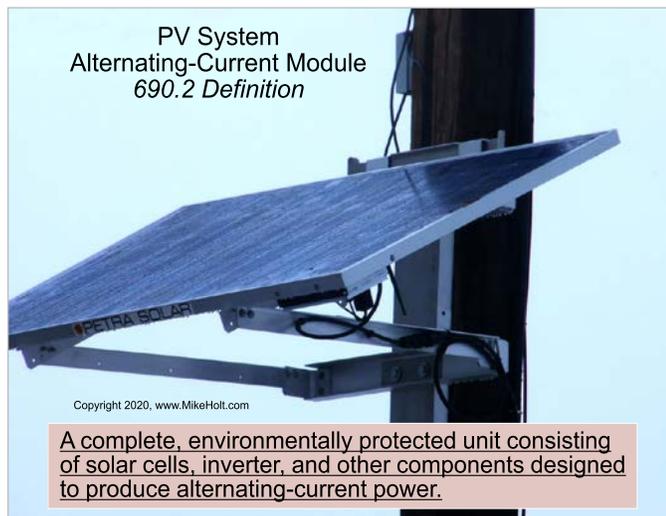


## 690.2 Definitions

The definitions in this section only apply within this article.

**Alternating-Current Module System.** An assembly of ac modules, wiring methods, materials, and subassemblies that are evaluated, identified, and defined as a system.

**Alternating-Current Module.** An ac module is a complete, environmentally protected unit consisting of solar cells, inverter, and other components designed to produce alternating-current power. ▶Figure 690-8



▶Figure 690-8

### Author's Comment:

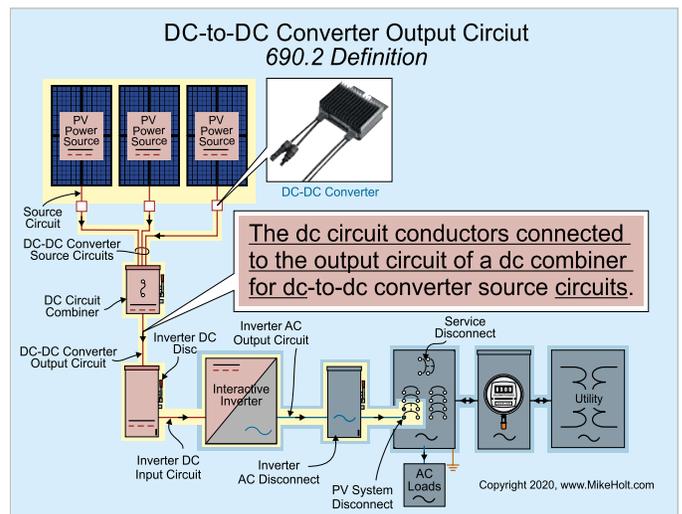
- ▶ Alternating-current modules are connected in parallel with each other and in parallel with the electric utility in an interactive mode. These modules operate interactively with the electric utility meaning that the ac output current from the ac module will cease exporting power upon sensing the loss of voltage from the electric utility.
- ▶ Manufacturers' instructions for ac modules will specify the size of the dedicated branch circuit on which they are to be connected and the maximum number of ac modules permitted on the branch circuit.

**Array.** An array is a mechanically and electrically integrated grouping of modules with a support system, including any attached system components such as inverter(s), dc-to-dc converter(s), and associated wiring. ▶Figure 690-9



