IDENTIFICATION

PRODUCT CODE: MAINDEC 12-D6CC-D (D)

PRODUCT NAME: A TO D TEST

DATE CREATED: 9-21-70

MAINTAINER: DIAGNOSTIC GROUP

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ADTST

1. ABSTRACT:

   THIS PROGRAM MAY BE USED TO TEST THE KNOBS FOR CONTINUITY,
   THE BASIC A-D FOR MONOTONICITY, AND TO TEST AND CALIBRATE
   THE PREAMPS FOR GAIN AND OFFSET. A PROVISION FOR TESTING
   SIXTEEN ADDITIONAL A-D CHANNELS IS INCLUDED FOR THE AM12-AG12
   MULTIPLEX EXTENSION.

   THREE METHODS ARE PROVIDED FOR TESTING THE KNOBS AND ADJUSTING
   THE PREAMPS. (NOTE: ADJUSTMENT OF THE LATCHING DIFFERENTIAL
   AMPLIFIER OR THE SAMPLE AND HOLD IS NOT NORMALLY REQUIRED.
   FOR ADJUSTMENT OF THESE MODULES SEE THE APPROPRIATE MAINTENANCE
   MANUAL.)

2. REQUIREMENTS:

2.1 EQUIPMENT

    A) A PDP-12 WITH A-D AND VR12 DISPLAY.
    B) AN ASR-33 OR EQUIVALENT.

2.2 PRELIMINARY PROGRAMS:

    A) INSURE THAT THE BINARY LOADER IS OPERATING PROPERLY.
    B) ALL BASIC PROCESSOR TESTS MUST HAVE BEEN RUN SUCCESSFULLY
       BEFORE ATTEMPTING TO EXECUTE ADTST.

3. LOADING PROCEDURES

3.1 METHOD

    THIS PROGRAM MAY BE LOADED WITH THE BINARY LOADER. IF YOU
    ARE UNFAMILIAR WITH THE PROPER BINARY LOADING PROCEDURES
    REFER TO "APPENDIX A" OF THIS PROGRAM, OTHERWISE PROCEED
    WITH THE FOLLOWING:

    A) SET THE TELETYPE READER SWITCH TO FREE.
    B) OPEN THE TELETYPE READER AND INSERT THE PROGRAM TAPE SO
       THAT THE ARROWS ON THE TAPE ARE VISIBLE TO AND POINTING
       TOWARD THE OPERATOR.
    C) CLOSE THE READER AND SET THE READER SWITCH TO START.
    D) SET THE TELETYPE FRONT PANEL SWITCH TO ON LINE.
    E) SET THE LEFT SWITCHES TO 7777.
    F) SET THE RIGHT SWITCHES TO 4000.
    G) SET THE MODE SWITCH TO 8 MODE.
    H) DEPRESS I/O PRESET.
    I) DEPRESS START LS.
    J) WHEN THE PROGRAM TAPE HAS BEEN READ THE ACCUMULATOR
       MUST BE 0000 IF IT IS NOT, A READ-IN ERROR HAS OCCURRED
       AND ONE MIGHT TRY RELOADING THE BINARY LOADER.
    K) REMOVE THE PROGRAM TAPE FROM THE READER.

4. STARTING PROCEDURES.

   A) TURN THE VR12 ON, AND ALLOW TO WARM UP AT LEAST ONE
      MINUTE.
   B) SET THE BRIGHTNESS POT ON THE VR12 TO 3/4 MAXIMUM.
      (NOTE! IF A BRIGHT DOT APPEARS ON THE VR12, SHUT DOWN THE
      INTENSITY IMMEDIATELY TO PREVENT BURNING THE PHOSPHOR)
   C) SET THE MODE SWITCH ON THE CONSOLE TO L MODE.
   D) DEPRESS I/O PRESET.
   E) SET ALL SWITCHES TO 0'S.
      (THIS WILL SET UP THE PROGRAM FOR THE FIRST DISPLAY)
   F) ROTATE ANALOG CHANNEL 00 TO FULL COUNTER CLOCKWISE AND
      ROTATE ANALOG CHANNEL 01 TO FULL CLOCKWISE (THIS IS TO
      INSURE THAT THEY ARE UNEQUAL FOR THE FAST SAMPLE TEST.
      THEY MAY BE CHANGED AFTER STARTING THE PROGRAM).
   G) DEPRESS START 20.
   H) THE PROGRAM IS NOW RUNNING. ADJUST THE INTENSITY ON THE
      VR12 TO GIVE A COMFORTABLE VIEWING LEVEL. IF ANY DIFFICULTY
      IS ENCOUNTERED, IT IS A HARDWARE PROBLEM AND MUST BE
      CORRECTED BEFORE PROCEEDING.
   I) THIS PROGRAM DOES USE FAST SAMPLE MODE.

