

Final Project: Solar Powered Charger Station

System Requirements

- 1. Customer Requirement:** The system display updated solar information.
Engineering Requirement: The system must display characteristics (Isc, Vopen, Pmax) of the operation of the solar panel. These characteristics must be updated whenever a calibration button is pressed by the user.
- 2. Customer Requirement:** The system must be safe.
Engineering Requirement: The system must use MC4 connectors, have a disconnect switch, and not have any exposed conductors. Wires must be organized in the split loom or other protective materials.
- 3. Customer Requirement:** The system should charge a larger slower battery with energy harvested from the solar panel.
Engineering Requirement: The charging of a [sealed lead-acid battery](#) should be based on a lead-acid battery charging curve. Information about the charging process should be output to the user. The minimum information given to the user should be present battery charge (+/- 1000 Coulombs), battery terminal voltage (+/- .2 volts), and charging current (+/- 100 milliamps).
- 4. Customer Requirement:** The system should charge smaller batteries from the energy stored in the larger battery.
Engineering Requirement: The system must be able to charge an [Li-ion](#), [NiCad](#), or [NiMH](#) battery. The linked batteries are only for reference. The size and chemistry are not specified for the battery, but the system must have options for selecting the correct battery chemistry and demonstrate the correct operation for at least 1 battery chemistry.
- 5. Customer Requirement:** The system shouldn't catch fire.
Engineering Requirement: The temperature of each battery in the system must be measured and displayed. Reported temperatures must be +/- 5 degrees F. The system will disconnect all solar cells and batteries if the temperature exceeds 113 degrees F.
- 6. Customer Requirement:** The system should be USB capable
Engineering Requirement: The system needs to be able to communicate with USB-A devices and supply appropriate power that is desired by the device. Be able to switch between USB 2.0 and USB 3.0/3.1 speeds.
- 7. Customer Requirement:** System stats should be available through an app.
Engineering Requirement: The app should display battery temperatures, charging progress of the lead-acid battery and solar panel characteristics. The app should send push notifications when protections are tripped (the system shuts down) as well as when battery charges are full.