



# Standalone DIY ATO System Assembly Manual

October 10, 2019 – Version 1



# Safety Reminder

- **READ & FOLLOW ALL SAFETY INSTRUCTIONS**
- Always turn off the soldering iron on when you leave the room
- **DANGER**
  - Never handle electrical equipment with wet hands
  - This is all low voltage but you should still take care
  - Lighters cause fires
  - Sniffing glue is dangerous
  - Soldering irons can burn you
- Ensure all components (power adapters, power boards, controllers, wires, etc.) are properly set up according to manufacturer's recommendations, to prevent accidental damage

# Contents

Summary and Assembly Tips .....	3
Parts List .....	4
Assembling the Robo-Tank ATO System .....	5
Step 1 – Mounting the Header Pins .....	6
Step 2 – Mounting the DC Power Socket.....	7
Step 3 – Mounting the USB Sockets .....	8
Step 4 – Mounting the Capacitor .....	9
Step 5 – Mounting the Buzzer.....	10
Step 6 – Mounting the Port Sockets.....	11
Step 7 – Mounting the Indicator LEDs.....	12
Step 8 – Circuit Board Assemble Complete .....	13
Step 9 – Attaching the Faceplate to the Case.....	14
Step 10 – Mounting the ATO in the Case .....	15
Step 11 – Mounting the PCB.....	16
Step 12 – Mounting the Push Switch Arm .....	17
Step 13 – Mounting the Push Switch Arm .....	18
Conclusion .....	19

## Summary and Assembly Tips

Thank-you for your purchase of the Robo-Tank DIY ATO System, with this kit you'll get a completely packaged ATO system that's housed in a strong 3D printed case.

I will explain in detail how to assemble your kit and be up and running in no time, assembly is estimated to take 30 – 60 minutes.

You will need the following tools and supplies to assemble everything.

- Medium size Phillips screwdriver (star tip)
- Small flat head screwdriver (flat tip)
- Scissors
- Soldering Iron
- Lighter, torch or hot air gun (optional)
- Solder
- Any type of glue (used to glue faceplate to case)



When soldering there are a few important things to remember such as

- Keep the tip of the soldering iron clean at all times, a damp sponge or cloth will work great
- Never put solder on the tip and try to solder, instead heat the pin you are soldering first for about 1 second and using your other hand touch the tip with some solder and it will flow evenly
- When mounting connectors and headers its important they are sitting flat on the board and straight, the easiest way to achieve this is to solder one pin then position the board so you can align the connector and touch the pin you just soldered so you can move it around. Once you are happy proceed to solder the other pins. Its much more difficult to remove things than solder in place so take your time to make sure you get everything correct before soldering completely in place.

## Parts List

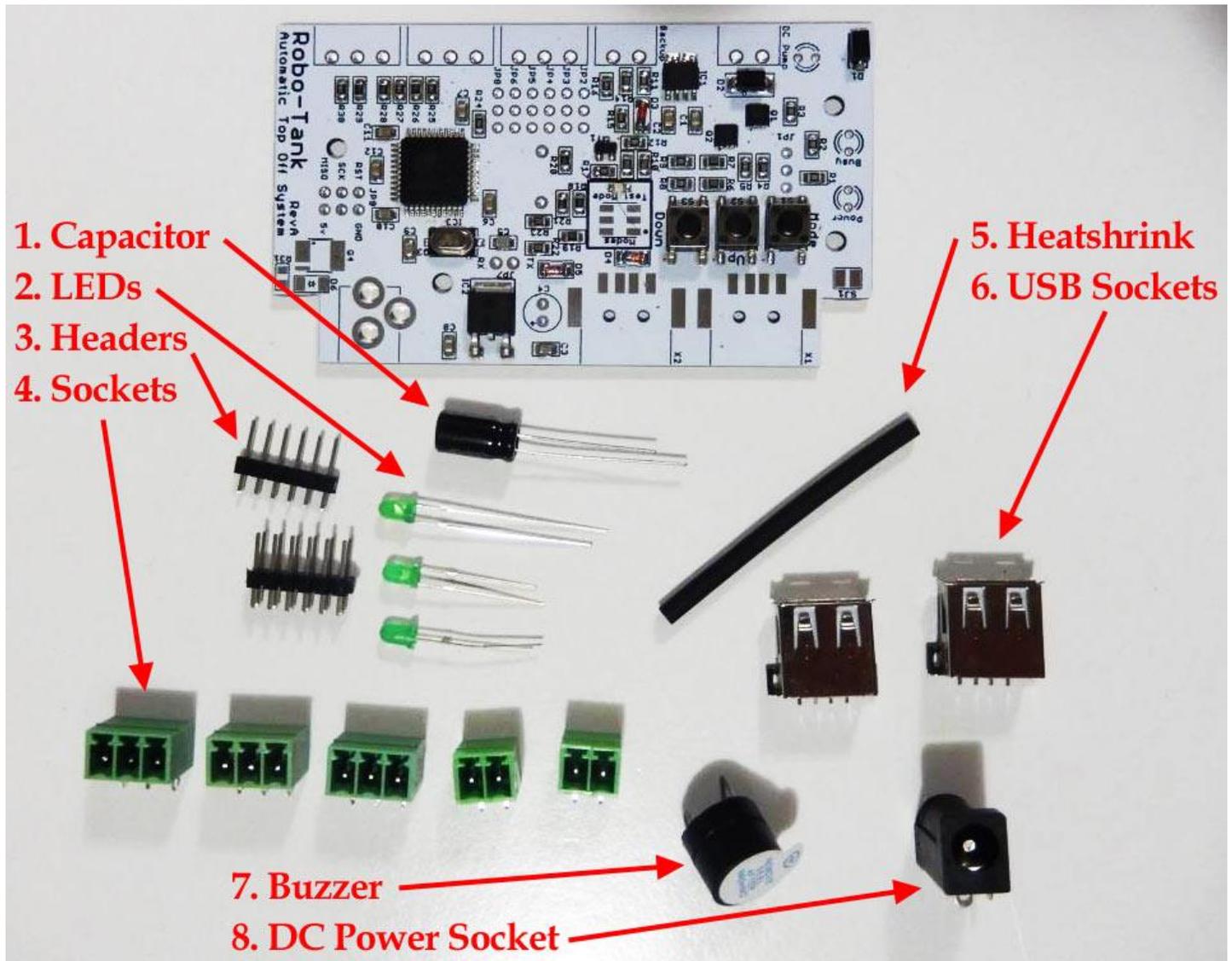
Here is a list of all the parts that should included in your kit.

- 1 – ATO printed circuit board (color may vary)
- 1 – 3D printed case with lid
- 6 – 6mm Screws
- 1 – Faceplate
- 1 – 1x6 male header pins
- 1 – 2x6 male header pins
- 1 – Capacitor
- 3 – LED
- 2 – USB socket
- 1 – Buzzer
- 1 – DC 2.1mm x 5.5mm power socket
- 3 – 3 pin socket + 3 pin pluggable screw terminal connector
- 2 – 2 pin socket + 2 pin pluggable screw terminal connector
- 6 – Pluggable header pin jumpers
- 1 – Heat Shrink tubing



## Assembling the Robo-Tank ATO System

Here an image with all the parts we start with as these all require soldering.

