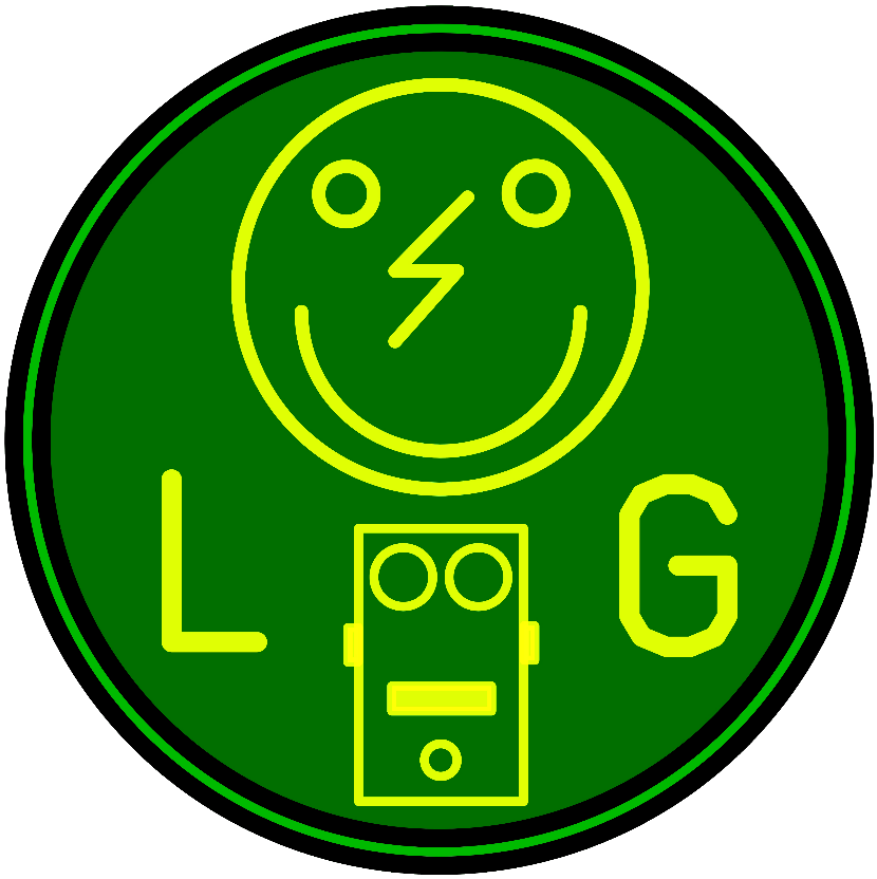
Sundialer

Building instructions

v1.1 & v1.2



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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.

Also, be very careful orienting the parts correct. Wrong orientation might result in broken or even exploding parts! I cannot be held responsible for the consequences. Follow the instructions with care. If a part starts to heat up, decouple the power!

Last update: 25-12-2018

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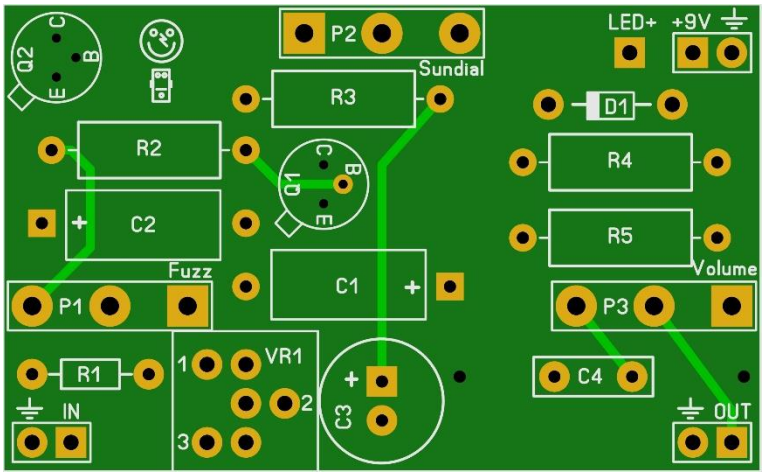
PCB layout



Dimensions: **49,6 mm x 30,5 mm**
1.95 inch x 1.20 inch

NB. V1.1 an v1.2 are exactly the same! Only some minor silkscreen updates and a cap rotation (C3).

