## IDENTIFICATION

| | |
|---|---|
| PRODUCT CODE | MAINDEC-08-DHVCA-A-D<br>REPLACES: MAINDEC-8E-D6CB |
| PRODUCT NAME | VC-8E DISPLAY DIAGNOSTIC |
| DATE CREATED | MARCH 1, 1973 |
| MAINTAINER | DIAGNOSTIC GROUP |
| AUTHOR | RAYMOND SHOOP |

# VC-8E DISPLAY DIAGNOSTIC

## 1. ABSTRACT

THE VC-8E DISPLAY DIAGNOSTIC IS A PROGRAM WHICH FACILITATES THE CALIBRATION CHECK-OUT, AND DIAGNOSIS OF A VC-8E DISPLAY. ALL ERRORS ARE VISUAL EXCEPT FOR THE CONTROL LOGIC TEST, WHICH PROVIDES ERROR TYPEOUT AND SCOPE LOOPS.

## 2. REQUIREMENTS

### EQUIPMENT

PDP-8E COMPUTER, TTY OR HIGH SPEED READER
M869 QUAD MODULE (DISPLAY CONTROL)
M885 QUAD MODULE (D/A CONVERTER)
TEKTRONIX 453 SCOPE OR EQUIVALENT
VR-14,VR-20,VR03A,611,613 OR EQUIVALENT DISPLAY

### STORAGE

THE PROGRAM OCCUPIES MEMORY LOCATIONS 0000 TO 6000

## 3. LOADING PROCEDURE

LOAD PROGRAM VIA BINARY LOADER.

4. STARTING PROCEDURE

CONTROL SWITCH SETTING

| SWITCH REGISTER | SET AS | ACTION ON PROGRAM |
|---|---|---|
| 0 | 1 | PROCEED TO NEXT |
| | 0 | CALIBRATE BIT. |
| 1 | 1 | Y AXIS |
| | 0 | X AXIS |
| 2 | 1 | VR03A |
| | 0 | VR14 |
| 3 | 1 | VR14 CHANNEL 2 |
| | 0 | VR14 CHANNEL 1 |
| 4 | 1 | EXIT SCOPE LOOP |
| | 0 | HANG IN SCOPE LOOP |
| | | (CONTROL LOGIC TEST) |
| 5 | 1 | 611/613 CONNECTED |
| | 0 | 611/613 NOT CONNECTED |
| | | (DIAGONAL LINE TEST) |
| 5 | 1 | PLOT UL TO LR DIAGONAL |
| | 0 | PLOT LL TO UR DIAGONAL |
| | | (VERTICAL OR HORIZONTAL BAR TEST) |
| 5 | 1 | HALT LINE MOVEMENT |
| | 0 | CONTINUE LINE MOVEMENT |
| | | (COLOR/STORAGE LOGIC TEST) |
| 5 | 1 | 611/613 NOT CONNECTED |
| | 0 | 611/613 CONNECTED |
| | | (store write-thru mode test) |
| 5 | 1 | WRITE-THRU MODE |
| | 0 | STORE MODE |
| 6 | 1 | SELECT 615X IOT |
| | 0 | SELECT 605X IOT |
| 7 | 1 | PERFORM TEST SELECTED BY SWITCHES 8-11. |
| | 0 | RETURN/STAY IN DISPATCH ROUTINE. |
| 8 | CONTAINS NUMBER OF TEST | |
| 9 | TO BE EXECUTED. | |
| 10 | (REFER TO TEST SELECTION TABLE) | |
| 11 | | |

## PROGRAM AND/OR OPERATOR ACTION

A. LOAD PROGRAM INTO MEMORY PER SECTION 3.

B. SET ADDRESS TO 200

C. LOAD ADDRESS

D. TEST THAT IS TO BE RUN MAY NOW BE SELECTED VIA SWITCHES 8-11. SW7 MUST BE SET TO A ONE TO PERFORM TEST. PROGRAM WILL TYPE

"SELECT TEST"

ANY TIME SW7 IS A ZERO AND WILL HANG IN DISPATCH ROUTINE UNTIL SW7 IS SET TO A ONE.

E. THE VC-8E CAN OPERATE WITH EITHER OF TWO SETS OF IOT INSTRUCTIONS, 605X AND 615X, THROUGH THE USE OF JUMPER CONNECTIONS ON THE M869 CONTROL BOARD. REFERENCE THE ENGINEERING SPECS FOR THE CONFIGURATION OF THESE JUMPERS. THESE IOT'S CAN BE CHANGED AT ANY TIME BY THE SETTING OF SW6 (REFER TO CONTROL SWITCH SETTING TABLE). IT IS NECESSARY THAT SW6 BE PUT IN THE DESIRED POSITION BEFORE ENTERING THE DISPATCH ROUTINE THAT IS BEFORE PUTTING SW7 TO A ZERO.

F. DEPRESS CLEAR, CONTINUE.

## DISPLAY TEST SELECTION

| SW8 TO 11 | TEST SELECTED |
|---|---|
| 0000 (0) | NO TEST |
| 0001 (1) | CONTROL LOGIC TEST |
| 0010 (2) | RAMP SLEWING |
| 0011 (3) | DC CALIBRATION |
| 0100 (4) | DISPLAYED CALIBRATION |
| 0101 (5) | CROSSING DIAGONALS TEST |
| 0110 (6) | HORIZONTAL FLYBACK TEST |
| 0111 (7) | VERTICAL FLYBACK TEST |
| 1000 (10) | CORNERS TEST |
| 1001 (11) | DIAGONAL LINE TEST |
| 1010 (12) | VERTICAL BAR TEST |
| 1011 (13) | HORIZONTAL BAR TEST |
| 1100 (14) | SINGLE POINT PLOT TEST |
| 1101 (15) | COLOR AND STORAGE LOGIC TEST (VR20,611,613) |
| 1110 (16) | STORE AND WRITE-THRU MODE (611,613) |
| 1111 (17) | COLOR ALIGNMENT TEST (VR-20) |

5. ERRORS

EXCEPT FOR THE CONTROL LOGIC TEST ALL ERRORS ARE DETERMINED BY VISUAL INSPECTION.

AN ERROR OCCURING DURING THE CONTROL LOGIC TEST WILL CAUSE AN ERROR TYPEOUT GIVING THE NUMBER OF THE TEST AND AN IDENTIFICATION OF THE ERROR. THE PROGRAM WILL THEN ENTER A SCOPE LOOP, UNLESS SW4 HAS PREVIOUSLY BEEN SET TO A ONE. TO EXIT THE SCOPE LOOP SIMPLY PUT SW4 TO A ONE.

6. RESTRICTIONS

STARTING RESTRICTIONS

PROGRAM MAY BE RESTARTED FROM LOCATION 200 AT ANY TIME.
ON THE VR20 THE REMOTE/RED/GREEN SWITCH MUST BE IN THE REMOTE POSITION.

7. PROGRAM DESCRIPTION

THE MASTER DISPATCH ROUTINE FOR TRANSFERRING CONTROL TO A SPECIFIC TEST STARTS AT LOCATION 200. TO SELECT A PARTICULAR TEST, SET SW8-11 TO THE TEST NUMBER DESIRED AND THEN SET SW7 TO A ONE. RECOVERY TO THE DISPATCH ROUTINE CAN BE MADE FROM ANY TEST BY SETTING SW7 TO A ZERO.
IN ANY TEST WHICH THE OPERATOR HAS THE OPTION OF SELECTING THE X OR Y AXIS, IT IS NECESSARY TO DO SO BEFORE THE TEST IS ENTERED. WHEN THE OPERATOR DECIDES TO CHANGE THE AXIS IT IS NECESSARY TO EXIT THE TEST BY PUTTING SW7 TO A ZERO, CHANGE THE AXIS SELECT SWITCH (SW1) TO THE APPROPRIATE POSITION AND THEN RE-ENTER THE TEST BY PUTTING SW7 TO A ONE.
IT SHOULD BE NOTED THAT TWO OF THE TESTS IN THIS DIAGNOSTIC WERE INCLUDED TO COVER A MINIMUM CONFIGURATION SYSTEM WHICH MEANS THE USER MAY NOT HAVE A DISPLAY ON THE SYSTEM. IF A DISPLAY IS NOT AVAILABLE THE "RAMP TEST" AND "DC CALIBRATION TEST" MUST BE RUN TO FACILITATE THE CHECKOUT OF THE D/A MODULE. REFER TO THE INDIVIDUAL TEST DESCRIPTION FOR MORE DETAILED INFORMATION ON EACH TEST.
ANY SYSTEM EQUIPPED WITH A VR-14/20 DISPLAY SHOULD BE CHECKED FOR CHANNEL SELECTION ABILITY, ANY OF THE TESTS WHICH DISPLAYS A PATTERN ON THE SCREEN CAN BE MADE TO DISPLAY THE PATTERN ON VR-14/20 CHANNEL ONE OR TWO UNDER CONTROL OF SW3.
SW3=0, SELECTS CHANNEL 1.
SW3=1, SELECTS CHANNEL 2.
ANY SYSTEM EQUIPPED WITH A VR-20 DISPLAY SHOULD BE CHECKED IN THE REMOTE COLOR SWITCH POSITION.

## CONTROL LOGIC TEST

THIS TEST EXERCISES THE CONTROL LOGIC PORTION OF THE VC8E. IT IS DIVIDED UP INTO 15 SUB-TESTS. WHEN AN ERROR IS ENCOUNTERED AN ERROR MESSAGE IS TYPED OUT GIVING A BRIEF DESCRIPTION OF THE ERROR AND THE PROGRAM WILL GO INTO A SCOPE LOOP ON THE ERROR. THE USER MAY EXIT THE SCOPE LOOP AT ANY TIME BY PUTTING SW4 TO A ONE. THE PROGRAM WILL THEN CONTINUE TO LOOP THROUGH THE TEST, TYPING OUT ALL ERRORS THAT ARE ENCOUNTERED BUT NOT ENTERING A SCOPE LOOP. IF SW4 IS THEN PUT BACK IN THE ZERO POSITION THE PROGRAM WILL ENTER A SCOPE LOOP ON THE NEXT ERROR IT ENCOUNTERS.
THERE ARE TWO SWITCHES LOCATED ON THE CONTROL LOGIC MODULE (M869), ONE (Z) CONTROLLING THE POLARITY OF THE INTENSIFY PULSE AND ONE (DELAY) WHICH DETERMINES THE TIME DELAY IN SETTING THE DONE FLAG AFTER GIVING A LOAD X OR LOAD Y COMMAND.
THERE IS ALSO A JUMPER (611/613 - VR14/20) FOR DELAY TIMING.
THESE SWITCHES ARE SET IN THE FOLLOWING MANNER:

| SWITCH NAME | POSITION | DISPLAY |
|---|---|---|
| Z | - | VR-14/20 |
| | + | VR03A |
| | + | 611/613 |
| DELAY | L | VR-14/20 |
| | L | 611/613 |
| | S | VR03A |

SWITCH 2 SHOULD BE SET PRIOR TO ENTERING THE CONTROL LOGIC TEST TO SELECT EITHER A VR-14 OR VR03A MODE OF OPERATION.
SW2=0, SELECTS VR-14/20
SW2=1, SELECTS VR03A
SW5=1, SELECTS 611/613 STORAGE SCOPE
THE MESSAGE "CONTROL LOGIC TEST" IS TYPED UPON ENTERING THE TEST AND AFTER EVERY COMPLETE PASS.
THIS TEST IS REPEATED AS LONG AS SW7 IS A ONE, AND SW8=11 INDICATE THIS TEST.

## RAMP TEST

THIS TEST GENERATES A SAWTOOTH PATTERN AT THE X OR Y DAC OUTPUTS (DEPENDING ON THE SETTING OF SW1). TO OBSERVE THIS PATTERN IT IS NECESSARY TO HANG A SCOPE PROBE ON THE TEST POINTS LABELED X AND Y OF THE M885 D/A BOARD. THE WAVEFORM WILL START AT -5 VOLTS, RISE IN A RAMP TO +5 VOLTS AND DEFLECT FULL SCALE (10 VOLTS) BEFORE RISING AGAIN.
THE RAMP SHOULD BE A STRAIGHT UNBROKEN LINE. ANY BREAKS OR STEPS IN THE RAMP WOULD INDICATE THAT A BIT IS NOT SWITCHING OR IS NOT WEIGHTED CORRECTLY.
THIS TEST IS REPEATED AS LONG AS SW7 IS A ONE, AND SW8-11 INDICATE THIS TEST.

## DC CALIBRATION TEST

THIS TEST AIDS IN THE CALIBRATION OF THE X AND Y D/A'S WHEN NO DISPLAY IS AVAILABLE. SW1 IS AGAIN USED TO SELECT THE X OR Y AXIS AND SHOULD BE SET PRIOR TO ENTERING THE ROUTINE. UPON ENTERING THIS TEST THE FIRST VALUE OF THE CALIBRATION TABLE IS LOADED INTO THE DAC SELECTED, AND OUTPUT TO THE TELETYPE. THE PROGRAM WILL THEN HALT. WHEN THE OPERATOR WISHES TO CONTINUE TO THE NEXT CALIBRATION VALUE HE SIMPLY DEPRESSES KEY CONTINUE. THE OPERATOR CAN GO THROUGH THE ENTIRE CALIBRATION TABLE IN THIS MANNER. THE USER CAN EXIT THE TEST AT ANY TIME BY PUTTING SW7 TO A ZERO BEFORE HE DEPRESSES KEY CONTINUE, OR BY RESTARTING THE PROGRAM AT LOCATION 200.
FOR THE VOLTAGE VALUES WHICH SHOULD BE OBSERVED FOR EACH OF THE VALUES OF THE CALIBRATION TABLE, AND FOR A STEP-BY-STEP PROCEDURE ON HOW TO IMPLEMENT THIS TEST REFER TO THE ENGINEERING SPECIFICATIONS.

## DC CALIBRATION TABLE

```
0777
0776
0775
0773
0767
0757
0740
0737
0700
0677
0600
0577
0400
0377
0000
1777
```

## DISPLAYED CALIBRATION TEST

THIS TEST IS USED TO CALIBRATE THE D/A'S WHEN A VR-14 OR EQUIVALENT DISPLAY IS AVAILABLE.
UPON ENTERING THE TEST THE FRIST VALUE OF A CALIBRATION TABLE IS OUTPUT OT THE TELETYPE AND LOADED INTO THE X OR Y D/A SELECTED BY SW1. THE VALUE IS ALSO PLOTTED ON THE DISPLAY. FOR EACH CHANGE OF SW0 THE PROGRAM PROCEEDS TO THE NEXT CALIBRATION VALUE, AND THE LINE ON THE SCREEN WILL BECOME LARGER UNTIL A SOLID STRAIGHT LINE IS DISPLAYED ON THE SCREEN. AS THE LINE GROWS IT SHOULD BE OBSERVED FOR GAPS OR OVERLAYED DOTS. EITHER OF THESE CONDITIONS WILL NECESSITATE AN ADJUSTMENT OF ONE OF THE CONTROL POTS ON THE M885 D/A MODULE. REFER TO THE ENGINEERING SPECIFICATIONS FOR THE NAMES AND LOCATIONS OF THESE POTS.
THIS PROCEDURE MUST BE FOLLOWED FOR BOTH THE X AND Y AXIS.

## DISPLAYED CALIBRATION TABLE

0000
0001
0003
0007
0017
0037
0077
0177
0377
0777
1777

## CROSSING DIAGONALS TEST

THIS TEST DISPLAYS TWO DIAGONAL LINE SEGMENTS OF EQUAL LENGTH WHICH SHOULD CROSS IN THE CENTER OF THE SCREEN. THE LINES SHOULD BE STRAIGHT AND UNBROKEN WITH NO EVIDENCE OF ANY TRACE ON THE TRANSITION POINTS (ENDS) BETWEEN THE TWO LINES. THIS TEST IS REPEATED AS LONG AS SW7 IS A ONE, AND SW8-11 INDICATE THIS TEST.

## HORIZONTAL FLYBACK TEST

THIS TEST DISPLAYS FOUR HORIZONTAL LINE SEGMENTS AT THE CORNERS OF THE DISPLAY. IT IS USED TO CHECK FOR ANY SIGNS OF FLYBACK TRACES AT THE ENDS OF THE LINES AND ALSO FOR HYSTERESIS INTERFERENCE ON MAGNETIC DEFLECTION DISPLAYS.
THE LINE SEGMENTS ARE PLOTTED IN THE FOLLOWING ORDER:
256 POINTS TO THE RIGHT AT THE LOWER LEFT HAND CORNER;
256 POINTS TO THE RIGHT AT THE UPPER LEFT HAND CORNER;
256 POINTS TO THE LEFT AT THE LOWER RIGHT HAND CORNER;
256 POINTS TO THE LEFT AT THE UPPER RIGHT HAND CORNER;
ALL LINE SEGMENTS SHOULD BE STRAIGHT WITH NO DISTORTION.
THIS TEST IS REPEATED AS LONG AS SW7 IS A ONE, AND SW8-11 INDICATE THIS TEST.

