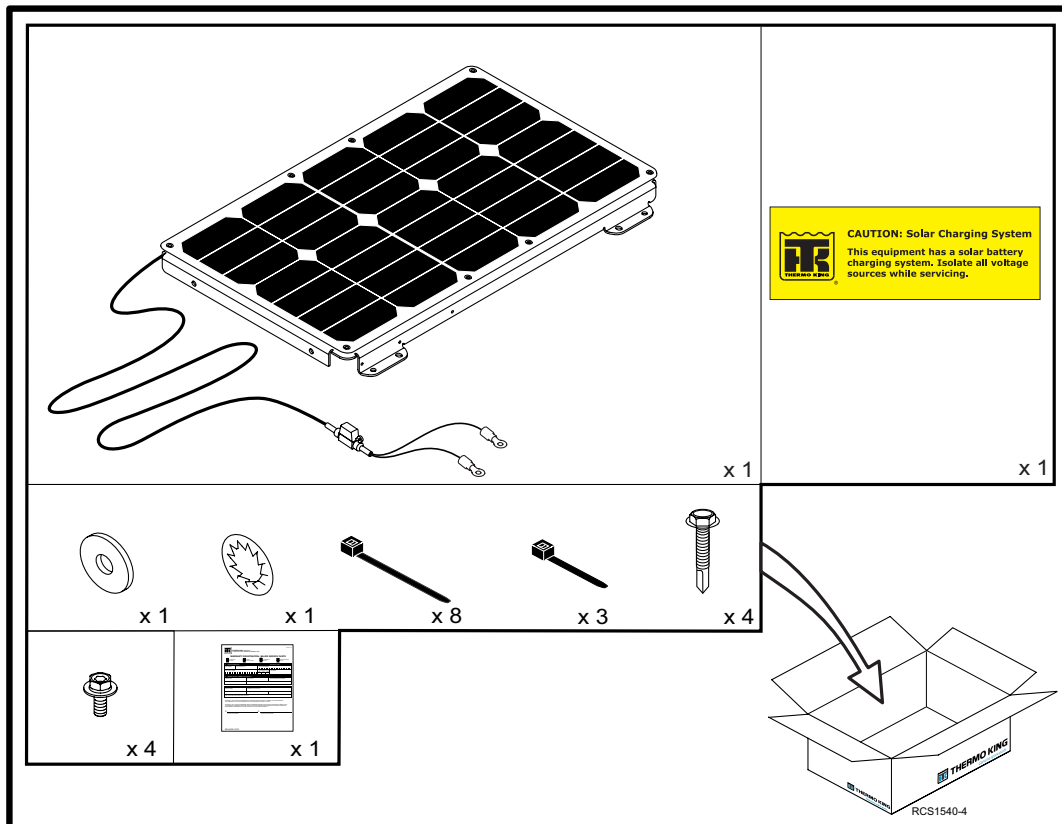


## Installation Instructions

### ThermoLite™ 30W Solar Panel Kit 401414

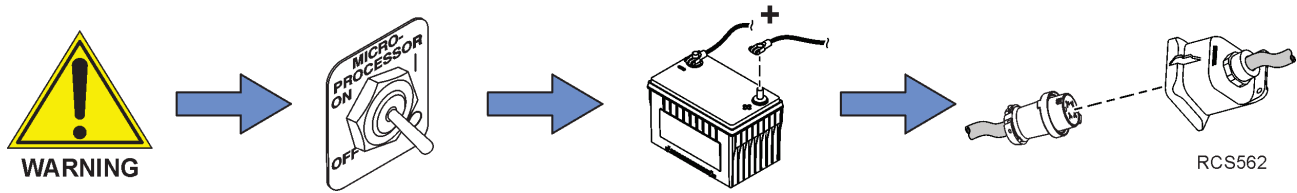
#### Applications:

- SB Units (retrofit applications) Bracket 401271 is also required and sold separately.
- Precedent™ Units (retrofit applications)
- Precedent™ Units (with factory solar panel option\*)
- Carrier™ Trailer Units (retrofit applications) Kit 903364 is also required and sold separately.



\* Precedent units from the factory with the solar panel as either an option or as standard equipment will come with the battery harness installed and only the solar panel will be in the box. Retrofit installations will come with the battery harness attached to the solar panel together in the box.

# Solar Panel Installation Best Practices



**Important:** *BEFORE* beginning the solar panel installation disconnect all power to the refrigeration unit including standby power (if equipped). Also disconnect all power at the batteries for solar panel installation onto tractors or buses and on trailers equipped with a lift gate.

⚠ WARNING
<p><b>Personal Protective Equipment (PPE) Required!</b></p> <p>A battery can be dangerous. A battery contains a flammable gas that can ignite or explode. A battery stores enough electricity to burn you if it discharges quickly. A battery contains battery acid that can burn you. Always wear goggles or safety glasses and personal protective equipment when working with a battery. If you get battery acid on you, immediately flush it with water and get medical attention.</p>

SOLAR PANEL INSTALLATION REQUIREMENTS
<ul style="list-style-type: none"> <li>For the solar panel to adhere properly, both the application surface and air temperature must be above 45 F (7 C).</li> <li>All surfaces must be roughened up with sand paper, Scotch-Brite or steel wool and then thoroughly cleaned/dried for the panels to adhere.</li> <li>Install panels using the adhesive backing, rivets, cable hold downs and sealant around the panel edges.</li> <li>If operating in northern climates with snow and possible snow scrapers, follow installation locations listed to reduce panel damage.</li> <li>Periodically inspect the solar system to make sure it still meets initial installation requirements, especially panel attachment.</li> </ul>

