D-Lev *Tour 2* Kit Build

Eric Wallin, 2026-05-23

This paper describes the design and construction of an enclosure for the D-Lev Theremin kit. My second shot at a rod-based Theremin is more squarish in aspect ratio, orients the coil boxes in line with the side members, and mounts the slimmer antennas via UHF connectors. The textured black finish, black plastic corner protectors, and black heatshrink tubing on the antennas impart a rather rugged, industrial appearance.

Prototyping & Ergonomics

First of all, this is a musical instrument, so playability was the primary objective. Factors like portability and appearance are of course important too, but ideally they take a back seat to ergonomics. Because one really can't determine if an instrument is comfortable to play without actually playing it, a functional mockup was constructed from a discarded cardboard shipping box. Any changes here are trivial and painless – I mean, who cares if you cut another hole in something that's headed for the recycling bin anyway – so you're more likely to try things, potentially improving the final design. If you think about it, ugliness is actually a positive feature of a prototype, because you're less inclined to deface a pretty box in the name of scientific experimentation, and you don't want anything impeding that activity.

The cardboard mockup in all its glory.

The control panel was centered with the tuner on top – I think it's important to position the tuner up high to keep it in view. After playing the mockup for a while, I decided to move the antenna mounts closer to the horizontal centerline, and to lower the playing angle to 22.5 degrees. The horizontal distance between the antennas felt fine.

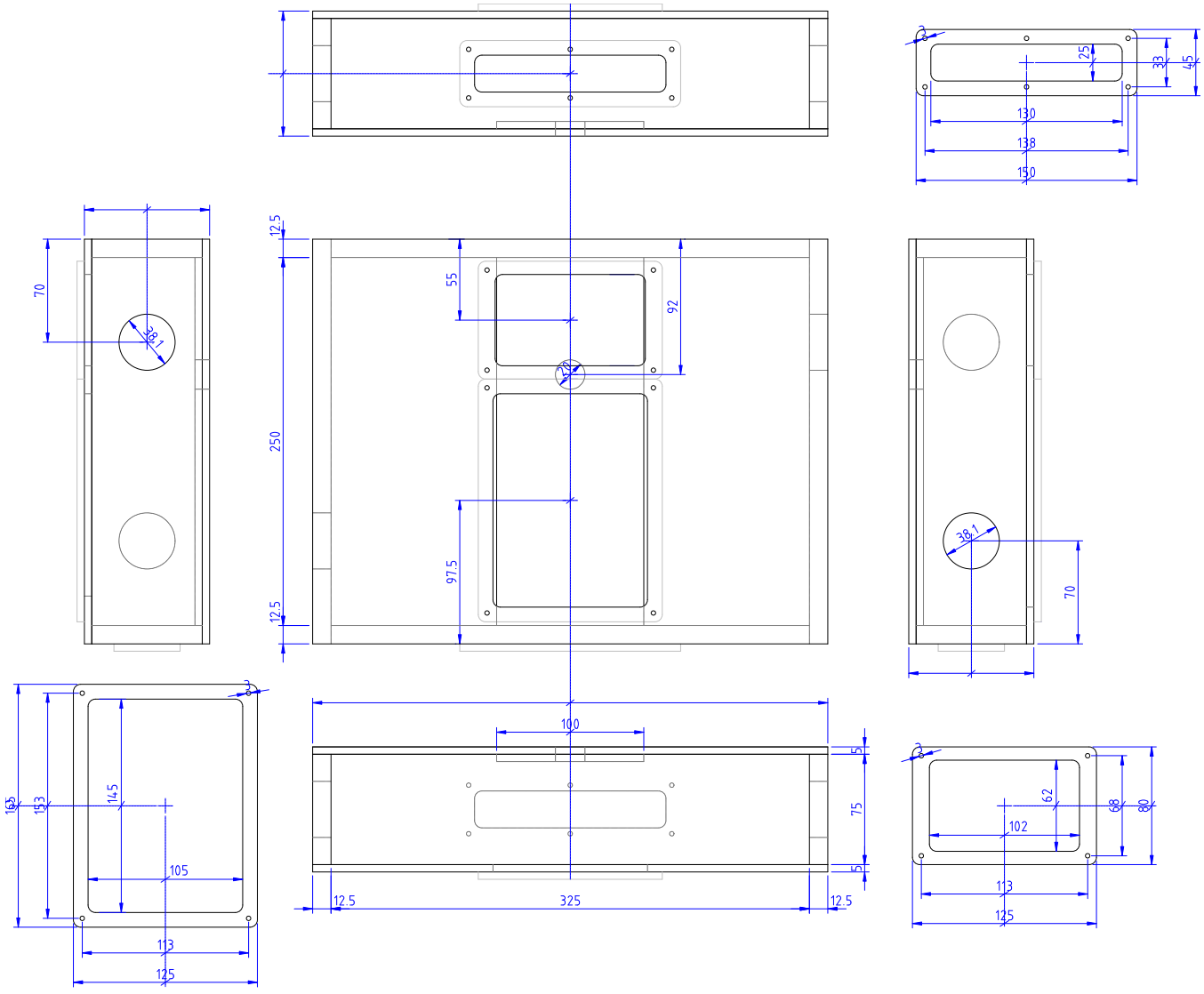
What really attracts me to this type of design is the fact that it's just a simple box with no hinged or removable top or bottom. When opened, removable panels tend to stretch the internal cabling to anything that is mounted on them. Here, access to the inside is naturally provided by the control and tuner panel cutouts.

