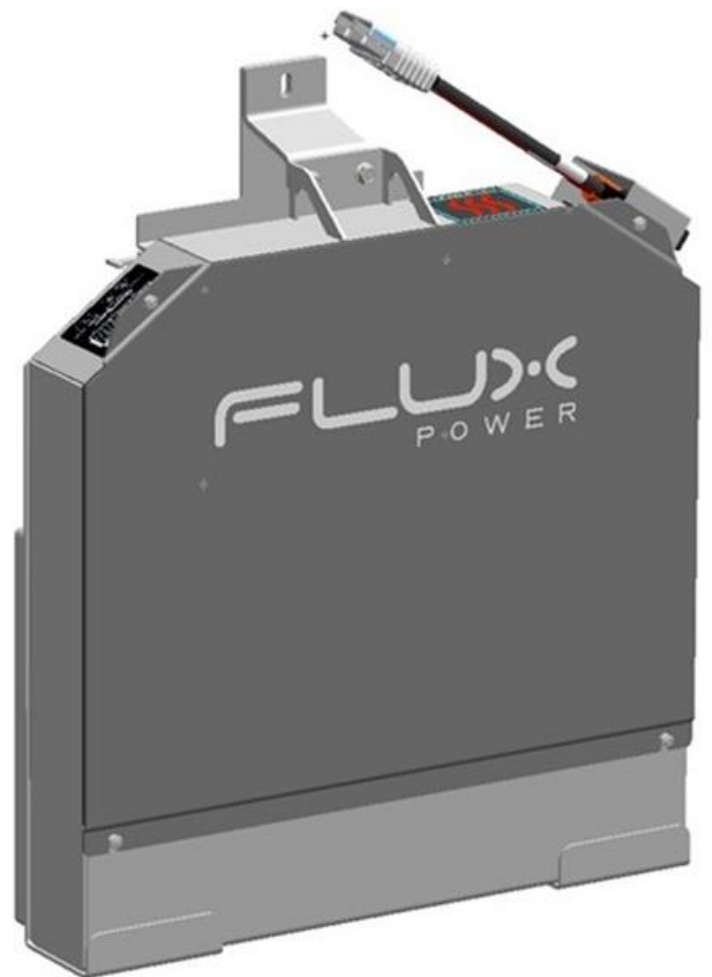




## Flux Power S24 Service and Parts Manual



## 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 hmore 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 S24 battery is a lithium-ion battery specialized for the material handling industry. This User Guide is intended to provide general information on how to service a Flux Power LiFT Pack S24. The *Online Troubleshooting Guide* for this battery is an online tool that further details every potential issue for the battery and details how to resolve them. That tool can be found on the Flux Power website.

## 2 Basic Troubleshooting

Before performing any work on the battery, make sure to follow the Control of Hazardous Energy Procedure.

### 2.1 Flux Power Battery Control of Hazardous Energy Procedure

1. Push the ON/OFF button.



2. Disconnect the AC battery charger power cord.



3. Locate the Deutsch12 pin connector and remove from receptacle



4. Use a DMM to test for voltage at the battery connector contacts. The voltage must be approximately zero volts.



# Service and Parts

5. Install a lockout device and “do not operate” tag on the battery discharge connector with a lock or a nylon wire tie. Sign and date the “do not operate” tag.



6. Install a lockout device and a “do not operate” tag on the AC power cord with a lock or a nylon wire tie. Sign and date the “do not operate” tag.



## 2.2 State of Charge Gauge and Device Trouble Codes (DTCs)

The first step in troubleshooting the battery is observing the State of Charge (SOC) gauge on top of the battery. Under normal operation, the gauge’s LED lights will be solid, showing the SOC. If the battery is charging, the lights will display a scrolling pattern. A single LED blinking indicates a Device Trouble Code (DTC). DTCs let the user or technician quickly assess why the battery is causing a disruption of operation. The following list details each DTC.