VERTICAL FLYBACK TEST
---
THIS TEST IS IDENTICAL TO THE HORIZONTAL TEST EXCEPT THAT THE LINES ARE PLOTTED IN THE VERTICAL DIRECTION AT THE TOP AND BOTTOM EDGES OF THE DISPLAY.
THIS TEST IS REPEATED AS LONG AS SW7 IS A ONE, AND SW8=11 INDICATE THIS TEST.

CORNERS TEST
---
THIS TEST COMBINES THE PREVIOUS TWO TESTS, IN THAT THROUGH THE USE OF VERTICAL AND HORIZONTAL LINE SEGMENTS CORNERS ARE FORMED IN EACH OF THE FOUR CORNERS OF THE DISPLAY, AN ADDED FEATURE IS THE USE OF INTERSECTING DIAGONAL LINE SEGMENTS IN EACH OF THE FOUR CORNERS. AGAIN ALL LINES SHOULD BE STRAIGHT AND UNBROKEN AND THE DIAGONAL LINES SHOULD INTERSECT AT THE CENTER OF EACH CORNER.
THIS TEST IS REPEATED AS LONG AS SW7 IS A ONE, AND SW8=11 INDICATE THIS TEST.

DIAGONAL LINE TEST
---
THIS TEST DISPLAYS A FULL (1024 POINTS) DIAGONAL LINE. UPON ENTERING THE ROUTINE SW5 IS TESTED TO DETERMINE IT'S POSITION. SW5=0 WILL CAUSE A DIAGONAL LINE TO BE DISPLAYED FROM THE LOWER LEFT CORNER TO THE UPPER RIGHT CORNER OF THE SCREEN. SW5=1 WILL CAUSE A DIAGONAL LINE TO BE DISPLAYED FROM THE UPPER LEFT CORNER TO THE LOWER RIGHT CORNER OF THE SCREEN.
THIS TEST IS REPEATED AS LONG AS SW7 IS A ONE, AND SW8=11 INDICATE THIS TEST.

VERTICAL BAR TEST
---
THIS TEST PLOTS A FULL VERTICAL BAR (1024 POINTS) MOVING HORIZONTALLY ACROSS THE DISPLAY, THE MOVEMENT OF THE BAR CAN BE CONTROLLED BY SW5. SW5=0 ALLOWS THE BAR TO MOVE ACROSS THE SCREEN, SW5=1 HALTS THE MOVEMENT OF THE BAR. THIS TEST ALLOWS THE USER TO EXAMINE THE CRT FOR SCOPE BURNS.
LIKE ALL THE TESTS IN THIS DIAGNOSTIC THIS TEST CAN BE EXITED BY PUTTING SW7 TO A ZERO, HOWEVER THIS TEST WILL ONLY EXIT AT THE COMPLETION OF A PASS OF THE BAR ACROSS THE SCREEN.
THIS TEST IS REPEATED AS LONG AS SW7 IS A ONE, AND SW8=11 INDICATE THIS TEST.

HORIZONTAL BAR TEST
-------------------
THIS TEST IS IDENTICAL TO THE VERTICAL BAR TEST EXCEPT THAT A HORIZONTAL BAR IS MOVED IN THE VERTICAL DIRECTION.

SINGLE POINT PLOT TEST
----------------------
THIS TEST DISPLAYS A POINT DETERMINED BY THE SETTING OF THE SWITCHES. UPON SELECTION OF THIS TEST THE COMPUTER WILL STOP TO ALLOW THE USER TO SET IN:
A. THE "X" COORDINATE,
B. THE "Y" COORDINATE,
C. RESET THE SWITCH OPTIONS.

COLOR/STORAGE LOGIC TEST
------------------------
THIS TEST EXERCISES THE COLOR/STORAGE LOGIC PORTION OF THE VC8E. IT IS DIVIDED UP INTO 8 SUB-TESTS AND IS SIMILAR TO THE CONTROL LOGIC TEST SEQUENCE. IN THIS TEST, SW5 IS USED TO INDICATE A STORAGE SCOPE (611/613) IS CONNECTED.

STORE AND WRITE-THRU MODE TEST (611/613)
----------------------------------------
THIS TEST AIDS IN THE ADJUSTMENT OF THE INTENSITY LEVELS ON THE 611/613 SCOPE. THE PROGRAM USES SW5 TO SELECT BETWEEN STORE AND WRITE-THRU MODE. WHEN SW5=0 INDICATES STORE MODE, THEREFORE INTENSITY LEVEL AND OPERATING LEVEL SHOULD BE ADJUSTED TO A LEVEL OF STORING THE DISPLAYED DATA. THEN PROPERLY ADJUSTED, THE TEST WILL ALSO SERVE AS A PHOSPHOR TEST FOR BURN SPOTS ON THE SCREEN.
SW5=1 INDICATES WRITE-THRU MODE, THEREFORE WRITE-THRU LEVEL SHOULD BE ADJUSTED TO A LEVEL OF NOT STORING THE DISPLAY DATA.

COLOR ALIGNMENT TEST
--------------------
THIS TEST AIDS IN THE ADJUSTMENT OF THE COMPENSATION GAIN AMPLIFIER IN THE VR20 SCOPE. THE PATTERN USED FOR THIS ADJUSTMENT IS A RECTANGLE WITH A 'X' IN THE CENTER OF THE SCREEN, THE TESTS PLOTS THIS PATTERN IN ALTERNATINE RED AND GREEN COLORS. THE COMPENSATION GAIN AMPLIFIER SHOULD BE ADJUSTED FOR THE BEST FIT OF THE COLOR OVERLAY. WHEN PROPERLY ADJUSTED BOTH PATTERNS SHOULD OVERLAY AND PRODUCE A MIXTURE OF THE TWO COLORS (ORANGE DISPLAY PATTERN).

8. LISTING
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```
                /MAINDEC-08-DHVCA-A VC8E POINT PLOT DISPLAY DIAGNOSTIC
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                        //INSTRUCTION EQUALITIES//

4125    DICL=JMS        XDICL   /CLEAR ENABLES, FLAGS, DELAYS.
4131    DICD=JMS        XDICD   /CLEAR DONE FLAG.
4135    DISD=JMS        XDISD   /SKIP ON DONE FLAG, DO NOT CLEAR FLAG.
4142    DILX=JMS        XDILX   /CLEAR DONE FLAG, LOAD X, WAIT FOR SETTLE,
                                /SET DONE, DO NOT CLEAR AC.
4146    DILY=JMS        XDILY   /CLEAR DONE FLAG, LOAD Y, WAIT FOR SETTLE,
                                /SET DONE, DO NOT CLEAR AC.
4152    DIXY=JMS        XDIXY   /CLEAR DONE FLAG, INTENSIFY, SET DONE.
4156    DILE=JMS        XDILE   /LOAD ENABLE REGISTER, CLEAR AC.
4162    DIRE=JMS        XDIRE   /TRANSFER ENABLE TO AC.

4025    SETUP=JMS       PRESET
4076    ERROR=JMS       FAIL
6007    CAF=6007
7402    XX=7402
```

```
                0001    *1
0001  5402               JMP I   RETURN
0002  0000    RETURN,     0
0003  0000    SUM1,       0
0004  0000    ERSWIT,     0
0005  0000    TALLY,      0

                0020    *20
0020  0213    DISRET, DISMSG                  /RETURN TO DISPATCH ROUTINE


0021  0000    TALLYA, 0
0022  0000    NXTST,  0
0023  0000    GETBAK, 0
0024  0000    DELAY,  0

                        //HOUSEKEEPING ROUTINE FOR CONTROL LOGIC TEST//
0025  0000    PRESET, 0
0026  7200            CLA
0027  3004            DCA     ERSWIT
0030  1177            TAD     (5000
0031  3005            DCA     TALLY
0032  4036            JMS     CKSW7
0033  2035            ISZ     MSGPNT
0034  5425            JMP I   PRESET

                        //ERROR MESSAGE POINTER//
0035  0057    MSGPNT, ERRMSG


                        //ROUTINE TO CHECK LOOP BIT, S',R',777
0036  0000    CKSW7,  0                       /GET S',R'
0037  7604            LAS                     /GET S',R'
0040  0176            AND     (20             /MASK BIT 9
0041  7650            SNA CLA                 /S',R',7=0?
0042  5420            JMP I   DISRET          /YES, RETURN TO DISPATCH
0043  5436            JMP I   CKSW7           /NO, LOOP IN CURRENT TEST

                        //ROUTINE TO SELECT CHANNEL FOR VRE47//
0044  0000    SELCHN, 0
0045  7604            LAS                     /GET S',R',
0046  0175            AND     (0400           /MASK BIT 3
0047  7640            SZA CLA                 /SW 3=
0050  1174            TAD     (0002           /0, SELECT CHANNEL 1
0051  4156            DILE                    /1, SELECT CHANNEL 2
0052  5444            JMP I   SELCHN
```



```
                        //SUBROUTINE CONTAINING IOT TO BE EXECUTED//
                        //
0053  0000    IOTT,   0
0054  7000            7000                    /MODIFIED TO CONTAIN IOT
0055  7000            7000
0056  5493            JMP I   IOTT

                        //ERROR MESSAGE LINKS//
0057  4360    ERRMSG, EMSG1
0060  4401            EMSG1A
0061  4431            EMSG1B
0062  4463            EMSG1C
0063  4513            EMSG2
0064  4542            EMSG3
0065  4572            EMSG4
0066  4622            EMSG5
0067  4643            EMSG6
0070  4667            EMSG7
0071  4722            EMSG8
0072  4750            EMSG9
0073  4775            EMSG10
0074  5030            EMSG11
0075  5052            EMSG12

                        //SUBROUTINE TO HANDLE ERROR-SCOPE LOOPING//
0076  0000    FAIL,   0
0077  7200            CLA
0100  1004            TAD     ERSWIT
0101  7650            SNA CLA
0102  4117            JMS     ERTYPE
0103  1173            TAD     (7777
0104  3004            DCA     ERSWIT
0105  1476            TAD I   FAIL
0106  3023            DCA     GETBAK
0107  2076            ISZ     FAIL
0110  1476            TAD I   FAIL
0111  3022            DCA     NXTST
0112  7604            LAS
0113  0172            AND     (0200
0114  7650            SNA CLA
0115  5423            JMP I   GETBAK
0116  5422            JMP I   NXTST

                        //ERROR TYPEOUT SUBROUTINE//
0117  0000    ERTYPE, 0
0120  1435            TAD I   MSGPNT
0121  3123            DCA     EOUT
0122  4771            JMS     MESAGE
0123  7402    EOUT,   HLT
0124  5517            JMP I   ERTYPE
```

```
                        //IOT SUBROUTINES//
                        //
0125  0000    XDICL,  0
0126  6050    RDICL,  6050            /CLEAR ENABLES, FLIGS, DELAYS',
0127  5525            JMP I   XDICL
0130  7402            HLT

0131  0000    XDICD,  0
0132  6051    RDICD,  6051            /CLEAR DONE FLAG',
0133  5531            JMP I   XDICD
0134  7402            HLT

0135  0000    XDISD,  0
0136  6052    RDISD,  6052            /SKIP ON DONE FLAG',
0137  7410            SKP
0140  2135            ISZ     XDISD
0141  5535            JMP I   XDISD

0142  0000    XDILX,  0
0143  6053    RDILX,  6053            /LOAD X BUFFER',
0144  5542            JMP I   XDILX
0145  7402            HLT
0146  0000    XDILY,  0
0147  6054    RDILY,  6054            /LOAD Y BUFFER',
0150  5546            JMP I   XDILY
0151  7402            HLT

0152  0000    XDIXY,  0
0153  6055    RDIXY,  6055            /INTENSIFY',
0154  5552            JMP I   XDIXY
0155  7402            HLT

0156  0000    XDILE,  0
0157  6056    RDILE,  6056            /LOAD ENABLE REGISTER',
0160  5556            JMP I   XDILE
0161  7402            HLT

0162  0000    XDIRE,  0
0163  6057    RDIRE,  6057            /TRANSFER ENABLE TO AC',
0164  5562            JMP I   XDIRE
0165  7402            HLT


0166  1703    SETSIZ, STSIZE
0167  5600    AMSAG,  MESAGE
```



```
      0200    *200
0200  6007    START,  CAF
0201  2259            ISZ     TITLE
0202  5213            JMP     DISMSG
0203  4777'           JMS     MESAGE
0204  3600            MSG1
0205  4777'           JMS     MESAGE
0206  3624            MSG2
0207  4777'           JMS     MESAGE
0210  3640            MSG3
0211  4777'           JMS     MESAGE
0212  3670            MSG4

0213  6007    DISMSG, CAF
0214  4777'           JMS     MESAGE
0215  3724            MSG5

                        //MASTER DISPATCH ROUTINE FOR TEST SELECTION//
                        //
0216  7300    DISPAT, CLA CLL
0217  7604            LAS                     /GET SWITCHES',
0220  0376            AND     (0040           /MASK SW6
0221  7104            CLL RAL
0222  3321            DCA     MIOT            /SETUP IOT MODIFIER',
0223  4256            JMS     SETIOT          /GOTO IOT MODIFY ROUTINE',
0224  7604            LAS                     /GET SWITCHES
0225  0375            AND     (28             /MASK TO CHECK S',R',7
0226  7450            SNA                     /SW7=0?
0227  5216            JMP     DISPAT          /YES, LOOP
0230  7604            LAS                     /NO, PICK UP TEST NUMBER
0231  0374            AND     (17             /MASK FOR S,R,8=1
0232  1373            TAD     (JMP I TEST+1   /SETUP TEST SELECTED',
0233  3234            DCA     TEST

0234  0000    TEST,   0
0235  0213            DISMSG                  /S',R',#0, NO TEST
0236  0600            CLTST                   /S',R',#1, CONTROL LOGIC TEST
0237  0457            RMPTST                  /S',R',#2, RAMP TEST
0240  0400            CALTST                  /S',R',#3, DC CALIBRATION TEST
0241  2242            DISTST                  /S',R',#4, DISPLAYED CALIBRATION TEST
0242  2400            CROTST                  /S',R',#5, CROSSING DIAGONALS TEST
0243  1400            HORTST                  /S',R',#6, HORIZONTAL FLYBACK TEST
0244  1434            VERTST                  /S',R',#7, VERTICAL FLYBACK TEST
0245  1600            CORTST                  /S',R',#10, CORNERS TEST
0246  2000            DBTST                   /S',R',#11, DIAGONAL LINE TEST
0247  2023            VRBTST                  /S',R',#12, VERTICAL BAR TEST
0250  2057            HRBTST                  /S',R',#13, HORIZONTAL BAR TEST
0251  2200            PNTST                   /S',R',#14, SINGLE POINT PLOT TEST
0252  3013            COLOR                   /S',R',#15, COLOR/STORAGE LOGIC TEST
0253  3274            PHOER                   /S',R',#16, STORE AND WRITE-THRU MODE TEST
0254  2740            ADJCOL                  /S',R',#17, COLOR ALIGNMENT

0255  7777    TITLE,  7777                    /TYPE OUT HEADER ONE TIME ONLY',
```

```
                        //ROUTINE TO MODIFY ALL IOT'S//
                        //
0256  0000    SETIOT, 0
0257  1126              TAD     RDICL
0260  0320              AND     K7877
0261  1321              TAD     MIOT
0262  3126              DCA     RDICL
0263  1132              TAD     RDICD
0264  0320              AND     K7877
0265  1321              TAD     MIOT
0266  3132              DCA     RDICD
0267  1136              TAD     RDISD
0270  0320              AND     K7877
0271  1321              TAD     MIOT
0272  3136              DCA     RDISD
0273  1143              TAD     RDILX
0274  0320              AND     K7877
0275  1321              TAD     MIOT
0276  3143              DCA     RDILX
0277  1147              TAD     RDILY
0300  0320              AND     K7877
0301  1321              TAD     MIOT
0302  3147              DCA     RDILY
0303  1153              TAD     RDIXY
0304  0320              AND     K7877
0305  1321              TAD     MIOT
0306  3153              DCA     RDIXY
0307  1157              TAD     RDILE
0310  0320              AND     K7877
0311  1321              TAD     MIOT
0312  3157              DCA     RDILE
0313  1163              TAD     RDIRE
0314  0320              AND     K7877
0315  1321              TAD     MIOT
0316  3163              DCA     RDIRE
0317  5656              JMP I   SETIOT

0320  7077    K7877,  7077
0321  0000    MIOT,   0
0322  0000    SIZE,   0
0323  0001    PSIZE,  1
0324  7777    MSIZE,  -1

0373  5635
0374  0017
0375  0020
0376  0040
0377  5600
      0400              PAGE
```



```
                        //DC CALIBRATION ROUTINE//
                        //
0400  6007    CALTST, CAF
0401  4777/             JMS     MESAGE
0402  3734              MSG6
0403  7200    CALIB,  CLA
0404  1376              TAD     (-88            /INITIALIZE
0405  3255              DCA     CALCNT          /COUNTER
0406  7604              LAS                     /GET S'R'.
0407  0375              AND     (2000           /CHECK SW1
0410  7650              SNA CLA                 /TO DETERMINE X OR Y AXIS
0411  5215              JMP     CALX            /GOTO X AXIS SETUP
0412  1374    CALY,   TAD     (DILY           /SETUP Y AXIS
0413  3054              DCA     IOTT+1          /SAVE Y IOT
0414  5217              JMP     GETVAL          /GOTO BEGIN OF CAL ROUTINE
0415  1373    CALX,   TAD     (DILX           /SETUP X AXIS
0416  3054              DCA     IOTT+1          /SAVE X IOT
0417  1372    GETVAL, TAD     (TABLE          /INITIALIZE POINTER
0420  3256              DCA     PNTR1           /FOR CALIBRATION PICKUP
0421  1656    UPDVAL, TAD I   PNTR1           /PICKUP CAL VALUE
0422  3003              DCA     SUM1            /SAVE IT.
0423  4771/             JMS     CALSND          /OUTPUT VALUE TO TTY
0424  1003              TAD     SUM1            /GET CAL VALUE AGAIN.
0425  4053              JMS     IOTT            /SEND TO DAC
0426  7402              HLT                     /HALT AT PRESENT CAL VALUE.
0427  4036              JMS     CKSW?           /CHECK TEST LOOP SWITCH.
0430  2256              ISZ     PNTR1           /INCREMENT POINTER
0431  2255              ISZ     CALCNT          /HAS PRESENT AXIS BEEN DUT?
0432  5221              JMP     UPDVAL          /NO, GET NEXT VALUE
0433  5203              JMP     CALIB           /YES, RETURN TO BEGIN OF ROUTINE.

