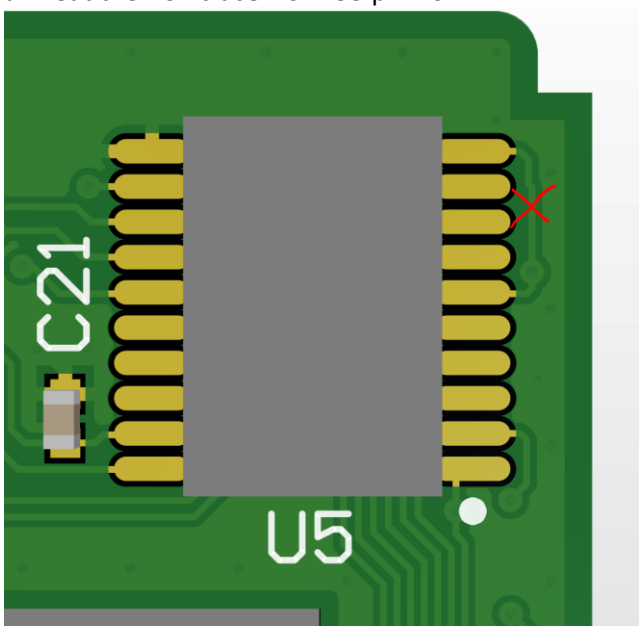
Balancing Robot Assembly Instructions

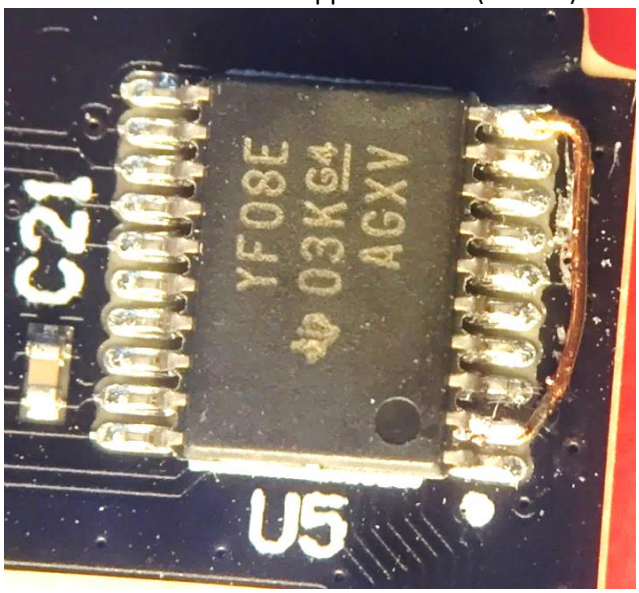
Preliminary Steps

Step 1. Modify each of the assembled PCBs. Note, this change is only required for v1.1 of the PCB; v1.2 corrects this issue and hence this change is not required.

a. Cut the PCB trace from U5 pin 10



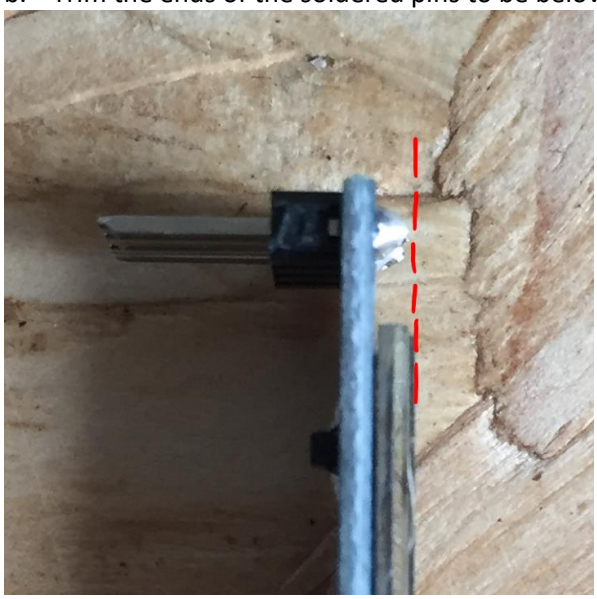
b. Solder an insulated copper air-wire (0.5mm) between U5 pin 10 and U5 pin 2



