SISU Battery Box Manual

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SISU
1520 Royston Lane
Round Rock, Texas 78664
United States of America

This manual is to be used with the SISU Battery Box.

SISU is not responsible for any damage, real or implied, resulting from the use of this document.

This document is subject to regular technical alterations.

Patent sisucinemarobtics.com/patents

IMPORTANT SAFETY INFORMATION

The following general safety requirements and specifications must be observed during all phases of operation of this equipment. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, intended use, and could void all warranty of this system. SISU assumes no liability for the customer's failure to comply with the requirements herein.

Using the SISU Battery Box and any of its components in a manner not specified by this manual may diminish the life of the equipment and/or personnel safety measures.

Before undertaking the installation process, carefully read the following caution notices. Protection equipment may be impaired if equipment is not used in the manner specified. **This equipment contains voltage hazardous to human life and safety, and is capable of inflicting personal injury.**

GENERAL WARNINGS

DANGER: The SISU Battery Box contains high voltage connections that can be hazardous to human life.

DANGER: There is a risk of electrocution and burn if panel(s) are removed.

DANGER: DO NOT ATTEMPT TO SERVICE THE BATTERY BOX. Only SISU trained service personnel are authorized to perform maintenance on this system.

DANGER: There is a risk of fire from the batteries in the Battery Box. If a fire occurs, evacuate area immediately and notify the fire department.

> **NOTE:** SISU uses an off-the-shelf, highly tested, LiFeP04 Lithium battery. This battery chemistry is one of the safest types of lithium battery on the market today. However, all lithium batteries do have some risk which, legally, SISU needs to disclose.

DANGER: Failure to ground the system with a ground cable or the AC charge cable is hazardous and outside of the system specifications. When using the battery box while the AC Charge cable is NOT attached, the operator MUST ensure that the battery box is properly grounded by connecting a ground cable from the SYSTEM GROUND on the Battery Box to a building ground, ground rod, or other suitable ground.

(**WARNINGS!** continued on next page)

DANGER: When using the battery box while the AC Charge cable is NOT attached, the operator MUST ensure that the battery box is properly grounded by connecting a ground cable from the SYSTEM GROUND on the Battery Box to a building ground, ground rod, or other suitable ground. Failure to ground the system with a ground cable or the AC charge cable is hazardous and outside of the system specifications.

DANGER: If the equipment is used in a manner not specificed by the manufacturer, the protection provided by the equipment may be impaired.

DANGER: Always position the battery box so that it is easy to access the power button in the event of an emergency.

DANGER: Use personal protective equipment (steel-toed shoes, etc.) when using the Battery Box to avoid injuries from any debris, sharp edges, or dropped equipment. Specifically, use closed toe shoes and steel toed boots when moving the Battery Box for maximum protection from wheels rolling over feet.

DANGER: Be aware that there is a possible tip hazard when the Battery Box is moved. Use personal protective equipment (steel-toed shoes, etc.) when moving the Battery Box in the event that it tips over.

DANGER: The handles on the Battery Box are only for hand moving the system. THE BATTERY BOX HANDLES SHOULD NOT BE USED TO LIFT THE BATTERY BOX.

DANGER: Equipment must be shut down in the order specified in this document.

DANGER: Observe all hazardous warning labels located on the SISU Battery Box components.

DANGER: The safety of any devices incorporated into the equipment during installation is the responsibility of the installer.

DANGER: Cables can be a trip hazard. Properly manage cabling to prevent injury.

(**WARNINGS!** continued on next page)

TRANSPORTATION WARNINGS

DANGER: The Battery Box is heavy. Failure to follow proper lifting procedures and hoists can result in damage to people and equipment.

CAUTION: When transporting the Battery Box commercially, follow the local transportation restrictions. Apply UN3481 warning label to crate.

CAUTION: Ensure that any tie down straps used for transportation are rated for the whole weight of the battery box (i.e. tie down straps rated for 600 lb or more).

CAUTION: All four wheels must be locked during transportation.

CAUTION: The Battery Box must be shipped upright and never on its side.

CAUTION: Do NOT use the four handles (two located on the front panel and two located on the back panel) for lifting OR securing the Battery Box during transport or at any other time. These handles should ONLY be used for hand guiding the system along while the wheels are moving. Tie downs or other straps should NOT be connected to these handles

CAUTION: Use the eight transport rings for lifting and securing the Battery Box for transporting. When lifting using the transportation rings, all four top transport rings must be used. The system weight must be distributed on more than one transport ring. The system carrier mass is within the area of the top four transport rings.

CAUTION: Failure to use all eight transport rings to secure the battery box during shipping may result in broken or damaged equipment.

CAUTION: While being used for transportation or securing purposes, transport rings MUST be oriented correctly with the ring pointed in the direction of the load and with the bolt on the opposite side of the ring (NOT in the center of the ring).

CAUTION: The customer is responsible for understanding and following all necessary transportation requirements. SISU is not liable for a customer's failure to comply with necessary transportation requirements.

(**WARNINGS!** continued on next page)

BATTERY CARE WARNINGS

DANGER: **Contact SISU support immediately if you suspect anything is wrong with the internal battery, such as a strong electrical odor. If this happens, turn the system OFF and DO NOT USE IT until checking with SISU support.**

CAUTION: Prevent total battery discharge at all times.

CAUTION: Familiarize yourself with the low battery notification and act when the low battery notification is active. **This will prevent a system shutdown.**

CAUTION: If the pre-alarm is active - or if the outputs have been disabled - make sure to recharge the batteries as soon as possible. **MINIMIZE THE TIME THE BATTERIES SPEND IN A LOW DISCHARGED STATE AS MUCH AS POSSIBLE.**

CAUTION: It is recommended to plug in and charge the battery box at least once a month.

CAUTION: When leaving the Battery Box stored for an extended period of time, make sure to occasionally charge the batteries during that time period.

ENVIRONMENTAL WARNINGS

CAUTION: All environmental conditions must be met.

CAUTION: Do **not** use near liquids.

CAUTION: Do **not** use in a wet environment.

CAUTION: Output capacity will be reduced if used in direct sunlight when the ambient temperature is above 95F (35C).

DANGER: The Battery Box is rated for indoor use.

DANGER: A GFCI extension cord or adapter is required when connecting the Battery Box to equipment that might be close to water or may get wet.

(**WARNINGS!** continued on next page)

MAINTENANCE WARNINGS

⚠ **CAUTION:** The SISU Battery Box components should be cleaned using a damp cloth with mild soap.

⚠ **CAUTION:** The Battery Box must remain upright to maintain proper ventilation. **DO NOT TIP OVER OR LAY ON SIDE.**

⚠ **CAUTION:** Keep the Battery Box in a well ventilated area with a minimum 12" space around the ventilated sides of the system while running. When being stored, keep at least a 1" space around ventilated sides.

CONTENTS

1. BEFORE YOU BEGIN

1.1 Chapter Contents

1.2 Icon Key

1.3 Intended Use

The SISU Battery Box system is intended to power 3-phase 400 VAC equipment such as a SISU Cinema Robot when no power - or when only standard residential wall power (i.e. 120 VAC) - is available.

1.4 Inspect Before Use and Install

1. Check front panel screen for cracks.
2. Check cables for wear.
3. Check that all cables and connectors are not damaged, and check that they are tightly connected.
4. Check the battery level. It is recommended that batteries are at 20% charge or higher before using to avoid low battery alarms.

> **DANGER:** If any issues are identified immediately cease use of the system until the maintenance issues are remedied.

1.5 Internal Fuses

- **Main battery fuse:** 250A/58V MEGA
- **48V battery monitor:** 3A/58V ATM MINI fuse
- **24V battery monitor:** 3A/58V ATM MINI fuse
- **48V bus bar:** 3A/58V ATM MINI fuse

1.6 Service Personnel

The following represent product specific risks that may affect service personnel.

DANGER: DO NOT remove the system panels or rewire the input or output connectors on the battery box.

DANGER: Only trained SISU service personnel are authorized to work on this system.

DANGER: There is a risk of electrocution and burn while performing maintenance.

- Power the system **OFF** and wait **1 FULL MINUTE** before servicing.
- Disconnect the battery quick-disconnect positive terminal before servicing.
- Verify with a multimeter that no residual voltage remains on the DC or AC wiring before servicing.
- To verify correct functionality after servicing, power the system back **ON**.

1.7 Spare Parts

To purchase spare parts from SISU, contact the SISU Sales Number: 512-377-6075

- Adapter cable for SISU C20, Track, and C31 robots - 402459-01 A
- Compatible plug for 400V outlets - ElecDirect SCM520P6S
- AC Input cord minimum requirements: C13 connector with cable rated to 15A (reference the battery box voltage input specifications)

1.8 Contact Information

For additional help or questions please contact SISU support:

- Email support@sisucinemarobotics.com
- Call or text 512-770-9518

2. INSTALLATION AND SETUP PROCEDURES

2.1 Chapter Contents

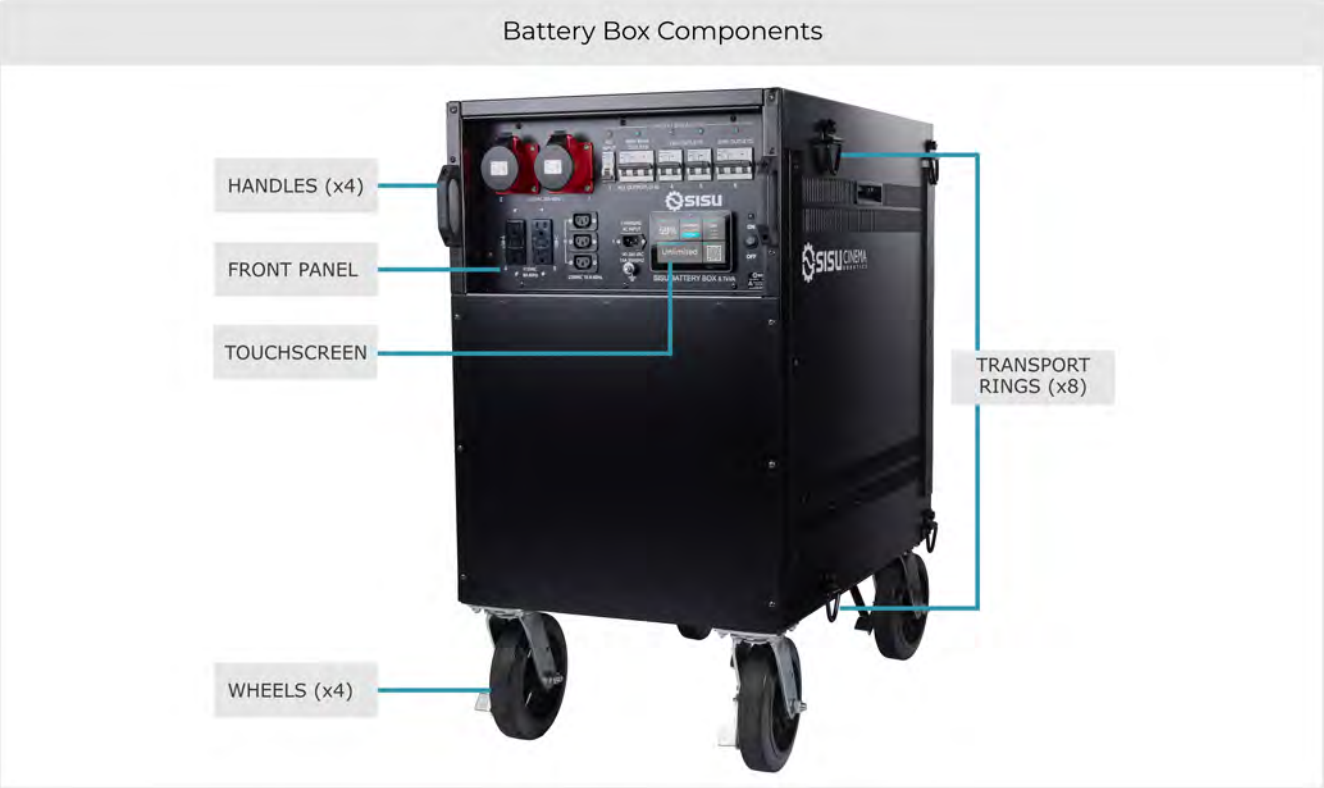
WARNING: The SISU Battery Box contains high voltage connections that can be hazardous to human life.

WARNING: There is a risk of electrocution and burn if panel(s) are removed.

2.2 Battery Box Hardware Guides

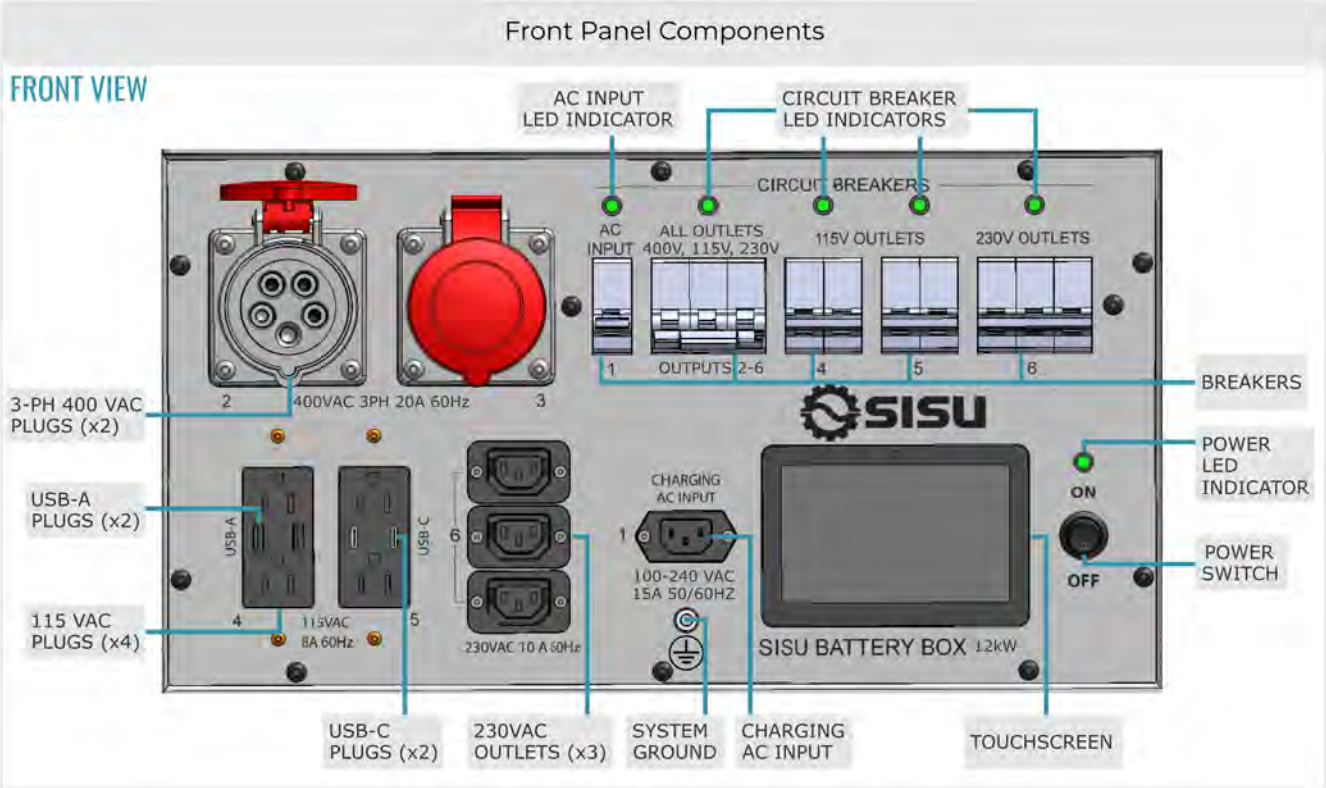
See the following pages for specific hardware guides.

2.2.1 Battery Box Components



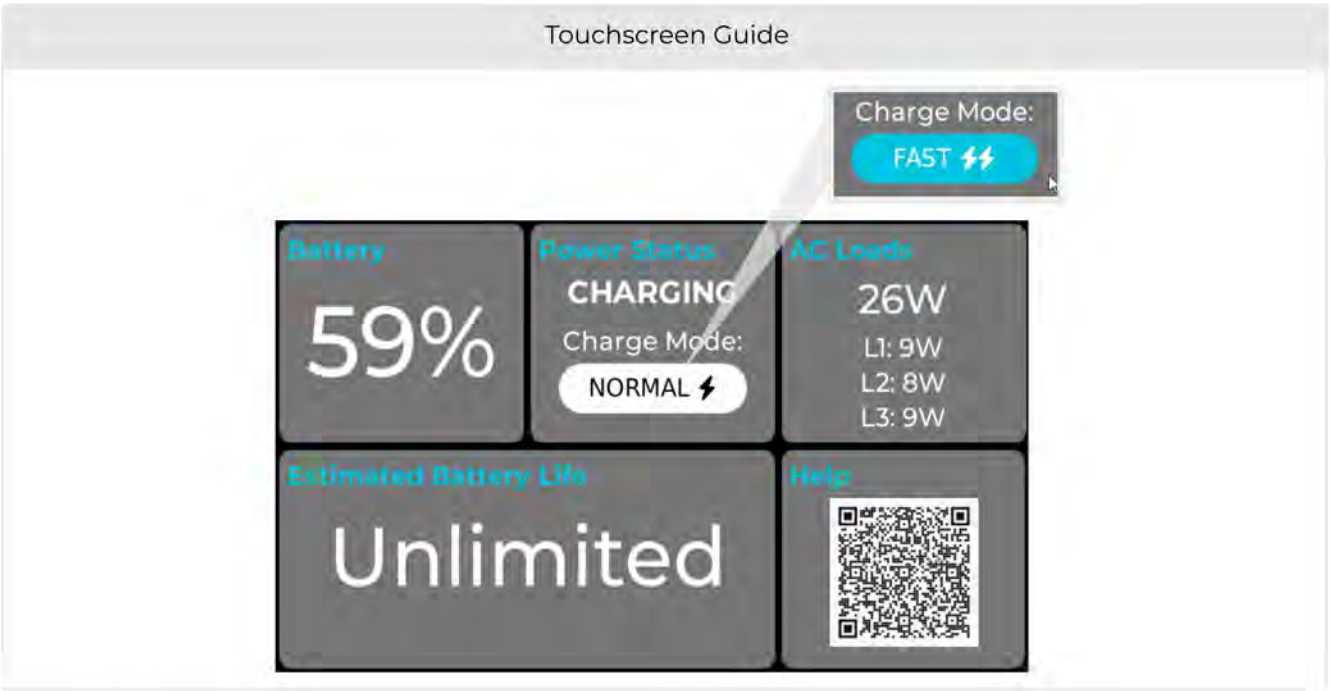
Name	Description
Handles (x4)	Used for pushing and pulling the system on the wheels (see section 4.2 Pushing the Battery Box to a New Location)
Front panel	Main panel for connecting input and output, and for turning on the system
Touchscreen	Used for checking system information such as battery status and time remaining, AC loads, and charging status
Wheels	Wheels should be locked for shipping, securing, and during use; wheels should be unlocked when system is being pushed or pulled to a new location
Transport rings (x8)	Used for lifting and securing the system (see section 4.3 Lifting the Battery Box)

