

# Descent assembly guide v1.0

## SONIC POTIONS

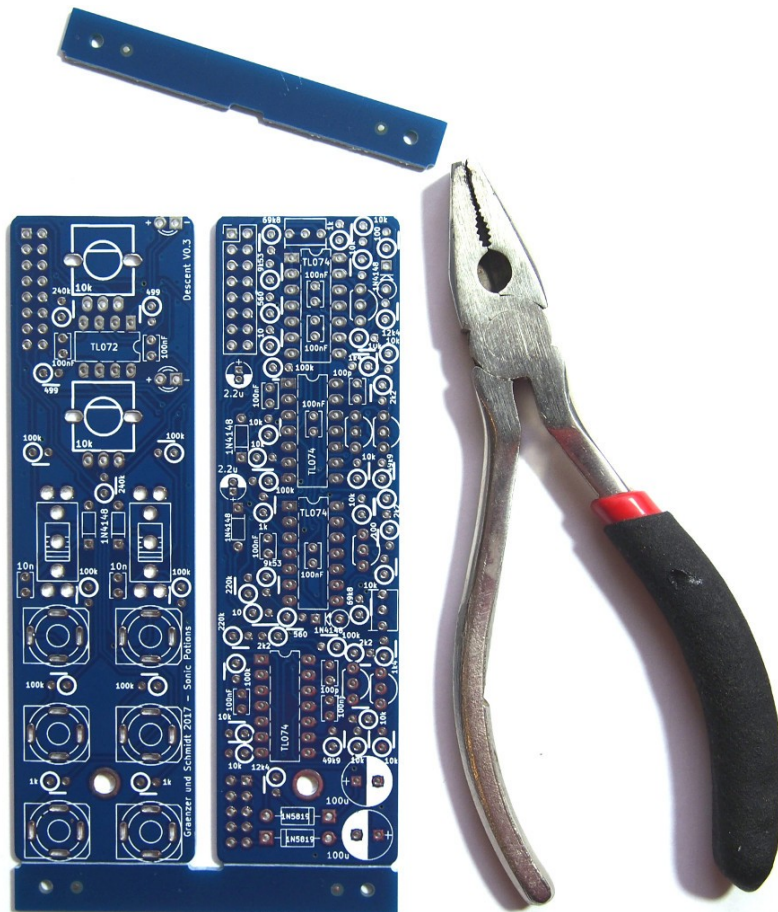
### Schematic and BOM

The BOM can be found on [Google Docs](#)

The schematic is available as a [PDF here](#)

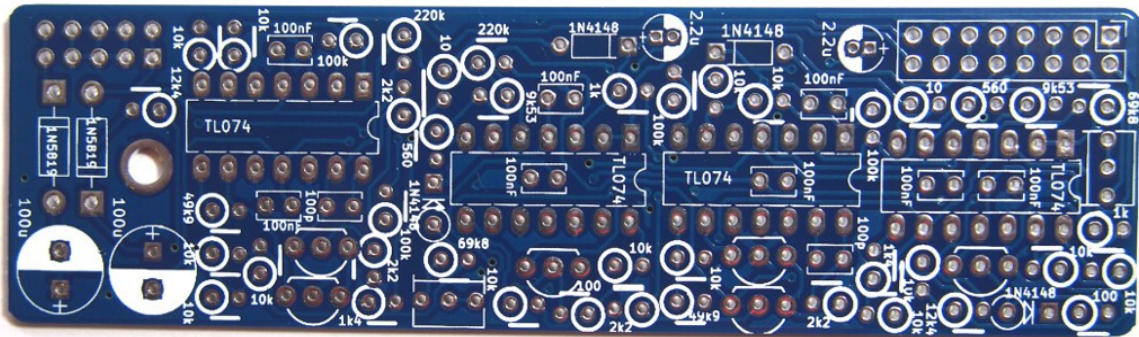
### Prepare the PCB

Separate the PCBs using some pliers.





# PCB 1

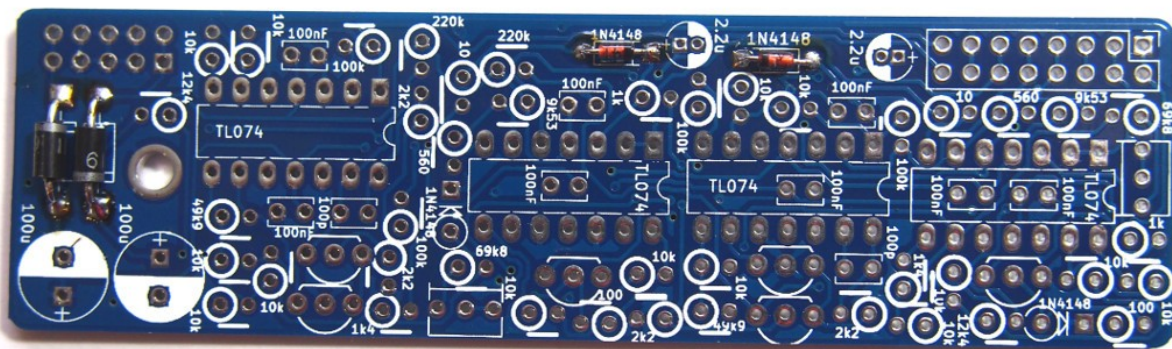
We start with the lower PCB and assemble it beginning with the flat and working our way to the high components.



## Diodes (horizontal)

Diodes are polarized parts, so the orientation is important. You have to align the ring on the diode to the line on the silkscreen as seen on the picture.

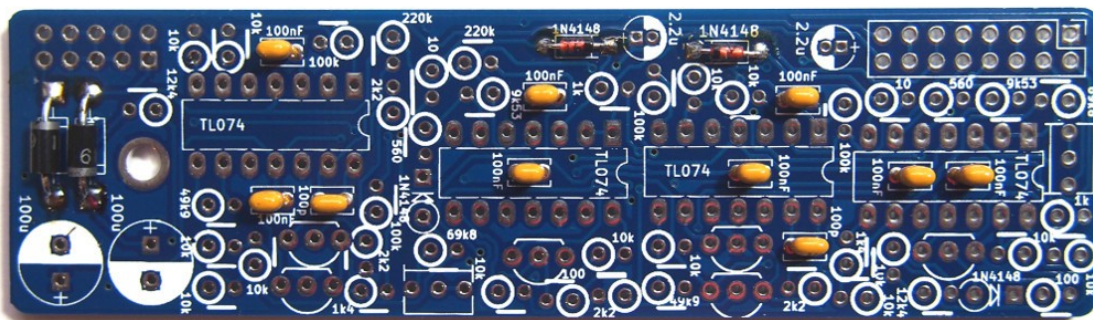
| Image   | Description  | Quantity | Notes  |
|---|--------------|----------|--|
|  | 1N5819 diode | 2        | Polarized part.<br>Orientation is important.<br>Look at the silver line on the diode and silkscreen. |
|  | 1N4148 diode | 2        | Polarized part.<br>Orientation is important.<br>Look at the black line on the diode and silkscreen.  |



# Ceramic capacitors


The ceramic capacitors are non polarized parts. So the orientation does not matter.

