

Part 2, Attachment 5.

Layout and Drilling Front, Back and Bottom Panels

Wall of Sound.ca Tubelab DIY EL84 Amp

Tools Required:

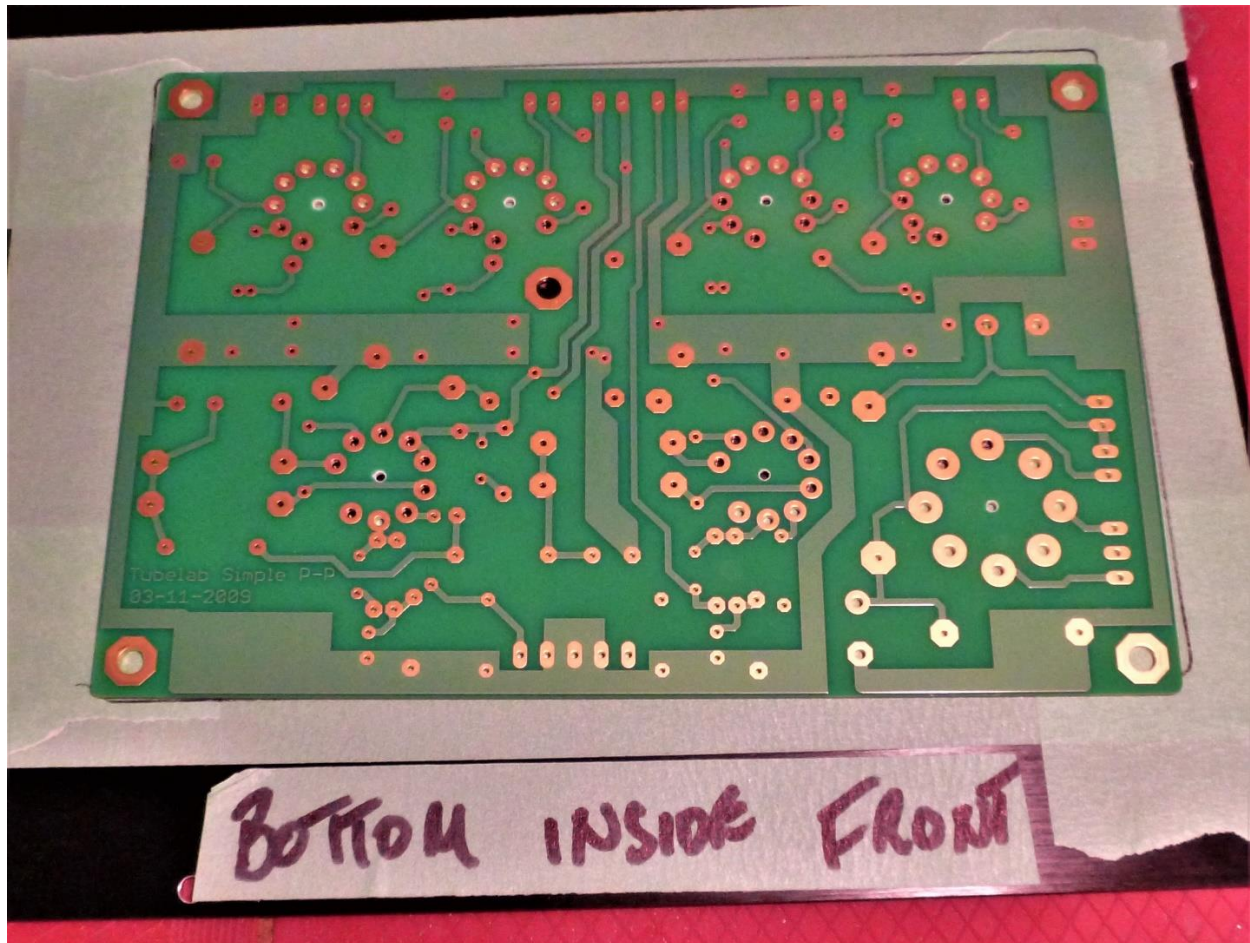
- 2-speed, variable speed electric drill
- Centre Punch
- Centre Drills: $\sim 1/8''$ and $\sim 1/4''$
- Drill Bits: 3.1mm (or $1/8''$), 4.3mm (or $11/64''$), 6.2mm (or $1/4''$), 9.5mm (or $3/8''$)
- Countersinks: $\sim 1/4''$, $\sim 3/8''$ and $\sim 1/2''$

If installing a volume control:

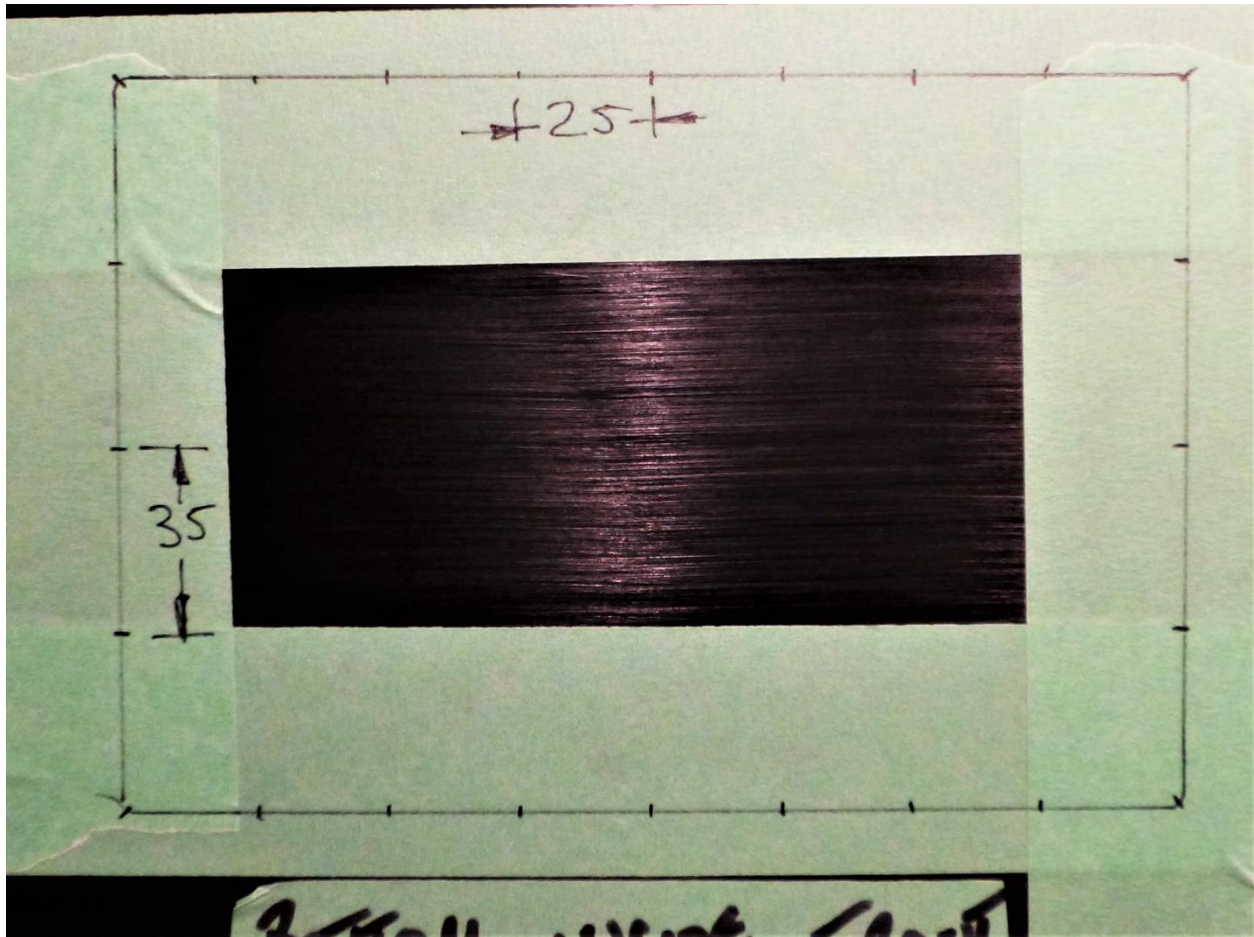
- Set of sheet metal step drills or 19mm (or $3/4''$) hole saw. See picture on a later page.
- Small piece of 3mm or $1/8''$ aluminum. See later page.
- 5 minute epoxy

Bottom Panel:

Apply four strips of painters' tape to the inside, front right corner of the bottom plate. Place the circuit board on it 40mm up from the front edge and 20mm over from the right edge.



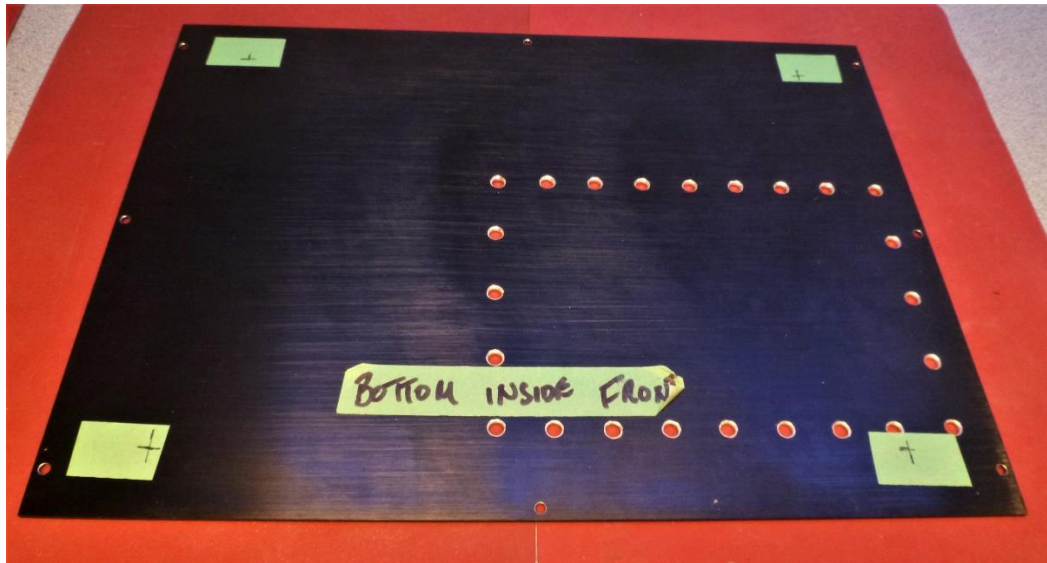
Trace around the board with a fine-tipped marker. Set the circuit board aside.



