

Operating Systems

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Introduction

Course Review

- Introduction
- Process
 - Multiprogramming
 - multithread
 - Synchronization
 - Deadlock
 - Evaluation
- Secondary Storage
 - Disks
 - file organization
- Main Memory
 - Absolute Address
 - Relative Address
 - paging
 - Virtual Memory
 - segmentation
 - segmentation and paging combinations
 - Invert table

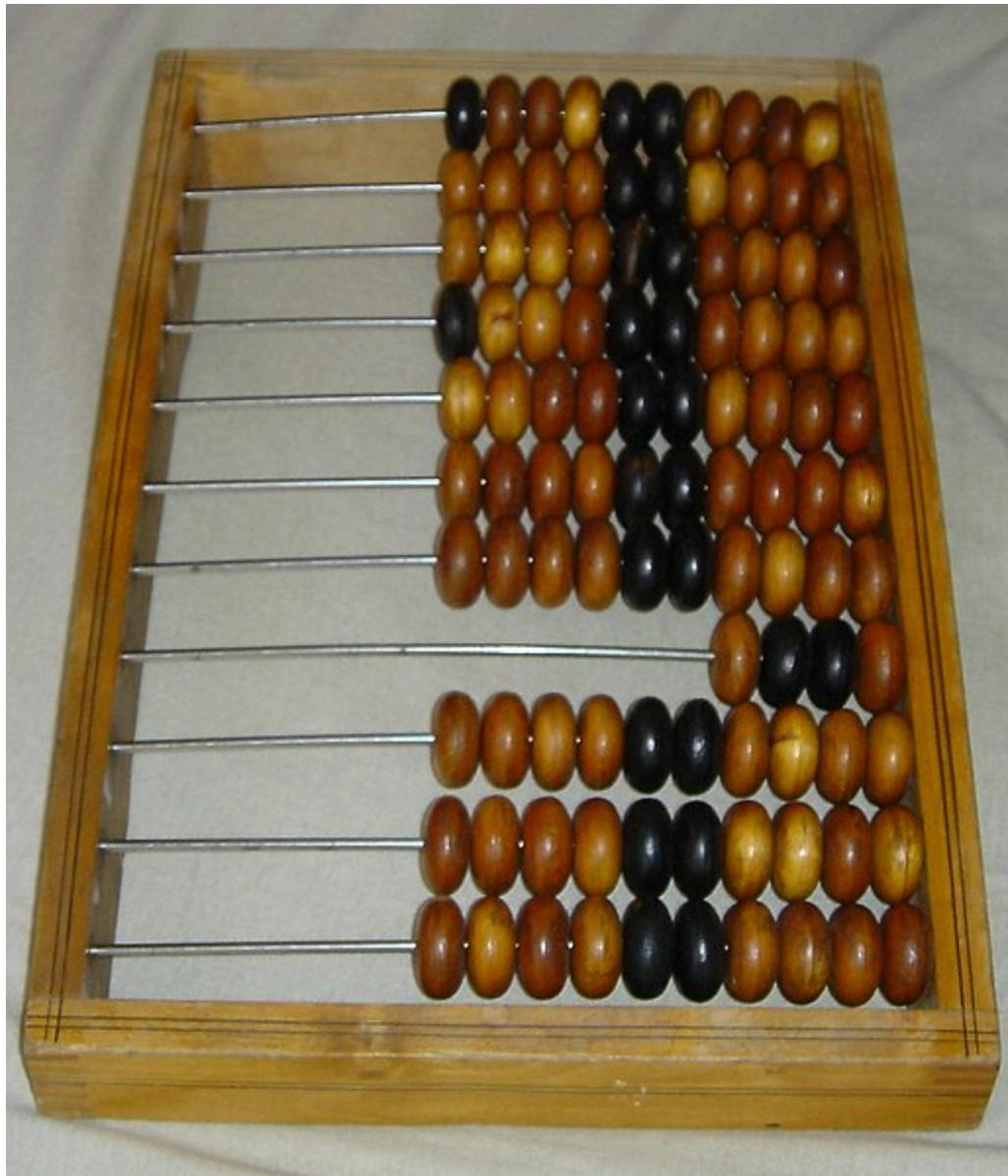
Making an imaginary computer step by step

Finding more about how hardware and software works

1. It needs to go back to principles
2. It provides clear path for what we already have
3. Understanding that why computers works this way nowadays

The Abacus and Counting Board

- <https://en.wikipedia.org/wiki/Abacus>



Mechanical Calculator

Pascaline

- A Pascaline signed by Pascal in 1652
- <https://en.wikipedia.org/wiki/Pascaline>



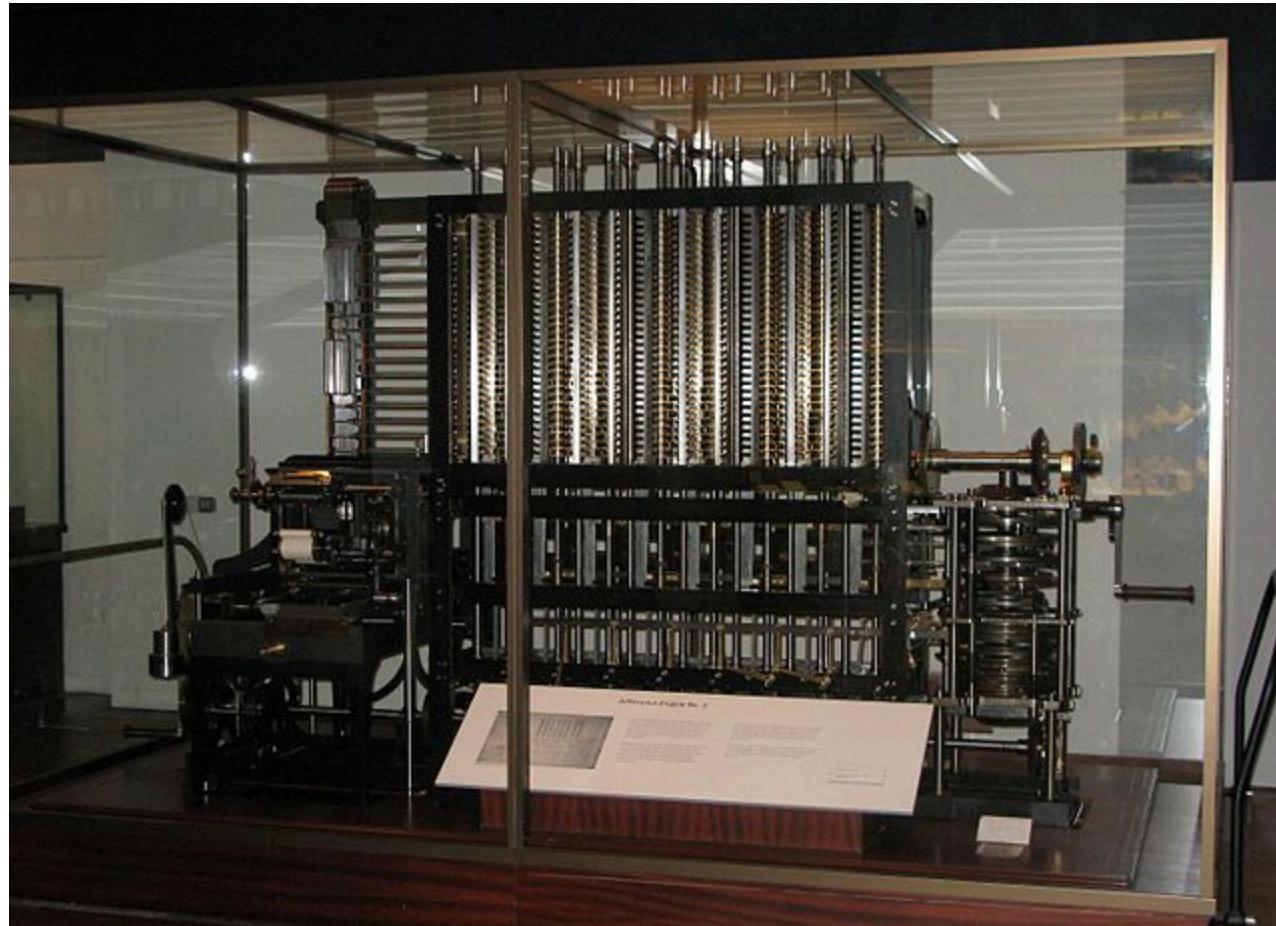
Jacquard Machines

- Joseph Marie Jacquard in 1804
- based on
 - the Frenchmen Basile Bouchon (1725)
 - Jean Baptiste Falcon (1728)
 - Jacques Vaucanson (1740). [8]
- https://en.wikipedia.org/wiki/Jacquard_machine



Mechanical Computer

- https://en.wikipedia.org/wiki/Mechanical_computer
- [Charles Babbage](#)
- [Ada Lovelace](#)



Analog Computer

- https://en.wikipedia.org/wiki/Analog_computer
- Polish analog computer AKAT-1 (1959)



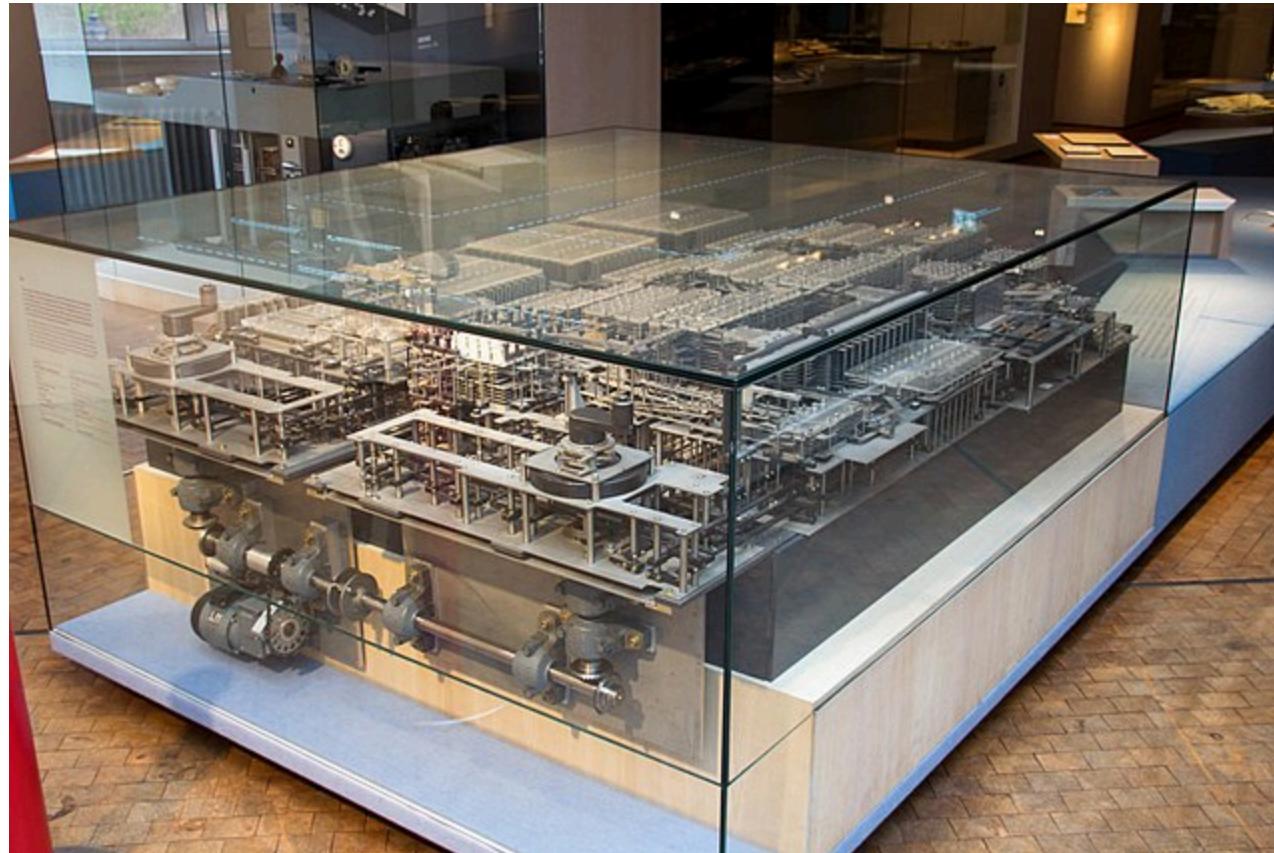
Analog vs Digital

- <https://en.wikipedia.org/wiki/Capacitance>
- <https://www.geeksforgeeks.org/difference-between-analog-computer-and-digital-computer/>

