DISPTST

IDENTIFICATION

PRODUCT CODE: MAINDEC 12-D6BC-D

PRODUCT NAME: VR14, VR20 DISPLAY TEST

DATE CREATED: AUGUST 1,1971

MAINTAINER: DIAGNOSTICS GROUP

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1. ABSTRACT

THIS PROGRAM TESTS THE PDP-12 DISPLAY SYSTEM BY GENERATING FOUR (FIVE IF A VR20) DISTINCT PATTERNS ON THE SCOPE, TWO (THREE IF A VR20) WITH THE DIS INSTRUCTION AND TWO 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

LOAD THIS PROGRAM INTO MEMORY BY THE STANDARD LOADING

PROCEDURE FOR A BINARY PROGRAM.

4. OPERATOR ACTION

SET THE CHANNEL SELECTOR SWITCH ON THE DISPLAY TO THE 1 & 2 POSITION (IF A VR20, SET THE COLOR SWITCH TO THE REMOTE POSITION AND SET SNS 5).
PLACE IN LINC-MODE, DEPRESS START 20.
UPON STARTING, THE PROGRAM WILL ALTERNATELY DISPLAY THE FOUR (FIVE IF A VR20) PATTERNS, EACH FOR APPROXIMATELY TEN SECONDS.

A. FREEZE ON CURRENT PATTERN,

SETTING OF SENSE SWITCHES 0-4 WILL CAUSE THE PROGRAM TO LOCK ON THAT PATTERN,

B. ALTERNATE BETWEEN FOUR (FIVE IF A VR20) PATTERNS.

RESETTING OF SENSE SWITCHES 0-4 WILL DIRECT THE PROGRAM TO ALTERNATE THE DISPLAY BETWEEN THE FOUR(FIVE IF A VR20) PATTERNS. IT SHOULD BE NOTED THAT REQUESTING A FREEZE ON A PATTERN (IE. 4) SETTING OF SNS 0-3 WILL CAUSE IT TO EXECUTE THE LEFT MOST SNS THAT IS SET.

C. RETURN TO DIAL.

TYPE "CTRL D" OF THE CONSOLE TELETYPE TO RETURN TO DIAL.

D. ADJUSTMENT OF THE COLOR DELAYS (SHORT-LONG)

TO SCOPE THE DELAYS START LINC-MODE 400.

5. PROGRAM DESCRIPTION

A. PATTERN 0

THIS PERMITS CALIBRATION OF THE SCOPE.

B. PATERN 1

THE PATTERN GENERATED BY THE DSC INSTRUCTION TAKES THE FOLLOWING FORM:

```
(QUADRANT 2)     CHAN 1          CHAN 2
                 HALF SIZE    FULL SIZE  (QUADRANT 1)


(QUADRANT 3)     CHAN 1          CHAN 2
                 FULL SIZE     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.

C. PATTERN 2

DISPLAY AN X PATTERN.

THIS PATTERN IS 2 DIAGONAL LINES FROM TOP LEFT CORNER
TO BOTTOM RIGHT CORNER, AND FROM BOTTOM LEFT CORNER
TO TOP, RIGHT CORNER. THIS PATTERN IS USED TO ADJUST
DEFLECTION AMPLIFIERS OF THE VR14.

D. PATTERN 3

TWO COLOR OVERLAY DISPLAY TEST (VR20)

THIS PATTERN IS USED TO ADJUST THE GAIN CONTROLS OF THE RED
AND GREEN AMPLIFIERS. THE PATTERN IS A BOX ON THE OUTER EDGE
OF THE SCREEN, AN "X" IN THE CENTER AND THE WORDS "RED" AND "GREEN".
THE DOTS SHOULD CONVERGE THE RESULT BEING AN ORANGE COLOR DISPLAY
THE WORDS "RED" AND "GREEN" WILL REMAIN UNCHANGED.
IF A HALT OCCURS DURING THIS TEST, RUN THE COLOR DELAY ADJUSTMENT ROUTINE.

F. PATTERN 4

POWER SUPPLY REGULATION TEST

THIS PATTERN IS USED TO TEST THE POWER SUPPLY REGULATION OF THE
VR20, THE WORD MAINDEC IS DISPLAYED IN THE CORNERS, AND THE THE MAINDEC NUMBER
IS DISPLAYED IN THE CENTER. THE CHARACTERS SHOULD NOT MOVE
MORE THAN 1/8 OF AN INCH.

```
                /VR14, VR20 DISPLAY CONTROL AND SCOPE TEST

                /COPYRIGHT 1971 DIGITAL EQUIPMENT CORP., MAYNARD, MASS.
          0456          SKP=0456


                /POINT DISPLAY PATTERN [DISPAT
                /CHARACTER DISPLAY PATTERN [DSCPAT
                /DISPLAY X PATTERN [DISP
                /DISPLAY COLOR [DISCL
                /DISPLAY POWER SUPPLY REGULATION [PSREG


          4000  SEGMNT 2
          4010  *0010
  4010    0000  Q4BETA, 0
  4011    0000  Q3BETA, 0
  4012    0000  Q2BETA, 0
  4013    0000  Q1BETA, 0