5. OPERATING PROCEDURES

5.1 SWITCH SETTINGS

   A) SSW=00;   CHANNELS 00-17(8) ARE SAMPLED AND DISPLAYED.
   B) SSW=40;   CHANNELS 20-37(8) ARE SAMPLED AND DISPLAYED.
                  THESE CHANNELS ARE OPTIONAL ON THE PDP-12;
                  IF NOT INSTALLED, THE VALUE DISPLAYED FOR EACH
                  CHANNEL WILL BE -777(8).
   C) SSW=20;   THE CHANNEL SELECTED BY BITS 07-11 OF THE LEFT
                  SWITCHES WILL BE DISPLAYED AS A FULL OSCILLOSCOPE
                  TYPE DISPLAY. THE ROUTINE USED FOR DISPLAY
                  WILL TRIGGER (SYNC) TO THE INPUT IF IT IS AN AC
                  SIGNAL WITH AT LEAST 2 BITS (.4 MV) OF CHANGE
                  WITHIN 15 MS.
   D) SSW=10;   CHANNELS 0-7 ARE SAMPLED AND DISPLAYED AS A
                  SEGMENTED OSCILLOSCOPE DISPLAY. EACH CHANNEL
                  HAS TRIGGERING CAPABILITY AS IN (C) ABOVE.
   E) SSW=04;   CHANNELS 10-17 ARE SAMPLED AND DISPLAYED AS A
                  SEGMENTED OSCILLOSCOPE DISPLAY. EACH CHANNEL
                  HAS TRIGGERING CAPABILITY AS IN (C) ABOVE.
   F) SSW=02;   CHANNELS 20-27 ARE SAMPLED AND DISPLAYED AS A
                  SEGMENTED OSCILLOSCOPE DISPLAY. EACH CHANNEL HAS
                  TRIGGERING CAPABILITY AS IN (C) ABOVE.
   G) SSW=01;   CHANNELS 30-37 ARE SAMPLED AND DISPLAYED AS A
                  SEGMENTED OSCILLOSCOPE DISPLAY. EACH CHANNEL HAS
                  TRIGGERING CAPABILITY AS IN (C) ABOVE.

5.2   ADJUSTMENT PROCEDURES

        FOR ADJUSTMENT OF THE AD12/AM12/AG12 A TO D CONVERTER, REFER
        TO THE CHECKS AND ADJUSTMENTS SECTION OF THE PDP-12 MAINTENANCE
        MANUAL.

5.3   ERROR ROUTINE

        THIS TEST HAS NO ERROR ROUTINES ONLY A HALT ON FAST SAMPLE
        ERROR; IF DIFFICULTY IS ENCOUNTERED WITH THE SAM
        INSTRUCTION, CHECK THE   TO D CONTROL. IF DIFFICULTY IS
        ENCOUNTERED WITH THE POTENTIOMETERS, IT WILL MOST LIKELY
        BE EITHER THE MULTIPLEXER OR THE POTS THEMSELVES. IF
        DIFFICULTY IS ENCOUNTERED WITH THE EXTERNAL ANALOG
        CHANNELS, CHECK THE PREAMPLIFIERS,

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 1
 2                          /PDP-12 A TO D TEST, MAINDEC 12-D6CC
 3                          /COPYRIGHT 1970, DIGITAL EQUIPMENT CORP., MAYNARD, MASS.
 4                          /THIS TEST IS DESIGNED TO DISPLAY ALL AVAILABLE
 5                          /ANALOG INPUT CHANNELS ON THE VR12 DISPLAY
 6                          /
 7                          /SENSE SWITCH 0 DETERMINES WHAT CHANNELS TO DISPLAY
 8                          /
 9                          /SENSE SWITCH 1 GIVES AN OSCILLOSCOPE DISPLAY
10                          /FOR THE CHANNEL ENTERED IN THE LEFT SW
11                          /
12                          /SENSE SWITCHES 2 THRU 5 GIVE AN OVERALL
13                          /OSCILLOSCOPE OF CHANNELS 0-7, 10-17, 20-27,
14                          /AND 30-37, RESPECTIVELY.
15                          /
16                          /I/O PRESET, START 20 LINC MODE.
17                          /
18                          /TYPING CTL-"D" RETURNS USER TO DIAL
19                          /
20                          /MAJOR START 4020
21                          /
22                          /TAGS AND CONSTANTS
23                          /
24              4001        *0001
25     4001     0000        H1,     0000              /HORIZONTAL COORDINATE STORAGE
26              4016        *0016
27     4016     N701        DIAL,   RCG
28     4017     7300                7300
29                                  EJECT
```

