

Basic Elec. Engr. Lab

ECS 204

Asst. Prof. Dr. Prapun Suksompong

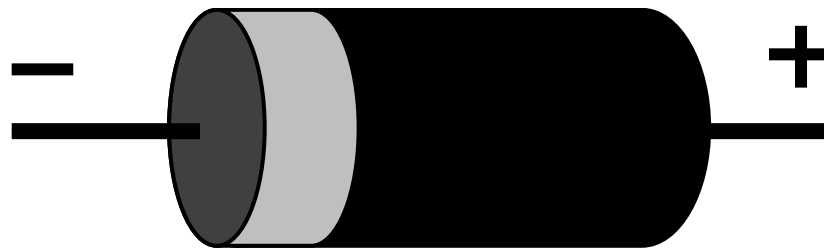
prapun@siit.tu.ac.th



Lab 6

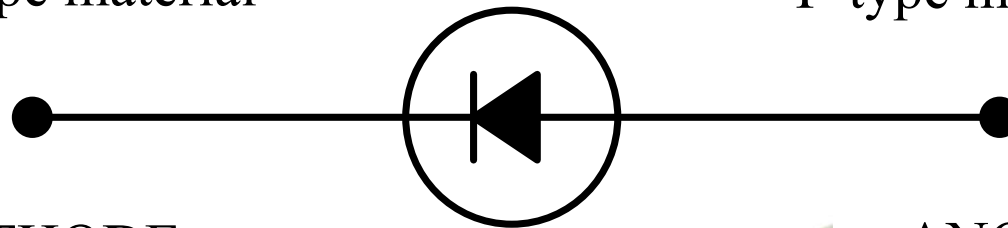
- Diode
- Transformer
- Rectifiers
- Electrolytic Capacitor

Diode



N-type material

P-type material



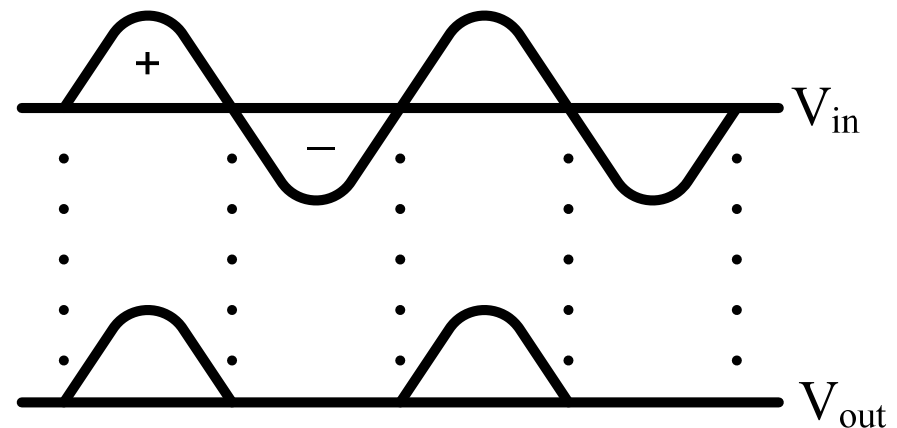
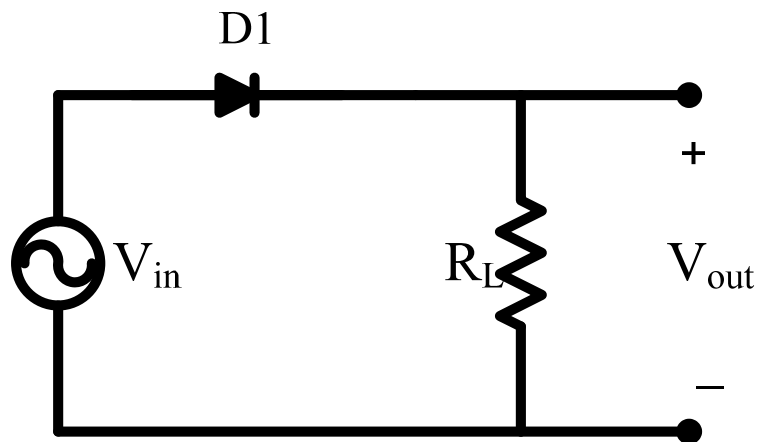
CATHODE

ANODE

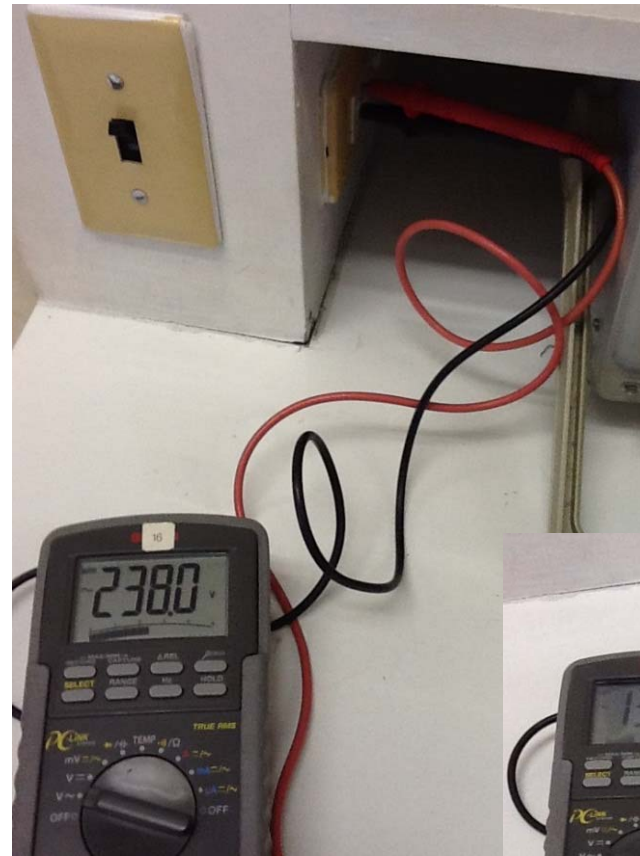


Unidirectional current characteristics

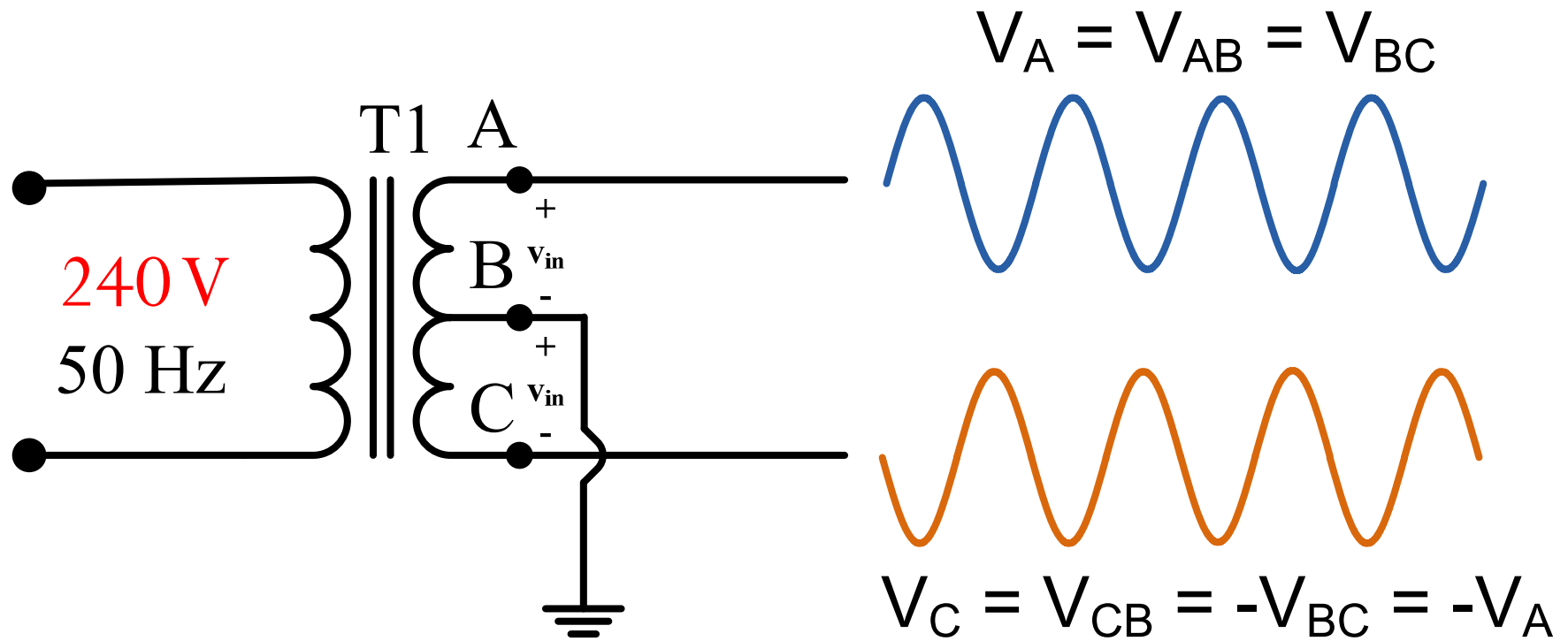
- Permit current to flow through in one direction (when **forward-biased**), but not the other (**reverse-biased**).



