



# User Manual

Applicable Battery Models:

R05BP400S20-2200 R05BP405S20-3000

R05BP405S35-3000 R05BP410S35-3000

R05BP405D35-3500

Applicable Charger Models:

CUA52 CUC54

Read instruction carefully before use

# Table of Contents

1. Safety.....	5
2. Special Notes .....	6
3. First Time Use .....	7
4. Battery Discharge.....	10
4.1. 1.5V Constant Voltage Discharge .....	10
4.2. Low Voltage Warning .....	10
4.3. Usable discharged energy .....	11
4.4. Over-discharge Protection.....	12
4.5. Timely Recharge After Depletion .....	12
4.6. Over-Current Protection and Reverse Polarity By- Pass	13
4.7. Discharge overload or short-circuit protection:	14
4.8. Discharge Temperature Protection .....	15
4.9. Discharging in Series .....	15
4.10. Discharging in parallel.....	17
5. Charging the Battery .....	18
5.1. Compatible Chargers .....	18

5.2.	Use with a USB 5V power source .....	18
5.3.	Charging from a computer USB port.....	19
5.4.	Under temperature charging .....	20
5.5.	LED Indicator of Charging status .....	20
5.6.	Charging Characteristics .....	21
5.7.	Charging Temperature Protection.....	23
5.8.	Charging Under-power Protection .....	24
5.9.	Factors affecting Charging Speed .....	25
5.10.	Full Charge Time .....	26
5.11.	Battery LED Not On During Charging .....	26
5.12.	Battery LED On for Too Long .....	26
<b>6.</b>	<b>Battery Charging Protection .....</b>	<b>28</b>
6.1.	Battery Charge Protection Type Indication .....	28
6.2.	Blinking Immediately Upon Charging.....	29
6.3.	Blinking After Charging Some Time.....	31
6.4.	Blinking After Charging Over Time .....	32
6.5.	Under Power Protection Remedies.....	33
6.6.	Indicators of Battery Fault or Degradation .....	34
<b>7.</b>	<b>Long Term Storage and Maintenance .....</b>	<b>36</b>

7.1. Preparation and Storage Conditions .....	36
7.2. Battery Care During Storage .....	37
7.3. Battery Storage Period Over Limit and Repairs	37
<b>8. Battery Usage and Maintenance .....</b>	<b>38</b>
8.1. Characteristics of Battery Charge and Discharge	38
8.2. Charge / Discharge Precautions .....	40
8.3. Methods to Extend Battery Life .....	40
<b>9. Jugee Charger .....</b>	<b>42</b>
9.1. Select Suitable USB 5V Power Adaptor .....	42
9.2. Use USB Ports of Computer .....	43
9.3. Preventing Charging Other Non-Jugee Batteries	43
9.4. Charging Thermal Management .....	44
9.5. Jugee Charger Operational Characteristics.....	45
9.6. Charger Fault Indicator .....	46
<b>Appendix 1: Quick Index.....</b>	<b>48</b>
<b>Appendix 2: Battery Rating mWh and mAh Differences.</b>	<b>49</b>
<b>Appendix 3: Estimate Jugee Battery Charge / Discharge</b>	<b>50</b>
<b>Appendix 4: Intellectual Properties .....</b>	<b>52</b>

Appendix 5: Product Certifications .....	53
EN5C3W0 Specifications.....	55
EN7C1W0 Specifications.....	56
CUA51 Specifications.....	<b>错误!未定义书签。</b>
CUA52 Specifications.....	57
CUA72 Specifications.....	<b>错误!未定义书签。</b>
CUM52 Specifications.....	57

# 1. Safety

- 1.1. Jugee battery must only be charged with a charger labeled with the MILBEP sign. Use of any other type of charger is strictly prohibited, or it may damage the battery or charger.
- 1.2. Jugee chargers must only be used to charge batteries labeled with the MILBEP sign. Use with any other type of battery is strictly prohibited, to avoid damages to the battery or charge.
- 1.3. It is strictly forbidden to disassemble, crush, hammer, hurl, heat, or put into water or fire, to avoid serious consequences such as fire or explosion.
- 1.4. Please do not use the battery or charger should it be drenched, hammered, hurled, crushed or otherwise damaged.
- 1.5. It is prohibited to charge or use the battery in or near inflammable, explosive or corrosive environment.
- 1.6. It is prohibited to mix the use of Jugee battery with other type batteries, doing so can damage Jugee or other batteries, and may lead to serious consequences such as battery leakage, fire and even explosion.
- 1.7. Jugee batteries must not be charged in series, doing so can damage Jugee batteries, and may lead to serious

consequences such as battery leakage, fire and even explosion.

- 1.8. Please observe polarity signs when using Jugee with electrical product, as mistakes may damage the battery and / or the product.
- 1.9. Jugee battery and charger are not suitable for use in high-power underwater or other sealed equipment, nor inside of high-power electrical equipment.
- 1.10. Series discharge connection of Jugee batteries should be limited under 10 cells, to avoid potential damages.
- 1.11. After Jugee batteries are depleted, please promptly recharge them according to instructions in Section 4.5.
- 1.12. Product not suitable for children, the intellectually impaired, inexperienced and uninformed, unless under the direction of competent supervisor. They may use the battery and charger under supervision, and instructed not play the products as toys.

