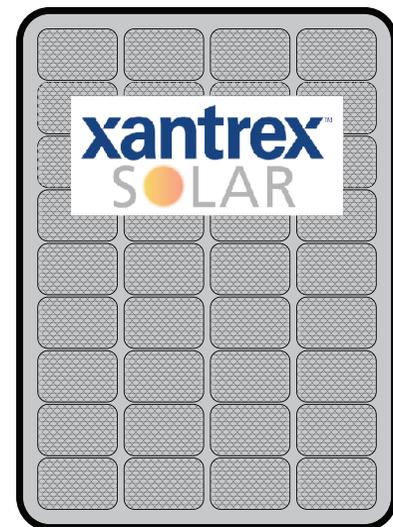


Xantrex Solar Kit

<http://www.xantrex.com>



Installation Guide

100W Xantrex Solar Kit

Model Number: 780-0100-01

160W Xantrex Solar Kit

Model Number: 780-0160-01

110W Xantrex Solar Flex Kit

Model Number: 781-0100-01

80W Xantrex Solar Max Flex Kit

Model Number: 784-0080-01

165W Xantrex Solar Max Flex Kit

Model Number: 784-0165-01

NOTE: Actual product may be different from what is shown.

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Safety Information Important Information

READ AND SAVE THIS INSTALLATION GUIDE FOR FUTURE REFERENCE.

Read these instructions carefully and look at the equipment to become familiar with the device before installing, operating, configuring, maintaining, and troubleshooting it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of either symbol to a "Danger" or "Warning" safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

Product Safety Information

1. Before using the solar panel kit, read all instructions and cautionary markings on the solar panel kit's components, the batteries, and all appropriate sections of this guide.
2. Use of accessories not recommended or sold by the manufacturer may result in injury to persons, a risk of electric shock, or a risk of fire.
3. The solar panel kit is designed to be connected to your DC electrical systems. The manufacturer recommends that all wiring be done by a certified PV technician or electrician to ensure adherence to the local and national electrical codes applicable in your jurisdiction.
4. To avoid a risk of fire and electric shock, make sure that existing wiring is in good condition and that wire is not undersized. Do not operate the solar panel kit with damaged or substandard wiring.
5. Do not operate the solar panel kit if it has been damaged in any way.
6. This solar panel kit does not have any user-serviceable parts. Do not disassemble the solar panel kit except where noted for connecting wiring and cabling. See your warranty for instructions on obtaining service. Attempting to service the solar panel kit yourself may result in a risk of electrical shock or fire.
7. To reduce the risk of electrical shock, disconnect all DC power sources from the solar panel kit before attempting any maintenance or cleaning or working on any components connected to the solar panel kit.
8. Do not expose the solar charge controller to rain, snow, or liquids of any type. This product is designed for dry-locations-use only. Damp environments will significantly shorten the life of this product and corrosion caused by dampness will not be covered by the product warranty.
9. To reduce the chance of short-circuits, always use insulated tools when installing or working with this equipment.
10. Remove personal metal items such as rings, bracelets, necklaces, and watches when working with electrical equipment.

⚠ DANGER

ELECTRICAL SHOCK AND FIRE HAZARD

Installation must be done by qualified personnel to ensure compliance with all applicable installation and electrical codes and regulations. Instructions for installing the Xantrex Solar Kit are provided here for use by qualified personnel trained in Recreational Vehicle and Solar power systems.

Failure to follow these instructions will result in death or serious injury.

⚠ WARNING

ELECTRIC SHOCK AND FIRE HAZARD

- Do not install the solar panel on top of a residential structure.
- Do not connect the solar panel's charge controller to a residential electrical system.
- Never use Lithium Ion type batteries, as this product is not designed for use with these battery types and doing so could result in an explosion.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠ WARNING

ELECTRIC SHOCK AND FIRE HAZARD

- Connect PV panels in parallel only.
- Do not connect the PV panels in series. The solar panel has a common positive design.
- Do not ground any PV conductors.
- Use the charge controller with PV panels rated at < 50 Voc.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠ WARNING

BATTERY TYPE HAZARD

Charge only properly rated 12 VDC lead-acid (Sealed, Gel, Flooded) rechargeable batteries because other battery types, such as lithium ion, may explode.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

FCC Information

This equipment (the charge controller) has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

CAUTION

Unauthorized changes or modifications to the equipment could void the user's authority to operate the equipment.

