IDENTIFICATION

PRODUCT CODE:	MAINDEC-8E-D6CB-D
PRODUCT NAME:	VC-8E DISPLAY DIAGNOSTIC
DATE CREATED:	OCTOBER 22, 1971
MAINTAINER:	DIAGNOSTIC GROUP
AUTHOR:	PATRICK COYNE

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, ITY OR HIGH SPEED READER
M869 QUAD MODULE (DISPLAY CONTROL)
M885 QUAD MODULE (D/A CONVERTER)
TEKTRONIX 453 SCOPE OR EQUIVALENT
VR-14,VR03A OR EQUIVALENT DISPLAY

STORAGE

THE PROGRAM OCCUPIES MEMORY LOCATIONS 0000 TO 4600

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
		(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
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)	NO TEST
1110 (16)	NO TEST
1111 (17)	NO TEST

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

NONE, PROGRAM MAY BE RESTARTED FROM LOCATION 200 AT ANY TIME.

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 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 CHANNEL ONE OR TWO UNDER CONTROL OF SW3.
SW3=0, SELECTS CHANNEL 1.
SW3=1, SELECTS CHANNEL 2.

CONTROL LOGIC TEST

THIS TEST EXERCISES THE CONTROL LOGIC PORTION OF THE VC8E, IT IS DIVIDED UP INTO 12 SUB-TESTS, THIS IS THE ONLY TEST IN THIS DIAGNOSTIC WHICH CONTAINS SCOPE LOOPS AND ERROR TYPE-OUTS, 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,
THESE SWITCHES ARE SET IN THE FOLLOWING MANNER!

SWITCH NAME	POSITION	DISPLAY
Z	-	VR-14
	+	VR03A
DELAY	L	VR-14
	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
SW2=1, SELECTS VR03A
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 INTER-
SECT 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,

, LISTING

```
                    /VC8E POINT PLOT DISPLAY DIAGNOSTIC
                    /COPYRIGHT 1971, DIGITAL EQUIPMENT CORPORATION, MAYNARD, MASS, 01754

                            //INSTRUCTION EQUALITIES//

          4130      DICL=JMS        XDICL   /CLEAR ENABLES, FLAGS, DELAYS,
          4134      DICD=JMS        XDICD   /CLEAR DONE FLAG,
          4140      DISD=JMS        XDISD   /SKIP ON DONE FLAG, DO NOT CLEAR FLAG,
          4145      DILX=JMS        XDILX   /CLEAR DONE FLAG, LOAD X, WAIT FOR SETTLE,
                                            /SET DONE, DO NOT CLEAR AC,
          4151      DILY=JMS        XDILY   /CLEAR DONE FLAG, LOAD Y, WAIT FOR SETTLE,
                                            /SET DONE, DO NOT CLEAR AC,
          4155      DIXY=JMS        XDIXY   /CLEAR DONE FLAG, INTENSIFY, SET DONE,
          4161      DILE=JMS        XDILE   /LOAD ENABLE REGISTER, CLEAR AC,
          4165      DIRE=JMS        XDIRE   /TRANSFER ENABLE TO AC,

          4025      SETUP=JMS       PRESET
          4101      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      0062      MSGPNT, ERRMSG


                    //ROUTINE TO CHECK LOOP BIT, S,R,7//
0036      0000      CKSW7,  0                       /GET S,R,
```

```
0037  7604          LAS                     /GET S,R,
0040  0176          AND     (20             /MASK BIT 7
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 VR14//
0044  0000  SELCHN, 0
0045  7604          LAS                     /GET S,R,
0046  0175          AND     (0400           /MASK BIT 3
0047  7640          SZA CLA                 /SW 3=
0050  5053          JMP     SEL1
0051  4161          DILE                    /0, SELECT CHANNEL 1
0052  5444          JMP I   SELCHN
0053  1174  SEL1,   TAD     (0002
0054  4161          DILE                    /1, SELECT CHANNEL 2
0055  5444          JMP I   SELCHN

                    //SUBROUTINE CONTAINING IOT TO BE EXECUTED//
                    //
0056  0000  IOTT,   0
0057  7000          7000                    /MODIFIED TO CONTAIN IOT
0060  7000          7000
0061  5456          JMP I   IOTT


                    //ERROR MESSAGE LINKS//
0062  3676  ERRMSG, EMSG1
0063  3717          EMSG1A
0064  3747          EMSG1B
0065  4001          EMSG1C
0066  4031          EMSG2
0067  4060          EMSG3
0070  4110          EMSG4
0071  4140          EMSG5
0072  4161          EMSG6
0073  4205          EMSG7
0074  4240          EMSG8
0075  4266          EMSG9
0076  4313          EMSG10
0077  4346          EMSG11
0100  4370          EMSG12

                    //SUBROUTINE TO HANDLE ERROR-SCOPE LOOPING//
0101  0000  FAIL,   0
0102  7200          CLA
0103  1004          TAD     ERSWIT
0104  7650          SNA CLA
0105  4122          JMS     ERTYPE
0106  1173          TAD     (7777
0107  3004          DCA     ERSWIT
0110  1501          TAD I   FAIL
0111  3023          DCA     GETBAK
0112  2101          ISZ     FAIL
```

```
0113  1501          TAD I   FAIL
0114  3022          DCA     NXTST
0115  7604          LAS
0116  0172          AND     (0220
0117  7650          SNA CLA
0120  5423          JMP I   GETBAK
0121  5422          JMP I   NXTST

                    //ERROR TYPEOUT SUBROUTINE//
0122  0000  ERTYPE, 0
0123  1435          TAD I   MSGPNT
0124  3126          DCA     EOUT
0125  4771'         JMS     MESAGE
0126  7402  EOUT,   HLT
0127  5522          JMP I   ERTYPE


                    //IOT SUBROUTINES//
                    //
0130  0000  XDICL,  0
0131  6050  RDICL,  6050            /CLEAR ENABLES, FLAGS, DELAYS,
0132  5530          JMP I   XDICL
0133  7402          HLT

0134  0000  XDICD,  0
0135  6051  RDICD,  6051            /CLEAR DONE FLAG,
0136  5534          JMP I   XDICD
0137  7402          HLT

0140  0000  XDISD,  0
0141  6052  RDISD,  6052            /SKIP ON DONE FLAG,
0142  7410          SKP
0143  2140          ISZ     XDISD
0144  5540          JMP I   XDISD

0145  0000  XDILX,  0
0146  6053  RDILX,  6053            /LOAD X BUFFER,
0147  5545          JMP I   XDILX
0150  7402          HLT
0151  0000  XDILY,  0
0152  6054  RDILY,  6054            /LOAD Y BUFFER,
0153  5551          JMP I   XDILY
0154  7402          HLT

0155  0000  XDIXY,  0
0156  6055  RDIXY,  6055            /INTENSIFY,
0157  5555          JMP I   XDIXY
0160  7402          HLT

0161  0000  XDILE,  0
0162  6056  RDILE,  6056            /LOAD ENABLE REGISTER,
0163  5561          JMP I   XDILE
0164  7402          HLT

0165  0000  XDIRE,  0
```

```
0166  6057    RDIRE,  6057            /TRANSFER ENABLE TO AC,
0167  5565            JMP I   XDIRE
0170  7402            HLT


      0200    *200
0200  6007    START,  CAF
0201  2255            ISZ     TITLE
0202  5213            JMP     DISMSG
0203  4777'           JMS     MESAGE
0204  3200            MSG1
0205  4777'           JMS     MESAGE
0206  3224            MSG2
0207  4777'           JMS     MESAGE
0210  3236            MSG3
0211  4777'           JMS     MESAGE
0212  3266            MSG4

0213  6007    DISMSG, CAF
0214  4777'           JMS     MESAGE
0215  3322            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     (20             /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,8-11
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  0213            DISMSG                  /S,R,=15, NO TEST
0253  0213            DISMSG                  /S,R,=16, NO TEST
```

```
0254  0213          DISMSG                  /S,R,=17, NO TEST

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


                    //ROUTINE TO MODIFY ALL IOT'S//
                    //
0256  0000  SETIOT, 0
0257  1131          TAD     RDICL
0260  0320          AND     K7077
0261  1321          TAD     MIOT
0262  3131          DCA     RDICL
0263  1135          TAD     RDICD
0264  0320          AND     K7077
0265  1321          TAD     MIOT
0266  3135          DCA     RDICD
0267  1141          TAD     RDISD
0270  0320          AND     K7077
0271  1321          TAD     MIOT
0272  3141          DCA     RDISD
0273  1146          TAD     RDILX
0274  0320          AND     K7077
0275  1321          TAD     MIOT
0276  3146          DCA     RDILX
0277  1152          TAD     RDILY
0300  0320          AND     K7077
