Photon Power Consumption

Due: Feb 20th @ 11:59pm

Version 2018.01

This project will introduce the various power states of the photon and the amount of energy that each uses.

Goal

The goal of this assignment is to cycle through the following list of device configurations and measure the power consumption for each. For each configuration, please estimate the expected battery life. Doing so will allow you to estimate the expected battery life of applications running on your photon.

For grading we will cycle through the states and measure the power consumption to make sure you correctly measured each state. To help facilitate grading you must make a button press cycle through the various modes. At each mode you should make the RGB LED flash a color indicating the mode being entered, then turn it off while in the mode to not affect power consumption. The device must stay in the desired mode for 20 seconds to allow us to measure it.

Measure the power consumption in the following states:

1. RED: Busy waiting (essentially polling) in the loop function with wifi turned on but not using it.
2. Blue: Busy waiting in the loop function with wifi turned off.
3. Green: Busy waiting in the loop function with wifi turned off and RGB LED turned to full brightness with white light.
4. Cyan: Continuously transferring TCP packets.
5. Magenta: WiFi off and cpu in standby mode

Resources

- We suggest looking at the particle.io docs.
- We are providing some wiring instructions for connecting the battery and measuring current with a multimeter at the end of this document. See below for more details.
- You may want to look at the firmware library source code to see what various API calls actually do.

Grading

The grading for this assignment will be based on 6 milestones:

- Wiring the power shield correctly to measure current (20%)
- Correctly measuring each configuration (16% each)

The points for these milestones are all dependent on correctly following the submission instructions.

Submission

All code should be developed in a private IU Github repository where the users akuhlens and lukefahr are added as collaborators. You must convey which commit will be demoed in class by submitting the link to the commit on IU Github. This link will look similar to

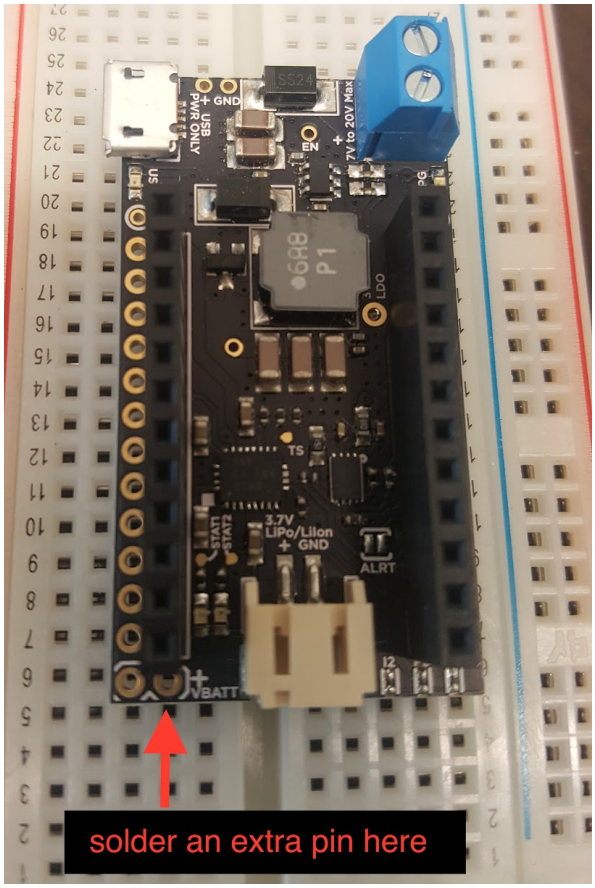
https://github.iu.edu/SOIC-Digital-Systems/Spring-2017/commit/269670d11d10decb79905ff3cb4ba456a9c928c0

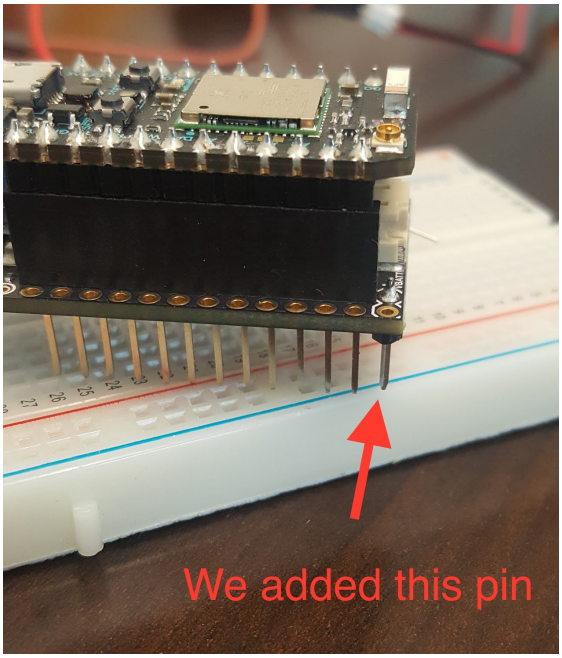
and when followed should lead to the commit summary page. The commit submitted needs to have a set of instructions for how to build the project, and we suggest that the process be automated via makefiles or a similar tool. During class we will ask each group to download the commit, build and flash using that download, and demo the capabilities of their device.

