#### **EnviroDIY Monitoring Station**



#### Basic overview of the EnviroDIY monitoring station functionality:

- The solar panel charges the Lithium Ion Polymer (LiPo) battery.
- The LiPo battery powers the mayfly data logger.
- The Mayfly data logger records data collected from the sensors.
- If there is cellular telemetry, the cell board sends data to online portal (MonitorMyWatershed.org).



#### Battery overview



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#### Battery overview cont.



- The LiPo battery is located at the very top of the logger box, above the mayfly data logger.
- These batteries come with a JST cable attached which allows it to be plugged directly into the mayfly data logger.



#### Battery overview cont.



Where the battery plugs into the Mayfly Data Logger :

 There are two identical JST connectors on the mayfly data logger labeled LIPO BATT. The battery can plug in to either one of these to power the mayfly.



### **Solar Panel Options**



From left to right: a 6 W, 3.5 W, and 2 W solar panel with solar panel bracket at top.



### Solar panel extension cable





## Solar panel cont.



- The solar panel cable plugs into the mayfly through a JST connector labeled SOLAR on the mayfly.
- When both the solar panel and the battery are plugged into their appropriate spots, the battery will be charged via solar energy.



## Battery charging indicator



- When both the battery and the solar panel are connected to the mayfly, a tiny yellow-orange LED light will shine showing that the battery is being charged
- The LED light will not shine for two reasons
  - 1.) the battery is full and therefore does not need to be charged
  - 2.) There is a malfunction that is not allowing the battery to charge.



## How to interpret battery voltage

#### **Basic rule of thumb to follow:**

- **4.0V or above:** fully charged battery
- 3.7V-3.9V: sufficiently charged battery
- 3.7V is the nominal voltage (Nominal voltage is the default, resting voltage of a battery pack). The middle ground between fully charged and the low voltage cutoff
- **3.5V-3.7V:** start to keep an eye on the battery pattern
- 3.5V or below: if it stays at or below 3.5V for an extended period of time you may want to replace your battery. If you see that your station has dropped offline and your battery is below 3.5V, your battery died and needs to be charged or replaced.



### Examples of proper battery charging patterns



Example of a station that is in full sun (Ridley Creek PURC2S) : Fully charges at 4.18V - 4.20V during the day and drops down to around 4.10V at night.



#### Examples of proper battery charging patterns cont.



The battery does not always need to be fully charged for the station to function properly. Example of a station that is very forested (<u>Mine Hole Brook PKMH2S</u>): During the winter, the battery voltage stays around the Nominal Voltage (3.7V). The sun is at a lower angle and daylight hours are shorter, so the battery does not fully charge, but still charges enough to keep the station running.



#### Examples of proper battery charging patterns cont.



#### Mine Hole Brook PKMH2S-

same station as mentioned before, after the winter solstice the battery begins to recover and the battery returns to being fully charged daily.





#### **Punches Run in Nolde State Forest :** You can see the end of April the charging pattern is normal, staying between 4.0V and 4.2V.

Then once the vegetation starts to come in, in May, the battery has trouble keeping up. The spikes represent when the battery was replaced.





**Pennypack Creek PUPP3S** – Battery is still charging, but an overall downward trend below 3.7V.

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**Sandy Run PUSR1S** – downward trend with no charging shown at all. This indicated there is no solar panel connected. Either the solar panel wire / connector got damaged or possibly an indicator of vandalism





 PUCR1S Crum Creek – The charging pattern is normal at the beginning, then suddenly drops from 4.0V to 3.4V over a few days. This is a pattern of unusual activity, you would follow up with a field visit.



#### WHAT TO DO IF YOUR BATTERY IS NOT CHARGING EFFICIENTLY

1. Go out to your site and make sure the solar panel is clear of any vegetation.





#### WHAT TO DO IF YOUR BATTERY IS NOT CHARGING EFFICIENTLY

2. See if there is a better angle to point the solar panel depending on the time of year or if there is a gap in the foliage (the U-bolt can be loosened using a 7/16" wrench)





#### WHAT TO DO IF YOUR BATTERY IS NOT CHARGING EFFICIENTLY

3. Buy a spare battery and a battery charger to cycle through batteries if your station battery regularly has trouble keeping a charge.





- Note\*\* Only buy the battery charger Stroud suggests Most sold on amazon have backwards polarity wires and will damage your battery.
- Links to purchase charger and and details are provided in the EnviroDIY online manual in <u>section 8.2.6</u>
  - (<u>https://www.envirodiy.org/mayfly-sensor-station-manual/#power-management</u>)



















# Swapping the batteries at your station

\*\*Very Important: remember to turn the mayfly data logger OFF before removing and replacing the battery\*\*

#### Steps:

- 1. Turn Mayfly off
- Unplug original battery from LIPO BATT connector on mayfly 2.
- Plug in new fully charged battery 3.
- Turn Mayfly back on 4.



Unplug dead battery and plug in new charged battery

#### **RESOURCES TO HELP TROUBLESHOOT**

- EnviroDIY manual section- 8.3. Data Patterns and Troubleshooting
  - https://www.envirodiy.org/mayfly-sensor-station-manual
- Troubleshooting quick guide Section 8.3.3 Troubleshooting
  - Troubleshooting Quick Guide
- This powerpoint presentation will be posted to <u>https://wikiwatershed.org/drwi/</u>
- Email Stroud Folks after you attempt to troubleshoot on your own-
  - <u>shicks@stroudcenter.org</u>
  - <u>dbressler@stroudcenter.org</u>
  - rjohnson@stroudcenter.org



# Questions ?















#### How to minimize moisture in the logger box



- Minimize the amount of times you open the logger box (try to only open it when you need to collect the data card or if there is an issue with the data)
- 2. If possibly, try to time your visit to collect data during dry weather.
- 3. Make sure the logger box is properly latched when closing it
- 4. Add desiccant packets near the battery and possibly the mayfly data logger.

