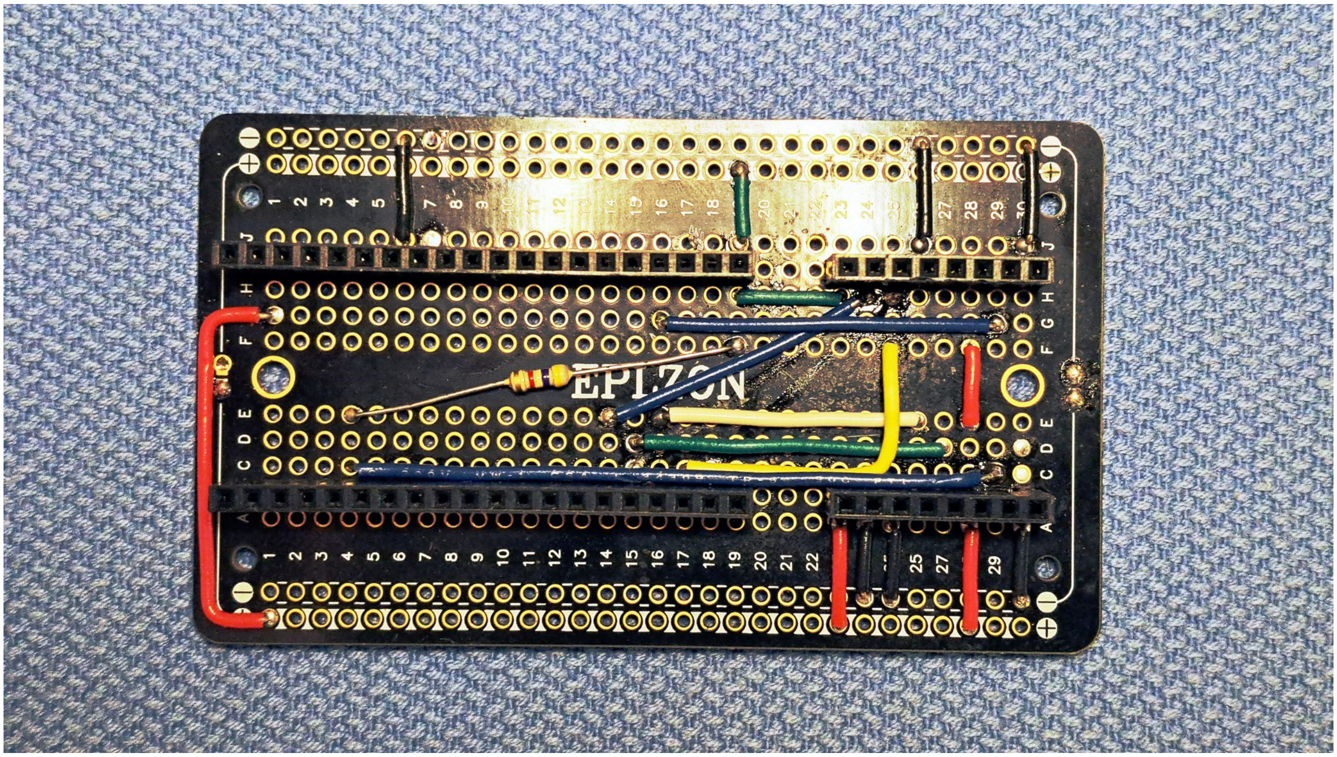
I almost always base my projects on PCB clones of breadboards to make planning easier. In rare cases, I will use plain old point-to-point boards if it doesn't involve a lot of jumper connections. Here's a link to the boards I used in the photos.

https://www.amazon.com/gp/product/B0BP28GYTV/



This project has quite a handful of soldered jumper wires. But, at least wires aren't as critical as things like electrolytic capacitors and diodes that have a polarity that has to be honored or you'll let out all of the magic smoke. As you can see, there is only a 4.7K pull-up resistor from the +3.3 volt pin of the ESP32 to the GPIO 15 pin.