There are no complex angles to deal with, as a variable tilt to the entire unit is imparted by a boom microphone stand. A small tilt angle provides a more perpendicular view of the tuner and LCD displays, good access to the encoders, and a bit of a height and distance differential to the antennas.

The I/O panel is centered on the front (I was using a test cable for the mockup since at that point the I/O panel hadn't been finalized). The resulting tilt to the I/O panel is also useful – it's not entirely horizontal, so connectors aren't jutting out and getting in the way of the player, and not entirely vertical underneath, where poor visibility can be an issue when hooking things up, and where the pull of gravity threatens to disconnect things. Also: I'm not a big fan of ugly I/O facing the audience.

Spinning just the loosened boom section by hand instead of the entire Theremin makes the threaded attachment process to the stand a less cumbersome and scary experience, and the boom angle lets you see what's going on under there while doing so.

Another nice feature of this design is it's inherently somewhat ambidextrous. In a pinch, a southpaw can be accommodated by swapping the antennas and setting the SYSTEM:P<>V knob to 3.



Technical Drawing.

Enclosure Construction

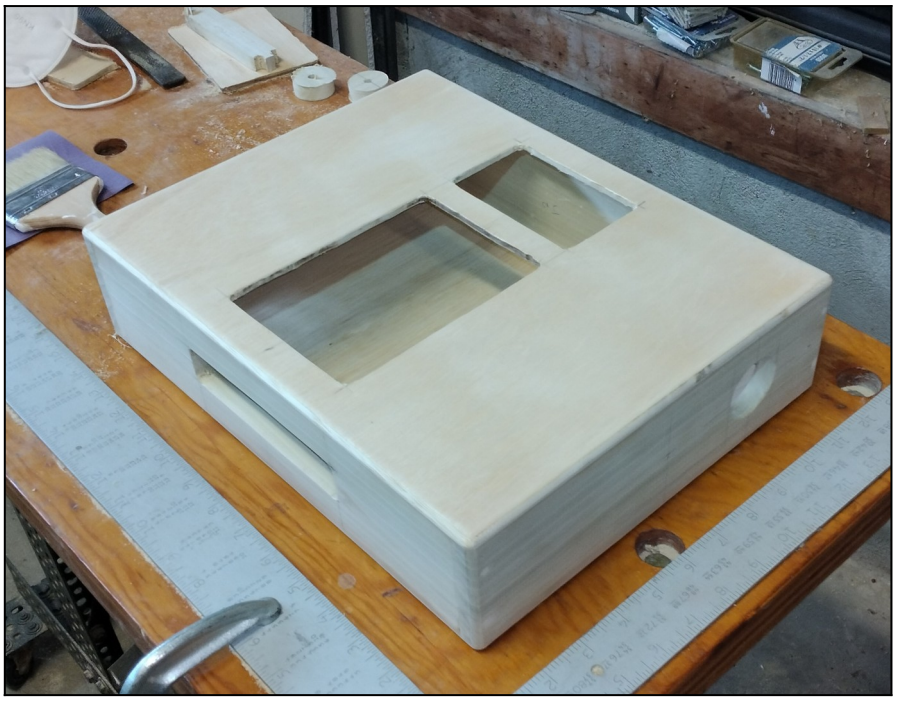
As with my previous design, 0.5” x 4” x 4’ poplar was selected for the sides, and 5mm luan plywood for the top and bottom, both purchased from the local Home Depot. Poplar is somewhere between a soft wood and a hard wood, so it is relatively lightweight and dimensionally stable (and the weight of an instrument directly impacts its portability). The poplar dimensions were actually 0.5” x 3.5” x a tad over 48”. Using a radial arm saw, the poplar width was ripped down to 75mm, and two pieces cut to a few mm longer than the 275mm length for the left and right sides. The remaining poplar was cut twice to 325mm long for the front and back. The boards were glued with a slight overhang, with intended final exterior dimensions of 350mm width by 275mm length. The glue joints were clamped via fender washers and drywall screws, which were later removed, the holes filled with DAP natural plastic wood after the glue dried.

