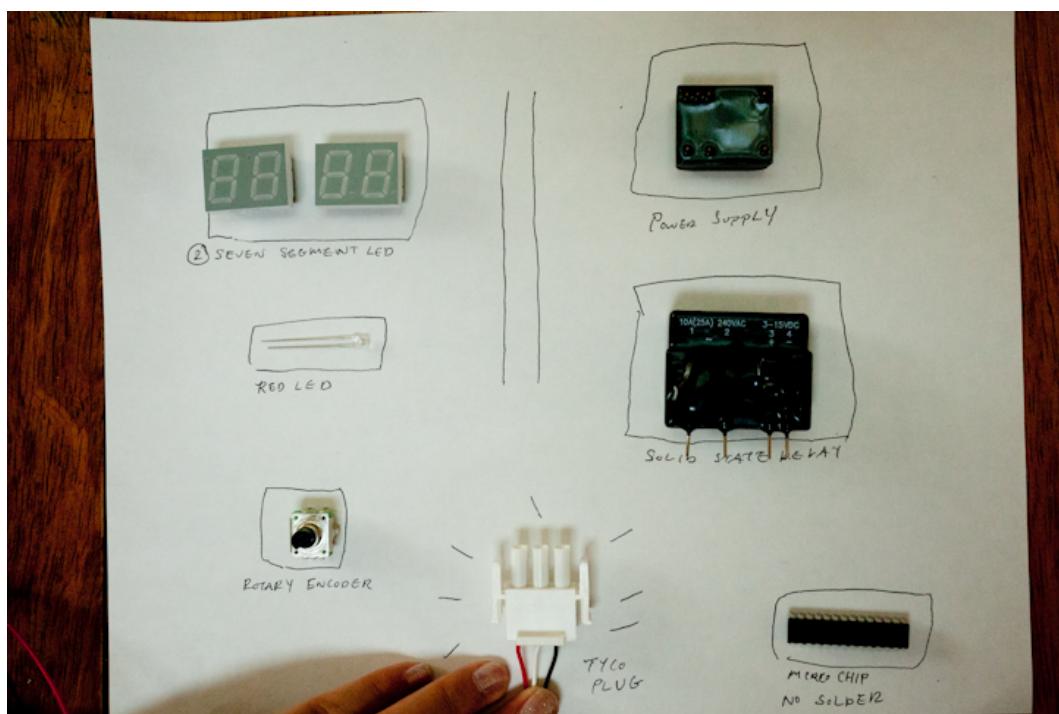
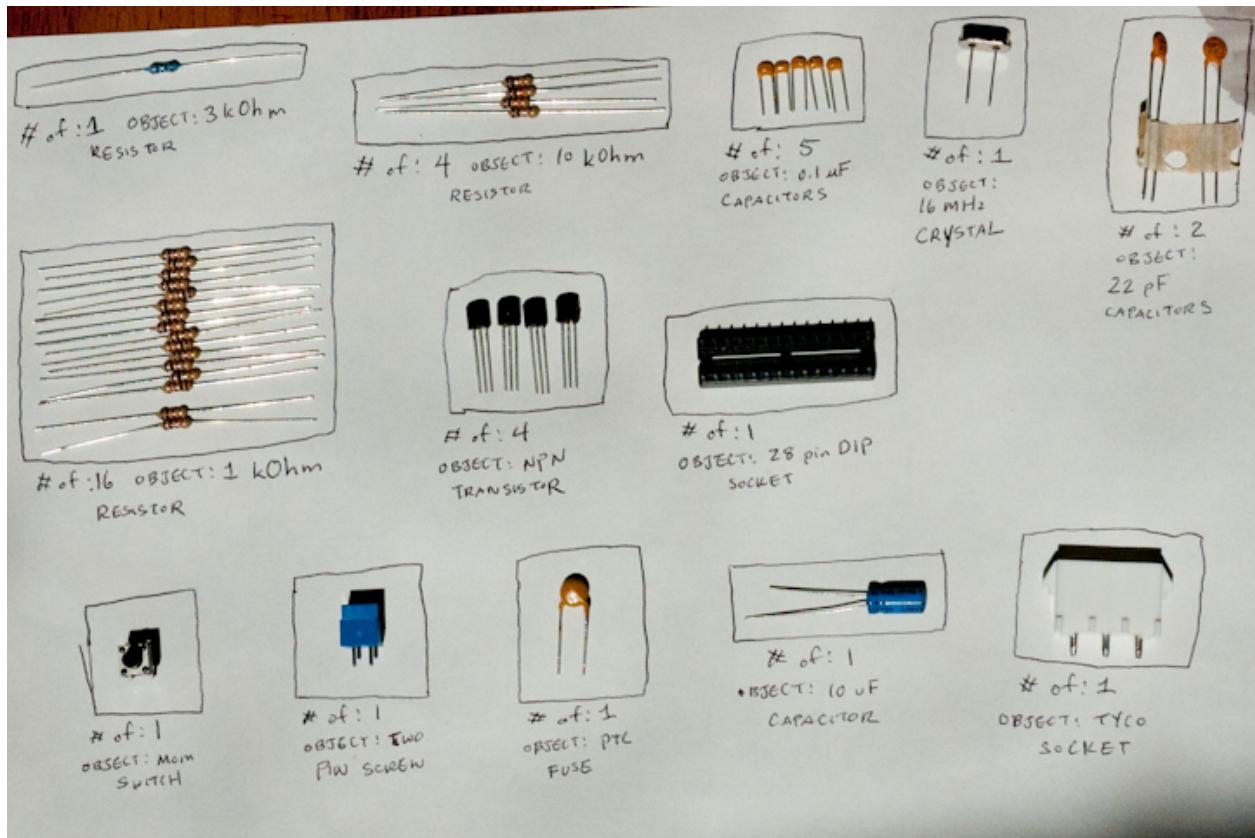


## Instructions for Building DIY Sous Vide: The Circuit Board

First thing first, check your kit to make sure you have all the parts (find these in the BOM online):



Next, make sure you have all the tools you'll need to assemble the circuit board:

- Soldering iron
- Solder
- Wire snippers
- (Absolutely required) Safety goggles
- (Optional) Solder sucker and braid, for mistakes

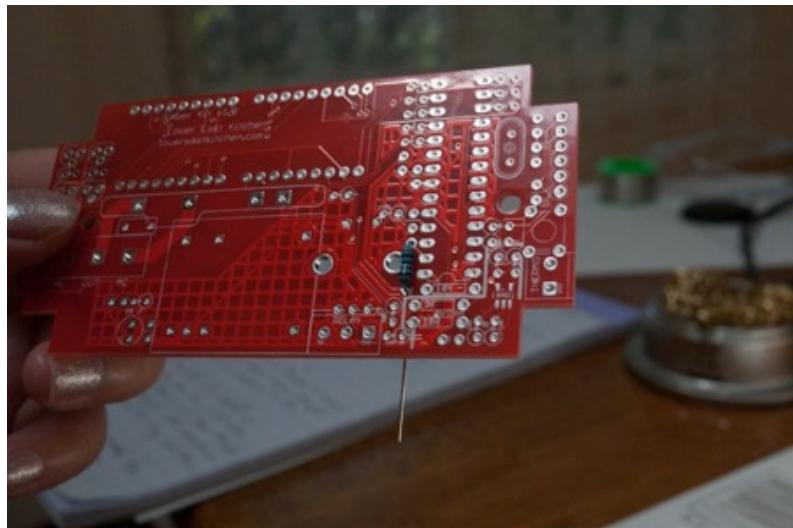
Reading the circuit board. The Lower East Kitchen circuit board is small but mighty. Its design is tight and both sides are utilized. Since we fit many components on one small board, we **highly** recommend some parts are put in before others as per our instructions below.

