

IDENTIFICATION

PRODUCT CODE: MAINDEC 12-D6CB-D (D)
PRODUCT NAME: A TO D TEST
DATE CREATED: OCTOBER 24, 1969
MAINTAINER: DIAGNOSTIC GROUP
AUTHOR: HAROLD LONG

(OUTDATED)

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 for 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 \emptyset 's.
(This will set up the program for the first display)
- f) Depress start 20.
- g) 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.
- h) This program does NOT use fast sample mode.

5. OPERATING PROCEDURES

5.1 Switch Settings

- a) SSW = $\emptyset\emptyset$; CHANNELS $\emptyset\emptyset$ -17₍₈₎ are sampled and displayed.
- b) SSW = 4 \emptyset ; CHANNELS 2 \emptyset -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 = 2 \emptyset ; The channel selected by bits \emptyset 7-11 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 = 1 \emptyset ; CHANNELS \emptyset -7 are sampled and displayed as a segmented oscilloscope display. Each channel has triggering capability as in (C) above.
- e) SSW = \emptyset 4; CHANNELS 1 \emptyset -17 are sampled and displayed as a segmented oscilloscope display. Each channel has triggering capability as in (C) above.
- f) SSW = \emptyset 2; CHANNELS 2 \emptyset -27 are sampled and displayed as a segmented oscilloscope display. Each channel has triggering capability as in (C) above.
- g) SSW = \emptyset 1; CHANNELS 3 \emptyset 3-37 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; if difficulty is encountered with the SAM instruction, check the A 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.


```

0000 *20
0001 /POP-12 A TO D TEST, MAINDEC 12-D6C
0002 /COPYRIGHT 1969, DIGITAL EQUIPMENT RP., MAYNARD, MASS.
0003 /THIS TEST IS DESIGNED TO DISPLAY ALL AVAILABLE
0004 /ANALOG INPUT CHANNELS ON THE VR12 DISPLAY
0005 /
0006 /SENSE SWITCH 0 DETERMINES WHAT CHANNELS TO DISPLAY
0007 /
0008 /SENSE SWITCH 1 GIVES AN OSCILLOSCOPE DISPLAY
0009 /FOR THE CHANNEL ENTERED IN THE LEFT SW
0010 /
0011 /SENSE SWITCHES 2 THRU 5 GIVE AN OVERALL
0012 /OSCILLOSCOPE OF CHANNELS 0-7, 10-17, 20-27,
0013 /AND 30-37, RESPECTIVELY.
0014 /
0015 /I/O PRESET, START 20 LINC MODE.
0016 /
0017 /TYPING CTL-"D" RETURNS USER TO DIAL
0018 /
0019 /MAJOR START 4020
0020 /
0021 /TAGS AND CONSTANTS
0022 /
0023 /
0024 /
0025 /
0026 /
0027 /
0028 /
0029 /
0030 /
0031 /
0032 /
0033 /
0034 /

```

/HORIZONTAL COORDINATE STORAGE

```

0001 0000
0016 0701 RCG
0017 7300
EJECT

```

```

0036 /TO HERE IF FIRST TIME THROUGH
0037 /
0040 0020 0461 B7, SNS I 1 /CHECK FOR OPTIONS
0041 0021 6275 JMP D5 /TRIGGERED SCOPE DISPLAY
0042 0022 0462 SNS I 2 /CHANNELS 0-7
0043 0023 6356 JMP J6
0044 0024 0463 SNS I 3 /CHANNELS 10-17
0045 0025 6360 JMP J6+2
0046 0026 0464 SNS I 4 /CHANNELS 20-27
0047 0027 6363 JMP J6+5
0050 0030 0465 SNS I 5 /CHANNELS 30-37
0051 0031 6366 JMP J6+10
0052 /
0053 /BASIC CHANNEL SAMPLE AND DISPLAY
0054 /LIFT SSW 0 FOR CHANNELS 20-37
0055 0032 0024 SFA /GET SPECIAL FUNCTIONS REGISTER
0056 0033 1620 BSE I /SET FOR FULL SIZE CHARACTERS
0057 0034 0200 0200
0060 0035 0004 ESF /ENABLE SPECIAL FUNCTIONS
0061 0036 1020 LDA I /SET FLOW TAG FOR 20 CHANNEL DISPLAY
0062 0037 1020 LDA I
0063 0040 1040 STA
0064 0041 0067 E1+25 /END OF SINGLE DISPLAY
0065 EJECT

