



Operation and Maintenance Manual

R-EC060050A1-US

ECube 60AP



2025 1ST EDITION

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○ E-mail: support@renon-usa.com

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1. General Part

This Operation and Maintenance Manual applies to the Renon ECube 60AP (Product Model: R-EC060030A1/R-EC060060A1-US) Battery Energy Storage System (BESS). This document outlines the operation guidelines and maintenance scope for the ECube 60AP system, ensuring safe and efficient maintenance practices throughout its entire lifecycle.

All personnel must thoroughly review and strictly comply with this manual prior to operating the equipment or performing maintenance activities. For procedures not specified herein, please contact Renon Technical Support Department.

2. Safety Regulations

2.1 Pre-maintenance Instructions

	1. Do not open the door of the battery cabinet for maintenance in rainy, humid, windy or thunderstorm weather. The company will not be liable for any loss caused by failure to avoid it. 2. When performing regular maintenance on the battery cabinet, please power down the BESS. Operating the equipment with power may cause damage or cause electric shock hazard. There is no such requirement during daily inspection. 3. In case of emergency, use the emergency stop button to power down the equipment.
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To safely and effectively maintain the system, maintenance personnel should carefully read and comply with the following safety requirements:

a. Maintenance personnel must hold a certificate of electrician and pass the professional training before being qualified to work.

b. Safety precautions must be observed, necessary tools must be used and personal protective equipment must be worn.

c. Metal jewelry such as jewelry or watches is strictly prohibited.

d. Under no circumstances is it allowed to touch the high voltage positive and negative electrodes of the energy storage system.

e. When cleaning, do not use water to clean directly, and use a vacuum cleaner when necessary.

f. When plugging in the cable, the operation should be standardized, and no brute force or violent operation should be used.

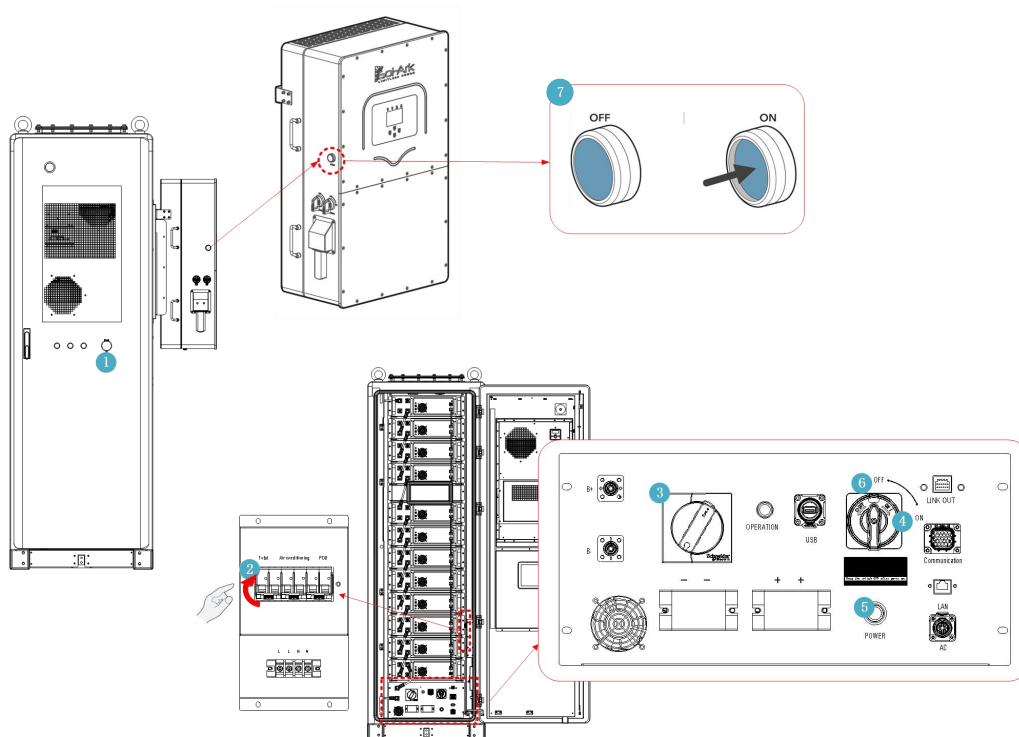
g. After maintenance, clean up the tools and materials in time to check whether there are any metal objects left inside or on top of the equipment.



