Solar/Battery Power System

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**Interface Control Document**

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Interface Control Document

for

Solar/Battery Power System

Team <16>

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# Overview

This document provides more detail on how the subsystems will interface together to achieve the system’s goals. It will list all of the dimensions, weights, inputs, and outputs descriptions. It will describe the interaction between the current and voltage sensors and the microcontroller (MCU), as well as the communication through WiFi between the microcontroller and the android app / computer website.

# References and Definitions

## References

# IEEE 802.11

# Standard for Wi-Fi Networks

## Definitions

MCU Microcontroller Unit

VME VERSA-Module Europa

TBD To Be Determined

DC Direct Current

AC Alternating Current

# Physical Interface

## Weight

* + 1. **Weight of the Solar/Battery Power System**

The entire Solar/battery power system, including the solar panels, will weigh no more than 70 pounds This allows one or two people to easily move the solar/battery power system into a desired location. The weight also ensures the system’s durability and stability after being mounted. **Table 1** below shows the weight of each component.

| **Component** | **Weight** |
| --- | --- |
| Solar Panel | Est. 60 lbs |
| DC-DC Buck Converter | TBD |
| DC-AC Inverter | TBD |
| Microcontroller | TBD |
| Battery | TBD |

**Table 1.** *Solar/Battery Power System Weight Specifications*

## Dimensions

* + 1. **Dimensions of the Solar/Battery Power System**

The Solar panel and battery will stand alone, but the other subsystems will fit into a 1ft by 1ft box to provide protection against outside factors. **Table 2** below shows the dimensions of the components.

| **Component** | **Length** | **Width** | **Height** |
| --- | --- | --- | --- |
| Solar Panel | Est. 5’8” | Est. 3.5’ | 6” |
| DC-DC Converter | TBD | TBD | TBD |
| DC-AC inverter | TBD | TBD | TBD |
| Microcontroller | TBD | TBD | TBD |
| Battery | TBD | TBD | TBD |

**Table 2.** *Solar/Battery Power System Dimension Specifications*

## Mounting Locations

**3.3.1. Placement of Solar/Battery System**

The solar panel needs to be mounted in a location that faces the sun or has access to the sun for the majority of the day. This constraint allows for the system to be mounted onto the ground or even to a wall with a few tools. It is suggested to mount the system onto a falter surface to obtain optimal harnessing and operation.

# Thermal Interface

**4.1. Thermal Shielding of Microcontroller**

The microcontroller will be shielded from direct sunlight from within a box that should be mounted onto the solar panel. This architecture, along with an internal fan, will secure the longevity of this device.

**4.2. Cooling of Battery**

The battery will be air cooled under the solar panel. The heat generated by the battery should be able to dissipate on its own.

# Electrical Interface



**Figure 1.** *Block Diagram of Solar/Battery Power System*

## Primary Input Power

## Microcontroller

The system design is intended to be autonomous and self-powered; the microcontroller will be powered by a 12V battery which is charged by the solar panel. The amount of capacity will be determined by the amount of charge throughout the day to the battery and the usage of the loads.

## Voltage and Current Levels

* + 1. **Maximum Values**

| **Component** | **Voltage [V]** | **Current [A]** | **Power [W]** |
| --- | --- | --- | --- |
| ESP32 | 3.3 | 0.5 | 1.65 |
| Current Sensor | TBD | TBD | TBD |
| Battery | 12V | TBD | TBD |

**Table 3.** *Maximum Voltage and Current Levels*

The current being drawn by the other components is not significant. The values of the table above are per second for power consumption at max power usage.

## Signal Interfaces

The signals interfaces are the signals from the microcontroller to the DC to DC converter in the form of PWM, the frequency is to be determined. Additionally, The input to the microcontroller comes from the voltage and current sensors.

## User Control Interface

There will be two different user interfaces, an Android App and a Website. Both of these applications will display the same data from our system allowing the user to view the data being collected by the internal sensors in real time. Specifically, the data consist of the voltage, current, power, and power harnessed from the sun throughout the day.

# Communications / Device Interface Protocols

## Wireless Communications (WiFi)

The microcontroller has a built-in Wi-Fi module using the IEEE 802.11 g/b/n standards. This connection will be used to send sensor outputs to the user database.