MOTOR TCD

ASSEMBLY MANUAL

1. 3d printed Components Assembly

1. Remove all supports and raft from the print, it is important to ensure that all parts are free from excessive material especially the friction surfaces to ensure smooth movement of the device.

2. The motor racks consists of 2 components, a hollow square at the front to attach to the strap and move the probe around a rectangular box to hold the motor

3. There are 4 open holes on the rectangular box of motor rack: 1 at the back and 1 on the side for motor wires, 2 at the front to connect the faceplate and innerplate.

4. With thin bar facing upwards, slide the headplate into through the upper hole on the front face of motor rack

5. Push the headplate as far back into the motor rack as possible

6. Tilt the faceplate at an angle where the thin bar is elevated as further away from the surface of motor rack as possible

7. Align the hollow square of the motor plate with the thin bar of faceplate

8. Slide the inner plate underneath the thin bar at and angle, ensuring that the bar is still align with the hollow square, then, pushes the end of the bar into the square
*Note: it is important that the small arm of the bar is located in between the closed hollow square and open hollow square)
(An easier technique is to place the motor plate perpendicular to the end of the thin bar, let the thin bar touches the upper surface then rotate the motor plate slowly underneath the thin bar allowing the end of the bar to go through the hollow square.)

9. After the open end of the bar has gone through the closed hollow square, push the inner plate forward the front face while also applying downward pressure so the motor plate lays flat onto the motor rack

10. A 'click' sound should be hear when the motor plate snaps into place

11. Ensure that all the movement are smooth (up and down movement along the motor plate of the faceplate and side movement of motor plate inside the motor rack)

12. If the movement is not smooth, remove the parts and smoothen all friction surface then repeat from step 4

13. If all movements are smooth, close the lid of motor rack to complete the assembly (move rotation may be needed to put the lid into place)

2. Power Components Assembly

Parts Needed:

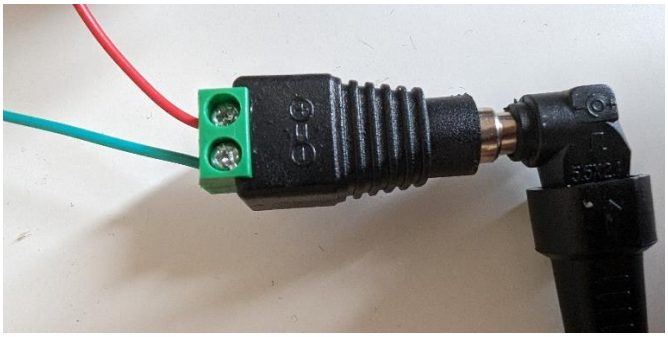
1. SwitchMode Plugpack(1)
2. 2.1MM DC SOCKET WITH TERMINAL BLOCK (1)
3. 22 AWG Wires: red and green (1 each 20 cm)

ASSEMBLY STEPS:

1. Turn the power output to 4.5V as the buck converter needs more than 3V for power source.

2. Take 5.5*2.1 mm jack and plug at the end with matching the arrows.

3. Wire the 2.1mm DC socket with Terminal Block.
   Strip the wires. Wire red wire to positive side and green wire to the ground.



3. Motor Components Assembly:

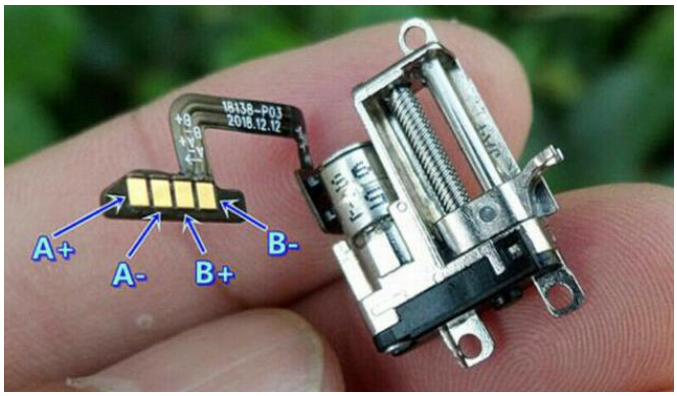
a. Soldering of stepper motor

Parts Needed:

1. eBay Mini 5mm 2-phase 4-wire 3V 5V Planetary Gear Stepper Motor linear Screw Slider-(2 units)
2. 26 AWG wire for soldering (Yellow, White, Black, Green)- 260 cm length for every wire-(2 units)

Steps:

1. Place the motor horizontally on table and stick the end of the motor flat onto the surface where soldering is to be done.
2. Strip the wires into the length half of the size of the motor soldering plate.
3. Now solder the wires into this order shown below:



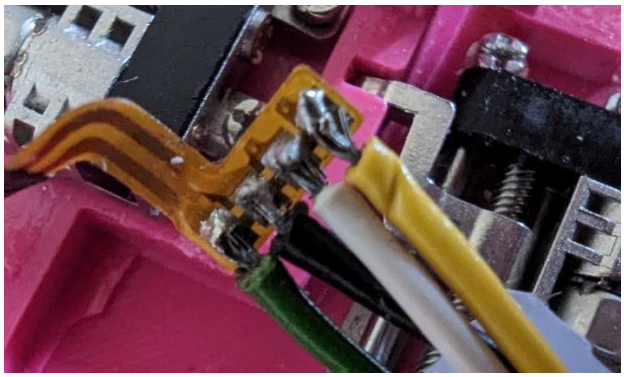
A+ to yellow wire

A - to white wire

B+ to black wire

B- to green wire

4. The soldering should be done carefully as the pad of motor is very small and two ends can join up during soldering.
5. The final soldering of the motor look like this:



6. Similarly, solder the second motor with similar wires in similar order.

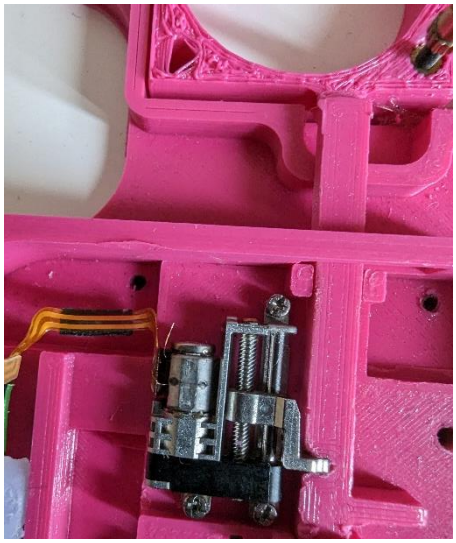
b. Assembling the motor into 3D printed Faceplate

Parts needed:

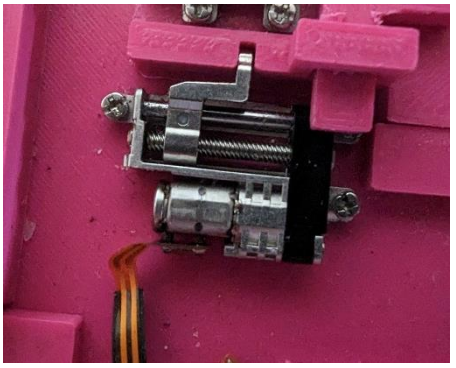
1. Soldered two stepper motors
2. 3D printed Assembly
3. M1.6*4.5 threaded bolts or screws

Steps:

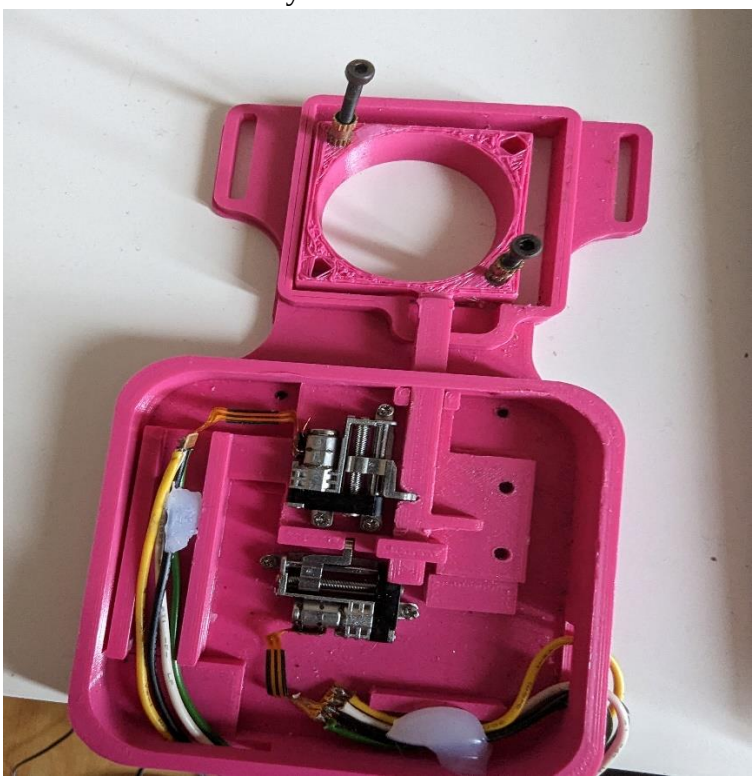
1. Of the two motors, one is responsible for vertical movements and one is responsible for horizontal movements.
2. The vertical movement motor is fixed upon upper three holes as shown in figure with its linear actuator fixed in the opening to its side. Take three screws and screw the three hinges of motor as in figure.



3. Similarly, the horizontal movement motor is fixed in there holes below the motor with its actuator fixed in the opening.