▶Figure 690-9

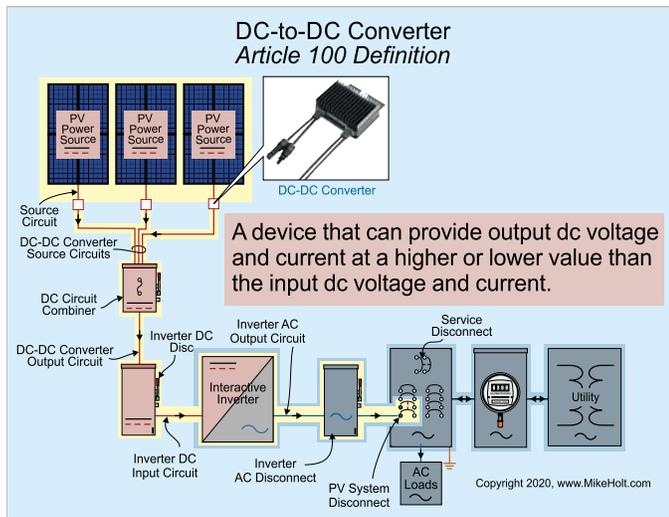
**DC-to-DC Converter Output Circuit.** A dc-to-dc converter output circuit consists of the dc circuit conductors connected to the output of a dc combiner containing multiple dc-to-dc converter source circuits. ▶Figure 690-10



▶Figure 690-10

### Author's Comment:

- ▶ According to Article 100, a "DC-to-DC Converter" is a device that can provide an output dc voltage and current at a higher or lower value than the input dc voltage and current. ▶Figure 690-11
- ▶ DC-to-DC converters are intended to maximize the power output of independent modules and reduce losses due to variances between the modules' outputs.

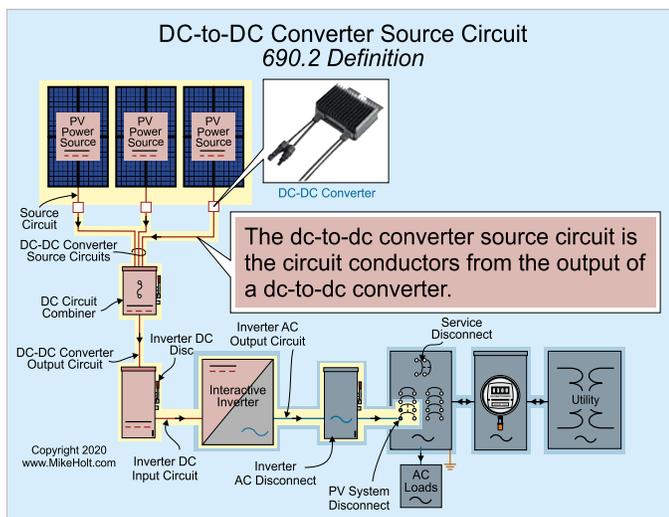


► Figure 690-11

**Author's Comment:**

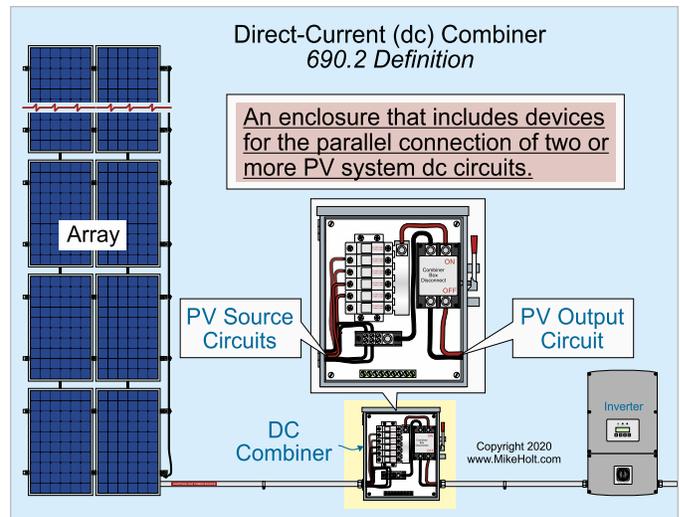
- A dc-to-dc converter enables the inverter to receive the circuit voltage that is maximized for direct-current and/or alternating-current power production by the inverter regardless of the circuit length, individual module performance, or variance in light exposure between modules.