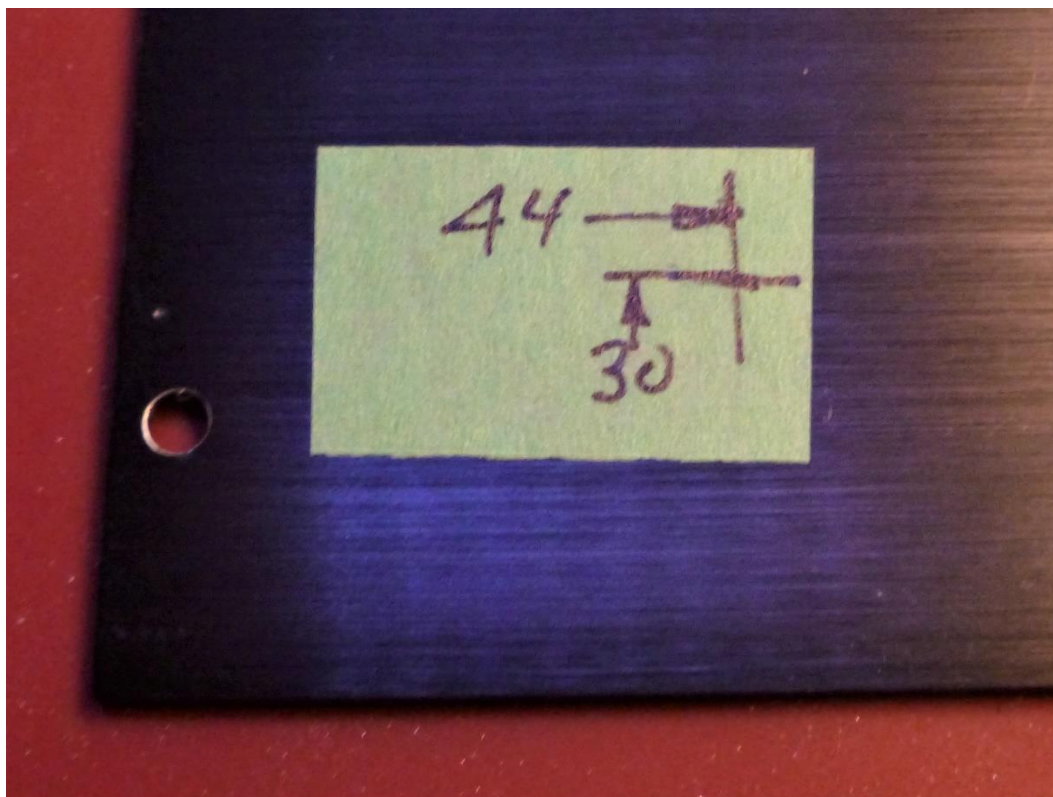
Mark as shown above at 25mm intervals along the top and bottom. Mark as shown above at 35mm intervals along the sides.

Centre punch, centre drill and drill through the bottom panel with a 6.2mm (or $\frac{1}{4}$ ") bit.

Remove the tape and deburr the holes with a countersink.



Put a piece of painters' tape in each corner as shown above.



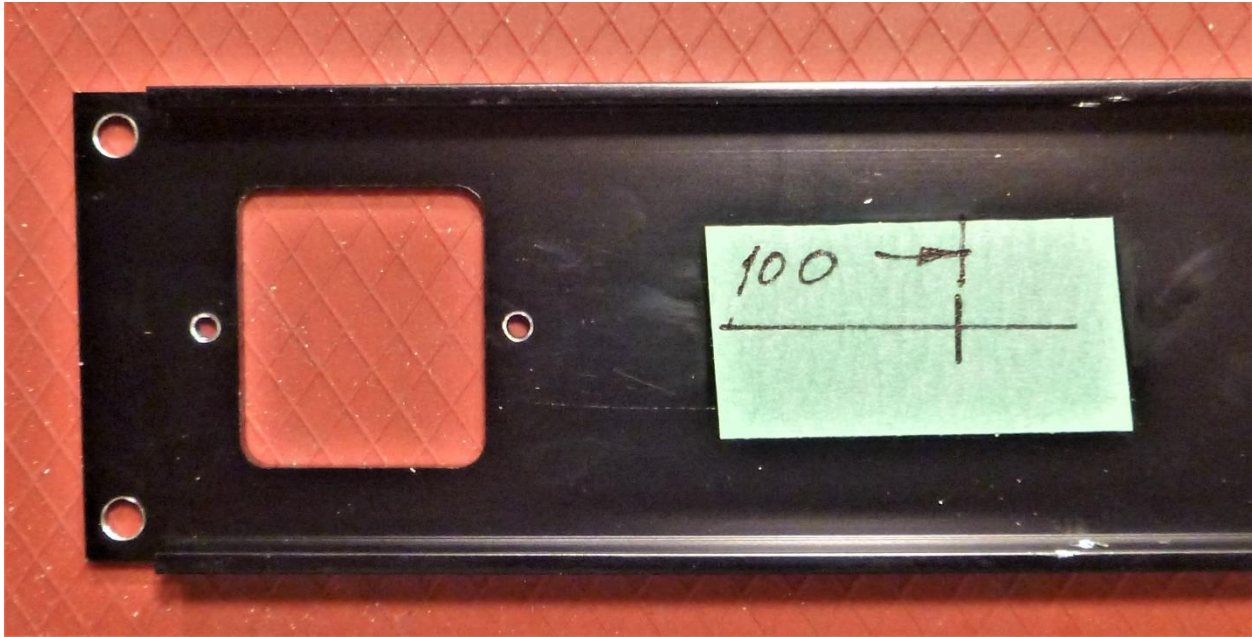
Measure and mark in 44mm from the sides and 30mm in from the top and bottom.

