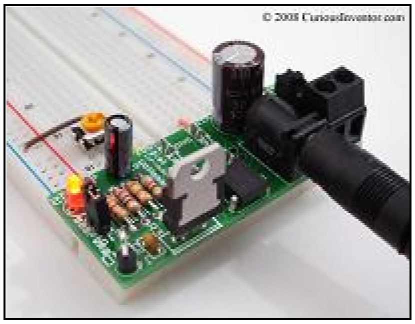
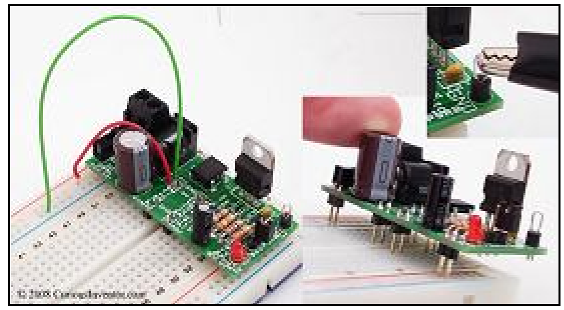


Bread Board Plug-in Power Supply Kit

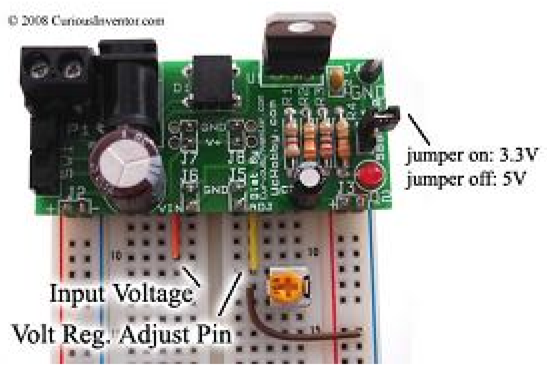
part# ci0120 - v2.0, 6/20/2008
designed by David @ ucHobby.com

Assembly and Soldering Instructions

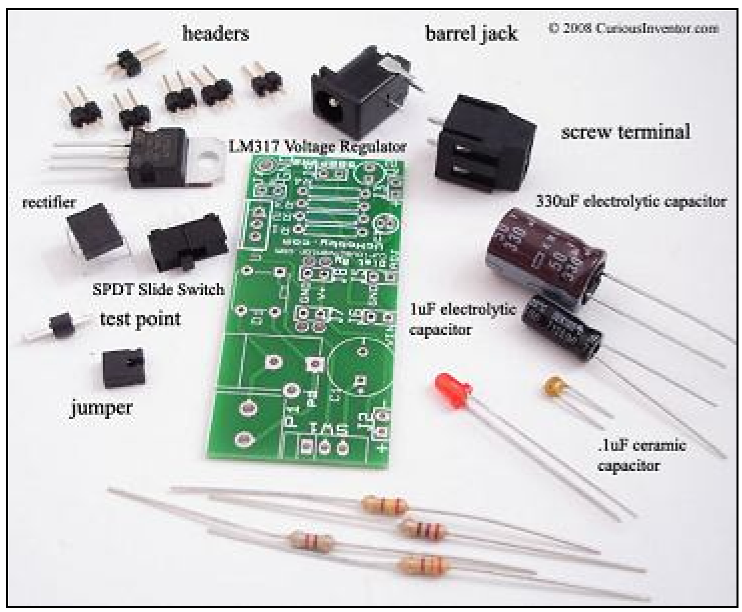
Features:



- On / off switch
- Jumper select 3.3V (jumper off) or 5V (jumper on)
- Standard "wall-wart" barrel power plug input or bare wires into screw terminals. AC or DC input OK, polarity doesn't matter. Should be ~3V greater than desired output.
- Easy-access ground test-point
- Outer headers fit most bread-boards, but wires can be added through middle (see red and green wires in right pic) for non-standard bread-boards.



- Supplies about 300mA without heat-sink, over 1A with heat-sink (not included).
- Adjustable voltage supported via user supplied pot
- Bread board access to rectified input voltage to drive relays, motors, or other devices.



