

#604 Solar, Batteries, Uses & Applications

Off-Grid Solar Systems

AGENDA

What - An Overview

What-What? The components

When - Does it make sense?

Why - do I have to do math?

How - do I get one of those?

LAB

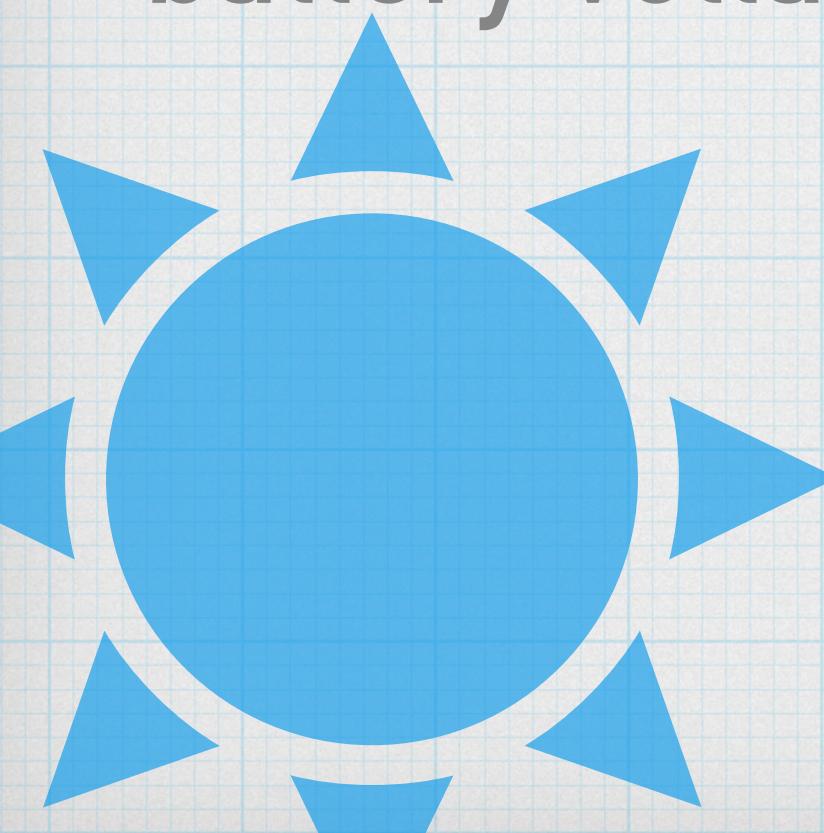
Overview Solar Power System

Solar Panels - Collect Energy from the Sun, even on cloudy days

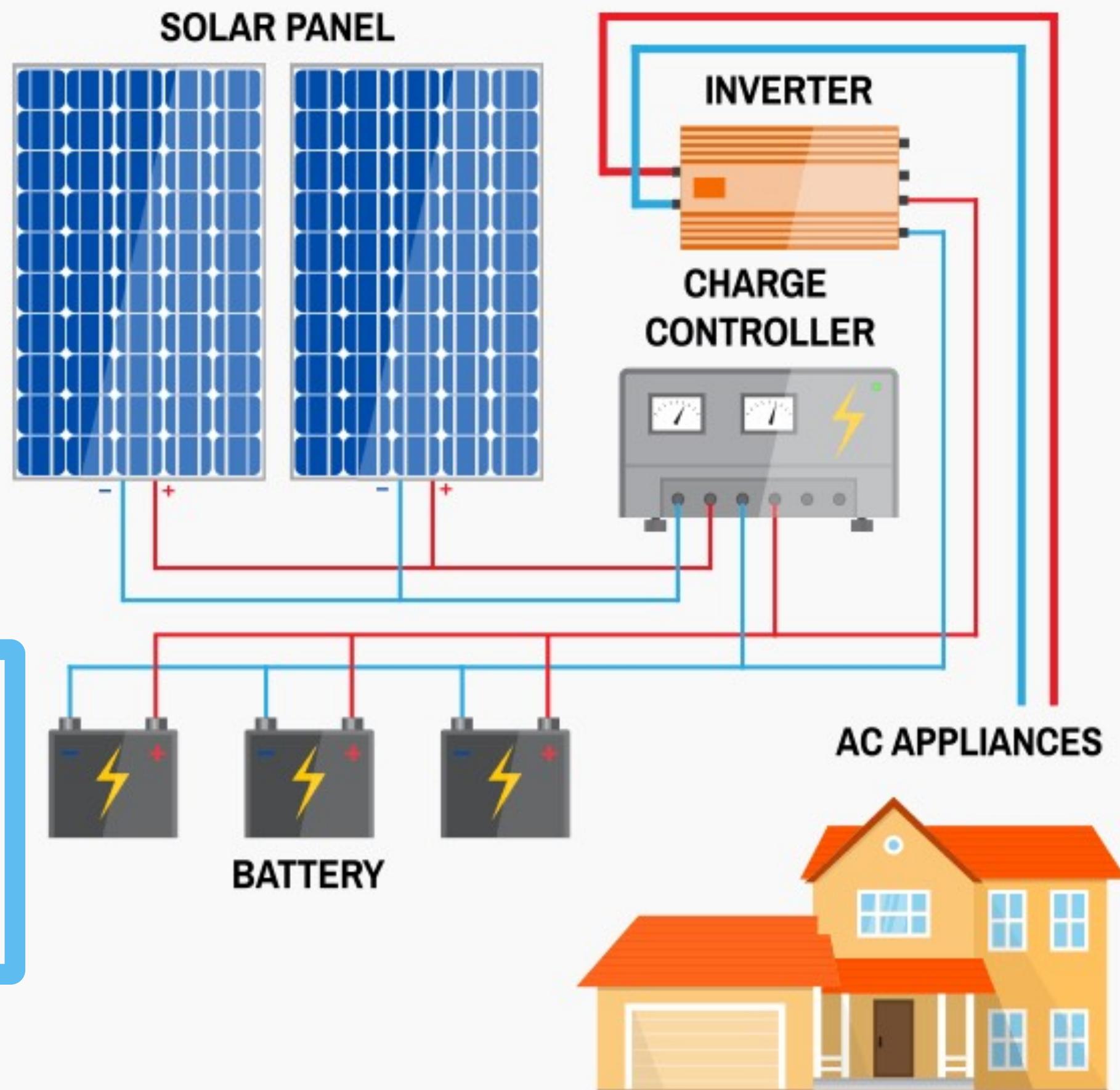
Batteries - Store & Release Energy

Charge Controller - Manages Solar Charging and in some cases manages output to load.

