Rogue GS100R Solid State Amplifier Modifications

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The Rogue GS100R is a 2x12 100W amp. As far as I can tell, Rogue is Musiciansfriend.com's house brand, but once you open it up you can see that on one of the circuit boards it says "Designed by HANA Electronics Co., Ltd." which is an electronics company based in Korea.

I bought this Rogue GS100R from my guitar instructor five or six years ago, and since then it has been my main amp. The clean channel sounded fine, but the distortion channel had always sounded sort of terrible. The distortion was harsh and no matter how I adjusted the tone controls it always sounded gutless. My original plan was to build a solid state guitar amp from scratch only reusing the Rogue cabinet I already had. Thankfully, Professor Errede convinced me that this would probably take far too much time for me to be able to complete in one semester, so I scaled my plans down and resolved to do what I could make the drive channel sound better.

The first step was to take some measurements in order to see just what was making the drive channel sound so terrible.

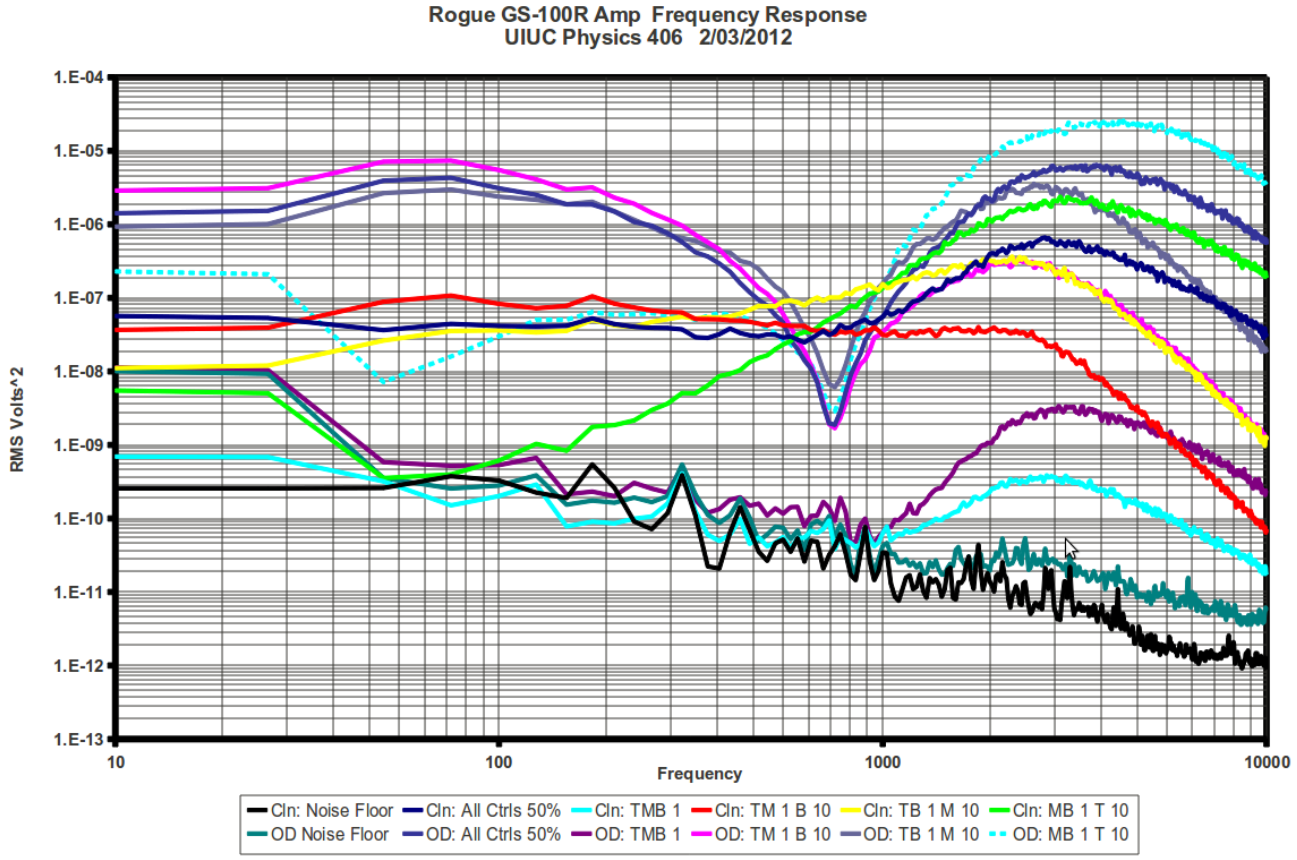

Figure 1: Frequency Response of Rogue GS100R Before Modifications

Figure 1 is a graph of the voltage across the speaker terminals versus frequency as white noise was fed into the amp at various settings, and it highlights the first of the major problems I wished to address: why the amp sounded gutless. Notice that in all the measurements taken of the drive channel (excepting the noise floor), there is a voltage drop of over three orders of magnitude in the frequencies around 700-800Hz.

