

# Solar Charging System Installation Manual

**Models:**  
**SOL 20, SOL 45, SOL 65,**  
**SOL 80, SOL 100, SOL 120**

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M-SOLCHGSYS  
As of August 12

## 0.0 Product Overview

This Solar Charging System is designed for use in emergency vehicles and other heavy duty commercial mobile applications. This mounting system is heavy duty and includes shock mounts to survive in high vibration environments. The mounting kit has parts that accomodates several variations of installations, thus all parts may not be used. If you have suggestions for additional parts that we could provide to ease installation, please let us know by emailing [Techservice@newmarpower.com](mailto:Techservice@newmarpower.com).

## 1.0 Unpacking

The Solar Charging System is shipped complete in one carton:

If any items are missing, please contact your distributor or Newmar immediately.

**WARNING: WHEN SOLAR PANEL IS TAKEN OUT OF ITS SHIPPING CARTON, DO NOT REMOVE PROTECTIVE CARDBOARD TAPED TO SOLAR PANEL UNTIL THE SOLAR PANEL IS INSTALLED AND WIRED TO THE CONTROLLER.** The solar panel is an energy source. Once cables are attached to it and the panel is exposed to a light source the cables become live. Bare or exposed copper conductors can short during wire preparation & routing, creating hazardous sparks and possible damage to solar panel. Leave protective cardboard in place until installation is 100% complete.

## 2.0 Materials Provided

1 x Manual-Solar Charging System

1 x Morningstar Regulator; 10 amp, 12 volt, model SS-10, with instructions in box

20' x Cable 12/2 Blk-Red; grey jacket, 105C

Accessory Parts Bag:

1 x RA-3 Right Angle Thru-Dex Fitting (cable feed-thru for vehicle roof)

1 x Fuse Auto 15 Amp (battery fuse)

1 x Fuseholder Inline; ATC/ATO, 12 AWG, Red (battery fuse)

4 x Cable Clamp; nylon, adhesive, black

1 x Cord Grip; NPT-1/2", Blk, 11-6 MM (pass cable through roof/firewall)

4 or 6 x Z Bracket (mount solar panel to vehicle roof top): 4 required for models: SOL-20, 45, 65, 80 & 100;  
6 required for model: SOL-120

8 or 12 x Machine Screw; Hex Head SS 1/4"-20 X 5/8" (mount Z brackets to roof top and solar panel)

4 x Sheet Metal Screw; Phillips Pan Head, SS #10-1/2" (mount controller)

8 or 12 x Nut Nylock, 1/4"-20 stainless steel

12 or 18 x Washer Flat, 1/4" stainless steel

4 or 6 x Nutsert 1/4"-20 Zinc-Steel (optional shock mount feet mounting tool required)

2 x Butt Connector Term. Insul. #1210GA (battery fuse holder wiring)

4 x Fork Term; #1210GA INS #8 Screw (controller wiring)



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### 3.0 Warnings

- **WARNING: DO NOT REMOVE PROTECTIVE CARDBOARD ON SOLAR PANEL UNTIL THE SOLAR PANEL IS INSTALLED AND WIRED TO THE CONTROLLER.** The solar panel is an energy source. Once cables are attached to it and the panel exposed to a light source the cables become live. Bare or exposed copper conductors can short during wire preparation & routing creating hazardous sparks and possible damage to solar panel. Leave protective cardboard in place until installation is 100% complete.
- **Warning:** Be very careful when working with batteries. Lead acid batteries can generate explosive gasses and short circuits can draw thousands of amps from the battery. Read these instructions and those included with the charge controller and battery.
- **DO NOT** exceed the voltage or current ratings of the controller. Use only with a 12 volt battery.
- **DO NOT** short circuit the PV array or load while connected to the controller. This will DAMAGE the controller.
- The controller should be protected from direct sunlight. Ensure adequate space for air flow around the controller
- The negative system conductor should be properly grounded.

