# Shakmat
# Harlequin's Context
# Building Guide

# Table of contents

# 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 neccesary 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).

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

4x Amber LEDs
1x 7 segment display
8x Push buttons
8x Round push button caps
4x M3 metal screws
2x M3 nylon screws
2x 14mm nylon spacers
6x Jack connector nuts
4x Metal potentiometer nuts

## Pack 2

2x 20 pin male header
2x 20 pin female header
1x 2x8 pin power header
4x 4 pin male header
4x WhiteLEDs
4x Green LEDs
3x 22 $\mu$F electrolytic capacitors
4x Metal potentiometers
6x Jack connectors
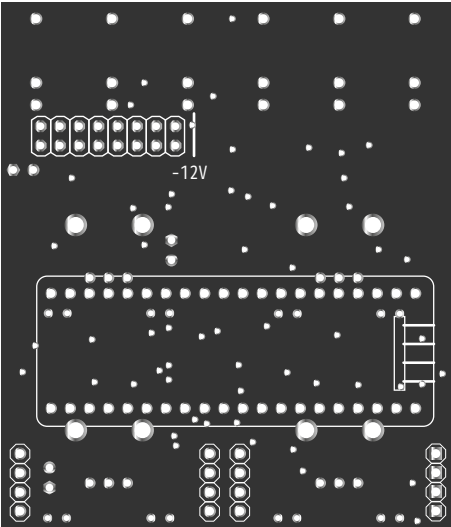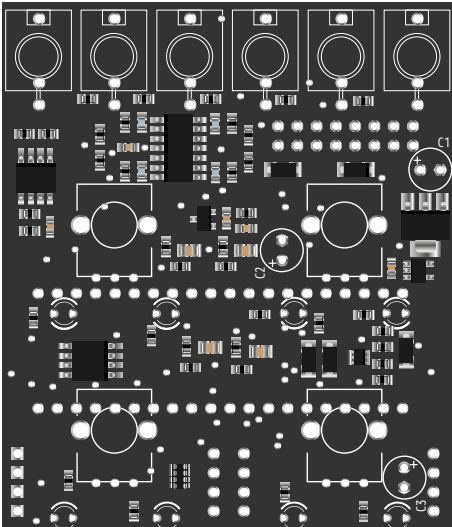
## Pack 3

1x Top PCB
1x Bottom PCB
1x Tactical Plan

## Loose parts

1x Front Panel
4x Black rubber knobs
1x Power cable
1x User manual
1x Cheat Sheet

## Necessay tools
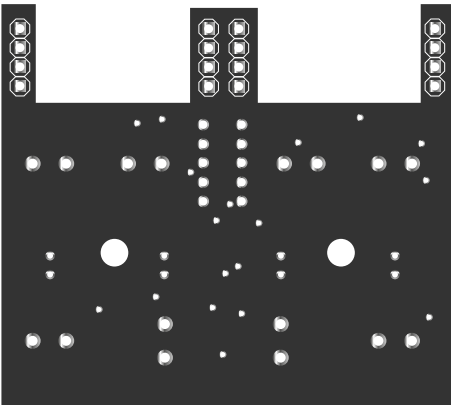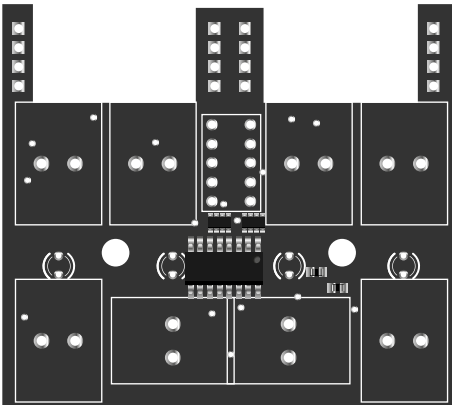
Soldering iron
Solder
Cutting pliers
Masking tape
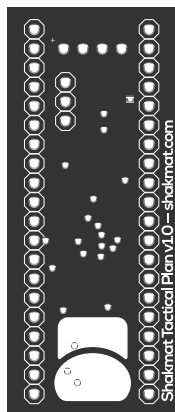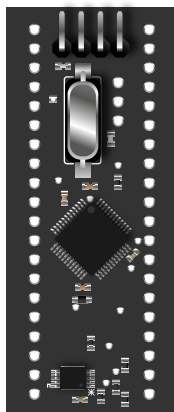
# 3. PCB details