SOLAR PANEL INSTALLATION BEST PRACTICES
Prior to installation, familiarize yourself with the components supplied in your kit.
Plan the solar panel layout and wire routing prior to permanently mounting any components.
OEM satellite radio antenna's are often mounted in the headliner above the driver towards the windshield. Avoid installing solar panels on the roof directly above the antenna as this will cause reduced radio reception.
DO NOT block the solar panel with antennas, telematics modules, etc. This will greatly reduce the output of the solar panel and inhibit its ability to supply power to maintain and support the battery or batteries it is connect to.
Make sure wire routes are free from abrasive materials and have adequate clearance from hot surfaces.
Holes used for routing harnesses through metal frames, skins or structures should be smooth and non-marring and lined with a grommet.
Remove solar panel fuse (located on the solar panel harness) prior to panel installation.
<b>Tractor with APU</b> – DO NOT connect solar panels to TriPac Envidia APU Batteries.
Solar panel electrical harnesses routed inside the refrigeration unit must be secured to other harnesses or to a solid frame structure with insulated clamps or cable ties to prevent making contact with rotating or hot components.
DO NOT attach electrical harnesses to copper tubing, exhaust components or fuel lines.
Solar Panel Test Procedures must be performed to complete the installation.
Fill out the Warranty Registration Form after completing the installation.

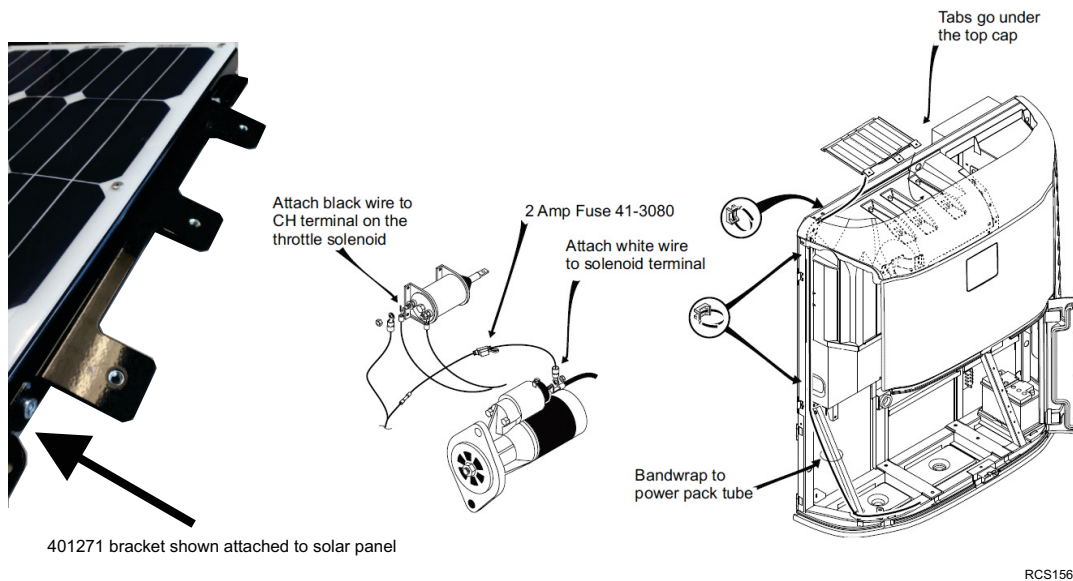
## SB Installations

**Important:** BEFORE beginning the installation, refer to “Solar Panel Installation Best Practices,” p. 2.

1. Attach adapter bracket (**401271**) to solar panel using supplied M6 hardware as shown.
    - a. Remove the three remaining M6 hardware from adapter bracket.
  2. Position solar panel on top of unit towards the curbside avoiding the muffler, condenser air outlet, and center mounting hole.
    - a. Using adapter bracket as a template, mark and drill three 1/4" dia. holes in top front cap.
- Note:** The charge controller is located under the solar panel. If your controller has LEDs, verify solar panel operation before securing panel onto unit. If panel is installed, follow test procedure for non-LED controllers. See “Solar Panel Test Procedures,” p. 11 .
3. Install front tabs of adapter bracket under top cap and secure with M6 hardware removed earlier.
  4. Attach rear of solar panel to frame member with two supplied self-taping screws.
  5. Route harness down rear curbside frame member to angled frame support and along frame front member to starter.

**Important:** Do not attach wiring harnesses to the fuel lines.

**Figure 1. Adapter bracket, wiring and solar panel shown installed.**



6. Attach positive (white/red) wire along with supplied flat and internal lock washers onto positive terminal on starter solenoid.
7. Attach negative (black) wire to CH terminal on throttle solenoid.
8. Secure harness as required with band wraps.
9. Clean door surface and attach supplied nameplate as shown.
10. Reinstall battery harness fuse and reconnect all power to unit.

**Note:** Remaining kit components are not used.

## PRECEDENT Retrofit Installations

*Important: BEFORE beginning the installation, refer to "Solar Panel Installation Best Practices," p. 2.*

