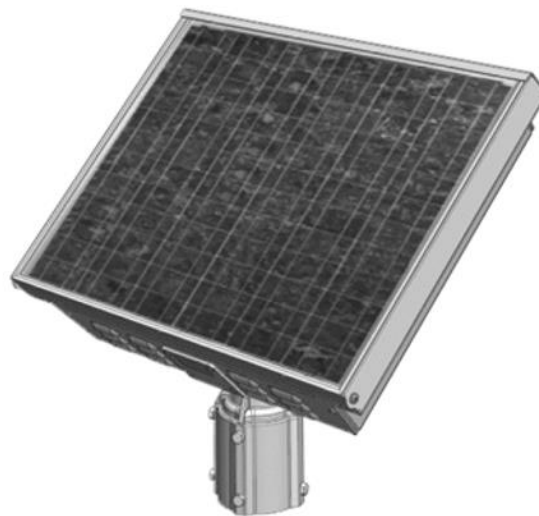


For the E/F Series and legacy R247-E/R920 systems



E Series (15W panel)



F Series (30W panel)

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1.0 Warnings and Precautions

The following symbols indicate important safety warnings and precautions throughout this guide:



WARNING indicates that serious bodily harm or death may result from failure to adhere to the precautions.



CAUTION indicates that damage to equipment may result if the instructions are not followed.



NOTE suggests optimal conditions and provides additional information.

1.1 Warranty Disclaimer

This guide will familiarize you with the installation of replacement solar panels for use with the E / F Series systems. Failure to comply with the use, storage, maintenance, installation or placement instructions detailed in this guide could void the warranty.

1.2 Standards

Perform all installation, wiring, grounding and maintenance in conformance with local building and electrical codes. Adherence to the National Electrical Code (NEC) is mandatory to comply with any certification markings. Non-adherence to code may void the warranty.

1.3 Safety and Usage Precautions



Use extreme caution when handling the batteries as they can generate hazardous short-circuit currents. Remove all jewelry (bracelets, metal-strap watches, etc.) before handling the batteries.



Solar panels produce DC electricity when exposed to light and can therefore produce an electrical shock or burn. To render solar panels inoperative, remove them from sunlight or fully cover their front surface with an opaque material.



Before lifting any heavy or bulky equipment, ensure the load is secured so moving parts do not shift, and that it can be lifted as far as needed without back strain or loss of grip. Installation may require more than one person.



Ensure the equipment is not powered during installation and wiring of the system.



Recheck all completed wiring for proper polarity prior to energizing the system.



Changes or modifications to Carmanah equipment not expressly approved by Carmanah could void both the user's authority to operate the equipment and the warranty.



All Carmanah traffic products use a constant-current LED output circuit. Not all traffic beacons are compatible with this output. Please contact Carmanah for additional information and guidance when adding or replacing beacons or other hardware.

This guide is specific to solar panel installation and is not a replacement for the complete E / F product user manuals.

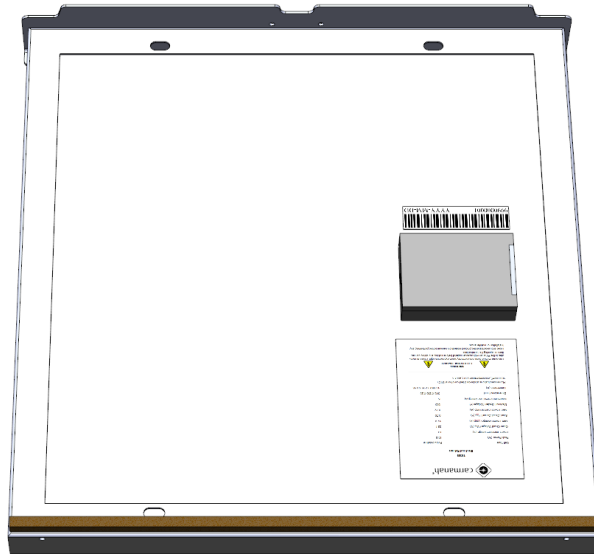


Visit support.carmanah.com to download the complete product user manual that is applicable to you.