          4020  *20
  4020    0011          CLR
  4021    5430          STC     SWITCH
  4022    0077          SET I   17
  4023    7477          -300
  4024    6026          JMP     INCMB           /TEST INCREMENT THE M.B.
  4025    6100          JMP     DISPAT          /OUTPUT THE PATTERNS
```

```
4026  1000    INCMB,  LDA                     /GET THE RETURN
4027  0000            0000                    / ADDRESS
4030  4066            STC     EXMB            /SAVE IN EXIT
4031  4000            STC     0               /CLEAR LOC. 0
4032  0160            DIS I                   /DISPLAY A POINT
4033  1000            LDA                     /GET THE VALUE IN
4034  0000            0000                    / LOC. 0000
4035  1460            SAE I                   /IS IT EQUAL TO
4036  0001            0001                    / THE EXPECTED
4037  0000            HLT                     /NO, INCREMENT THE
                                              /MB FAILED AFTER
                                              /A DIS INSTRUCTION
4040  0011            CLR                     /CLEAR A,C,
4041  0004            ESF                     /CLEAR S,F,R,
4042  4001            STC     1               /CLEAR LOC. 0001
4043  1760            DSC I                   /DISPLAY A CHARACTER
4044  4477            4477
4045  1000            LDA                     /LOAD THE A,C, WITH
4046  0001            0001                    / THE VALUE IN LOC. 0001
4047  1460            SAE I                   /IS IT EQUAL TO
4050  0004            0004                    / THE EXPECTED VALUE?
4051  0000            HLT                     /INCREMENT THE M.B.
                                              /FAILED AFTER A
                                              /DSC INSTRUCTION (HALF-SIZE)
4052  1020            LDA I                   /LOAD THE A,C,
4053  0200            0200                    / WITH 0200
4054  0004            ESF                     /LOAD S,F,R,
4055  0011            CLR                     /CLEAR A,C, AND
4056  4001            STC     1               / LOC. 0001
4057  1760            DSC I                   /DISPLAY A CHARACTER
4060  7744            7744
4061  1000            LDA                     /LOAD THE A,C, WITH
4062  0001            0001                    / VALUE IN LOC 1
4063  1460            SAE I                   /IS IT EQUAL TO
4064  0010            0010                    / THE EXPECTED?
4065  0000            HLT                     /NO, INCREMENT THE
                                              /MB FAILED AFTER
                                              /A DSC INSTRUCTION (FULL-SIZE)
4066  6066    EXMB,   JMP     .
```

```
                4100    *100

                        /THE SUBROUTINE BELOW WILL GENERATE 5
                        /LINES ACROSS THE SCREEN. THE POINT
                        /SPACING IS 4 UNITS
                        /THE FIRST LEFT HAND POINT IS
                        /0000. THE LAST RIGHT HAND POINT IN
                        /EACH LINE IS 0774.

                        /A GLITCH IS PLACED AT THE HORIZONTAL
                        /POINTS OF 100,300,500 AND 700 ON
                        /EACH LINE

4100  0077      DISPAT, SET I   17              /LOAD THE CLOCK
4101  7500              7500
4102  6667      TST1A,  JMP     CLOCK
4103  6105              JMP     TST1B
4104  6447              JMP     DSCPT
4105  1020      TST1B,  LDA I
4106  0010              10
4107  0004              ESF
4110  4136              STC     REL
4111  0062              SET I   2
4112  0000              0

4113  6137      TST1LP, JMP     LP1
4114  1000              LDA
4115  0002              2
4116  1660              BCO I
4117  0100              100
4120  1560              BCL I
4121  7600              7600
4122  0470              AZE I
4123  6210              JMP     T1GL
4124  1000              LDA
4125  0002              2
4126  1120              ADA I
4127  0004              4
4130  1040              STA
4131  0002              2
4132  1460              SAE I
4133  1000              1000
4134  6113              JMP     TST1LP
4135  6234              JMP     TST2

4136  0000      REL,    0000                    /VARIABLE
```

```
                        /THIS IS THE ROUTINE THAT DISPLAYS
                        /FIVE POINTS, ONE ON EACH OF THE
                        /HORIZONTAL LINES
4137  1000      LP1,    LDA
4140  0000              0
4141  1060              STA I
4142  0000              0
4143  1020              LDA I
4144  0370              370
4145  2136              ADD     REL
4146  0142              DIS     2
4147  1000              LDA
4150  0002              2
4151  0017              COM
4152  4002              STC     2
4153  1020              LDA I
4154  0367              367
4155  2136              ADD     REL
4156  0142              DIS     2
4157  1000              LDA
4160  0002              2
4161  0017              COM
4162  4002              STC     2
4163  1020              LDA I
4164  0570              570
4165  2136              ADD     REL
4166  0142              DIS     2
4167  1000              LDA
4170  0002              2
4171  0017              COM
4172  4002              STC     2
4173  1020              LDA I
4174  0167              167
4175  2136              ADD     REL
4176  0142              DIS     2
4177  1000              LDA
4200  0002              2
4201  0017              COM
4202  4002              STC     2
4203  1020              LDA I
4204  0767              767
4205  2136              ADD     REL
4206  0142              DIS     2
4207  6142              JMP     LP1+3
```

```
4210  1000    T1GL,   LDA             /GLITCH GENERATOR
4211  0000            0
4212  1060            STA I
4213  0000            0
4214  1020            LDA I
4215  0020            20
4216  4136            STC     REL
4217  6137            JMP     LP1
4220  0011            CLR
4221  1020            LDA I
4222  7774            7774
4223  1200            LAM
4224  0136            REL
4225  1460            SAE I
4226  7774            7774
4227  6217            JMP     T1GL+7
4230  1020            LDA I
4231  0010            10
4232  4136            STC     REL
4233  6213            JMP     T1GL+3

                /THIS ROUTINE GENERATES 5 VERTICAL LINES
                /AT HORIZONTAL LOCATIONS 0,177,377,577,777,
                /GLITCHES ARE DISPLAYED AT VERTICAL LOCATIONS
                /177,377,500,700 ON THE LINES.

