

Hasse Modifications to the Carvin Vintage 16 Guitar Amp

The Carvin Vintage 16 amplifier is a 16 watt combo amp with Reverb and a single 12" speaker. The power stage consists of two EL84 power tubes run in Class A/B push pull style, and the pre-amp section has three 12AX7 tubes, one is used for the two gain stages of the pre-amp, one is used to drive and recover the Reverb signal and one is used as the phase inverter.

I've been interested in getting my hands inside one of these amps for awhile now, and the opportunity recently came up to do so, and I grabbed it. The owner of the amp gave me pretty much Carte Blanche to do whatever I wanted with the amp. He wasn't happy with it and was set to give up on it, so instead of that he gave it to me to see what I could do with it. There were several issues he had with the amp, but the main problem he had with it was the over abundance of mid range that he just couldn't dial out of the tone; and he wasn't satisfied with the results of any pedals through the amp either. Besides that, the gain available from the amp is pretty low, and he wanted some increase there, but the overriding problem was just the tone of the amp he didn't like. I have corresponded with several other people though who were looking for more gain from their V16's, at least one of those people tried some different tubes, I think JJ's, and was happy with the results.

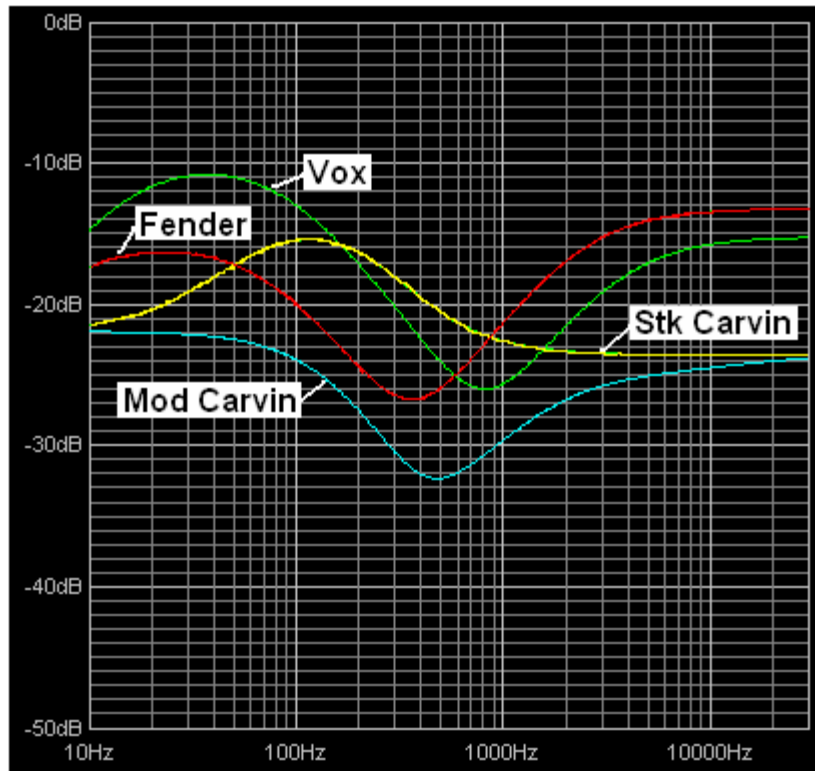
But from my taste testing of the amp in the showrooms I had to agree about the gain thing, I typically like an amp with a little more than this one has available. After I received the amp for mods I spent quite a bit of time playing it just get a handle on all of it's tonal qualities. I have an old Fender Silver Face Princeton Reverb (with 12" speaker) I played back to back with this V16 for a long time. In fact, to keep things on an even playing field I played both thru the same speaker cabinet. The two amps are really very similar in tone, levels of gain and volume, with the edge going to the Princeton Reverb for better tone and higher levels of gain; and the edge to the V16 for a little more volume, it was just a little louder. So, I decided to use this PR as a baseline to compare the V16 against as I started to develop it, and by the time I was done the modded V16 just blows the PR out of the water! There is NO comparison, in every respect (tone, gain level, volume) the modded V16 is far superior to the PR. I have long planned on getting inside the PR to make it more gig worthy; I now have a new goal to reach. If I can get the PR close to the Modded V16 I will be very happy.

