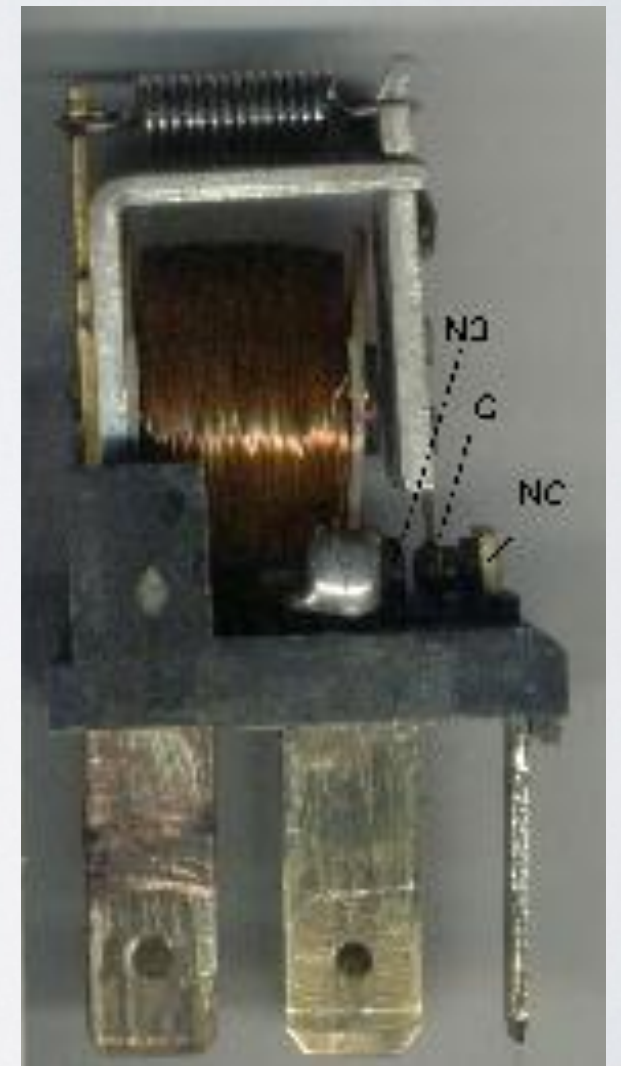
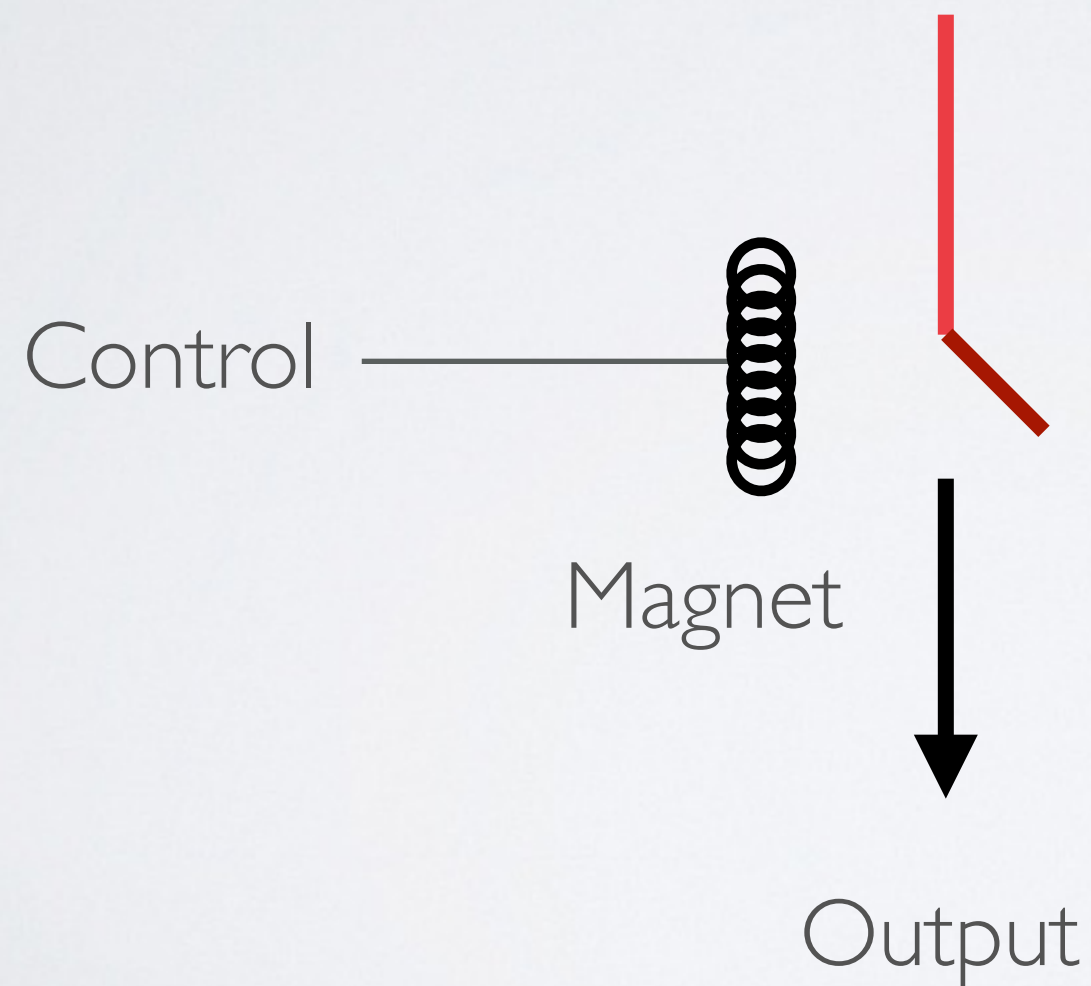


