ATTENUVERTER BANK
Build document

Soldering of components
Most of the components are already soldered to the PCB, there are only a few elements left to be soldered by you.

> **Soldering tip:**
> *When it comes to soldering a component, I do it this way all the time:*
> *I solder only one leg of the component. Then I adjust its position. It is indeed easy to apply the soldering iron to the soldered leg and move the component by hand to better replace it.*
> *Typically by making sure that the component is firmly seated in its place. We will see more example bellow.*

BOM :

- 2x5 Pin Header x1
  0,100 po (2,54mm)
  (exemple : PH2-10-UA Adam Tech | Connecteurs, interconnexions | DigiKey)

- 3,5mm MONO Jacks (**Thonkiconn**) x41
- 10Kohm potentiometers x16
  ALPHA 9mm Pots (or compatible)
  (or 9mm Trimmer Pots)
- Knobs (for ALPHA 9mm Pots only) x16
  Use same Shaft as your Pots : D-Shaft, T-18 or Round.
  Davies, SIFAM or others styles as you prefer.

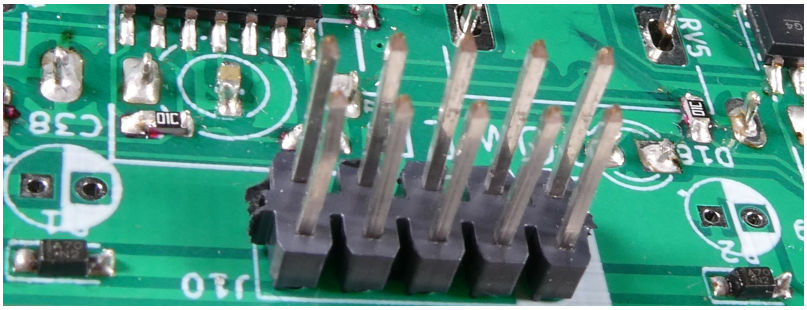
WARNING : use the same shft for the potentiometer and the knob !
Should be D-Shaft, T-18 or round.

- 4 pos. DIP Switch x8
  Type **CES-0402MC**
  (CES-0402MC Nidec Components Corporation | Commutateurs | DigiKey)
- bicolor LED x20
  Green/Red 3mm round type MT2030-HGR-A
  Forward voltage (Vf) (typ.) **2.1V** (Green and Red)
  Forward current (If) (typ.) **20mA** (Green and Red)

OPTIONNAL :
- 1x4 Pin Header x4
  (PH1-04-UA Adam Tech | Connecteurs, interconnexions | DigiKey)
  You can use longeur Breakable Strip too.
- 10uF 25V (or more) Capacitor x2
  Pin Spacing 0,079po (2,00mm), diameter : 5mm
  (ECE-A1VKS100 Panasonic Electronic Components | Condensateurs | DigiKey)

A- components side:

1-PSU connector:
Solder the 2x5-pin connector.

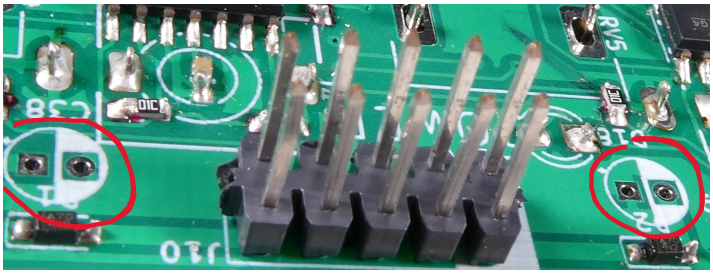


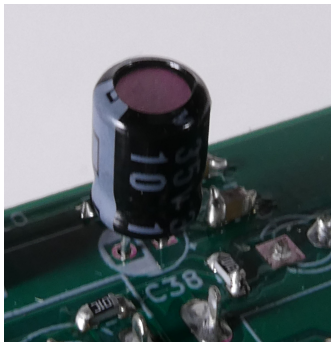
2- Optional capacitor:
There are already capacitors to filter the power supply, but for purists or if you have a noisy PSU, optionally, you can add 2 capacitors, to smooth out the current coming into the module even better. A few uFs are sufficient. (**10uF** should be good enought), Remember to take care that can support **at least 16V**, for safety **25V** is a better choice.
Format capacitors :