Fender washers + drywall screws; clamps, weight, and square holding things true.

Corner block reinforcements were fashioned by cutting the Poplar rip scrap at a 30 degree angle (this angle is easiest to cut before the rip). The top and bottom surfaces of the sides were leveled with a sanding stick (a luthier trick) then the plywood top and bottom pieces were cut a few mm oversize and glued on.

Sanding stick trick; Gluing up the top & bottom (note slight overhang).

One secret to really crisp joinery is to cut things a few mm oversize and trim off the overhang with a flush cutting router bit. The corners should first be relieved with a file to keep them from splintering out when routing flush. All corners were rounded using a 1/2” rounding over router bit, then the exterior sanded using a small palm sander. Then the controls and display holes were cut by first drilling the corners and then freehand routing with a 0.25” router bit. The I/O panel hole was also first drilled at the corners but then finished with a handheld jigsaw. The holes for the antenna mounts were drilled using a 1.5” circle cutter and hand drill.



All edges trimmed & rounded, with holes & cutouts.

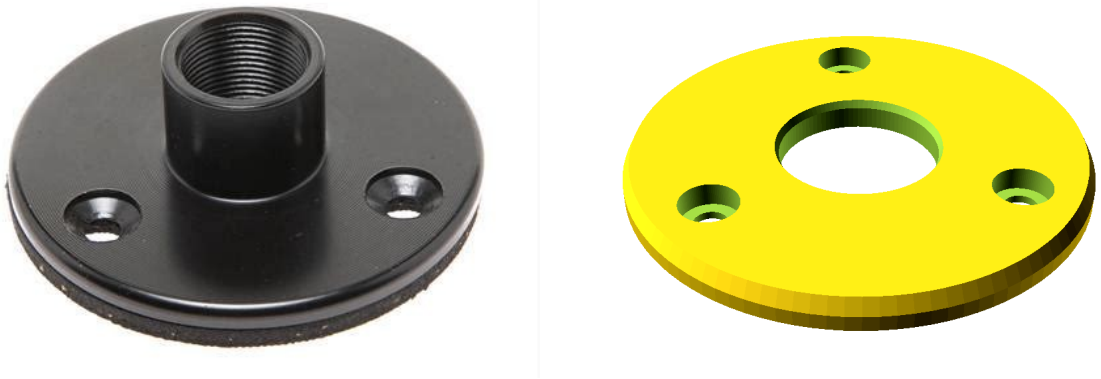
A scrap piece of 5mm luan plywood was cut to 100mm x 250mm and glued to the inside back, centered from left and right, to reinforce the mike stand flange. The flange itself was located 1/3 of the way down from the front (92mm) to give an automatic upright orientation gravitational assist when mounted on an angled boom mike stand. The hole for the flange was cut with a 7/8” circle cutter and hand drill.

The case was vacuumed and dusted, and the exterior given 3 coats of water-based Dura Tex, a heavy bodied latex paint which provides an appearance similar to that of Tolex (a vinyl protective material seen on guitar amps and such).

Dura Tex is rather expensive, but it’s almost trivial to get a professional looking textured finish with a perfect gloss level somewhere between satin and matte. Drying time is quick, and cleanup with water is very easy. I applied the first thin coat with a foam brush, which acts like a primer and ensures that there are no voids in the finish. The second and third coats were applied with a small highly textured foam roller that Parts Express pairs with it. Heavier coats increase the texture. A pint is more than twice what was required for this small project.

