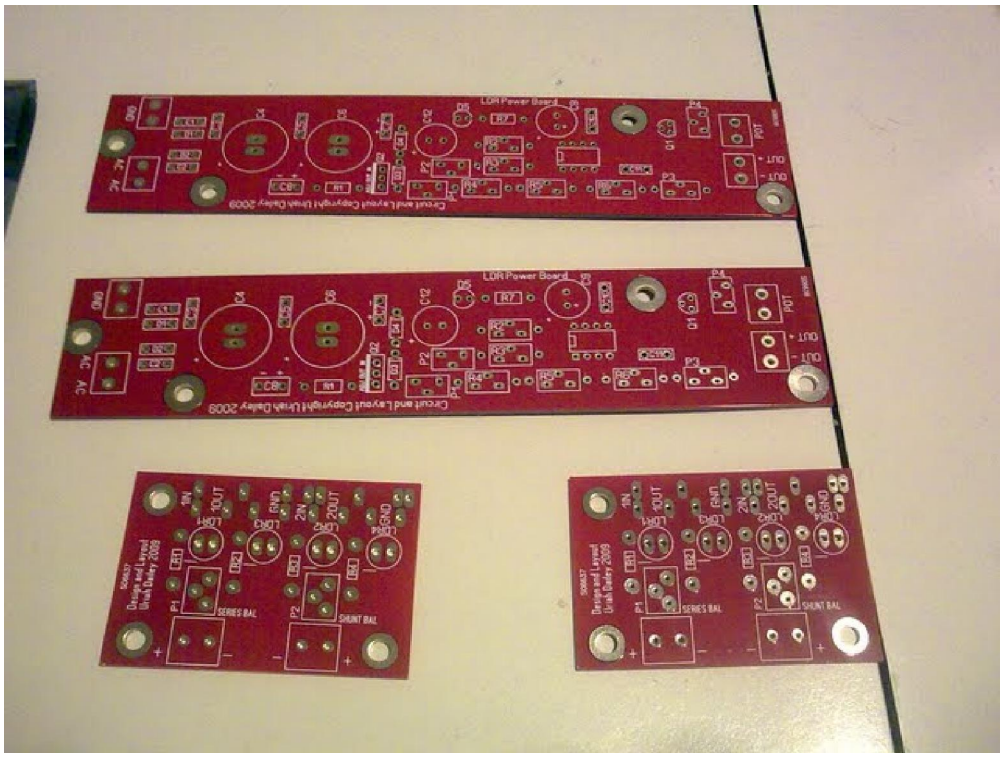
2 LDR controller boards, 2 BOM, and a mount and balance board. 2x Mount Balance shown, only 1 needed.
3 bags per BOM.
Active Bag = LM334, LM317, LME49710, PDIP socket for the LME49710.
Resistor Bag=1x240R, 1x1k, 6x22k1 Only need 5x 22k1
4 pots 1x5kR, 1x200R, 1x500R, 1x1kR. 500R unnecessary, replaced w/ 100k
Diodes=4x1N4001
LED=1
Terminal Blocks=4
CAPACITOR BAG ALL 35VDC= Lytics - 1x47uf, 1x100uf, 1x1000uf
Film= 2x.1uf, 3x.47uf
Tantalum - note polarity - 2x.1uf, 1x1uf
Ceramic = 1x68pf

Parts for mount and balance not included. You will need to source a 1k dual log or linear pot. Must be dual, must be 1k. You will need this for the Lighter Note. If you are building a Lightspeed instead you must use 100k dual log.

Lighter Note BOM
C1 .1uf Film
C2 .1uf Film
C3 .47uf Film
C4 1000uf Electrolytic
C5 .47uf Film
C6 1000uf Electrolytic
C7 1uf Tantalum
C8 .1uf Tantalum
C9 47uf Electrolytic
C10 .1uf Film
C11 68pf Ceramic
C12 100uf Electrolytic

D1-D4 1N4001
R1 240R
R2-R6 22k1
P1 5k
P2 200R
P3 1k
P4 100k
Q1 LM334
Q2 LM317
Q3 LME49710
QTY4 Terminal Blocks with 5mm spacing of pins

All caps are 35V or higher. Lower will explode. I use a dual secondary toroid of 12VAC for each board. Configure the secondaries as a center tap. Use the center tap for 0V/GND and use the other two wires for AC/AC power input on the board.
Please remember to use a fuse. I use a .5A. I am sure you would be even safer with a .25A fuse. I put it on the primary for convenience. You could place it on the secondaries, however its not a safe idea ever to put fuses on secondaries. Never do that in a power amp.



Close up of the boards. Starting with the top boards, the LDR Controller boards...
A few things we need to note here. Orientation of the diodes is not shown on AC input. The silver line on the 1N4001 must face toward the far end of the board, away from the transformer side of the board. So they point toward the output.