DIGITAL LOGIC AND GATES

RELAYS



Power
Source



RELAYS



Power
Source

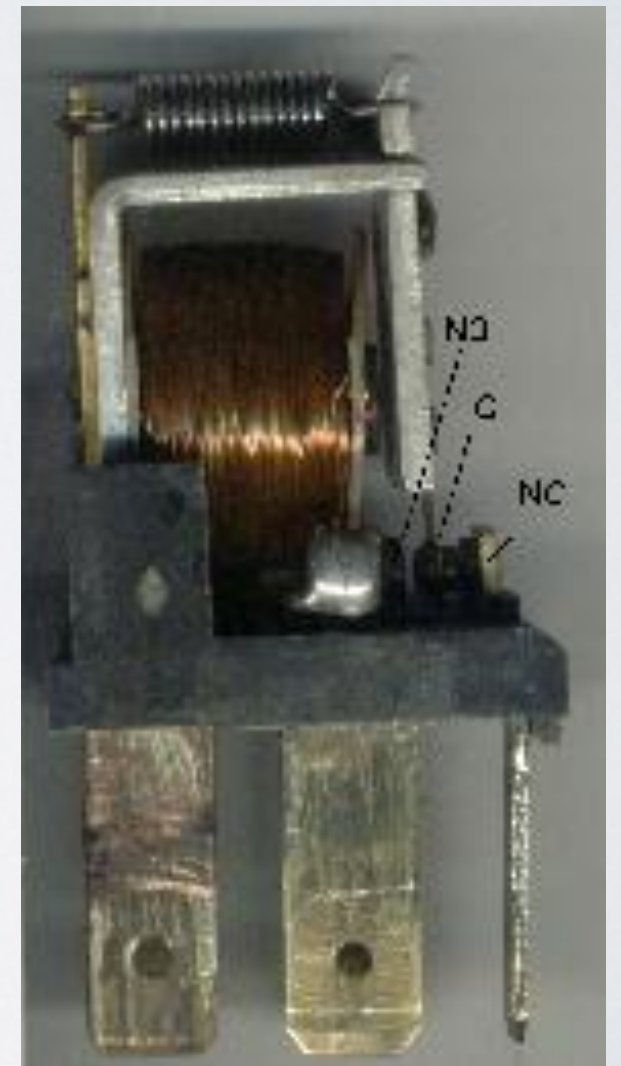
Control



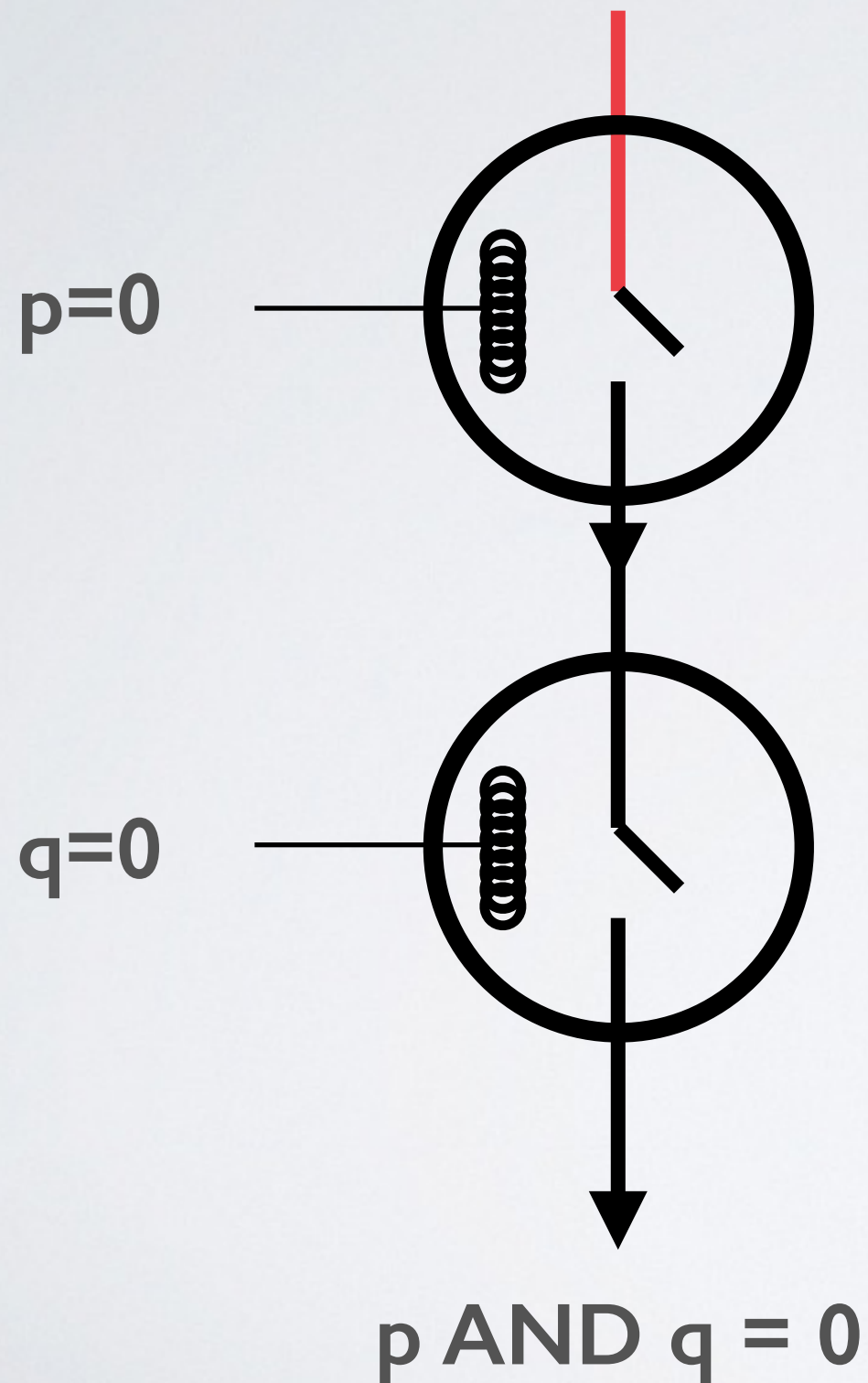
Magnet



Output