**DC-to-DC Converter Source Circuit.** A dc-to-dc converter source circuit consists of the dc circuit conductors from the output of a dc-to-dc converter. ► Figure 690-12



► Figure 690-12

**Direct-Current (dc) Combiner.** A dc combiner is an enclosure that includes devices for the parallel connection of two or more PV system dc circuits. ► Figure 690-13



► Figure 690-13

**Author's Comment:**

- A dc combiner connects multiple PV source circuits and dc-to-dc converter source circuits in parallel with each other to create a PV output or dc-to-dc converter output circuit. Direct-current combiners can also recombine multiple PV output circuits and dc-to-dc converter output circuits with a larger two-wire PV output or dc-to-dc converter output circuit.

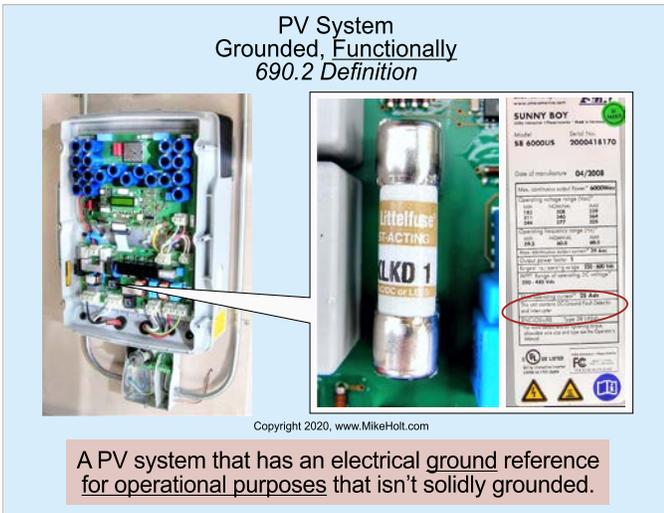
**Electronic Power Converter.** An electronic power converter is a device that uses electronics to convert one form of electrical power into another.

**Note:** Examples of electronic power converters include (but are not limited to) inverters, dc-to-dc converters, and electronic charge controllers. These devices have limited current capabilities based on the device ratings at continuous rated power.

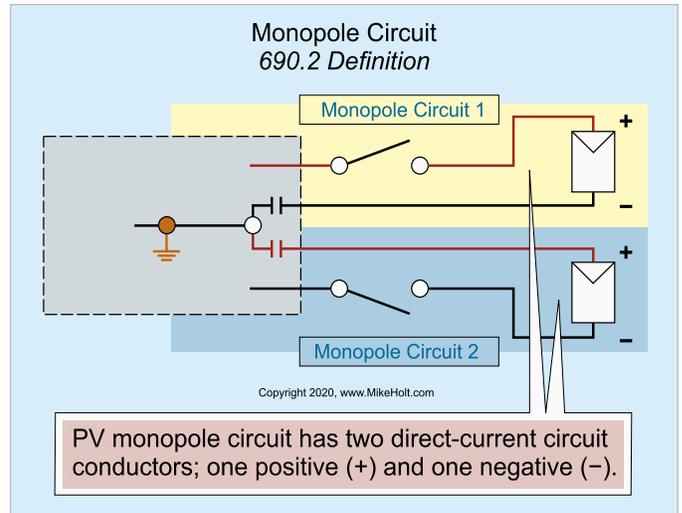
**Grounded, Functionally.** A functionally grounded PV system is one that has an electrical ground reference for operational purposes that is not solidly grounded. ► Figure 690-14

**Note:** A functionally grounded PV system is often connected to ground through an electronic means that is internal to an inverter or charge controller that provides ground-fault protection. Examples of operational purposes for functionally grounded systems include ground-fault detection and protection, as well as performance-related issues for some power sources.