### 4.0 Tools Required (Additional tools may be required)

- Philips screwdriver
- Punch or Awl
- Wire strippers
- Wire cutters
- Wire crimpers
- Electric hand drill
- 1/8" drill bit for the Thru-Dex roof cable feed-thru mounting screws (pilot hole)
- 15/32" drill bit for the cable to pass through roof using RA-3 Right Angle Thru-Dex fitting
- 25/64" drill bit for Nutserts (Grip-n-serts), optional. Requires nutsert tool - contact NEWMAR for more info.
- 27/32" drill bit if using optional 1/2" NPT cord grip
- 9/64" drill bit for #10 sheet metal screws (pilot hole - mount solar regulator)
- 5/16 and 7/16 inch wrench
- Adjustable wrench (1-1/16") if installing 1/2" NPT cord grip
- Sealant
- Thread locker (high vibration applications)

### 5.0 Installation Overview/Planning

#### A. Solar Panel Wiring

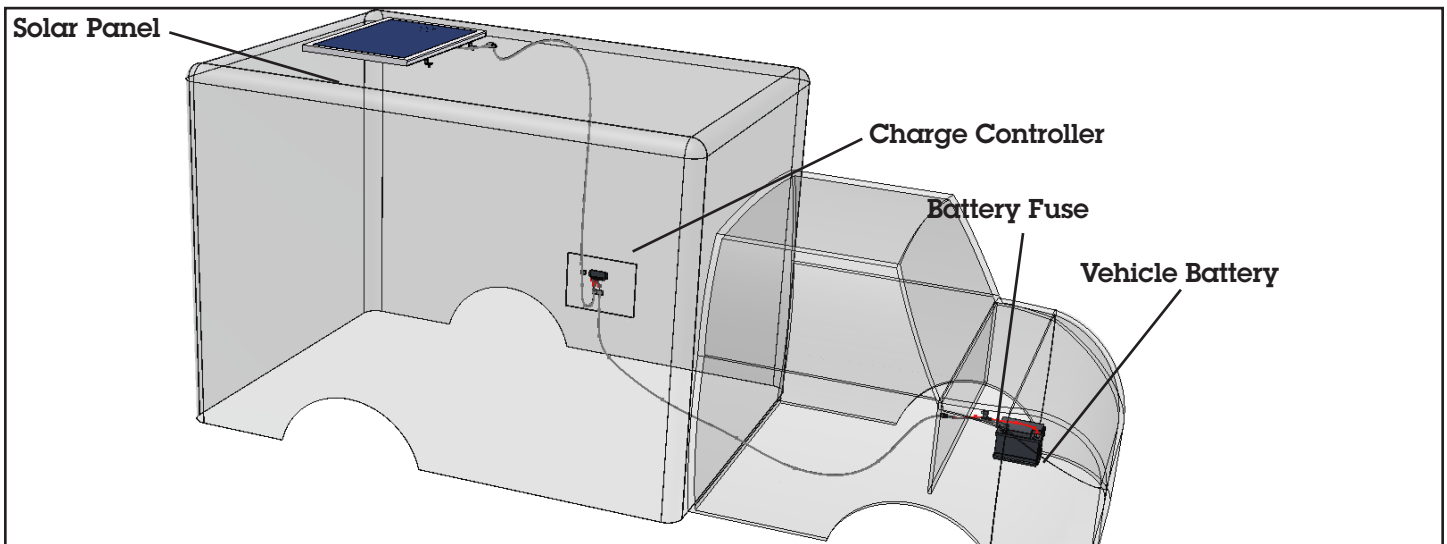
- Review the system diagram on the following page (**Figure 1**) and determine best location for the solar panel, charge controller and a convenient wiring location to connect to the vehicle battery system.
- Please note, the solar panel and mounting brackets will increase vehicle clearance requirements by approximately 3" if mounting panel to the highest location on the vehicle. Personnel operating vehicle should be made aware of increased vehicle height clearance requirements.



