

## Amplifier Board Assembly, Part 1 Revised Jan. 4, 2019

### Alternate 12AT7 (ECC81) Input Tube Version

Wall of Sound.ca DIY all tube phono preamp project

If you've followed the instructions religiously, you won't have placed any components on the board yet.

Tools required:

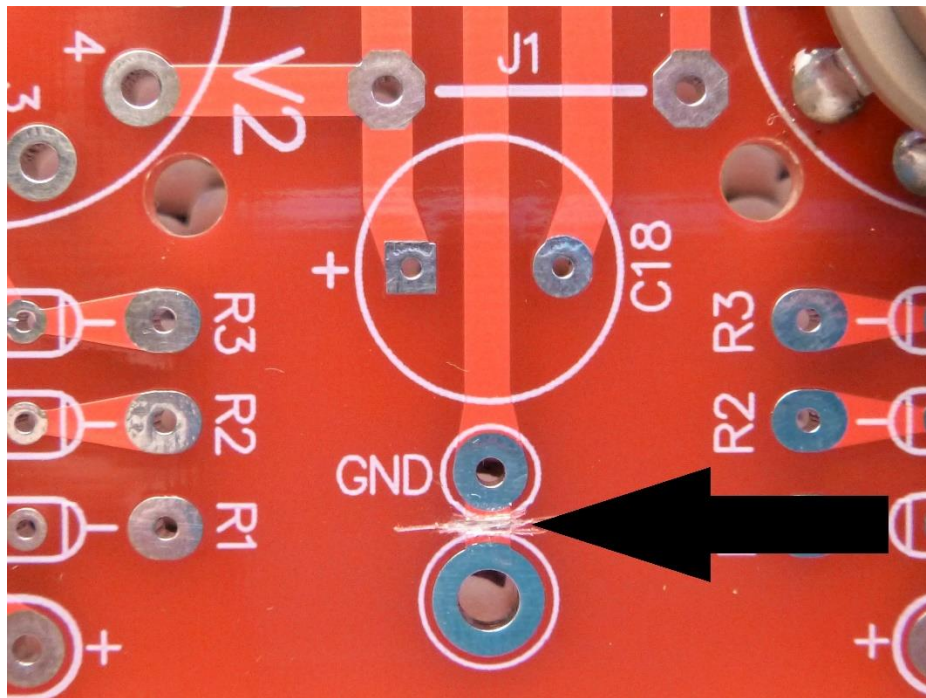
Same as the Power Switch PCB Assembly

Sharp knife, Olfa or similar

Clear nail polish

First a little board fix:

With the board as received it's possible to ground it through one of the chassis standoffs. We don't want this to happen. Near C18 on the input end of the board, on the top side, a trace needs to be cut. See below, score the trace in two places about .060" (1.5mm) apart, with a sharp knife. Peel off the trace between the cuts. Seal the modified area with a bit of clear nail polish but don't get any in the hole of the "GND" pad.



There are a couple of areas in the manual that need correction:

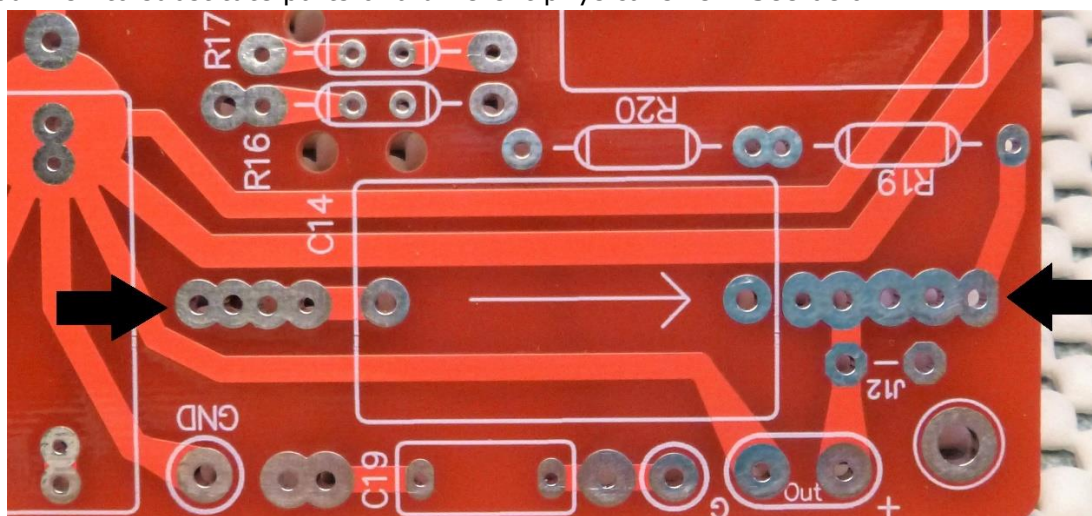
1. Near the bottom of pages 8 and 9, R11 is specified as 100 to 47K ohms. This is incorrect. The value should be 1 meg ohm. R11, as supplied in the parts kit, is 1 Meg ohm but the manual can be confusing
2. Broskie states on pages 5 and 6 that resistor R9 is optional. The implication is that R9 can be deleted and no resistor at all installed on the board. In my experience if the R9 position is not filled the frequency response rises in the top octaves and deviates too much from the ideal RIAA replay curve. My buddies Tetra and the prototype I built have 100 ohm resistors in the R9 position. Both measure flat within 1dB up to about 15 KHz, with my admittedly crude measurement capabilities.