Inverter - If you need to convert from DC battery voltage to AC: you need an inverter



"LOAD" is
the
devices
you power



Start with the end in mind: what are you powering?

Solar Panels

Usually come as big rectangles with main purchasing options: POWER, VOLTAGE and SIZE

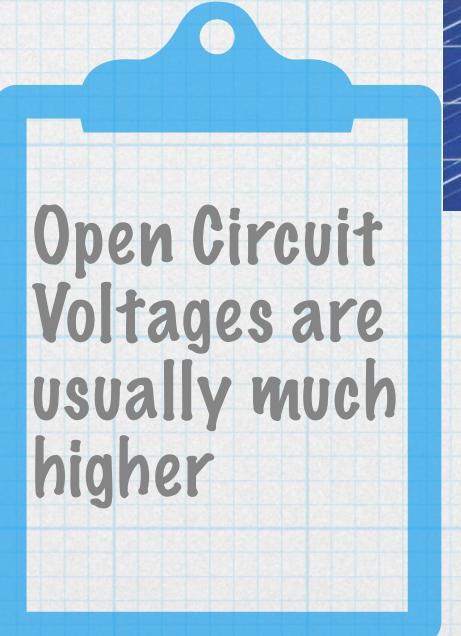
Power (P:IE) Ratings from 10W to 400W

- Power (Watts) = Current (Amps) x Volts

Most panels have ~30-36 cells with operating voltages 19V-24.5V

41.8"x20.9"/50.2x26.8/58.7x26.8/65x26.4, etc.

Built-in charge controller? Connectors?



