# Summary

The purpose of this document is to outline various connection methodologies for connecting Legion Solar to your home or commercial building's electrical system. Before you start to produce energy, it is important to understand some specifics about your electrical system so that you select the most appropriate connection method for your needs.

Grid Energy Basics

The fundamentals of electric power transmission has not changed since 1890. A power station generates electricity by inducing current through motors. Voltage is stepped up to thousands of volts and transmitted long distances to your city. Near your home, a transformer then converts the high voltage down to 110VAC or 230VAC (depending on your local standards).

Power Plant — Step-up Transformer — Tower — Local Distribution — Step-down Transformer — Home or Business
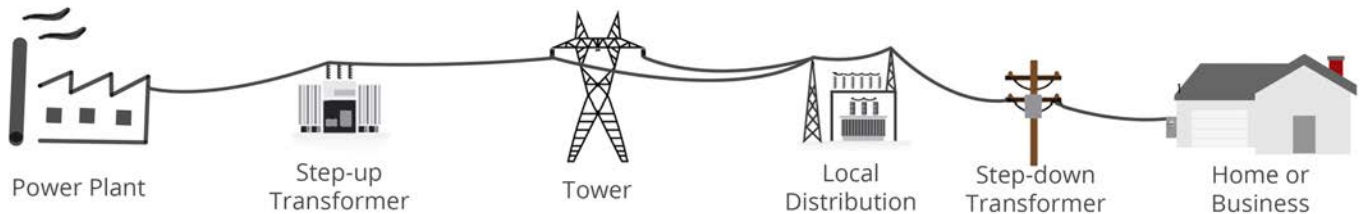
Electric power comes into your home via 3 wires. Neutral, Hot Phase A, Hot Phase B. Wires can come from overhead or underground.
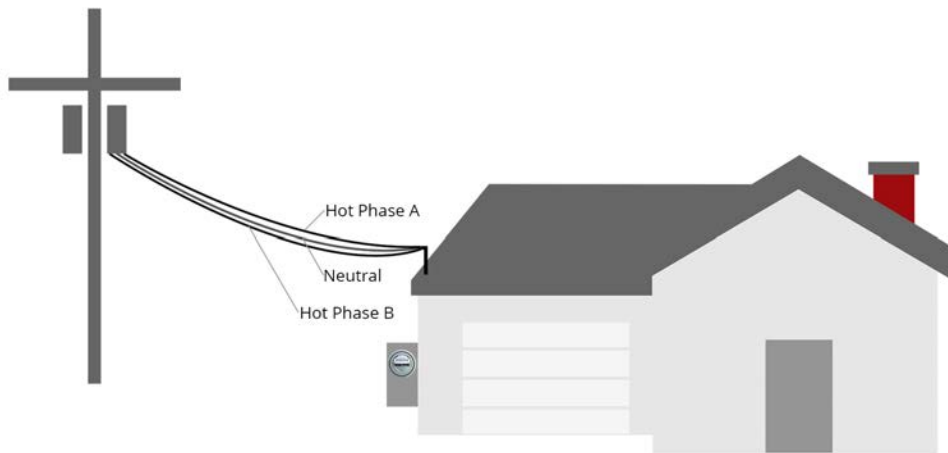
When a circuit is activated (such as a light source or appliance), current flows, energy is consumed and your utility meter measures your energy consumption. The energy consumed from phase A and B are added together to determine your total consumption where by your utility company bills you for energy used.
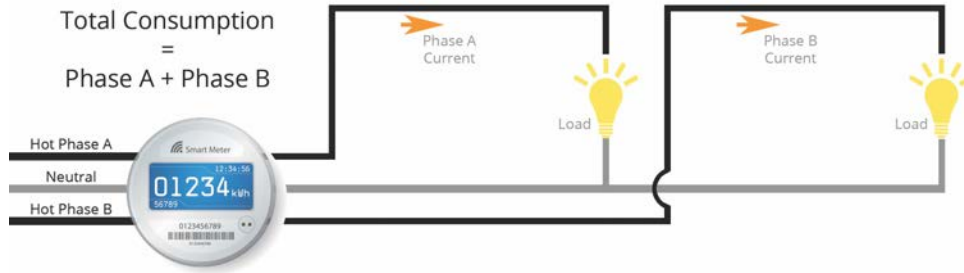
Home/Business Electrical Distribution