**In some instances, parts supplied with the kit, resistors especially, don't match the values in the manual. Don't be concerned. Broskie often tweaks the ideal values for the kit but doesn't update the manual.**

I know you're itching to start populating the board but just a few more tips before we begin:

The board looks like it will hold a lot more components than supplied. The reason is twofold:

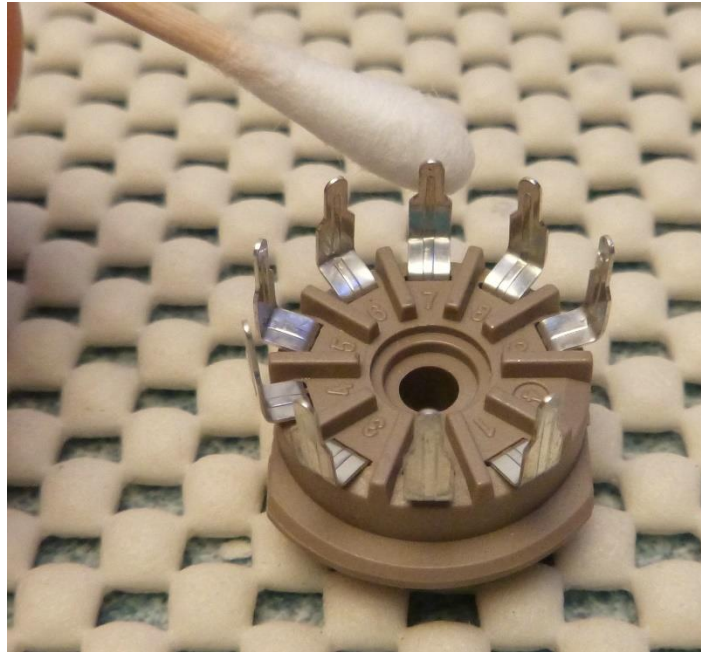
1. There are different configurations of the circuit possible but we'll be building the one on page 8 of the manual that uses fewer parts. So, expect to see holes empty and some component designations not filled.
2. Extra holes are provided to accommodate a variety of part sizes. This is helpful if you wish to substitute parts of a different physical size. See below.



**We must be careful to get the components on the correct side of the PCB. To put the tube sockets on the wrong side would mean a nasty repair.**

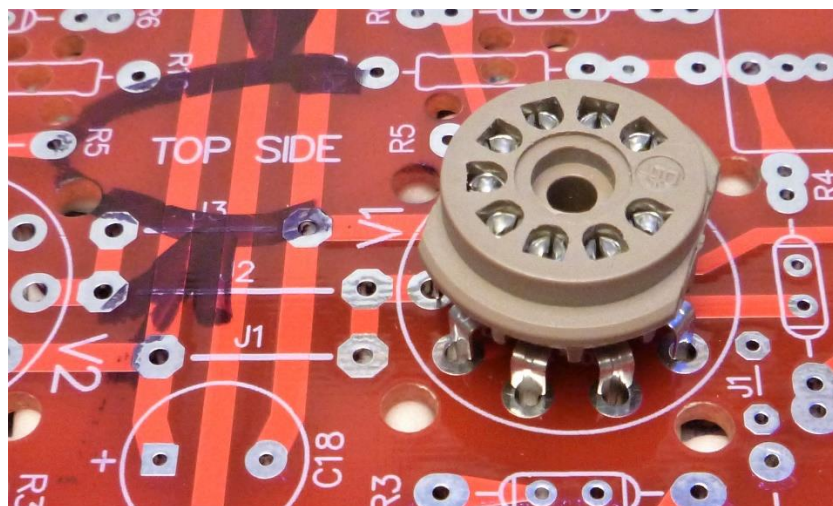
Solder one tube socket to the board first to keep on track.

