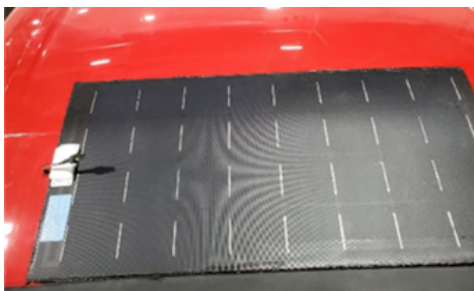


## Soltronix Semi-Flexible Solar Panel Installation Instructions

The Soltronix Solar Panel charging system maintains your battery voltage during extended off cycles, increases battery lifetime, and reduces jump start service calls. Daylight-sleeping truckers may notice increased time between engine idlings or APU battery charging occurrences. Daylight-driving truckers could measure a decrease in alternator current demand, leading to small diesel savings.

Soltronix is a product line designed and manufactured by PowerFilm, Inc.



## Package Contents

Quantity	Part Number	Part Description
1	R3-32F13.7VB	110W Solar Panel with Integrated Charge Controller
1	CA1225WPRTCF	25ft. Harness, Wire (Panel to the battery)
1	ELECFUSE10ABLAD	10A blade fuse

## Cost Benefits

Battery lifetime improves from 12m-18m up to ~48 months.

Reduce jump-start service calls.

## Safety Precautions

Your Soltronix Solar Panel with Integrated Charge Controller is a DC power source when exposed to light. The typical output will be 10.5V-14.4V and 0A-10A, depending upon system conditions.

## Battery Safety

Lead-acid batteries typically vent small amounts of flammable hydrogen gas. Do not smoke when checking or installing the battery or solar panel. A battery explosion can cause serious physical harm or blindness.

A lithium battery can be a fire hazard due to high energy densities and the flammable organic electrolyte. Studies show that physical damage, electrical abuse such as short circuits, overcharging, and exposure to elevated temperatures can cause a thermal runaway.

Always verify that the charge controller in your panel is compatible with your specific battery chemistry. Only use a lithium-ion solar charge controller for a lithium-ion battery. Likewise, only use a lead-acid solar charge controller for a lead-acid battery.

*R3-32F13.7VB is designed to work only with lead-acid batteries. For lithium batteries or other battery chemistries, contact PowerFilm to order the correct panel and charge controller.*

## Panel Handling

**Do not** bend more than 2" deflection over its length or pick up the solar panel by a corner. When handling or mounting the solar panel, hold using two hands on opposite edges of the solar panel. Treat the panel like hanging a dress shirt. You don't want wrinkles.

**Do not** install the solar panel in the path of the TRU or tractor's exhaust system. This can lead to excessive soot build-up, affecting the solar panel's performance or damaging the panel.

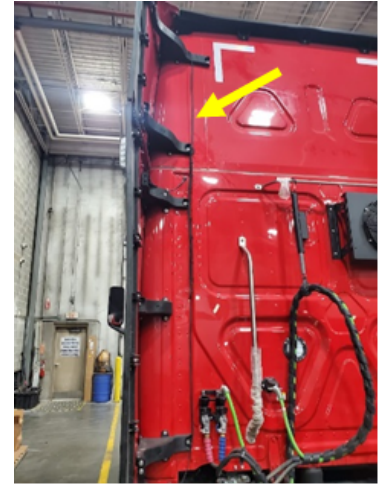
Install the solar panel out of direct sunlight (in a garage or cover the panel with cardboard). The solar panel uses an industrial butyl adhesive to ensure a permanent installation. If the adhesive is too cold, the solar panel will not bond properly. If the adhesive is too hot, the release liner covering the adhesive will become challenging to remove, and installation can become messy.

For best results, install the solar panel when the ambient temperature is between 40°F and 80°F (4°C to 27°C). In lower temperatures, the solar panel and mounting surface can be warmed to this temperature before installation with a heat gun. A best practice is to keep the installed panel clean, dry, and at bonding temperature for 24 hours.

## Installation Preparations

Ensure all technicians working on elevated surfaces are properly tethered or secured against falling off the elevated surface. Technicians should wear appropriate Personal Protective Equipment (PPE).

For a truck roof fairing installation, use a 9-11' platform that will roll over the truck's rear tires so that the lead installer can be knee- or waist-high at the top of the back wall of the vehicle.



