

IDENTIFICATION

Product Code: MAINDEC-08-D1B0-D
Product Name: Memory Address Test
Date Created: March 25, 1968
Maintainer: Diagnostic Group
Author: R. Green
Previous Code: MAINDEC-08-D11A-D

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 0000-0222. The high version occupies locations 7400-7575, 0-3. 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

SRO Halt after error printout.

4.2 Starting Addresses

~~0000~~ ⁰⁰⁰⁴ 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.

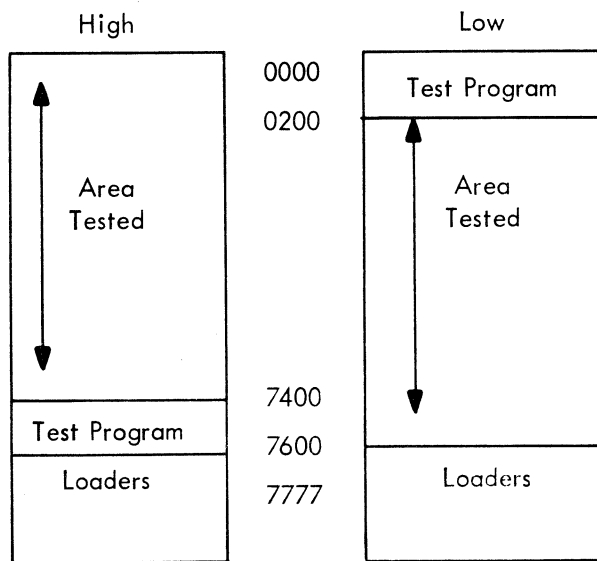
```
TAD [Bad Location]
JMP .-1
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7. MISCELLANEOUS

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.

/POP=0 MEMORY ADDRESS TEST (LOW, PAGE 0)
*0

0000

/LOAD MEMORY FORWARD DIRECTION

0000	0000	LOADUP, 0	
0001	5001	JMP 1	/SET TEST AREA STARTING ADDRESS
0002	0002	2	
0003	0003	3	
0004	5405	JMP I ,+1	
0005	0200	PATCH	/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 M7410	
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	SEA	/SKIP IF EQUAL
0021	4116	JMS EHROR	/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 M7410	
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 M7410	
0041	3103	DCA CTR	

```

                                /SEQUENTIAL LOCATION TEST (DOWN)
LOOP2, TAD LIMH1
        DCA AURES                /SET STARTING ADDRESS
        TAD I AURES              /GET CONTENTS
        CIA
        TAD AURES                /GET ADDRESS
        SZA                      /SKIP IF EQUAL
        JMS ERROR                /CONTENTS NOT SAME AS ADDRESS
        CLA CMA                  /AC=-1
        TAD AURES                /AC*(AURES)-1
        DCA AURES                /SELECT NEXT ADDRESS
        ISZ CTR                  /SKIP IF END TEST AREA
        JMP LOOP2+2
        ISZ COUNT
        JMP LOADUP
        TAD RESTOR
        DCA COUNT
        TAD CR
        JMS PRINT
        TAD LF
        JMS PRINT
        TAD K261
        JMS PRINT
        TAD K261
        JMS PRINT
        JMP LOADUP

```

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                                /CONSTANTS AND VARIABLES
0073 0000      ADRES, 0
0074 7610      LIMH1, 7610
0075 0200      LIML0, 200
0076 0370      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

```

0116	0000	ERROR,	/ERROR ROUTINE	
0117	7041		0	
0120	1073		CIA	/RESTORE CONTENTS
0121	3110		TAD ADRES	/OF FAILING ADDRESS
			DCA CONT	/PUT RESULT IN CONT
		MSG,	/ERROR MESSAGE	
0122	1111		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 CONT	
0137	4152		JMS TYPAC	
0140	7604		LAS	
0141	7710		SPA CLA	
0142	7402		HLT	/HALT ON ERROR (SR0)
0143	5916		JMP I ERROR	
		PRINT,	0	
0144	0000		TLS	
0145	6046		TSF	
0146	6041		JMP ,=1	
0147	5146		CLA	
0150	7200		JMP I PRINT	
0151	5544			

/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 PHINT	
0171	1107		TAD NUM	
0172	3163		DCA BACK*2	
0173	2103		ISE CTR	
0174	5161		JMP BACK	
0175	5552		JMP I TYPAC	
	0200	*0200		
0200	1215	PATCH,	TAD X0	/RESTORE 1ST PAGE
0201	3000		DCA 0	
0202	1216		TAD X1	
0203	3001		DCA 1	
0204	1217		TAD X2	
0205	3002		DCA 2	
0206	1220		TAD X3	
0207	3003		DCA 3	
0210	1221		TAD X4	
0211	3004		DCA 4	
0212	1222		TAD X5	
0213	3005		DCA 5	
0214	5000		JMP 0	
0215	1075	X0,	TAD LIMLO	
0216	3073	X1,	DCA AURES	
0217	1076	X2,	TAD M7410	
0220	3103	X3,	DCA CTR	
0221	1073	X4,	TAD AURES	
0222	3473	X5,	DCA I AURES	

