# Xantrex Lithium-ion Batteries Quickstart Guide

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A MISSION CRITICAL ELECTRONICS BRAND

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A MISSION CRITICAL ELECTRONICS BRAND
LITHIUM ION BATTERY

**884-0310-12**
**884-0410-12**

## ⚠⚠DANGER

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

This Xantrex Lithium-ion Batteries Quickstart Guide is in addition to, and incorporates by reference, the relevant product manuals for each product in the power system. After 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.**

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**NOTE**: Visit http://www.xantrex.com , click Products, select a Product category, select a Product, and search the Product Documents panel for a translation of the English guide, if available.

### Contact Information


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## IMPORTANT: ON FIRST USE

Perform a full charge, discharge, and charge cycle to ensure maximum battery life. For information, see section A on battery storage guidelines and section B on battery maintenance guideline.

# 1

## Important Safety Information

### READ AND SAVE THESE INSTRUCTIONS

Electrical equipment shall be installed, operated, serviced, and maintained only by qualified personnel. Certain configuration tasks shall only be performed by qualified personnel in consultation with your local utility and/or an authorized dealer. Servicing of batteries and the BMS 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 Xantrex LLC for any consequences arising out of the use of this material.

**ARC FLASH HAZARD**

⚠ An example of an arc flash event could be a direct short circuit caused by a metallic object such as a tool bridging between the positive and negative of an energized circuit.

## ⚠⚠DANGER

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

- This battery shall be installed and serviced only by qualified personnel.
- Always wear proper PPE (safety glasses and clothing) when working on the Li-ion battery and follow safe electrical work practices according to local codes.
- Do not wear metallic items such as watches or bracelets when working on the battery. Use insulated tools to prevent accidental short circuit.
- Do not install the Li-ion battery module adjacent to any heat source. Keep away from sources of ignition.
- Do not install or operate any of the system devices in a compartment containing flammable materials or in locations that require ignition-protected equipment.
- Do not use in vital, medical, or life-support applications.

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

## ⚠⚠DANGER

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

- No user-serviceable parts. Do not attempt to open or dismantle the Li-ion battery. If the battery module is damaged, do not touch the corrosive electrolyte or powder, and consult your dealer.
- When the battery module is damaged, it can release harmful gases. Ensure the surrounding environment is well-ventilated.
- In case battery content comes in contact with skin or eyes, immediately flush the affected area with large amount of clean water and seek medical help.
- In case of fire, use only a Class ABC (dry chemical) or $CO_2$ type fire extinguisher. Water can be a dangerous extinguishing medium for energized equipment because of the risk of electric shock.
- Dispose of Li-ion batteries through a local recycling center. Do not mix batteries with other wastes Contact your local recycling center for proper disposal information.
- Do not crush, puncture, drop, disassemble, or dispose of in fire.

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

## ⚠WARNING

**HAZARD OF FIRE, ELECTRIC SHOCK, EXPLOSION, AND PERSONAL INJURY**

- Do not expose the Li-ion battery to rain, snow, or liquids of any type. Products are designed for indoor use only.
- Do not step or stand on the battery module enclosure.
- Always use proper lifting techniques when handling the battery module. Battery is heavy.
- Do not charge the battery in ambient temperature below freezing.
- Do not disconnect the battery while it is being charged.

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

## *NOTICE*

**RISK OF EQUIPMENT DAMAGE**

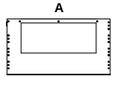
- Do not allow the battery to be depleted.
- Charge the battery module with an approved charger. Contact Xantrex for details.
- Do not charge the battery above the recommended voltage.

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

# 2

## Introduction

The Xantrex Lithium-ion Batteries are lithium iron phosphate ($LiFePO_4$) chemistry batteries used in conjunction with the internal Battery Management System (BMS) unit which protects the batteries and monitors state-of-charge (SoC), voltage, current, and temperature.




