

# BZ PRODUCTS, INC.

## MODEL MPPT500™ and MPPT500HV™

### INSTALLATION MANUAL v 3.0

#### CURRENT BOOSTING MAXIMUM POWER POINT SOLAR CHARGE CONTROL READ ALL INSTRUCTIONS PRIOR TO INSTALLING OR USING THIS EQUIPMENT.

**SAFETY INSTRUCTIONS:** Refer installation and service to qualified service personnel. Incorrect installation may result in risk of fire. Remove all sources of electrical power, photovoltaic and battery before servicing this equipment. Never charge a frozen battery. Warning! Batteries produce explosive gasses. Install batteries in a well ventilated area. Follow battery manufacturer's maintenance and charging recommendations. Install properly rated fuses as required. Do not connect controller to generators or alternators. Caution, high voltages may be present. Do not disturb any components on the circuit board.

**DESCRIPTION:** The model MPPT500 is a high performance current boosting solar control. Through the use of advanced microprocessor control and high efficiency power converter, power wasted in older PWM style solar controls is converted into higher battery charge current. The MPPT500 allows for input voltage conversion. This increases the Maximum Power Point voltage of the solar panel and allows for higher boost current over wider operating conditions. Model MPP500HV operating efficiency has been optimized for 48 volt nominal PV input voltage.

A high accuracy digital volt and amp meter displays battery voltage, photovoltaic current and battery charge current. Proper battery charging is maintained over a wide temperature range with the battery temperature sensor. Battery float voltage is accurately regulated. Night time battery discharge is eliminated through the use of a reverse flow diode. Maximum input power to the MPPT500 is 500 watts. **Maximum photovoltaic input voltage is 100 VDC open circuit.**

**OPERATION:** During operation the MPPT500 may feel warm. Operation of the MPPT500 is fully automatic. No adjustments are required for most installations. When power is available from the solar panel, the MPPT500 microprocessor measures and determines the optimum operating point of the solar panel to produce the highest charge current possible to the battery. There is no interaction between the MPPT500 and other battery charging systems.

The float voltage of the MPPT500 is calibrated to 14.1 volts. When the battery voltage reaches 14.1 volts the red Float LED turns on. At this point, charge current to the battery will gradually diminish to maintain the 14.1 float voltage. As soon as load is turned on, maximum charge current is applied to the battery. Temperature compensation adjusts the float voltage to properly charge the battery over a wide temperature range. When the battery is warm, the float voltage will drop and when the battery is cold, the float voltage will rise. MPPT500 is well suited for flooded, deep cycle and gel type batteries.

**SYSTEM PLANNING:** Carefully plan your installation. Determine fuse ratings, wire size. Install the MPPT500 near the battery bank. Avoid installing the controller in wet, damp or small confined locations. Do not install the MPPT500 in direct sunlight. Use short direct wiring. Install the controller in accordance with state, local and national electrical codes. Securely fasten the controller to a wall or other suitable structure. Provide support for all wiring. Place the battery temperature sensor on or near the battery. Install properly rated fuses.

**WIRING:** Remove the four # 6 black Phillips screws to gain access to the interior of the MPPT500. Install the two wire bushings in the wire conduit holes if conduit is not used. Do not touch or disturb any components of the MPPT500. Use high quality stranded wire only. Solid wire is not recommended. The MPPT500 wire connector will accept up to # 2 AWG wire. A short length of # 2 wire may be spliced into a larger size wire for long wire runs. Install the battery fuse within 9" of the battery. See wiring diagram (last page) for more details. Make certain no loose strands of wire fall onto the MPPT500 circuit board or enclosure.

Protect wiring from damage. If wire conduit is not used, install the wire bushings (supplied) to protect the wiring from damage. Clearly labeling all wiring with permanent wire markers will simplify installation and help prevent wiring errors. Write the wire designations on the MPPT500 wiring diagram. Documenting the installation will help troubleshoot any problems in the future. Permanent wire labels are available from most electrical parts suppliers. Route wiring as directly as possible to the photovoltaic panels and batteries. Take care to follow the wiring diagram exactly.