Centre punch, centre drill and drill through the bottom panel with a 4.3mm (or 11/64"), bit.

Remove the tape and deburr the holes with a countersink.

Rear Panel:

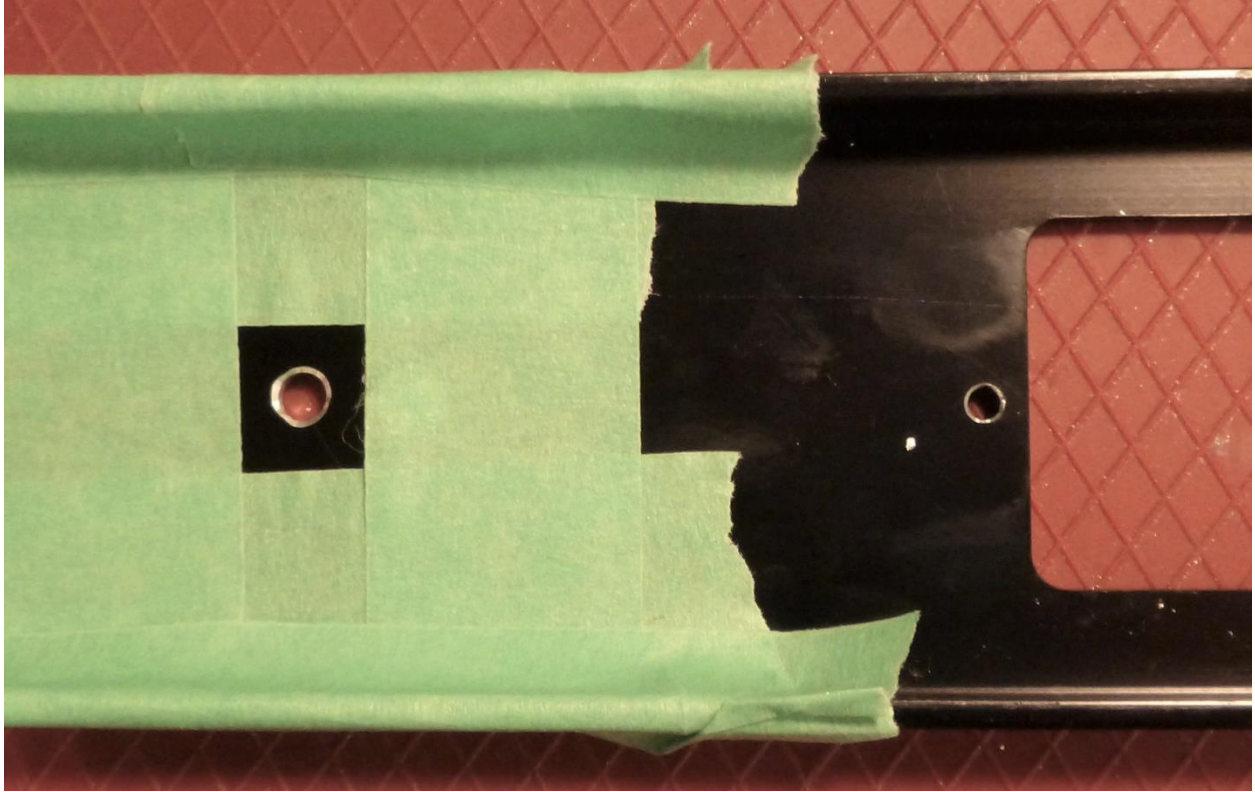
Place the rear panel in front of you looking at the inside with the AC inlet hole on your left.



Apply a piece of tape as shown, draw a line centered between the top and bottom and another 100mm in from the left edge.

Centre punch, centre drill and drill through with a 4.3mm (or 11/64"), bit.

Remove the tape and deburr the hole with a countersink.

