CI0120 - Plug-in Bread-Board Power Supply Building Instructions
kit by David @ uCHobby.com, instructions by Curious Inventor

Introduction:
This guide will walk through the assembly of this board at a beginner's pace, and is also meant as a basic tutorial for making circuits. We'll mention the "right" way to do things (according to IPC standards) in case you were curious, but also point out more common, practical techniques.

1. Recommend Tools and Supplies:

- **Soldering Iron and Solder:** A 15 Watt iron will get the job done, but it'll be easier with a 25 or 35 Watt iron. Don't lose sleep purchasing your first iron; any cheap RadioShack one will do. We like small chisel or screw driver shaped tips (say 1/16th of an inch wide), but personal preference plays a big role. The goal is to use a tip that's about the same size as the pad you're soldering. This way you get you get as much surface area contact as possible (better for heat transfer) but are still small enough to avoid touching neighboring pads.

  For solder, we recommend .02 or .031" diameter, rosin cored flux, tin-lead solder, either 63/37 or 60/40, whatever's cheaper. Lead-free solder is a little bit harder to use since it "wets" metal somewhat slower and has a slighty higher melting point. If your kit has sat on the shelf for a while (a year), some steel wool or a pink eraser is useful to remove oxidation from the components and board before starting.

- **Needle Nose Pliers:** Used to clinch or bend component leads, and also during component removal.
- **Flush Cutters:** Used to trim leads close ("flush") to the board.
- **Solder Sucker or Solder Wick:** Used to remove solder.
- **Clamp:** A table top will be fine for most of the job, but a clamp can be handy, especially when removing components.
- **Multimeter:** To check your work.

2. What First?

David (the kit designer [uCHobby.com]) recommends starting with the shortest components first, and then progressing by height. This way, the component you're currently on will be the tallest on the board, so when you turn the board over to solder, that component will be held in place by the table. Other approaches are to start from the center, or to do the harder components first so that easier components don't get in the way later.

note: If you want to install a potentiometer to add infinite adjustability to the power supply, leave off R1--the pot will replace it.

First, pre-bend the leads into a U shape so the resistor can be inserted without stressing the part or the board. Hold it up to the holes to get the size, and then pre-bend using pliers, a "christmas tree," or fingers. Pliers without serated edges are recommended since the serations can weaker the lead by scratching it, or also cause flakes of metal to come off (but don't worry too much about this). The goal while bending is to keep stress off the connection between the lead and resistor body.

Placement: R1: 820 Ohms (Grey, Red, Brown), R2: 240 (Red, Yellow, Brown), R3: 270 (Red, Purple, Brown), R4: 330 (Red, Red, Brown).

Clinch, bend or splay the leads outward to hold the resistors in place while soldering. It's important that the components do not move while the solder is solidifying. You may be able to simply rest the top side of the board against the table top to keep things in place, also. The downside to clinching is that it can be harder to remove components later.

Install the resistors so that the tolerance band is to the right so that all the values can be quickly read from left-to-right without having to rotate the board.

Soldering:

First tin the tip with a small amount of solder, then hold the tip so that it can heat both the component and pad at the same time. Apply solder to the opposite side--the component lead and pad should do the melting. The golden rule of soldering is to apply solder to the components, and not the iron, but there is a catch: a "dry" iron tip does not conduct heat very well at all. So, some molten solder is needed in between the tip and component in order to transfer heat quickly. It's helpful to first melt a little solder in between the tip and component to establish a "heat bridge" and only then apply solder to the opposite side.

The solder should look like it's clinging to the board and the component, forming a smooth ramp to all the surfaces. Lead-based solder will have a shiny appearance, but lead-free solder may appear slightly duller--this is usually OK. It's good but necessary for the solder to flow up to the top, or component, side of the board.

Now trim the leads with the flush cutters. Thicker leads from diodes or voltage regulators can fly off with substantial speed, so it's a good idea to wear safety glasses and hold on to the end with pliers. For smaller leads, a quick technique is to rest a finger at the end of the lead--when cut, your finger will absorb the energy and the lead will fall to the table. This isn't recommended for larger leads.

For extremely critical applications, leads are not permitted to be trimmed after soldering since there is some risk the joint will develop small cracks that eventually lead to failure, but this is unlikely; trimming afterwards is probably OK for just about everything except NASA circuits.

3. Slide Switch (SW1) and Red LED (D2)

Install the slide switch into SW1. You can clinch the leads with pliers to hold in place, or just rest it against the table top.

Install the LED into D2, making sure to place the longer lead (positive) into pin 1. It's fairly common for board designers to make pin 1 a square shape instead of round or oval.

4. Headers (J5 through J8)

Install the center headers that will plug into the bread board by soldering on the top side of the board.

Now check to see if the outer power-rail headers will fit your bread board by looking through the holes for J2 and J3. If they line up, install those outer headers, otherwise leave them off.

5. Rectifier (D1) and Ceramic Capacitor (C2):

It doesn't matter which direction the ceramic capacitor is installed, but make sure to line up the notch on the rectifier with the notch on the board.

In general, components should be inserted as far as possible into the board. Exceptions to this rule include components with metal casings that could short a trace, ones that require clearance for heat dissipation or components that could seal off a hole and prevent solder from flowing inside.

It's OK if some solder touches the meniscus (yellow plastic covering) of the ceramic cap, just as long as the meniscus doesn't interfere with the joint on the other side of the board.

6. Barrel Jack (P2) and Screw Terminal (P1)

For both the barrel jack and screw terminal (and any other multi-pin component), it's a good idea to solder one pin, and then check the alignment before soldering the others. It's easy to adjust the component by re-heating the first pin, but once multiple pins are soldered, oftentimes the entire component will have to be removed to make any position adjustments.

The picture shows a small gap that was corrected by reheating a pin.

7. Electrolytic Capacitors (C1 and C3)

Be sure to install the longer pin into the positive hole (square pad). The polarity of the capacitors is also indicated by the stripe on the side, which can be thought of as a giant negative sign.

8. Finish up with the Voltage Regulator (U1), Ground Test Point (J4) and Jumper Header (J9)