**Top PCB**
Front & back



**Bottom PCB**
Front & back
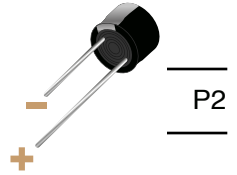
**Tactical Plan**
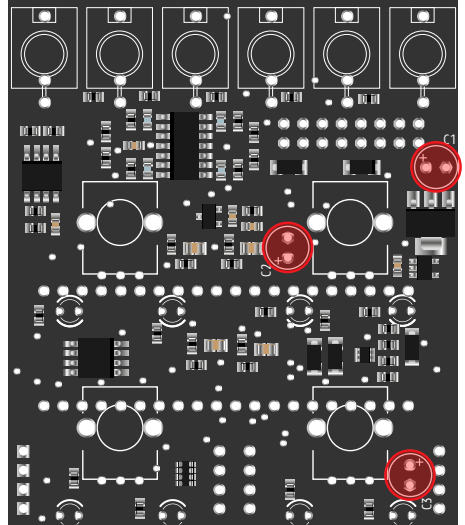Front & back

# 4. Top PCB assembly
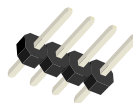
## 4.1  Front

**4.1.1** Electrolytic capacitors (x3)

P2

Solder the three 22μF capacitors. You must pay attention to the orientation of these components. The long leg indicates the positive side, therefore it has to match the + sign on the PCB silkscreen.

## 4.2 Back

P2

Flip the PCB and place a 4 pin male header, with the short pin side through the hole. We will solder these four headers one by one. Be sure to lay them flat and upright. Those headers will later join the two PCBs together so they need to be perfectly perpendicular.

We recommend you only solder one of the pins. Then reheat your soldered point and simultaneously press the plastic part of the header against the PCB until it's flat. Take off the soldering iron but keep pressing. Avoid touching the pins themselves because they will become hot very quickly and move out of alignment within their plastic bracket. Once you are satisfied with you placement, solder the remaining pins.
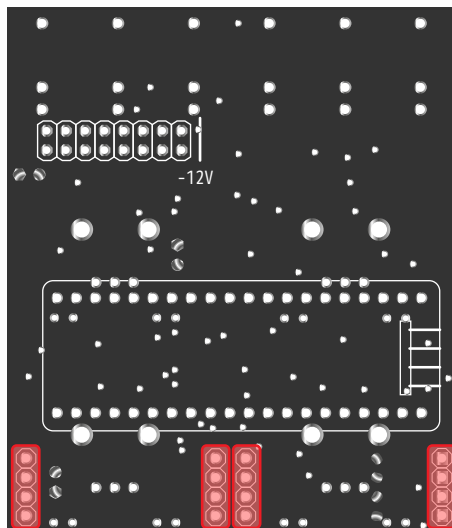
Place the power header, the short pin side in the holes and solder only one of the pins. Check the alignment and correct with the same method as for a single row header. Then, once your component is upright and flat on the PCB, solder the remaining pins.
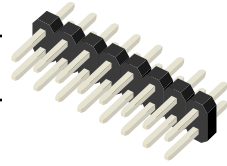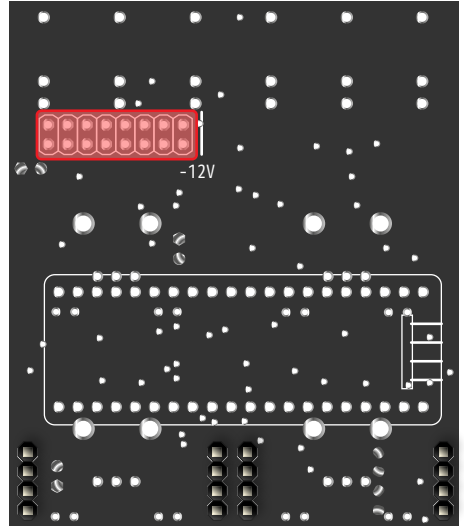


-12V

# 5. Tactical Plan assembly

**5.1** Male & Female headers (x2)
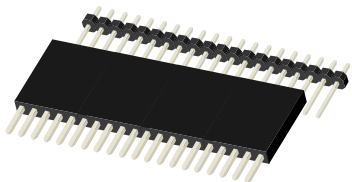
Now, we are going to stack the Tactical Plan with the top PCB. For this we use two 20 pin pairs of male & female headers. First assemble the headers, then place them on the Tactical Plan, female side down. Then assemble the two boards toghether and solder one pin, on each side, for each header. Once the PCBs are held together and correctly aligned, you can solder all the remaining points.