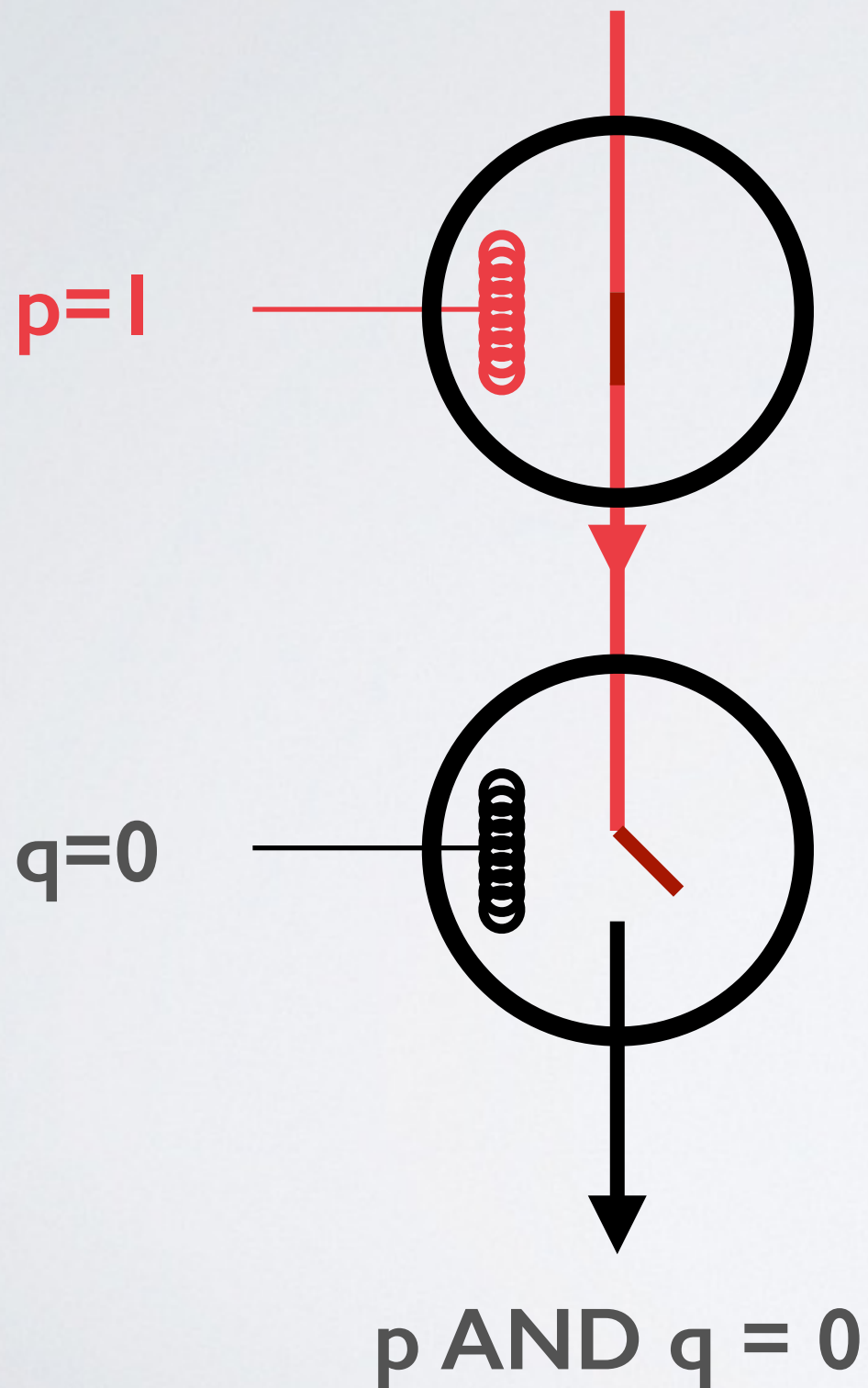
AND GATE



Schematic Symbol



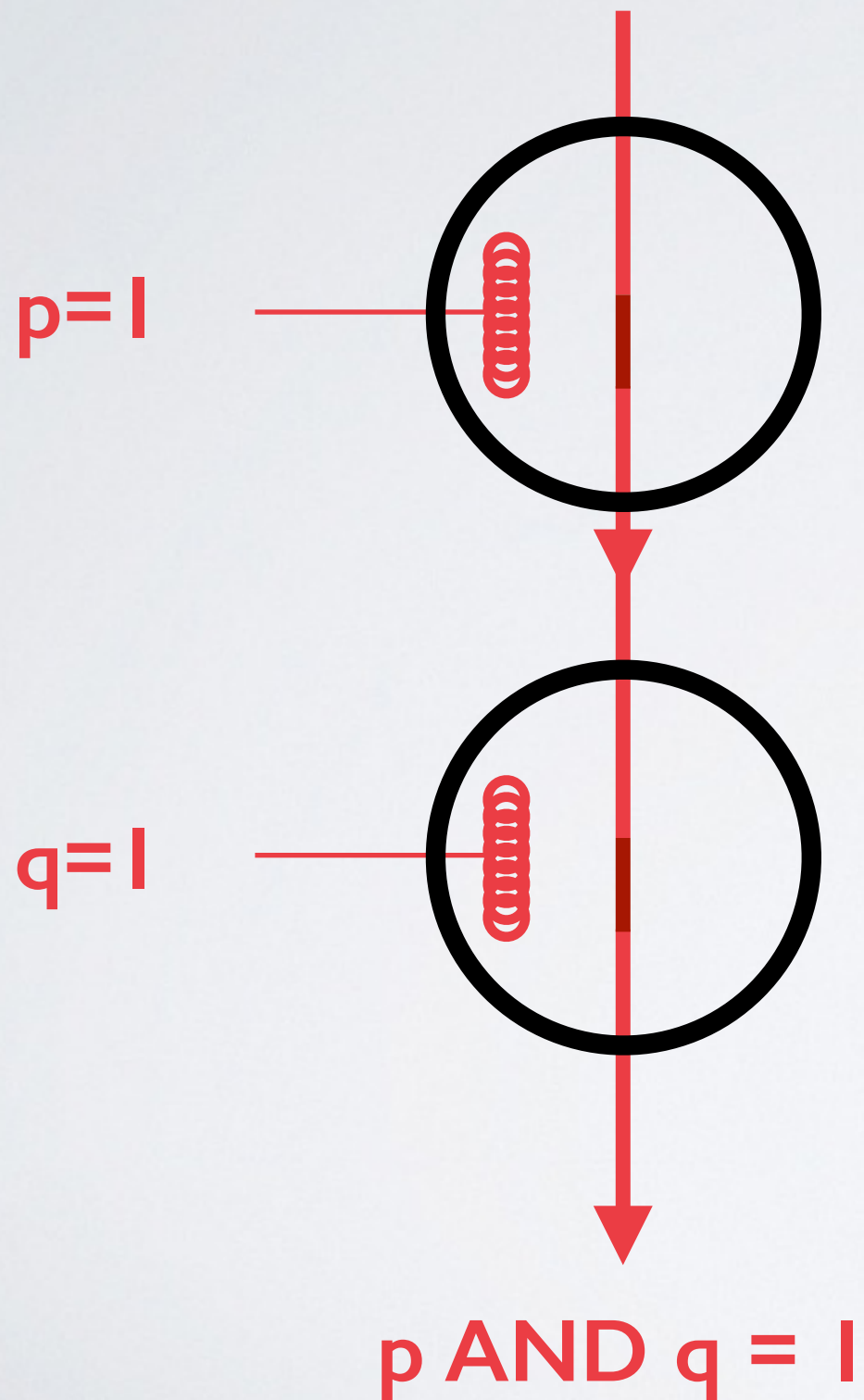
AND GATE



Schematic Symbol



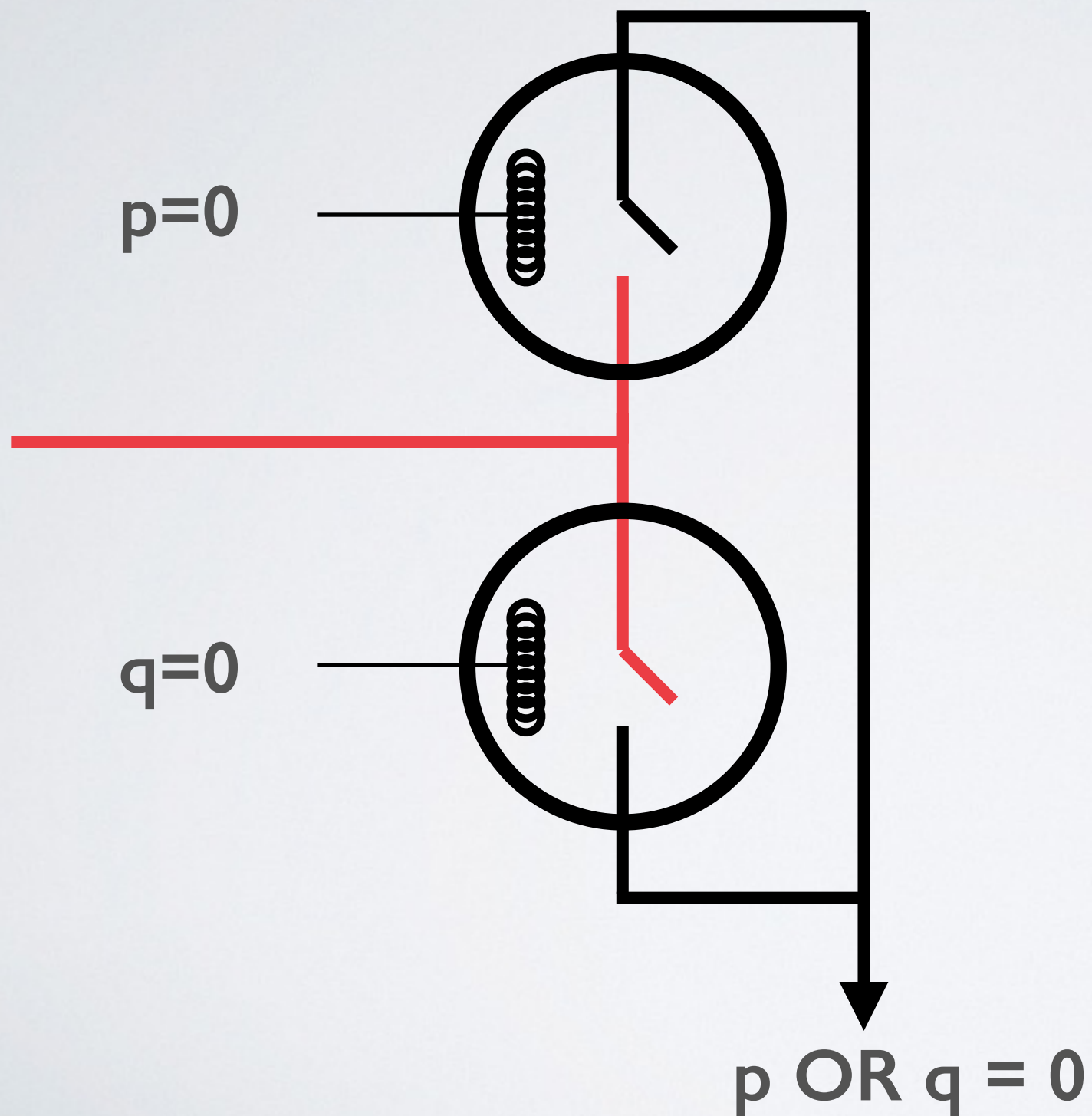
AND GATE



Schematic Symbol



