



AL- MUSTAQBAL UNIVERSITY COLLEGE
DEPARTMENT OF BIOMEDICAL ENGINEERING

Laboratory Instrumentation

BME 422

Lecture 3

- Schematics I -

Dr. Zaidoon AL-Shammari

Lecturer / Researcher

zaidoon.waleed@mustaqbal-college.edu.iq

Things have to know them



1. Power supplies.
2. Block Diagrams.
3. Schematic Diagrams.
4. Circuit Diagrams.

1. Power supplies



- 3.3 volt for micro chips (processor or controller).**
- ± 5.0 volt for logic and related Integrated Circuits.**
- $\pm 10 - \pm 15$ volt for Op-amp and power elements.**

MAIN Power supplies:

- 220 volt AC for single phase.**
- 380 volt AC for three phase.**

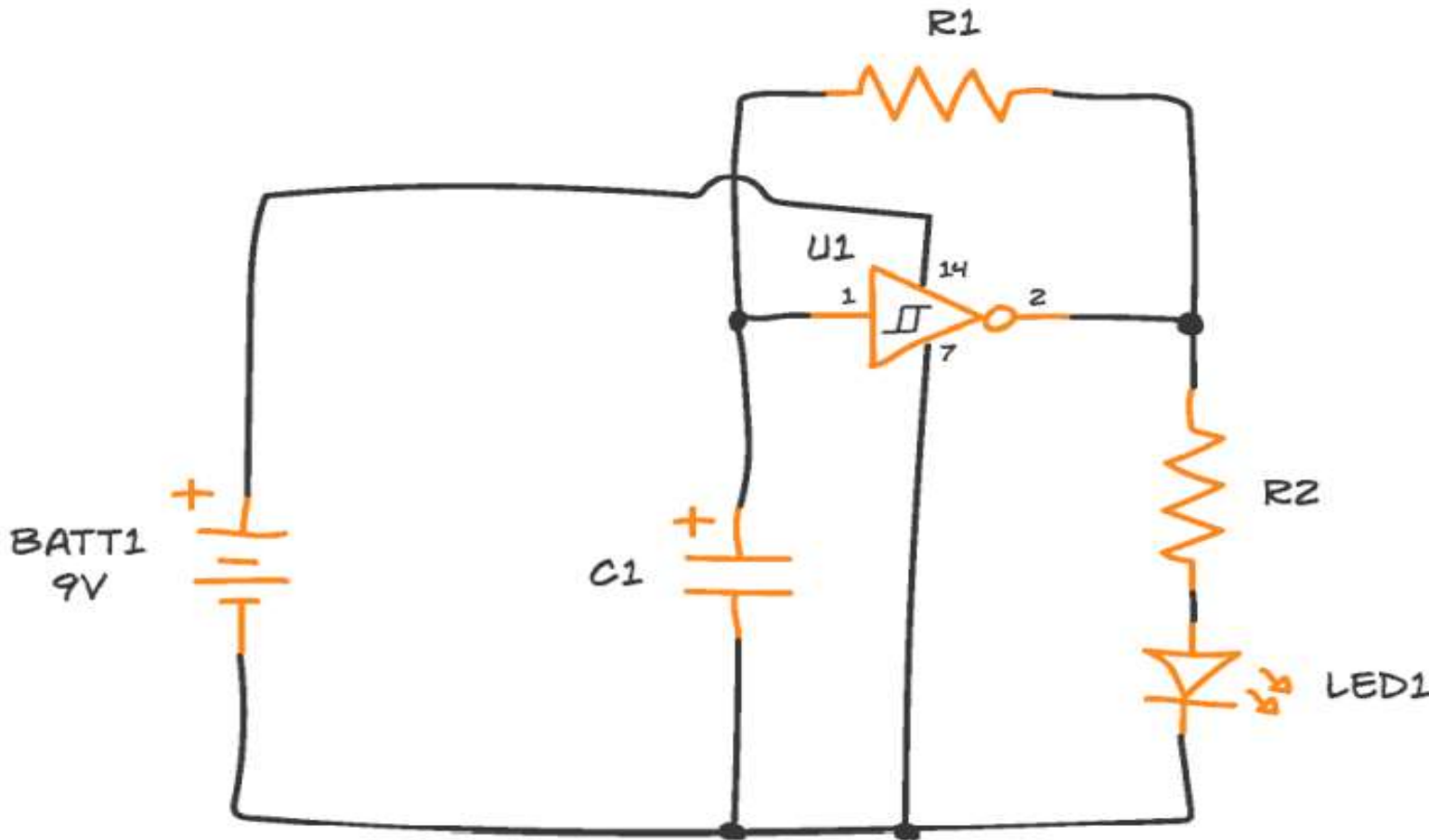
Other Power supplies:

- Hundreds of volt for power units such as x-ray tubes.**
- # volt for bus communications.**

3. Schematic Diagrams



Sets of standards real components shape (such as amplifiers and so on) interconnected in logical way.



Standard shapes

No values or code of elements

Hidden practical details such as

How to Read a Schematic



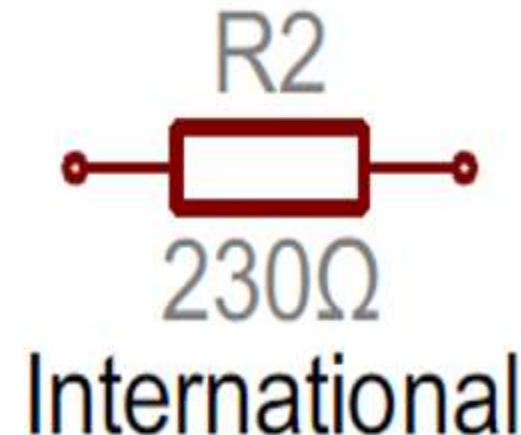
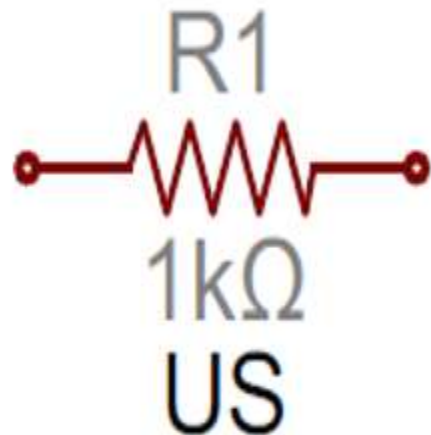
A. Schematic Symbols (Part 1)

- Resistors.
- Capacitors.
- Inductors.
- Switches.
- Power Sources.
- Batteries.

Resistors



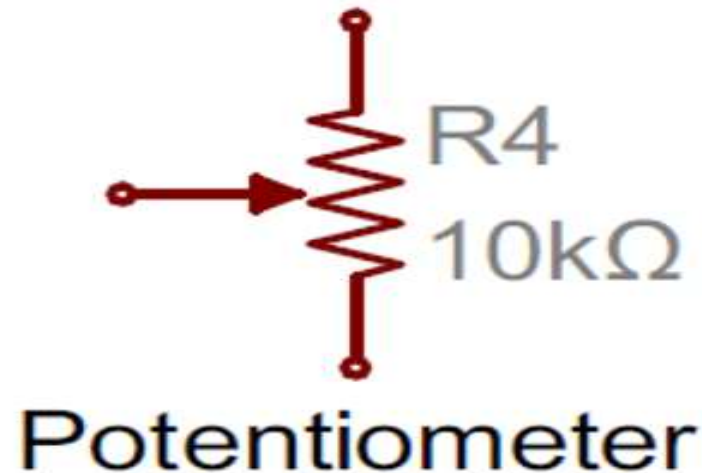
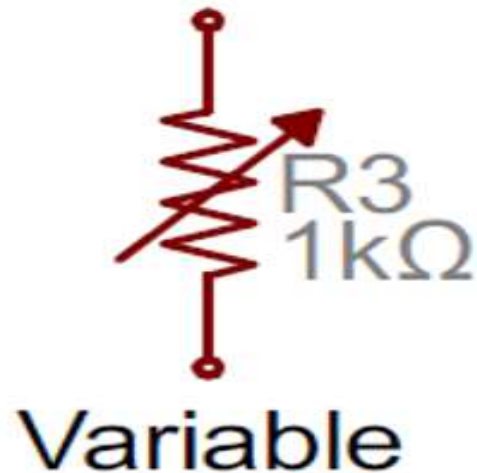
- Resistors on a schematic are usually represented by a few zig-zag lines, with two terminals extending outward.
- Schematics using international symbols may instead use a featureless rectangle, instead of the squiggles.