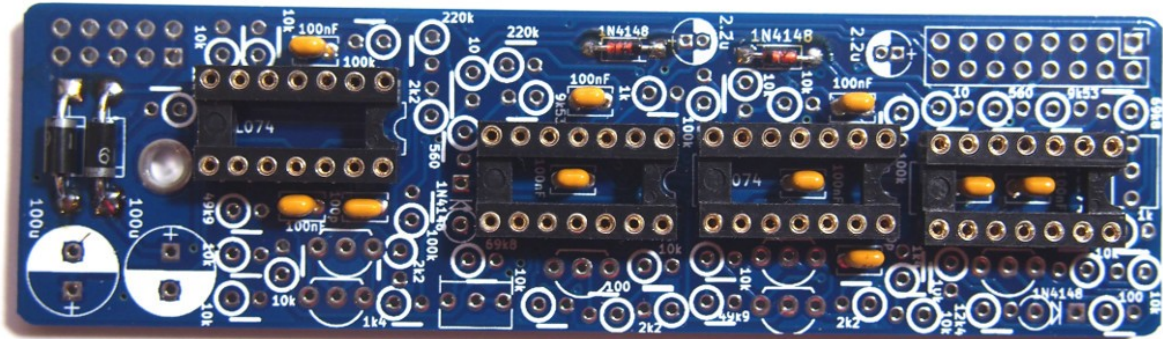
| Image   | Description | Quantity | Notes                   |
|---|-------------|----------|-------------------------|
|  | 100pF       | 2        | Has "101" written on it |
|  | 100nF       | 8        | Has "104" written on it |



## IC sockets





Align the notch of the IC sockets with the notch on the silkscreen. The notch indicates the IC orientation.

| Image   | Description | Quantity | Note       |
|---|-------------|----------|------------|
|  | DIP 14      | 1        | Notch left |

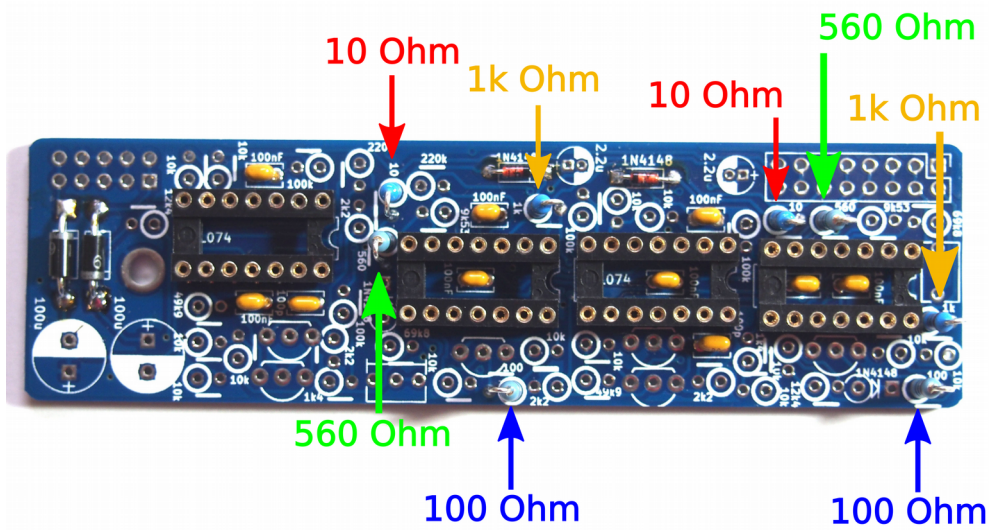





## Standing resistors

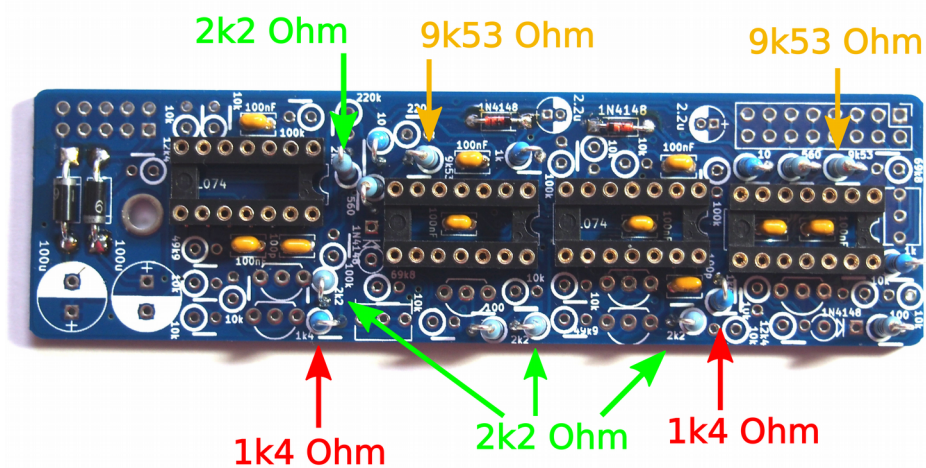
Next are the upright resistors. Just bend one leg over so it is parallel to the other.


| Image   | Description / Value ( $\Omega$ ) | Quantity | Notes                             |
|---|----------------------------------|----------|-----------------------------------|
|  | 10                               | 2        | brown, black, black, gold, brown  |
|  | 100                              | 2        | brown, black, black, black, brown |
|  | 560                              | 2        | green, blue, black, black, brown  |
|  | 1k                               | 2        | brown, black, black, brown, brown |

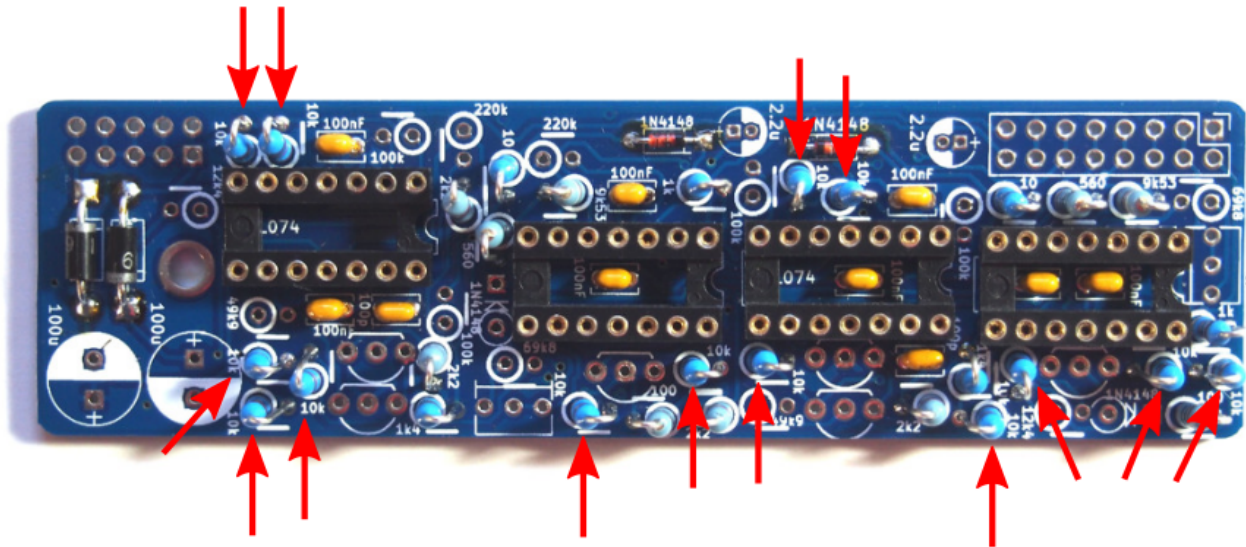







| Image   | Description / Value ( $\Omega$ ) | Quantity | Notes                              |
|---|----------------------------------|----------|------------------------------------|
|    | 1k4                              | 2        | brown, yellow, black, brown, brown |
|   | 2k2                              | 4        | red, red, black, brown, brown      |
|  | 9k53                             | 2        | white, green, orange, brown, brown |



