



# Energy Pak user manual



## High Power Lithium Ferrous Phosphate (LFP) Battery

3kWh / 6kWh / 12kWh Models



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# 1 How to use this manual

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Read this entire manual before installing or using the Energy Pak.



## **WARNING**

Failure to do so can lead to electrical shock, serious injury or death, or can damage the Energy Pak.

### **Applicability**

This manual applies to the following products:

Energy Pak 3 - EP12240

Energy Pak 6 - EP12480

Energy Pak 6 - EP24240

Energy Pak 12 - EP24480

Energy Pak 12 - EP48240

All specifications and descriptions contained in this document are verified to be accurate at the time of printing. However, because continuous improvement is a goal at Microgreen, we reserve the right to make product modifications at any time.

The images provided in this document are for demonstration purposes only. Depending on product version, details may appear slightly different.

### **ERRORS**

To communicate any inaccuracies in this manual, send an email to:

[info@microgreen.ca](mailto:info@microgreen.ca)

### **ELECTRONIC DEVICE: DO NOT THROW AWAY**

Proper disposal of batteries is required in accordance with local regulations.

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This warning symbol appears throughout this manual to alert the reader that a particular action, or inaction, may result in damage to the Energy Pak, damage to surrounding property, and/or potential risk of injury or death. These warnings must be heeded when installing or operating the Energy Pak.

For the latest documents on Energy Pak, visit [microgreen.ca](http://microgreen.ca)

## 2 Energy Pak Models

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This manual covers the 3 available Energy Pak models. The features and functionalities are largely the same, the main difference is the output voltage and the capacity.

Also the Energy Pak 12 comes with a multi-function LED display, whereas the Energy Pak 3 and Energy Pak 6 come with a voltage display only. The LED display is optional for the Energy Pak 3 and Energy Pak 6 models.

### Energy Pak 3



- Lithium battery ideal for RV or boat power
- 3 kWh capacity
- 12 V output

## Energy Pak 6



- Lithium battery ideal for typical cottage, cabin or modular home
- 6 kWh capacity
- 12/24 V output

## Energy Pak 12



- Lithium battery ideal for home off-grid system, transit vehicle emissions reduction system
- 12 kWh capacity
- 24/48 V output

# 3 Energy Pak Overview

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The Energy Pak is a lithium ferrous phosphate (LFP) battery system that can be used for energy storage in off-grid systems, boats and recreational vehicles. It is most commonly used to store energy from solar panels for use during periods of low sunlight, but it may also be used to store energy from any other source: i.e. diesel generators, wind turbines, the electrical grid, etc.

The Energy Pak accepts DC current and requires a charger or a charge controller to supply appropriate voltage and current from the charging source. It outputs DC current, and requires an inverter to convert into AC for powering standard home appliances and electronics. The Energy Pak has a maximum current of 250A to feed high power loads, and to enable faster charging. The Energy Pak includes a BMS (Battery Management System) and related circuitry for safe and hassle-free operation.

The Energy Pak is built using LFP battery cells, a type of lithium ion battery, manufactured by [CATL](#). They have been field-proven to last well over 5,000 usage cycles. It will offer an operating lifetime of over 15 years if your usage is one charge-discharge cycle per day. These battery cells have been rigorously tested to handle mechanical stress (shock, crush, vibration, nail penetration) and electrical loads, and also external fire. More than 350 tests are performed.

The available models of the Energy Pak have an energy storage capacity between 3 kWh to 12 kWh, and options for voltage levels of 12/24/48 volts.

All models include a temperature sensing mechanism and an internal heater for low-temperature charging, as well as a remote controller with a display screen to view and set the operating parameters.

Available Models of Energy Pak		
Energy Pak Model	Energy Storage Capacity	Nominal Voltage (approximate)
Energy Pak 3 – EP 12240	3 kWh	12 V
Energy Pak 6 – EP 12280	6 kWh	12 V
Energy Pak 6– EP 24240	6 kWh	24 V
Energy Pak 12 – EP 24480	12 kWh	24 V
Energy Pak 12 – EP 48240	12 kWh	48 V

NOTE: The voltages shown here are the nominal voltages rounded to standard electrical system voltages. The actual operating voltage varies with the SOC and is normally higher at high SOC, as shown in the product specifications sheet at the end of this manual.

The Energy Pak can be operated using the buttons and switches located directly on the front panel (see Figure below), or using the LED Display / Remote Controller. For the Energy Pak 3 and Energy Pak 6 this is an optional component that plugs into it (see Figure 3e below). Table 3 explains the components of the user interface found on the Energy Pak and on the LED Display / Remote Controller.

The the LED Display / Remote Controller includes a display screen to provide battery's operating parameters. It is not compulsory to monitor the Display screen during normal operations of Energy Pak. Some users may find the information provided about the operating parameters valuable. It may also provide useful insight if any troubleshooting is required.

