

## **Micropump Module**

**ID: PP-1**

### **Prototyping Protocol – 10 Pts**

**Due Date: 2/13/2020 11:59 PM, Canvas Upload**

**Date Written – 04/02/2020**

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#### **Protocol Description – (Prototyping Protocol)**

This protocol outlines the steps necessary to create and design a PCB board using Eagle software to make the pump device more compact and easier to assemble. The device components were first tested on a breadboard to confirm the pump worked before designing in Eagle software. In Eagle software, the parts for the stepper motor driver, wall power interface, Arduino Uno, push button, LED light, and other components were placed into the schematic. Once the schematic had all components, lines representing the wire tracings were placed to corresponding locations to match the circuit. This was done as neatly as possible to allow for minimal confusion. A breadboard file was then generated and traces were laid in accordance to PCB manufacturer recommendations (thickness, angle). Once the schematic and breadboard file is completed, a corresponding Gerber file can then be generated in order to send to the manufacturer to create a PCB board that fits over the Arduino, an Arduino shield.

After the PCB board is printed it must have the circuit electronic components soldered onto the correct locations to allow the device to fit properly onto the Arduino, following the locations outlined in the schematic. Once these are soldered, the Arduino can be connected to the computer to have the control code uploaded to it, if not already uploaded, and test the motor and pump. If everything works accordingly, the device should be easier to assemble in the field and be able to be stored in smaller locations.

## Tools and Equipment

ID	Tool	Name / # if applicable	Location	Purpose
PT1	Computer	Mac Book	N/A	Design and create parts; Upload code to Arduino and change the pump flow rate
PT2	Circuit Software	Eagle	N/A	PCB board-specific software
PT3	Soldering Kit	Elenco Deluxe	Design Lab	To connect parts of the circuit
PT4	Arduino Uno	Arduino Uno	Design Lab	To run the circuit
PT5	Arduino IDE Software	Arduino Software	N/A	To program the code for the circuit

## Materials

ID	Material	Purpose
PM1	Fiberglass	Create PCB board
PM2	Epoxy Resin	Create PCB board
PM3	Copper foil/plate	Create PCB board
PM4	Wires	Circuit Assembly
PM5	Resistors	Circuit Assembly
PM6	Capacitor	Circuit Assembly
PM7	LED	Circuit Assembly
PM8	Button	Circuit Assembly
PM9	Stepper Motor Driver	Circuit Assembly
PM10	Stepper Motor	Pump Assembly
PM11	Pump Housing	Pump Assembly

## **Micropump – Prototyping Protocol**

PM12	Pump Rotor	Pump Assembly
PM13	Bearings	Pump Assembly
PM14	Screws	Pump Assembly
PM15	Nuts	Pump Assembly
PM16	Washers	Pump Assembly
PM17	Tubing	Pump Assembly

### **Computer Files**

<b>ID</b>	<b>FileName / Link</b>	<b>Purpose</b>	<b>Location</b>
CF1	Pump_Disignette_PCB_SCH_BRD_Files.zip	PCB file	Google Drive
CF2	Pump_Disignette_PCB_Gerber_Files.zip	PCB file	Google Drive
CF3	PCB_Schematic.png	Circuit Schematic	Google Drive
CF4	PCB_Breadboard.png	Circuit Schematic	Google Drive

## Schematics:

