5245        JMP .-1      /READ ERROR
5447    5643        JMP I TGET
                /
5450    0000    TSETUP,0  /MERGED TSETUP AND BUFSTX FROM REGULAR SYS.
5451    1272        TAD P2000
5452    3023        DCA DDCORE
5453    1273        TAD P10
5454    3026        DCA DSFELD
5455    1052        TAD ARG3
5456    7106        CLL RTL
5457    7004        RAL
5460    1043        TAD FSDATA
5461    3027        DCA DTBLOK
5462    1047        TAD M2000
5463    3024        DCA DDWCNT
5464    1054        TAD ARG5
```

```
5465    0274    AND P7
5466    7112    CLL RTR
5467    7012    RTR
5470    3030    DCA DTUNIT
5471    5650    JMP I TSETUP
5472    2000    P2000,2000
5473    0010    P10,10
5474    0007    P7,7
```

14 Dec '74

Tape 62A,

front + file 3.

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

*
*
*
*OPT-T

ARG1    0050
ARG10   0061


            /CON0
            XLIST
            PAUSE/
            /
            /XCON
            FIELD 1
            XLIST
            PAUSE/
            /
            /SWP1
            /S  D=FMEMX(N,C,R,S,P,K);X MEMY(0,C,R--)--LOAD SWEEPS
            /MUX NO. IS 3;OR S IF NON-ZERO...P=1 TO BYPASS ERROR PRINT.
            /N=1 FOR NORMAL SWEEP..R=1 TO READ,0 TO SEND.
            /.K=1 TO BYPASS 4K SCANNER MEMORY.
            /C IS SWEEP CENTER
            /INPUT CABLE 7;OUTPUT CABLE 18.
            /
            /***NODISC
            /
            /ASSUMES MUX CYCLE TIME<20 MICROSEC.
            /WILL HANG IN XMIT IF ARG7 SET AND MUX DISABLED.
            /
            DATA=ARG10
            FUNCP=ARG10H
            COUNTS=ARG9
            FUNC=ARG9H
            COUNT=ARG8H
            UNIT=ARG7H
            BYPASS=ARG6H
            CENGO=5400    /DUMMY LOC FOR NODISC VERSION.
            /
            MUX=6350
            DKSKIP=1
            DUNSKP=2
            DAREAD=3
            FREAD=4
            FLOAD=5
            LAMOFF=6
            DLOAD=7
            GRAB=4
            /
            SYNSKP=6452
            FUNLOD=6453
            /
            *FNKB1+71
0735   1200   1200    /MEMX
```

```
0232    5521    MEMY
                /
                *5475    /NODISC MOD
                /
5475    0300    UNIT0,300
5476    0200    UNIT1,200
5477    0100    UNIT2,100
5500    0300    UNIT3,300
5501    0040    UNIT4,40
5502    0240    UNIT5,240
5503    0140    UNIT6,140
5504    0340    UNIT7,340
5505    0000    MEMX,0
5506    1052        TAD ARG3
5507    7440        SZA
5510    7330        STL CLA RAR    /4000
5511    1335        TAD NORM0
5512    3075        DCA NORMAL
5513    1054        TAD ARG5
5514    7640        SZA CLA
5515    1330        TAD XREAD       /READ,NOT WRITE
5516    1332        TAD FUNCX
5517    4734        JMS I SETUPX
5520    5705        JMP I MEMX
                /
5521    0000    MEMY,0
5522    1054        TAD ARG5
5523    7640        SZA CLA
5524    1331        TAD YREAD       /READ,NOT WRITE
5525    1333        TAD FUNCY
5526    4734        JMS I SETUPX
5527    5721        JMP I MEMY
                /
5530    0400    XREAD,1000-400    /CHANGE WRITE TO READ
5531    0100    YREAD,200-100
5532    6630    FUNCX,6630
5533    7131    FUNCY,7131
5534    5644    SETUPX,SETUP
5535    3230    NORM0,3230
                /
5536    0000    SFUNL,0            /PUT FUNCTION IN SWEEP BOX
5537    7421    SETIN,MQL
5540    1777        TAD PORT18     /CABLE SELECT
5541    4776        JMS XMIT
5542    5337        JMP SETIN      /ERROR
5543    1775        TAD CABLE7
5544    7421        MQL
5545    7330        CLA STL RAR    /4000 FOR PULSE 1
5546    4776        JMS XMIT
5547    5337        JMP SETIN      /ERROR
5550    5736        JMP I SFUNL
                /
5551    0000    DELAY,0 /LENGTH IN AC=12+N*4.5 MICRO SEC
5552    3031        DCA TEMPS0
5553    2031        ISZ TEMPS0
5554    5353        JMP .-1
5555    5751        JMP I DELAY
                /
5556    0000    SYNC,0
5557    3374        DCA TEMP
```

```
5560   6452   WAITS,SYNSKP
5561   5366     JMP TESTCL
5562   6452     SYNSKP          /WAIT FOR 4K MEM. CYCLE
5563   7410     SKP
5564   5362     JMP .-2
5565   5756     JMP I SYNC
5566   2374   TESTCL,ISZ TEMP
5567   5360     JMP WAITS
5570   1075     TAD NORMAL
5571   7040     CMA
5572   6453     FUNLOD          /TRY TO START THE I MHZ CLOCK
5573   5360     JMP WAITS
5574   0000   TEMP,0
              /
5575   5771