## **2. Special Notes**

- 2.1. Jugee battery incorporates short-circuit or overload protections, and therefore may not be suitable for certain applications that require high-current capability, e.g. :
  - A. Toy-racing cards using high powered 4-wheel drive;

- B. Camera external flash with flyback boost;
  - C. High power products that drain 1.5V alkaline batteries within 0.5 hour.
- 2.2. For easy understanding and reference, usage and specific guidelines of Jugee battery and charger will be given in detail in sections related to these applications. Please refer to these for details.
- 2.3. Jugee battery and charger are charge-discharge compatible and interchangeable with products marked with the MILBEP™ logo.
- 2.4. Jugee battery products carry a 6-month warranty. Questions relating to the use of Jugee battery and charger should be directed to aftersales customer care departments of Jugee or its distributors.

### **3. First Time Use**

- 3.1. After unpacking the product, please check Jugee battery and charger. Do not use if there are signs of damage during shipment such as impact, crush deformation, water immersion etc., and contact your seller.
- 3.2. In accordance with relevant lithium-ion battery transportation regulations, Jugee battery has been charged to approximately 30% for air-freight, or 80%



ground-freight, and should be ready to use out of package.

Note: If the product is stored in the channel for too long, there may be a low voltage state (1.1V) or zero voltage state after some battery unpacking.

- 3.3. There are no special requirements for first charge or use of Jugee battery, and any of the following practice is acceptable:
  - A. Jugee battery does not need to be charged full, and can be taken out to use any point during charging.
  - B. Jugee battery does not need to be used to empty, and can be charged at any stage of discharging.
  - C. The number and slot portions of Jugee batteries not restricted when working with a multi-cell charger.
  - D. Any un-occupied slot in multi-cell charger can be used, and likewise, any battery being charged can be taken out for use at any time.
- Notes
  - A. It is recommended to charge the battery under the condition that the temperature of the Jugee

battery and the ambient temperature are higher than 0 °C.

- B. When Jugee battery is in depleted (0 V voltage) state, it should be re-charged as soon as possible, and in any case within specified time for the type of battery (see Section 4.5).
  - C. 5V power source used with the USB charger should be selected in accordance with Sections 5.2 and 5.3.
- 3.4. In some product packaging, there is an insulating insert between the positive contacts of the battery and charger. This must be removed to allow before charging can proceed.
- 3.5. If Jugee battery is to be left idle some time, please follow instructions in Chapter 7 pertinent to “Battery Long Term Storage and Maintenance.
- 3.6. Jugee battery and charger have certain special functions not present in other products in their category. Please consult this User Manual before use.

## 4. Battery Discharge

### 4.1. 1.5V Constant Voltage Discharge

Jugee discharges energy at a 1.5V constant voltage while the charge is released, creating a feeling as if the battery is always feel “as fresh”.

### 4.2. Low Voltage Warning

Jugee battery will lower output voltage to 1.1V when its internal energy is nearly depleted, as a signal in order to avoid sudden power cut without warning.

- Special Notes
  - A. When used devices with battery gage, the remaining charge indicator or bars would reduce only at the point when the battery is in low energy state.
  - B. With other types devices, low battery charge condition can be observed from the reduced power
  - C. The amount of energy reaming at low charge state varies by the different Jugee battery models. Please see the datasheets attached to this manual.

#### 4.3. Usable discharged energy

Jugee battery capacity rated in accordance with the “5-hour discharge method”, a standard adopted in China and internationally. Below is table of measured energy using this method for different Jugee battery models:

Battery Model	Rated Capacity	Min. Capacity
R05BP405D35-3500	3500mWh	3400mWh
R05BP405S20-3000 R05BP405S35-3000 R05BP410S35-3000	3000mWh	2900mWh
R05BP400S20-2200	2200mWh	2100mWh

- Special Notes:

To help consumers estimate battery capacity in actual use, Jugee battery use mWh as the metric of storage capacity. This is not to be confused with the mAh metric used by some other battery brands.

To understand the difference in meaning between mWh and mAh, and how to use this to estimate usage performance, please read Appendix 2 and 3.

#### 4.4. Over-discharge Protection

Jugee battery employs over-discharge protection, which automatically shuts off battery power output when energy is depleted, hence avoiding potential damages to battery. User is thus assured of normal use of the battery till it is auto-shut.

- Notes:

After depletion shut-off, Jugee battery terminal voltage is 0V. This is a normal for battery in over-discharge protection.

#### 4.5. Timely Recharge After Depletion

The Jugee battery is exhausted or stored in a depleted state. It is best to charge it within 10 days after the battery is discharged. The maximum length is not recommended for more than 30 days to avoid damage to the battery and affect the use of the battery. This a critical point about requiring user attention!

- Attention:

Should allowed recharge delay period has elapsed after Jugee battery is depleted, over-discharge condition could damage the battery, to degrees ranging from reduced capacity, shortened cycle life, to malfunction of the battery in the most server case. Slight damage to battery is detected and automatically repaired by the built-in electronics, but some irreversible degradation to the battery is to be expected.

#### 4.6. Over-Current Protection and Reverse Polarity By-Pass

Jugee battery has over-current protection, and a by-pass function where a depleted cell in a series can allow current continuation with reversed polarity, so the series can continue to provide power. This feature makes it easier to put batteries in series, as the user does need to be concerned with state of charge or relative ages of cells in a series.

- Attention:
  - A. Serial connection of cells of different state of charge or relative age is limited to Jugee battery models listed in this manual, namely EN5C3W0 and EN7C1W0. It is not permitted to mix Jugee batteries with other makes of batteries, or

damage to Jugee batteries or the other cells can be caused.

- B. Jugee battery in depletion shut-off mode does not have active over-current or over-temperature protection. It is therefore necessary to limit working current of series string to 1A.

#### 4.7. Discharge overload or short-circuit protection:

Jugee battery has protection against discharge overload or short-circuit, and limit discharge current to approximately 2.5A, to protect external electric devices from series damage when overloaded or short-circuited.

