



Installation Instructions

ThermoLite™ 40W Solar Panels

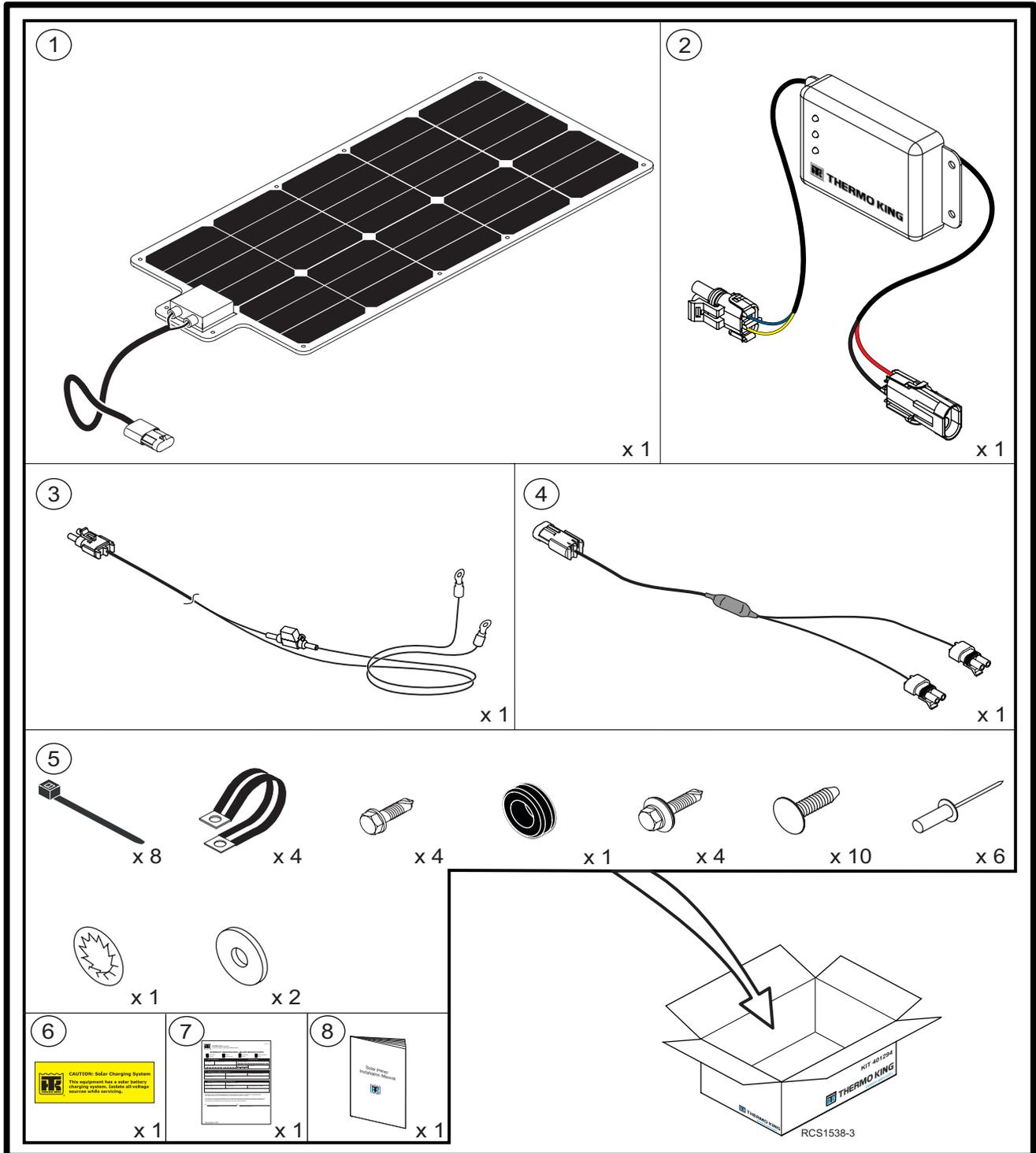
Kits 401415, 401416 and 401454

For the following applications:

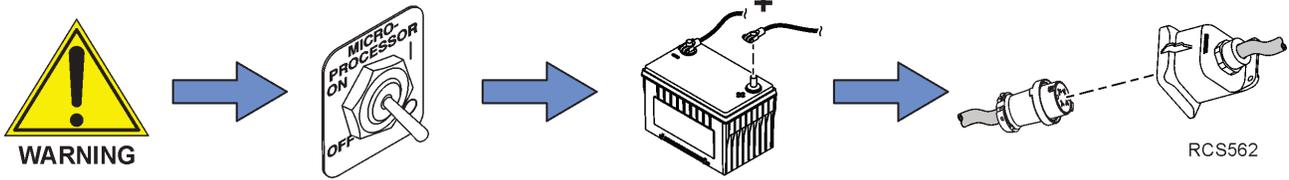
1. Heat King (all models)
2. Precedent™ DRC Front Skin Mounted
3. Class 8 Tractor Fairing Mounted Solar Panel(s) for TriPac
4. T-Series Truck

Item	Description	Part Number	401415	401416	401454
			Kit	Expansion Kit	TriPac Kit
			Qty.	Qty.	Qty.
1.	Solar Panel, 40W	423381	1	1	1
2.	Charge Controller	424548	1		1
3.	Fused Battery Harness	422456	1		1
4.	Y-Cable Harness	422453		1	
5.	Hardware kit	903869	1	1	1
6.	Nameplate	513123	1		1
7.	Warranty Registration	NSS	1	1	1
8.	Installation Instructions	NSS	1	1	1
Optional Extension Harnesses Available:					
	422405 — 8 ft.				
	401293 — 12 ft				
	422406 — 25 ft.				1
	422407 — 50 ft.				

Figure 1. 40W Solar Panel Kit Components



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>Personal Protective Equipment (PPE) Required!</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"> • For the solar panel to adhere properly, both the application surface and air temperature must be above 45 F (7 C). • All surfaces must be roughened up with sand paper, Scotch-Brite or steel wool and then thoroughly cleaned/dried for the panels to adhere. • Install panels using the adhesive backing, rivets, cable hold downs and sealant around the panel edges. • If operating in northern climates with snow and possible snow scrapers, follow installation locations listed to reduce panel damage. • Periodically inspect the solar system to make sure it still meets initial installation requirements, especially panel attachment.

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.
Tractor with APU – 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.

40W Solar Panel Installation Techniques

Adhesive Installation

ThermoLite solar panels utilize a very aggressive adhesive to secure panels to surfaces. This adhesive creates a long-lasting bond that develops its maximum bonding strength 72 hours after installation. The following procedures should be followed to ensure reliability of the adhesion for panel mounting.

Roughing up the Surface

All mounting surfaces should be roughened up using ScotchBrite™ pads, steel wool, or sand paper. The rougher the surface the better the adhesion. Rough up an area 6" greater than the panel.

If surfaces have degraded due to UV and weather exposure, the application and adhesion of solar panels on non-metallic surfaces, even if cleaned thoroughly, may require additional evaluation of adhesion strength. Surfaces showing loose fibers or color fading should be considered to have bond strength reductions.

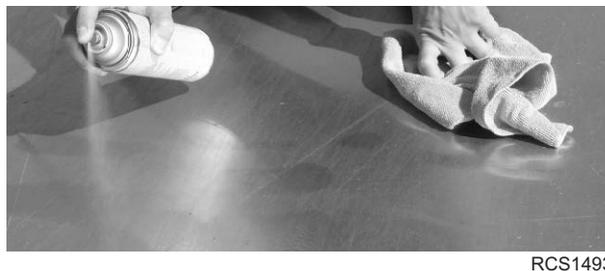
Figure 2. Roughen surface for best adhesion of solar panel



Cleaning the Surface

Ensure installation location is clean, free of any dirt and cleaner residue. Clean surface with isopropyl alcohol or de-greasers before installing panel. All cleaning residue must be removed and surface completely dry before installing panel. Cleaners other than alcohol require a clean water rinse and then dry. Clean area 6" greater than panel size.

Figure 3. Clean surface thoroughly



Adhering the Panel

Remove adhesive backing paper and firmly press down (13 PSI) over the entire area to ensure the panel is properly adhered to the surface. Press with hands do not use tools; tools may damage the panel internal structure. Testing the adhesive grip after installing the panel by lightly pulling up on the panel is recommended.

Important: For solar panel to adhere properly, both the application surface and air temperature must be above 45 F (7 C) and 120 F (50 C). Adhesive will develop maximum bond strength in 72 hours.