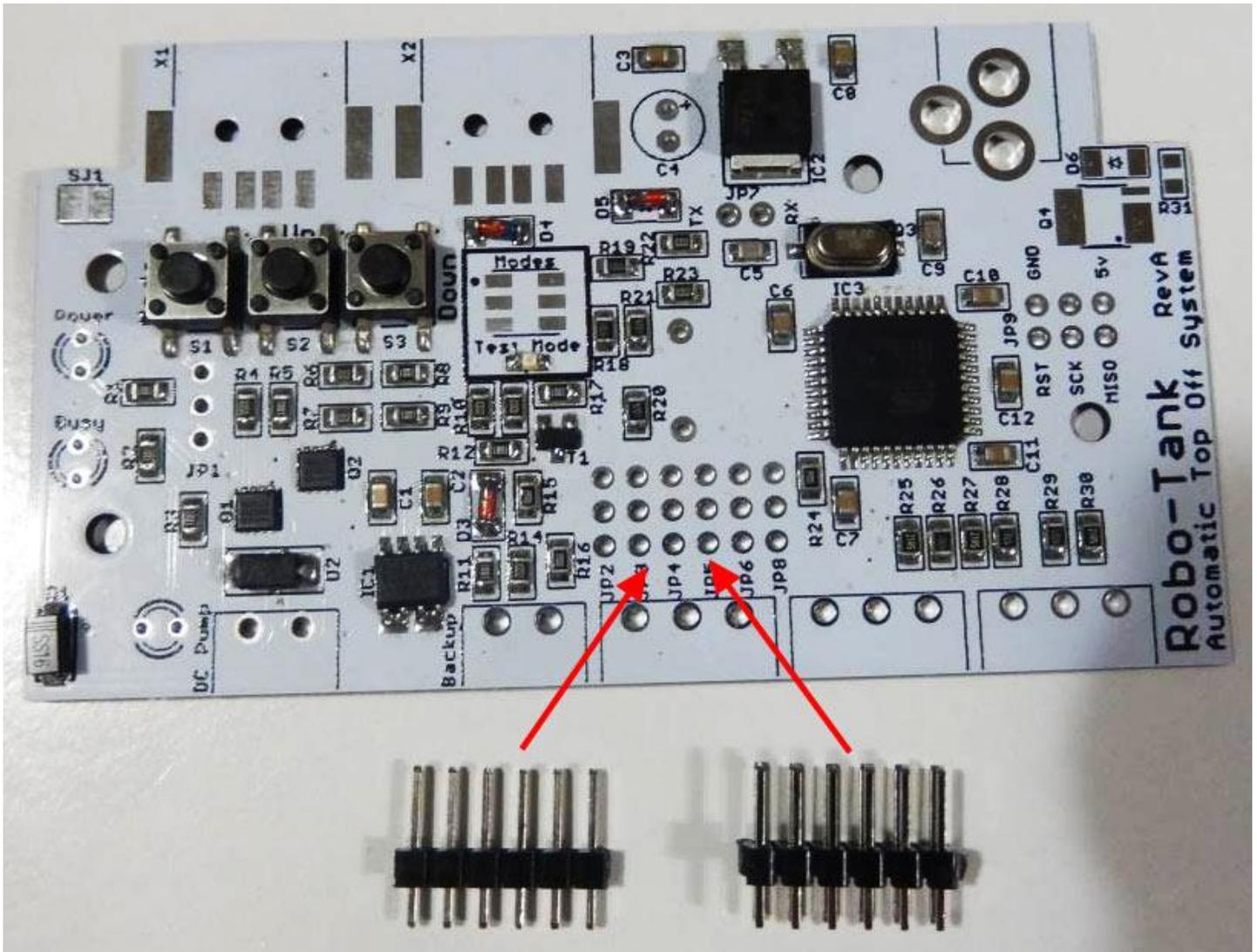


## Step 1 – Mounting the Header Pins

We will start by mounting the 18 header pins, place them on the top of the board and solder one pin on both header sets. Once you have them in place re-heat the pin you soldered and press the header flat and so it's sitting straight. Once in place proceed to soldering the remaining pins.

If the plastic around the pins gets too hot it will start to melt so if you need to reposition it be sure to give it time to cool.

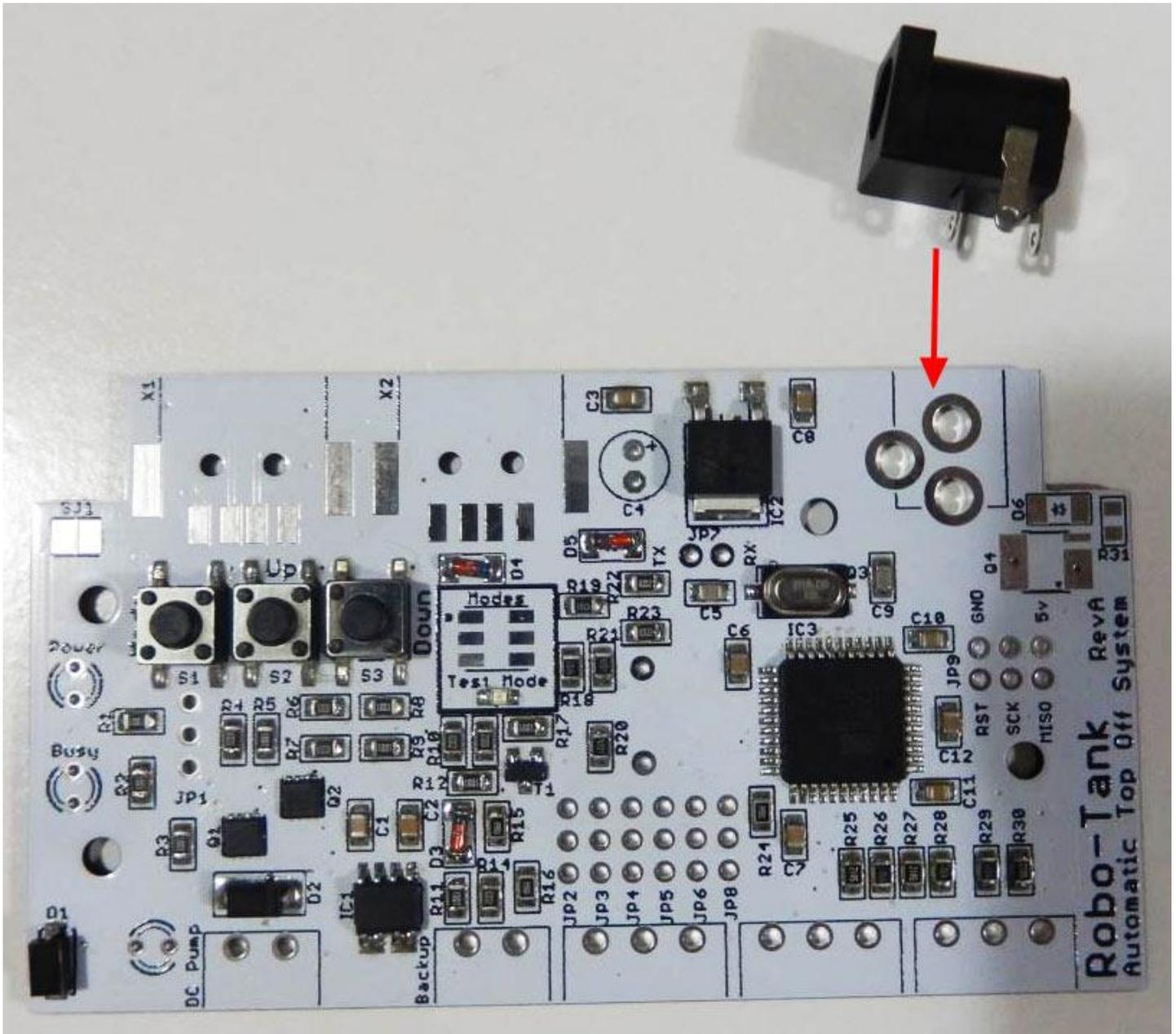
It's important to remember, heat the pin first for about a second and then touch the iron with solder and it will flow nice around the pin. Never load solder on the iron and try to solder something, it will be a mess and you won't enjoy what can be an enjoyable experience.