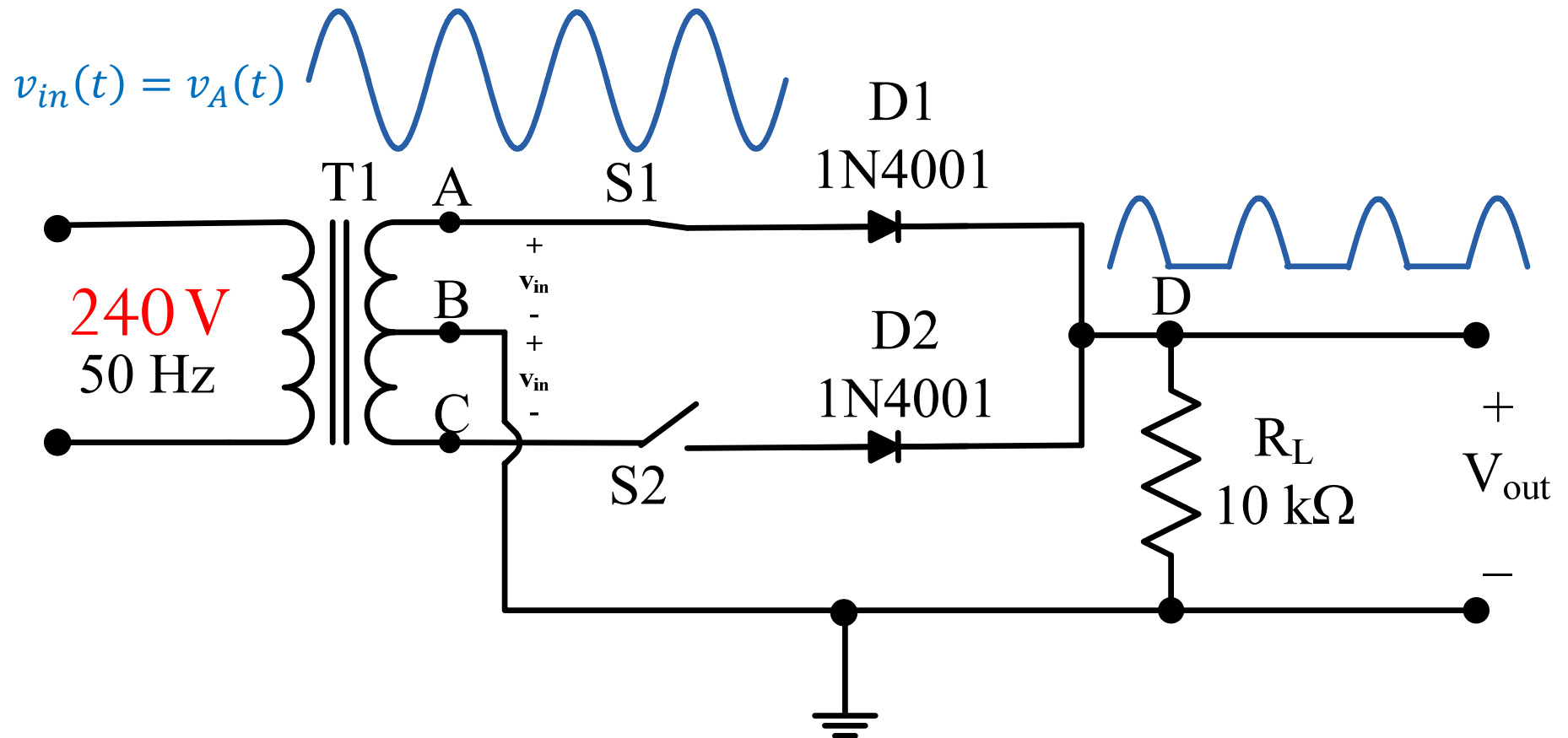
Transformer



Transformer

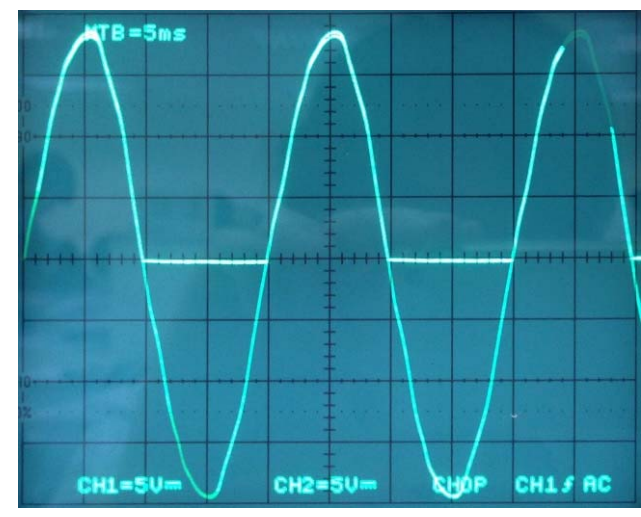
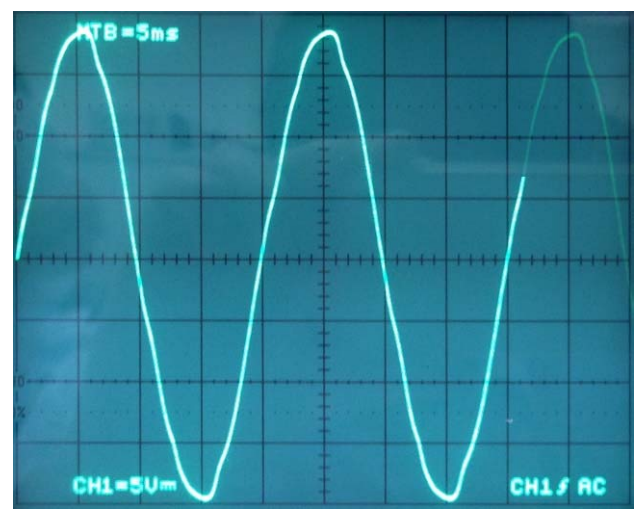
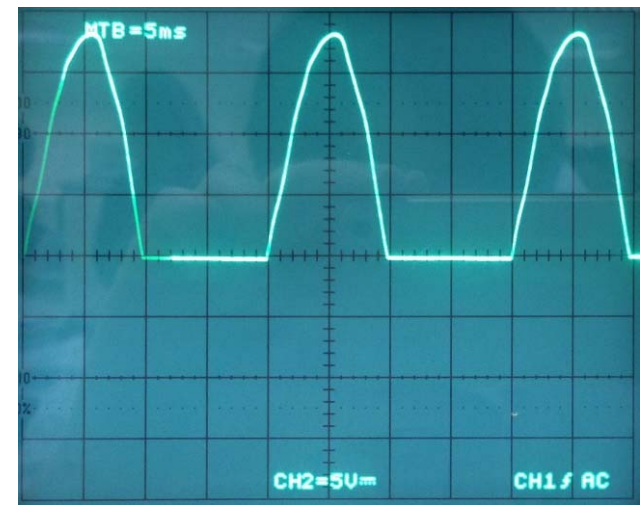