In the Bag:

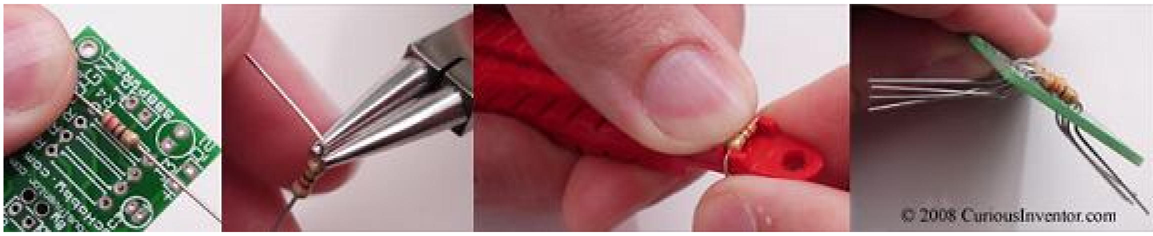
- (1) PCB
- Capacitors: (1) C1: 330uF, 50V, electrolytic, (1) C3: 1uF, 50V, electrolytic, (1) C2: .1uF, ceramic
- (1) Screw terminal, (1) P2:barrel jack
- (1) SW1: DTSP slide switch
- (1) D2: Red LED
- Resistors: R2: 240 Ohms, R3: 270, R4: 330, R1: 820
- (7) 2-pin headers
- (1) Rectifier
- (1) Test point
- (1) LM317 Voltage Regulator
- (1) Jumper

Recommended Tools:

- **Soldering Iron**: just about any standard 20-40 Watt iron will do, 25W or higher for lead-free solder. Solder "guns" are designed more for plumbing soldering, and can apply too much heat. The "Cold heat" irons are very hard to use.
- **Solder: Get 60/40, or 63/37, or a lead-free version, .031 or .02" diameter**. Stay away from "acid core" types, as these can leave corrosive residues. A mild rosin-cored solder is ideal.
- **Needle nose pliers and Flush Cutters**: Pliers are good for bending leads and removing components. Flush cutters let you trim leads close to the board.
- **Solder wick and pump** for desoldering and fixing mistakes.
- **A clamp and multi-meter.** A table top should be more than adequate for this circuit. A multi-meter is essential for de-bugging.

Short Parts First:

Insert parts in order of height from shortest to tallest so that a table top will hold the most recent part in place when the board is flipped over. Start with the resistors by first pre-bending the leads so the resistor can be easily inserted without stressing the part or pcb.

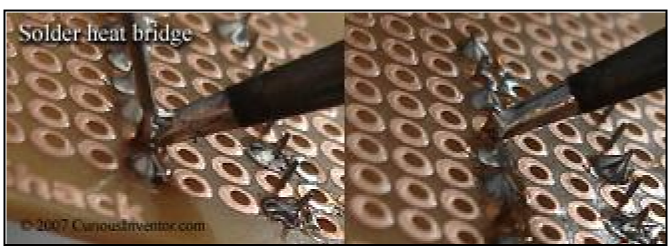


Insert all components as far as possible without excessive force. Bend out the leads to hold the resistor in place while soldering. The resistor codes are: R2: 240 Ohms (Red-Yellow-Brown), R3: 270 (Red-Purple-Brown), R4: 330 (Orange-Orange-Brown), R1: 820 (Grey-Red-Brown). Leave R1 off if you're going to use your own pot to adjust the voltage.

