

General Solar Installation Tips – Mar 2023

These tips for installation and mounting are generic. Depending on the platform each solar panel may need to be mounted in slightly different ways. However, general guidelines apply for all installations.

For detailed recommendations and additional installation information please contact your supporting FSR (FSR support map ion page 17).

Safety and quality installation should be the #1 priority.



- Safety Instructions: Working in the vicinity of a lead acid battery can be dangerous. Batteries generate explosive gases during normal battery operation. To reduce risk of battery explosion, follow these instructions and those published by the battery manufacturer and manufacturer of any equipment you intend to use in the vicinity of the batteries. Review cautionary markings on the products and equipment.
- Always work safely by turning off all power switches and disconnecting the main negative battery cable or cables as required prior to installation.
- **Keep wires away from high traffic areas. Ensure they are securely mounted the entire way from the solar panel, along the chosen path to the Pulse Recovery Unit (PRU), and finally to the main Positive and Negative battery lugs.** Wires should be run where they are protected from being pinched by doors, windows, etc. Additionally avoid areas where excessive debris (such as rocks, mud, etc.) may build up, avoid exhaust pipes, and excessive heat sources.
 - > This can usually be accomplished on many vehicles / generators by running the wires along other harnesses that are already in place.
- The Pulse Recovery Unit (PRU) should be mounted within the battery box or in a location that will not receive excessive water or rain buildup. The PRU is water resistant but is not waterproof. Submersion, even for a short period could cause a PRU short.

24V Systems: The PulseTech® 24V Pulse Solar Chargers are designed to compensate for the normal daily parasitic drain. They can, over time desulfate all types of 24-Volt lead-acid battery systems (conventional flooded, gel, sealed "maintenance free" VRLA and AGM).

7.2 - Watt systems are recommended for systems with 2 batteries in series or single battery 24V systems.

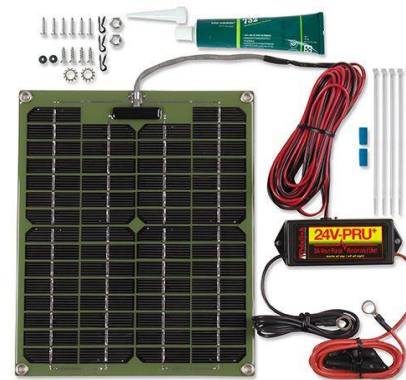
12 - Watt systems are recommended for 24V systems with up to 4 batteries in series parallel.

In areas where sunlight is limited, we recommend consulting with your FSR, as larger panels may be needed to maintain batteries.

All panels are safe, reliable, weatherproof and are designed to prevent dead batteries by keeping charged batteries in a charged condition. An LED light indicates the circuit is energized and the unit is working.

The 735X640 and 735X724 hard wired panels come with installation kits, which are usually sufficient for most installations.

The NATO connection systems are designed for temp use while equipment is parked. They plug directly into the equipment NATO adapter and are temporarily attached with supplied Velcro straps.



7.2 Watt, with installation kit.
Part# 735X640, NSN 6130-01-487-0035

12 Watt with installation kit.
Part# 735X724, NSN 6130-01-688-4857



Optional – 7.2 Watt Military NATO Plug
Part# 735X687, NSN 6130-01-558-5371

25-Watt Military Nato: Part# 735X712
25-Watt with Clips: Part# 735X689

12V Systems: The PulseTech® 12V solar applications compensate for the daily parasitic drain and desulfate all types of 12-Volt lead-acid battery systems (conventional flooded, gel, sealed "maintenance free" VRLA and AGM).

They are safe, reliable and weatherproof systems which prevent dead batteries by keeping them in like-new condition. An LED light indicates the circuit is energized and the unit is working.

The 12V PSC and SP10 each come with installation kits, which are usually sufficient for most installations.



