Documentation:

Low-level function library for coding ([link](https://support.labjack.com/docs/low-level-functions-ud-devices-only))

Python documentation for U3 ([link](https://github.com/labjack/LabJackPython/blob/master/src/u3.py)) Very long

* Download LabJack U3 (May be labeled as UD as this is all U family devices) software package from [website](https://support.labjack.com/docs/ud-software-installer-downloads-u3-u6-ue9)
* For custom code download LabjackPython package ([link](https://support.labjack.com/docs/labjackpython-for-ud-exodriver-u12-windows-mac-lin))
  + Need to have python installed on computer
  + Need to have UD driver (installed as part of LabJack package installed earlier)
    - Easiest way is to install in terminal using pip
      * >>> before text means put command in terminal
    - >>> “pip install LabJackPython”
      * Downloads package
    - >>> “python setup.py install”
      * Installs package (Might not be necessary unknown)
  + Can now interact with device using VS code or other coding platform
    - * > before text means code to run in python file
    - > “import u3” allows communication with device
    - > “d = u3.U3()” initializes U3 device and allows code to be run on it (creates U3 object)
* For simple modifications use LJ Control Panel (part of UD software package)
  + Test for temporary
  + Config defaults for permanent (saved settings)
* Use only XXXXXUD applications with U3
  + XXXXM applications installed with labjack package but for T series devices so wont work
* Use LJLog\_UD as instant grapher
  + Instantly idnetifes inputs vs ouputs and saves as DAT file
    - Figure out how to convert to csv
* Also LJStream\_UD as grapher ([documentaton](https://support.labjack.com/docs/ud-series-applications) for all UD applications)
  + Might be better IDK
  + Main benefit is it can take data at faster then 100Hz
    - Wont be relevant for this project
    - Use LJLogUD

A red circuit board with white text

Description automatically generatedHardware description

FIO = Flexible input output

* Can input or output voltage
* Ports 4-7
* Analog input [AIN] = read incoming variable voltage
  + For reading sensor data or voltage (use for reading output voltage from photosensor)
* Digital output [DO] = sends voltage
  + Sends high (3.3 V) or low voltage (0V). Records as binary value with 1 as high and 0 as low. Appears as check box in test panel (checked is high and unchecked is low).
* Digital input [DI] = IDK
* Can set type in LJ control panel
  + Use test tab for temp
  + Use config defaults to save settings to device

EIO = Edge input output

* Fat plug on bottom of device
* Same set up as FIO but just more jank because no screw terminals
  + Figure out if can get more inputs by sticking wires in specific holes??
* Diagram of EIO on bottom of picture above

AIN = Analog input

* Default set for measuring incoming voltage
* Like FIO but cant send out voltage, can only read incoming
* Ports 0-3

VS = source voltage

* Outputs volatage coming into device
* Think varies depending on input so when plugged into computer outputs 5V but would do 3V if hooked up to 3V battery

GND = Ground

SGND = ground but separate from others

* Use when worried about shorting device and want to keep it separate from other GND

SPC = IDK

DAC = Digital to analog converter [IDK]

* Can set specific voltage between 0 and 5V
  + Figure out how to use bc good for LED

Notes:

* Led will fry if using VS bc 5V and LED needs 3V
* Wiring schema for sensor

A diagram of a machine

Description automatically generated

* OG Paper ([link](https://www.frontiersin.org/journals/microbiology/articles/10.3389/fmicb.2021.790576/full))
  + Paper supplementary materials ([link](../../../../Desktop/Research%20Paper%20Supplementary%20Materials.docx))
    - Detailed instructions on constructing sensor
* Google doc with initial research for project and questions ([link](https://docs.google.com/document/d/1-11wC0V31NNc2M3ApU17S9E9agojdKUojSKmovhNdYg/edit?tab=t.0))

Sensor Data

* LED takes 3V
  + LED driver soldered to short end to keep constant volatage and prevent spikes
  + Might be able to run 5V thru now bc of it but not sure
* [Photosensor](https://protosupplies.com/product/temt6000-ambient-light-sensor-module/) can take 3.3-5V
  + Can run of Lab jack VS