0301  1321          TAD     MIOT
0302  3152          DCA     RDILY
0303  1156          TAD     RDIXY
0304  0320          AND     K7077
0305  1321          TAD     MIOT
0306  3156          DCA     RDIXY
0307  1162          TAD     RDILE
0310  0320          AND     K7077
0311  1321          TAD     MIOT
0312  3162          DCA     RDILE
0313  1166          TAD     RDIRE
0314  0320          AND     K7077
0315  1321          TAD     MIOT
0316  3166          DCA     RDIRE
0317  5656          JMP I   SETIOT

0320  7077  K7077,  7077
0321  0000  MIOT,   0



0373  5635
0374  0017
0375  0020
0376  0040
0377  4600
      0400          PAGE
```

```
                        //DC CALIBRATION ROUTINE//
                        //
0400  6007    CALTST, CAF
0401  4777'           JMS     MESAGE
0402  3332            MSG6
0403  7200    CALIB,  CLA
0404  1376            TAD     (-20            /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  3057            DCA     IOTT+1          /SAVE Y IOT
0414  5217            JMP     GETVAL          /GOTO BEGIN OF CAL ROUTINE
0415  1373    CALX,   TAD     (DILX           /SETUP X AXIS
0416  3057            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  4056            JMS     IOTT            /SEND TO DAC
0426  7402            HLT                     /HALT AT PRESENT CAL VALUE,
0427  4036            JMS     CKSW7           /CHECK TEST LOOP SWITCH,
0430  2256            ISZ     PNTR1           /INCREMENT POINTER
0431  2255            ISZ     CALCNT          /HAS PRESENT AXIS CALED OUT?
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  3346              MSG7
0462  7300    RAMP,     CLA CLL
0463  7604              LAS                     /PICK UP S'R'
0464  0375              AND     (2000           /CHECK SW1, TO DETERMINE
0465  7650              SNA CLA                 /X OR Y AXIS
0466  5272              JMP     XRAMP           /GOTO X AXIS SETUP
0467  1374              TAD     (DILY           /SETUP Y AXIS
0470  3057              DCA     IOTT+1          /IOT
0471  5274              JMP     RAMPA+1         /GOTO RAMP ROUTINE
0472  1373    XRAMP,    TAD     (DILX           /SETUP X AXIS
0473  3057              DCA     IOTT+1          /IOT
0474  1370              TAD     (1000           /RAMP ORIGIN
0475  4056    RAMPA,    JMS     IOTT            /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  3000
0572  0434
0573  4145
0574  4151
0575  2000
0576  7760
0577  4600
      0600              PAGE


                        //CONTROL LOGIC TEST//
                        //
0600  6007    CLTST,    CAF
0601  4777'             JMS     MESAGE
0602  3355              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  7300    CLT1,     CLA CLL
0612  1374              TAD     (7777           /BRING AC TO ALL ONES,
```

```
0613  4161          DILE                    /TRANS, TO ENABLE AND CLR AC,
0614  7650          SNA CLA
0615  5221          JMP     .+4             /AC CLEAR, CONTINUE,
0616  4101          ERROR                   /DILE FAILED TO CLR AC,
0617  0611          CLT1                    /ERROR-SCOPE LOOP ADDRESS,
0620  0623          CLT1A+1                 /NEXT TEST,
0621  2005          ISZ     TALLY           /TEST LOOP COUNT,
0622  5211          JMP     CLT1            /RETURN,
                    /
0623  4025          SETUP
0624  7300  CLT1A,  CLA CLL
0625  1373          TAD     (0002
0626  4161          DILE                    /SET CHANNEL F/F = 1
0627  4165          DIRE                    /READ ENABLE INTO AC,
0630  0373          AND     (0002           /MASK TO CHECK FOR CHANNEL = 1,
0631  7640          SZA CLA
0632  5236          JMP     .+4             /CHANNEL SET AND READ BACK,
0633  4101          ERROR                   /FAILED, CHNL NOT SET OR NOT READ BACK,
0634  0624          CLT1A                   /ERROR-SCOPE LOOP ADDRESS,
0635  0640          CLT1B+1                 /NEXT TEST,
0636  2005          ISZ     TALLY           /TEST LOOP COUNT,
0637  5224          JMP     CLT1A           /RETURN,
                    /

0640  4025          SETUP
0641  7300  CLT1B,  CLA CLL
0642  1372          TAD     (0001
0643  4161          DILE                    /SET INTERRUPT ENABLE,
0644  4165          DIRE                    /READ ENABLE INTO AC,
0645  0372          AND     (0001           /MASK TO CHECK FOR INT, ENABLE,
0646  7640          SZA CLA
0647  5253          JMP     .+4             /INT, SET AND READ BACK,
0650  4101          ERROR                   /FAILED, INT, NOT SET OR READ BACK,
0651  0641          CLT1B                   /ERROR-SCOPE LOOP ADDRESS,
0652  0655          CLT1C+1                 /NEXT TEST,
0653  2005          ISZ     TALLY           /TEST LOOP COUNT,
0654  5241          JMP     CLT1B           /RETURN,
                    /
0655  4025          SETUP
0656  7300  CLT1C,  CLA CLL
0657  1373          TAD     (0002
0660  4161          DILE                    /SET CHANNEL,
0661  4165          DIRE                    /READ ENABLE INTO AC,
0662  0373          AND     (0002           /MASK TO CHECK FOR CHANNEL BIT,
0663  7640          SZA CLA
0664  5270          JMP     .+4             /CHANNEL SET AND READ BACK,
0665  4101          ERROR                   /FAILED, CHNL NOT SET OR READ BACK,
0666  0656          CLT1C                   /ERROR-SCOPE LOOP ADDRESS,
0667  0672          CLT2+1                  /NEXT TEST,
0670  2005          ISZ     TALLY           /TEST LOOP COUNT,
0671  5256          JMP     CLT1C           /RETURN,
                    /
                    /CHECK THAT DICL WILL CLEAR ENABLES
                    /
0672  4025          SETUP
```

```
0673  7300    CLT2,   CLA CLL
0674  1371            TAD     (4003
0675  4161            DILE                    /SET ENABLES
0676  4130            DICL                    /CLEAR ENABLES
0677  4165            DIRE                    /READ ENABLE STAUS INTO AC,
0700  7650            SNA CLA
0701  5305            JMP     .+4             /ENABLES CLEARED, CONTINUE,
0702  4101            ERROR                   /FAILED, ENABLES NOT CLEARED,
0703  0673            CLT2                    /ERROR=SCOPE LOOP ADDRESS',
0704  0707            CLT3-1                  /NEXT TEST',
0705  2005            ISZ     TALLY           /TEST LOOP COUNT',
0706  5273            JMP     CLT2            /RETURN,

                      /
                      /CHECK THAT DILX WILL SET DONE AND NOT CLEAR AC',
                      /
0707  4025            SETUP
0710  7300    CLT3,   CLA CLL
0711  1374            TAD     (7777           /SETUP VALUE OF
0712  3024            DCA     DELAY           /DELAY FOR VR03A SCOPE',
0713  7604            LAS                     /GET S,R',
0714  0370            AND     (1000           /CHECK BIT 2 FOR SCOPE SELECTION,
0715  7640            SZA CLA                 /SW 2 = 0, SETUP FOR VR14',
0716  5321            JMP     .+3             /SW 2 = 1, SETUP FOR VR03A,
0717  1367            TAD     (-16            /SETUP VALUE OF
0720  3024            DCA     DELAY           /DELAY FOR VR14,
0721  1374            TAD     (7777           /ALL 1'S TO AC',
0722  4134            DICD                    /CLEAR DONE,
0723  4145            DILX                    /LOAD X BUFFER',
0724  2024            ISZ     DELAY
0725  5324            JMP     .-1             /WAIT,
0726  4140            DISD                    /SKIP ON DONE',
0727  7410            SKP
0730  5334            JMP     .+4             /DONE SET, CONTINUE,
0731  4101            ERROR                   /FAILED, DONE WAS NOT SET',
0732  0710            CLT3                    /ERROR=SCOPE LOOP ADDRESS',
0733  1000            CLT4-1                  /NEXT TEST',
0734  7440            SZA                     /WAS AC CLEARED?
