

# USER MANUAL

## EX2 12V Edge

### EX-EX2-12240-BCH



### Disclaimer

While every precaution has been taken to ensure the accuracy of the contents of this guide, Expion360 assumes no responsibility for errors or omissions. Note as well that specifications and product functionalities may change without notice. Find the latest updates online at [expion360.com](http://expion360.com).

### Important

Please be sure to read and save the entire manual before using the products. Misuse may result in damaging the products, causing harm, or incurring serious injury. Read this manual in its entirety before using the products. Instead of saving this manual, refer to the digital version of this manual on the Expion360 website for any updates and future reference.

<https://expion360.com/pages/customer-support>

### About Us

#### Safety

Expion360 lithium batteries use lithium iron phosphate (LiFePO<sub>4</sub>/LFP) chemistry, which is the best choice for RV, marine, and off-grid power storage applications because of its high degree of safety and long cycle life.

#### Quality

Every Expion360 battery uses cells that are UL 1642 recognized (file no. MH64383), and the battery is certified compliant to UL 1973 by Tei Listing Services (file no. 22D01) to meet the highest standard in safety and performance. Internal power distribution bus bars are mechanically connected (bolted) rather than soldered to lower contact resistance and provide a robust physical connection point. The internal power-distribution plates connecting the cells, battery management system (BMS), and internal terminals are solid copper.

Our proprietary case contains structural elements to protect the battery pack and BMS inside from the effects of vibration and movement. The high current dual quick disconnect (QD) positive and negative terminals allow toolless installation.

#### Service

The Expion360 technical support department has experts on standby to assist you. For assistance with our products, please contact us by phone or email any weekday during business hours.

[support@expion360.com](mailto:support@expion360.com)

+1 (541) 797-6714

Please read each warning carefully to prevent damage to the unit and injury to operators.  
Ignoring warnings can potentially void the warranty.

## WARNINGS:

- ⚠ DO NOT drop the battery.
- ⚠ DO NOT disassemble the battery.
- ⚠ DO NOT short-circuit the battery.
- ⚠ DO NOT submerge the battery in water.
- ⚠ DO NOT use the battery as a starter battery.
- ⚠ DO NOT attempt to repair the battery.
- ⚠ DO NOT mix batteries of different ages, voltages, capacities, or manufacturers.
- ⚠ DO NOT ignore battery installation guidelines.
- ⚠ DO NOT undersize battery cables.
- ⚠ DO NOT undersize the battery system.
- ⚠ DO NOT connect EX2 batteries in series.
- ⚠ DO NOT connect more than two batteries in parallel per string.
- ⚠ DO NOT connect an unequal number of batteries in parallel within each string.
- ⚠ DO NOT charge the battery with an incorrect charger profile.
- ⚠ DO NOT charge the battery above the BMS protection voltage.
- ⚠ DO NOT charge the battery beyond its maximum charge rate.
- ⚠ DO NOT discharge the battery below the BMS protection voltage.
- ⚠ DO NOT discharge the battery beyond its maximum discharge rate.
- ⚠ DO NOT connect the battery to any load while in long-term storage.
- ⚠ DO NOT operate or store the battery outside the specifications outlined in the manual.

## Table of Contents

Disclaimer.....	2
Important .....	2
About Us.....	2
Safety .....	2
Quality.....	2
Service.....	2
WARNINGS:.....	3
Overview .....	6
LED Status .....	8
LED Light.....	8
SOC Indicator .....	8
DIP Switch .....	9
Battery System Installation.....	10
Battery System Configurations.....	10
Parallel Installation.....	10
Series Installation .....	10
Battery Terminal Connections.....	11
Battery System Installations .....	12
Communication.....	14
SmartTalk™ and the Expion360 App .....	14
Controller Area Network (CAN) Bus Communication .....	15
Victron Communication .....	15
Vertical Heat Conduction Technology™ (VHC™) .....	16
Operation of the VHC™ .....	16
Wiring Recommendations .....	17
RV Installations.....	17
Recommended Wire Gauge .....	18
Circuit Protection.....	19
Single String Battery System .....	20
Multi-string Battery System .....	20
Charging .....	21
Charger Profile.....	21
Two-Stage CC-CV Charger .....	21
Single-Stage CC Charger .....	21
Multi-Stage Charger .....	21
Charging Options .....	22
Shore Power Charging.....	22
Inverter Charger Charging.....	22
Solar Charging .....	22
Alternator Charging.....	22

Charger Sizing .....	23
Discharge.....	24
Inverter Sizing .....	24
Battery Management System (BMS) .....	25
Short Circuit Protection .....	25
Overvoltage Protection .....	25
Undervoltage Protection .....	25
Overcurrent Protection .....	25
Thermal Protection.....	25
Cell Balancing.....	25
Battery Life.....	26
Depth of Discharge (DoD).....	26
Operating Temperature Range.....	26
Charge/Discharge Rate .....	26
Storage Condition .....	26
Storage .....	27
Accessories.....	28
Battery Specifications .....	29
Warranty .....	30
12-Year Warranty .....	30
0-8 Years/2000 Cycles.....	30
8-10 Years .....	30
10-12 Years .....	30
Installation .....	30
Non-Transferable.....	31
Product Return and Shipping.....	31
Battery Storage.....	31
Water Ingress Warning.....	31
Warranty Exclusions .....	31
Warranty Disclaimer .....	32
Legal Rights .....	32
Submitting A Warranty Claim .....	32

# EXPION360®

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## Overview

The Expion360 SmartTalk™ EDGE™ LiFePO4 (Lithium Iron Phosphate, LFP) Battery is specifically designed for Recreation Vehicle (RV) applications, featuring Bluetooth, CAN Bus Communication, and Vertical Heat Conduction™ (VHC) technology in a new slim profile.

The slim design enhances the modularity of the battery system configuration. The cells contribute to the battery's structure, providing added rigidity. Additionally, the internal reinforcement allows for flexible installation options—vertically on a wall, horizontally on the ground, or even upside down on the ceiling. (Note: The terminals must always be positioned to the side or top. Do not install the battery with the terminals facing downward.) The high-current, dual quick-disconnect (QD) positive and negative terminals also allow for toolless installation.

SmartTalk™ technology continuously monitors the battery system's status and reports wirelessly or via CAN Bus for real-time communication.

The proprietary Vertical Heat Conduction™ (VHC™) technology utilizes Positive Temperature Coefficient Heating Films (PTCHF) and advanced heating algorithms, providing the industry's most efficient and safe heating solution with superior performance and comprehensive application coverage.



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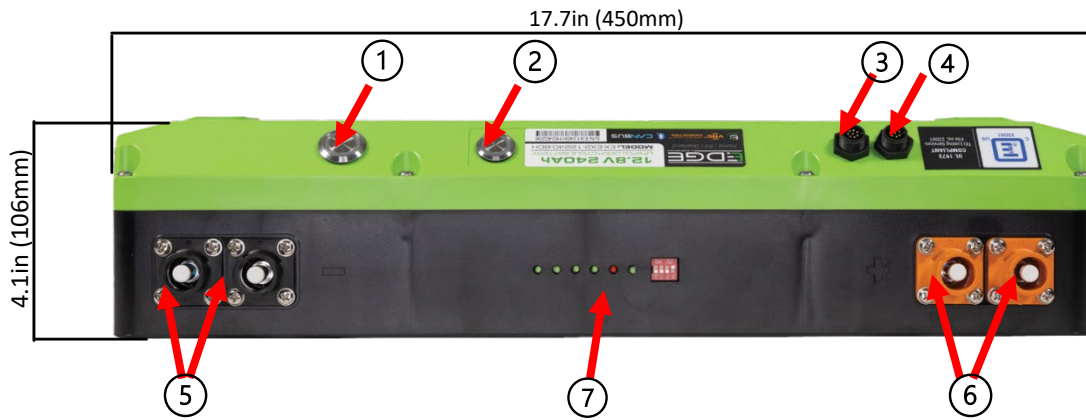


Figure 1: View of the EX2 terminal connection side and dimensions.