On your side of the meter, there exists a main circuit breaker and branch circuit breakers for phase A and B. In an electric power system a circuit breaker is an over-current device where the device opens the circuit automatically on a predetermined current rating to prevent the excessive generation of heat and the risk of fire or damage to equipment.
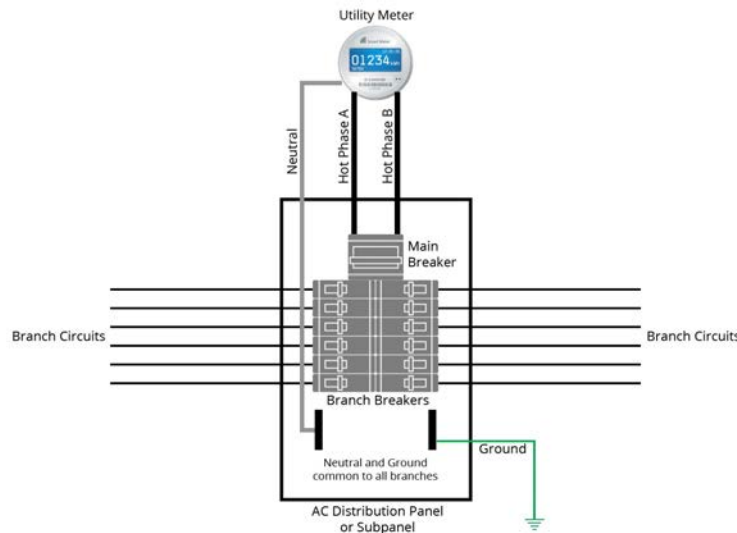
Branch Rules

Circuit Breaker Amp Rating ≥ (Solar Max Watt Generation / 110) + Sum of all Loads in Amps
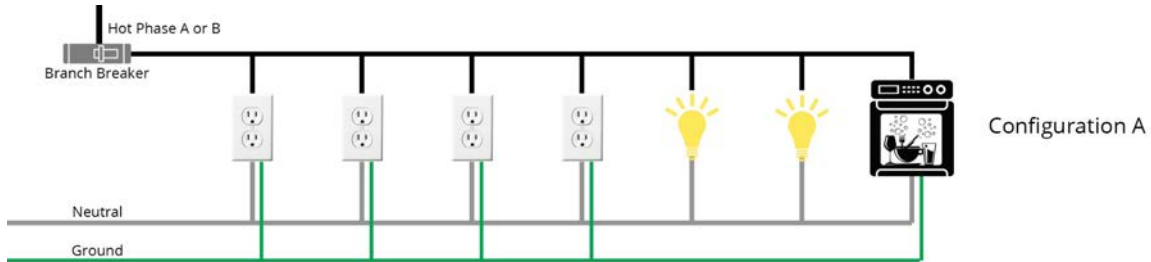*If branch voltage is 230VAC, substitute 110 with 230

⚠WARNING   Violating branch rules may pose a risk to fire or damage to equipment.

Branch Circuit Selection

Home/business branch circuits are connected to loads in varying configurations. This section illustrates the pros and cons for selecting branch circuits for connecting Legion Solar.