5576   5600
5577   5766
              *5600  /NODISC MOD
5600   0000   XMIT,0
5601   1037     TAD P20         /SEND
5602   1014     TAD UNIT
5603   6355     MUX FLOAD       /FUNCTION
5604   3016     DCA FUNC
5605   6354     MUX FREAD
5606   7041     CIA
5607   1016     TAD FUNC        /BE SURE CORRECT CODE LOADED
5610   7450     SNA
5611   5214     JMP GO
5612   4536     JMS I OCTPNX    /IF PDP S IO BAD PRINTS DELTA
5613   5231     JMP FAULT
5614   7501   GO,MQA
5615   6357     MUX DLOAD       /"DATA" AND TRANSMIT
5616   7344     CLA CMA CLL RAL        /-2 IN AC FOR 21 USEC.
5617   4775     JMS I DELAYX
5620   6352     MUX DUNSKP
5621   5231     JMP FAULT
5622   6354     MUX FREAD
5623   7041     CIA
5624   1016     TAD FUNC
5625   6351     MUX OKSKIP
5626   7240     CLA CMA         /ERROR
5627   7650     SNA CLA
5630   5242     JMP OK
5631   1013   FAULT,TAD BYPASS
5632   1056     TAD ARG7
5633   7640     SZA CLA
5634   5600     JMP I XMIT      /BYPASS ERROR MESSAGE
5635   4422     JMS I MESAGX
5636   1525   TEXT /MU
5637   3077   X?
5640   0000   /
5641   5600     JMP I XMIT
5642   2200   OK,ISZ XMIT
5643   5600     JMP I XMIT
              PAUSE/
              /
              /SWP2
5644   0000   SETUP,0
5645   3017     DCA FUNCP
5646   6002     IOF
```

```
5647    6354    MUX GRAB        /STOP OTHER COAX USER
5650    7350    CLA CMA CLL RAR        /SET A LONG DELAY
5651    4775    JMS I DELAYX   /WAIT FOR SPECTRGRAPH CONTROL TO FINISH
5652    1055    TAD ARG6
5653    0374    AND P7
5654    1365    TAD LIST
5655    3031    DCA TEMPS0
5656    1431    TAD I TEMPS0
5657    3014    DCA UNIT
5660    2013    TEST,ISZ BYPASS /SET ERROR PRINT BYPASS
5661    2015    ISZ COUNT
5662    7410    SKP
5663    5266    JMP GOSYNC
5664    4200    INIT,JMS XMIT   /PUTS MPX IN PHASE,WITH NO ERROR PRINT
5665    5260    JMP TEST
5666    3013    GOSYNC,DCA BYPASS        /CLEAR ERROR PRINT BYPASS
5667    1057    TAD ARG8
5670    7650    SNA CLA
5671    4776    JMS I  SYNCX   /WAIT FOR 4K SCANNER MEMORY CYCLE
5672    1017    TAD FUNCP
5673    0363    AND P5777       /MEM. CLOCK OFF
5674    7040    CMA
5675    6453    FUNLOD          /STOP 4K MEM.
5676    1017    TAD FUNCP
5677    4764    JMS I SFUNLX
5700    1372    TAD M1000
5701    3015    DCA COUNT
5702    7332    CLA STL RTR    /CORE BUFFER 1,ADDRESS 2000
5703    3061    DCA DATA
5704    1244    TAD SETUP
5705    1377    TAD CENTES      /CHECK FOR CENTERING ONLY
5706    7650    SNA CLA
5707    5342    JMP GETOUT      /YES
5710    1373    NEXT,TAD M10
5711    3060    DCA COUNT8
5712    1054    TAD ARG5
5713    7650    SNA CLA
5714    5327    JMP PUTING      /SETTING SWEEPS(SEND)
5715    6454    STEPRD,MCSTEP
5716    2060    ISZ COUNT8
5717    5315    JMP STEPRD
5720    1373    GET,TAD M10     /CHANGE SEND TO RECEIVE
5721    1367    TAD PORT7
5722    4200    JMS XMIT
5723    5320    JMP GET         /ERROR
5724    6353    MUX DAREAD      /READ 12 BIT WORD
5725    3461    DCA I DATA
5726    5337    JMP ONGO
5727    1461    PUTING,TAD I DATA
5730    7421    MQL
5731    1366    TAD PORT18
5732    4200    JMS XMIT
5733    5327    JMP PUTING      /ERROR
5734    6454    STEPW,MCSTEP
5735    2060    ISZ COUNT8
5736    5334    JMP STEPW       /8 PULSES PER STEP
5737    2061    ONGO,ISZ DATA
5740    2015    ISZ COUNT
5741    5310    JMP NEXT
5742    1075    GETOUT,TAD NORMAL
```

```
5743   .4764      JMS I SFUNLX
5744   1053    SETIT,TAD ARG4
5745   7421       MQL
5746   1366       TAD PORT18        /SETTING 'CENTER' FOR SWEEPS
5747   4200       JMS XMIT
5750   5344       JMP SETIT         /ERROR
5751   1370       TAD CABL18
5752   7421       MQL
5753   7330       CLA STL RAR       /4000 FOR PULSE1
5754   4200       JMS XMIT
5755   5344       JMP SETIT         /ERROR
5756   1075       TAD NORMAL
5757   7040       CMA    /FOR HARDWARE INVERSION
5760   6453       FUNLOD
5761   6356       MUX LAMOFF
5762   5644       JMP I SETUP
                /
5763   5777    P5777,5777
5764   5536    SFUNLX,SFUNL
5765   5475    LIST,UNIT0
5766   0400    PORT18,400        /CABLE FOR DATA
5767   7000    PORT7,7000
5770   0020    CABL18,20         /CABLE FOR PULSES
5771   0040    CABLE7,40
5772   7000    M1000,-1000
5773   7770    M10,-10
5774   0007    P7,7
5775   5551    DELAYX,DELAY
5776   5556    SYNCX,SYNC
                /
                /
5777   2400    CENTES,-CENGO
```

