

**Go Power!
Electric Inc**

Go Power! RV Kit Manual

GP-RV10

GP-RV50/55/80

GP-RV102/110/115

GP-RV160

GP-RV240

GP-RV50/55E

GP-RV80E

GP-RV102/110E



Canadian Contact Information

Go Power! Electric Inc.
1969 Keating Cross Rd
Victoria, BC V8M 2A4
Tel: 866-247-6527
Fax: 866-607-6527
Email: info@gpelectric.com

US Contact Information

Go Power! Electric Inc.
340 El Pueblo Rd. Suite F
Santa Cruz, CA 95060
Tel: 866-247-6527
Fax: 866-607-6527
Email: info@gpelectric.com

RV Kit Installation

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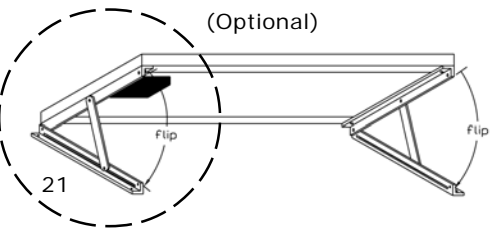
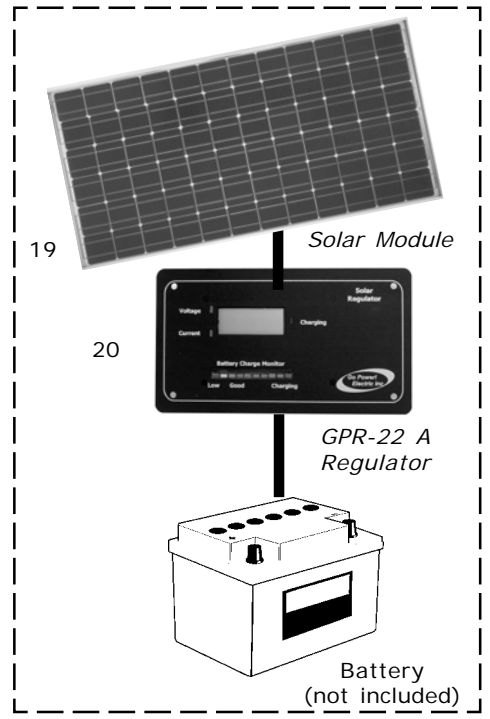
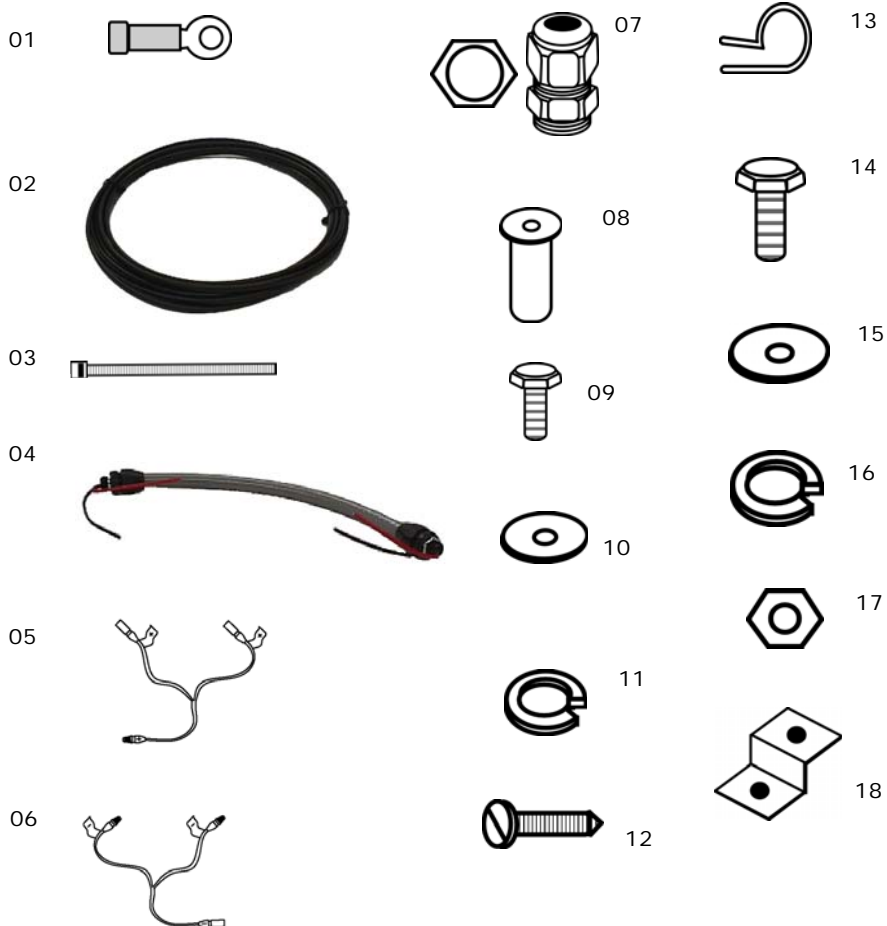
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PART	Standard Kits								
	RV-10	RV-50/ 55	RV-80	RV-102/ 110/115	RV-160	RV-240	RV-50/ 55E	RV-80E	RV-102/ 110/115E
01. Ring Terminal Battery Connector	2	2	2	2	2	2	-	-	-
02. Power Cable (7 m)	1	1	1	1	1	1	-	-	-
03. Tie Wrap	-	6	6	6	6	6	-	-	-
04. Interconnect cable	-	-	-	-	1	2	1	1	-
05. Positive MC Parallel Cable	-	-	-	-	-	-	-	-	1
06. Negative MC Parallel Cable	-	-	-	-	-	-	-	-	1
07. Connector & lock nut	1	1	1	-	1	1	-	-	-
08. #10/32 Well Nut	4	4	4	6	8	12	4	4	6
09. #10/32 Well Nut Bolt	4	4	4	6	8	12	4	4	6
10. #10/32 Well Nut Flat Washer	4	4	4	6	8	12	4	4	6
11. #10/32 Well Nut Lock Washer	4	4	4	6	8	12	4	4	6
12. #6 Self-tapping screws	6	6	6	6	6	6	-	-	-
13. Cable clamp	6	6	6	6	6	6	-	-	-
14. 1/4" Bolt	4	4	4	6	8	12	4	4	6
15. 1/4" Flat Washer	4	4	4	6	8	12	4	4	6
16. 1/4" Lock Washer	4	4	4	6	8	12	4	4	6
17. 1/4" Nut	4	4	4	6	8	12	4	4	6
18. Mounting Feet	4	4	4	6	8	12	4	4	6
19. Solar module	1	1	1	1	2	3	1	1	1
20. GPR-22 Amp Regulator	-	1	1	1	1	1	-	-	-
21. ARM-UNI Mount				(Optional)					