Both negative buses on the PCB are connected together, but the top positive bus is +3.3 volts and the bottom one is +5 volts. The +3.3 volt bus is supplied by the ESP32's onboard 600ma voltage regulator. This is more than enough current for the VL53L0X, everything else connected to this device runs on +5 volts.

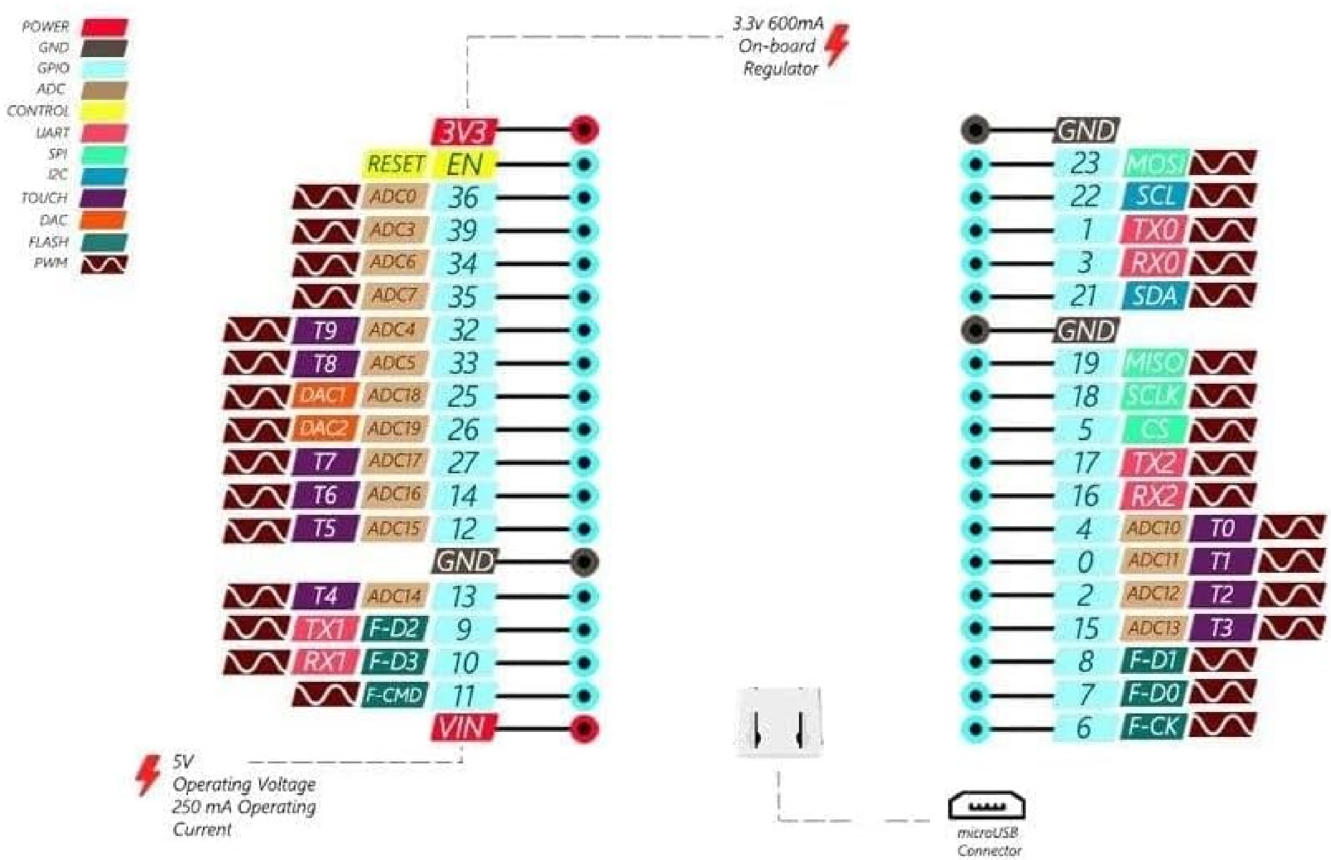
As with the Load Cell Hydrometer, the far left pins on the ESP32 socket are clipped off because the socket strips are 20 pin and the ESP32 has 19 pins on each side. The socket strips to the right of the ESP32 are the bus for connecting the 5 volts and serial communications from the RPi Smart Still Controller, the DS18B20, flow sensor, and VL53L0X.

