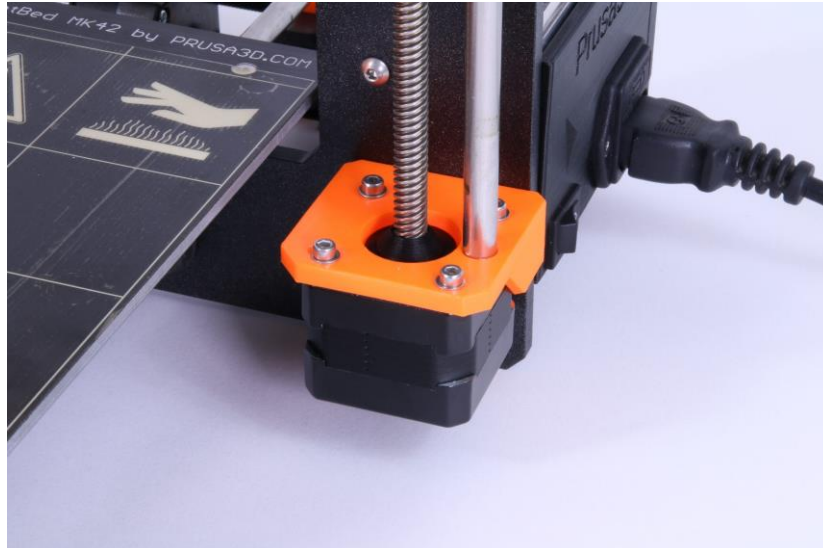


Using second external driver (v2.3/v2.4) board for Z motors on MK2S/MK2.5



Ok, so you want it all? You want the Z motors to use external drivers, too? This guide is for the more advanced users as it requires more soldering and more wire connections. After you do it you'll have the advantage of quiet Z motors and also running them with two separate drivers instead of running them with one as on the original Rambo board.

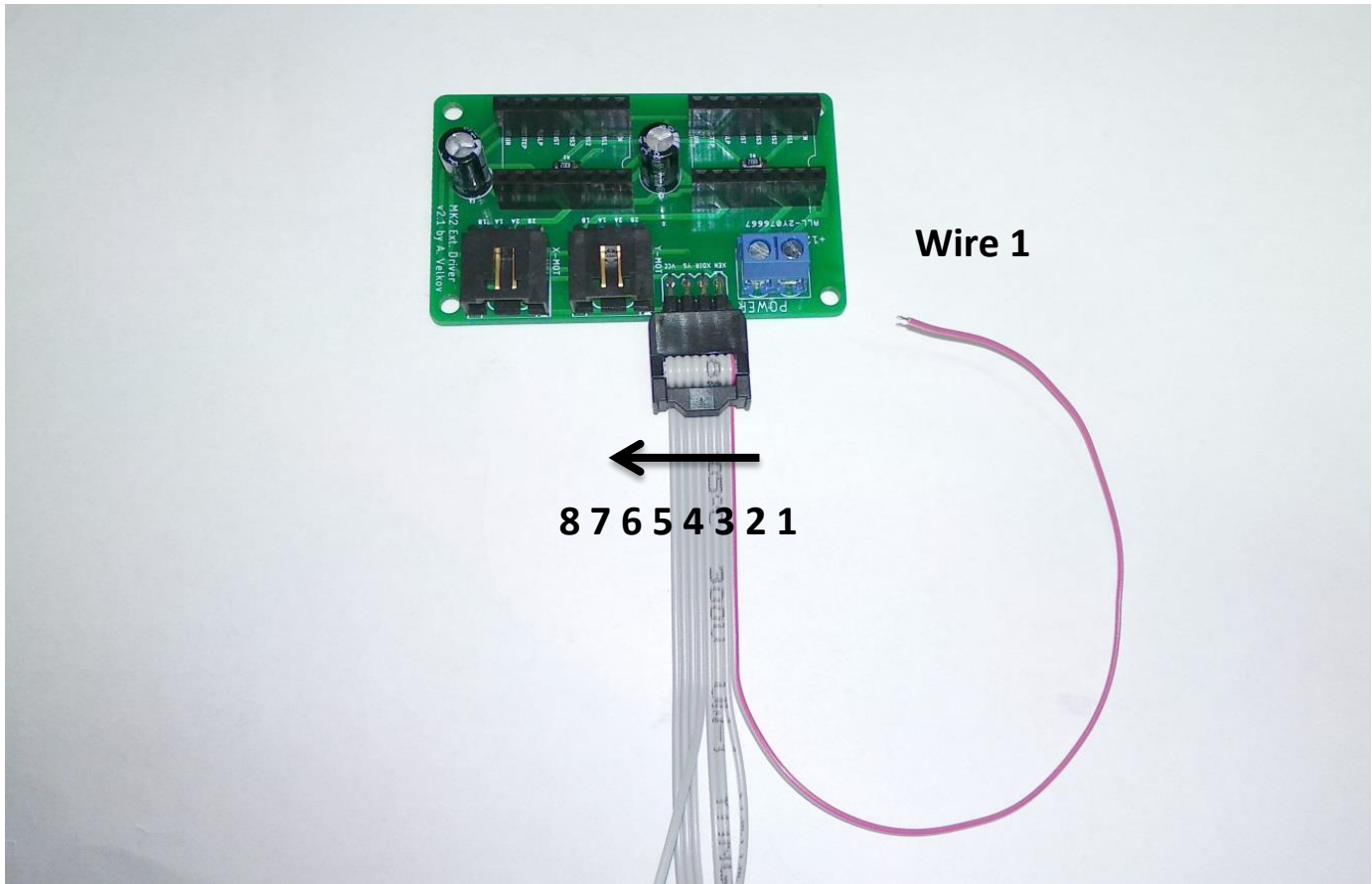
So here's a short guide how to do it.