4234  0011    TST2,   CLR
4235  4136            STC     REL

4236  6271            JMP     LP2A            /SET UP INDEX REG,
4237  6310    TST2LP, JMP     LP2B            /GO DISPLAY SOME POINTS
4240  1000            LDA
4241  0136            REL
4242  1660            BCO I
4243  0100            100
4244  1560            BCL I
4245  7600            7600
4246  0470            AZE I
4247  6334            JMP     GL2
4250  1020            LDA I
4251  0004            4
4252  1140            ADM
4253  0136            REL
4254  1460            SAE I
4255  1000            1000                    /DONE ALL POINTS YET
4256  6237            JMP     TST2LP
```

```
                        /DISPLAY UPPER LEFT AND LOWER RIGHT DOTS

4257  0011              CLR
4260  4010              STC     Q4BETA
4261  3426              ADD     K377
4262  0150              DIS     Q4BETA
4263  0070              SET I   Q4BETA
4264  0777              777
4265  1020              LDA I
4266  0400              400
4267  0150              DIS     Q4BETA
4270  6102              JMP     TST1A

4271  1000    LP2A,     LDA                     /SET UP INDEX REGISTERS
4272  0000              0
4273  1060              STA I
4274  0000              0000
4275  0062              SET I   2
4276  0000              0
4277  0063              SET I   3
4300  0177              177
4301  0064              SET I   4
4302  0377              377
4303  0065              SET I   5
4304  0577              577
4305  0066              SET I   6
4306  0777              777
4307  6274              JMP     LP2A+3

                        /ACTUALLY DISPLAY THE 5 POINTS
4310  1000    LP2B,     LDA
4311  0000              0
4312  1060              STA I
4313  0000              0
4314  1000              LDA
4315  0136              REL
4316  0142              DIS     2
4317  0017              COM
4320  0146              DIS     6
4321  1000              LDA
4322  0136              REL
4323  1120              ADA I
4324  0200              200
4325  0143              DIS     3
4326  0017              COM
4327  0145              DIS     5
4330  1000              LDA
4331  0136              REL
4332  0144              DIS     4
4333  6313              JMP     LP2B+3
```

```
                        /DISPLAY THE GLITCHES ON THE VERTICAL LINES
4334  1000    GL2,      LDA
4335  0000              0
4336  1060              STA I
4337  0000              0
4340  0075              SET I   15
4341  7772              -5
4342  1020              LDA I
4343  0767              767
4344  4352              STC     GL2V
4345  0067              SET I   7
4346  7772              -5
4347  0070              SET I   10
4350  0001              1
4351  1020              LDA I
4352  0767    GL2V,     767
4353  1170              ADM I   10
4354  0227              XSK I   7
4355  6351              JMP     .-4
4356  6310              JMP     LP2B
4357  1020              LDA I
4360  0004              4
4361  4352              STC     GL2V
4362  0235              XSK I   15
4363  6345              JMP     GL2V-5
4364  6271              JMP     LP2A            /RESET HORIZONTAL POSITION
4365  6337              JMP     GL2+3           /GO BACK
```

```
                4400    *400

4400  1020      DORED,  LDA I
4401  0014              14
4402  0004              ESF                     /CHANGE TO RED
4403  0011              CLR
4404  4015              STC     15
4405  0447              SKPRD                   /SKIP ON RED
4406  0000              HLT                     /SKIP ON RED FAILED
4407  0467              SKPGR                   /SKIP ON GREEN
4410  0456              SKP                     /SHOULD NOT SKIP
4411  0000              HLT                     /SKIPPED IN ERROR
4412  0446              SKPVND                  /SKIP ON COLOR NOT DONE
4413  0000              HLT                     /SKIP ON COLOR NOT DONE FAILED
4414  0466              SKPVRD                  /SKIP ON COLOR DONE
4415  0456              SKP                     /NOT YET
4416  6423              JMP     .+5             /YES
4417  0235              XSK I   15              /DELAY
4420  6414              JMP     .-4             /
4421  0000              HLT                     /SKIP ON COLOR DONE FAILED
4422  6400              JMP     DORED           /TRY AGAIN
```

