1 The Carlin Compressor

A very long time ago now, my music dealer showed me a guitar compressor (no need to mention the brand), asking me if I could make something better. I looked at the circuit and decided to try and in a while, this is what I came up with. For the benefit of anyone who'd like to build one, here's how I reasoned:

A guitar compressor should adjust the gain to compensate for the attack and decay, with "normal" gain at the beginning of each note, then increasing the gain as the note dies down. This makes the tone "hold" or "sustain" much longer than otherwise. Apart from this, it should not change the character of the note. This also means low distortion – unless you actually want a measured amount of distortion added!

It must react immediately to the tone starting, or else the character of the guitar will be lost entirely.

Another thing: since the gain is high when the guitar is silent, the inherent noise should be kept as low as possible. Current consumption should also be low. The unit I looked at had little or none of these features, but I took the basic idea of using a JFET as a voltage controlled resistor in my design – it turned out just a little bit more complex, but a lot better, I'd say.

The first BC548b (or any low-noise NPN transistor – there are many suitable types. I hand picked the two leftmost transistors for low noise!) as an emitter follower stage, not to load down a high impedance guitar pickup. The 4.7k+2.2nF serves as a filter at the input.

The JFET 2N5457 and the 47k resistor form a voltage controlled signal attenuator – the JFET is set to have high resistance with no signal, but if the bias goes up, the resistance goes down and the signal is attenuated.

This signal goes to the 2-stage amplifier (next two BC548b) feeding the output volume control. The sustain pot controls the gain of this amplifier – from about 500 down to some 17.

The output feeds the phase inverter BC307 (lots of PNP types would work) feeding the active rectifier (the left pair of BC548b's), a pair that will charge the 4.7 uF capacitor immediately the attack comes (you will notice that the transistors are biased "on" to start rectifying even small signals!). This voltage is the control voltage fed to the JFET gate, lowering the total gain – as it happens, due to the characteristics of the JFET, compression will be about 1:3.

The JFET is quite non-linear, however, and you would get a significant 2nd harmonic distortion – to cancel it, half the signal voltage is added to the JFET gate (at the junction of the sustain pot, the 1.5k and 1.1M resistors, the voltage is some 1.97/0.47=4.19 times the input voltage, divided down by the 1.1M and the 150k resistors (the latter tied to the FUZZ pot) by a factor 1250/150= 1/8.33 – close enough. This leaves only a small residual 3rd harmonic distortion.

However, if you want more distortion, there is a second pair of BC548s also rectifying, but with no capacitor – this means the control voltage varies with amplitude, and you get a fairly strong 3rd harmonic distortion, but no clipping – you still have the compressed envelope of the

guitar. By turning the FUZZ pot, you mix the voltages and can get just as much or little distortion as you like – unlike just about any other unit.

The 22k trimmer sets the bias voltage near cutoff for the JFET – about 1.5-1.8 V if I recall correctly. With no input, you set the sustain pot to max and listen to the output noise, and set the trimmer to where it just starts to decrease. You may appreciate that it is set with the base-emitter voltage of the second BC548b transistor as the reference voltage and NOT a fraction of the battery voltage, and thus won't alter as the battery ages (within reason, of course).

Another feature: the 2.2nF capacitor across the JFET forms a low-pass filter, cutting above 1500 Hz with no signal. But when the signal is strong and the JFET conducts, the cutoff frequency is very high. Thus, the full audio spectrum is passed when the tone is strong, but as it decays (and the higher frequencies have died out, anyway), the high frequency noise is significantly attenuated.

The original circuit board is scanned (300 pixels/inch, I believe – 64 mm between the mounting hole centers), as well as the component side, if you would try copying the design. If so, or you have questions, mail me There is no real need to copy the circuit board - if I were to make a prototype today, I'd use perf board....

