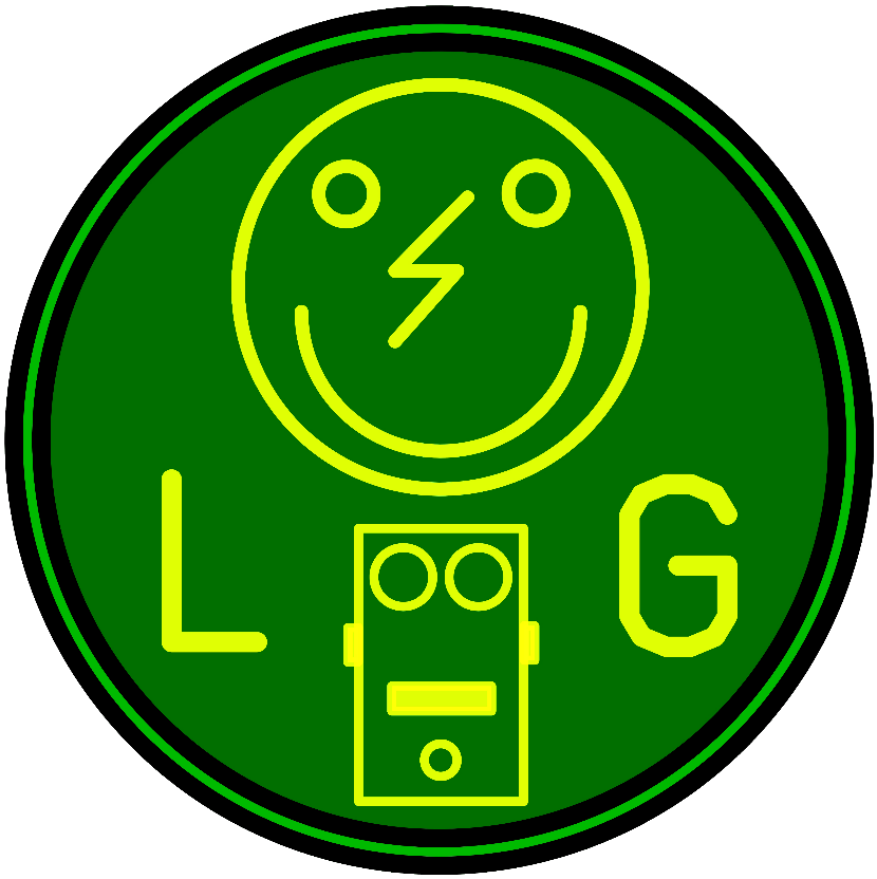
OmniWah

Building instructions

V2.1



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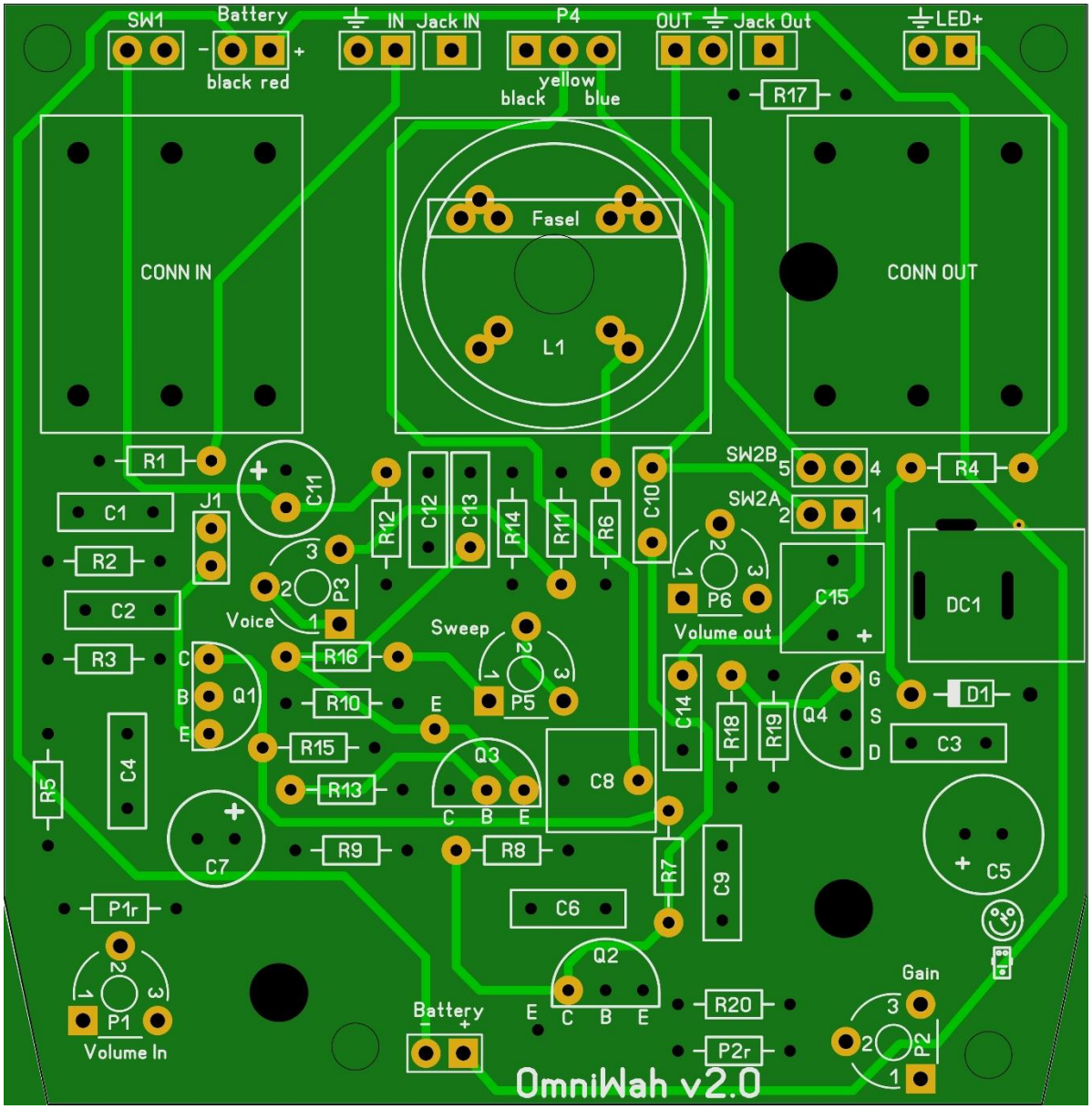
Read this entire manual thoroughly before you start building the effect! There are some available options and mods and you should choose which one you want to incorporate before starting your build.

Last update: 10-12-2017

PCB layout



Dimensions: 74 mm x 75 mm
2.91 inch x 2.95 inch

Build options

This PCB can be used to mimic a wide range of vintage to modern wahs.

Vintage Wahs

- Thomas: Organ CryBaby
- Vox: Grey Wah, v847, Clyde McCoy