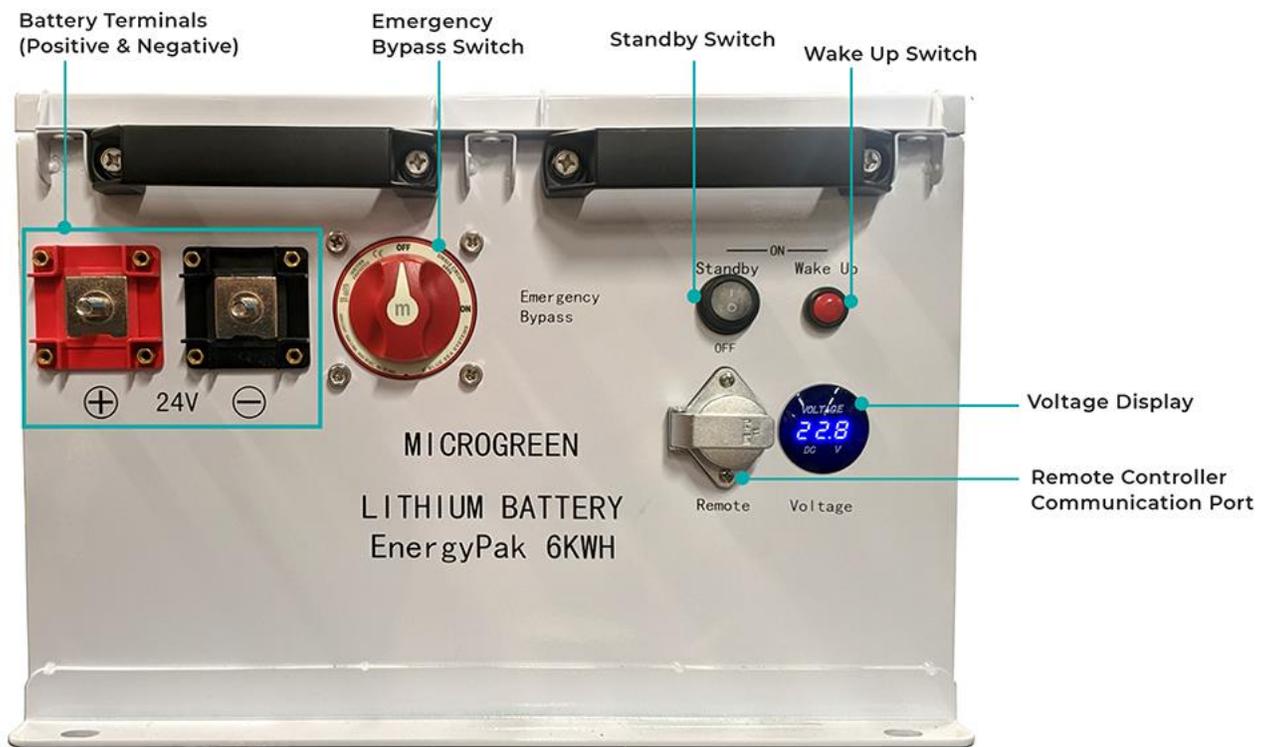


Figure 3a: Front panel components of the 6 kWh Energy Pak (Note: same elements available on the 3 kWh Energy Pak)