2.2 Battery Cabinet Activation

Steps:

- (1) Verify the emergency stop button, and ensure it's release.
- (2) Close the circuit breakers (i.e., push the circuit breaker upward). Close the "Total", "Air Conditioning", and "PDU" switches in sequence.
- (3) Turn the DC switch to the ON position.
- (4) Turn the DC isolation switch to the ON position.
- (5) Press down the power button.
- (6) Turn the DC isolation switch to the OFF position.
- (7) Press down the inverter's power button to the ON position. Wait for the "Normal" LED indicator to turn on.



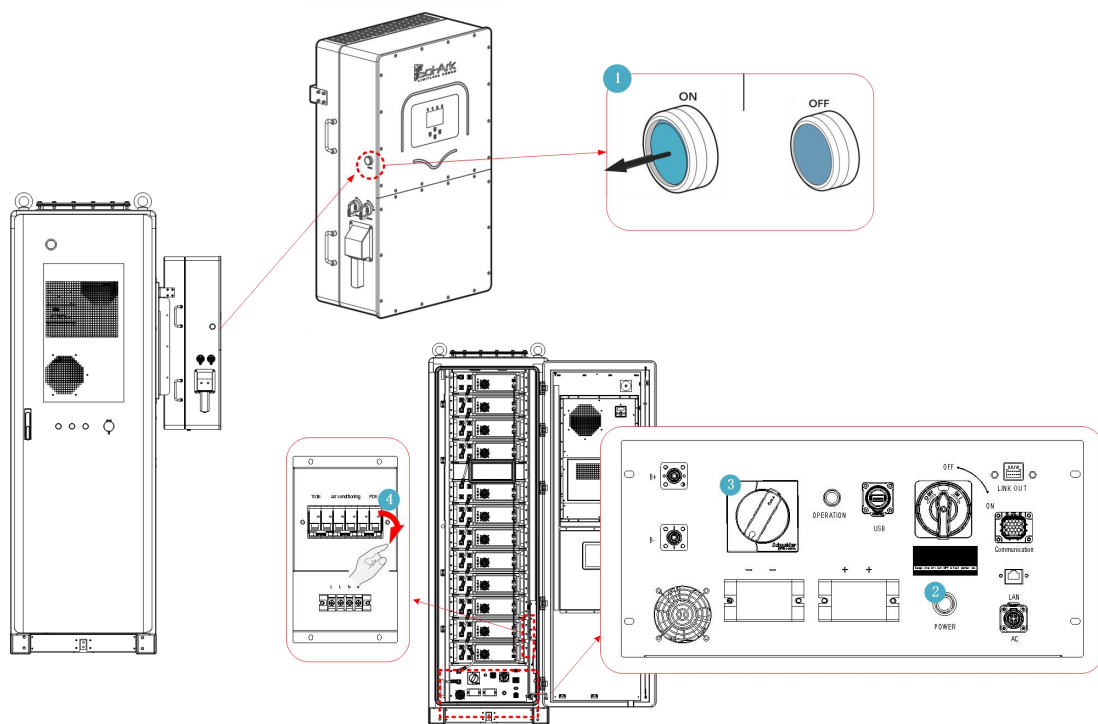
- After the battery racks is powered on, if there is no abnormal situation and fault alarm, please close the battery racks door and keep the key properly.



2.3 Battery Cabinet Deactivation

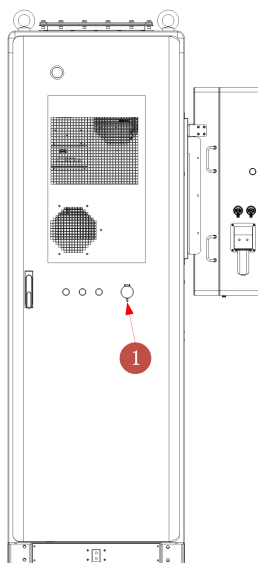
Steps:

- (1) Press up the inverter's power button.
- (2) Press the power button to turn it off.
- (3) Turn the DC switch to the OFF position.
- (4) Open the circuit breakers (i.e., push it downward). Turn off the "PDU", "Air Conditioning" and "Total" circuit breaker in sequence.



