Freedom e-GEN System User Guide

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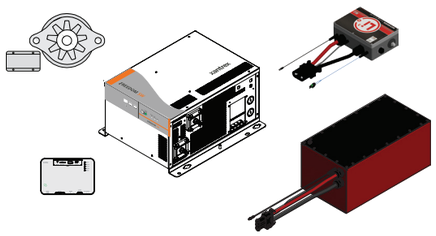

You must match the serial numbers labeled here to the serial numbers labeled on the BMS and battery module units.
⚠ Do not proceed if the serial numbers do not match.

BMS Serial Number

Battery Module Serial Number

⚠⚠DANGER

HAZARD OF FIRE, ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

This Freedom e-GEN System User Guide is in addition to, and incorporates by reference, the relevant product manuals for each product included in the power system. Before reviewing this guide you must read the relevant product manuals. Unless specified, information on safety, specifications, installation, and operation is as shown in the primary documentation received with the product. Ensure you are familiar with that information before proceeding.

Failure to follow these instructions will result in death or serious injury.

Exclusion for Documentation

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Contact Information

http://www.xantrex.com

Please contact Xantrex at 1-800-670-0707, customerservice@xantrex.com, or visit the Xantrex website at: http://www.xantrex.com.

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Important Safety Information

READ AND SAVE THESE INSTRUCTIONS - DO NOT DISCARD

This guide is intended for qualified personnel. Certain configuration tasks shall only be performed by qualified personnel in consultation with your local utility and/or an authorized dealer. Electrical equipment shall be installed, operated, serviced, and maintained only by qualified personnel. Servicing of batteries shall only be performed or supervised by qualified personnel with knowledge of lithium-ion batteries and their required precautions.

Qualified personnel have training, knowledge, and experience in:

- Installing electrical equipment
- Applying applicable installation codes
- Analyzing and reducing the hazards involved in performing electrical work
- Installing and configuring lithium-ion batteries
- Selecting and using Personal Protective Equipment (PPE)

No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

⚠⚠DANGER

HAZARD OF FIRE, ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- Equipment must only be installed and serviced by qualified electrical personnel.
- Never operate equipment energized with covers removed.
- Inverters are energized from multiple sources. Before removing covers of inverters and other equipment identify all sources, de-energize, lock-out, and tag-out and wait 2 minutes for circuits to discharge.
- Always use a properly rated voltage sensing device to confirm all circuits are de-energized.

Failure to follow these instructions will result in death or serious injury.

⚠⚠DANGER

HAZARD OF FIRE, ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

In case of fire, use only a Class D type fire extinguisher. Lithium reacts chemically to water and may cause an explosion and worsen the fire.

Failure to follow these instructions will result in death or serious injury.

⚠WARNING

HAZARD OF ELECTRIC SHOCK OR PERSONAL INJURY

- A battery can present a risk of electrical shock, burn from high short-circuit current, fire or explosion from vented gases. Observe proper precautions.
- Do not alter or modify the system. Do not replace any of the system devices – lithium-ion battery module, BMS, alternator/regulator, or Freedom SW 3012.
- Do not connect a battery charger of any kind to the system DC load. Energy must not be injected into the system DC bus.
- Do not operate the inverter and other equipment with damaged or substandard wiring.
- Do not expose any of the equipment to rain, snow, or liquids of any type. Products in the system are designed for indoor use only.
- Do not modify the battery module or the BMS. Always use the battery module with the BMS.
- Never bypass the BMS. The BMS must always be connected to the battery and in the circuit for proper operation and safety.

Failure to follow these instructions can result in death or serious injury.

NOTICE

RISK OF EQUIPMENT DAMAGE

- Do not physically modify the system devices, wiring harness, and accessories.
- Do not alter system factory settings on any of the system devices, including the BMS, the Freedom SW 3012, and the alternator/regulator.
- Do not disassemble the battery module and the BMS. They contain non-serviceable parts.
- Do not charge the battery through the system DC load.
- Do not allow the battery to be depleted. Charge the battery when the low battery alarm's orange light is illuminated.
- Perform a full charge cycle every seven (7) days to maintain battery health and system accuracy.
- Fully charge the battery before putting it and the BMS away for short term storage. Proper storage technique is crucial to battery longevity and fast system deployment.
- Store the battery within its specified storage temperature (see "***Power System Specifications***"). For more information on battery storage, refer to the battery manufacturer's recommendations on short-term (< 3 months) and long-term (> 3 months) storage.

Failure to follow these instructions can result in damage to equipment and may void the warranty.

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Introduction

The Freedom e-GEN System solution from Xantrex is a lithium-ion battery-based power system that offers safe, clean, efficient onboard power with high power density and low operating cost. The system provides grid quality 120V/ 60Hz true sine wave AC output and a steady DC battery output. The system supports charging from both the second alternator and shore power offering flexibility and minimum recharge time. The Freedom e-GEN System consists of the following core components:

- Freedom SW 3012 Inverter/Charger
- Lithium-ion Battery Management System (BMS) and associated battery module
- Second alternator and associated regulator
- Conext ComBox

This user guide provides basic instructions on how to operate and maintain the system. For more information, refer to each device's Owner's Guide.

