

IDENTIFICATION

Product Code: MAINDEC-08-D11A-D

Product Name: Memory Address Test

Date Created: June 8, 1967

Maintainer: Diagnostic Group

Author: R. Green



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.

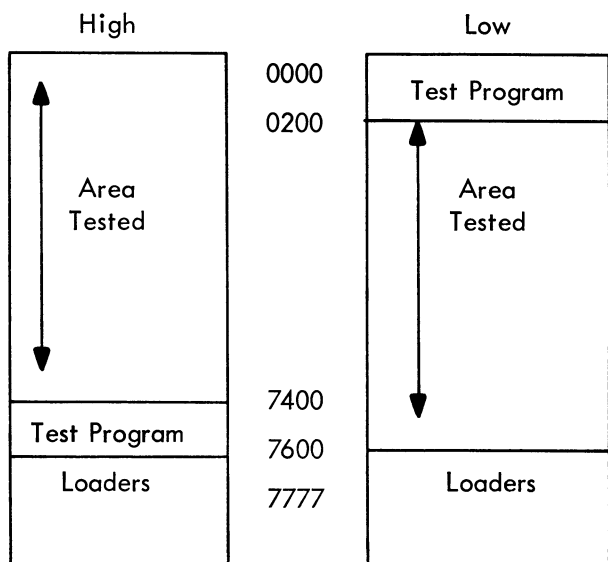
```
TAD [Bad Location]
JMP .-1
```

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.



MAINDEC-08-D11A-D

9/30/67 1:45.5

PAGE 1

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=0
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
    
```

```

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

```

```

/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

```



			/ERROR ROUTINE	
0116	0000	ERROR,	0	
0117	7041		CIA	/RESTORE CONTENTS
0120	1073		TAD AURES	/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 AURES	
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

§

THERE ARE NO ERRORS

## SYMBOL TABLE

A	0114
ADRES	0073
BACK	0161
C	0115
CUNT	0110
CUUNT	0077
CR	0111
CTR	0103
ERRUR	0116
K261	0101
LF	0112
LIMHI	0074
LIMLO	0075
LOADUP	0000
LOADWN	0025
LOOP2	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
CK	0111
LF	0112
SPACE	0113
A	0114
C	0115
ERROR	0116
MSG	0122
PRINT	0144
TYPAC	0152
BACK	0161

/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

```

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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

```

```

/SEQUENTIAL LOCATION TEST (DOWN)
7442 1274 LOOP2, TAD LIMHI
7443 3273 DCA ADRES /SET STARTING ADDRESS
7444 1673 TAD I ADRES /GET CONTENTS
7445 7041 CIA
7446 1273 TAD ADRES /GET ADDRESS
7447 7440 SZA /SKIP IF EQUAL
7450 4316 JMS ERROR /CONTENTS NOT SAME AS ADDRESS
7451 7240 CLA CMA /AC=-1
7452 1273 TAD ADRES /AC=(ADRES)-1
7453 3273 DCA ADRES /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 ADRES, 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 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		CIA	/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 MSK7
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

5

THERE ARE NO ERRORS



## SYMBOL TABLE

A	7514
ADRES	7473
BACK	7561
C	7515
CUNT	7510
COUNT	7477
CH	7511
CTR	7503
ERRUR	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