Technical Bulletin #100210

Issued: 12/02/02
Revised: 10/28/03

Affected Products: Solar Boost™ 50, 3048 and 6024H

Purpose: PV Module Sizing for Non-standard Voltage Modules, or 5 Series Modules on an SB3048 or SB6024H

Background:

PV module sizing for controllers listed for continuous operation at their full rated current would be accomplished by applying a maximum Short Circuit Current (I_{SC}) of the controller rating divided by 1.25. Maximum I_{SC} would then be 40A for a Solar Boost 50 if the system was configured for the same nominal input (PV) and output (battery) voltage. Solar Boost charge controllers by nature of their MPPT operation can charge a lower voltage battery from a higher voltage PV array. When a higher input voltage is used, I_{SC} must be reduced to limit input power to a value equivalent to what would be applied in a system with the same nominal input and output voltage.

➢ **WARNING:** Read, understand and follow the Important Safety Instructions included in the particular product's installation and operation manual before proceeding. To reduce the risk of fire, connect only to a circuit provided with the recommended branch-circuit over current protection installed and wired in accordance with National Electrical Code, ANSI/NFPA 70. Do not exceed maximum recommended PV module Open Circuit Voltage (V_{OC}) or Short Circuit Current (I_{SC}) specified in this Technical Bulletin.

PV Module Ratings:

➢ **CAUTION:** For the purpose of this Technical Bulletin, use only the PV module manufacturers published specifications conducted at Standard Test Conditions (STC) per ASTM E1036 which generally specifies; 25°C cell temperature and illumination of 1KW/m^2 (1 sun) at a spectral distribution of AM 1.5 (ASTM E892 global spectral irradiance).

Maximum PV Module Open Circuit Voltage V_{OC}:

When considering use of higher input voltage, first confirm that the maximum input voltage rating of the controller is suitable for the modules. Total applied series PV Open Circuit Voltage (V_{OC}) @ 25°C must be less than the controller's maximum V_{OC} rating divided by 1.25.

Solar Boost Controller	Maximum Controller V_{OC} Specification	Maximum PV 25°C V_{OC} Applied
SB50	57VDC	45.6VDC
SB3048	140VDC	112VDC
SB6024H	140VDC	112VDC

Maximum PV Module Short Circuit Current I_{SC}:

In general, I_{SC} must reduced by the ratio of the actual applied PV module Maximum Power Voltage (V_{MP}) @ 25°C, to the 25°C V_{MP} that would be applied if the system had the same nominal input and output voltage. For this determination the actual modules to be used are to be compared to modules with a V_{MP} of 17V@ 25°C. Maximum applied I_{SC} applied can be calculated as follows:

$$I_{SC\text{-}MAX} = (I_{SB} \div 1.25) \times V_{PV\text{-}STANDARD} \div V_{PV\text{-}ACTUAL}$$

Where:

$I_{SC\text{-}MAX}$ = maximum input 25°C PV Short Circuit Current I_{SC}

I_{SB} = Solar Boost controller maximum current rating

$V_{PV\text{-}STANDARD}$ = total series 25°C PV Maximum Power Voltage V_{MP} if system used same nominal input and output voltage, expressed in multiples of 17V

$V_{PV\text{-}ACTUAL}$ = total series 25°C PV Maximum Power Voltage V_{MP} actually installed on system

Example 1: Solar Boost 50, charging 12V battery, two 17V V_{MP} @ 25°C modules in series (nominal 24V input, 12V output)

$$I_{SC\text{-}MAX} = (50A \div 1.25) \times (1 \times 17V) \div (2 \times 17V) = 20.0A$$

Max. I_{SC} if unit had same nominal PV and battery voltage, which would be controller rating ÷ 1.25.

Standard PV module total V_{MP} if conventional controller was charging battery. Must be in multiples of 17V, i.e., 17, 34, or 68V.

Total applied PV module V_{MP}. Must be actual value, may not be multiples of 17V depending on modules used.

Example 2: Solar Boost 6024H, charging 24V battery, five 17V V_{MP} @ 25°C modules in series (nominal 60V input, 24V output)

$$I_{SC\text{-}MAX} = (60A \div 1.25) \times (2 \times 17V) \div (5 \times 17V) = 19.2A$$

Example 3: Solar Boost 3048, charging 48V battery, two 51V V_{MP} @ 25°C modules in series (odd voltage input, 48V output)

$$I_{SC\text{-}MAX} = (30A \div 1.25) \times (4 \times 17V) \div (2 \times 51V) = 16.0A$$

MPPT Adjust Range and Initial Setting:

As described in the operators manual, the primary MPPT operating point is based on the difference between the PV module's V_{OC} and V_{MP}. Verify that the modules used will fit within the range of MPPT trim adjustment shown in the appropriate manual. In the case of using a five module (17V V_{MP} @ 25°C) input with an SB3048 or SB6024H, configure the system for 48V input and set the MPPT trim pot to 5/4$^{th's}$ of its initial setting or 5.5V (5 ÷ 4 x 4.4V = 5.5V) for a total V_{OC} - V_{MP} value of 22V. For modules with odd voltage values, select a dip switch 5 setting and MPPT trim potentiometer position for the total series difference between the PV module's V_{OC} and V_{MP}. Refer to the MPPT voltage range table in the *Maximum Power Voltage* section of the operators manual. Once the system is operating, it would be desirable to trim the MPPT setting as described in the *Optimizing MPPT* section of the operators manual.