The “**back**” side of the circuit board (where your resistors will go) says:

Ember Kit v1.0

Lower East Kitchen

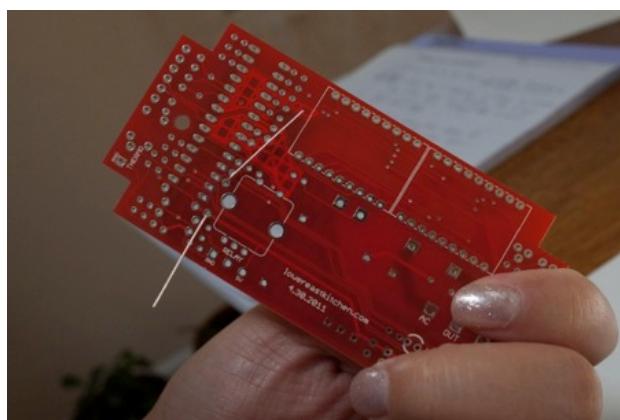
[Lowereastkitchen.com](http://Lowereastkitchen.com)



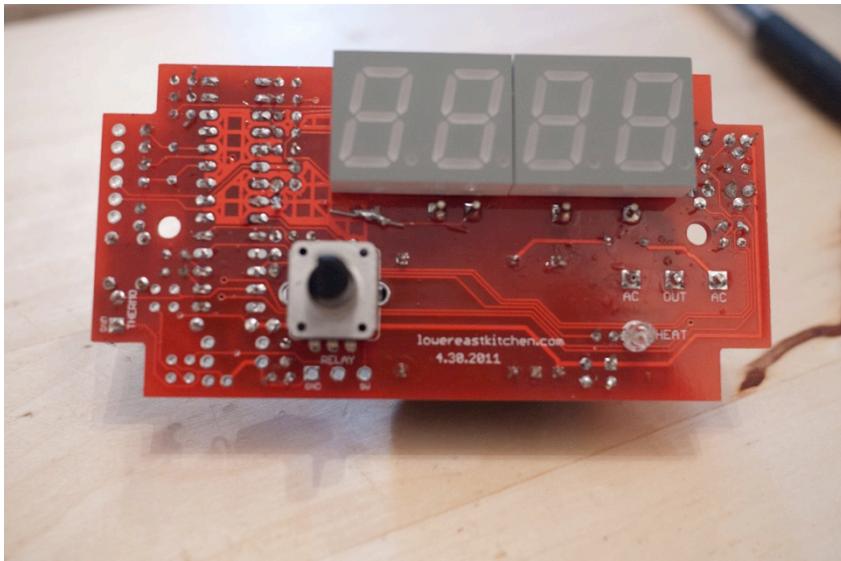
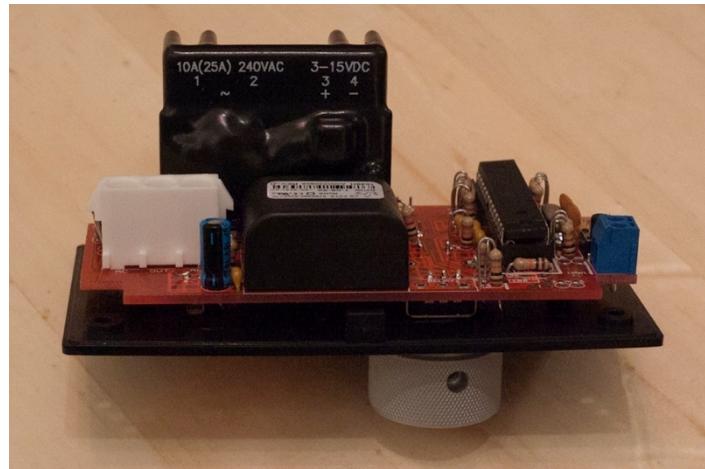
The “**front**” side of the circuit board (where the display and power supply will go) says:

[Lowereastkitchen.com](http://Lowereastkitchen.com)

4.30.2011



Reference board front and back:



Now that you are well acquainted with your supplies, we can start soldering!

We will start by soldering the resistors and circuits that are marked on the “back” of the circuit board.

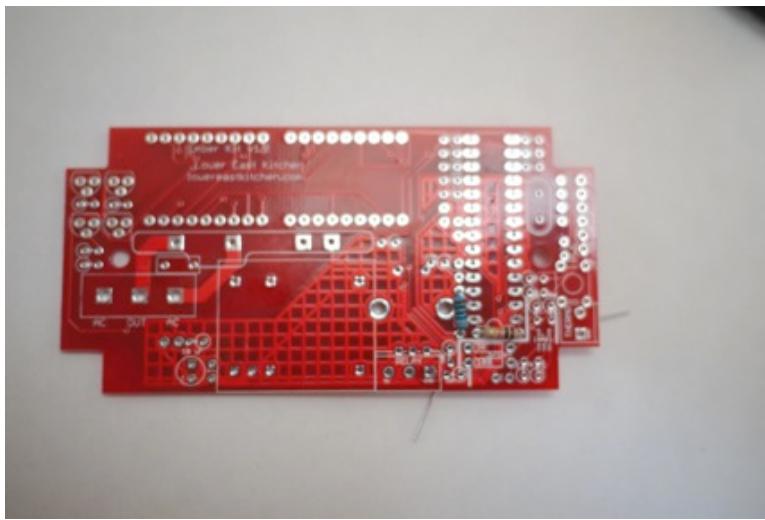
**NB:** Ignore the bottom right hand corner sectioned off by a THICK white line. It is the designated amplifier area for people who want to attach their own thermocouple, i.e. someone who wishes to go above 100 °C). A thermocouple is already provided for you in this kit.



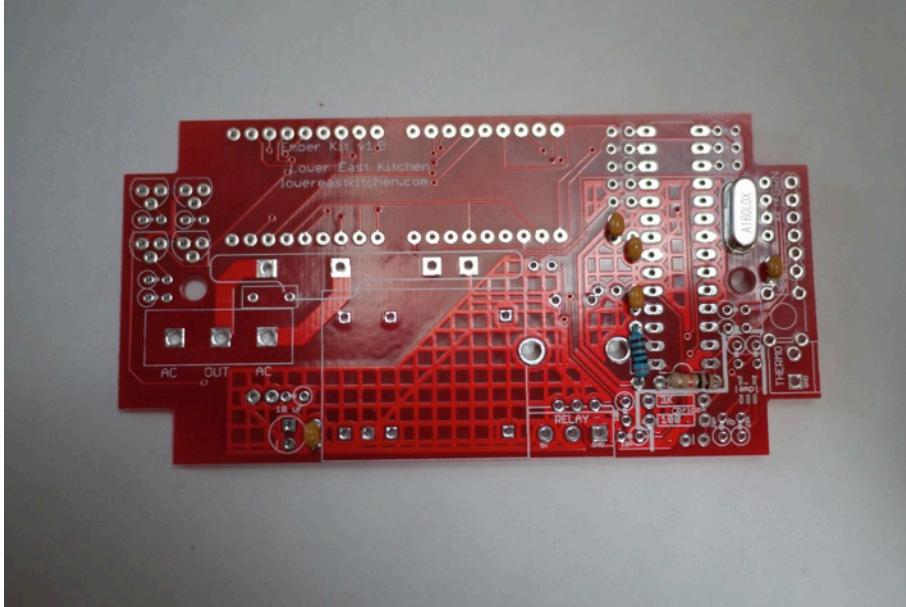
1. The **first** thing to solder on the board is your **blue 3kOhm resistor**. Bend the wires of the resistor and insert them into position in the vertical 3K rectangle spot on the lower right side. Solder and snip off the excess leads.