This device (the charge controller) complies with (ISED Canada) Industry Canada EMC standard(s), pursuant to ICES-003, Class B. Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

End of Life Disposal

The Xantrex Solar Kit is designed with environmental awareness and sustainability in mind. At the end of its useful life, the solar panel can be decommissioned and disassembled. Components which can be recycled must be recycled and those that cannot be recycled must be disposed of according to local, regional, or national environmental regulations.

Many of the electrical components used in the Xantrex Solar Kit are made of recyclable material like steel, copper, aluminum, and other alloys. These materials can be auctioned off to traditional scrap metal recycling companies who resell reusable scraps.

Electronic equipment such as the circuit boards, connectors, and fuses can be broken down and recycled by specialized recycling companies whose goal is to avoid having these components end up in the landfill.

For more information on disposal, contact Xantrex.

Introduction

Thank you for purchasing the Xantrex Solar Kit. The Xantrex Solar Kit is a high quality, carbon emissions-free, and sustainable power source for your vehicle – recreational vehicle (RV), truck, or boat. In conjunction with the included solar charge controller, it is designed to take solar energy and quietly produce power for your vehicle's DC appliances and store energy to a battery during daylight hours.

To get the most out of your Xantrex Solar Kit, carefully read and follow the instructions in this guide. These instructions include safety instructions that must be observed during installation and procedures for a basic installation.

The charge controller in the kit is equipped with the following features:

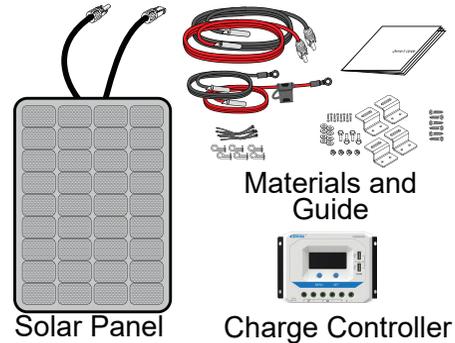
Unit protection	The solar panel kit is protected from over-charging, input overloading, and short-circuiting.
3-stage charging algorithm	The solar panel kit employs advanced 3-stage pulse width modulation (PWM) charging algorithm optimized for charging 12 VDC nominal rated lead-acid (Sealed, Gel, or Flooded) rechargeable batteries.
Temperature compensated charging	With the Remote Battery Temperature Sensor (PN: 708-0080), sold separately, charging parameters are automatically adjusted for efficient charging of the battery.

NOTE: The charge controller has additional features not required in the utilization of the solar panel for charging batteries. See the charge controller's separate guide for these features.

Materials List

The solar panel base package includes the following items:

- one solar panel
- one charge controller
- one set of installation hardware
- one Installation Guide



Installation Hardware Materials
one pair (black/red) 20 ft. MC4-type PV cable
one pair (black/red) 10 ft. MC4-type Battery cable, built-in 30A DC ATC fuse on red cable
one set of four 1/4" nuts/bolts/washers
six cable ties
six cable clamps and screws
one set of four mounting brackets and #10-16x1 screws (for Rigid-type panels only)
one set of six #10-16x1 screws and washers (for Flex-type panels only)

NOTE: If any of the accessories, materials, and other items are missing, contact Kussmaul or any authorized Kussmaul dealer for replacement. See *Contact Information on page 1*.

Safety Instructions

Please read this section for safety information regarding installing your solar panel.

Before beginning your installation:

- Read this entire Installation section so you can plan the installation from beginning to end.
- Assemble all the tools and materials you require for the installation.
- Be aware of all safety and electrical codes which must be met.

⚠ WARNING

ELECTRICAL SHOCK AND FIRE HAZARD

- The power system must be designed by a certified recreational vehicle and PV system designer and installed by a certified RV technician.
- All wiring should be done by qualified personnel to ensure compliance with all applicable installation codes and regulations.
- Disconnect all power sources.
- Disable and secure disconnect devices.

