

BASTL INSTRUMENTS

SPA (GRANDPA EXPANDER) v1.1 - Assembly Guide

bastl-instruments.com

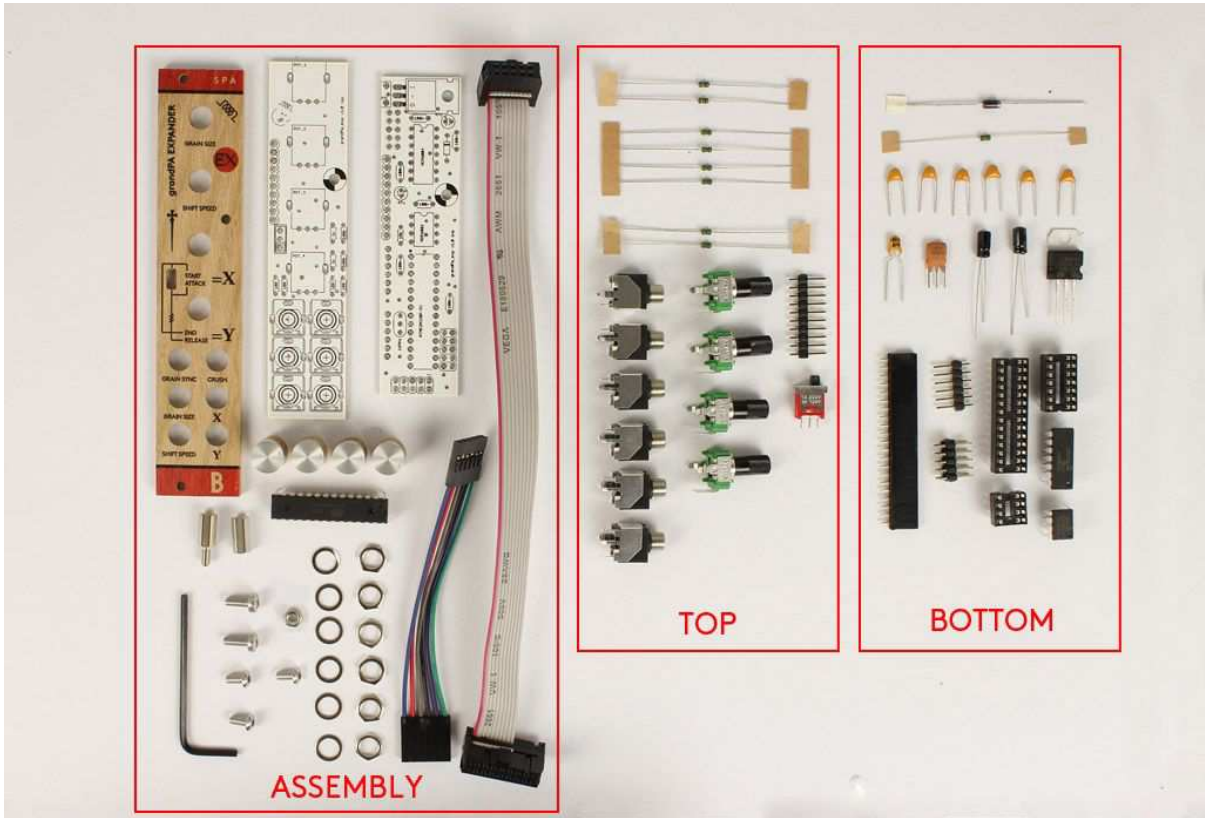


INTRODUCTION

This guide is for building Spa module from Bastl Instruments. It is good to have basic soldering skills and to be able to identify electronic components before starting this kit. However if you have never soldered before, check out this [tutorial first](http://www.instructables.com/id/How-to-solder/)¹. We even included some of the best quality solder we have found to help you solder everything faster and better.

The Spa module consists of two boards. All the parts comes in three bags separated for Top board, Bottom board and Assembly parts. See Bill of Materials ([BOM](#)) for detailed list.

