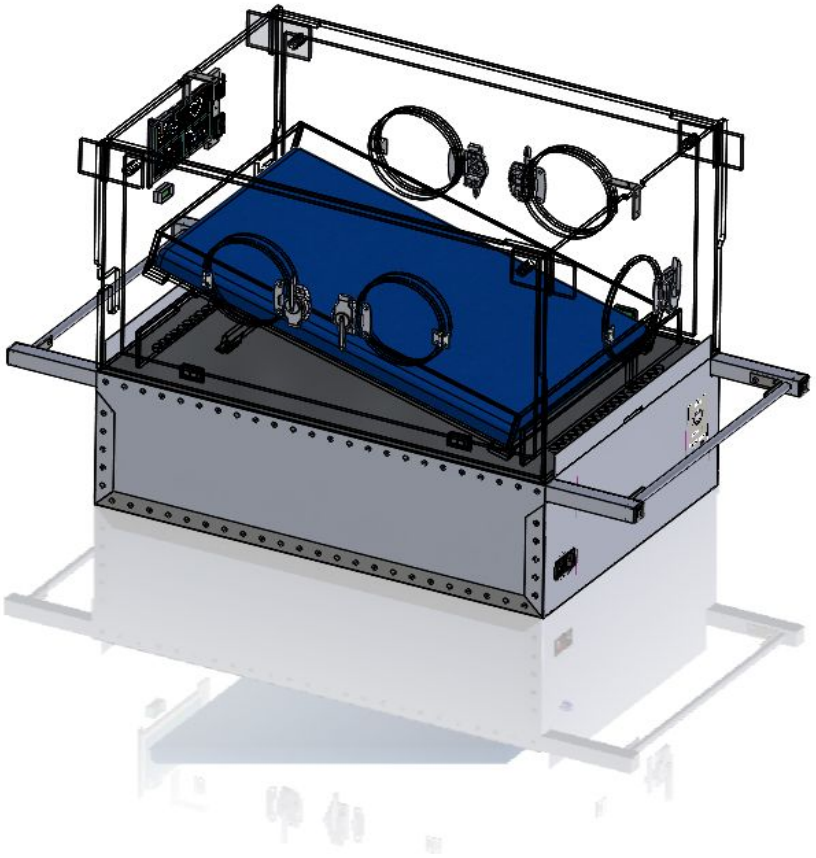


BLUE LIGHT INCUBATOR PROTOTYPE

BLUE ANGELS

User Manual

GT SENIOR DESIGN SPRING 2020

Table of Contents:

Abbreviations, Definitions and Symbols

- ℃ - degrees Celsius
- ℉ - degrees Fahrenheit
-  - Incubator is working on external battery
-  - Alarms are turned on
-  - Temperature
-  - Humidity
-  - Heart Rate
- O_2 - Oxygen Saturation
- A - Apnea Detection

Important Safety Considerations

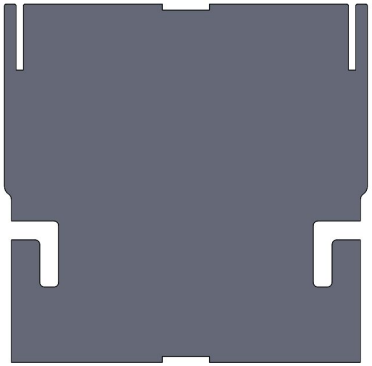
- **This Prototype is not ready for use on humans.**

For all Electrical Appliances

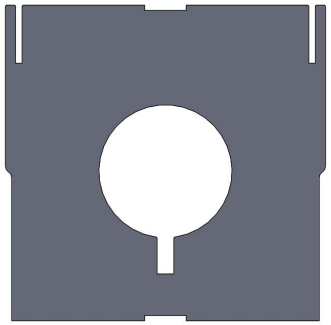
- Do not directly touch hot surfaces.
- Follow the electrical diagrams carefully in order to prevent fire, electrical shock and injury.
- Always allow the device to cool before beginning the cleaning procedure.
- Do not let wires and cords hang loose