Clean the pins of one tube socket with a Q-Tip soaked in alcohol. See below.



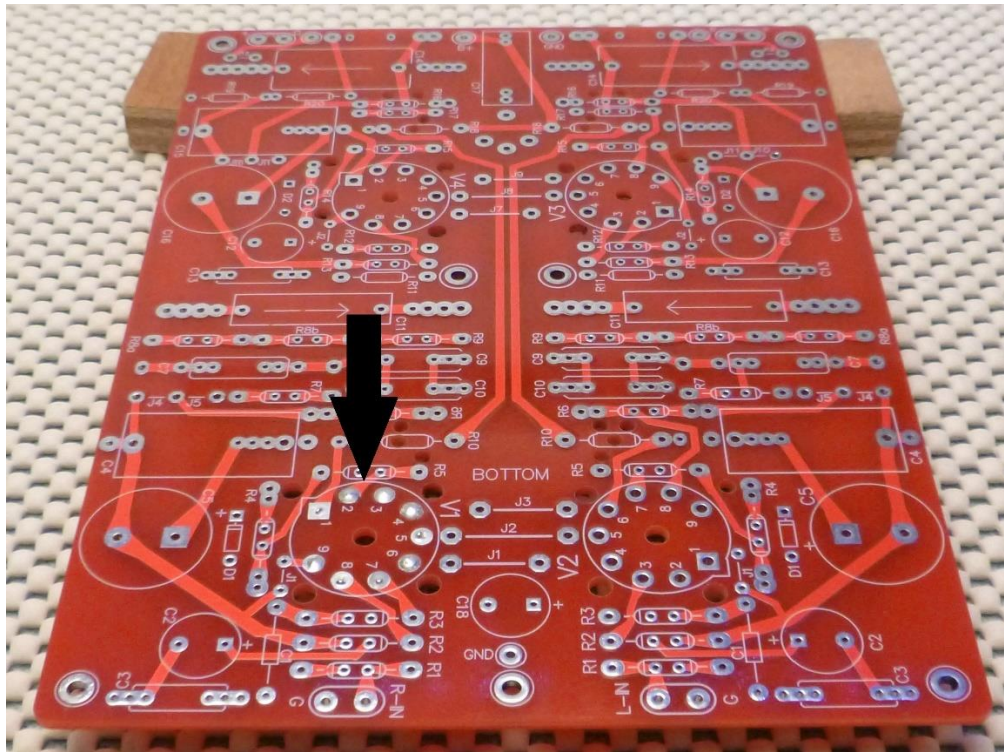
Wipe the pads on both sides of the board at the V1 (tube 1) position with alcohol. It's close to the "TOP SIDE" designation we've seen and marked earlier.

Insert the socket as shown below with the gap between pins 1 and 9 facing the nearest long edge of the board.





Flip the board and socket over, rest it on your bench and prop the far end up with wood blocks or similar to keep the board parallel to the top face of the socket. Solder the socket to the board.



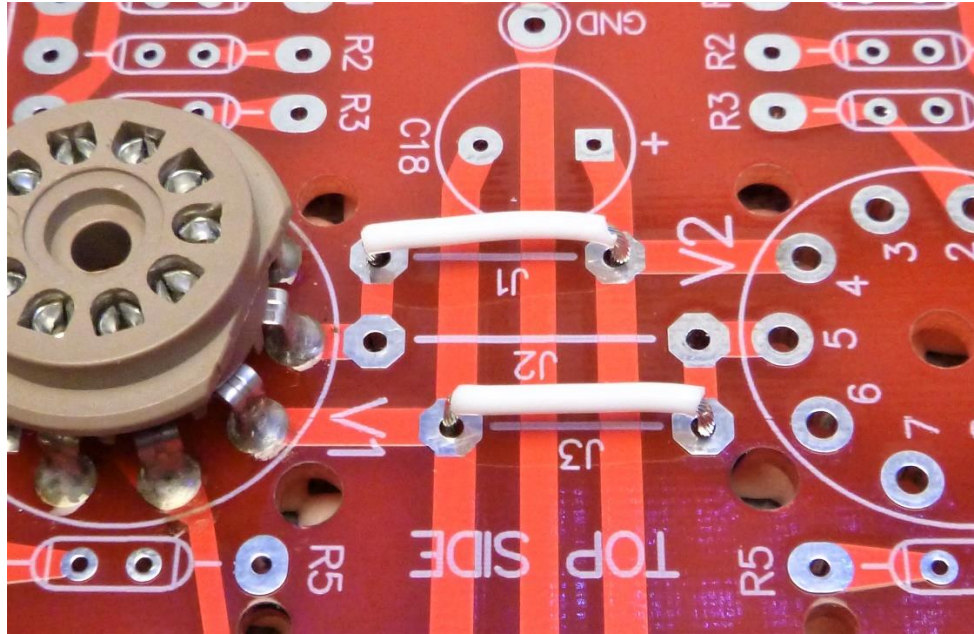
Flip the board over and solder the socket on the top side as well. This will be more secure when inserting and removing tubes.

