

10 AMP RVC-MPPT Solar Controller

User Manual

GP-RVC-10-MPPT



© 2020 Go Power!

Worldwide Technical Support and Product Information gpelectric.com

Go Power!

201-710 Redbrick Street Victoria, BC, V8T 5J3

Tel: 1.866.247.6527

MAN_GP-RVC-30-MPPT_RevA



Congratulations on purchasing your Go Power! GP-RVC-10-MPPT Solar Controller!

Record the unit's model and serial number below. It is much easier and quicker to record this information now at the pre-installation stage.

Model Number:
Serial Number:
Date of Install:
Battery Bank Information: (size, install date, battery type)

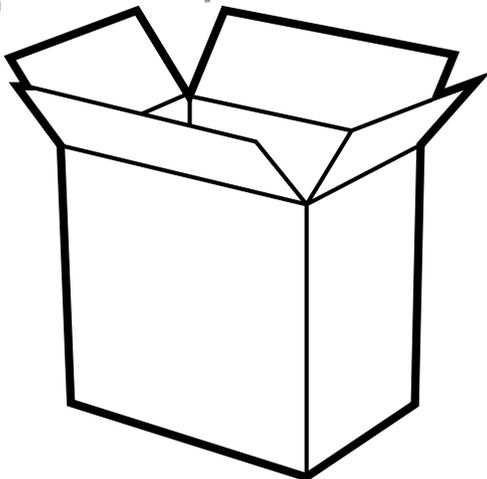


Product Packaging

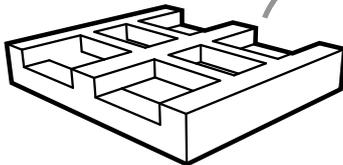
Please safely store the packing the product was delivered in or recycle the packaging components as outlined below:



Corrugated fiberboard
main box



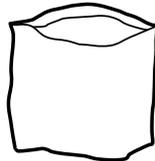
Plastic
foam protection



LDPE
Low Density
Polyethylene



Plastic
accessories bag





1. SAFETY4

2. INTRODUCTION5

3. APPERANCE.....6

4. MAXIMUM POWER POINT TECHNOLOGY.....7

5. CHARGING STAGES.....9

6. PRODUCT DIMENSIONS.....12

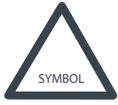
7. SPECIFICATIONS13

8. LED INDICATORS14

9. INSTALLATION.....15

10. RV-C INSTANCE NUMBER.....17

Important safety information is contained throughout this manual that should be carefully observed and followed. This information is presented using the following format:



Warning / Caution: Result
Description of condition leading to result

The information is categorized in two ways:

Warning: Bodily harm could occur if instructions are not explicitly followed. If there are any doubts about the procedure or conditions, please call GoPower! technical support before doing anything.

Caution: Damage to property could occur if instructions are not followed properly.

The following symbols are used to indicate the type of hazard.

SYMBOL	MEANING	SYMBOL	MEANING
	General Warning		Hot Surface
	Risk of Shock		Risk of Fire
	Risk of Electrocution		Risk of Chemicals
	Risk of Explosion		Risk of Eye Injury

GENERAL SAFETY

- Read entire manual before installation
- Any voltage above 30 VDC should be considered dangerous. Make sure power is disconnected before touching terminals that exceed this voltage.
- There are no parts inside the controller that need to be maintained or repaired. The controller shall never be disassembled
- Unless otherwise specified, all terminal blocks should be re-tightened at least every 6 months to prevent possible fire caused by connections that have vibrated loose.
- Ensure all connections are tight and secure. Loose connections may generate sparks and heat. Be sure to check connections one week after installation to ensure they are still tight.

SOLAR CONTROLLER SAFETY

- Always connect the battery BEFORE connecting the solar array to prevent damage to the controller. If the battery wires need to be disconnected, the solar array wires should first be disconnected.
- To prevent damage to the controller, ensure the solar array voltage does not exceed the maximum voltage of the solar controller. See specifications table below to determine the limit for your controller.

