PDP-4 PROGRAM LIBRARY

NUMBER: DEC - 4 - 45 - M (7-78-M)

NAME: 370 Light Pen Diagnostic Program

AUTHOR: C. Stein - DEC

DATE: April 29, 1964

SPECS: PB

NEEDED: 340 Display

ABSTRACT: Light Pen Diagnostic is a utility program designed to test the 370 Light pen operation with a 340 display. The test and intensity settings are selected by the AC switches. The program starts in location 22_8. All error detection is visual.

CHAPTER I

Console Operating Procedure

The tables below describe the operation procedure to be used when running this diagnostic:

Table 1-1 Loading Procedure:

1. Place tape 370 DIAGNOSTIC in reader
2. Start in 7770_8 or 17770, depending on the size of the computer.

Table 1-2 Switches:

Switch	Meaning
1	Sensitivity and resume iot test
3	Light pen follow test
5	Field of view test
7-9	X coordinate of lower left corner of field of view box
11-13	Y coordinate of lower left corner of field of view box
15-17	Intensity value for pen follow and field of view box

All error detection is visual.

CHAPTER II

Test Description

2-1 Sensitivity and Resume Iot Test: This tests the light pen interrupt and the display resume iot (DRS.) at all eight intensity levels. Eight horizontal vectors are drawn parallel to one another starting at x = 700_8, y = 100_8, and at minimmm (0) intensity with the last vector at maximum (7) intensity starting at x = 700, y = 1000_8. When the light pen is placed at any point to the right of center of any line, the vector will be truncated. This demonstrates that the pen is "seeing" light. If the pen is placed to the left of center, the line appears in full. This shows that the display is resuming after a pen interrupt.

2-2 Light Pen Follow Test: This test indicates the speed of response of the 370 light pen. A cross is drawn in the center of the screen. The operator places the pen on the cross and then can move the pen. Two lines are drawn perpendicular to one another from the center of the screen to the present pen position. Thus as the pen is moved, a different line is drawn. The cross is drawn in such a way, that if the pen approaches the edge of the screen, the cross will stop.

2-3 Field of View Test: This test determines the light pen field of view or the area "seen" by the pen at any position or intensity on the screen. A box approximately one half inch on a side is diplayed on the screen. The position and intensity of the box is determined by the user. Every point within the box is displayed. When the pen is placed over the box, a 4x enlargement of the points "seen" is drawn in the opposite half of the screen. Above the box a digital readout is displayed of the number of points seen by the pen in decimal. To use this test, set AC switches 0 and 5 up and place two numbers in AC switches 7-9 and 11-13. The number placed in AC switches 7-9 and 11-13 are the x and y coordinates of the lower left corner of the solid box, divided by 200_8. Thus if the number 5 were placed in switches 11-13 and 6 placed in 7-9, the coordinate of the lower left corner of the box would be:

$$X = 6 \times 200 = 1400_8$$
$$Y = 5 \times 200 = 1200_8$$

The purpose of allowing the user to position the box is to allow him to test the field of view at any point on the screen.

Next place a desired intensity setting (0=minimum, 7=maximum) in AC switches 15-17. This allows the user to test the sensitivity of the pen to all or any intensity level.