$$i(t) = C \frac{dv(t)}{dt}$$

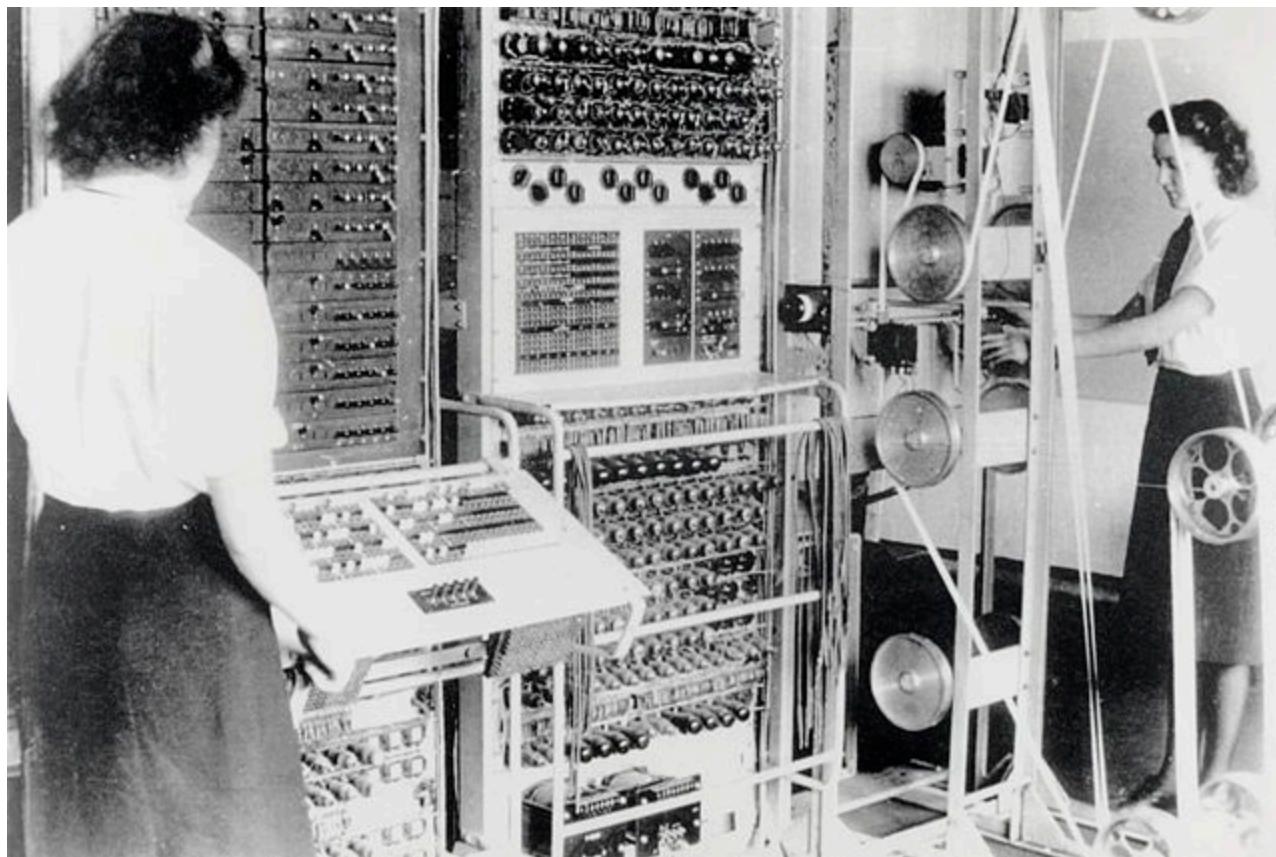
Electro Mechanical

- [Konrad Zuse](#)
 - [Z1\(1936\)](#)
 - Programmable
 - binary
 - electrically motor-driven mechanical computer
 - [Z2\(1940\)](#)
- [Harvard Mark I\(1944\)](#)



Digital Computer

- [Vacuum-tube computer](#)
- [Atanasoff–Berry computer](#)
 - neither programmable, nor Turing-complete
- [Colossus computer](#)
 - British code breakers
 - programmable
 - electronic
 - digital computer
 - programmed by switches and plugs
 - not by a stored program



Stored Program

- [Manchester Mark I](#)
- [The 1946 ENIAC computer used more than 17,000 vacuum tubes](#)
- [bootstrap_computer_history](#)
- [oldest-original-working-digital-computer](#)



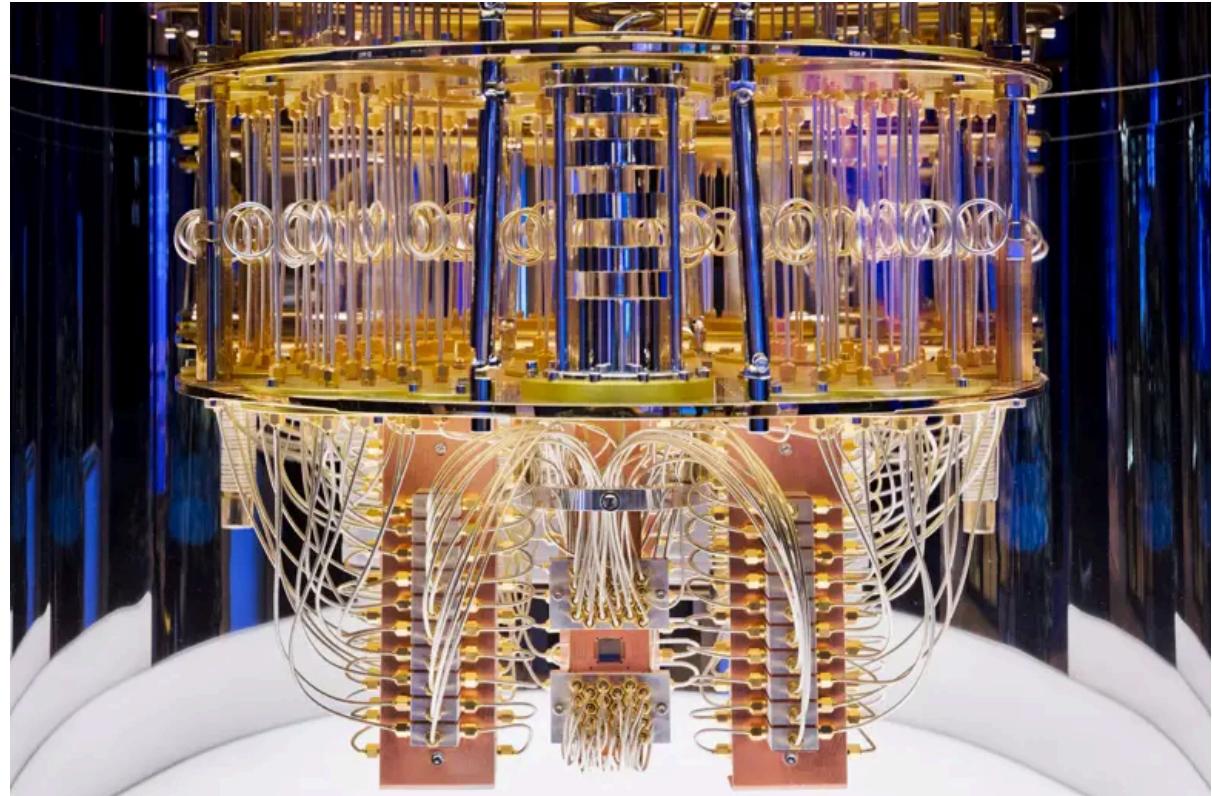
Analog Chipsets for AI Applications

- [Developers Turn To Analog For Neural Nets](#)
- [Texas Instruments](#)
- [IIC](#)
- [Analog Neural Circuit and Hardware Design of Deep Learning Model](#)
- [The Promise of Analog Deep Learning: Recent Advances, Challenges and Opportunities](#)
- [Harnessing Analog Hardware for Machine Learning](#)
- [Developers Turn To Analog For Neural Nets](#)



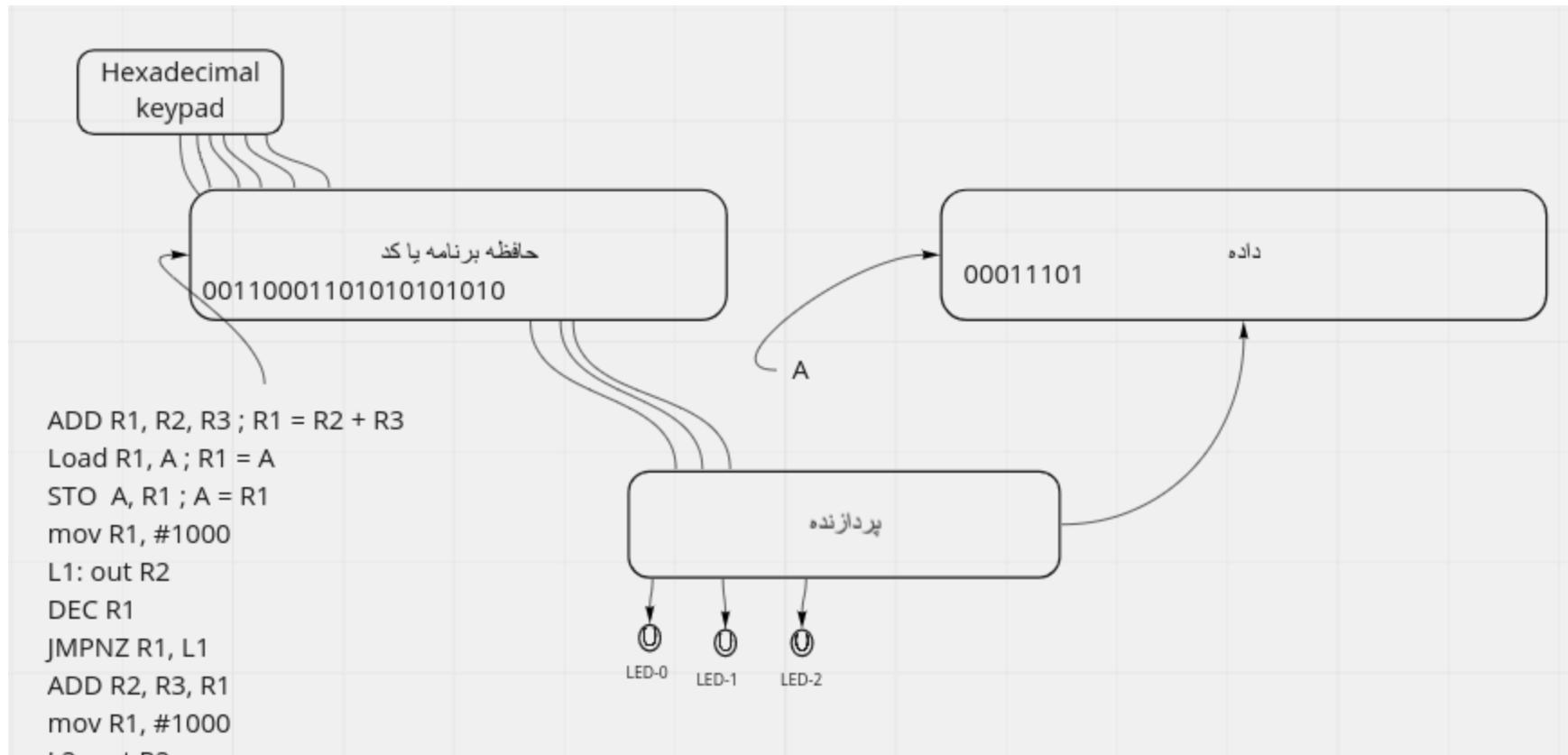
General Types of Computers

- Analog Computer
 - pros
 - cons
- Digital Computer
 - pros
 - cons
- Quantum Computer
 - pros
 - cons
- Biocomputing
 - pros
 - cons