Wipe both sides of the board with a paper towel moistened with alcohol.

All components, except for two, are mounted on the top side of the board.

As with the power switch solder component leads on both sides of the board wherever possible.

There are a few jumpers to be installed on the board. It's easiest to do these before any of the other components are installed. When jumpers cross other board traces I like to use insulated wire rather than bare wire. Even then I space them above the board with toothpicks until they have been soldered.



*Note, there are three J1s on the board, 2 for grounding and one for filament supply. The two J1s close to the two R4s are **not** used with 12AT7 input tubes.*

Install and solder jumpers at the following locations:

J1 and J3, between V1 and V2, see picture above

J5, near C4, two places

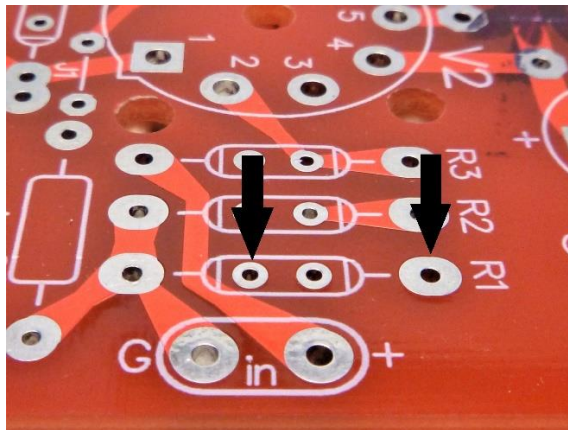
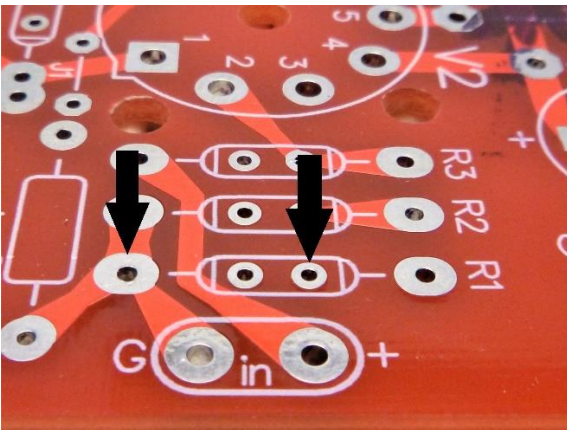
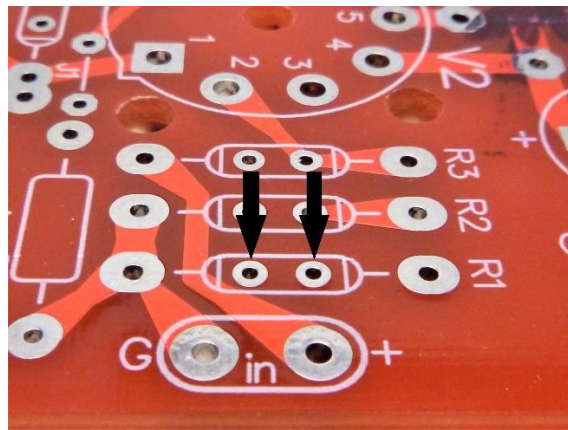
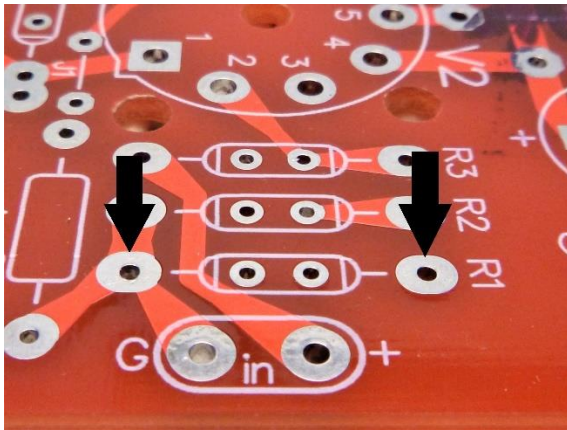
J7 and J9, between V3 and V4

J11, near C15, two places

Trim the leads on the bottom of the board after soldering.