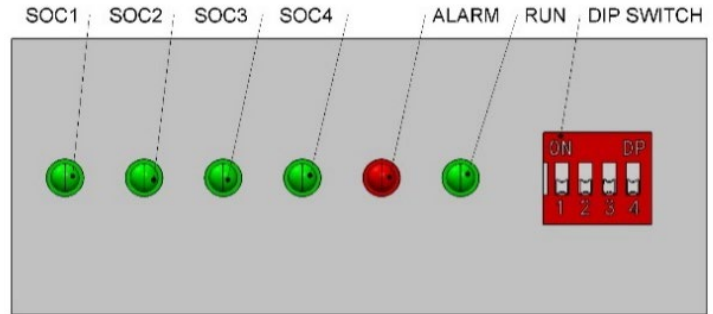
1	Power Switch
2	Heater Switch
3	COMM 2
4	COMM 1
5	Negative QD Terminals
6	Positive QD Terminals
7	LED and Dip Switch



Figure 2: EX2 battery dimensions.

### LED Status

LED Status	Explanation
Off	LED Off/SOC Disabled
On	LED On/SOC Enabled
Flash	Flash



### LED Light

Battery State	Condition	SOC	Alarm	Run	Remark
OFF	OFF	Off	Off	Off	Normal, Battery Off
IDLE	Normal	On	Off	Flash	Normal, Battery ready for use
	Warning	On	Flash	Flash	Low Voltage Warning
CHARGING	Normal	On	Off	On	Normal, Battery charging
	Warning	On	Flash	On	Temperature/Overcurrent Warning
	Protection	Off	On	Off	Temperature, Overcurrent
DISCHARGING	Normal	On	Off	Flash	Normal, Battery Discharging
	Warning	On	Flash	Flash	Low Voltage Warning
	Protection	Off	On	Off	Low Voltage Protection
OTHERS	Malfunction	Off	On	Off	Low Voltage, Temperature, Overcurrent, Short Circuit, Reverse Polarity

### SOC Indicator

SOC	Charging					Discharging				
	SOC1	SOC2	SOC3	SOC4	Run	SOC1	SOC2	SOC3	SOC4	Run
[0%, 25%]	Flash	Off	Off	Off	On	On	Off	Off	Off	Flash
(25%, 50%]	On	Flash	Off	Off	On	On	On	Off	Off	Flash
(50%, 75%]	On	On	Flash	Off	On	On	On	On	Off	Flash
(75%, 100%]	On	On	On	Flash	On	On	On	On	On	Flash



### DIP Switch

Numbers of Batteries	Address	Dip 1	Dip 2	Dip 3	Dip 4	Configurations
1P	1	1 (on)	0 (off)	0	0	Parent (P1)
2P	2	0	1	0	0	Child (C2)
3P	3	1	1	0	0	C3
4P	4	0	0	1	0	C4
5P	5	1	0	1	0	C5
6P	6	0	1	1	0	C6
7P	7	1	1	1	0	C7
8P	8	0	0	0	1	C8

The battery system consists of the Parent (P) battery and Child (C) batteries for communication purposes. Parent and Child batteries are identified by their addresses. The battery with address "1" is assigned as the Parent. Other batteries with higher address numbers are assigned as Children, for example, address "2-8". One battery system's maximum number of batteries is 8 (i.e., the Parent and 7 Children).

The Parent battery represents the battery system and communicates with other devices, such as inverters. The addresses of the Child batteries should not be duplicated. For example, no two Child batteries have the address "3" in the battery system. It is recommended that the addresses of the Child batteries be allocated consecutively.

For most energy storage applications, 8 batteries are enough for the battery system. If the users have higher power or energy demands, please consult Expion360 technical support.

## Battery System Installation

The Expion360 SmartTalk™ EDGE™ LiFePO<sub>4</sub> Battery should be installed in an enclosed compartment with vents to be protected from heat, cold, and water. DO NOT connect the batteries in series. A maximum of 2 batteries can be connected in parallel for a battery string. Each battery string in the battery system shall be connected to a common busbar or distribution panel. All LiFePO<sub>4</sub> battery systems must be installed in an enclosure or location that protects the system from harm (environmental, physical damage, etc..).

For a 12V system (EX-EX2-12240-BCH), each battery string's maximum continuous power/current is 2.4kW/200A.

1. All batteries must be charged to 100% individually before installing batteries.
2. Make sure the Power Switch is off on each battery.
3. Connect the batteries in parallel to build a battery string.
4. Connect each battery string to a distribution panel or busbar.
5. Connect the communication port to each battery (if using a CAN Bus device).
6. Set the address of each battery on the Dip Switch.
7. Turn on the Power Switch of each battery, beginning with the first installed battery.

## Battery System Configurations

Do not mix batteries of different ages and sizes in one battery system. When connecting multiple EX2 batteries, use the Expion360 Quick Disconnect cables of the same length. Before installing batteries for use in parallel, all batteries must be charged to 100%.

### Parallel Installation

Connecting multiple batteries in parallel will increase the available energy (watt-hour), charge and discharge rates (current), and capacity (amp-hour) of the battery system. The voltage will not increase. Up to (2) batteries may be connected in a single parallel string. Additional strings may be connected to a common bus bar with equal-length cables to increase the battery system capacity.

Check the current of each battery pack on the Expion360 App. Make sure the difference between the current of each battery pack and the average current is within the 5% range of the average current. Otherwise, check the battery system wiring and make sure the system is installed correctly.

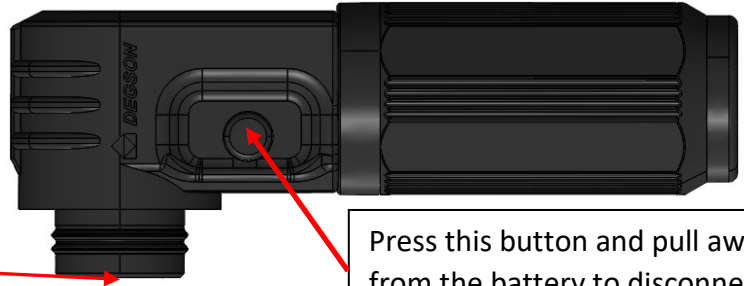
*Important: Any batteries wired in parallel using cables must be connected by cables of equal length and gauge (AWG).*

### Series Installation

**DO NOT connect EX-EX2-12240-BCH batteries in series.**

## Battery Terminal Connections

Line up the notches on the terminal post with the inside of the Quick Disconnect (QD) connector. Do not force the QD connector over the terminal post. This will damage the QD connector and the terminal post. An audible “Click” indicates the connection is correct.



Press this button and pull away from the battery to disconnect the QD connector.



The terminal post for the positive side has notches in different places than the negative QD connector. Ensure the correct cable is used for each connection and the notches are aligned before installing the battery cables.