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Figure 1: Installation Overview



## 6.0 Installaion

A. Solar panel wiring preparation (reference Figure 2 & 3)

**WARNING: DO NOT REMOVE THE CARDBOARD COVERING THE PVC SIDE OF PANEL UNTIL THE INSTALLATION IS COMPLETED. ONCE CABLES ARE CONNECTED TO THE PANEL'S JUNCTION BOX THE CABLES WILL BECOME LIVE IF THE PANEL IS EXPOSED TO A LIGHT SOURCE.**

Figure 2: Junction Box

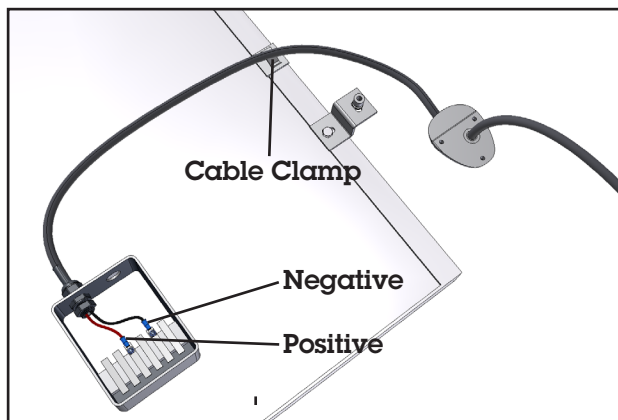
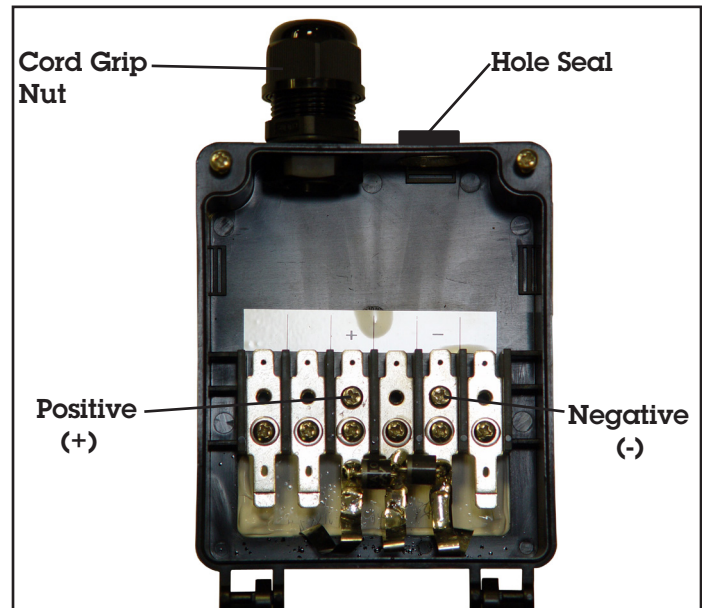


Figure 3: Junction Box Close Up



1) Locate the black junction box on the rear of the solar panel and remove the two Philips head screws on the junction box cover, and open.

2) Unscrew the cord grip nut on the outside of box and remove it and the rubber grommet. Feed the end of the 12/2 provided cable which has the two # 8 ring lugs attached through the nut, grommet and the fitting body attached to the box and loosely re-fit the nut back on to the fitting. **Note:** Two junction box holes are provided with a cord grip installed in one and a watertight hole seal in the other. The cord grip and hole

seal can be swapped for wire routing convenience.

3) Observing correct polarity attach the red wire to the POSITIVE (+) screw terminal and the black wire to the NEGATIVE (-) screw terminal. Secure both screws tightly. Tighten the cord grip fitting nut securely so it grips the cable and provides a water tight seal around the cable.

4) Close the junction box cover and secure it with the two Philips head screws.

5) Using the provided self adhesive cable clamps, secure the cable to the rear of panel to eliminate cable movement while the vehicle is in motion. Route cable towards cable feed thru location on roof.