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

APOINT 7132
ARG1    0050


                /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
                /
                /
                /MODIFIED FOR NODISC SYS.
                /
                CODLOD=6361
                READSW=6362
                LITSET=6367
                ERASE=6362
                /
                *KB1+12
0152    7000    SWITCH
                *FNKB1+12
0656    1334    1334    /SWIT
                /
                *7000
7000    0000    SWITCH,0
7001    1052        TAD ARG3
7002    7700        SMA CLA
7003    5207        JMP OK
7004    1303        TAD P16
7005    6361        CODLOD          /SET GATE FOR ERASE
7006    6362        ERASE
7007    1053    OK,TAD ARG4
7010    7450        SNA
7011    7001        IAC             /ALLOW 0 SHIFT READOUT FOR SH=0
7012    3275        DCA SHIFT
7013    1054        TAD ARG5
7014    3050        DCA ARG1
7015    1055        TAD ARG6
7016    7440        SZA
7017    5232        JMP JOYCAL
7020    1052        TAD ARG3
7021    7650        SNA CLA
7022    5226        JMP LIGHTS
7023    4256        JMS SWTRED
7024    3051        DCA ARG2
7025    5600        JMP I SWITCH
                /
```

```
7026    1053    LIGHTS,TAD ARG4
7027    6367       LITSET
7030    7200       CLA
7031    5600       JMP I SWITCH
                /
7032    3051    JOYCAL,DCA ARG2  /INITIAL MARK LOCATION
7033    1057       TAD ARG8
7034    7650       SNA CLA
7035    4256       JMS SWTRED
7036    7640       SZA CLA
7037    5235       JMP .-2        /WAIT TILL SWITCH OFF UNLESS ARG8 SET
7040    4705    JOYTES,JMS I JOYSTX
7041    4256       JMS SWTRED
7042    7650       SNA CLA
7043    5240       JMP JOYTES     /SWITCH NOT CLOSED
7044    1051       TAD ARG2       /CONVERT TO 1024*X+Y
7045    7106       CLL RTL        /FROM 4096*X+Y
7046    7421       MQL
7047    1050       TAD ARG1
7050    7417       LSR
7051    0001       1
7052    3050       DCA ARG1
7053    7501       MQA
7054    3051       DCA ARG2
7055    5600       JMP I SWITCH
                /
7056    0000    SWTRED,0
7057    1052       TAD ARG3
7060    6361       CODLOD         /SELECT SWITCH GROUP
7061    7041       CIA
7062    3017       DCA 17
7063    1304       TAD P17
7064    7110    MVMASK,CLL RAR    /GENERATE MASK
7065    2017       ISZ 17
7066    5264       JMP MVMASK
7067    3302       DCA MASK       /3 BITS FOR 1,2 FOR 2,1 FOR 3
7070    1056       TAD ARG7
7071    7440       SZA
7072    3302       DCA MASK
7073    6362       READSW
7074    7417       LSR
7075    0000    SHIFT,0
7076    7413       SHL
7077    0001       1
7100    0302       AND MASK
7101    5656       JMP I SWTRED
                /
7102    0000    MASK,0
7103    0016    P16,16
7104    0017    P17,17
7105    6600    JOYSTX,JOYSTK
                PAUSE/
                /
                /JOY1
                /
7106    0000    ARMAKE,0          /DRAW A DIAMOND
7107    3350       DCA XTEMP
7110    1353       TAD P2
7111    3346       DCA XMOVE
7112    1353       TAD P2
```