Anyway, so what did I do to the V16 to make it so good? Okay, here's the lowdown, looking at the mods from the input working toward the output:

1. Plate Load Resistors, the stock plate load resistors for the two gain stages are 220k (common for Carvin amps). These resistors just make the sound too grainy, I don't like them. I much prefer 100k plate loads. Change out R2 for 100k and change R4 & R41 for 47k (The second gain stage uses a kind of a split load with a small capacitor to bleed some treble off around the top resistor. Only in an apparent after thought they eliminated the cap. Anyway, each of the stock resistors is 100k, changing them to 47k nets 94k resistance, close enough for

- guitar amps! This will smooth out the distortion making it more vintage like and more pleasant.
2. The stock V16 has a funky high pass filter just after the first gain stage before the Volume control. I assume the intent with this filter was to brighten the tone. Then they have a treble bleed cap just after the Soak control to bleed some of the brightness off. This doesn't make sense to me, let's clean this up and do things a little more common to vintage amps. The simpler we can make it, with fewer obstacles, the better we can make the touch response.
 3. Add a Bright Cap, the stock pcb has a place for a Bright cap around the Soak control, but it was not used in this amp. Some amps may have a cap here, some may not. It probably depends on the year of manufacture. Adding a small value Silver Mica cap here helps add some sparkle to the tone at low Soak settings, as the Soak control is increased the effect of the Bright Cap is diminished until at full Soak it is nil.
 4. Volume Control, this was one of the things that really bothered me about this amp. Due to the design of the amp, with this control placed before the Tone Stack instead of after it like all the other Carvin tube amps, reducing the volume shunts the signal before it gets to the tone stack, where it is going to loose strength anyway, and the combination just shoots the tone all to hell! I didn't like using the Volume control at all and felt I only got decent tone with it cranked all the way up. It might be better to label this control "Suck" because as you turn it down all the quality just gets sucked out of the tone. A Post Phase Inverter Master Volume works much better here, letting you drive the entire pre-amp and phase inverter hard, and get some clipping going in the phase inverter before reducing the volume. Ahhhhh, much, much better!! This is one of three must do's on this amp.
 5. Tone Stack, the type of tone stack used on this amp is the typical modified Baxandall style stack Carvin uses in all of it's modern tube amps. This is a good stack, but it differs very much from the style used in Fenders and Marshall's and most all other amps that copy those. The problem here is it is tuned for pretty strong mid range response. And coupled with the stock GT12 speaker, which also has a very pronounced mid range, it was just too much. Replacing two capacitors in the tone stack with 100pf Silver Mica caps helps to scoop the mids a little and makes the amp sound more like a vintage amp. Below is a graph comparing the response curve of the stock Carvin amp to the response curve of a Vox and Fender amp with typical values and the response curve of the modified V16 stack. Note how the stock curve has a pronounced lower mid range hump? And how the modified curve is much closer to the shape of the typical Fender/Vox style stack. This mod does lead to a little more insertion loss, so there is a small penalty to pay for the scooped mids tone. But overall I think it is worth it. We'll make up for the lost gain later.

Tone Stack Comparison w/ controls at 5



6. Raw Control, since there are only two gain stages in this amp, using a full tone stack to EQ the tone results in quite a loss of gain from the signal. To help here I installed a potentiometer to by-pass the tone stack, and labeled it the Raw control. By-passing the tone stack results in a great increase in gain. The increase in gain comes with the price of the loss of the tone stack controls, but I have to admit that the frequencies that are there are just about perfect. I didn't miss the adjustability of the tone stack at all! This is the Second of the three Must Do's for this amp.
7. Negative Feedback, this amp uses Negative Feedback (nfb) to reduce gain before the phase inverter. How this works is part of the output signal going to the speaker is taken and fed back upstream just before the phase inverter, which causes it to cancel out some of the signal going to the phase inverter from the pre-amp. This is a very common practice to add stability to an amp. Not all amps use nfb, for instance the very highly loved Vox AC30 used no nfb. And in my Carvin Nomad/BelAir mods one of the things I typically do is add a 100k potentiometer to the nfb circuit to allow the user to decrease the amount of nfb, resulting in increased gain and harmonic content of the amplified signal. I experimented with a potentiometer in the nfb circuit of this amp also, but after much experimenting I decided that I just flat preferred no nfb at all. Just disconnect it completely and the amp responds much, much better. Touch sensitivity is increased, gain is increased, and harmonic complexity is increased. This is the third of the three Must Do's on this amp.
8. Phase Inverter Bias, since I went to the Vox AC30 for inspiration on the nfb circuit, I went back to it for inspiration on biasing the phase inverter, since these

