



GP-MPPT-R  
:: MAXIMUM  
POWER BOOST TECHNOLOGY™



# User Manual



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# 1.0 Installation Overview

## 1.1 *Introduction*

A Solar Controller (or Charge Controller / Regulator) is an essential component of your photovoltaic solar system. The Controller maintains the life of the battery by protecting it from overcharging. When your battery has reached a 100% state of charge, the Controller prevents overcharging by limiting the current flowing into the batteries from your solar array.

The GP-MPPT-R is a flush mounted remote display for GP-MPPT-40 photovoltaic (PV) charge controller. The GP-MPPT-R shows the charge current to the battery, battery voltage, and battery state of charge (SOC). The GP-MPPT-R also features Maximum Power Boost Technology™ for manual bulk and absorption charge at any stage of the charge cycle.







## 1.2 Specifications

**NOTE**

Values before and after the slash correspond to 12 and 24 V systems respectively.

Description	Value	Dimensions (H x W x D):	
Nominal System Voltage	12 / 24V	149 x 98 x 33 mm 5.87 x 3.86 x 1.30 in Weight: 220 g / 7.76 oz	
Battery Voltage Range of GP-MPPT-40	9V – 31V (Must be >10.5V to start up)		
Operating Consumption (Display backlight on)	15mA	Ethernet cable: 25 ft.	
Operating Consumption (Display backlight off)	6mA	Warranty: 5 years	
Display to Controller Port	RJ45	<ul style="list-style-type: none"> <li>• 4 battery charging profiles</li> <li>• Symbols for errors and charging state</li> <li>• RoHS compliant, environmentally safe</li> <li>• Maximum Power Boost Technology</li> <li>• Inverter on/off control for select Go Power! inverters</li> </ul>	
Display to Inverter Port	RJ11		
Operating Temperature	- 10 to 55°C, 14 to 131°F		
Humidity	99% N.C.		
Protection	Battery Reverse Polarity, Solar Array Reverse Polarity, Over Temperature, PV Short Circuit, Battery Short Circuit, Over Current		
<p><b>Use a non-inverting Ethernet cable.</b></p> <p>GP-MPPT-R is intended for use with non-inverting Ethernet cables. Use the one provided, or be sure to purchase a non-inverting type.</p>			

## 2.0 Warnings

	<b>Disconnect all power sources</b>	Electricity can be very dangerous. Installation should be performed only by a licensed electrician or qualified personnel.
	<b>Battery and wiring safety</b>	Observe all safety precautions of the battery manufacturer when handling or working around batteries. When charging, batteries produce hydrogen gas, which is highly explosive.
	<b>Wiring connections</b>	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.
	<b>Work safely</b>	Wear protective eyewear and appropriate clothing during installation. Use extreme caution when working with electricity and when handling and working around batteries.
	<b>Observe correct polarity</b>	Reverse polarity of the battery or array will cause the controller to flash warning LEDs. The controller and display unit will not function unless battery terminals are connected to a battery with proper polarity. Failure to correct this fault could damage the controller.
	<b>Do not exceed the GP-MPPT-40 max voltage ratings</b>	The voltage rating of the solar system is the sum of the Open Circuit Voltage (Voc) of the solar PV panels in series. The resulting system Voc voltage including temperature effects is not to exceed 150V. If your solar system exceeds these ratings, contact your dealer for a suitable controller alternative. PV voltage increases in cold weather. Refer to section <b>Error! Reference source not found.</b> of the controller manual.

## 3.0 Tools and Materials Needed

- Philips Screwdriver (for mounting screws)

**NOTE**

A 25 ft. Ethernet cable is included for connection to the GP-MPPT-40 controller.

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## 4.0 Choosing a Location

The GP-MPPT-R is designed to be mounted flush against a wall, out of the way but easily visible.

The GP-MPPT-R should be:

- Indoors, protected from the weather

In an RV, the most common remote display location is above the refrigerator. 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. Positive and negative battery connections must connect directly from the controller to the batteries. Use of a positive or negative distribution bus is allowed between the controller and battery as long as it is properly sized, electrically safe and an adequate wire size is maintained.

## 5.0 Installation Instructions

1. **Prepare for mounting.** Use a template to mark the four mounting holes and the cutting line for flush mounting your remote display.
2. **Complete the installation of the solar modules, batteries and controller.** If this GP-MPPT-R was purchased as part of a Go Power! Solar Power Kit, follow the Installation Guide provided. Otherwise, follow manufacturer's instructions for mounting and wiring.

