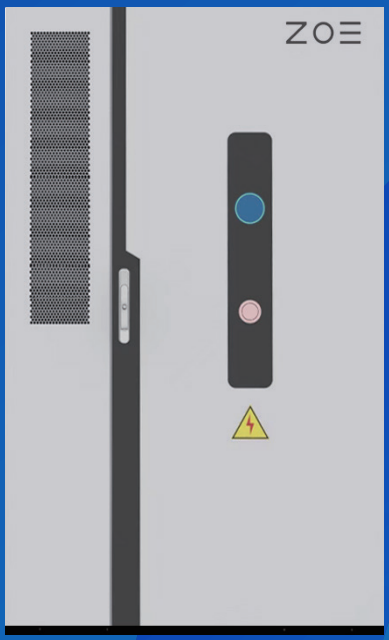
ZOE
ENERGY STORAGE

Maintenance Manual

Z BOX-I Air-cooling energy storage system



I 156-1H

150kW / 156kWh | 1C

Before application, please read the energy storage system instruction manual cautiously, read and save these instructions.

This product complies with the design requirements for environmental protection and personal safety. The storage, use and disposal of the product should comply with the requirements of the product manual, relevant contracts or relevant laws and regulations.
When there are product updates or technical changes, you can query relevant information through the ZOE Energy Storage website. If this product is improved or technical changes are made, we will not notify you.

Catalog

Preface

Overview

This document describes the operation and maintenance of the Z BOX-I01 Energy Storage System (hereinafter referred to as the Energy Storage System) and how to deal with malfunctions. Please read this manual carefully to understand the safety information and familiarize yourself with the troubleshooting methods of the energy storage system before maintaining the energy storage system.

Attention

Please read this manual carefully and familiarize yourself with this equipment before servicing it.

Readers

This manual is intended for power plant operators and qualified electrical technicians.

Manual application

Please read the manual carefully before using the product, the contents of the manual will be constantly updated and amended, but there is inevitably a slight discrepancy or error with the real thing, the user should be based on the actual product purchased, and can be downloaded through the company's official website or sales channels to obtain the latest version of the manual information.

1 Troubleshooting List

1.1 Common faults and solutions

Fault name	Possible causes of failure	Solution	Remark
The system cannot start normally	1. The secondary circuit of the system is not powered 2. The circuit breaker of some equipment is not closed. 3. Other reasons	1. Check if the monitoring power supply indicator light is on 2. Refer to the electrical diagram to see if any equipment circuit breaker is not closed. 3. If it still does not work properly, please contact the manufacturer for after-sales service.	The system can run again after troubleshooting
System, single cell over-voltage, the system shutdown for protection	1. System, single voltage is higher than the protection value. 2. The battery sampling cable is disconnected or the sampling plug-in connection is not firmed. 3.BMU works abnormally.	Re-plug the power plug of the BMU sampler and check the system's battery voltage. If the battery cell is damaged, please replace the damaged battery.	After troubleshooting, refer to 'Human-Machine Interface Manual' Start the system manually, and after complete the operation, the system can run again
System, single cell low-voltage, the system shutdown protection	1. System, single voltage is lower than the protection value. 2. The battery sampling cable is disconnected or the sampling plug-in connection is not firmed. 3.BMU works abnormally. 4. Other reason.	Re-plug the power plug of the BMU sampler and check the system's battery voltage. If the battery cell is damaged, please replace the damaged battery.	
Charge and discharge over-temperature shutdown protection	1. The system temperature is higher than the protection value. 2. The temperature sampling cable is disconnected or the sampling plug-in connection is not firmed. 3. BMU works abnormally. 4. Other reasons.	Re-insert and unplug the power plug of the BMU sampler and check whether the air conditioner is operating normally. If it is not working properly, please contact the manufacturer's after-sales service.	
Stop charging and discharging to proctect the system due to low temperature	1. The system temperature is lower than the protection value. 2. The temperature sampling cable is disconnected or the sampling plug-in connection is not firmed. 3. BMU works abnormally. 4. Other reasons.	Re-insert and unplug the power plug of the BMU sampler and check whether the air conditioner is operating normally. If it is not working properly, please contact the manufacturer's after-sales service.	
Charge and discharge overcurrent and the system shutdown protection	1. Insulation detection failure. 2. System leakage.	Apply the remote backend to shut down the PCS, disconnect the DC switch and contact the manufacturer's after-sales service	
BCU and BMU Communication failure	1. The BMS system is not powered. 2. The corresponding CAN communication line is loose.	Check if the BMS system is normally on power, check if the corresponding BCU and BMU communication plug-ins are loose, and if the wiring cable is damaged.	The system can run again after troubleshooting
BMS and PCS Communication failure	1. The BMS system is not powered. 2. PCS system is not powered. 3. The corresponding communication network cable is loose	Check whether the entire energy storage system is normally powered, check whether the corresponding BMS and PCS communication plug-ins loose, and whether the wiring cable is damaged.	The system can run again after troubleshooting
Air conditioner and BMS communication failure	1. The energy storage system is not powered on. 2. Corresponding communication line loose	Check whether the entire energy storage system is normally powered and whether the wiring cable is damaged.	The system can run again after troubleshooting
SOC display abnormally	1. SOC is not calibrated 2. SOC cumulative error is too large	Fully charge and discharge the system once	