Figure 3b: Front Panel components of the 12 kWh Energy Pak

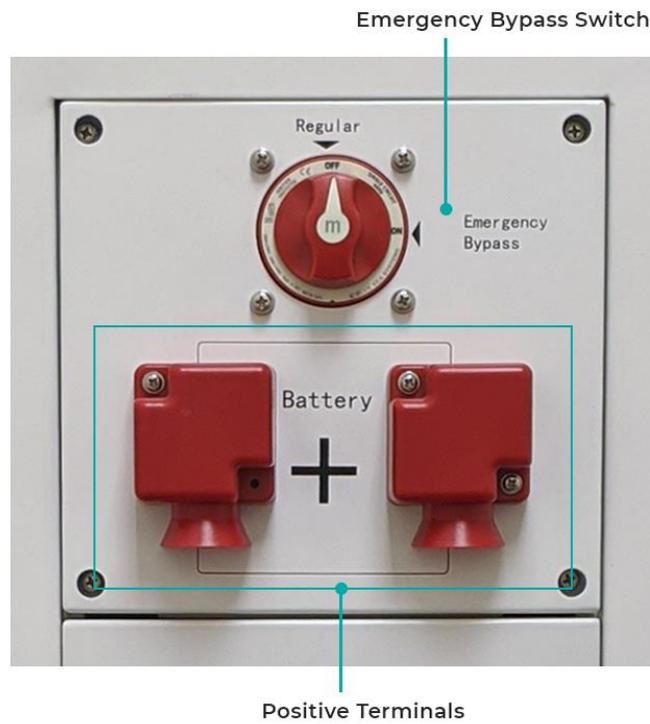


Figure 3c: Left Panel components of the 12 kWh Energy Pak



Figure 3d: Right Panel components of the 12 kWh Energy Pak

**Table 3: Features of the Main Panel**

FEATURE	DESCRIPTION
Battery Terminals	The positive and negative terminals provide the power connections needed to transfer power to or from the Energy Pak.
Voltage Display	Shows the operating voltage of Energy Pak.
Standby Switch	When the Standby switch is in the OFF position, the Energy Pak is OFF and no power is available from the Battery Terminals. When it is in the ON position, the Energy Pak is in Standby mode where no power will be available from the battery terminals until the Wake Up button is pressed for 5 seconds.
Wake Up Button	Pressing this switch will wake up the Energy Pak. If the Standby switch is ON, the Energy Pak will stay ON after pressing the Wake Up button for 5 seconds. If the Standby switch is OFF, the Energy Pak will be ON while the Wake Up button is pressed, but will be OFF when the Wake Up button is released.
Emergency Bypass Switch	<p>This switch should be OFF at virtually all times. It is used only when the Energy Pak's control circuits have shut down the system, and there is an emergency need to use the battery. When the Emergency Bypass is ON, power is directly delivered from the batteries while bypassing all the other switches; the BMS and protective circuitries are bypassed.</p> <p> This allows the Energy Pak to provide power despite risk of damage and personal injury. Extreme caution must be taken when using the Emergency Bypass.</p> <p>Remember to switch the Emergency Bypass switch back to the OFF position after any emergency usage.</p>
Communication Port (for Remote Controller)	This port is for the user to plug in the LED Display /Remote Controller.
Display	<p>This comes with the Energy Pak 12 ONLY, replacing the voltage display of the Energy Pak 3 and Energy Pak 6 models. The Display is available on the Energy Pak 3 and Energy Pak 6 as an optional wired component.</p> <p>This can be used to turn the Energy Pak ON/OFF. It also displays operating parameters:</p> <ul style="list-style-type: none"> <li>● Energy Pak overall voltage</li> <li>● Voltage of individual battery cells</li> <li>● Electrical current</li> <li>● Battery temperature</li> <li>● Battery state of charge</li> </ul>

The picture below shows the default mode of the LED display. The LED display is included in the Energy Pak 12, and is optional for the Energy Pak 3 and Energy Pak 6 via a wired connection (see Section 9 for more details).

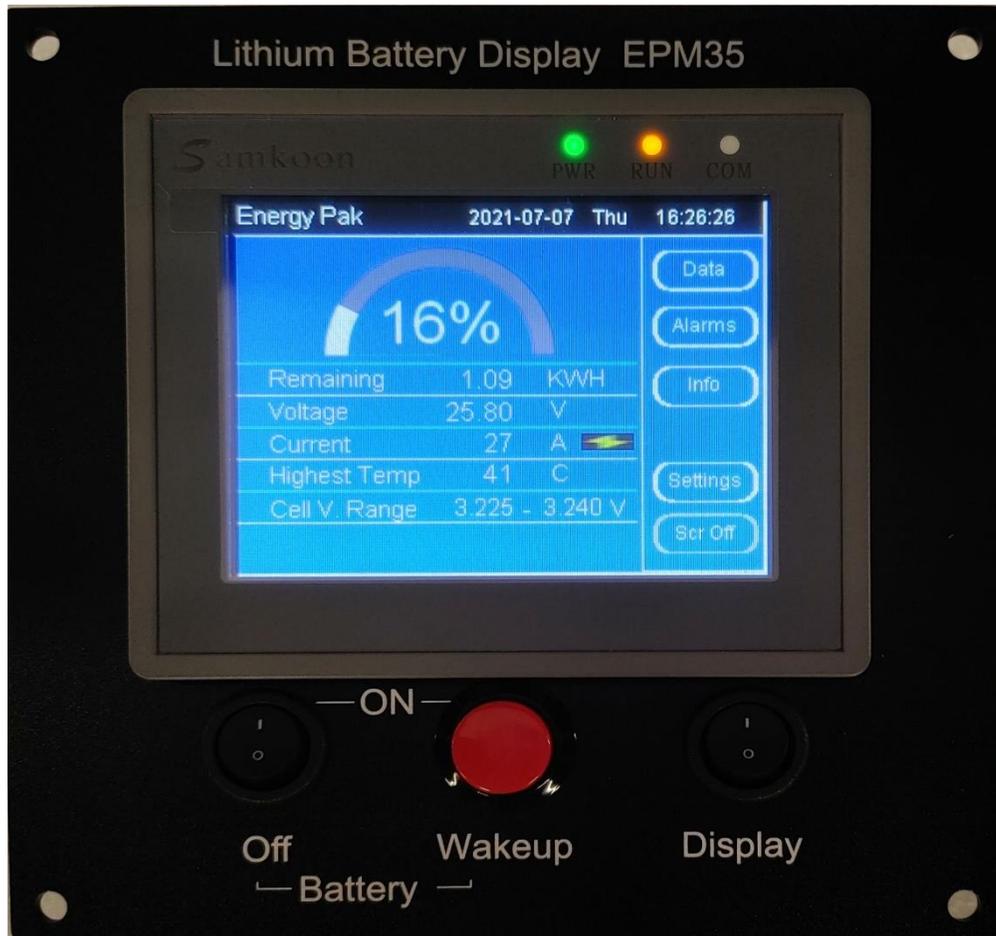


Figure 3e: LED display / Remote Controller

## 4 Important Safety Information

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### WARNING

This manual contains important instructions for all Energy Pak models that must be followed during installation, and operation. Failure to follow these instructions may result in damage, fire, injury or death.