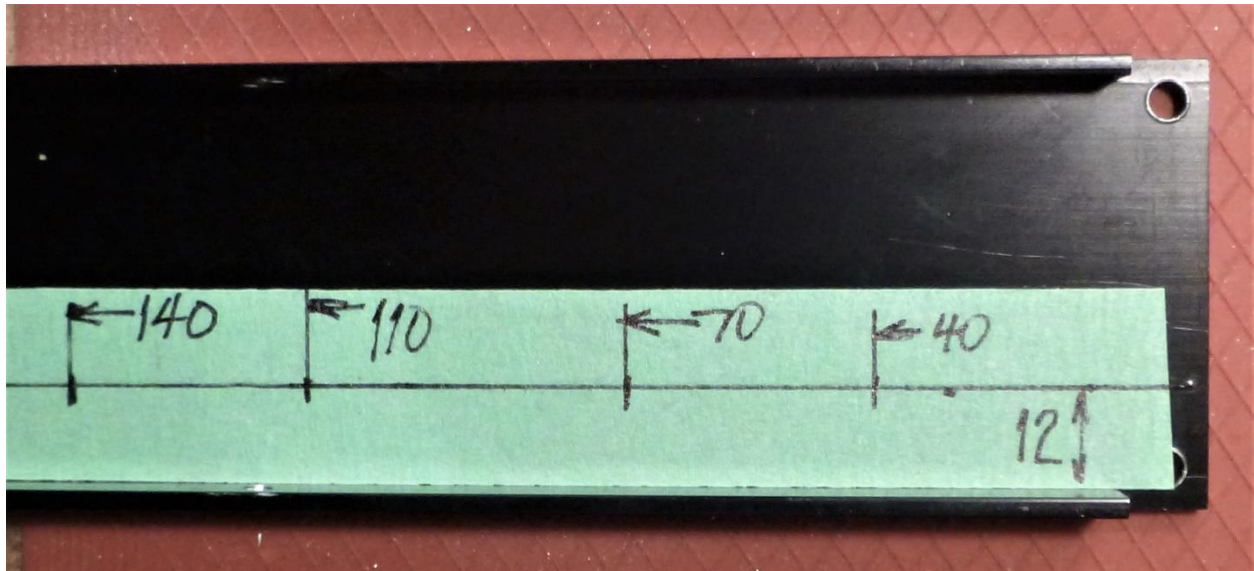


Mask off the area around the hole leaving an area approx. 10 to 12mm ($\frac{3}{8}$ to $\frac{1}{2}$ ") clear.

Sand through the anodizing in the unmasked area until you see bare metal.

Remove the tape and clean with solvent.

Anodizing is an insulator and bare metal is needed for grounding purposes.



Place a piece of painters' tape against the bottom lip, in from the edge on your right as shown above.

Draw a line 12mm up from the bottom lip and mark it at 40mm and 70mm from the edge on your right as shown.

If you are opting for the two-input version mark the tape at 110mm and 140mm as well.

Centre punch and centre drill to the full $\frac{1}{4}$ " diameter the holes required.

Clamp the rear panel securely to a bench or table.

Drill the holes with a 9.5mm (or $\frac{3}{8}$ ") bit.

Deburr the drilled holes but please note: Deburr the inside of the holes very slightly. The insulating washer supplied with the RCA jacks has a very small lip. The lip needs to locate on the hole (not the chamfer of the deburring) to keep the jack insulated from the chassis.

Front Panel:



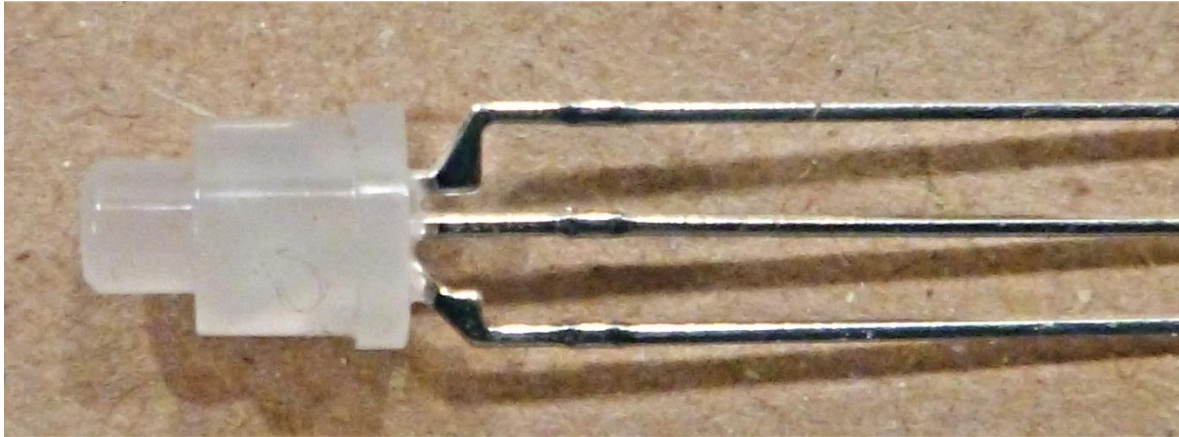
Place the panel in front of you with the inside facing up and the top edge away from you. This means that the left side, as seen from the outside, will be on your right.