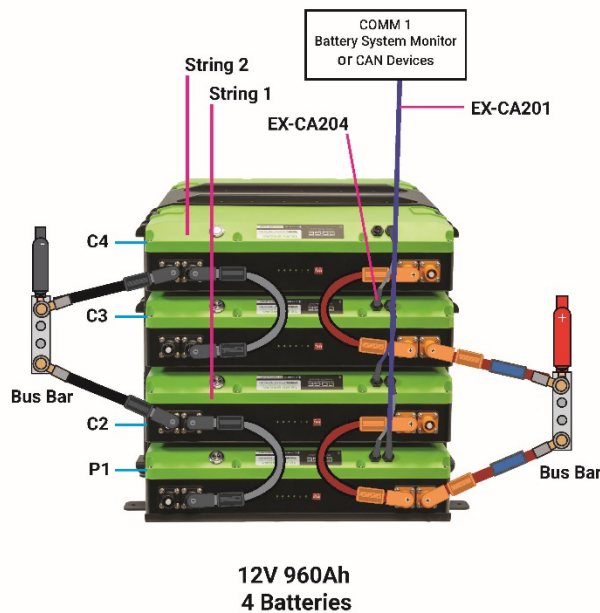
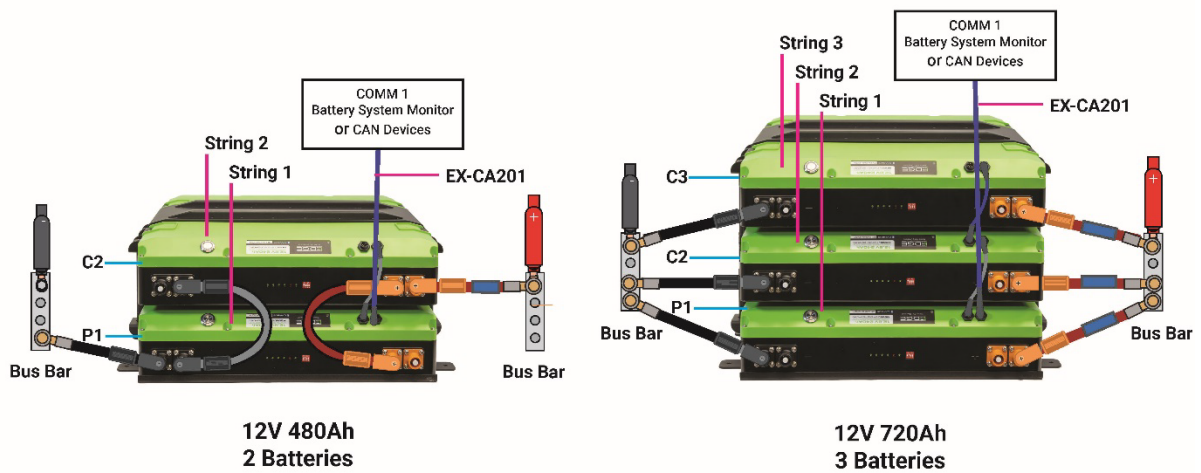


## Battery System Installations



### Battery Parallel System Wiring Diagrams

#### 12V Parallel Connection



\* Negative and Positive Power Cables must be equal length.

\* CAN connection between batteries (Black wire) are not necessary if no CAN device is connected.



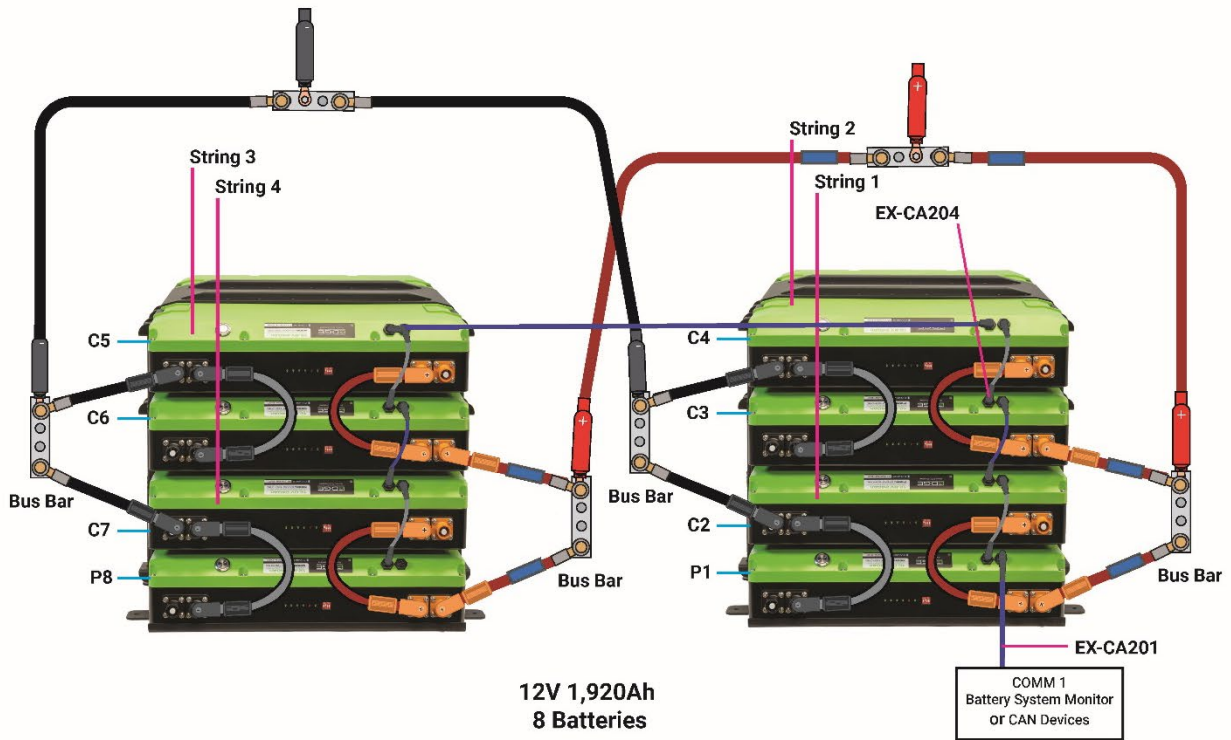
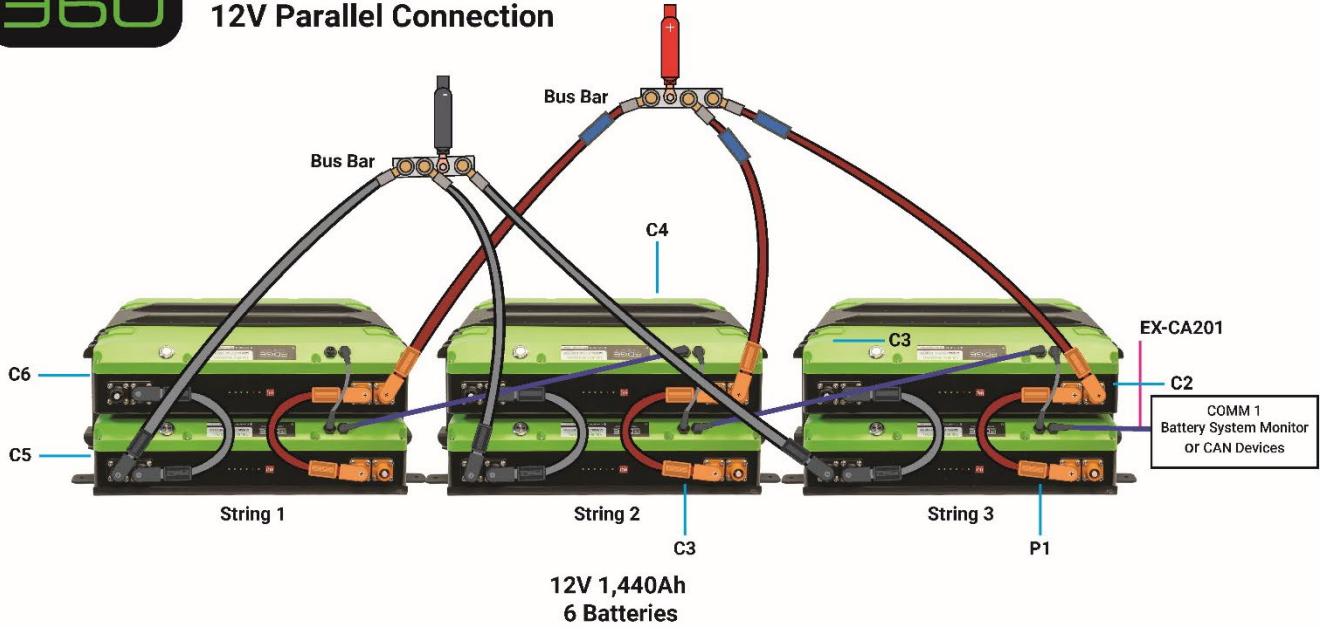
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## Parallel Battery Bank Wiring Diagrams

### 12V Parallel Connection



\* Negative and Positive Power Cables in each string must be equal length.  
\* CAN connection between batteries (Black wire) are not necessary if no CAN device is connected.