## Step 2 – Mounting the DC Power Socket

Now we can move on to the DC power socket. We also want to take the same approach, place a little bit off solder on one pin just to hold it in place. Then position the board so you can press on the socket and re-heat the pin and align as straight as possible.

Remember, clean your soldering iron often on a damp cloth or sponge.



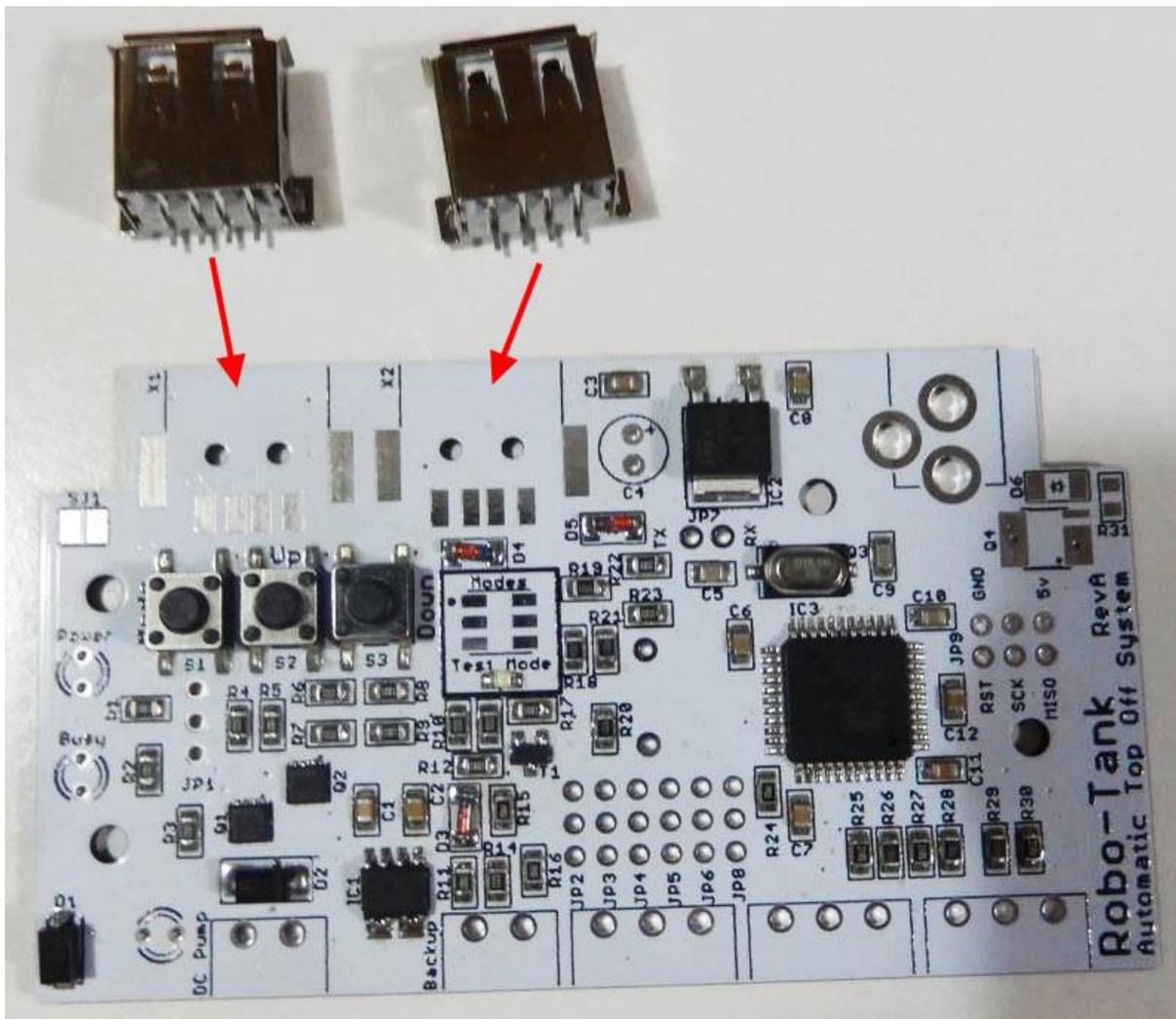
### Step 3 – Mounting the USB Sockets

Next is the 2 USB sockets. Place one of them on the board, notice the two small pins on the bottom that sit inside the holes on the circuit board, with these you can feel when it's in place so do a dry test to feel it out. While soldering this the casing gets very hot, if you don't like the heat a good trick is to add tap to your index finger and thumb so you have a heat barrier.

Now add some solder to one of the side tab pads on the circuit board, you can do this without the USB in place. Then take the USB connector with your fingers, heat the pad you just added solder to and place the USB on the board. Make sure you feel the 2 pins stuck in the holes and pull the USB plug forward (away from the board) until it won't move any more.

If the socket is fairly straight you can solder the other tab and then re-heat the tabs and adjust until its nice and straight and sitting flat. When you look straight on it can appear flat but isn't so look at different angles to verify. One you have it where you like let it cool before soldering the 4 pins as we don't want it too hot. You can proceed to mount the 2nd socket and go back when it's cool.

Remember, heat the pad first for a second and touch the iron with solder.