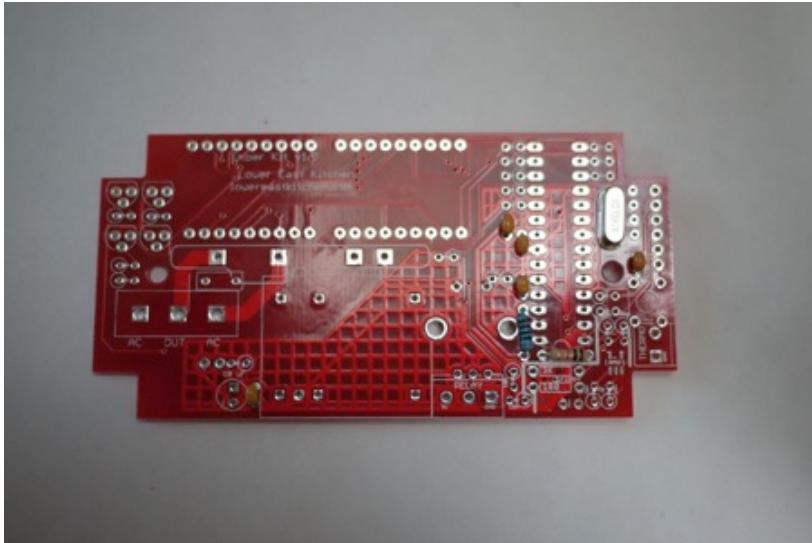
2. Solder in **one** out of your **four 10kOhm resistors** (orange stripe). Bend the wires of the resistor and insert them into the position in the horizontal 10K rectangle spot adjacent to the 3K you just soldered. They should form an L shape. We solder this one down before all of the others because it lays flat, allowing for smoother future soldering.



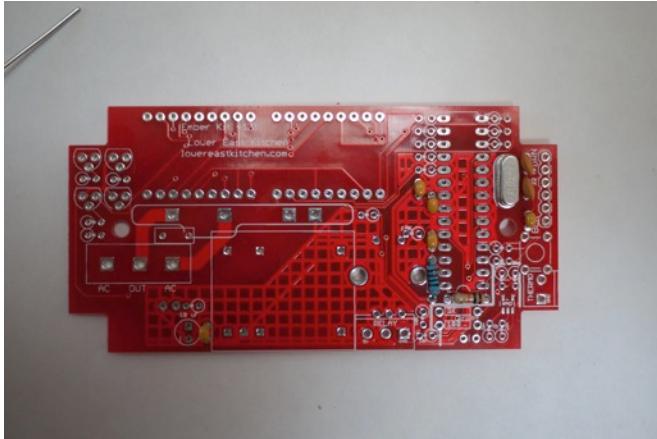
3. Solder in all **five** of your **0.1 uF capacitors**. Their places on the board are marked with a thin horizontal white line between the thru-holes. They are located at these spots: one next to your blue 3kOhm resistor, one on the far right in the middle above the word BLK, two above the blue 3kOhm resistor in a parallel.



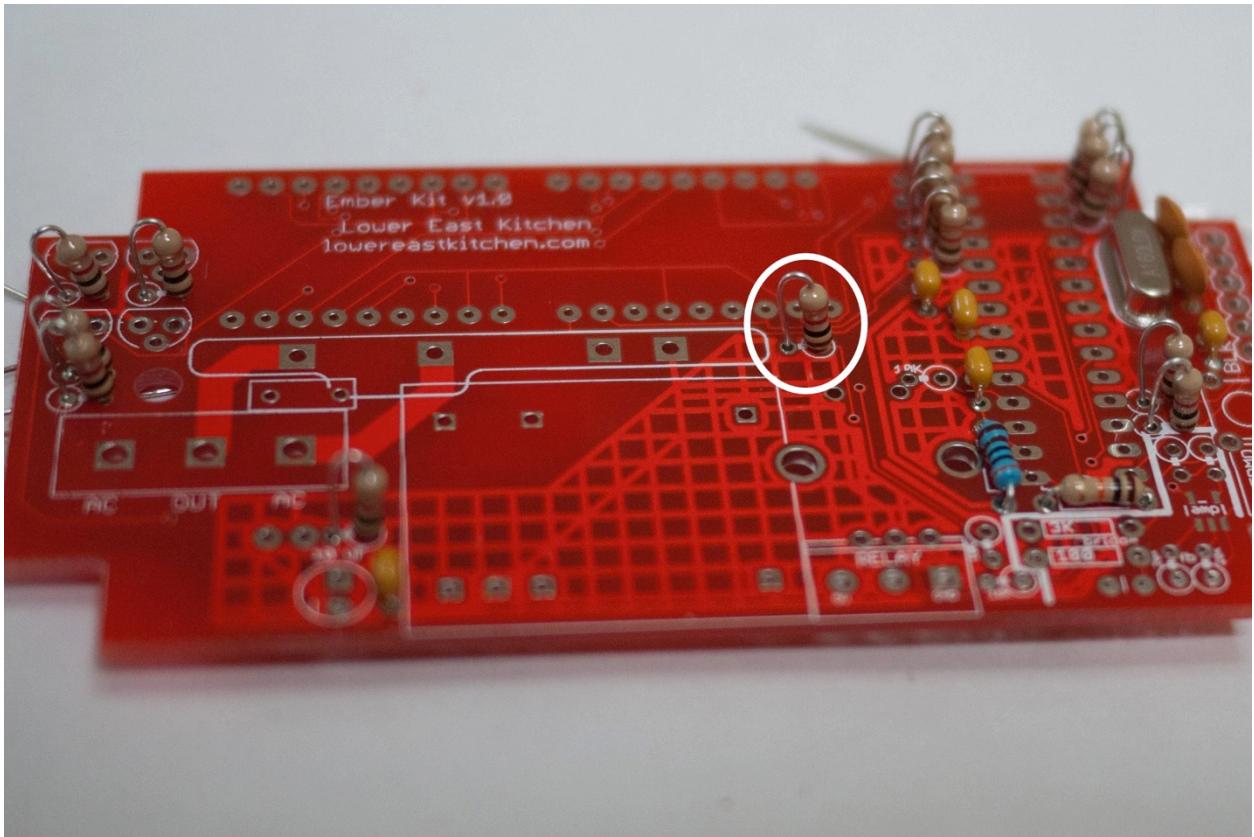
4. Solder the **crystal** into its shaped outline on the top right corner of the circuit board.



5. Solder in both of your **22 pF capacitors** vertically next to the crystal. The thru-holes are marked 22 nf (a typo).

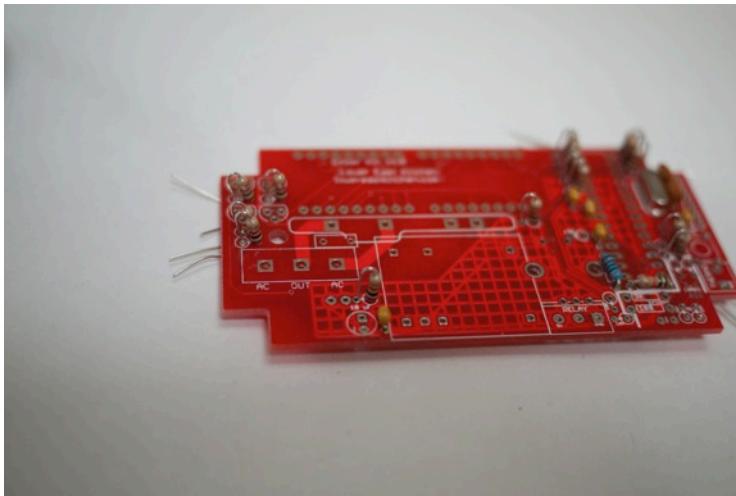


6. Soldering all of your fifteen **1 kOhms** (red stripe) is the fun part!  
Put them **vertically** in wherever you see a thick short white line attached to a thin white circle encircling the thru-hole. Bend the leads before you put them in the thru-holes. BUT WAIT. The one by the SSR should just be replaced by a wire lead. It can cause troubles.





