● 6HP Eurorack Module ● Built & designed in Belgium ● www.shakmat.com

Shakmat Gemini's Path Building Guide

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1. Preamble

Thank you for purchasing a Shakmat DIY kit !

We spare no effort in our kit packing process to prevent any mistakes or missing parts. In this document as well, we do our best to describe the assembly process in the most practical and comprehensive way. If by any chance there is a missing/damaged part in your kit or if you have any suggestion, feel free to contact us via shakmat.com.

We strongly advise you NOT to spill all the bags open and mix their components. Some of them are virtually indistinguishable (like LEDs that all appear clear when inactive). We recommend to only take the necessary component out of its bag, or to empty the bags in separate & marked containers. For each step, next to the component's graphic representation, there is a reference indicating where to find it (i.e. P1 for Pack 1, or LP for Loose Part).

Also, the assembly process will be dramatically simplified if you follow the order defined by this building guide. We tested various orders of steps before finding the most convenient, and the one presented here is the best !

2. Component list & necessary tools

Pack 1

2x 200Ω resistors
7x Jack connectors
7x Jack connectors nuts
1x 78L05 IC
1x 8 pin female header
1x 8 pin male header
2x Diodes
1x Quartz
3x Green LEDs

Pack 2

1x 3k6Ω resistor
2x 33μF Electrolytic capacitors
1x Power header
1x Small potentiometer
3x 6 pin female headers
3x 6 pin male headers
4x Amber LEDs

Pack3

4x 20kΩ resistors
3x Push buttons
3x Push buttons caps
2x Big potentiometers
2x Big potentiometers hex nuts
3x White LEDs
2x M3 screw

Pack 4

1x Top PCB
1x SMD PCB
1x Aluminum panel

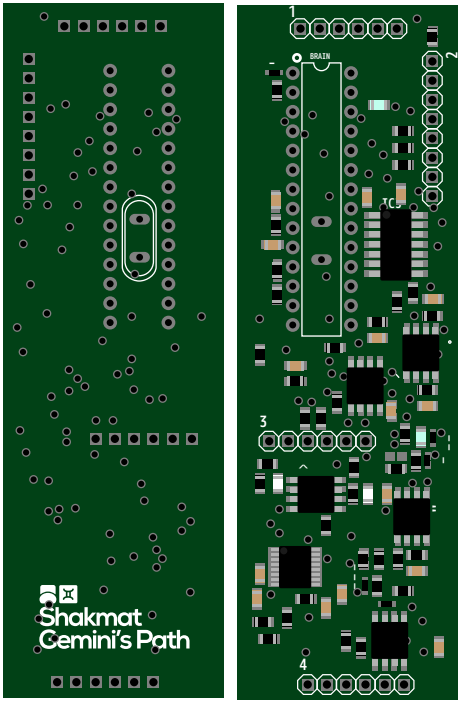
Loose parts

2x Black rubber knobs
1x 28 pin IC socket
1x ATtiny IC
1x Power cable
1x User manual

