## Part 4, Attachment 3. **Wiring Part 2**

Wall of Sound.ca Tubelab DIY EL84 Amp

### Tools Required:

-Same as previous attachment.

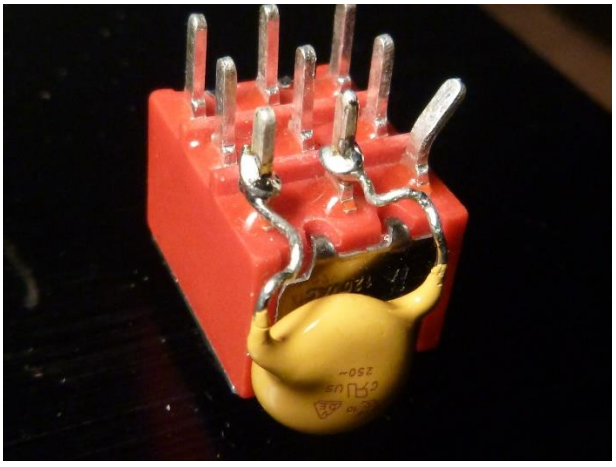
Power Switch Wiring:

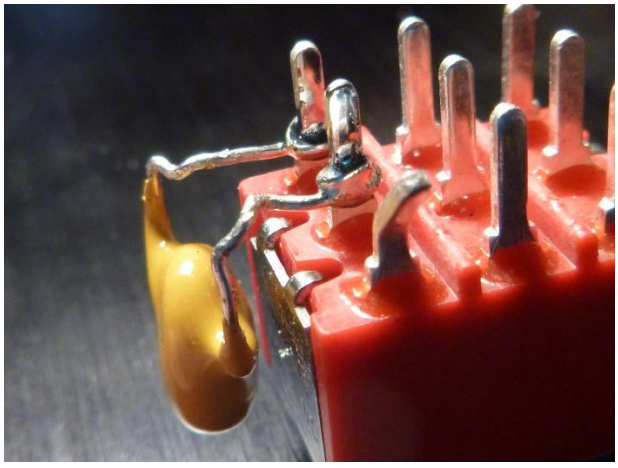
Note:

-A double pole, double throw (DPDT) switch is spec'd in the parts list. Mouser was out of stock so I ordered a triple (3PDT) switch.

-Only one pole is used as a switch, the other is used as a convenient place to locate and connect the Inrush Limiter. The Limiter is a sort of resistor that has a high resistance when cold but as current flows it warms and the resistance decreases. This characteristic provides a softer start for the amp that lessens the strain on tubes and other components.

-I've selected a PC-mount switch as it affords more room for connecting wires than a conventional switch with short lugs.

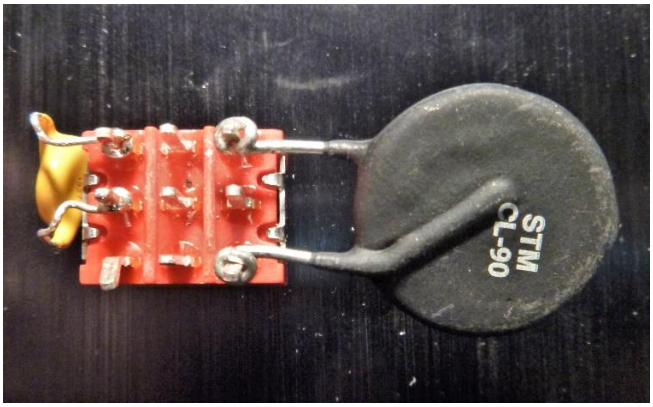




Form the leads of the yellow capacitor and attach to the centre and one side lug of the power switch.

Ensure that the capacitor leads don't touch the metal frame of the switch as shown above.

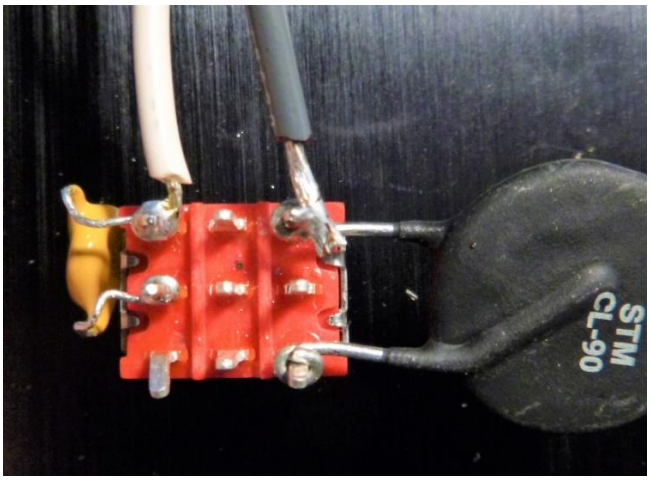
Solder the capacitor to the switch.




Assemble the Inrush Limiter as shown above, to the two OUTSIDE lugs at the other end of the switch.