## B. Mounting the Solar Panel

**Note:** Install cable to junction box on solar panel rear before proceeding with panel installation.

Figure 4: Mounting Solar Panel

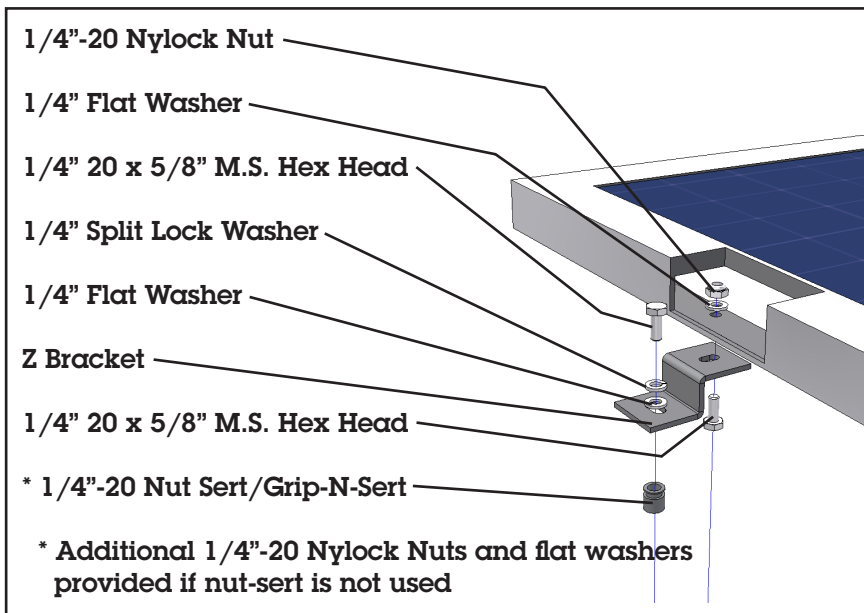


Figure 4A: Z Bracket Orientation

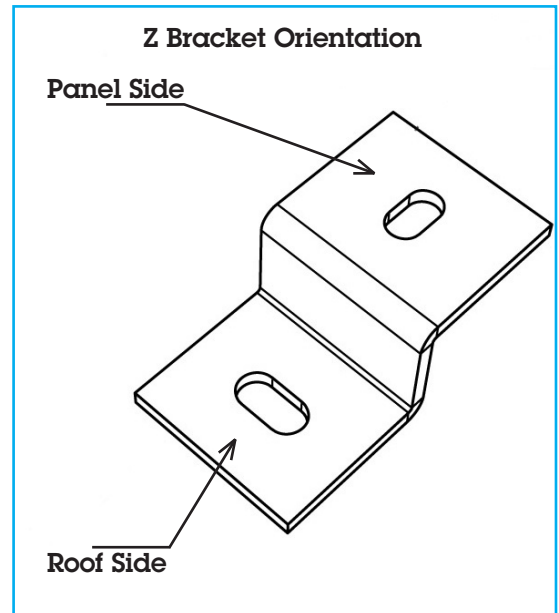
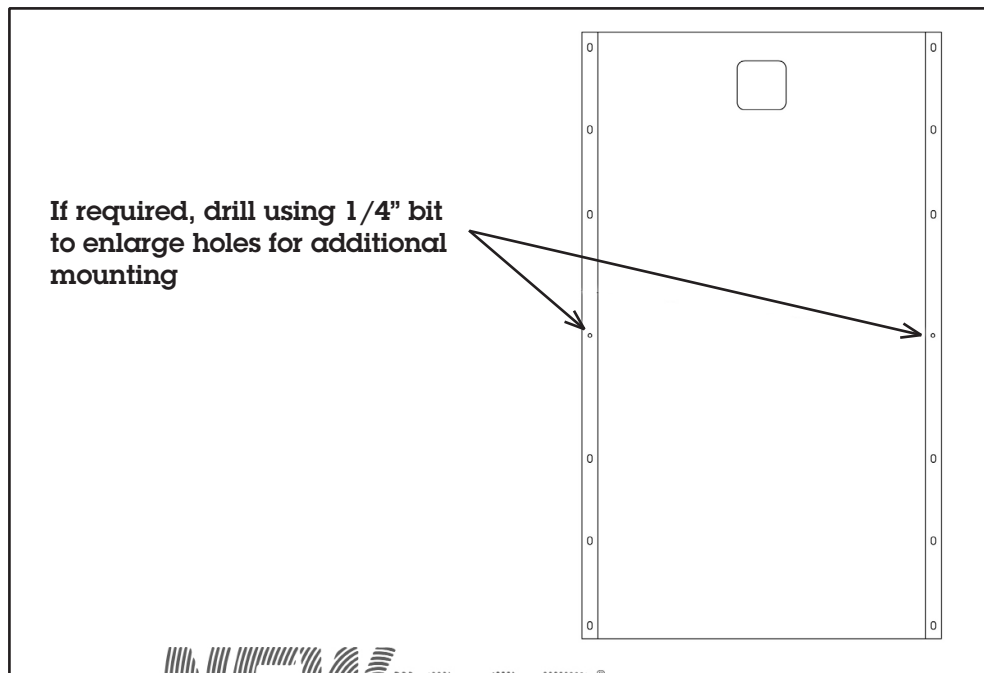