- Notes

- A. Jugee battery is not harmed in over-load or short-circuit protection mode, however, the battery may become hot due to the rapid discharge current.
- B. The over-load / short-circuit protection function of Jugee battery is effective in protecting the external device or the battery, but it limits current rating of the battery, which may render the battery incapable of power certain high-current applications, such as camera external flash with flyback boost or class-4 high power racing model car.

#### 4.8. Discharge Temperature Protection

Jugee battery has discharge temperature protection, which shuts down battery power output when battery cell temperature is higher than 60°C or lower than -30°C. Battery discharge function automatically resumes once the temperature is in the range of 60°C ~ -30°C.

- Note:

**Do not store or use Jugee battery in environment of temperature higher than 60°C (e.g. inside of a car on a summer day) or lower than -30°C, to avoid damages to the battery.**

#### 4.9. Discharging in Series

When multiple Jugee batteries are connected in series, power output is not stopped when one of the batteries is depleted and shut down. However, energy released or discharging power of individual batteries in the series are not necessary uniform, nor will the batteries in the series all reach low-energy state, or enter into depletion shut-down mode at the same time.

- Note:



- A. When Jugee batteries are put into series connection, the combined voltage and total power will increase. Connection of more than 10 batteries together should only be performed by electric power technical professionals.
- B. A Jugee battery operating in reversed polarity current continuation mode will incur certain voltage drop (typically 0.3-0.4V) across its terminals. When the battery is used in series: If any one of the batteries is exhausted and the discharge is turned off, the total series voltage is approximately equal to the sum of the remaining battery voltage minus the drop.

Take the 4-cell Jugee battery in series as an example. After any one of the batteries is exhausted, the output voltage of the series battery pack is:  $1.5 \times 4 - 1.5 - 0.4 = 4.1V$

- C. Under depletion shutdown mode Jugee battery's discharge over-current or over-temperature protection is unavailable. It is therefore necessary to ensure that total discharge current of a series of batteries, especially when one of the batteries in the series is depleted, should be limited to 1A.

#### 4.10. Discharging in parallel

When multiple Jugee batteries are connected in parallel, current will never flow from batteries of higher remaining charge to lower ones (even when batteries operate in 1.5V and 1.1V modes co-exist). However, energy released or discharging power of individual batteries in the group are not necessary uniform, nor will they all reach low-energy state, or enter into depletion shut-down mode at the same time

- Note:

When Jugee batteries are connected in parallel, the voltage across the group is equal to the highest among the individual batteries in the group, and therefore the total discharge energy and current will increase. Connection of more than 10 batteries together should only be performed by electric power technical professionals.

## 5. Charging the Battery

### 5.1. Compatible Chargers

Jugee batteries can only be charged with chargers showing the label MILPEB mark. MILPEB chargers contain charging regulator and protection circuits, and ensure normal, rapid and safe charging operation for Jugee batteries.

Charging Jugee batteries with non-MILPEB chargers can significantly reduce charging speed, and cause no-charge, incomplete charge or even damage to the batteries and/or the chargers.

- Notes:

The Jugee battery of the model listed in this manual can also be charged using MILBEP's old 4-cell charger (CUM54). It should be noted that the charging time of the old charger may be longer, and may be accompanied by the phenomenon that the battery LED indicator flickers at a low frequency.

### 5.2. Use with a USB 5V power source

To use 110/220/240V AC power, a 5V USB power adaptor must be used. The following guidelines should be used when selecting the USB 5V adaptor:

- A. For 4-cell charger, adaptor current rating should be no lower than 3.0A;
- B. For 2-cell charger, adaptor current rating should be no lower than 1.5A;

- Note:

If a USB 5V power adaptor used has a current rating lower than the above requirements, Jugee battery may exhibit under-power protection mode when charging. Under this condition, not only will the charging time increase significantly, the 5V USB power source will also be in full load condition. This should be avoided in general, unless for emergency short period of time.

### 5.3. Charging from a computer USB port

When charging from USB port with any Jugee charger, use the following guideline to determine the number of Jugee batteries that can be charged at the same time:

- A. For USB port V1.0 or lower, 1 type AA batteries;
- B. For USB port V2.0 or higher, 2 type AA batteries;
- C. For USB port Type-C, 4 type AA batteries(You need to bring your own Type-c to Type-c cable).

- Note:

Generally, USB ports on PCs (including laptops) share a common power supply. Charging more batteries than the above guidelines may over use the provided power resources, and affect external equipment connected to other USP ports.

#### 5.4. Under temperature charging

In view of the fact that the general lithium-ion battery can not be charged normally at low temperature, the Jugee battery is specially optimized and low temperature protection, allowing the user to use normally at low temperatures in an emergency, but the charging time is lengthened and the battery life is shortened. Long-term use in low temperature environment will still affect the life of Jugee battery. Therefore, users should try to avoid charging in the environment below 0 °C.

#### 5.5. LED Indicator of Charging status

On Jugee battery positive end there is a charging status LED. Combined with the status LED on the charger, user can get a range of charging operation states:

State	Battery LED	Charger LED
a) Normal	ON	GREEN

b) Under-Power Over-Temp	Low frequency blinking	GREEN
c) Battery Abnormal	High frequency blinking	GREEN
d) Battery Full	OFF	GREEN
e) Charger Protection	OFF	RED

- Note:

- A. If above mentioned b), c) state occur, it suggests that Jugee battery is in Protection Charging. Please consult Chapter 6 Battery Charging Protection for possible solutions.
- B. If condition e) should occur, the Jugee charger is in Protection mode. Please check solutions in sections 9.6 or 9.3.