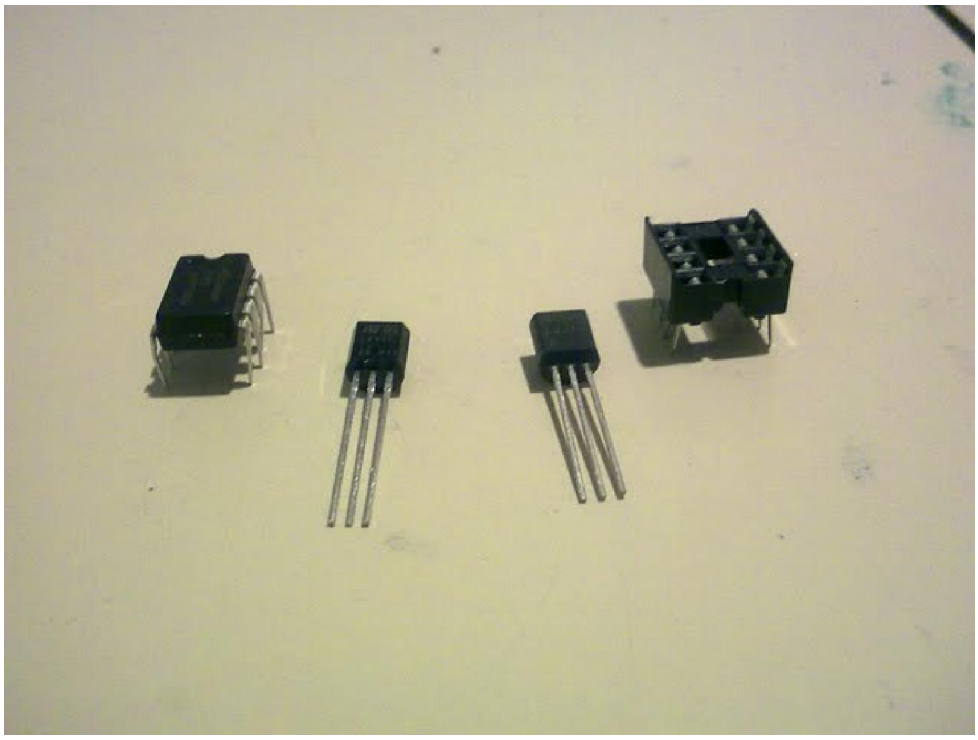
Toward the far right side of the boards in this pic there is component Q1 and P4. These are the LM334 and the 500R pot. These have changed. There was a mistake in the pcb. LM334 must have pins 2 and 3 reversed. I included teflon tube in your kit. Cut a small amount for leg 2 and leg 3. Now cross them so 3 is now the center. Solder in this way. The boards will work the other way

but not very well after a short while. When we make this change performance is much better and P4 must change from 500R to 100k.

A 100k pot is included in each BOM as well as the 500R that you may now put in your junk drawer.
Another result of this change is that the 10k dual linear control pot is now not going to work for LDR resistances of higher than about 500R. You will need a 1k dual log or dual linear pot. Mine is working great with dual log but linear is also just as good an option.
I have included 6x22k1 resistors. You only need 5. Junk drawer for one of them.

Okay, that all of the changes. Everything else is the way it has been from the start. If you dont change the parts the way I have stated please do not contact me for help until you have.

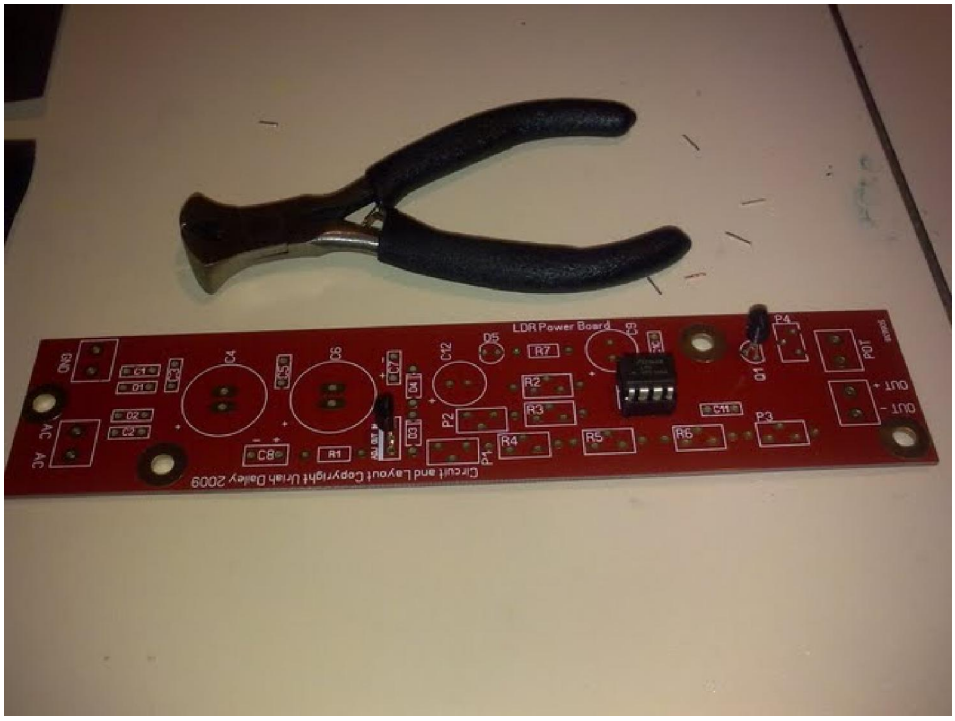
The mount and balance boards are perfect. I love them. They work so much better than I had expected and were fun to play with. Remember you only need one for single ended operation.



