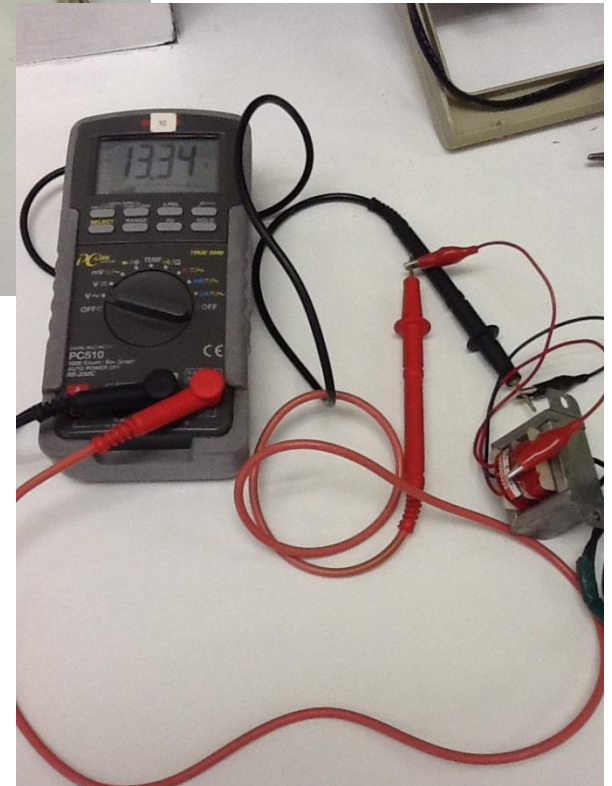
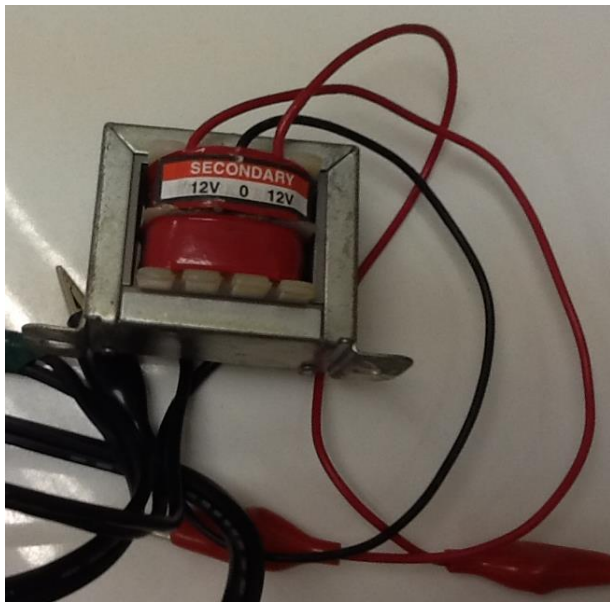
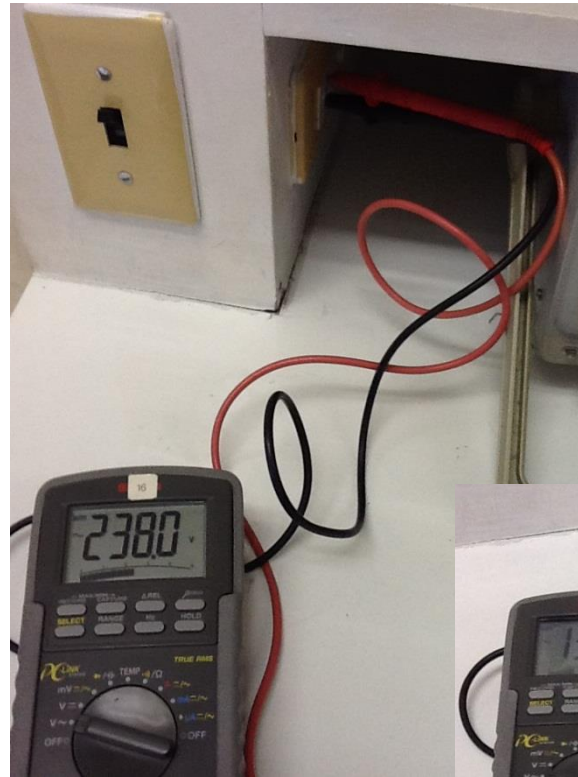
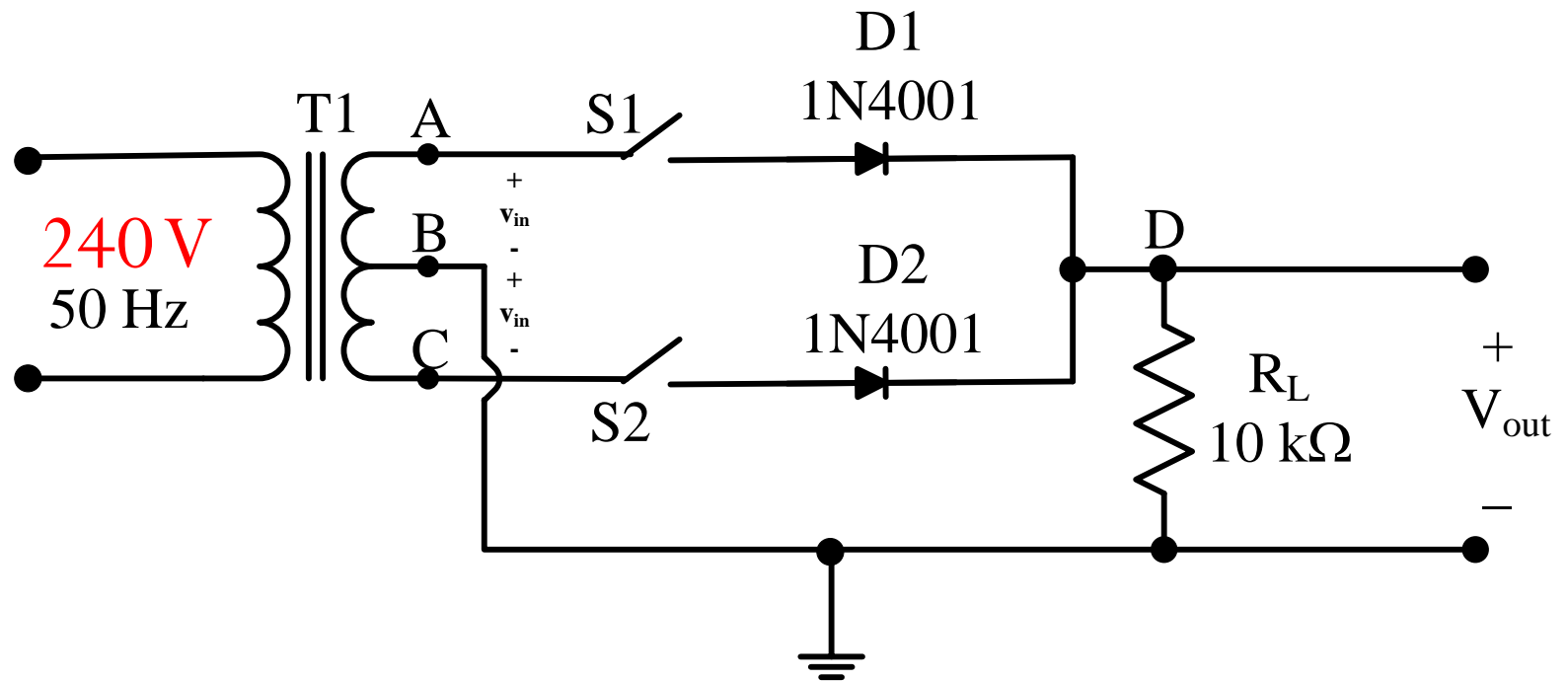