Failure to follow these instructions can result in death, serious injury, or equipment damage

You will need the following tools to install the solar panel:

- #2 Phillips screwdriver
- Drill with drill bit set
- Wrench set
- Torque driver

Basic Installation Steps

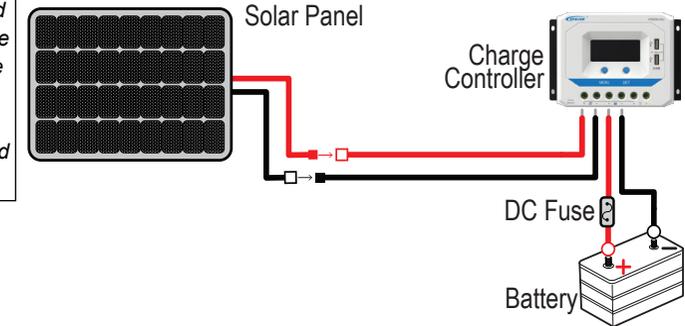
1. Plan the power system and where to mount the solar panel

a. Depending on your power needs and installation type, you have a number of solar kits available below.

Type ^a	80 W	100 W	110 W	160 W	165 W
Rigid		✓		✓	
Flex			✓		
Max Flex	✓				✓

b. Draw your power system on paper similar to *Figure 1*
Figure 1 Cable Schematic

IMPORTANT: Always use the provided PV and battery cables. If not, use alternate cables with the following specifications found in *Cable Specifications for PV and Battery on page 7*.



^aThe Xantrex Solar Kits come with roof installation materials that make it possible to mount the solar panel on most roofs of RVs

2. Plan where to mount the charge controller, fuses, and cable locations

- a. Identify and gather information about your vehicle.
 - Some vehicles are factory-installed with roof cable entry points.
 - If a cable entry point is absent, factory-installed vents can be used to route cables through.
- b. Locate a suitable location for the charge controller inside the vehicle. Select an area that is readily accessible, viewable, and free from exposure to moisture.
- c. Plan the route and measure the lengths of cables needed to reach their connection points factoring in bends and slack.
- d. You may add a second solar panel in parallel to double your energy harvest. For compatible models, see *Expansion Kit List on page 9*.

⚠ WARNING

ELECTRIC SHOCK AND FIRE HAZARD

- Connect PV panels in parallel only.
- Do not connect the PV panels in series. The solar panel has a common positive design.
- Do not ground any PV conductors.
- Use the charge controller with PV panels rated at < 50 Voc.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

3. Mount the solar panel (Rigid-type)

T1:  Torque 20 lb-in 2.3 N-m

T2:  Torque Depends on roof material

TIP: Contact the RV manufacturer for recommendations on roof sealant.

- a. Unpack the solar panels and prepare all installation tools and materials.
- b. Prepare the mounting surface by removing dust, dirt, and debris.

NOTICE

GENERAL PRECAUTIONS

- Select a mounting surface on the roof of your vehicle that is firm, thick, rigid, and able to support mounting hardware.
- Do not select a roof location within 1 m (3 ft) of the front of the vehicle to reduce wind lift forces during motion.
- Do not mount the solar panel near other roof fixtures that can obstruct direct exposure to sunlight.

Failure to follow these instructions can result in physical damage to vehicles and property.

- c. Install the mounting brackets on the solar panel. See **T1**.
- d. Place the solar panel assembly on the planned location on the roof, mark the locations of mounting bracket holes on the roof of the vehicle, pre-drill the two holes [one (+), one (-)].
- e. Apply an RV roof sealant around the pre-drilled holes.
- f. Install the solar panel assembly on the roof and fasten the brackets using the supplied #10 screws. See **T2**.
- g. Apply an RV roof sealant to the screw heads.

4. Mount the solar panel (Flex-type)

TIP 1: Once applied to a surface, any industrial grade adhesive sealant cannot be easily removed without damaging the solar panel and doing so will void the warranty. Contact the RV manufacturer for recommendations.

TIP 2: Apply roof sealant around the screw holes and on the screw head after fastening to prevent moisture penetration. Contact the RV manufacturer for application recommendations on roof sealant.

- a. Unpack the solar panels and prepare all installation tools and materials.
- b. Prepare the roof mounting surface by removing dust, dirt, and debris. Clean and degrease the roof surface with isopropyl alcohol and dry completely.