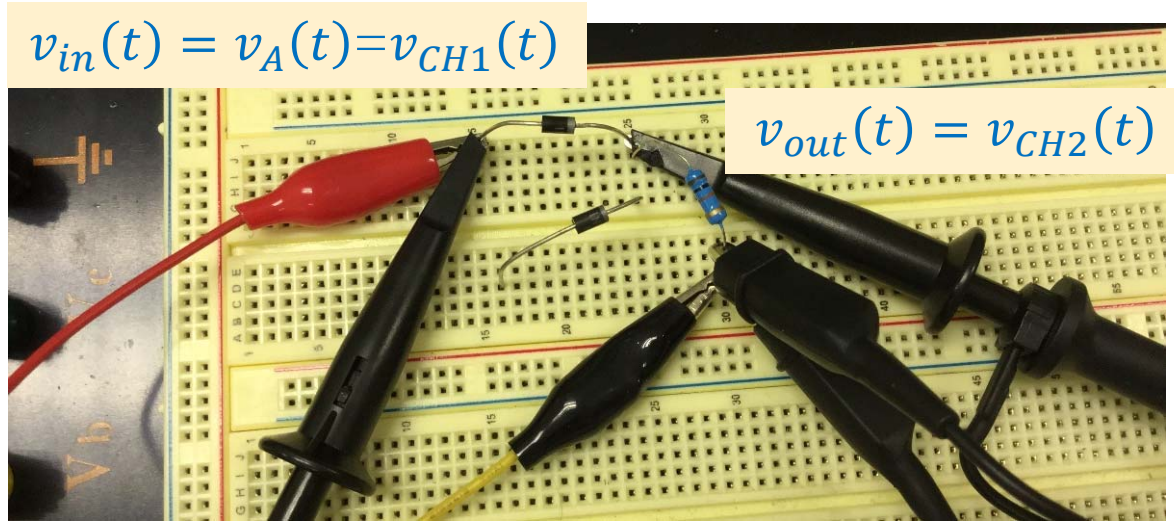


Part A: Half-Wave Rectifier (HWR)

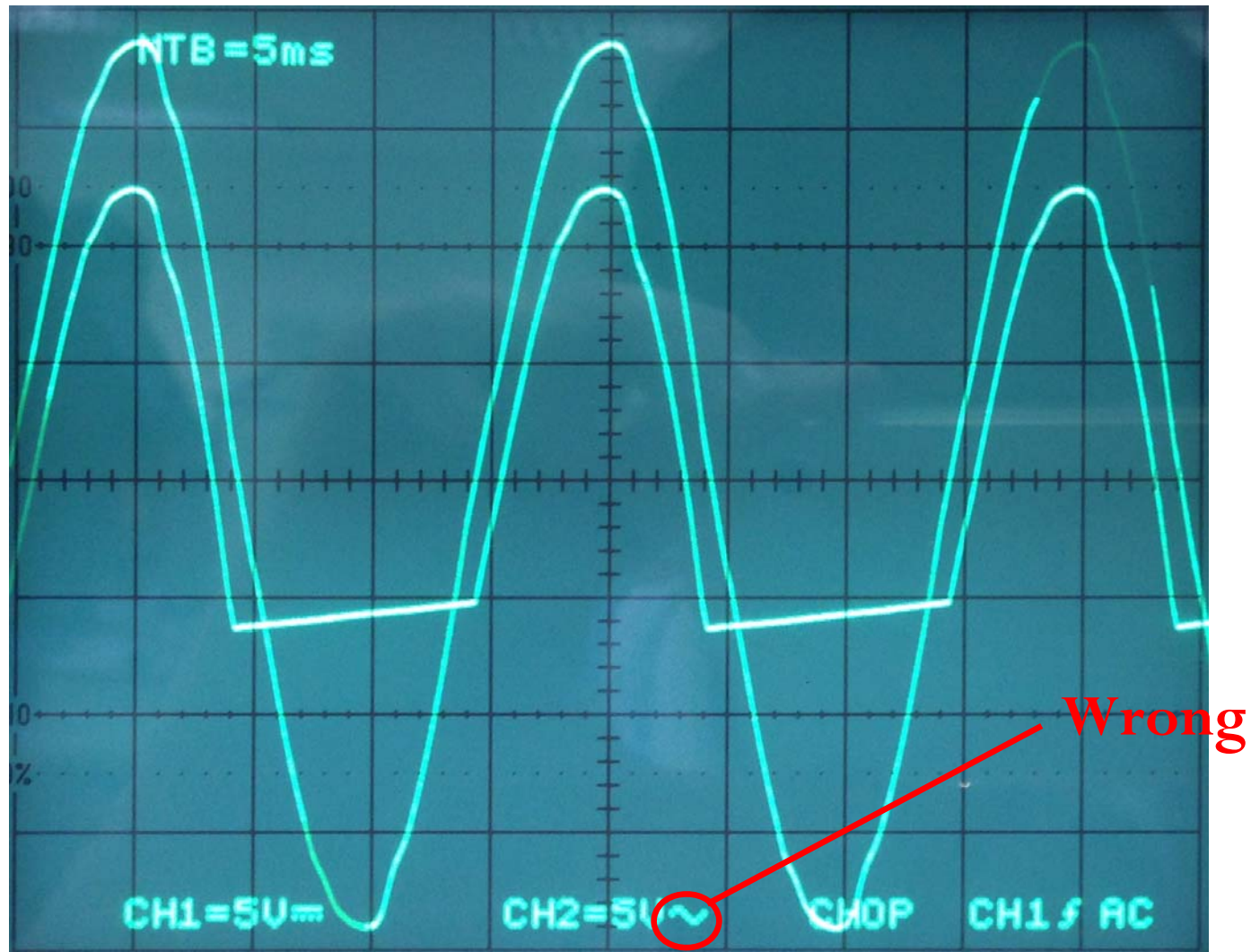


- A **rectifier** is an electrical device that converts alternating current (AC) to direct current (DC).

