WATER SENSOR PACKAGE

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PLAN FOR ENVIRONMENTAL SENSOR PACKAGE

1. Create a datalogger for TDS sensor
2. Combine all the sensors into one datalogger
3. Design PCB to tie everything together
4. Design waterproof case to house all components
5. Test and validate

1/18/2022

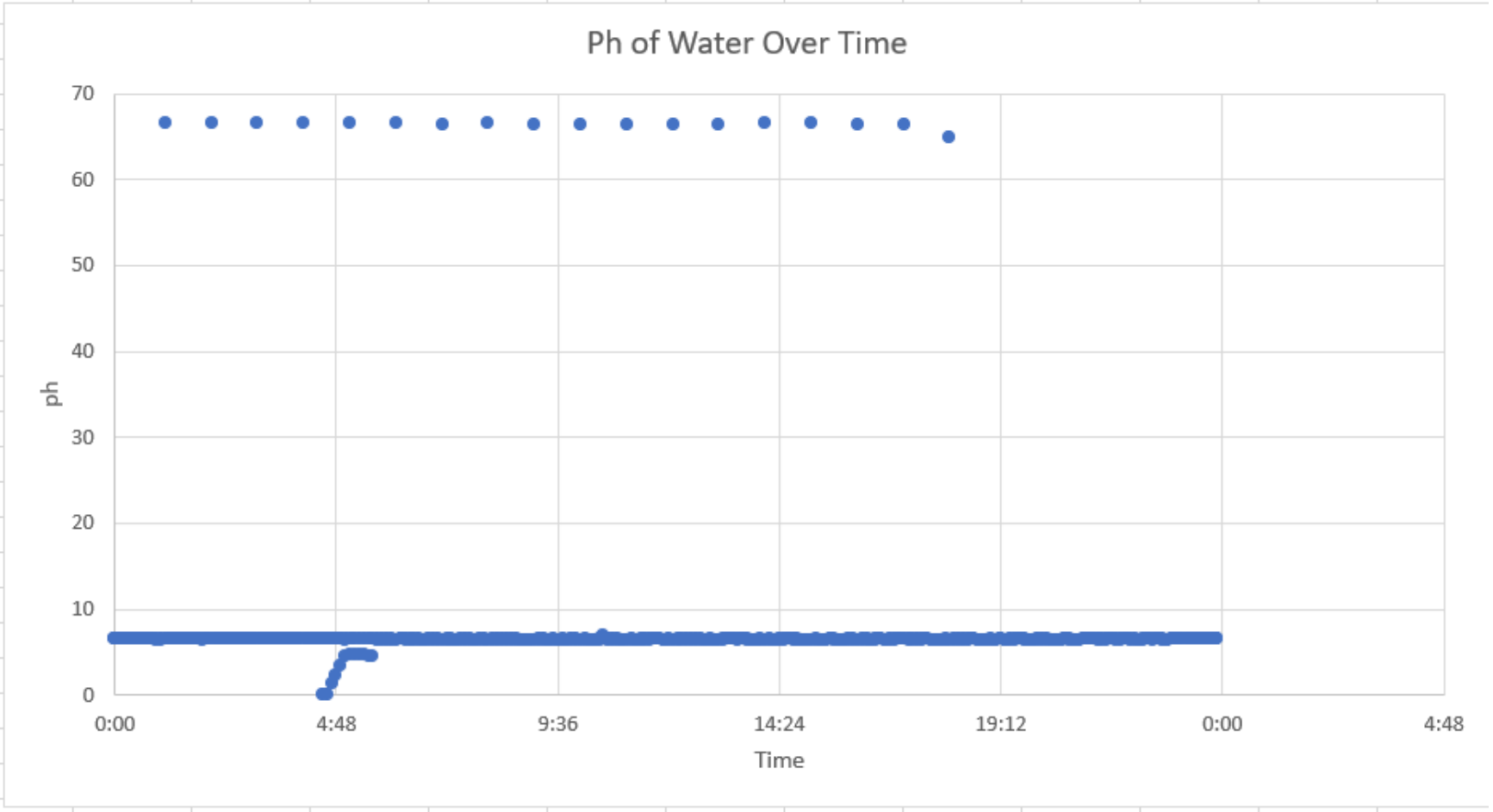
- Need to order TDS Probe and obtain a SD card and SD card reader
- RTC, SD card reader, and TDS sensor code


a3ml_a | Arduino 1.8.19 (Windows Store 1.8.57.0)
File Edit Sketch Tools Help
a3ml_a §
#include <SPI.h>
#include <SD.h>
#include <Wire.h>
#include "Sodaq_DS3231.h"
#include <EEPROM.h>
#include <GravityTDS.h>
#define TdsSensorPin A1
GravityTDS gravityTds;
float temperature = 25,tdsValue = 0;
File myFile;
DateTime now;
int newHour = 0;
int oldHour = 0;
void save_temperature() {
myFile = SD.open("temp.txt", FILE_WRITE);
now = rtc.now();
myFile.print(now.hour());
myFile.print(":");
myFile.print(now.minute());
rtc.convertTemperature(); //convert current temperature i
myFile.print(",");
myFile.println(rtc.getTemperature()); //read registers an
myFile.close();
}
void setup ()
{
Serial.begin(115200);
gravityTds.setPin(TdsSensorPin);
gravityTds.setAref(5.0); //reference voltage on ADC, defa
gravityTds.setAdcRange(1024); //1024 for 10bit ADC;4096
gravityTds.begin(); //initialization
Sodaq_DS3231.h: No such file or directory
Copy error messages
compilation terminated.
exit status 1
Sodaq_DS3231.h: No such file or directory
RTC_temp_datalogger | Arduino 1.8.19 (Wi...
File Edit Sketch Tools Help
RTC_temp_datalogger
#include <SD.h>
#include <SPI.h>
File myFile;
int pinCS = 53; // Pin 10 on Arduino Uno
void setup() {
Serial.begin(9600);
pinMode(pinCS, OUTPUT);
// SD Card Initialization
if (SD.begin())
{
Serial.println("SD card is ready to use.");
} else
{
Serial.println("SD card initialization failed");
return;
}
// Create/Open file
myFile = SD.open("test.txt", FILE_WRITE);
// if the file opened okay, write to it:
if (myFile) {
Serial.println("Writing to file...");
// Write to file
myFile.println("Testing text 1, 2 ,3...");
myFile.close(); // close the file
Serial.println("Done.");
}
// if the file didn't open, print an error:
Board at COM5 is not available
Copy error messages
Sketch uses 10966 bytes (33%) of program storage spac
Global variables use 988 bytes (48%) of dynamic memor
Board at COM5 is not available
TDS_code | Arduino 1.8.19 (Windows Store 1.8.57.0)
File Edit Sketch Tools Help
TDS_code §
#include <EEPROM.h>
#include "GravityTDS.h"
#define TdsSensorPin A1
GravityTDS gravityTds;
float temperature = 25,tdsValue = 0;
void setup()
{
Serial.begin(115200);
gravityTds.setPin(TdsSensorPin);
gravityTds.setAref(5.0); //reference voltage on ADC, default 5.0V on Arduino UNO
gravityTds.setAdcRange(1024); //1024 for 10bit ADC;4096 for 12bit ADC
gravityTds.begin(); //initialization
}
void loop()
{
//temperature = readTemperature(); //add your temperature sensor and read it
gravityTds.setTemperature(temperature); // set the temperature and execute temperat
gravityTds.update(); //sample and calculate
tdsValue = gravityTds.getTdsValue(); // then get the value
Serial.print(tdsValue,0);
Serial.println("ppm");
delay(1000);
GravityTds.h: No such file or directory
Copy error messages
compilation terminated.
exit status 1
GravityTds.h: No such file or directory

1/25/2022

- Code for TDS sensor data logging to SD card working
- Need to test code when probe arrives

