2A

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IDENTIFICATION

Product Code: Maindec 12-D6BA-D(P)

Product Name: VR12 Display Test

Date Created: June 6, 1969

Maintainer: Diagnostics Group

Author: Dave Ferrarini

Mnemonic : DISPTST

1. ABSTRACT

This program tests the PDP-12 Display System by generating three distinct patterns on the scope, two with the DIS Instruction, and one with the DSC Instruction.

2. REQUIREMENTS

2.1 EQUIPMENT

a. PDP-12A or PDP-12B

2.2 STORAGE

Most of locations 4000_8 to 6000_8

3. LOADING PROCEDURES

3.1 METHOD

a. Mount a DIAL Tape on Unit Ø.

b. Set mode to LINC and depress I/O Preset twice.

c. Set LSW=701 RSW=7300 and hit the DO toggle.

d. Depress Start 2Ø.

e. Call the program from the ASR by:

→ LO DIS TEST, Ø)

f. DIAL Loader will halt at ~~7525~~. 7775

g. Depress I/O Preset.

h. Depress Start 2Ø to execute.

i. Restart Procedure: Depress Start 2Ø.

j. This program is also available on Binary Paper Tape.

4. OPERATOR ACTION

Upon starting, the program will alternately display the three patterns, each for approximately ten seconds.

a. Freeze on current pattern.

Striking the key F will direct the program to lock into the routines that are controlling display of the current pattern.

b. Alternate between three patterns.

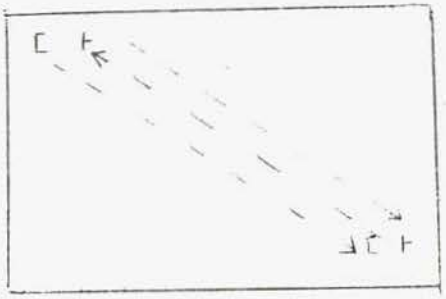
Striking any key but F will direct the program to alternate the display between the three patterns. It should be noted that requesting the alternate sequence while in alternate mode or the freeze sequence while in freeze mode has no effect.

5. PROGRAM DESCRIPTION

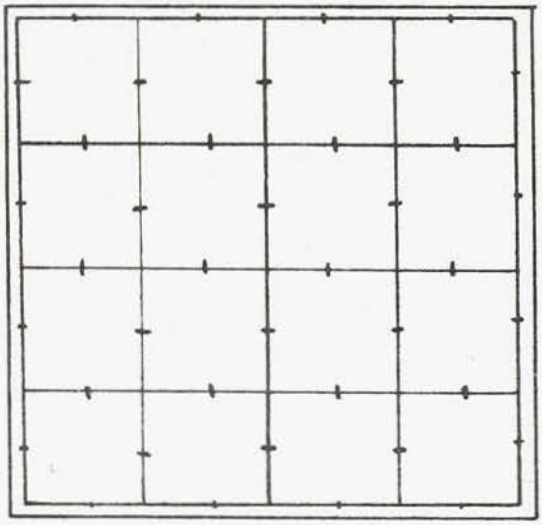
a. The pattern generated by the DSC instruction takes the following form:

(QUANDRANT 2)	CHAN Ø HALF SIZE / CHAN 1 FULL SIZE	(QUADRANT 1)
(QUADRANT)	CHAN Ø FULL SIZE / CHAN 1 HALF SIZE	(QUADRANT 4)

The pattern does what the display says. One half of one character is displayed in one corner of the scope, then half of one character is displayed in the opposite corner of the scope. The left half of the character in quadrants 2 and 4 are displayed first, then the left half of the character in quadrants 1 and 3 are displayed. When the left half of all characters on the scope have been displayed the sequence is repeated for the right half of the characters.



b. One pattern generated by the DIS Instruction takes the following form:



This permits calibration of the scope.

c. Display a cross.

This pattern is two diagnonal lines from the bottom left corner to the top right corner of the display, and bottom right to top left. It is used when setting up the D/A converters of the VC12 Display System.

