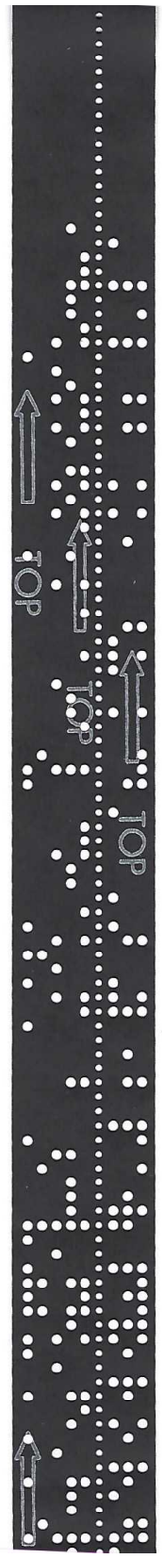
RetroComputing

H316 Paper Tape Project

- What is “punched paper tape”?
- Why was paper tape used for minicomputers?
- Paper Tape demo
- Honeywell H316 minicomputer simulator


TOP
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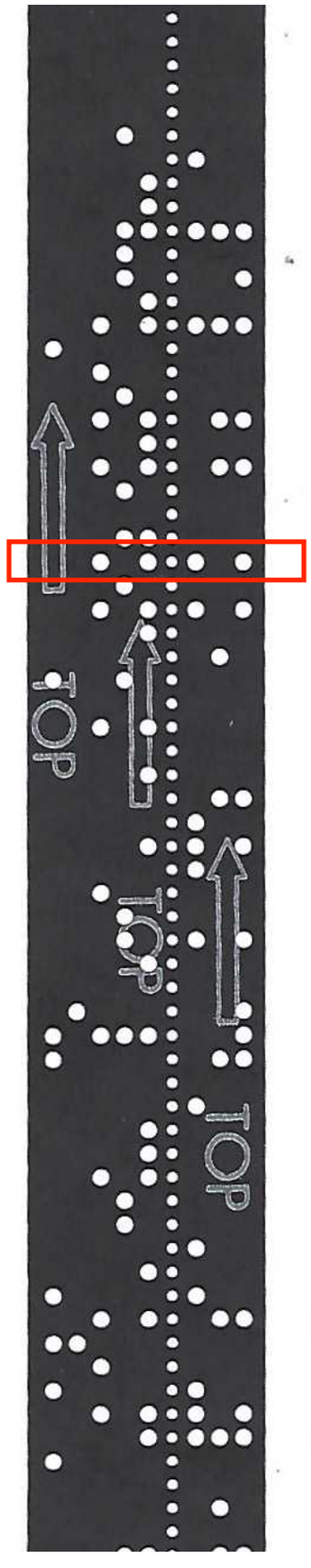

One 8-bit ASCII character
or
8 bits of data
00101x101

“teletype noise is a common background to old newspaper movies”