2/1/2022



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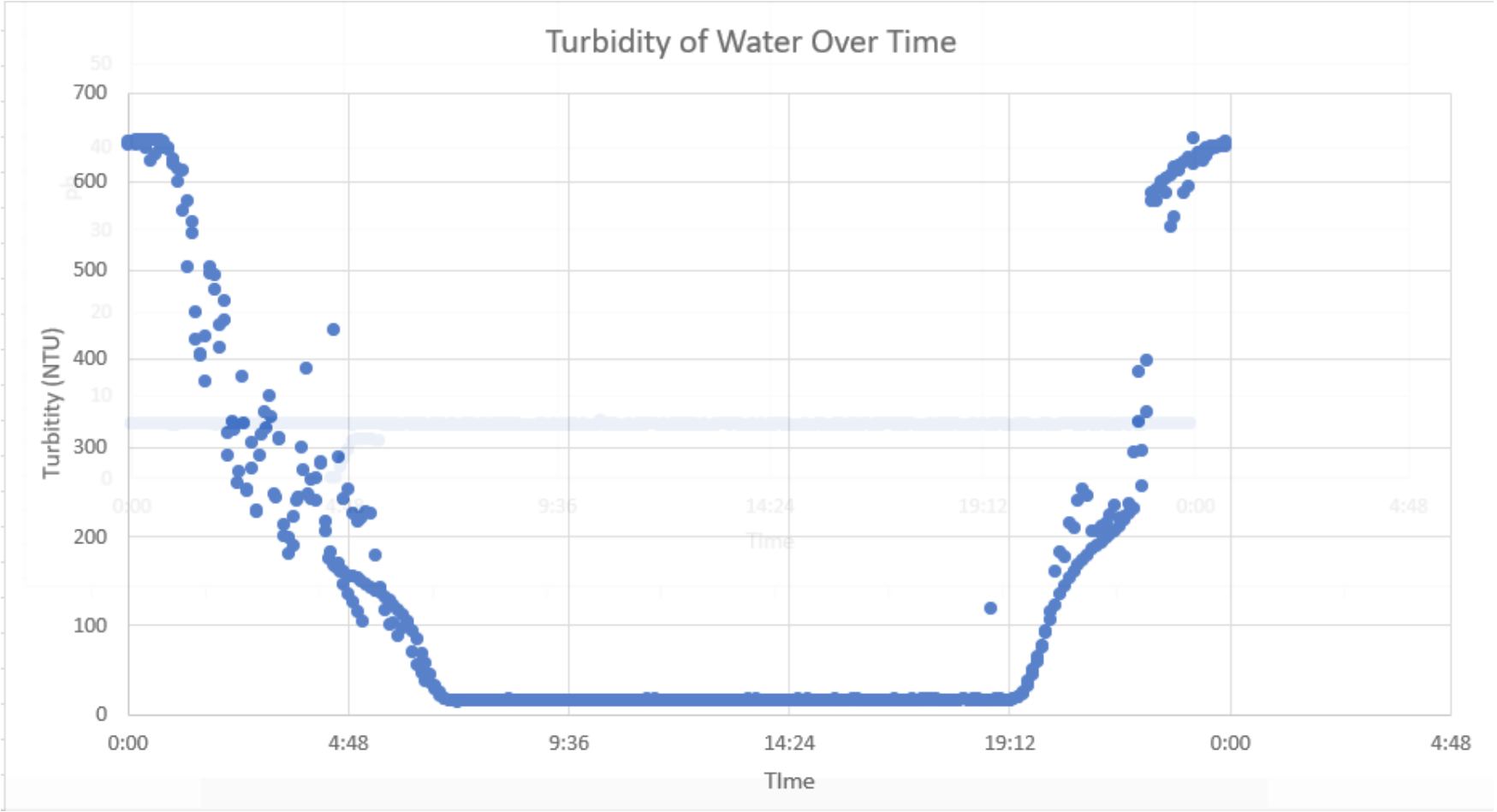
Turbidity



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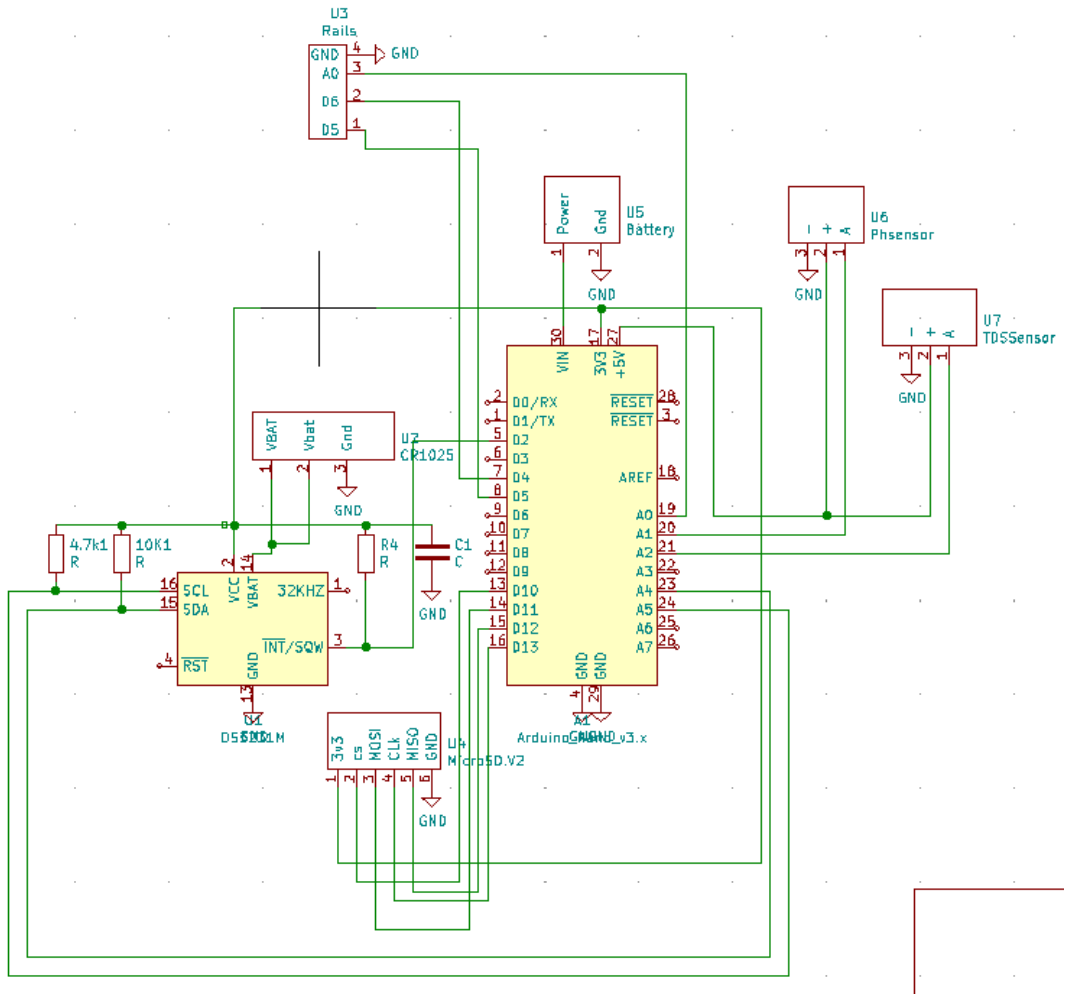
2/15/2022

- Included TDS sensor into current sensor package
- Next Step: rearrange components on board to fit in new housing