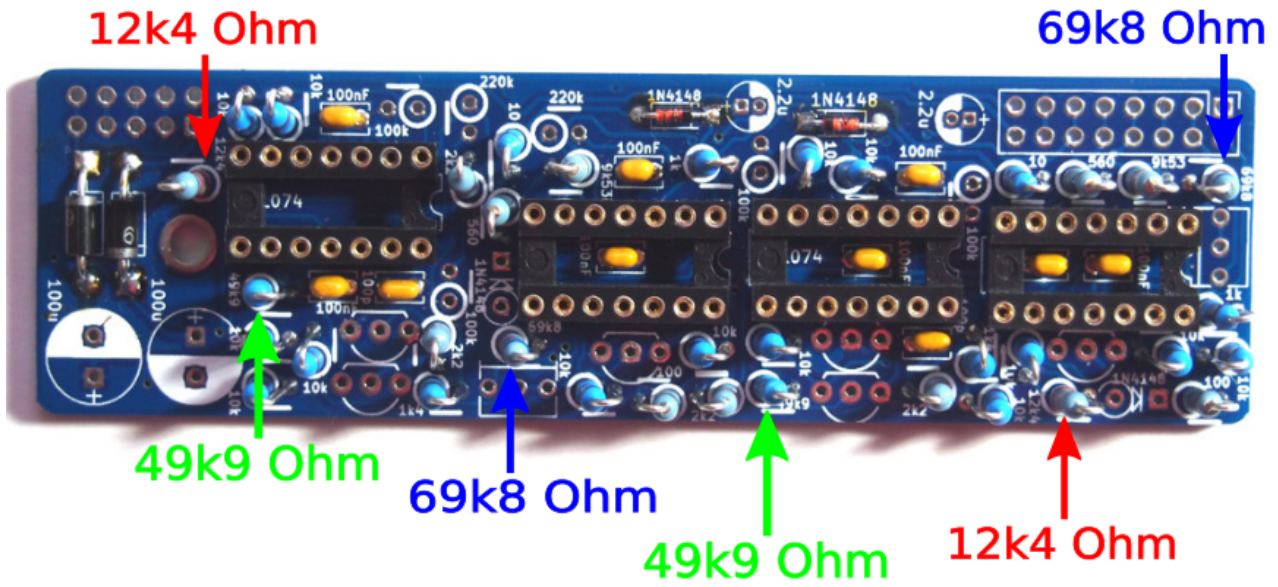
| Image   | Description / Value ( $\Omega$ ) | Quantity | Notes                           |
|---|----------------------------------|----------|---------------------------------|
|  | 10k                              | 14       | brown, black, black, red, brown |






**all marked resistors are 10k Ohm**

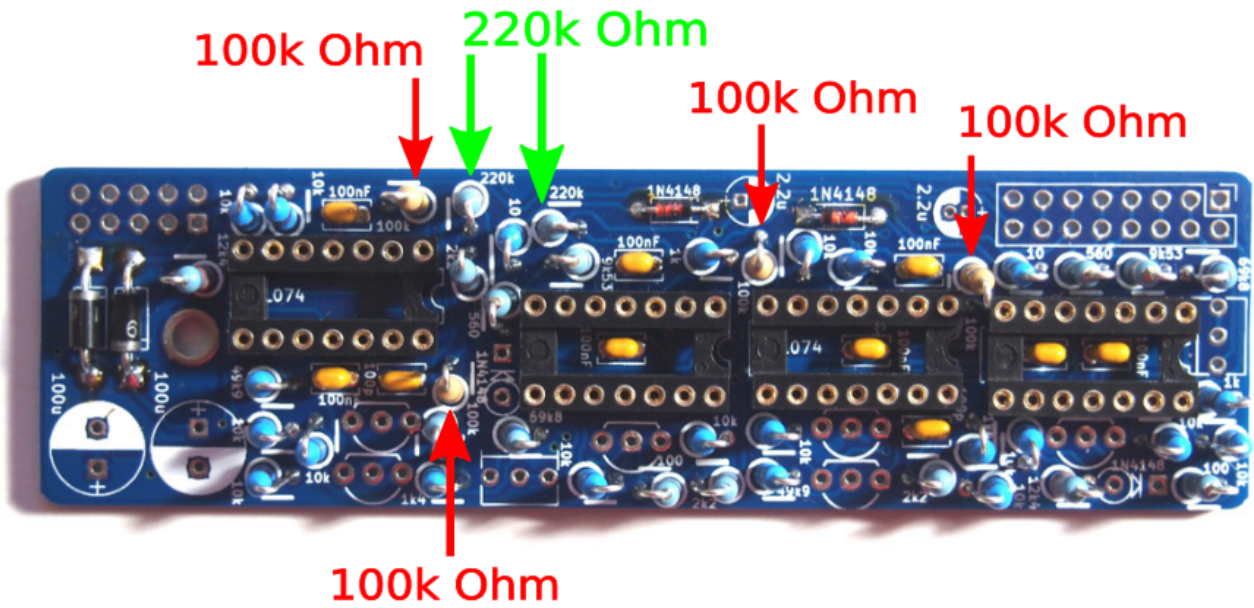
| Image   | Description / Value ( $\Omega$ ) | Quantity | Notes                            |
|---|----------------------------------|----------|----------------------------------|
|  | 12k4                             | 2        | brown, red, yellow, red, brown   |
|  | 49k9                             | 2        | yellow, white, white, red, brown |
|  | 69k8                             | 2        | blue, white, grey, red, brown    |






| Image   | Description / Value ( $\Omega$ ) | Quantity | Notes   |
|---|----------------------------------|----------|---|
|  | 100k                             | 4        | if 1% metal film (blue body):<br>brown, black, black, orange, brown |
|  |                                  |          | if 5% carbon (brown body):<br>brown, black yellow gold              |
|  | 220k                             | 2        | red, red, black, orange, brown                                      |





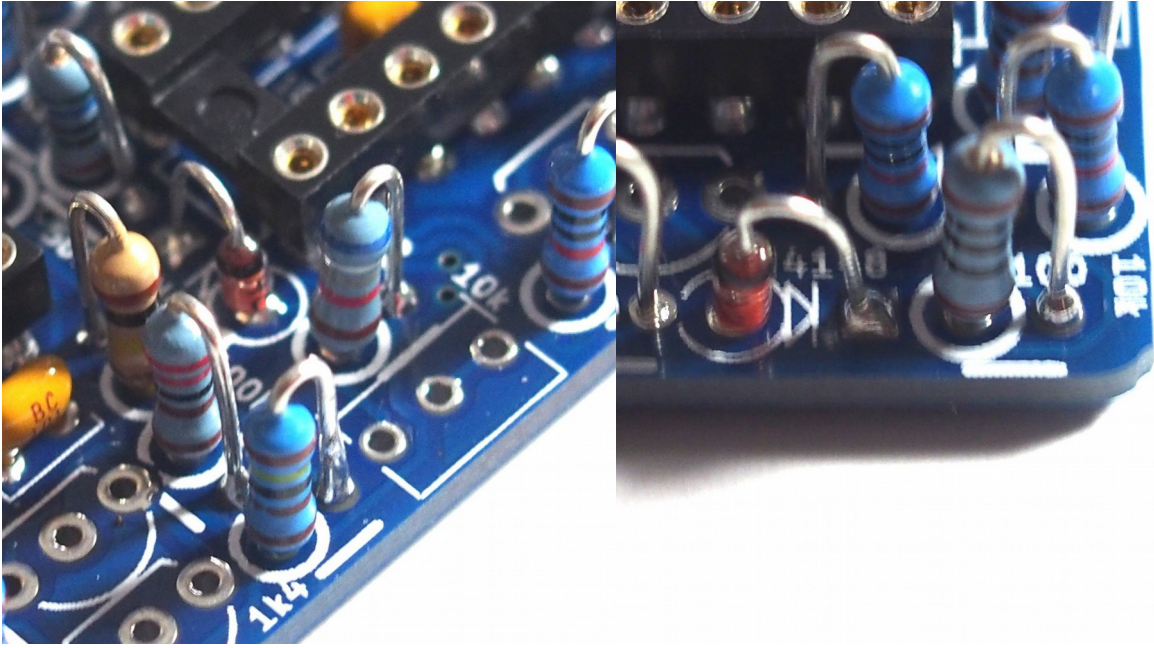
## Diodes (vertical)

Diodes are polarized parts, so the orientation is important. You have to align the black ring on the diode to the line on the silkscreen as seen on the picture.

