

Project Apollo

Why

- Ventilators need oxygen! (typical FiO_2 0.3 ... 1)
- Oxygen generation is a big problem in developing countries.
 - No established infrastructure.
 - Oxygen bottles are expensive
- People are already looking at alternative (local) ways for producing oxygen

What it is

- Goal of the Apollo prototype = enabling people around the world to build the prototype as fast as possible
- Focus = Simplicity and speed of build
 - Open source, off-the-shelf materials
 - Very low cost (aspirational target = \$100 for 5 liters/min @ 90%)
- Final goal = Enable people to iterate and publish their own designs in the community

How to build it

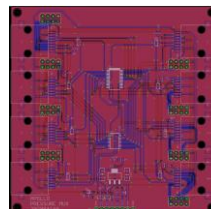
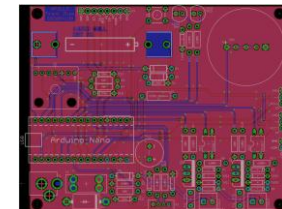
- Follow the published build [documentation](#)
- Buy/source the materials (check out the [BOM](#))
- Build the prototype
- Validate O_2 concentration and flow. Use a **good** reference O_2 and flow sensor for calibration
- Think about risk analysis and assessment: [template for Apollo-derived design](#)
- Document and iterate your own design. Publish your findings to the community!

Collaborations

- Helpful Engineering, Oxikit, Public Invention, Quick2space.org, Microsoft Garage

