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IDENTIFICATION

PRODUCT CODE:	MAINDEC-8E-D1EA-D-(D)
PRODUCT CODE:	MEMORY ADDRESS TEST
DATE CREATED:	OCTOBER 24, 197Ø
MAINTAINER:	DIAGNOSTIC GROUP
AUTHOR:	BRUCE HANSEN
PREVIOUS CODE:	MAINDEC-08-D1B0-D

DIE-7

1. ABSTRACT

Memory Address Test a relocatable program, checks for proper memory address selection on the PDP-8E.

2. REQUIREMENTS

2.1 Equipment

PDP-8E equipped with a teletype

2.2 Storage

Memory Address Test occupies locations 7400-7707.

After relocating, the test occupies locations 0000-0307.

2.3 Preliminary Programs

NONE

3. LOADING PROCEDURE

The program is supplied in RIM format.

4. STARTING PROCEDURE

4.1 Initial Switch Settings

All SR's = 0 Run Address Test High and relocate program after 1 pass to Address Test Low and then relocate program to Address Test High, repeatedly.

SR0(0) Halt after error printout

SR1(1) and SR2(0) Run Address Test High only

SR1(1) and SR2(1) Relocate program and run address test Low only

SR1(0) Program will relocate after 1 pass

SR1(1) Program will stay in test and will not relocate

4.2 Switch Settings After Program is Running

SR0(0) Halt after error printout

SR1(0) Run Test and relocate

SR1(1) Run same test, do not relocate

4.3 Starting Addresses

0200 initially

Restart Address: 0000,7400

4.4 Operator Action

a. Set SR to 0200 and press LOAD ADDRESS

b. Set SR for desired operation (see 4.1) press CLEAR, then CONTINUE. For most cases the switch register should equal zero.

5. OPERATING PROCEDURE

Once the program is running, the starting routine is given up for a test area. SR0 and SR1 are the only switches that have any affect on the program. (see 4.2) In order to restart the program, certain locations (see below) to determine where the program is, since the program relocates itself from Address Test High to Address Test Low and from Address Test Low to Address Test High. If address 0000 contains a 7300 and address 307 contains a 7400, start the program at location 0000 for Address Test Low. If 7400 and 7707 has 73ØØ and 7400 respectively, Load Address 7400 and set desired switches and hit clear and then continue.

6. ERRORS

6.1 Error Printouts

A xxxx C yyyy (Error Printout Format)

A xxxx (Address) xxxx = Address containing wrong data.

C yyyy (Contents) yyyy = Contents of location xxxx

The address shold 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 selection.

If it is necessary to scope the problem, the following two instructions may be entered in memory:

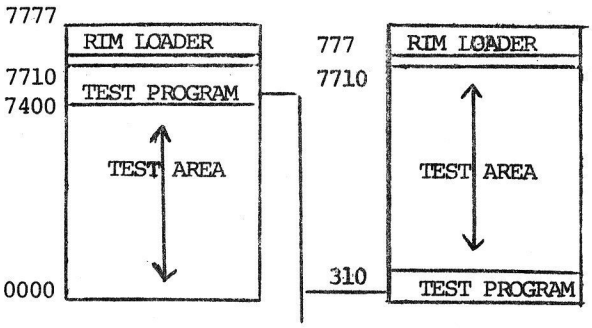
```
TAD  (Bad Location)
JMP  .-1
```

7. MISCELLANEOUS

7.1 Execution Time

After every 96 complete program loops an EA is printed out before the program relocates, EA is typed out twice, once after address Test High and the second time after Address Test Low.

7.2 Memory Maps



Relocatable Program

8. PROGRAM DESCRIPTION

The program consist 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 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 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:

A2566 C 2760

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

After 96 program loops of Phases 1-4 the program relocates and runs another 96 program loops before it relocates again.

Address Test High - test memory locations 0000-7377.