## Communication

### SmartTalk™ and the Expion360 App

SmartTalk™ Bluetooth technology by Expion360® revolutionizes monitoring and controlling energy storage systems. Seamlessly integrated into Expion360 batteries, SmartTalk™ offers unparalleled convenience and insight into the battery setup. The status of each battery can be checked on the Expion360 app with Bluetooth. The details of configuring the battery system on the Expion360 app can be found in the [Expion360 App Walkthrough](#). The walkthrough can be found by visiting <https://expion360.com/pages/customer-support>.

The Expion360 App is available for download on both the Apple App Store and Google Play Store.

After being idle for an hour, the battery Bluetooth module enters sleep mode to conserve energy. Charging and discharging the battery system wakes up Bluetooth.

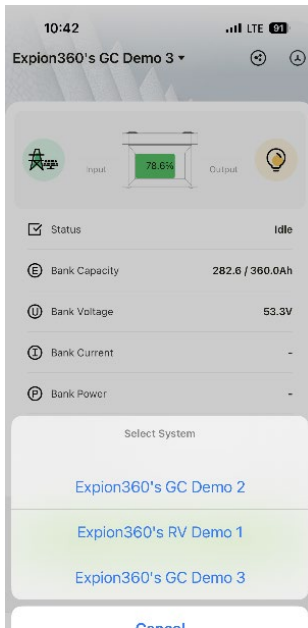


Figure 5: Selecting battery systems in the Expion360 App

#### Example:

*If you have a battery system containing 16 batteries, your phone cannot connect to them all simultaneously. You can, however, virtually separate the battery system into multiple battery subsystems. Each battery subsystem represents one string of batteries. As depicted below, the battery system is divided into two subsystems: GC Demo 2 and GC Demo 3. Each battery subsystem can be selected from the drop-down battery system list (top left corner) to activate the Bluetooth connections and display the subsystem information.*

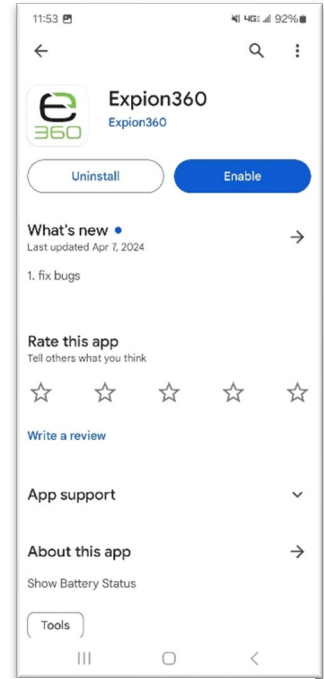


Figure 3: Expion360 App in Google Play Store

### Controller Area Network (CAN) Bus Communication

Expion360 EX2 batteries have CAN Bus capabilities, which ensure seamless integration with electrical systems, facilitating reliable and efficient communication between the battery system and monitoring or electrical devices. The battery system will communicate with inverters through the Parent battery. The Parent battery will share the battery system status, such as voltage, current, temperature, SOC, and warnings with inverters.

Connecting multiple EX2 batteries with CAN Bus:

- a) Connect the COMM 2 socket of the Parent (P1) battery to the COMM 1 socket of the Child (C2) battery using a Parent-to-Child communication cable (EX-CA204). Pay attention to the port orientation; do not use force if the connector port is not aligned with the socket. Battery communication socket damage is not covered by warranty.
- b) If connecting more than 2 batteries together, connect the COMM 2 socket of the C2 battery to the COMM 1 socket of the C3 battery using a battery-to-battery communication cable (EX-CA202).
- c) Repeat step b until the COMM1 socket connects the last child battery.



### Victron Communication

When connecting EX2 batteries to Victron Cerbo GX or Ekrano GX,

- a) Use a piece of regular Ethernet (CAT 5 or CAT 6) cable at the appropriate length (Do not use Victron VE.CAN CAN Bus BMS cable, neither Type A nor Type B).
- b) Connect one side of the Ethernet cable to the RJ45 socket on the first adapter cable (EX-CA201) and another side to the Victron Cerbo GX BMS-CAN port or VE. Connect CAN 1 on Ekrano GX.
- c) Terminate the second Victron Cerbo GX BMS-CAN port or Ekrano GX VE CAN 1 port with a 120 Ohm terminal resistor.
- d) For Victron Cerbo GX users, the battery system information will be displayed on the screen. For Victron Ekrano GX users, go to Settings – Services – VE.CAN 1 port – CAN Bus Profile, and select BMS CAN (500 kbps).

## Vertical Heat Conduction Technology™ (VHC™)

Expion360's patent-pending VHC™ internal heating technology marks a significant industry breakthrough for battery performance in cold climates. It features a Positive Temperature Coefficient Heating Film (PTCHF) in direct contact with a nickel-plated copper plate for uniform heat distribution. A sophisticated Battery Thermal Management System (BTMS) ensures real-time monitoring and control, promoting operational safety and longevity in cold temperatures. This innovative heating technology intelligently utilizes the combination of external charger and internal battery power to heat the battery pack, whether the chargers fully meet the power demand of the PTCHF. VHC™ activation is also available through the Expion360 App only if the chargers cannot power the PTCHF when the battery packs are cold.

### Operation of the VHC™

- Make sure the battery power is turned on.
- Only if the battery temperature is below 0°C (32°F), turn on VHC™ by pressing the HEAT switch on each battery. When the button is depressed, the heater can turn on, but it does not mean the heater is always on. Turn off the HEAT switch if the batteries do not need to be heated. For example, the batteries will not be used for several days in winter.
- If the battery system is connected to chargers (the combinations of alternator charger, MPPT charger, inverter charger...), make sure the chargers have more than 10A per battery. For example, a battery system consists of 4 batteries, and the minimum charger current is 40A. Otherwise, VHC™ will combine the external charger and internal battery power to heat the battery, which may drain the battery system if SoC is low. In this case, VHC™ will be activated when the battery system temperature is below 0°C (32°F) and will maintain the battery system temperature between 0°C (32°F) and 15°C (59°F).
- If the battery system is not connected to chargers or the charger can't provide power to the battery, VHC™ can be activated through the Expion360 App. In this case, VHC™ will use battery power to heat the battery system. This is a backup feature and is for emergency use only. The minimum SoC requirement is 30%. Charge the battery system immediately after the minimum temperature of the battery system is above 5°C (41°F).



### Wiring Recommendations

Wiring should meet all local codes and standards and be performed by qualified personnel such as a licensed electrician. The NEC (National Electric Code, ANSI/NFPA 70) for the United States and the CEC (Canadian Electrical Code) for Canada provide the standards for safe wiring. The NEC/CEC lists requirements for wire sizes, overcurrent protection, and installation methods/standards. There are also standards and requirements specific to Recreational Vehicles (RV) published by RVTI (Recreational Vehicle Training Institute) that should be considered before installing in an RV.