**Table 1: Situations where the Flux Power lithium battery will cut power and display a DTC**

Fault Description	Cause and Required Duration to Trigger	Fault Protection	LED Indicator	Service Required?	Fault Resolution
0% state of charge	At least one cell has reached a voltage value of 2.80V	Contactor opens  Buzzer Sounds Periodically	LED 1	No	Plug battery in to charge
Electronics Hardware Failure	Electronic component failure for more than 10 seconds	Contactor Opens	LED 3	Yes	Service
Over-temperature	Discharge temperature > 129F, 60 seconds  Discharge temperature > 131F, Immediate  Charge temperature >130F, 60 seconds  Charge temperature >131F, Immediate	Contactor opens	LED 4	No	Allow pack to cool, then cycle the circuit breaker OFF, then ON

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Under-temperature	Discharge temperature < 33F, 60 seconds	Contactor opens	LED 4	No	Allow pack to warm up, then cycle the circuit breaker OFF, then ON
	Discharge temperature < 32F, Immediate				
	Charge temperature < 35F, 60 seconds				
	Charge temperature < 34F, Immediate				
Current exceeded	Discharge current < (-1000A), 10 seconds	Contactor opens	LED 5	No	Cycle the circuit breaker OFF, then ON
	Discharge current < (-200A), 2 minutes				
	Charge current > 1000A, 10 seconds				
	Charge current > 200A, 2 minutes				
Low cell Imminent	At least one cell has reached a voltage value of 2.95V	None	LED 6	No	Plug battery in to charge

## 2.3 Temperature (DTC 4)

Flux Power lithium-ion batteries without the heater option have an operational ambient temperature range of 32°F to 131°F when discharging. The BMS2 will prevent operation outside these temperatures, but a heater option is available for cold storage and freezing weather applications. Batteries subjected to low temperatures (0°C / 32°F or lower) may experience decreased performance if not equipped with the heater option. A Flux Power lithium-ion battery, without heaters, experiencing an LED 4 DTC should be approached with either the following:

- 1) If the temperature outside the battery is cold, then the battery should be taken to a warmer environment to warm up.
- 2) If the temperature outside the battery is warm, then the battery should be taken to a cooler environment to cool down.

If a temperature DTC is continuously being seen, contact a Product Support representative.

## 2.4 Solid Red Light on SOC, No Power to Truck

If the SOC shows a solid red light and there is no power to the truck, the battery is in Sleep Mode. It protects itself from over discharge. If the battery has been left idle for more than 3 days or it is at <20% SOC, and is idle for more than 4 hours, it will go into a sleep mode to cut power consumption and reduce the risk of over discharge. To wake the battery up you must:

- 1) Cycle the battery by pressing the battery's push button on and off.

- a. If the red light starts flashing and you hear an alarm, the pack must be plugged in for charging. The SOC is too low to power the truck.
  - b. If the state of charge gauge lights up and shows the SOC, the battery can be used. If it has been in storage, it should be plugged in and allowed to fully charge. Charging may take up to 5 minutes to start once the battery is plugged in.
- 2) Plug the battery in. It may take up to five minutes for charging to begin.

## 2.5 No Lights on SOC, No Power to Truck

If there are no lights on the SOC and there is no power to the truck, it may be in storage mode. Storage mode prevents the electronics from draining the battery and increases storage time. It is recommended the battery be plugged in and fully charged every six months when being stored.

- 1) Check the push button on the battery. Cycle the battery by pushing the push button on and off. If the battery does not power up, continue to step 2.
- 2) First remove the battery from the truck and follow the proper controls of hazardous energy, and if required, unscrew the 4 bolts on the front face of the battery to remove the face covering.
  - a. Blown 15 A Fuse – There are two 15A fuses inside the battery. As seen from the figure below the 15A fuses are blue and have the number 15 on their top side facing towards the exterior. Check the fuses for continuity and replace if blown.
  - b. Blown 3 A Fuse – There is one 3A fuse inside the battery. As seen from the figure below the 3A fuse is purple with the number 3 on its top side facing towards the exterior. Check the fuse for continuity and replace if blown.



Figure 1: Fuse block with all 3 fuses in place

## 2.6 Overdischarged

The battery pack contains advanced electronics which will slowly drain the battery if it is not charged up regularly. If a pack drains below 22.4V, the contactor opens. A battery with an overall voltage of 20V or less is severely overdischarged. Recovering a battery from this state requires the following:

- Computer with the proper Flux Power GUI.
- Cables to properly connect a computer to the battery.
- An approved power supply with controllable voltage output and varying current output that can go down to 1.5A for every 100Ah of the battery.

The *Online Troubleshooting Guide* for this battery thoroughly describes how to carry out a recovery process for this battery. It also allows a user to order the required parts to recover the battery. That tool can be found on the Flux Power website.

## 2.7 Charger Troubleshooting

If the battery has lights on the SOC but does not show a scrolling pattern on the SOC when plugged in to charge, it is possible that the charger has malfunctioned. To check the charger, observe the base of the charger. A lit blue LED indicates the charger is connected and receiving signal from the BMS2. A lit lightning bolt indicates the charger is operating at 28 V.

- 1) Charger has a blue light but there is an error code on the internal charger's display.
  - a. Use the charger error and fault codes from the chart below to find a solution based on the error code.
- 2) Charger has a blue light, lit lightning bolt, and no error code on the internal charger's display.
  - a. The charger will need to be replaced.
- 3) Charger has no lights on
  - a. Check that the battery is receiving 110-120V AC from its power source to its 3-pronged AC inlet.
  - b. If the battery is receiving the proper voltage, then the charger will need to be replaced.

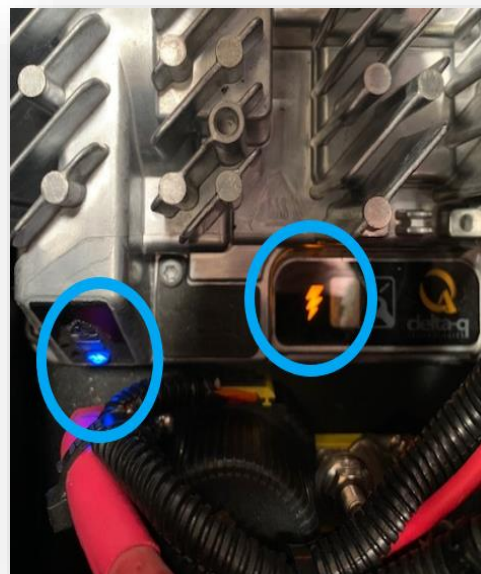


Figure 5: Delta-Q lightning bolt and error code display seen through the upper electronics deck.

The *Online Troubleshooting Guide* for this battery thoroughly describes how to further troubleshoot an internal charger in this battery. That tool can be found on the Flux Power website.



# Service and Parts

**Table 2: Charger Error and Fault Codes**

Code	Description	Solution
E-0-0-1 E-0-2-1	Battery high voltage	Possible causes: wrong battery voltage for charger, other charger also attached, resistive battery. Possible solutions: Check the battery voltage and cable connections. Check the battery size and condition. This error will automatically clear once the voltage is in range.
E-0-0-2 E-0-2-2	Battery low voltage	Possible causes: battery disconnected, battery over discharged. Possible solutions: Check the battery voltage and cable connections. Check battery size and condition. This error will automatically clear once the voltage is in range.
E-0-0-3	Charge timeout caused by battery pack not reaching required voltage within safe time limit (charge profile dependent)	Possible causes: Charger output reduced due to high temperatures, poor battery health, very deeply discharged battery, and /or poorly connected battery. Possible solutions: Operate at lower ambient temperature. Replace the battery pack. Check the DC connections. This error will clear once the charger is reset by cycling DC or AC.
E-0-0-4	Battery could not meet minimum voltage (charge profile dependent)	Possible causes: Check for shorted or damaged cells. Possible solutions: Replace battery pack. Check DC connections. This error will automatically clear once the charger is reset by cycling DC or AC.
E-0-0-7	Battery amp hour limit exceeded	Possible causes: Poor battery health, very deeply discharged battery, poorly connected battery, and / or high parasitic loads on battery while charging. Possible solutions: Replace the battery pack. Check the DC connections. Disconnect parasitic loads. This error will automatically clear once the charger is reset by cycling DC or AC.
E-0-0-8	Battery temperature is out of range	Possible battery temperature sensor error. Check the temperature sensor and connections. Reset the charger. This error will clear once the condition is corrected.
E-0-1-2	Reverse polarity error	Battery is connected to the charger incorrectly. Check the battery connections. This error will clear once the condition is corrected.
E-0-1-6 E-0-1-8 E-0-2-6	USB operation failed (software)	Software upgrade failure or script operation failure. Ensure the USB flash drive is properly formatted and reinsert the USB flash drive.
E-0-1-7	USB operation failed (hardware)	Remove and reinsert the USB drive. If condition persists, cycle AC and retry by reinserting the USB drive.
E-0-2-3	High AC voltage error (>270VAC)	Connect charger to an AC source that provides stable AC between 85 - 270 VAC / 45-65 Hz. This error will clear once the condition is corrected.
E-0-2-4	Charger failed to initialize	The charger has failed to turn on properly. Disconnect AC input and battery for 30 seconds before retrying.
E-0-2-5	Low AC voltage oscillation error	AC source is unstable. Could be caused by undersized generator and /or severely undersized input cables. Connect charger to an AC source that provides stable AC between 85 - 270 VAC / 45-65 Hz. This error will clear once the condition is corrected.
F-0-0-1, F-0-0-2, F-0-0-3, F-0-0-4, F-0-0-6		Internal charger fault. Remove AC and battery for minimum 30 seconds and retry charger. If it fails again, please contact the manufacturer of your vehicle or machine.