NOTE: Setting sense switch Ø to a one will cause a return to the Dial monitor.

```
0000                    *20
0001
0002
0003                    /DIS TEST   VERSION 4
0004                    /PDP-12 DISPLAY CONTROL AND SCOPE TEST
0005
0006                    /COPYRIGHT 1969 DIGITAL EQUIPMENT CORP.
0007
0010                    /FERRARINI D.
0011
0012                     /POINT DISPLAY PATTERN [DISPAT
0013                     /CHARACTER DISPLAY PATTERN [DSCPAT
0014                     /DISPLAY A DIAGONAL LINE [DIAG
0015
0016                     /6-7-69
0017
0020
0021                    SEGMNT 2
0022                     *10
0023    0010  0000       04BETA,0
0024    0011  0000       03BETA,0
0025    0012  0000       02BETA,0
0026    0013  0000       01BETA,0
0027
0030                             *20
0031    0020  1020              LDA I
0032    0021  0001              1
0033    0022  4654              STC FLAG
0034    0023  0077              SET I 17
0035    0024  7477              -300
0036    0025  6621              JMP CLOCK          /CHECK CLOCK
0037    0026  6030              JMP DISPAT
0040    0027  6400              JMP 400            /DO DSC TEST
0041    0030  6100  DISPAT,     JMP TST1           /DO DIS PATTERN
0042    0031  6232              JMP TST2
0043    0032  6635              JMP TTYOPT         /CHECK TTY OPTIONS
0044    0033  6025              JMP DISPAT-3
0045    0034  6027              JMP DISPAT-1       /BACK TO GO
0046
0047                    *100
0050
0051
0052                    /THE SUBROUTINE BELOW WILL GENERATE 5
0053                    /LINES ACROSS THE SCREEN.  THE POINT
0054                    /SPACING IS 4 UNITS
0055                    /THE FIRST LEFT HAND POINT IS
0056                    /0000, THE LAST RIGHT HAND POINT IN
0057                    /EACH LINE IS 0774.
0060
0061                    /A GLITCH IS PLACED AT THE HORIZONTAL
0062                    /POINTS OF 100,300,500,AND 700 ON
0063                    /EACH LINE
0064    0100  1000  TST1,    LDA
0065    0101  0000            0
0066    0102  1060            STA I
0067    0103  0000            0
0070    0104  1020            LDA I
0071    0105  0010            10
0072    0106  4134            STC REL
0073    0107  0062            SET I 2
0074    0110  0000            0
```

```
0111  6135  TST1LP, JMP LP1
0112  1000        LDA
0113  0002        2
0114  1660        BCO I
0115  0100        100
0116  1560        PCL I
0117  7600        7600
0120  0470        AZE I
0121  6206        JMP T1GL
0122  1000        LDA
0123  0002        2
0124  1120        ADA I
0125  0004        4
0126  1040        STA
0127  0002        2
0130  1460        SAE I
0131  1000        1000
0132  6111        JMP TST1LP
0133  6103        JMP TST1+3
0134  0000  REL,  0000    /VARIABLE

                  /THIS IS THE ROUTINE THAT DISPLAYS
                  /FIVE POINTS , ONE ON EACH OF THE
                  /HORIZONTAL LINES
0135  1000  LP1,  LDA
0136  0000        0
0137  1060        STA I
0140  0000        0
0141  1020        LDA I
0142  0370        370
0143  2134        ADD REL
0144  0142        DIS 2
0145  1000        LDA
0146  0002        2
0147  0017        COM
0150  4002        STC 2
0151  1020        LDA I
0152  0367        367
0153  2134        ADD REL
0154  0142        DIS 2
0155  1000        LDA
0156  0002        2
0157  0017        COM
0160  4002        STC 2
0161  1020        LDA I
0162  0570        570
0163  2134        ADD REL
0164  0142        DIS 2
0165  1000        LDA
0166  0002        2
0167  0017        COM
0170  4002        STC 2
0171  1020        LDA I
0172  0167        167
0173  2134        ADD REL
0174  0142        DIS 2
0175  1000        LDA
0176  0002        2
0177  0017        COM
0200  4002        STC 2
```

```
0174    0201  1020          LDA I
0175    0202  0767          767
0176    0203  2134          ADD REL
0177    0204  0142          DIS 2
0200    0205  6140          JMP LP1+3