## 5.6. Charging Characteristics

Jugee battery has comprehensive charging control and protection, and is compliant with MILBEP technical specifications. The following are the characteristics of compliant charging process:

- A. Jugee batteries of different model, specification or at different state of discharge (including other brand batteries with MILBEP marking) can all be used in the same charger.

- B. Jugee battery is no minimum or maximum charging time restrictions.
- C. Jugee battery will automatically shut off once fully charged, and can be taken out for use, or left in charger till later. It is recommended that the fully charged battery be removed from the charger within 24 hours to reduce the adverse effects of the charger on the battery micro-floating charge.
- D. Jugee battery does not have to be fully charged before use, and can be taken out for use at any stage of charging without causing performance degradation. The amount of discharge available is the same as the amount charged into the battery.
- E. A Jugee battery can be charged at any stage of use of storage, with any amount of remaining charge, without causing performance degradation. Recharge the battery while keeping the battery power 40%-80%, which can effectively extend the battery life.
- F. Jugee battery has a rapid charging, which means that at the point of depletion, a Jugee battery only need to be charged for 30 seconds to get complete typical urgent tasks similar to these:

- 1 shave on an electric shaver;
- 1 brush or floss on an electric toothbrush;
- 1 day of standard wireless keyboard or mouse;
- 2 days or more of a remote control handset.

### 5.7. Charging Temperature Protection

Jugee battery has over-heating protection capability against possible damages caused to the lithium-ion core during charging. Overheat protection may be momentarily on during charging when ambient temperature is above 27°C or when ventilation is limited, and this is indicated by the blinking battery LED.

When overheat protection is activated charging will continue while automatically regulating temperature limit, and charge-to-full time will be longer accordingly.

● Note:

Charge time will be longer the higher the ambient temperature or poorer the ventilation. It is therefore a good to place the charger in cool and well ventilated spot. More details on troubleshooting temperature protection can be found in Chapter 6 “Battery Charging Protection”.



## 5.8. Charging Under-power Protection

Jugee battery has under-power charging protection capability against possible over-load damage to under-rated power sources connected to the battery charger. When used with a USB 5V power source having a current output rating lower than the combined charging current Jugee batteries in the charger, these batteries may activate under-power protection mode, indicated by the blinking LED on the batteries.

Charging speed will reduce significantly when under-power protection is activated, and the USB 5V power source will be operating at maximum load condition. To be prudent, under-power charging should be carried out under supervision. Use of small USB 5V power source should be restricted to emergency situation, and for limited time only.

- Note:

**Charge time will be longer the lower the current rating of the 5V USB source. More details on troubleshooting under-power protection can be found in Chapter 6 “Battery Charging Protection”.**

## 5.9. Factors affecting Charging Speed

The main factors affecting Jugee battery charging speed are: type of charger used, 5V USB power source current rating, ambient temperature and ventilation, and the remaining charges of the battery.

- A. Chargers marked with the MILBEP label are equipped with electric and heat regulators, and therefore are the best assurance for rapid and safe charge of Jugee batteries.
- B. Always try to use USB 5V power sources that meet the requirements outlined in Section 5.2, to avoid the activation of under-power protection, which will slow down charging.
- C. Always try to charge the Jugee batteries in a well-conditioned environment with good ventilation and heat dissipation

- Note:

Overheat protection may be momentarily on during charging when ambient temperature is above 27°C. It is therefore recommended to always use MILBEP chargers in a well ventilated spot when ambient temperature is relatively high, in order to reduce the effect of over-heat protection on charging speed.

During normal use, full-charge times can vary significantly, due to differences of insertion time, remaining charge, model numbers of batteries.

#### 5.10. Full Charge Time

When used with Jugee Charger, with USB 5V power source meeting current rating requirements, in environment under 25 °C and adequate ventilation. Different models of Jugee batteries charge from a depleted state to a fully charged state. The charging time is generally less than 4 hours.

#### 5.11. Battery LED Not On During Charging

If after power is connected and the charger LED is GREEN, but battery LED is not on, often it is because of improper contact between the battery and charger. Please check if the insulation piece is removed, rotate the battery slightly, or try to clean the battery and charger contacts.

#### 5.12. Battery LED On for Too Long

Jugee battery LED will be on during charging under 30 °C. It is abnormal if the LED is still on after 4 hours. It is recommended to take Jugee battery out of charger, lay idle for 5 minutes, and inserted back to charger by itself.

Battery should complete a full charge under 2 hours. If not, please consult Chapter 6.6 to determine the cause.

- Note:

**A number of reasons could cause prolonged charging, for instances, battery repairs trickle charge, under-power protection, over-heating protection, intermittent power shutdown etc.**

## 6. Battery Charging Protection

When charging Jugee batteries, some detected conditions such as power source under power, battery core over temperature, battery core fault or severe degradation will activate charging protection mode, indicated by the blinking LED on the battery. This chapter will further explain the various conditions signaled by the blinking pattern, and corresponding remedial actions.

### 6.1. Battery Charge Protection Type Indication

Jugee battery has multiple protection modes such as: under-power protection, over-temperature protection, battery core fault protection, battery core failure protection. A battery is in protective mode when its LED indicator blinks.

Jugee battery has 3 blinking patterns, and careful observation can determine which pattern it falls under and therefore appropriate remedial actions.

#### A. Blinking Immediately Upon Charging

Battery LED immediately start blinking when charger is powered on. The can indicate either supply under-power

or battery core fault protection. Further actions are given in Section 6.2.

**B. Blinking After Charging Some Time**

Battery LED switches on after charger power on, but starts blinking after some time. This indicates battery has entered over-temperature protection mode. Actions are in Section 6.3.

**C. Blinking After Charging Over Time**

Battery LED is switched on, but after 4 hours continuous charging starts blinking. This may indicate the possibility of battery core failure. Remedial actions are suggested in Section 6.4.

