Notes.

- If you want edit access, please request it. My email is stevenebin@gmail.com and my phone is 415.404.0706]
- Discord server here: https://discord.gg/UUKmgz
- Team here: Producing and Distributing 1M Ventilators Roster
- Website will be up by Monday.

Producing and Distributing 1 Million Cheap Ventilators for COVID-19 Response

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See team here

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Background.
With the rate of COVID-19 infections growing exponentially, and with the chances of effective global containment dwindling, the epidemiological strategy must now focus on treatment. There is a wealth of ongoing research on pharmaceutical treatments and vaccines. Some promising areas of research include the use of anti-malarial medications, and medications used in the treatment of rheumatoid arthritis. What's lacking, however, is a plan to rapidly produce ventilators, which are a necessary component if we are to reduce the mortality rate of this deadly virus.

Summary.
We describe in this document a prototype ventilator that is capable of artificial resuscitation and can be useful in areas where there may not be trained medical professionals or a functioning healthcare system. We outline the components we use and compare our device to others spearheaded by MIT and Rice University. Ultimately, the scale of the problem demands we approach solutions from multiple angles, and we are working on several ventilator designs at once.

The functions of a normal ventilator.
Ventilation is the process of passing air through and out of the lung alveoli. Most medical-grade ventilators are designed to have a multitude of settings including control over the partial

pressures of different gases, touch screen interfaces, and real time graphing displays. While these features are useful in non-emergent settings, they are often unnecessary for basic life-sustaining ventilation support.

The functions of our stripped-down ventilator.

We developed a prototype for a ventilator that is useful in caring for COVID-19 patients. The system is simple and has just 3 input variables: Tidal Volume, Respiratory Rate, and Positive End Expiratory Pressure (PEEP). Tidal Volume refers to the volume of air moving with each breath. Respiratory Rate refers to the amount of times a breath is given per minute. PEEP is the intrapulmonary pressure after exhalation. A high PEEP setting prevents lungs from collapsing between breaths. Notably, our ventilator does not provide supplementary oxygen, which is sometimes necessary in acute cases of COVID-19, but is not needed for most cases.

The regulatory strategy

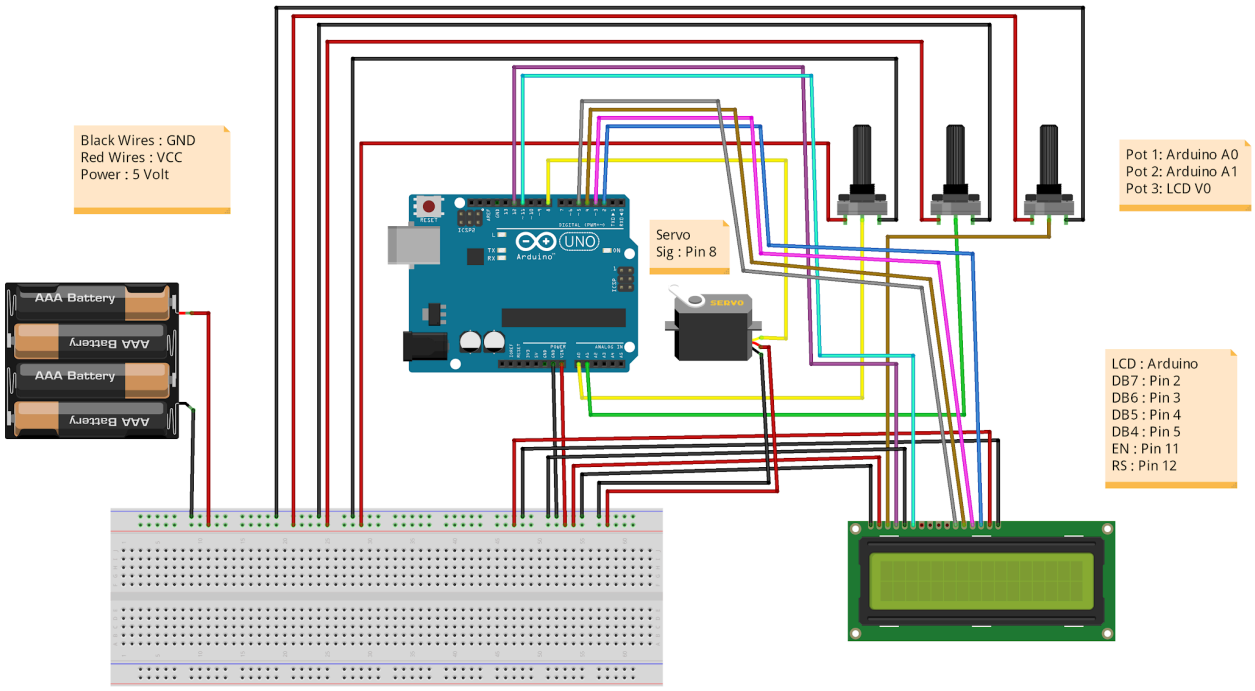
We are working with regulators on this device, and want to ensure that we don't take a Silicon Valley "move fast and break things" approach to a device that can sustain someone's life or kill that person. We are also hoping to convince the medical community of the device's efficacy by open sourcing the specifications. With that said, in some regions, regulatory acceptance is considered 'nice to have' as there is not enough time. Our primary focus is convincing the medical community itself that the device is safe.

Functional requirements.

- Unlike other approaches here we emphasize the need for absolute simplicity.
- Users have control on only 3 settings: Respiratory Rate (values 1 to 50), Tidal Volume (values 1 to 600), and Positive End Expiratory Pressure
- To avoid barotrauma a PEAK volume valve that open at 35 cm H20 is included- Unfinished
- There are no additional sensors for pressure, gas concentrations, or humidity.
- There is no real time graph displays of the ventilation cycle.
- To avoid pressure sensors a PEEP attachment is included
- To avoid viral shedding a small filter can be placed on the expiratory port ending
- Voltage input option begins at 12 Volts to support using the car battery power supply.
- Backup power supply include a 7.4 Volt 2000mAh Lipo battery- PLEASE CHECK THIS
- The parts for the ventilator must be available in bulk quantities today.
- Both the motor and power source must be able to run continuously for two weeks.
- The ventilator must be easy to produce at scale.
- The ventilator must be easy to use by virtually anyone.
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- The ventilator must be durable, rugged, and easily shippable





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https://www.facebook.com/jeff.ebin/videos/pcb.675336579943404/10157962700143971/?type=3&theater

Next steps.

- We're rallying around a design by Harvey Hawes
- We're organizing a team and assigning roles.
- We will get in touch with volunteers shortly.

Related work.

- Both MIT and RICE have created previous emergency ventilators (figure 1 and 2, respectively).
- Alphabet's Verily is working on a ventilation system based on the MIT design.