

# *ABS Alaskan, Inc.*

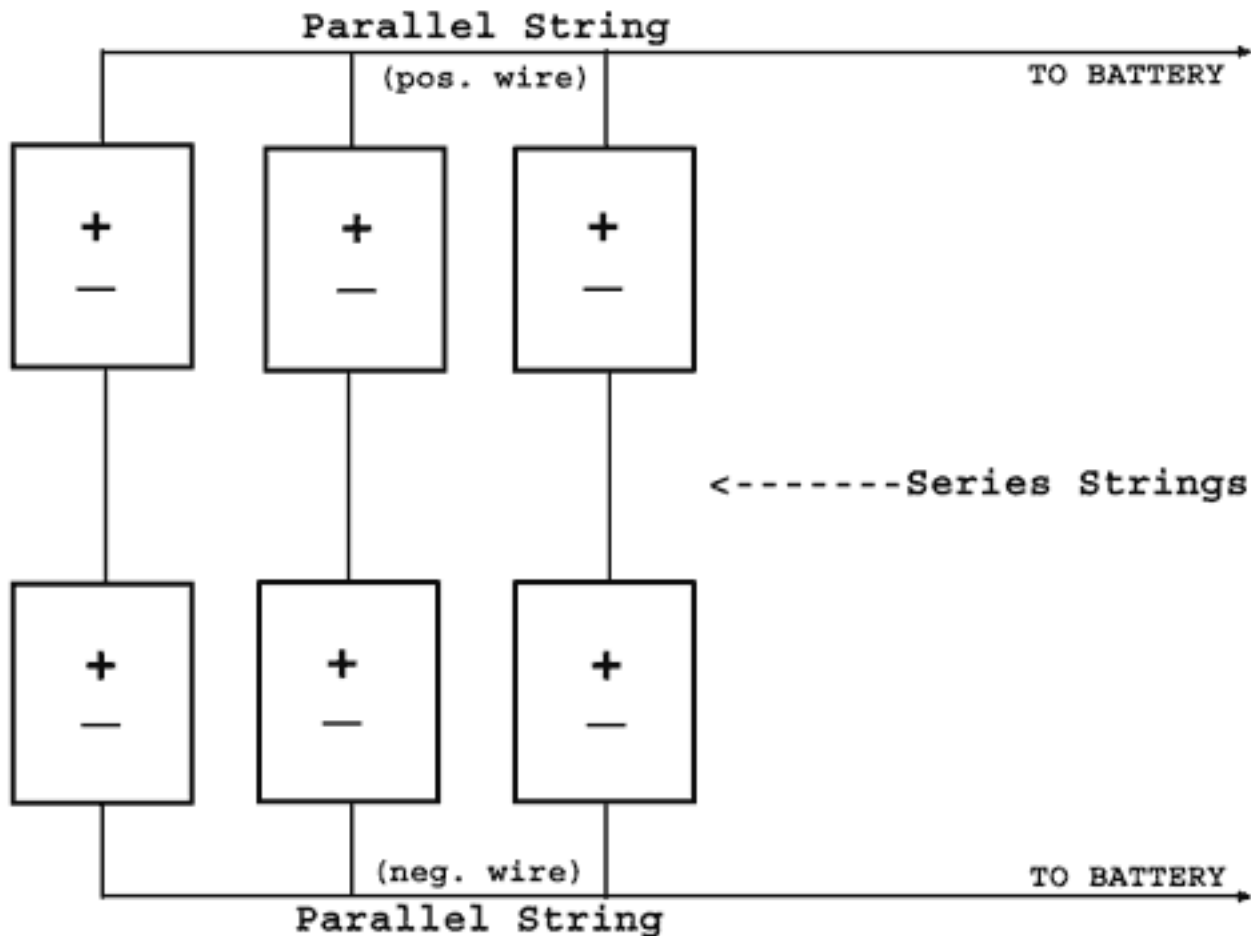
2130 Van Horn Road, Fairbanks, Alaska 99701 • (907) 451-7145  
166 E Potter Drive #2, Anchorage, AK 99518-1363 • (907) 562-4949  
Alaska Toll-Free (800) 478-7145 - U.S. Toll-Free (800) 235-0689  
FAX: (907) 451-1949 Web: <http://www.absAK.com/>