- Do not attempt to use the Energy Pak if it appears damaged.
- Do not allow the Energy Pak to be submerged in water. It is not waterproof.
- Do not attempt to disassemble the Energy Pak. There are no user-serviceable parts inside. Coming into contact with the electrolyte contained in the battery cells can cause personal injury.
- To avoid risk of shock or fire, make sure all wires are properly sized and prepared in good condition.
- Verify that all equipment to be connected to the Energy Pak is turned OFF before making any connections.
- Make sure the Energy Pak is turned OFF before making connections.
- This equipment contains components which can produce electrical arcs or sparks. To prevent fire or explosion do not install in compartments containing flammable materials or in locations which require ignition-protected equipment. This includes any space containing gasoline-powered machinery, fuel tanks, or joints, fittings, or other connection between components of a fuel system.
- Remove metallic personal items such as rings, bracelets, necklaces, and watches when working with a battery. A battery can produce a short-circuit current high enough to weld a ring or other metallic items, causing a severe burn.
- Use caution when working with metal tools near the Energy Pak. Do not short the Energy Pak by connecting any metallic object across the positive and negative terminals. The resulting short-circuit may cause fire, serious injury or death.
- Ensure any connected equipment is compatible with the voltage and current specifications for your Energy Pak (see section 12: Product Specifications). If using a multi-chemistry battery charger, ensure it is set for lithium iron phosphate (also known as LFP or  $\text{LiFePO}_4$ ).



### WARNING - LIMITATIONS ON USE

The Energy Pak should not be used in connection with life support systems or other medical equipment or devices.

# 5 Installation

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Follow any applicable regulations when installing the Energy Pak.

The Energy Pak must be turned OFF during installation. Avoid touching the battery terminals. Do not place any objects on top of the Energy Pak. Do not sit, stand or lean on the Energy Pak.

## 1. Selecting your location

The Energy Pak should be installed in a dry area that is free from moisture. Do not install this product in locations where flooding may occur. Install the Energy Pak as close as possible to the charger, inverter and/or electrical loads to minimize power losses in the cables.

If installing on a concrete floor, it is recommended to place the Energy Pak on an insulating pad to prevent the cold temperature of the floor from affecting battery performance.

Unlike some types of AGM batteries, ventilation is not required. The Energy Pak does not discharge toxic chemicals or vapours.

Do not install in compartments containing flammable materials or in locations which require ignition-protected equipment. This includes any space containing gasoline-powered machinery, fuel tanks, or joints, fittings, or other connection between components of a fuel system.

## 2. Proper orientation

It is best to place the Energy Pak in the upright position, i.e. with all labels oriented horizontally. Placing the Energy Pak on its side is permitted but not recommended. Never place the Energy Pak upside down - this could lead to the battery cells detaching from the bottom of the chassis, which can then lead to short circuits.

Secure the Energy Pak with fasteners after installation, especially if it is being used in a moving vehicle such as a boat or RV. This is especially applicable to the Energy Pak 3 and Energy Pak 6; note that the casing contains holes which enable them to be fastened down with screws; use screws of an appropriate strength and fasten them to fixtures capable of supporting the weight.

### 3. Wiring:

Whenever making any connection to the battery terminals, **DOUBLE-CHECK** that the polarity is correct.

Do not connect more than one pair of electrical cables to the battery terminals of the Energy Pak. If you want to power multiple loads, use two bus bars that each make a single connection to one of the battery terminals of the Energy Pak, and then connect all of your loads to the bus bars. Attempting to stack multiple cables from multiple loads onto the Battery Terminals can cause excessive strain and potentially damage the terminals. See Figure 5a below for proper usage of a bus bar for multiple loads. Figure 5b shows a frequently encountered incorrect connection that should be avoided.



Figure 5a: Correct connection for multiple loads using bus bars

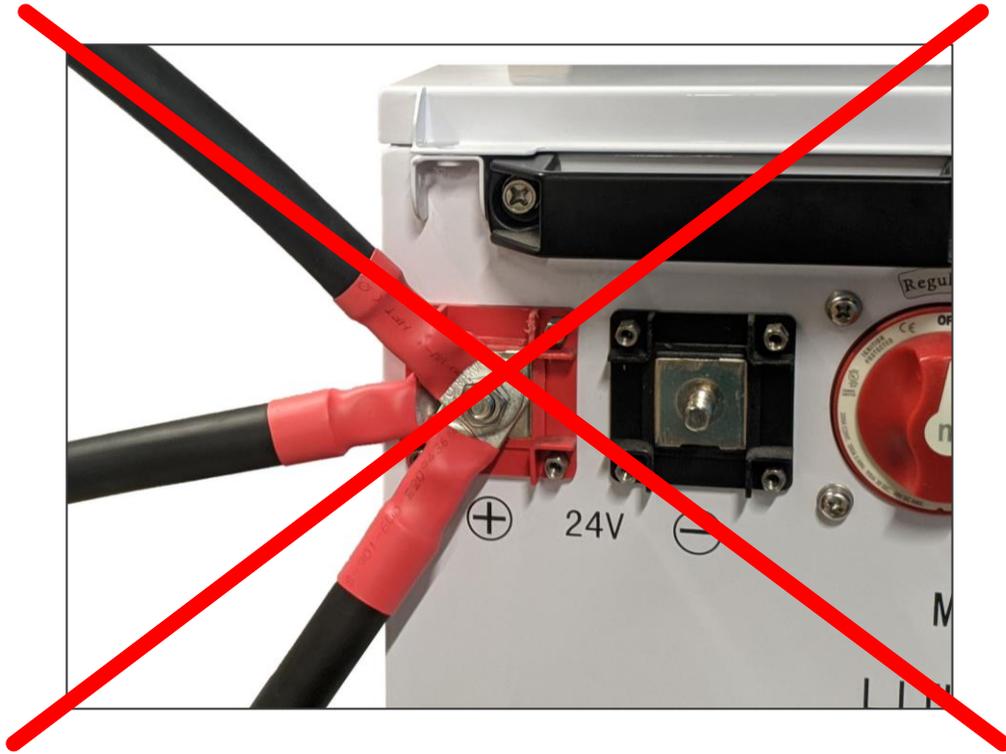


Figure 5b: **Incorrect** connection for multiple loads (multiple wires directly connected to the battery terminal)

#### 4. Use power cables with proper gauge

Users are advised to select the proper length and specifications of power cables to fit the power rating of their applications. The Energy Pak has been designed to handle a maximum current of 250A. The required cable specifications for different current ratings are listed below. The size of the cable will also vary depending on the length of the cable run. Consult with an electrician to ensure the cable is sized according to the electrical code within your region.