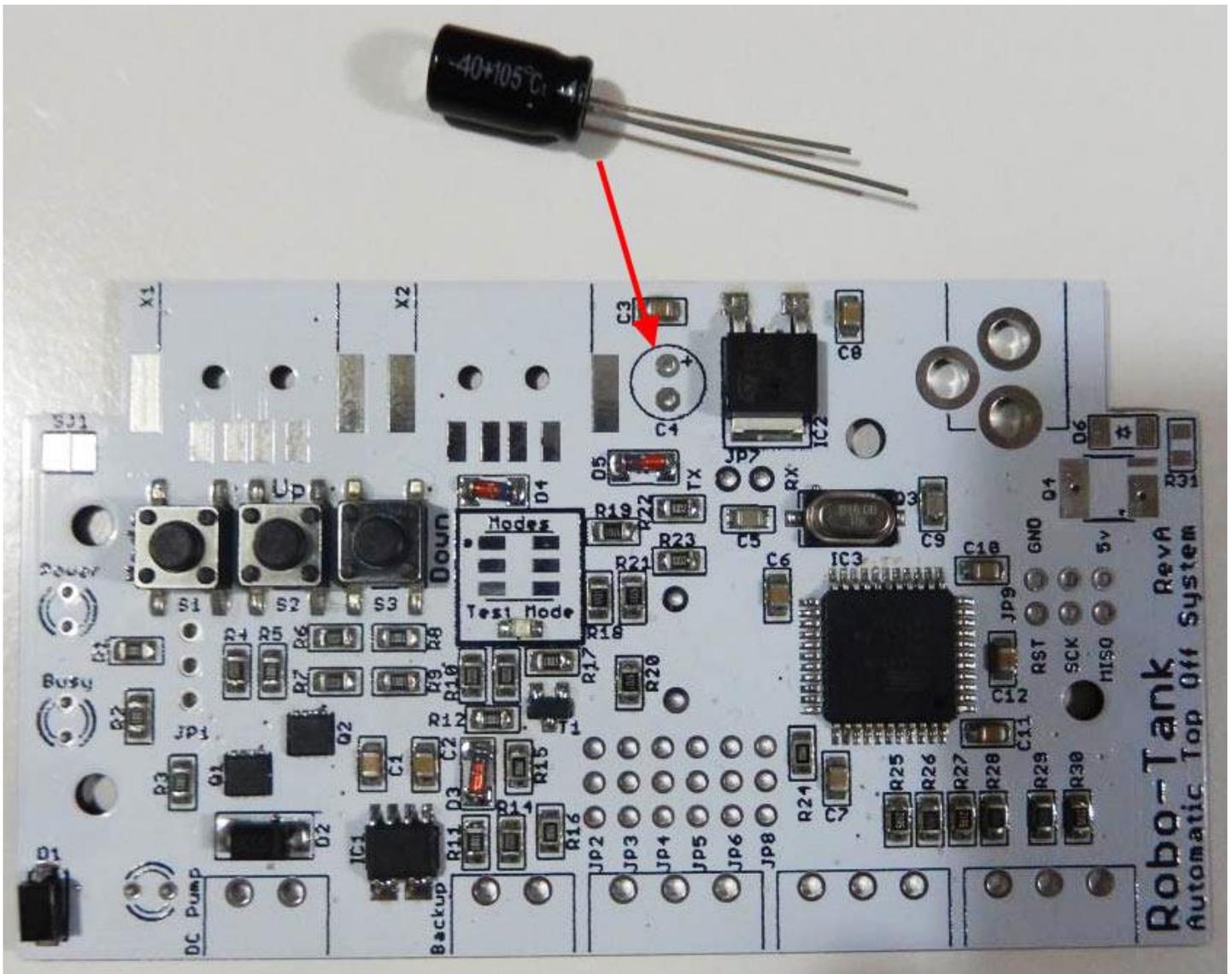
#### Step 4 – Mounting the Capacitor

Ok an easy step, let's mount the capacitor. **The capacitor is polarity sensitive** to be sure you mount it properly otherwise it will blow up and you'll have confetti all over.

On the circuit board you can see one hole has a + sign for positive, the other hole is the negative or ground.

On the capacitor there are 2 ways you can see polarity, first on the side there is a – sign which indicates it's the negative or ground pin. Also on new capacitors if the leads haven't been cut the long lead is positive.

Once you have this worked out you can solder one of the pins just to hold it in place, then position the board so you can press on the capacitor while heating the pin you just soldered, this will allow you to push it firmly to the board, then you can solder the other pin.

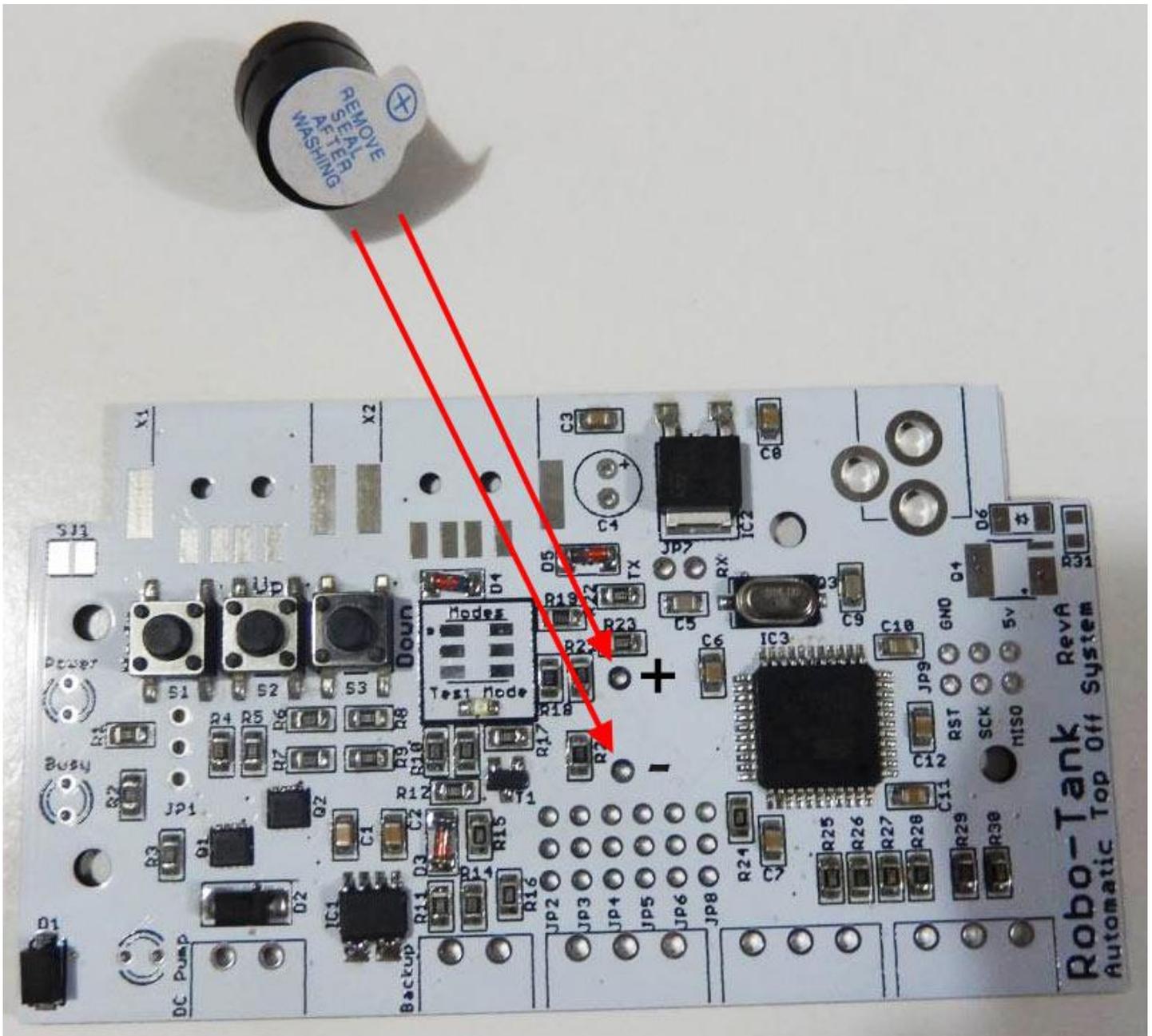


## Step 5 – Mounting the Buzzer

Now it's time to mount the buzzer. This is also polarity sensitive so make sure you place it correctly.

On the PCB you'll see the + (positive) and – (ground) symbol and on the buzzer you can see the sticker indicates the positive pin. It's a good idea to remove the sticker though and verify the marking on the buzzer itself, it also has a + sign under the sticker.

Once you get this correct place on the board and solder in place. It's close to the header pins but there is enough clearance.



