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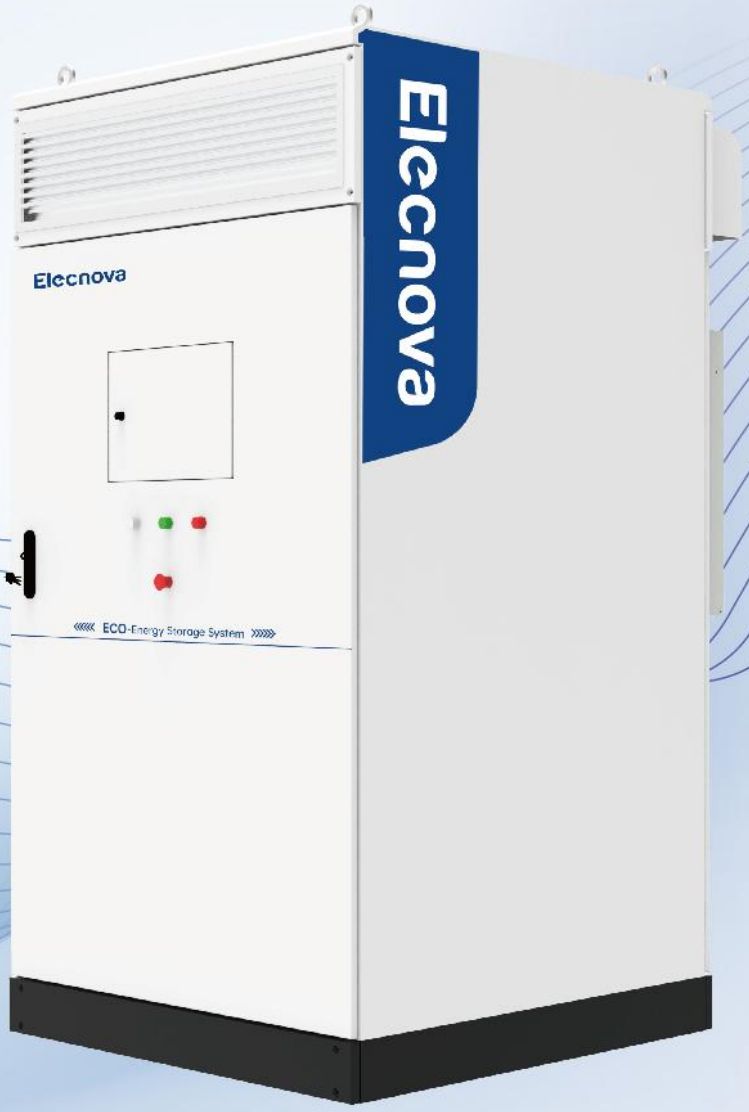

All-in-one Air-cooled

ESS Cabinet ECO-E100WX User Manual

Shanghai Elecnova Energy Storage Co., Ltd.

The release date identified in the change history for this Manual is correct. Elecnova reserves the right to modify products and documentation at any time.

The images provided in this Manual are for demonstration purposes only. Details vary slightly based on product version and market region. Elecnova has the final right of interpretation on all detailed designs of products.

The information and advice are given in good faith and are believed to be accurate as of the date of editing. Elecnova does not express or imply any warranty regarding the information

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Revision History

Version	Description	Editor	Date	Remark
A/1	release	Qian Zhihao	29th FEB, 2024	

Table of Contents

1. About this manual

1.1 Preface

Dear user, much appreciation for using the all-in-one air-cooled ESS Cabinet ECO-E100WX product (hereafter referred as ECO-E100WX, or the ESS Cabinet, or the Product) developed and produced by Shanghai Elecnova Energy Storage Co., Ltd. We sincerely hope that this product can meet your needs, and we also hope that you are satisfied with its performance and provide us with your valuable comments and suggestions. We will continue to evolve and improve product quality.

1.2 Applicable Product

This manual is applicable to product model: ECO-E100WX, the ESS Cabinet.

1.3 Security Statement

In this Manual, the “DANGER”, “WARNING” and “CAUTION” tags in the following instructions are used to deliver information about hazards related to specific tasks and procedures. These safety precautions do not represent all hazards when performing a given task. Installers and operators should adhere to premium industrial safety practices, site specific ambience, health/safety plans, local safety requirements and regulations.

Only properly trained and qualified personnel are allowed to complete the installation procedures identified in this manual.

	" DANGER” indicates a hazardous situation which, if not avoided, will result in death or serious injury. "DANGER" is only limited to the most extreme cases. "DANGER" indicator is not used for property damage hazards unless there is also a risk of personal injury corresponding to these levels.
	"WARNING" indicates a hazardous situation which, if not avoided, could result in death or serious injury. "WARNING" indicator is not used for property damage hazards unless there is also a risk of personal injury appropriate to those levels.
	"CAUTION" indicates a hazardous situation which, if not avoided, may result in minor or moderate injury. “CAUTION” indicator can be used to warn of unsafe operations that could result in property damage.

1.4 Safety instructions

◆ Safety notice

This section introduces the general safety rules that need to be followed during operation of ESS cabinet. Read this safety instructions before operation.

For specific safety matters, refer to the corresponding chapter.

	Touching the terminals, contacts, etc. connected to the power grid or ESS Cabinet may result in death from electric shock! Lethal high voltage exists in the Cabinet. Pay attention to and follow the warning labels on the product! Damaged internal component may cause electric shock or fire!

◆ User Manual

Read this Manual before operation and keep the manual properly for review.

Operate the ESS Cabinet in strict accordance with descriptions in this Manual; otherwise, serious accidents such as product damage, property damage and even personal injury/death may occur.

◆ Personnel requirements

	Staff who performs electrical work on this product must undergo professional training and hold relevant licenses!

◆ Safety warning signs

For safe maintenance and inspection, please comply with the following requirements:

- ✓ To avoid mis-operation, put up warning signs on the front and rear side of the Cabinet. Also stick warning signs nearby a switch.
- ✓ Put up warning signs or warning tapes around the installation area.

◆ Battery protection signs

	This sign indicates a high voltage hazard which may cause electrical hazards if touched.
	This sign indicates that this is the protective earthing (PE) terminal, which needs to be firmly grounded to ensure the safety of personnel.

◆ Environment Requirements

- ✓ It is strictly prohibited to stack flammable, explosive and other dangerous items around the ESS Cabinet.
- ✓ The installation location of the ESS Cabinet shall comply with moisture-proofing requirements and others
- ✓ The intrusion of moisture may damage the battery system. To ensure the normal and safe running of the system, pay attention to the ambient humidity when performing routine maintenance and inspection.

◆ product end-of-life

When the battery system reaches end-of-life, it shall not be disposed of as regular waste. Contact the relevant authorized recycling agency for proper disposal

2. ESS Cabinet Introductions

2.1 System Overview

ECO-E100WX is a C&I ESS Cabinet product solely developed and produced by Elecnova. This product adopts the All-In-One integrated design and integrates LFP batteries, BMS, PCS, FSS, BCQ (local EMS controller), air-cooled HVAC and other components into a single ESS Cabinets. The ESS Cabinet has the characteristics of energy saving, small size, high energy density, high environmental flexibility, fast on-site installation, friendly-grid-access and easy capacity expansion etc.

ECO-E100WX Cabinet appearance and internal view are as Figure 2-1 and Figure 2-2.

