# DOMETIC GP-PWM-30-FM-DL 30 AMP Flush Mount Solar Controller User Manual



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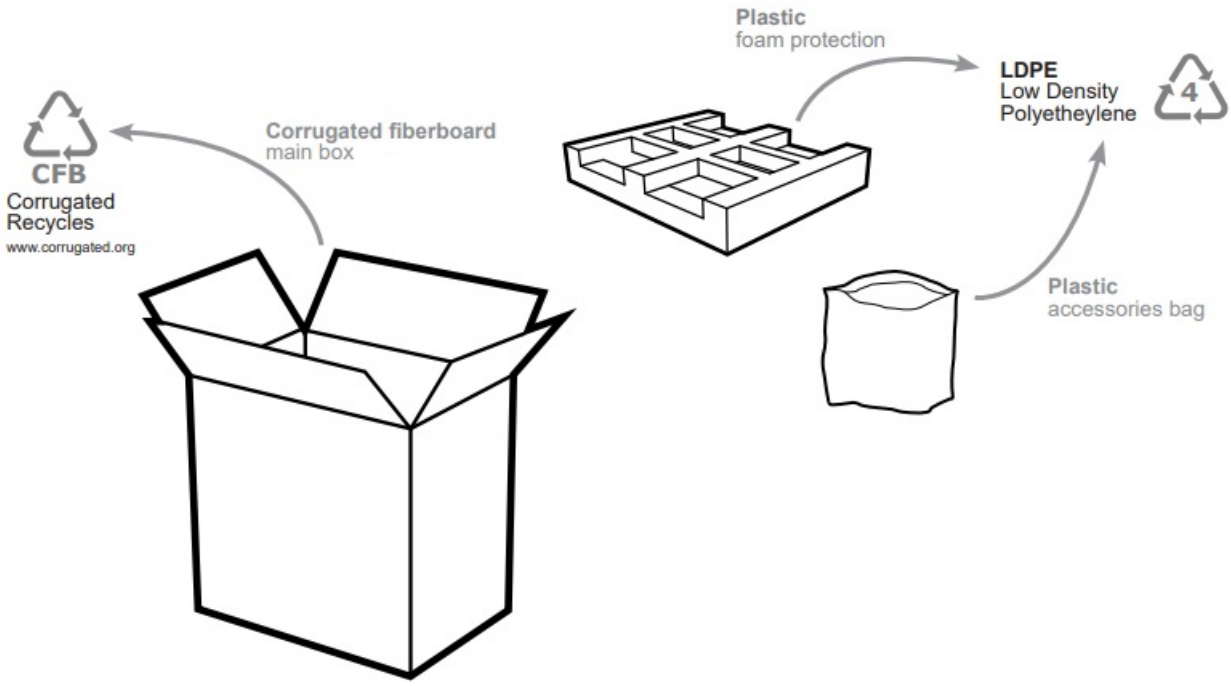
## DOMETIC GP-PWM-30-FM-DL 30 AMP Flush Mount Solar Controller


Congratulations on purchasing your Go Power! GP-PWM-30-FM-DL 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 IC Series was delivered in or recycle the packaging components as outlined below:




## 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 solar controller used features an LCD digital display that shows the charge current of the solar array, system battery voltage and battery state of charge.

### SYSTEM VOLTAGE AND CURRENT

This controller is intended for use at 12 VDC system voltage and is rated for a maximum continuous DC input current of 37.5A and input voltage of 35VDC. Per National Electrical Code (NEC) articles 690.7 and 690.8, PV module nameplate ratings must be multiplied by required values (typically 1.25 for both voltage and current) to obtain the maximum voltage and continuous current available from the module. Applying NEC factors, the maximum allowable nameplate PV Panel rated Isc is 30A (30A x 1.25 = 37.5A), and the maximum voltage, Voc is 28VDC (28VDC x 1.25 = 35VDC). The voltage and current ratings of all equipment connected to PV panels must be capable of accepting the voltage and current levels available from PV panels installed in the field.

### BATTERY TYPE

This solar controller is suitable for use with lead acid batteries (vented, GEL, or AGM* type) as well as some lithium iron phosphate (LiFePO4) batteries that are supplied with a Battery Management System (BMS).