                        //CALIBRATION TABLE//
0434  0777    TABLE,  0777
0435  0776              0776
0436  0775              0775
0437  0773              0773
0440  0767              0767
0441  0757              0757
0442  0740              0740
0443  0737              0737
0444  0700              0700
0445  0677              0677
0446  0600              0600
0447  0577              0577
0450  0400              0400
0451  0377              0377
0452  0000              0000
0453  1777              1777

0454  0000    SWITCH, 0
0455  0000    CALCNT, 0
0456  0000    PNTR1,  0
```

```
                        //RAMP TEST//
                        //
0457  6007    RMPTST, CAF
0460  4777'           JMS     MESAGE
0461  3750            MSG7
0462  7300    RAMP,   CLA CLL
0463  7604            LAS                     /PICK UP S'R',
0464  0375            AND     (2000           /CHECK SW11 TO DETERMINE
0465  7650            SNA CLA                 /X OR Y AXIS
0466  5272            JMP     XRAMP           /GOTO X AXIS SETUP
0467  1374            TAD     (DILLY          /SETUP Y AXIS
0470  3054            DCA     IOT+1           /IOT
0471  5274            JMP     RAMPA-1         /GOTO RAMP ROUTINE
0472  1373    XRAMP,  TAD     (DILX           /SETUP X AXIS
0473  3054            DCA     IOT+1           /IOT
0474  1370            TAD     (1000           /RAMP ORIGIN
0475  4053    RAMPA,  JMS     IOT             /SETUP DAC SELECTED
0476  1367            TAD     (1              /INCREMENT RAMP
0477  3303            DCA     SAVIT
0500  4036            JMS     CKSW7           /CHECK TEST LOOP SWITCH
0501  1303            TAD     SAVIT
0502  5275            JMP     RAMPA           /CONTINUE RAMP

0503  0000    SAVIT,  0

0567  0001
0570  1000
0571  3447
0572  0434
0573  4142
0574  4146
0575  2000
0576  7760
0577  5600
      0600            PAGE
```



```
                        //CONTROL LOGIC TEST//
                        //
0600  6007    CLTST,  CAF
0601  4777'           JMS     MESAGE
0602  3757            MSG8
0603  7200            CLA
0604  1376            TAD     (-200
0605  3021            DCA     TALLYA
                        /
                        /CHECK DATA TRANSFERS, AC AND ENABLE REGISTERS.
                        /
0606  4025            SETUP
0607  1375            TAD     (ERRMSG
0610  3035            DCA     MSGPNT
0611  7340    CLT1,   CLA CLL CMA             /BRING AC TO ALL ONES.
0612  4156            DILE                    /TRANS. TO ENABLE AND CLR AC.
0613  7650            SNA CLA
0614  5220            JMP     .+4             /AC CLEAR, CONTINUE.
0615  4076            ERROR                   /DILE FAILED TO CLR AC.
0616  0611            CLT1
0617  0622            CLT1A-1                 /NEXT TEST.
0620  2005            ISZ     TALLY           /TEST LOOP COUNT.
0621  5211            JMP     CLT1            /RETURN.
                        /
0622  4025            SETUP
0623  7300    CLT1A,  CLA CLL
0624  1374            TAD     (0002
0625  4156            DILE                    /SET CHANNEL PTR = 1.
0626  4162            DIRE                    /READ ENABLE INTO AC.
0627  0374            AND     (0002           /MASK TO CHECK FOR CHANNEL = 1.
0630  7640            SZA CLA
0631  5235            JMP     .+4             /CHANNEL SET AND READ BACK.
0632  4076            ERROR                   /FAILED, CANT NOT SET OR NOT READ BACK.
0633  0623            CLT1A
0634  0637            CLT1B-1                 /NEXT TEST.
0635  2005            ISZ     TALLY           /TEST LOOP COUNT.
0636  5223            JMP     CLT1A           /RETURN.
                        /
```

```
0637  4025            SETUP
0640  7300    CLT1B,  CLA CLL
0641  1373            TAD     (0001
0642  4156            DILE                    /SET INTERRUPT ENABLE',
0643  4162            DIRE                    /READ ENABLE INTO AC',
0644  0373            AND     (0001           /MASK TO CHECK FOR INT' ENABLE',
0645  7640            SZA CLA
0646  5252            JMP     .+2             /INT' SET AND READ BACK',
0647  4076            ERROR                   /FAILED, INT' NOT SET OR READ BACK',
0650  0640            CLT1B                   /ERROR=SCOPE LOOP ADDRESS',
0651  0654            CLT1C=1                 /NEXT TEST',
0652  2005            ISZ     TALLY           /TEST LOOP COUNT',
0653  5240            JMP     CLT1B           /RETURN,
                      /
0654  4025            SETUP
0655  7300    CLT1C,  CLA CLL
0656  1374            TAD     (0002
0657  4156            DILE                    /SET CHANNEL',
0660  4162            DIRE                    /READ ENABLE INTO AC',
0661  0374            AND     (0002           /MASK TO CHECK FOR CHANNEL BIT',
0662  7640            SZA CLA
0663  5267            JMP     .+2             /CHANNEL SET AND READ BACK',
0664  4076            ERROR                   /FAILED, CANL NOT SET OR READ BACK',
0665  0655            CLT1C                   /ERROR=SCOPE LOOP ADDRESS',
0666  0671            CLT2=1                  /NEXT TEST',
0667  2005            ISZ     TALLY           /TEST LOOP COUNT',
0670  5255            JMP     CLT1C           /RETURN,
                      /
                      /CHECK THAT DICL WILL CLEAR ENABLES
                      /
0671  4025            SETUP
0672  7300    CLT2,   CLA CLL
0673  1372            TAD     (4003
0674  4156            DILE                    /SET ENABLES
0675  4125            DICL                    /CLEAR ENABLES
0676  4162            DIRE                    /READ ENABLE STAUS INTO AC',
0677  7650            SNA CLA
0700  5304            JMP     .+2             /ENABLES CLEARED, CONTINUE',
0701  4076            ERROR                   /FAILED, ENABLES NOT CLEARED,
0702  0672            CLT2                    /ERROR=SCOPE LOOP ADDRESS',
0703  0706            CLT3=1                  /NEXT TEST',
0704  2005            ISZ     TALLY           /TEST LOOP COUNT',
0705  5272            JMP     CLT2            /RETURN,
```



```
                      /
                      /CHECK THAT DILX WILL SET DONE AND NOT CLEAR AC',
                      /
0706  4025            SETUP
0707  7340    CLT3,   CLA CLL CMA             /SETUP VALUE OF
0710  3024            DCA     DELAY           /DELAY FOR VR8A SCOPE',
0711  7604            LAS                     /GET S,R',
0712  0371            AND     (1000           /CHECK BIT 2 FOR SCOPE SELECTION',
0713  7640            SZA CLA                 /SW 2 = 0, SETUP FOR VR14',
0714  5326            JMP     CLT3B           /SW 2 = 1, SETUP FOR VR8A',
0715  7604            LAS                     /GET SWITCHES
0716  0370            AND     (100            /MASK
0717  7650            SNA CLA                 /IS IT SET ?
0720  5324            JMP     CLT3A           /NO, VR14/8B
0721  1376            TAD     (-200           /YES, 61I/613
0722  3024            DCA     DELAY           /
0723  5326            JMP     CLT3B           /
0724  1367    CLT3A,  TAD     (-16            /SETUP VALUE OF
0725  3024            DCA     DELAY           /DELAY FOR VR12',
0726  7240    CLT3B,  CLA CMA                 /ALL 1'S TO AC',
0727  4131            DICD                    /CLEAR DONE',
0730  4142            DILX                    /LOAD X BUFFER',
0731  2024            ISZ     DELAY
0732  5331            JMP     .-1             /WAIT,
0733  4135            DISD                    /SKIP ON DONE',
0734  7410            SKP
0735  5341            JMP     .+4             /DONE SET, CONTINUE,
0736  4076            ERROR                   /FAILED, DONE WAS NOT SET',
0737  0707            CLT3                    /ERROR=SCOPE LOOP ADDRESS',
0740  1000            CLT4=1                  /NEXT TEST',
0741  7440            SZA                     /WAS AC CLEARED?
0742  5346            JMP     .+2             /NO, CONTINUE',
0743  4076            ERROR                   /YES, FAILED',
0744  0707            CLT3                    /ERROR=SCOPE LOOP ADDRESS',
0745  1000            CLT4=1                  /NEXT TEST',
0746  2005            ISZ     TALLY           /TEST LOOP COUNT',
0747  5307            JMP     CLT3            /RETURN,
0750  5771            JMP     CLT4=1          /NEXT TEST',

0767  7762
0770  0100
0771  1000
0772  4003
0773  0001
0774  0002
0775  0057
0776  7600
0777  5600
      1000            PAGE
```

```
                        /
                        /CHECK THAT DILY WILL SET DONE AND NOT CLEAR AC.
                        /
1000  4025              SETUP
1001  7340    CLT4,     CLA CLL CMA             /SETUP VALUE OF
1002  3024              DCA     DELAY           /DELAY FOR VR8SA SCOPE.
1003  7604              LAS                     /GET S,R.
1004  0377              AND     (1000           /CHECK BIT 2 FOR SCOPE SELECTION.
1005  7640              SZA CLA                 /S,R, 2=0, SETUP FOR VR14.
1006  5220              JMP     CLT4B           /S,R, 2=1, SETUP FOR VR8SA.
1007  7604              LAS                     /GET SWITCHES
1010  0376              AND     (100            /MASK
1011  7650              SNA CLA                 /IS IT SET ?
1012  5216              JMP     CLT4A           /NO, VR14/80
1013  1375              TAD     (-200           /YES, 611/613
1014  3024              DCA     DELAY           /
1015  5220              JMP     CLT4B
1016  1374    CLT4A,    TAD     (-16            /SETUP VALUE OF
1017  3024              DCA     DELAY           /DELAY FOR VR14.
1020  7240    CLT4B,    CLA CMA                 /ALL 1'S TO AC.
1021  4131              DICD                    /CLEAR DONE.
1022  4146              DILY                    /LOAD Y BUFFER.
1023  2024              ISZ     DELAY
1024  5223              JMP     .-1
1025  4135              DISD                    /SKIP ON DONE.
1026  7410              SKP
1027  5233              JMP     .+4             /DONE SET, CONTINUE.
1030  4076              ERROR                   /FAILED, DONE WAS NOT SET.
1031  1001              CLT4                    /ERROR-SCOPE LOOP ADDRESS.
1032  1042              CLT5-1                  /NEXT TEST.
1033  7440              SZA                     /WAS AC CLEARED?
1034  5240              JMP     .+2             /NO, CONTINUE.
1035  4076              ERROR                   /YES, FAILED.
1036  1001              CLT4                    /ERROR-SCOPE LOOP ADDRESS.
1037  1042              CLT5-1                  /NEXT TEST.
1040  2005              ISZ     TALLY           /TEST LOOP COUNT.
1041  5201              JMP     CLT4            /RETURN.
```



```
                        /
                        /CHECK THAT DIXY WILL SET DONE.
                        /
1042  4025              SETUP
1043  7300    CLT5,     CLA CLL
1044  4125              DICL                    /CLEAR FLAGS.
1045  4152              DIXY                    /INTENSIFY AND SET DONE.
1046  4135              DISD                    /SKP ON DONE.
1047  7410              SKP
1050  5254              JMP     .+4             /DONE SET, CONTINUE.
1051  4076              ERROR                   /FAILED, DONE NOT SET.
1052  1043              CLT5                    /ERROR-SCOPE LOOP ADDRESS.
1053  1056              CLT6-1                  /NEXT TEST.
1054  2005              ISZ     TALLY           /TEST LOOP COUNT.
1055  5243              JMP     CLT5            /RETURN.
                        /
                        /CHECK THAT DICD CLEARS DONE FLAG.
                        /
1056  4025              SETUP
1057  7300    CLT6,     CLA CLL
1060  4152              DIXY                    /SET DONE.
1061  4131              DICD                    /CLEAR DONE.
1062  4162              DIRE                    /READ ENABLE STATUS INTO AC.
1063  7650              SNA CLA
1064  5270              JMP     .+2             /DONE CLEARED, CONTINUE.
1065  4076              ERROR                   /FAILED, DONE NOT CLEARED.
1066  1057              CLT6                    /ERROR-SCOPE LOOP ADDRESS.
1067  1072              CLT7-1                  /NEXT TEST.
1070  2005              ISZ     TALLY           /TEST LOOP COUNT.
1071  5257              JMP     CLT6            /RETURN.
```

```
                        /
                        /CHECK THAT DISD WILL SKIP ON DONE FLAG AND NOT CLEAR FLAG.
                        /
1072  4025              SETUP
1073  7300    CLT7,     CLA CLL
1074  4152              DIXY                    /SET DONE.
1075  4135              DISD                    /SKP ON DONE.
1076  7610              SKP CLA
1077  5303              JMP     .+4             /SKIP WORKED, CONTINUE.
1100  4076              ERROR                   /FAILED, DISD DID NOT CAUSE SKP ON DONE.
1101  1073              CLT7                    /ERROR-SCOPE LOOP ADDRESS.
1102  1121              CLT8-1                  /NEXT TEST.
1103  4162              DIRE                    /READ ENABLE STATUS INTO AC.
1104  7640              SZA CLA                 /DONE = 1?
1105  5311              JMP     .+4             /YES, CONTINUE.
1106  4076              ERROR                   /NO, FAILED.
1107  1073              CLT7                    /ERROR-SCOPE LOOP ADDRESS.
1110  1121              CLT8-1                  /NEXT TEST.
1111  4131              DICD                    /CLEAR DONE.
1112  4135              DISD                    /SKP ON DONE.
1113  5317              JMP     .+4
1114  4076              ERROR                   /FAILED, DISD SKIPPED ON DONE=0.
1115  1073              CLT7                    /ERROR-SCOPE LOOP ADDRESS.
1116  1121              CLT8-1                  /NEXT TEST.
1117  2005              ISZ     TALLY           /TEST LOOP COUNT.
1120  5273              JMP     CLT7            /RETURN.
                        /
                        /CHECK THAT INTERRUPT ENABLE REGISTER ALONE WILL
                        /NOT CAUSE AN INTERRUPT.
1121  4025              SETUP
1122  7300    CLT8,     CLA CLL
1123  1373              TAD     (ERR8           /GET RETURN ADDRESS.
1124  3002              DCA     RETURN          /SETUP RETURN ADDRESS.
1125  6007              CAF                     /CLEAR ALL.
1126  7001              IAC                     /SETUP AC TO
1127  4156              DILE                    /ENABLE INTERRUPT REGISTER.
1130  6001              ION                     /TURN INTERRUPT ON.
1131  7000              NOP                     /WAIT.
1132  6002              IOF                     /TURN INTERRUPT OFF.
1133  5337              JMP     .+4             /NO INTERRUPT OCCURRED, CONTINUE.
1134  4076    ERR8,     ERROR                   /FAILED, INTERRUPT TOOK PLACE.
1135  1122              CLT8                    /ERROR-SCOPE LOOP ADDRESS.
1136  1200              CLT9-1                  /NEXT TEST.
1137  2005              ISZ     TALLY           /TEST LOOP COUNT.
1140  5322              JMP     CLT8            /RETURN.
1141  5772              JMP     CLT9-1          /NEXT TEST.