–Bryan Dietz

https://youtu.be/CwblSeIdi0s

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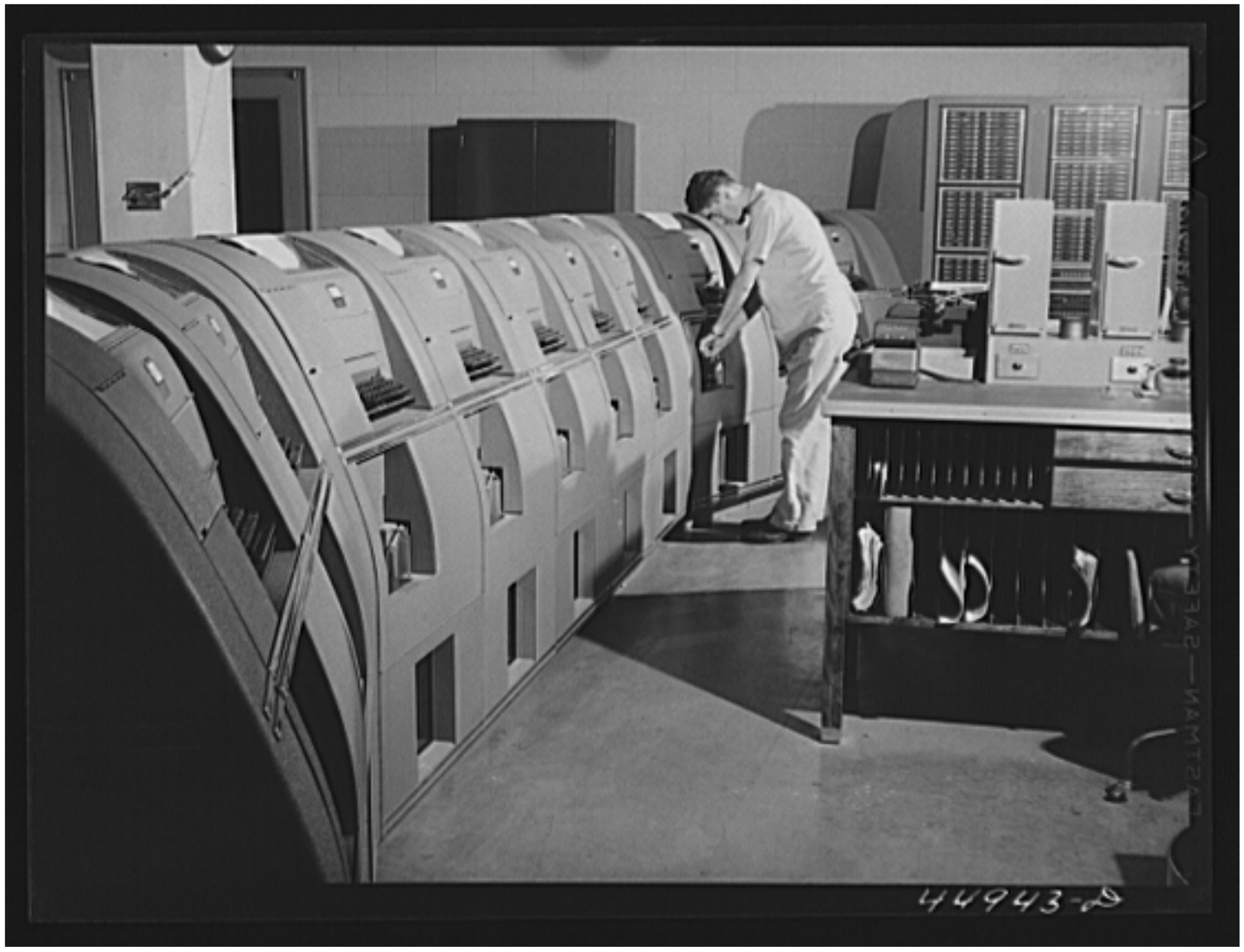
Why did minicomputers use paper tape?

- inexpensive, high volume teletype/tape readers (vs. low volume mainframe computer i/o devices)
- Honeywell H316/DEC-PDP 11/DG Nova/others (program loading/file storage)
- Late 1960s up until introduction of personal computers and i/o devices

