



# The Solar Sailors Present

The Affordable  
Pyranometer Prototype



# Objective

**Affordable**

**\$20-\$80**

**User Friendly**

- Instruction manual and parts list
- Commented code
- High school level knowledge base

**Accurate**

- Large field of view (180 degrees)
- Provide a 0 - 5 Vdc control signal
  - 0 W/m<sup>2</sup> , to 2,000 W/m<sup>2</sup>
- Compares to a calibrated pyranometer.
  - +- 15%

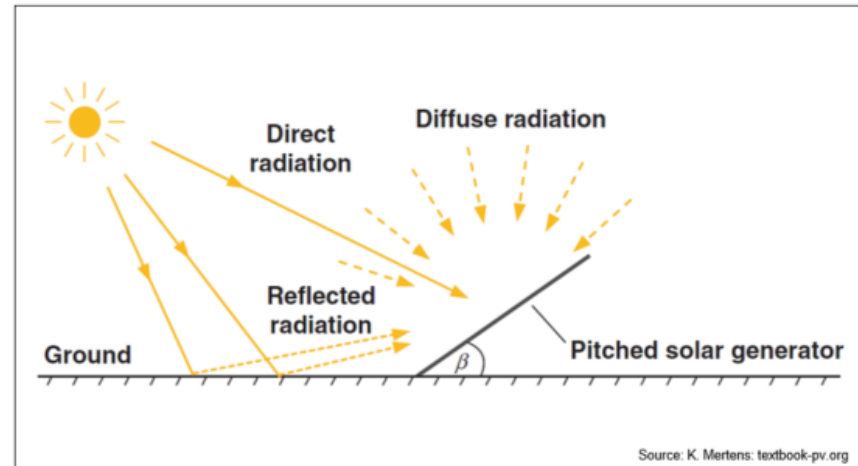
# Value Proposition



KILOWATTS  
FOR HUMANITY

# Back ground: What is a pyranometer?

- Measures how much energy from the sun is hitting a planar surface
  - Solar irradiance ( $\text{W}/\text{m}^2$ )
- Uses:
  - Photovoltaic system monitoring
- Types:
  - Thermopile
  - Silicon photodiode



# Why are we designing one?



KILOWATTS  
FOR HUMANITY

- Commercial pyranometer cost: ~\$200
- We are looking to provide our sponsor with an affordable alternative