Application: Simple Rectifier

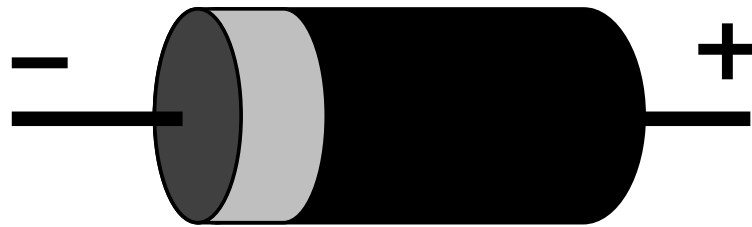
Transformer



Part A

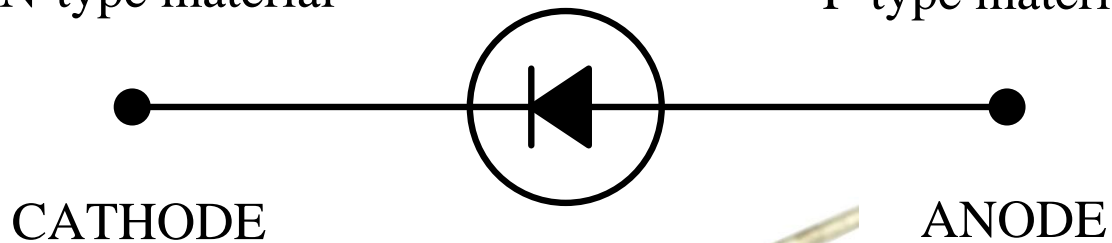


Diode



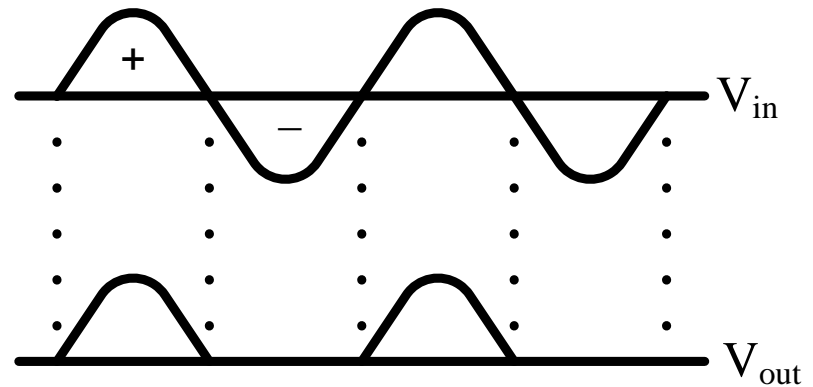
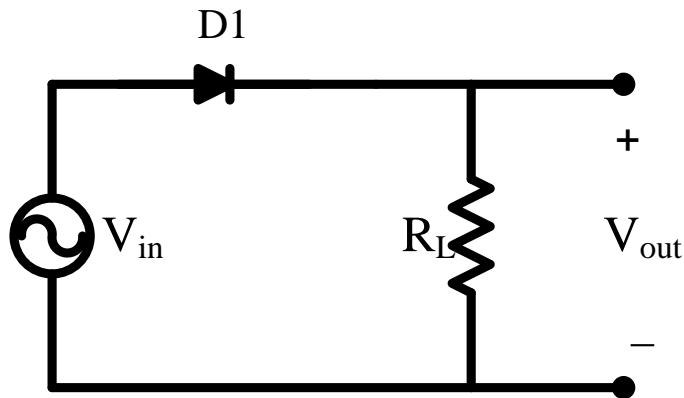
N-type material

