IDENTIFICATION

Product Code:	MAINDEC-08-D04A-D
Product Name:	Random JMP Test
Date Created:	April 1, 1967
Maintainer:	Diagnostic Group
Author:	R. Green

1. ABSTRACT

This program tests the JMP instruction of the PDP-8. Most of memory is used as a JUMP field with a random number generator selecting each JUMP FROM and JUMP TO location.

2. REQUIREMENTS

2.1 Equipment

PDP-8 equipped with Teletype.

2.2 Storage

0000, 0364. The Binary Loader must be stored in the last memory page.

2.3 Preliminary Programs

It is assumed that MAINDEC 08-D01(n), 08-D02(n), and 08-D03(n) have run successfully.

3. LOADING PROCEDURE

3.1 Method

Use standard Binary Loader.

4. STARTING PROCEDURE

4.1 Control Switch Settings

SR0	Halt on Error.
SR2	Hold JUMP FROM addresses constant. (1) Select random JUMP FROM addresses. (0)
SR3	Hold JUMP TO addresses constant. (1) Select random JUMP TO addresses. (0)

4.2 Starting Address

0200

Restart Address

0214

4.3 Operator Action

a. Set SR to 0201 and press LOAD ADDRESS.

b. Set SR to desired mode. If a particular memory location is desired for either a "constant FROM" or "constant TO", this memory address is entered into one of the locations shown below:

FROM 1	ADDRESS	=	0116
FROM	ADDRESS	=	0115
TO	ADDRESS	=	0114

NOTE: Always make (FROM 1) = (FROM) - 1

If SR2 or SR3 is set after the program has been started, the last address taken from the random number generator is used repeatedly.

c. Press START.

5. OPERATING PROCEDURE

Same as section 4.

6. ERRORS

6.1 Error Halts

All unused memory locations are loaded with HLT orders. If the program executes one of these background HLTS, it is probable that the interrupt failed to occur following the JMP instruction.

6.2 Error Printouts

F wwww TO xxxx

Z = yyyy

(FROM) F wwww: wwww = the address of the JMP instruction.

(TO) T xxxx: xxxx = the address that the JMP instruction is jumping to.

(LOC 0000) Z = yyyy: yyyy = the address stored in location 0000 during the interrupt. Note that yyyy should equal xxxx.

Example: the following is a typical error printout:

F 4252 TO 7020

Z = 7000

Line 1 of the printout is a statement of the problem. A JMP instruction is placed at location 4252. This JMP instruction is trying to jump to location 7020. Line 2 of the printout indicates

the error. The TO address (7020) was to have been stored in location 0000 but instead a 7000 was stored. Thus bit 7 was dropped.

6.3 Error Recovery

The program continues testing following an error printout. When enough information has been gathered from the error printouts, a FROM and TO address is selected for use in the scope mode loop. Enter the chosen addresses into proper locations (see section 4.3.b). Restart the program with SR2 and SR3 set. After allowing it to run for a moment push STOP, enter (5516) into location 1, and restart the program at location 0025 with SR2 and SR3 set. The scope mode loop is

Location	Coding
0000	
0001	JMP I FROM 1
xxxx	A, ION
xxxx	JMP I TO
0116	FROM 1, A

When it is desired to discontinue the scope mode loop, restore the original contents (1114) of location 1, and restart the program.

7. RESTRICTIONS

(None)

8. MISCELLANEOUS

8.1 Execution Time

7200 random tests/second

9. PROGRAM DESCRIPTION

The JMP instruction is checked through the use of the interrupt function. A random number generator selects a FROM and a TO address. An ION instruction is then placed at FROM -1 and the JMP instruction at FROM. The JMP instruction jumps to the address specified by TO. After executing these two orders, an interrupt occurs starting the program counter at location 1. A checking routine located here verifies that the operation was successful before starting the next test.