### RV Installations

As stated in the RVTI Level 2 Electrical Systems material, current-carrying conductors (cables/wires) used in low-voltage wiring systems of an RV are required to be of the stranded copper type. Conductors of sizes 6AWG through 18AWG or SAE must be evaluated by a third-party listing agency such as UL or CSA. The identification mark of the listing agency needs to be printed on the wire. Any conductor used needs to be sized according to the load and overcurrent protection provided. Low-voltage conductors used in RV's interior must have a minimum insulation rating of 90°C. Low-voltage conductors in the engine compartment or under the chassis where the conductors are within 10 inches of any exhaust system component must be rated at least 125°C. The temperature rating and other information will usually be printed on the wire. If the temperature rating of the wire cannot be determined, do not use it.

Wiring should meet all local codes and standards and be performed by qualified personnel such as a licensed electrician. The NEC (National Electric Code, ANSI/NFPA 70) for the United States and the CEC (Canadian Electrical Code) for Canada provide the standards for safe wiring. The NEC/CEC lists requirements for wire sizes, overcurrent protection, and installation methods/standards. The recommendations given by our technical support team are for guidance purposes only. Installers are responsible for independent evaluation and verification of suitability and compatibility. Any reliance on these recommendations is at the installer's own risk.

## Recommended Wire Gauge

Below is an example of Blue Sea System wiring recommendations. Refer to their official website for details.

1. Calculate the circuit's maximum sustained amperage. The easiest way to do this is to use the maximum load drawn by the inverter or converter in the system. If this is measured in watts, divide the maximum watt draw by 12.8. This equals the inverter/converter's amp draw. Measure the distance from the batteries to the inverter/converter and back for the total length of the wire run.
2. Determine if the circuit runs in an engine space or non-engine space. Engine spaces are assumed to be at 125C°, and non-engine spaces are assumed to be at 90C°.
3. Multiply the maximum amp draw by the distance of the circuit to calculate for feet x amps (abbreviated as Famps).
4. Base the wire on the 3% or 10% voltage drop. In general, items that affect the safe operation of the recreational vehicle (running lights, electronics, and distribution panel supply circuits) use 3%; all other loads (cabin lights) use 10%.
5. Now look at the table below.
  - a) Starting in the column that has the correct voltage (12V, 24V, 36V) and voltage drop shown at the top.
  - b) Go down the list of numbers until you arrive at a value greater than the calculated Famps.
  - c) Move left to the Ampacity column to verify that the circuit's total amperage does not exceed that row's maximum allowable amperage of the wire size.
  - d) Finally, move left to the wire size column to select the wire size.

Example:

You have a 200Ah battery system with a 1500W inverter charger, which is 10 feet from the battery system.

$10ft * 2 = 20ft$  (total circuit to and from the battery)

$1500W / 12.8V = 117.2A$

(Maximum amp draw from the inverter)  $117.2A * 20 = 2344$  Famps

1. With a 3% voltage drop at 12V, you will go down the column below to the next number that is larger than 2344, which in this case is 2803.
2. Move left across that row from 2803 to the Wire Ampacity non-engine column. The Ampacity listed is 245. This is higher than 117.2; continue to step 3. If 245A was lower than the amp draw you initially found in your calculations, move down the column to an ampacity higher than your amp draw.
3. Move left along that row to the Wire Size AWG. For the 245A row, the wire will be 1AWG. This is the recommended wire size for the wire run from your batteries to the Inverter.

Wire Size AWG	Metric*	Minimum Acceptable CM area	Wire Ampacity non-engine	Wire Ampacity engine	12 Volts Volt Drop		24 Volts Volt Drop		32 Volts Volt Drop	
					3%	10%	3%	10%	3%	10%
16	1	2336	25.0	21.3	86	288	173	576	230	768
14	2	3702	35.0	29.8	138	459	275	918	367	1223
12	3	5833	45.0	38.3	219	729	437	1458	583	1944
10	5	9343	60.0	51.0	348	1159	695	2317	927	3090
8	8	14810	80.0	68.0	553	1843	1106	3686	1474	4915
6	13	24538	120.0	102.0	879	2929	1757	5858	2343	7811
4	19	37360	160.0	136.0	1398	4659	2796	9319	3727	12425
2	32	62450	210.0	178.5	2222	7408	4445	14815	5926	19754
1	40	77790	245.0	208.3	2803	9342	5605	18684	7474	24912
0	50	98980	285.0	242.3	3536	11788	7073	23576	9430	31434
00	62	125100	330.0	280.5	4457	14858	8915	29715	11886	39620
000	81	158600	385.0	327.3	5619	18731	11239	37462	14985	49950
0000	103	205500	445.0	378.3	7086	23620	14172	47241	18896	62988

Note: This chart assumes wire with 105°C insulation rating and AWG wire sizes.  
\*Metric wire sizes may be used if of equivalent circular mil area.

Figure 4: Systems, Blue Sea. "Voltage Drop in Conductor - Wire Sizing Chart." Blue Sea Systems, [www.bluesea.com/resources/535/Voltage\\_Drop\\_in\\_Conductor\\_-](http://www.bluesea.com/resources/535/Voltage_Drop_in_Conductor_-). Accessed 25 Mar. 2024.

### Circuit Protection

Properly sized circuit protection must consider the battery system's maximum DC output, the inverter's maximum DC input, and the size, length, and rating of the cables being used. The fuse or circuit breaker must be able to withstand the maximum continuous current that can be supplied by the battery system and must be located as close to the battery system as is safely possible. Below is an example of a list of Blue Sea System fuse ratings, types, and part numbers for reference only. Refer to their official website for details.

Fuse Rating	Class T Fuse P/N	Fuse Holder	ANL Fuse P/N	Fuse Holder
60 A	N/A		5123	5005
80 A	N/A		5124	5503
100 A	N/A		5125	
110 A	5112	5007100	N/A	
125 A	5113		N/A	
150 A	5114		5127	
175 A	5115	5502100	5128	
200 A	5116		5129	
225 A	5117		N/A	
250 A	5118		5131	
300 A	5119		5133	
350 A	5120	5502	5135	5503
400 A	5121		5136	
500 A	N/A		5137	
600 A	N/A		5161	
750 A	N/A		5163	

*ANL fuse is ignition-protected and safe to use in the engine bay. Class T fuse has an extremely fast short-circuit response and is ignition-protected when using a 5502100/5507100 fuse holder. Use fuse and breakers from the following approved manufacturers to protect against overcurrent events and ensure the safety of the Expion360 battery system: Blue Sea Systems, Littlefuse, Eaton, or Bussman.*

### Single String Battery System

For small battery systems with fewer than four batteries or a single string configuration, circuit protection (fuse or circuit breaker) should be installed close to the battery system's positive terminal before connecting to the load. The fuse rating is based on the battery system's maximum continuous discharge rate.

*Example:*

*If the maximum continuous discharge rate of a 400Ah battery system is 400A, the battery system should be paired with a 400A DC fuse. In this example, any cables connecting the battery system to the inverter must also be properly sized for a 400A continuous current.*

### Multi-string Battery System

For large battery systems with more than 2 batteries in a multiple string configuration, the circuit protection (fuses or circuit breakers) should be installed close to each string's battery system positive terminal before connecting to the common bus bar. The fuse rating is based on the maximum continuous discharge rate of each string of the battery system.

*Example:*

*If the maximum continuous discharge rate of two strings of parallel-connected batteries is 800A and 400A on each string, the battery system should be paired with a 400A DC fuse on each string. The cables connecting the two strings to the inverter must be sized properly for the maximum 800A current.*

For more information about correctly sizing circuit protection for the battery power system, please contact an authorized installer or Expion360 technical support:

[Support@expion360.com](mailto:Support@expion360.com)

+1 (541)797-6714

## Charging

A battery system's optimal and maximum charge rates are equal to the rates of a single battery multiplied by the number of batteries connected in parallel. The optimal charge rate for LiFePO<sub>4</sub> batteries of 0.2C is recommended to prolong the batteries' useful life. The battery system can be charged at the maximum charge rate (0.5C) for rapid power recovery if the temperature conditions listed in the [Battery Specifications](#) section are met. Never charge the battery system above the maximum charge rate. See the [Battery Specifications](#) for each battery's optimal and maximum charge rates for different temperature conditions.

