## IDENTIFICATION

| | |
|---|---|
| PRODUCT CODE: | MAINDEC-08-**D1MA**-D |
| PRODUCT NAME: | MEMORY ADDRESS TEST |
| DATE CREATED: | FEBRUARY 11, 1971 |
| MAINTAINER: | DIAGNOSTIC GROUP |
| AUTHOR: | R. GREEN/B. HANSEN |

## 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

0004 Low Storage Restart 0000

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.

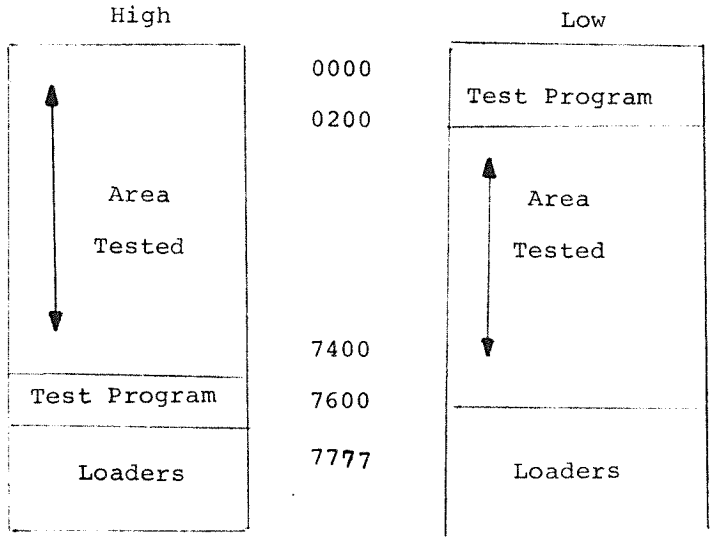
```
TAD [Bad Location]
JMP .-1
```

7. MISCELLANEOUS

7.1 Execution Time

An 11 is printed after every 96 complete program loops (every 28 seconds).

7.2 Memory Maps



```
                        /PDP-8 MEMORY ADDRESS TEST (LOW, PAGE 0)
0000                    *0

                        /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 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=-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)
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 ADRES                /OF FAILING ADDRESS
0121  3110              DCA CONT                 /PUT RESULT IN CONT

                        /ERROR MESSAGE
0122  1111    MESG,     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  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 MSK/
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

$
```

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 |
| MESG | 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 |
| MSK/ | 0104 |
| TW6 | 0105 |
| STOR | 0106 |
| NUM | 0107 |
| CUNT | 0110 |
| CR | 0111 |
| LF | 0112 |
| SPACE | 0113 |
| A | 0114 |
| C | 0115 |
| ERROR | 0116 |
| MESG | 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            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
```

```
                        /ERROR ROUTINE
7516  0000  ERROR,     0
7517  7041              CIA             /RESTORE CONTENTS
7520  1273              TAD ADRES               /OF FAILING ADDRESS
7521  3310              DCA CONT                /PUT RESULT IN CONT

                        /ERROR MESSAGE
7522  1311  MESG,      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 ADRES
7531  4352              JMS TYPAC
7532  1313              TAD SPACE
7533  4344              JMS PRINT
7534  1315              TAD C
7535  4344              JMS PRINT
7536  1310              TAD CONT
7537  4352              JMS TYPAC
7540  7604              LAS
7541  7710              SPA CLA
7542  7402              HLT             /HALT ON ERROR (SR0)
7543  5716              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 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 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  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 |
| CONT | 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 |
| MESG | 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 |
| MEMLUP | 7415 |
| LOADWN | 7425 |
| LOOP2 | 7442 |
| ADRES | 7473 |
| LIMHI | 7474 |
| LIMLO | 7475 |
| M/400 | 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 |
| MESG | 7522 |
| PRINT | 7544 |
| TYPAC | 7552 |
| BACK | 7561 |