Getting Started - Hood Parts

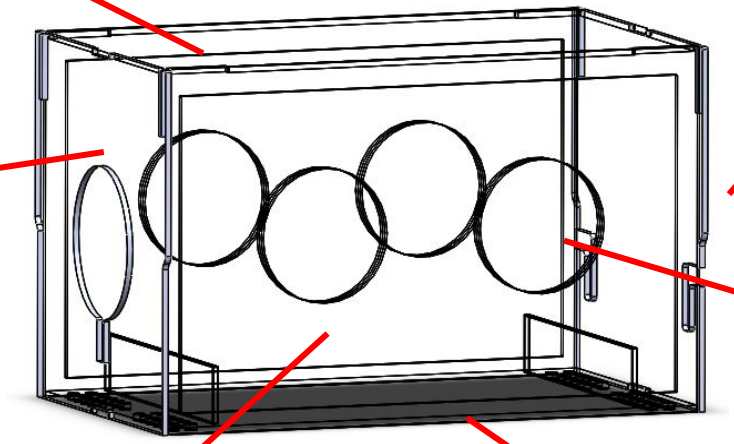
Top End

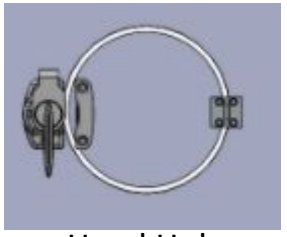


Head End

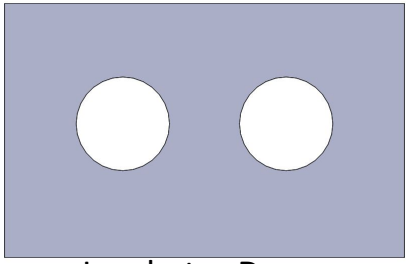


Foot End

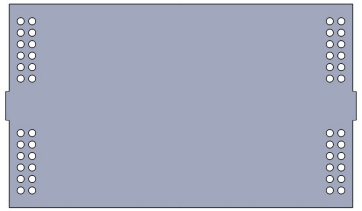




Hand Holes