Now the pen may be placed over the small box, and the 4x enlargement and digital readout will be seen. To eliminate the digital readout, set AC switches 0 down. To stop the test, set AC switches 0 and 5 down.

```
bthsid,     dac temp2
            lac (jmp i outgo)
            dac stpcod
            dac corhit
            lac (jmp gotcha
            dac lphit
            dzm lpct

outpt,      jms outgo
            jms outgo
            lac noswit
            sna
            jmp .+6
            law nobfxx
            iot 606
            iof
            iot 601
            jmp .-1
            lac buf+1
            add (1)
            sad bufdon
            skp
            jmp incre
            lac temp1
            dac buf+1
            lac temp2
            dac buf 5
            lac buf 6
            add (4)
            dac buf 6
            lac buf+2
            add (1)
            sad bufd1
            jmp done
            dac buf+2
            jmp outpt

incre,      dac buf+1
            lac buf 5
            add (4)
            dac buf 5
            jmp outpt
```

```
done,           las
                and (400000
                sna
                jmp lftsid-6
                lac buf+5
                and (1777
                dac call+2
                lac (1300
                dac call+3
call,           lac lpot
                jms outnox
                0
                0
                dac nobfxx
                dac temp1
                lac (400000
                dac i temp1
                isz temp1
                lac (3000
                dac i temp1
                law .
                dac noswit
                las

                and (10000
                sza
                jmp hole 2
                dzm noswit
                jmp i hole

lftsid,         lac buf+5
                jmp bthsid

hobuf,          34110
                20000
                202000
                13000
                30137
                20000
                342000
                306310
                621462
                3000
                777777
```

```
gotcha,     isz lpct
            iot 704
            law buf 4
            jmp outgo 2
nobfxx,     nobfxx+300/

blt,        0
            dac 10
            law buf-1
            dac 11
            lac i 10
            sad (777777)
            jmp i blt
            dac i 11
            jmp blt+4

follow,     0
            lac fx
            dac xpt
            lac fy
            dac ypt
            las
            and (7)
            xor param
            dac buf
            lac (3000)
            dac buf+4
            lac ypt
            xor fywd
            dac buf 1

            lac (jmp gety)
            dac stpcod
            lac (jmp i outgo)
            dac lphit
            lac (hlt)
            dac corhit
            lac xpt
            add (50)
            and (2000)
            sza
            jmp backup
            lac xpt
            add (50)
            xor fxwd
            dac buf+2
            lac (600277
            dac buf+3
            jms outgo
            iot 716
            rtr
            rtr
            rtr
            rtr
            and (1776)
            dac x1

            lac xpt
            tad (-47)
            spa
            jmp moveup
            xor fxwd
            dac buf+2
            lac (600077
            dac buf+3
            jms outgo
            iot 716
            rtr
            rtr
            rtr
            rtr
            and (1776)
            add x1
            rar
            and (1777)
            dac xpt
gety,       lac (jmp sho)
            dac stpcod
            lac xpt
            xor fxwd
            dac buf+2
            lac ypt
            add (50)
            and (2000)
            sza
            jmp bacyup
            lac ypt
            add (50)
            xor fywd
            dac buf+1
            lac (737400
            dac buf+3
            jms outgo

            iot 716
            ral
            and (1776)
            dac y1
            lac ypt
            tad (-47)
            spa
            jmp movyup
```

```
           xor fywd
           dac buf+1
           lac (637400
           dac buf+3
           jms outgo
           iot 716
           ral
           and (1776)
           add y1
           rcr
           dac ypt

show,      law buf 2
           dac 10
           lac (34114
           dac buf
           lac fy
           xor fywd
           dac buf 1
           lac fx
           xor fxwd
           dac buf 2
           lac fx
           cma
           tad (1
           tad xpt
           dzm sign
           spa
           jms absval
           dac mag
           and (777600)
           sza
           jmp modify

lastx,     lac (200000)
           xor mag
           xor sign
           dac i 10
           lac fy
           cma
           add (1)
           tad ypt
           dzm sign
           spa
           jms yabs
           dac mag
           and (777600)
           sza
           jmp modifx
```

```
lasty,      lac mag
            rtl
            rtl
            rtl
            rtl
            and (77400)
            xor sign
            xor (600000)
            dac i 10
            lac (3000)
            dac i 10
            lac (jmp done1)
            dac stpcod
            dac lphit
            dac corhit
            jms outgo

absval,     0
            cma
            dac temp2
            lac (200)
            dac sign
            lac temp2
            jmp i absval

yabs,       0
            cma
            dac temp2
            lac (100000)
            dac sign
            lac temp2
            jmp i yabs

done1,      las
            and (40000)
            sza
            jmp follow+5
            jmp i follow

modify,     lac mag
            tad (-176)
            dac mag
            lac (200177)
            xor sign
            dac i 10
            lac mag
            jmp lastx-3
```

```
modifx,     lac (277400)
            xor sign
            dac i 10
            lac mag
            tad (-176)
            dac mag
            jmp lasty-3

senst,      0
            law senbu-1
            jms blt
            lac (jmp gotlp)
            dac lphit
            lac (jmp i outgo)
            dac stpcod
outpt1,     jms outgo
            lac buf
            sad (34117)
            jmp reset
            add (1)
            dac buf
            lac buf+2
            add (100)
            dac buf+2
            jmp outpt1
reset,      lac (34110)
            dac buf
            lac (302100)
            dac buf+2