```
4423  1020    DOGRN,  LDA I
4424  0010            10
4425  0004            ESF                     /CHANGE TO GREEN
4426  0011            CLR
4427  4015            STC     15
4430  0467            SKPGR                   /SKIP ON GREEN
4431  0000            HLT                     /SKIP ON GREEN FAILED
4432  0447            SKPRD                   /SKIP ON RED
4433  0456            SKP                     /SHOULD NOT SKIP
4434  0000            HLT                     /SKIPPED IN ERROR
4435  0446            SKPVND                  /SKIP ON COLOR NOT DONE
4436  0000            HLT                     /SHOULD SKIP
4437  0466            SKPVRD                  /SKIP ON DONE
4440  0456            SKP                     /NOT DONE YET
4441  6446            JMP     .+5             /YES
4442  0235            XSK I   15              /DELAY
4443  6437            JMP     .-4             /TRY AGAIN
4444  0000            HLT                     /SKIP ON COLOR DONE FAILED
4445  6423            JMP     DOGRN           /TRY AGAIN
4446  6400            JMP     DORED
```

```
4447  0077    DSCPT,  SET I   17
4450  0000            0
4451  6667    DSCPTA, JMP     CLOCK
4452  6454            JMP     DSCPAT
4453  7155            JMP     DISPX

4454  0075    DSCPAT, SET I   15              /PUT GRID PATTERN ADDR FOR
4455  0740            Q1GRID=1                /EACH QUAD IN 4 RETAS
4456  1035            LDA I   15
4457  4013            STC     Q1BETA
4460  1035            LDA I   15
4461  4012            STC     Q2BETA
4462  1035            LDA I   15
4463  4011            STC     Q3BETA
4464  1035            LDA I   15
4465  4010            STC     Q4BETA
                /HAFFLG=0 WHEN DISPLAYING LEFT HALF OF PATTERN
                /=4 WHEN DISPLAYING RIGHT HALF
4466  4733            STC     HAFFLG
4467  0067            SET I   7               /INITIALIZE ARGUMENTS
4470  0734            RHCHNG=1
4471  0074            SET I   14              /THERE ARE
4472  7773            -4                      /4 QUADRANTS
                /IN RIGHT HALF PASS NOP BELOW WILL BE REPLACED BY ADA I 7
                /LEFT AND RIGHT HALF SEQUENCES ARE STAGGERED BY A CONSTANT
                /20 FOR FULL SIZE CHARACTERS, 10 FOR HALF SIZE
4473  1035            LDA I   15              /PTR FOR HORIZ COORD
4474  0016    RH1,    NOP
4475  1075            STA I   15              /HORIZ ARGUMENT
4476  1035            LDA I   15              /PTR FOR VERT COORD
4477  1075            STA I   15              /VERT ARGUMENT
4500  0234            XSK I   14              /DONE ALL QUADRANTS]
4501  6473            JMP     RH1-1           /NO
4502  4734            STC     LNFLG           /=0 WHEN DOING LN 2 ,N
                                                /E, 0 WHEN DOING LN 1
4503  0075            SET I   15              /THERE ARE 6 CHAR ON LN 1
4504  7771            -6
4505  0004            ESF                     /ENABLE HALF SIZE CHARS
4506  2752    LOOP1,  ADD     Q2HOR           /SELECT CHAN 0 AND
4507  4001            STC     1               /SET HORIZ COORD
4510  2754            ADD     Q2VER           /VERT COORD TO AC
4511  1772            DSC I   Q2BETA          /DSC IN QUAD 2
4512  1020            LDA I                   /BUMP HORIZ COORD TO
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```
4513  0010    BHQ2,   10
4514  2001            ADD     1
4515  4752            STC     Q2HOR
4516  2762            ADD     Q4HOR           /SET HORIZ COORD
4517  1620            BSE I
4520  4000            4000
4521  4001            STC 1
4522  2764            ADD     Q4VER
4523  1770            DSC I   Q4BETA          /DSC IN QUAD 4
4524  1020            LDA I                   /BUMP HORIZ COORD
4525  0010    BHQ4,   10
4526  2001            ADD     1
4527  4762            STC     Q4HOR
4530  0235            XSK I   15              /DONE A LN?
4531  6506            JMP     LOOP1           /NO
4532  2734            ADD     LNFLG
4533  0470            AZE I                   /DONE 2 LNS?
4534  6560            JMP     FULSIZ          /YES GO TO FULL SIZE CHARS
4535  0075            SET I   15              /THERE ARE 11
4536  7766            -11                     /CHARS IN LN 2
4537  0011            CLR                     /SET LNFLG
4540  4734            STC     LNFLG           /TO EXIT ON NEXT CHK
4541  2751            ADD     KQ2HOR          /RESET HORIZ
4542  2733            ADD     HAFFLG          /AND VERT
4543  4752            STC     Q2HOR           /COORD
4544  2753            ADD     KQ2VER          /FOR LN 2
4545  1120            ADA I
4546  7737    BVQ2,   -40
4547  4754            STC     Q2VER
4550  2761            ADD     KQ4HOR
4551  2733            ADD     HAFFLG
4552  4762            STC     Q4HOR
4553  2763            ADD     KQ4VER
4554  1120            ADA I
4555  7737    BVQ4,   -40
4556  4764            STC     Q4VER
4557  6506            JMP     LOOP1           /DOO LN 2
4560  0075    FULSIZ, SET I   15              /SET CTR
4561  7771            -6                      /FOR LN 1
```

```
                    /DELAY, SIZE CHANGE NEXT
4562  0076          SET I   16
4563  7737          -40
4564  0236          XSK I   16
4565  6564          JMP     .-1