0735  5341            JMP     .+4             /NO, CONTINUE,
0736  4101            ERROR                   /YES, FAILED',
0737  0710            CLT3                    /ERROR=SCOPE LOOP ADDRESS',
0740  1000            CLT4-1                  /NEXT TEST',
0741  2005            ISZ     TALLY           /TEST LOOP COUNT',
0742  5310            JMP     CLT3            /RETURN,
0743  5770'           JMP     CLT4-1          /NEXT TEST',

0767  7762
0770  1000
0771  4003
0772  7001
0773  7002
0774  7777
0775  7062
0776  7600
0777  4600
```

```
                1000            PAGE


                                /
                                /CHECK THAT DILY WILL SET DONE AND NOT CLEAR AC,
                                /
1000  4025                      SETUP
1001  7300      CLT4,           CLA CLL
1002  1377                      TAD     (7777           /SETUP VALUE OF
1003  3024                      DCA     DELAY           /DELAY FOR VR03A SCOPE',
1004  7604                      LAS                     /GET S,R,
1005  0376                      AND     (1000           /CHECK BIT 2 FOR SCOPE SELECTION,
1006  7640                      SZA CLA                 /S,R, 2=0, SETUP FOR VR14',
1007  5212                      JMP     .+3             /S,R, 2=1, SETUP FOR VR03A',
1010  1375                      TAD     (-16            /SETUP VALUE OF
1011  3024                      DCA     DELAY           /DELAY FOR VR14,
1012  1377                      TAD     (7777           /ALL 1'S TO AC',
1013  4134                      DICD                    /CLEAR DONE,
1014  4151                      DILY                    /LOAD Y BUFFER',
1015  2024                      ISZ     DELAY
1016  5215                      JMP     .-1
1017  4140                      DISD                    /SKIP ON DONE',
1020  7410                      SKP
1021  5225                      JMP     .+4             /DONE SET, CONTINUE,
1022  4101                      ERROR                   /FAILED, DONE WAS NOT SET',
1023  1001                      CLT4                    /ERROR=SCOPE LOOP ADDRESS',
1024  1034                      CLT5-1                  /NEXT TEST',
1025  7440                      SZA                     /WAS AC CLEARED?
1026  5232                      JMP     .+4             /NO, CONTINUE,
1027  4101                      ERROR                   /YES, FAILED',
1030  1001                      CLT4                    /ERROR=SCOPE LOOP ADDRESS',
1031  1034                      CLT5-1                  /NEXT TEST',
1032  2005                      ISZ     TALLY           /TEST LOOP COUNT',
1033  5201                      JMP     CLT4            /RETURN,


                                /
                                /CHECK THAT DIXY WILL SET DONE,
                                /
1034  4025                      SETUP
1035  7300      CLT5,           CLA CLL
1036  4130                      DICL                    /CLEAR FLAGS',
1037  4155                      DIXY                    /INTENSIFY AND SET DONE,
1040  4140                      DISD                    /SKP ON DONE',
1041  7410                      SKP
1042  5246                      JMP     .+4             /DONE SET, CONTINUE,
1043  4101                      ERROR                   /FAILED, DONE NOT SET,
1044  1035                      CLT5                    /ERROR=SCOPE LOOP ADDRESS',
1045  1050                      CLT6-1                  /NEXT TEST',
1046  2005                      ISZ     TALLY           /TEST LOOP COUNT',
1047  5235                      JMP     CLT5            /RETURN,
                                /
                                /CHECK THAT DICD CLEARS DONE FLAG,
                                /
1050  4025                      SETUP
```

```
1051  7300    CLT6,   CLA CLL
1052  4155            DIXY                    /SET DONE,
1053  4134            DICD                    /CLEAR DONE,
1054  4165            DIRE                    /READ ENABLE STATUS INTO AC,
1055  7650            SNA CLA
1056  5262            JMP     .+4             /DONE CLEARED, CONTINUE,
1057  4101            ERROR                   /FAILED, DONE NOT CLEARED,
1060  1051            CLT6                    /ERROR-SCOPE LOOP ADDRESS,
1061  1064            CLT7-1                  /NEXT TEST,
1062  2005            ISZ     TALLY           /TEST LOOP COUNT,
1063  5251            JMP     CLT6            /RETURN,

                      /
                      /CHECK THAT DISD WILL SKIP ON DONE FLAG AND NOT CLEAR FLAG,
                      /
1064  4025            SETUP
1065  7300    CLT7,   CLA CLL
1066  4155            DIXY                    /SET DONE,
1067  4140            DISD                    /SKP ON DONE,
1070  7610            SKP CLA
1071  5275            JMP     .+4             /SKIP WORKED, CONTINUE,
1072  4101            ERROR                   /FAILED, DISD DID NOT CAUSE SKP ON DONE,
1073  1065            CLT7                    /ERROR-SCOPE LOOP ADDRESS,
1074  1113            CLT8-1                  /NEXT TEST,
1075  4165            DIRE                    /READ ENABLE STATUS INTO AC,
1076  7640            SZA CLA                 /DONE = 1?