## Resistor Installation:

Most resistor locations on the board are provided with four holes. Depending on component size or personal preference they may be installed in any of the ways shown below.



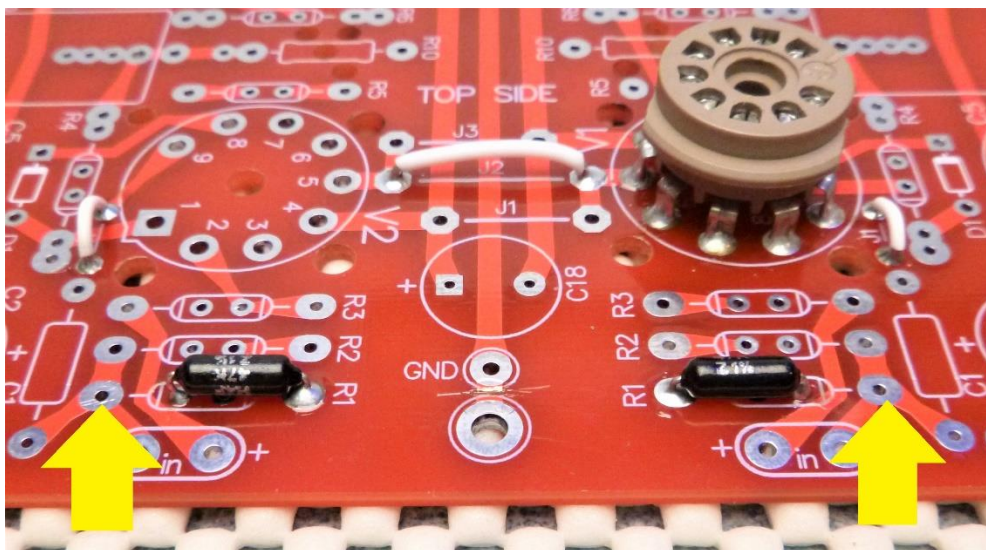


The resistors are packaged with the required value by circuit location. **All the same it pays to check them with your multimeter before assembling to the board.**



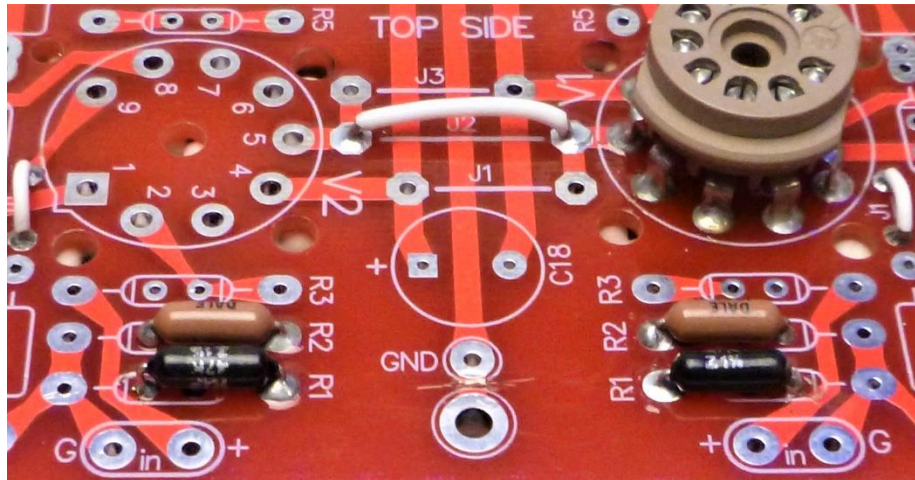
Open the package containing the two R1s (one for each channel) and check resistance with a multimeter.

Install the resistors on the board as shown below keeping the indicated holes open. The open holes might be needed later. Solder the leads and trim the excess.



Do not use the R2 resistors supplied with the kit. Use the 200 ohm resistors purchased separately.

Assemble resistors R2, two places, to the board as shown below, solder and trim the excess leads. *Note, the jumper seen at J2 in the picture below is not correct for this version.*



Assemble R3, two places, to the board. Solder and trim the excess lead lengths.

Assemble R5, two places, to the board. Solder and trim.

Do not use the R4 and R6 resistors supplied with the kit. Use the 47K ohm, 1 watt resistors purchased separately.

Assemble R4 and R6, two places each to the board but space above the board 1 to 2mm. Solder and trim.

