Build your own
LC Meter

Part 4: Enclosures

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LC meter in a 3D-printed tray

After completing Part 1, Part 2, and Part 3 of this series, it's time to put the finishing touches on your meter. This document describes two enclosures that you can 3D print.

Introduction

It's confession time. I admire the ingenuity of hobbyists who surround their projects with handsome enclosures of aluminum, acrylic, and wood. My shack is filled with projects that never seem to achieve that polished look. So, I decided to invest in a small 3D printer. 3D printing allows you to create custom enclosures with minimal fuss. And while the result may not be as beautiful as hand-rubbed mahogany, it will protect your electronics in a secure, cost-effective manner.

1. Tray, anyone?

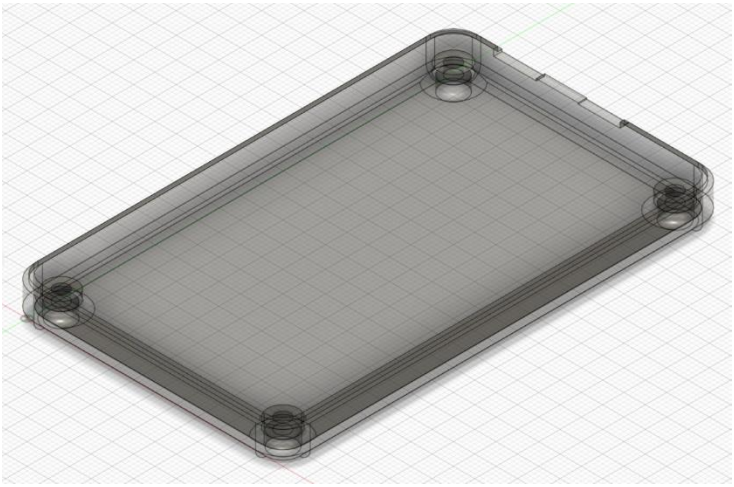
The first case isn't a case at all. It's a case-bottom of sorts, or tray. See the photo above. It is a simple design, inexpensive to build, and protects the solder-side of the project from your desktop (and vice-versa). Best of all, it shows off your handiwork. I like it so much that I intend to go back and create trays for some of my other projects.

To print this tray, download the LC meter enclosure "Bob" from my Thingiverse account. Then use your slicer software of choice to create a G-code file for your printer. I use PrusaSlicer for my Prusa MINI printer. I print at the default, medium-resolution settings using standard 1.75mm PLA filament.

The tray contains 4 mounting posts. The PCB should fit into the tray, resting on the mounting posts, with a small amount (0.4mm) of lateral wiggle room. Use four (4) M3 button-head screws, **6mm** in length, to secure the PCB to the tray. Do not use screws longer than 6mm. The holes in the posts are 2.9mm in diameter and unthreaded. The M3 screw will bite into unthreaded PLA and self-tap if you work slowly and carefully, maintaining a perpendicular orientation to the hole. Do not overtighten.

2. Full Enclosure

The second case is a traditional, two-part design that completely surrounds the PCB. The bottom cover is like the tray, except that the screws are inserted into recessed holes from below. To print this enclosure, download the LC meter Enclosure "Doug" from my Thingiverse account.