Undersizing the power cables can potentially cause a risk of equipment damage or personal injury.



It is recommended that at least 2 people are present during the installation. This is a common safety practice when working with electrical equipment in case of electrocution. The weight of the Energy Pak (33 kg - 115 kg depending on model) cannot be readily handled by one person.

Once the power cables have been connected to the Energy Pak and to the load, it is ready for use.

# 6 Normal Operation

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Once installed, you can operate the Energy Pak simply by turning it on/off. It must be turned on to supply power or to charge. The Energy Pak should be turned off during installation, when connecting/disconnecting wires, and for long-term storage.

To turn ON the Energy Pak for charge & discharge (regular) operation

1. Turn the Standby switch to the ON position
2. Press and hold the Wake Up button for approximately 5 seconds. Release the button after a click sound is heard.
3. The Energy Pak is now turned on and can be used for normal charge and discharge operations. This can be confirmed by checking that the Voltage Display has illuminated.

To turn OFF the Energy Pak for disconnecting & storing

1. Turn the Standby switch to the OFF position.
2. The Energy Pak is now turned off. This can be confirmed by checking that the Voltage Display is no longer illuminated.

Charging your Energy Pak

You can charge the Energy Pak by connecting a power source to the battery terminals. Some common sources of charging power are listed below. In each case, connect your power source to a charger, then connect the outputs of your charger to the battery terminals on the front panel of the Energy Pak.

- Grid power connected to a charger
- Solar panels connected to a charge controller
- Vehicle alternator or boat alternator connected to a charger
- Wind turbine or hydro turbine connected to a charger

**DO NOT OVERLOAD** your Energy Pak

Always operate your Energy Pak within the permitted current limit to prevent overload. When overloading occurs, the Energy Pak will automatically shut down as a safety precaution, and will have to go through a restart procedure. The current limit for all models is 250 A.

Maintain the SOC level above 20% to avoid auto-shutdown

The built-in BMS has been programmed to shut off the Energy Pak when the SOC (State of Charge) falls below approximately 20%. This prevents over-discharging the battery cells and improves the operating lifetime of your Energy Pak.

To avoid auto-shutdown, keep the SOC above 20% at all times. See the table below to see how the voltage corresponds to the SOC. In practice, it may be best to start charging Energy Pak at an SOC of 30% to provide a safety margin.

BATTERY VOLTAGE V ( no load attached )			
12 V Model	24 V Model	48 V Model	SOC %
12.4	24.8	49.6	20
12.6	25.2	50.4	30
12.8	25.6	51.2	40
13	26	52	50
13.2	26.4	52.8	60
13.4	26.8	53.6	70
13.6	27.2	54.4	80
13.8	27.6	55.2	90
14.4	28.8	57.6	100

Table 6: Battery Voltage vs. SOC. Note: SOC % is approximate due to the variability of battery cells.

Note that the shutting down of the Energy Pak at 20% SOC means that 80% of the capacity is still utilized for powering your loads. By comparison, only 50% of the capacity for AGM and flooded batteries can typically be used for powering your loads.

#### Initializing Phase

Due to the chemistry of lithium ion battery cells, the Energy Pak reaches its maximum energy capacity after about 10 full charge-discharge cycles.

In addition, if you have an LED display, the SOC indicator may not be accurate until 1 full charge-discharge cycle has occurred. Furthermore, the SOC may become inaccurate over time; again, a full charge-discharge cycle will restore the accuracy of the indicator.

### Low Temperature Operation

Due to the inherent nature of lithium ion battery cells, their performance is reduced at low temperatures. The Energy Pak can provide power in temperatures down to  $-30^{\circ}\text{C}$ , but its efficiency will be significantly lower compared to room temperature operation.

It is not safe to charge lithium ion batteries below  $0^{\circ}\text{C}$ . The Energy Pak includes a temperature sensor and an internal heater to permit charging at low temperatures. When charging at temperatures below  $0^{\circ}\text{C}$ , the Energy Pak will heat its batteries to  $0^{\circ}\text{C}$  before charging. You likely would encounter a delay from the time a power source is connected to the time the Energy Pak begins storing energy while it heats up.

### Monitor Operating Conditions for the best user experience

The Energy Pak features a BMS (Battery Management System) which includes circuitry that continuously monitors and protects the battery from overcharging, overdischarging, or overheating. It will automatically shut down the Energy Pak if it approaches an unsafe state. Although this will protect the battery, a restart procedure will have to be performed before using the Energy Pak again. It is best to avoid having the BMS shut down the system. Therefore it is advisable to monitor the following operating parameters when using the Energy Pak. The LED display / remote controller (see Section 9) will allow you to monitor all of these parameters. See Section 5 also for a description of the restart procedure.

