Lucid Bots Battery User Manual

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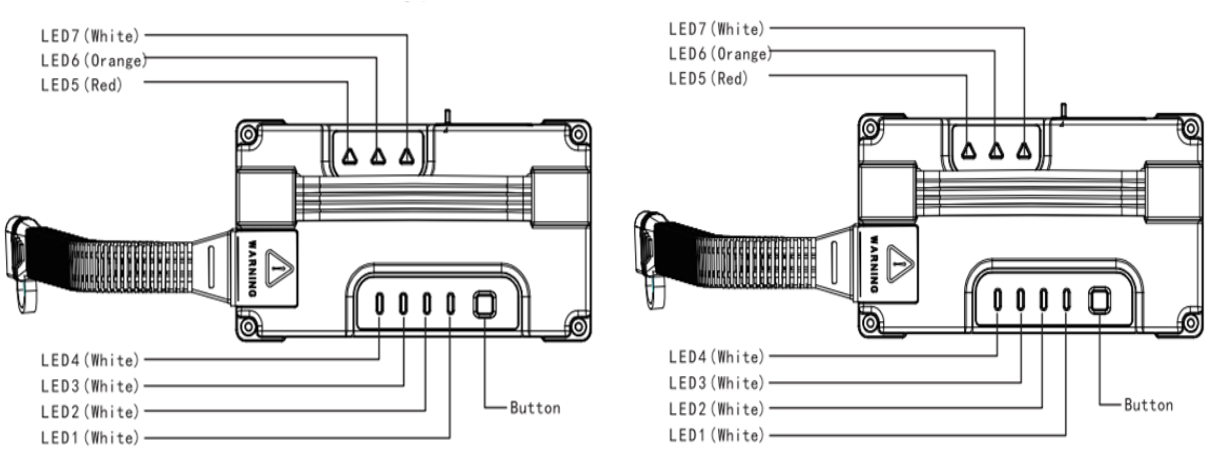
Date: November 6, 2024
Version: A

1. Battery Indicator Information

Battery LED Indicator

Definition of Indicator



1. LED1, LED2, LED3, LED4 are white, showing state of charge
2. LED5, LED6, LED7 are different colors, showing battery health status

Warning Information	Warning Parameters	LED Status	Warning Reset Conditions	LED Status After Reset
Excessive Voltage Difference (High) Cell Imbalance (Pg. 19)	Voltage difference > 300mV	Red Light On	Voltage difference < 280mV	Red Light Off, Orange Light On
Over-Temperature Warning (Discharge)	Discharge temperature > 85°C	Red Light On	Discharge temperature < 75°C	Red Light Off, Orange Light On
Short Circuit Warning (Charge/Discharge)	Charge current > 70A, discharge current > 400A	Red Light On	Disconnect charger/load	Red Light Off
Low Temperature Warning	Charge temperature < 4°C	White Light On	Temperature > 5°C	White Light Off
	Discharge temperature < 10°C	White Light On	Temperature > 15°C	White Light Off
Overcurrent Warning (Charge)	Charge current I > 22A	White Light On	Current I < 20A	White Light Off
Overcurrent Warning (Discharge)	Discharge current I > 80A	White Light On	Current I < 50A	White Light Off
Low State of Charge	SOC<8%	White Light Flashing	SOC > 15%	White Light Off
Excessive Voltage Difference (Low)	Voltage difference > 100mV	Orange Light On	Voltage difference < 80mV	Orange Light Off
Overvoltage/Undervoltage Warning	Single cell voltage > 4.25V	Orange Light On	Single cell voltage < 4.15V	Orange Light Off
Undervoltage Warning	Single cell voltage < 3.1V	Orange Light On	Single cell voltage > 3.3V	Orange Light Off
High Temperature Warning (Discharge)	Discharge temperature > 75°C	Orange Light On	Discharge temperature < 65°C	Orange Light Off
High Temperature Warning (Charge)	Charge temperature > 51°C	Orange Light On	Charge temperature < 50°C	Orange Light Off

2. Battery Usage Precautions

Charging

- The optimal charging temperature is 20–50°C / 68–122°F.
- After use, do not charge the battery immediately. Wait until the battery temperature drops below 50°C / 122°F before connecting to a charger.
- The charging current must not exceed the maximum current specified in the datasheet, generally no more than 3C.
- Do not charge batteries that are swollen, deformed, leaking, or have a voltage below 2.75V.
- The maximum charging voltage should not exceed 4.25V.
- Use chargers from reputable manufacturers with reliable quality. It is recommended to use a charger with a balancing function for battery packs.
- Non-smart batteries must be charged with a balance charger.
- Do not charge the battery in a residential environment. Keep flammable materials and other batteries at least 3 meters away from the charger.