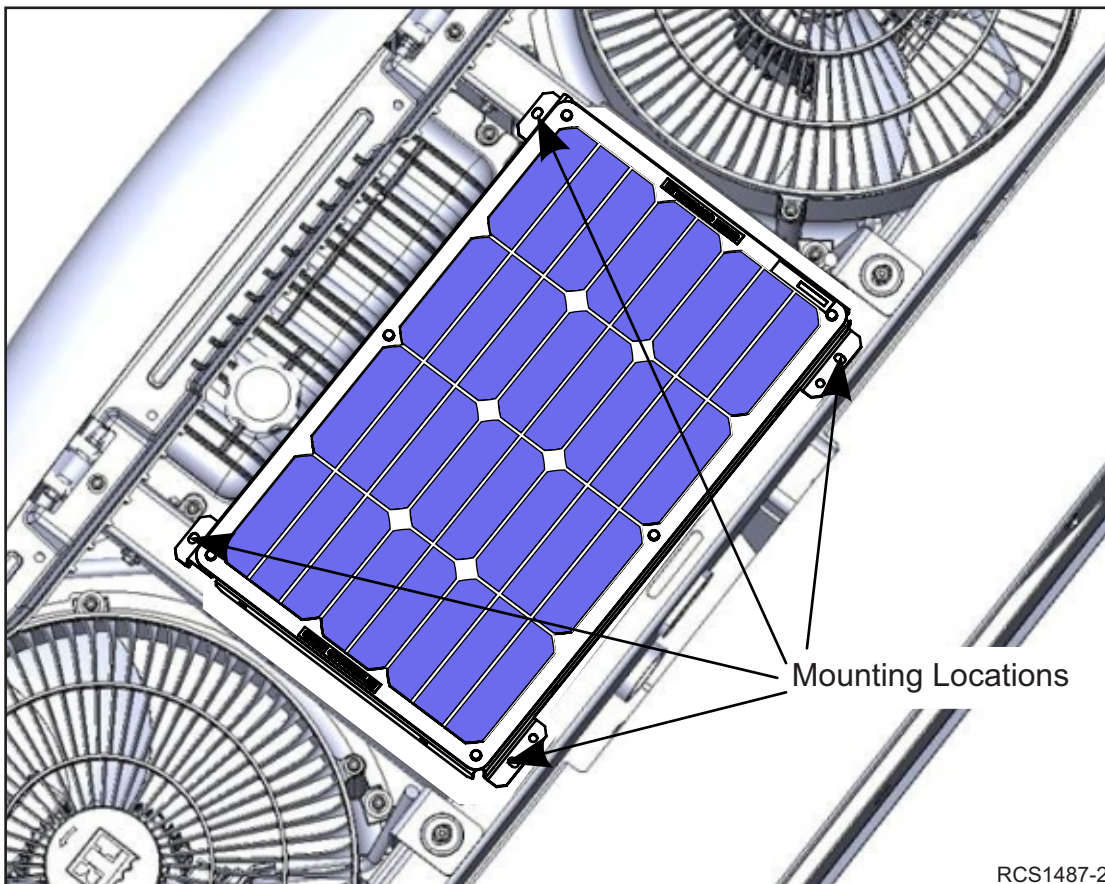
### Mounting Hole Information:

- If your frame has mounting holes with threaded inserts on the top frame channels – proceed to Step 3, otherwise proceed to Step 1.

1. Attach harness to solar panel and secure with supplied band wraps.
2. Position solar panel on top of unit between the condenser fans with the rear mounting tabs against the trailer wall:
  - a. Secure panel to frame using the four supplied self-tapping screws. Continue to Step 5.

**Note:** Do not install self-tapping screws into factory holes, use screws to create new holes in sheet metal.

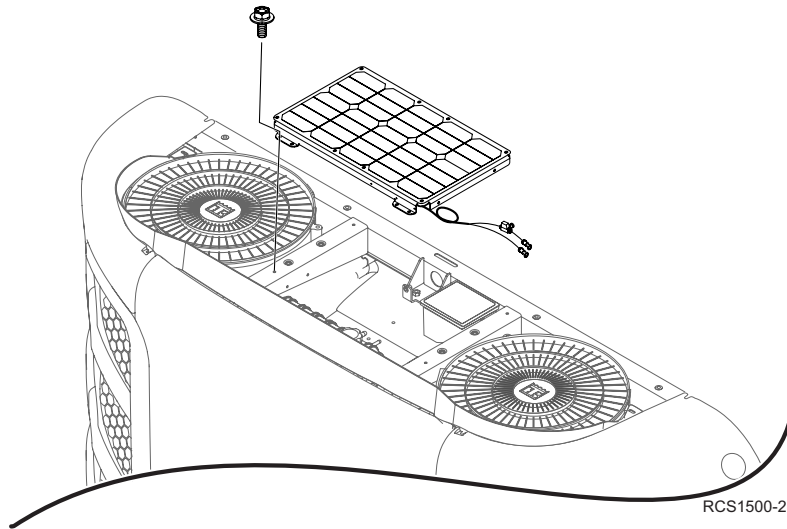
**Figure 2. Mounting hole locations shown.**



**Note:** The charge controller for the 30W panel is located under the panel. If your controller has LEDs, verify solar panel operation before securing panel onto unit. If panel is installed, follow test procedure for non-LED controllers. See “Solar Panel Test Procedures,” p. 11 .

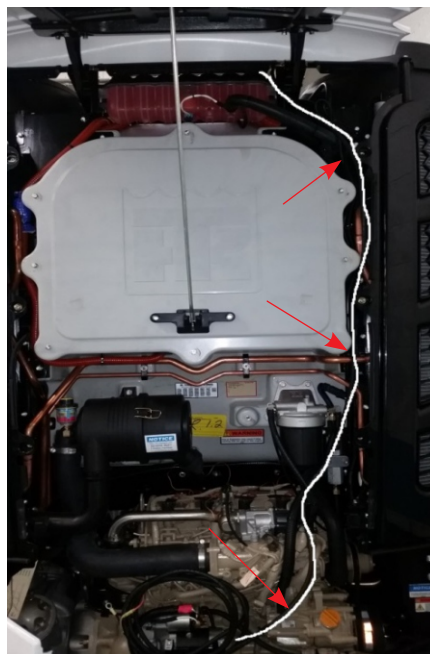
3. Attach harness to solar panel and secure with supplied band wraps.
4. Secure panel to frame using supplied Sems screws (for units with inserts).