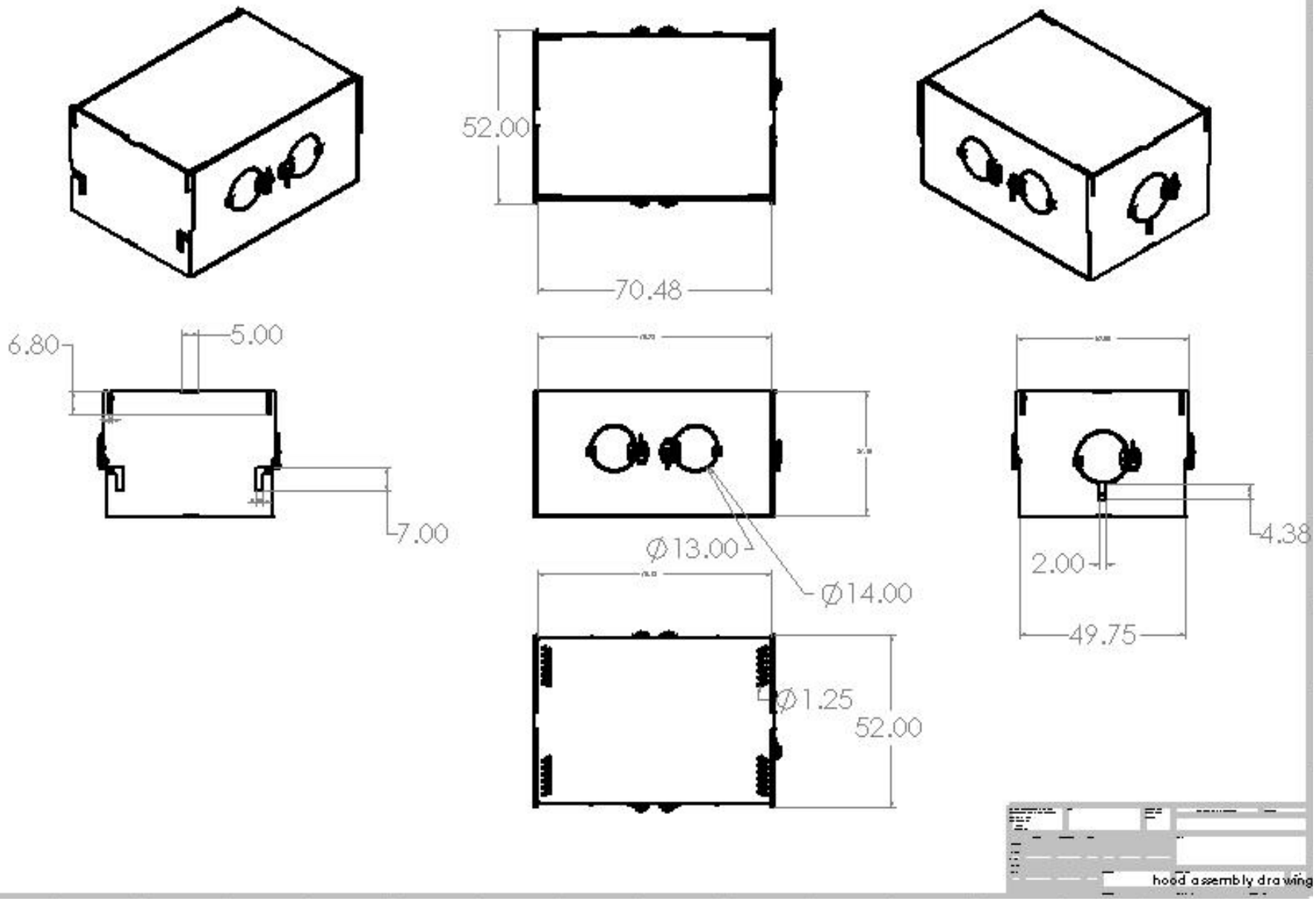


Incubator Doors



Top Plate

- **This Prototype is not ready for use on humans.**



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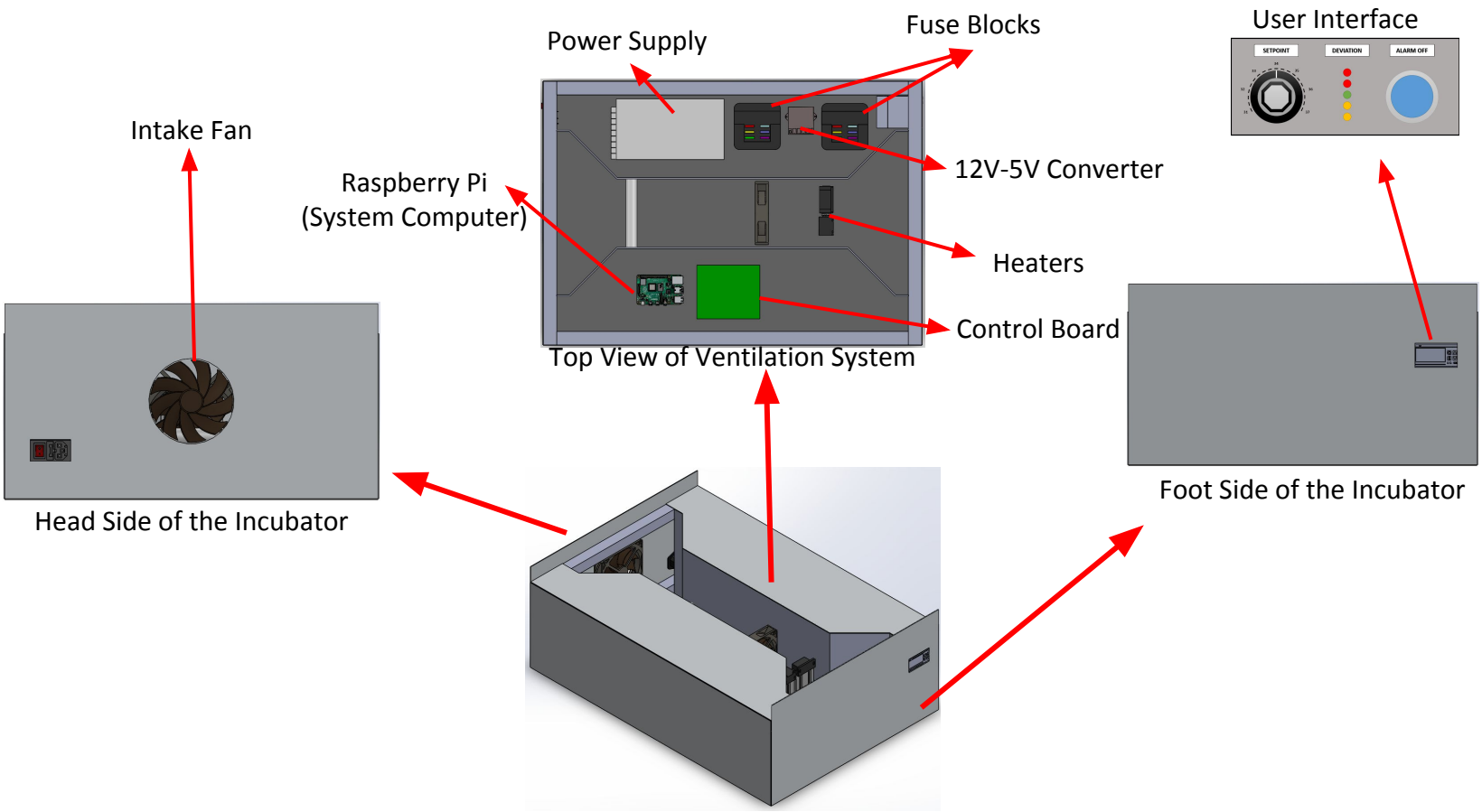
Getting Started - Base Parts