to functions are so closely related. So, I replaced all of the resistors in the phase inverter circuit with identical values for the AC30. The difference is not as great as the other changes, but the amp does respond well to these values.

That's it, just eight little changes (okay, a speaker swap would do wonders too) are all that stand in the way of boutique quality tone from your little Vintage 16. Go ahead, make a Princeton Reverb (or Marshall 18 watt) owner weep!

Summary

Warning, there are potentially dangerous voltages lurking inside the amp!

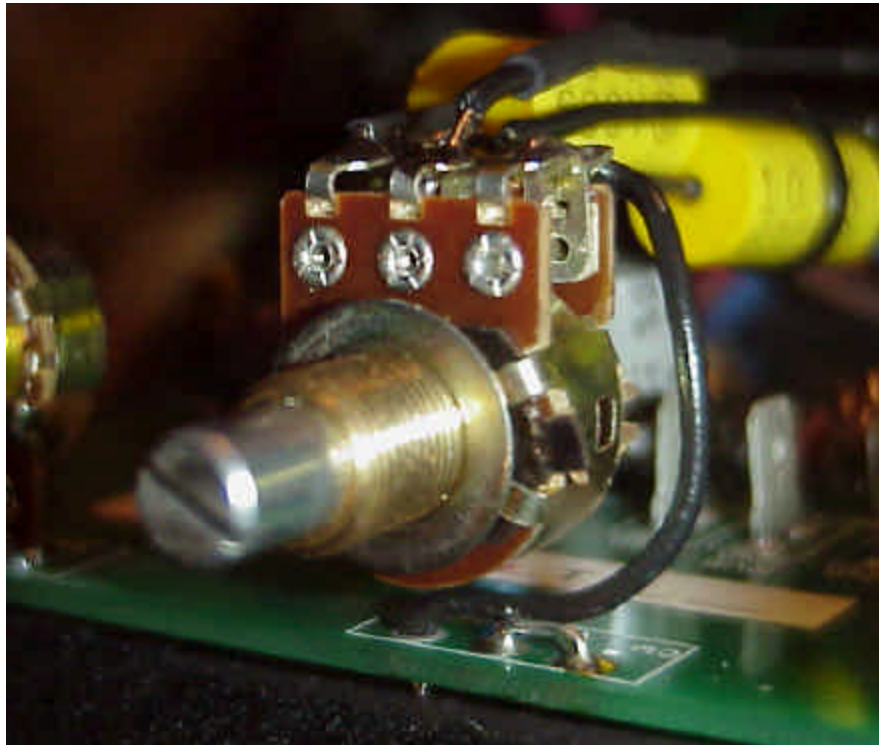
Even with the amp unplugged voltage can remain in components for some time. Always unplug the amplifier before working on it. Use only insulated tools to touch or work on any parts inside the amp. Never touch any of the parts with your fingers. Research and find out how to drain filter caps and how to work safely on tube amplifiers. If you do not know how to do this contact the author for help!

To perform these mods you must remove the chassis from the cab, then remove the pcb from the chassis. Remove all of the tubes, remove all of the chicken head knobs and the pot retaining nuts, remove the input jack retaining nut, disconnect the wires from the pcb and remove the three retaining screws holding it in place. Note: the LED for the On light will just slip out the backside when you slide the pcb back, you don't have to disconnect anything for this. To remove the components use desoldering wick on the back side to remove the solder and gently push the leads toward the front side of the pcb. Flip it over and heat the leads of the components one at a time and gently pull them free. Don't concentrate too much heat directly on the pcb traces or they can lift. Don't force anything, when the solder gets to the right temp it will melt and things will move. The hardest thing to remove is the Volume pot, remove as much solder as you can with the wick and gently persuade it to leave the board.

