

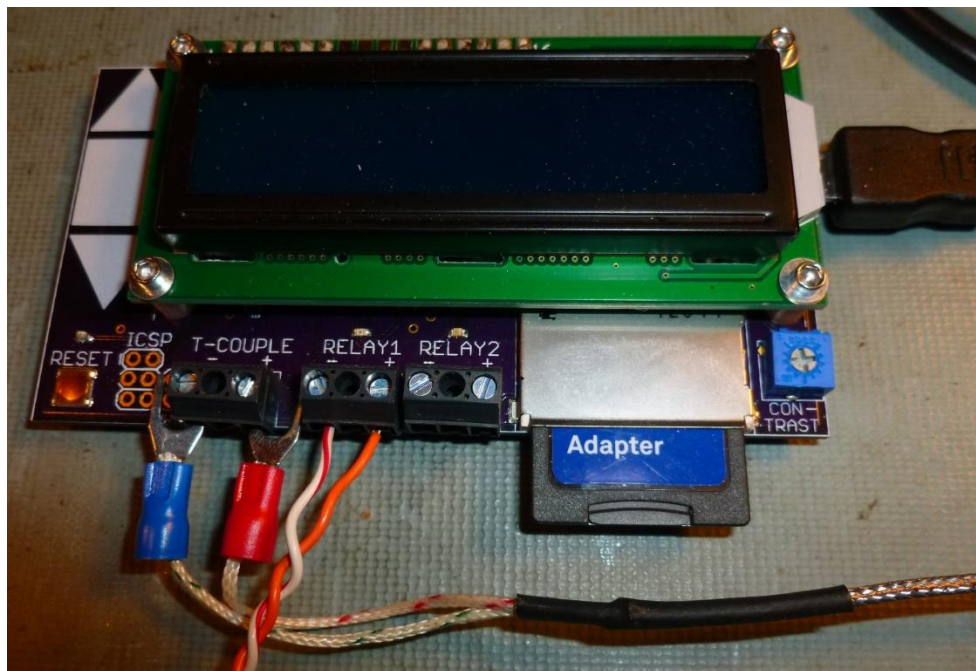
REFLOLEO

Mike Seguin, N1JEZ

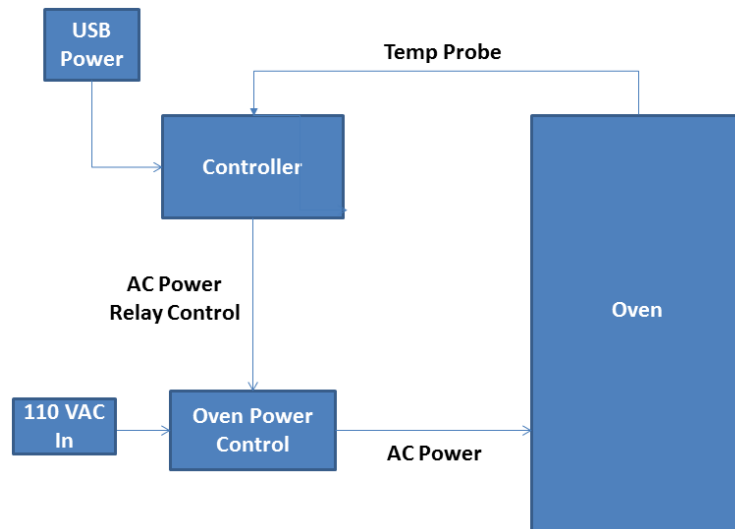
RefloLeo is a KickStarter Project created by John Kicklighter. It is an Arduino based Toaster Oven controller used for Reflow Soldering. Here are some of the specifications:

- ❖ **Arduino Leonardo compatible**
- ❖ **K-type thermocouple**
- ❖ **Simple setup and operation**
- ❖ **USB powered**
- ❖ **5V, 600mA external relay control capability**
- ❖ **SD Card Profile storage**
- ❖ **Open hardware design**

Here is the RefloLeo controller. On the left are three buttons for selecting profiles and starting the oven. There is an SD card on the lower right for storing the various temperature profiles. On the right is the USB power input. There are also connections for the Thermocouple mounted in the oven and an output to the AC control relay. There is a two line LCD that shows the current operation.