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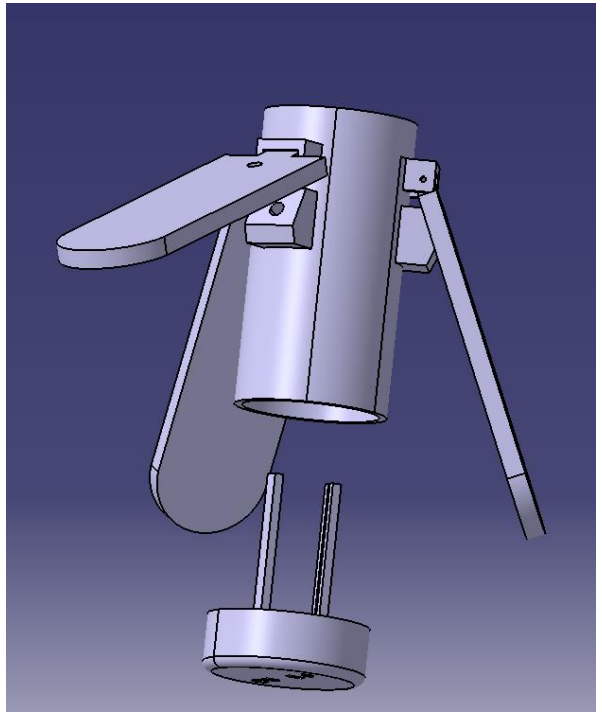
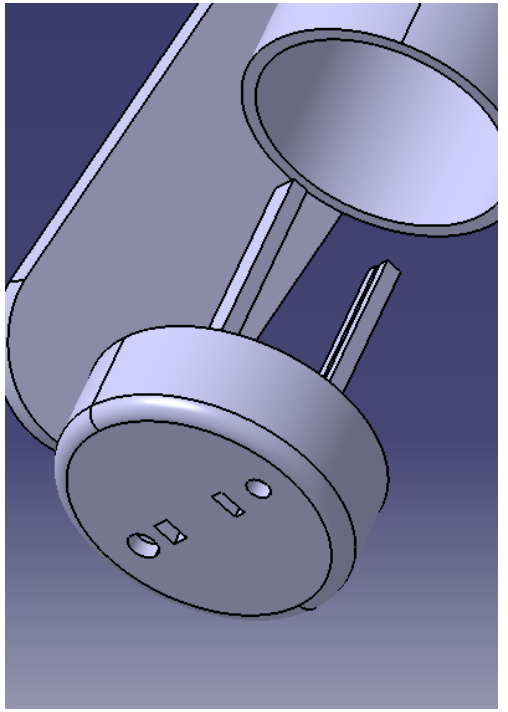
HOUSING FOR SENSORS

- Solar flaps can be used as a tripod
- Probes and sensors will fit through the bottom
- PCB with components will fit between the slots in the two rails
- Next Steps:
  - Add protection for probes/sensors on the bottom
  - Add battery holder to the bottom component holder



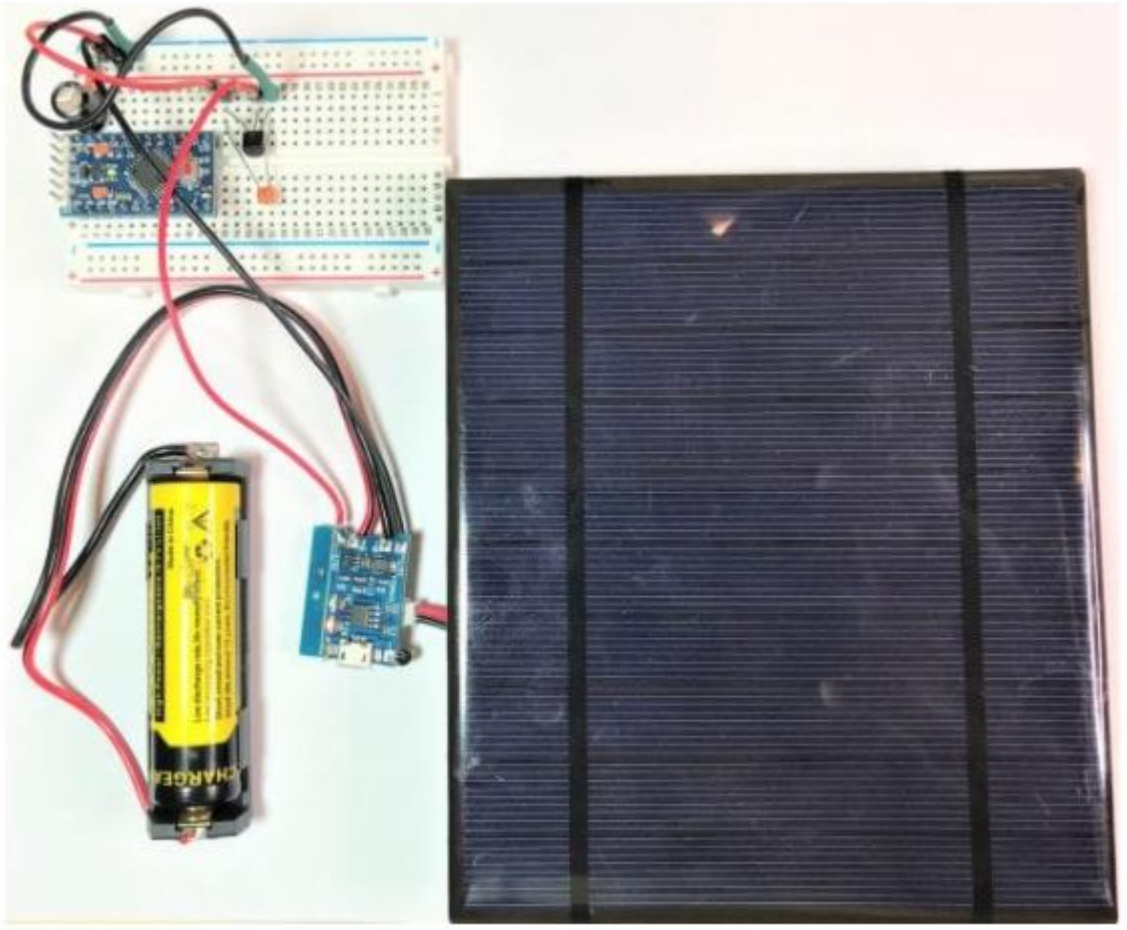


2/22/2022

- Solar Charging Findings
- TDS Testing
- Updated Housing for components

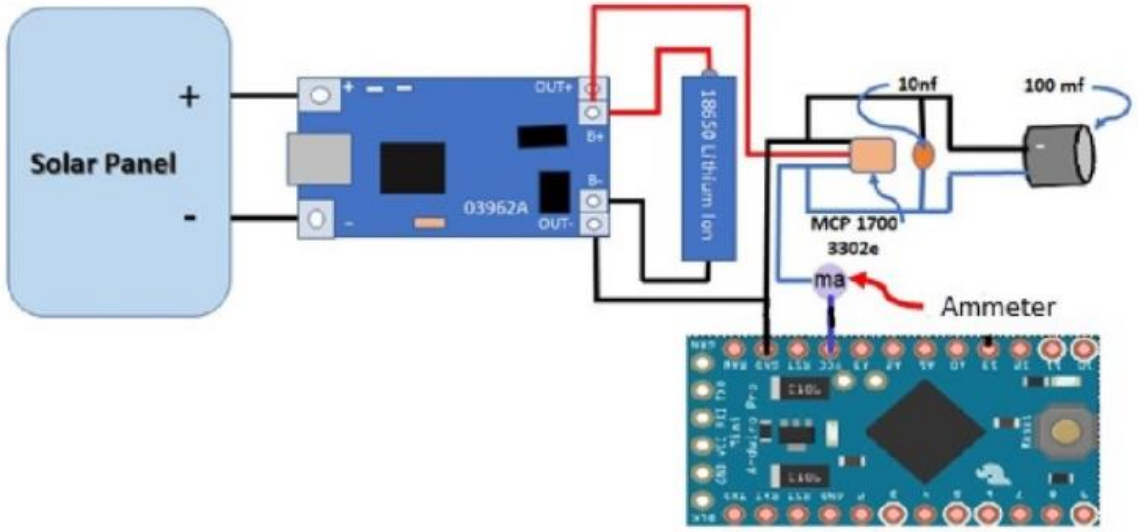
SOLAR CHARGING

- Arduino Pro-Mini, or Arduino Nano
- TP4056 battery charge controller
- 100 uF capacitor
- 100 nF capacitor
- MCP1700-3302E 3.3V voltage regulator
- 3.7V 18650 Lithium Ion battery (2000 mAH or more)*
- 6V DC, 500 mA solar panel*
- Breadboard
- Jumper wires

