



PERMANENT
MEMORANDUM

M1130
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SUBJECT Instruction Test Programs
TO Technicians, PDP-1 Distribution List

ABSTRACT A series of small diagnostic routines for checking memory reference and augmented instructions. Each routine is written using the program format for PDP-1 maintenance programs (see memo - 1127).

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INTRODUCTION

The following routines are written in sequential order starting with a basic set of instructions, that are assumed working, and branching out into different areas of the machine using these instructions to analyze other instructions.

OPERATING INSTRUCTIONS

To start each test, ss #1 must be off. With ss #2 on, each routine will iterate about itself provided ss #1 is off. SS #2 off, the following routine (in read-in-mode format) on tape, will be read in. All Frap symbols used, are defined in memo - 1127.

,TEST 1

,clear memory

,9/15/61

,G. B. & S. L.

org 7762

```

be0          szs 10
ph0          hlt
              dzm * t1
              idx t1
              sas p0
              jmp be0
fi0          rpb
              dio p0
              spi *
              rpb
p0           7762
              jmp fi0
t1           0
end .

```

,TEST 2

,skip spa sma szs 1 2 3 hlt cma cla test don't skip uses jmp

,partially tests sza

,9/15/61

,G. B. & S. L.

```

bel          szs 10
ph0          hlt
              cla
              sza
er0          hlt *      ,0 no good
              sza *
              jmp p0
pl           cma
              sza

```

```
650000 ,end sza check
er1 hlt
    cma
    sza
er2 hlt
    spa
er3 hlt
    cma
    spa
    650000
er4 hlt
    sma
er5 hlt
    cma
    sma
    650000
er6 hlt
fil szs 20
    jmp bel
    rpb
    dio  $\phi$  & 3
    spi *
    rpb
    0
    jmp fil
p0 szs 30
ph1 hlt
    jmp pl
end .
```

```
,TEST 3
,test for all lac dac idx and addl sas also uses jmp hlt
,9/17/61
,G. B. & S. L.
```

```
be2 szs 10
    hlt
    lac t1
    dac p2
    cla
    dac t3
    dac t4
    jmp p2
pl idx t4
    lac t3
    add tb3 & 1
    dac t3
    sas t4
ehl hlt
    sza *
    jmp p3
p2 sas
```

```
                                jmp p1
                                idx p2
                                jmp p1
t3                               0
t4                               0
tb3                              0
                                1
                                3
                                7
                                17
                                37
                                77
                                177
                                377
                                777
                                1777
                                3777
                                7777
                                17777
                                37777
                                77777
                                177777
                                377777
                                777777
t1                               sas tb3
t2                               sas tb3 & 2
p3                               lac p2
                                sas t2
                                hlt
f12                              szs 20
                                jmp be2
                                rpb
                                dio  $\phi$  & 3
                                spi *
                                rpb
                                0
                                jmp fi2
end .
```

```
,TEST 4
,add sub lio dio sas sza lac jmp isp test szo dac hlt idx dap spi
,9/14/61
,G. B. & S. L.
be3
```

```
szs 10
hlt
law tb5
dap p5
dzm t1
dzm t2
dzm t3
dzm t4
```

p2 dzm t5
dzm t6
lac t7
dac p6 & 1

p3 lac t10
dac p6 & 2
lac t1
add t11
szo *
jmp ϕ & 3
sas t13
hlt
dac t1
lac t11

add t2
szo *
jmp ϕ & 3
sas t13
hlt
dac t2
lac t3
sub t12
szo *
jmp ϕ & 3
sas t13
hlt
dac t3
lio t3
dio t4

t7 idx t5
sas t4
hlt
sas t3
hlt
sas t2
hlt
sas t1
hlt

p6 isp t6
0

p5 0
sas
jmp p3
sza *
~~jmp p13 sas t14~~
~~sas t14~~
~~jmp p7~~
lac t10
dac p6 & 1
lac t7
dac p6 & 2
jmp p11
spi *

```
p7      jmp p10
        spi *
        jmp p11
        sas t12
        jmp p3
        idx p5
        jmp p2
p11     idx p5
        jmp p3
fi3     szs 20
        jmp be3
        rpb
        dio  $\phi$  & 3
        spi *
        rpb
        0
        jmp fi3
t1      0
t2      0
t3      0
t4      0
t5      0
t6      0
t10     jmp p6 & 3
t11     1
t12     777776
t13     400000
t14     377777
tb5     1
        2
        3
        4
        7
        10
        17
        20
        37
        40
        77
        100
        177
        200
        377
        400
        777
```

1000
1777
2000
3777
4000

7777
10000
17777
20000
37777
40000
77777

100000
177777
200000
377777
400000
777776
000000

end .