*Example:*

*A battery system has (4) 100Ah batteries connected in parallel. The maximum charge rate of a single Expion360 battery is 50A at 0.5C. The capacity of the battery system is 400Ah, and the maximum charge rate of the battery system is 200A (0.5C). This method also applies to the optimal charge current.*

**If a battery or battery system has been discharged to 0% SoC, it must be recharged within one week to prevent battery damage and voiding the warranty.**

## Charger Profile

### Two-Stage CC-CV Charger

Chargers using a constant current (CC) constant voltage (CV) profile are ideal for charging LiFePO<sub>4</sub> chemistry batteries. Check the [Battery Specifications](#) for the recommended charging voltage.

The CC (bulk or boost) stage charges the battery to 95% SoC at the charger's rated current until the battery reaches the charger's voltage setting. The charger then transitions to the CV (absorption or saturation) stage at the charger's given voltage setting. It tapers the charge current down to zero as the battery reaches the charger's charging voltage. The charger then enters standby mode and charges the battery if a lower voltage is detected.

### Single-Stage CC Charger

A single CC stage charger can charge the battery to nearly 100% SoC. Single-stage CC chargers with target recommended voltage settings may also charge Expion360 batteries. However, a CC-CV charger is advised.

### Multi-Stage Charger

A multi-stage (CC, CV, float, equalization) charger is primarily designed for flooded, AGM, and gel lead-acid batteries and is not an ideal selection for LiFePO<sub>4</sub> batteries. The multi-stage charger slows down the charging process and may not fill the battery to 100% SoC. Expion360 batteries do not require a float stage because of their low self-discharge rates. LiFePO<sub>4</sub> batteries do not require an equalization stage because they do not experience damaging sulfation when left at states of charge lower than 100% for long periods. The charge voltage may also rise above the recommended charge voltage during the equalization stage, which would cause the BMS to disconnect due to overvoltage protection.

## Charging Options

Shore power, an inverter charger, solar power, an alternator, or a combination of these can charge Expion360 batteries. Lithium batteries must be charged by regulated charge sources.

### Shore Power Charging

A CC-CV two-stage charger should charge expion360 batteries with a voltage set to the recommended charge voltage. The rated charge current should never exceed the battery system's maximum charge rate. See [Battery Specifications](#) for individual charge currents for each model.

### Inverter Charger Charging

Expion360 batteries may be configured as an uninterruptible power supply (UPS) with an inverter charger. Inverter chargers must be programmed before a connection to shore power. On the inverter charger controller, under the "Battery Type" menu, choose the "CC-CV" setting in the setup and set it to the recommended charge voltage. The "Custom" setting on some inverter chargers is not recommended. The power system's design and the different inverter chargers determine the additional settings. Please refer to the inverter charger manual or contact Expion360 support for more information.

### Solar Charging

Expion360 batteries can be charged from solar power using a solar charge controller. A maximum power point tracking (MPPT) charge controller is recommended as it is more efficient than a pulse-width modulation (PWM) charge controller. Some PWM charge controllers can cause a voltage spike when cycling on and off. This can potentially damage the battery.

Choose a solar charge controller that can be programmed for two-stage charging or one with a lithium battery setting. If using a programmable solar charge controller, set it to the recommended charge voltage.

To prevent the solar charge controller from charging the battery system below 0°C (32°F), a disconnect switch between the batteries and the solar charge controller must be installed. Match the disconnect switch's size to the maximum voltage and current of the solar array. Some solar charge controllers have a temperature sensor and can be programmed to stop charging at a specific temperature. It is advised to place the temperature sensor close to the battery system and set this temperature to 0°C (32°F). Please refer to the solar charge controller manual or contact the Expion360 support department for more assistance.

### Alternator Charging

The Expion360 battery can be charged from an alternator using any DC-to-DC charger equipped with settings for LiFePO<sub>4</sub> batteries. LiFePO<sub>4</sub> batteries cannot be charged directly from the alternator. The Expion360 DC-to-DC charger is a CC-CV two-stage charger designed only to charge LiFePO<sub>4</sub> batteries with a 25A output current. It is simple to install and compatible with any other LiFePO<sub>4</sub> battery. Within the limits of the battery system and alternator specifications, up to two Expion360 DC-to-DC chargers can be used in parallel to achieve a higher charge rate.

### Charger Sizing

Once the battery system has been appropriately sized, the charger specifications can be determined based on the preferred charge rate or time. A minimum 5-hour charge time is recommended to maximize the battery's life span.

#### Calculation:

$$\text{Total charging current} = \frac{N_{\text{Parallel Packs}} * \text{Capacity Battery}}{T_{\text{hours}}}$$

or

$$\text{Total charging power} = \frac{N_{\text{Parallel Packs}} * \text{Energy Battery}}{T_{\text{hours}}}$$

T = desired charging time (hours)

N = number of parallel battery packs in the system (whole number)

E = Energy rating of a single battery pack (Watt-hours) C = Capacity of a single battery pack (Amp-hours)

#### Example:

For a battery system consisting of 4 EX-G27-12100-BCH battery packs, the desired charging time is 5 hours.

$$C = 100Ah,$$

$$E = 12.8V * 100Ah = 1280Wh,$$

$$N = 4,$$

$$T = 5.$$

$$\text{Total charging current} = N * C / T = \frac{4 * 100Ah}{5h} = 80A$$

$$\text{Total charging power} = N * E / T = \frac{4 * 1280Wh}{5h} = 1024W$$

The calculated total charging current must be lower than the maximum charging rate of the battery system.

## Discharge

The Expion360 EX2 batteries are specifically designed for deep-cycle use and should never be used for engine-starting applications. The maximum continuous discharge rate of the battery system is determined by the discharge rate of a single battery multiplied by the number of batteries connected in parallel. It is important to never discharge the battery system beyond its maximum continuous discharge rate. See the [Battery Specifications](#) page for the optimal, maximum, and pulse discharge rates of each Expion360 battery.

***Example:***

*A battery system consisting of 4 EX-G27-12100-BCH 100Ah batteries connected in parallel. The maximum continuous discharge rate of a single battery is 100A.*

*The capacity of the battery system is 400Ah.*

*The maximum continuous discharge rate of the battery system is 400A.*

## Inverter Sizing

When pairing a battery system with an inverter, it's crucial to carefully consider the maximum continuous DC current. The inverter's maximum DC input current must not exceed the battery system's maximum DC output current. If it does, the Battery Management System (BMS) may shut down due to discharge overcurrent protection. In worst-case scenarios, using an oversized inverter could cause irreversible damage to the battery system. The example below outlines the minimum battery system capacities required for various 12V DC inverters, along with the estimated discharge times at full load.

Inverter Size	Number of Battery Packs	Estimated discharge time for the EX-EX2-12240-BCH
1000W (78A at 12.8V)	1	3hr 4m
	2	6hr 8m
	3	9hr 12m
	4	12hr 16m
2000W (156A at 12.8V)	1	1hr 32m
	2	3hr 4m
	3	4hr 36m
	4	6hr 8m
3000W (234A at 12.8V)	1	1hr 1m
	2	2hr 2m
	3	3hr 3m
	4	4hr 4m

Properly size the battery system capacity to the inverter to prevent battery damage. Match the battery system's maximum pulse and continuous discharge current to the inverter's maximum surge and input current, respectively. Use only inverters certified to conform to UL 458 or UL 1741.

For more information about pairing inverters and battery systems with capacities that are not listed above, please contact Expion360 technical support.



## Battery Management System (BMS)

See the [Battery Specifications](#) page for complete BMS protection settings.