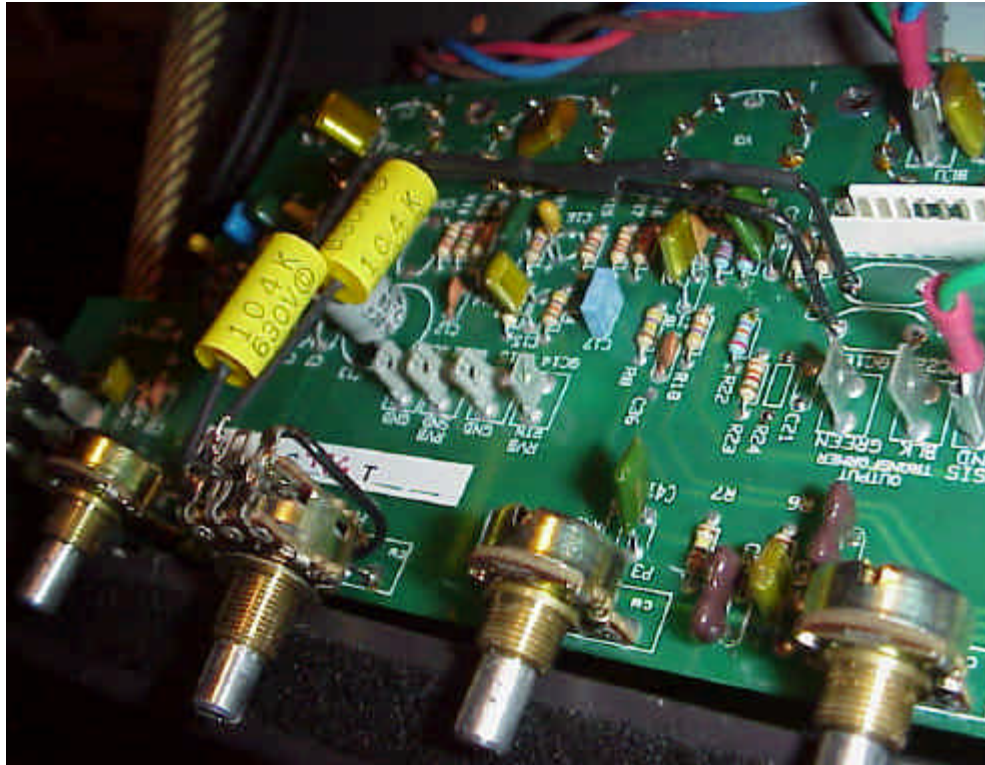
1. **Plate Load Resistors:** Change resistor R2 to 100k, resistors R4 & R41 to 47k
2. **Clean up:** Remove resistor R40 and capacitor C32. Replace R40 with small piece of wire. I use part of an excess length of lead from a resistor or capacitor that has been trimmed off. Bend it to fit the holes for R40, insert and solder.
3. **Brightness:** If your amp does not have a cap here (C4) insert one, I recommend a 100pf Silver Mica.
4. **Post PI Master Volume:** This mod is a little tricky, probably the trickiest of any of these mods to complete. Take your time and work carefully to make you work as neat as possible. Remove the Volume pot (see remarks above), and jump the two terminals shown with a bare lead like you did in step 2 above. See pic below:



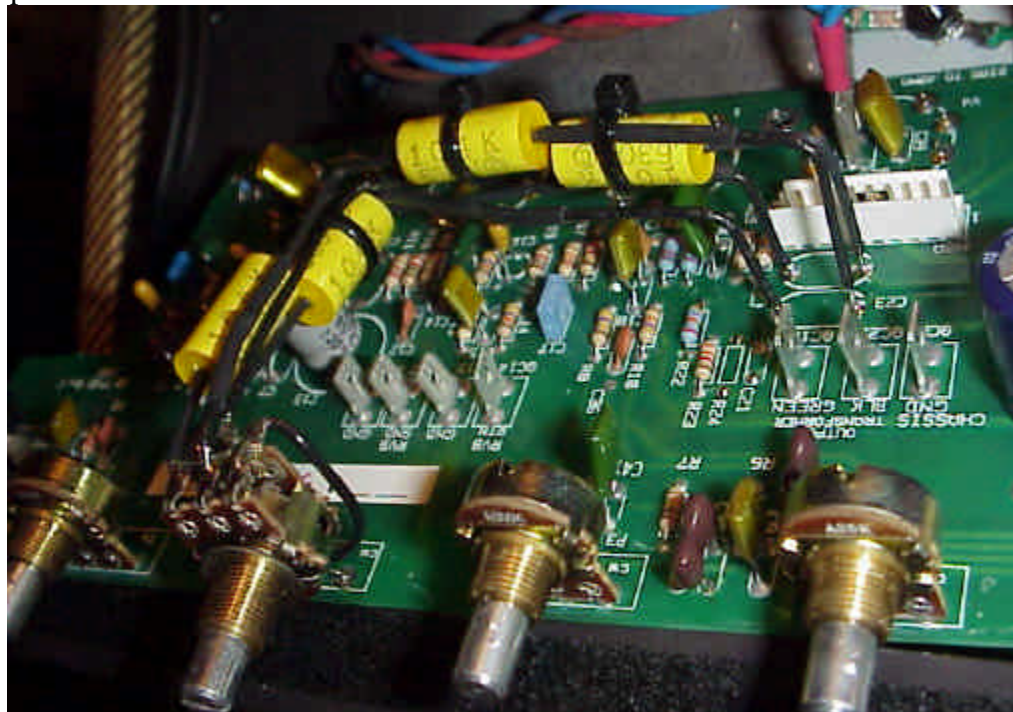
Then connect the two far right (with the shaft pointing towards you) posts of a dual 1M pot together with a wire, and run that wire underneath the pot and insert it into the remaining open hole in the pcb, as shown below:



Next, Remove capacitors C22 & C23. Now install two new .1uf caps from the pcb to the far left outside terminals of the pot, as shown below:



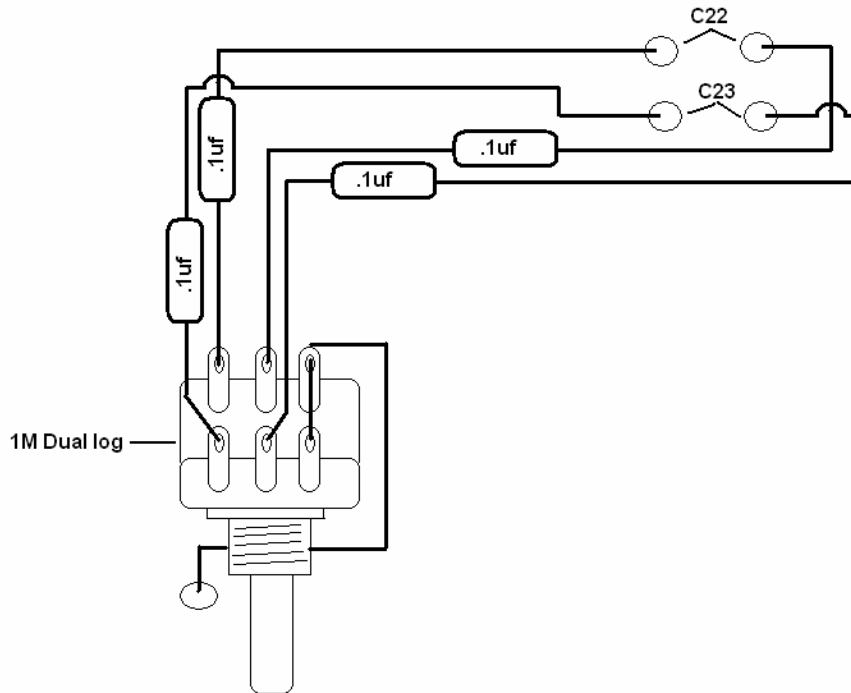
Now install two more .1uf caps from the wiper (center) terminals of the pot back to the pcb as shown below:



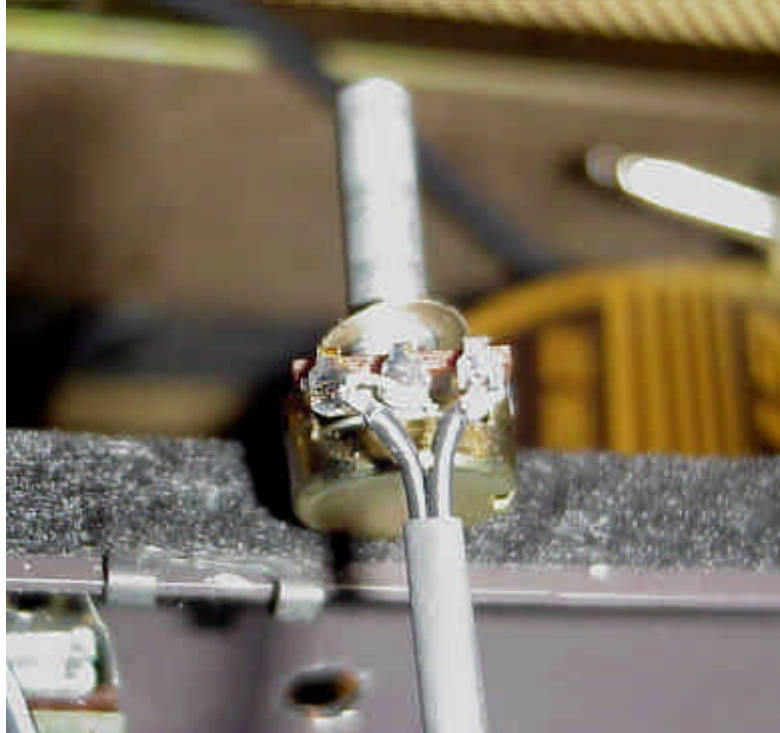
To recap, what we've just done is to remove the volume pot and replaced it with a hard wire. Then we removed capacitors C22 & C23 and inserted a dual 1M pot and four new capacitors in place of C22 & C23. This is our new Volume control, and it is

placed after the phase inverter, commonly called a Post PI Master Volume. The stock caps were .047uf, the new caps are each .1uf, which when ran in series will result in .050uf, which is close enough to the stock value of .047 that the tone is virtually unchanged. Note: if the leads of the caps are not long enough to reach between the pot and the pcb you will need to lengthen them I added lengths of #20 solid core wire to the cap leads in this installation.

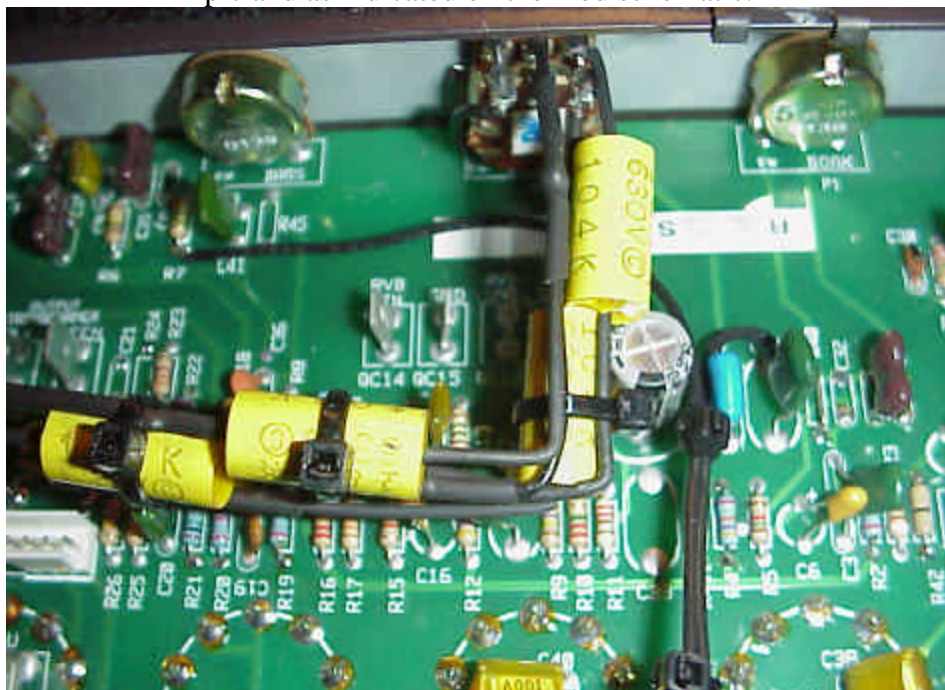
Here is a wiring diagram of the master volume circuit:



5. **Tone Stack Mod:** Remove capacitors C35, C8 & C10. Install 100pf silver mica caps in place of C8 & C10, do not install anything in place of C35, leave it open.
6. **Raw Control:** For this mod you have to mount a pot somewhere, I chose the rear panel of the amp as there is plenty of room there. Connect the center lug of the pot to the outside lug to provide zero resistance between the two outside lugs with the pot turned full clockwise. (see photo below).