**6.2. Blinking Immediately Upon Charging**

Select a USB 5V power source that is able to charge standard cell phone. Connect empty charger and observe the green indicator on. Insert a Jugee battery that was blinking, observe which of the following situation occurs, and follow the suggested actions:

- A.** If battery LED is long on, then this battery is normal, and the reason for previous blinking was source under-power causing the battery to enter under-

power protection mode. Follow Section 6.5 for solutions.

- B. If battery blinking resumes, take note of charger slot, take the battery out, and swap into this slot another Jugee battery that has been fully discharged. Observe what follows to further narrow down the cause: If the second battery LED indicator is long on hence it is charging normally, it can be concluded the first battery has a battery core fault, and should no longer be used. Contact the retailer for warranty services. If the second battery also blinks, then likely the charger or the power source cable could be faulty. Please follow instruction in Section 6.5. If the charger is the problem, please stop using it and contact your retailer or Jugee Customer Service.

- Note:

Jugee battery charging current is reduced below rated level when its remaining charge is above 85%. Because of this, when used with a weak power supply the same battery can exhibit under-power protection at times and then normal at other times.

### 6.3. Blinking After Charging Some Time

When a Jugee battery LED is long on at the start of charging, and then goes into blinking after some time, the battery is in charge over-temperature protection mode.

Battery can still continue and complete charging under temperature protection, but charge speed will be reduced. The methods below can effectively reduce or eliminate impact on charge speed due to over-temperature protection:

- A. Charge batter with MILBEP labelled charger in well ventilated spot;
- B. Do not cover the charger with cloth, paper or other soft fabric that can affect ventilation;
- C. Do not place the charger on top of soft fabric or paper that can affect ventilation;
- D. Do not place charger in narrow, enclosed space with poor ventilation;
- E. Do not place the charger on top of heater, radiator or electric appliances;
- F. Try avoid using USB ports close to the exhaust fan of computer;



- Note:

Charging battery in ambient temperature above 27°C can result in over temperature protection. The higher the temperature, the higher proportion of charge time will be in the protection mode, and the slower the charge speed. For instance, charging in 30°C in well ventilated space, charge time can be prolonged 20%.

#### 6.4. Blinking After Charging Over Time

When a Jugee battery LED is long on at the start of charging, and then goes into blinking after 4 hours charging, take the battery out of charger, wait for 5 minutes, and then place it back to charger alone. Observe which of the following situations occurs, and follow the suggested actions:

- A. After re-insertion, the battery LED is long on, and can be charged to full (LED off) after 2 hours, then the battery is normal.
- B. After re-insertion, the battery LED is long on, but starts blinking after 2 hours, then the battery core is likely degraded. Follow suggestions in Section 6.6.

- C. After re-insertion, the battery LED immediately starts blinking, then follow instructions in Section 6.2. If the USB 5V adaptor, charger and charger cables are verified to function properly, then go to Section 6.6.

#### 6.5. Under Power Protection Remedies

Under power conditions occurs when power supply current is lower than the required battery charging current. This significantly prolongs the charging time, forces the power source to operate in full-load mode and therefore should be avoided normally. These are methods for avoiding under-power protection:

- A. Follow the requirements of Section 5.2 in selecting USB 5V adaptor to avoid under power protection caused by power source under-rating;
- B. Follow the requirements of Section 5.3 in choosing the correct number of batteries charged at the same time to avoid over using power resources provided by a computer to other loads;
- C. Charging cable aging and USB port oxidation due to wear can also cause power losses, resulting in charging under power. Power supply intermittency caused by loose USB connector, or unusually high

temperature of the charger cable or connectors should be eliminated by replacing with appropriate parts before using again.

- D. Dirt build-up on Charger or battery contacts can increase resistance and under-power condition. Please keep contact points on battery and charger free of dirt.

#### 6.6. Indicators of Battery Fault or Degradation

Jugee battery performs diagnostics during charging, and uses LED blinking to indicate potential fault or core degradation conditions. If these conditions are suspected, the following steps can be taken to make further determination:

- A. Select a USB 5V adaptor that can charge cell phones normally to power the Jugee charger, place one fully depleted Jugee battery into charger, and if the LED is long on, use this adaptor for testing other suspected faulty HUIEE batteries.
- B. Place a single suspected faulty or degraded Jugee battery in the charger tested in step A above. If the battery LED immediately starts blinking, the battery is faulty. Please do not use the battery anymore, and contact the retailer or Jugee Customer Services.

- C. Place a single suspected faulty or degraded Jugee battery in the charger tested in step A above. If the battery LED is long on, then the test can proceed. If within 4 hours charging, battery LED goes off, then the battery is normal.

If the battery is continuously charged for 4 hours, the battery LED will flash. The battery can be taken out and left for about 5 minutes, and then charged in the charger. If the battery LED is always on when charging starts and goes out within 2 hours, the battery performance is normal. If the battery LED is still flashing, it means that the battery core is depleted and cannot be repaired. If this happens, please do not use it again, and contact the dealer or Jugee battery after-sales service consultation.

- Note:

**The Jugee charger selected in step A should be compatible with the suspected faulty battery, and the charger cable and USB 5V adaptor must have ratings higher than battery rated charging current.**

## 7. Long Term Storage and Maintenance

If Jugee battery is temporary unused and stored away, please follow storage and maintenance instructions in this section to avoid damages to the battery.