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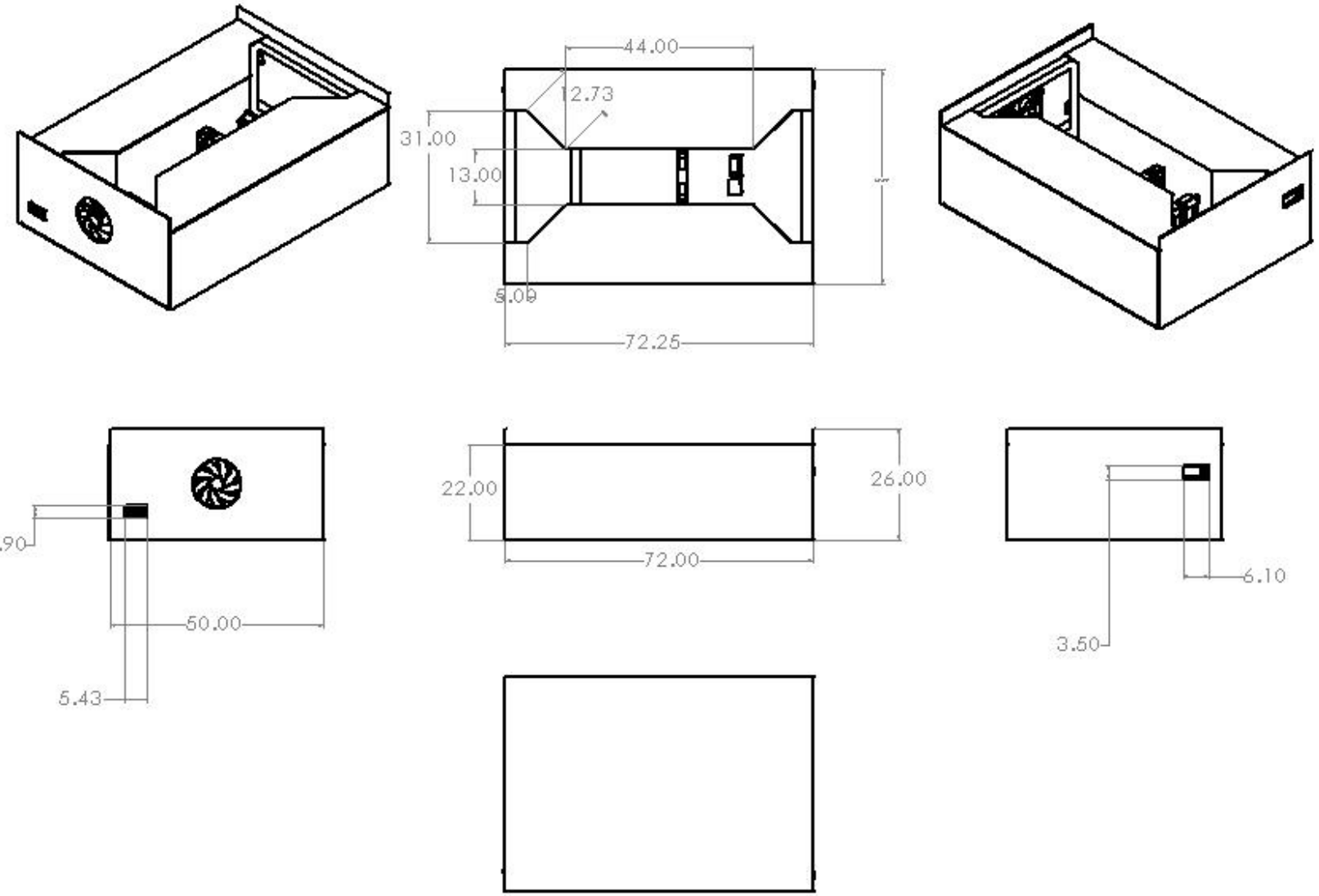
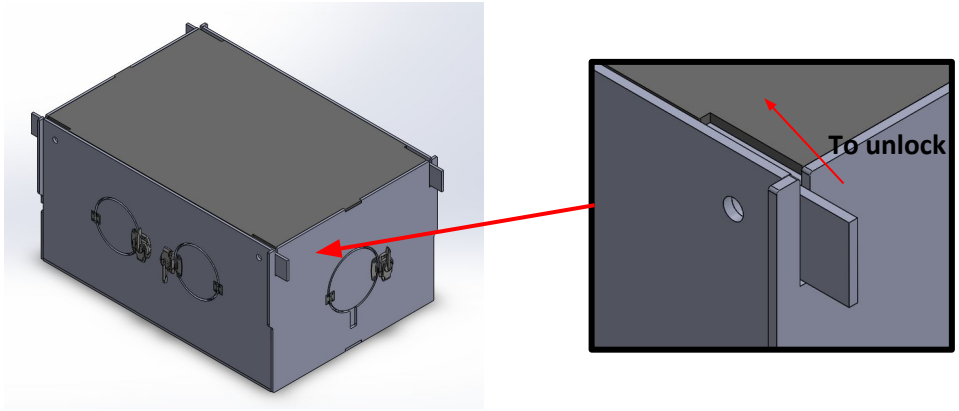
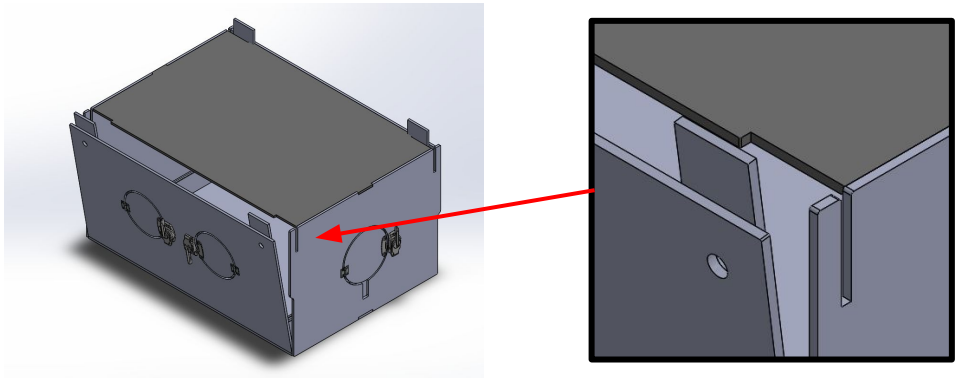