0201
0202    0206  1000  T1GL,    LDA                 /GLITCH GENERATOR
0203    0207  0000          0
0204    0210  1060          STA I
0205    0211  0000          0
0206    0212  1020          LDA I
0207    0213  0020          20
0210    0214  4134          STC REL
0211    0215  6135          JMP LP1
0212    0216  0011          CLR
0213    0217  1020          LDA I
0214    0220  7774          7774
0215    0221  1200          LAM
0216    0222  0134          REL
0217    0223  1460          SAE I
0220    0224  7774          7774
0221    0225  6215          JMP T1GL+7
0222    0226  1020          LDA I
0223    0227  0010          10
0224    0230  4134          STC REL
0225    0231  6211          JMP T1GL+3
0226
0227
0230
0231
0232                  /THIS ROUTINE GENERATES 5 VERTICAL LINES
0233                  /AT HORIZONTAL LOCATIONS 0,177,377,577,777.
0234                  /GLITCHES ARE DISPLAYED AT VERTICAL LOCATIONS
0235                  /177,377,500,700 ON THE LINES.
0236    0232  1000  TST2,    LDA
0237    0233  0000          0
0240    0234  1060          STA I
0241    0235  0000          0
0242
0243    0236  0011          CLR
0244    0237  4134          STC REL
0245
0246    0240  6262          JMP LP2A            /SET UP INDEX REG.
0247    0241  6301  TST2LP,  JMP LP2B            /GO DISPLAY SOME POINTS
0250    0242  1000          LDA
0251    0243  0134          REL
0252    0244  1660          BCO I
0253    0245  0100          100
0254    0246  1560          BCL I
0255    0247  7600          7600
0256    0250  0470          AZE I
0257    0251  6325          JMP GL2
0260    0252  1020          LDA I
0261    0253  0004          4
0262    0254  1140          ADM
0263    0255  0134          REL
0264    0256  1460          SAE I
0265    0257  1000          1000                /DONE ALL POINTS YET
0266    0260  6241          JMP TST2LP
0267    0261  6235          JMP TST2+3
0270
0271
0272    0262  1000  LP2A,    LDA     /SET UP INDEX REGISTERS
```

```
0273    0263  0000          0
0274    0264  1060          STA I
0275    0265  0000          0000
0276    0266  0062          SET I 2
0277    0267  0000          0
0300    0270  0063          SET I 3
0301    0271  0177          177
0302    0272  0064          SET I 4
0303    0273  0377          377
0304    0274  0065          SET I 5
0305    0275  0577          577
0306    0276  0066          SET I 6
0307    0277  0777          777
0310    0300  6265          JMP LP2A+3
0311
0312
0313                  /ACTUALLY DISPLAY THE 5 POINTS
0314    0301  1000  LP2B,    LDA
0315    0302  0000          0
0316    0303  1060          STA I
0317    0304  0000          0
0320    0305  1000          LDA
0321    0306  0134          REL
0322    0307  0142          DIS 2
0323    0310  0017          COM
0324    0311  0146          DIS 6
0325    0312  1000          LDA
0326    0313  0134          REL
0327    0314  1120          ADA I
0330    0315  0200          200
0331    0316  0143          DIS 3
0332    0317  0017          COM
0333    0320  0145          DIS 5
0334    0321  1000          LDA
0335    0322  0134          REL
0336    0323  0144          DIS 4
0337    0324  6304          JMP LP2B+3
0340
0341
0342                  /DISPLAY THE GLITCHES ON THE VERTICAL LINES
0343    0325  1000  GL2,     LDA
0344    0326  0000          0
0345    0327  1060          STA I
0346    0330  0000          0
0347    0331  0075          SET I 15
0350    0332  7772          -5
0351    0333  1020          LDA I
0352    0334  0767          767
0353    0335  4343          STC GL2V
0354    0336  0067          SET I 7
0355    0337  7772          -5
0356    0340  0070          SET I 10
0357    0341  0001          1
0360    0342  1020          LDA I
0361    0343  0767  GL2V,    767
0362    0344  1170          ADM I 10
0363    0345  0227          XSK I 7
0364    0346  6342          JMP .-4
0365
0366    0347  6301          JMP LP2B
0367    0350  1020          LDA I