### 7.1. Preparation and Storage Conditions

- A. Jugee battery must be fully charged before storage.
- B. Battery contacts should not touch metal conductors, nor should the battery be left in the charger of the electric device it is used with, to avoid over discharge.
- C. Jugee battery should be stored in ambient temperature range 5°C~30°C.
- D. Jugee battery storage should not exceed the periods indicated in the table below:

Battery Model	Maximum Permissible Storage Period (Days)
R05BP410S35-3000	270 天
R05BP410S20-2200	190 天

## 7.2. Battery Care During Storage

If Jucee battery need to be stored for longer than the allowed period, then recharging must be one before the end of the period, to extend the storage period counting from the recharging day.

- Note:

It is recommended that battery recharging is performed no later than 70% of the maximum permissible storage period, as this helps prolonging battery life.

## 7.3. Battery Storage Period Over Limit and Repairs

Jucee battery can be damaged if stored over the allowed period limit without maintenance recharge. Light damage caused by storage period over limit will be detected by charging self diagnostics and repairs, but varying degrees of degradation to battery capacity and life can be expected and irreversible.

If after 5 hours of automatic self-repairs of an over-storage-period battery, the battery LED still blinks non-stop, the battery can be taken out and left for about 5 minutes, and then charged in the charger. If the battery LED is always on when charging starts and goes out within 2 hours, the battery performance is normal. If the battery

LED is still flashing, it means that the battery core is depleted and cannot be repaired. If this happens, please do not use it again, and contact the dealer or Jugee battery after-sales service consultation.

## **8. Battery Usage and Maintenance**

After careful reading sections of this Manual, and under normal usage condition, please follow the instructions in this section for simple usage and maintenance of Jugee battery.

### **8.1. Characteristics of Battery Charge and Discharge**

Jugee battery has built-in charge and discharge control and DC-DC output voltage regulation, which exhibit the following battery performance characteristics while fully protecting the lithium-ion core.

- A. 1.5V constant output voltage kept while charge is reducing;
- B. 1.1V constant voltage as warning of charge exhaustion;
- C. Battery can be used till full depletion (0V);

- D. Can release all stored energy, hence a high actual usable energy output;
- E. Can mix use batteries of different types of batteries, old and new batteries, charge the battery with different power.
- F. Output maximum current under short-circuit or over-load conditions;
- G. Can charge at any time irrespective of remaining charge;
- H. Can discharge at any time irrespective of remaining charge;
- I. Automatic full-charge shutoff, no need to take battery out after full charge;
- J. Automatic charging control with status LED;
- K. High speed recharge, support short burst charge/discharge in emergency;
- L. Frequent charge/discharge rotation without battery life degradation;
- M. Built-in charge/discharge controls and protection prolonging battery life;
- N. Built-in battery management, no need for external maintenance.



## 8.2. Charge / Discharge Precautions

Caution! Please follow the instructions below carefully when using Jugee battery, to ensure proper performance and longevity.

- A. Always follow the safety guidelines of Chapter 1;
- B. Charge battery when depleted, according to Section 4.5;
- C. Follow storage and maintenance instructions of Chapter 7;
- D. Only use battery in temperatures  $-20^{\circ}\text{C} \sim 60^{\circ}\text{C}$ ;
- E. Only charge battery in temperatures  $0^{\circ}\text{C} \sim 35^{\circ}\text{C}$ ;
- F. Charge battery in well ventilated spot, Section 6.3;
- G. Select suitable USB 5V adaptor, Section 5.2;

## 8.3. Methods to Extend Battery Life

In addition to the instructions of Section 8.2, follow the recommendations of this section to ensure Jugee battery performance and extend battery to or beyond the expected battery cycle life.

- A. Charge battery to full before it is depleted;
- B. After battery depletion, try to charge it the same day;

- C. Store battery for no longer than 70% of the Permissible longest storage period;
- D. Use battery in temperatures  $-10^{\circ}\text{C} \sim 30^{\circ}\text{C}$ ;
- E. Charge battery in temperatures  $10^{\circ}\text{C} \sim 30^{\circ}\text{C}$ ;
- F. Keep the positive and negative contacts clean'

## 9. Jugee Charger

All charger models mentioned in this manual are compliant to MILBEP technical specifications, and have the performance level and protection functions of this sections.

### 9.1. Select Suitable USB 5V Power Adaptor

Jugee chargers should be used with USB 5V adaptors for the following description:

#### A. For AA Chargers:

Select USB 5V power adaptor with rated current above # of charge slots X 0.7A. As an example, for the 4-slot AA charger(CUC54), the USB 5V adaptor should have rated current no lower than  $4 \times 0.7A = 2.8A$ .

#### ● Note:

If the USB 5V adaptor has a rated current below the recommended level of this section, battery will activate under-power charge protection. This can significantly reduce charge speed, and will put the USB adaptor in full-load condition for prolonged period of time.

## 9.2. Use USB Ports of Computer

When using multi-slot Jugee charger with USB port on PC, please note the number of Jugee batteries being charged should follow the following guidelines:

- A. For USB port lower than USB2.0: 1 AA type of Jugee batteries;
- B. For USB port USB2.0 or higher: 2 AA type of Jugee batteries;
- C. For USB TYPE-C, 4 AA type of Jugee batteries

- Note:

Generally, USB ports on PCs (including laptops) share a common power supply. Charging more batteries than the above guidelines may over use the provided power resources, and affect external equipment connected to other USB ports.

## 9.3. Preventing Charging Other Non-Jugee Batteries

Jugee charger can detect most 1.5V dry cell or 1.2V Ni-MH batteries. When these batteries are detected, the charger will automatically lock in shut-off protection mode, and the RED LED will switch on as warning. To a certain degree, this can protect senior, children or the inexperienced from dangers of mistakenly charging these

batteries, such as battery leakage, fire even explosion. Once in lock protection mode, Jugee charger must be powered off, and all batteries removed, leave for 2 seconds before power on again, for the lock protection to be reset and resume normal operation.