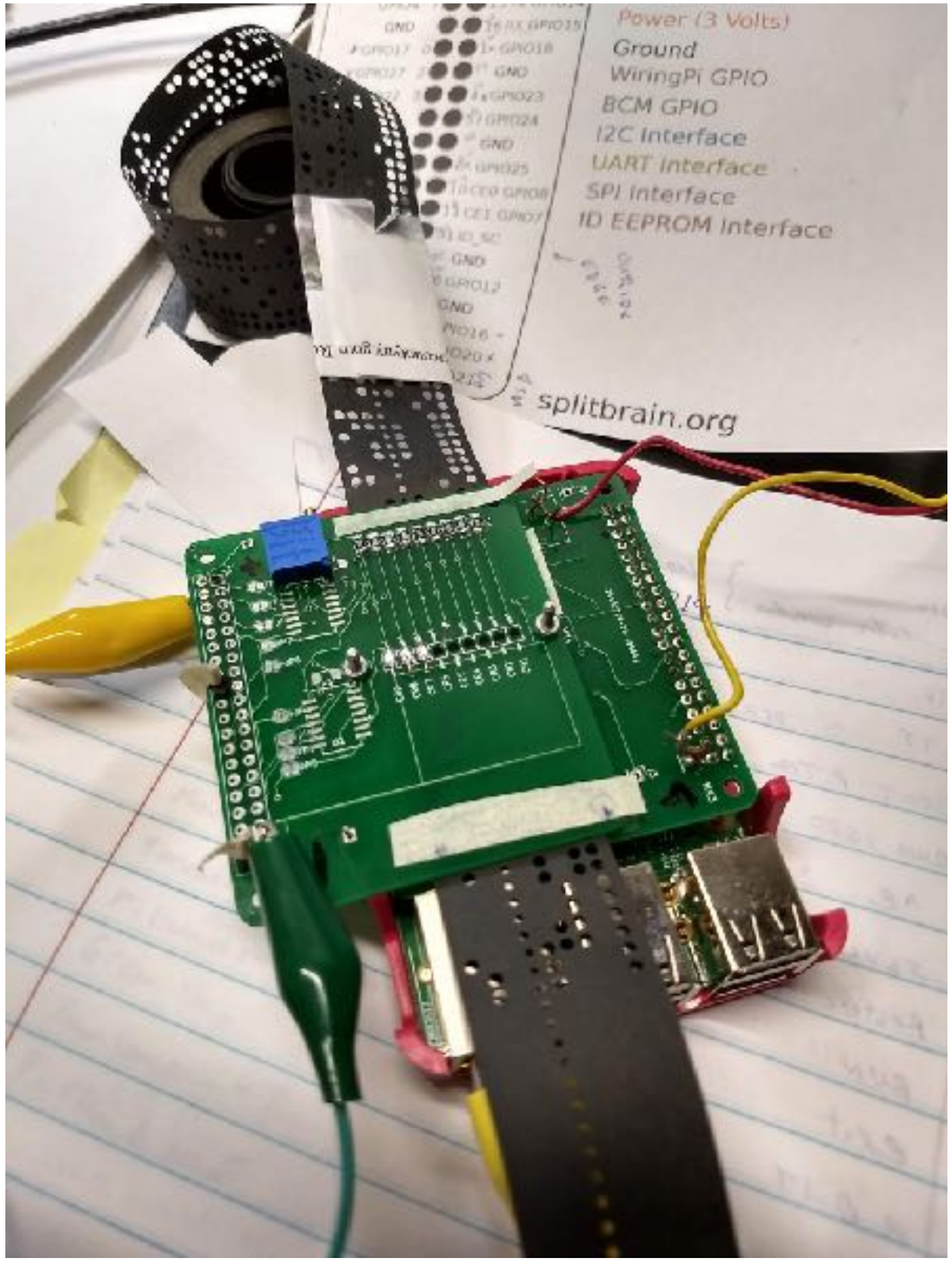
10 characters/second

32 K words/64 K bytes
1 microsecond cycle time
Simple RISC-like instructions



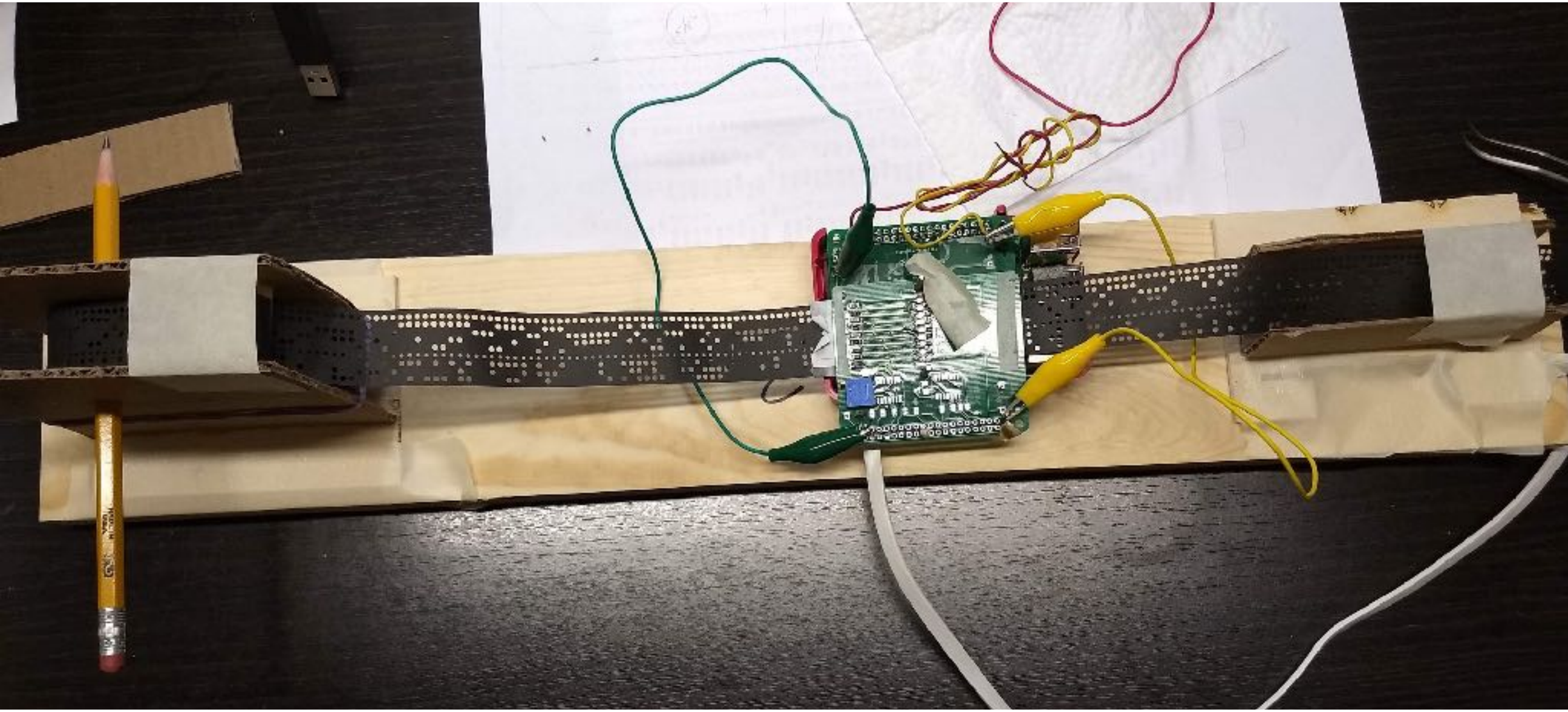
Typical H316 Applications

- Interactive technical calculations - during “slide rule era”
- Dedicated teletype networks “message switching”
- Machinery control - CNC
- Hospital Labs/data entry/mainframe networking … ARPAnet Nodes



