SONGZ

Maintenance guide

Matsushige Electric Bus Air Conditioning Repair Guide

Songzhi BUS AirConditioner maintenance guide

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Preamble

Shanghai Kallang Songzhi Automobile Air Conditioning Co., Ltd. is a listed company specialising in the research, development, manufacture and sales of air conditioners for buses, passenger cars, railcars and refrigerated trucks, which was founded in Shanghai in 1998. Bus Air Conditioning

Since 2003, the production and sales volume has been ranked first in the industry, and the current market retains more than 170,000 units.

With the development of bus air-conditioning technology, Shanghai Songzhi's bus air-conditioning products adopt a large number of new technologies, new techniques and new materials, especially in recent years with the rapid development of the company, the company's product line is constantly enriched, in order to make our technical support engineers, service engineers, technicians of our company's contracted service stations, maintenance personnel, as well as the supporting bus factories, the customers of the company's products to be able to understand and grasp In order to make our technical support engineers, service engineers, technicians of our special service stations, maintenance personnel, as well as supporting bus factories and customers to know and master the company's products and keep pace with the development of the products, and to improve the skills of using, maintaining and repairing the products, the technical centre of the bus division of Shanghai Kallanchong Automobile Air Conditioning Co.

This manual mainly explains the new energy air conditioner failure principle, troubleshooting and other related contents, which can be used as a

Training materials for air-conditioning sales and after-sales service technicians of pure electric buses.

During the preparation of this manual, colleagues from the

Technical Centre, Marketing Department and After-sales Service Department gave a lot of guidance and help in sharing technical information and maintenance experience, especially Wang Zhiyuan, Zhang Haibin, Wu Ronghua, Chen Lizhe and Yuan Fule from the Bus Rail Division.

At the same time, due to the time rush and our limited ability, please criticize and correct any mistakes or omissions in the textbook! So that we can revise and improve it when we reprint it.

Shanghai Kallang Matsushige
Automobile Air Conditioning Co.
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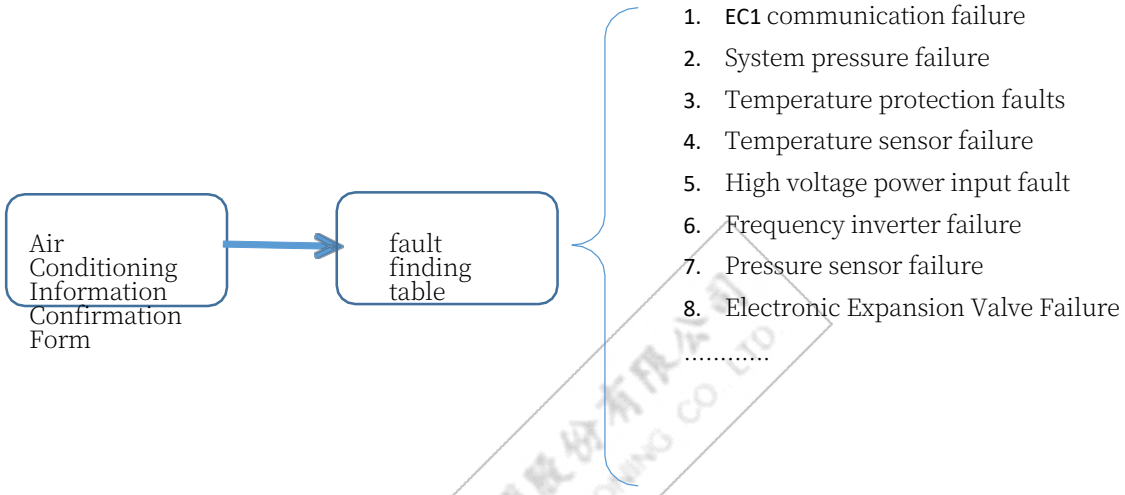
I. After-sales troubleshooting flowchart and list of commonly used tools

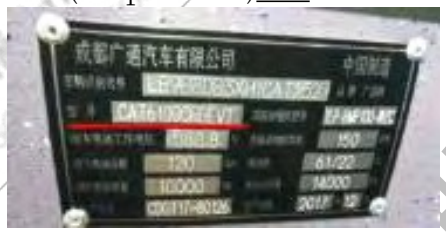
(1) Flowchart of after-sales troubleshooting for buses



(2) List of common tools for bus aftermarket

name (of a thing)	quantities
thermometers	1
anemometer	1
multimeter	1
13mm Sleeve	1
10mm Sleeve	1
Phillips screwdriver (i.e. with cross slit)	1
one-piece screwdriver	1
Leak Detectors/Halogen Leak Detectors	1
Water/soapy water	/
pressure gauge	1

II. Basic Information Confirmation Form

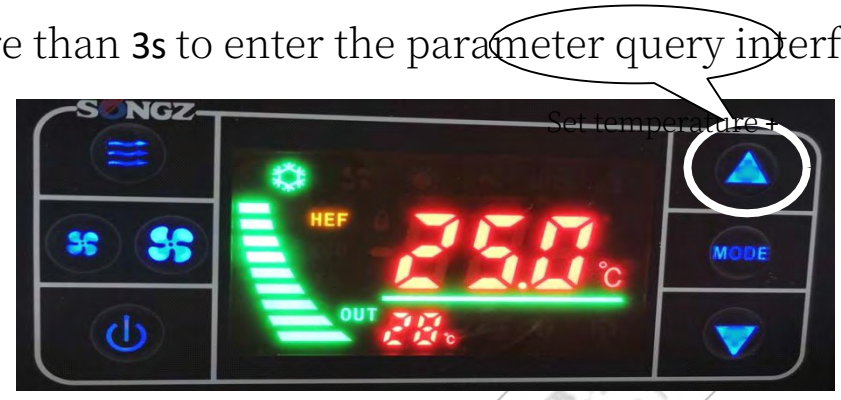
move	name (of a thing)	Recording/verification of content	Inspection results
1	Vehicle air conditioning manipulator	Confirmation of Matsushita Manipulator  	☐Yes ☐No
2	trouble code	record (in sports etc)___	☐Yes ☐No
3	vehicle registration number	record (in sports etc)___ 	☐Yes ☐No
4	Vehicle model	record (in sports etc)___ 	
		single return air vent 	☐Yes ☐No

5	Air Conditioning Return Air Vent	dual return air vent 	☐Yes ☐No
6	Air conditioner nameplate	Air conditioner nameplate location 	
		Air conditioner nameplate information: 	NO:_____ CODE:_____

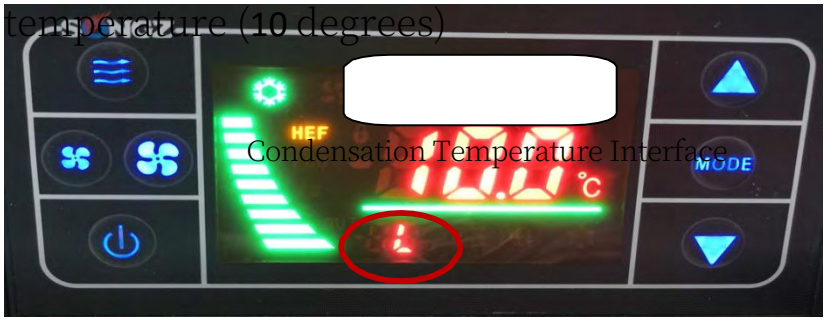
Fill in the form below with the information confirmed above:

trouble code	vehicle registration number	Vehicle model	Air Conditioning Return Air Vent	Air conditioner nameplate	
			Single double	serial number	coding_____
			Single double	serial number	coding_____
			Single double	serial number	coding_____

III. Manipulator query parameters

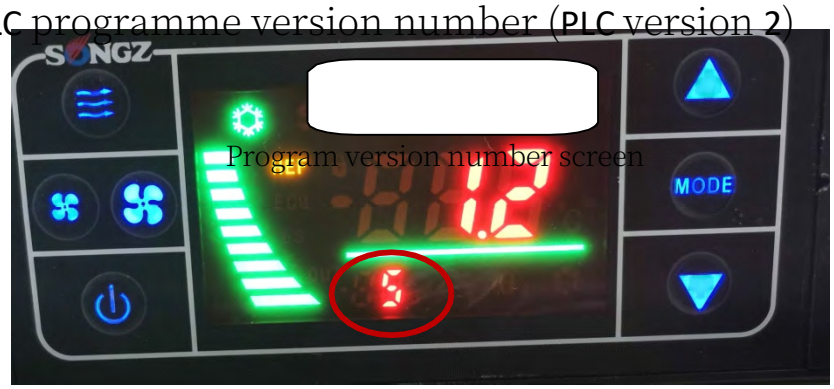
move	methodologies
1	Press and hold down the "Set Temperature +" key for more than 3s to enter the parameter query interface: 
2	Each time you press the "Set Temperature +" button, the panel will display in turn: return air temperature (L1)→ outdoor temperature (0U) → plate exchange water temperature (b) → defrost temperature / PTC out Water temperature (CS) → condensing coil temperature (L) → air conditioning DC voltage (U) → DC current (I) → return air temperature (H) → number of valve steps (F) → compressor frequency (CF) → fan current (FI) → system Pressure (P) → PLC programme version (S) (e.g., at normal power-on, long press the "Temperature +" key, and the data will be displayed in a cyclic manner from there)

3	Main temperature zone display represents: return air temperature (29 degrees)  Return Air Temperature Interface
4	Main temperature zone display represents: Outdoor temperature (28 degrees)  Outdoor Temperature Interface
5	Main temperature zone display represents: Water temperature (25 degrees)  Outlet Temperature Interface
6	Main temperature zone display represents: Defrost temperature (10 degrees)  Defrost Temperature Screen

7	Main temperature zone display represents: Condensing coil temperature (10 degrees)  Condensation Temperature Interface
8	Main temperature zone display representative: Air conditioning DC voltage (600V)  DC Voltage Interface
9	Main temperature zone display representative: DC current (30A)  DC Current Interface
10	Main temperature zone display represents: return air temperature (26 degrees)  Return Air Temperature Interface

11	Main Temperature Zone Display Interface Representative: Valve Steps (300)  Valve steps interface
12	Main temperature zone display interface representative: Compressor frequency (50 HZ)  Compressor Frequency Interface
13	Main temperature zone display interface representative: Fan current (30A)  Fan Current Interface

14	Main temperature zone display interface representative: system pressure (3MPa)(high and low pressure cycle switching display)  System Pressure Interface

15	Main temperature zone display screen representation: PLC programme version number (PLC version 2)  Program version number screen
16	When it is in the parameter query interface, it will automatically exit the parameter query interface without keystroke within 5s, and the main temperature zone will display the return air temperature. 

III. Three-in-one troubleshooting (dual electronics)

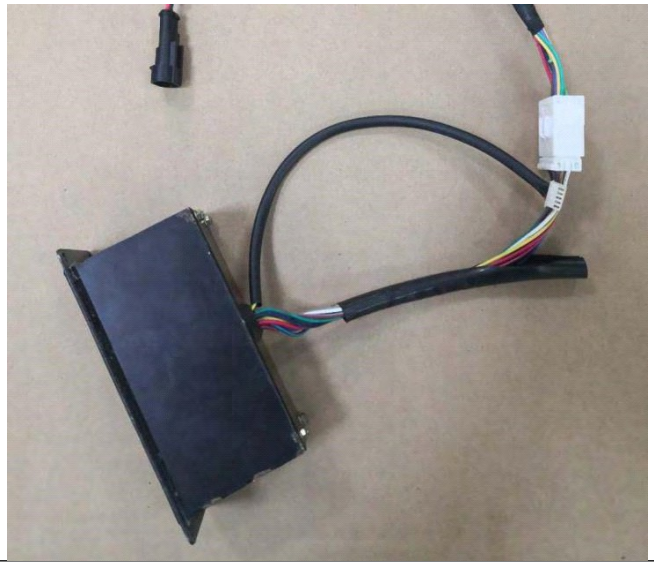
3-in-1 Repair Essential Tools

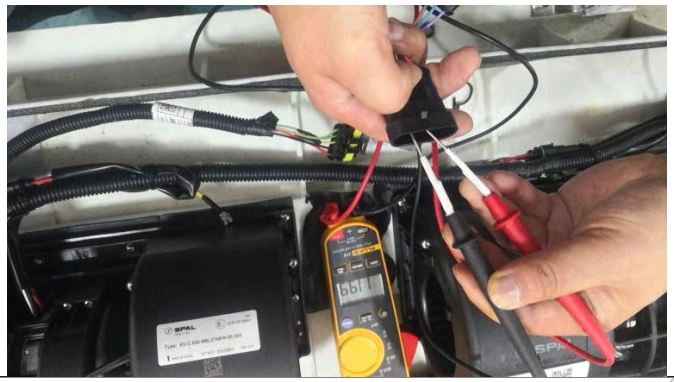
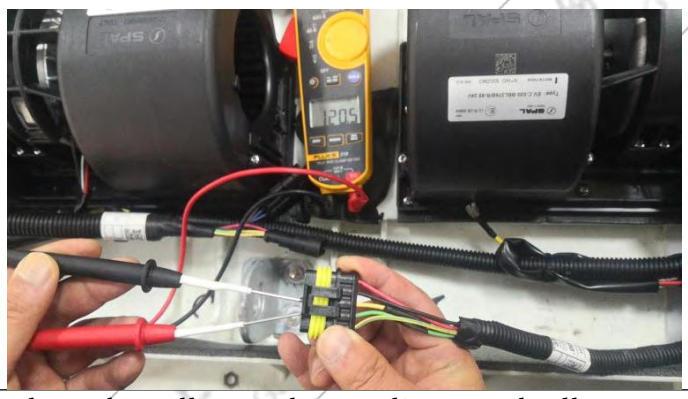
name (of a thing)	quantities
SOP-20	1
Programme download cable (PC-panel)	1 root
Programme download cable (air return)	1 root
ordinary network cable	1 root

1 EC1 Overhead Controller and Panel Communication Failure

malfunctions coding	Fault name	Type of fault	fault principle
EC1	Top-mounted controller with panel malfunction of communications	communication type fault	This fault occurs continuously when the overhead controller does not receive the manipulator message for 1min consecutively.

move	methodologies	Inspection results	Treatment programme

1	Whether the manipulator plug connection is normally connected and reliable, whether the yellow and green wire pin is skewed and broken 	☐Yes ☐No	Reconnect or replace the wiring harness
2	Check that the manipulator harness in the duct is intact and not broken (pay special attention to the bolt mounting position)	☐Yes ☐No	Repair or Replacement of Wiring Harness
3	Check that the manipulator harness is properly and reliably connected to the overhead connection 	☐Yes ☐No	Repair or Replacement of Wiring Harness

4	Disconnect the manipulator harness from the top unit and measure the resistance between the yellow and green wires at the manipulator end to see if it is 100~150Ω (communication resistance 120Ω). 	☐Yes ☐No	Replacing the manipulator harness
5	Disconnect the manipulator harness from the top unit and measure the resistance between the yellow and green wires at the top unit end for abnormality 100~150Ω (120Ω) 	☐Yes ☐No	
6	Along the yellow and green lines gradually check to the top controller, the intermediate line is intact, reliable connections 	☐Yes ☐No	

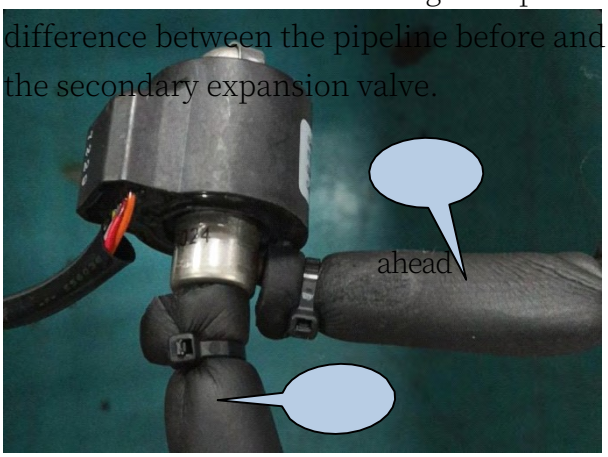
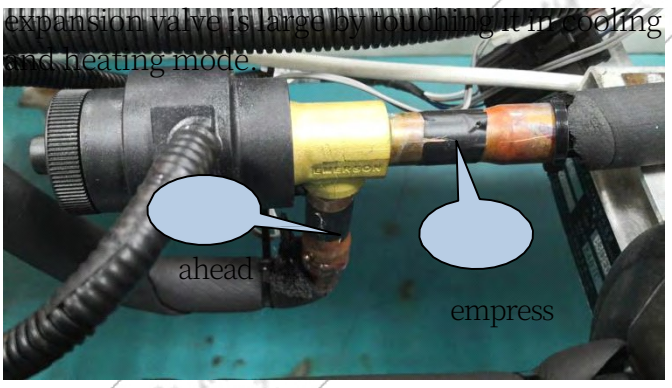
7	Connect a low-voltage filter in series with the 24V power input of the manipulator and separate the manipulator harness from the high-voltage harness in the air duct, and try for a period of time to see if the fault no longer occurs.	☐Yes ☐No	Low-voltage filters in series with top controller inputs

2 LPF Low Pressure Failure Check

malfunctions coding	Fault name	Type of fault	fault principle	Component Monitoring
LPF	Low Pressure Failure	Pressure monitoring type failure	When the low pressure is below 0.05MPa This fault occurs when	D0820 (CV801 model) D0564 (CV800 model)

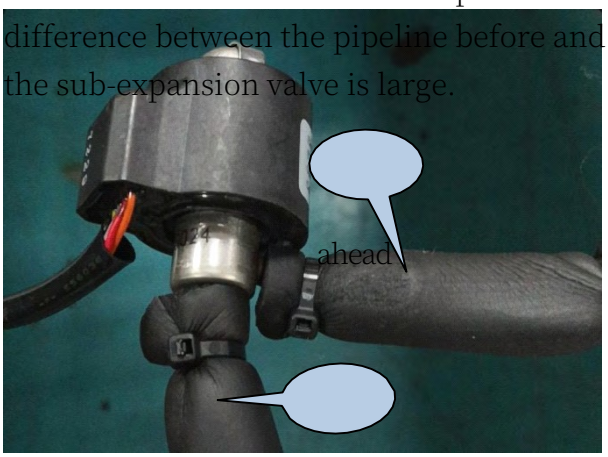
move	methodologies	Inspection results	operating method
1	Vehicle: Power up and switch on the vehicle to verify that the air-conditioning control panel displays LPH normally. trouble code	☐Yes ☐No	View historical faults
2	Tap into a manifold pressure gauge to see if the system balance pressure is within range	☐Yes ☐No	Insufficient or leaking system refrigerant, check for leaks and refill.

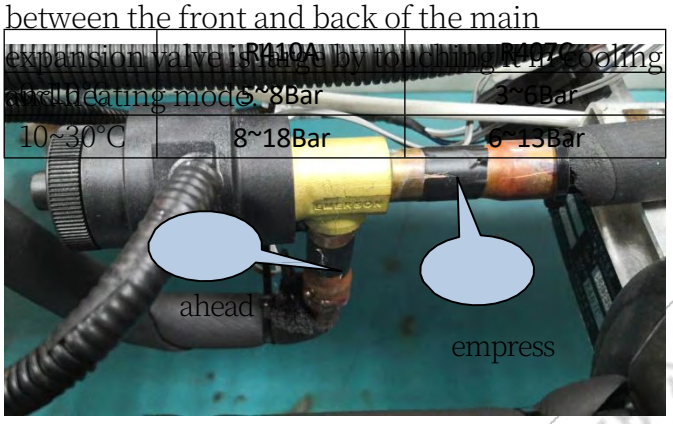
	R410A	R407C
0~10℃	5~8Bar	3~6Bar
10~30℃	8~18Bar	6~13Bar

3 Integrated Electrical pool Management System	Touch to check if there is a large temperature difference between the pipeline before and after the secondary expansion valve.  	☐ No. Yes.	Check that the secondary electronic expansion valve operates correctly when re-powering up the unit.
4	Whether the cooling and heating modes can be activated properly	☐ No. Yes.	Check low pressure sensor
5	Check whether the condensing and evaporating fans are operating normally and the air is strong.	☐ No. Yes.	Replacement of the corresponding fan
6	Check whether the temperature difference between the front and back of the main expansion valve is large by touching it in cooling and heating mode.  The diagram shows the cooling mode and the opposite for the heating mode.	☐ No. Yes.	System clogged or main electronic expansion valve not opening

3 HPF High Pressure Failure Check

malfunctions coding	Fault name	Type of fault	fault principle	Component Monitoring
HPF	High Pressure Failure	Pressure monitoring type failure	When the high pressure is higher than 2.8MPa This fault occurs when	D0840 (CV801 model) D0562 (CV800 model)

move	methodologies	Inspection results	operating method
1	Vehicle: Power on and verify that the air-conditioning control panel displays HPF normally. trouble code	☐Yes ☐No	View historical faults
2	Tap into a manifold pressure gauge to see if the system balance pressure is within range	☐Yes ☐No	System refrigerant overload
3 Integrated Electrical pool Management System	Touch to check whether the temperature difference between the pipeline before and after the sub-expansion valve is large.  empress	☐Yes ☐No	Check that the secondary electronic expansion valve operates correctly when re-powering up the unit.
4	Whether the cooling and heating modes can be activated properly	☐Yes ☐No	Check low pressure switch

5	Check whether the condensing and evaporating fans are operating normally and the air is strong.	☐Yes ☐No	Replacement of the corresponding fan
6	Check whether the temperature difference between the front and back of the main expansion valve is large by touching it in cooling or heating mode.  The diagram shows the cooling mode and the opposite for the heating mode.	☐Yes ☐No	System clogged or main expansion valve not opening

4 C7H Compressor discharge temperature protection

malfunctions coding	Fault name	Type of fault	fault principle	Component Monitoring
C7H	Compressor discharge temperature protection	Switch type faults	When the monitored temperature exceeds 103°C, the protective switch opens and this fault occurs.	X0000

move	methodologies	Inspection results	operating method
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays normally C7H	☐Yes ☐No	View historical faults
2	Check if X0000 is OFF Compressor outside temperature / Protection switch status <103°C / conduction ≥103°C / turn off (electric switch)	☐Yes ☐No	Replacement of 3-in-1
3	Measurement of the protection switch for 24V input	☐Yes ☐No	Check and repair the protection switch and PLC interline
4	Measurement of protective switches for compliance	☐Yes ☐No	Replacement of exhaust gas temperature protecti

			on switch
5	Check and repair the wiring between PLC pin X0000 and the protection switch.		

5 P1r Compressor 1 exhaust temperature protection

malfunctions coding	Fault name	Fault type	fault principle	Component Monitoring
P1r	Compressor 1 Discharge temperature protection	Switch type faults	Disconnect when monitoring temperature exceeds 103°C	X0000

Compressor outside temperature	Protection switch status
<103°C	conduction
>103°C	turn off (electric switch)

move	methodologies	Inspection results	operating method
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays P1r normally.	□Yes □No	View historical faults
2	Check if X0000 is OFF	□Yes □No	Replacement of 3-in-1
3	Measurement of the protection switch for 24V input	□Yes □No	Check and repair the protection switch

			and PLC interline
4	Measurement of protective switches for compliance	☐Yes ☐No	Replacement of exhaust gas temperature protection switch
5	Check and repair the wiring between PLC pin X0000 and the protection switch.		

6 P2r Compressor 2 exhaust temperature protection

malfunctions coding	Fault name	Fault type	fault principle	Component Monitoring
P2r	Compressor 2 Discharge Temperature Protection	Switching faults	Disconnect when the monitored temperature is greater than 103°C	X0000 (PLC2)

move	methodologies	Inspection results	operating method
1	Vehicle: Power up and switch on the vehicle to verify that the air-conditioning control panel displays P2r normally.	☐Yes ☐No	View historical faults
2	Check if X0000 is OFF	☐Yes ☐No	Replacement of 3-in-1

3	Measurement of the protection switch for 24V input	□Yes □No	Check and repair the protection switch and PLC interline
4	Measurement of protective switches for compliance Compressor outside temperature / Protection switch status <103℃ / conduction ＞103℃ / turn off (electric switch)	□Yes □No	Replacement of exhaust gas temperature protection switch
5	Check and repair the wiring between PLC pin X0000 and the protection switch.		

7 P3r Compressor 3 Exhaust temperature protection

malfunctions coding	Fault name	Type of fault	fault principle	Component Monitoring
P3r	Compressor 3 exhaust temperature protection	Switch type faults	Disconnect when monitoring temperature exceeds 103°C	X0000 (PLC3)

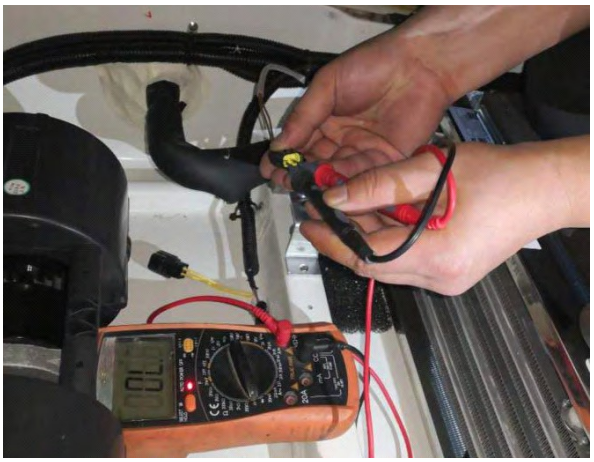
move	methodologies	Inspection results	operating method
1	Vehicle: power up and switch on the vehicle to verify that the air conditioning control panel displays normally P3r	□Yes □No	View historical faults

2	Check if X0000 is OFF Compressor outside temperature / Protection switch status <103℃ / conduction >103℃ / turn off (electric switch)	☐Yes ☐No	Replacement of 3-in-1
3	Measurement of the protection switch for 24V input	☐Yes ☐No	Check and repair the protection switch and PLC interline
4	Measurement of protective switches for compliance	☐Yes ☐No	Replacement of exhaust gas temperature protection switch
5	Check and repair the wiring between PLC pin X0000 and the protection switch.		

8 POH PTC overheat protection

malfunctions coding	Fault name	Type of fault	fault principle	Component Monitoring
POH	PTC overheating	switchgear	When the PLC monitors the PTC overheat protection open, the PLC will detect the PTC	X0004

	protectio n fault		overheat protection open. This fault occurs when the switch is turned on	

move	methodologies	Test results	operating method
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays POH normally. trouble code	☐Yes ☐No	View historic al faults
2	Check if X0004 is OFF	☐Yes ☐No	Replace ment of 3-in-1
3	Measure the PTC temperature control switch with a multimeter for compliance. 	☐Yes ☐No	Replace ment of PTC
4	Measurement of PTC temperature control protection switch for 24V input	☐Yes ☐No	Check wiring betwee n tempera ture control switch and PLC

9 EII0 Faulty front steam defrost temperature sensor

malfunctions coding	Fault name	Type of fault	fault principle	Component Monitoring
EII0	Return air temperature sensor failure	Resistance detection class	This condition occurs when the PLC detects that the resistance of the return air temperature sensor is out of the range of 0.6~108KΩ.	