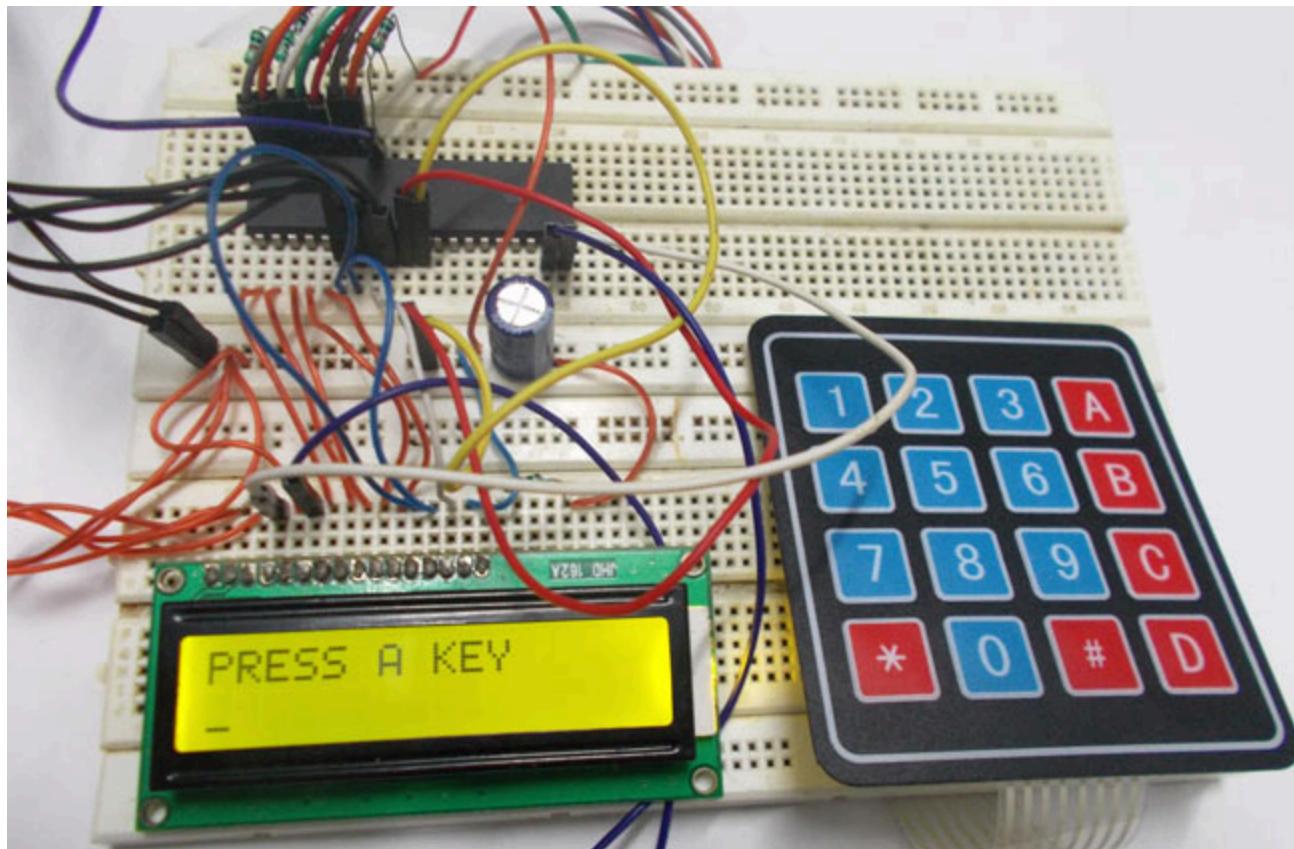


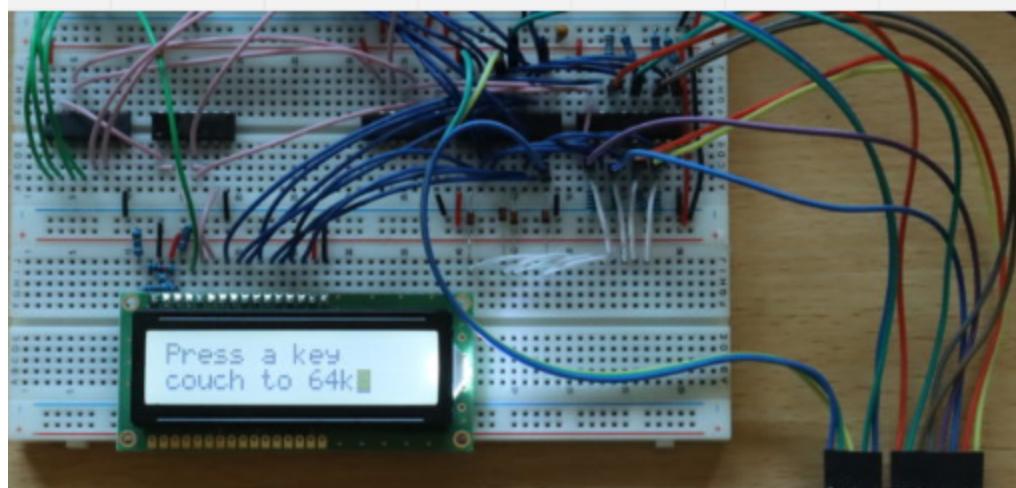
Imaginary Computer (YIC-10)

