

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(OUTDATED)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 0'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 = 00; CHANNELS 00-17<sub>(8)</sub> are sampled and displayed.
- b) SSW = 40; CHANNELS 20-37<sub>(8)</sub> are sampled and displayed.  
These channels are optional on the PDP-12; if not installed, the value displayed for each channel will be -777<sub>(8)</sub>.
- 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; 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 *0001
0028 H1, 0000 /HORIZONTAL COORDINATE STORAGE
0029 *0016
0030 DIAL, RCG
0031 0016 0701
0032 0017 7300
0033 EJECT
0034

```

```

0036 /TO HERE IF FIRST TIME THROUGH
0037 /
0040 B7,
0041 SNS I 1
0042 JMP D5
0043 SNS I 2
0044 JMP J6
0045 SNS I 3
0046 JMP J6+2
0047 SNS I 4
0048 JMP J6+5
0049 SNS I 5
0050 JMP J6+10
0051
0052 /BASIC CHANNEL SAMPLE AND DISPLAY
0053 /LIFT SSW 0 FOR CHANNELS 20-37
0054
0055 SFA
0056 BSE I
0057 0200
0060 ESF
0061 LDA I
0062 LDA I
0063 STA
0064 E1+25
0065
0020 0461
0021 6275
0022 0462
0023 6356
0024 0463
0025 6360
0026 0464
0027 6363
0030 0465
0031 6366
0032 0024
0033 1620
0034 0200
0035 0004
0036 1020
0037 1020
0040 1040
0041 0067
0042 /CHECK FOR OPTIONS
0043 /TRIGGERED SCOPE DISPLAY
0044 /CHANNELS 0-7
0045 /CHANNELS 10-17
0046 /CHANNELS 20-27
0047 /CHANNELS 30-37
0048 /GET SPECIAL FUNCTIONS REGISTER
0049 /SET FOR FULL SIZE CHARACTERS
0050 /ENABLE SPECIAL FUNCTIONS
0051 /SET FLOW TAG FOR 20 CHANNEL DISPLAY
0052 /END OF SINGLE DISPLAY
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  
DSC  
JMP  
DSC  
DSC  
LDA  
-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

1  
G1  
11  
T1  
2  
G1  
10  
V1  
10  
10  
X1  
11  
11  
11  
I

```

0123 /SAMPLE CHANNEL JUST LABELED
0124 /
0125
0126 CLR 0011 /GET CHANNEL NUMBER
0127 ADD 2244 /SET FOR SAM X
0130 BSE I A1
0131 100 /STORE FOR EXECUTION
0132 0077 4100 /EXECUTE SAM X
0133 0000
0134
0135 /CONVERT SAMPLE
0136 /
0137 APO 0451 /POSITIVE?
0140 JMP 6106 /NO, SET POINTER FOR NEGATIVE PREFIX
0141 SET I 10 /YES, SET POINTER FOR POSITIVE PREFIX
0142 0104 0271 T2+20
0143 JMP 6111 .+4
0144 0106 0070 SET I 10 .+4
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
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
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
0174 EJECT

```

```

0175
0176
0177
0200
0201
0202
0203
0204
0205
0206
0207
0210
0211
0212
0213
0214
0215
0216
0217
0220
0221
0222
0223
0224
0225
0226
0227
0230
0231
0232
0233
0234
0235
0236
0237
0240
0241
0242

/ DISPLAY DIGITS
/
0136 11200
0137 7737
0140 2250
0141 1750
0142 1770
0143 6216
0144 1751
0145 1771
0146 6216
0147 1752
0150 1772
0151 6216
0152 1753
0153 1773

ADA I
-40
ADD
DSC I
DSC I
JMP
DSC I
DSC I
JMP
DSC I
DSC I
JMP
DSC I
DSC I

/ IS ROW ENDED?
/
0154 1000
0155 0244
0156 1560
0157 7774
0160 1460
0161 0003
0162 6224

LDA
A1
BCL I
7774
SAE I
0003
JMP P1

/ IS DISPLAY ENDED?
/
0163 1000
0164 0244
0165 1560
0166 7760
0167 1460
0170 0017
0171 6235

LDA
A1
BCL I
7760
SAE I
0017
JMP U1

EJECT

/ DECREMENT VERTICAL TO DISPLAY BELOW CHAN NO.
/ ADD BASIC VERTICAL COORDINATE
/ DISPLAY PREFIX (+ OR -)
/ INCREMENT HORIZONTAL
/ DISPLAY DIGITS
/ INCREMENT HORIZONTAL
/ DISPLAY DIGITS
/ INCREMENT HORIZONTAL
/ DISPLAY DIGITS

/ FIND CHANNEL NUMBER
/ SAVE LOW-ORDER 2 BITS
/ DISPLAY 4 CHANNELS PER LINE
/ NOT END OF ROW, INCREMENT HORIZONTAL AND CHANNEL

/ FIND CHANNEL NUMBER
/ SAVE LOW-ORDER 4 BITS
/ DISPLAY 17 OCTAL CHANNELS PER FRAME
/ NOT END OF DISPLAY, DECREMENT VERTICAL, INCREMENT CHANNEL