Be VERY careful with the soldering of the female part of the headers. Once the potentiometers will be in place, those solder points will be inaccessible. After everything is well soldered, disconnect the Tactical Plan and proceed to the next step with the top PCB.

01  **2x**

02

03
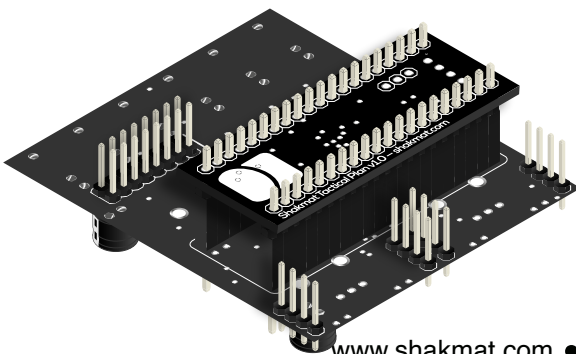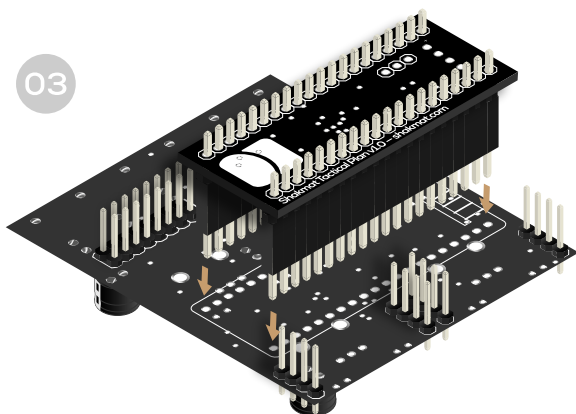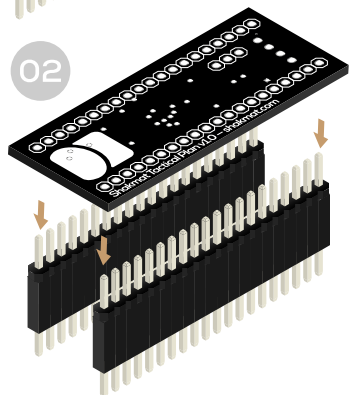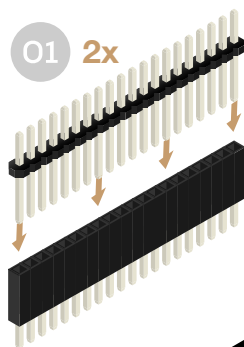
# 6. Top PCB final assembly

## 6.1 Front

**6.1.1** Jack connectors (x6)
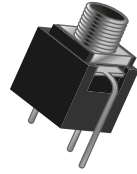
P1

Flip the PCB around and solder the six jack connectors. Be sure to lay them completely flat on the PCB before soldering. If those jacks aren't perpendicular, the front panel will be very hard to mount.

If one of the jacks is not perfectly perpendicular with the PCB, you can reheat the pads and push it down with your thumb to re-align.
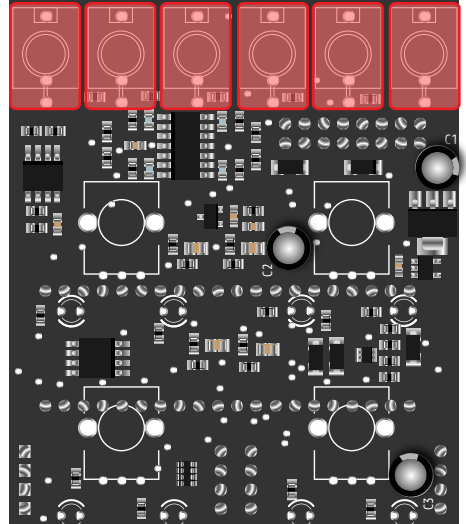
## 6.1.2 Potentiometers & nuts (x4)

P1&P2
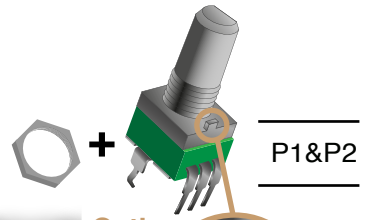
Before soldering, you will have to cut a little metal piece off the top of each potentiometer, as shown in the picture. This little stud prevents the front panel from sitting properly. Use some small & sharp cutting pliers for this task.