Address Test Low - test memory locations 310-7707.

```
                    /PDP-8E MEMORY ADDRESS TEST
          0000      *0000
0000      0000              0
0001      5001              JMP 1
0002      0002              2
0003      0003              3
0004      0000              0
0005      0000              0
          0200      *200
0200      7604      BEG,    LAS
0201      7440              SZA
0202      5204              JMP .+2
0203      5615              JMP I START     /SR=0 RUN PROGRAM AND RELOCATE
0204      1217              TAD M2000
0205      7640              SZA CLA
0206      5210              JMP .+2
0207      5615              JMP I START     /RUN MEMORY ADDRESS TEST HIGH
0210      7604              LAS
0211      1220              TAD M3000
0212      7640              SZA CLA
0213      5615              JMP I START             /WRONG SWITCH SETTING RUN HIGH AND RELOCATE
0214      5616              JMP I LOWER     /RELOCATES PROGRAM AND RUNS MEMORY ADDRESS TEST HIGH
0215      7400      START,  LOADUP
0216      7605      LOWER,  MOVELH
0217      6000      M2000,  -2000
0220      5000      M3000,  -3000

          7400      *7400

                    /LOAD MEMORY FORWARD DIRECTION


7400      7300      LOADUP, CLA CLL
7401      1276              TAD LIMLO
7402      3274              DCA ADRES               /SET TEST AREA STARTING ADDRESS
7403      1277              TAD M7400
7404      3304              DCA CTR
7405      1274              TAD ADRES
7406      3674              DCA I ADRES     /DEPOSIT ADDRESS IN CONTENTS
7407      2274              ISZ ADRES
7410      2304              ISZ CTR
7411      5205              JMP LOADUP+5
7412      1276              TAD LIMLO
7413      3274              DCA ADRES
7414      1277              TAD M7400
7415      3304              DCA CTR

7416      1674      MEMLUP, TAD I ADRES     /GET CONTENTS FORWARD DIRECTION
7417      7041              CIA
7420      1274              TAD ADRES               /GET ADDRESS
7421      7440              SZA             /SKIP IF EQUAL
7422      4317              JMS ERROR               /CONTENTS NOT SAME AS ADDRESS
7423      2274              ISZ ADRES               /SELECT NEXT ADDRESS
7424      2304              ISZ CTR         /SKIP IF END TEST AREA
```

```
7425  5216          JMP MEMLUP

                    /LOAD MEMORY REVERSE DIRECTION
7426  1275  LOADWN, TAD LIMHI
7427  3274          DCA ADRES             /SET TEST AREA ENDING ADDRESS
7430  1277          TAD M7400
7431  3304          DCA CTR
7432  1274          TAD ADRES
7433  3674          DCA I ADRES     /DEPOSIT ADDRESS IN CONTENTS
7434  7240          CLA CMA         /AC=-1
7435  1274          TAD ADRES               /AC=(ADRES)-1
7436  3274          DCA ADRES               /DECREMENT ADDRESS
7437  2304          ISZ CTR         /SKIP WHEN LOWER LIMIT REACHED
7440  5232          JMP LOADWN+4
7441  1277          TAD M7400
7442  3304          DCA CTR


                    /SEQUENTIAL LOCATION TEST (DOWN)
7443  1275  LOOP2,  TAD LIMHI
7444  3274          DCA ADRES               /SET STARTING ADDRESS
7445  1674          TAD I ADRES     /GET CONTENTS
7446  7041          CIA
7447  1274          TAD ADRES               /GET ADDRESS
7450  7440          SZA             /SKIP IF EQUAL
7451  4317          JMS ERROR               /CONTENTS NOT SAME AS ADDRESS
7452  7240          CLA CMA         /AC=-1
7453  1274          TAD ADRES               /AC=(ADRES)-1
7454  3274          DCA ADRES               /SELECT NEXT ADDRESS
7455  2304          ISZ CTR         /SKIP IF END TEST AREA
7456  5245          JMP LOOP2+2
7457  2300          ISZ COUNT
7460  5200          JMP LOADUP
7461  1301          TAD RESTOR
7462  3300          DCA COUNT
7463  1312          TAD CR
7464  4345          JMS PRINT
7465  1313          TAD LF
7466  4345          JMS PRINT
7467  1302          TAD K305
7470  4345          JMS PRINT
7471  1315          TAD A
7472  4345          JMS PRINT
7473  5377          JMP  BANK1

                    /CONSTANTS AND VARIABLES
7474  0000  ADRES,  0
7475  7377  LIMHI,  7377
7476  0000  LIMLO,  0
7477  0400  M7400,  -7400

7500  7640  COUNT,  -140
7501  7640  RESTOR, -140
7502  0305  K305,   305
7503  7774  M4,     -4
```

```
7504  0000    CTR,    0
7505  0007    MSK7,   7
7506  0260    TW6,    260
7507  0000    STOR,   0
7510  7004    NUM,    RAL
7511  0000    CONT,   0
7512  0215    CR,     215
7513  0212    LF,     212
7514  0240    SPACE,  240
7515  0301    A,      301
7516  0303    C,      303


                      /ERROR ROUTINE
7517  0000    ERROR,  0
7520  7041            CIA             /RESTORE CONTENTS
7521  1274            TAD ADRES               /OF FAILING ADDRESS
7522  3311            DCA CONT                /PUT RESULT IN CONT

                      /ERROR MESSAGE
7523  1312    MESG,   TAD CR
7524  4345            JMS PRINT
7525  1313            TAD LF
