

Metal-Working for Dummies, part 4. Front, back and side panels.

Wall of Sound.ca DIY all tube phono preamp project

Tools required:

Same as: Metal Working for Dummies, part 1.

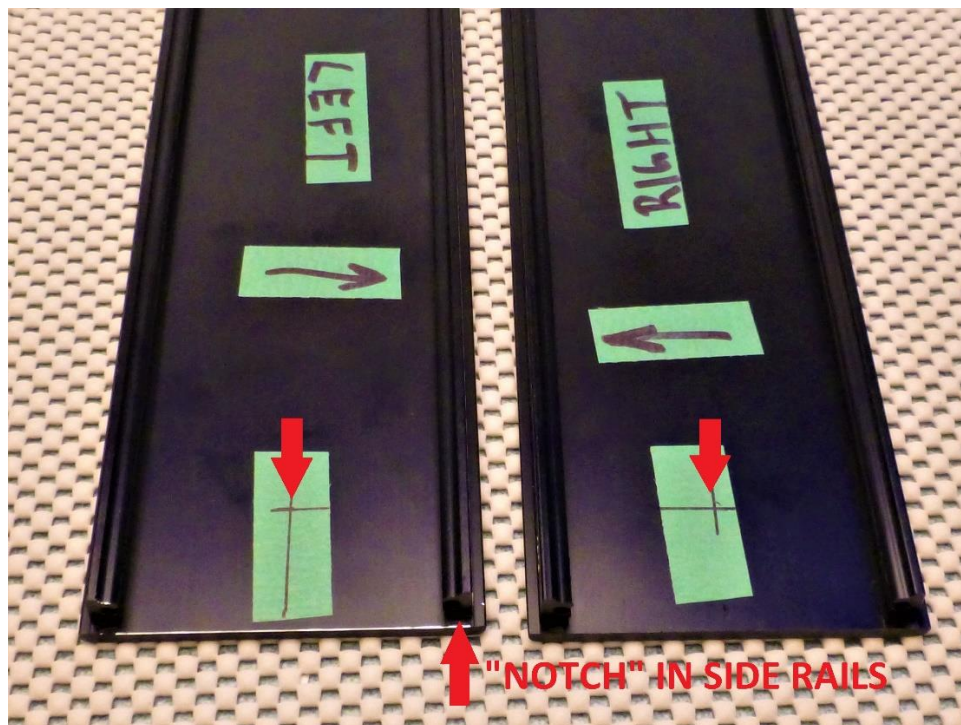
Remove the screws securing the front, back and side panels together. Remove the AC inlet from the rear panel.

Side Panels:

Note: The panels will be marked and drilled from the inside.

To avoid scratching the outside surfaces place a piece of rubber or vinyl on your work bench. The mesh shelf liner sold in dollar stores works well for this.

Position the two plates as shown below with the notched "rails" facing you. The notches are where the back panel attaches. Measure and mark for a hole midway between the top and bottom and $1\frac{1}{4}$ " (32mm) in from the back edge.

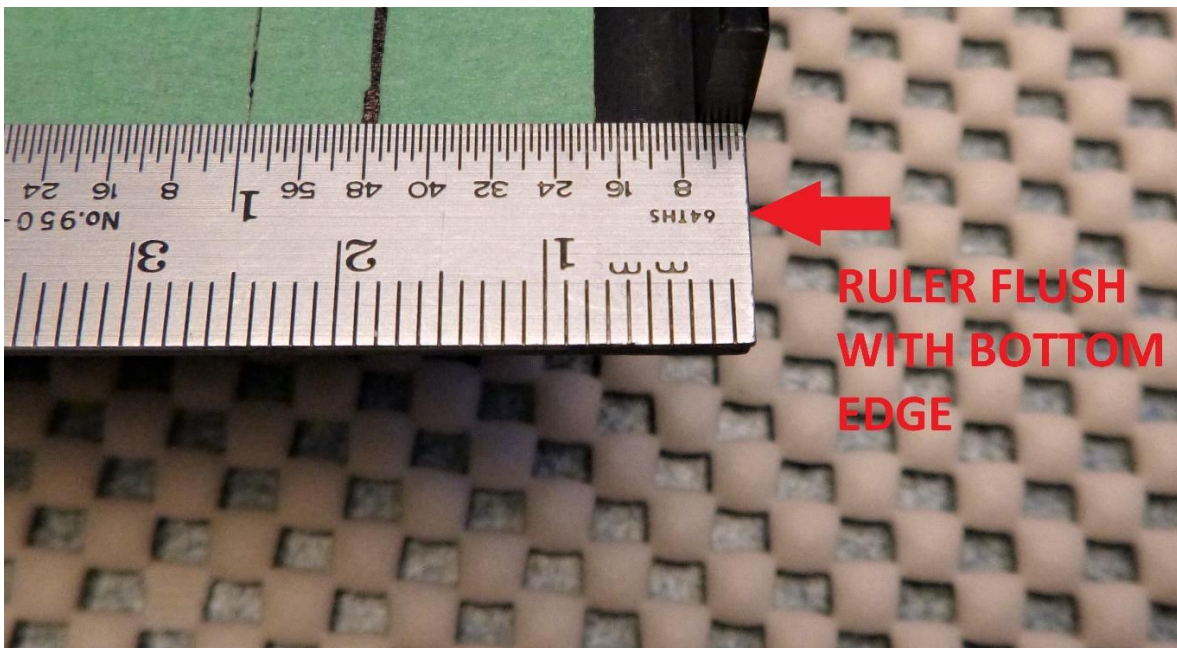
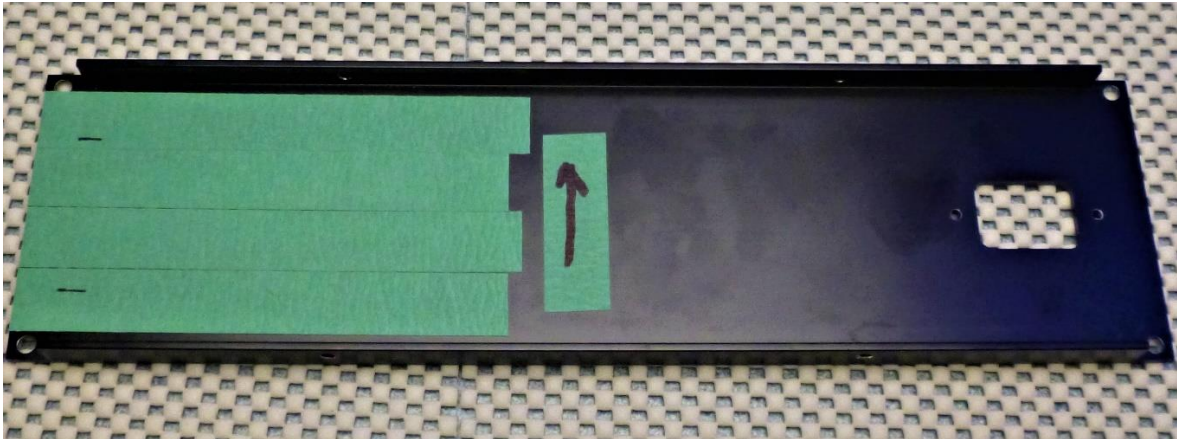


Center punch, centre drill, drill a $\frac{1}{8}$ " (3.2mm) hole and deburr, one hole in each side panel.

Rear Panel:

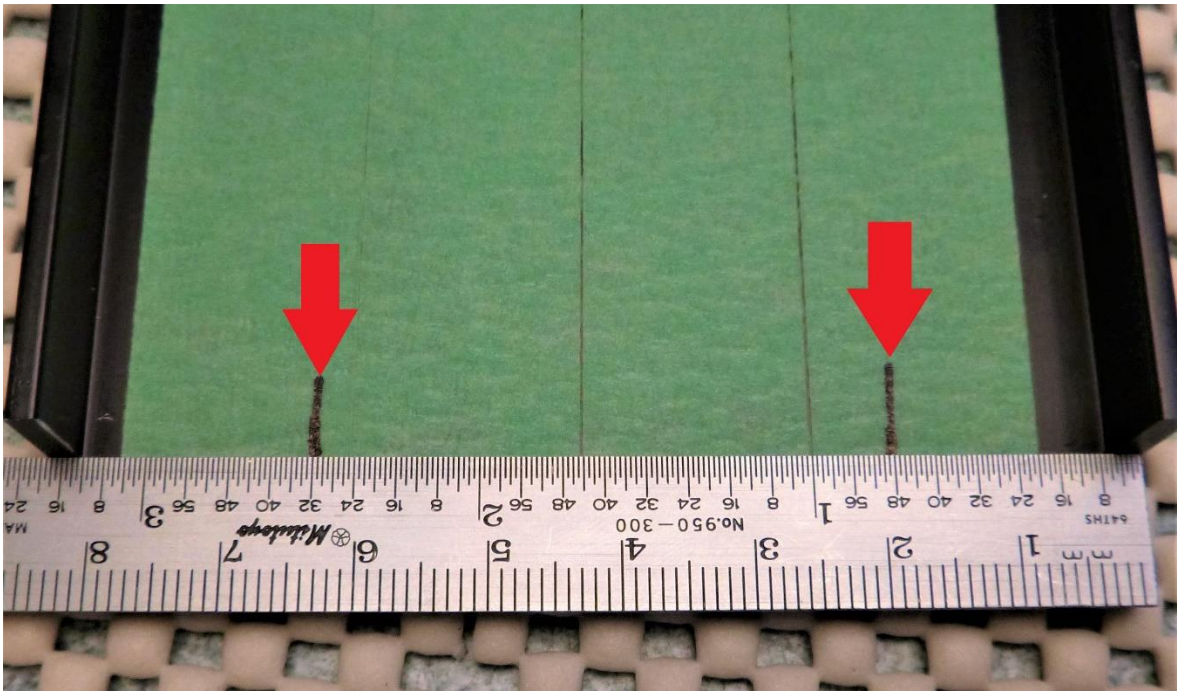
Note: The panel will be marked and drilled from the inside.