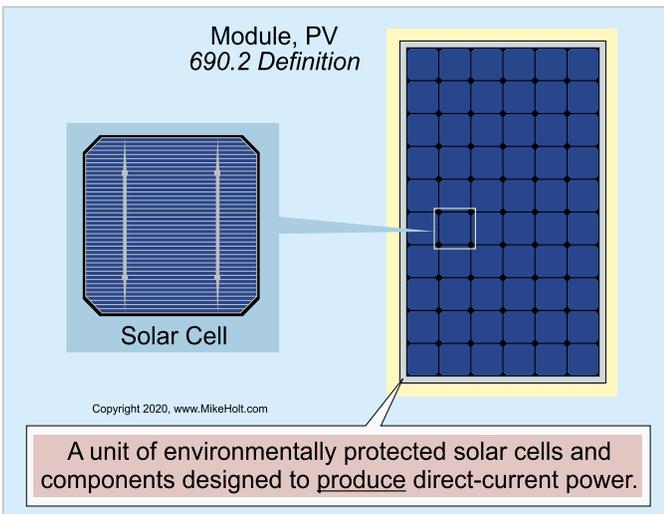
**Module.** A PV module is a unit of environmentally protected solar cells and components designed to produce dc power. ► Figure 690-15



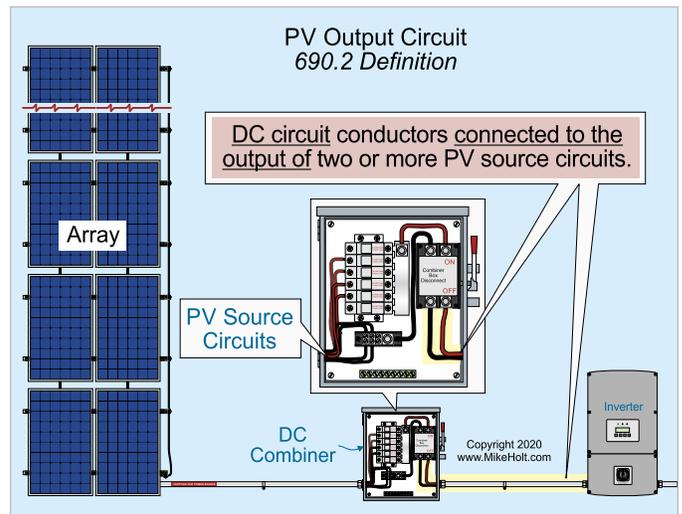
▶Figure 690-14



▶Figure 690-16



▶Figure 690-15



▶Figure 690-17

**Author's Comment:**

- ▶ PV modules use sunlight to generate direct-current (dc) electricity by using light (photons) to move electrons in a semiconductor. This is known as the "photovoltaic effect."

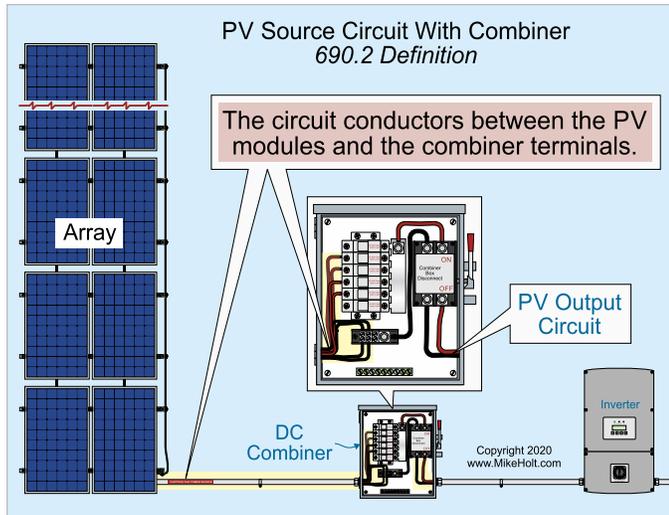
**Monopole Circuit.** A PV monopole circuit has two dc circuit conductors: one positive (+) and one negative (-). ▶Figure 690-16

**PV Output Circuit.** A PV output circuit consists of dc circuit conductors connected to the output of two or more PV source circuits. ▶Figure 690-17