- Use the Sealed battery profile for AGM

### REGULATORY INFORMATION

CE RoHS

## SPECIFICATIONS

| DESCRIPTION | VALUE | DIMENSIONS (H X W X D): |
|---|---|---|
| Nominal System Voltage | 12 VDC | |
| Range of Battery Input Voltage | 8 ~ 32 VDC | |
| Rated Charge Current | 30A | |
| Charging Output DC Voltage Range | 9 – 14.9 VDC | |
| Max. PV Short Circuit Current | 30A | |
| Max. PV Open Circuit Voltage | 50V | |
| Operating Consumption (Display backlight on) | 15 mA | |
| Operating Consumption (Display backlight off) | 6 mA | Dimensions (H x W x D):<br>178.5 × 105.5 × 48.3mm<br>7.02 x 4.15 x 1.90 in<br>Weight: 300g / 10.6 oz<br>Recommended Wire Gauge: |

| | |
|---|---|
| Charge Circuit Voltage Drop | 0.21V |
| Battery Types Supported | Sealed, Gel, Flooded, Lithium 1, and Lithium 2 |
| Self-consumption | ≤4.2mA/12V;≤2.6mA/24V |
| Temperature Compensation | -3mV/°C/2V(Default) |
| Charge Circuit Voltage Drop | 0.21V |
| Operating Consumption (Display backlight on) | 15mA |
| Operating Consumption (Display backlight off) | |
| Battery Types Supported | |

#8 AWG

Warranty: 5 years

- PWM Charging
- 4 Battery Charging profiles
- 4 Stage Charging
- Displays Charging Current, Battery Voltage and Battery State of Charge
- Temperature Compensated
- RoHS Compliant, environmentally safe
- Accepts up to 300 watts of solar
- at 12 volts

| | | |
|---|---|---|
| Protection | Over Temperature, PV Short Circuit, PV Over Current, PV Over Voltage, | |

## IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

THIS MANUAL CONTAINS IMPORTANT INSTRUCTIONS FOR THE SOLAR CONTROLLER THAT SHOULD BE FOLLOWED DURING USE AND MAINTENANCE.

- Read this manual in its entirety before using the solar controller for the first time.
- DO NOT GET WET.
- Use only with approved connections and harnessing.
- Please cut off all connections of the PV array, fuses or breakers which close to the battery before the controller installation and adjustment.
- Power connections should remain tight to avoid excessive overheating
- No user-serviceable component inside the controller. DO NOT disassemble or attempt to repair the controller.

| | |
|---|---|
| **Disconnect all power sources** | Electricity can be very dangerous. Installation should be performed only by a licensed electrician or qualified personnel. |
| **Battery and wiring saf ety** | Observe all safety precautions of the battery manufacturer when handling or working around batteries. When charging, batteries produce hydrogen gas, which is highly ex plosive. Ensure batteries are in a well-ventilated space, away from sparks for open fla mes. |
| **Wiring connections** | Ensure all connections are tight and secure. Loose connections may generate sparks and heat. Be sure to check all connections before using the portable solar kit. |

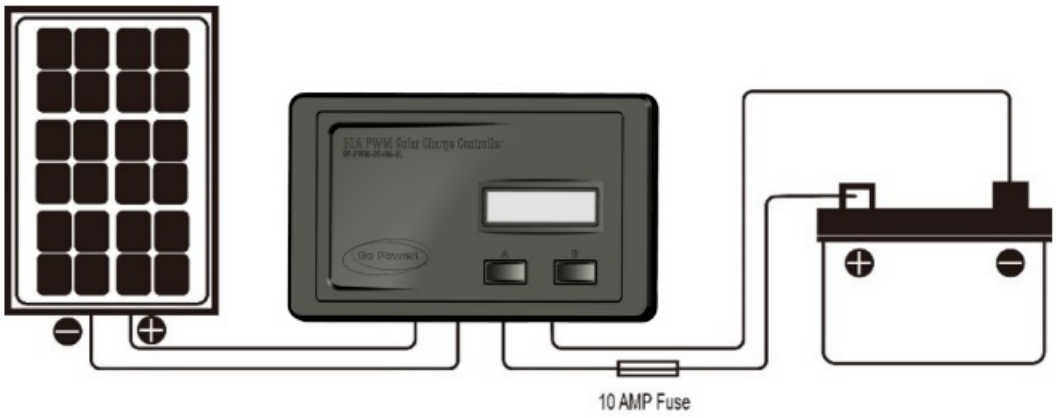
| | |
|---|---|
| **Work safely** | Wear protective eyewear and appropriate clothing during installation. Use extreme ca ution when working with electricity and when handling and working around batteries. |
| **Observe correct polar ity** | The reverse polarity of battery terminals will permanently damage the controller. |
| **Do not exceed the Ch arge Controller curre nt and voltage ratings** | The maximum current of the solar system is the sum of parallel-connected PV module–rated short circuit Currents (Isc) multiplied by 1.25. The resulting system curr ent is<br><br>not to exceed 37.5A. If your solar system exceeds this value, contact your dealer for a suitable controller alternative. |
| **Do not exceed max v oltage ratings** | The maximum voltage of the array is the sum of the PV module–rated open-circuit vol t-age of the series connected modules multiplied by 1.25 (or by a value from NEC 690 .7 provided in Table 690.7 A). The resulting voltage is not to exceed 35V. If your solar system exceeds this value, contact your dealer for a suitable controller alternative. |

