# SOLAR BOADER BOADER SYSTEM INSTALLATION MANUAL ROAD WARRIOR KIT



### TOOLS REQUIRED



\*Disclaimer: Contact Merlin Solar for details on primer type \*\*If rubber roller not available use microfiber rag

# CAUTION

### Points to check before wiring.

- Wear insulated gloves when modules are exposed to light.
- Use a multimeter for volts, amps, resistance, and continuity capable of measuring DC and AC up to 600 volts and 40 Amps.
- Modules should be mounted before operating electrical components
- Installation of modules should only be performed by a qualified licensed professional
- Do not direct concentrated sunlight or artificially concentrated sunlight on the module
- Do not wear metallic jewelry to avoid electric shock during installation
- Do not disconnect the cables under load
- Do not allow children or unauthorized personnel near the area of module installation
- Only work under dry weather conditions and always keep the modules and tools dry during installation
- Do not install modules where flammable gases or vapors are present

### **BILL OF MATERIAL**

Solar Panel Assembly		
Component	#	Unit
Road Warrior Solar Panel(s)	1-4	рс
Charge Controller Assembly		
Component	#	Unit
Merlin Optimized Charge Controller with Inline Fuse, Plug & Play	1	рс
Battery Cable with Deutsch Connector/Ring Terminals	1	2.5 ft, 5 ft, 10 ft
Solar Wire Assembly		
Component	#	Unit
Jacketed Home Run Cable with Staubli MC4 Connectors	1	20 ft, 50 ft
Mounting Hardware		
Component	#	Unit
Mounting Hardware Kit, Screw, Cable Clamp, Warning Label, Wire Tie	1	рс
Edge Tape	1	рс





Mounting Hardware and Edge Tape



Merlin Solar<sup>®</sup> Road Warrior PV Module with Adhesive Backing





Merlin Solar® TS10/15/30 Charge Controller with Fuse

# **INSTALLATION PROCEDURE: 3 SIMPLE PARTS**

### PART 1: INSTALL MODULES

### **Assess Condition Of The Mounting Surface**

- Observe and measure surface obstructions.
- Ascertain which areas need extensive cleaning.
- ★ Apply isopropyl alcohol, acetone, or any quality industrial surface cleaner/degreaser that does not leave any surface residue to amicrofiber rag and apply with force to the mounting surface to remove any substance that would limit adhesion. Cleaner may be applied directly to surface, but absolutely no cleaner residue can remain on mounting surface prior to panel installation.

### **Install Panel**

- Mark mounting location of panel.
- Hold module in place, then remove several inches of liner from one end.
- ★ PRO TIP: Place end of module aligned to marked line. Peel off around 12 inches of liner from below module, making sure it is aligned. Partially remove and stick the module on in 1 foot increments, making sure module conforms to the surface.
- Roll out the module with rubber roller or microfiber rag.

### Note:

- 1. Use of edge tape is required.
- 2. Place edge tape along sides of the module, 0.25 inches away from the edge of the cells.

Step 1: Clean area thoroughly with cleaner as described above before installation.



**Step 3:** Hold module in place then remove several inches of liner from one end. Place end of module aligned to marked line. Peel off remaining liner from below module.





SCAN HERE FOR INSTALL VIDEO



Step 2: Mark mounting location. Apply primer to

**Step 4:** Roll out the module with the rubber roller. Avoid excessive pressure.





EXAMPLE INSTALLATION OF TWO MERLIN® ROAD WARRIOR MODULES ON A TRUCK

## PART 2: MOUNTING THE CHARGE CONTROLLER

- The charge controller is designed to mount away from direct heat, water, salt, snow, ice, and debris.
- Mount the unit and ensure the heat fins have sufficient air flow.
  - See page 8 for detailed mounting instructions.
- Use the charge controller housing as a template and mark the location of the mounting holes.



Note: make sure the in-line fuse is connected on the (+) side of the battery side of the charge controller.

If you have a busman disconnect, make sure it is not near an area where it can disconnect by touching other cables or components.



MERLIN TS CHARGE CONTROLLER PROPERLY MOUNTED AND WITH STRAIN RELIEF

PART 3: STRAIN RELIEF INSTRUCTIONS

### **OPTION 1: HORIZONTAL MOUNT (RECOMMENDED)**





# PART 3: STRAIN RELIEF INSTRUCTIONS

### **OPTION 2: VERTICAL MOUNT**



### PART 3: STRAIN RELIEF INSTRUCTIONS

### PART 3: CHARGE CONTROLLER MOUNTING (CONTINUED)

### Option 1 - #10 Self-Drilling Screw (Hardware Provided):

- 1. Place charge controller on desired mounting location
- 2. Ensure surrounding area is free of obsctructions and has sufficient air flow
- 3. Equip 5/16" hex-head socket to drill
- 4. Apply pressure and fasten down #10 self-drilling screw
  - A. Ensure charge controller is held firmly in place while drilling
- 5. Repeat for remaining three mounting holes

