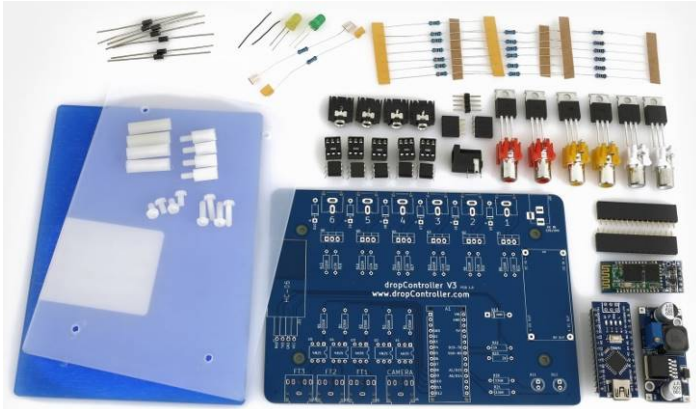
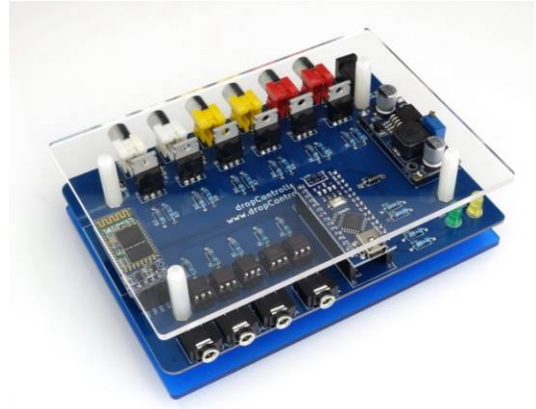


# **dropControllerV3 KIT Assembly Guide**

This is a basic guide to assembling the dropControllerV3 Kit.



From this



to this

## **Tools Required**

A soldering Iron + solder.

Wire cutters/snips (the small kind not the large razor wire cutting kind).

A blob of Blutak (always useful in many circumstances).

Tweezers will come in handy.

A desoldering pump.

A stand or helping hands device maybe helpful but not essential.

Solder wick (just in case but not essential).

Solder flux (if you are a soldering purist).

A multimeter to check the resistor values and the voltage out from the buck converter.

## **Skills Required**

The ability to hold a soldering iron by the cold end and not poke yourself in the eye with the hot end. Some soldering experience would be good and although possible to do, I do not really recommend this as a first soldering project.

## Initial Preparation

Before doing anything else, lay out the parts and check you have everything. There is a parts list at the end of this guide.

## Getting Started

When soldering the PCB it is easiest if you start with the flattest\*/shortest components and work up to the tallest. This will allow you to lay the PCB flat to hold components in place while working on them. In order this is:

- Resistors
- Diodes
- 6 pin DIL sockets
- 3.5 audio sockets
- Barrel Jack
- LEDs
- Phono/RCA sockets
- Bluetooth module 4 pin header
- Buck Converter
- Arduino 15 pin headers (This is a special case)
- Mosfets

The PCB has been designed with additional space around the components where possible to make it a little easier for people who do not have a lot of experience soldering.

The components are clearly marked on the PCB but care is still required and components can be easily put the wrong way around.

After completing the PCB add the supports and the top and bottom pieces.

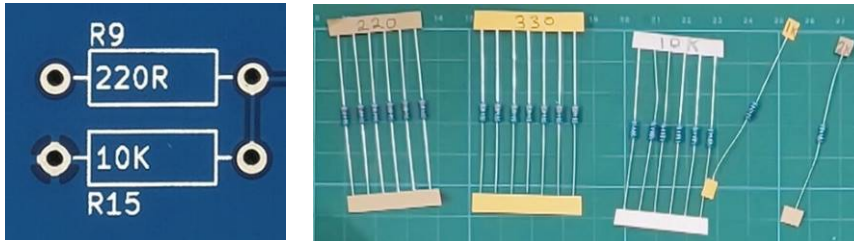
I like to try and make my projects as clean and tidy looking as possible. I have a thing for getting things lined up and straight and throughout this guide encourage you to do the same. However, if this is not you and you don't really care what the end project looks like as long as it works then a good portion of this guide can be ignored. Just make sure you get the right bits in the right holes.

Some steps, like cutting the pins, aren't mentioned at every stage. If you forget you will soon find the untrimmed pins get in the way as a reminder.

*\*This needs to be a proper word.*

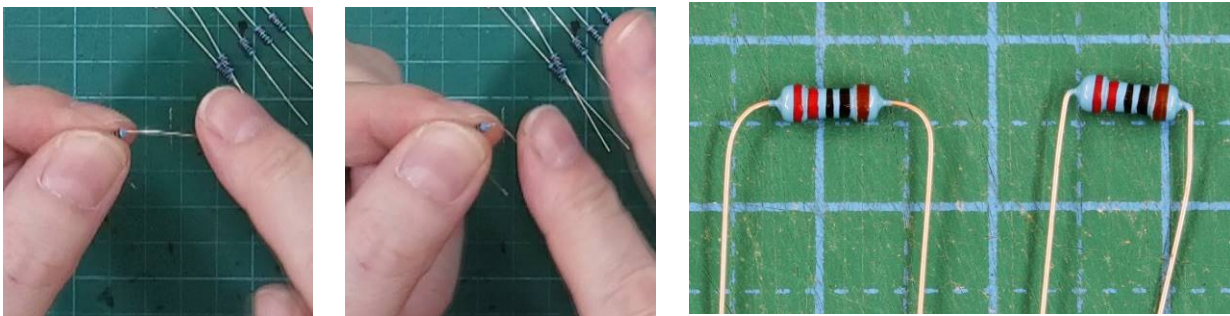
## Resistors

The resistor values are marked on the PCB so the hard part is making sure the resistor value is what you think it is. The values should be written on the paper tabs but it is worth double checking to be sure.