2 Watt, 12VPSC, with installation kit.
Part# 735X740, NSN 6130-01-546-8432

3 Watt, SP-3,
Part# 735X453, NSN 6130-01-388-0245

7 Watt, SP-7:
Part# 735X467, NSN 6130-01-446-7154

10 Watt, SP10 with installation kit.
Part# 735X315, NSN 6130-01-688-4859

12 Watt, SP-12, Part# 735X468

25 Watt, SP-25, Part# 735X325

Below is a typical installation kit for the 7.2-watt and 12-watt hard mounted panels discussed on the previous slides. In addition, some suggested minimum tools are listed below. Some platforms will require more tools and equipment for installation.



Tools / Supply List:

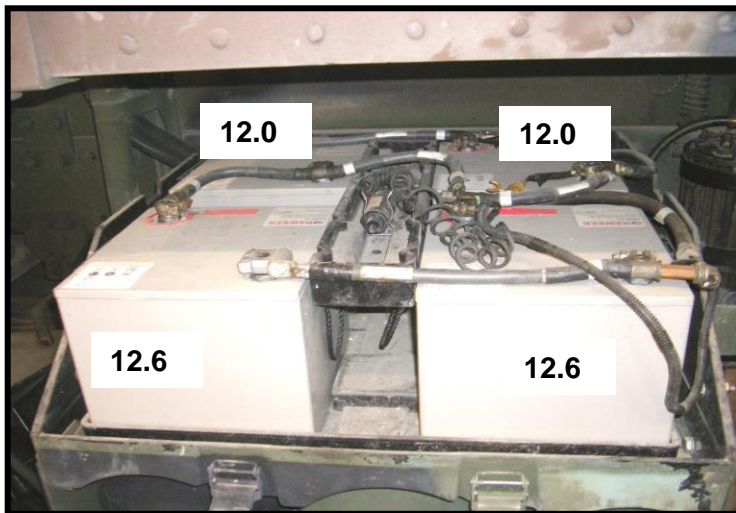
1. Wrenches for battery terminals.
2. Wire strippers and crimpers
3. Side cutting pliers
4. Drill and drill bits.
5. Electrical tape.

Another Mounting option (not included in any install kits): Double stick Velcro

1. NSN: 8315-01-435-2117 gets 5 yards.

24V systems: This applies to all 24V solar applications.

1. Visually inspect batteries and check to ensure all cables / terminals are serviceable, clean and tight. Repair any deficiencies.
2. Test batteries with a conductance tester. In a series / parallel system test all batteries to verify VDC balance.
 - > Batteries should be balanced and system VDC at or above 24.6 VDC.
 - > If there is more than .5Vdc between any batteries or the system is below 24.6 VDC we highly suggest this be remedied by charging batteries before depending on solar.



Not ready for solar! System is at 24.6 VDC, but **batteries are out of balance.**



Ready for solar. System is above 24.6 VDC and batteries are balanced.

12V systems: This applies to all 12V solar applications.

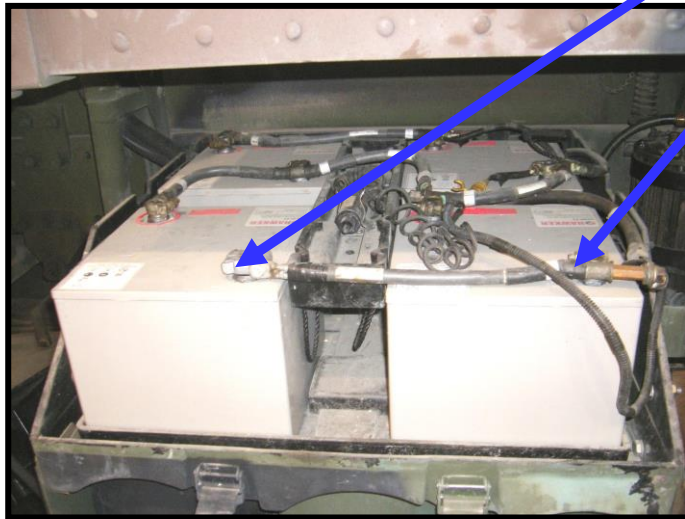
1. Visually inspect battery or batteries to ensure all cables / terminals are serviceable, clean and tight. Repair any deficiencies.
2. Test batteries with a conductance tester. In a parallel system test all paralleled batteries by disconnecting a paralleling cable to verify battery conditions and VDC balance.
 - > Batteries should be balanced to within .2VDC and overall VDC at or above 12.3.
 - > If there is more than .2VDC between any paralleled batteries or below 12.3 we highly suggest this be remedied by charging batteries before depending on solar.