1. SOC (State of Charge): indicates how much energy is in the Energy Pak, i.e. how full the battery is, at any time; use this to estimate how much runtime the battery has left, and to avoid overdischarging and ending up with a dead battery.
2. Voltage: another indication of how much energy is in the Energy Pak (the SOC is derived from voltage measurements); use this to estimate how much runtime the battery has left, and to avoid overdischarging and ending up with a dead battery. If you do not have an LED display; rely on the voltage display to estimate the SOC.
3. Current: indicates how much electrical current, and by extension how much power, is being consumed or supplied; use this to determine whether the battery is close to being overloaded.
4. Temperature: The efficiency of Energy Pak has a critical dependency on the operating temperature. The ideal operation temperature is between  $5^{\circ}\text{C}$  and  $30^{\circ}\text{C}$ . The Energy Pak will shut itself down if the temperature goes below  $-20^{\circ}\text{C}$  or above  $68^{\circ}\text{C}$ .

# 7 Maintenance / Protections and Storage

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## 7.1 Maintenance / Protections

Unlike traditional AGM batteries, the Energy Pak can be operated safely with little maintenance.

The Energy Pak features a BMS (Battery Management System) which is a protective circuitry that continuously monitors and protects the battery from being overcharged, overdrained, or overheated. It will automatically shut down the Energy Pak (system) if any improper state is reached.

Also, the Energy Pak has a built-in heating system which will heat the battery whenever there is a need to charge the battery when its temperature is below 0°C.

Although the BMS will protect the battery, it is best to avoid having it shutdown the system, as a restart procedure will have to be performed. Therefore it is advised to monitor the state of operation of the Energy Pak as you are using it. See Section 6 for the operating attributes to monitor and the significance of them.

## 7.2 Off-season Storage Procedure

- Turn the Energy Pak OFF for long term storage (>1 week) to avoid draining the battery.
- Although the Energy Pak has a very low self discharge rate when OFF ( $\leq 2\%$ /month,  $\leq 12\%$ /year), it should be charged a minimum of once every six months.
- Recommended state of charge for long-term storage: 50%
- Recommended storage temperature: 15°C to 35°C.
- Warranty-approved storage temperature: -30°C to 45°C
- Recommended storage humidity: 45% to 75% relative humidity.

Note: it is NOT necessary to disconnect the battery terminals during storage; turning the Energy Pak off automatically disengages the battery from the terminals.

# 8 Emergency Bypass Mode

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## 8.1 Why have a Bypass Mode?

As previously mentioned, the Energy Pak is equipped with a BMS that shuts down the system when a potentially unsafe condition is detected. The BMS thus maximizes the operational safety (as well as prolonging the lifetime of the battery). In the event of a shutdown, the Energy Pak is also equipped with an Emergency Bypass Mode to override the BMS and allow users to continue using battery power in emergency situations.

### Enabling the Emergency Bypass

The Emergency Bypass Switch will enable/disable Emergency Bypass mode. During normal operation the Emergency Bypass Switch must be set to the OFF position at all times. Turn it to the ON position to trigger Emergency Bypass mode ONLY when normal operation fails and there is an emergency need to use the Energy Pak.

## 8.2 When and How to use the Emergency Bypass Mode



The Energy Pak's built-in protective circuits are bypassed when the Emergency Bypass Switch is turned ON, and it is not protected from overcharging, over-discharging, or overheating. Risks include: equipment damage, fire and personal injury. Excessive use of the Emergency Bypass Mode also risks damaging the battery and reducing its lifetime.

Users are advised to only trigger the Emergency Bypass mode in emergency situations, for example if there is a medical emergency during a power outage that requires lights to be turned on, or low-powered medical devices to run. Running high-power loads in the Emergency Bypass mode, such as microwaves, air conditioners or hair dryers, creates the highest risk of damage or injury and should be avoided. All non-critical loads should be avoided so that the battery is not subject to over-discharging.

It is possible to charge the Energy Pak in Emergency Bypass mode, but be aware that there will be no protection against overcharging, or charging at a temperature below what is safe. It is extremely unlikely to encounter a situation where emergency charging is required, and so it is generally inadvisable to charge in Emergency Bypass mode.

While running in Emergency Bypass Mode, the operating voltage is still measured accurately and is the most reliable parameter. It is advisable to monitor the voltage to ensure that the Energy Pak is operating in the appropriate voltage range:

- 12.0 - 14.0 V for 12V models
- 24.0 - 28.0 V for 24V models
- 48.0 - 56.0 V for 48V models

After the emergency use, turn the Emergency Bypass Switch to the OFF position and have your Energy Pak inspected by your authorized service agent.

# 9 Using the LED Display / Remote Controller

The LED Display provides more detailed information about the Energy Pak.

It is a standard component built-in the Energy Pak 12 front panel. For the Energy Pak 3 and Energy Pak 6, it is an optional component. The LED display is a wired connection that also serves as a remote controller.