```
30
31                          /
32                          /TO HERE IS FIRST TIME THROUGH
 3                          /
 4      4020   6466              JMP FSAM            /TEST FAST SAMPLE
 5      4021   0461    B7,       SNS I 1            /CHECK FOR OPTIONS
36      4022   6276              JMP D5              /TRIGGERED SCOPE DISPLAY
37      4023   0462              SNS I 2             /CHANNELS 0-7
38      4024   6357              JMP J6
39      4025   0463              SNS I 3             /CHANNELS 10-17
40      4026   6361              JMP J6+2
41      4027   0464              SNS I 4             /CHANNELS 20-27
42      4030   6364              JMP J6+5
43      4031   0465              SNS I 5             /CHANNELS 30-37
44      4032   6367              JMP J6+10
45                          /
46                          /BASIC CHANNEL SAMPLE AND DISPLAY
47                          /LIFT SSW 0 FOR CHANNELS 20-37
48      4033   0024              SFA                 /GET SPECIAL FUNCTIONS REGISTER
49      4034   1620              BSE I               /SET FOR FULL SIZE CHARACTERS
50      4035   0200              0200
51      4036   0004              ESF                 /ENABLE SPECIAL FUNCTIONS
52      4037   1020              LDA I               /SET FLOW TAG FOR 20 CHANNEL DISPLAY
53      4040   1020              LDA I
54      4041   1040              STA
55      4042   0070              E1+25               /END OF SINGLE DISPLAY
56                              EJECT
```

```
57
58                      /
59                      /DISPLAY CHANNEL NO.
60                      /
61      4043  1003   E1,    LDA              /GET CHANNEL NUMBER
62      4044  0245          A1
63      4045  1040          STA              /SAVE IT
64      4046  0246          T1
65      4047  0241          ROL 1            /GET LAST BIT
66      4050  1540          BCL              /SAVE BITS 8,9,10
67      4051  0250          M1
68      4052  2247          ADD G1           /ADD POINTER
69      4053  4011          STC 11           /SAVE FIRST ADDRESS AND CLEAR AC
70      4054  2246          ADD T1           /ADD BASIC CHANNEL NUMBER
71      4055  0302          ROR 2
72      4056  1540          BCL              /SAVE BITS 8,9,10
73      4057  0250          M1
74      4060  2247          ADD G1           /ADD POINTER
75      4061  4010          STC 10           /SAVE SECOND ADDRESS AND CLEAR AC
76      4062  2251          ADD V1           /PICK UP VERTICAL COORDINATE
77      4063  1750          DSC 10           /DISPLAY HALF CHARACTER
78      4064  1770          DSC I 10         /DISPLAY SECOND HALF CHARACTER
79      4065  6217          JMP X1           /GO INSERT SPACE BETWEEN CHARACTERS
80      4066  1751          DSC 11           /DISPLAY HALF CHARACTER
81      4067  1771          DSC I 11         /DISPLAY SECOND HALF CHARACTER
82      4070  1020          LDA I            /DECREMENT HORIZONTAL COORDINATE
83      4071  7737          -40
84      4072  1140          ADM
85      4073  0001          H1
86                          EJECT
```