Components

Negative ground version (board layout default)

Name	Value	Comment	Name	Value	Comment
C1	1u	Axial 4x10mm	**Q1**	BC108C	NPN
C2	22u	Axial 4x10mm	**Q2**	BC108C	NPN
C3	47u	Electrolytic 10V	**R1**	1M	1% metal film
C4	10n	SMF or Mallory	**R2**	100k	Carbon Composite
D1	1N5817		**R3**	33k	Carbon Composite
P1	B1k	Fuzz	**R4**	470R	Carbon Composite
P2	B5k	Sundial	**R5**	2k2	Carbon Composite
P3	A250k	Volume	**VR1**	B50k	Pre-gain (trimpot)

Positive Ground version

Name	Value	Comment	Name	Value	Comment
C1*	1u	Axial 4x10mm	**Q1**	NKT275	PNP
C2*	22u	Axial 4x10mm	**Q2**	NKT275	PNP
C3*	47u	Electrolytic 10V	**R1**	1M	1% metal film
C4	10n	SMF or Mallory	**R2**	100k	Carbon Composite
D1*	1N5817		**R3**	33k	Carbon Composite
P1	B1k	Fuzz	**R4**	470R	Carbon Composite
P2	B5k	Sundial	**R5**	2k2	Carbon Composite
P3	A250k	Volume	**VR1**	B50k	Pre-gain (trimpot)

* Orange marked parts need to be reversed on the board for positive ground version!

C3, **R1** and **D1** are not part of the original Fuzz Face layout and can be left out if you wish. They are added as polarity protection, DC noise filter, and pulldown resistor (anti pop).

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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! Also take extra care not to short components.

Before you start you must decide if you are going to build this board as **negative ground** effect, which is the standard layout of the components on the board, or as **positive ground** effect like the vintage examples of the Fuzz Face. When building the effect as positive ground, just must take extra care in orienting the components. **C1**,**C2**,**C3** must be reversed (so put the negative ent of the capacitor where the board is marked as positive) as well as **D1**. If you do not orient these parts correct, the caps may blow up! Also read the off board wiring section carefully as positive ground also needs the power and ground leads to be reversed.

When you do not want to externally control the Sundial **P2** then solder pins 1 and 2 of **P2** together and change **R5** to 8k2.

My suggestion for a build sequence is to start with **R1**, **D1** and then **R2**, **R3**, **R4**, **R5.**

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 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 solder **VR1** (an internal trimpot), **C4** and **C3**. C4 fits both SMF or Mallory 150 series:

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:

- **1 mono input jack and 1 stereo input jack**.
- **3PDT footswitch** (9 pins)
- **2,1mm DC jack** (isolated) not recommended in positive ground setup.
- **22 gage stranded hook-up wire.**
- **OPTIONAL LED holder and LED (3mm or 5mm depending on your taste).** This enables you to mount the LEDs in the enclosure. Optional and not recommended due to sound popping.
- **Hammond 1590B** case (or similar) in your favorite color.

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Modifications

Transistors

There are a lot of options for transistors. You could use any PNP/NPN, but I do suggest the following:

Negative ground version NPN: BC108B, BC108C, BC109B, BC109C, BC183

Positive ground version PNP: NKT275, 2SB171, 2SB175

Potentiometers

By default **P2** is a B5k. This makes the maximum resistance 2,2k (**R5**) + 5k (**P2**) = 7,2k. The original Fuzz Face has 8k2 total resistance. You could consider using a B10k for **P2** to be able to get 8k2 (and more). If you do this, you could also consider to lower **R5** to 1k or even 470R.

You could also consider using a 3k3 for **R5** instead of a 2k2 and stick to the B5k for **P2**.

VR1 is an internal trimpot for some pre-gain, but you can always make it external with an alpha 16mm pot. The pins are marked for your convenience.

End cap

The Sundialer has a 10nF end cap (**C4**). The original Fuzz Faces have 100nF on that spot. Feel free to experiment!