- Pin Spacing 0,079po (2,00mm)
- Diameter : 5mm

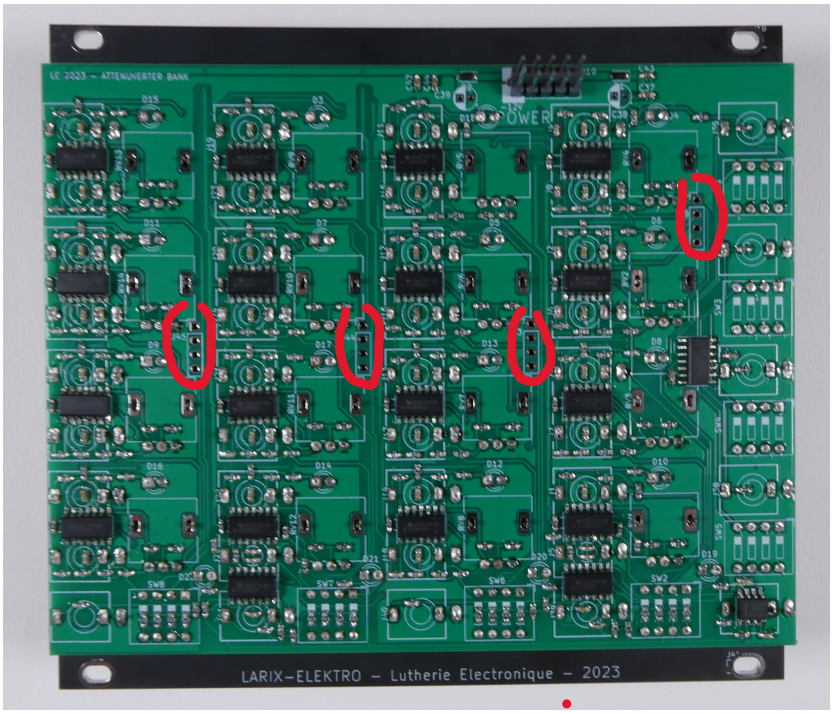
Others formats are possible, of course, but you will need to adjust the pin !

Be careful, these capacitors are polarized, which means that you should not put them in any direction: The pine under the Minus (-) sign of the capacitor goes into the hole surrounded by white.





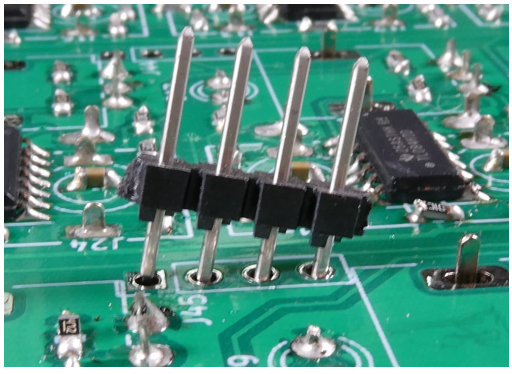
3- Optional connector:



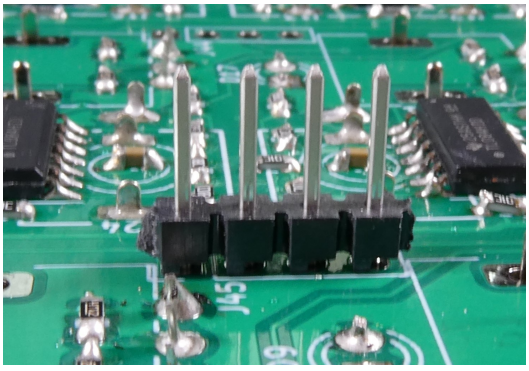
There are 4 optional connectors: 4 line of 4 pins.
These are the outputs of the 16 attenuverters, the same signal as the one on the front jack.
The CV inputs of most LARIX-ELEKTRO (LE) modules have the same connector on the back.
This allows you to add the attenuversion function to these CV entries without having to patch the 2 module together. thus saving cables at the front.
It can also be useful for DIYers.
If you don't think you need this feature, then there's no need to solder these connectors.

WARNING, once all the potentiometers and jacks are soldered, it will be difficult to add these connectors.