Then, place the 4 potentiometers on the PCB. Be sure that no metal part of the potentiometer touches a soldering point from the previous step. Mount the front panel and tighten the potentiometers nuts (this will ensure a proper placement of the pots) and then solder them.

Once you have soldered everything, remove the nuts, the front panel and proceed to the next step.
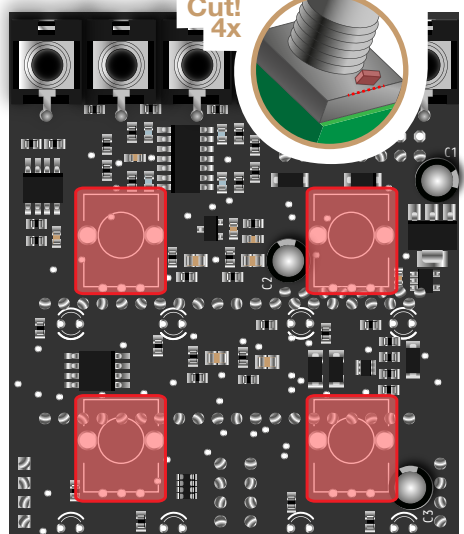
# 7. PCB stacking

It's now time to join and solder the two PCBs together. Be **very careful** during this step. If you solder every pin and the PCBs arn't well aligned, you will likely not be able to correct it and will encounter all sorts of problems on your way to the end of this build.

The first step is to assemble the two PCBs as shown above, and only solder the first pin of the small vertical header. It is vey important that you firmly hold the two PCBs against each other while soldering this point. There must be no gap between the PCBs and the header's black plastic part between them.

Once you've soldered the first point, you can move on to the second header as shown below. Repeat the same procedure as for the first point for all of the four points listed. Once they are all perfect, without any gap between the PCBs and headers, you can solder every remaining point.
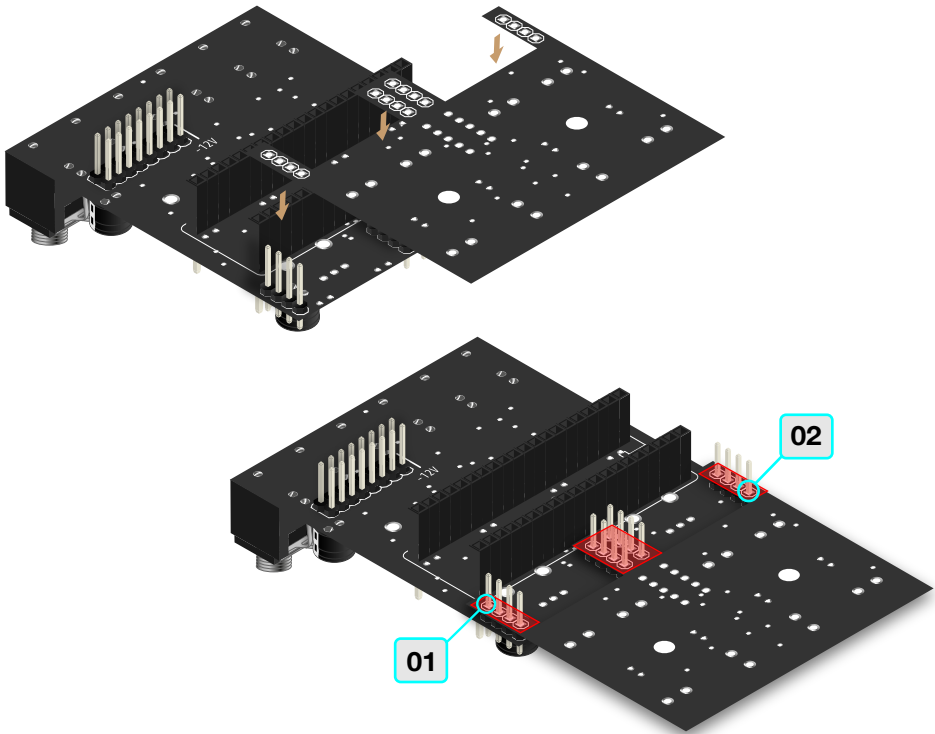
# 8. Bottom PCB assembly