Transformer Primary Wiring:

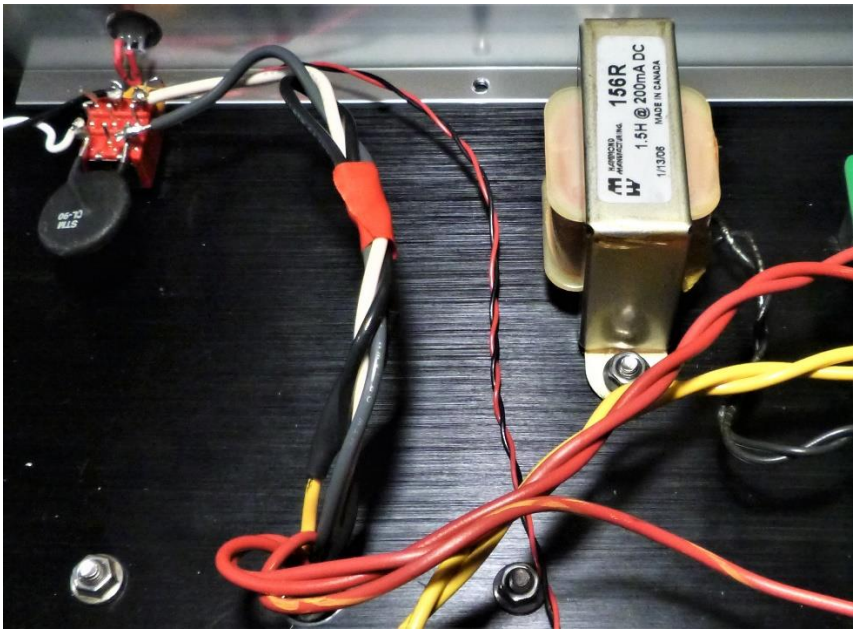
Recent Hammond power transformers have two voltage taps on the primary, 115 and 125 volts. The AC voltage has crept up from 115 to sometimes over 120 volts in North America. Using the 125-volt tap can be useful in keeping filament voltages from running too high, especially when the Hammond 272JX is used. The JX is over-specified (a good thing) and isn't loaded down quite as much so filament voltage might run a bit high anyway. We'll deal with selection of the appropriate tap to use in Part 5.



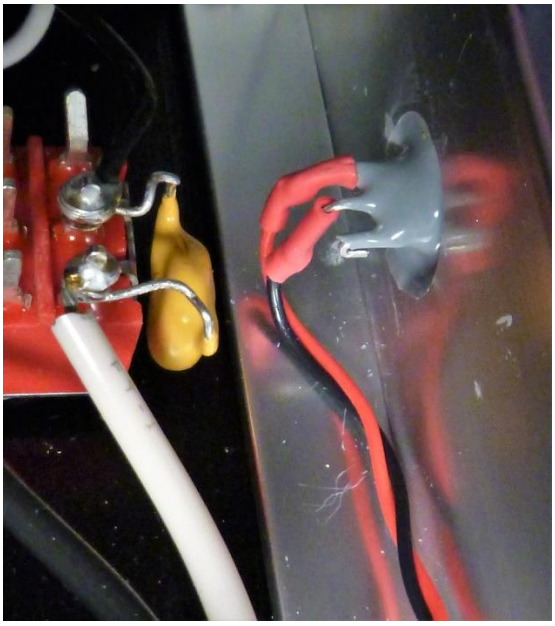

Wrap the white transformer lead around the lug and solder as shown above.

I started with the 115-volt (gray wire) but later switched to the 125-volt (black wire) during testing. The black wire is likely the safer place to start.

Temporarily tack-solder whichever wire you prefer to the terminal lug on the switch as shown above.



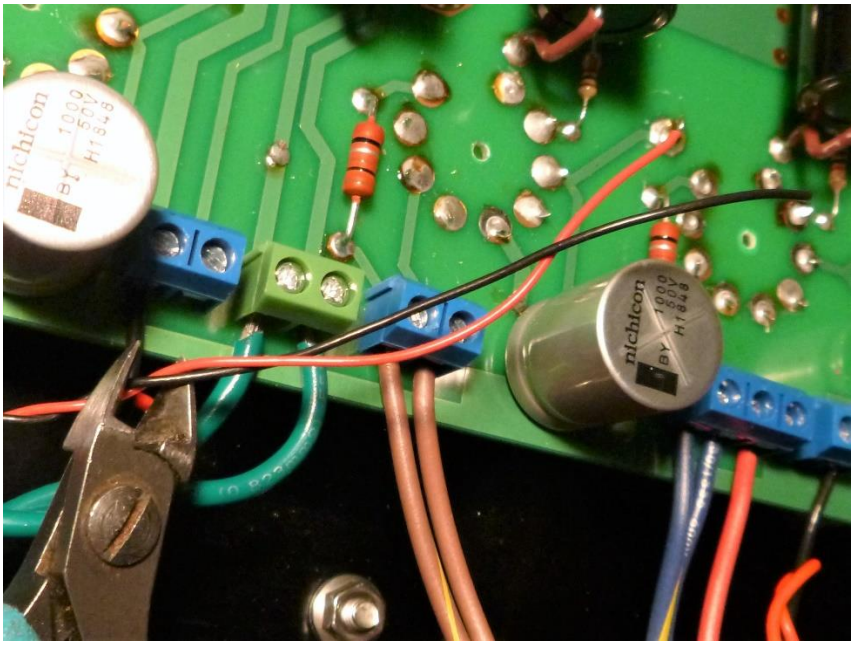

Fold the unused primary wire back on the other wires.  Insulate and secure with a piece of tape.  We'll have a more secure solution once the final primary selection is made during testing.