4. Now take the other end of the wires and line them up in their appropriate way and glue them in. There are two holes provided for the end of wires to follow along. The final sub-assembly look like this:



c. Soldering and Wiring 3V regulator

Parts needed:

1. 3V Buck converter set
2. Some Arduino jumper wires female-female (orange, red and green)

Steps:

1. Take the buck converter set and solder the pins into place like this.

2. Now, cut the jumper wires into half and strip the end.

3. Now there are three pins which should be connected to jumper wires female like listed below:
   Vin-orange GND-green 3V-red

d. Connecting the stepper motor drive controller

Parts needed:

1. Sub-assembly obtained from step b
2. Stepper Motor Drive Controller *2
3. Arduino female-female jumper wires (2*green, 1*yellow, 1*white, 1*black, 1*red) *2

Steps:

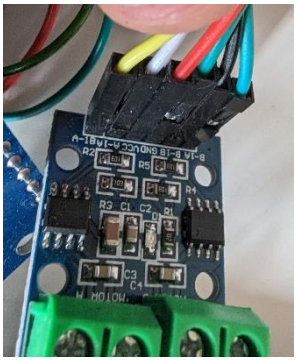
1. Strip the loose ends of wire coming from two stepper motor.
2. Now, these wires (4 each) is connected to the stepper motor drive controller.
3. Take all 4 wires (yellow, white, black green) from a motor with vertical movements and a motor drive controller green end.
4. The yellow and white wire is wired into Motor A and black and green is wired into Motor B. Take reference of the picture:

5. Similarly, wire the other motor controller drive with the horizontal movement motor.

6. Now, the opposite end of motor drive controller has pins where female Arduino jumper wires should be connected.

7. Cut the Arduino jumper wires into the half and strip the end.

8. Now connect the female end of jumper wire to the corresponding pin as listed below:
   A-1B with yellow
   A-1A with white
   VCC with red
   GND with green
   B-1B with black
   B-1A with green



9. Similarly, follow the similar steps for another motor and this section is complete.

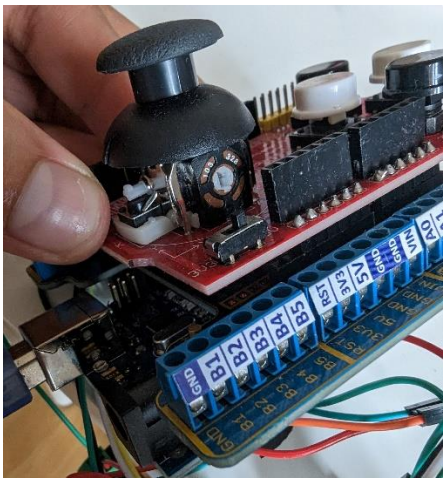
3. Arduino with Terminal and joystick shield Assembly

Parts Needed:

1. Arduino Uno * 1
2. Terminal Shield *1
3. Joystick Shield Funduino *1

Steps:

1. Take Arduino Uno and on top of that place the terminal shield by aligning the digital and analog pins of Arduino with that of terminal shield.
2. Now take joystick shield and place on top of the black female pins of terminal shield. Align the shield accordingly with the number of pins per side.
3. The sub-assembly is complete.



4. Final wiring

Parts Needed:

1. All sub-assemblies created till now.
2. Green 26 AWG wire of length 20 cm.

Steps:

1. **Power terminal sub assembly with 3V regulator and Arduino:**
   The end of the 2.1MM DC SOCKET WITH TERMINAL BLOCK has two green and red loose wires. Strip the end of these wires if needed. Screw the green wire into near ground terminal (GND) in Terminal shield. Connect the red wire to the orange wire of the 3V regulator.

2. **3V regulator with motor drive controllers and Arduino.**
   Take red wires of the two-motor drive controller (one each) and connect with the red wire of 3V regulator. These three wires must be joined together and bonded by an electrical tape.
   Now take Green 26 AWG wire of length 20 cm and strip both ends. Take green wires (GND not B-1A) of the two motor drive controller (one each) and connect with the green wire of 3V regulator and the one end of the Green 26 AWG wire of length 20 cm. These four wires must be joined together and bonded by an electrical tape. Now take the free end of Green 26 AWG wire of length 20 cm and connect to the near ground terminal (GND) in Terminal shield.

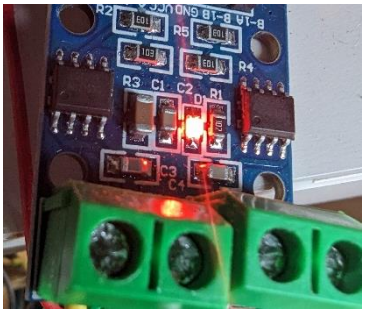
3. **Motor drive controller with Arduino**
   Now there are four wires (yellow, white, black and green) left in motor drive controller which should be connected to the respective pins in Arduino.

Vertical Movement Motor	Horizontal Movement Motor
Yellow(A2)	Yellow(D9)
White(A3)	White(D10)
Black(A4)	Black(D11)
Green(A5)	Green(D12)

   Connect these wires into Terminal shield and screw it accordingly.

5. Final Check

- Connect the power supply and both red LED from motor controller drivers should turn on. If not, check your connect again from Step 2 and check the wiring as grounds should be connected properly.



- Upload code into the Arduino and try to run with joysticks. If there is no red LED in joystick shield, check your connection in Step 3. If any problems by running the joystick, see the correct wires are connected to correct pins in terminal shield.