¹ <http://www.instructables.com/id/How-to-solder/>



Before starting this kit, prepare the following tools :

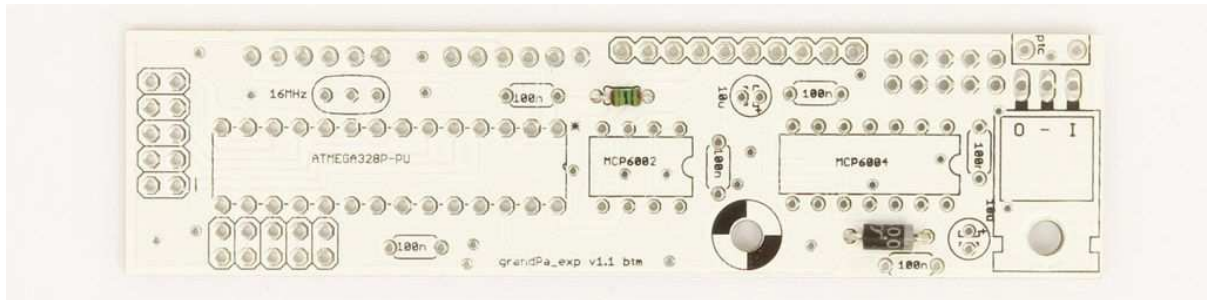
- Soldering iron (15-20W)
- Multi-meter
- Flush cutters
- n2. hex screwdriver or allen key (enclosed with kit)
- Phillips screwdriver (cross)
- Wrench No. 8
- Protective eyewear

We suggest that you work in a clean and a well lit and ventilated environment to avoid accidents or losing any of the small components.

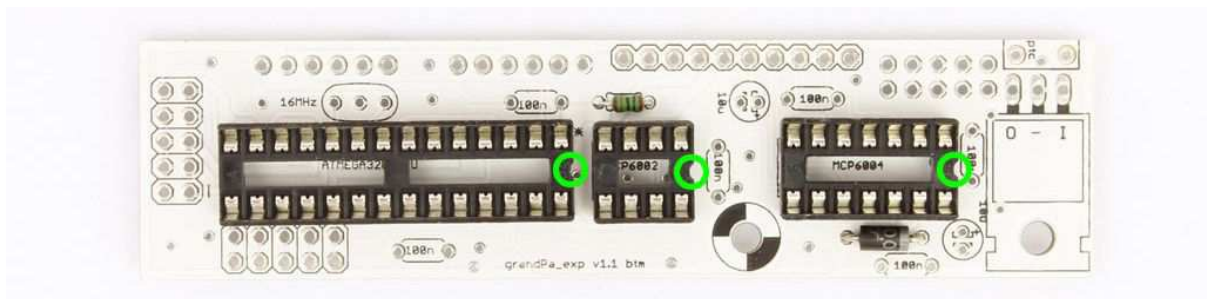
Also briefly go through this guide and make sure that you understand all the steps.

BOTTOM BOARD

Let's start with the bottom board. Solder in the 10k **resistor**. Then snip the leads as close to the PCB as you can (be sure to make this step on all remaining leads in the course of this guide). Then do the same with the **diode** (1N4007). Be careful, **diodes are polarized!** Make sure that the marking ring on the diode body matches the marking on the circuit board.

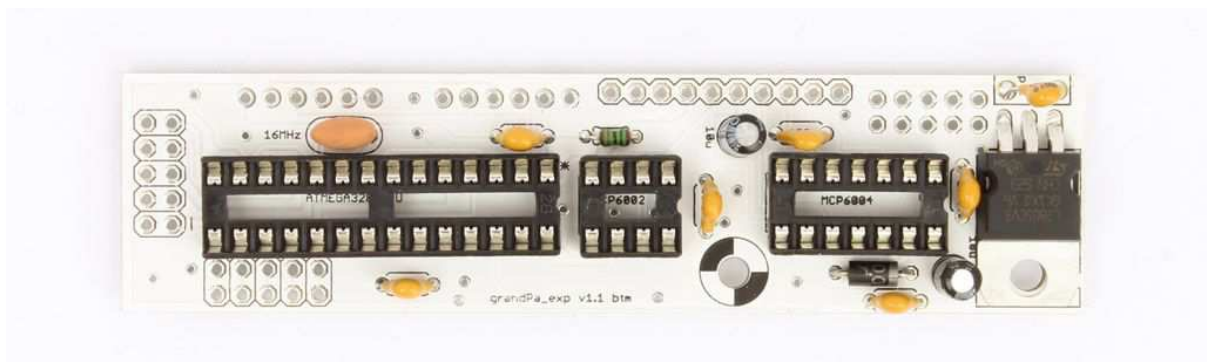


Next place and solder the **IC sockets** (8 pin, 14 pin and 28 pin). **Notice the notch** on them. Make sure that it is in the same direction as the printing on the board (the sockets are all oriented the same way).

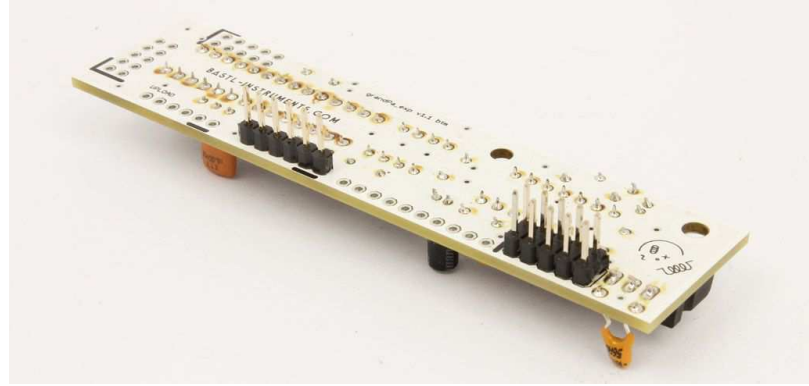


Proceed to soldering the next components in the following order:

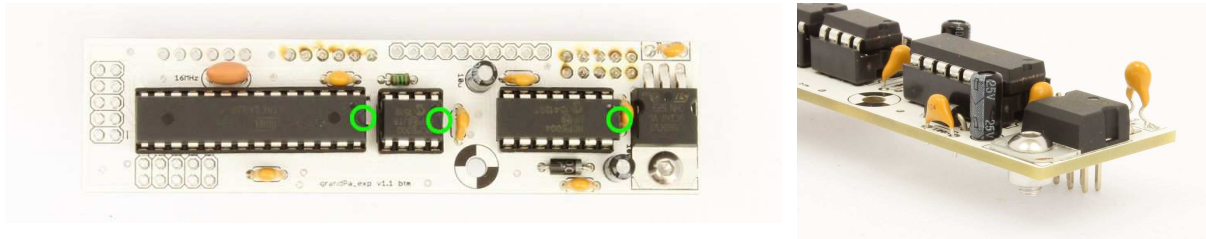
- **7805 voltage regulator** (bend its legs as close to the body as possible, at a right angle to make sure that it lies flat on the circuit board)
- Six **100nF ceramic capacitors** (marked "104")
- One **16 MHz resonator** (the orange component with 3 leads)
- Two **10µF electrolytic capacitors** (watch out, **these ones are polarized!** There is a plus (+) sign on the PCB that should match the longer lead of the capacitor)
- One **protective fuse** (marked "PTC" on board; be careful, **they look quite similar to capacitors**).



Turn around the PCB and insert and solder the **male pinheaders** (6 pin, 2x5 pin). Be careful to solder the pinheaders straight! You may first solder one of the pin, then take the board in your hand and re-heat that pin while pressing down on the header to align it. Wait for it to cool and solder the rest of the pins.

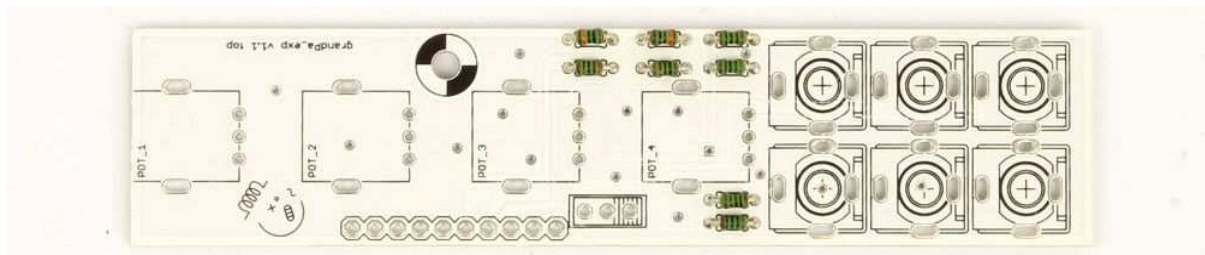


Now you can insert three **ICs** into the sockets (MCP6002, MCP6004, Atmega). **Watch out for orientation!** There is a notch on the ICs that should match with the notch on the sockets. Install also the **small nut** and **screw** on the voltage regulator.