**BATTERY VOLTAGE SELECTION:** SW-1 on the MPPT500 circuit board selects the battery voltage. The switch is marked 12, 24 and 48 corresponding to the battery voltage. Select the battery voltage by depressing the required battery voltage white switch to the right. As shipped SW-1 is set for 12 volt and flooded battery. To change the battery from 12 volts to 24 volts, press SW-1 position 4 (marked 12) to the left and press SW-1 position 3 (marked 24) to the right. For 48 volt operation, press SW-1 position 2 (marked 48) to the right. Position 1 on SW-1 open (as shipped) is set for flooded batteries. For sealed batteries, depress position 1 rocker to the closed (right) position.

**FOR 12 VOLT INSTALLATIONS USING FLOODED BATTERIES  
NO ADJUSTMENTS ARE REQUIRED.**

**WIRE SIZING:** For best operation use properly sized wire. Refer to the wire size chart to determine minimum wire size. Wire sizes specified are the minimum required, a larger wire size than specified may be used.

**WIRE SIZING CHART**

TOTAL PV INPUT WATTS	1-10 FT	11-20 FT	21-30 FT	31-40 FT	41-50 FT
100 TO 250 WATTS	# 10 AWG	# 8 AWG	# 6 AWG	# 4 AWG	# 2 AWG
251 TO 500 WATTS	# 8 AWG	# 6 AWG	# 4 AWG	# 2 AWG	# 1/0 AWG

**USE CAUTION WHEN CHANGING FUSES**

**FUSES:** Separate fuses are required for the solar panel and battery circuits. Use properly rated fuses in all circuits. See wiring diagram (last page) for more information.

**FUSE RATINGS:** Properly rated fuses are required in all installations. Refer to the fuse selection chart and wiring diagram to determine the proper fuse ratings.

## SOLAR PANEL FUSE SIZING CHART

SOLAR PANEL VOLTAGE	INPUT POWER 100 TO 250 WATTS	INPUT POWER 251 TO 500 WATTS
12 VOLTS	20 AMPS	40 AMPS
24 VOLTS	10 AMPS	20 AMPS
36 VOLTS	10 AMPS	20 AMPS
48 VOLTS	10 AMPS	10 AMPS

## BATTERY FUSE SIZING CHART

BATTERY VOLTAGE	INPUT POWER 100 TO 250 WATTS	INPUT POWER 101 TO 500 WATTS
12 VOLTS	25 AMPS	50 AMPS
24 VOLTS	15 AMPS	25 AMPS
48 VOLTS	10 AMPS	15 AMPS

**BATTERY TEMPERATURE SENSOR:** Position the battery temperature sensor (the gray wire on the bottom of the MPPT500) on or near the main battery. If the main battery is in a non heated location, place the battery temperature sensor outside of the heated area that the MPPT500 is installed.

**FLOAT VOLTAGE CALIBRATION:** Battery float voltage is pre-calibrated to 14.1 volt. In most installations the float voltage needs no adjustment. Check battery manufacturer's specifications for proper float voltage.

To adjust the battery float voltage locate the float voltage control on the MPPT500. Let the battery charge up to 14.1 volts (the red float LED will light) before adjusting the float control. Adjust the float voltage counter clockwise to lower the float voltage and clockwise to increase the voltage. Adjust the float control in small increments until the desired voltage is displayed on the MPPT500 volt meter. To properly charge the battery over a wide temperature range, the battery float voltage is temperature compensated. Battery voltage will be higher in cold temperatures and lower in warm temperatures. Secure battery temperature on or near the main battery.

**BOOST CURRENT:** The solar panel produces higher output voltage than the battery voltage. This higher voltage, the maximum power point voltage is wasted with conventional PWM solar controls. The MPPT 500 electronically converts this higher solar panel voltage into higher battery charge current. This is referred to as boost current. Highest boost current occurs when the battery voltage is low and the solar panel is cold.

Advanced microprocessor control and high efficiency power converter circuitry combine to produce the highest boost current possible over a wide range of conditions. Depending on conditions, boost current may be as high as 30%. Current boost in the 20% range is common.