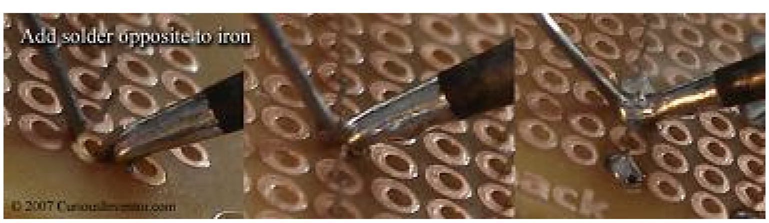
Soldering:

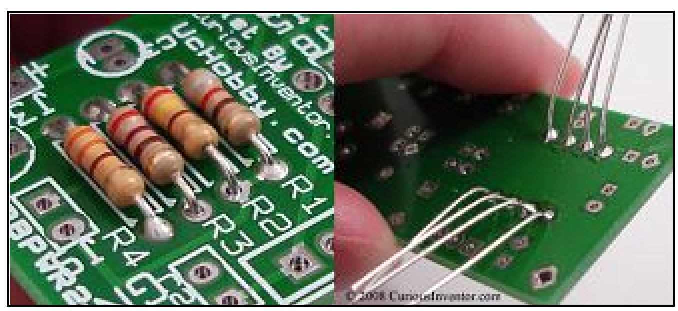
First add a little solder to the iron tip, this is called "tinning the tip." Then hold the tip so that its faces touch the part and pad. No heat will transfer through the very point.

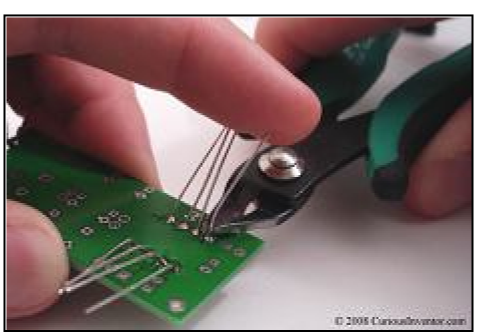
Now melt solder on the opposite side of the lead and pad from where the iron is touching. This will ensure the parts are hot enough to bond with the solder, and will also help to spread the solder over the connection, as it will be drawn to the heat. Remove the solder, then the iron a bit later. Larger components will require more heat and time for the solder to coat the connection. You should be left with a small volcano that smoothly ramps into all the surfaces.



If there isn't enough solder on the iron tip from "tinning the tip," little heat will transfer from it (a "dry" tip). It's important to have a little solder between the iron tip and work. This is called a "**heat bridge**." Melt a small amount of solder between the tip and lead, and then continue adding solder on the opposite side.





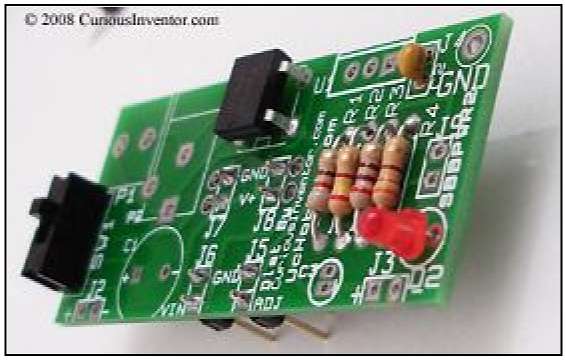


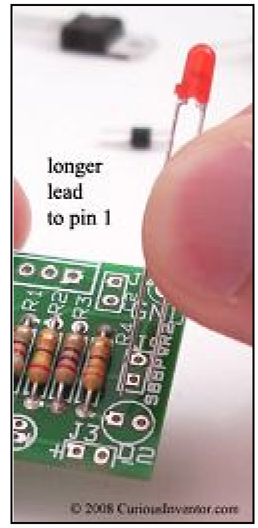
Trim the leads after soldering, safety glasses are a good idea for this. A finger at the end will help contain the shrapnel, but be wary of the thicker leads.

A short, 7 min. video is available that shows up-close shots of good and bad technique, and also explains what flux is and what's in the fumes: www.CuriousInventor.com/HowToSolder

Rectifier (D1), Switch (SW1), LED (D2), and .1uF Cap (C2):

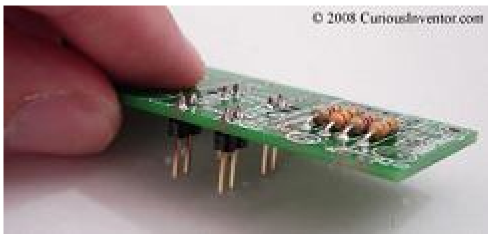
Now install the rectifier, switch, small ceramic cap, and LED similarly to the LEDs. The direction doesn't matter for the switch and capacitor, but make sure the small notch on the top of the rectifier matches the white label on the pcb. Also, make sure the **positive (longer) lead of the LED goes in the square pad as shown (right)**.