**A - Xantex Battery**
**B - Quickstart guide**
**C - Rebling connector**

### ⚠*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.

## Installation

1. Check the battery, the cable-mounted keyable plug (*Figure 1* ), and the battery cable (if included) for visible damage including cracks, dents, chips, and deformations.
2. Select a location for the battery that is stable, clean, cool, dry, and well-ventilated.
3. Mount the battery with either the top label or the side label pointing up. Keep the battery away from all heat sources.
4. Orient the devices so that the cables avoid sharp bends. Follow the bending radius recommendation (*Figure 3* ). This applies to all DC cables.
5. Disassemble the cable-mounted keyable plug (*Figure 1* ) and set them (the top, terminals, and boot) aside.

**NOTE**: Installation and maintenance shall only be performed by qualified personnel as defined in Important Safety Information above.

6. Make sure the battery is turned off. If the LED on the battery is lit, press and hold the button for ten (10) seconds until the LED turns off. Also ensure all other DC sources have been powered off and disconnected, if possible.
7. Attach using a 5/16" (or 3/8") lug, the negative (-) battery cable to the negative (-) battery terminal of the cable-mounted keyable plug. Review *Figure 2* for proper routing including feeding the cables through the boot and stacking the terminal hardware. Tighten the bolt to 60±3 in-lb (or 6.7±0.35 N-m).
8. Install your DC-rated circuit protection device (*Figure 2* ) in line with the positive battery cables.

## *NOTICE*

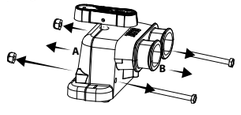
**BATTERY DAMAGE**

- Check the cable polarity before making the final DC connection to avoid damage due to reverse polarity.
- Do not connect multiple batteries in series to avoid damaging the battery. See *Figure 4* .
- You may connect multiple batteries in parallel. See *Figure 4* .

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

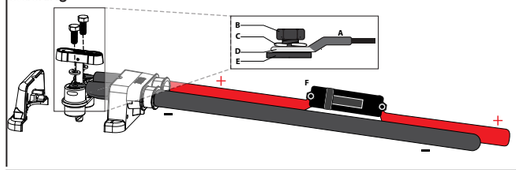
9. Attach the protected positive (+) battery cable to the positive (+) battery terminal of the cable-mounted keyable plug. Review *Figure 2* for proper routing including feeding the cables through the boot and stacking the terminal hardware. Tighten the bolt to 60±3 in-lb (or 6.7±0.35 N-m).
10. Reassemble the cable-mounted keyable plug by encapsulating the key assembly with the top and boot.
11. Attach the cable-mounted keyable plug to the battery terminals by turning the key lever clockwise.

*Figure 1 Cable-mounted keyable plug*




**TIP**: Separate the top (A) from the boot (B) as shown to expose the key assembly which contains the battery terminals.

*Figure 2 Cable routing and terminal post stacking*




**A - battery cable**
**B - terminal bolt**
**C - lock washer**
**D - cable ring lug**
**E - terminal**
**F - DC-rated circuit protection device e.g. battery breaker**

**NOTE**: The cable-mounted keyable plug doubles as a protective boot that securely attaches the battery cables as an assembly to the battery terminals.

12. Turn on the battery by pressing and holding the Power button for one (1) second. The battery takes approximately 40 seconds to boot up and the contactor to close.
13. Verify that the voltage on the DC bus is approximately 12VDC (nominal).