**MIXED SOLAR PANELS:** Ideally all of the solar panels in a system should be of the same type and power rating. The MPPT500 works equally well with mixed solar panels. The microprocessor control determines the operating point of the solar panels that produce the highest charge current to the battery. See wiring diagram (last page) for solar panel wiring configurations. Maximum input power is 500 watts and minimum recommended input is 100 watts.

**SOLAR PANEL VOLTAGE:** The advanced microprocessor control of the MPPT500 allows a higher input voltage from the solar panels to charge the battery. In many installations higher boost current over a greater operating range may be achieved by wiring the solar panels in series. For example, wiring the

photovoltaic panels for 24 volts for charging a 12 volt battery will generally produce a higher Maximum Power Point Voltage. The higher MPPT voltage is then electronically converted to a higher battery charge current. However good boost performance is also achieved with 12 volt photovoltaic panels charging a 12 volt battery system.

**DO NOT EXCEED THE MAXIMUM SOLAR POWER OF 500 WATTS**

**MPPT500 WIRE CONNECTION ORDER:** Connect the MPPT500 wiring in the following order (failure to follow exact order may result in damage to the control). Connect battery + and - to the MPPT 500. The LCD display will display the battery voltage. Connect the solar panel + and - to the MPPT500. In a few seconds the controller will turn on and begin charging the battery. PV and Battery current will be displayed on the digital meter.

**MAINTENANCE:** The MPPT500 requires little maintenance. Clean the MPPT500 with a damp cloth. Recalibrate float voltage if required. Visually inspect the entire system for damage. Tighten any loose connections. Keep the photovoltaic array clean and properly aligned to the sun. Keep batteries clean. Follow battery manufacturer’s maintenance recommendations.

**WARRANTY:** BZ PRODUCTS, INC. Model MPPT500 is warranted to be free of defects in material and workmanship for five years from the date of purchase. Failure to provide correct installation, operation or care for this product, in accordance with the instruction manual, will void the warranty. Product liability shall be limited to repair or replacement, at the discretion of the manufacturer. The manufacturer is not responsible for the labor or other charges necessitated by the removal, transportation, or reinstallation of any defective product. Warranty does not cover damage due to, mishandling, abusive conditions, lightning, or exposure to weather. No specific claim of merchantability shall be assumed or implied beyond what is printed in this manual. No liability shall exist from circumstances arising from the inability to use this product, or it’s inappropriateness for any specific purpose. In all cases, it shall be the responsibility of the customer to insure a safe installation in compliance with local, state and national electrical codes.

**RETURN PROCEDURE:** To return a model MPPT500 for warranty service, provide the following information. Name/Company name, return address, daytime phone number, description of failure, copy of sales receipt. Include \$14.00 for return shipping.

**BZ PRODUCTS, INC.**

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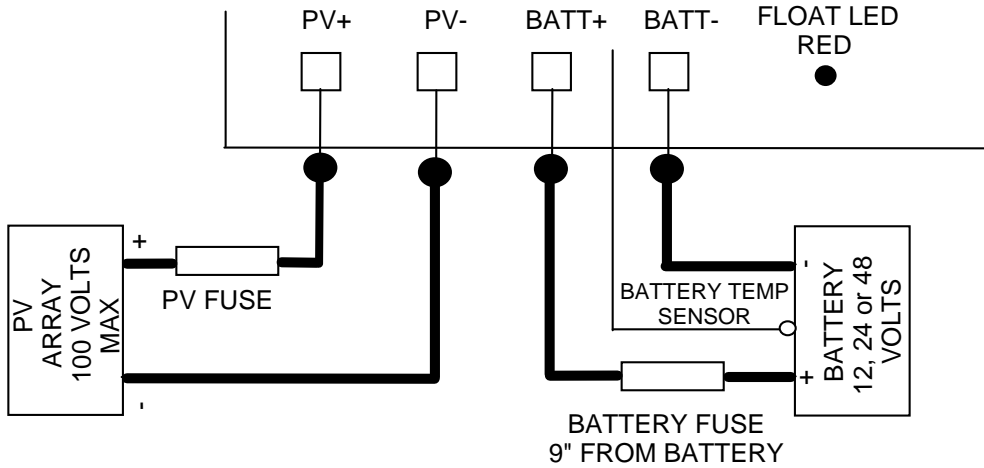
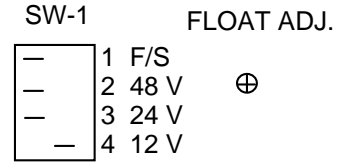
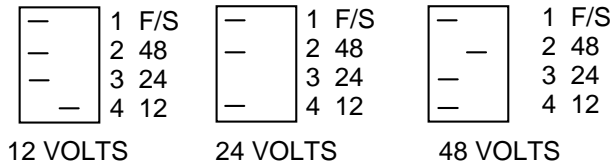
**MPPT500 SPECIFICATIONS: FLOAT VOLTAGE IS FACTORY SET TO 14.1 VOLTS.**