## CHOOSING A BATTERY

phate (LiFePO4) batteries that are supplied with a Battery Management System (BMS). If using lithium-ion, it must be lithium iron phosphate (LiFePO4) chemistry with a BMS. No other chemistries are compatible. Lithium batteries usually have maximum allowed charge currents. These maximums typically decrease in cold temperatures. THE GP-PWM-30-FM-DL does not limit current for these restrictions, and system design of the solar array must account for this. Be sure to follow all battery manufacturer safety instructions.

## WIRING DIAGRAM

The GP-PWM-30-FM-DL maximum 37.5A rating is based on a 30-amp total maximum short circuit current rating (Isc) from the solar modules' nameplate ratings. The National Electric Code specifies the PV equipment/system rating to be 125% of the maximum Isc from the PV module ratings (1.25 times 30 = 37.5A). E.G. Three modules in parallel with an Isc of 7 amps each equal a total Isc input of 21 amps. When selecting PV modules for use with the GP-PWM-30-FM-DL, do not exceed a total nameplate Isc current of 30A. Solar modules list the Isc amps on their nameplate label.




**NOTE:** The controller will not work unless there is a battery connected to the Battery 1 terminals.

**WARNING:** When the photovoltaic (solar) array is exposed to light, it supplies a dc voltage to this equipment.

**Note:** The fuse or breaker used should be no larger than 30 amps.

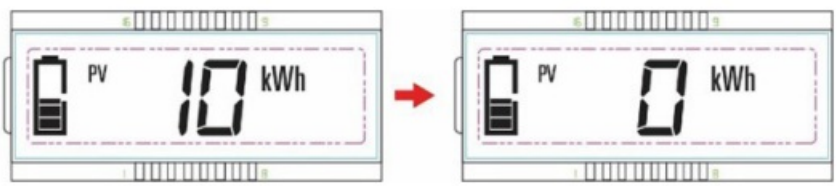
## OPERATING INSTRUCTIONS

#### Automatic cycle interface


- **Display:** PV voltage, PV current, PV power, Battery voltage and Battery temperature

1. Clear the generated energy

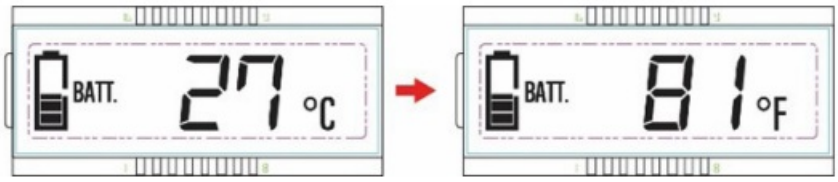
#### Operation




- **Step 1:** Press the “B” button and hold 5s under the PV power interface and the value is flashing.
- **Step 2:** Press the “B” button to clear the generated energy.

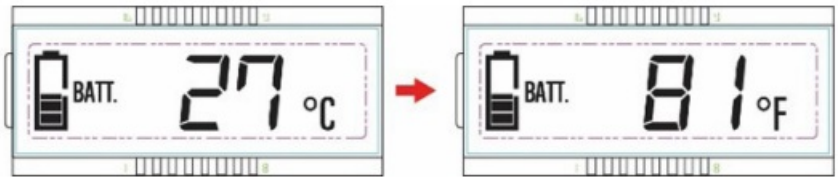
1. Switch the battery temperature unit

Press the “B” button and hold 5s under the battery temperature interface.