# Service and Parts

## 3 Parts

### 3.1 Service Kits

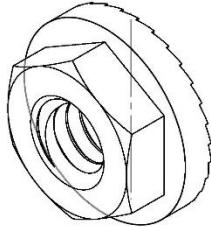
Part No.	Part Name	Appendix
131031	Service Contactor Kit	A-1
131032	Current Sensor Service Kit	A-2
131033	Service Fuse	A-3
131034	Service Main Harness	A-4
131035	Service INT Power Cables	A-5
131036	Service Kit BMS	A-6
131038	Service Gasket	A-7
131039	Service Passthru Power Jumper	A-8
131040	Service Kit Heater Pad	A-9
160001	PCAN Dongle	A-10
190025	Kit, Damaged Battery Shipping	A-11
500040-02	Assembly CAN Connection Cable	A-12
131057	Kit Service LED Board	A-13
131064	BMS2 Kit Service Charger	A-14

# Service and Parts

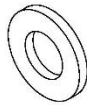
## 4 Appendix

### Appendix A1: KIT SERVICE CONTACTOR

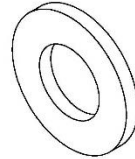
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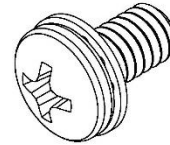
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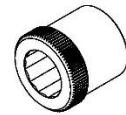
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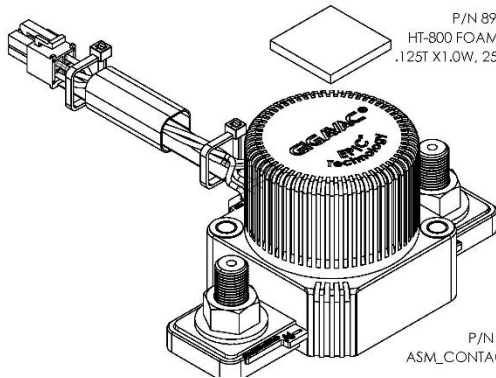
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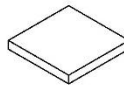
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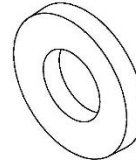
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HEX DRIVE



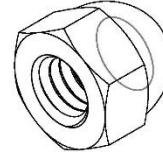
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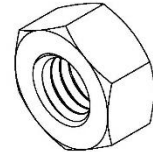
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.125T X 1.0W, 256M PSA, GRY



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x .32ID x .088THK x .096H



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5/16-18



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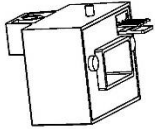
# Service and Parts

## Appendix A2: KIT SERVICE CURRENT SENSOR

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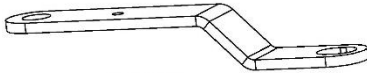
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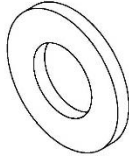
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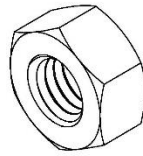
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SCREW, 3/8" OD, 3/16" LONG



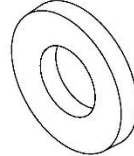
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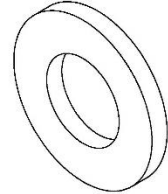
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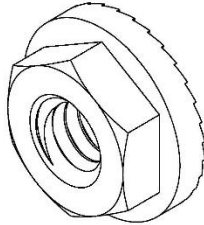
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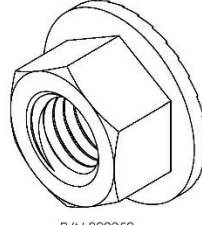
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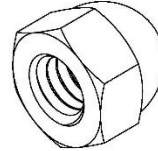
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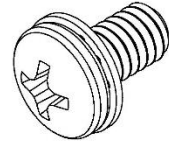
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M10 X 1.5, SS