0370    0351  0004          4
0371    0352  4343          STC GL2V
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```
0372    0353  0235          XSK I 15
0373    0354  6336          JMP GL2V-5
0374    0355  6262          JMP LP2A        /RESET HORIZONTAL POSITION
0375    0356  6330          JMP GL2+3       /GO BACK
0376
0377
0400
0401
0402                        *400
0403    0400  0077          SET I 17
0404    0401  0000          0
0405    0402  6621          JMP CLOCK
0406    0403  6405          JMP DSCPAT
0407    0404  7777          JMP DIAG
0410
0411    0405  0375  DSCPAT, SET I 15        /PUT GRID PATTERN ADDR
                    FOR
0412    0406  0662          01GRID-1        /EACH QUAD IN 4 BETAS
0413    0407  1035          LDA I 15
0414    0410  4013          STC 01BETA
0415    0411  1035          LDA I 15
0416    0412  4012          STC 02BETA
0417    0413  1035          LDA I 15
0420    0414  4011          STC 03BETA
0421    0415  1035          LDA I 15
0422    0416  4010          STC 04BETA
0423                  /HAFFLG=0 WHEN DISPLAYING LEFT HALF OF PATTERN
0424                  /=4 WHEN DISPLAYING RIGHT HALF
0425    0417  4655          STC HAFFLG
0426    0420  0067          SET I 7         /INITIALIZE ARGUMENTS
0427    0421  0656          RHCHNG-1
0430    0422  0074          SET I 14        /THERE ARE
0431    0423  7773          -4              /4 QUADRANTS
0432                  /IN RIGHT HALF PASS NOP BELOW WILL BE REPLACED
                    BY ADA I 7
0433                  /LEFT AND RIGHT HALF SEQUENCES ARE STAGGERED BY
                    A CONSTANT
0434                  /20 FOR FULL SIZE CHARACTERS , 10 FOR HALF SIZE
0435    0424  1035          LDA I 15        /PTR FOR HORIZ COORD
0436    0425  0016  RH1,     NOP
0437    0426  1075          STA I 15        /HORIZ ARGUMENT
0440    0427  1035          LDA I 15        /PTR FOR VERT COORD
0441    0430  1075          STA I 15        /VERT ARGUMENT
0442    0431  0234          XSK I 14        /DONE ALL QUADRANTS ]
0443    0432  6424          JMP RH1-1        /NO
0444    0433  4656          STC LNFLG       /=0 WHEN DOING LN 2 .N
                    E. 0 WHEN DOING LN 1
0445    0434  0075          SET I 15        /THERE ARE 6 CHAR ON L
                    N 1
0446    0435  7771          -6
0447    0436  0004          ESF             /ENABLE HALF SIZE CHAR
                    S
0450    0437  2674  LOOP1,  ADD 02HOR        /SELECT CHAN 0 AND
0451    0440  4001          STC 1           /SET HORIZ COORD
0452    0441  2676          ADD 02VER       /VERT COORD TO AC
0453    0442  1772          DSC I 02BETA    /DSC IN QUAD 2
0454    0443  1020          LDA I           /BUMP HORIZ COORD TO
0455    0444  0010  BH02, 10
0456    0445  2001          ADD 1
0457    0446  4674          STC 02HOR
0460    0447  2704          ADD 04HOR       /SET HOPIZ COORD
0461    0450  1620          RSE I
0462    0451  4000          4000
```

```
0463    0452  4001            STC 1
0464    0453  2706            ADD 04VER
0465    0454  1770            DSC I 04BETA      /DSC IN QUAD 4
0466    0455  1020            LDA I             /BUMP HORIZ COORD
0467    0456  0010  BH04, 10
0470    0457  2001            ADD 1
0471    0460  4704            STC 04HOR
0472    0461  0235            XSK I 15          /DONE A LN ?
0473    0462  6437            JMP LOOP1         /NO
0474    0463  2656            ADD LNFLG
0475    0464  0470            AZE I             /DONE 2 LNS ?
0476    0465  6511            JMP FULSIZ        /YES GO TO FULL SIZE C
                      HARS
0477    0466  0075            SET I 15          /THERE ARE 11
0500    0467  7766            -11               /CHARS IN LN 2
0501    0470  0011            CLR               /SET LNFLG
0502    0471  4656            STC LNFLG         /TO EXIT ON NEXT CHK
0503    0472  2673            ADD K02HOR        /RESET HORIZ
0504    0473  2655            ADD HAFFLG        /AND VERT