Place a piece of painters' tape against the top lip, in from the edge on your right as shown above.

Draw a line 12mm down from the top lip and mark it at 49mm in from the edge on your right as shown.

Centre punch, centre drill and drill through with a 3.1mm (or 1/8"), bit. Deburr the hole on the inside with a 1/4" countersink. Deburr the outside end of the hole making the chamfer cut by the countersink as small as possible.

Retrieve the LED from your parts kit.



There are good reasons why I have chosen this "top hat-style" LED as a power-on indicator.

- The end is flat and can be set flush with the front panel.
- Most standard LEDs have their conductors very close to the molded plastic surface on their outer diameter.
- In this project the LED is powered from the filament supply and that supply "floats" at several volts above the ground.
- The method I use to locate the LED does not place its conductors near enough to the front panel to cause a problem.
- The LED chosen is a bi-colour unit, red and green. A choice can be made by the builder of either colour or of one wants to get tricky, yellow or orange are possible too.

Clamp the front plate, face down, securely to a table or bench with the previously drilled hole overhanging the edge. Use a piece of rubber or silicone between the plate and the bench to prevent damage to the plate and to hold it securely.

In the next steps we will countersink the hole, from the back side, a bit at a time, until the face of the LED is flush with the front surface of the panel.



Using a 3/8" countersink cut your way down into the 3.1mm (or 1/8") hole drilled previously.

Cut a bit at a time, lubricating the bit with alcohol, and after each cut try the LED to judge your progress.

Stop once the front face of the LED is flush with the outside surface of the panel.

You will like wind up almost "burying" the countersink into the back of the panel.

There will likely be a burr on the hole which you will need to remove with a 1/2" countersink.

If you are wondering why we didn't use a drill bit to set the LED depth well..... a drill bit will "grab" into the aluminum panel. It would be difficult to control the depth and it might even go right through and out the other side!

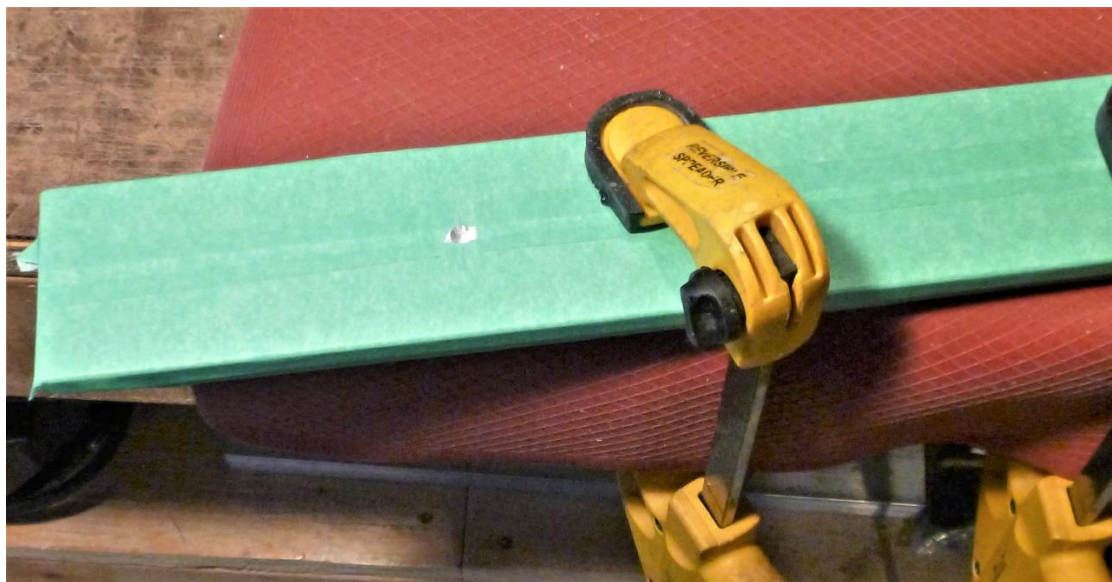
Fitting the optional volume control on the front panel:

Fitting the Alps volume control will require some intensive metal working. The reason is the front panel, at 8mm, is too thick for the Alps pot. A large diameter counterbore is a possibility, if you have access to a milling machine. Otherwise drilling a large hole through the front panel and gluing a thin plate to the rear is a workable solution.



A sheet metal step drill set, like the one shown above is used to make a large diameter hole. These can be fairly expensive but I bought the set you see above at an automotive discount store for about \$15 on sale. Alternatively, 19mm (3/4") hole saw will make the require hole.

Decide where you want the volume pot, I located the one on my prototype roughly centered on the two 12AT7 tubes and centered between the top and bottom edges.