Take car to solder correctly these connector:



NOK



OK

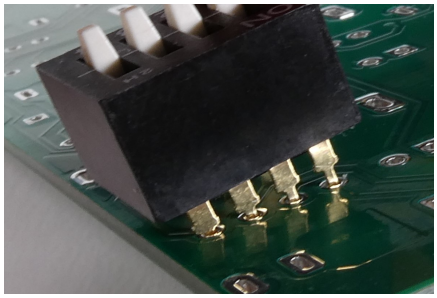
There is nothing left to solder on this side of the PCB.
Everything else is to be soldered on the other side.

B- Side without components:

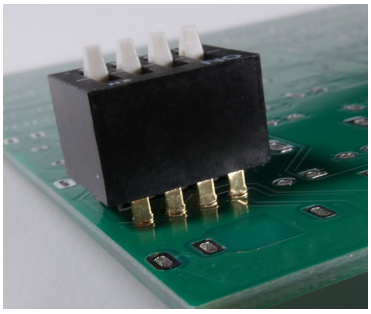
All that remains is what will be on the front panel: the jacks, potentiometers, switches and LEDs.
It is best to solder each family of components one by one as described here:

1-SWITCH

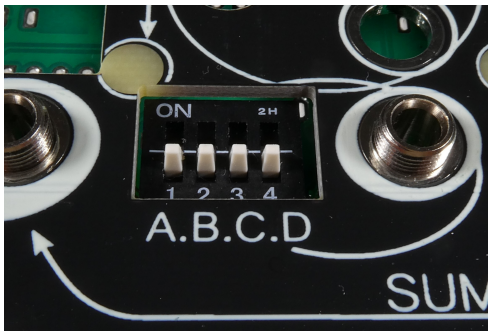
There are 8 "DIP Switch" to solder.
Depending on how you want them to appear, the time to solder them may differ.
I prefer when they are a little recessed, so the edge of the front panel protects the small switches.
In this case, it's best to solder these DIP Switch first, before everything else. Thus, it will be well pressed against the PCB.
There are different ways to do it, for my part, I place all the switches, put a hard surface (a cardboard for example) on them, and turn everything over.
As described above, I only solder one leg of each component.
Then I turn the PCB and check that everything is in place. With just one solder tab, it's easy to readjust each component.
Once it's firmly in place, I finish soldering all the pins.