**Figure 3. Secure panel with Sems screws as shown.**



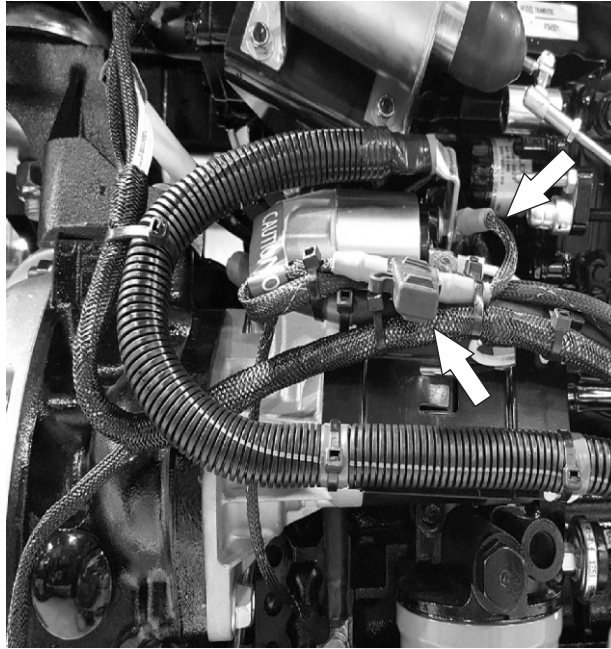
5. Route harness down inside the unit, under the fuel filter and over to the starter as shown.  
**Important:** DO NOT attach electrical harnesses to copper tubing, exhaust components or fuel lines.

**Figure 4. Battery harness routing shown.**



6. Attach positive (white/red) wire along with supplied flat and internal lock washers onto the positive terminal on the starter solenoid (terminal with the battery cable attached).
7. Secure the fuse holder to the existing harness.

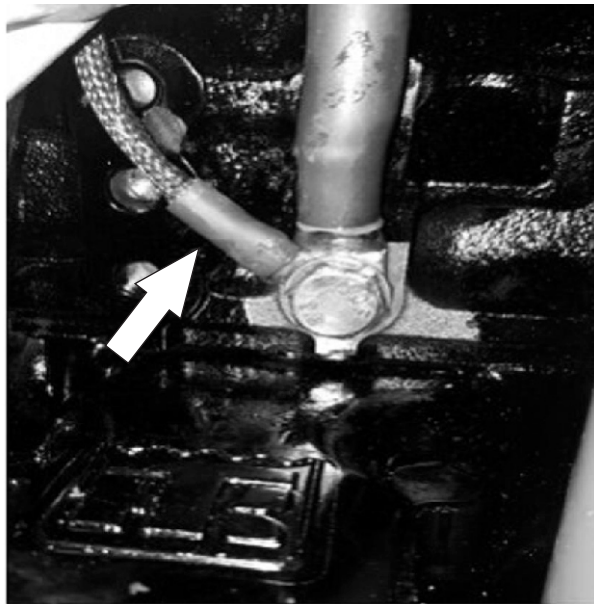
**Figure 5. Positive wire and fuse holder shown.**



RCS1504

8. Attach negative (black) wire with terminal ring to engine block ground stud behind oil filter.  
*Note: The black wire with terminal ring should be installed under the flat washer followed by the large ground cable and the external lock washer last.*

**Figure 6. Negative wire shown attached to engine block.**

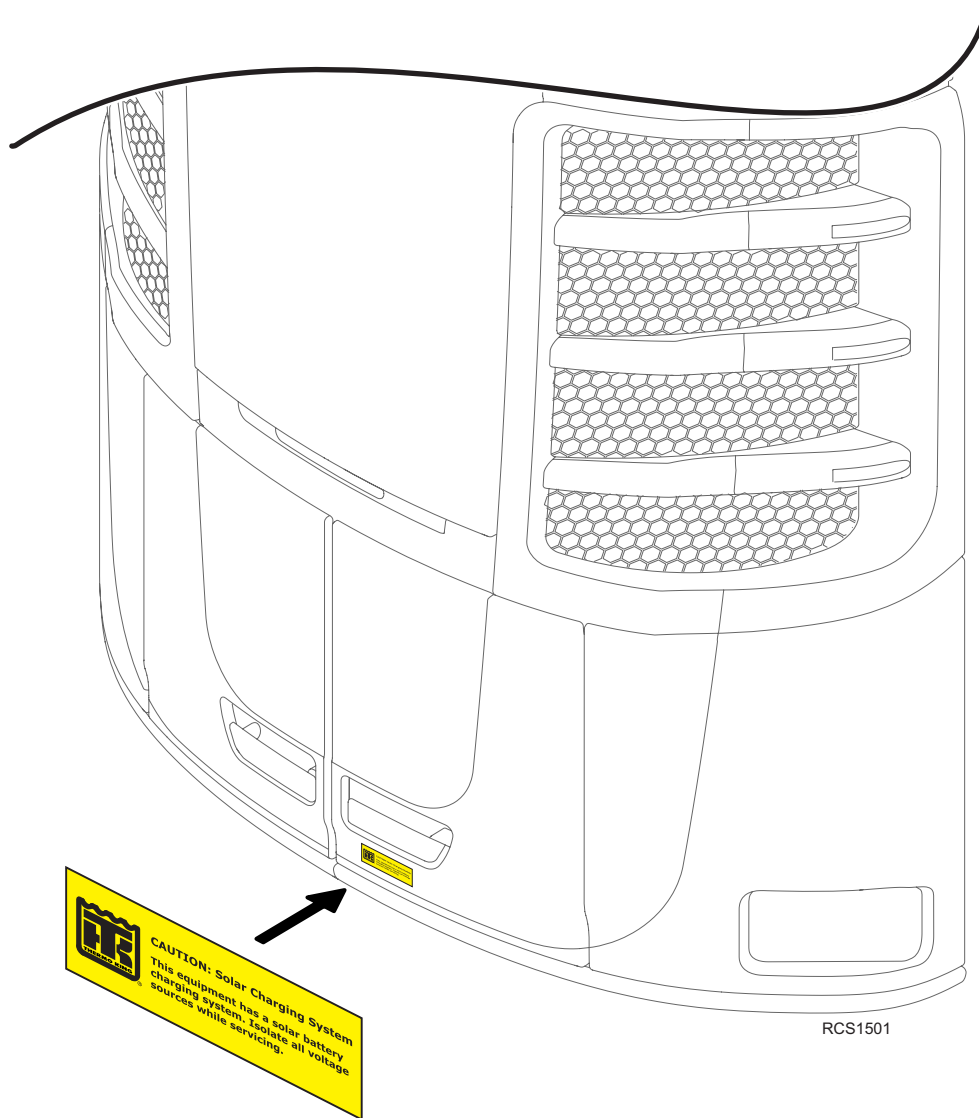


RCS1505

9. Coil up the extra harness length in front of the starter and secure with supplied band wraps.
10. Clean door surface and attach supplied nameplate as shown.
11. Reinstall battery harness fuse and reconnect all power to unit.

