

IDENTIFICATION

Product Code: MAINDEC-08-D11A-D

Product Name: Memory Address Test

Date Created: June 8, 1967

Maintainer: Diagnostic Group

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1. ABSTRACT

The Memory Address Test checks for proper memory address selection on the PDP-8.

2. REQUIREMENTS

2.1 Equipment

Standard PDP-8 Computer.

2.2 Storage

The low version occupies locations 0000-0175. The high version occupies locations 7400-7575. The binary loader must be stored in the last memory page.

2.3 Preliminary Programs

It is assumed that the only malfunction is in the memory addressing circuits.

3. LOADING PROCEDURE

The program is supplied in RIM format.

4. STARTING PROCEDURE

4.1 Control Switch Settings

SR0 Halt after error printout.

4.2 Starting Addresses

0000 Low Storage
7400 High Storage

4.3 Operator Action

- a. Load the starting address into the program counter.
- b. Set the SWITCH REGISTER to 4000, if halt on error is desired.
- c. Push START.

5. OPERATING PROCEDURE

Same as section 4.

6. ERRORS

6.1 Error Printouts

Axxxx Cyyyy (Error printout format)

Axxxx. (Address). xxxx = Address containing the wrong data

Cyyyy. (Contents). yyyy = Contents of location xxxx.

The address should always equal the contents.

6.2 Error Recovery

Analysis of several error printouts should establish a meaningful pattern that will single out a particular address selector card.

If it is necessary to scope the problem, the following two instruction loop may be entered into memory by the operator.

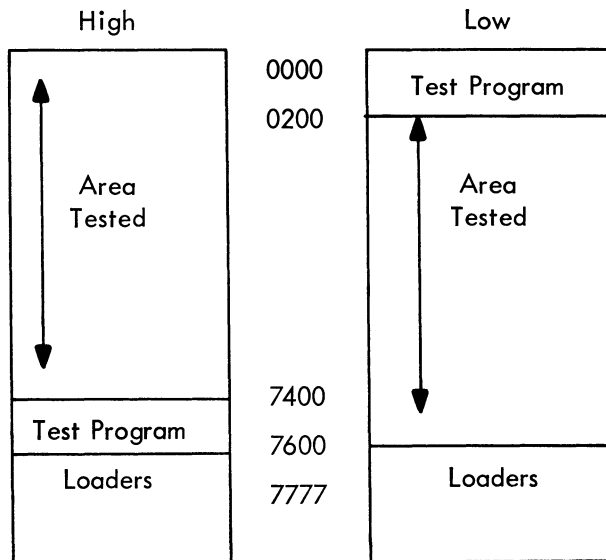
```
TAD [Bad Location]
JMP .-1
```

7. MISCELLANEOUS

7.1 Execution Time

An 11 is printed after every 96 complete program loops (every 28 seconds).

7.2 Memory Maps



8. PROGRAM DESCRIPTION

The program consists of four phases which occur in the following sequence.

- Phase 1 Load memory sequentially in the forward direction, starting with the lowest address to be tested.
- Phase 2 Read and check memory in the same manner as it was loaded in phase 1.
- Phase 3 Load memory sequentially in the reverse direction, starting with the highest address to be tested.
- Phase 4 Read and check memory in the same manner as it was loaded in phase 3.

In the load phases the contents of every location to be tested is set equal to its address. If the contents of an address are wrong, the contents specify the address which was in the MA register when the failure occurred. The address whose contents are wrong is the address that was selected in error.

Sample error printout:

A2560 C2760

Explanation - While attempting to write a 2760 into location 2760, the data was written into location 2560.

0000 /PDP-8 MEMORY ADDRESS TEST (LOW, PAGE 0)
*0

/LOAD MEMORY FORWARD DIRECTION

```

0000 1075 LOADUP, TAD LIMLO
0001 3073 DCA ADRES /SET TEST AREA STARTING ADDRESS
0002 1076 TAD M/410
0003 3103 DCA CTR
0004 1073 TAD ADRES
0005 3473 DCA I ADRES /DEPOSIT ADDRESS IN CONTENTS
0006 2073 ISZ ADRES
0007 2103 ISZ CTR
0010 5004 JMP LOADUP+4
0011 1075 TAD LIMLO
0012 3073 DCA ADRES
0013 1076 TAD M/410
0014 3103 DCA CTR
    
```

```

0015 1473 MEMLUP, TAD I ADRES /GET CONTENTS FORWARD DIRECTION
0016 7041 CIA
0017 1073 TAD ADRES /GET ADDRESS
0020 7440 SZA /SKIP IF EQUAL
0021 4116 JMS ERROR /CONTENTS NOT SAME AS ADDRESS
0022 2073 ISZ ADRES /SELECT NEXT ADDRESS
0023 2103 ISZ CTR /SKIP IF END TEST AREA
0024 5015 JMP MEMLUP
    
```