1172  1200
1173  1134
1174  7762
1175  7600
1176  0100
1177  1000
      1200              PAGE
```



```
                        /
                        /CHECK THAT DONE REGISTER ALONE WILL NOT CAUSE
                        /AN INTERRUPT.
1200  4025              SETUP
1201  7300    CLT9,     CLA CLL
1202  1377              TAD     (ERR9           /GET RETURN ADDRESS.
1203  3002              DCA     RETURN          /SETUP RETURN ADDRESS.
1204  6007              CAF                     /CLEAR ALL.
1205  1376              TAD     (4000           /SETUP AC TO
1206  4156              DILE                    /ENABLE DONE FLAG.
1207  6001              ION                     /TURN INTERRUPT ON.
1210  7000              NOP                     /WAIT.
1211  6002              IOF                     /TURN INTERRUPT OFF.
1212  5216              JMP     .+4             /NO INTERRUPT OCCURRED, CONTINUE.
1213  4076    ERR9,     ERROR                   /FAILED, INTERRUPT TOOK PLACE.
1214  1201              CLT9                    /ERROR-SCOPE LOOP ADDRESS.
1215  1220              CLT10-1                 /NEXT TEST.
1216  2005              ISZ     TALLY           /TEST LOOP COUNT.
1217  5201              JMP     CLT9            /RETURN.
                        /
                        /CHECK THAT DONE AND INTERRUPT ENABLE WILL CAUSE AN
                        /INTERRUPT.
1220  4025              SETUP
1221  7300    CLT10,    CLA CLL
1222  1375              TAD     (OK10           /GET RETURN ADDRESS.
1223  3002              DCA     RETURN          /SETUP RETURN ADDRESS.
1224  7001              IAC                     /SETUP AC TO
1225  4152              DIXY                    /ENABLE DONE
1226  4156              DILE                    /AND INTERRUPT.
1227  6001              ION                     /TURN INTERRUPT ON.
1230  7000              NOP                     /WAIT.
1231  6002              IOF                     /TURN INTERRUPT OFF.
1232  4076              ERROR                   /FAILED, INTERRUPT DID NOT TAKE PLACE.
1233  1221              CLT10                   /ERROR-SCOPE LOOP ADDRESS.
1234  1237              CLT11-1                 /NEXT TEST.
1235  2005    OK10,     ISZ     TALLY           /TEST LOOP COUNTER.
1236  5221              JMP     CLT10           /RETURN.
```

```
                        /
                        /CHECK THAT DILX WILL CLEAR DONE.
                        /
1237  4025              SETUP
1240  7300    CLT11,    CLA CLL
1241  1143              TAD     RDILX           /GET LOAD X IOT
1242  3250              DCA     CLT11A          /SAVE IT
1243  1163              TAD     RDIRE           /GET READ ENABLE IOT
1244  3251              DCA     CLT11A+1        /SAVE IT
1245  4142              DILX                    /LOAD X
1246  4135              DISD                    /WAIT FOR DONE
1247  5246              JMP     .-1
1250  7402    CLT11A,   XX                      /DONE IS SET, NOW EXECUTE A LOAD X
                                                / AND CLEAR DONE
1251  7402              XX                      /READ ENABLES
1252  0376              AND     (4000           /MASK TO DNE
1253  7450              SNA                     /IS IT SET ?
1254  5260              JMP     .+4             /NO, IT WAS CLEARED
1255  4076              ERROR                   /YES, IT WAS SET
1256  1240              CLT11                   / DILX FAILED TO CLEAR DONE
1257  1262              CLT12+1                 /NEXT TEST
1260  2005              ISZ     TALLY           /TEST LOOP COUNTER
1261  5240              JMP     CLT11           /RETURN
                        /
                        /CHECK THAT DILY WILL CLEAR DONE.
                        /
1262  4025              SETUP
1263  7300    CLT12,    CLA CLL
1264  1147              TAD     RDILY           /GET LOAD Y IOT
1265  3273              DCA     CLT12A          /SAVE IT
1266  1163              TAD     RDIRE           /GET READ ENABLE
1267  3274              DCA     CLT12A+1        /SAVE IT
1270  4146              DILY                    /LOAD Y
1271  4135              DISD                    /WAIT FOR DONE
1272  5271              JMP     .-1
1273  7402    CLT12A,   XX                      /LOAD Y AND CLEAR DONE
1274  7402              XX                      /READ ENABLE
1275  0376              AND     (4000           /MASK TO DONE
1276  7450              SNA                     /IS IT SET ?
1277  5303              JMP     .+4             /NO, NEXT TEST
1300  4076              ERROR                   /DILY FAILED TO CLEAR DONE
1301  1263              CLT12                   /
1302  0606              CLT1-3                  /NEXT TEST
1303  2005              ISZ     TALLY           /TEST LOOP COUNTER
1304  5263              JMP     CLT12           /RETURN
1305  2021              ISZ     TALLYA          /TEST PASS COUNTER
1306  5774'             JMP     CLT1-3          /RETURN
1307  5773'             JMP     CLTST           /RETEST

1373  0600
1374  0606
1375  1235
1376  4000
1377  1213
      1400              PAGE
```



```
                        //HORIZONTAL LINE SEGMENT TEST
                        //DISPLAY FOUR HORIZONTAL LINE SEGMENTS
                        //CHECK FOR PLYBACK TRACE
1400  6007    HORTST,   CAF
1401  4777'             JMS     MESAGE
1402  4006              MSG10
1403  7300              CLA CLL
1404  4776'             JMS     SETHOR          /SETUP FOR HORIZONTAL LINES.
1405  4044    HORFLY,   JMS     SELCHN          /CHECK FOR VR-14 CHANNEL.
1406  7200              CLA                     /DISPLAY HORIZONTAL LINE AT Y=1001 (RIGHT).
1407  1375              TAD     (1001           /NON-VARIABLE AXIS ORIGIN (Y).
1410  4774'             JMS     PLINE           /ROUTINE TO INCREMENT X AXIS.
1411  7377              -401                    /PLOT COUNTER.
1412  1001              1001                    /ORIGIN OF X AXIS.
1413  7200              CLA                     /DIAPLAY HORIZONTAL LINE AT Y=777(RIGHT).
1414  1373              TAD     (0777           /NON-VARIABLE AXIS ORIGIN (Y).
1415  4774'             JMS     PLINE           /ROUTINE TO INCREMENT X AXIS.
1416  7377              -401                    /PLOT COUNTER.
1417  1001              1001                    /ORIGIN OF XAXIS.
1420  7200              CLA                     /DISPLAY HORIZONTAL LINE AT Y=1001 (LEFT).
1421  1375              TAD     (1001           /NON-VARIABLE AXIS ORIGIN (Y).
1422  4772'             JMS     MLINE           /ROUTINE TO DECREMENT X AXIS.
1423  7377              -401                    /PLOT COUNTER.
1424  0777              0777                    /ORIGIN OF X AXIS.
1425  7200              CLA                     /DISPLAY HORIZONTAL LINE AT Y=777 (LEFT).
1426  1373              TAD     (0777           /NON-VARIABLE AXIS ORIGIN (Y).
1427  4772'             JMS     MLINE           /ROUTINE TO DECREMENT X AXIS.
1430  7377              -401                    /PLOT COUNTER.
1431  0777              0777                    /ORIGIN OF X AXIS
1432  4036              JMS     CKSW7           /SW7=0, RETURN TO DISPITCH.
1433  5205              JMP     HORFLY          /SW7=1, CONTINUE IN CURRENT TEST.
```

```
                        //VERTICAL LINE SEGMENT TEST
                        //DISPLAY FOUR VERTICAL LINE SEGMENTS
                        //CHECK FOR FLYBACK TRACE
1434  6007    VERTST, CAF
1435  4777'           JMS     MESAGE
1436  3773            MSG9
1437  7300            CLA CLL
1440  4771'           JMS     SETVER          /SETUP FOR VERTICAL LINES.
1441  4044    VERFLY, JMS     SELCHN          /CHECK FOR VR-14 CHANNEL.
1442  7300            CLA CLL                 /DISPLAY VERTICAL LINE AT X=1001 (UP).
1443  1375            TAD     (1001           /NON-VARIABLE AXIS ORIGIN (X).
1444  4774'           JMS     PLINE           /ROUTINE TO INCREMENT Y AXIS.
1445  7377            -401                    /PLOT COUNTER.
1446  1001            1001                    /ORIGIN OF Y AXIS.
1447  7200            CLA                     /DISPLAY VERTICAL LINE AT X=0777 (UP).
1450  1373            TAD     (0777           /NON-VARIABLE AXIS ORIGIN (X).
1451  4774'           JMS     PLINE           /ROUTINE TO INCREMENT Y AXIS.
1452  7377            -401                    /PLOT COUNTER.
1453  1001            1001                    /ORIGIN OF Y AXIS.
1454  7200            CLA                     /DISPLAY VERTICAL LINE AT X=1001 (DOWN).
1455  1375            TAD     (1001           /NON-VARIABLE AXIS ORIGIN (X).
1456  4772'           JMS     MLINE           /ROUTINE TO DECREMENT Y AXIS.
1457  7377            -401                    /PLOT COUNTER.
1460  0777            0777                    /ORIGIN OF Y AXIS.
1461  7200            CLA                     /DISPLAY VERTICAL LINE AT X=0777 (DOWN)
1462  1373            TAD     (0777           /NON-VARIABLE AXIS ORIGIN (X)
1463  4772'           JMS     MLINE           /ROUTINE TO DECREMENT Y AXIS.
1464  7377            -401                    /PLOT COUNTER
1465  0777            0777                    /ORIGIN OF Y AXIS.
1466  4036            JMS     CKSW7           /SW7=0, RETURN TO DISPATCH.
1467  5241            JMP     VERFLY          /SW7=1, CONTINUE IN CURRENT TEST.

1571  2600
1572  2416
1573  0777
1574  2447
1575  1001
1576  2613
1577  5600
      1600            PAGE
```



```
                        //CORNERS - ROUTINE TO DISPLAY FOUR CORNERS
                        //WITH INTERSECTING DIAGONAL LINE SEGMENTS
                        //

1600  6007    CORTST, CAF
1601  4777'           JMS     MESAGE
1602  4022            MSG11
1603  7300            CLA CLL
1604  4044    CORNER, JMS     SELCHN          /CHECK FOR VR-14 CHANNEL.
1605  4776'           JMS     SETVER          /SETUP FOR VERTICAL LINES.
1606  7300            CLA CLL
1607  1375            TAD     (1001           /X AXIS ORIGIN.
1610  4774'           JMS     PLINE           /PLOT A VERTICAL LINE AT X=1001(UP)
1611  7577            -201                    /PLOT COUNTER.
1612  1001            1001                    /Y AXIS ORIGIN.
1613  7200            CLA
1614  1373            TAD     (0777
1615  4772'           JMS     MLINE           /PLOT A VERTICAL LINE AT X=777(DOWN)
1616  7577            -201
1617  0777            0777
1620  7200            CLA
1621  1375            TAD     (1001
1622  4772'           JMS     MLINE           /PLOT A VERTICAL LINE AT X=1001(DOWN)
1623  7577            -201
1624  0777            0777
1625  7200            CLA
1626  1373            TAD     (0777
1627  4774'           JMS     PLINE           /PLOT A VERTICAL LINE AT X=777(UP)
1630  7577            -201
1631  1001            1001
1632  4771'           JMS     SETHOR          /SETUP FOR HORIZONTAL LINES.
1633  7200            CLA
1634  1373            TAD     (0777           /Y AXIS ORIGIN.
1635  4774'           JMS     PLINE           /PLOT HORIZONTAL LINE AT Y=777(RIGHT)
1636  7577            -201
1637  1001            1001
1640  7200            CLA
1641  1375            TAD     (1001
1642  4774'           JMS     PLINE           /PLOT HORIZONTAL LINE AT Y=1001(RIGHT)
1643  7577            -201
1644  1001            1001
```

```
1645  7200          CLA
1646  1373          TAD     (0777
1647  4772'         JMS     MLINE           /PLOT HORIZONTAL LINE AT Y=777(LEFT)
1650  7577          -201
1651  0777          0777
1652  7200          CLA
1653  1375          TAD     (1001
1654  4772'         JMS     MLINE           /PLOT HORIZONTAL LINE AT Y=1001(LEFT)
1655  7577          -201
1656  0777          0777
1657  7200          CLA
1660  4770'         JMS     DIAG1           /PLOT DIAGNOL LINE (LOWER LEFT)
1661  7577          -201
1662  1001          1001
1663  7200          CLA
1664  4770'         JMS     DIAG1           /PLOT DIAGNOL LINE (UPPER RIGHT)
1665  7577          -201
1666  0577          0577
1667  7200          CLA
1670  4767'         JMS     DIAG2           /PLOT DIAGNOL LINE (UPPER LEFT)
1671  7577          -201
1672  1001          1001                    /X ORIGIN,
1673  0777          0777                    /Y ORIGIN,
1674  7200          CLA
1675  4767'         JMS     DIAG2           /PLOT DIAGNOL LINE (LOWER RIGHT)
1676  7577          -201
1677  0577          0577
1700  1201          1201
1701  4036          JMS     CKSW7
1702  5204          JMP     CORNER
```



```
                /SUBROUTINE TO SET INCREMENT SIZE

1703  0000      STSIZE, 0
1704  7300              CLA CLL
1705  1766'             TAD     SIZE
1706  7640              SZA CLA
1707  5315              JMP     STSIZA          /INCREMENT BY 10
1710  7001              IAC
1711  3765'             DCA     PSIZE           /NO INCREMENT BY 1
1712  7040              CMA
1713  3764'             DCA     MSIZE           /
1714  5703              JMP I   STSIZE

1715  1363      STSIZA, TAD     (10
1716  3765'             DCA     PSIZE           /SET UP  INCREMENT
1717  1362              TAD     (-10
1720  3764'             DCA     MSIZE
1721  3766'             DCA     SIZE
1722  5703              JMP I   STSIZE

                /WAIT SUBROUTINE FOR WRITE-THRU MODE TEST

1723  0000      WAIT,   0
1724  7300              CLA CLL
1725  1362              TAD     (-10
1726  3341              DCA     WAITA           /SET UP DELAY COUNTER
1727  3342              DCA     WAITB           /SET UP DELAY
1730  4036      WAIT1,  JMS     CKSW7           /CHECK SW ?
1731  4152              DIXY                    /INTENSIFY
1732  4135              DISD                    /DONE
1733  5332              JMP     .-1
1734  2342              ISZ     WAITB           /DELAY
1735  5330              JMP     WAIT1
1736  2341              ISZ     WAITA           /FINISHED ?
1737  5330              JMP     WAIT1
1740  5723              JMP I   WAIT            /EXIT

1741  7770      WAITA,  -10
1742  0000      WAITB,  0
1762  7770
1763  0010
1764  0324
1765  0323
1766  0322
1767  2664
1770  2626
1771  2613
1772  2416
1773  0777
1774  2447
1775  1001
1776  2600
1777  5600
      2000            PAGE
```

```
                        //ROUTINE TO DISPLAY DIAGONALS
                        //
2000  6007    DBTST,    CAF
2001  4777'             JMS     MESAGE
2002  4235              MSG19
2003  7300              CLA CLL
2004  4044    DIABIS,   JMS     SELCHN          /CHECK FOR VR-I4 CHANNEL.
2005  7604              LAS                     /GET S,R.
2006  0376              AND     (0100           /MASK TO CHECK SW5.
2007  7640              SZA CLA                 /SW5 = 0, PLOT LL TO UR DIAGONAL.
2010  5215              JMP     .+5             /SW5 = 1, PLOT UL TO LR DIAGONAL.
2011  4775'             JMS     DIAG1           /PLOT LL TO UR DIAGONAL.
2012  5777              -2001
2013  1001              1001
2014  5221              JMP     .+5
2015  4774'             JMS     DIAG2           /PLOT UL TO LR DIAGONAL.
2016  6000              -2000
2017  1001              1001
2020  0777              0777
2021  4036              JMS     CK5W7           /SW7=0, RETURN TO DISPATCH.
2022  5204              JMP     DIABIS          /SW7=1, CONTINUE PLOT.

