



Beijing TT Aviation Technology Co., Ltd.

Add: No.1 TTA Building, Niantou Industrial Park ,Changping District,Beijing, China

TTA Battery Use and Maintenance Instruction V2.4



北方天途航空技术发展（北京）有限公司
Beijing TT Aviation Technology Co.,Ltd.

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Record of Revisions

Issue No.	Issue. Date	Reason for Revision	Insert page
V1.0	2019/07/31	Issued	
V2.1	2019/12/09	Add “How to deal with a burning battery”	4
		Add “First Aid Measures”	5
V2.2	2020/09/10	Add “8.3 Long-term Storage”	6
V2.3	2021/07/15	Add “Receive Inspection”	1
V2.4	2022/03/09	Add “Quick Overview of Key Points for Use and Maintenance”	1
		Update “3.1 Set Alarming Voltage”	3
		Add”3.4 Charge empty battery timely”	4
		Update ”5.Balancing”	4
		Add “How to put battery in storage mode”	6
		Update “6.3 Long-term storage maintenance”	7



Receive Inspection

Followings shall be done firstly after you receive batteries.

- ◆ **Inspect** all batteries immediately once you receive them. All goods have a **7-day open-box warranty** period. Report to TTA timely and apply for warranty within open-box warranty period, if you note anything abnormal.
- ◆ **Maintain all batteries immediately** since you receive them. Generally, shipment will take a long time, and batteries have to be shipped with low remaining capacity. Once receive batteries, perform a charge-discharge cycle to activate and maintain them. Otherwise, battery performance will be adversely affected, and battery will even die because of them. **Hereby TTA claim that the failures that caused by improper maintenance will not be covered by warranty.**

Quick Overview of Key Points for Use and Maintenance

Daily Use

- ◆ Set alarming voltage according to drone manual, and Land immediately when battery voltage drop to 2nd alarming voltage(Critical Low).
- ◆ Don't leave empty battery for over 12 hours, otherwise battery performance will be adversely affected.
- ◆ Recommended to balance battery voltage every 3~5 work days to maintain battery, or when you note that cell difference is bigger than 30mv.
- ◆ Never leave a full battery for over 3 days, otherwise battery may be adversely affected or even damaged.
- ◆ Recommended to charge or balance battery with balance cable connected, especially when balancing voltage.
- ◆ Pay Attention to battery abnormality and always keep safe in mind.

Long-term Storage

Before long-term storage, put battery into Storage voltage.

During long-term storage, please performing followings to maintain batteries.

- ◆ Every 30 days, charge battery in "Storage" mode to maintain its voltage at storage voltage
- ◆ Every 2~3 months, perform a "charge-discharge" cycle to activate battery for maintaining its performance.

More details, follow the below contents please.



1. Before Charging / Discharging

- ◆ Inspect the battery for any damages. Do not charge / discharge a damaged battery.
- ◆ Inspect the battery for any swelling and possible battery fluid leaks. Do not charge / discharge a malfunctional battery.
- ◆ Inspect the voltage for each battery cell. If the voltage difference between cells is too large, please contact with TTA sales or engineers. **(Normal range of voltage difference is 1mv-30mv)**. If voltage difference between cells is greater than 30mv, do not use the battery before balancing it by using storage function of charger.
- ◆ The productive rubber plug of the battery balance port and charging port can effectively protect battery from water, pesticide, dust. Please use it carefully and prevent from falling off from battery.
- ◆ Inspect the battery compartment of drone and clean the residual liquid before mounting battery to prevent the liquid from permeating the charging port and damaging the battery electronic board and cells. Use funnel to add liquid to prevent liquid splashing on drone parts.

Attention: Be aware of plugging the rubber plugs into the balance port after charging completely.

2. Drone Batteries Use

2.1 Use the SAME kind of Battery

If drone is mounted more than one piece of battery, never use batteries with different voltage and capacity. The differences would definitely damage your batteries and hard to calculate the endurance which would cause unexpected drone crash.

2.2 Check the Battery Status

Before take off, check the status of batteries, ensure they are fully charged and mounted firmly to the drone.



2.3 Caution with the Temperature

Battery should be used at a temperature between -10°C to 40°C (14°F to 104°F). LiPo batteries do not work well in cold weather. The colder it is, the shorter running times due to the slowing down of the chemical activity within the battery.

2.4 Battery Life Cycles

Battery has about 300 life cycles. Leaving them on a full charge all the time, running them completely out, or exposing them to high temperatures will shorten its lifespan definitely.

2.5 Battery Connection

Make sure the wire connection polarity is correct; do not short circuit the battery.

3. Discharging

3.1 Set Alarming Voltage

Over-discharge will not only affect flight safety, but also lead to battery damage. Therefore, we need to set an alarming voltage for batteries to avoid over-discharge. LiPo Battery is composed by multiple pieces of cells.

For each cell of **General** Lipo battery, Recommended alarming voltage is as follow:

1st alarming cell voltage: 3.7V

2nd alarming cell voltage: 3.65V

Attention:

(1) For general Lipo battery, if cell voltage is below 3.6V, this battery is over-discharged.