P-type material



Unidirectional current characteristics

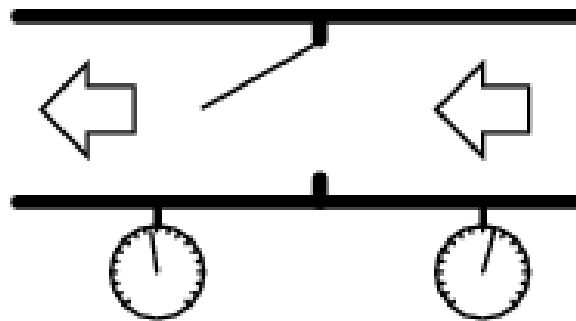
- Permit current to flow through in one direction (when **forward-biased**), but not the other (**reverse-biased**).



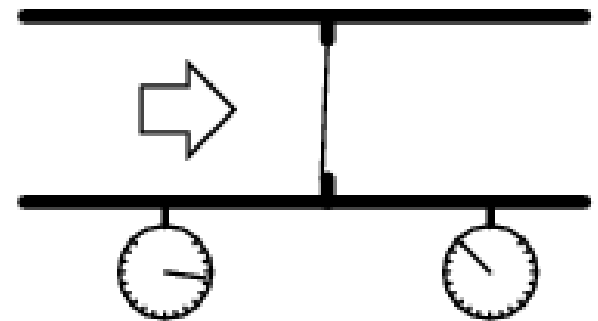
Analogy to Check Valve

- Diode behavior is analogous to the behavior of a hydraulic device called a **check valve**.
- A check valve allows fluid flow through it in only one direction
- Check valves are essentially pressure-operated devices:
 - They open and allow flow if the pressure across them is of the correct “polarity” to open the gate (in the analogy shown, greater fluid pressure on the right than on the left).
 - If the pressure is of the opposite “polarity,” the pressure difference across the check valve will close and hold the gate so that no flow occurs.