This is a block diagram of the system.



This is the complete oven with temp sensor and controller.

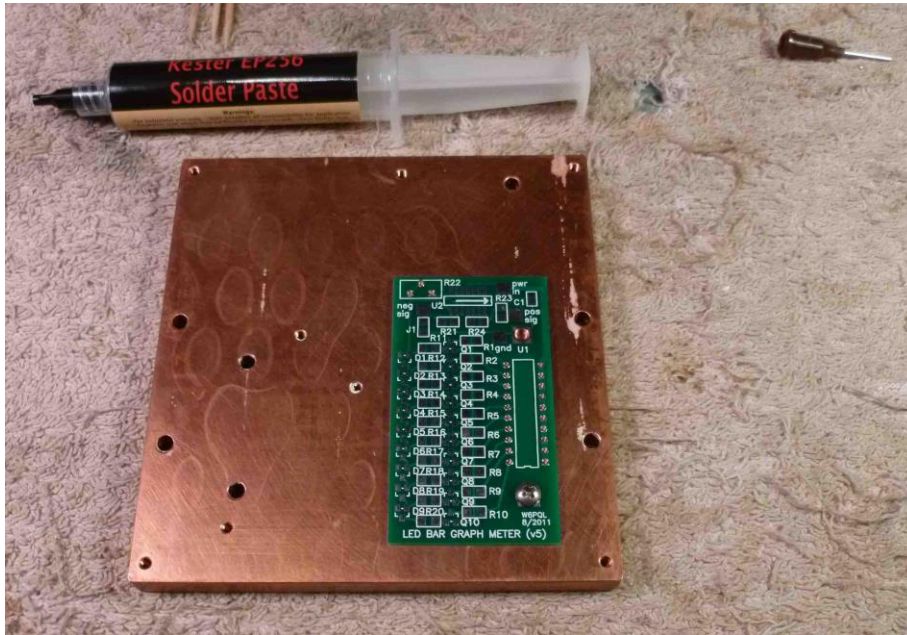


The power for the oven is a PowerSwitch Tail II that is controlled by RefloLeo.

My first project was a W6PQL LED Bar graph display. I can say that I never want to go back to hand soldering boards like this again!

The W6PQL board has 40+ SMD parts. Over half are small 3 legged diodes and transistors. If you've ever hand soldered these, you know what a pain it is.

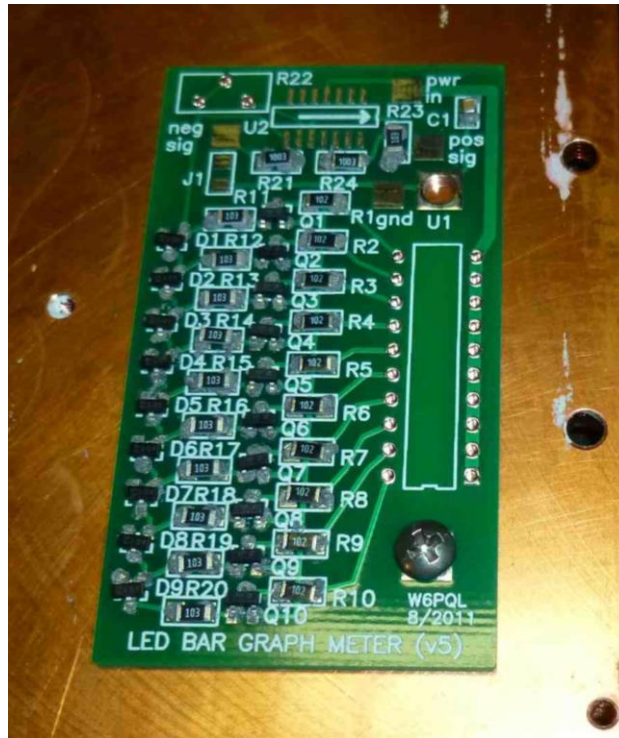
Step one was to secure the board so it wouldn't move around as I was working on it. I prefer to use something like the chunk of copper pictured here. This keeps the work flat on the bench rather than elevated in a circuit board vise. I tend to get a bit shaky working on elevated boards.