**IMPORTANT:** Identify the polarity (positive and negative) on the cable used for the battery and solar module. Use colored wires or mark the wire ends with tags. Although the GP-MPPT-R is protected, a reverse polarity of the battery on the controller will prevent the remote display from functioning.

**Wiring the GP-MPPT-R.** Wire the GP-MPPT-R according to the wiring schematic in **Section 6**.

- 3. Mounting the GP-MPPT-R.** Mount the GP-MPPT-R to the wall using the included four mounting screws.
- 4. Connect the Ethernet cable.** Connect the Ethernet cable to the RJ45 port on the GP-MPPT-R and one of the RJ45 ports on the GP-MPPT-40 controller.

**IMPORTANT:** You must set the battery type on the GP-MPPT-40 DIP switches before you begin to use the controller and display. The default battery setting is for AGM batteries.

Congratulations, your GP-MPPT-R should now be operational. If the battery power is low and the solar array is producing power, your battery should begin to charge.

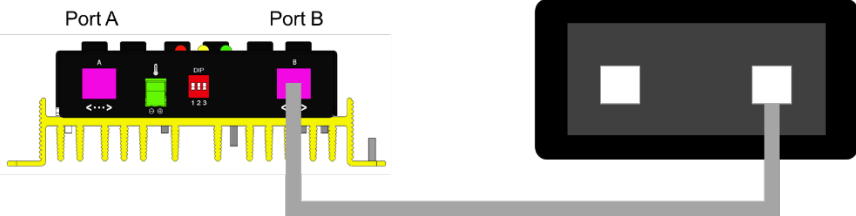
## 6.0 Wiring Diagram

The GP-MPPT-R is both powered by GP-MPPT-40 and communicates with GP-MPPT-40. Use the wiring diagram to connect your remote display to your controller. The display may be connected to either Port A or Port B of the controller.

### NOTE

**The remote display will not work unless there is a battery connected to the controller battery terminals.**

Port Connection for Remote Display to Controller



Remote Display cable may connect to either Port A or Port B of the controller



## 7.0 Operating Instructions

### 7.1 Power Up

When the GP-MPPT-R is connected to the controller and the controller has battery power, the remote display will go into Power Up Mode.

**Icons Displayed:** All segments of the numerical display; Backlight blinks

### 7.2 Battery Charging Profile Chart

**NOTE**

Values before and after the slash correspond to 12 and 24 V systems respectively.

Battery type must be set using the DIP switches on GP-MPPT-40.

Battery Type	SEALED /GEL	AGM/ Lithium	FLOODED
<b>Float Charge @ 25°C:</b>	13.8/27.6V (± 0.1/0.2V)		
<b>Bulk/Absorption Charge @ 25°C:</b> Set to 30 minutes every morning. <i>Applied for 2 hours if the battery voltage drops below 12.3/24.6 volts.</i>	14.1/28.2V (± 0.1/0.2V)	14.4/28.8V (± 0.1/0.2V)	14.4/28.8V (± 0.1/0.2V)
<b>Equalization Charge @ 25°C:</b> <i>Applied for 2 hours every 30 days and if the battery voltage drops below 12.1/24.2 volts.</i>	N/A	N/A	14.9/29.8V (± 0.1/0.2V)
The terms SEALED/GEL, AGM and FLOODED are generic battery designations. Choose the charging profile that works best with your battery manufacturer's recommendations.			

**Auto Equalize:** The GP-MPPT-40 has an automatic equalize feature that will charge and recondition your batteries once a month at a higher voltage to ensure that any excess sulfation is removed.

**NOTE**

This feature is only available when Flooded batteries are selected.

### 7.3 *Maximum Power Boost Technology™*

Maximum Power Boost Technology™ (MPBT) allows you to override the normal charging algorithm of the solar controller. MPBT is designed to be used before the end of the day, if you know you will require many loads through the night. This feature can also be used when you have just installed the solar controller, to put batteries on a boost charge up to 14.4 (Flooded and AGM) (14.1 for Sealed/Gel) right away.

To activate, hold the **MAX BOOST Button** for 3 seconds. As long as there is full sunlight present, your battery voltage will be boosted (to 14.4V for Flooded and AGM/Lithium and 14.1V for SEALED/GEL) for 30 minutes regardless of the battery's state of charge.

**Icons Displayed:** BOOST; Battery Symbol

**IMPORTANT:** Do not use the Maximum Power Boost function more than twice a day as it could damage your batteries due to gassing.

### 7.4 *Viewing the Remote Display Information*

The GP-MPPT-R has two modes to watch the display information, manual and auto scroll. Auto mode is on by default.