**Note:** Remaining kit components are not used.

**Figure 7. Install nameplate as shown.**



## PRECEDENT Installations (Ordered as Factory Option)

**Important:** BEFORE beginning the installation, refer to “Solar Panel Installation Best Practices,” p. 2.

**Note:** Precedent units ordered from the factory with the solar panel option will include only the solar panel in a box, the battery harness will be factory installed on the unit.

1. Locate the battery harness connector on top of unit behind coolant tank.
  - a. Remove and discard the cap from the connector.
  - b. Attach connector to solar panel controller and secure harness to bracket with three band wraps (supplied).

**Note:** The charge controller for the 30W panel is located under the panel. If your controller has LEDs, verify solar panel operation before securing panel onto unit. If panel is installed, follow test procedure for non-LED controllers. See “Solar Panel Test Procedures,” p. 11 .

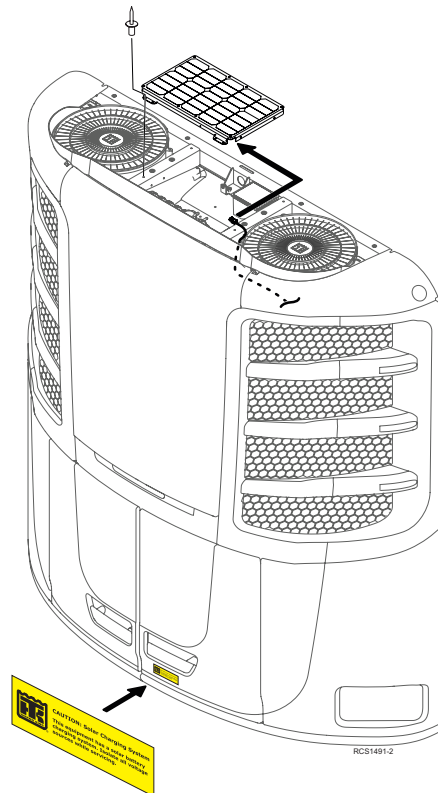
2. Secure solar panel with supplied self-tapping screws (if unit does not have threaded inserts on the top frame channels), or with supplied SEMS screws when threaded inserts are present.

**Note:** Do not install self-tapping screws into factory holes, use screws to create new holes in sheet metal.

3. Clean door surface and attach supplied nameplate as shown.
4. Reinstall battery harness fuse and reconnect all power to unit.

**Note:** Remaining kit components are not used.

**Figure 8. Connect battery harness to panel and secure panel to frame.**





## CARRIER™ Installations

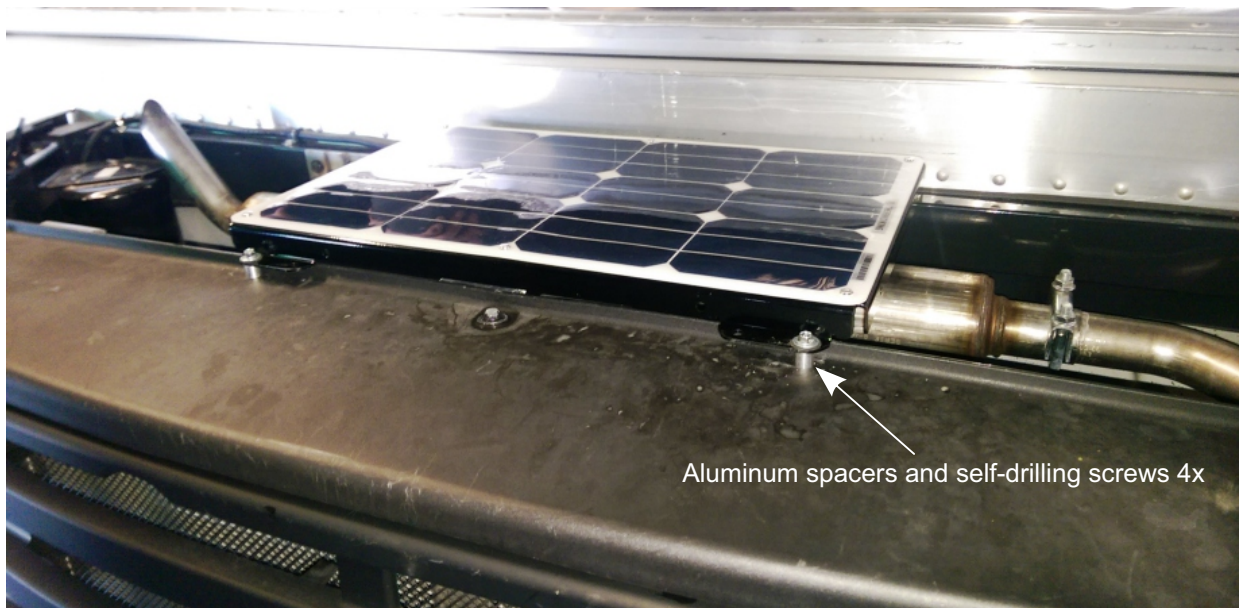
**Important:** BEFORE beginning the installation, refer to “Solar Panel Installation Best Practices,” p. 2.

**Note:** Requires Optional Kit 903364 (sold separately) to install.

**Note:** The charge controller for the 30W panel is located under the panel. If your controller has LEDs, verify solar panel operation before securing panel onto unit. If panel is installed, follow test procedure for non-LED controllers. See “Solar Panel Test Procedures,” p. 11 .

1. Position solar panel on top of unit as shown with one aluminum spacer under each mounting hole.
2. Secure panel to the front of the top cover and the rear frame member with the supplied self-drilling screws.

