

Maxwell Generator Starting Solutions GSS)

Frequently Asked Questions (FAQ)

- Q: What is the self-discharge on GSS modules after fully charging it?

A: GSS modules begin self-discharge as soon as charging voltage is removed. With no charger connected, fully charged modules will self-discharge to half voltage in approximately 15-16 hours.
- Q: Shelf life before charging it?

A: If stored at $25^{\circ}\text{C} \pm 10^{\circ}\text{C}$, fully discharged GSS modules have a 4-year shelf life.
- Q: Do GSS modules ship charged?

A: No. By shipping the units fully discharged, they avoid the classification of DANGEROUS GOODS and can therefore be legally shipped via air freight. Lead-acid batteries, on the other hand, cannot be fully discharged without damage and therefore fall under the classification of DANGEROUS GOODS.
- Q: How is the CCA calculated on GSS VS. Batteries?

A: Cold Cranking Amps (CCA) CCA is a rating used in the battery industry to define a battery's ability to start an engine in cold temperatures. The rating refers to the number of amps a 12-volt battery can deliver at 0°F for 30 seconds while maintaining a voltage of at least 7.2 volts. For lead-acid batteries this is a measured (tested) value, not calculated.

Ultracapacitors perform very differently from lead-acid batteries in that they:

 - 1) Lose voltage much more rapidly during discharge than lead-acid batteries
 - 2) Can continue to source substantial when discharged to half voltage
 - 3) Have lower internal resistance than lead-acid batteries

As a result of the above, measuring the CCA of an ultracapacitor using the lead-acid 30-second time period would result in an artificially low value. Accordingly, CCA for ultracapacitors is calculated using the following formula: $C \times (V_{\text{max}} - V_{\text{min}}) / (T + C \times \text{ESR})$ where C = capacitance in Farads, V_{max} =Starting voltage, V_{min} =Ending voltage, T = time, and ESR = equivalent series resistance in ohms. This calculation is commonly made with T = 3 seconds although the ultracapacitor module will typically crank an engine for 3 times that period.
- Q: Typical Failure mode of GSS modules?

A: The typical failure mode for Maxwell ultracapacitors is a gradual decrease in capacitance over their lifetime. End of Life (EOL) is defined as a 20% decrease in capacitance. It is extremely rare for an ultracapacitor to fail with a SHORT or OPEN condition.
- Q: Does GSS module contain any electrolyte?

A: Yes, GSS modules use an electrolyte known as acetonitrile, chemical formula CH_3CN . It is widely used in ultracapacitor applications because of its relatively high dielectric constant and ability to dissolve salts. It has also been used in formulations for nail polish remover.
- Q: Are GSS modules shipped with MSDS sheets?

No, but the full Ultracapacitor Safety Datasheet can be downloaded from the Maxwell website at: http://www.maxwell.com/images/documents/Safety_Datasheet_3000389_EN_4.pdf
- Q: How to determine how many GSS modules are required to start different engines?

A: Maxwell has developed the GSS Module Sizing Calculator which can be downloaded from the Maxwell website. It is a tool that quickly and easily determines the number of modules need to crank a diesel engine for a specified period of time. Inputs are: engine displacement, battery voltage, minimum cranking temperature, oil weight, and number of starter motors.

9. Q: How to configure GSS modules for a 90 second start requirement?
A: The GSS Module sizing calculator can handle this.
10. Q: How to comply with NFPA110 using GSS modules?
A: For Level 1 installation, the Simple Parallel, Solenoid Hybrid, or Diode Hybrid configurations must be used. Use of all-GSS configuration is in violation of NFPA 110.
11. Q: What is the warranty on GSS modules? Is it prorated?
A: 10 years when charged with Maxwell-approved (La Marche) charger; 4 years otherwise. Both are non-prorated.
12. Q: Can GSS modules be connected in parallel with batteries?
A: Yes. Care is required when first connecting new modules in parallel with fully charged batteries. Warranty is 4 years, non-prorated.
13. Q: Can GSS modules be used in parallel with engines with alternators?
A: Yes, but only after GSS module is full charged before being connected to alternator.
14. How long can the alternator charge the GSS modules before any detrimental effects on GSS module?
No limit as long as maximum voltage of GSS module is not exceeded (16.2 volts for 12-volt modules and 27.0 volts for 24-volt modules).
15. Q: How to size GSS module to power control panel power?
A: GSS Module Sizing Calculator handles this.
16. Q: Is interconnecting hardware included when using multiple GSS modules in parallel?
A: Currently, furnishing of connecting hardware is left to the installer.
17. Q: Testing procedure for GSS modules to diagnose end of life? Are load banks required?
A: The procedure below will allow the user/installer to monitor the capacity of the GSS system. Load banks are not required.
- A) Record the temperature displayed on the front panel of the charger.
 - B) Using a voltmeter measure and record the open circuit voltage of the GSS module bank.
 - C) Turn off fuel.
 - D) Crank the engine for a specific and accurate period of time (20.0 or 30.0 seconds recommended)
 - E) Immediately measure the open circuit voltage of the modules
 - F) Record the voltage
 - G) Subtract the second voltage measurement from the first; this value should remain relatively constant whenever the test is run. Major changes in temperature can and will influence this test; colder temperatures will cause an artificially large voltage drop.

The procedure above will accurately test for loss of capacitance in capacitors but cannot be used to test batteries. The reason is that ultracapacitors lose voltage linearly with time as they are discharged. Batteries do not exhibit the same characteristic.

18. Q: If the charger fails how long will the GSS module be charged for?
A: With no charger connected, fully charged modules will self-discharge to half voltage in approximately 15-16 hours.
19. Q: Is there current draw from GSS module even after it has been fully charged?
A: Yes, the GSS module will continue to draw a small current from the charger when fully charged. See table below for specific values for each model.

Module Voltage	12V		24V	
Model Number	GEN 31-900-12V-2T	GEN 31-1800-12V-2T	GEN 31-900-24V-2T	GEN 31-980-24V-2T
Leakage current (ma)	113	226	113	126

20. Is the temperature sensing probe included with USC Charger? Which terminal should it be connected to?
Yes, one temperature probe with 10 feet of cable is included with each charger. The probe is on a ring lug that must be connected to the negative terminal of the GSS module that is in the warmest location.
21. What is the recharge time for the GSS module to get charged from fully discharged state?
Approximately 25 to 30 minutes per module when using the La Marche 10-amp charger.