IDENTIFICATION

PRODUCT NAME:	AD8E, AM8E A-D CONVERTER AND MULTIPLEXER DIAGNOSTIC
PRODUCT CODE:	MAINDEC-08-DHADA-A-D
FORMERLY:	MAINDEC-8E-D6BB-D-(D)
DATE REVISED:	MARCH 1972
MAINTAINER:	DIAGNOSTIC GROUP
AUTHOR:	P.T. COYNE

READ THIS DOCUMENT PRIOR TO RUNNING PROGRAM:

1. ABSTRACT

This program performs basic tests on the Input/Output control logic and multiplexer. The analog tests are designed to provide a means of calibrating the converter and checking conversion parameters.

2. REQUIREMENTS

2.1 Equipment

PDP-8/E with 4K core, ASR33 teletpye, AD8E A-D Converter, (AM8E Multiplexer optional), Adjustable High Quality Voltage Source, EDC MODEL MV105G or equivalent.

NOTE: To run MONOTINICITY TEST, a function generator capable of .1 CPS, sine or ramp output must be used.

2.2 Storage

Maindec resides in locations 0000-4500.

2.3 Preliminary Programs

All basic CPU and teletype Maindecs must have been run successfully.

NOTE: If external enable utilizing the DK8-E REAL TIME CLOCK is to be run, the Maindec for the DK8-E must be successfully run first. In addition, VC8-E Control Tests must be run prior to special LAB-E SYSTEM CHECK routine.

3. LOADING PROCEDURE

The binary loader is used to load the program.

3.1 Control Switches

SW0 = Suppress error messages and "END LOGIC TEST" MESSAGE
SW1 = HALT ON ERROR WITH PC displayed in AC.
SW2 = Scope loop override to exit from loop on error and permit continuance of test. Also halts with converted word in AC for EXTERNAL ENABLE when there is no error.
SW3 = Enables halt during calibration routine. Converted word is displayed in AC.
SW4 = Must be set to run EXTERNAL ENABLE test.
SW5 = Allows operator to explicitly select any one of the logic routines.

4. USAGE PROCEDURE

SEE SPECIFICATIONS FOR MAXIMUM VOLTAGE INPUTS!!

INSURE THAT TELETYPE IS ON-LINE.

a. Control Logic Test

1. LOAD 200.

2. Press CLEAR then CONTINUE. HALT will occur.

3. Select options from switches 0, 1, 2, 5.

4. If SW5 is present (1), select test from SW8-11.

5. Press CONTINUE.

6. After each pass (12 sec) "END OF LOGIC TEST" will be printed.

NOTE: With SW5 down and SW2 up, any error will be reported once, then program will continue to next test.

b. IOT Scope Loop

1. LOAD 201.

2. Place low order six bits of IOT 65xx in SW6-11.

3. Press CLEAR, then CONTINUE.

NOTE: IOT may be reselected while running.

c. Display Converted Value In AC.

1. Apply voltage to A-D converter Input or to multiplexer channel Inputs.

2. LOAD 202.

3. If a HALT after conversion is desired, select SW3.

4. Select MPX channel from SW8-11; Select channel 0 if no multiplexer is available.

5. Press CLEAR, the CONTINUE; the converted value will be observed In the AC.

6. When SW3 halt select is engaged, operator may change channels. If desired, then press CONTINUE to loop. SW3 may be deselected at this time.

d. External Enable with Real Time Clock (DK8EP or DK8ES)

1. Apply voltage to A-D Converter Input or preamplifiers, if desired.

2. LOAD 203.

3. Set SW4.

4. Select switches 0 or 2 as desired.

5. Select channel with SW 8-11.

6. Press CLEAR, then CONTINUE.

7. After each pass the TTY bell will ring.

NOTE: Channel may be changed while running test.

e. Monoticity Test

NOTE: Ramp Speed of function generator must be slower than slow rate of converter. See ENGINEERING SPECIFICATIONS. (.1 HZ is a good setting).

1. Connect function generator to CHNL 0 or to AD8E Input.

2', LOAD 204

3', Select SW0 if desired,

4', Press CLEAR, then CONTINUE,

5', Program will halt,

6', Select Stall time between tests Iterations by selecting SW0-11, The larger the number in the switch register, the greater the stall time,

7', Press CONTINUE,

8', If error occurs, program will halt with word "N" in AC, Pressing CONTINUE will display "N+1" word in AC, Pressing CONTINUE again will restart test,

f', Resolution Accuracy Test

1', Apply a known voltage to A-D converter input,

2', LOAD 205,

3', Select SWS 0,1 if desired,

4', Select channel with SW8-11,

5', Press CLEAR, then CONTINUE,

6', If error occurs, program will typeout the two non-comparing words on TTY then continue with test,

7', If no error occurs, TTY bell will ring once then, program will recycle, One cycle being 500,000(10) conversions,

g', Successive Reads Test

1', Apply any voltage to A-D converter inputs at preamplifier,

2', LOAD 206,

3', Select SW0 if desired,

4', Select channel from SW8-11,

5', Press CLEAR, then CONTINUE,

6. If error occurs, program will halt with first read in AC. Press CONTINUE to get second read into AC.

7. To restart, press continue.

8. If no error occurs, TTY bell will ring once, then program will recycle.

h. Multiplexer noise test

1. LOAD 207.

2. Select channel in SW8-11 and apply voltage to that channel.

3. Select SW0 if desired.

4. Press CLEAR, then CONTINUE.

5. If error occurs, message will be typed on TTY, then routine will recycle.

i. LAB8-E System Test

The system must contain a DK8-EP option and a VC8-E option with a display.

1. Apply a voltage input to the A/D or multiplexer.

2. LOAD 210.

3. Depress CLEAR, CONTINUE.

4. Program will halt.

5. Select clock frequency via SW3-5, reference LAB8-E programming card for DK8-EP clock rate. (1MHZ=6, 100KHZ=5,....100HZ=2).

6. Press CONTINUE then observe printout: "SET SW5(AUTO-INC), NUMBER OF CHNLS IN SW8-11 OR SET SW8-11 (SINGLE CHNL)".

7. If all channels are to be displayed at the same time, set SW5, then set the number of channels contained within the system into SW8-11. I.E., IF SYSTEM CONTAINS ONE A232, SET THE SWITCH REGISTER TO 0110. IF ONLY CHNL FOUR IS TO BE OBSERVED SET THE SWITCH REGISTER TO 0004.

8. DEPRESS CONTINUE and observe the display scope. A horizontal line should be present for channel selected. By varying the input voltage the line should move up or down. ØV=mid-screen, +V=TOP, -V= bottom. A sweep of the scope is generated on each clock overflow. Thus it is a function of the clock rate set in (5).

5. PROGRAM DESCRIPTION

5.1 Control Logic Tests

Consists of 14 separate checks to assure the control logic is functioning properly.

TST0 - Checks that A-D DONE and TIMING ERROR flags are cleared by Initialize.

TST1 - Checks that A-D DONE flag can be set then cleared.

TST2 - Checks that TIMEING ERROR flag can be set then cleared.

TST3 - Test for unexpected Interrupt request.

TST4 - Tests to see if ADRB Jam transfers to AC.

TST5 - Tests to see if ADRS Jam transfers to AC.

TST6 - Tests to see if enable register can be loaded and read back.

TST7 - Tests to see if A-D DONE will generate Interrupt.

TST10- Tests to see if TIMING ERROR will generate Interrupt.

TST11- Test that MPX Register can be loaded and read back.

TST12- Tests that all channels can be loaded into MPX register and read back.

TST13- Tests auto-increment mode of MPX register.

TST14- Test to see if conversion can be made in specified time.

5.2 Miscellaneous Tests

A. IOT Scope Loop Test - enables IOT to be repeated for troubleshooting.

B. External Enable Test - utilizes DK8/E Real Time Clock to start conversion. NOTE: This test can be used only if DK8/E is present in system.

C. Display Converted Value In AC - used to calibrate converter. (See setup procedure of AD8E).

D. LAB8-E SYSTEM CHECKS - assures reliability of system as homogeneous unit.

5.3 Analog Tests

A. Successive Reads Tests - checks for noise in A-D buffer logic.

B. Monotinicity Test - checks that all specified values can be converted.

C. Resolution Accuracy Test - samples a known voltage 64 times and checks that resolution is within specification.

D. Multiplexer Noise Test - checks for noise in MPX, ENABLE, and STATUS REGISTER.

6. ERROR REPORTS

6.1 Logic Errors

Message will be typed out once per error on teletype stating test number and nature of failure.

6.2 Other Errors

Message will be typed out on teletypewriter stating nature of failure.

7. LISTING

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                /MAINDEC-08-DHADA-A A/D CONVERTER, MULTIPLEXER DIAGNOSTIC
                /AD8EA,AM8EA,AM8EB
                /COPYRIGHT 1972, DIGITAL EQUIPMENT CORPORATION, MAYNARD, MASS. 01754
                /DATE REVISED: 6 MAR 72
                /REVISED BY: P. T. COYNE

                /IOT DEFINITIONS
4520    ADCL=   JMS I   XADCL           /CLEAR ALL
4521    ADLM=   JMS I   XADLM           /LOAD MPX REG FROM AC8-11 CLA
4522    ADST=   JMS I   XADST           /CLEAR FLAGS, START CONVERSION
4523    ADRB=   JMS I   XADRB           /CLEAR DONE, READ A-D BUFFER INTO AC,
4524    ADSK=   JMS I   XADSK           /SKIP ON A-D DONE, DO NOT CLEAR FLAG,
4525    ADSE=   JMS I   XADSE           /SKIP ON TMG ERROR, DO NOT CLEAR FLAG,
4526    ADLE=   JMS I   XADLE           /LOAD ENAB REG FROM AC 2-5, CLA,
4527    ADRS=   JMS I   XADRS           /READ STATUS, ENAB, MPX REG INTO AC,
4530    CLOE=   JMS I   XCLOE           /AC TO CLOCK ENABLE
4531    CLSK=   JMS I   XCLSK           /SKIP ON CLOCK OVERFLOW
4532    CLZE=   JMS I   XCLZE           /ONES IN AC CLEAR CLOCK ENABLE REGISTER
4533    CLSA=   JMS I   XCLSA           /CLOCK STATUS TO AC, AC ONES CLEAR CLOCK STATUS REGISTER
4534    CLED=   JMS I   XCLED           /CLOCK ENABLE TO AC
4535    CLAB=   JMS I   XCLAB           /AC ONES TO CLOCK BUFFER
4536    DISD=   JMS I   XDISD           /SKIP ON DISPLAY DONE
4537    DILX=   JMS I   XDILX           /LOAD X
4540    DILY=   JMS I   XDILY           /LOAD Y
4541    DIXY=   JMS I   XDIXY           /INTENSIFY
4542    DILE=   JMS I   XDILE           /LOAD DISPLAY ENABLE FROM AC

