

MAINDEC-08-D1B0-D

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

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.

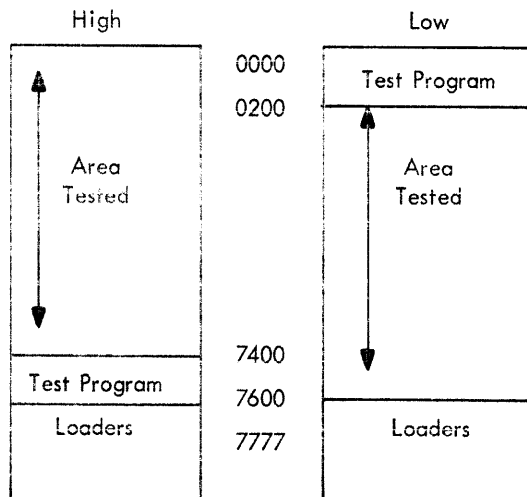
```
TAD [Bad Location]
JMP .-1
```

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.

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

0000

/LOAD MEMORY FORWARD DIRECTION

0000 0000
0001 5001
0002 0002
0003 0003
0004 5405
0005 0200
0006 2073
0007 2103
0010 5004
0011 1075
0012 3073
0013 1076
0014 3103

LOADUP, 0
JMP 1 /SET TEST AREA STARTING ADDRESS
2
3
JMP I ,+1
PATCH /DEPOSIT ADDRESS IN CONTENTS
ISZ ADRES
ISZ CTR
JMP LOADUP*4
TAD LIMLO
DCA ADRES
TAD M7410
DCA CTR

0015 1473
0016 7041
0017 1073
0020 7440
0021 4116
0022 2073
0023 2103
0024 5015

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

/LOAD MEMORY REVERSE DIRECTION

0025 1074
0026 3073
0027 1076
0030 3103
0031 1073
0032 3473
0033 7240
0034 1073
0035 3073
0036 2103
0037 5031
0040 1076
0041 3103

LOADWN, TAD LIMHI
DCA ADRES /SET TEST AREA ENDING ADDRESS
TAD M7410
DCA CTR
TAD ADRES
DCA I ADRES /DEPOSIT ADDRESS IN CONTENTS
CLA CMA /AC=-1
TAD ADRES /AC*(ADRES)-1
DCA ADRES /DECREMENT ADDRESS
ISZ CTR /SKIP WHEN LOWER LIMIT REACHED
JMP LOADWN*4
TAD M7410
DCA CTR

```

/SEQUENTIAL LOCATION TEST (DOWN)
LOOP2,  TAD LIMHI
        DCA AURES           /SET STARTING ADDRESS
        TAD I AURES         /GET CONTENTS
        CIA
        TAD AURES           /GET ADDRESS
        SZA                 /SKIP IF EQUAL
                                /CONTENTS NOT SAME AS ADDRESS
        JMS ERROR
        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

```

```

/CONSTANTS AND VARIABLES
0073  0000  AURES,  0
0074  7610  LIMHI,  7610
0075  0200  LIMLO,  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 AURES	/OH FAILING ADDRESS
			DCA CONT	/PUT RESULT IN CONT
0122	1111	MSG,	/ERROR MESSAGE	
0123	4144		TAD CH	
0124	1112		JMS PRINT	
0125	4144		TAD LF	
0126	1114		JMS PRINT	
0127	4144		TAD A	
0130	1073		JMS PRINT	
0131	4152		TAD AURES	
0132	1113		JMS TYPAC	
0133	4144		TAD SPACE	
0134	1115		JMS PRINT	
0135	4144		TAD C	
0136	1110		JMS PRINT	
0137	4152		TAD CONT	
0140	7604		JMS TYPAC	
0141	7710		LAS	
0142	7402		SPA CLA	
0143	5516		HLT	/HALT ON ERROR (SR0)
			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	
	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 ADRES	
0217	1076	X2,	TAD M7410	
0220	3103	X3,	DCA CTR	
0221	1073	X4,	TAD ADRES	
0222	3473	X5,	DCA I ADRES	

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
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
ERRQR	0116
MSG	0122
PRINT	0144
TYPAC	0152
BACK	0161
PATCH	0200
X0	0215
X1	0216
X2	0217
X3	0220
X4	0221
X5	0222

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

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	SEA	/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
7443 3273
7444 1673
7445 7041
7446 1273
7447 7440
7450 4316
7451 7240
7452 1273
7453 3273
7454 2303
7455 5244
7456 2277
7457 5200
7460 1300
7461 3277
7462 1311
7463 4344
7464 1312
7465 4344
7466 1301
7467 4344
7470 1301
7471 4344
7472 5200

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/SEQUENTIAL LOCATION TEST (DOWN)
LOOP2, TAD LIMHI
DCA ADRES /SET STARTING ADDRESS
TAD I ADRES /GET CONTENTS
CIA
TAD ADRES /GET ADDRESS
SEA /SKIP IF EQUAL
JMS ERROR /CONTENTS NOT SAME AS ADDRESS
CLA CMA /AC=-1
TAD ADRES /AC=(ADRES)-1
DCA ADRES /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

```

```

7473 0000
7474 7377
7475 0000
7476 0400

```

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/CONSTANTS AND VARIABLES
ADRES, 0
LIMHI, 7377
LIMLO, 0
M7400, -7400

```

```

7477 7640
7500 7640
7501 0261
7502 7774
7503 0000
7504 0007
7505 0260
7506 0000
7507 7004
7510 0000
7511 0215
7512 0212
7513 0240
7514 0301
7515 0303

```

```

COUNT, -140
RESTOR, -140
K261, 261
M4, -4
CTR, 0
MSK7, 7
TW6, 260
STOR, 0
NUM, RAL
COUNT, 0
CR, 215
LF, 212
SPACE, 240
A, 301
C, 303

```

7516	0000	ERROR,	0	/ERROR ROUTINE
7517	7041		CLA	/RESTORE CONTENTS
7520	1273		TAD ADRES	/OF FAILING ADDRESS
7521	3310		DCA CNT	/PUT RESULT IN CNT
7522	1311	MSG,		/ERROR MESSAGE
7523	4344		TAD CR	
7524	1312		JMS PRINT	
7525	4344		TAD LP	
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 CNT	
7540	7604		JMS TYPAC	
7541	7710		LAS	
7542	7402		SPA CLA	
7543	5716		HLT	/HALT ON ERROR (SR0)
			JMP I ERROR	
7544	0000	PRINT,	0	
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 HACK+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
0000	0000	*0000	0
0001	5001		JMP 1
0002	0002		2
0003	0003		3

\$

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
M/400	7476
NUM	7507
PRINT	7544
RESTOR	7500
SPACE	7513
STOR	7506
TW6	7505
TYPAC	7552

SYMBOL TABLE

LOADUP	7400
HEMLUP	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
CH	7511
LF	7512
SPACE	7513
A	7514
C	7515
ERROR	7516
MESG	7522
PRINT	7544
TYPAC	7552
BACK	7561