

BZ PRODUCTS, INC.

INSTALLATION MANUAL VERSION 3.0

MODELS MPPT250™ and MPPT250HV™

CURRENT BOOSTING MAXIMUM POWER POINT SOLAR CHARGE CONTROL

For best battery charging performance with Model MPPT250, configure the solar panels for 24 volts nominal.

CAUTION! READ ALL INSTRUCTIONS PRIOR TO INSTALLING OR USING THIS EQUIPMENT.

SAFETY INSTRUCTIONS: Refer 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 manufactures maintenance and charging recommendations. Install properly rated fuses as required. Do not connect controller to generators or alternators.

DESCRIPTION: The model MPPT250 is a 25 amp 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 charge current. The MPPT250 allows for input voltage conversion. This increases the Maximum Power Point voltage and allows for higher boost current over wider operating conditions. The MPPT250 is designed to charge 12 volt batteries only.

A high accuracy digital volt and amp meter displays battery voltage and charge current. An auxiliary 100 ma 13.8 volt trickle charger is provided to keep the engine/generator start battery fully charged. A 15 amp capacity low voltage disconnect protects the battery from over discharge conditions. 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 high efficiency Scotkey diode. Maximum input power to the MPPT250 is 250 watts.

OPERATION: During operation the MPPT250 may feel warm. Operation of the MPPT250 is fully automatic. No adjustments are required for most installations. When power is available from the solar panel, the MPPT250 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 MPPT250 and other battery charging systems.

The float voltage of the MPPT250 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 a load is turned on, maximum charge current is applied to the battery. 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. MPPT250 is well suited for flooded, deep cycle and gel type batteries.

A low voltage disconnect is used to protect the battery from excessive discharge by automatically turning off a load. The load is disconnected when the battery voltage is 12.0 volts or lower. When the batteries are recharged to 12.6 volts the low voltage disconnect reconnects the load. The yellow LED on the face of the MPPT250 is lit when the load is connected. Operation of the low voltage disconnect is fully automatic. Maximum low voltage disconnect load current is 15 amps. **Do Not** connect the low voltage disconnect to inverters.

A unique feature of the MPPT250 is the 100 ma 13.8 volt trickle charger. The purpose of the trickle charger is to maintain full charge on the engine/generator starter battery. The low charge current will keep engine start batteries fully charged without using water. Operation is fully automatic and transparent from other charging circuits.

SYSTEM PLANNING: Carefully plan your installation. Determine fuse ratings, wire size and solar panel input voltage. Install the MPPT250 near the battery bank. Avoid installing the controller in wet, damp or small confined locations. Do not install the MPPT250 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: Use high quality stranded wire only. Solid wire is not recommended. The MPPT250 wire connector will accept up to # 12 wire. A short length of #12 wire may be spliced into a larger size wire. See wiring diagram for more details.

Protect 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 MPPT250 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 PV panels and batteries. Take care to follow the wiring diagram exactly.

WIRE SIZING: For best operation use properly sized wire. Refer to the wire size chart to determine minimum wire size. Both solar panel and battery circuits should use the same size wire. Wire sizes specified are minimum required , a larger wire size than specified may be used

WIRE SIZING CHART

TOTAL	0-10 FT	11-20 FT	21-30 FT	31-40 FT	41-50 FT
0 TO 100	# 10 AGW	# 8 AWG	# 6 AWG	# 4 AWG	# 2 AWG
101 TO 250	# 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, main battery, low voltage disconnect and auxiliary battery circuits. Use properly rated fuses in all circuits. See wiring diagram 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.

BATTERY AND SOLAR PANEL FUSE CHART

PV VOLTAGE 12 VOLTS UP TO 100 WATTS	BATTERY & PV FUSE RATING 10 AMPS
PV VOLTAGE 12 VOLTS 100 TO 250 WATTS	BATTERY & PV FUSE RATING 30 AMPS
PV VOLTAGE 24 VOLTS UP TO 150 WATTS	BATTERY FUSE 20 AMPS PV FUSE 10 AMPS
PV VOLTAGE 24 VOLTS UP TO 250 WATTS	BATTERY FUSE 30 AMPS PV FUSE 15 AMPS

BATTERY TEMPERATURE SENSOR: Position the battery temperature sensor 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 MPPT250 is installed.