PTC Temperature	Temperature control switch status
<150°C	conduction
>150°C	turn off (electric switch)

move	methodologies	Test results	operating method

1	Vehicle: Power on and verify that the air conditioning control panel displays **EII0** normally. trouble code	☐Yes ☐No	View historical faults
2	Multimeter to measure if the return air temperature sensor resistance is within the range temperature range / Corresponding resistance range 80~50°C — 0.6~2.0KΩ 50~20°C — 2.0~6KΩ 20~-0°C — 6~14.2KΩ 0~7°C — 14.2~20KΩ	☐Yes ☐No	Replacement of temperature sensor
3	Measure the sensor with a multimeter for 2V input voltage. 	☐Yes ☐No	Check and repair wiring between sensor and controller

10 EII1 Return air temperature sensor failure

malfunctions coding	Fault name	Type of fault	fault principle	Component Monitoring
EII1	Return air temperature	Resistance detec	This condition occurs when the PLC detects that the resistance of the return air	D8402

	sensor failure	tion class	temperature sensor is out of the range of 0.6~108KΩ. malfunctions	

move	methodologies	Test results	operating method
1	Vehicle: power up and switch on the vehicle to verify that the air-conditioning control panel displays **EII1** normally. trouble code temperature range / Corresponding resistance range 80~50°C: 0.6~2.0KΩ 50~20°C: 2.0~6KΩ 20~-0°C: 6~14.2KΩ 0~-7°C: 14.2~20KΩ	☐Yes ☐No	View historical faults
2	Multimeter to measure if the return air temperature sensor resistance is within range	☐Yes ☐No	Replace the return air temperature sensor
3	Measure the sensor with a multimeter for 2V input voltage. 	☐Yes ☐No	Check and repair wiring between sensor and controller

11 EII2 Evaporator left defrost temperature sensor failure

malfunctions	Fault name	Type of fault	fault principle	Component Monitoring

codin g				
EII2	Evaporato r left defrost temperatu re sensing device failure	Resist ance detec tion class	This condition occurs when the PLC detects that the resistance of the return air temperature sensor is out of the range of 0.6~108KΩ. malfunctions	D8403

move	methodologies	Test results	operating method
1	Vehicle: power up and switch on the vehicle to verify that the air-conditioning control panel displays **EII2** normally. trouble code	☐Yes ☐No	View historic al faults
2	Multimeter to measure if temperature sensor resistance is within range	☐Yes ☐No	Replaci ng the Left Defrost Temper ature Sensor
3	Measure the sensor with a multimeter for 2V input voltage. 	☐Yes ☐No	Check and repair wiring between sensor and controll er

12 EII3 Evaporator right defrost temperature sensor failure

malfunctions coding	Fault name	Type of fault	fault principle	Component Monitoring
EII3	Evaporator right defrost temperature sensing device failure	Resistance detection class	This condition occurs when the PLC detects that the resistance of the return air temperature sensor is out of the range of 0.6~108KΩ.	D8404

temperature range	Corresponding resistance range
80~50°C	0.6~2.0KΩ
50~20°C	2.0~6KΩ
20~-0°C	6~14.2KΩ
0~7°C	14.2~20KΩ

move	methodologies	Test results	operating method
1	Vehicle: power up and switch on the vehicle to verify that the air-conditioning control panel displays **EII3** normally. trouble code	☐Yes ☐No	View historical faults
2	Multimeter to measure if the return air temperature sensor resistance is within range	☐Yes ☐No	Replace the return air temperature sensor

3	Measure the sensor with a multimeter for 2V input voltage. 	☐Yes ☐No	Check and repair wiring between sensor and controller

Temperature range	Corresponding resistance range
80~50°C	0.6~2.0KΩ
50~20°C	2.0~6KΩ
20~-0°C	6~14.2KΩ
0~7°C	14.2~20KΩ

13 EII4 Outdoor temperature sensor failure

malfunctions coding	Fault name	Type of fault	fault principle	Component Monitoring
EII4	Outdoor temperature sensor failure	Resistance Detection Class	This condition occurs when the PLC detects that the resistance of the return air temperature sensor is out of the range of 0.6~108KΩ. malfunctions	D8401

move	methodologies	Test results	operating method
1	Vehicle: power up and switch on the vehicle to verify that the air-conditioning control panel displays **EII4** normally. trouble code	☐Yes ☐No	View historical faults

2	Multimeter to measure if the outdoor temperature sensor resistance is within range	☐Yes ☐No	Replacement of Outdoor Temperature Sensor
3	~~Measure the sensor with a multimeter for 2V~~ input voltage. temperature range / Corresponding resistance range 80~50℃ 0.6~2.0KΩ 50~20℃ 2.0~6KΩ 20~0℃ 6~14.2KΩ 0~7℃ 14.2~20KΩ 	☐Yes ☐No	Check and repair wiring between sensor and controller

14 EII5 Faulty condensate coil temperature sensor

malfunctions coding	Fault name	Type of fault	fault principle	Component Monitoring
EII5	Condensation coil temperature sensor failure	numerical value of electrical impedance phylogeny	When the PLC monitors the condensation temperature sensor resistance value, the PLC will detect the condensation temperature sensor resistance value. This fault occurs when the range of 0.6~108KΩ is exceeded.	D8400

move	methodologies	Test results	operating method

1	Vehicle: Power up and switch on the vehicle to verify that the air-conditioning control panel displays **EII5** normally. trouble code	☐Yes ☐No	View historical faults
2	Measure condensing coil temperature sensor resistance with a multimeter to see if it is within range. temperature range / Corresponding resistance range 80~50°C — 0.6~2.0KΩ 50~20°C — 2.0~6KΩ 20~-0°C — 6~14.2KΩ 0~7°C — 14.2~20KΩ	☐Yes ☐No	Replace condensing coil temperature sensor
3	Measure the sensor with a multimeter for 2V input voltage. 	☐Yes ☐No	Check and repair wiring between sensor and controller

15 EII6 Plate change inlet water temperature sensor failure

malfunctions coding	Fault name	Type of fault	fault principle	Component Monitoring
EII6	Faulty inlet water temperature sensor	Resistance detection class	This fault occurs when the PLC detects that the resistance of the inlet water temperature sensor is out of the range of 0.6~108KΩ.	D8407

move	methodologies	Test results	operating method
1	Vehicle: Power up and switch on the vehicle to verify that the air-conditioning control panel displays **EII6** normally. trouble code temperature range / Corresponding resistance range 40~50℃ / 1.2~0.9KΩ 20~40℃ / 2.6~1.2KΩ 0~20℃ / 6~2.6KΩ	☐Yes ☐No	
2	Multimeter to measure if the water temperature sensor resistance is within range	☐Yes ☐No	Replacement of water outlet temperature sensor
3	Measure the sensor with a multimeter for 2V input voltage. 	☐Yes ☐No	Check and repair wiring between sensor and controller

16 EII7 Board swap water temperature sensor failure

malfunctions coding	Fault name	Type of fault	fault principle	Component Monitoring
EII7	Failure of board exchange water	Resistance detection class	PLC detects sensor resistance exceeding 0.6~108KΩ range of faults block	D8406

	temperature sensor			

move	methodologies	Test results	operating method
1	Vehicle: Power up and switch on the vehicle to verify that the air-conditioning control panel displays **EII7** normally. trouble code temperature range / Corresponding resistance range 40~50℃ — 1.2~0.9KΩ 20~40℃ — 2.6~1.2KΩ 0~20℃ — 6~2.6KΩ	☐Yes ☐No	View historical faults
2	Multimeter to measure if the water temperature sensor resistance is within range	☐Yes ☐No	Replacement of water outlet temperature sensor
3	Measure the sensor with a multimeter for 2V input voltage. 	☐Yes ☐No	Check and repair wiring between sensor and controller

17 H1r Main circuit 1 Return air temperature sensor failure

malfunctions coding	Fault name	Type of fault	fault principle	Component Monitoring

H1r	Main circuit 1 Return air temperature sensor failure	Resistance detection class	PLC detects sensor resistance exceeding 0.6~108KΩ range of faults block	

move	methodologies	Test results	operating method
1	Vehicle: power up and switch on the vehicle to verify that the air conditioning control panel displays normally **H1r** trouble code temperature range / Corresponding resistance range: 80~50℃ 0.6~2.0KΩ 50~20℃ 2.0~6KΩ 20~0℃ 6~14.2KΩ 0~7℃ 14.2~20KΩ	☐Yes ☐No	View historical faults
2	Multimeter to measure if temperature sensor resistance is within range	☐Yes ☐No	Replace the main circuit 1 return air temperature sensor
3	Measure the sensor with a multimeter for 2V input voltage. 	☐Yes ☐No	Check and repair wiring between sensor and controller

18 H2r Main circuit 2 Return air temperature sensor failure

malfunctio	Fault name	Type of fault	fault principle	Component

ns coding				Monitoring
H2r	Main circuit 2 Return air temperature sensor failure	Resistance detection class	PLC detects sensor resistance exceeding range of faults block	

temperature range	Corresponding resistance range
80~50°C	0.6~2.0KΩ
50~20°C	2.0~6KΩ
20~0°C	6~14.2KΩ
0~7°C	14.2~20KΩ

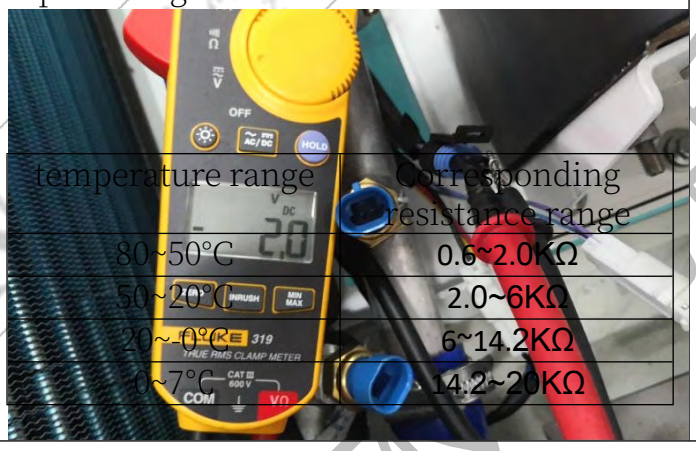
move	methodologies	Test results	operating method
1	Vehicle: power up and switch on to verify that the air-conditioning control panel displays normally **H2r** trouble code	☐Yes ☐No	View historical faults
2	Multimeter to measure if temperature sensor resistance is within range	☐Yes ☐No	Replace main circuit 2 return air temperature sensor
3	Measure the sensor with a multimeter for 2V input voltage. 	☐Yes ☐No	Check and repair wiring between sensor and controller

temperature range	Corresponding resistance range
80~50°C	0.6~2.0KΩ
50~20°C	2.0~6KΩ
20~0°C	6~14.2KΩ
0~7°C	14.2~20KΩ

19 H3r Sub-circuit 1 Return air temperature sensor failure

malfunctio	Fault name	Type of fault	Fault principle	Component Monitoring

ns codin g				
H3r	Sub-circuit 1 Return air temperature sensor failure	Resistance detection class	PLC detects sensor resistance exceeding 0.6~108KΩ range of faults block	D8408

move	methodologies	Test results	operating method
1	Vehicle: power up and switch on to verify that the air-conditioning control panel displays properly **H3r** trouble code	☐Yes ☐No	
2	Multimeter to measure if temperature sensor resistance is within range	☐Yes ☐No	Replace ment of sub-circuit 1 return air tempera ture sensor
3	Measure the sensor with a multimeter for 2V input voltage. 	☐Yes ☐No	Check and repair wiring between sensor and controll er

temperature range	Corresponding resistance range
80~50°C	0.6~2.0KΩ
50~20°C	2.0~6KΩ
20~0°C	6~14.2KΩ
0~7°C	14.2~20KΩ

20 H4r Sub-circuit 2 Return air temperature sensor failure

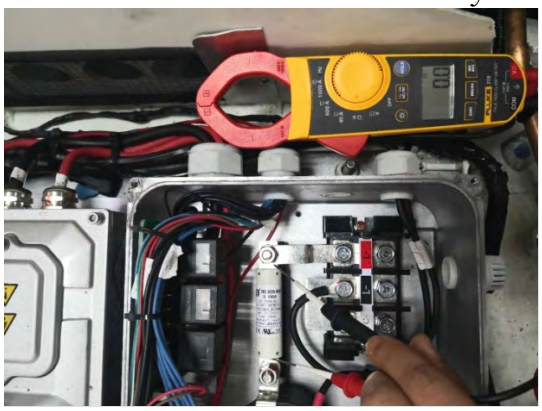
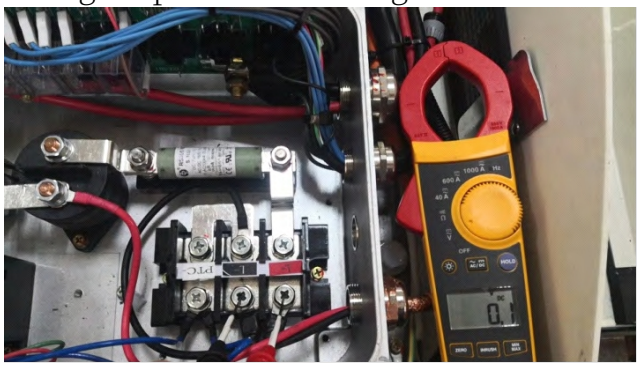
malfu nctio	Fault name	Type of fault	fault principle	Compone nt

ns codin g				Monitorin g
H4r	Sub-circuit 2 Return air temperature sensor failure	Resistance detection class	PLC detects sensor resistance exceeding 0.6~108KΩ range of faults block	

move	methodologies	Test results	operating method
1	Vehicle: power up and switch on to verify that the air-conditioning control panel displays properly **H4r** trouble code	☐Yes ☐No	
2	Multimeter to measure if the return air temperature sensor resistance is within range	☐Yes ☐No	Replace the return air tempera ture sensor
3	Measure the sensor with a multimeter for 2V input voltage. 	☐Yes ☐No	Check and repair wiring between sensor and controll er

21 HUF High Voltage Input Power Failure Check

malfunctions coding	Fault name	Type of fault	fault principle
HUF	High-voltage input disconnection fault	Voltage Inspection	This fault occurs when the input voltage for load-side detection is less than 400V.

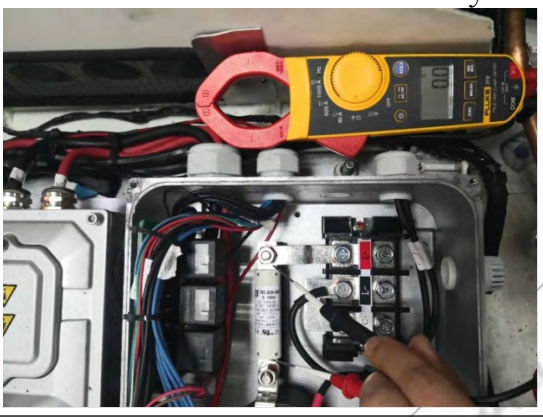
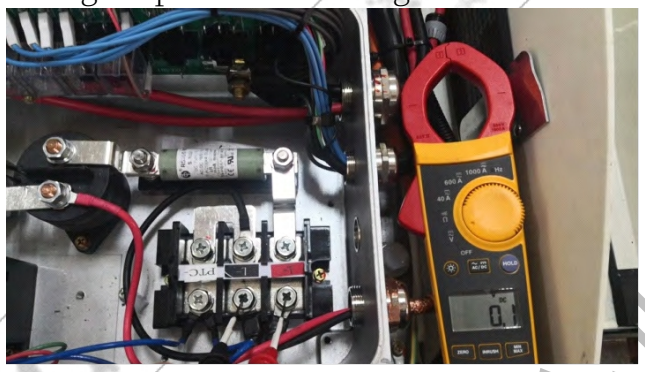
move	methodologies	Test results	operating method
1	Vehicle: power up and switch on to verify that the air conditioning control panel displays normally. **HUF** Fault Code	☐Yes ☐No	View historical faults
2	Measurement of fuse continuity 	☐Yes ☐No	Replacement of fuses
3	Measure whether the air conditioner high voltage input is in the range of 450~750V. 	☐Yes ☐No	Check the air-conditioning insurance at the vehicle end Contact the vehicle manufacturer to restore air-conditio

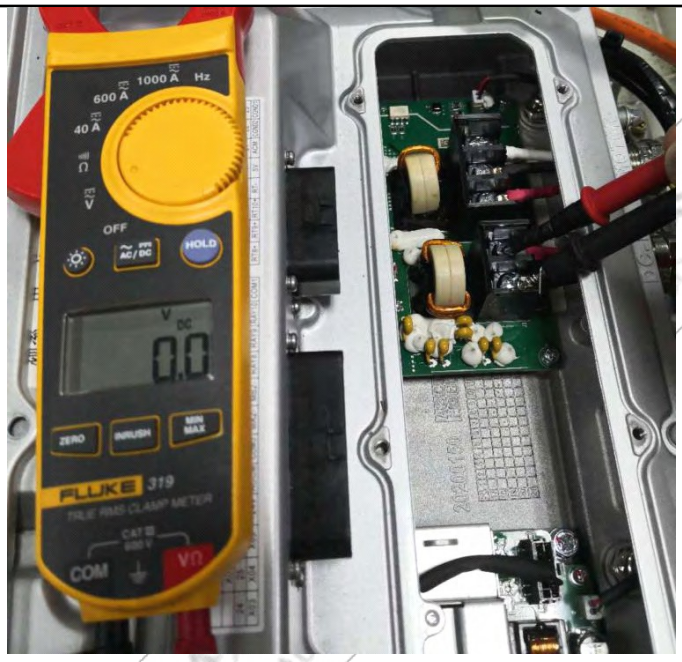
			ning power if necessary
4	Measure whether the input voltage of 3-in-1 is between 450~750V. 	☐Yes ☐No	Check main contactor weak coil and input voltage
5	Replace the 3-in-1 and try to run for a period of time whether the fault no longer occurs	☐Yes ☐No	

22 LU Inverter undervoltage

malfunctions coding	Fault name	Type of fault	fault principle

LU	Inverter undervoltage fault	Voltage Detection	This fault occurs when the input voltage is detected to be less than 300V at the load side during operation.

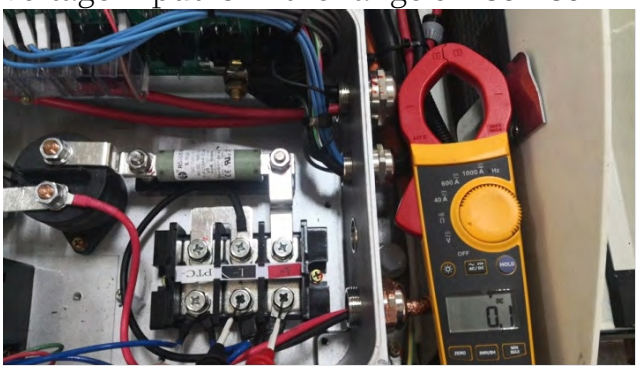
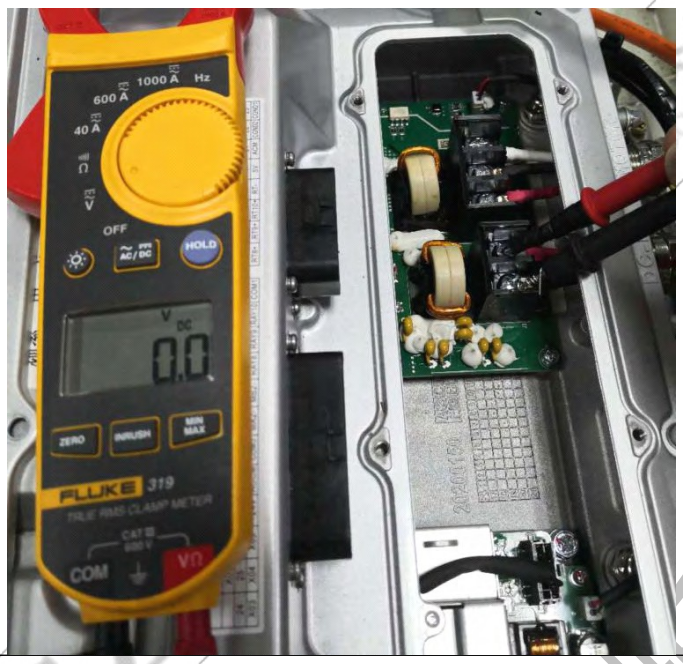
move	methodologies	Test results	operating method
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays normally **LU** trouble code	☐ No. Yes.	
2	Measurement of fuse continuity 	☐ No. Yes.	Replacement of fuses
3	Measure whether the air conditioner high voltage input is in the range of 450~750V. 	☐ No. Yes.	Check the air-conditioning insurance of the whole vehicle Contact the vehicle manufacturer to restore the air-conditioning power supply if necessary

4	Measure whether the input voltage of 3-in-1 is between 450~750V.	☐ No. Yes.	Check main contactor weak coil and input voltage
			
5	Replace the 3-in-1 and try to run for a period of time, whether the fault no longer occurs	☐Yes ☐No	

23 OU Inverter overvoltage

malfunctions coding	Fault name	Type of fault	fault principle
OU	Inverter over pressure failure	Voltage Detection resemble	This fault occurs when an input voltage higher than 750V is detected on the load side during operation.

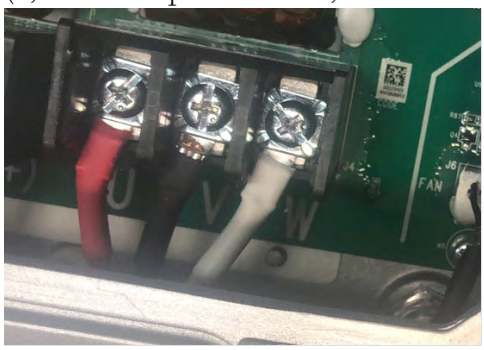
move	methodologies	Test results	operating method
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays **OU** normally**.** trouble code	☐Yes ☐No	View historical faults

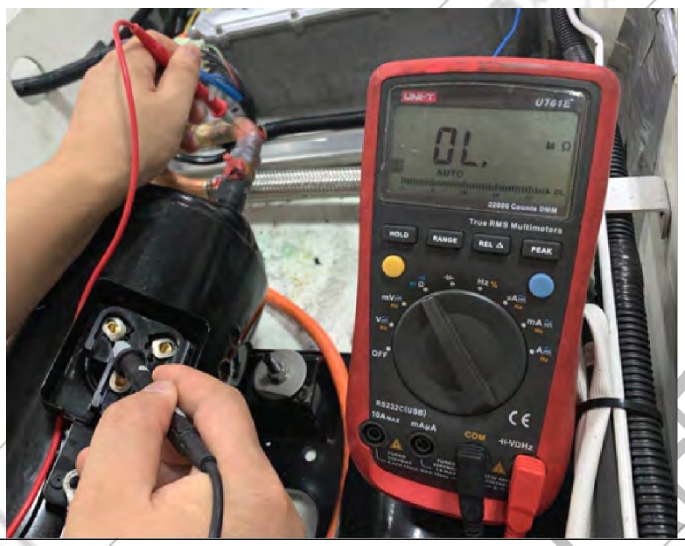
2	Measure whether the air conditioner high voltage input is in the range of 450~750V. 	☐Yes ☐No	
3	Measure whether the input voltage of 3-in-1 is between 450~750V. 	☐Yes ☐No	Rehabilitation of intermediate routes
4	Replacement of 3-in-1		

24 COC Compressor Inverter Overcurrent

malfunctions coding	Fault name	Type of fault	fault principle
COC	Compressor variants	current detection resemble	When the inverter detects that the compressor turn-to-turn current exceeds the setting

	Frequency converter overcurrent		This fault occurs when the maximum value

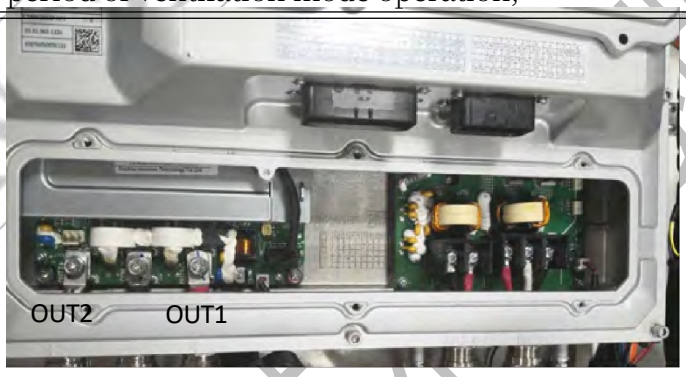
move	methodologies	Inspection results	Treatment programme
1	Vehicle: power up and switch on the vehicle to verify that the air conditioning control panel is displaying **COC** normally**.**	☐Yes ☐No	View historical faults
2	No abnormal noise during compressor operation	☐Yes ☐No	
3	Check compressor wiring connections for reliable connections and correct wire sequence (U.), (V, W correspond to red, black and white) 	☐Yes ☐No	Tighten connections or correct wiring sequence
4	Check that the compressor three-phase wiring is intact, no damage, short circuit	☐Yes ☐No	Repair or replacement of wiring

5	Measure the compressor turn-to-turn resistance, three lines of two measurements, three groups of resistance value is equal and less than 10Ω 	☐Yes ☐No	Replacement of compressor
6	Multimeter to measure whether the resistance between the compressor phase line and the shell is more than 5MΩ. 	☐Yes ☐No	Replacement of compressor
7	Replacement method, replace the three in one, test run for a period of time, whether the fault no longer occurs	☐Yes ☐No	Replacement of compressor

25 LOC condensing fan inverter overcurrent

malfunctions coding	Fault name	Type of fault	fault principle
LOC	Condensing fan inverter over stream of water or sth. resembling one	Current detection class	This fault occurs when the triplex detects a DC output current greater than 100A

move	methodologies	Inspection results	Treatment programme
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays properly **LOC** trouble code	☐Yes ☐No	View historical faults
2	Check the appearance of the fan is intact, no damage, no blockage, fan blade rotation freely	☐Yes ☐No	Replace or remove the blockage
			
3	Check the condensing fan line connections, whether the connection is reliable, no skewed plugs, back pins	☐Yes ☐No	Tighten connections or correct wiring sequenc