2.2.2 Battery Box Front Panel Components



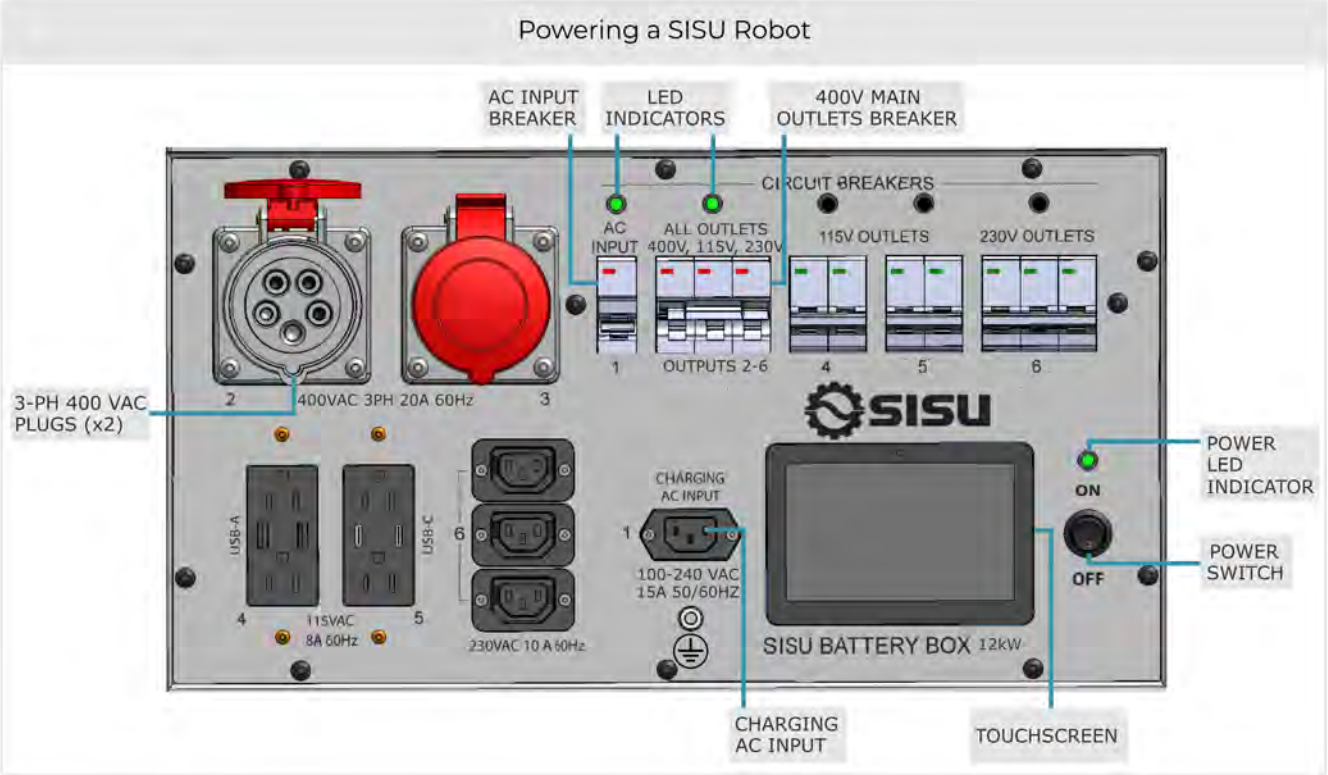
Name	Description
AC input LED indicator	Indicator will turn green when breaker is turned **ON** and battery charger is active
Circuit breaker LED indicators	Indicators will turn green when breakers are turned **ON**
Breakers	Automatic devices that stop current flow as a safety measure
Power LED indicator	Indicator will turn green when battery box power is turned **ON**
Power switch	Powers **ON** the battery box
Touchscreen	Gives relevant information on: battery, power status, AC loads, estimated battery life, and help
Charging AC input	Connector for receiving wide range AC input for charging the Battery Box
System ground	Grounding lug for system earth grounding
230 VAC outlets (x3)	Outlets that allow the user to plug in 230 VAC devices
USB-C plugs (x2)	Plugs that allow the user to plug in USB-C devices
115 VAC plugs (x4)	Plugs that allow the user to plug in 115 VAC devices
USB-A plugs (x2)	Plus that allow the user to plug in USB-A devices
3-PH 400 VAC plugs (2)	Plugs that allow the user to plug in 3-PH 400 VAC devices

2.2.3 Battery Box Touchscreen Guide



- **BATTERY** - Displays the % of the battery remaining. Also displays if the battery is being charged or discharged, the battery voltage, and amperage levels.
- **POWER STATUS** - Indicates the charging status and system charge mode. Normal mode is a 1.2kW peak on the AC input for charging the system (i.e. 10A at 120VAC) which allows you to fully charge the system in 4.5 hours. In fast mode that increases by 50% to a 1.8kW peak (i.e. 15A at 120VAC). This means that in fast mode charging the system is 50% faster (i.e. 3 hours to fully charge with no loads connected).
- **AC LOADS** - Displays the total system AC wattage output as well as a breakdown of wattage from each of the 3 phases: L1, L2, and L3.
- **ESTIMATED BATTERY LIFE** - Displays an estimated run time remaining until the battery is fully depleted. This is calculated from an average power use over the past 3 minutes. If the power output is less than the charging input, then nothing is displayed, indicating that at the current rate the battery will never deplete.
- **HELP** - QR code that takes you to a troubleshooting document which also contains a link to this manual.

2.3 Powering a SISU Robot



1. Place the battery box on set with a minimum of 12" between the ventilated sides of the battery box and any other objects.
2. Confirm the **POWER SWITCH** is in the **OFF** position. All LEDs will be unlit.
3. Connect the device to be powered (e.g. a SISU Cinema robot) into one of the **RED 400 VAC (robot power) PLUGS (2, 3)**. Lock the power connector by engaging the battery box socket cover with the power cable tab.
4. To charge the battery while running the robot, connect the AC charging cable to the **AC INPUT (1)**.
5. Switch the **POWER SWITCH** to the **ON** position.

> **NOTE:** The **POWER LED INDICATOR** will turn **ON**.

(Continued on next page)

6. If it is not done already, switch the **AC INPUT BREAKER (1)** to the **ON** position.

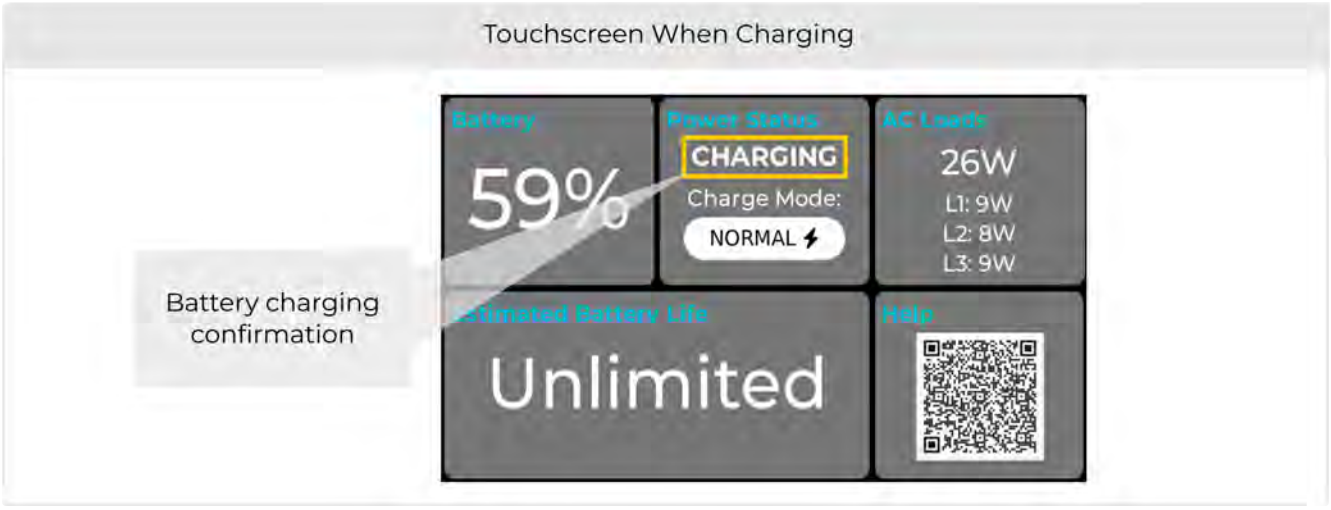
   NOTE: The LED above the **AC INPUT BREAKER (1)** will be **ON**, and the breaker will show **RED** on the switch.

7. Switch the **400V MAIN OUTLETS (2-6)** up to the **ON** position.

   NOTE: The LED above the **400V MAIN OUTLETS (2-6)** will be **ON**, and the breaker will show **RED** on the switch.

8. It is now safe to turn your robot **ON**.

9. After applying power to the system, check the battery box **TOUCHSCREEN** to confirm the system battery and power status.



   NOTE: The screen will take approximately 45 seconds to show after the system is powered **ON**. The **BATTERY** section on the touchscreen will read **charging** when trickle-charging on the AC Input.

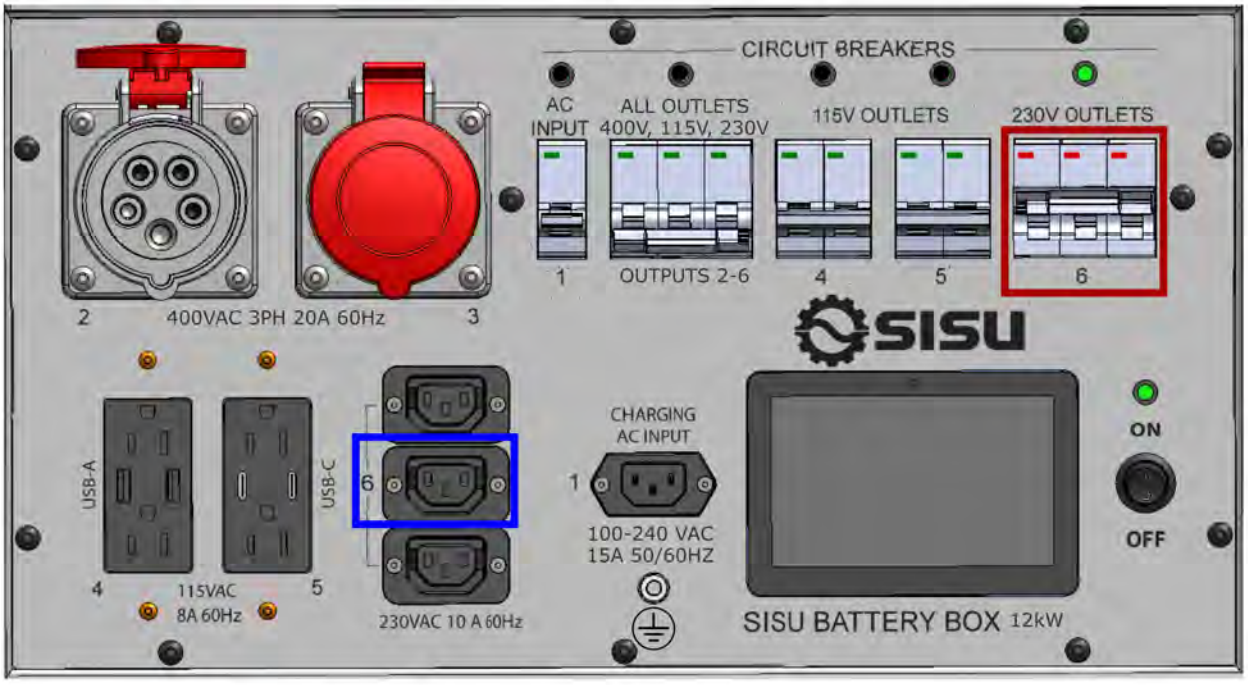
2.4 Powering Devices from Outlets 4-6

1. Confirm that the **POWER SWITCH** is in the **ON** position.
2. Flip the **MAIN OUTLETS breaker** to the **ON** position.
3. **Check the number near the outlet that you want to use.** Flip the **circuit breaker** with the SAME number **UP** to turn on power to that outlet.

> **NOTE:** The **LED** above that breaker should turn **ON**.