6007    CAF=    6007
7002    BSW=    7002

                /MPX, ENABLE, STATUS REGISTER

                / 0  AD DONE
                / 1  TIMING ERROR
                / 2  ENABLE INTERRUPT ON AD DONE
                / 3  ENABLE INTERRUPT ON TIMING ERROR
                / 4  ENABLE EXTERNAL AD START
                / 5  AUTO-INCREMENT MODE
                / 6,7  NOT USED
                / 8-11  MPX CHANNEL 0-17 OCTAL


                /STARTING ADDRESS       TEST
                /
                /200                    NORMAL START FOR CONTROL LOGIC TESTS
                /201                    IOT SCOPE LOOP
                /202                    DISPLAY CONVERTED VALUE IN AC
                /203                    EXTERNAL ENABLE TEST
                /204                    MONOTINICITY TEST
                /205                    ACCURACY TEST
                /206                    SUCCESSIVE READS TEST
                /207                    MULTIPLEXER NOISE TEST
                /210                    SYSTEM CHECK FOR LAB8-E
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                0000    *0
0000    0000            0
0001    5402            JMP I   .+1
0002    0000            0
0003    5404            JMP I   .+1
0004    0000            0
0005    7402            HLT


                0017    *17
0017    0145    MSGPNT, ERMSG

                0020    *20
0020    4000    SW0,    4000            /SWITCH REG 0 INHIBIT TYPEOUT
0021    2000    SW1,    2000            /           1 HALT ON ERROR
0022    1000    SW2,    1000            /           2 SCOPE LOOP OVERRIDE
0023    0400    SW3,    0400            /           3 CALIBRATION TEST HALT
0024    0200    SW4,    0200            /           4 EXTERNAL ENABLE
0025    0100    SW5,    0100            /           5 SELECT TEST
0026    0000    TEMP0,  0               /STORAGE BUFFER 0
0027    0000    TEMPA,  0               /STORAGE BUFFER A
0030    0000    TEMPB,  0               /               B
0031    0000    TEMPC,  0               /               C
0032    0000    TEMPD,  0               /               D
0033    0000    CNTR1,  0               /MONOTONICITY COUNTER
0034    0000    TALLY,  0
0035    1226    ERR,    ERTYP           /ERROR REPORT ROUTINE
0036    1000    XCONVT, CONVT           /DISPLAY CONVERTED VALUE
0037    1400    XINSTR, INSTR           /IOT SCOPE LOOP
0040    2000    XMONOT, MONOT           /MONOTONICITY TEST
0041    0207    K207,   207             /BELL CODE
0042    0212    K212,   212             /LINE FEED
0043    0215    K215,   215             /CARRIAGE RETURN
0044    6500    K6500,  6500
0045    7777    M1,     7777
0046    7776    M2,     7776
0047    7774    M4,     7774
0050    1000    K1000,  1000
0051    0077    K77,    0077
0052    1200    XMOVE,  MOVE
0053    1024    EXTBL,  EXTL
0054    4377    XSTOR,  STORAG-1
0055    2400    XCOMPR, COMPAR
0056    2200    XRESOL, RESOL
0057    2051    XNOISE, NOISE
0060    2103    XGLIT,  GLITCH
0061    2600    XSYST,  SYST
0062    7777    ERSWIT, 7777
0063    0000    CHAN,   0
0064    1600    TAL,    XTAL
0065    1647    SELECT, XSELEC
0066    1552    SETUP,  XSETUP
                0077    *77
0077    0000    CHNL,   0
```



```
0100    0001            1
   01   0002            2
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  102  0003              3
 0103  0004              4
 0104  0005              5
 0105  0006              6
 0106  0007              7
 0107  0010              10
 0110  0011              11
 0111  0012              12
 0112  0013              13
 0113  0014              14
 0114  0015              15
 0115  0016              16
 0116  0017              17
 0117  0000              0


       0120     *120

                /IOT LINKS

 0120  1410     XADCL,  XXADCL
 0121  1414     XADLM,  XXADLM
 0122  1420     XADST,  XXADST
 0123  1424     XADRB,  XXADRB
 0124  1430     XADSK,  XXADSK
 0125  1436     XADSE,  XXADSE
 0126  1444     XADLE,  XXADLE
 0127  1450     XADRS,  XXADRS
 0130  1454     XCLOE,  XXCLOE
 0131  1460     XCLSK,  XXCLSK
 0132  1466     XCLZE,  XXCLZE
 0133  1472     XCLSA,  XXCLSA
 0134  1476     XCLED,  XXCLED
 0135  1502     XCLAB,  XXCLAB
 0136  1506     XDISD,  XXDISD
 0137  1514     XDILX,  XXDILX
 0140  1520     XDILY,  XXDILY
 0141  1524     XDIXY,  XXDIXY
 0142  1530     XDILE,  XXDILE

       0145     *145

                /ERROR MESSAGE LINKS

 0145  3200     ERMSG,  EMSG0
 0146  3244             EMSG1
 0147  3302             EMSG2
 0150  3344             EMSG3
 0151  3372             EMSG4
 0152  3422             EMSG5
 0153  3452             EMSG6
 0154  3503             EMSG7
 0155  3540             EMSG10
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 0156  3601             EMSG11
 0157  3637             EMSG12
 0160  3677             EMSG13
 0161  3744             EMSG14
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                0200    *200
0200    5211            JMP     START           /NORMAL START
0201    5437            JMP I   XINSTR          /IOT SCOPE LOOP OPTION
0202    5436            JMP I   XCONVT          /DISPLAY CONVERTED VALUE OPTION
0203    5453            JMP I   EXTBL           /EXTERNAL ENABLE TEST
0204    5440            JMP I   XMONOT          /MONOTINICITY TEST
0205    5456            JMP I   XRESOL          /ACCURACY TEST
0206    5457            JMP I   XNOISE          /SUCCESSIVE READS TEST
0207    5460            JMP I   XGLIT           /MPX NOISE TEST
0210    5461            JMP I   XSYST           /LAB8-E SYSTEM CHECK
0211    7402    START,  HLT
0212    7604            LAS
0213    0025            AND     SW5             /SELECT SPECIFIC TEST?
0214    7440            SZA                     /SKIP IF NO
0215    4465            JMS I   SELECT          /YES


                /HOUSEKEEPING
0216    7300    INITL,  CLA CLL
0217    4777'           JMS     MESAGE
0220    4161            XLABEL
0221    1376            TAD     (144
0222    3017            DCA     MSGPNT          /INITIALIZE ERROR POINTER
0223    4466            JMS I   SETUP
0224    6007    TST0,   CAF
0225    4524            ADSK                    /CHECK FOR DONE FLAG - SHOULD BE CLEARED BY INIT
0226    5231            JMP     .+3
0227    4435            JMS I   ERR             /DONE FLAG NOT CLEARED
0230    0224            TST0
0231    4525            ADSE                    /CHECK FOR TIMING ERROR FLAG - SHOULD BE CLEARED BY INIT
0232    5237            JMP     .+5
0233    4435            JMS I   ERR             /TIMING ERROR FLAG NOT CLEARED
0234    0224            TST0
0235    5240            JMP     TST1-1
0236    5224            JMP     TST0
0237    4464            JMS I   TAL

                /CHECK TO SET DONE FLAG AND CLEAR DONE FLAG
0240    4466            JMS I   SETUP
0241    7200    TST1,   CLA
0242    4522            ADST                    /CONVERT, RESULTS NOT NEEDED
0243    1177            TAD     (-100
0244    3026            DCA     TEMP0
0245    2026            ISZ     TEMP0
0246    5245            JMP     .-1
0247    4524            ADSK
0250    7410            SKP
0251    5255            JMP     .+4
0252    4435            JMS I   ERR             /FLAG NOT SET
0253    0241            TST1

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0254    5265            JMP     TST2-1
0255    4520            ADCL                    /CLEAR FLAG
0256    4524            ADSK                    /CHECK FOR FLAG
0257    5264            JMP     .+5             /FLAG CLEARED
0260    4435            JMS I   ERR             /FLAG     CLEARED
0261    0241            TST1
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     2  5265            JMP     TST2-1
0263  5241            JMP     TST1
0264  4464            JMS I   TAL

                /CHECK TO SET TIMING ERROR FLAG AND CLEAR TIMING ERROR FLAG
0265  4466            JMS I   SETUP
0266  7200    TST2,   CLA
0267  4522            ADST                    /TWO A-D STARTS TO PRODUCE TIMING ERROR
0270  4522            ADST
0271  4525            ADSE                    /CHECK FOR TIMING ERROR FLAG
0272  7410            SKP
0273  5276            JMP     .+3
0274  4435            JMS I   ERR             /FLAG NOT SET
0275  0266            TST2
0276  4520            ADCL                    /CLEAR FLAG
0277  4525            ADSE                    /CHECK FLAG
0300  5305            JMP     .+5
0301  4435            JMS I   ERR             /FLAG NOT CLEARED
0302  0266            TST2
0303  5306            JMP     TST3-1
0304  5266            JMP     TST2
0305  4464            JMS I   TAL

                /TEST FOR UNEXPECTED INTERRUPT REQUEST
0306  4466            JMS I   SETUP
0307  7200    TST3,   CLA
0310  1176            TAD     [TST3S
0311  3004            DCA     4
0312  1317            TAD     .+5             /ERROR TRAP
0313  3001            DCA     1
0314  6001            ION                     /TURN INT ON
0315  7000            NOP
0316  5322            JMP     .+4
0317  4435            JMS I   ERR             /UNEXPECTED INTERRUPT OCCURRED
0320  0307            TST3
0321  5326            JMP     TST4-1
0322  6002    TST3S,  IOF                     /TURN INT OFF
0323  7410            SKP
0324  5307            JMP     TST3
0325  4464            JMS I   TAL

                /TEST THAT ADRB JAM TRANSFERS TO AC

0326  4466            JMS I   SETUP
0327  7240    TST4,   CLA CMA                 /AC=7777
0330  4523            ADRB                    /SHOULD CLEAR AC
0331  3027            DCA     TEMPA           /SAVE AC
0332  7040            CMA
0333  4523            ADRB                    /READ WITH AC=0

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0334  7041            CIA
0335  1027            TAD     TEMPA
0336  7440            SZA                     /EQUAL?
0337  7410            SKP
0340  5345            JMP     .+5
0341  4435            JMS I   ERR             /NO-ERROR
0342  0327            TST4
0343  5346            JMP     TST5-1
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0344  5327            JMP     TST4
0345  4464            JMS I   TAL

                /TEST THAT ADRS JAM TRANSFERS TO AC

0346  4466            JMS I   SETUP
0347  4520    TST5,   ADCL
0350  4521            ADLM
0351  4522            ADST
0352  4524            ADSK
0353  5352            JMP     .-1
0354  7340            CLA CMA CLL             /AC=7777
0355  4527            ADRS
0356  3027            DCA     TEMPA           /SAVE AC, SHOULD BE 4000
0357  1027            TAD     TEMPA
0360  7004            RAL
0361  7440            SZA                     /DID ADRS CLEAR AC?
0362  7410            SKP
0363  5370            JMP     .+5
0364  4435            JMS I   ERR             /NO
0365  0347            TST5
0366  5775'           JMP     TST6-1
0367  5347            JMP     TST5
0370  4464            JMS I   TAL
0371  5775'           JMP     TST6-1

0375  0400
0376  0144
0377  1274
      0400    PAGE

                /CHECKS THAT ENABLE REGISTER CAN BE LOADED AND READ BACK

0400  4466            JMS I   SETUP
0401  7300    TST6,   CLA CLL
0402  1175            TAD     C17             /GET BITS AND
0403  7002            BSW                     /PLACE IN AC 2-5
0404  4526            ADLE                    /LOAD
0405  7440            SZA
0406  7410            SKP
0407  5212            JMP     .+3
0410  4435            JMS I   ERR             /AC NOT CLEARED BY ADLE
0411  0401            TST6
0412  7040            CMA
0413  4527            ADRS                    /READ BACK
0414  7002            BSW
0415  1174            TAD     C7761           /CHECK FOR ONLY AC 2-5 SET
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0416  7440            SZA
0417  7410            SKP
0420  5225            JMP     .+5
0421  4435            JMS I   ERR             /WRONG BITS
0422  0401            TST6
0423  5226            JMP     TST7-1
0424  5201            JMP     TST6
0425  4464            JMS I   TAL             /DONE?