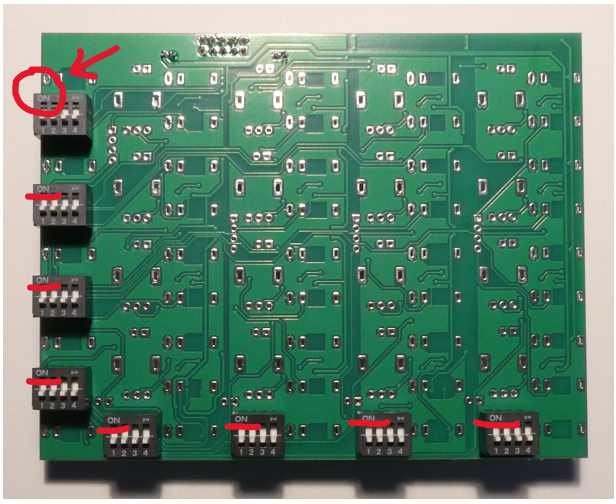
NOK



OK

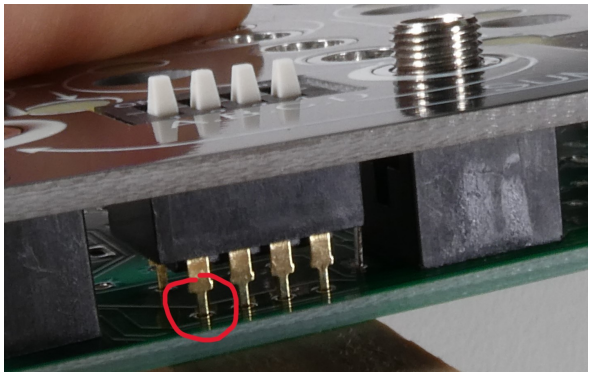


Switch with the front panel : result



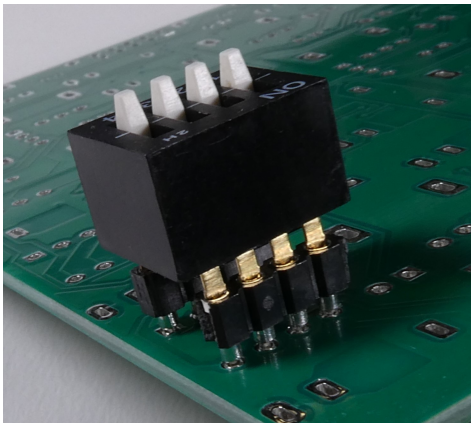
Position of the DIP Switches : the « ON » mark is on the TOP.

NOTE :
If you want the DIP switches to be soldered to be right at the edge of the front panel, it's better to wait until you have the jacks attached.
I don't recommend this solution, even if it is more aesthetic, because the DIP switch is no longer in contact with the PCB on which it is soldered, and therefore becomes mechanically fragile.



Switch at the edge of the front panel.

Another solution is to raise the DIP switch with a socket connector.

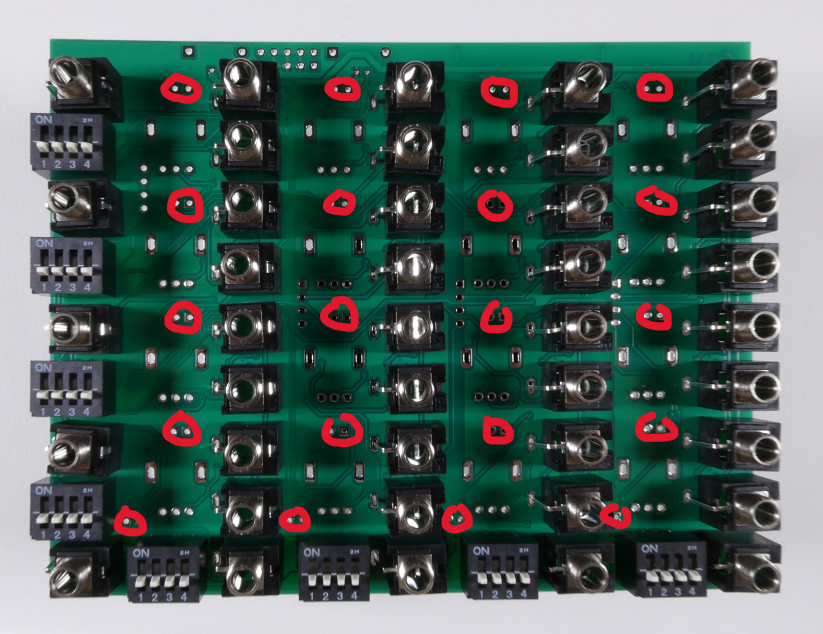


With socket

Result with the front panel

2- JACK and LEDS
To avoid mounting and disassembling the front panel too many times, we will solder the Jack and LED at the same time.

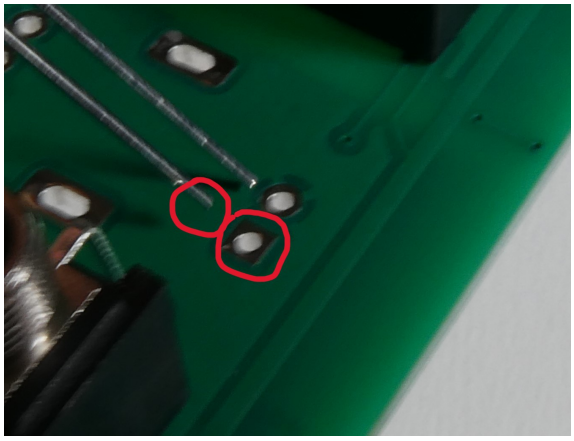
It's best not to mounting the potentiometers right away. This is because it will be easier to solder the LEDs without these potentiometers.
Place all jacks on the PCB. There are **41** in all.