DIY Paper Tape Reader

1. top board — 9 LEDs
2. paper tape slot
3. 9 phototransistors
4. raspberry pi

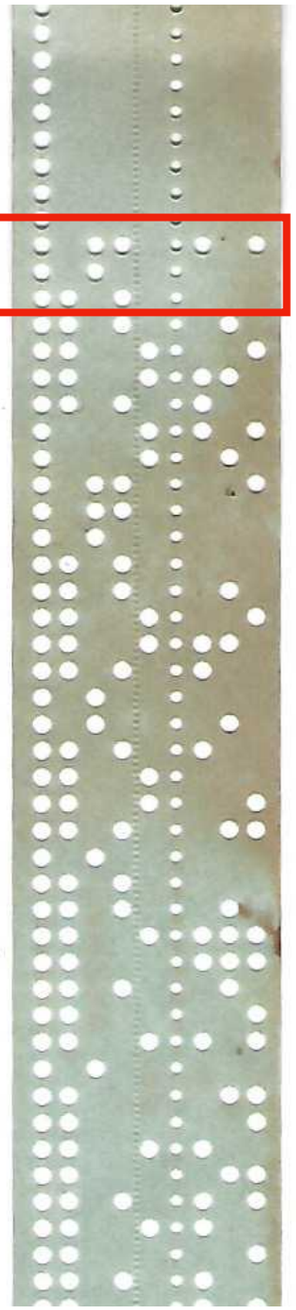


```
-rw-r--r-- 2 pi pi 10000 Jul 22 14:50 tandi_tander.basic
drwxr-xr-x 2 pi pi  4096 Jul 22 15:12 old
-rw-r--r-- 1 pi pi 10000 Jul 22 15:40 mortgage.basic
pi@bry-pi:/media/pi/data/projects/raspberry-sw $ ./ptread.py sample
i/o number  [2, 4, 7, 8, 3, 5, 12, 13, 6]
|10000o000| 80 _
|00000o000| 0 _
|00000o000| 0 _
|10000o000| 80 _
|00000o000| 0 _
|00000o000| 0 _
|00000o000| 0 _
|00000o000| 0 _
|00000o000| 0 _
|00000o000| 0 _
|00000o000| 0 _
|00000o000| 0 _
|00000o000| 0 _
|00000o000| 0 _
|00110o101| 35 5
|00100o000| 20
|01010o000| 50 P
|01010o010| 52 R
|01001o001| 49 I
|11001o110| ce N
|11010o100| d4 T
 10001o101| 8d
|10001o010| 8a

|10110o001| b1 1
|10110o000| b0 0
|10100o000| a0
|11010o000| d0 P
|11010o010| d2 R
|11001o001| c9 I
|01001o110| 4e N
|11010o100| d4 T
|10100o000| a0
|10100o010| a2 "
|11010o100| d4 T
|01001o000| 48 H
|01001o001| 49 I
|01010o011| 53 S
```

```
-rw-r--r-- 1 pi pi 10000 Jul 22 15:40 mortgage.basic
pi@bry-pi:/media/pi/data/projects/raspberry-sw $ ./ptread.py sample
i/o number  [2, 4, 7, 8, 3, 5, 12, 13, 6]
|10000o000| 80 _
|00000o000| 0 _
|00000o000| 0 _
|10000o000| 80 _
|00000o000| 0 _
|00000o000| 0 _
|00000o000| 0 _
|00000o000| 0 _
|00000o000| 0 _
|00000o000| 0 _
|00000o000| 0 _
|00000o000| 0 _
|00000o000| 0 _
|00000o000| 0 _
|00000o000| 0 _
|00110o101| 35 5
|00100o000| 20
|01010o000| 50 P
|01010o010| 52 R
|01001o001| 49 I
|11001o110| ce N
|11010o100| d4 T
 10001o101| 8d
|10001o010| 8a

|10110o001| b1 1
|10110o000| b0 0
|10100o000| a0
|11010o000| d0 P
|11010o010| d2 R
|11001o001| c9 I
|01001o110| 4e N
|11010o100| d4 T
|10100o000| a0
|10100o010| a2 "
|11010o100| d4 T
|01001o000| 48 H
|01001o001| 49 I
|01010o011| 53 S
|00100o000| 20
|01010o000| 50 P
|01010o010| 52 R
|01001o111| 4f O
|01000o111| 47 G
|01010o010| 52 R
|01000o001| 41 A
|01001o101| 4d M
```



https://en.wikipedia.org/wiki/Emulator

“An emulator is … software that enables one computer system to behave like another computer system.”
An emulator typically enables the host system to run software … designed for another system.

Host system: Raspberry Pi 2B
Guest system: Honeywell H316 ira 1974

Paper Tape labeled “DOCTOR 3/27/74 16K 33000 has LP EXA”

```
$
# - 47777
    14 +  2013
    15 - 70000 = DAC* 10000 : 110000 $
    16  $
    17  -100
    20  17: 100040
    20   2010 100/ DAC* 40702 ?
$
```