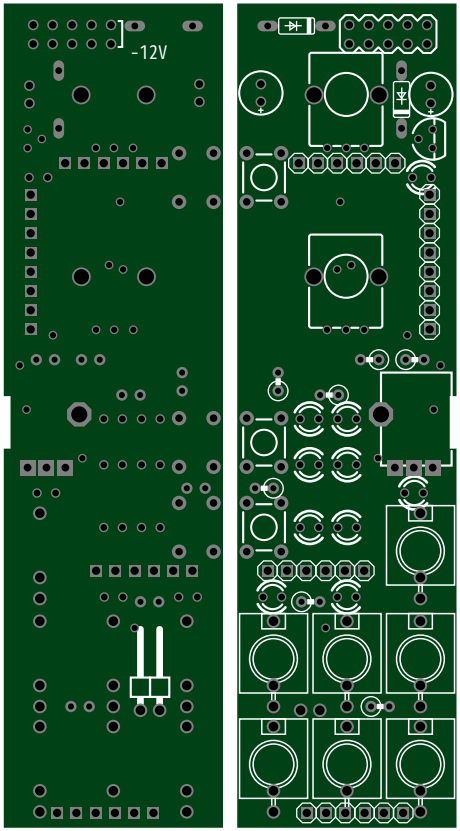
Necessary tools

Soldering iron
Solder
Cutting pliers
Masking tape

3. PCB details



SMD PCB
Back & front



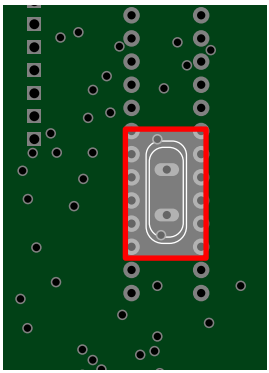
Top PCB
Back & front

4. SMD PCB assembly

4.1 Back side

4.1.1 Quartz

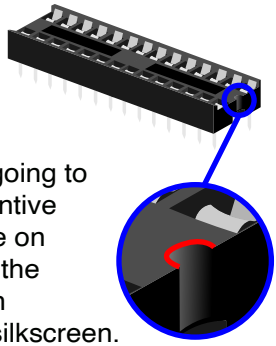
P1



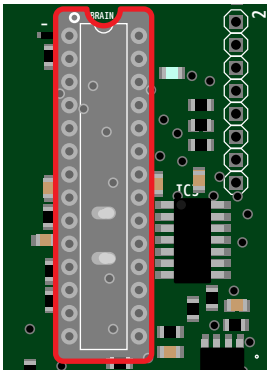
Solder the quartz on the back side of the SMD PCB. Be very careful to solder the component well and trim the legs flush. This quartz solder points will seat under the 28 pin IC and will therefore not be accessible later.

4.2 Front side

4.2.1 28 pin IC socket



LP

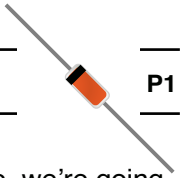


Flip the PCB around, we're going to solder the IC socket. Be attentive to its orientation. The red line on the magnified picture shows the indentation that has to match the indentation on the PCB silkscreen.

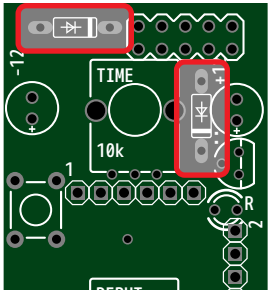
5. Top PCB assembly

5.1 Front side

5.1.1 Diode (x2)



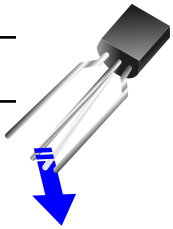
P1

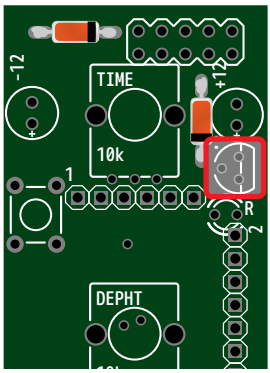


Take the second PCB from the front side, we're going to solder two diodes. Be attentive to their orientation, the thick white line on the PCB silkscreen has to match the black line on the component.

5.1.2 78L05

P1

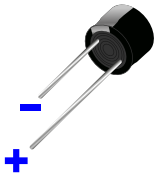


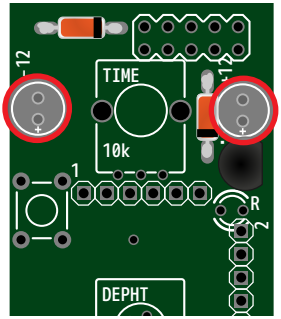


Before soldering the 78L05, bend the central leg a little to help it sit flush on the PCB.
Also, pay attention to the orientation, the flat & round contour of the component have to match the contour of the PCB silkscreen.