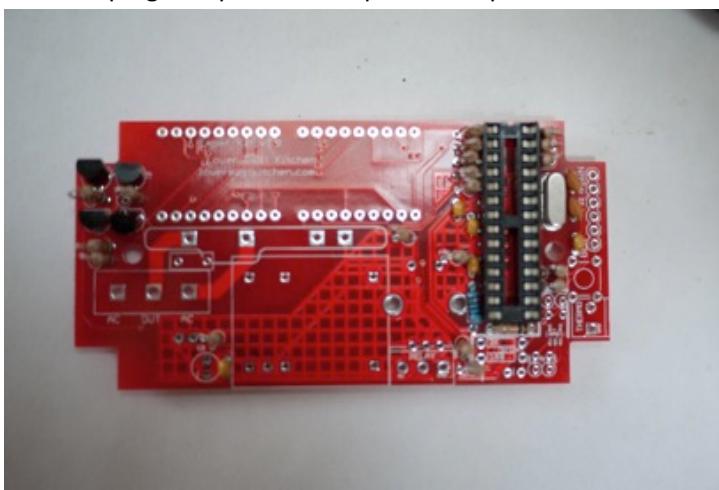
7. Now solder your **three** remaining **10 kOhm resistors** (orange stripe) . They are marked with the resistor symbol that pairs with the number and letter 10K respectively.



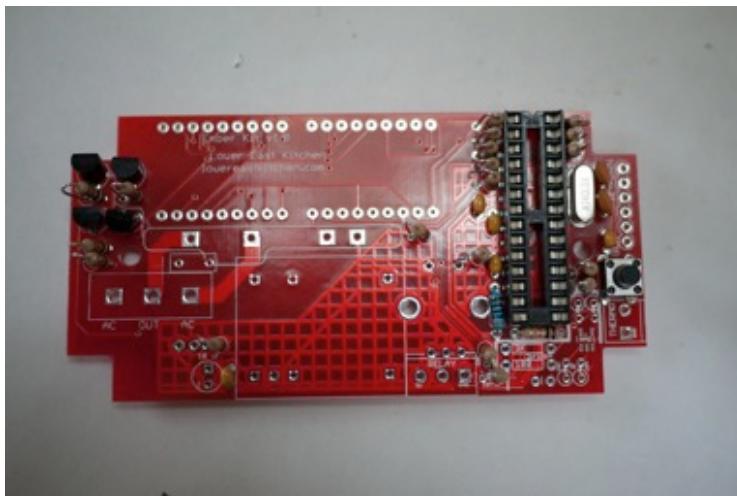
8. Solder your **four NPN transistors** on the far left side, you shall see white half-circles that outline your transistors. Bend the leads before you insert them into the thru-holes.



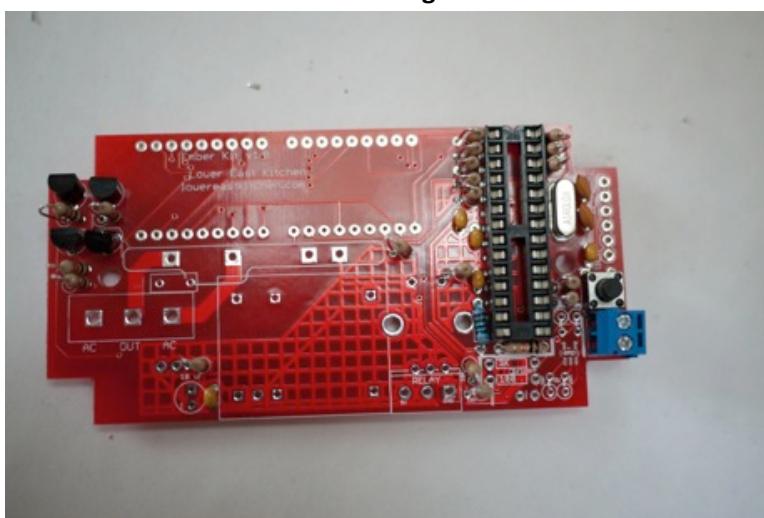
9. Solder in your **DIP socket**. It goes in to the right of the vertical row of 1 kOhm resistors. Take your time and breathe, yes, there are a lot of holes to fill with solder. If you're having a hard time keeping it in place, use a piece of tape to secure it.



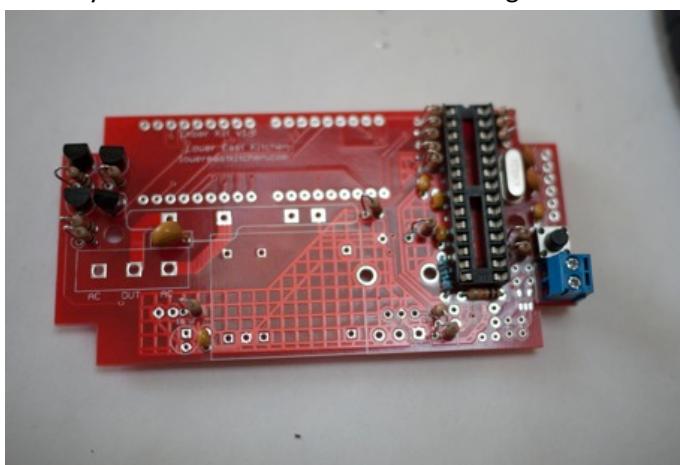
10. Solder in **the MOM switch**, it is on the far right of the wing of the solder board towards the bottom. It is outlined in thin white square with a circle in the middle.



11. Next solder in your **two pin screw terminal** right under the mom switch. It is marked THERMO. Solder it so that the holes are **facing inwards**.



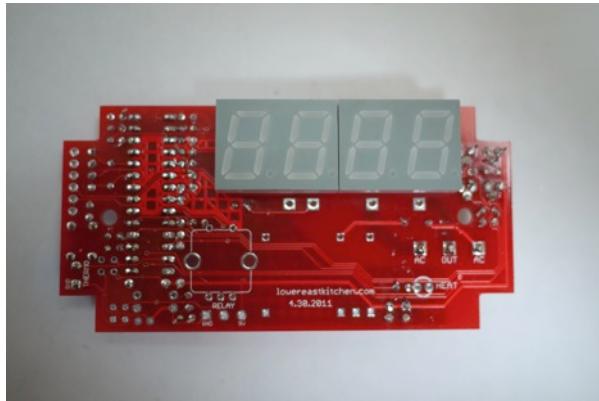
12. Solder your **PTC fuse** into the small rectangle **above** rectangle marked AC OUT AC.



