IDENTIFICATION

Product Code: MAINDEC-08-DO4B-D

Product Name: Random JMP Test

Date Created: December 28, 1967

Maintainer: Diagnostic Group

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 0200 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.

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

      0000              *0
0000  0000                      0                 /FOR SCOPE MODE INSERT
0001  5001                      JMP 1             /JMP 1 FROM1 (5516) INTO LOC. 1
0002  0002                      2
0003  0003                      3
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  0516                      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
```

```
        0200                    *200
                                /SPREAD HALTS THROUGH MEMORY

0200    5770                    JMP I PATCH             /TAD LIMLO
0201    7041                    CIA
0202    3114                    DCA T0
0203    1113            GON,    TAD HALT
0204    3514                    DCA I T0
0205    1114                    TAD T0
0206    7001                    IAC
0207    3114                    DCA T0
0210    1114                    TAD T0
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 MSK/
0225  1125                      TAD TW6
0226  3147                      DCA INS2
0227  1130                      TAD SAVE+1
0230  0126                      AND MSK/
0231  1125                      TAD TW6
0232  3150                      DCA INS3
0233  1131                      TAD SAVE+2
0234  0126                      AND MSK/
0235  1125                      TAD TW6
0236  3151                      DCA INS4
0237  1114                      TAD TU
0240  4341                      JMS SLOC
0241  3155                      DCA INS5
0242  1127                      TAD SAVE
0243  0126                      AND MSK/
0244  1125                      TAD TW6
0245  3156                      DCA INS6
0246  1130                      TAD SAVE+1
0247  0126                      AND MSK/
0250  1125                      TAD TW6
0251  3157                      DCA INS7
0252  1131                      TAD SAVE+2
0253  0126                      AND MSK/
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 MSK/
0263  1125                      TAD TW6
0264  3171                      DCA INS10
0265  1130                      TAD SAVE+1
0266  0126                      AND MSK/
0267  1125                      TAD TW6
0270  3172                      DCA INS11
0271  1131                      TAD SAVE+2
0272  0126                      AND MSK/
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 M20/
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 MSK/
```

```
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

0370  0400              PATCH,  XPATCH



      0400              *400
0400  3000              XPATCH, DCA 0             /RESTORE 0,1,2,3 AND GO
0401  1212                      TAD X1            /AWAY
0402  3001                      DCA 1
0403  1213                      TAD X2
0404  3002                      DCA 2
0405  1214                      TAD X3
0406  3003                      DCA 3
0407  1215                      TAD X4
0410  3616                      DCA I X5
0411  5616                      JMP I X5

0412  1114              X1,     1114              /TAD TO
0413  7041              X2,     CIA
0414  1000              X3,     1000              /TAD 0
0415  1121              X4,     TAD LIMLO
0416  0200              X5,     200

                        $
```

THERE ARE NO ERRORS

SYMBOL TABLE

AER	0132
AMSG1	0135
AMSG2	0361
CT	0136
CT1	0137
ER	0220
FROM	0115
FROM1	0116
GETRAN	0032
GUN	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
PATCH	0370
RANUM	0117
SAVE	0127
SLOC	0341
SUP	0316
THREE	0120
TO	0114
TW6	0125
WORK	0133
XPATCH	0400
X1	0412
X2	0413
X3	0414
X4	0415

SYMBOL TABLE

XS 0416

SYMBOL TABLE

LOOP	0025
GETRAN	0032
LOOP1	0055
GTRAN1	0062
JPLP	0102
HALT	0113
TU	0114
FROM	0115
FROM1	0116
RANUM	0117
THREE	0120
LIMLO	0121
LIMHI	0122
JMP1	0123
IION	0124
TW6	0125
MSK7	0126
SAVE	0127
AER	0132
WORK	0133
M207	0134
AMSG1	0135
CT	0136
CT1	0137
M17	0140
MSG1	0141
INS1	0146
INS2	0147
INS3	0150
INS4	0151
INS5	0155
INS6	0156
INS7	0157
INS8	0160
INS9	0170
INS10	0171
INS11	0172
INS12	0173
GON	0203
ER	0220
LP	0277
SUP	0316
LP1	0326
SLOC	0341
AMSG2	0361
M264	0366
M15	0367
PATCH	0370
XPATCH	0400
X1	0412
X2	0413
X3	0414
X4	0415

SYMBOL TABLE

XS 0416