**Optional**: Connect the 12-pin connector cable and route the remote connectors as required.

*Table 1 Pin reference guide*

| Pin # | Color | Function | Signal | Feature Description |
|---|---|---|---|---|
| 1 | Red | Engine Running Input | Input High (12V) | 12V Power signal will:<br>• Turn the battery from OFF to ON state. (Will not turn the battery from MAINTENANCE to ON state.)<br>• If the internal contactor is closed then it shall wait two seconds before Pin 2 shall go high (12V). (If the power is removed from this pin, Pin 2 shall also drop immediately.) |
| 2 | Orange | Alternator Activation Output (FCC Enable) | Output High (12V) | If the internal contactor is closed and the battery pack needs to open it (due to an error), the BMS will set the Alternator Activation output low (0V) to turn off the alternator, wait two seconds, and then open the internal contactor. |
| 3 | Grey | Push button wire 1 out (power) | Signal (12V/10mA) | Push Button wire 1 (momentary switch)<br>⚠ This wire is to be utilized for the Remote Push-button Supply ONLY. |
| 4 | Grey | Push button wire 2 in (return) | Return (12V) | Push button wire 2 (momentary switch)<br>Power on this pin for certain times and sequences can perform the following actions:<br>• Power the Unit ON<br>• Power the Unit OFF<br>• Enter Maintenance Mode<br>• Clear Faults<br>• Other Maintenance Features. |
| 5 | Black | LED output | Output (12V) | On/Off LED output (12V) |
| 6 | Black | LED return | Return (12V) | Common return for remote on/off LEDs |
| 7 | White | CAN High | COMM | CAN/RV-C High |
| 8 | Blue | CAN Low | COMM | CAN/RV-C Low |
| 9 | Black | Low SOC alarm | Output (12V) | The pin will pulse a 12V signal while the battery SOC is between 20%-10%. Once the SOC has reached <10% the 12V signal shall be constant. |
| 10 | Violet | Charge Percentage (control of voltage) | Output PWM | If the alternator is enabled, the pack controller will regulate the duty cycle of the Charger Percentage PWM output to maintain the desired battery charging voltage. |
| 11 | Brown | Contactor state/Aux output | Output (12V) | 12V signal when contactor is closed |
| 12 | Yellow | Shore Charge Signal input | Input High (12V) | 12V Power signal will:<br>• Turn the battery from OFF state to ON state. (Will not turn the battery from MAINTENANCE to ON state.)<br>• Activates the internal heater and logic in cold environments.<br>• Indicate to the battery that shore power is present on the DC Bus. |

# 3

## Operation

**> 1 sec ON**

**3-5 sec MAINTENANCE**

**> 10 sec OFF**

**Power** push button for ON | OFF | MAINTENANCE. The push button is a multi-function button that must be held down for specified durations to complete each action.

a. Press the push button for more than one (1) second from either OFF or MAINTENANCE mode to turn the battery ON.

b. Press and hold the push button for 3-5 seconds during ON mode and this will put the battery to MAINTENANCE mode. This disconnects the cells and reduces the idle power consumption of the battery.

c. Press and hold the push button for more than ten (10) seconds during either ON or MAINTENANCE mode and the battery will turn OFF.

See the Owner's guide (*document number: 975-1044-01-01*) for information on *Interpreting Ring LED Patterns on the Battery.*

## Troubleshooting

⚠ When planning to remove the battery pack from a live system, **place the battery in MAINTENANCE mode before disconnecting the Rebling connector**.

The Xantex Battery has event or error states that are available through the Xantrex App via Bluetooth. Alternatively, the Power button's ring LED shows flashing patterns which correspond to an event or error state. See the Owner's guide (*document number: 975-1044-01-01*) online by scanning the QR code at the last section of this guide.

**NOTE**: The battery LED shall blink once per second for the first three seconds while held down, then transition to four times per second.

**NOTE**: If you connect with the Xantrex BMS via Bluetooth and using the Xantrex App on your smart device, you can find out more detail about the battery state including diagnosing and solving detected error events.

## Storage and Maintenance Instructions for Long Durations

1. Reduce the battery state-of-charge (SoC) to 50% ±10% which is approximately 13.2V for a 12V battery.
2. Turn off the battery by pressing and holding the Power pushbutton for ten (10) seconds.
3. Keep the battery in an environment according to *Battery Storage Guidelines*.
4. Every six months maintain the battery by charging it to 100% SoC, then discharging the battery to low voltage cutoff (LVC) level, then charging it back to 50% ±10% SoC.