Configuration A - Is a <u>terrible choice</u> for a Legion Solar branch circuit because it contains too many loads. The mixture of receptacles, lights and appliances makes this branch circuit difficult to predict loads. Appliances such as dish washers, laundry machines draw high levels of current that could subject this branch to a high probability to violating the branch rules during solar production.
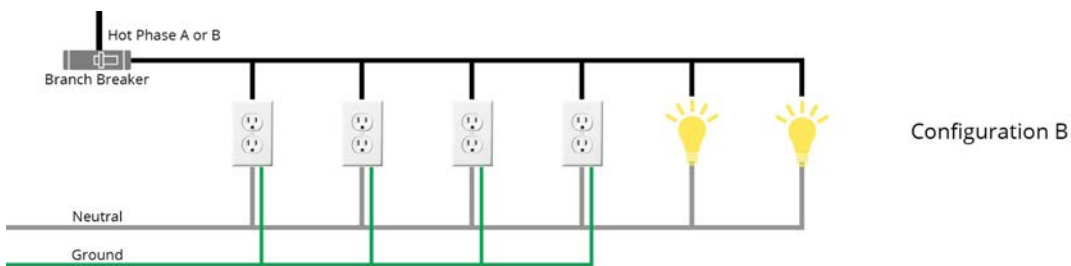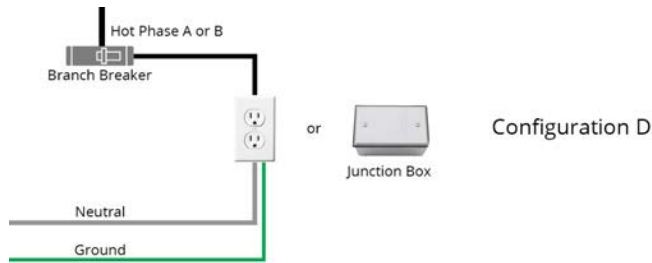

Configuration B - Is a <u>poor choice</u> for a Legion Solar branch circuit because it contains a mixture of lights and receptacles. If lights are not energy efficient this branch has a moderate probability to violating branch rules during solar energy production.
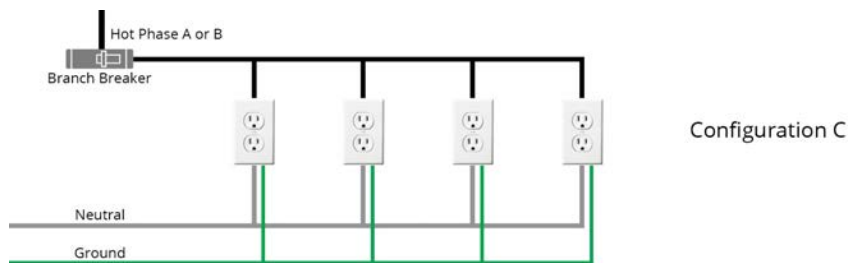
Configuration C - Is a <u>good choice</u> for a Legion Solar branch circuit because it only contains receptacles. Each receptacle can be individually protected using the methods described in (Configuration C Provisions below) to address the possibility of violating branch rules.

Configuration D - Is an _ideal choice_ for a Legion Solar branch circuit because it contains only one receptacle (or junction box) tied to a dedicated circuit breaker eliminating the possibility of violating branch rules. If you have unused slots in your distribution panel, an electrician can configure this setup at a relatively low cost.
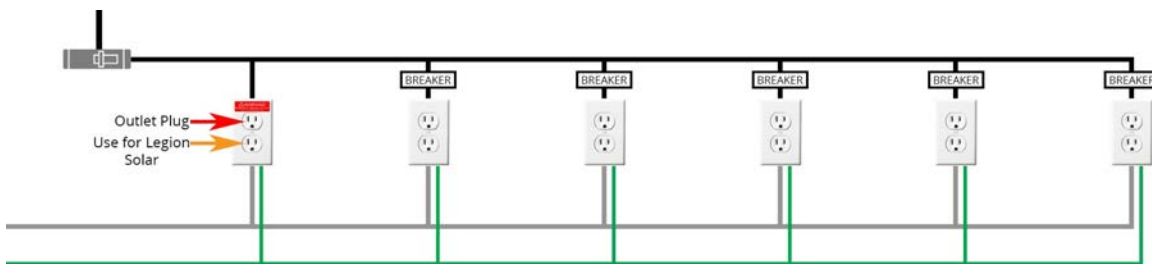
Configuration C Provisions

Option A - Install outlet plugs on unused receptacles.
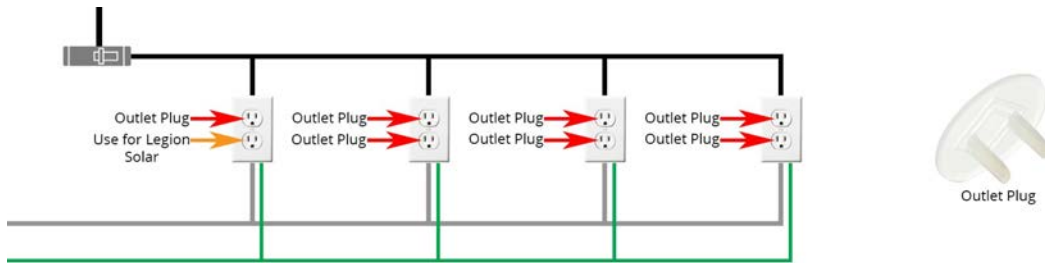
Option B - Signage on the receptacles.

Option C - Install receptacle breakers.

Receptacle breaker amp rating is calculated with the following formula.

Receptacle Amp Rating = (Branch Breaker Amp Rating - (Solar Max Watt Generation / 110)) / Number of Receptacles
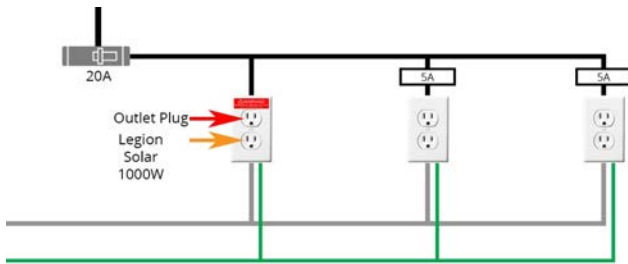*Substitute 110 with 230 if branch is 230VAC

Example: If you have a 20A Branch Circuit breaker on 110VAC, your Legion Solar system size is 1000 Watts, and you have 2 receptacles. Each SubBreaker is calculated as follows:

Receptacle Amp Rating = (20A - (1000W/110)) / 2
Receptacle Amp Rating = 5.5A
*Use SubBreaker current rating equal to or less than calculated value

See Technical Document Branch Breaker Installation for details.
www.plxdevices.com/legionsolarbranchbreakerinstall

Option D - Smart Electronics

With the advancement of home automation technologies, a receptacle timer can be programmed to switch on at sunset, and off at sunrise making that receptacle usable only during non solar production times to eliminate the possibility of violating branch rules.

Option E - Combination
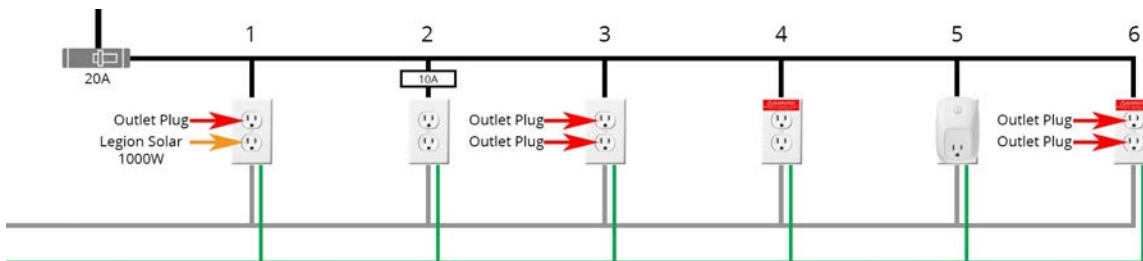
Any combination of the above options can be used to custom design your branch to meet your specific needs.

Example:
Receptacle 1 - Used for Legion Solar, other slot plugged
Receptacle 2 - 10A receptacle installed for use anytime
Receptacle 3 - Outlets plugged
Receptacle 4 - Outlet labeled for nighttime use only
Receptacle 5 - Outlet set on a smart timer for nighttime use only
Receptacle 6 - Outlet plugged and labeled for nighttime use only

3rd Party Helpful Tools

Circuit Breaker Finder
Locate the correct circuit breaker or fuse without turning off the power.

Ground and Outlet Tester
A useful tool for plug and play AC installation to test and validate your outlet's connection for proper ground, hot and neutral wiring.

Live Wire Tester
A useful safety tool to verify that your wires are not energized before you start working on them.

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