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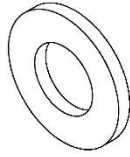


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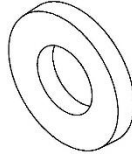
# Service and Parts

## Appendix A3: KIT SERVICE FUSE

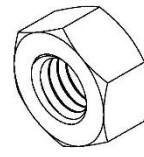
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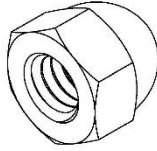
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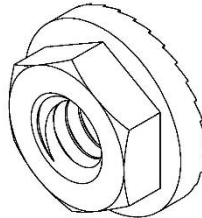
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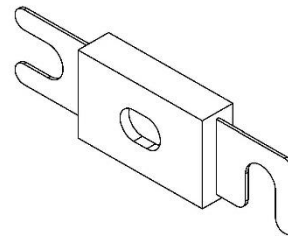
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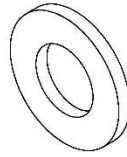
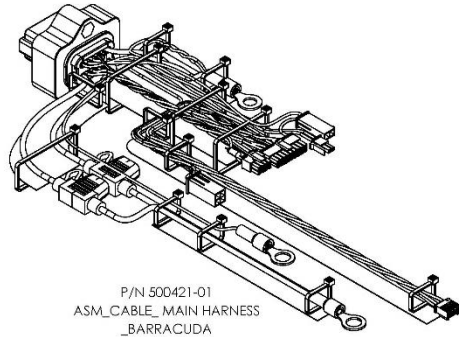


P/N 600084  
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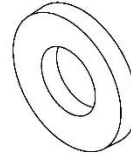
# Service and Parts

## Appendix A4: BMS2 KIT SERVICE MAIN HARNESS

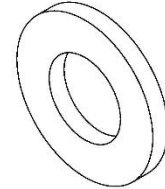
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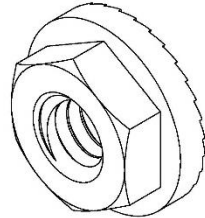
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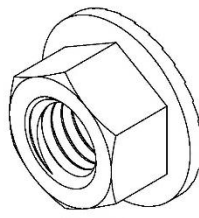
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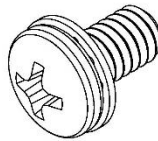
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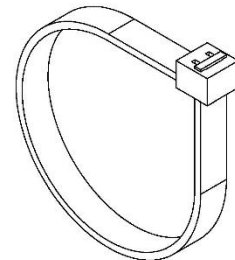
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M10 X 1.5, SS



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SEMS\_PH\_PHIL\_SS



P/N 830248  
SCREW, M6-1 X 14L, BTN HD ALLEN, SS

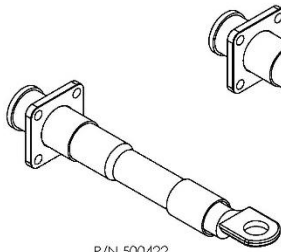


P/N 850101  
ZIP TIE, 7", BLK, .14 WIDE

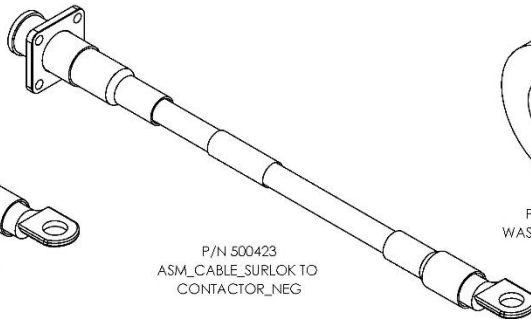
# Service and Parts

## Appendix A5: KIT SERVICE INT POWER CABLES

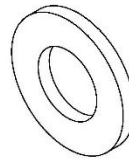
Flux Power part number: 131035



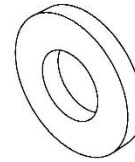
P/N 500422  
ASM\_CABLE\_SURLOK  
TO CELL\_POS



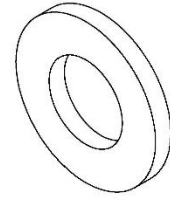
P/N 500423  
ASM\_CABLE\_SURLOK TO  
CONTACTOR\_NEG



