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).

Optional
A blob of Blutak (useful in many circumstances).
A stand or helping hands device maybe helpful.
Tweezers will come in handy.
A desoldering pump/solder wick, just in case.
Solder flux (if you are a soldering purist).
A multimetre to double check the resistor values.

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 as a first soldering project I do not really recommend it.
**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.

![Parts list](image)

*Parts may change without notice. For example the optocouples may be white.*

When soldering the PCB it is easiest if you start with the flattest or lowest profile components and work up to the tallest. This will allow you to place the PCB upside down and use the worktop to hold components in place while soldering. 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
To help make assembly a little easier extra space has been added to the PCB layout. There are some tight spaces though; such as the pins on the Arduino and the IC sockets.

The components are clearly marked on the PCB but care is still required and components can be easily put the wrong way around. If you are not a soldering ninja take your time and double check as you go.

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 I 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 parts in the right holes the right way around.

Some steps, like trimming 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.
**Arduino Pins**

The Arduino may come without the pins attached.

If you are experienced with soldering start by attaching the pins to the Arduino. If you are a little unsure leave this till later when you have warmed up.

Insert the pins into the supports, place support with pins on to the PCB, place the Arduino on to the pins, solder the Arduino to the pins.

Do not attach the supports to the PCB yet. That comes later.
Resistors

The resistor values are marked on the PCB and also on the tabs holding the resistors together.

If you have the facility it is worth double checking the resistor values before soldering.

Bending the pins

When bending the pins on the resistors (and also the diodes) hold the resistor body and bend the pin from the pin 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, the resistor will want to sit at one end and will look messy. Bend from the end to give a nice curve and the resistor will sit better, and a nice looking dropController is a better dropController.
When the pins have rounded corners 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.

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

Separating the pins slightly helps keep the resistors in place.

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 (not really true but close enough) and if you get them the wrong way round the resultant explosion will destroy the planet* (I did say I would try to keep the patronizing to minimum. I didn’t say there would be none).

*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 (it’s 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.

Don’t forget the diode near the buck converter.
6 Pin DIL Sockets

Next up are the sockets that hold the 4N25s.

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 hot pin and recoil in horror from a cold one.

*We are not talking white hot here! About half a second contact with the soldering iron is more than enough.

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 so much that you cause a flood and join all the pins together. Place one socket, flip the board over and solder. Then do the rest one at a time.

Getting the socket to stay in place when you flip the board over can be finicky. A small blob of Blutak can help.

When done check for solder bridges/shorts that join pins together. If you have any remove the solder and re do.

Don’t put the 4N25 chips in yet. Leave them until the end.
### 3.5mm Audio Sockets

While you are at the bottom of the PCB add the 3.5mm sockets as well.

Add a little extra solder to the ground pins

Same as the IC sockets, place one 3.5mm socket, flip over the board and solder.

Solder one pin, check the socket position, and if OK solder the remaining 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 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.

The photo is from an earlier version of the PCB. The layout for the Bluetooth modules has been updated in newer versions.
DC-DC Step Down Buck Converter

There are two types of buck converter; a variable out version and a fixed 9V output version. Most kits now come with the fixed 9V converter.

Variable Output Buck Converter

The variable output converter included in the kit is pre-set to around 8V output but it is still worthwhile checking before soldering to the PCB.

Important!
If you are not using the kit make sure you set the voltage out on the buck converter before you solder it to the PCB. I recommend 8v but this does not need to be exact anywhere from 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 converter 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 it hits you in the eye in which case it should be easy to find.
Place the pins in to the PCB and then drop the buck converter on to the pins. Do not solder the pins to the PCB yet.

Make sure the buck converter is the right way around. Follow the arrow.

Solder the pins to the buck converter first. Then flip the board over and solder the pins to the PCB.

Remember to check the voltage out. If you do not have a multimeter search on line for “Arduino volt meter” and make your own.
9V Fixed Output Buck Converter

There are two ways to connect the 9V converter; either using pins the same as the above or attaching it directly to the PCB SMD style.

Pins

Place the 4 pins in the PCB as shown in the photo. You may need to raise the PCB off the work surface.

Place the buck converter on the pins. Solder the pins to the buck converter first. Then flip the PCB over and solder the bottom connections.

Make sure you have the buck converter in the correct direction.

SMD Style

Tin the pads where the converter will go. Just need to add a small amount of solder.
I like to hold the buck converter in place while I attach it.

Solder in place by running solder from the pad on the PCB to the pad on the converter.

Adjacent pads are the same so they can be soldered together if you wish.

These two pads are the same.

These two pads are the same.
**Arduino headers**

Put the headers on to the Arduino pins and then place on to the PCB. Putting the headers on to 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 headers are still in position and are lying flat. You are happy with the position solder the diagonally opposite pin next. This will keep the Arduino in place while to solder the remaining pins.

The pins are fairly close together and it is easy to join two together. If you are not used to soldering take your time and check as you go along.
Mosfets

Last but not least 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 may help here. I find the Blutak and the table top are sufficient though.

After soldering the first pin, check the position of the mosfet and if it didn’t move while soldering do the remaining two pins.

The mosfets do not solder as easy as some of the other components. The mosfest have thicker pins which require slightly more heat especially the ground pin.

Try and get all the mosfets to line up straight.
4N25s

Add the opto-couplers.

You have already soldered the sockets so now insert the opto-coupler chips.

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.

Let’s hope you have the nice looking PCB.
Cover

All that is left is the cover and base. 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 short screws use them at the bottom. All the bits screw in to each other:

Done.

Note: The kit may include small connectors that are used as feet.
### dropControllerV3 Kit Contents

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<th>CHECK</th>
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Some parts may change without notice depending on availability. The kit may contain a different DC-DC buck converter.
PCB Version 1.5
Completed PCB

PCB with the 9v DC-DC buck converter.