*Hydraulic
check valve*

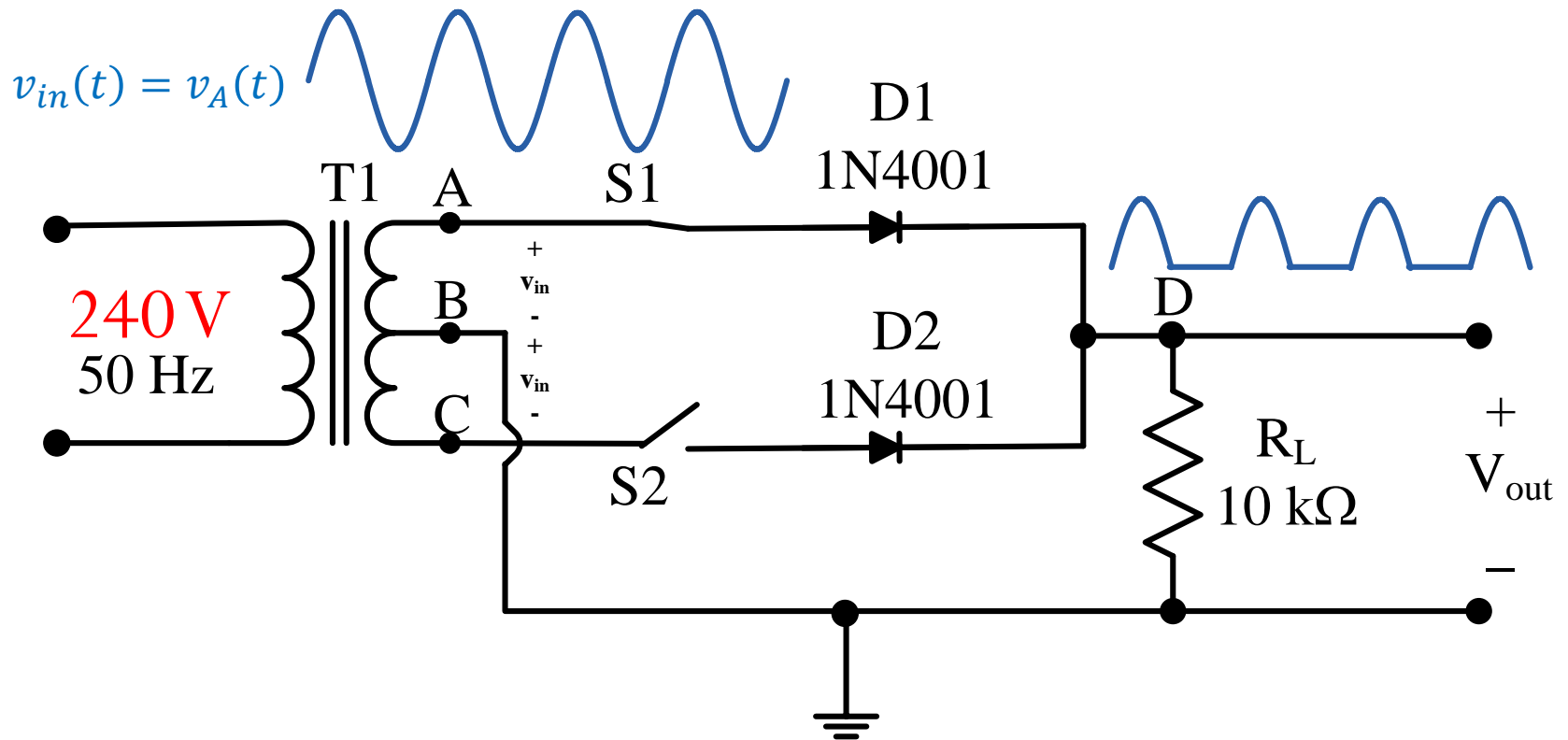


(a) Flow permitted



(b) Flow prohibited

Part A: Half-Wave Rectifier (HWR)



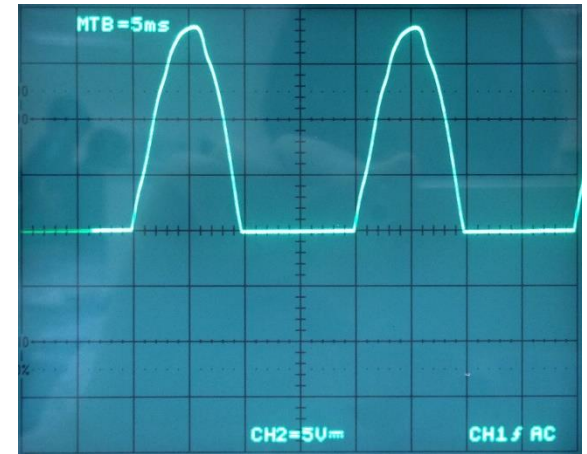
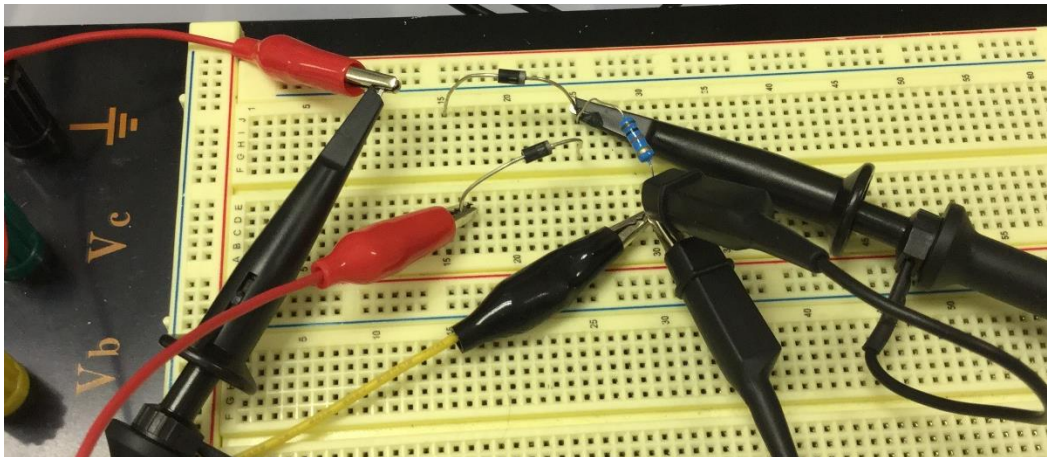
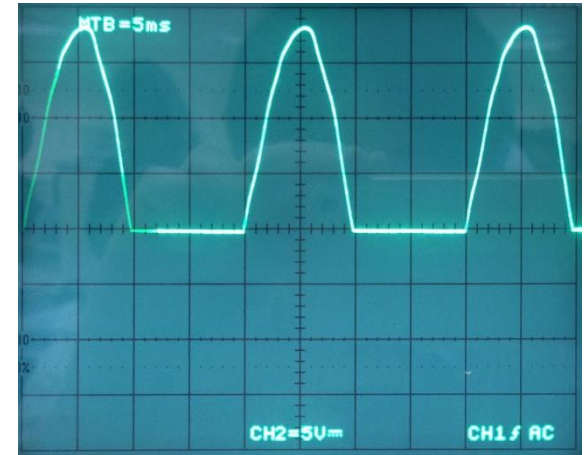
- A **rectifier** is an electrical device that converts alternating current (AC) to direct current (DC).