BATTERY SAFETY

- Ensure the battery type is set correctly in the controller settings to avoid possible explosion or fire
- Read manual for battery and observe safety precautions before connecting the battery to the controller
- Only use deep cycle batteries that are intended for energy storage applications



2. INTRODUCTION

2.1 OVERVIEW

The 10A RV-C MPPT solar controller is an advanced device with RV-C communication for smart RV systems. As an MPPT Solar controller it continuously monitors the solar panel's generating power and tracks the maximum power point, enabling the system to charge the battery with maximum power all the time. It is designed to be used in off-grid solar photovoltaic systems to coordinate operation of the solar panel, battery, functioning as the core control unit in off-grid photovoltaic systems.

With comprehensive electronic fault self-detecting functions and powerful electronic protection functions built inside the controller, component damage caused by installation errors or system failures can be avoided.

This product features an optional LCD remote which displays the operating status and allows the control of configurable parameters. Users can conveniently check parameters using the buttons and modify control parameters to cater to different system requirements. The optional remote also includes Bluetooth communication that allows a smart phone to be conveniently used to perform all the same tasks that the LCD remote can.

2.2 FEATURES

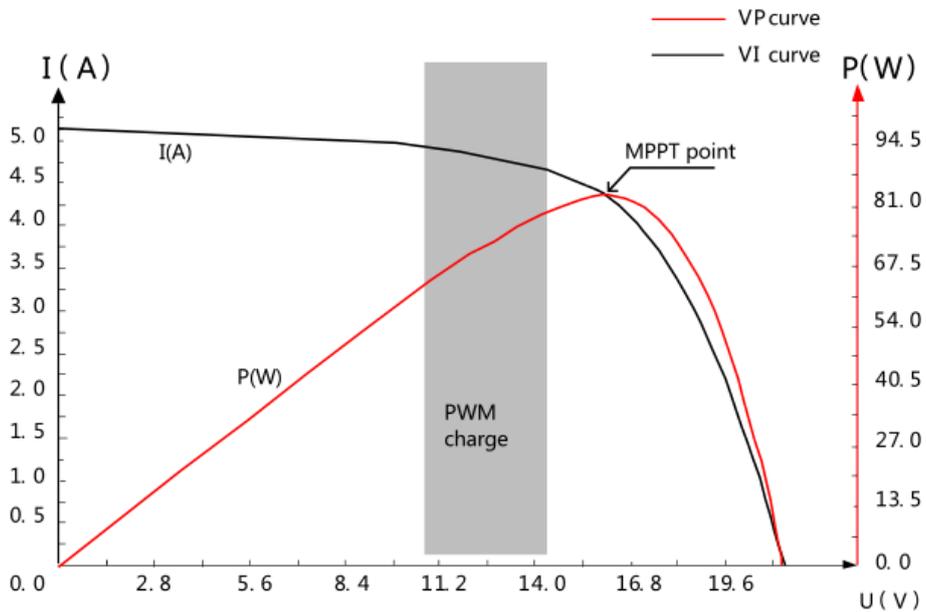
- Advanced multi-peak tracking technology. When the solar panel is shadowed or part of the panel fails resulting in multiple peaks on the I-V curve, the controller is still able to accurately track the maximum power point
- Built-in maximum power point tracking (MPPT) algorithm significantly increases energy utilization efficiency of the photovoltaic system, (up to 30% higher than traditional PWM charging)
- MPPT tracking efficiency of up to 99.9%
- Power conversion efficiency of up to 98%
- Lithium battery reset capability allows a BMS protected over discharged battery to be automatically recovered without having to disconnect the battery
- Presets for multiple battery chemistries, including LiFePO₄, Flooded, Gel and AGM
- Supports user customized charge parameters
- Current-limited charging mode. When the power of solar panel is too large and the charging current is higher than the rated value, the controller automatically reduces the charging power so that the solar panel can operate at the rated charging current.
- Features LED fault indicators, which can display abnormal information, helps users to quickly identify system faults.
- Historical data storage function is available
- Minimal derating up to the maximum operating temperature
- Temperature compensation and automatic adjustment of charge parameters help to improve battery life.