Charging

When charging the Tattu smart battery with the Tattu TA3200 charger, the charging current is adjusted accordingly to the temperature changes to prevent overcurrent. The following is the temperature-current reference chart:

Battery Temperature	Charging Current (Max)	Battery Temperature	Charging Current (Max)
≤4°C / 39.2°F	Can‘t Charge	15-25°C / 59-77°F	20A
5-10°C / 41-50°F	5A	25-45°C / 77-113°F	20A
10-15°C / 50-59°F	10A	45-50°C / 113-122°F	5A
≥51°C / 123.8°F	2A Low-Current Precharge	Single Cell < 2V	Can't charge

Battery Usage Precautions

- The normal voltage range for the battery is 3.5V to 4.2V.
- The voltage deviation for each battery pack at shipment is within 20mV.
- For battery packs used multiple times, the fully charged voltage deviation should be within 50mV.
- The maximum voltage tolerance for each cell is 4.25V, and the minimum limit is 2.75V.
- When the battery voltage exceeds 4.25V or falls below 2.75V, it may damage the cell's charging and discharging performance and safety, potentially causing:
    - Overheating
    - Leakage
    - Swelling
- Do not expose the battery to direct sunlight or leave it in an enclosed vehicle outdoors, where the temperature can exceed 60°C / 140°F.
- When not in use, remove the battery and store it in a cool, shaded place.

Parallel Usage Precautions for 2 Battery Packs

- When using two batteries in parallel on a device, try to use batteries from the same batch, and label them accordingly (e.g., with dates: 241017-1, 241017-1, 241017-2, 241017-2).
- Avoid mixing new and old batteries or batteries with different cycle counts.
- If one of the paired batteries fails, do not mix the remaining battery directly with other batteries. Instead, re-pair based on discharge capacity, ensuring a capacity difference of no more than 1000mAh.

Storage

- **Storage Voltage**: Maintain a storage voltage of 3.75–3.9V or two bars of charge. If the voltage is >3.95V and stored for more than 5 days, discharge it to the storage voltage to avoid storing at full charge.
- **Battery Separation**: If not used for more than one day, disconnect the battery from the drone to prevent over-discharge caused by the drone's power consumption.
- **Storage Environment**: Store in an area separated by brick or solid walls with a well-ventilated exhaust system.
- **Fire Safety Equipment**: Ensure asbestos blankets, asbestos gloves, fire extinguishers, sand, and smoke alarms are available.
- **24-Hour Monitoring**: A 24-hour duty system is recommended, with warehouse personnel trained in fire safety, including regular drills on fire extinguisher use and emergency evacuation.
- **Temperature and Humidity**: Keep the temperature within 10–35°C / 50–95°F, with a maximum of 40°C / 104°F. Humidity should be between 30% and 80%, with no direct sunlight or water leaks.
- **Flammable Material Distance**: Store batteries away from flammable items, such as fuel generators.
- **Original Packaging**: Store batteries in their original boxes, with at least a 0.5m gap between each pallet.
- **Labeling**: Label batteries upon entry to the warehouse, including specifications, model, and shipment date, to facilitate FIFO (first in, first out) management and identify products stored for extended periods.
- **Storage Segregation**: The warehouse should have separate areas for good and defective products, and drones and batteries should be stored in areas separated by solid walls.

Storage (long-term)

For long-term battery storage, perform a full charge and discharge cycle every 3 months.

- Fully charge the battery and let it rest for 15 minutes.
- Use a drone or load device to perform a deep discharge, discharging to 15%.
- Let the battery rest for more than 15 minutes, then use the charger’s storage mode to maintain the battery.

If the battery is stored long-term without maintenance, it may lead to over-discharge, which is irreversible. Over-discharged batteries cannot be repaired.

Maintenance with TA3200

Connect both the battery discharge cable and balance cable into the TA3200 charger. Select the storage mode and press and hold the right button to start maintenance until the charger indicates that the storage process is complete.

Storage - Improper Usage Cases

During a break, batteries were not removed from the drone and were exposed to direct sunlight.

Batteries left in a vehicle, resulting in an explosion and fire outdoors.

3. Troubleshooting Methods

Using the Bluetooth Mobile App for Troubleshooting

Android users scan the QR code, and iOS users search for "TATTU" directly in the App Store to download.