Figure 4. Firmly press panel down over entire area



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Mechanical Fastening

ThermoLite solar panels have grommets around the edge to provide for mechanical fastening using screws or rivets. All holes **MUST BE FILLED** with sealant before inserting any fastener to ensure a sealed joint. It is also advised to apply sealant over the fastener once installed.

Figure 5. Fastening panel using rivets shown

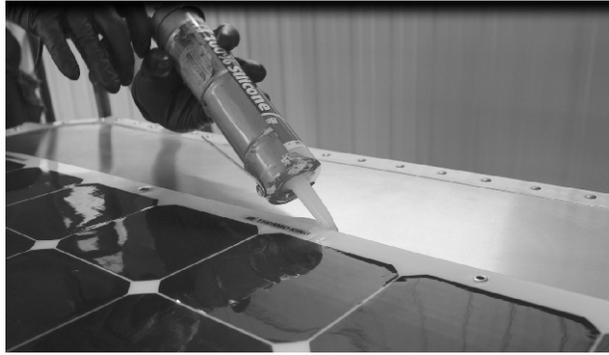


RCS1495

Edge Sealing

Edge sealing is required around the perimeter of the solar panels to prevent wind and liquid from getting under the panel.

Figure 6. Sealing edges of panel shown



RCS1496

Wire Hold Downs

Mechanical clamps must be used to hold the wires as they go over the roof edge into the roof channel. Depending on orientation the first clamp may be in the roof channel. Continue with clamps in the roof channel every 12" until you reach the destination. If not going into a conduit hole in the roof channel then continue down the trailer surface with clamps until you reach the destination.



THERMO KING

40W Trailer Roof Top Installations

Orientation Options

Important: BEFORE beginning the installation, refer to “Solar Panel Installation Best Practices,” p. 3 and “40W Solar Panel Installation Techniques,” p. 4.

Important: If operating in northern climates with snow and possible snow scrapers, the front installation is the recommended location. Snow scrapers will generally miss the junction box and wires at the front trailer edge due to their V design. Make sure to discuss the snow scraper equipment used on the trailer before finalizing installation strategy.

Plan your installation before starting to make sure things line up.

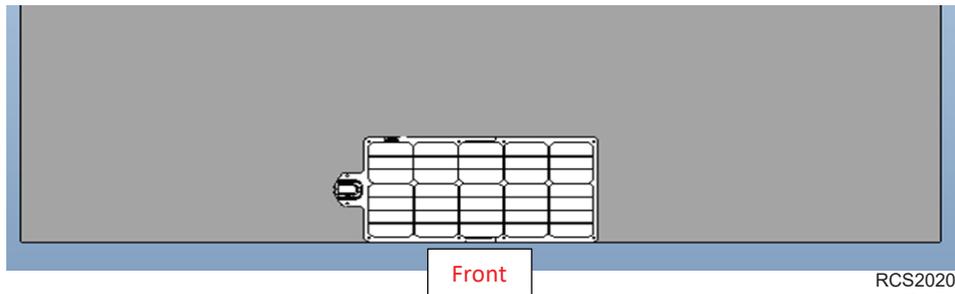
- 40W panels are about 29” long X 12.5” wide with 22” wire leads.
- Y-harnesses to connect more than one panel together
- Extension harnesses are available in various lengths and go from either 1 panel or the Y-harness end down to your batteries or battery connection. One end of the extension harness has the connector loose so that it can be pulled through conduit.

Important: If operating in northern climates with snow and possible snow scrapers, the front installation is the recommended location. Snow scrapers will generally miss the junction box and wires at the front trailer edge due to their V design. Make sure to discuss the snow scraper equipment used on the trailer before finalizing installation strategy.

Front Orientation

A single 40W panel should be placed with the long side to the roof edge to allow the grommets to be riveted to the roof rail. A clamp should be used on the top roof rail and also inside the rail to hold the wire slightly away from the trailer roof edge. Clamps should be used as needed to minimize loose cable in the channel. Place panel away from refrigeration exhaust (if present).

Figure 7. Single 40W panel front installation shown



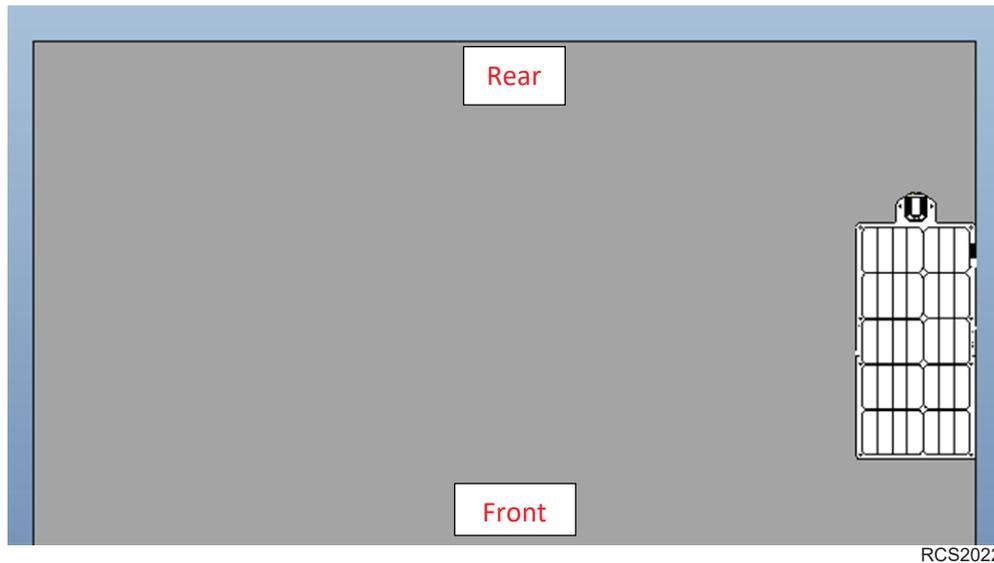
Thermo King does not recommend more than one 40W panel (unless there are specific space restrictions) as going to a single 110W solar panel is a better solution.

Rear/Mid Orientation

Important: *If operating in northern climates with snow and possible snow scrapers, the front installation is the recommended strategy. The rear/mid orientation strategy is not recommended as a snow scraper is more likely to hit the junction box and possibly the harnesses.*

One 40W panel orientation for rear/mid should be placed with the long side to the trailer edge with the wires exiting towards the rear of the trailer. The panel edge should be riveted along the roof edge. A clamp should be used to make sure that the wire does not rub against the roof edge. Generally this clamp would be placed on the roof edge surface. Clamps should be used in the channel to route to the extension harness and where the installer wants the final wires to go.

Figure 8. 40W panel rear/mid orientation shown



Thermo King does not recommend more than one 40W panel (unless there are specific space restrictions) as going to a single 110W solar panel is a better solution.

Side Channel Wiring

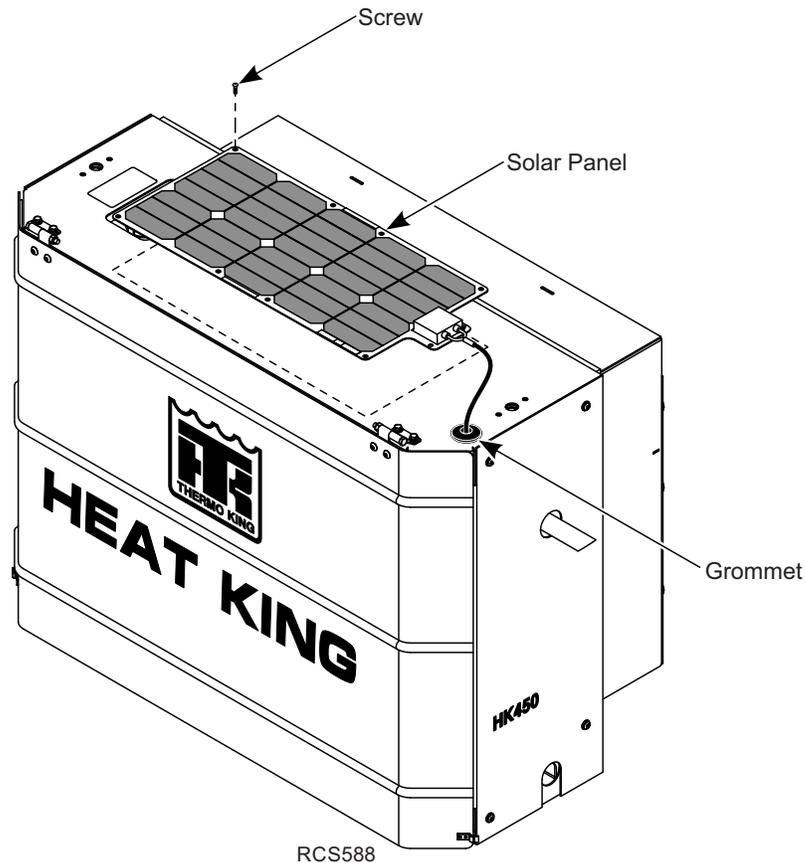
Clamps should be used to hold the harnesses in the channel. Clamp as needed. When using the Y-harnesses with multiple panels, clamp one wire and tie wrap to overlapped cables. The extension harness is then routed through the trailer conduit and connected.