                /GENERATE INTERRUPT WITH A-D DONE FLAG
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```
 0426  4466              JMS I   SETUP
 0427  7200    TST7,     CLA
 0430  4522              ADST                    /CONVERT
 0431  4524              ADSK                    /DONE?
 0432  5231              JMP     .-1             /WAIT
 0433  1173              TAD     [DON1
 0434  3002              DCA     2               /RETURN POINTER
 0435  1050              TAD     K1000
 0436  4526              ADLE                    /LOAD INTERRUPT ENABLE
 0437  6001              ION
 0440  7000              NOP
 0441  6002              IOF
 0442  4435              JMS I   ERR             /DID NOT INTERRUPT
 0443  0427              TST7
 0444  5251              JMP     TST10-1
 0445  4520    DON1,     ADCL                    /CLEAR WORLD
 0446  7410              SKP
 0447  5227              JMP     TST7
 0450  4464              JMS I   TAL

                 /GENERATE INTERRUPT WITH TIMING ERROR FLAG
 0451  4466              JMS I   SETUP
 0452  7200    TST10,    CLA
 0453  1172              TAD     [TMG1
 0454  3002              DCA     2
 0455  4522              ADST                    /CAUSE ERROR HERE
 0456  4522              ADST
 0457  4524              ADSK                    /DONE?
 0460  5257              JMP     .-1
 0461  4525              ADSE                    /TIMING ERROR?
 0462  5261              JMP     .-1
 0463  7300              CLA CLL
 0464  1050              TAD     K1000
 0465  7010              RAR
 0466  4526              ADLE                    /LOAD INTERRUPT ENABLE
 0467  6001              ION                     /INT ON
 0470  7000              NOP
 0471  6002              IOF                     /INT OFF
 0472  4435              JMS I   ERR             /DID NOT INTERRUPT
 0473  0452              TST10
 0474  5301              JMP     TST11-1
 0475  4520    TMG1,     ADCL                    /CLEAR WORLD
 0476  7410              SKP
 0477  5252              JMP     TST10
 0500  4464              JMS I   TAL
```



```
                 /LOAD AND READ MPX REG
 0501  4466              JMS I   SETUP
 0502  7240    TST11,    CLA CMA
 0503  4521              ADLM
 0504  7450              SNA                     /CHECK IF AC CLEARED
 0505  5311              JMP     .+4
 0506  4435              JMS I   ERR             /AC WAS NOT CLEARED BY ADLM
 0507  0502              TST11
 0510  7200              CLA
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0511  4521            ADLM                    /LOAD MPX REG WITH 00
0512  4527            ADRS                    /READ MPX REG
0513  0175            AND     C17             /MASK FOR MPX REG
0514  7440            SZA
0515  7410            SKP
0516  5321            JMP     .+3
0517  4435            JMS I   ERR             /MPX REG NOT 0
0520  0502            TST11
0521  7040            CMA
0522  0175            AND     C17
0523  4521            ADLM                    /MPX REG SET TO 17
0524  4527            ADRS                    /READ MPX REG
0525  0175            AND     C17
0526  1171            TAD     C7760           /MASK
0527  7040            CMA
0530  7440            SZA
0531  7410            SKP
0532  5337            JMP     .+5
0533  4435            JMS I   ERR             /MPX REG NOT 17
0534  0502            TST11
0535  5777            JMP     TST12-1
0536  5302            JMP     TST11
0537  4464            JMS I   TAL
0540  5777            JMP     TST12-1

0577  0600
      0600    PAGE

              /LOAD MPX REG WITH EACH CHANNEL
0600  4466            JMS I   SETUP
0601  7300    TST12,  CLA CLL
0602  3026            DCA     TEMP0
0603  1026            TAD     TEMP0           /CHANNEL INTO AC
0604  7040            CMA
0605  3027            DCA     TEMPA           /COMPLEMENTED CHANNEL
0606  1026            TAD     TEMP0
0607  4521            ADLM                    /LOAD IT
0610  4527            ADRS                    /READ MPX REG
0611  0175            AND     C17             /MASK 8-11
0612  3030            DCA     TEMPB           /STORE IT
0613  1027            TAD     TEMPA           /CHECK IT
0614  1030            TAD     TEMPB
0615  7001            IAC
```



```
0616  7440            SZA
0617  7410            SKP
0620  5224            JMP     .+4
0621  4435            JMS I   ERR             /WRONG CHANNEL
0622  0601            TST12
0623  5236            JMP     TST13-1
0624  1171            TAD     C7760
0625  1026            TAD     TEMP0
0626  7001            IAC
0627  7440            SZA                     /DONE WITH ALL CHANNELS?
0630  7410            SKP                     /NO
0631  5235            JMP     .+4             /YES
0632  7300            CLA CLL
0633  2026            ISZ     TEMP0           /SET N    CHANNEL
```

```
 0634  5203            JMP     TST12+2
 0635  4464            JMS I   TAL             /DONE WITH TEST?

                 /AUTO-INCREMENT MODE TEST
 0636  4466            JMS I   SETUP
 0637  7300    TST13,  CLA CLL
 0640  1170            TAD     C76
 0641  3010            DCA     10
 0642  4520            ADCL
 0643  7200    AUTO1,  CLA
 0644  1410            TAD I   10              /CHANNEL N
 0645  3027            DCA     TEMPA
 0646  1027            TAD     TEMPA
 0647  7040            CMA
 0650  3030            DCA     TEMPB
 0651  1025            TAD     SW5             /AUTO-INCREMENT BIT
 0652  4526            ADLE                    /LOAD ENABLE REG
 0653  1027            TAD     TEMPA           /CHANNEL N
 0654  4521            ADLM                    /LOAD MPX REG
 0655  4522            ADST                    /START CONVERSION
 0656  4524            ADSK                    /WAIT FOR
 0657  5256            JMP     .-1             /DONE FLAG
 0660  4527            ADRS                    /READ STATUS
 0661  0175            AND     C17             /MASK OUT ALL BUT MPX REG
 0662  3031            DCA     TEMPC
 0663  1027            TAD     TEMPA           /CHECK IF CHANNEL 17 INCREMENTED TO 0
 0664  1174            TAD     C7761
 0665  7640            SZA CLA                 /IF CHANNEL 17 SKIP
 0666  5272            JMP     .+4
 0667  1410            TAD I   10
 0670  1031            TAD     TEMPC
 0671  5274            JMP     AUTO2           /AC SHOULD = 0
 0672  1031            TAD     TEMPC
 0673  1030            TAD     TEMPB           /CHECK FOR CHANNEL N+1
 0674  7440    AUTO2,  SZA
 0675  7410            SKP
 0676  5302            JMP     .+4
 0677  4435            JMS I   ERR             /WRONG CHANNEL
 0700  0637            TST13
 0701  5310            JMP     TST14-1

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 0702  1031            TAD     TEMPC
 0703  7440            SZA                     /LAST CHANNEL?
 0704  5243            JMP     AUTO1           /NO
 0705  7410            SKP
 0706  5237            JMP     TST13
 0707  4464            JMS I   TAL

                 /ROUTINE TO CHECK THAT CONVERSION CAN BE MADE IN 20 MICROSECS
 0710  4466            JMS I   SETUP
 0711  7300    TST14,  CLA CLL
 0712  1377            TAD     (-6
 0713  3026            DCA     TEMP0
 0714  4520            ADCL
 0715  4522            ADST
 0716  2026            ISZ     TEMP0
```

```
0717  5316            JMP     .-1
0720  4524            ADSK
0721  7410            SKP
0722  5327            JMP     .+5
0723  4435            JMS I   ERR             /TIME OUT ERROR
0724  0711            TST14
0725  5330            JMP     FINIS
0726  5311            JMP     TST14
0727  4464            JMS I   TAL
0730  7604    FINIS,  LAS
0731  0020            AND     SW0             /SWITCH SET TO DELETE
0732  7640            SZA CLA                 /TYPEOUT OF END LOGIC TEST
0733  5337            JMP     .+4
0734  4776'           JMS     MESAGE
0735  4146            XEND
0736  7200            CLA
0737  1041            TAD     K207
0740  4775'           JMS     PRLP
0741  5774'           JMP     TST0-3          /RETURN TO BEGINNING OF LOGIC TESTS.