Place the back panel on your workbench as shown below. The dimensions are not super critical but you'll want to get them within about .020" (0.5mm) so that the finished amplifier looks presentable. Put some painters tape on the inside as shown below to aid layout. The dimensions "up", as described below, are from the outside of the bottom edge.

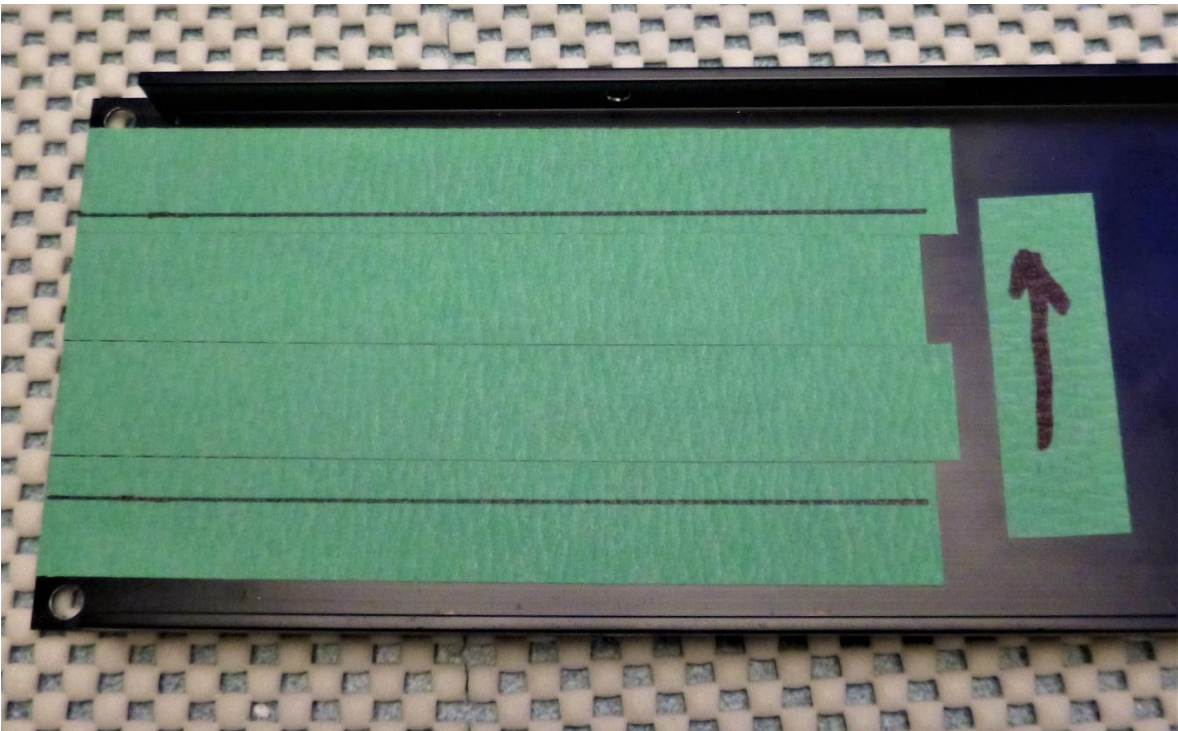


Place a mark on the tape 3/4" (19mm) up from the bottom.

Place a mark on the tape 2 1/2" (63mm) up from the bottom.



Using a square draw lines across the tape on the marks made above.



On the lower line measure over from the left-hand edge $\frac{3}{4}$ " (19mm) and mark the position. Write $\frac{1}{4}$ close to the mark. See below.

On the lower line measure over from the left-hand edge $2\frac{3}{8}$ " (60mm) and mark the position. Write $\frac{3}{8}$ close to the mark. See below.

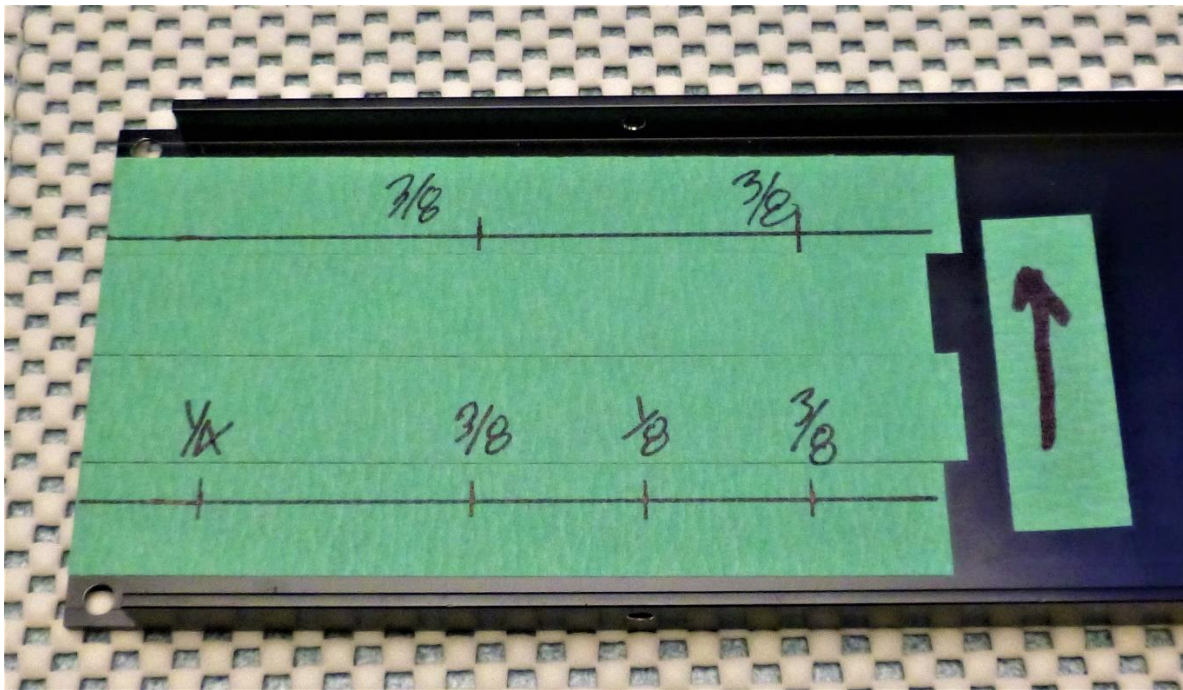
On the lower line measure over from the left-hand edge $3\frac{3}{8}$ " (86mm) and mark the position. Write $\frac{1}{8}$ close to the mark. See below.

On the lower line measure over from the left-hand edge $4\frac{3}{8}$ " (111mm) and mark the position. Write $\frac{3}{8}$ close to the mark. See below.

On the upper line measure over from the left-hand edge $2\frac{3}{8}$ " (60mm) and mark the position. Write $\frac{3}{8}$ close to the mark. See below.

On the lower line measure over from the left-hand edge $4\frac{3}{8}$ " (111mm) and mark the position. Write $\frac{3}{8}$ close to the mark. See below.