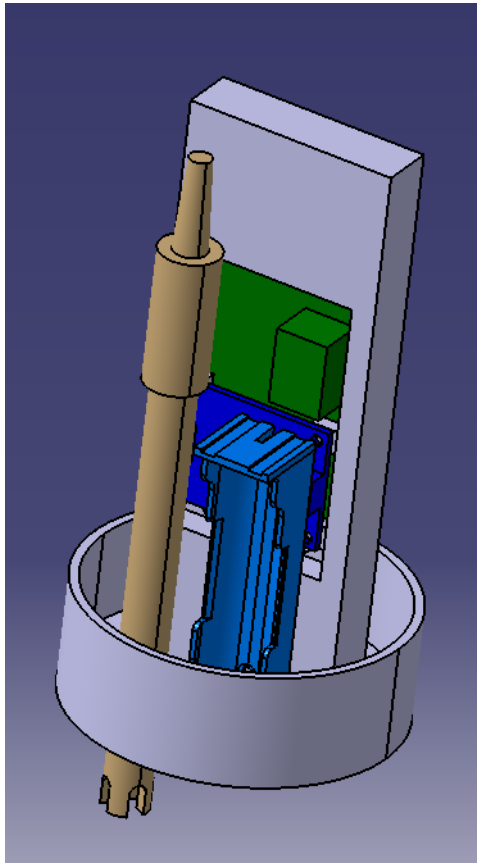


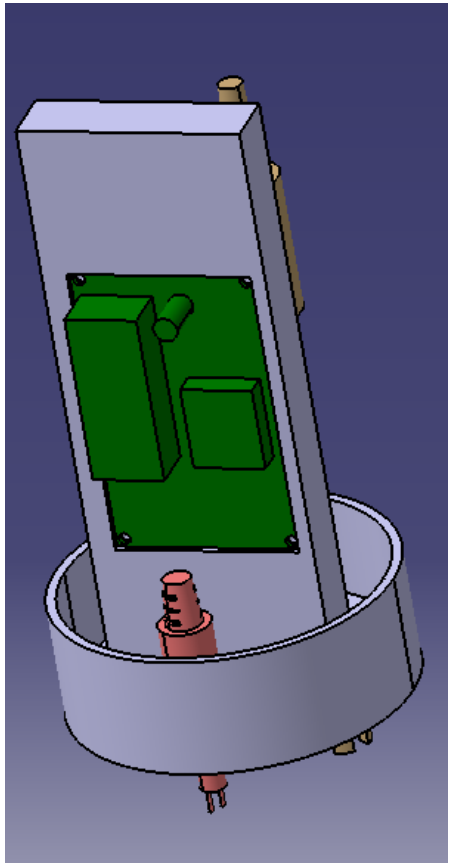
SOLAR CHARGING CONFIGURATION

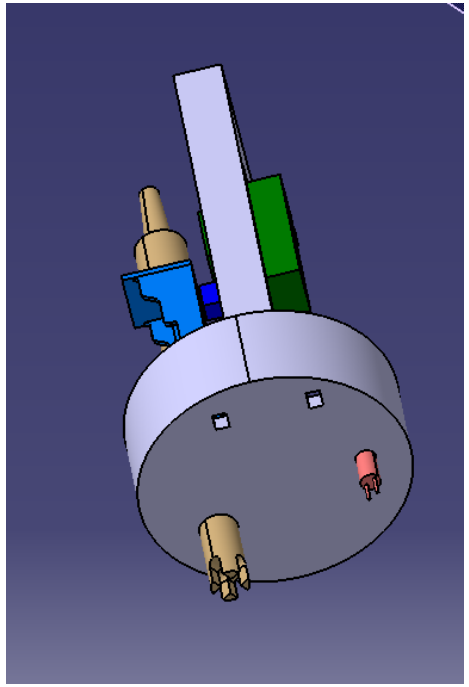
- Charges battery
- Supplies power to circuit when solar is producing enough energy
- Charge circuit disconnects at night and the battery takes over as power source
- Lithium-Ion batteries can be connected in parallel if both batteries are identical