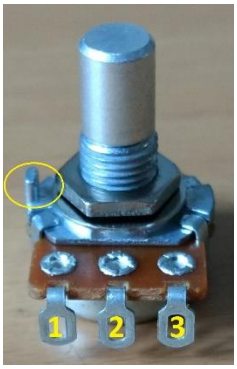
Off board wiring

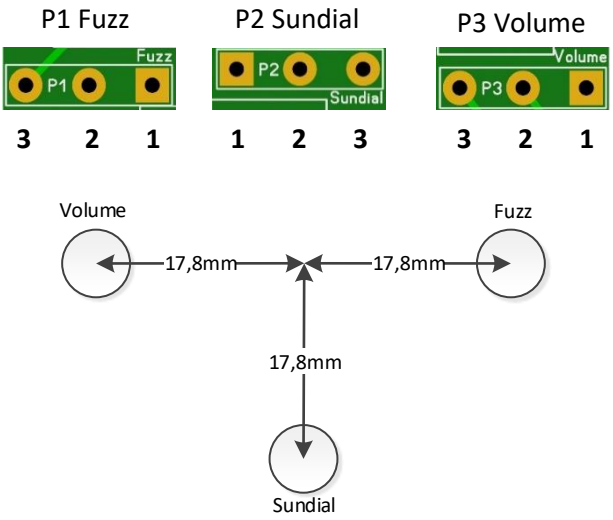
Potentiometers

In the pictures below you see the correct pin numbering of the pots.
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 of the pin I marked with the yellow circle with a small pair of pliers.

Note: If you plan on using the PCB mounted pots then first solder the off board wiring and finish by soldering the pots. Else you will not be able to solder the 9V connection!





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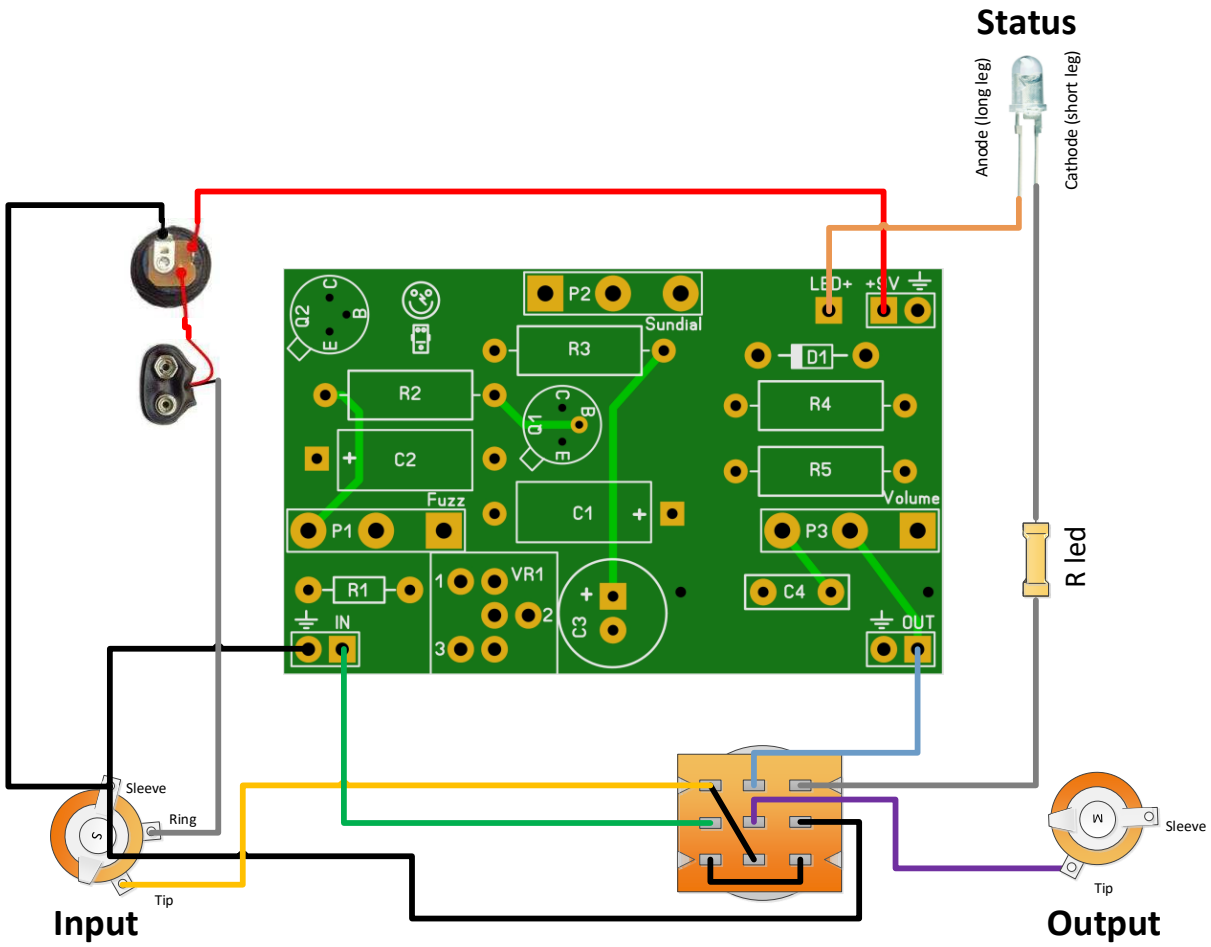
Negative ground version (default)



The status LED is optional and not in the original.