0774  0221
0775  1534
0776  1274
0777  7772
      1000    PAGE

              /ROUTINE TO DISPLAY CONVERTED VALUE IN AC.
1000  4520    CONVT,  ADCL                    /CLEAR WORLD
1001  3026            DCA     TEMP0
1002  7604            LAS                     /LOAD CHANNEL
1003  4521            ADLM                    /LOAD MPX REG
1004  4522            ADST                    /CONVERT
1005  4524            ADSK                    /DONE?
1006  5205            JMP     .-1             /WAIT
1007  4523            ADRB                    /READ A-D BUFFER
1010  2026            ISZ     TEMP0           /STALL TO DISPLAY
1011  5210            JMP     .-1             /CONVERTED VALUE
1012  2026            ISZ     TEMP0           /IN AC FOR
```



```
1013  5212            JMP     .-1             /33 MILLISECONDS
1014  3031            DCA     TEMPC
1015  7604            LAS                     /CHECK IF HALT DESIRED
1016  0023            AND     SW3
1017  7650            SNA CLA
1020  5223            JMP     .+3
1021  1031            TAD     TEMPC
1022  7402            HLT                     /PRESS CONTINUE IF NOT DONE ADJUSTING
1023  5200            JMP     CONVT           /LOOP


              /ROUTINE TO CHECK FOR EXTERNAL ENABLE FROM REAL TIME CLOCK

1024  4466    EXTL,   JMS I   SETUP
1025  4520            ADCL                    /CLEAR ALL
1026  7604            LAS
1027  0024            AND     SW4             /CHECK EXT/L ENABLE SWITCH
```

```
 1030  7450            SNA
 1031  7402            HLT                     /SWITCH NOT SET, STOP!
 1032  7604    EXT1,   LAS
 1033  0024            AND     SW4
 1034  4526            ADLE                    /LOAD EXTERNAL ENABLE INTO ADC
 1035  7604            LAS
 1036  0175            AND     C17
 1037  4521            ADLM                    /LOAD CHANNEL FROM SW8-11
 1040  1377            TAD     C4340           /LOAD CLOCK ENABLE REG
 1041  4530            CLOE                    /TRIGGER FROM RTC
 1042  7040            CMA
 1043  4532            CLEE
 1044  4531            CLSK                    /OCCURS ON OVERFLOW
 1045  5244            JMP     .-1
 1046  4533            CLSA                    /STOP CLOCK
 1047  7240            CLA CMA
 1050  4532            CLEE
 1051  7200            CLA
 1052  2026            ISZ     TEMP0           /TIME OUT
 1053  5252            JMP     .-1
 1054  4524            ADSK
 1055  4776'           JMS     ERPT3           /CONVERSION NOT MADE
 1056  4523            ADRB
 1057  3027            DCA     TEMPA           /STORE CONVERSION
 1060  7604            LAS
 1061  0022            AND     SW2             /LOOP?
 1062  7650            SNA CLA
 1063  5266            JMP     EXTTE           /YES
 1064  1027            TAD     TEMPA           /HALT WITH CONVERTED
 1065  7402            HLT                     /VALUE IN AC.
 1066  4466    EXTTE,  JMS I   SETUP
 1067  4520            ADCL
 1070  7604            LAS
 1071  0024            AND     SW4
 1072  4526            ADLE
 1073  7240            CLA CMA
 1074  4535            CLAB                    /CLOCK BUFFER = 7777
```



```
 1075  7200            CLA
 1076  1375            TAD     C1640           /TO GIVE TIMING ERROR ON NEXT CLOCK
 1077  4530            CLOE
 1100  7000            NOP
 1101  4525            ADSE                    /TIMING ERROR SEEN HERE
 1102  4776'           JMS     ERPT3           /DID NOT RAISE FLAG
 1103  7240            CLA CMA
 1104  4532            CLEE            /CLEAR CLOCK ENABLE REG
 1105  7200            CLA
 1106  4520            ADCL
 1107  1024            TAD     SW4
 1110  4526            ADLE            /LOAD EXT'L ENABLE INTO ADC
 1111  7240            CLA CMA
 1112  4535            CLAB            /SET THEN CLEAR
 1113  7200            CLA             /CLOCK BUFFER TO CHECK
 1114  4535            CLAB            /FOR ERRONEOUS START PULSE
 1115  1374            TAD     C-6
 1116  3031            DCA     TEMPC
 1117  2031            ISZ     TEMPC
 1120  5317            JMP     .-1
```

```
1121  4524            ADSK            /IF FLAG FOUND
1122  5325            JMP     .+3     /REPORT
1123  4776'           JMS     ERPT3   /ERROR
1124  4520            ADCL
1125  7200            CLA
1126  1041            TAD     K207
1127  4773'           JMS     PRLP
1130  5232            JMP     EXIT1



1173  1534
1174  7772
1175  1640
1176  1732
1177  4340
      1200      PAGE

                /SUBROUTINE TO MOVE VARIABLE LENGTH DATA FIELDS

1200  0000      MOVE,   0
1201  7300              CLA CLL
1202  1600              TAD I   MOVE          /GET "FROM ADDR" AND
1203  3223              DCA     FADDR         /STORE
1204  2200              ISZ     MOVE
1205  1600              TAD I   MOVE          /GET "TO ADDR" AND
1206  3224              DCA     TADDR         /STORE
1207  2200              ISZ     MOVE
1210  1600              TAD I   MOVE          /GET "MOVE COUNT" AND
1211  3225              DCA     MCTR          /STORE
1212  2200              ISZ     MOVE          /SETUP FOR EXIT
1213  7200      MOVEA,  CLA
1214  1623              TAD I   FADDR         /GET "FROM" WORD
1215  3624              DCA I   TADDR         /STORE AT "TO" LOCATION
1216  2223              ISZ     FADDR         /+1 TO "FROM" ADDR

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1217  2224              ISZ     TADDR         /+1 TO "TO" ADDR
1220  2225              ISZ     MCTR          /ALL WORDS MOVED?
1221  5213              JMP     MOVEA         /NO, RETURN
1222  5600              JMP I   MOVE          /YES, EXIT
1223  0000      FADDR,  0
1224  0000      TADDR,  0
1225  0000      MCTR,   0



                /ERROR TYPEOUT ROUTINE

1226  0000      ERTYP,  0
1227  7200              CLA
1230  1346              TAD     IND
1231  7640              SZA CLA
1232  5243              JMP     EOUT+1        /TYPE ERROR MESSAGE ONE TIME ONLY
1233  7604              LAS
1234  0020              AND     SW0           /SUPPRESS TYPEOUT?
1235  7710              SPA CLA
1236  5247              JMP     EOUT+5        /YES
  37  1417              TAD I   MSGPNT        /GET POINTER FOR ERROR MESSAGE
```

```
   40  3242            DCA     EOUT
 .+241  4274            JMS     MESAGE
 1242  7402    EOUT,   HLT
 1243  7200            CLA
 1244  1346            TAD     IND
 1245  7640            SZA CLA
 1246  5250            JMP     .+2
 1247  2346            ISZ     IND
 1250  7604            LAS
 1251  0021            AND     SW1             /HALT ON ERROR SWITCH ON?
 1252  7650            SNA CLA                 /SKIP IF ON
 1253  5257            JMP     SCOPE
 1254  1226            TAD     ERTYP
 1255  1045            TAD     M1
 1256  7402            HLT                     /HALT WITH ERROR P.C. IN AC,
 1257  7604    SCOPE,  LAS
 1260  0022            AND     SW2             /OVERRIDE LOOP?
 1261  7640            SZA CLA
 1262  5272            JMP     .+10
 1263  1626            TAD I   ERTYP           /NO
 1264  3271            DCA     EXIT
 1265  1017            TAD     MSGPNT
 1266  1045            TAD     M1
 1267  3017            DCA     MSGPNT
 1270  5671            JMP I   EXIT
 1271  7402    EXIT,   HLT
 1272  2226            ISZ     ERTYP           /YES
 1273  5626            JMP I   ERTYP

                /MESSAGE ROUTINE FOR LOGIC ERRORS

 1274  0000    MESAGE, 0

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 1275  7240            CLA CMA
 1276  1674            TAD I   MESAGE
 1277  3010            DCA     10
 1300  2274            ISZ     MESAGE
 1301  1410            TAD I   10
 1302  3313            DCA     MSRGHT
 1303  1313            TAD     MSRGHT
 1304  7012            RTR
 1305  7012            RTR
 1306  7012            RTR
 1307  4314            JMS     TYPECH
 1310  1313            TAD     MSRGHT
 1311  4314            JMS     TYPECH
 1312  5301            JMP     MESAGE+5
 1313  0000    MSRGHT, 0
 1314  0000    TYPECH, 0
 1315  0051            AND     K77
 1316  7450            SNA
 1317  5674            JMP I   MESAGE
 1320  1377            TAD     (-40
 1321  7510            SPA
 1322  5325            JMP     .+3
 1323  1376            TAD     (240
 1324  5340            JMP     MTP
```

```
1325  7001            IAC
1326  7440            SZA
1327  5332            JMP     .+3
1330  1043            TAD     K2115
1331  5340            JMP     MTP
1332  7001            IAC
1333  7440            SZA
1334  5337            JMP     .+3
1335  1042            TAD     K2112
1336  5340            JMP     MTP
1337  1375            TAD     (336
1340  6046    MTP,    TLS
1341  6041            TSF
1342  5341            JMP     .-1
1343  6042            TCF
1344  7200            CLA
1345  5714            JMP I   TYPECH
1346  0000    IND,    0


1375  0336
1376  0240
1377  7740
      1400    PAGE
              /SCOPE LOOP FOR IOTS 65XX,
1400  7000    INSTR,  NOP
1401  7604            LAS                     /SELECT IOT FROM SR 6-11
1402  0051            AND     K77             /MASK OUT AC 0-5
1403  1044            TAD     K6500           /CREATE IOT
1404  3205            DCA     .+1
1405  7402            HLT                     /LOCATION OF IOT
```



```
1406  7000            NOP                     /POSSIBLE SKIP
1407  5201            JMP     INSTR+1         /LOOP


              /IOT SUBROUTINES

1410  0000    XXADCL, 0
1411  6530            6530                    /CLEAR ALL
1412  5610            JMP I   XXADCL
1413  7402            HLT

1414  0000    XXADLM, 0
1415  6531            6531                    /LOAD MPX REG
1416  5614            JMP I   XXADLM
1417  7402            HLT

1420  0000    XXADST, 0
1421  6532            6532                    /START CONVERSION
1422  5620            JMP I   XXADST
1423  7402            HLT

1424  0000    XXADRB, 0
1425  6533            6533                    /READ A-D BUFFER
1426  5624            JMP I   XXADRB
   27 7402            HLT
```

```
1430  0000    XXADSK, 0
1431  6534            6534                    /SKIP ON A=D DONE
1432  7410            SKP
1433  2230            ISZ     XXADSK
1434  5630            JMP I   XXADSK
1435  7402            HLT

1436  0000    XXADSE, 0
1437  6535            6535                    /SKIP ON TIMING ERROR
1440  7410            SKP
1441  2236            ISZ     XXADSE
1442  5636            JMP I   XXADSE
1443  7402            HLT

1444  0000    XXADLE, 0
1445  6536            6536                    /LOAD ENABLE REGISTER
1446  5644            JMP I   XXADLE
1447  7402            HLT

1450  0000    XXADRS, 0
1451  6537            6537                    /READ STATUS REGISTER
1452  5650            JMP I   XXADRS
1453  7402            HLT

1454  0000    XXCLOE, 0
1455  6132            6132                    /LOAD CLOCK ENABLE
1456  5654            JMP I   XXCLOE
1457  7402            HLT
```



```
1460  0000    XXCLSK, 0
1461  6131            6131                    /SKIP ON CLOCK OVERFLOW
1462  7410            SKP
1463  2260            ISZ     XXCLSK
1464  5660            JMP I   XXCLSK
1465  7402            HLT

1466  0000    XXCLZE, 0
1467  6130            6130                    /ONES IN AC CLEAR CLOCK ENABLE REG
1470  5666            JMP I   XXCLZE
1471  7402            HLT

1472  0000    XXCLSA, 0
1473  6135            6135                    /CLOCK STATUS TO AC, AC ONES CLR CLK STATUS REG
1474  5672            JMP I   XXCLSA
1475  7402            HLT