## 8.1  Front

### 8.1.1 Push buttons (x8)

The buttons need to be upright and pushed well against the PCB. An imprecise mounting will result in button caps scrapping against the front panel. We recommend you to place the buttons, then flip the PCB (holding the buttons in place with a piece of cardboard) and press it against a table.

At the final step, if a button is not well aligned with the front panel, you can gently re-heat its solder points and push it into alignment.
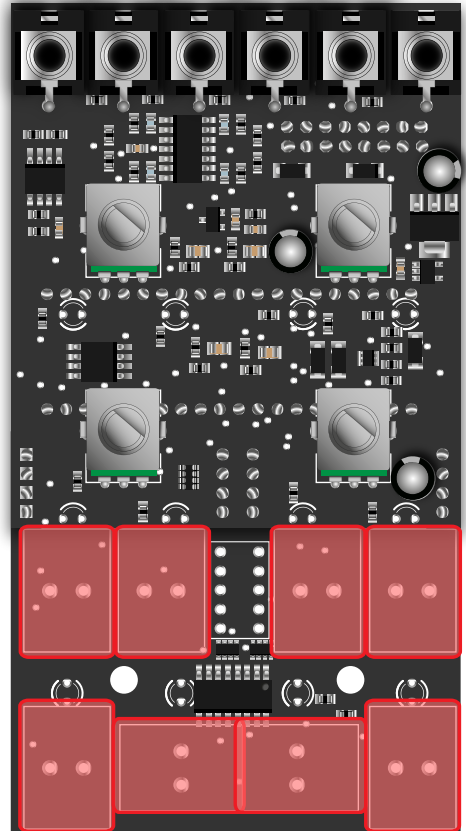
# 9. Front panel preparation

Nylon spacer (x2)

P1

Place some masking tape over every LED hole on the front panel. Make sure not to block any other component's hole with the tape. The LEDs are flat top and intended to be mounted flush with the front panel. The masking tape will help you to do this neatly.

You also need to screw the two nylon spacers on each of the two studs at the back of the front panel. Screw them until the end of the thread. These spacers will assure the stability & alignment of the PCB's bottom half.