```
7113    3347        DCA YMOVE
7114    4327        JMS DIAGON
7115    1351        TAD M2
7116    3347        DCA YMOVE
7117    4327        JMS DIAGON
7120    1351        TAD M2
7121    3346        DCA XMOVE
7122    4327        JMS DIAGON
7123    1353        TAD P2
7124    3347        DCA YMOVE
7125    4327        JMS DIAGON
7126    5706        JMP I ARMAKE
                /
7127    0000    DIAGON, 0
7130    1354        TAD M4
7131    3352        DCA COUNTA
7132    1350    APOINT, TAD XTEMP
7133    1346        TAD XMOVE
7134    6053        DXL
7135    3350        DCA XTEMP
7136    7501        MQA
7137    1347        TAD YMOVE
7140    6063        DYL
7141    7421        MQL
7142    6362        BRITEN
7143    2352        ISZ COUNTA
7144    5332        JMP APOINT
7145    5727        JMP I DIAGON
                /
7146    0000    XMOVE, 0
7147    0000    YMOVE, 0
7150    0000    XTEMP, 0
7151    7776    M2, -2
7152    0000    COUNTA, 0
7153    0002    P2, 2
7154    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    7106    ARMAKX,ARMAKE
                /
```

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

ARG 1    0050
```

```
                    /CON0
                    XLIST
                    PAUSE/
                    /PROGRAM WIPE---CLEARS KB1, FNKB1 TABLES.
                    /
                    /  .XFOC
                    /  .WIPE
                    /  (LOAD NODISC FOCAL FUNCTIONS)          (AGC
                    /  .SAVE XFOC!10000-1177,4000-7577;1100
                    /  (PUTT AND/OR PIP TO SAVE NEW XFOC ON TAPE)
                    /  .FAST
                    /  .XFOC
                    /  .TAPE
                    /  .STEN
                    /  (MANUAL START AT 12000 TO SAVE SYSTEM ON
                    /     NEW TAPE, UNIT 8 )
                    /
                    FIELD 1
                    *5000
5000    6211        CDF 10
5001    7200        CLA
5002    1224        TAD MM100
5003    3223        DCA CTR
5004    1221        TAD LKB1
5005    3225        DCA LOC1
5006    1222        TAD LFNKB1
5007    3226        DCA LOC2
5010    3625    LOOP,DCA I LOC1
5011    3626        DCA I LOC2
5012    2225        ISZ LOC1
5013    2226        ISZ LOC2
5014    2223        ISZ CTR
5015    5210        JMP LOOP
5016    6203        CDF CIF
5017    5620        JMP I .+1
5020    7600    7600          /RESTART DISC MONITOR.
5021    0140    LKB1,KB1
5022    0644    LFNKB1,FNKB1
5023    0000    CTR,0
5024    7700    MM100,-100
5025    0000    LOC1,0
5026    0000    LOC2,0
```