Below is how I have connected things to this bus. The bottom row is "A" and the top row is "B". I number the pins 1 to 8 from left to right.

Please note that the serial communications jack uses the tip for the TX line and the ring for the RX line.

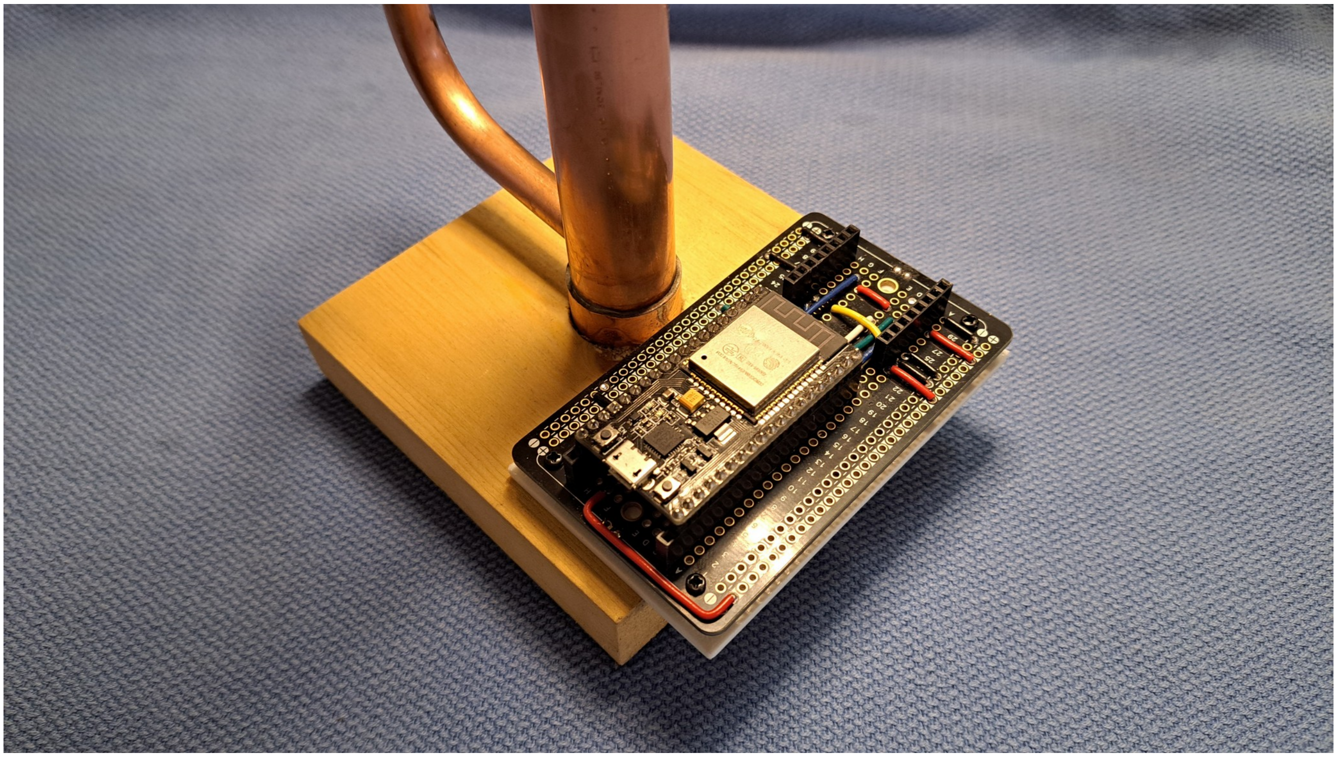
Power supply +5 volts	1A	1B VL53L0X +3.3 volts
Power supply negative	2A	2B VL53L0X SDA
Serial comm jack gnd	3A	3B VL53L0X SCL
Serial comm jack TX	4A	4B VL53L0X negative
Serial comm jack RX	5A	5B
DS18B20 +5 volts	6A	6A Flow sensor +5 volts
DS18B20 data	7A	7B Flow sensor pulse
DS18B20 negative	8A	8B Flow sensor negative