Heat King Installation

Important: BEFORE beginning the installation, refer to BEFORE beginning the installation, refer to “Solar Panel Installation Best Practices,” p. 3 and “40W Solar Panel Installation Techniques,” p. 4.

1. Thoroughly prepare surface per “,” Failure to properly prepare mounting surface will result in poor adhesive strength of the solar panel.
2. Peel back the top 4 inches of the backing paper and apply top edge of panel near the rear bolts and the left side against the coolant cap cutout hole. The panel’s junction box should be facing toward the roadside of the unit.
3. With panel properly positioned, remove remainder of backing paper and firmly press panel down over the entire area. Repeat several times to ensure the entire panel is properly adhered to the sheet metal skin. This is critical to prevent moisture between the surfaces.
4. Drill 5/32" holes at all panel grommet holes. Secure panel with #10-1/2" long thread forming screws (10 places).
5. Drill a 7/8" hole near the front roadside corner as shown.
6. Cut a slit in the supplied rubber grommet and place around the panel harness. Route connector through hole in frame and then install grommet into hole.

Figure 9. Solar panel shown installed with harness routed through grommet into unit



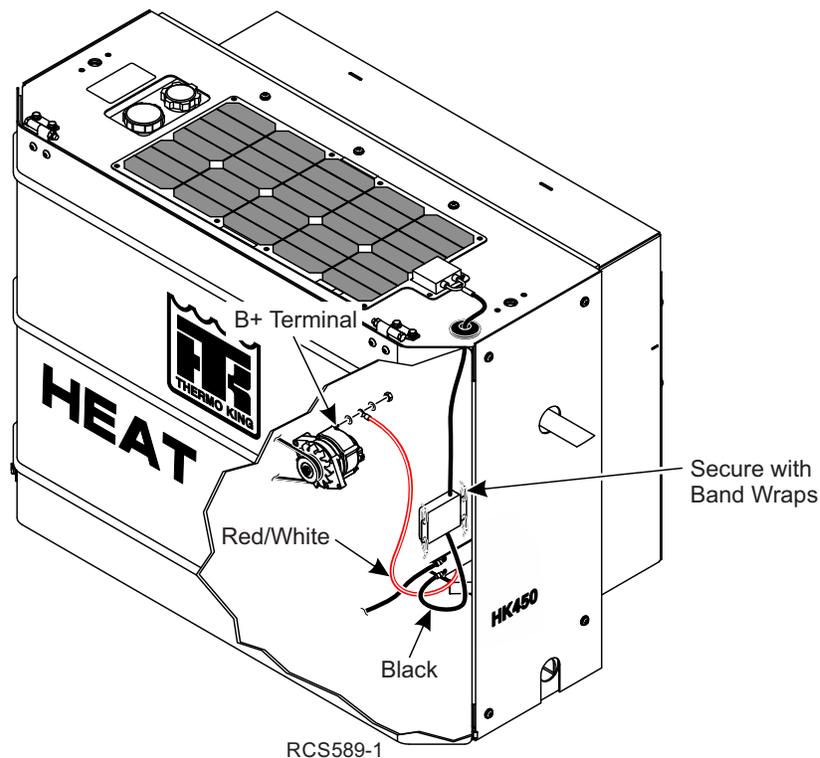
Heat King Installation (continued)

Harnesses Connections

7. Connect panel harness connector to charge controller harness and route it down the roadside corner frame.
8. Drill 1/4" holes into the vertical frame member on either side of the charge controller.
9. Secure the charge controller to the frame on both sides using band wraps through the 1/4" holes and around the charge controller cables.
10. Attach the fused battery harness to the charge controller. Route the **RED/WHITE** lead to the **B+ positive** terminal on the back of the alternator, install the supplied 3/8" brass flat and internal brass lock washers on each side of harness ring terminal on the B+ stud. Torque to 6.0 N•m (44-53 lb-in).
11. Attach the **BLACK** wire to the **negative ground** cable or to other secure chassis ground mounting hardware. Verify 0 ohms resistance to ground using a multi-meter.
12. Ensure the harness has a drip loop to prevent water from running down onto the terminals.
13. Apply sealant to the all screws securing the panel and around the rubber grommet.
14. Clean surface and attach supplied nameplate on the unit near the solar panel terminal connection. The label must be visible to servicing technicians to warn of additional charging sources.
15. Reinstall fuse in solar panel battery harness and reconnect all battery connections on unit.
16. Perform "[Solar Panel Test Procedures](#)," p. 27 to complete the installation.

Note: Depending on the installation, all kit components may not be used.

Figure 10. Solar panel electrical connections shown



Precedent DRC Installations

Important: BEFORE beginning the installation, refer to BEFORE beginning the installation, refer to "Solar Panel Installation Best Practices," p. 3 and "40W Solar Panel Installation Techniques," p. 4.

1. Thoroughly prepare surface per "40W Solar Panel Installation Techniques," p. 4. Failure to properly prepare mounting surface will result in poor adhesive strength of the solar panel.
2. Peel back the top 4 inches of the backing paper and apply the top edge of the panel to the middle door skin just under the Thermo King crest with the panel's junction box facing towards the roadside of the unit. The curbside edge should be just inside the curbside door edge.
3. With the panel properly positioned, remove the remainder of the backing paper and firmly press the panel down over the entire area. Repeat several times to ensure the entire panel is properly adhered to the sheet metal skin. This is critical to prevent moisture between the surfaces.

Figure 11. Correct panel location shown



4. Drill 3/16" holes at each panel grommet. Insert supplied nylon fasteners (10 places).
 - a. Alternate mounting method: Drill 5/32" holes at all panel grommet holes. Secure panel with #10-1/2" long thread forming screws (10 places).

Precedent DRC Installations (continued)

5. Drill a 7/8" hole to the left edge of the panel.
6. Cut a slit in the supplied rubber grommet and place around the panel harness. Route connector through hole in frame and then install grommet into hole.

Figure 12. Proper harness routing through grommet shown



7. Connect the extension harness (**401293**) and route the harness near the top of the roadside door hinge. Secure using band wraps and ensure the door does not bind when closing.

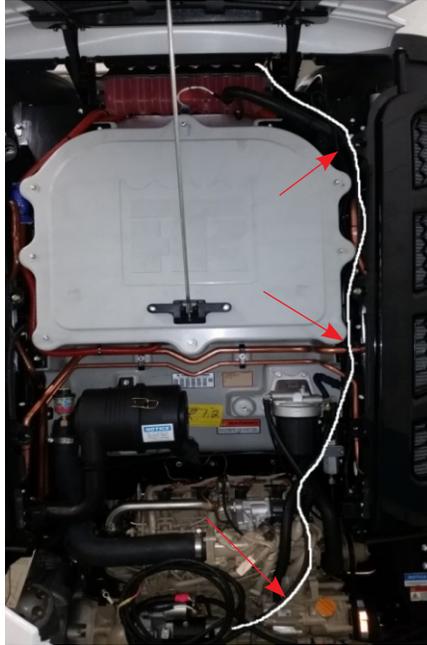
Figure 13. Proper harness routing shown



Precedent DRC Installations (continued)

8. Route the harness down the roadside wall next to the condenser wall and following existing wires to starter. Ensure that the wire does not touch hot copper tubing and that it is properly band tied to solid structures or other harnesses. Coil excess cable as shown.

Figure 14. Proper harness routing shown



RCS1490

Figure 15. Coil excess cable as shown



RCS1544

Precedent DRC Installations (continued)

9. Attach the **white/red** wire to the **positive** terminal on the starter solenoid (terminal with the positive battery cable).