7526  4345            JMS PRINT
7527  1315            TAD A
7530  4345            JMS PRINT
7531  1274            TAD ADRES
7532  4353            JMS TYPAC
7533  1314            TAD SPACE
7534  4345            JMS PRINT
7535  1316            TAD C
7536  4345            JMS PRINT
7537  1311            TAD CONT
7540  4353            JMS TYPAC
7541  7604            LAS
7542  7700            SMA CLA
7543  7402            HLT             /HALT ON ERROR (SR0)
7544  5717            JMP I ERROR

7545  0000    PRINT,  0
7546  6046            TLS
7547  6041            TSF
7550  5347            JMP .-1
7551  7200            CLA
7552  5745            JMP I PRINT

                      /TYPE (AC) IN OCTAL

7553  0000    TYPAC,  0
7554  3307            DCA STOR
7555  1363            TAD BACK+1
7556  3364            DCA BACK+2
7557  1303            TAD M4
7560  3304            DCA CTR
```

```
7561  7100          CLL
7562  1307  BACK,   TAD STOR
7563  7006          RTL
7564  7006          RTL
7565  3307          DCA STOR
7566  1307          TAD STOR
7567  0305          AND MSK7
7570  1306          TAD TW6
7571  6345          JMS PRINT
7572  1310          TAD NUM
7573  3364          DCA BACK+2
7574  2304          ISZ CTR
7575  5362          JMP BACK
7576  5753          JMP I TYPAC
7577  7000  BANK1,  NOP

7600  7604          LAS             /LOOK AT SR TO SEE IF PROGRAM RELOCATES
7601  0257          AND COMP
7602  7650          SNA CLA
7603  5205          JMP MOVELH      /JMP TO MOVE ROUTINE
7604  5277          JMP  LOADP      /KEEP PROGRAM IN SAME AREA
7605  1264  MOVELH, TAD STORE
7606  7040          CMA
7607  3264          DCA STORE
7610  1264          TAD STORE
7611  7700          SMA CLA
7612  5236          JMP MOVEH       /RELOCATES PROGRAM TO HIGH MEMORY
7613  5214          JMP MOVEL       /RELOCATES PROGRAM TO LOW MEMORY
7614  7300  MOVEL,  CLA CLL
7615  1260          TAD LIMLOL
7616  3673          DCA I X1        /LOW ADDRESS UNDER TEST=310
7617  1261          TAD LIMHIL
7620  3674          DCA I X2        /HIGH ADDRESS UNDER TEST=7710
7621  7300  SETL,   CLA CLL        /SETS UP COUNTERS FOR MOVING
7622  3265          DCA CONT1
7623  1262          TAD CNT2
7624  3266          DCA CONT2
7625  1263          TAD HGH
7626  3267          DCA HIGH
7627  1667  MOVITL, TAD I HIGH      /MOVES PROGRAM TO LOWER MEMORY
7630  3665          DCA I CONT1
7631  2265          ISZ CONT1
7632  2267          ISZ HIGH
7633  2266          ISZ CONT2       /IS PROGRAM RELOCATED
7634  5227          JMP MOVITL      /NO
7635  5000          JMP 0           /YES START PROGRAM
7636  1270  MOVEH,  TAD LIMLOH
7637  3675          DCA I X3        /LOW ADDRESS UNDER TEST=0000
7640  1271          TAD LIMHIH
7641  3676          DCA I X4        /HIGH ADDRESS UNDER TEST=7377
7642  7300  SETH,   CLA CLL        /RESETS COUNTERS
7643  3272          DCA LOW
7644  1262          TAD CNT2
7645  3266          DCA CONT2
7646  1263          TAD HGH
```

```
7647  3267            DCA HIGH
7650  1672  MOVITH,   TAD I LOW        /MOVE PROGRAM TO UPPER MEMORY
7651  3667            DCA I HIGH
7652  2272            ISZ LOW
7653  2267            ISZ HIGH
7654  2266            ISZ CONT2        /IS PROGRAM RELOCATED
7655  5250            JMP MOVITH       /NO
7656  5663            JMP I HGH        /YES START PROGRAM
7657  2000  COMP,     2000
7660  0310  LIMLOL,   0310
7661  7710  LIMHIL,   7710
7662  7470  CNT2,     7470
7663  7400  HGH,      7400
7664  0000  STORE,    0
7665  0000  CONT1,    0
7666  7470  CONT2,    7470
7667  7400  HIGH,     7400
7670  0000  LIMLOH,   0
7671  7377  LIMHIH,   7377
7672  0000  LOW,      0
7673  7476  X1,       LIMLO
7674  7475  X2,       LIMHI
7675  0076  X3,       0076
7676  0075  X4,       0075
7677  7000  LOADP,    NOP
7700  4301            JMS .+1
7701  0000            0
7702  1301            TAD .-1
7703  0307            AND STAY
7704  7700            SMA CLA
7705  5000            JMP 0
7706  5707            JMP I STAY
7707  7400  STAY,     7400
            $
```

```
0000  11111100  00000000  00000000  00000000  00000000  00000000  00000000  00000000
0100  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000

0200  11111111  11111111  10000000  00000000  00000000  00000000  00000000  00000000
0300  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000

0400
0500

0600
0700


1000
1100

1200
1300

1400
1500

1600
1700


2000
2100

2200
2300

2400
2500

2600
2700


3000
3100

3200
3300

3400
3500

3600
3700
```

```
4000
4100

4200
4300

4400
4500

4600
4700


5000
5100

5200
5300

5400
5500

5600
5700


6000
6100

6200
6300

6400
6500

6600
6700


7000
7100

7200
7300

7400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
7500  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

7600  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
7700  11111111  00000000  00000000  00000000  00000000  00000000  00000000  00000000
```