Note: You may not need all included parts for your particular installation
 Kits with MC connectors will not include parts 04 and 07.
 Only kits with MC connectors and more than one module will include parts 05 and 06.

Parts Checklist



RV Kit Installation

1.0 Installation Overview

Congratulations on your purchase of a Go Power! Electric RV Solar Power Kit. You have chosen a clean, quiet and sustainable way to provide power to your recreational vehicle. A Go Power! Electric RV Solar Power Kit gives you the ability to dry camp while ensuring your batteries remain fully charged. The Go Power! Electric RV Solar Power Kit allows you to enjoy the luxuries and necessities that electricity provides, with or without a campsite hookup. For simple battery maintenance to full-time live-aboard power, Go Power! Electric RV Solar Power Kits are available in a variety of sizes and can be installed on RVs, campers, trailers, 5th wheels and motor homes.

1.1 How Does the Go Power! Electric RV Solar Power Kit Work

The solar module converts a portion of the sun's energy into DC electricity and this electricity or specifically the current travels to the battery via a conductor, usually copper wire. The battery stores the current as amperage, similar to a water tank storing water. A battery is also designed to produce voltage which, when combined with amperage, gives power. The battery power may be used at any time to operate devices connected to the battery. When a battery is receiving and storing current from the solar module, the battery is referred to as being charged or charging. To stop the battery from being overcharged by the solar module, a charge controller or regulator is connected between the two. The GPR-22 regulator will disconnect power from the solar module when the battery voltage reaches the fully charged point. A battery can only absorb a small percentage of its capacity at any given time, therefore when the regulator stops the charging process the battery voltage will drop slightly. Once the battery voltage drops by approximately one volt, the GPR-22 regulator will resume charging.

Please read and understand all instructions before installing your new product for the easiest and safest installation. Before installing the kit, please review the installation design included in this Installation Manual. If you have any doubts as to this kit's sustainability or compatibility with your RV, please contact your authorized Go Power! Electric RV Dealer. It is advisable to retain this manual for future reference.

1.2 Warnings

Electrical Safety

Disconnect all power sources before attempting installation. Electricity can be very dangerous. Installation should be performed only by a licensed electrician or qualified personnel.



Solar Module Safety

Photovoltaic modules generate DC electricity when exposed to sunlight or other light sources. Contact with the electrically active parts of the module, such as terminals, can result in burns, sparks and lethal shock whether the module is connected or disconnected.

When modules are connected in parallel, amperages are additive. Consequently, a system assembled from photovoltaic modules can produce high amperages, which constitute an increased hazard.



Do not touch terminals while module is exposed to light. Cover the module face completely with opaque material to halt the production of electricity when installing or working with modules or wiring.