Note that **R led** is a **4k7** resistors. You can change these value depending on the type of LED you use but 4k7 is safe enough for almost all LEDs @+9V/-9V.

The sleeve of the output jack is not connected on purpose. It does however require a good contact between the output jack and enclosure to work. If this is not possible then connect the sleeve of the output jack to the sleeve of the input jack.

This negative ground version can be safely used with a daisy chain on the power supply (although I never recommend using a daisy chain as it will always introduce extra noise in the signal!).

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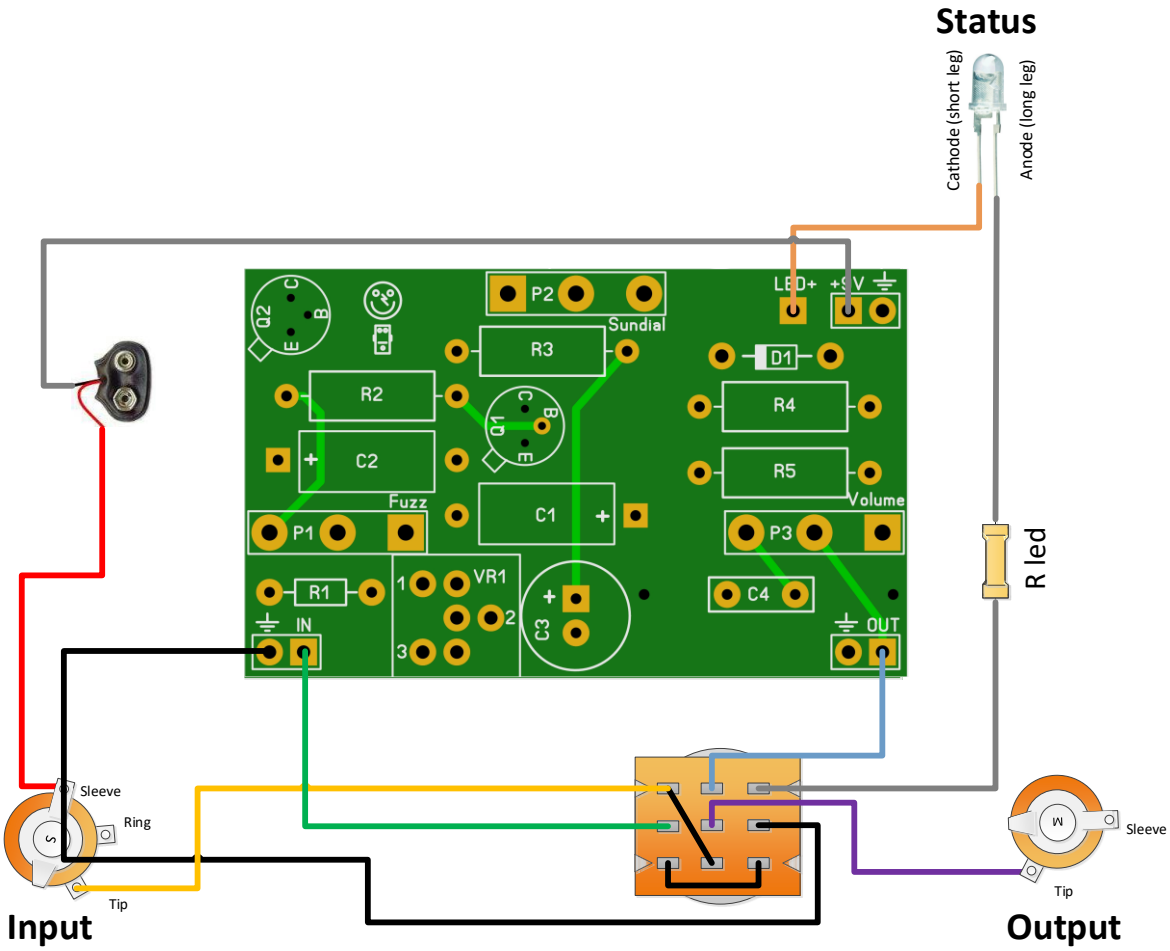
Positive ground version

If you consider building the positive ground version than you **cannot** use it with other negative ground effects on the same daisy chain. This can and will damage the effects! I suggest to only use a battery in a positive ground setup. If you leave out the status LED it will work for months and months! Just to show all the options I will show LED in the off board wiring, but again, I suggest you only use a battery and no status LED. (Watch out that the polarity of the status LED is also reversed to the negative ground version!).