```
87
88                      /
89                      /SAMPLE CHANNEL JUST LABELED
90                      /
91     4074  0011               CLR
92     4075  2245               ADD A1              /GET CHANNEL NUMBER
93     4076  1626               BSE I               /SET FOR SAM X
94     4077  0100               100
95     4100  4101               STC .+1             /STORE FOR EXECUTION
96     4101  0000               0000                /EXECUTE SAM X
97                      /
98                      /CONVE  SAMPLE
99                      /
100    4102  0451   E1+??  APO                      /POSITIVE?
101    4103  6107           JMP .+4                 /NO, SET POINTER FOR NEGATIVE PREFIX
102    4104  0070           SET I 10                /YES, SET POINTER FOR POSITIVE PREFIX
103    4105  0272  0503     T2+20  FSAM+15
104    4106  6112           JMP .+4
105    4107  0070           SET I 10
106    4110  0274  0505     T2+22  FSAM+17
107    4111  0017           COM                     /COMPLEMENT NEGATIVE SAMPLE
108    4112  1040           STA                     /SAVE SAMPLE
109    4113  0246           T1
110    4114  0241           ROL 1                   /FIND AND STORE TABLE ADDRESSES FOR DISPLAY
111    4115  1540           BCL
112    4116  0250           M1
113    4117  2247           ADD G1
114    4120  4013           STC 13                  /LAST DIGIT
115    4121  2246           ADD T1
116    4122  0302           ROR 2
117    4123  1040           STA
118    4124  0246           T1
119    4125  1540           BCL
120    4126  0250           M1
121    4127  2247           ADD G1
122    4130  4012           STC 12                  /SECOND DIGIT
123    4131  2246           ADD T1
124    4132  0303           ROR 3
125    4133  1540           BCL
126    4134  0250           M1
127    4135  2247           ADD G1
128    4136  4011           STC 11                  /FIRST DIGIT
129                         EJECT
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130
131                                 /
132                                 /DISPLAY DIGITS
133                                 /
134      4137   1120                ADA I            /DECREMENT VERICAL TO DISPLAY BELOW CHAN NO,
135      4140   7737                -40
136      4141   2251                ADD V1           /ADD BASIC VERTICAL COORDINATE
137      4142   1750                DSC 10           /DISPLAY PREFIX (+ OR -)
138      4143   1770                DSC I 10
139      4144   6217                JMP X1           /INCREMENT HORIZONTAL
140      4145   1751                DSC 11           /DISPLAY DIGITS
141      4146   1771                DSC I 11
142      4147   6217                JMP X1           /INCREMENT HORIZONTAL
143      4150   1752                DSC 12           /DISPLAY DIGITS
144      4151   1772                DSC I 12
145      4152   6217                JMP X1           /INCREMENT HOBIZONTAL
146      4153   1753                DSC 13           /DISPLAY DIGITS
147      4154   1773                DSC I 13
148                                 /
149                                 /IS ROW ENDED?
150                                 /
151      4155   1000                LDA              /FIND CHANNEL NUMBER
152      4156   0245                A1
153      4157   1560                BCL I            /SAVE LOW-ORDER 2 BITS
154      4160   7774                7774
155      4161   1460                SAE I            /DISPLAY 4 CHANNELS PER LINE
156      4162   0003                0003
157      4163   6225                JMP P1           /NOT END OF ROW, INCREMENT HORIZONTAL AND CHANNEL
158                                 /
159                                 /IS DISPLAY ENDED?
160                                 /