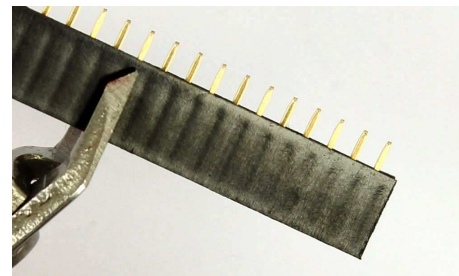


TOP BOARD

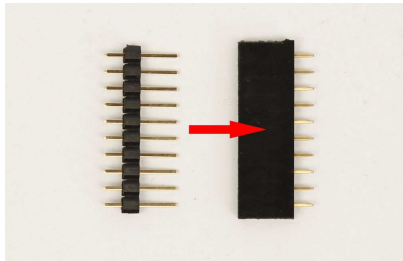
Now populate the top board. Take your time and find the values of remaining **resistors** [using a multimeter](https://learn.sparkfun.com/tutorials/how-to-use-a-multimeter/measuring-resistance)² (or you can check the color codes if you are seasoned enough). There are eight of them to solder (4x 100R, 2x 1k, 2x 100k).



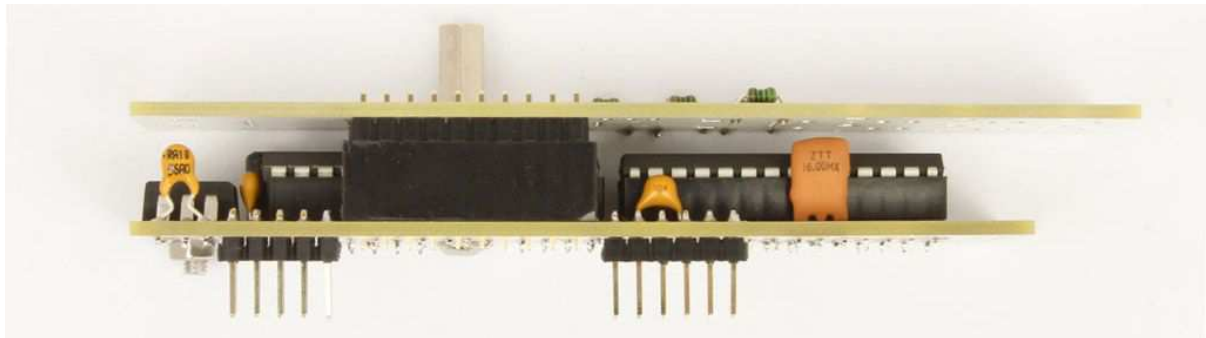
Prepare **female pinheader** with your flush cutters now. You need a 10 pin one. You will always lose one pin when cutting the female headers, so be sure to cut it always after the last required pin - check the picture to see where to cut to get 10 pin).



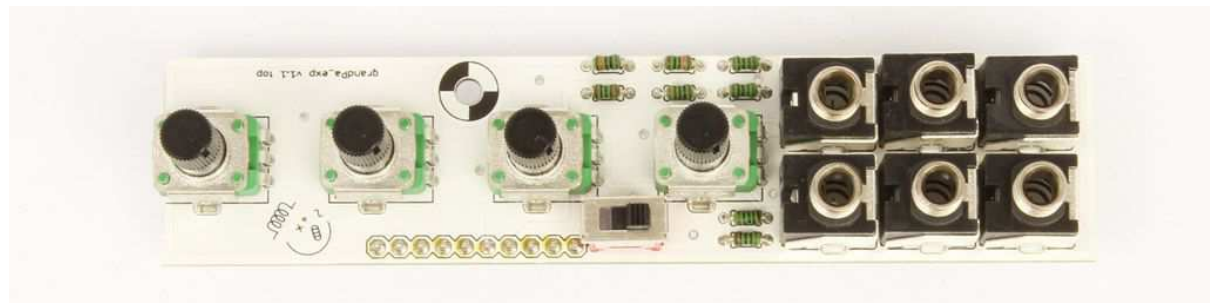
² <https://learn.sparkfun.com/tutorials/how-to-use-a-multimeter/measuring-resistance>