FLOAT VOLTAGE CALIBRATION: Battery float voltage is pre-calibrated to 14.1 volts. In most installations the float voltage needs no adjustment. Check battery manufacturers specifications for proper float voltage.

To adjust the battery float voltage locate the float voltage control on the rear of the MPPT250. 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 MPPT250 volt meter. In order 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 MPPT250 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.

SOLAR PANELS: Ideally all of the solar panels in the system should be of the same type and power rating. The MPPT250 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 250 watts and minimum recommended input is 68 watts.

SOLAR PANEL VOLTAGE: The advanced microprocessor control of the MPPT250 allows a higher input voltage from the solar panels to charge a 12 volt battery. In many installations higher boost current over a greater operating range may be achieved by wiring the solar panels in series to produce a 24 volt PV input to the MPPT250. **100 volts maximum PV input voltage for model MPPT250HV.** Nominal 12 volt solar input performs very well too. See wiring diagram (last page) for solar panel wiring configurations.

DO NOT EXCEED THE MAXIMUM SOLAR POWER OF 250 WATTS

MPPT250 WIRE CONNECTION ORDER: Connect the MPPT250 wiring in the following order (failure to follow exact order could result in damage to the control). If used ,connect the auxiliary battery charger and low voltage disconnect circuits to the appropriate terminals on the MPPT250. Connect battery + and - to the MPPT250. The LCD display and the yellow Low Voltage Disconnect led will turn on. Connect the solar panel + and - to the MPPT250. In a few seconds the controller will turn on and begin charging the battery.

MAINTENANCE: The MPPT250 requires little maintenance. Clean the MPPT250 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 manufacturers maintenance recommendations.

WARRANTY: BZ PRODUCTS, INC. Model MPPT250 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 MPPT250 for warranty service provide the following information. Name/Company name, return address, daytime phone number, description of failure, copy of the sales receipt. Include \$14.00 for return shipping and handling.

BZ PRODUCTS, INC.

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MPPT250 /MPPT250HV SPECIFICATIONS:

PV charge current	25 amps continuous	Digital meter	1/2" LCD display
Surge current	35 amps 10 min.	DC volts range	0-99.9 volts \pm .5%
Array voltage open circuit	50 volts open circuit	DC current range	0-99.9 amps \pm .75%
Input power max	250 watts	Batt. Temp. comp.	-18mV/ $^{\circ}$ C nominal
Input power min	68 watts	PV input voltage	12 or 24 volts nominal
PV input voltage	auto ranging	Reverse current	.01 amps nominal
Min battery voltage	10 volts	Battery capacity	100 AH minimum
Operating temp.	-20 to + 60 $^{\circ}$ C	Storage temp.	-30 to + 70 $^{\circ}$ C
Float voltage range	12.5 to 15.5 volts	Weight	2 pounds
Operating current	.15 amps nominal	Float regulation	\pm .05 volts nominal
Wire size	# 12 max. AWG	Mounting	four # 6 screws
Efficiency	>95% @ 20 amps	Finish	black powder coat
Float voltage	14.1 volts	Aux. batt. charger	13.8 volts @ .1 amp max.
Lightning protection	MOV 1000 watt	Size	7.8" X5.1" X2.5"
LVD current	15 amps max.	LVD current	20 amps surge
LVD disconnect	12.0 volts	LVD reconnect	12.6 volts