/LOAD MEMORY REVERSE DIRECTION

```

0025 1074 LOADWN, TAD LIMHI
0026 3073 DCA ADRES /SET TEST AREA ENDING ADDRESS
0027 1076 TAD M/410
0030 3103 DCA CTR
0031 1073 TAD ADRES
0032 3473 DCA I ADRES /DEPOSIT ADDRESS IN CONTENTS
0033 7240 CLA CMA /AC=-1
0034 1073 TAD ADRES /AC=(ADRES)-1
0035 3073 DCA ADRES /DECREMENT ADDRESS
0036 2103 ISZ CTR /SKIP WHEN LOWER LIMIT REACHED
0037 5031 JMP LOADWN+4
0040 1076 TAD M/410
0041 3103 DCA CTR
    
```

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0042 1074      LOOP2, /SEQUENTIAL LOCATION TEST (DOWN)
0043 3073      TAD LIMHI
0044 1473      DCA ADRES           /SET STARTING ADDRESS
0045 7041      TAD I ADRES       /GET CONTENTS
0046 1073      CIA
0047 7440      TAD ADRES           /GET ADDRESS
0050 4116      SZA           /SKIP IF EQUAL
0051 7240      JMS ERROR       /CONTENTS NOT SAME AS ADDRESS
0052 1073      CLA CMA         /AC=1
0053 3073      TAD ADRES           /AC=(ADRES)-1
0054 2103      DCA ADRES       /SELECT NEXT ADDRESS
0055 5044      ISZ CTR         /SKIP IF END TEST AREA
0056 2077      JMP LOOP2+2
0057 5000      ISZ COUNT
0060 1100      JMP LOADUP
0061 3077      TAD RESTOR
0062 1111      DCA COUNT
0063 4144      TAD CR
0064 1112      JMS PRINT
0065 4144      TAD LF
0066 1101      JMS PRINT
0067 4144      TAD K261
0070 1101      JMS PRINT
0071 4144      TAD K261
0072 5000      JMS PRINT
              JMP LOADUP

```

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0073 0000      /CONSTANTS AND VARIABLES
0074 7610      ADRES, 0
0075 0200      LIMHI, 7610
0076 0370      LIMLO, 200
              M7410, -7410

0077 7640      COUNT, -140
0100 7640      RESTOR, -140
0101 0261      K261, 261
0102 7774      M4, -4
0103 0000      CTR, 0
0104 0007      MSK7, 7
0105 0260      TW6, 260
0106 0000      STOR, 0
0107 7004      NUM, RAL
0110 0000      CONT, 0
0111 0215      CR, 215
0112 0212      LF, 212
0113 0240      SPACE, 240
0114 0301      A, 301
0115 0303      C, 303

```


			/ERROR ROUTINE	
0116	0000	ERROR,	0	
0117	7041		CIA	/RESTORE CONTENTS
0120	1073		TAD ADRES	/OF FAILING ADDRESS
0121	3110		DCA CUNT	/PUT RESULT IN CONT
			/ERROR MESSAGE	
0122	1111	MSG,	TAD CR	
0123	4144		JMS PRINT	
0124	1112		TAD LF	
0125	4144		JMS PRINT	
0126	1114		TAD A	
0127	4144		JMS PRINT	
0130	1073		TAD ADRES	
0131	4152		JMS TYPAC	
0132	1113		TAD SPACE	
0133	4144		JMS PRINT	
0134	1115		TAD C	
0135	4144		JMS PRINT	
0136	1110		TAD CUNT	
0137	4152		JMS TYPAC	
0140	7604		LAS	
0141	7710		SPA CLA	
0142	7402		HLT	/HALT ON ERROR (SR0)
0143	5516		JMP I ERROR	
0144	0000	PRINT,	0	
0145	6046		TLS	
0146	6041		TSF	
0147	5146		JMP , -1	
0150	7200		CLA	
0151	5544		JMP I PRINT	

```

/TYPE (AC) IN OCTAL
0152 0000      TYPAC, 0
0153 3106      DCA STOR
0154 1162      TAD BACK+1
0155 3163      DCA BACK+2
0156 1102      TAD M4
0157 3103      DCA CTR
0160 7100      CLL
0161 1106      BACK, TAD STOR
0162 7006      RTL
0163 7006      RTL
0164 3106      DCA STOR
0165 1106      TAD STOR
0166 0104      AND MSK7
0167 1105      TAD TW6
0170 4144      JMS PRINT
0171 1107      TAD NUM
0172 3163      DCA BACK+2
0173 2103      ISZ CTR
0174 5161      JMP BACK
0175 5552      JMP I TYPAC