You can change between the two modes by holding down the **A Button** for 3 seconds.

#### **Mode 1: Manually Scroll Through Display Information**

To toggle between Battery Voltage, PV Charging Current and Battery State of Charge (SOC), press the **B Button**.

Push the **B Button** to show the battery voltage.

**Icons Displayed:** Battery SOC, Volt Symbol (V)

Push the **B Button** to show the PV charging current.

**Icons Displayed:** Arrow, Ampere Symbol (A), Battery SOC

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Push the **B Button** to show the battery state of charge (shown as a percentage).

**Icons Displayed:** Battery SOC, Percent Symbol (%)

## Mode 2: Automatically Change Display Information

You can select the auto mode by holding down the **A Button** for 3 seconds.

The display shows the same information as in Mode 1 but changes the display automatically every 8 seconds between Battery Voltage, PV Charging Current and Battery State of Charge (SOC).

### 7.5 Errors

#### Low Voltage

If the battery state of charge reaches 0%, the battery SOC symbol will show the text “LOW” beneath it. The controller and remote display will continue operating in this condition and will only stop operating if the voltage drops below 9 volts.

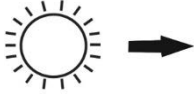



**Icons Displayed:** Battery SOC Symbol, LOW






## 8.0 Display Symbols

**NOTE**

Values before and after the slash correspond to 12 and 24 V systems respectively.

Battery type must be set using the DIP switches on GP-MPPT-40 before it is powered on.

Symbol	Indicator For:
	Day Time: PV Charge Current
	Night Time
	Battery Voltage
	Battery State of Charge
<b>SEALED</b>	Sealed/Gel
<b>AGM</b>	AGM/Lithium
<b>FLOODED</b>	Flooded
<b>Other Symbols</b>	
<b>BOOST</b>	Max Power Button Pushed, Controller tries to keep battery at Boost Voltage
<b>LOW</b>	Battery voltage is lower than 11.0/22.0V

Battery State of Charge	
Symbol	Battery Voltage
	Shows only after full Boost or Equalization Cycle
	>= 12.6/25.2V
	>= 11.8 – 12.6 / 23.6 – 25.2V
	> 11.0 – 11.8 / 22.0 – 23.6V
 LOW	<= 11.0/22.0V
100%	Shows only after full Boost or Equalization Cycle
90%	>= 12.8/25.6V
$SOC = \frac{battery\ voltage - 11.0V}{1.8V} * 90\%$	< 12.8/25.6V and > 11.0/22.0V
0%	<= 11.0/22.0V

## 9.0 Inverter Control (on/off)

The following Go Power!® inverters can be turned on/off through the GP-MPPT-R when a modular 6p4c RJ11 type connector is used (included with an optional Go Power!® inverter remote):

- GP-SW1000-12
- GP-SW1000-24
- GP-HS1500-12
- GP-SW2000-12
- GP-SW2000-24
- GP-SW3000-12
- GP-SW3000-24

\*The GP-SW1500 Inverter is not compatible.

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First, connect the inverter directly to the battery (follow the installation instructions included with the inverter).

Then, connect the modular cable (found in the inverter remote box) to the remote terminal of the inverter and to the remote terminal of the GP-MPPT-R (marked with an **AC Plug symbol**).

Please change the switch of the inverter to Position 2 (Remote controlled).

Now, you can enable /disable the connected inverter by holding down the **AC Symbol Button** for 3 seconds.

The inverter is enabled when the **AC plug symbol** appears on the display and is disabled when it disappears.

## 10.0 Frequently Asked Questions (FAQs)

Before a problem is suspected with the system, read this section. There are numerous events that may appear as problems but are in fact perfectly normal. Please visit **[gpelectric.com](http://gpelectric.com)** for the most up-to-date FAQs.

### **It seems like my flooded batteries are losing water over time.**

Flooded batteries may need to have distilled water added periodically to replace fluid loss during charging. Excessive water loss during a short period of time indicates the possibility of overcharging or aging batteries.

### **When charging, my flooded batteries are emitting gas.**

During charging, hydrogen gas is generated within the battery. The gas bubbles stir the battery acid allowing it to receive a more full state of charge. Important: **Ensure batteries are in a well-ventilated space.**

### **My voltmeter shows a different reading than the GP-MPPT-R display**

The meter value on the GP-MPPT-R display is an approximate reading intended for indication purposes only. There is an approximate 0.1/0.2 volt inherent error present that may be accentuated when compared with readings from another voltmeter.