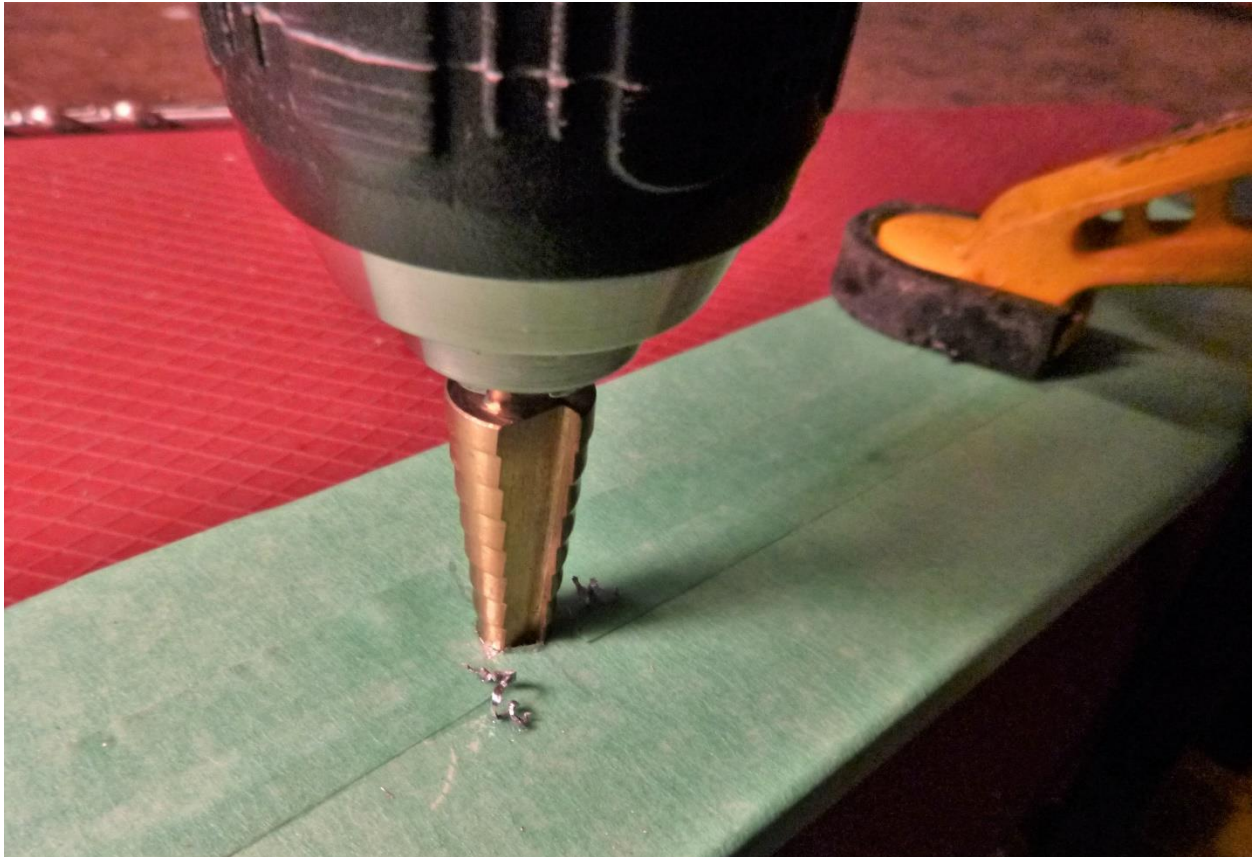


Centre punch and centre drill the spot. Cover the front with tape to protect it while drilling.

Clamp the plate to a bench or table, put a bit on lubricant on the spot and drill a hole 6.2mm (1/4") through the plate.

Use a 3/4" hole saw if you wish or proceed with step drills as described below.

The step drills aren't really designed for metal this thick but the grade of aluminum is quite soft. These tools will work if you take it slowly and use lots of lubricant.