For a trailer roof installation: use a mobile scissor lift to position the installer close to the panel location. A scissor lift with a sliding extension may allow you to work very close to the installation location.

A second installer could use a rolling 9' staircase or mobile scissor lift from the side of the truck or trailer to assist during the installation.

Installers may need additional platforms if you are installing two or more panels on the roof fairing. Before permanently installing a solar panel, verify with a digital voltmeter on a DC scale that the solar panel has the correct voltage. Take the panel outside into direct sunlight (no shadows). If the panel has an integrated charge controller, the voltage should be 10.5V-14.5V. For a 110W panel without an integrated charge controller, the voltage should read  $\sim 0.69V \times$  the number of 5" wafers on the panel (32 wafers  $\times 0.69V/\text{wafer} = 22.4V$ ) or lower with poor sunlight conditions (12V - 18V).

## Installation with Integrated Charge Controller

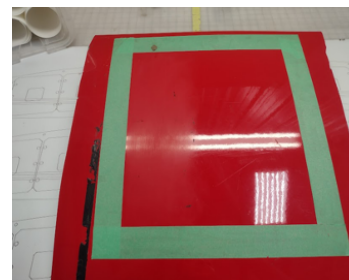
**NOTE:** If you're installing a separate charge controller, please see [Separate Charge Control & Harness Installation](#).

Ensure all technicians working on elevated surfaces are properly tethered or secured against falling off the elevated surface. Technicians should wear appropriate Personal Protective Equipment (PPE).

Before permanently installing the solar panel, verify with a digital voltmeter on a DC scale that the solar panel's voltage, when exposed to direct sunlight, is above 10V DC.

1. Verify correct battery and system operation before beginning any installation.
2. Locate a position to maximize solar exposure and minimize wind exposure, if possible. The roof, hood, or fairing area should be smooth and in good condition. If the roof, hood, fairing, or drip edge has sharp corrugation, edges, or is textured, consult with your PowerFilm contact for alternative attachment methods that may be needed.

3. Turn off the reefer and ensure the system won't start automatically by disconnecting the battery terminals
4. Dry-fit the panel to verify that the cabling will reach between the panel and battery locations. Don't be alarmed if the panel doesn't lay flat on a curved fairing. A 1" gap on one side of the panel is normal. The panel will flex to a 36" radius of curvature. A thinner backside black fiberglass would allow for more flexing, if necessary and is a custom option for PowerFilm panels.
5. Clean the surface where you plan to mount the panel removing all dirt, dust, and debris. Use disposable rags and 99% isopropyl alcohol (IPA). Let the surface dry for a minute.
6. Use 2" wide painter's tape to outline the panel's perimeter onto the fairing, hood, or trailer roof. Leave an extra  $\frac{1}{4}$  to  $\frac{3}{8}$  of an inch gap on all sides. This gap will be covered with mastic (e.g., Vulkem 116) to seal the edge to the surface and prevent water from pushing under the panel.
7. Use a scouring pad (e.g., 3M Scotch Brite pad) to buff the entire panel bonding area. This will remove any oxidation and score the clear coat resulting in a better bonding surface for the butyl. The picture to the right shows a demonstration piece of a fairing with a taped perimeter established. Take a close look at the sample panel bonding area, with  $\frac{1}{3}$  of the bonding area receiving the scouring pad treatment. Note the dull reflection of the treated surface.
8. Clean the bonding area with 99% isopropyl alcohol again. This will remove dust and debris left after scouring. Let the surface dry for a minute. Failure to properly prepare the mounting surface will result in poor adhesive strength of the solar panel.
9. If mechanically fastening the solar panel is required, use the holes at the corners of the panel. Using a  $\frac{3}{16}$ " drill thru the laminate. Ensure the holes in the panel are located in the correct spot before removing the release liner. **Do not** drill holes in the trailer's roof liner, only the rivet strip.
10. Place the solar panel upside down next to the chosen mounting area. Peel the release liner from the back of the solar panel, beginning with the isopropyl/corner. Be careful not to significantly bend the solar panel when pulling on the release liner.
11. Pick up and rotate the solar panel. Center the panel and place it inside the painter's tape outline. **Do not** lift or try to reposition the solar panel after the panel is down, or damage **will occur**. You get **one chance** to place the panel.
12. Apply light pressure with your hand or a j-roller to ensure that the entire solar panel is firmly joined to the roof or fairing. Work the butyl adhesive from the center of the solar panel toward the edges.
13. If the panel was positioned to utilize additional mechanical fasteners, use the solar panel as a template to drill into a drip edge (**do not drill into a trailer roof**). Then use cushioned self-tapping screws or rivets to attach the panel.