                        //ROUTINE TO MOVE A VERTICAL BAR HORIZONTALLY.
                        //
2023  6007    VRBTST,   CAF
2024  4777'             JMS     MESAGE
2025  4033              MSG12
2026  7300              CLA CLL
2027  4044              JMS     SELCHN          /CHECK FOR VR-I4 CHANNEL.
2030  4773'             JMS     SETVER          /SETUP FOR VERTICAL LINES.
2031  7200              CLA
2032  1372              TAD     (-2000
2033  3255              DCA     HORCNT          /SET UP X AXIS COUNTER.
2034  1371              TAD     (1001           /SET UP X ORIGIN.
2035  3256              DCA     XVERT
2036  7200    VERBAR,   CLA
2037  1256              TAD     XVERT           /GET X COORDINATE.
2040  4770'             JMS     PLINE           /PLOT VERTICAL BAR.
2041  5777              -2001                   /COUNT.
2042  1001              1001                    /Y COORDINATE.
2043  7604              LAS                     /GET S,R.
2044  0376              AND     (0100           /MASK BIT 5
2045  7640              SZA CLA                 /S,R, 5 = 0 CONTINUE LINE MOVE.
2046  5236              JMP     VERBAR          /S,R, 5 = 1 HALT LINE MOVEMENT.
2047  2256              ISZ     XVERT           /UPDATE X COORDINATE.
2050  7000              NOP                     /UPDATE X AXIS COUNTER.

2051  2255              ISZ     HORCNT          /IS PLOT COMPLETE?
2052  5236              JMP     VERBAR          /NO, CONTINUE.
2053  4036              JMS     CK5W7           /SW7=0, RETURN TO DISPATCH.
2054  5223              JMP     VRBTST          /SW7=1, CONTINUE IN CURRENT TEST.
2055  0000    HORCNT,   0
2056  0000    XVERT,    0
```



```
                        //ROUTINE TO MOVE A HORIZONTAL BAR VERTICALLY.
                        //
2057  6007    HRBTST,   CAF
2060  4777'             JMS     MESAGE
2061  4046              MSG13
2062  7300              CLA CLL
2063  4044              JMS     SELCHN          /CHECK FOR VR-I4 CHANNEL.
2064  4767'             JMS     SETHOR          /SETUP FOR HORIZONTAL LINES.
2065  7200              CLA
2066  1372              TAD     (-2000
2067  3311              DCA     VERCNT          /SETUP Y AXIS COUNTER.
2070  1371              TAD     (1001           /SETUP Y ORIGIN.
2071  3312              DCA     YVERT
2072  7200    HORBAR,   CLA
2073  1312              TAD     YVERT           /GET Y COORDINATE.
2074  4770'             JMS     PLINE           /PLOT HORIZONTAL BAR.
2075  5777              -2001                   /COUNT.
2076  1001              1001                    /X COORDINATE.
2077  7604              LAS                     /GET S,R.
2100  0376              AND     (0100           /MASK BIT 5
2101  7640              SZA CLA                 /SW 5 = 0 CONTINUE LINE MOVE.
2102  5272              JMP     HORBAR          /SW 5 = 1 HALT LINE MOVEMENT.
2103  2312              ISZ     YVERT           /UPDATE Y COORDINATE.
2104  7000              NOP                     /UPDATE Y AXIS COUNTER.
2105  2311              ISZ     VERCNT          /IS PLOT COMPLETE?
2106  5272              JMP     HORBAR          /NO, CONTINUE.
2107  4036              JMS     CK5W7           /SW7=0, RETURN TO DISPATCH.
2110  5257              JMP     HRBTST          /SW7=1, CONTINUE IN CURRENT TEST.
2111  0000    VERCNT,   0
2112  0000    YVERT,    0
2167  2613
2170  2447
2171  1001
2172  6000
2173  2600
2174  2664
2175  2626
2176  0100
2177  5600
      2200              PAGE
```

```
                        //SINGLE POINT PLOT TEST
                        //ALL COORDINANTS FROM S,R.
                        //
2200  6007    PNTST,    CAF
2201  4777'             JMS     MESAGE
2202  4062              MSG14
2203  4777'             JMS     MESAGE
2204  4100              MSG15
2205  7402              XX                      /HALT
2206  7604              LAS                     /GET X COORDINANT FROM SWITCHES.
2207  3240              DCA     XPOINT          /SAVE IT.
2210  4777'             JMS     MESAGE
2211  4133              MSG16
2212  7402              XX                      /HALT
2213  7604              LAS                     /GET Y COORDINANT FROM SWITCHES.
2214  3241              DCA     YPOINT          /SAVE IT.
2215  4777'             JMS     MESAGE
2216  4166              MSG17
2217  4777'             JMS     MESAGE
2220  4204              MSG18
2221  7402              XX                      /HALT
2222  7200    SINPNT,   CLA
2223  1240              TAD     XPOINT          /GET X COORDINANT.
2224  4142              DILX                    /LOAD X.
2225  4135              DISD                    /SKP ON DONE
2226  5225              JMP     .-1
2227  7200              CLA
2230  1241              TAD     YPOINT          /GET Y COORDINANT.
2231  4146              DILY                    /LOAD Y.
2232  4135              DISD                    /SKP ON DONE
2233  5232              JMP     .-1
2234  4152              DIXY                    /INTENSIFY
2235  4044              JMS     SELCHN
2236  4036              JMS     CKSW7           /SW7=0, RETURN TO DISPATCH.
2237  5222              JMP     SINPNT          /SW7=1, CONTINUE IN CURRENT TEST.

2240  0000    XPOINT,   0
2241  0000    YPOINT,   0
```



```
                        //DISPLAYED CALIBRATION TEST
                        //
2242  6007    DISTST,   CAF
2243  4777'             JMS     MESAGE
2244  4260              MSG21
2245  7340    DISCAL,   CLA CLL CMA             /INITIALIZE
2246  3776'             DCA     SWITCH          /SWITCH LOCATION.
2247  1375              TAD     (-13            /INITIALIZE
2250  3774'             DCA     CALCNT          /COUNTER.
2251  7604              LAS                     /GET S,R.
2252  0373              AND     (2000           /CHECK SW1
2253  7650              SNA CLA                 /TO DETERMINE X OR Y AXIS.
2254  5257              JMP     .+3
2255  4772'             JMS     SETVER          /SW1=1, SETUP Y AXIS.
2256  7410              SKP
2257  4771'             JMS     SETHOR          /SW1=0, SETUP X AXIS.
2260  1370              TAD     (TABLEA         /INITIALIZE POINTER.
2261  3326              DCA     PNTR2           /FOR CALIBRATION PICKUP.
2262  1726              TAD I   PNTR2           /PICKUP CAL VALUE.
2263  3003              DCA     SUM1
2264  4767'             JMS     CALSND          /OUTPUT LIMITS OF LINE TO TTY.
2265  1003    DISLOP,   TAD     SUM1            /GET BIT
2266  7040              CMA                     /TO DETERMINE
2267  1366              TAD     (-1             /LENGTH OF LINE.
2270  3272              DCA     VARYCT          /SETUP PLOT COUNTER.
2271  4765'             JMS     PLINE           /PLOT LINE.
2272  7402    VARYCT,   XX                      /MODIFIED TO PLOT COUNT.
2273  0000              0000                    /ORIGIN OF LINE.
2274  4036              JMS     CKSW7           /CHECK TEST LOOP SWITCH.
2275  4044              JMS     SELCHN          /CHECK VR-14 CHANNEL.
2276  7704              LAS CLL                 /GET S,R.
2277  7006              RTL                     /CHECK SW0
2300  0364              AND     (1              /TO SEE IF IT WAS
2301  1776'             TAD     SWITCH          /CHANGED SINCE
2302  7640              SZA CLA                 /LAST PASS.
2303  5265              JMP     DISLOP          /NO, CONTINUE IN PRESENT PLOT.
2304  1776'             TAD     SWITCH          /YES, RESET
2305  7040              CMA                     /LOCATION
2306  3776'             DCA     SWITCH          /SWITCH.
2307  2326              ISZ     PNTR2           /INCREMENT POINTER.
2310  2774'             ISZ     CALCNT          /HAS PRESENT AXIS CALED OUT?
2311  5262              JMP     DISLOP+3        /NO,GET NEXT VALUE.
2312  5247              JMP     DISCAL+2        /YES, RETURN TO BEGIN OF ROUTINE.
```

```
2313  0000    TABLEA, 0000
2314  0001            0001
2315  0003            0003
2316  0007            0007
2317  0017            0017
2320  0037            0037
2321  0077            0077
2322  0177            0177
2323  0377            0377
2324  0777            0777
2325  1777            1777

2326  0000    PNTR2,  0


2364  0001
2365  2447
2366  7777
2367  3447
2370  2313
2371  2613
2372  2600
2373  2000
2374  0455
2375  7765
2376  0454
2377  5600
      2400            PAGE
```



```
                      //CROSSING DIAGONALS TEST
                      //
2400  6007    CROTST, CAF
2401  4777'           JMS     MESAGE
2402  4244            MSG20
2403  7300            CLA CLL
2404  4044    XCROS,  JMS     SELCHN          /CHECK FOR VR-14 CHANNEL.
2405  4776'           JMS     DIAG1           /PLOT LL TO UR DIAGONAL.
2406  7000            -1000                   /COUNT.
2407  1400            1400                    /X AND Y ORIGINS.
2410  4775'           JMS     DIAG2           /PLOT UL TO LR DIAGONAL.
2411  6777            -1001                   /COUNT.
2412  1400            1400                    /X ORIGIN.
2413  3400            0400                    /Y ORIGIN.
2414  4036            JMS     CKSW7           /SW7=0, RETURN TO DISPITCH.
2415  5204            JMP     XCROS           /SW7=1, CONTINUE PLOT.
                      //SUBROUTINE TO DISPLAY A LINE (MINUS INCREMENTS)
                      //HORIZONTAL OR VERTICAL
                      //
2416  2000    MLINE,  0
2417  7402    DISP3,  XX                      /MODIFIED TO DISPLAY IOT.
2420  4566            JMS I   SETSIZ          /SET UP SIZE INCREMENT
2421  1136            TAD     RDISD           /SETUP
2422  3234            DCA     DISP4-2
2423  1136            TAD     RDISD           /SETUP
2424  3237            DCA     DISP4+2         /SKIP ON DONE IOT.
2425  1153            TAD     RDIXY           /SETUP
2426  3236            DCA     DISP4+3         /INTENSIFY IOT.
2427  1616            TAD I   MLINE           /GET PLOT COUNT.
2430  3300            DCA     PLOTCT          /SAVE IT.
2431  2216            ISZ     MLINE
2432  1616            TAD I   MLINE
2433  5241            JMP     DISP4
2434  6052            6052                    /SKIP ON DONE.
2435  5234            JMP     .-1             /WAIT FOR DONE.
2436  6055            6055                    /INTENSIFY
2437  6052            6052
2440  5237            JMP     .+1
2441  7402    DISP4,  XX                      /MODIFIED TO LOAD IOT.
2442  1774'           TAD     MSIZE           /DECREMENT VARIABLE AXIS.
2443  2300            ISZ     PLOTCT          /IS PLOT COMPLETE?
2444  5234            JMP     DISP4-2         /NO, CONTINUE PLOT.
2445  2216            ISZ     MLINE           /YES, SETUP RETURN.
2446  5616            JMP I   MLINE           /RETURN
```

```
                        //SUBROUTINE TO DISPLAY A LINE (PLUS INCREMENTS)
                        //HORIZONTAL OR VERTICAL
2447  0000    PLINE,  0
2450  7402    DISP1,  XX                      /MODIFIED TO DISPLAY IOT.
2451  4566            JMS I   SETSIZ
2452  1136            TAD     RDISD           /SETUP
2453  3265            DCA     DISP2-5
2454  1136            TAD     RDISD           /SETUP
2455  3270            DCA     DISP2-2         /SKIP ON DONE IOT.
2456  1153            TAD     RDIXY           /SETUP
2457  3267            DCA     DISP2-3         /INTENSIFY IOT.
2460  1647            TAD I   PLINE           /GET PLOT COUNT.
2461  3300            DCA     PLOTCT          /SAVE IT.
2462  2247            ISZ     PLINE
2463  1647            TAD I   PLINE           /GET ORIGIN OF VARIABLE AXIS.
2464  5272            JMP     DISP2
2465  6052                    6052            /SKIP ON DONE.
2466  5265            JMP     .-1             /WAIT FOR DONE.
2467  6055                    6055            /INTENSIFY
2470  6052                    6052
2471  5270            JMP     .-1
2472  7402    DISP2,  XX                      /MODIFIED TO LOAD IOT.
2473  1773'           TAD     PSIZE           /INCREMENT VARIABLE AXIS.
2474  2300            ISZ     PLOTCT          /IS PLOT COMPLETE?
2475  5265            JMP     DISP2-5         /NO, CONTINUE PLOT.
2476  2247            ISZ     PLINE           /YES, SETUP RETURN.
2477  5647            JMP I   PLINE           /RETURN

2500  0000    PLOTCT, 0

                        //SUBROUTINE TO DISPLAY A BOX WITH A X IN THE CENTER
                        ///// PINCUSHION TEST ///////
                        /

2501  0000    COLADJ, 0
2502  4772'           JMS     SETHOR          /SET-UP HORIZ.
2503  7240            CLA CMA
2504  3771'           DCA     SIZE            /SET UP SIZE
2505  1370            TAD     (1001
2506  4247            JMS     PLINE           /DRAW LOWER LINE
2507  7577            -201
2510  1001            1001

2511  4767'           JMS     SETVER
2512  7240            CLA CMA
2513  3771'           DCA     SIZE
2514  1366            TAD     (777
2515  4247            JMS     PLINE           /DRAW RIGHT LINE
2516  7577            -201
2517  1000            1000

2520  4772'           JMS     SETHOR          /SET-UP HORIZ.
2521  7240            CLA CMA
2522  3771'           DCA     SIZE            /SET-UP SIZE
```



```
2523  1366            TAD     (777
2524  4216            JMS     MLINE           /DRAW TOP LINE
2525  7577            -201
2526  0777            777

2527  4767'           JMS     SETVER
2530  7240            CLA CMA
2531  3771'           DCA     SIZE
2532  1370            TAD     (1001
2533  4216            JMS     MLINE           /DRAW LEFT LINE
2534  7577            -201
2535  0777            777

2536  7240            CLA CMA
2537  3771'           DCA     SIZE
2540  4776'           JMS     DIAG1           /PLOT LL TO UR LINE
2541  7700            -100
2542  1400            1400
2543  7240            CLA CMA
2544  3771'           DCA     SIZE
2545  4775'           JMS     DIAG2           /PLOT UL TO LR DIAG
2546  7700            -100
2547  1400            1400
2550  0400            400
2551  7000            NOP
2552  7000            NOP
2553  5701            JMP I   COLADJ          /EXIT
2566  0777
2567  2600
2570  1001
2571  0322
2572  2613
2573  0323
2574  0324
2575  2664
2576  2626
2577  5600
      2600      PAGE

                        //SUBROUTINE TO SETUP DISPLAY IOT'S FOR VERTICAL PLOT//
2600  0000    SETVER, 0
2601  7200            CLA
2602  1143            TAD     RDILX
2603  3777'           DCA     DISP1
2604  1147            TAD     RDILY
2605  3776'           DCA     DISP2
2606  1143            TAD     RDILX
2607  3775'           DCA     DISP3
2610  1147            TAD     RDILY
2611  3774'           DCA     DISP4
2612  5600            JMP I   SETVER
```

```
                        //SUBROUTINE TO SETUP DISPLAY IOT'S FOR HORIZONTAL PLOT//
2613  0000  SETHOR,  0
2614  7200          CLA
2615  1147          TAD     RDILY
2616  3777          DCA     DISP1
2617  1143          TAD     RDILX
2620  3776          DCA     DISP2
2621  1147          TAD     RDILY
2622  3775          DCA     DISP3
2623  1143          TAD     RDILX
2624  3774          DCA     DISP4
2625  5613          JMP I   SETHOR

                        //SUBROUTINE TO DISPLAY A DIAGONAL LINE
                        //FROM LOWER LEFT TO UPPER RIGHT.
                        //
2626  0000  DIAG1,   0
2627  4566          JMS I   SETSIZ
2630  1136          TAD     RDISD
2631  3247          DCA     DIAG1A-5
2632  1136          TAD     RDISD           /SETUP
2633  3252          DCA     DIAG1A-2        /SKIP ON DONE IOT.
2634  1153          TAD     RDIXY           /SETUP
2635  3251          DCA     DIAG1A-3        /INTENSIFY IOT.
2636  1143          TAD     RDILX           /SETUP
2637  3254          DCA     DIAG1A          /LOAD X IOT.
2640  1147          TAD     RDILY           /SETUP
2641  3255          DCA     DIAG1A+1        /LOAD Y IOT.
2642  1626          TAD I   DIAG1           /SETUP COUNTER.
2643  3263          DCA     DIACNT
2644  2226          ISZ     DIAG1
2645  1626          TAD I   DIAG1
2646  5254          JMP     DIAG1A
2647  6052          6052                    /SKIP ON DONE.
2650  5247          JMP     .-3             /WAIT FOR DONE.
2651  6055          6055                    /INTENSIFY
2652  6052          6052
2653  5252          JMP     .-3
2654  6053  DIAG1A, 6053                    /LOAD X
2655  6054          6054                    /LOAD Y
2656  1773          TAD     PSIZE           /INCREMENT COORDINANT.
2657  2263          ISZ     DIACNT          /IS PLOT COMPLETE?
2660  5247          JMP     DIAG1A-5        /NO, CONTINUE PLOT.
2661  2226          ISZ     DIAG1           /YES, SETUP RETURN.
2662  5626          JMP I   DIAG1           /RETURN