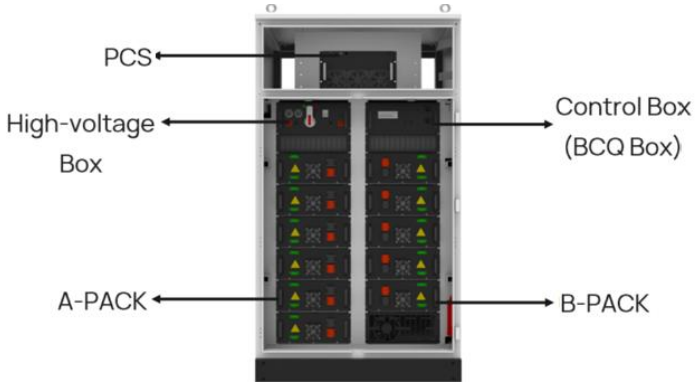

Figure 2-1 Product Image

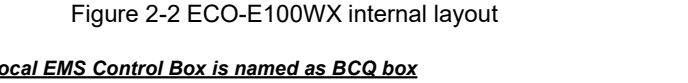

Figure 2-2 ECO-E100WX internal layout

Note: Local EMS Control Box is named as BCQ box

Product Advantages:

- Ingress Protection level IP55, supporting outdoor and indoor multi-scenario installation.
- Fire early-warning + fully immersive Aerosol FSS
- Dual power supply design, supporting black start.
- High efficiency for charging/discharging, delivering more power with excellent profitability.
- Flexible installation for critical site conditions.
- On-site easy grid connection and commissioning.
- Easy multi-unit parallelization for easy capacity expansion.
- Support remote access, remote maintenance management, unattended operation via local cloud platform

2.2 Technical parameters

Item	Specifications	Remark
Product model	ECO-E100WX	
DC Side Parameters		
Cell type	LFP 120 Ah	
Configuration	1P264S	
Rated energy	101.376kWh	100% DOD, 25℃,1P
Rated capacity	120 Ah	
Rated voltage	844.8V	
Recommended voltage range	DC 739.2～950.4V	Cell voltage range: 2.8v~3.6v
AC Side Parameters		
Rated Output Power	100kW	
Max Power	110 kW (continuous 1 minute)	
Nominal Voltage	380 Vac /3P+N+ PE	
Nominal Frequency	50Hz / 60Hz	
THDi	<3%	
DC Component	＜0.5% Ipn	
Power Factor	-0.98 lagging～0.98 leading	
General		
System Efficiency	≥89%	Auxiliary power excluded
Charge/discharge Rate	1P	constant power
Depth Of Discharge	95%DOD	
Cycle Life	≥5000 times (25±2℃)	25±2℃，1P, 95% DOD rated operating conditions
Ingress Protection	IP55	
Cooling Method	forced air cooling	
Operating Temperature	-25～55℃	
Relative Humidity	0～95% RH, no-condensing	
Altitude	≤2000m	Derating above 2000m
Dimension(W*D*H)	1250*1200*2250mm	
Weight	Appr 1850kgs	
Fire Suppression System	Smoke detection, +Temperature detection +Immersive Aerosol	
Communication Interface	Ethernet / RS485	
Standards Complied with	GB /T 36276, GB /T 34120, GB /T 34131, UN38.3, IEC62619, UL1973, UL9540, CE - EMC	

2.3 System Diagram

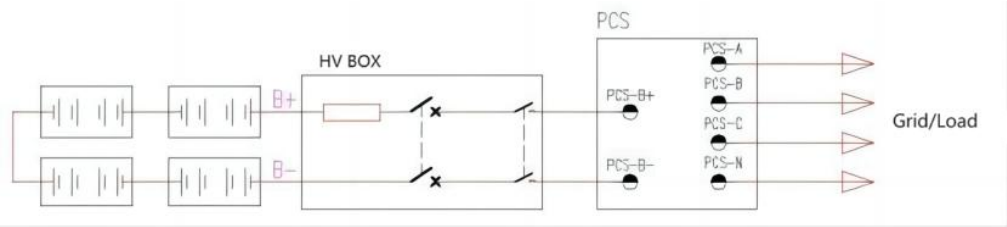

Figure 2-3 ECO-E100WX Main Circuit

Operation Modes

◆ **Grid-tied operation mode**

The AC side of ECO-E100WX is connected to the grid, and the DC side is internally connected to the lithium battery. It is applicable for scenarios such as power expansion, PV plus EV charging, peak shaving, demand management, power quality management. Based on the grid-tied P/Q operating mode, the ESS Cabinet can be charged/discharged with constant power, constant current and constant voltage on lithium batteries

◆ **Off-grid operation mode**

The DC side of ECO-E100WX is connected to the lithium battery. When the system is running off-grid or used as black start power, ECO-E100WX operates with VF Mode. It delivers fixed-frequency and effective three-phase AC and voltage, supplying continuous AC power to loads on AC side. ECO-E100WX is applicable in scenarios such as microgrid in islands and remote areas, as well as a backup power source for important loads.

2.4 Communication Control

ECO-E100WX adopts a three-level communication system. Level-I is the BMU slave control device of the BMS, responsible for acquisition of PACK voltage, NTC temperature and other signal as well as battery equalization management. Level-II is the BCU, main control device of the BMS, responsible for the summary and processing of the signal acquired by BMU, the realization of charging/discharging control, threshold protection, and the formulation and execution of thermal management strategies. Level-III is the BCQ, Local EMS Controller, the brain of ESS Cabinet. Level-III realizes the info-acquisition, monitoring, processing and control of the BMS, PCS, HVAC, FSS status and other signals of the ESS Cabinet.