If you follow the wires in the above photo and the pin definition constants in the source code, you shouldn't have any problem wiring things correctly. Below is an image of the pin layout for the 38 pin ESP32 board that I use. This is pretty much standard for all 38 pin boards.

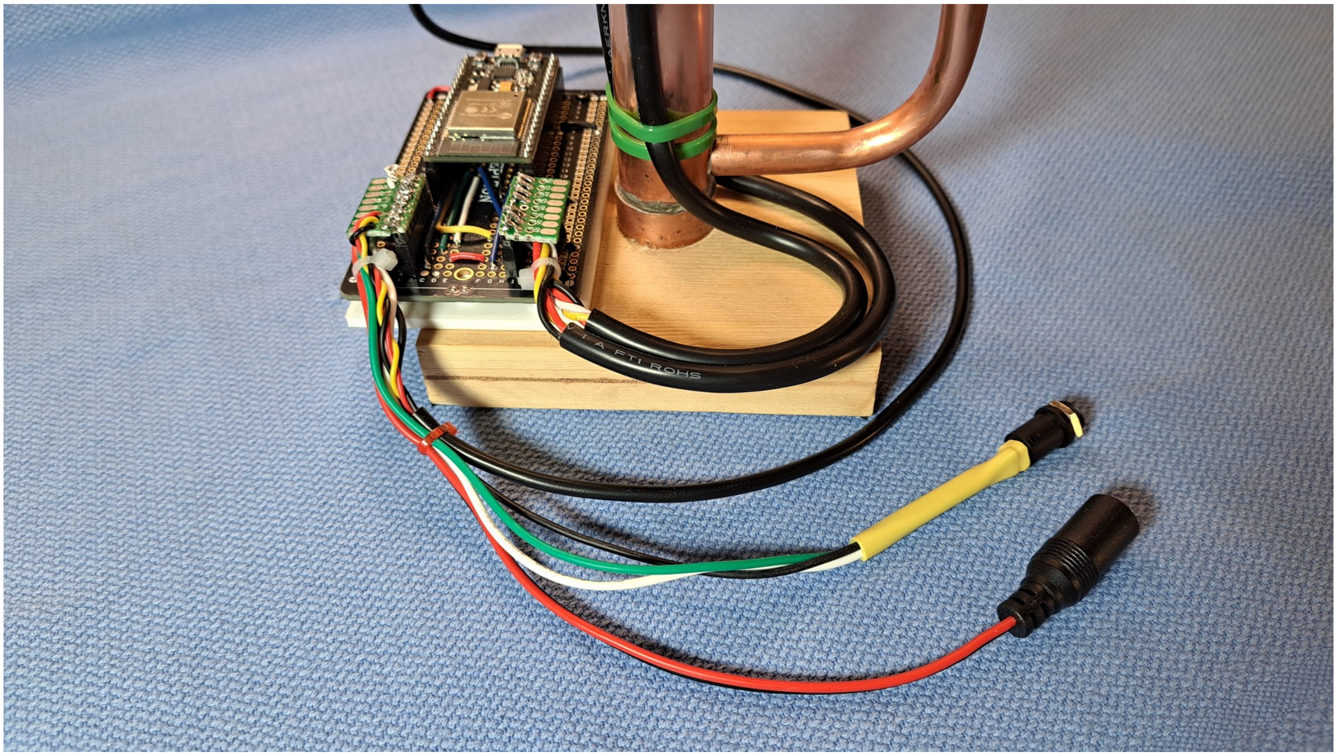


Yes, I realize that 38 pins is entirely overkill for what I'm doing in this project, but I only buy 38 pin boards because they're cheap and always leave me room to grow. Smaller boards really don't save me a whole lot, usually less than a dollar.