0505    0474  4674            STC 02HOR         /COORD
0506    0475  2675            ADD K02VER        /FOR LN 2
0507    0476  1120            ADA I
0510    0477  7737  BV02,     -40
0511    0500  4676            STC 02VER
0512    0501  2703            ADD K04HOR
0513    0502  2655            ADD HAFFLG
0514    0503  4704            STC 04HOR
0515    0504  2705            ADD K04VER
0516    0505  1120            ADA I
0517    0506  7737  BV04,     -40
0520    0507  4706            STC 04VER
0521    0510  6437            JMP LOOP1         /DO LN 2
0522    0511  0075  FULSIZ,    SET I 15          /SET CTR
0523    0512  7771            -6                /FOR LN 1
0524
0525                                  /DELAY , SIZE CHANGE NEXT
0526    0513  0076          SET I 16
0527    0514  7737          -40
0530    0515  0236          XSK I 16
0531    0516  6515          JMP .-1
0532
0533    0517  1020            LDA I             /ENABLE
0534    0520  0200            200               /FULL SIZE
0535    0521  0004            ESF               /CHAR
0536    0522  4656            STC LNFLG         /SET FLAG FOR LN 1
0537    0523  2670  LOOP2,     ADD 01HOR         /HORIZ COORD
0540    0524  1620          RSE I
0541    0525  4000          4000
0542    0526  4001            STC 1
0543    0527  2672            ADD 01VER
0544    0530  1773            DSC I 01BETA      /QUAD 1
0545    0531  1020            LDA I             /BUMP HORIZ
0546    0532  0020  BH01, 20
0547    0533  2001            ADD 1
0550    0534  4670            STC 01HOR
0551    0535  2700            ADD 03HOR         /HORIZ COORD
0552    0536  4001            STC 1             /CHAN 0
0553    0537  2702            ADD 03VER
0554    0540  1771            DSC I 03BETA      /QUAD 3
0555    0541  1020            LDA I
0556    0542  0020  BH03, 20
0557    0543  2001            ADD 1
0560    0544  4700            STC 03HOR
```

```
0561    0545  0235          XSK I 15          /DONE A LN ]
0562    0546  6523          JMP LOOP2         /NO
0563    0547  2656          ADD LNFLG
0564    0550  0470          AZE I             /DONE 2 LNS ]
0565    0551  6577          JMP HAFCHK        /YES CHK FOR 2ND HALF
                      OF PATTERN
0566    0552  0075          SET I 15          /NO SET FOR LN 2
0567    0553  7766          -11
0570    0554  0011          CLR               /SET LNFLG FOR
0571    0555  4656          STC LNFLG         /EXIT TO HAFCHK
0572    0556  2667          ADD K01HOR        /RESET COORDINATES
0573    0557  2655          ADD HAFFLG
0574    0560  2655          ADD HAFFLG
0575    0561  4670          STC 01HOR
0576    0562  2671          ADD K01VER
0577    0563  1120          ADA I
0600    0564  7737  BV01,   -40
0601    0565  4672          STC 01VER
0602    0566  2677          ADD K03HOR
0603    0567  2655          ADD HAFFLG
0604    0570  2655          ADD HAFFLG
0605    0571  4700          STC 03HOR
0606    0572  2701          ADD K03VER
0607    0573  1120          ADA I
0610    0574  7737  BV03,   -40
0611    0575  4702          STC 03VER
0612    0576  6523          JMP LOOP2         /DO LN 2
0613    0577  1000  HAFCHK, LDA               /DONE BOTH
0614    0600  0655          HAFFLG            /LEFT AND RIGHT
0615    0601  0450          AZE               /SEQUENCES ]
0616    0602  6614          JMP DSCEND        /YES EXIT
0617    0603  1020          LDA I             /NO SET FOR
0620    0604  0004          4                 /DSC RIGHT SEQ.
0621    0605  4655          STC HAFFLG        /SET HAFFLG FOR EXIT
0622    0606  1020          LDA I             /ENAPLE INST TO ADD A
0623    0607  1127          ADA I 7           /CONSTANT FOR
0624    0610  4425          STC RH1           /RIGHT HALF SEQ.
0625    0611  0075         SET I 15
0626    0612  0666         K01HOR-1
0627    0613  6420          JMP RH1-5         /DO RIGHT HALF SEQ.
0630    0614  1020  DSCEND, LDA I             /RESTORE NOP