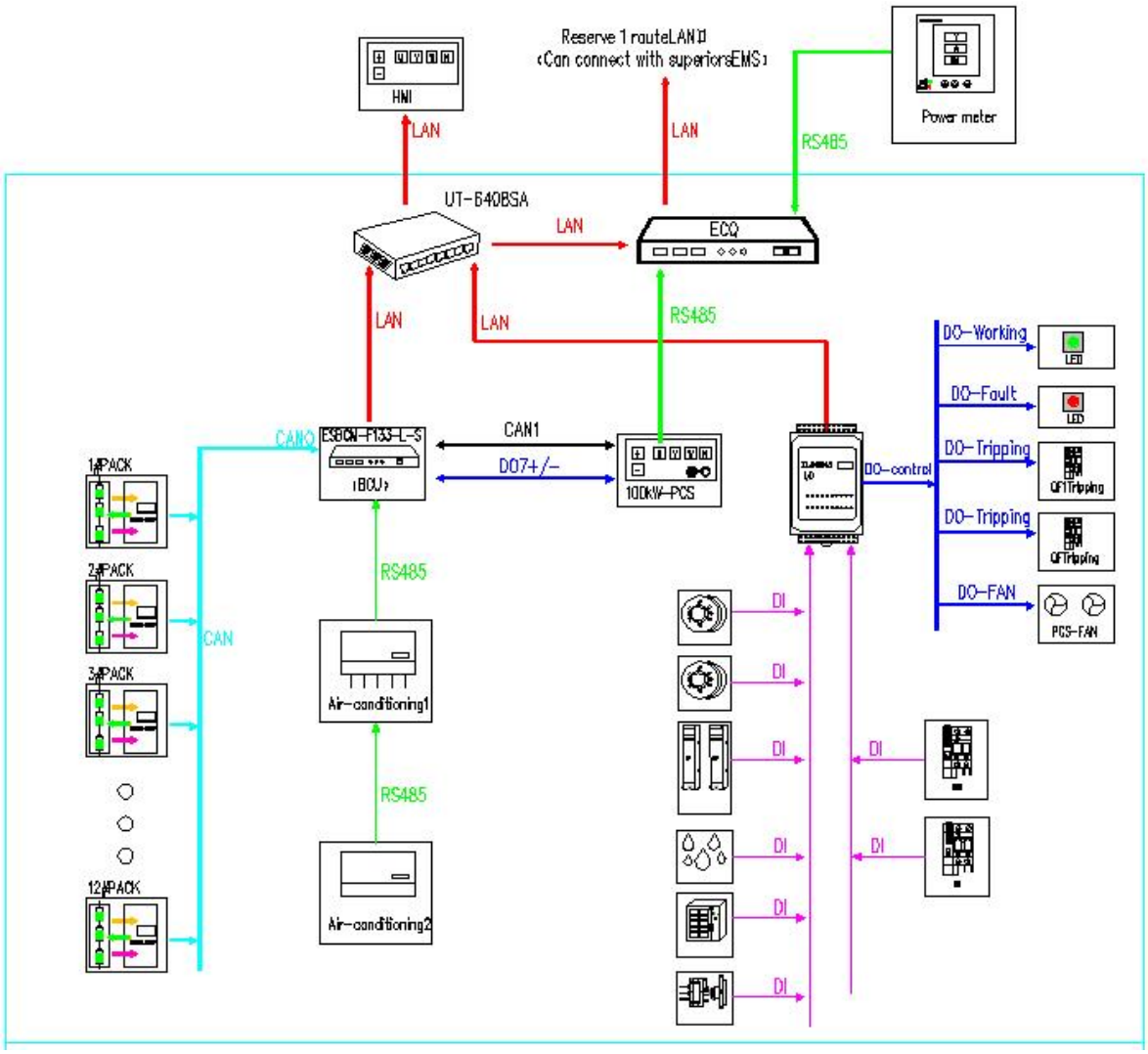

Figure 2-4 ECO-E100WX Communication Diagram

2.5 Ports

◆ A-PACK Port

Figure 2-6 7Pin-plug (for both A-PACK and B-PACK)

Port	Pin No.	Pin Descriptions	Pin Definitions
Comm IN	1	2V-	External 24V power supply
	2	2V+	External 24V power supply
	3	CAN0L	BMS internal communication CAN0L
	4	CAN0H	BMS internal communication CAN0H
	5	I01	BMS address automatic allocation
	6	1V-	External 24V power supply
	7	1V+	External 24V power supply
Comm OUT	1	1V+	External 24V power supply
	2	1V-	External 24V power supply
	3	I02	BMS address automatic allocation
	4	CAN0H	BMS internal communication CAN0H
	5	CAN0L	BMS internal communication CAN0L

	6	2V+	External 24V power supply
	7	2V-	External 24V power supply

◆ B-PACK Ports

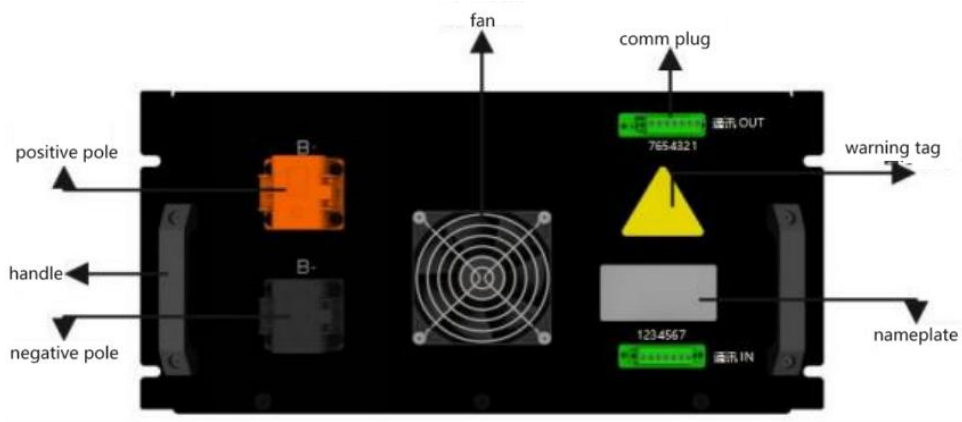

Figure 2-7 B-PACK Panel

◆ High-voltage Box Ports

Figure 2-9 High-voltage Box Panel

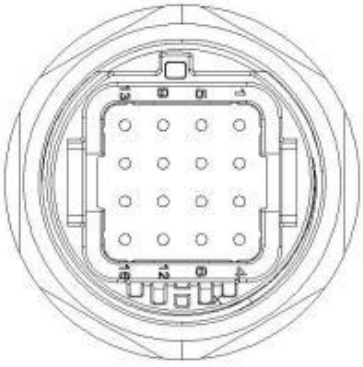

Figure 2-10 GAM, GBM plug

Ports	Pin No.	Pin Descriptions	Pin Definitions
GAM	1	1V+	BMU power supply
	2	1V-	BMU power supply
	3	I01	BMU address allocation
	4	CAN0H	BMS internal communication CAN0H
	5	CAN0L	BMS internal communication CAN0L
	6	2V+	BMU power supply
	7	2V-	BMU power supply
	8	NA	/
	9	NA	/
	10	NA	/
	11	NA	/
	12	NA	/
	13	KT-485A	Air-conditioning 485 communication
	14	KT-485B	Air-conditioning 485 communication
	15	CAN2H	PC debugging communication
	16	CAN2L	PC debugging communication
GBM	1	CAN1H	PCS communication
	2	CAN1L	PCS communication
	3	D07+	PCS normal-open dry contact
	4	D07-	PCS normal-open dry contact
	5	DI4H	Fire sprinkler feedback
	6	DI4H-V+	Fire sprinkler feedback
	7	5V+	Cabinet black-start power indicator
	8	HW-L1	Cabinet black-start power indicator
	9	NA	/
	10	3V+	Internal 24V components power supply
	11	3V-	Internal 24V components power supply
	12	DI5L	QF3(AC220V) power supply normal-open signal
	13	DI5L-V-	QF3(AC220V) power supply normal-open signal
	14	L1	220V/230V power input
	15	N1	220V power input
	16	PE	PC debugging communication

◆ BCQ Box Ports

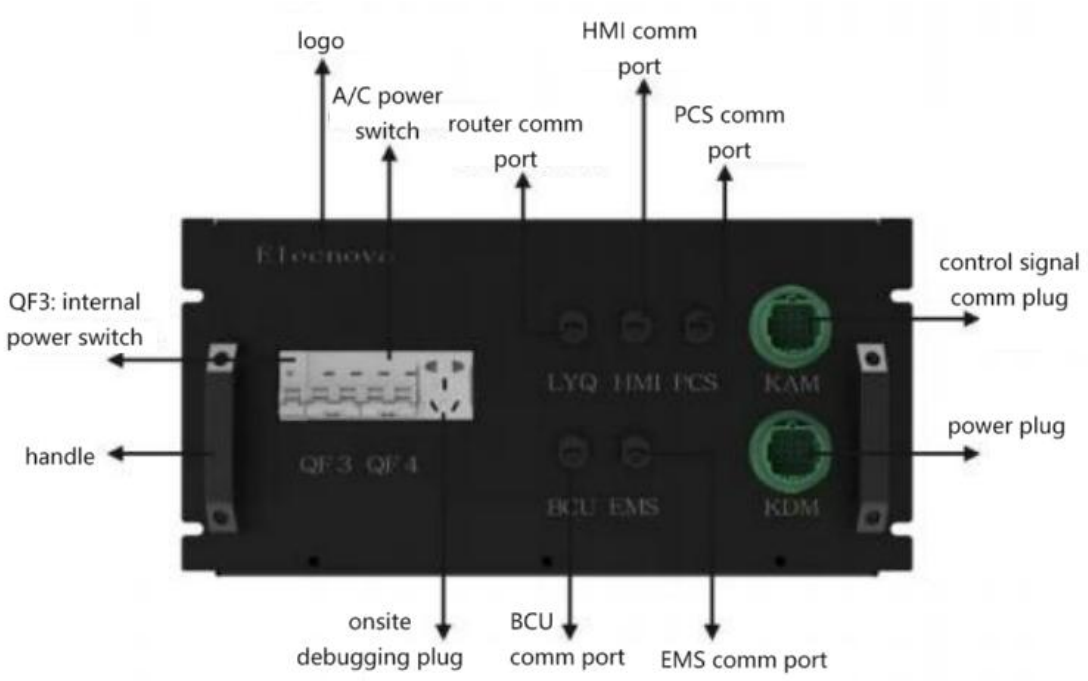

Figure 2-11 BCQ box panel

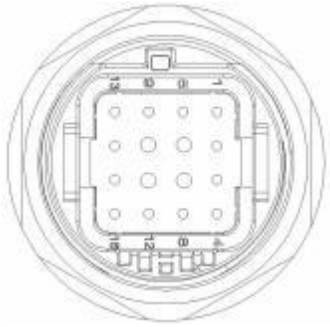

Figure 2-12 KDM plug

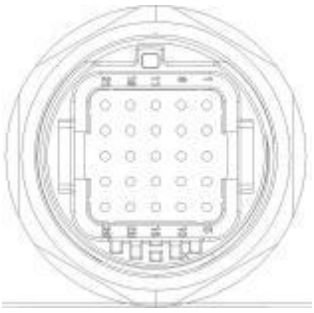

Figure 2-13 KAM plug

Plug	Pin no.	Pin Descriptions	Pin Definitions
KDM	1	4V+	Power supply in BCQ box
	2	4V-	Power supply in BCQ box
	3	DO4+	Power supply switch trip of POC cabinet corresponding to ECO-E100WX
	4	DO4-	Power supply switch trip of POC cabinet corresponding to ECO-E100WX
	5	DO5+	Main power supply switch trip of POC cabinet
	6	KL	1# air-conditioning power supply
	7	KN	1# air-conditioning power supply
	8	PE	1# air-conditioning earthing
	9	DO5-	Main power supply switch trip of POC cabinet
	10	2KL	2# air-conditioning power supply
	11	2KN	2# air-conditioning power supply
	12	PE	2# air-conditioning earthing
	13	KA2:A2	Emergency stop button trip QF3
	14	6V-	Emergency stop button trip QF3
	15	KA2:A2	Fire sprinkler trip QF3
	16	6V-	Fire sprinkler trip QF3
KAM	1	SNO	Immersion signal feedback
	2	YNO	Smoke detection signal feedback
	3	WNO	Temperature detection signal feedback
	4	DI4	Sprinkling signal feedback
	5	MNC	Door/Access control signal feedback
	6	DI6	Emergency stop signal feedback
	7	DI7	Power supply switch trip signal feedback of POC cabinet corresponding to ECO-E100WX
	8	GND	I/O signal common terminal
	9	HW-L1	Cabinet POWER indicator
	10	HG-L1	Cabinet RUN indicator
	11	HR-L1	Cabinet FAULT indicator
	12	5V-	Indicator power supply 24V-
	13	485A2	Meter communication
	14	485B2	Meter communication
	15	485A3	PCS communication
	16	485B3	PCS communication
	17	DI8	Main power supply switch trip signal feedback of POC cabinet
	18	NA	/
	19	KA7-FS	PCS fan power supply
	20	7V-	PCS fan power supply
	21	NA	/
	22	5V+	Cabinet black start power indicator
	23	HW-L1	Cabinet black start power indicator
	24	KA1:24	QF3(AC220V) power supply normal-open signal feedback
	25	KA1:21	QF3(AC220V) power supply normal-open signal feedback

2.5.5 ESS Cabinet External Interface Wiring Diagram

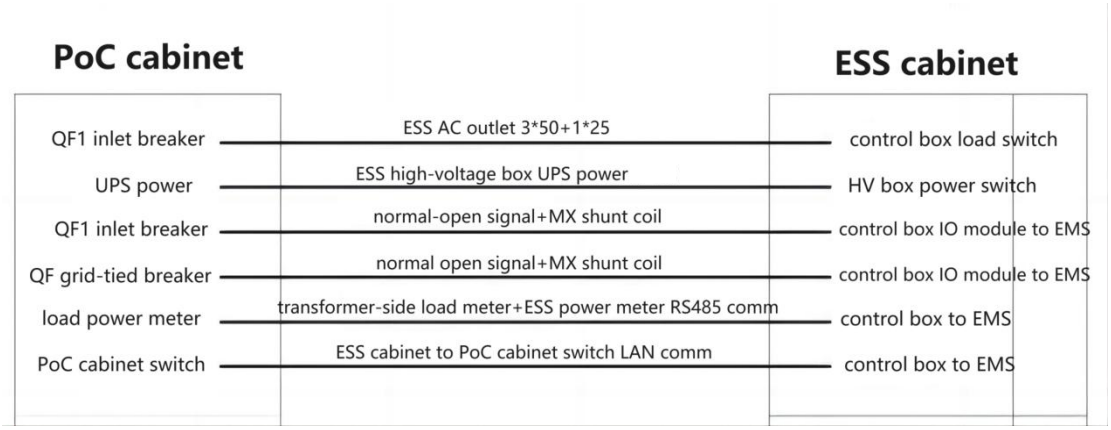

Figure 2-14 External Interface Diagram

(see Installation Manual for details, for a specific project, wiring method may vary)

2.6 PCS

◆ PCS Introduction

PCS, also known as bidirectional converter, is a device that realizes bidirectional conversion of electrical energy. It inverts DC into AC feeding to power grid or directly to AC loads; it also rectifies the AC into DC to charge the batteries.

◆ PCS System Diagram

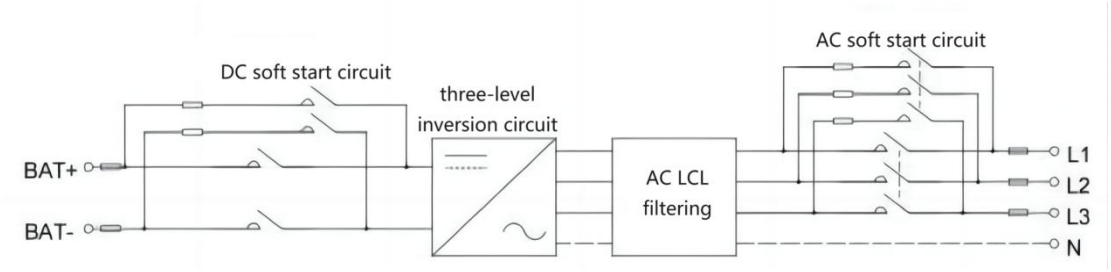

Figure 2-15 PCS System Diagram

◆ PCS Parameters

Item	Technical Parameters	Note
DC Side Parameters		
Rated DC power (kW)	100	
Number of routes	1	
Max. input current (A)	170	
DC Voltage range (V)	672~950	
Voltage stabilization accuracy	≤±2%	
Current stabilization accuracy	≤±5%	
Voltage limiting	Support	
Current limiting	Support	
AC Side Parameters		
Rated output power (kW)	100	
Rated output current (A)	145A	
AC Wiring	3-phase-4-wire	
Isolation	Non-transformer	
Power factor	-0.99 lagging ~ 0.99 leading	
Rated voltage (Vac)	AC 400V/220V	
Voltage range (Vac)	400V (-20% ~ +15%)	
Rated frequency (Hz)	50	

Frequency range	45Hz ~ 55Hz	
Switching time (ms)	<100	
Protection Functions		
DC-side protection	Isolating switch or fuse bank	
DC-side control	DC contactor	
AC-side protection	Circuit breaker or fuse	
AC-side control	AC relay	
Short circuit protection	Support	
AC phases sequence protection	Support	
Comm fault protection	Support	
Anti-islanding protection	≤2s	
DC overvoltage protection	Support	
AC overvoltage protection	Support	
Reverse polarity protection	Support	
Overheating protection	Support	
LVRT	With fault-ride-through	Compliant with GB/T 36558
Other Parameters		
Dimensions(mm)	W544*D670*H270	
Structure & ventilation	Rear maintenance; Front air-in/rear air-out	
Weight (kg)	50	
Cooling method	Forced air cooling	
Overload capacity	110%	Continuous,(@ambient temperature≤35℃)
	120%	60 seconds
Standby loss	≤0.2% rated power	
No-load loss	≤0.5% rated power	
Max efficiency	≥98%	
Communication protocol	BCQ Communication: RS 485 interface, Communication protocol: MODBUS - RTU; BMS Communication: CAN	
Environment		
Installation location	Inside Cabinet	
Ingress protection	IP20	
Operating environment temperature	-20℃~+55℃	
Relative humidity	0%～95%RH	Non-condensing
Altitude	2000m	Derating above 2000m

◆ PCS Panel layout

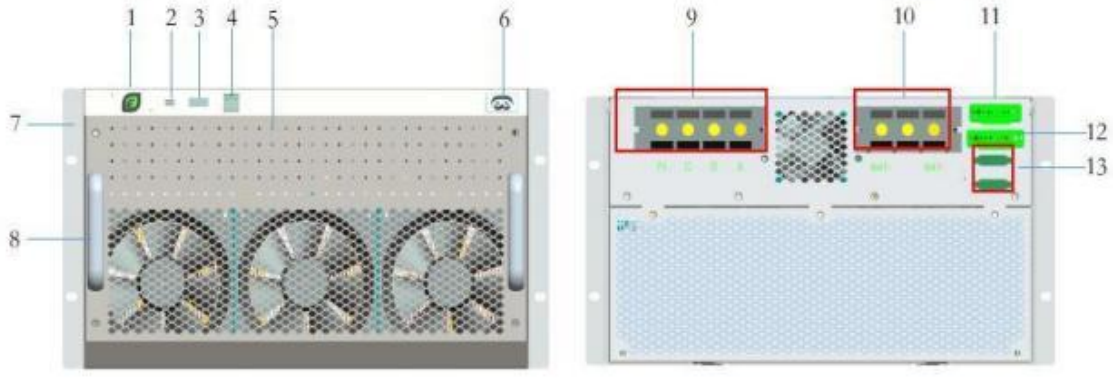

Figure 2-16 PCS Panel Layout

No.	Item	Descriptions
1	Indicator light	Steady-on in green when power is on; Fast flash in green at 0.5s intervals when standby;

		Slow flash in green at 1s intervals when power is off with no fault; Continuous in red when a fault occurs
2	ETH/LOCAL	Ethernet/local debugging switch; Right turn LOCAL for local debugging; Left turn for ETH Ethernet (reserved)
3	(IO) 6-digit DIP switch	Digit 1-2 are CAN Communication matching resistor connection; Digit 3-6 is the module address setting (binary) - the 6th digit is the lowest digit (from right to left)
4	TEST debugging network port	Debugging communication port for internal use only
5	Vents	Air duct vents, front air-in and rear air-out
6	220V/230V Power interface	220Vac input (internal use only)
7	Fixing bracket	Fixing brackets are installed on the left and right sides of the module for fixing to Cabinet.
8	Handle	Drawer module handle, not to bear heavy load
9	AC interface	AC terminal wiring
10	DC interface	DC terminal wiring
11	Grid current sampling interface	A/B/C three-phase current feeder-in and feed-out interface (reserved for 105 kW equipment)
12	Grid voltage sampling interface	A/B/C/N grid voltage sampling input interface (reserved for 105 kW equipment)
13	External communication port	COM (26-pin signal terminal) signal port

◆ 2.6.5 PCS External Communication Terminal Definition

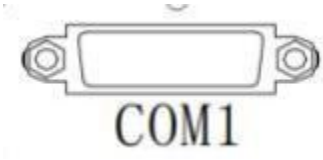

Figure 2-17 PCS External Communication Terminal

No.	Pin No.	Pin Descriptions	Pin Definitions
1	10	BCQ_485A	BCQ communication
2	19	BCQ_485B	
3	1	HMI_485A	HMI communication
4	11	HMI_485B	
5	20	ETH_485A	Reserve communication
6	2	ETH_485B	
7	12	CAN_1L	CAN parallel connection
8	21	CAN_1H	
9	3	CAN_2L	BMS communication
10	31	CAN_2H	
11	18	OP	24V+/ GND type selection signal
12	5	DC 24V+ output power supply 1	DC24V Output power
13	15	DC 24V+ output power supply 2	DC24V Output power
14	14	GND - IS01	Signal common terminal 1
15	23	GND - IS02	Signal common terminal 2
16	26	EPO_ISO	Emergency stop input
17	25	FIRE_ALARM	Fire alarm input signal
18	24	LED_RUN	LED run signal
19	6	LED_FLT	LED fault signal
20	16	SPD_ALARM	Lightning protection input signal
21	8	DO_ISO	DO1 digital output (reserved)
22	7	DI1_ ISO	DI1 digital input signal (BMS to PCS fault shutdown alarm)
23	17	DI2_ ISO	DI2 digital input signal (reserved)
24	4	INV_SYNC	Internal power frequency synchronization signal
25	22	CARRIER SYNC	Internal carrier synchronization signal

26	9	GND-ISO4	DO digital output (STS backup)

2.7 Fire Suppression System (FSS)

◆ FSS Working Principle

When the smoke detector and temperature detector both detect the fire, the audible and visual alarm are immediately activated to notify personnels to take an action; And Aerosol FSS device is simultaneously activated to extinguish the fire, meanwhile an electronic signals of FIRE emergency is transmitted to BMS, notifying all parties to take actions immediately.

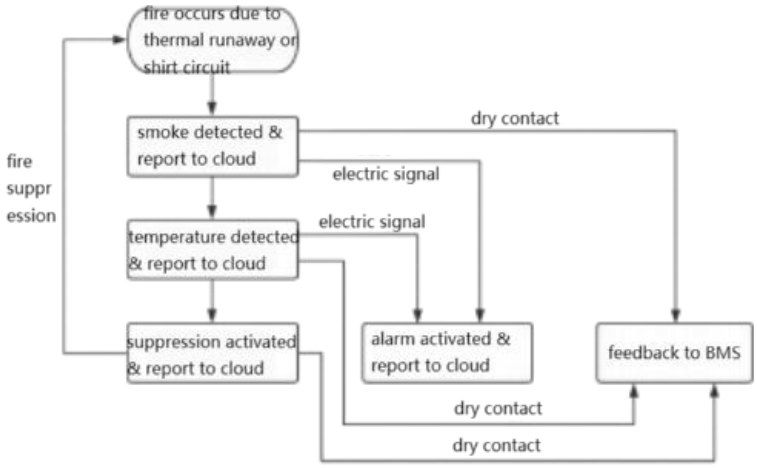

Figure 2-18 ECO-E100WX FSS logic block diagram

◆ FSS Components

✓ FSS Aerosol Device

Product descriptions:

QRR0.3G/S-Q, Hot Aerosol Fire Suppression Device is a new high-efficiency and environment-friendly fire-suppression product; It was born under the background of the international Montreal Agreement, adopting the world's top-level standard with benefit to mankind. It is an ideal substitute for Halon fire suppression devices and it is widely used for relatively closed spaces such as distribution Cabinets.

Working principle:

When a fire occurs, the aerosol generator is activated upon ignition of thermal wire or upon an open flame. The heat released by the aerosol generator through the oxidation-reduction reaction decomposes the chemical coolant, to achieve aerosol generator and coolant to participate in fire extinguishing together.

✓ Audible & Visual Alarm

Product descriptions:

The audible and visual alarm is a device that can emit sound and light alarms. Activated by signal of smoke+temeprature, the alarm emits emergency sound and light to alert on-site personnels to pay attention.

✓ Point-type photoelectric smoke detector

Product descriptions:

Point-type photoelectric smoke detectors have specially-designed EMC capabilities with stable & reliable performance. They are suitable for smoke detection in rail transit, communication stations, shopping malls, warehouses, motor rooms, distribution Cabinets, energy storage cabinets and other civil and industrial places. The detector has the

characteristics of high sensitivity, stability and reliability, low power consumption, fashion-design and durability.

✓ Point-type thermal detector

Product descriptions:

Point-type photoelectric thermal detectors have specially-designed EMC capabilities with stable & reliable performance. They are suitable for temperature detection in rail transit, communication stations, shopping malls, warehouses, motor rooms, distribution cabinets, energy storage cabinets and other civil and industrial places. The detector has the characteristics of high sensitivity, stability and reliability, low power consumption, fashion-design and durability.

3. ESS Cabinet operations

3.1 Hazards

◆ Electric Shock Hazard

	Personnel will be exposed to voltages up to 864 VDC from battery pack, and there is also the possibility of low- and medium-voltage AC exposure. Arc flash and electric shock hazards are common at ESS Cabinet sites. Elecnova encourages full compliance with the practices and procedures specified in NFPA 70E, including the use of personal protective equipment (PPE), to adequately mitigate hazards of arc flash. Emergency personnel should rely on standard operating procedures (SOPs) to respond to incidents at power generation facilities.

◆ Fire and Explosion Hazards

	The system contains flammable material and ignition sources. With enough oxygen, fire can spread. If not properly mitigated, the fire and other sources of extreme heat can cause thermal runaway of batteries and the release of combustible gases. If the combustible gases exists in sufficient density, there is a risk of explosion. If a fire alarm or other indication of thermal runaway occurs at ESS Cabinet site, first responders are advised to maintain a safety distance till BESS site is verified to be safe in accordance with the site-specific Emergency Response Plan (ERP) and SOP.

◆ Chemical Exposure Hazards

	The system contains hazardous chemicals named LFP battery electrolyte. These chemicals can be harmful to both human health and the environment.

◆ Operation Precautions

	The battery cannot be powered off. The shutdown sequence described below only isolates the battery and associated hazardous voltages. Personnel must be extremely cautious and wear appropriate PPE at all times.
	The complete ESS shutdown sequence varies based on project-specific design. Always consult site-specific schematics and manuals to ensure proper isolation of electrical equipment.
	All personnel operating the ESS Cabinet should be properly trained and qualified. Personnel are expected to read and understand all manuals and project documents and comply with their requirements and instructions.
	Turning off thermal management and communication systems for extended periods of time can result in equipment damage and failure to detect fault conditions.
	Disconnecting the BMS contactor under load may damage the BMS, and direct power failure may cause the main positive and negative contactors to stick. Only use the Emergency Stop in emergency situations.

CAUTION	Do not start the ESS Cabinet until commissioning and inspection are completed by Elecnova on-site technicians. Do not restart ESS Cabinet before scheduled maintenance are completed.
CAUTION	Do not modify or alter this manual without Elecnova's written permission.

3.2 Cabinet Panel

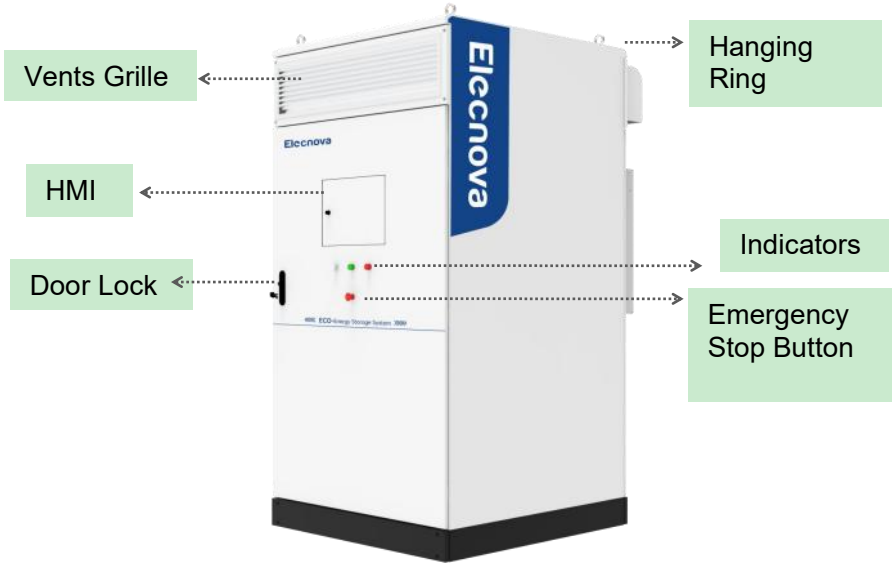

Figure 3-1 ECO-E100WX Front View

No.	Item	Quantity	Remark
1	Hanging ring	4	For lifting the Cabinet
2	Human machine interface (HMI)	1	Onsite parameters monitoring
3	Indicator light (white)	1	Power indication (See indicator status table for details)
4	Indicator light (green)	1	Run indication (See indicator status table for details)
5	Indicator light (red)	1	Fault indication (See indicator status table for details)
6	Emergency stop button	1	For emergency shut down
7	Cabinet door lock	1	
8	Ventilation grille	1	For ventilation

Front door Indicator status

Indicator	Status	Operation Conditions	Remarks
POWER indicator White light	On	1. AC220V/230V main power is on; 24V power is on. QF2 is switched on 2. Power supply for liquid cooling unit is on; QF3 is switched on 3. DC/DC power is on. 24V power is on. QF4 is switched on 4. Both AC220V/230V and DC/DC power are switched on, which means QF2 and QF4 are both switched on.	
	Off	Both AC220V/230V and DC/DC are power off, which means QF2 and QF4 are both switched off	
RUN indicator Green light	On	1. The ESS Cabinet in charging status, charging power ≥5kW. 2. The ESS Cabinet in discharging status, discharging power ≥3kW.	
	Off	The ESS Cabinet in standby mode, neither charging nor discharging.	

FAULT indicator Red light	On	1. Temperature detector is activated (alarm signal transmitted) 2. Smoke detector is activated (alarm signal transmitted) 3. Aerosol device is activated (alarm signal transmitted) 4. Immersion detector is activated (alarm signal transmitted) 5. Charge/discharge power ≥5kW. Cabinet door is open 6. BMS charge/discharge 3rd level alarm (SOC alarm excluded).	General Faults
	On	PCS fault list 1. Grid peak value overvoltage fault; 2. Grid effective value overvoltage fault 3. Grid effective value undervoltage fault 4. Branch-I peak value overvoltage fault 5. Branch-II peak value overvoltage fault 6. Branch-I effective value overvoltage fault 7. Branch-II effective value overvoltage fault 8. DC fuse failure; 9. Emergency stop failure; 10. DC overvoltage fault; 11. DC undervoltage fault; 12. Ove deviation fault between positive and negative busbars; 13. DC overcurrent fault; 14. Battery short circuit fault; 15. Grid high frequency fault; 16. Grid low frequency fault; 17. Grid phase sequence fault; 18. Grid Phase missing fault; 19. Battery polarity reversal fault, reserved (for parallel use); 20. Module external CAN comm fault; 21. EEPROM read and write failure; 22. IGBT module over temperature fault; 23. Hardware overcurrent fault; 24. Zero sequence over circulating current; 25. Grid instantaneous overcurrent fault; 26. AC pre-charge failure; 27. DC pre-charge failure; 28. High-voltage close failure; 29. Contactor status fault, communication fault with BMS and/or with BCQ (RUN light on, and PCS working)	PCS fault
	On	BMS fault list 1. PACK discharge over-current 2nd-level alarm; 2. PACK charge over-current 2nd-level alarm; 3. PACK insolation 2nd-level alarm 4. Cell charge over-heat 2nd-level alarm 5. Cell charge under-heat 2nd-level alarm 6. Cell voltage difference abnormal 2nd-level alarm; 7. Cell temp difference abnormal 2nd-level alarm; 8. DI1, DI2, DI3, DI4, DI5, DI6, DI7 and DI8 faults; 9. Internal comm lost; 10. Cell voltage sampling abnormal; 11. Cell temperature sampling abnormal; 12. Battery limit fault; 13. Software version parameters inconsistent; 14. PCS communication fault; 15. PC forced control debugging mode; 16. CAN Hall sensor failure; 17. CAN Hall sensor comm failure; 18. Hardware self-test abnormal; 19. Balance fault; 20. BCQ communication fault 21. Cell discharge over heat 2nd-level alarm; 22. Cell discharge under heat 2nd-level alarm 23. Cell temperature rise abnormal 2nd-level alarm 24. AC communication fault	BMS fault
	On	BCQ Fault: 1. IO module Fault; 2. 4G router Fault;	BCQ fault