In case you are unfamiliar with this VL53L0X device, this is a LIDAR sensor, which is a what "laser tape measures" use. If you have ever used one, you probably saw the procedure in the owner's manual that shows you how to measure the height of a telescopic pole. A reflector is placed atop of the pole and you measure from the ground-up. This is how the hydrometer reader works, a paper disk is placed at the top of the hydrometer and its height is measured to obtain the ABV reading.

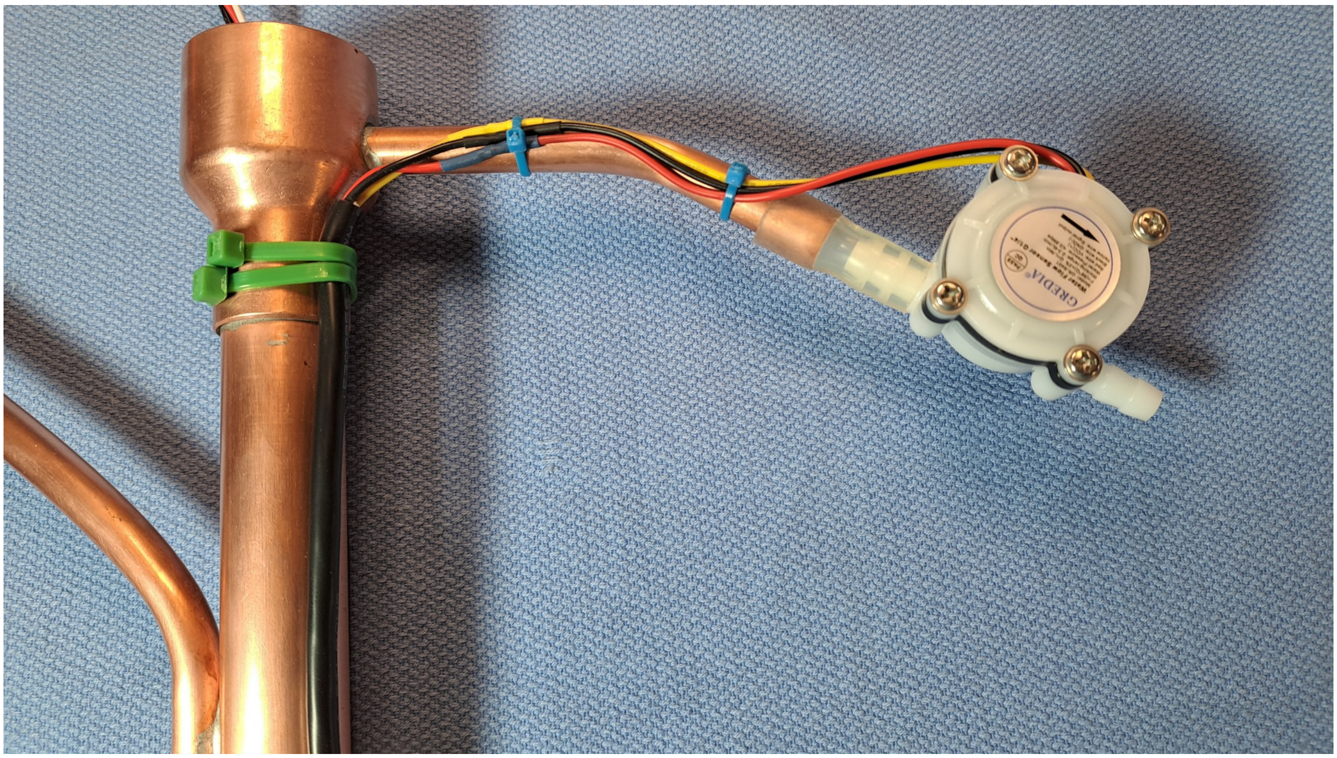


In my case, I 3D printed the “Power Breakout Mounting Plate.stl” and mounted it to the base of my parrot and then attached the PCB to that. Before you assume I made a serious mistake here, neither ethanol nor distilled water are conductive. Plus, there is also a 3D printed cover that goes over the whole thing. There is no fire hazard, danger of electrical shock, or threat of short circuit going on here.