1476  0000    XXCLED, 0
1477  6134            6134                    /CLOCK ENABLE TO AC
1500  5676            JMP I   XXCLED
1501  7402            HLT

1502  0000    XXCLAB, 0
1503  6133            6133                    /AC ONES TO CLOCK BUFFER
1504  5702            JMP I   XXCLAB
1505  7402            HLT
```

```
1506  0000  XXDISD, 0
1507  6052          6052                    /SKIP ON DISPLAY DONE
1510  7410          SKP
1511  2306          ISZ     XXDISD
1512  5706          JMP I   XXDISD
1513  7402          HLT

1514  0000  XXDILX, 0
1515  6053          6053                    /LOAD X
1516  5714          JMP I   XXDILX
1517  7402          HLT

1520  0000  XXDILY, 0
1521  6054          6054                    /LOAD Y
1522  5720          JMP I   XXDILY
1523  7402          HLT

1524  0000  XXDIXY, 0
1525  6055          6055                    /INTENSIFY
1526  5724          JMP I   XXDIXY
1527  7402          HLT

1530  0000  XXDILE, 0
1531  6056          6056                    /LOAD ENABLE FROM AC, CLEAR AC
1532  5730          JMP I   XXDILE
1533  7402          HLT
```



```
                /PRINT ROUTINE
1534  0000  PRLP,  0
1535  6046          TLS                     /XMIT CHARACTER
1536  6041          TSF                     /WAIT FOR FLAG
1537  5336          JMP     .-1
1540  7200          CLA
1541  5734          JMP I   PRLP            /RETURN

                /CARRIAGE RETURN LINE FEED ROUTINE
1542  0000  CRLF,  0
1543  7240          CLA CMA
1544  0043          AND     K215            /CARRIAGE RETURN CODE
1545  4334          JMS     PRLP            /PRINT ROUTINE
1546  7240          CLA CMA
1547  0042          AND     K212            /LINE FEED CODE
1550  4334          JMS     PRLP            /PRINT ROUTINE
1551  5742          JMP I   CRLF            /RETURN

                /ROUTINE TO CLEAR WORKING BUFFERS PRIOR TO TEST

1552  0000  XSETUP, 0
1553  4452          JMS I   XMOVE           /CLEAR WORK AREA
1554  0026          TEMP0
1555  0027          TEMPA
1556  7773          -5
1557  6002          IOF
  \0  6007          CAF
```

```
    2  0000    ERPT3,  0
 1733  7604            LAS
 1734  0020            AND     SW0
 1735  7710            SPA CLA
 1736  5342            JMP     .+4
 1737  4777'           JMS     MESAGE
 1740  4056            EMSG22
 1741  4776'           JMS     CRLF
 1742  7604            LAS
 1743  0021            AND     SW1
 1744  7650            SNA CLA
 1745  5732            JMP I   ERPT3
 1746  1332            TAD     ERPT3
 1747  1045            TAD     M1
 1750  7402            HLT

 1751  0000    ERPT4,  0
 1752  4777'           JMS     MESAGE
 1753  4105            EMSG23
 1754  4776'           JMS     CRLF
```



```
 1755  5751            JMP I   ERPT4

 1756  0000    ERPT5,  0
 1757  7604            LAS
 1760  0020            AND     SW0
 1761  7710            SPA CLA
 1762  5366            JMP     .+4
 1763  4777'           JMS     MESAGE
 1764  4122            EMSG24
 1765  4776'           JMS     CRLF
 1766  5756            JMP I   ERPT5



 1773  2051
 1774  2200
 1775  3000
 1776  1542
 1777  1274
       2000    PAGE
               /MONOTONICITY TEST
 2000  7300    MONOT,  CLA CLL
 2001  3027            DCA     TEMPA           /CLEAR N AND
 2002  3030            DCA     TEMPB           /N+1 CONVERSION STORAGE
 2003  4520            ADCL                    /CLEAR CONVERTER
 2004  4522            ADST                    /START CONVERSION
 2005  4524            ADSK                    /WAIT FOR DONE
 2006  5205            JMP     .-1
 2007  4523            ADRB                    /READ A-D BUFFER
 2010  3027            DCA     TEMPA           /STORE NTH CONVERSION
 2011  7604    CONT,   LAS                     /GET SWITCHES
 2012  7040            CMA                     /COMPLEMENT FOR DOWN COUNT
 2013  3033            DCA     CNTR1
 2014  4522            ADST                    /DO N+1ST CONVERSION
 2015  4524            ADSK
```

```
2016  5215            JMP     .-1
2017  4523            ADRB
2020  3030            DCA     TEMPB           /SAVE
2021  1027            TAD     TEMPA           /SUBTRACT
2022  7041            CIA
2023  1030            TAD     TEMPB
2024  7510            SPA             />0?

2025  7041            CIA             /NO, TAKE ABSOLUTE VALUE
2026  7450            SNA             /DIFFERENCE 0?
2027  5243            JMP     OK      /YES, OK.
2030  1045            TAD     M1
2031  7650            SNA CLA         /DIFFERENCE = 1?
2032  5243            JMP     OK      /YES, OK.
2033  4777'           JMS     ERPT4
2034  7200            CLA
2035  1027            TAD     TEMPA   /DIFFERENCE > 1, DISPLAY NTH CONVERSION
2036  7402            HLT
2037  7300            CLA CLL

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2040  1030            TAD     TEMPB   /DISPLAY N+1 CONVERSION
2041  7402            HLT
2042  5200            JMP     MONOT           /RESTART TO RESYNC
2043  2033    OK,     ISZ     CNTR1   /STALL
2044  5243            JMP     .-1
2045  7300            CLA CLL
2046  1030            TAD     TEMPB   /N+1 CONVERSION BECOMES
2047  3027            DCA     TEMPA   /N
2050  5211            JMP     CONT    /GET N+1 CONVERSION

                /ROUTINE TO TEST FOR EQUALITY OF TWO SUCCESSIVE ADRB'S.

2051  7300    NOISE,  CLA CLL
2052  1177            TAD     C-100           /SET TALLY FOR 64 TIMES
2053  3026            DCA     TEMP0
2054  1022            TAD     SW2             /ENABLE DONE BIT
2055  4521            ADLM                    /LOAD MPX REG
2056  4522            ADST                    /CONVERT
2057  4524            ADSK                    /DONE FLAG?
2060  5257            JMP     .-1             /NO
2061  4523            ADRB                    /YES, READ AD BUFFER
2062  3027            DCA     TEMPA           /STORE
2063  4523            ADRB                    /RE-READ
2064  3030            DCA     TEMPB           /STORE
2065  1027            TAD     TEMPA           /COMPARE FOR EQUALITY
2066  7041            CIA
2067  1030            TAD     TEMPB
2070  7420            SNL                     /LINK SHOULD BE SET
2071  4776'           JMS     ERPT2           /NOT EQUAL
2072  7440            SZA
2073  4776'           JMS     ERPT2           /NOT EQUAL
2074  7300            CLA CLL
2075  2026            ISZ     TEMP0           /CONTINUE
2076  5256            JMP     NOISE+5         /YES
2077  7200            CLA
2100  1041            TAD     K207
  01  4775'           JMS     PRLP            /RING BELL
  02  5251            JMP     NOISE           /DO TE    AGAIN
```

```
                        /ROUTINE TO CHECK FOR NOISE IN MULTIPL  R
2103  7300    GLITCH, CLA CLL
2104  1177            TAD     [-100
2105  3026            DCA     TEMP0
2106  7604            LAS                     /OPERATOR TO SELECT CHANNEL
2107  0175            AND     [17
2110  3031            DCA     TEMPC
2111  1031            TAD     TEMPC
2112  4521            ADLM
2113  4522            ADST
2114  4524            ADSK
2115  5314            JMP     .-1
2116  4523            ADRB
2117  3027            DCA     TEMPA
2120  4344    CHNL1,  JMS     RANCHN          /GET RANDOM CHANNEL
2121  1077            TAD     CHNL
```



```
2122  4521            ADLM
2123  4527            ADRS
2124  2026            ISZ     TEMP0
2125  5320            JMP     CHNL1
2126  7300            CLA CLL
2127  4523            ADRB
2130  3030            DCA     TEMPB
2131  1027            TAD     TEMPA
2132  7041            CIA
2133  1030            TAD     TEMPB
2134  7420            SNL
2135  4774'           JMS     ERPT5
2136  7440            SZA
2137  4774'           JMS     ERPT5
2140  7300            CLA CLL
2141  1041            TAD     K207
2142  4775'           JMS     PRLP
2143  5303            JMP     GLITCH

2144  1357    RANCHN, TAD     FSTNO
2145  7006            RTL
2146  3357            DCA     FSTNO
2147  1357            TAD     FSTNO
2150  1360            TAD     SECNO
2151  7006            RTL
2152  1360            TAD     SECNO
2153  7012            RTR
2154  0175            AND     [17
2155  3077            DCA     CHNL
2156  5744            JMP I   RANCHN

2157  0437    FSTNO,  0437
2160  2525    SECNO,  2525
```



```
2174  1756
2175  1534
2176  1710
```

```
2177  1751
      2200    PAGE
              /ROUTINE TO PERFORM 1000(10) CONVERSIONS OF ANY GIVEN VOLTAGE ON SELECTED CHANNEL

2200  4466    RESOL,  JMS I   SETUP
2201  1054            TAD     XSTOR
2202  3010            DCA     10
2203  3777/           DCA     STORAG
2204  4452            JMS I   XMOVE           /CLEAR WORK AREA
2205  4400            STORAG
2206  4401            STORAG+1
2207  6030            -1750
2210  1165            TAD     [-1750
2211  3026            DCA     TEMP0
2212  4520            ADCL
2213  7604            LAS                     /GET CHANNEL
2214  0175            AND     [17
2215  3063            DCA     CHAN            /STORE CHANNEL
2216  1063            TAD     CHAN
2217  4521            ADLM                    /LOAD CHANNEL
2220  4522            ADST
2221  4524            ADSK
2222  5221            JMP     .-1
2223  4523            ADRB
2224  3410            DCA I   10              /PLACE IN TABLE
2225  2026            ISZ     TEMP0           /DONE?
2226  5220            JMP     .-6             /NO
2227  5455            JMP I   XCOMPR          /YES, NOW CHECK
2377  4400
      2400    PAGE




              /ROUTINE TO COMPARE FOR GREATER THAN + OR - 1 LSB DIFFERENCE IN 1000(10) CONVERSIONS

2400  7300    COMPAR, CLA CLL
2401  1164            TAD     [-1747
2402  3026            DCA     TEMP0
2403  1054            TAD     XSTOR           /POINTER FOR FIRST WORD
2404  3010            DCA     10
2405  1410            TAD I   10
2406  3027            DCA     TEMPA
2407  7200    COMPR1, CLA
2410  1410            TAD I   10
2411  3030            DCA     TEMPB
2412  1027            TAD     TEMPA
2413  7041            CIA

