

**INSTALLATION INSTRUCTIONS**

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Model: **Generator Sets up to 400 kW**

Market: **Industrial**

Subject: **12 VDC/6 Amp Float/Equalize Battery Chargers GM28341 and GM28694**

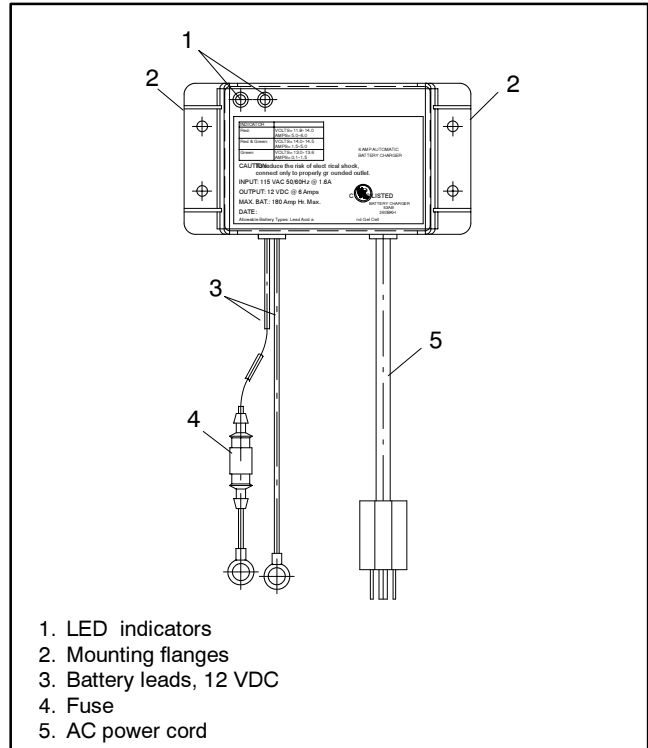
**1.1 Introduction**

This document explains the connection and operation of battery chargers GM28341 and GM28694.

The GM28341/GM28694 float/equalize battery charger is designed to both recharge your battery and extend your battery's life in applications where it is stored for long periods of time. The float/equalize battery charger is a 3-stage electronic battery charger. Rainproof, lightweight, silent, and completely automatic, it produces 12 volts DC at a full 6 amps, while using much less AC current than other battery chargers. Unlike automotive trickle battery chargers, the float/equalize battery charger will not boil off the electrolyte in properly installed and maintained batteries. When the battery charger is attached to your battery and plugged into a standard 120 volt/60 Hz AC outlet, the red and green LEDs let you know the unit is recharging and maintaining your battery. Figure 1 illustrates the battery charger.

The GM28341/GM28694 float/equalize battery charger is designed to be used as an on-board battery charger for lead acid batteries (flooded cell or AGM types) and gel-cell type batteries.

For 24 VDC systems, use two battery chargers. Connect one battery charger to each battery as described in section 1.3.2.



**Figure 1** Battery Charger GM28341/GM28694

## 1.2 Important Safety Instructions

This manual contains important safety and operating instructions for the battery charger. Read the entire manual before using the battery charger. Also read all instructions and cautions for and on the battery charger, batteries, and equipment in the vicinity of the batteries.

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### WARNING



**Sulfuric acid in batteries.  
Can cause severe injury or death.**

Wear protective goggles and clothing. Battery acid may cause blindness and burn skin.

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**Battery electrolyte is a diluted sulfuric acid. Battery acid can cause severe injury or death.** Battery acid can cause blindness and burn skin. Always wear splashproof safety goggles, rubber gloves, and boots when servicing the battery. Do not open a sealed battery or mutilate the battery case. If battery acid splashes in the eyes or on the skin, immediately flush the affected area for 15 minutes with large quantities of clean water. Seek immediate medical aid in the case of eye contact. Never add acid to a battery after placing the battery in service, as this may result in hazardous spattering of battery acid.

**Battery acid cleanup. Battery acid can cause severe injury or death.** Battery acid is electrically conductive and corrosive. Add 500 g (1 lb.) of bicarbonate of soda (baking soda) to a container with 4 L (1 gal.) of water and mix the neutralizing solution. Pour the neutralizing solution on the spilled battery acid and continue to add the neutralizing solution to the spilled battery acid until all evidence of a chemical reaction (foaming) has ceased. Flush the resulting liquid with water and dry the area.

