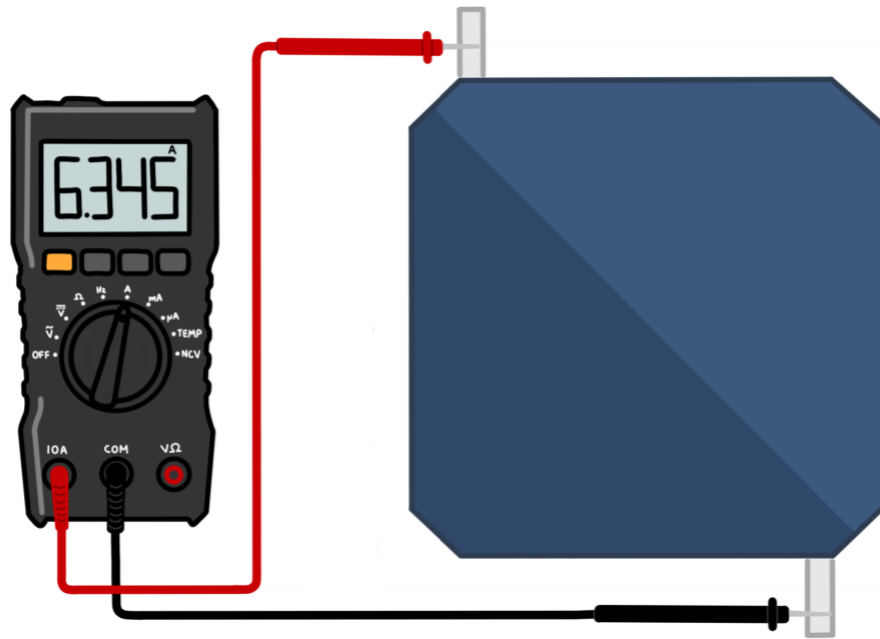


Multimeter Measurements

The following section describes how to measure short circuit current, open circuit voltage, and resistance of a solar cell module with a multimeter. These instructions are modeled off of a LIUMY LM5005 digital multimeter, but most standard multimeters operate on similar principles.

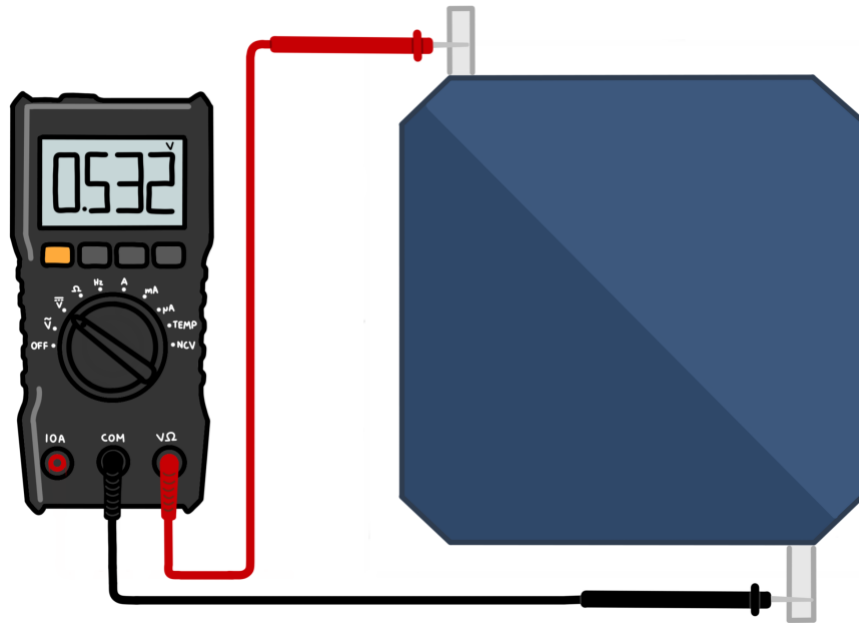
Short Circuit Current, I_{sc}

Short circuit current measurements should be performed outdoors in sunlight. To set up the multimeter, put the black jack in the COM port and the red jack in the 10A port. Set the multimeter dial to A. Touch the multimeter leads to opposite ends of the module. Reverse the leads if the multimeter reads a negative current. Note that performing this measurement creates a short circuit through the cell, so the circuit loop should not be kept closed for very long. In other words, do not hold the leads of the multimeter to the wires longer than necessary after obtaining a reading. If the module is not yet mounted on the car, try measuring I_{sc} of the module in different conditions – i.e. midday sun, low sun, module flat, module normal to the sun – to get a comprehensive overview of the module performance.



Open Circuit Voltage, V_{oc}

Open circuit voltage measurements should be performed outdoors in sunlight. To set up the multimeter, put the black jack in the COM port and the red jack in the V port. Set the multimeter dial to V. Touch the multimeter leads to opposite ends of the module. Reverse the leads if the multimeter reads a negative voltage. Again, try measuring V_{oc} of the module in different conditions. Observe that V_{oc} is not as drastically impacted by angle of incidence and irradiance as I_{sc} .



Resistance

Resistance measurements should be performed in complete darkness. Cover the cells to prevent any light from reaching them and turn off any nearby lights if possible. Put the black jack in the COM port and the red jack in the V Ω port. Touch the multimeter leads to opposite ends of the cells or module.