```

0243  
0244  
0245  
0246  
0247  
0250  
0251  
0252  
0253  
0254  
0255  
0256  
0257  
0260  
0261  
0262  
0263  
0264  
0265  
0266  
0267  
0270  
0271  
0272  
0273  
0274  
0275  
0276  
0277  
0300

/END OF DISPLAY  
/

0172 1020  
0173 0300  
0174 4250  
0175 4001  
0176 0440  
0177 6203  
0200 1020  
0201 0020  
0202 6204  
0203 0011  
0204 4244  
0205 0415  
0206 6020  
0207 0500  
0210 6036  
0211 1460  
0212 0204  
0213 6020  
0214 0643  
0215 6016  
0216 0221  
0217 0221  
0220 0221  
0221 0221  
0222 0016  
0223 6000

LDA I  
0300  
STC  
STC  
SNS  
JMP  
LDA I  
0020  
JMP  
CLR  
STC  
KST  
JMP  
IOB  
6036  
SAE I  
0204  
JMP  
LDF  
JMP  
XSK I  
XSK I  
XSK I  
XSK I  
NOP  
JMP

V1  
H1  
0  
.\*4  
.\*2  
A1  
B7  
B7  
03  
DIAL  
H1  
H1  
H1  
H1  
0

/RESET COORDINATES  
/VERTICAL TOP OF FRAME  
/HORIZONTAL LEFT EDGE  
/WHICH SET?  
/CHANNELS 20-37  
/CHANNELS 0-17  
/RESET CHANNEL NUMBER  
/KEYBOARD?  
/BACK TO START  
/READ KEYBOARD  
/CONTROL 0?  
/RESET DATA FIELD  
/YES, BACK TO DIAL  
/INCREMENT HORIZONTAL TO SPACE CHARCTERS

EJECT

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

0343  
0344  
0345  
0346  
0347  
0350  
0351  
0352  
0353  
0354  
0355  
0356  
0357  
0360  
0361  
0362  
0363  
0364  
0365  
0366  
0367  
0370  
0371  
0372

/  
/DISPLAY MATRICIES  
/  
T2,

0251 4136  
0252 3641  
0253 2101  
0254 0177  
0255 4523  
0256 2151  
0257 4122  
0260 2651  
0261 2414  
0262 0477  
0263 5172  
0264 0651  
0265 1506  
0266 4225  
0267 4443  
0270 6050  
0271 0404  
0272 0437  
0273 0404  
0274 0404

/ZERO  
/ONE  
/TWO  
/THREE  
/FOUR  
/FIVE  
/SIX  
/SEVEN  
/PLUS  
/MINUS

EJECT

```

0373 /TRIGGERED SCOPE DISPLAY
0374 /
0375 D5,
0376 LSW 0517
0377 BCL I 1560
0400 0276 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 /FIND CHANNEL NUMBER
0276 1560 /CHANNEL NO. TO A1
0300 1040 /SET FOR SAMPLE
0301 0244 /STORE FOR EXECUTION
0302 1620 /GET FLOW TAG
0303 0100 E6
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 /START TIMER
0323 1000
0324 6462 /GO SAMPLE CHANNEL
0325 0451 /POSITIVE?
0326 6331 /NO, TRY AGAIN
0327 0234 /INCREMENT TIMER
0330 6324 /WAIT
0331 0074
0332 1000
0333 6462 /SAMPLE CHANNEL
0334 0471 /NEGATIVE?
0335 6340 /NO, TRIGGER NOW FIRES
0336 0234 /WAIT SOME MORE
0337 6333