```

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THERE ARE NO ERRORS

SYMBOL TABLE

A	0114
ADRES	0073
BACK	0161
C	0115
CUNT	0110
COUNT	0077
CR	0111
CTR	0103
ERRUR	0116
K261	0101
LF	0112
LIMHI	0074
LIMLO	0075
LOADUP	0000
LOADWN	0025
LUOP2	0042
MEMLUP	0015
MSG	0122
MSK7	0104
M4	0102
M/410	0076
NUM	0107
PRINT	0144
RESTOR	0100
SPACE	0113
STOR	0106
TW6	0105
TYPAC	0152

SYMBOL TABLE

LOADUP	0000
MEMLUP	0015
LOADWN	0025
LOOP2	0042
AURES	0073
LIMHI	0074
LIMLO	0075
M7410	0076
COUNT	0077
RESTOR	0100
K261	0101
M4	0102
CTR	0103
MSK7	0104
TW6	0105
STOR	0106
NUM	0107
CUNT	0110
CR	0111
LF	0112
SPACE	0113
A	0114
C	0115
ERROR	0116
MSG	0122
PRINT	0144
TYPAC	0152
BACK	0161

7400 /PDP-8 MEMORY ADDRESS TEST (HIGH, PAGE 30)
*7400

/LOAD MEMORY FORWARD DIRECTION

```

7400 1275 LOADUP, TAD LIMLO
7401 3273      DCA ADRES           /SET TEST AREA STARTING ADDRESS
7402 1276      TAD M7400
7403 3303      DCA CTR
7404 1273      TAD ADRES
7405 3673      DCA I ADRES       /DEPOSIT ADDRESS IN CONTENTS
7406 2273      ISZ ADRES
7407 2303      ISZ CTR
7410 5204      JMP LOADUP+4
7411 1275      TAD LIMLO
7412 3273      DCA ADRES
7413 1276      TAD M7400
7414 3303      DCA CTR

7415 1673      MEMLUP, TAD I ADRES /GET CONTENTS FORWARD DIRECTION
7416 7041      CIA
7417 1273      TAD ADRES         /GET ADDRESS
7420 7440      SZA              /SKIP IF EQUAL
7421 4316      JMS ERROR        /CONTENTS NOT SAME AS ADDRESS
7422 2273      ISZ ADRES        /SELECT NEXT ADDRESS
7423 2303      ISZ CTR          /SKIP IF END TEST AREA
7424 5215      JMP MEMLUP

```

/LOAD MEMORY REVERSE DIRECTION

```

7425 1274      LOADWN, TAD LIMHI
7426 3273      DCA ADRES           /SET TEST AREA ENDING ADDRESS
7427 1276      TAD M7400
7430 3303      DCA CTR
7431 1273      TAD ADRES
7432 3673      DCA I ADRES       /DEPOSIT ADDRESS IN CONTENTS
7433 7240      CLA CMA          /AC=-1
7434 1273      TAD ADRES         /AC={ADRES}-1
7435 3273      DCA ADRES        /DECREMENT ADDRESS
7436 2303      ISZ CTR          /SKIP WHEN LOWER LIMIT REACHED
7437 5231      JMP LOADWN+4
7440 1276      TAD M7400
7441 3303      DCA CTR