There may be a slight difference between the battery voltage displayed on the GP-MPPT-R display and the battery voltage measured at the battery terminals. When troubleshooting using a voltmeter, check both

the battery voltage at the GP-MPPT-40 controller terminals and battery voltage at the battery terminals. If a difference of more than 0.5 volts is noted, this indicates a large voltage drop possibly caused by loose connections, long wire runs, small wire gauge, faulty wiring, a faulty voltmeter or all the above. Consult the Suggested Minimum Wire Gauge chart in **Section 5** of the GP-MPPT-40 manual for wiring suggestions and check all connections.

## 11.0 Troubleshooting Problems

### How to Read this Section

*Troubleshooting Problems* is split into three sub-sections, grouped by symptoms involving key components. Components considered irrelevant in a diagnosis are denoted 'Not Applicable' (N/A). A multimeter or voltmeter may be required for some procedures listed.

It is imperative all electrical precautions stated in the Warning Section and outlined in the Installation Section are followed. Even if it appears the system is not functioning, it should be treated as a fully functioning system generating live power.

### 11.1 Problems with the Display

**Display Reading:** Blank

Time of Day: Daytime/Nighttime

#### Possible Causes:

Ethernet cable connection, battery or fuse connection and/or solar array connection (Daytime only), or battery or fuse connection (Nighttime only).

#### How to tell:

1. Check the Ethernet cable connection at the remote display port, and check the Ethernet cable connection at the controller port.
2. Check the voltage at the controller battery terminals with a voltmeter and compare with a voltage reading at the battery terminals.
3. If there is no voltage reading at the controller battery terminals, the problem is in the wiring between the battery and the

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controller. If the battery voltage is lower than 9 volts the controller and display will not function.

**Remedy:**

Check connections between the display and controller. Check all connections from the controller to the battery including checking for correct wire polarity. Check that all connections are clean, tight, and secure. Ensure the battery voltage is above 10.5 volts for startup and above 9 volts thereafter.

**Display Reading:** Nighttime

Time of Day: Daytime

**Possible Causes:**

Panel is covered by something; PV panel is too dirty to supply a high enough voltage to charge the battery; PV panel is not connected.

**Remedy:**

Check the panel and to ensure it is not obscured. Clean the panel if it is dirty. Check that PV cables are connected to the controller.

## **11.2 *Problems with Voltage***

**Voltage Reading:** Inaccurate

**Time of Day:** Daytime/Nighttime

**Possible Cause:**

Excessive voltage drop from batteries to controller due to loose connections, small wire gauge or both.

**How to tell:**

1. Check the voltage at the controller battery terminals with a voltmeter and compare with the voltage reading at the battery terminals.
2. If there is a voltage discrepancy of more than 0.5 V, there is an excessive voltage drop.



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**Remedy:**

Check all connections from the controller to the battery including checking for correct wire polarity. Check that all connections are clean, tight, and secure. Shorten the distance from the controller to battery or obtain larger gauge wire. It is also possible to double up the existing gauge wire (i.e. two wire runs) to simulate a larger gauge wire.

### 11.3 *Problems with Current*

**Current Reading:** 0 A

**Time of Day:** Daytime, clear sunny skies

**Possible Cause:**

Current is being limited below 1 Amp as per normal operation or poor connection between solar array and controller.

**How to tell:**

1. The State of Charge (SOC) screen is close to 100% and the Sun and Battery icon are present with an arrow between.
2. With the solar array in sunlight, check the voltage at the controller solar array terminals with a voltmeter.
3. If there is no reading at the controller solar array terminals, the problem is somewhere in the wiring from the solar array to the controller.

**Remedy:**

1. Hold down the MAX BOOST Button for approximately 3 seconds to activate Maximum Power Boost. This will allow the controller to charge batteries to  $14.4/28.8 \pm 0.1/0.2V$  ( $14.1/28.2 \pm 0.1/0.2V$  Sealed/Gel) with all current the solar array is producing.
2. Check all connections from the controller to the array including checking for correct wire polarity. Check that all connections are clean, tight, and secure. Continue with the solutions below for additional help on low current readings.

**Current Reading:** Less than expected

**Time of Day:** Daytime, clear sunny skies

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### Possible Causes:

- (1) Current is being limited below 1 Amp as per normal operation.
- (2) Incorrect series/parallel configuration and/or wiring connections and/or wire gauge.
- (3) Dirty or shaded module or lack of sun.
- (4) Blown diode in solar module when two or more modules are connected in parallel.