1.2 PCS common faults and solutions

Fault name	Possible causes of failure	Solution
Module A1/B1/C1 phase overcurrent alarm	Load is too large	Reduce load
Module A2/B2/C2 phase overcurrent alarm	Load is too large	Reduce load
AC output short circuit failure	A side cable short circuit	Check terminal connection
Fan 1/2/3 failure	The ambient temperature exceeds the limit value or the fan does not operate normally.	Check system fan
Grid phase alarm	AC side wiring sequence error	Modify the cable sequence
Battery low-voltage alarm	DC input low-voltage	Check whether the DC input voltage exceeds the limit value
Battery over-voltage alarm	DC input high-voltage	Check whether the DC input voltage exceeds the limit value
Power bus total very low voltage alarm	Power bus voltage exceeds the limit value when the system is running.	Check the system parameters and whether the power bus supplied voltage exceeds the limit value
Power bus total very high voltage alarm	Power bus voltage exceeds the limit value when the system is running.	Check the system parameters and whether the power bus supplied voltage exceeds the limit value
Low grid frequency alarm	Grid frequency is too low	It can automatically recover after the grid frequency returns to normal.
High grid frequency alarm	Grid frequency is too high	It can automatically recover after the grid frequency returns to normal.
Grid low voltage alarm	Grid voltage is too low	It can automatically recover after the grid voltage returns to normal.
Grid high voltage alarm	Grid voltage is too high	It can automatically recover after the grid voltage returns to normal.
Module A1/B1/C1 high temperature alarm	1. The ambient temperature is too high 2. The dust filter is seriously covered with dust.	1. Reduce ambient temperature 2. Clean or replace the dust filter
Module A2/B2/C2 high temperature alarm		
The network port cannot communicate	1. The network parameters are incorrectly configured. 2. The network is not connected	1. Reset network parameters 2. Check network connection

If it still cannot work normally after following the treatment methods, power off and restart the system. If it still cannot work, please contact our company.

1.3 DC/DC Common faults and solutions

Fault name	Possible causes of failure	Solution
Fan 1/2/3 fault	Fan does not run properly	Check the system fan
Low voltage and under voltage alarm	DC input voltage is very low	Check whether the DC input voltage exceeds the limit value
Low voltage and over voltage alarm	DC input voltage is very high	Check whether the DC input voltage exceeds the limit value
Low voltage soft start up fault	The low-voltage side voltage of the system is less than the set value during the startup process.	Check whether the DC input voltage exceeds the limit value
Power bus total very low voltage alarm	Power bus voltage exceeds the limit value when the system is running.	Check the system parameters and whether the power bus supplied voltage exceeds the limit value
Power bus total very high voltage alarm	Power bus voltage exceeds the limit value when the system is running.	Check the system parameters and whether the power bus supplied voltage exceeds the limit value
Power bus soft start up fault	Power bus voltage is lower the limit value when the system is running.	Check the system parameters and whether the power bus supplied voltage exceeds the limit value
Overcurrent alarm	Too large load	Reduce load
Emergency stop	External emergency stop signal disconnects	Check the dry connector signal of external emergency stop

If it still cannot work normally after following the treatment methods, power off and restart the system. If it still cannot work, please contact our company.

1.4 Routine maintenance

1.4.1 Instructions before maintenance

⚠Warning

•Do not open the battery outdoor cabinet for maintenance in rainy, humid or windy weather. If it cannot be avoided, ZOE Energy Storage will not be responsible for any losses caused.