Different memory for code and data

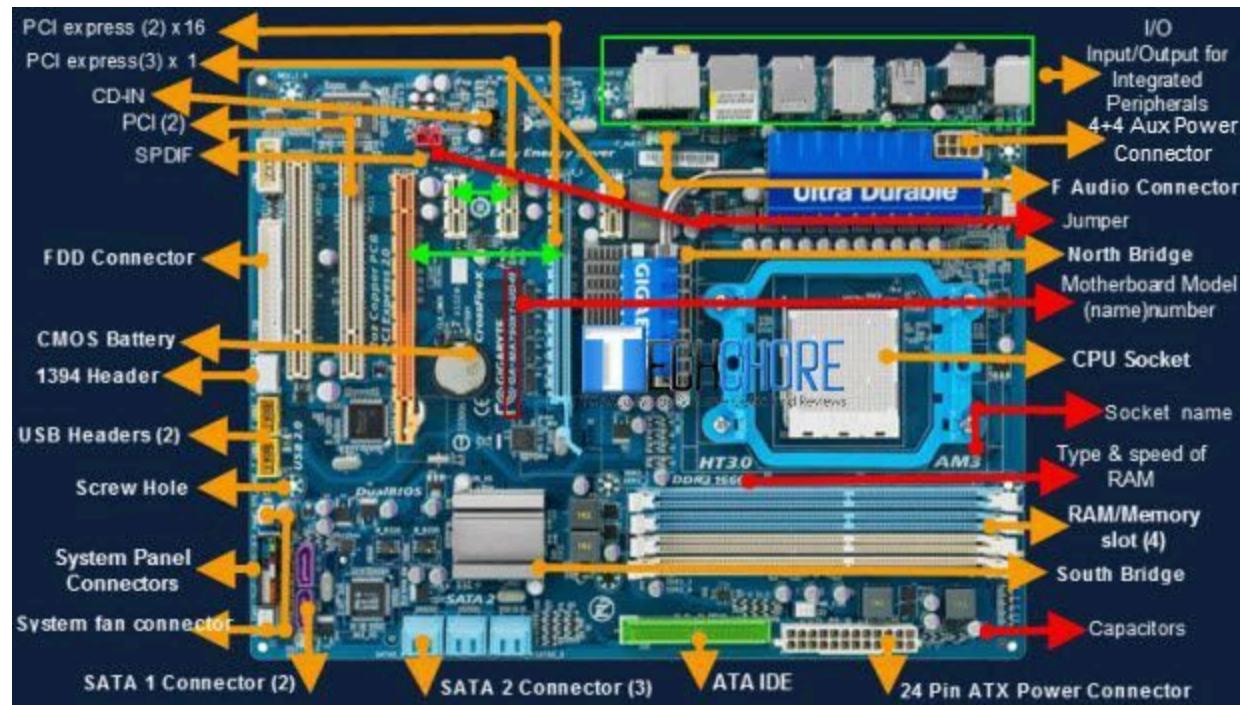




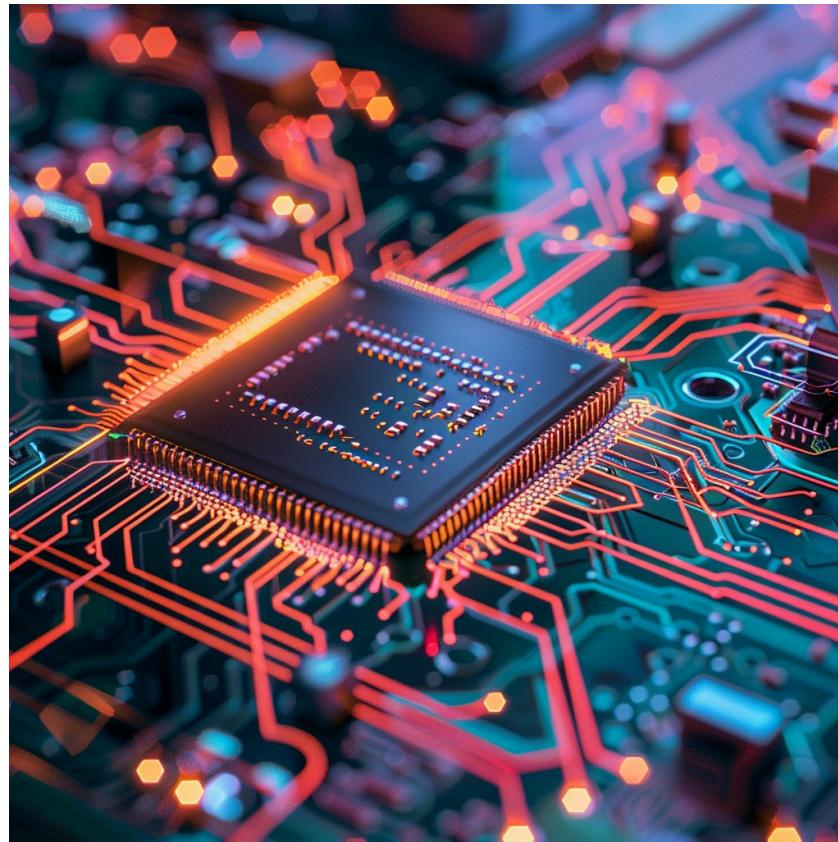


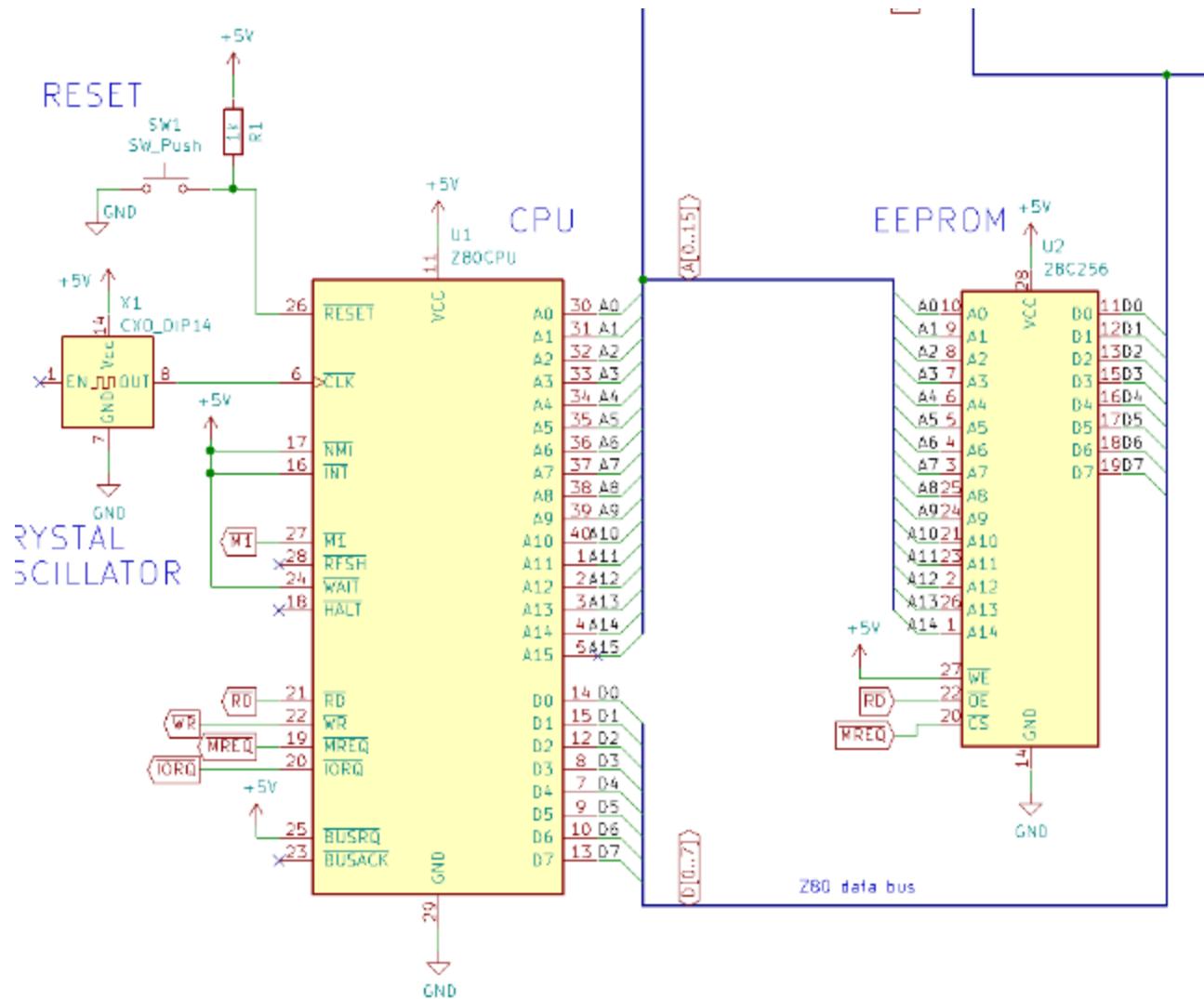


Real Motherboard



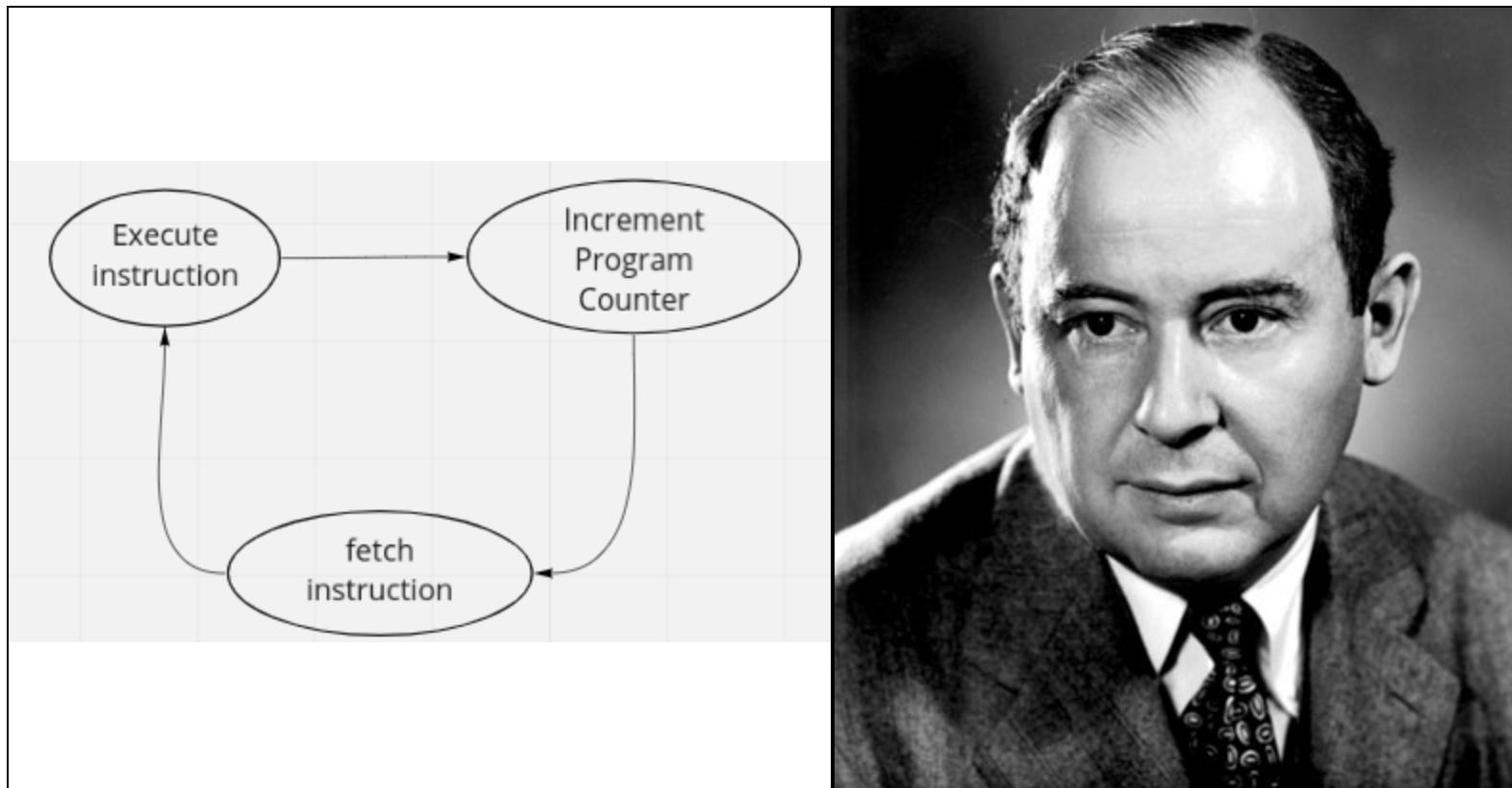
Motherboard Circuit

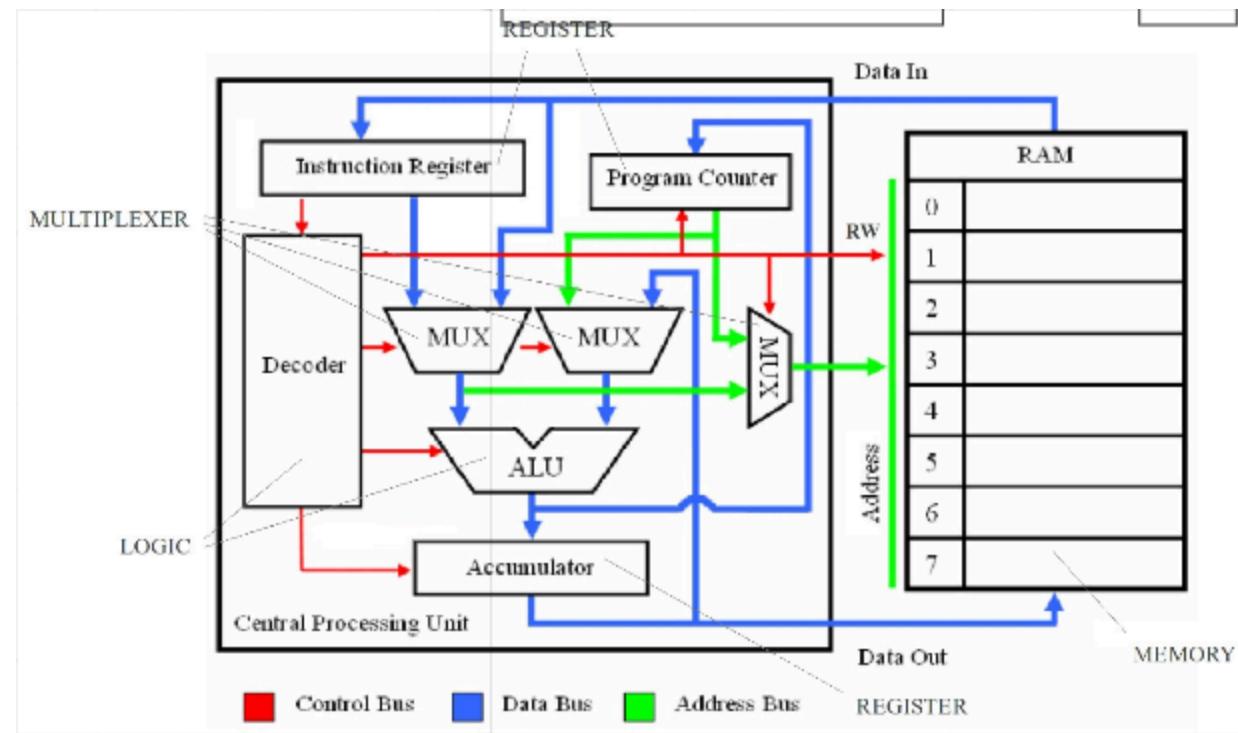




The Second Computer (YIC-10)

Uniform memory (John von Neumann)





Assembly Code and Machine Code

ADD A,B

A = A + B

; 01010111 00010101 0101010

OPcode	DATA_1	DATA_2
ADD	A	B

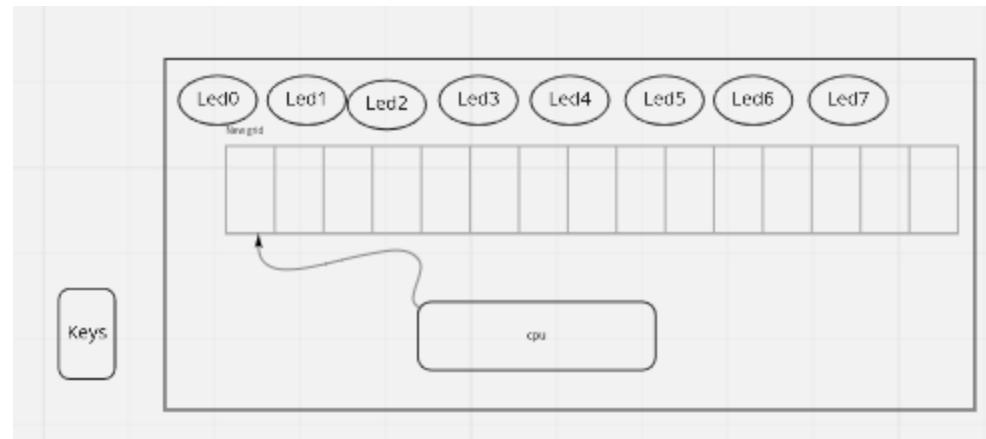
R1 = R2 + R3

ADD R1, R2, R3

; 010101001 0001 0010 0011

OP	Code	R1	R2	R3
----	------	----	----	----

010101001000100100011



Main Type of Processors

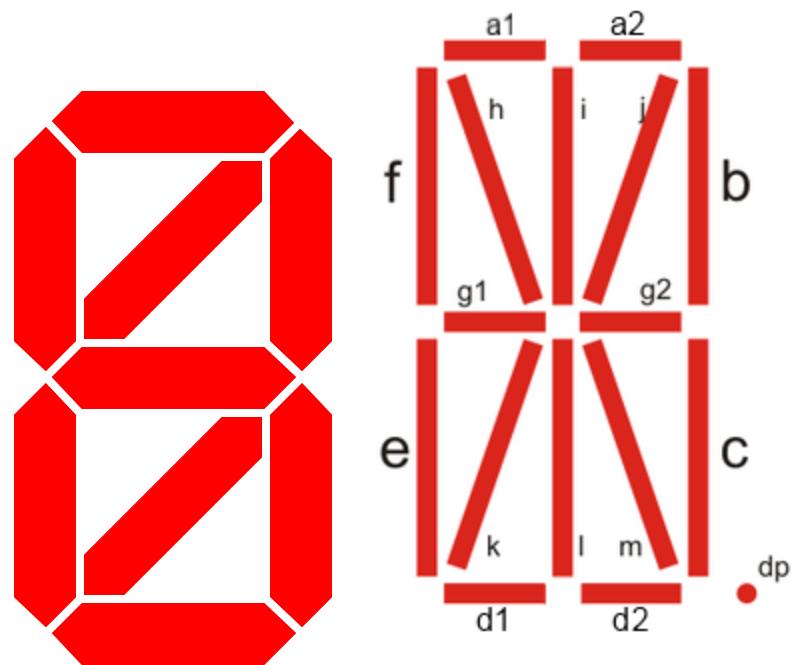
- RISC (Reduced instruction set computer)
 - https://en.wikipedia.org/wiki/Reduced_instruction_set_computer
- CISC (Complex Instruction Set Computer)
 - https://en.wikipedia.org/wiki/Complex_instruction_set_computer

Hardware vs Software

- pros
 - Less code
 - More speed
 - Less errors of writing code
- cons
 - Cost
 - Less Flexible

The common segment displays

- [Seven-segment display](#)
- [9 Segments Display](#)
- [Fourteen-segment display](#)
- [Sixteen-segment display](#)



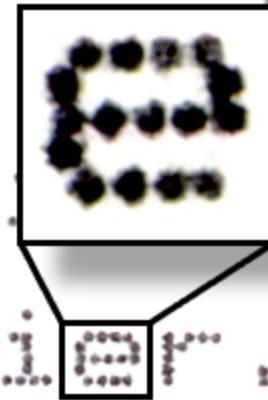
Epson WideCarriage Line Printer



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

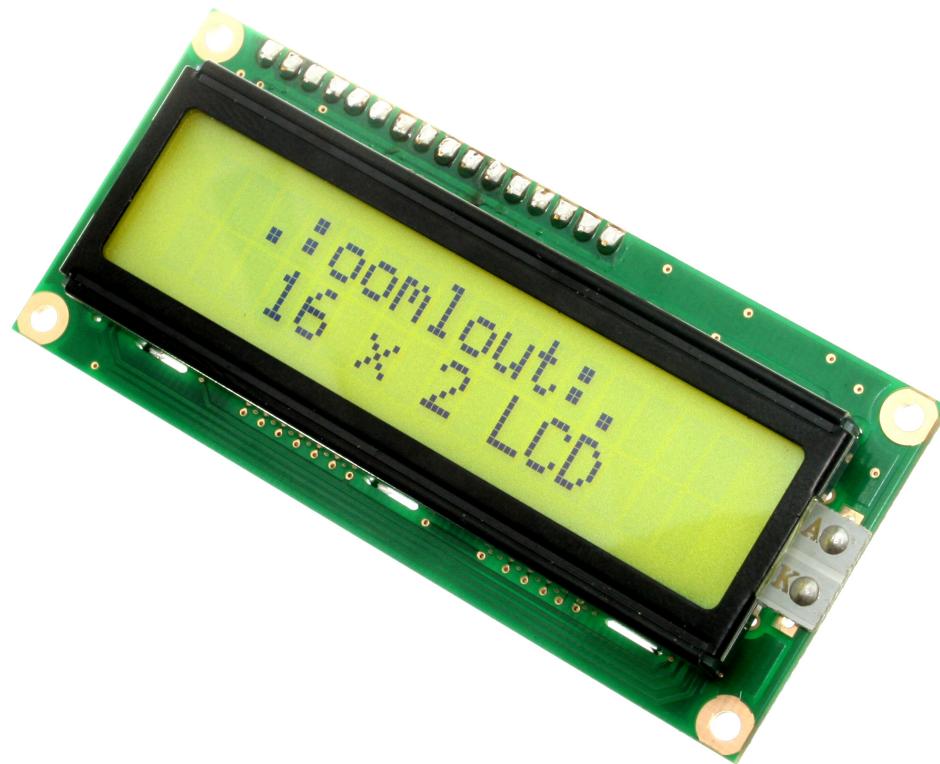
Dot matrix example text

ystem where a
ld allow us to
mercial supplier.



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

Dot-matrix display



- 128×16 (Two-lined)
- 128×32 (Four-lined)
- 128×64 (Eight-lined)
- 92×31 (Four or three-lined)
- https://en.wikipedia.org/wiki/Dot-matrix_display
- https://en.wikipedia.org/wiki/History_of_display_technology

1969 Braille display



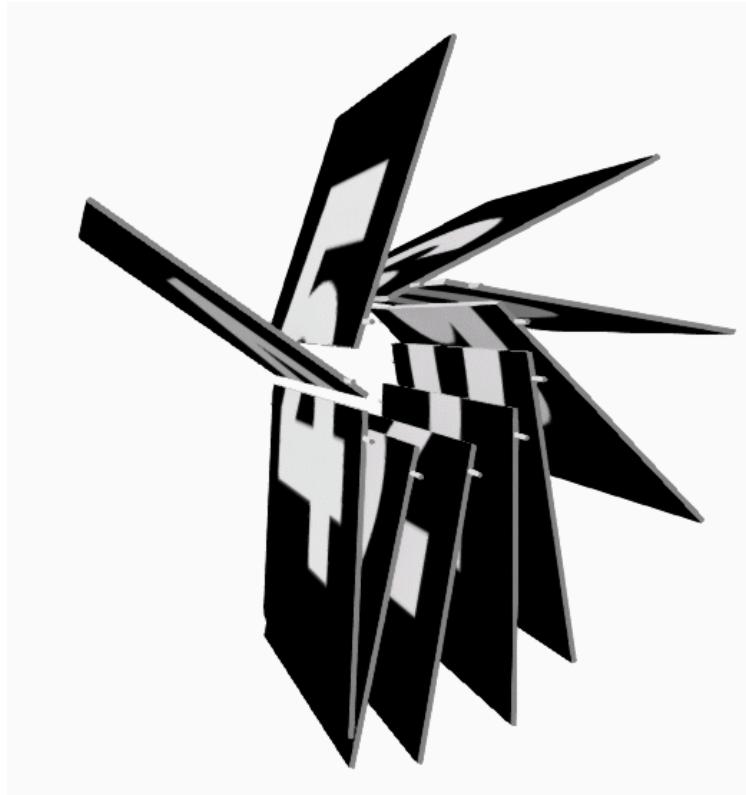
- https://en.wikipedia.org/wiki/History_of_display_technology

split flap display(I)