**Battery type**

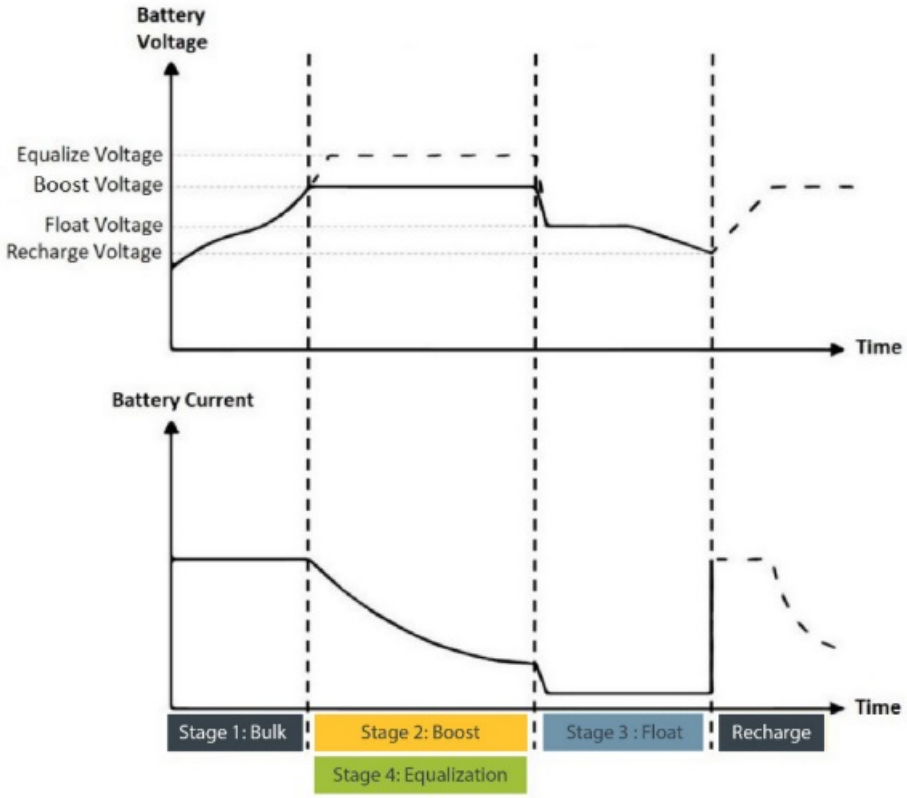
- Battery type
  - Sealed Gel Flooded User(1)
- Set battery type by LCD(1)




**Operation**

- **Step 1:** Press the “B” button and hold 5s under the battery voltage interface.
- **Step 2:** Press the “A” button when the battery type interface is flashing.
- **Step 3:** Press the “B” button to confirm the battery type.

**BATTERY CHARGING PROFILE CHART**




| ITEM | SEALED | GEL | FLOODED | LF1 (12V) | LF2 (24V) |
|---|---|---|---|---|---|
| **Over Voltage Disconnect Voltage** | 16.0V | 16.0V | 16.0V | 14.6V | 29.2V |
| **Charging Limit Voltage** | 15.0V | 15.0V | 15.0V | 14.8V | 28.8V |
| **Over Voltage Reconnect Voltage** | 15.0V | 15.0V | 15.0V | 14.8V | 28.8V |
| **Equalize Charging Voltage** | 14.6V | —— | 14.8V | —— | —— |
| **Boost Charging Voltage** | 14.4V | 14.2V | 14.6V | 14.8V | 28.8V |

| | | | | | |
|---|---|---|---|---|---|
| **Float Charging Voltage** | 13.8V | 13.8V | 13.8V | 14.0V | 28.0V |
| **Boost Reconnect Charging Voltage** | 13.2V | 13.2V | 13.2V | 13.2V | 26.4V |
| **Low Voltage Reconnect Voltage** | 12.6V | 12.6V | 12.6V | 12.2V | 24.4V |
| **Under Voltage Warning Reconnect Voltage** | 12.2V | 12.2V | 12.2V | 12.4V | 28.8V |
| **Under Voltage Warning Voltage** | 12.0V | 12.0V | 12.0V | 12.0V | 24.0V |
| **Low Voltage Disconnect Voltage** | 11.1V | 11.1V | 11.1V | 11.0V | 22.0 |
| **Discharging Limit Voltage** | 10.6V | 10.6V | 10.6V | 10.5V | 21.0V |
| **Equalize Duration** | 120min. | —— | 120min. | —— | —— |
| **Boost Duration** | 120min. | 120min. | 120min. | 120min. | 120min. |