### Short Circuit Protection

If a short circuit occurs, the BMS will disconnect to protect the battery. Once the short circuit condition is resolved, the BMS will automatically reconnect. If it does not reconnect automatically, a charge is required to reset the BMS.

### Overvoltage Protection

If the charge voltage is higher than the recommended charge voltage, the BMS will disconnect to protect the battery.

### Undervoltage Protection

If the battery reaches the minimum battery voltage, the BMS will disconnect to protect the battery. A charge is required within one week to prevent permanent damage that will void the battery warranty. When the battery voltage rises above the reconnect voltage, the BMS will reconnect. Some chargers will not charge if an open circuit is detected as the BMS has disconnected. We recommend using the Expion360 DC-DC charger or a conventional AC-DC charger to avoid this open circuit problem.

### Overcurrent Protection

The BMS monitors charge and discharge currents to protect the battery. If the charge or discharge current is too high, the BMS disconnects to protect the battery. When an overcurrent condition is corrected, the BMS automatically reconnects. If the BMS does not reconnect, a charge for discharge overcurrent protection or a discharge for charge overcurrent protection is required to reset the BMS. See the [Battery Specifications](#) page for more details.

### Thermal Protection

While charging or discharging the battery, if the temperature is too high (130°F charging, 140°F discharging) or too low (32°F charging, -4°F discharging), the BMS will disconnect to protect the battery. The BMS will automatically reconnect when the temperature is within the acceptable range. See the [Battery Specifications](#) page for more details.

### Cell Balancing

The BMS monitors and prevents each of the four bricks from overcharging. The BMS automatically balances the brick voltage if the individual brick voltages are outside the acceptable range.

## Battery Life

The battery is considered to have reached its end-of-life (EoL) when its remaining available capacity falls below 80% of the original capacity. The cycle life of Expion360 batteries is evaluated at a charge/discharge rate of 0.2C/1C, at 25°C (77°F), and with a 100% depth-of-discharge (DoD). Please note that various factors can influence battery cycle life. Adhering to the recommended charge and discharge rates will help ensure a longer battery lifespan.

## Depth of Discharge (DoD)

The cycle life of Expion360 batteries is tested by discharging them to 100% Depth of Discharge (DoD). However, the optimal operating window for LiFePO<sub>4</sub> batteries is a DoD between 20% and 80%. To achieve this, it is advisable to slightly oversize the battery system's capacity so that the DoD remains around 80% for each cycle. This approach will help extend the lifespan of the batteries.

To calculate: divide the required capacity by 80% (0.8) to achieve the recommended battery system capacity.

### **Example:**

*300Ah is required for each cycle:*

$$\begin{aligned} \text{Capacity}_{\text{Recommended}} &= \frac{\text{Capacity}_{\text{required}}}{0.8} \\ \text{Capacity}_{\text{Recommended}} &= \frac{300\text{Ah}}{0.8} \\ \text{Capacity}_{\text{Recommended}} &= 375 \text{ Ah} \end{aligned}$$

*Therefore, it is recommended to use a battery system with a capacity of 375Ah. This exact number may not be available; it is best to round to a higher Ah battery.*

## Operating Temperature Range

Operating LiFePO<sub>4</sub> batteries at extremely low or high temperatures will significantly decrease their cycle life. Please ensure the battery system is well-ventilated or cooled during high temperatures and heated at low temperatures. Maximum battery life can be achieved when operating temperatures are as close to 25°C (77°F) as possible.

## Charge/Discharge Rate

Charging and discharging the battery at rates higher than recommended will generate excess heat within the cells. Since temperature is a key factor influencing cycle life, it is essential to consider the charge/discharge specifications relative to ambient temperature extremes when configuring the battery system. The specifications page at the end of this manual takes both safety and maximum life cycle into account when recommending optimal parameters for the battery system.

## Storage Condition

Most users will see their batteries in storage more often than active daily use. To prolong the battery life during storage periods of one month or longer, please follow storage instructions.

## Storage

Properly storing the battery system between 50% and 80% state-of-charge (SoC) will prolong the battery. Check the SoC on the battery system monitor or Expion360 App. Batteries must be stored in an enclosure or space that protects them from outside elements.

Before storing, turn off the battery system disconnect switch, and turn off each of the batteries in the system by pressing their POWER switch so the button is no longer recessed. Charge the battery system to full before using it after storage.

Please follow the guidelines below for the storage time lengths.

**1 month:** 13.4Vdc, -4°F to 113°F (-20°C to 45°C )

**3 months:** 13.4Vdc, 32°F to 77°F (0°C to 25°C )

Every 3 to 6 months, charge each battery to 80% SoC.

### **IF BATTERIES ARE DISCHARGED TO 0% SoC...**

**Immediately** charge the battery system to 80% SoC and confirm that the battery system disconnect switch is disconnected. All batteries using LiFePO4 chemistry will be permanently damaged if discharged to 0% SoC and left for over one week. The warranty excludes coverage for such damage due to the end-user's neglect of the batteries.

## Accessories

The products listed below are compatible with Expion360's EX2 batteries.

**EX-25DC:** Expion360 DC to DC 25A, 14.6Vdc, 2-stage charger.

**EX-CA001:** Edge EX2 12 V Battery Power Cable Set.

**EX-CA002:** Edge EX2 12V Parallel Cable.

**EX-CA201:** Battery system to Victron CAN Bus communication adapter cable.

**EX-CA202:** Edge EX2 Battery-to-battery communication cable.

**EX-EX2-TDS:** Base Mounting Kit for Edge EX2 Battery.

**EX-EX2-TDS-2:** Edge EX2 Battery Mounting add-on kit for two batteries.

**EX-EX2-TDS-3:** Edge EX2 Battery Mounting add-on kit for three batteries.

**EX-EX2-TDS-4:** Edge EX2 Battery Mounting add-on kit for four batteries.

For questions regarding these products, feel free to contact Expion360 technical support:

[Support@expion360.com](mailto:Support@expion360.com)

+1 (541)797-6714

## Battery Specifications

	Parameters <sup>1</sup>	EX-EX2-12240-BCH	
<b>General</b>	Battery Nominal Voltage	12.8 V	
	Battery Rated Capacity (@ 0.2C, 25°C)	240 Ah	
	Battery Rated Energy (@ 0.2C, 25°C)	3072 Wh	
	Internal Impedance (@ 1kHz AC, 25°C)	≤5 mΩ	
	Battery Self-discharge Rate (@ 25°C)	<5% per month	
	Battery Cycle Life (80% Capacity retention) (@ 0.2C / 1C, 25°C, 100% DoD)	>3500	
	Max. Parallel Connections (per string)	2	
	Max. Power / Current (per string) <sup>2</sup>	2.4 kW / 200 A	
	Communication	Monitor, Bluetooth, RS485 (9600bps), CAN Bus (500kbps).	
	Cell Type (Chemistry)	Cylindrical (LiFePO <sub>4</sub> )	
	Battery Size	EX2	
	Battery Dimensions	17.7 x 21.9 x 4.1 in (450 x 556 x 106 mm)	
	Battery Weight	67 lb (30 kg)	
	Battery Housing	ABS	
<b>Charge</b>	Method	CC-CV	
	Voltage	Max.	14.6 V
		Float	13.6 V
		Protection	14.6 V
		Protection Release	13.6 V
	Current	Optimal	60 A
		Max @ 32°F to 50°F (0°C to 10°C)	120 A
		Max @ 50°F to 140°F (10°C to 60°C)	150 A (3s)/180 A (1s)
		Protection Release Condition	Auto-recovery every 60s, lock after 3 consecutive attempts. Disconnect the load to unlock.
	Temp.	Operating	32 °F to 130 °F (0 °C to 55 °C)
		Protection Release	40 °F to 120 °F (5 °C to 50 °C)
Protection Release Condition		Temperature meets protection release conditions.	
<b>Discharge</b>	Voltage	Optimal Shut-off	12 V
		Protection	10 V
		Protection Release	12 V
	Current	Optimal	120 A
		Max. Continuous	200 A
		Max. Pulse	250 A (3s)/300 A (1s)
		Protection Release Condition	Auto-recovery every 60s, lock after 3 consecutive attempts. Disconnect the load to unlock.
	Temp.	Operating	-4 °F to 140 °F (-20 °C to 60 °C)
		Protection Release	5 °F to 130 °F (-15 °C to 55 °C)
		Protection Release Condition	Temperature meets protection release conditions.
<b>Short</b>	Short Circuit Release Condition	Auto-recovery every 60s, lock after 3 consecutive attempts. Disconnect the load and charge to unlock.	
<b>Storage</b>	Recommended Voltage	50-80% SoC	
	1 month	32 °F to 77 °F (0 °C to 25 °C)	
	3 months	32 °F to 77 °F (0 °C to 25 °C)	
	Maintenance	Discharge-charge cycle every 3 to 6 months.	

