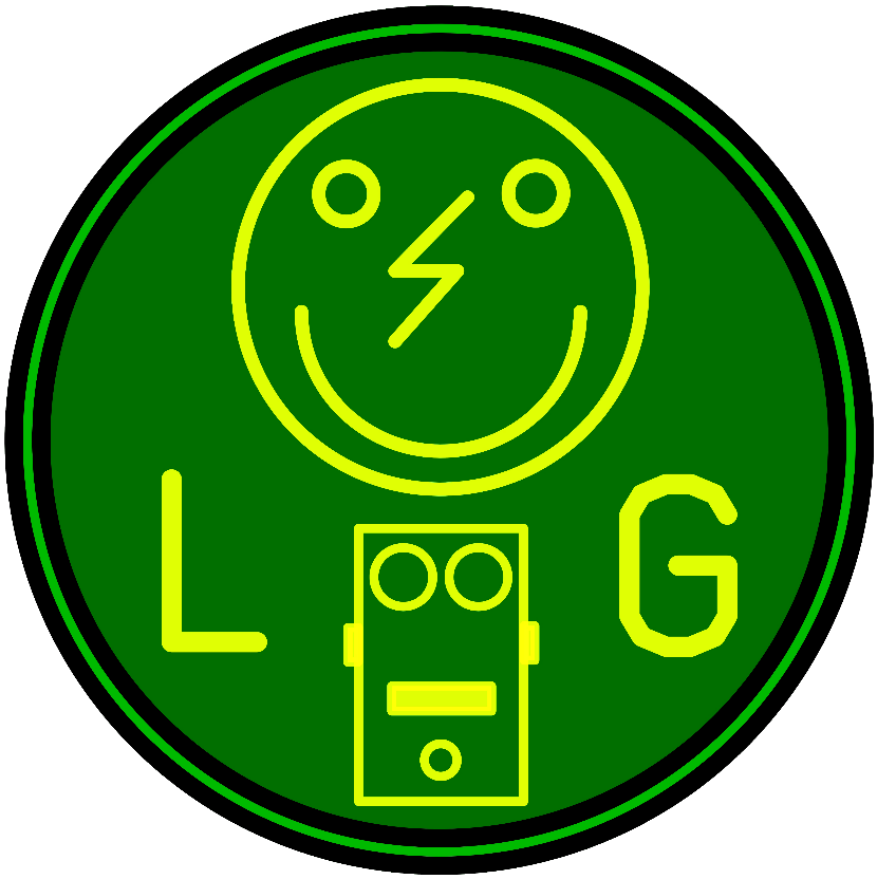
OmniRat

Building instructions

v1.0



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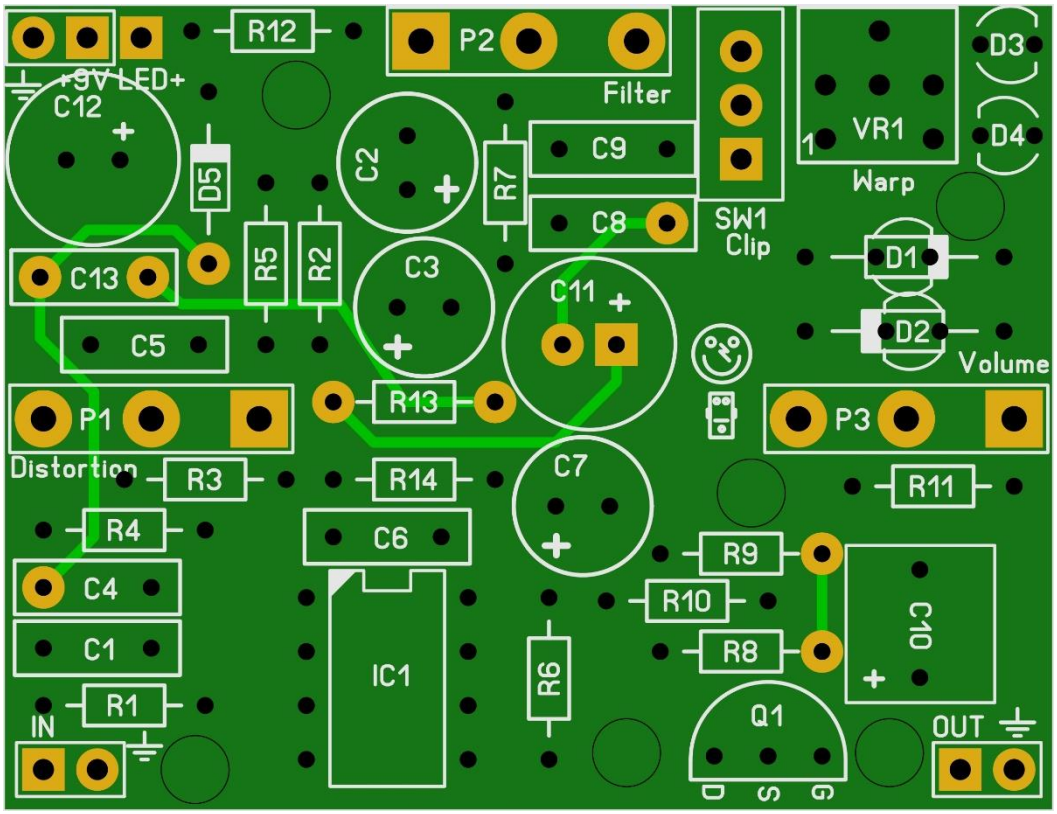
Read this entire manual thoroughly before you start building the effect! There are some available options and you should choose which one you want to incorporate before starting your build.