NO.	NAME	NO.	NAME
1	Instance Indicators	7	Battery Negative
2	PV Indicator	8	Extreme Temp Sensor
3	Battery Indicator	9	RV-C Connector
4	Solar Positive	10	Remote Port
5	Solar Negative	11	Instance Config Button
6	Battery Positive	12	Installation Holes

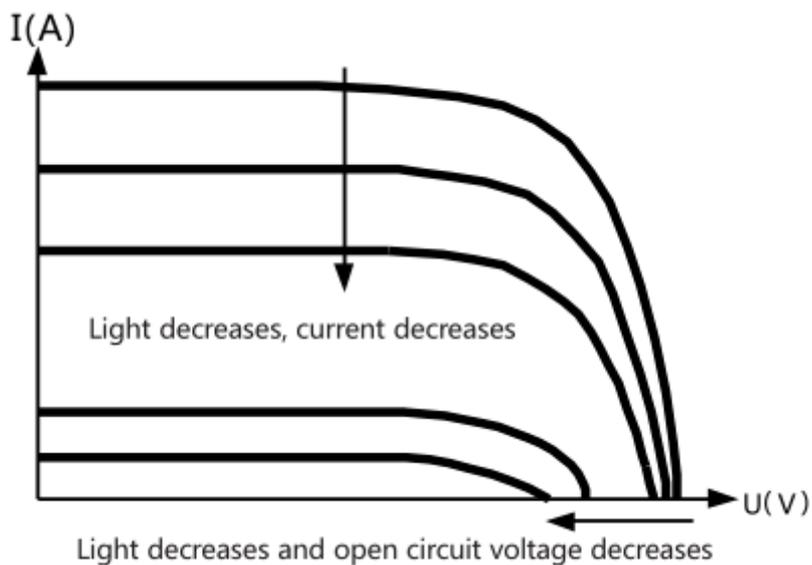
4. MAXIMUM POWER POINT TECHNOLOGY

Maximum Power Point Tracking (MPPT) is an advanced charging technology that more efficiently harvests power from solar panels in all conditions. It does this by continuously tracking the I-V curve of the solar array and modifying operating conditions to maximize output power. The graph below shows the MPPT point compared to a traditional PWM charger, which always runs the solar array at a voltage close to the battery voltage.

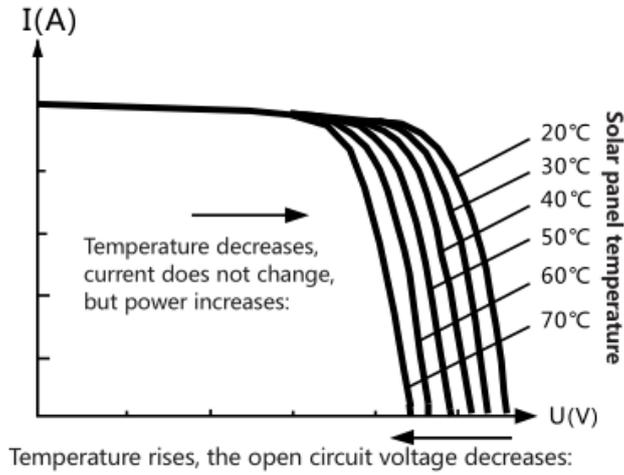


Due to differences in ambient temperature and light conditions, the maximum power point often changes. The MPPT controller can adjust parameters according to quickly changing conditions to keep the system near to its maximum working point. The whole process is fully automatic and does not require any adjustments or interference by users.

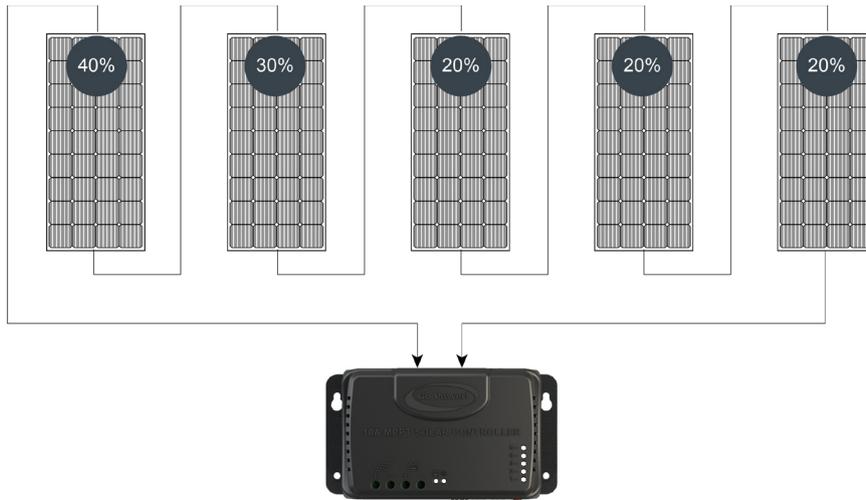
The graph below shows how the IV curve of a solar panel changes with varying sunlight conditions.