- Note:

Jugee charger cannot guarantee to detect all non-MILBEP battery types. It is therefore prudent not to use any non-MILBEP battery with Jugee charger, else dangers of leakage, fire or explosion could occur.

#### 9.4. Charging Thermal Management

The built-in thermal management of Jugee charger can effectively reduce the heat generated when charging MILBEP batteries, and improve charging speed even in relative high temperature environment.

- Note:

Some heat will always be generated by Jugee charger during operation, and the recommendations below should be followed:

- A. Do not place the charger on top of soft fabric or paper that can affect ventilation;

- B. Do not cover the charger with cloth, paper or other soft fabric that can affect ventilation;
- C. Do not place charger in narrow, enclosed space with poor ventilation;
- D. Do not place the charger on top of heater, radiator or electric appliances;

#### 9.5. Jugee Charger Operational Characteristics

Jugee charger has built-in MILBEP battery compatible control system, and exhibits the following operation characteristics:

- A. Charger LED status indicator will show GREEN upon power on indicating normal, and turns RED when it is in protective modes.
- B. Multi-slot charger does not set minimum number of batters being charged.
- C. Charger does specify which slot position to be used.
- D. During charging operation, any battery can be taken out and placed in without affecting the charging of other batteries in the charger;
- E. Batteries can be placed into the charger before or after the charger is powered on from USB 5V adaptor.

- F. Different model or different brand MILBEP batteries can be put in the same charger at the same time, and battery charging is not influenced by each other. Batteries of different capacity or charge current may require different time to charge to full.
- G. If a MILBEP battery being charged by Jugee charger malfunctions, charger will automatically lock in protection. When this happens, it is necessary to take all batteries out of the charger, shut off the power for 2 seconds and re-power to restore normal charging operation.

#### 9.6. Charger Fault Indicator

If Jugee charger status LED shows RED upon power on, with no battery inserted, it is in protection mode. Causes for protection modes include: USB 5V adaptor has output voltage is too high, charger was damp or submersed, charger has been damaged by force etc.. If these causes have been eliminated and yet fault condition persists, the charger has malfunctioned. Please contact your retailer or Jugee Customer Services.

- Note:

**Jugee charger is not waterproof, and user should take care not to expose the devise to water or excessive**

moisture. Jugee USB 5V connector is compliant to the USB standard, and can be damaged by high voltage.



## Appendix 1: Quick Index

Function and features	Section
Battery Rated Capacity	4.3
Est. Usable Capacity and Charge Losses	Appendix 3
Constant 1.1V Output at Low Charge	4.2
0V Output at Depletion	4.4
Permissible Recharge Wait Time After Depletion	4.5
Mixed Use of Batteries Old & New, or with Different State of Charge	4.6
Charge / Discharge Characteristics	8.1
Charge / Discharge Operation Guideline	8.2
Methods to Extend Battery Life	8.3
Selecting Suitable USB 5V Power Source for Charger	5.2, 9.1
Using USB Poets on PC 电	5.3, 9.2
Rated Battery Charge to Full Time	5.10
Battery LED Blinking During Charging	6.1
Charger LED on \Long RED	9.3, 9.6
Inserting and Removing Battery from Charger	9.5
Interchangeability of Jugee Charger and Battery Models	5.1
Maximum Permissible Battery Storage Period	7.1
Customer Service Contacts	2.4, Back

## Appendix 2: Battery Rating mWh and mAh Differences

1. mWh, Wh, kWh etc. are metric units of electric energy, commonly used by meters or energy losses. One unit of electricity is sometime used to denote  $1 \text{ kWh} = 1,000 \text{ Wh} = 100,000 \text{ mWh}$ . Jugee battery is a constant voltate source, and therefore it is suitable to use mWh as a unit to measure its energy storage and release when a user tries to gage its energy actual performance. Appendix 3 has more details.
2. mAh and Ah are electric charge metric units, which are commonly used in the battery industry to gage the amount of electric charge movements between the positive and negative poles. Because mAh is a metric not related to battery internal electric motive or external potentials, it is not suitable as a direct measurement of energy absorbed or released. A user cannot use the mAh metric to estimate actual performance in an application. Traditional electrochemical battery cells have unstable output voltage that varies with state of charge, making mWh an inaccurate metric to gage charge and discharge, hence mAh is more widely used.

## Appendix 3: Estimate Jugee Battery Charge / Discharge

### 1. Rated Capacity vs. Actual Discharged Energy

The rated capacity of Jugee battery is calibrated according to the “5 hour discharge rate” standards used by the battery industry. Under normal usage where the discharge rate is 1.5 or lower than the calibration rate, Jugee rated capacity can be directly used as estimate of actual energy released. Take 3000mWh Jugee battery as an example, its calibration current is  $(3000\text{mWh}/1.5\text{V}) / 5\text{h} = 400\text{mA}$ . For external devices that draw working current less or equal  $400\text{mA} \times 1.5 = 600\text{mA}$ , 3000mWh can be directly used as estimated total energy discharged.

### 2. Example of Working Hour Estimate

Suppose an electric shaver has rated working voltage 3V, and rated power of 1.5W, and 2 fully charged Jugee AA 3000mWh batteries are used to power it.

#### A. Shaver Working Current Calculation

$1.5\text{W} / 3\text{V} = 0.5\text{A} = 500\text{mA}$ , less than 600 mA.

#### B. Working Hours Estimation from Full Charge

2 Jugee 3000 mWh batteries have a total rated energy capacity of  $2 \times 3000\text{mWh} = 6000 \text{mWh} = 6\text{Wh}$ . Shaver can be powered continuously for  $6\text{Wh} / 1.5\text{W} = 4\text{h}$  (Hours). If an average daily shave lasts for 3 minutes, the batteries can support 80 days of use.