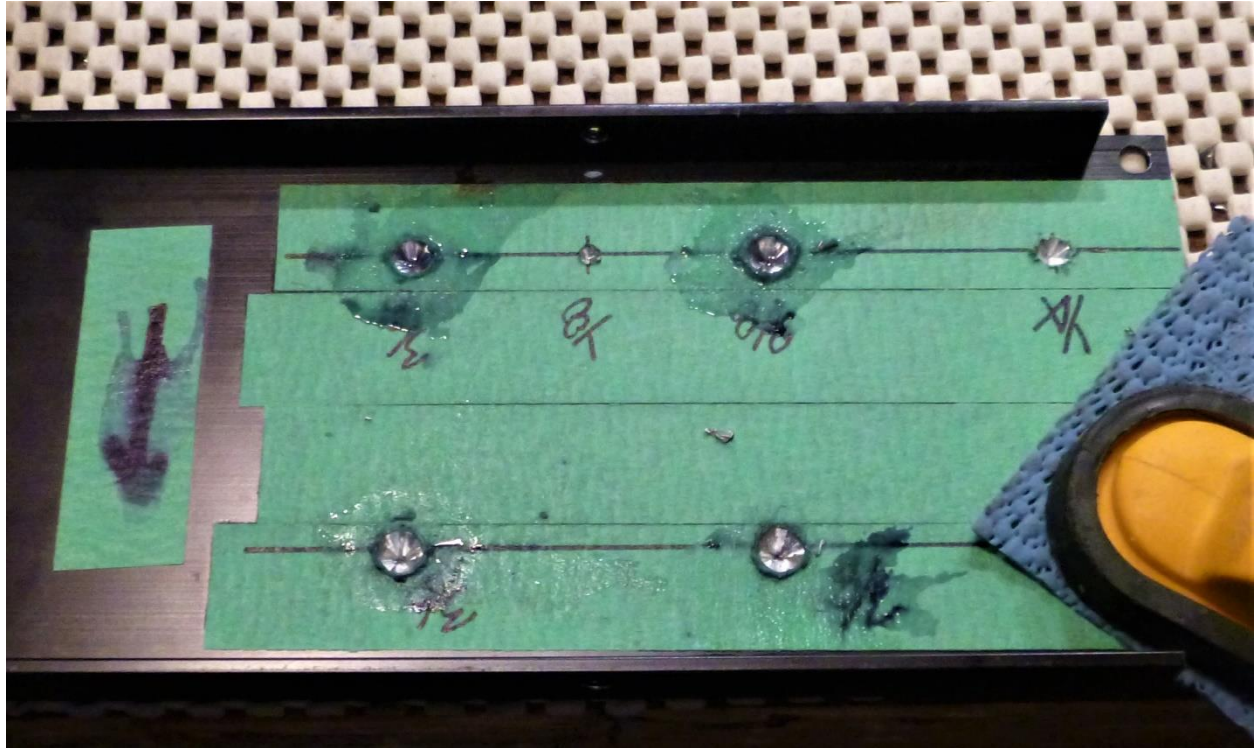
Centre punch all 6 locations.



Clamp the panel to the workbench as shown below.

Use the small centre drill on the 1/8 location.

Use the large centre drill on the other 5 locations.



Centre drill the 6 holes. At the 1/4 and 3/8 locations allow the angled part of the centre drill to bite into the panel as shown above. This will help guide the drill bit.

At the 1/8 position drill a 1/8" (3.2mm) hole.

If you have access to a drill press I'd advise using it for the larger holes. If you have been using a few drops of alcohol to cool the drill bits as described in Part 1, I salute your dedication to following instructions. For the remaining holes in this plate a more serious lubricant will ease the drilling process. Automatic transmission fluid (ATF), works well when drilling aluminum. ATF will require cleanup with acetone to fully remove it from the panel.

At the 1/4 position drill a 1/4" (6.4mm) hole.

At the four 3/8 positions first drill a 1/4" (6.4mm) hole.

Using the large countersink put a small bevel on the 1/4" hole.

Put a 3/8" (9.5mm) bit in the drill and at the four 3/8 locations drilled previously with the 1/4" drill enlarge the holes to 3/8".

Remove the layout tape.

Deburr the 1/8 and 1/4 holes.

For the 3/8" holes deburr them the minimum amount necessary to remove the burr. As the aluminum used in these chassis is quite soft you might try turning the countersink with your bare fingers. If the chamfer made when deburring is too big the shoulder of the RCA jack insulating washer won't centre the jack properly in the hole.



Clean the panel with a bit of alcohol or acetone (if ATF has been used) on a piece of paper towel.

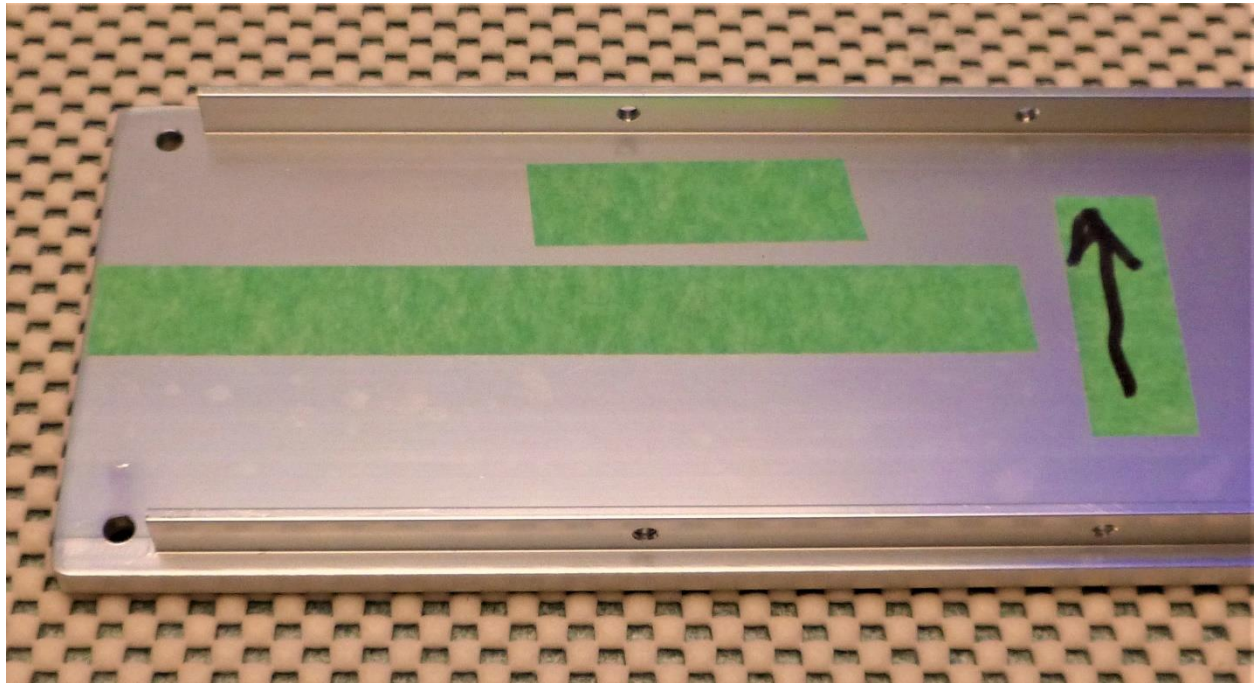
Front Panel:

Note: The panel will be marked and drilled from the inside. If you have access to a drill press now would be an especially good time to use it.

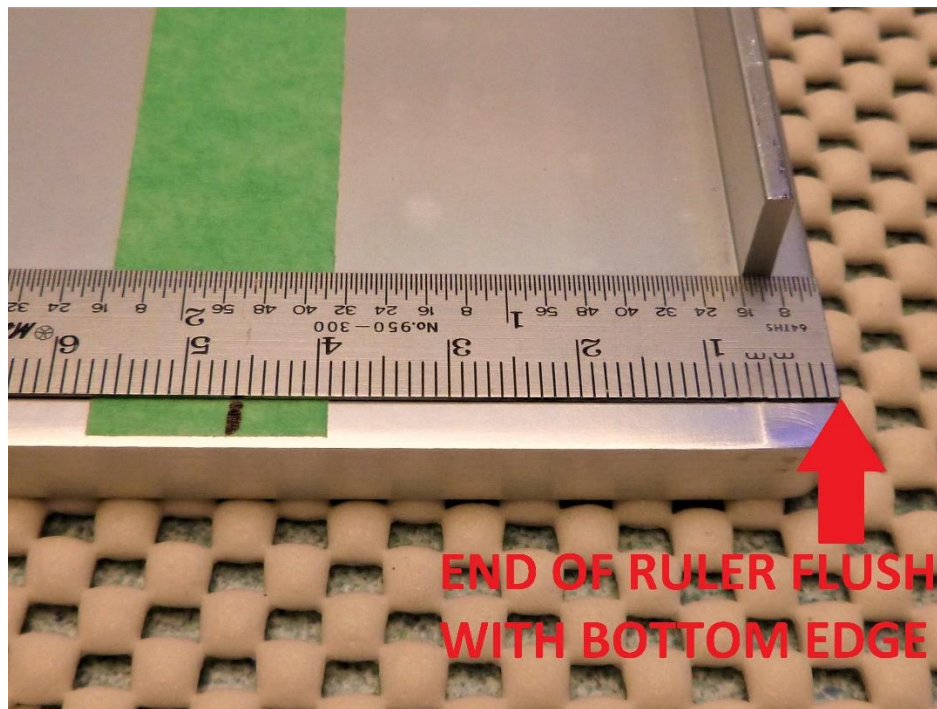
To avoid scratching the outside surfaces place a piece of rubber or vinyl on your work bench. The mesh shelf liner sold in dollar stores works well for this. Alternatively, cover the entire front panel with painter's tape.