Random addresses are restricted as follows: 0400 < random address < 7600. The area between 0400 and 7600 is filled with HLT instructions in case the interrupt fails. A "04" is printed after each group of 72,000 tests.

```
@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@?@
@AER     0132
AMSG1    0135
AMSG2    0361
CT       0136
CT1      0137
ER       0220
FROM     0115
FROM1    0116
GETRAN   0032
GON      0203
GTRAN1   0062
HALT     0113
INS1     0146
INS10    0171
INS11    0172
INS12    0173
INS2     0147
INS3     0150
INS4     0151
INS5     0155
INS6     0156
INS7     0157
INS8     0160
INS9     0170
ITON     0124
JMP1     0123
JPLP     0102
LIMHI    0122
LIMLO    0121
LOOP     0025
LOOP1    0055
LP       0277
LP1      0326
MSG1     0141
MSK7     0126
M15      0367
M17      0140
M207     0134
M264     0366
RANUM    0117
SAVE     0127
SLOC     0341
SUP      0316
THREF    0120
TO       0114
TW6      0125
WORK     0133
)
```

```
                /RANDOM JMP TEST
                  /SR0=HALT ON ERROR
                /SR2=CONSTANT FROM ADDRESS
                /SR3=CONSTANT TO ADDRESS

                *0
0000   0000       0                         /FOR SCOPE MODE INSERT
0001   1114       TAD TO                    /JMP I FROM1 (5516) INTO LOC. 1
0002   7041       CIA
0003   1000       TAD 0
0004   7640       SZA CLA
0005   5532       JMP I AER
0006   1113       TAD HALT
0007   3515       DCA I FROM
0010   1113       TAD HALT
0011   3516       DCA I FROM1
0012   3000       DCA 0
0013   7001       IAC
0014   1136       TAD CT
0015   3136       DCA CT
0016   1136       TAD CT
0017   7640       SZA CLA
0020   5025       JMP LOOP
0021   5422       JMP I .+1
0022   0316       SUP
0023   1140       TAD M17
0024   3137       DCA CT1

                /CHECK FOR CONSTANT FROM

0025   7604     LOOP,       LAS
0026   7004       RAL
0027   7006       RTL
0030   7630       SZL CLA
0031   5055       JMP LOOP1

                /SELECT RANDOM FROM

0032   1117     GETRAN,     TAD RANUM
0033   7104       RAL CLL
0034   7430       SZL
0035   1120       TAD THREE
0036   3117       DCA RANUM
0037   7100       CLL
0040   1117       TAD RANUM
0041   1122       TAD LIMHI
0042   7630       SZL CLA
0043   5032       JMP GETRAN
0044   1117       TAD RANUM
0045   1121       TAD LIMLO
0046   7620       SNL CLA
0047   5032       JMP GETRAN
0050   1117       TAD RANUM
0051   3115       DCA FROM
0052   7040       CMA
0053   1115       TAD FROM
0054   3116       DCA FROM1
```

```
                /CHECK FOR CONSTANT TO ADDRESS

0055  7604  LOOP1,      LAS
0056  7006    RTL
0057  7006    RTL
0060  7630    SZL CLA
0061  5102    JMP JPLP

                /SELECT RANDOM TO ADDRESS

0062  1117  GTRAN1,     TAD RANUM
0063  7104    RAL CLL
0064  7430    SZL
0065  1120    TAD THREE
0066  3117    DCA RANUM
0067  7100    CLL
0070  1117    TAD RANUM
0071  1122    TAD LIMHI
0072  7630    SZL CLA
0073  5062    JMP GTRAN1
0074  1117    TAD RANUM
0075  1121    TAD LIMLO
0076  7620    SNL CLA
0077  5062    JMP GTRAN1
0100  1117    TAD RANUM
0101  3114    DCA TO

                /PLACE INSTRUCTIONS

0102  1123  JPLP,       TAD JMP1
0103  3515    DCA I FROM
0104  1124    TAD ITON
0105  3516    DCA I FROM1

                /RAISE FLAG
0106  6041    TSF
0107  6046    TLS
0110  6041    TSF
0111  5110    JMP .-1

                /DO IT

0112  5516    JMP I FROM1
0113  7402  HALT,       HLT                    /JUMP FAILED
```

```
                        /CONSTANTS, VARIABLES, AND SUCH

0114  0000  TO,         0
0115  0000  FROM,       0
0116  0000  FROM1,      0
0117  2525  RANUM,      2525
0120  0003  THREE,      3
0121  7400  LIMLO,      -400
0122  0200  LIMHI,      -7600
0123  5514  JMP1,       JMP I TO
0124  6001  ITON,       ION
0125  0260  TW6,        260
0126  0007  MSK7,       7
0127  0000  SAVE,       0
0130  0000    0
0131  0000    0
0132  0220  AER,        ER
0133  0000  WORK,       0
0134  7571  M207,       -207
0135  0141  AMSG1,      MSG1
0136  0000  CT,         0
0137  0000  CT1,        0
0140  7761  M17,        -17

                        /TTY MESSAGE
0141  0215  MSG1,       215                          /CR
0142  0212    212                        /LF
0143  0212    212                        /LF
0144  0306    306                        /F FROM ADDRESS
0145  0240    240                        /SPACE
0146  0000  INS1,       0                          /X
0147  0000  INS2,       0                          /X
0150  0000  INS3,       0                          /X
0151  0000  INS4,       0                          /X
0152  0240    240                        /SPACE