Not ready for solar. Single battery at 12.0 VDC, VDC should be at 12.3VDC or above.



Ready for solar. Single battery is at or above 12.3 VDC.



1. All power systems turned off.
 2. Disconnect the Main Negative terminal or terminals.
- Note: Some systems have more than one main negative connection, so ensure ALL grounds from the batteries are disconnected prior to starting work on installation.

When choosing where to mount panels ensure the location will receive the maximum amount of sunlight possible throughout the day.



6.3-Watt hard mounted panel on HMMWV:



10-Watt Hard mounted with optional FMTV snorkel kit on M1083 MTV:



6.3-Watt Nato Plug SPCMS hard mounted on Case Skid Steer:

Other considerations:

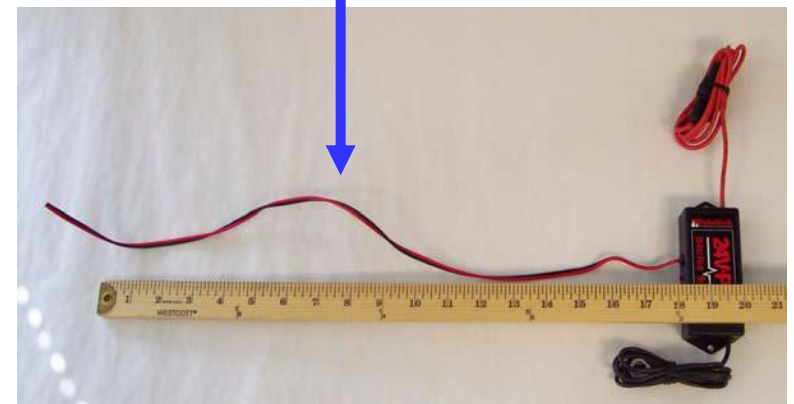
- Armor plating cannot be drilled into or modified in any way.
- Panels should be placed as close to the batteries as possible.
- Panels should be placed where they will not be damaged during equipment use. Example: They should not be stepped on, concertina wire placed on them, etc.

Note: These steps mainly pertain to the permanent mounted panels. The NATO plug or clip systems can be permanently mounted also if desired. However, the nato plug systems are usually temp mounted and removed when equipment is in use.



Unwrap the wire from the PRU and cut at approximately 18" from the PRU.

This will make it much easier when tracing the wires from the panel back to the battery box area.



From your predetermined mounting location determine if a drill hole is required for the wire to run back to the battery box. In the HMMWV example at right, it was needed.

Note: You can change the mounting location as needed, but please keep in mind:

1. Maximum sunlight.
2. You cannot drill or modify ANY armor plates.
3. Closer to the batteries is best.



Run wire through hole, and mount panel. Panel can be secured with screws, bolts, epoxy, or doubled sided sticky Velcro if needed. Epoxy or Velcro are usually used for adhering panels to Armor plates.

Run wires back to the battery box while keeping them away from high traffic areas. Ensure they are securely mounted the entire way from the solar panel and along the chosen path to the battery box. Wires should be run where they are protected from debris (such as rocks, mud, etc.), and not near any exhaust systems or excessive heat sources. This can usually be accomplished by running the wires along other harnesses that are already in place.