Flange & Trim

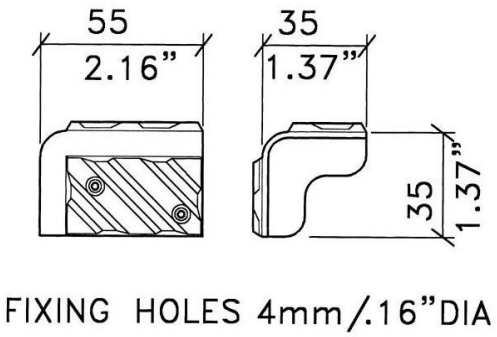
The flange is mounted inside the case, rather than outside, so the internally threaded neck doesn't stick out so far. A 3D printed black PETG trim ring brings the neck end flush and spiffs up the appearance. 4mm stainless socket head cap screws affix the flange and trim ring. The rubber backing glued onto the flange back at manufacture was retained to prevent anything inserted too far inside the mounting thread hole from damaging the back of the control unit.



Microphone flange (On-Stage u-mount, UM5006); 3D printed trim ring geometry.

Bottom view showing flange and trim ring.

I can’t remember what vendor I obtained the corners from, but it looks like Penn-Elcom carries them.



I do remember that it was difficult finding corners that weren’t too big or too small. The corners were attached to the case via #6 x 3/4” stainless flat head phillips sheet metal screws -1/2” would probably work as well or better but I couldn’t find them in stainless.

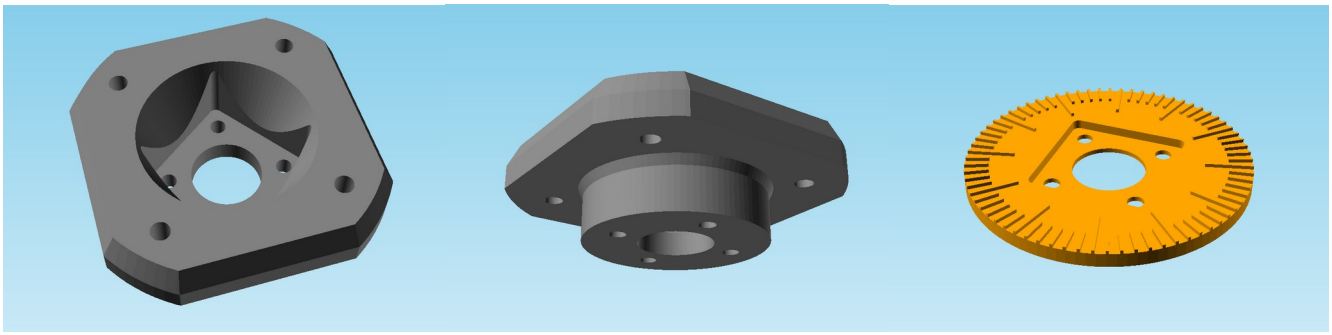
When doing some knob fit testing, I printed some knobs in transparent (really: translucent) PETG, which just happened to be the spool on the printer at the time. I like the effect so much that I printed 7 more and installed them on this build.

Antennas

I tend to advocate for the use of UHF connectors for attaching Theremin antennas, they are physically rugged and make for electrically positive connections. There are teeth in the plug and notches in the jack that keep the plug from rotating once tightened, with 22.5 degree increments. The antenna electrical connection is via the center conductor rather than the outer conductor, which helps to guard against ESD discharge damaging the field circuitry when the metal connectors are touched with statically charged fingers. The more premium and expensive versions are insulated with Teflon.

Panel mount SO-239; Plug PL-259 (for RG8 cable); 90 degree Elbow.

I designed and 3D printed in black PETG a trim adapter for the panel mount jacks. The trim adapter is flush with the outer face of the panel mount, which protects it during transit. The deep scoop allows clearance for finger tightening of the plug. A small printed trim square hides the panel mount metal face. One quirk of the panel mount is that the serrated notches tend to be oriented at a random angle. I printed a jig to help measure this angle and then compensated with the trim adapter code to line things up. I've been told that some versions of the panel mount can be rotated into alignment if given enough force, but mine wouldn't budge.