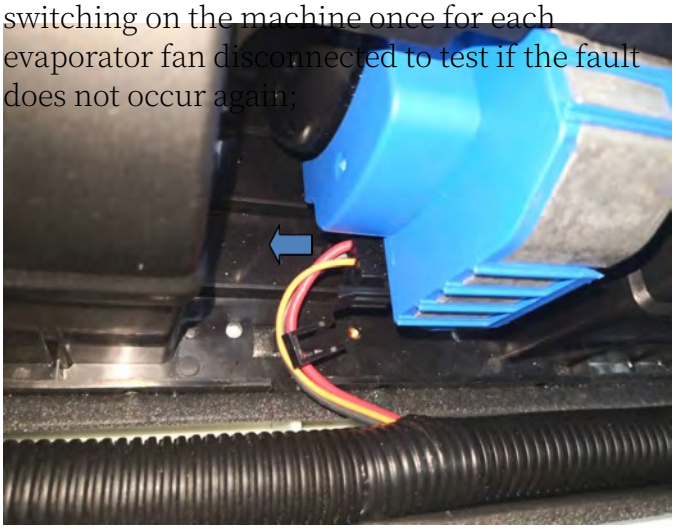
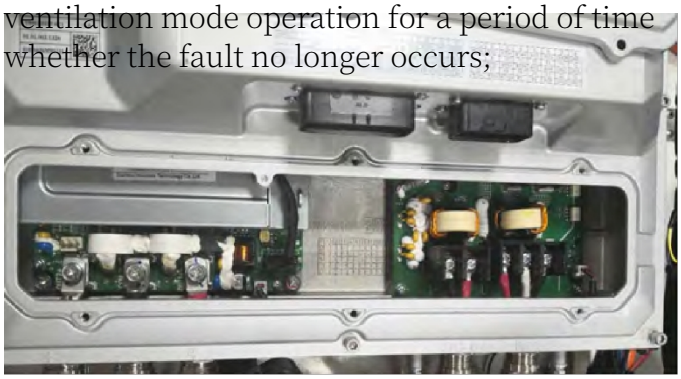
			e
4	Check that the condensing fan wiring is intact and free of damage and short circuits.	☐Yes ☐No	Repair or replace ment of wiring
5	Remove and disconnect the condensing fan inserts one by one, and test each condensing fan disconnected by switching it on and testing whether the fault no longer occurs; 	☐Yes ☐No	Replace the appropr iate condens ing fan
6	1,Connect the condensing fan (OUT2 power cord) to the evaporating fan (OUT1) and remove the original evaporating fan (OU1 power cord). 2,Swap AVO1 and AVO2 pins in the PLC interface; 3, whether the fault no longer occurs after a period of ventilation mode operation;  	☐Yes ☐No	Replace ment of 3-in-1

8	Replace the appropriate condensing fan	☐Yes ☐No	

26 EOC Evaporator fan inverter overcurrent

malfunctions coding	Fault name	Type of fault	fault principle
EOC	Evaporator fan inverter over stream of water or sth. resembling one	Current detection class	When the triplex detects that the evaporator fan output current is greater than the This fault occurs at 100A

move	methodologies	Inspection results	Treatment programme
1	Vehicle: power up and start to verify that the air conditioning control panel displays **EOC** normally. trouble code	☐Yes ☐No	View historical faults
2	Check the appearance of the fan is intact, no damage, no blockage, fan blade rotation freely 	☐Yes ☐No	Replace or remove the blockage

3	Check the evaporator fan line connections, whether the connection is reliable, no skewed plugs, back pins	☐Yes ☐No	Tighten connections or correct wiring sequence
4	Check that the evaporator fan wiring is intact and free of damage and short circuits	☐Yes ☐No	Repair or replacement of wiring
5	Remove and disconnect the evaporator fan inserts one by one, and test the fault by switching on the machine once for each evaporator fan disconnected to test if the fault does not occur again; 	☐Yes ☐No	Replacement of the appropriate evaporator fan
6	1, the condensing fan (OUT2 power cord) into the evaporating fan (OUT1) feet and remove the original evaporating fan (OUT1 power cord); 2, ventilation mode operation for a period of time whether the fault no longer occurs;  OUT2 OUT1	☐Yes ☐No	Replacement of 3-in-1

7	Replacement of the appropriate evaporator fan	☐Yes ☐No	

27 LOH condensing fan inverter overheating

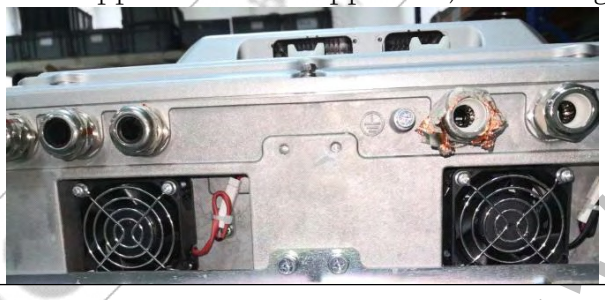
malfunctions coding	Fault name	Type of fault	fault principle
LOH	Condensing fan inverter over heat up	Temperature Detection	This fault occurs when the detection value of the 3-in-1 internal temperature sensor reaches or exceeds the set maximum value.

move	methodologies	Inspection results	Treatment programme
1	Vehicle: power up and switch on the vehicle to verify that the air-conditioning control panel displays LOH normally. trouble code	☐ No. Yes.	View historical faults
2	Turn on the machine and run it for a while to check if the heat fan in the appliance compartment is running. 	☐ No. Yes.	Replacement of 3-in-1
3	Check that the air inlet and outlet of the electrical compartment are cleared. 	☐ No. Yes.	Clear the blockage

4	Check that the electrical compartment insulation foam is intact and has not fallen off. 	☐ No. Yes.	Replace or reapply insulation foam

28 EOH Evaporator fan inverter overheating

malfunctions coding	Fault name	Type of fault	fault principle
EOH	Evaporator fan inverter over heat up	Temperature Detection	This fault occurs when the detection value of the 3-in-1 internal temperature sensor reaches or exceeds the set maximum value.

move	methodologies	Inspection results	Treatment programme
1	Vehicle: Power on and verify that the air conditioning control panel displays **EOH** normally. trouble code	☐ No. Yes.	View historical faults
2	Switch on and run for a period of time to check whether the heat fan in the appliance compartment (including stand-alone fans and fans supplied with the appliance) is running. 	☐ No. Yes.	Replace the cooling fan or corresponding components
3	Check that the inlet and outlet of the electrical compartment are not blocked 	☐ No. Yes.	Clear the blockage

4	Check that the electrical compartment insulation foam is intact and has not fallen off.	☐ No. Yes.	Replace or reapply insulation foam
			

29 COH Compressor inverter overheat

malfunctions coding	Fault name	Fault type	fault principle
COH	Compressor variants Frequency converter overheating	Temperature Detection resemble	When the 3-in-1 internal temperature sensor detection value reaches or exceeds the This fault occurs when the set maximum value is exceeded.

move	methodologies	Inspection results	Treatment programme
1	Vehicle: power up and switch on the vehicle to verify that the air-conditioning control panel displays COH normally. trouble code	☐Yes ☐No	

2	Switch on and run for a period of time to check whether the heat fan in the appliance compartment (including stand-alone fans and fans supplied with the appliance) is running. 	☐Yes ☐No	Replacement of cooling fans or corresponding components
3	Check that the air inlet and outlet of the electrical compartment are cleared. 	☐Yes ☐No	Clear the blockage
4	Check that the electrical compartment insulation foam is intact and has not fallen off. 	☐Yes ☐No	Replace or reapply insulation foam

30 LOL condensing fan inverter overload

malfunctions coding	Fault name	Type of fault	fault principle

LOL	Condensing fan inverter over year	Current detection class	This fault occurs when the triplex detects that the condensing fan output (DC2) current is greater than the rated fan current

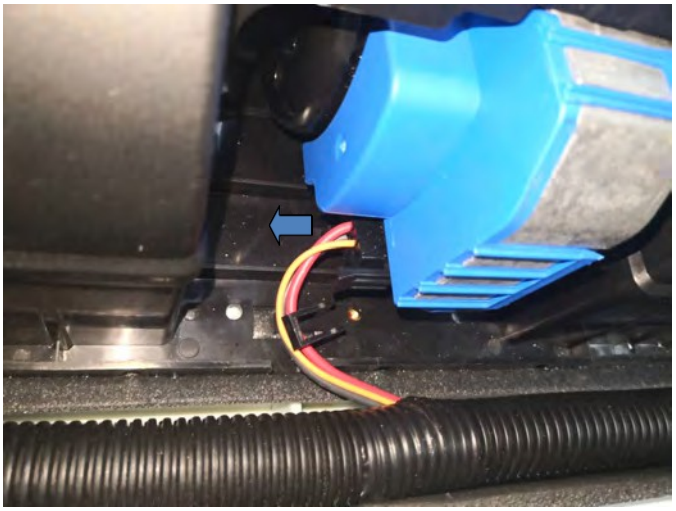
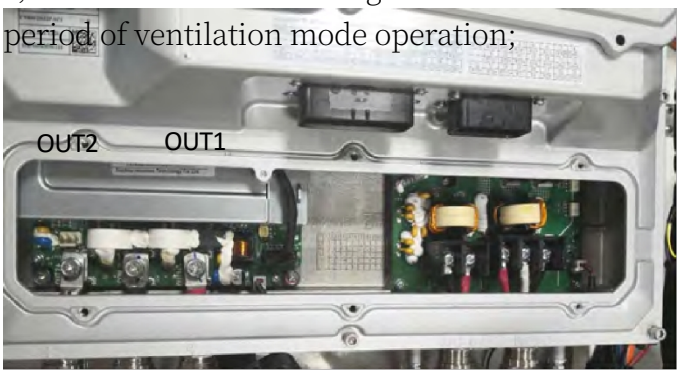
move	methodologies	Inspection results	Treatment programme
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays properly **LOC** trouble code	☐Yes ☐No	View historical faults
2	Check the appearance of the fan is intact, no damage, no blockage, fan blade rotation freely 	☐Yes ☐No	Replace or remove the blockage
3	Check the condensing fan line connections, whether the connection is reliable, no skewed plugs, back pins	☐Yes ☐No	Tighten connections or correct wiring sequence
4	Check that the condensing fan wiring is intact and free of damage and short circuits.	☐Yes ☐No	Repair or replacement of wiring

5	Remove and disconnect the condensing fan inserts one by one, and test each condensing fan disconnected by switching it on and testing whether the fault no longer occurs; 	☐Yes ☐No	Replace the appropriate condensing fan
6	1,Connect the condensing fan (OUT2 power cord) to the evaporating fan (OUT1) and remove the original evaporating fan (OU1 power cord). 2,Swap AVO1 and AVO2 pins in the PLC interface; 3, whether the fault no longer occurs after a period of ventilation mode operation; 	☐Yes ☐No	Replace the appropriate condensing fan
8	Replace the 3-in-1 and try it for a while, does the fault no longer occur	☐Yes ☐No	

31 EOL Evaporator fan inverter overload

malfunctions coding	Fault name	Type of fault	fault principle
EOL	Evaporator fan inverter over year	Current detection class	This fault occurs when the triplex detects that the evaporator fan output (DC1) current is greater than the rated fan current

move	methodologies	Inspection results	Treatment programme
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays properly **LOC** trouble code	☐Yes ☐No	View historical faults
2	Check the appearance of the fan is intact, no damage, no blockage, fan blade rotation freely 	☐Yes ☐No	Replace or remove the blockage
3	Check the evaporator fan line connections, whether the connection is reliable, no skewed plugs, back pins	☐Yes ☐No	Tighten connections or correct wiring sequence
4	Check that the evaporator fan wiring is intact and free of damage and short circuits	☐Yes ☐No	Repair or replacement of wiring

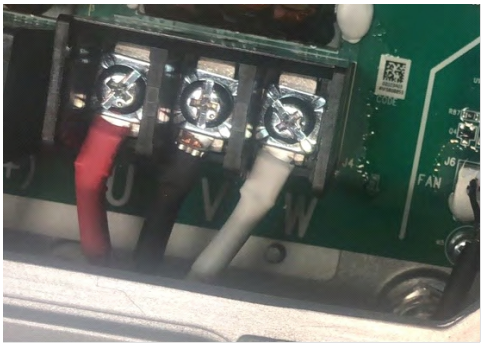
5	Remove and disconnect the evaporator fan inserts one by one, and test the fault by switching on the machine once for each evaporator fan disconnected to test if the fault does not occur again;	☐Yes ☐No	Replace the appropriate condensing fan
			
6	1,Connect the condensing fan (OUT2 power cord) to the evaporating fan (OUT1). Foot position and removal of the original evaporator fan (OU1 power cord); 2,Swap AVO1 and AVO2 pins in the PLC interface; 3, whether the fault no longer occurs after a period of ventilation mode operation; 	☐ No. Yes.	Replacement of the corresponding Evaporation fans

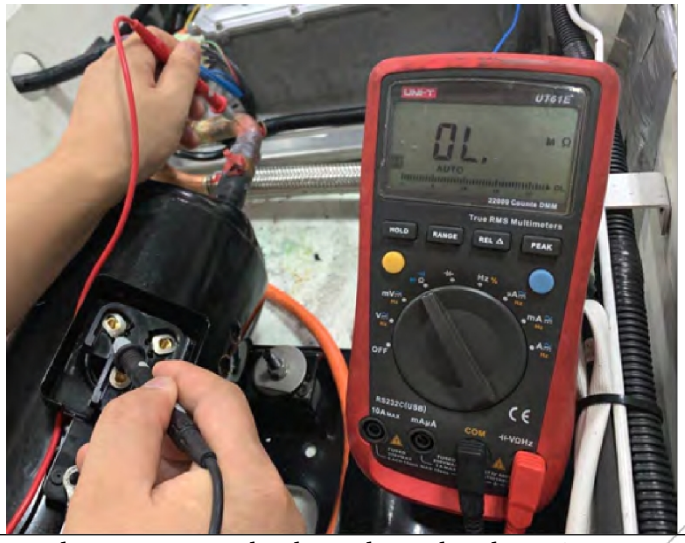
8	Replace the 3-in-1 and try it for a while, does the fault no longer occur	☐ No. Yes.	

32 COL Compressor inverter overload

malfunctions coding	Fault name	Type of fault	fault principle
COL	Compressor variants Frequency converter overload	current detection resemble	When the triplex detects that the compressor output current is greater than the motor This fault occurs at rated current

move	methodologies	Inspection results	Treatment programme
1	Vehicle: power up and switch on to verify that the control panel displays properly **COL**	☐Yes ☐No	View historical faults
2	No abnormal noise during compressor operation	☐Yes ☐No	

3	Check compressor wiring connections for reliable connections and correct wire sequence (U.), (V, W correspond to red, black and white) 	☐Yes ☐No	Tighten connections or correct wiring sequence
4	Check that the compressor three-phase wiring is intact, no damage, short circuit	☐Yes ☐No	Repair or replacement of wiring
5	Measure the compressor turn-to-turn resistance, three lines of two measurements, three groups of resistance value is equal and less than 10Ω 	☐Yes ☐No	Replacement of compressor

6	Multimeter to measure whether the resistance between the compressor phase line and the shell is more than 5MΩ. 	☐Yes ☐No	Replacement of compressor
7	Replacement method, replace the three in one, test run for a period of time, whether the fault no longer occurs	☐Yes ☐No	Replacement of compressor

33CHF Compressor Inverter Hardware Failure

malfunctions coding	Fault name	Type of fault	fault principle
CHF	Compressor Inverter Hardware malfunctions	Three-in-one internal malfunction	3-in-1 internal detection and feedback of fault codes

move	methodologies	Inspection results	Treatment programme

1	Vehicle: power up and switch on the vehicle to verify that the control panel displays **CHF** normally**.**	☐Yes ☐No	View historical faults
2	Replacement method, replace the three in one, test run for a period of time, whether the fault no longer occurs	☐Yes ☐No	

34FL Reverse connection fault

malfunctions coding	Fault name	Fault type	fault principle
FL	reverse polarity fault	Voltage Detection resemble	When the triplex detects that the polarity of the input power supply is opposite to the marking This fault occurs

move	methodologies	Inspection results	Treatment programme
1	Complete vehicle: power up and start to verify that the control panel displays properly **FL**	□Yes □No	View historical faults
2	Check that the polarity of the air-conditioning input power supply matches the marking.	□Yes □No	Correcting power supply polarity
3	Check that the polarity of the 3-in-1 input power supply matches the marking.	□Yes □No	Correcting power supply polarity

35 C5F Pressure Sensor Failure

malfunctions coding	Fault name	Type of fault	fault principle
C5F	pressure sensing device failure	Voltage Detection	The triplex detects that the pressure sensor feedback voltage exceeds This fault occurs in the 0~5V range

move	methodologies	Inspection	Treatment

		results	programme
1	Vehicle: power up and switch on the vehicle to verify that the air-conditioning control panel displays **C5F** normally.	☐Yes ☐No	View historical faults
3	Measure the sensor for 5V input voltage 	☐Yes ☐No	Check wiring from sensor to PLC
4	Measure whether the sensor feedback voltage is in the range of 0~5V Pressure(MPa) / Low Pressure Sensor Reverse Feed voltage (V) / High Pressure Sensing Feedback Voltage (V) 0~1.6 / 0.5~1.88 / 0.45~2.13 1.6~3.0 / 1.88~3.09 / 2.13~3.61 3.0~4.0 / 3.09~3.93 / 3.61~4.03	☐Yes ☐No	Check sensor to PLC feedback signal line
5	Replacement of the pressure sensor		

36 S1r Pressure sensor failure

malfunctions coding	Fault name	Type of fault	fault principle
S1r	pressure sensing device failure	Voltage Detection	Triplex detects pressure transducer 1 feedback voltage exceeded This fault occurs in the 0~5V range

move	methodologies	Inspection results	Treatment programm

			e
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays properly S1r	☐Yes ☐No	View historical faults
3	Measure the sensor for 5V input voltage	☐Yes ☐No	Check wiring from sensor to PLC
			
4	Measure whether the sensor feedback voltage is in the range of 0~5V Pressure(MPa) / Low Pressure Sensor Reverse Feed voltage (V) / High Pressure Sensing Feedback Voltage (V) 0~1.6 / 0.5~1.88 / 0.45~2.13 1.6~3.0 / 1.88~3.09 / 2.13~3.61 3.0~4.0 / 3.09~3.93 / 3.61~4.03	☐Yes ☐No	Check sensor to PLC feedback signal line
5	Replacement of the pressure sensor		

37 S2r Pressure sensor failure

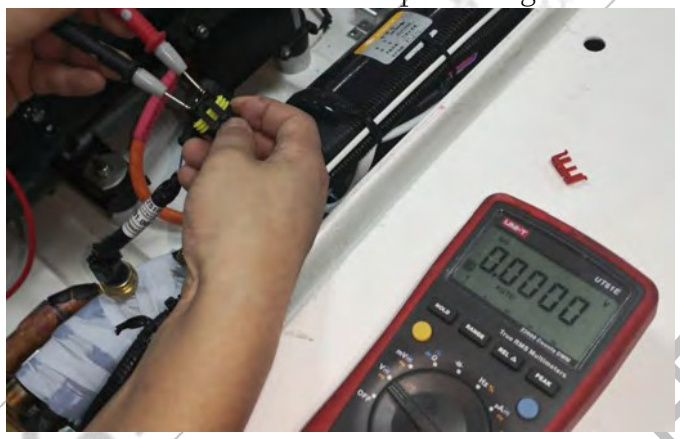
malfunctions coding	Fault name	Type of fault	fault principle
S2r	pressure sensing device	Voltage Detection	Triplex detects pressure transducer 1 feedback voltage exceeded This fault occurs in the 0~5V range

	failure		

move	methodologies	Inspection results	Treatment programme
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays properly **S2r**	☐Yes ☐No	View historical faults
3	Measure the sensor for 5V input voltage	☐Yes ☐No	Check wiring from Sensor 2 to PLC.
			
4	Measure whether the sensor feedback voltage is in the range of 0~5V	☐Yes ☐No	Check Sensor 2 to PLC feedback signal wire
5	Replacement of pressure sensor 2		

38 S3r Pressure sensor failure

malfunctions coding	Fault name	Fault type	fault principle
S3r	pressure sensing device failure	Voltage Detection	Triplex detects pressure transducer 3 feedback voltage exceeded This fault occurs in the 0~5V range

move	methodologies	Inspection results	Treatment programme
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays properly S3r	☐Yes ☐No	View historical faults
3	Measure the sensor for 5V input voltage 	☐Yes ☐No	Check wiring from Sensor 3 to PLC.
4	Measure whether the sensor feedback voltage is in the range of 0~5V	☐Yes ☐No	Check Sensor 3 to PLC feedback signal wire

Pressure (MPa)	Low Pressure Sensor Reverse Feed voltage (V)	High Pressure Sensing Feedback Voltage (V)
0~1.6	0.5~1.88	0.45~2.13
1.6~3.0	1.88~3.09	2.13~3.61
3.0~4.0	3.09~3.93	3.61~4.03

5	Replacement of pressure sensor 3		

39 S4r Pressure sensor failure

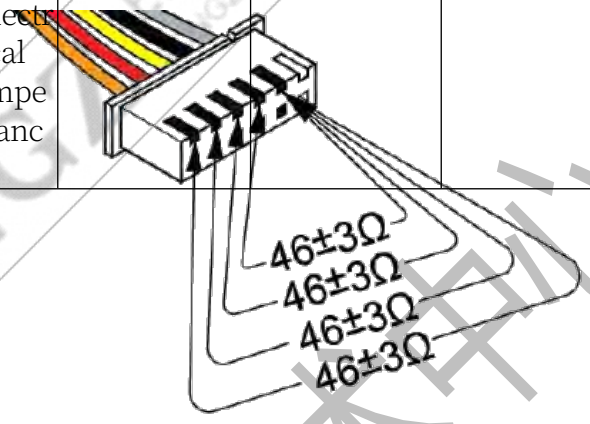
malfunctions coding	Fault name	Type of fault	fault principle
S4r	pressure sensing device failure	Pressure (MPa) / Low Pressure Sensor Reverse Feed voltage (V) Detection	High Pressure Sensing Feedback Voltage (V) / Triplex detects pressure transducer 4 feedback voltage exceeded This fault occurs in the 0~5V range
		0~1.6 / 0.5~1.88	0.45~2.13
		1.6~3.0 / 1.88~3.09	2.13~3.61
		3.0~4.0 / 3.09~3.93	3.61~4.03

move	methodologies	Inspection results	Treatment programme
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays properly **S4r**	☐Yes ☐No	View historical faults
3	Measure the sensor for 5V input voltage 	☐Yes ☐No	Check wiring from Sensor 4 to PLC.

<table>
<tr><td>4</td><td>Measure the sensor feedback voltage to see if it is within range</td><td>☐Yes ☐No</td><td>Check Sensor 4 to PLC feedback signal wire</td></tr>
<tr><td>5</td><td>Replacement of pressure sensor 4
<table>
<tr><th>Pressure (MPa)</th><th>Low Pressure Sensor Reverse Feed voltage (V)</th><th>High Pressure Sensing Feedback Voltage (V)</th></tr>
<tr><td>0~1.6</td><td>0.5~1.88</td><td>0.45~2.13</td></tr>
<tr><td>1.6~3.0</td><td>1.88~3.09</td><td>2.13~3.61</td></tr>
<tr><td>3.0~4.0</td><td>3.09~3.93</td><td>3.61~4.03</td></tr>
</table></td><td></td><td></td></tr>
</table>

40 UHF Electronic Expansion Valve Failure

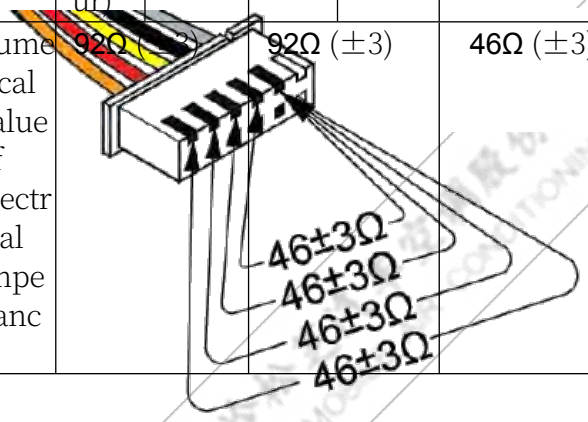
malfunctions coding	Fault name	Fault type	fault principle
UHF	electronic expansion valve failure	current detection	Three-in-one detection of electronic expansion valve coil output current overfan This fault occurs when you are surrounded by

move	methodologies	Inspection results	Treatment programme
1	Vehicle: power up and switch on to verify that the air conditioning control panel displays normally. HUF	☐Yes ☐No	View historical faults
2	Measuring electronic expansion valve coil 	☐Yes ☐No	Replace electronic expansion valve coil
3	Check and repair miswiring and short circuits between the PLC and the expansion valve coil.		

guide wire colour	Coil 1		Coil 2		common (use)
	orange	pink	porn ogra	ferrous	pessimistic (Neutral)
resistance (colour)			pink		
numerical value of electrical impedance	92Ω (±3)		92Ω (±3)		46Ω (±3)

41 F1r Electronic Expansion Valve 1 Fault

malfunctions coding	Fault name	Type of fault	fault principle
F1r	electronic expansion Valve 1 Failure	current detection	Three-in-one detection of electronic expansion valve coil output current overfan This fault occurs when you are surrounded by

<table>
<tr><th>move</th><th>methodologies</th><th>Inspection results</th><th>Treatment programme</th></tr>
<tr><td>1</td><td>Vehicle: Power up and switch on the vehicle to verify that the air-conditioning control panel displays normally F1r</td><td>☐Yes ☐No</td><td>View historical faults</td></tr>
<tr><td>2</td><td>Measuring electronic expansion valve coil resistance
<table>
<tr><td></td><td>Coil 1</td><td></td><td>Coils 2</td><td></td><td>common (use) (Neutral)</td></tr>
<tr><td>guide wire colour</td><td>orange (colour)</td><td>pink</td><td>porn ographic</td><td>ferrous</td><td>pessimistic</td></tr>
<tr><td>numerical value of electrical impedance</td><td>92Ω (±3)</td><td></td><td>92Ω (±3)</td><td></td><td>46Ω (±3)</td></tr>
</table>


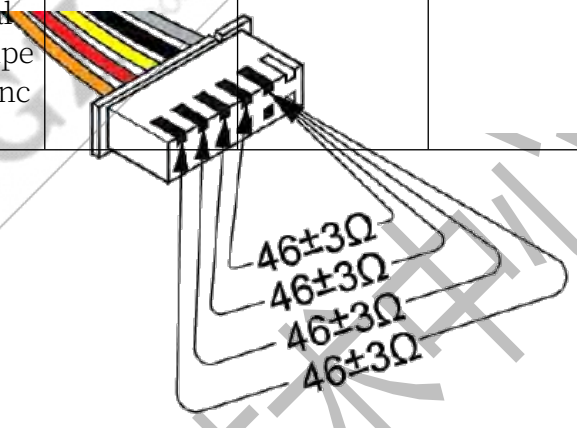
</td><td>☐Yes ☐No</td><td>Replace electronic expansion valve coil</td></tr>
<tr><td>3</td><td>Check and repair miswiring and short circuits between the PLC and the expansion valve coil.</td><td></td><td></td></tr>
</table>

42 F2r Electronic Expansion Valve 2 Fault

malfunctions coding	Fault name	Type of fault	fault principle
F2r	electronic expansion Valve 2 Failure	current detection	Three-in-one detection of electronic expansion valve coil output current overfan This fault occurs when you are surrounded by

move	methodologies	Inspection results	Treatment programme
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays normally F2r	☐Yes ☐No	View historical faults
2	Measuring electronic expansion valve coil resistance	☐Yes ☐No	Replace electronic expansion valve coil
3	Check and repair miswiring and short circuits between the PLC and the expansion valve coil.		