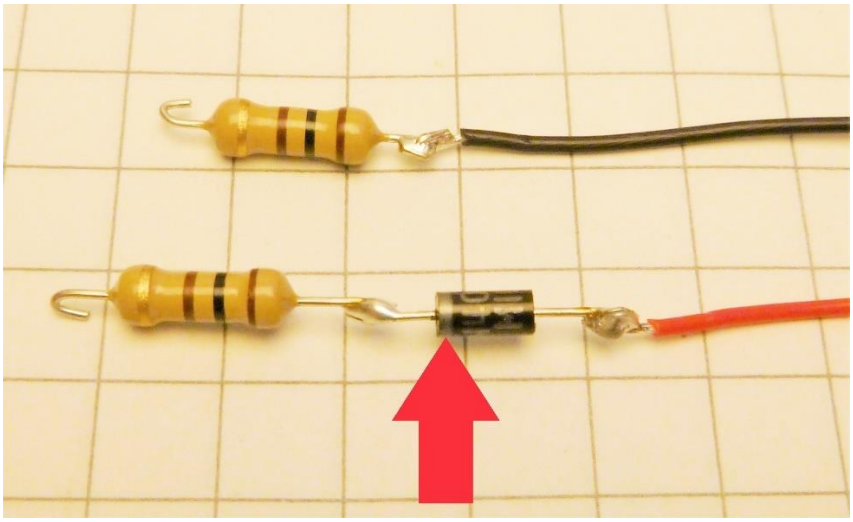
Bend the LED wires over to keep them away from the switch.

Assemble the front panel to the top plate.  Use a screw in the front middle of the top plate to hold the front panel in place.

Route the wires from the LED as shown in the top picture on this page.



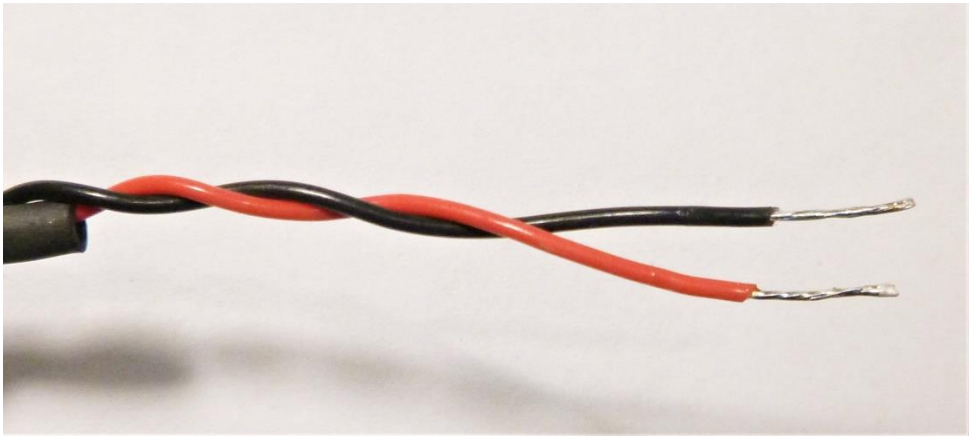

Run the wires along the rear of the circuit board and trim as shown above.  Save the offcut ends.



Prep, connect and solder two **100Ω** resistors and the **1N4007** diode as shown above to the red and black offcut ends.  Note the location of the band on the diode.

The diode isn't strictly necessary but provides a safety factor for the LED.

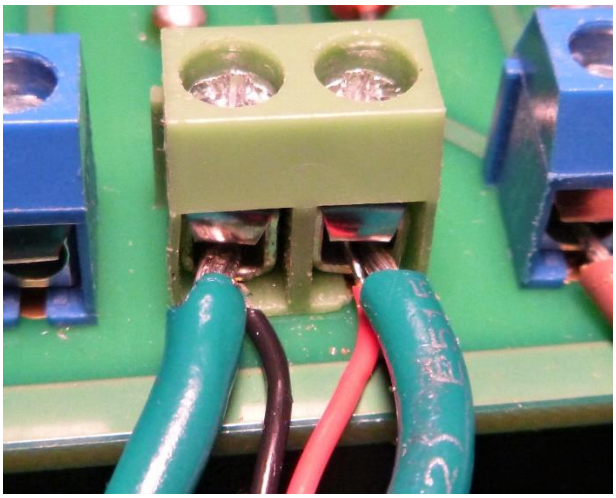
Strip the ends of the wires coming from the LEDs, connect to the resistors as shown above and solder the connections.