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2414  1030            TAD     TEMPB
2415  7440            SZA                     /SKIP HERE
2416  5222            JMP     .+4             /AND
2417  7420            SNL                     /HERE IF =
  20  5222            JMP     .+2
  21  5257            JMP     AOK
```

```
1561  1167            TAD     [5402
1562  3001            DCA     1
1563  7040            CMA
1564  3062            DCA     ERSWIT
1565  3767            DCA I   XIND
1566  5752            JMP I   XSETUP
1567  1346    XIND,   IND

      1600    PAGE

              /ROUTINE TO CHECK IF TEST COMPLETED ITERATION

1600  0000    XTAL,   0
1601  7604            LAS
1602  0022            AND     SW2             /LOOP OVERRIDE?
1603  7640            SZA CLA
1604  5230            JMP     XTAL1           /YES
1605  7604            LAS
1606  0025            AND     SW3             /TEST SELECTED?
1607  7640            SZA CLA
1610  5214            JMP     .+4
1611  2034            ISZ     TALLY           /DONE WITH TEST?
1612  7410            SKP                     /NO
1613  5230            JMP     XTAL1           /YES
```



```
1614  1062            TAD     ERSWIT          /CHECK FOR ERROR
1615  7640            SZA CLA                 /ERROR THIS PASS?
1616  5224            JMP     .+6             /NO
1617  1017            TAD     MSGPNT          /GET MESSAGE POINTER
1620  1045            TAD     M1              /DECREMENT POINTER
1621  3017            DCA     MSGPNT          /RESTORE POINTER
1622  1045            TAD     M1
1623  3062            DCA     ERSWIT          /RESTORE ERROR INDICATOR
1624  1200            TAD     XTAL            /SET RETURN ADDRESS
1625  1046            TAD     M2
1626  3200            DCA     XTAL            /STORE RETURN ADDRESS
1627  5600            JMP I   XTAL
1630  2017    XTAL1,  ISZ     MSGPNT
1631  5600            JMP I   XTAL

              /POINTER FOR SELECTED TEST OPTION

1632  0223    XTEST,  TST0-1
1633  0240            TST1-1
1634  0265            TST2-1
1635  0306            TST3-1
1636  0326            TST4-1
1637  0346            TST5-1
1640  0400            TST6-1
1641  0426            TST7-1
1642  0451            TST10-1
1643  0501            TST11-1
1644  0600            TST12-1
1645  0636            TST13-1
1646  0710            TST14-1

              /ROUTINE TO SELECT SPECIFIC LOGIC TEST SUBROUTINE
```

```
1647  0000  xSELEC, 0
1650  7604        LAS                     /GET TEST
1651  0175        AND     [17
1652  3026        DCA     TEMP0           /STORE TEST
1653  1026        TAD     TEMP0
1654  1045        TAD     M1
1655  1166        TAD     [140
1656  3017        DCA     17              /MESSAGE POINTER SET NOW
1657  1026        TAD     TEMP0           /GET TEST
1660  1266        TAD     JMPLOC          /DEVELOP POINTER
1661  0051        AND     K77
1662  1267        TAD     JMPINS          /DEVELOP INSTRUCTION
1663  3264        DCA     JMPPTR
1664  7402  JMPPTR, HLT                   /DO IT!
1665  7402        HLT                     /TRAP
1666  1632  JMPLOC, XTEST
1667  5600  JMPINS, 5600


              /ERROR HANDLERS FOR OPEN LOOP TESTS

1670  0000  ERPT1,  0

/MAINDEC-08-DHADA-A A/D CONVERTER, MULTIPLEXER DIAGNOSTIC       PAL10  V141   21-MAR-72      13:25  PAGE 2-17

1671  7604        LAS
1672  0020        AND     SW0
1673  7710        SPA CLA
1674  5300        JMP     .+4
1675  4777'       JMS     MESAGE
1676  4003        EMSG20
1677  4776'       JMS     CRLF
1700  4775'       JMS     MESS
1701  4776'       JMS     CRLF
1702  7604        LAS
1703  0021        AND     SW1             /HALT ON ERROR?
1704  7650        SNA CLA                 /SKIP IF YES
1705  5774'       JMP     RESOL
1706  7402        HLT
1707  5774'       JMP     RESOL           /RETURN TO ROUTINE

1710  0000  ERPT2,  0
1711  7604        LAS
1712  0020        AND     SW0
1713  7710        SPA CLA
1714  5320        JMP     .+4
1715  4777'       JMS     MESAGE
1716  4034        EMSG21
1717  4776'       JMS     CRLF
1720  7604        LAS
1721  0021        AND     SW1             /HALT ON ERROR?
1722  7650        SNA CLA                 /SKIP IF YES
1723  5710        JMP I   ERPT2
1724  1027        TAD     TEMPA
1725  7402        HLT
1726  7200        CLA
1727  1030        TAD     TEMPB
1730  7402        HLT
   1  5773'       JMP     NOISE           /RETURN TO ROUTINE
```

```
   22  7430            SZL
 2423  5230            JMP     .+5
 2424  7040            CMA
 2425  7440            SZA                     /SKIP HERE IF DIFFERENCE +1 LSB
 2426  7410            SKP
 2427  5257            JMP     AOK
 2430  7100            CLL
 2431  7010            RAR
 2432  7440            SZA                     /SKIP HERE
 2433  5237            JMP     .+4             /AND
 2434  7420            SNL                     /HERE IF DIFFERENCE -1 LSB
 2435  7410            SKP
 2436  5257            JMP     AOK
 2437  7300            CLA CLL                 /CHECK FOR SPECIAL CASE OF 7777 AND 0
 2440  1027            TAD     TEMPA
 2441  7440            SZA                     /A=0?
 2442  7410            SKP                     /NO
 2443  5247            JMP     .+4             /YES
 2444  7040            CMA                     /A=7777?
 2445  7440            SZA                     /SKIP IF YES
 2446  4777'           JMS     ERPT1
 2447  1030            TAD     TEMPB           /A =7777 OR 0
 2450  7440            SZA                     /B=0?
 2451  5253            JMP     .+2             /NO
 2452  5257            JMP     AOK
 2453  7040            CMA                     /B=7777?
 2454  7440            SZA                     /SKIP IF YES
 2455  4777'           JMS     ERPT1
 2456  5257            JMP     AOK
 2457  7300    AOK,    CLA CLL
 2460  1030            TAD     TEMPB
 2461  3027            DCA     TEMPA
 2462  2026            ISZ     TEMP0           /DONE?
 2463  5207            JMP     COMPR1
 2464  2273            ISZ     FIVHUN
 2465  5776'           JMP     RESOL
 2466  1375            TAD     (-764           /COUNT OF 500(10),
 2467  3273            DCA     FIVHUN
 2470  1041            TAD     K207
 2471  4774'           JMS     PRLP
 2472  5776'           JMP     RESOL           /YES, REPEAT TEST
 2473  7014    FIVHUN, -764

 2574  1534
 2575  7014
 2576  2200
 2577  1670
       2600    PAGE
```



```
                /LAB8-E SYSTEM CHECK

 2600  0000    SYST,   0
 2601  4466            JMS I   SETUP
 2602  4520            ADCL
 2603  7402            HLT
 2604  7604            LAS
 2605  0377            AND     (700
```

```
2606  1376            TAD     (4040           /RATE AND ENABLE EXT'L
2607  3031            DCA     TEMPC           /SAVE
2610  1031            TAD     TEMPC
2611  4530            CLOE                    /START CLOCK
2612  7040            CMA
2613  4532            CLZE
2614  7200            CLA
2615  1024            TAD     SW4             /EXT START FOR A-D
2616  3026            DCA     TEMP0
2617  4775'           JMS     MESAGE          /TYPE OUT TEST INSTRUCTIONS
2620  4215            AUTMSG
2621  7402            HLT
2622  7604            LAS
2623  0025            AND     SW5
2624  7440            SZA                     /SKIP IF NOT AUTO-INCREMENT
2625  4321            JMS     LSTCHN          /CHECK FOR LAST CHANNEL
2626  7604            LAS
2627  0175            AND     [17
2630  4521            ADLM                    /LOAD CHANNEL
2631  1026            TAD     TEMP0
2632  4526            ADLE                    /LOAD EXT ENABLE BIT IF PRESENT
2633  1026            TAD     TEMP0
2634  7650            SNA CLA                 /SKIP FOR EXTL ENABLE
2635  5245            JMP     .+10
2636  1374    CLKST,  TAD     (7001           /-X(MAX) TO RESET SWEEP
2637  3027            DCA     TEMPA           /AND START INITIAL CONVERSION
2640  4533            CLSA                    /FROM REAL
2641  4531            CLSK                    /TIME CLOCK
2642  5241            JMP     .-1
2643  7240            CLA CMA
2644  4532            CLZE                    /STOP CLOCK
2645  7200            CLA
2646  7410            SKP
2647  4522    STCONV, ADST                    /START CONVERSION HERE FOR ALL VALUES
2650  4524            ADSK                    /OTHER THAN -X(MAX)
2651  5250            JMP     .-1
2652  4527            ADRS
2653  0175            AND     [17
2654  1030            TAD     TEMPB
2655  7001            IAC
2656  7440            SZA
2657  5261            JMP     .+2
2660  4521            ADLM
2661  4523            ADRB                    /GET Y VALUE
2662  4540            DILY
2663  7200            CLA
2664  1027            TAD     TEMPA

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2665  4537            DILX
2666  7001            IAC                     /GET NEXT X VALUE
2667  3027            DCA     TEMPA
2670  1027            TAD     TEMPA
2671  1374            TAD     (7001
2672  7640            SZA CLA                 /SKIP IF -X(MAX)

2673  7410            SKP
2674  5305            JMP     RESTR
  75  4536            DISD
```

```
     6  5275             JMP      .-1
  2677  4541             DIXY
  2700  1047             TAD      M4              /TIME OUT TO ALLOW
  2701  3340             DCA      TEMPX           /TRACE TO RETURN TO 1001(X)
  2702  2340             ISZ      TEMPX           /AND SETTLE
  2703  5302             JMP      .-1
  2704  5247             JMP      STCONV
  2705  1031  RESTR,      TAD      TEMPC           /TO RESTART CLOCK
  2706  4530             CLOE
  2707  7040             CMA
  2710  4532             CLZE
  2711  7604             LAS
  2712  0025             AND      SW5             /A-I MODE
  2713  7640             SZA CLA                  /SKIP IF NO
  2714  5236             JMP      CLKST
  2715  7604             LAS
  2716  0175             AND      C17             /TO CHANGE CHANNEL
  2717  4521             ADLM
  2720  5236             JMP      CLKST           /GO
  2721  0000  LSTCHN,     0                        /CHECK FOR LAST CHANNEL
  2722  7604             LAS                      /IF AUTO INCREMENT MODE
  2723  0175             AND      C17
  2724  7040             CMA
  2725  3030             DCA      TEMPB
  2726  2321             ISZ      LSTCHN
  2727  2321             ISZ      LSTCHN
  2730  7604             LAS
  2731  0025             AND      SW5
  2732  7650             SNA CLA          /SKIP IF AUTO INCREMENT MODE
  2733  5337             JMP      .+4
  2734  1024             TAD      SW4
  2735  1025             TAD      SW5
  2736  3026             DCA      TEMP0
  2737  5721             JMP I    LSTCHN
  2740  0000  TEMPX,      0