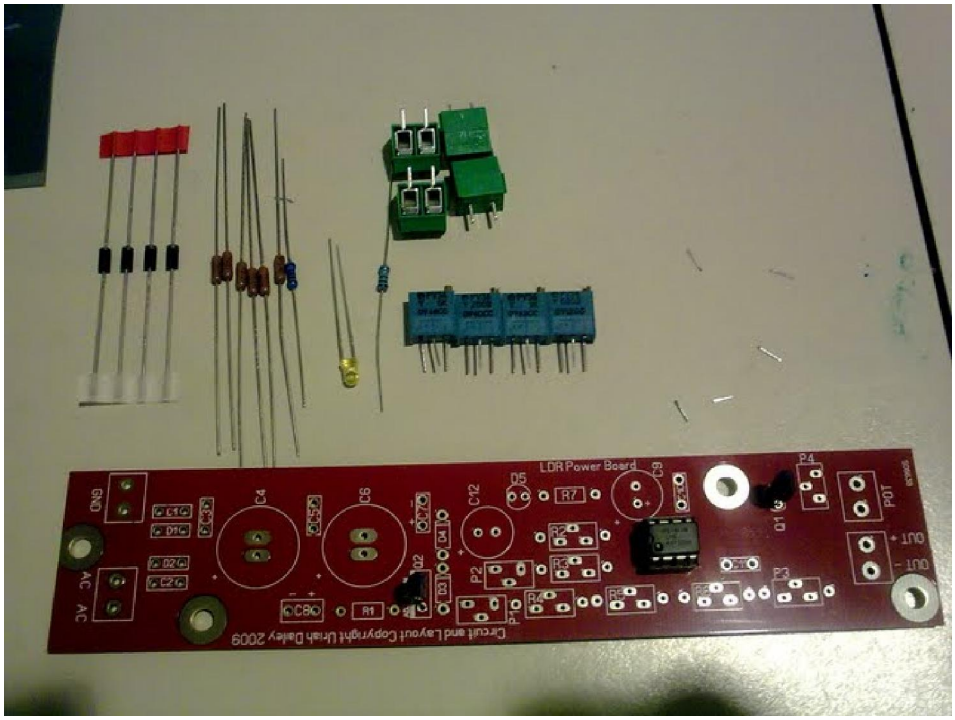
Open your active bag and remove the components.
LME49710 OpAmp, LM317 voltage regulator. LM334 Constant Current Source.
LM317 could be a TO-220 if you desire using that. Its not necessary. This little TO-92 has more than the punch we need.

These parts get populated first.
LM317 goes in Q2. LM334 goes in Q1. It gets preferential treatment because I love it so.
The LME49710 goes in the unmarked obvious dip package footprint. However we solder in the socket NOT the OpAmp. So solder the socket in place with the notch facing as shown on the silkscreen. The LME49710 has a dimple on it that denotes Pin 1. Pin 1 goes at the top of the silkscreen where the notch is in the connector. So Pin1 and its dimple face toward the AC/AC input end of the board.

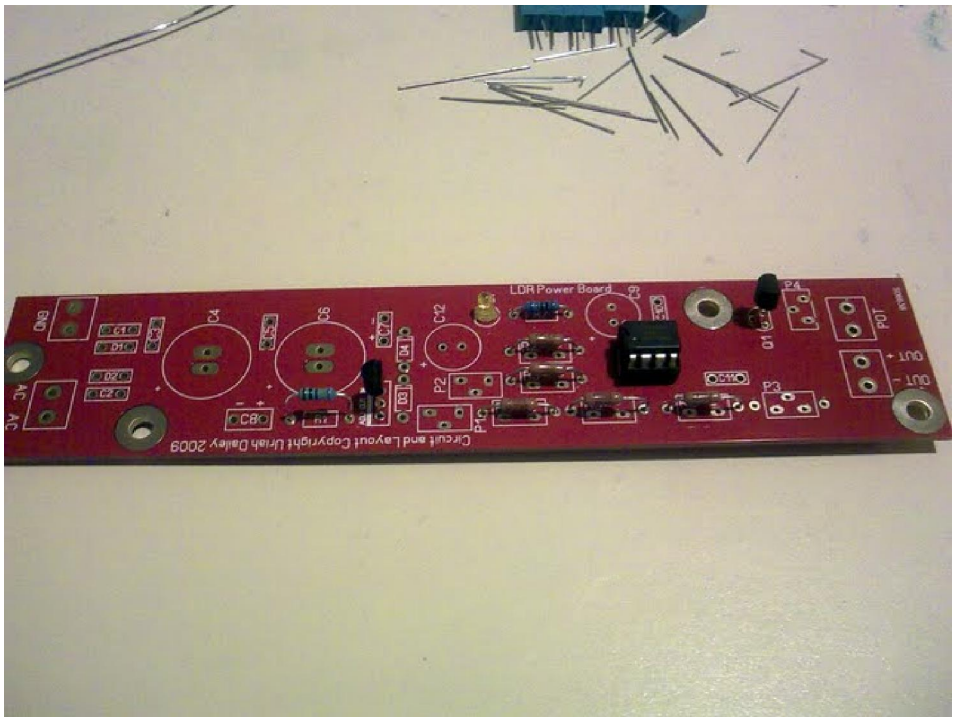
Do not forget to use tubing on LM334 and twist leg 3 toward the center and pin 2 out to the side where 3 used to be. Sorry about this but hey its the first board run after the prototype run and the proto, with legs reversed, worked perfect for months, so I had no clue.