A	7515	STORE	7664
ADRES	7474	TW6	7506
BACK	7562	TYPAC	7553
BANK1	7577	X1	7673
BEG	0200	X2	7674
C	7516	X3	7675
CNT2	7662	X4	7676
COMP	7657		
CONT	7511		
CONT1	7665		
CONT2	7666		
COUNT	7500		
CR	7512		
CTR	7504		
ERROR	7517		
HGH	7663		
HIGH	7667		
K305	7502		
LF	7513		
LIMHI	7475		
LIMHIH	7671		
LIMHIL	7661		
LIMLO	7476		
LIMLOH	7670		
LIMLOL	7660		
LOADP	7677		
LOADUP	7400		
LOADWN	7426		
LOOP2	7443		
LOW	7672		
LOWER	0216		
M2000	0217		
M3000	0220		
M4	7503		
M7400	7477		
MEMLUP	7416		
MESG	7523		
MOVEH	7636		
MOVEL	7614		
MOVELH	7605		
MOVITH	7650		
MOVITL	7627		
MSK7	7505		
NUM	7510		
PRINT	7545		
RESTOR	7501		
SETH	7642		
SETL	7621		
SPACE	7514		
START	0215		
STAY	7707		
STOR	7507		

ERRORS DETECTED: 0

LINKS GENERATED: 0

RUN-TIME: 3 SECONDS

2K CORE USED