Battery Safety

Observe all safety precautions of the battery manufacturer when handling or working around batteries. When charging, batteries may produce explosive hydrogen gas. Work in a well ventilated area and use caution when making or removing electrical connections. Ensure wires are disconnected from their power sources when wiring. Do not expose battery to open flame, cigarettes, or sparks. Shield skin and eyes from battery acid.



Wiring Safety Ensure all connections are tight and secure. Loose connections may generate sparks.

Work safely Wear protective eyewear and appropriate clothing during installation. Use extreme caution when working with electricity and when handling and working around batteries. Use properly insulated tools only.



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Observe correct polarity at all times. Any contact in reverse polarity, however brief, will cause the regulator and/or inverter fuse to blow and may damage the unit.

Do not exceed the voltage and current ratings of the regulator. The total current of the solar system is the sum of the short circuit current of the solar modules in parallel multiplied by a safety factor of 1.25. The resulting system current is not to exceed the amperage rating of the regulator. The voltage of the array is the rated open circuit voltage of the solar modules and is not to exceed 26 volts for a 12 volt system and 52 volts for a 24 volt system. If your solar system exceeds these ratings, contact your dealer for a suitable regulator alternative.

1.3 Tools Required (Additional tools may be required)

- | | |
|--|--------------------------------|
| a. Slot Screwdriver | g. Wire crimpers |
| b. # 2 Robertson Square Head Screwdriver | h. Electric hand drill |
| c. Keyhole saw | i. 1/16 and 3/8 inch drill bit |
| d. Punch or Awl | j. 5/16 and 7/16 inch wrench |
| e. Pliers | k. Sealant |
| f. Wire Strippers | |

2.0 Wiring the Solar Module and Power Cable

Please follow the directions in the appropriate section, depending on which kit you are about to install.

Kit Model	Manual Section
RV-10	Section 2.1
RV-50/55	Section 2.2
RV-80	Section 2.3
RV-102/110/115	Section 2.3
Weekender	Section 2.3
RV-160	Section 2.4
RV-240	Section 2.4
Snowbird	Section 2.4

Wiring Diagrams (located at the end of the manual)

Junction Boxes	Diagram-1
Wiring Single and Parallel Modules	Diagram-2
Cable Extensions for MC Connectors	Diagram-3
MC Connections for 1-2 Modules	Diagram-4

Note:

This installation guide does not list all possible variations of available solar modules. This installation guide will address the assembly of standard Go Power! Electric RV Solar Power Kits, which contain one, two or three solar modules connected in parallel for a 12 volt system. Expander Kits are available to add solar modules to an existing system.

2.1 RV-10

1. Remove the module's Junction Box cover. Remove the knockout on the Junction Box for the connector and power cable. In some cases the connector may have already been factory installed. To remove the knockout on the Junction Box, hold a screwdriver tip against the knockout and strike sharply.
2. Install the connector for the power cable as shown in Diagram-1, "Junction Boxes". Strip back 3" of sheathing from the power cable. Insert the stripped back end of the power cable through the connector and into the junction box. Secure the black wire under the screw on the positive terminal, and the white wire under the negative terminal. If the power cable consists of red and black wire, then red is positive and black is negative. Ensure that all the wiring connections are tight. Replace the Junction Box cover.
3. Continue to Section 4, "*Routing the Power Cable through the Fridge Vent*".

The RV-10 solar module has a limited 5 year warranty.

2.2 RV-55

1. Remove the module's Junction Box cover. Remove the knockout on the Junction Box for the connector and power cable. In some cases the connector may have already been factory installed or may consist of a foam insert. To remove the knockout on the Junction Box, hold a screwdriver tip against the knockout and strike sharply.

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The RV-55 module may have two junction boxes, one for the positive (+) wire and one for the negative (-) wire. In this case, strip back enough sheathing from the power cable to insert a single wire into each junction box.

2. Install the connector for the power cable as shown in Diagram-1, "Junction Boxes". Strip back 3" of sheathing from the power cable.
3. Insert the stripped back end of the power cable through the connector and into the junction box. Secure the red wire under the screw on the positive terminal, and the black wire under the negative terminal. Ensure that all the wiring connections are tight. Replace the Junction Box covers.
4. Continue to Section 4, "*Routing the Power Cable through the Fridge Vent*".

2.3 RV-50/80/ Weekender – Single Panel/Wiring One Junction Box

1. Strip 6" of outer sheathing from the power cable exposing the positive (red) and negative (black) wires. Do not "nick" wires.
2. Refer to Diagram-1, "Junction Boxes" and Diagram-2, "Wiring Single and Parallel Modules". Remove the module's Junction Box cover. Remove the knockout on the Junction Box for the power cable. To remove the knockout on the Junction Box, hold a screwdriver tip against the knockout and strike sharply.
3. Install the ½" connector for the power cable onto the Junction Box. Secure the red wire under the positive terminal, and the black wire under the negative terminal. Ensure that all wiring connections are tight. Replace the Junction Box cover.
4. Continue to Section 4, "*Routing the Power Cable through the Fridge Vent*".