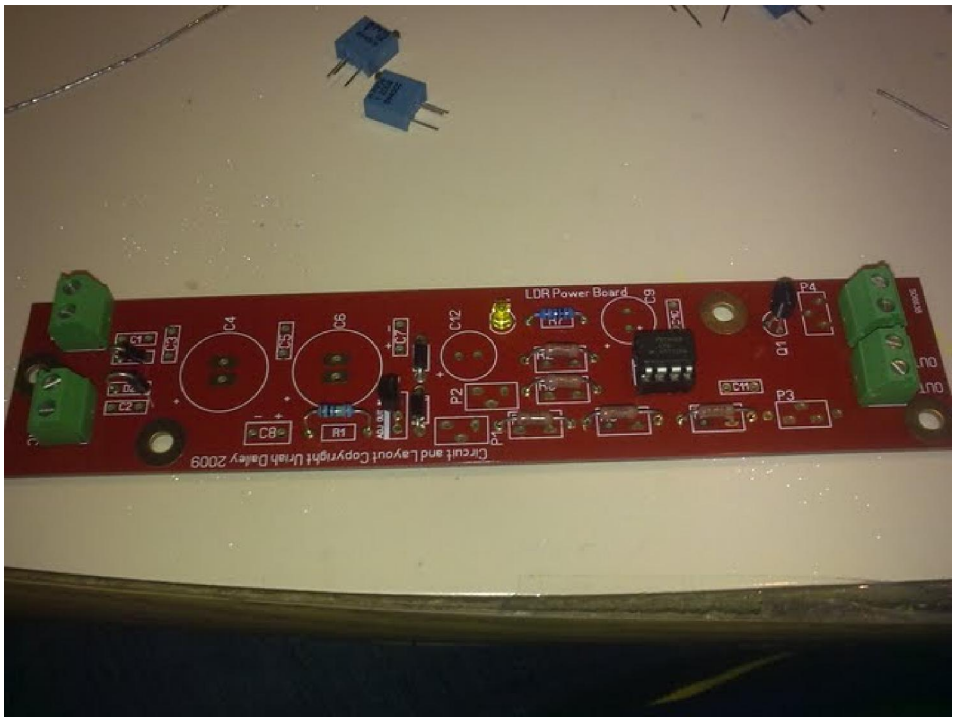
Trim the legs after soldering. See the dimple on the LME49710?
Yes in this photo I have LM334 in with the pin 2 and 3 in the wrong holes. Remember your tubing. Remember to reverse those legs.



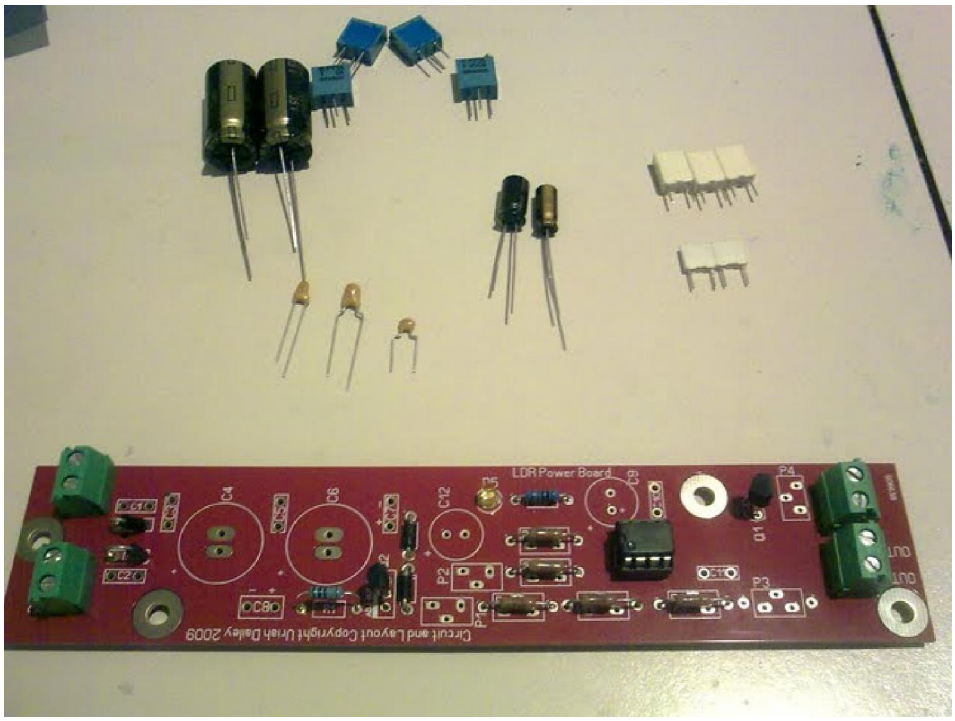
Solder the 4 terminal blocks first. Then proceed with the rest.
Put in the resistors first.
R1=240R
R2-R6 =22k1
R7=1k
LED goes in Q5. Note polarity. Long leg toward R7. Short leg to ground.
D1 and D2 point their silver line toward the far end of the board. RIGHT in this pic.
P1=5k trimmer
P2=200R trimmer
P3=1k trimmer
P4=100k trimmer
Nice job guys and gals. Now solder and trim the leads.