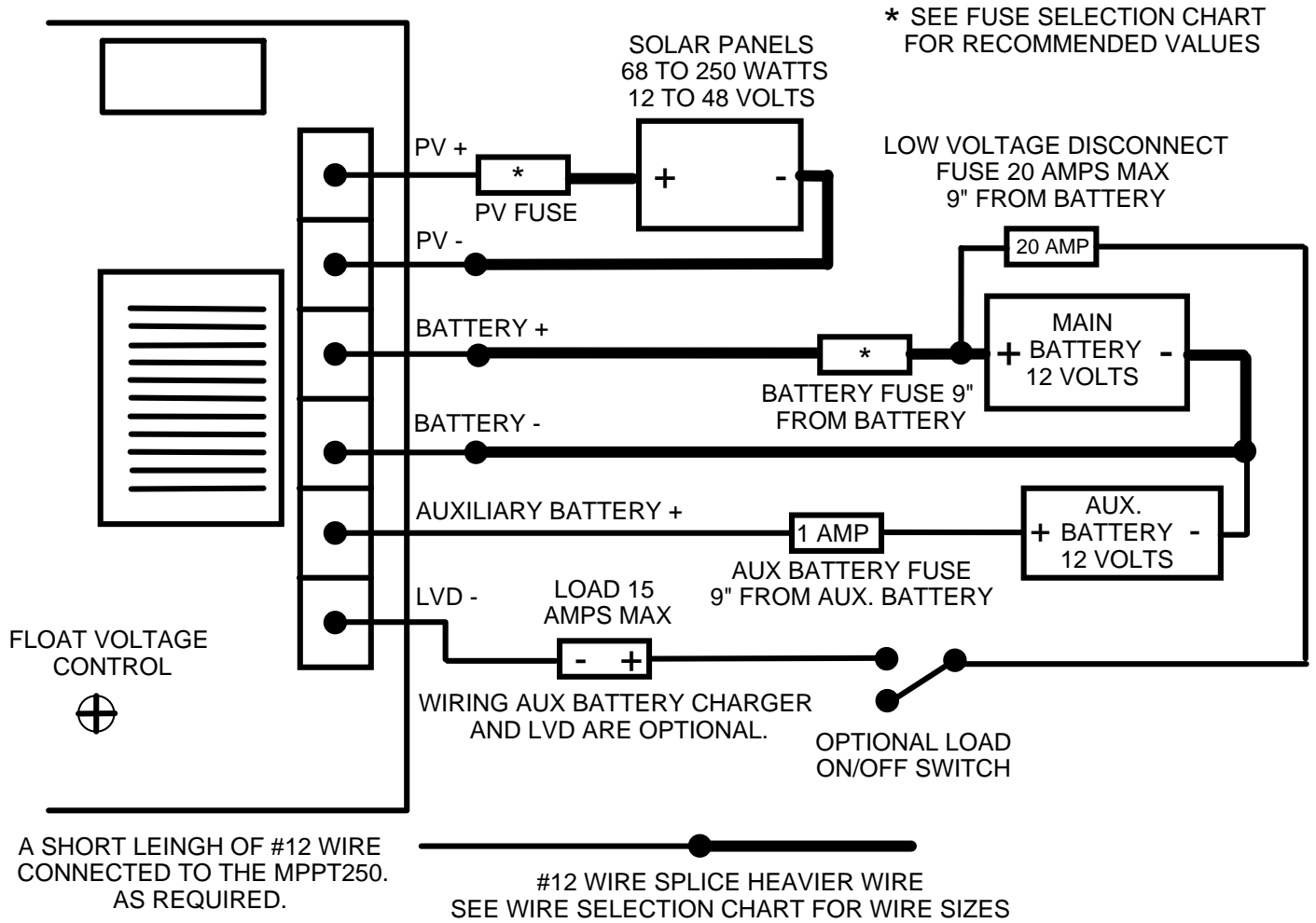
100 volts maximum PV input for model MPPT250HV.

An optional enclosure is available for the MPPT250/MPPT250HV.

Specifications subject to change without notice.

BZ PRODUCTS, INC. MPPT250 WIRING DIAGRAM V 3.0

MPPT250 REAR VIEW



12 AND 24 VOLT PV WIRING COMBINATIONS FOR MPPT250 ONLY.
MPPT250HV INPUT PV VOLTAGE 12 TO 48 VOLTS. 100 VOLTS MAXIMUM.
MAXIMUM PV INPUT POWER 250 WATTS.