Part A: Half-Wave Rectifier (HWR)

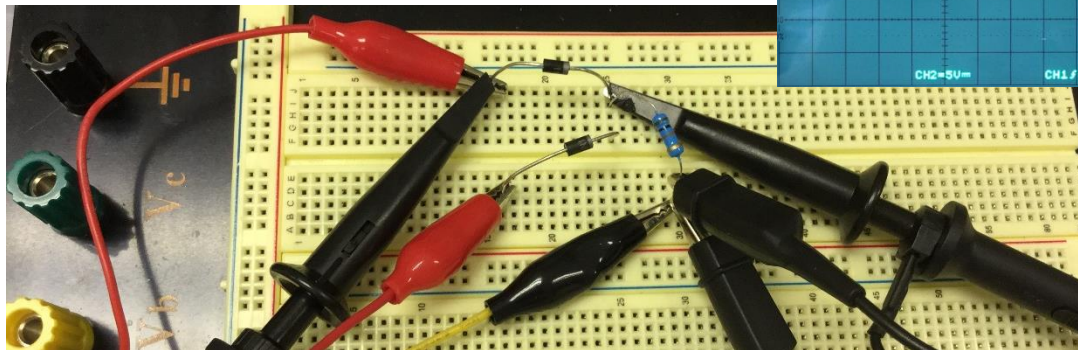
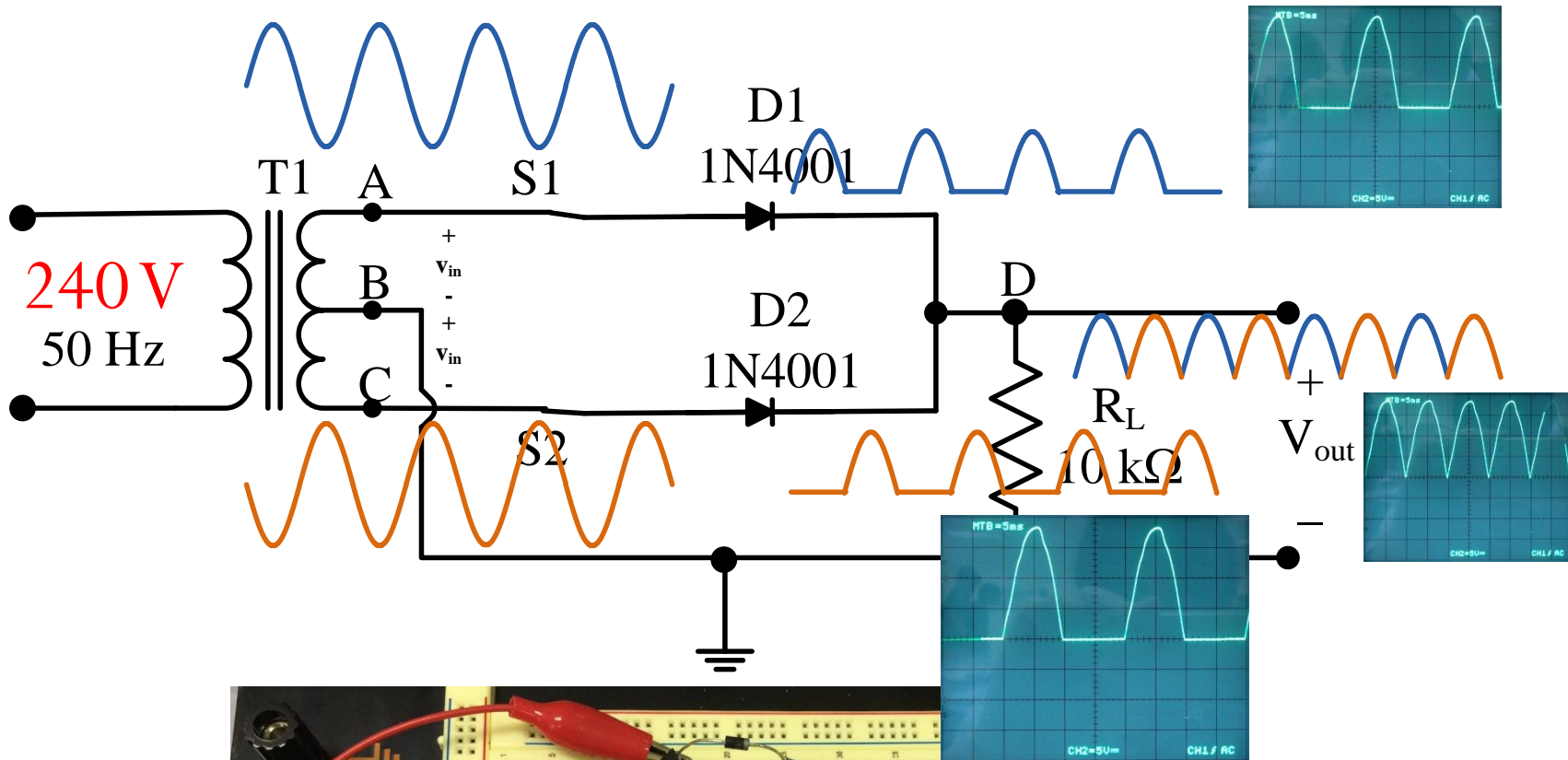
$$v_{in}(t) = v_A(t) = v_{CH1}(t)$$