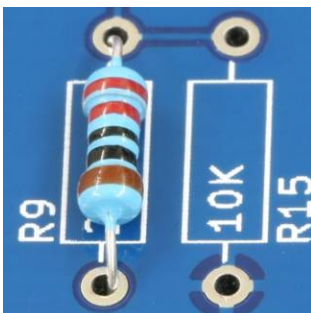


## Bending the pins

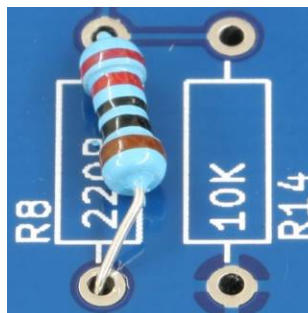
When bending the pins on the resistors (and also the diodes) hold the resistor body and bend the pin from its end. This will give the bend a nice round shape and the resistor will fit the PCB better.



If you bend the pin close to the resistor body you will find it doesn't fit the holes on the PCB very well and will look messy, the resistor will want to sit at one end, and a nice looking dropController is a better dropController (I wonder if that is worth trade marking?).



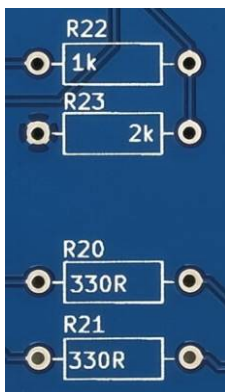
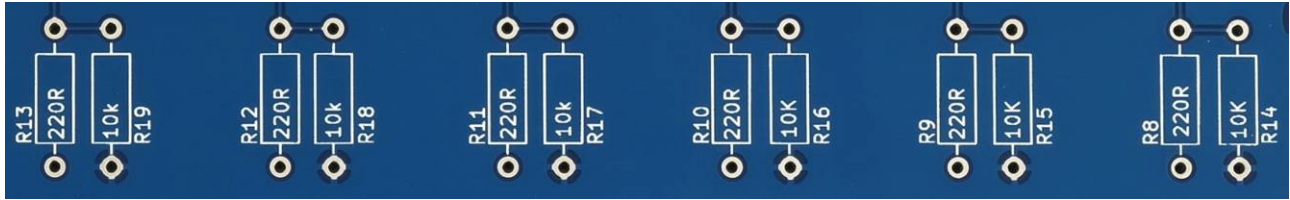
When the pins have rounded bends the resistor sits in the middle where it belongs



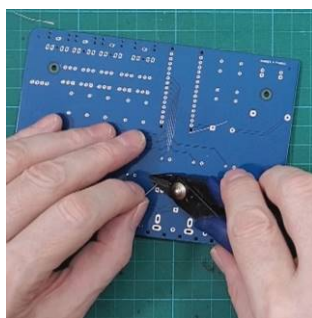
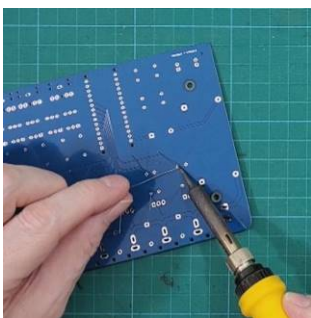
When the pins are bent sharply the resistor will want to sit at one end on top of a hole and will not lie flat.

A nice touch is to place all the resistors in the same orientation so the coloured bands line up.

Across the top of the PCB, start with the 220 ohm and 10k ohm resistors. Then move to the 330 ohm and the 1k and 2k.



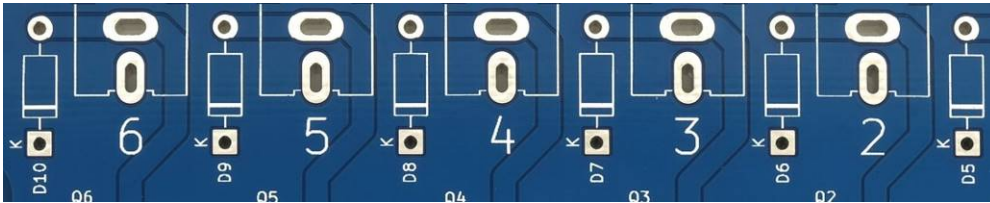
The 2K label being at the opposite side to the 1K really bugs me. I must remember to move it in the next version of the PCB.



Solder then trim.

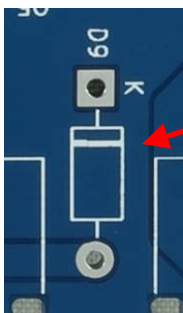
Note: as this guide progresses I include less and less detail and try to keep the patronizing to a minimum.

## Diodes



After completing the resistors move on to the diodes. Diodes are one way devices (I did say I would try to keep the patronizing to minimum. I didn't say there would be none) and if you get them the wrong way round the resultant explosion will destroy the planet\*.

\*Not quite the whole planet just the tiny part that is the dropController. Look up flyback diodes if you want to know more.



On the diode there is a white (its actually grey or silver) line at one end, align this with the line on the PCB.

As with the resistor, bend the legs from the end of the leg so you get a nice round corner and don't forget the diode near the buck converter.