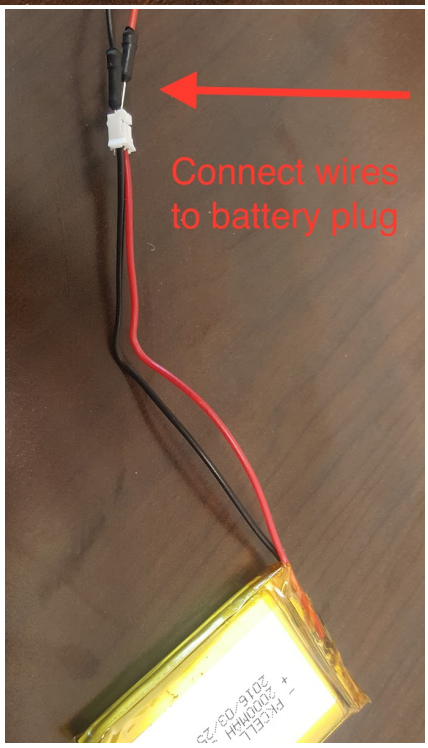
Each group member should make a submission to canvas even if it is a duplicate of the github link.

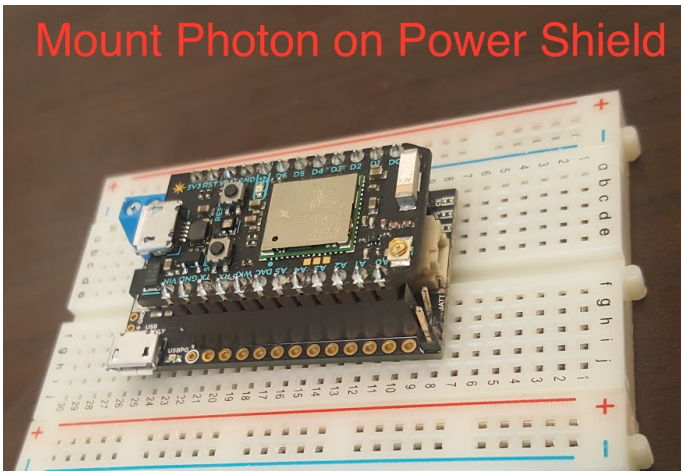
Power Shield Wiring

The first step to connecting the power shield will be adding an extra pin to the `+vbat` pad on the power shield. You will then want to mount the photon on the power shield and mount the power shield on a breadboard. Note that the two micro USB sockets are on the same end.