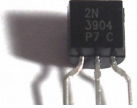
| Image   | Description  | Quantity | Part No. | Notes   |
|---|--------------|----------|----------|---|
|  | 1N4148 diode | 2        | D1 D2    | Polarized part. Orientation is important. Look at the black line on the diode and silkscreen. |

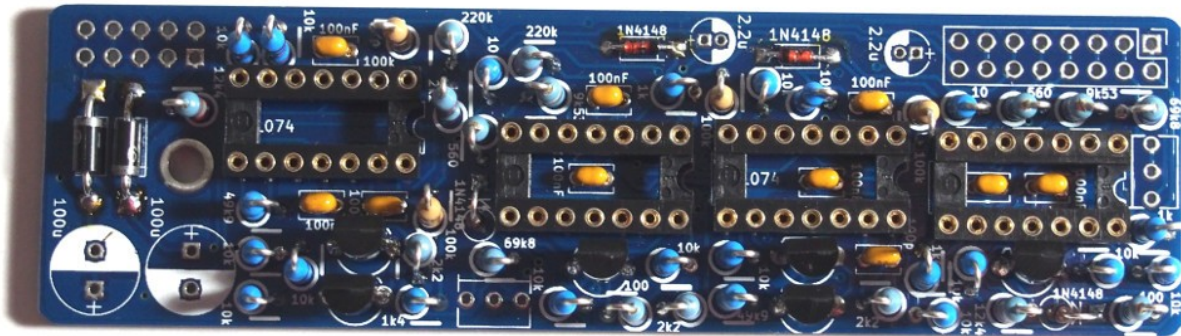







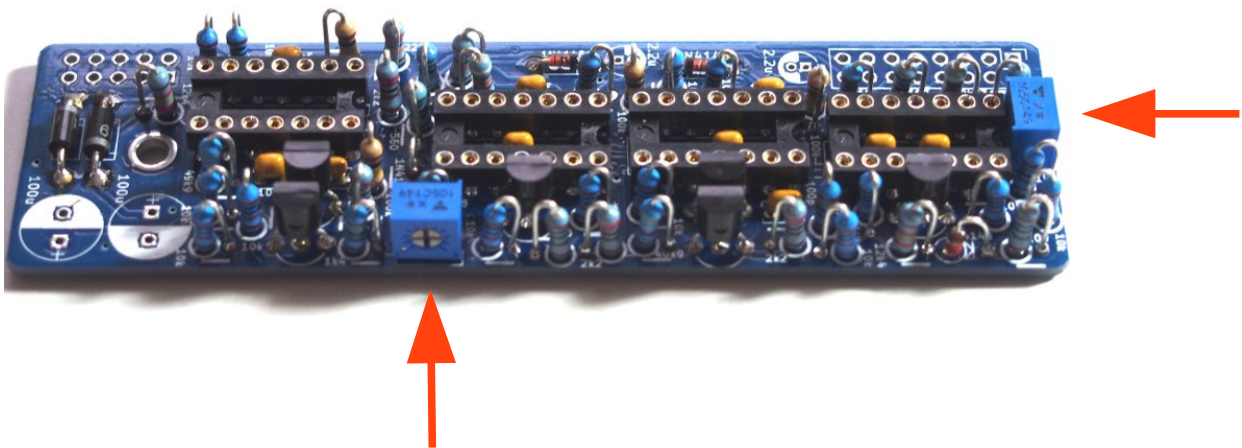
## Transistors

| Image   | Description       | Quantity | Notes |
|---|-------------------|----------|-------|
|  | 2N3904 transistor | 6        | --    |




## Trimmer Resistors

| Image   | Description | Quantity | Notes   |
|---|-------------|----------|---|
|  | 1M          | 2        | The trimmers have to be soldered so that the white adjustment screw faces the outside of the PCB. |

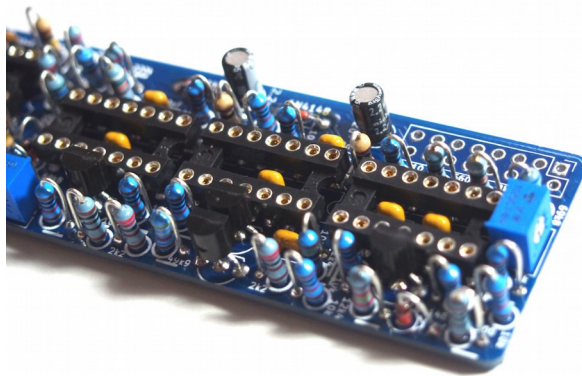



## Big capacitors

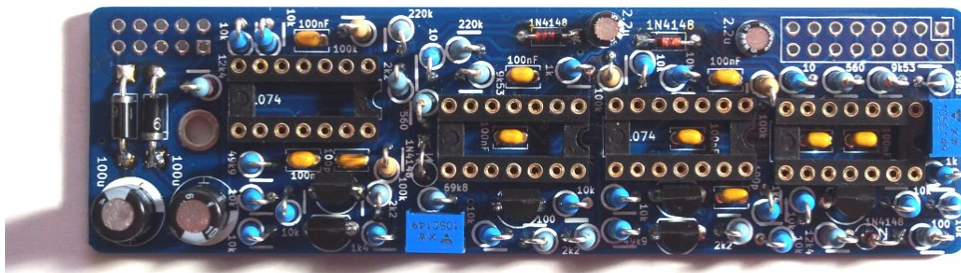
**For these capacitors the orientation is important!** On both cap types the long leg is positive (+) and the short leg is negative (-). On the electrolytic capacitors the negative side is also marked with a big white stripe. The footprints on the silkscreen have a '+' sign on the side where the long leg has to be inserted.

| Image   | Description | Quantity | Notes   |
|---|-------------|----------|---|
|  | 2.2uF       | 2        | <b>Polarized part!</b><br>Short leg is -<br>Long leg is + |





| Image   | Description | Quantity | Notes   |
|---|-------------|----------|---|
|  | 100uF       | 2        | <b>Polarized part!</b><br>Short leg is -<br>Long leg is + |

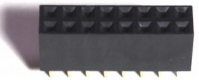
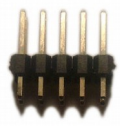


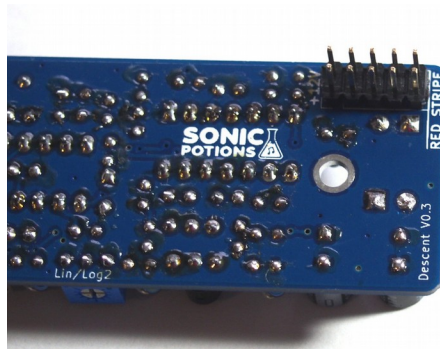
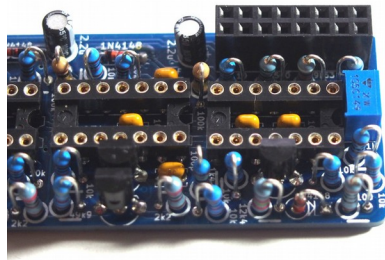
## Board and power connectors

Now it's time for the board and power connectors. You have to break apart the long 2x20 pin header into 2x5 and 2x8 pieces. Be careful not to break away single pins. A side cutter and some small pliers may help here. A good method could be to twist the pin headers gently at the separation point until they split apart. Also pay attention to which side of the PCB the parts have to be soldered.

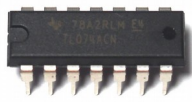
The female socket goes on top of the PCB, the other connectors to the bottom.



| Image   | Description | Quantity | Notes                         |
|---|-------------|----------|-------------------------------|
|  | 2x8 female  | 1        | Board connector <b>top</b>    |
|  | 2x5 male    | 1        | Power connector <b>bottom</b> |

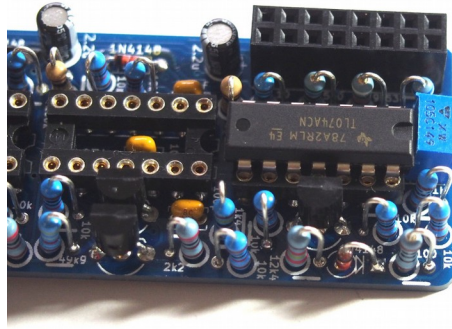


## Insert ICs

| Image   | Description | Quantity | Notes      |
|---|-------------|----------|------------|
|  | TL074 ACN   | 1        | Quad OpAmp |

Be careful to align the notches of the ICs to the right side as shown in the pictures below. The IC near the trimmer for lin/log1 maybe collides with it so that it could be necessary to push the trimmer a little bit away while inserting the IC (e.g. using a small screwdriver).