## Step 6 – Mounting the Port Sockets

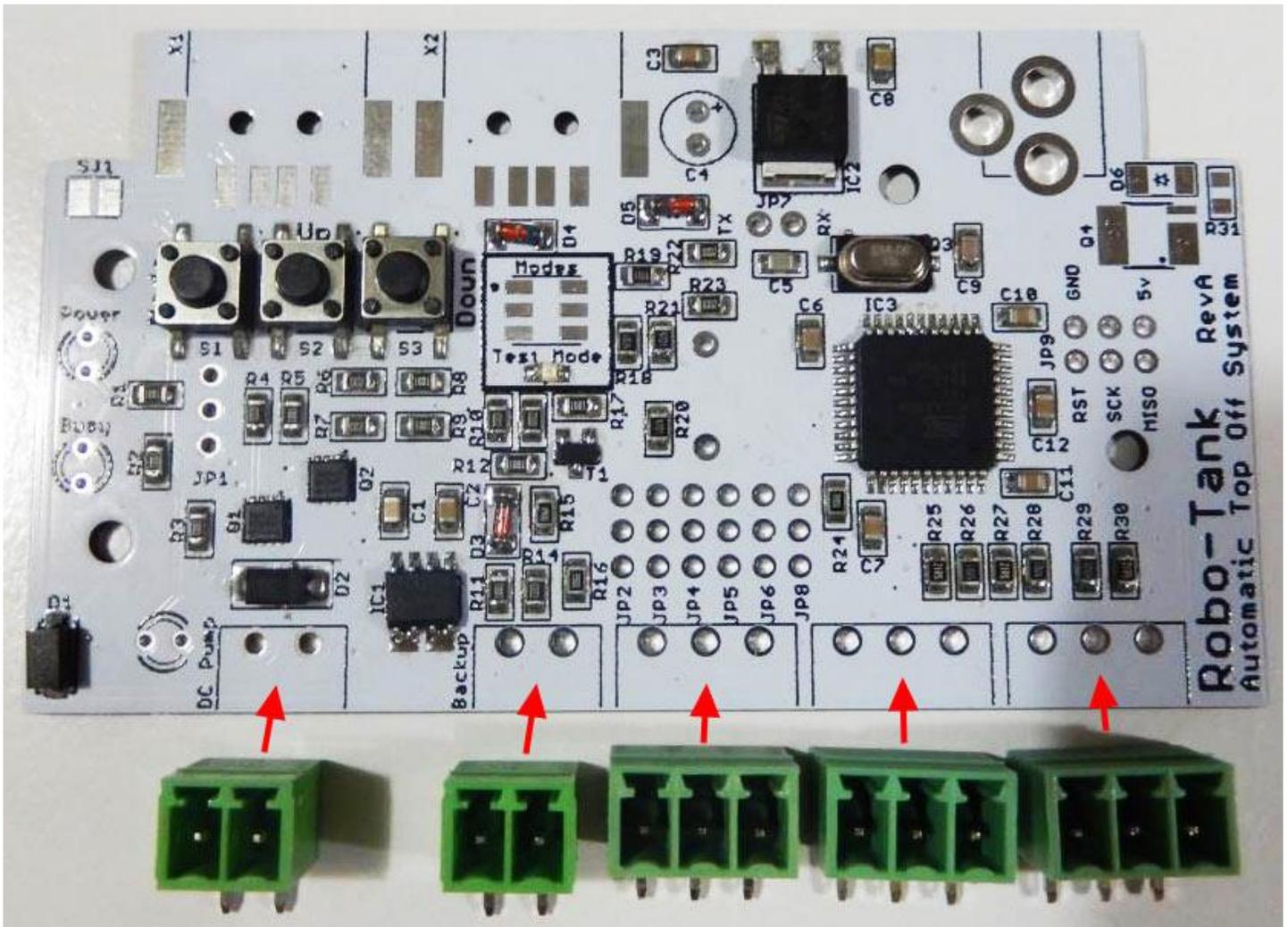
Next is the screw terminal sockets, its best to start with the 3 pin sockets for alignment purposes.

Place one of the sockets on the circuit board and solder one of the pins. Then set the board so you can heat the pin while pushing down and pulling the socket away from the board. You want to pull it as far from the board as it goes, this will allow the sockets to be flush with the faceplate later on.

Take your time getting them align as the end result will look much better.

You'll notice when you pull the 2 pin sockets forward they stick out slightly more than the 3 pin, that's why we mounted the 3 pin first so you have a straight edge to align them to.

Remember, clean your soldering iron often on a damp cloth or sponge.

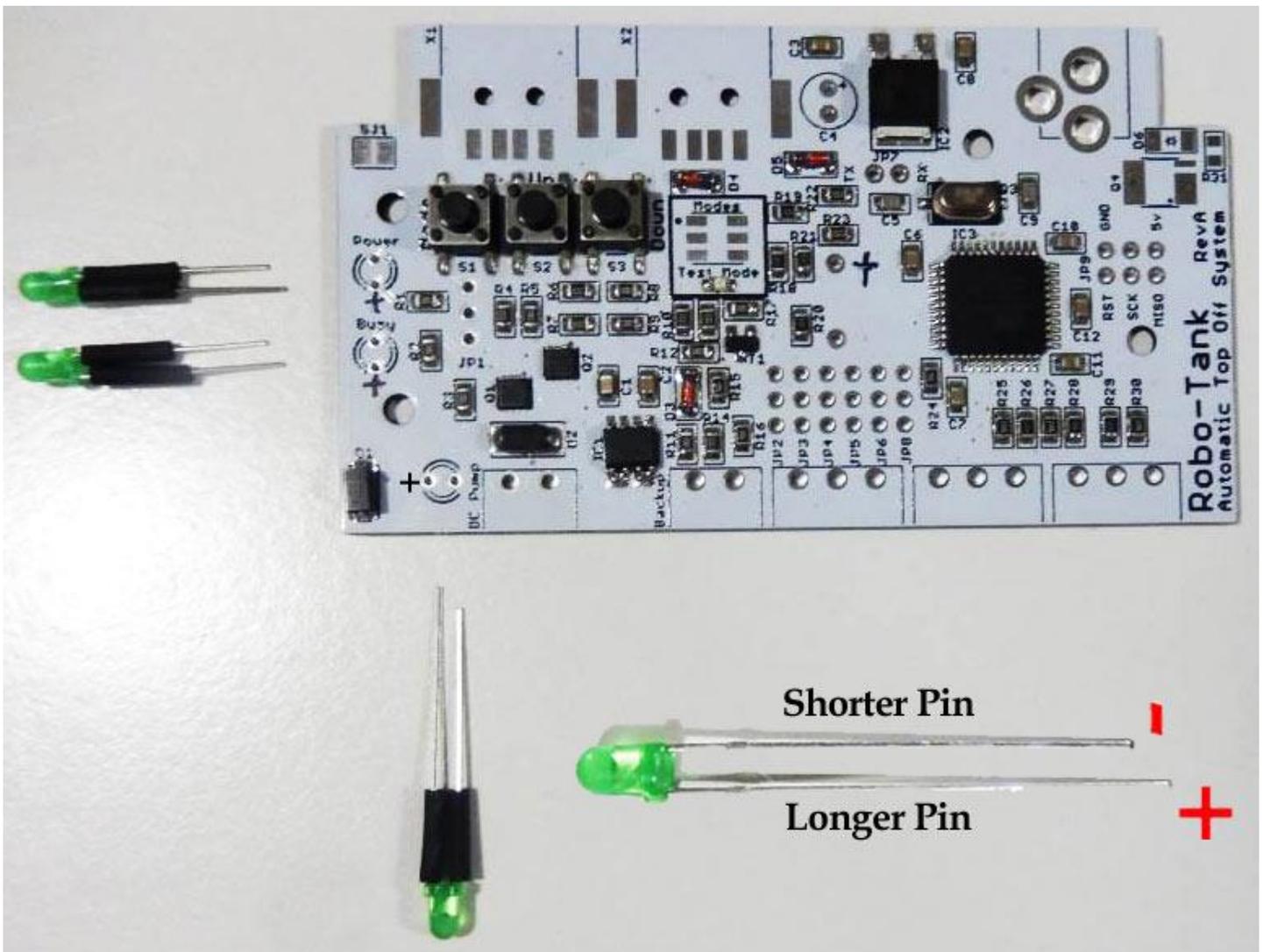


## Step 7 – Mounting the Indicator LEDs

And now on to the final step that involves the soldering iron, the LEDs. In the kit you should have a piece of heat shrink, cut it into 6 small pieces about 10mm or 0.4" in length to protect the LEDs from shorting out. If you have a heat source heat the shrink without putting the LED under the flame. You'll see the heat shrink doesn't shrink to a tight fit and will still move, this is ok.