**Figure 9. Aluminum spacers shown installed.**

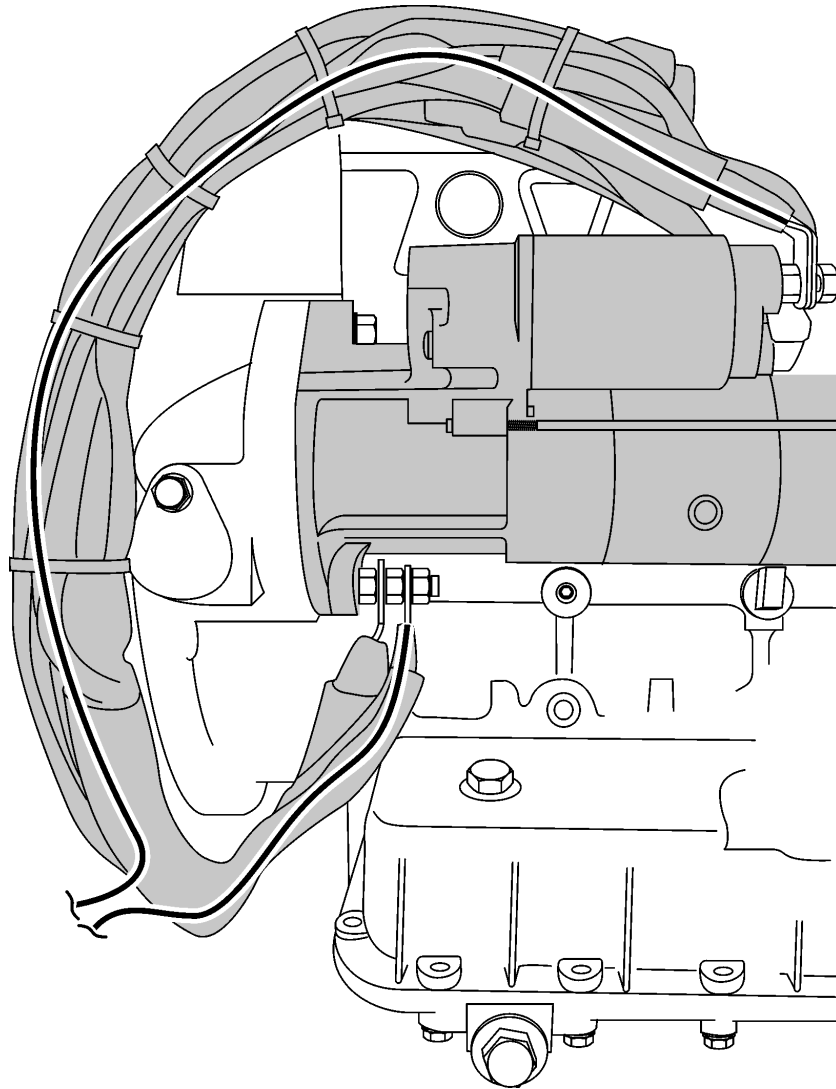


RCS1488

3. Route harness down inside the unit and over to the starter.
4. Attach positive (white/red) wire to the positive terminal on the starter solenoid (terminal with the battery cable attached).
5. Secure the fuse holder to an existing harness.
6. Attach negative (black) wire with terminal ring to the engine block ground stud.

**Note:** The black wire with terminal ring should be installed under the flat washer followed by the large ground cable and the external lock washer last.

Figure 10. Harness connections at starter shown.



7. Coil up the extra harness length in front of the starter and secure with band wraps.
8. Clean door surface and attach supplied nameplate.
9. Reinstall battery harness fuse and reconnect all power to unit.
10. Perform the [“Solar Panel Test Procedures,”](#) p. 11 to complete the installation.

**Note:** Remaining kit components are not used.

## Solar Panel Test Procedures

There are two types of 5A Charge Controllers:

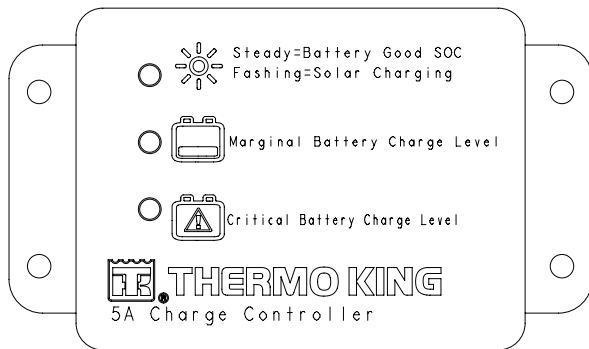
1. Controller with LED status lights.
2. Controller without LED status lights.

The test procedures are different depending on the type of charge controller you have.

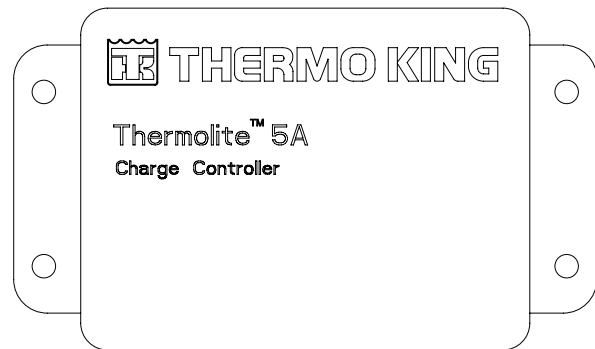
**Note:** Charge controllers can take up to one minute to turn on.

**Figure 11. Two Types of Battery Charge Controllers Shown**

5A Charge Controller with LED status lights



5A Charge Controller without LED status lights



RCS1633

### Charge Controller with LED Status Lights

This charge controller has three LED status lights that indicate battery charging and system operation. If you have this version controller refer to the **Status Light Function** table below to verify solar panel operation. Also see **“Solar Panel Troubleshooting Guide”** if necessary.