- Foxx: Foxx Fuzz Wah Octave (wah only)
- DA: Dallas Arbiter Wah Face (wah only)
- FullTone: Clyde Wah
- Colorsound: Inductor Wah
- Shin Ei: Shinei Wah
- Jen: Italian Jen Wah Clyde McCoy, MrCrybaby Wah Volume
- EH: Electro Harmonix Fuzz Wah (wah only)
- Maestro: Boomerang Wah BG-1, BG-2 and EG-1

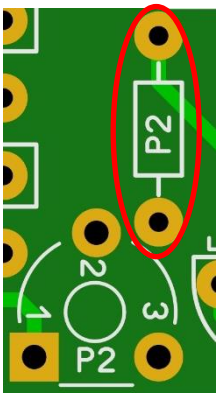
Modern signature Wahs

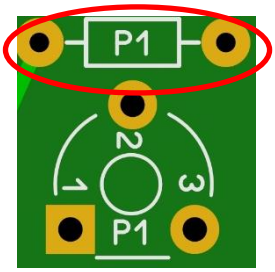
- Dunlop: JH-1 Hendrix Crybaby, ZW-45 Wylde Crybaby, DB-1 Dimebag Crybaby, JC-95 Jerry Cantrell Crybaby, GCB-100 Bass
- BBE: Ben Wah (Axis Wah)
- Rocktron: TriWah
- Custom: Modded Dunlop GCB-95 Crybaby