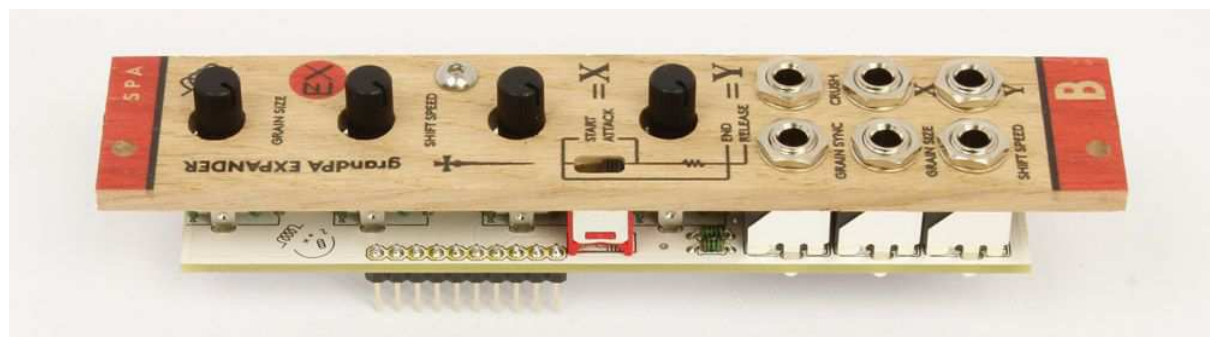
To ensure that the headers are properly aligned, screw the **hex screw** and the **11 mm spacer** (nut - nut) on bottom board. Place the **female headers on bottom board with the male pins inserted**. Connect the boards together and mount them with the other spacer (**10 mm one, screw - nut**). Now you can **solder the headers** on both boards.



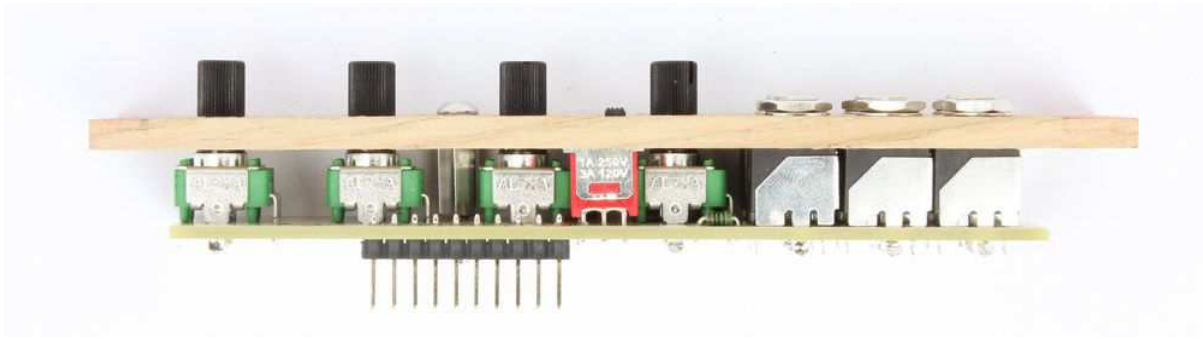
Unscrew the spacer on top and disconnect the two boards. Next place the four **potentiometers** (B100k) to their respected places on the top board. Push them well until they sit absolutely flat on the board. Then place the **mono jacks** and the **switch** on the board. **Don't solder anything yet**.