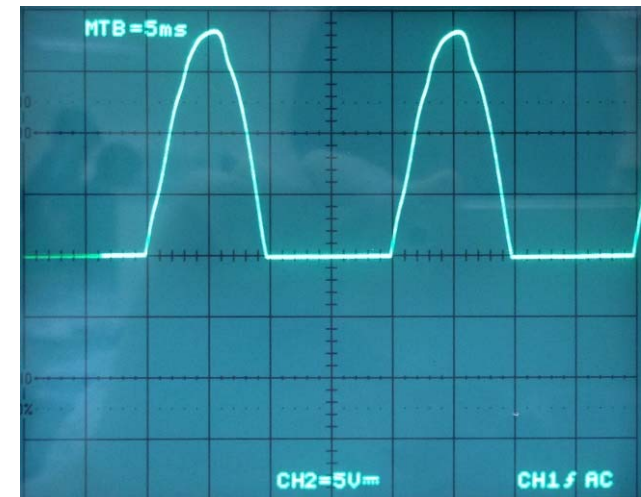
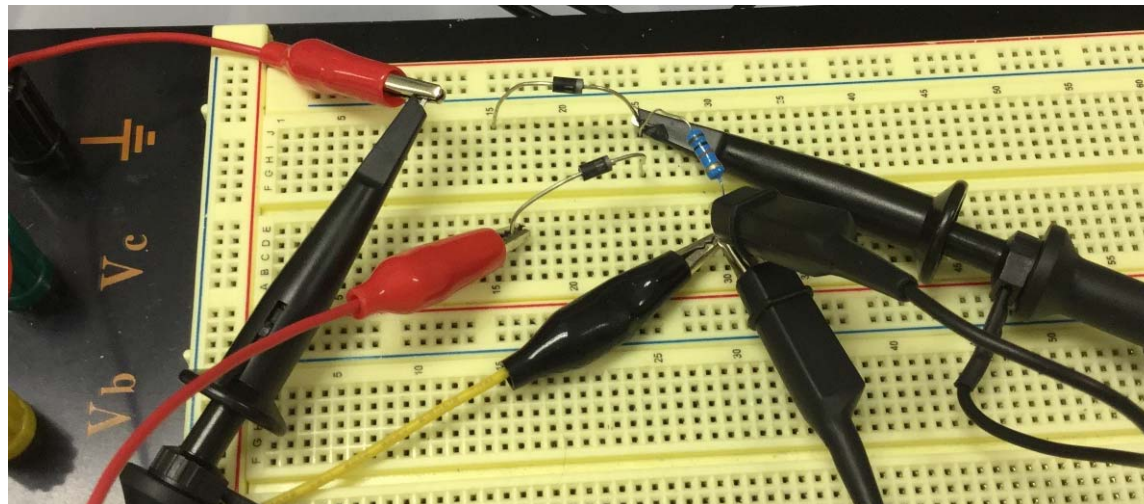
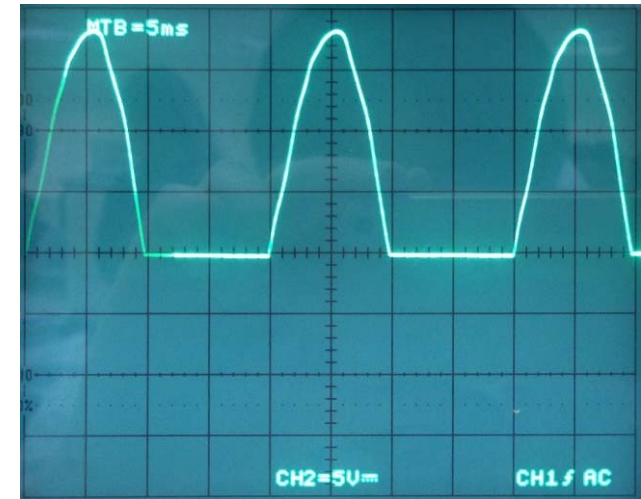
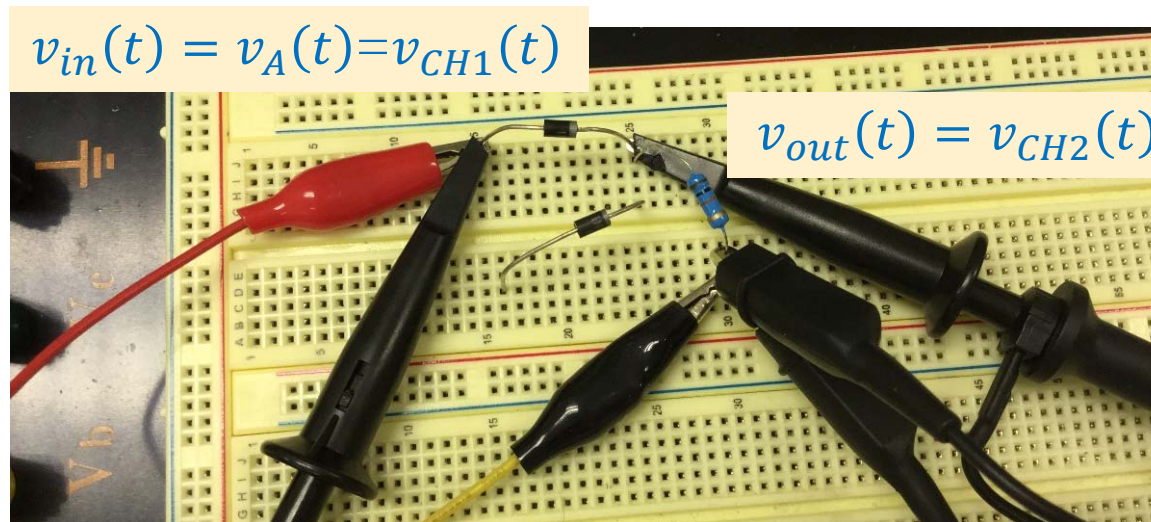
Part A: Half-Wave Rectifier (HWR)



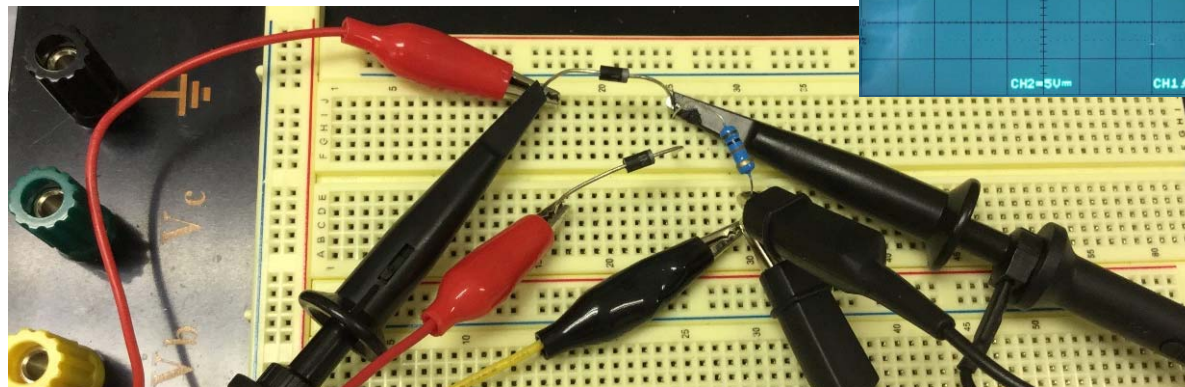
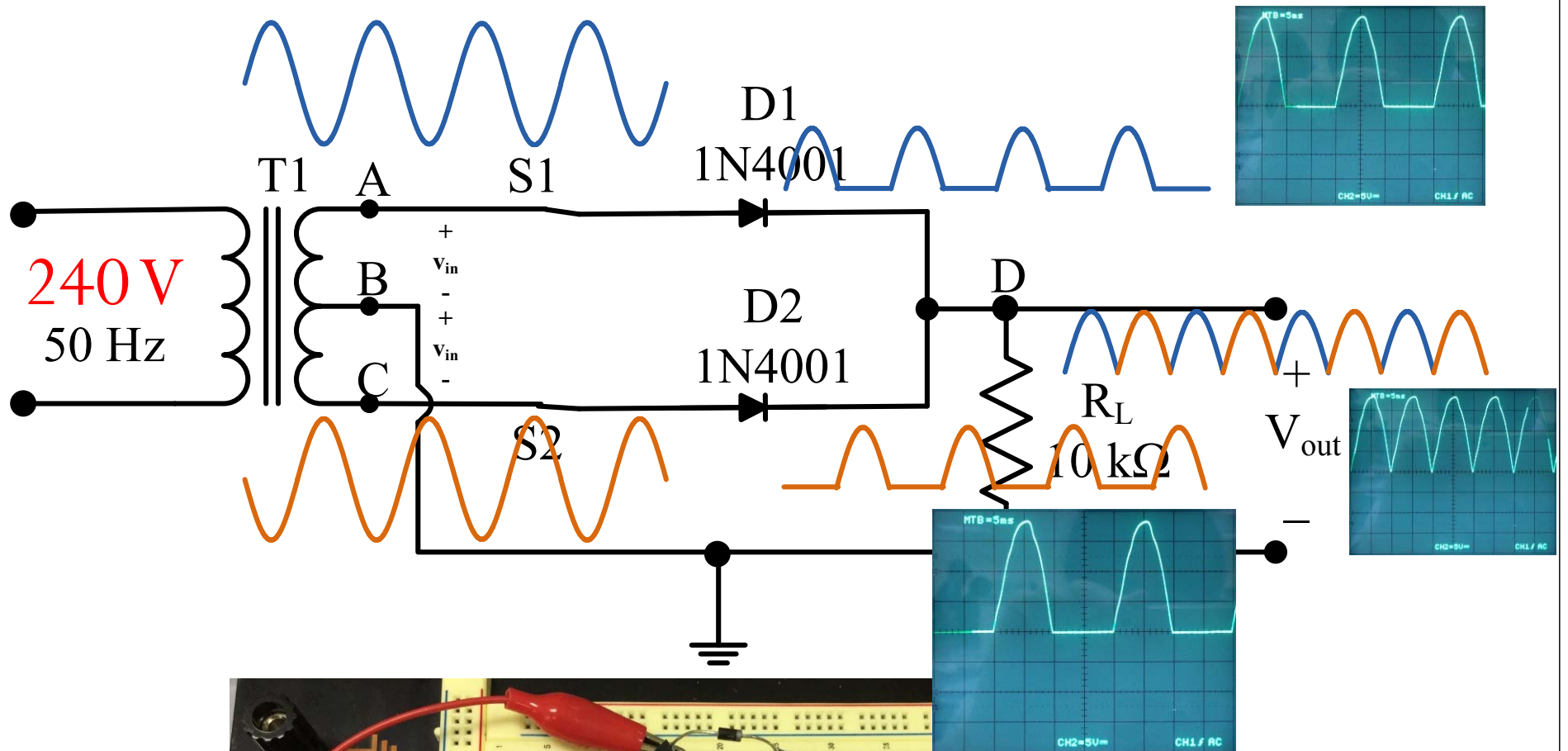
Use the osc. in DC mode