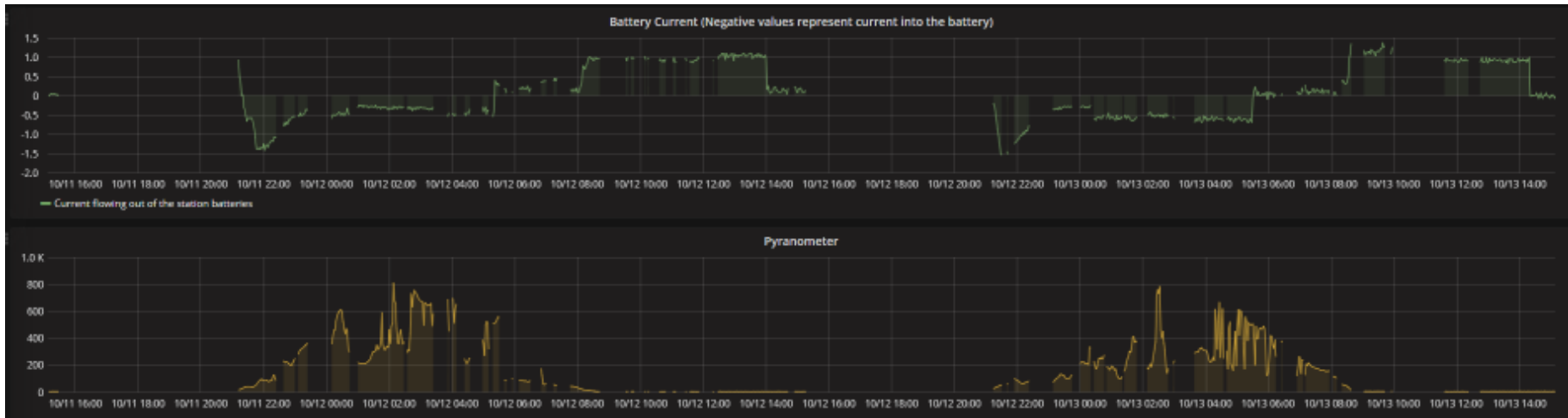
## Current Pyranometer



SP-215-SS: AMPLIFIED 0-5 VOLT  
PYRANOMETER

\$273.00

# Filibaba Zambia 1.8kW charging station



<http://kw4h.org>

# Our goal

**Affordable**

**\$20-\$80**

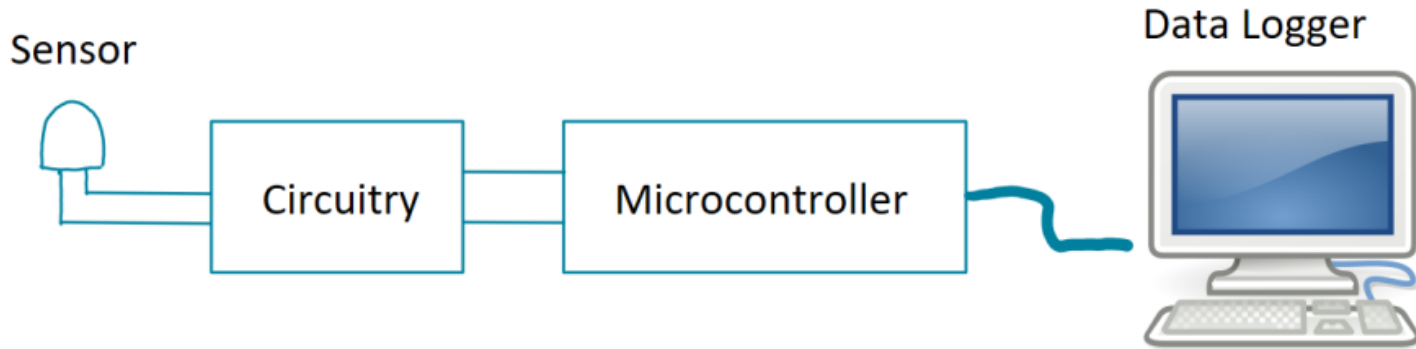
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# Our plan

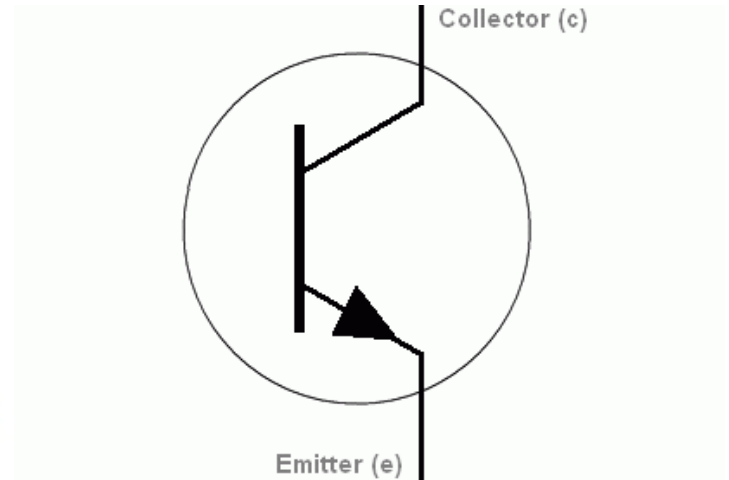




# The sensor

## Phototransistor

- Light Sensitive BJT
- Capable of turning light energy into electric energy
- Our sensor
  - SFH 3310
  - 150 degree viewing angle



- Sensitivity
- Why this sensor?