## 6 Pin DIL Sockets

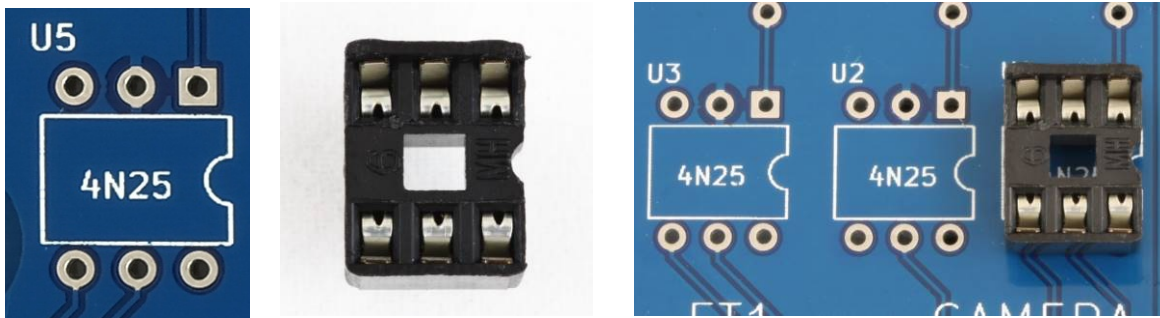
The pins are now starting to get closer together. If you are not that experienced with soldering just take your time and remember to heat the pin\* as well as the solder. Solder will flow on a nice hot pin and recoil in horror from a cold one.

\*We are not talking white hot here!

Next up are the sockets that hold the 4N25s.



Not critical but follow convention and align the circular cut out in the socket with the cutout is the outline on the PCB.



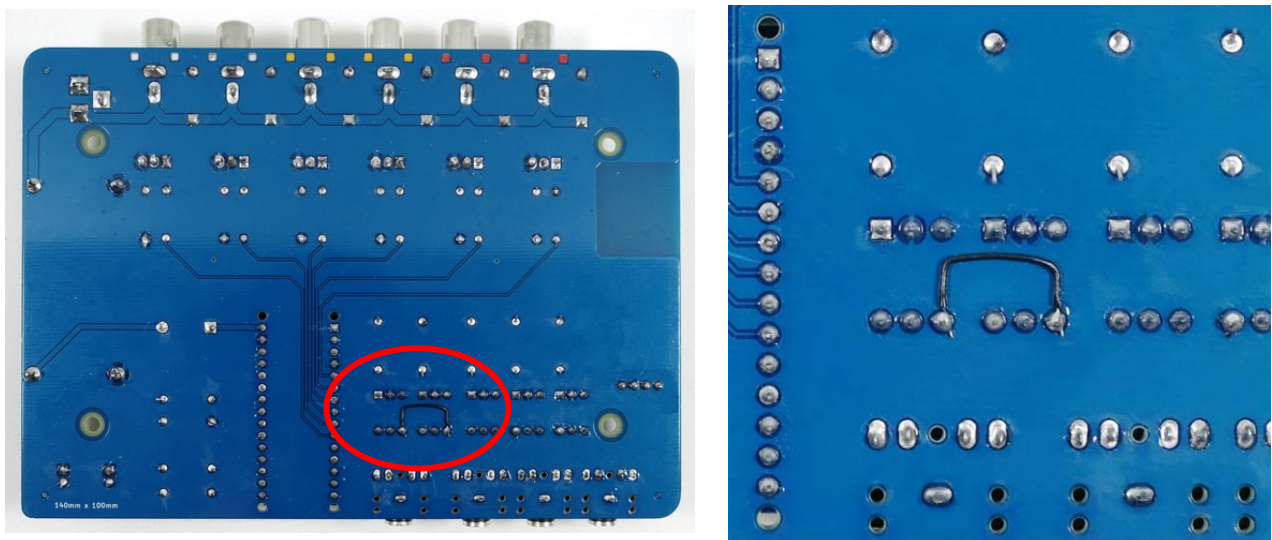
When soldering you want enough solder to hold the pins but not too much that you cause a flood and join them all together.

Don't put the 4N25 chips in yet. Leave them until the end.

## PCB v1.0: Free Soldering Practice.

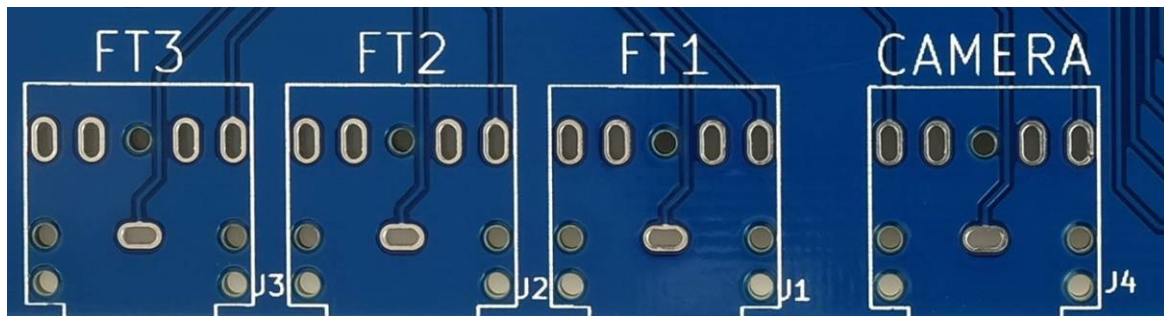
Version 1.0 of the PCB requires a small jumper wire (somebody forgot a ground connection). I find it better to solder the pins first then add the wire afterwards, you may want to do it differently.

This is where the tweezers come in handy. Holding the wire in your hand while soldering it is going to mean hot fingers. A small piece Blutack is also useful to hold the wire in place.