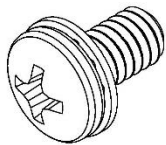
P/N 810013  
WASHER, FLAT, M8



P/N 810045  
WASHER, DISC SPRING, .625OD x  
.32ID x .088THK x .096H



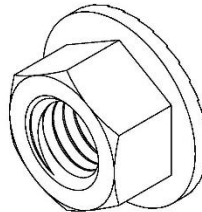
P/N 810067  
WASHER, FLAT, 10.5 ID X  
20 OD X 2.0 THK, 18-8 SS



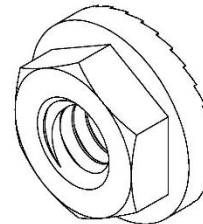
P/N 830091  
SCREW, 8-32 X 5/16L\_INT  
SEMS\_PH\_PHIL\_SS



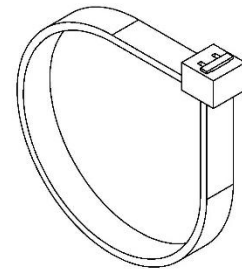
P/N 830144  
SCREW, 6-32 X .50L,  
PANHD, PHIL, SEMS, SS



P/N 820059  
NUT, FLANGE, SERRATED,  
M10 X 1.5, SS



P/N 820061  
NUT 1/4-20 FLANGE LOCKNUT SS

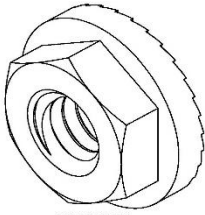


P/N 850101  
ZIP TIE, 7", BLK, .14 WIDE

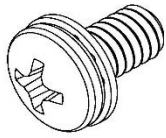
# Service and Parts

## Appendix A6: KIT SERVICE BMS FX 100Ah

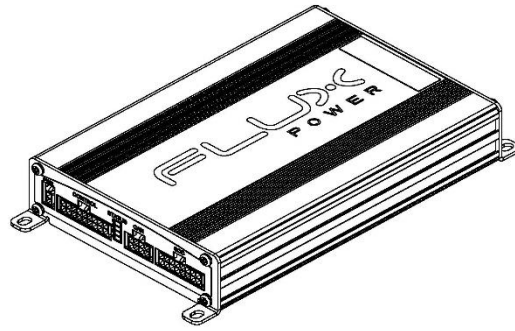
Flux Power part number: 131036



P/N 820061  
NUT 1/4-20 FLANGE LOCKNUT SS



P/N 830091  
SCREW\_8-32 X 5/16L\_INT  
SEMS\_PH\_PHIL\_SS

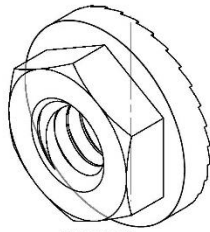


P/N 100105-07-02  
ASM\_BMS\_2.0\_S24

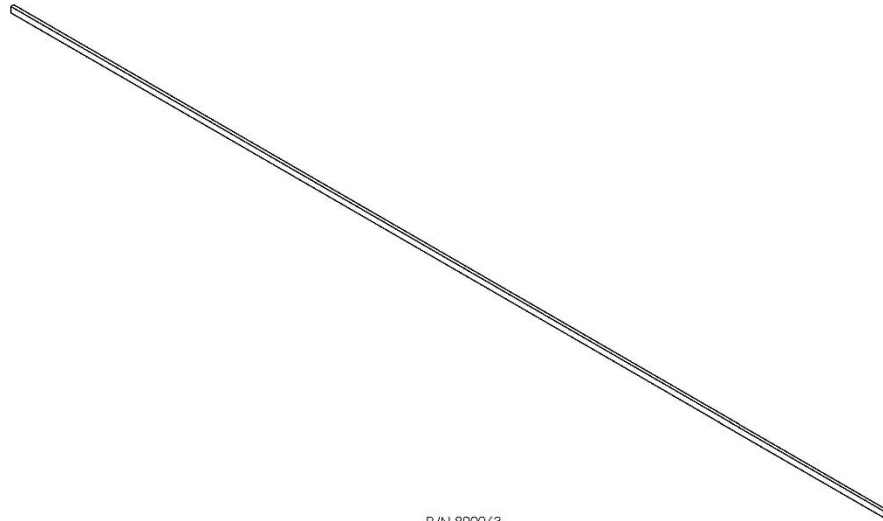


## Appendix A7: KIT SERVICE GASKET

Flux Power part number: 131038



P/N 820061  
NUT 1/4-20 FLANGE LOCKNUT SS