## Interlude

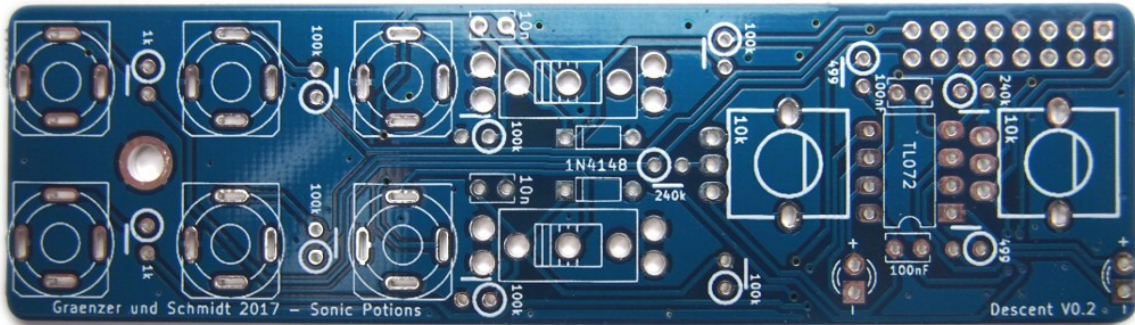
Congratulations on finishing the first PCB! Now is a good time to drink a nice cup of tea or coffee, take a step back for a few minutes and get a clear head. Trust me it's worth it!



# PCB 2


Wasn't that refreshing? Then back to work with the 2<sup>nd</sup> PCB.

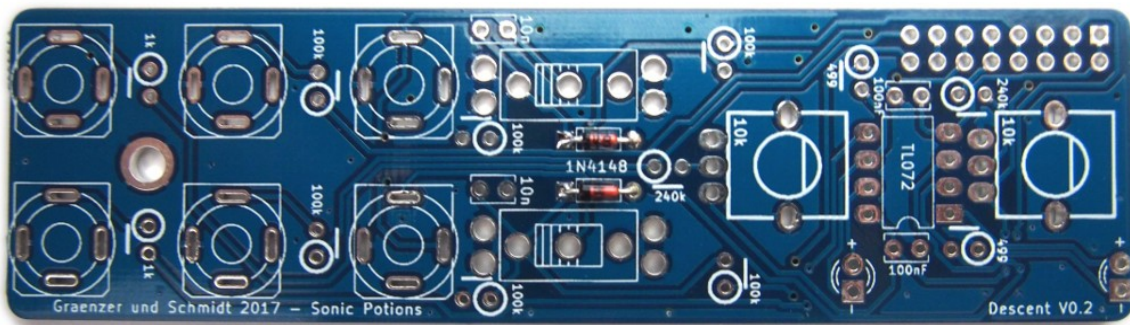
As before we start with the flat parts and work our way up higher and higher.



## Diodes



Diodes are polarized parts, so the orientation is important. You have to align the black ring on the diode to the line on the silkscreen as seen on the picture.

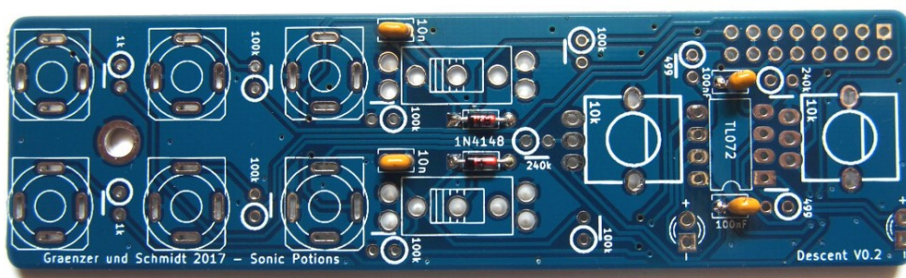
| Image   | Description  | Quantity | Notes   |
|---|--------------|----------|---|
|  | 1N4148 diode | 2        | Polarized part.<br>Orientation is important.<br>Look at the black line on the diode and silkscreen. |



# Capacitors


The ceramic capacitors are non polarized parts. So the orientation does not matter.

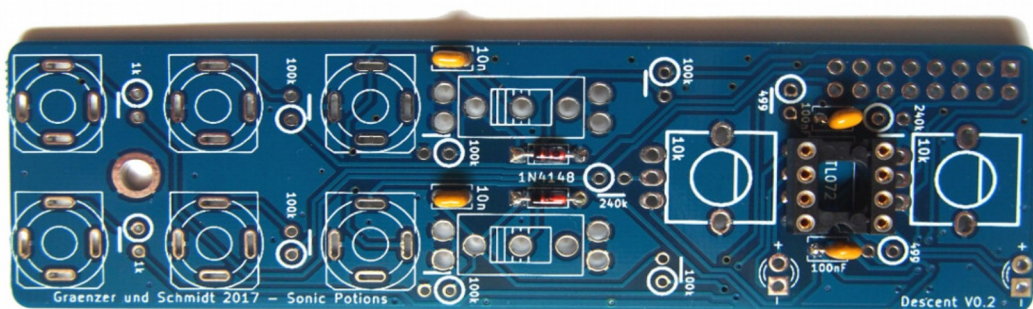
| Image   | Description | Quantity | Notes                   |
|---|-------------|----------|-------------------------|
|  | 10nF        | 2        | Has "103" written on it |
|  | 100nF       | 2        | Has "104" written on it |



# IC socket

Align the notch of the IC sockets with the notch on the silkscreen. The notch indicates the IC orientation.

| Image   | Description | Quantity | Notes                       |
|---|-------------|----------|-----------------------------|
|  | DIP 8       | 1        | Align notch with silkscreen |

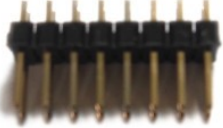


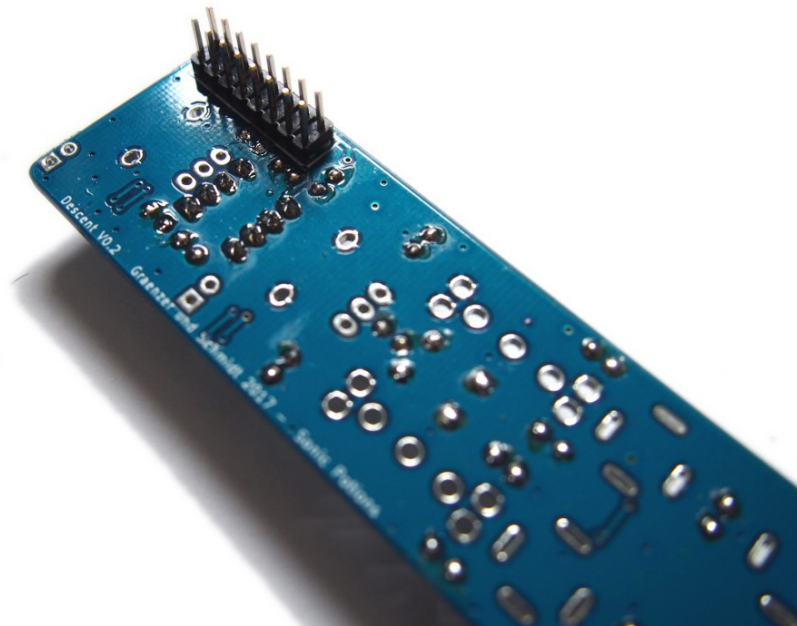




## Pin array bottom


Solder the pin header to the bottom of the PCB.

| Image   | Description    | Quantity | Notes                         |
|---|----------------|----------|-------------------------------|
|  | 2x8 pin header | 1        | Board connector <b>bottom</b> |