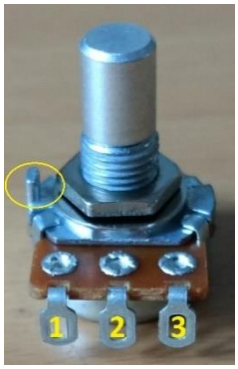
In the components section you will find the components needed for the different configurations. When it says “jump”, there is no component to be place but instead you’ll need to connect both pad of the component with a jumper wire (eg a spare piece of lead wire you get when cutting a resistor to size). When it says “jump 1-2”, then you’ll need to connect pad 1 to pad 2 of the component with a jumper wire. With “jump 2-3” you’ll need to connect pad 2 to pad 3 of the component with a jumper wire. A dash (“-“) means there is no component to be placed at that spot for that type of wah.

P1-**P5** can be either an internal or external potentiometers. When you want to use the controls during play, I suggest you make them external by using an Alpha 16mm pot meter. The pads are marked accordingly to match the pins of the potentiometer. Else us a 6 mm PCB potentiometer.

P1 and **P2** can be either a potentiometer or a single resistor depending on the type of wah you want to build. Only for the Omni version you’ll need to add the potentiometer. For all other versions, you can use the added special extra pads (marked in red below) on the board for the fixed (or jumped) value resistor.







Components

Since the OmniWah can be used to build so many different types of wahs, we split off the components section in to a separate document with all possible configurations.

My advice: Capacitors with values **< 1nF** should be **MLCC**, values of **1nF – 1µF** should be **SMF/MKT/MKS** and all values **> 1µF** are **Electrolytic**.

Then there is always the magic question: "***Will it really sound like a <your favorite wah brand and series here>?***". Well, that depends on the quality of the parts you are using. I will not go into a rant about parts (vintage or not) but I will give you my personal view based on building all the configurations and comparing some of them to the original.

Inductor

I think this is the most important part to invest in. You can go 2 ways on this. First, you could buy the prefab ones from eg. Dunlop™ or Vox™, but changes are you will not get to the tonal characteristics of your configuration (unless it is a modern Dunlop™ or Vox™ ☺). Next, you can buy a real vintage one. You will have a very hard time finding a genuine vintage inductor so the best way to go here is to buy them from people who custom wind them. This will cost you more, but these people often made it their lifework to master this art.

Wah Pot

Also very important. A well enclosed pot will last longer and the type of taper will influence the sweep characteristics. But do not be fooled by sellers who charge you an arm and a leg for a single pot. Experiment and find out yourself

Resistors and capacitors

Ok, this is going to get me some hate mail. I found no (real) tonal difference using vintage carbon composition resistors or modern metal film resistors. I am NOT a certified electrical engineer so this is based on simply experimenting.

Ditto goes for the capacitors. I used mostly WIMA, SMF and electrolytic capacitors from Panasonic™ and they sound great everywhere. I know that there is a lot of discussion about this on the internet so feel free to totally disagree with me.

None the less the value and tolerance of these components influence the sound greatly. Components have a spread in their values. Every part is sold with these values inside a certain tolerance. Carbon Composite are +/- 5% and while metal film mostly are +/- 1%. Capacitors are even worse. Generally the tolerance is about +/- 10% but can also be +/- 20% or even +/- 5%. It depends. This is (only) one of the reasons that no 2 effects of the same type really sound the same. To conclude: sound is more influenced by the tolerance (and change of that over the years) of the components then the brand.

Recreating an effect should also mean that the exact value of the components should be measured and not just their advertised value. An old 20% 4.7µF will range between 3.76 µF and 5.64 µF. This can and will have a lot of influence in a RC filter!

To conclude, there is also the influence of temperature. Every component will measure different under different temperatures. So, at -20°C an effect might sound different then at +40°C.

Configuration note

P1-P3, **P5** and **P6** are arranged as onboard trimpots on the PCB. This is done because most of them are set and forget. However, you could choose to make them external by wiring a chassis pot to them. For this we added the pinout next to the trompot pads so you know what pad to connect to which pin on the pot. See the off board wiring section for the pin numbers on the pot.