Documentation

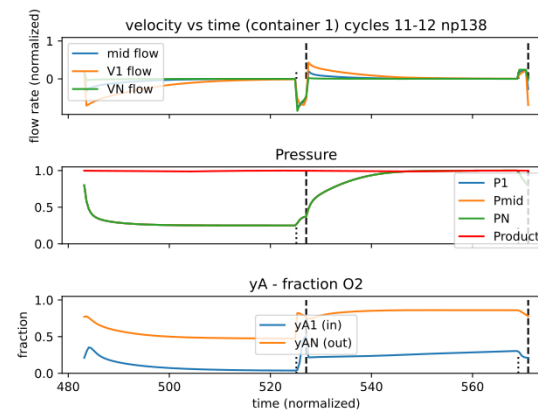
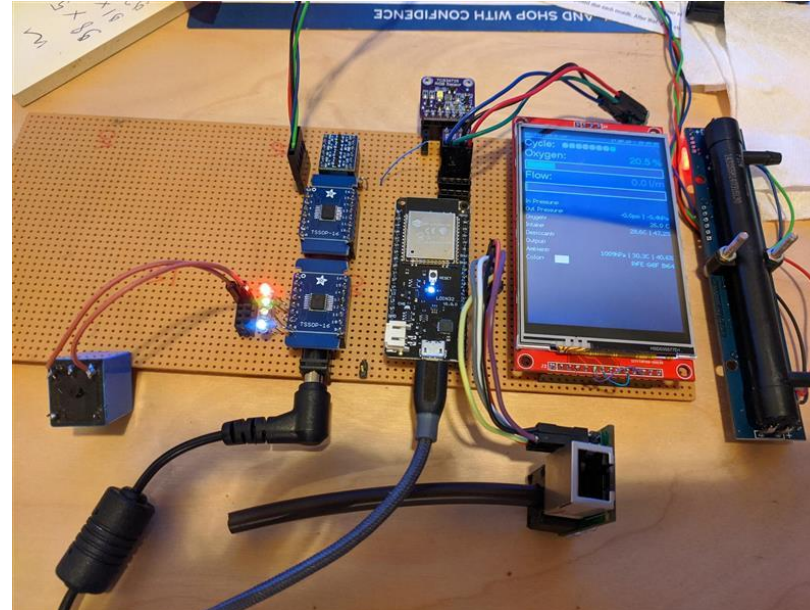
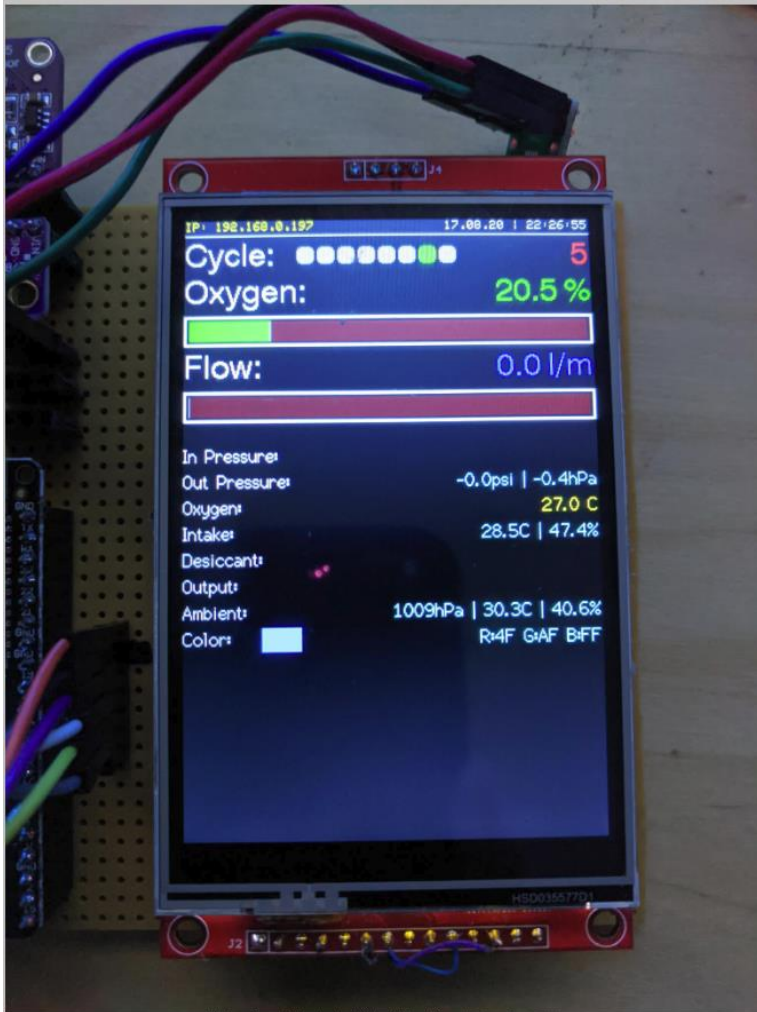
- <http://project-apollo.org>