**Battery gases. Explosion can cause severe injury or death.** Battery gases can cause an explosion. Do not smoke or permit flames or sparks to occur near a battery at any time, particularly when it is charging. Do not dispose of a battery in a fire. To prevent burns and sparks that could cause an explosion, avoid touching the battery terminals with tools or other metal objects. Remove all jewelry before servicing the equipment. Discharge static electricity from your body before touching batteries by first touching a grounded metal surface away from the battery. To avoid sparks, do not disturb the battery charger connections while the battery is charging. Always turn the battery charger off before disconnecting the battery connections. Ventilate the compartments containing batteries to prevent accumulation of explosive gases.

**Battery short circuits. Explosion can cause severe injury or death.** Short circuits can cause bodily injury and/or equipment damage. Disconnect the battery before generator set installation or maintenance. Remove all jewelry before servicing the equipment. Use tools with insulated handles. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery. Never connect the negative (-) battery cable to the positive (+) connection terminal of the starter solenoid. Do not test the battery condition by shorting the terminals together.

**This battery charger should be used to charge only 12 volt DC lead acid or gel-cell type battery systems.** Use on other than a 12 VDC electrical system can cause the battery to explode and cause personal injury.

### 1.2.1 Personal Safety Precautions

Adhere to the following personal safety precautions when installing or working with the battery chargers:

1. Someone should be within voice range or close enough to come to your aid when you work near a lead-acid battery.
2. Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing, or eyes.
3. Wear complete eye protection and clothing protection. Avoid touching your eyes while working near a battery.
4. If battery acid contacts your skin or clothing, wash immediately with soap and water. If acid enters the eye, flood the eye with cold, running water for at least ten minutes and get medical attention.
5. Never smoke or allow an open flame in the vicinity of the battery.
6. Do not drop a metal tool onto the battery. It may spark, short circuit the battery, and may cause an explosion.
7. Remove all metal personal items such as rings, bracelets, necklaces, and watches when working near a lead-acid battery. A battery can produce short circuit currents high enough to weld a ring or other metal object to metal, causing a severe burn.

## 1.2.2 Preparing to Charge Precautions

Before charging a battery with the battery charger, read the following precautions:

1. Do NOT operate the battery charger if the input or output cables or an LED is damaged or defective.
2. Make sure all accessories connected to the batteries you are charging are OFF.
3. If the battery or batteries must be removed from the equipment, always remove the grounded terminal from the battery first.
4. Be sure the area around the battery is well ventilated while the battery is being charged. Gas can be effectively blown away using a piece of cardboard or other non-metallic material as a hand fan.
5. Clean the battery terminals. Be careful to keep corrosion from coming in contact with your eyes.
6. For all batteries, carefully follow the manufacturer's recharging instructions.
7. Never allow the ring terminals to touch each other.
8. NEVER charge a frozen battery.

## 1.2.3 Grounding Precautions

**Grounding electrical equipment. Hazardous voltage can cause severe injury or death.** Electrocutation is possible whenever electricity is present. Open the main circuit breakers of all power sources before servicing the equipment. Configure the installation to electrically ground the generator set and related equipment and electrical circuits to comply with applicable codes and standards. Never contact electrical leads or appliances when standing in water or on wet ground because these conditions increase the risk of electrocution.

**Note:** Do not operate this battery charger with a two-prong adapter plug or extension cord. Doing so can result in serious personal injury.

**Note:** To reduce the risk of shock, connect only to an electrically grounded outlet.

## 1.3 Battery Charger Installation

For factory-installed battery chargers, proceed to Section 1.3.2.

### 1.3.1 Battery Charger Location

Mount the battery charger in a location that complies with national and local electrical codes. The manufacturer recommends that the battery charger have at least 203 mm (8 in.) of unobstructed area on all sides of the unit for effective cooling. The case of this battery charger will become warm during operation. Do not install the battery charger on carpeted, upholstered, or varnished surfaces.