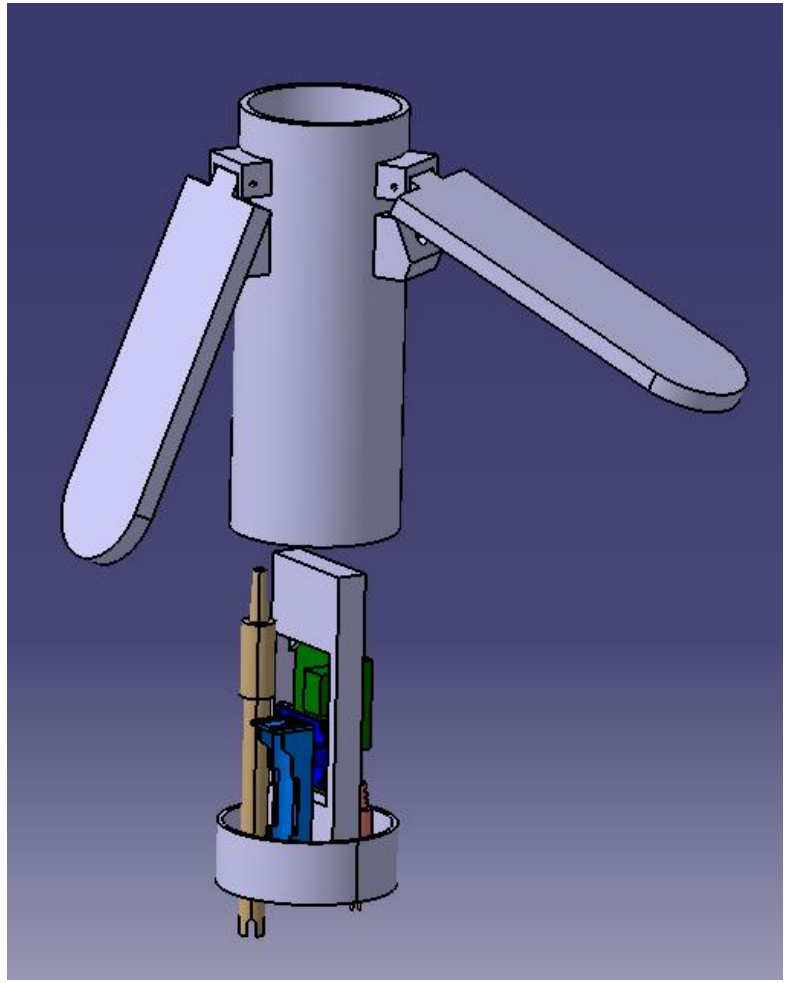


MODEL UPDATES

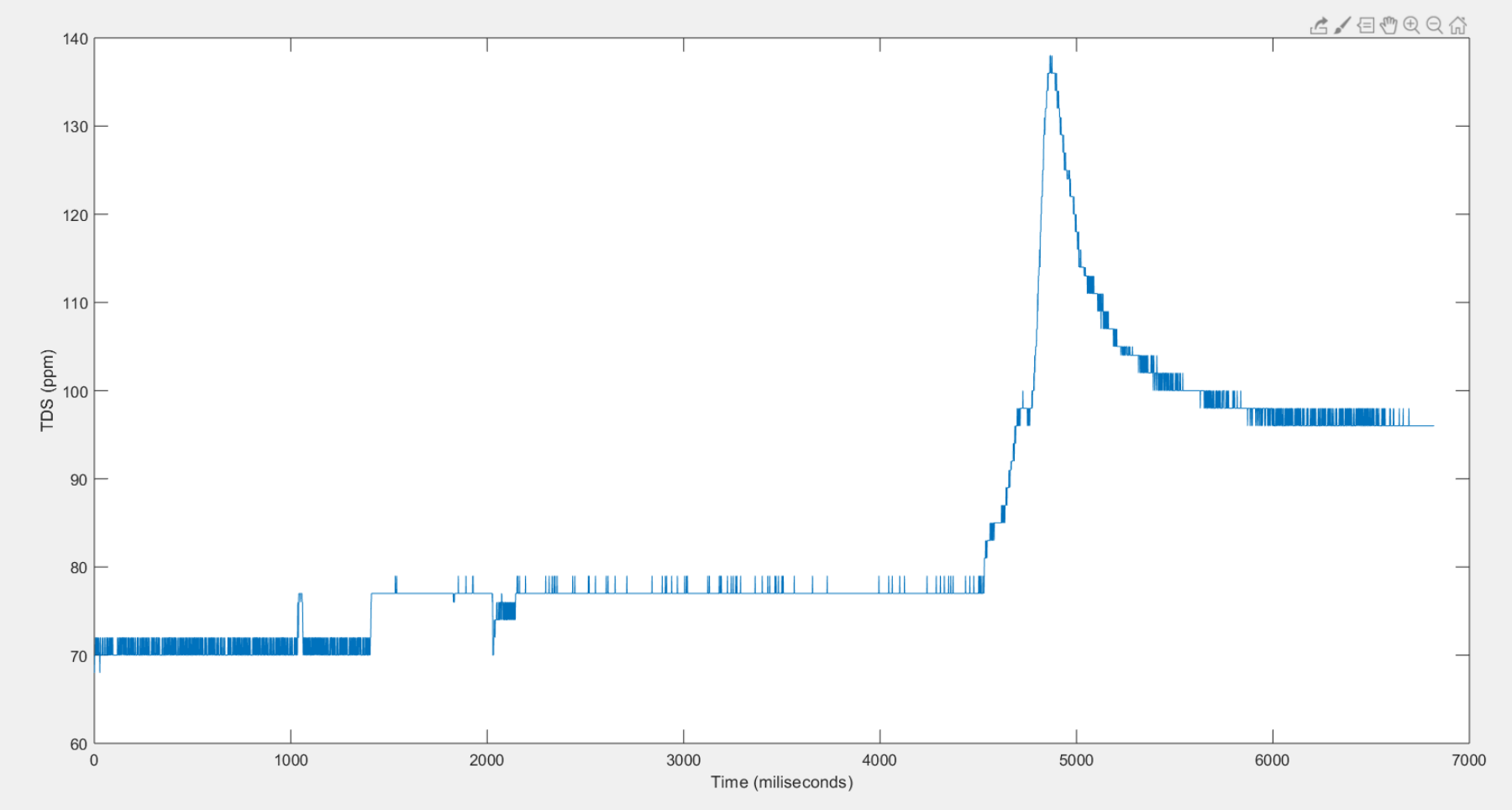








TDS SALT EXPERIMENT



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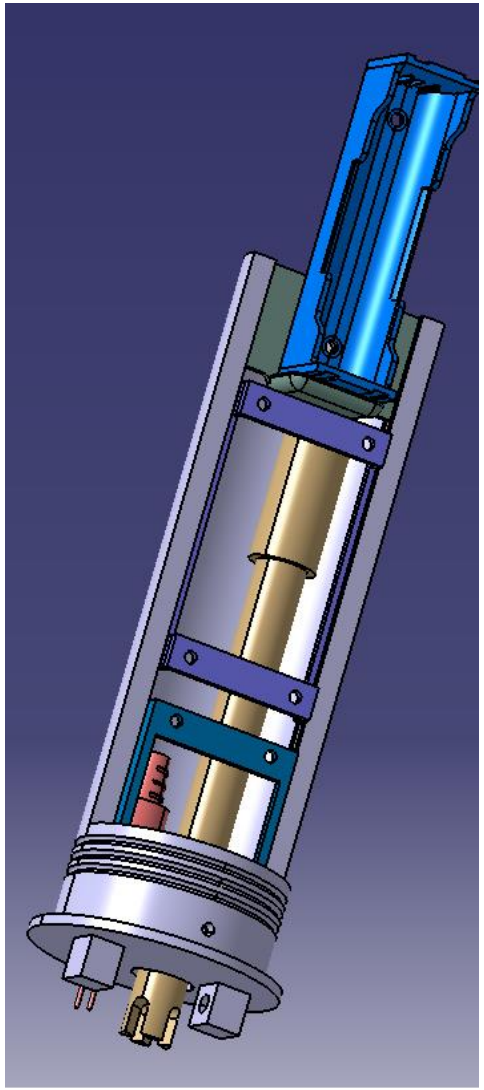
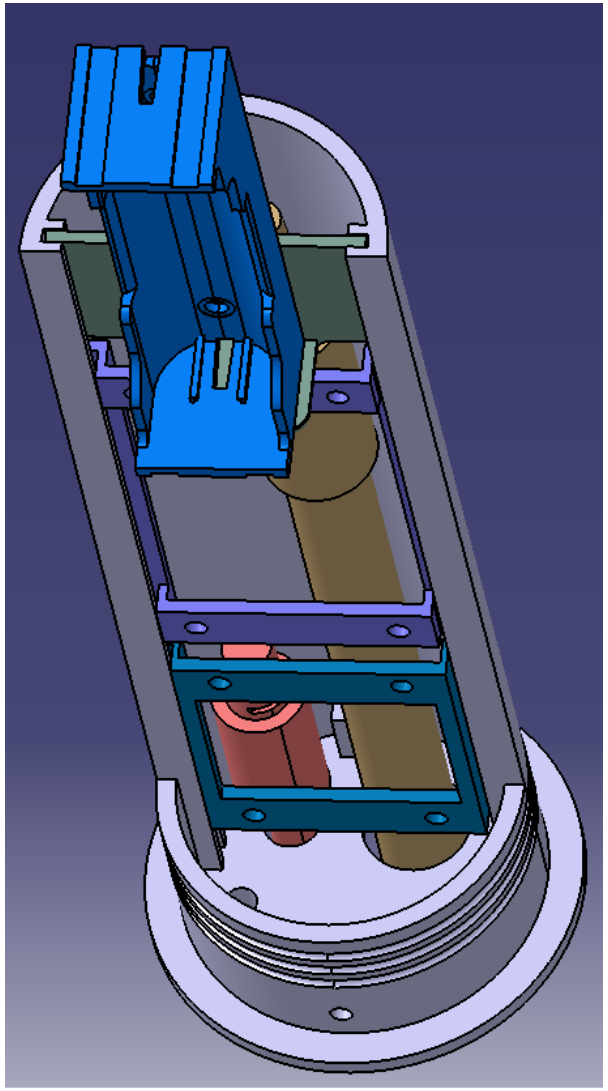
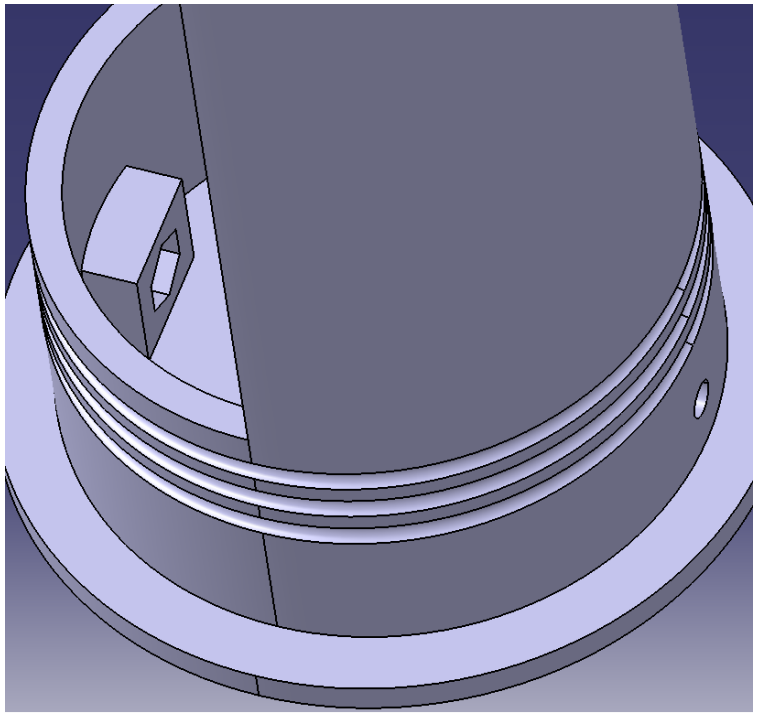
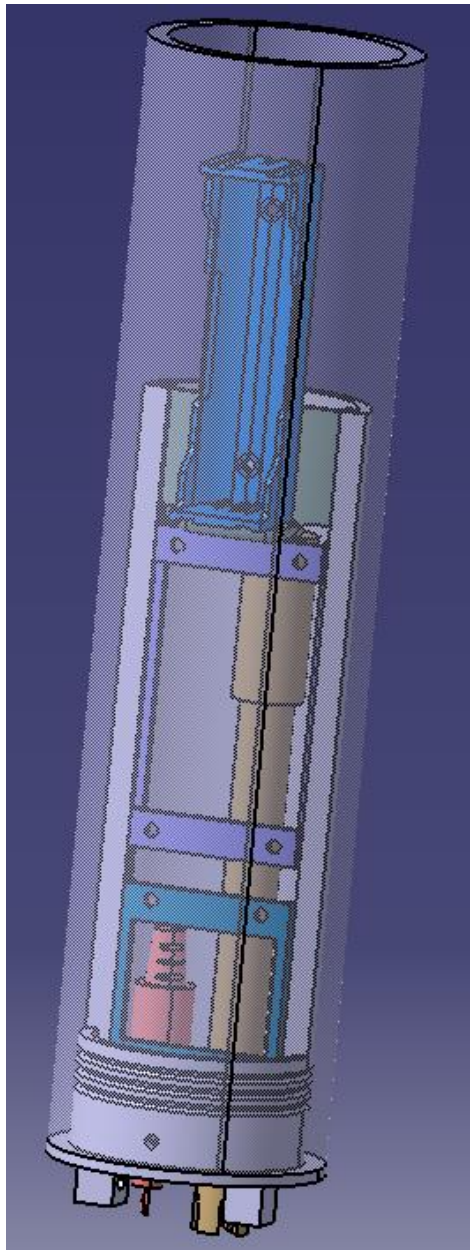
UPDATED COMPONENT TRAY