Potentiometers and Variable Resistors



- The variable resistor remains a two-terminal device, so the arrow is just laid diagonally across the middle.
- A potentiometer is a three-terminal device, so the arrow becomes the third terminal.



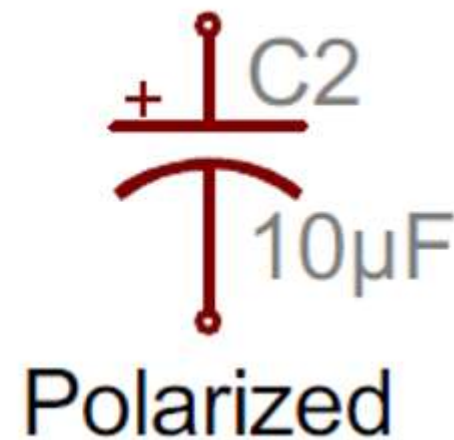
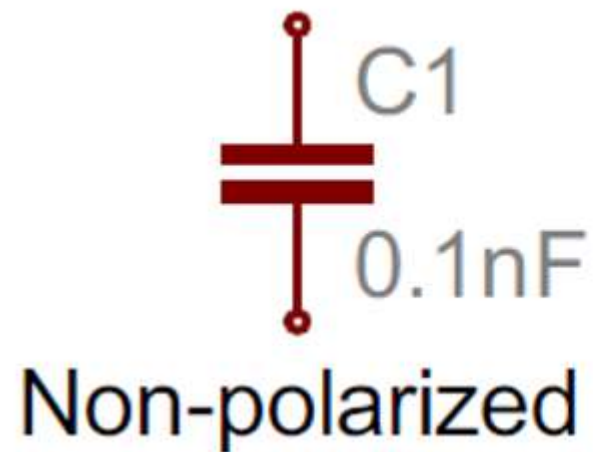
Capacitors



There are two commonly used capacitor symbols.

- One symbol represents a polarized (usually electrolytic or tantalum) capacitor. A plus sign should also be added to the positive pin of the polarized capacitor symbol.
- The other one is for non-polarized caps.

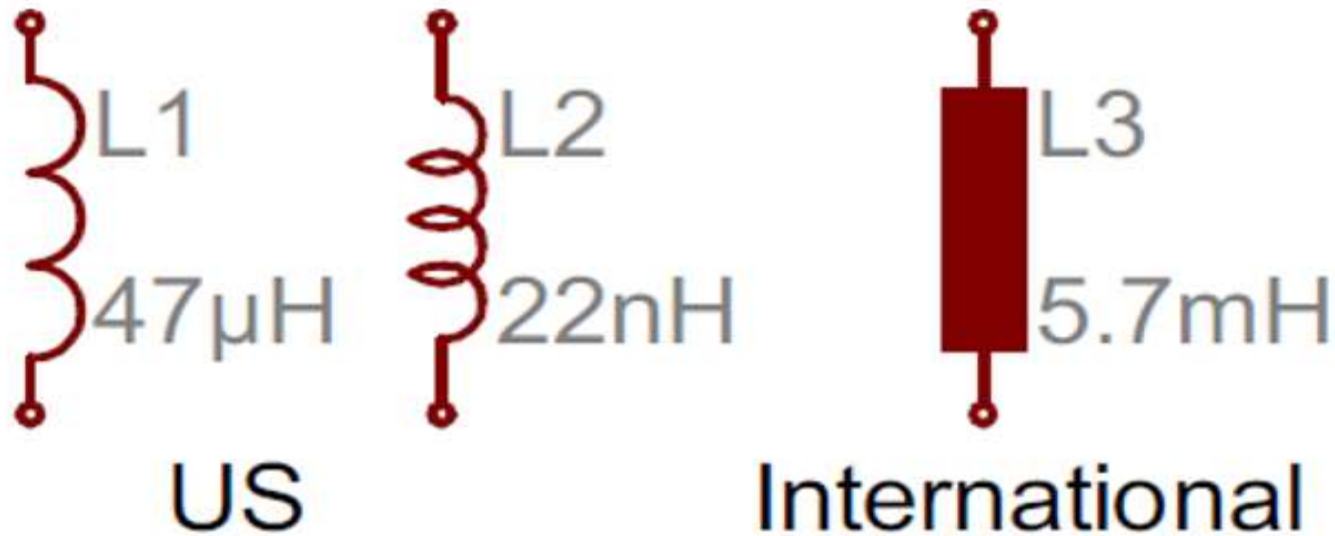
In each case there are two terminals, running perpendicularly into plates.