Step 2. Attach the display.

a. Solder a 4-way 0.1” header to the display

b. Trim the ends of the soldered pins to be below the level of the screen

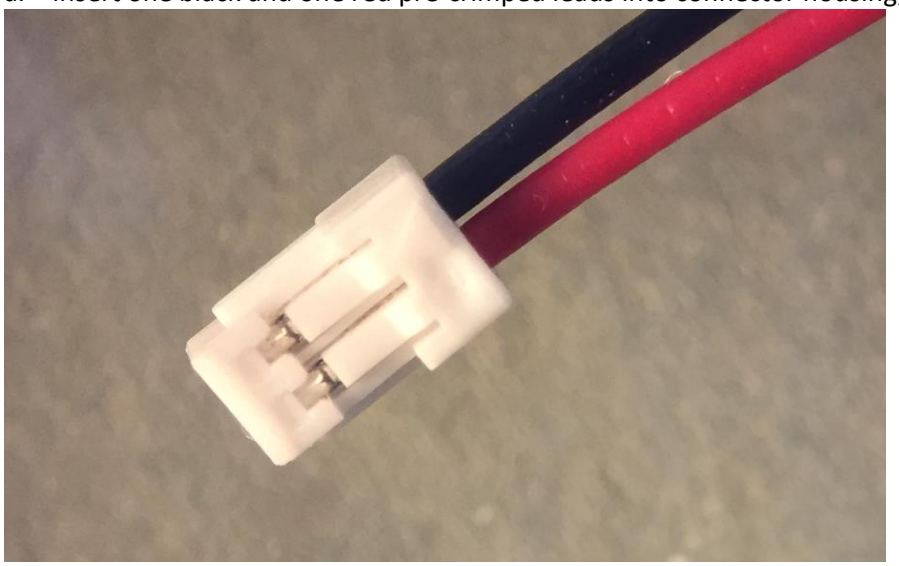


(step continues on next page)

c. Finally, solder the display to the PCB and trim the ends of the soldered pins. When finished, the display should be parallel to the main PCB, both horizontally and vertically. (It can be helpful to use a small piece of Blu Tack under the top-end of the display to position and hold it prior to soldering.)

Step 3. Cable assemblies (three are required for each device).

a. Insert one black and one red pre-crimped leads into connector housing, observing polarity:



b. Trim the leads to 50mm in length (not including the connector housing)