1077  5303            JMP     .+4             /YES, CONTINUE,
1100  4101            ERROR                   /NO, FAILED,
1101  1065            CLT7                    /ERROR-SCOPE LOOP ADDRESS,
1102  1113            CLT8-1                  /NEXT TEST,
1103  4134            DICD                    /CLEAR DONE,
1104  4140            DISD                    /SKP ON DONE,
1105  5311            JMP     .+4
1106  4101            ERROR                   /FAILED, DISD SKIPPED ON DONE=0,
1107  1065            CLT7                    /ERROR-SCOPE LOOPE ADDRESS,
1110  1113            CLT8-1                  /NEXT TEST,
1111  2005            ISZ     TALLY           /TEST LOOP COUNT,
1112  5265            JMP     CLT7            /RETURN,
                      /
                      /CHECK THAT INTERRUPT ENABLE REGISTER ALONE WILL
                      /NOT CAUSE AN INTERRUPT,
1113  4025            SETUP
1114  7300    CLT8,   CLA CLL
1115  1374            TAD     (ERR8           /GET RETURN ADDRESS,
1116  3002            DCA     RETURN          /SETUP RETURN ADDRESS,
1117  6007            CAF                     /CLEAR ALL,
1120  1373            TAD     (0001           /SETUP AC TO
1121  4161            DILE                    /ENABLE INTERRUPT REGISTER,
1122  6001            ION                     /TURN INTERRUPT ON,
1123  7000            NOP                     /WAIT,
1124  6002            IOF                     /TURN INTERRUPT OFF,
1125  5331            JMP     .+4             /NO INTERRUPT OCCURRED, CONTINUE,
1126  4101    ERR8,   ERROR                   /FAILED, INTERRUPT TOOK PLACE,
1127  1114            CLT8                    /ERROR-SCOPE LOOP ADDRESS,
```

```
1130  1200            CLT9-1                  /NEXT TEST;
1131  2005            ISZ     TALLY           /TEST LOOP COUNT;
1132  5314            JMP     CLT8            /RETURN;
1133  5772'           JMP     CLT9-1          /NEXT TEST;

1172  1200
1173  0001
1174  1126
1175  7762
1176  1000
1177  7777
      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  4161            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  4101    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  1374            TAD     (0001           /SETUP AC TO
1225  4155            DIXY                    /ENABLE DONE
1226  4161            DILE                    /AND INTERRUPT;
1227  6001            ION                     /TURN INTERRUPT ON;
1230  7000            NOP                     /WAIT;
1231  6002            IOF                     /TURN INTERRUPT OFF;
1232  4101            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  1146          TAD     RDILX
1242  3250          DCA     CLT11A
1243  1166          TAD     RDIRE
1244  3251          DCA     CLT11A+1
1245  4145          DILX
1246  4140          DISD
1247  5246          JMP     .-1
1250  7402  CLT11A, XX
1251  7402          XX
1252  0376          AND     (4000
1253  7450          SNA
1254  5260          JMP     .+4
1255  4101          ERROR
1256  1240          CLT11
1257  1262          CLT12-1
1260  2005          ISZ     TALLY
1261  5240          JMP     CLT11
                    /
                    /CHECK THAT DILY WILL CLEAR DONE,
                    /
1262  4025          SETUP
1263  7300  CLT12,  CLA CLL
1264  1152          TAD     RDILY
1265  3273          DCA     CLT12A
1266  1166          TAD     RDIRE
1267  3274          DCA     CLT12A+1
1270  4151          DILY
1271  4140          DISD
1272  5271          JMP     .-1
1273  7402  CLT12A, XX
1274  7402          XX
1275  0376          AND     (4000
1276  7450          SNA
1277  5303          JMP     .+4
1300  4101          ERROR
1301  1263          CLT12
1302  0606          CLT1-3
1303  2005          ISZ     TALLY
1304  5263          JMP     CLT12
1305  2021          ISZ     TALLYA
1306  5773'         JMP     CLT1-3
1307  5772'         JMP     CLTST

1372  0600
1373  0606
1374  0001
1375  1235
1376  4000
1377  1213
      1400          PAGE

                    //HORIZONTAL LINE SEGMENT TEST
```

```
                        //DISPLAY FOUR HORIZONTAL LINE SEGMENTS
                        //CHECK FOR FLYBACK TRACE
1400  6007    HORTST, CAF
1401  4777'           JMS     MESAGE
1402  3404            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 DISPATCH,
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  3371            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  2443
1575  1001
1576  2613
1577  4600
      1600          PAGE

                    //CORNERS = ROUTINE TO DISPLAY FOUR CORNERS
                    //WITH INTERSECTING DIAGONAL LINE SEGMENTS
                    //
1000  6007  CORIST, CAF
1001  4777' JMS     MESAGE
1002  3420          MSG11
1003  7300          CLA CLL
1004  4044  CORNER, JMS     SELCHN        /CHECK FOR VR=14 CHANNEL,
1005  4776' JMS     SETVER                /SETUP FOR VERTICAL LINES,
1006  7300          CLA CLL
1007  1375          TAD     (1001         /X AXIS ORIGIN,
1010  4774' JMS     PLINE                 /PLOT A VERTICAL LINE AT X=1001(UP)
1011  7577          -201                  /PLOT COUNTER,
1012  1001          1001                  /Y AXIS ORIGIN,
1013  7200          CLA
1014  1373          TAD     (0777
1015  4772' JMS     MLINE                 /PLOT A VERTICAL LINE AT X=777(DOWN)
1016  7577          -201
1017  0777          0777
1020  7200          CLA
1021  1375          TAD     (1001
1022  4772' JMS     MLINE                 /PLOT A VERTICAL LINE AT X=1001(DOWN)
1023  7577          -201
1024  0777          0777
1025  7200          CLA
1026  1373          TAD     (0777
1027  4774' JMS     PLINE                 /PLOT A VERTICAL LINE AT X=777(UP)
1030  7577          -201
1031  1001          1001
1032  4771' JMS     SETHOR                /SETUP FOR HORIZONTAL LINES,
1033  7200          CLA
1034  1373          TAD     (0777         /Y AXIS ORIGIN,
1035  4774' JMS     PLINE                 /PLOT HORIZONTAL LINE AT Y=777(RIGHT)
1036  7577          -201
1037  1001          1001
1040  7200          CLA
1041  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

1767  2660
1770  2626
1771  2613
1772  2416
1773  0777
1774  2443
1775  1001
1776  2600
1777  4600
      2000           PAGE

                     //ROUTINE TO DISPLAY DIAGONALS
                     //
2000  6007  DBTST,   CAF
2001  4777'          JMS     MESAGE
2002  3633           MSG19
2003  7300           CLA CLL
2004  4044  DIABIS,  JMS     SELCHN          /CHECK FOR VR=14 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     CKSW7           /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  3431          MSG12
2026  7300          CLA CLL
2027  4044          JMS     SELCHN          /CHECK FOR VR=14 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  4778'         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     CKSW7           /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  3444          MSG13
2062  7300          CLA CLL
2063  4044          JMS     SELCHN          /CHECK FOR VR=14 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     CKSW7           /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  2443
2171  1001
2172  6000
2173  2600
2174  2660
2175  2626
2176  0100
2177  4600
      2200           PAGE

                     //SINGLE POINT PLOT TEST
                     //ALL COORDINANTS FROM S,R,
                     //
2200  6007  PNTST,   CAF
2201  4777'          JMS     MESAGE
2202  3460           MSG14
2203  4777'          JMS     MESAGE
2204  3476           MSG15
2205  7402           XX                      /HALT
2206  7604           LAS                     /GET X COORDINANT FROM SWITCHES,
2207  3240           DCA     XPOINT          /SAVE IT,
2210  4777'          JMS     MESAGE
2211  3531           MSG16
2212  7402           XX                      /HALT
2213  7604           LAS                     /GET Y COORDINANT FROM SWITCHES,
2214  3241           DCA     YPOINT          /SAVE IT,
2215  4777'          JMS     MESAGE
2216  3564           MSG17
2217  4777'          JMS     MESAGE
2220  3602           MSG18
```

```
2221  7402          XX                      /HALT
2222  7200  SINPNT, CLA
2223  1240          TAD     XPOINT          /GET X COORDINANT,
2224  4145          DILX                    /LOAD X,
2225  4140          DISD                    /SKP ON DONE
2226  5225          JMP     .-1
2227  7200          CLA
2230  1241          TAD     YPOINT          /GET Y COORDINANT,
2231  4151          DILY                    /LOAD Y,
2232  4140          DISD                    /SKP ON DONE
2233  5232          JMP     .-1
2234  4155          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  3656          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  2443
2366  7777
2367  3000
2370  2313
2371  2613
2372  2600
2373  2000
2374  0455
2375  7765
2376  0454
2377  4600
      2400            PAGE

                      //CROSSING DIAGONALS TEST
                      //
2400  6007    CROTST, CAF
2401  4777'           JMS     MESAGE
2402  3642            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  0400            0400                    /Y ORIGIN,
2414  4036            JMS     CKSW7           /SW7=0, RETURN TO DISPATCH,
2415  5204            JMP     XCROS           /SW7=1, CONTINUE PLOT,
```

```
                        //SUBROUTINE TO DISPLAY A LINE (MINUS INCREMENTS)
                        //HORIZONTAL OR VERTICAL
                        //
2416  0000    MLINE,    0
2417  7402    DISP3,    XX                        /MODIFIED TO DISPLAY IOT,
2420  7200              CLA
2421  1141              TAD       RDISD           /SETUP
2422  3232              DCA       DISP4-3         /SKIP ON DONE IOT',
2423  1156              TAD       RDIXY           /SETUP
2424  3234              DCA       DISP4-1         /INTENSIFY IOT',
2425  1616              TAD I     MLINE           /GET PLOT COUNT,
2426  3270              DCA       PLOTCT          /SAVE IT,
2427  2216              ISZ       MLINE
2430  1616              TAD I     MLINE
2431  5235              JMP       DISP4
2432  6052              6052                      /SKIP ON DONE,
2433  5232              JMP       .-1             /WAIT FOR DONE',
2434  6055              6055                      /INTENSIFY
2435  7402    DISP4,    XX                        /MODIFIED TO LOAD IOT,
2436  1374              TAD       (-1             /DECREMENT VARIABLE AXIS,
2437  2270              ISZ       PLOTCT          /IS PLOT COMPLETE?