Shot with Resistors and LED in place.
Yes you may want to use your DMM to figure out the blue resistors. Light blue is 240R. Dark blue 1k.



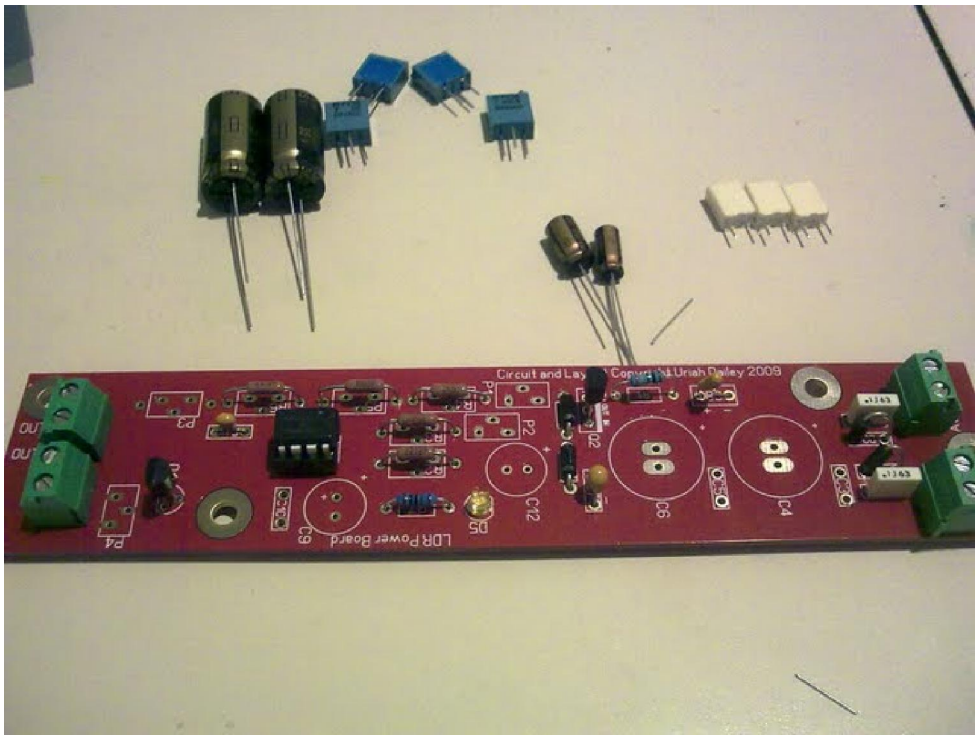
Terminal blocks in. Should have put them in first but I learned the hard way.
Note the diodes. Its easy to fit them this way. You can actually get them to fit perfect but its a 90degree angle down from the body of the diode and sometimes thats hard to bend perfectly.



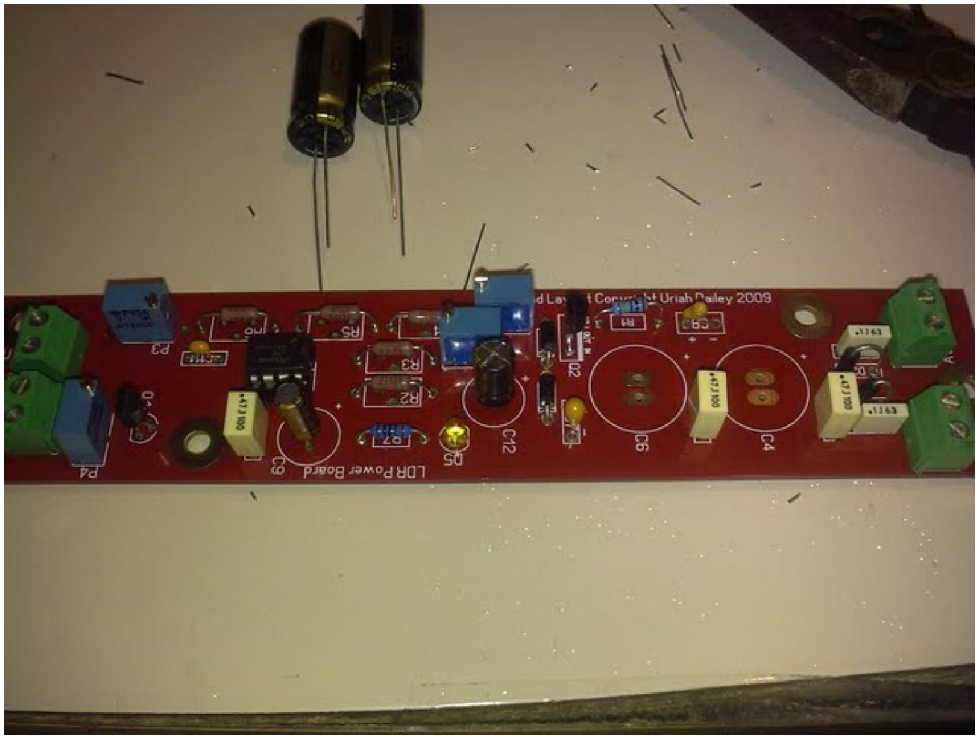
See those little yellow guys? Left one is .1uf. Middle one but largest is 1uf. Small one on the left is 68pf. The large electrolytics are 1000uf as marked and then you have two other electros at 100uf and 47uf. The white boxes: the 3 larger ones are .47uf and the two smaller are .1uf.