NOTICE

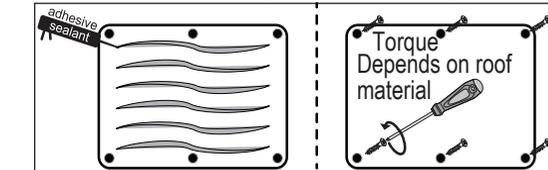
GENERAL PRECAUTIONS

- Do not mount the solar panel near other roof fixtures that can obstruct direct exposure to sunlight.
- Select the mounting area carefully and mark the exact and intended location of the solar panel.

Failure to follow these instructions can result in physical damage to vehicles and property.

- c. For permanent mounting, apply an adhesive sealant (see **TIP 1**) to the solar panel's backside and place the panel on the exact and intended location. Alternatively, install the solar panel on the roof using appropriate screws and washers to fasten the panel.
- d. Apply an RV roof sealant (see **TIP 2**) to the screw heads.

Figure 2 Two ways to mount the panel



5. Mount the solar panel (Max Flex-type)

- a. Unpack the solar panels and prepare all installation tools and materials.
- b. Prepare the roof mounting surface by removing dust, dirt, and debris. Clean and degrease the roof surface with isopropyl alcohol and dry completely.

TIP: Once applied to a surface, the industrial grade adhesive on the solar panel cannot be easily removed without damaging the solar panel and doing so will void the warranty.

IMPORTANT: Follow the recommendations illustrated in Figure 3 on page 10.

NOTICE

GENERAL PRECAUTIONS

- Do not mount the solar panel near other roof fixtures that can obstruct direct exposure to sunlight.
- Select the mounting area carefully and mark the exact and intended location of the solar panel.

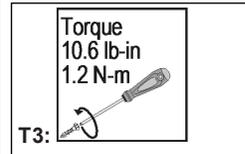
Failure to follow these instructions can result in physical damage to vehicles and property.

- c. Peel off the adhesive covers and place the solar panel on the exact and intended location.
- d. Using a roller (not provided), apply even pressure to multiple points to ensure adhesion of the panel onto the roof surface.
- e. Allow 72 hours for the adhesive to cure before exposing the solar panel to wind lift forces such as while driving.
- f. Apply protective tape (recommended 3M™ Extreme Sealing Tape, not included) around the solar panel edges to seal it from the environment.

6. Mount the charge controller.

- a. Mount the charge controller on the location you pre-selected in Step 2 using the self-tapping screws provided in the kit.
- b. Loosen the terminal screws on the charge controller.

7. Connect the DC cables.



IMPORTANT: Follow the recommendations illustrated in Figure 4 and Figure 5 on page 10.

NOTICE

REVERSE POLARITY

Check polarity at all terminals before making the final DC connection. Pos(+) (red) must connect to charge controller pos(+) (red); Neg(-) (black) must connect to charge controller neg(-) (black).

Failure to follow these instructions can result in equipment damage.

- a. Cover the solar panel with a blanket (or the packaging box) to de-energize it.
- b. Connect the red pos (+) and black neg (-) PV cables to the solar panel using the MC4-type connectors.
- c. Route the PV cables through the roof entry point and connect the red pos (+) and black neg (-) PV cables to the charge controller. See **T3**.
- d. Connect the red pos (+) and black neg (-) battery cables to the charge controller. See **T3**.
- e. Route the battery cable inside the vehicle and connect the red pos (+) and black neg (-) battery cables to the respective battery terminals.
- f. Secure all cables with clamps (and/or cable ties) and additional strain-relief as necessary.
- g. Clear the roof and the cable routes of tools and other debris that may have been left during installation.

8. Operate the system.

- a. Remove the blanket (or the packaging box) covering the solar panel to start energizing the solar panel.
- b. Check the LCD display of the charge controller for indications of power.
NOTE: The charge controller has no power switch and the LCD display turns on immediately when power is detected.
- c. Configure the battery type using the charge controller.
- d. Use the charge controller to monitor the charging operation.