## DIODES IN SOLAR ARRAYS

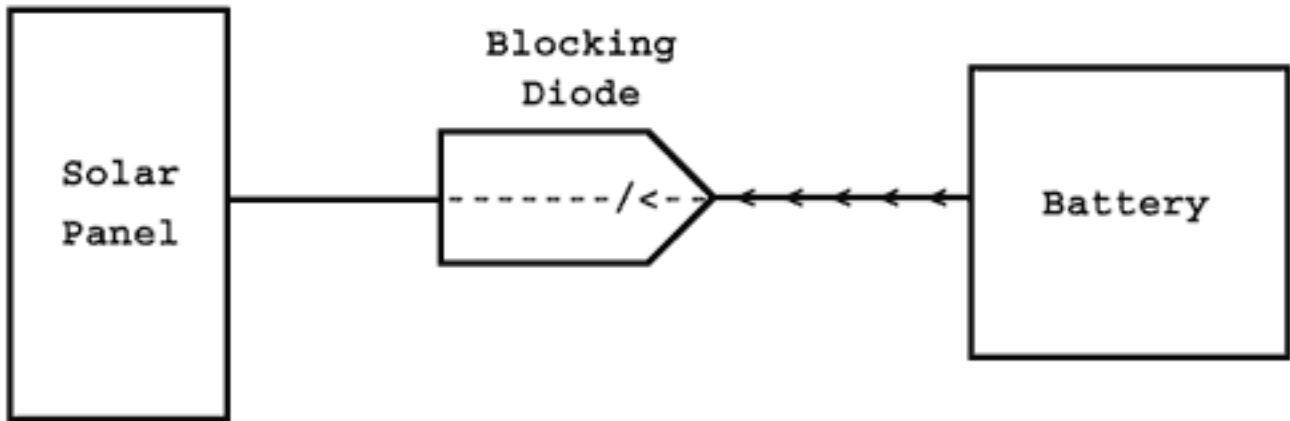
A diode is an electrical device that only allows current to flow one direction. Two types of diodes are discussed in conjunction with PV panels and arrays – bypass and blocking diodes. These are not actually two different devices but the same device use for two different purposes.

Solar panels are comprised of PV cells in series. Each cell is an electricity generating unit. Remember that, just as in batteries, when cells are connected in series, the voltage is compounded. So a solar panel with 36 cells (each generating approximately .5 volts DC) in series is producing approximately 18 VDC for charging 12V batteries. If the battery bank is greater than 12V, several panels are wired in series to increase the panel voltage to match that of the battery. For instance, two panels in series would produce approximately 36 VDC for charging a 24V battery. If additional charging amperage is desired, two or more panel series strings are paralleled to increase the amperage output.

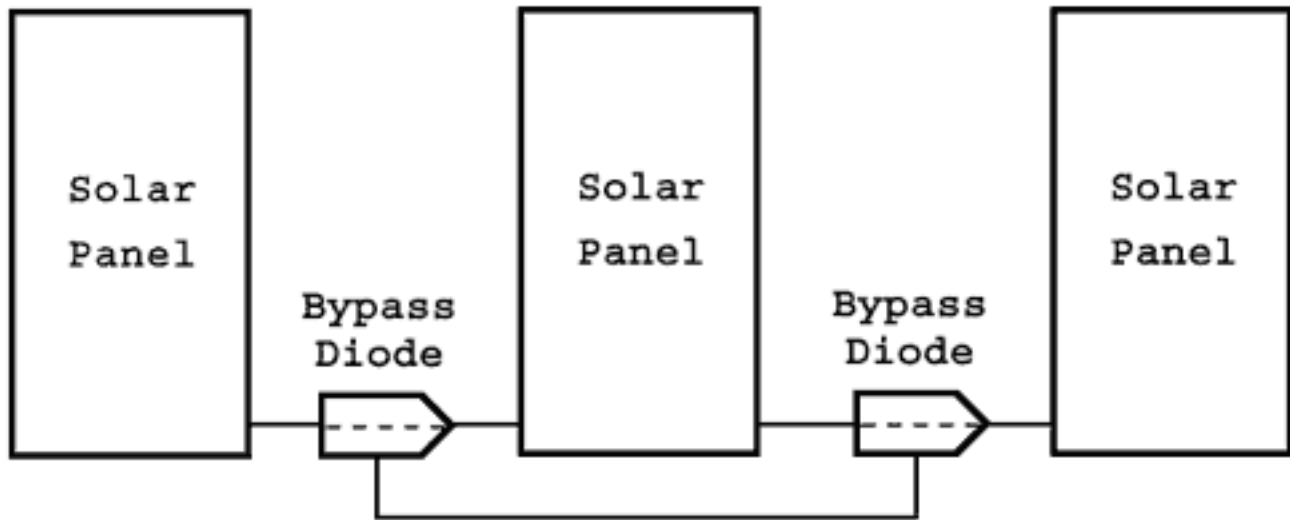
This example shows a typical series/parallel panel array configuration:



Each PV cell (this also applies to the entire panel) is either a power producer or a power consumer, depending on whether it is exposed to sunlight or not. Diodes used in a blocking capacity are installed between parallel panel strings and/or between the entire array and the battery. They prevent current from flowing back into shaded paralleled series strings or arrays that are acting as a power consumer, discharging all of the power produced by the other series strings and/or the power stored in the battery at night when the array is darkened.



Diodes utilized in a bypass capacity are installed within the series string. There is a certain amount of resistance inherent in the forward direction of the diode. The diode's internal resistance is greater than that of a PV cell (or panel) when exposed to sunlight. The current follows the path of least resistance and flows through each consecutive cell (or panel) in the string. When a cell (or panel) in the series string is shaded (and potentially consuming power) the resistance in that cell (or panel) increases tremendously, making the bypass diode the path of least resistance. The current follows the path of least resistance, shunting the power through the bypass diode and through an alternate circuit around that PV cell (or panel) to the next producing PV cell or panel in the string. The only voltage loss is that created by eliminating the cell (or panel) that is inactive.



*ABS Alaskan Tech Notes (c) 2001, ABS Alaskan, Inc.*