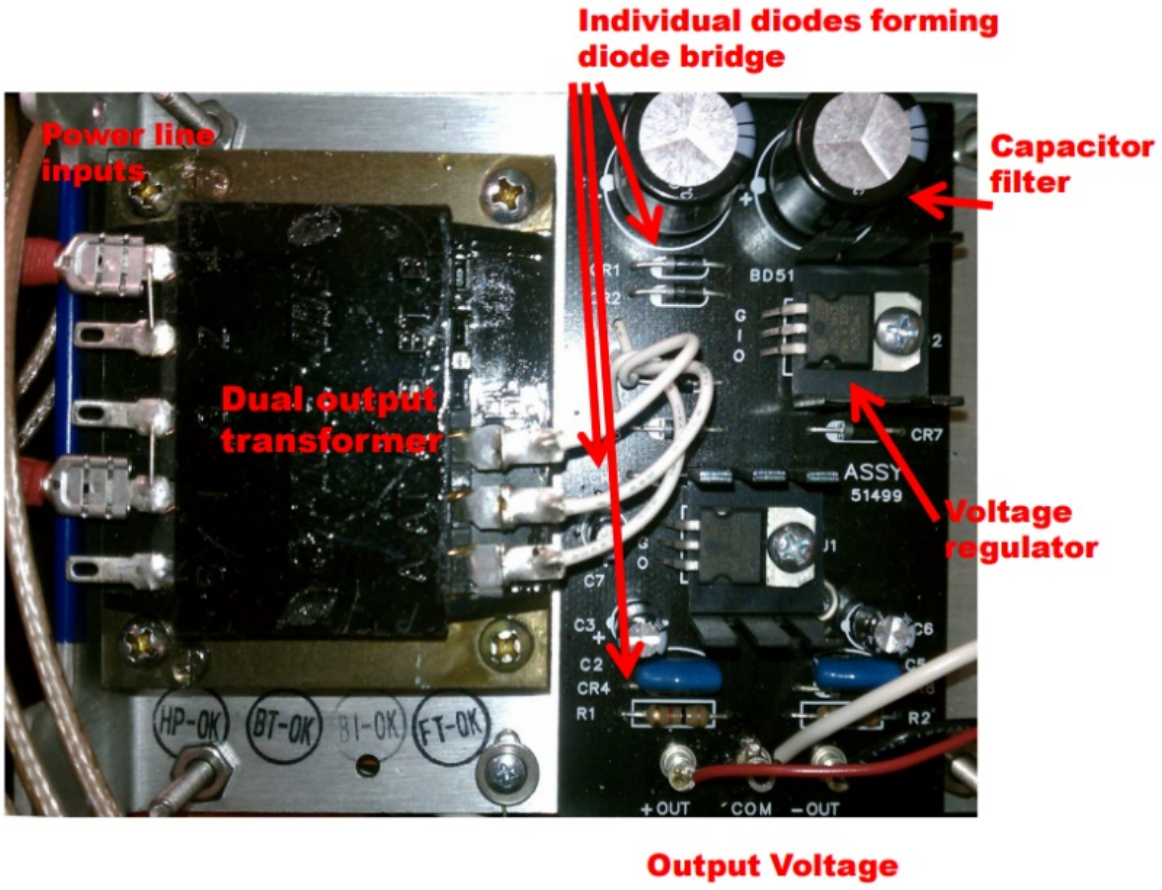
Linear Regulated DC Power Supply Design

Prelab:

You are tasked to design and test a 5 V DC linear regulated power supply capable of producing a current of 0.5 A. Background information on dc power supplies can be found in Chapter 11 of the "Practical Electronics for Inventors" reading and in many online resources. Linear dc power supplies are often used in precision instruments because they do not produce high frequency noise as switching power supplies do. A photo of a medical grade linear dc power supply is shown below. This power supply produces two dc voltage (+/- 12 V).



With your lab partner, brainstorm on the following points:

What is the basic design of a linear regulated power supply? What components do you need to specify?

What important factors do you need to consider for each component?

How will you assemble your power supply and verify that it satisfies the requirements of the design?

You must build a Multisim model for your design and check the waveforms and values of important voltages and currents at various points in the circuit. You will turn-in a draft of your answers to the questions above and your Multisim design (screenshot with part numbers and passive component ratings) as prelab for this assignment. Include waveform screenshots in your prelab.

At the beginning of the laboratory, we will discuss your answers and your design and settle on possible implementations, which you will build and validate.

Parts available in the laboratory include:

Transformer 120 Vrms primary 6 Vrms secondary (CUI – Model EPA060100-P5-SZ) + output connector

Integrated diode bridges: DF02M, DF04M, 2KBB05R

Individual diodes: 1N4001, 1N4005, 1N914

Capacitors: 33 pF to 10000 μF

5V regulator: LF 50 ABV

Adjustable regulator: LM431

Various resistors, LEDs and other parts

Report:

Each work group will submit a report due one week after the laboratory experiment which should include the following sections:

1. All the initial answers to the questions of the assignment (i.e. the prelab corrected and augmented by the discussion).

2. Your Multisim circuit representing the circuit design you built in the laboratory.

3. Your data (measurements and calculations) and your analysis of these data that establish that your circuit complies with the requirements (5 V DC linear power supply – 0.5 A max current)

4. Your assessment of the design approach and a discussion of important issues you would consider for the design of a power supply with different requirements

5. The data sheets for the components you used in the laboratory, including a discussion of what information you used in the data sheets for your design

6. A summary of your investigations and recommendations for improving the laboratory if you were to repeat it.