Cover the resistor and resistor diode combination, each with their own piece of heat shrink.

Strip **6mm** of insulation off of the **red** and **black** wires and fuse together with a bit of solder.

Twist the red and black together as shown above.



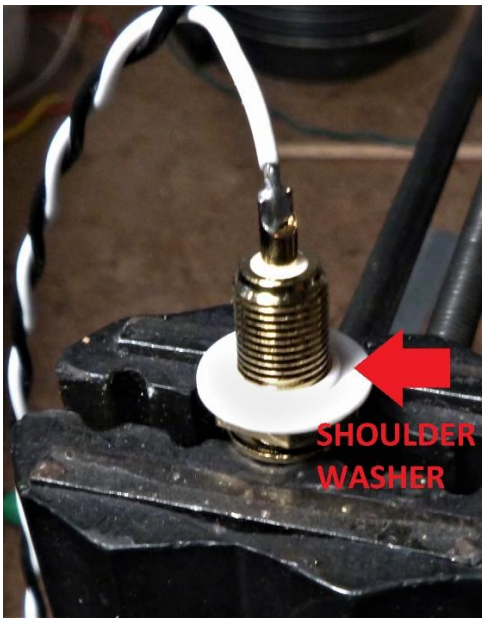
Fully loosen the screws on connector positions **8** and **9**.

Insert the leads from the LED and the green wires from the transformer.

Tighten the screws securely.  It might take a bit of fiddling to get the connector to clamp the small wires from the LED securely.

Rear Panel Assembly:

Though not shown this way in the photos, it will be easier to assemble the input RCA jacks to the rear panel before it is attached to the top.




Secure the left channel (back ring) RCA jack in a vise or clamp.

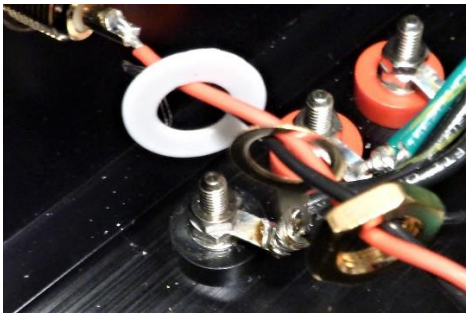
Drop a shoulder washer over the threaded end as shown above.

From the **black** and **white** pair of previously twisted 18- or 20-gauge wires, cut a piece 560mm (22”) long.

Strip **6mm** (1/4”) insulation from one end. Melt a little solder on the white wire then solder it to the jack’s centre conductor. The jacks in the parts list have a Teflon insulator so no worries about too much heat.

The washers that insulate the jack from the chassis are **not** Teflon so care must be exercised with them.

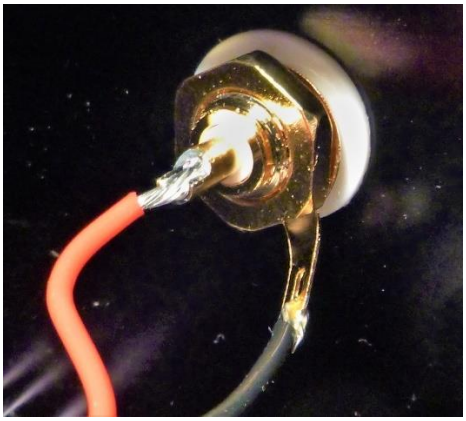
Repeat for the right channel jack (red ring) using a 560mm piece of the **red** and **black** wires previously twisted.



Slide both jack-wire combinations through the holes in the rear panel from the **outside**.

Slide, in this order, the flat plastic washer, the ground lug and the nut as shown above.

Push the washer and lug over the nut then only <u>start</u> the nut on the jack.



Solder the black wire to the lug.

Tighten the nut down securely against the lug and flat washer.

Apply a drop of nail polish to the nut and exposed thread.

Assemble the back panel to the top plate with the jacks at the circuit board end.  Use a screw in the rear middle of the top plate to hold the back panel in place.

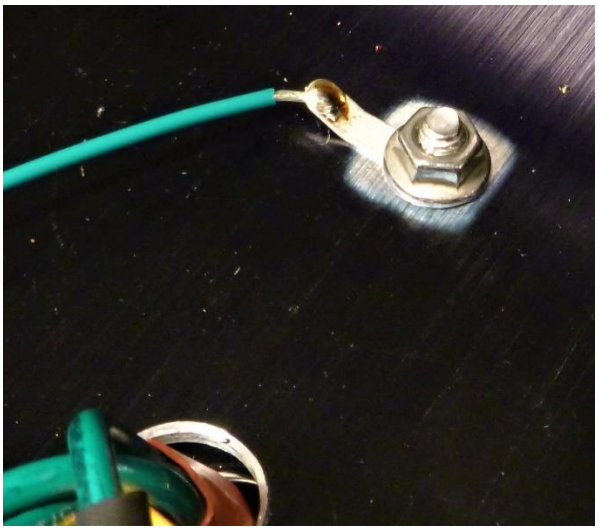
Cut the following pieces of 18- or 20-gauge **green** hook up wire:

2 pieces **125mm** (5”) long.