These are polarity sensitive so it's important to mount them correctly or they will burn out immediately. As the image shows the shorter pin is negative or ground and the longer pin is positive. On the circuit board the hole with a + sign next to it is the positive.

Solder one pin in place, check if needs adjustments and solder the other.



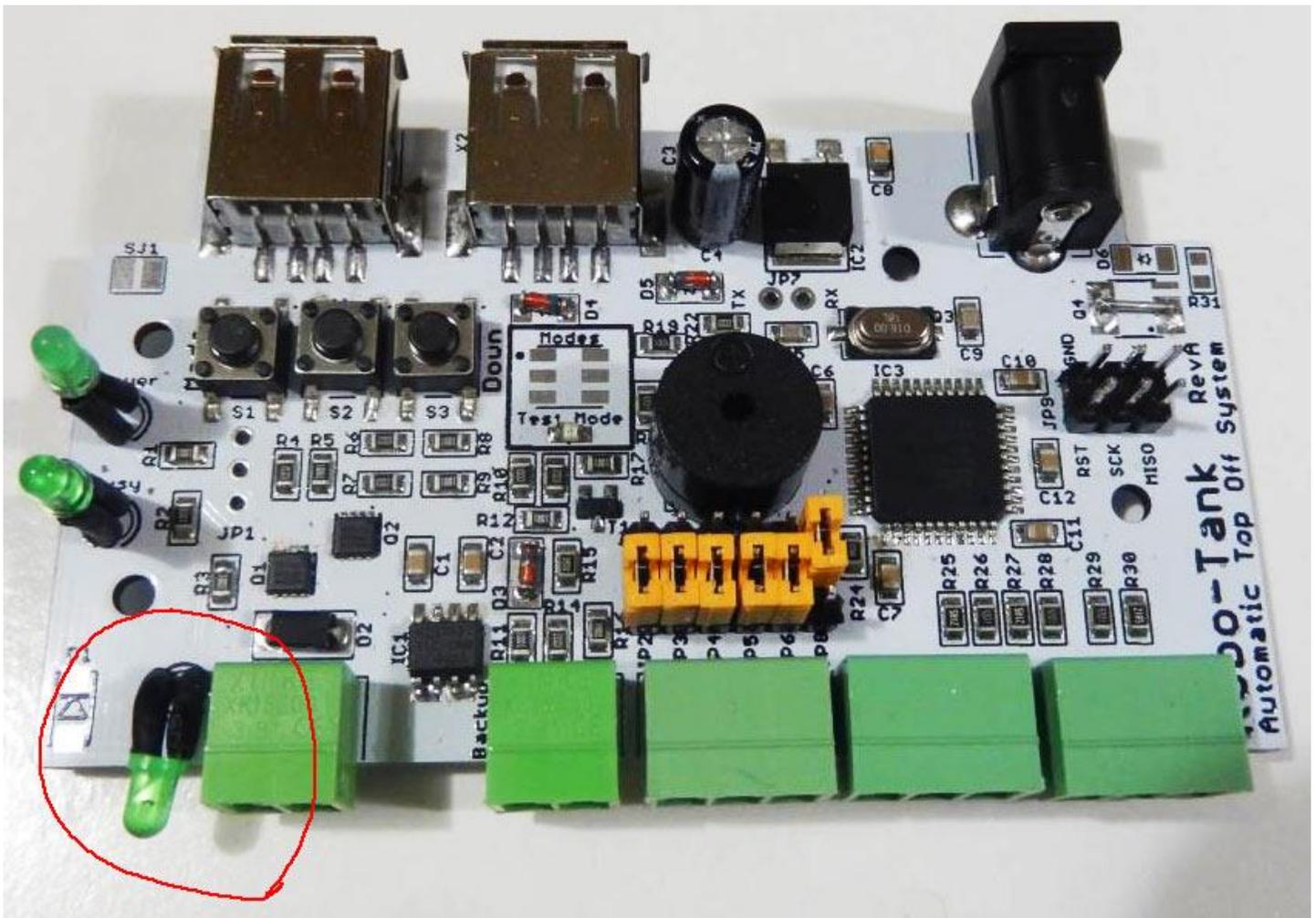
## Step 8 – Circuit Board Assemble Complete

Congratulations if your PCB looks like the image below you get 2 thumbs up. You can now plug in a 9v – 24v DC power supply to the power socket and the side back LED should light up. The LED beside it only illuminates if connected to the Robo-Tank controller.

Notice the pump LED circled in the image below, you want to set it like this so it lines up when you put the board in the case. The LED should sit center to the 2 pin plug next to it.

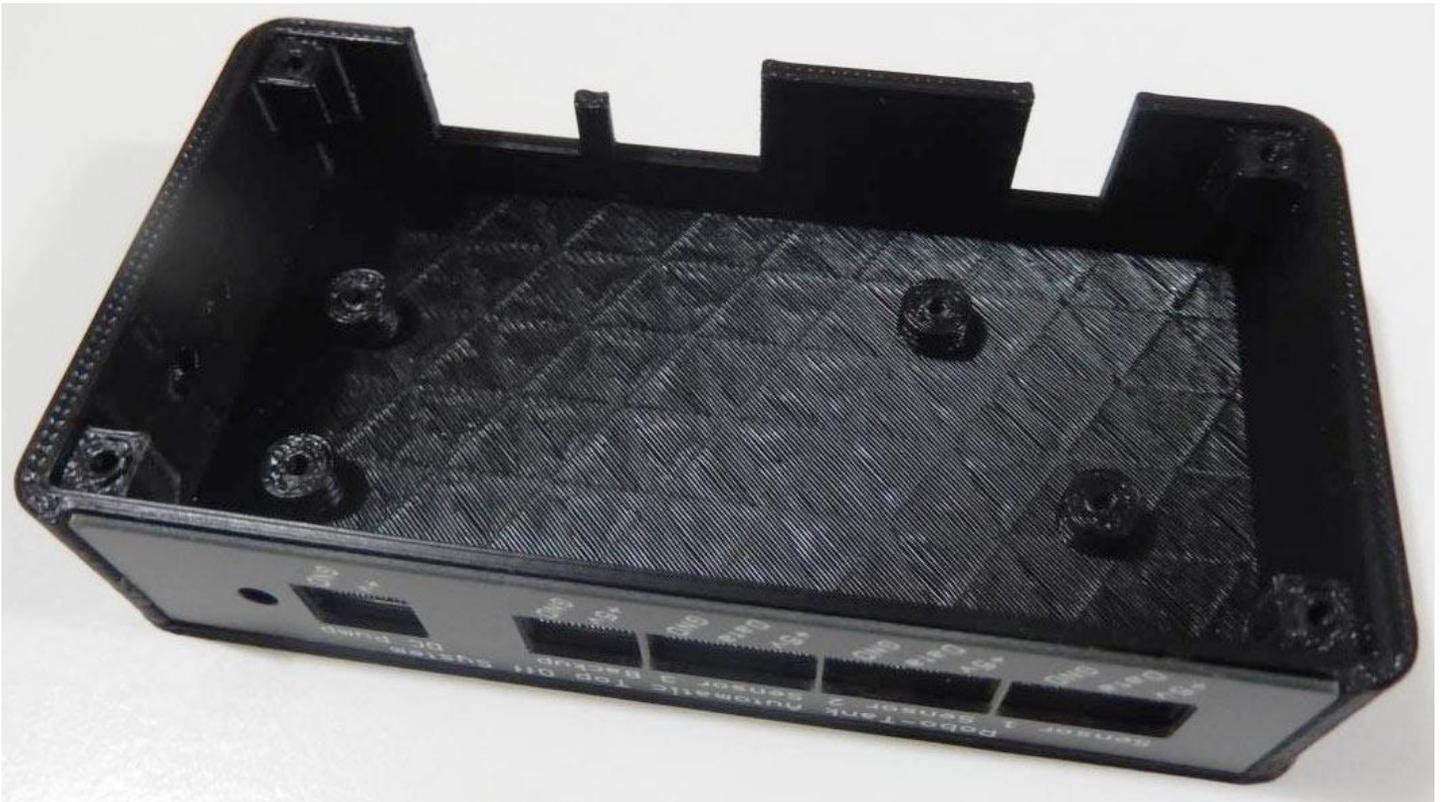
The LEDs on the side can be bent into place once it's in the case but its ok to but a kink in them near the bottom beforehand.