	Coil 1	Coils 2	common (use) (Neutral)
guide wire colour	orange (colour)	pink porn ographic	ferrous pessimistic
numerical value of electrical impedance	92Ω (±3)	92Ω (±3)	46Ω (±3)



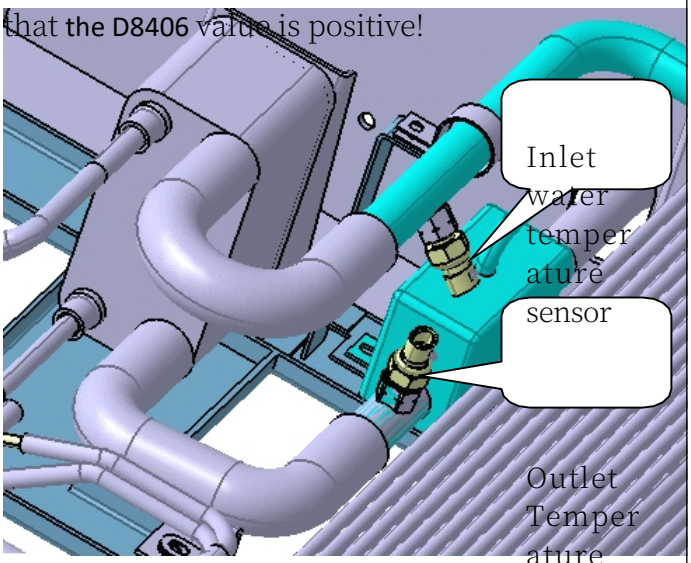
43 F3r Inefficient Water Circulation Failure

malfunctions	Fault name	Type of fault	fault principle
coding			
F3r	Failure of inefficient water circulation	logical judgement	When D8405 is detected to be less than 10°C after 3 min of operation and D8406 minus D8405 is greater than 10°C for 20S, this condition occurs. malfunctions

move	methodologies	Inspection results	Treatment programme
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays normally F3r	☐ No. Yes.	View historical faults
2	Take the manifold pressure gauge tube in forced plate change mode and drain the valve core at the plate change to see if any water comes out. 	☐ No. Yes.	Check that the pump is running
3	Observe the status of the drainage tube to see if it appears to be columnar and flows out forcefully	☐ No. Yes.	Continuously empty the drain tube until the drainage is columnar

44 F4r Water inlet and outlet reverse connection fault

malfunctions coding	Fault name	Type of fault	fault principle
F4r	Water inlet and outlet reverse polarity fault	logical judgement	Detecting D8406 is greater than D8407 after 3min operation and the difference value Failure occurs when the temperature is greater than 1.5°C

move	methodologies	Inspection results	Treatment programme
1	Vehicle: power up and switch on the vehicle to verify that the air conditioning control panel displays normally F4r	☐Yes ☐No	View historical faults
2	Unplug the water temperature sensor and check that the D8406 value is positive!  	☐Yes ☐No	Inlet and outlet water temperature sensors are reversed.

3	Observe the inlet and outlet water temperature D8406, D8407 values for multiple runs for any changes.	□Yes □No	Replacement of sensors with no value change
4	Communicate and assist vehicle personnel in making corrections to the water system		

45PFF Water pump failure

malfunctions coding	Fault name	Type of fault	fault principle	Component Monitoring
PFF	Water pump failure	Switch type faults	When the PLC monitors the X03 status OFF This fault occurs when (pump 0V feedback)	X0003
			When the PLC monitors the X03 state ON This fault occurs (pump 24V feedback)	

move	methodologies	Inspection results	operating method
1	Vehicle: Power on and verify that the air conditioning control panel displays PFF normally.	□Yes □No	View historical faults
2	Measure for 24V input to pump in 777 (forced plate change) mode.	□Yes □No	Check and repair wiring and fuses

<table>
<tr><td>3</td><td>Pump operation with 24V input</td><td>☐Yes ☐No</td><td>Replacement of water pumps</td></tr>
<tr><td>4</td><td>Take the manifold pressure gauge tube in forced plate change mode and drain the valve core at the plate change to see if any water comes out.
  </td><td>☐Yes ☐No</td><td>Purge air from the water system</td></tr>
<tr><td>5</td><td>Test whether the current during pump operation ≤ rated power/27</td><td>☐Yes ☐No</td><td>Check and remove water line blockages</td></tr>
<tr><td>6</td><td>SOP-20 Check that the X0003 status is consistent with the feedback signal.
<table><tr><td>Pump Feedback Signal</td><td>X0003 Status</td></tr><tr><td>0V or Suspended</td><td>OFF</td></tr><tr><td>24V</td><td>ON</td></tr></table></td><td>☐Yes ☐No</td><td>Check and repair the line between the pump feedback signal and PLC pin X03. kind</td></tr>
<tr><td>7</td><td>Replacement of water pumps</td><td></td><td></td></tr>
</table>

46LLF Liquid Level Fault

malfunctions coding	Fault name	Type of fault	fault principle	Component Monitoring
LLF	Liquid level failure	Switch type faults	When the PLC monitors the X01 status OFF This fault occurs when (normally closed)	X0001
			When the PLC monitors the X01 state ON This fault occurs (normally open)	

move	methodologies	Inspection results	operating method
1	Vehicle: power up and switch on the vehicle to verify that the air-conditioning control panel displays LLF normally.	☐Yes ☐No	View historical faults
2	Check that the kettle level is not below the lower limit when the pump is running	☐Yes ☐No	
3	Measurement level switch with or without 24V input (electric switch)	☐Yes ☐No	Check and repair the level switch and PLC (X01, (DCM) interline kind
4	SOP-20 Check that the X0001 status matches the level switch status. The above table is for normally closed level	☐Yes ☐No	Check and repair the level switch and PLC

Level switch status	X0001 Status	fault state
turn off	OFF	malfunctions
short circuit	ON	normalcy

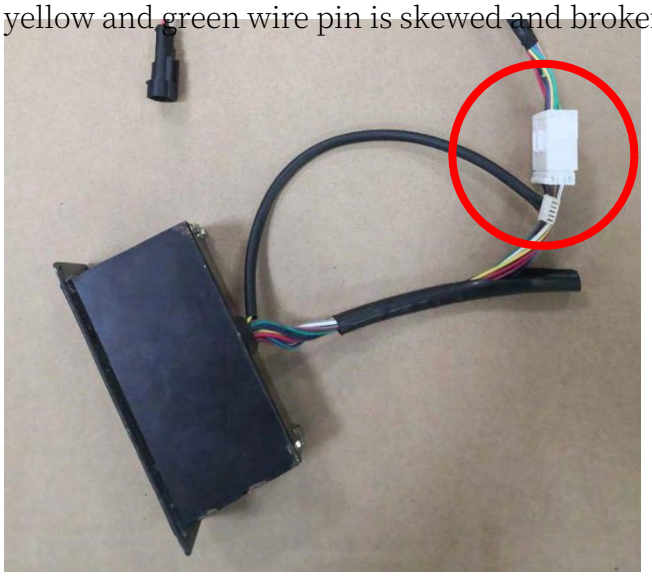
	switches, normally open type fault status is the opposite of this		(Interline (X01, DCM)
5	Replacement of level switch		

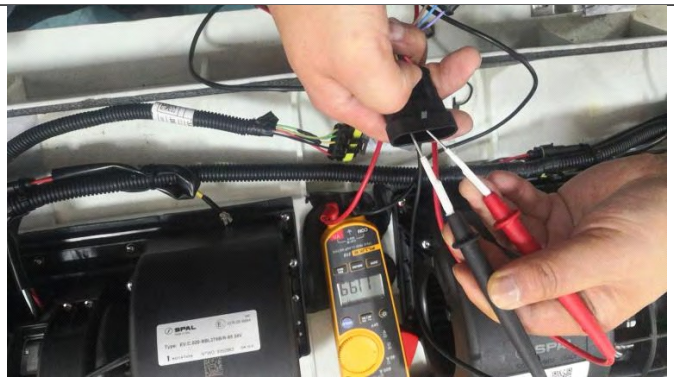
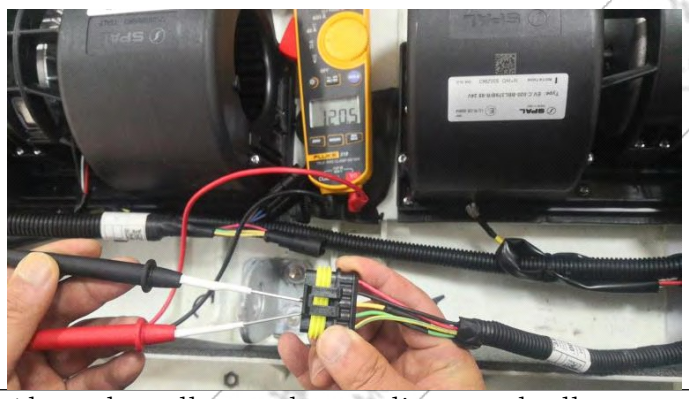
V. Three-in-one troubleshooting (single electronic)

1 EC1 Overhead Controller and Panel Communication Failure

malfunctions coding	Fault name	Fault type	fault principle
EC1	Top-mounted controller with panel malfunction of communications	Communication faults	This fault occurs continuously when the overhead controller does not receive the manipulator message for 1min consecutively.

move	methodologies	Inspection results	Treatment programme

1	Whether the manipulator plug connection is normally connected and reliable, whether the yellow and green wire pin is skewed and broken 	☐Yes ☐No	Reconnect or replace the wiring harness
2	Check that the manipulator harness in the duct is intact and not broken (pay special attention to the bolt mounting position)	☐Yes ☐No	Repair or Replacement of Wiring Harness
3	Check that the manipulator harness is properly and reliably connected to the overhead connection 	☐Yes ☐No	Repair or Replacement of Wiring Harness
4	Disconnect the manipulator harness from the top unit and measure the resistance between the yellow and green wires at the manipulator end to see if it is 100~150Ω (communication resistance 120Ω).	☐Yes ☐No	Replacing the manipulator harness

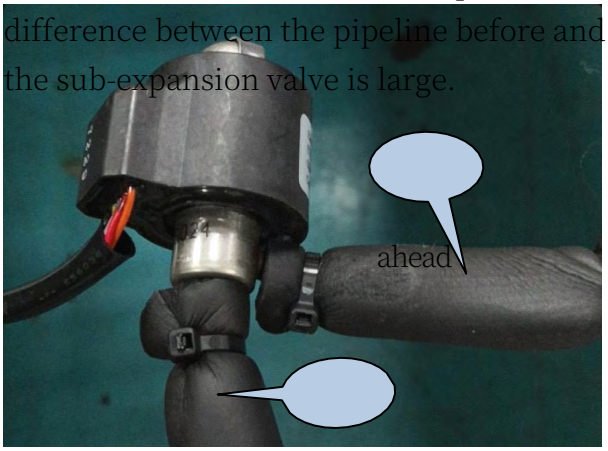
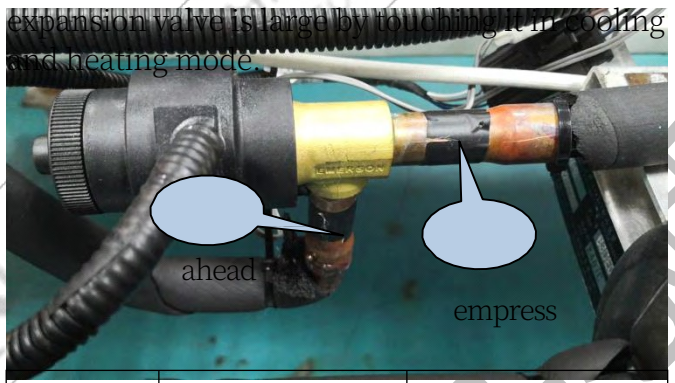
			
5	Disconnect the manipulator harness from the top unit and measure the resistance between the yellow and green wires at the top unit end for abnormality 100~150Ω (120Ω) 	☐Yes ☐No	
6	Along the yellow and green lines gradually check to the top controller, the intermediate line is intact, reliable connections 	☐Yes ☐No	
7	Connect a low-voltage filter in series with the 24V power input of the manipulator and separate the manipulator harness from the high-voltage harness in the air duct, and try for a period of time to see if the fault no longer occurs.	☐Yes ☐No	Low-voltage filters in series with top controller inputs

2 LPF Low Pressure Failure Check

malfunctions coding	Fault name	Type of fault	fault principle	Component Monitoring
LPF	low pressure malfunctions	Pressure monitoring block	When the low pressure is below 0.05MPa This fault occurs when	D0564 (CV800 model)

move	methodologies	Inspection results	operating method
1	Vehicle: Power up and switch on the vehicle to verify that the air-conditioning control panel displays LPH normally. trouble code	☐Yes ☐No	View historical faults
2	Tap into a manifold pressure gauge to see if the system balance pressure is within range	☐Yes ☐No	Insufficient or leaking system refrigerant, check for leaks and refill.

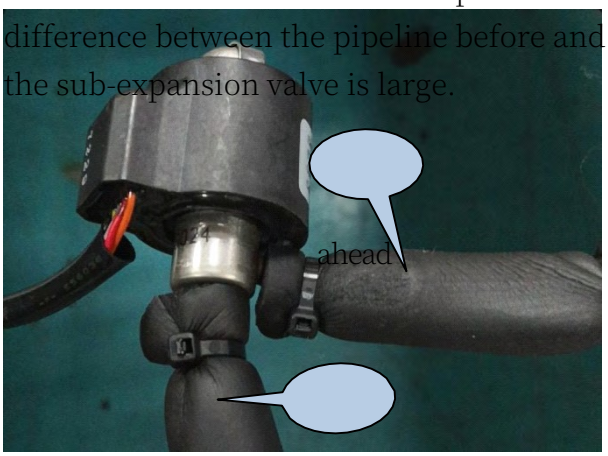
	R410A	R407C
0~10℃	5~8Bar	3~6Bar
10~30℃	8~18Bar	6~13Bar

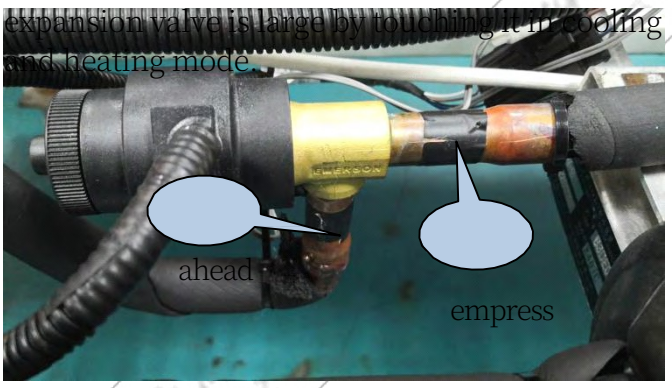
3 Integrated Electrical pool Management System	Touch to check whether the temperature difference between the pipeline before and after the sub-expansion valve is large.  	☐Yes ☐No	Check that the secondary electronic expansion valve operates correctly when re-powering up the unit.
4	Whether the cooling and heating modes can be activated properly	☐Yes ☐No	Check low pressure sensor
5	Check whether the condensing and evaporating fans are operating normally and the air is strong.		Replacement of the corresponding
		☐Yes ☐No	ventilator
6	Check whether the temperature difference between the front and back of the main expansion valve is large by touching it in cooling and heating mode.  The diagram shows the cooling mode and the opposite for the heating mode.	☐Yes ☐No	System clogged or main electronic expansion valve not opening

	R410A	R407C
0~10℃	5~8Bar	3~6Bar
10~30℃	8~18Bar	6~13Bar

3 HPF High Pressure Failure Check

malfunctions coding	Fault name	Type of fault	fault principle	Component Monitoring
HPF	High pressure malfunctions	Pressure monitoring block	When the high pressure is higher than 2.8MPa This fault occurs when	D0562 (CV800 model)

move	methodologies	Inspection results	operating method
1	Vehicle: Power on and verify that the air-conditioning control panel displays HPF normally. trouble code	☐Yes ☐No	View historical faults
2	Tap into a manifold pressure gauge to see if the system balance pressure is within range	☐Yes ☐No	System refrigerant overload
3 Integrated Electrical pool Management System	Touch to check whether the temperature difference between the pipeline before and after the sub-expansion valve is large.  empress	☐ No. Yes.	Check that the secondary electronic expansion valve operates correctly when re-powering up the unit.
4	Whether the cooling and heating modes can be activated properly	☐ No. Yes.	Check low pressure switch

5	Check whether the condensing and evaporating fans are operating normally and the air is strong.	☐ No. Yes.	Replacement of the corresponding fan
6	Check whether the temperature difference between the front and back of the main expansion valve is large by touching it in cooling and heating mode.  The diagram shows the cooling mode and the opposite for the heating mode.	☐ No. Yes.	System clogged or main expansion valve not opening

4 C7H Compressor discharge temperature protection

malfunctions coding	Fault name	Type of fault	fault principle	Component Monitoring
C7H	Compressor discharge temperature protection	Switch type faults	When the monitored temperature exceeds 103°C, the protective switch opens and this fault occurs.	X0001

move	methodologies	Inspection results	operating method

1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays normally C7H	☐Yes ☐No	View historical faults
2	Check if X0001 is OFF	☐Yes ☐No	Replacement of 3-in-1
3	Measurement of the protection switch for 24V input Compressor outside temperature: <103°C — Protection switch status: conduction Compressor outside temperature: >103°C — Protection switch status: turn off (electric switch)	☐Yes ☐No	Check and repair the protection switch and PLC interline
4	~~Measurement of protective switches for compliance~~	☐Yes ☐No	Replacement of exhaust gas temperature protection switch
5	Check and repair the wiring between PLC pin X0001 and the protection switch.		

5 P1r Compressor 1 exhaust temperature protection

malfunctions coding	Fault name	Type of fault	fault principle	Component Monitoring
P1r	Compressor 1 Discharge temperature	Switch type faults	Disconnect when monitoring temperature exceeds 103°C	X0001

	protection			

move	methodologies	Inspection results	operating method
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays P1r normally. Compressor outside temperature / Protection switch status <103°C / conduction >103°C / turn off (electric switch)	☐Yes ☐No	View historical faults
2	Check if X0001 is OFF	☐Yes ☐No	Replacement of 3-in-1
3	Measurement of the protection switch for 24V input		examine and fix
		☐Yes ☐No	Duplex protection switch with PLC interline
4	Measurement of protective switches for compliance	☐Yes ☐No	Replacement of exhaust gas temperature protection switch
5	Check and repair the wiring between PLC pin X0000 and the protection switch.		

6 P2r Compressor 2 exhaust temperature protection

malfunctions codin	Fault name / Type of fault / fault principle Compressor outside temperature / Protection switch status <103°C / conduction >103°C / turn off (electric switch)	Component Monitoring

g				
P2r	Compressor 2 Discharge Temperature Protection	Switch type faults	Disconnect when the monitored temperature is greater than 103°C	X0001 (PLC2)

move	methodologies	Inspection results	operating method
1	Vehicle: Power up and switch on the vehicle to verify that the air-conditioning control panel displays P2r normally.	☐Yes ☐No	View historical faults
2	Check if X0001 is OFF	☐Yes ☐No	Replacement of 3-in-1
3	Measurement of the protection switch for 24V input	☐Yes ☐No	Check and repair the protection switch and PLC interline
4	Measurement of protective switches for compliance Compressor outside temperature / Protection switch status <103°C / conduction ＞103°C / turn off (electric switch)	☐Yes ☐No	Replacement of exhaust gas temperature protection switch
5	Check and repair the wiring between PLC pin X0000 and the protection switch.		

7 P3r Compressor 3 Exhaust temperature protection

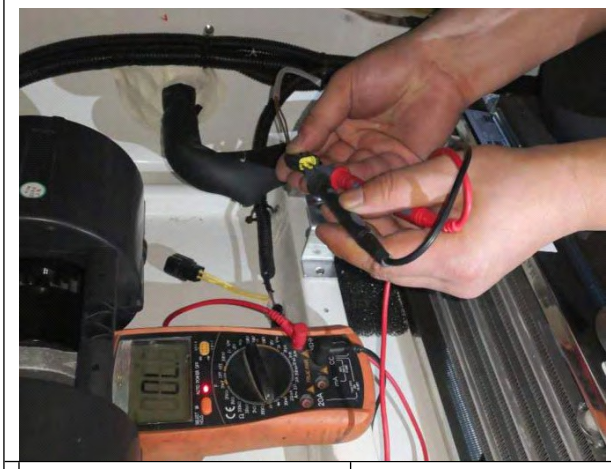
malfunctions coding	Fault name	Type of fault	fault principle	Component Monitoring
P3r	Compressor 3 exhaust temperature protection	Switch type faults	Disconnect when monitoring temperature exceeds 103°C	X0001 (PLC3)

move	methodologies	Inspection results	operating method
1	Vehicle: power up and switch on the vehicle to verify that the air conditioning control panel displays normally P3r	☐Yes ☐No	View historical faults
2	Check if X0001 is OFF	☐Yes ☐No	Replacement of 3-in-1
3	Measurement of the protection switch for 24V input	☐Yes ☐No	Check and repair the protection switch and PLC interline
4	Measurement of protective switches for compliance	☐Yes ☐No	Replacement of exhaust gas temperature protection switch
5	Check and repair the wiring between PLC pin X0001 and the protection switch.		

8 POH PTC overheat protection

malfunctions coding	Fault name	Type of fault	fault principle	Component Monitoring
POH	PTC overheating protection fault	switchgear	When the PLC monitors the PTC overheat protection open, the PLC will detect the PTC overheat protection open. This fault occurs when the switch is turned on	X0004

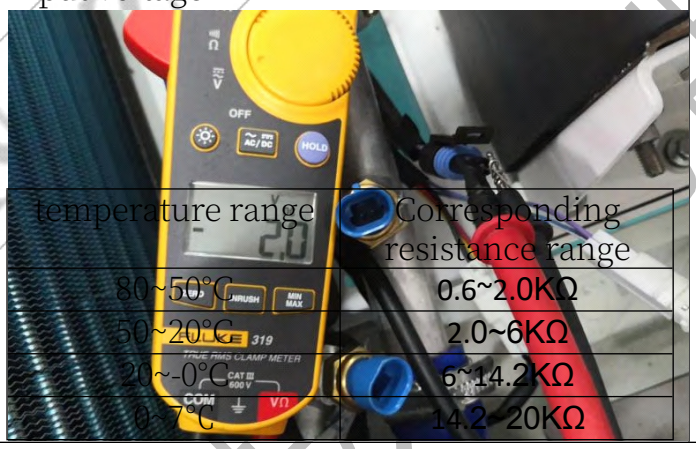
move	methodologies	Test results	operating method
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays POH normally. trouble code	☐Yes ☐No	View historical faults
2	Check if X0004 is OFF	☐Yes ☐No	Replacement of 3-in-1

3	Measure the PTC temperature control switch with a multimeter for compliance.  PTC Temperature / Temperature control switch status <150°C / conduction ＞150°C / turn off (electric switch)	☐Yes ☐No	Replacement of PTC
4	Measurement of PTC temperature control protection switch for 24V input	☐Yes ☐No	Check wiring between temperature control switch and PLC

9 EII0 Faulty front steam defrost temperature sensor

malfunctions coding	Fault name	Type of fault	temperature range / Corresponding resistance range	Component Monitoring
		80~50°C	0.6~2.0KΩ	
		50~20°C	2.0~6KΩ	
		20~-0°C	6~14.2KΩ	
		0~7°C	14.2~20KΩ	

EII0	Return air temperature sensor failure	Resistance detection class	This condition occurs when the PLC detects that the resistance of the return air temperature sensor is out of the range of 0.6~108KΩ. malfunctions	

move	methodologies	Test results	operating method
1	Vehicle: Power on and verify that the air conditioning control panel displays **EII0** normally. trouble code	☐Yes ☐No	View historical faults
2	Multimeter to measure if the return air temperature sensor resistance is within range	☐Yes ☐No	Replacement of temperature sensor
3	Measure the sensor with a multimeter for 2V input voltage.  temperature range / Corresponding resistance range 80~50℃ / 0.6~2.0KΩ 50~20℃ / 2.0~6KΩ 20~0℃ / 6~14.2KΩ 0~-7℃ / 14.2~20KΩ	☐Yes ☐No	Check and repair wiring between sensor and controller

10 EII1 Return air temperature sensor failure

malfunctions coding	Fault name	Type of fault	fault principle	Component Monitoring
EII1	Return air temperature sensor failure	Resistance detection class	This condition occurs when the PLC detects that the resistance of the return air temperature sensor is out of the range of 0.6~108KΩ. malfunctions	D8402

move	methodologies	Test results	operating method
1	Vehicle: power up and switch on the vehicle to verify that the air-conditioning control panel displays **EII1** normally. trouble code	☐Yes ☐No	View historical faults
2	Multimeter to measure if the return air temperature sensor resistance is within range	☐Yes ☐No	Replace the return air temperature sensor

3	Measure the sensor with a multimeter for 2V input voltage. 	☐Yes ☐No	Check and repair wiring between sensor and controller

11 EII2 Evaporator left defrost temperature sensor failure

malfunctions coding	Fault name	Type of fault	fault principle	Component Monitoring
EII2	Evaporator left defrost temperature sensing device failure	Resistance detection class	This condition occurs when the PLC detects that the resistance of the return air temperature sensor is out of the range of 0.6~108KΩ. malfunctions	D8403

move	methodologies	Test results	operating method
1	Vehicle: power up and switch on the vehicle to verify that the air conditioning control panel displays normally. trouble code	☐Yes ☐No	View historical faults

temperature range	Corresponding **EII2** resistance range
-30~50°C	0.6~2.0KΩ
50~20°C	2.0~6KΩ
20~-0°C	6~14.2KΩ
0~7°C	14.2~20KΩ

2	Multimeter to measure if temperature sensor resistance is within range	☐Yes ☐No	Replacing the Left Defrost Temperature Sensor
3	Measure the sensor with a multimeter for 2V input voltage. 	☐Yes ☐No	Check and repair wiring between sensor and controller