2 pieces **560mm** (22”) long.

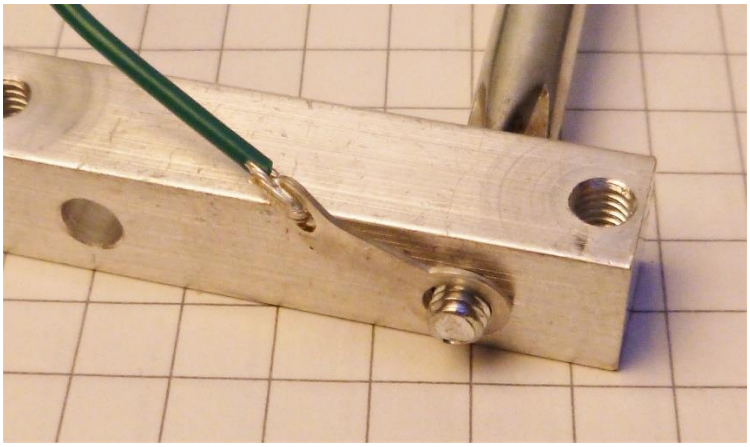
Note:  I find connecting ground wires especially boring.  **However**, grounding is critical for safety **and** minimizing hum in a finished amplifier.  So, as the man said, “Take your time, make a nice job.”

Strip about **9mm** (3/8”) of insulation off of all ends of the previously cut green wires.



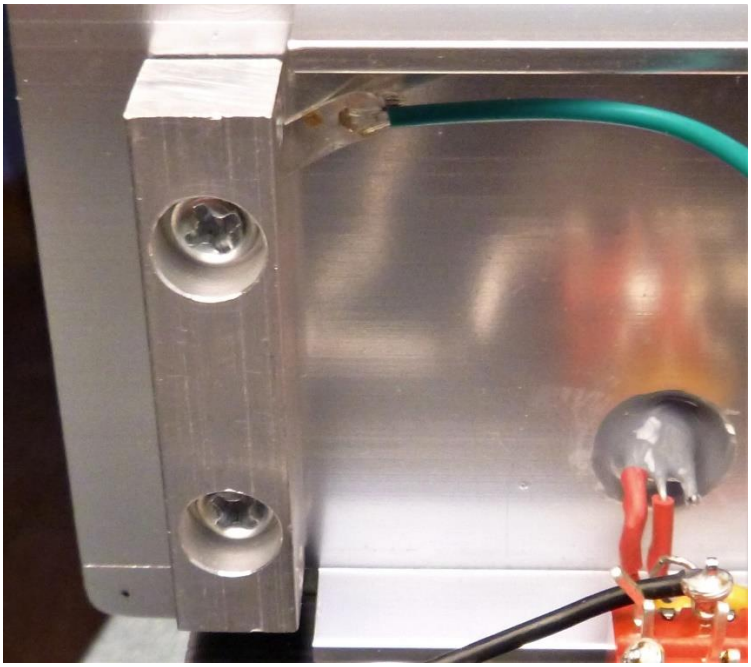
Connect and solder one or the **125mm** wires to the lug under one of the power transformer retaining nuts.

Connect and solder one of the **560mm** wires to one of the lugs ordered from Mouser.



Assemble a screw to one of the side-to-front panel connecting blocks.

Slip the lug with the **560mm** wire attached over the threads as shown above.