3

THERE ARE NO ERRORS

SYMBOL TABLE

A	0114
AURES	0073
BACK	0161
C	0115
CONT	0110
COUNT	0077
CR	0111
CTR	0103
ERROR	0116
K261	0101
LF	0112
LIMHI	0074
LIMLO	0075
LOADUP	0000
LOADWN	0025
LOOP2	0042
MEMLUP	0015
MSG	0122
MSK7	0104
M4	0102
M7410	0076
NUM	0107
PATCH	0200
PRINT	0144
RESTOR	0100
SPACE	0113
STOR	0106
TW6	0105
TYPAC	0152
X0	0215
X1	0216
X2	0217
X3	0220
X4	0221
X5	0222

SYMBOL TABLE

LOADUP	0000
MEMLUP	0015
LOADWN	0025
LOOP2	0042
AURE	0073
LIMMI	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
CH	0111
LF	0112
SPACE	0113
A	0114
C	0115
ENRUR	0116
MSG	0122
PRINT	0144
TYPAC	0152
BACK	0161
PATCH	0200
X0	0215
X1	0216
X2	0217
X3	0220
X4	0221
X5	0222

/POP=8 MEMORY ADDRESS TEST (HIGH, PAGE 30)
*7400

7400

/LOAD MEMORY FORWARD DIRECTION

7400 1275
7401 3273
7402 1276
7403 3303
7404 1273
7405 3673
7406 2273
7407 2303
7410 5204
7411 1275
7412 3273
7413 1276
7414 3303

LOADUP, TAD LIMLO /SET TEST AREA STARTING ADDRESS
DCA ADRS
TAD M7400
DCA CTR
TAD ADRS
DCA I ADRS /DEPOSIT ADDRESS IN CONTENTS
ISZ ADRS
ISZ CTR
JMP LOADUP*4
TAD LIMLO
DCA ADRS
TAD M7400
DCA CTR

7415 1673
7416 7041
7417 1273
7420 7440
7421 43,6
7422 2273
7423 2303
7424 5215

MEMLUP, TAD I ADRS /GET CONTENTS FORWARD DIRECTION
CIA /GET ADDRESS
TAD ADRS /SKIP IF EQUAL
SEA /CONTENTS NOT SAME AS ADDRESS
JMS ERROR /SELECT NEXT ADDRESS
ISZ ADRS /SKIP IF END TEST AREA
ISZ CTR
JMP MEMLUP

/LOAD MEMORY REVERSE DIRECTION

7425 1274
7426 3273
7427 1276
7430 3303
7431 1273
7432 3673
7433 7240
7434 1273
7435 3273
7436 2303
7437 5231
7440 1276
7441 3303

LOADWN, TAD LIMHI /SET TEST AREA ENDING ADDRESS
DCA ADRS
TAD M7400
DCA CTR
TAD ADRS /DEPOSIT ADDRESS IN CONTENTS
DCA I ADRS /AC=-1
CLA CMA /AC*(ADRES)-1
TAD ADRS /DECREMENT ADDRESS
DCA ADRS /SKIP WHEN LOWER LIMIT REACHED
ISZ CTR
JMP LOADWN*4
TAD M7400
DCA CTR

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

/CONSTANTS AND VARIABLES
7473 0000 ADRS, 0
7474 7377 LIMHI, 7377
7475 0000 LIMLO, 0
7476 0400 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 COUNT, 0
7511 0215 CR, 215
7512 0212 LF, 212
7513 0240 SPACE, 240
7514 0301 A, 301
7515 0303 C, 303

```

		/ERROR ROUTINE	
7516	0000	ERROR, 0	
7517	7041	CIA	/RESTORE CONTENTS
7520	1273	TAD ADRS	/OF FAILING ADDRESS
7521	3310	DCA CNT	/PUT RESULT IN CNT
		/ERROR MESSAGE	
7522	1311	MSG, TAD CR	
7523	4344	JMS PRINT	
7524	1312	TAD LF	
7525	4344	JMS PRINT	
7526	1314	TAD A	
7527	4344	JMS PRINT	
7530	1273	TAD ADRS	
7531	4352	JMS TYPAC	
7532	1313	TAD SPACE	
7533	4344	JMS PRINT	
7534	1315	TAD C	
7535	4344	JMS PRINT	
7536	1310	TAD CNT	
7537	4352	JMS TYPAC	
7540	7604	LAS	
7541	7710	SPA CLA	/HALT ON ERROR (SR0)
7542	7402	HLT	
7543	5716	JMP I ERROR	
		PRINT, 0	
7544	0000	TLS	
7545	6046	TSF	
7546	6041	JMP ,=1	
7547	5346	CLA	
7550	7200	JMP I PRINT	
7551	5744		

/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 MSK7
7567	1305		TAD TW6
7570	4344		JMS PRINT
7571	1307		TAD NUM
7572	3363		DCA BACK*2
7573	2303		ISE CTR
7574	5361		JMP BACK
7575	5752		JMP I TYPAC
	0000	*0000	
0000	0000		0
0001	5001		JMP 1
0002	0002		2
0003	0003		3

5

THERE ARE NO ERRORS

SYMBOL TABLE

A	7514
AURES	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
CUNT	7510
CK	7511
LF	7512
SPACE	7513
A	7514
C	7515
ERROR	7516
MESG	7522
PRINT	7544
TYPAC	7552
BACK	7561