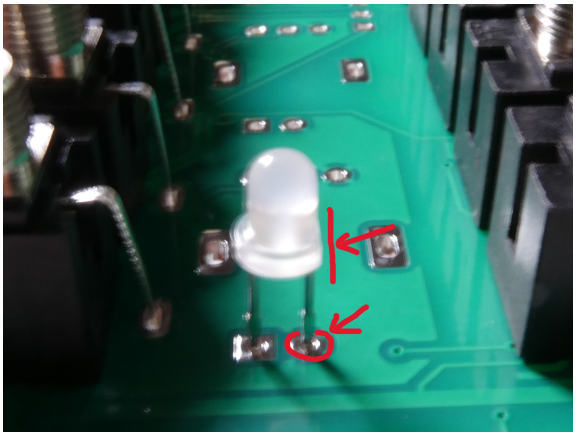
All the Jacks + all LED (red traces)

Then place all the LED (**20**).
The LEDs used by default are two-color red and green LEDs. When the signal is positive, one LED is lit, and the other when the signal is negative.

If you want the GREEN LED to be lit up when the signal is positive, then you need to place the LED as shown in the picture:



Small pin to square hole



or the flat edge to the round hole

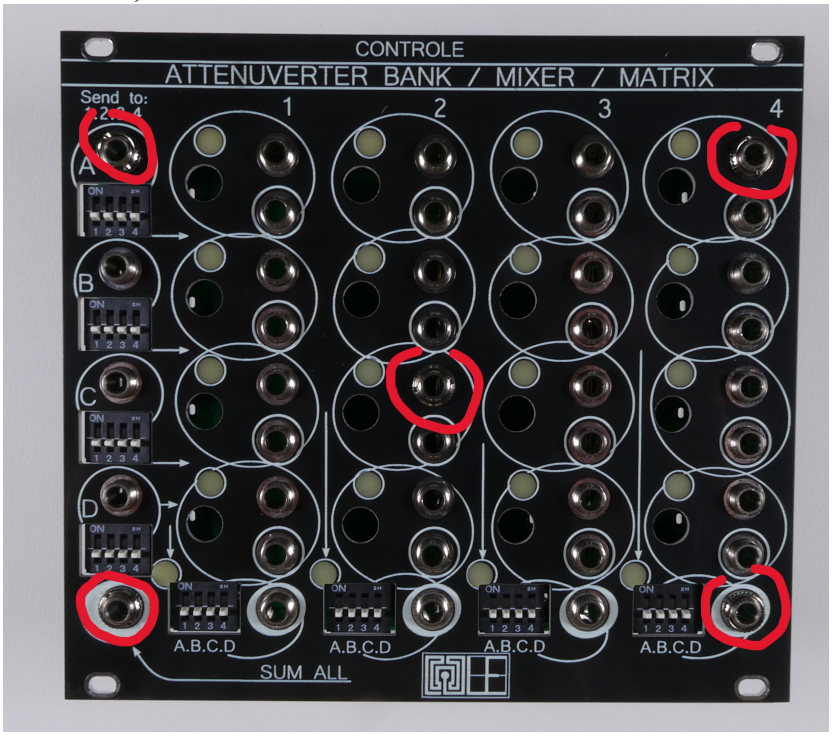
If you invert the legs of the LED, you also invert the color.

NOTE 1: The module consumes quite a bit of current. One way to reduce it is to remove the LEDs. It's also a way to save money!
In this case, before placing it and soldering the LEDs, consider whether you are going to need it or not.

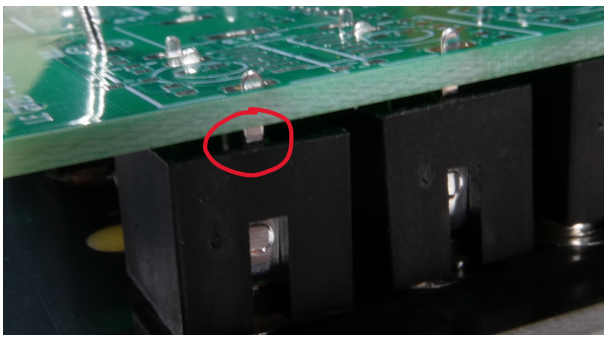
NOTE 2: The circuit has been calibrated for a specific type of LED. If you want other colors, be careful to use LEDs with the same characteristics :

Forward voltage (Vf) (typ.) **2.1V** (Green and Red)
Forward current (If) (typ.) **20mA** (Green and Red)