5.1.3 Electrolytic capacitors (x2)

P2

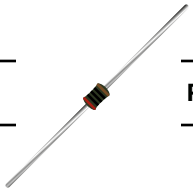


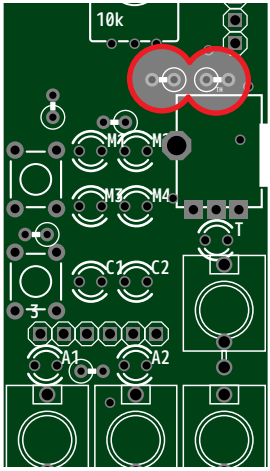


Solder the two 33μF capacitors.
You must pay attention to the orientation of these components. The long leg is indicating the positive side, therefore it has to match the + sign on the PCB silkscreen.

5.1.4 200Ω resistors (x2)

P1

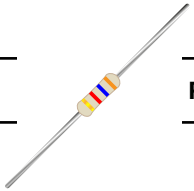


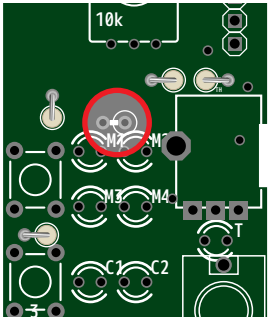


Solder the two 200Ω resistors.
All the resistors are mounted perpendicularly to the PCB, so only one of the leg has to be bent. Be careful not to bend too far from the resistor's body, because this can lead to short-circuits with the aluminium front panel.

5.1.5 3k6Ω resistor

P2

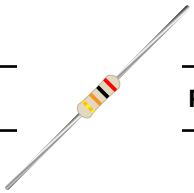


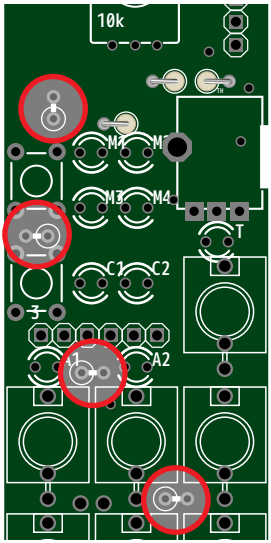


Solder the 3k6Ω resistor,
perpendicularly to the PCB.

5.1.6 20kΩ resistors (x4)

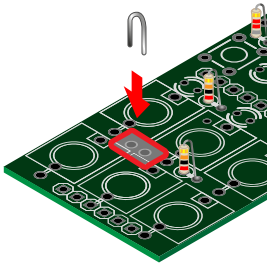
P3





Solder the last four resistors.
Those are 20kΩ and also mounted straight up.
Save the longest trimmed leg for the next step.

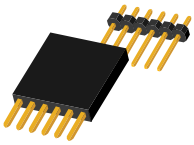
5.1.7 Resistor leg bridge



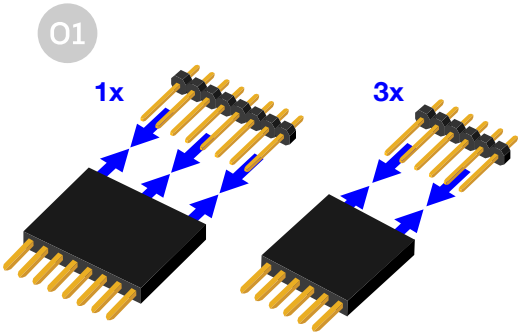
Bend a trimmed resistor leg in a U shape.
Pass it through the two holes on the front of the top PCB and solder it on the back side.