9. Maintain the system

- a. Periodically check the cable connections at each of the charge controller terminals. Vibration can cause terminals to loosen.
- b. Check also for signs of corrosion.
- c. Periodically clean the surface of the solar panel using water and sponge. Do not pressure wash.
- d. When storing the vehicle for winter season, there may be insufficient solar charging capacity due to weather or an RV cover, therefore charge the battery by using the vehicle's AC powered battery charger.
- e. When storing the vehicle outside in temperate weather, remove all DC loads that can drain the battery unnecessarily.

Troubleshooting

WARNING

ELECTRICAL SHOCK HAZARD

- Do not disassemble the charge controller unit. It does not contain any user-serviceable parts. Attempting to service the unit yourself could result in an electrical shock or burn.
- If the in-line fuse on the positive (+) battery cable blows, replace only with exactly the same rating and type of fuse. For reference, see *Fuse Rating on page 7*.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

NOTE: To obtain service go to *Contact Information on page 1*.

Common Issues

Problem	Possible Cause	Solution
Battery does not get charged even when sunlight is present.	Solar panel is partially shaded or there is insufficient sunlight.	Move the vehicle so the whole solar panel is exposed to direct sunlight.
	Loose or no DC cable connections.	Connect DC cables to the battery and solar panel and tighten terminal connections.
	Fuse is blown.	Check the DC blade fuse on the battery cable and replace the fuse with the same type and rating as the old fuse.

Problem	Possible Cause	Solution
The charge controller is indicating an event condition.	Battery over-discharge or over-voltage event condition.	See the charge controller's Owner's Guide for more further instructions.

Specifications

NOTE: Specifications are subject to change without prior notice.

Torque Specifications for Fasteners

30A charge controller terminal screws	10.6 lb-in (1.2 N-m)
Mounting bracket bolt screws	20 lb-in (2.3 N-m)
Mounting bracket roof screws	Depends on roof material.

Cable Specifications for PV and Battery

PV cable	#10AWG, 600V, -40°C–90°C
Battery cable	#10AWG, 300V, -40°C–90°C

Fuse Rating

Battery cable in-line fuse	ATO/ATC blade-type fuse 30A (green)
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Solar Panel Specifications

100W Xantrex Solar Kit 780-0100-01, Expansion Kit 780-0100-02

Solar panel physical dimensions	840 × 670 × 30 mm (33.1 × 26.4 × 1.2 inches)
Unit weight	6.8 kg (15 lbs.)
Operating temperature	-40° –85°C (-40° –185°F)
Rated power	100 W
Max power voltage	19.2 V
Max power current	5.21 A
Open circuit voltage	23 V
Short circuit current	5.51 A

160W Xantrex Solar Kit 780-0160-01, Expansion Kit 780-0160-02

Solar panel physical dimensions	1350 × 670 × 30 mm (53.1 × 26.4 × 1.2 inches)
Unit weight	10.5 kg (22.5 lbs.)
Operating temperature	-40° –85°C (-40° –185°F)
Rated power	160 W
Max power voltage	19.2 V
Max power current	8.34 A
Open circuit voltage	23 V
Short circuit current	8.7 A

Solar Panel Specifications

110W Xantrex Solar Flex Kit 781-0100-01, Expansion Kit 781-0100-02

Solar panel physical dimensions	995 × 670 × 24 mm (39.2 × 26.4 × 0.9 inches)
Unit weight	2.5 kg (5.5 lbs.)
Operating temperature	-40° –85°C (-40° –185°F)
Rated power	110 W
Max power voltage	18.9 V
Max power current	5.83 A
Open circuit voltage	23.3 V
Short circuit current	5.95 A

80W Xantrex Solar Max Flex Kit 784-0080-01, Expansion Kit 784-0080-02

Solar panel physical dimensions	981 × 609 × 17 mm (38.6 × 24 × 0.67 inches)
Unit weight	2.1 kg (6.8 lbs.)
Operating temperature	-40° –85°C (-40° –185°F)
Rated power	80 W
Max power voltage	18.92 V
Max power current	4.23 A
Open circuit voltage	23.01 V
Short circuit current	4.36 A

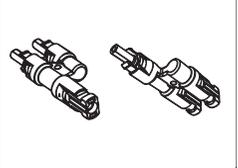
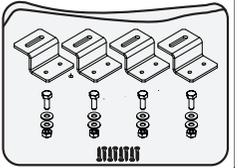
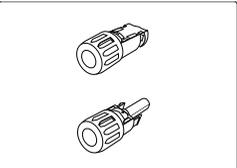
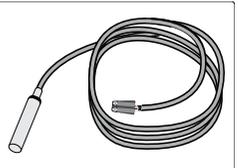
Solar Panel Specifications