2.0 E / F Series Replacement Solar Panel Kit

The E / F Series replacement solar panel kits include:

- | | |
|--|---|
| <ol style="list-style-type: none">1. Solar panel assembly, E or F Series (1)2. Flat washer (2)3. Nylon spacer (2)4. 5/32" sealing rivet (2)5. 1/8" sealing rivet, all three only required for F Series systems (3) | <ol style="list-style-type: none">6. Cable tie (3)7. Door labels, two for legacy R247-E, R920 and one for E or F Series (2)8. Foam tape, needed for E Series only (12.9")9. #8-32 tap (1)10. #29 (0.136") drill bit (1) |
|--|---|



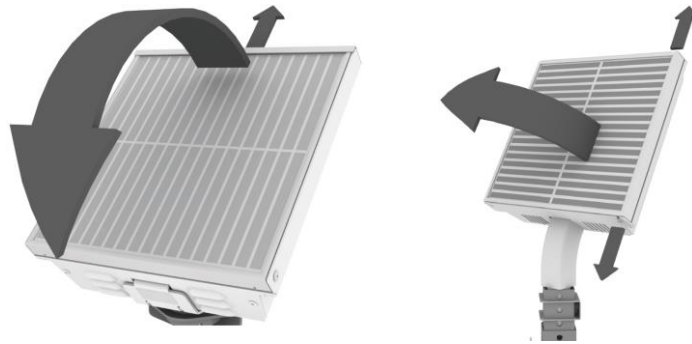
3.0 Tools and Materials Required

The following tools and materials may be required to install the E / F Series replacement solar panel:

- | |
|--|
| <ol style="list-style-type: none">1. Hand rivet tool with #2 and #5 nosepieces (not included)2. #8-32 tap (included, for legacy R920/R247-E only)3. #29 drill bit (included, for legacy R920/R247-E only)4. Side cutters5. Large drill bit for drilling rivets6. Electrical tape or wire nuts |
|--|

4.0 Installation

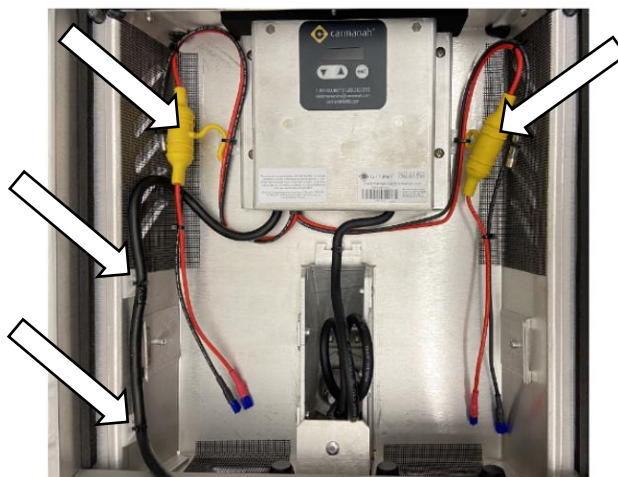
The images in this guide focus on E Series (or legacy R920/R247-E) systems. The same steps are used for F Series systems. There are two variations of solar engines which open horizontally or vertically:



Current – vertical opening Legacy – horizontal opening

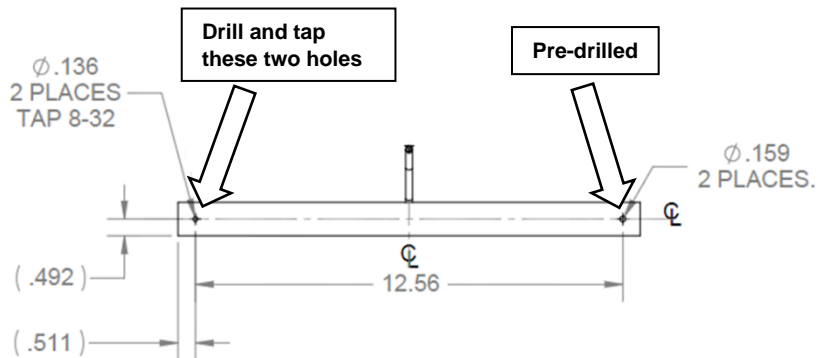
4.1 Disconnect Existing Wiring

1. Remove power to the system by disconnecting both battery fuses.
2. Cut the cable ties holding the solar panel cable. Remove the four screws on the Energy Management System (EMS) enclosure to gain access to the circuit board connections. Remove the cable tie holding the solar panel cable in place inside the EMS enclosure. Remove the solar panel wires from the circuit board terminals by pressing down on the release buttons and pulling out the wires. Cap off or tape the wires temporarily as voltage may be present.
3. Refer to [Section 4](#) to see which version of solar engine you have. For horizontal opening engines you will need to modify the replacement solar panel as in [Section 4.2](#). Otherwise proceed to [Section 4.3](#).