Figure 16. Positive starter connection shown



10. Attach the **black** wire to the engine block **ground** stud behind the oil filter.

Figure 17. Negative ground connection shown



11. Coil up the extra harness length in front of the starter and secure with band wraps.

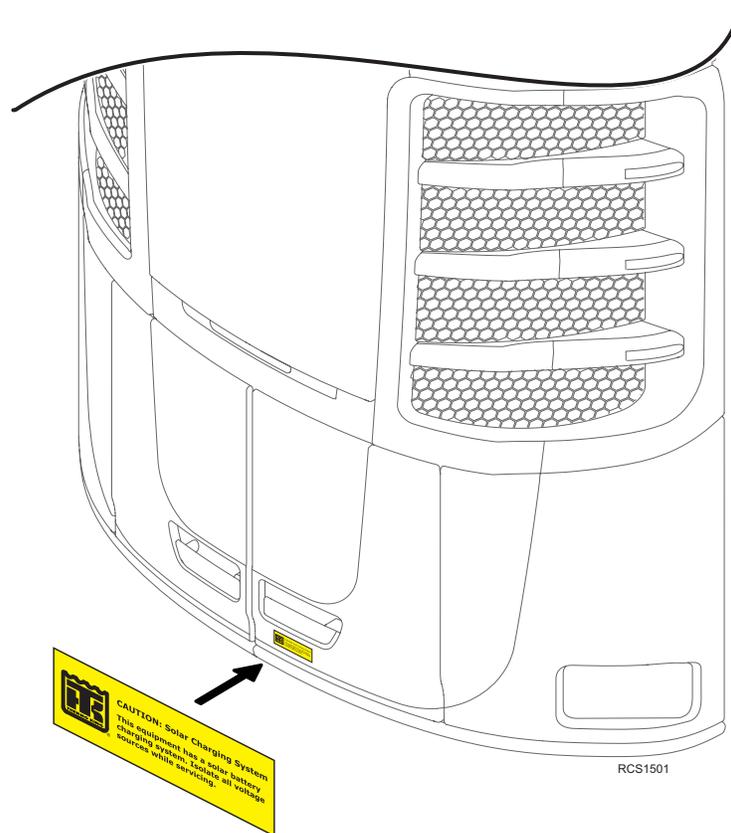
Figure 18. Secure excess harness length in front of starter



Precedent DRC Installations (continued)

- Clean surface and attach supplied nameplate on the unit near the solar panel terminal connection. The label must be visible to servicing technicians to warn of additional charging sources.

Figure 19. Install nameplate on unit



- Reinstall fuse in solar panel battery harness and reconnect all battery connections on unit.

- Perform [“Solar Panel Test Procedures,” p. 27](#) to complete the installation.

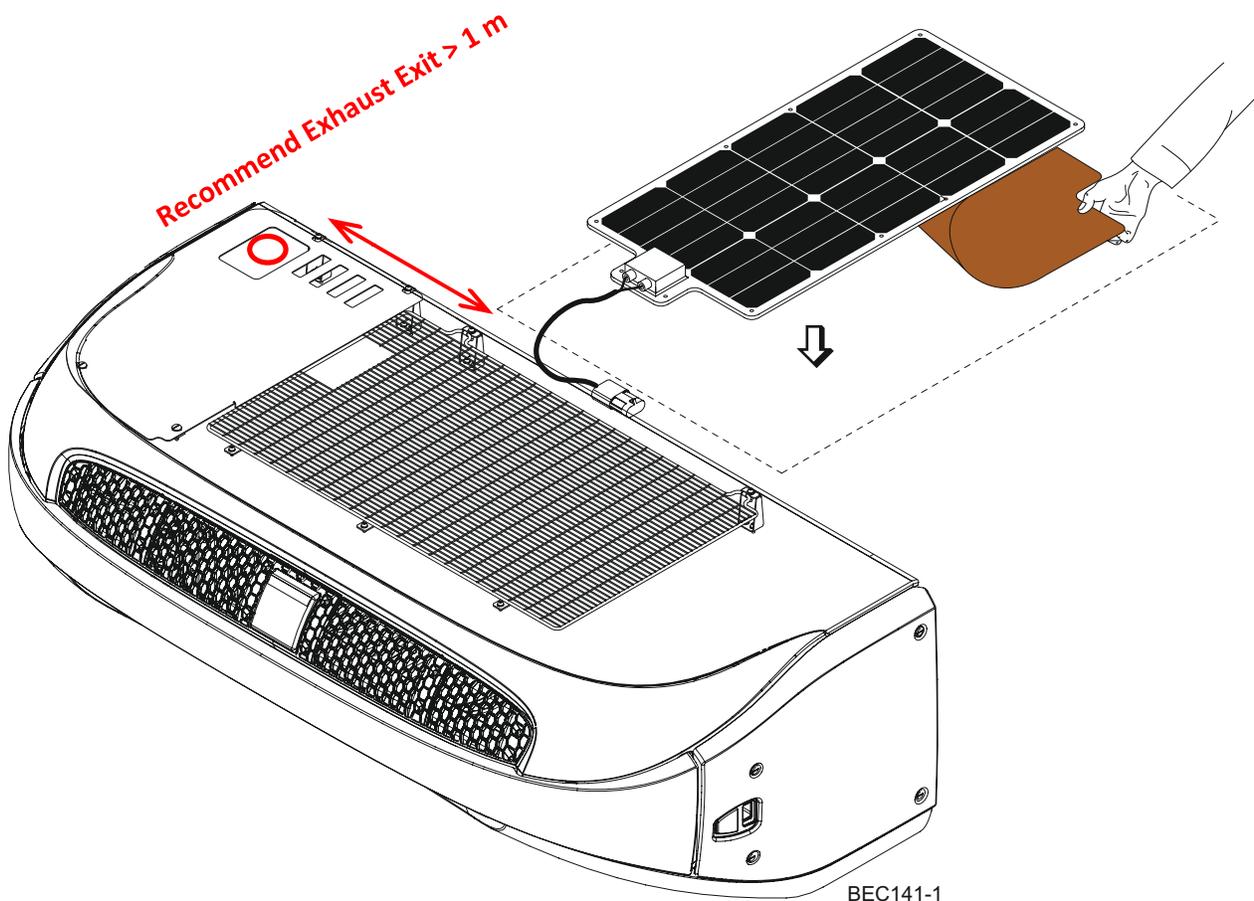
Note: Depending on the installation, all kit components may not be used.

T-Series Truck Installations

Important: BEFORE beginning the installation, refer to *BEFORE beginning the installation, refer to "Solar Panel Installation Best Practices," p. 3 and "40W Solar Panel Installation Techniques," p. 4.*

1. Thoroughly prepare surface per *"40W Solar Panel Installation Techniques," p. 4.* Failure to properly prepare mounting surface will result in poor adhesive strength of the solar panel.
2. Position solar panel onto roof of cargo box and away from the exhaust exit as shown.
 - a. With the panel's junction box facing forward, peel back the top 4 inches of the backing paper and begin to apply panel to surface.
 - b. With panel properly positioned, remove remainder of backing paper and firmly press panel down over the entire area. Repeat several times to ensure the entire panel is properly adhered to the surface. This is critical to prevent moisture between the surfaces.