Professor Errede suggested that there may be a T-type notch filter somewhere in the preamp circuit that was causing this drop, but to know for sure I would have to examine the circuit diagram. After attempting to contact HANA Electronics and receiving no response it became apparent that I would have to trace and draw the circuit by hand in order to make any progress.

Four weeks later I had what you see in Figure 2.

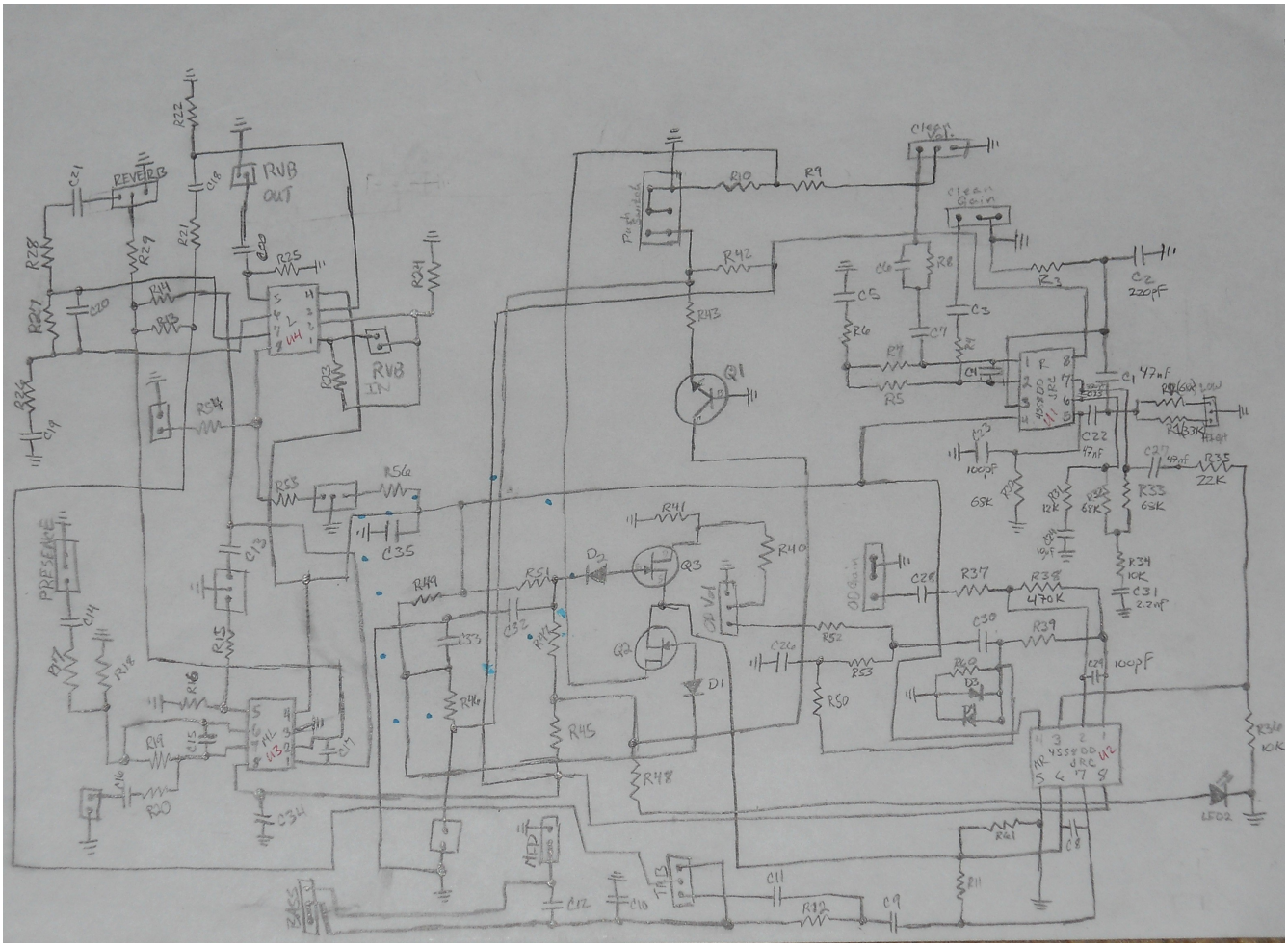

Figure 2: My original hand-drawn schematic for the Rogue GS100R

Using this schematic it was very hard to see where anything went or how the components connected. It also doesn't have any of the resistor or capacitor values, but it did make it much easier for me to redraw the circuit in easy to read sections. For the purpose of understanding the modifications I made, the only diagram we need to look at is the one related to the drive channel circuitry.