### Option 2 - #10-24 Machine Screw, Lock Washers, and Nylock Nuts:

- 1. Place charge controller on desired mounting location
- 2. Ensure surrounding area is free of obsctructions and has sufficient air flow
- 3. Mark mounting hole locations using charge controller mounting flanges
- 4. Equip 7/32" drill bit to driver and drill marked holes
  - A. If drilling through metal, use lubrication oil
- 5. Place charge controller on mounting holes and fasten down as shown in visual stack (see below)



### Option 3 - 3/16" Blind Rivet:

- 1. Place charge controller on desired mounting location
- 2. Ensure surrounding area is free of obsctructions and has sufficient air flow
- 3. Mark mounting hole locations using charge controller mounting flanges
- 4. Equip 3/16" drill bit to driver and drill marked holes
- 5. If drilling through metal, use lubrication oil
- 6. You then load the pop rivet into the rivet gun mandrel first, so the sleeve is pointing outward.
- 7. Insert the body of the pop rivet all the way into the pre-drilled hole. The flange of the rivet should be flush to the joint.
- 8. Squeeze the trigger of the power rivet gun (or apply pressure to the levers on the manual rivet gun) until you hear the snap sound that indicates the mandrel has been removed. Once the mandrel is snapped off, the collar becomes the rivet head.
- 9. Lastly, the mandrel is collected. You will have to collect the mandrel yourself if you are using a manual rivet tool. Most power rivet guns have a built-in receptacle to capture the mandrel once it is removed.



# PART 4: WIRING THE SYSTEM

### **STEP 1**

- a) Connect positive battery cable ring terminal to battery (+) terminal on battery.
- b) Connect negative battery cable ring terminal to battery (-) terminal on battery.

		Battery Cable	O. O
+ Battery Cable	+ / -		+ – –
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### **STEP 2**

- a) Connect positive battery cable to battery (+) terminal on charge controller.
- b) Connect negative battery cable to battery (-) terminal on charge controller.

Charge Controller



### **STEP 3**

- a) Connect positive home run cable to PV (+) terminal on charge controller.
- b) Connect negative home run cable to PV (-) terminal on charge controller.
- c) Connect home run cables to cables on Merlin Solar panel.

Note: PV = solar panel



### **STEP 4: LED INDICATORS**

Indicator	Color	Status	Instruction	
PV	Green	On Solid		
		OFF	No PV voltage (night time) or PV connection problem	
		Slowly Flashing (1 Hz)	In charging	
		Fast Flashing (4 Hz)	PV overvoltage	
BATT	Green	On Solid	Battery is normal	
		Slowly Flashing (1 Hz)	Battery charges full	
		Fast Flashing (4 Hz)	Battery overvoltage	
	Orange	On Solid	Battery undervoltage	
	Red	Fast Flashing (4 Hz)	Battery overheating Lithium battery low temperature	
Charging indicator (green) and battery indicator (orange) flashing simultaneously		Battery overheating Lithium battery low temperature		
*When the battery type is a lithium battery, the controller does not				

recognize the system voltage automatically.





### **STEP 5**

When disconnecting the system, the sequence will be reversed.



# TESTING AND MAINTENANCE

### System Check

- Ensure that charge controller is receiving power from the PV array by checking that the light on the charge controller is blinking green, as shown on the right.
  - Use DC clamp-on multimeter to measure amperage of PV wire.
  - Positive HR cable to controller: [0.1-40A]
    - Positive cable to battery: [0-40A]
- If controller does not respond, ensure connections are sound. Please note if batteries are full, no current will be available, this is an indication that the system is working properly. Check again when batteries are not full.
- Check panels for dust and clean if dirty.
- Tighten all battery/charge controller connections. Use a proper torque wrench to tighten batteries, following battery manufacturer specs.
- Pull test all floating connections.

### Notes:

- 1. Voc is voltage coming out of the HR cable to the controller
- 2. The Voc of the panel array can be significantly higher than the charging voltage. Check specific modules to determine appropriate voltage ranges. If the Voc of the array exceeds 48V, make sure a safety breaker is installed on the PV side of the circuit.
- 3. Based on state of charge of the battery, if you have a full battery the current might be zero...meaning the currents don't need to match (bulk, absorbtion, float).

### System Maintenance

- Clean surface of panels as needed with isopropyl alcohol or other degreaser.
- When replacing batteries, ensure that terminals are cleaned as well. Make sure the solar panels are disconnected by removing the fuse or using the breaker (if available).
- After replacing the batteries, make sure the solar panels are connected again and that the breaker is back in the ON position (if applicable).
- In the rare event that you need to jump start the vehicle, make sure solar panels are disconnected.



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#### Product Model Number & Description:

MST Transportation Kits (Be sure to have this information available when you need service for your product.)

#### Warranty Period for this Product:

The warranty period for material defects and workmanship is 5 years from installtion date. This warranty is transferable when product remains installed in original location at the time of product warranty registration.

#### ADDITIONAL ITEM(S) EXCLUDED FROM WARRANTY COVERAGE

Warranty coverage does not apply when:

- The product is improperly installed
- The product is subjected to abuse, damage from external impacts
- The product is subjected to improper voltage or power surges or abnormal environmental conditions, lightning, floods, other condition beyond manufacturer's control
- o The components in the construction base on which the module is mounted are defective
- o External corrosion, mold discoloration or the like occurs



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