NewBMS

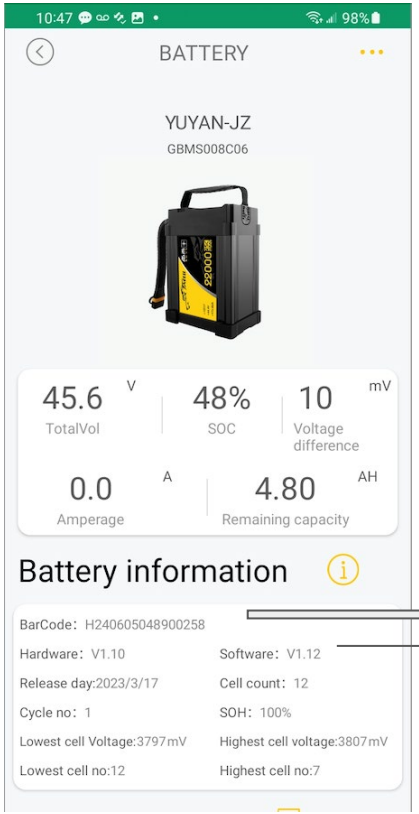
Watch the following video for more instructions.

Android Users: https://www.youtube.com/watch?v=M1SDsk5HY0E&t=51s

iOS Users: https://www.youtube.com/watch?v=cUQJkTssoQw

In case of a battery fault, please provide the battery barcode and history log for further investigation. If you are unable to download the history log through the app, ensure that both the battery firmware and the app are updated to the latest version.

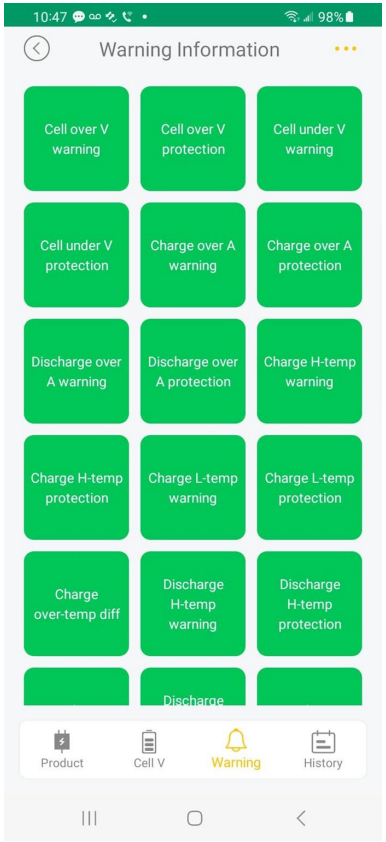
Bluetooth Mobile App - Android Version



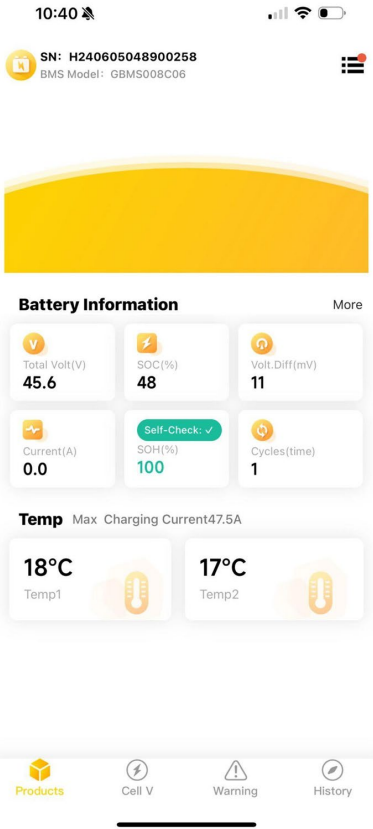
Green means normal.
Red means abnormal.