0153  0324    324                        /T JMP TO
0154  0240    240                        /SPACE
0155  0000  INS5,       0                          /X
0156  0000  INS6,       0                          /X
0157  0000  INS7,       0                          /X
0160  0000  INS8,       0                          /X
0161  0215    215                        /CR
0162  0212    212                        /LF

0163  0377    377                        /RUBOUT
0164  0332    332                        /Z LOCATION ZERO
0165  0240    240                        /SPACE
0166  0275    275                        /=
0167  0240    240                        /SPACE
0170  0000  INS9,       0                          /X
0171  0000  INS10,      0                          /X
0172  0000  INS11,      0                          /X
0173  0000  INS12,      0                          /X
0174  0207    207                        /STOPPER
```

```
                *200
                /SPREAD HALTS THROUGH MEMORY

0200  1121      TAD LIMLO
0201  7041      CIA
0202  3114      DCA TO
0203  1113  GON,          TAD HALT
0204  3514      DCA I TO
0205  1114      TAD TO
0206  7001      IAC
0207  3114      DCA TO
0210  1114      TAD TO
0211  1122      TAD LIMHI
0212  7640      SZA CLA
0213  5203      JMP GON
0214  1367      TAD M15
0215  3137      DCA CT1
0216  3136      DCA CT
0217  5025      JMP LOOP
```

```
                /ERROR ROUTINES
0220  1115  ER,         TAD FROM
0221  4341    JMS SLOC
0222  3146    DCA INS1
0223  1127    TAD SAVE
0224  0126    AND MSK7
0225  1125    TAD TW6
0226  3147    DCA INS2
0227  1130    TAD SAVE+1
0230  0126    AND MSK7
0231  1125    TAD TW6
0232  3150    DCA INS3
0233  1131    TAD SAVE+2
0234  0126    AND MSK7
0235  1125    TAD TW6
0236  3151    DCA INS4
0237  1114    TAD TO
0240  4341    JMS SLOC
0241  3155    DCA INS5
0242  1127    TAD SAVE
0243  0126    AND MSK7
0244  1125    TAD TW6
0245  3156    DCA INS6
0246  1130    TAD SAVE+1
0247  0126    AND MSK7
0250  1125    TAD TW6
0251  3157    DCA INS7
0252  1131    TAD SAVE+2
0253  0126    AND MSK7
0254  1125    TAD TW6
0255  3160    DCA INS8
0256  1000    TAD 0
0257  4341    JMS SLOC
0260  3170    DCA INS9
0261  1127    TAD SAVE
0262  0126    AND MSK7
0263  1125    TAD TW6
0264  3171    DCA INS10
0265  1130    TAD SAVE+1
0266  0126    AND MSK7
0267  1125    TAD TW6
0270  3172    DCA INS11
0271  1131    TAD SAVE+2
0272  0126    AND MSK7
0273  1125    TAD TW6
0274  3173    DCA INS12
```

```
                /PRINT ERROR MESSAGE
0275  1135    TAD AMSG1
0276  3133    DCA WORK
0277  1533  LP,         TAD I WORK
0300  6046    TLS
0301  6041    TSF
0302  5301    JMP .-1
0303  7201    CLA IAC
0304  1133    TAD WORK
0305  3133    DCA WORK
0306  1533    TAD I WORK
0307  1134    TAD M207
0310  7640    SZA CLA
0311  5277    JMP LP
0312  7604    LAS
0313  7710    SPA CLA
0314  7402    HLT                     /HALT ON ERROR
0315  5006    JMP 6

0316  1137  SUP,        TAD CT1
0317  7001    IAC
0320  3137    DCA CT1
0321  1137    TAD CT1
0322  7640    SZA CLA
0323  5025    JMP LOOP

0324  1361    TAD AMSG2
0325  3133    DCA WORK
0326  1133  LP1,        TAD WORK
0327  7001    IAC
0330  3133    DCA WORK
0331  1533    TAD I WORK
0332  6046    TLS
0333  6041    TSF
0334  5333    JMP .-1
0335  1366    TAD M264
0336  7640    SZA CLA
0337  5326    JMP LP1
0340  5023    JMP LOOP-2

0341  0000  SLOC,       0
0342  3131    DCA SAVE+2
0343  1131    TAD SAVE+2
0344  7012    RTR
0345  7010    RAR
0346  3130    DCA SAVE+1
0347  1130    TAD SAVE+1
0350  7012    RTR
0351  7010    RAR
0352  3127    DCA SAVE
0353  1127    TAD SAVE
0354  7012    RTR
0355  7010    RAR
0356  0126    AND MSK7
0357  1125    TAD TW6
0360  5741    JMP I SLOC
```

```
0361  0361  AMSG2,        .
0362  0215    215         /CR
0363  0212    212         /LF
0364  0260    260         /0
0365  0264    264         /E

0366  7514  M264,         -264
0367  7763  M15,          -15

@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
@AER     0132
AMSG1   0135
AMSG2   0361
CT      0136
CT1     0137
ER      0220
FROM    0115
FROM1   0116
GETRAN  0032
GON     0203
GTRAN1  0062
HALT    0113
INS1    0146
INS10   0171
INS11   0172
INS12   0173
INS2    0147
INS3    0150
INS4    0151
INS5    0155
INS6    0156
INS7    0157
INS8    0160
INS9    0170
ITON    0124
JMP1    0123
JPLP    0102
LIMHI   0122
LIMLO   0121
LOOP    0025
LOOP1   0055
LP      0277
LP1     0326
MSG1    0141
MSK7    0126
M15     0367
M17     0140
M207    0134
M264    0366
RANUM   0117
SAVE    0127
SLOC    0341
SUP     0316
THREF   0120
TO      0114
TW6     0125
WORK    0133
D
```