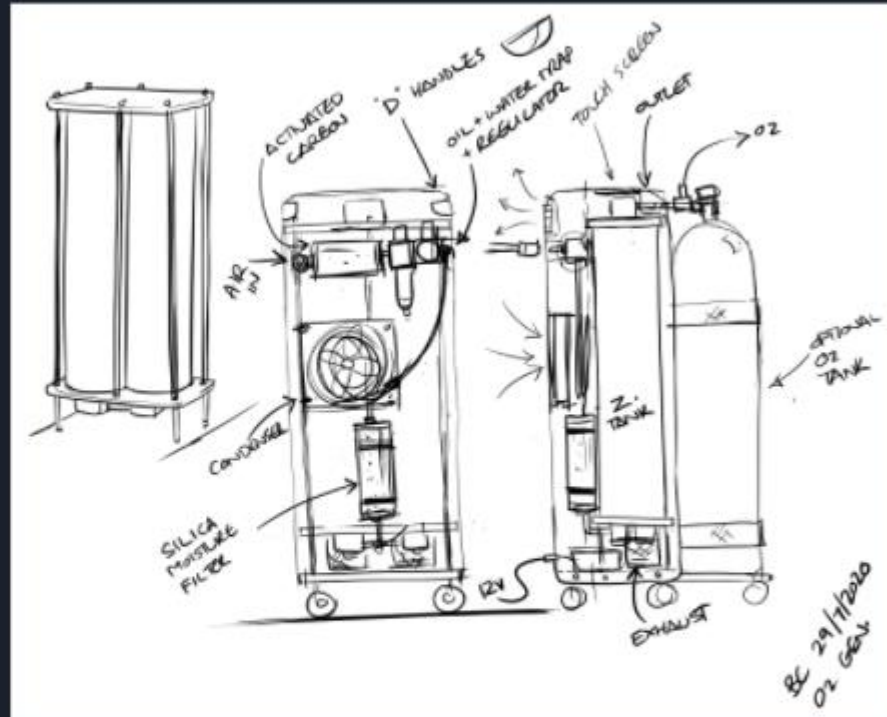
Project Apollo – latest progress

- Next version
 - Focused on safety, user experience and maintainability
 - O2 compatible materials in the oxygen path
 - Dedicated PCB controller board, sensor integration, valve operational sensing
 - 3” TFT touch screen for diagnostic messages, medical-grade buzzer
 - Auto-tuning (valve timing, auto-adjusts to changes in compressed air input pressure)
- Status
 - Mechanical design
 - Focus on FDA approval and manufacturing
 - Please see project “Oxygen Concentrator” from Public Invention (@Ben Coombs)
 - Software prototypes for Apollo v4 – working
 - Simulation software
 - “device in the loop’ optimization strategies – tested and delivering close to theoretical
 - Can control Apollo for O2 generation and basic optimization
 - WiFi and Bluetooth integration TBD
 - Sensor selection
 - Sensors for pressure, humidity, temperature – selected and tested
 - Valve board – schematic done, PCB in progress
 - Controller board – schematic in review, PCB in progress
 - Sensor board – schematic in progress, PCB in progress (similar with Apollo v3)

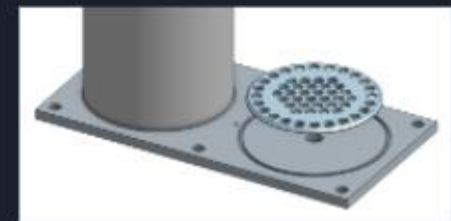
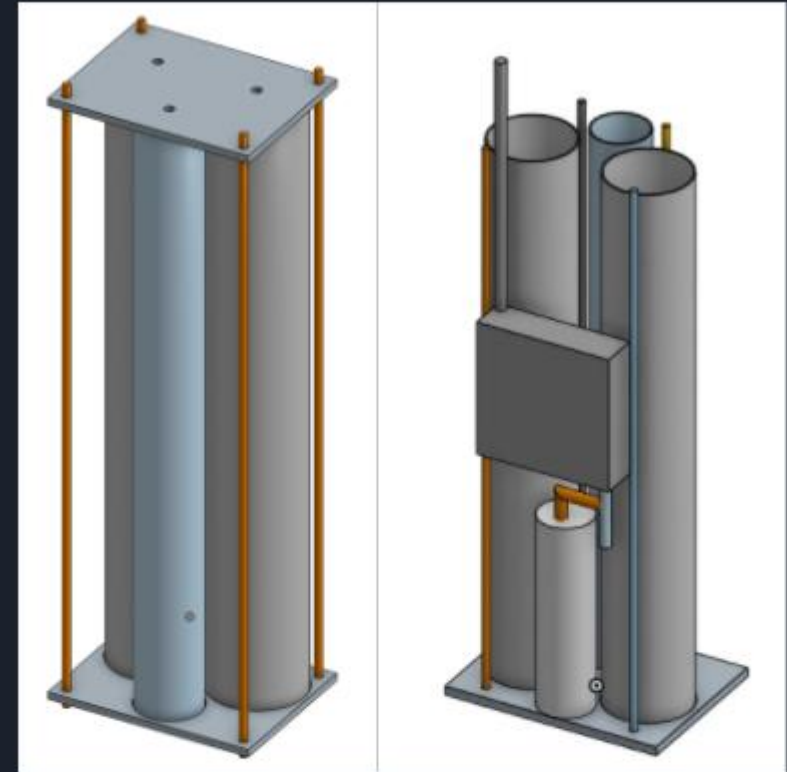
Prototyping effort – electronics, software