0631    0615  0016          NOP               /FOR NEXT LEFT HALF SE
                      Q.
0632    0616  4425          STC RH1
0633    0617  6635          JMP TTYOPT        /CHK OPTIONS
0634    0620  6402          JMP DSCPAT-3
0635    0621  1000  CLOCK,  LDA               /CHK FOR ALTERNATING S
                      EQ.
0636    0622  0654          FLAG
0637    0623  0470          AZE I             /WHICH SEQ. ]
0640    0624  6000          JMP 0             /FREEZE SEQ IGNORE CLO
                      CK
0641    0625  0237          XSK I 17          /TICK CLOCK AND
0642    0626  6000          JMP 0             /REFRESH SCOPE
0643
0644
0645    0627  1000          LDA
0646    0630  0000          0
0647    0631  1120          ADA I
0650    0632  0001          1
0651    0633  4000          STC 0
0652    0634  6000          JMP 0
0653
```

```
0654
0655
0656    0635  1000   TTYOPT, LDA              /SAVE RTN JMP
0657    0636  0000          0
0660    0637  4653          STC EXIT
0661    0640  0415          KST              /HAVE TTY OPTIONS BEEN
                     REQUESTED ]
0662    0641  6000          JMP 0            /NO RTN
0663    0642  0500          IOB              /YES GET CHAR
0664                        PMODE
0665    4643  6036          KRB              /F FREEZES THE
0666                        LMODE
0667    0644  1460          SAE I            /CURRENT PATTERN
0670    0645  0306          306              /ANY OTHER KEY ALTERNA
                     TES
0671    0646  6652   JMP EXIT-1
0672    0647  0011          CLR              /FREEZE ON CURRENT PAT
                     TERN
0673    0650  4654          STC FLAG         /BY SETTING FLAG TO 0
0674    0651  6653          JMP EXIT
0675    0652  4654          STC FLAG         /SET FLAG .NE. TO 0
0676    0653  0000   EXIT,  0
0677    0654  0000   FLAG,  0
0700    0655  0000   HAFFLG, 0
0701    0656  0000   LNFLG,  0
0702    0657  0010   RHCHNG, 10
0703    0660  0004          4
0704    0661  0010          10
0705    0662  0004          4
0706    0663  0706   01GRID, Q4VER            /ADDR -1 OF GRID PATTE
                     RNS
0707    0664  0744   Q2GRID, Q4VER+36
0710    0665  1002   Q3GRID, Q4VER+74
0711    0666  1040   Q4GRID, Q4VER+132
0712    0667  0450   K01HOR, 450
0713    0670  0000    Q1HOR, 0
0714    0671  0340   K01VER, 340
0715    0672  0000    Q1VER, 0
0716    0673  0010   KQ2HOR, 10
0717    0674  0000    Q2HOR, 0
0720    0675  0340   KQ2VER, 340
0721    0676  0000    Q2VER, 0
0722    0677  0010   KQ3HOR, 10
0723    0700  0000    Q3HOR, 0
0724    0701  7477   KQ3VER, -300
0725    0702  0000    Q3VER, 0
0726    0703  0600   KQ4HOR, 600
0727    0704  0000    Q4HOR, 0
0730    0705  7477   KQ4VER, -300
0731    0706  0000    Q4VER, 0
0732                  /GRID PATTERNS
0733                  /QUAD 1 LEFT HALF
0734    0707  4136   4136  /C
0735    0710  1077   1077  /H
0736    0711  4477   4477  /A
0737    0712  3077   3077  /N
0740    0713  0000   0     /SPACE
0741    0714  2101   2101  /1
0742    0715  4477   4477  /F
0743    0716  0177   0177  /U
0744    0717  0177   0177  /L
0745    0720  0177   0177  /L
0746    0721  0000   0     /SPACE
-
```

```
0747        0722  5121    5121  /S
0750        0723  7741    7741  /I
0751        0724  4543    4543  /Z
0752        0725  4577    4577  /E
0753                      /RIGHT HALF
0754        0726  2241    2241  /C
0755        0727  7710    7710  /H
0756        0730  7744    7744  /A
0757        0731  7706    7706  /N
0760        0732  0000    0     /SPACE
0761        0733  0177    0177  /1
0762        0734  4044    4044  /F
0763        0735  7701    7701  /U
0764        0736  0301    0301  /L
0765        0737  0301    0301  /L
0766        0740  0000    0     /SPACE
0767        0741  4651    4651  /S
0770        0742  0041    0041  /I
0771        0743  6151    6151  /Z
0772        0744  4145    4145  /E
0773                      /QUAD 2 LEFT HALF
0774        0745  4136    4136  /C