All of the wires are soldered to 8x3 pin sections of point to point PCB material with an 8 pin header to plug into the socket strips. The DS18B20, power, and the serial communications wires are intentionally ganged together on one plug so the whole thing can be easily unplugged from the RPi Smart Still Controller and carried away so you can dump the parrot.

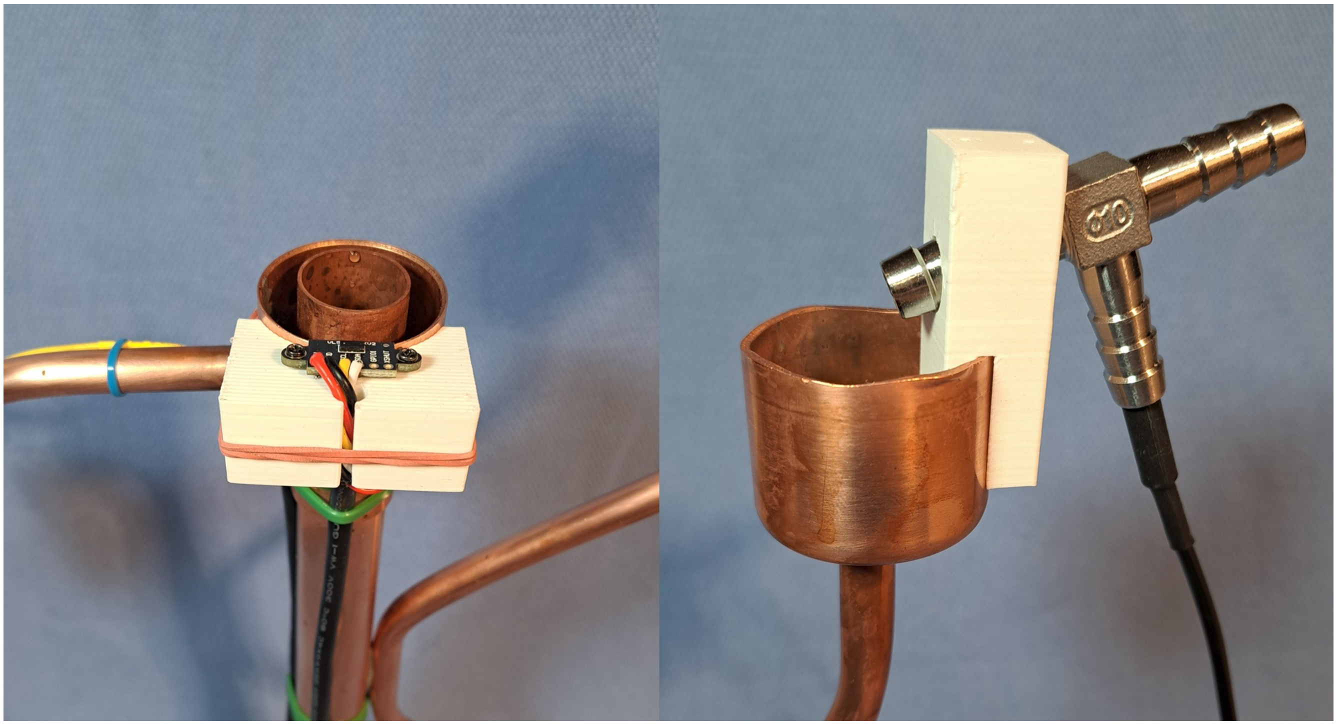
The wires on the right are for the VL53L0X and flow sensor and are zip tied to the parrot center tube. Yes, I realize that I could have used smaller cables for this, but I used what I had since this is only a prototype design. If I was out to win a beauty contest here, I'd contact Wayne Herbert at Ozark Still Works to build me a custom parrot with a separate tube going up one side to run the wires up through.