Now that the wires are in or near the battery box you will need to determine where to mount your PRU.

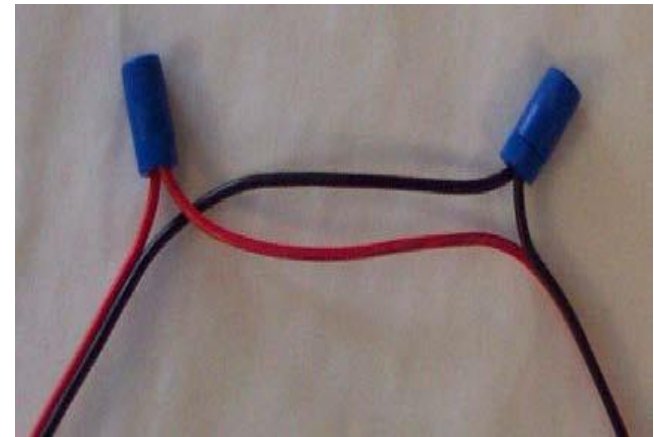
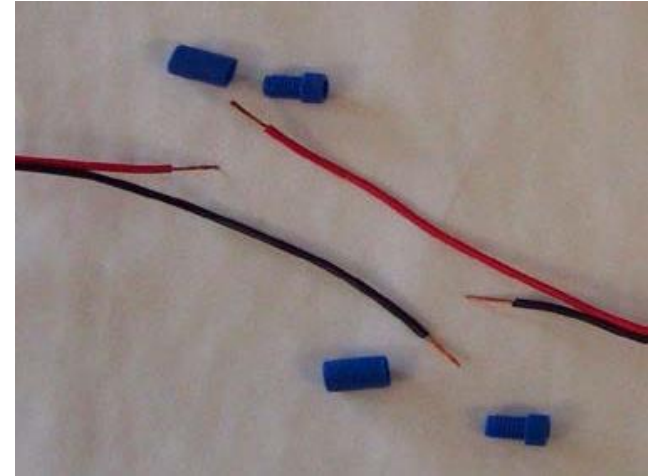
See examples at right. The top one is hard mounted 6.3 watt system with screws near the batteries on a 15KW AMMPS Gen set, and the bottom is a 10 watt PRU mounted with zip ties to a wire harness on an Army MTV. Either method is ok, as long as:

1. It is mounted within or near the battery box.
2. PRU location will not receive excessive water or rain buildup. The PRU is water resistant but is not waterproof. Submersion, even for a short period could cause a PRU short.
3. It must be secured in a way to ensure it does not rattle around or move when the equipment is in use.
4. Finally, it **MUST** be mounted to ensure the red LED on top can be seen when checked.



Now that the wires are in or near the battery box and the PRU is now mounted you will need to connect the wires from the PRU and the panel.

1. Determine how much wire you will need from the panel. It comes with 38' and any excess should be cut and removed.
2. Strip away $\frac{1}{2}$ " wire and offset (if desired), as shown in the picture at top right.
3. The install kits come with wire nut splices or if not a system with an install kit normal wire connectors are fine.
4. For wire nut splices; Twist wires together, slide the open-end part of wire nut splice over the wires until they are even with edge. Then place the other half of the wire nut splice into the open end and hand tighten. Ensure there is sufficient wire in the open end when tightened. Lightly tug on the wires to ensure a solid connection.



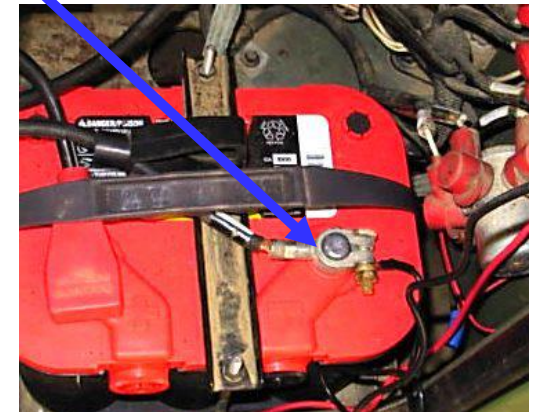
1. Take the PRU positive (Red) lead and connect to Main Positive (+) battery terminal. The install kit provided has a nut that will fit most standard battery terminals, or you can use existing hardware to connect. Ensure connection is clean, and tight.

