



# GENASUN **GV-5 Manual**

Solar Charge Controllers with Maximum Power Point Tracking

For models:

|                             |  |
|-----------------------------|--|
| <b>GV-5-Pb-12V:</b>         | 12 V Lead-Acid/AGM/Gel/Sealed/Flooded                    |
| <b>GV-5-Pb-CV:</b>          | 12 V Custom Multi-Stage Lead-Acid/AGM/Gel/Sealed/Flooded |
| <b>GV-5-Li-10.7V (-SP):</b> | 9 V (3S) Lithium Iron Phosphate                          |
| <b>GV-5-Li-12.5V:</b>       | 11.1 V (3S) Lithium Cobalt/Manganese/Nickel              |
| <b>GV-5-Li-14.2V:</b>       | 12 V (4S) Lithium Iron Phosphate                         |
| <b>GV-5-Li-16.7V:</b>       | 14.8 V (4S) Lithium Cobalt/Manganese/Nickel              |
| <b>GV-5-Li-CV:</b>          | Custom CC/CV or Multi-Stage Lithium                      |

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## 5 A Rated Output

GENASUN GV-5 (ALL MODELS) MANUAL, REVISION 4.1 | 2021

**IMPORTANT SAFETY INSTRUCTIONS | SAVE THESE INSTRUCTIONS**

# Safety Instructions:

This manual contains important instructions for the GV-5-Pb and GV-5-Li solar charge controllers that shall be followed during installation and maintenance. Various models of the GV-5 are available to charge different battery types as follows:

- GV-5-Pb-12V: 12 V Lead-Acid/AGM/Gel/Sealed/Flooded
- GV-5-Pb-CV: 12 V Custom Multi-Stage Lead-Acid/AGM/Gel/Sealed/Flooded
- GV-5-Li-10.7V (-SP): 9 V (3S) Lithium Iron Phosphate
- GV-5-Li-12.5V: 11.1 V (3S) Lithium Cobalt/Manganese/Nickel
- GV-5-Li-14.2V: 12 V (4S) Lithium Iron Phosphate
- GV-5-Li-16.7V: 14.8 V (4S) Lithium Cobalt/Manganese/Nickel
- GV-5-Li-CV(\*\*.\*V): Custom CC/CV or Multi-Stage Lithium
- GV-5-Li-PCB CC/CV or Multi-Stage Lithium
- GV-5-Pb-PCB 12 V Multi-Stage Lead-Acid/AGM/Gel/Sealed/Flooded

Consult your battery charging specifications to ensure that the GV-5 is compatible with your chosen batteries.

The GV-5 does not include a fuse. Overcurrent protection suitable for the application must be provided by the user.

**UL SAFETY AND HAZLOC WARNING:** EXPLOSION HAZARD. DO NOT CONNECT OR DISCONNECT WHEN ENERGIZED. DO NOT DISCONNECT WHILE THE CIRCUIT IS LIVE OR UNLESS THE AREA IS FREE OF IGNITABLE CONCENTRATIONS.

ATTENTION: RISQUE D'EXPLOSION. NE PAS CONNECTER NI DÉCONNECTER PAS LORSQU'IL EST SOUS TENSION. NE PAS CONNECTER LE CIRCUIT ALORS QUE EST VIVANT OU A MOINS QUE LA ZONE EST LIBRE DE CONCENTRATIONS IGNITAIRES.

CAUTION for the GV-5-Pb (Lead-Acid Versions Only): **INTERNAL TEMPERATURE COMPENSATION. RISK OF FIRE, USE WITHIN 1 ft (0.3 m) of BATTERIES.** Lead-acid batteries can create explosive gases. Short circuits can draw thousands of amps from a battery. Carefully read and follow all instructions supplied with the battery. Use only 12 V lead-acid batteries with the GV-5-Pb-12 V and GV-5-Pb-CV.

To avoid stress on the GV-5 and possible damage, **DO NOT SHORT CIRCUIT** the solar array when plugged into the controller, and **DO NOT MEASURE SHORT CIRCUIT CURRENT** of the array while connected to the controller.