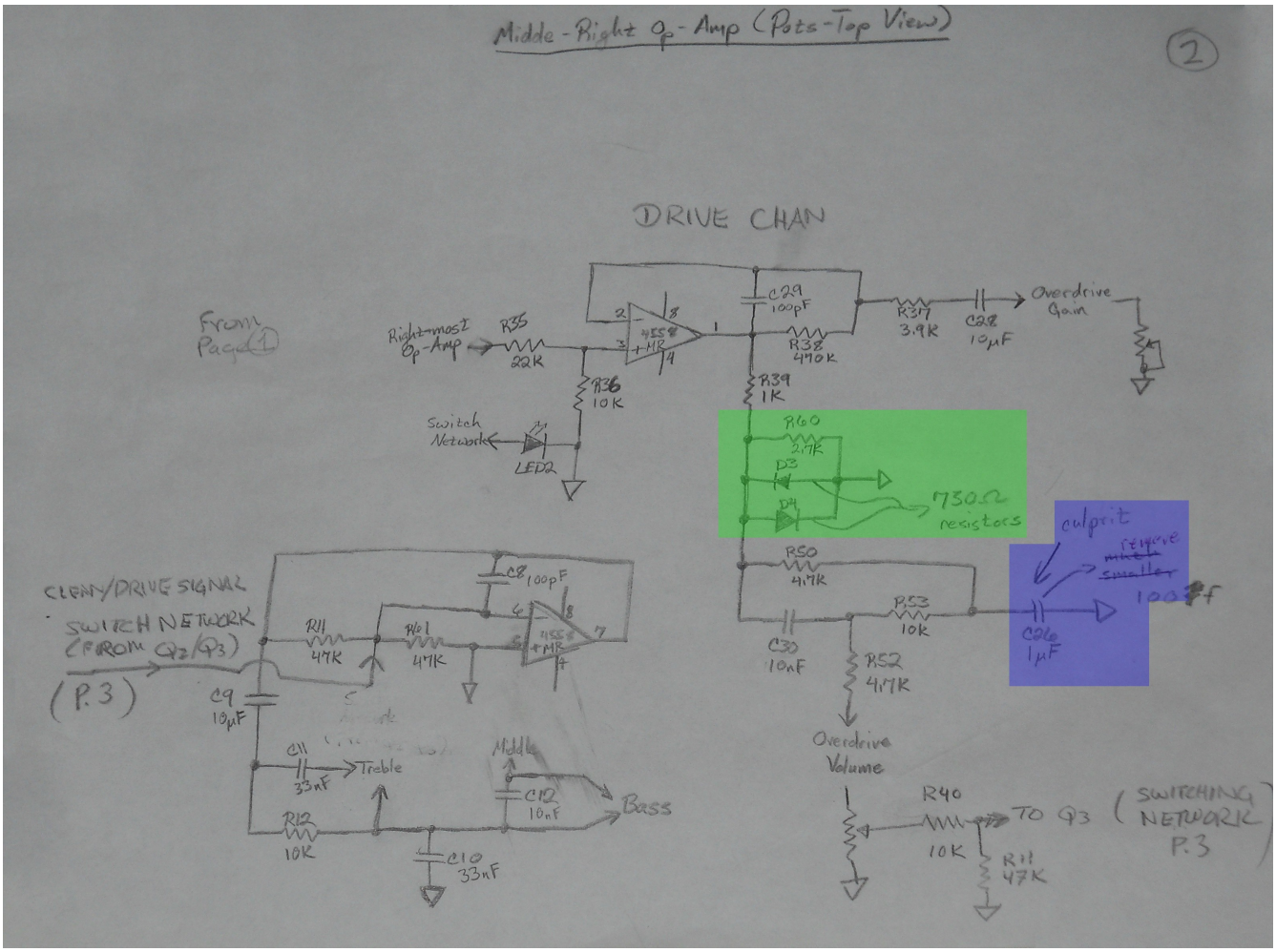

Figure 3: Drive Channel Circuitry (Changes hilighted)

After simulating various sections of the preamp circuit in MultiSym, I found that the significant notch in the mid-range frequencies first showed up in the section shown in Figure 3. After a few more simulations it was determined that the culprit lay in the blue highlighted area of Figure 3. Specifically capacitor C26 (the one labeled "culprit"). By removing this capacitor from the circuit I was able to completely eliminate the notch in frequency response from this section.