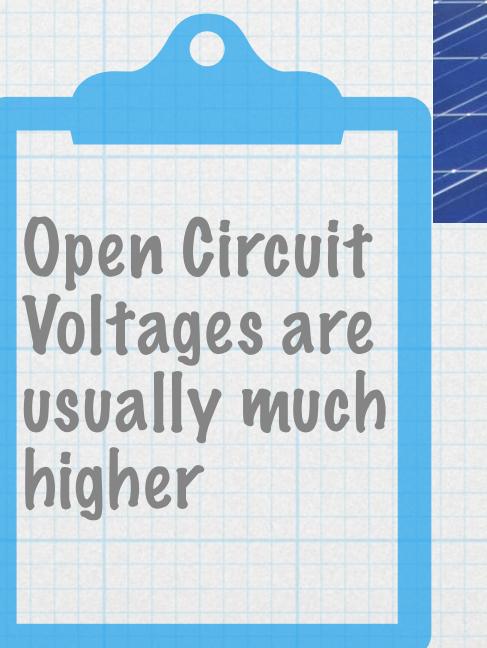
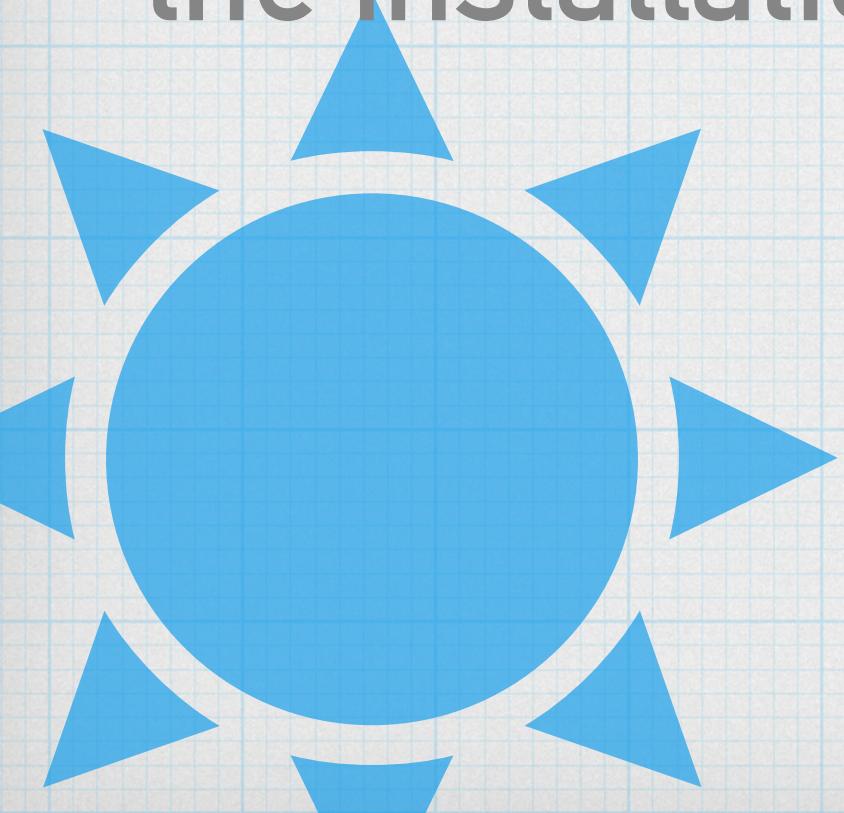
Solar Panels

Installation

Sizing - Panel sizing and mount vary by manufacturer and model

Tilt - Most small systems use a fixed mount tilt based on location - In this area use 39 degrees

Connectors - “Solar Panel Connectors” - or keep it simple and maintainable based on the installation location.