2.4 RV-160/RV-240/Snowbird/Expander Kits - Multipanel - Using an Interconnect Cable

1. Strip 6" of outer sheathing from the power cable, exposing positive (red) and negative (black) wires. Do not "nick" wires.
2. Remove the modules' Junction Box covers. Place the modules side-by-side, glass down. Remove the knockout on the Junction Box for the cable. To remove the knockout on the Junction Box, hold a screwdriver tip against the knockout and strike sharply.
3. Refer to Diagram-1, "Junction Boxes" and Diagram-2, "Wiring Single and Parallel Modules". Install the connector for the power cable onto the Junction Box. Secure the red wire under the screw for the positive terminal, and the black wire under the negative terminal. Ensure that all the wiring connections are tight.
4. Install the interconnect cable between the modules as shown in Diagram-2, "Wiring Single and Parallel Modules". Make sure the red wires are secured under the positive terminals, and the black wires are secured under the negative terminals. Ensure that all wiring connections are tight. Replace the Junction Box covers.
5. Continue to Section 4, "*Routing the Power Cable through the Fridge Vent*".

2.5 Expander Kits - Junction Box - Using an Interconnect Cable

1. Strip 6" of outer sheathing from the power cable, exposing positive (red) and negative (black) wires. Do not "nick" wires. Remove the modules' Junction Box covers. Place the modules side-by-side, glass down.
2. Remove the knockout on the Junction Box for the power cable. To remove the knockout on the Junction Box, hold a screwdriver tip against the knockout and strike sharply.
3. Refer to Diagram-1, "Junction Boxes" and Diagram-2, "Wiring Single and Parallel Modules".

Note:

For modules with MC cables and a sealed junction box, refer to Diagram-3, "MC Connections for 1-2 Modules" and Section 3.

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4. Install the connector for the power cable in the Junction Box. Secure the red wire under the screw for the positive terminal, and the black wire under the negative terminal. Ensure that all the wiring connections are tight. Install the interconnect cable between the modules as shown in the wiring diagrams. Make sure the red wires are secured under the positive terminals, and the black wires are secured under the negative terminals. Ensure that all wiring connections are tight. Replace the Junction Box covers.
5. Expander Kits for modules with two junction boxes will have a single red wire connecting the two positive junction boxes together and a single black wire connecting the two negative junction boxes together. The Power Cable will then be connected to the positive and negative junction box of one of the modules.
6. Continue to Section 4, "Routing the Power Cable through the Fridge Vent".

Caution:

On contact, uncured adhesive/sealant may irritate eyes. In the event of contact, flush eyes with water and consult a physician immediately.

3.0 Wiring the RV-102/110/115 Kits

RV Kits containing a single module with MC cables will be equipped with an MC power cable. Plug in the appropriate connections. Refer to Diagram-3, "MC Connections for 1-2 Modules".

3.1 Wiring Two Solar Modules In Parallel with MC Cables

RV Kits containing two modules with MC cables will be equipped with an MC power cable, a negative MC parallel cable, and a positive MC parallel cable. Plug in the appropriate connections. Refer to Diagram-3, "MC Connections for 1-2 Modules".

3.2 Modules with MC Connectors Wired to a Non-Potted Junction Box

Please be aware that some modules are equipped with MC cables and a fully functioning non-potted Junction Box. In this case, the MC cables may be ignored and the Junction box may be wired normally. The MC cables may be removed or left in place as long as they do not impede the installation process. Do not connect the positive and negative MC cables from the same junction box together; this will short circuit the module.

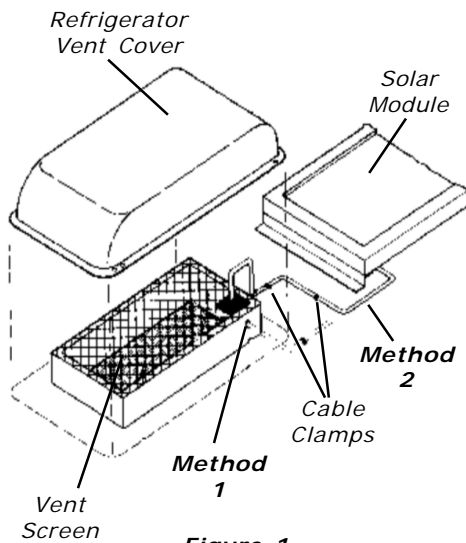


Figure 1

Caution:

The screen may have sharp edges or burrs.

4.0 Routing Power Cable through the Fridge Vent

Locate the refrigerator vent on the roof of the RV. Remove vent cover to gain access to the duct opening. Refer to **Figure 1**. Retain vent-fastening hardware.