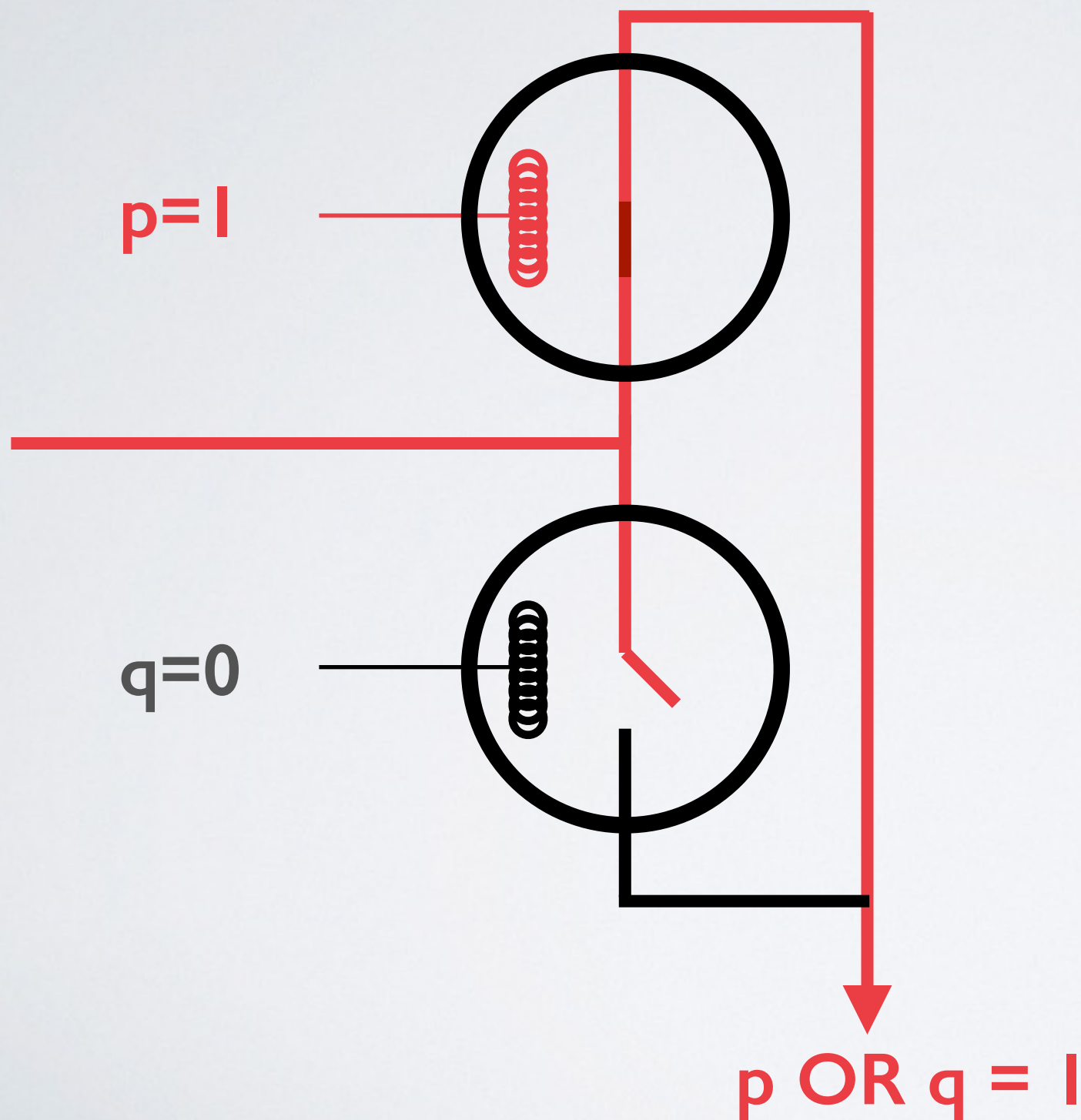
OR GATE



Schematic Symbol



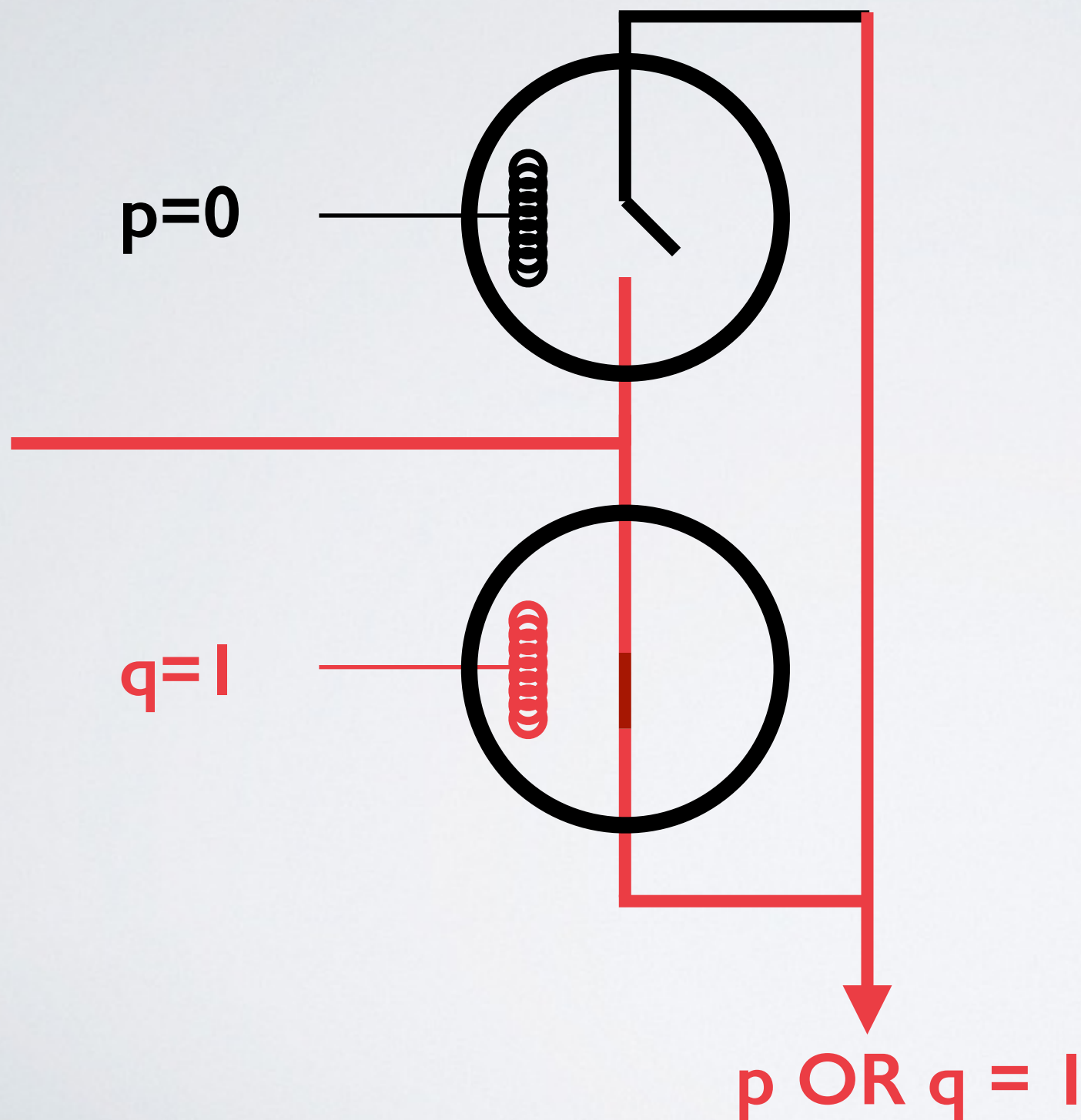
OR GATE



Schematic Symbol



OR GATE



Schematic Symbol



MORE GATES

Not



$$\neg A$$

NAND