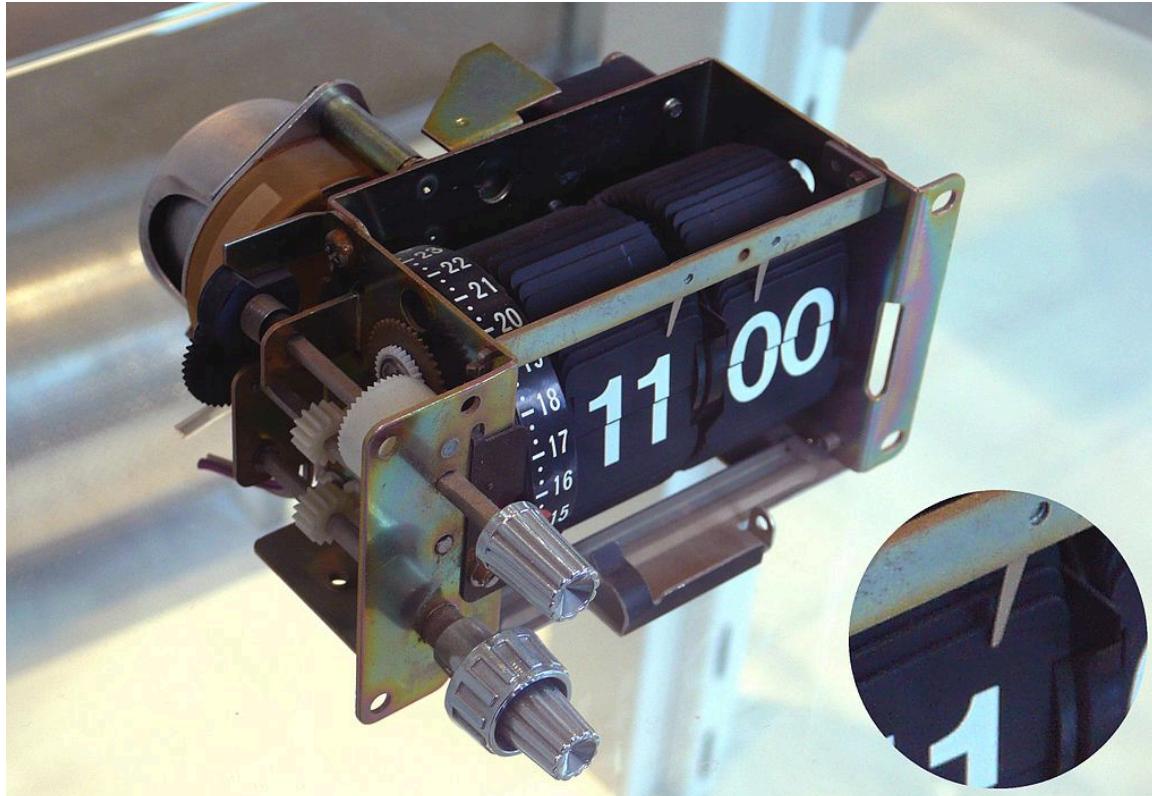
<http://arduinomania.com/tag/split%20flap%20display>

Split-flap display(II)



- https://en.wikipedia.org/wiki/Split-flap_display
- <https://www.dreamstime.com/illustration/airport-flip-sign.html>

Enlarged inner workings of a split-flap clock



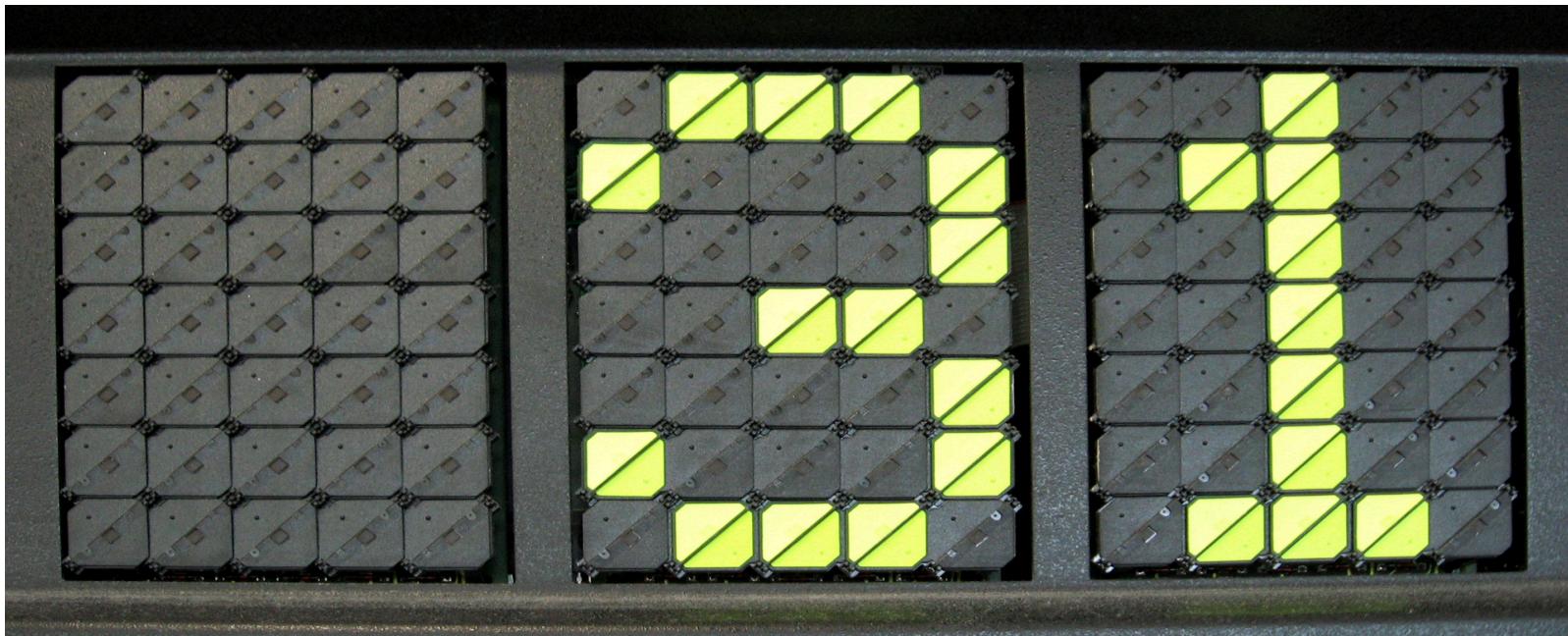
- https://en.wikipedia.org/wiki/Split-flap_display

Airport Board with Split-Flip Display



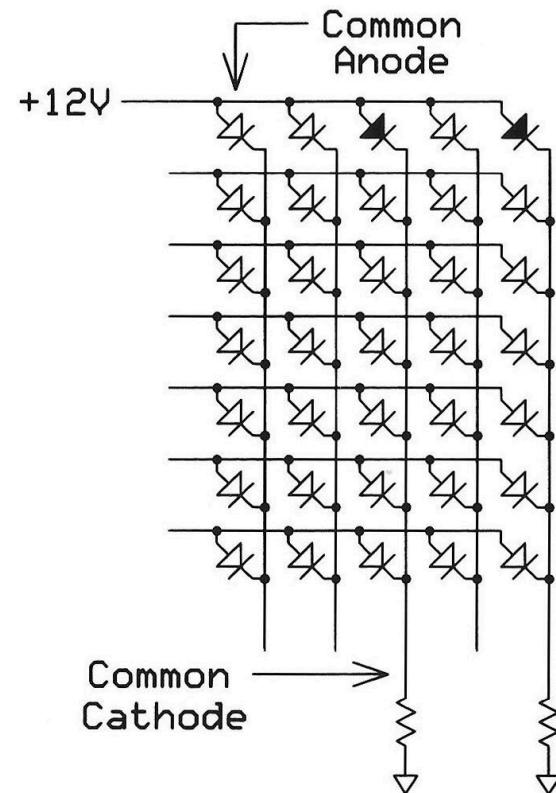
- https://en.wikipedia.org/wiki/Split-flap_display

Flip-Dot-Display



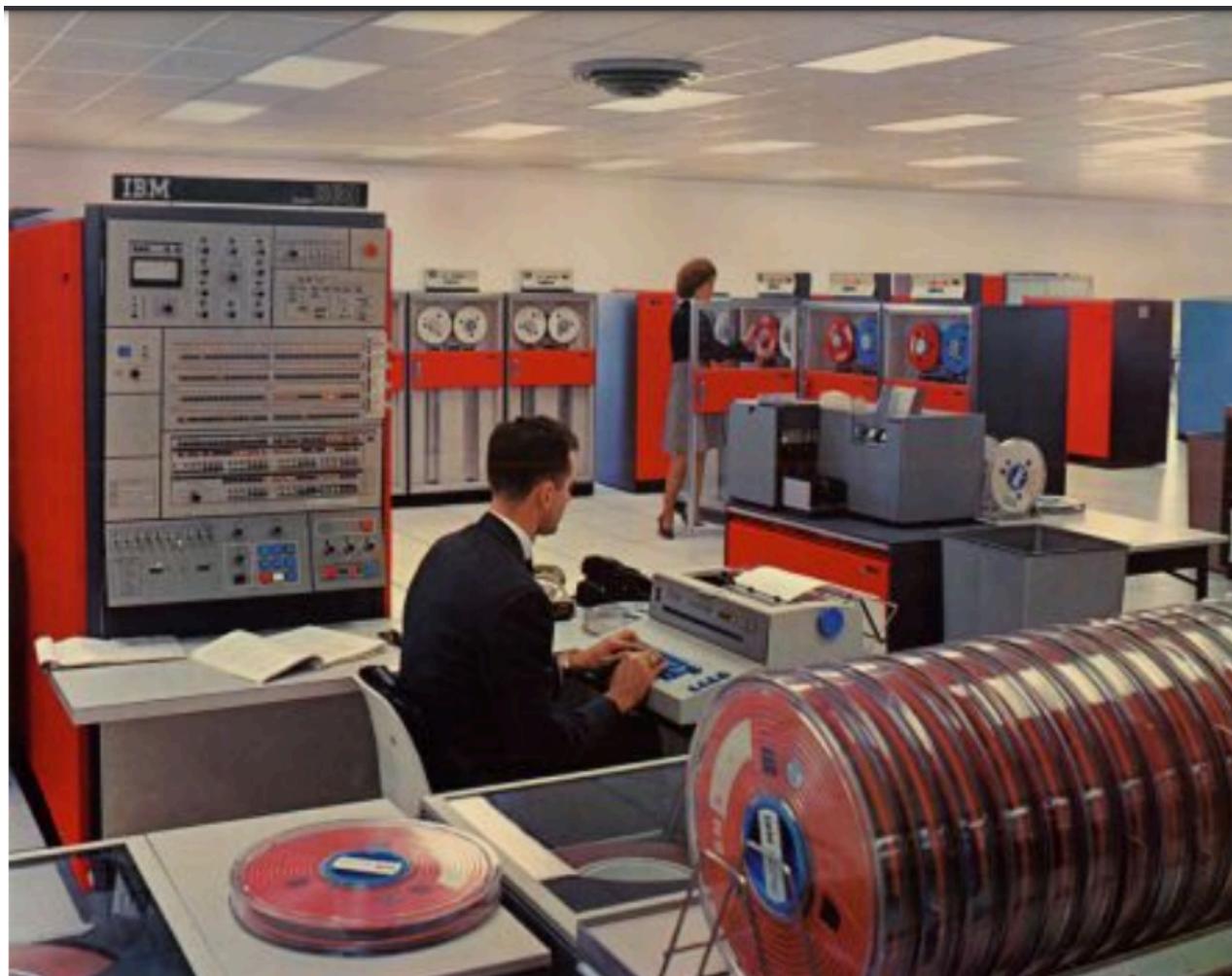
- https://en.wikipedia.org/wiki/History_of_display_technology
- https://en.wikipedia.org/wiki/Flip-disc_display

5x7 LED module

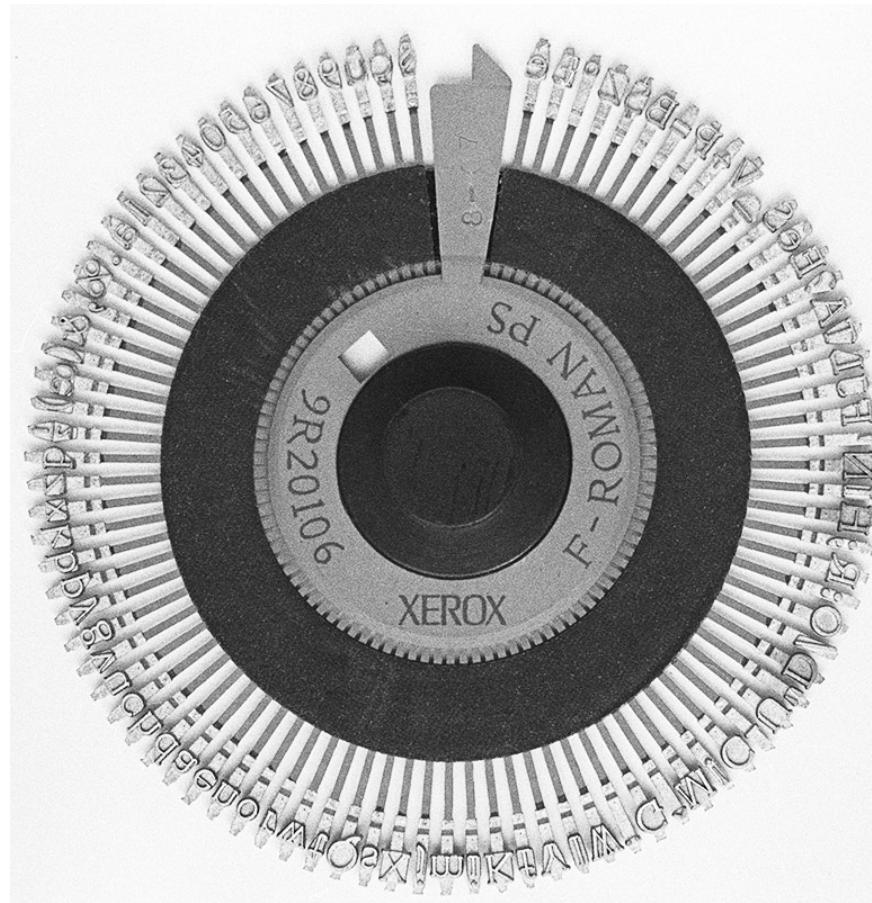


- <https://www.nutsvolts.com/magazine/article/create-an-led-sign-controller>

Tape



Xerox Roman PS Daisywheel



Royal Typewriter Company since 1906



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

IBM Selectric Typewriter 1961(I)