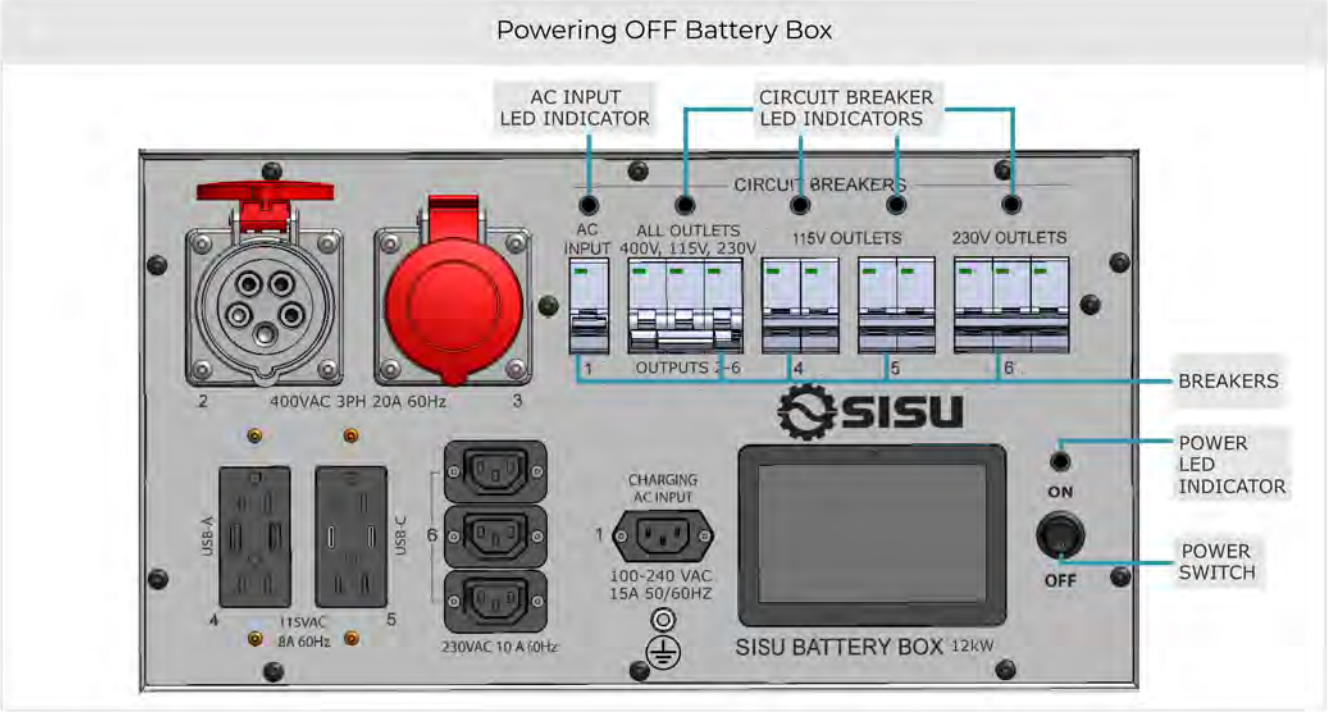
a) **EXAMPLE:** To use the **230V outlet** designated in **BLUE (6)**, flip **UP** the **230V OUTLETS (6)** designated in **RED**.

Powering Devices from Outlets

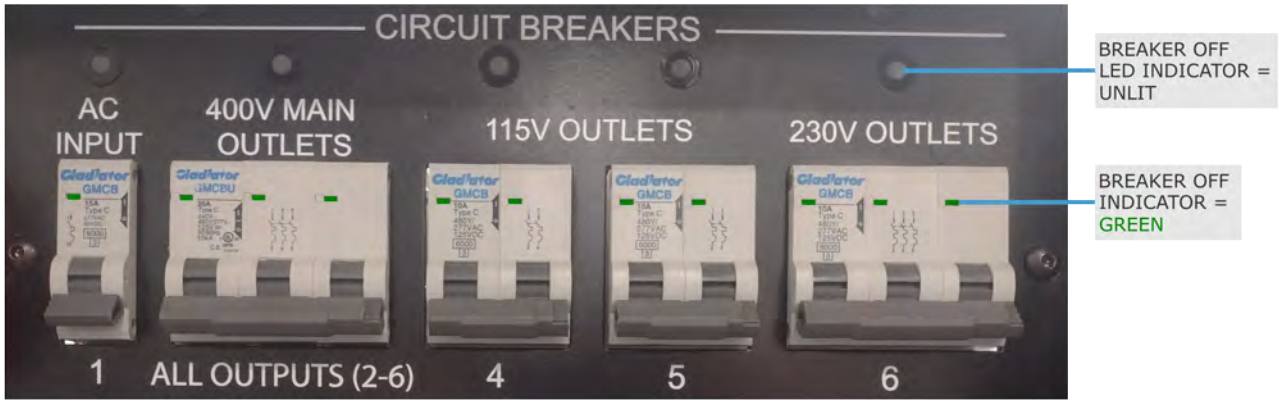


4. You should now have power at the desired outlet.

2.5 Powering OFF the Battery Box



1. Confirm that all devices connected to the **BATTERY BOX OUTLETS** have been properly shut down.
2. Flip all **BREAKERS** to the down position (**OFF**).



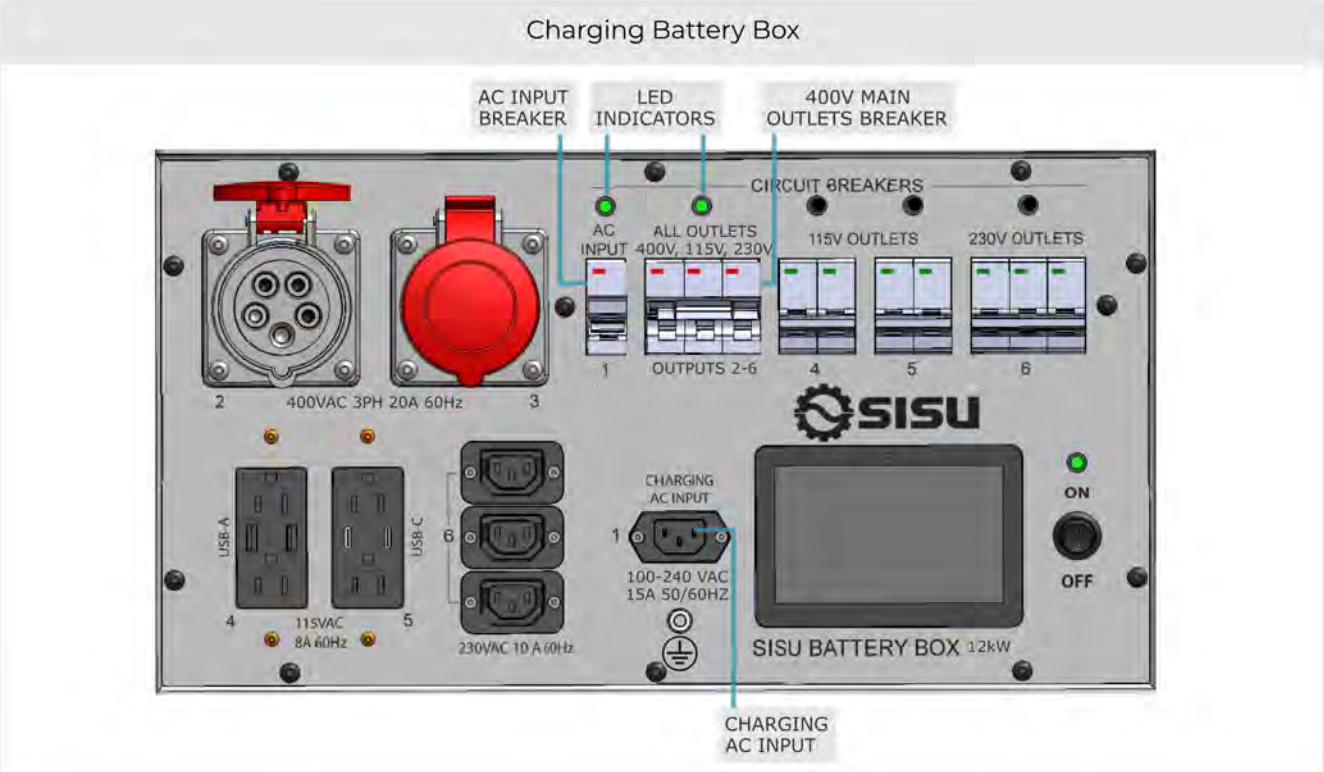
3. Confirm that all **BREAKER LEDs** turn **OFF**.
4. Switch the **POWER SWITCH** to the **OFF** position.
5. Confirm that the **POWER LED INDICATOR** has turned **OFF**.
6. Disconnect any devices and cables from the battery box.

2.6 Charging the Battery Box

Overview of Power Status: The SISU battery box power status indicates the charging status and charge mode of the battery box.

Possible Charge Statuses:

1. **CHARGING**: This means that the battery box system is properly charging. The system output power draw is less than the rate that the battery box can charge.
2. **IDLE**: This means that no power is currently being output from the battery box.
3. **DISCHARGING**: This means that the battery box system power is being drawn faster than it can charge. This status will show when the system is NOT connected to properly charge, or when the total power being used is greater than the system's ability to charge.



1. Plug a compatible cable into the **CHARGING AC INPUT** plug.
2. Plug the cable into a compatible 90-265 VAC, 50/60Hz outlet.

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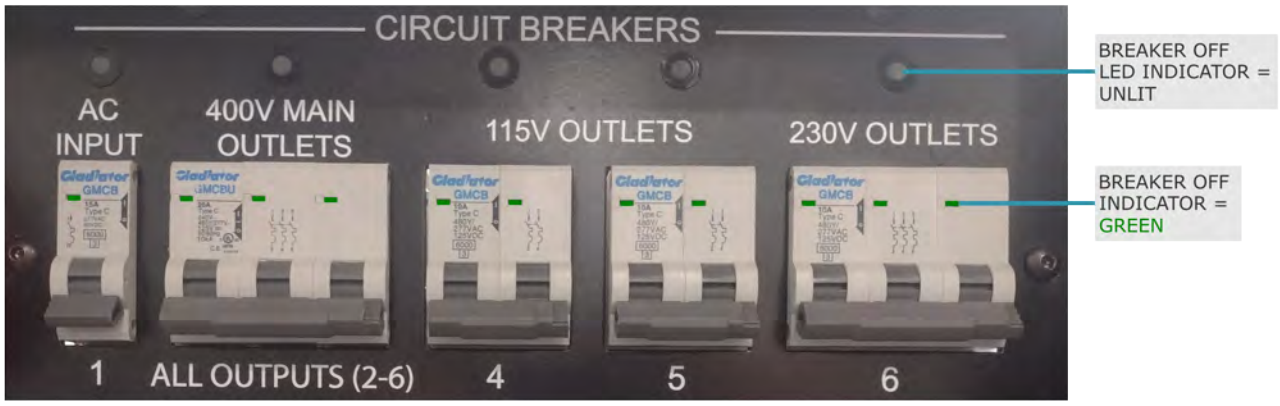
3. Flip the **AC INPUT breaker** to the **ON** position (flip breaker **UP**).