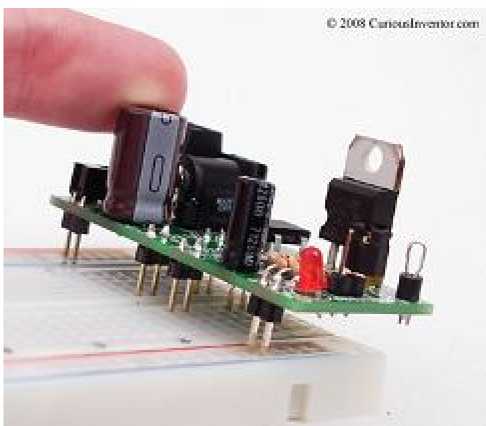




Bottom-side Headers:

Check to see if J2 and J3 line up with the holes in your bread board. If they do, solder in all 6 headers J2, J3, J5, J6, J7 and J8. Otherwise, leave off J2 and J3.



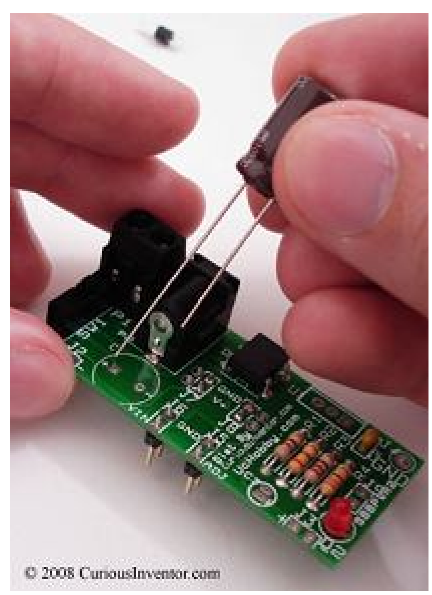


Barrel Jack (P2), then Screw Terminal (P1):

With both of these, it's a good idea to solder one pin, and then re-check alignment and make sure the part is all the way seated. Re-heat the first pin if necessary and adjust the part. It will be very difficult to make adjustments after more than one pin is soldered.

Electrolytic Capacitors (C1 and C3):

Be sure to insert the positive (longer) lead into the positive pad, which happens to be the square pad for both of these parts. On C3, it is the pad closer to the edge.



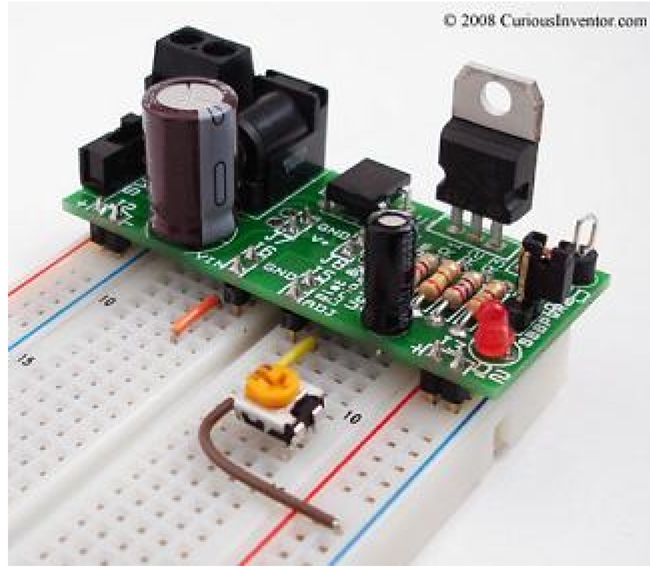
Finish with Voltage Regulator (U1), Test Point (J4) and top-side Header (J9):

The metal tab of the voltage regulator should face the edge.