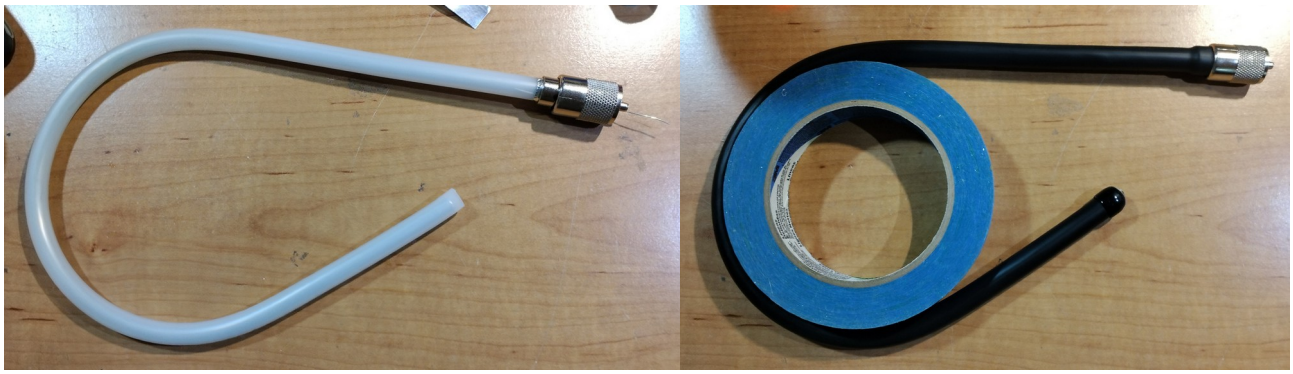
Panel mount trim adapter (two views); Angle jig.

In the past I've used 3/8" PEX tubing, but this time I used milky white poly tubing, 3/8" OD, 1/4" ID which I had a coil of handy. I cut two 500mm lengths off of it and straightened them with the help of a heat gun. it's fairly rigid once wrapped in aluminum tape and heatshrink tubing, though likely pliant enough to withstand a drop to the floor.

The pitch antenna was made conductive via 2" wide Aluminum tape, the thin unreinforced type used for HVAC ductwork. I cut a strip as long as the rod, removed the protective backing, and

laid it on a flat table surface. The rod was then placed on the tape with approx. 20mm hanging off of one end (to keep it from contacting the outer UHF conductor once assembled) and rolled. A small roughly 12mm wide strip was then applied to the exposed end of the poly tubing to improve the bite into the UHF plug cable threads. A length of 26 AWG tinned bus wire (you could use just about anything here) was snaked through the inside of the tubing, brought to the far end, and secured to the foil tape, and then soldered to the UHF plug center terminal. To insulate it (IMO all antennas should be insulated) I covered with 12.7mm diameter 3:1 marine adhesive glue lined heat shrink tubing that I bought off of eBay. This was my first experience with this thicker, adhesive lined heatshrink – it takes a lot of heat to shrink it, and it can get air bubbles trapped in it if you're not careful. You also have to be careful when buying the stuff, sometimes the unshrunk flat width or diameter is given, sometimes the target shrunk diameter is given. Anyway, it's is really thick compared to what I'm used to, and the adhesive seems to stick well to the poly tubing, imparting some welcomed rigidity. To literally top things off, a vinyl automotive cap was installed on the top of the antenna.

Attempts to make the volume antenna simply a bent version of the pitch antenna were met with failure and frustration. Even when applying a fairly large radius, the aluminum tape inside would split and electrically disconnect from the rest. Luckily, after rummaging around, I found a small roll of 6mm diameter (roughly 3 AWG and sometimes sold as such) solid aluminum wire that Evan Kahn gave me a while ago. It was a perfect fit for the poly tube ID, so I cut a 500mm length, straightened it, and inserted it into the poly tube. A few cm of bus wire was forced into one end to provide electrical connectivity to the UHF connector, and that end of the poly tubing was also wrapped with a small strip of aluminum tape to grip the UHF plug cable threads. The assembly was made more pliant with a heat gun, and a partially used roll of painter's masking tape was pressed into service as the bending form. The internal aluminum wire really helps it hold its shape.