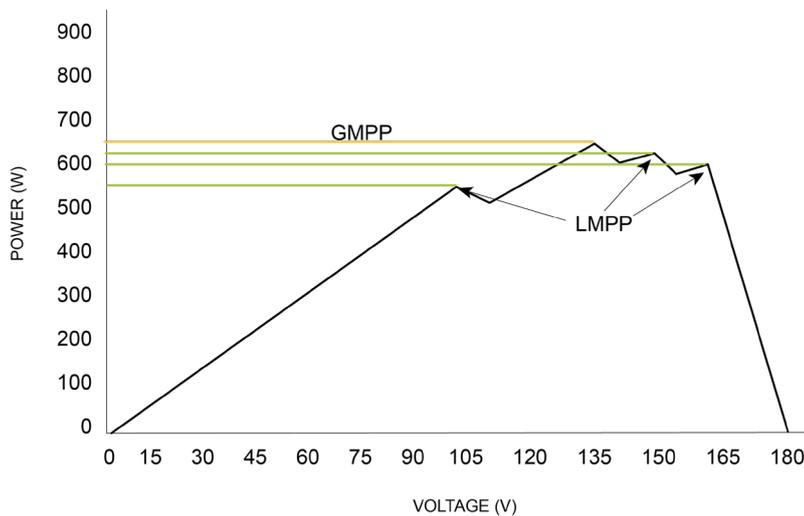
The graph below shows how the IV curve of a solar panel changes with varying temperatures.



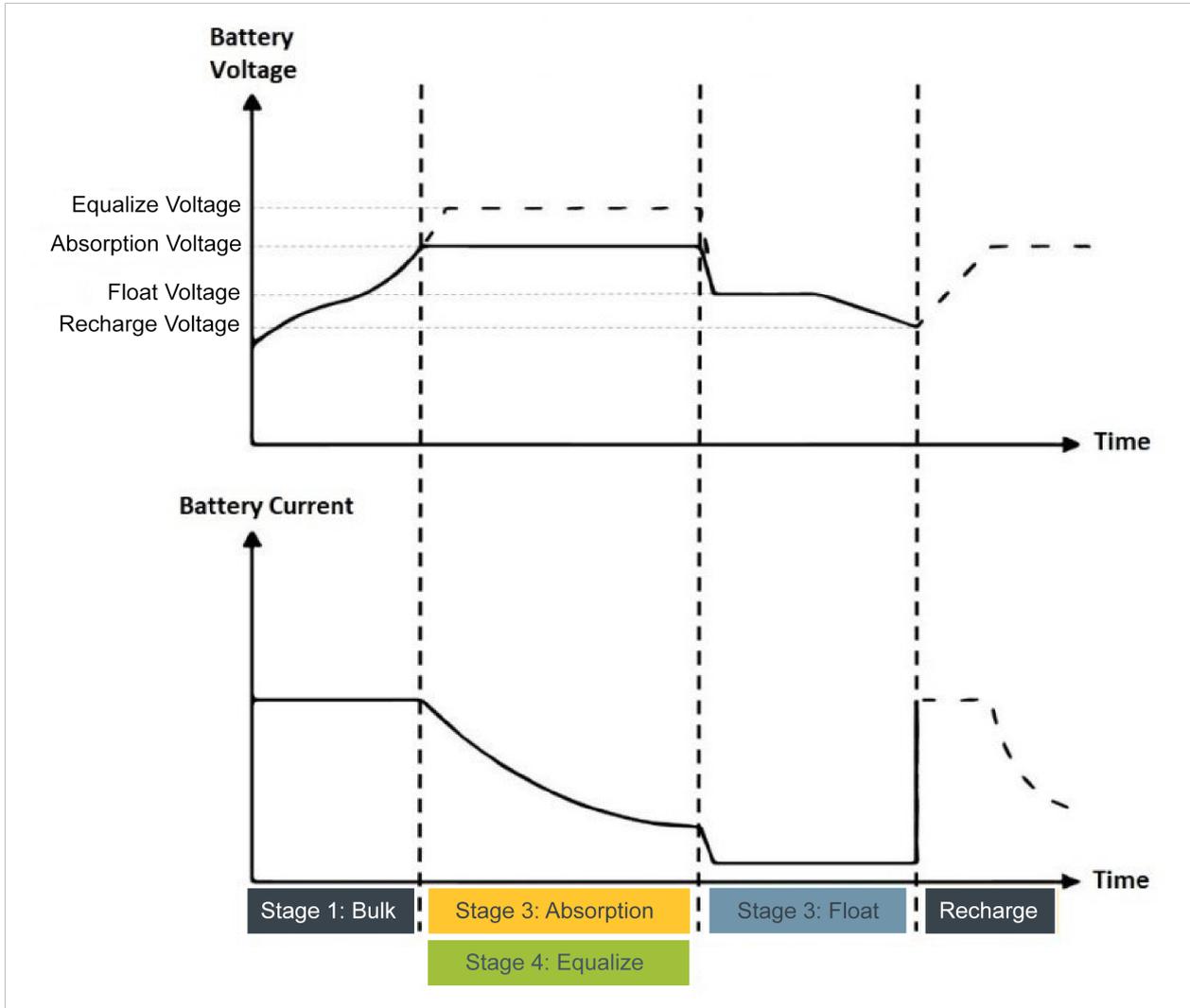
In partially shaded conditions there can also be multiple peaks in the P-V curve that can confuse an MPPT algorithm. Shown in the diagram below is a series string of solar panels.