  2774  7001
  2775  1274
  2776  4040
  2777  0700
        3000  PAGE

  3000  0000  MESS,      0
  3001  4777'            JMS      CRLF
  3002  7300             CLA CLL

/MAINDEC-08-DHADA-A A/D CONVERTER, MULTIPLEXER DIAGNOSTIC       PAL10   V141    21-MAR-72       13:25   PAGE 3-4

  3003  1027             TAD      TEMPA
  3004  0376             AND      (7000
  3005  7002             BSW
  3006  7012             RTR
  3007  7010             RAR
  3010  1375             TAD      (260
  3011  4774'            JMS      PRLP
  3012  7300             CLA CLL
  3013  1027             TAD      TEMPA
  3014  7006             RTL
  3015  7004             RAL
  3016  0376             AND      (7000
```

```
3017  7002            BSW
3020  7012            RTR
3021  7010            RAR
3022  1375            TAD     (260
3023  4774'           JMS     PRLP
3024  7200            CLA
3025  1027            TAD     TEMPA
3026  7012            RTR
3027  7010            RAR
3030  0373            AND     (7
3031  1375            TAD     (260
3032  4774'           JMS     PRLP
3033  7300            CLA CLL
3034  1027            TAD     TEMPA
3035  0373            AND     (7
3036  1375            TAD     (260
3037  4774'           JMS     PRLP
3040  7300            CLA CLL
3041  4777'           JMS     CRLF
3042  7300            CLA CLL
3043  1030            TAD     TEMPB
3044  0376            AND     (7000
3045  7002            BSW
3046  7010            RAR
3047  7012            RTR
3050  1375            TAD     (260
3051  4774'           JMS     PRLP
3052  7300            CLA CLL
3053  1030            TAD     TEMPB
3054  7006            RTL
3055  7004            RAL
3056  0376            AND     (7000
3057  7002            BSW
3060  7010            RAR
3061  7012            RTR
3062  1375            TAD     (260
3063  4774'           JMS     PRLP
3064  7300            CLA CLL
3065  1030            TAD     TEMPB
3066  7010            RAR
3067  7012            RTR
3070  0373            AND     (7
3071  1375            TAD     (260
```



```
3072  4774'           JMS     PRLP
3073  7300            CLA CLL
3074  1030            TAD     TEMPB
3075  0373            AND     (7
3076  1375            TAD     (260
3077  4774'           JMS     PRLP
3100  7300            CLA CLL
3101  4777'           JMS     CRLF
3102  4777'           JMS     CRLF
3103  7300            CLA CLL
3104  5600            JMP I   MESS

3173  0007
 74   1534
```

```
   /5  0260
3176   7000
3177   1542
       3200     PAGE
```



```
       3200     PAGE
                /CONTROL LOGIC ERROR MESSAGES

3200   3736     EMSG0,  TEXT    "*'TEST 0 = DONE FLAG OR TIMING ERROR FLAG NOT CLEARED OR SKIP FAILURE*'"
3201   2405
3202   2324
3203   4060
3204   4055
3205   4004
3206   1716
3207   0540
3210   0614
3211   0107
3212   4017
3213   2240
3214   2411
3215   1511
3216   1607
3217   4005
3220   2222
3221   1722
3222   4006
3223   1401
3224   0740
3225   1617
3226   2440
3227   0314
3230   0501
3231   2205
3232   0440
3233   1722
3234   4023
3235   1311
3236   2040
3237   0601
3240   1114
3241   2522
3242   0537
3243   3600
3244   3736     EMSG1,  TEXT    "*'TEST 1 = DONE FLAG NOT SET THEN CLEARED OR SKIP FAILURE*'"
3245   2405
3246   2324
3247   4061
3250   4055
3251   4004
3252   1716
3253   0540
3254   0614
```

```
3255  0107
3256  4016
3257  1724
3260  4023
```



```
3261  0524
3262  4024
3263  1005
3264  1640
3265  0314
3266  0501
3267  2205
3270  0440
3271  1722
3272  4023
3273  1311
3274  2040
3275  0601
3276  1114
3277  2522
3300  0537
3301  3600
3302  3736    EMSG2,  TEXT    "*+TEST 2 = TIMING ERROR FLAG NOT SET THEN CLEARED OR SKIP FAILURE*+"
3303  2405
3304  2324
3305  4062
3306  4055
3307  4024
3310  1115
3311  1116
3312  0740
3313  0522
3314  2217
3315  2240
3316  0614
3317  0107
3320  4016
3321  1724
3322  4023
3323  0524
3324  4024
3325  1005
3326  1640
3327  0314
3330  0501
3331  2205
3332  0440
3333  1722
3334  4023
3335  1311
3336  2040
3337  0601
3340  1114
3341  2522
3342  0537
3343  3600
3344  3736    EMSG3,  TEXT    "*+TEST 3 = UNEXPECTED INTERRUPT OCCURRED*+"
  45  2405
```

```
   46  2324
 3347  4063

 3350  4055
 3351  4025
 3352  1605
 3353  3020
 3354  0503
 3355  2405
 3356  0440
 3357  1116
 3360  2405
 3361  2222
 3362  2520
 3363  2440
 3364  1703
 3365  0325
 3366  2222
 3367  0504
 3370  3736
 3371  0000
 3372  3736    EMSG4,  TEXT    "←↑TEST 4 = ADRB FAILED TO JAM TRANSFER TO AC←↑"
 3373  2405
 3374  2324
 3375  4064
 3376  4055
 3377  4001
 3400  0422
 3401  0240
 3402  0601
 3403  1114
 3404  0504
 3405  4024
 3406  1740
 3407  1201
 3410  1540
 3411  2422
 3412  0116
 3413  2306
 3414  0522
 3415  4024
 3416  1740
 3417  0103
 3420  3736
 3421  0000
 3422  3736    EMSG5,  TEXT    "←↑TEST 5 = ADRS FAILED TO JAM TRANSFER TO AC←↑"
 3423  2405
 3424  2324
 3425  4065
 3426  4055
 3427  4001
 3430  0422
 3431  2340
 3432  0601
 3433  1114
 3434  0504
 3435  4024
 3436  1740
```

```
3437  1201
3440  1540
3441  2422
3442  0116
3443  2306
3444  0522
3445  4024
3446  1740
3447  0103
3450  3736
3451  0000
3452  3736    EMSG6,  TEXT    "<15><12>TEST 6 - ENABLE REGISTER NOT PROPERLY LOADED<15><12>"
3453  2405
3454  2324
3455  4066
3456  4055
3457  4005
3460  1601
3461  0214
3462  0540
3463  2205
3464  0711
3465  2324
3466  0522
3467  4016
3470  1724
3471  4020
3472  2217
3473  2005
3474  2214
3475  3140
3476  1417
3477  0104
3500  0504
3501  3736
3502  0000
3503  3736    EMSG7,  TEXT    "<15><12>TEST 7 - FAILED TO GENERATE INTERRUPT WITH DONE FLAG<15><12>"
3504  2405
3505  2324
3506  4067
3507  4055
3510  4006
3511  0111
3512  1405
3513  0440
3514  2417
3515  4007
3516  0516
3517  0522
3520  0124
3521  0540
3522  1116
3523  2405
3524  2222
3525  2520
```

```
3526  2440
3527  2711
3530  2410
3531  4004
3532  1716
3533  0540
3534  0614
3535  0107
3536  3736
3537  0000
3540  3736     EMSG10, TEXT    "←↑TEST 10 - FAILED TO GENERATE INTERRUPT WITH TIMING ERROR FLAG←↑"
3541  2405
3542  2324
3543  4061
3544  6040
3545  5540
3546  0601
3547  1114
3550  0504
3551  4024
3552  1740
3553  0705
3554  1605
3555  2201
3556  2405
3557  4011
3560  1624
3561  0522
3562  2225
3563  2024
3564  4027
3565  1124
3566  1040
3567  2411
3570  1511
3571  1607
3572  4005
3573  2222
3574  1722
3575  4006
3576  1401
3577  0737
3600  3600
3601  3736     EMSG11, TEXT    "←↑TEST 11 - FAILED TO LOAD AND READ MPX REG AND CLEAR AC←↑"
3602  2405
3603  2324
3604  4061
3605  6140
3606  5540
3607  0601
3610  1114
3611  0504
3612  4024
3613  1740
3614  1417

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3615  0104
```

```
3616  4001
3617  1604
3620  4022
3621  0501
3622  0440
3623  1520
3624  3040
3625  2205
3626  0740
3627  0116
3630  0440
3631  0314
3632  0501
3633  2240
3634  0103
3635  3736
3636  0000
3637  3736    EMSG12, TEXT    "**TEST 12 - FAILED TO LOAD AND READ ALL CHANNELS INTO MPX REG**"
3640  2405
3641  2324
3642  4061
3643  6240
3644  5540
3645  0601
3646  1114
3647  0504
3650  4024
3651  1740
3652  1417
3653  0104
3654  4001
3655  1604
3656  4022
3657  0501
3660  0440
3661  0114
3662  1440
3663  0310
3664  0116
3665  1605
3666  1423
3667  4011
3670  1624
3671  1740
3672  1520
3673  3040
3674  2205
3675  0737
3676  3600
3677  3736    EMSG13, TEXT    "**TEST 13 - FAILED TO LOAD AND READ ALL CHANNELS IN AUTO-INCREMENT MODE**"
3700  2405
3701  2324
3702  4061
3703  6340
```



```
3704  5540
3705  0601
  06  1114
```

```
3707  0504
3710  4024
3711  1740
3712  1417
3713  0104
3714  4001
3715  1604
3716  4022
3717  0501
3720  0440
3721  0114
3722  1440
3723  0310
3724  0116
3725  1605
3726  1423
3727  4011
3730  1640
3731  0125
3732  2417
3733  5511
3734  1603
3735  2205
3736  1505
3737  1624
3740  4015
3741  1704
3742  0537
3743  3600
3744  3736     EMSG14, TEXT    "<>TEST 14 - FAILED TO COMPLETE CONVERSION IN SPECIFIED TIME<>"
3745  2405
3746  2324
3747  4061
3750  6440
3751  5540
3752  0601
3753  1114
3754  0504
3755  4024
3756  1740
3757  0317
3760  1520
3761  1405
3762  2405
3763  4003
3764  1716
3765  2605
3766  2223
3767  1117
3770  1640
3771  1116
3772  4023
```