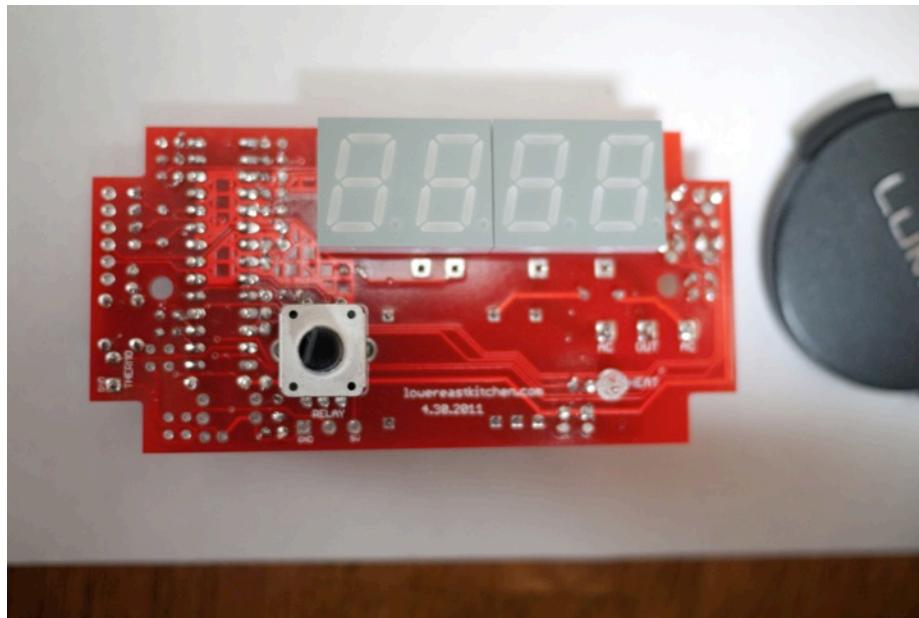
13. **ATTENTION:** When soldering your **10 uF capacitor**, it is very important that the negative end (the shorter metal lead) gets threaded through the very bottom thru-hole marked with a negative sign (**or else the board will explode**). The circle outline to insert the 10 uF is located on the bottom left of the circuit board.

## TURN OVER YOUR BOARD TO THE BACK

14. Solder in your **seven segment LED** in the top two rectangles. Make sure the decimal points are facing down.

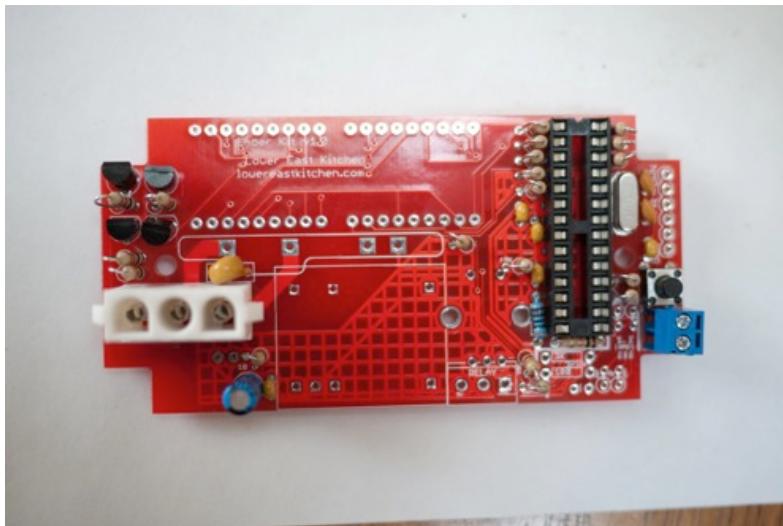


15. Solder in your **LED light** into the area that is marked HEAT, lower right. The left side is positive so put the longest lead in the left thru-hole.  
16. Solder in your **rotary encoder** in the box provided on the lower left. Take care to make sure it lays as flat as it can on the board, otherwise, it will not fit into the box correctly.



## TURN OVER YOUR BOARD TO THE FRONT

**17.** The position you solder your **Tyco socket** in is very important. The fingers at the bottom of the piece **must face down towards the board**. Now, solder your Tyco socket into the rectangle marked **AC OUT AC**.



**18.** Solder in your **power supply**. It's the huge rectangle at the bottom, left of center.



**19.** Solder in your **solid state relay**. Take care to not let your solder gun burn your LED display.



20. Finally, bend the sides of your **microchip** gently and fit them into your DIP socket. Make sure the notched side is pointed down (toward the blue screw terminals).

### Congrats! Now you're ready to hack this baby on!

We recommend hacking the Professional Series 30 cup coffee urn. It has built in convection with no need for a bubbler.

#### The tools you'll need:

- Power drill, drill bits
- Hammer
- Awlf
- Silicone sealant
- Philips screwdriver and glasses repair screwdriver
- Crimper
- Wire stripper
- Multimeter

#### Summary:

1. **Familiarize yourself.** Open up what you'll hack and get orientated the parts. You want to find where power comes in through the wall and where the main heater is. We don't care about anything else, like the LED or "keep warm" heater. Small disks attached to the heater or elsewhere are usually thermistors that prevent overheating. You can leave them or discard them.
2. **Drill.**
  - a. Take off the part you'll drill into to attach the ember kit (usually the plastic base). Drill holes using included template into the base (or you could make one yourself, two smaller equidistant holes side by side a main larger hole).
  - b. Drill holes into the ember kit box matching the base holes.
  - c. Drill or poke a small hole (1/16") in the water container near where the ember kit is being attached. This is for the thermistor. Put the thermistor through the hole.
3. **Wire**
  - a. Attach the box for the ember kit and string the wires from the tyco plug through the largest central hole.
  - b. Strip and attach the wires from the tyco plug to the terminals you found: red goes to one end of the heater that connects to the wall. Black goes to the other AC terminal (from the wall). White goes to the opposite end of the heater from the red socket. We recommend you disconnect everything else. **BE VERY CAREFUL HERE.** Remember: red

and black connect to the wall, red and white to the heater (white goes through SSR to black). Test with a multimeter.

- c. Attach the thermistor with Sugru.
4. **Finish.**
  - a. Thread the leads of the thermistor into the ember kit box and reattach the base.
  - b. Screw the PCB into the lid.
  - c. Attach the knob.
  - d. Screw in the leads and plug in the tyco plug.
  - e. Attach the lid to the ember kit box.
  - f. Always plug in through a GFCI outlet/adapter to be safe.

1. Orient yourself with the device and locate where to unscrew it to take a look at the parts inside. If you are using a coffee urn, the panel to open it is on the bottom.