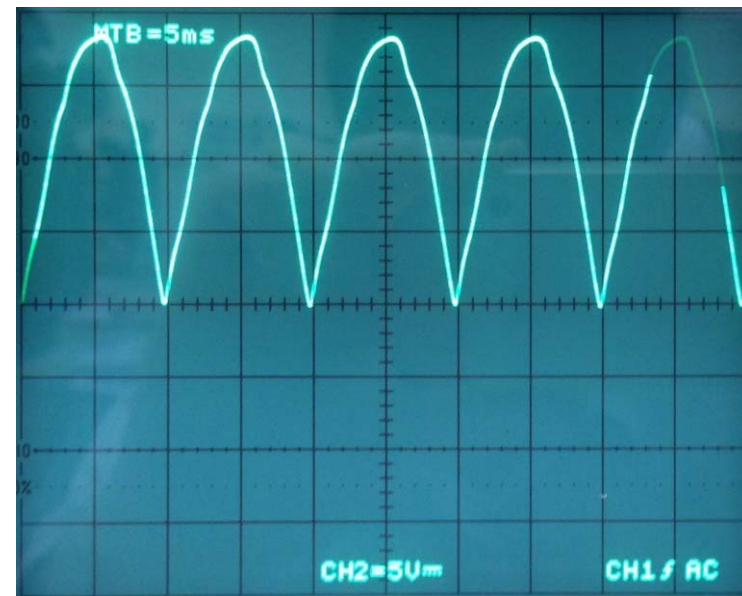
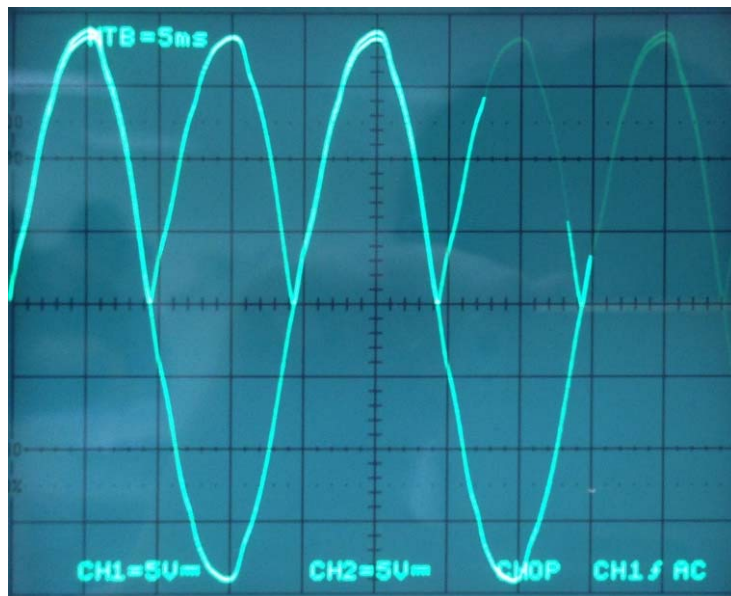
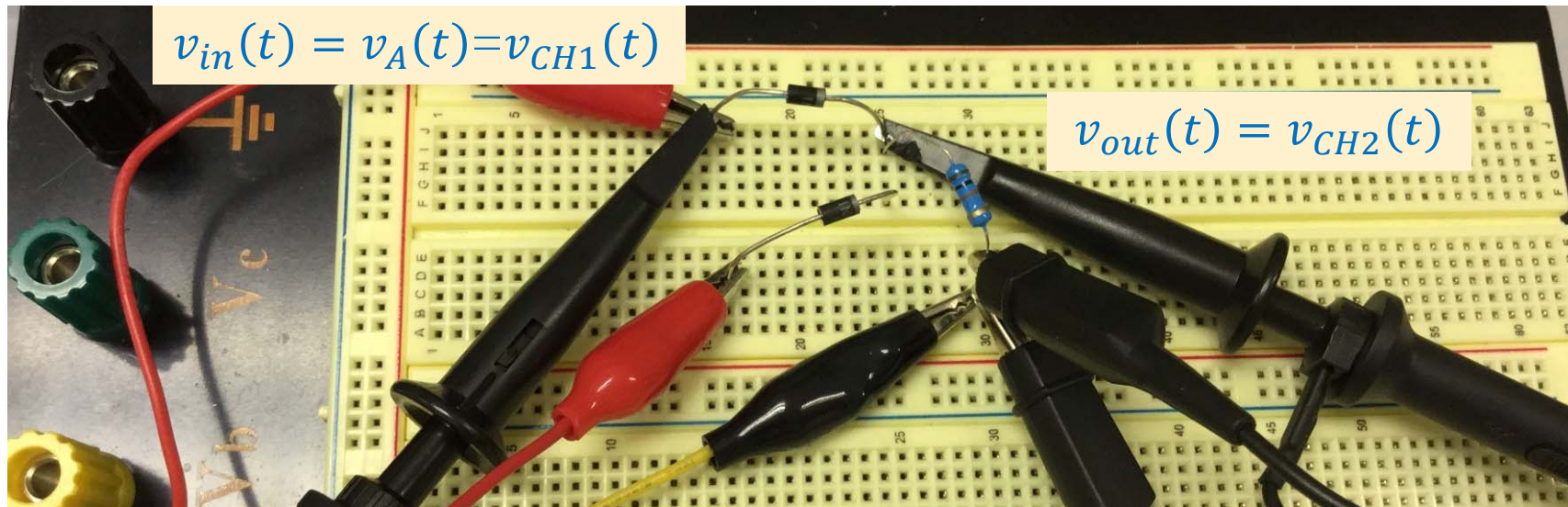
Part A: Half-Wave Rectifier (HWR)