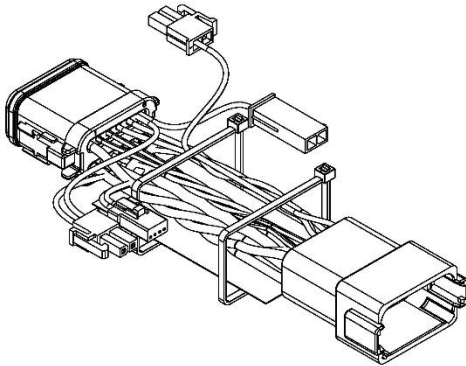


P/N 890063  
CUSHION MITL. - 0.25 X 0.50 X 20FT HT-800

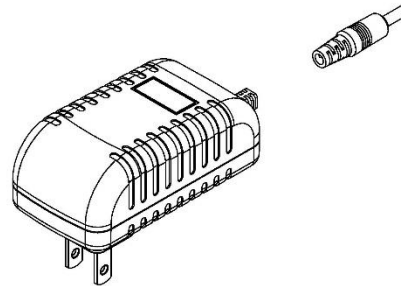
# Service and Parts

## Appendix A8: KIT SERVICE PASSTHRU POWER JUMPER

Flux Power part number: 131039



P/N 570001  
ASM, CABLE, PASSTHRU, 12PIN, BMS 2.0

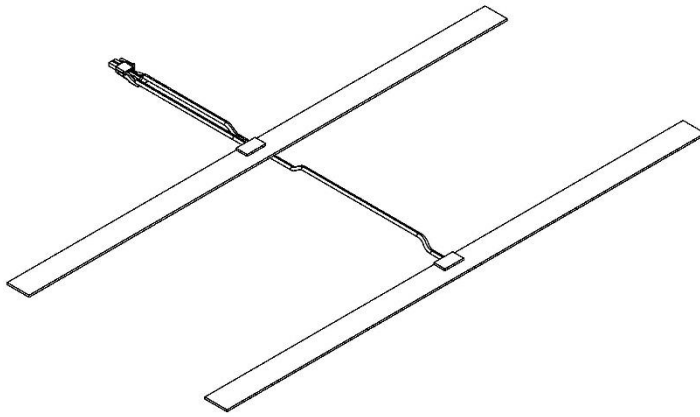


P/N 570002  
ASM\_CABLE\_24V POWER JUMPER\_BMS2

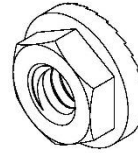
# Service and Parts

## Appendix A9: KIT SERVICE HEATER PAD

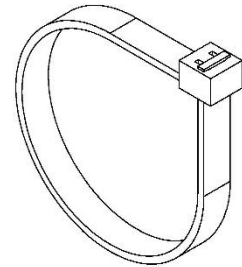
Flux Power part number: 131040



P/N 500427  
ASM\_HEATER PAD\_S24



P/N 820061  
NUT 1/4-20 FLANGE LOCKNUT SS



P/N 850241  
CABLE TIE\_7LX.19W\_50LB  
TENSILE STRGTH\_BLK

## Appendix A10: ASSY, CAN CONNECTION CABLE DONGLE

Flux Power part number: 160001



P/N 160001  
USB PEAKCAN ADAPTER TOOL

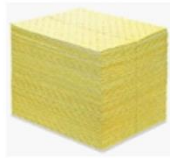
# Service and Parts

## Appendix A11: KIT, DAMAGED BATTERY SHIPPING

Flux Power part number: 190025



P/N 860048  
APRON, NEOPRENE



P/N 860049  
ABSORBENT PAD, 15"X19"



P/N 860050  
(1 PAIR) NITRILE GLOVES, CHEMICAL  
RESISTANT, LARGE



P/N 860051  
(1 PAIR) GOGGLES, SAFETY



P/N 860052  
ABSORBENT PILLOW, 18"X18"