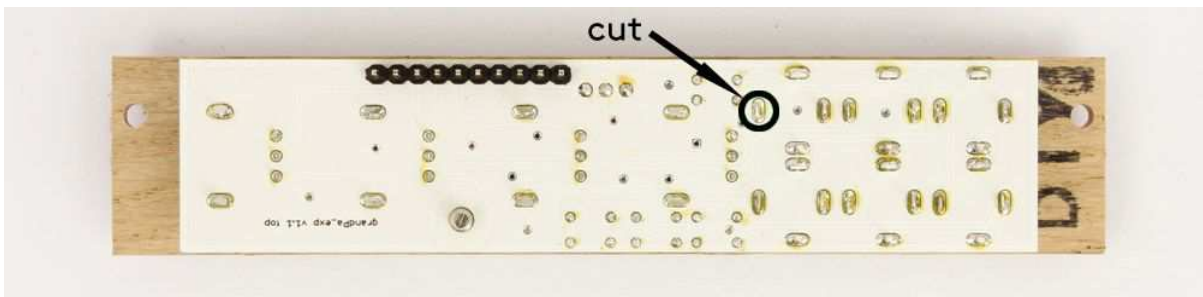
Place the **spacer** back in the opening. Take the **front panel, screw** and mount it with the board. Check that all the components came through. Secure the jacks to the panel with the **washers** and the **nuts** (keep in mind not to tighten the jack nuts too much as you may damage the panel!).



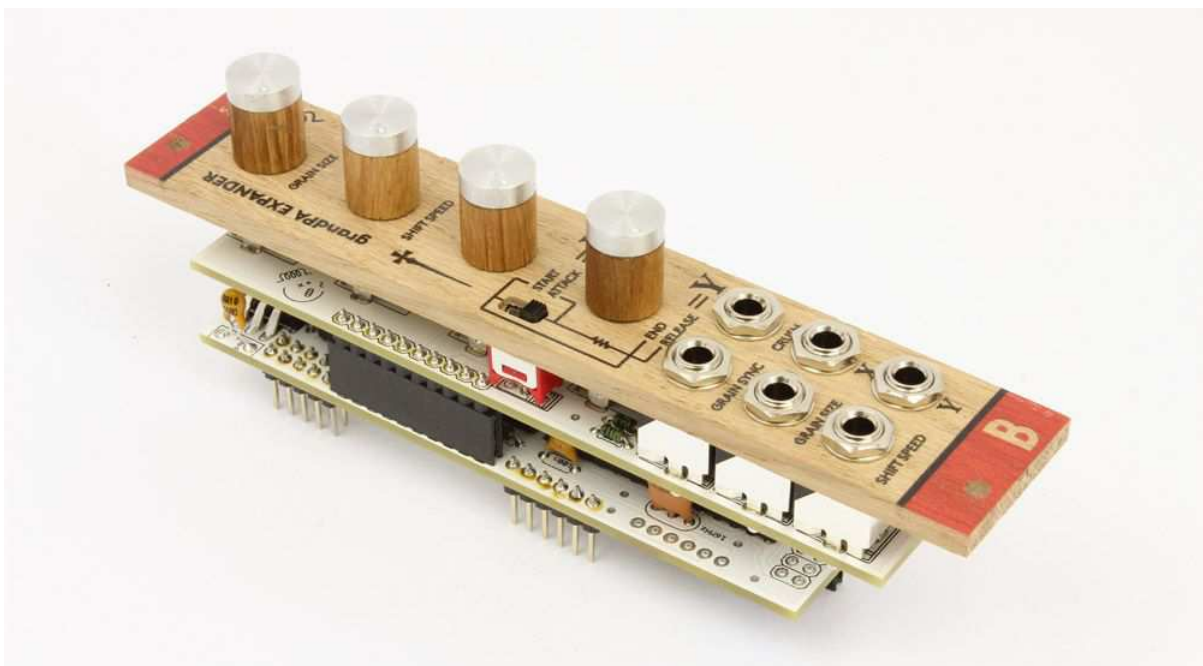
Push the **switches** to be sure that they come through the panel. Make sure that everything is properly aligned. Now you are finally ready to solder all these components.



Then cut one leg of the jack connector.



Congratulations! You have made it through. Now just connect the bottom board, add the knobs, connect Spa with the Grandpa (see the [manual](#)) and you are ready to enjoy your new module!



Before you connect anything, make sure that your system is disconnected from power. Also double check the polarity of the ribbon cable, the red cable should match the -12V rail both on the module and on the bus board!

TROUBLESHOOTING

First check out the [DIY F.A.Q.](#)

If you are having some more trouble, the best thing is to take a nap! Especially late at night!

If you are still in trouble you can send the detailed description of the problem with enclosed high-resolution photos on diy@bastl-instruments.com.

If you think that you are unable to make the module work on your own, consider our "[Come to Daddy](#)" service.