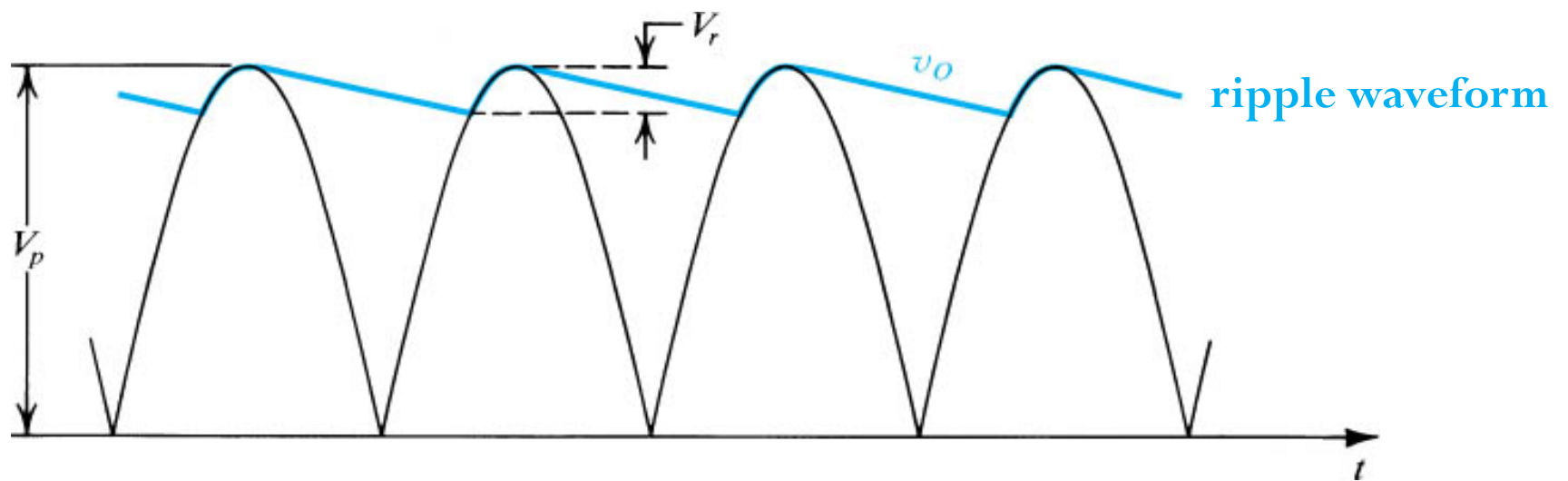
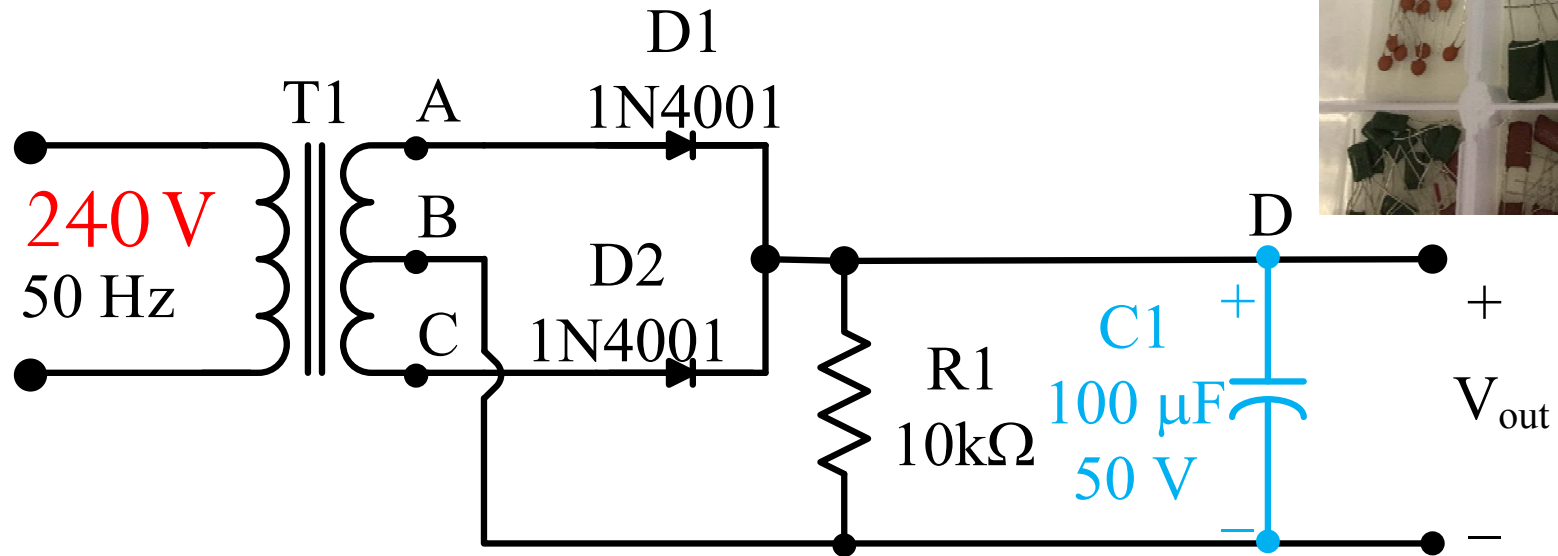
Part A: Full-Wave Rectifier (FWR)



Part A: Full-Wave Rectifier (FWR)



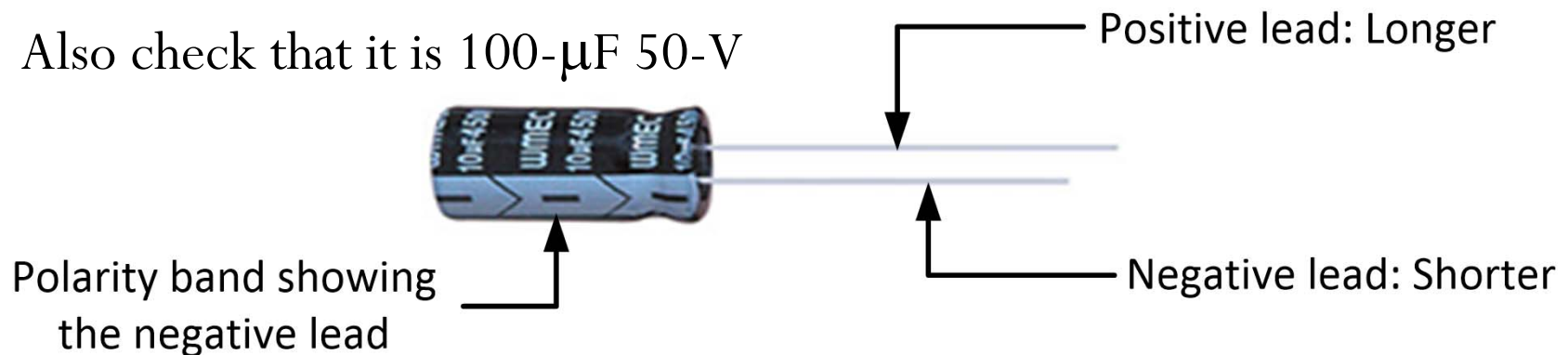
Part B: Filter Capacitor



Electrolytic Capacitor

- The polarity is almost always indicated by a printed band.
 - The lead nearest to that band is the cathode lead (-).
- Additionally, the positive lead is usually longer.
- Hook them up the wrong way and at best, you'll block the signal passing through. At worst (for higher voltage applications) they'll explode.