2440  5232              JMP       DISP4-3         /NO, CONTINUE PLOT',
2441  2216              ISZ       MLINE           /YES, SETUP RETURN',
2442  5616              JMP I     MLINE           /RETURN



                        //SUBROUTINE TO DISPLAY A LINE (PLUS INCREMENTS)
                        //HORIZONTAL OR VERTICAL
2443  0000    PLINE,    0
2444  7402    DISP1,    XX                        /MODIFIED TO DISPLAY IOT,
2445  7200              CLA
2446  1141              TAD       RDISD           /SETUP
2447  3257              DCA       DISP2-3         /SKIP ON DONE IOT',
2450  1156              TAD       RDIXY           /SETUP
2451  3261              DCA       DISP2-1         /INTENSIFY IOT',
2452  1643              TAD I     PLINE           /GET PLOT COUNT,
2453  3270              DCA       PLOTCT          /SAVE IT,
2454  2243              ISZ       PLINE
2455  1643              TAD I     PLINE           /GET ORIGIN OF VARIABLE AXIS,
2456  5262              JMP       DISP2
2457  6052              6052                      /SKIP ON DONE,
2460  5257              JMP       .-1             /WAIT FOR DONE',
2461  6055              6055                      /INTENSIFY
2462  7402    DISP2,    XX                        /MODIFIED TO LOAD IOT,
2463  7001              IAC                       /INCREMENT VARIABLE AXIS,
2464  2270              ISZ       PLOTCT          /IS PLOT COMPLETE?
2465  5257              JMP       DISP2-3         /NO, CONTINUE PLOT',
2466  2243              ISZ       PLINE           /YES, SETUP RETURN',
2467  5643              JMP I     PLINE           /RETURN

2470  0000    PLOTCT,   0
2574  7777
```

```
2575  2660
2576  2626
2577  4600
```

```
2000                    PAGE


                        //SUBROUTINE TO SETUP DISPLAY IOT'S FOR VERTICAL PLOT//
2000  0000    SETVER, 0
2001  7200            CLA
2002  1146            TAD     RDILX
2003  3777'           DCA     DISP1
2004  1152            TAD     RDILY
2005  3776'           DCA     DISP2
2006  1146            TAD     RDILX
2007  3775'           DCA     DISP3
2010  1152            TAD     RDILY
2011  3774'           DCA     DISP4
2012  5600            JMP I   SETVER

                        //SUBROUTINE TO SETUP DISPLAY IOT'S FOR HORIZONTAL PLOT//
2013  0000    SETHOR, 0
2014  7200            CLA
2015  1152            TAD     RDILY
2016  3777'           DCA     DISP1
2017  1146            TAD     RDILX
2020  3776'           DCA     DISP2
2021  1152            TAD     RDILY
2022  3775'           DCA     DISP3
2023  1146            TAD     RDILX
2024  3774'           DCA     DISP4
2025  5613            JMP I   SETHOR


                        //SUBROUTINE TO DISPLAY A DIAGONAL LINE
                        //FROM LOWER LEFT TO UPPER RIGHT,
                        //
2026  0000    DIAG1,  0
2027  7300            CLA CLL
2030  1141            TAD     RDISD           /SETUP
2031  3245            DCA     DIAG1A-3        /SKIP ON DONE IOT,
2032  1156            TAD     RDIXY           /SETUP
2033  3247            DCA     DIAG1A-1        /INTENSIFY IOT,
2034  1146            TAD     RDILX           /SETUP
2035  3250            DCA     DIAG1A          /LOAD X IOT,
2036  1152            TAD     RDILY           /SETUP
2037  3251            DCA     DIAG1A+1        /LOAD Y IOT,
2040  1626            TAD I   DIAG1           /SETUP COUNTER,
2041  3257            DCA     DIACNT
2042  2226            ISZ     DIAG1
2043  1626            TAD I   DIAG1
2044  5250            JMP     DIAG1A
2045  6052            6052                    /SKIP ON DONE,
2046  5245            JMP     .-1             /WAIT FOR DONE,
2047  6055            6055                    /INTENSIFY
2050  6053    DIAG1A, 6053                    /LOAD X
2051  6054            6054                    /LOAD Y
2052  7001            IAC                     /INCREMENT COORDINANT,
2053  2257            ISZ     DIACNT          /IS PLOT COMPLETE?
```

```
2654  5245            JMP     DIAG1A-3        /NO, CONTINUE PLOT;
2655  2226            ISZ     DIAG1           /YES, SETUP RETURN;
2656  5626            JMP I   DIAG1           /RETURN

2657  7000  DIACNT, 0

                      //SUBROUTINE TO DISPLAY A DIAGNOL LINE
                      //FROM UPPER LEFT TO LOWER RIGHT.
                      //
2660  0000  DIAG2,    0
2661  7300            CLA CLL
2662  1141            TAD     RDISD           /SETUP
2663  3303            DCA     DIAG2A-3        /SKIP ON DONE IOT;
2664  1156            TAD     RDIXY           /SETUP
2665  3305            DCA     DIAG2A-1        /INTENSIFY IOT;
2666  1146            TAD     RDILX           /SETUP
2667  3307            DCA     DIAG2A+1        /LOAD X IOT,
2670  1152            TAD     RDILY           /SETUP
2671  3312            DCA     DIAG2A+4        /LOAD Y IOT,
2672  1660            TAD I   DIAG2           /SETUP COUNTER;
2673  3257            DCA     DIACNT
2674  2260            ISZ     DIAG2
2675  1660            TAD I   DIAG2
2676  3773'           DCA     XPOINT
2677  2260            ISZ     DIAG2
2700  1660            TAD I   DIAG2
2701  3772'           DCA     YPOINT
2702  5306            JMP     DIAG2A
2703  6052            6052                    /SKIP ON DONE;
2704  5303            JMP     .-1             /WAIT FOR DONE;
2705  6055            6055                    /INTENSIFY
2706  1773'  DIAG2A,  TAD     XPOINT          /GET X COORDINANT;
2707  6053            6053                    /LOAD X
2710  7200            CLA
2711  1772'           TAD     YPOINT          /GET Y COORDINANT;
2712  6054            6054                    /LOAD Y
2713  1371            TAD     (-1             /DECREMENT Y;
2714  3772'           DCA     YPOINT          /SAVE Y,
2715  1773'           TAD     XPOINT          /GET X COORDINANT;
2716  7001            IAC                     /INCREMENT X;
2717  3773'           DCA     XPOINT          /SAVE X,
2720  2257            ISZ     DIACNT          /IS PLOT COMPLETE?