Figure 4B: 120 Watt Panel Center Mounting Holes (six Z Brackets total)



**Note:** 100 Watt and smaller panels require four (4) mounting brackets. The 120 Watt model requires six (6) mounting brackets. If you are missing any Z mounting brackets (700-5389-1) please contact Newmar immediately for replacements.

**1)** Install the black Z mounting brackets to the solar panels aluminum frame - see **Figure 4 & 4A** for proper location and bracket positioning. Note the two different size holes on mounting brackets. The larger hole is used to mount bracket to roof top. Mount one Z bracket each near the four corners using the 1/4"-5/8" hex head bolts provided, flat washers and nylock lock nuts. If not installing a 120 Watt panel skip step 2).

**2)** 120 Watt Panel Only: Install two more Z brackets using the center holes on the solar panel frame's long axis. If the mounting hole is too small for the 1/4" hex head bolt use a 1/4" drill bit to enlarge these two holes - See **Figure 4A**

**3)** Find a clear, un-obstructed area of the roof where the solar panel will fit. Stay at least several inches away from antennas to prevent radio signal attenuation.

**4)** Using two persons for the larger wattage panels- set the panel down on the roof with solar panel side facing skyward. Position panel in desired mounting location. Using a felt tip marker or pencil mark the location within the Z brackets obround hole to identify rooftop hole drill location. Remove panel from mounting location.

**5)** Two mounting options:

- a)** Blind hole installation: For blind hole installations we provide four (20-100W models) or six (120 W model) 1/4"-20 Nutserts/Grip-n-serts (special insert tool required-contact Newmar for info on purchasing tool). Drill four or six 25/64" holes depending upon model, install nutserts in roof using the nutsert tool. Drop the solar panel back down on to roof aligning the Z brackets holes with the installed nut-serts in the roof and secure panel to roof with the 1/4" hardware provided - see **Figure 4**. Recommended torque: 75 in/lbs. Loctite or similar thread locker is recommended for high vibration applications.
- b)** Thru-Hole Mounting on underside of roof: If underside roof mounting location is easy to reach you can perform a thru hole installation: drill 1/4" roof top holes for Z bracket mounting, place panel on to roof with Z mounting bracket holes lined up with 1/4" holes and secure brackets/panel to roof using the 1/4" hardware provided. Additional flat washers and nylock nuts are provided to secure bolts on the underside of the roof.

### **C. Cable Feed-Thru Installation**

**1)** Roof top cable feed thru- A model RA-3 Right Angle Thru-dex fitting is provided for routing the solar panel's 12/2 round cable through the roof and to the charge controller, see **Figure 5**. Carefully choose a location that can be accessed from inside the vehicle and mark the location on roof for the RA-3 location and follow the install instructions provided with the RA-3.

**2)** A drill size of 15/32 " is recommended for the wire routing hole and a 1/8" drill for creating pilot holes for the fitting's three self tapping screws.