Batteries

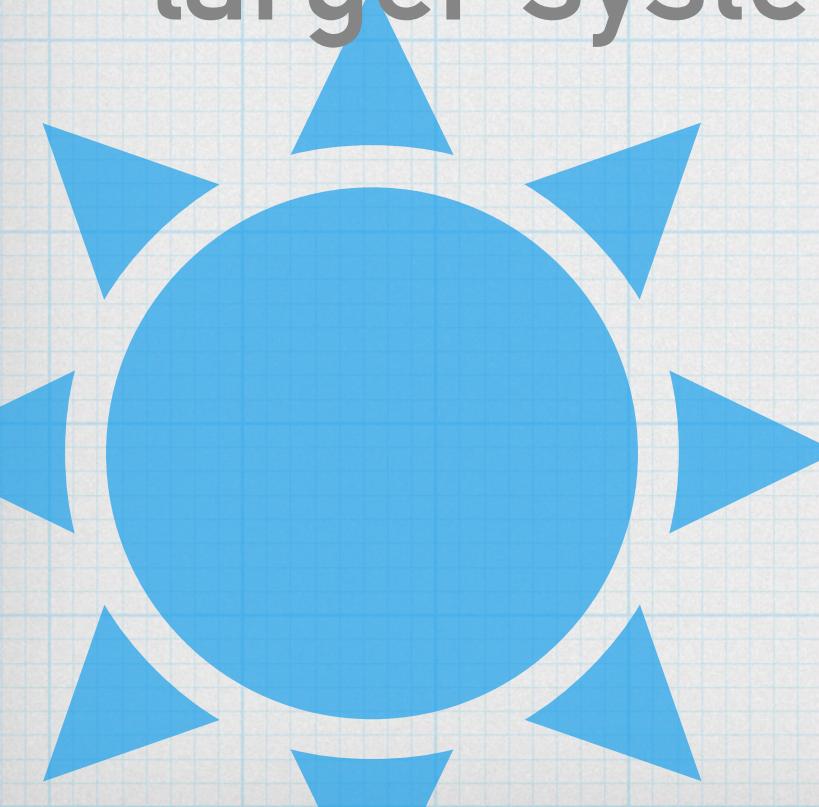
Fancy Batteries = Expensive and Complex

Low cost installation include AGM, GEL and SLA 12 Volt batteries

Systems with multiple batteries should be the same size/capacity.

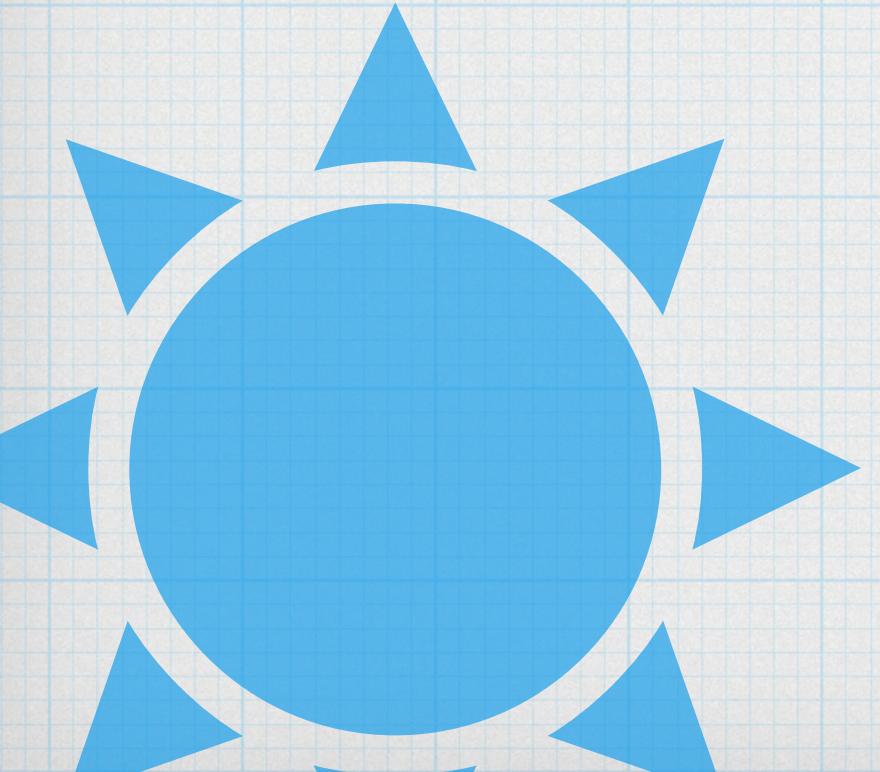
Usually batteries are wires in parallel, but larger systems are series-parallel

Installations that need to be light are usually LiFePO₄ type batteries but requires a programmable charge controller



Check Point

Knowledge Test ..