A corresponding graph below shows lower maximum power points (LMPP) and the greater maximum power point (GMPP) that will result in maximum energy transfer. The GP-RVC series has a smart algorithm that will always choose the right peak.



Maximum power point tracking is used to charge the batteries with the highest current possible, but this is only part of the equation. A battery cannot be charged at maximum power all the time for safety reasons, so multiple stages are used. These stages include: bulk, absorption, float and, for some types of batteries, equalization as indicated below.



STAGE 1: BULK

In quick charge stage, the battery voltage has not yet reached the set value of full charge voltage (i.e. equalizing/boost charge voltage) and the controller will perform MPPT charging, which will provide maximum solar energy to charge the battery. When the battery voltage reaches the pre-set value, Stage 2 charge will start.

STAGE 2: ABSORPTION

When the battery voltage reaches the absorption voltage, the controller will perform constant voltage charging. This is no longer MPPT charging, and the charging current will gradually decrease with time.

STAGE 3: FLOAT

Float charge is conducted following the absorption charge stage. The controller will reduce the charge current to a small amount in order to reduce sulfates on the battery plates or to allow a lithium battery to balance its cells. If the load exceeds this small current the battery voltage will start to decrease until it reaches the recharge voltage. When the battery voltage falls below the recharge voltage, the controller will switch back to bulk charging.

STAGE 4: EQUALIZE



Warning: Risk of explosion!

Equalizing vented lead-acid battery may generate explosive gases. So, the battery compartment must be well ventilated.



Caution: Damage of device!

Equalization can increase the battery voltage to levels that may damage sensitive DC loads. It is necessary to verify that the allowable input voltage of all system loads is greater than the equalizing charge set value.



Caution: Damage of device!

Over charge and excessive gas evolution may damage the battery plates and cause active substances on the battery plate to come off. Equalizing charge may cause damage if voltage is too high or time is too long. Please carefully check the specific requirements of battery used in the system.

Certain battery types benefit from regular equalizing charge, which can stir electrolytes, balance battery voltage, and complete the chemical reaction. The equalize charge increases the battery voltage above a standard voltage, causing vaporization of battery electrolyte. By default, this happens every 30 days for flooded batteries.