Grounding is not necessary for operation and is at the user's discretion. If the GV-5 is to be used with a solar array electrically connected to earth ground, please note the following:

**WARNING: THIS UNIT IS NOT PROVIDED WITH A GFDI DEVICE.** Consult Article 690 of the National Electrical Code (or the standards in force at the installation location) to determine whether a GFDI is necessary for your installation.

**WARNING: THIS UNIT IS NOT PROVIDED WITH DISCONNECT DEVICES.** Consult Article 690 of the National Electrical Code (or the standards in force at the installation location) to determine whether disconnect devices are necessary for your installation.

Use only 12 – 30 AWG (3.0 mm<sup>2</sup> max) copper conductors suitable for a minimum of 60 °C. If operation at high power or at high ambient temperatures is expected, wire with a higher temperature rating may be necessary. Recommended terminal block tightening torque: 3 – 5 in-lbs, 0.35 – 0.55 Nm.






**LITHIUM WARNING:** Use caution when working with lithium systems. Genasun Li controllers use the CC/CV charging profile indicated on the controller. Check the specifications of the battery pack to ensure that the CV voltage is correct. Further check that the power supplied by the solar array and Genasun controller is within the battery specified design limits.

**LITHIUM BMS WARNING:** Genasun recommends using a lithium battery with a Battery Management System (BMS) capable of disconnecting the solar charge controller in the event that any cell in the pack is outside of its rated temperature, current, or voltage range. Failure to do so may result in property damage, injury or death. Genasun highly recommends the use of a BMS with cell balancing. Cell balancing is mandatory for lithium iron phosphate.

## Inspection & Maintenance

- No user-serviceable parts inside.
- Inspect the controller at least once per year to ensure proper performance.
- Check for animal or insect damage.
- Inspect for corrosion / water damage.
- Inspect the security of all connections.
- Ensure the solar array does not exceed the maximum input voltage.
- Repair and clean as necessary.

## Product Certifications<sup>1</sup>

|   |  |  |  |   |
|---|--|--|--|---|
|  |     |               |   |  |
| Safety<br>Conforms to:<br>UL STD 1741<br>Certified to:<br>CSA STD C22.2#107.1     | HazLoc (C1D2)<br>Conforms to:<br>UL STD 121201<br>Certified to:<br>CSA STD C22.2#213 | EMC<br>Conforms to:<br>EN 61000-6-3:2007+A1:2011<br>EN 61000-6-2:2005<br>AS/NZS 61000-6-3:2012 | EMC<br>Conforms to:<br>FCC (CFR Title 47) Part 15 Radio frequency<br>Devices, Subpart B - Unintentional<br>Radiators. Tested for compliance. | Restriction of Hazardous Substances<br>Conforms to:<br>EN 50581:2012                |

(1) The GV-5-PCB models are ETL Recognized Components for safety (UL1741).


# Installation & System Connections:

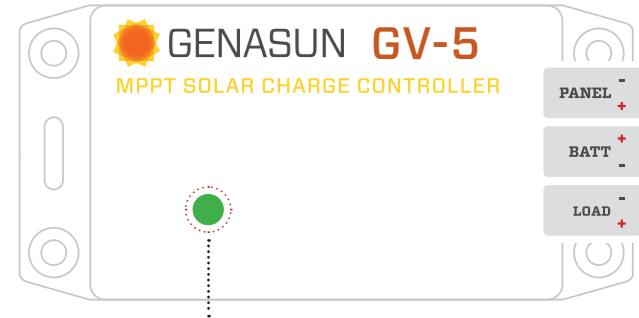
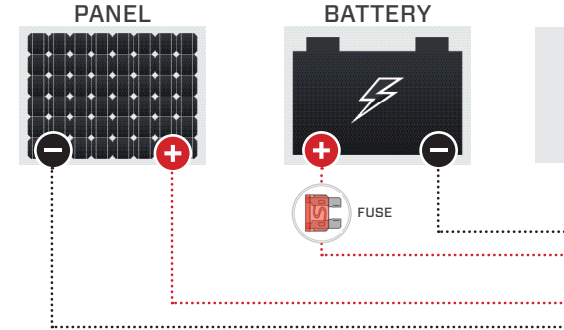
- Connections should be made according to Article 690 of the National Electrical Code (NFPA 70) or the standards in force at the installation location.
- Electrical connections may be made in any order; however the sequence below is recommended.