# 10. LED & display mounting

Green LEDs ( A x4)                     **P2**

Amber LEDs ( B x4)                     **P1**

White LED ( C x4)                      **P2**

**LED POLARITY!**

**+**

7 Segment display
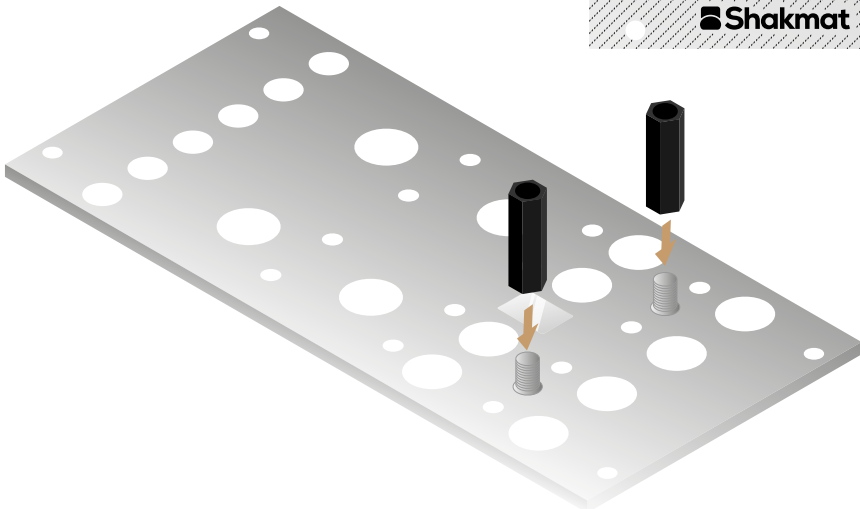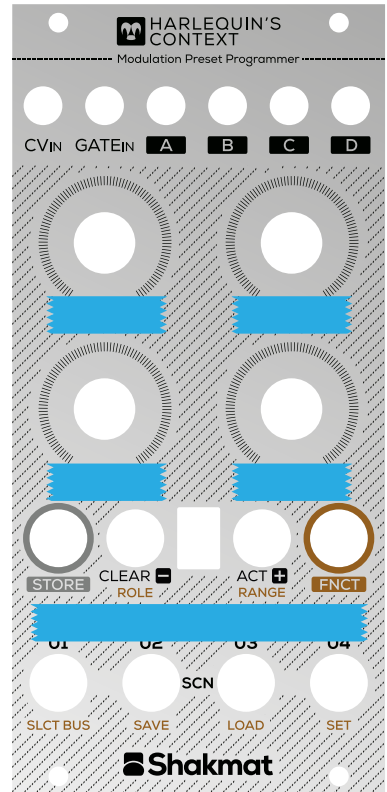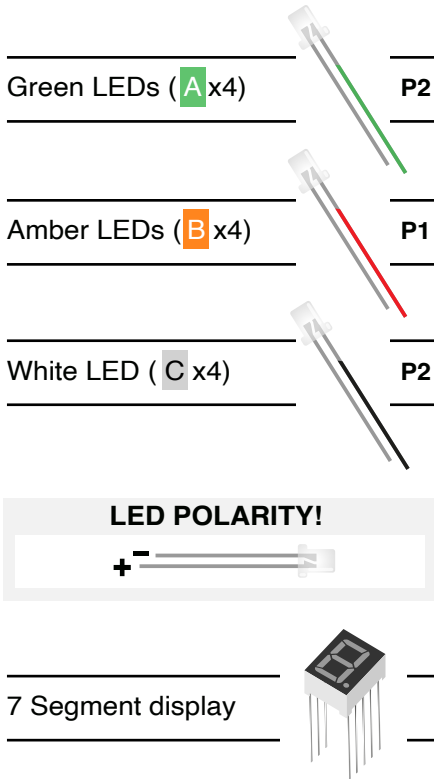
Placing the LEDs requires a specific orientation due to their polarity. The long legs are the positive side and they all go into the left holes of the top PCB. For the bottom PCB, place the long leg in the upper hole.

Place all the LEDs through the PCBs. Be aware of LED colors (some of their legs can be coloured to help you differenciate them). Place the 7 segment display on the PCB, dot to the bottom right, **but don't solder anything yet.**
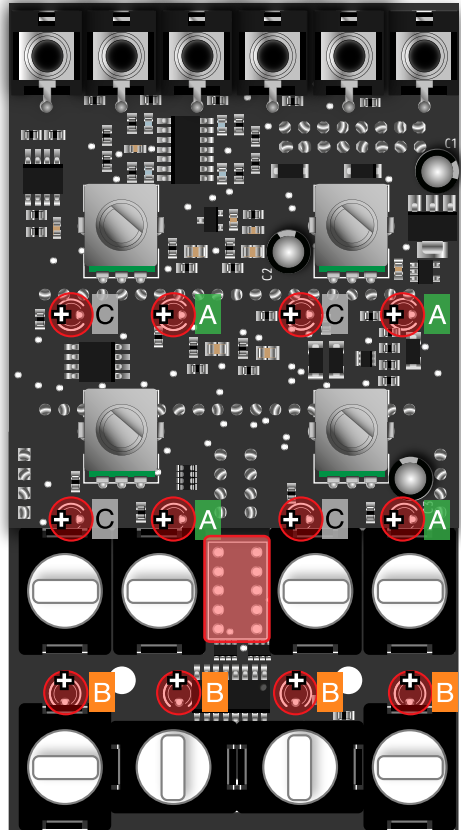
Place the front panel on the PCB and secure everything with four nuts on the potentiomers and two nylon screws through the bottom PCB into the spacers. Once everything is well secured, push every LED through their hole until they sit flush with the panel and stick to the tape. Once everything is in place, you can solder and trim the LED legs.