161      4164   1000                LDA              /FIND CHANNEL NUMBER
162      4165   0245                A1
163      4166   1560                BCL I            /SAVE LOW-ORDER 4 BITS
164      4167   7760                7760
165      4170   1460                SAE I            /DISPLAY 17 OCTAL CHANNELS PER FRAME
166      4171   0017                0017
167      4172   6236                JMP U1           /NOT END OF DISPLAY, DECREMENT VERTICAL, INCREMENT CHANNEL
168                                 EJECT
```

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169
170                          /
171                          /END OF DISPLAY
172                          /
173    4173  1020            LDA I                /RESET COORDINATES
174    4174  0300            0300
175    4175  4251            STC V1               /VERTICAL TOP OF FRAME
176    4176  4001            STC H1               /HORIZONTAL LEFT EDGE
177    4177  0440            SNS 0                /WHICH SET?
178    4200  6204            JMP ,+4
179    4201  1020            LDA I                /CHANNELS 20-37
180    4202  0020            0020
181    4203  6205            JMP ,+2
182    4204  0011            CLR                  /CHANNELS 0-17
183    4205  4245            STC A1               /RESET CHANNEL NUMBER
184    4206  0415            KST                  /KEYBOARD?
185    4207  6021            JMP B7               /BACK TO START
186    4210  0500            IOB                  /READ DEYBOARD
187    4211  6036            6036
188    4212  1460            SAE I
189    4213  0204            0204                 /CONTROL D?
190    4214  6021            JMP B7
191    4215  0643            LDF 03               /RESET DATA FIELD
192    4216  6016            JMP DIAL             /YES, BACK TO DIAL
193    4217  0221     X1,    XSK I H1             /INCREMENT HORIZONTAL TO SPACE CHARACTERS
194    4220  0221            XSK I H1
195    4221  0221            XSK I H1
196    4222  0221            XSK I H1
197    4223  0016            NOP
198    4224  6000            JMP 0
199                          EJECT
```

```
200
201                         /
202                         /NOT END OF ROW
203                         /
204      4225  1020   P1,       LDA I         /INCREMENT HORIZONTAL TO SPACE CHANNELS
205      4226  0077             0077
206      4227  1140             ADM
207      4230  0001             H1
208                         /
209                         /INDEX CHANNEL NUMBER
210                         /
211      4231  1020   Q1,       LDA I         /INCREMENT CHANNEL NUMBER (NOT END OF ROW
212      4232  0001             0001          /OR NOT END OF DISPLAY)
213      4233  1140             ADM
214      4234  0245             A1
215      4235  6043             JMP E1        /GET NEXT CHANNEL AND DISPLAY
216                         /
217                         /NOT END OF DISPLAY
218                         /
219      4236  1000   U1,       LDA           /DECREMENT VERTICAL TO SPACE ROWS
220      4237  0251             V1
221      4240  1120             ADA I
222      4241  7577             -200
223      4242  4251             STC V1
224      4243  4001             STC H1
225      4244  6231             JMP Q1        /GO INCREMENT CHANNEL NUMBER
226                         /
227                         /TAGS AND REGISTERS
228                         /
229      4245  0000   A1,       0000          /CONTAINS CHANNEL NUMBER
230      4246  0000   T1,       0000          /TEMPORARY STORAGE
231      4247  0252   G1,       T2            /MATRIX POINTER
232      4250  7761   M1,       7761          /BCL CONSTANT
233      4251  0000   V1,       0             /VERTICAL COORDINATE STORAGE
234                            EJECT
```