Do not use the R7 resistors supplied with the kit. Use the 22.1K ohm resistors purchased separately.

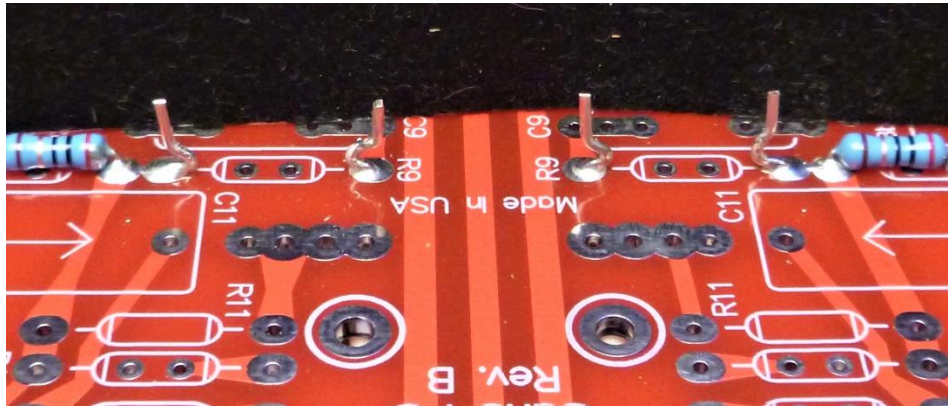
Assemble R7, two places, to the board. Solder and trim.

R8 consists of two sections, R8a and R8b. Using 2 resistors helps keep the RIAA correction closer to the ideal. Assemble to the board, solder and trim.

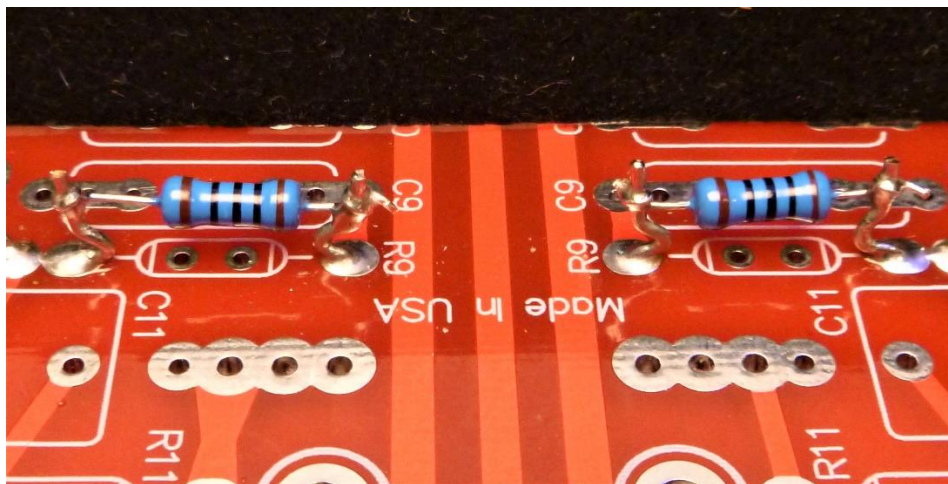


There are options for R9 as mentioned on page 2. Three values 49.9, 78.7 and 100 ohms are supplied. You can just go ahead pick one and solder it in or if desired, you may do as described and shown below.

Open the package of C11 capacitors and from each lead (four total) cut  $\frac{1}{2}$ " (13mm). Assemble these short leads and solder to the R9 positions as shown below.



Solder the desired resistors to the protruding leads. It may be changed more easily.



Assemble R10, two places to the board but space above the board 1 to 2mm. Solder and trim.

Assemble R11, two places, to the board. Solder and trim.

Assemble R12, two places, to the board. Solder and trim.

Assemble R13, two places, to the board. Solder and trim.

Assemble R14, two places, to the board. Solder and trim.

Assemble R15, two places, to the board. Solder and trim.