4566  1020          LDA I                   /ENABLE
4567  0210          210                     /FULL SIZE
4570  0004          ESF                     /CHAR
4571  4734          STC     LNFLG           /SET FLAG FOR LN 1
4572  2746  LOOP2,  ADD     Q1HOR           /HORIZ COORD
4573  1620          BSE I
4574  4000          4000
4575  4001          STC 1
4576  2750          ADD     Q1VER
4577  1773          DSC I   Q1BETA          /QUAD 1
4600  1020          LDA I
4601  0020  BHQ1,    20                      /BUMP HORIZ
4602  2001          ADD 1
4603  4746          STC     Q1HOR
4604  2756          ADD     Q3HOR           /HORIZ COORD
4605  4001          STC     1               /CHAN 0
4606  2760          ADD     Q3VER
4607  1771          DSC I   Q3BETA          /QUAD 3
4610  1020          LDA I
4611  0020  BHQ3,    20
4612  2001          ADD     1
4613  4756          STC     Q3HOR
4614  0235          XSK I   15              /DONE A LN?
4615  6572          JMP     LOOP2           /NO
4616  2734          ADD     LNFLG
4617  0470          AZE I                   /DONE 2 LNS?
4620  6646          JMP     HAFCHK          /YES CHK FOR 2ND HALF OF PATTERN
4621  0075          SET I   15              /NO SET FOR LN 2
4622  7766          -11
4623  0011          CLR                     /SET LNFLG FOR
4624  4734          STC     LNFLG           /EXIT TO HAFCHK
4625  2745          ADD     KQ1HOR          /RESET COORDINATES
4626  2733          ADD     HAFFLG
4627  2733          ADD     HAFFLG
4630  4746          STC     Q1HOR
4631  2747          ADD     KQ1VER
4632  1120          ADA I
4633  7737  BVQ1,    -40
```

```
4634  4750          STC     Q1VER
4635  2755          ADD     KQ3HOR
4636  2733          ADD     HAFFLG
4637  2733          ADD     HAFFLG
4640  4756          STC     Q3HOR
4641  2757          ADD     KQ3VER
4642  1120          ADA I
4643  7737  BVQ3,   -40
4644  4760          STC     Q3VER
4645  6572          JMP     LOOP2           /DO LN 2
4646  1000  HAFCHK, LDA                     /DONE BOTH
4647  0733          HAFFLG                  /LEFT AND RIGHT
4650  0450          AZE                     /SEQUENCES?
4651  6663          JMP     DSCEND          /YES EXIT
4652  1020          LDA I                   /NO SET FOR
4653  0004          4                       /DSC RIGHT SEQ',
4654  4733          STC     HAFFLG          /SET HAFFLG FOR EXIT
4655  1020          LDA I                   /ENABLE INST TO ADD A
4656  1127          ADA I   7               /CONSTANT FOR
4657  4474          STC     RH1             /RIGHT HALF SEQ',
4660  0075          SET I   15
4661  0744          KQ1HOR-1
4662  6467          JMP     RH1-5           /DO RIGHT HALF SEQ',

4663  1020  DSCEND, LDA I                   /RESTORE NOP
4664  0016          NOP                     /FOR NEXT LEFT HALF SEQ',
4665  4474          STC     RH1
4666  6451          JMP     DSCPTA
```

```
4667  1000    CLOCK,  LDA
4670  0000            0
4671  4732            STC     RTNJMP
4672  0415            KST
4673  6706            JMP     CLOCKA
4674  0500            IOB
                      PMODE
4675  6036            KRB
                      LMODE
4676  1460            SAE I
4677  0204            0204
4700  6706            JMP     CLOCKA
4701  0076            SET I   16
4702  0701            0701
4703  0077            SET I   17
4704  7300            7300
4705  6016            JMP     16
4706  0460    CLOCKA, SNS I   0
4707  6105            JMP     TST1B
4710  0461            SNS I   1
4711  6454            JMP     DSCPAT
4712  0462            SNS I   2
4713  7162            JMP     GO
4714  0463            SNS I   3
4715  7221            JMP     DRW
4716  0444            SNS     4
4717  6723            JMP     CLOCKB
4720  0077            SET I   17
4721  1770            1770
4722  7474            JMP     PSREGB
4723  0237    CLOCKB, XSK I   17              /TICK CLOCK AND
4724  6732            JMP     RTNJMP          /REFRESH SCOPE
4725  1000            LDA
4726  0732            RTNJMP
4727  1120            ADA I
4730  0001            1
4731  4732            STC     RTNJMP
4732  2000    RTNJMP, 0
4733  0000    HAFFLG, 0
4734  0000    LNFLG,  0
```