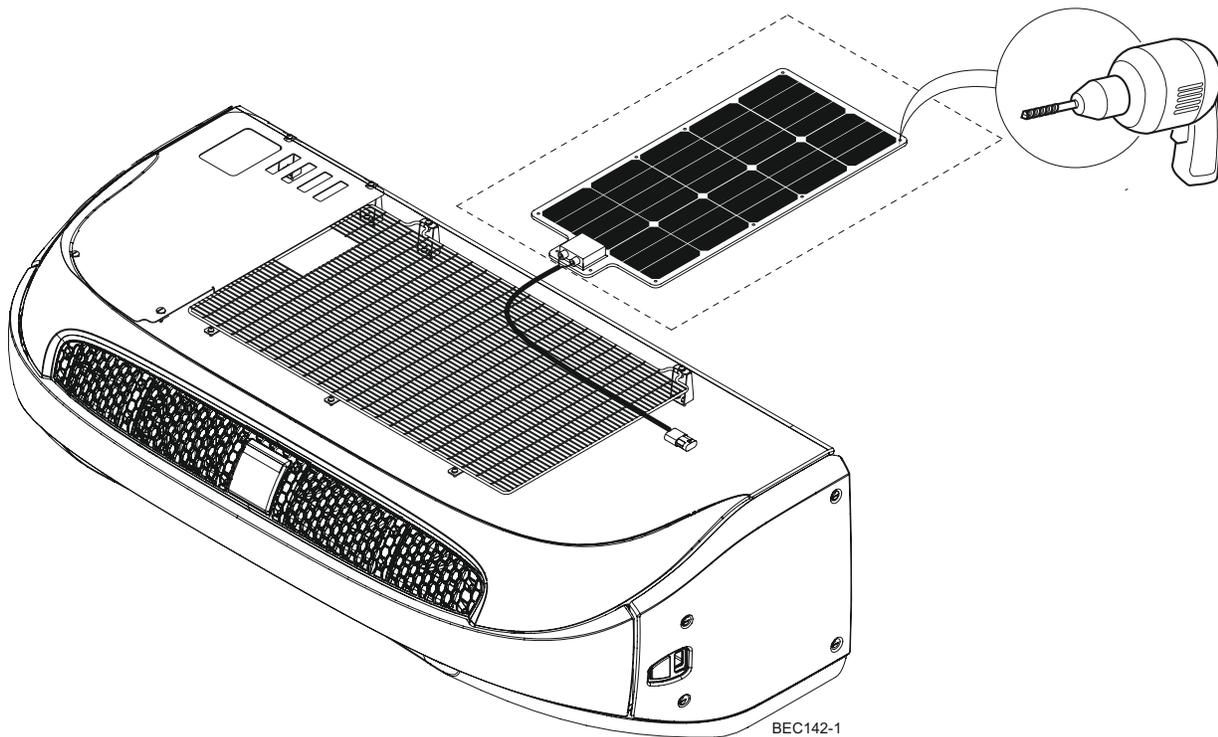
Figure 20. Typical installation on roof of cargo box shown



T-Series Truck Installations (continued)

3. Drill 5/32" holes at all panel grommet holes. Secure panel with #10-1/2" long thread forming screws (10 places).
 - a. Alternate mounting method: Drill 3/16" holes at each panel grommet. Insert supplied nylon fasteners (10 places).

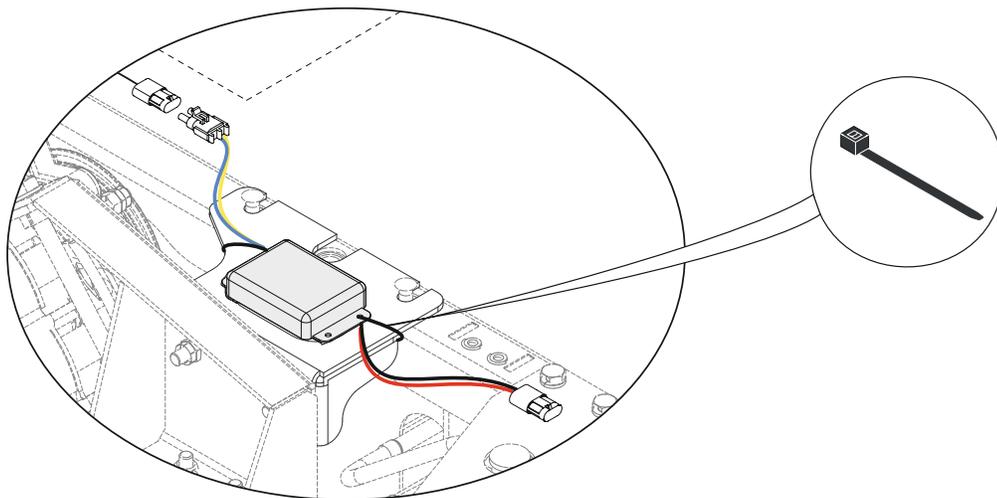
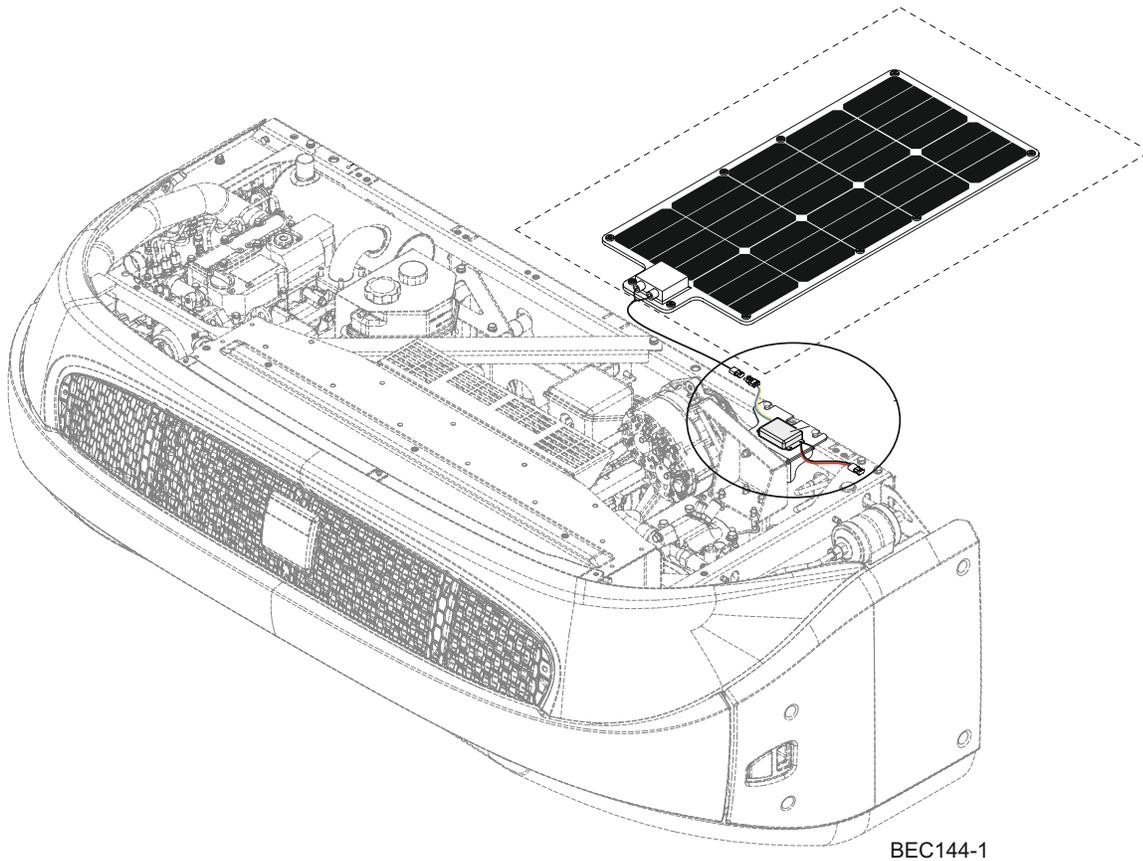
Figure 21. Drill holes for mechanical fasteners to secure panel



T-Series Truck Installations (continued)

- Secure Charge Controller onto unit frame with supplied band wraps.

Figure 22. Charge Controller shown secured to unit

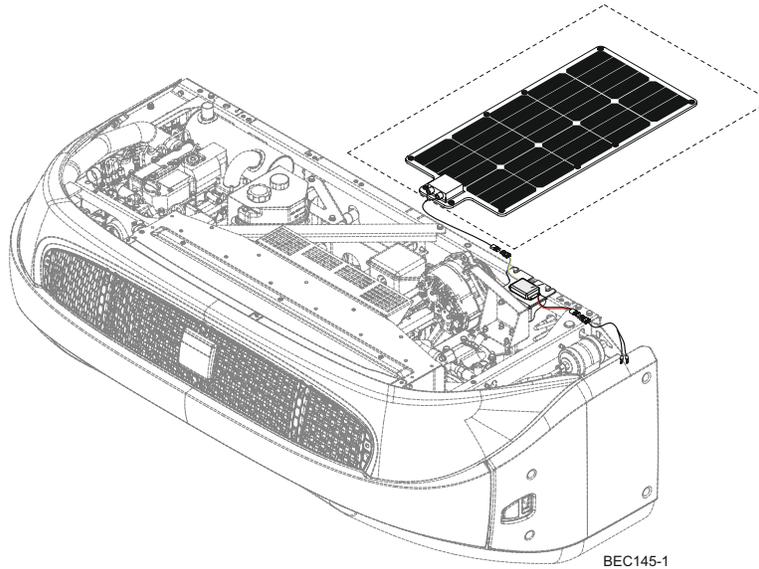


T-Series Truck Installations (continued)