WARNING: If AC INPUT is connected and AC INPUT breaker is ON, the battery box fan will turn ON. The system will charge even if the power switch is OFF.

4. Flip the **400 VAC MAIN OUTLETS breaker** to the **ON** position (flip breaker **UP**).



5. Confirm that the system is charging as expected by checking the TOUCHSCREEN. To charge more quickly, use Fast Charge mode.

FOR CUSTOMERS WITH A SERIAL NUMBER LOWER THAN 2341008: The battery box will only charge if the power switch is **ON**.

2.6.1 Charge Mode

Overview of Charge Mode: The SISU battery box has two different charge modes that can be set to charge the battery box more quickly.

Possible Charge Modes:

1. **NORMAL**: Normal mode requires between 100-240 VAC at 10A to charge properly. The battery box will draw a peak 1.2kW on the AC Input and can fully charge the system with NO loads in 4.5 hours.
2. **FAST**: Fast mode requires between 100-240 VAC at 15A to charge properly. When set to Fast Charge, the battery box system can charge 50% more quickly. This translates from 0% to fully charged with NO loads connected in 3 hours.

Enabling Fast Mode Charging:

1. Confirm that the power source circuit (that will charge the battery box) can support up to 15A
2. Confirm that you have followed ALL previous steps in the 2.6 Charging the Battery Box section.
3. On the TOUCHSCREEN under **Power Status** and **Charge Mode**, press the button that says **NORMAL**. It should now read **FAST** to show the system is charging in Fast Mode.
4. To change back to Normal Mode, press the button on the TOUCHSCREEN that says **FAST**. It should now read **NORMAL**.

3. POSSIBLE ERROR NOTIFICATIONS

3.1 Chapter Contents

3.2 Battery Box Notifications

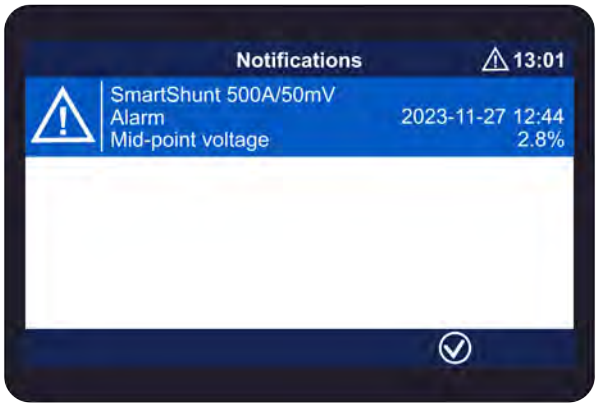
Overview: The SISU battery box system has several alarm and notification features to notify the user when there is a potential issue with the system or with system usage. The battery box uses the TOUCHSCREEN, the AC Input LED, the Power Switch LED, and an audible alarm to notify the user when there is an issue.

The table in section 3.2.1 Table of Possible Notifications lists the possible alarms and notifications that can occur with the battery box. The table also describes how to identify them. All following sections in this chapter describe how to resolve the issues.

TIME-SENSITIVE ERRORS: Some errors are time-sensitive. Check the battery box error and follow the corresponding manual's steps AS SOON AS POSSIBLE when an error occurs. Failure to do so with time-sensitive errors can damage the battery box or reduce the lifetime of your system.

LEDs in Bright Light Environments: In bright light conditions it may be difficult to determine if the battery box LED is lit. You may need to cover/shade the LEDs from direct light to see if they are ON or OFF.

Example of Touchscreen Notification:



3.2.1 Table of Possible Notifications

Overview: The following are possible alarm notifications for the battery box. The TOUCHSCREEN text indicates what information will display for the notification when the issue occurs. The LED indicates any LED behaviors and will show when the issue occurs.

Issue	Touchscreen Text and LED	Alarm	Link to More Details
Low Battery Notification	**TEXT**: SmartShunt 500A/50mV Alarm, Low SOC **LED**: NONE	✓	3.3 Low Battery Notification
Battery Midpoint Deviation Notification	**TEXT**: SmartShunt 500A / 50mV Alarm, Mid point Voltage **LED**: NONE	✓	3.4 Battery Midpoint Deviation Notification
Low Cell Voltage Notification	**TEXT**: NONE **LED**: The **AC Input** LED indicator will blink at 1 Hz (1 flash every second)	✗	3.5 Low Cell Voltage Notification
Charger Over Temperature Notification	**TEXT**: NONE **LED**: The **AC Input** LED indicator will blink at 2 Hz (2 flashes per second)	✗	3.6 Charger Over Temperature Notification
Contactor Failed Closed Notification	**TEXT**: NONE **LED**: The **Power Switch** LED indicator will blink at 1 Hz (1 flash every second)	✗	3.7 Contactor Failed Closed Notification
Contactor Failed Open Notification	**TEXT**: NONE **LED**: The **Power Switch** LED indicator will blink at 2 Hz (2 flashes every second)	✗	3.8 Contactor Failed Open Notification

3.3 Low Battery Notification

- **Visible/Audible Notifiers** - The battery box will give an audible alarm when the batteries reach 20%. The touchscreen will also show a notification.

> **FOR CUSTOMERS WITH A SERIAL NUMBER LOWER THAN 2341008:** Systems with a serial number lower than 2341008 will receive this alarm when the batteries reach 10%.

- **What User Should Do** - Use the touchscreen to acknowledge the alarm by tapping the notification triangle on the screen. Then charge the system as soon as possible.

3.4 Battery Midpoint Deviation Notification

- **Description** - The battery midpoint deviation is a warning that notifies users if one of the two batteries inside of the battery box ever becomes significantly more or less charged than the other. This can be a problem when high power loads are connected to the battery box and will pull more power from one battery vs the other. This can cause stress to that battery that will reduce its cycle life.
- **Visible/Audible Notifiers** - The battery box will give an audible alarm and the touchscreen will show a notification.
- **What User Should Do** - If this notification happens **while you're charging the battery box**, flip the **AC Input** breaker **OFF** (in the down position) and select the checkmark on the touchscreen to acknowledge the alarm. Then attach a load to the system to discharge it slowly for 30+ minutes (<1000W AC). If this doesn't resolve the midpoint deviation, then remove the load and start charging the system again for 30+ minutes. Cycle between these if necessary.

  If this notification happens **while you're discharging or using the battery box**, **STOP DISCHARGING IMMEDIATELY** and start charging the battery box as soon as possible.
- **When User Should Contact SISU Support** -
  - If this alarm occurs often enough to be disruptive
  - If this alarm occurs when the battery charge is ABOVE 20% and BELOW 95%

> **WARNING: Failure to follow these instructions can cause damage to the system.**

3.5 Low Cell Voltage Notification

- **Visible/Audible Notifiers** - The **AC Input** LED indicator will blink at 1 Hz (1 flash every second).
- **What User Should Do** - When this alarm occurs user should **STOP DISCHARGING AS SOON AS POSSIBLE** and charge the system.

> **WARNING: The battery box will shut down if the system continues to discharge.**

- **When User Should Contact SISU Support** -
  - If this alarm occurs often enough to be disruptive
  - If this alarm occurs when the battery system charge is ABOVE 10%

3.6 Charger Over Temperature Notification

- **Visible/Audible Notifiers** - The **AC Input** LED indicator will blink at 2 Hz (2 flashes per second) AND the battery box will not charge.
- **What User Should Do** - If the battery box is being used in a hot environment, move the battery box into a cooler environment and check that vents are not obstructed (there should be a minimum 12" clearance around each side with vents). Wait for the charger to cool - charging will begin automatically once the temperature is back in range.
- **When User Should Contact SISU Support** -
  - If this alarm occurs WITHIN the recommended operating temperatures stated in this manual - 41F to 95F (5C to 35C)

3.7 Contactor Failed Closed Notification

- **Visible/Audible Notifiers** - The **Power Switch** LED indicator will blink at 1 Hz (1 flash every second).
- **What User Should Do** - Continue to use the battery box normally. However, note that when the battery box is switched **OFF**, it will slowly lose battery charge over time, typically noticeable over days or weeks. Request service by a SISU technician to repair the failed contactor.
- **When User Should Contact SISU Support** -
  - Anytime this alarm occurs

> **NOTE:** It **IS** safe to transport the battery box in this state.

3.8 Contactor Failed Open Notification

- **Visible/Audible Notifiers** - The **Power Switch** LED indicator will blink at 2 Hz (2 flashes every second) AND the battery box will not output power.
- **What User Should Do** - Request support from SISU to schedule the repair.
- **When User Should Contact SISU Support** -
  - Anytime this alarm occurs

> **NOTE:** It **IS** safe to transport the battery box in this state.

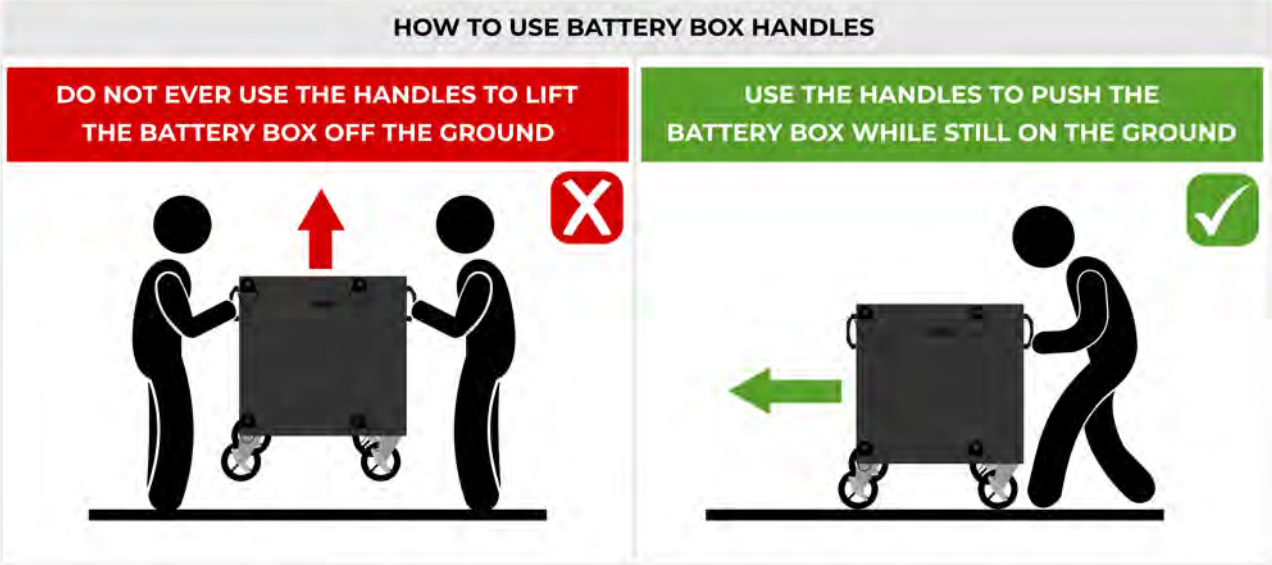
4. TRANSPORTING THE BATTERY BOX

4.1 Chapter Contents

4.2 Pushing the Battery Box to a New Location

1. If you need to push the battery box (e.g. onto a ramp to get it into a truck or into a new position on the set), first make sure all four wheels are in the UNLOCKED position.