- https://en.wikipedia.org/wiki/IBM_Selectric_t typewriter

IBM Selectric Typewriter 1961 (II)



- https://en.wikipedia.org/wiki/List_of_IBM_products#Typewriters

Simple computer simulator

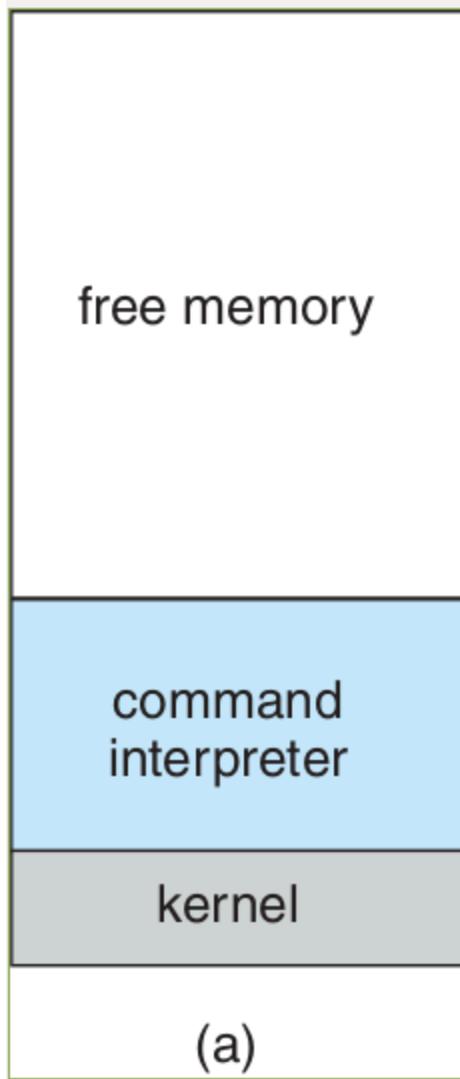
- <https://github.com/jeaniehandler/OS>
- <https://github.com/Naheel-Azawy/Simple-Computer-Simulator>
- <https://web.njit.edu/~carpinel/Applets.html>
- <http://www.science.smith.edu/dftwiki/index.php/IBooks>
- <http://www.science.smith.edu/dftwiki/index.php/>

Simple Computer Simulator Instruction Set

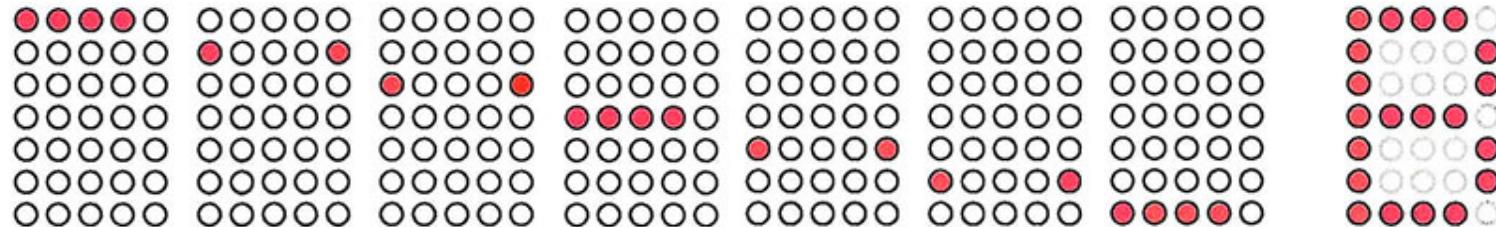
- <http://euler.vcsu.edu/curt.hill/Computer.html>

YIC120 - Adding Keyboard & Disk

- terminal (command prompt)
- batch system
- interactive system

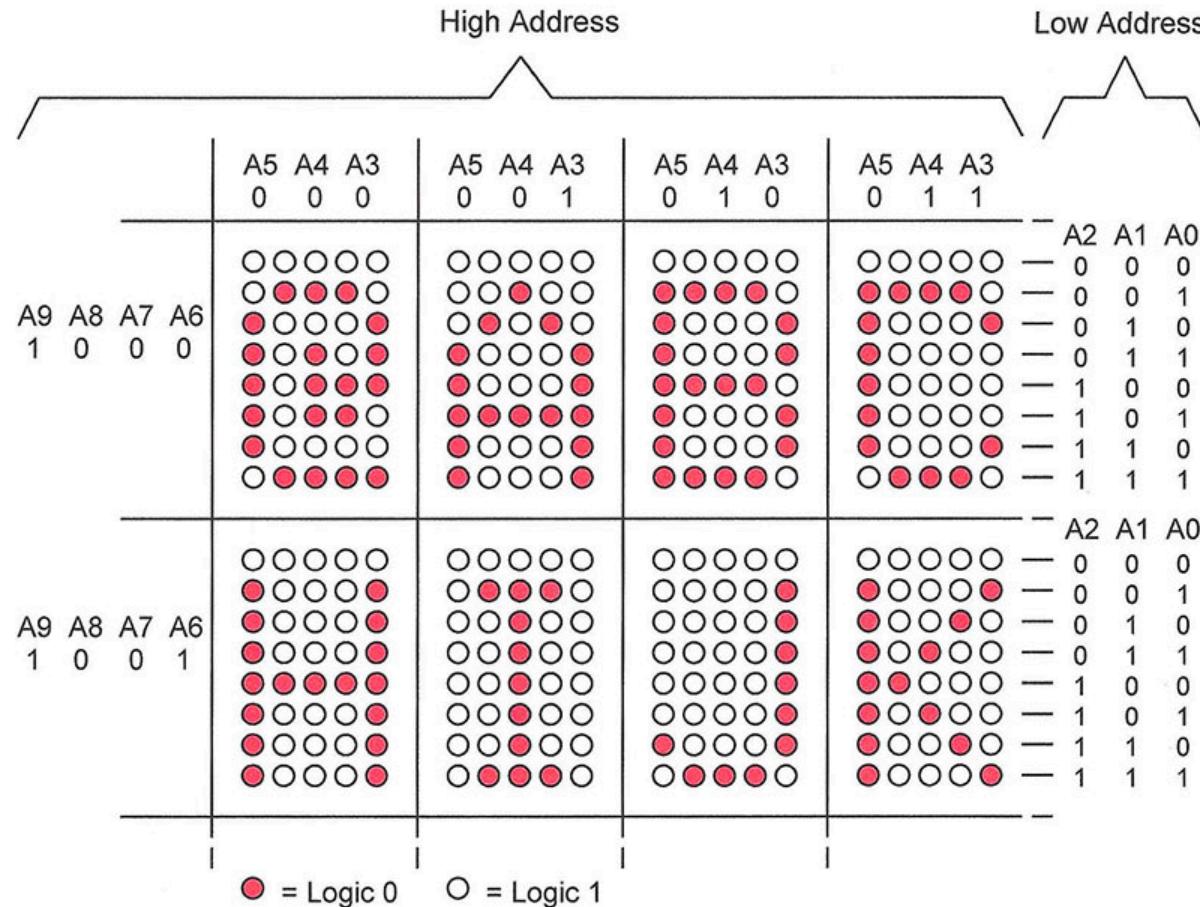


When a controller rapidly turns on LEDs in one row at a time



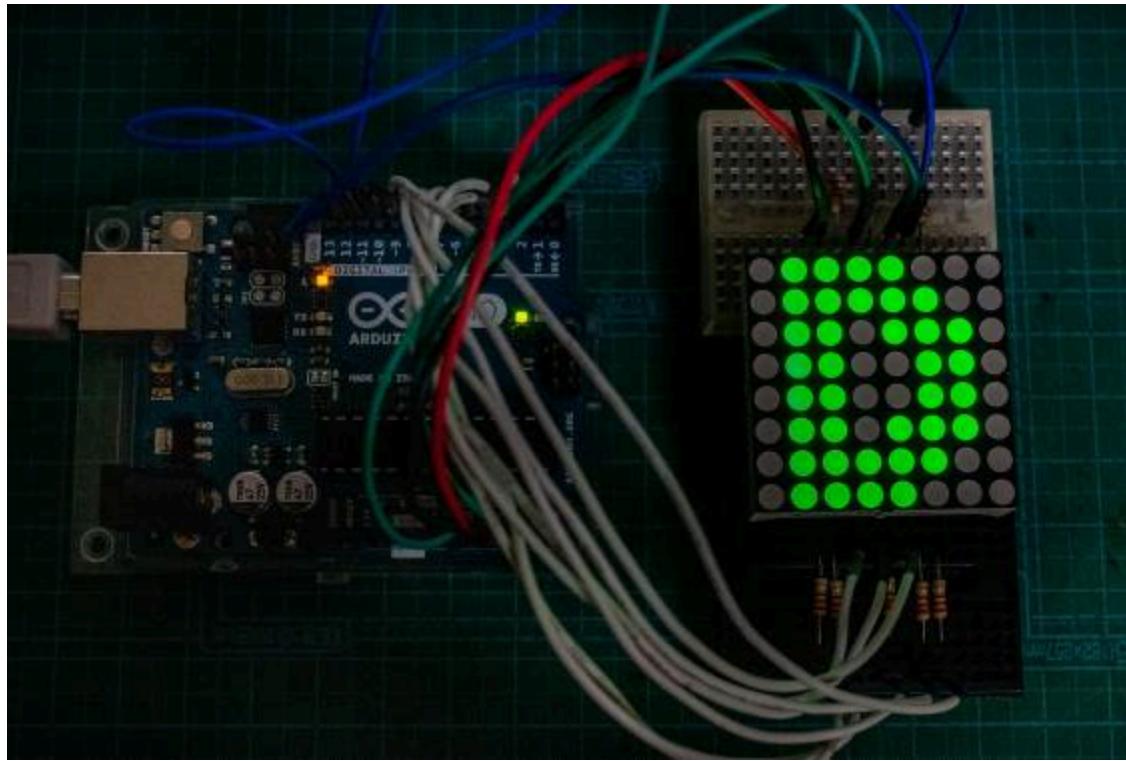
<https://www.nutsvolts.com/magazine/article/create-an-led-sign-controller>

GET THE DOTS, FORM A LETTER using ROM



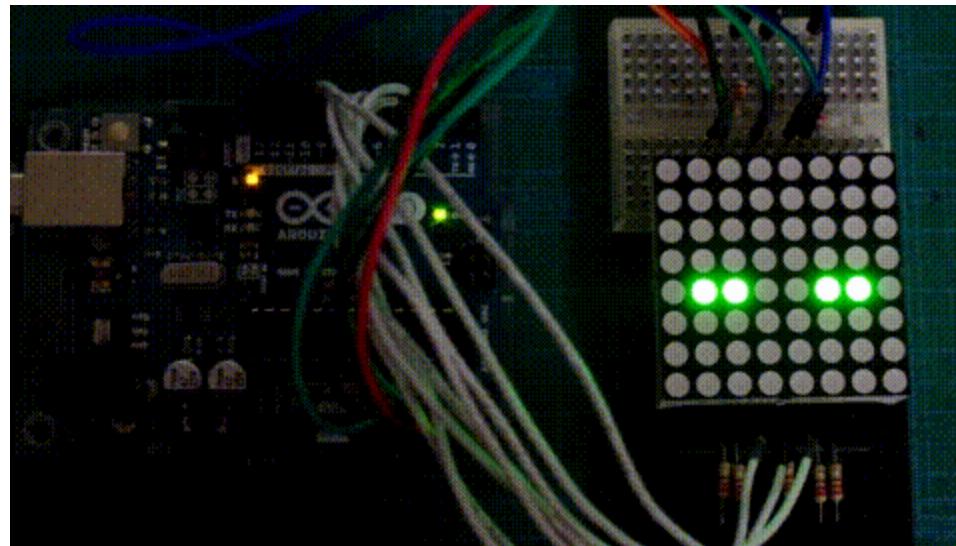
<https://www.nutsvolts.com/magazine/article/create-an-led-sign-controller>