```
3773  2005
3774  0311
3775  0611
3776  0504
```

```
4000  1115
4001  0537
4002  3600
4003  3736     EMSG20, TEXT    "←↑FAILED TO RESOLVE CONVERSIONS TO + OR - 1 LSB←↑"
4004  0601
4005  1114
4006  0504
4007  4024
4010  1740
4011  2205
4012  2317
4013  1426
4014  0540
4015  0317
4016  1626
4017  0522
4020  2311
4021  1716
4022  2340
4023  2417
4024  4053
4025  4017
4026  2240
4027  5540
4030  6140
4031  1423
4032  0237
4033  3600
4034  3736     EMSG21, TEXT    "←↑TWO SUCCESSIVE READS NOT EQUAL←↑"
4035  2427
4036  1740
4037  2325
4040  0303
4041  0523
4042  2311
4043  2605
4044  4022
4045  0501
4046  0423
4047  4016
4050  1724
4051  4005
4052  2125
4053  0114
4054  3736
4055  0000
4056  3736     EMSG22, TEXT    "←↑ERRONEOUS EXTERNAL ENABLE OR TIMING ERROR←↑"
4057  0522
4060  2217
4061  1605
```



```
4062  1725
4063  2340
4064  0530
4065  2405
4066  2216
4067  0114
  70  4005
```

```
 071  1601
4072  0214
4073  0540
4074  1722
4075  4024
4076  1115
4077  1116
4100  0740
4101  0522
4102  2217
4103  2237
4104  3600
4105  3736     EMSG23, TEXT    "↑↑MONOTINICITY FAILURE↑↑"
4106  1517
4107  1617
4110  2411
4111  1611
4112  0311
4113  2431
4114  4006
4115  0111
4116  1425
4117  2205
4120  3736
4121  0000
4122  3736     EMSG24, TEXT    "↑↑NOISE IN MULTIPLEXER AND A↑D BUFFER↑↑"
4123  1617
4124  1123
4125  0540
4126  1116
4127  4015
4130  2514
4131  2411
4132  2014
4133  0530
4134  0522
4135  4001
4136  1604
4137  4001
4140  5504
4141  4002
4142  2506
4143  0605
4144  2237
4145  3600
                /END OF LOGIC TEST TYPESTRING
4146  3736      XEND,   TEXT    "↑↑END OF LOGIC TEST↑↑"
4147  0516

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4150  0440
4151  1706
4152  4014
4153  1707
4154  1103
4155  4024
4156  0523
4157  2437
4160  3600
```

```
                        /HEADER MESSAGE
4161  3736              XLABEL, TEXT    "=*AD8E A TO D CONVERTER, AM8E MULTIPLEXER DIAGNOSTIC=*"
4162  0104
4163  7005
4164  4001
4165  4024
4166  1740
4167  0440
4170  0317
4171  1626
4172  0522
4173  2405
4174  2254
4175  4001
4176  1570
4177  0540
4200  1525
4201  1424
4202  1120
4203  1405
4204  3005
4205  2240
4206  0411
4207  0107
4210  1617
4211  2324
4212  1103
4213  3736
4214  0000
4215  3736              AUTMSG, TEXT    "=*SET SW5 (AUTO-INC), # OF CHANS IN SW8-11, OR SET SW8-11 (SINGLE CHAN)=*"
4216  2305
4217  2440
4220  2327
4221  6540
4222  5001
4223  2524
4224  1755
4225  1116
4226  0351
4227  5440
4230  4340
4231  1706
4232  4003
4233  1001
4234  1623
4235  4011

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4236  1640
4237  2327
4240  7055
4241  6161
4242  5440
4243  1722
4244  4023
4245  0524
4246  4023
4247  2770
      50  5561
```

```
 251  6140
4252  5023
4253  1116
4254  0714
4255  0540
4256  0310
4257  0116
4260  5137
4261  3600

      4400     *4400
               /TABLE OF CONVERSION VALUES/
4400  0000     STORAG, 0


               $
0164  6031
0165  6030
0166  0140
0167  5402
0170  0076
0171  7760
0172  0475
0173  0445
0174  7761
0175  0017
0176  0322
0177  7700
```



```
0000  11111100  00000001  1111?111  1111111?  11111111  11111111  ?1?1?1?1?0  000?00001
0100  11111111  111?111?1  1111?111  1111111?  11100111  11111111  ?100?1?1  1?1?11111

0200  1111111?1  111?1111?  1111?111  111?111?1  11111111  11111111  ?1?1?1?1?  1?1?11111
0300  11111111  111?1111?  1111?111  1111111?1  ?1111111  11111111  ?1?1?1?1?  1?0?0111

0400  1111111?1  111?1111?  1111?111  1111111?1  ?1111111  11111111  ?1?1?1?1?  1?1?11111
0500  1111111?1  111?1111?  1111?111  1111111?1  10000000  00000000  00000000  000?00001

0600  11111111  111?1111?  1111?111  1111111?1  11111111  11111111  ?1?1?1?1?  1?1?11111
0700  11111111  111?1111?  1111?111  1111111?1  10000000  00000000  00000000  0000?1111

1000  11111111  111?1111?  1111?111  1111111?1  11111111  11111111  ?1?1?1?1?  1?1?11111
1100  11111111  111?1111?  1?111?111  10000000  00000000  00000000  00000000  000?11111

1200  11111111  111?1111?  1111?111  1111111?1  11111111  11111111  ?1?1?1?1?  1?1?11111
1300  11111111  111?1111?  1111?111  1111111?1  11111110  00000000  00000000  00000?111

1400  11111111  111?1111?  1111?111  1111111?1  11111111  11111111  ?1?1?1?1?  1?1?11111
1500  11111111  111?1111?  1111?111  1111111?1  11111111  11111111  ?1?1?1?1?  000?00000

1600  11111111  111?1111?  11111111  1111111?1  ?1111111  11111111  ?1?1?1?1?  1?1?11111
1700  11111111  111?1111?  1111?111  1111111?1  11111111  11111111  ?1?1?1?1?0  000?11111
```

```
2000  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
2100  11111111  11111111  11111111  11111111  11111111  11111111  10000000  00001111

2200  11111111  11111111  11111111  00000000  00000000  00000000  00000000  00000000
2300  00002000  00000000  00000000  00000000  00000000  00000000  00000000  00000001

2400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11110000
2500  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00001111

2600  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
2700  11111111  11111111  11111111  11111111  10000000  00000000  00000000  00001111

3000  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
3100  11111000  00000000  00000000  00000000  00000000  00000000  00000000  00011111

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
```



```
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  11000000  00000000
4300  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000

4400  10000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000
4500  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000

4600
4700

5000
5100

5200
5300

5400
5500

5600
5700

6000
6100

6200
6300
```

```
6400
6500

6600
6700


7000
7100

7200
7300

7400
7500

7600
7700
```



```
ADCL    4520        EMSG6   3452        RESTR   2705        XCLSK   0131
ADLE    4526        EMSG7   3503        SCOPE   1257        XCLZE   0132
ADLM    4521        EOUT    1242        SECNO   2160        XCOMPR  0055
ADRB    4523        ERMSG   0145        SELECT  0065        XCONVT  0036
ADRS    4527        ERPT1   1670        SETUP   0066        XDILE   0142
ADSE    4525        ERPT2   1710        START   0211        XDILX   0137
ADSK    4524        ERPT3   1732        STCONV  2647        XDILY   0140
ADST    4522        ERPT4   1751        STORAG  4400        XDISD   0136
AOK     2457        ERPT5   1756        SW0     0020        XDIXY   0141
AUTMSG  4215        ERR     0035        SW1     0021        XEND    4146
AUTO1   0643        ERSWIT  0062        SW2     0022        XGLIT   0060
AUTO2   0674        ERTYP   1226        SW3     0023        XIND    1567
BSW     7002        EXIT    1271        SW4     0024        XINSTR  0037
CAF     6007        EXT1    1032        SW5     0025        XLABEL  4161
CHAN    0063        EXTBL   0053        SYST    2600        XMONOT  0040
CHNL    0077        EXTL    1024        TADDR   1224        XMOVE   0052
CHNL1   2120        EXTTE   1066        TAL     0064        XNOISE  0057
CLAB    4535        FADDR   1223        TALLY   0034        XRESOL  0056
CLED    4534        FINIS   0730        TEMP0   0026        XSELEC  1647
CLKST   2636        FIVHUN  2473        TEMPA   0027        XSETUP  1552
CLOE    4530        FSTNO   2157        TEMPB   0030        XSTOR   0054
CLSA    4533        GLITCH  2103        TEMPC   0031        XSYST   0061
CLSK    4531        IND     1346        TEMPD   0032        XTAL    1600
CLZE    4532        INITL   0216        TEMPX   2740        XTAL1   1630
CNTR1   0033        INSTR   1400        TMG1    0475        XTEST   1632
COMPAR  2400        JMPINS  1667        TST0    0224        XXADCL  1410
COMPR1  2407        JMPLOC  1666        TST1    0241        XXADLE  1444
CONT    2011        JMPPTR  1664        TST10   0452        XXADLM  1414
CONVT   1000        K1000   0050        TST11   0502        XXADRB  1424
CRLF    1542        K207    0041        TST12   0601        XXADRS  1450
DILE    4542        K212    0042        TST13   0637        XXADSE  1436
DILX    4537        K215    0043        TST14   0711        XXADSK  1430
DILY    4540        K6500   0044        TST2    0266        XXADST  1420
DISD    4536        K77     0051        TST3    0307        XXCLAB  1502
DIXY    4541        LSTCHN  2721        TST3S   0322        XXCLED  1476
DON1    0445        M1      0045        TST4    0327        XXCLOE  1454
EMSG0   3200        M2      0046        TST5    0347        XXCLSA  1472
EMSG1   3244        M4      0047        TST6    0401        XXCLSK  1460
EMSG10  3540        MCTR    1225        TST7    0427        XXCLZE  1466
```

```
EMSG11  3601        MESAGE  1274        TYPECH  1314        XXDILE  1530
EMSG12  3637        MESS    3000        XADCL   0120        XXDILX  1514
EMSG13  3677        MONOT   2000        XADLE   0126        XXDILY  1520
EMSG14  3744        MOVE    1200        XADLM   0121        XXDISD  1506
EMSG2   3302        MOVEA   1213        XADRB   0123        XXDIXY  1524
EMSG20  4003        MSGPNT  0017        XADRS   0127
EMSG21  4034        MSRGHT  1313        XADSE   0125
EMSG22  4056        MTP     1340        XADSK   0124
EMSG23  4105        NOISE   2051        XADST   0122
EMSG24  4122        OK      2043        XCLAB   0135
EMSG3   3344        PRLP    1534        XCLED   0134
EMSG4   3372        RANCHN  2144        XCLOE   0130
EMSG5   3422        RESOL   2200        XCLSA   0133

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ERRORS DETECTED: 0

LINKS GENERATED: 53

RUN-TIME:  11 SECONDS

3K CORE USED
```