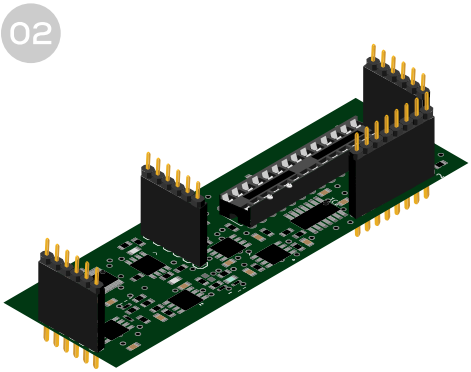
6. PCB stacking

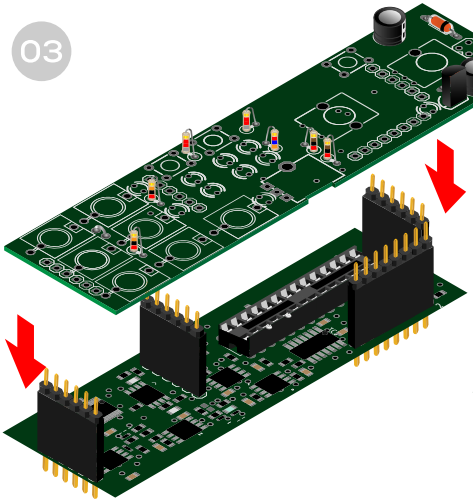
6.1 Headers

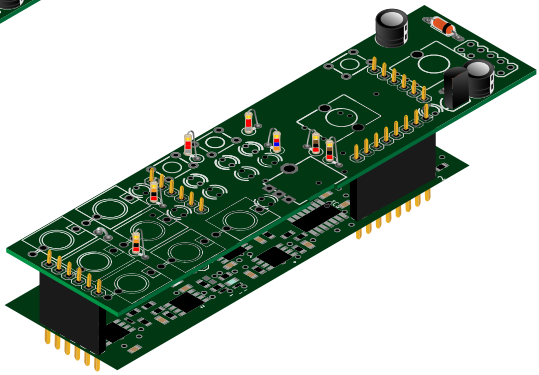


To stack the two PCBs together, headers are used.
There are three pairs of 6 pin male & female headers and one 8 pin pair. First assemble all the headers with their mate. Then place the female part on the SMD PCB and the male part on the top PCB. Then assemble the two boards together and finally once everything is fitted, solder.





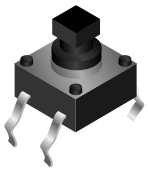




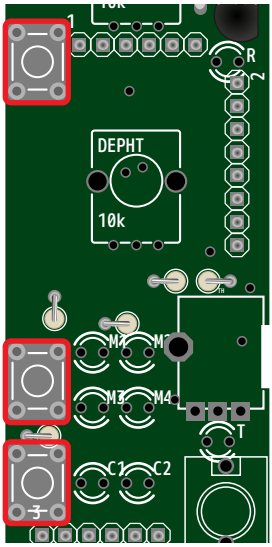
7. Complete top PCB assembly

7.1 Front & back side

7.1.1 Push Buttons (x3)



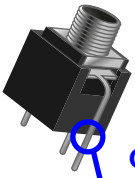
P3



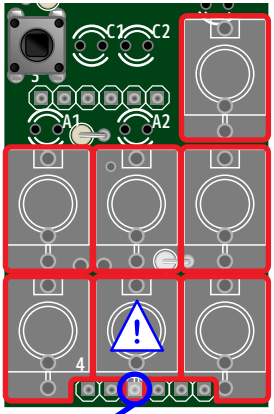
Now that all the headers joining the two PCBs are soldered, dissociate them and complete the top PCB assembly.

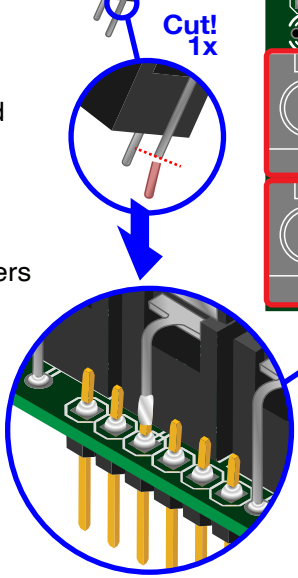
It's very important to solder the three push buttons flat onto the PCB. If they are crooked or not thoroughly pushed through, the caps won't pop properly through the front panel and the buttons will be hard to press.