0775        0746  1077    1077  /H
0776        0747  4477    4477  /A
0777        0750  3077    3077  /N
1000        0751  0000    0     /SPACE
1001        0752  4136    4136  /0
1002        0753  1077    1077  /H
1003        0754  4477    4477  /A
1004        0755  0177    0177  /L
1005        0756  4477    4477  /F
1006        0757  0000    0     /SPACE
1007        0760  5121    5121  /S
1010        0761  7741    7741  /I
1011        0762  4543    4543  /Z
1012        0763  4577    4577  /E
1013                      /RIGHT HALF
1014        0764  2241    2241  /C
1015        0765  7710    7710  /H
1016        0766  7744    7744  /A
1017        0767  7706    7706  /N
1020        0770  0000    0     /SPACE
1021        0771  3641    3641  /0
1022        0772  7710    7710  /H
1023        0773  7744    7744  /A
1024        0774  0301    0301  /L
1025        0775  4044    4044  /F
1026        0776  0000    0     /SPACE
1027        0777  4651    4651  /S
1030        1000  0041    0041  /I
1031        1001  6151    6151  /Z
1032        1002  4145    4145  /E
1033                      /QUAD 3 LEFT HALF
1034        1003  4136    4136  /C
1035        1004  1077    1077  /H
1036        1005  4477    4477  /A
1037        1006  3077    3077  /N
1040        1007  0000    0     /SPACE
1041        1010  4136    4136  /0
1042        1011  4477    4477  /F
1043        1012  0177    0177  /U
1044        1013  0177    0177  /L
1045        1014  0177    0177  /L
```

```
1046    1015  0000   0      /SPACE
1047    1016  5121   5121   /S
1050    1017  7741   7741   /I
1051    1020  4543   4543   /Z
1052    1021  4577   4577   /E
1053                 /RIGHT HALF
1054    1022  2241   2241   /C
1055    1023  7710   7710   /H
1056    1024  7744   7744   /A
1057    1025  7706          7706   /N
1060    1026  0000          0      /SPACE
1061    1027  3641   3641
1062    1030  4044   4044
1063    1031  7701   7701
1064    1032  0301   0301
1065    1033  0301   0301
1066    1034  0000   0
1067    1035  4651   4651
1070    1036  0041   0041
1071    1037  6151   6151
1072    1040  4145   4145
1073                 /QUAD 4 LEFT HALF
1074    1041  4136   4136
1075    1042  1077   1077
1076    1043  4477   4477
1077    1044  3077   3077
1100    1045  0000   0
1101    1046  2101   2101
1102    1047  1077   1077
1103    1050  4477   4477
1104    1051  0177   0177
1105    1052  4477   4477
1106    1053  0000   0
1107    1054  5121   5121
1110    1055  7741   7741
1111    1056  4543   4543
1112    1057  4577   Q4EL, 4577
1113                 /RIGHT HALF
1114    1060  2241   2241
1115    1061  7710   7710
1116    1062  7744   7744
1117    1063  7706   7706
1120    1064  0000   0
1121    1065  0177   0177
1122    1066  7710   7710
1123    1067  7744          7744   /A
1124    1070  0301          0301   /L
1125    1071  4044          4044   /F
1126    1072  0000          0   /SPACE
1127    1073  4651          4651   /S
1130    1074  0041          0041   /I
1131    1075  6151          6151   /Z
1132    1076  4145   Q4ER, 4145
1133
1134
1135
1136
1137                 /THIS ROUTINE DISPLAYS A DIAGONAL
1140                 /LINE FROM BOTTEM LEFT TO TOP RIGHT
1141                 /OF SCREEN
1142    1077  0077   DIAG,    SET I 17
1143    1100  6377   LNTIME,  -1400
1144    1101  6621            JMP CLOCK
```

```
1145          1102  7104          JMP  GO
1146          1103  6023          JMP  DISPAT-5
1147          1104  1020    GO,   LDA  I
1150          1105  0400          400
1151          1106  0061          SET  I  1
1152          1107  1777          1777
1153          1110  0161          DIS  I  1
1154          1111  1120          ADA  I
1155          1112  0001          1
1156          1113  1464          SAE  I
1157          1114  1400          1400
1160          1115  7114          JMP  .-5
1161          1116  6635          JMP  TTYOPT
1162          1117  7101          JMP  GO-3
1163
1164
1165
```