```


0066
0067
0070
0071
0072
0073
0074
0075
0076
0077
0100
0101
0102
0103
0104
0105
0106
0107
0110
0111
0112
0113
0114
0115
0116
0117
0120
0121
0122

/DISPLAY CHANNEL NO.
/E1,
LDA
A1
STA
T1
ROL
BCL
M1
ADD
STC
ADD
ROR
BCL
M1
ADD
STC
ADD
DSC I
JMP
DSC
DSC I
LDA I
-40
ADM
H1
EJECT

0042 1000
0043 0244
0044 1040
0045 0245
0046 0241
0047 1540
0050 0247
0051 2246
0052 4011
0053 2245
0054 0302
0055 1540
0056 0247
0057 2246
0060 4010
0061 2250
0062 1750
0063 1770
0064 6216
0065 1751
0066 1771
0067 1020
0070 7737
0071 1140
0072 0001

/GET CHANNEL NUMBER
/SAVE IT
/GET LAST BIT
/SAVE BITS 8,9,10
/ADD POINTER
/SAVE FIRST ADDRESS AND CLEAR AC
/ADD BASIC CHANNEL NUMBER
/SAVE BITS 8,9,10
/ADD POINTER
/SAVE SECOND ADDRESS AND CLEAR AC
/PICK UP VERTICAL COORDINATE
/DISPLAY HALF CHARACTER
/DISPLAY SECOND HALF CHARACTER
/GO INSERT SPACE BETWEEN CHARACTERS
/DISPLAY HALF CHARACTER
/DISPLAY SECOND HALF CHARACTER
/DECREMENT HORIZONTAL COORDINATE

```

0123
0124 /SAMPLE CHANNEL JUST LABELED
0125 /
0126 0073 0011 CLR
0127 0074 2244 ADD A1 /GET CHANNEL NUMBER
0130 0075 1620 BSE I /SET FOR SAM X
0131 0076 0100 100
0132 0077 4100 STC .+1 /STORE FOR EXECUTION
0133 0100 0000 0000 /EXECUTE SAM X
0134 /
0135 /CONVERT SAMPLE
0136 /
0137 0101 0451 APO /POSITIVE?
0140 0102 6106 JMP .+4 /NO, SET POINTER FOR NEGATIVE PREFIX
0141 0103 0070 SET I 10 /YES, SET POINTER FOR POSITIVE PREFIX
0142 0104 0271 T2+20
0143 0105 6111 JMP .+4
0144 0106 0070 SET I 10
0145 0107 0273 T2+22
0146 0110 0017 COM /COMPLEMENT NEGATIVE SAMPLE
0147 0111 1040 STA /SAVE SAMPLE
0150 0112 0245 T1
0151 0113 0241 ROL 1 /FIND AND STORE TABLE ADDRESSES FOR DISPLAY
0152 0114 1540 BCL
0153 0115 0247 M1
0154 0116 2246 ADD G1
0155 0117 4013 STC 13 /LAST DIGIT
0156 0120 2245 ADD T1
0157 0121 0302 ROR 2
0160 0122 1040 STA
0161 0123 0245 T1
0162 0124 1540 BCL
0163 0125 0247 M1
0164 0126 2246 ADD G1
0165 0127 4012 STC 12 /SECOND DIGIT
0166 0130 2245 ADD T1
0167 0131 0303 ROR 3
0170 0132 1540 BCL
0171 0133 0247 M1
0172 0134 2246 ADD G1
0173 0135 4011 STC 11 /FIRST DIGIT
0174 EJECT