A hall effect flow sensor has been attached to the output tube of the parrot using a piece of ¼" silicone tubing as the coupler. Depending on the one you get and the amount of flow coming out of your parrot, you may need to rotate the sensor to a different angle to get it to track your ethanol flow correctly. Mine is rotated upright for this picture in order to show the label.

The way this unit works is that every second, the ESP32 checks to see how many pulses there have been since the last check [0 to 255]. These readings are stored in an array of 100 readings and they are averaged every time a serial data block is sent to the RPi Smart Still Controller. This is displayed as 0% to 100% flow rate, ½ liter per hour would result in a 100% value.

If you don't intend to use RPi Smart Still Controller programs that shut down a run when the flow drops below a certain value, you can safely leave this device out of the mix. The ESP32 won't hang if this device doesn't exist.



On the left, you can see the VL53L0X mounted to the side of the parrot overflow cup using the 3D printed “LIDAR Sensor Mount.stl” model. This holds the sensor at just the right angle in order to track the reflector at any ABV level. This is held in place with nothing more than a rubber band and the sensor hangs over the edge just far enough to catch the top of the overflow cup to work as a position memory.

On the right, you can see that the DS18B20 temperature sensor is plugged into the bottom of a 3/8” stainless steel barbed tee. The sensor is siliconed in place to prevent leaks and protrudes into the tee far enough that your distillate has to flow over it so its temperature can be monitored. The tee is mounted to the collector cup using the 3D printed “LIDAR Parrot Feed Support.stl” model.

Everything you see in this document should fit any parrot that uses roughly 1.5” outside diameter pieces for the collector and overflow cups. This seems to be the standard size for every parrot that I’ve seen. If you need these 3D models to fit a different size, contact me through my website and I can adjust them for you.