165W Xantrex Solar Max Flex Kit 784-0165-01, Expansion Kit 784-0165-02

Solar panel physical dimensions	1556 × 689 × 18 mm (61.3 × 27.1 × 0.7 inches)
Unit weight	4.6 kg (10.2 lbs.)
Operating temperature	-40° –85°C (-40° –185°F)
Rated power	165 W
Max power voltage	19.34 V
Max power current	8.54 A
Open circuit voltage	23.25 V
Short circuit current	8.81 A

Accessory List

Accessories (Sold Separately). Contact a Kussmaul authorized dealer to order.

<p>PV Extension Cables, 15-ft (PN: 708-0030)</p> 	<p>PV Branch Connector (PN: 708-0050)</p> 	<p>Mounting Hardware (PN: 708-0070)</p> 	<p>PV Adapter Cable SAE-MC4-Type (PN: 708-0100)</p> 
<p>PV Single Connector (PN: 708-0040)</p> 	<p>PV Connector Assembly Tool (PN: 708-0060)</p> 	<p>Remote Battery Temperature Sensor (PN: 708-0080)</p> 	<p>PV Adapter Cable DC Plug (PN: 708-0110)</p> 

Solar Kit List

Model Number	780-0100-01	780-0160-01	781-0100-01	784-0080-01	784-0165-01
Rating	100 W	160 W	110 W	80 W	165 W
Type	Rigid	Flex	Max Flex		
solar panel	✓	✓	✓	✓	✓
30A Charge Controller	✓	✓	✓	✓	✓
one pair (black/red) MC4-type PV cable, 20 ft.	✓	✓	✓	✓	✓
one pair (black/red) MC4-type Battery cable, 10 ft., built-in 30A DC fuse blade on red cable	✓	✓	✓	✓	✓
six cable ties	✓	✓	✓	✓	✓
six cable clamps and screws	✓	✓	✓	✓	✓
one set of 4 mounting brackets and screws	✓	✓			
one set of 4 nuts/bolts/washers	✓	✓			
one set of 6 screws and washers			✓		

Expansion Kit List

Model Number	780-0100-02	780-0160-02	781-0100-02	784-0080-02	784-0165-02
Rating	100 W	160 W	110 W	80 W	165 W
Type	Rigid	Flex	Max Flex		
solar panel	✓	✓	✓	✓	✓
one set of 4 mounting brackets and screws	✓	✓			
one set of 4 nuts/bolts/washers	✓	✓			
MC4-type branch connector (male/female)	✓	✓	✓	✓	✓
one set of 6 screws and washers			✓		

CAUTION

PHYSICAL INJURY OR EQUIPMENT DAMAGE

- Do not cross-match solar panels when increasing capacity. Always match the solar panel ratings of the Solar Charging Kit and the Expansion Kit.
- Do not exceed the current capacity of the charge controller when expanding solar panels using the Expansion Kit.
- Attach the solar panels together in parallel using the MC4-type branch connectors. The relative positions of the two solar panels must be within reach of the pigtail cables. See *Figure 4* for examples.

Failure to follow these instructions can result in physical injury or equipment damage.

Installation Tips

Figure 3 Applying peel and stick panels

1. Peel off the adhesive cover from the back of the module carefully.
2. Use a 3" roller (not included) to firmly bond the panel to the roof surface.
3. Use a 2" wide protective tape (recommended 3M™ Extreme Sealing Tape, not included) around the edges of the solar panel.