```



```

0243
0244 /
0245 /END OF DISPLAY
0246 /
0247 LDA I /RESET COORDINATES
0250 0172 1020 STC V1 /VERTICAL TOP OF FRAME
0251 0173 0300 STC H1 /HORIZONTAL LEFT EDGE
0252 0174 4250 SNS 0 /WHICH SET?
0253 0175 4001 JMP .+4
0254 0176 0440 LDA I /CHANNELS 20-37
0255 0177 6203 STC H1
0256 0200 1020 LDA I
0257 0201 0020 STC H1
0260 0202 6204 JMP .+2
0261 0203 0011 CLR /CHANNELS 0-17
0262 0204 4244 STC A1 /RESET CHANNEL NUMBER
0263 0205 0415 KST /KEYBOARD?
0264 0206 6020 JMP B7 /BACK TO START
0265 0207 0500 IOB /READ KEYBOARD
0266 0210 6036 6036
0267 0211 1460 SAE I
0270 0212 0204 /CONTROL D?
0271 0213 6020 JMP B7
0272 0214 0643 LDF 03 /RESET DATA FIELD
0273 0215 6016 JMP DIAL /YES, BACK TO DIAL
0274 0216 0221 X1, XSK I H1 /INCREMENT HORIZONTAL TO SPACE CHARCTERS
0275 0217 0221 XSK I H1
0276 0220 0221 XSK I H1
0277 0221 0221 XSK I H1
0300 0222 0016 NOP
0300 0223 6000 JMP 0
EJECT

```

```

0301 /NOT END OF ROW
0302 /
0303 /
0304 P1, LDA I
0305 0224 1020 /INCREMENT HORIZONTAL TO SPACE CHANNELS
0306 0225 0077
0307 ADM
0308 0226 1140
0309 0227 0001 H1
0310 /
0311 /INDEX CHANNEL NUMBER
0312 /
0313 Q1, LDA I
0314 0230 1020 /INCREMENT CHANNEL NUMBER (NOT END OF ROW
0315 0231 0001 /OR NOT END OF DISPLAY)
0316 0232 1140 ADM
0317 0233 0244 A1
0318 0234 6042 JMP E1
0319 /GET NEXT CHANNEL AND DISPLAY
0320 /
0321 /NOT END OF DISPLAY
0322 /
0323 U1, LDA
0324 0235 1000 /DECREMENT VERTICAL TO SPACE ROWS
0325 0236 0250 V1
0326 0237 1120 ADA I
0327 0240 7577 -200
0328 0241 4250 STC V1
0329 0242 4001 STC H1
0330 0243 6230 JMP Q1
0331 /GO INCREMENT CHANNEL NUMBER
0332 /
0333 /TAGS AND REGISTERS
0334 /
0335 A1, 0000 /CONTAINS CHANNEL NUMBER
0336 T1, 0000 /TEMPORARY STORAGE
0337 G1, T2 /MATRIX POINTER
0338 M1, 7761 /BCL CONSTANT
0339 V1, 0 /VERTICAL COORDINATE STORAGE
0340 EJECT
0341
0342

```

```
0343
0344 /DISPLAY MATRICIES
0345 /
0346 0251 4136 T2, 4136 /ZERO
0347 0252 3641 3641
0350 0253 2101 2101 /ONE
0351 0254 0177 0177
0352 0255 4523 4523 /TWO
0353 0256 2151 2151
0354 0257 4122 4122 /THREE
0355 0260 2651 2651
0356 0261 2414 2414 /FOUR
0357 0262 0477 0477
0360 0263 5172 5172 /FIVE
0361 0264 0651 0651
0362 0265 1506 1506 /SIX
0363 0266 4225 4225
0364 0267 4443 4443 /SEVEN
0365 0270 6050 6050
0366 0271 0404 0404 /PLUS
0367 0272 0437 0437
0370 0273 0404 0404 /MINUS
0371 0274 0404 0404
0372 EJECT
```

```

0373 /TRIGGERED SCOPE DISPLAY
0374 /
0375 D5,
0376 LSW 0517
0377 BCL I 1560
0400 0277 7740
0401 0300 1040
0402 0301 0244
0403 0302 1620
0404 0303 0100
0405 0304 4462
0406 0305 1020
0407 0306 0064
0410 0307 4340
0411 0310 1020
0412 0311 6322
0413 0312 4067
0414 0313 1020
0415 0314 0100
0416 0315 1040
0417 0316 0001
0420 0317 0017
0421 0320 4250
0422 0321 6042
0423
0424
0425
0426
0427
0430
0431
0432
0433
0434
0435
0436
0437
0440
0441
0442
0443
0444

0275 0517
0276 1560
0277 7740
0300 1040
0301 0244
0302 1620
0303 0100
0304 4462
0305 1020
0306 0064
0307 4340
0310 1020
0311 6322
0312 4067
0313 1020
0314 0100
0315 1040
0316 0001
0317 0017
0320 4250
0321 6042

0322 0074
0323 1000
0324 6462
0325 0451
0326 6331
0327 0234
0330 6324
0331 0074
0332 1000
0333 6462
0334 0471
0335 6340
0336 0234
0337 6333

/
A5,
SET I 14
1000
JMP
APO
JMP
XSK I 14
JMP
SET I 14
1000
JMP
APO I
JMP
XSK I 14
JMP

EJECT