12 EII3 Evaporator right defrost temperature sensor failure

malfunctions coding	Fault name	Type of fault	fault principle	Component Monitoring
EII3	Evaporator right defrost temperature sensing device failure	Resistance detection class	This condition occurs when the PLC detects that the resistance of the return air temperature sensor is out of the range of 0.6~108KΩ.	D8404

temperature range	Corresponding resistance range
80~50°C	0.6~2.0KΩ
50~20°C	2.0~6KΩ
20~-0°C	6~14.2KΩ
0~7°C	14.2~20KΩ

move	methodologies	Test results	operating method

1	Vehicle: power up and switch on the vehicle to verify that the air-conditioning control panel displays **EII3** normally. trouble code	☐Yes ☐No	View historical faults
2	Multimeter to measure if the return air temperature sensor resistance is within range	☐Yes ☐No	Replace the return air temperature sensor
3	Measure the sensor with a multimeter for 2V input voltage. 	☐Yes ☐No	Check and repair wiring between sensor and controller

13 EII4 Outdoor temperature sensor failure

malfunctions coding	Fault name	Type	Fault principle	Component Monitoring
EII4	Outdoor temperature sensor failure	Resistance detection class	This condition occurs when the PLC detects that the resistance of the return air temperature sensor is out of the range of 0.6~108KΩ.	D8401

temperature range	Corresponding resistance range
80~50°C	0.6~2.0KΩ
50~20°C	2.0~6KΩ
20~-0°C	6~14.2KΩ
0~7°C	14.2~20KΩ

			malfunctions	

move	methodologies	Test results	operating method
1	Vehicle: power up and switch on the vehicle to verify that the air-conditioning control panel displays **EII4** normally. trouble code	☐Yes ☐No	View historical faults
2	Multimeter to measure if the outdoor temperature sensor resistance is within range	☐Yes ☐No	Replacement of Outdoor Temperature Sensor
3	Measure the sensor with a multimeter for 2V input voltage.  	☐Yes ☐No	Check and repair wiring between sensor and controller

temperature range	Corresponding resistance range
80~50°C	0.6~2.0KΩ
50~20°C	2.0~6KΩ
20~-0°C	6~14.2KΩ
0~7°C	14.2~20KΩ

14 EII5 Faulty condensate coil temperature sensor

malfunctions	Fault name	Type of fault	fault principle	Component Monito

codin g				ring
EII5	Condensation coil temperature sensor failure	numeric al value of electrical impedan ce phylogen y	When the PLC monitors the condensation temperature sensor resistance value, the PLC will detect the condensation temperature sensor resistance value. This fault occurs when the range of 0.6~108KΩ is exceeded.	D8400

move	methodologies	Test results	operating method
1	Vehicle: Power up and switch on the vehicle to verify that the air-conditioning control panel displays **EII5** normally. trouble code	☐Yes ☐No	View historic al faults
2	Measure condensing coil temperature sensor resistance with a multimeter to see if it is within range.	☐Yes ☐No	Replace condens ing coil tempera ture sensor
3	Measure the sensor with a multimeter for 2V input voltage. 	☐Yes ☐No	Check and repair wiring between sensor and controll er

15 EII6 Plate change inlet water temperature sensor failure

malfunctions coding	Fault name	Type of fault	fault principle	Component Monitoring
EII6	Faulty inlet water temperature sensor	Resistance detection class	This fault occurs when the PLC detects that the resistance of the inlet water temperature sensor is out of the range of 0.6~108KΩ.	D0332

move	methodologies	Test results	operating method
1	Vehicle: Power up and switch on the vehicle to verify that the air-conditioning control panel displays **EII6** normally. trouble code	☐Yes ☐No	
2	Multimeter to measure if the water temperature sensor resistance is within range	☐Yes ☐No	Replacement of water outlet temperature sensor

temperature range	Corresponding resistance range
40~50℃	1.2~0.9KΩ
20~40℃	2.6~1.2KΩ
0~20℃	6~2.6KΩ

3	Measure the sensor with a multimeter for 2V input voltage. 	☐Yes ☐No	Check and repair the wiring between the sensor and the manipulator

16 EII7 Board swap water temperature sensor failure

malfunctions coding	Fault name	Type of fault	fault principle	Component Monitoring
EII7	Failure of board exchange water temperature sensor	Resistance detection class	PLC detects sensor resistance exceeding 0.6~108KΩ range of faults block	D0336

move	methodologies	Test results	operating method
1	Vehicle: Power up and switch on the vehicle to verify that the air-conditioning control panel displays **EII7** trouble code normally. temperature range / Corresponding resistance range 40~150℃ / 1.2~0.9KΩ 20~40℃ / 2.6~1.2KΩ 0~20℃ / 6~2.6KΩ	☐Yes ☐No	View historical faults

2	Multimeter to measure if the water temperature sensor resistance is within range	☐Yes ☐No	Replacement of water outlet temperature sensor
3	Measure the sensor with a multimeter for 2V input voltage. 	☐Yes ☐No	Check and repair the wiring between the sensor and the manipulator

17 H1r Main circuit 1 Return air temperature sensor failure

malfunctions coding	Fault name	Type of fault	fault principle	Component Monitoring
H1r	Main circuit 1 Return air temperature sensor failure	Resistance detection class	PLC detects sensor resistance exceeding 0.6~108KΩ range of faults	D8405

temperature range	Corresponding resistance range	block
80~50°C	0.6~2.0KΩ	
50~20°C	2.0~6KΩ	
20~-0°C	6~14.2KΩ	
0~7°C	14.2~20KΩ	

move	methodologies	Test results	operating method
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays normally **H1r** trouble code	☐Yes ☐No	View historical faults

2	Multimeter to measure if temperature sensor resistance is within range	☐Yes ☐No	Replace the main circuit 1 return air temperature sensor

3	Measure the sensor with a multimeter for 2V input voltage. 	☐Yes ☐No	Check and repair wiring between sensor and controller

18 H2r Main circuit 2 Return air temperature sensor failure

malfunctions coding	Fault name	Type of fault	fault principle	Component Monitoring
H2r	Main circuit 2 Return air temperature sensor failure	Resistance detection class	PLC detects sensor resistance exceeding 0.6~108KΩ range of faults block	

move	methodologies	Test results	operating method
1	Vehicle power up and switch on to verify that the air-conditioning control panel displays normally **H2r** trouble code temperature range / Corresponding resistance range 80~50°C / 0.6~2.0KΩ 50~20°C / 2.0~6KΩ 20~-0°C / 6~14.2KΩ 0~7°C / 14.2~20KΩ	☐Yes ☐No	View historical faults
2	Multimeter to measure if temperature sensor resistance is within range	☐Yes ☐No	Replace main circuit 2 return air temperature sensor

3	Measure the sensor with a multimeter for 2V input voltage. 	☐Yes ☐No	Check and repair wiring between sensor and controller

19 H3r Sub-circuit 1 Return air temperature sensor failure

malfunctions coding	Fault name	Type of fault	fault principle	Component Monitoring
H3r	Sub-circuit 1 Return air temperature sensor failure	Resistance detection class	PLC detects sensor resistance exceeding 0.6~108KΩ range of faults block	

move	methodologies		Test results	operating method
1	Vehicle: power up and switch on to verify that the air-conditioning control panel displays the fault code **H3r** trouble code		☐Yes ☐No	
	temperature range	Corresponding resistance range		
	80~50°C	0.6~2.0KΩ		
	50~20°C	2.0~6KΩ		
	20~-0°C	6~14.2KΩ		
	0~7°C	14.2~20KΩ		
2	Multimeter to measure if temperature sensor resistance is within range		☐Yes ☐No	Replacement of sub-circuit 1 return air temperature sensor

3	Measure the sensor with a multimeter for 2V input voltage. 	☐Yes ☐No	Check and repair wiring between sensor and controller

20 H4r Sub-circuit 2 Return air temperature sensor failure

malfunctions coding	Fault name	Type of fault	fault principle	Component Monitoring
H4r	Sub-circuit 2 Return air temperature sensor failure	Resistance detection class	PLC detects sensor resistance exceeding 0.6~108KΩ range of faults block	

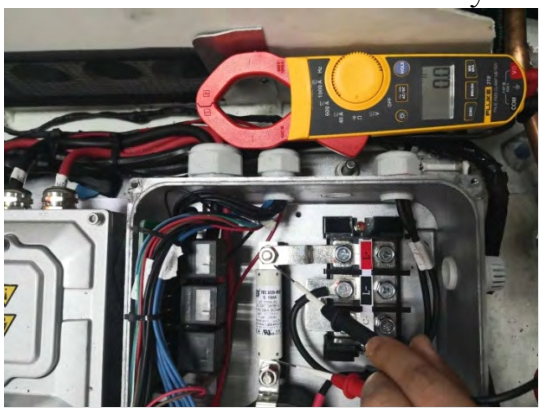
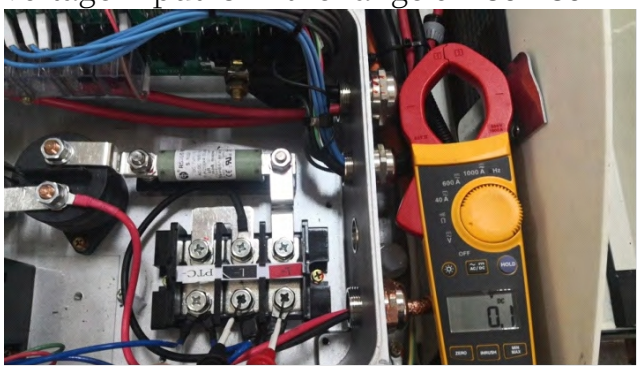
move	methodologies		Test results	operating method
1	Vehicle: power up and switch on to verify that the air-conditioning control panel displays the fault trouble code **H4r**		☐Yes ☐No	
	temperature range	Corresponding resistance range		
	80~50°C	0.6~2.0KΩ		
	50~20°C	2.0~6KΩ		
	20~-0°C	6~14.2KΩ		
	0~7°C	14.2~20KΩ		

2	Multimeter to measure if the return air temperature sensor resistance is within range	☐Yes ☐No	Replace the return air temperature sensor
3	Measure the sensor with a multimeter for 2V input voltage. 	☐Yes ☐No	Check and repair wiring between sensor and controller

21 HUF High Voltage Input Power Failure Check

malfunctions coding	Fault name	Type of fault	fault principle
HUF	High-voltage input disconnection fault	Voltage Inspection	This fault occurs when the input voltage for load-side detection is less than 400V.

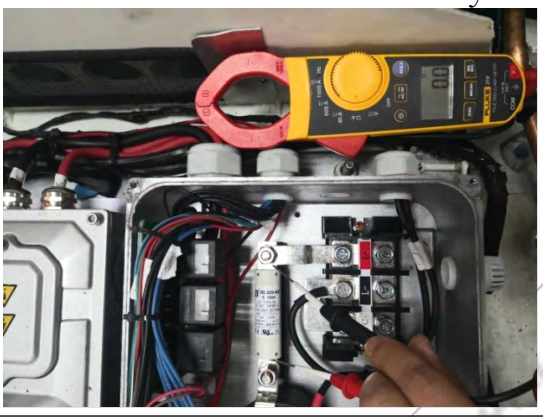
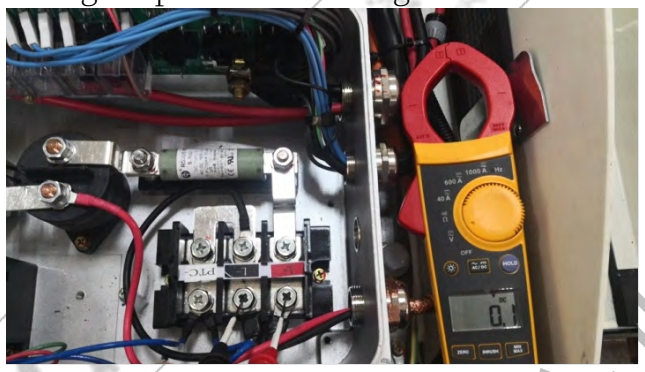
move	methodologies	Test results	operating method

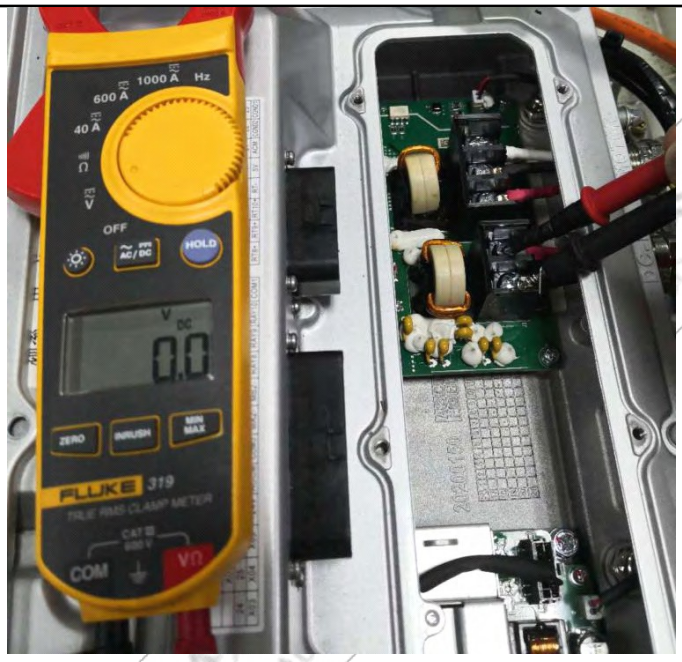
1	Vehicle: power up and switch on to verify that the air conditioning control panel displays normally. **HUF** Fault Code	☐Yes ☐No	View historical faults
2	Measurement of fuse continuity 	☐Yes ☐No	Replacement of fuses
3	Measure whether the air conditioner high voltage input is in the range of 450~750V. 	☐Yes ☐No	Check the air-conditioning insurance at the vehicle end Contact the vehicle manufacturer to restore air-conditioning power if necessary

4	Measure whether the input voltage of 3-in-1 is between 450~750V. 	☐Yes ☐No	Check main contactor weak coil and input voltage
5	Replace the 3-in-1 and try to run for a period of time whether the fault no longer occurs	☐Yes ☐No	

22 LU Inverter undervoltage

malfunctions coding	Fault name	Type of fault	fault principle
LU	Inverter undervoltage fault	Voltage Detection	This fault occurs when the input voltage is detected to be less than 300V at the load side during operation.

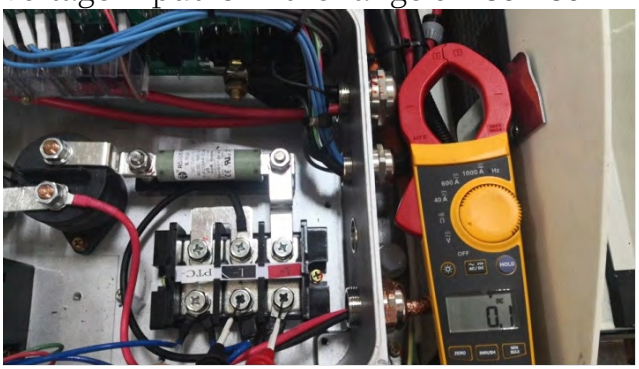
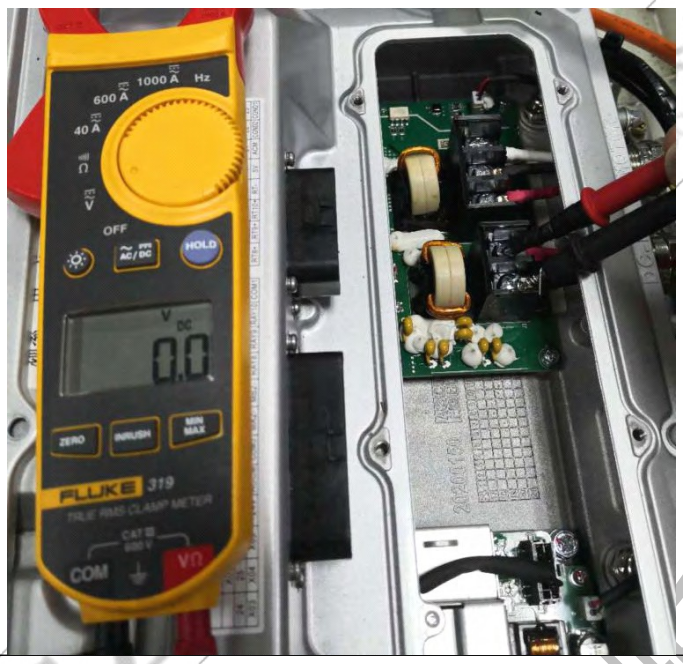
move	methodologies	Test results	operating method
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays normally **LU** trouble code	☐ No. Yes.	
2	Measurement of fuse continuity 	☐ No. Yes.	Replacement of fuses
3	Measure whether the air conditioner high voltage input is in the range of **450~750V**. 	☐ No. Yes.	Check the air-conditioning insurance of the whole vehicle Contact the vehicle manufacturer to restore the air-conditioning power supply if necessary

4	Measure whether the input voltage of 3-in-1 is between 450~750V.	☐ No. Yes.	Check main contactor weak coil and input voltage
			
5	Replace the 3-in-1 and try to run for a period of time, whether the fault no longer occurs	☐Yes ☐No	

23 OU Inverter overvoltage

malfunctions coding	Fault name	Type of fault	fault principle
OU	Inverter over pressure failure	Voltage Detection resemble	This fault occurs when an input voltage higher than 750V is detected on the load side during operation.

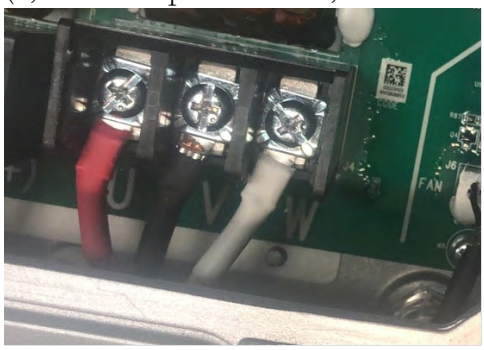
move	methodologies	Test results	operating method
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays **OU** normally**.** trouble code	☐Yes ☐No	View historical faults

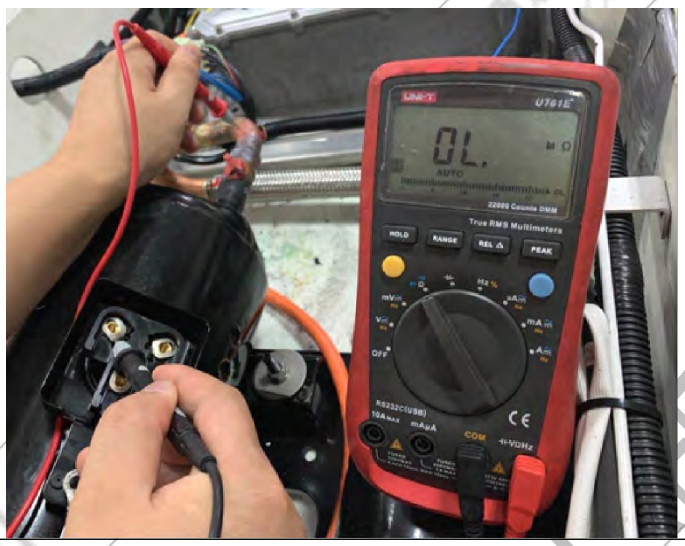
2	Measure whether the air conditioner high voltage input is in the range of 450~750V. 	☐Yes ☐No	
3	Measure whether the input voltage of 3-in-1 is between 450~750V. 	☐Yes ☐No	Rehabilitation of intermediate routes
4	Replacement of 3-in-1		

24 COC Compressor Inverter Overcurrent

malfunctions coding	Fault name	Type of fault	fault principle
COC	Compressor variants	current detection resemble	When the inverter detects that the compressor turn-to-turn current exceeds the setting

	Frequency converter overcurrent		This fault occurs when the maximum value

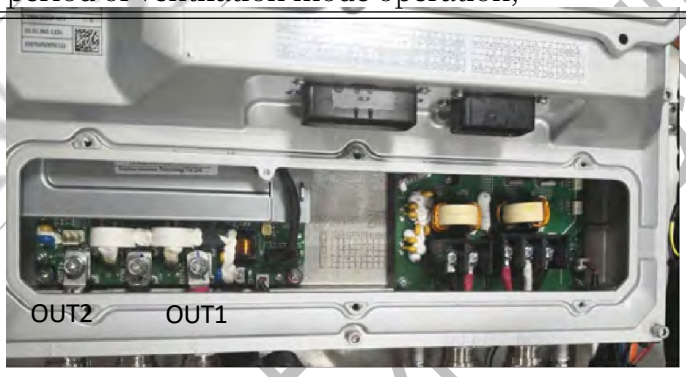
move	methodologies	Inspection results	Treatment programme
1	Vehicle: power up and switch on the vehicle to verify that the air conditioning control panel is displaying **COC** normally**.**	☐Yes ☐No	View historical faults
2	No abnormal noise during compressor operation	☐Yes ☐No	
3	Check compressor wiring connections for reliable connections and correct wire sequence (U.), (V, W correspond to red, black and white) 	☐Yes ☐No	Tighten connections or correct wiring sequence
4	Check that the compressor three-phase wiring is intact, no damage, short circuit	☐Yes ☐No	Repair or replacement of wiring

5	Measure the compressor turn-to-turn resistance, three lines of two measurements, three groups of resistance value is equal and less than 10Ω 	☐Yes ☐No	Replacement of compressor
6	Multimeter to measure whether the resistance between the compressor phase line and the shell is more than 5MΩ. 	☐Yes ☐No	Replacement of compressor
7	Replacement method, replace the three-in-one, test run for a period of time, whether the fault no longer occurs	☐Yes ☐No	Replacement of compressor

25 LOC condensing fan inverter overcurrent

malfunctions coding	Fault name	Type of fault	fault principle
LOC	Condensing fan inverter over stream of water or sth. resembling one	Current detection class	This fault occurs when the triplex detects a DC output current greater than 100A

move	methodologies	Inspection results	Treatment programme
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays properly **LOC** trouble code	☐Yes ☐No	View historical faults
2	Check the appearance of the fan is intact, no damage, no blockage, fan blade rotation freely	☐Yes ☐No	Replace or remove the blockage
			
3	Check the condensing fan line connections, whether the connection is reliable, no skewed plugs, back pins	☐Yes ☐No	Tighten connections or correct wiring sequenc

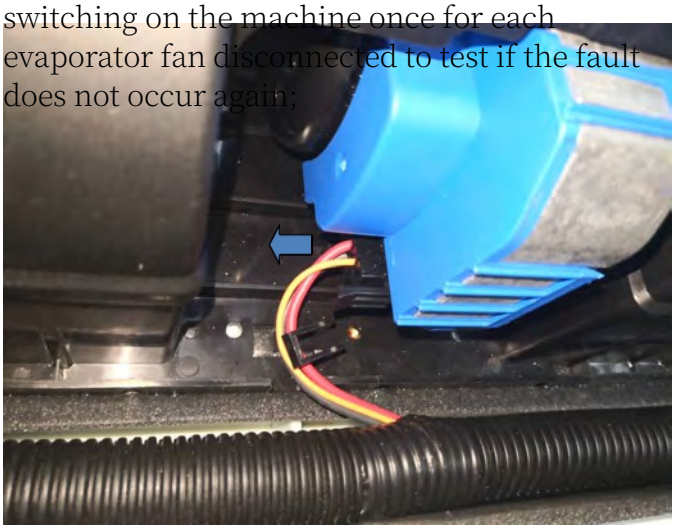
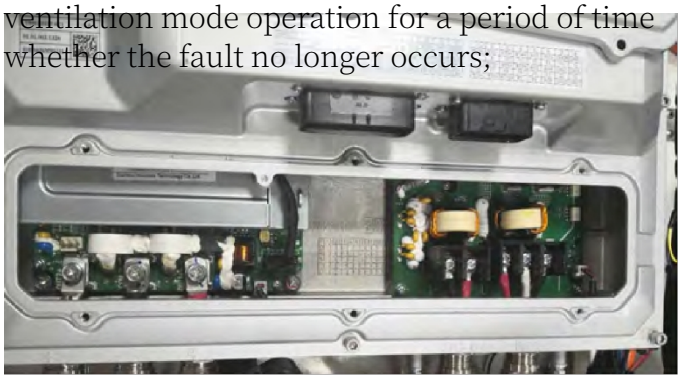
			e
4	Check that the condensing fan wiring is intact and free of damage and short circuits.	☐Yes ☐No	Repair or replace ment of wiring
5	Remove and disconnect the condensing fan inserts one by one, and test each condensing fan disconnected by switching it on and testing whether the fault no longer occurs; 	☐Yes ☐No	Replace the appropr iate condens ing fan
6	1,Connect the condensing fan (OUT2 power cord) to the evaporating fan (OUT1) and remove the original evaporating fan (OU1 power cord). 2,Swap AVO1 and AVO2 pins in the PLC interface; 3, whether the fault no longer occurs after a period of ventilation mode operation; 	☐Yes ☐No	Replace ment of 3-in-1

8	Replace the appropriate condensing fan	☐Yes ☐No	

26 EOC Evaporator fan inverter overcurrent

malfunctions coding	Fault name	Type of fault	fault principle
EOC	Evaporator fan inverter over stream of water or sth. resembling one	Current detection class	When the triplex detects that the evaporator fan output current is greater than the This fault occurs at 100A

move	methodologies	Inspection results	Treatment programme
1	Vehicle: Power on and verify that the air conditioning control panel displays **EOC** normally. trouble code	☐Yes ☐No	View historical faults
2	Check the appearance of the fan is intact, no damage, no blockage, fan blade rotation freely 	☐Yes ☐No	Replace or remove the blockage

3	Check the evaporator fan line connections, whether the connection is reliable, no skewed plugs, back pins	☐Yes ☐No	Tighten connections or correct wiring sequence
4	Check that the evaporator fan wiring is intact and free of damage and short circuits	☐Yes ☐No	Repair or replacement of wiring
5	Remove and disconnect the evaporator fan inserts one by one, and test the fault by switching on the machine once for each evaporator fan disconnected to test if the fault does not occur again; 	☐Yes ☐No	Replacement of the appropriate evaporator fan
6	1, the condensing fan (OUT2 power cord) into the evaporating fan (OUT1) feet and remove the original evaporating fan (OUT1 power cord); 2, ventilation mode operation for a period of time whether the fault no longer occurs;  OUT2 OUT1	☐Yes ☐No	Replacement of 3-in-1

7	Replacement of the appropriate evaporator fan	☐Yes ☐No	

27 LOH condensing fan inverter overheating

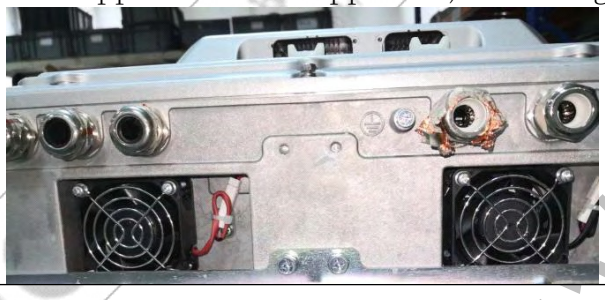
malfunctions coding	Fault name	Type of fault	fault principle
LOH	Condensing fan inverter over heat up	Temperature Detection	This fault occurs when the detection value of the 3-in-1 internal temperature sensor reaches or exceeds the set maximum value.