Modifications

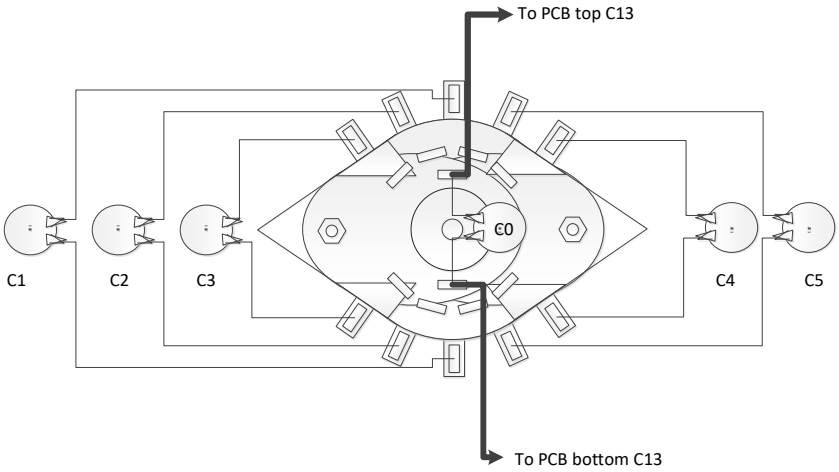
Mix and match the configurations

You could mix a few options of different versions to get your own custom effect. I think it would be a good idea to add **R1** (pull down resistor) and **P2** (Gain) to all types. This way you can reduce the pop when switching on the effect and add a gain control that influence the tone of the Wah.

Also consider to experiment with different types of transistors. The described transistors can be replaced with any **300-400 Hfe NPN transistor**.

Sweep board

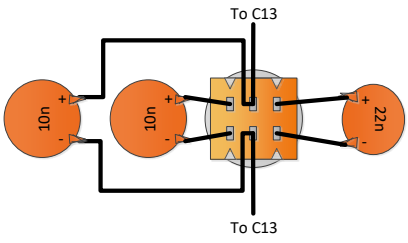
A nice added feature for some configurations is the off board sweep to replace **C13**. You can use a rotary switch for the for example a 2P5T so you can switch between 5 different values.



Configuration	Type	C0	C1	C2	C3	C4	C5
EH	2P4T	2n2	3n3	10n	47n	100n	-
Foxx	2P4T	-	10n	47n	3n3+4n7	47n+100n	-
Rock	2P3T	10n	-	10n	22n	-	-
Omni	2P5T	-	4n7	10n	47n	68n	100n

The **Rocktron** can also be made using a DP3T (ON-OFF-ON) like this:

Left = Classic
Middle = Normal
Right = Bass



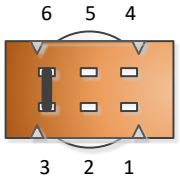
Mechanical Sweeprange mod

If you are using an old crybaby shell, then you might want to remove the rubber underneath the heel of the wah plate. Also you might want to cut about half of the front 2 rubbers off. This way the sweeprange of the wah will increase dramatically. But be careful not to remove too much. Maybe cut in stages and test.

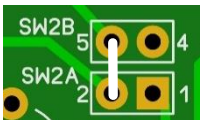
Outputbuffer

Wahpedals do not play nice with a fuzz after them (in series) and will not really “wah”. Although a lot of people like this, it can be prevented by implementing an output buffer. This build includes such an optional output buffer. It is not specific to any build and can be used with any configuration. If you want to incorporate the buffer, you will need to solder **C14**, **C15**, **P6**, **Q4**, **R18**, **R19** and **SW2**.

Note that **SW2** consists of 2 parts, **SW2A** and **SW2B**. Pins 3 and 6 are not on the PCB and should be shorted on the switch itself, like this:

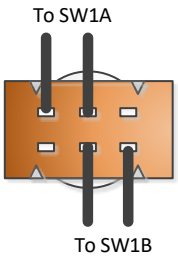


Also note that if you are not planning of implementing the buffer then you should leave out the parts and switch but short **pad 2 (SW2A)** and **5 (SW2B)** on the PCB (also noted in the configuration sheet).