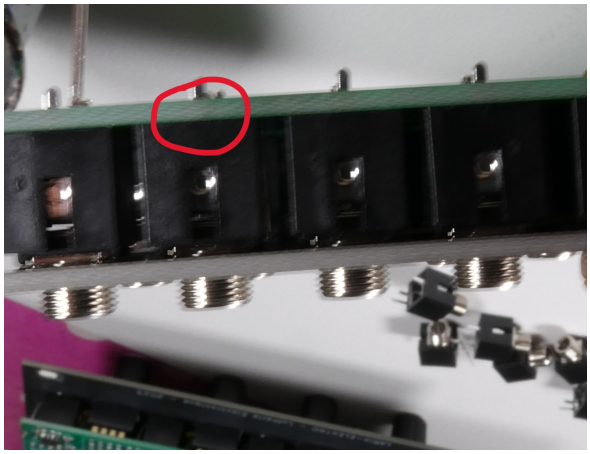
Insert the front panel into the jacks.
If you have already soldered the DIP Switches, they should be just below the front panel, and in front of the holes.
Screw 4 jacks onto the front, and one on the center. There is no need to screw them too hard.



Before soldering, check that the jacks are firmly inserted in the PCB.



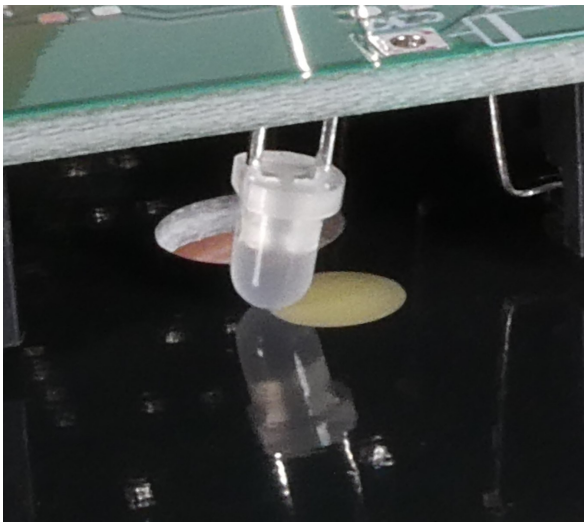
Space between the jack and the PCB : NOK !



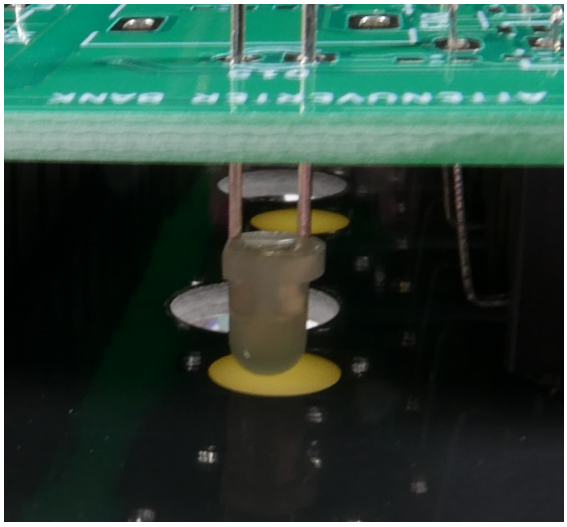
No space = OK

As with the previous taps, solder only one PIN of each Jack.
Check again that all the jacks are against the PCB.

Properly replace the LEDs' PINs so that they are approximately vertical. Solder a single pin of each.
Now replace the LEDs correctly one by one.



BEFOR



AFTER

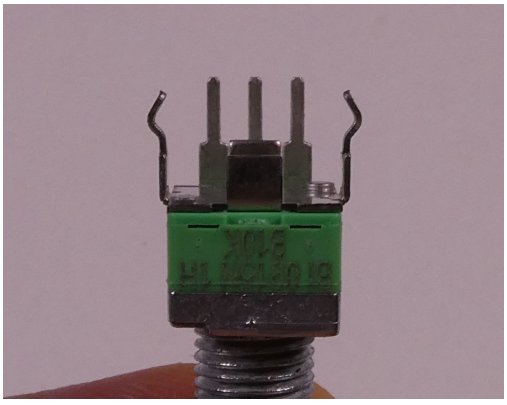
Be careful, once the 2 PINs of the LEDs are soldered, it will be more difficult to readjust the locations.
Don't panic, the LEDs don't have to be perfectly aligned with their transparent window. These are large enough to withstand the fact that the associated LED is not exactly in front of it.