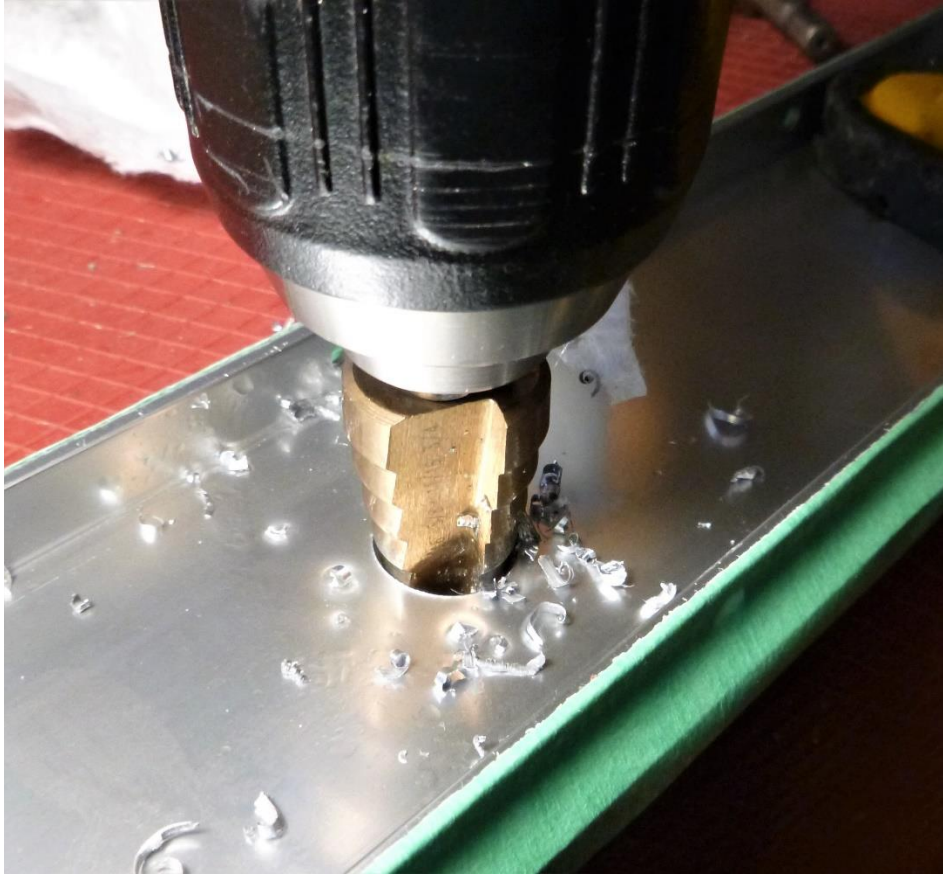


Start with the smallest step drill bit. Set your drill to the lowest speed, and again, use lots of lubricant, cut a hole to the maximum size of the bit.

Do the same with the medium size bit.

Our aim is to make a hole about 18 to 19mm in diameter. If a 3/4" hole saw is available it could be used instead of the step drills. A hole saw will require a great deal of lubricant and chip clearing. See Attachment 4 for details of using the hole saw.

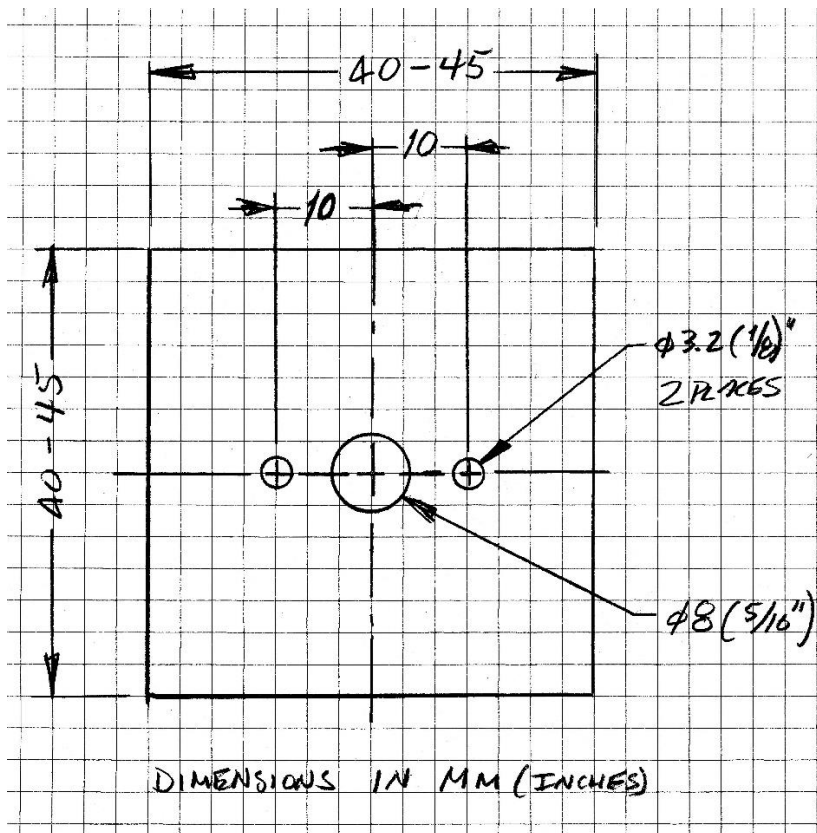
It isn't critical that the hole be "clean", that is to say smooth. The volume knob will hide our hole drilling sins.



When you get to the largest step drill it will be tough going. Alternating between drilling from the front and from the back will help.

Once the hole is drilled remove the tape, clean the plate with solvent and deburr the edges of the hole.

To attach the volume control to the front panel, a small plate must be fabricated and glued in place. As our patron didn't opt for this, you'll have to endure one of my sketches and some extra text.



Make the plate shown above from a small piece of 3mm or 1/8" thick aluminum.

The external dimensions are not critical – somewhere between 40 and 45mm.

The two small holes should be accurately placed relative to the large hole.

Rough up the back surface of the front panel, around the hole where the volume pot will be, with some sand paper.

Do the same with one surface of the pot mounting plate.

Wipe both roughened areas with solvent.

Mix some 5 minute epoxy and apply to the back of the front panel in the area of the large hole but not up to the hole.

Press the roughened surface of the pot mounting plate into the epoxy on the front panel.

Look at the hole in the small plate from the front of the front panel and center in the large hole.

Set the front plate aside for an hour or two so that the epoxy cures completely.

That is it! All of the metalworking is complete!

In the next installment of this series we will have some fun and assemble parts to the circuit board.