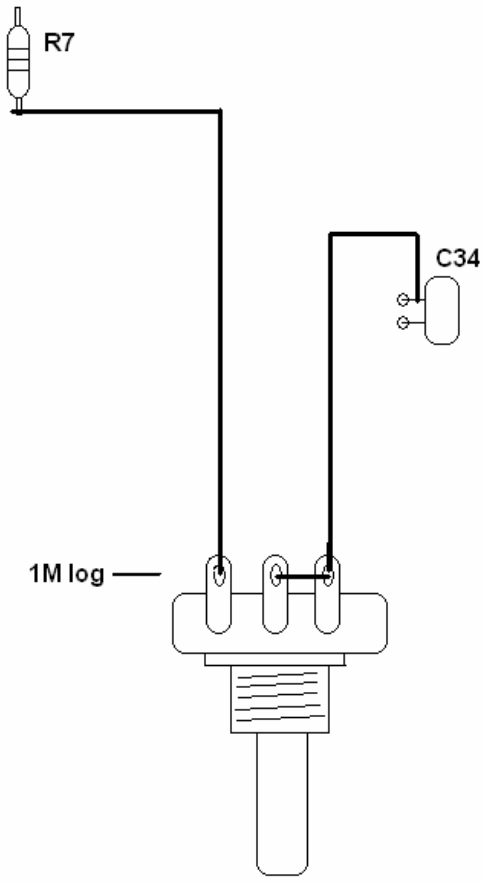
Then connect two wires to the outside two lugs. Run one of those wires to capacitor C34, clip the wire to length and strip the insulation from the end, bend a small j-hook shape into the end of the wire, slip the j-hook around the lead of C34 as shown in the attached pic and as indicated in the mod schematic. Run the other wire to resistor R7, clip the wire to length and strip the insulation from the end, bend a small j-hook shape into the end of the wire, slip the j-hook around the lead of R7 as shown in attached pic and as indicated on the mod schematic.



Drill a hole in the rear panel where you want it and mount the pot and add a knob to the pot. I labeled the control RAW with rub on letters from a local supplier.



Here's a wiring diagram of the Raw circuit:



7. **Negative Feedback Eliminator:** Remove resistor R24 and capacitor C21 (in the amp I worked on C21 was not installed to begin with. It may or may not be on your amp. If it's there remove it, if not it's no big deal)
8. **Phase Inverter Bias mod:** Remove resistor R20 and replace with 1.2k, remove R19 & R21 and replace with 1M, and remove R22 and replace with 47k. All resistors should be ¼ watt rated metal film.

Good luck, if I can be of help just contact me at hasserl@netzero.net and I will help you out as much as I can.

12-1-2004 Note: After my second V16 mod I found the tone through the amps speaker was rather thin and lacking. The original mods were developed on an amp chassis only, I didn't have the cabinet w/ speaker. I developed the mods while plugging the amp into a closed back cabinet. I actually used two different cabinets, one is a 1 x 12" closed back Jensen Bass Reflex cab fitted with an Eminence Tonker, the other is an old Fender style 2 x 12"¹ closed back cab fitted with one Eminence Red Fang and one Eminence Governor. (the Jensen sounds much better and is the one I mostly used) There is a major difference between playing this amp through it's cabinet mounted speaker and through a good closed back cabinet. Anyway, after I performed the above mods in the second amp and installed it back in the cab and fired it up I wasn't happy with the lack of bottom end, so I ended up making one more step to the above listed steps:

9. **Coupling Cap Change:** Change out the C3 Coupling Cap from .0047 to .022.

¹ Richard Hassebrock 11-19-2004