Jan. 2007 - Nils Olof Carlin

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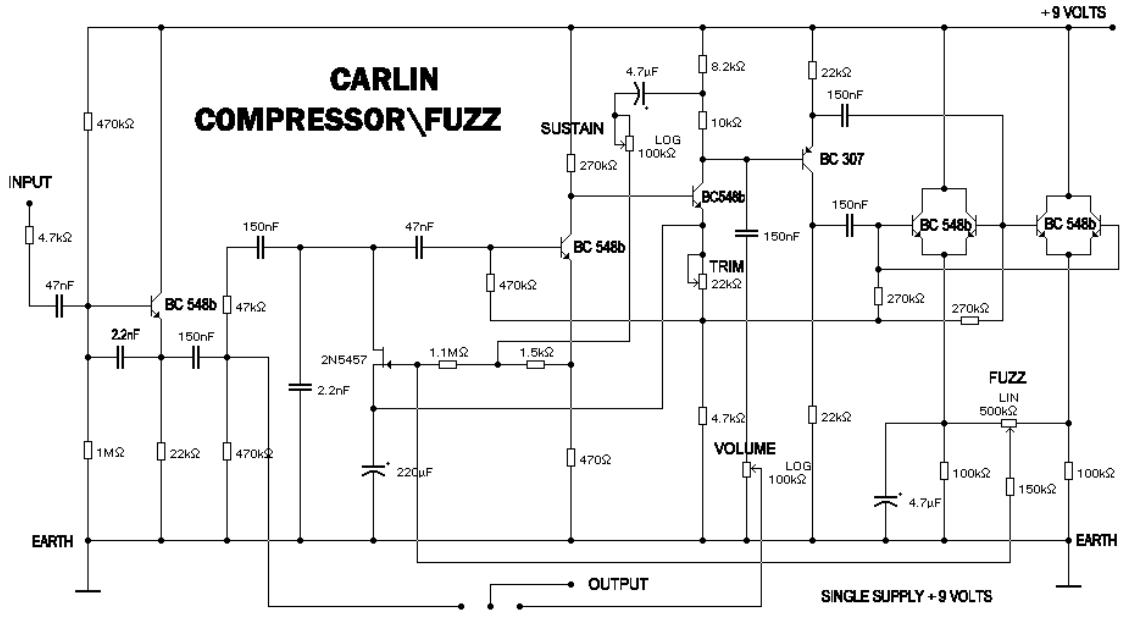
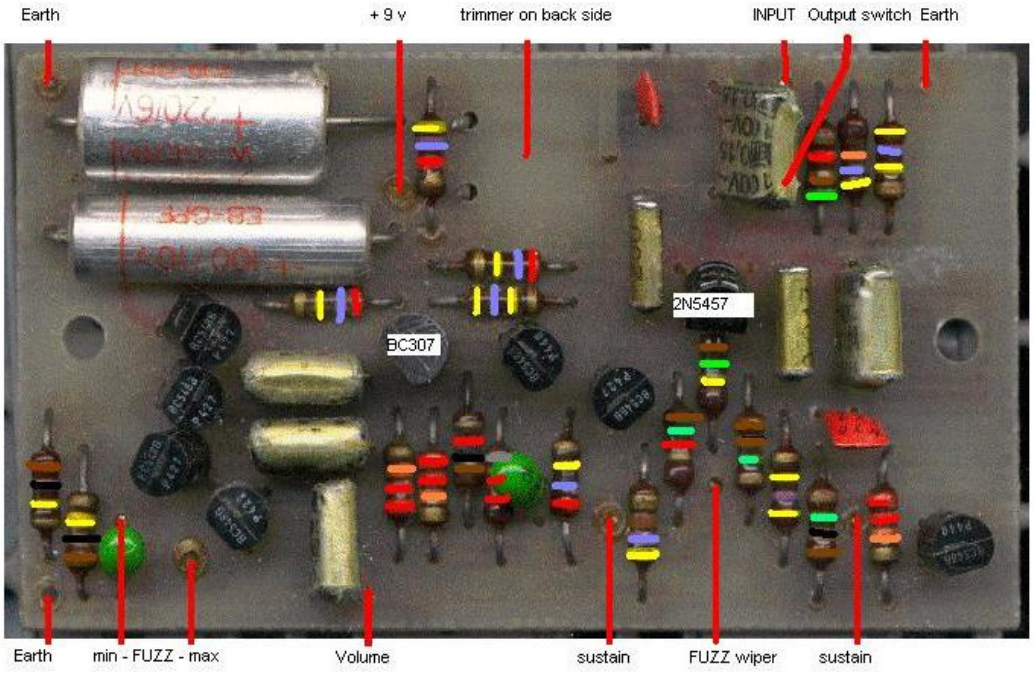
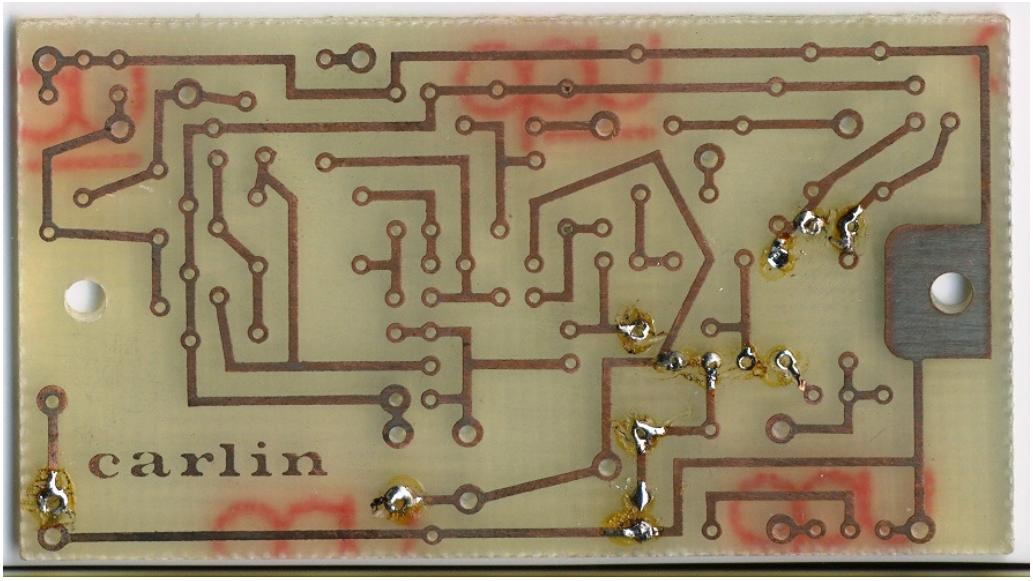



Earth
+ 9 v
trimmer on back side
INPUT
Output switch
Earth
2N5457
BC307
Earth
min - FUZZ - max
Volume
sustain
FUZZ wiper
sustain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