

Safety Proposal for building a Centrifuge

Off-campus

Presented by:
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I. Product description:

The University of Rochester iGEM 2020 team will be working on finding a non invasive diagnosis method for endometriosis. The hardware team will also be working on creating different DIY lab equipment including the previously approved incubator and currently a centrifuge. This product is meant to be part of our contribution in making simple and cheaper centrifuges that could be made available for more clinics as well as labs.

II. Required components:

- A. Centrifuge
 - 1. Hard drive
 - 2. Arduino
 - 3. Wires
 - 4. Wifi shield
 - 5. ESC controller
 - 6. LCD screen
 - 7. Battery
 - 8. 4 digit 7 segment display
 - 9. Buttons
 - 10. Resistors
 - 11. 10k ohm potentiometer
 - 12. 3D printed sample holder
 - 13. Possible Plexiglass as a shield

III. Assembly techniques

Since the main components will be Arduino development boards for all possible modules, the assembly method will generally be simply using jumper wires for all the connections. No soldering would be performed with the exception if we return to campus in the fall semester.

All longer connections will be performed using simple female-male wires, all shorter connections will be done using male-male wires.

For opening the hard drive a simple screwdriver should be sufficient.

IV. Safety Procedures and Precautions

Considering the low voltage that we will be working with the risk from any of these components is extremely low, and if the diagrams for the hardware pieces are carefully followed as to make sure current is flowing in the correct direction there should be no risk at all. Any possible risks can be fully controlled, there is no significant risk of anything catching on fire with the supplied 5V, with only exception of using 12V supply for the ESC controller but that will be a closed connection with no risk of electrocution

Other precautions and measures:

- A. All pieces will be marked with correct way of connecting them (according to product diagramas) before actually being connected to a power supply as to avoid any possible short circuits or heating
- B. Main power will be switched off while doing any work with the cricut
- C. Will use the alternative 3V output instead of 5V to lower any possible risks. (calculations for resistors and voltage dividers will be adjusted for such)
- D. No biological or biochemical substances will be used

V. COVID-19 Work space precautions

All items are expected to be sent to one address which has confirmed that they will have available space to work on the project uninterrupted by other residents. The team member has also confirmed that there won't be any children around the project work space.

When received all boxes will be sanitized to ensure safety.

VI. Team Experience with Hardware

There will be only one member working on this project who has already practiced how to use Arduino using a previously sent Arduino kit and has practiced all these components with the exception of the ESC controller. To further make sure that everything is safe the hardware manager (who has 5 years experience with Arduino) will be on zoom call whenever any hardware related work is being done to make sure all safety protocols are being followed and everything is safe

VII. Expected Item Budgeting

| Item | price | Amount | Total | purpose |
|---|---------|--------|----------|---------------------------------|
| ESC controller | \$17.00 | 1 | \$17.00 | Control the rotations |
| Membrane Switch Keypad | \$7.00 | 1 | \$7.00 | Value input control |
| Hard drive | \$19.00 | 1 | \$19.00 | Base for centrifuge |
| Jumper wires | \$6.00 | 2 | \$12.00 | Connections |
| Brushless motor kit | \$19.00 | 1 | \$19.00 | Motor for rotation |
| ELEGOO Mega 2560 R3 Project Starter Kit | \$30.00 | 1 | \$30.00 | Microntroller kit |
| Lipo Battery with XT60 plug | \$30.00 | 1 | \$30.00 | Power supply for ESC controller |
| Breadboard | \$9.00 | 1 | \$9.00 | Solderless connections |
| Total | | | \$143.00 | |

**Note: this is the primary list, which may have slight alterations as the different modules are confirmed

VIII. Campus resume expected activities

Once the team is back on campus it is expected that for the completion of this project we will be using soldering, and machine shop and fabrication tools.

All members of the team have previous experience using soldering techniques through engineering classes. Hardware manager has experience using the machine shop tools. Standard safety measures will be followed, as well as additional COVID-19 regulations of social distancing, wearing the masks and sanitizing all equipment before and after use.