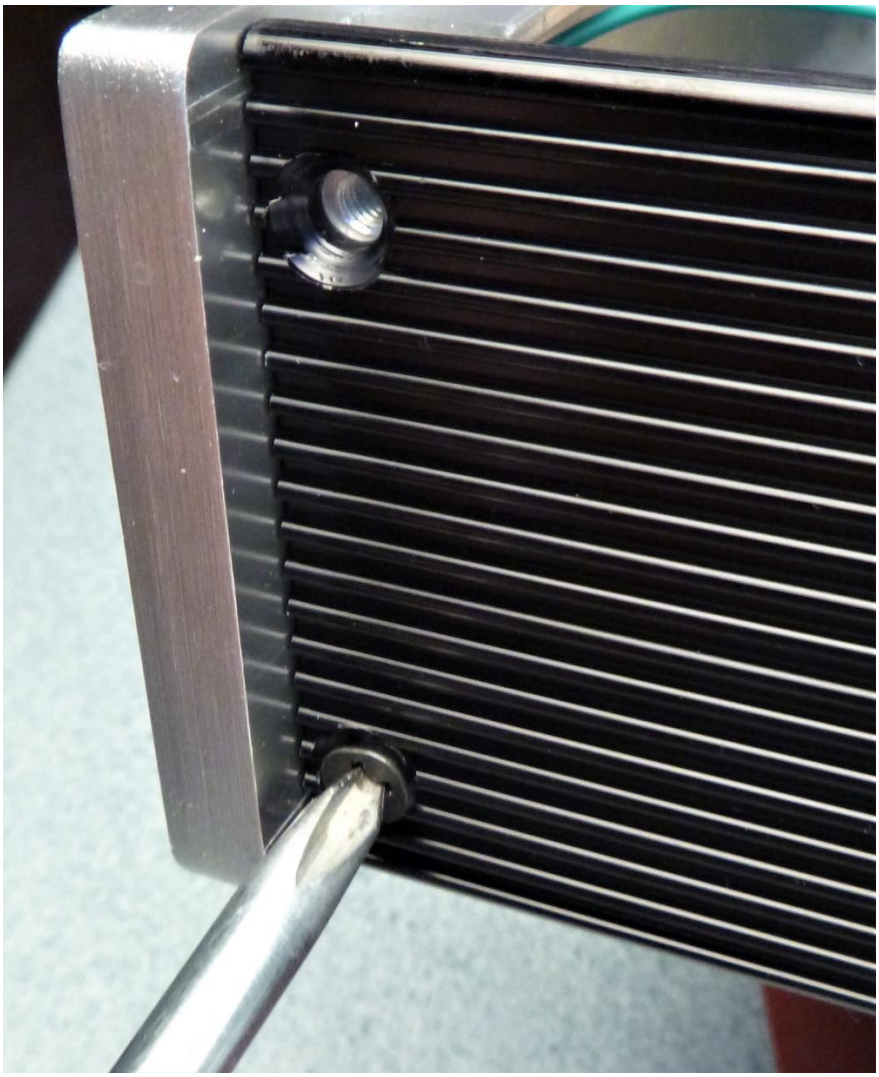
Assemble the connecting block to the front panel at the LED end as shown above.  Leave the screws slightly loose.

Attach the second connector block at the other end of the front panel.

Put a rubber mat or piece of cardboard on your bench to avoid scratching the transformers and top plate.

Remove the top plate from your work stand.  Gently set the top panel down resting the transformers on the bench.

A second set of hands is helpful at this juncture as the front panel will be turned up on edge to attach the sides.

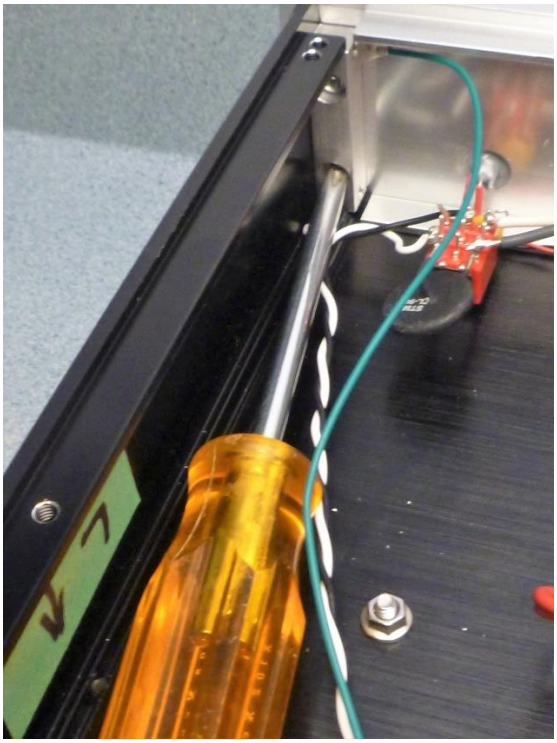


In the following steps put a drop nail polish on the screw threads before assembling.

*In I seem a bit fussy about using a thread locker (nail polish in this instance) it's because I spent the majority of my working life with military, commercial and medical products.  We ALWAYS used thread locker.  Nail polish will keep screws in place but they may be easily removed if desired.*

Assemble both side panels and secure with screws to the blocks, back and top panel.

Drop the bottom panel in place to ensure it fits between the side panels.

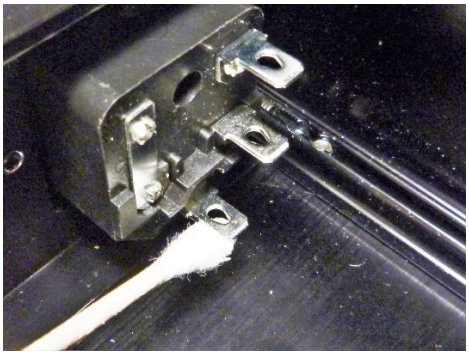


Remove the bottom panel and tighten the screws securing the blocks to the front panel.