move	methodologies	Inspection results	Treatment programme
1	Vehicle: power up and switch on the vehicle to verify that the air-conditioning control panel displays LOH normally. trouble code	☐ No. Yes.	View historical faults
2	Turn on the machine and run it for a while to check if the heat fan in the appliance compartment is running. 	☐ No. Yes.	Replacement of 3-in-1
3	Check that the air inlet and outlet of the electrical compartment are cleared. 	☐ No. Yes.	Clear the blockage

4	Check that the electrical compartment insulation foam is intact and has not fallen off. 	☐ No. Yes.	Replace or reapply insulation foam

28 EOH Evaporator fan inverter overheating

malfunctions coding	Fault name	Type of fault	fault principle
EOH	Evaporator fan inverter over heat up	Temperature Detection	This fault occurs when the detection value of the 3-in-1 internal temperature sensor reaches or exceeds the set maximum value.

move	methodologies	Inspection results	Treatment programme
1	Vehicle: Power on and verify that the air conditioning control panel displays **EOH** normally. trouble code	☐ No. Yes.	View historical faults
2	Switch on and run for a period of time to check whether the heat fan in the appliance compartment (including stand-alone fans and fans supplied with the appliance) is running. 	☐ No. Yes.	Replace the cooling fan or corresponding components
3	Check that the inlet and outlet of the electrical compartment are not blocked 	☐ No. Yes.	Clear the blockage

4	Check that the electrical compartment insulation foam is intact and has not fallen off.	☐ No. Yes.	Replace or reapply insulation foam
			

29 COH Compressor inverter overheat

malfunctions coding	Fault name	Fault type	fault principle
COH	Compressor variants Frequency converter overheating	Temperature Detection resemble	When the 3-in-1 internal temperature sensor detection value reaches or exceeds the This fault occurs when the set maximum value is exceeded.

move	methodologies	Inspection results	Treatment programme
1	Vehicle: power up and switch on the vehicle to verify that the air-conditioning control panel displays COH normally. trouble code	☐Yes ☐No	

2	Switch on and run for a period of time to check whether the heat fan in the appliance compartment (including stand-alone fans and fans supplied with the appliance) is running. 	☐Yes ☐No	Replacement of cooling fans or corresponding components
3	Check that the air inlet and outlet of the electrical compartment are cleared. 	☐Yes ☐No	Clear the blockage
4	Check that the electrical compartment insulation foam is intact and has not fallen off. 	☐Yes ☐No	Replace or reapply insulation foam

30 LOL condensing fan inverter overload

malfunctions coding	Fault name	Type of fault	fault principle

LOL	Condensing fan inverter over year	Current detection class	This fault occurs when the triplex detects that the condensing fan output (DC2) current is greater than the rated fan current

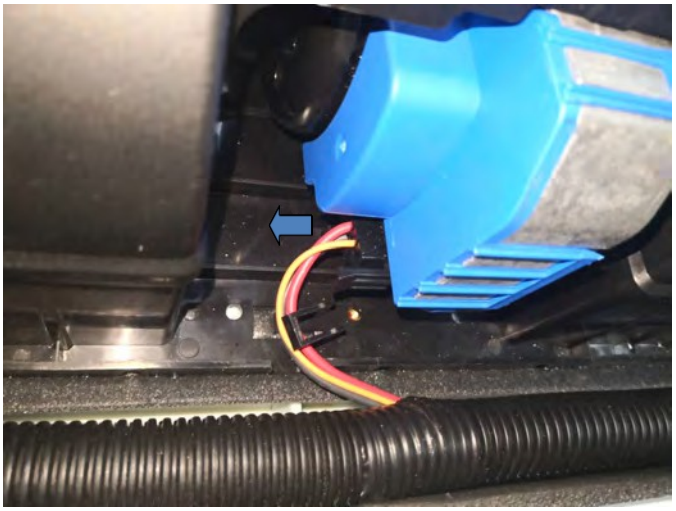
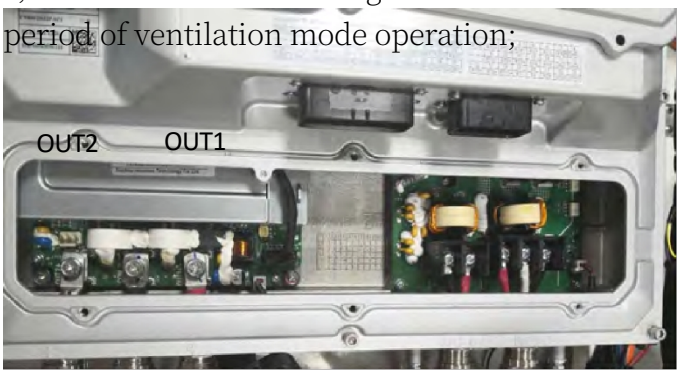
move	methodologies	Inspection results	Treatment programme
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays properly **LOC** trouble code	☐Yes ☐No	View historical faults
2	Check the appearance of the fan is intact, no damage, no blockage, fan blade rotation freely 	☐Yes ☐No	Replace or remove the blockage
3	Check the condensing fan line connections, whether the connection is reliable, no skewed plugs, back pins	☐Yes ☐No	Tighten connections or correct wiring sequence
4	Check that the condensing fan wiring is intact and free of damage and short circuits.	☐Yes ☐No	Repair or replacement of wiring

5	Remove and disconnect the condensing fan inserts one by one, and test each condensing fan disconnected by switching it on and testing whether the fault no longer occurs; 	☐Yes ☐No	Replace the appropriate condensing fan
6	1,Connect the condensing fan (OUT2 power cord) to the evaporating fan (OUT1) and remove the original evaporating fan (OU1 power cord). 2,Swap AVO1 and AVO2 pins in the PLC interface; 3, whether the fault no longer occurs after a period of ventilation mode operation; 	☐Yes ☐No	Replace the appropriate condensing fan
8	Replace the 3-in-1 and try it for a while, does the fault no longer occur	☐Yes ☐No	

31 EOL Evaporator fan inverter overload

malfunctions coding	Fault name	Type of fault	fault principle
EOL	Evaporator fan inverter over year	Current detection class	This fault occurs when the triplex detects that the evaporator fan output (DC1) current is greater than the rated fan current

move	methodologies	Inspection results	Treatment programme
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays properly **LOC** trouble code	☐Yes ☐No	View historical faults
2	Check the appearance of the fan is intact, no damage, no blockage, fan blade rotation freely 	☐Yes ☐No	Replace or remove the blockage
3	Check the evaporator fan line connections, whether the connection is reliable, no skewed plugs, back pins	☐Yes ☐No	Tighten connections or correct wiring sequence
4	Check that the evaporator fan wiring is intact and free of damage and short circuits	☐Yes ☐No	Repair or replacement of wiring

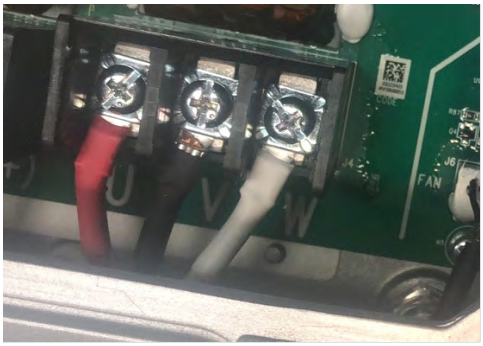
5	Remove and disconnect the evaporator fan inserts one by one, and test the fault by switching on the machine once for each evaporator fan disconnected to test if the fault does not occur again;	☐Yes ☐No	Replace the appropriate condensing fan
			
6	1,Connect the condensing fan (OUT2 power cord) to the evaporating fan (OUT1). Foot position and removal of the original evaporator fan (OU1 power cord); 2,Swap AVO1 and AVO2 pins in the PLC interface; 3, whether the fault no longer occurs after a period of ventilation mode operation; 	☐ No. Yes.	Replacement of the corresponding Evaporation fans

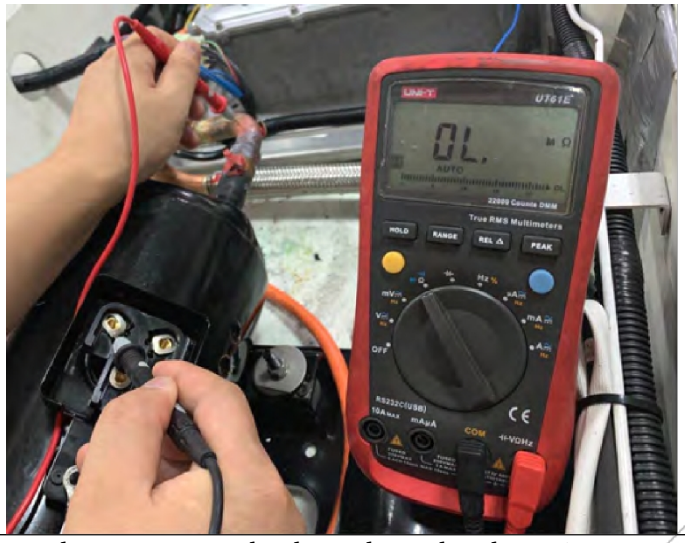
8	Replace the 3-in-1 and try it for a while, does the fault no longer occur	☐ No. Yes.	

32 COL Compressor inverter overload

malfunctions coding	Fault name	Type of fault	fault principle
COL	Compressor variants Frequency converter overload	current detection resemble	When the triplex detects that the compressor output current is greater than the motor This fault occurs at rated current

move	methodologies	Inspection results	Treatment programme
1	Vehicle: power up and switch on to verify that the control panel displays properly **COL**	☐Yes ☐No	View historical faults
2	No abnormal noise during compressor operation	☐Yes ☐No	

3	Check compressor wiring connections for reliable connections and correct wire sequence (U.), (V, W correspond to red, black and white) 	☐Yes ☐No	Tighten connections or correct wiring sequence
4	Check that the compressor three-phase wiring is intact, no damage, short circuit	☐Yes ☐No	Repair or replacement of wiring
5	Measure the compressor turn-to-turn resistance, three lines of two measurements, three groups of resistance value is equal and less than 10Ω 	☐Yes ☐No	Replacement of compressor

6	Multimeter to measure whether the resistance between the compressor phase line and the shell is more than 5MΩ. 	☐Yes ☐No	Replacement of compressor
7	Replacement method, replace the three-in-one, test run for a period of time, whether the fault no longer occurs	☐Yes ☐No	Replacement of compressor

33CHF Compressor Inverter Hardware Failure

malfunctions coding	Fault name	Fault type	fault principle
CHF	Compressor Inverter Hardware malfunctions	Three-in-one internal malfunction	3-in-1 internal detection and feedback of fault codes

move	methodologies	Inspection results	Treatment programme

1	Vehicle: power up and switch on the vehicle to verify that the control panel displays **CHF** normally**.**	☐Yes ☐No	View historical faults
2	Replacement method, replace the three in one, test run for a period of time, whether the fault no longer occurs	☐Yes ☐No	

34FL Reverse connection fault

malfunctions coding	Fault name	Type of fault	fault principle
FL	reverse polarity fault	Voltage Detection resemble	When the triplex detects that the polarity of the input power supply is opposite to the marking This fault occurs

move	methodologies	Inspection results	Treatment programme
1	Complete vehicle: power up and start to verify that the control panel displays properly **FL**	□Yes □No	View historical faults
2	Check that the polarity of the air-conditioning input power supply matches the marking.	□Yes □No	Correcting power supply polarity
3	Check that the polarity of the 3-in-1 input power supply matches the marking.	□Yes □No	Correcting power supply polarity

35 C5F Pressure Sensor Failure

malfunctions coding	Fault name	Type of fault	fault principle
C5F	pressure sensing device failure	Voltage Detection	The triplex detects that the pressure sensor feedback voltage exceeds This fault occurs in the 0~5V range

move	methodologies	Inspection	Treatment

		results	programme
1	Vehicle: power up and switch on the vehicle to verify that the air-conditioning control panel displays **C5F** normally.	☐Yes ☐No	View historical faults
3	Measure the sensor for 5V input voltage 	☐Yes ☐No	Check wiring from sensor to PLC
4	Measure whether the sensor feedback voltage is in the range of 0~5V Pressure(MPa) / Low Pressure Sensor Reverse Feed voltage (V) / High Pressure Sensing Feedback Voltage (V) 0~1.6 / 0.5~1.88 / 0.45~2.13 1.6~3.0 / 1.88~3.09 / 2.13~3.61 3.0~4.0 / 3.09~3.93 / 3.61~4.03	☐Yes ☐No	Check sensor to PLC feedback signal line
5	Replacement of the pressure sensor		

36 S1r Pressure sensor failure

malfunctions coding	Fault name	Type of fault	fault principle
S1r	pressure sensing device failure	Voltage Detection	Triplex detects pressure transducer 1 feedback voltage exceeded This fault occurs in the 0~5V range

move	methodologies	Inspection results	Treatment programm

			e
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays properly S1r	☐Yes ☐No	View historical faults
3	Measure the sensor for 5V input voltage	☐Yes ☐No	Check wiring from sensor to PLC
			
4	Measure whether the sensor feedback voltage is in the range of 0~5V Pressure(MPa) / Low Pressure Sensor Reverse Feed voltage (V) / High Pressure Sensing Feedback Voltage (V) 0~1.6 / 0.5~1.88 / 0.45~2.13 1.6~3.0 / 1.88~3.09 / 2.13~3.61 3.0~4.0 / 3.09~3.93 / 3.61~4.03	☐Yes ☐No	Check sensor to PLC feedback signal line
5	Replacement of the pressure sensor		

37 S2r Pressure sensor failure

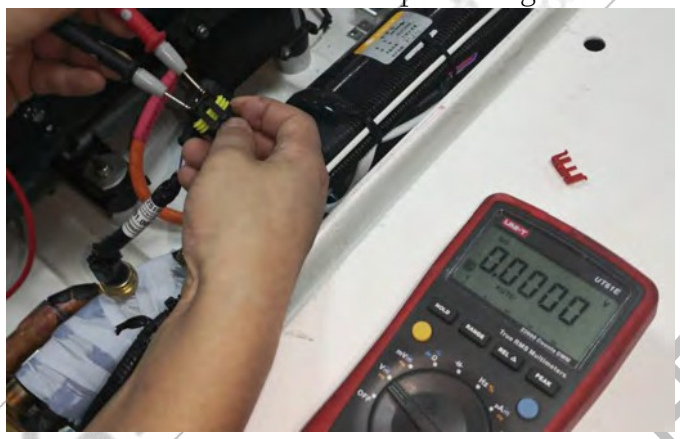
malfunctions coding	Fault name	Type of fault	fault principle
S2r	pressure sensing device	Voltage Detection	Triplex detects pressure transducer 1 feedback voltage exceeded This fault occurs in the 0~5V range

	failure		

move	methodologies	Inspection results	Treatment programme
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays properly **S2r**	☐Yes ☐No	View historical faults
3	Measure the sensor for 5V input voltage	☐Yes ☐No	Check wiring from Sensor 2 to PLC.
			
4	Measure whether the sensor feedback voltage is in the range of 0~5V	☐Yes ☐No	Check Sensor 2 to PLC feedback signal wire
5	Replacement of pressure sensor 2		

38 S3r Pressure sensor failure

malfunctions coding	Fault name	Fault type	fault principle
S3r	pressure sensing device failure	Voltage Detection	Triplex detects pressure transducer 3 feedback voltage exceeded This fault occurs in the 0~5V range

move	methodologies	Inspection results	Treatment programme
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays properly S3r	☐Yes ☐No	View historical faults
3	Measure the sensor for 5V input voltage 	☐Yes ☐No	Check wiring from Sensor 3 to PLC.
4	Measure whether the sensor feedback voltage is in the range of 0~5V	☐Yes ☐No	Check Sensor 3 to PLC feedback signal wire

Pressure (MPa)	Low Pressure Sensor Reverse Feed voltage (V)	High Pressure Sensing Feedback Voltage (V)
0~1.6	0.5~1.88	0.45~2.13
1.6~3.0	1.88~3.09	2.13~3.61
3.0~4.0	3.09~3.93	3.61~4.03

5	Replacement of pressure sensor 3		

39 S4r Pressure sensor failure

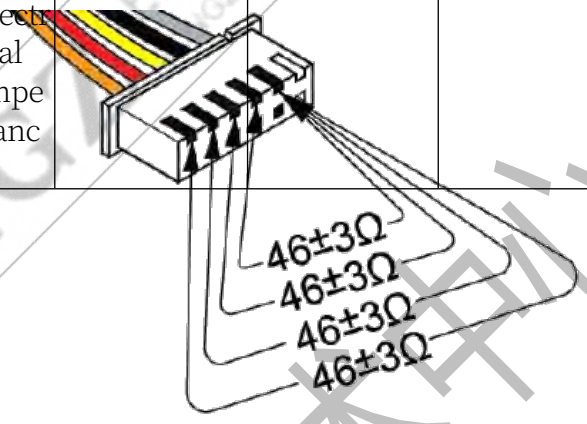
malfunctions coding	Fault name	Type of fault	fault principle
S4r	pressure sensing device failure	Low Pressure Sensor Reverse Feed voltage (V) Detection	High Pressure Sensing Feedback Voltage (V) Triplex detects pressure transducer 4 feedback voltage exceeded This fault occurs in the 0~5V range
	Pressure (MPa)	Voltage	
	0~1.6	0.5~1.88	0.45~2.13
	1.6~3.0	1.88~3.09	2.13~3.61
	3.0~4.0	3.09~3.93	3.61~4.03

move	methodologies	Inspection results	Treatment programme
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays properly **S4r**	☐Yes ☐No	View historical faults
3	Measure the sensor for 5V input voltage 	☐Yes ☐No	Check wiring from Sensor 4 to PLC.

<table>
<tr><td>4</td><td>Measure the sensor feedback voltage to see if it is within range</td><td>☐Yes ☐No</td><td>Check Sensor 4 to PLC feedback signal wire</td></tr>
<tr><td>5</td><td>Replacement of pressure sensor 4
<table>
<tr><th>Pressure (MPa)</th><th>Low Pressure Sensor Reverse Feed voltage (V)</th><th>High Pressure Sensing Feedback Voltage (V)</th></tr>
<tr><td>0~1.6</td><td>0.5~1.88</td><td>0.45~2.13</td></tr>
<tr><td>1.6~3.0</td><td>1.88~3.09</td><td>2.13~3.61</td></tr>
<tr><td>3.0~4.0</td><td>3.09~3.93</td><td>3.61~4.03</td></tr>
</table></td><td></td><td></td></tr>
</table>

40 UHF Electronic Expansion Valve Failure

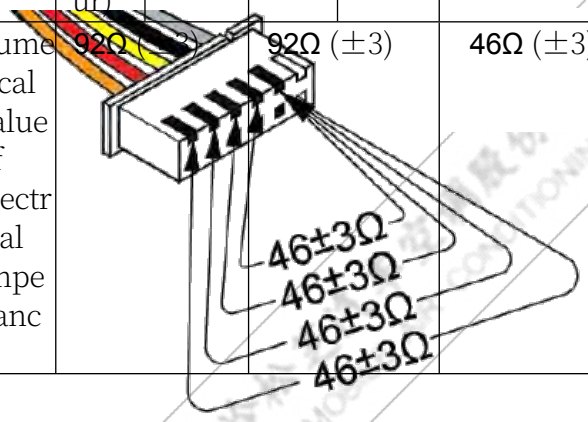
malfunctions coding	Fault name	Type of fault	fault principle
UHF	electronic expansion valve failure	current detection	Three-in-one detection of electronic expansion valve coil output current overfan This fault occurs when you are surrounded by

move	methodologies	Inspection results	Treatment programme
1	Vehicle: power up and switch on to verify that the air conditioning control panel displays normally. HUF	☐Yes ☐No	View historical faults
2	Measuring electronic expansion valve coil 	☐Yes ☐No	Replace electronic expansion valve coil
3	Check and repair miswiring and short circuits between the PLC and the expansion valve coil.		

guide wire colour	Coil 1		Coil 2		common (use)
	orange	pink	porn ogra	ferrous	pessimistic (Neutral)
resistance (colour)			pink		
numerical value of electrical impedance	92Ω (±3)		92Ω (±3)		46Ω (±3)

41 F1r Electronic Expansion Valve 1 Fault

malfunctions coding	Fault name	Fault type	fault principle
F1r	electronic expansion Valve 1 Failure	current detection	Three-in-one detection of electronic expansion valve coil output current overfan This fault occurs when you are surrounded by

<table>
<tr><th>move</th><th>methodologies</th><th>Inspection results</th><th>Treatment programme</th></tr>
<tr><td>1</td><td>Vehicle: Power up and switch on the vehicle to verify that the air-conditioning control panel displays normally F1r</td><td>☐Yes ☐No</td><td>View historical faults</td></tr>
<tr><td>2</td><td>Measuring electronic expansion valve coil resistance
<table>
<tr><td></td><td>Coil 1</td><td></td><td>Coils 2</td><td></td><td>common (use) (Neutral)</td></tr>
<tr><td>guide wire colour</td><td>orange (colour)</td><td>pink</td><td>porn ographic</td><td>ferrous</td><td>pessimistic</td></tr>
<tr><td>numerical value of electrical impedance</td><td>92Ω (±3)</td><td></td><td>92Ω (±3)</td><td></td><td>46Ω (±3)</td></tr>
</table>


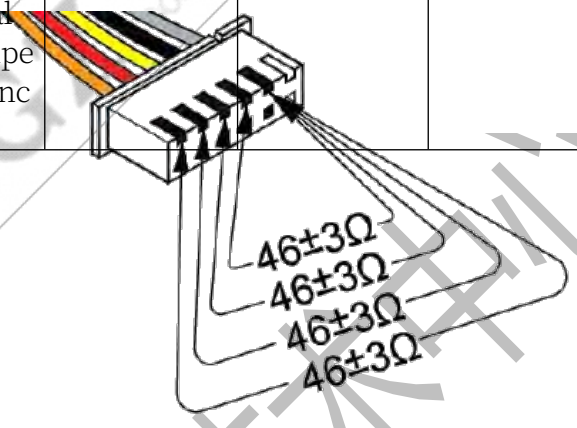
</td><td>☐Yes ☐No</td><td>Replace electronic expansion valve coil</td></tr>
<tr><td>3</td><td>Check and repair miswiring and short circuits between the PLC and the expansion valve coil.</td><td></td><td></td></tr>
</table>

42 F2r Electronic Expansion Valve 2 Fault

malfunctions coding	Fault name	Type of fault	fault principle
F2r	electronic expansion Valve 2 Failure	current detection	Three-in-one detection of electronic expansion valve coil output current overfan This fault occurs when you are surrounded by

move	methodologies	Inspection results	Treatment programme
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays normally.F2r	☐Yes ☐No	View historical faults
2	Measuring electronic expansion valve coil resistance	☐Yes ☐No	Replace electronic expansion valve coil
3	Check and repair miswiring and short circuits between the PLC and the expansion valve coil.		

	Coil 1	Coils 2	common (use) (Neutral)
guide wire colour	orange (colour)	pink	pornographic ferrous pessimistic
numerical value of electrical impedance	92Ω (±3)	92Ω (±3)	46Ω (±3)



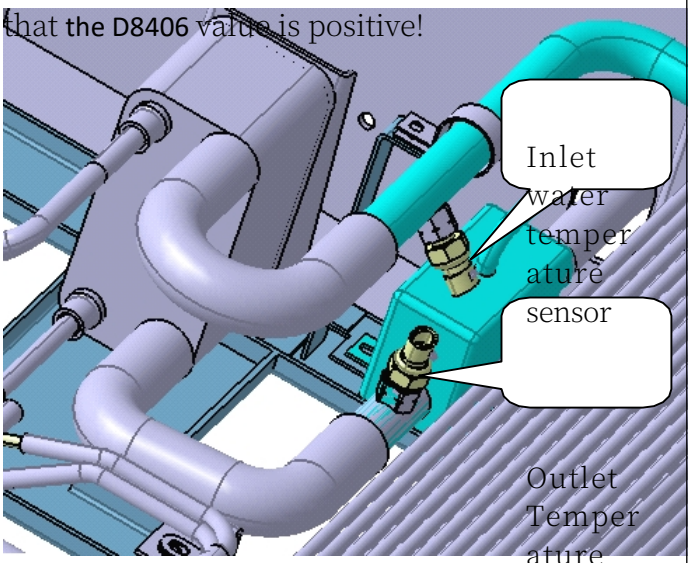
43 F3r Inefficient Water Circulation Failure

malfunctions	Fault name	Type of fault	fault principle
coding			
F3r	Failure of inefficient water circulation	logical judgement	When D8405 is detected to be less than 10°C after 3 min of operation and D8406 minus D8405 is greater than 10°C for 20S, this condition occurs. malfunctions

move	methodologies	Inspection results	Treatment programme
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays normally F3r	☐ No. Yes.	View historical faults
2	Take the manifold pressure gauge tube in forced plate change mode and drain the valve core at the plate change to see if any water comes out. 	☐ No. Yes.	Check that the pump is running
3	Observe the status of the drainage tube to see if it appears to be columnar and flows out forcefully	☐ No. Yes.	Continuously empty the drain tube until the drainage is columnar

44 F4r Water inlet and outlet reverse connection fault

malfunctions coding	Fault name	Type of fault	fault principle
F4r	Water inlet and outlet reverse polarity fault	logical judgement	Detecting D8406 is greater than D8407 after 3min operation and the difference value Failure occurs when the temperature is greater than 1.5°C

move	methodologies	Inspection results	Treatment programme
1	Vehicle: power up and switch on the vehicle to verify that the air conditioning control panel displays normally F4r	☐Yes ☐No	View historical faults
2	Unplug the water temperature sensor and check that the D8406 value is positive!  	☐Yes ☐No	Inlet and outlet water temperature sensors are reversed.