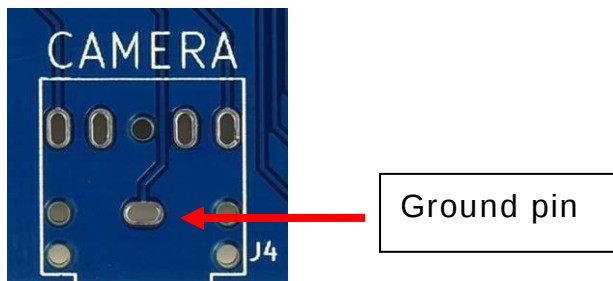


### 3.5mm Audio Sockets

While you are on this part of the PCB add the 3.5mm sockets as well.



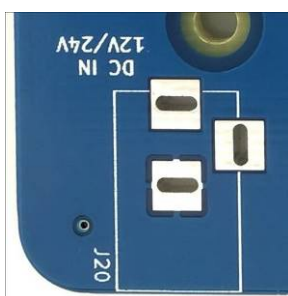
Add a little extra solder to the ground pins



### Barrel Jack

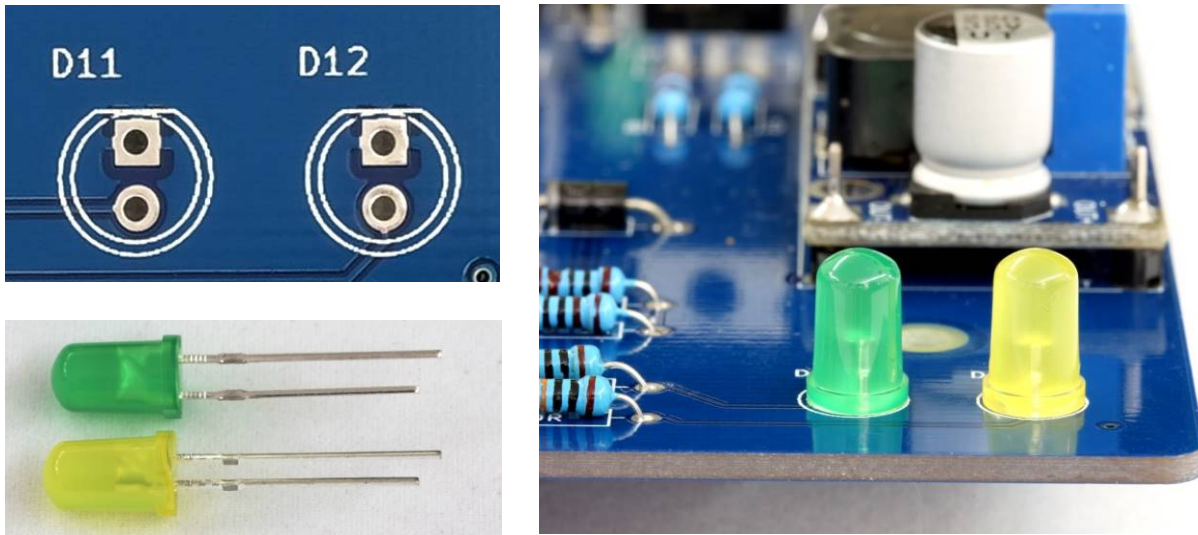
Spin the board round and add the barrel jack

Don't be shy with the solder here. The barrel jack will have stress from plugging in and pulling out the power supply plug so make the joints a little stronger.



## LEDs

Add the LEDs. Try to get them flat to the PCB. D11 is the green LED and D12 is the yellow one.



LEDs normally have a long pin and a short pin\*. The long pin goes through the circular hole\*\*. After inserting, separate the pins slightly to stop them falling out while you solder them.

\*On the LEDs included with the kit, the long pin is the anode. While this is very common (haha) it is not guaranteed to be the same for all LEDs.

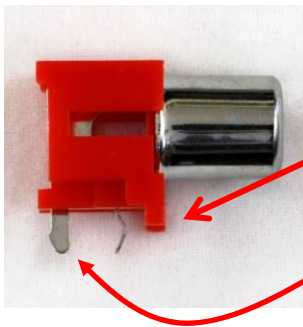
\*\* *Hold on. Both holes are circular I hear you say. Er yes they are, it's the circular hole surrounded by the circular pad. Is that better?*



## Phono/RCA sockets

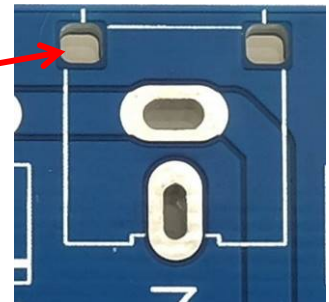
The phono sockets are another high stress part and require lots of solder. Get the pins and pads nice and hot while adding the solder and let the solder run around the joint. Do not get it that hot that you melt the plastic and set fire to the PCB though. Maybe I should add fire extinguisher to the list of tools.

The small square feet on the sockets fit in to the small square holes in the PCB. To get them to lay flat you may need to jostle the socket a little.

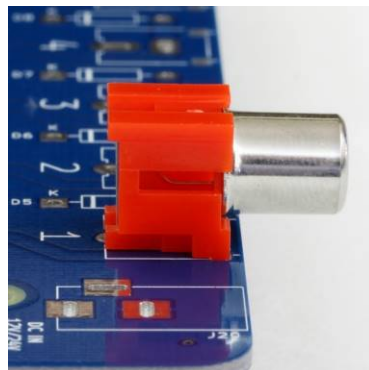


The feet at the front fit in to the holes in the PCB.