So this is really easy. Hopefully you already populated the trimmers. I should have done this already.
Your first step here is the little caps. Lets start by putting
2x.1uf in C1, C2
Then
3x.47uf in C3, C5, NO not C7 but the last one goes in C10. Almost gotcha!
The little 68pf ceramic goes in C11
Put the small tantalum .1uf in C8 and the large tantalum 1uf in C7.
TANTALUMS ARE POLARIZED JUST LIKE ELECTROLYTICS. And the burn fast when they are used wrong. Just like LED. Long leg + and short leg -.

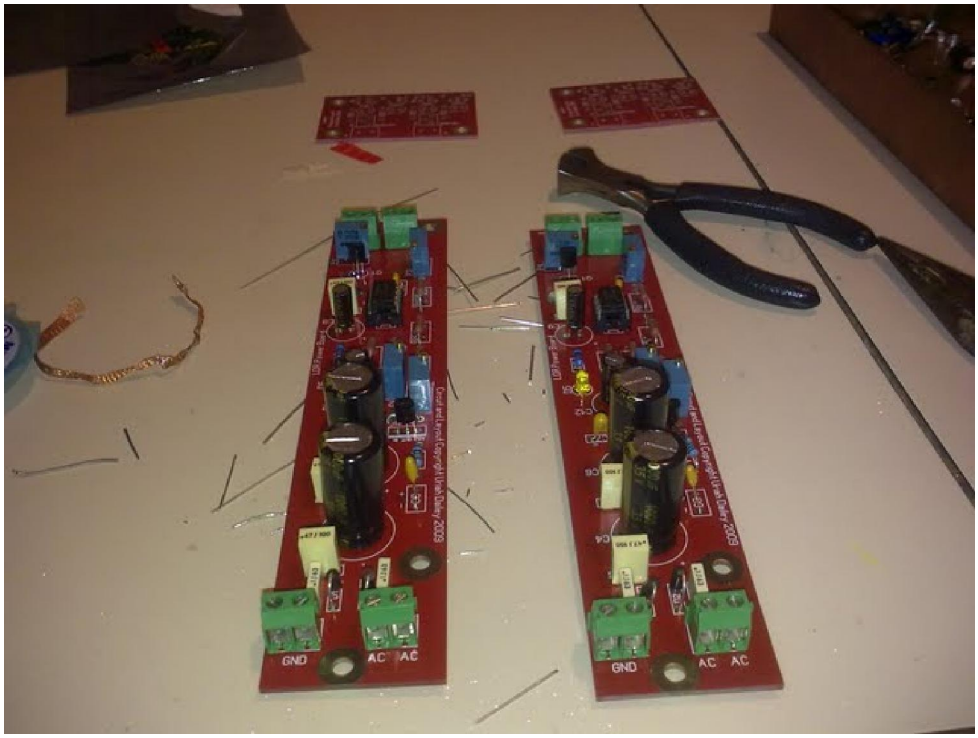
Electrolytics
Lets go from small to large. Same as LEDs and Tantalums. Polarity matters. The polarity is marked on the side with a stripe that has minus symbols on it. This is always the short leg. The long leg is always positive.
47uf goes right near the opamp as C9.
100uf goes near the LM317 as C12
Now the big guys. 1000uf go in C4 and C6.



Here is a pic with tantalum, ceramic and .1uf films populated.



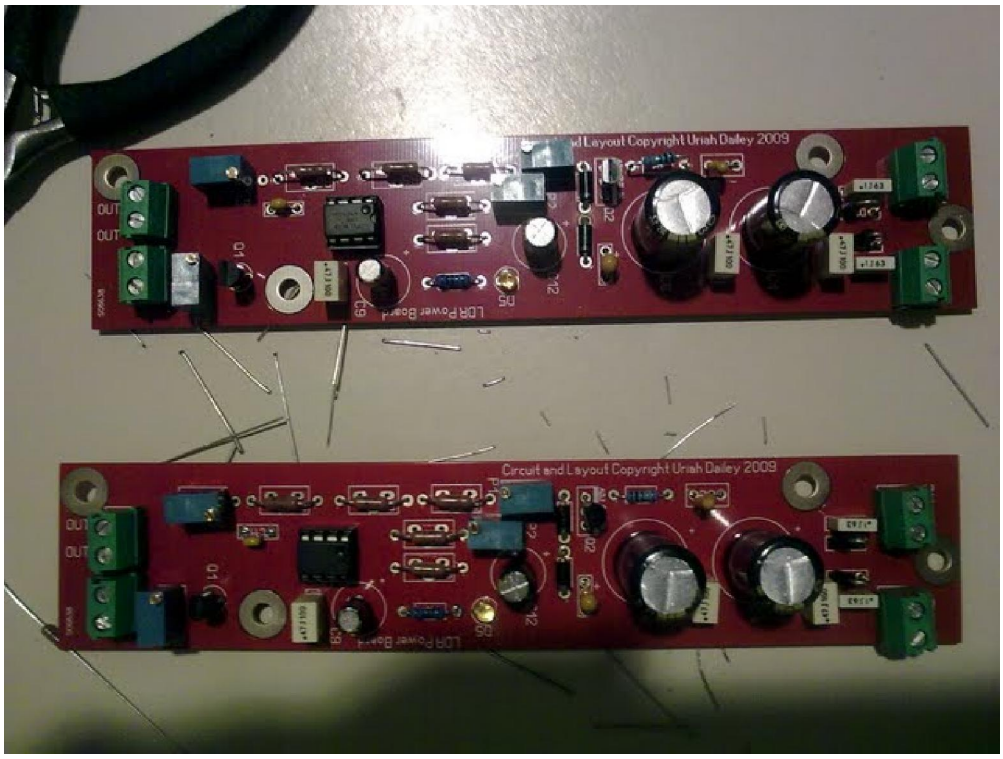
All trimmers and .47uf caps in place as well as 47uf near opamp and 100uf near LM317.



