Title: VentMon: and Open Source Inline Ventilator Test Fixture and Monitor

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Abstract: A device that plugs into the airway circuit and measures the parameters of an operating ventilator that are carefully controlled by clinicians.

Keywords: COVID-19, open source medical device,

Specifications table:

Hardware name	*Insert hardware name*
Subject area	• *Engineering and Material Science* • *Chemistry and Biochemistry* • *Medical (e.g. Pharmaceutical Science)* • *Neuroscience* • *Biological Sciences (e.g. Microbiology and Biochemistry)* • *Environmental, Planetary and Agricultural Sciences* • *Educational Tools and Open Source Alternatives to Existing Infrastructure* • *General*
Hardware type	• *Imaging tools* • *Measuring physical properties and in-lab sensors* • *Biological sample handling and preparation* • *Field measurements and sensors* • *Electrical engineering and computer science* • *Mechanical engineering and materials science* • *Other (please specify)*
Open source license	*Please specify the open source license. For more details see the guide to authors.*
Cost of hardware	*Approximate cost of hardware (complete breakdown will be included in the Bill of Materials).*
Source file repository	*DOI URL to an approved source file repository: Mendeley Data, the OSF, or Zenodo (instructions). For example: https://doi.org/10.5281/zenodo.3346799* *If there is no external repository write " Available in the article "*

1. Hardware in context

Include a short description of the hardware, putting into context of similar open hardware and proprietary equipment in the field.

2. Hardware description

Describe the hardware, highlighting the customization rather than the steps of the procedure. Highlight how it differs/which advantage it offers over pre-existing methods. For example, how could this hardware: be compared to other hardware in terms of cost or ease of use, be used in the development of further designs in a particular area, and so on.

Add 3-5 bulleted points to broadly explain to other researchers how the hardware could be potentially useful to them, for either standard or novel laboratory tasks, inside or outside of the original user community.

- ...
- ...
- ...

3. Design files

TODO Need to make hyperlinks colored in *Location of File* column

3.1 Design Files Summary

Design file-name	**File type**	**Open source license**	**Location of the file**
Embedded Firmware	C++ Source Code	MIT License	VentMon Firmware
PIRDS Data Viewer	HTML Source Code	MIT License	Vent Display
PIRDS Data Logger	C Source Files	MIT License	PIRDS Logger
VentMon T0.3 PCB	PCB Design Files	MIT License	VentMon PCB
Pressure Sensor and Airway Adaptor	STL File	MIT License	VentMon Adaptors
PIRDS Data Standard			

For each design file listed above, include a short description of the file here (one or two sentences)

4. Bill of materials

Current Link: VentMon HardwareX BOM

- BOM needs to be converted to PDF and uploaded per instructions:
  For a complex Bill of Materials, the complete Bill of Materials (editable spreadsheet file e.g., ODS file type or PDF file) can be uploaded in an open access online location such as the Open

Science Frameworks repository. Include the link here. Alternatively, the Bill of Materials can be uploaded at the time of submission on the online Elsevier submission interface as supplementary material.

5. Build instructions

Two versions of VentMon can be assembled depending on availability of parts and time. The most physically robust and complete version of VentMon requires the purchase and manufacture of a custom PCB as well as a number of 3D printed plastic parts. This version of the device requires the least amount of time to assemble and contains fewest discrete components. Due to the high cost of PCB manufacture and assembly, VentMon can also be created using off the shelf components readily available from DIY electronics suppliers. This version requires significantly more assembly time. Both assembly procedures are outlined below.

5.1 PCB Based VentMon

1. PCB Assembly
2. Enclosure
3. Flow Sensor Assembly
4. Oxygen Sensor Assembly
5. Final Assembly

5.2 PCB Based VentMon

1. Qwiic Shield Assembly
2. Enclosure
3. Flow Sensor Assembly
4. Oxygen Sensor Assembly
5. Final Assembly