$$\neg(A \wedge B)$$

NOR



$$\neg(A \vee B)$$

XOR

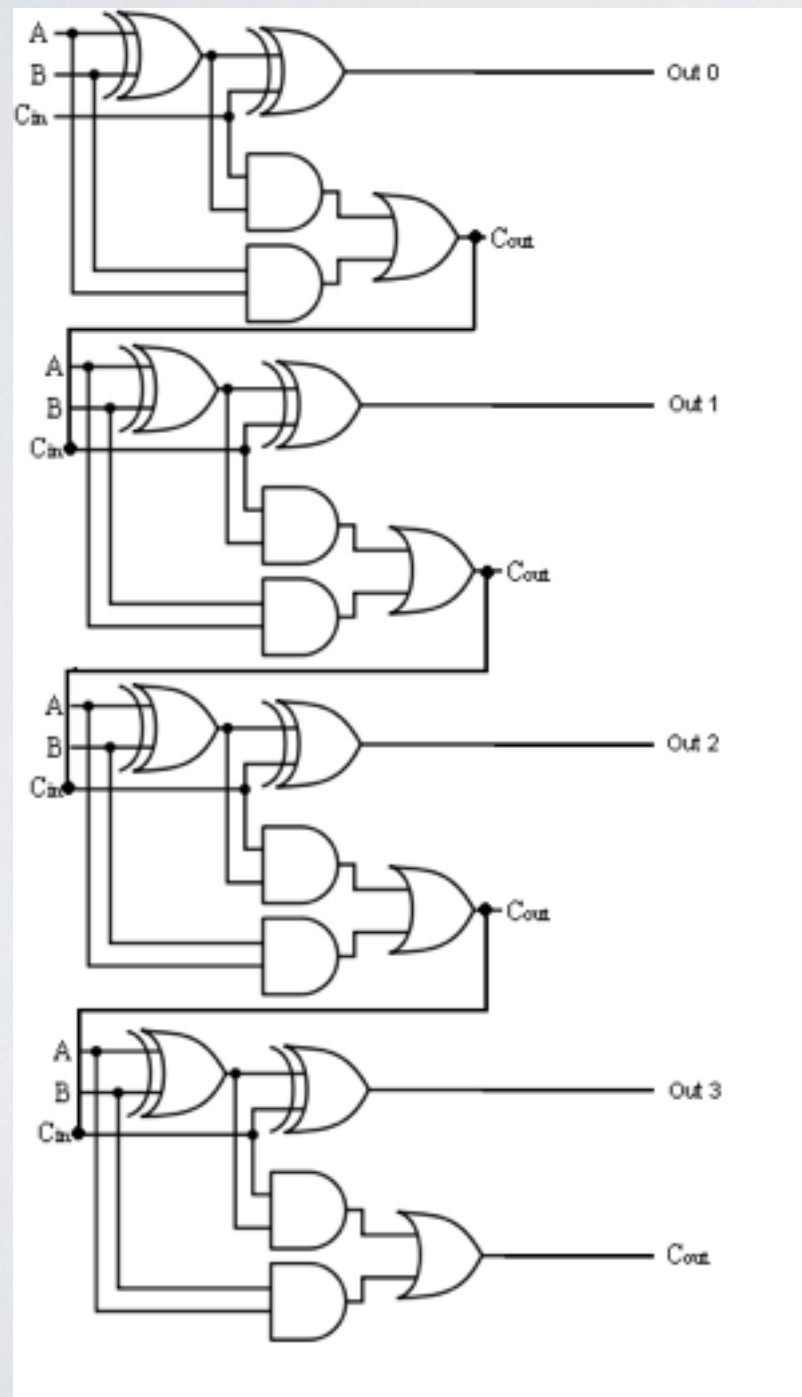


$$A \oplus B$$

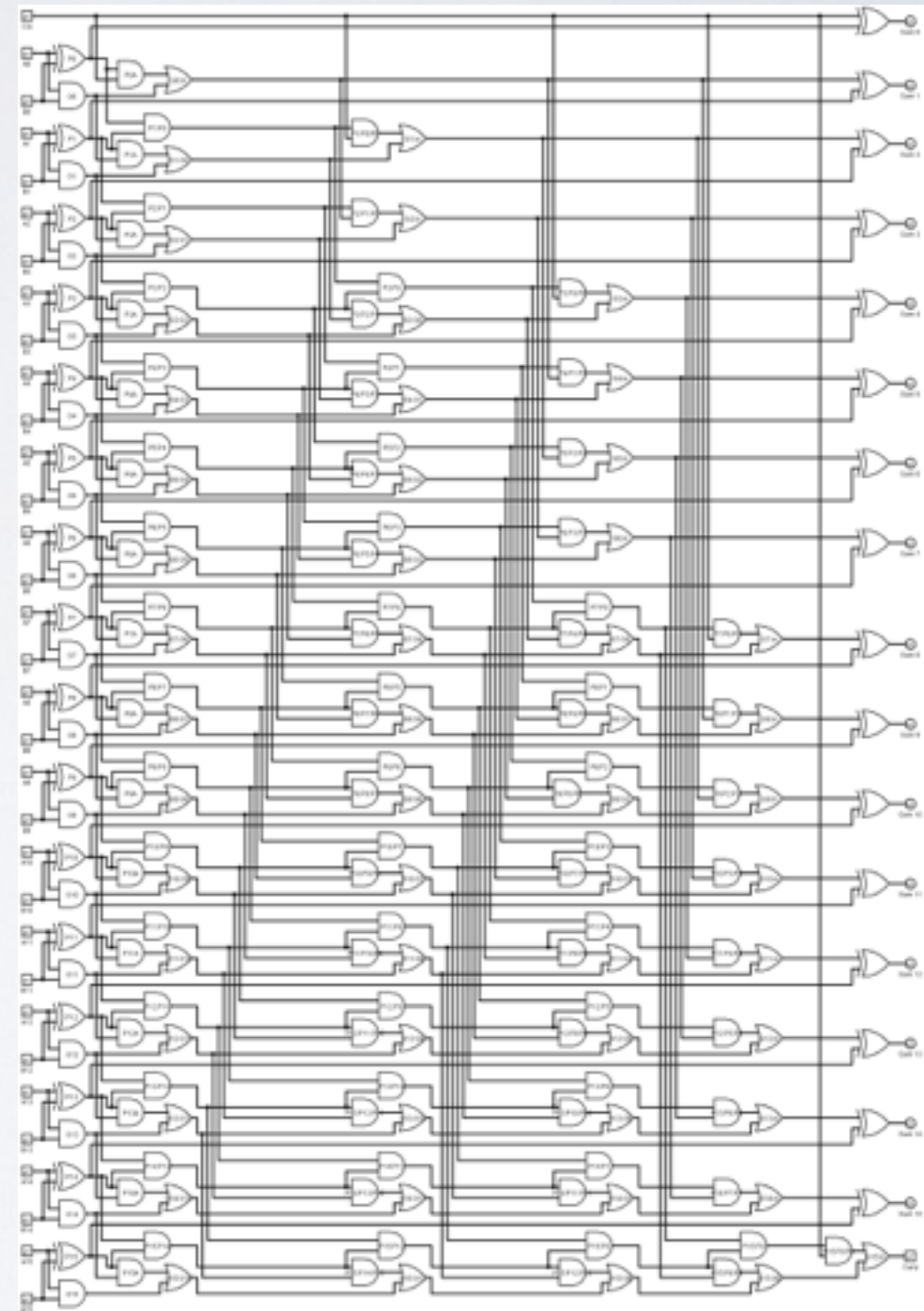
DO STUFF ON BOARD

ALL YOU COMPUTER DOES IS LOGIC!