•Avoid opening the cabinet door when the humidity is high in rain, snow or fog. Meanwhile, after closing the cabinet door, make sure that the sealing strip around the door does not curl.

•To reduce the risk of electric shock, do not perform any other maintenance or repair operations beyond those in this manual. If necessary, contact ZOE Energy Storage customer service personnel for maintenance and inspection.

When the weather is fine, it is recommended to open the cabinet door to ventilate and dehumidify the equipment.

1.4.2 Maintenance project list and cycle

Frist time connect to grid

Item List	Inspection Method
Electrical connection specifications	Check the following items. If they do not meet the requirements, please correct them immediately: Check the input and output cable materials and specifications. Terminal material, specifications and installation direction. Bolt size and its gasket installation direction.

Once per month

Item List	Inspection Method
Cabinet	•Check the outdoor cabinet for oxidation or rust. •Check whether the outdoor cabinet and internal equipment are damaged or deformed. •Check the top of the outdoor cabinet for flammable objects. •Check whether the welding joints between the outdoor cabinet and the foundation steel plate are firm and whether there is any rust. •Check whether the cabinet door locks can be opened flexibly. •Check whether the sealing strips, etc. are well fixed.
Air outlet	Check whether the air inlet and outlet of the outdoor cabinet are blocked.
Cable	Check whether the cable is damaged.
System status	•Check whether there are any abnormal noises from the internal equipment during operation. •Check whether the temperature inside the outdoor cabinet is too high. •Check whether the humidity inside the outdoor cabinet is under the normal range.

Once every half year

Item List	Inspection Method
Security Function	•Check stopping function of the emergency stop button. •Simulated shutdown. •Check whether the warning signs on the machine body and other equipment signs are clearly visible and not stained. If they are blurred or damaged, please replace them in time.
Internal conponets inspection	•Check the cleanliness of circuit boards and components •Check whether the fan is operating normally and whether there is any abnormal noise. •Check radiator temperature and dust. If necessary, apply a vacuum cleaner to clean the cooling module, etc. •Replace the air filter if necessary.
Device maintenance	•Routine inspection (six-monthly) of all metal components for corrosion. •Annual inspection of contactors (auxiliary switches and micro switches) to ensure that their mechanical operation is in good condition. •Check operating parameters (especially voltage and insulation, etc.). •Check whether there is an unoperated UPS. The unoperated UPS needs to be charged once every six months.

Once per year

Item List	Inspection Method
Cable shield grounding	Check whether the cable shielding layer and the insulating sleeve are in good contact; whether the earth copper bar is fixed in place.
Surge protection device and back-up protectors	Check whether surge protection device and backup protectors are properly tightened
Wiring and Cable Arrangement	•Check whether the cable arrangement is standardized and whether there are short circuits, etc. If there are any abnormalities, they need to be corrected immediately. •Check whether all cable entry and exit holes of the outdoor cabinet are well sealed. •Check whether the power cable connection is loose and retighten according to the previously specified torque. •Check whether the power cables and control cables are damaged, especially whether there are cuts on the surface in contact with the metal surface. •Check whether the insulation wrapping tape of the power cable terminal block is peeled off.
Earth and equipotential connnection	•Check whether the earth connection is correct. The earth resistance should not be greater than 4Ω. •Check whether the equipotential connections within the integrated energy storage system are correct

1.4.3 Cabinet maintenance

Clean the outer surface of the box

It is recommended to clean the top firstly and then the sides. It can be cleaned directly or flushed with water while cleaning. Check the appearance of the box for damage:

Situation 1: Surface dirt caused by water stains and dust can be cleaned.

Situation 2: The surface is dirty & the topcoat is damaged, and the surface traces cannot be cleaned.

Situation 3: The primer is damaged and the substrate is exposed.

Maintenance steps for situation 1:

Materials:

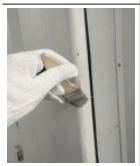
•Rag •Water •Alcohol or other non-abrasive cleaner

Illustration	Steps
	1. Use a rag (or other scrubbing tool) dipped in water to scrub the dirty parts of the surface.
	2. If it cannot be scrubbed clean with water, scrub with 97% alcohol until the surface cleanliness reaches an acceptable range. (You can also try to use non-corrosive cleaners commonly used in your area.

