Welcome to Bradley's the Lawn Rover User Guide

This guide will discuss:

1. **Critical Reminder**
2. Emergency STOP methods
3. Pre Roving checklist
    a. Includes mower attachment checklist
4. Post Roving checklist (don't forget to do this!)
5. Rover failure mode checklist
6. 3-6 month maintenance requirements.
7. Battery datasheet and how to charge

Critical Reminder

This is a critical reminder to unplug the Battery Management System (BMS) when the battery is not in use. The BMS will slowly drain the battery and kill it unrecoverably. Did you do this?

Emergency STOP methods

1. Push off on remote power fob attached to RC Transmitter
2. Turn off RC Transmitter
3. Turn off onboard toggle switch power
4. Unplug battery
5. Unplug voltage regulator
6. Recover via controls

What to do before Roving

- Check all of the bolts, paying special attention to all the bolts on the wheels. They tend to loosen
- Check all wires are plugged in and nothing looks super out of place or potentially shorted
- Flip rover power switch to off (Flipped to right side when lid is down)
- Check the microcontroller wires are in good condition(abrasion has been seen on wires)
- Check tire pressure - more deflation may give you better grip?
- If using reel mower attachment
    - Attach to mounting arms with pins
    - **Lubricate the blades with vegetable oil - important!**
- Connect black battery plug (Battery Management System (BMS))
- Probably check the battery level with a multimeter to see the voltage
    - Battery Chemistry is LiFePO4 - See datasheet section for manufacturer specific data
        - Nominal is 25.6V
        - Maximum is 29V
        - Don’t let it go below 25V idle
        - 24V starts the danger zone but it’s an exponential dropoff
- Put battery in holster with locking arm
- Attach battery charging plug to harness clip so it doesn’t get tangled
- Plug in battery
- Close lid and fasten closing buckle
    - Buckle goes over reel handle as if to secure it to the lid
- Turn on toggle switch power
- Turn OFF RC transmitter
- Turn on remote power
- Should hear a click - voltage regulator (leftmost box) and microcontroller (center box) should power on
- Check voltage reading from voltage regulator (see above for values) and make a mental note
- While off - set RC transmitter to desired mode and put left joystick back to center
    - For Single Stick Forward mode
        - Top left switch is toggled to the back of the transmitter (single vs dual mode)

        - Top right switch is toggled to the back of the transmitter (forward vs reverse mode)
- Turn on transmitter - Should see a light change in the center microcontroller/receiver box if transmitter is connected
- Send kudos to Bradley and enjoy!

What to do after Roving

1. Turn off the RC Transmitter
2. Turn off the rover with the remote power fob by clicking the off button. You should hear a switch on the motor
3. Turn off the onboard power switch (to the right)
4. Clean off rover and mower with compressor
5. Disconnect the battery
6. **Disconnect the battery BMS!**
    a. **Or charge the battery and then disconnect it!**
    b. **Did you disconnect it???**
7. **Store battery in a non extreme temperature environment**
8. Clean and lubricate mower with vegetable oil (prevent rusting)
9. Double check you turned off RC Transmitter and disconnected the BMS

Rover failure modes

Assuming you followed the checklist but the rover is unresponsive here are some of the failure modes that you may see

- The voltage regulator got unplugged (most common, wire is a bit too short)
- Remote power switch off
- Accidentally ran into something and flipped onboard power switch
- RC transmitter is not on
- RC transmitter is in unexpected mode (dual vs single ir forward vs reverse)
- RC Transmitter became unpaired (will see leds on microcontroller change from connection/disconnection)
- Usb power to microcontroller disconnected from voltage regulator
- Fuse blew (Yellow 20A) (Could go higher but shouldn't need to)
- Some other loose plug unplugged
- RC Receiver to microcontroller wires severed or solder joint cracked
    - Either unresponsive or uncontrollable rover
- Battery BMS not connected

3-6 month maintenance

- Every 3-6 months (hopefully 3) set a recurring alarm in you phone to check
    - The battery is not going to experience extreme temperatures/temperature swings wherever it is stored

    - The battery voltage. Fine to charge fully before storage. Should be 25V or higher
    - The Battery BMS is disconnected (Don't forget)!
    - Maybe oil up that reel mower
    - Tell Bradley how wonderful you think his invention is and that you were thinking about him

Battery datasheet and how to charge

To Charge the battery:

- Connect the BMS
- Attach charger, should hear fan kick in and charger light should go from green to red
- Wait until the charger goes back to green
    - When charging the battery not all the BMS lights go on. Don't worry about it
    - The charger will continue to cycle from red to green to red when it's full. Once you hit green you're good
- Disconnect the charger
- Disconnect the BMS!!!!
- Did you disconnect the BMS?
- Store Battery in a place where it is not going to experience extreme temperatures/temperature swings wherever it is stored

Datasheet (pulled from the wayback machine - pingbattery.com - 24v, 15Ah):

Free BMS and Charger

- It will come with a BMS and 4 Amp charger.

Leadtime: 7 days

- It will take about 7 days for us to build and test this new battery pack for you.

Delivery Time:

- Delivery time is in this page (click).

Specifications:

- Suitable Wattage of Motor: up to 450 Watt, 200-400 Watt suggested
- Applications: E-Bike, Electric Bike, E-Scooter, Electric Scooter
- Voltage: 24 Volts (25.6 Volts Nominal)
- Capacity: 15 Amp Hours
- Dimensions (Size of BMS is not included):
  - 135*105*140 mm / 5.3*4.1*5.5 inches
  - 75*210*140mm / 2.9*8.2*5.5 inches
  - 75*105*280mm / 2.9*4.1*11 inches
- Weight: 3.4 kg / 7.5 lbs
- Charging Voltage: 29-30 Volts
- Charging Current: <8 Amps (<15 Amps with High Rate BMS)
- Rated Discharging Amperage: 15 Amps
- Max Continuous Discharging Amperage: 30 Amps (60 Amps with High Rate BMS)
- Maximum Discharging Current: 60 Amps
- Discharging Cut-off Protection: 30-35 Amps (65 Amps with High Rate BMS)
- Lifecycle of the whole pack: >85% capacity after 1000 cycles. Lifecycle of single cell: >85% capacity after 1500 cycles, >70% capacity after 3000 cycles. (<1C discharge rate and <1C charge rate)