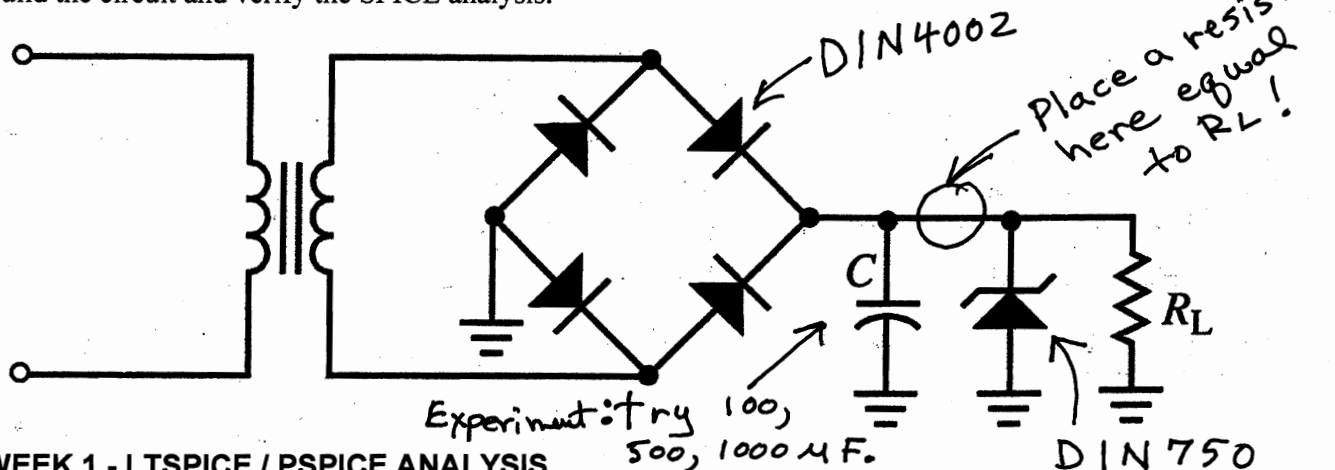


Lab 2 - Full-Wave Bridge Rectifier Circuit

This lab will be a two-week lab. The first week, we will do LTSPICE or PSPICE analysis on the circuit shown below. This circuit is Figure 27-46, found on Page 47 of your text. The second week, you will build the circuit and verify the SPICE analysis.



WEEK 1 - LTSPICE / PSPICE ANALYSIS.

Use either LTSPICE or PSPICE to produce a plot of the input and output of the circuit. Assume that the input is 120-VAC and the transformer has a 10:1 turns ratio. (NOTE: To simplify the SPICE circuit, just use a 12-VAC VSIN source in place of the 120-VAC and the transformer.) For the capacitor, use 330uF. Assume that the load is to be 500 ohms. The Zener diode should be rated at 5-VDC. Do the analysis in the following steps:

- (1) Draw the circuit with just the load resistor attached. (I.E., leave the capacitor and Zener diode off for the time-being.) Your circuit should look like Circuit 1 on the next page.
- (2) Analyze the circuit without the capacitor and Zener diode. On the same plot, show the transformer's 12-VAC output together with the voltage across the load. (See Plot 1, next page.)
- (3) Add the capacitor and produce a similar plot, showing the 12-VAC together with the voltage across the load. (See Circuit 2 and Plot 2 on next page.)
- (4) Now add the Zener diode, keeping the capacitor attached. Again produce a plot showing the 12-VAC and the voltage across the load. (See Circuit 3 and Plot 3 on next page.)

WEEK 2 - BUILDING THE CIRCUIT.

Build the circuit, leaving out the capacitor and Zener diode. Instead of using a transformer, use the trainer's 12-V sine wave output in place of the low-side output of the transformer. Verify how close the actual circuit is to your SPICE analysis.

- (1) Using the oscilloscope, observe the 12-VAC sine wave and the output of the rectifier without the capacitor or Zener diode. How close is the oscilloscope display to Figure 1?
- (2) Add the capacitor and repeat. How does the oscilloscope display compare to Figure 2?
- (3) Now, add the Zener diode and repeat. How does the oscilloscope display compare to Figure 3?

LAB REPORT. (Due 2 weeks after Week 2.)

Include the print-outs of all three SPICE circuits. On each print-out, draw what you observed on the oscilloscope when you built the corresponding circuit. (WARNING: I would use a photocopy of your SPICE plots, in case you make a mistake when drawing the oscilloscope display.) Comment on how closely the SPICE analyses compare to the oscilloscope displays. Discuss what may account for differences.