APPENDIX B

Focal Programs Used by the No-disc Focal

Scanner Data Taking System

Program Number	Contents
0	Calling Program - reached by XCALL($\emptyset$,1).
8	Set sweeps.
9	Start, stop, save scans.
10	Set sweeps.
11	Save scans.
16	Memory test.
21	Precession.
23	"Disaster" message.
24	Offset arithmetic.
26	Listing routines.
49	Set sweeps.

```
 X FILE(0)

B=11462*9
C:LICK FOCAL NODSC-A  L2E3

01.01 C-PROG 0
01.02 X TYPE(-1)
01.04 X STAT(-1)
01.20 S D=FSWIT(1,1)
01.30 X GO(D+10,10)

02.10 C-LIST ALL
02.20 X CALL(26,2)

03.10 C-LIST SOME
03.20 X CALL(26,3)

10.10 X CALL(21,138);C-PRECESSION
10.20 G

11.10 X CALL(16,25)
11.20 GO

12.10 X STAT(-1);T !!"INITIALIZE DATA TAKING"
12.15 A !"TYPE FIRST SCAN NO."RO
12.30 A !"COUNT IN PROGRESS? <Y/N>"K;D 20;I (K)12.3,12.4;S TM=0;G 12.5
12.40 S TM=1
12.50 I (-TM)12.6;X CALL(9,2)
12.60 T !"SCAN "%2 RO," IN PROGRESS.";X CALL(9,3)
12.70 X CALL(9,2)

13.01 C-CONTINUE DATA TAKING.
13.10 I (-<FCTAK(3)-FCTAK(4)+333>12)12.15
13.20 S TM=FCTAK(1);S QL=FCTAK(2);S RO=FCTAK(3);G 12.5

14.10 X CALL(10,137);C-SET SWEEPS
14.20 GO

15.10 X STAT(-1);T !!"PROGRAM NOT AVAILABLE"!!
15.20 O

16.10 X CALL(24,2)

17.10 G 15.1

20.10 I (K-0N)20.5,20.3;I (K-0Y)20.5,20.4
20.20 I (K-0NO)20.5,20.3;I (K-0YES)20.5,20.4,20.5
20.30 S K=1;R
20.40 S K=0;R
20.50 T "   ???";S K=-1

31.98 V
31.99 X END(0)
*

 P 1.02
*X FILE(0)
```

```
Z FILE(8)

S=11636*9
C:LICK FOCAL NOTSC-A   NIK2

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

05.02 S ST=50
05.04 IF (MN-4) 5.10,5.10,5.06
05.06 C
05.10 IF (MN) 5.14,5.14,5.2
05.14 S MN=1;S Y0=0
05.20 T !!"TEACH TOP SCAN",!
05.22 F J=0,300;S A=A
05.30 S K=0;DO 7
05.32 X STAT(-1)
05.40 X STAT(1,980,1);T !"NOW TRACE SECOND SCAN"
05.50 S K=256;DO 7
05.52 S D=FCHAN(0,1);X EDIT(511,1,D)
05.53 S D=FCHAN(256,1);X EDIT(255,1,D)
05.60 X STAT(-1)

06.05 X MEMY(0,CN);X MEMY(0,CN);X CALL(10,3)
06.07 F J=0,511;S K=FCHAN(J)-10;X EDIT(J,1,A)
06.10 F J=0,1;X CRT(A/MN,256,256+J,1,100)
06.20 A !"LEFT SLIT CHANNEL OFFSET"OF
06.25 X CLER(0);X EDIT(511,1,A0);X BCON(A0,0,254);X BCON(A0-OF,255,510)
06.30 X MEMX(1,CN);T "   OFFSET="%4,OF;X CALL(10,4)

07.01 C-JOYSTICK
07.04 S X=10;S Y=500
07.10 S D=FSWIT(3,11,X,Y)
07.20 S X=FITR(D/1024);S Y=D-1024*X
07.22 X STAT(X-2,Y-6);T "+"
07.24 S X1=X2;S X2=X
07.30 S Y1=Y2;S Y2=Y0+Y*4/MN
07.40 IF (X2-25) 7.42,7.44,7.44
07.42 S XP=0;S X=X+ST;G 7.1
07.44 S SL=4*(Y2-Y1)/(X2-X1)
07.46 S L1=K+X1/4;S L2=K+X2/4
07.50 IF (X2-1030) 7.54,7.54,7.6
07.54 F J=L1,L2;X EDIT(J,1,(1+SL*<J-L1>))