2.4 Emergency Stop

Emergency Stop Button in battery cabinets serves as a critical safety device designed to immediately cut off power or halt system operation during emergencies, effectively preventing personnel injuries, equipment damage, and other dangerous scenarios.



3. Routine Inspection

This inspection form is used for the routine safety inspection of energy storage cabinet. The inspection frequency is determined based on a comprehensive consideration of risk assessment, manufacturer recommendations, industry standards, and practical operational experience.

The table below provides our recommended inspection frequencies for different scenarios, where "Manned sites" refer to locations with frequent human activity and relatively high dynamic risks; while "Unmanned sites" indicates unmanned locations with relatively static risks.

However, the specific frequency is ultimately determined by the user.

Different scenarios	Manned sites	Unmanned sites
The first 3 months of new equipment put into operation	2-3 times per week	Weekly
After stable operation	Weekly	Bi-weekly
With the use of cloud platforms or remote monitoring for equipment inspection	Bi-weekly	Monthly

Please check and record the data according to the following items.

Number	Inspection items	Requirements
1	Cabinet	1) No flammable object on the top of the battery cabinet, no foreign matter accumulation, and no foreign matter blocking the door and heat dissipation positions around the cabinet; 2) The exterior and structure of the cabinet are intact, without damage, paint loss, oxidation, rust, water leakage, etc.; 3) The cabinet doors and locks open smoothly, and the door seals are free from aging or damage; 4) The mounting points between the cabinet and the foundation/channel steel are



		secure, with no signs of corrosion; 5) No cracking or settlement of the foundation of the cabinet; 6) The temperature and humidity are within the normal operating range (operating temperature: -30°C~55°C, operating humidity: 0 ~95% RH), air-conditioner, ventilation and other temperature adjustment equipment are running normally, and no odor in the room; 7) The bottom sealing plates are intact, and measures to prevent small animals are in place; 8) The nameplate is clear and identifiable; 9) The indicator lights on the cabinet door are intact and function normally.
2	Battery system	1) No abnormal smoke, vibration and sound; 2) Batteries are intact without damage, swelling, deformation, or leakage; 3) Battery compartment grounding is intact, with no rust or loosening of grounding flat iron; 4) Battery voltage and temperature collection lines are reliably connected, and the inspection collection unit is operating normally; 5) BMS parameters displayed via EMS are normal, battery voltage and temperature are within acceptable ranges, and there are no alarm signals;
3	Electrical connection	1) Cable markings are clear and identifiable; 2) Grounding of internal equipment is intact; 3) Cable insulation is free of aging; 4) Cable connections are free of loosening, corrosion, blackening, or other defects, and cable terminals are free of high-temperature burn marks.
4	Fire extinguisher system	1) The fire protection system is in good condition, with no damaged or missing parts. 2) Smoke and heat detectors are functioning normally, with no abnormal alarms (open the cabinet door, with the battery cabinet powered on, observed that the indicator light on the temperature sensor flashes once every 2~3 seconds, while the indicator light on the smoke sensor flashes once every 6~7 seconds, which indicates normal operation).
5	EMS	1) Operating normally, with normal switching between functional interfaces; 2) Communicating normally with BMS, inverter, fire protection, and other systems; 3) No abnormal alarm messages when reading data via the local EMS. If you have any questions, please contact Renon Technical Support Department promptly. Do not open the cabinet without authorization. (Due to limited memory, data is stored for approximately 3 months, depending mainly on the data storage interval and the total number of measurement points.)
6	Air conditioner	1) The air conditioner is operating normally without abnormal noises or vibrations, and the temperature and humidity inside the battery cabinet are within the set range. 2) The drainage outlet located at the bottom of the cabinet door is not blocked (with the cabinet door open). 3) The air filters for both the internal and external circulation air intake and outlet vents are clean and in good condition. (Refer to Appendix 1: Air Conditioner Maintenance Instructions for detail) 4) The display shows normal readings without any alarm messages.
7	Inverter	1) No dust or foreign matter on the surface. 2) All the terminals and ports are properly sealed.



4. Special inspection

This inspection form is used for special safety inspection. In case of special circumstances (extreme weather, abnormal and fault after operation, new equipment put into operation, etc.), please check each item according to the following items and record the data.