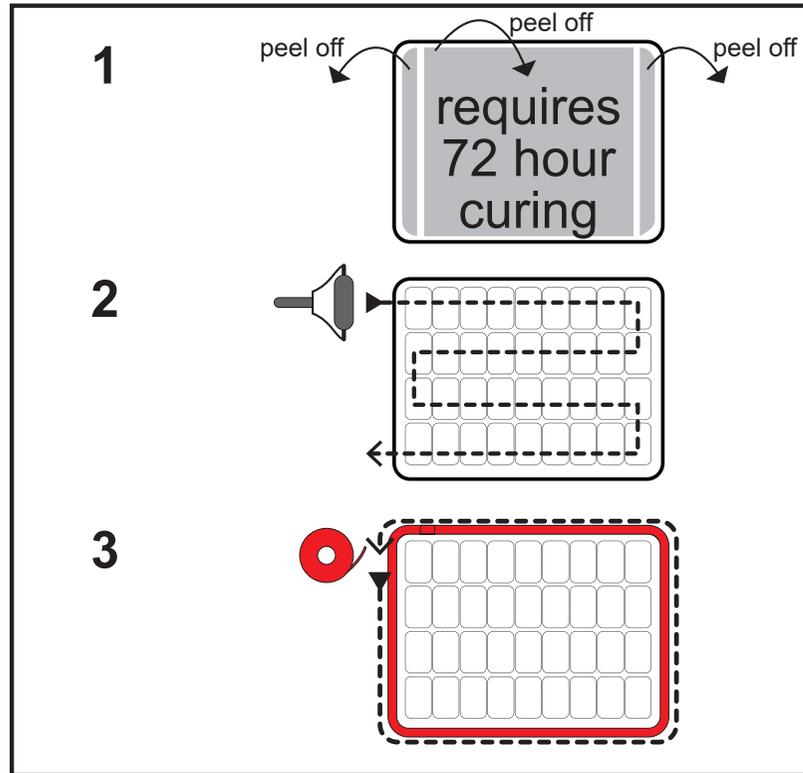


Figure 4 Panel positions and cable management

TIP: Avoid placing the cable towards the front of the vehicle. Protect cables from any damage through friction or stress.

TIP: Protect connectors from humidity as much as possible. Place them directly beneath a covering when possible. Do not let them hang loose or be moved around by wind. When securing connectors with fasteners, secure the cable instead of the connector.

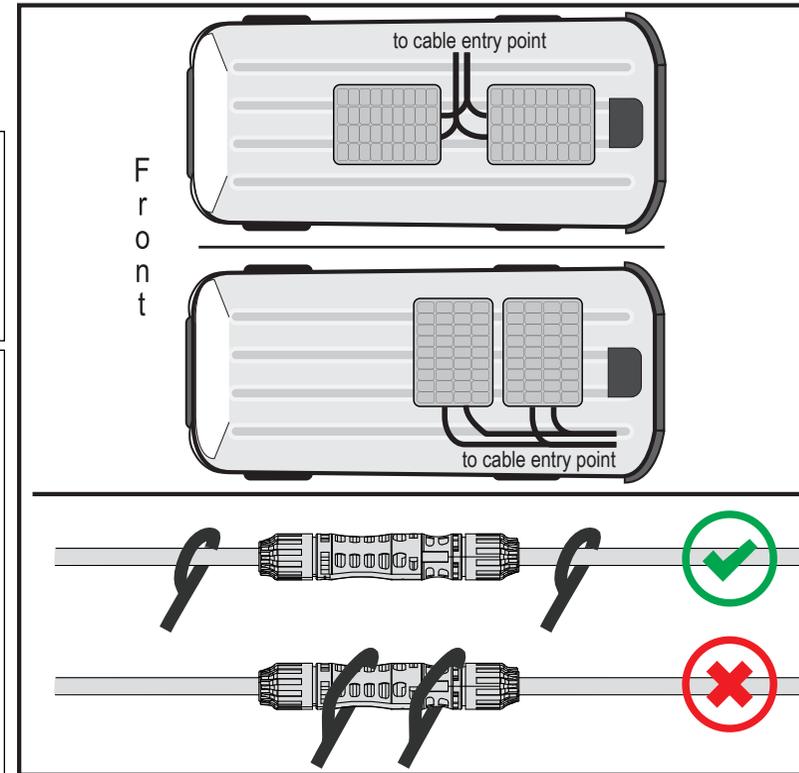


Figure 5 Cable bends and connections

TIP: Avoid sharp bends when routing cables. Follow the bending radius recommendation on the right. This applies to connections to the charge controller and battery.

TIP: You should hear a click when the connectors are attached correctly. Use only the supplied connector assembly tool to detach connectors from each other.