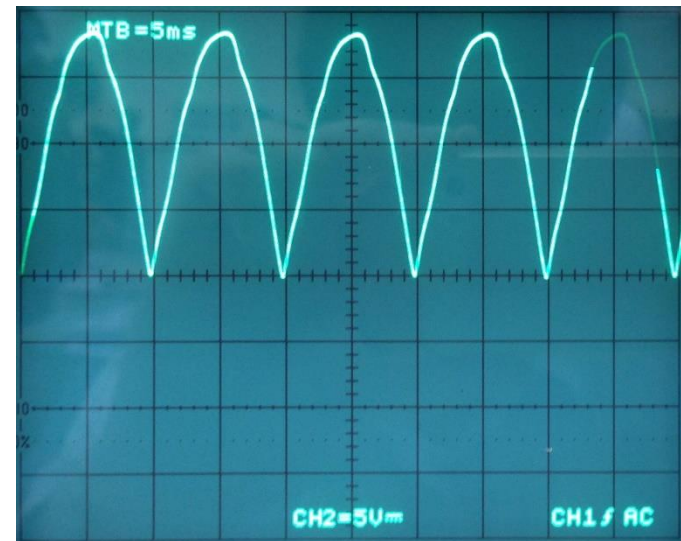
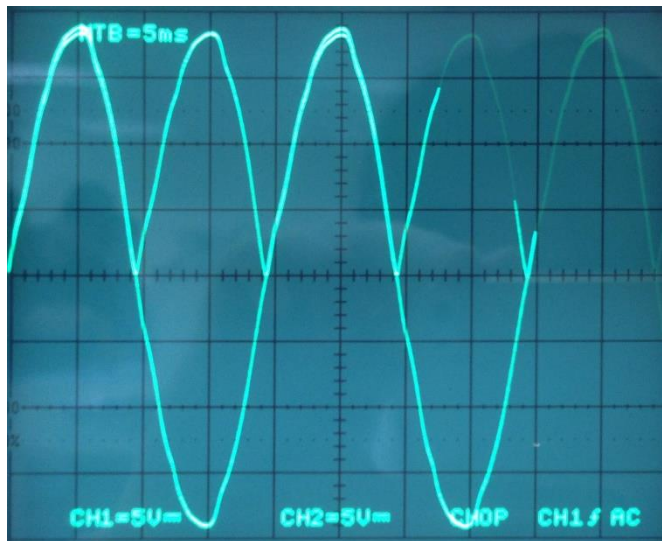
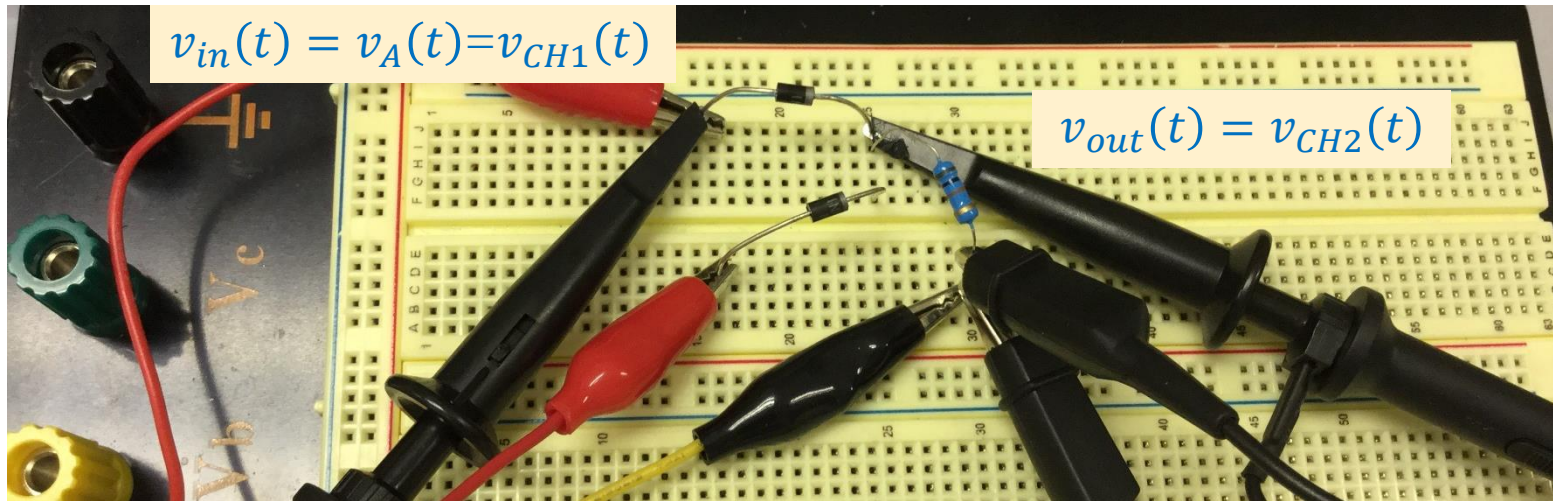
$$v_{out}(t) = v_{CH2}(t)$$