Jen Mr Crybaby Wah Volume DPDT switch

The switch should be wired like this:



C16 placement

We built in a possibility to put a capacitor in parallel with the inductor. This part should be placed at the bottom side of the board. Make sure you leave the legs long enough to be able to bend it flat to the board, but short enough not to short with other pads. It is meant as experiment so please experiment!

Build sequence

Soldering this board can be very complicated for some people since the solder pads are very close together. Use a magnifying glass to make the job easier. The trick to soldering a PCB is to work from small to big components. My building sequence suggestions in this section are based on the parts I used myself. Sometimes some components are smaller (or bigger) so always use your own common sense and change the order accordingly. Usually capacitors can differ a lot in size depending on their rating and value.

Note: Do not blow on your solder in an attempt to cool it down. That can result in a bad join that might corrode!

Start by soldering the jumpers where needed. Next, solder the resistors and diode (if needed).

If you want to experiment with other transistors then you could socket them instead of soldering them to the board. You'll need a some 20 SIL sockets, break off the sockets and solder them to the board. Now is the time to solder these sockets on the PCB. Place the transistors only once you are finished with all soldering and off board wiring!

Note: Orientation of the transistors vary for each different type you use. For this reason I marked the pinout on the board for your convenience. I also added a graphic of the flat and rounded side of the transistor. This is based on the vintage transistors. Eg. a MPSA needs to be rotated 180 degrees! Always consult the datasheet of the transistor and orient accordingly.

Now continue by soldering the small capacitors (MLCC) then the small SMF, trimpots and then the Electrolytic capacitors. Finish with soldering the inductor.

I suggest you now drill the holes in your enclosure (maybe a spare old crybaby shell) so you can use it during the off board wiring. Try to keep wires as short as possible.

Note: Really take some time to determine where to place the pots, switches, jacks and PCB in the enclosure before you start drilling (if any drilling is needed at all). Measure twice, drill once.

You are almost ready to rock, well… not really. The difficult part starts now. Besides the components mentioned in the components table, you will need:

- **2 input jacks**. 2 mono jacks if you are not going to use a battery but only the 9V adapter. 1 mono (for output) and 1 stereo jack (for input) if you will be using both a 9V battery and the 9V adapter. If you are going for the PCB mounted version You will need 2 stereo input jacks with PCB pins.
- **1 x 3PDT footswitch** (9 pins)
- **2,1mm DC jack** (isolated) center negative. Depending on your build it will need to be PCB mount or external.
- **9v battery clip** (optional).
- **22 gage stranded hook-up wire.**
- **A LED holder.** This enables you to mount the LED in the enclosure.
- **Wah enclosure** (new or used).

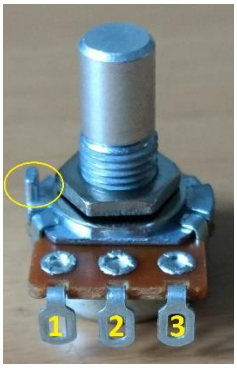
Off board wiring

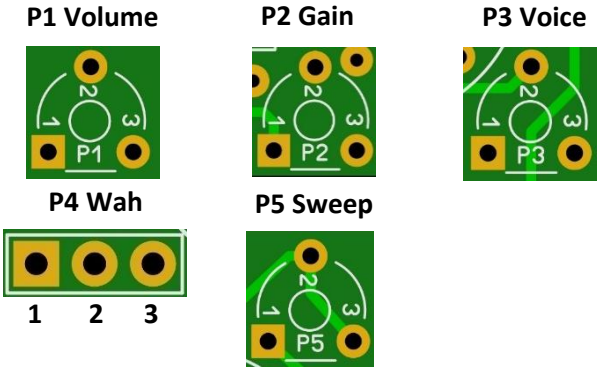
The version 2 of the OmniWah has been designed to be used in a standard Crybaby enclosure with either onboard soldered jacks or separate jacks (like the neutrik/rean type of input jacks). There are also 4 holes added for PCB stands in case you want to use a custom enclosure.