Maintenance steps for situation 2:

Materials:

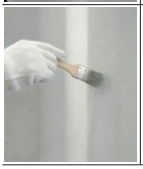
•Sandpaper •Rag •Water •Alcohol •Brush •Paint

Illustration	Steps
	1.Use sandpaper to polish the raised or scratched parts of the surface paint to make the surface smooth.
	2.Use a rag dipped in water or 97% alcohol to scrub the damaged area to remove surface stains.
	3. After the surface is dry, use a soft brush to clean the scratched parts of the paint.Make sure the paint is applied as evenly as possible

Maintenance steps for situation 3:

Materials:

• Sandpaper • Rag • Water • Alcohol • Zinc-rich primer • Brush • Paint

Illustration	Steps
	1.Use a rag (or other scrubbing tool) dipped in water to scrub the dirty parts of the surface.
	2.Use a rag dipped in water or 97% alcohol to scrub the damaged area to remove surface stains.
	3.After the surface is dry, spray zinc-rich primer on the exposed parts of the substrate to protect it. Spray should completely cover the exposed substrate.
	4.After the primer is dry, use a soft-bristled brush to touch up the damaged areas. The paint should be applied evenly.

It is necessary to check whether the protective paint sprayed on the outer shell of the energy storage system is peeling off or paint loss. If found, please repair it in time. The entire exterior of the energy storage integrated system should be re-sprayed with special protective paint every 5 years.

Check door locks and hinges

After the cleaning work is completed, check whether the door locks, hinges, etc. of the energy storage integrated system can be used normally and are in good condition. If necessary, the door lock hole, hinges, etc. should be properly lubricated.

Check the seal

A seal in good condition is an important guarantee for effectively preventing water seepage inside the container. It should be carefully inspected and replaced immediately if damaged.

1.4.4 Battery maintenance

The following is the recommended maintenance cycle. The actual maintenance cycle should be adjusted based on the specific installation environment of the product. Factors such as power station size, installation location, and on-site environment will all affect the maintenance cycle of the product. If the operating environment is sandy or dusty, it is necessary to shorten the maintenance cycle and increase the frequency of maintenance.

⚠ Attention

During maintenance or shutdown, the capacity loss caused by the following two conditions for more than 120 hours is not covered by the warranty.

- The battery discharge cell voltage is lower than 2.7V.
- The SOC of any battery cluster is 0%.

Frist time connect to grid

Instpection content	Instpection method
Battery cluster status and cleaning	Check the following items. If they do not meet the requirements, please correct them immediately: •Check whether the battery cluster and internal devices are damaged or deformed. •Check whether there are any abnormal noises from the internal equipment during operation. •Check whether the temperature inside the battery cluster is too high. •Check whether the humidity and grayscale inside the battery cluster are within the normal range. Clean if necessary. •Check whether the air inlet and outlet of the battery cluster are blocked. Check warnings.
Warning signs wiring and cables	Whether logos and labels are clearly visible and not defaced. Replace if necessary. Check whether the switch box (if any) and the battery module are connected correctly, and whether the battery module is connected correctly.
Corrosion	Check whether there is oxidation or rust inside the battery cluster.

Maintenance once per year

Instpection content	Instpection method
Switch box (if any) and battery module box	Check the following items. If they do not meet the requirements, please correct them immediately: •Check flammable objects on top of the battery cluster. •Check whether the fixing points between the battery cluster and the foundation steel plate are firm and whether there is any corrosion. •Check the box for damage, paint peeling, oxidation, etc. •Check whether there are foreign objects, dust, dirt and condensation inside the battery cluster.
Wiring and Cable Arrangement	It is necessary to wait until the internal equipment of the battery cluster is completely powered off before starting the inspection! During the inspection, if any non-compliance is found, please correct it immediately. •Check whether the cable arrangement is standardized and whether there are short circuits, etc. If there are any abnormalities, they need to be corrected immediately. •Check whether all cable entry and exit holes of the battery cluster are well sealed. •Check whether there is water leakage inside the battery cluster. •Check whether the power cable and copper bar connections are loose, and tighten them according to the previously specified torque. • Check whether the power cables and communication cables are damaged, especially whether there are cuts on the skin in contact with the metal surface.
Earth connection	Check whether the earth connection is correct. The earth resistance should not be greater than 4Ω.
Fan	•Check whether the fan has any faults, such as blocked rotation or stalling. •Check whether there is any abnormal noise when the fan is running.
Screws	Check whether there are any loose screws, rust, etc. inside the battery cluster.