07.56 S X=X+ST;G 7.1
07.60 S L2=255+K;DO 7.54
07.90 R

31.98 4
31.99 X END(0)
*
```

```
 X F(LF(9)

F=11627*W
C:LICK FOCAL NODSC-A  NW4/

01.01 C-PROG.9
01.02 X CALL(0,1)

02.11 S TM=0;D 12.05
02.14 T !"SCAN ",%2 RU
02.15 T " READY";F J=0,300;S A=A
02.17 S SW=FSWIT(3,1,0,0,4094);IF (SW)2.3,2.3
02.18 S SW=FLOG(SW*2)/.69;X SWIT(0,63);X GO(8,SW+2)
02.30 IF (TM) 2.36,2.36;IF (PS)2.31,2.31;X PAUS(1);S PS=0
02.31 IF (FMEMC<1>)2.32,2.40
02.32 S CT=CT+1
02.36 X SWIT(0,CT/20);G 2.17
02.38 X MEMC(0);IF (TM) 2.11,2.11;T " STOPPING!"
02.40 X CALL(11,8);C-SAVE IT
02.70 C
02.80 S B=0;S RU=RU+1
02.84 IF (18-RU) 2.9,2.9
02.86 G 2.11
02.90 X CALL(11,2)
02.91 S RU=0;G 2.11

03.10 D 12.05;G 2.17

08.01 C-TOGGLE DISPATCH
08.04 X STAT(-1);T !!"FUNCTION NOT AVAILABLE"!!
08.05 G 2.3
08.06 G 8.04
08.07 G 2.3
08.08 X PAUS(0);S PS=1;G 2.17
08.10 G 8.04
08.11 G 2.3
08.12 G 8.04
08.13 G 2.3
08.14 G 8.04
08.15 G 2.3
08.16 G 12.06;C-START
08.18 G 2.11;C-RESET
08.20 G 2.38;C-STOP
08.22 G 2.3
08.24 G 2.3;C-IGNORE

12.05 X CPUT(1,TM);X CPUT(2,QL);X CPUT(3,RU);X CPUT(4,RU+333)
12.06 E
12.10 S D=FSWIT(1,7)
12.20 S TM=(2↑D)*15;S CT=0;X MEMC(0)
12.22 X MEMC(0);X MEMC(TM*233+1)
12.30 X CPUT(1,TM);S QL=FCTAK(2);S RU=FCTAK(3)
12.35 D 2.14;T " STARTED"
12.90 G 2.17

31.98 W
31.99 X END(9)
```

```
 X CALL(10)
*W
C:LICK FOCAL NODSC-B   N!IH

01.01 X CALL(0,1);C-P 10
01.11 E
01.12 X STAT(-1);T !!!"SET SWEEPS";S YA=2000;S M=0;S Y1=32;S YZ=850
01.15 S X0=4070;S CN=0
01.20 A !"FAST LOAD? <Y/N>"K;D 15;I (K)1.2,1.25
01.22 X CALL(49,2)
01.25 S MN=2
01.30 A !"MAP TUBE? <Y/N>"K;D 15;I (K)1.3,1.35;X CALL(49,10)
01.35 A !"SWEEP # (-1=NO CHNG, 0=JOYSTICK, 1-8=FROM TAPE)"SW
01.37 I (SW)2.2,1.9
01.40 X MGET(SW+23);S D=FCHAN(4)/4096
01.45 I (-FITR(D))2.1;T "  NOTHING THERE"!;G 1.35
01.90 X CALL(8,5)

02.10 X CALL(8,6)
02.20 X CALL(8,6*128+20)

03.20 A !"SAVE AS SWEEP NO"SW;I (SW)3.6,3.6;S D=FCHAN(4)
03.30 S D=D-4096*FITR(D/4096);X EDIT(4,0,4096*MN+D);X MSAV(SW+23)
03.60 X CALL(8,6*128+7)

04.10 A !"CURVES OK? <Y/N>"K;D 15;I (K) 4.1,1.35
04.20 T !"ALL SET"!!!
04.30 I (FSWIT<3,1,0,0,4095>)1.01,4.3,1.01

15.10 I (K-0N)15.3,15.5;I (K-0Y)15.3,15.4
15.20 I (K-0NO)15.3,15.5;I (K-0YES)15.3,15.4
15.30 T "  ???";S K=-1;R
15.40 S K=1;R
15.50 S K=0

20.10 D 1.15;X CLER(1);X MEMY(0,CN,1);S K=FCHAN(254,1)-FCHAN(255,1)
20.20 S J=FCHAN(511,1)-FCHAN(510,1);X MEMX(1,CN,1);S L=FCHAN(100,1)
20.30 I (FABS(J)+FABS(K)-1.E4*FABS(L-X0)-40)20.4;X CALL(9,326)
20.40 X CALL(23,10)

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