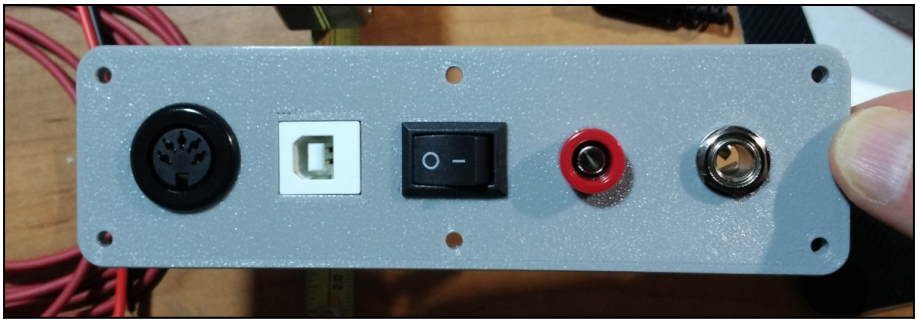


Before heatshrink; After heatshrink and vinyl cap (demonstrating impromptu bending form).

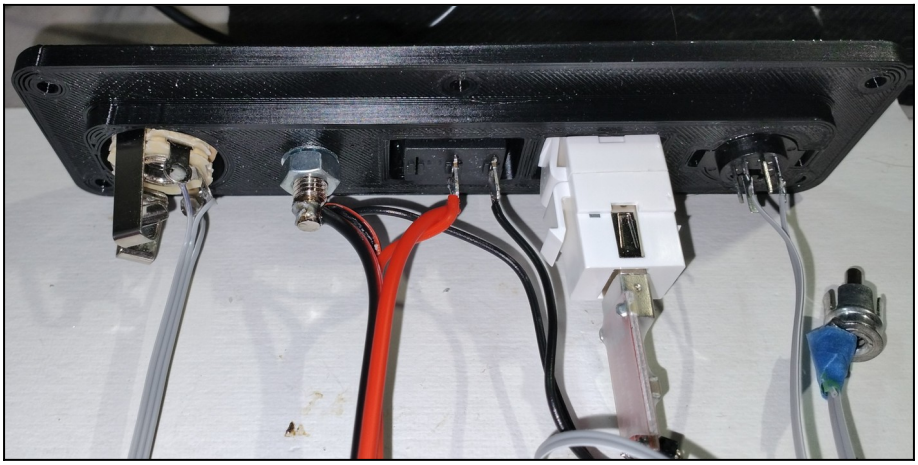
The panel mount trim adapters were attached to the case via #6 x 1" stainless pan head phillips sheet metal screws.

I/O Panel

An I/O panel was designed and 3D printed with black PETG. It (as well as the tuner and control panel) was attached to the case via #4 x 1/2” stainless pan head phillips sheet metal screws. The connectors from left to right: MIDI TX (5-pin DIN); serial port & power (female USB B); power (rocker switch); ground (banana jack); monitor stereo headphone / line level output (1/4” TRS).

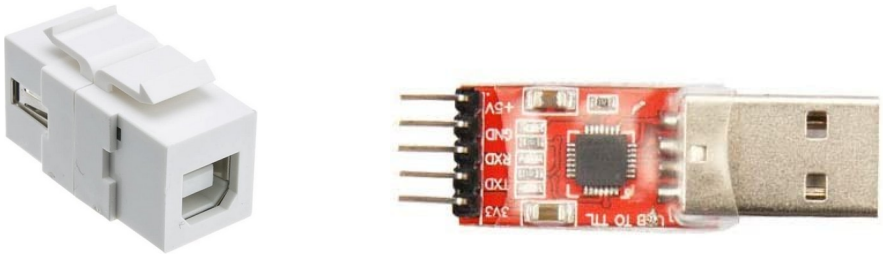


The I/O panel (an earlier gray version is shown here).



I/O panel rear view.

The USB B connector is a keystone mount with a USB A type internal connector. Plugged into this is a USB TTL serial port PCB. Both were obtained from Amazon.