4-Bit Binary Adder

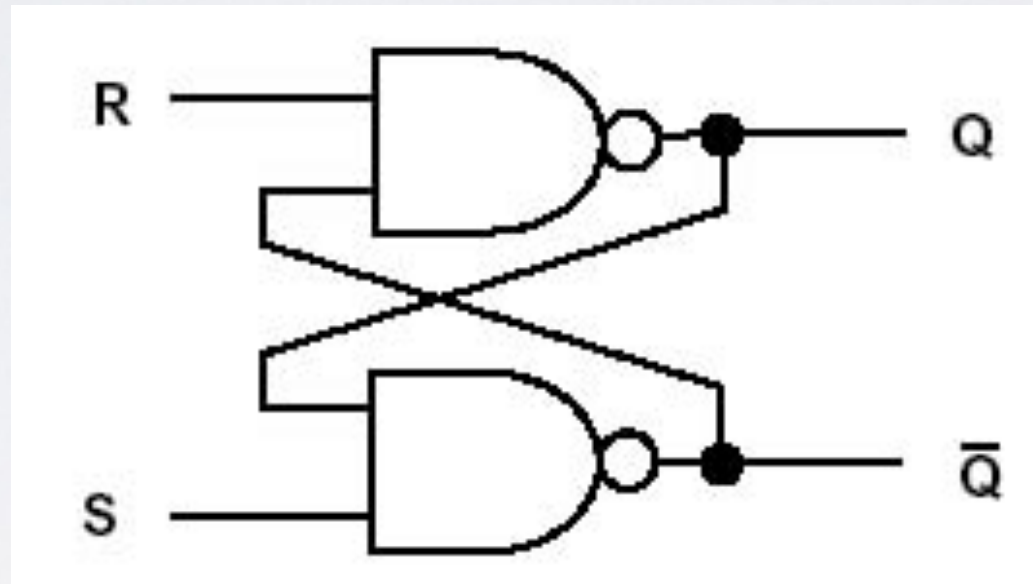


16-Bit Binary Adder



ALL YOUR COMPUTER DOES IS LOGIC!

Reset-set (RS) latch memory cell



WHAT YOU NEED TO BUILD A COMPUTER

WHAT YOU NEED TO BUILD A COMPUTER

- Wire (magnets)

WHAT YOU NEED TO BUILD A COMPUTER

- Wire (magnets)
- Dowels (wrapping)

WHAT YOU NEED TO BUILD A COMPUTER

- Wire (magnets)
- Dowels (wrapping)
- Masking tape (insulation)

WHAT YOU NEED TO BUILD A COMPUTER

- Wire (magnets)
- Dowels (wrapping)
- Masking tape (insulation)
- Tin foil (switches)

WHAT YOU NEED TO BUILD A COMPUTER

- Wire (magnets)
- Dowels (wrapping)
- Masking tape (insulation)
- Tin foil (switches)
- Lots of Lemons (power)

WHAT YOU NEED TO BUILD A COMPUTER

- Wire (magnets)
- Dowels (wrapping)
- Masking tape (insulation)
- Tin foil (switches)
- Lots of Lemons (power)
- CMSE 250H

WHAT YOU NEED TO BUILD A COMPUTER

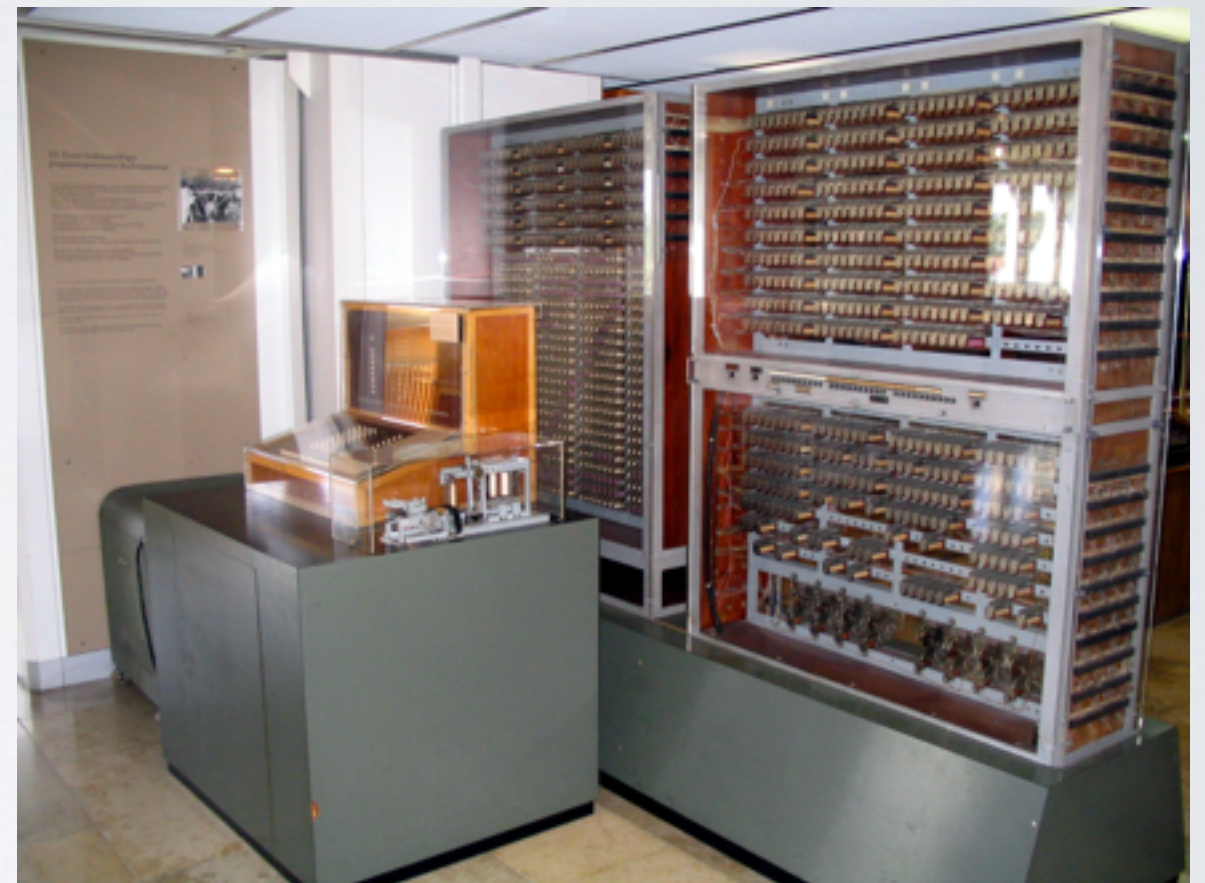
- Wire (magnets)
- Dowels (wrapping)
- Masking tape (insulation)
- Tin foil (switches)
- Lots of Lemons (power)
- CMSE 250H
- Nothing better to do

