



## Flux Power LiFT Pack M24 User Guide



## Safety Precautions

The Flux Power Lithium-ion Battery is composed of lithium-ion cells and is classified as Class 9 miscellaneous hazardous material.

Precautions to correctly handle the Flux Power lithium-ion battery include:

- The battery shall only be handled by Flux Power authorized personnel familiar with handling, storing, and the installation of a lithium-ion battery.
- Do not open the battery. – Only Flux Power authorized technicians shall perform service on a lithium-ion battery.
- Do not tamper with the main power Anderson connector.
- Do not mount or store the battery upside down or on its side.
- Upon receipt, check the battery for damage during transportation.
- Always use a lifting device when installing a battery.
- Never recycle lithium-ion batteries with lead-acid batteries, please consult Flux Power or your local recycler for more information on how to recycle a Lithium-ion Battery.
- **WARNING – Risk of Fire – No User Serviceable Parts**
-  Consider all DC battery cells and circuits to be energized, shorting of circuits may cause a hazardous condition. Remove all metallic jewelry from hands and arms before working on battery cells or circuits.
-  **SAFETY** - Follow Safety Standards as required; review and follow all Safety Data Sheets “SDS” for chemical use. Follow instructions for the proper use of PPE as required.

For technical assistance on the Flux Power lithium-ion battery, contact your local Flux Power dealer at [www.fluxpower.com](http://www.fluxpower.com).

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## 1 Introduction

The LiFT Pack M24 is a lithium-ion battery specialized for the material handling industry. This User Guide is intended to provide information on how to operate a Flux Power LiFT Pack M24 and maximize its productivity, longevity, and cost savings features.

## 2 LiFT Pack M24 Basics

### 2.1 Construction

The battery's main components consist of lithium-ion cells, a Battery Management System (BMS), a Battery Discharge Indicator (BDI), ON/OFF switch, and counterweights. The components are encased in a powder coated, 10-gauge steel enclosure. A diagram of the Flux LiFT Pack M24 can be seen in Figure 1.