The position of the large hole is not super critical, but you'll want to get the two smaller holes near it lined up squarely with it so that the finished amplifier will look more presentable. Put some painters tape on the inside as shown below to aid layout. The dimensions "up", as described below, are from the outside bottom edge.

Lay the front panel on your work bench with the top edge farthest from you. The power knob is on the right-hand side as viewed from the outside, so it's on the left viewed from the inside.

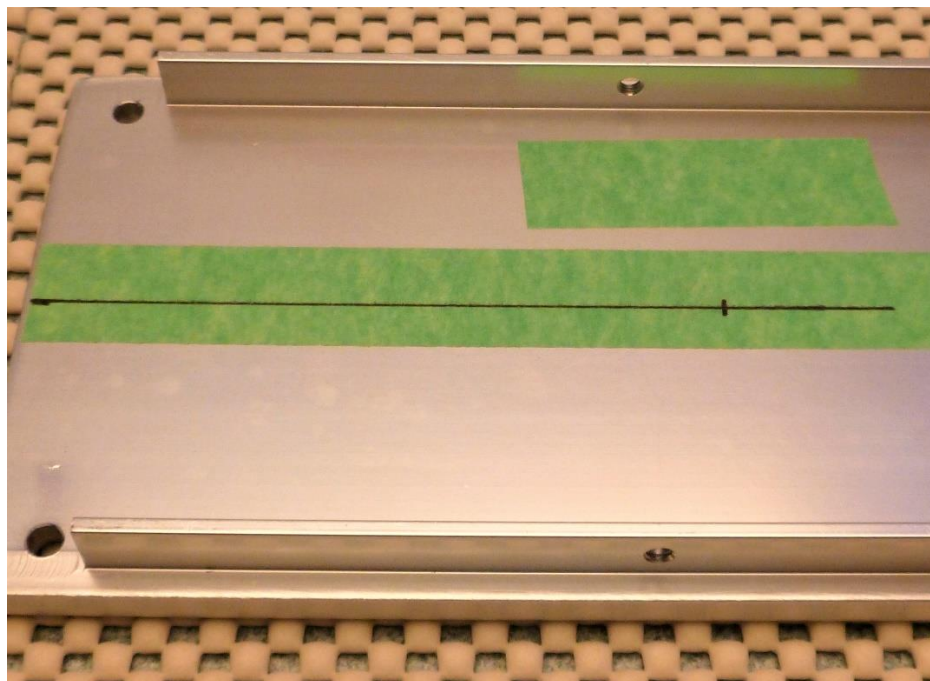


Measure up $1 \frac{13}{16}$ " (46mm) see, isn't metric easier, from inside the bottom edge of the panel and put a mark on the tape.

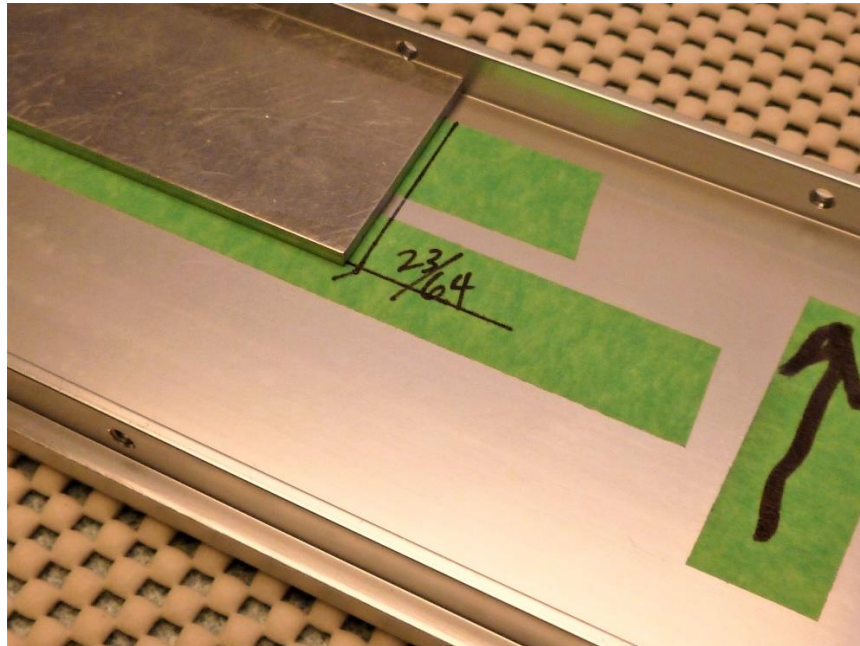


Using a square extend the line over as shown below.

Measure over 4" (102mm) and mark the position. Write $\frac{23}{64}$ near this mark. This is where the power switch will go.

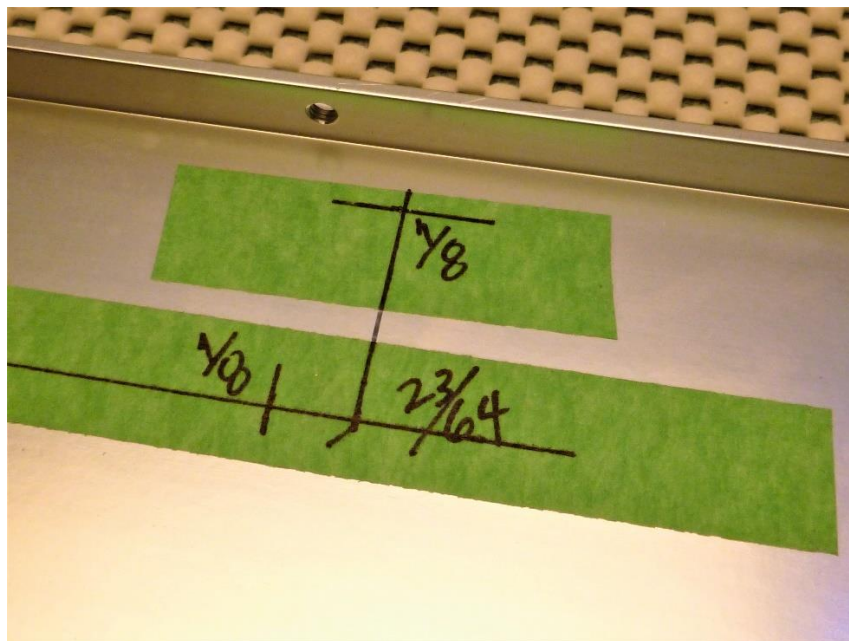


Draw a vertical line up from the position just marked. A small piece of scrap metal or wood that has two adjacent side square will aid in layout.



Measure up $1 \frac{3}{16}$ " (30mm) from the $\frac{23}{64}$ position and mark. Write $\frac{1}{8}$ near this location.

Measure over .400" (10mm) to the left from the $\frac{23}{64}$ position and mark. Write $\frac{1}{8}$ near this location.



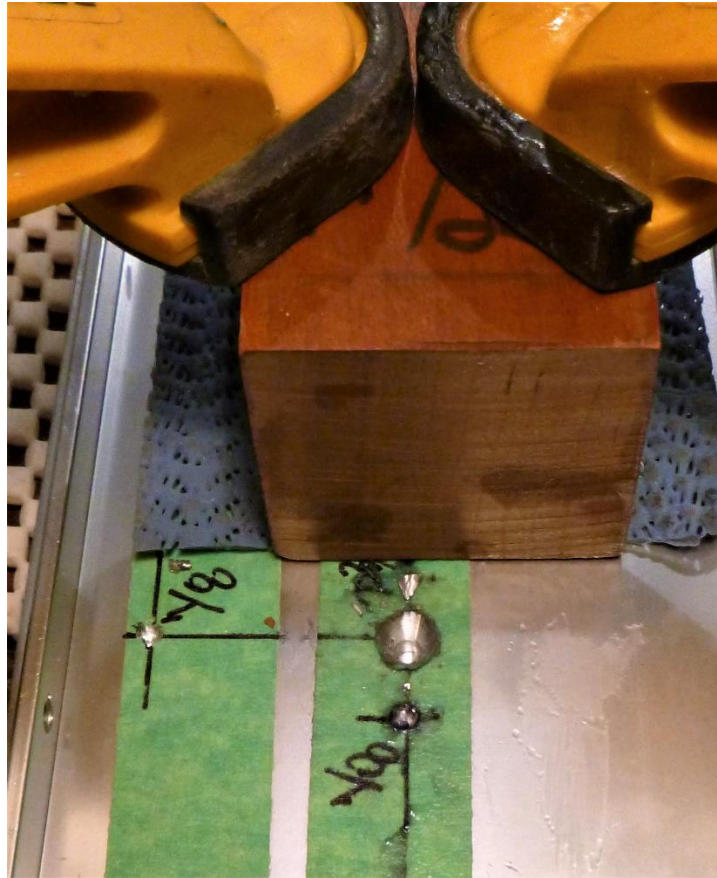
Be sure to use shelf liner between the panel and the work bench to minimise damage.