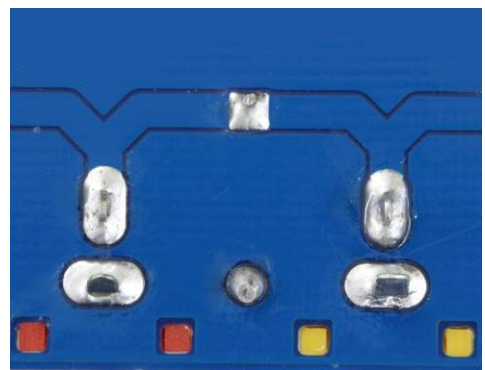
The cut out on the back pin can catch and cause the socket to not sit flat.



Note quite flat



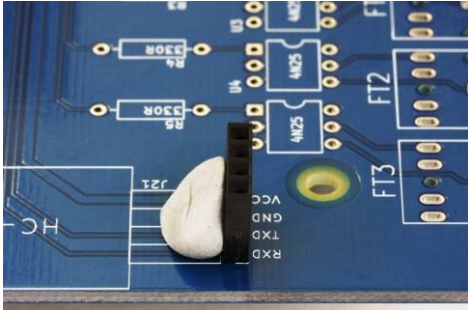
This is better



Lots of solder

## Bluetooth module 4 pin header

This is where the Blutack really shines. Without the Blutack getting the 4 pin header straight and level can be very frustrating.



Place the header and fix it in place with the Blutack.

Flip the board over and solder 1 of the end pins.

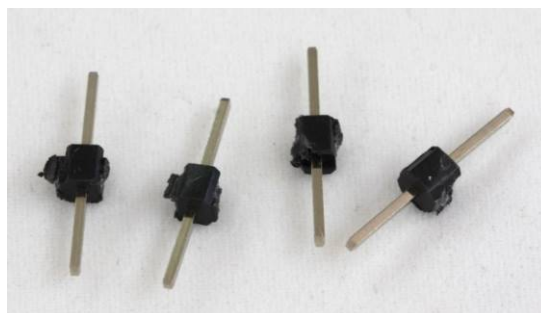
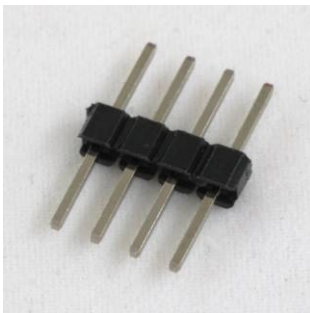
Check that the header is still in place and straight and then solder the remaining pins.

Remove the Blutack, you will need it for the next step.

## Buck Converter

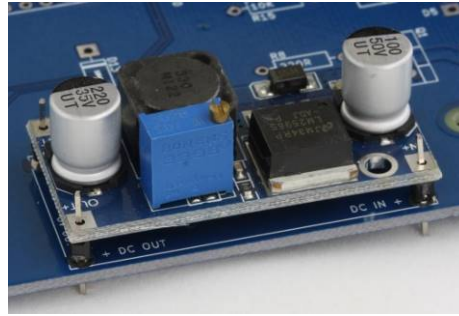
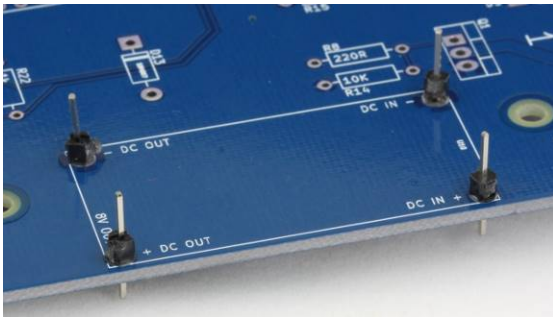
**Important! Make sure the voltage out is set before you solder to the PCB. The voltage out is set before shipping but you should double check. I recommend 8V but this does not need to be exact and 7v to 9v is OK.**

In the kit there is a 4 pin male header, you were probably wondering what this was for, wonder no more, it is to support the buck converter.



Separate each pin, place a pin in each hole, put the buck convertor on top and solder the pins to the buck converter.

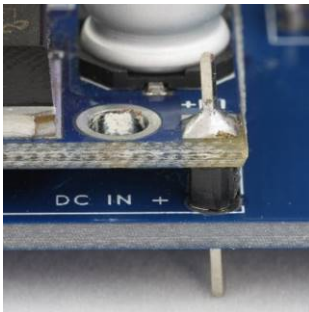
*If you use wire cutters to separate the pins the pin(s) will fly off never to be seen again. Unless of course, they hit you in the eye in which case they should be easy to find.*



Solder the top pins first. This makes the bottoms ones a lot easier.



Make sure the buck converter is the right way around.



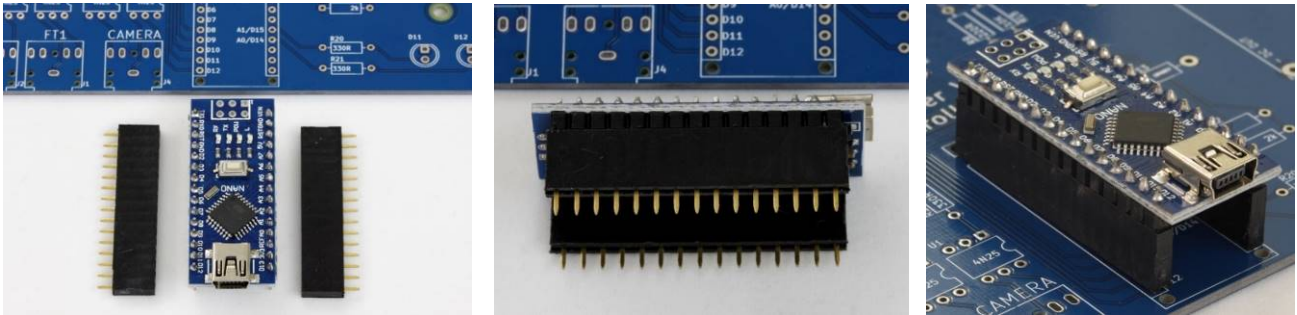
Solder the top pins first and add plenty of solder.