You could also consider using a power inverter. Depending on the type refer to that manual and wire accordingly. Power inverters enable you to use a positive ground effect in a negative ground DC setup.

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Setup

To start off the setup, set the sundial **P2** at just past 12 o'clock. To be more exact use a multimeter and connect/touch the black probe to the enclosure and the red probe to the square pad of **P2**. Turn the sundial until it reads about +5V or -5V depending on the type of ground version you are building.

The maximum amount of fuzz can be set using **VR1**. By default set it to full open (full clockwise). If you think this is too much fuzz than you will ever be using, you can turn it down (counter clockwise). Note that this is a low to medium gain Fuzz, so do not expect to get for those over the top sounds.

With the sundial set to +/-5V and VR1 turned on full, you have the vintage setting (when using germanium transistors of course) of a 1967 Fuzz Face.

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.

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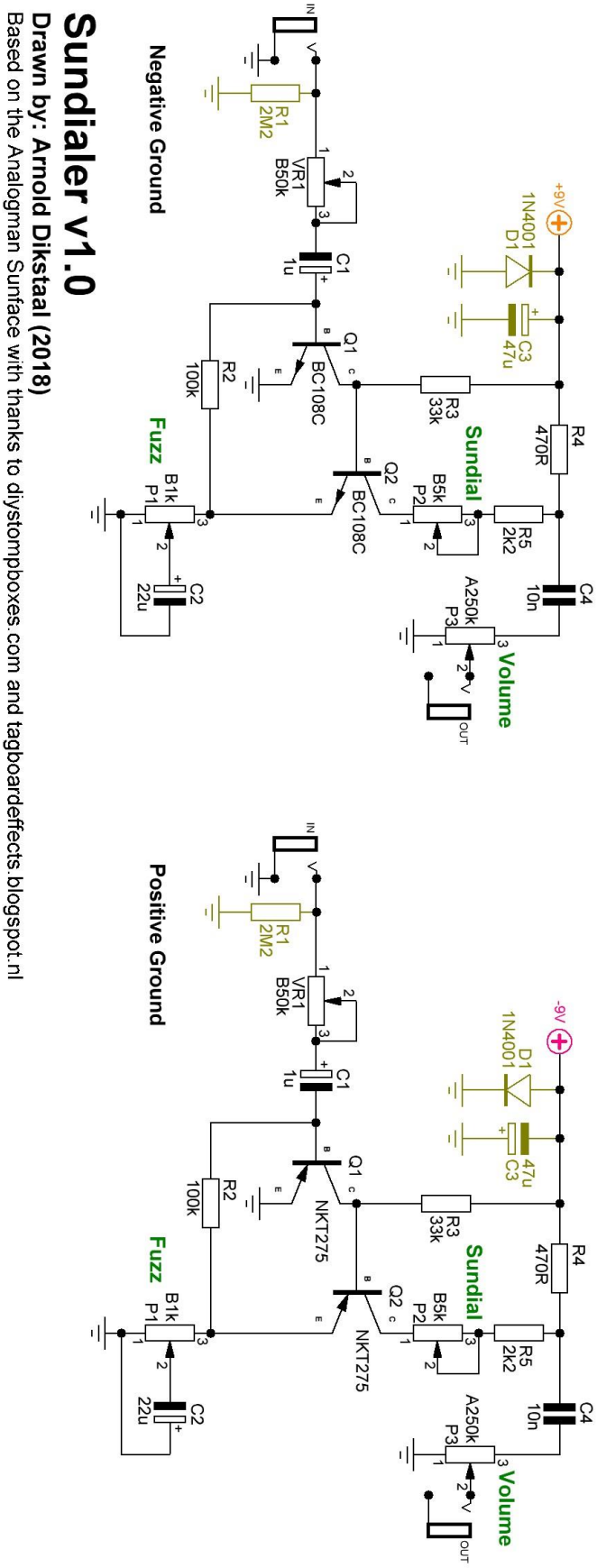
Schematic



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