2721  5303            JMP     DIAG2A-3        /NO, CONTINUE PLOT;
2722  2260            ISZ     DIAG2           /YES, SETUP RETURN;
2723  5660            JMP I   DIAG2           /RETURN

2771  7777
2772  2241
2773  2240
2774  2435
2775  2417
2776  2462
2777  2444
      3000            PAGE
```

```
                        //SUBROUTINES TO HANDLE OUTPUTS TO TTY//

3000  0000    CALSND, 0
3001  4214            JMS     SIXTY
3002  0003            SUM1
3003  3006            OUT1
3004  4777'           JMS     MASAGE
3005  3736            3736
3006  7777    OUT1,   7777
3007  7777            7777
3010  4040            4040
3011  0000            0000
3012  6001            ION
3013  5600            JMP I   CALSND

3014  0000    SIXTY,  0
3015  7000            NOP
3016  7000            NOP
3017  7200            CLA
3020  1614            TAD I   .+4
3021  3023            DCA     .+2
3022  5624            JMP I   .+2
3023  0000            0
3024  3026            SIXTY+12
3025  5217            JMP     SIXTY+3
3026  1623            TAD I   SIXTY+7
3027  0376            AND     (0007
3030  3271            DCA     MASKA
3031  1623            TAD I   SIXTY+7
3032  0375            AND     (0070
3033  3272            DCA     MASKB
3034  1623            TAD I   SIXTY+7
3035  0374            AND     (700
3036  3273            DCA     MASKC
3037  1623            TAD I   SIXTY+7
3040  0373            AND     (7000
3041  3274            DCA     MASKD
3042  1273            TAD     MASKC
3043  7112            RTR CLL
3044  7010            RAR
3045  1274            TAD     MASKD
3046  7012            RTR
3047  7010            RAR
3050  1275            TAD     MASKD+1
3051  3273            DCA     MASKC
3052  2214            ISZ     SIXTY
3053  4224            JMS     SIXTY+10
3054  1273            TAD     MASKC
3055  3623            DCA I   SIXTY+7
3056  1272            TAD     MASKB
3057  7004            RAL
3060  7006            RTL
3061  1271            TAD     MASKA
3062  1275            TAD     MASKD+1
```

```
3063  2223            ISZ     SIXTY+7
3064  3623            DCA I   SIXTY+7
3065  1372            TAD     (SIXTY+12
3066  3224            DCA     SIXTY+10
3067  2214            ISZ     SIXTY
3070  5614            JMP I   SIXTY
3071  0000    MASKA,  0
3072  0000    MASKB,  0
3073  0000    MASKC,  0
3074  0000    MASKD,  0
3075  6060            6060

3172  3026
3173  7000
3174  0700
3175  0070
3176  0007
3177  4660
      3200            PAGE

                      //MESSAGE LISTINGS//

3200  3736    MSG1,   TEXT    "**VC8E POINT PLOT DISPLAY DIAGNOSTIC**"
3201  2603
3202  7005
3203  4020
3204  1711
3205  1624
3206  4020
3207  1417
3210  2440
3211  0411
3212  2320
3213  1401
3214  3140
3215  0411
3216  0107
3217  1617
3220  2324
3221  1103
3222  3736
3223  0000

3224  3736    MSG2,   TEXT    "**MAINDEC-8E-D6CB-*"
3225  1501
3226  1116
3227  0405
3230  2355
3231  7005
3232  5504
3233  6603
3234  0237
3235  3600
```

```
3236  3736    MSG3,   TEXT    "**S,R,7=1, PERFORM TEST SELECTED BY S,R, 8-11=*!"
3237  2356
3240  2256
3241  6775
3242  6154
3243  4020
3244  0522
3245  0617
3246  2215
3247  4024
3250  0523
3251  2440
3252  2305
3253  1405
3254  0324
3255  0504
3256  4002
3257  3140
3260  2356
3261  2256
3262  4070
3263  5561
3264  6137
3265  3600

3266  2356    MSG4,   TEXT    "S,R,7=0, RETURN TO DISPATCH ROUTINE TO GET NEXT TEST**"
3267  2256
3270  6775
3271  6054
3272  4022
3273  0524
3274  2522
3275  1640
3276  2417
3277  4004
3300  1123
3301  2001
3302  2403
3303  1040
3304  2217
3305  2524
3306  1116
3307  0540
3310  2417
3311  4007
3312  0524
3313  4016
3314  0530
3315  2440
3316  2405
3317  2324
3320  3736
3321  0000

3322  3736    MSG5,   TEXT    "**SELECT TEST**"
```

```
3323  2305
3324  1405
3325  0324
3326  4024
3327  0523
3330  2437
3331  3600

3332  3736    MSG6,   TEXT    "**DC CALIBRATION TEST*?"
3333  0403
3334  4003
3335  0114
3336  1102
3337  2201
3340  2411
3341  1716
3342  4024
3343  0523
3344  2437
3345  3600

3346  3736    MSG7,   TEXT    "**RAMP TEST*?"
3347  2201
3350  1520
3351  4024
3352  0523
3353  2437
3354  3600

3355  3736    MSG8,   TEXT    "**CONTROL LOGIC TEST*?"
3356  0317
3357  1624
3360  2217
3361  1440
3362  1417
3363  0711
3364  0340
3365  2405
3366  2324
3367  3736
3370  0000
3371  3736    MSG9,   TEXT    "**VERTICAL FLYBACK*?"
3372  2605
3373  2224
3374  1103
3375  0114
3376  4006
3377  1431
3400  2201
3401  0313
3402  3736
3403  0000

3404  3736    MSG10,  TEXT    "**HORIZONTAL FLYBACK*?"
3405  1017
```

```
3406  2211
3407  3217
3410  1624
3411  2114
3412  4006
3413  1431
3414  0201
3415  0313
3416  3736
3417  0000

3420  3736    MSG11,  TEXT    "**CORNERS TEST**"
3421  0317
3422  2216
3423  0522
3424  2340
3425  2405
3426  2324
3427  3736
3430  0000

3431  3736    MSG12,  TEXT    "**VERTICAL BAR TEST**"
3432  2605
3433  2224
3434  1103
3435  0114
3436  4002
3437  0122
3440  4024
3441  0523
3442  2437
3443  3600

3444  3736    MSG13,  TEXT    "**HORIZONTAL BAR TEST**"
3445  1017
3446  2211
3447  3217
3450  1624
3451  0114
3452  4002
3453  0122
3454  4024
3455  0523
3456  2437
3457  3600

3460  3736    MSG14,  TEXT    "**SINGLE POINT PLOT TEST**"
3461  2311
3462  1607
3463  1405
3464  4020
3465  1711
3466  1624
3467  4020
3470  1417
```

```
3471  2440
3472  2405
3473  2324
3474  3736
3475  0000

3476  3736    MSG15,  TEXT    "**PUT DESIRED VALUE OF X IN S'R', AND PRESS CONTINUE**"
3477  2025
3500  2440
3501  0405
3502  2311
3503  2205
3504  0440
3505  2601
3506  1425
3507  0540
3510  1706
3511  4030
3512  4011
3513  1640
3514  2356
3515  2256
3516  4001
3517  1604
3520  4020
3521  2205
3522  2323
3523  4003
3524  1716
3525  2411
3526  1625
3527  0537
3530  3600

3531  3736    MSG16,  TEXT    "**PUT DESIRED VALUE OF Y IN S'R', AND PRESS CONTINUE**"
3532  2025
3533  2440
3534  0405
3535  2311
3536  2205
3537  0440
3540  2601
3541  1425
3542  0540
3543  1706
3544  4031
3545  4011
3546  1640
3547  2356
3550  2256
3551  4001
3552  1604
3553  4020
3554  2205
3555  2323
```

```
3556  4003
3557  1716
3560  2411
3561  1625
3562  0537
3563  3600

3564  3736    MSG17,  TEXT    "**SET SW7=1 TO LOOP IN TEST"
3565  2305
3566  2440
3567  2327
3570  6775
3571  6140
3572  2417
3573  4014
3574  1717
3575  2040
3576  1116
3577  4024
3600  0523
3601  2400

3602  3736    MSG18,  TEXT    "**SET SW7=0 TO PLOT POINT ONCE, PRESS CONTINUE**"
3603  2305
3604  2440
3605  2327
3606  6775
3607  6040
3610  2417
3611  4020
3612  1417
3613  2440
3614  2017
3615  1116
3616  2440
3617  1716
3620  0305
3621  5440
3622  2022
3623  0523
3624  2340
3625  0317
3626  1624
3627  1116
3630  2505
3631  3736
3632  2000

3633  3736    MSG19,  TEXT    "**DIAGONALS**"
3634  0411
3635  0107
3636  1716
3637  0114
3640  2337
3641  3600
```

```
3642  3736    MSG20,  TEXT    "**CROSSING DIAGONALS*!"
