

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.

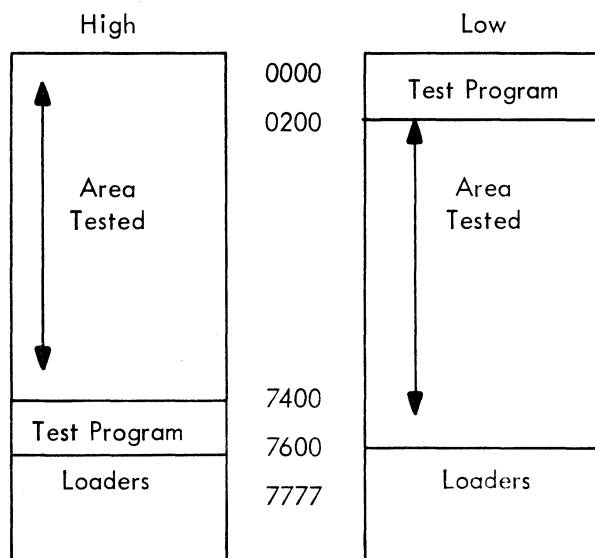
```
TAD [Bad Location]
JMP .-1
```

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.

/POP-B 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 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	
0025	1074	/LOAD MEMORY REVERSE DIRECTION	
0026	3073	LOADWN, TAD LIMHI	
0027	1076	DCA ADRES	/SET TEST AREA ENDING ADDRESS
0030	3103	TAD M7410	
0031	1073	DCA CTR	
0032	3473	TAD ADRES	
0033	7240	DCA I ADRES	/DEPOSIT ADDRESS IN CONTENTS
0034	1073	CLA CMA	/AC=-1
0035	3073	TAD ADRES	/AC=(ADRES)-1
0036	2103	DCA ADRES	/DECREMENT ADDRESS
0037	5031	ISZ CTR	/SKIP WHEN LOWER LIMIT REACHED
0040	1076	JMP LOADWN+4	
0041	3103	TAD M7410	
		DCA CTR	

```

0042 1074      /SEQUENTIAL LOCATION TEST (DOWN)
0043 3073      LOOP2, TAD LIMHI
0044 1473      DCA AURES      /SET STARTING ADDRESS
0045 7041      TAD I AURES    /GET CONTENTS
0046 1073      CIA
0047 7440      TAD AURES      /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 AURES      /AC=(AURES)-1
0054 2103      DCA AURES      /SELECT NEXT ADDRESS
0055 5044      ISZ CTR        /SKIP IF END TEST AREA
0056 2077      JMP LOOP2+2
0057 5000      ISZ COUNT
0060 1100      JMP LOAUUP
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
0072 5000      JMP LOAUUP

                                /CONSTANTS AND VARIABLES
0073 0000      ADRES, 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	/OF 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 ADRES	
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 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
CN	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
MEHLUP	0015
LOADWN	0025
LOOP2	0042
AURES	0073
LIMMI	0074
LIMLO	0075
M7410	0076
COUNT	0077
RESTOR	0100
K261	0101
M4	0102
CTR	0103
MWK7	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

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

7400

/LOAD MEMORY FORWARD DIRECTION

7400	1275	LOADUP, TAD LIMLO	
7401	3273	DCA ARES	/SET TEST AREA STARTING ADDRESS
7402	1276	TAD M7400	
7403	3303	DCA CTR	
7404	1273	TAD ARES	
7405	3673	DCA I ARES	/DEPOSIT ADDRESS IN CONTENTS
7406	2273	ISZ ARES	
7407	2303	ISZ CTR	
7410	5204	JMP LOADUP+4	
7411	1275	TAD LIMLO	
7412	3273	DCA ARES	
7413	1276	TAD M7400	
7414	3303	DCA CTR	
7415	1673	MEMLUP, TAD I ARES	/GET CONTENTS FORWARD DIRECTION
7416	7041	CIA	
7417	1273	TAD ARES	/GET ADDRESS
7420	7440	SEA	/SKIP IF EQUAL
7421	4316	JMS ERROR	/CONTENTS NOT SAME AS ADDRESS
7422	2273	ISZ ARES	/SELECT NEXT ADDRESS
7423	2303	ISZ CTR	/SKIP IF END TEST AREA
7424	5215	JMP MEMLUP	

/LOAD MEMORY REVERSE DIRECTION

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

/SEQUENTIAL LOCATION TEST (DOWN)
LOOP2, TAD LIMH
      DCA ADRES /SET STARTING ADDRESS
      TAD I ADRES /GET CONTENTS
      CIA
      TAD ADRES /GET ADDRESS
      SZA /SKIP IF EQUAL
      JMS EHRRR /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 PHINT
      TAD LF
      JMS PHINT
      TAD K261
      JMS PHINT
      TAD K261
      JMS PHINT
      JMP LOADUP

/CONSTANTS AND VARIABLES
7473 0000 ADRES, 0
7474 7377 LIMH, 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 CNT, 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		0
7520	1273		CL A
7521	3310		DCA AURES
			DCA CONT
			/RESTORE CONTENTS
			/OF FAILING ADDRESS
			/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 AURES
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 CL A
7543	5716		HLT
			JMP I ERROR
			/HALT ON ERROR (SR0)
7544	0000	PRINT,	0
7545	6046		TLS
7546	6041		TSP
7547	5346		JMP , -1
7550	7200		CL A
7551	5744		JMP I PRINT

/TYPE (AC) IN OCTAL

```

7552 0000
7553 3306
7554 1362
7555 3363
7556 1302
7557 3303
7560 7100
7561 1306
7562 7006
7563 7006
7564 3306
7565 1306
7566 0304
7567 1305
7570 4344
7571 1307
7572 3363
7573 2303
7574 5361
7575 5752
0000 0000
0001 5001
0002 0002
0003 0003

```

```

TYPAC, 0
        DCA STOR
        TAD BACK*1
        DCA BACK*2
        TAD M4
        DCA CTR
        CLL
BACK,   TAD STOR
        RTL
        RTL
        DCA STOR
        TAD STOR
        AND MSK7
        TAD TW6
        JMS PRINT
        TAD NUM
        DCA BACK*2
        ISZ CTR
        JMP BACK
        JMP I TYPAC
*0000
0
JMP 1
2
3

```

S

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