```

```

/ FIND CHANNEL NUMBER
/ CHANNEL NO. TO A1
/ SET FOR SAMPLE
/ STORE FOR EXECUTION
/ GET FLOW TAG
/ SAM SET-UP
/ GET FLOW TAG
/ REINITIALIZE AFTER CHANNEL NUMBER DISPLAY
/ CHANNEL NUMBER HORIZONTAL COORDINATE
/ CHARACTER DISPLAY VERTICAL COORDINATE
/ SET V,H
/ START TIMER
/ GO SAMPLE CHANNEL
/ POSITIVE?
/ NO, TRY AGAIN
/ INCREMENT TIMER
/ WAIT
/ SAMPLE CHANNEL
/ NEGATIVE?
/ NO, TRIGGER NOW FIRES
/ WAIT SOME MORE

```

```

E6
4
C5-2
A5
E1+25
V1
E1

```

```

/ TRIGGERING ROUTINE (EQUIVALENT TO AUTO TRIG, INTERNAL SYNC, DC POSITIVE).

```

```

0445 /
0446 /DISPLAY A TRACE TO HERE IF TRIGGERED, OR NOT TRIGGERED AND
0447 /
0450 0340 0064 SET I 4 /START DISPLAY AT LEFT SIDE
0451 0341 1000 1000
0452 0342 6462 C5, JMP E6 /SAMPLE CHANNEL
0453 0343 0144 DIS 4 /DISPLAY CHANNEL
0454 0344 0011 CLR
0455 0345 0144 DIS 4 /DISPLAY 0V REFERENCE
0456 0346 1020 LDA I
0457 0347 0377 377
0460 0350 0144 DIS 4 /DISPLAY +.5V REFERENCE
0461 0351 0017 COM
0462 0352 0144 DIS 4 /DISPLAY -.5V REFERENCE
0463 0353 0224 XSK I 4 /INCREMENT HORIZONTAL
0464 0354 6342 JMP C5 /CONTINUE TRACE
0465 0355 6206 JMP X1-10 /GO CHECK KEYBOARD
0466 /
0467 /TRIGGERED PREAMP DISPLAY
0470 /
0471 0356 0011 J6, CLR /TO HERE IF SSW2=1
0472 0357 6370 JMP K6
0473 0360 1020 LDA I /TO HERE IF SSW3=1
0474 0361 0010 10
0475 0362 6370 JMP K6
0476 0363 1020 LDA I /TO HERE IF SSW4=1
0477 0364 0020 20
0500 0365 6370 JMP K6
0501 0366 1020 LDA I /TO HERE IF SSW5=1
0502 0367 0030 30
0503 0370 1040 K6, STA /STORE CHANNEL NUMBER
0504 0371 0244 A1
0505 0372 4464 STC B6 /WE NOW HAVE CHANNEL
0506 0373 1020 LDA I /SET FLOW TAG
0507 0374 6407 JMP A6
0510 0375 4067 STC E1+25
0511 0376 1020 LDA I /INITIALIZE DISPLAY
0512 0377 7600 -177
0513 0400 4250 STC V1 /SET VERTICAL COORDINATE FOR CHANNEL NUMBER DISPLAY
0514 0401 1020 LDA I
0515 0402 0014 14
0516 0403 4001 STC H1 /SET HORIZONTAL COORDINATE FOR LEFT SIDE
0517 0404 0064 SET I 4 /PRESET HORIZONTAL FOR SAMPLE DISPLAY
0520 0405 1000 1000
0521 0406 6042 JMP E1 /GO DISPLAY CHANNEL NUMBER
0522
EJECT

```


A1 4244
A5 4322
A6 4407
B6 4464
B7 4020
C5 4342
DIAL 4016
D5 4275
D6 4424
E1 4042
E6 4462

F0	4750
G1	4246
G6	4430
H1	4001
H6	4457
J6	4356
K6	4370
M1	4247
P1	4224
Q1	4230
T1	4245
T2	4251
U1	4235
V1	4250
X1	4216