- **This Prototype is not ready for use on humans.**

Door Mechanism





To unlock the door:

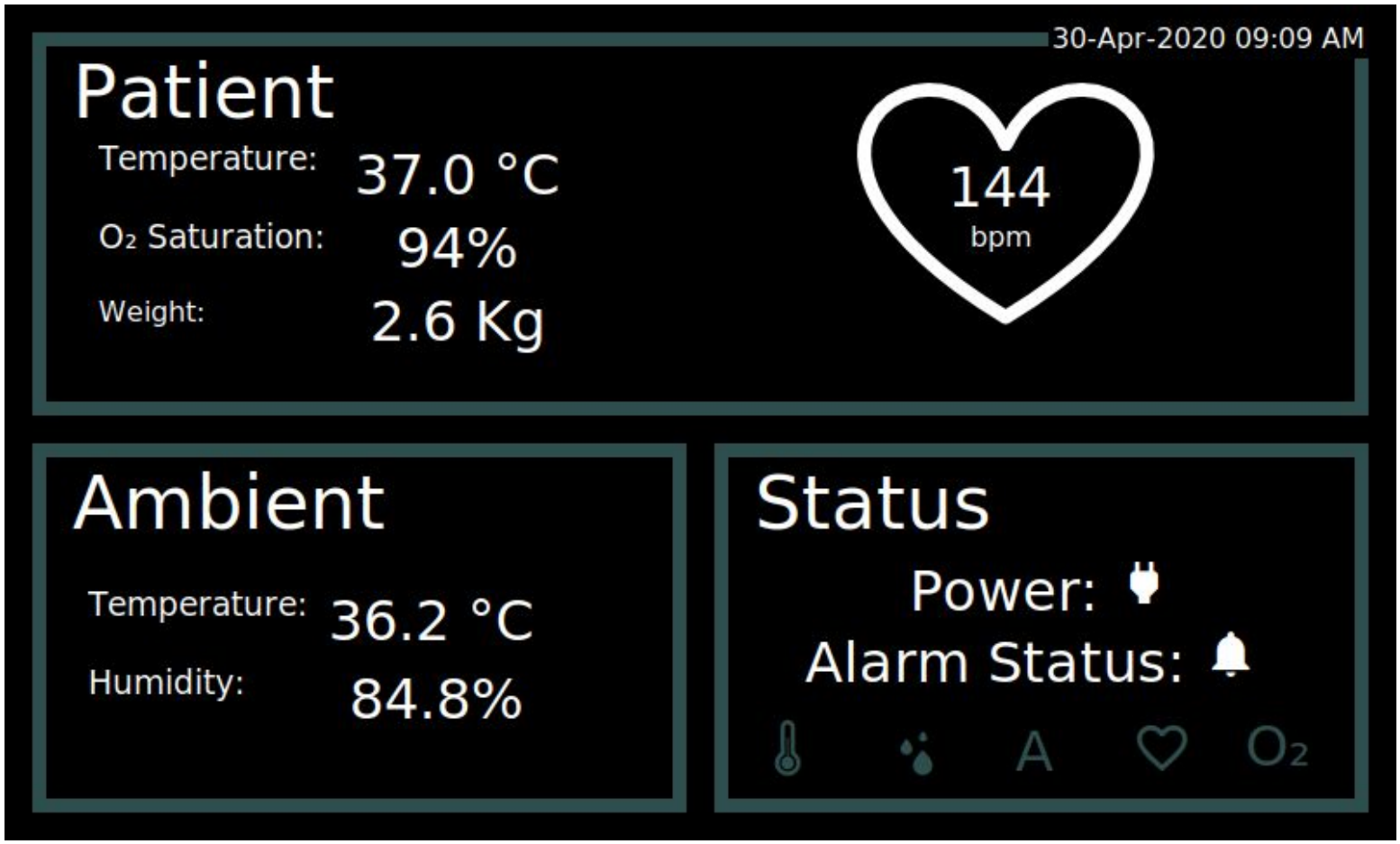
1. Rotate both acrylic locks out of their slots of one side.
2. Carefully open the door towards you until the door rests against the base of the incubator.