Last update: 17-07-2019

PCB layout



Dimensions: **49,5 mm x 38 mm**
1.95 inch x 1.50 inch

Components

Part	Value	Type	Part	Value	Type
C1	22n	MKT	**R1**	**	1% metal film
C2	4u7	Electrolytic 25V+	**R2**	560R	1% metal film
C3	2u2	Electrolytic 25V+	**R3**	**	1% metal film
C4	1n	MKT	**R4**	1k	1% metal film
C5	100p	MLCC/Silver Mica	**R5**	47R	1% metal film
C6	**	MLCC/Silver Mica	**R6**	1k	1% metal film
C7	4u7	Electrolytic 25V+	**R7**	**	1% metal film
C8	**	MKT	**R8**	**	1% metal film
C9	22n	MKT	**R9**	**	1% metal film
C10	**	Electrolytic 25V+/MKT	**R10**	10k	1% metal film
C11	1u	Electrolytic 25V+	**R11**	**	1% metal film
C12	100u	Electrolytic 25V+	**R12**	**	1% metal film
C13	10n	MKT	**R13**	100k	1% metal film
D1	**		**R14**	100k	1% metal film
D2	**		**P1**	**	Distortion
D3	**		**P2**	A100k	Filter/Tone
D4	**		**P3**	A100k	Volume
D5	1N4001		**Q1**	2N5458	
IC1	**		**VR1**	10k	Bourns 3386

Optional diode switch **SW1** SPDT (On-On)

MKT can also be FKS, SMF or even greenies.

Configurations

	Early Big Box RAT	RAT	Chinese RAT2	RAT2	Turbo RAT	Vintage RAT	You Dirty RAT
C6	33p	30p	30p	30p	30p	30p	30p
C8	3n	3n3	2n7	3n3	3n3	3n3	3n3
C10	1u	1u	10u	10u	10u	1u	10u (?)
D1-D2	1N914	1N914	1N4148	1N4148	LED	1N4148	1N34A
IC1	LM308N	LM308N	LM308N	LM308 / OP07	OP07	LM308N / OP07	OP07
R1	x	x	2M2	2M2	2M2	x	x
R3	1M	1M	2M2	2M2	2M2	1M	1M
R7	1k5	1k6	1k6	1k6	1k6	1k6	1k6
R8	x	x	x	x	2M2	x	x
R9	1M	1M	1M	1M	2M2	1M	1M
R11	x	x	10k	10k	10k	x	x
R12	47R	47R	47R or 100R	47R or 100R	47R	47R	47R
P1	A150k	A100k	A100k	A100k	A100k	A100k	A100k

Build sequence

Before starting with this section, make sure you have read the configurations section first!

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! Also take extra care not to short components.