### 1.3.2 DC Connections

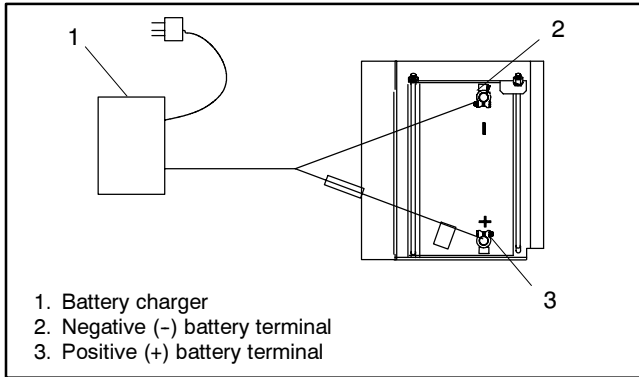
**Connecting the battery and the battery charger. Hazardous voltage can cause severe injury or death.** Reconnect the battery correctly, positive to positive and negative to negative, to avoid electrical shock and damage to the battery charger and battery(ies). Have a qualified electrician install the battery(ies).

Do not add extensions to the DC output leads. Extending the leads will degrade the battery charger performance and shorten battery life.

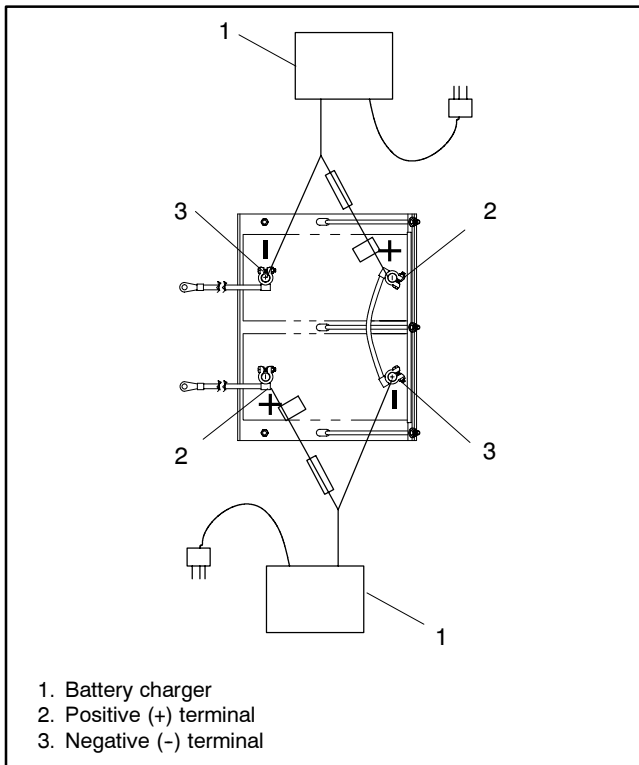
See Figure 2 for a single-battery, 12 VDC system. Use two battery chargers for a two-battery, 24 VDC system. See Figure 3.

1. Check the polarity of the battery posts. The POSITIVE (POS., P, +) battery post usually has a larger diameter than the NEGATIVE (NEG., N, -) post.
2. Attach the red POSITIVE ring terminal (identified by the red POSITIVE label on the red output wire) from the battery charger to the POSITIVE post of the battery. Attach the black NEGATIVE ring terminal (black output wire) from the battery charger to the NEGATIVE post of the battery.

- When disconnecting the battery charger, first disconnect the AC power cord, then remove the black (NEGATIVE) ring terminal from the negative battery post. Remove the red (POSITIVE) ring terminal from the positive battery post last.



**Figure 2** Single-Battery Connection, 12-Volt Electrical System



**Figure 3** Two-Battery Connection, 24-Volt Electrical System (requires two battery chargers)

### 1.3.3 AC Power Connections

The AC power connection must comply with national and local electrical codes. After securing the battery connections, plug the AC line cord into an electrically grounded 120 VAC outlet.

## 1.4 Battery Charger Specifications

Output	
Charging:	12 volts DC (min.) at 6 amps
Maintaining:	13.30 volts DC at 0.1 amps
Input	
Rated AC voltage	90-135 VAC, 50/60 Hz
Current draw	1.6 amp at full output
Maximum Recommended Battery Size	
For recharging	Up to 150 amp-hours
Maintenance only	Up to 300 amp-hours
Physical Dimensions	
Height	89 mm (3.5 in.)
Width	163 mm (6.4 in.)
Depth	53 mm (2.1 in.)
Weight	1.6 kg (3.5 lb.)