2663  0000  DIACNT,  0
```



```
                        //SUBROUTINE TO DISPLAY A DIAGNOL LINE
                        //FROM UPPER LEFT TO LOWER RIGHT.
                        //
2664  0000  DIAG2,   0
2665  4566          JMS I   SETSIZ
2666  1136          TAD     RDISD           /SETUP
2667  3316          DCA     DIAG2A-2
2670  1136          TAD     RDISD           /SETUP
2671  3334          DCA     DIAG2B
2672  1136          TAD     RDISD           /SETUP
2673  3313          DCA     DIAG2A-5        /SKIP ON DONE IOT.
2674  1153          TAD     RDIXY           /SETUP
2675  3315          DCA     DIAG2A-3        /INTENSIFY IOT.
2676  1143          TAD     RDILX           /SETUP
2677  3321          DCA     DIAG2A+1        /LOAD X IOT.
2700  1147          TAD     RDILY           /SETUP
2701  3324          DCA     DIAG2A+4        /LOAD Y IOT.
2702  1664          TAD I   DIAG2           /SETUP COUNTER.
2703  3263          DCA     DIACNT
2704  2264          ISZ     DIAG2
2705  1664          TAD I   DIAG2
2706  3772          DCA     XPOINT
2707  2264          ISZ     DIAG2
2710  1664          TAD I   DIAG2
2711  3771          DCA     YPOINT
2712  5328          JMP     DIAG2A
2713  6052          6052                    /SKIP ON DONE.
2714  5313          JMP     .-3             /WAIT FOR DONE.
2715  6055          6055                    /INTENSIFY
2716  6052          6052
2717  5316          JMP     .-3
2720  1772  DIAG2A, TAD     XPOINT          /GET X COORDINANT.
2721  6053          6053                    /LOAD X
2722  7200          CLA
2723  1771          TAD     YPOINT          /GET Y COORDINANT.
2724  6054          6054                    /LOAD Y
2725  1770          TAD     MSIZE           /DECREMENT Y.
2726  3771          DCA     YPOINT          /SAVE Y.
2727  1772          TAD     XPOINT          /GET X COORDINANT.
2730  1773          TAD     PSIZE           /INCREMENT X.
2731  3772          DCA     XPOINT          /SAVE X.
2732  2263          ISZ     DIACNT          /IS PLOT COMPLETE?
2733  5313          JMP     DIAG2A-5        /NO, CONTINUE PLOT.
2734  6052  DIAG2B, 6052                    /WAIT FOR LAST DONE
2735  5334          JMP     .-3
2736  2264          ISZ     DIAG2           /YES, SETUP RETURN.
2737  5664          JMP I   DIAG2           /RETURN
```

```
                    /COLOR ADJUSTMENT TEST

2740  6007    ADJCOL, CAF
2741  4767/           JMS     MESAGE
2742  4343            MSG24

2743  7300            CLA CLL
2744  7000            NOP
2745  3005            DCA     TALLY

2746  7300    ADJCLA, CLA CLL
2747  1366            TAD     (6
2750  4156            DILE                    /CHANGE TO RED COLOR AND CHANNEL 2
2751  4135            DISD                    /DONE
2752  5331            JMP     .-1
2753  4765/           JMS     COLADJ          /PLOT PINCUSHION TEST
2754  7300            CLA CLL
2755  4156            DILE                    /CHANGE TO GREEN AND CHANNEL 1
2756  4135            DISD                    /DONE ?
2757  5356            JMP     .-1
2760  4765/           JMS     COLADJ          /PLOT PINCUSHION TEST
2761  4036            JMS     CKSW7           /SW7=0 RETURN TO DISPATCH
2762  2005            ISZ     TALLY
2763  5346            JMP     ADJCLA
2764  5340            JMP     ADJCOL

2765  2501
2766  0006
2767  5600
2770  0324
2771  2241
2772  2240
2773  0323
2774  2441
2775  2417
2776  2472
2777  2450
      3000            PAGE
```



```
3000  5074    ERMSG,  EMSG20
3001  5125            EMSG21
3002  5154            EMSG22
3003  5203            EMSG23
3004  5240            EMSG24
3005  5274            EMSG25
3006  5330            EMSG26
3007  5363            EMSG27
3010  7000            NOP
3011  7000            NOP
3012  7000            NOP

                      /
                      / COLOR AND STORAGE SCOPE LOGIC TEST
                      /
3013  6007    COLOR,  CAF
3014  4777/           JMS     MESAGE
3015  4300            MSG22
3016  7300            CLA CLL
3017  1376            TAD     (-200
3020  3021            DCA     TALLYA
3021  7300    COLO,   CLA CLL
3022  1375            TAD     (ERMSG-1
3023  3035            DCA     MSGPNT
3024  4025            SETUP
3025  7300    CLT20,  CLA CLL
3026  1374            TAD     (40             /LOAD WRITE THRU
3027  4156            DILE                    / MODE BIT
3030  4162            DIRE                    /READ ENABLE
3031  0374            AND     (40             /MASK TO BIT 6
3032  7640            SZA CLA                 /IS THE BIT SET ?
3033  5237            JMP     .+4             /YES
3034  4076            ERROR                   /NO, BIT 6 FAILED TO SET
3035  3025            CLT20                   /THIS TEST
3036  3041            CLT21-1                 /NEXT TEST
3037  2005            ISZ     TALLY           /FINISHED ?
3040  5225            JMP     CLT20           /NO

3041  4025            SETUP
3042  7300    CLT21,  CLA CLL
3043  1373            TAD     (20             /LOAD STORE
3044  4156            DILE                    / MODE BIT
3045  4162            DIRE                    /READ ENABLE
3046  0373            AND     (20             /MASK TO BIT 7
3047  7640            SZA CLA                 /IS THE BIT SET ?
3050  5254            JMP     .+4             /YES
3051  4076            ERROR                   /NO, BIT 7 FAILED TO SET
3052  3042            CLT21                   /THIS TEST
3053  3056            CLT22-1                 /NEXT TEST
3054  2005            ISZ     TALLY           /FINISHED ?
3055  5242            JMP     CLT21           /NO
```

```
3056  4025          SETUP
3057  7300  CLT22,  CLA CLL
3060  1372          TAD     (4              /LOAD COLOR
3061  4156          DILE                    / CHANGE
3062  4162          DIRE                    /READ ENABLE
3063  0372          AND     (4              /MASK TO BIT 9
3064  7640          SZA CLA                 /IS THE BIT SET ?
3065  5271          JMP     .+4             /YES
3066  4076          ERROR                   /NO, BIT 9 FAILED TO SET
3067  3057          CLT22                   /THIS TEST
3070  3073          CLT23+1                 /NEXT TEST
3071  2005          ISZ     TALLY           /FINISHED ?
3072  5257          JMP     CLT22           /NO
                    /
                    /       TEST THAT START CHANGING COLORS CLEARS DONE
                    /
3073  4025          SETUP
3074  7300  CLT23,  CLA CLL
3075  6007          CAF
3076  7000          NOP
3077  7000          NOP
3100  7000          NOP
3101  7000          NOP
3102  1372          TAD     (4              /RED COLOR
3103  4156          DILE                    /CHANGE COLOR
3104  4135          DISD                    /DID DONE CLEAR ?
3105  5311          JMP     .+4             /YES
3106  4076          ERROR                   /CHANGING COLOR FAILED TO CLEAR DONE
3107  3074          CLT23                   /
3110  3113          CLT24+3
3111  2005          ISZ     TALLY
3112  5274          JMP     CLT23
```



```
                    /       TEST COLOR CHANGE SETS DONE
                    /       GREEN TO RED <300 USEC'S>
3113  4025          SETUP
3114  1371          TAD     (-10            /SET UP EXECUTION
3115  3005          DCA     TALLY           / COUNTER
3116  6007  CLT24,  CAF                     /CLEAR
3117  7300          CLA CLL
3120  1370          TAD     (-400           /SET UP A DELAY
3121  3024          DCA     DELAY           / COUNTER
3122  2024          ISZ     DELAY           / DELAY
3123  5322          JMP     .-1             /
3124  6007          CAF                     /CLEAR
3125  7300          CLA CLL
3126  1367          TAD     (-42            /SET UP A DELAY
3127  3024          DCA     DELAY           /COUNTER
3130  1372          TAD     (4              /GET RED COLOR BIT
3131  4156          DILE                    /CHANGE TO RED
3132  4135          DISD                    /WAIT FOR DONE
3133  7410          SKP                     /NOT SET
3134  5342          JMP     CLT24A          /NEXT TEST
3135  2024          ISZ     DELAY           /WAIT
3136  5332          JMP     .-4             /NOT FINISHED
3137  4076          ERROR                   /CHANGE IN COLOR FAILED TO SET DONE
3140  3116          CLT24
3141  3200          CLT25+3                 /NEXT TEST
3142  2005  CLT24A, ISZ     TALLY           /FINISHED ?
3143  5316          JMP     CLT24           /NO
3144  5745          JMP I   .+1             /YES, NEXT TEST
3145  3200          CLT25+3
3167  7716
3170  7200
3171  7790
3172  0004
3173  0020
3174  0040
3175  2777
3176  7600
3177  5600
      3200    PAGE
```

```
                        /       TEST THAT CHANGING COLORS SETS DONE
                        /       RED TO GREEN < 1.6 MSEC.>
3200  4025              SETUP
3201  1377              TAD     (-10            /SET UP EXECUTION
3202  3005              DCA     TALLY           / COUNTER
3203  7300    CLT25,    CLA CLL
3204  1376              TAD     (-420           /SET UP DELAY
3205  3024              DCA     DELAY           / COUNTER
3206  1375              TAD     (4              /CHANGE TO RED
3207  4156              DILE
3210  4135              DISD                    /WAIT FOR DONE
3211  5210              JMP     .-1
3212  7300              CLA CLL
3213  4156              DILE                    /CHANGE TO GREEN
3214  4135              DISD                    /WAIT FOR DONE
3215  7410              SKP                     /NOT SET NOW
3216  5224              JMP     CLT25B          /FLAG WAS SET
3217  2024              ISZ     DELAY           /DELAY
3220  5214              JMP     .-4             /TRY AGAIN
3221  4076              ERROR                   /ERROR, RED TO GREEN COLOR CHANGE FAILED
3222  3203              CLT25                   /THIS TEST
3223  3226              CLT26+1                 /NEXT TEST
3224  2005    CLT25B,   ISZ     TALLY           /TEST COUNTER
3225  5203              JMP     CLT25           /NO TRY AGIN
```



```
                        /
                        /
                        /ERASE TEST
                        /       DOES DONE CLEAR AFTER ERASE COMMAND

3226  4025              SETUP
3227  7604    CLT26,    LAS                     /READ SWITCHES
3230  0374              AND     (180            /MASK TO BIT 5
3231  7640              SZA CLA                 /IS IT SET ?
3232  5271              JMP     CLT30           /YES, BYPASS ERASE TESTS
3233  1373              TAD     (30             /NO GET ERASE AND STORE MODE
3234  4156              DILE                    /ERASE SCREEN
3235  4135              DISD                    /DID DONE SET/CLEAR
3236  5242              JMP     .+4             /CLEARED
3237  4076              ERROR                   /ERROR, ERASE FAILED TO CLEAR DONE
3240  3227              CLT26                   /THIS TEST
3241  3244              CLT27+3                 /NEXT TEST
3242  2005              ISZ     TALLY           /TEST COUNTER
3243  5227              JMP     CLT26           /TRY AGAIN

                        /DOES DONE SET AFTER ERASE COMMAND
                        /       500 MSEC.
3244  4025              SETUP
3245  7240              CLA CMA                 /SET UP EXECUTION
3246  3005              DCA     TALLY           /COUNTER
3247  7300    CLT27,    CLA CLL
3250  1372              TAD     (-30            /SET UP A DELAY
3251  3024              DCA     DELAY           / COUNTER
3252  3003              DCA     SUM1            /CLEAR TEMP
3253  1373              TAD     (30             /GET ERASE
3254  4156              DILE                    /EXECUTE ERASE
3255  4135    CLT27A,   DISD                    /WAIT FOR DONE
3256  7410              SKP                     /NO DONE FLAG
3257  5267              JMP     CLT27C          /FLAG WAS SET
3260  2003              ISZ     SUM1            /DELAY
3261  5265              JMP     CLT27A          /WAIT
3262  2024              ISZ     DELAY           /WAIT
3263  5265              JMP     CLT27A          /
3264  4076              ERROR                   /ERROR, ERASE FAILED TO SET DONE
3265  3247              CLT27                   /611/613 MUST BE POWERED ON
3266  3271              CLT30                   /NEXT TEST
3267  2005    CLT27C,   ISZ     TALLY           /TEST COUNTER
3270  5247              JMP     CLT27           /RETURN
3271  2021    CLT30,    ISZ     TALLYA          /TEST PASS COUNTER
3272  5771/             JMP     COLO            /RESTART
3273  5770/             JMP     COLOR
```

```
                    /STORE AND WRITE-THRU MODE TEST
                    /
3274  6007    PHOER,  CAF
3275  4767'           JMS     MESAGE          /PRINT THE MESSAGE
3276  4321            MSG23
3277  7604            LAS
3300  0374            AND     (100
3301  7640            SZA CLA
3302  5306            JMP     WRITU           /USE WRITE THRU MODE
3303  4315            JMS     PHOAR
3304  4315            JMS     PHOAR
3305  5274            JMP     PHOER

3306  4766'   WRITU,  JMS     WRTHU
3307  4766'           JMS     WRTHU
3310  4766'           JMS     WRTHU
3311  4766'           JMS     WRTHU
3312  4766'           JMS     WRTHU
3313  4766'           JMS     WRTHU
3314  5274            JMP     PHOER

3315  0000    PHOAR,  0
3316  7300            CLA CLL
3317  1373            TAD     (30             /GET ERASE AND STORE BITS
3320  4136            DILE                    /ERASE THE SCREEN
3321  4135            DISD                    /WAIT FOR DONE
3322  5321            JMP     .-1
3323  4765'           JMS     SETHOR
3324  1364            TAD     (-2000          /SET UP VERTICAL COUNT
3325  3763'           DCA     VERCNT          / LOCATION
3326  1362            TAD     (1001           /SET UP VERTICAL
3327  3761'           DCA     YVERT           /
3330  7300    PHOBR,  CLA CLL
3331  1761'           TAD     YVERT           /GET Y AXIS
3332  4760'           JMS     PLINE           /DRAW A LINE
3333  5777            -2001
3334  1001            1001
3335  4036            JMS     CKSW7
3336  2761'           ISZ     YVERT           /INCREMENT Y AXIS
3337  7000            NOP
3340  2763'           ISZ     VERCNT          /INCREMENT Y COUNT
3341  5330            JMP     PHOBR           /FINISH THE SCREEN
3342  7300            CLA CLL
3343  1357            TAD     (-400           /SET UP A DELAY
3344  3763'           DCA     VERCNT          / COUNTER
3345  3761'           DCA     YVERT
3346  4036            JMS     CKSW7           /TEST SWITCH 7
3347  2761'           ISZ     YVERT           /DELAY
3350  5346            JMP     .-2
3351  2763'           ISZ     VERCNT          /DELAY
3352  5346            JMP     .-4
3353  5715            JMP I   PHOAR
3357  7400
3360  2447
3361  2112
```



```
3362  1001
3363  2111
3364  6000
3365  2613
3366  3400
3367  5600
3370  3013
3371  3021
3372  7750
3373  0030
3374  0100
3375  0004
3376  7360
3377  7770
      3400          PAGE
```