```
X FILE(11)

B=11047 kW
C:LICK FOCAL NODSC-A  H'GP

01.01 C-PROG.11
01.02 X CALL(0,1)

02.04 X STAT(-1)
02.10 T !!"TAPE IS FULL;MOUNT NEW TAPE ON UNIT 7"
02.14 X STAT(100,800,2);DO 2.1;X STAT(-1)
02.30 X END(0)

03.10 F K=0,7;D 13
03.16 X CPUT(1,0)
03.25 T !"SCAN "%2 RU," ON TAPE;TIME ",%5.02 TM*233*.0044,%5 C!
03.35 X CALL(10,2%)

13.04 T "   ";C-BELL
13.10 X MEMR(512*K);X MSAV(8*RU+K,0,7)
13.90 R

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

```
 X FILE(16)

R=11252*W
C:LICK FOCAL NODSC-A   J*FD

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

25.01 A !"READY TO TEST MEMORY,O.K?",K;IF (A-0YES)31.99,25.02,31.99
25.02 X CLER(0);X BCON(3800,0,511);X MEMX(1)
25.03 X BCON(2900,0,511);X MEMY(0);X MEMY(0)
25.10 T !" WILL LOAD SCANNER MEM. WITH RAMPS,"
25.20 T !"THEN TESTS EACH CHANNEL CONTENT"
25.30 T !"CHANNEL 15 WILL BE PRINTED EVEN IF ALL OK."

26.04 F J=0,511;X EDIT(J,1,J+193)
26.20 F J=0,512,4000;X MEMW(J,512);X MEMW(J,512,1)

27.20 X MEMR(0)
27.36 X EDIT(15,1,712)
27.40 F J=0,511;S D=FCHAN(J,1);D 27.9
27.50 T !"TEST COMPLETE";GO
27.60 Q
27.90 IF (D-J+193) 27.91,27.92,27.91
27.91 T !%3 J,%6 D
27.92 R

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

```
 X  CALL(21)
*W
C:LICK FOCAL NODSC-B  L3FE

01.01  C- PROGRAM 21, PRECESSION
01.02  X  CALL(0,1)
01.10  T  !!"PRECESSION"
01.20  T  !!" EQUINOX        RA: HR MIN SEC   DEC: DEG MIN"!
01.30  A  !"OLD"T1,"        "H1," "M1," "S1,"          "D1
01.40  I  (D1)1.6,1.5,1.6
01.50  T  "ENTER MIN. OF DEC WITH SIGN"
01.60  A  " "MD,!"NEW"T2;I (T2)2.8,2.8

02.01  S  RAD=57.29578
02.30  S  AM=(15.*H1+.25*M1+.004167*S1)/RAD
02.40  S  AA=MD;S MX=MD;I (FSGN(MD)-FSGN(D1))2.44,2.44;S MX=-MD
02.44  S  DW=(D1+.016667*MX)/RAD
02.50  X  CALL(22,5,1)
02.60  G  6.32
02.80  T  ! "ERROR";X END(0)

06.32  I  (FABS(M2)-60.)6.5,6.5
06.34  I  (M2)6.38,6.84,6.42
06.38  D  6.6;G 6.32
06.42  D  6.62;G 6.32
06.50  I  (M2)6.56,6.7,6.52
06.52  I  (DG)6.54,6.7,6.7
06.54  D  6.62;G 6.7
06.56  I  (DG)6.7,6.7;D 6.6;G 6.7
06.60  S  M2=M2+60;S DG=DG-1
06.62  S  M2=M2-60;S DG=DG+1
06.70  T  #"                "%2,H2," "M1,%3.01,S2,"          "%2,DG
06.80  T  %3.01,FSGN(DG)*M2;G 6.89
06.84  T  !"ERROR IN M2"
06.89  T  !;G 1.3
06.98  T  "+"

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

```
 X FILE(23)

B=10737*W
C:LICK FOCAL NODSC-A   G?GN

01.01  C-PROG 23
01.02  X CALL(0,1)

10.05  X CPUT(4)
10.10  X STAT(300,500,4);T "DISASTER!";X STAT(-1)
10.15  T "        ";C-BELLS
10.20  T !!!"DISASTER!"!"SWEEPS HAVE MOVED."!"RELOAD SWEEPS."!!
0.30  Q

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

```
 X CALL(24)
*W
C:LICK FOCAL NODSC-B   06H'

01.01 C- PROGRAM 24, OFFSET ARITHMETIC
01.02 X CALL(0,1)

02.01 E
02.30 X STAT(50,950,1);X SWIT(-1);F J=0,50;S LN=6
02.32 T "ALWAYS ENTER ZERO TO PROCEED TO NEXT STEP"!!
02.33 T "FIRST SET RETICLE ON PROGRAM STAR, THEN ON FIELD STAR"!
02.35 T "    PROGRAM STAR    FIELD STAR         DX        DY"!
02.40 T "        X       Y       X         Y"!
02.45 S N=1

03.10 D 6;T %2.0,!N;A " "XP(N);I (XP(N))3.4,3.4;A YP(N);I (YP(N))3.4,3.4
03.15 A XF(N);I (XF(N))3.4,3.4;A YF(N);I (YF(N))3.4,3.4
03.20 S DX(N)=XP(N)-XF(N);S DY(N)=YP(N)-YF(N);T %5.0," "DX(N)
03.25 T "  "DY(N);S N=N+1;G 3.10
03.40 D 6
03.42 D 6;A !"DELETE LINE NO."ST;I (ST)4.1,4.1
03.45 S DX(ST)=0;S DY(ST)=0;G 3.42