Number	Special Circumstances	Inspection and inspection requirements
1	Extreme Weather (Severe weather events such as heavy rainfall and thunderstorms)	1) Check whether the operating temperature and humidity of the battery are normal (working temperature: $-30^{\circ}\text{C} \sim 55^{\circ}\text{C}$, working humidity: $0 \sim 95\% \text{ RH}$); 2) Check whether the battery, inverter and terminals are overheated; 3) Check whether the cable is too tight and the terminal is not cracked in cold weather (daily min temp $\leq -20^{\circ}\text{C}$); 4) Increase the frequency of infrared temperature measurement in high temperature weather (daily max temp $\geq 35^{\circ}\text{C}$), and check the condensation inside the battery compartment; 5) Check whether the grounding is normal before and after the thunderstorm season; 6) Check whether the drainage of the dehumidifier is smooth and the air outlet is not blocked in high humidity environment.
2	After Abnormality or Fault	1) Check whether the battery case is swollen or leaking in the fault range; 2) Focus on checking whether the fuse and terminals are melted or black; 3) Retrieve the BMS fault alarm records through EMS and analyze abnormal voltage and temperature points; 4) Retrieve and save the inverter operating data before and after the fault (such as current fluctuations) through EMS.
3	New equipment put into operation or put back into operation after major repairs	1) Monitor battery voltage consistency during the first charge and discharge cycle; 2) Check for leaks in the liquid cooling pipes (simulated operation for 30 minutes); 3) Check for abnormal noises, overheating of joints, etc. (refer to routine inspection items). 4) When the equipment is not put into operation and the cabinet door is frozen, do not force it open. Use auxiliary equipment to heat and thaw it first.
4	Other types	1) Increase the number of inspections appropriately during power protection; 2) For defective and faulty equipment, focus on checking whether the abnormal phenomenon and defects are developing.

5. Regular Maintenance

Regular maintenance is a kind of preventive maintenance. It means that maintenance personnel carry out periodic inspection and maintenance work during the normal operation of equipment, so as to find and eliminate alarms and potential faults in the equipment in time. The following is the recommended maintenance cycle, and the actual maintenance cycle should be adjusted according to the specific installation environment of the product.

Factors such as the scale of energy storage system, installation location and site environment will affect the maintenance cycle of products. If the operating environment is windy and sandy, thick dust or high salt spray area, it is necessary to shorten the maintenance cycle and increase the maintenance frequency.





When performing regular maintenance on the battery cabinet, the BESS must be powered down.

5.1 Overall Maintenance of Battery Cabinet

Requirement	Recommended maintenance period
1) Clean the top and surrounding area of the battery cabinet, especially pay attention to clean the air inlet and outlet mesh holes, and use a vacuum cleaner when necessary (do not rinse with water) to ensure that the air can circulate freely in the cabinet.	Frequency: ≤6 months
2) Check the door panel sealing strip to confirm whether it is aging and needs to be replaced. (When the sealing strip is broken or brittle and loses its elasticity, it indicates that the sealing strip has aged).	Frequency: ≤6 months
3) Polish and repaint the areas where paint is off or corroded.	Frequency: ≤6 months
4) Check and tighten the bolts at user wiring connections (refer to the installation manual for torque).	Frequency: ≤12 months

5.2 Battery System Maintenance

Requirement	Recommended maintenance period
1) Perform regular charging and discharging for batteries stored under low power. (Before storage, it is recommended to adjust the battery level to 25%-40%. Continuous storage should not exceed two months, or perform maintenance every two months. Before the first use after storage, ensure full charging at least once to activate the battery system and restore optimal performance.)	Frequency: ≤2 months
2) Regularly read and save battery management system data via EMS.	Frequency: ≤3 months

5.3 Fire Protection System Maintenance

Requirement	Recommended maintenance period
1) Check whether the aerosol is within the validity period. (The installation service life of the fire protection system is 10 years. The production date and validity period will be indicated on the product label. If the validity period exceeds, please contact Renon Technical Support Department for replacement.)	Frequency: ≤12 months