Figure 9: Energy Pak with LED Display/ Remote Controller connected

## Using the LED Display / Remote controller

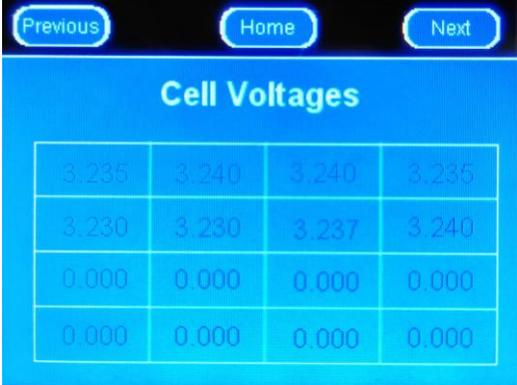
1. Connect the LED Display / Remote controller to the Communication Port on the Energy Pak.
2. Turn the Standby Switch on the Energy Pak to the OFF position.
3. Operate the Standby Switch and Wake-Up Button on the LED Display / Remote Controller in the same way as the switches on the Energy Pak itself.

## Operating the Display Screen

1. Use the Display switch to turn the display screen ON/OFF. This will not affect the battery operation.
2. After turning on the Display, its Home Page summarizes the battery status.

3. Use the touch screen to navigate to other pages and access more detailed information. Various pages of the Display Screen are explained below.

Table 9: Pages of the Display Screen

Display Screen	Description
	<p><b>Home Page</b></p> <ul style="list-style-type: none"> <li>• Displays all key operating parameters</li> <li>• The large percentage number at the top indicates the SOC (State of Charge - the percentage of energy remaining)</li> <li>• Remaining energy in kWh</li> <li>• Operating voltage of the Energy Pak</li> <li>• Current: positive value means the battery is being charged; negative value means battery is discharging to power electrical loads</li> <li>• The maximum temperature recorded by the internal temperature sensors</li> <li>• The range of voltage levels of individual battery cells</li> <li>• Data button: press for detailed data on cell voltages, temperature sensors, and balancing currents</li> <li>• Alarms button: press to display status of all alarms</li> <li>• Info button: press this for general info (see below)</li> <li>• Settings: press this to view/modify settings</li> </ul>
	<p><b>Cell Voltages</b></p> <ul style="list-style-type: none"> <li>• Shows the voltage of the individual battery cells in the Energy Pak</li> <li>• Nominal cell voltage is 3.2V; actual voltage measured will vary depend on the battery cell's SOC</li> <li>• The Energy Pak 6 model contains 8 battery cells, therefore 8 valid voltage readings are shown on the Display. The Energy Pak 3 contains 4 cells; so only 4 voltage readings are valid.</li> <li>• The Energy Pak 12 model contains 16 battery cells, so 16 readings are valid.</li> </ul>



### Cell Temperatures

- The Energy Pak includes two temperature sensors to monitor the temperature of the battery cells
- The two numbers on this page show the temperature at two specific locations inside the Energy Pak
- Temperatures in the range of -20 to 68 C are considered acceptable for connecting a load (the Energy Pak will automatically shut down outside this range)
- At temperatures below 2 C, the Energy Pak will not charge; its heater will be activated and charging will be permitted once it is heated.



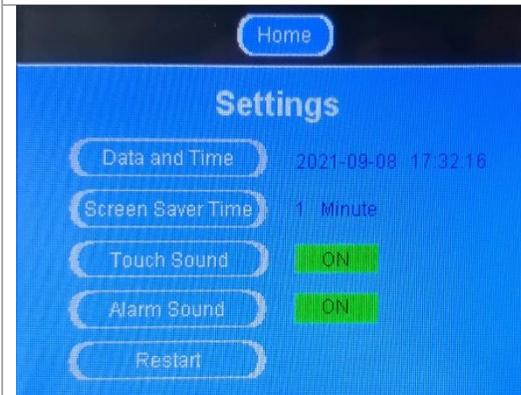
### Balance Current

- The Energy Pak automatically balances the voltage of individual cells to optimize overall performance
- Balancing is performed by charging or discharging small amounts of current in selected cells
- This page shows the values of the balancing current being applied to each cell
- Cell balancing only occurs when the BMS detects the necessity to do so; the image shows current balancing is not occurring at this time because all of the balancing currents are zero



### Alarms

- The Energy Pak includes alarms that trigger when operating parameters move beyond certain limits
- This page shows the status of the alarms
- This image shows the Energy Pak is working properly and no alarms are active
- No user action is required when an alarm is activated. The Energy Pak's built-in protective circuits will make auto-corrections or shut down the Energy Pak if needed



### Settings

- This page can be used to configure the alarm sound, screen saver time and display language
- This page can also be used to change the parameter settings - it is strongly recommended that users do not change any parameter settings



### Info

- This page displays general information about the Energy Pak as shown.

# 10 How to Deal with an Emergency

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If your health or safety is threatened, please always start with the following two steps before dealing with the other suggestions.

## STEPS:

1. Contact the fire department or other first responders immediately.
2. Inform all people who may be affected to ensure that they can evacuate the area.



WARNING: Only perform the actions suggested below if safe to do so.