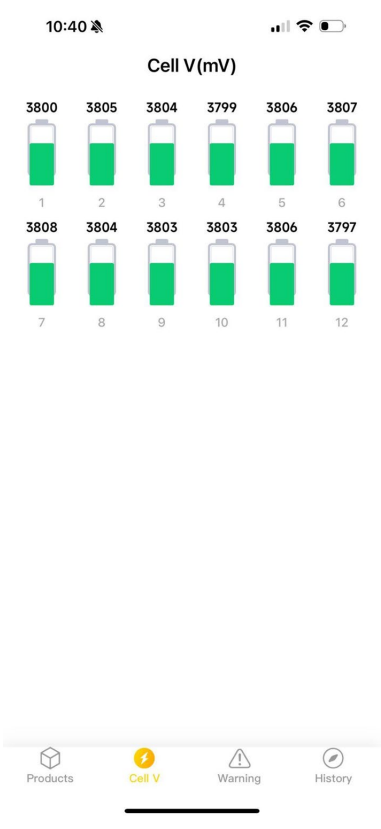
Battery barcode

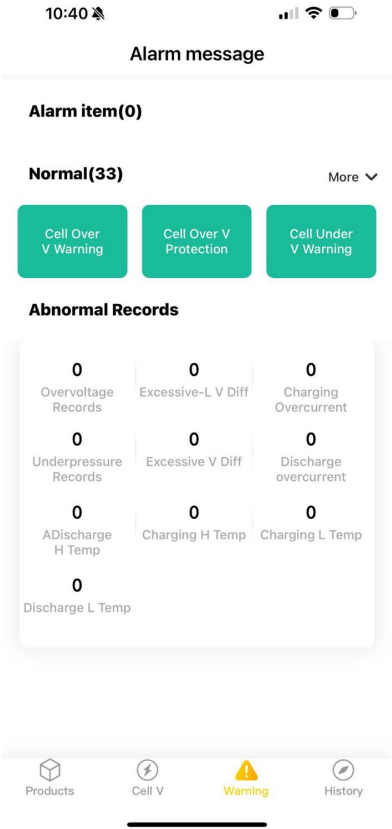
Firmware Version



Bluetooth Mobile App - iOS Version

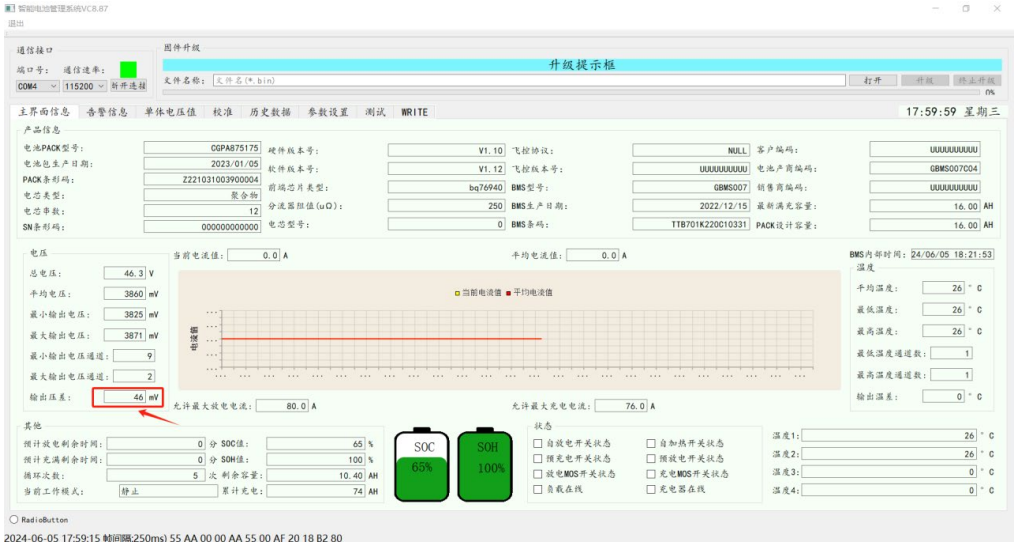






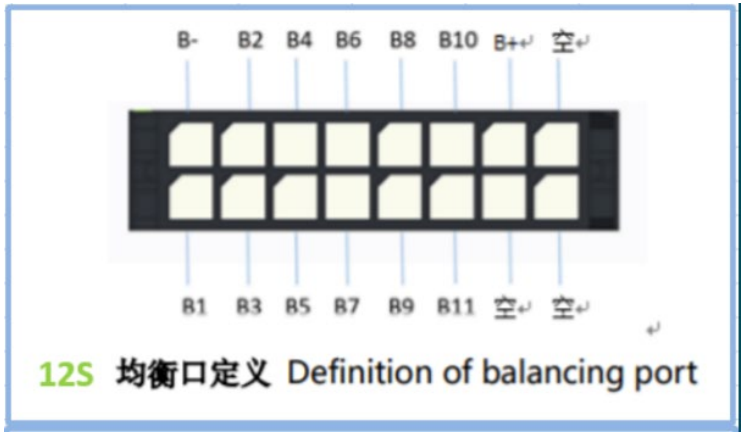
Install the desktop software to retrieve fault information.