4.1 Method 1 – Hole in Side of Vent

Drill a hole through the side of the vent (5/8" hole). Insert a rubber grommet (not included) into the hole. Insert the power cable (already wired to the solar module) through the hole and carefully route it to the battery. Be certain to leave enough slack to allow cable routing from module to vent along desired path.

4.2 Method 2 – Through Screen Grid

1. Thread power cable (already wired to solar module) carefully through the screen and into opening. Enlarge screen grid hole if necessary.
2. Avoid strapping the power cable to existing wire between the module and the battery. Allowing a few inches of space between the power cable and existing wire will lessen the chance of voltage loss through thermal conduction. Use cable clamps with the # 6 self-tapping screw and/or tie wraps every few feet along RV roof and interior route to battery.
3. Ensure all penetrations into the RV roof are watertight. Use an appropriate sealant as recommended by your RV Dealer to seal holes wherever necessary.
4. Replace vent cover.

5.0 Mounting the Solar Module

Cover the entire module with paper to prevent the danger of shock during installation. Do not remove the paper until the installation is complete. The solar modules may be horizontally mounted to the roof using the included mounting feet. An optional adjustable roof mount (ARM-UNI) is also available from Go Power! Electric Inc.

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5.1 Using the Mounting Feet

1. Assemble the mounting feet onto the ends of the solar module using the 1/4" bolts, washers and nuts as shown in **Figure 2**.
 2. Tighten nuts securely using a 7/16" wrench.
 3. Place the module in a location that follows the criteria listed here:
 - Select a location where the mounting surface is at least 1/2" thick and strong enough to support mounting hardware, the solar module and wind loads.
 - Minimize distance between the location of the solar module and the location where the power cable will enter the vehicle to connect to the battery.
 - Place the module lengthwise along the roof to reduce wind loading on vehicles (if applicable).
 - Avoid internal wiring when selecting the spots for drilling the four mounting holes.
 - Ensure obstacles, such as air conditioners, will not shade the solar module.
- * Place module so that you have room to expand the current system if needed.
4. Mark the mounting hole locations by using a pencil to trace through the holes in the mounting feet. Drill mounting holes only one inch deep with a 3/8" drill bit.
 5. Use the appropriate sealant as recommended by your RV Dealer to ensure a watertight installation.
 6. Gently insert the well-nuts into the drill holes so that only the topmost flange part remains above the roofline. Be careful not to push well-nuts through the holes.
 7. Insert screws with lock washers and tighten. Do not overtighten.

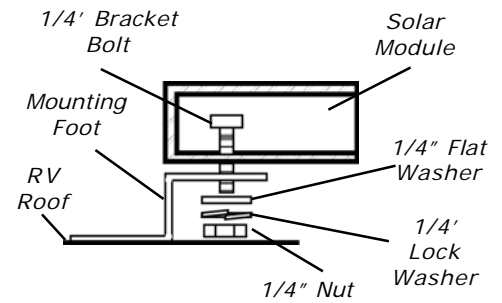


Figure 2

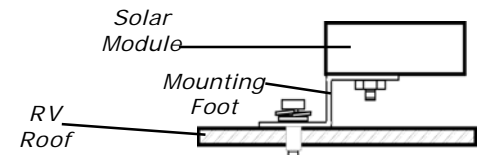


Figure 3

6.0 Installing the GPR-22 Regulator

The GPR-22 regulator is included in all Go Power! RV Kits except the GP-RV10 and Expander Kits.

The GPR-22 regulator provides the necessary protection for the RV battery system. A condensed version of the installation instructions appear below, however please read the full installation manual included with the GPR-22 regulator.

1. Disconnect or cover the solar modules and disconnect the batteries before commencing the GPR-22 regulator wiring.
2. Run the solar module power cable to the location of the GPR-22 regulator. **Do not connect the wires to the regulator or the batteries. Identify the polarity of the wires located on the battery and solar module (positive and negative).** Use coloured wires or mark wire ends with tags. Contacting the leads of the regulator in reverse polarity, however brief, will blow the panel fuse and may damage the GPR-22.
3. Wire the regulator according to the wiring schematic shown in **Figure 4** and **Figure 5**. Tighten all connections.
4. Read the *GPR-22 regulator Manual* prior to installing.

6.1 Mounting the Regulator

The GPR-22 regulator should be mounted in a location relatively close to the battery, but easily seen for monitoring system operation. Wires must be run from the solar module to the regulator and then to the battery. The GPR-22 regulator is designed to be flush mounted on the side of a cabinet or wall where the wiring can be accessed from the back. Allow two to three inches behind the unit. **The regulator should be mounted indoors, in a dry location.**

1. Select a suitable location for the installation of the regulator. Run the power cable from the solar module to the location selected.