3	Observe the inlet and outlet water temperature D8406, D8407 values for multiple runs for any changes.	□Yes □No	Replacement of sensors with no value change
4	Communicate and assist vehicle personnel in making corrections to the water system		

45PFF Water pump failure

malfunctions coding	Fault name	Fault type	fault principle	Component Monitoring
PFF	Water pump failure	Switch type faults	When the PLC monitors the X03 status OFF This fault occurs when (pump 0V feedback)	X0003
			When the PLC monitors the X03 state ON This fault occurs (pump 24V feedback)	

move	methodologies	Inspection results	operating method
1	Vehicle: Power on and verify that the air conditioning control panel displays PFF normally.	□Yes □No	View historical faults
2	Measure for 24V input to pump in 777 (forced plate change) mode.	□Yes □No	Check and repair wiring and fuses

<table>
<tr><td>3</td><td>Pump operation with 24V input</td><td>☐Yes ☐No</td><td>Replacement of water pumps</td></tr>
<tr><td>4</td><td>Take the manifold pressure gauge tube in forced plate change mode and drain the valve core at the plate change to see if any water comes out.
  </td><td>☐Yes ☐No</td><td>Purge air from the water system</td></tr>
<tr><td>5</td><td>Test whether the current during pump operation ≤ rated power/27</td><td>☐Yes ☐No</td><td>Check and remove water line blockages</td></tr>
<tr><td>6</td><td>SOP-20 Check that the X0003 status is consistent with the feedback signal.
<table><tr><td>Pump Feedback Signal</td><td>X0003 Status</td></tr><tr><td>0V or Suspended</td><td>OFF</td></tr><tr><td>24V</td><td>ON</td></tr></table></td><td>☐Yes ☐No</td><td>Check and repair the line between the pump feedback signal and PLC pin X03. kind</td></tr>
<tr><td>7</td><td>Replacement of water pumps</td><td></td><td></td></tr>
</table>

46LLF Liquid Level Fault

malfunctions coding	Fault name	Type of fault	fault principle	Component Monitoring
LLF	Liquid level failure	Switch type faults	When the PLC monitors the X07 status OFF This fault occurs when (normally closed)	X0007
			When the PLC monitors the X07 state ON This fault occurs (normally open)	

move	methodologies	Inspection results	operating method
1	Vehicle: power up and switch on the vehicle to verify that the air-conditioning control panel displays LLF normally.	☐Yes ☐No	View historical faults
2	Check that the kettle level is not below the lower limit when the pump is running	☐Yes ☐No	
3	Measurement level switch with or without 24V input (electric switch)	☐Yes ☐No	Check and repair the level switch and PLC (X07, (DCM) interline kind
4	SOP-20 Check that the X0001 status matches the level switch status. The above table is for normally closed level	☐Yes ☐No	Check and repair the level switch and PLC

Level switch status	X0007 Status	fault state
turn off	OFF	malfunctions
short circuit	ON	normalcy

	switches, normally open type fault status is the opposite of this		(Interline (X07, DCM)
5	Replacement of level switch		

Six, two-in-one troubleshooting

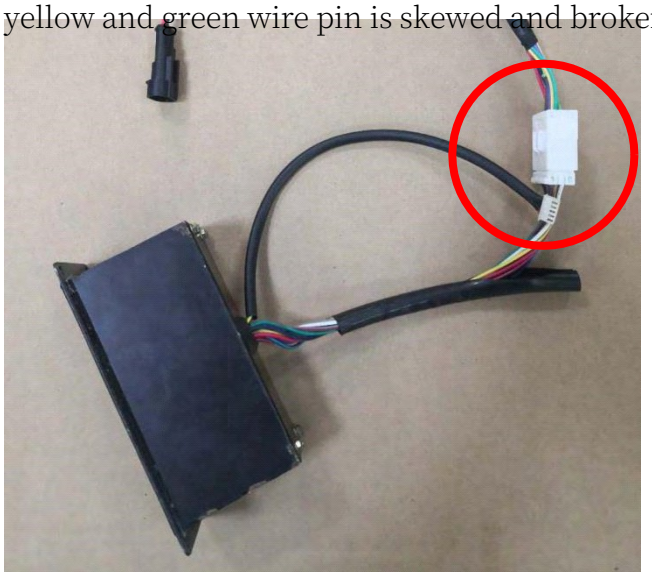
2-in-1 Essential Tools

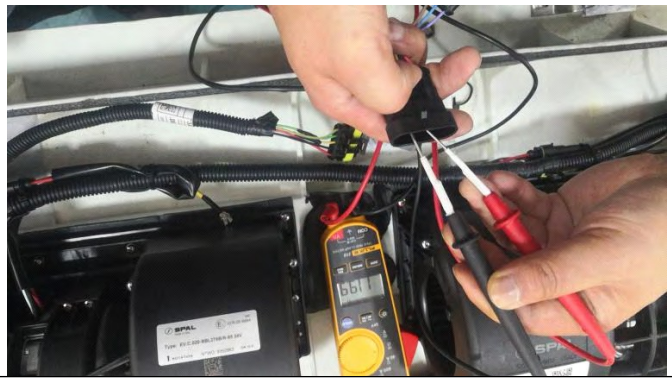
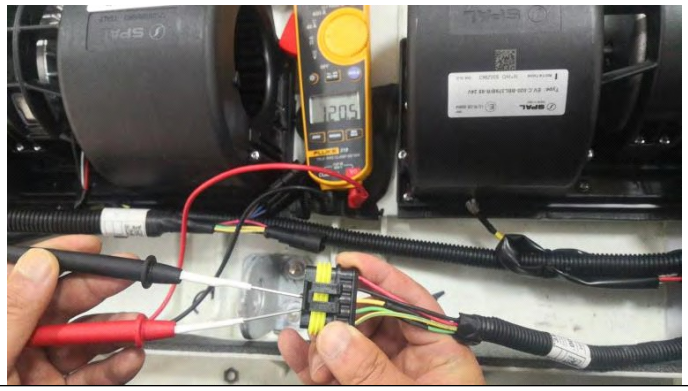
name (of a thing)	quantities
RS232 (USB to interface)	1
Crystal Head 485 Cable	1 root
laptops	1 unit

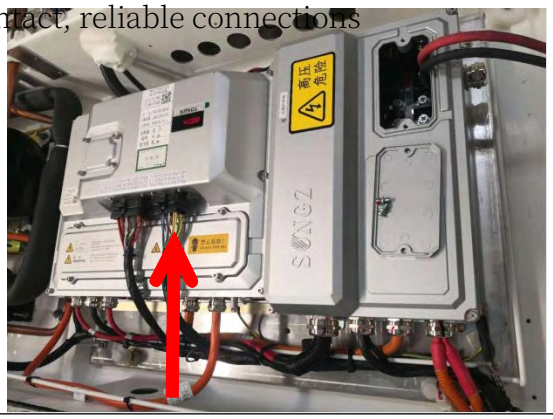
1 EC1 Overhead Controller and Panel Communication Failure

malfunctions coding	Fault name	Type of fault	fault principle
EC1	Top-mounted controller with panel malfunction of communications	Communication faults	This fault occurs continuously when the overhead controller does not receive the manipulator message for 1min consecutively.

move	methodologies	Inspection results	Treatment programme

1	Whether the manipulator plug connection is normally connected and reliable, whether the yellow and green wire pin is skewed and broken 	☐Yes ☐No	Reconnect or replace the wiring harness
2	Check that the manipulator harness in the duct is intact and not broken (pay special attention to the bolt mounting position)	☐Yes ☐No	Repair or Replacement of Wiring Harness

3	Check that the manipulator harness is properly and reliably connected to the overhead connection 	☐Yes ☐No	Repair or Replacement of Wiring Harness
4	Disconnect the manipulator harness from the top unit and measure the resistance between the yellow and green wires at the manipulator end to see if it is 100~150Ω (communication resistance 120Ω). 	☐Yes ☐No	Replacing the manipulator harness
5	Disconnect the manipulator harness from the top unit and measure the resistance between the yellow and green wires at the top unit end for abnormality 100~150Ω (120Ω) 	☐Yes ☐No	Failure occurs between the disconnect point and the top PLC

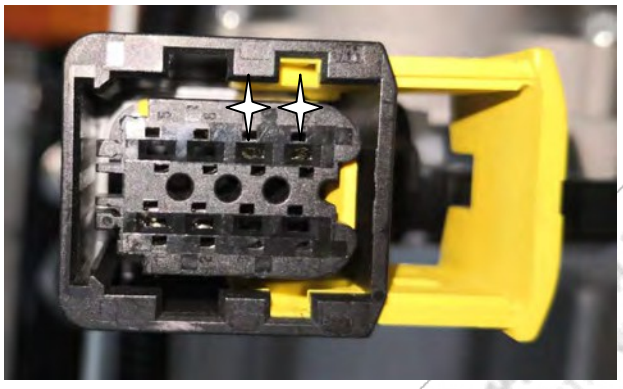
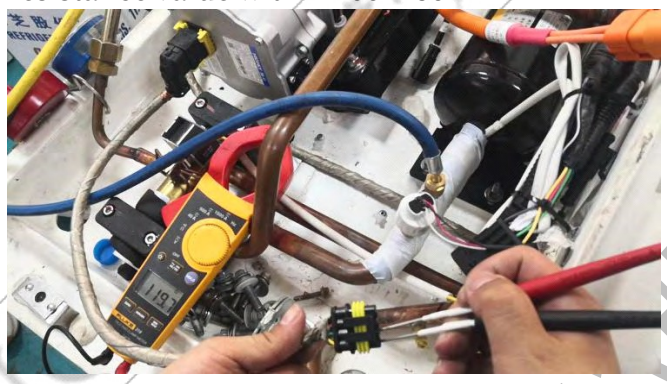
6	Along the yellow and green lines gradually check to the top controller, the intermediate line is intact, reliable connections 	☐Yes ☐No	
7	Connect a low-voltage filter in series with the 24V power input of the manipulator and separate the manipulator harness from the high-voltage harness in the air duct, and try for a period of time to see if the fault no longer occurs.	☐Yes ☐No	Low-voltage filters in series with top controller inputs

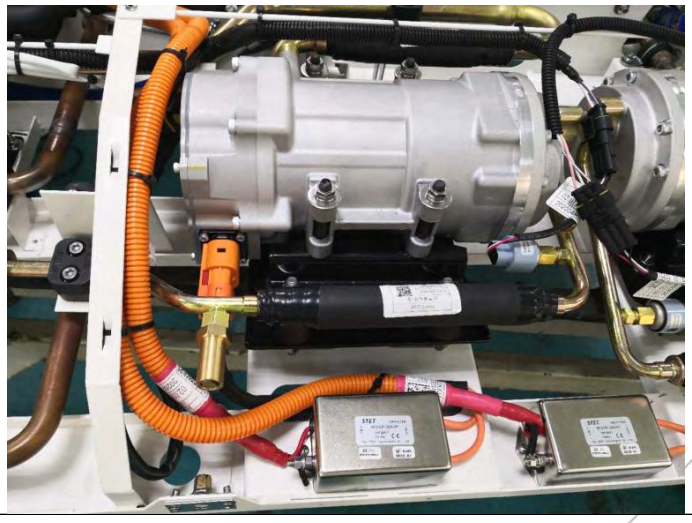
2 EC2 Overhead Controller Internal Communication Failure

malfunctions coding	Fault name	Type of fault	fault principle
EC2	Overhead controller and compressor communication failure block	communication type fault	This fault occurs continuously when the overhead controller does not receive feedback from the compressor for 1min continuously.

move	methodologies	Inspection results	Treatment programme

1	Vehicle: Power on and verify that the air conditioning control panel displays EC2 normally. trouble code	☐Yes ☐No	View historical faults

2	Unplug the compressor low voltage harness and measure the 24V supply for proper wiring sequence.  	☐Yes ☐No	Correcting the wire sequence or checking for breaks along the route
3	Measure the compressor communication resistance value within 100~150Ω. 	☐Yes ☐No	Replacement of compressor
4	Check whether the communication wires (yellow and green wires) between the low voltage harness of the compressor and the overhead controller are intact, reliably connected and free from breaks and shorts.	☐Yes ☐No	Repair or Replacement of Wiring Harness

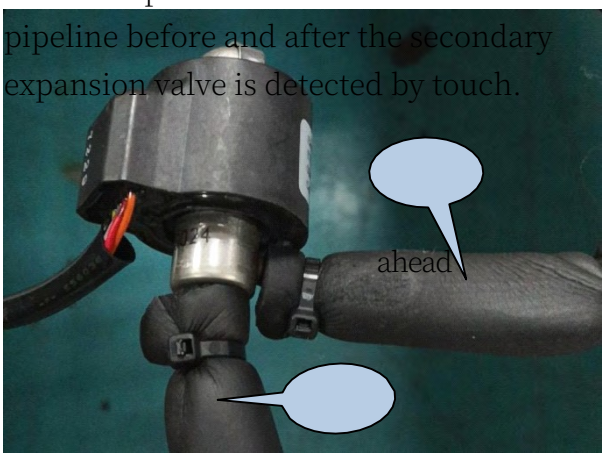
5	Connect high and low voltage filters in series on the compressor high and low voltage wiring harness, try for a period of time, whether the fault no longer occurs 	☐Yes ☐No	High-voltage filter in series with the high-voltage input of the compressor

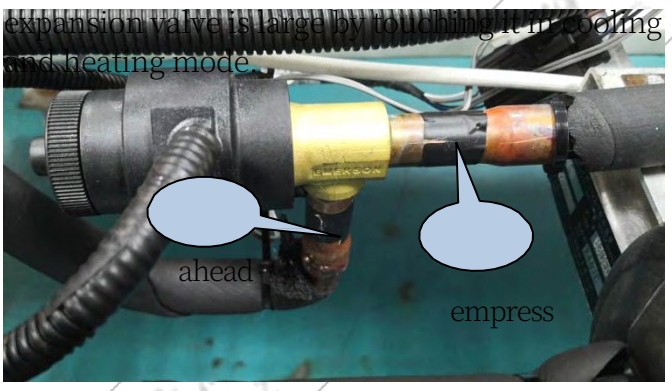
3 LPF Low Pressure Failure

malfunctions coding	Fault name	Type of fault	fault principle	PLC foot position
LPF	Low Pressure Failure	Switch type faults	When the PLC monitors that the pressure switch is open This fault occurs	X3, COM0
		Pressure monitoring type failure	This fault occurs when the low pressure is less than 0.05 MPa.	5V, AI1, AICOM

move	methodologies	Inspection results	operating method

	R410A	R407C
0~10℃	5~8Bar	3~6Bar
10~30℃	8~18Bar	6~13Bar

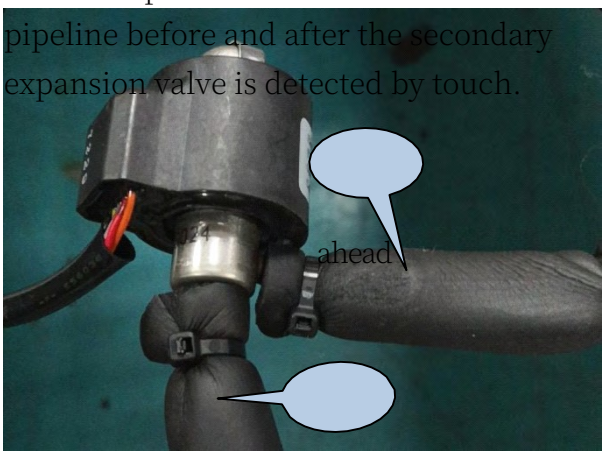
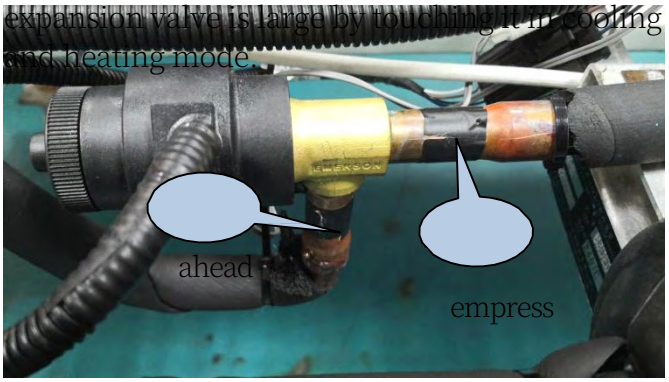
1	Vehicle: power on and verify that the air conditioning control panel displays LPF normally. trouble code	☐Yes ☐No	View historical faults
2	Tap into a manifold pressure gauge to see if the system balance pressure is within range	☐Yes ☐No	Insufficient or leaking system refrigerant, check for leaks and refill.
3	Small temperature difference between the pipeline before and after the secondary expansion valve is detected by touch.  empress	☐ No. Yes.	Check that the secondary electronic expansion valve operates correctly when re-powering up the unit.
4	Whether the cooling and heating modes can be activated properly	☐ No. Yes.	Check low pressure switch/sensor
5	Check that the condensing and evaporating fans are operating normally and that the air is coming out strongly.	☐ No. Yes.	Replacement of the corresponding fan

6	Check whether the temperature difference between the front and back of the main expansion valve is large by touching it in cooling and heating mode.  The diagram shows the cooling mode and the opposite for the heating mode.	☐ No. Yes.	System clogged or main electronic expansion valve not opening

4 HPF High Pressure Failure

malfunctions coding	Fault name	Type of fault	fault principle	PLC foot position
HPF	High Pressure Failure	Switch type faults	When the PLC monitors the high pressure switch This fault occurs when disconnecting	X2, COM0
		Pressure monitoring block	When the high pressure is higher than 2.8MPa This fault occurs	5V, AI2, AICOM

move	methodologies	Inspection results	operating method
1	Vehicle: Power on and verify that the air-conditioning control panel displays HPF normally. trouble code	☐Yes ☐No	View historical faults

2	Tap into a manifold pressure gauge to see if the system balance pressure is within range	☐Yes ☐No	System refrigerant overload
3	Small temperature difference between the pipeline before and after the secondary expansion valve is detected by touch.  	☐Yes ☐No	Check that the secondary electronic expansion valve operates correctly when re-powering up the unit.
4	Whether the cooling and heating modes can be activated properly	☐Yes ☐No	Check high pressure pressure switch/sensor
5	Check whether the condensing and evaporating fans are operating normally and the air is strong.	☐Yes ☐No	Replacement of the corresponding fan
6	Check whether the temperature difference between the front and back of the main expansion valve is large by touching it in cooling and heating mode.  	☐Yes ☐No	System clogged or main expansion valve not opening

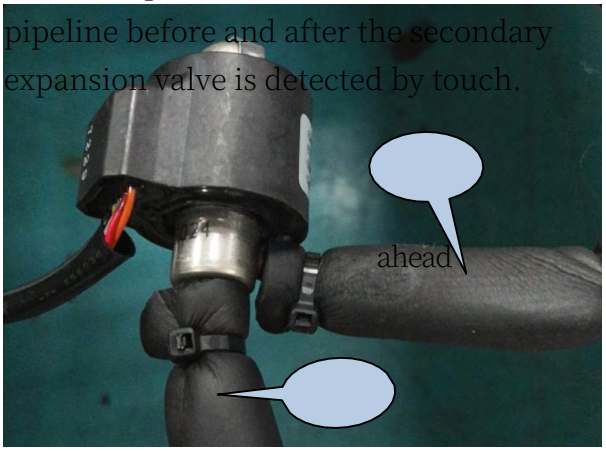
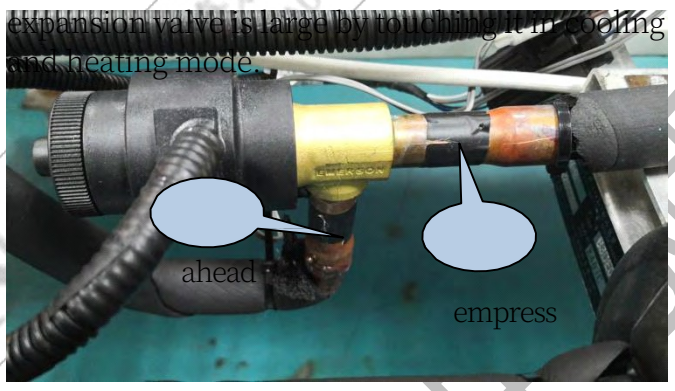
The diagram shows the cooling mode and the opposite for the heating mode.

	R410A	R407C
0~10℃	5~8Bar	3~6Bar
10~30℃	8~18Bar	6~13Bar

5 LP1 Left low pressure fault

malfunctions coding	Fault name	Type of fault	fault principle	PLC foot position
LP1	Left low pressure fault	Switch type faults	When the PLC monitors the pressure open This fault occurs when the switch is turned on	
		Pressure monitoring type failure	When the low pressure is below 0.05MPa block	5V, AI1, AICOM

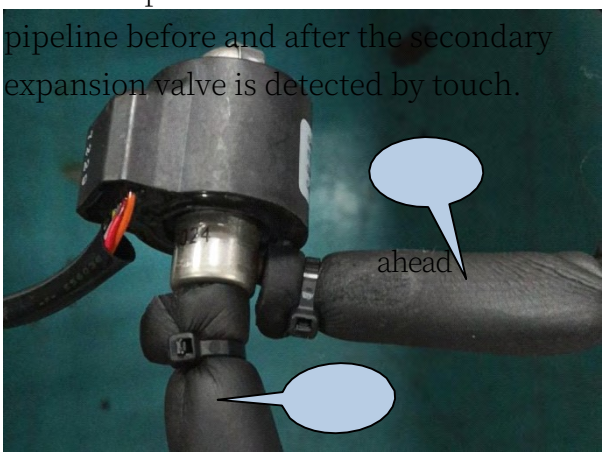
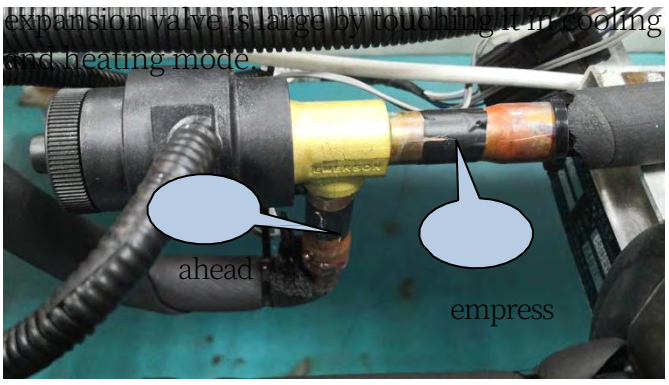
move	methodologies	Inspection results	operating method
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays LP1 normally, trouble code R410A / R407C 0~10°C: 5~8Bar / 3~6Bar 10~30°C: 8~18Bar / 6~13Bar	☐Yes ☐No	View historical faults
2	Tap into a manifold pressure gauge to see if the system balance pressure is within range	☐Yes ☐No	Insufficient or leaking system refrigerant, check for leaks and refill.

3	Small temperature difference between the pipeline before and after the secondary expansion valve is detected by touch.  	☐Yes ☐No	Check that the secondary electronic expansion valve operates correctly when re-powering up the unit.
4	Whether the cooling and heating modes can be activated properly	☐Yes ☐No	Check low pressure switch/sensor
5	Check whether the condensing and evaporating fans are operating normally and the air is strong.	☐Yes ☐No	Replacement of the corresponding fan
6	Check whether the temperature difference between the front and back of the main expansion valve is large by touching it in cooling and heating mode.  The diagram shows the cooling mode and the opposite for the heating mode.	☐Yes ☐No	System clogged or main electronic expansion valve not opening

6 LP2 Right side low pressure fault

malfunctions coding	Fault name	Type of fault	fault principle	PLC foot position
LP2	Right side low pressure fault	Switch type faults	Fires when the pressure switch is disconnected failures of this kind occur	X3, COM0
		Pressure monitoring type failure	When the low pressure is below This fault occurs at 0.05MPa	

move	methodologies	Inspection results	operating method
1	Vehicle: Power up and switch on the vehicle to verify that the air-conditioning control panel displays LP2 normally. trouble code	☐Yes ☐No	View historical faults

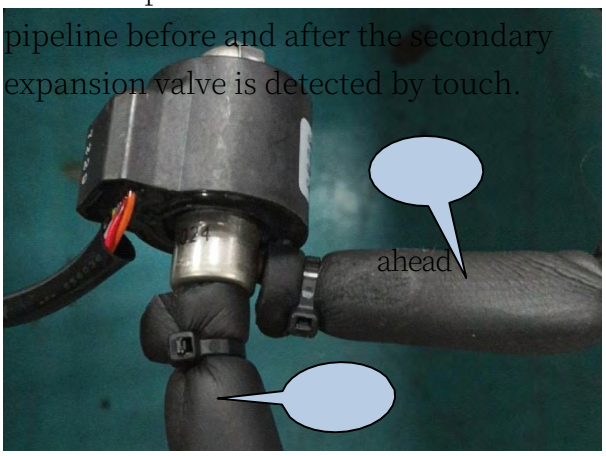
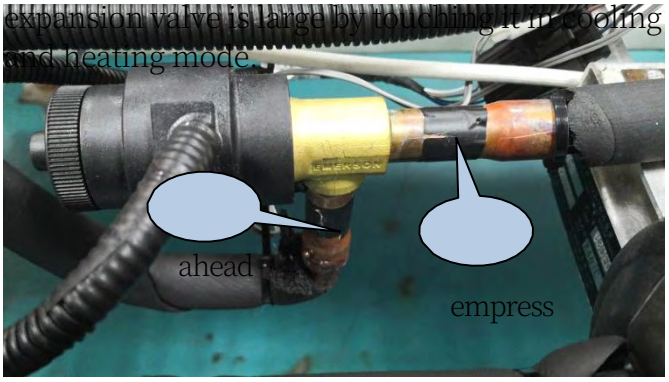
2	Tap into a manifold pressure gauge to see if the system balance pressure is within range	☐Yes ☐No	Insufficient or leaking system refrigerant, check for leaks and refill.
3	Small temperature difference between the pipeline before and after the secondary expansion valve is detected by touch.  	☐Yes ☐No	Check that the secondary electronic expansion valve operates correctly when re-powering up the unit.
4	Whether the cooling and heating modes can be activated properly	☐Yes ☐No	Check low pressure switch/sensor
5	Check whether the condensing and evaporating fans are operating normally and the air is strong.	☐Yes ☐No	Replacement of the corresponding fan
6	Check whether the temperature difference between the front and back of the main expansion valve is large by touching it in cooling and heating mode.  	☐Yes ☐No	System clogged or main electronic expansion valve not opening

	The diagram shows the cooling mode and the opposite for the heating mode. R410A: 0~10℃ 5~8Bar; 10~30℃ 8~18Bar R407C: 0~10℃ 3~6Bar; 10~30℃ 6~13Bar		

7HP1 Left side high pressure fault

malfunctions	Fault name	Type of fault	fault principle	PLC foot position
	R410A / R407C 0~10℃ 5~8Bar / 3~6Bar 10~30℃ 8~18Bar / 6~13Bar			
coding				
HP1	High pressure failure on the left side	Switch type faults	This fault occurs when the high-pressure pressure switch is disconnected	X2, COM0
		Pressure monitoring type failure	When the high pressure is higher than This fault occurs at 2.8MPa	

move	methodologies	Inspection results	operating method
1	Vehicle: Power up and switch on the vehicle to verify that the air-conditioning control panel displays LPH normally. trouble code	☐Yes ☐No	View historical faults

2	Tap into a manifold pressure gauge to see if the system balance pressure is within range	☐Yes ☐No	System refrigerant overload
3	Small temperature difference between the pipeline before and after the secondary expansion valve is detected by touch.  	☐Yes ☐No	Check that the secondary electronic expansion valve operates correctly when re-powering up the unit.
4	Whether the cooling and heating modes can be activated properly	☐Yes ☐No	Check high pressure pressure switch/sensor
5	Check whether the condensing and evaporating fans are operating normally and the air is strong.	☐Yes ☐No	Replacement of the corresponding fan
6	Check whether the temperature difference between the front and back of the main expansion valve is large by touching it in cooling and heating mode.  	☐Yes ☐No	System clogged or main electronic expansion valve not opening

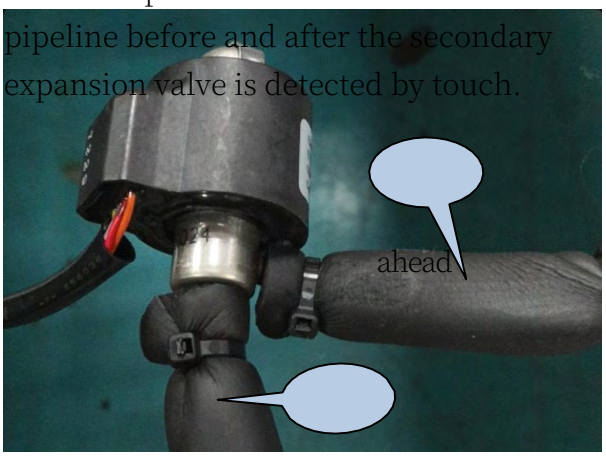
	The diagram shows the cooling mode and the opposite for the heating mode.		