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235
236                         /
237                         /DISPLAY MATRICIES
238                         /
239    4252   4136    T2,     4136              /ZERO
240    4253   3641             3641
241    4254   2101             2101             /ONE
242    4255   0177             0177
243    4256   4523             4523             /TWO
244    4257   2151             2151
245    4260   4122             4122             /THREE
246    4261   2651             2651
247    4262   2414             2414             /FOUR
248    4263   0477             0477
249    4264   5172             5172             /FIVE
250    4265   0651             0651
251    4266   1506             1506             /SIX
252    4267   4225             4225
253    4270   4443             4443             /SEVEN
254    4271   6050             6050
255    4272   0404             0404  5126       /PLUS EIGHT
256    4273   0437             0437  2651
257    4274   0404             0404  5122       /MINUS NINE
258    4275   0404             0404  3631
259                            EJECT
```

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260
261                       /
262                       /TRIGGERED SCOPE DISPLAY
263                       /
264     4276   0517   D5,    LSW                    /FIND CHANNEL NUMBER
265     4277   1560          BCL I
266     4300   7740          7740
267     4301   1040          STA
268     4302   0245          A1                     /CHANNEL NO. TO A1
269     4303   1620          BSE I                  /SET FOR SAMPLE
270     4304   0100          0100
271     4305   4463          STC E6                 /STORE FOR EXECUTION
272     4306   1020          LDA I                  /GET FLOW TAG
273     4307   0064          SET I 4
274     4310   4341          STC C5-2               /SAM SET-UP
275     4311   1020          LDA I                  /GET FLOW TAG
276     4312   6323          JMP A5
277     4313   4070          STC E1+25              /REINITIALIZE AFTER CHANNEL NUMBER DISPLAY
278     4314   1020          LDA I                  /CHANNEL NUMBER HORIZONTAL COORDINATE
279     4315   0100          100
280     4316   1040          STA
281     4317   0001          H1
282     4320   0017          COM
283     4321   4251          STC V1                 /CHARACTER DISPLAY VERTICAL COORDINATE
284     4322   6043          JMP E1                 /SET V,H
285                       /
286                       /TRIGGERING ROUTINE (EQIVALENT TO AUTO TRIC, INTERNAL SYNC, DC POSITIVE),
287                       /
288     4323   0074   A5,    SET I 14               /START TIMER
289     4324   1000          1000
290     4325   6463          JMP E6                 /GO SAMPLE CHANNEL
291     4326   0451          APO                    /POSITIVE?
292     4327   6332          JMP ,+3                /NO, TRY AGAIN
293     4330   0234          XSK I 14               /INCREMENT TIMER
294     4331   6325          JMP ,-4                /WAIT
295     4332   0074          SET I 14
296     4333   1000          1000
297     4334   6463          JMP E6                 /SAMPLE CHANNEL
298     4335   0471          APO I                  /NEGATIVE?
299     4336   6341          JMP ,+3                /NO, TRIGGER NOW FIRES
300     4337   0234          XSK I 14               /WAIT SOME MORE
301     4340   6334          JMP ,-4
302                          EJECT
```

```
303
304                         /
305                         /DISPLAY A TRACE TO HERE IF TRIGGERED, OR NOT TRIGGERED AND
306                         /
307     4341    0064                SET I 4         /START DISPLAY AT LEFT SIDE
308     4342    1000                1000
309     4343    6463        C5,     JMP E6          /SAMPLE CHANNEL
310     4344    0144                DIS 4           /DISPLAY CHANNEL
311     4345    0011                CLR
312     4346    0144                DIS 4           /DISPLAY 0V REFERENCE
313     4347    1020                LDA I
314     4350    0377                377
315     4351    0144                DIS 4           /DISPLAY +.5V REFERENCE
316     4352    0017                COM
317     4353    0144                DIS 4           /DISPLAY -.5V REFERENCE
318     4354    0224                XSK I 4         /INCREMENT HORIZONTAL
319     4355    6343                JMP C5          /CONTINUE TRACE
320     4356    6206                JMP X1-11       /GO CHECK KEYBOARD
321                         /
322                         /TRIGGERED PREAMP DISPLAY
323                         /
324     4357    0011        J6,     CLR             /TO HERE IF SSW2=1
325     4360    6371                JMP K6
326     4361    1020                LDA I           /TO HERE IF SSW3=1
327     4362    0010                10
328     4363    6371                JMP K6
329     4364    1020                LDA I           /TO HERE IS SSW4=1
330     4365    0020                20
331     4366    6371                JMP K6
332     4367    1020                LDA I           /TO HERE IF SSW5=1
333     4370    0030                30
334     4371    1040        K6,     STA             /STORE CHANNEL NUMBER
335     4372    0245                A1
336     4373    4465                STC B6          /WE NOW HAVE CHANNEL
337     4374    1020                LDA I           /SET FLOW TAG
338     4375    6410                JMP A6
339     4376    4070                STC E1+25
340     4377    1020                LDA I           /INITIALIZE DISPLAY
341     4400    7600                -177
342     4401    4251                STC V1          SET VERTICAL COORDINATE FOR CHANNEL NUMBER DISPLAY
343     4402    1020                LDA I
344     4403    0014                14
345     4404    4001                STC H1          SET HORIZONTAL COORDINATE FOR LEFT SIDE