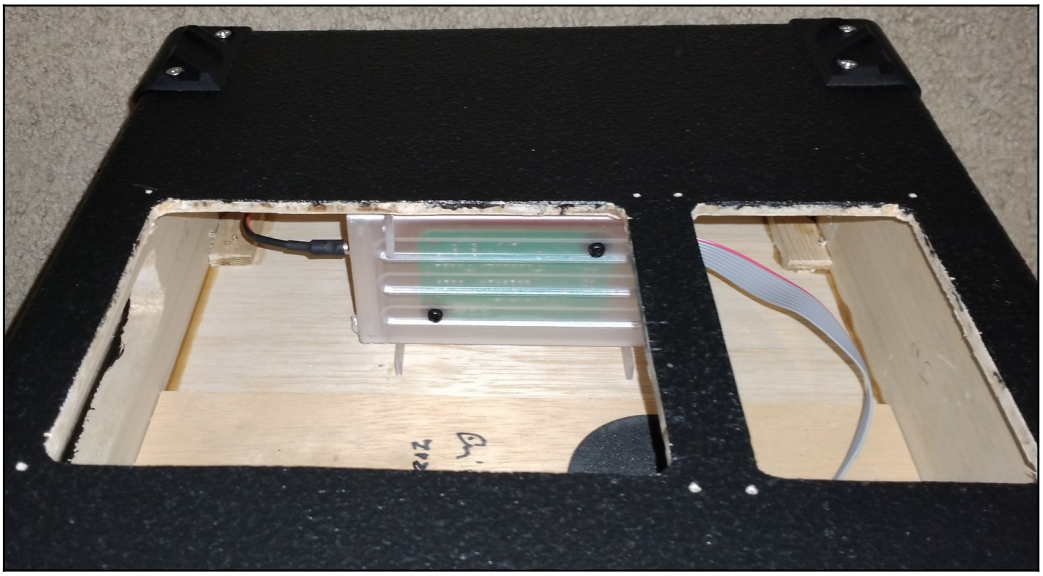


USB keystone connector; USB TTL serial PCB.

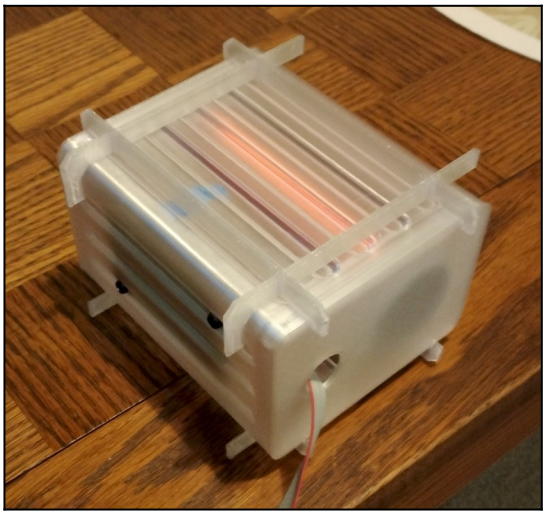
Also: I routed the Mute LED drive to the decimal dot of the 7-segment display on the tuner. This provides a positive indication of the mute state.

Internal Arrangement

The coil boxes were installed in alignment with the sides of the enclosure. To hold them in place I designed and 3D printed a two piece “cradle” of transparent PETG. The cradle dimensions hold the coil boxes equidistant from and tight against the top and bottom of the enclosure. A bit of hot melt glue further helps to hold them in position. I decided to orient the boxes so that the coil side was closest to the enclosure sides. Note that the cradle also provides some distancing here (generally the more “breathing room” the coils are given the better, though there are inverse square diminishing returns at work).



Volume box on cradle and in position, the pitch box placement on the other side is similar.



Coil box sitting in its cradle.

The lid of the Prozor DAC box was removed and a small hole was drilled through the center. A screw through this hole attached the DAC box lid to the microphone flange plywood reinforcement, whereupon the DAC box was reassembled.

View through the control panel cutout showing the mounted microphone flange and DAC box.

Final Thoughts

This build rather scandalously took me literally years to finally get around to and complete, but I'm quite happy with the results. My plans to improve the current kit include the construction of much larger coils, and this enclosure with some adjustment should be able to accommodate them. So perhaps it will become a reference design of sorts for those players who prefer rod antennas.

Happy Theremining everyone!

The following software was used to create this document:

- Linux Mint v21.3 Cinnamon
- LibreOffice Writer v25.2
- GIMP v2.10.30
- LibreCAD v2.2.1.5 *

* For LibreCad => LibreOffice Writer: File | Export | Export as Image | svg