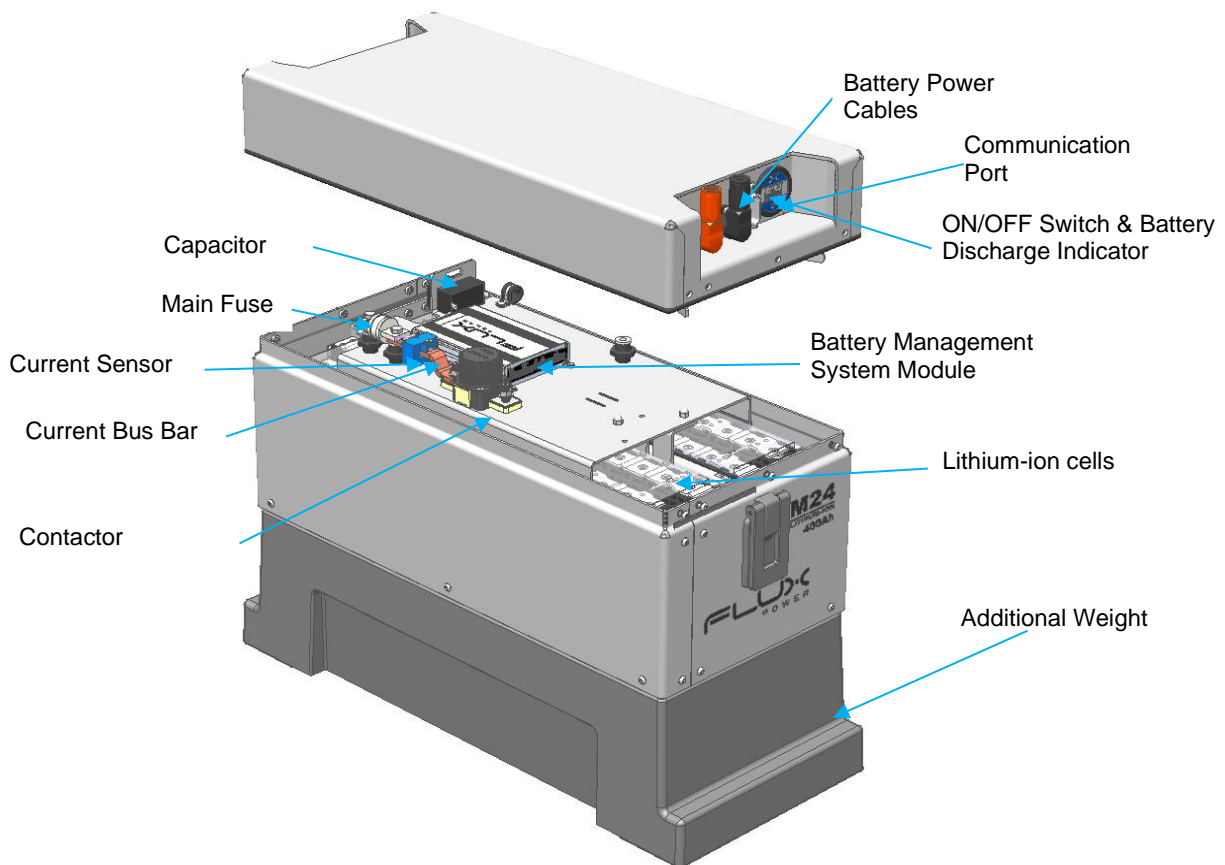


Figure 1: A diagram of the Flux Power LiFT Pack M24 Lithium Battery and all major components.

Refer to the data plate for the service weight of the battery.

## 2.2 Initial Startup

To turn on the battery, connect the external harness that came with the battery to its communications port. Depending on the external harness that came with the battery, an external State of Charge Gauge (SOC) and or Telematics box will also connect to the external harness. Use the capacitive touch button on the Battery discharge Indicator BDI gauge. Hold finger on the button for 3 seconds. When turned ON, the battery will close the main contactor relay and supply power to the truck.

## 2.3 Charger

There are no internal chargers with this battery. To charge using an external charger, disconnect the pack from the truck, and then plug the pack into the external charger using the standard SB connector. Make sure your charger has the appropriate charging profile loaded. An external charger set at a charge current of 240A will fully charge the battery within 2 hours.

The pack will suspend charging if cell temperatures are above 55°C (131 °F) or below 0 °C (32 °F) to maintain the optimal health. If you need to charge in colder conditions, integrated heaters are an option.

Use only a Flux Power approved charger for external charging.

### 2.3.1 Opportunity Charging

Opportunity charging reduces wear and tear on the pack and **increases** the lifetime of the pack. There are no sulfation, acid stratification, or heating issues, and the pack can be charged anytime, anywhere. To maintain pack health and longevity, it is recommended to fully charge the battery once per week.

- Plug the LiFT Pack into an external charger whenever it is not in use.
- Prior to storing the battery, fully charge and balance the pack. Toggle the power switch to storage mode once it is fully charged. The pack must be charged every 4 months or more.
- When only opportunity charging, the battery must be plugged in for eight (8) consecutive hours once per week. This will give the LiFT Pack time to fully charge and balance the lithium-ion cells.

As a safety feature, the battery will cut power to the truck while it is plugged in for charging. Once unplugged from charging, it will re-enable power to the truck.

## 2.4 Flux Power Battery Management System (BMS)

All of Flux Power's energy storage solutions use our patented Battery Management System (BMS) which monitors and protects the life of the battery and provides valuable information to the end user.

A Battery Discharge Indicator (BDI) connected to the BMS tells the end user how much energy is left and warns the user of any issues the battery may be experiencing.

### 2.4.1 Cell Balancing

Cell balancing is managed by the Flux Power BMS and is automatically performed whenever the pack is fully charged. If the pack is being used in an opportunity charging application, and is not given time to fully charge, we recommend the pack be allowed to fully charge and balance once per week. Leave the pack plugged in overnight and it will be charged, balanced, and ready to use the following day.

## 2.5 Battery Discharge Indicator

The primary function of the BDI is to display the amount of energy in a Flux Power LiFT Pack M24. It has a secondary function displaying Device Trouble Codes (DTCs) which provide information to the end user in case there is a problem.

To check the amount of energy available, refer to the BDI on the Flux Power LiFT Pack M24. The BDI on the truck will also give you the correct BDI if it is integrated with the truck.

When the pack is unplugged from charging, the BDI will be steadily illuminated and display the current state of charge. If the pack is plugged in and charging, the BDI will light up in sequence indicating it is charging. Once all lights are steadily illuminated, the pack is fully charged and balanced.