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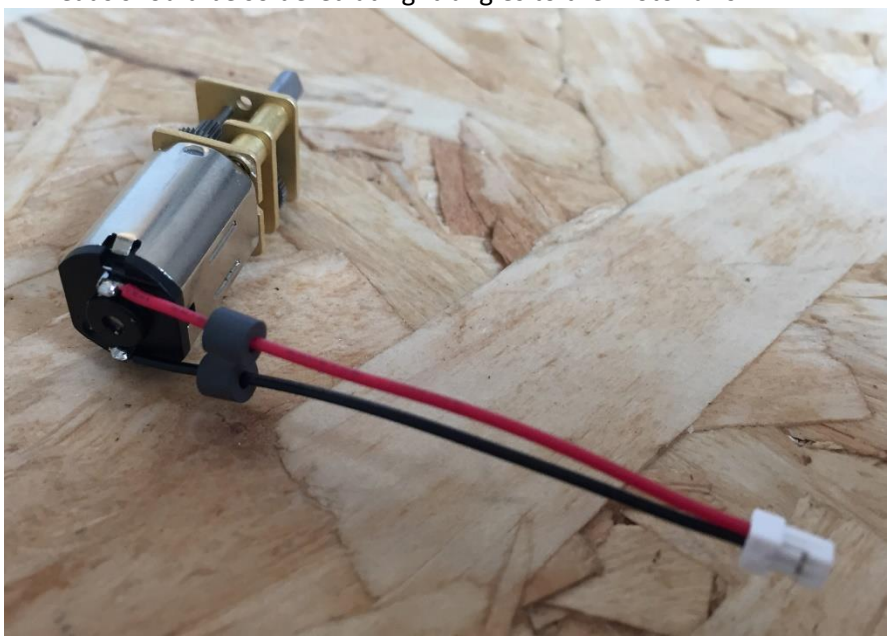
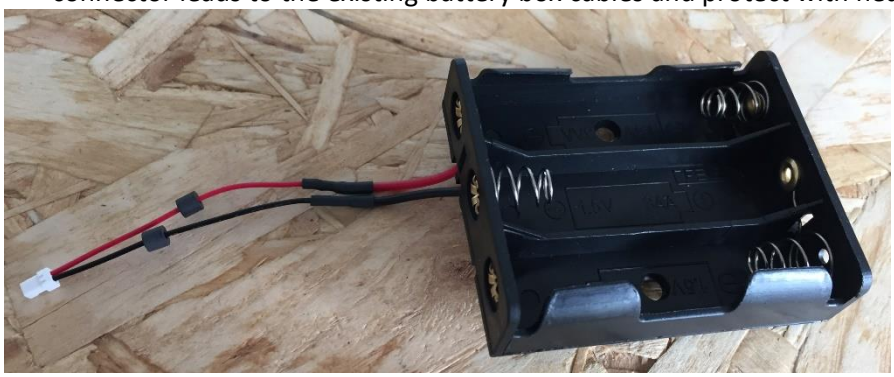
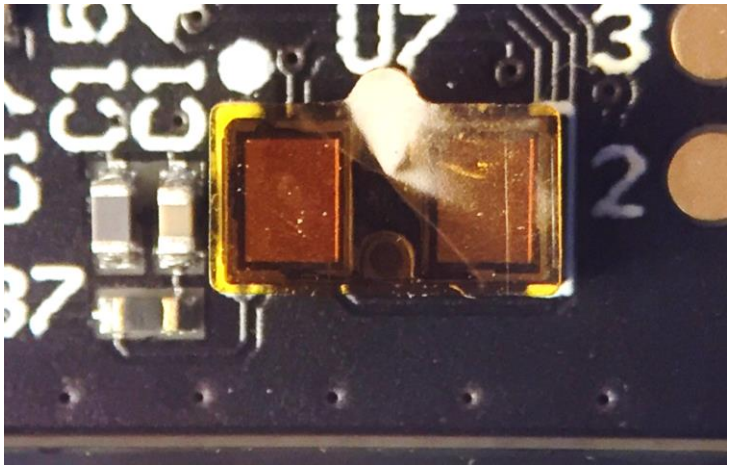
c. Remove ~4mm insulation from the end of each lead and tin ready for soldering.
d. Add a small ferrite core to each lead.
e. ***Motors (2x)*** - Solder leads to motor terminals, observing polarity (red lead to + terminal). The leads should be soldered at right-angles to the motor axis.



f. ***Battery box*** – trim the existing battery box cables to 25mm length and then solder the connector leads to the existing battery box cables and protect with heat-shrink sleeving.