3/15/2022

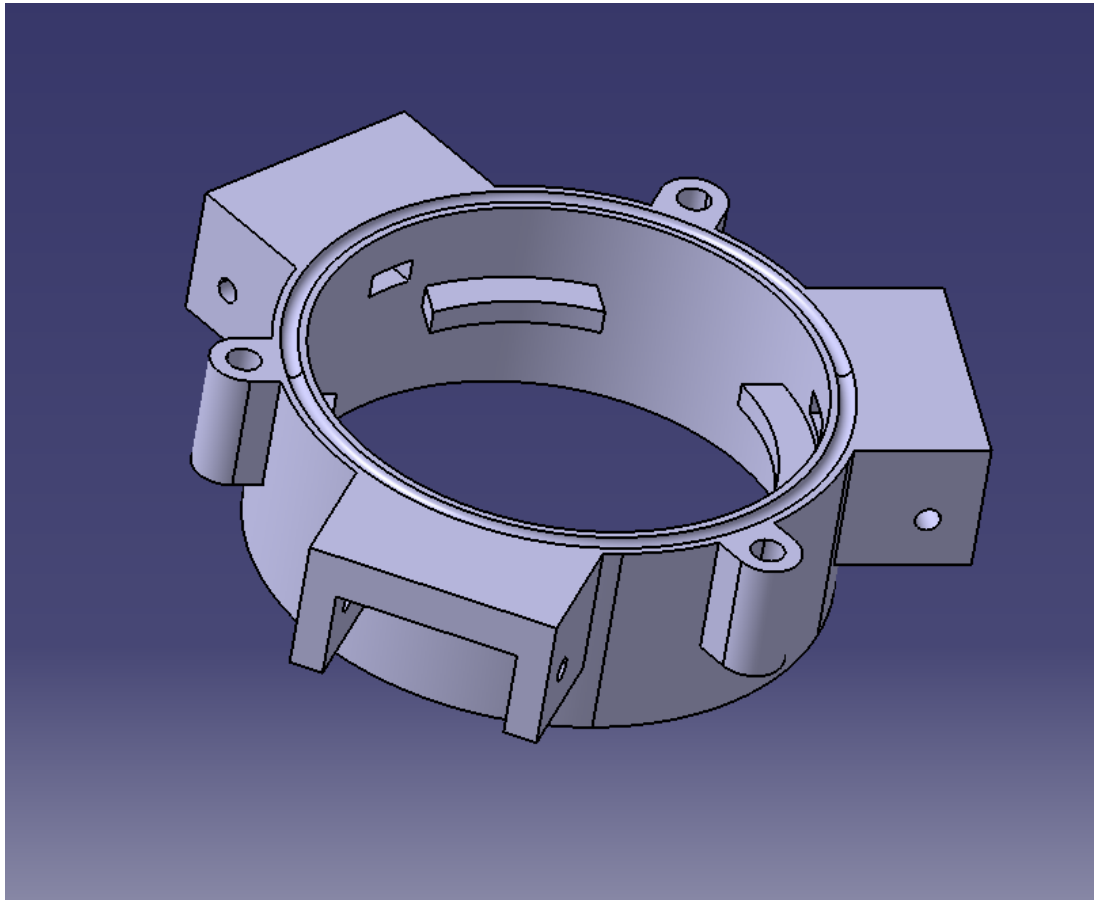
Updates:

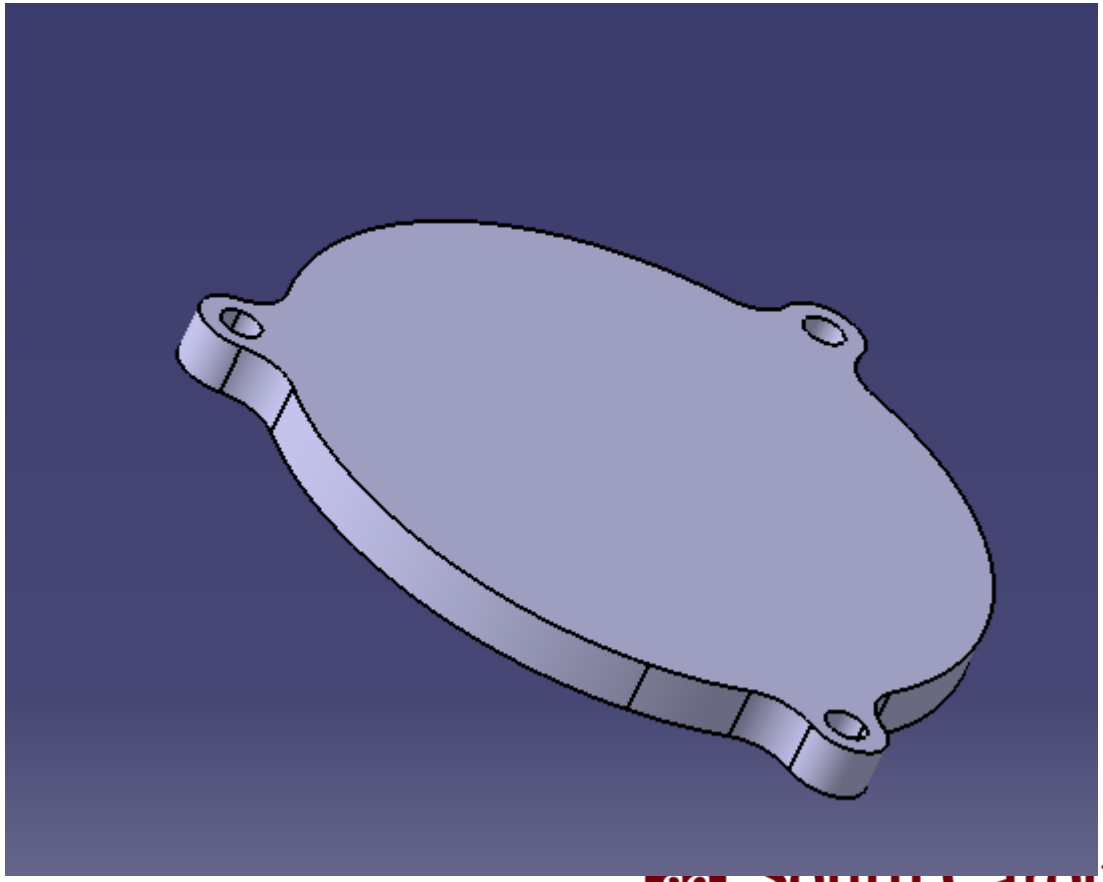
- Redesigned component holder
- Redesigned water proof solar panel petal holder and cap
- Test fit components in the component holder
- Collected parts for solar charging