## 1 MOUNTING

Mount the controller near your battery securely using the holes provided on the enclosure's flanges or with a means appropriate to the application.

- Mount near the battery (for lead-acid versions only, use within 1 ft (0.3 m) of batteries. See *Caution*, p.2).
- The GV-5 can be mounted in any orientation on the floor or wall. We recommend a position in which all labels are clearly visible. Although the GV can be used in any orientation, for marine or other applications where liquid water may be nearby, the GV should be mounted with the terminal block down (or where not possible, to the side). This orientation facilitates the use of drip loops to prevent liquid water from running along the wiring into the controller.
- Do not expose to water.
- Do not mount in direct sunlight or near a source of heat.
- Allow adequate airflow around the controller to achieve maximum output capability.
- For outdoor use, the controller must be housed in an enclosure providing protection at least equivalent to NEMA Type 3.

-  **Note:** The positive or negative battery cable must be protected by a fast-acting fuse or circuit breaker of 10 A or less, rated for the maximum battery voltage and connected close to the battery terminal or power distribution block. This fuse will protect the wiring in the event of a short circuit or controller damage.




The GV-5 has a **MULTICOLOR** LED. Learn more about this indicator on page 6.



## 2 CONNECTING THE SOLAR PANEL

Connect the solar panel to the PANEL+ and PANEL- terminals.

- In most applications, the panel should be connected only to the GV-5.
- Never connect the panel negative to the battery negative, as your batteries may be damaged.
-  **Note:** In the GV-5, the positive side of the battery is connected internally to the positive side of the solar panel.
- Do not use blocking diodes for single-panel installations. The GV-5 prevents reverse-current flow.
- If multiple panels are being used in parallel, blocking diodes are recommended in series with each panel, unless the panel manufacturer recommends otherwise.
- Solar panel voltage rises in cold weather. Check that the solar panel open circuit voltage (Voc) will remain below the maximum input voltage of the GV-5 at the coldest possible expected temperature.
- **Genasun Overdrive for Oversized Solar Arrays:** The GV-5 incorporates adaptive power-limiting technology, allowing it to be used with solar arrays far in excess of its rated power. If an oversized array is connected, the GV-5 will deliver the most power possible while keeping its electronics at a safe temperature for long-term operation. This GV-5 automatically adjusts for temperature and other factors to smoothly deliver power at up to 85 °C ambient. When limiting in this manner, the LED will display the "Charging at current limit" blinks (see *Status Indication*, p.6). Moving the GV-5 to a cooler location or providing increased airflow may increase charging power. If the GV-5 will be used with a solar panel or array with a short circuit current (Isc) of more than 8 A, the GV-5 input should be protected with a fast-acting fuse or circuit breaker of 10 A and rated for the maximum solar panel voltage. Note that solar input voltage limits **MUST ALWAYS** be respected. Exceeding the input voltage limit will void the warranty and damage the GV-5.

## 3 CONNECTING THE BATTERY

Connect the battery to the BATT+ and BATT- terminals.



- A small spark while connecting the battery is ok.
- **CAUTION, RISK OF FIRE OR EXPLOSION:** Do not make the final battery connection near lead-acid batteries that have recently been charging.

## 4 CONNECTING THE LOAD

Connect the load(s) to the LOAD+ and LOAD- terminals.

- The load draw should not exceed 5 A continuous.
- Larger loads should be connected directly to the battery. The GV-5 will not be able to protect the battery against over-discharge (low voltage disconnect (LVD)) in this case.



**Note:** Drip loop to protect charge controller from water.

# Status Indication:

The GV-5 has a **MULTICOLOR** LED.