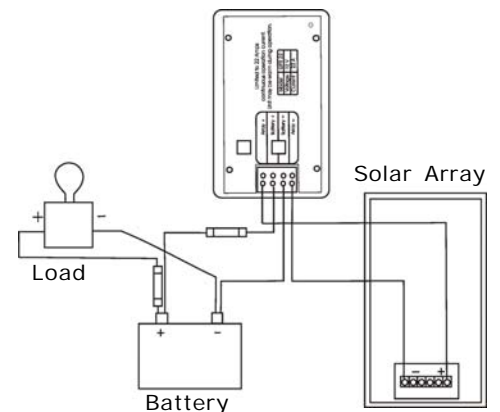


Figure 4 GPR-22 regulator wiring schematic

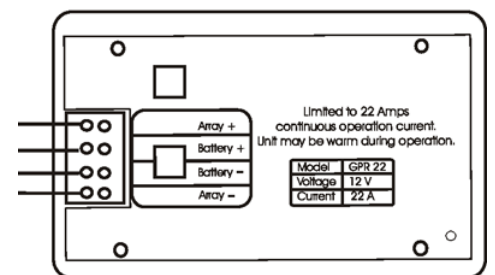


Figure 5 GPR-22 regulator wiring connection detail

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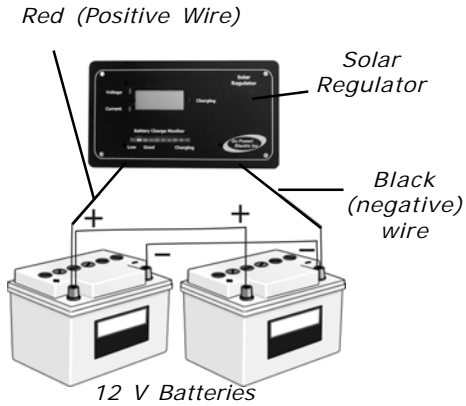


Figure 6

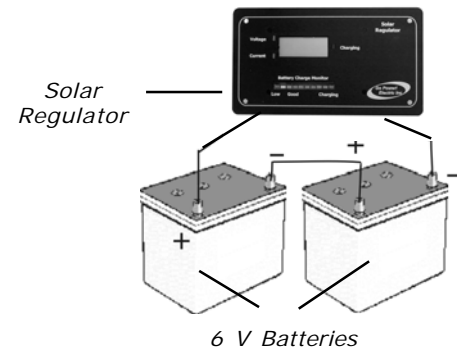


Figure 7

2. Use the template included in the *GPR-22 Regulator Manual* to mark the four mounting holes and the “cutting line for flush mounting”. Drill the mounting holes. Use a keyhole or jig saw to cut along the rectangular outline you marked.
3. Wire the regulator as shown in the *GPR-22 Regulator Manual*. Use the leftover power cable to connect the regulator to the batteries.
4. Mount the regulator to the wall using the four wood screws provided. Slip the washers (supplied) over the screws so the washers are between the back of the regulator and the wall. This provides an air gap for added cooling. Ensure the back of the regulator is protected from damage by any object.

7.0 Connecting to the Battery & Solar Array

It is recommended to connect directly to the battery wherever possible.

1. Clean all corrosion from battery terminals before proceeding. Crimp ring terminals onto the negative and positive wires of the power cable to be attached to the battery.
2. Attach the negative (black) wire's 3/8" ring terminal to the RV battery. Check all electrical connections and apply a protective coating to battery terminals.

7.1 Typical Battery Connection

1. Multiple 12 volt battery connection. (See Figure 6)
2. 6 volt battery connection. (See Figure 7)

8.0 Limited Warranty

1. Go Power! Electric Inc. warrants the Go Power! Electric RV Solar Power Kit for a period of one (1) year from the date of shipment from its factory. This warranty is valid against defects in materials and workmanship for the one (1) year warranty period. It is not valid against defects resulting from, but not limited to:
 - Misuse and/or abuse, neglect, or accident.
 - Exceeding the unit's design limits.
 - Improper installation, including, but not limited to, improper environmental protection and improper hook-up.
 - Acts of God, including lightning, floods, earthquakes, fire, and high winds.
 - Damage in handling, including damage encountered during shipment.
2. This warranty shall be considered void if the warranted product is in any way opened or altered. The warranty will be void if any eyelet, rivets, or other fasteners used to seal the unit are removed or altered, or if the unit's serial number is in any way removed, altered, replaced, defaced or rendered illegible.
3. The one (1) year term of this warranty does not apply to equipment where another manufacturer's warranty is available. This may include but is not limited to, the charge controller, the solar modules and the inverter. The time limit for this warranty may be for more or less than the Go Power Electric Inc. limited warranty. Go Power Electric Inc. will assist the claimant in attempts to seek warranty claims for such equipment.

8.1 General Warranty Issues

Refer to the manufacturer's warranty sheet(s) where applicable.