```

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7442 1274          LOOP2, /SEQUENTIAL LOCATION TEST (DOWN)
7443 3273          TAD LIMHI
7444 1673          DCA ADRES          /SET STARTING ADDRESS
7445 7041          TAD I ADRES        /GET CONTENTS
7446 1273          CIA
7447 7440          TAD ADRES          /GET ADDRESS
7450 4316          SZA              /SKIP IF EQUAL
7451 7240          JMS ERROR          /CONTENTS NOT SAME AS ADDRESS
7452 1273          CLA CMA          /AC=01
7453 3273          TAD ADRES          /AC=(ADRES)-1
7454 2303          DCA ADRES          /SELECT NEXT ADDRESS
7455 5244          ISZ CTR          /SKIP IF END TEST AREA
7456 2277          JMP LOOP2+2
7457 5200          ISZ COUNT
7460 1300          JMP LOADUP
7461 3277          TAD RESTOR
7462 1311          DCA COUNT
7463 4344          TAD CR
7464 1312          JMS PRINT
7465 4344          TAD LF
7466 1301          JMS PRINT
7467 4344          TAD K261
7470 1301          JMS PRINT
7471 4344          TAD K261
7472 5200          JMS PRINT
                    JMP LOADUP

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```

7473 0000          /CONSTANTS AND VARIABLES
7474 7377          ADRES, 0
7475 0000          LIMHI, 7377
7476 0400          LIMLO, 0
                    M7400, -7400

7477 7640          COUNT, -140
7500 7640          RESTOR, -140
7501 0261          K261, 261
7502 7774          M4, -4
7503 0000          CTR, 0
7504 0007          MSK7, 7
7505 0260          TW6, 260
7506 0000          STOR, 0
7507 7004          NUM, RAL
7510 0000          CONT, 0
7511 0215          CR, 215
7512 0212          LF, 212
7513 0240          SPACE, 240
7514 0301          A, 301
7515 0303          C, 303

```

7516	0000	ERROR,	/ERROR ROUTINE	
7517	7041		Ø	
7520	1273		CJA	/RESTORE CONTENTS
7521	3310		TAD ADRES	/OF FAILING ADDRESS
			DCA CONT	/PUT RESULT IN CONT
7522	1311	MSG,	/ERROR MESSAGE	
7523	4344		TAD CR	
7524	1312		JMS PRINT	
7525	4344		TAD LF	
7526	1314		JMS PRINT	
7527	4344		TAD A	
7530	1273		JMS PRINT	
7531	4352		TAD ADRES	
7532	1313		JMS TYPAC	
7533	4344		TAD SPACE	
7534	1315		JMS PRINT	
7535	4344		TAD C	
7536	1310		JMS PRINT	
7537	4352		TAD CONT	
7540	7604		JMS TYPAC	
7541	7710		LAS	
7542	7402		SPA CLA	
7543	5716		HLT	/HALT ON ERROR (SRØ)
			JMP I ERROR	
7544	0000	PRINT,	Ø	
7545	6046		TLS	
7546	6041		TSF	
7547	5346		JMP , -1	
7550	7200		CLA	
7551	5744		JMP I PRINT	

```

                                /TYPE (AC) IN OCTAL
7552  0000      TYPAC,  0
7553  3306                DCA STOR
7554  1362                TAD BACK+1
7555  3363                DCA BACK+2
7556  1302                TAD M4
7557  3303                DCA CTR
7560  7100                CLL
7561  1306      BACK,   TAD STOR
7562  7006                RTL
7563  7006                RTL
7564  3306                DCA STOR
7565  1306                TAD STOR
7566  0304                AND MSK/
7567  1305                TAD TW6
7570  4344                JMS PRINT
7571  1307                TAD NUM
7572  3363                DCA BACK+2
7573  2303                ISZ CTR
7574  5361                JMP BACK
7575  5752                JMP I TYPAC

```

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THERE ARE NO ERRORS

SYMBOL TABLE

A	7514
ADRES	7473
BACK	7561
C	7515
CUNT	7510
COUNT	7477
CR	7511
CTR	7503
ERROR	7516
K261	7501
LF	7512
LIMHI	7474
LIMLO	7475
LOADUP	7400
LOADWN	7425
LOOP2	7442
MEMLUP	7415
MSG	7522
MSK7	7504
M4	7502
M7400	7476
NUM	7507
PRINT	7544
RESTOR	7500
SPACE	7513
STOR	7506
TW6	7505
TYPAC	7552

SYMBOL TABLE

LOADUP	7400
MEMLUP	7415
LOADWN	7425
LOOP2	7442
ADRES	7473
LIMHI	7474
LIMLO	7475
M7400	7476
COUNT	7477
RESTOR	7500
K261	7501
M4	7502
CTR	7503
MSK7	7504
TW6	7505
STOR	7506
NUM	7507
CONT	7510
CR	7511
LF	7512
SPACE	7513
A	7514
C	7515
ERROR	7516
MSG	7522
PRINT	7544
TYPAC	7552
BACK	7561