```
4735  0010    RHCHNG, 10
4736  0004            4
4737  0010            10
4740  0004            4
4741  0764    Q1GRID, Q4VER                   /ADDR =1 OF GRID PATTERNS
4742  1022    Q2GRID, Q4VER+36
4743  1060    Q3GRID, Q4VER+74
4744  1116    Q4GRID, Q4VER+132
4745  0450    KQ1HOR, 450
4746  0000    Q1HOR,  0
4747  0340    KQ1VER, 340
4750  0000    Q1VER,  0
4751  0010    KQ2HOR, 10
4752  0000    Q2HOR,  0
4753  0340    KQ2VER, 340
4754  0000    Q2VER,  0
4755  0010    KQ3HOR, 10
4756  0000    Q3HOR,  0
4757  7477    KQ3VER, -300
4760  0000    Q3VER,  0
4761  0600    KQ4HOR, 600
4762  0000    Q4HOR,  0
4763  7477    KQ4VER, -300
4764  0000    Q4VER,  0
              /GRID PATTERNS
              /QUAD 1 LEFT HALF
4765  4136            4136                    /C
4766  1077            1077                    /H
4767  4477            4477                    /A
4770  3077            3077                    /N
4771  0000            0                       /SPACE
4772  4523            4523                    /2
4773  4477            4477                    /F
4774  0177            0177                    /U
4775  0177            0177                    /L
4776  0177            0177                    /L
4777  0000            0                       /SPACE
5000  5121            5121                    /S
5001  7741            7741                    /I
5002  4543            4543                    /Z
5003  4577            4577                    /E
              /RIGHT HALF
5004  2241            2241                    /C
5005  7710            7710                    /H
5006  7744            7744                    /A
5007  7706            7706                    /N
5010  0000            0                       /SPACE
5011  2151            2151                    /2
5012  4044            4044                    /F
5013  7701            7701                    /U
5014  0301            0301                    /L
5015  0301            0301                    /L
5016  0000            0                       /SPACE
5017  4651            4651                    /S
5020  0041            0041                    /I
```

```
5021  6151            6151                    /Z
5022  4145            4145                    /E
                /QUAD 2 LEFT HALF
5023  4136            4136                    /C
5024  1077            1077                    /H
5025  4477            4477                    /A
5026  3077            3077                    /N
5027  0000            0                       /SPACE
5030  2101            2101                    /1
5031  1077            1077                    /H
5032  4477            4477                    /A
5033  0177            0177                    /L
5034  4477            4477                    /F
5035  0000            0                       /SPACE
5036  5121            5121                    /S
5037  7741            7741                    /I
5040  4543            4543                    /Z
5041  4577            4577                    /E
                /RIGHT HALF
5042  2241            2241                    /C
5043  7710            7710                    /H
5044  7744            7744                    /A
5045  7706            7706                    /N
5046  0000            0                       /SPACE
5047  0177            0177                    /1
5050  7710            7710                    /H
5051  7744            7744                    /A
5052  0301            0301                    /L
5053  4044            4044                    /F
5054  0000            0                       /SPACE
5055  4651            4651                    /S
5056  0041            0041                    /I
5057  6151            6151                    /Z
5060  4145            4145                    /E
                /QUAD 3 LEFT HALF
5061  4136            4136                    /C
5062  1077            1077                    /H
5063  4477            4477                    /A
5064  3077            3077                    /N
5065  0000            0                       /SPACE
5066  2101            2101                    /1
5067  4477            4477                    /F
5070  0177            0177                    /U
5071  0177            0177                    /L
5072  0177            0177                    /L
5073  0000            0                       /SPACE
5074  5121            5121                    /S
5075  7741            7741                    /I
5076  4543            4543                    /Z
5077  4577            4577                    /E
```

```
                        /RIGHT HALF
5100  2241              2241                    /C
5101  7710              7710                    /H
5102  7744              7744                    /A
5103  7706              7706                    /N
5104  0000              0                       /SPACE
5105  0177              0177                    /1
5106  4044              4044
5107  7701              7701
5110  0301              0301
5111  0301              0301
5112  0000              0
5113  4651              4651
5114  0041              0041
5115  6151              6151
5116  4145              4145
                        /QUAD 4 LEFT HALF
5117  4136              4136
5120  1077              1077
5121  4477              4477
5122  3077              3077
5123  0000              0
5124  4523              4523
5125  1077              1077
5126  4477              4477
5127  0177              0177
5130  4477              4477
5131  0000              0
5132  5121              5121
5133  7741              7741
5134  4543              4543
5135  4577    Q4EL,     4577

                        /RIGHT HALF
5136  2241              2241
5137  7710              7710
5140  7744              7744
5141  7706              7706
5142  0000              0
5143  2151              2151
5144  7710              7710
5145  7744              7744                    /A
5146  0301              0301                    /L
5147  4044              4044                    /F
5150  0000              0                       /SPACE
5151  4651              4651                    /S
5152  0041              0041                    /I
5153  6151              6151                    /Z
5154  4145    Q4ER,     4145
```

```
                        /THIS ROUTINE DISPLAYS X PATTERN
5155  0077    DISPX,    SET I   17
5156  1300              1300
5157  6667    GOA,      JMP     CLOCK
5160  7162              JMP     GO
5161  7212              JMP     DISCL
5162  1020    GO,       LDA I
5163  0210              210
5164  0004              ESF
5165  0073              SET I   13
5166  0377              377
5167  0074              SET I   14
5170  7400              -377
5171  0075              SET I   15
5172  7001              7001
5173  0061              SET I   1
5174  0000              0
5175  1020    XPATRN,   LDA I
5176  7776              -1
5177  1140              ADM
5200  0013              13
5201  0161              DIS I   1
5202  1020              LDA I
5203  0001              1
5204  1140              ADM
5205  0014              14
5206  0141              DIS     1
5207  0235              XSK I   15
5210  7175              JMP     XPATRN
5211  7157              JMP     GOA
```