P/N 860053  
BAG, 95 GAL\_6 MIL\_CLEAR



P/N 860054  
DRUM, SALVAGE, OPEN  
HEAD, 110 GAL STEEL



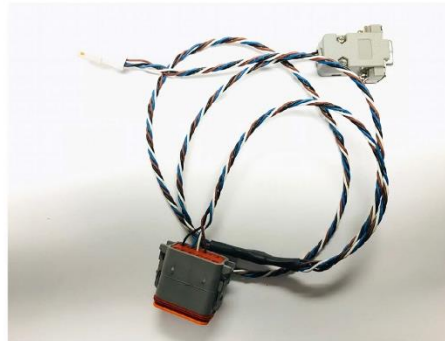
P/N 940066  
LABEL, LI-ION, UN-3480



P/N 990948  
MANUAL\_SAFETY, BATTERY FAILURES

## Appendix A-12: ASSY, CAN CONNECTION CABLE

Flux Power part number: 500040-02

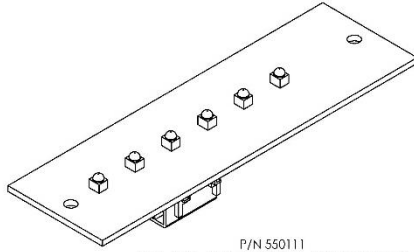


P/N 500040  
ASSY, CAN CONNECTION CABLE  
QTY: 1

# Service and Parts

## Appendix A-13: BMS2 KIT SERVICE LED BOARD

Flux Power part number: 131057



P/N 550111  
PCA, SOC, 6 LED, UNIVERSAL COMMON VCC  
QTY: 1



P/N 810026  
WASHER, W NEOPRENE,  
1/4 SCREW, .275 ID x .625 OD, SS  
QTY: 16



P/N 830066  
SCREW, 1/4-20x.75L,  
BINHD, ALLEN  
QTY: 16



P/N 860007  
EPOXY, PRO-DOME (LED POTTING)  
QTY: 1

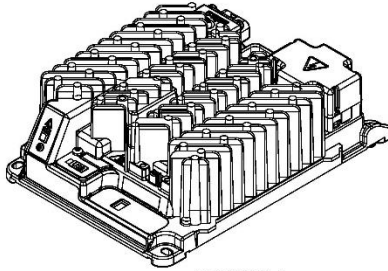


P/N 880013  
RIVET, AL, STEEL MANDREL, DOMED,  
1/8 OD, .126-.187 GRIP, SEALED  
QTY: 2

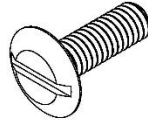
# Service and Parts

## Appendix A-14: BMS2 KIT SERVICE CHARGER

Flux Power part number: 131064



P/N 600101-1  
CHARGER, DELTA Q IC650  
QTY: 1



P/N 800022  
BLT,FLT,SDW,  
5/16-18,1.000,SS1  
QTY: 8



P/N 800024  
BOLT, 5/16-18 BUTTON  
HEAD STAINLESS STEE  
QTY: 4



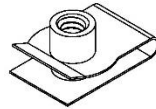
P/N 810016  
WASHER, FLAT, #12  
QTY: 1



P/N 810025  
WASHER, FLAT, MIL SPEC,  
.500OD x.265ID, CAD  
QTY: 4



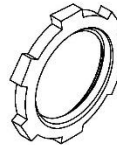
P/N 810026  
WASHER, W NEOPRENE,  
1/4 SCREW, .275 ID x .625 OD, S  
QTY: 16



P/N 820015  
CLIP-NUT, 1/4-20, .531 CENTER  
HOLE TO ED  
QTY: 4



P/N 820024  
NUT - NYLOC 12-24  
QTY: 1



P/N 820022  
LOCKNUT, RIGID 1/2" STEEL  
QTY: 1



P/N 830065  
1/4-20 X 3/4 SOC  
CAP SCREW ALLOY  
QTY: 4



P/N 830066  
SCREW, 1/4-20x.75L,  
BTNHD, ALLEN, 18-8 SS  
QTY: 16



P/N 890022  
CAULK SAVER POLYFOAM  
GRAY 350' ROLL  
QTY: 25 INCHES



P/N 860005  
SILICONE SEALANT  
QTY: 1



## 5 Flux Power Contact Details

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Address: 2685 South Melrose Drive,  
Vista, CA 92081

Tel: 877-505-3589

Fax: 760-741-3535

Email: [Support@fluxpower.com](mailto:Support@fluxpower.com)

Web: [www.fluxpower.com](http://www.fluxpower.com)

WARNING – Risk of Fire – No User Serviceable Parts