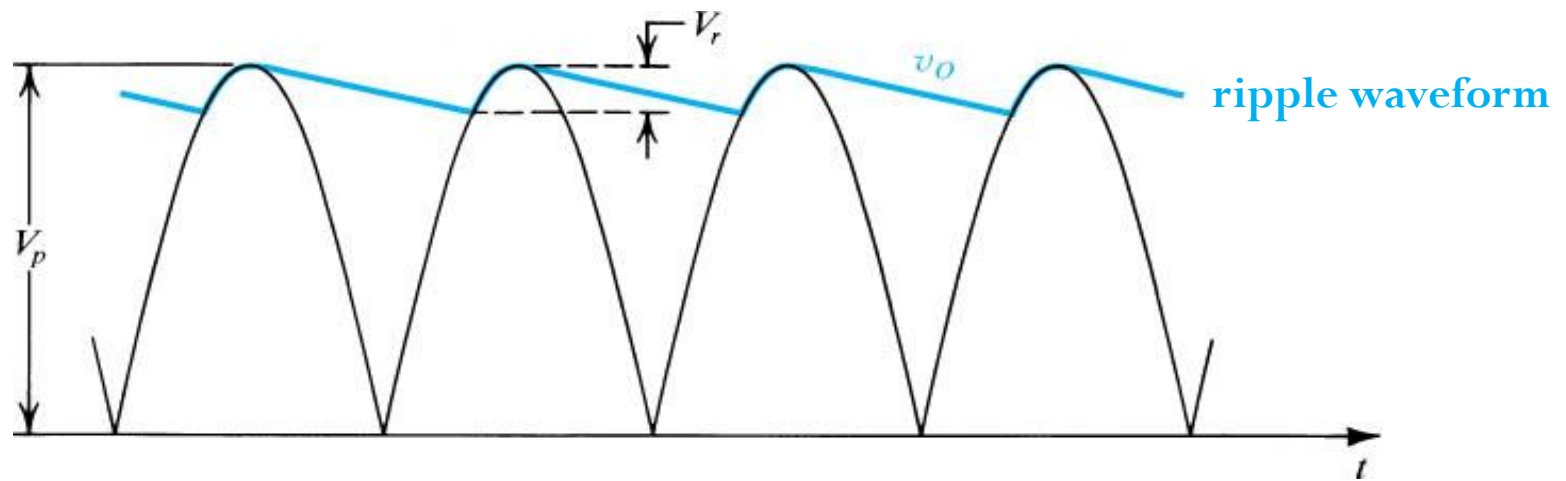
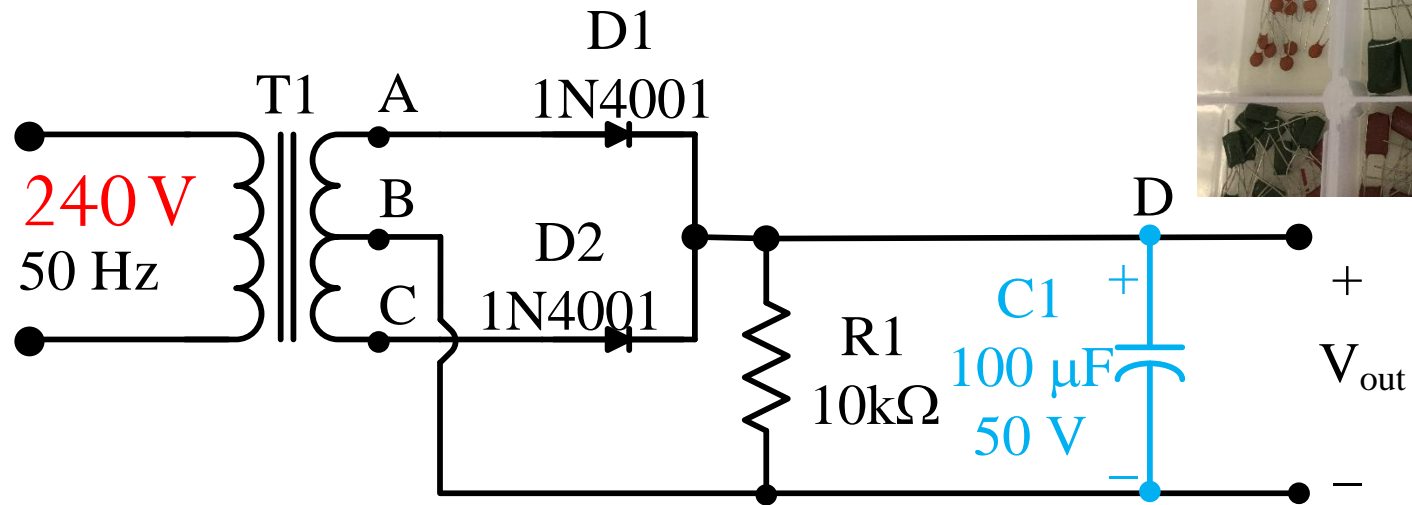
Part A: Full-Wave Rectifier (FWR)