(2) For HV Lipo battery, alarming voltage is different, contact TTA for more details.

◆ Ensure drone low-voltage protection has been enabled.

For 6S battery(M4E): 1st alarming voltage 22.2V, 2nd alarming voltage 21.9V

For 12S battery(M6E): 1st alarming voltage 44.4V, 2nd alarming voltage 43.8V.

For 14S battery(G200): 1st alarming voltage 51.8V, 2nd alarming voltage 51.1V

◆ When reaching the 1st alarming voltage, drone should be prepared for Return-to-Home. When reaching the 2nd alarming voltage, drone should be landed immediately in case of over-discharge.



- ◆ Battery over-discharging not only greatly decrease the battery lifespan, but also lead to **crash** because of out of power. Therefore, stop performing missions immediately when reaching the 2nd alarming voltage.

3.2 Binding Battery Firmly

Battery shell is an important structure to prevent battery from explosion and flames caused by liquid leakage. When fixing the battery on the drone, the cable tie should be tightened. Battery may be fallen out from drone while flying violently or crash, which may easily causes shell breakage.

3.3 Inspection after Discharging

3.3.1 After each day's work, clean the residual liquid on battery

3.3.2 After each day's work, inspect the appearance of battery for damages, swelling, liquid permeating through the charging port etc. If find above malfunction conditions, stop using the battery immediately and contact with TTA engineer for instructions.

3.3.3 Inspect the balance & charging cable and power cable regularly for possible breakage, open circuit, short circuit etc. If find any, replace the broken parts immediately.

3.3.4 Place batteries on a cool and dry ground far away from flammable and explosive materials. It is suggested to store it in a fireproof and explosion-proof container.

3.4 Charge Empty Battery Timely

Charge empty battery timely after performing missions.

Never leave an empty battery for over 12hours, otherwise battery performance will be adversely affected.

4.Charging

- ◆ For general Lipo battery, the nominal voltage of one cell is 3.7V, and voltage will increase to 4.2V after full charge.

As a result, the nominal voltage of 6S battery = $3.7V \times 6$, the fully charged voltage= $4.2V \times 6$.

- ◆ For HV Lipo battery(e.g.,G300 battery), the nominal voltage of one cell is 3.8V, and cell voltage will increase to 4.35V after full charge.



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For G300 HV battery, its nominal voltage is $3.8V \times 14$, its fully charged voltage= $4.35V \times 14$

4.1 Do not charge while overheating

After battery is used, the battery cannot be directly charged due to overheating. Place the battery until the temperature drops to less than 40°C .

Notice: It is suggested to charge battery in 10 A current to charge more fully and lengthen its lifespan.

4.2 Use Official Charger

Official charger is the best fit for batteries. Any consequences caused by three-party charger shall be undertaken by users.

4.3 NEVER Leave Batteries on Charge Unsupervised

NEVER leave your batteries on charge unsupervised. If a battery starts to become puffy, smoke, or catches fire you need to be able to immediately handle the situation. Battery do have overcharge protection, however user should be around for safe.

4.4 Remove Fully Charged Battery

Once the battery is fully charged, remove it from charger to avoid any over-charge risks.

5. Balancing

Battery balancing is the process by which each cell voltage is equalized. Balancing is to ensure that each cell is performing in the same voltage, and discharging the same amount of energy. Balance charging will surely improve the performance and lifespan of battery.

The official charger will balance the battery automatically while charging. Keep the balancing cable **connected** while charging and storage.

After completing 3~5 work days, balance the battery by charging it in “Storage” mode to reduce cell voltage difference.

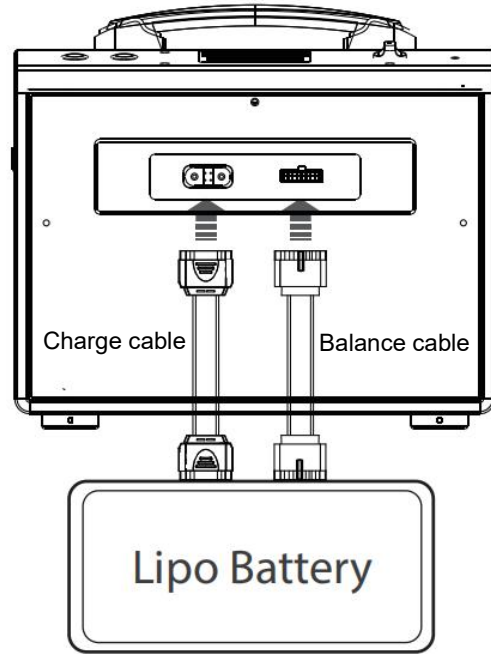


Figure 0 1 Charge&Storage With Balance cable connected

6.Storage

6.1 Storage Voltage

- ◆ Never leave your fully charged or low voltage battery for more than 3~4 days, because gases might build-up inside the cells or active material of poles decreased damage your battery. Therefore it need to be discharged to reach storage voltage.
- ◆ If you are not going to use your LiPo battery for longer than two weeks, you need to prepare it for storage. The proper storage voltage is about 3.85V per cell.