Goals:

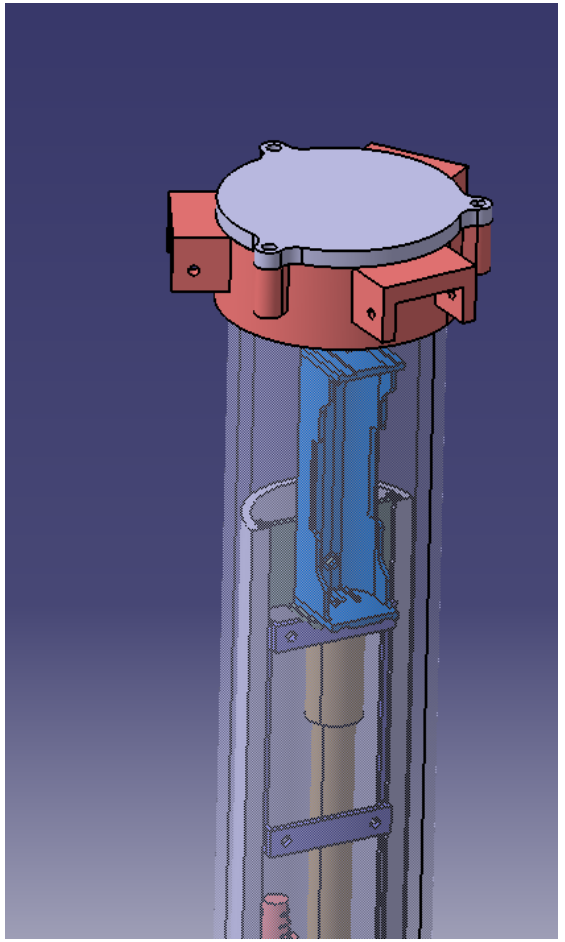
- Create initial standalone solar battery charger

SOLAR PANEL HOLDER AND TOP CAP





ASSEMBLY



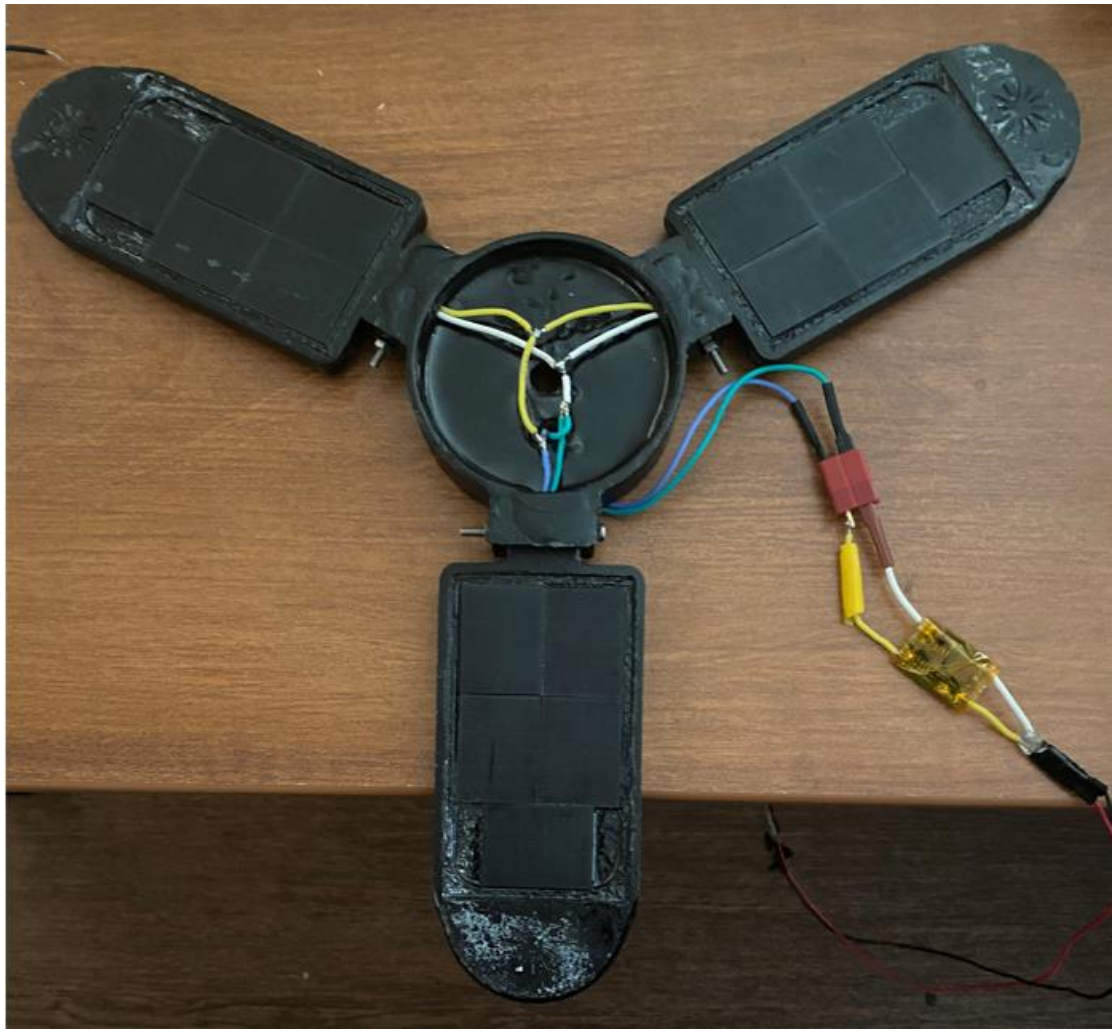
3/29/2022 SOLAR UPDATE

- Current and voltage reading from solar panel
- Current and voltage reading from solar panel with voltage step down
- Current and voltage reading from solar panel with voltage step down and bms
- Reviewing Daniels design