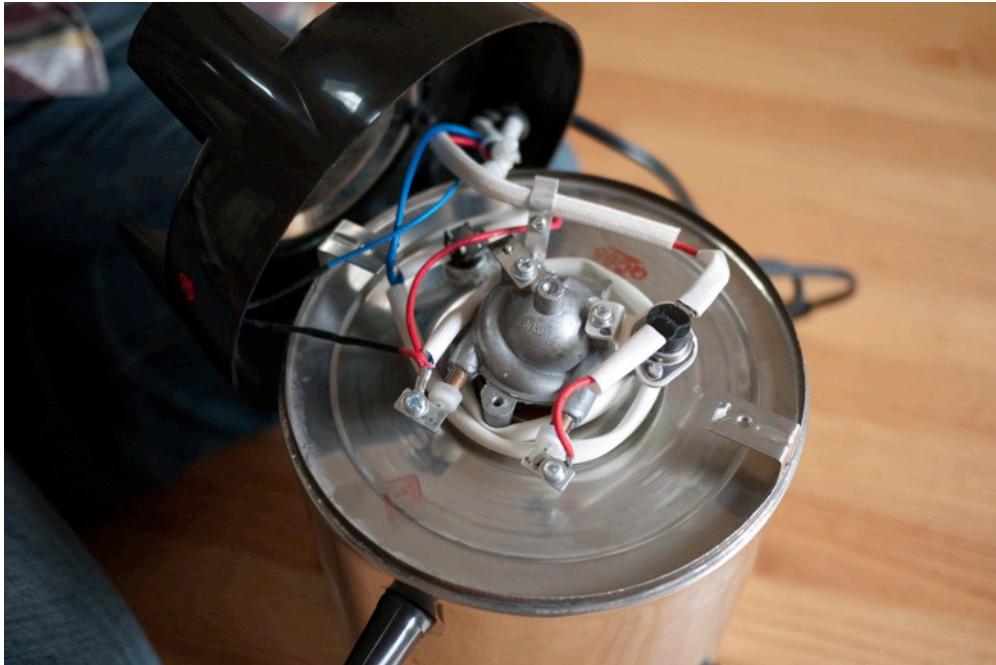


2. Take your Philips screwdriver and twist out all of the screws.

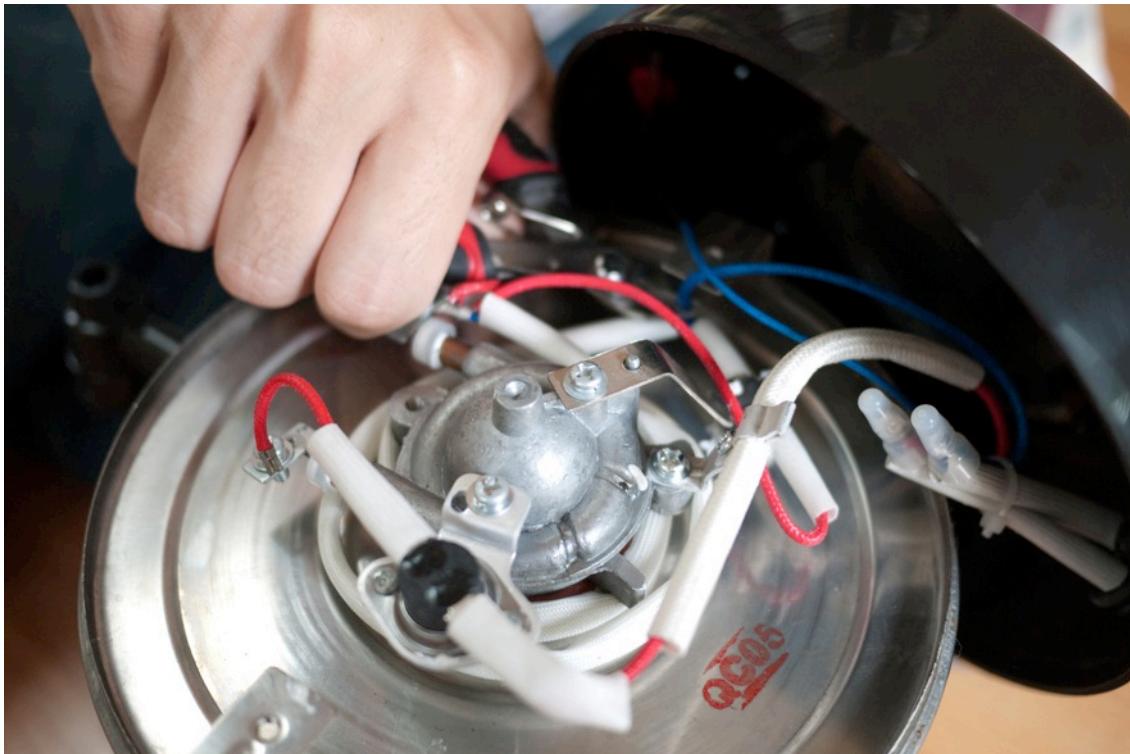


3. Lift and familiar yourself with the innards of the appliance. The coffee urn is hilarious and beautiful in its simplicity. All we will need is the main heater, but there are a few other things:

- a. The main heater is in the middle, fairly bulky, with the two connectors jutting out parallel to the bottom of the urn.
- b. The “keep warm” heater, which is usually a special wire covered in insulation, wrapped around the main heater.
- c. Small disks attached to various places. These are thermistors that prevent overheating. We recommend discarding the one that connects to the container but keeping the one that connects to the heater.
- d. An indicator light.



- 4. We snip the blue wire just where it connects to the “keep warm” heater wire. We will splice into this later for AC power. Then remove the keep warm heater altogether.



5. Unscrew the wires that connect to the main heater.

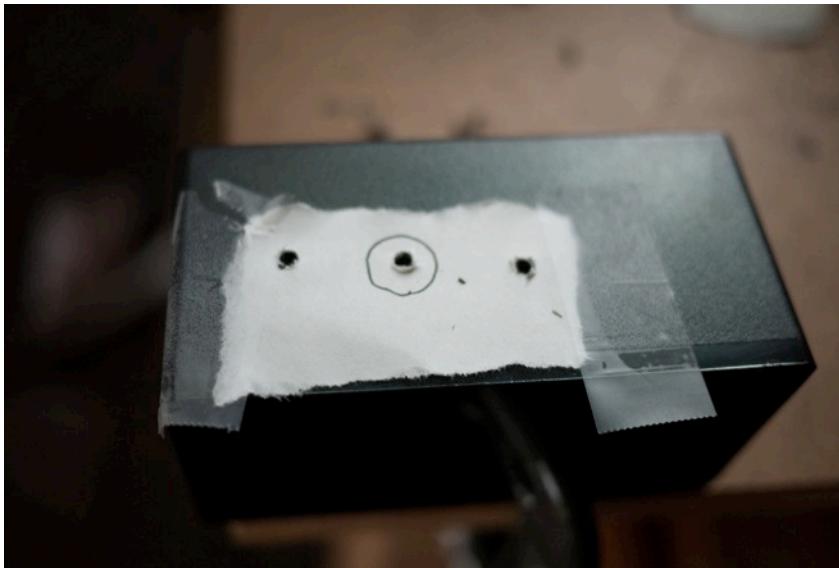


6. Attach the base to your workbench with a C-clamp. Line the template up just to the right of the front so that the box will not overlap anything, but it is accessible. Drill holes using the template, starting with a small drill bit and working up to larger ones.

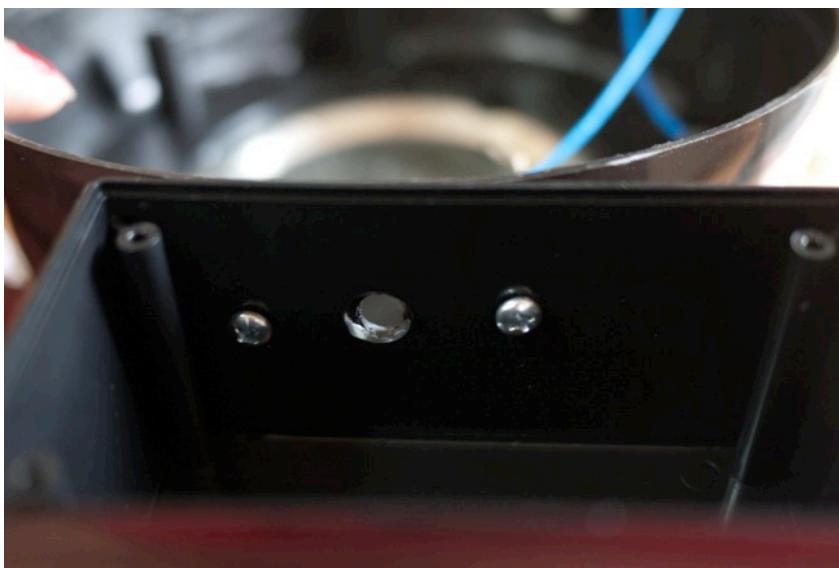


7. Remove the base then clamp down the Ember Kit box. Attach the template toward the left side (if the opening is facing you), but make sure there is room for the screw on the inside. Then drill

holes in it with the other template.