To lock the door.

1. Lift the door until the acrylic locks are aligned with the slots
2. Rotate both locks into the slots until they hit the bottom of them and are entirely in.

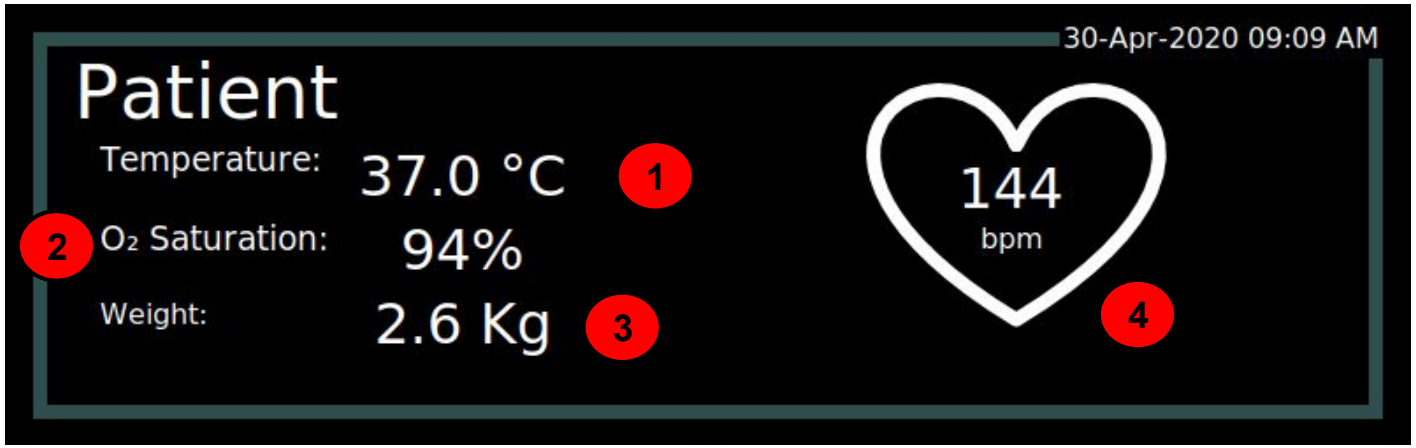
- **This Prototype is not ready for use on humans.**