            las
            and (200000)
            sza
            jmp outpt1
            jms i senst

gotlp,      iot 712
            and (400000
            sza
            jmp outpt1+1
            iot 504
            jmp outgo 3

backup,     lac xpt
            tad (-27
            dac xpt
            jmp gety
```

```
moveup,     lac xpt
            tad (30
            dac xpt
            jmp gety

bacyup,     lac ypt
            tad (-27
            dac ypt
            jmp show
movyup,     lac ypt
            add (30
            dac ypt
            jmp show
senbu,      34110
            20700
            302100
            600177
            3000
            777777

outgo,      0
            law buf
            iot 606
            ion
            jmp .


inter,      jms corrut
            skp
            jmp corhit-1
            iot 701
            skp
            jmp lphit-1
            iot 601
            skp
            jmp stpcod-1
            iot 102
            iot 202
            iot 302
            iot 402
            ion
            jmp i 0
```

```
dsi=iot 601
dsp=iot 701

            iot 704
stpcod,     0
            iot 704
corhit,     0
            iot 704
lphit,      0

corrut,     p
            dsx
            skp
            jmp . 3
            dsy
            jmp i corrut
            isz corrut
            jmp i corrut

buf,        0
buf 20/

dsx=iot 501
dsy=iot 1001

fy,         1000
fx,         1000
param,      34110
fxwd,       102000
fywd,       220000

start
```

```
display octal and decimal output

outnox,    0

/ routine to convert octal numbers to decimal and generate
/ buffer for display
/ calling sequence:
/ call,    lac a             number to be converted
/          jms outnox
/          x                 x coordinate of left number
/                            bit 0=1 if octal rather than dec.
/          y                 y coordinate of left number
/          dac buff          address of buffer
/          return            last buffer address in AC
/          leading zeros replaced by blanks.

            dac outmpx
            lac i outnox
            and (377777
            xor xwdx
            dac t1x
            lac i outnox
            and (400000
            dac t68x
            isz outnox
            lac i outnox
            xor ywdx
            dac t2x
            isz outnox
            lac 10
            dac t3x
            lac i outnox
            dac 10
            lac t68x
            sza
            jmp octout
            lac (tab-1)
            dac tabcon
bothx,      lac paramx
            xct i outnox
            lac t1x
            dac i 10
            lac t2x
            dac i 10
            lac 11
            dac t1x
            lac 12
            dac t2x
            lac tabcon
            dac 11
            dzm zerswt
            -4
            dac cvntx
```

```
loopx,          dzm t4x
                lac i 11
                dac t5x
                lac outmpx
                tad t5x
                spa
                jmp .+3
                isz t4x
                jmp .-4
                dac outmpx
                lac t5x
                cma
                tad outmpx
                dac outmpx
                isz outmpx
                lac t4x
                sna
                jms zerois
                law .
                dac zerswt
                lac t4x
                add (base)
                dac t69x
                xct i t69x
                jms bltx
                isz cvntx
                jmp loopx
                nop
                -0
                dac cvntx
                lac (jmp .+4
                dac .-4
                dac zerswt
                jmp loopx
                lac (nop
                dac .-10
                lac 10
                dac t4x
                lac t3x
                dac 10
                lac tix
                dac 11
                lac t2x
                dec 12
                isz t4x
                lac t4x
                isz outnex
                jmp i outnex
```

```
paramx,     30177
xwdx,       20000
ywdx,       340000
tab,        -303237
            -23417
            -1747
            -143
            -11
            -0

zerox,      307042
            221250
            331463
            237400
            104200
            777777
onex,       304216
            221042
            227400
            135673
            030000
            777777
twox,       225252
            227317
            230000
            031460
            234210
            104000
            777777
threex,     225612
            167340
            225213
            237660
            135400
            777777
fourx,      124000
            226302
            325243
            231463
            236000
            104200
            777777
fivex,      225612
            221354
            370042
            224210
            135463
            031400
            777777
```

```
sixx,          307052
               341052
               305400
               170000
               235477
               104200
               777777
sevenx,        021042
               221210
               301777
               371460
               104210
               100000
               777777
eightx,        307052
               361250
               331773
               237400
               104200
               777777

ninex,         225612
               221042
               366363
               334000
               135660
               777777
blank,         104210
               100000
               777777
```

```
zerois,         0
                lac zerswt
                sza
                jmp zerxit
                lac (12)
                dac t4x
                isz zerois
zerxit,         isz zerois
                isz zerois
                jmp i zerois

bltx,           0
                dac 12
                lac i 12
                sad (-0
                jmp i bltx
                dac i 10
                jmp bltx+2

base,           law zerox-1
                law onex-1
                law twox-1
                law threex-1
                law fourx-1
                law fivex-1
                law sixx-1
                law sevenx-1
                law eightx-1
                law ninex-1
                law blank-1

octout,         lac (tabix-1)
                dac tabcon
                jmp bothx

tabix,          777777
                7777
                777
                77
                7
                -0

start
```