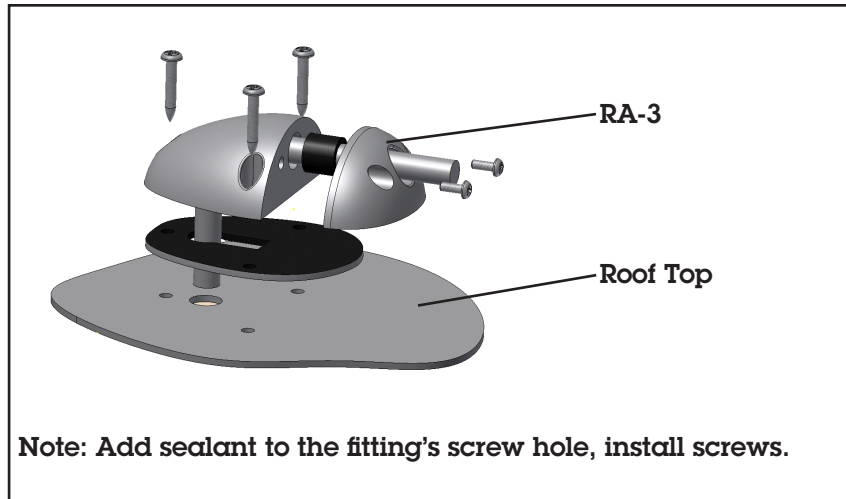
**3)** Additional cable feed thru for bulk heads- A 1/2" NPT Liquid tight cord grip is provided to allow the 12/2 round cable to pass through a bulkhead or fire wall. To install this cord grip drill a 27/32 " (21.4 mm) hole.



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Figure 5: RA-3 Right Angle Feed-Thru



**D. Installing and Wiring the Charge Controller (see Morningstar 'Operator's Manual' for additional information)**

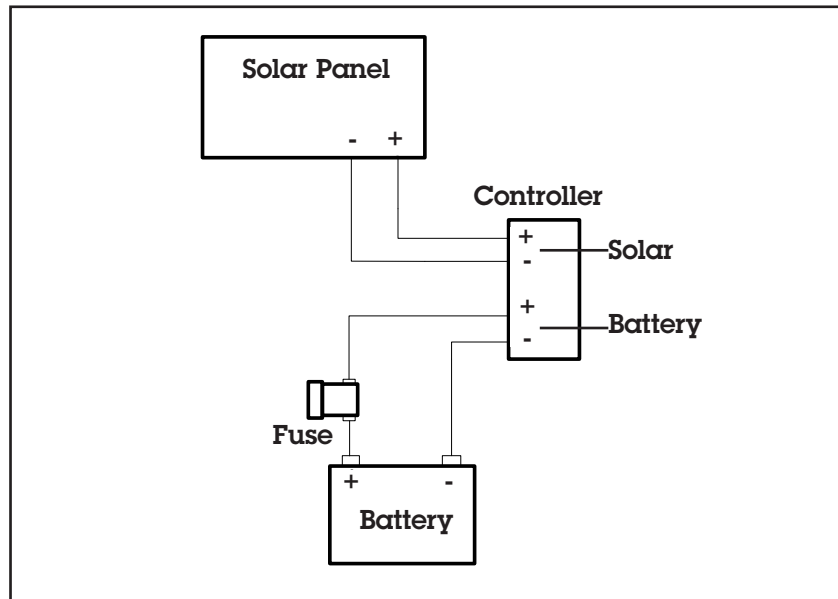
Figure 6: Charge Controller



1. Select a suitable location for the installation of the regulator. Although the regulator is potted for vibration and protection from the elements/foreign contaminants, a location inside the vehicle such as the cab or other protected compartment is recommended (operating temperature range: -40 to +85° C). The regulator should be mounted to a vertical surface and have free space around it for cooling. Use the four #10, 1/2" sheet metal screws provided. Use a 9/64" drill bit for the pilot hole.