7.1.2 Jack connectors (x7)



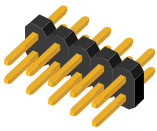
P1



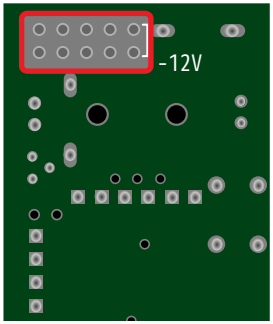


Time to solder the seven jack connectors. Six of them are soldered conventionally, but one has its outer ground leg soldered on an adjacent pin from the previously soldered header. For this connector, you need to cut about three millimeters off the outer ground leg (as shown in the picture above) in order to be able to solder correctly to the adjacent pin header.

7.1.3 Power header (2x5 pin)

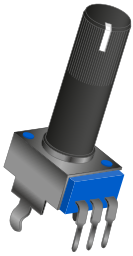


P2

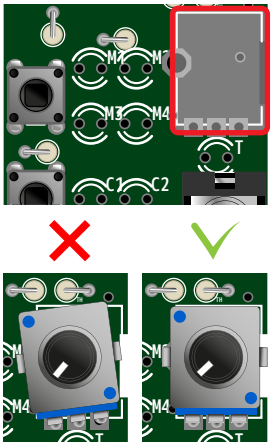


Be careful : the silkscreen marks the position of the 2x5 pin header on the front of the PCB **but it has to be soldered on the back side.** Be sure to lay it flat and solder it perpendicularly. We recommend you to solder only one pin and check the alignment, correct it if necessary, and then solder the remaining pins.

7.1.4 Small potentiometer



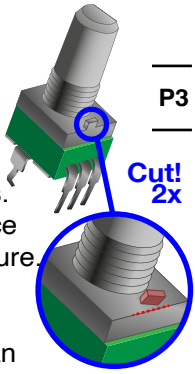
P2



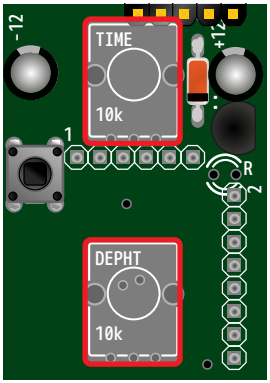
One of the support legs of this mini potentiometer is not soldered.
Be careful that the potentiometer stays perpendicular to the PCB.

Because the unsoldered leg can cause the potentiometer to twist on itself, be attentive to the alignment before soldering.

7.1.5 Big potentiometers (x2)



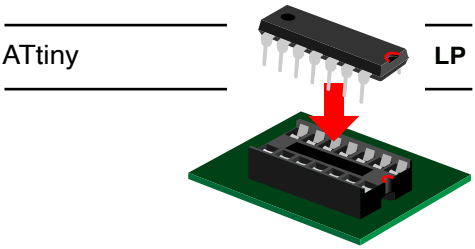
P3



Time to mount the 2 big potentiometers. First you'll have to cut a little metal piece on top of them off, as shown in the picture. This little stud prevents the front panel from sitting properly. Use some sharp cutting pliers for this task. Then, you can place the potentiometers on the board and solder.

8. IC plugging

Plug the ATtiny IC in the 2x14 IC socket previously soldered on the SMD PCB. Make sure the indentation on the IC (shown here with the red line) is matching the indentation on the IC socket.



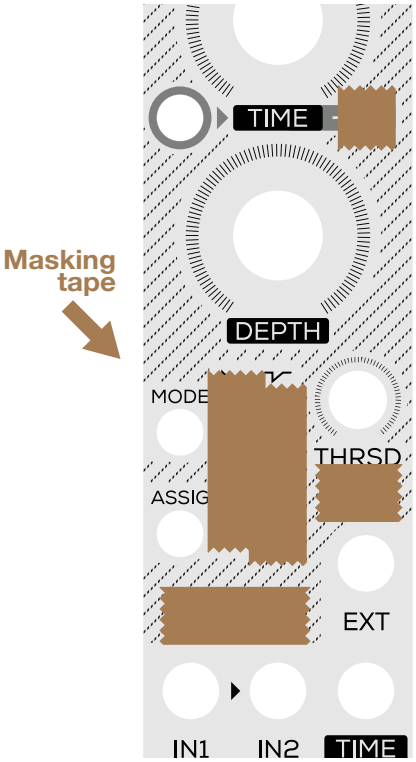
9. LED mounting (1)

The LEDs are special flat top models intended to be mounted flush with the aluminum front panel.