8. Now insert the two long bolts and attach the Ember Kit to the base. Attach them together with the nuts.

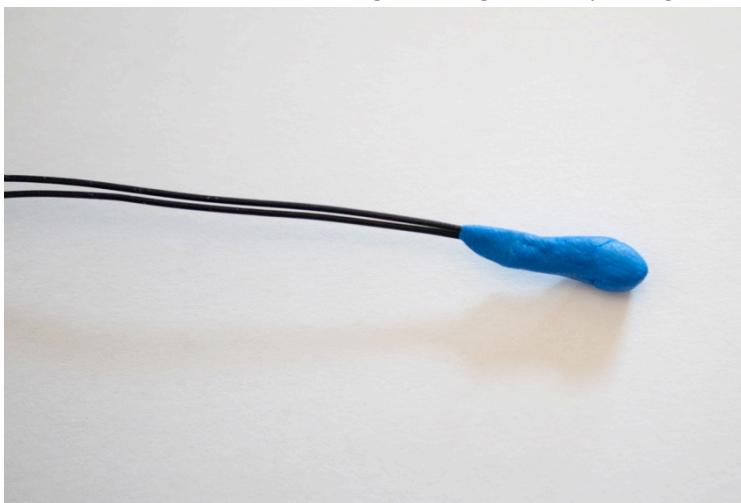


9. Locate the place on the container you will be attaching the ember kit (line it up with the base to check). Near the ember kit location, not too close to the heater or wall, drill or poke a small hole into the base of the container. It doesn't need to be more than 1/16", but if it is larger don't worry, you can still cover it with the silicone sealant. The Professional Series is stainless steel, so

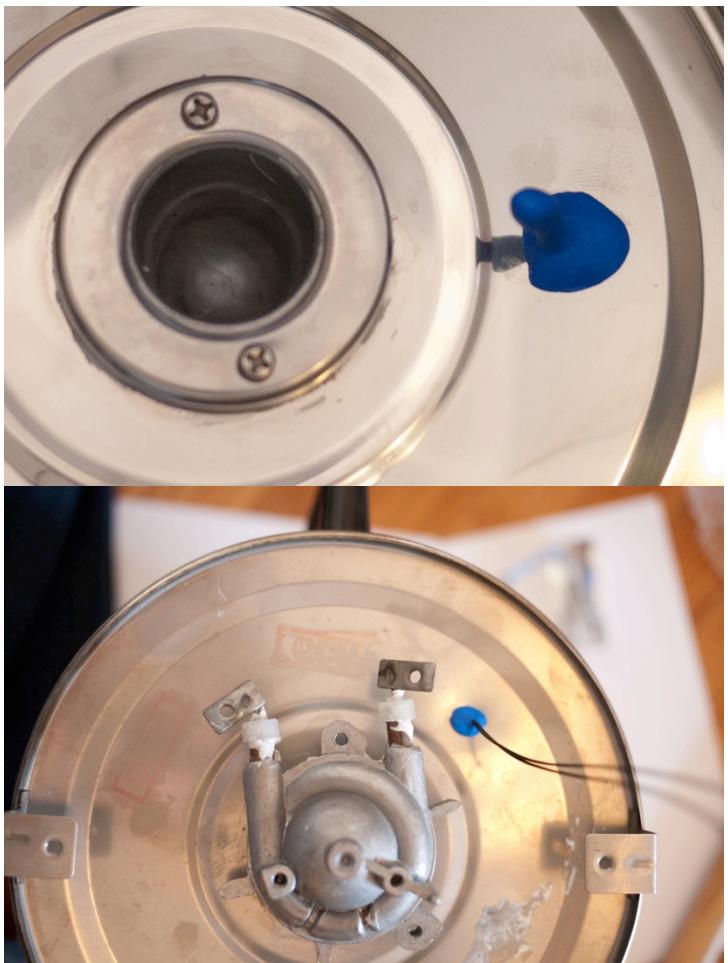
our drill couldn't handle it. A hammer and awl did the trick.



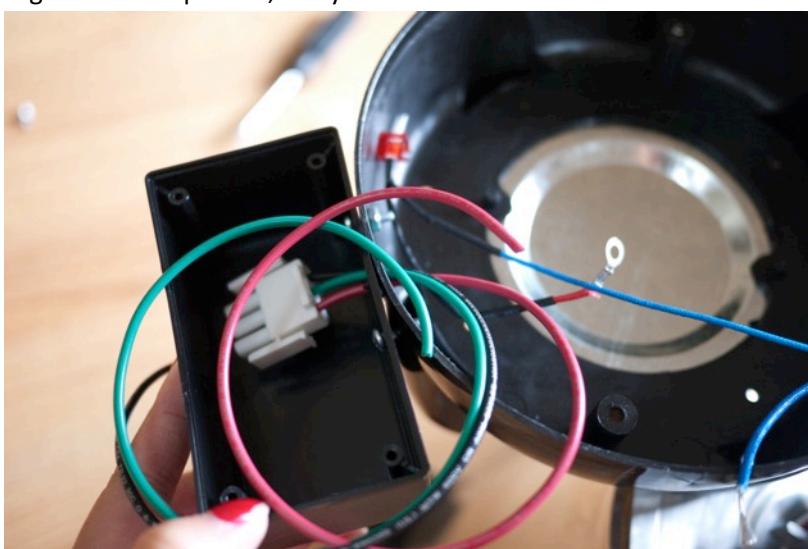
10. Wrap the top part of the thermistor completely in a thin layer of Sugru. The Sugru needs to protect it from the water, but shouldn't be too thick to prevent reading the right temperature. See the instructions for working with sugru at <http://sugru.com/instructions/>



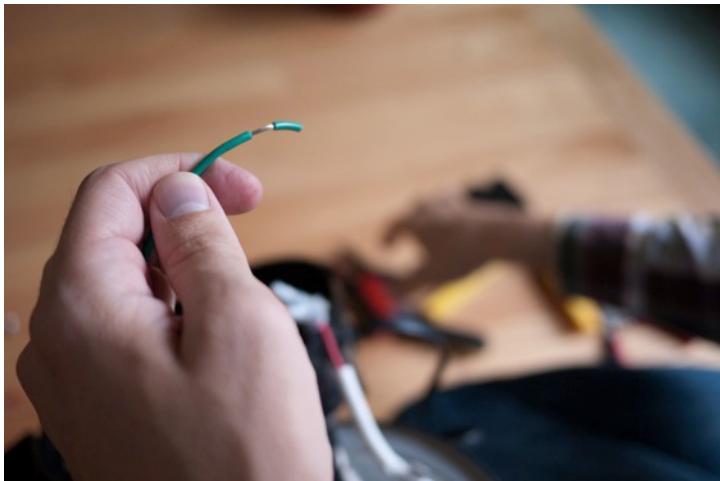
11. Put the thermistor wire through the hole, with the head in the container. Use sugru to seal the hole on the bottom of the container. Also apply sugru on the underside for strain relief.