In addition, a warning buzzer sounds on the truck, when the pack is at 5% BDI to notify the user that it should be plugged in.



Figure 2: BDI gauge.

## 2.6 Temperature

Discharge temperature range: 0 °C to 55 °C (32 °F to 131 °F)

Charge Temperature Range: 0 °C to 45 °C (32 °F to 113 °F)

The BMS will prevent operation outside these limits. Batteries subjected to low temperatures (32°F / 0°C or lower) may experience decreased performance if not equipped with the heater option. Integrated heaters are available for cold storage applications.

## 2.7 Storage

Do not store the pack upside down or sideways. Make sure the LiFT Pack is turned OFF whenever it is being stored. This dramatically increases the storage time. The following table shows the storage times of a fully charged pack before it needs a recharge. If the pack is partially discharged, storage times are reduced.

LiFT Pack M24 Capacity	400A
Storage Time (ON)	90 days
Storage Time (OFF)	1 year

Table 1: The number of days a fully charged LiFT Pack M24 can be stored before needing a recharge.

If a LiFT Pack M24 is allowed to drain completely while in storage, it will damage the lithium-ion cells and void the warranty.

## 3 Device Trouble Codes (DTCs) on BDI

The BDI will display Device Trouble Codes which warn the user if there is an issue with the battery. The table below will display certain system conditions. In normal operation, the BDI will display the battery's current state in as a percentage with no DTCs present. If a DTC is present, then the BDI will indicate so with a DTC number. DTCs let the user or technician quickly assess why a battery may be disrupting operation. The following list details each DTC.

OEM Version - There are some cases where the LiFT Pack may need to cut power to the truck 10 seconds before cutting power, the LiFT Pack will a blinking light as a warning.

Table 2: Situations where the Flux Power lithium battery will cut power and display a DTC.

Fault Description	Cause and Required Duration to Trigger	Fault Protection	DTC Number	Service Required?	Fault Resolution
0% State of Charge	<5% State of Charge, Immediate	Buzzer Sounds Periodically	1	No	Connect appropriate charger
Over-temperature	Discharge temperature > 131F, 60 seconds Discharge temperature > 133F, Immediate Charge temperature > 114F, 60 seconds Charge temperature > 115F, Immediate	Contactors opens	2	No	Allow pack to cool, then cycle the circuit breaker OFF, then ON
Under temperature	Discharge temperature < -2F, 60 seconds Discharge temperature < -4F, Immediate Charge temperature < 33F, 60 seconds Charge temperature < 34F, Immediate	Contactors opens	2	No	Allow pack to warm, then cycle the circuit breaker OFF, then ON
High Cell	At least one cell is >3.65V, Immediate	Contactors opens	3	No	Cycle the battery OFF, then ON through the battery's BDI. If fault occurred while charging, allow cells to settle

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Current Exceeded	Discharge current <(-1000A), 10 seconds Discharge current <(-400A), 2 minutes Charge current > 1000A, 10 seconds Charge current > 400A, 2 minutes	Contactors opens	4	No	Cycle the battery OFF, then ON through the battery's BDI
Hardware Failure	Electronic component failure for more than 10 seconds	Contactors opens	6	Yes	Service
Low Cell	Fixed threshold of <2.8V for cell temp >25C	Contactors opens	9	No	Connect the appropriate charger and cycle the battery through the battery's BDI
Integrity Signal	Communications port missing loop-back or external harness issue	Contactors opens	11	Yes	Ensure that the communications port has a proper loop-back. If an external harness is connected, then ensure that all components of the harness are properly connected and functioning. Contact Product Support if further assistance is needed

## 4 Safety and Reliability

Flux Power LiFT Packs are completely sealed and require no watering. No electrolyte must be added and there is no danger of acid spills or explosive vapors during normal use. In addition, the Flux Power LiFT Pack M24 is designed to pass the UL 2580 standard.

- **WARNING:** Do Not Disconnect the Anderson cable connector under load.
- Not Suitable for water exposure.
- Not intended for use in a marine environment.
- For indoor use only.
- ALWAYS use proper lifting techniques and equipment when installing the battery.
- The battery does not require regular maintenance but should be plugged in overnight once per week to allow the cells to balance.
- Do NOT attempt to open the battery, unless authorized by a Flux Power representative.
- Do NOT tamper with the main power Anderson connector.