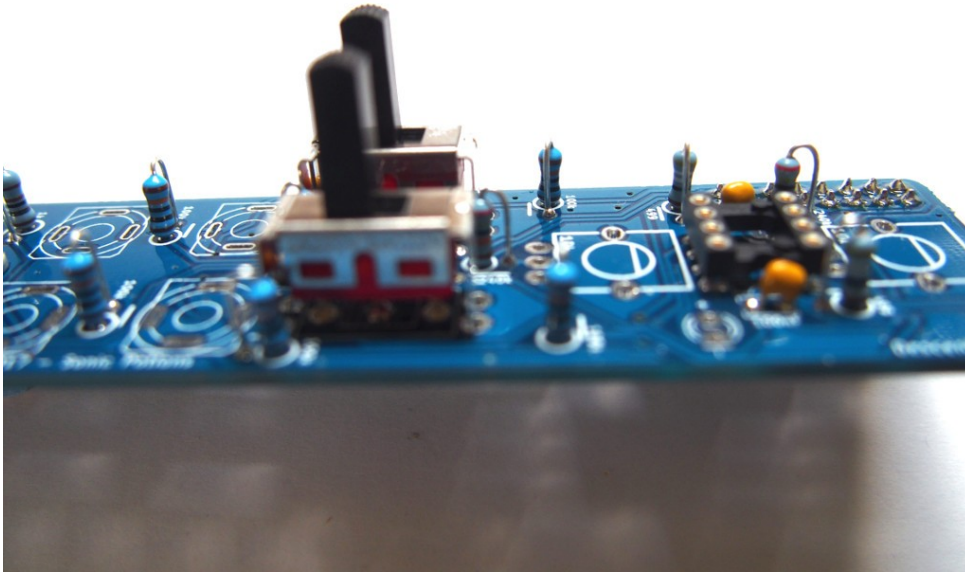


## Switch

**Make sure to solder the switch completely straight.** Solder a single leg first, adjust position, then solder the rest of the pins.


| Image   | Description | Quantity | Notes                      |
|---|-------------|----------|----------------------------|
|  | SPST switch | 1        | Selects the operation mode |



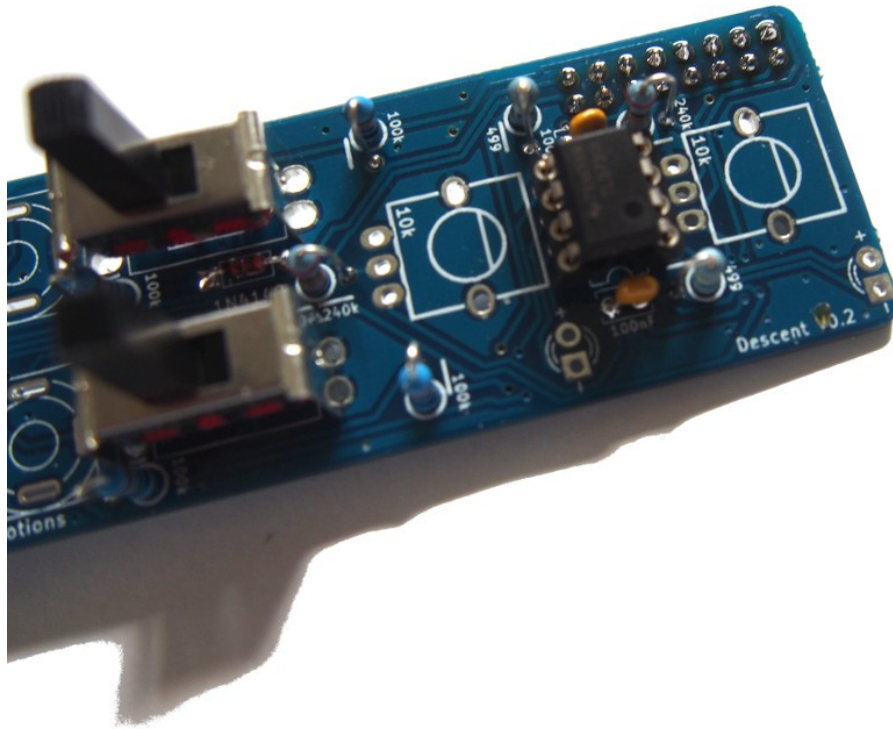


## Insert IC

Insert the TL072 IC into the socket. The small round dot on the IC marks pin 1 and goes to the side of the socket with the notch.



| Image   | Description | Quantity | Notes      |
|---|-------------|----------|------------|
|  | TL072       | 1        | dual OpAmp |



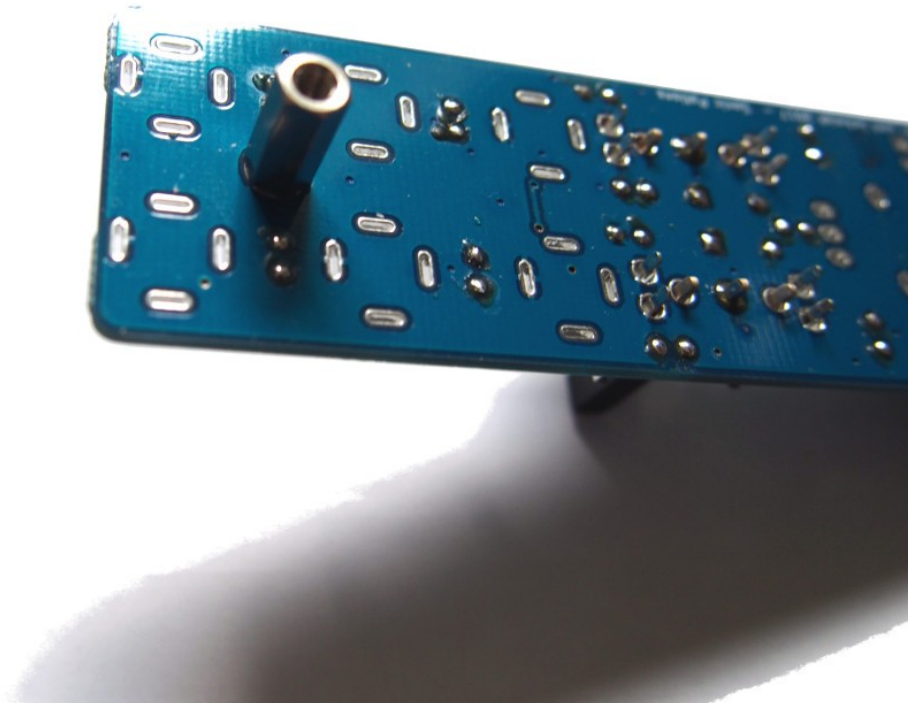


## Bolt and Screw

Put an M3 screw in the hole of the PCB from the top and screw the 11mm bolt to the bottom. The bolt will secure the other PCB later on.

| Image   | Description | Quantity | Notes |
|---|-------------|----------|-------|
|  | M3 screw    | 1        |       |
|  | 11mm bolt   | 1        |       |






## Attention!

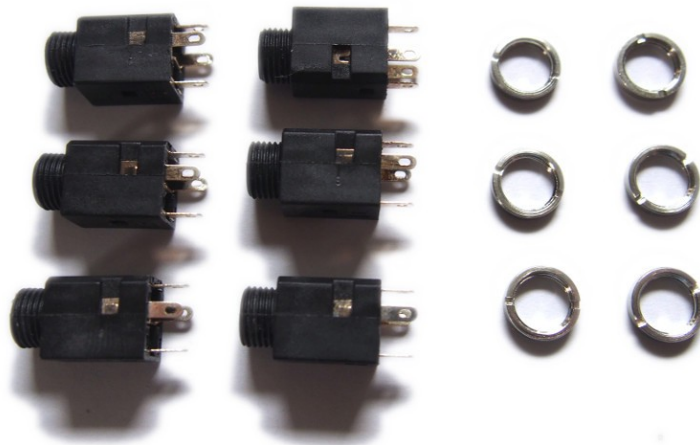
For the following steps parts have to be placed on the PCB but **not soldered** before the frontpanel is attached. This is to make sure all components are properly aligned with the panel and fit through the holes.

## Jacks

Remove the nuts and put the 6 audio jacks on the PCB. **Do not solder yet!**

| Image   | Description | Quantity | Notes |
|---|-------------|----------|-------|
|  | 3.5mm Jacks | 6        |       |






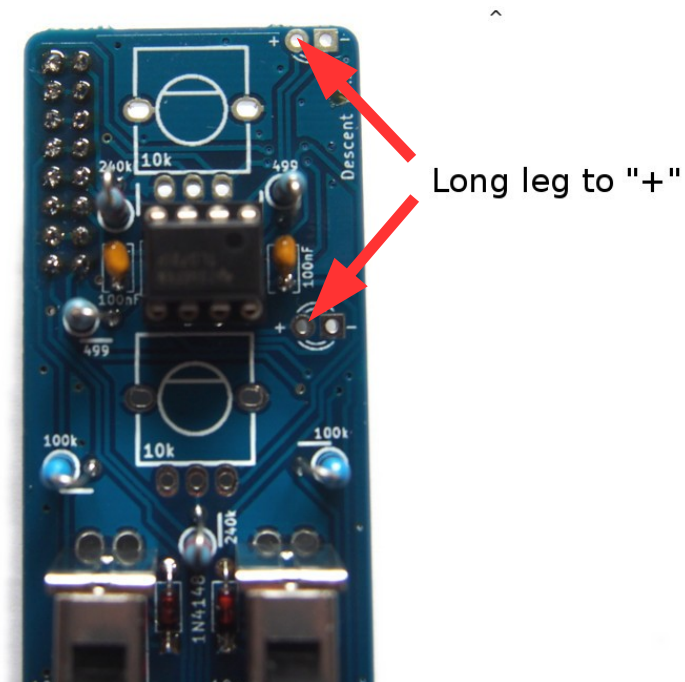
## LED

The LED is a polarized part. The long leg has to be put in the pad marked with a '+' sign.