There's two important things to know before proceeding with this mod:

1. **By soldering on the back of your mini-rambo you're practically voiding your prusa warranty!**
2. **I take no responsibility if you mess this modification up and/or damage your printer. You need to have basic soldering skills. Do at your own risk, or get someone more experienced to do it for you!**

You will need a second external driver board kit. Following my previous manuals, you may already have soldered the Data cable from the first ext. board to the mini-Rambo. If not, you can do them all at once. Here's where to solder the second Data cable:

The data cable has 8 wires and they are counted like this:



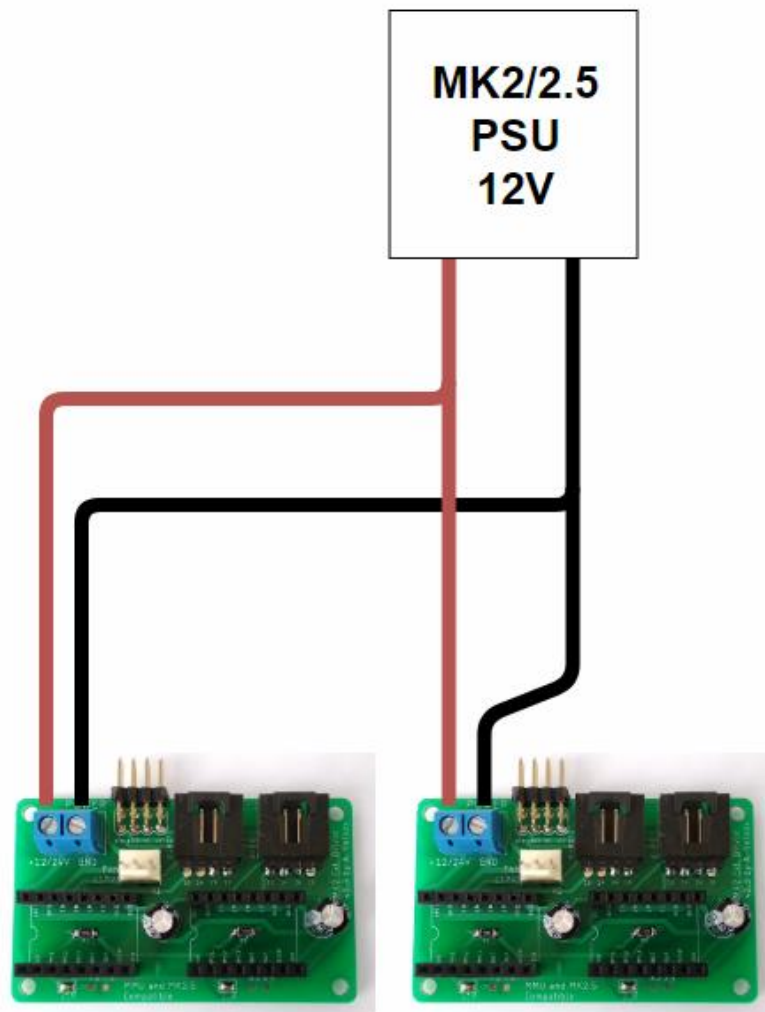
Wires description:

The wire on the side of the blue power connector is always wire number 1 (**cable color could be red or grey**)

1. X-EN - has to be soldered to ZEN pad on the mini Rambo
2. X-STEP – has to be soldered to ZSTEP pad on the mini Rambo
3. X-DIR – has to be soldered to ZDIR pad on the mini Rambo
4. Y-EN – has to be soldered to ZEN pad on the mini Rambo
5. Y-STEP - has to be soldered to ZSTEP pad on the mini Rambo
6. Y-DIR - has to be soldered to ZDIR pad on the mini Rambo
7. VCC - has to be soldered to +5V pad on the mini Rambo
8. GND - has to be soldered to GND pad on the mini Rambo

Once you have the second Data cable soldered you can proceed assembling back the mini-rambo and reconnecting all the wires.

Next thing to do is get 12V to supply the second board. You'll have to cut the power cable for the first ext. driver board and connect the second power cable to it. Solder them together and insulate them good. Here's the schematic:



Next thing to do is just connect the two Z motor wires to the connectors on the second external driver board (no matter which goes where, both do the same).

Next are jumpers, for ext. board v2.3 follow this:

If you'll be using TMC2100 you're ok to plug them in the board and continue to adjust VRef.

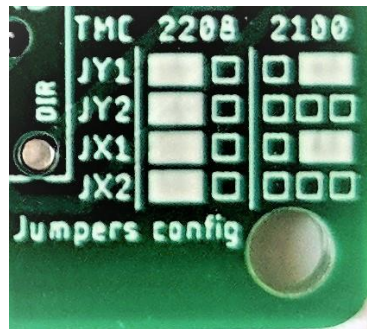
If you'll be using **TMC2208** please desolder the two jumpers on the ext. driver board and solder the bridge wire on the drivers as described in the TMC2208 manual here:

<https://drive.google.com/open?id=1JyrXp6G7wkWhmKt6thdGa5ojQeswQbob>

WARNING! If you don't follow the above manual for TMC2208 you WILL DAMAGE your Rambo mainboard! So please read it and do it carefully!!!

For **v2.4** of the ext. board follow this:

There's a table on the right side of the board on which jumpers to solder:



Here's the combinations for the TMC drivers:

TMC2208 (solder all jumpers on the left side for **Stealthchop2 mode**):



TMC2100 (solder JY1 and JX1 on the right side for Spreadcycle or **leave all unsoldered** for **Stealthchop** which is the **recommended** mode):



Be careful not to short the other side of the jumpers when soldering! You WILL DAMAGE your mini-Rambo if you short both sides of any jumper!!

I suggest you use the TMC2208 as they have a number of advantages over TMC2100. You can read more here:

<https://vmod.wordpress.com/2018/06/04/ext-driver-board-with-tmc2208/>

Check all wiring again and power on the printer. Before trying to do anything you'll have to set Vref on both TMCs as you did with the first board, just follow that manual and set Vref to **0.75V** for both Z motors. It should be enough to move freely the motors.

Previous manuals can be found here:

https://drive.google.com/open?id=1o_A4ZHai253kLMRttBMnLbElv-KRri8t

Lastly just try to move the Z axis via the Menu. If all looks good do the Z calibration again and enjoy the silence!

Happy printing!