Also check that it is 100- μ F 50-V



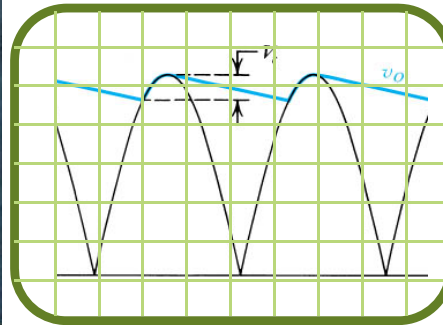
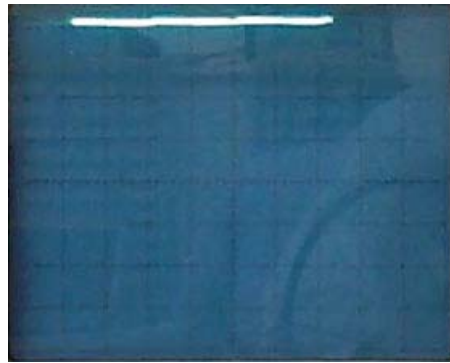
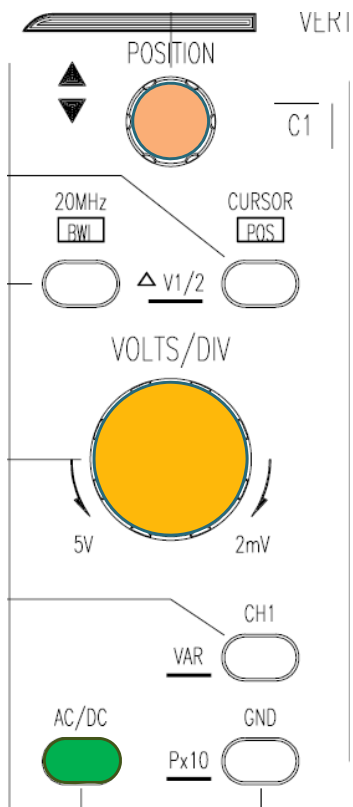
Oscilloscope: DC mode vs. AC mode

- Input signal: $v(t)$
- DC mode: Show $v_{DC}(t) = v(t)$
- AC mode: Show $v_{AC}(t) = v(t) - V_{DC}$
 - $v_{AC}(t)$ always have 0 average (theoretically)
- $v_{AC}(t) = v_{DC}(t)$ when $V_{DC} = 0$.

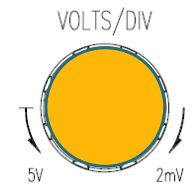
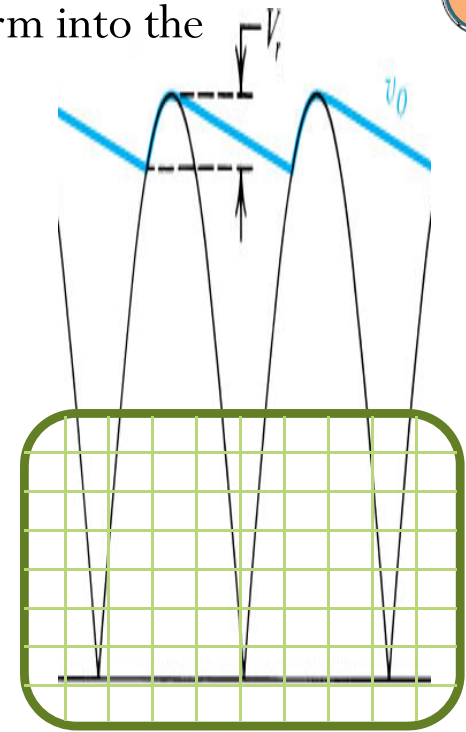
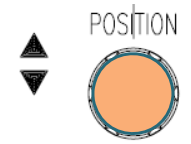


DC vs. AC

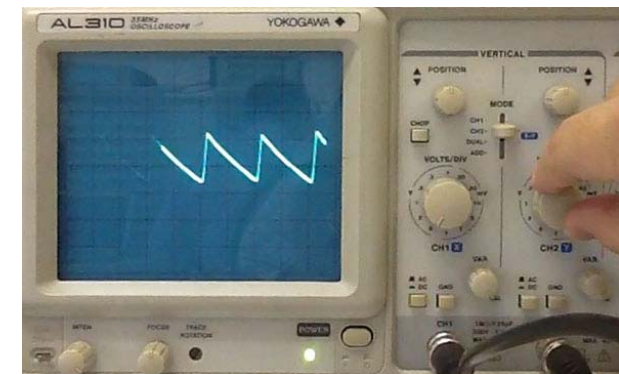
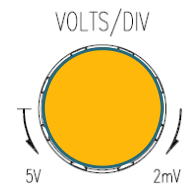
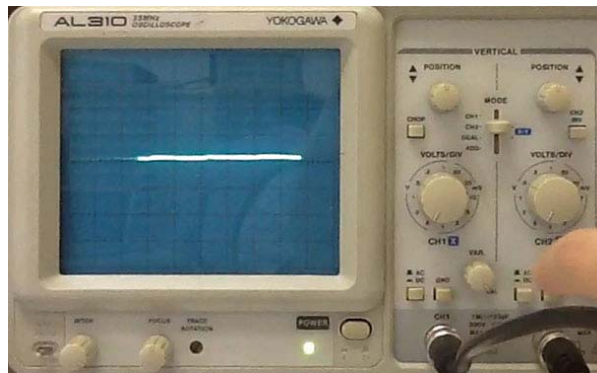
In DC mode...



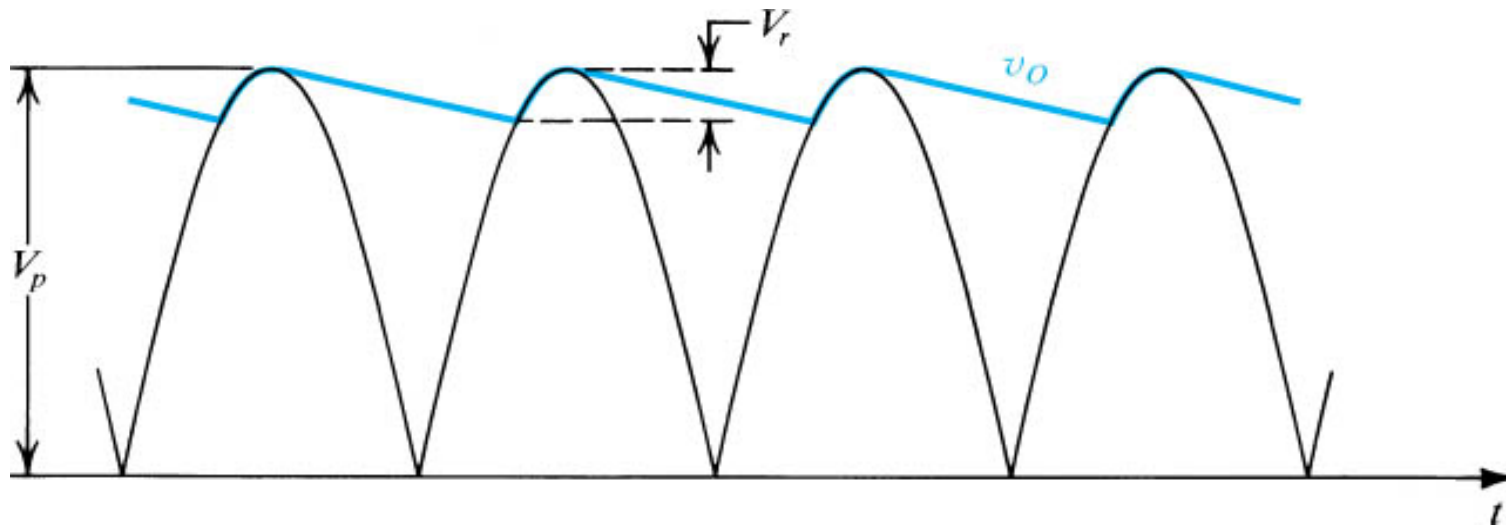
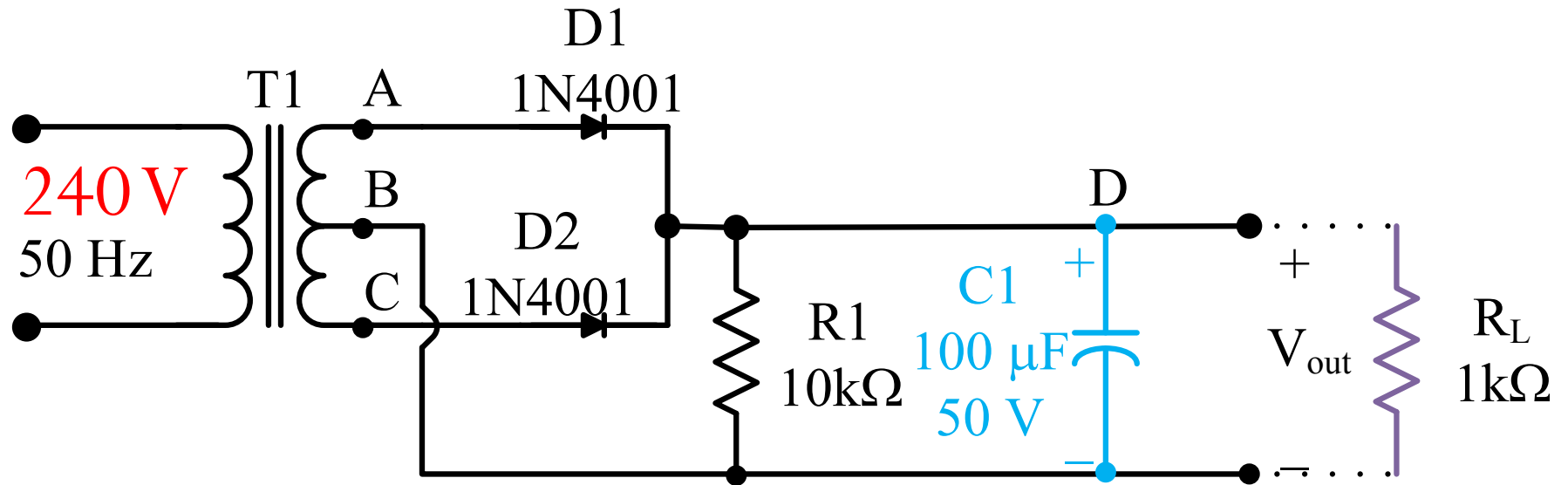
Not enough to move the interesting part of the waveform into the screen