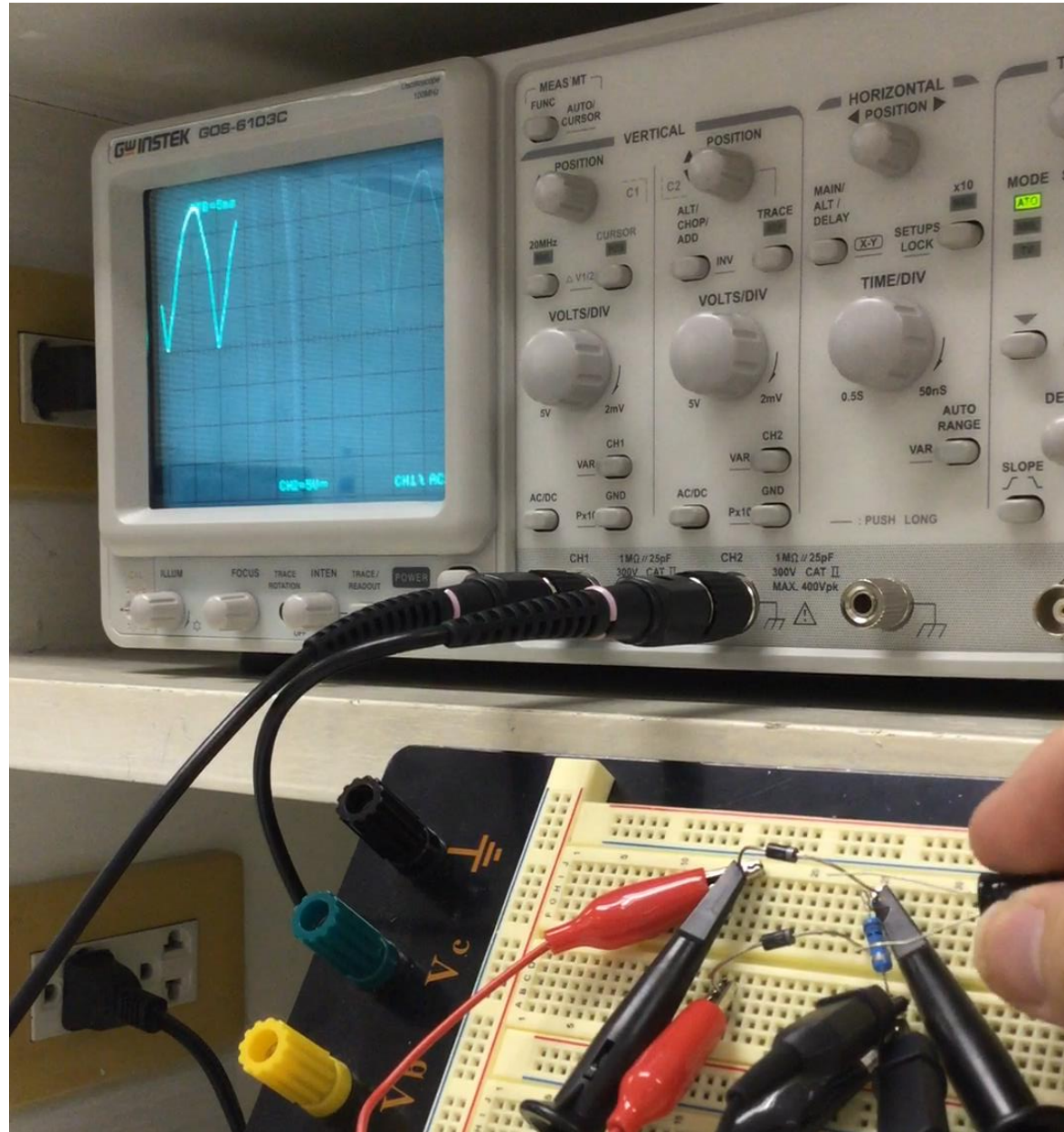
Part A: Full-Wave Rectifier (FWR)



Part B: Filter Capacitor

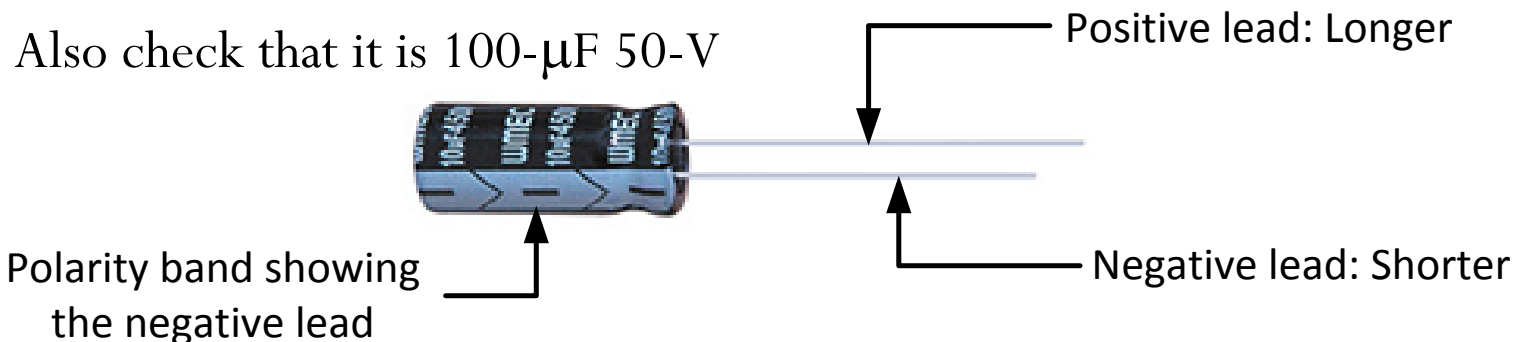


Rectifiers convert ac to dc voltage.



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.



Exploding Capacitor