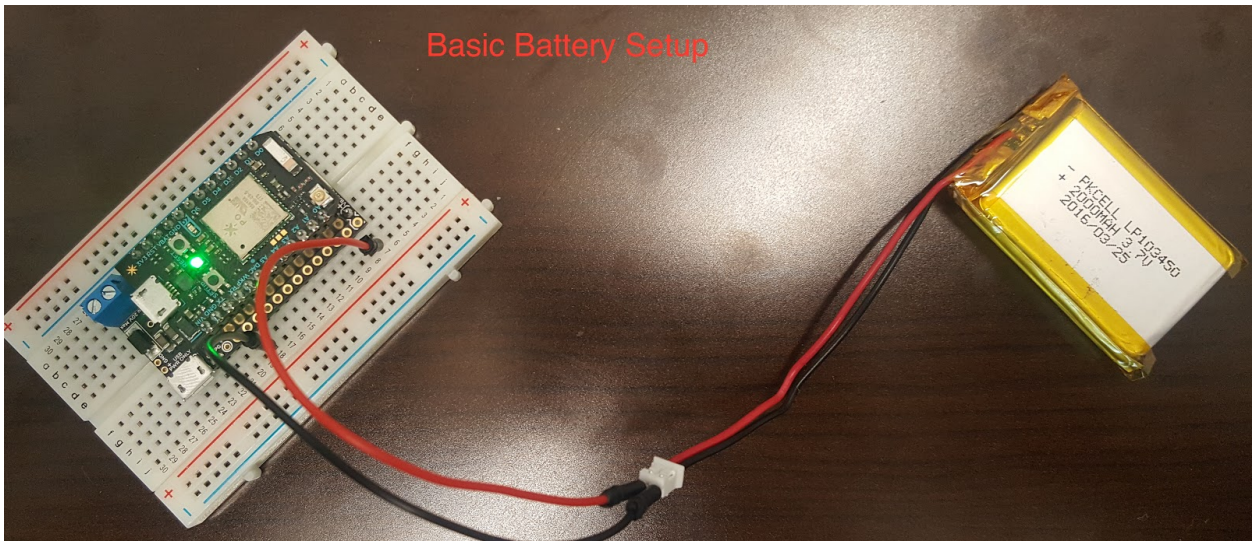


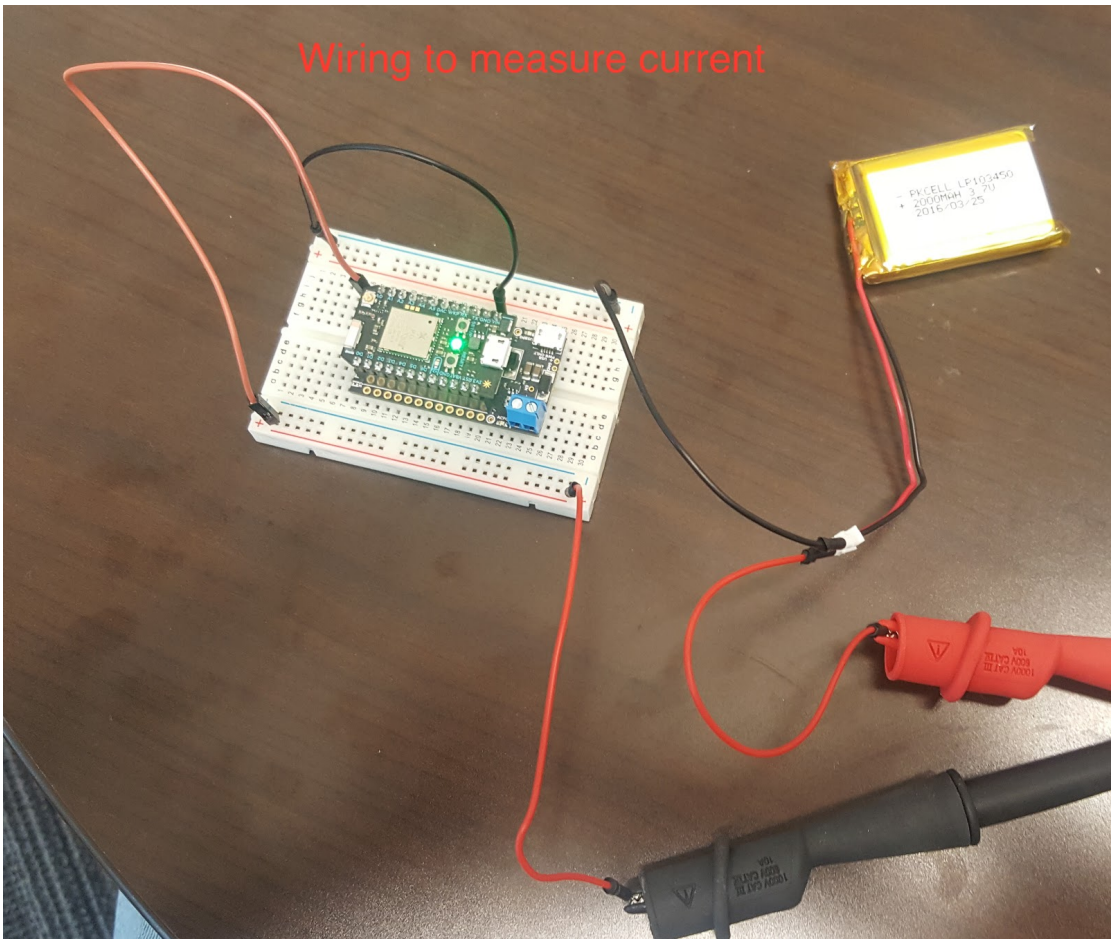




Power Shield Wiring (Continued)

The battery can be connected via plug and socket on the power shield, but for testing purposes you may also want to connect positive to `+vbat` and negative to `gnd` using jumpers from the battery plug． For measuring the power usage, you will want to connect the multimeter inline with the positive battery jumper. Here are pictures of each setup.





Measuring Power Consumption

Multimeters are provided in the lab and can be used anytime the lab isn't in use, but **may not be removed from the lab**. When measuring the current your multimeter should be configured to measure milliamps of DC current. For the lab multimeters, the yellow button switches between AC and DC. Otherwise, the following picture shows our multimeter configuration and the current we measured for the lowest power configuration. **Make sure to turn off multimeters after you are done using them.**