```
                    /WRITE-THRU MODE SUBROUTINE FOR 611/613

3400  0000    WRTHU,  0
3401  7300            CLA CLL
3402  1377            TAD     (30
3403  4156            DILE                    /ERASE THE DISPLAY
3404  4135            DISD                    /WAIT FOR DONE
3405  5204            JMP     .-1
3406  4776'           JMS     SETHOR          /SET UP HORIZ.
3407  4775'           JMS     DIAG1           /PLOT A 'X'
3410  5777            -2001
3411  1001            1001
3412  4774'           JMS     DIAG2
3413  6000            -2000
3414  1001            1001
3415  0777            777
3416  7300            CLA CLL
3417  1373            TAD     (-10
3420  3005            DCA     TALLY           /SET UP WIDTH COUNT
3421  1372            TAD     (1001           /SET UP X POSITION
3422  3771'           DCA     XPOINT          / VALUE
3423  3770'           DCA     YPOINT          /SET UP Y VALUE
3424  1367            TAD     (60
3425  4156            DILE
3426  7300    WRTHUA, CLA CLL
3427  1771'           TAD     XPOINT          /GET X POSITION
3430  4142            DILX
3431  4135            DISD                    /WAIT FOR DONE
3432  5231            JMP     .-1
3433  7300            CLA CLL
3434  1770'           TAD     YPOINT          /GET Y POSITION
3435  4146            DILY
3436  4135            DISD                    /WAIT FOR DONE
3437  5236            JMP     .-1
3440  4766'           JMS     WAIT            /INTENSIFY AND DELAY A LONG TIME
3441  1365            TAD     (200            /UPDATE X POSITION
3442  1771'           TAD     XPOINT
3443  3771'           DCA     XPOINT          /NEW X POSITION
3444  2005            ISZ     TALLY           /FINISHED HORIZ. LINE ?
3445  5226            JMP     WRTHUA          /NO
3446  5600            JMP I   WRTHU           /EXIT
```



```
                    //SUBROUTINES TO HANDLE OUTPUTS TO TTY77

3447  0000    CALSND, 0
3450  4263            JMS     SIXTY
3451  0003            SUM1
3452  3455            OUT1
3453  4764'           JMS     MASAGE
3454  3736            3736
3455  7777    OUT1,   7777
3456  7777            7777
3457  4040            4040
3460  0000            0000
3461  6001            ION
3462  5647            JMP I   CALSND

3463  0000    SIXTY,  0
3464  7000            NOP
3465  7000            NOP
3466  7200            CLA
3467  1663            TAD I   .-4
3470  3272            DCA     .+2
3471  5673            JMP I   .+2
3472  0000            0
3473  3475            SIXTY+12
3474  5266            JMP     SIXTY+3
3475  1672            TAD I   SIXTY+7
3476  0363            AND     (0007
3477  3340            DCA     MASKA
3500  1672            TAD I   SIXTY+7
3501  0362            AND     (0070
3502  3341            DCA     MASKB
3503  1672            TAD I   SIXTY+7
3504  0361            AND     (700
3505  3342            DCA     MASKC
3506  1672            TAD I   SIXTY+7
3507  0360            AND     (7000
3510  3343            DCA     MASKD
3511  1342            TAD     MASKC
3512  7112            RTR CLL
3513  7010            RAR
3514  1343            TAD     MASKD
3515  7012            RTR
3516  7010            RAR
3517  1344            TAD     MASKD+1
3520  3342            DCA     MASKC
3521  2263            ISZ     SIXTY
3522  4273            JMS     SIXTY+10
3523  1342            TAD     MASKC
3524  3672            DCA I   SIXTY+7
3525  1341            TAD     MASKB
3526  7004            RAL
3527  7006            RTL
```

```
3530  1340            TAD     MASKA
3531  1344            TAD     MASKD+1
3532  2272            ISZ     SIXTY+7
3533  3672            DCA I   SIXTY+7
3534  1357            TAD     (SIXTY+12
3535  3273            DCA     SIXTY+10
3536  2263            ISZ     SIXTY
3537  5663            JMP I   SIXTY
3540  0000    MASKA,  0
3541  0000    MASKB,  0
3542  0000    MASKC,  0
3543  0000    MASKD,  0
3544  6060            6060

3557  3475
3560  7000
3561  0700
3562  0070
3563  0007
3564  5660
3565  0200
3566  1723
3567  0060
3570  2241
3571  2240
3572  1001
3573  7770
3574  2664
3575  2626
3576  2613
3577  0030
      3600            PAGE
```



```
                      //MESSAGE LISTINGS//

3600  3736    MSG1,   TEXT    "<<VC8E POINT PLOT DISPLAY DIAGNOSTIC<<"
3601  2603
3602  7005
3603  4020
3604  1711
3605  1624
3606  4020
3607  1417
3610  2440
3611  0411
3612  2320
3613  1401
3614  3140
3615  0411
3616  0107
3617  1617
3620  2324
3621  1103
3622  3736
3623  0000

3624  3736    MSG2,   TEXT    "<<MAINDEC-08-DHVCA-A<<"
3625  1501
3626  1116
3627  0405
3630  0335
3631  6070
3632  5504
3633  1026
3634  0301
3635  5501
3636  3736
3637  0000

3640  3736    MSG3,   TEXT    "<<S'R',7+I, PERFORM TEST SELECTED BY S'R', 8-11<<"
3641  2356
3642  2256
3643  6775
3644  6154
3645  4020
3646  0522
3647  0617
3650  2215
3651  4024
3652  0523
3653  2440
3654  2305
3655  1405
3656  0324
3657  0504
3660  4002
3661  3140
```

```
3662  2356
3663  2256
3664  4070
3665  5561
3666  6137
3667  3600

3670  2356    MSG4,   TEXT    "S'R'7@0, RETURN TO DISPATCH ROUTINE TO GET NEXT TEST@@"
3671  2256
3672  6775
3673  6054
3674  4022
3675  0524
3676  2522
3677  1640
3700  2417
3701  4004
3702  1123
3703  2001
3704  2403
3705  1040
3706  2217
3707  2524
3710  1116
3711  0540
3712  2417
3713  4007
3714  0524
3715  4016
3716  0530
3717  2440
3720  2405
3721  2324
3722  3736
3723  0000

3724  3736    MSG5,   TEXT    "@@SELECT TEST@@"
3725  2305
3726  1405
3727  0324
3730  4024
3731  0523
3732  2437
3733  3600

3734  3736    MSG6,   TEXT    "@@DC CALIBRATION TEST@@"
3735  0403
3736  4003
3737  2114
3740  1102
3741  2201
3742  2411
3743  1716
3744  4024
3745  0523
```



```
3746  2437
3747  3600

3750  3736    MSG7,   TEXT    "@@RAMP TEST@@"
3751  2201
3752  1520
3753  4024
3754  0523
3755  2437
3756  3600

3757  3736    MSG8,   TEXT    "@@CONTROL LOGIC TEST@@"
3760  0317
3761  1624
3762  2217
3763  1440
3764  1417
3765  0711
3766  0340
3767  2405
3770  2324
3771  3736
3772  0000
3773  3736    MSG9,   TEXT    "@@VERTICAL FLYBACK@@"
3774  2605
3775  2224
3776  1103
3777  2114
4000  4006
4001  1431
4002  0201
4003  0313
4004  3736
4005  0000

4006  3736    MSG10,  TEXT    "@@HORIZONTAL FLYBACK@@"
4007  1017
4010  2211
4011  3217
4012  1624
4013  2114
4014  4006
4015  1431
4016  0201
4017  0313
4020  3736
4021  0000

4022  3736    MSG11,  TEXT    "@@CORNERS TEST@@"
4023  0317
4024  2216
4025  0522
4026  2340
4027  2425
4030  2324
```

```
4031  3736
4032  0000

4033  3736    MSG12,  TEXT    "<<VERTICAL BAR TEST<<"
4034  2605
4035  2224
4036  1103
4037  0114
4040  4002
4041  0122
4042  4024
4043  0523
4044  2437
4045  3600

4046  3736    MSG13,  TEXT    "<<HORIZONTAL BAR TEST<<"
4047  1017
4050  2211
4051  3217
4052  1624
4053  0114
4054  4002
4055  0122
4056  4024
4057  0523
4060  2437
4061  3600

4062  3736    MSG14,  TEXT    "<<SINGLE POINT PLOT TEST<<"
4063  2311
4064  1607
4065  1405
4066  4020
4067  1711
4070  1624
4071  4020
4072  1417
4073  2440
4074  2405
4075  2324
4076  3736
4077  0000

4100  3736    MSG15,  TEXT    "<<PUT DESIRED VALUE OF X IN S'R', AND PRESS CONTINUE<<"
4101  2025
4102  2440
4103  0405
4104  2311
4105  2205
4106  0440
4107  2601
4110  1425
4111  0540
4112  1706
4113  4030
```



```
4114  4011
4115  1640
4116  2356
4117  2256
4120  4001
4121  1604
4122  4020
4123  2205
4124  2323
4125  4003
4126  1716
4127  2411
4130  1625
4131  0537
4132  3600

4133  3736    MSG16,  TEXT    "<<PUT DESIRED VALUE OF Y IN S'R', AND PRESS CONTINUE<<"
4134  2025
4135  2440
4136  0405
4137  2311
4140  2205
4141  0440
4142  2601
4143  1425
4144  0540
4145  1706
4146  4031
4147  4011
4150  1640
4151  2356
4152  2256
4153  4001
4154  1604
4155  4020
4156  2205
4157  2323
4160  4003
4161  1716
4162  2411
4163  1625
4164  0537
4165  3600

4166  3736    MSG17,  TEXT    "<<SET SW7=1 TO LOOP IN TEST"
4167  2305
4170  2440
4171  2327
4172  6775
4173  6140
4174  2417
4175  4014
4176  1717
4177  2040
4200  1116
```

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4201  4024
4202  0523
4203  2400

4204  3736    MSG18,  TEXT    "**SET SW7=0 TO PLOT POINT ONCE, PRESS CONTINUE**"
4205  2305
4206  2440
4207  2327
4210  6775
4211  6040
4212  2417
4213  4020
4214  1417
4215  2440
4216  2017
4217  1116
4220  2440
4221  1716
4222  0305
4223  5440
4224  2022
4225  0523
4226  2340
4227  0317
4230  1624
4231  1116
4232  2505
4233  3736
4234  0000

4235  3736    MSG19,  TEXT    "**DIAGONALS**"
4236  0411
4237  0107
4240  1716
4241  0114
4242  2337
4243  3600

4244  3736    MSG20,  TEXT    "**CROSSING DIAGONALS**"
4245  0322
4246  1723
4247  2311
4250  1607
4251  4004
4252  1101
4253  0717
4254  1601
4255  1423
4256  3736
4257  0000

4260  3736    MSG21,  TEXT    "**DISPLAYED CALIBRATION TEST**"
4261  0411
4262  2320
4263  1401
```



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4264  3105
4265  0440
4266  0301
4267  1411
4270  0222
4271  0124
4272  1117
4273  1640
4274  2405
4275  2324
4276  3736
4277  0000

4300  3736    MSG22,  TEXT    "**COLOR AND STORAGE LOGIC TEST**"
4301  0317
4302  1417
4303  2240
4304  0116
4305  0440
4306  2324
4307  1722
4310  0107
4311  0540
4312  1417
4313  0711
4314  0340
4315  2405
4316  2324
4317  3736
4320  0000
4321  3736    MSG23,  TEXT    "**STORE AND WRITE-THRU MODE TEST**"
4322  2324
4323  1722
4324  0540
4325  0116
4326  0440
4327  2722
4330  1124
4331  0555
4332  2410
4333  2225
4334  4015
4335  1704
4336  0540
4337  2405
4340  2324
4341  3736
4342  0000
4343  3736    MSG24,  TEXT    "**COLOR ALIGNMENT TEST **"
4344  0317
4345  1417
4346  2240
4347  0114
4350  1107
4351  1615
```

```
4352  0516
4353  2440
4354  2405
4355  2324
4356  4037
4357  3600

                        //CONTROL LOGIC ERROR MESSAGES//

4360  3736    EMSG1,  TEXT    "<<CLTI-DILE FAILED TO CLEAR AC<<"
4361  0314
4362  2461
4363  5504
4364  1114
4365  0540
4366  0601
4367  1114
4370  0504
4371  4024
4372  1740
4373  0314
4374  0501
4375  2240
4376  0103
4377  3736
4400  0000

4401  3736    EMSG1A, TEXT    "<<CLTIA-CHANNEL F/F NOT SET OR NOT READ BACK<<"
4402  0314
4403  2461
4404  0155
4405  0310
4406  0116
4407  1605
4410  1440
4411  0657
4412  0640
4413  1617
4414  2440
4415  2305
4416  2440
4417  1722
4420  4016
4421  1724
4422  4022
4423  0501
4424  0440
4425  0201
4426  0313
4427  3736
4430  0000

4431  3736    EMSG1B, TEXT    "<<CLTIB-INTERRUPT ENABLE NOT SET OR NOT READ BACK<<"
4432  0314
4433  2461
```



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4434  3255
4435  1116
4436  2405
4437  2222
4440  2520
4441  2440
4442  0516
4443  0102
4444  1405
4445  4016
4446  1724
4447  4023
4450  0524
4451  4017
4452  2240
4453  1617
4454  2440
4455  2205
4456  0104
4457  4002
4460  0103
4461  1337
4462  3600

4463  3736    EMSG1C, TEXT    "<<CLTIC-CHANNEL F/F NOT SET OR NOT READ BACK<<"
4464  0314
4465  2461
4466  0355
4467  0310
4470  0116
4471  1605
4472  1440
4473  0657
4474  0640
4475  1617
4476  2440
4477  2305
4500  2440
4501  1722
4502  4016
4503  1724
4504  4022
4505  0501
4506  0440
4507  0201
4510  0313
4511  3736
4512  0000

4513  3736    EMSG2,  TEXT    "<<CLTB-DILE FAILED TO CLEAR ENABLE REGISTER<<"
4514  0314
4515  2462
4516  5504
4517  1114
4520  0540
```

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4521  0601
4522  1114
4523  0504
4524  4024
4525  1740
4526  0314
4527  0501
4530  2240
4531  0516
4532  0102
4533  1405
4534  4022
4535  0507
4536  1123
4537  2405
4540  2237
4541  3600

4542  3736    EMSG3,  TEXT    "**CLK3-DILX FAILED TO SET DONE OR CLEARED AC**"
4543  0314
4544  2463
4545  5504
4546  1114
4547  3040
4550  0601
4551  1114
4552  0504
4553  4024
4554  1740
4555  2305
4556  2440
4557  0417
4560  1605
4561  4017
4562  2240
4563  0314
4564  0501
4565  2205
4566  0440
4567  0103
4570  3736
4571  0000

4572  3736    EMSG4,  TEXT    "**CLK4-DILY FAILED TO SET DONE OR CLEARED AC**"
4573  0314
4574  2464
4575  5504
4576  1114
4577  3140
4600  0601
4601  1114
4602  0504
4603  4024
4604  1740
4605  2305
```



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4606  2440
4607  0417
4610  1605
4611  4017
4612  2240
4613  0314
4614  0501
4615  2205
4616  0440
4617  0103
4620  3736
4621  0000

4622  3736    EMSG5,  TEXT    "**CLK5-DIXY FAILED TO SET DONE**"
4623  0314
4624  2465
4625  5504
4626  1130
4627  3140
4630  0601
4631  1114
4632  0504
4633  4024
4634  1740
4635  2305
4636  2440
4637  0417
4640  1605
4641  3736
4642  0000

4643  3736    EMSG6,  TEXT    "**CLK6-DICD FAILED TO CLEAR DONE FLAG**"
4644  0314
4645  2466
4646  5504
4647  1103
4650  0440
4651  0601
4652  1114
4653  0504
4654  4024
4655  1740
4656  0314
4657  0501
4660  2240
4661  0417
4662  1605
4663  4006
4664  1401
4665  0737
4666  3600

4667  3736    EMSG7,  TEXT    "**CLK7-DISD FAILED TO SKIP ON DONE FLAG OR CLRD FLG**"
4670  0314
4671  2467
```

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4672  5504
4673  1123
4674  0440
4675  0601
4676  1114
4677  0504
4700  4024
4701  1740
4702  2313
4703  1120
4704  4017
4705  1640
4706  0417
4707  1605
4710  4006
4711  1401
4712  0740
4713  1722
4714  4003
4715  1422
4716  0440
4717  0614
4720  0737
4721  3600

4722  3736    EMSG8,  TEXT    "<<CLT8-ILLEGAL INT, CAUSED BY INT, ENABLE<<"
4723  0314
4724  2470
4725  5511
4726  1414
4727  0507
4730  0114
4731  4011
4732  1624
4733  5640
4734  0301
4735  2523
4736  0504
4737  4002
4740  3140
4741  1116
4742  2456
4743  4005
4744  1601
4745  0214
4746  0537
4747  3600