5.4 Inverter Maintenance

Requirement	Recommended maintenance period
1) Clean the dirt on the inverter with a soft brush. 2) Clean the screen and the LED status indicator lights with cloth if they are too dirty to be read. CAUTION: 1) Do not touch the surface when the inverter is operating. Some parts may be hot and could cause burns. Turn OFF the inverter and let it cool down before you do any maintenance or cleaning of inverter. 2) Never use any solvents, abrasives, or corrosive materials to clean the inverter.	Frequency: ≤6 months





5.5 Air conditioner Maintenance

Requirement	Recommended maintenance period
1) Use a brush to clean dust from the fans and remove any foreign objects from the air vents (ensure the system has been powered off for at least 1 minute before operation). 2) If the fan operates abnormally (e.g., unusual noise during rotation), power off the system for over 1 minute, then tighten fan fasteners and check whether internal cables interfere with fan rotation. If the fan is faulty or blades are damaged, replace the fan promptly (Refer to Appendix 1: Air Conditioner Maintenance Instructions for detail).	Frequency: ≤6 months

6. Dismantling and Scrapping

6.1 Remove the energy storage system

Step 1: Open the cabinet door.

Step 2: Perform the power down operation on the energy storage system.

Step 3: Disconnect the external power supply and communication of the energy storage system.

Step 4: Disconnect all electrical connections of the energy storage system, including AC lines, DC lines, communication lines and protective earth lines.

Step 5: Properly store the energy storage system. If the energy storage system needs to be put into use later, ensure that the storage conditions meet the requirements.

6.2 Disposal of energy storage systems

Prior to decommissioning and disposal of the energy storage system, contact the Renon Technical Support Department. The system must then be disposed of in compliance with local e-waste regulations and must not be disposed of as household waste.

Special attention must be given to battery disposal. Used batteries shall be handled in an appropriate and environmentally sound manner.

Important safety precautions include:

- 1) Do not incinerate batteries. Exposure to fire or high heat may cause rupture or explosion.
- 2) Do not disassemble, crush, or puncture batteries. The released electrolyte is corrosive and highly toxic, posing serious risks of skin irritation, eye damage, and chemical burns.
- 3) Store discarded batteries in a non-flammable, stable container until they can be properly recycled.
- 4) Do not dispose of the UPS or UPS batteries as general waste. This product contains sealed lead-acid batteries and must be handled appropriately. For detailed information, please contact your local recycling/reuse center or hazardous waste disposal facility.

7. Revision Table

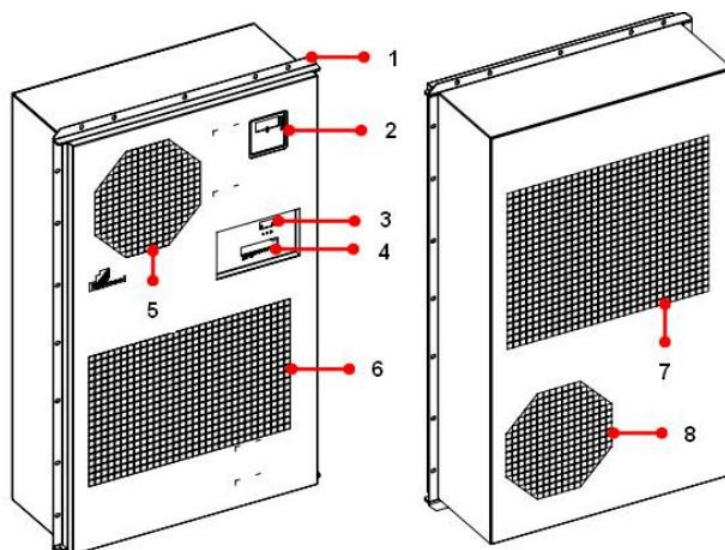
The document revision history is tracked in the following table:

Revision Number	Date (MM/DD/YYYY)	Description
1.0	Sep 10, 2025	Initial version



Appendix 1 Air Conditioner Maintenance Instructions

1.Product Appearance



1	Mounting flange	2	Display
3	Power terminal	4	Communication terminal
5	Internal circulation air inlet	6	Internal circulation air outlet
7	External circulation air outlet	8	External circulation air inlet

2.Replacing the External Circulation Fan

Step 1: Power off and wait for at least 1 min.