### 3. Battery Charging Energy Consumption

If a Jugee charger is used to charge 4 depleted Jugee batteries, the following is calculation of electricity consumed to charge them to full:

Batteries absorb  $4 \times 3000\text{mWh} = 12\text{Wh}$ .

Assuming the USB power source and charger have a combined efficiency of 40%, then electricity consumed is about  $12\text{Wh}/0.4 = 30\text{Wh} = 0.03$  units.

## Appendix 4: Intellectual Properties

Jugee products and related technology have applied for patent protection in China, USA, European Union, Japan, South Korea, and is protected by applicable IP laws of these countries or regions.

1. Granted patents in China:

ZL201110219892.0      ZL201310436748.1

ZL201310436714.2      ZL201510400612.4

ZL201320588983.6      ZL201320588986.X

ZL201630444420.9      ZL201630444127.2

2. Granted patents in USA/EU/JAPAN/SOUTH KOERA:

USA:      10,103,412

EU:      3051622

Japan:      6387415

South Korea: 10-1838540

## Appendix 5: Product Certifications

EN5C3W0&EN7C1W0 have passed various 3<sup>rd</sup> party certifications:

1. Lithium Battery Core Safety Certification

UL 1462

IEC 62133

GB31241-2014

2. Transportation Safety Certification

UN 38.3

EU Battery Directive: 2013/56/EU

MSDS

3. EMC

USA FCC (Part 15 Subpart B)

EU: EN55032, EN55024

## Jugee Battery Common Specifications

Applicable Models	R05BP400S20-2200 R05BP405S20-3000 R05BP405S35-3000, R05BP410S35-3000 R05BP405D35-3500
Rated Discharge Voltage	1.5V $\pm$ 2% ( $I_{out} \leq 1.0A$ )
Low SoC Output Voltage	1.1V $\pm$ 2% ( $I_{out} \leq 0.5A$ )
Low SoC Threshold	1%~2.4% (0.2C, 25°C)
Discharge Voltage Ripple	$\leq 20mV_{p-p}$ ( $I_{out} \leq 1.0A$ )
Discharge Max Current	2.5A $\pm$ 25%
Max Continuation Current	1.5A (Max)
Rated Charge Voltage	DC 5.2V $\pm$ 0.5V
Full Charge Cycle Life	$\geq 500$ (60% of Rated Cap.)
Charging Ambient Temperatures	0°C ~ 35°C
Discharging Ambient Temperatures	-20°C ~ 60°C
Storage Ambient Temperatures	0°C ~ 35°C
Suitable Charger Types	MILBEP
Charge / Discharge Specifications	MILBEP 2.0
Executed Standards	GB31241、IEC62133
Structural Dimensions	GB/T 8897.2, IEC60086-2

## R05BP405S20-3000/R05BP405S35-3000/R05BP410S35-3000 Specifications

Product Type	5 号/AA/R6
Li-Ion Battery Core	900mAh, 3.8V
Rated Capacity	2000mAh (0.2C, CC)
Rated Discharge Energy	3000mWh (0.2C, CC)
Minimum Discharge Energy	2900mWh (0.2C, CC)
Rated Discharge Current	600mA (BET)
Maximum Constant Voltage Discharge Current	2000mA (Max)
Permissible Recharge Wait Time After Depletion	10 Days (Max)
Permissible Storage Period After Full Charge	270 Days (Max)
Maximum Charge Current	750mA (Max)
Rated Charge to Full Time	≤4h (MILBEP & 25°C)
Product Diameter	14.10mm ± 0.30mm
Product Height	50.10mm ± 0.30mm
Product Net Weight	About 20g
Maximum Permissible Radial Static Pressure	7.5kg(Max)
Maximum Permissible Axial Static Pressure	9.5kg Days (Max)



## R05BP400S20-2200 Specifications

Product Type	5 号/AA/R6
Li-Ion Battery Core	650mAh, 3.7V
Rated Capacity	1467mAh (0.2C, CC)
Rated Discharge Energy	2200mWh (0.2C, CC)
Minimum Discharge Energy	2100mWh (0.2C, CC)
Rated Discharge Current	400mA (BET)
Maximum Constant Voltage Discharge Current	2000mA (max)
Permissible Recharge Wait Time After Depletion	10 Days (Max)
Permissible Storage Period After Full Charge	190 Days (Max)
Maximum Charge Current	550mA (Max)
Rated Charge to Full Time	≤4h (MILBEP & 25°C)
Product Diameter	14.10mm ± 0.30mm
Product Height	50.10mm ± 0.30mm
Product Net Weight	About 19g
Maximum Permissible Radial Static Pressure	7.5kg(Max)
Maximum Permissible Axial Static Pressure	9.5kg Days (Max)

## CUA52 Specifications

Charging Slots	2 X AA Type
Suitable Battery Type	MILBEP
Rated Input Voltage	DC 5.2V $\pm$ 0.5V
USB 5V Adaptor Output Current	$\geq$ 1.5A
Charging Ambient Temperature	-20°C ~ 35°C
Charger Specifications	MILBEP 2.0
Executed Standard	GB 4706.18-2014

## CUC54 Specifications

Charging Slots	4 X AA Type
Suitable Battery Type	MILBEP
Rated Input Voltage	DC 5.2V $\pm$ 0.5V
USB 5V Adaptor Output Current	$\geq$ 3.0A
Charging Ambient Temperature	-20°C ~ 35°C
Charger Specifications	MILBEP 2.0
Executed Standard	GB 4706.18-2014



Embedded Battery Management technology

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