**Boston University**

**Electrical & Computer Engineering**

**ClearSol**

**Second Prototype Test Report**

By Team 29

ClearSol

Team Members

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**Equipment:**

Hardware:

* Raspberry Pi
* INA219 Current Power Sensor
* Solar Panel Assembly & High Power LED Light
* ‘Power Supply’ Switch box
* 6V DC Power Supply
* Relay HAT
* 7 Segment LCD Display
* Renogy Wanderer Solar Charge Controller
* 12V Lead Acid Battery
* Buck/Boost Converter
* Buck Converter
* Resistor

Software:

* Python:
  + Gets data from INA219 Current Power Sensor
  + Initializes LCD Display and prints voltage and current data
  + Reads from the GPIO pins to determine the position of switch for the EDS
  + Activates the relay to turn on and off the dummy EDS

**Set-Up:**

The essence of our prototype testing is to utilize the circuit we currently have assembled as well as demonstrate activation of the circuit through both power coming in from the panel (as demonstrated with our high wattage LED lamp) as well as with a direct supply of power fed into the circuit through our power supply. Since the circuit is still a prototype, it is not yet installed into the interior of our cooler assembly, however it is functionally all as if it were. This should not affect performance.

We will additionally be demonstrating that the solar panel can charge a connected battery and power a connected load. This will be a separate demonstration, since we have yet to incorporate these two systems together.

**Discussion:**

The measurements taken during the testing were the current and voltage out of the solar panel. The measurements varied due to the light intensity added on to the solar panel. We demonstrated the readings from our monitoring system in three different conditions. The first condition was when the panel was receiving no light that the readings to the monitoring system were low in range for both current and voltage (~0.005 mA and 0.0 V). The second condition was testing the solar panel under bright light conditions to prove that the monitoring system is able to read the current and voltage out of the solar panel (~125mA and 1.86V). The third condition was to test under both conditions by turning the light on and off and have the monitoring system be able to show the current and voltage under these conditions.

The other measurement taken during the testing was to show that the charge controller is able to charge the battery with the solar panel and that it is able to power the dummy load, simulating the power draw from the EDS (1W at 12V). The charge controller displayed appropriate power management, where it would charge the battery when the panel is exposed to light. Also, the DC-DC converters displayed appropriate voltage levels at their output, providing 12V to our dummy load.

We are happy to say that our testing was successful, and that our system is functioning properly, both in hardware and software, at this stage of development. At this stage, the next step on our end are the implementations of the supercapacitors and installation of the storage rack. Given the capacitors have an integrated charging circuit, we expect it to be as easy as connecting it to our circuit. Unfortunately we have yet to receive the EDS film or its power supply, but we will have the 12V DC connection to a dummy load, to serve as a proof of concept. We do not expect the integration of these circuit components nor the upcoming removable rack to be an issue.

We did have a problem during the presentation in which the rubber had not been stripped off one of the wires connecting to the solar charge controller. This prevented a connection and as a result we had to strip it down a few more millimeters in order to demonstrate functionality. Although this is fairly trivial in the grand scheme of things, we intend to double check all of our connections to ensure that does not happen again, even for the prototype circuit we have now.