Output current 12 volts	45 amps continuous	Surge current	120% for 10 min.
Output current 24 volts	22 amps continuous	Digital meter	½” LCD display
Output current 48 volts	11 amps continuous	DC volts range	0-99.9 volts ± .5%
Array voltage open circuit	100 volts open circuit	DC current range	0-99.9 amps ± .5%
Input power max.	500 watts	Input power min	100 watts
Float voltage	14.1 /28.2/56.4 flooded	Float voltage	13.8/27.6/55.2 sealed
Temp. comp.	-18mV/°C cell	Float regulation	±.05 volts nominal
Reverse current	.02 amps nominal	Photovoltaic input	auto ranging
Min battery voltage	10 volts	Battery capacity	100 AH minimum
Operating temp.	-20 to + 60°	Storage temp.	- 30 to + 70° C
Float voltage range	12.5 to 15.5 volts	Operating current	.15 amps nominal
Float voltage range	25 to 31 volts	Weight	3 pounds
Float voltage range	50 to 60 volts	Wire size	# 2 max AWG
Mounting	four # 6 screws	Lightning protection	1000 watt MOV
Efficiency	> 95% @ 40 amps	Finish	beige powder coat
Size	6” X 8 ½” X 3 3/8”	Conduit size	½ inch two each

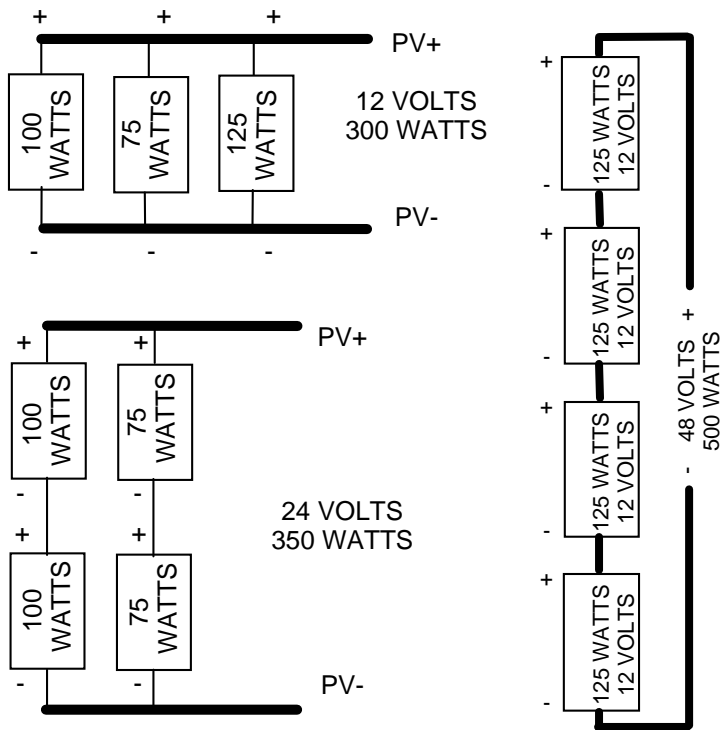
MPPT500 specifications subject to change without notice.

# BZ PRODUCTS, INC. MPPT500 WIRING DIAGRAM V3.0

## SW-1 BATTERY VOLTAGE SELECTION



## BASIC WIRING CONFIGURATIONS



LARGE GAGE WIRE      #2 WIRE  
 SPLICE LARGER GAGE WIRE IF REQUIRED