Power System Specifications

The specifications listed here are for the Freedom e-GEN System. Certain operating conditions apply. For complete specifications, refer to each device's datasheet and Owner's Guide.

Electrical Overview

Energy Storage Capacity: 600Ah
Nominal System DC Voltage: 12.8VDC
Nominal System AC Voltage: 120VAC @ 60Hz
System AC Output Power Rating: 3000W up to 40 °C (104 °F)

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Battery Overview

Battery/System State	Battery Voltage	Battery State-of-Charge (SoC)
Fully Charged	14.6V-13.6V	100%
Nominal Operation	14.6-12.2V	100-12%
Low Battery Warning	12.2V	12%
Inverter Shutdown	12.1V	11%
Reserve Shutdown	12.0V	10%
Low Battery Shutdown	11.6V	<3%

Recommended Ambient Temperature

Charging range*	0 – 35 °C (32 – 95 °F)
Discharging range*	-20 – 40 °C (-4 – 104 °F)
Storage range**	15 – 35 °C (59 – 95 °F)

* Staying within the recommended temperature range will yield optimal system performance. For maximum temperature specifications, refer to each device's datasheet and Owner's Guide.

** Refer to the NOTICE above for direction on proper storage.

Humidity

Operating range	5 – 95% RH, non-condensing
Storage range**	45 – 75% RH, non-condensing

Battery Disposal

At the end of the battery's useful life, proper disposal is required. Do not dispose the battery with ordinary household waste. Refer to your local codes for proper disposal of lithium-ion batteries.

⚠⚠DANGER

HAZARD OF FIRE, ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Upon disposal, do not crush, puncture, drop, disassemble, dispose of in fire, or similar actions.

Failure to follow these instructions will result in death or serious injury.

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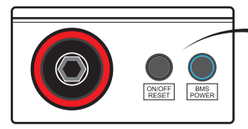
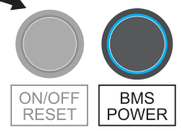
BMS Operation



BMS UNIT (+) TERMINAL SIDE VIEW

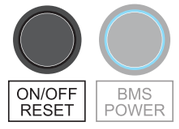
Turning ON the BMS



- Push down the **BMS POWER** button once.

The internal circuit of the BMS is powered and you will hear a clicking sound once battery power is engaged at the BMS output terminals.

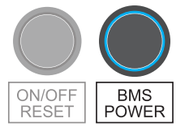
Disengaging/Engaging Battery Power



- Push and hold the **ON/OFF RESET** button for 3 seconds.

You will hear a clicking sound once battery power is disengaged successfully at the BMS output terminals. Repeat to re-engage battery power.

Turning OFF the BMS



- Push the **BMS POWER** button once.

Battery power is disengaged and the internal circuit of the BMS is powered down. The BMS and battery module is ready for storage and transportation.

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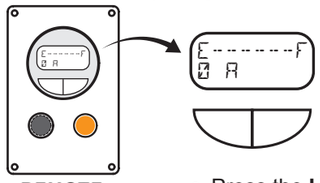
LCD Display



REMOTE PANEL

The **LCD Display** screen has two lines where battery information is displayed.

When first turned on, the screen displays the battery bar on the first line and battery current on the second line.

- Press the **Left (**or **Right)** button.
  The first line display will show battery information in the following order.

E-------F	Battery bar gauge (Empty-Full)
99% FUEL	Battery fuel (%) - indicates battery capacity before system shutdown
99% SOC	Battery state-of-charge (%) - indicates battery capacity before depletion
5.0 A	Charging current (amps) - shown with "+" or Discharging current (amps) - no sign
100 W	Load power consumption (watts)
10.0 A	Battery current (amps)
12.8 V	Battery voltage (volts)
79F TMP	Battery temperature
R00001	Battery status code
x.x AH	Battery amp-hours (Ah) remaining
x.x WH	Battery watt-hours (Wh) remaining

The second line display will show battery information in the same order starting with battery current.

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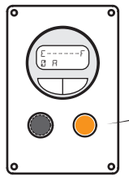
Remote RESET Button and Low Battery Alarm (Orange Light)



REMOTE PANEL

- Push (and hold) the **RESET** button on the left to engage (disengage) battery power.
  This button has the same function as the **ON/OFF RESET** button on the BMS.

The orange light on the right is illuminated when battery voltage is low (12% battery capacity left). When this occurs, remove load and charge the battery either by turning on the vehicle engine or applying shore power.

At 11% battery capacity, the Freedom SW stops inverter operation.

At 10% battery capacity, a reserve shutdown event occurs. Follow the steps in the "***System Charging***" section to begin charging the battery.