04.10 S T=0;S XD=0;S YD=0;F J=1,N-1;D 10
04.15 I (T)5.1,5.1;S XD=XD/T;S YD=YD/T
04.19 D 6
04.20 D 6;T %5.0, !"DIFFERENCES ARE:  DX: "XD,"  DY: "YD
04.23 D 6;D 6;D 6;T !"PUT FIELD STAR IN SLIT, "
04.25 T "THEN ENTER GUIDE STAR POSITION";A !"X"XG,"  Y"YG
04.27 D 6;T !"TO PUT PROGRAM STAR IN SLIT, PUT GUIDE STAR AT:"
04.30 D 6;T %7.01,!"X="XG-XD,"      Y="YG-YD
04.35 X STAT(-1);D 4.3
04.40 E
04.45 X STAT(-1);X CALL(0,13)

05.10 D 6;T !"ERROR----ALL ENTRIES DELETED!";G 4.45

06.10 S LN=LN+1;I (24-LN)6.2;R
06.20 X STAT(-1)

10.10 I (DX(J))10.2,10.15,10.2
10.15 I (DY(J))10.2,10.4
10.20 S XD=XD+DX(J);S YD=YD+DY(J);S T=T+1
10.40 R

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

```
   X  CALL(26)
*W
C:LICK FOCAL NODSC-B   JWJL

01.01  C-PROG.26   MISC.

02.10  C-LISTING ROUTINE
02.20  ASK !!"FIRST AND LAST PROG.NO.S",PA,PZ
02.25  DO 5
02.30  S J=PA
02.35  T !!!!!!!!!!!!"PROG.NO.",%2 J;DO 6;T !!
02.40  X CALL(J,128*31+97)
02.50  S J=J+1
02.60  IF (J-PZ) 2.35,2.35,2.99
02.99  Q

03.01  C-LIST
03.20  T !"TYPE PROG.'S TO BE LISTED,END WITH -VE"
03.30  E
03.35  S N=-1
03.40  S N=N+1;ASK ! PA(N)
03.50  IF (PA<N>) 3.7;G 3.4
03.70  S N=-1;DO 5
03.80  S N=N+1;IF (PA<N>)2.99;S J=PA<N>;DO 2.35
03.90  X CALL(PA<N>,128*31+97)
03.92  GO 3.8

05.10  ASK !"TYPE TO-DAY'S DATE",DZ,MZ,YZ
05.20  R

06.10  T "   ",%2 DZ,"/",MZ,"/",%4 YZ
06.20  R

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

```
  X CALL(49)
*W
C:LICK FOCAL NODSC-A   M5E;

01.01 X CALL(1,1);C-PROG 49, SET SWEEPS

02.05 A !"ENTER SWEEP NO. (FROM TAPE)"SW;I (SW)4.1,4.1
02.10 X MGET(SW+23)
02.20 I (FCHAN(4)-4096)4.2;S K=FCHAN(4);X EDIT(4,0,K-4096*FITR(K/4096))
02.25 X MEMY(0,CN);X MEMY(0,CN)
02.30 A !"OFFSET"OF;X CLER(0);X EDIT(511,0,X0);X BCON(X0,0,254)
02.40 X BCON(X0-OF,255,510)
02.60 X MEMX(1,CN);T "          SWEEP"%4,SW," ALL SET."
02.70 X CALL(0,13)


04.10 T !"MUST BE >0. BAILING OUT.";G 2.7
04.20 T !"NOTHING THERE. BAILING OUT.";G 2.7


10.01 C-MAP TUBE
10.02 A !"COUNTS PER DOT"SC
10.04 X CLER(1);X BCON(X0,0,511);X MEMX(1,CN)
10.10 S Y=YZ;S X=0;S Y0=10*FITR(Y/10)
10.15 X CLER(0);X BCON(Y,0,255);X BCON(Y+YI,256,511)
10.20 X MEMY(0,CN);X MEMC(0);X MEME(0);X MEMC(500)
10.25 S D=FMEMC(1);I (-FSWIT(3,11))10.5;I (-FSWIT(3,12))10.10
10.30 I (-FABS(D))10.25;F K=0,512,2040;D 11
10.35 S Y=Y+YI;F K=2048,512,4090;D 11
10.45 I (2000+Y0-Y)10.10;S Y=Y+YI
10.50 I (FSWIT(3,11))10.6,10.6;X END(0)
10.60 I (Y-4000)10.15;S M=M+25;G 10.10

11.10 X MEMR(K);X MASH(2);X LOOK(K/2,<Y-Y0>*MN/4,1,256,SC)

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