Mechanical Design



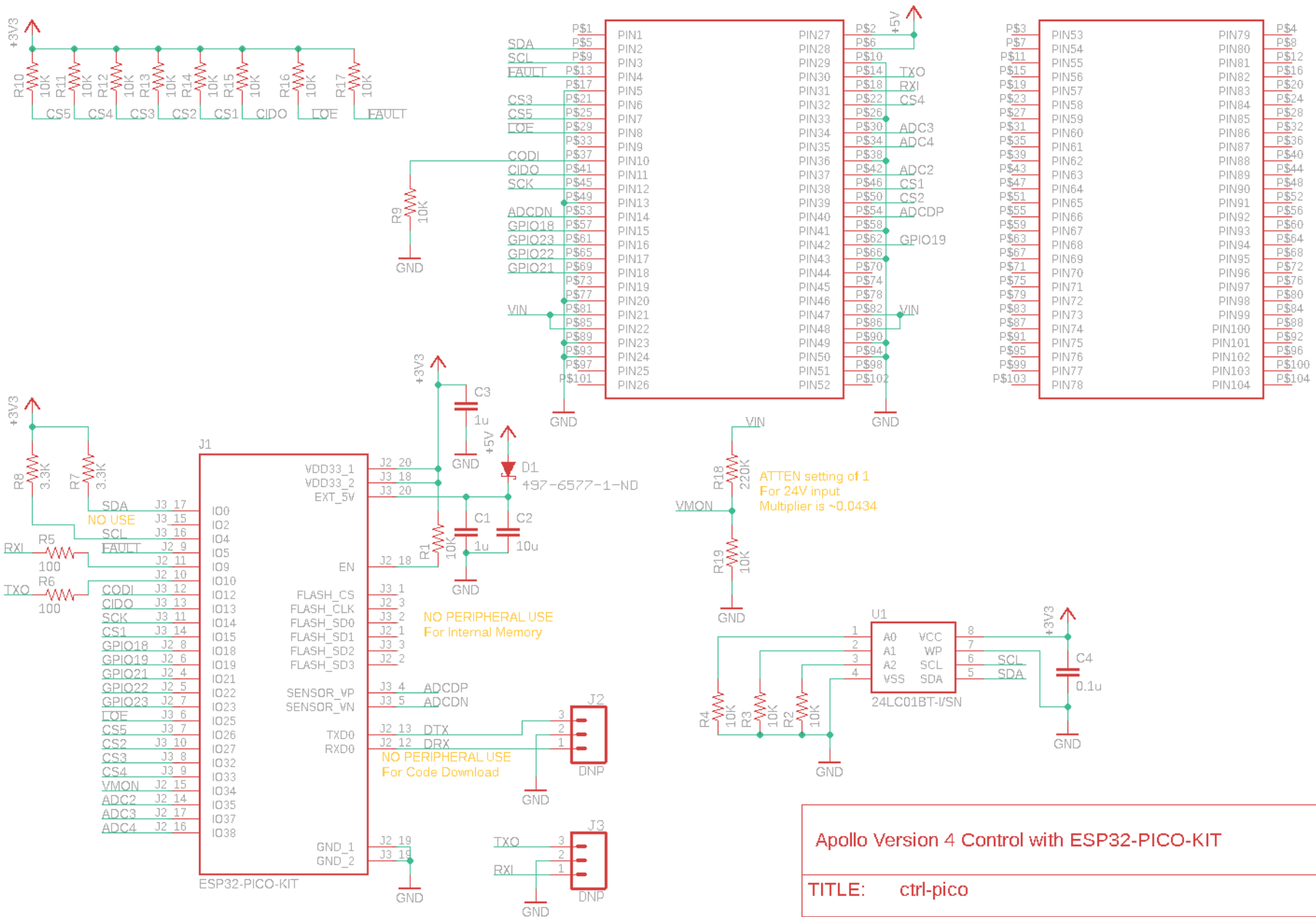
- Runs off 24V power supply and a compressed air source.
- Built in air filtration to produce medical grade air.
- Rugged plastic body with handles and wheels.
- Durable aluminium pressure vessels.
- Reliable, long-life parts that are easy to service.