### 4.1 Hazardous Material Information

Lithium-ion batteries are considered HazMat Class 9 - Miscellaneous. There are no reporting regulations required for Flux Power LiFT Packs federally (specifically under the Resource Conservation and Recovery Act of 1976 (RCRA) and



the Emergency Planning and Community Right-to-Know Act (EPCRA)). There are hazmat regulations when shipping lithium-ion batteries.

There are sometimes state or city regulations which differ from federal law, however generally speaking, a Flux Power LiFT Pack M24 under normal use has no danger of leakage, spilling, outgassing, or presenting any danger to the end user. Federal regulations are very strict when dealing with lead-acid batteries due to the environmental impacts of heavy metals (lead) and inherent dangers present: acid spills, explosive gases, and lead poisoning.

For more information on local regulations, contact your local EPA and fire department or contact FLUX Power and we will do our best to assist you.

## 4.2 What to do if a Cell Breach Occurs

If a cell breach occurs open the doors and windows to allow ventilation. Do not use water to clean up the electrolyte, but instead use absorbent material. Place the contaminated rags in a metal bin. Avoid breathing the fumes, and in case of fire, do not use water, use a type D, CO<sub>2</sub>, Dry Chemical, or foam fire extinguisher. For more information contact Flux Power or refer to the Safety Data Sheet (SDS). The SDS is available on the Flux Power website at [www.fluxpower.com](http://www.fluxpower.com).

The damaged pack and cleaning materials should be placed in a sealed plastic or steel container and disposed of or recycled using the measures required by your local EPA.

## 4.3 Heavy Water Spray

The Flux Power LiFT Pack M24 should not be used in equipment where there is excessive water spray, such as applications that require power washing. The pack should also never be submerged in water. In the event that a LiFT Pack M24 is submerged, please do not attempt to use, or charge the pack. Please contact Flux Power Technical Support at 877-505-3589.

## 5 Recycling/Disposal

### 5.1 Recycle

Lithium-ion batteries are recyclable and there are lithium-ion recycling plants nationwide. **Do not include lithium-ion batteries in shipments of lead-acid batteries being sent for recycling.** Sending a lithium-ion battery to a lead-acid recycler could cause damage to equipment and personnel. Contact Flux Power if you need assistance. If you are unable to locate a lithium-ion recycler in your area, Flux Power agrees to take back any battery that is at its end of life.

### 5.2 Re-Use

When a LiFT Pack M24 no longer holds enough charge, there are already a number of options, such as:

- Cells can be deployed into alternate second life usage, such as grid storage or emergency power.
- The steel case and electronics can be refurbished into a new pack or be recycled.

## 5.3 Disposal

Flux Power is committed to the environment. Lithium-ion batteries are not specifically discussed in the Federal Resource Conservation and Recovery Act (RCRA). However, given the federal requirements for hazardous materials, a *completely discharged lithium iron phosphate cell is considered **non-hazardous** material*. States and cities may have more stringent regulations in place, some of which blanket all lithium-ion batteries as hazardous waste, while others classify them as normal waste. The Flux Power LiFT Pack M24 End of Life Guide and Guarantee ensures full compliance with laws and the highest environmental standards. The guide is available on the Flux Power website at [www.fluxpower.com](http://www.fluxpower.com).

## 6 Shipping Information

When shipping Flux Power LiFT Packs, the products are classified as *UN 3480 Dangerous goods - Part II - Class 9 (miscellaneous)* and can only be shipped ground. The battery must be secured to a pallet or in a wooden crate. There must be nonconductive material between multiple batteries, and they cannot be stacked. If it is being shipped in equipment it must be securely installed and protected against heat, short circuit, movement, and accidental activation of the equipment. Shipping declarations, hazmat shipping documentation, and hazmat shipping training are all required. Please see the *Flux Power LiFT Pack Shipping and Reporting Guide* for more information. It is the responsibility of the shipper to obey all regulations when shipping a Flux Power LiFT Pack M24.

This guide is available on the Flux Power website at [www.fluxpower.com](http://www.fluxpower.com).

## 7 Flux Power Contact Details

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WARNING – Risk of Fire – No User Serviceable Parts

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