**Figure 4** Battery Charger Specifications

## 1.5 Battery Charger Operation

Figure 5 illustrates the three-stage charging method. The chart in Figure 6 describes the LED indicator operation during each stage of the charging process.

## 1.6 Battery Charger Maintenance

Periodically clean both battery terminals with baking soda and tighten all connections. No other maintenance on the battery charger is required.

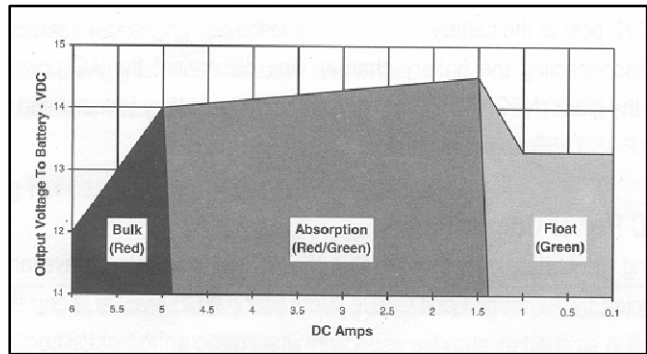


Figure 5 Charging Method

## 1.7 Troubleshooting

Use the LED indicators and the table in Figure 7 to troubleshoot battery charger operation problems.

Display	Operating Condition
Red ON Green OFF	When the red LED is on, it indicates the battery is discharged and the battery charger is recharging at the BULK rate (stage 1). This charging rate is 6 amps. While the red LED is on, the voltage measured (with the battery charger on) will be 11.8-14 volts.  If the red LED stays on for more than 24 hours, refer to Problem 1 in the troubleshooting section in this manual.
Red ON Green ON	When both the green and the red LEDs are on, the battery charger is charging at an ABSORPTION rate of between 1.5 and 5 amps (stage 2). This mode of charging gradually tops off your battery, and reduces harmful sulfating. While both LEDs are on, the voltage measured (with the battery charger on) should be approximately 14.0-14.5 VDC.  If both LEDs stay on longer than 24 hours, refer to Problem 2 in the troubleshooting section in this manual.
Red OFF Green ON	When the green LED is on, the battery charger is charging at a FLOAT or MAINTENANCE rate of less than 1.5 amps (stage 3). Your battery is now 90% charged and ready for use. This float charging current will gradually decrease to as low as 0.1 amps as the battery reaches 100% charge. It will now be kept at full charge without overcharging.  If the green LED stays on when your battery is known to be low, refer to Problem 3 in the troubleshooting section in this manual.

Figure 6 LED Indicator Functions

Problem	Cause	Solution
Red LED stays on for more than 24 hours	One or more defective or damaged cells.	Load test the battery and replace, if necessary
	Battery charger has reduced its output voltage below the normal level due to a DC overload or a DC short.	Remove the source of the overload or short. Disconnect the battery charger's black (NEGATIVE) ring terminal from the battery. Reapply AC power and the green LED only should now light.
	Onboard DC systems are drawing more current than the battery charger can replace.	Turn off all DC equipment while charging.
Red and green LEDs stay on for more than 24 hours	Onboard DC systems are drawing between 1.5 and 5 amps.	Turn off all DC equipment while charging.
	One or more defective or damaged cells.	Load test the battery and replace, if necessary
	Extremely low AC voltage at the battery charger.	Apply a higher AC voltage source or reduce the length of the extension cord.
Green LED stays on when the battery is known to be low	Other	Check battery manufacturer's specifications on battery charging.
	Open DC output fuse.	Replace AGS-10 fuse.
	Faulty or contaminated terminal connections.	Clean and tighten or repair all terminal connections.
Neither of the LEDs turn on when the AC power is applied	One or more defective or damaged cells.	Load test the battery and replace, if necessary.
	No AC power available at the battery charger.	Connect AC power or reset the AC breaker on the main panel.
	Component failure.	Return battery charger to the Service Dept.

Figure 7 Battery Charger Troubleshooting

## 1.8 FCC Class B EMC Notice

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. Class B digital devices can also be used in commercial, business and industrial environments. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.