Potentiometers

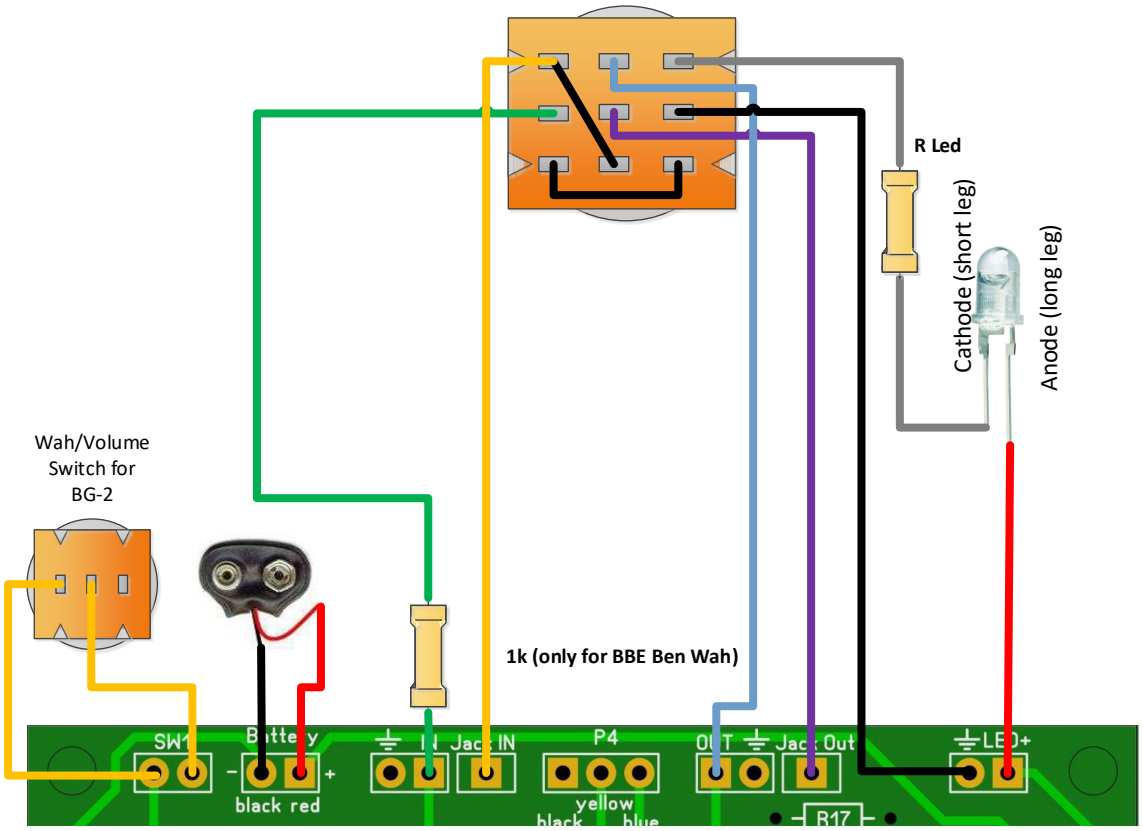
In the pictures below you see the correct pin numbering of the pots (Alpha 16mm style).
Solder the wires accordingly and it is always a good idea to twist the wires together to create a sort of extra shielding against external noise.

You can break off the pin I marked with the yellow circle with a small pair of pliers.