Understanding the Monitor



- **This Prototype is not ready for use on humans.**

Understanding the Monitor
-The Patient-

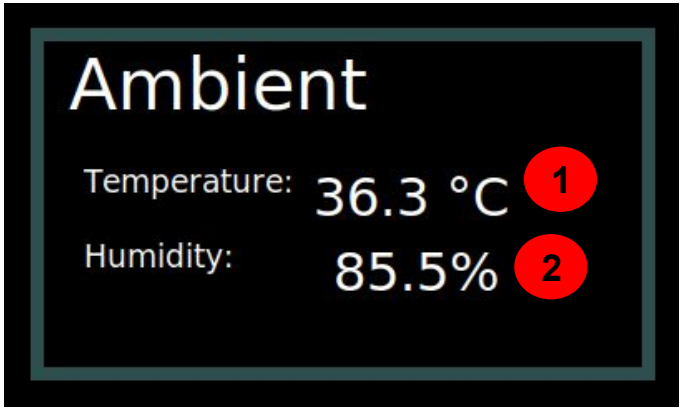


The top box on the monitor is where the patient's vital signs can be found.

1. **This is the patient's body temperature**
2. **This is the patient's oxygen saturation level.**
3. **This is the weight of the patient**
4. **This is the live heart rate of the patient.**

- **This Prototype is not ready for use on humans.**

Understanding the Monitor
-The Ambient-



The bottom left box on the monitor is where the the information about the incubator environment can be found.

1 **This is the temperature inside of the hood of the incubator.**

2 **This is the percentage of humidity in the air inside the incubator.**

- **This Prototype is not ready for use on humans.**

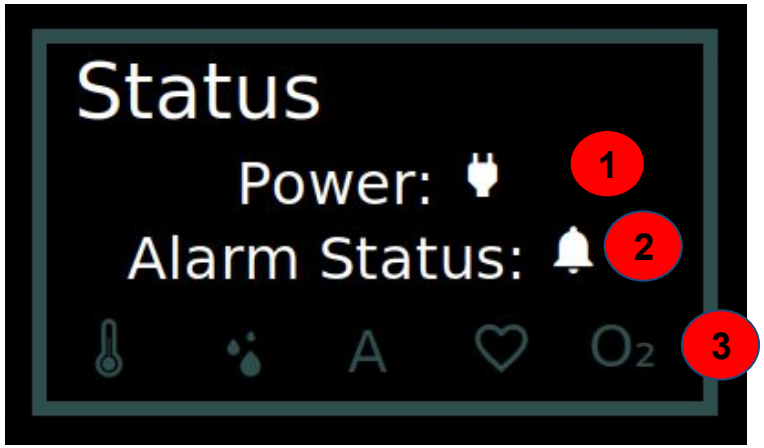
Understanding the Monitor
-Alarms and Device Status-

The box with purple text on the monitor is where the general information on the status of the system are.

1. **This shows whether the incubator is running on battery power ( ) or on wall power ( ).**

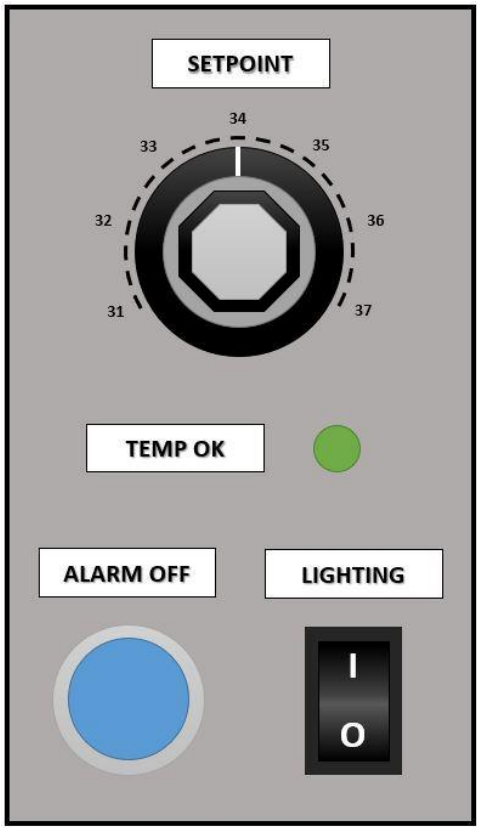
2. **This is where it can be seen whether the alarms are activated ( ) or have been muted ( ) .**

3. **If an alarm goes off, the corresponding symbol will turn red to indicate what is wrong.**
   - **Temperature**
   - **Ambient Humidity**
   - **Patient Heart Rate**
   - **O_2 Patient Oxygen Saturation**
   - **A Apnea detection**