In AC mode...

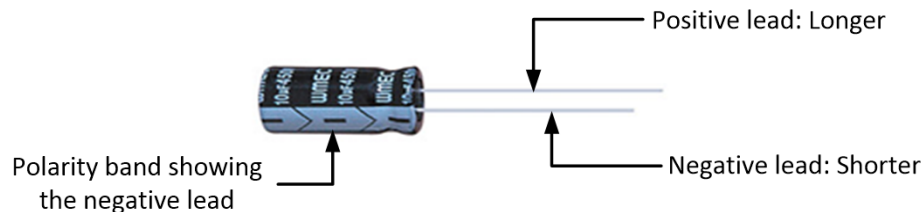
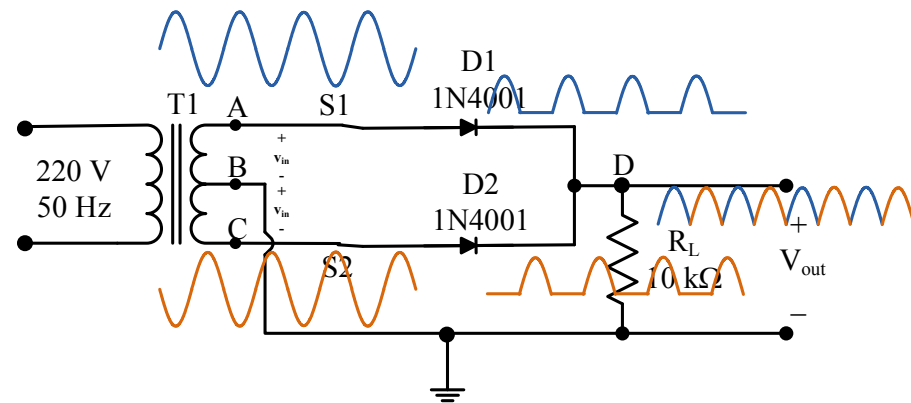


Part B: Filter Capacitor + Load

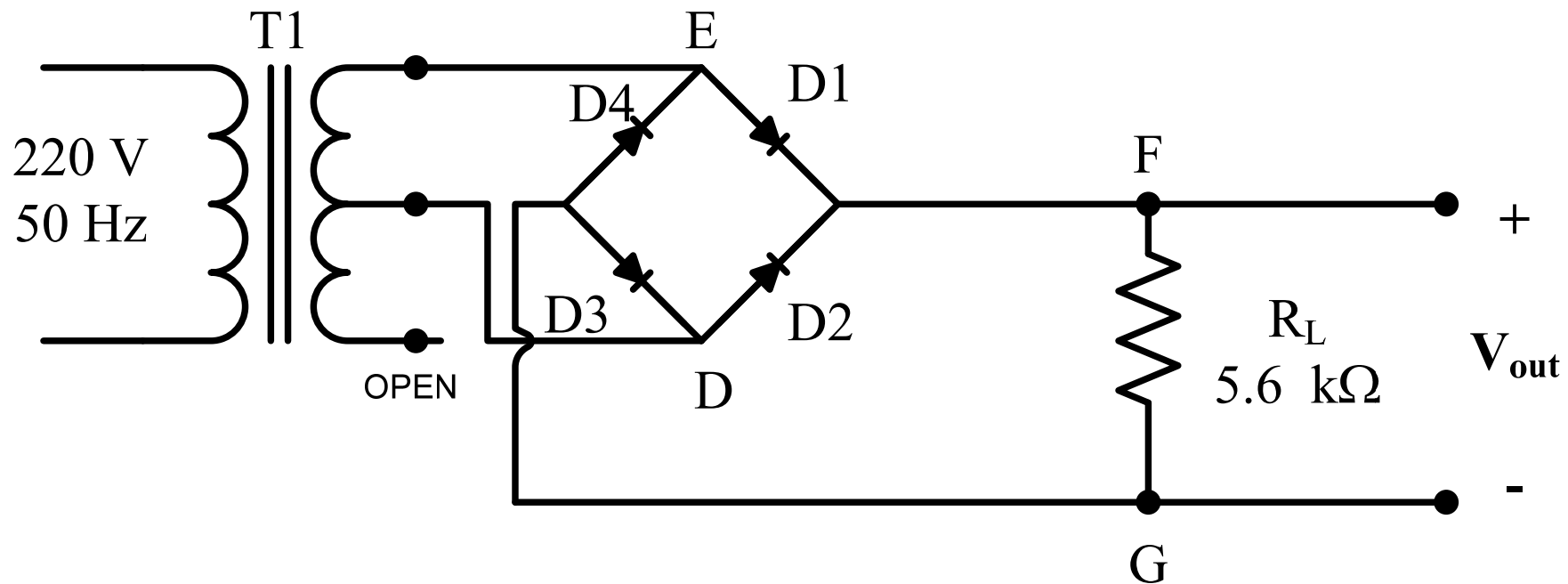


Summary: Rectifiers

- Use diode to rectify AC waveform
- Use large capacitor to reduce ripple
- Two dangerous mistakes:
 - Unknowingly shorting between nodes (A, B, C) of the transformer outputs
 - You will smell something burning.
 - Reverse the polarity of the capacitor



Part C: Bridge rectifier



For next quiz ... Op-Amp 741

- **OP**erational **AMPL**ifier