```
                    /COLOR ROUTINE (VR20)
                    / EXECUTE THIS TEST ONLY IF SNS 5=1

          0446              SKPVND=0446             /SKIP ON COLOR NOT DONE
          0466              SKPVRD=0466             /SKIP ON COLOR DONE
          0447              SKPRD=0447              /SKIP ON RED
          0467              SKPGR=0467              /SKIP ON GREEN

    5212  0445  DISCL,  SNS     5
    5213  7467            JMP     PSREG
    5214  0077            SET I   17
    5215  0000            0
    5216  6667  DISCLA, JMP     CLOCK
    5217  7221            JMP     DRW
    5220  7467            JMP     PSREG

                    /DRAW OUTER BOX

    5221  0011  DRW,    CLR
    5222  4010            STC     Q4BETA
    5223  3427            ADD     K400
    5224  0150            DIS     Q4BETA
    5225  0011            CLR
    5226  3425            ADD     K10
    5227  2010            ADD     Q4BETA
    5230  1460            SAE I
    5231  1000            1000
    5232  7222            JMP     DRW+1

    5233  0011  DRWA,   CLR
    5234  4010            STC     Q4BETA
    5235  3426            ADD     K377
    5236  0150            DIS     Q4BETA
    5237  0011            CLR
    5240  3425            ADD     K10
    5241  2010            ADD     Q4BETA
    5242  1460            SAE I
    5243  1000            1000
    5244  7234            JMP     DRWA+1

    5245  0070            SET I   Q4BETA
    5246  0777            777
    5247  3426            ADD     K377
    5250  0150            DIS     Q4BETA
```

```
5251  0011    DRWB,   CLR
5252  4010            STC     Q4BETA
5253  3427            ADD     K400
5254  0146            DIS     6
5255  3425            ADD     K10
5256  1460            SAE I
5257  1400            1400
5260  7254            JMP     .-4

5261  0066            SET I   6
5262  0777            777
5263  0011            CLR
5264  3427            ADD     K400
5265  0150            DIS     Q4BETA
5266  3425            ADD     K10
5267  1460            SAE I
5270  1400            1400
5271  7265            JMP     .-4
5272  0073            SET I   13
5273  0200            200
5274  0074            SET I   14
5275  0600            600
5276  0075            SET I   15
5277  7700            7700
5300  0061            SET I   1
5301  0220            220
5302  1020    DRWC,   LDA I
5303  7773            -4
5304  1140            ADM
5305  0013            13
5306  0161            DIS I   1
5307  1020            LDA I
5310  0004            4
5311  1140            ADM
5312  0014            14
5313  0141            DIS     1
5314  1020            LDA I
5315  0002            2
5316  1140            ADM
5317  0001            1
5320  0235            XSK I   15
5321  7302            JMP     DRWC
```

```
5322  0011          CLR
5323  3430          ADD     SWITCH
5324  0450          AZE                     /0=RED -0=GREEN
5325  7367          JMP     GREEN
5326  1020    RED,  LDA I
5327  7070          7070
5330  5430          STC     SWITCH
5331  1020          LDA I
5332  0014          14
5333  0004          ESF
5334  0011          CLR
5335  4015          STC     15
5336  0447          SKPRD                   /SKIP ON RED
5337  0000          HLT                     /SKIP ON RED FAILED
5340  0467          SKPGR                   /SKIP ON GREEN
5341  0456          SKP                     /SHOULD NOT SKIP
5342  0000          HLT                     /SKIP ON GREEN IN ERROR
5343  0446          SKPVND                  /SKIP ON COLOR NOT DONE
5344  0000          HLT                     /SKIP ON COLOR NOT DONE FAILED
5345  0466          SKPVRD                  /SKIP ON COLOR DONE
5346  0456          SKP                     /NOT YET
5347  7354          JMP     .+5             /YES
5350  0235          XSK I   15              /DELAY
5351  7345          JMP     .-4             /
5352  0000          HLT                     /SKIP ON COLOR DONE FAILED
5353  7326          JMP     RED             /TRY AGAIN
5354  0011          CLR
5355  0061          SET I   1
5356  0200          200
5357  0070          SET I   Q4BETA
5360  1430          TXT1-1
5361  0071          SET I   Q3BETA
5362  7765          -12
5363  1770          DSC I   Q4BETA
5364  0231          XSK I   Q3BETA
5365  7363          JMP     .-2
5366  7216          JMP     DISCLA
```

```
5367  0011    GREEN,  CLR
5370  5430            STC     SWITCH
5371  1020            LDA I
5372  0010            10
5373  0004            ESF
5374  0011            CLR
5375  4015            STC     15
5376  0467            SKPGR                   /SKIP ON GREEN
5377  0000            HLT                     /SKIP ON GREEN FAILED
5400  0447            SKPRD                   /SKIP ON RED
5401  0456            SKP                     /SHOULD NOT SKIP
5402  0000            HLT                     /SKIP ON RED SKIPPED IN ERROR
5403  0466            SKPVRD                  /SKIP ON COLOR DONE
5404  0456            SKP                     /NOT YET
5405  7412            JMP     .+5             /YES
5406  0235            XSK I   15              /DELAY
5407  7403            JMP     .-4             /TRY AGAIN
5410  0000            HLT                     /SKIP ON COLOR DONE FAILED
5411  7367            JMP     GREEN           /TRY AGAIN
5412  0011            CLR
5413  0061            SET I   1
5414  0470            470
5415  0070            SET I   Q4BETA
5416  1444            TXT2-1
5417  0071            SET I   Q3BETA
5420  7755            -22
5421  1770            DSC I   Q4BETA
5422  0231            XSK I   Q3BETA
5423  7421            JMP     .-2
5424  7216            JMP     DISCLA