You can now pause, read the user manual and test out the ATO system or proceed to install it in the case.



## Step 9 – Attaching the Faceplate to the Case

Before mounting the ATO in the case you should glue the faceplate to the front however you can do this later. Any type of glue will work.



## Step 10 – Mounting the ATO in the Case

Now you can place the PCB in the case which is designed to be a snug fit but goes in without too much trouble. You need to place it in the case like the image below for it to go in. I circle the pump LED as this is what makes it snug and can give some resistance.

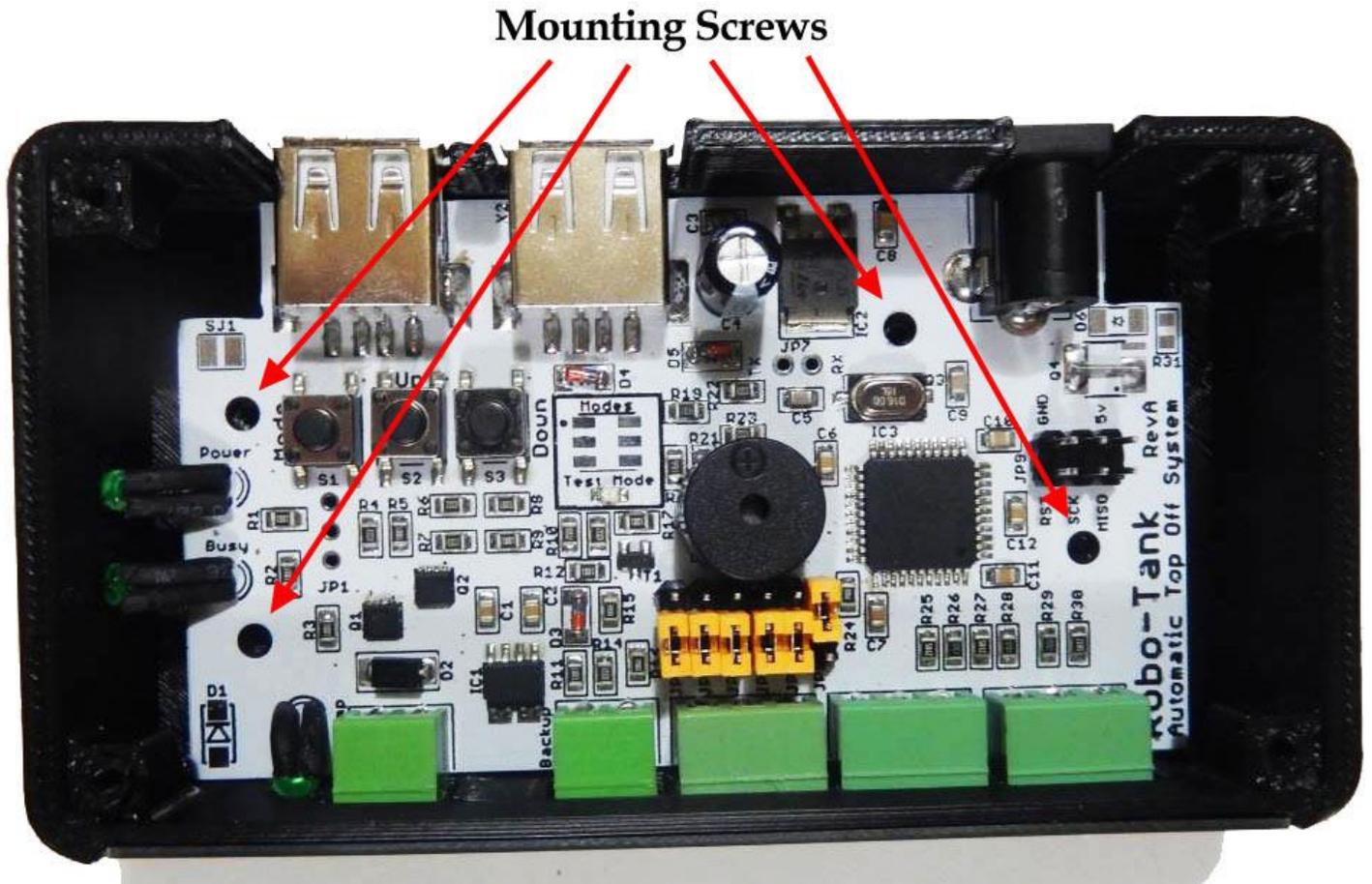
When you place the PCB in the case look from the front to see that the plugs are in place and the LED is lined up. Then press on the LED to the front and down at the back of the bulb so you can make it straight with the hole. Then gently press the PCB forward from the back and down and it will go into place.

Now you can align the 2 side LEDs with the holes and push them in place. The LEDs have a lip at the back so they can't be pushed in too far.