How to put battery into Storage Mode?

Step01: Connect battery to charger

Step02: Press "Storage" button to start. Battery will be charged or discharged to storage voltage automatically.

Step03: After storage complete, remove battery from charger. Battery is ready for long-term storage.

6.2 Storage Conditions

- ◆ Store LiPo batteries in a room temperature range -- $23 \pm 5^{\circ}\text{C}$, humidity-- $65 \pm 20\%RH$, a dry and cool place.



- ◆ Keep away from wet and high temperature resources. Avoid long-time sunshine.
- ◆ Put batteries in a fireproof, explosion-proof industrial case for storage.



Figure 0 2 Explosion-proof and Fire-proof Metal Cases

6.3 Long-term Storage Maintenance

- ◆ Every 30 days, maintain the batteries cell voltage at storage voltage around 3.85V(General Lipo) or 3.9V (HV Lipo). During long time storage, battery will discharge itself. Charge batteries in storage mode to prevent damages caused by over self-discharge.
 - (1) Connect batteries to charger
 - (2) Start charging in "Storage" mode
 - (3) After "Storage" charge completely, store batteries properly
- ◆ Every 2~3 months, perform a **charge-discharge** cycle to every battery for activating batteries in long-term storage.
 - (1) Connect batteries to charger
 - (2) Start charging in "Storage" mode to balance cell voltage
 - (3) After storage complete, switch to "Charge" mode to charge batteries fully
 - (4) After charge fully, leave battery for over 10 minutes. Then switch charger to "Storage" mode again to put battery in storage voltage
 - (5) After "storage" charge completely, store batteries properly.

Attention:



(1) Long-term storage will adversely influence battery's performance without maintenance.

(2) Battery will discharge to dead in long-term storage without regular maintenance.

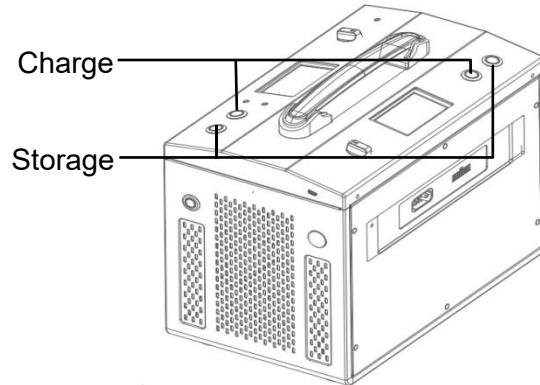


Figure 0 3 Charge and Storage Switch

7.How to deal with a burning battery?

Isolation and suffocation is the best way to deal with burning batteries. When battery is on fire, first cut off the power supply. Quickly try to find the location of the asbestos blanket and the asbestos gloves, use asbestos gloves or fire tongs to move the burning battery to a safe and open place, such as fire bucket.

- ◆ Cover the burning battery with asbestos blanket.
- ◆ Use fire sand to bury asbestos blankets for isolating the battery from the air.



Fire sand



Asbestos gloves and blanket



8.First Aid Measures

If human body contact with the contents of an open battery, take the following “Fist Aid Measures” immediately.

8.1 Eye Contact.

Flush eyes with plenty of water for several minutes while holding eyelids open. Get medical attention if irritation persists.

8.2 Skin Contact.

Remove contaminated clothing and shoes. Immediately wash with water and soap and rinse thoroughly. Wash clothing and shoes before reuse. If irritation occurs, get medical attention.

8.3 After Inhalation.

Remove victim to fresh area. Administer artificial respiration if breathing is difficult. Seek medical attention.

8.4 After Swallowing

Do not induce vomiting. Get medical attention.

9.Transport

If battery needs to be long-distance transported, it need to be discharged to lower than 50% of its capacity first.

Place battery in a proper case(covered by soft materials, not flammable) and avoid any damages, such as collision, squeezing,and falling.

10.Safety Rules

- 1) Never remove batteries from a armed drone.
- 2) Never connect batteries to a armed drone.
- 3) Keep a fire extinguishing device (extinguisher or sand) nearby for safety.
- 4) Lift the battery by its handle. Do not lift it by the cables.
- 5) Do not use a battery If it has been dropped, or was involved in any kind of heavy impact.



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- 6) Never use a bulging battery which should be recycled according to local laws.
- 7) Never puncture a LiPo battery which will most certainly catch fire.
- 8) Charge battery in well-ventilated areas and firm surfaces.
- 9) Keep battery away from liquid, such as water,alcohol.
- 10) Do not expose to sunlight for long time in summer.
- 11) Do not charge the batteries and if its temperature is over 40℃ . Otherwise it will damage its lifespan.
- 12) If a battery falls into water, take it our immediately, and put it in a safe and open place. Do not use the battery again and dispose it as the described in <TTA Battery Disposal Recycling Instruction>.



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TT AVIATION

This content is subject to change.

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