Done.
Trim you leads. Check for any sign of bad solder job. A bubble of solder rather than a cone of solder is a good sign of a bad solder joint that just might work for a few months/years and then ....!!! Hey What the Heck!!

Now please connect your 0V tap from your transformer to the GND terminals. You can attach the ground from earth in addition but you MUST use a 0V from your transformer. The earth GND would only be in addition to 0V.
Also connect the other two secondary leads to AC/AC.
Use your DMM. Connect one lead to the point where the two diodes near the LM317 come together. The middle of these two diodes is a test point. So clip a lead here and touch the other lead to the top of the GND terminal block.

Do you get DC Voltage? If so, good. We dont care right now what the voltage is. Now change the 5k pot. Does the voltage change? If so, good.
Do this on both boards to check for functionality.
I use a dual secondary 12VAC toroid for each board. 5VA. You could use 1VA and be fine. $10 each from Antek. I have not tried a center tapped trafo and I have not tried lower than 12VAC. This is an excursion on your own if you do so.
I get 14.5VDC from that test from the center of the two LM317 Diodes to GND.



So with 14.5VDC on each please wire up your 1k dual log or dual linear pot. 1k is best. You may get away with 1.5k or possibly 2k but I think 2k2 is to high. If you have 2k2 you could probably put a 2k resistor in parallel with each gang of the pot.

The pot gets wired like this...
You need 4 wires. One wire goes to the wiper on each gang. One wire goes to the right side of the first gang and one to the left side of the second gang, or reverse, doesnt matter. But if we have pins 123 on each gang we do wire pins 2 with one wire each and then we wire pin 1 on one gang and pin 3 on the other gang leaving a pin 1 and a pin 3 open since we have two gangs. See? We do NOT connect the two gangs in any way to each other. This is not the Lightspeed.

So stick two wires from one gang in the terminal block marked POT.
Do the same with the other board and other gang.
Your LDRs are NOT HOOKED UP to the boards right now.
Turn the pot to halfway.
Connect the two wires from your Series LDRs to one of the boards. Do not get - and + reversed.
Assuming you actually have the 14.5VDC we measured a while ago then now you should have a resistance on the Series LDRs.

Now we need to become very careful. Until we are done with this board we will NOT remove the DMM from the series LDRs and we will not connect the shunt LDRs.
Turn the pot slowly in a direction that increases the resistance of the series LDRs. If this direction happens to be counter clockwise then good. If not then return the pot to the halfway point and use the two wires from the other gang instead of this gang to control the series LDRs.

With DMM still connected and the correct gang affirmed please slowly turn the pot all the way counter clockwise for full resistance. A balancing act will now start and you will fully be on your own for much of it as it depends on the resistance of your LDRs at certain voltages and currents. Right now my two 100k pots are measuring 99k5 and 55k5. These pots are the most important in setting your series and shunt max impedance.

The 100k pots will help set the max impedance. You will turn this until you get the max resistance you want to see on that series. The pot we are talking about is P4.

Now we will turn pot P3. This is the dangerous one. It is slow to respond so we can see the danger coming and we have 25 turns to use so its hard to screw up and kind of hard to do right. This is a balancing act between pot 4 and 3. When you get P4 set you will use your 1k dual gang pot and you will dial it clockwise and the SERIES LDRs will decrease in value. Lets remember our shunt LDRs are NOT ON at this time. You can turn them off by not plugging in these two 1k pot wires to that board. So we are safe.

Now begin turning clockwise to reduce the value of Series. When we get in 250R range we will become very careful and if we hit 40 at any time we will quickly turn the value of the series LDRs higher. Going under 40 is dangerous. It means to much power is going to those LDRs.

So what are we doing with P3? Well we are careful at 250 and we slowly decrease until we hit 50 or we hit the end of the 1k dual gang pot. If we hit the end and the resistance is anything in the 50R-250R range we are fine. Hell, if its 1k you probably dont care because you wont be using that part of the pot.
If we have not turned it all the way clockwise and we already are at 50R then we turn P3 to increase the 50R to 100R and then continue with our 1k pot in a clockwise rotation until we hit 50R. Repeat.