0000 ERRORS

```
BH01    4532
BH02    4444
BH03    4542
BH04    4456
BV01    4564
BV02    4477
BV03    4574
BV04    4506
CLOCK   4621
DIAG    5077
DISPAT  4030
DSCEND  4614
DSCPAT  4405
EXIT    4653
FLAG    4654
FULSIZ  4511
GL2     4325
GL2V    4343
GO      5104
HAFCHK  4577
HAFFLG  4655
K01HOR  4667
K01VER  4671
K02HOR  4673
K02VER  4675
K03HOR  4677
K03VER  4701
K04HOR  4703
K04VER  4705
LNFLG   4656
LNTIME  5100
LOOP1   4437
LOOP2   4523
LP1     4135
LP2A    4262
LP2R    4301
01BETA  4013
01GRID  4663
01HOR   4670
01VER   4672
02BETA  4012
02GRID  4664
02HOR   4674
02VER   4676
```

```
03BETA  4011
03GRID  4665
03HOR   4700
03VER   4702
04BETA  4010
04EL    5057
04ER    5076
04GRID  4666
04HOR   4704
04VER   4706
REL     4134
RHCHNG  4657
RH1     4425
TST1    4100
TST1LP  4111
TST2    4232
TST2LP  4241
TTYOPT  4635
T1GL    4206
```