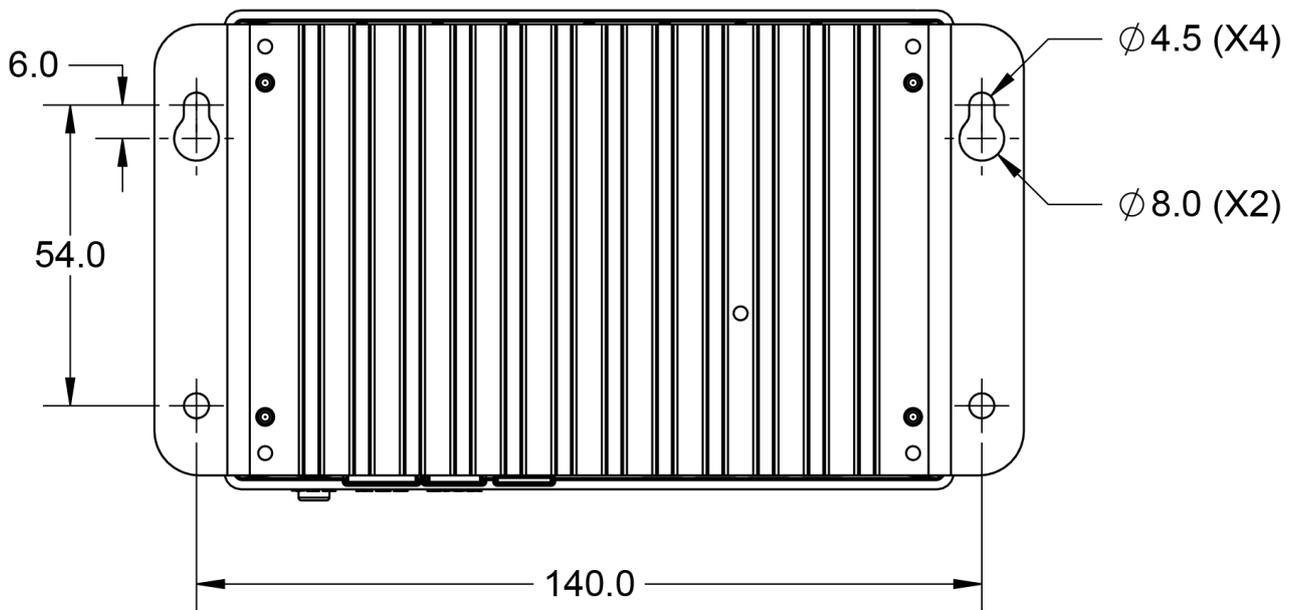
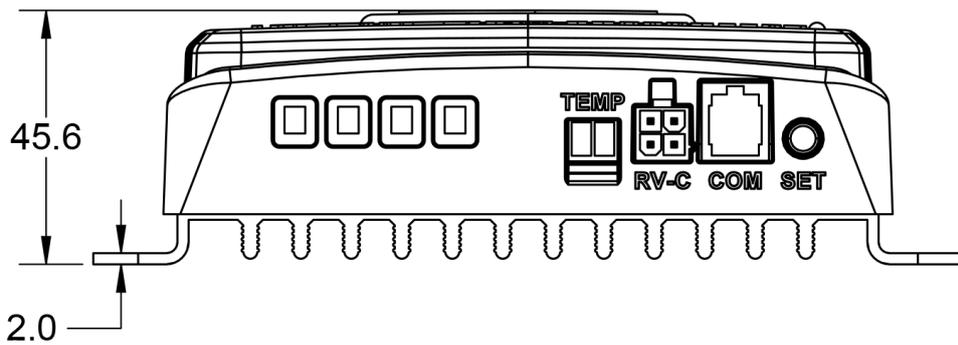
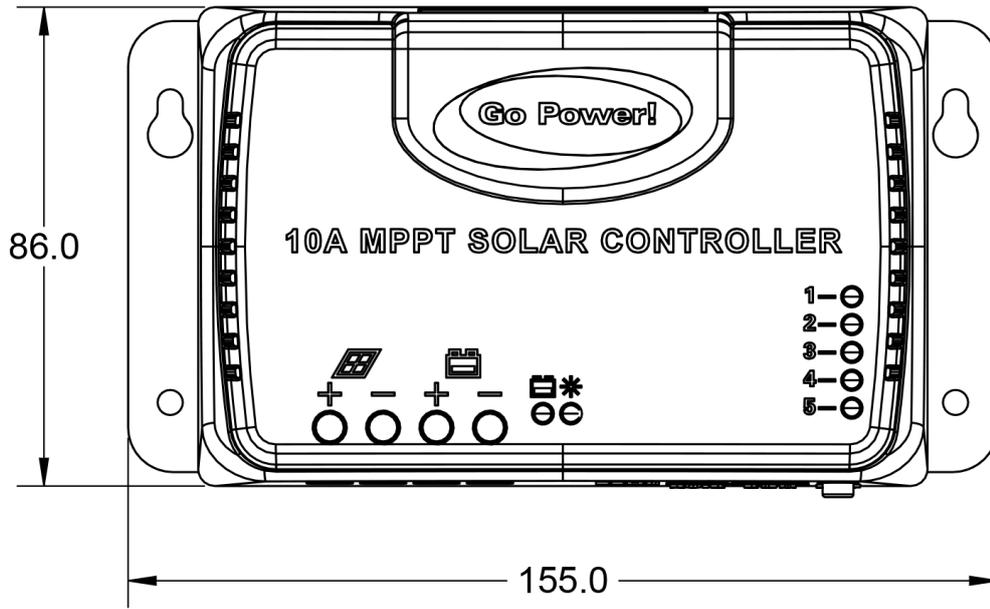
RECHARGE

After the battery is completely charged the charging cycle completes and the battery is allowed to slowly discharge until it reaches the charge return voltage at which point a new charge cycle is initiated.