5. Route Charge Controller harness to control box between compressor and frame following other harness.

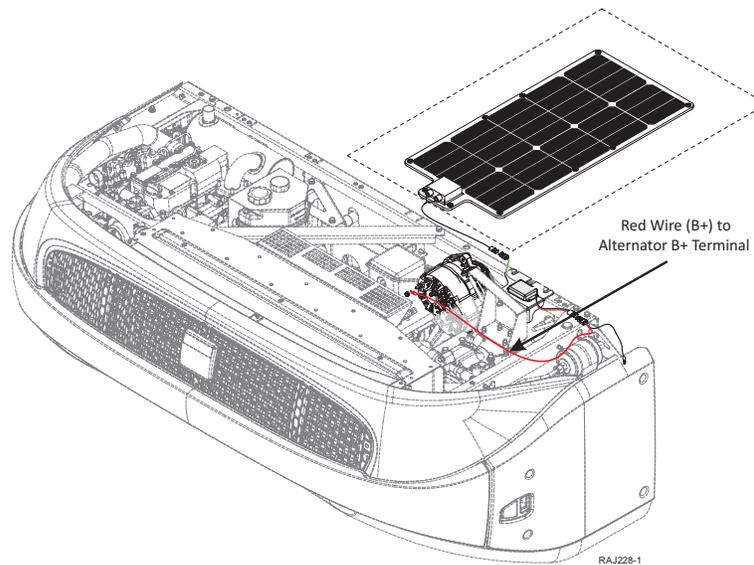
Important: Make sure that the fuse is removed from solar panel harness.

Figure 23. Charge Controller harness routing shown



6. Safely route, secure, and connect the red wire (B+) to alternator B+ terminal.

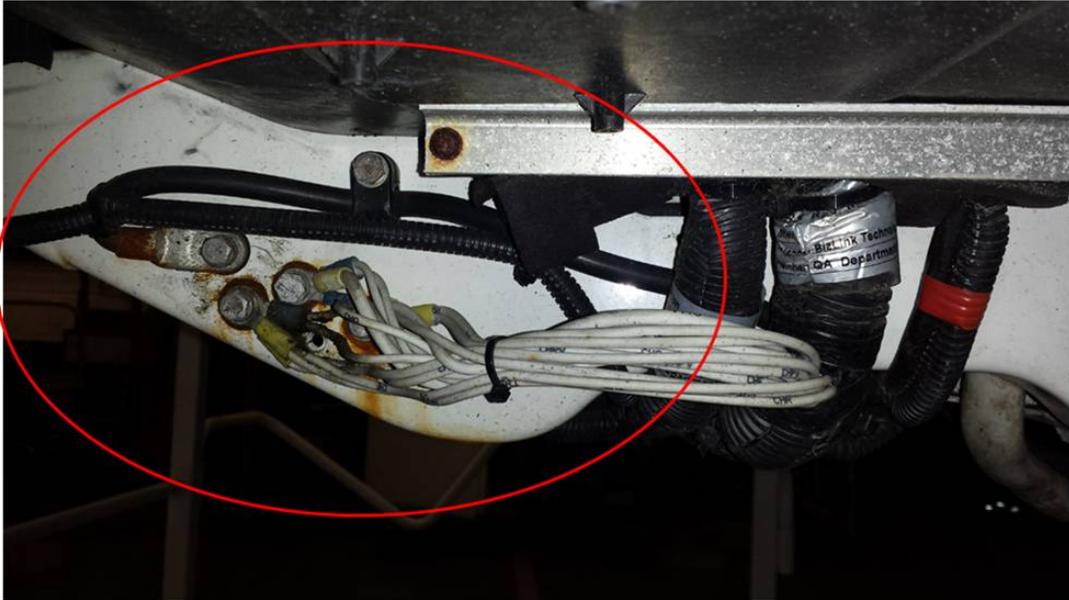
Figure 24. Attach red wire (B+) to alternator B+ terminal



T-Series Truck Installations (continued)

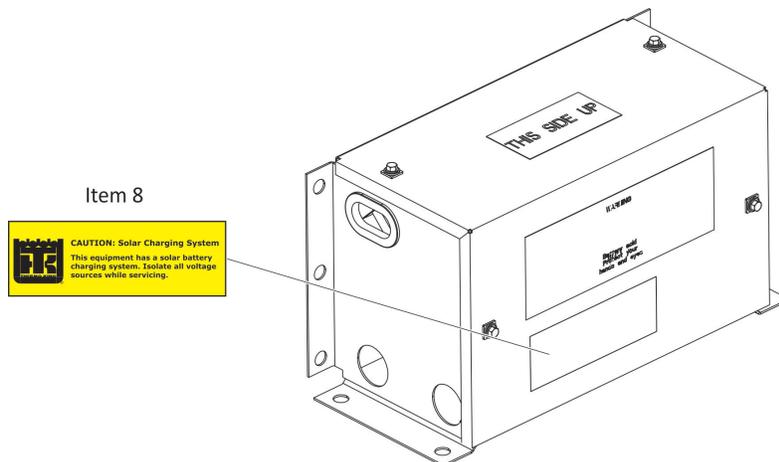
7. Route and connect black negative ground (B-) connection below control box on chassis (below the cable entry point on truck control box).

Figure 25. Ground connection shown below control box on chassis



8. Clean surface and attach supplied nameplate on the battery box unit near the solar panel terminal connection. The label must be visible to servicing technicians to warn of additional charging sources.

Figure 26. Install Nameplate



9. Reinstall fuse in solar panel battery harness and reconnect all battery connections on unit.
10. Perform "Solar Panel Test Procedures," p. 27 to complete the installation.

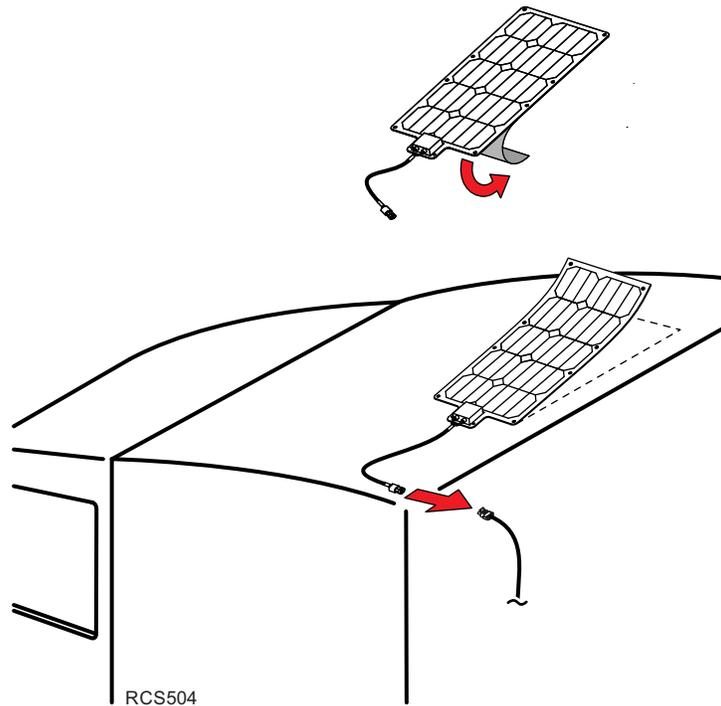
Note: Depending on the installation, all kit components may not be used.

Class 8 Tractor Cab Installation

Important: *BEFORE* beginning the installation, refer to *BEFORE* beginning the installation, refer to “Solar Panel Installation Best Practices,” p. 3 and “40W Solar Panel Installation Techniques,” p. 4.

1. Thoroughly prepare surface per “40W Solar Panel Installation Techniques,” p. 4. Failure to properly prepare mounting surface will result in poor adhesive strength of the solar panel.
2. Position solar panel onto roof of the cab and away from the exhaust exit.
3. Peel back the top 4 inches of the backing paper and begin to apply panel to surface.
4. With panel properly positioned, remove remainder of backing paper and firmly press panel down over the entire area. Repeat several times to ensure the entire panel is properly adhered to the surface. This is critical to prevent moisture between the surfaces.