### How to tell:

- (1) Battery State of Charge screen is close to 100% and the Sun and Battery icon are present with an arrow in between.
- (2) Check that the modules and batteries are configured correctly. Check all wiring connections.
- (3) Modules look dirty, overhead object is shading modules or it is an overcast day in which a shadow cannot be cast.

**NOTE**

Avoid any shading no matter how small. An object as small as a broomstick held across the solar module may cause the power output to be reduced. Overcast days may also cut the power output of the module.

- (4) Disconnect one or both array wires from the controller. Take a voltage reading between the positive and negative array wire. A single 12 volt module often has an open circuit voltage between 17 and 22 volts. A single 24 volt module often has an open circuit voltage between 36 and 48 volts. If you have more than one solar module, you will need to conduct this test between the positive and negative terminals of each module junction box with either the positive or the negative wires disconnected from the terminal.

### Remedy:

- (2) Reconnect in correct configuration. Tighten all connections. Check wire gauge and length of wire run. Refer to Suggested Minimum Wire Gauge in **Section 5** of controller manual.
- (3) Clean modules, clear obstruction or wait for conditions to clear.

(4) If the open circuit voltage of a non-connected module is lower than the manufacturer's specifications, the module may be faulty. Check for blown diodes in the solar module junction box, which may be shorting the power output of module.

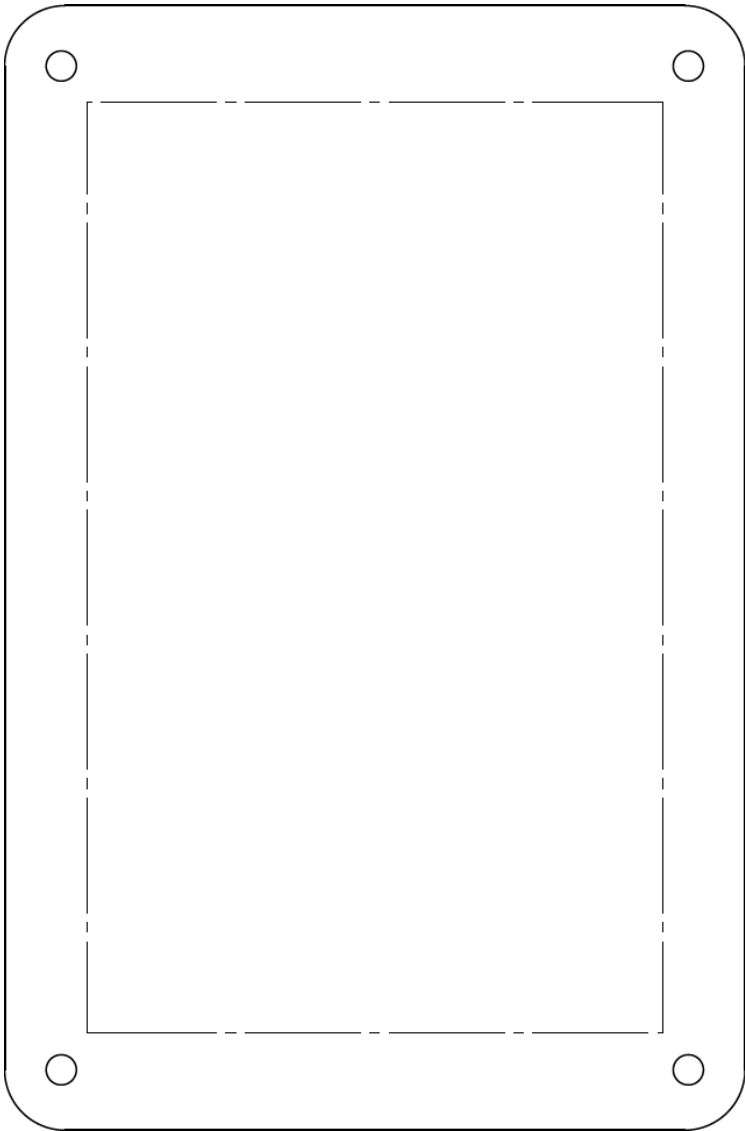
## 12.0 Limited Warranty

1. Go Power! warrants the GP-MPPT-R for a period of five (5) years from the date of shipment from its factory. This warranty is valid against defects in materials and workmanship for the five (5) 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.

### 12.1 *Repair and Return Information*

Visit [www.gpelectric.com](http://www.gpelectric.com) to read the "frequently asked questions" section of our website to troubleshoot the problem. If trouble persists:

1. Call your Go Power!® Technical Support team (1-866-247-6527).
2. Return defective product to place of purchase





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