**Remember to check the voltage out.**

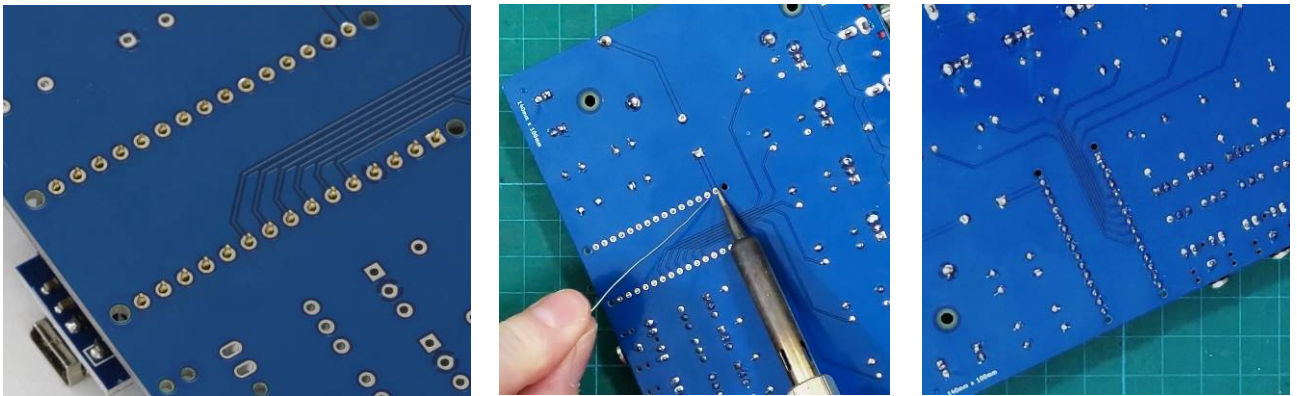
**If you do not have a millimeter search on line for “Arduino volt meter” and make your own.**

## Arduino headers

Put the headers on to the Arduino pins and then place on to the PCB. Putting the headers on the Arduino will hold them in place while you solder them.



Flip the board over and solder one of the corner pins.

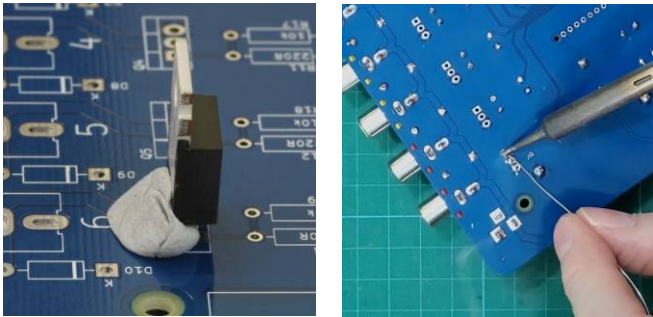


After soldering the first pin check that the Arduino is still in position and then solder a pin on the opposite side, ideally the opposite corner. Check the position again and if happy, solder the remaining pins.

## Mosfets

Last but not least, especially because the solenoids won't work without them, are the mosfets. You can remove the Arduino while attaching the mosfet. It may make things a little easier or it might not.

Place one of the mosfets, secure in place with Blutack, flip over the PCB and solder one of the pins. A helping hands would help here.

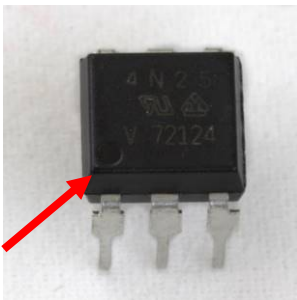


Check the position of the mosfet and if it didn't move while soldering the first pin do the remaining two.

The mosfets do not solder as easy as some of the other components, especially the ground pin which dissipates heat.

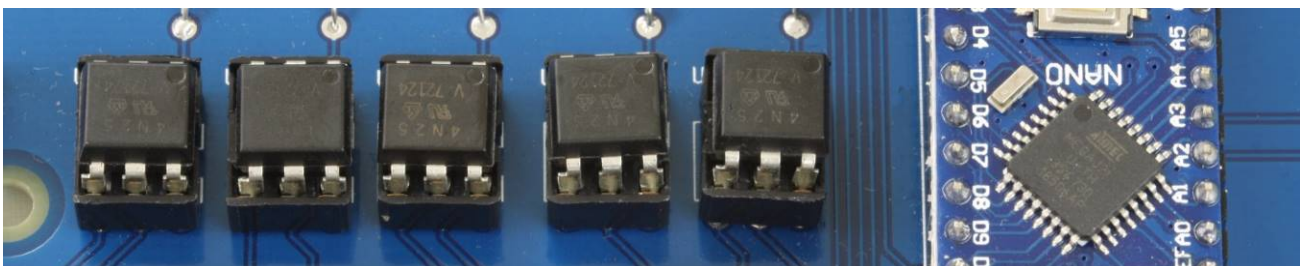
## 4N25s

Add the opto-couplers.



If you look closely at the chip you should notice a small circle at one corner. This denotes pin 1.