Once you have checked that all the LEDs and JACKs are in place, solder all the remaining pins.
Be careful not to forget any pin! The main reason why the module is not working properly is due to forgetting a solder.

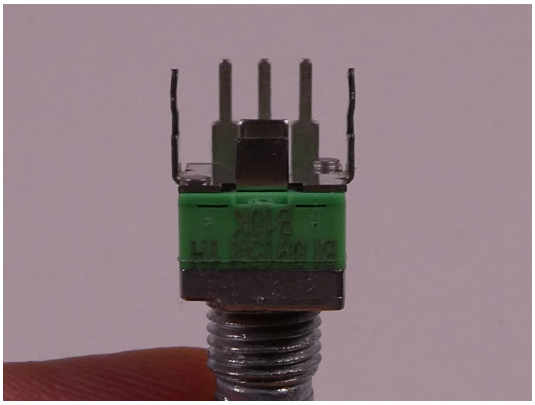
> **NOTE:** in case you wanted the DIP switch to be right at the edge of the front panel, this is time to solder them. (See previous chapter)

3- POTENTIOMETERS

It is now possible to add the potentiometers.
Disassemble the front panel, and place the Pots.
As space was limited, it was necessary to reduce the size of some holes.
"Pinch" the pin to make it straight:

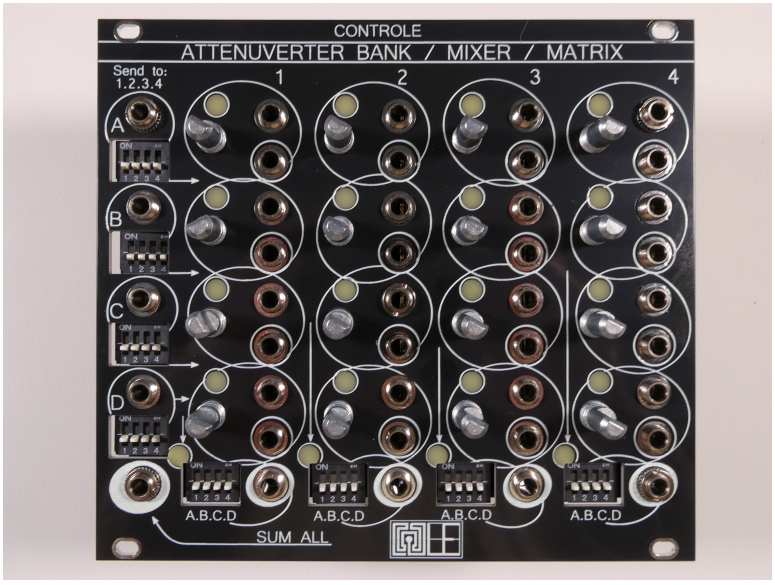


before



After

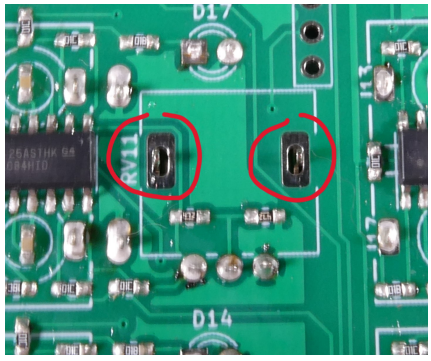
NOTE: Depending on your choice, the module can use potentiometers like :



Alpha 9mm pots (or similar), that will need knobs.

9mm trimmer pots, that doesn't need knobs.