Status Light Function	
Flashing Green	Solar panel working properly and charging
Solid Green	Battery fully charged
Flashing Yellow	Marginal battery, charging
Solid Yellow	Marginal battery, not charging (night time)
Flashing Red	Extremely low battery, charging
Solid Red	Extremely low battery, not charging (night time)
No light	Controller not connected/extremely low or dead battery

### Charge Controller without LED Status Lights

This charge controller does not have LED status lights to indicate battery charging and system operation. If you have this type of controller you must use the **“Test Procedure”** on the following page to verify solar panel operation. Also see **“Solar Panel Troubleshooting Guide”** if necessary.

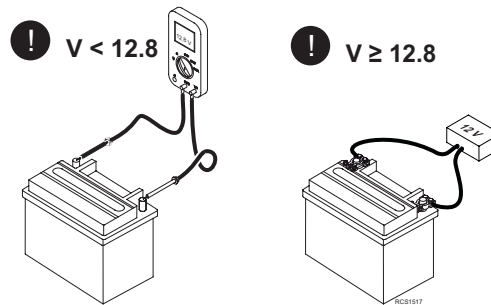
## Test Procedure

To properly test the solar output you must have the following items:

- Halogen lamp (500W or greater) or be outdoors in the daylight.
- Voltage meter
- Amp clamp or Ammeter

1. Attach voltmeter on the battery and measure the voltage.
  - Voltage must be less than 12.8V for the solar panel controller to turn on.
  - If battery voltage is not less than 12.8V, then put a 12V load on the battery.

**Figure 12. Measure battery voltage**

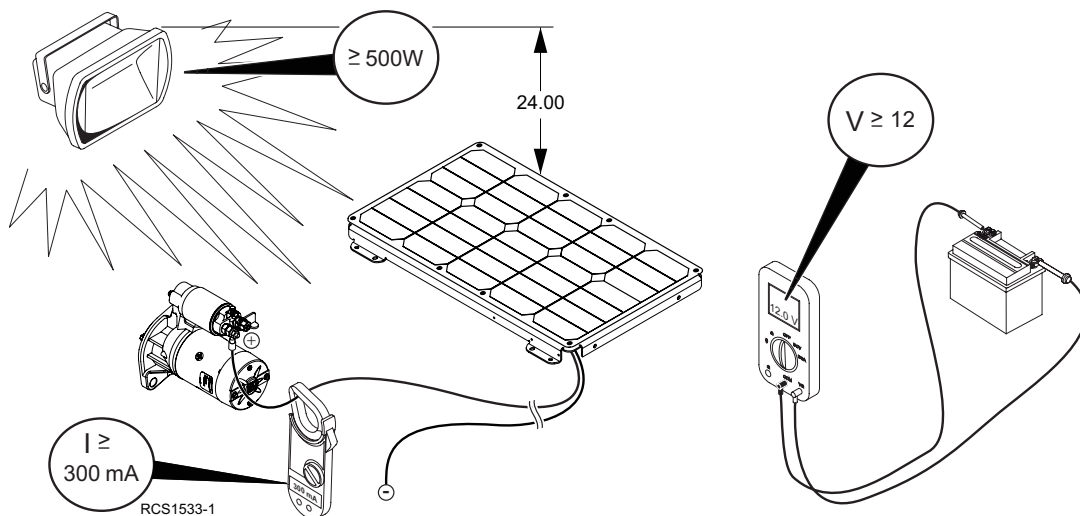


2. Move vehicle outdoors into the daylight. If indoors, put at least a 500W halogen lamp approximately 24" above the solar panel and turn lamp on.

**Note:** The solar panel controller may take up to a minute to turn on. The solar panel must be connected to the battery in order to turn on the charge controller.

3. Attach voltmeter on the battery and measure the voltage.
  - a. Voltage reading should begin increasing or stay the same.
4. Place amp clamp around the positive cable from the solar panel.
  - a. Amperage reading should be greater then 300 mA

**Figure 13. Measure solar panel voltage and amperage readings**



## Solar Panel Troubleshooting Guide

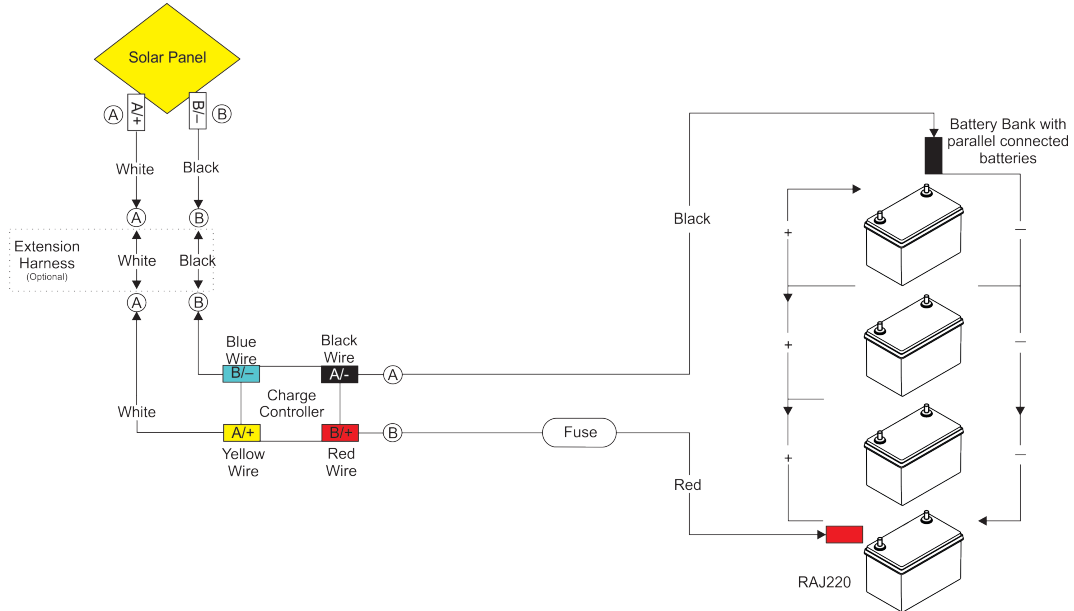
Use the following table to troubleshoot ThermoLite Solar Panel Systems.