**Make sure that the display is falling down against the window in the front panel.** Solder only one leg of and triple check the display alignment through the front panel window. When all of its legs are s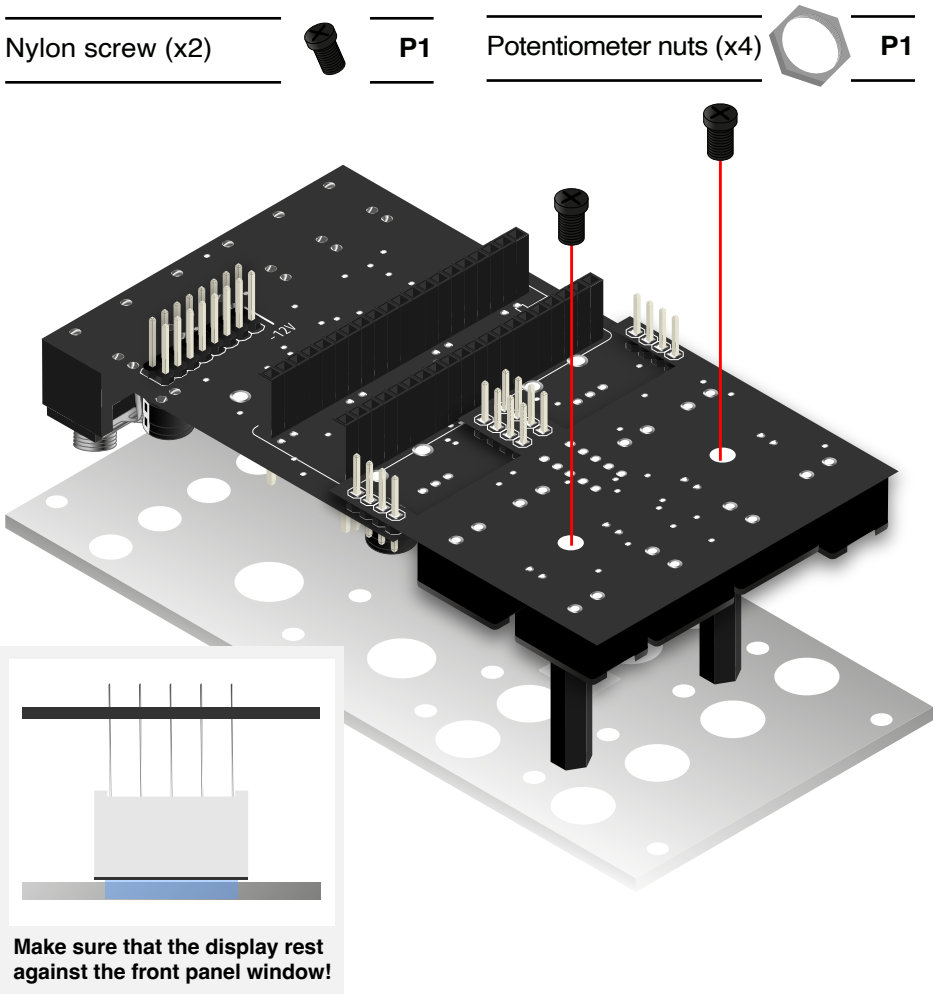oldered, it is imposible to correct its placement. Once it's nicely placed, you can solder the remaining legs of the display and trim them.

| Nylon screw (x2) | | **P1** | Potentiometer nuts (x4) | | **P1** |
|---|---|---|---|---|---|



**Make sure that the display rest against the front panel window!**

# 11. Finish

You're almost done! The last thing to do is to place the tactical plane on the top PCB. Pay attention to the orientation. The Shakmat logo must be on the left side as shown here.

Place all the push button caps. Tighten the knurled nuts on the jack sockets. Push the four knobs onto their metal potentiometer.

| | | |
|---|---|---|
| Button caps (x8) | | **P1** |
| Jack nuts (x6) | | **P1** |
| Knobs (x4) | | **LP** |