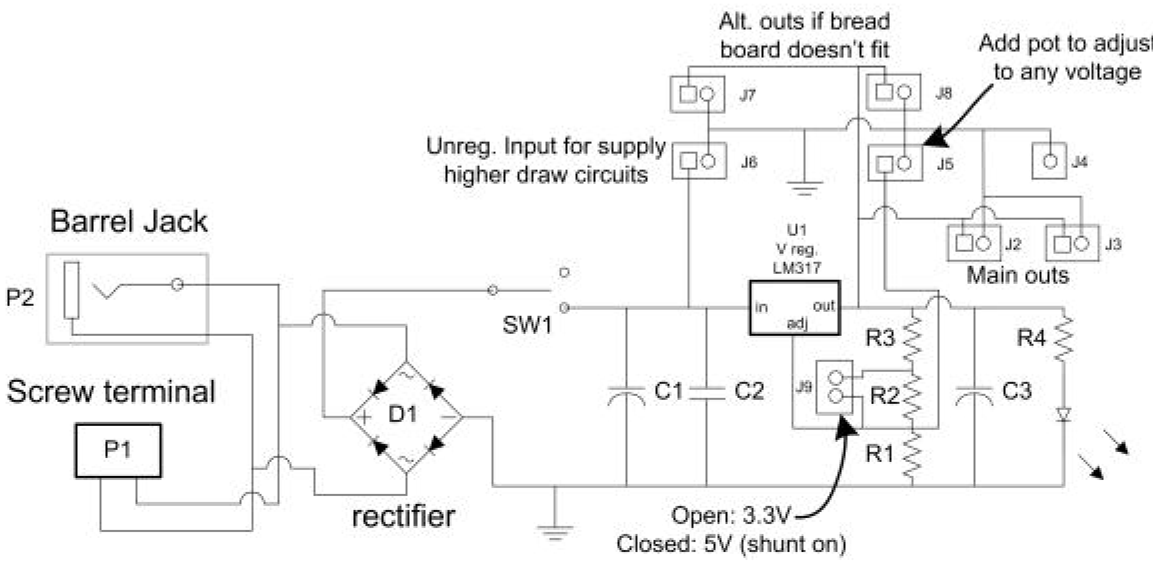
Done!

Questions? Leave a comment here:
www.CuriousInventor.com/kits/bread_power

or email us directly:
support@CuriousInventor.com



Instructions and How it Works:



The **rectifier** flips negative voltages so that only positive voltages pass to the rest of the circuit. C1 acts as large filter to smooth out AC inputs, and it also buffers energy when a DC supply is being used. The smaller .1uF (C2) capacitor next to it is there to shunt electrical noise from the regulator before it can spread to the rest of the circuit. The small ceramic capacitor has a much lower "Equivalent Series Resistance" (ESR) to higher noise frequencies than the larger C1. C3 on the other side helps to deal with spikes in power demand.

The **regulator** can produce an output voltage ranging from 1.2 to 37V depending on the load, input, whether a heat-sink is attached and resistors R1-R3. The output voltage = 1.25*(1 + R1/(R2+R3)), where the jumper can make R2=0. The regulator tries to maintain 1.25V between its adjust and output pins, which forces a current = 1.25 / (R2+R3) through R1, since no almost 0 current can flow into the adjust pin. Placing at pot at J5 and removing R1 allows the output to be adjusted to whatever value is desired. Jumpers can be pushed through the holes next to J7 and J8 to get access to the output voltage if the outer two headers are not installed. Alternatively, jumpers can simply be run under the board.

Power: The input voltage should be about 3V higher than the desired output. The amount of current the circuit can supply depends mostly on how much heat the regulator can dissipate. The regulator works by dumping excess power straight into heat, so if the input voltage is a lot higher than the output, you won't be able to supply as much current. The heat formula is roughly (Vin-Vout) * Current. It should be able to provide 5V from a 9V supply while providing at least 300mA without a heat sink.