,TEST 5
,ior xor & and test
,9/14/61
,G. B. & S. L.

be4 szs 10
 hlt

 law tb1
 dac t1
 law tb2
 dac t2
p0 lac * t1
 ior * t1
 sas * t1
 hlt
 lac * t1
 ior * t2

 cma

 sza
 hlt
 lac * t2

 ior * t1
 cma

 sza
 hlt

 lac * t2
 ior * t2
 sas * t2

```
hlt  
hlt  
lac * t1  
  
and * t1  
sas * t1  
  
hlt  
lac * t1  
and * t2  
sza  
  
hlt  
lac * t2  
and * t1  
  
sza  
hlt  
lac * t2  
  
and * t2  
sas * t2  
hlt  
lac * t1  
xor * t1  
sza  
  
hlt  
lac * t1  
xor * t2  
  
cma  
sza  
hlt  
lac * t2  
xor * t1  
cma  
sza  
hlt  
lac * t2  
xor * t2  
sza  
  
hlt  
idx t1  
idx t2  
sas t3  
  
f14  
jmp p0  
szs 20  
jmp be4  
  
rpb  
dio  $\phi$  & 3  
spi *  
  
rpb  
0  
jmp f14  
  
t1  
0
```


t2	0
t3	tb2 & 23
tbl	0
	1
	2
	4
	10
	20
	40
	100
	200
	400
	1000
	2000
	4000
	10000
	20000
	40000
	100000
	200000
	400000
tb2	777777
	777776
	777775
	777773
	777767
	777757
	777737
	777677
	777577
	777377
	776777
	775777
	773777
	767777
	757777
	737777
	677777
	577777
	377777

end .

,TEST 6
,jmp jsp jda test
,9/20/61
,G. B. & S. L.

```
be5          org 7721
             szs 10

             hlt
             dzm t1
             law 1
             dap t2
             lac t2

             dac * t1
             idx t2
             idx t2
             idx t1
             lac t4
             dac * t1
             idx t1

             lac t2
             dac * t1
             idx t2
             idx t2
             idx t1
             lac t3

             dac * t1
             idx t1
             sas t5

             jmp be5 & 5
             jmp p2 & 1
p1           0 BE
             dap p2 dap p2

             sas t1
             hlt

             idx t1
             idx t1
             sas t5
p2           jmp
             law 2
             dac t1

f15          szs 20
             jmp be5
```

```
                                rpb
                                dio  $\phi$  & 3
                                spi
                                rpb
                                0
                                jmp f15
t1
t2                                jmp
t3                                jsp p1 & 1
t4                                170000 p1
t5                                be5 - 1
end .
```

```
,TEST 7
,cal test
,9/25/61
,G. B. & S. L.
org 100
```

```
                                0
                                dap p0
                                sas t1
                                hlt
                                sad t2
                                jmp p4
                                idx t1
                                sas t3
p0                                jmp
f16                                szs 20
                                jmp be6
                                rpb
                                dio  $\phi$  & 3
                                spi *
                                rpb
                                0
                                jmp f16
p4                                add t4
                                dac t1
                                idx t1
                                jmp p0
                                szs 10
be6                                hlt
                                dzm t1
p5                                idx t1
                                sad t2
                                jmp p1
                                sad t3
                                jmp p3
```

```
p2      ior t6
        dac * t1
        jmp p5
p1      add t4
        dac t1
        jmp p2
p3      dzm t1
        idx t1
        idx t1
        lac t5
        dac 77
        jmp l
t3      7777
t6      160000
t1      0
t2      77
t4      60
t5      jmp 157
end .
```

```
,TEST 8
, simple ac & io shift rotate test
, 9/21/61
, G. B. & S. L.
```

```
be7     szs 10
ph1     hlt
        lac t1
        dac t2
        lio t2
        ril s9
        ral s9
        dio t3
        sas t3
eh1     hlt
        rir s9
        rar s9
        sas t2
eh2     hlt
        dio t3
        sas t3
eh3     hlt
        sal s9
```

```
eh4      sil s9
         dio t3
         sas t3
         hlt
         lac t2
         lio t2
         sar s9
         sir s9

eh5      dio t3
         sas t3
         hlt
         idx t1
         sza

fi7      jmp be7
         szs 20

         jmp be7
         rpb
         dio 0 & 3
         spi *
         rpb
         0
         jmp fi7

t1       0
t2       0
t3       0
end .
```

```
,TEST 9
, super rotate test
, 9/20/61
,G. B.
be10
```

```
szs 10
p17      hlt
         law 1
         dac p05 , base initialize
p13      law tb2
         dap p11
         dap p12 ,setup
p16      cla cma cli ,test that it does move
         rcr s9
         rcl s1
         rcr s1
         ral s2
         rar s1
         rir s9
         ril s1
         dio p06
         sas p06
```