The best way to do this neatly is to use masking tape to cover the panel LEDs holes.

Therefore you can place all the LEDs on the top PCB, assemble PCB & panel with some nuts (one on Time potentiometer & one on Out 2) then push the LEDs through their holes until they sit flush with the panel by sticking to the tape.

Once everything is in place, you can solder all the LEDs.



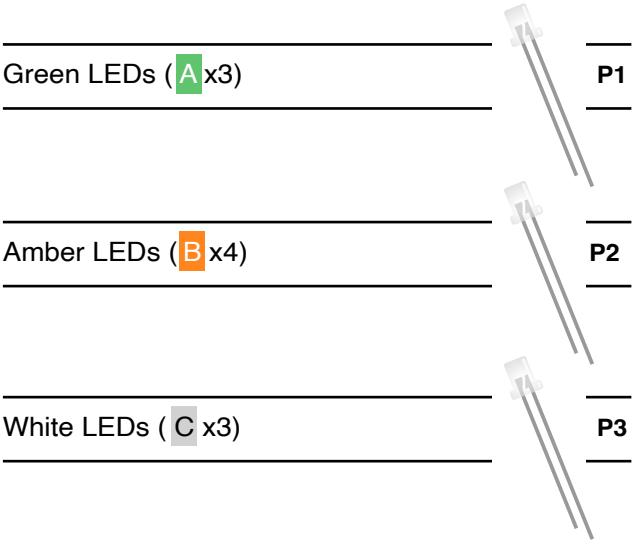
9. LED mounting (2)

Be careful with the LED polarity, the long leg is the positive side and they all go to the left side hole. Please refer to the following picture to know which LED color goes where. Pay attention not to mix LEDs from different packs, when inactive those clear LEDs are very hard to differentiate from each other.

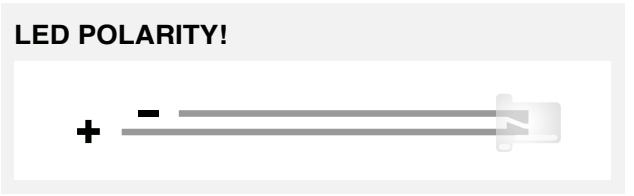
Green LEDs (A x3) **P1**

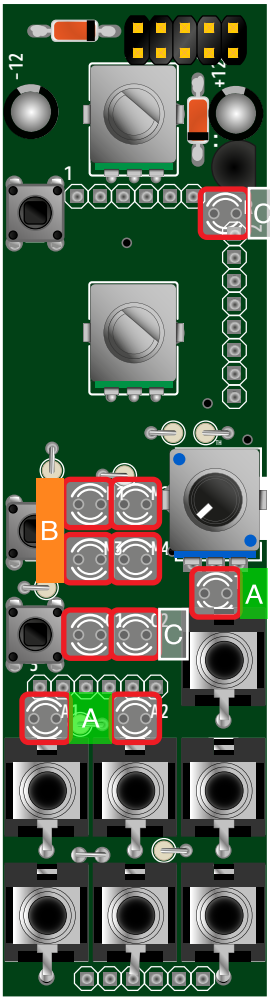
Amber LEDs (B x4) **P2**

White LEDs (C x3) **P3**



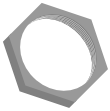
LED POLARITY!