I used Kester EP256 Solder Paste in a syringe. It comes with several small tips for easy dispensing. I store it in my refrigerator until I need it. It wants to be stored between 32-50 degrees. You bring it up to room temperature before you apply it. I got it here:

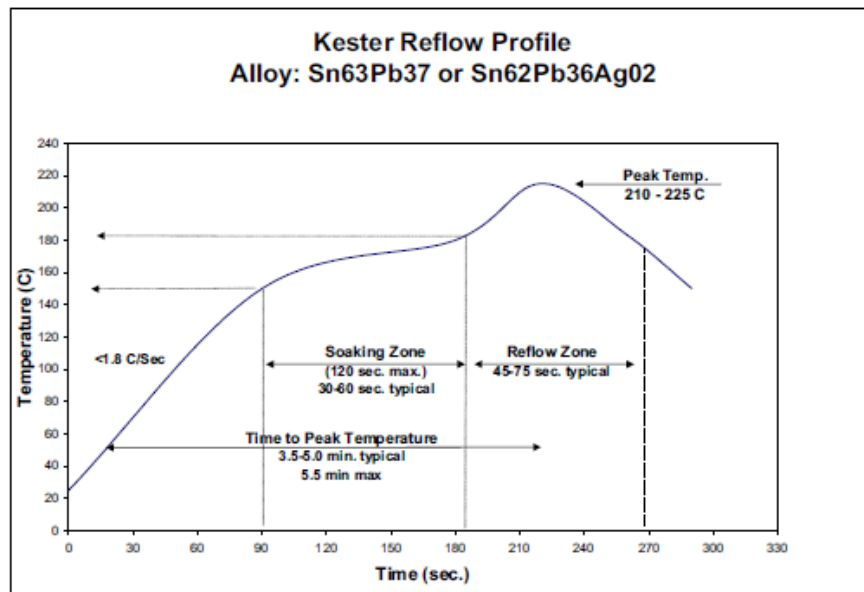
<http://www.cmlsupply.com/electronics-materials/solder-paste/kester-ep-256-syringe.html>

I applied the solder paste to all the pads and placed the parts with a pair of tweezers. The paste was sticky enough that it held the parts quite nicely. This took only about 15 minutes. Here is the board with all the parts fitted.



You might notice that all the parts are not perfectly straight. I wanted to see if the reflow process would straighten them out.

The next step was to bake the board. The Kester solder has the following Reflow Profile. This curve shows the temperature vs time needed to reflow the solder paste.



The RefloLeo controller has several user temperature profiles stored on its SD card. I used the standard profile as it looked to be a good match for the Kester Profile. The profiles stored on the RefloLeo SD card are simple text files that are easy to edit.