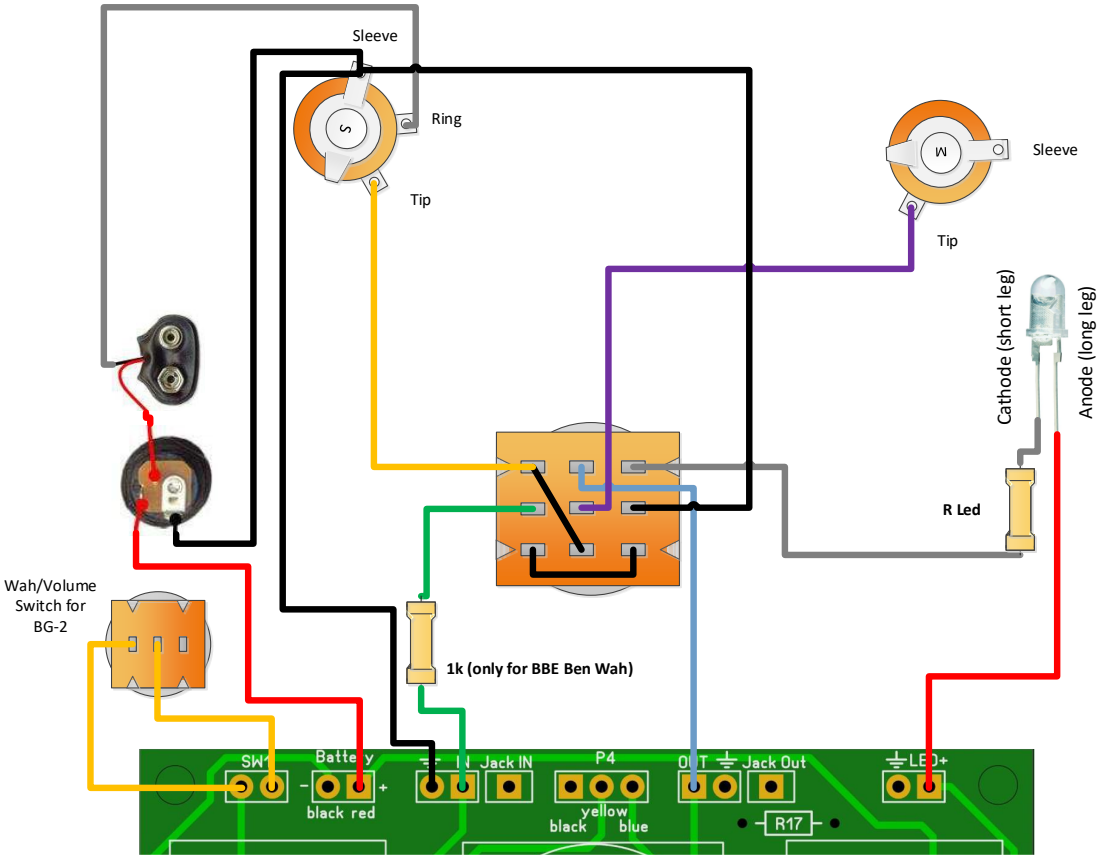


Footswitch with PCB mounted input and output

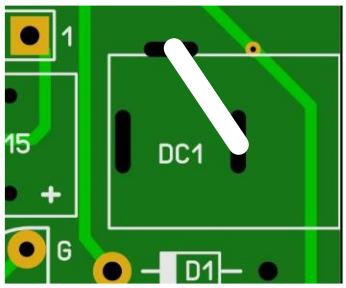


In this case you will need to populate DC1, CONN IN and CONN OUT with PCB mounted jacks. Note that **R led** is a **4k7** resistors. You can change this value depending on the type of LED you use but 4k7 is safe enough for almost all LEDs @ 9V.

Footswitch with external input and output



As the onboard DC jack is not installed, you will need to connect 2 DC pins on the board like this:



The sleeve on the output jack is not connected on purpose. Make sure the output jack is in good electronic contact with the enclosure else you can try and connect the sleeves of the input and output together. If you test the unit outside of an enclosure you need to connect the output sleeve to ground!

It is now time to place your transistors in the sockets if needed. Connect everything, build it in your enclosure and enjoy your effect!

Troubleshooting

All PCB's have been 100% factory e-tested and out of every batch I receive I build an effect to double check, so there should not be a connection problem on the PCB itself.

The board is not working (at all), what now?

- Check if your 9V is plugged in correctly (and/or soldered correctly on the board). Pay special attention to the polarity.
- Check that you oriented the capacitors, IC's ,transistors and diodes the right way. SMF, MKT and ceramic capacitors as well as resistors do not need to be oriented. A likely sign of incorrect capacitors and/or orientation is when an effect is sputtering, rumbling or "motorboating".
- Check if you used the correct values of the components. For resistors you can look here: http://www.diyaudioandvideo.com/Electronics/Color/
- Double and triple check your soldering! A loose or cold solder can be really bad for your board.
- Replace the IC and/or transistors, one might be defective. Before doing that first unplug the 9V and wait for 5 seconds.
- Check that you have good/high grade components. A lot of Chinese sourced parts are fakes (especially high end opamps, audio capacitors, vintage diodes and transistors) so be careful that you source your parts from reliable suppliers.

Schematic