Note: The Positive lead from the PRU to the battery is equipped with a Fuse and a spare. Ensure the housing for the fuse is tight and the wires are not routed where it may pull apart over time.

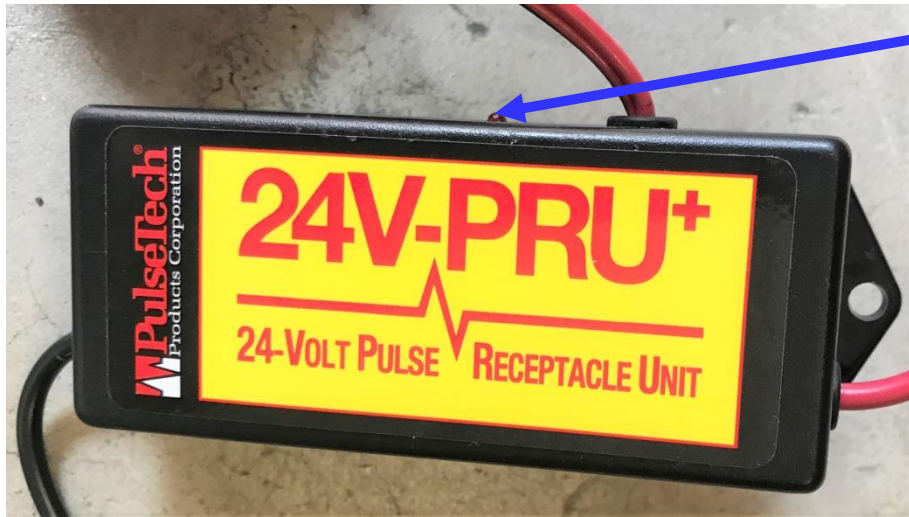


Performance validation: If there is adequate sunlight on the panel at this point we highly recommend you validate performance prior to the last step of placing the Negative connection on the battery terminal. With panel exposed to sunlight, take a multimeter and place on DC volts and test between the main positive battery terminal, and the still unconnected negative lead from the PRU. You should read between 28 and 40 VDC. DO not be alarmed at the high VDC as the PRU will regulate the application once a battery is connected.

1. Take the PRU negative (Black) lead and connect to Main Negative (-) battery terminal. Reconnect the main Negative terminal to the battery post. The install kit provided has a nut that will fit most standard battery terminals, or you can use existing hardware to connect. Ensure connection is clean, and tight.
2. Secure all wires using zip ties, or other means.
3. Once the Negative terminal is placed back on the battery your solar maintainer should be ready to function.



Performance validation: Once the panel is exposed to sunlight there should be a red LED blinking on the PRU. This indicates the correct function between the panel and the PRU.



Red blinking light when adequate sunlight is received.

Troubleshooting: If you do not have a red blinking light in direct sun do the following:

1. Check wires to ensure good connections.
2. Check the Positive lead fuse to ensure it is serviceable.
3. Check the fuse case to ensure it is fully seated.
4. Perform the optional test in step 8 to verify VDC.
5. Contact your support FSR (contact info next page) for assistance and additional TS steps.

Example Solar application use:



12-Watt Panel on a M113.



6.3 Watt Panel on a M1083.



7-Watt Panels on HMMWVs.



7-Watt Panels on Gen Sets.



6.3 Watt Panel on M1152.



12-Watt Panel on Dozer.

Example Solar application use:



12-Watt Panel on a M88.



7-Watt Panel on a Skid steer.