Center punch the marked positions.

Clamp the panel to the workbench as shown below.

Centre drill the 13/64 position allowing the angled part of the centre drill to bite into the panel as shown below. This will help guide the drill.

The other two positions just need a small point drilled.

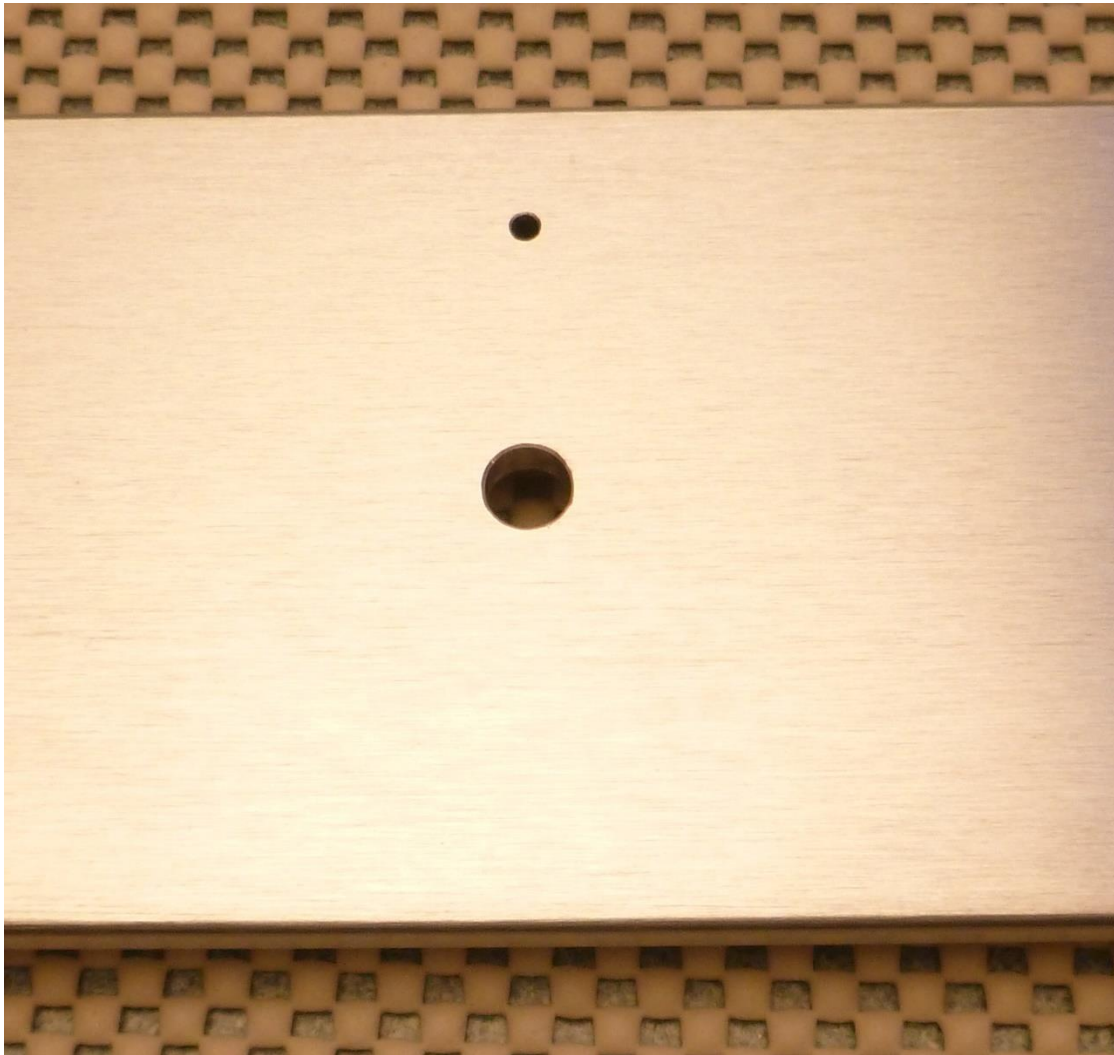


Drilling a large hole with a hand drill can be difficult. Drill through the plate with a 1/4" (6.4mm) drill first. Use the larger countersink to put a small bevel on the 1/4" hole then drill with the 13/64" (9mm) bit.

As the front panel is quite thick it's important to make the holes, particularly the large one, perpendicular to the surface. If you are using a hand drill have another person "spot" you to help start and keep the drill bit perpendicular to the surface. Use ATF for lubrication as described earlier. **Note:** Please don't use a 3/8" (9.5mm) drill for this hole. If the hole in the front panel is over-sized, damage to the power switch may result!

Deburr the hole the minimum amount necessary to remove the burr. If the chamfer made when deburring is too big the switch might be damaged when installed.

For the two remaining holes use a 1/8" (3.2mm) bit. Drill the "top" hole through the panel keeping the bit perpendicular to the surface. The "side" hole only needs to go about 1/8" (3.2mm) deep.



As before put the minimum chamfer on the two 1/8 (3.2) holes just drilled, especially on the "top" one where it pierces the outside of the panel. Just twirling the small countersink in your fingers might be sufficient.

The inside of the top hole will need to be countersunk to correctly set the depth of the power LED. To do this use the small and large countersinks. Why not just grab a bit and only drill part way through the panel you ask? Two reasons: 1. A drill bit is hard to control and might just bite in and pop right on through the other side. 2. The other reason is a bit more subtle. If you look closely at most LEDs the conductors are quite close to the outside diameter of the moulded plastic housing. By making a tapered hole for the LED we avoid the chance of having these conductors create a short circuit to the front panel. The tapered hole also gives a good-sized area for the adhesive used later to secure the LED in place.

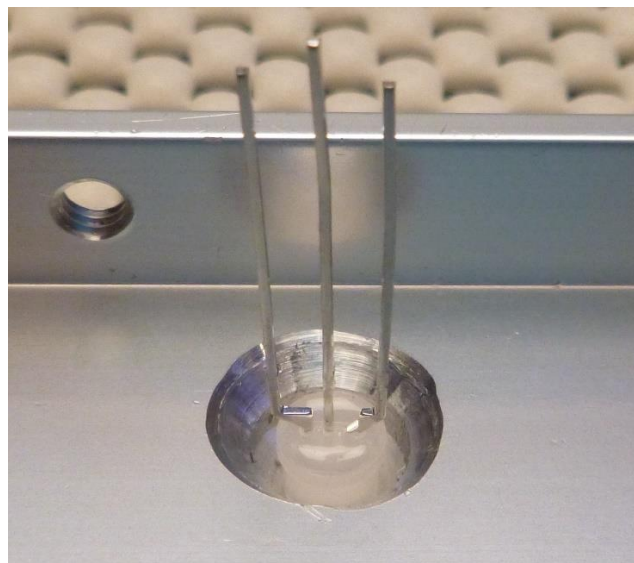
Start with the smaller countersink on the inside of the top hole. Use a little ATF if you wish and stop when you've reached the maximum countersink diameter. See below.



Using the large countersink, keep taking small amounts of material out then checking the depth with the LED specified in the parts list. The depth of the countersink should be such that at the proper depth the front face of the LED should be flush with the front of the panel. It will appear quite recessed from the back as shown below.



Once completed flush the three holes with alcohol and wipe the entire panel with an alcohol dampened paper towel. If you have been using ATF, acetone may be required for a proper cleanup.



The eBay sourced knob for the power switch comes with a 6mm hole. The power switch has a 1/4" shaft so the knob will have to be drilled out.

Use rubber pieces (an old bicycle inner tube works well) to protect the knob from damage when clamped in a vise.

Remove the set screw from the knob using a 1.5mm hex key.

Clamp the knob in a vise using rubber to protect it.

Put a chamfer on the hole using a counter sink.



Put a 1/4" or 6.4mm drill bit in your drill and dip the end in ATF.

Drill out the hole in the knob. It's only necessary to go about 3/8" (10mm) deep. Drilling to the full depth isn't needed.



Once drilled, rinse the whole knob, especially the back and holes, in acetone to remove any ATF. Re-install the set screw.