***NOTICE***

**RISK OF BATTERY DAMAGE**
Do not charge the battery in ambient temperature below freezing.
**Failure to follow these instructions can result in damage to the battery and may void the warranty.**

# 4

## Specifications

**NOTE**: Specifications are subject to change without prior notice.

| Feature | 884-0310-12 | 884-0410-12 |
|---|---|---|
| Nominal Capacity | 310Ah | 410Ah |
| Nominal Voltage | 12.8V | 12.8V |
| Charging Voltage (max) | 14.6V | 14.6V |
| Float Voltage | 14.0V | 14.0V |
| Low Battery Cutoff Voltage | 11.2V | 11.2V |
| Recommended Charge Current | ≤ 250A | ≤ 300A |
| Max Charge Current (continuous) | 300A | 300A |
| Recommended Discharge Current | ≤ 250A | ≤ 300A |
| Max Discharge Current (continuous) | 300A | 300A |
| Max Pulse Discharge Current | 1000A (10 sec) | 1000A (10 sec) |
| Internal Impedance | ≤ 5mΩ | ≤ 5mΩ |
| Weight | 85lbs (38.5kg) | 120lbs (54.4kg) |
| L x W x H | 21.6 x 6.9 x 11.7 in (550 x 175 x 298 mm) | 21.6 x 8.9 x 11.7 in (550 x 225 x 298 mm) |
| Charging Temperature | 32 – 131 °F (0 – 55 °C) | |
| Discharging Temperature | -4 – 131 °F (-20 –55 °C) | |

*Figure 3 Avoiding sharp bends*

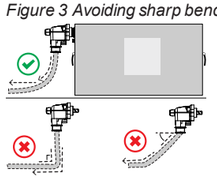
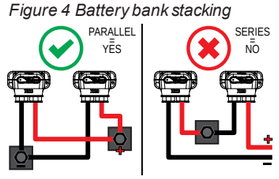


*Figure 4 Battery bank stacking*




This is for illustration purposes only.
**NOTE**: Keep the cables between batteries and ground cables the same lengths for optimal performance and to ensure equal discharging and charging.

# B

## Battery Maintenance Guideline

The Xantrex Lithium-ion Batteries system is designed to require the least amount of maintenance as possible. The battery and internal BMS are contained in a sealed device and do not require disassembly for maintenance reasons.

In general, to properly maintain the battery, follow the storage guidelines in the previous sections.

If the battery/ies are in regular use, then it is recommended that the battery/ies be fully charged a minimum of once per two weeks in order for the BMS to recalibrate its State of Charge (SoC) setting. This process also ensures that the SoC meter maintains its accuracy.

# A

## Battery Storage Guidelines

In order to keep your Xantrex Lithium-ion Batteries at peak performance and at its healthiest state, you have to store it according to proper storage conditions and also maintain it with proper care.

Storage can be short term, such as less than one month or long term, such as more than six months.

*Table 2 Storage specifications*

| Term | Temperature | Humidity | Self-discharge Rate | Duration |
|---|---|---|---|---|
| < one week | –4 to 113°F ( –20 to 45°C) | < 85%RH | ≤3% per month | Short |
| < one month | 14 to 113°F (–10 to 45°C) | < 85%RH | ≤3% per month | Short |
| < six months | 50 to 77°F (10 to 25°C) | < 85%RH | ≤3% per month | Short |
| > six months* | 50 to 77°F ( 10 to 25°C) | < 85%RH | ≤3% per month | Long |

* For long term duration storage the battery should be kept in a particular charged state such as, 13.2V, ~50% SoC, and stored at the recommended storage specifications shown above.

## Storage Instructions for Short Durations

1. Fully charge the battery.
2. Turn off the battery by pressing and holding the Power pushbutton for ten (10) seconds.
3. Keep the battery in an environment according to *Battery Storage Guidelines*.

**NOTE**: For more information, scan and follow the links below.

| | |
|---|---|
| | Xantrex Lithium Ion Batteries website |
| | Xantrex Lithium Ion Batteries User and Installation Guides |