**Do not solder yet!**


| Image   | Description   | Quantity | Notes |
|---|---------------|----------|-------|
|  | 3mm LED green | 2        |       |



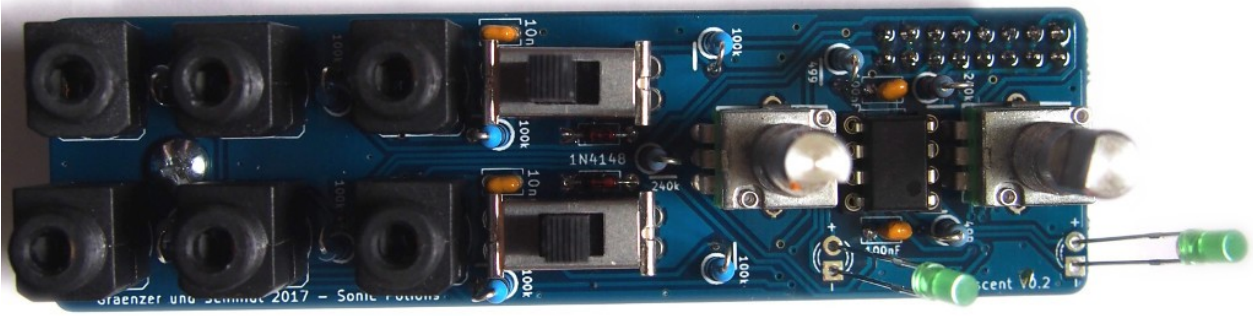


## Potentiometer

Same for the pots. Put them in place but do not solder yet.

| Image   | Description                     | Quantity | Notes |
|---|---------------------------------|----------|-------|
|  | 9mm potentiometer<br>10k linear | 2        |       |





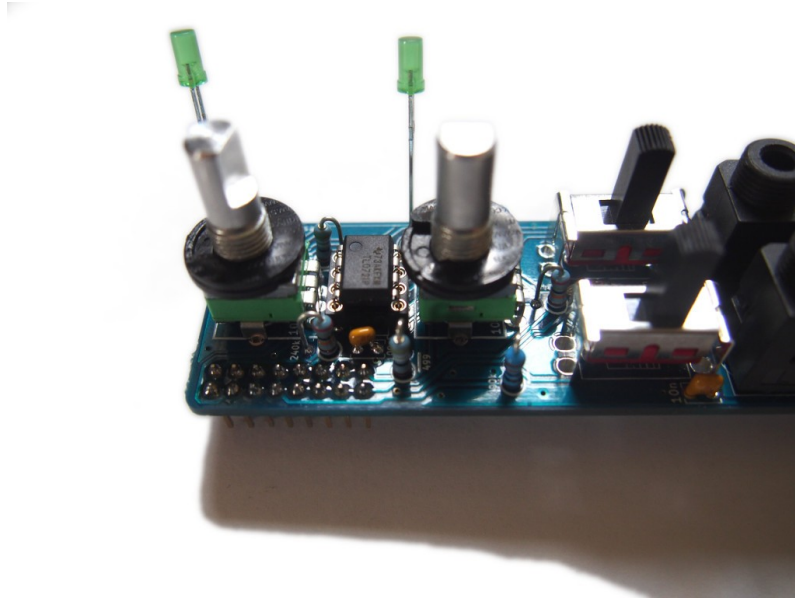
## Panel

| Image | Description     | Quantity | Notes |
|-------|-----------------|----------|-------|
|       | Aluminum Panel  | 1        |       |
|       | washer          | 2        |       |
|       | nuts            | 2        |       |
|       | plastic spacers | 4        |       |



First, put the plastic spacers on the threading of the pots. 2 spacers each.

Since the jacks are a bit higher than the body of the potentiometers, these spacers assure that you can screw the nuts from the pots tight to the frontpanel.

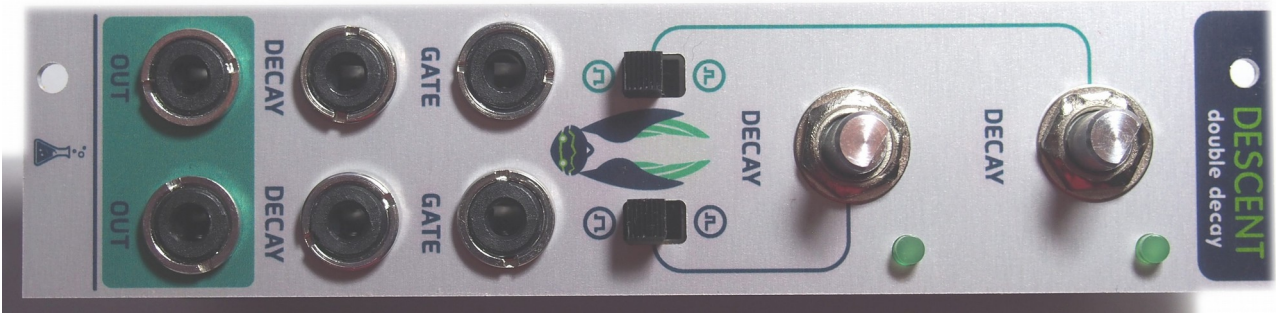


Then attach the panel and secure the 2 metal pots with a washer and a nut each.



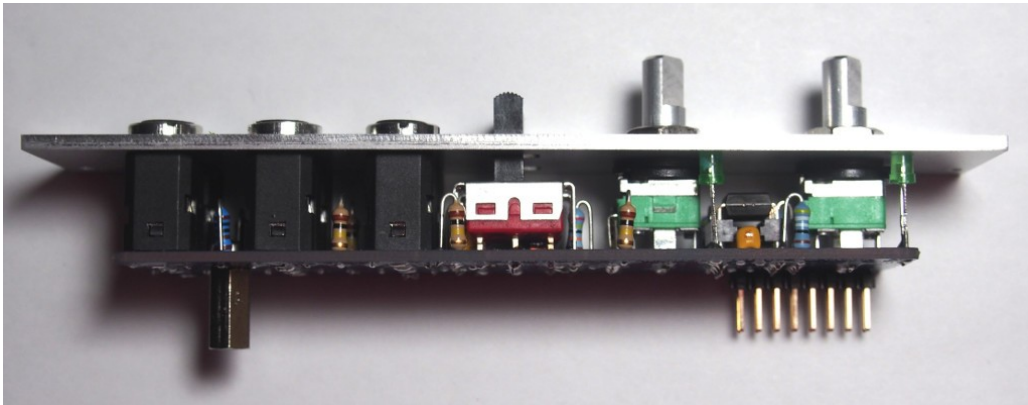


The jacks should be attached with their nuts, too. Push up the LEDs so they are flat with the front panel. Make sure everything is properly aligned and straight.

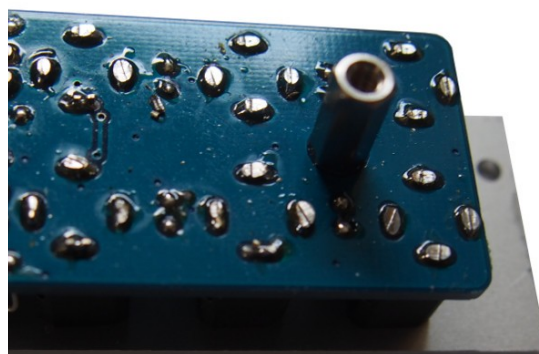


## Solder the components



Now solder 1 pin on each component. Before soldering the other pins, make sure that all components are straight. Then solder the rest of the pins. This method assures that everything fits into the panel later on.