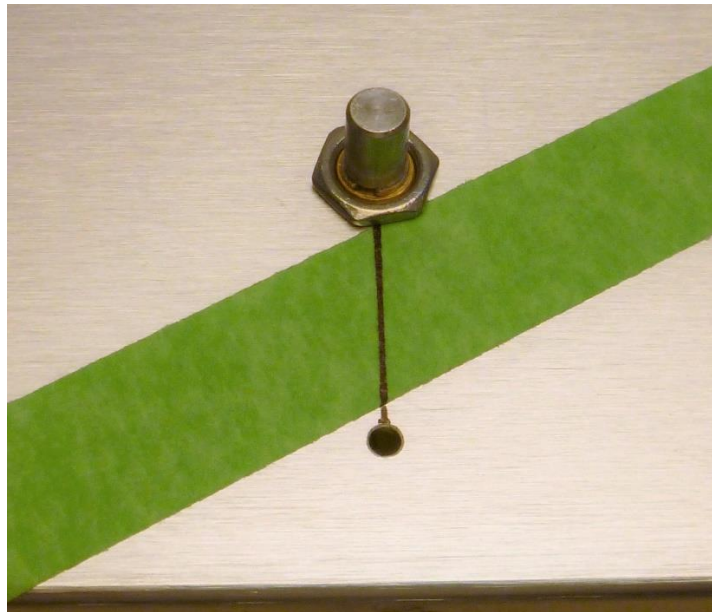
Optional marking of front panel for the power switch.

If you are feeling confident in your metalworking prowess give this a try.

Place a piece of painters' tape on the front panel as shown below.

Being careful not to damage the panel set a square on the bottom edge running up through the centre of the large hole and the LED hole and draw a line.

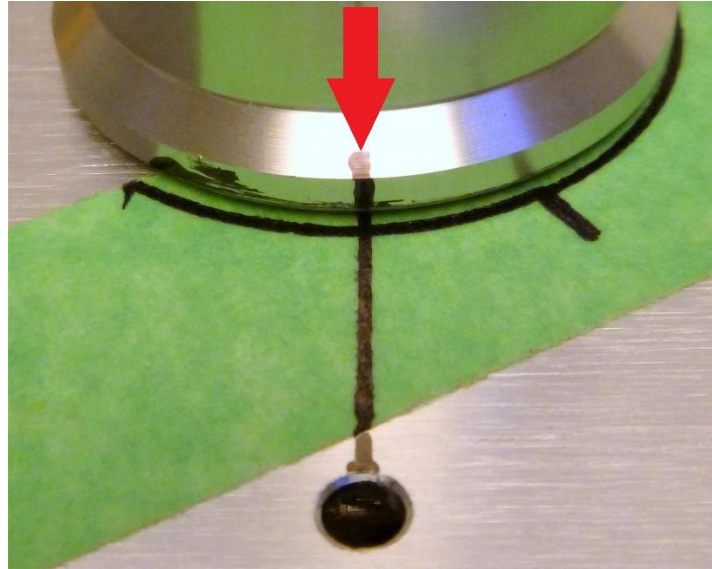
Assemble the switch supplied in the Tubecad kit through the rear of the panel with the locating tang in the shallow hole. Don't use the flat washer supplied with the switch. We only just have enough thread to engage the nut. Screw the nut, finger tight, onto the switch to hold it in place.



Place the knob over the switch shaft, rotational orientation not critical, and tighten the set screw. Turn the knob clockwise as far as it will go.

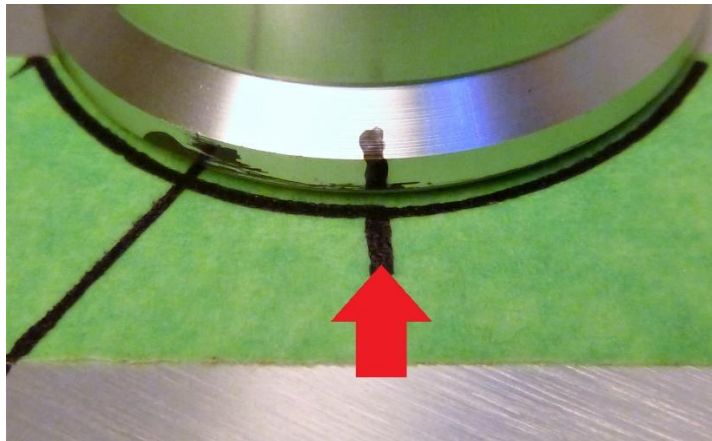
Trace around the edge of the knob onto the tape applied earlier. See picture below.

Put a mark on the outside diameter of the knob adjacent to the line drawn through the switch and LED hole earlier.



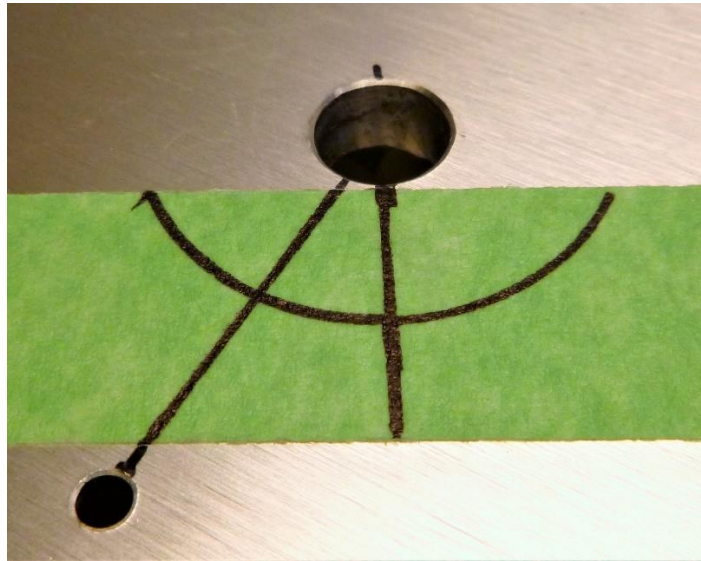
Rotate the knob one step counter-clockwise.

Make a mark on the tape adjacent to the mark on the knob. See below.

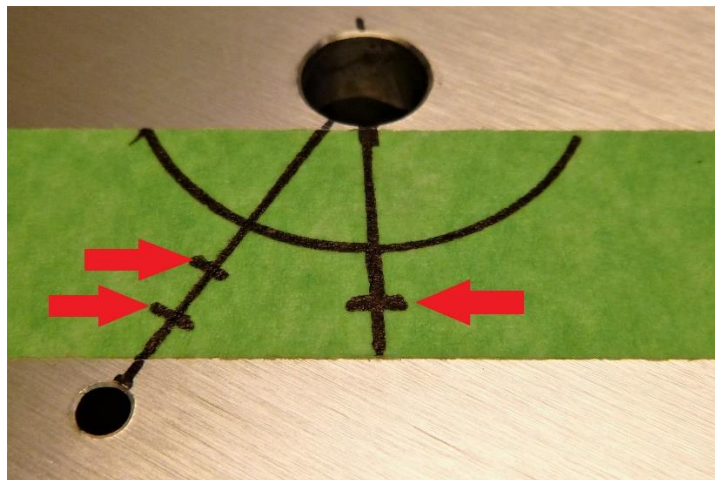


Remove the knob from the switch and the switch from the front panel.

Draw a line from the center of the switch hole through the mark made to the right of the vertical line. See below.



About $\frac{5}{32}$ " (4mm) out from the traced circle place a mark on the angled line.

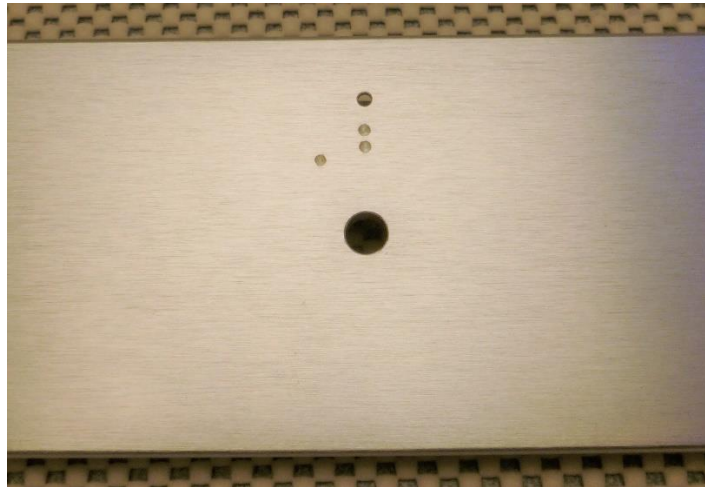


On the vertical line between the large hole and the LED hole, $\frac{5}{32}$ " (4mm) out from the traced circle, place a mark on the line. See above.

Place another mark about $\frac{5}{32}$ " (4mm) farther out from the first mark.

Centre punch the three marked locations. Remove the masking tape.

Centre drill the three marked locations to a diameter of about 1/16" (1.5mm). Try to get them all the same size.