STEP	ACTION	RESULT	COMMENT
1	Verify the system is connected to a battery.		The system will not operate if not connected to a battery.
2	Verify the battery voltage is between 11V & 12.6V	Either discharge or charge the battery to the range for the solar charge controller to operate	The solar controller will only operate if the battery voltage is within the range of 11V to 12.6V.
3	Verify system operation by exposing the panel to sufficient light.	Any amount of sunlight (even cloudy day) will result in some current (>100mA) flowing to the battery. This must be verified with an amp clamp around the positive cable to the battery.	If tested inside, at least 500W of halogen light at a range of about 12-24" should be used. Ensure the light shines on the entire panel.
4	Check if the fuse is present in the harness and verify continuity		Ensure any replaced fuse is rated at 20A.
5	Is the solar charge controller present in the system (applies to 36 & 100W systems)?	Once connected, the charge controller will take up to 1 minute to turn on and start charging. At this point current will be flowing.	The absence of a charge controller will result in unregulated power input to the battery that could under or overcharge the battery.
6	Verify cable polarity using the diagrams provided in the installation instructions TK 56127 and TK 56237 (applies to 36 & 100W systems).	Cable Polarity is swapped in the controller so the polarity from start to finish must be checked. If polarity is found to be wrong, swap the pins in the extension cable.	This is a common issue during installation if the connector is installed backwards and the polarity isn't checked.
7	Confirm cable integrity	Check cable integrity to ensure that abrasions, scrapes, or breaks in the wire are not affective voltage drop or power loss.	Breaks in the power cable anywhere along the line will result in voltage or power loss that will result in ineffective charging.
8	Verify solar panel output (without charge controller) by disconnecting the panel from the harness and checking voltage output at the panel plug connector.	Unregulated panel output voltage may range from approximately 17V to 21V. If the panel has low output voltage then it's defective and should be replaced.	Testing the panel output will isolate the issue in the system.
9	Confirm charge controller functionality.	With the panel in sunlight the system should put out at least 200mAmps.	If all above tests are confirmed then use an Amp clamp with at least 3 decimal points around the positive cable going to the battery.

## Wiring Diagram: Single Panel Wiring

Ⓐ **Terminal A** - is always positive + on the Solar Panel side of the charge controller.

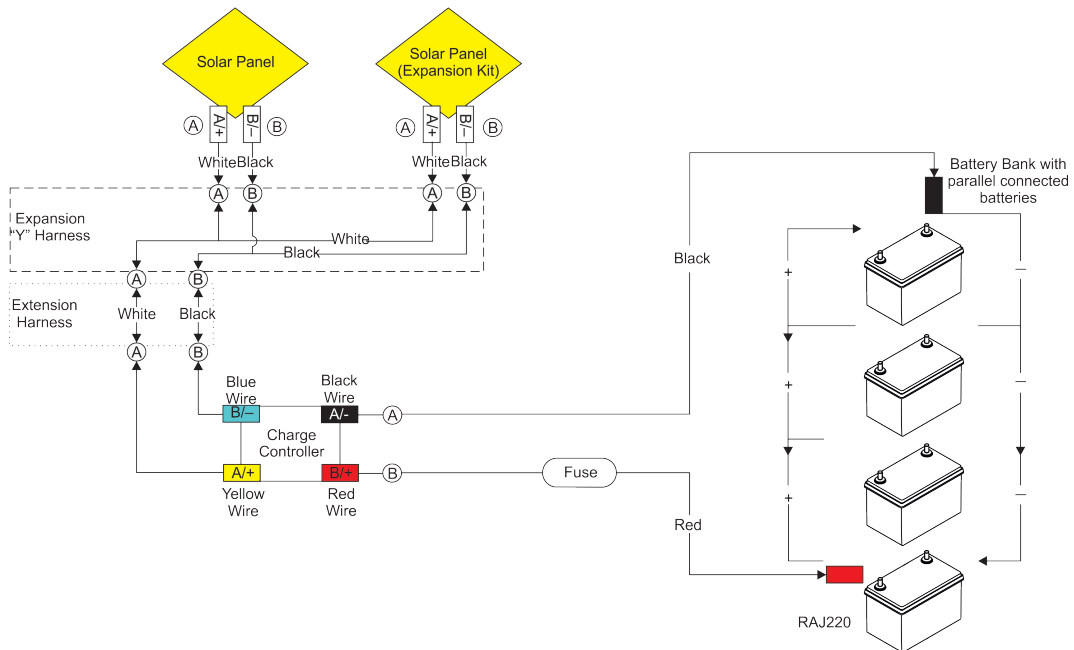
Ⓑ **Terminal B** - is always positive + on the Battery side of the charge controller.



## Wiring Diagram: Expansion Panel Wiring

Ⓐ **Terminal A** - is always positive + on the Solar Panel side of the charge controller.

Ⓑ **Terminal B** - is always positive + on the Battery side of the charge controller.





## ThermoLite™ Solar Panel Kit Warranty

All ThermoLite solar panels installed by an authorized Thermo King dealer and registered within the first twelve (12) months of installation receive five (5) years parts and labor warranty coverage from date of installation. ThermoLite solar panels installed by an authorized Thermo King dealer not registered in that time will automatically receive five (5) years plus 90 days parts and labor coverage from date of manufacture.

Customer installed ThermoLite solar panels registered within the first twelve (12) months of installation receive five (5) years parts warranty coverage from date of installation. Customer installed ThermoLite solar panels not registered in that time will automatically receive five (5) years plus 90 days parts coverage from date of manufacture.

## Customer Satisfaction Survey

Let your voice be heard!

Your feedback will help improve our manuals. The survey is accessible through any internet-connected device with a web browser.

Scan the Quick Response (QR) code or click [Technical Publications TK Americas Feedback](#) to complete the survey.