FIRST DIGITAL COMPUTER

This guy actually did that



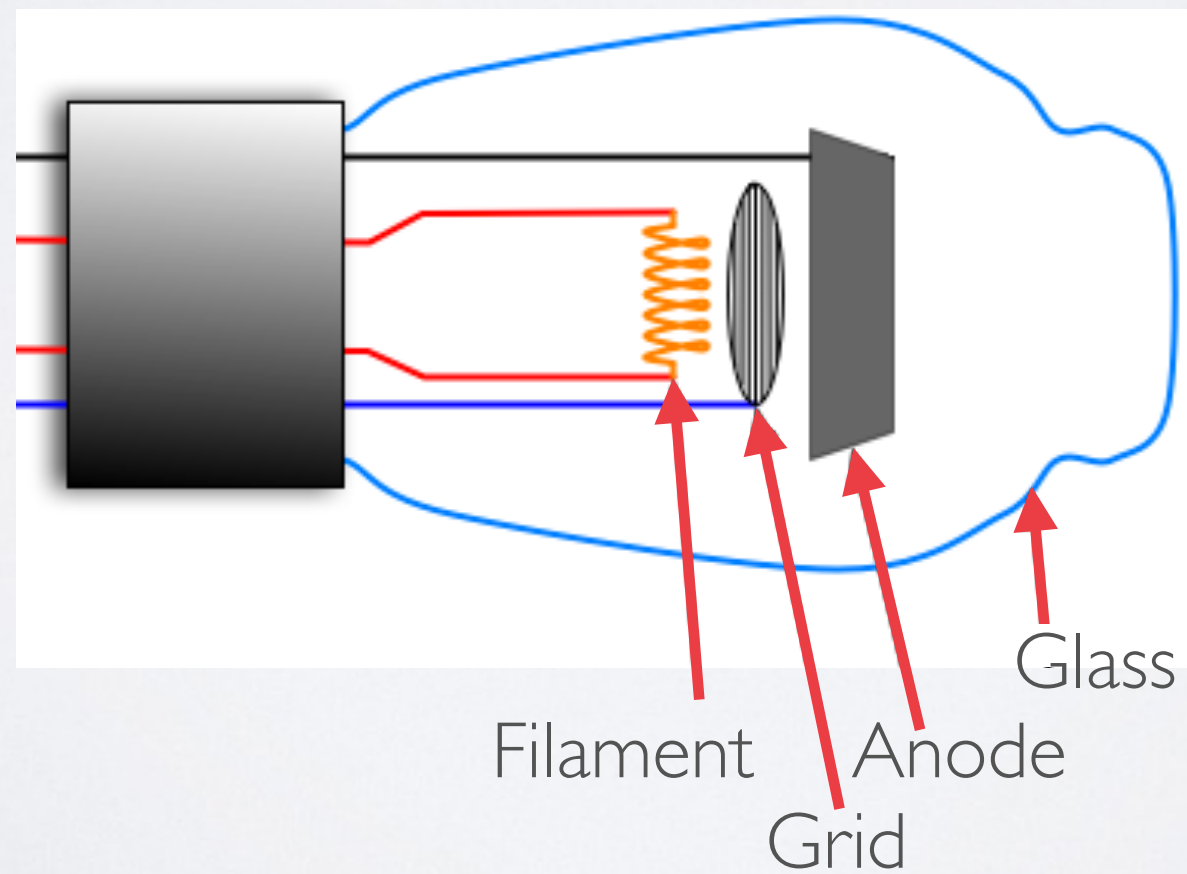
Konrad Zuse



Z2, 1939

First electronic digital computer

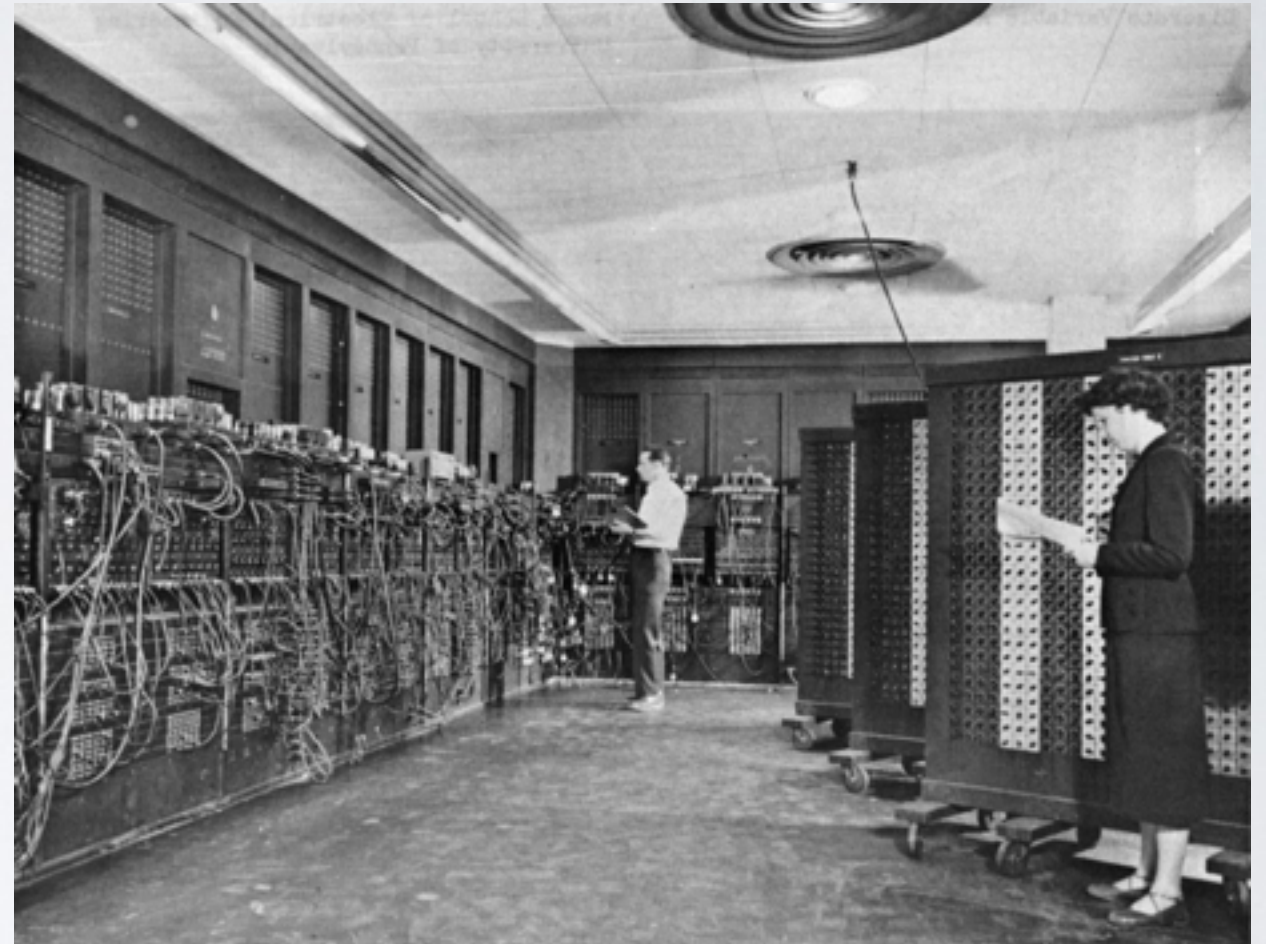
VACUUM TUBES



ENIAC

First “turning complete” machine

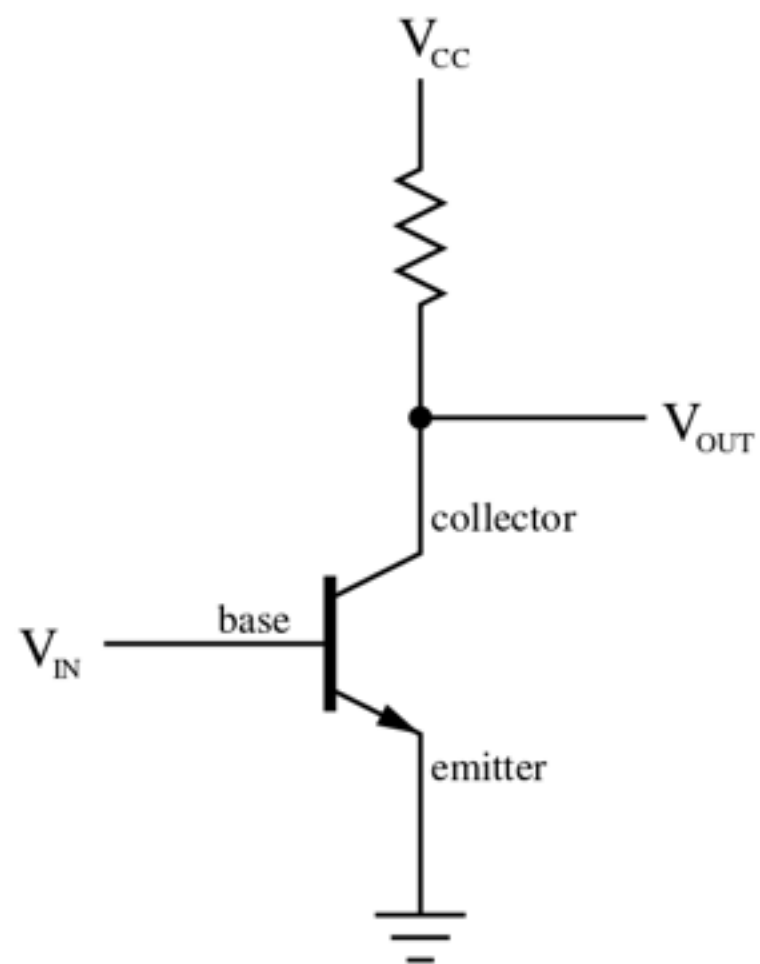
- 18K tubes
- 15K relays
- 10K Capacitors
- 5M hand-soldered joints



TRANSISTORS

Transfer-resistor

Semiconductor acts as relay