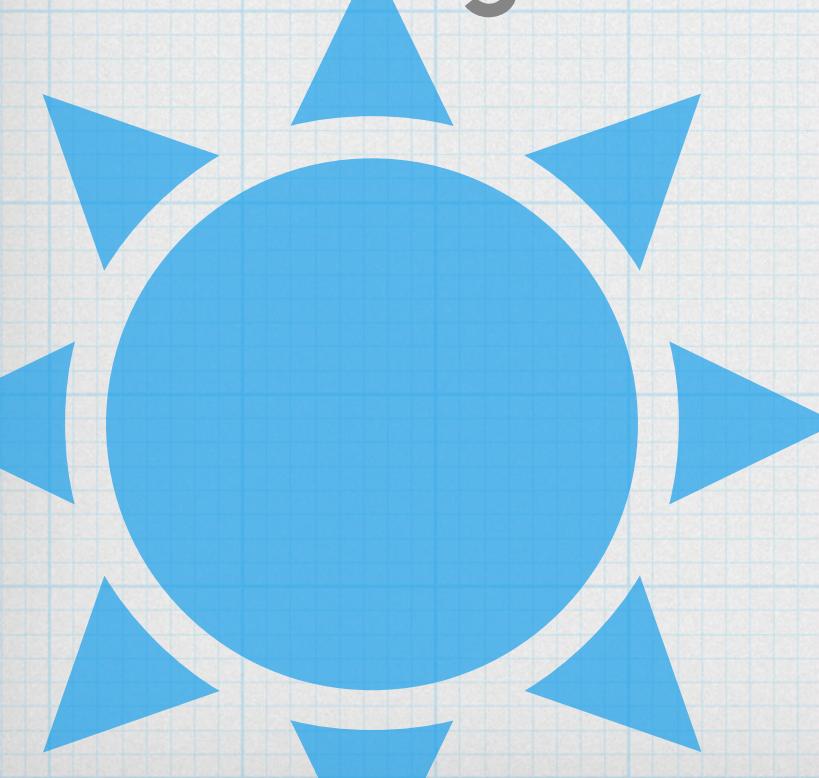


Charge Controllers

Fancy Charge Controllers = Expensive and Complex

Simple (PWM) charge controllers usually only work on lead acid type batteries and require no configuration outside of wiring.

Mid-range controllers (MPPT) needed for reliable operation will require some basic settings to be adjusted before operating.