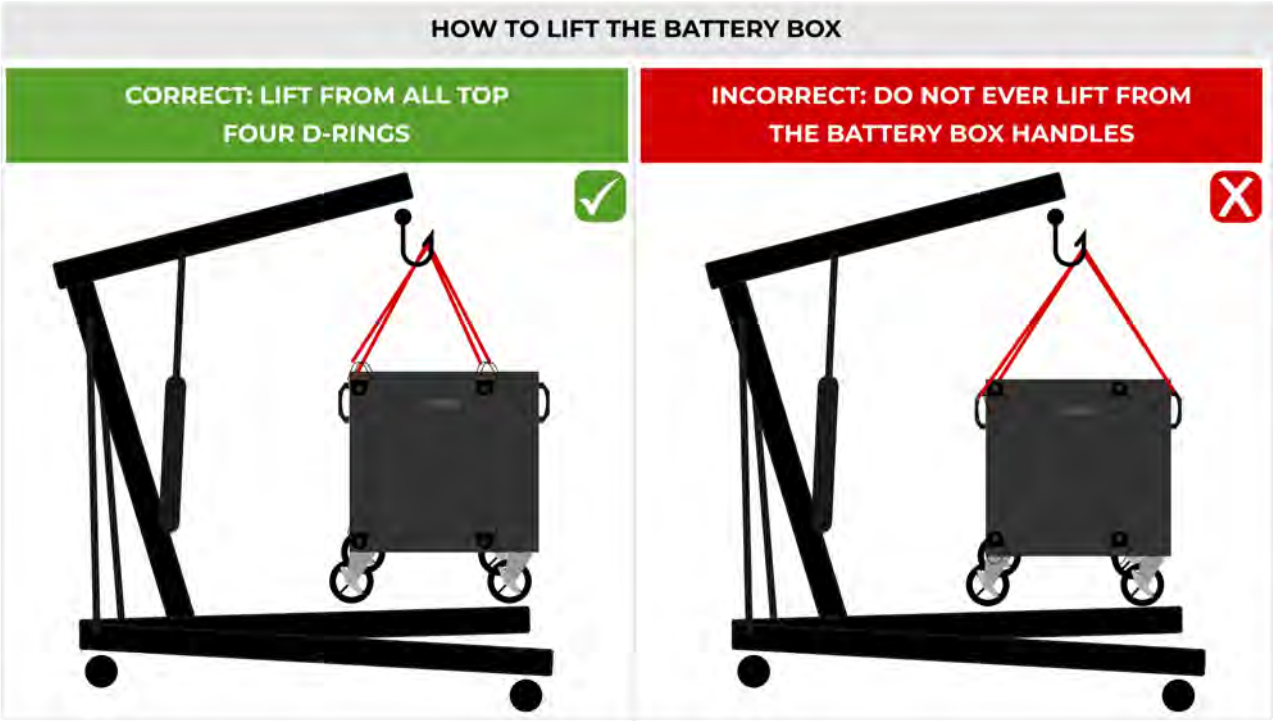
2. Use the four handles on the battery box to push or pull the battery box into its new location. Once the battery box is in the final location, **make sure to put all four wheels in the LOCKED position**.



4.3 Lifting the Battery Box

1. If you need to lift the battery box (e.g. to move it onto a different location on the set), first **make sure that all four wheels (wheels) are in the LOCKED position.**

2. **DO NOT USE THE FOUR HANDLES TO LIFT THE BATTERY BOX.** Instead, attach ratchet or lifting straps to ALL FOUR transport rings located on the top of the battery box. **All four transport rings must be used to distribute the weight of the battery box when lifting. DO NOT have all weight on one transport ring.**



NOTE: See the next page for illustrated instructions on how to properly use the transport rings.

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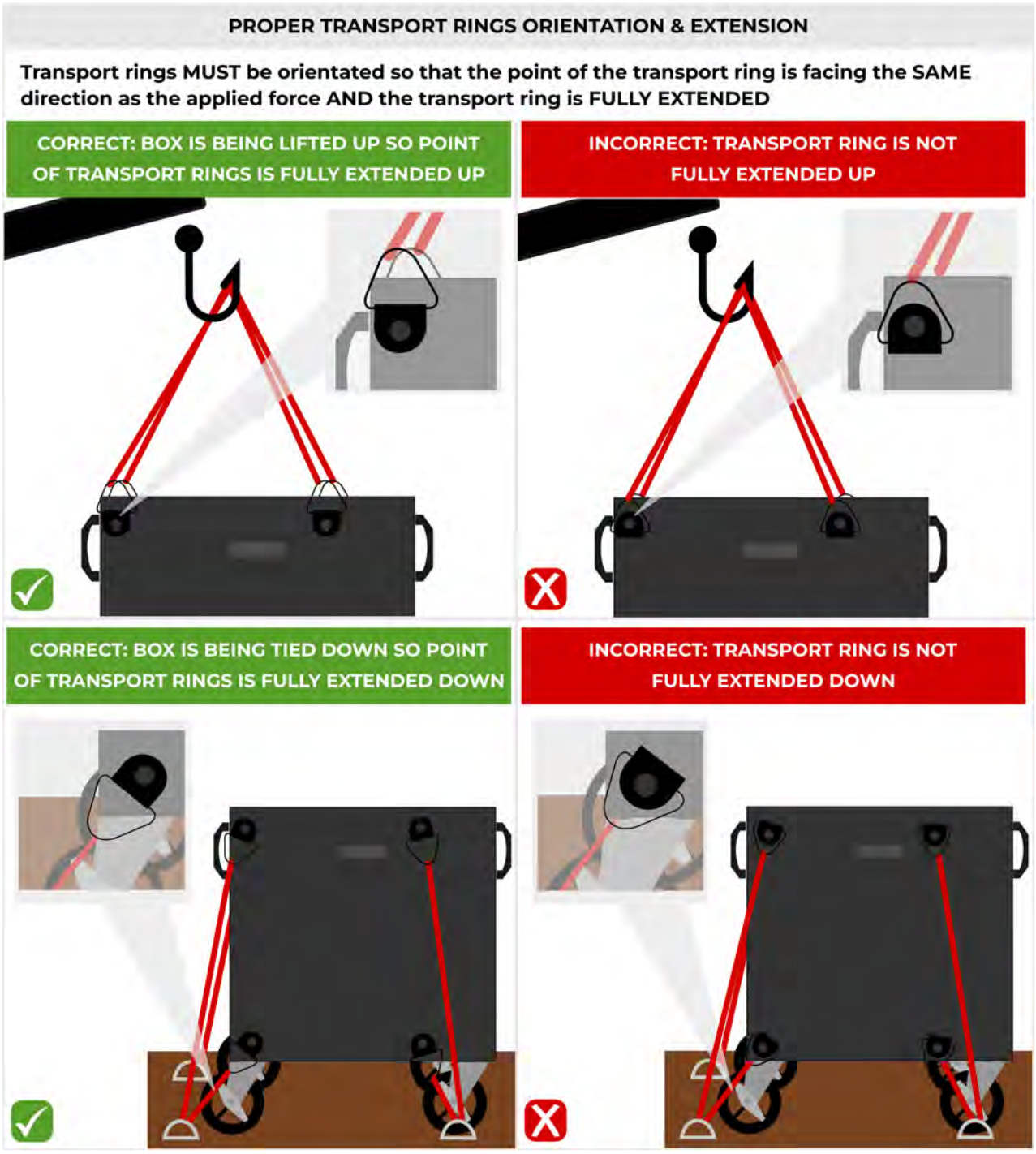


3. Once straps are secured to the four transport rings the battery box can be carefully lifted and moved to a new location.

4.4 Shipping the Battery Box

1. Detach all equipment that might still be plugged into the battery box.
2. Make sure the battery box is turned OFF and powered down.
3. For instructions on how to **LIFT** the battery box into its shipping location, use the following link:

   JUMP TO: See section 4.3 Lifting the Battery Box for instructions on how to lift the battery box.

4. For instructions on how to **PUSH** the battery box into its shipping location, use the following link:

   JUMP TO: See section 4.2 Pushing the Battery Box to a New Location for instructions on how to push the battery box.

5. **Securing the battery box during shipping: You must use ALL EIGHT battery box transport rings** (four on the top, four on the bottom) when securing the battery box for shipping purposes (e.g. to a truck, van, crate, etc.).

   DANGER: Failure to use all eight transport rings to secure the battery box during shipping may result in broken or damaged equipment.

   DANGER: The battery box must be shipped upright and NEVER on its side.

6. **When transporting the battery box commerically:** Be sure to follow local transportation restrictions. Restrictions typically require: UN3481 Label.

   DANGER: Ensure that any tie-down straps used for transportation are rated for the whole weight of the battery box (i.e. tie down straps rated for 600 lb or more)

   WARNING: The customer is responsible for understanding and following all necessary transporation requirements. SISU is not liable for a customer's failure to comply with necessary transportation requirements.

5. APPENDIX A - BATTERY BOX SPECS

5.1 Chapter Contents

5.2 Dimensions and Weight

- **Footprint** - 34.3" l x 21.8" w x 39.5" h (871mm l x 553mm w x 1003mm h)
- **Weight** - 595 lbs (270 kg)

5.3 Power

- **Continuous total power output** - 12kW

  NOTE: Continuous power output DECREASES by <10% as the ambient temperature reaches 95F (35C).

- **Peak total power output** - 27kW

5.4 AC Outputs

- **IEC 60309 pin and sleeve connector** - 4 pole, 5 wire 3P + N + E, 6h, 200/415 volt type
- **IEC 60309 pin and sleeve output** - 400 VAC, 3Ph, +/-10%, 60Hz, 20A
- **C13 outlets** - 230 VAC, +/-10%, 60 Hz, 10A each (x3)
- **NEMA 15-5R outlets** - 115 VAC, +10%, 60Hz, 8A each gang 4 and 5
- **Ground and neutral** - AC outputs have ground and neutral bonded internally (isolated from AC input neutral)

5.5 USB Outlets

- **USB-C PD charging port (qty 2)** - 30W combined max
- **USB-A charging port (qty 2)** - 2.4A @ 5V, 12W, 18W combined max

5.6 AC Input Charging

- **AC input voltage range** - 100VAC to 240VAC +/-10% (90 to 264VAC), 50/60 Hz, 15A max (<10A typ)
- **AC input connector** - IEC60320 C13 (15 ft NEMA 5-15P Edison power cord included)
- **AC charging time** - 4.5 hours to fully charge with **NO** loads connected in normal mode. 3 hours to fully charge in fast mode.