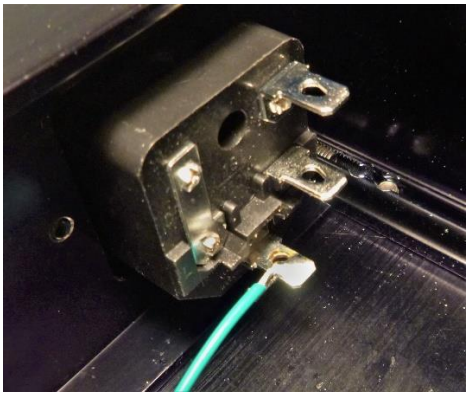
Place a big drop of nail polish between the block and the head of each screw.

Assemble the AC inlet to the rear panel.

Apply nail polish to the screws and secure the AC inlet.



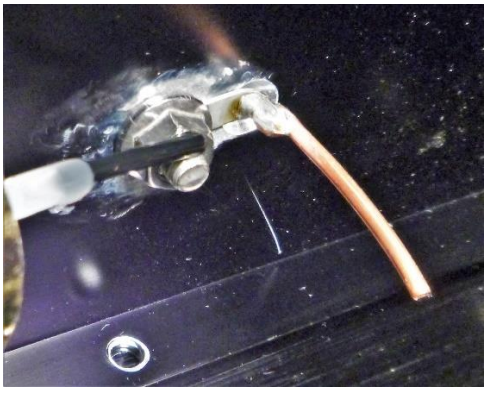
Wipe all three lugs on the AC inlet with an alcohol moistened swab.



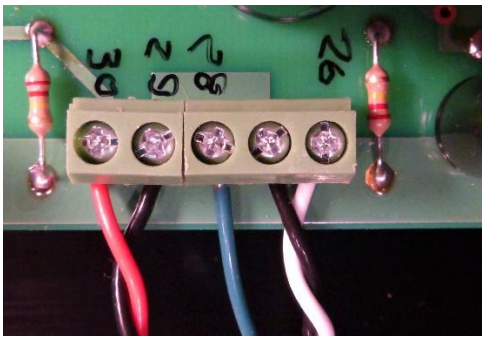
Connect an end of the second **125mm** wire to the ground lug of the AC inlet and solder.

**NOTE:** The plastic used to mould the AC inlets is easily damaged by heat. Get in, solder the wire quickly and get out. I've ruined AC inlets with too much heat for too long. The reason I specify cleaning with solvent before soldering is to remove any residue from the moulding process. Residue must be burned off before solder can adhere and this extends "hot" time.

Using a piece of solid copper wire about **30mm** (1 1/4”) long and a lug, make a grounding bar like the one shown above.

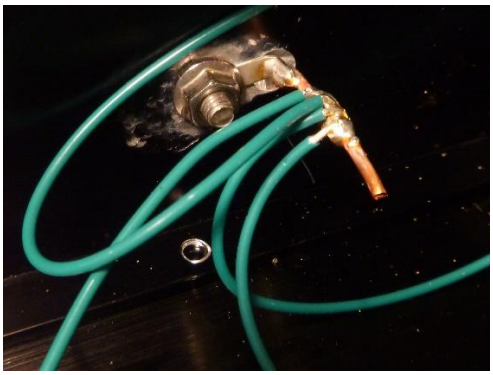


Using a M4 or 8-32 screw and nut attach the bar to the rear panel.  Stake the nut to the screw with a drop of nail polish.



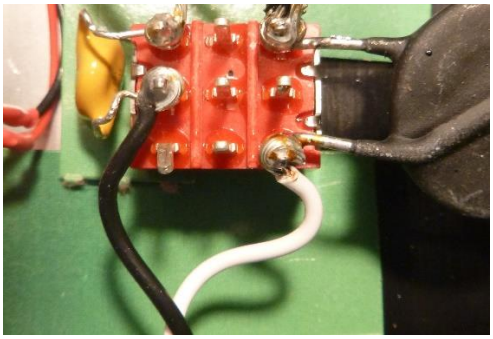
Fuse the bare wires on the end of the second **560mm** piece of green wire with a small amount of solder.

Trim the bare part to **6mm** (1/4”), insert into terminal **28** and tighten securely as shown above.



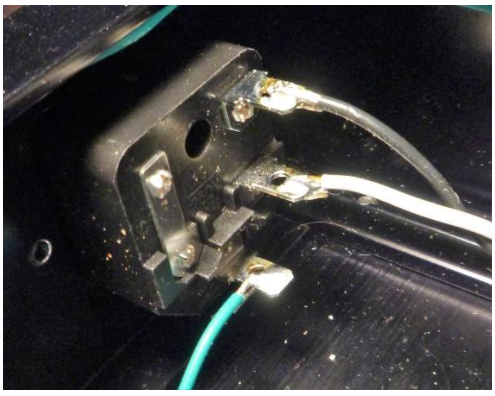
Wrap all 4 ends of the green grounding wires around the grounding bar and solder.

If you wish bend the end of the bar in a loop to prevent injury.



Cut a piece of the previously twisted **black** and **white** wire pair **450mm** (18”) long.