- **This Prototype is not ready for use on humans.**

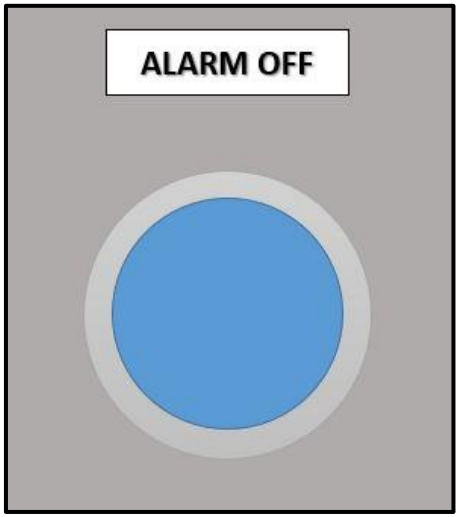
Buttons on the Base



- **This Prototype is not ready for use on humans.**

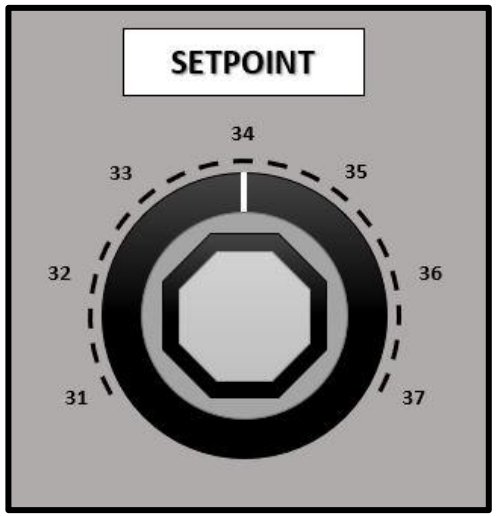
Buttons on the Base
-Managing the Alarms-

- **The blue button of the interface located is meant to give the caregiver the option to mute the incubator alarms as a form of acknowledgement that something is wrong.**
- **By pressing this button, the incubator will stop sounding the alarm but will continue to show the problem on the monitor until the problem is fixed.**



- **This Prototype is not ready for use on humans.**

Buttons on the Base
-Heating the Incubator-



- **The dial located on the left side are where the caregiver can set the desired temperature of the air inside of the incubator**
- **When the heater is turned the green light underneath the setpoint dial will indicate if the temperature is in the right range.**
- **If the temperature is consistently found to be different than the setpoint it might be an indication of failure in the heater.**

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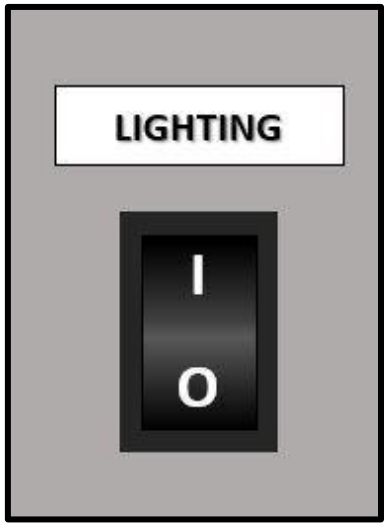
Buttons on the Base
-Lighting-



- **At the bottom right of the interface there is a switch to control the lighting of the incubator.**
  - **To turn the light on switch it to the "|" side.**
  - **To turn the light off, switch it to the "O" side.**

- **This Prototype is not ready for use on humans.**

Cleaning the Incubator

- The incubator is designed to be cleaned with diluted bleach.
- Once more testing is done, specific instructions will be made to clarify the cleaning procedure.

- **This Prototype is not ready for use on humans.**

Transporting the Incubator

- The incubator is meant to be transported by two adults, one from each side.
- The incubator needs to be unplugged from the wall power and transferred to be connected to the external battery.

- **This Prototype is not ready for use on humans.**

Maintenance of the Hood

- Hinges
  - Handholes
  - interior/exterior door
  - monitor mount
  - tray stand
- Long Acrylic components
- Monitor Mount
- Lock system

- **This Prototype is not ready for use on humans.**

Maintenance of the Base -Structure-

- Wires
- Fans
  - Cleaning
  - Noise
- Cleaning
- Heaters

- **This Prototype is not ready for use on humans.**

Maintenance of the Electrical Components

- Temperature Sensor failure
- Calibration of Temperature Sensor
- Wires
- Voltage level on the backup battery
- Battery leak

- **This Prototype is not ready for use on humans.**

Maintenance of the Monitor/Sensor Interface

- Sensors
  - Cables
  - actual sensors
  - Arduino
- Calibration
- Monitor Failure
- Computer (Raspberry Pi) failure.