Start by soldering the jumpers (if applicable) , resistors and small diodes (not LEDs if used). If needed you can create a jumper using a spare piece of lead from a resistor or diode.

If you want to experiment with another transistor for **Q1** then you could socket it instead of soldering it to the board. You'll need a some 20 SIL sockets, break off the 3 pin socket and solder it to the board. Now is the time to solder this socket on the PCB as well as the socket for the IC. Place the transistors and IC once you are finished with all soldering and off board wiring!

Now continue by soldering the MLCC, small SMF/MKT/Wima capacitors then solder the internal trim pot (**VR1**). Now finish by soldering the transistors (if not socketed), the bigger SMF/MKT/WIMA and the electrolytic capacitors.

I suggest you now drill the holes in your enclosure so you can use it during the off board wiring. This PCB is very sensitive to noise! Prevent crossing input and output wires and keep the wires as short as possible (and/or use shielding on the input and output).

Besides the components mentioned in the components table, you will need:

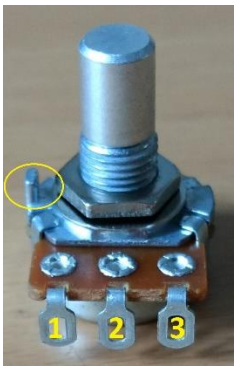
- **1 stereo input kack and 1 mono output jack**.
- **2,1mm DC jack** (isolated).
- **22 gage stranded hook-up wire.**
- **LED holder.** This enables you to mount the LEDs in the enclosure.
- **Footswitch 3PDT** (9 pins)
- **Hammond 1590B** or **125B** style case (or similar) in your favorite color. You can of course experiment with other enclosures, but measure twice before you start drilling!

Off board wiring

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 some extra shielding against external noise. The **rectangle pad** marks **pin 1**.

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



3 2 1

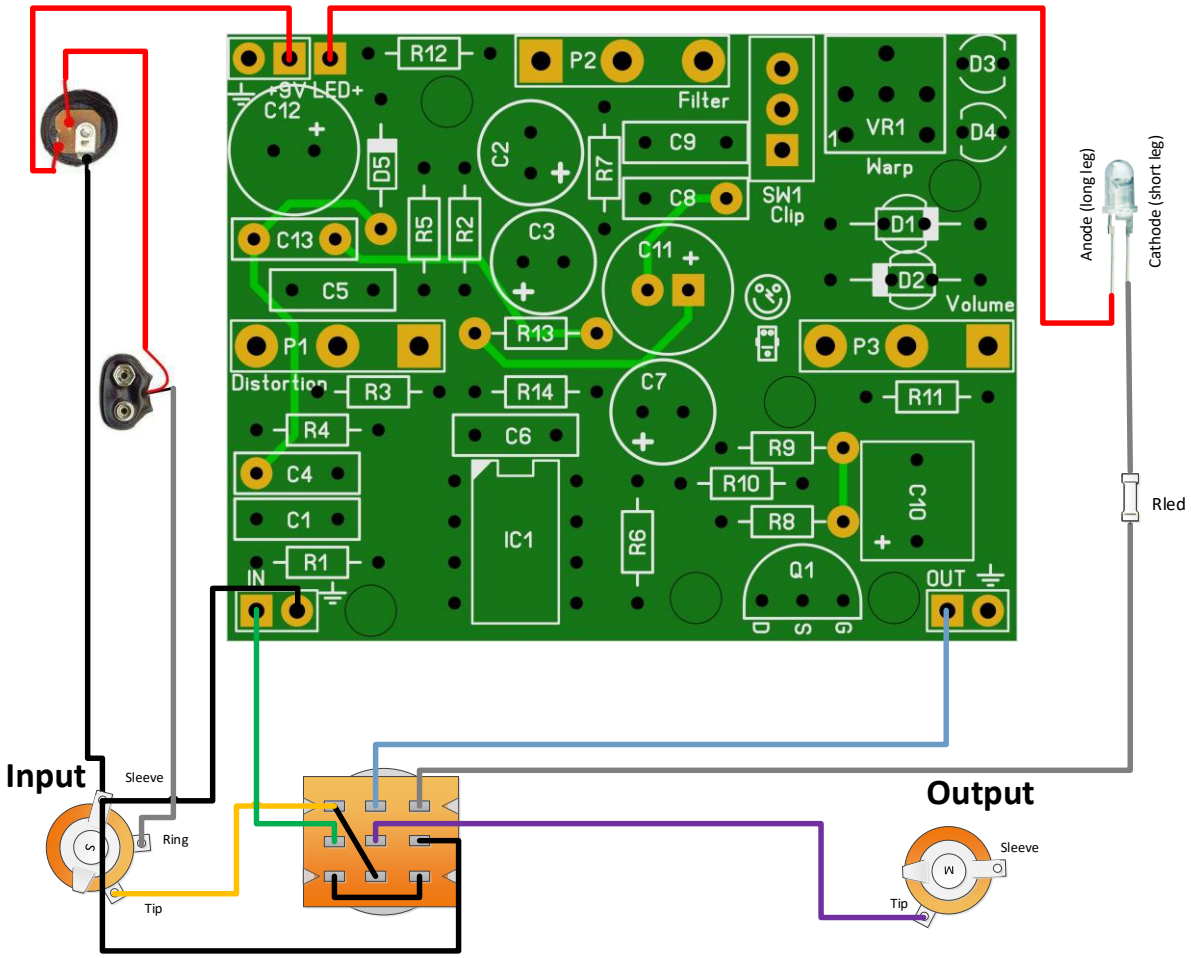
Note that the Tone/Filter pot is wired different on early RATs vs later RATs. So there is no actual right or wrong way to wire it. If you do not like the orientation in this version you can reverse the PCB mounted pot or use a reverse wired Alpha pot with solder lugs (like in the picture above).

Diode Switch

The wiring for the switch is the same as for potentiometers, marking pin 1 with a **rectangle pad**. There is no wrong way to wire it as long as the pad of pin 2 is connected to the middle lug of the SPDT switch.

The optional diode switch (**SW1**) enables you to switch between 2 sets of diodes. You could choose to equip **D1** and **D2** with the correct set of diodes per your chosen configuration and use **D3** and **D4** to experiment with your own configuration. As the 1N4148 and 1N914 are almost identical, I suggest you use 3 mm LEDs for **D3** and **D4**, but of course you are free to choose different. D1 and D2 are designed to fit almost all types of diodes, but D3 and D4 are designed for LEDs. If you want to use other diodes in those positions, you will have to mount them upright.

VR1 is a so called Warp control as described by AMZfx. This control is used to change the harmonic content of the clipped output from primarily odd harmonics to a mixture of even and odd harmonics. If you do not want to use it you can leave it out and connect pin 1 to pin 2 with a jumper.



Rled can be somewhere between 1k5 and 10k (try 4k7). The lower the value the brighter the LED shines, but at the cost of power consumption and wear of the LED.
The diagram is also based on star wiring where all ground connections go to the sleeve of the input jack. It requires very good conductivity between the input jack, output jack and the enclosure to work correct. If you do not have good conductivity, please connect a wire between the input jack sleeve and the output jack sleeve.

Modifications

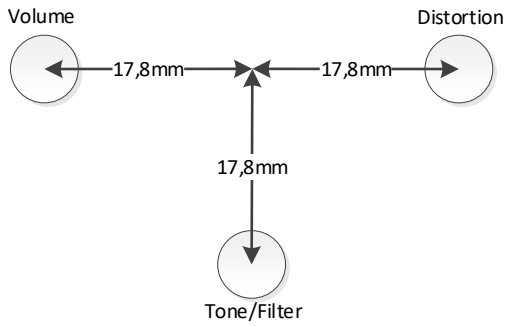
OpAmp

It all started with the LM308N Opamp. Through the years as these got obsolete it changed to the OP07. Nowadays the LM308N can still be bought, but be aware of fakes!
Other alternatives are the CA3130 and TL070.
Actually you can use almost any single pin compatible OpAmp, but be aware that it is externally compensated via pin 1 and 8.

Reutz Mod

Replace the 47 Ohm (**R5**) resistor in the feedbackloop with a 500R or 1K pot to sculpt the feedback even more.

Drill instructions



Holes for the potentiometers should be **7mm**.

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