346     4405    0064                SET I 4         RESET HORIZONTAL FOR SAMPLE DISPLAY
347     4406    1000                1000
348     4407    6043                JMP E1          /GO DISPL  CHANNEL NUMBER
349                                 EJECT
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```
350
351                         /
352                         /DISPLAY CHANNEL NUMBERS
353                         /
354    4410  1020   A6,     LDA I            /INCREMENT CHANNEL NUMBER
355    4411  0001           1
356    4412  1140           ADM
357    4413  0245           A1
358    4414  1560           BCL I            /SAVE LOW-ORDER 3 BITS
359    4415  7770           7770
360    4416  0470           AZE I            /IF 0, WE JUST DISPLAYED LAST CHANNEL IN FRAME
361    4417  6425           JMP D6           /NOW DISPLAY ANALOG INPUTS
362    4420  1020           LDA I            /INCREMENT HORIZONTAL
363    4421  0034           34
364    4422  1140           ADM
365    4423  0001           H1
366    4424  6043           JMP E1           /DISPLAY NEXT CHANNEL NUMBER
367    4425  1020   D6,     LDA I            /BEGIN DISPLAY
368    4426  6437           JMP F6           /SET FLOW TAG TO PREVENT OVERLAP OF CHANNELS
369    4427  4341           STC C5-2
370    4430  2465           ADD B6           /GET CHANNEL
371    4431  1620   G6,     BSE I            /SET FOR SAM X
372    4432  0100           100
373    4433  4463           STC E6           /INITIALIZED
374    4434  0075           SET I 15         /SET WIDTH OF CHANNEL DISPLAY
375    4435  7677           -100
376    4436  6323           JMP A5           /GO LOOK FOR TRIGGER IF AVAILABLE
377    4437  6463   F6,     JMP E6           /GO SAMPLE CHANNEL
378    4440  0144           DIS 4            /DISPLAY CHANNEL
379    4441  1020           LDA I            /DISPLAY +,5V REFERENCE
380    4442  0377           377
381    4443  0144           DIS 4
382    4444  0017           COM              /DISPLAY -,5V REFERENCE
383    4445  0144           DIS 4
384    4446  0011           CLR              /DISPLAY 0V REFERENCE
385    4447  0144           DIS 4
386    4450  0235           XSK I 15         /END OF SAMPLE DISPLAY?
387    4451  6460           JMP H6           /NO, GO INCREMENT HORIZONTAL
388    4452  1020           LDA I            /END OF SEGMENT
389    4453  0001           1
390    4454  1140           ADM              /INCREMENT CHANNEL NUMBER
391    4455  0465           B6
392    4456  0224           XSK I 4          /INCREMENT HORIZONTAL
393    4457  6431           JMP G6           /DISPLAY NEXT SAMPLE
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394
395    4460   0224    H6,    XSK I 4            /INCREMENT HORIZONTAL
396    4461   6437           JMP F6            /DISPLAY SAMPLE
397    4462   6206           JMP X1-11         /GO CHECK KEYBOARD
398    4463   0000    E6,    0                 /EXECUTE SAM X
399    4464   6000           JMP 0             /RETURN
400    4465   0000    B6,    0                 /HOLDS CHANNEL NUMBER
401                   /FAST SAMPLE TEST
402                   / ANALOG CHANNEL 00 AND 01 "MUST" NOT" BE EQUAL AT THE START OF THE TEST
403                   /ROTATE ANALOG 00 TO FULL COUNTER CLOCKWISE
404                   /ROTATE ANALOG 01 TO FULL CLOCKWISE
405                   /
406                   /THIS TO INSURE CHANNEL 00 & 01 ARE NOT EQUAL
407                   / AT THE START OF THE TEST
408    4466   1020    FSAM,  LDA I             /LOAD AC WITH
409    4467   0100           0100              /0100
410    4470   0004           ESF               /SET FAST SAMPLE
411    4471   0101           SAM     1         /SET UP
412    4472   0101           SAM     1         /GET CHANNEL 01
413    4473   4476           STC     .+3       /SAVE IT
414    4474   0100           SAM     0         /GET CHANNEL 01 AGAIN
415    4475   1460           SAE I             /IS IT EQUAL
416    4476   0000           0000              /
417    4477   0000           HLT               /NO, FAST SAMPLE FAILED
418    4500   0011           CLR               /CLEAR AC
419    4501   0004           ESF
420    4502   6000           JMP     0         /EXIT
421    4503   7610    @
       4504   0110
       4505   1010
       4506   0110
```

```
0000
0100

0200
0300

0400
0500

0600
0700


1000
1100

1200
1300

1400
1500

1600
1700


2000
2100

2200
2300

2400
2500

2600
2700


3000
3100

3200
3300

3400
3500

3600
3700
```

```
4000   01000000   00000011   11111111   11111111   11111111   11111111   11111111   11111111
4100   11111111   11111111   11111111   11111111   11111111   11111111   11111111   11111111

4200   11111111   11111111   11111111   11111111   11111111   11111111   11111111   11111111
4300   11111111   11111111   11111111   11111111   11111111   11111111   11111111   11111111

4400   11111111   11111111   11111111   11111111   11111111   11111111   11111111   11111111
4500   11110000   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
```

```
            A1      4245
            A5      4323
            A6      4410
            B6      4465
            B7      4021
            C5      4343
            D5      4276
            D6      4425
            DIAL    4016
            E1      4043
            E6      4463
            F6      4437
            FSAM    4466
            G1      4247
            G6      4431
            H1      4001
            H6      4460
            J6      4357
            K6      4371
            M1      4250
            P1      4225
            Q1      4231
            T1      4246
            T2      4252
            U1      4236
            V1      4251
            X1      4217
```

ERRORS DETECTED: 0

LINKS GENERATED: 0

RUN-TIME: 4 SECONDS

2K CORE USED