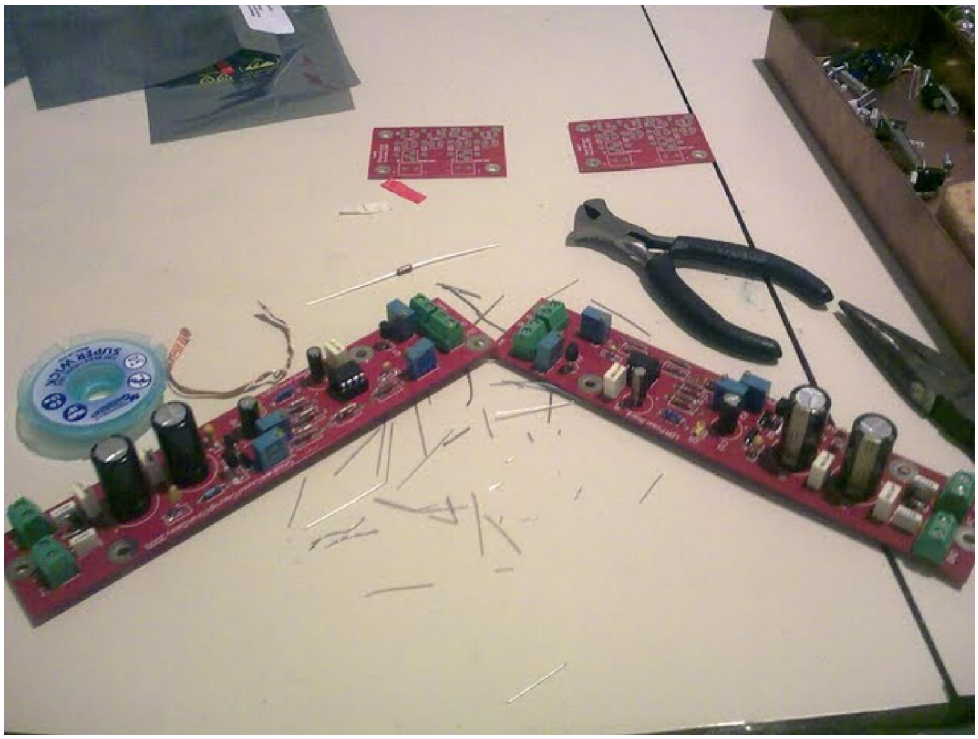
So we are creating a window of resistance from 50R to the max resistance we want. Once you get your 50R-250R at the far end of the series resistors resistance then we will turn 1k dual pot again all the way counterclockwise. You will find it is now lower than you left it. So we will turn the 100k P4 pot til we get back our desired resistance and we confidently turn the 1k dual pot all the way the other way again and we find that the low resistance is higher so we go back and forth until we are satisfied.

Lets look at a situation where you have done all you can and you can make an attenuator with the LDRs but you cant get the max resistance you want. They you can start to dial down the voltage using the 5k pot near LM317. The 200R pot near the 5k is only fine fine fine tuning. So that 5k, for instance just allowed me a minute ago, to turn a 9k LDR attenuator into a 15k attenuator. From 15k-100R was the range I got easily by messing with dropping the voltage a bit on 5k and working a little with 100k P4. Easy

Trust me. It works. Yes its frustrating and sometimes you will have your voltage to low or your P4 pot to low and you will have zero resistance meaning its so high that your DMM wont read it. About 25MegOhm. Persevere. This is not the time to quit or email me for some magic explanation. I am not saying you are on your own. I am simply saying this IS a bitch to dial in and to expect it to be easy will lead to exasperation.

Building is easy. Dialing in is not. Once you dial it in though it will be easy the next few times as you decide to listen to the sound of different impedances. And when I say dialing in is not easy thats a little false. Its just that you need to be prepared for this to take as long as it took to build the boards. Its not hard to dial a few pots :)

Next up.. Shunt.



So now your series work well. If not do not proceed til they do.
Okay we can turn the 1k dual pot back to halfway. Plug in the two wires coming from the 1k dual pot that were not used when setting Series. What? You left those plugged in? Well, you may have fried your shunt LDRs.
Okay you didn't fry them? Let's proceed. Series unplugged. Shunt plugged. 1k dual pot at halfway. DMM on one shunt LDR to keep measuring it.

We repeat the same process as we did in dialing in the Series LDRs. This time we want the max resistance to be kind of close to the max of the Series. We dont care if we are 1k off or less. Well, you might care, but I don't. And its nice cuz we can get, with perseverance, within less than a hundred ohms difference.
In the case of the Shunt we have to go back and forth more times because we really do care about the min resistance whereas with the Series we had a big range for min resistance of 50R-250R or so.

So for Shunt we want 50R. You can go lower, like 45 or 40 but I warn that doing so will age your LDRs faster than you might like. 50R is recommended. 50R means that you will never mute your LDRs by turning them down all the way because there will still be 50R resistance to ground. It will be a low listening level. But not all quiet. You could add a relay to ground if you wanted. This would work with a mute switch, but thats your project, not mine.

Well, like I said follow the same procedure as with Series. Once you can go from 50R to your max resistance with one full turn of the 1k dual pot then you have finished. You may turn the 1k pot

back to halfway. Plug in the Series LDR wires from the pot to the controller board. With half way on the pot and both boards running and all wires plugged in you can do a sweep with your volume pot, 1k, and read on your DMM that all is well. Plug in your CDP and Amp. :) DONE.