1. Go Power Electric Inc. cannot assume responsibility for any damages to any system components used in conjunction with Go Power Electric Inc. products, nor for claims for personal injury or property damage resulting from the use of Go Power Electric Inc. products or the improper operation thereof or consequential damages arising from the products or use of the products.
2. Go Power Electric Inc. cannot guarantee compatibility of its products with other components used in conjunction with Go Power Electric Inc. products, including, but not limited to, solar modules, batteries, and system interconnects, and such loads as inverters, transmitters, and other loads which produce “noise” or electromagnetic interference, in excess of the levels to which Go Power Electric Inc. products are compatible.

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3. Warranty repair and/or evaluation will be provided only at the Victoria, British Columbia facility of Go Power Electric Inc. Units for such repair and/or evaluation must be returned freight prepaid to Go Power Electric Inc. with a written description of any apparent defects. An RMA # issued only by Go Power Electric Inc. must be clearly visible on the outside of the returned package. Go Power Electric Inc. will not be required at any time to visit the installation site wherein Go Power Electric Inc. products are subject to warranty repair and/or evaluation.
4. Only Go Power Electric Inc. is authorized to repair any of its products, and they reserve the right to repair or replace any unit returned for warranty repair. The party returning a unit for repair is responsible for proper packaging and for shipping and insurance charges, as well as any other charges encountered, in shipping to and from Go Power Electric Inc.
5. The purchaser's exclusive remedy for any and all losses or damages resulting from the date of sale of this product including, but not limited to, any allegations of breach of warranty, breach of contract, negligence or strict liability, shall be limited, at the option of Go Power Electric Inc., to either the return of the purchase price or the replacement of the particular product for which claim is made and proved. In no event shall Go Power Electric Inc. be liable to purchaser or purchaser's customers or to anyone else for any punitive, special, consequential, incidental or indirect losses or damages resulting from the sale of the product, whether based upon loss of goodwill, lost profits, work stoppages, impairments of other goods, breach of contract, or otherwise.
6. This warranty supersedes all other warranties and may only be modified by statement in writing, signed by Go Power Electric Inc.
7. Warranty terms effective as of January 2, 2004.

8.2 Repair and Return Information

To return items:

1. Call your Go Power Electric Inc. sales representative or Go Power Electric Inc. Technical Support (1-866-247-6527) to try and troubleshoot the problem.
2. Obtain an RMA # through your Go Power Electric Inc. sales representative or Go Power Electric Inc. Technical Support.
3. Ensure the RMA # is clearly visible on the outside of the package, or **THE PACKAGE WILL BE REFUSED**.
4. Ship to Go Power Electric Inc. PREPAID at the following address:

CANADA	USA
Go Power Electric Inc.	Go Power Electric Inc.
1969 Keating Cross Rd.	340 El Pueblo Rd. Suite F
Victoria, BC V8M 2A4	Santa Cruz, CA 95060
5. **Do not ship product collect**, unless approved by management prior to Go Power Electric Inc. receiving said product, or **THE PACKAGE WILL BE REFUSED**.
6. Test items or items that are not under warranty, or units that are not defective, will be charged a minimum bench charge of \$50.00 US plus taxes and shipping.
7. A 15% restocking charge will be applied on goods returned and accepted as "new" stock.

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9.0 System Glossary

Ampere A unit of electrical current. Designates the number of electrons flowing per second through a conductive material.

Ampere-Hour (Ahr or amp hour): A unit of energy, typically referring to battery capacity. One ampere of current flowing for one hour.

Azimuth of the Sun: The angular measure between due south and the point on the horizon directly below the sun.

Array: A number of photovoltaic modules electrically connected to produce a single electrical output.

Angle of Incidence: The angle between a ray of sunlight striking a surface and a line perpendicular to that surface. Rays perpendicular to a surface have a zero angle of incidence.

Battery: Two or more electrochemical cells connected to provide energy storage. May be used to designate one cell. PV system batteries may be "sealed" or "flooded".

Blocking Diode: A diode application that prevents a battery from discharging through the array at night or if the array becomes shaded. Most charge controllers are equipped with a blocking diode.

Charge Controller (regulator): The PV system component that controls the battery's state of charge. It may also provide other system control functions. Also known as a regulator.

Charge Rate: The current applied to a battery to restore its energy capacity. The battery manufacturer will usually have a recommended charge rate for their product. The rate is typically 10 –20 percent of the amp hour capacity at the 20-hour rate.

Current: DC or Direct Current is the type of electron flow provided by a battery or solar cell, which flows in one direction. The unit for current is ampere or amp for short and designated by the letter *A*.

Cycle: One battery cycle equals one discharge and one charge.

Deep Cycle Battery: Batteries that are designed to discharge as much as 80% of their capacity as opposed to engine-starting or *shallow cycle* batteries which are designed for heavy cranking but will not stand up to repeated deep discharges.