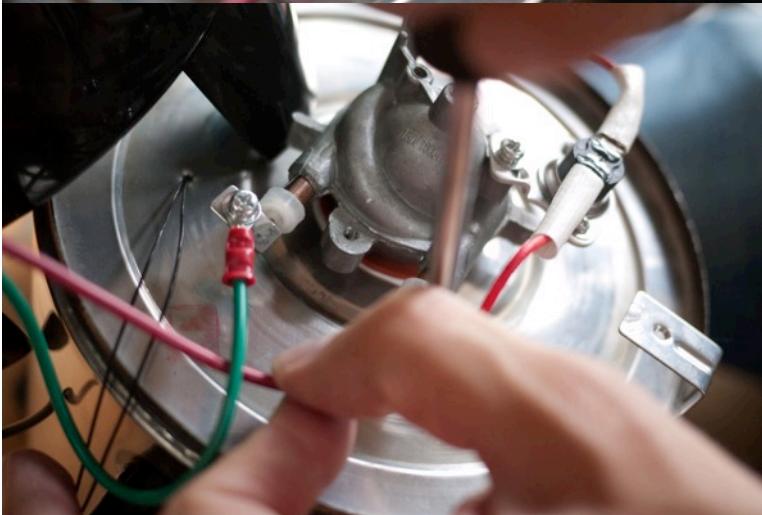
12. Now thread the wires from the Tyco socket through from the box to the base. Our middle wire is green in this picture, but yours should be **white**.



13. Shorten the red and white wires so they are only about 8 inches long. Strip the ends of the wires and crimp on the ring terminals.



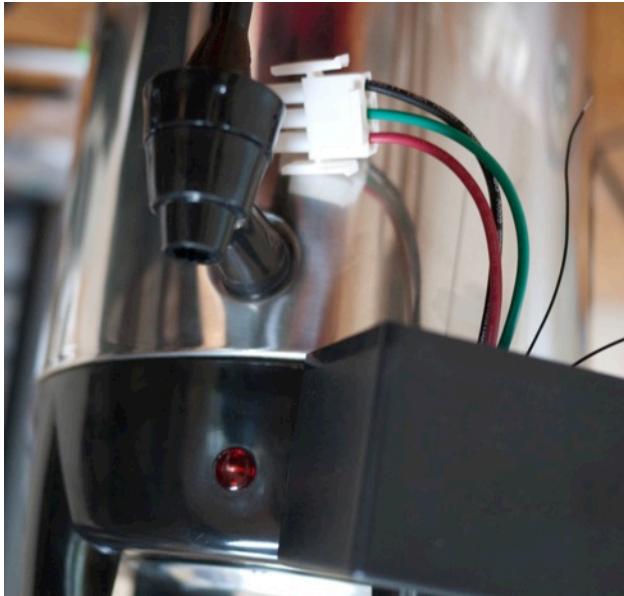
14. Screw them, with the red wire removed in step 5, to the terminals of the heater.



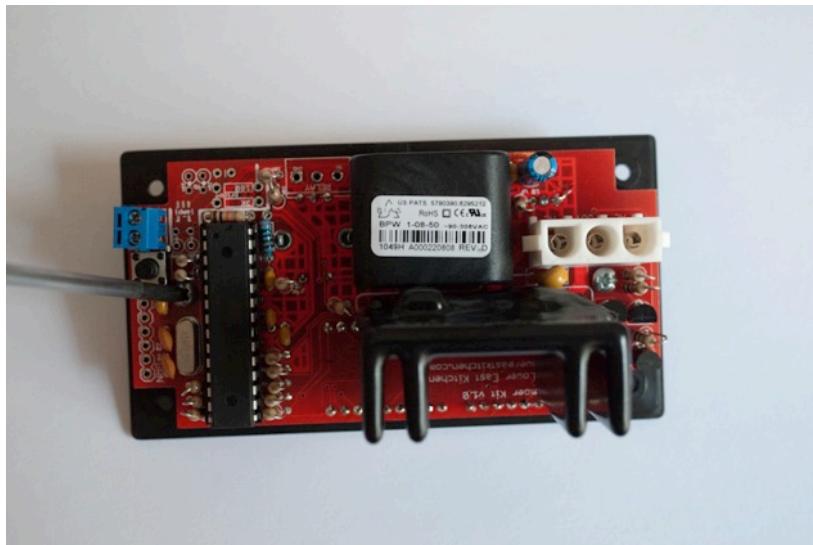
15. Take the blue wire we snipped from the keep warm heater a long way back (Step 4). Strip it and the black wire, and crimp together with a butt connector.



16. Test the tyco socket with a multimeter before packing everything up. There should be no connection between the black and either other lead. There should be 15 ohms or so between the red and white leads.
17. Now thread the leads from the thermistor into the ember kit box, and close everything back up!



18. Now turn to the PCB. Screw the PCB into the lid so the LED and rotary encoder go through the holes.



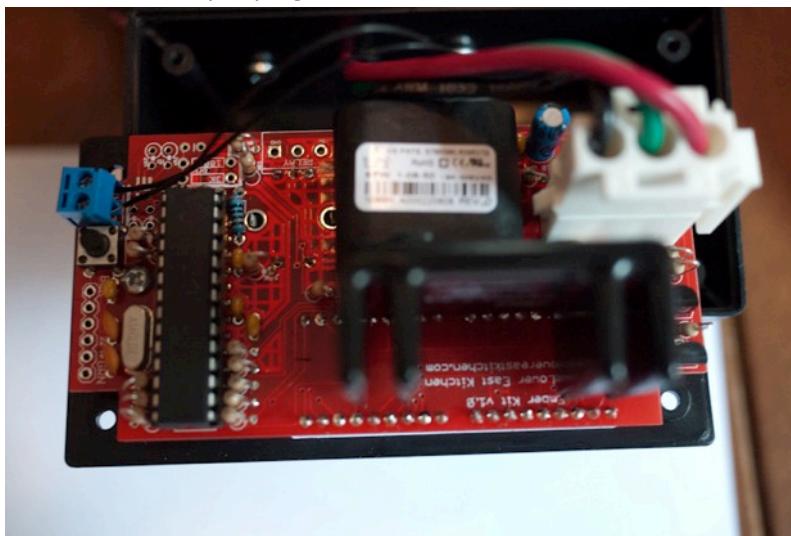
19. Now attach the knob to the rotary encoder with the allen wrench provided. Pull the knob away from the face slightly so that it has room to spin and can be pushed in (it includes a push switch).



20. Now screw the leads from the thermistor into the screw terminal. You will need a very small screwdriver, we had a 1/16" flathead.



21. Also attach the Tyco plug to the socket.



22. Now screw the faceplate onto the box! Looking sharp! You are almost done!



23. After the sugru dries (overnight), add water to the container to see if it leaks. If it holds, go ahead and plug it in (to a GFCI outlet or adapter).
24. It should turn on and say the temperature! If this does not happen, unplug, remove the board and check for shorts. Check the connection of the Tyco plug electrodes (red and black) to the prongs on the coffee urn power plug. The most common mistake made is that you have inserted the microchip the wrong way.
25. It should also heat up! If you don't notice boiling after 30 seconds, something is up. Unplug the coffee urn. If the LED indicating heat (behind the ember sticker) was not turning on, check for a short on your board. If the LED turns on but it is not heating, check the wiring (multimeter the red and white wires on the Tyco plug, should have a resistance of 12-20 ohms). If that is not working, check the resistor next to the SSR. We pulled the pad here on one setup. You can just short across the resistor if you need to (take the lead of a resistor you clipped, solder it to the two electrodes). With a multimeter, check the wiring of the SSR pin to the resistor, and the other SSR signal pin to ground.
26. You're ready to get cooking! Try some eggs at 63 C for 45 minutes. Or one of our recipes at [QandAbe.com](http://QandAbe.com). Enjoy! Tell us what you think!