TRANSISTORS ARE SMALL

WWII Radio



1950'S Radio

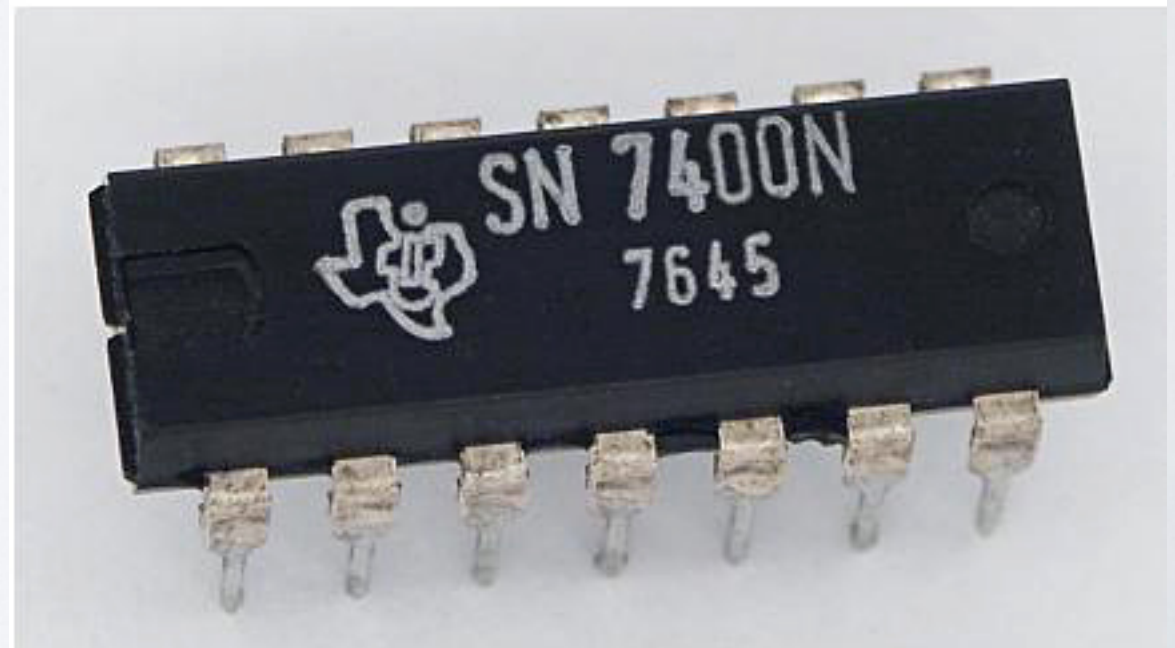
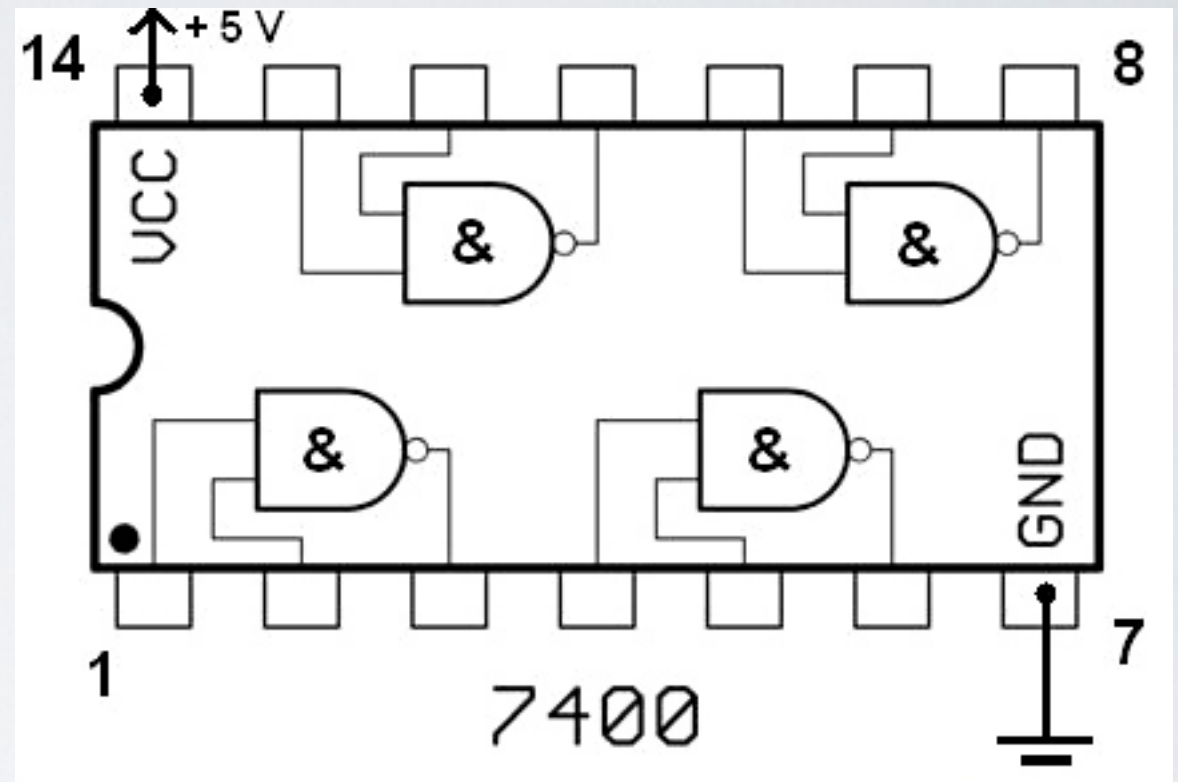


Transistor invented in 1947 (Bell Labs)

INTEGRATED CIRCUITS

Logic gates printed on wafer

- Printed on silicon wafer
- Germanium “ink”
- CMOS: Complementary metal–oxide–semiconductor (CMOS)



LOGIC IS BIG BUSINESS

[illegible]

INTEL XEON

Logic gates printed into chip



MOTOROLA POWER PC

