

Percussor

Digitally Controlled Analog Kick Drum with Tap Tempo

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Overview

Have you ever seen one of those one man band performers with the bass drum on their back? It's kind of cool with how the bass drum helps keep the beat and can really flesh out a solo performance. If you have something that will do it for you, it also helps keep time and sounds way cooler than a boring metronome click. So I started looking around at analog kick drum circuits and found one that had some great sound shaping capability and decided I had to make a tap tempo kick drum pedal.

How it Works

The concept for the Percussor pretty straightforward. It has three main parts: guitar audio path, trigger generation, and the kick drum circuit. The guitar audio path allows for the kick drum sound to be mixed in with the guitar signal so that you can send it all to an amplifier and play it together. It also has the ability to send the kick drum signal out on it's own, acting as a standalone kick drum generator if you want to send it to its own channel or something like that. As you can see below, the guitar audio path is simply an inverting input buffer and a summing amplifier, so that overall the output is in phase with the input.



The first opamp is used for conditioning the input pulse so that it will work well with the following stage.

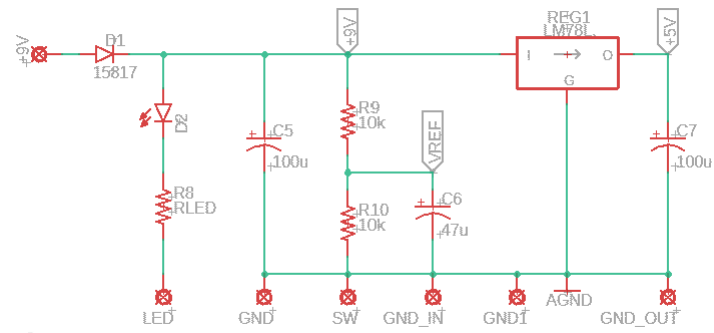


The second opamp stage is a twin T filter where the actual kick drum sound is created from the pulse by filtering the trigger. Changing the two different filters allows for changing the frequency and decay of the kick drum sound, while the attack switch allows for a faster and slower setting.

the kick drum circuitry is cool and all, it doesn't do anything without a trigger pulse repeated

[illegible]

ver section for the percussor is the same as many of my digital/analog hybrid circuits. N



Percussor Power Section

BOM

The BOM below is the list of parts I used for mine along with quantities. All parts are through hole with resistors being 1/4W. I got everything from Tayda.

Part	Qty.	Notes
100R Resistor	1	
220R Resistor	1	
1k Resistor	3	
3k3 Resistor	1	
4k7 Resistor	2	
10k Resistor	10	
22k Resistor	5	
47k Resistor	3	
100k Resistor	2	
470k Resistor	2	
1M Resistor	2	
Current Limiting Resistor	2	
47pF Capacitor	1	
100pF Capacitor	1	
100nF Capacitor	9	
1uF Ceramic/Film Capacitor	3	
47uF Electrolytic Capacitor	1	
100uF Electrolytic Capacitor	2	
A100k Potentiometer	1	16mm PCB Mount
B10k Potentiometer	1	16mm PCB Mount
B100k Potentiometer	2	16mm PCB Mount
C10k Potentiometer	1	16mm PCB Mount
SPDT Toggle Switch	1	
1N5817	1	
1N4148	6	
LED	2	
78L05	1	
TL072	1	
TL074	1	

ATTiny85	1	ATTiny45 will also work
Enclosure	1	
1/4" input jack	2	
DC power jack	1	
3PDT footswitch	1	
SPST Momentary footswitch	1	Tap switch

Schematic

The schematic for this project is a little big to be legible on a single sheet, so it is included as a separate image in the project documentation folder.

Build Notes

Here are some things I noted from building the Percussor that might be helpful to you. Please read this section to make sure you don't go through excessive frustration.

Enclosure Size/Drilling

The Percussor fits nicely into a 125B. The board is a little too wide to fit a 1590B. Drilling for the footswitches should be done with some amount of care, as I ended up having to grind out one of the corner supports to fit in the switches. Moving them more towards the center would have saved me this headache.

Jacks

Whatever jacks you use for in/out and power in 125B are fair game; no restrictions here.

Manual Mode

It is possible to do a manual mode where the Percussor behaves like a foot stomp box, meaning the pulse is only triggered when pressing the tap switch. I have some code that does this, but it makes tap tempo a little flaky, so I don't have this released at this moment

Ideas for Further Improvement

There are several unused pins on the ATTiny chip. I thought about setting up a manual time control, but opted not for this iteration. Additionally, a snare circuit could be added and triggered according to programmed patterns. These ideas are left as an exercise for the reader.

In Closing

While not a guitar effect itself, the Percussor can make your guitar playing a little more fun if playing by yourself.