p11
p12

```
hlt
rir      ,test for zero rotate
rcr
ril
ril
rcr
rar
rcl
ral
ral
dio p06
sas p06
hlt
lac
lio
jda p00
rar
sas * p11
hlt
dio p06
sas p06
hlt      ,finish rar
lac * p11
lio * p12.
jda p00
ral
sas * p11
hlt
dio p06
sas p06
hlt      ,finish ral
lac * p11
lio * p12
jda p00
rir
sas * p11
hlt
dio p06
sas p06
hlt      ,rir done
lac * p11
lio * p12
jda p00
ril
sas * p11
hlt
dio p06
sas p06
```

```

                                hlt      ,ril done
                                lac * p11
                                lio * p12
                                jda p00
                                rcr
                                sas * p11
                                hlt
                                dio p06
                                sas p06
                                hlt      , rcr done
                                lac * p11
                                lio * p12
                                jda p00
                                rcl
                                sas * p11
                                hlt
                                dio p06
                                sas p06
                                hlt      ,rcl done
                                idx p12
                                idx p11
                                sas p14

                                jmp p16
                                idx p05
                                sas p15
                                jmp p13
f110  szs 20
                                jmp be10
                                rpb
                                dio & & 3
                                spi *
                                rpb
                                0
                                jmp f110
                                jmp p01      ,temp for residue
p10   0
p06   0      ,base
p05   0      ;temp for command
p02   0
p00   0      ,ac
                                dap p01      ,return
                                lac * p01
                                dac p02
                                idx p01      ,return
                                law p03
                                dap p08      ,to put ccmmands away
                                law 44      ,36
                                dac p06
p07   lac p06
                                sub p05
                                spa
                                jmp p09

```

```

                                dac p06
                                law p04
                                add p05
                                dap  $\phi$  & 1
                                lac
p08                               add p02
                                dac
                                idx p08
p09                               jmp p07
                                law p04
                                add p06
                                dap  $\phi$  & 1
                                lac
                                add p02
                                dac * p08
                                idx p08
                                lac p10
                                dac * p08
                                lac p00
p03                               0
org p03                          & 46
p01                               jmp
p04                               0
                                s1
                                s2
                                s3
                                s4
                                s5
                                s6
                                s7
                                s8
                                s9
p15                               12
p14                               lac tb2 & 5
tb2                               0
                                - 0
                                525252
                                252525
end .
```

```
,TEST 10
,shift test law dap isp ior rar idx
,9/22/61
,S. L.
bell                               szs 10
                                hlt
                                law p5
```



```

dap p4
law tb1
dap p1

law tb3

dap p5
law tb4

dap p6
law * 3
dac t1
law tb2
dap p2 & 2

p1 law
dap p7
idx p1

isp t1
jmp p2
sad t2
jmp fillp13
sad t12
jmp p14
law p7 - 4
dap p4
law t10
dap p11

p2 dap p12
law * 7

dac t3
lac

dac p10
dac t4

idx p10

idx p2 & 2

p4 isp t3
jmp

jmp p1 - 2

p14 law t11
jmp p2 - 2

p5 law

dap p11

p6 idx p5
law
dap p12

idx p6
law 1

dac t5
```

```

                                law * 11
                                dac t6
p7                               lac
                                lio * p7
p10
p11                               sas
eh1                              hlt
                                dio t7
                                lac t7
p12                               sas
eh2                              hlt
                                lac t5
                                ral s1
                                dac t5
                                lor t4
                                dac p10
                                isp t6
                                jmp p7
                                jmp p2 & 2
fill                             szs 20
                                jmp bell
                                rpb
                                dio  $\phi$  & 3
                                spi *
                                rpb
                                0
                                jmp fill
t1                               0
t3                               0
t4                               0
t5                               0
t6                               0
t7                               0
tb1                             252525
                                525252
t10                             000000
t11                             777777
tb2                             sal
                                sar
                                sil
                                sir
                                scl
                                scr
tb3                             125252
                                125252

```

252525

252525
125252
125252

652525

652525

525252

525252

652525

652525

t2
t12
tb4

2

1

252525
252525

125252
125252

525252

525252

525252

525252

652525

652525

252525

252525

end .