SOLAR PANELS

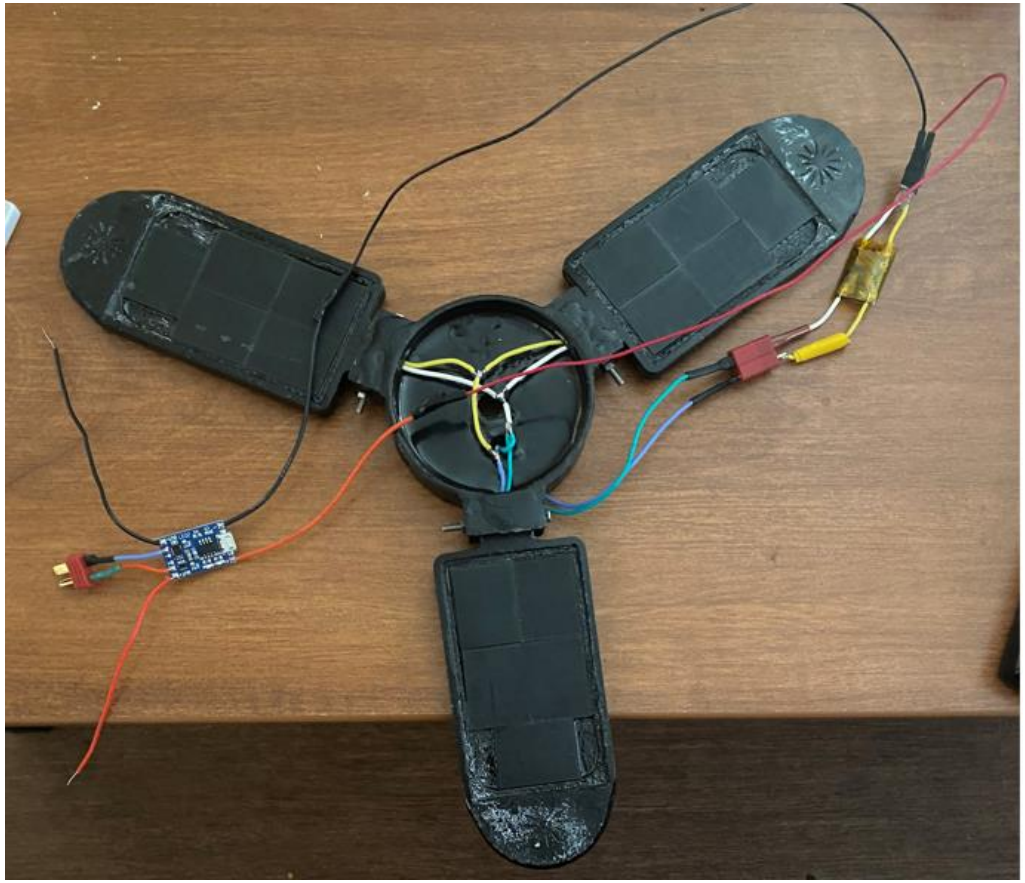
- Voltage : 16V
- Current : 40mA

SOLAR PANELS WITH VOLTAGE STEP DOWN



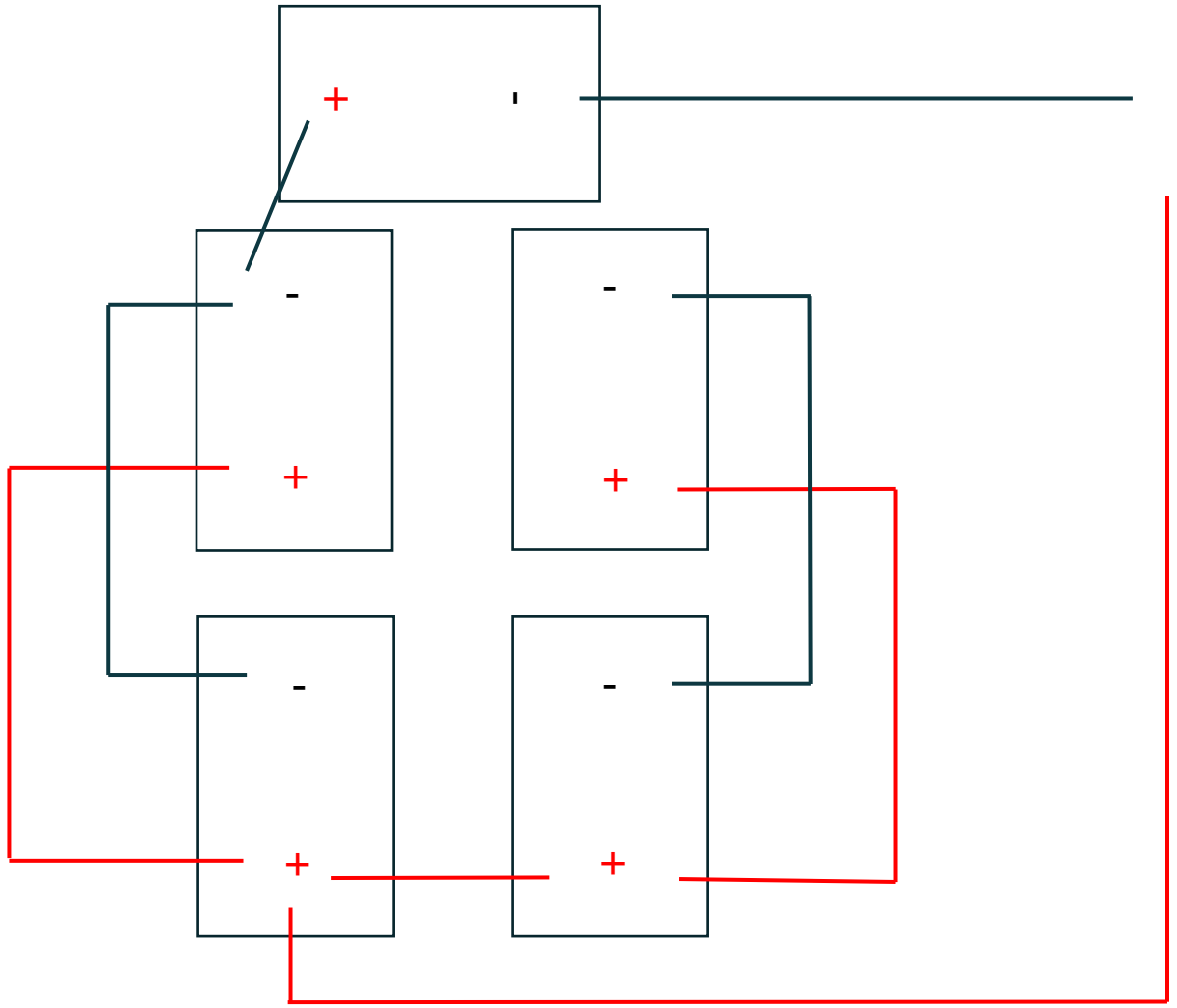
- Voltage : 5V
- Current : 160mA

SOLAR PANELS WITH VOLTAGE STEP DOWN AND BMS



- Voltage : 4.2V
- Current : 33mA

WIRING FOR PANELS



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INDIVIDUAL SOLAR CELL INFORMATION

Individual Cells Specs

- Power : 132.3mW
- Voltage : 8.29 V
- Current : 21 mA

18 cells in parallel

- Voltage : 8.29V
- Current : 378mA

Battery Specs

2.3 Standard Charge (Refer to 4.1.1)	Constant current	0.5C (1700mA)
	Constant voltage	4.2V
	End current(Cut off)	50mA

Would need 42 cells to achieve standard charge rate

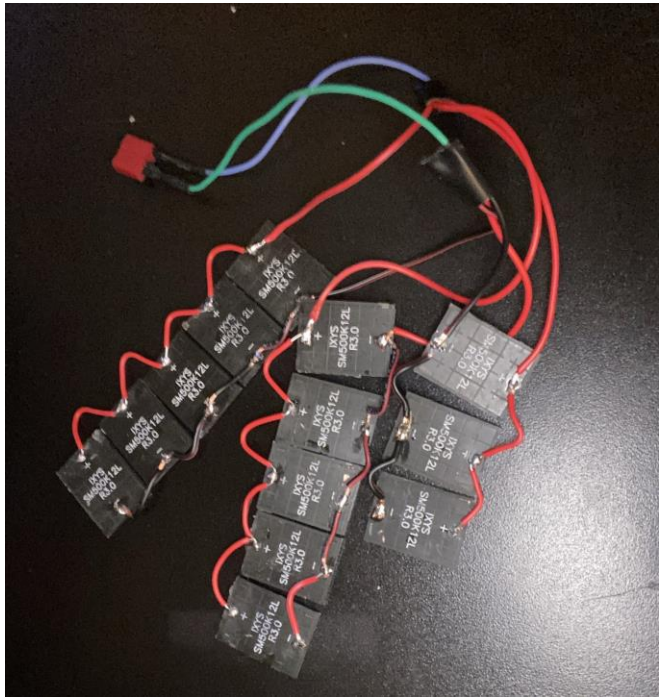
4/5/2022

New updates

- Removed solar panels from epoxy to resolder and test
- Pulled information on package power consumption

Future plans

- Run test on fully charged 18650 to set a baseline for how long it will sustain the package for
- Run test with solar charging added to see the impact it has on battery life
- Design a probe protector for the bottom of the package
- Create probe mounting cap out of PVC
- Waterproof the 3D printed solar panel flap holder or make it out of solid plastic as well
- Make the cap to the solar flap holder out of metal



SOLAR CELLS

- 2 cells were damaged while removing from epoxy and cannot be used
- The remaining cells were wired in parallel and produce 7.4V and 157mA
- Arudino nano power consumption: 19mA
- TDS power consumption: 3 – 6mA
- Ph power consumption: 3 mA

4/12/2022

New updates

- Solar charging circuit has been soldered together with connectors

Future plans

- Run test on fully charged 18650 to set a baseline for how long it will sustain the package for
- Run test with solar charging added to see the impact it has on battery life
- Design a probe protector for the bottom of the package
- Create probe mounting cap out of PVC
- Waterproof the 3D printed solar panel flap holder or make it out of solid plastic as well
- Add metal piece to the solar cap for magnet
- Add in Air tag holder to solar cap
- Redesign solar flap for new solar panel arrangment

THANKS!

Name

Title

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