CHARGE PARAMETERS FOR VARIOUS BATTERY TYPES

Parameter	GEL	AGM	Flooded	LiFePO4	Custom
High Voltage Disconnect	16.0 V	16.0 V	16.0 V	14.6 V	8..17 V
Equalize Voltage	-	-	14.9 V	-	8..17 V
Bulk-Absorption Voltage	14.1 V	14.4 V	14.4 V	14.4 V	8..17 V
Float Voltage	13.7 / V	13.7 V	13.7 V	14.0 V	8..17 V
Recharge Voltage	13.2 V				8..17 V
Over-Discharge Return Voltage	12.8 V	12.8 V	12.8 V	12.2 V	8..17 V
Under-Voltage Warning Level	12.0 V				8..17 V
Over-Discharge Voltage	11.0 V				8..17 V
Discharge Limit Voltage	10.5 / V				8..17 V
Over-Discharge Time Delay	5 seconds				0..120 seconds
Equalize Duration	-	-	120 minutes	-	0..600 minutes
Absorption Duration	120 minutes	120 minutes	120 minutes	120 minutes	10..600 minutes
Equalize Interval	-	-	30 days	-	0..250 days
Temperature Compensation Factor	-24 mV/°C	-24 mV/°C	-24 mV/°C	-	0..-30 mV/°C

6. PRODUCT DIMENSIONS





7. SPECIFICATIONS

ITEM	PARAMETERS
Battery Voltage Range	8V – 16V
Max Charge Current	10A
Conversion Efficiency	≤98%
MPPT Tracking Efficiency	>99%
Max Panel Input Voltage	100Voc
Max PV Power Input	200W
No-Load Loss	<10mA
Grounding	Negative
Operating Temperature	-35 to 45°C
Storage Temperature	-35 to 75°C
Humidity	95% N.C.
Battery Type	Lead Acid (AGM, GEL, Flooded), LiFePO4
Max Wire Gauge	8 AWG
Dimensions (H x W x D)	3.35" x 6.1" x 1.57"
Weight	0.67lbs (300g)
Water Ingress Protection	IP32
Altitude	< 3000m
Protection	Solar/battery reverse polarity Solar/battery over voltage Solar/battery short circuit Over temperature

8.1 LED IDENTIFICATION



8.2 BATTERY INDICATOR ①

LED PATTERN	STATUS
Single Flash	No Battery
Fast Flash	Battery over voltage
Slow Flash	Battery over discharged
Steady On	Battery status is ok

8.3 PV INDICATOR ②

LED PATTERN	STATUS
Off	Night time
Double flash	Day time
Single Flash	No PV input
Steady On	MPPT charging
Fast Flash	Absorption or Equalize
Slow Flash	Float Charging

9.1 TOOLS AND MATERIALS NEEDED

- Screwdriver
- Drill
- Multimeter

9.2 INSTALLATION AND WIRING

STEP 1: CHOOSE AN INSTALLATION LOCATION

The following things should be considered when choosing an installation location for GP-RVC-30-MPPT controllers.

- The controller should be installed indoors where it is safe from water or condensation
- Avoid installing the controller in direct sunlight
- Mount the controller to a non-flammable surface
- For best thermal performance mount the controller vertically with power terminals facing downward, this will encourage natural convection through the heatsink and keep it cooler
- There should be at least 6 inches of air gap above and below the controller for the natural convection to occur effectively



- Locate the controller as close to the battery as possible (but not directly above the battery to prevent potential damage due to gassing of the battery), this will keep the battery wires short and prevent voltage drop
- Ensure any enclosed space where the controller is mounted is well ventilated, this will prevent heat buildup that could lead to derating of the controller

STEP 2: MARK THE MOUNTING POSITION ACCORDING TO THE MOUNTING DIMENSIONS OF THE CONTROLLER

First, place the controller at a proper position and use a marking pen to mark the mounting points. Drill 4 mounting holes of the appropriate size at the 4 marks. Fix screws into the upper two mounting holes.