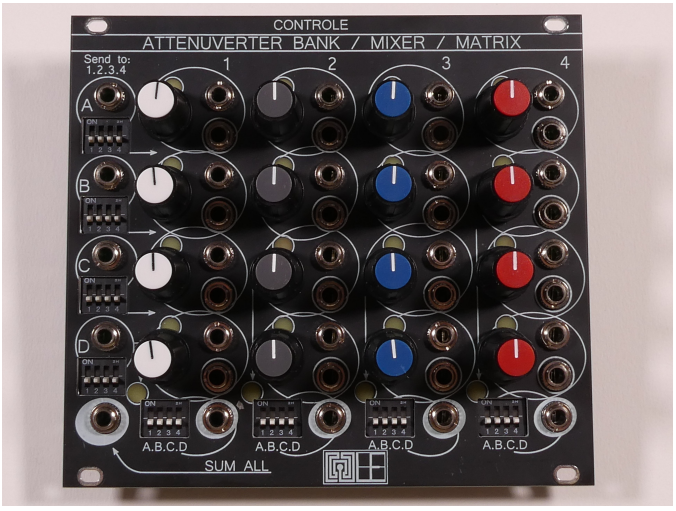
Replace the front panel, and attach at least 4 jacks.
As always, I recommend soldering only one PIN of each component to check that they are properly positioned before soldering the rest.
There are the 2 pins that are used for better mechanical support.
For strength, it is best to solder them. But in this case the potentiometer will be more difficult to desolder. It's up to you.



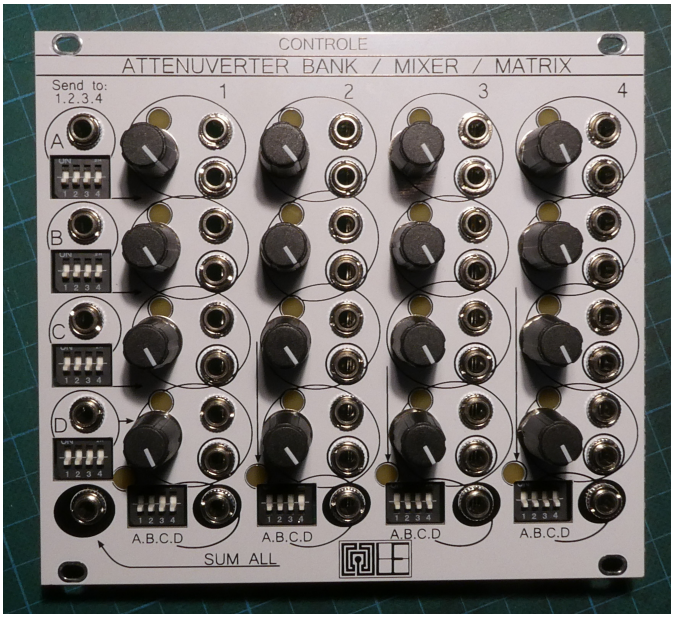
4- Finalize

All that remains is to fix all the remaining jacks as well as the potentiometers.
And then insert the Knobs onto the potentiometers.

Black panel :



White panel :



C- TESTING YOU MODULE :

There are no adjustments to be made, the module is ready to use.
But I recommend testing that each circuit is working before attaching the module to your rack.
Ideally, you need a signal generator like an LFO, or a fixed voltage, and an oscilloscope.
But for example, you can use a VCO that will be frequency controlled. Thus, its modulation will make it possible to make audible the proper functioning of the module.

As a first step, test the attenuators one by one. Checking that the potentiometer is working properly: no output signal at 12 o'clock, inverted signal when the potentiometer is pointed to the left, and not inverted when the potentiometer is pointed to the right.

Also check that the LED is working as expected (color !).

Next, check the common entry for each line. Put all 4 switches on and check that the LEDs light up as expected.
Normally, with the first test already done, it is not necessary to check the output of each circuit in the line.

Repeat for all 4 lines.

Finally, test the common output for each column. Turn all 4 switches ON. Connect the signal to one of the inputs and check that the LEDs light up as expected.
As with the previous test, there is no need to check the output.

Repeat for all 4 columns.

There remains the common output.
Stay in the last configuration: a signal in one of the input, with the switches ON.
As this last output does not have a matching LED, it is necessary to check that the signal is present at the output with your VCO or oscilloscope.

WARNING:
The output signal of each attenuating circuit is amplifier of X1.5
But not amplified at the output of the mix of each column.
And attenuated a bit in common outing!
(At each step, to avoid clipping)

If one of the circuits does not work, check that a solder has not been missed. In most cases, that's where the problem comes from !

And now,it's time to have fun with your module !

Contact : larix.elektro@gmail.com
www.larix-elektro.com