Figure 27. Peel back backing paper and position solar panel on to roof



Class 8 Tractor Cab Installation (continued)

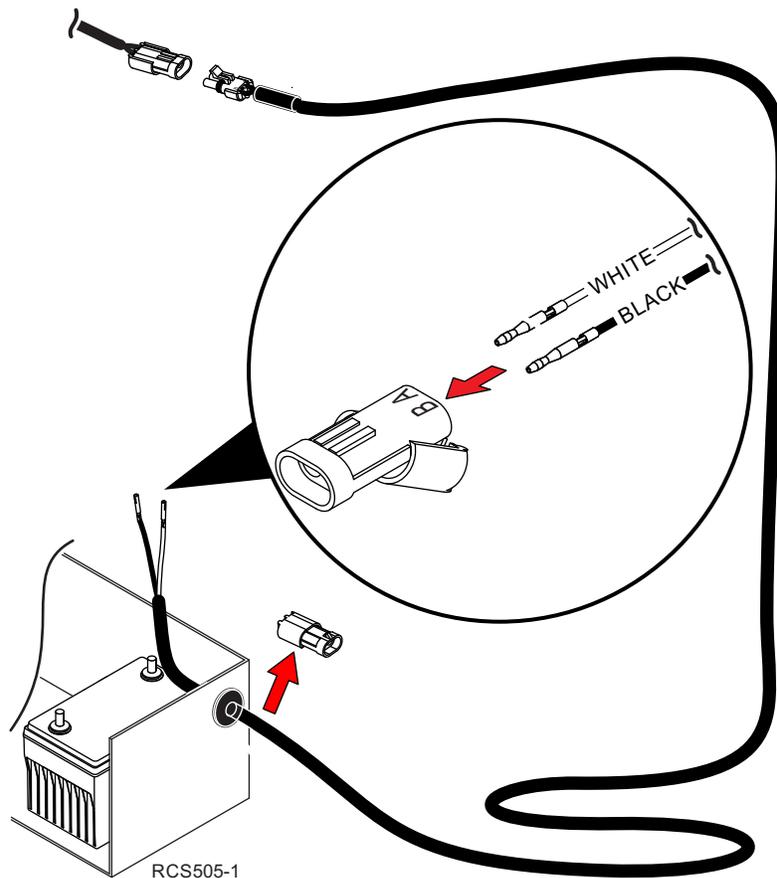
Extension Harnesses Connections

5. Extension harnesses are provided with one non-plugged end and a loose connector housing. Verify the polarity of the cable to the panel and charge controller prior to routing the wire. Plan your route and route the wiring starting with the non-plugged end.
6. Attach 25 ft. extension harness to the solar panel connector and route harness down the rear of the cab and over to the tractor's batteries.
 - a. Secure harness with supplied clamps and band wraps.

Important: Allow slack in the extension harness going from the cab to the tractor's frame to allow for normal cab movement.

7. Remove 2-pin connector (attached to harness) and route harness through a rubber grommet and into tractor's battery box.
8. Attach 2-pin connector to harness by releasing the locking tab, inserting wires until they are fully seated, and closing locking tab securely.
 - White wire (B+) into socket A
 - Black wire (B-) into socket B

Figure 28. Extension Harness to Battery connections shown



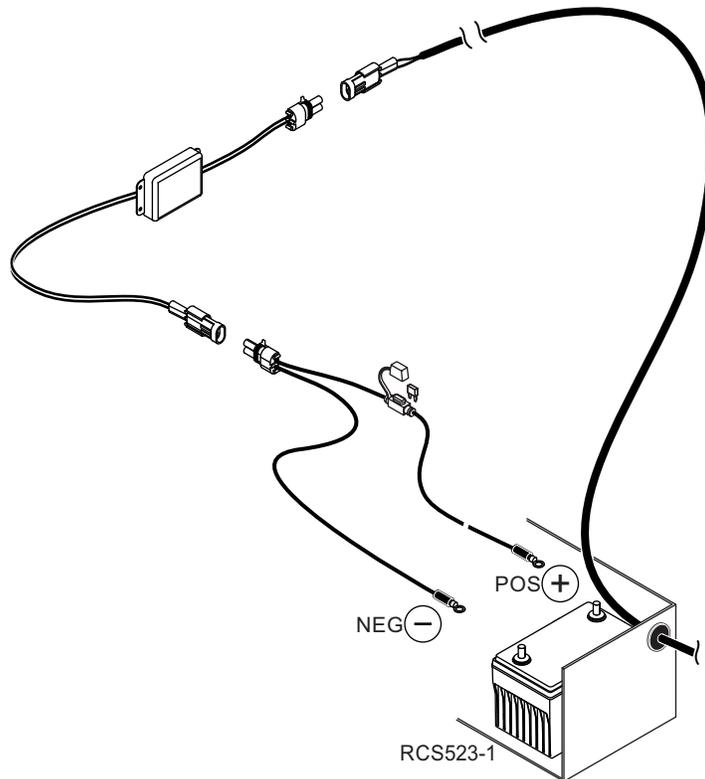
Class 8 Tractor Cab Installation (continued)

Charge Controller and Battery Harness Connections

9. Connect charge controller to extension harness.
10. Remove fuse from battery harness and connect to charge controller.
11. Connect terminal rings from battery harness to **TRACTOR BATTERIES ONLY**:
 - Black to Negative (-)
 - White to Positive (+)
12. Secure controller inside battery compartment.
13. Clean surface and attach supplied nameplate near the battery box or the solar panel terminal connection. The label must be visible to servicing technicians to warn of additional charging sources.
14. Reinstall fuse in solar panel battery harness and reconnect all battery connections.
15. Perform “,” to complete the installation.

Note: Depending on the installation, all kit components may not be used.

Figure 29. Charge Controller and Battery Harness Connections shown

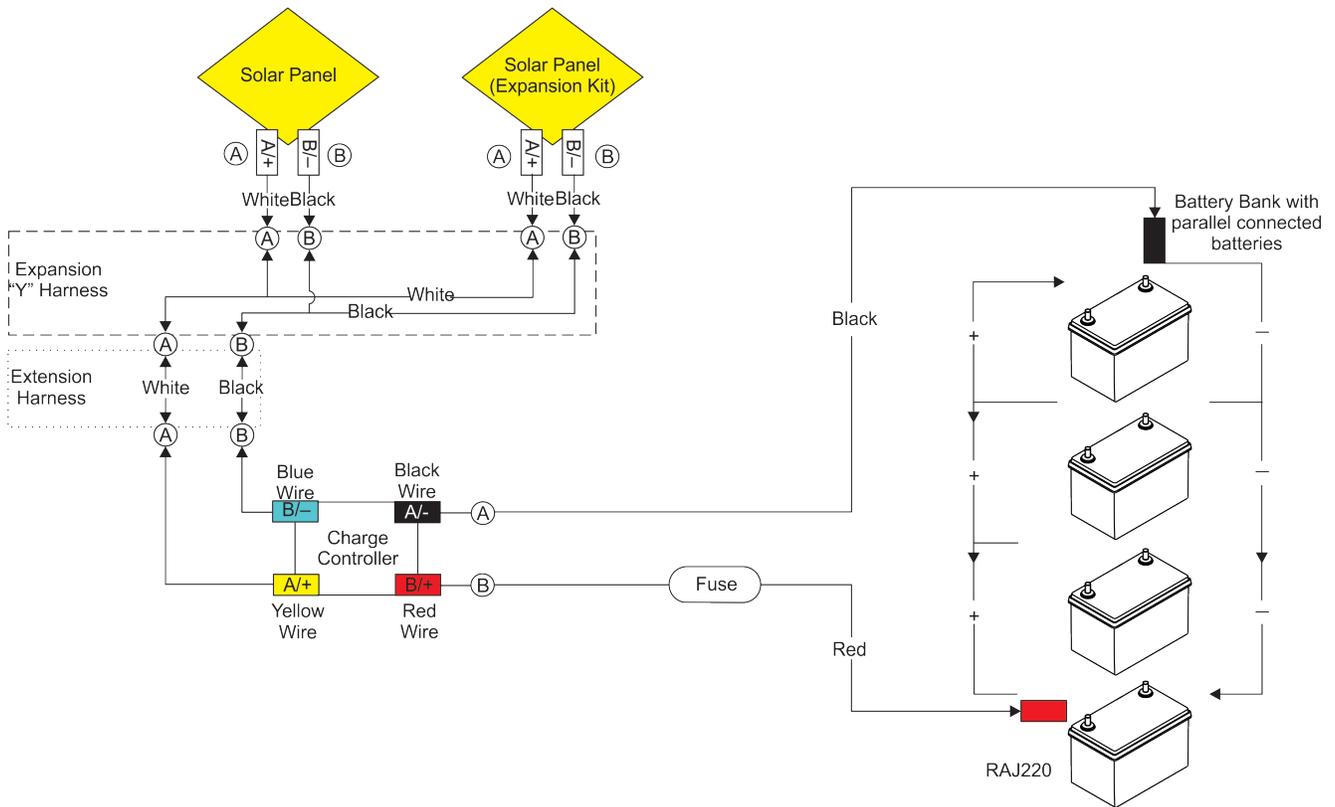


IMPORTANT!
Connect Solar Panel(s) to Tractor Batteries ONLY.
DO NOT Connect to TriPac ENVIDIA APU Batteries.