## Step 11 – Mounting the PCB

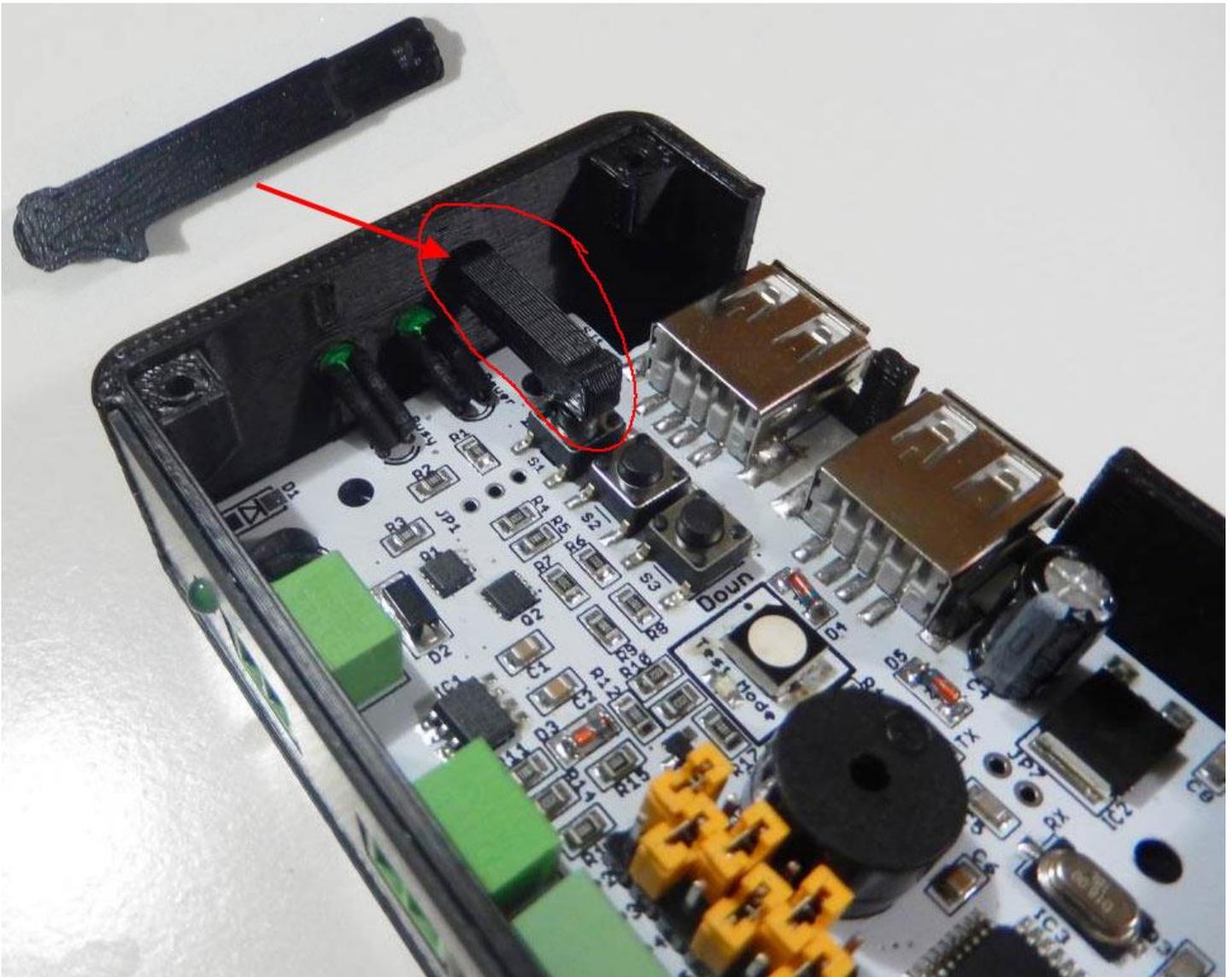
Now you can add 2 screws to hold the circuit board in place and place the jumpers on the board. Please refer to the Robo-Tank ATO System User Manual to set the jumpers in the correct position to match your sensors. Failure to get these correct could damage your sensor.



## Step 12 – Mounting the Push Switch Arm

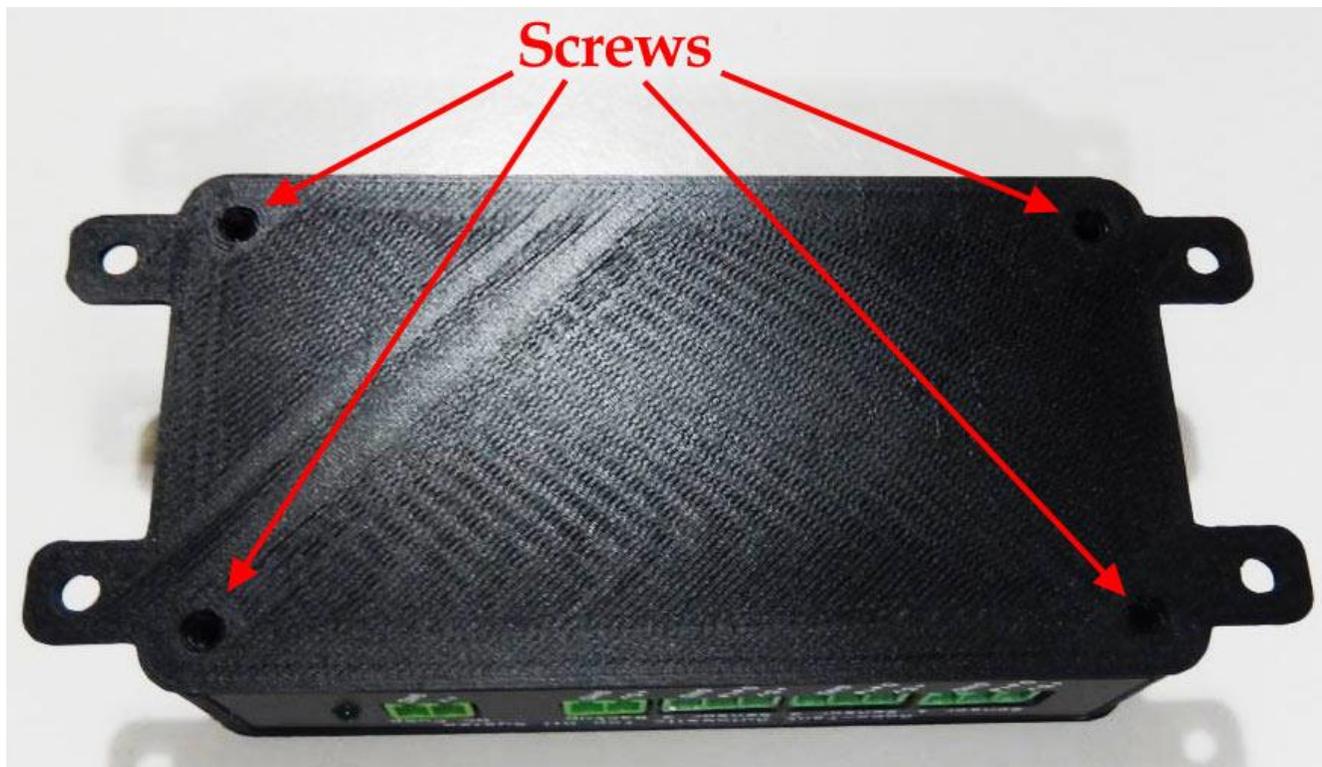
In the kit you'll see a small 3D printed arm that look like the image below. Notice the bottom has a small slope sticking past it, this sits on the push switch. The other end is round and goes through the hole in the side of the case from the inside.

This just sits there, make sure its straight and when you place the lid on it'll be held in place. Note for it to work properly the lid doesn't need to be screwed in place. If you squeeze the top/bottom of the case it may not work as it's preciously set.



### Step 13 – Mounting the Push Switch Arm

Now you can place the lid on and secure it with the included screws.



## Conclusion

Congratulations, if you made it this far you should have a smile on your face and good job!

I recommend you read the user manual to get familiar with how the ATO works and the different settings you can adjust to customize it for your aquarium. You can also find all the details on how to set up the ATO for the various sensor types available.

Thank-you again for your purchase and I hope you enjoy the Robo-Tank ATO System.



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