## In case of fire:

- Turn off the Energy Pak by switching the Standby switch to the OFF position
- Shut down or disconnect any connected chargers or electrical loads
- Acceptable fire extinguisher types include: water, CO<sub>2</sub>, and ABC fire extinguishers
- Avoid using type D (flammable metal) fire extinguishers

## If there is odor or smoke:

- Turn off the Energy Pak by switching the Standby switch to the OFF position
- Shut down or disconnect any connected chargers or electrical loads
- Ventilate the room

## In case of flood:

- If any part of the Energy Pak or wires are submerged in water, do not allow any person to come into contact with the water
- Turn off the Energy Pak by switching the Standby switch to the OFF position
- Shut down or disconnect any connected chargers or electrical loads
- If possible, protect the system by finding and stopping the water source and pumping the water away

# 11 Troubleshooting

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## Energy Pak automatically shuts down

When the battery is drained below 20% SOC%, the BMS automatically shuts down the Energy Pak. The battery will need to be charged manually before resuming normal operation. This is done through two steps:

1. Connect the power source to the Battery Terminals of the Energy Pak.
2. Turn on the Energy Pak by turning the Standby Switch to the ON position, then press the Wake-up Button for 5 seconds. This step re-initializes the BMS so that it detects that the battery cells require charging and that the external power source is connected. The BMS will automatically initiate the charging process and will automatically stop it when the battery is fully charged.

The BMS will also shut down the Energy Pak when other operating parameters are outside safe limits. If this happens, follow the same steps above to restore the operation of your Energy Pak.

The most common causes of shutdown are:

- Leaving the Energy Pak operating too long without charging.
- Exceeding the electrical current limit of the Energy Pak. For example connecting too many high power loads like running a kettle and a microwave simultaneously.

## Incorrect current reading displayed

By frequently monitoring the LED Display Screen (optional on the Energy Pak 3 and Energy Pak 6, standard on the Energy Pak 12), you will develop a good feel for how your electrical loads affect the displayed electrical current. If you suspect that the displayed electrical current does not match the load conditions, attempt to verify whether the current reading varies in the right direction as the amount of load is changed.

If the current reading appears *high*, when you turn off any high power loads the current reading should show a drastic reduction. If the current reading appears *low*, when you turn on a high power load such as a hair dryer, microwave, or coffee maker, the current reading should show a drastic increase. If the current reading does not change as expected, restart the Energy Pak, and repeat the above. If the current reading still does not seem valid, the most likely cause is a malfunctioning current sensor in the Energy Pak. In this case, bring the Energy Pak in for servicing.

## Display giving inaccurate reading for SOC

SOC is a measure of the energy actually contained in the Energy Pak, expressed as a percentage of the nominal (perfect) capacity of Energy Pak. The Energy Pak may initially display an inaccurate SOC, or the reading may become inaccurate over time – this can be corrected by going through a full charge-discharge cycle.

## Energy Pak is shut off but the operating state seems valid

If the Energy Pak has been shut down by the BMS but you suspect that the SOC, voltage, and temperature are within the allowable range, there is a possibility that the BMS circuitry is malfunctioning. You may then attempt to operate the battery in Emergency Bypass Mode. See Section 7 for how to enable this mode, as well as the precautions that should be taken.

# 12 Warranty & Technical Support

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## WARRANTY

The Energy Pak comes with a 3-year warranty period under normal usage.

## TECHNICAL SUPPORT

If you need further assistance, please contact Microgreen.

When contacting us, please provide the following information:

- Name of owner
- Your preferred method of contact (phone, mobile phone or email)
- Energy Pak serial number
- Brief description of the problem

# 13 Energy Pak Specs Sheet

MODEL NAME	Energy Pak 3	Energy Pak 6		Energy Pak 12		NOTE
MODEL NUMBER	EPI2240	EP 12480	EP 24240	EP 24480	EP 48240	
BATTERY CHEMISTRY	LiFePO <sub>4</sub>					Lithium Iron Phosphate
NOMINAL VOLTAGE (V)	12.8 V	12.8 V	25.6 V	25.6 V	51.2 V	
RATED CAPACITY (AH)	240 AH	480 AH	240 AH	480 AH	240 AH	Rate at 25°C, 120A of current
RATED CAPACITY (KWH)	3.07 kWh	6.14 kWh		12.28 kWh		
OPERATING VOLTAGE (V)	12.0 – 14.0 V	12.0 – 14.0 V	24.0 – 28.0 V	24.0 – 28.0 V	48.0 – 56.0 V	
ABSOLUTE MAX VOLTAGE (V)	14.6 V	14.6 V	29.2 V	29.2 V	58.4 V	
ABSOLUTE MIN VOLTAGE (V)	10 V	10 V	20 V	20 V	40 V	
STANDARD CHARGE CURRENT (A)	120 A					Capacity is rated at this current
MAX CHARGE CONT. CURRENT (A)	250 A					
STANDARD DISCHARGE CURRENT (A)	120 A					Capacity is rated at this current
MAX CONT. DISCHARGE CURRENT (A)	250 A					
MAX SURGE DISCHARGE CURRENT (A)	700 A					700A for max of 10 sec
AMBIENT WORKING TEMP. (°C)	-30 to 55 °C					
BATTERY LIFE (CHARGING CYCLES)	4000					80% capacity at the end of 4000 cycles
COMMUNICATION	RS232, CAN					RS232 baud 38400
BATTERY WEIGHT (KG)	33 kg	60 kg		115 kg		
BATTERY DIMENSIONS - LxWxH (MM)	600 x 210 x 270	600 x 420 x 270		420 x 400x 600		

# 14 How to Contact Us

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Email: [info@microgreen.ca](mailto:info@microgreen.ca)

Website: <https://www.microgreen.ca>

Scan this QR code to find out more on Energy Pak

