Lab 1: Diodes

"Never perform a measurement or simulation without first anticipating the results you expect to see."

- Eric Bogatin

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Lab procedure

1. Hand-draw the schematic diagram of the circuit you are building as shown below in your lab notebook. Include all values, connections and pertinent part numbers.

   Schematic diagrams should include enough information that an experienced person would not need to look anywhere else to replicate your circuit.

   You will need a second DMM to measure voltage across the diode. Share with a old or new friend as needed.
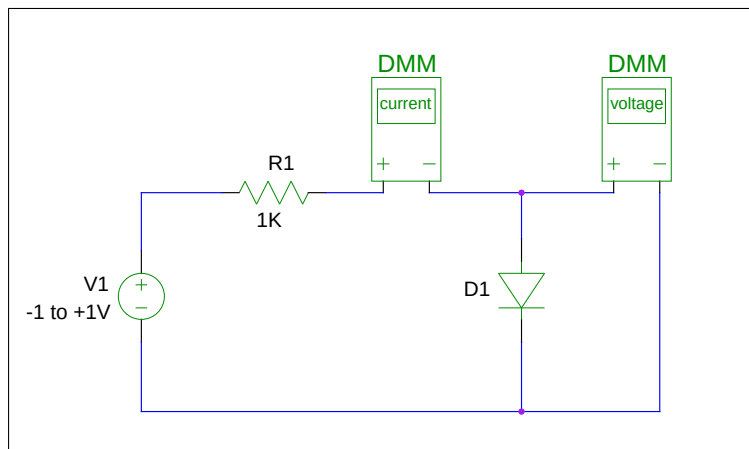

Figure 1: Schematic Diagram for Lab 1

2. Build the circuit using alligator clips. Initially, use a 1N4148 diode for the diode D1.

3. Slowly increase the voltage of the power supply in 0.1V increments, from -1V to +1V and record (in lab notebook) the voltage across the diode and current through it. If you need to get more data points to make the plot clearer, make more measurements as you approach the diode's turn-on voltage.

4. Download the model and spice file: 1N4007.mod, and full_wave.sp to a working area on your COE account (probably a "flip" machine). It would be good to create organization at this point and make directories for each lab assignment. The `full_wave.sp` file represents the circuit below.
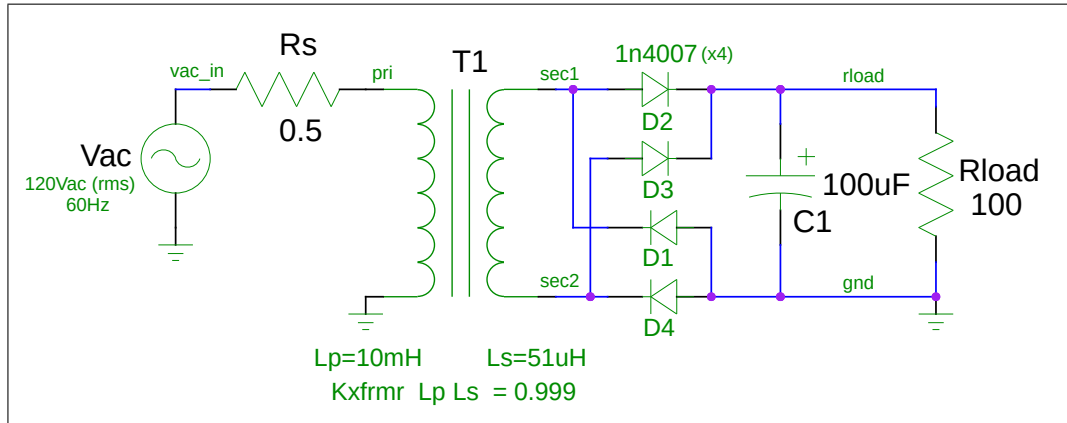

Figure 2: Full wave Rectifier

5. Run an ngspice simulation using spice file `full_wave.sp`. Note the waveforms obtained with the 100uF capacitor. What is the ripple voltage?

6. Comment out the 100uF capacitor and replace with the 1000uF capacitor. Rerun the simulation with the larger capacitor and record the ripple voltage.

7. Build the circuit with the 100uF capacitor on your protoboard observing the correct polarization of the diodes. Cut the connector off the wall-wart transformer to make connection to it.

8. Plug in the transformer when the circuit is finished. Never alter a circuit while the power is still applied. Using the oscilloscope, probe the signal at the load resistor. Record the waveform to a USB drive and make record the ripple voltage.

9. Replace the 100uF capacitor with a 1000uF unit and note the ripple voltage. Record this waveform on a USB drive as well and make note of the ripple voltage.

   Hints:
   In Linux, you can covert .ps format to .pdf with the command:
   `$convert file.ps file.pdf`
   The "$" is the Linux prompt. You do not enter it with the command. Put the print of the plots for each diode in your lab notebook. But, be neat, not sloppy.

Your lab work is done when it contains the following:

- Schematic of the first diode circuit including instruments used

- Plotted VI cures for the 1N4148 diode from first diode circuit

- Ripple voltage for each case of filter capacitor (100uF, 1000uF).

- Graph of ripple voltage with both 100uf and 1000uf capacitors.

All lab notebook entries should be hand-written in ink, except for plots and Spice netlists.