Inductors



- Inductors are usually represented by either a series of curved bumps, or loopy coils.
- International symbols may just define an inductor as a filled-in rectangle.



Switches



Switches exist in many different forms.

- A single-pole/single-throw (SPST).

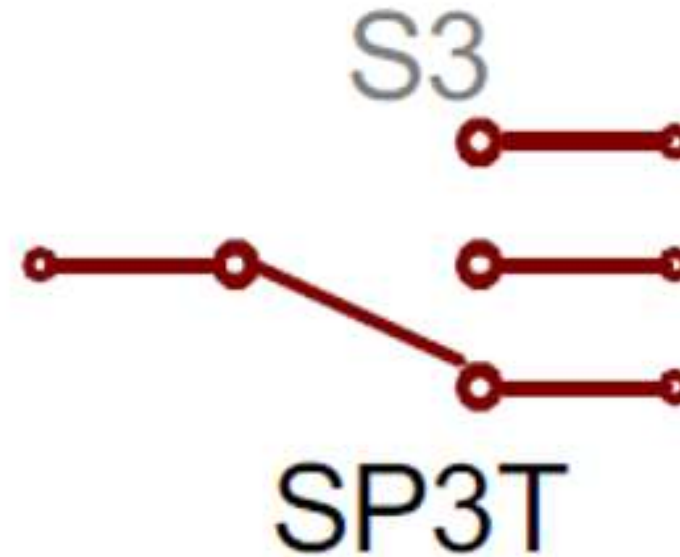
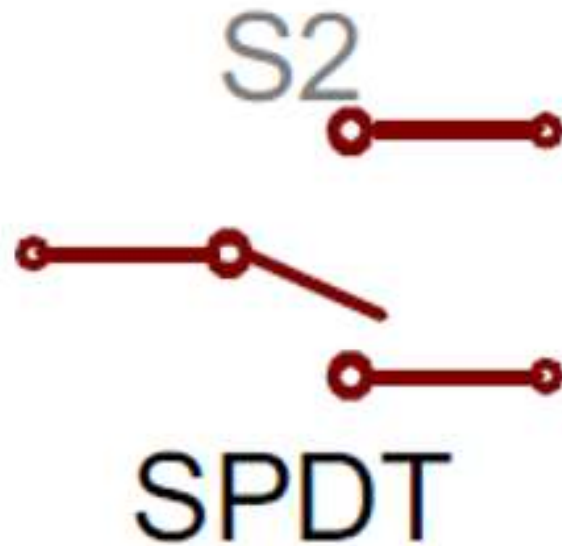
The most basic switch, a single-pole/single-throw (SPST), is two terminals with a half-connected line representing the actuator (the part that connects the terminals together).