At 3% battery capacity, the battery is depleted and a low voltage shutdown event occurs. Follow the steps in the "***Low Battery Recovery***" section and charge the battery immediately.

NOTE: Pushing the **RESET** button when the Orange Light is illuminated will cause the light to turn off.

NOTICE

RISK OF BATTERY DAMAGE

Do not allow the battery to be depleted. Charge the battery immediately when the low battery alarm orange light illuminates.
Failure to follow these instructions can result in damage to the battery.

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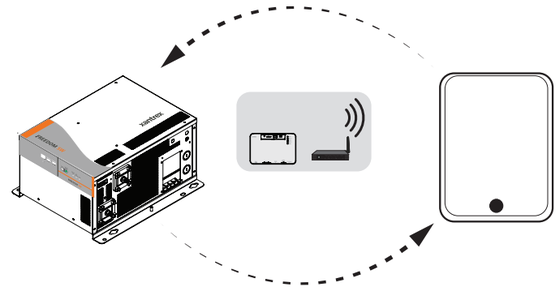
Inverter Operation



Once battery power is engaged (see "***BMS Operation***"), the Freedom SW can now produce AC power.

You may control and monitor Freedom SW performance through an Android tablet which is enabled by Conext ComBox.

NOTICE

RISK OF EQUIPMENT DAMAGE

Do not change the factory settings of the Freedom SW.
Failure to follow these instructions can result in damage to equipment.

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DC Loads

The system can also provide a 12V DC power source tapped from the house battery to power DC loads. Contact your dealer for this option.

NOTE: When charging, avoid using DC loads to prevent prolonging the charging time. Also, avoid using heavy DC loads during charging to prevent the system from transitioning to thermal protection mode.

⚠WARNING

HAZARD OF FIRE, ELECTRIC SHOCK, OR EXPLOSION

Do not connect a battery charger to the DC load to charge the house battery.
Failure to follow these instructions can result in death or serious injury.

NOTICE

RISK OF BATTERY DAMAGE

- Do not leave DC load appliances on if they are not in use as this will drain the battery.
- Avoid using heavy DC loads and AC loads simultaneously.

Failure to follow these instructions can result in damage to the battery.

System Charging

When the battery's SoC is greater than 10% and while battery power is still engaged, you may charge the battery by applying shore power or turning on the engine of the vehicle.

When SoC is less than 10% but greater than 3% and the reserve shutdown event has occurred, press and briefly hold the **ON/OFF RESET** button on the BMS (or **RESET** button on the remote panel) to engage battery power. While battery power is engaged, promptly turn on the engine or apply shore power to charge the battery or both.

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Low Battery Recovery

NOTICE

RISK OF BATTERY DAMAGE

Turn off (or disconnect) all DC loads completely before performing a Low Battery Recovery procedure.
Failure to follow these instructions can result in damage to the battery.

When SoC is less than 3% and the low voltage shutdown event has occured, you can only charge the battery through shore power. Follow the steps below.

1. Turn off (or disconnect) all DC and AC loads completely.
2. Apply shore power to the power system's AC input (shore power input).
3. Push and hold the **ON/OFF RESET** button on the BMS/remote panel for 5 seconds to engage battery power.
4. Charging automatically begins once battery power is engaged and shore power has been qualified.

* The user can accelerate charging by turning on the engine shortly after shore power charging begins.

When SoC is less than 3% and following the steps above does not begin charging, then the battery including the entire power system has to be serviced by a qualified person such as an authorized technician. See your dealer for help.

NOTICE

RISK OF BATTERY DAMAGE

Do not perform the low battery recovery procedure repeatedly. Contact customer service so they can refer you to an authorized technician for service .
Failure to follow these instructions can result in damage to the battery.

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Troubleshooting

PROBLEM	CAUSE	SOLUTION
Battery and LCD Display are turned off automaticaly.	Battery is low.	Follow the steps in "***System Charging***" and charge the battery immediately.
	Battery is critically low.	Follow the steps in "***Low Battery Recovery***" and charge the battery immediately.
Battery will not turn on by pressing and holding the **RESET** button.	Battery temperature is too high or too low.	Use proper ventilation and make sure ambient temperature is not too hot or too cold.
	A short-circuit has occurred and the BMS has locked the battery.	Remove the short-circuit and cycle the **BMS Power** Button.
The orange alarm light activates when the battery is not low.	**ON/OFF RESET** button on the BMS or Remote was activated inadvertently.	Press the **ON/OFF RESET** button again.
Charging from the second alternator is slow.	Alternator temperature is too high.	Allow the alternator to cool down. Provide it with sufficient ventilation. When idle-charging, park the vehicle in a cool spot.
No charging from the second alternator.	Fuse blown or the alternator is damaged.	Call for service.

NOTE: Refer to the Troubleshooting section in the Freedom SW Owner's Guide for troubleshooting tips for your inverter/charger.

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