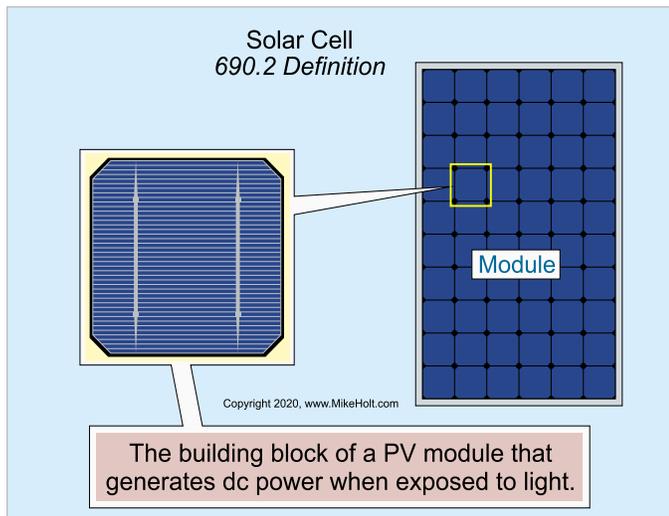
**PV Source Circuit.** The PV source circuit consists of the dc circuit conductors between modules and from modules to dc combiners, electronic power converters, or the PV System disconnecting means. ▶Figure 690-18 and ▶Figure 690-19

**PV System DC Circuit.** The PV system dc circuit consists of any dc conductor in PV source circuits, PV output circuits, dc-to-dc converter source circuits, and dc-to-dc converter output circuits.

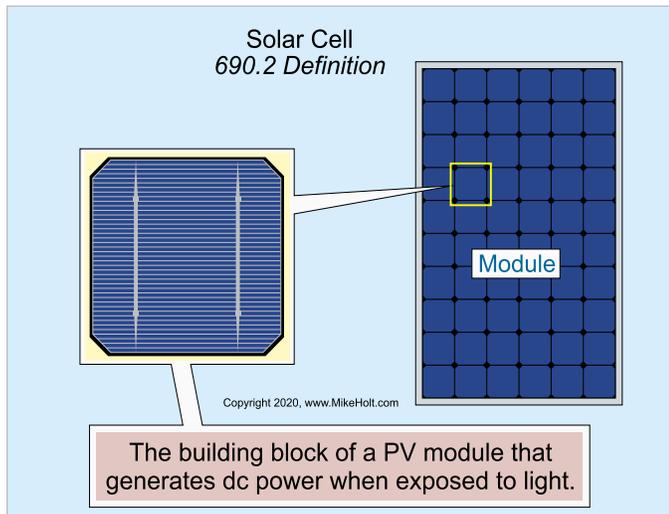
**Solar Cell.** The building block of a PV module that generates dc power when exposed to light. ▶Figure 690-20



▶ Figure 690-18



▶ Figure 690-19



▶ Figure 690-20

**Caution**



Although sunlight is the primary light source for a solar cell, other light sources such as moonlight can generate dc power.

**Author's Comment:**

- ▶ All Article 100 definitions are important, but the following definitions located there are often components commonly found in PV systems:
  - ▶ Charge Controller
  - ▶ DC-to-DC Converter
  - ▶ DC-to-DC Output Circuit
  - ▶ Hybrid System
  - ▶ Interactive Inverter
  - ▶ Interactive System
  - ▶ Inverter, Multimode
  - ▶ Inverter Output Circuit
  - ▶ Power Production System
  - ▶ Photovoltaic (PV) System
  - ▶ Stand-Alone System

**690.4 General Requirements**

**(A) PV Systems.** A PV system is permitted to supply electric power to buildings or other electrical supply systems.

**(B) Listed or Field Labeled Equipment.** Components of the PV system including inverters, PV modules, ac modules, ac module systems, dc combiners, dc-to-dc converters, rapid shutdown equipment, dc circuit controllers, and charge controllers must be listed or be evaluated for the application and have a field label applied. ▶ Figure 690-21

**Author's Comment:**

- ▶ "Listing" means the equipment is included in a list published by a testing laboratory acceptable to the authority having jurisdiction [Article 100].
- ▶ "Field Labeled" means the equipment or materials which have a label, symbol, or other identifying mark of a field evaluation body (FEB) indicates the equipment or material was evaluated and found to comply with the requirements described in the field body evaluation report [Article 100].