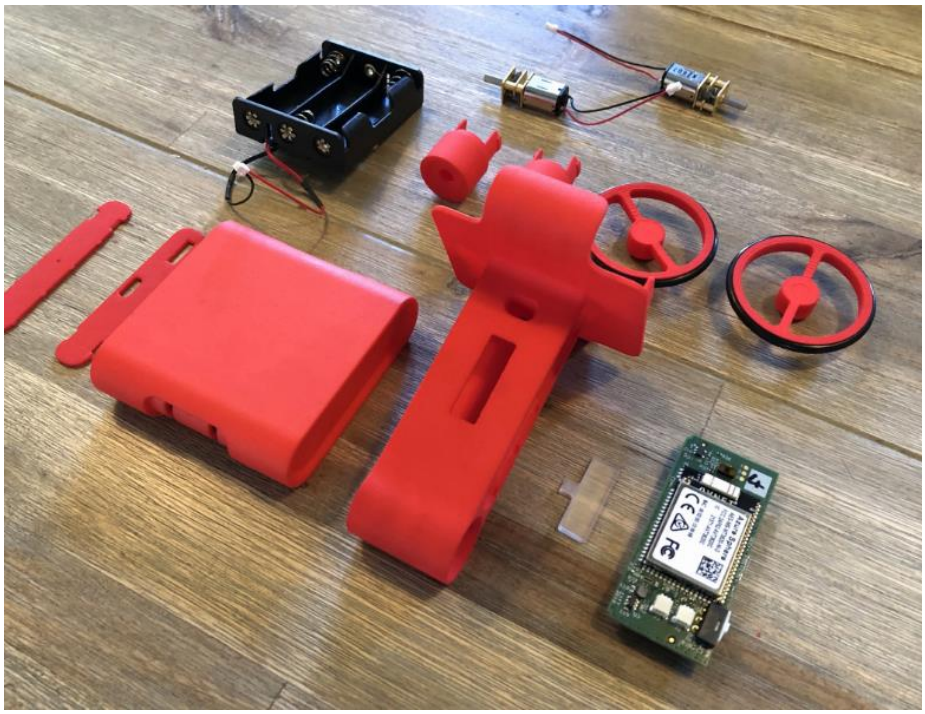


Step 4. Remove the protective Kapton covering from both time of flight sensors (front and rear).



Main Assembly

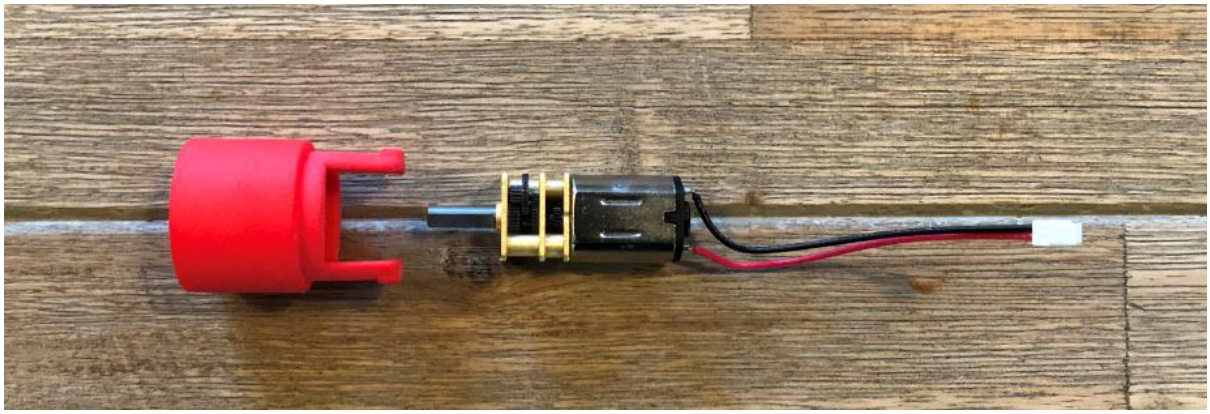
Overview of the required assembly components:

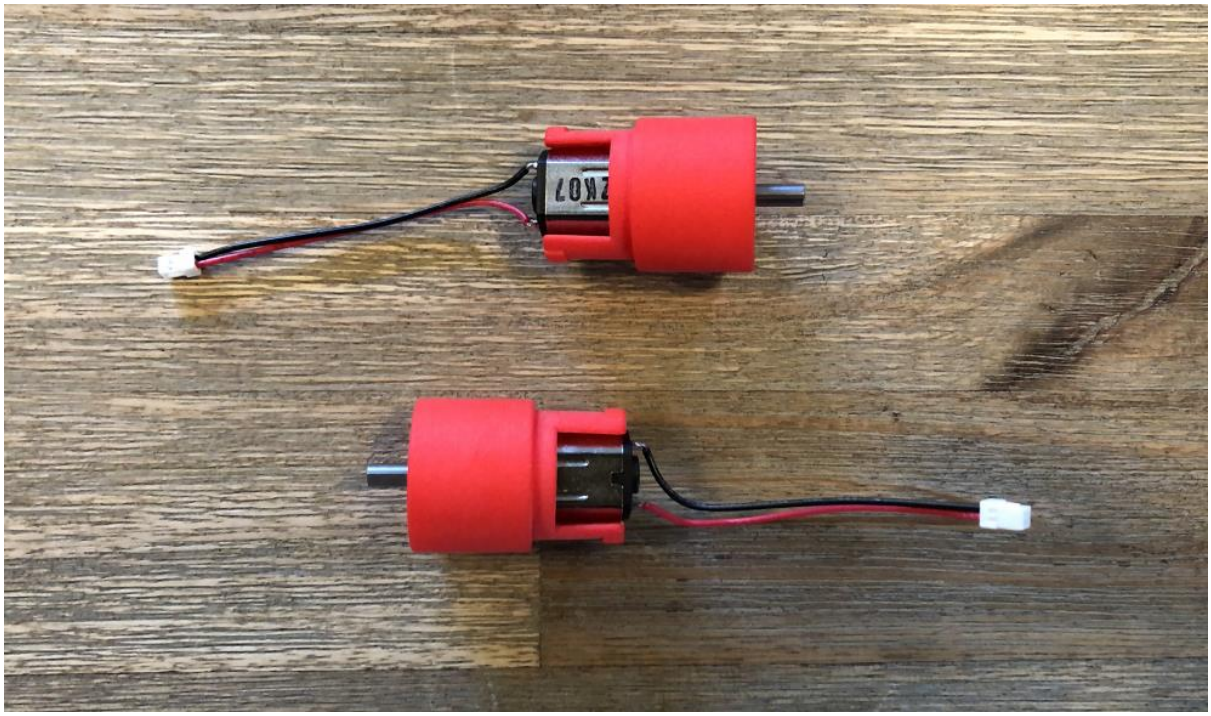


Step 5. Before starting the assembly, ensure any excess nylon particles are removed from the 3D printed parts, in particular the wheels (just check the main chassis PCB rails as well but probably no action needed there). The wheels will need clearing out, use a sharp tool, or thin screwdriver to scoop out any excess nylon particles so the wheel is able to slide onto the shaft completely *[Don't push too hard (no excess force is needed) as you might poke through the cavity end wall]*:

Step6. Insert the motors into the motor holders

Note: the ferrite cores are missing/not shown in the following images but should be fitted as explained earlier.





Step 7. Feed the connector plug of the first motor through the cavity in the bottom of the chassis:

Step 8. Push the motor holder with the inserted motor into the main chassis:

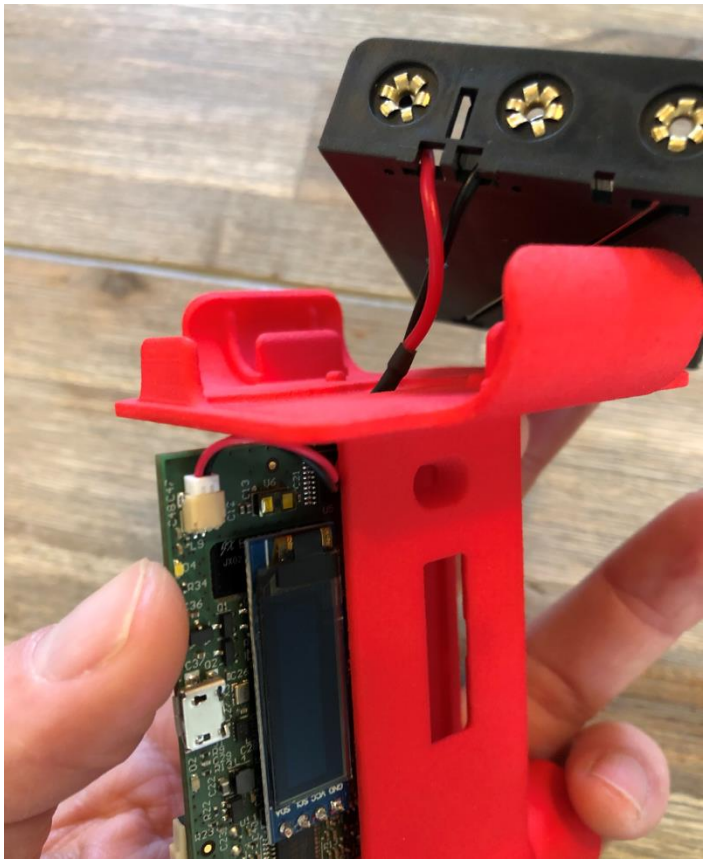
Step 9. Feed the connector plug of the second motor through the same cavity in the bottom of the chassis, before pushing the motor holder into the main chassis:

Step 10. Make sure both connectors come out of the chassis on the correct side, which is the side with the rail/cavity guidance feature, encircled in the picture below:

Step 11. Insert both motor connector plugs into the sockets on the PCB. Make sure to correctly insert the connectors into the sockets as illustrated below. Left motor connector into the left socket. Right motor connector into the right socket:

Step 12. Feed the connector plug of the battery unit through the cavity on the top of the chassis. *[Don't click-in the battery unit just yet!]*:

Step 13. Connect the battery unit connector plug to its socket on the top of the PCB. *[Don't click in the battery unit just yet!]*:



Step 14. Slide the PCB into the chassis rails *[only so far as depicted in the picture below]*, make sure the cables sit on the correct sides of the PCB (on the side of the cavity) so they don't get caught as you slide the PCB into the chassis. The excess motor cables can go in the cavity at the bottom of the chassis. The excess cable of the battery unit can just come out at the top for now *[Don't click in the battery unit just yet!]*:

Step 15. Insert the display cover into its designated cavity; you can use a small pair of pliers to help do so. Make sure it sits flush in the cavity so the display can slide in front of it when pushing the PCB in fully in the next step:

Step 16. Push the PCB fully into the chassis and be careful to ensure the display passes the display cover and does not hit any part of the internal chassis. Ensure the ToF sensors end up in the center of their cavities, depicted in the second picture below:

Step 17. Fold the excess battery box cable into the designated space and cavity on top of the chassis. Line up this side of the battery unit with its mating feature as depicted below
[Note: If it's slightly elevated it's likely not all of the cables ended up in the designated cavities. Don't click in the battery unit just yet!]:

Step 18. Line up the other side of the battery unit with its mating feature and click in the battery box. Make sure the cables aren't tangled/twisted under the battery compartment so that it sits flush with the top of the chassis.
[Note: If it's slightly elevated it's likely not all of the cables ended up in the designated cavities/the cables are tangled]:

Step 19.
Add a small Dymo serial number label to the side of the battery box (the number should match the hand-written number on the PCB.

Step 20. Push-on the battery box cover onto the top of the chassis:

Step 21. Add a rubber ‘O’ ring to each wheel and then slide the wheels on the motor shafts. Make sure to have cleaned the axel holes in the wheel first (see step 1).

Step 22. Fit the side covers to ensure the PCB is locked in place. Note, the small indentations on the covers should be on the inside of the finished device.

Step 23. Finally, place the finished device into a protective case (place the case dividers in the case as shown) and zip up the case to complete the assembly process.