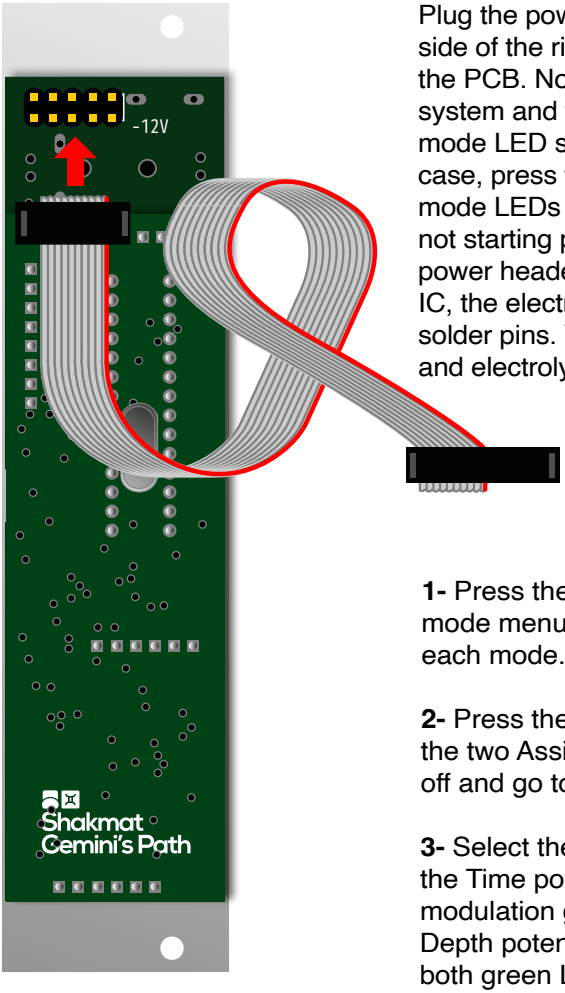


10. Nuts and caps

Place all the push button caps. Tighten the knurled nuts on the jack sockets & hex nuts on the two metal potentiometers. Push the two knobs onto their metal potentiometer.

Push button cap (x3)		**P3**
Jack connector nut (x7)		**P1**
Potentiometer nut (x2)		**P3**
Potentiometer knob (x2)		**LP**

13. Powering & basic testing



Plug the power cable and make sure the red side of the ribbon cable matches the -12V on the PCB. Now let's plug the module in your system and test it. when starting up the first mode LED should be on. If this is not the case, press the Mode button, if the other mode LEDs does not light up, your module is not starting properly. In that case, check the power header, PCB to PCB header, the big IC, the electrolytic capacitors and the diodes solder pins. You can also check the IC, diodes and electrolytic capacitors orientations.

If the module starts normally (the first mode LED is on), let's try the following tests :

1- Press the Mode button and verify that the mode menu LED light up as you pass by each mode.

2- Press the Assign button and check that the two Assign LEDs are on. Then, turn them off and go to the next step.

3- Select the thirs mode (Sine panning), turn the Time potentiometer and check if the modulation goes faster and slower. Turn the Depth potentiometer fully counterclockwise, both green LEDs should be on without any light variation. Turn the potentiometer clockwise, the LED should pulse in turn.

4- Now, let's test the CV inputs (stay in the same Sine Panning mode), send a positive voltage in the Time input (with the Time potentiometer fully counterclockwise) (...)

(..) and check if the modulation goes faster.
Do the same with the depth potentiometer, turned fully counterclockwise, a positive signal in the Depth CV input should dim the green LEDs.

5- For testing the audio inputs and outputs, send an audio signal in the first output. Still in Sine panning mode with Depth fully counterclockwise the audio signal should go thru the module with a slight attenuation.

6- Then, test the Ext input by sending a trigger in it (this input can receive any form of signals but better debug it with a simple one). Send a 0-5V trigger, adjust the Threshold potentiometer fully counterclockwise and the green LED should react to the trigger.

7- Finally, we test the Time+ button and LED. Pressing the button should light on the LED.

If after this debugging you still have problem, don't hesitate to contact us at support@shakmatmodular.com.

www.shakmat.com

Shakmat

Product design & engineering : François Gaspard
Product & brand design : Steve Hackx