1. When the battery type is sealed, gel, flooded, the adjusting range of equalizing duration is 0 to180min and boost duration is 10 to180min.
2. When setting a lithium battery type, (for example: a LiFePO4) use these rules when setting voltage parameters.
    - Over Voltage Disconnect Voltage > Charging Limit Voltage ≥ Equalize Charging Voltage ≥ Boost Charging Voltage ≥ Float Charging Voltage > Boost Reconnect Charging Voltage.
    - Over Voltage Disconnect Voltage > Over Voltage Reconnect Voltage
    - Low Voltage Reconnect Voltage > Low Voltage Disconnect Voltage ≥ Discharging Limit Voltage.
    - Under Voltage Warning Reconnect Voltage > Under Voltage Warning Voltage ≥ Discharging Limit Voltage.

- Boost Reconnect Charging voltage > Low Voltage Disconnect Voltage.

**Note:** LFP1 is used for 12V Lithium batteries. LFP2 is used for 24V lithium batteries.

## ERRORS AND TROUBLESHOOTING

### No Power to LCD Screen

### Solution 1

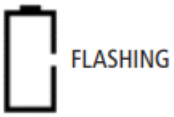
- Check the connection between the solar panel and the controller, and the controller and the battery. The controller requires a minimum voltage of 8v to run.

### Solution 2

- Your battery may be too far discharged to accommodate the controller. Keep the solar kit plugged in and placed in full sun for a few hours and try the controller again.


**Solution**

- This is an Overvoltage Error. The battery voltage is too high. Disconnect the solar panel and plug in a power draw to lessen the voltage in the battery.




**Solution**

- This is an Over Discharge Error. The battery voltage is too low. Connect the solar panel to charge the battery.

## DISPLAY SYMBOLS

| ICON | MOTION | ISSUE |
|---|---|---|
|  | Solid | The system is normal but not charging |
| | Energy bars are Flashing | Charging |
|   | Solid | Full |
| | Flashing | Battery Overvoltage |
|   | Flashing | Battery Over Discharge |

## FREQUENTLY ASKED QUESTIONS

- 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 **https://gpelectric.com/support/** for the most up-to-date FAQs and troubleshooting videos.
- 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 fuller state of charge.

**Important:** Ensure batteries are in a well-ventilated space.

#### My voltmeter shows a different reading than the GP-PWM-30-FM-DL display

The meter value on the GP-PWM-30-FM-DL display is an approximate reading intended for indication purposes only. There is an approximate 0.1 VDC 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-PWM-30-FM-DL display and the battery voltage measured at the battery terminals. When troubleshooting using a voltmeter, check both the battery voltage at the GP-PWM-30-FMDL controller terminals and battery voltage at the battery terminals. If a difference of more than 0.5 VDC 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 6 for wiring suggestions and check all connections.

**For advanced users**

The GP-PWM-30-FM-DL makes voltage measurement adjustments based on resistance it detects at the battery terminals. In addition to resistance in the wires, batteries also have an internal resistance due to chemical properties. The controller cannot distinguish between these two sources of resistance. It will compensate up to 250mV in the displayed value.

**Why does the voltage fluctuate so much when charging with the LITHIUM setting?**

Lithium batteries contain smaller battery cells. The voltages of these individual cells must be balanced during the charging process by the Battery Management System (BMS). Imbalances will cause fluctuations in the battery voltage measurement, but this will stabilize as the cells are charged and balanced.

Additionally, lithium batteries have higher resistance than lead acid batteries. This affects the charge controller's battery voltage measurements and its compensation for wire resistance. Reduce wire inductance which may also cause voltage fluctuations. Keep battery wires close together, or gently twist positive and negative wires together.

## TROUBLESHOOTING

**How to Read this Section**

Troubleshooting Problems is split into three sub-sections, grouped by symptoms involving key components. 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.