5425  0010    K10,    10
5426  0377    K377,   377
5427  0400    K400,   400
5430  0000    SWITCH, 0
```

```
5431  4477    TXT1,   4477
5432  3146            3146
5433  0000            0
5434  0000            0
5435  4577            4577
5436  4145            4145
5437  0000            0
5440  0000            0
5441  4177            4177
5442  3641            3641
5443  0000            0
5444  0000            0
5445  4136    TXT2,   4136
5446  2645            2645
5447  0000            0
5450  0000            0
5451  4477            4477
5452  3146            3146
5453  0000            0
5454  0000            0
5455  4577            4577
5456  4145            4145
5457  0000            0
5460  0000            0
5461  4577            4577
5462  4145            4145
5463  0000            0
5464  0000            0
5465  3077            3077
5466  7706            7706
```

```
                    /POWER SUPPLY REGULATION TEST

5467  0077    PSREG,  SET I   17
5470  1770            1770
5471  6667    PSREGA, JMP     CLOCK
5472  7474            JMP     PSREGB
5473  6100            JMP     DISPAT

5474  0076    PSREGB, SET I   16
5475  7000            7000
5476  1020            LDA I
5477  0210            210
5500  0004            ESF
5501  0061    PSREGC, SET I   1
5502  0000            0
5503  1020            LDA I
5504  0377            377
5505  7546            JMP     OPTIT
5506  0061            SET I   1
5507  0000            0
5510  1020            LDA I
5511  7400            -377
5512  7546            JMP     OPTIT
5513  0061            SET I   1
5514  0440            440
5515  1020            LDA I
5516  0377            377
5517  7546            JMP     OPTIT
5520  0061            SET I   1
5521  0440            440
5522  1020            LDA I
5523  7400            -377
5524  7546            JMP     OPTIT
5525  0236            XSK I   16
5526  7501            JMP     PSREGC
5527  0076    PSREGD, SET I   16
5530  0000            0
5531  0061    PSREGE, SET I   1
5532  0200            200
5533  0070            SET I   Q4BETA
5534  1611            TXT4-1
5535  0071            SET I   Q3BETA
5536  7745            -32
5537  0011            CLR
5540  1770            DSC I   Q4BETA
5541  0231            XSK I   Q3BETA
5542  7540            JMP     .-2
5543  0236            XSK I   16
5544  7531            JMP     PSREGE
5545  7471            JMP     PSREGA
```

```
5546  0046    OPTIT,  SET     6
5547  0000            0
5550  0070            SET I   Q4BETA
5551  1557            TXT3-1
5552  0071            SET I   Q3BETA
5553  7745            -32
5554  1770            DSC I   Q4BETA
5555  0231            XSK I   Q3BETA
5556  7554            JMP     .-2
5557  6006            JMP     6

5560  3077    TXT3,   3077                    /MAINDEC
5561  7730            7730
5562  0000            0
5563  0000            0
5564  4477            4477
5565  7744            7744
5566  0000            0
5567  0000            0
5570  7741            7741
5571  0041            0041
5572  0000            0
5573  0000            0
5574  3077            3077
5575  7706            7706
5576  0000            0
5577  0000            0
5600  4177            4177
5601  3641            3641
5602  0000            0
5603  0000            0
5604  4577            4577
5605  4145            4145
5606  0000            0
5607  0000            0
5610  4136            4136
5611  2241            2241
```

```
5612  2101    TXT4,   2101                    /12-D6BC
5613  0177            0177
5614  0000            0
5615  0000            0
5616  4523            4523
5617  2151            2151
5620  0000            0
5621  0000            0
5622  0404            0404
5623  0404            0404
5624  0000            0
5625  0000            0
5626  4177            4177
5627  3641            3641
5630  0000            0
5631  0000            0
5632  1506            1506
5633  4225            4225
5634  0000            0
5635  0000            0
5636  5177            5177
5637  2651            2651
5640  0000            0
5641  0000            0
5642  4136            4136
5643  2241            2241

      /END
      @
```

```
0000
0100

0200
0300

0400
0500

0600
0700


1000
1100

1200
1300

1400
1500

1600
1700


2000
2100

2200
2300

2400
2500

2600
2700


3000
3100

3200
3300

3400
3500

3600
3700
```

```
4000  00000000  11110000  11111111  11111111  11111111  11111111  11111110  00000000
4100  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

4200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
4300  11111111  11111111  11111111  11111111  11111111  11111111  11111100  00000000

4400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
4500  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

4600  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
4700  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111


5000  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
5100  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

5200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
5300  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

5400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
5500  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

5600  11111111  11111111  11111111  11111111  11110000  00000000  00000000  00000000
5700  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000


6000
6100

6200
6300

6400
6500

6600
6700


7000
7100

7200
7300

7400
7500

7600
7700
```

ERRORS DETECTED: 0

LINKS GENERATED: 0

RUN-TIME: 7 SECONDS

3K CORE USED