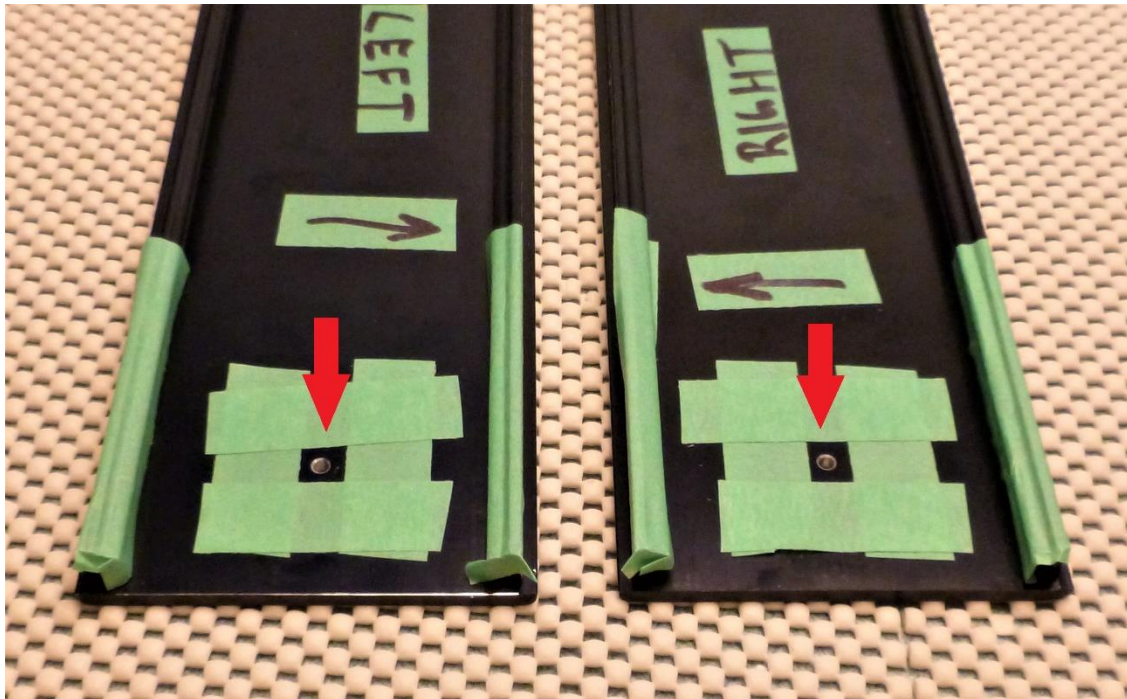
The picture above may look a bit odd but once the knob is on it looks better.



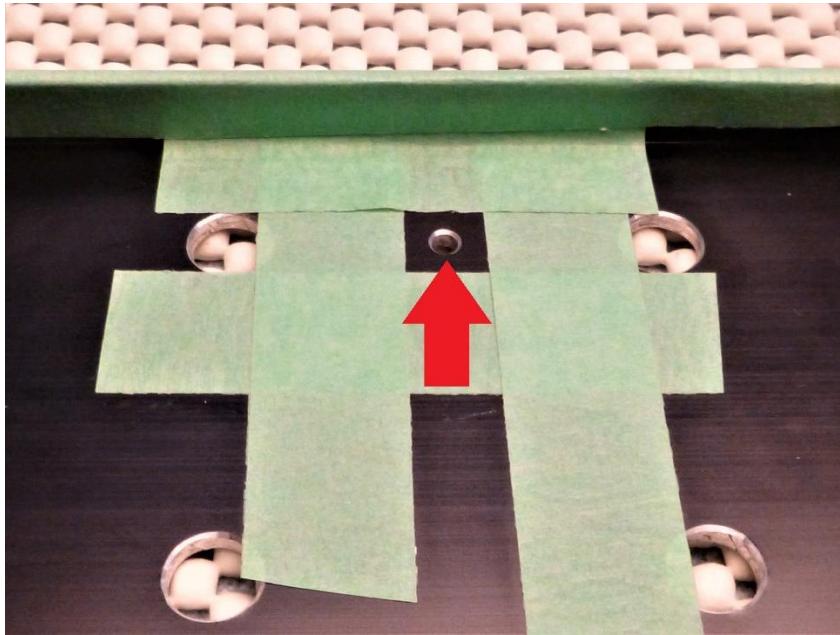
One last operation needs to be performed on all of the panels to ensure proper grounding. Aluminum anodizing is an insulator. We need to remove some for good electrical conductivity.

Mask off around the 1/8" (3.2mm) grounding holes, an area about 3/8" (10mm) square as shown in the pictures below. THIS IS PERFORMED ON THE **INSIDE** SURFACES OF ALL THE PANELS.

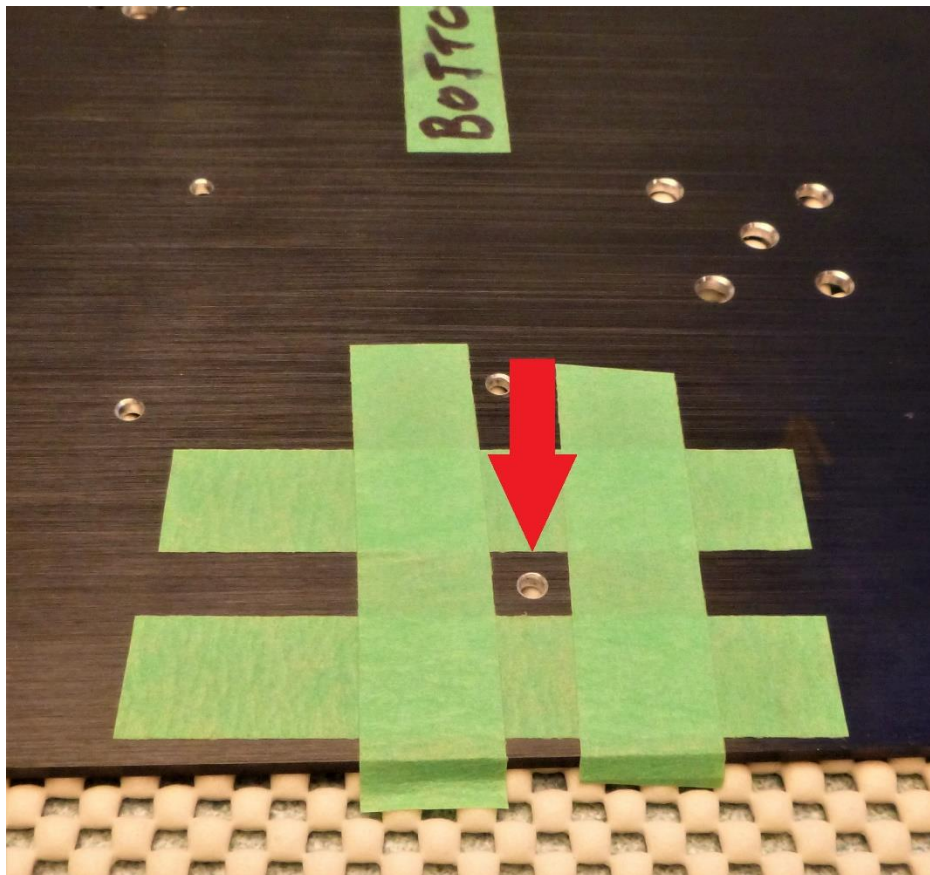
The holes near the rear edges of the side panels:



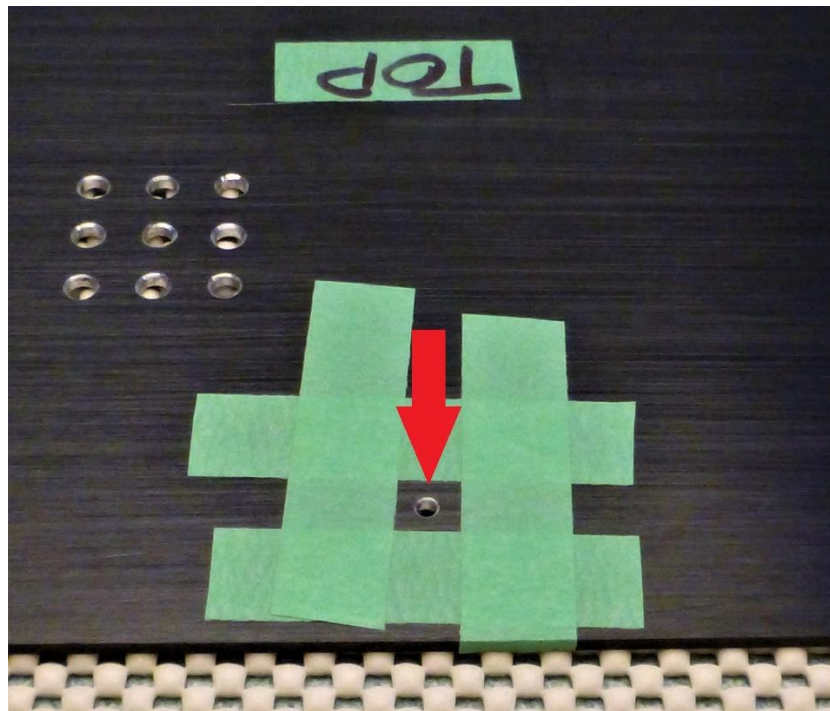
The hole in the rear panel:



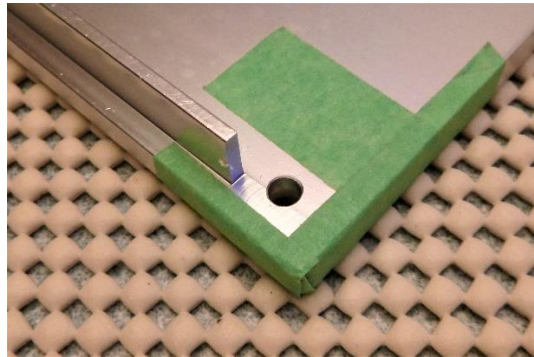
The hole near the rear edge of the bottom panel:



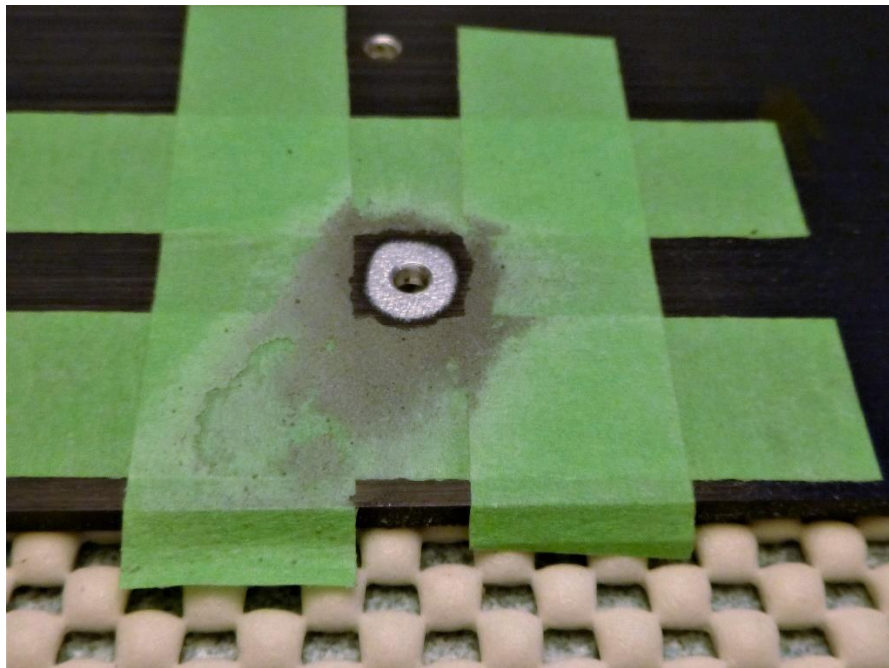
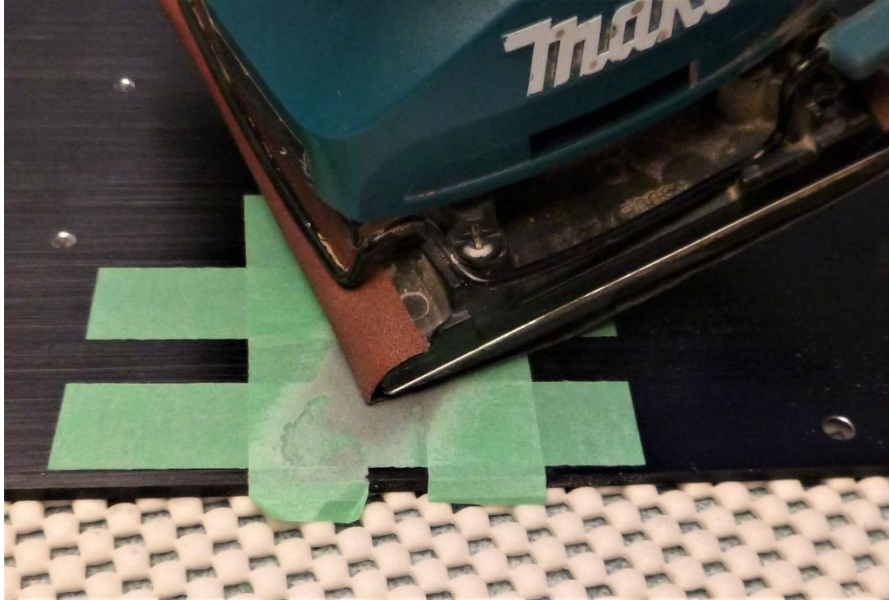
The hole near the rear edge of the top panel:



The hole in the lower right, as viewed from the inside, of the front panel.



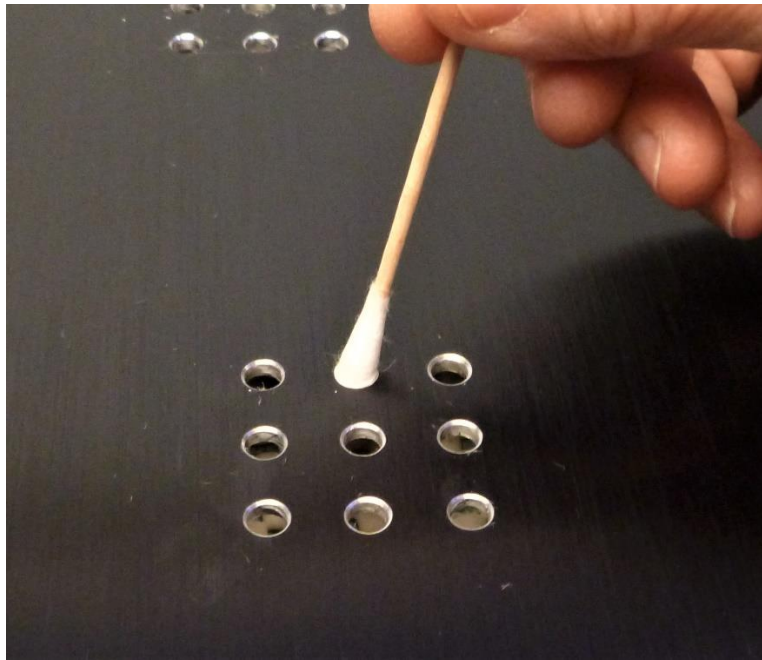
Once the masking is complete use the corner of a ¼-sheet palm sander with 150 to 220 grit paper and sand until bare aluminum can be seen. It will be a bit harder to see on the back of the natural anodized front panel. Usually only a few seconds is required to remove the anodizing.



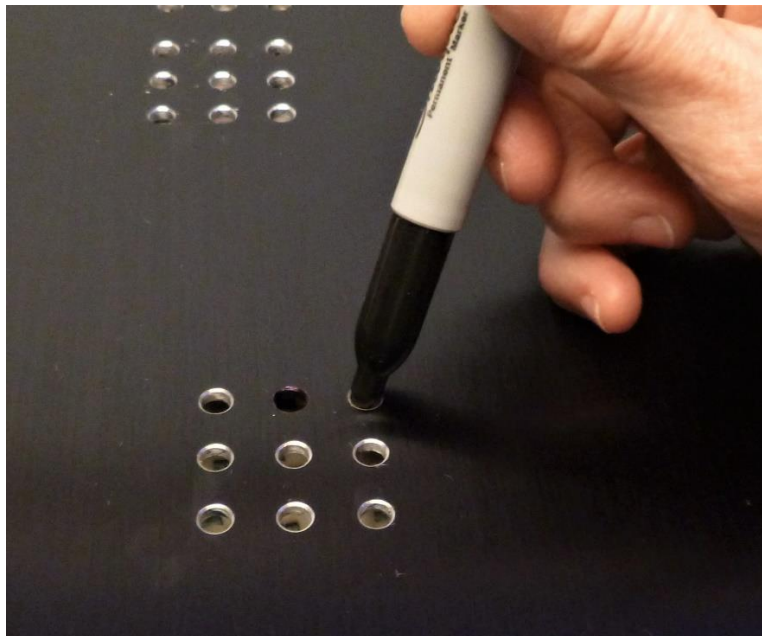
Remove all of the tape from the panels and wipe them down with alcohol or acetone.

If desired you may blacken the drilled holes in the top panel with a Sharpie marker.

Clean the holes with an acetone-soaked Q-Tip:



Blacken with the Sharpie:



All of the metal-working is now complete! Set the panels aside in a safe place. Assembly of the circuit boards is next.