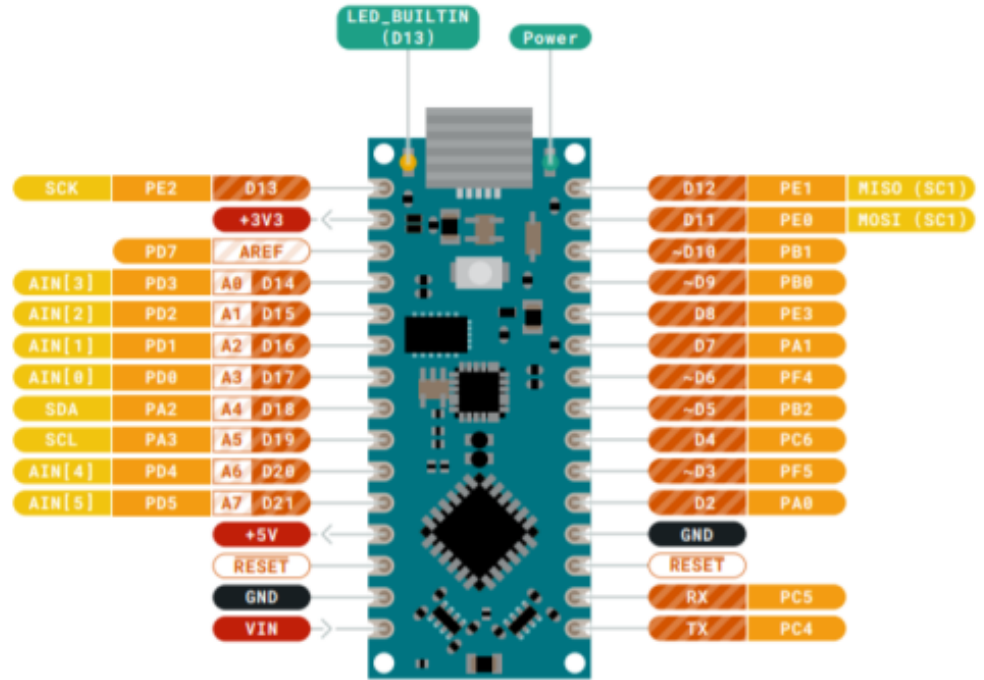
# The circuitry

Update

# The microcontroller: The Arduino Nano Every

Inputs: A1-A7

Outputs: +5V, A0/DAC, PWM



# Why This Microcontroller?

- Why?: Cheap & easy ;)
  - Customer support
- Dimensions: 15 X 45 mm
- Date sheet...

# PWM vs DAC

Recommendations and justification for which concept will be the most successful path moving forward.

- Nick's project

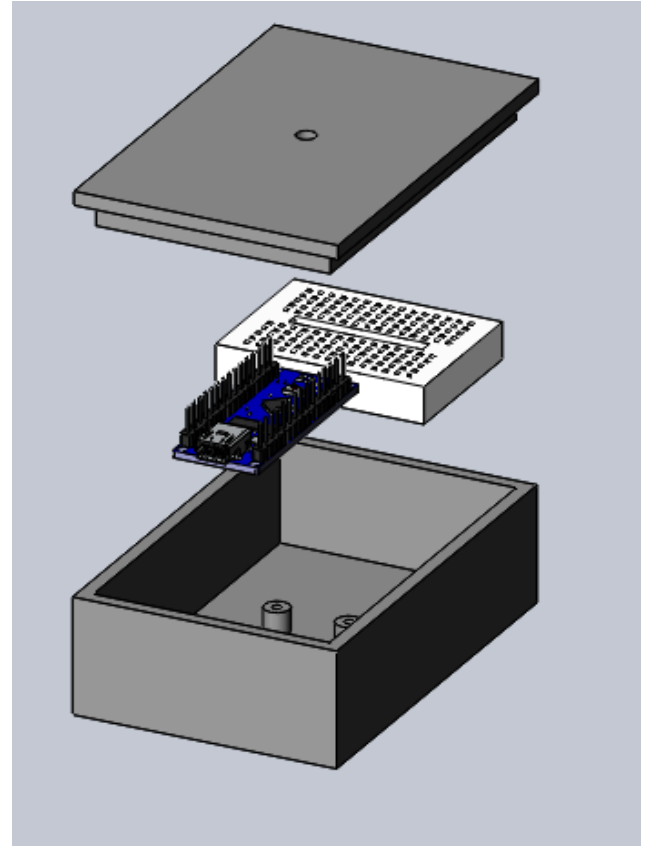
# Testing

- Pyranometers to compare with



# The case

- 3D printed made of PETG
- Currently relies on a snap fitting with plans to update to use fasteners.
- Plans on keeping particles larger than 1mm out and be water resistant.



# Our Budget

- Update
- Per unit cost

# Moving Forward

- Add a voltage to current converter
  - Desired output should be in current
- Construction and testing of our first prototype
- Research and test the viability of using two sensors for a better result