Maintenance once every six months to one year

Instpection content	Instpection method
Ambient temperature and humidity check	•Check the ambient temperature record to see if the temperature is within the operating range. •Check the environmental humidity record to see if the humidity is within the usage range.
Function Inspection	•Check the operating status of the DC contactor: In case of shutdown, send an open/close command to check whether the operation is normal. •Measure whether the 24V output voltage is within specifications. •Check the battery cluster operating records to see if the current, voltage, and temperature are within the usage range.

Maintenance precautions

In order to maintain and maintain the system safely and effectively, maintenance personnel are required to carefully read and comply with the following safety requirements:

1. Maintenance personnel must hold an electrician certificate issued by the Safety Supervision Bureau and undergo professional training before they can work.
2. Must comply with relevant safety precautions, use necessary tools, and wear personal protective equipment.
3. It is strictly prohibited to wear metal accessories such as jewelry or watches.
4. Under any circumstances, it is strictly prohibited to touch the high-voltage positive and negative poles of the energy storage system with both hands at the same time.
5. Before performing maintenance on the battery energy storage system, disconnect all high-voltage and low-voltage switches.
6. When performing cleaning operations, it is strictly forbidden to use water to clean directly. If necessary, use a vacuum cleaner to clean.
7. When plugging and unplugging cables, you should operate them in a standardized manner and do not use brute force or violence.
8. After maintenance, please clean tools and materials in time and check whether there are any metal objects left inside or on top of the equipment.
9. If you have any questions about the operation and maintenance of the equipment, please contact the Customer Service Center of Shanghai ZOE Energy Storage Co., Ltd. Unauthorized operation is strictly prohibited.

System Maintenance

1. Recommended ambient temperature: -30°C~50°C. The temperature control range during charging and discharging should be maintained at 15°C~30°C, with a typical value of 25°C.
2. Avoid high-rate charging and discharging of RACK. The continuous charging and discharging current of a single RACK should not exceed the rated current.

3. When the battery energy storage system is left unused for a long time, the system should be charged and discharged every 6 months to bring the system SOC to 30%~40%. The SOC must remain consistent after recharging.

4. Before using the long-term system for the first time, fully charge it at least once to restore battery performance to its optimal state.

5. Regularly check whether the air duct of the cooling system is blocked and clean the system regularly. Pay special attention to cleaning the fan inlet and outlet. If necessary, use a vacuum cleaner to clean to ensure that air can circulate freely in the cabinet. The power supply must be cut off before dust removal; it is strictly forbidden to flush with water.

6. Regularly check whether the fastening bolts of the high-voltage cables of the battery energy storage system and the connecting rows are loose, whether the contacts are good, and whether the terminal surfaces are severely corroded or oxidized.

7. Regularly check whether the positive and negative high-voltage protective covers of the PACK are aged, damaged or missing.

8. Regularly check whether the cables are loose, aged, damaged or broken, and whether the insulation is in good condition.

9. Regularly check whether there is a pungent smell in the battery cabinet and whether there is a burning smell at the high-voltage connection part.

10. Regularly check and monitor whether the voltage, temperature and other data of the host computer are normal, and whether there are any abnormal alarms in the alarm bar.

11. Regularly check whether the status of the battery energy storage system and the alarm indicator light are intact and functioning normally.

12. Regularly check whether the emergency stop switch of the battery energy storage system is effective to ensure that the system can be quickly stopped in an emergency.

13. Check the fire protection system regularly to see if it is in good condition and within the validity period.

14. It is prohibited to use different types of battery modules in series or parallel.

⚠Warning

- Battery is potentially dangerous and appropriate protective measures must be taken during operation and maintenance!
- Incorrect operation may result in serious personal injury and property damage!
- Correct tools and protective equipment must be used when handling batteries.
- Battery maintenance must be performed by persons with battery expertise and safety training.

1.5 Common spare parts list

Componet	Model	Remark
Fuse	520.300.4-4A	Match fuse terminal
Fan behind cabinet	KA1238-3600E0BPL (E)	PCS behind cabinet, DC/DC heat dissipation
Light	GKL5205/GKL5212	Lighting in cabinet
Indicator light	CTL30Q-T-D/Y150	System status indication

1.6 Contact

• If you have any questions about this product please contact us!

• In order to provide you with faster and better after-sales service, we need your help to provide the following information:

• Device model _____

• Device SN _____

• Fault code/name _____

• Brief description of the fault phenomenon _____

_____

_____

_____

Version Number: 1.0-202404

While the product is being improved, the manual may be changed without prior notice.

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FOLLOW
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Energy for Life