14. Apply mastic (ex: Vulkem 116 caulk) around the entire perimeter of the solar panel to keep water out from underneath the panel. This is highly recommended on flat surfaces that can pool water.
15. Attach the cable to the battery terminals. The positive (+) branch has the fuse and a short section of loose red heat shrink. In addition, it has a  $\frac{3}{8}$ " diameter ring terminal to match the battery. The negative (-) branch has a 5/16" diameter ring terminal. Verify that the 10 Amp blade fuse is installed in the fuse holder. Never use higher-value fuses as replacements in this kit.
16. Use zip ties and cushion clamps to secure the cabling from the battery to the panel. Ensure connectors and wires are secure and do not come into contact with sharp, hot, or moving components. Vibrating wires during transport lead to failures.
17. Install any labels, stickers, or safety signs (**labels and signs not provided**) near the battery box and the charge controller to alert the technician or mechanic that a solar panel is active on the roof and providing power to the battery.
18. The final step is to connect the panel to the battery cable.

## Separate Charge Control & Harness Installation

1. Dry-fit the panel, charge controller, and cabling to verify the system fits your application.
2. Turn off the machine. Ensure the battery will not start automatically by disconnecting battery terminals.

**NOTE:** Follow proper Lockout-Tagout procedures.

**NOTE:** Charge controllers are unique for each solar panel application. Ensure the correct Soltronix charge controller is installed during installation/service; incorrect charge controllers will result in poor performance or failure to operate.

3. Install the charge controller as close to the battery as possible. Mark and drill the charge controller mounting holes using a 1/8" drill bit. Using self-tapping screws, secure the charge controller to the structural support, ensuring the wire leads are accessible (See Figure 1).
4. Connect the battery wire harness to the (+) positive and the (-) negative starter studs making sure the fuse holder lead is connected to the (+) positive stud. Route the battery cable on structural non-moving components. Use cushion clamps for attachment.
5. Connect the solar panel wire harness to a separate charge controller mounted near the battery. Secure the harness tightly with zip ties or cushion clamps every 6-12 inches.



**Figure 1**

## Checking Solar Panel Operation

1. Remove the fuse from the solar panel cable/harness.
2. Measure the battery voltage.
3. With the solar panel exposed to sunlight, re-install the fuse and check the battery voltage. The battery voltage should be higher depending on the amount of direct sunlight.
4. Connect a DC Amp clamp around the wire with the fuse installed. Depending on the battery's state of charge and the amount of sunlight, the current will vary from 0-9A. A low current reading can occur if the battery is at a high voltage (14.5V).

## Checking Solar Panel Voltage

### Separate charge controller configuration

1. Disconnect the solar cable from the charge controller.
2. Measure the voltage at the end of the cable with a voltmeter.
3. Voc of the panel should be approximately 0.69V multiplied by the number of cells on the panel at full sun for 125mm cells ( $32\text{wafers} * 0.69\text{V/wafer} = 22.4\text{V}$ ).
4. If there is less than ideal sun, the voltage can be lower (e.g., 12V to 18V).

### Integrated charge controller

1. Disconnect the cable from the battery.
2. Measure the voltage at the end of the cable with a voltmeter.
3. Since the voltage comes through a charge controller with no load, it should be 13.7V to 14.5V (assuming a minimal light level and individual cells are not shaded).

## Final System Checks

1. Ensure all connections are secure and weather-protected if possible.
2. Check the condition of any fuses that might be in the power path.
3. Check all connections and terminals for good electrical contact.

## Inspection & Preventative Maintenance

1. Inspect the wire harness and connections, and correct any issues found within the first 30 days and semi-annually after that.
2. Inspect the solar panel's adhesion to the rooftop. If caulking is cracked, re-apply. Repair as needed with semi-annual checks.
3. Clean the solar panel with a mild soap solution and water as needed for optimal performance.