Showing Character D



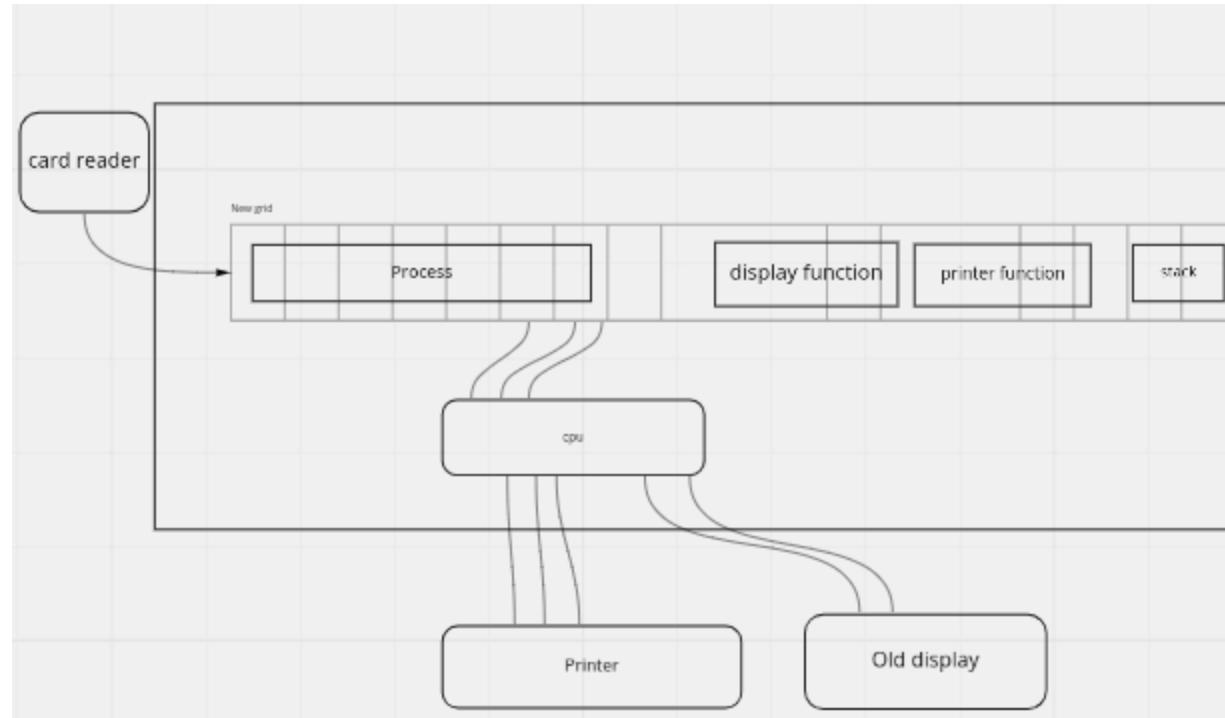
<https://www.deviceplus.com/arduino/display-characters-with-leds-how-to-use-a-matrix-led/>

Showing Character D (real refresh)



<https://www.deviceplus.com/arduino/display-characters-with-leds-how-to-use-a-matrix-led/>

Card reader instead of Hex pad input



Display

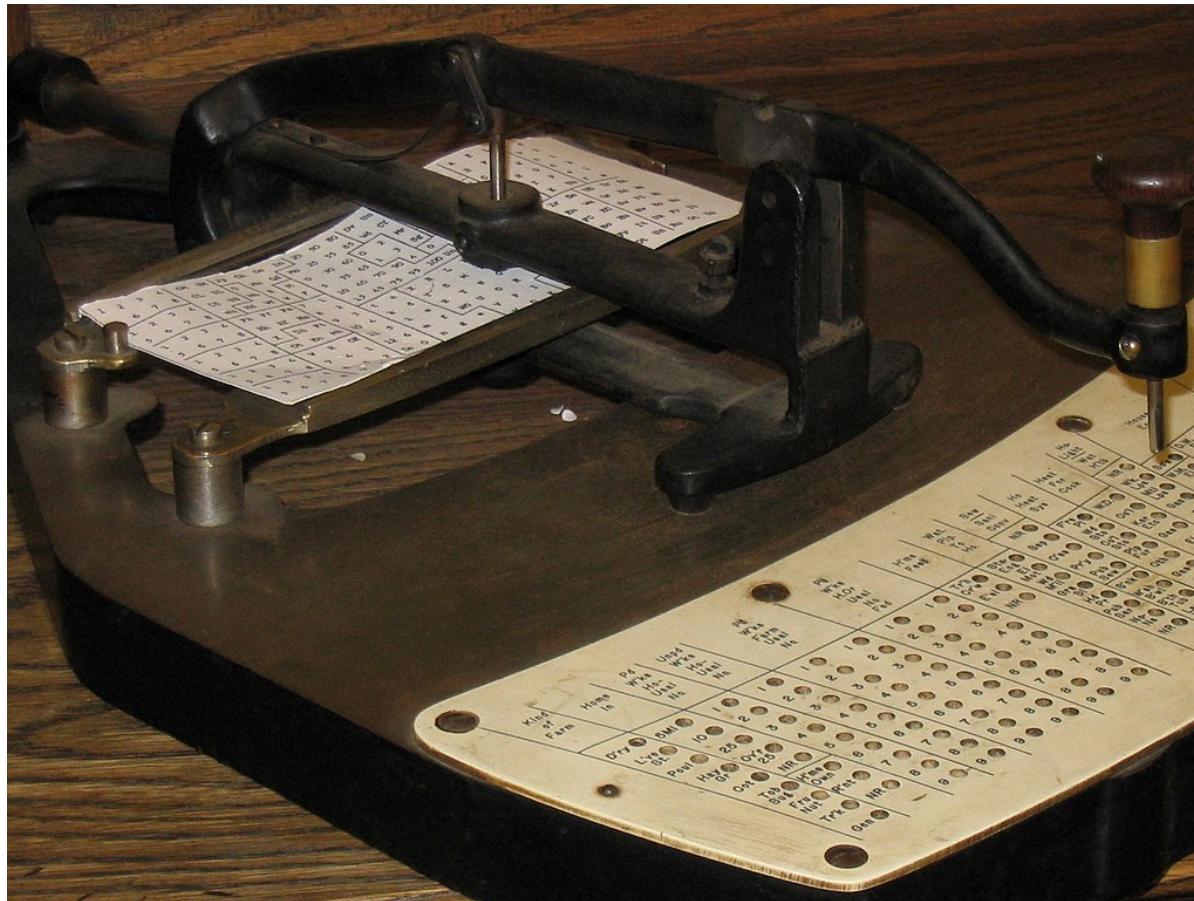
- https://en.wikipedia.org/wiki/IBM_3270

IBM 3270 Display Terminal

- https://en.wikipedia.org/wiki/File:IBM_3277_Model_2_terminal.jpg
- <http://www.columbia.edu/cu/computinghistory/fisk.pdf>

- [IEEE Std 1275 1994 Standard for boot initialization](#)
- [https://github.com/openbios](https://openfirmware.info>Welcome_to_OpenBIOS• <a href=)
- <https://github.com/openbios/openbios>

Hollerith and IBM keypunches, 1890



- <https://en.wikipedia.org/wiki/Keypunch>

IBM 011 Electric Key Punch(1923)



- columbia.edu <<http://www.columbia.edu/cu/computinghistory/oldpunch.html>>-

IBM Type 032 Printing Punch(1935)



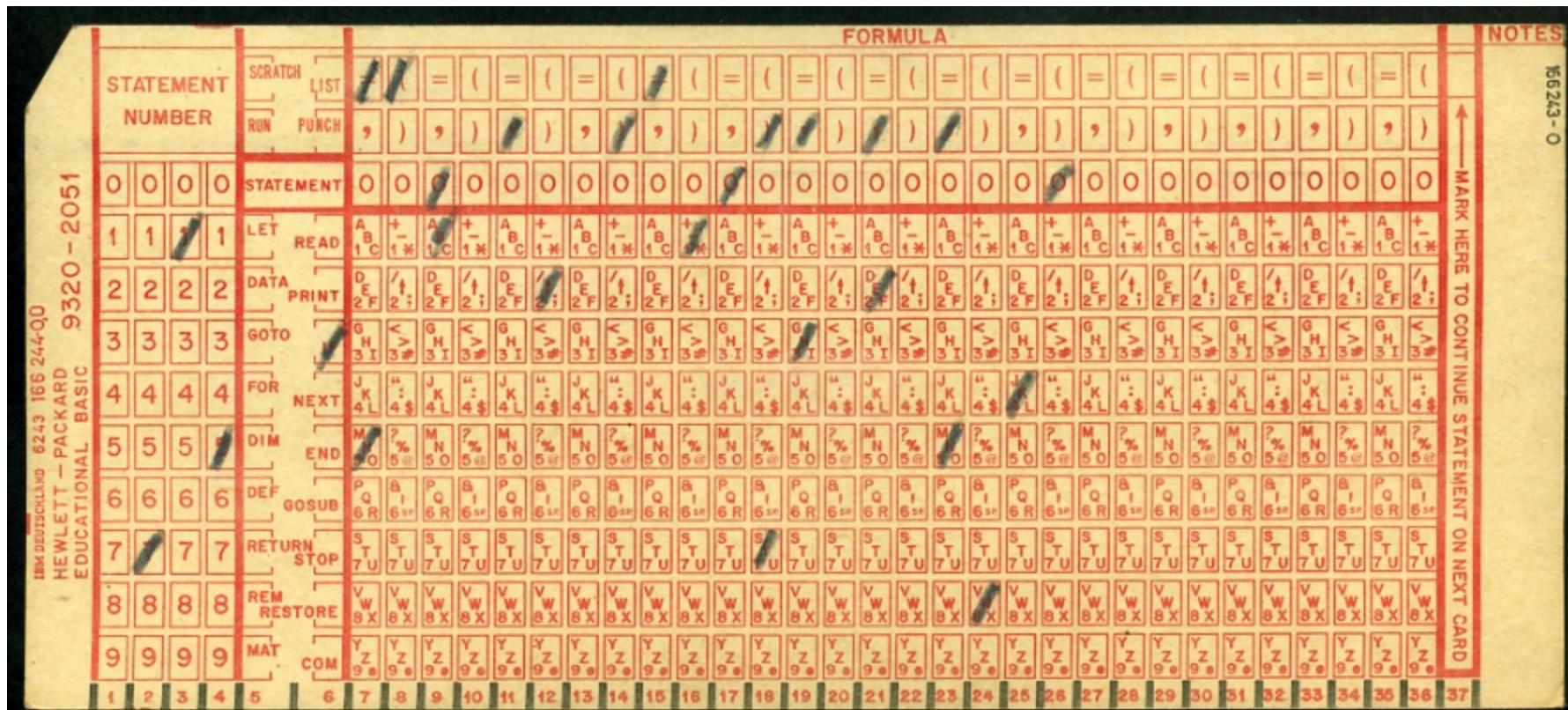
- columbia.edu <<http://www.columbia.edu/cu/computinghistory/oldpunch.html>>

A Key Punch Room in the 1960s



- <https://en.wikipedia.org/wiki/Keypunch>

Card Mark sense format



Cartons of Punch cards(1959)

In a United States National Archives Records Service facility in 1959. Each carton could hold 2,000 cards



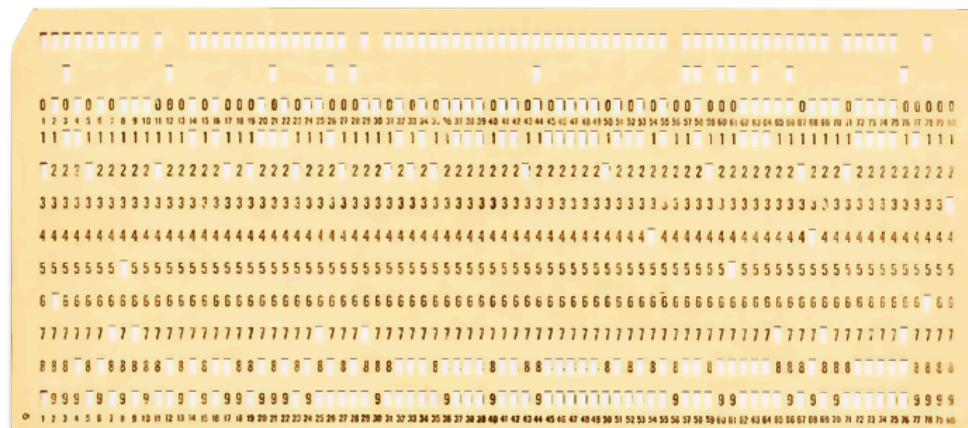
- https://en.wikipedia.org/wiki/Punched_card