Cut off the pins of the jacks as flat as possible, otherwise they may touch the caps on the lower PCB later on. Be careful, the legs of the jacks are like small powered high energy projectiles when cut off with wire cutters! (You'll shoot your eye out!)



# Knobs

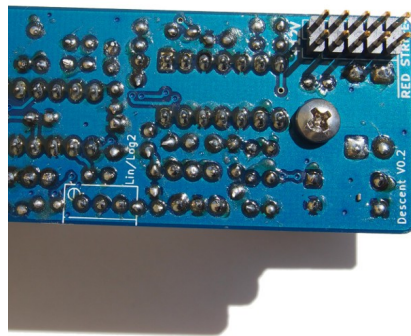
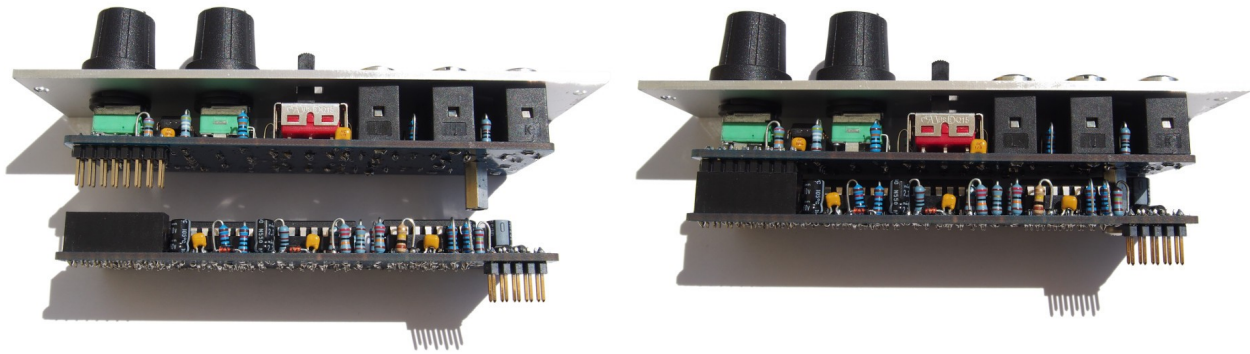
| Image   | Description | Quantity | Notes |
|---|-------------|----------|-------|
|  | Knob        | 2        |       |
|  | Cap         | 2        |       |

Attach the knobs and turn the pots to their minimum position. Then put the caps onto the knobs with their marker pointing to 7 o'clock

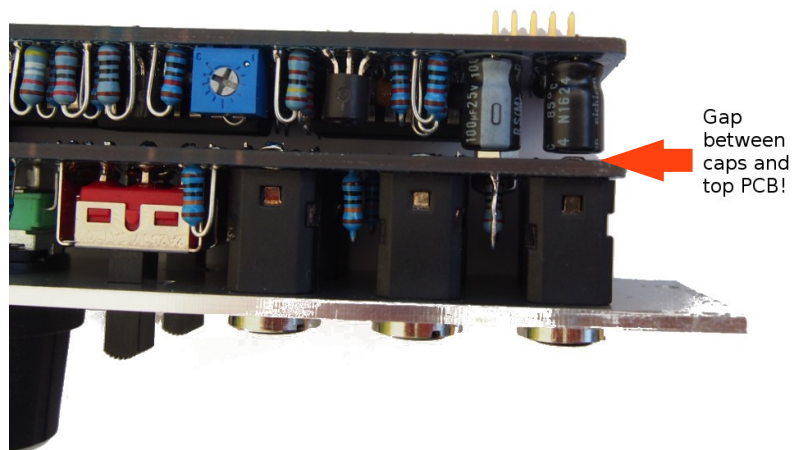


## Final assembly

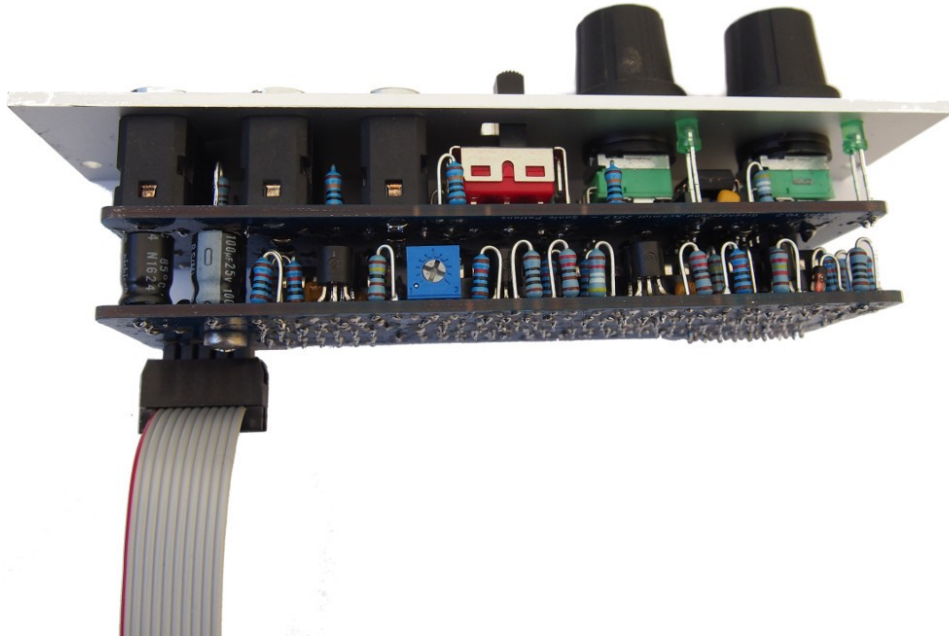
Attach the lower to the upper PCB and attach it with the M3 screw to the bolt.



**Make sure the electrolytic capacitors do not touch the upper PCB!!!**



Attach the power cable with regard to the proper orientation (**red stripe to the bottom of the PCB**)



## Test the module

Congratulations! You should now have a working Descent module in front of you.

Turn both knobs to the minimum position and attach it to a power source. Connect a trigger signal to the left gate input (remember, the second gate is normalized to the first gate as long as no plug is inserted to it). Both LEDs should flash and decay when a trigger is sent.

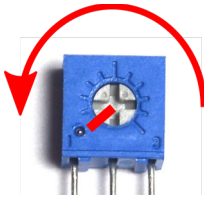
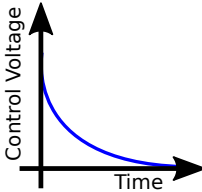
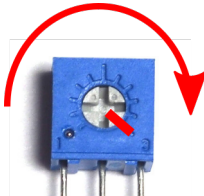
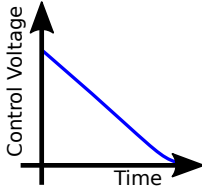
**If that is not the case, turn off the power and re-check your work!**

If that works, test the outputs for different potentiometer settings and/or CV Inputs (eg. by controlling a VCA which amplifies any audio signal).



If that works also, chances are good that you did a great job and the module is fully working.

Now you can (optional) adjust the PCB Trimmers for each decay channel to set them to equal or different ranges and for their decay behaviour to achieve any behaviour in between the following extremal positions:

| Trimmer Setting   | Decay Time Range<br>(for Pot-Knob and/or CV) | Decay Behaviour   |
|---|--|---|
|   | <p>Approx.: 40 ms to approx. 5 seconds*</p>  |  <p>Nonlinear<br/>(e.g. for "audio"-applications due to logarithmic hearing)</p> |
|  | <p>Approx. 80 ms to approx. 25 seconds*</p>  |  <p>(nearly) Linear<br/>(e.g. for general CV-applications)</p>                 |

\* The range boundaries vary due to component tolerances (use higher capacitor values instead of the 2.2 uF capacitors showed on page 13 if you need a longer max. decay time – but be pay attention, that these will fit into the stacked PCBs)

Have fun with your new module!