		3. Industrial computer body fault; 4. Industrial switch fault; 5. IO module Communication fault; 6. 4G router Communication fault; 7. Industrial exchange Comm fault; 8. Comm fault with BMS (Indicator on, PCS running); 9. Comm fault with PCS (indicator on. PCS running); 10. Comm fault with meter (indicator, PCS running);	
	Off	The battery is either fully charged or fully discharged, the 3rd-level alarm not triggered.	Fully charged or discharged
	Off	BMS 1st-level or 2nd-level alarm	MBS Mild fault
	Off	ECO-E233LS no-fault status.	No-fault

3.4 Connection and Power-on

◆ 3.4.1 Cable Connection

Please refer to the installation manual.

◆ 3.4.2 Power-on Operation

After POC cabinet is connected to Grid and Grid power lines are connected to the ESS Cabinet, switch on QF1, QF2, QF5, QF3, and QF4 sequentially, make sure ***that the PCS is in standby mode*** while Grid is connected (Check the status of PCS on HMI or WEB). Then BMS closes both the main contactors. As a result, the ESS Cabinet RUN indicator lights up, indicating that the whole ESS Cabinet is successfully powered on.

- ✓ QF1 switched on, the 220V/230V auxiliary powered is on;
- ✓ QF2 switched on, the main positive/negative contactors of PACKs are connected;
- ✓ QF5 switched on, the high-voltage box is powered on. After the high-voltage box is powered on, BCQ starts self-checking, and automatically connects the high-voltage contactors in the box once no fault is found. At this point, a DC high voltage is generated at both positive and negative polarities of the battery. Then BCQ starts checking PCS. If no fault is found, BCQ notifies PCS to connect its main contactors. If BCQ does not release any command, PCS remains standby. If BMS issues power-on command, PCS starts self-checking for grid connection;
- ✓ QF3 switched on, the 220V/230V system inside the BCQ box is powered on;
- ✓ QF4 switched on, the HVAC is powered on and starts to run in standby mode.

3.5 Charging and Discharging

After ESS Cabinet is powered on, BCQ starts its programmed operation and issues charging/discharging commands to the charger. BMS detects the charging/discharging current. Built-in charger starts charging/discharging operations. During charge/discharge period, both green indicator and white indicator light up

Note: During commissioning or maintenance, if PCS is not in standby mode, it is strictly prohibited to perform power-on operation via BMS!!!

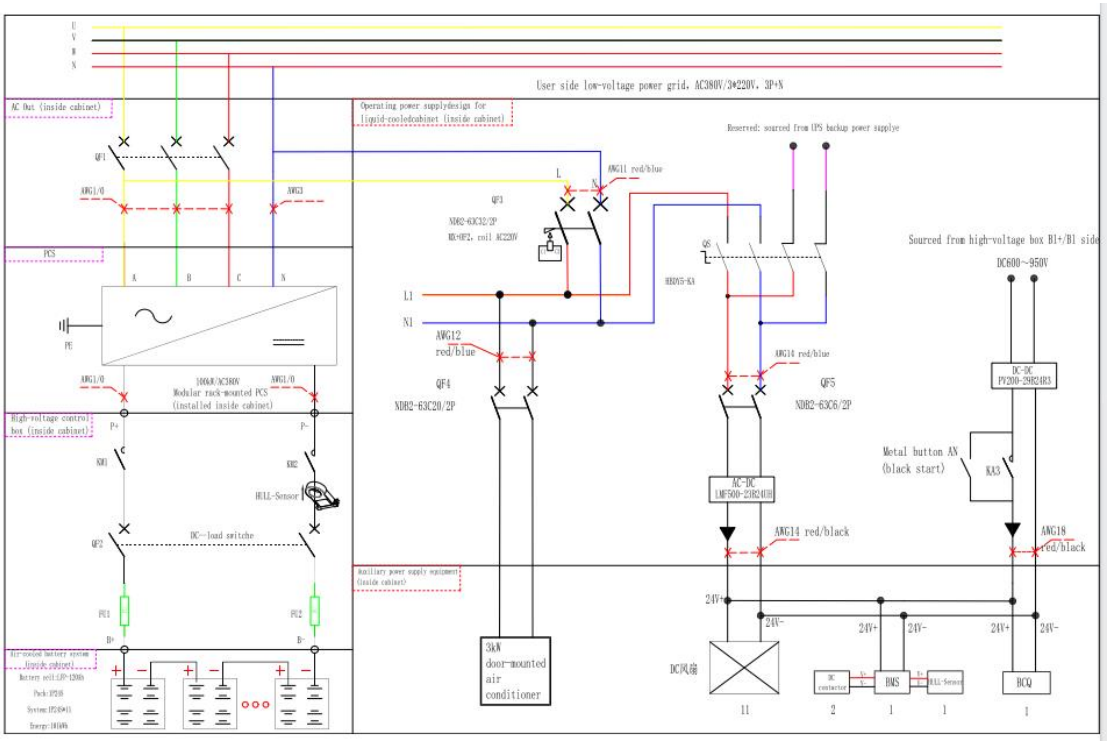

Figure 3-2 ESS Cabinet Primary Circuit Wiring Diagram

3.6 Power-off Operation

- First step, disconnect QF2, DC load switch, on the high-voltage box panel. Second step, disconnect QF5, MCB, on the high-voltage box panel. As a result, the main circuit contactors in the high-voltage box are disconnected, the green and red LED indicators on the high-voltage box panel goes out, indicating that the high-voltage box is powered off.
- After the high-voltage box is powered off, switch off QF4 on the BCQ panel to cut off the HVAC units; Thereafter, switch off QF3 on the BCQ panel to disconnect ESS Cabinet from AC220V/230V power supply. Then switch off QF1 on the rear side of BCQ box.
- Disconnect the breaker inside POC or DB to disconnect ESS Cabinet from Power Grid. The white LED indicator on the Cabinet panel goes out, it indicates that ECO-E100WX, the ESS Cabinet, is successfully powered off.

Note: Before powering off ECO-E100WX, please ensure that it has exited from the charge/discharge mode. Never cut off the power supply when it is in charge/discharge mode!!!

3.7 Operation Instructions for Upper Computer

- Preparation before Debugging of Upper Computer
  - ✓ In light of the actual application scenario, find and confirm the corresponding debugging port: For single module PACK debugging/testing, connect the CAN card to the CAN0 port; For battery system debugging/testing, connect the CAN card to the CAN2 port of high-voltage box;
  - ✓ Before turning on low-voltage power supply, inspect whether the supply voltage is within the normal system voltage range. The power supply of a 12V (24V) system is generally required to be in the range of DC9-16V (DC22-32V);
  - ✓ Before turning on the low-voltage power, connect CAN card and measure resistance between CAN-H and CAN-L with a multimeter: Resistance value around 60Ω is acceptable, minding sequence of CAN-H and CAN-L
  - ✓ Before turning on the low-voltage DC power, double check the sequence of Voltage ± wire

- ✓ Check the system configuration table: Be sure that EvbmaServer.ini is consistent with the model of CAN card. Examine the baud rate;
- ✓ Check the system configuration table: Be sure that EvbmaServer.ini is consistent with the model of CAN card. Examine the baud rate;
- ✓ Check the parameter configuration table: Be sure that EVBCM_Para_new.ini is consistent with the design parameters of the battery system.
- ✓ Popular CAN cards, 6 types

- ✓ It is necessary to install CAN driver for computers that CAN software is not yet installed in.

◆ Data Viewing on Upper Computer

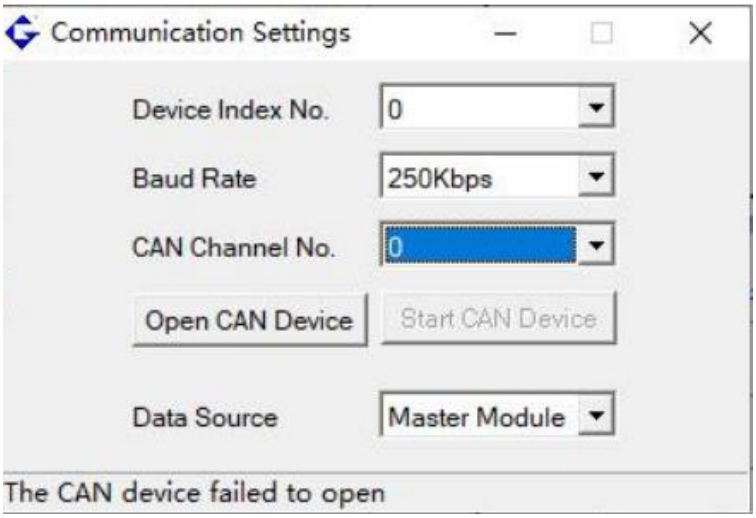

Figure 3-3 Communication Setting Interface of BMS Upper Computer

For other details, please refer to User Manual for BMS

WARNING	When manually simulating the closing of DO on the upper computer, check and confirm that the load end is in unloaded state, verifying the logical relationship. Unauthorized closing may lead to safety accident and system damage.
CAUTION	Before turning on the upper computer, check and confirm that other CAN software has been turned off; otherwise, software errors may occur.

3.8 Operation Instructions for HMI

Please refer to User Manual for HMI configuration screen

3.9 Operation Instructions for WEB Platform

Please refer to User Manual for web platform

4. Maintenance

4.1 Interpretation of Terms

◆ Normal Operation: ESS Cabinet operates every day;

◆ Intermittent Operation: ESS Cabinet operation frequency is not fixed during a month. ESS Cabinet does not run on daily basis

- Long-term Idle: ESS Cabinet is shut down for more than 3 consecutive months (the battery system shall be charged to minimum SOC 40% before it is laid idle).

4.2 Maintenance under Normal Operation

- Perform the battery system maintenance once every 12 months to prevent battery damage. Refer to Chapter 4.5 for specific maintenance methods;
- Inspect the system once every 12 months (Refer to Annex 1) and keep the inspection records properly.

4.3 Maintenance under Intermittent Operation

Same as those for Normal Operation system (see Chapter 4.2).

4.4 Maintenance under Long-term Idle

- Keep ESS Cabinet SOC in 30%~50% during storage; Avoid long-term storage when SOC is lower than 15%. In case ESS Cabinet is to lay idle for a long time, turn off the power-consuming equipment in a timely manner;
- Check ESS Cabinet every 3 months (Refer to Annex 1). Make and keep the inspection records properly.
- ESS Cabinet maintenance shall be done every 3 months to prevent battery damage. Refer to 4.5 for maintenance methods;
- Before using ESS Cabinet under Long-term Idle, fully charge the ESS Cabinet at least once to restore its performance to the optimal state.

4.5 Methods for Maintenance

To ensure safety and reliability, read and comply with the following maintenance process:

- Option 1:
  - ✓ This option is recommended for ESS Cabinet with SOC at low level.
  - ✓ Discharge the battery to the cut-off condition (average cell voltage <3.1V or min voltage <2.8V), then keep still for 1 hour;
  - ✓ Charge the battery to SOC 100% (max cell voltage >3.65V), then keep still for 1 hour;
  - ✓ Discharge the battery system to SOC 40%.
- Option 2:
  - ✓ This option is recommended for ESS Cabinet with SOC at high level.
  - ✓ Charge the battery to SOC 100% (max cell voltage >3.65V) then keep still for 1 hour;
  - ✓ Discharge the battery to cut-off condition (average cell voltage <3.1V or min voltage <2.8V), then keep still for 1 hour;
  - ✓ Recharge the battery to SOC 40%.

5. ESS Cabinet Fault Handling

5.1 Common Faults Classifications

The abnormal operations of ESS Cabinet are classified as "Warning", "Minor fault", and "Major fault". For "Warning", the ESS Cabinet does not take any action; For "Minor fault", there is a minor fault in the system; For "Major fault", there is a major abnormality in the system.

- ✓ Users may view fault details through HMI, ESS Cabinet display interface.
- ✓ Users may also view fault details through local Website (within the same LAN area)

- ✓ Users may contact after-sale-service to report a fault as well.

5.2 Emergency Faults Handling Methods

◆ 5.2.1 Fire

- ✓ Step 1: Evacuate the on-site personnel to a safe place, delineate a safe isolation zone, and pass the warning message to relevant personnels to report.
- ✓ Step 2: To the extent that the personal safety is ensured, follow steps below:

  (1) In case any wiring harness is in fire, fight fire with a carbon dioxide or dry powder fire extinguisher.

  (2) In case the ESS Cabinet catches fire, fight fire with a high-pressure water gun at a distance.

  (3) In case site smoke inhaled, please evacuate and seek medical methods at nearest hospital as soon as possible.

◆ 5.2.2 Water Flooding

- ✓ Step 1: Regardless of whether the system is powered on or not, evacuate personnels from site to a safe place and delineate a safe isolation zone.
- ✓ Step 2: Notify ESS Cabinet supplier to conduct maintenance after the water recedes.
- ✓ Step 3: Be sure not to start the ESS Cabinet until original supplier/manufacturer determines so.

If a fire is caused by abnormal charging or discharging, cut off the power supply immediately. Then extinguish the fire!!!

6. Warranty Statement

Refer to Limited Warranty Letter for Elecnova ESS Products (Standard Edition).
The warranty conditions are also subject to terms and conditions of a contract.

7. After-sales Services

For any question about this product, find support with below contact info:

Name: Shanghai Elecnova Energy Storage Co., Ltd.
Address: 3F-T1, Hongqiaohui, Shanghai, China
T: +86 21 5439 6121, +86 199 0616 5606
Service Hotline: +86 21 5439 6121,
Email: sales@elecnova-ess.com
https://www.elecnova-ess.com

To the extent permitted by laws, Elecnova has the final right of interpretation for this Manual. Elecnova reserves the right to modify this Manual without further notice.

Annex 1:

Inspection Item	Method	Yes -√ No - × N/A -O	Abnormal Record
Is the fire extinguishing system complete	Visual inspection		
Is the cooling system complete	Visual inspection		
Is the air duct of cooling system blocked	Visual inspection		

Are there any surfaces of the cabinet deformed	Visual inspection		
Are there any surfaces of the cabinet rusted or damaged	Visual inspection		
Is there any moisture inside the cabinet	Visual inspection		
Is the low-voltage wiring harness loose or damaged	Visual inspection		
Is the high-voltage wiring harness loose or damaged	Visual inspection		
Is there wiring harness interfering with structural components	Visual inspection		
Is the high voltage connection ablated	Visual inspection		
Are there any bolts loose or missing	Visual inspection		
Is there foul odor inside the cabinet	Smell with nose		
Is there irritating odor inside the cabinet	Smell with nose		
Is there burnt smell in the high voltage connection area	Smell with nose		
Is the summary data complete	by upper computer		
Is the cell voltage data complete	by upper computer		
Is the cell temperature data complete	by upper computer		
Is there abnormal alarm in the alarm bar	by upper computer		
Note: In case that an abnormality is found, please provide feedback in time and contact relevant personnel for handling			

(END)