```

EJECT

```

0442 /DISPLAY A TRACE TO HERE IF TRIGGERED, OR NOT TRIGGERED AND
0446 /
0447 /
0450 0340 0064 SET I 4 /START DISPLAY AT LEFT SIDE
0451 0341 1000 1000 /SAMPLE CHANNEL
0452 0342 6462 JMP E6 /DISPLAY CHANNEL
0453 0343 0144 DIS 4 /DISPLAY 0V REFERENCE
0454 0344 0011 CLR /DISPLAY +.5V REFERENCE
0455 0345 0144 DIS 4 /DISPLAY -.5V REFERENCE
0456 0346 1020 LDA I /INCREMENT HORIZONTAL
0457 0347 0377 377 /CONTINUE TRACE
0460 0350 0144 DIS 4 /GO CHECK KEYBOARD
0461 0351 0017 COM
0462 0352 0144 DIS 4
0463 0353 0224 XSK I 4
0464 0354 6342 JMP C5
0465 0355 6206 JMP X1-10
0466 /
0467 /TRIGGERED PREAMP DISPLAY
0470 /
0471 / J6,
0472 0356 0011 CLR /TO HERE IF SSW2=1
0473 0357 6370 JMP K6 /TO HERE IF SSW3=1
0474 0360 1020 LDA I
0475 0361 0010 /
0476 0362 6370 JMP K6 /TO HERE IF SSW4=1
0477 0363 1020 LDA I
0478 0364 0020 /
0479 0365 6370 JMP K6 /TO HERE IF SSW5=1
0480 0366 1020 LDA I
0481 0367 0030 /STORE CHANNEL NUMBER
0482 0370 1040 STA /WE NOW HAVE CHANNEL
0483 0371 0244 A1 /SET FLOW TAG
0484 0372 4464 STC B6
0485 0373 1020 LDA I
0486 0374 6407 JMP A6
0487 0375 4067 STC E1+25
0488 0376 1020 LDA I
0489 0377 7600 -177 /INITIALIZE DISPLAY
0490 0400 4250 STC V1 /SET VERTICAL COORDINATE FOR CHANNEL NUMBER DISPLAY
0491 0401 1020 LDA I
0492 0402 0014 14 /SET HORIZONTAL COORDINATE FOR LEFT SIDE
0493 0403 4001 STC H1 /PRESET HORIZONTAL FOR SAMPLE DISPLAY
0494 0404 0064 SET I 4
0495 0405 1000 1000 /GO DISPLAY CHANNEL NUMBER
0496 0406 6042 JMP E1
0497 EJECT
0500
0501
0502
0503
0504
0505
0506
0507
0510
0511
0512
0513
0514
0515
0516
0517
0520
0521
0522

```



```

0523 /DISPLAY CHANNEL NUMBERS
0524 /
0525 /
0526 /
0527 /
0528 /
0529 /
0530 /
0531 /
0532 /
0533 /
0534 /
0535 /
0536 /
0537 /
0538 /
0539 /
0540 /
0541 /
0542 /
0543 /
0544 /
0545 /
0546 /
0547 /
0548 /
0549 /
0550 /
0551 /
0552 /
0553 /
0554 /
0555 /
0556 /
0557 /
0558 /
0559 /
0560 /
0561 /
0562 /
0563 /
0564 /
0565 /
0566 /
0567 /
0568 /
0569 /
0570 /
0571 /
0572 /
0573 /
0574 /
0575 /
0576 /
0577 /
0600 /
0601 /
0602 /
0603 /
0407 1020 LDA I
0410 0001 1 ADM
0411 1140 ADM
0412 0244 A1
0413 1560 BCL I
0414 7770 7770
0415 0470 AZE I
0416 6424 JMP
0417 1020 LDA I
0420 0034 34
0421 1140 ADM
0422 0001 H1
0423 6042 JMP
0424 1020 LDA I
0425 6436 JMP
0426 4340 STC
0427 2464 ADD
0430 1620 BSE I
0431 0100 100
0432 4462 STC
0433 0075 SET I
0434 7677 -100
0435 6322 JMP
0436 6462 JMP
0437 0144 DIS
0440 1020 LDA I
0441 0377 377
0442 0144 DIS
0443 0017 COM
0444 0144 DIS
0445 0011 CLR
0446 0144 DIS
0447 0235 XSK I
0450 6457 JMP
0451 1020 LDA I
0452 0001 1
0453 1140 ADM
0454 0464 B6
0455 0224 XSK I
0456 6430 JMP
0457 0224 XSK I
0460 6436 JMP
0461 6206 JMP
0462 0000 0
0463 6000 JMP
0464 0000 0
06, A6,
D6, D6,
G6, G6,
F6, F6,
H6, H6,
E6, E6,
B6, B6,
/INCREMENT CHANNEL NUMBER
/SAVE LOW-ORDER 3 BITS
/IF 0, WE JUST DISPLAYED LAST CHANNEL IN FRAME
/NOW DISPLAY ANALOG INPUTS
/INCREMENT HORIZONTAL
/DISPLAY NEXT CHANNEL NUMBER
/BEGIN DISPLAY
/SET FLOW TAG TO PREVENT OVERLAP OF CHANNELS
/GET CHANNEL
/SET FOR SAM X
/INITIALIZED
/SET WIDTH OF CHANNEL DISPLAY
/GO LOOK FOR TRIGGER IF AVAILABLE
/GO SAMPLE CHANNEL
/DISPLAY CHANNEL
/DISPLAY +.5V REFERENCE
/DISPLAY -.5V REFERENCE
/DISPLAY 0V REFERENCE
/END OF SAMPLE DISPLAY?
/NO, GO INCREMENT HORIZONTAL
/END OF SEGMENT
/INCREMENT CHANNEL NUMBER
/INCREMENT HORIZONTAL
/DISPLAY NEXT SAMPLE
/INCREMENT HORIZONTAL
/DISPLAY SAMPLE
/GO CHECK KEYBOARD
/EXECUTE SAM X
/RETURN
/HOLDS CHANNEL NUMBER

```



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

5700  
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

G1  
G6  
H1  
H6  
J6  
K6  
M1  
P1  
Q1  
T1  
T2  
U1  
V1  
X1