(Continued on next page)

5.7 Battery

- **Capacity** - 5.1kWh
- **Type** - LiFeP04
- **Life cycle** - 5000 cycles @ 50% DoD to 2500 cycles @ 80% DoD

5.8 Environmental

- **Operating temperature** - 41F to 95F (5C to 35C)
- **Storage temperature** - 41F to 122F (5C to 50C)
- **Humidity** - 0% to 95% non-condensing
- **Sunlight** - Exposing the system to direct sunlight at the peak operating temperature of 95F (35C) will further decrease the continuous and peak output of the system
- **Indoor Use** - The battery box is rated for indoor use
- **IP rating** - IP 20
- **Altitude** - 2000m (or below)
- **Pollution degree** - Level 2
- **Noise (@ 3m)** - <25 db (not charging), 55 db (charging)

5.9 SISU Cinema Robots Run Time

NOTE: BATTERY ONLY time estimates are highly dependent on robot program and cycle rate with no other AC loads assumed.

- **C14 robot** - 12-16 hours
- **C20 robot** - 6-10 hours
- **C20 robot on track** - 4-8 hours
- **C31 robot** - 4-8 hours
- **Plugged into AC charging input*** - Indefinite

NOTE: *Robot AC load only

(Continued on next page)

5.10 Features

- 4.7" (119mm) color LCD screen that displays battery level, AC output load, and other system information.
- Individual circuit breakers for each of the AC output types.
- Auto battery disconnect when turned off to minimize battery drain during storage.
- 4 swivel and lockable 8" (203mm) wheels.

6. APPENDIX B - TROUBLESHOOTING ISSUES

6.1 Chapter Contents

DANGER: THE BATTERY BOX DOES NOT CONTAIN USER-SERVICEABLE PARTS. DO NOT ATTEMPT TO DISASSEMBLE OR REPAIR THE BATTERY BOX. Contact SISU support if you need to request a repair.

6.2 SISU Support Contact Information

For URGENT issues:

- Call **(512) 770-9518**
- PHONE HOURS: The listed phone line is staffed from 9:00 AM to 6:00 PM **CENTRAL** time.

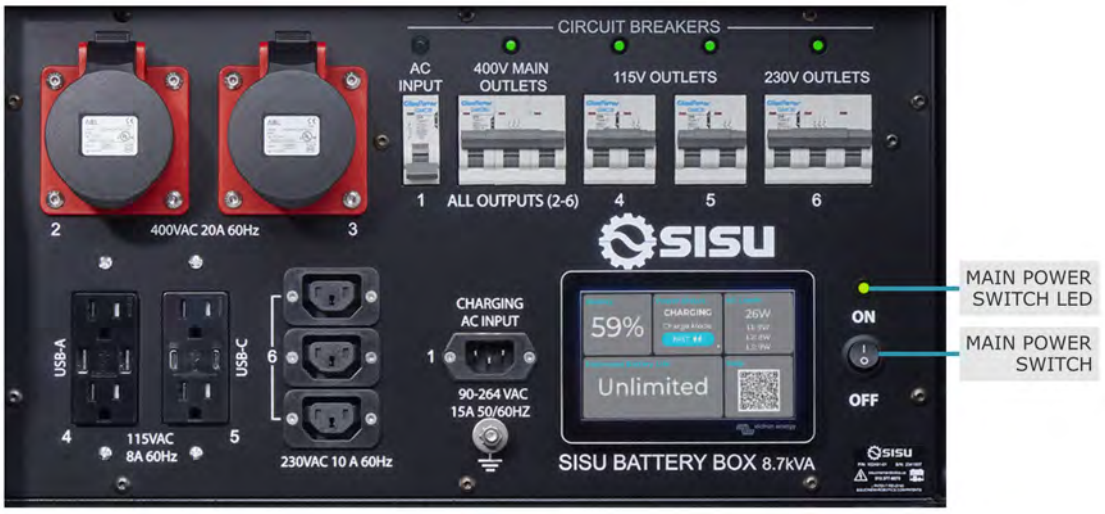
For NON-URGENT issues:

- Call **(512) 770-9518**
- PHONE HOURS: The listed phone line is staffed from 9:00 AM to 6:00 PM **CENTRAL** time.
- Email support@sisucinemarobotics.com

6.3 ISSUE: The Battery Box Does Not Turn ON

PROBLEM: The battery box touchscreen is not turning ON and the LED above the power switch is not lit.

POTENTIAL RESOLUTION #1: If your battery box is not turning ON, make sure the main power switch on the front panel is in the ON position (**I**). The **POWER SWITCH** is indicated below. After turning the main power switch ON, check the LED above the switch; it should turn ON immediately. The front touchscreen will take about 45 seconds to boot, and then it should also turn ON.



POTENTIAL RESOLUTION #2: Connect the battery box to charge. It is possible that the battery box has fully discharged and is unable to turn ON. After 15 minutes, try to turn the battery box ON.

(Continued on next page)

POTENTIAL RESOLUTION #3: If the battery box is plugged in to charge, check that the circuit that the battery box is plugged into is outputting the appropriate power and is not tripped.

> **JUMP TO:** If the power source circuit is tripped, see section 6.7 ISSUE: The Battery Box Trips the Building Circuit Breaker.

POTENTIAL RESOLUTION #4: If the screen and LED still do not turn ON, this may indicate a blown fuse or some other internal issue. Contact SISU Support to request a repair.

6.4 ISSUE: The Battery Box Does Not Output Power

PROBLEM: The battery box screen and LEDs are turned ON, but a connected robot or device is not powering ON.

> **JUMP TO:** For instructions on properly turning ON and powering devices from the SISU battery box, see section 2.3 Powering a SISU Robot and 2.4 Powering Devices from Outlets 4-6.

POTENTIAL RESOLUTION #1: Make sure the device that you are trying to power is plugged securely into the appropriate outlet and is turned ON.

POTENTIAL RESOLUTION #2: Make sure the correct breakers are turned ON to provide power to your device. The breaker labeled **ALL OUTPUTS (2-6)** must be turned ON to use **ANY** of the outputs.

If you are using outputs 4, 5, or 6, check that both the **ALL OUTPUTS (2-6) AND** the corresponding numbered breaker (**4**, **5**, or **6**) are turned ON.

> **NOTE:** A red bar on the circuit breaker indicates that it is turned ON, while a green bar indicates that it is turned OFF.

POTENTIAL RESOLUTION #3: Check the LED above the circuit breaker (for the corresponding outlet) and make sure it is lit (ON). If the LED is ON, the system is detecting that power is being output at the corresponding outlet.

- Test the output by connecting a different device (like a phone charger). If another device also fails, try additional troubleshooting steps in this list.

(Continued on next page)

- If a different device powers ON at the battery box outlet, test your device on a non-battery box outlet (if available). It is possible that your device is non-functioning.

> **LEDs in Bright Light Environments:** In bright light conditions it may be difficult to determine if the battery box LED is lit. You may need to cover/shade the LEDs from direct light to see if they are ON or OFF.

POTENTIAL RESOLUTION #4: Check the **Battery Status** percentage. If the battery is at or near 0%, charge the battery box above 10% before trying to power your devices.

> **JUMP TO:** For more information on charging the battery box see section 2.6 Charging the Battery Box.

POTENTIAL RESOLUTION #5: Power-cycle the battery box by turning the battery box main power switch to the OFF position. Wait for 30 seconds, and then turn the main power switch back to the ON position. Try powering your device again.

POTENTIAL RESOLUTION #6: Check for any error notifications on the touchscreen or a flashing **AC INPUT** LED or **Power Switch** LED.

> **JUMP TO:** For more information on how to fix and clear errors see section 3.2.1 Table of Possible Notifications.

POTENTIAL RESOLUTION #7: If you are still unable to get power from the battery box there may be an internal issue. Contact SISU Support to request a repair.

6.5 ISSUE: The Battery Box Will Not Charge

PROBLEM: The battery box is plugged in to charge, but the **POWER STATUS** does not say **CHARGING**, or the battery box **BATTERY STATUS** percentage does not appear to be charging.

POTENTIAL RESOLUTION #1: Check that the charging cable is securely plugged into the **AC INPUT** and into the power source outlet. Check for visual signs of damage to the cable.

- If the cable shows damage, try using a new cable.
- If possible, test a different device (like a phone charger) on the outlet that is providing power to the battery box. If another device does not receive power, the outlet from which you are trying to charge the battery box may be malfunctioning.

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POTENTIAL RESOLUTION #2: Turn on the **AC INPUT** circuit breaker. The **AC INPUT** circuit breaker needs to be switched ON and the LED above the **AC INPUT** circuit breaker should be ON to charge. When it is ON, the breaker will be flipped UP and you should see a red bar on the breaker.

> **NOTE:** When the LED is ON, the system has detected that the internal charger is working.

POTENTIAL RESOLUTION #3: Check the **AC LOADS** on the touchscreen for how much power is being drawn from the battery box.

If the total power being drawn is GREATER THAN 1000 W, the battery box will discharge faster than it can charge. In this case, the power status will say **Discharging**, and the battery percentage will decrease. **This is not a problem, but the battery box will eventually need to charge without other devices connected.**

POTENTIAL RESOLUTION #4: Check for any error notifications on the screen. If there is an error on the touchscreen (or if one of the LEDs on the panel is blinking) the system is experiencing an error that you need to address.

> **JUMP TO:** For more information on how to fix and clear errors see section 3.2.1 Table of Possible Notifications.

> **TIME-SENSITIVE ERRORS: Some errors are time-sensitive.** Check the battery box error and follow the corresponding manual's steps AS SOON AS POSSIBLE when an error occurs. Failure to do so with time-sensitive errors can damage the battery box or reduce the lifetime of your system.

(Continued on next page)

POTENTIAL RESOLUTION #5: If the battery box is still unable to charge, turn the main power switch to the OFF position, wait 30 seconds, and turn the main power switch back to the ON position. Try powering the device again.

POTENTIAL RESOLUTION #6: If you are still unable to get the battery box to charge there may be an internal issue. Contact SISU Support to request a repair.

6.6 ISSUE: A Circuit Breaker on the Battery Box Trips and Stops Powering the Device

PROBLEM: The battery box is connected to devices and is powering them, but the circuit breakers on the battery box trip and stop powering the devices.

> **NOTE:** The circuit breakers on the battery box are a safety feature designed to protect the battery box and its users from fire and other damage caused by overcurrent. If the circuit breakers trip, this means that the device(s) that are plugged in are overloading the circuitry in the battery box.