Depth of Discharge: A measure of how much energy has been withdrawn from a battery, expressed as a percentage of full capacity. A 100 Ahr battery from which 30 Ahr has been withdrawn has undergone a 30% depth of discharge (DOD). This term is the inverse of state of charge (SOC); the example battery would be at 70% SOC.

Diode: A semi-conductor device that allows current to flow in one direction only. "Blocking diodes" and "isolation diodes" are standard diodes that have specific applications.

Electrolyte: Battery acid.

Equalization: The process that equalizes the specific gravity of all the cells in a battery by means of a controlled overcharge that breaks down sulfation on the battery plates. Most inverter/chargers and some charge controllers are equipped with this feature. Usually performed only on flooded batteries.

Flooded or Wet Cell Batteries: The most common type of PV battery. Battery caps may be removed to expose the electrolyte inside the battery. Need proper ventilation due to gassing and may need to be topped up with distilled water at regular intervals.

Grid-Connected: A power system interconnected with the grid (or *mains*) of the local electric utility. Also referred to as *utility-interactive* or *grid-tie*.

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Hybrid System: A power system consisting of two or more energy sources (e.g., a PV array and a wind generator).

Hydrometer: A device used to measure the specific gravity (SG) of the electrolyte in a flooded battery. A very accurate way to see the true charge of a battery.

Insolation: The solar energy received at a place over a given period. May be expressed as sunhours per day, watts per square meter per hour, or any number of other units.

Inverter: A device that converts DC electricity to AC.

Isolation Diode: A diode application that prevents one segment of an array from interacting with another array segment. Usually used in situations where two parts of an array are facing in different directions therefore one part of an array may experience shading while the other does not. Prevents array energy from flowing backwards through a low voltage string of the array. May also serve the function of blocking diode.

Maximum Power (peak power): The point of a solar array, panel or module output where the product of I_{mp} and V_{mp} (P_{max} , measured in watts) is maximized. The points used to calculate P_{max} are I_{mp} (current @ max power) and V_{mp} (voltage @ max power).

Module: A number of solar cells electrically connected, and protected from the environment usually by an aluminum frame covered with a pane of glass. A module is self-contained and not sub dividable, therefore providing a single electrical output.

NOCT (Nominal Operating Cell Temperature): the temperature at which PV cells in a module operate under *Standard Operating Conditions* (SOC), which are: irradiance of 0.8 kW/m², 20°C ambient temperature, and average wind speed of 1 m/s, with the wind oriented parallel to the plane of the array, and all sides of the array fully exposed to the wind.

Open-Circuit Voltage (Voc): Refers to a photovoltaic device's voltage potential when it is disconnected from the rest of the PV system.

Panel: A group of photovoltaic modules (or single module) mechanically mounted on a single frame.

Parallel Connection: Electrical connection where the positive terminals of a number of devices are connected together, as are their negative terminals. The output voltage is usually limited to the device with the lowest voltage, and the total current is the sum of the current of all the devices.

Photovoltaic (PV): Capable of producing a voltage when exposed to radiant energy, especially light.

Regulator: See "Charge Controller" definition.

Sealed Batteries: Electrolyte will not spill out and gassing is kept to a minimum. A sealed battery is maintenance free and may be installed in several orientations.

Series Connection Electrical connection where the positive terminal of one device is attached to the negative terminal of the next in a series string; in this connection, the string voltage is the sum of the device voltages and the string current is limited to the current of the least productive device in the string.

Short-Circuit Current (Isc): Refers to a PV device's current output when the positive terminal is directly connected to the negative terminal.

Specific Gravity: In relation to a flooded battery, it is the density of the "electrolyte" compared with the density of water thereby measuring the battery state of charge.

Standard Operating Conditions (SOC): A set of reference PV device measurement conditions consisting of irradiance of 0.8 kW/m², 20°C ambient temperature, and average wind speed of 1m/s, with the wind oriented parallel to the plane of the array, and all sides of the array fully exposed to the wind.

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Standard Test Conditions (STC): A set of reference PV device measurement conditions consisting of irradiance of 1 kW/m², AM 1.5, and 25°C cell temperature.

Standalone System: A power system not connected to the utility grid (*mains.*) Sometimes referred to as an autonomous system.

State of Charge: The percentage of energy in a battery referenced to its nominal full capacity.

Sulfation: The formation of lead sulfate crystals on the plates of a lead-acid battery. Normally used to refer to large sulfate crystals, rather than small crystals formed in normal battery operation. The sulfate on the plates of a battery will harden if left in a partially charged state, causing reduced battery capacity and shortening the life of the battery. If caught in time, "equalization" will remove the buildup of sulfation.

Voltage: The electrical potential between two points. Voltage is analogous to water pressure in that it pushes the electrons or current through a conductor. The unit for voltage is volt and designated by the letter *V*.