4750  3736    EMSG9,  TEXT    "<<CLT9-ILLEGAL INT, CAUSED BY DONE FLAG<<"
4751  0314
4752  2471
4753  5511
4754  1414
4755  0507
4756  0114
```



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4757  4011
4760  1624
4761  5640
4762  0301
4763  2523
4764  0504
4765  4002
4766  3140
4767  0417
4770  1605
4771  4006
4772  1401
4773  0737
4774  3600

4775  3736    EMSG10, TEXT    "<<CLT10-INT, ENABLE AND DONE FLG DID NOT INTERRUPT<<"
4776  0314
4777  2461
5000  6055
5001  1116
5002  2456
5003  4005
5004  1601
5005  0214
5006  0540
5007  0116
5010  0440
5011  0417
5012  1605
5013  4006
5014  1407
5015  4004
5016  1104
5017  4016
5020  1724
5021  4011
5022  1624
5023  0522
5024  2225
5025  2024
5026  3736
5027  0000

5030  3736    EMSG11, TEXT    "<<CLT11-DILX FAILED TO CLEAR DONE<<"
5031  0314
5032  2461
5033  6155
5034  0411
5035  1430
5036  4006
5037  0111
5040  1405
5041  0440
5042  2417
5043  4003
```

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5044  1405
5045  0122
5046  4004
5047  1716
5050  0537
5051  3600
5052  3736    EMSG12, TEXT    "**CLT12-DILY FAILED TO CLEAR DONE**"
5053  0314
5054  2461
5055  6255
5056  0411
5057  1431
5060  4006
5061  0111
5062  1405
5063  0440
5064  2417
5065  4003
5066  1405
5067  0122
5070  4004
5071  1716
5072  0537
5073  3600

5074  3736    EMSG20, TEXT    "**CLT20-WRITE THRU F/F NOT SET OR NOT READ BACK**"
5075  0314
5076  2462
5077  6055
5100  2722
5101  1124
5102  0540
5103  2410
5104  2225
5105  4006
5106  5706
5107  4016
5110  1724
5111  4023
5112  0524
5113  4017
5114  2240
5115  1617
5116  2440
5117  2205
5120  0104
5121  4002
5122  0103
5123  1337
5124  3600
5125  3736    EMSG21, TEXT    "**CLT21-STORE F/F NOT SET OR NOT READ BACK**"
5126  0314
5127  2462
5130  6155
5131  2324
```



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5132  1722
5133  0540
5134  0657
5135  0640
5136  1617
5137  2440
5140  2305
5141  2440
5142  1722
5143  4016
5144  1724
5145  4022
5146  0501
5147  2440
5150  0201
5151  0313
5152  3736
5153  0000
5154  3736    EMSG22, TEXT    "**CLT22-COLOR F/F NOT SET OR NOT READ BACK**"
5155  0314
5156  2462
5157  6255
5160  0317
5161  1417
5162  2240
5163  0657
5164  0640
5165  1617
5166  2440
5167  2305
5170  2440
5171  1722
5172  4016
5173  1724
5174  4022
5175  0501
5176  2440
5177  0201
5200  0313
5201  3736
5202  0000
5203  3736    EMSG23, TEXT    "**CLT23-START OF COLOR CHANGE FAILED TO CLEAR DONE FLAG**"
5204  0314
5205  2462
5206  6355
5207  2324
5210  0122
5211  2440
5212  1706
5213  4003
5214  1714
5215  1722
5216  4003
5217  1001
5220  1637
```

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5221  0540
5222  0601
5223  1114
5224  0504
5225  4024
5226  1740
5227  0314
5230  0501
5231  2240
5232  0417
5233  1605
5234  4006
5235  1401
5236  0737
5237  3600
5240  3736    EMSG24, TEXT    "**CLT24-GREEN TO RED COLOR CHANGE FAILED TO SET DONE**"
5241  0314
5242  2462
5243  6455
5244  0722
5245  0505
5246  1640
5247  2417
5250  4022
5251  0504
5252  4003
5253  1714
5254  1722
5255  4003
5256  1001
5257  1607
5260  0540
5261  0601
5262  1114
5263  0504
5264  4024
5265  1740
5266  2305
5267  2440
5270  0417
5271  1605
5272  3736
5273  0000
5274  3736    EMSG25, TEXT    "**CLT25-RED TO GREEN COLOR CHANGE FAILED TO SET DONE**"
5275  0314
5276  2462
5277  6555
5300  2205
5301  0440
5302  2417
5303  4007
5304  2205
5305  0516
5306  4003
5307  1714
```



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5310  1722
5311  4003
5312  1001
5313  1607
5314  0540
5315  0601
5316  1114
5317  0504
5320  4024
5321  1740
5322  2305
5323  2440
5324  0417
5325  1605
5326  3736
5327  0000
5330  3736    EMSG26, TEXT    "**CLT26-START OF ERASE COMMAND FAILED TO CLEAR DONE**"
5331  0314
5332  2462
5333  6655
5334  2324
5335  0122
5336  2440
5337  1706
5340  4005
5341  2201
5342  2305
5343  4003
5344  1715
5345  1501
5346  1604
5347  4006
5350  0111
5351  1405
5352  0440
5353  2417
5354  4003
5355  1405
5356  0122
5357  4004
5360  1716
5361  0537
5362  3600
5363  3736    EMSG27, TEXT    "**CLT27-ERASE IN STORE MODE FAILED TO SET DONE FLAG**"
5364  0314
5365  2462
5366  6755
5367  0522
5370  0123
5371  0540
5372  1116
5373  4023
5374  2417
5375  2205
5376  4015
```

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5377  1704
5400  0540
5401  3601
5402  1114
5403  0504
5404  4024
5405  1740
5406  2305
5407  2440
5410  0417
5411  1605
5412  4006
5413  1401
5414  0737
5415  3600

      5600            PAGE
```



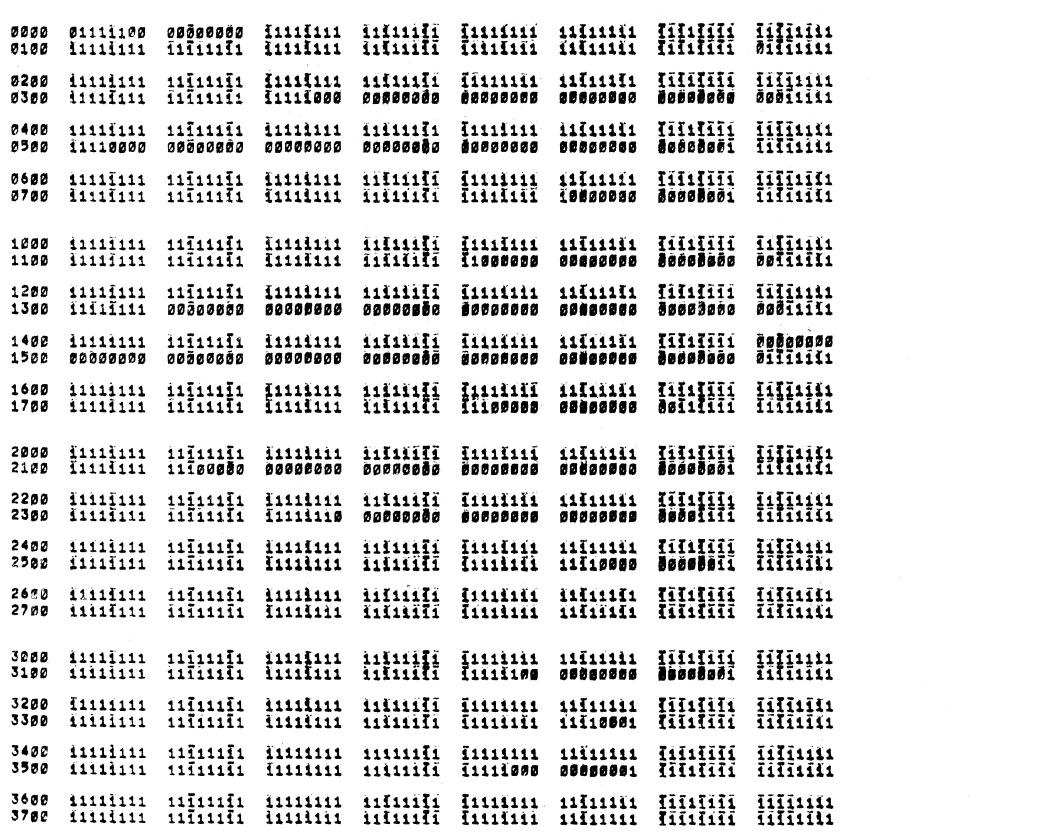
```
5600  0000    MESAGE, 0                       /MESSAGE TYPE-OUT ROUTINE
5601  7240            CLA CMA
5602  1600            TAD I   MESAGE
5603  3010            DCA     10
5604  2200            ISZ     MESAGE
5605  1410            TAD I   10
5606  3217            DCA     MSRGHT
5607  1217            TAD     MSRGHT
5610  7012            RTR
5611  7012            RTR
5612  7012            RTR
5613  4220            JMS     TYPECH
5614  1217            TAD     MSRGHT
5615  4220            JMS     TYPECH
5616  5205            JMP     MESAGE+5
5617  2000    MSRGHT, 0
5620  2000    TYPECH, 0
5621  0252            AND     MASK77
5622  7450            SNA
5623  5600            JMP I   MESAGE
5624  1253            TAD     M40
5625  7510            SPA
5626  5231            JMP     .+3
5627  1254            TAD     C240
5630  5244            JMP     MTP
5631  7001            IAC
5632  7440            SZA
5633  5236            JMP     .+3
5634  1255            TAD     C215
5635  5244            JMP     MTP
5636  7001            IAC
5637  7440            SZA
5640  5243            JMP     .+3
5641  1256            TAD     C212
5642  5244            JMP     MTP
5643  1257            TAD     C336
5644  6046    MTP,    TLS
5645  6041            TSF
5646  5245            JMP     .-1
5647  6042            TCF
5650  7200            CLA
5651  5620            JMP I   TYPECH
5652  0077    MASK77, 77
5653  7740    M40,    -40
5654  0240    C240,   240
5655  0215    C215,   215
5656  0212    C212,   212
5657  0336    C336,   336
```

```
                                //MESSAGE ROUTINE FOR CALIBRATION VALUES//
5660  0000    MASAGE, 0
5661  6002            IOF
5662  7240            CLA CMA
5663  1260            TAD     MASAGE
5664  3010            DCA     10
5665  1410            TAD I   10
5666  3277            DCA     MSRGT
5667  1277            TAD     MSRGT
5670  7012            RTR
5671  7012            RTR
5672  7012            RTR
5673  4300            JMS     TYPEC
5674  1277            TAD     MSRGT
5675  4300            JMS     TYPEC
5676  5265            JMP     MASAGE+5
5677  0000    MSRGT,  0
5700  0000    TYPEC,  0
5701  0252            AND     MASK77
5702  7490            SNA
5703  5410            JMP I   10
5704  1253            TAD     M48
5705  7510            SPA
5706  5311            JMP     .+3
5707  1254            TAD     C240
5710  5324            JMP     MTPA
5711  7001            IAC
5712  7440            SZA
5713  5316            JMP     .+3
5714  1255            TAD     C215
5715  5324            JMP     MTPA
5716  7001            IAC
5717  7440            SZA
5720  5323            JMP     .+3
5721  1256            TAD     C212
5722  5324            JMP     MTPA
5723  1257            TAD     C336
5724  6046    MTPA,   TLS
5725  6041            TSF
5726  5325            JMP     .-1
5727  6042            TCF
5730  7200            CLA
5731  5700            JMP I   TYPEC

                      $

0171  5600
0172  0200
0173  7777
0174  0002
0175  0400
0176  0020
0177  5000
```





```
4000  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
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  11111111  11111111

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  11111100  00000000  00000000  00000000  00000000  00000000  00000000
5500  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000

5600  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
5700  11111111  11111111  11111111  11000000  00000000  00000000  00000000  00000000

6000
6100

6200
6300

6400
6500

6600
6700

7000
7100

7200
7300

7400
7500

7600
7700
```



```
ADJCLA  2746        COLOR   3013        EMSG8   4722        MSG8    3757
ADJCOL  2740        CORNER  1604        EMSG9   4760        MSG9    3773
AMSAG   0167        CORTST  1600        EQUT    0143        MSGPNT  0035
C212    5656        CROTST  2400        ERMSG   3000        MSIZE   0324
C215    5655        DBTST   2000        ERR8    1134        MSRGHT  5617
C240    5654        DELAY   0024        ERR9    1213        MSRGT   5677
C336    5657        DIABIS  2004        ERRMSG  0057        MTP     5644
CAF     6007        DIACNT  2663        ERROR   4076        MTPA    5724
CALCNT  0435        DIAG1   2626        ERSWIT  0004        NXTST   0022
CALIB   0403        DIAG1A  2654        ERTYPE  0117        OK10    1235
CALSND  3447        DIAG2   2644        FAIL    0076        OUT1    3435
CALTST  0400        DIAG2A  2720        GETBAK  0023        PHOAR   3315
CALX    0415        DIAG2B  2734        GETVAL  0417        PHOBR   3330
CALY    0412        DICO    4131        HORBAR  2072        PHOER   3274
CKSW7   0036        DICL    4125        HORCNT  2065        PLINE   2447
CLT1    0611        DILE    4136        HORFLY  1405        PLOTCT  2500
CLT10   1221        DILX    4142        HORTST  1400        PNTR1   0456
CLT11   1240        DILY    4146        HRBTST  2057        PNTR2   2326
CLT11A  1250        DIRE    4162        IOTT    0053        PNTST   2200
CLT12   1263        DISCAL  2245        K7077   0320        PRESET  0025
CLT12A  1273        DISD    4135        M40     5653        PSIZE   0323
CLT1A   0623        DISLOP  2265        MASAGE  5640        RAMP    0462
CLT1B   0640        DISMSG  0213        MASK77  5652        RAMPA   0475
CLT1C   0655        DISP1   2450        MASKA   3510        RDICO   0132
CLT2    0672        DISP2   2472        MASKB   3521        RDICL   0126
CLT20   3025        DISP3   2417        MASKC   3522        RDILE   0157
CLT21   3042        DISP4   2441        MASKD   3523        RDILX   0143
CLT22   3057        DISPAT  0216        MESAGE  5600        RDILY   0147
CLT23   3074        DISRET  0020        MIOT    0321        RDIRE   0163
CLT24   3116        DISTST  2242        MLINE   2416        RDISD   0136
CLT24A  3142        DIXY    4152        MSG1    3600        RDIXY   0153
CLT25   3203        EMSG1   4340        MSG10   4006        RETURN  0002
CLT25B  3224        EMSG10  4775        MSG11   4022        RMPTST  0457
CLT26   3227        EMSG11  5030        MSG12   4033        SAVIT   0503
CLT27   3247        EMSG12  5052        MSG13   4026        SELCHN  0044
CLT27A  3255        EMSG1A  4401        MSG14   4062        SETHOR  2613
CLT27C  3267        EMSG1B  4431        MSG15   4100        SETIOT  0256
CLT3    0707        EMSG1C  4463        MSG16   4133        SETSIZ  0166
CLT30   3271        EMSG2   4513        MSG17   4166        SETUP   4025
CLT3A   0724        EMSG20  5074        MSG18   4204        SETVER  2600
CLT3B   0726        EMSG21  5125        MSG19   4235        SINPNT  2222
CLT4    1001        EMSG22  5154        MSG2    3624        SIXTY   3463
CLT4A   1016        EMSG23  5203        MSG20   4244        SIZE    0322
CLT4B   1020        EMSG24  5240        MSG21   4260        START   0200
CLT5    1043        EMSG25  5274        MSG22   4300        STSIZA  1715
CLT6    1057        EMSG26  5330        MSG23   4321        STSIZE  1703
CLT7    1073        EMSG27  5343        MSG24   4343        SUM1    0003
CLT8    1122        EMSG3   4542        MSG3    3640        SWITCH  0454
CLT9    1201        EMSG4   4572        MSG4    3670        TABLE   0434
CLTST   3600        EMSG5   4622        MSG5    3724        TABLEA  2313
COLADJ  2501        EMSG6   4643        MSG6    3734        TALLY   0005
COLO    3021        EMSG7   4667        MSG7    3750        TALLYA  0021
```

```
TEST    0234
TITLE   0295
TYPEC   5700
TYPECH  5620
UPDVAL  0421
VARYCT  2272
VERBAR  2036
VERCNT  2111
VERFLY  1441
VERTST  1434
VRBTST  2023
WAIT    1723
WAIT1   1730
WAITA   1741
WAITB   1742
WRITU   3306
WRTHU   3400
WRTHUA  3426
XCROS   2404
XDICD   0131
XDICL   0125
XDILE   0156
XDILX   0142
XDILY   0146
XDIRE   0162
XDISD   0135
XDIXY   0152
XPOINT  2240
XRAMP   0472
XVERT   2056
XX      7402
YPOINT  2241
YVERT   2112
```

ERRORS DETECTED: 0

LINKS GENERATED: 142

RUN-TIME: 18 SECONDS

3K CORE USED