3643  2322
3644  1723
3645  2311
3646  1607
3647  4004
3650  1101
3651  0717
3652  1601
3653  1423
3654  3736
3655  0000

3656  3736    MSG21,  TEXT    "**DISPLAYED CALIBRATION TEST**"
3657  0411
3660  2320
3661  1401
3662  3105
3663  0440
3664  0301
3665  1411
3666  0222
3667  0124
3670  1117
3671  1640
3672  2405
3673  2324
3674  3736
3675  0000


                      //CONTROL LOGIC ERROR MESSAGES//

3676  3736    EMSG1,  TEXT    "**CLT1-DILE FAILED TO CLEAR AC**"
3677  0314
3700  2461
3701  5504
3702  1114
3703  0540
3704  0601
3705  1114
3706  0504
3707  4024
3710  1740
3711  0314
3712  0501
3713  2240
3714  0103
3715  3736
3716  7000

3717  3736    EMSG1A, TEXT    "**CLT1A-CHANNEL F/F NOT SET OR NOT READ BACK*!"
3720  0314
```

```
3721  2461
3722  0155
3723  0310
3724  0116
3725  1605
3726  1440
3727  0657
3730  0640
3731  1617
3732  2440
3733  2305
3734  2440
3735  1722
3736  4016
3737  1724
3740  4022
3741  0501
3742  0440
3743  0201
3744  0313
3745  3736
3746  0000

3747  3736    EMSG1B, TEXT    "**CLT1B-INTERRUPT ENABLE NOT SET OR NOT READ BACK**"
3750  0314
3751  2461
3752  0255
3753  1116
3754  2405
3755  2222
3756  2520
3757  2440
3760  0516
3761  0102
3762  1405
3763  4016
3764  1724
3765  4023
3766  0524
3767  4017
3770  2240
3771  1617
3772  2440
3773  2205
3774  0104
3775  4002
3776  0103
3777  1337
4000  3600

4001  3736    EMSG1C, TEXT    "**CLT1C-CHANNEL F/F NOT SET OR NOT READ BACK**"
4002  0314
4003  2461
4004  0355
4005  7310
```

```
4006  0116
4007  1605
4010  1440
4011  0657
4012  0640
4013  1617
4014  2440
4015  2305
4016  2440
4017  1722
4020  4016
4021  1724
4022  4022
4023  0501
4024  0440
4025  0201
4026  0313
4027  3736
4030  0000

4031  3736    EMSG2,  TEXT    "**CLT2-DILE FAILED TO CLEAR ENABLE REGISTER-*"
4032  0314
4033  2462
4034  5504
4035  1114
4036  0540
4037  0601
4040  1114
4041  0504
4042  4024
4043  1740
4044  0314
4045  0501
4046  2240
4047  0516
4050  0102
4051  1405
4052  4022
4053  0507
4054  1123
4055  2405
4056  2237
4057  3600

4060  3736    EMSG3,  TEXT    "**CLT3-DILX FAILED TO SET DONE OR CLEARED AC-*"
4061  0314
4062  2463
4063  5504
4064  1114
4065  3040
4066  0601
4067  1114
4070  0504
4071  4024
4072  1740
```

```
4073  2305
4074  2440
4075  0417
4076  1605
4077  4017
4100  2240
4101  0314
4102  0501
4103  2205
4104  0440
4105  0103
4106  3736
4107  0000

4110  3736    EMSG4,  TEXT    "**CLT4-DILY FAILED TO SET DONE OR CLEARED AC**"
4111  0314
4112  2464
4113  5504
4114  1114
4115  3140
4116  0601
4117  1114
4120  0504
4121  4024
4122  1740
4123  2305
4124  2440
4125  0417
4126  1605
4127  4017
4130  2240
4131  0314
4132  0501
4133  2205
4134  0440
4135  0103
4136  3736
4137  0000

4140  3736    EMSG5,  TEXT    "**CLT5-DIXY FAILED TO SET DONE**"
4141  0314
4142  2465
4143  5504
4144  1130
4145  3140
4146  0601
4147  1114
4150  0504
4151  4024
4152  1740
4153  2305
4154  2440
4155  0417
4156  1605
4157  3736
```

```
4160  0000

4161  3736    EMSG6,  TEXT    "**CLT6-DICD FAILED TO CLEAR DONE FLAG**"
4162  0314
4163  2466
4164  5504
4165  1103
4166  0440
4167  0601
4170  1114
4171  0504
4172  4024
4173  1740
4174  0314
4175  0501
4176  2240
4177  0417
4200  1605
4201  4006
4202  1401
4203  0737
4204  3600

4205  3736    EMSG7,  TEXT    "**CLT7-DISD FAILED TO SKIP ON DONE FLAG OR CLRD FLG**"
4206  0314
4207  2467
4210  5504
4211  1123
4212  0440
4213  0601
4214  1114
4215  0504
4216  4024
4217  1740
4220  2313
4221  1120
4222  4017
4223  1640
4224  0417
4225  1605
4226  4006
4227  1401
4230  0740
4231  1722
4232  4003
4233  1422
4234  0440
4235  0614
4236  0737
4237  3600

4240  3736    EMSG8,  TEXT    "**CLT8-ILLEGAL INT, CAUSED BY INT, ENABLE**"
4241  0314
4242  2470
4243  5511
```

```
4244  1414
4245  0507
4246  0114
4247  4011
4250  1624
4251  5640
4252  0301
4253  2523
4254  0504
4255  4002
4256  3140
4257  1116
4260  2456
4261  4005
4262  1601
4263  0214
4264  0537
4265  3600

4266  3736    EMSG9,  TEXT    "**CLT9-ILLEGAL INT, CAUSED BY DONE FLAG*"
4267  0314
4270  2471
4271  5511
4272  1414
4273  0507
4274  0114
4275  4011
4276  1624
4277  5640
4300  0301
4301  2523
4302  0504
4303  4002
4304  3140
4305  0417
4306  1605
4307  4006
4310  1401
4311  0737
4312  3600

4313  3736    EMSG10, TEXT    "**CLT10-INT, ENABLE AND DONE FLG DID NOT INTERRUPT**"
4314  0314
4315  2461
4316  6055
4317  1116
4320  2456
4321  4005
4322  1601
4323  0214
4324  3540
4325  0116
4326  2440
4327  0417
4330  1605
```

```
4331  4006
4332  1407
4333  4004
4334  1104
4335  4016
4336  1724
4337  4011
4340  1624
4341  0522
4342  2225
4343  2024
4344  3736
4345  0000

4346  3736    EMSG11, TEXT    "**CLT11-DILX FAILED TO CLEAR DONE*!"
4347  0314
4350  2461
4351  6155
4352  0411
4353  1430
4354  4006
4355  0111
4356  1405
4357  0440
4360  2417
4361  4003
4362  1405
4363  0122
4364  4004
4365  1716
4366  0537
4367  3600
4370  3736    EMSG12, TEXT    "**CLT12-DILY FAILED TO CLEAR DONE*!"