<sup>1</sup> Voltage/Current measurement tolerance: ± 3%. Temperature measurement accuracy: ± 9°F (5°C). Time delay accuracy: ± 0.5s.

<sup>2</sup> Depend on the size of ring terminals/cables/busbars.

## Warranty

Expion360 online product registration with proof of purchase is required for warranty coverage.

### 12-Year Warranty

Expion360 warrants the EX-EX2-12240-BCH batteries sold by Expion360 or any of its authorized dealers, distributors, and OE manufacturers to be free of manufacturer defects in material and workmanship under normal use for 12 years from the date of sale as determined by the customer's sales receipt as proof of purchase. Expion360, at its sole discretion, will only repair or replace the battery and/or parts of the battery in question if it is determined to be defective in material and/or workmanship by the Expion360 Technical Support Team. Expion360 reserves the right to deny a warranty claim if the battery is determined, upon inspection, to be at its normal end of life or used improperly, even if within the Warranty Period. Expion360 online product registration is also required for warranty coverage. The end user can register the batteries here: <https://expion360.com/pages/product-registration>

### 0-8 Years/2000 Cycles

Within the first 8 years or 2000 cycles (whichever comes first) of the warranty period, subject to the exclusions listed below, Expion360, at its sole discretion, will repair or replace the battery and/or parts of the battery in question if it is determined to be defective in material and/or workmanship, by the Expion360 Technical Support Team.

### 8-10 Years

After 8 years and up to 10 years, if the batteries in question are determined to be defective in material or workmanship, and Expion360 deems the components to be repairable, the battery will be repaired and returned. If Expion360 deems the components not to be repairable, a new, similar battery will be offered at a discount of 40% off the published market price listed at the time of the offer. The offer is valid for 60 days after a representative from Expion360 has contacted the customer with the repairability decision.

### 10-12 Years

After 10 years and up to 12 years, if the batteries in question are determined to be defective in material or workmanship, and Expion360 deems the components to be repairable, the battery will be repaired and returned. If Expion360 deems the components not to be repairable, a new, similar battery will be offered at a discount of 20% off the published market price listed at the time of the offer. The offer is valid for 60 days after a representative from Expion360 has contacted the customer with the repairability decision.

## Installation

Expion360 recommends a professional installation by a qualified RV, Marine, Golf Cart, or low voltage technician; however, the total warranty applies whether professionally installed or not if installation instructions are correctly followed in the User Manual.

## Non-Transferable

This Limited Warranty is for the original purchaser with proof of purchase only. It is not transferable to any other person or entity. Please contact Expion360 directly regarding any warranty claim. ([support@expion360.com](mailto:support@expion360.com))

## Product Return and Shipping

The product must be returned to Expion360 before warranty coverage is authorized to determine if it is defective. If the product is faulty and determined to be a warranted item, it may be repaired, returned, or replaced as determined by Expion360. Expion360 will cover Continental US ground/freight shipping of the repaired, replacement, and defective batteries within the 0 to 8-year full replacement warranty period. If the battery(s) are found to be in good working condition, the customer, dealer, or distributor will be responsible for the cost of shipping the battery(s) back. After 8 years and up to 12 years, the customer, dealer, or distributor will be responsible for the cost of Continental US ground/freight shipping of the replacement battery(s).

## Battery Storage

Before storing Expion360 lithium batteries for periods longer than 3 months, ensure the batteries are between 50-80% state of charge using the Expion360 battery monitor or Bluetooth app. If the battery is not equipped with a battery monitor or Bluetooth app, measure the voltage with a multimeter to confirm the state of charge is not below 50%. Do not store batteries below 50% state of charge. Completely discharge and charge the battery bank to the recommended storage voltage every 3 to 6 months. Battery specifications can be found in the battery user manual to confirm the measured voltage is within an acceptable range. For further instructions, see the battery user manual. Damage to the battery(s) will not be covered under warranty if the user has failed to adhere to the storage instructions in the battery user manual.

## Water Ingress Warning

Expion360 lithium batteries are not designed to be exposed to water and are not intended for use in environments where prolonged moisture exposure could be reasonably expected. If damage to the cells or BMS is incurred from water ingress into the battery case, the battery is damaged beyond repair and will not be covered under warranty.

## Warranty Exclusions

Expion360 has no obligation under this Limited Warranty for any battery subject to the following conditions (including, but not limited to):

- Damage caused by road debris, dropping the battery, or collision (either while installed or object that was struck).
- Damage due to over/undercharging, over-discharging, under-sizing for application, not using surge limiting device in specific applications, and reverse polarity connections.
- Damage due to improper installations: incorrect wire sizing, loose connections, improper parallel and series connections, short-circuit, not maintaining terminals, and oversizing inverters (see owner's manual for proper inverter sizing).

- A battery that has been opened, tampered with, and/or modified.
- Used in any starting application or other application for which deep-cycle batteries are not intended.
- Environmental damage such as water submersion, fire, and extreme weather conditions.
- Improper storage conditions as defined in the battery storage section of this warranty.

### Warranty Disclaimer

THIS LIMITED WARRANTY REPRESENTS THE TOTAL LIABILITY OF EXPION360 FOR ANY BATTERY. ALL OTHER WARRANTIES IMPLIED BY LAW APPLICABLE TO THE BATTERY SHALL BE LIMITED TO THE WARRANTY PERIOD STATED. EXPION360 MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. EXPION360 SHALL NOT BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING REMOVAL, SHIPPING, OR INSTALLATION EXPENSES.

The battery owner must cooperate with Expion360 Technical Support Staff or an Expion360 authorized service provider by chat, email, video call, or telephone when troubleshooting suspected battery issues. This may involve performing routine diagnostic procedures, hardware updates, eliminating possible third-party issues, and/or replacing items known to be incompatible with Expion360 batteries. If assistance is required, contact Expion360 technical support, and a technician will provide assistance using online chat, email, video call, or telephone. Expion360 RMA (Return Merchandise Authorization) documentation will be sent to the customer if the product must be returned to Expion360 for testing unless otherwise stipulated by applicable local law. In cases where it is required to return the product for further testing to Expion360, the product must be shipped to Expion360 within fifteen (15) business days. The product must be returned with the associated documentation in the provided shipping material.

### Legal Rights

Some states do not allow limitations on how long an implied warranty lasts or exclusion or limitation of incidental or consequential damages, so the above limitations may not apply to the end user. This warranty gives the end user specific legal rights, and the end user may also have other rights that vary from state to state. This warranty shall be governed by and interpreted by the laws of Oregon. This warranty is understood to be the exclusive agreement between the parties relating to the subject matter hereof. No employee or representative of Expion360 is authorized to make any warranty in addition to those made in this agreement.

### Submitting A Warranty Claim

To submit a warranty claim, please contact Expion360 at [support@expion360.com](mailto:support@expion360.com)





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