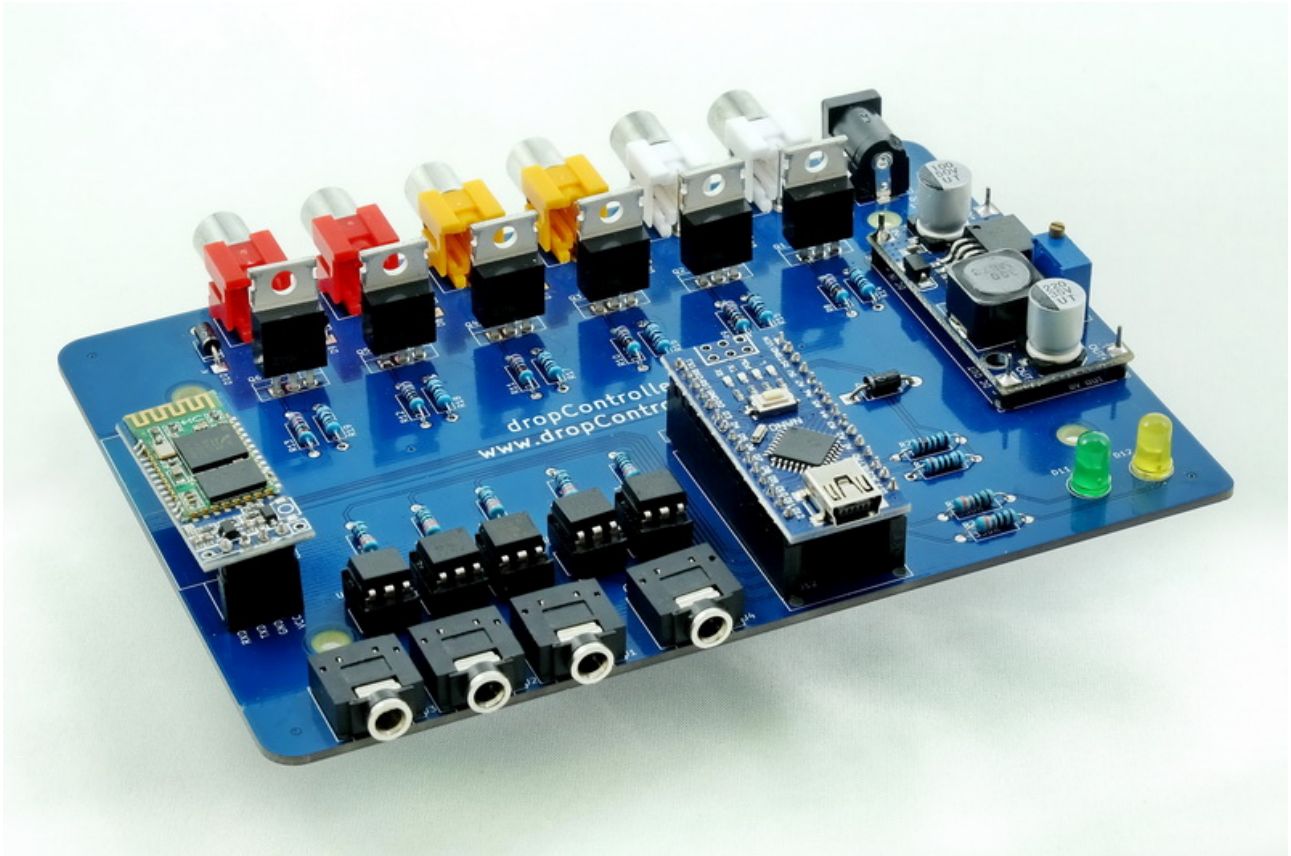
Pin 1 goes to the top right when the PCB is the correct way up (the writing is the correct way). Insert the chips and take care not to bend any of the legs. You may need to bend the pins on the chip in slightly before inserting in to the socket.



At this point you should have either;

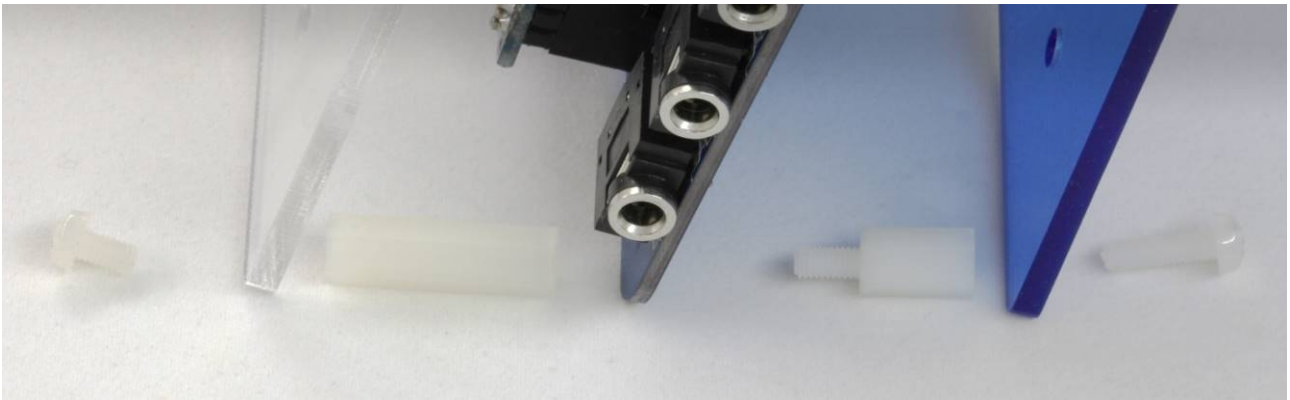
- a nice looking PCB, or
- hands in bandages and the lingering smell of burnt flesh.