<https://github.com/PubInv/oxygen-concentrator>

Conclusion

- Apollo
 - Open source oxygen concentrator with focus on low-cost
 - When Apollo v4 comes out we encourage everyone to build one!
- Please visit us at
 - <http://project-Apollo.org>
 - Github for designs, PCBs and software
 - <http://HelpfulEngineering.org>
 - Slack channel = #project-oxygen-concentrator



Apollo Version 4 Control with ESP32-PICO-KIT

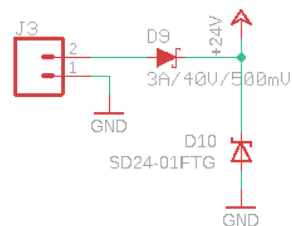
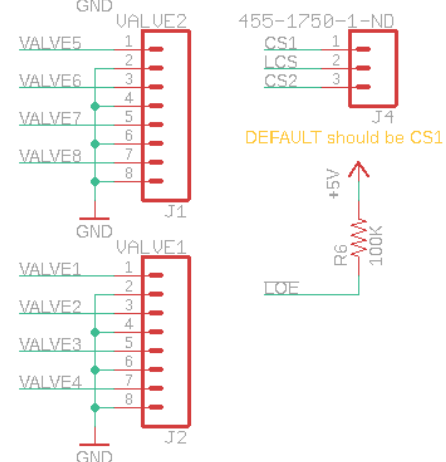
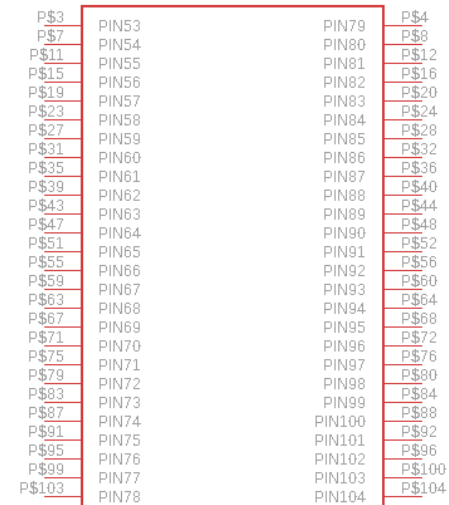
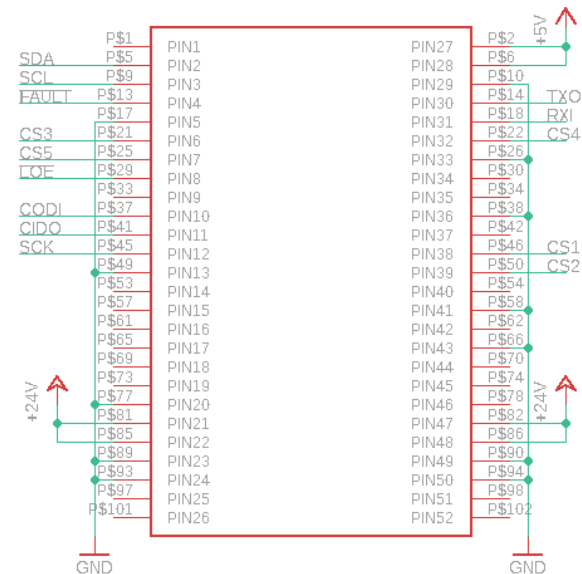
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Apollo Version 4 Valve and Power Board

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