

Reflow Oven Project

featuring X-Toaster Controller

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The picture shows the sheet metal box, with all the different holes for mountings and air vents.

SSR and Shielding in place for trial. Took me quite a while to drill the holes, and finish the cut-outs for the controller, but it was worth it. Very good EMI, temperature and it is virtually indestructible. 😊

I wanted the box as small as possible, but big enough to access it easily, even with everything mounted in place.

The box spray-painted, cut-outs visible for the controller, and the RGB Led strip sliders and fan.

On the right, there is the outer wall of the toaster-oven, which I made to fit the measurements of the controller box, to easily mount cables and stuff through it. The rest of the toaster can then be taken away quickly for access if necessary.



Box and Wall mounted.

For all you curious, beachwood has the flashpoint at at least 300°C 😊. So it shouldn't be a problem with my nicely grounded metalboxes.

Potentiometer on the right side is for pwm fancontrol.

Spacing between „the wall“ and the controller box is to remove heat, and to run some low-voltage cables and the thermocouple.

The box layout is divided between a main-power and a low-voltage section. The bare-metal on the backwall is to ground the shielding when screwed on.

The secondary temperatur sensor (big white cable) can either be fitted to read the temperature of the SSR or in the cable-section in the toaster.

I made the cable long enough to be able to change that if I want to.



A close-up of the piggyback electronics on the controller.

I made a thin sheet metal shielding in between the controller and my power-supply board, to improve EMI. Just in case.

My power-board gets 12V from the ac-dc adaptor (flat white box, mean well, 5A).

It features a 5V(1.5A) dc-dc regulator powering the X-toaster board, and the red adjustable output buck converter for adjusting the case fan speed.

There is a separate fuse for the 12V (2.5A) and 5V (0.5A) section.

Note the different tantalum, ceramic and electrolytic caps everywhere to improve things.

At the bottom is the RGB Led strip, the rubber cable protection for the thermocouple and fan wire.

The three transistors for the Led strip are sitting on the protoboard.



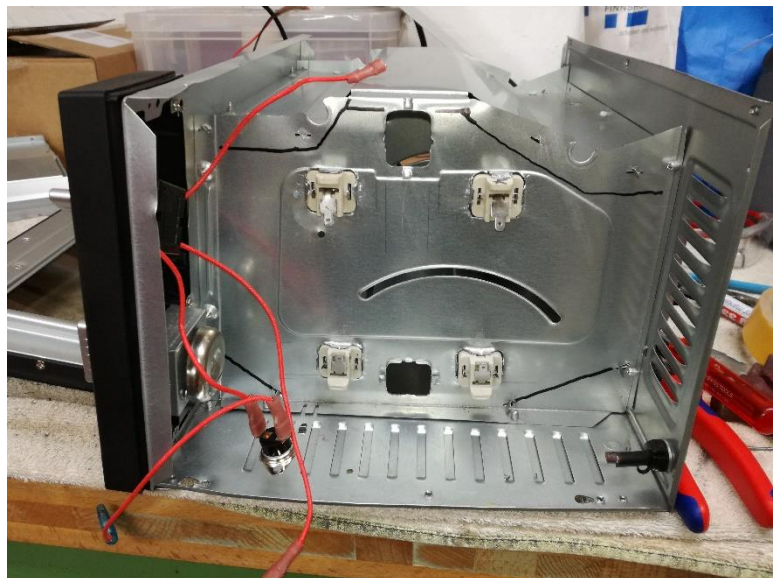
All the wiring in place.
I added a 10A fuse, seen bottom right, with the two brown cables connected to it.

I used a big fat rubber cable for the mains, I like it flexible. (3x2.5mm²)

Shielding is white for better reflexion of the light shining in the box. The rows of holes running along the bottom are intended to let air flow into that space between the box and oven, to cool it down, if necessary. (Case fan is sucking air into the box)

I bought two ovens of 1000W each. I then fitted the quarzelements into one oven, resulting in 2000W at 12 litres of space.

Until now I left additional insulation off to improve cooling, but I might add some if I find there are cold/warm spots on the pbc's. Subject of investigation 😊.
I also made pieces of sheetmetal, covering the round slot of the crappy grill and the two holes of the quartz elements. Not seen on pics.



First test run on the balcony. The white stuff is original glasswool-insulation. As I said, I left it off when I closed the toaster.

I left the original controls on there, just for fun. If I would do batch production in the future, I might add small fans there to suck air into the cablespace of the toaster, to cool down the toastercase quicker, before starting another run. But that's not for now. Outside temperature here was somewhere around -7°C. No problem cranking up to reflow temperature.
RGB setting on pink 😊



Fitted plexiglass window.
The RGB LED strip is run off the 12V AC-DC powersupply on the bottom.

Low gain npn transistor connecting each RGB colour to ground. Each base is controlled by the 1MOhm sliders (they are actually stereo, soldered together, resulting in 2MOhm), and a 1.4k resistor as minimum value. The led's actually never turn all the way off, as there is always around 1 mA flowing, but that doesn't bother me.



Another test run.

Note the original grill in the oven, I made myself something lighter, as seen in the next picture.

We'll see if that needs some further improvements as experience increases.

Temperature under the oven never reaches more than 40°C, on top of the oven it gets to around 50-60°C. The SSR only gets 1°C above ambient on one run at the time with the fan off.

I made some handles on the sides of the toaster, to make carrying it around easier.

The toaster is actually slanted backwards only to save cost on some closing mechanism, resulting in the door flapping in the breeze.

I wanted something that allowed me to open the door partly, finely adjustable. So, I came up with that flat bar-brake. Works quite well.



As for now I am still finding the right PID adjustments. The pcb's and solder paste are already waiting for the first run. ☺ Well exiting...

All in all, it was a fun project, that taught me a lot about mains wiring and all. It was actually my first mains powered project.

What I really like about the X-toaster controller are the safety features, the touch screen, the user manual, the nicely packed controller kit with all the bits and pieces, and especially the customer care!

Just splendid!

Thank you very much,

And happy toasting ☺

M.Hofmann