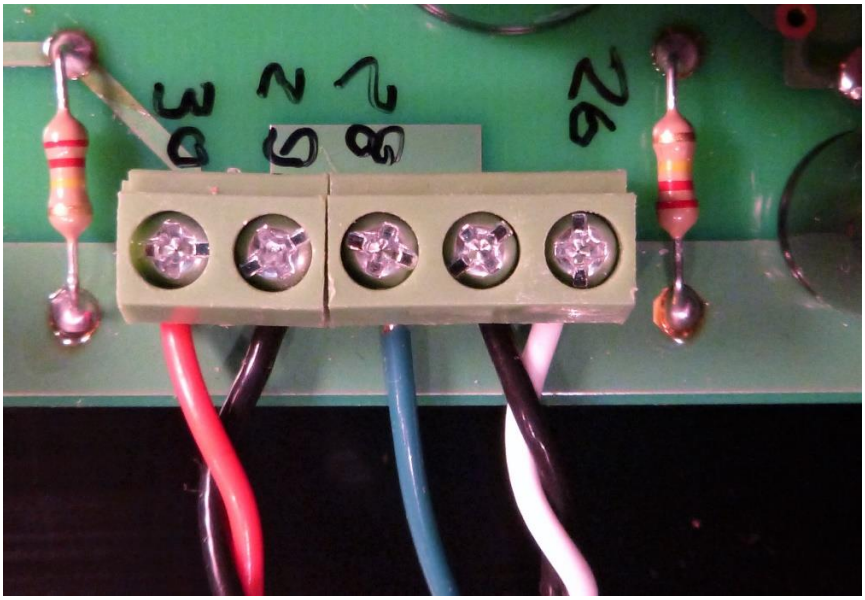
Strip **6mm** from one end, wrap around the power switch terminals and solder as shown above.



Strip **9mm** from the other end, attach to the lugs of the power inlet as shown and solder.

Be careful to not apply heat any longer than necessary.

Form the pairs of wires from the input jacks along the side panel, around the front and over to the terminal block connections




Strip **6mm** insulation from the end of each wire and fuse with solder.

Attach the **white** from the **black-white** pair to terminal **26**.

Attach the **black** from the **black-white** pair to terminal **27**.

Attach the **black** from the **black-red** pair to terminal **29**.

Attach the **red** from the **black-red** pair to terminal **30**.

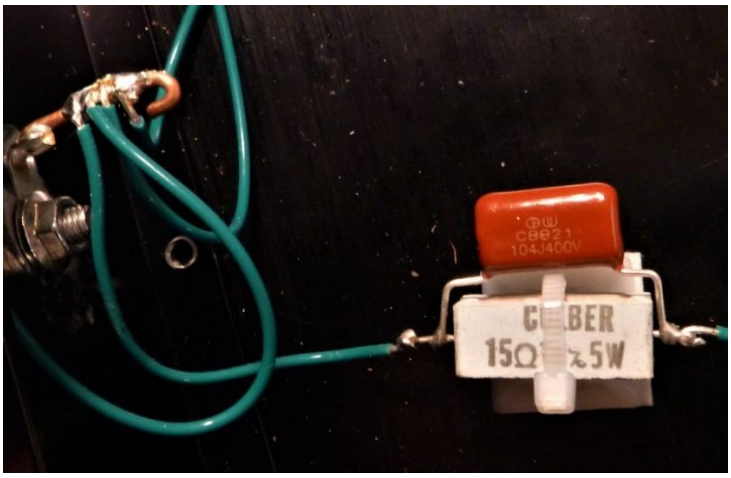
Hold on, we’re almost done.

I've included a modification for grounding the circuit board. Parts used are a 10Ω 5watt wire wound resistor and a 0.1uF capacitor included on the revised Mouser parts list.

In theory, grounding the board directly to the chassis ground should be sufficient. In practice, the manner in which the amplifier interfaces with the preamplifier can affect performance with regards to hum minimization.

Inserting a resistor and cap in the board grounding lead can <u>possibly</u> decrease hum sensitivity. At any rate, the resistor and cap should not have any detrimental effect.

(A resistor between 10 and 20Ω is fine. The 15Ω from my stash is shown below. The 10Ω in the parts list has the same wattage rating as the one shown below but is more compact.)




Cut the green lead from connector **28** on the circuit board close to the grounding bar as shown above.

Connect the cap and resistor in parallel as shown and solder.

Strip the ends of the green wire and solder to the resistor-cap combo as shown above.

To keep the cap and resistor out of harm's way, clean the top plate near them with a bit of alcohol, stick on one of the cable mounts, run a zip tie through and cinch as shown above.

Whew, wiring's done!

In Part 5 we'll power up the amp, do a little testing and tidy up the wiring with some cable mounts and zip ties. With any luck, we'll proceed to playing some music very shorty thereafter.

Part 5 will also include – or maybe there'll be a Part 6 – wiring for the optional volume control. I'll also show wiring for pentode and triode modes. As built above, the amp is running in ultralinear, or as some call it, distributed loading mode.