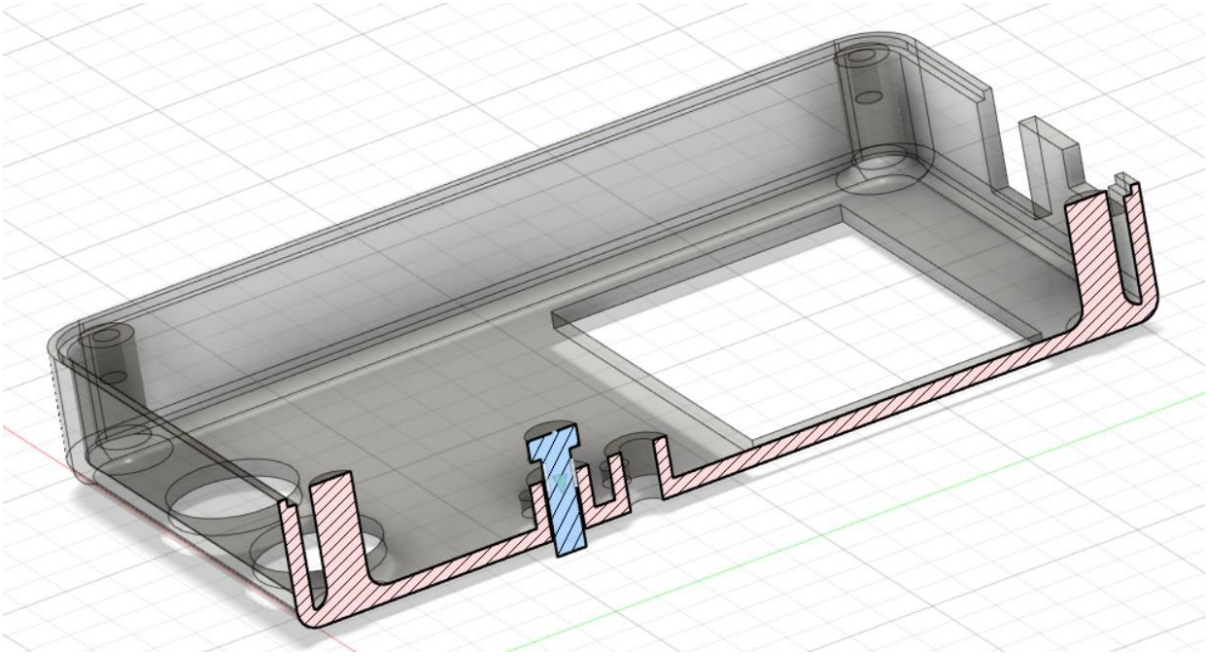
This case requires M3 button-head screws that are **8mm** in length. When fully inserted, the screw heads should lie just below the case surface. Again, do not overtighten.

There is a 1mm lip on both case halves which ensures proper alignment.

The case top contains openings for the DC jack, on/off switch, display, button switches, LEDs, and testing jacks.

The display opening admits the upper portion of the display module, so that the display surface is nearly flush with the case. A slightly taller case could have a narrower opening, but I enjoy seeing a small bit of the display hardware. It hints at the interesting DIY electronics below.

Openings for the tactile switches posed an interesting problem: how can you press a small, PCB-mounted button that lies a centimeter below the case cover? My first thought was to case-mount the switch and run wires back to the board. But my switches were already PCB-mounted. I settled on 3D printing a "linear actuator", which is a short, piston-shaped rod. The actuator is held vertically, above the switch, by an extruded case hole. Once the case is closed, the actuator cannot fall out.



Cutaway view of case top, upside-down, showing actuator placement (blue).

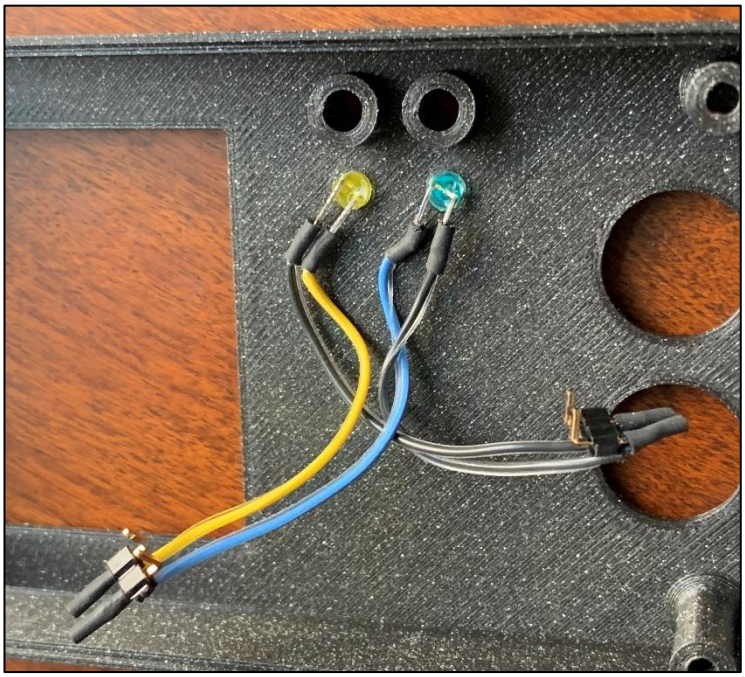
Board-mounted LEDs are hard to see though the enclosure holes. An interesting solution would be to use light pipes, which are available from Mouser and other electronic supply houses. Instead, I chose to panel-mount two 3mm-LEDs and wire them in parallel with the existing board-mounted LEDs:

1. Bend the LED leads at a 90-degree angle and clip them about 1cm in length.

2. Cut four (4), 5cm lengths of stranded wire and solder them to the LED leads. I used rainbow IDC ribbon cable.

3. Apply heat shrink tubing to the connections.

4. Solder the wire ends to two 1x2 right angle male headers, such that the LED anodes go to one header, and the cathodes go to the other header. See photo at right.



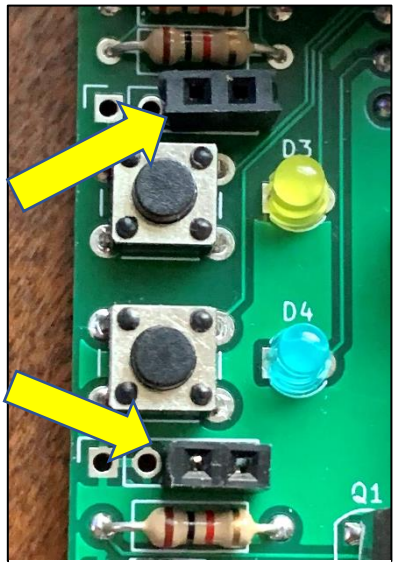
Case-mounted LEDs with anode header on left and cathode header on right

5. Insert the LEDs into the top case. The holes are sized to create a tight fit. Gently ream the holes if they are too small. Apply glue to secure the LEDs to the case, if desired.

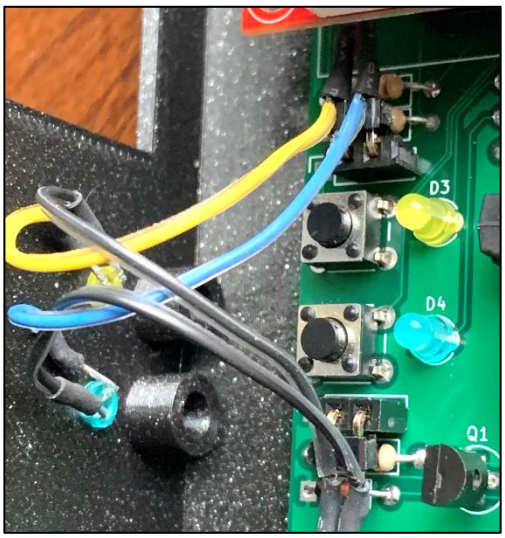
6. Solder two 1x2 female headers to the PCB at the positions indicated below. On the upper female header, the left hole corresponds to the yellow LED and the right hole is for the blue LED.

7. Insert the male headers into the female headers as shown. The male headers should be pointed away from each other (and not over the switches).

8. Insert both switch actuators before closing the case.



Female header placement



Right-angle male headers attached

3. Enclosure with Battery Compartment

The third and final enclosure adds an internal compartment for a 9V battery. To print this enclosure, download the LC meter Enclosure "Karl" from my Thingiverse account. The battery cover uses a 3D-printed plastic clip like those found on TV remotes. The case opening contains a recessed surface for the cover, which necessitates slicing and printing this case using printing supports.

Case with battery enclosure (rear view)

Securing the 9V battery clip

Carefully remove all printing supports and follow the directions for the second enclosure. Then thread a 9V battery connector through the case openings, as shown at left. Run the wires beneath the PCB and solder them to the undersurface of the PCB at the location marked "+ -". As usual, solder the red wire to "+" and the black wire to "-". If the wires are not long enough and need to be extended, I highly recommend insulating the wire joints with heat shrink tubing.

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