POTENTIAL RESOLUTION #1: A connected device may be faulty and tripping the breaker. If you suspect this is the case, unplug the device and do not power it again until you can verify that it is working properly. After disconnecting a potentially faulty device, reset the breaker by pushing the switch all of the way DOWN, and then all of the way UP again.

> **NOTE:** Unplugging one device at a time from the battery box until the issue resolves can help narrow down if a specific device is causing an issue. If unplugging a specific device stops the breaker from tripping, leave the device unplugged or try powering the device from a different power source.

POTENTIAL RESOLUTION #2: The battery box circuit may be overloaded due to too many devices being plugged in and powered from the battery box. Reduce the load on the battery box by unplugging unused devices or by powering devices from a different power source.

> **JUMP TO:** See section 6.6.1 Battery Box Load Distribution for tips on redistributing the powered devices to avoid tripping specific circuit breakers.

After reducing the devices that are connected, or after redistributing the load, reset the breaker by pushing the switch all of the DOWN, and then all of the way UP again.

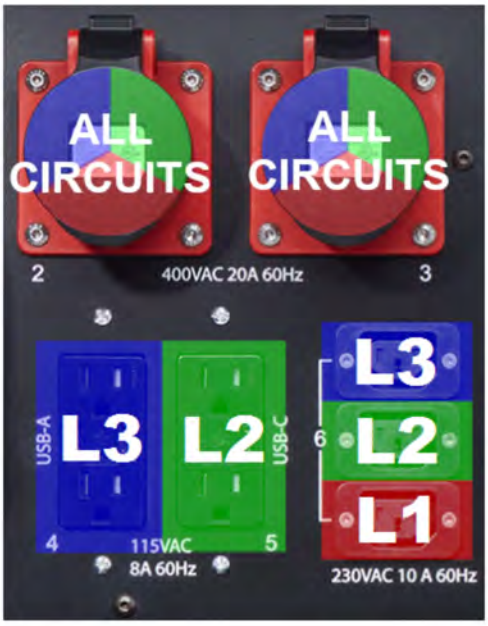
POTENTIAL RESOLUTION #3: If you are still unable to get the battery box to charge there may be an internal issue. Contact SISU Support to request a repair.

6.6.1 Battery Box Load Distribution

See the sections below corresponding to the specific circuit breaker on the battery box that has tripped.

ALL OUTPUTS (2-6) CIRCUIT BREAKER: This circuit breaker protects the three main internal circuits in the battery box: L1, L2, and L3. Check the power on each of these three circuits on the touchscreen in the **AC LOADS** section. All three circuits should be under 4500 W.

If any one of the three circuits is producing significantly more power than the others, you might be able to redistribute the loads and prevent the breaker from tripping again. The following diagram shows which circuits power which outlets:



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Check which outlets your devices are plugged into and compare to the diagram. If you notice that the overloaded circuit is powering multiple devices, try moving one or more devices to an outlet on a different circuit.

CIRCUIT BREAKER 4 OR 5: These breakers protect outlets 4 and 5. If you have multiple devices plugged into one of these outlets, try balancing the loads by moving one device to the other outlet.

CIRCUIT BREAKER 6: This circuit breaker protects output group 6. If breaker 6 trips, this means that one of the devices connected to these outputs is drawing too much current. In this case, redistributing the loads will not prevent the breaker from tripping in the future. You will need to unplug whichever device is overloading its circuit and find an alternate power source for it.

6.7 ISSUE: The Battery Box Trips the Building Circuit Breaker

PROBLEM: When plugged in and charging, the battery box can draw up to 10A in **Normal Charge** mode, or 15A in **Fast Charge** mode. If the battery box draws more current than the power source is intended to provide, it can trip a circuit breaker on the power source.

POTENTIAL RESOLUTION #1: If the battery box is in **Fast Charge** mode, switch to **Normal Charge** mode.

POTENTIAL RESOLUTION #2: If other devices are plugged into the same circuit as the battery box, switch the battery box charging cable to its own dedicated circuit.

POTENTIAL RESOLUTION #3: Try a different charging cable (or extension cord if applicable). It is possible that damage to the cables supplying power to the battery box can trip your power source circuits.

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6.8 ISSUE: The Battery Box Shuts Down During Use

PROBLEM: The battery box was successfully powering devices, but unexpectedly shut down/turned off. The troubleshooting steps you take will depend on whether or not the screen remains on.

6.8.1 ISSUE: The Battery Box Shuts Down Completely During Use

PROBLEM: The battery box has shut down completely; the touchscreen is OFF and the battery box is not producing power.

POTENTIAL RESOLUTION #1: Power-cycle the battery box by turning the battery box power switch to the OFF position. Wait for 30 seconds and then turn the switch to the OFF position. Wait for 30 seconds and then turn the switch back to the ON position. Check if the battery box starts producing power again.

POTENTIAL RESOLUTION #2: If you are still unable to get the battery box to turn back ON there may be an internal issue. Contact SISU Support to request a repair.

6.8.2 ISSUE: The Battery Box Shuts Down During Use - Touchscreen Is Still ON

PROBLEM: The touchscreen is still ON but the battery box has stopped producing power.

POTENTIAL RESOLUTION #1: Check the **Battery Status** percentage on the touchscreen. The battery box will stop producing power when the battery reached 0%. Disconnect any devices and charge the battery box about 10% before trying to power your devices.

> **JUMP TO:** For more information on charging the battery box see section 2.6 Charging the Battery Box.

POTENTIAL RESOLUTION #2: Check the circuit breakers. If a circuit breaker has tripped, any devices drawing power through that circuit will lose power.

> **JUMP TO:** For more information on circuit breakers see section 6.6 ISSUE: A Circuit Breaker on the Battery Box Trips and Stops Powering the Device.

(Continued on next page)

POTENTIAL RESOLUTION #3: Check for any error notifications on the touchscreen. If you see an error (or if one of the LEDs on the front panel is blinking) there is an error that needs to be addressed.

> **JUMP TO:** For more information on how to fix and clear errors see section 3.2.1 Table of Possible Notifications.

POTENTIAL RESOLUTION #4: Power-cycle the battery box by turning the main battery box power switch to the OFF position. Wait for 30 seconds, and then turn the main power switch back to the ON position. Check if the battery box starts producing power again.

POTENTIAL RESOLUTION #5: If you are still unable to get the battery box to turn back ON there may be an internal issue. Contact SISU Support to request a repair.

6.9 ISSUE: A Sound Alarm Occurs on the Battery Box

PROBLEM: An alarm sound indicates that the battery box has encountered an error.

POTENTIAL RESOLUTION #1: The touchscreen will tell you what the error is.

> **JUMP TO:** For more information on how to fix and clear errors see section 3.2.1 Table of Possible Notifications.

> **TIME-SENSITIVE ERRORS: Some errors are time-sensitive.** Check the battery box error and follow the corresponding manual's steps AS SOON AS POSSIBLE when an error occurs. Failure to do so with time-sensitive errors can damage the battery box or reduce the lifetime of your system.

POTENTIAL RESOLUTION #2: If you are unable to resolve the error, contact SISU Support to request a repair.

6.10 ISSUE: The AC INPUT LED or the Power Switch LED on the Battery Box is Blinking

PROBLEM: A blinking or flashing LED indicates that the battery box has encountered an error.

POTENTIAL RESOLUTION #1: Look the error up in the error notifications table in this manual.

> **JUMP TO:** For more information on how to fix and clear errors see section 3.2.1 Table of Possible Notifications.

> **TIME-SENSITIVE ERRORS: Some errors are time-sensitive.** Check the battery box error and follow the corresponding manual's steps AS SOON AS POSSIBLE when an error occurs. Failure to do so with time-sensitive errors can damage the battery box or reduce the lifetime of your system.

> **LEDs in Bright Light Environments:** In bright light conditions it may be difficult to determine if the battery box LED is lit. You may need to cover/shade the LEDs from direct light to see if they are ON or OFF.

POTENTIAL RESOLUTION #2: If you are unable to resolve the error, contact SISU Support to request a repair.

7. APPENDIX C - SISU COMPLIANCE

7.1 Chapter Contents

The SISU Battery Box conforms to the following compliances and standards:

7.2 CE Certification

SISU Battery Boxes are CE certified.

CE

7.3 Industrial EMC Standards

SISU Battery Box is tested to industrial EMC standards per IEC 61326-1:2012:

1. Radiated Emissions, 30MHz - 1GHz, CISPR 11:2009 / A1:2010, Group 1, Class A

2. AC Power, Conducted Emissions, 230VAC / 50Hz, CISPR 11:2009 / A1:2010, Group 1, Class A

3. ESD on Enclosure, 4kV/8kV IEC 61000-4-2:2008 Criteria B

4. Radiated Immunity, 80MHz - 1GHz, 10V/m, IEC 61000-4-3:2006 / A1:2007 / A2:2010, Criteria C*

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5. Radiated Immunity, 1.4GHz - 2GHz, 3V/m, IEC 61000-4-3:2006 / A1:2007 / A2:2010, Criteria A

6. Radiated Immunity, 2GHz - 2.7GHz, 1V/m, IEC 61000-4-3:2006 / A1:2007 / A2:2010, Criteria A

7. AC Power, Burst: 2kV, 5/50ns, 5kHz, IEC 61000-4-4:2004 / Corr:2007 / A1:2010, Criteria B

8. I/O Line, Burst: 1kV, 5/50ns, 5kHz, IEC 61000-4-4:2004 / Corr:2007 / A1:2010, Criteria B

9. AC Power, Surge: 1kV line-to-line / 2kV line-to-earth, IEC 61000-4-5:2005 / Corr:2009, Criteria B

10. AC Line, Conducted Immunity: 150kHz - 80MHz, 3Vrms, IEC 61000-4-6:2008, Criteria A

11. I/O Line, Conducted Immunity: 150kHz - 80MHz, 3Vrms, IEC 61000-4-6:2008, Criteria A

12. Radiated Magnetic Field, 30A/m, IEC 61000-4-8:2009, Criteria A

13. AC Power, Voltage Dips: 0% for 1 cycle, 40% for 10/12 cycles, 70% for 25/30 cycles, IEC 61000-4-11:2004, Criteria A

14. AC Power, Short Interruptions: 0% for 250/300 cycles, IEC 61000-4-11:2004, Criteria C

7.4 Electrical Safety

The SISU Battery Box is designed to Electrical Safety per UL/EN 61010-1:2010.

7.5 Standards Applied to Design

Principles of the following standards are applied to design:

1. EN ISO 12100:2010 Safety of machinery – General principles for design – Risk assessment and risk reduction and RIA TR R15.306-2016 Task-based Risk Assessment Methodology

7.6 Risk Assessment

A risk assessment must be performed by the final integrator (when integrating into a robotic or final system) following EN ISO 12100:2010 or RIA TR R15.306-2016 to be compliant with general safety standards.