Switches



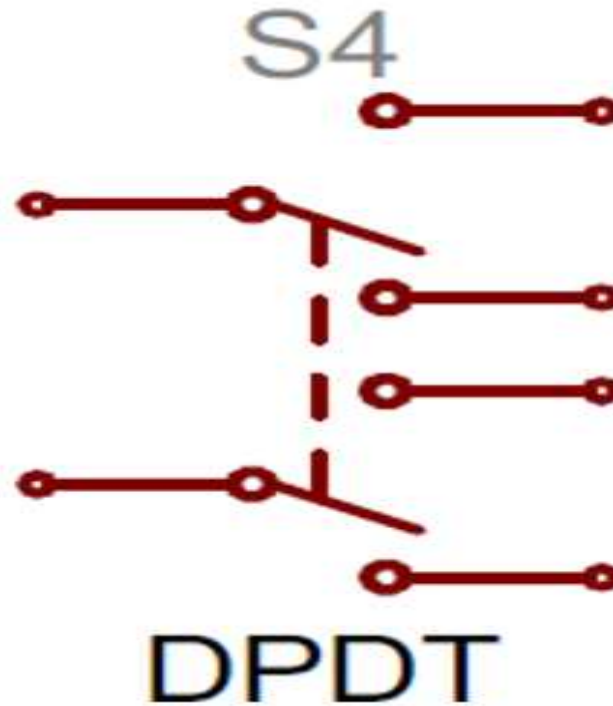
- Switches with more than one throw, like the SPDT and SP3T below, add more landing spots for the actuator.



Switches



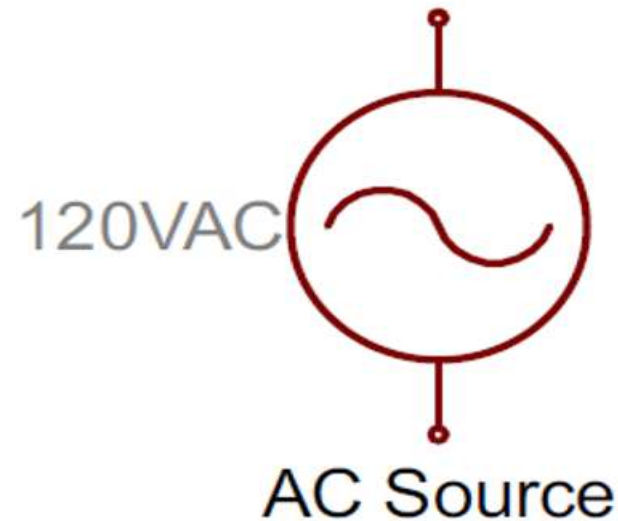
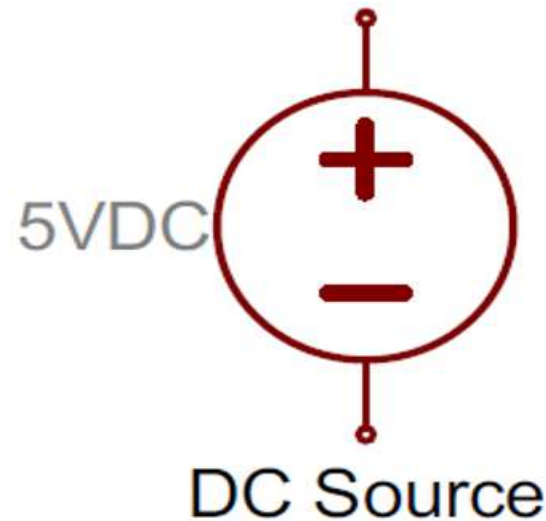
- Switches with multiple poles, usually have multiple, alike switches with a dotted line intersecting the middle actuator.





1. DC or AC Voltage Sources

- Most of the time when working with electronics, you'll be using constant voltage sources.
- We can use either of these two symbols to define whether the source is supplying direct current (DC) or alternating current (AC).





2. Batteries

- Batteries, usually look like a pair of disproportionate, parallel lines.
- More pairs of lines usually indicates more series cells in the battery.
- Also, the longer line is usually used to represent the positive terminal, while the shorter line connects to the negative terminal.