12-Watt Panel on a HMMWV.



12-Watt Panel on a JLTV.
This would be for the primary batteries.

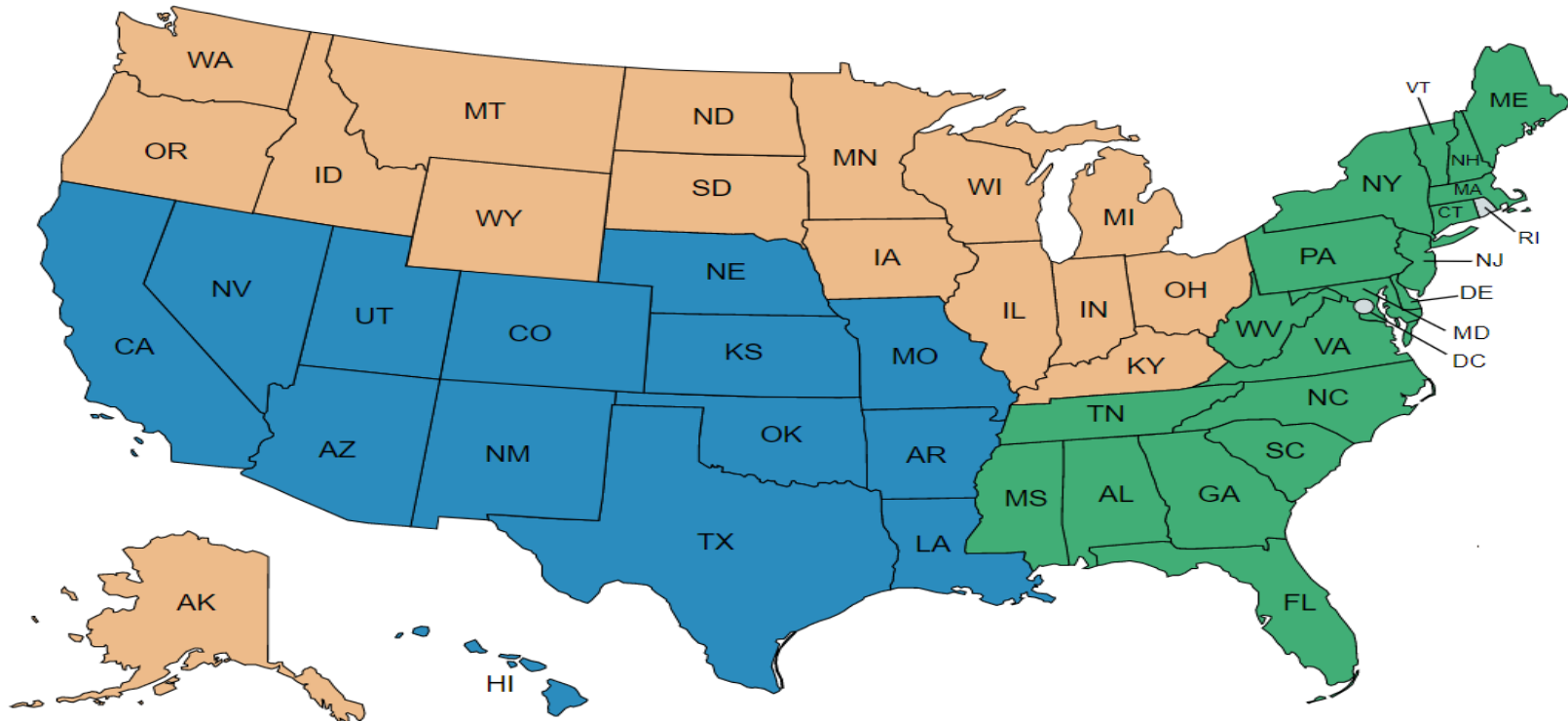


12-Watt Panel on NTC OPFOR
Tracked vehicle.



12-Watt Panel on Stryker.

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