I hope you have the nice looking PCB.

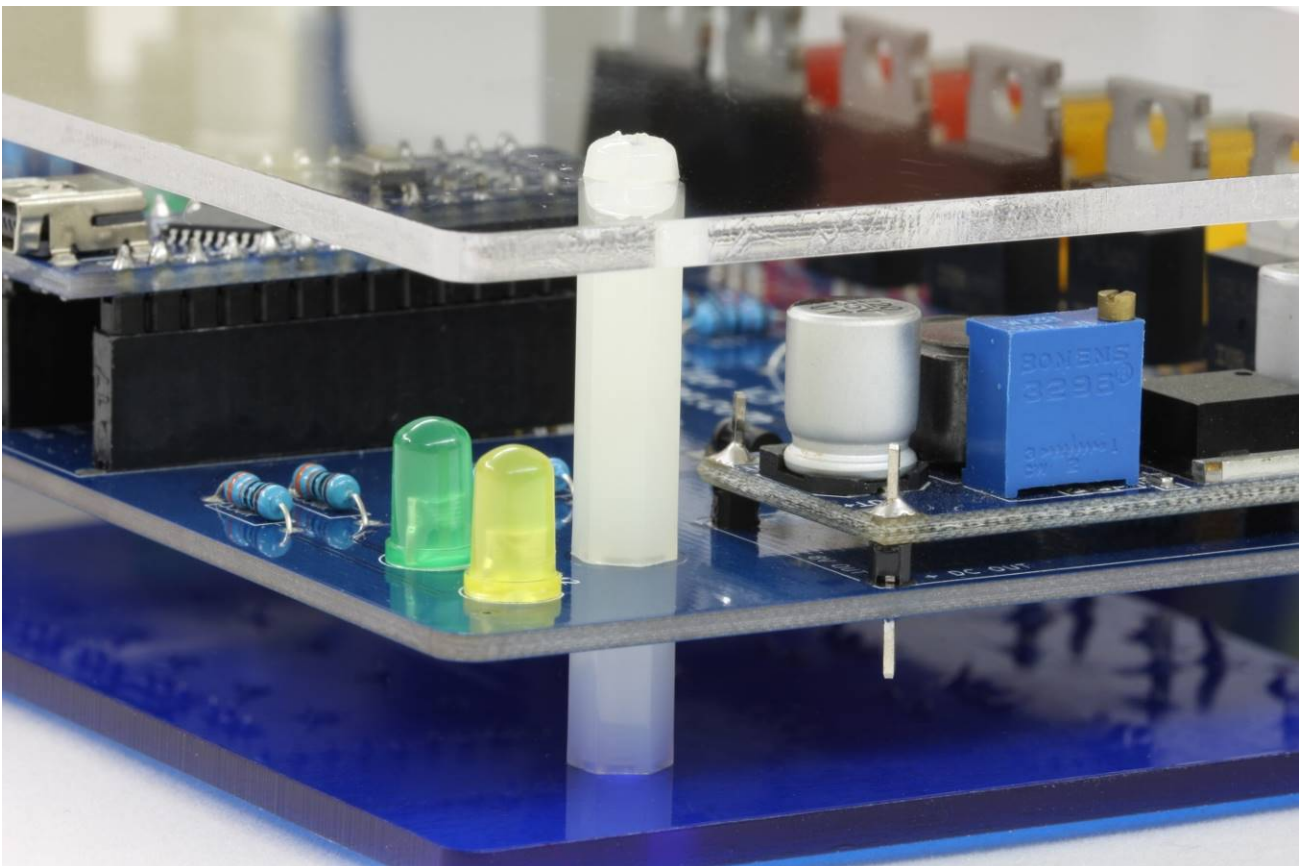


## Cover

All that is left is the cover. This is 2 pieces of acrylic held by supports.



For each corner there is 1 short support, 1 long support and 2 screws. If you have a short screw use it for the top. All the bits screw in to each other:



Done.

## dropControllerV3 Kit Contents

| DESCRIPTION                                | QTY |
|--------------------------------------------|-----|
| PCB v1.0                                   | 1   |
| ACRYLIC BASE                               | 1   |
| ACRYLIC TOP                                | 1   |
| STAND 20MM                                 | 4   |
| STAND 5MM                                  | 4   |
| 3M SCREW - SHORT                           | 4   |
| 3M SCREW - LONG                            | 4   |
|                                            |     |
| ARDUINO NANO                               | 1   |
| HC-06                                      | 1   |
| DC-DC BUCK CONVERTOR                       | 1   |
|                                            |     |
| 1x15 SIL FEMALE 2.54                       | 2   |
| 1x 4 SIL FEMALE 2.54                       | 1   |
|                                            |     |
| BARREL JACK - TYPE A: 5.5 mm OD, 2.1 mm ID | 1   |
| RCA/PHONO SOCKET - RCA-RCJ-04x             | 6   |
| 3.5MM STEREO SOCKET - PJ-307               | 4   |
| 6 PIN DIL SOCKET                           | 5   |
| 4N25                                       | 5   |
|                                            |     |
| YELLOW LED 5mm                             | 1   |
| GREEN LED 5mm                              | 1   |
|                                            |     |
| MOSFET IRL540N                             | 6   |
| 1N4007                                     | 7   |
| 1/4W RESISTOR 10K                          | 6   |
| 1/4W RESISTOR 2K                           | 1   |
| 1/4W RESISTOR 1K                           | 1   |
| 1/4W RESISTOR 330 OHM                      | 7   |
| 1/4W RESISTOR 220 OHM                      | 6   |