Wiring Diagrams

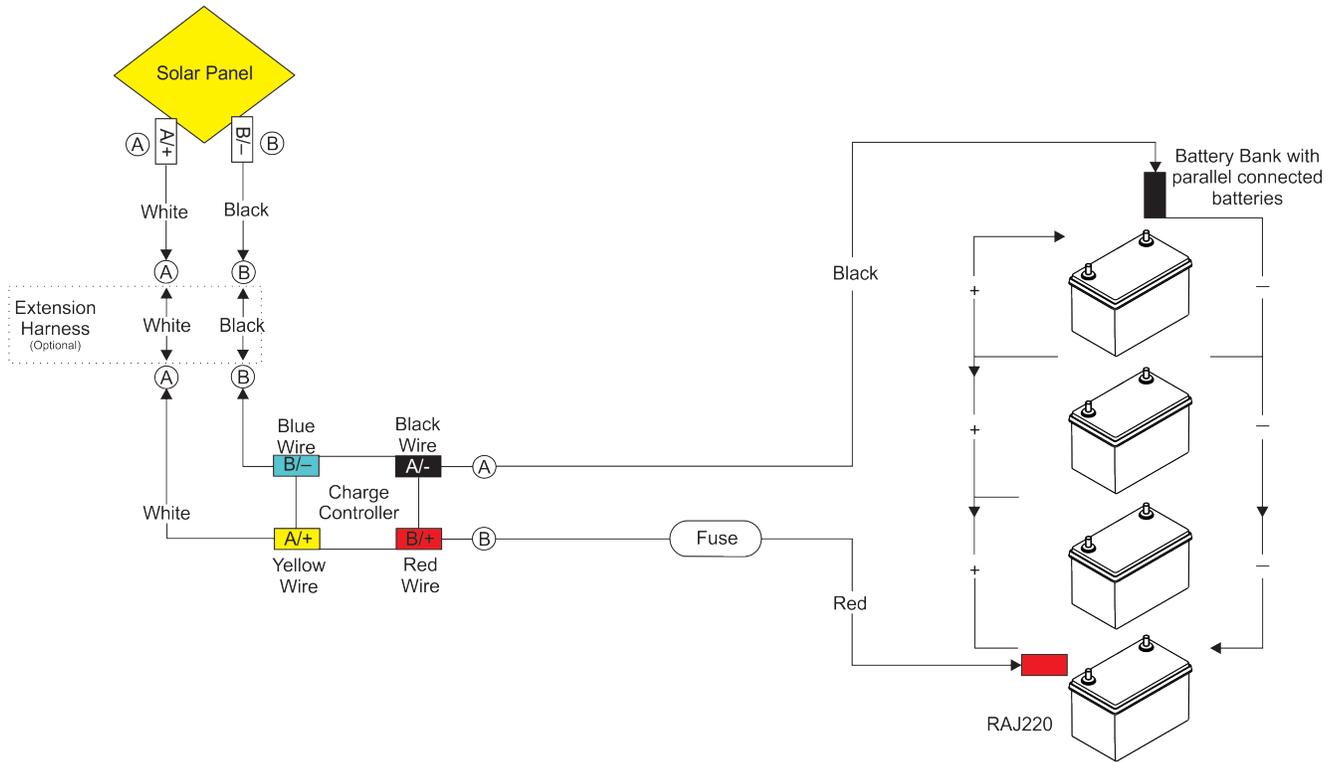
Wiring Diagram: Expansion Panel Wiring

- Ⓐ **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.



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.



Solar Panel Test Procedures

There are two types of 5A Charge Controllers:

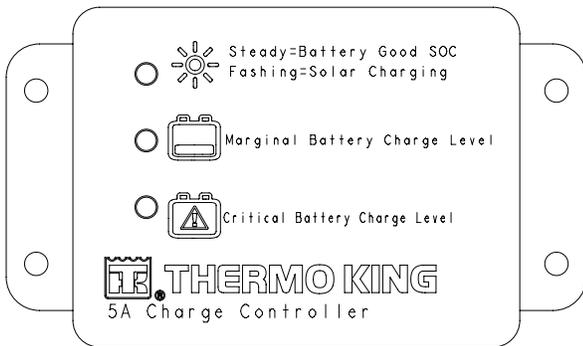
1. Controller with LED status lights.
2. Controller without LED status lights.

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

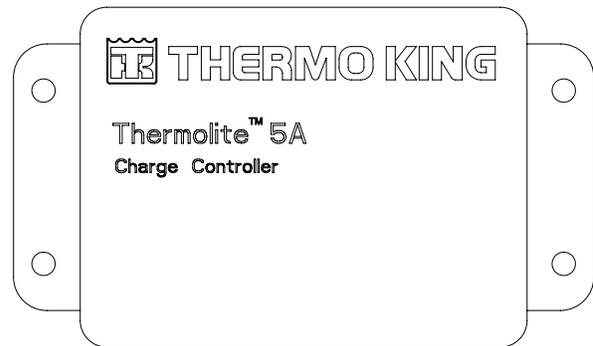
Note: Charge controllers can take up to one minute to turn on.

Figure 30. Two Types of Battery Charge Controllers Shown

5A Charge Controller with LED status lights



5A Charge Controller without LED status lights



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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.

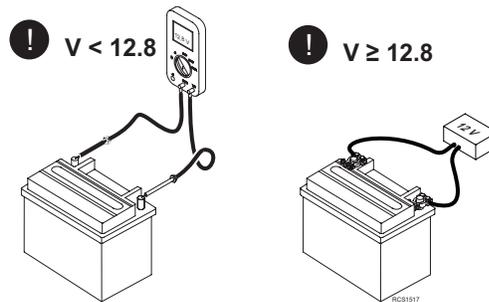
Test Procedure

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 31. Measure battery voltage

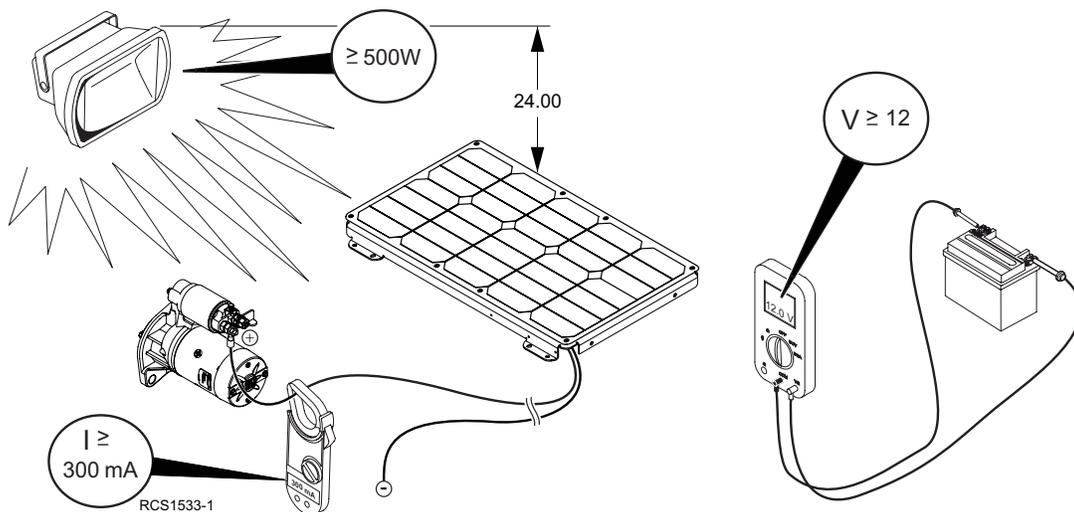


2. Move vehicle outdoors into the daylight. If indoors, put at least a 500W halogen lamp approximately 24" above the solar panel and turn lamp on.

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 than 300 mA

Figure 32. Measure solar panel voltage and amperage readings





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.