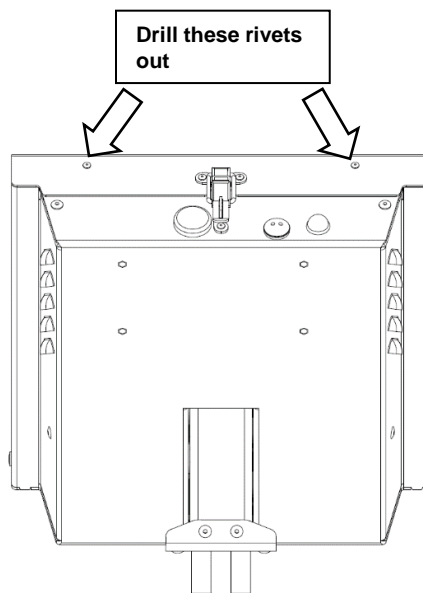
4.2 Legacy Systems (R920/R247-E) – Horizontal Opening Engines Only

1. For legacy systems that open horizontally the replacement panel will need to be modified. Drill and tap two holes (one on each side of the panel) as shown with the supplied 0.136" drill and #8-32 tap.
 - a. Alternatively, simply mark the hole locations while holding the solar panel in place within the engine, then drill and tap the holes in the panel extrusion.
2. Plug the two open holes in the top of the solar panel with two 1/8" sealing rivets.



4.3 Removing Existing Solar Panel

1. Drill out the solar panel hinge rivets on each side of the metal enclosure then remove the solar panel. Pull on the side of the enclosure to allow the old rivets ends to come free from the enclosure. Ensure the rivet holes aren't enlarged from drilling the rivets.
2. For vertical opening systems solar engines, drill out the rivets shown below to remove the top cap from the damaged solar panel. Ensure the rivet holes aren't enlarged from drilling the rivets. Reuse the top cap and attach it to the replacement solar panel using two 1/8" rivets.
 - a. For F Series engines there will be a third rivet near the center on the top cap that needs to be drilled out as well.

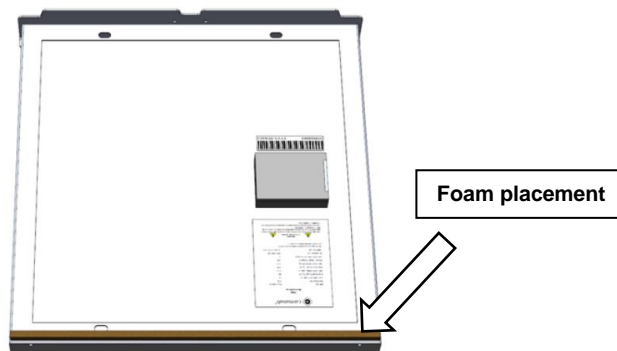


4.4 Installing Replacement Solar Panel

1. Assemble the flat washer, nylon spacer, and rivet as shown. Use these parts to rivet the replacement solar panel to the metal chassis. Ensure that the rivets protrude completely through the solar panel frame until the washer makes contact with solar engine chassis prior to compressing rivet.



2. Route the solar panel cable the same way as the panel that was removed. Insert the stripped ends of the wires into the EMS terminal labelled as PV+/- . Insert the black wire into the “PV-” terminal, and the red wire into the “PV+” terminal. Give the wires a light tug to ensure they’re fully seated. Install a cable tie around the EMS cover finger near the hole. Replace the cable ties that were removed from [Section 4.1](#). Reinstall the EMS enclosure and tighten the 4 screws.
3. Apply the foam tape to the bottom edge of the solar panel as shown below (not needed for F Series engines).



4. Reconnect the battery fuse holders to power the system. Navigate to the solar menu (solr) to confirm the solar panel is producing good voltage (15-20 VDC) with the solar panel exposed to sunlight. Navigate to the battery menu (batt) and ensure the voltage rises to confirm the charging is working properly.
 - a. If the EMS does not power on with the display lighting up, check to ensure the fuses are intact and the solar wires were not installed backwards.
5. Run the built-in self-test (BIST) and ensure it does not report a charging error of 1000 (legacy) or 4000 (current systems). Contact Carmanah for clarification at support.carmanah.com.

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