**Note:** The 'LOAD' terminals are not used in this application.

**Figure 7: Wiring**



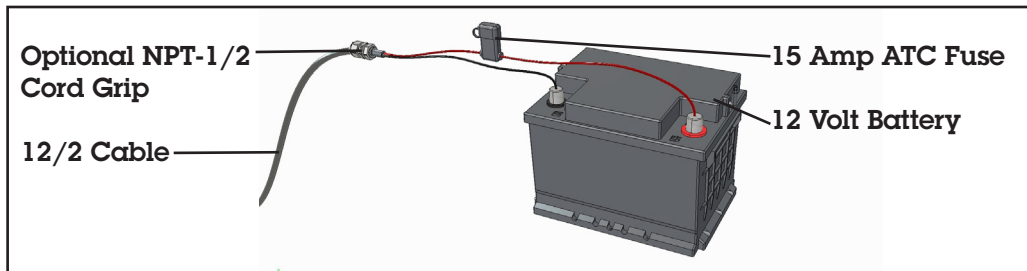
**2) Wire the battery to controller:**

**a)** Crimp a pair of #8 fork terminals provided to one end of a separate length of the 2/2 cable provided and connect to the charge controller Battery screw terminals:

Red wire to Battery (+)  
Black wire to Battery (-)

**b)** Route this cable either directly to the battery or if more convenient, to the line side of a power distribution bus. Before connecting to vehicle battery system install the ATC in-line fuse holder provided on the red/positive (+) wire on the battery end (as close to + battery/+ bus as practical) – do not install the ATC-15 fuse at this time. Connect the black/negative (-) wire to the battery negative (-) terminal or a convenient ground bus point.

**Figure 8: Battery Wiring**



**3)** Once solar panel wiring preparation has been completed (see section 6A), install panel on roof, verify protective cardboard is still taped to solar panel PVC side to prevent solar panel current from flowing during wiring. Route the solar panel cable from the roof to the charge controller and crimp a pair of # 8 fork terminals provided and connect to the charge controller 'Solar' panel screw terminals:

Red wire to Solar (+)  
Black wire to Solar (-)

See the Morningstar Sun Savers Operators Manual for more information regarding controller operation.



## 7.0 Powering Up the Solar Charging System

- A. Double check polarity of wire connectors
- B. Install the ATC/ATO-15 fuse into the battery fuse holder
- C. Remove protective cardboard from the solar panel
- D. Verify the green LED indicator on the charge controller is illuminating whenever sunlight is available
- E. Using a digital multi-meter, place the probes across the vehicle battery with the solar panel exposed to sunlight and no other charging sources operating (alternator and shore battery charger off). Verify battery voltage is rising. The set point for the charge controller is 14.1 VDC (sealed battery). For open, flooded batteries remove the jumper on the controller (see Charge Controller manual for more information.)

## 8.0 Maintenance

- A. For optimum performance, clean the solar panel glass at least once a month with window cleaner or mild soap, or when vehicle is washed.
- B. Periodically verify charge controller is operating by:
  - 1) Disconnect shore power charger if so equipped.
  - 2) Place vehicle so the solar panel is exposed to full sunlight.
  - 3) Turn vehicle engine off.
  - 4) Turn on a small 12 volt load such as a radio and using a digital voltmeter, verify battery voltage does not drop below 12.8 VDC. Depending upon solar panel wattage, panel output voltage, sun exposure and current draw of load, the battery voltage may measure between 13 - 14 VDC.

## 9.0 WARRANTY & FACTORY CONTACT INFORMATION

NEWMAR warrants with original purchase of products sold by NEWMAR, that they shall be free from defects of material and workmanship for two years from the date of purchase.

If you have a problem with the Solar Charging System, or have any questions about the installation and proper operation of the Solar Charging System, please contact NEWMAR's Technical Services Manager:

**Phone:** 714-751-0488 - From the hours of 7:00 A.M. to 4:30 P.M. weekdays, P.S.T.

**Fax:** 714-957-1621 - Anytime

**Email:** techservice@newmarpower.com - Anytime



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