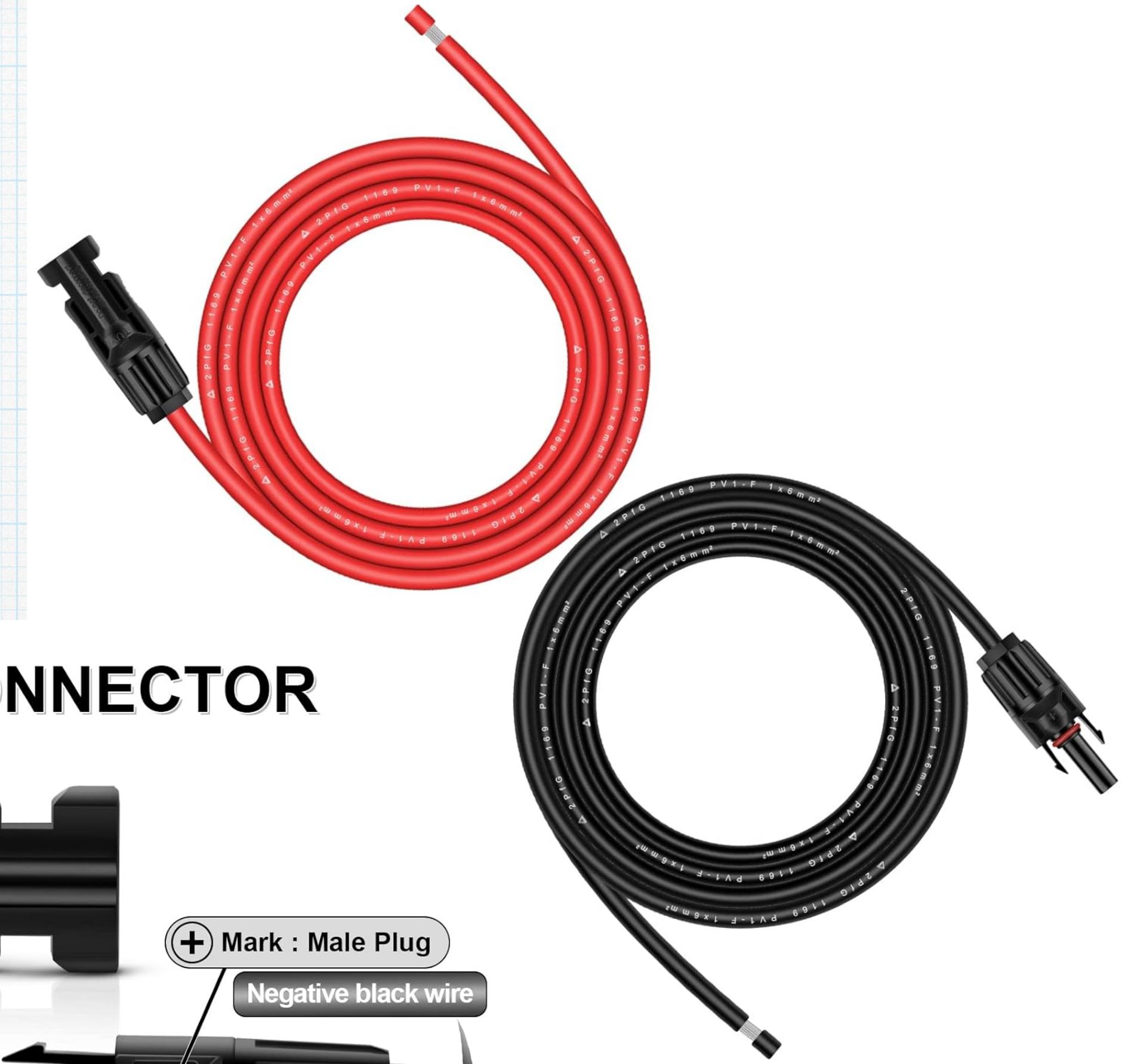
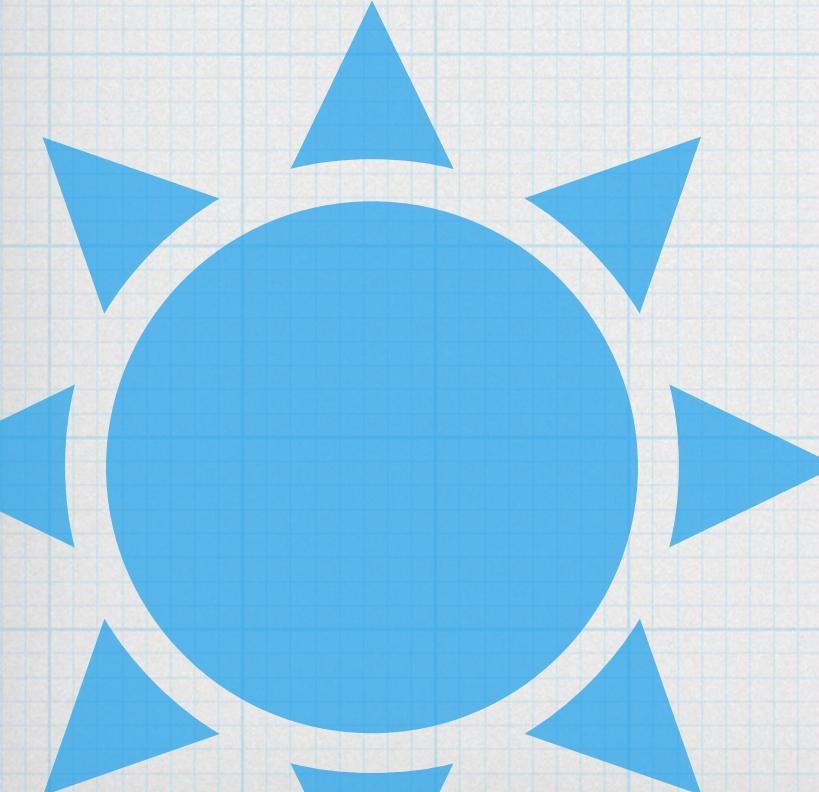
Some systems only charge batteries, some have built in load-control



Connectors and Wiring

Know your DC electronics - If you work on vehicles stick to the same voltages, polarities and wire color coding... or just read the manual.

Red goes to Red, Back goes to Black... Red is positive or "+" and black is negative or "-"



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- Build the system to diagram
- Measure input voltage
- Measure output voltage
- Calculate total daily generations of panels (if properly installed)