With my first goal taken care of, and the distortion channel already laid out in MultiSym, it seemed prudent to see what could be done about changing the harshness of the distortion.

The initial simulation showed that the waveform was very peaked, somewhat like a sawtooth wave, which was causing lots of higher harmonics when listening to the speaker output. Professor Errede suggested that by adding a resistor between the diodes and ground (green highlighted area of Figure 3), I could soften the peaks of the waveform and have much more pleasant distorted sound.

After another simulation, I installed two 1k 25 turn trim-pots between the diodes and ground. The trim-pots allow me to change the resistance and alter the waveform to my liking without the necessity of unsoldering and resoldering new resistors. They also open the possibility of having an asymmetrical waveform, which I will experiment with at some point in the future. For now, both of them are set to 750 Ohms which gives me much improved distortion characteristics compared to the unmodified circuit.

The final step was to measure the frequency response again to see how well the modified amp stacked up compared to the original.

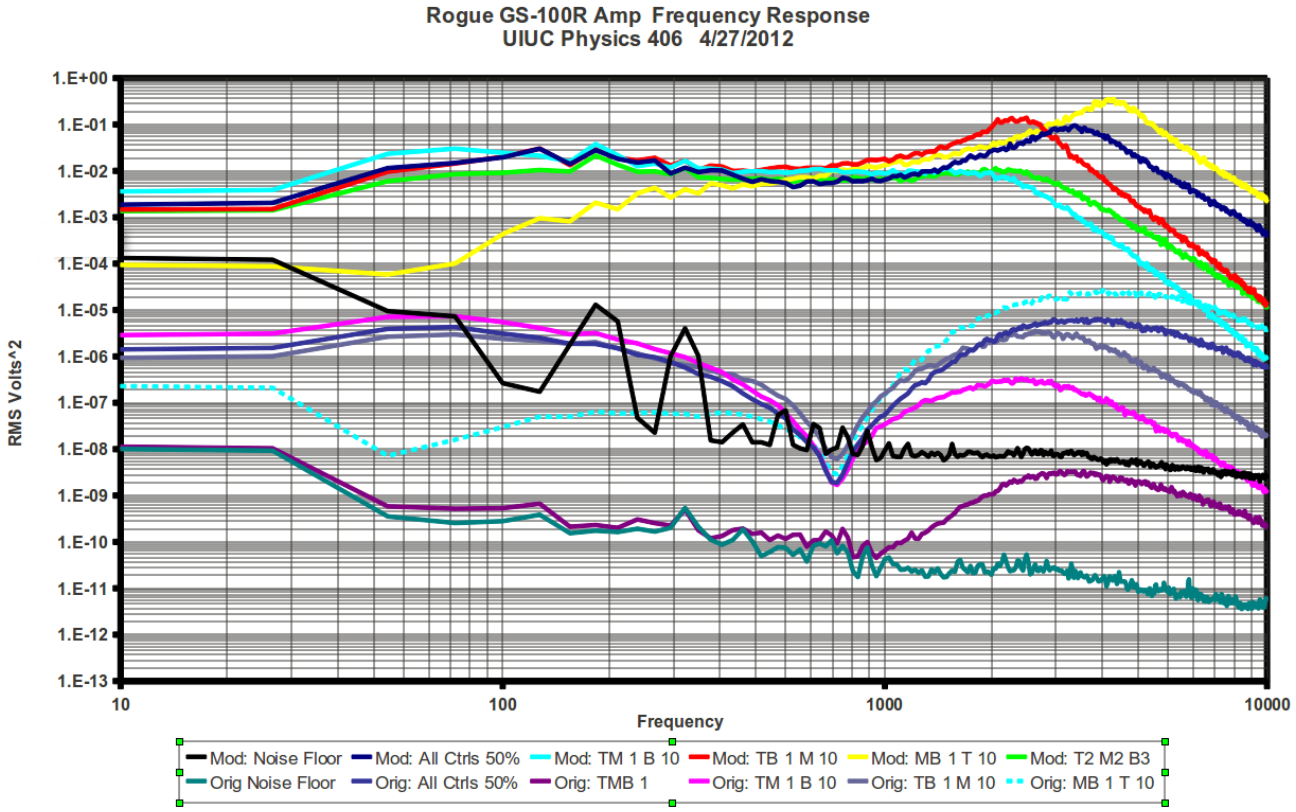

Figure 4: Frequency Response of Rogue GS100R After Modifications

You can see in Figure 4 the original drive channel measurements (lower on the chart) versus the modified measurements (higher on the chart. This clearly shows the vast improvement that was achieved with my simple modification; the notch in the midrange response was entirely eliminated.