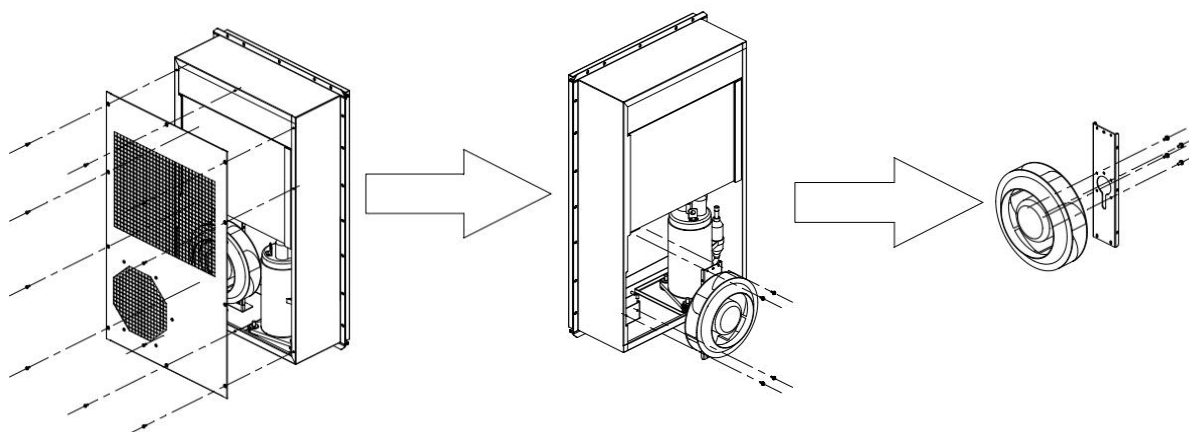
Step 2: Remove the outer cover plate of the cabinet air conditioner and the electrical wiring terminals of the external circulation fan.

Step 3: Remove the fixing screws on the external circulation fan bracket.

Step 4: Remove the fixing screws between the fan and the bracket.

Step 5: Take out the external circulation fan for replacement.

Step 6: Install in the reverse order of Step 3 to Step 1 to complete the parts replacement.





3. Replacing the Internal Circulation Fan

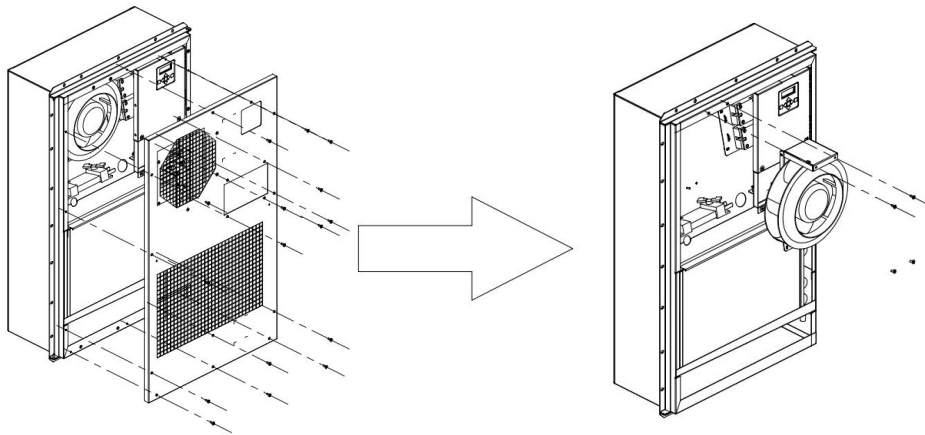
Step 1: Remove the inner cover plate of the cabinet air conditioner.

Step 2: Remove the electrical wiring terminal of the internal circulation fan and the fixing screw on the fan bracket.

Step 3: Remove the fixing screws between the fan and the bracket.

Step 4: Take out the internal circulation fan for replacement.

Step 5: Install in the reverse order of Step 3 to Step 1 to complete the parts replacement.



Technical Support

Email: support@renon-usa.com

Renon Power USA LLC

580 McIntyre Rd. McKinney, TX 75071

Renon Power Technology B.V.

Rietbaan 10, 2908 LP Capelle aan den IJssel

Renon Power 株式会社

東京都中央区日本橋箱崎町 20-5 VORT 箱崎 5F



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