Amazon links for specific parts used in this project

38 pin ESP32 developer board
https://www.amazon.com/gp/product/B09J95SMG7/

Hall effect flow sensor
https://www.amazon.com/gp/product/B07RF57QF8/

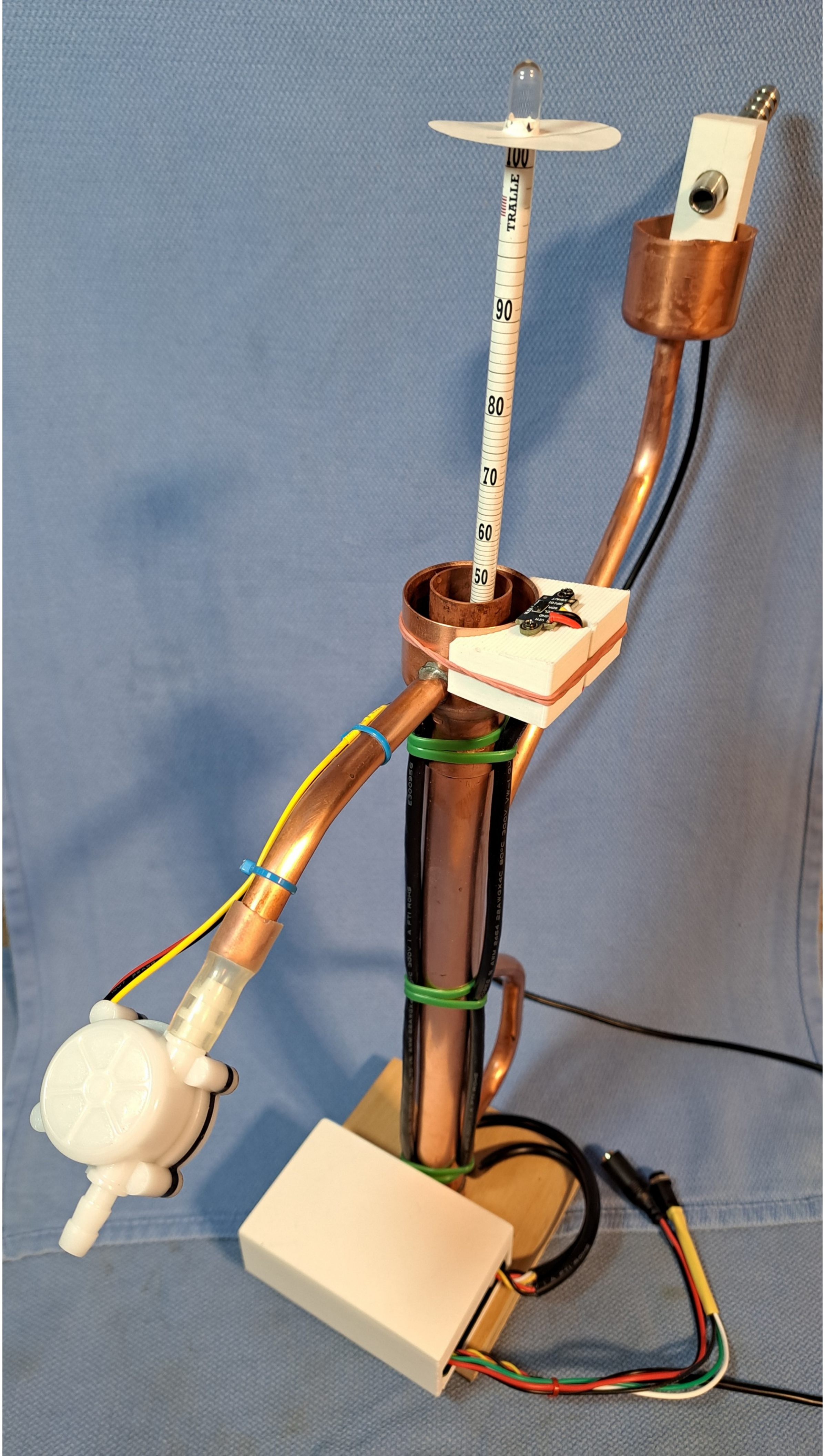
VL53L0X LIDAR sensor
https://www.amazon.com/dp/B07RF57QF8/
DS18B20 temperature sensor
https://www.amazon.com/gp/product/B00M1PM55K/

3/8” stainless steel barbed tee
https://www.amazon.com/dp/B08YJW4K52/

Below is a picture of the completed unit with the hydrometer in place and a paper reflector on top of it. I use a 3D printed “LIDAR Hydrometer Reflector Template.stl” model to trace the reflector on a sheet of printer paper. You could also get by with construction paper and try different colors to see which one tracks better. I have found that darker colors work better and glossy paper should be totally avoided.

After I cut out the reflector, I just cut an X in the center circle so it will slide down the hydrometer and stay in place with plain old friction. If you are a perfectionist, you can starch and iron the reflector so it is more rigid and perfectly flat. You can also use a drop of rubber cement to keep it in place, but don’t use too much or it can affect the accuracy of your hydrometer.

The 3D printed “LIDAR Hydrometer Reader Cover.stl” model is used to cover the entire PCB and simply slides on, there are no fasteners or clips. It gives things a more finished look, but let’s be honest, the parrot still looks like Dr. Frankenstein built it. Again, this is all prototype stuff that I build, I’m not making a commercial product here. Somebody else can do that if they are so inclined.


TRALLE
100
90
80
70
60
50