OPEnS eDNA Sampler Function (This falls under “Hardware Description” Section)

Outline:

* General Specs/Introduction
  + 24 Filter Housings capable of holding 47mm samples.
  + Sampling Rate (1L sample takes 10-15 minutes with a 5um filter.
  + Cross Contamination Value?
  + Temperature, Flow, and Volume measurements taken for researchers.
  + Pressure data taken in for safety measures and general sampler operation.
* Hydraulic Layout of the sampler
  + Pair with next section
* General Sampling Procedure
* Other functions of the sampler
* Electronics
* Layout of the Browser Application
* Outline of the SD Card (Include in the code upload portion?)

1st Draft:

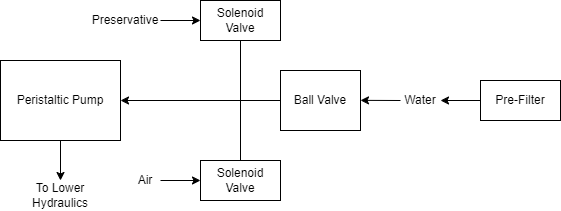
The eDNA sampler we have developed is an autonomous multi-sampling device that collects eDNA samples from water via 47mm filter holders and provides a non-invasive, safe, and autonomous means of DNA collection. The sampler can hold 24 of these filter housing and are designed to be easily replaced and reusable. The sampler is controlled by a custom logic board with an Adafruit M0 Feather Wi-Fi microcontroller loaded with a webserver to act as the interface for the sampler’s operations. This webserver hosts a browser application which is used for real-time monitoring, scheduling tasks, and data logging for time, pressure, temperature, flow, and sample volume. This data is located stored onto an SD Card for later data analysis.

The hydraulics of the sampler can be roughly split into the following sections:

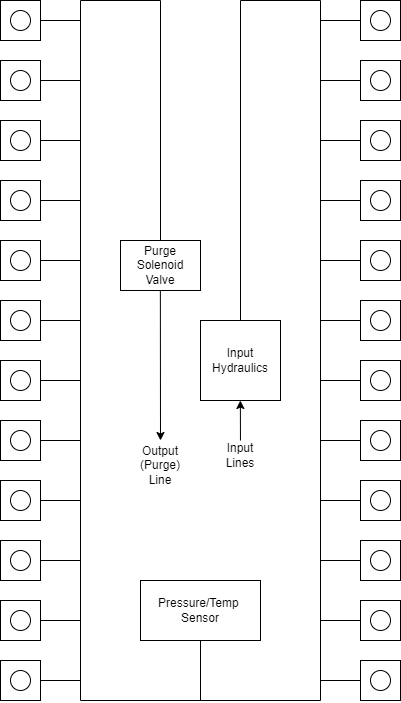
* Inputs
* The Pump and Input Source control
* The Lower Hydraulic Rail
* The Filters
* The Upper Hydraulic Rail/Output

There are three inputs into the sampler: one for air, one for preservative, and one for water. The preservative input is connected to a hydration bladder where the preservative of choice can be stored. The water input has a prefilter at the front end of the tube to prevent debris from entering the sampler. Three valves are used to control the flow from these inputs with the air preservative being regulated by a solenoid valve and the water being controlled by a ball valve. These three valves connect into a single tube connected to the input of the peristaltic pump.

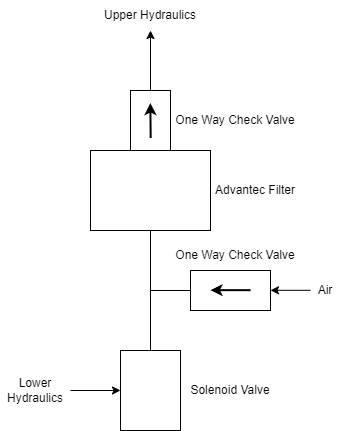
The pump is capable of 400ml/min of flow under ideal conditions. The output of the pump connects directly into the Lower Hydraulic Rail.



The Lower Hydraulic Rail consists of 24 solenoid valves connected parallel to each other which controls which filter liquid flows through. The valves are split into two sets, one on each side of the sampler. In between these two sets is a M32JM-000105-100PG pressure and temperature sensors. The temperature is logged for later use and the pressure is used for monitoring, stopping an operation if the pressure exceeds a certain margin. At the end of the Lower Hydraulic Rail is another solenoid valve which allows for the lower hydraulics to be purged of their current contents when necessary.



After the solenoid valve there is a tee connection that goes to a one-way check valve and a modified Advantec filter. The one-way check valve allows air into the solenoid valve that opens when the pump runs backwards. The Advantec filter is modified with a CPC quick disconnect and a one-way check valve. The one-way check valve is connected to the Upper Hydraulics and is used to prevent liquid from going backwards through the filter. The Upper Hydraulics simply connects the output of all the filters to one central line that goes through a flow meter and out of the sampler.



(Sampling Procedure)

Having worked on multiple iterations of the sampler, we have decided to go with a \_\_-step sampling sequence that helps reduce cross contamination significantly. This \_\_-step sequence can be split into \_\_ unique steps: Prefilter Clear, Flush, Offshoot Clean, Sample, Preservative Flush, Preservative.

(Other Tasks Description)

(Electronics Description)

(Browser Application)