Punched Card Printing Plate

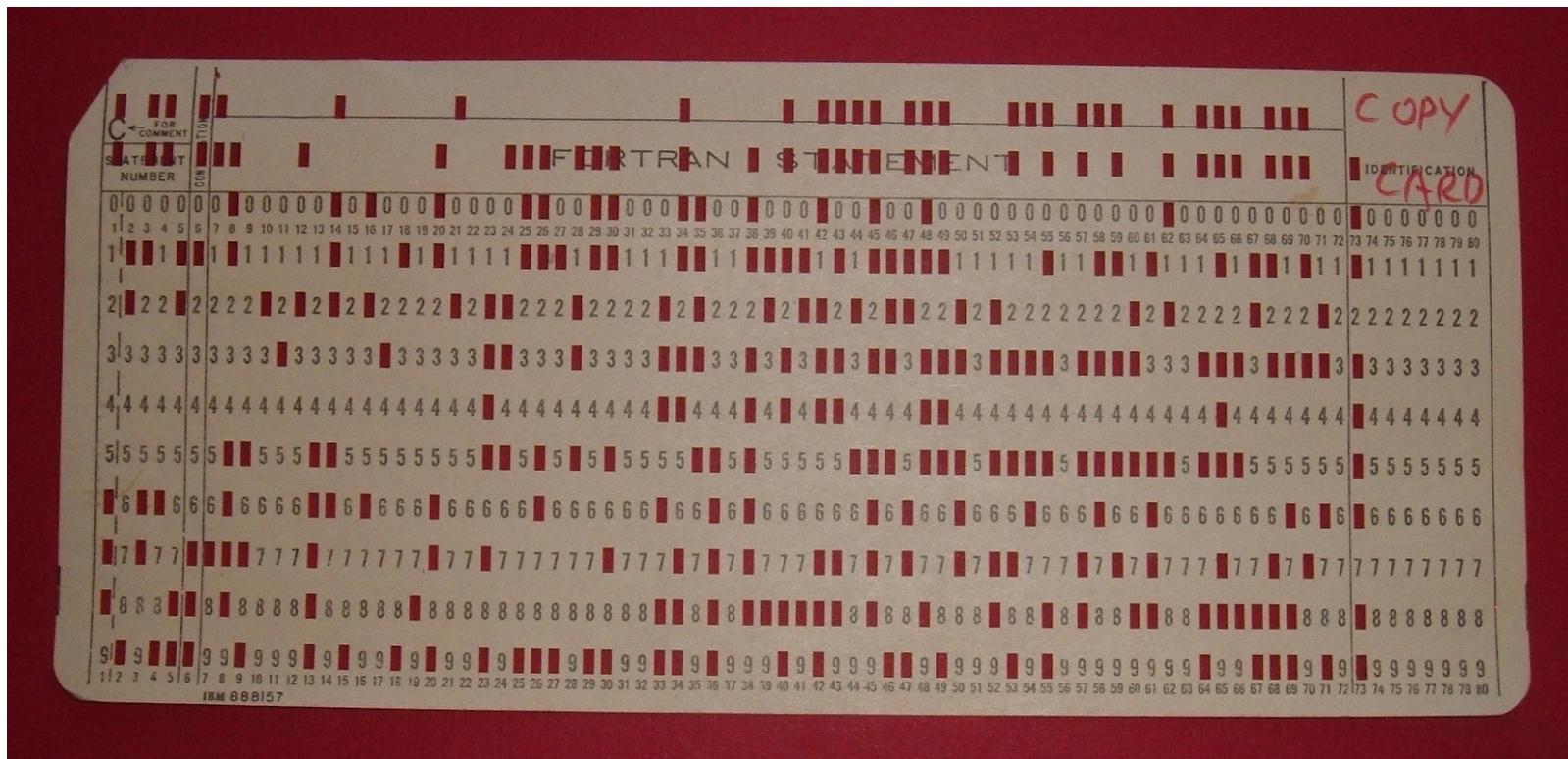


Example of a Punch Card

Example of a punch card

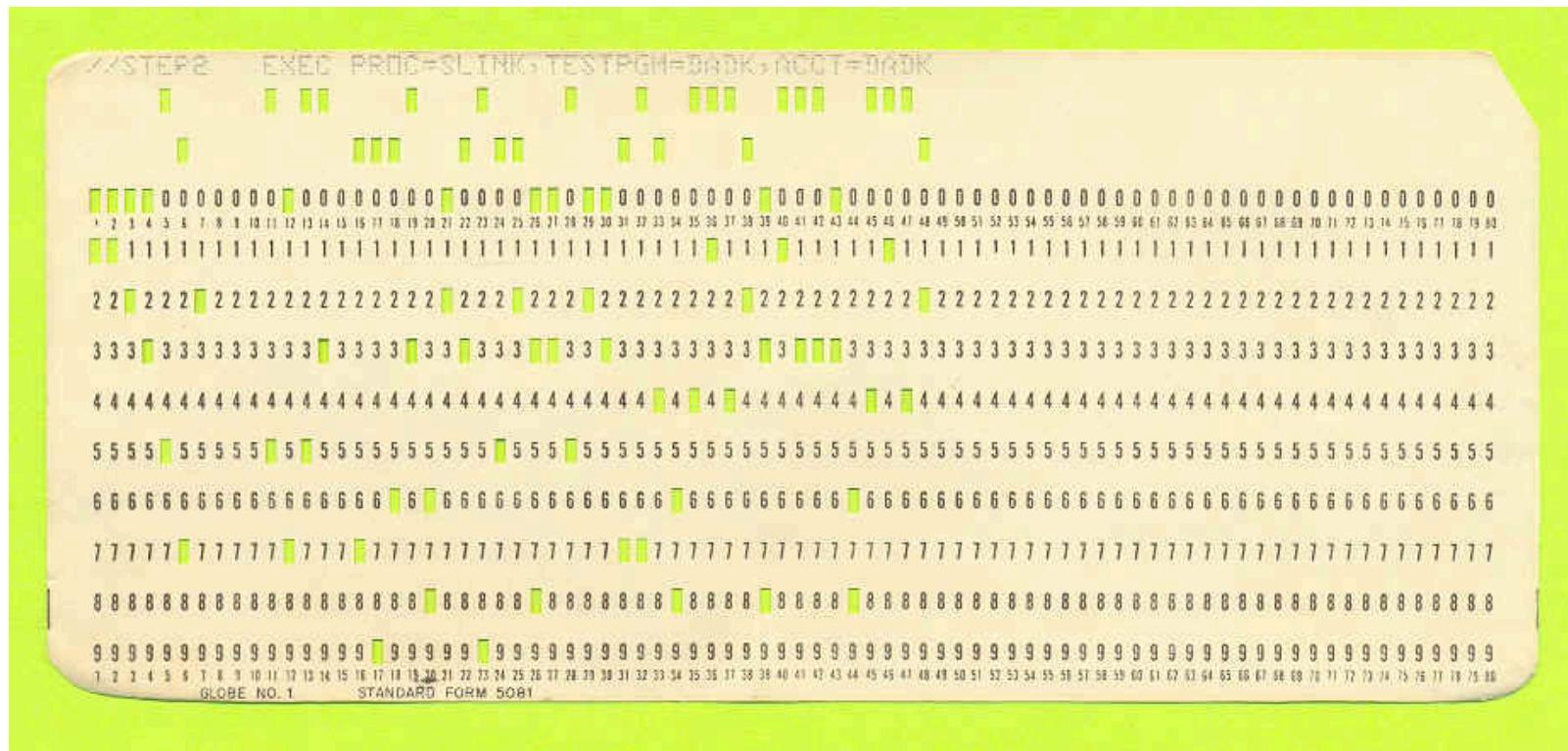


IBM1130 Binary Punched Card



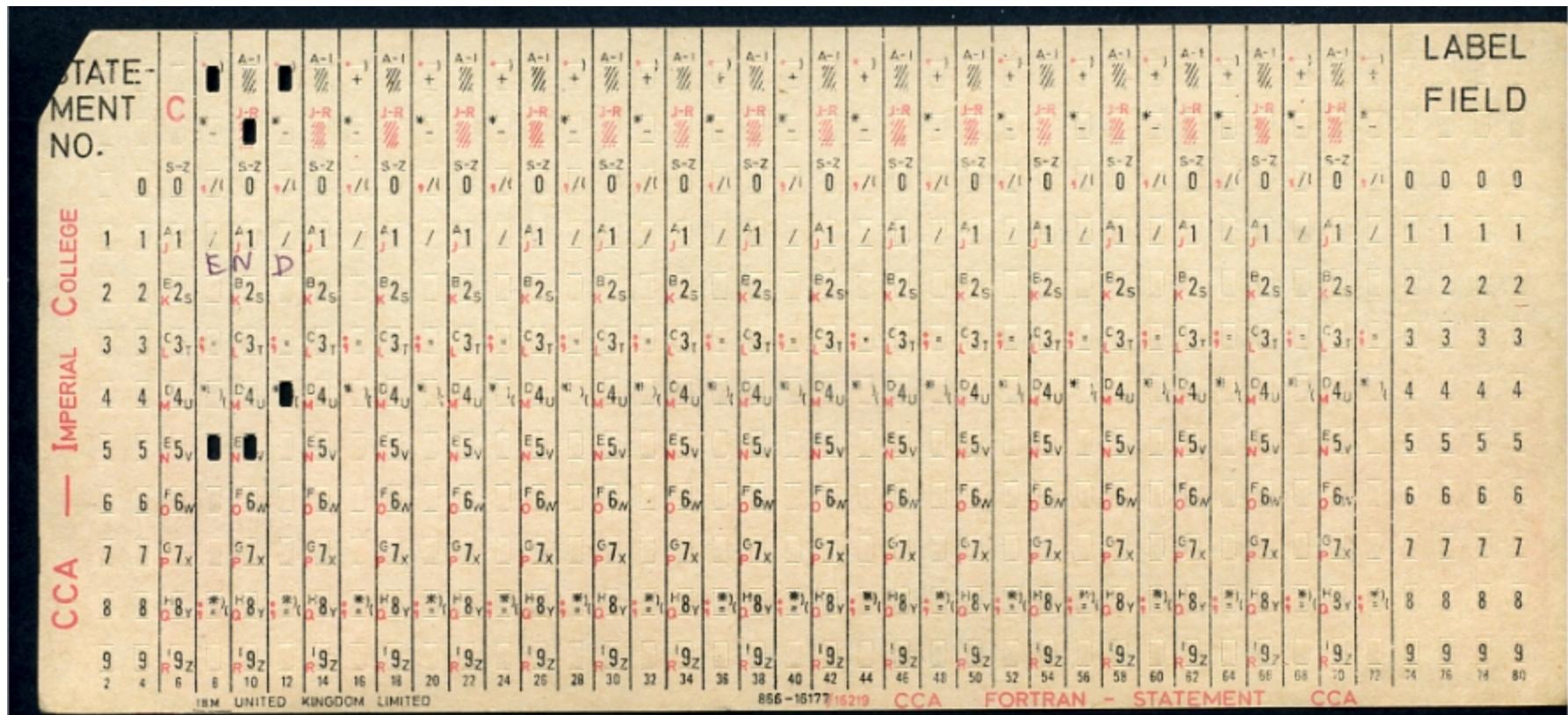
- https://en.wikipedia.org/wiki/Punched_card

A 5081 Card from a non-IBM Manufacturer



- https://en.wikipedia.org/wiki/Punched_card

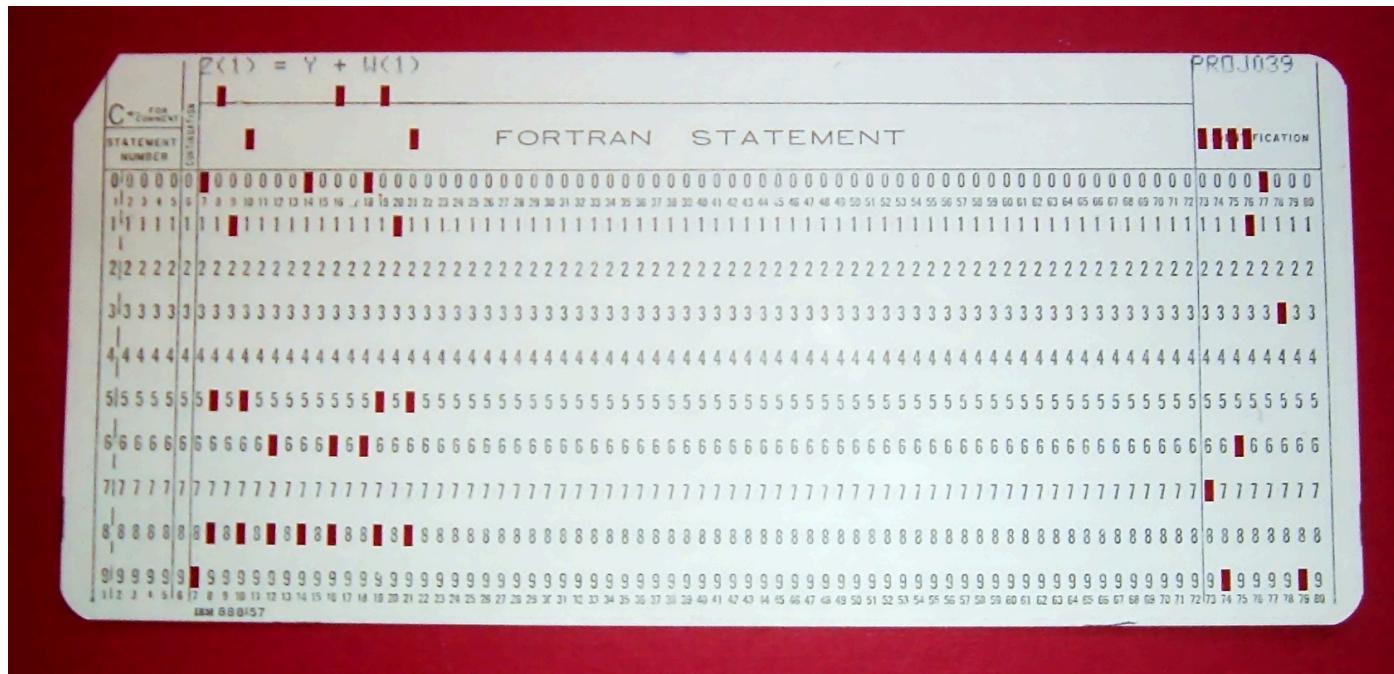
FORTRAN Port-A-Punch card. Compiler directive "SQUEEZE"



- https://en.wikipedia.org/wiki/Punched_card

Punched card from a Fortran program

$Z(1) = Y + W(1)$, plus sorting information in the last 8 columns



- https://en.wikipedia.org/wiki/Punched_card

img/in/The_IBM_2501_Card_Reader2501.jpg <https://www.columbia.edu/cu/computinghistory/2501.html>

END