## GREEN LED RUN/CHARGE INDICATION

**Standby:** The battery is connected properly and ready to charge when solar panel power is available.

8-10 SEC. BETWEEN GREEN BLINKS



**Charging (low current, less than 0.2 A):**

4-5 SEC. BETWEEN GREEN BLINKS



**Charging (between 0.2 A - 2 A):**

FAST GREEN BLINKS



**Charging (high current, more than 2 A):**

LONGER, SLOWER GREEN BLINKS



**Charging at current limit:** Genasun Overdrive active.

The GV-5 is overloaded and limiting charging current.

LONG, THEN SHORT GREEN BLINKS



**Battery charged:** The battery is in the absorption or float charging stage.

SOLID GREEN



## RED LED ERROR INDICATION

**Over-temperature:** The controller's internal temperature is too high.

SETS OF 2 RED BLINKS



**Overload:** This could be caused by changing the solar panel connections while the controller is operating.

SETS OF 3 RED BLINKS



**Battery voltage too low:** The controller cannot begin charging normally due to low battery voltage. Check the battery connections, wait for the GV-5's trickle function to charge the battery, or charge the battery by another means.

SETS OF 4 RED BLINKS



SOLID RED



OR OTHER LED INDICATIONS NOT LISTED

**Battery voltage too high:** If the nominal battery voltage is correct (12 V), check the functioning of other chargers that may be connected to the system.

SETS OF 5 RED BLINKS



**Panel voltage too high:** Only 12 V nominal solar panels may be used with this controller.

SETS OF 6 RED BLINKS



**Internal error:** Contact your dealer for assistance.

2 LONG BLINKS, FOLLOWED BY ANY NUMBER

OF SHORT BLINKS



## Troubleshooting

If the LED Indicator will not light, or displays an indication not listed in this manual:

- Verify correct battery polarity.
- Check that there is a solid electrical connection to the battery.
- Check that battery voltage appears on the GV-5 battery terminal screws.
- Check the GV-5 terminal area for water or mechanical damage.

The GV-5 will not operate without a battery. If the system appears to be overcharging or the GV-5 will not begin charging, ensure that the solar panel is wired only to the GV-5, and in particular that the solar panel negative terminal is not connected to ground (battery negative). For more in-depth system troubleshooting, please visit the support area of our website: <https://sunforgellc.com/learning-center>

## Specifications:

|   | MODEL (GV-5-**) | Pb-12V               | Li-10.7V-SP            | Li-10.7V | Li-12.5V             | Li-14.2V               | Li-16.7V  | Li-CV                               |
|---|-----------------|----------------------|------------------------|----------|----------------------|------------------------|-----------|-------------------------------------|
| Rated Panel Power:                            |                 | 65 W                 | 20 W (-SP)             | 50 W     | 55 W                 | 65 W                   | 75 W      | (See specs for closest Li version.) |
| Battery Type:                                 |                 | 12 V Lead-Acid       | 3S LiFePO <sub>4</sub> |          | 3S Li-ion            | 4S LiFePO <sub>4</sub> | 4S Li-ion | Custom Voltage                      |
| Genasun Overdrive: <sup>2</sup>               |                 |                      |                        |          | Yes                  |                        |           |                                     |
| Max Input Voltage:                            |                 |                      |                        |          | 27 V                 |                        |           |                                     |
| Recommended Max Panel Voc at STC:             |                 |                      |                        |          | 22 V                 |                        |           |                                     |
| Max Input Short Circuit Current: <sup>3</sup> |                 | 15 A                 | 2 A                    | 15 A     |                      |                        | 15 A      |                                     |
| Max Input Current: <sup>4</sup>               |                 | 15 A                 | 2 A                    | 15 A     |                      |                        | 15 A      |                                     |
| Min Battery Voltage for Normal Operation:     |                 |                      |                        |          | 7.2 V                |                        |           |                                     |
| Trickle Charge to Recover Dead (0 V) Battery: |                 |                      |                        |          | Yes                  |                        |           |                                     |
| Rated Charging Current:                       |                 | 5 A                  | 2 A                    | 5 A      |                      |                        | 5 A       |                                     |
| Continuous Rated Load Current:                |                 | 5 A                  | 2 A                    | 5 A      |                      |                        | 5 A       |                                     |
| Tracking Efficiency:                          |                 |                      |                        |          | 99+% typical         |                        |           |                                     |
| MPPT Tracking Speed:                          |                 |                      |                        |          | 15 Hz                |                        |           |                                     |
| Electrical Efficiency:                        |                 | 96% – 99.85% typical |                        |          | 94% – 99.85% typical |                        |           |                                     |
| Operating Consumption:                        |                 |                      |                        |          | 0.190 mA (190 uA)    |                        |           |                                     |
| Standby Consumption:                          |                 |                      |                        |          | 0.125 mA (125 uA)    |                        |           |                                     |