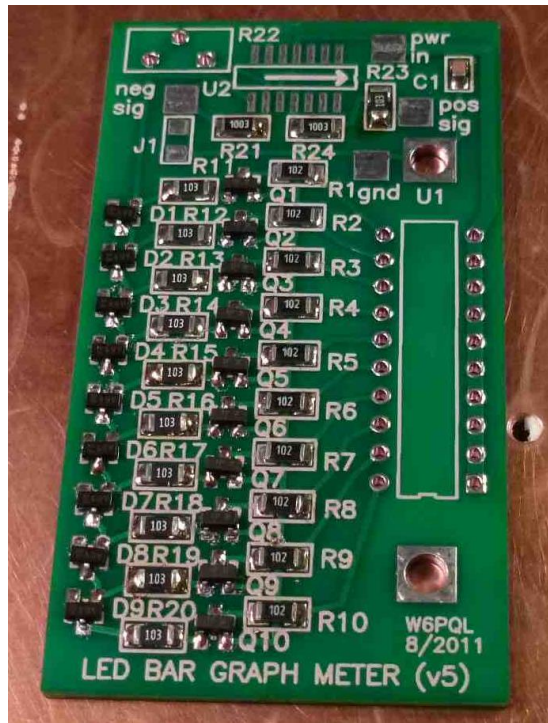
Here's an example low temperature reflow profile:

- T130,000 Goto 130 degrees
- W000,015 Wait 15 seconds (and turn off heat)
- H150,120 Hold at 150 degrees for 120 seconds
- T212,000 Goto 212 degrees
- W000,020 Wait 20 seconds (and turn off heat)
- H225,020 Hold at 225 degrees for 20 seconds
- X000,000 Exit program and turn off relay

Into the Oven goes the board.

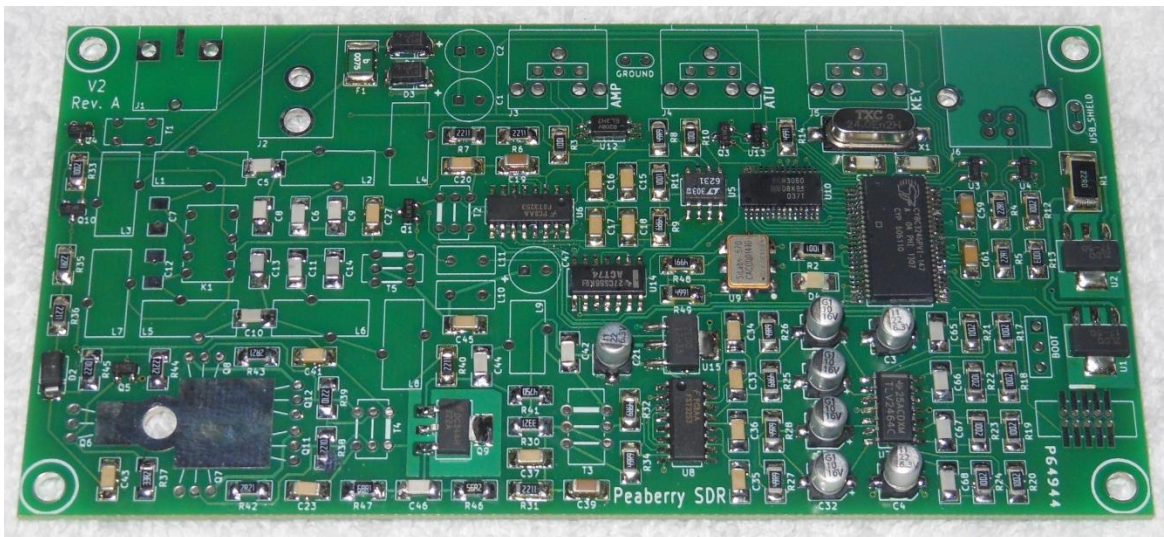


About 5 minutes later, I have a complete board. You will notice that the parts tended to center themselves on the pads.



One thing I did notice is that my temperature profile was a bit too aggressive. Some of the resistors showed signs of slight overheating. Testing shows they are electrically fine, but it meant my temperature sensor in the oven was not really close enough to reflect actual board temperature. I have edited the temperature profile on the RefloLeo SD card to lower the overall curve. I also repositioned the sensor so it was closer to the board. Assembling 2 more boards showed the new profile to work fine.

The next project was a Peaberry SDR. It came out well!



RefloLeo is now the standard way I assemble boards with SMD's.