STEP 3: FASTEN THE CONTROLLER

Align fixed holes of the controller with the two pre-fixed screws and hang the controller up. Then fix the lower two screws.

STEP 4: WIRING

Wiring and installation must comply with national and local electrical code requirements.

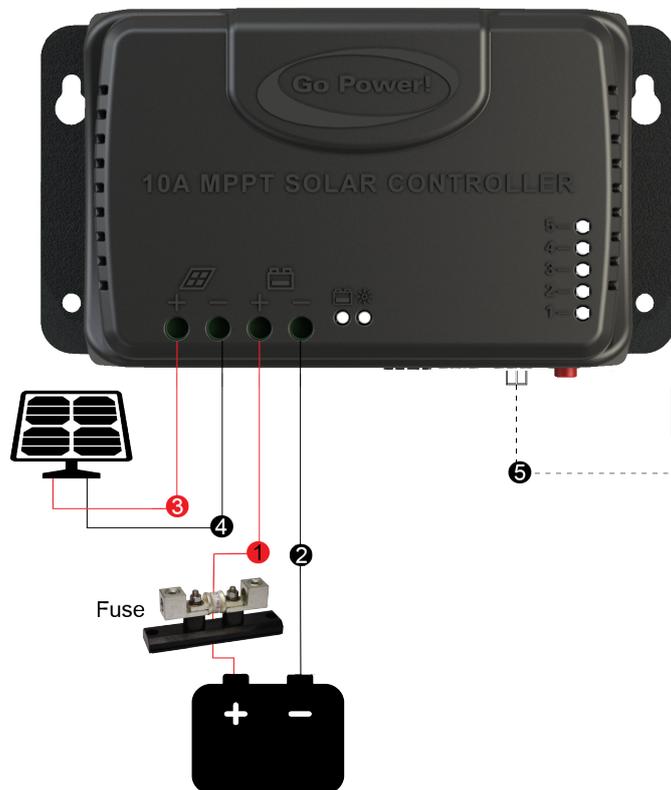
The wire from the solar array most commonly enters the RV through the fridge vent on the roof or by using the Go Power! Cable Entry Plate (sold separately) that allows installers to run wires through any part of the roof. PV connections should connect directly to the controller.

Note Positive and negative battery connections must connect directly from the controller to the batteries and positive and negative PV connections must connect directly from the solar array to the controller. Wires that are as short as possible and adequately sized (see table below) should always be used. Use of a positive and/or negative distribution bus that is properly sized is recommended between the controller and battery – do not stack wires on the battery terminals.

Warning: Danger, Electric shock hazards! We strongly recommend connect a fuse or circuit breaker to the PV array and battery terminals to prevent electric shock hazards during wiring or error operation, and make sure that fuse or circuit breaker is disconnected before wiring.

PV Max Input Current	PV Max Wire Diameter (mm ² /AWG)	Rated Charge Current	Battery Max Wire Diameter (mm ² /AWG)
10A	2.5/13	10A	2.5/13

We recommend the wiring sequence shown below.



Note (1) The battery fuse should be installed as close as possible to the battery terminal. The recommended distance is not more than 150mm.

(2) The battery temperature will read 25°C (fixed value) when the controller is **not** connected to a remote temperature sensor.

10.1 RV-C INSTANCE NUMBER IDENTIFICATION

The RV-C instance of an individual controller can be identified by the 5 LEDs on the controller shown below.



10.1 CHANGING THE RV-C INSTANCE NUMBER

The instance of the solar controller on the RV-C network can be configured using the SET button and LEDs. Up to 5 unique instances are supported. To change the instance follow these steps:

1. Hold the SET button down for approximately 3 seconds until one of the LEDs starts flashing.



2. Press the SET button to change instance until the LED for the desired instance is flashing.
3. Press and hold the SET button for approximately 3 seconds to lock in the setting.



© 2020 Go Power!

Worldwide Technical Support and Product Information gpelectric.com

Go Power!

201-710 Redbrick Street Victoria, BC, V8T 5J3

Tel: 1.866.247.6527

MAN_GP-RVC-30-MPPT_RevA