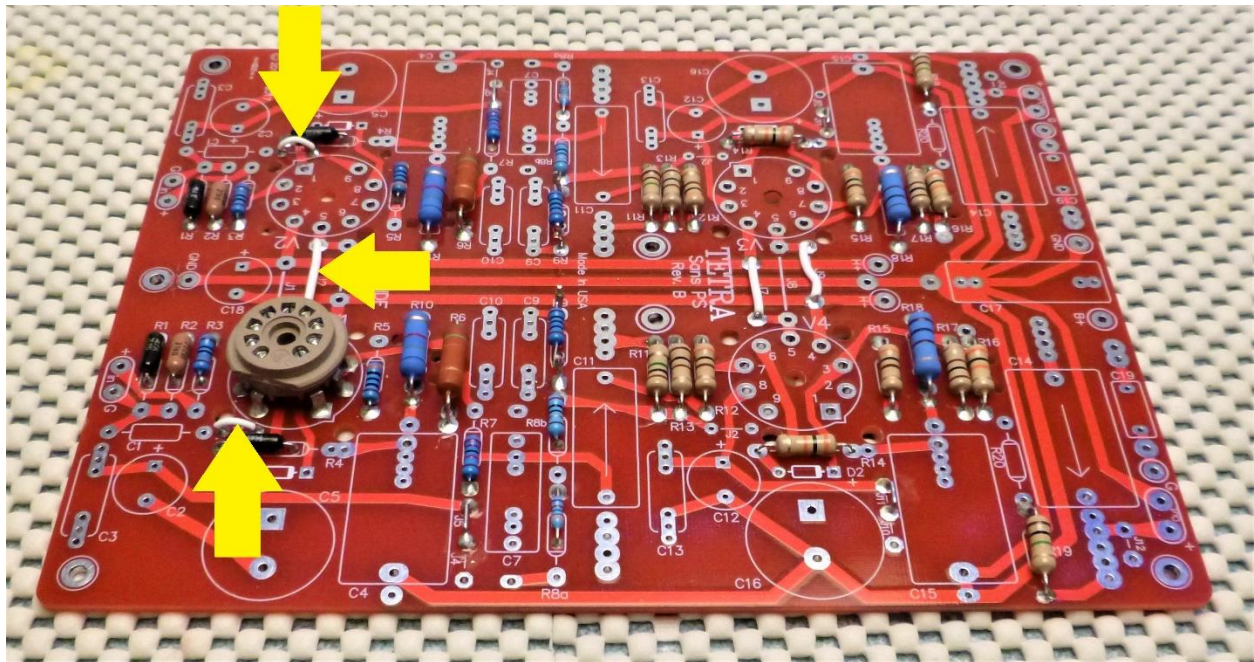
Assemble R16, two places, to the board. Solder and trim.

Assemble R17, two places, to the board. Solder and trim.

Assemble R18, two places, to the board but space above the board 1 to 2mm. Solder and trim.

Assemble R19, two places, to the board. Solder and trim. Leave R20 off, it can be added later if desired.

Board with all resistors installed, see below. Note the three jumpers "arrowed" are not correct for this version.



Install the remaining tube sockets, first cleaning the socket pins with alcohol. Solder the socket pins on both sides of the board.

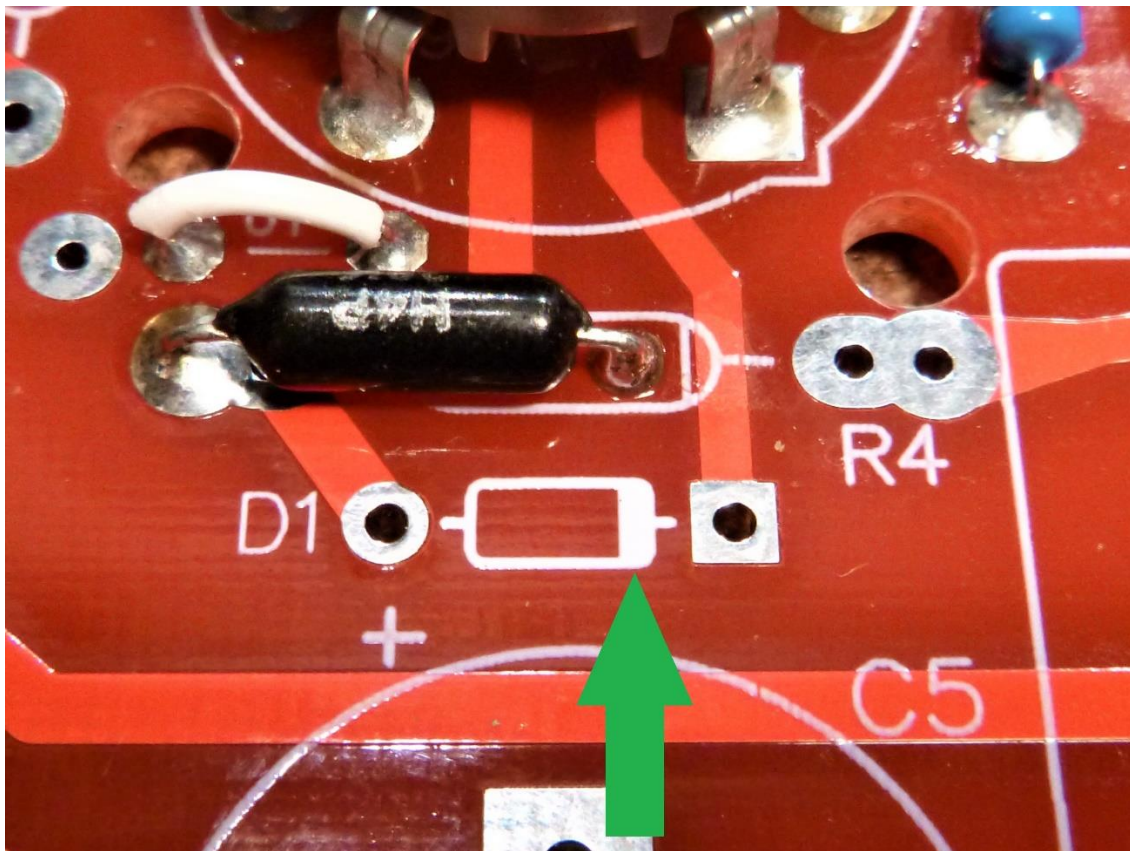
If you have a defective 9 pin tube plug it in and out of each socket a few times to loosen them up a bit.