The desktop software can be used for firmware upgrades, retrieving historical logs, viewing fault records, and calibrating system time.
Required tools: a window computer and a BD3000 communication device (Tattu will provide it when it’s needed)



Using a Multimeter to Measure Individual Cell Voltage

1. Use a multimeter and measure individual cell voltages through the balance connector pins.
2. Sequentially touch the **B- and B1**, **B1 and B2**, **B2 and B3**, **B3 and B4**, etc., with the red and black probes of the multimeter.
3. Be cautious to keep the red and black probes at a safe distance to avoid short circuits.
4. Record each measured voltage value.
5. Calculate the voltage difference by subtracting the minimum voltage value from the maximum voltage value.
6. Finally, measure the total voltage between **B- and B+**.



Using the Balance Cable to Check Individual Cell Voltage with a Charger

1. If you have imbalanced cells, its best to charge your battery fully to 100%, then discharge the battery through normal use. Within a few charge cycles, the cells will balance. If you are unable to charge normally, follow the instructions below:

2. To only check the cells w/o charging, connect the battery and charger using the balance cable only.
3. On the charger, select the appropriate channel option:
    a. Use the left and right buttons to select **Channel A**.
    b. Use the right button to select **Channel B**.
4. Check the real-time voltage and voltage differences of individual cells on the charger's display.
5. Once you've determined an imbalance, connect the power cable and press the "Start" button to begin charging

4. Lithium Battery Fire Extinguishing Method and Incident Handling

Fire Extinguishing Method and Incident Handling

1. Extinguishing Method for Burning Lithium Batteries

- Use an **asbestos blanket** and **sand** to isolate and suffocate the fire.

2. Steps for Extinguishing

a. Disconnect the power supply to the equipment immediately. Locate asbestos gloves and asbestos blankets nearby.

b. Use asbestos gloves or tongs to move the burning battery to the ground or a fireproof sand bucket.

c. Cover the burning lithium battery with an asbestos blanket. Use fireproof sand to bury the blanket, isolating oxygen to extinguish the flames.

d. For outdoor fires or self-ignition: If there are no nearby hazards, allow the battery to burn until the self-ignition intensity decreases. Then bury the battery in soil or sand until smoke ceases. Avoid using water. Retrieve the extinguished battery for separate storage and analysis.

e. For indoor fires or self-ignition: If the storage area has dedicated lithium battery fire safety equipment, promptly extinguish the fire following lithium battery fire protocols.

f. If nearby hazards are present (e.g., electrical cabinets): Immediately request assistance from professional property management personnel or the local fire department.

3. Preserving the Scene

- **Minor damage (battery only)**: Retain the undamaged remains in a safe location and contact the manufacturer's after-sales service for further processing.
- **Property damage**: Preserve the site and contact the manufacturer for remote video confirmation to jointly assess and evaluate the property loss.
- **Serious injuries**: Preserve the accident scene and provide the following documents to the manufacturer:
    - Injury assessment report issued by a hospital.
    - Medical records and receipts.

Fire Extinguishing Method and Incident Handling

4. **Information Collection for Burning Batteries**:
   (Ensure to preserve the battery BMS as much as possible to facilitate chip transfer for analyzing the cause of the fire.)

   In the event of self-ignition, collect information based on the following form.

5. Handling of Scrap Batteries

Handling of Scrap Batteries

Identification

1. **Appearance Evaluation**:
   - Visible swelling, damage, leakage, or deformation.
2. **Voltage Evaluation**:
   - Individual cell voltage ≥ 4.25V or < 2.8V.
3. **Internal Resistance Evaluation**:
   - Battery internal resistance is infinite (cannot be tested) or has reached three times the initial internal resistance.
4. **Capacity Evaluation**:
   - Capacity is less than 70% of the rated capacity after two consecutive 1C discharges.

Handling

1. **Isolation and Labeling**:
   - Clearly label batteries identified as scrap and store them separately.
   - Do not recharge or discharge scrap batteries.
   - Temporary storage locations must meet fire safety requirements, such as iron cabinets or iron barrels.
2. **Saltwater Soaking**:
   - Prepare a 5% saltwater solution and use a wide-mouth plastic container.
   - Place the container in an open outdoor area, away from flammable and explosive materials.
   - Submerge the battery in saltwater for at least 72 hours.
3. **Expansion Space**:
   - Ensure the container has at least a 5 cm expansion gap around the edges to prevent damage from battery swelling during soaking.
4. **Post-Soaking Handling**:
   - Use tongs to remove the soaked remains.
   - Confirm that the battery has no voltage or residual heat before treating it as general solid waste.
5. **Additional Note**:
   - If conditions allow, you can also contact the manufacturer for assistance with disposal.

Operation Example

Add salt to clean water to create a saltwater solution.

Ensure the battery is fully submerged in the saltwater.

The End