(2) See *Genasun Overdrive*, p. 4.

(3) Panel Isc. Inputs exceeding this rating may cause damage to the GV-5 if the input or battery voltage changes abruptly. See *Genasun Overdrive*, p.4.

(4) Maximum steady-state current that the controller could draw from an unlimited source. This specification is intended for sizing input circuit protection. See *Genasun Overdrive*, p.4.

# Specifications (cont.):

| MODEL (GV-5-**)                                      | Pb-12V  | Li-10.7V(-SP) | Li-12.5V       | Li-14.2V       | Li-16.7V        | Li-CV                |
|--|---|---------------|----------------|----------------|-----------------|----------------------|
| Charge Profile:                                      | Multi-Stage with Temperature Compensation                         | CC-CV         |                |                |                 | CC/CV or Multi-Stage |
| Bulk Voltage:  | 14.4 V  | -             |                |                |                 |                      |
| Absorption Voltage:                                  | 14.2 V  | -             |                |                |                 |                      |
| Absorption Time:                                     | 2 hours   | -             |                |                |                 |                      |
| Float Voltage (Pb models) or CV Voltage (Li models): | 13.5 V  | 10.5 V        | 12.5 V         | 14.2 V         | 16.7 V          | Custom Voltage       |
| Re-Absorb (Re-Bulk): <sup>5</sup>                    | 12.5 V  | -             |                |                |                 |                      |
| Load Disconnect (LVD)/Reconnect Voltage:             | 11.4 V / 12.5 V   | 8.2 V / 9.0 V | 9.3 V / 10.5 V | 11.0V / 12.0 V | 12.4 V / 14.0 V | Custom Voltage       |
| Battery Temperature Compensation:                    | -28 mV/°C (referred to 25 °C)                                     | Disabled      |                |                |                 |                      |
| Operating Temperature:                               | -40 °C – 85 °C  |               |                |                |                 |                      |
| Max Full Power Operating Ambient: <sup>6</sup>       | 45 °C   |               |                |                |                 |                      |
| Connection:  | 6-position terminal block for 12 – 30 AWG wire                    |               |                |                |                 |                      |
| Weight: <sup>7</sup>                                 | 2.8 oz (80 g)   |               |                |                |                 |                      |
| Dimensions: <sup>7</sup>                             | 4.3" x 2.2" x 1.14" (11 cm x 5.6 cm x 2.9 cm)                     |               |                |                |                 |                      |
| Environmental Protection: <sup>7</sup>               | IP40, Conformal Coating, Nickel-Plated Brass & Stainless Hardware |               |                |                |                 |                      |
| Certifications:                                      | cETLus, CE, FCC, RoHS   |               |                |                |                 |                      |
| Warranty:  | 10 years  |               |                |                |                 |                      |

(5) If the battery voltage drops below this point, the controller will attempt to run an absorption cycle. Otherwise, it will charge to the float voltage.

(6) Max ambient temperature for full operating power. Test conditions: 16 V input, 13 V output, GV-5 vertically (wall) mounted.

(7) This specification does not apply to GV-5-PCB. Specifications for the GV-5-PCB are as follows: Weight: 0.8 oz (23 g); Dimensions: 3.3" x 1.9" x 0.9" (8.3 cm x 4.8 cm x 2.3 cm); Environmental Protection: IP00.