### Diode Installation:

Diodes, you ask? You said there wasn't any silicon in the circuit. It is all tube.

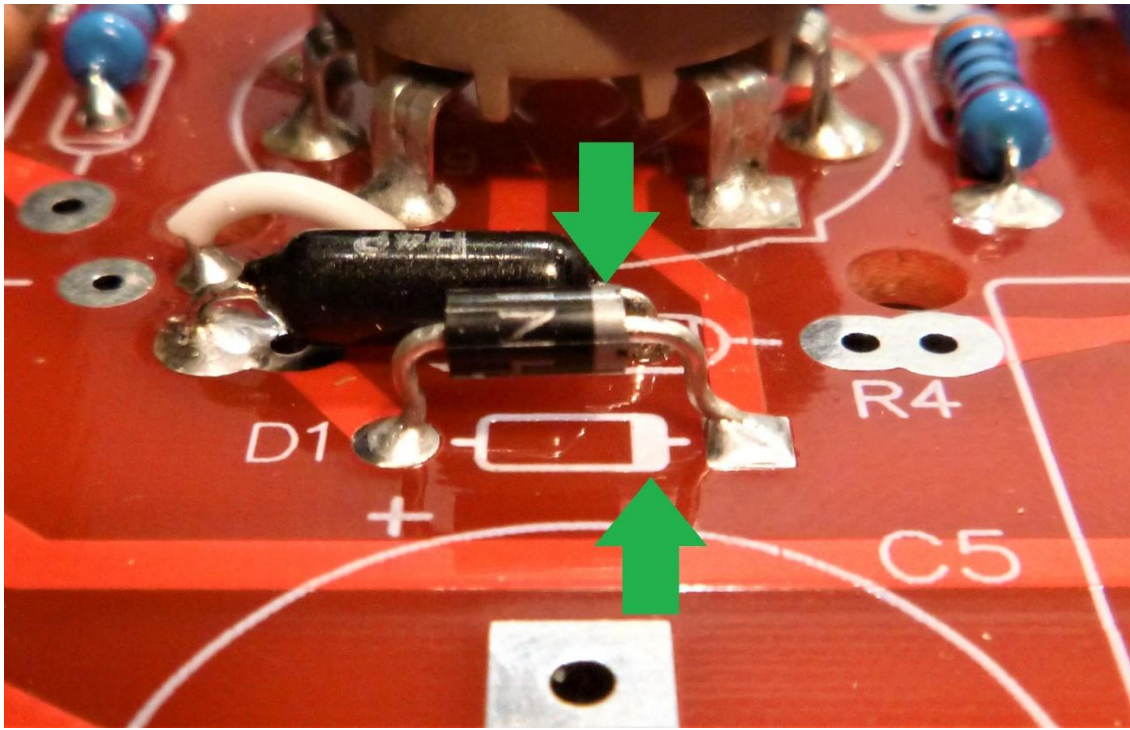
The diodes are there just to protect the tubes during warm-up. Once the amp has warmed up and settled down the diodes are effectively not in the circuit.

Notice the white band at the diode location on the board, see below.





Install the diodes with its white band in the same orientation. Too much heat during soldering can damage diodes. By bending the leads, as shown below, a bit of length is gained between the solder site and the diode.



See **Amplifier Board Assembly, Part 2** for capacitor assembly.