4371  0314
4372  2461
4373  6255
4374  0411
4375  1431
4376  4006
4377  0111
4400  1405
4401  0440
4402  2417
4403  4003
4404  1405
4405  0122
4406  4004
4407  1716
4410  0537
4411  3600

      4600          PAGE


4000  0000    MESAGE, 0                   /MESSAGE TYPE-OUT ROUTINE
```

```
4001  7240            CLA CMA
4002  1600            TAD I   MESAGE
4003  3010            DCA     10
4004  2200            ISZ     MESAGE
4005  1410            TAD I   10
4006  3217            DCA     MSRGHT
4007  1217            TAD     MSRGHT
4010  7012            RTR
4011  7012            RTR
4012  7012            RTR
4013  4220            JMS     TYPECH
4014  1217            TAD     MSRGHT
4015  4220            JMS     TYPECH
4016  5205            JMP     MESAGE+5
4017  0000    MSRGHT, 0
4020  0000    TYPECH, 0
4021  0252            AND     MASK77
4022  7450            SNA
4023  5600            JMP I   MESAGE
4024  1253            TAD     M40
4025  7510            SPA
4026  5231            JMP     .+3
4027  1254            TAD     C240
4030  5244            JMP     MTP
4031  7001            IAC
4032  7440            SZA
4033  5236            JMP     .+3
4034  1255            TAD     C215
4035  5244            JMP     MTP
4036  7001            IAC
4037  7440            SZA
4040  5243            JMP     .+3
4041  1256            TAD     C212
4042  5244            JMP     MTP
4043  1257            TAD     C336
4044  6046    MTP,    TLS
4045  6041            TSF
4046  5245            JMP     .-1
4047  6042            TCF
4050  7200            CLA
4051  5620            JMP I   TYPECH
4052  0077    MASK77, 77
4053  7740    M40,    -40
4054  0240    C240,   240
4055  0215    C215,   215
4056  0212    C212,   212
4057  0336    C336,   336

                      //MESSAGE ROUTINE FOR CALIBRATION VALUES//
4060  0000    MASAGE, 0
4061  6002            IOF
4062  7240            CLA CMA
4063  1260            TAD     MASAGE
4064  3010            DCA     10
4065  1410            TAD I   10
```

```
4066  3277            DCA     MSRGT
4067  1277            TAD     MSRGT
4070  7012            RTR
4071  7012            RTR
4072  7012            RTR
4073  4300            JMS     TYPEC
4074  1277            TAD     MSRGT
4075  4300            JMS     TYPEC
4076  5265            JMP     MASAGE+5
4077  0000  MSRGT,    0
4700  0000  TYPEC,    0
4701  0252            AND     MASK77
4702  7450            SNA
4703  5410            JMP I   10
4704  1253            TAD     M40
4705  7510            SPA
4706  5311            JMP     .+3
4707  1254            TAD     C240
4710  5324            JMP     MTPA
4711  7001            IAC
4712  7440            SZA
4713  5316            JMP     .+3
4714  1255            TAD     C215
4715  5324            JMP     MTPA
4716  7001            IAC
4717  7440            SZA
4720  5323            JMP     .+3
4721  1256            TAD     C212
4722  5324            JMP     MTPA
4723  1257            TAD     C336
4724  6046  MTPA,     TLS
4725  6041            TSF
4726  5325            JMP     .-1
4727  6042            TCF
4730  7200            CLA
4731  5700            JMP I   TYPEC

                      $

0171  4600
0172  0200
0173  7777
0174  0002
0175  0400
0176  0020
0177  5000
```

```
0000  01111100  00000000  11111111  11111111  11111111  11111111  11111111  11111111
0100  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

0200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
0300  11111111  11111111  11000000  00000000  00000000  00000000  00000000  00011111

0400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
0500  11110000  00000000  00000000  00000000  00000000  00000000  00000001  11111111

0600  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
0700  11111111  11111111  11111111  11111111  11110000  00000000  00000001  11111111

1000  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
1100  11111111  11111111  11111111  11110000  00000000  00000000  00000000  00111111

1200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
1300  11111111  00000000  00000000  00000000  00000000  00000000  00000000  00111111

1400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  00000000
1500  00000000  00000000  00000000  00000000  00000000  00000000  00000000  01111111

1600  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
1700  11100000  00000000  00000000  00000000  00000000  00000000  00000001  11111111

2000  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
2100  11111111  11100000  00000000  00000000  00000000  00000000  00000001  11111111

2200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
2300  11111111  11111111  11111110  00000000  00000000  00000000  00001111  11111111

2400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  10000000
2500  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00001111

2600  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
2700  11111111  11111111  11110000  00000000  00000000  00000000  00000000  01111111

3000  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111100
3100  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00111111

3200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
3300  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

3400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
3500  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

3600  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
3700  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
```

```
4 000  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
4 100  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

4 200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
4 300  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

4 400  11111111  11000000  00000000  00000000  00000000  00000000  00000000  00000000
4 500  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000

4 600  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
4 700  11111111  11111111  11111111  11000000  00000000  00000000  00000000  00000000


5000
5100

5200
5300

5400
5500

5600
5700


6000
6100

6200
6300

6400
6500

6600
6700


7000
7100

7200
7300

7400
7500

7600
7700
```

```
C212    4656        DISP2   2462        MSG12   3431        SIXTY   3014
C215    4655        DISP3   2417        MSG13   3444        START   0200
C240    4654        DISP4   2435        MSG14   3460        SUM1    0003
C336    4657        DISPAT  0216        MSG15   3476        SWITCH  0454
CAF     6007        DISRET  0020        MSG16   3531        TABLE   0434
CALCNT  0455        DISTST  2242        MSG17   3564        TABLEA  2313
CALIB   0403        DIXY    4155        MSG18   3602        TALLY   0005
CALSND  3000        EMSG1   3676        MSG19   3633        TALLYA  0021
CALTST  0400        EMSG10  4313        MSG2    3224        TEST    0234
CALX    0415        EMSG11  4346        MSG20   3642        TITLE   0255
CALY    0412        EMSG12  4370        MSG21   3656        TYPEC   4700
CKSW7   0036        EMSG1A  3717        MSG3    3236        TYPECH  4620
CLT1    0611        EMSG1B  3747        MSG4    3266        UPDVAL  0421
CLT10   1221        EMSG1C  4001        MSG5    3322        VARYCT  2272
CLT11   1240        EMSG2   4031        MSG6    3332        VERBAR  2036
CLT11A  1250        EMSG3   4060        MSG7    3346        VERCNT  2111
CLT12   1263        EMSG4   4110        MSG8    3355        VERFLY  1441
CLT12A  1273        EMSG5   4140        MSG9    3371        VERTST  1434
CLT1A   0624        EMSG6   4161        MSGPNT  0035        VRBTST  2023
CLT1B   0641        EMSG7   4205        MSRGHT  4617        XCROS   2404
CLT1C   0656        EMSG8   4240        MSRGT   4677        XDICD   0134
CLT2    0673        EMSG9   4266        MTP     4644        XDICL   0130
CLT3    0710        EOUT    0126        MTPA    4724        XDILE   0161
CLT4    1001        ERR8    1126        NXTST   0022        XDILX   0145
CLT5    1035        ERR9    1213        OK1B    1235        XDILY   0151
CLT6    1051        ERRMSG  0062        OUT1    3006        XDIRE   0165
CLT7    1065        ERROR   4101        PLINE   2443        XDISD   0140
CLT8    1114        ERSWIT  0004        PLOTCT  2470        XDIXY   0155
CLT9    1201        ERTYPE  0122        PNTR1   0456        XPOINT  2240
CLTST   0600        FAIL    0101        PNTR2   2326        XRAMP   0472
CORNER  1604        GETBAK  0023        PNTST   2200        XVERT   2056
CORIST  1600        GETVAL  0417        PRESET  0025        XX      7402
CROTST  2400        HORBAR  2072        RAMP    0462        YPOINT  2241
DBTST   2000        HORCNT  2055        RAMPA   0475        YVERT   2112
DELAY   0024        HORFLY  1405        RDICD   0135
DIABIS  2004        HORTST  1400        RDICL   0131
DIACNT  2657        HRBTST  2057        RDILE   0162
DIAG1   2626        IOTT    0056        RDILX   0146
DIAG1A  2650        K7077   0320        RDILY   0152
DIAG2   2660        M40     4653        RDIRE   0166
DIAG2A  2706        MASAGE  4660        RDISD   0141
DICD    4134        MASK77  4652        RDIXY   0156
DICL    4130        MASKA   3071        RETURN  0002
DILE    4161        MASKB   3072        RMPTST  0457
DILX    4145        MASKC   3073        SAVIT   0593
DILY    4151        MASKD   3074        SEL1    0053
DIRE    4165        MESAGE  4600        SELCHN  0044
DISCAL  2245        MIOT    0321        SETHOR  2613
DISD    4140        MLINE   2416        SETIOT  0256
DISLOP  2265        MSG1    3200        SETUP   4025
DISMSG  0213        MSG10   3404        SETVER  2600
DISP1   2444        MSG11   3420        SINPNT  2222
```