# 12. First startup routine

**Make sure all the potentiometers are fully counterclockwise when turning on your Harlequin's Context for the first time.** Plug in the power cable and make sure the red side of the ribbon matches the -12V on the PCB. Now 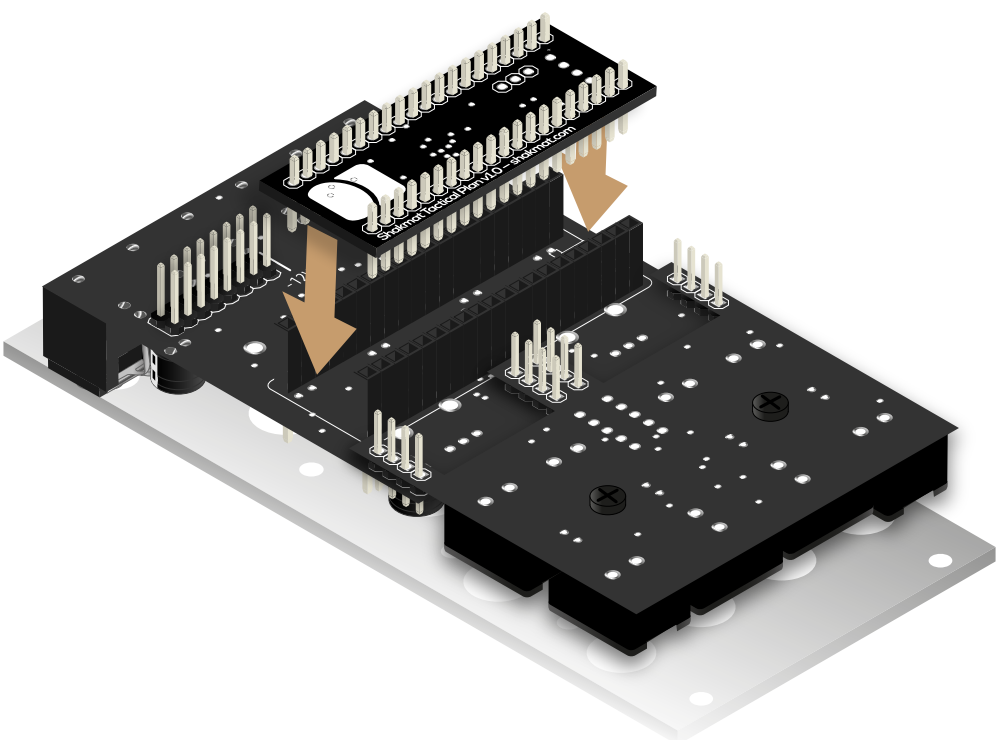let's plug the module into your system and test it. The module identifies the first time it turns on and automatically starts the calibration, test and factory reset routines.

Turn on your rack. The Harlequin's display shows a "C" for calibration.

• Patch the channel A output into the CV input and press the Scene 1 button
• Patch the channel B output into the CV input and press the Scene 2 button
• Patch the channel C output into the CV input and press the Scene 3 button
• Patch the channel D output into the CV input and press the Scene 4 button

The calibration is now done and the Harlequin automatically switches to the test routine :

• Each output produces a ramp (saw up LFO)
• CV input positive voltage values are displayed on the 7 segment display
• When an active gate is received in the gate input, the screen turns off

Therefore, patch each channel's output into the CV input (the 7 segment display will give values from 0 to F). Patch one of the outputs into the gate input (the 7 segment display should slowly blink).

To test the white and amber LEDs, press each of the eight buttons of your Harlequin's Context. When pressed, each button lights an individual LED up. The green LEDs show the potentiometer value by their intensity. Turn all the potentiometers fully clockwise until all the green LEDs are fully on. You will exit the test routine when all the potentiometers are fully clockwise.

Now hold the first Scene button until the display shows the letter "F".
Press the Store button to start the Factory Reset routine. This operation will clear all the non volatile memory, slot by slot, and the display will show the slot currently being cleared (from 1 to G).

Once the Factory Reset routine is done, the module will start normally.

# 13. Debug

**The module does not turn on**
Check the orientation of the Tactical plan.
Re-check the electrolytic capacitors and power cable orientation.

**The module is stuck in the calibration routine, or one or several outputs are not working**
Check the jack connectors & Tactical plan soldering.

**One or several LEDs are not working**
Check the LEDs solder points and LED orientation.
Check the Tactical Plan headers solder points.
For the amber LEDs, check the PCB to PCB headers solder points on both PCBs.

**One or several potentiometers are not working**
Check the solder points and Tactical Plan headers solder points

**One or several buttons are not working**
Check the buttons solder points.
Check the PCB to PCB headers solder points on both PCBs.

**The 7 segment display is not working**
Check the display solder points.
Check the PCB to PCB headers solder points on both PCBs.

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