#### PROBLEMS WITH THE DISPLAY

- **Display Reading:** Blank
- **Time of Day:** Daytime/Nighttime
- **Possible Causes:** Battery or fuse connection and/or solar panel connection (Daytime only) or battery or fuse connection (Nighttime only).
- **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. Ensure the battery voltage is above 8 volts.

**Further Steps (if required):** Check the voltage at the controller battery terminals with a voltmeter and compare with a voltage reading at the battery terminals. If there is no voltage reading at the controller battery terminals, the problem could be a fuse or the wiring between the battery and the controller. If the battery voltage is lower than 8 volts the controller will not function. For the solar panel, repeat steps 1 and 2 substituting all battery terminals with solar panel terminals.

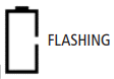
- **Display Reading:** 0
- **Time of Day:** Daytime/Nighttime

**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. Ensure the battery voltage is above 6 volts.

- **Display Reading:** Full battery icon flashing 

- **Time of Day:** Daytime/Nighttime

Reconnect solar panel after a few minutes. Repeat as needed.

- **Display Reading:** Empty battery icon flashing 

- **Time of Day:** Daytime/Nighttime

**Remedy:** Undervoltage error. Battery is too low to register a voltage to the solar controller. Plug your RV/trailer in to shore power to recharge battery to above 8V.

#### 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.

**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.

**Further Steps (if required):** Check the voltage at the controller battery terminals with a voltmeter and compare with the voltage reading at the battery terminals. If there is a voltage discrepancy of more than 0.5 VDC, there is an excessive voltage drop.

#### 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 there is a poor connection between the solar panel and the controller.
- The State of Charge (SOC) screen is close to 100% and the Sun and Battery icon are present with an arrow between.
- With the solar array in sunlight, check the voltage at the controller solar array terminals with a voltmeter.
- 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:** 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 +/- 0.1 VDC (14.1 +/- 0.1 VDC Sealed/Gel) with all current the solar array is producing.

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.

**Further Steps (if required):** With the solar panel in sunlight, check the voltage at the controller solar panel terminals with a voltmeter. If there is no reading at the controller solar panel terminals, the problem is somewhere in the wiring from the solar panel to the controller.

- **Current Reading:** Less than expected
- **Time of Day:** Daytime, clear sunny skies

#### Possible Causes

1. Currently 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.
5. The battery is full.

#### 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 significantly 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 should have an open circuit voltage between 17 and 23 VDC. 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

1. Reconnect in correct configuration. Tighten all connections. Check wire gauge and length of wire run. Refer to Suggested Minimum Wire Gauge in Section 6.
2. Clean modules, clear obstruction or wait for conditions to clear.
3. If the open circuit voltage of a non-connected 12 volt 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.

**Further Steps (if required):** Disconnect one or both panel wires from the controller. Take a voltage reading between the positive and negative panel wire. A single 12 volt module should have an open circuit voltage between 17 and 23 VDC. 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.

## WARRANTY

Go Power! warrants the Solar Controller (GP-PWM-30-FM-DL) for 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
- Vandalism or theft
- Acts of God, including lightning, floods, earthquakes, fire, and high winds
- Damage in handling, including damage encountered during shipment or installation

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. Visit gpelectric.com for additional product warranty information.

### REPAIR AND RETURN INFORMATION

Visit **https://gpelectric.com/support/** to read the "frequently asked questions" section of our website to troubleshoot the problem. If trouble persists:

1. Fill out our online Contact Us form or Live Chat with us
2. Email **techsupport@gpelectric.com**
3. Return defective product to place of purchase



Worldwide Technical Support and Product Information **gpelectric.com**
Go Power! | Dometic
201-710 Redbrick Street Victoria, BC, V8T 5J3
**Tel:** 1.866.247.6527
MAN_GP-PWM-30-FM-DL_RevA

## Documents / Resources

| | |
|---|---|
|  | **DOMETIC GP-PWM-30-FM-DL 30 AMP Flush Mount Solar Controller** [pdf] User Manual GP-PWM-30-FM-DL 30 AMP Flush Mount Solar Controller, GP-PWM-30-FM-DL, 30 AMP Flush Mount Solar Controller, 30 AMP Solar Controller, Flush Mount Solar Controller, Solar Controller |

## References

- **Home - Go Power! - powered by HappyFox**