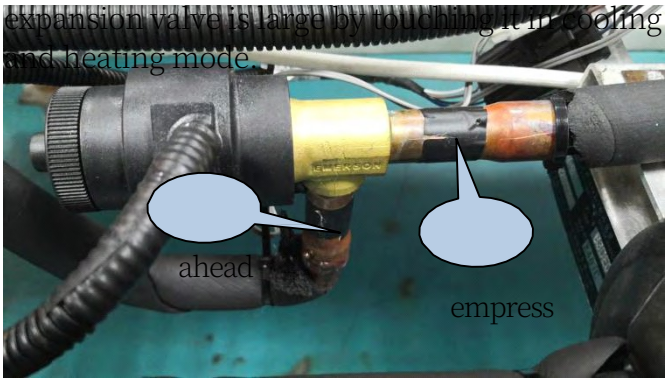
8HP2 Right side high pressure fault

malfunctions coding	Fault name	Type of fault	fault principle	PLC foot position
HP1	Right side high pressure pressure failure	Switch type faults	When the PLC monitors the high pressure open This fault occurs when the switch is turned on	X2, COM0
		Pressure monitoring type failure	When the high pressure is below 0.05MPa This fault occurs when	

move	methodologies	Inspection results	operating method
1	Vehicle: Power up and switch on the vehicle to verify that the air-conditioning control panel displays ~~LPH~~ normally. trouble code	☐Yes ☐No	View historical faults

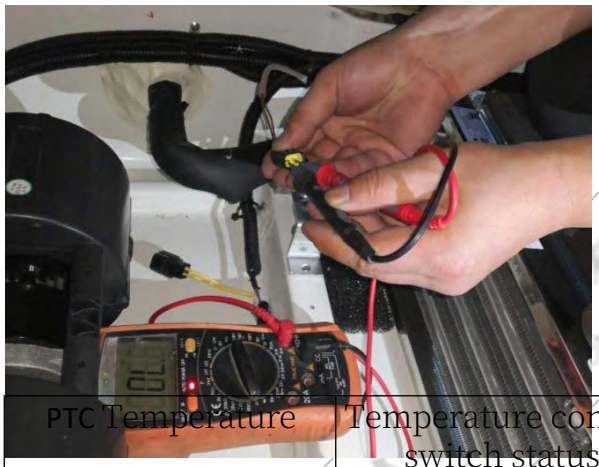
	R410A	R407C
0~10℃	5~8Bar	3~6Bar
10~30℃	8~18Bar	6~13Bar

2	Tap into a manifold pressure gauge to see if the system balance pressure is within range	☐Yes ☐No	System refrigerant overload
3	Small temperature difference between the pipeline before and after the secondary expansion valve is detected by touch.  	☐ No. Yes.	Check that the secondary electronic expansion valve operates correctly when re-powering up the unit.
4	Whether the cooling and heating modes can be activated properly	☐ No. Yes.	Check high pressure pressure switch/pressure sensing tool
5	Check that the condensing and evaporating fans are operating normally and that the air is coming out strongly.	☐ No. Yes.	Replacement of the corresponding fan

6	Check whether the temperature difference between the front and back of the main expansion valve is large by touching it in cooling and heating mode.  The diagram shows the cooling mode and the opposite for the heating mode.	☐ No. Yes.	System clogged or main electronic expansion valve not opening

9 POH PTC overheat protection

malfunctions coding	Fault name	Type of fault	fault principle	PLC foot position
POH	PTC overheating protection fault	switchgear	When the PLC monitors the PTC overheat protection, the PLC will detect the PTC overheat protection. This fault occurs when the switch is disconnected	X0, COM0

move	methodologies	Test results	operating method
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays POH normally. trouble code	☐Yes ☐No	View historical faults
2	Measure the PTC temperature control switch with a multimeter for compliance.  PTC Temperature / Temperature control switch status <150°C / conduction >150°C / turn off (electric switch)	☐Yes ☐No	Replacement of PTC
3	Measurement of PTC temperature control protection switch for 24V input	☐Yes ☐No	Check wiring between temperature control switch and PLC

10 EII1 Return air temperature sensor failure

malfunctions codin	Fault name	Type of fault	fault principle	PLC foot position

g				
EII1	Return air temperature sensor failure	Resistance detection class	This condition occurs when the PLC detects that the resistance of the return air temperature sensor is out of the range of 0.6~108KΩ. malfunctions	RT3, RT-

<table>
<tr><td>move</td><td>methodologies</td><td>Test results</td><td>operating method</td></tr>
<tr><td>1</td><td>Vehicle: power up and switch on the vehicle to verify that the air-conditioning control panel displays EII1 normally.
trouble code</td><td>☐Yes ☐No</td><td>View historical faults</td></tr>
<tr><td>2</td><td>Multimeter to measure if the return air temperature sensor resistance is within range<table><tr><td>temperature range</td><td>Corresponding resistance range</td></tr><tr><td>90~50°C</td><td>0.5~2.0KΩ</td></tr><tr><td>50~20°C</td><td>2.0~6KΩ</td></tr><tr><td>20~-0°C</td><td>6~14.2KΩ</td></tr><tr><td>0~7°C</td><td>14.2~20KΩ</td></tr></table></td><td>☐Yes ☐No</td><td>Replace the return air temperature sensor</td></tr>
<tr><td>3</td><td>Measure the sensor with a multimeter for 5V input voltage.
 
</td><td>☐Yes ☐No</td><td>Check and repair wiring between sensor and controller</td></tr>
</table>

11 EII2 Evaporator left defrost temperature sensor failure

malfunctions codin	Fault name	Type of fault	fault principle	PLC foot position

g				
EII2	Evaporator left defrost temperature sensing device failure	Resistance detection class	If the PLC detects that the resistance value of the return air temperature sensor is out of the range of 0.6~108KΩ, it sends a message to the PLC. failures of this kind occur	RT4, RT-

move	methodologies	Test results	operating method
1	Vehicle: power up and switch on the vehicle to verify that the air-conditioning control panel displays **EII2** normally. trouble code	☐Yes ☐No	View historical faults
2	Multimeter to measure if temperature sensor resistance is within range temperature range / Corresponding resistance range 90~50°C: 0.5~2.0KΩ 50~20°C: 2.0~6KΩ 20~-0°C: 6~14.2KΩ 0~7°C: 14.2~20KΩ	☐Yes ☐No	Replacing the Left Defrost Temperature Sensor
3	Measure the sensor with a multimeter for 5V input voltage. 	☐Yes ☐No	Check and repair wiring between sensor and controller

12 EII3 Evaporator right defrost temperature sensor failure

malfunctions coding	Fault name	Type of fault	fault principle	PLC foot position

EII3	Evaporator right defrost temperature sensing device failure	Resistance detection class	This fault occurs when the PLC detects that the resistance value of the return air temperature sensor is outside the range of 0.6~108KΩ.	RT5, RT-

move	methodologies	Test results	operating method
1	Vehicle: power up and switch on the vehicle to verify that the air-conditioning control panel displays normally. trouble code **EII3** temperature range / Corresponding resistance value 90~50°C: 0.5~2.0KΩ 50~20°C: 2.0~6KΩ 20~0°C: 6~14.2KΩ 0~7°C: 14.2~20KΩ	☐Yes ☐No	View historical faults
2	Multimeter to measure if the return air temperature sensor resistance is within range	☐Yes ☐No	Replace the return air temperature sensor
3	Measure the sensor with a multimeter for 5V input voltage. 	☐Yes ☐No	Check and repair wiring between sensor and controller

13 EII4 Outdoor temperature sensor failure

malfunctions coding	Fault name	Type of fault	fault principle	PLC foot position
EII4	Outdoor temperature sensor failure	Resistance detection class	When the PLC detects that the resistance of the return air temperature sensor is out of the range of 0.6~108KΩ, the PLC will detect the return air temperature sensor. This fault occurs when	RT2, RT-

move	methodologies	Test results	operating method
1	Vehicle: power up and switch on the vehicle to verify that the air-conditioning control panel displays **EII4** normally. trouble code	☐Yes ☐No	View historical faults
2	Multimeter to measure if the outdoor temperature sensor resistance is within range	☐Yes ☐No	Replacement of Outdoor Temperature Sensor

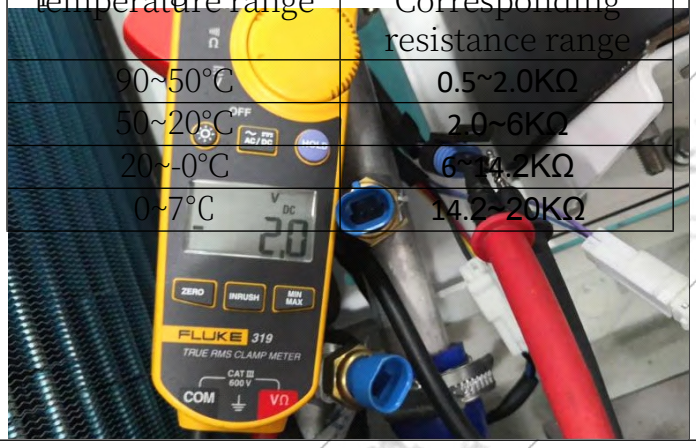
3	Measure the sensor with a multimeter for 5V input voltage.  	☐Yes ☐No	Check and repair wiring between sensor and controller

Temperature range	Corresponding resistance range
90~50°C	0.5~2.0KΩ
50~20°C	2.0~6KΩ
20~-0°C	6~14.2KΩ
0~-7°C	14.2~20KΩ

14 EII5 Faulty condensate coil temperature sensor

malfunctions coding	Fault name	Type of fault	fault principle	PLC
EII5	Faulty condensing coil temperature sensor	Resistance detection class	When the PLC detects that the condensation temperature sensor resistance value is out of the range of 0.6~108KΩ, the PLC will detect the condensation temperature sensor resistance value. This fault occurs when	RT1, RT-

move	methodologies	Test results	operating method
1	Vehicle: Power up and switch on the vehicle to verify that the air-conditioning control panel displays **EII5** normally. trouble code	☐Yes ☐No	View historical faults

2	Measure condensing coil temperature sensor resistance with a multimeter to see if it is within range.	☐Yes ☐No	Replace condensing coil temperature sensor
3	Measure the sensor with a multimeter for 5V input voltage  Temperature range / Corresponding resistance range 90~50℃ 0.5~2.0KΩ 50~20℃ 2.0~6KΩ 20~0℃ 6~14.2KΩ 0~7℃ 14.2~20KΩ	☐Yes ☐No	Check and repair wiring between sensor and controller

15 EII6 Plate change inlet water temperature sensor failure

malfunctions coding	Fault name	Type of fault	fault principle	PLC
EII6	Faulty inlet water temperature sensor	Resistance detection class	Occurs when the PLC monitors that the resistance of the inlet water temperature sensor is outside the range of 0.6~108KΩ. this fault	RT9, RT-

move	methodologies	Test results	operating method

1	Vehicle: power up and switch on the vehicle to verify that the air-conditioning control panel displays **EII6** normally. trouble code	☐Yes ☐No	
2	Multimeter to measure if the inlet water temperature sensor resistance is within range temperature range / Corresponding resistance range 40~50℃ 1.2~0.9KΩ 20~40℃ 2.6~1.2KΩ 0~20℃ 6~2.6KΩ	☐Yes ☐No	Replacing the water inlet temperature sensor
3	Measure the sensor with a multimeter for 5V input voltage. 	☐Yes ☐No	Check and repair wiring between sensor and controller

16 EII7 Board swap water temperature sensor failure

malfunctions coding	Fault name	Type of fault	fault principle	PLC
EII7	Failure of board exchange water temperatur	Resistance detection class	PLC detects sensor resistance outside the range of 0.6~108KΩ. breakdown	RT10, RT-

	e sensor			

move	methodologies	Test results	operating method
1	Vehicle: Power up and switch on the vehicle to verify that the air-conditioning control panel displays **EII7** normally. trouble code temperature range / Corresponding resistance range 40~50℃ — 1.2~0.9KΩ 20~40℃ — 2.6~1.2KΩ 0~20℃ — 6~2.6KΩ	☐Yes ☐No	View historical faults
2	Multimeter to measure if the water temperature sensor resistance is within range	☐Yes ☐No	Replacement of water outlet temperature sensor
3	Measure the sensor with a multimeter for 5V input voltage. 	☐Yes ☐No	Check and repair wiring between sensor and controller

17 H1r Main circuit 1 Return air temperature sensor failure

malfunctions coding	Fault name	Fault type	fault principle	PLC foot position

H1r	Main circuit 1 Return air temperature sensor failure	Resistance detection class	PLC detects sensor resistance exceeding 0.6~108KΩ range of faults block	RT7, RT-

move	methodologies	Test results	operating method
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays normally **H1r** trouble code temperature range / Corresponding resistance range 90~50℃ / 0.5~2.0KΩ 50~20℃ / 2.0~6KΩ 20~0℃ / 6~14.2KΩ 0~7℃ / 14.2~20KΩ	☐Yes ☐No	View historical faults
2	Multimeter to measure if temperature sensor resistance is within range	☐Yes ☐No	Replace the main circuit 1 return air temperature sensor
3	Measure the sensor with a multimeter for 5V input voltage. 	☐Yes ☐No	Check and repair wiring between sensor and controller

18 H2r Main circuit 2 Return air temperature sensor failure

malfunctio	Fault name	Fault type	fault principle

ns codin g			
H2r	Main circuit 2 Return air temperature sensor failure	Resistance detection class	Malfunction when PLC detects sensor resistance outside the range of 0.6~108KΩ.

temperature range	Corresponding resistance range
90~50°C	0.5~2.0KΩ
50~20°C	2.0~6KΩ
20~0°C	6~14.2KΩ
0~7°C	14.2~20KΩ

move	methodologies	Test results	operating method
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays normally **H1r** trouble code	☐Yes ☐No	View historical faults
2	Multimeter to measure if temperature sensor resistance is within range	☐Yes ☐No	Replace main circuit 2 return air temperature sensor
3	Measure the sensor with a multimeter for 5V input voltage. 	☐Yes ☐No	Check and repair wiring between sensor and controller

19 H3r Sub-circuit 1 Return air temperature sensor failure

temperature range	Corresponding resistance range
90~50°C	0.5~2.0KΩ
50~20°C	2.0~6KΩ
20~0°C	6~14.2KΩ
0~7°C	14.2~20KΩ

malfunctio	Fault name	Type of fault	Fault principle	PLC

ns codin g				
H3r	Sub-circuit 1 Return air temperature sensor failure	Resistance detection class	The PLC sends a message when it detects that the sensor resistance value is out of the range of 0.6~108KΩ. malfunction	RT6, RT-

move	methodologies	Test results	operating method
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays normally **H1r** trouble code	☐Yes ☐No	
2	Multimeter to measure if temperature sensor resistance is within range	☐Yes ☐No	Replace ment of sub-circuit 1 return air tempera ture sensor
3	Measure the sensor with a multimeter for 5V input voltage. 	☐Yes ☐No	Check and repair wiring between sensor and controll er

temperature range	Corresponding resistance range
90~50°C	0.5~2.0KΩ
50~20°C	2.0~6KΩ
20~0°C	6~14.2KΩ
0~7°C	14.2~20KΩ

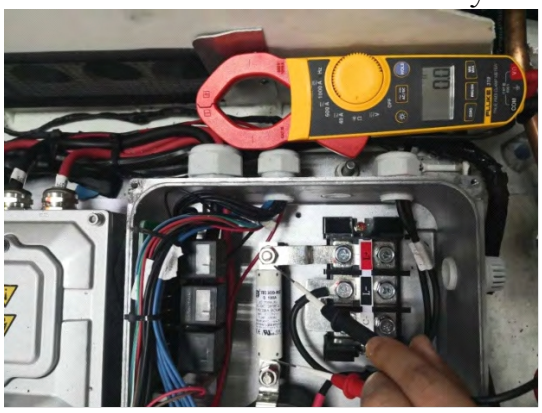
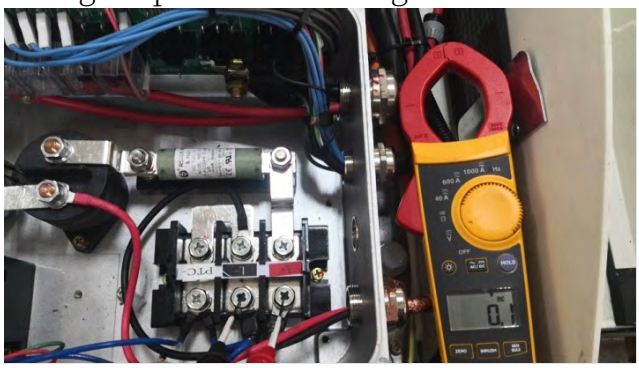
20 H4r Sub-circuit 2 Return air temperature sensor failure

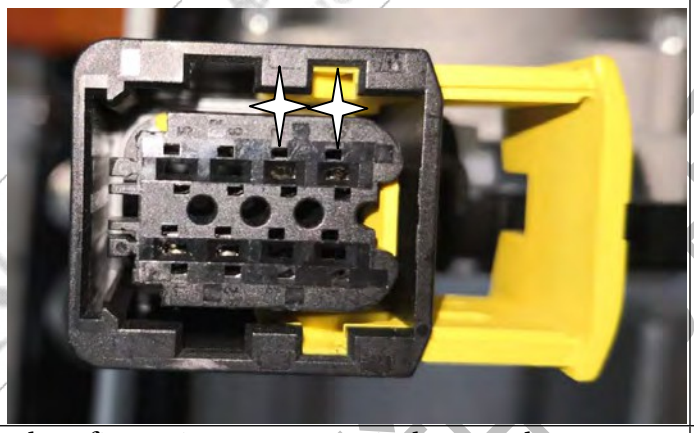
malfunctions coding	Fault name	Type of fault	fault principle
H4r	Sub-circuit 2 Return air temperature sensor failure	Resistance detection class	PLC detects a malfunction when the sensor resistance value exceeds the range of 0.6~108KΩ.

move	methodologies	Test results	operating method
1	Vehicle: power up and switch on to verify that the air-conditioning control panel displays properly **H4r** trouble code	☐Yes ☐No	
2	Multimeter to measure if temperature sensor resistance is within range	☐Yes ☐No	Replace Sub-Circuit 2 Temperature Sensor
3	Measure the sensor with a multimeter for 5V input voltage. 	☐Yes ☐No	Check and repair wiring between sensor and controller

21 HUF High Voltage Input Power Failure Check

malfunctions coding	Fault name	Type of fault	fault principle
HUF	High-voltage input disconnection fault	Voltage Inspection	This fault occurs when the input voltage for load-side detection is less than 400V.

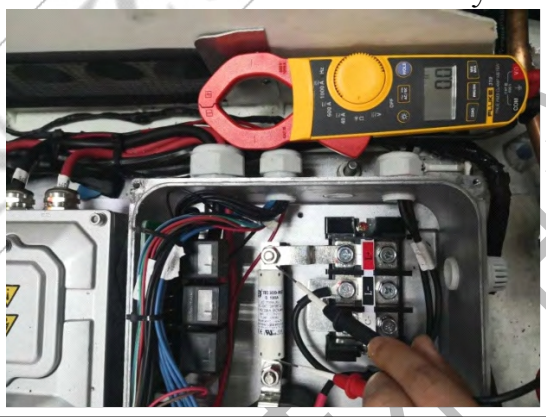
move	methodologies	Test results	operating method
1	Vehicle: power up and switch on to verify that the air conditioning control panel displays normally. **HUF** Fault Code	☐Yes ☐No	View historical faults
2	Measurement of fuse continuity 	☐Yes ☐No	Replacement of fuses
3	Measure whether the air conditioner high voltage input is in the range of **450~750V**. 	☐Yes ☐No	Check the air-conditioning insurance of the whole vehicle Contact the vehicle manufacturer to

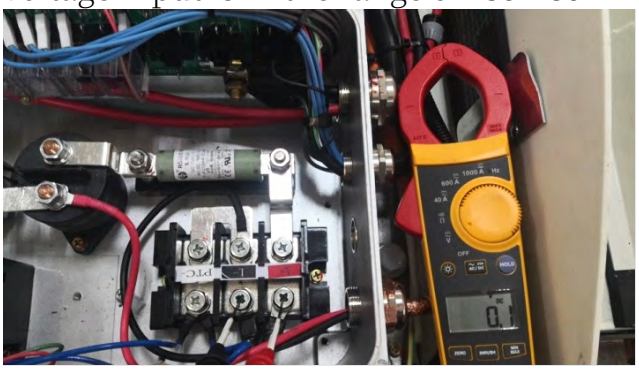
			restore the air-conditioning power supply if necessary
5	Measure the low voltage input of the HELI compressor between 18 and 32V.  	☐Yes ☐No	Find and repair breaks and false connections along the line.
6	The first time you switch on the power manipulator to start the machine, that is to say, to measure whether the high voltage input of the HELI compressor (DC) is at 450V (based on the rated voltage range of the nameplate of the compressor).	☐Yes ☐No	Replace Compressor High Pressure Harness

7	Check the communication line between the compressor and the PLC for breaks, shorts and false connections.	☐Yes ☐No	Replacement of compression

22 LU Inverter undervoltage

malfunctions coding	Fault name	Type of fault	fault principle
LU	Inverter undervoltage fault	Voltage Detection	This fault occurs when the input voltage is detected to be less than 300V at the load side during operation.

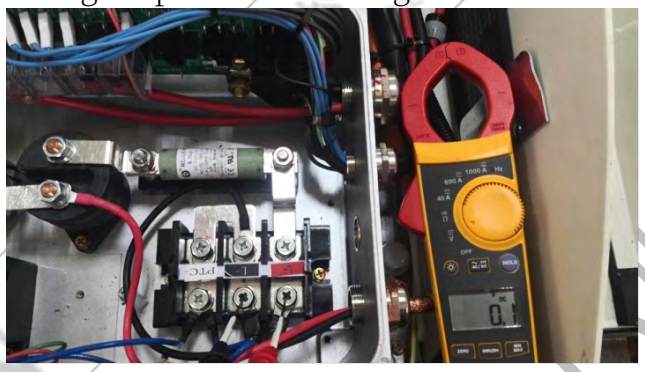
move	methodologies	Test results	operating method
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays normally **LU** trouble code	☐Yes ☐No	
2	Measurement of fuse continuity 	☐Yes ☐No	Replacement of fuses

3	Measure whether the air conditioner high voltage input is in the range of 450~750V. 	☐Yes ☐No	Check the air-conditioning insurance of the whole vehicle Contact the vehicle manufacturer to restore the air-conditioning power supply if necessary
4	Measure whether the input voltage of 2-in-1 is between 450~750V.	☐Yes ☐No	Check main contactor weak coil and input voltage
5	The first time the power-up manipulator is switched on, the 2-in-1 input voltage is measured at the 400~750V range	☐Yes ☐No	Replace Compressor High Pressure Harness

			
7	Check the communication line between the compressor and the PLC for breaks, shorts and false connections.	☐Yes ☐No	Replacement of compression

23 OU Inverter overvoltage

malfunctions coding	Fault name	Fault type	fault principle
OU	Inverter overvoltage fault	Voltage Detection	This fault occurs when an input voltage higher than 750V is detected on the load side during operation.

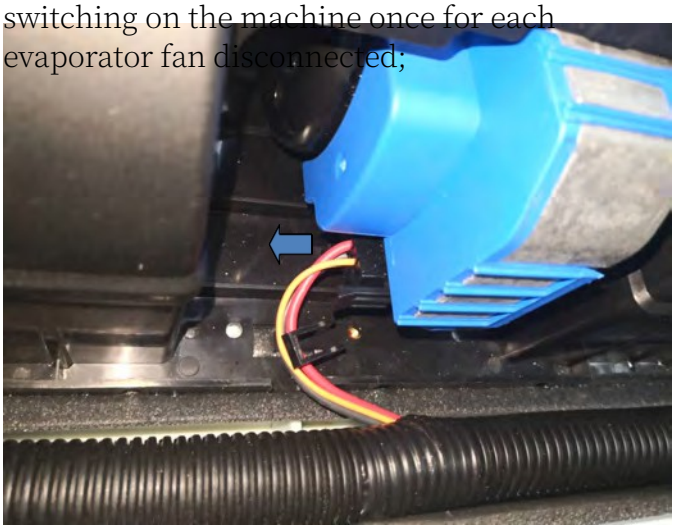
move	methodologies	Test results	operating method
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays **OU** normally. trouble code	☐Yes ☐No	View historical faults
2	Measure whether the air conditioner high voltage input is in the range of 450~750V. 	☐Yes ☐No	
3	Measure whether the input voltage of 2-in-1 is between 450~750V.	☐Yes ☐No	Replacement of 2-in-1

24 EOC Evaporator fan inverter overcurrent

malfunctions coding	Fault name	Type of fault	fault principle
EOC	Evaporator fan inverter over stream of water or sth. resembling one	Current detection class	When the 2-in-1 detects that the evaporator fan output current is greater than the This fault occurs at 100A

move	methodologies	Inspection results	Treatment programme
1	Vehicle: Power on and verify that the air conditioning control panel displays **EOC** normally. trouble code	☐Yes ☐No	View historical faults

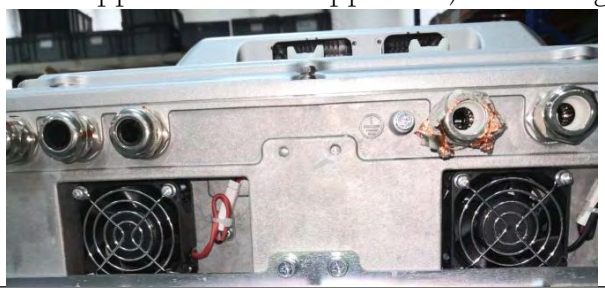
2	Check the appearance of the fan is intact, no damage, no blockage, fan blade rotation freely	☐Yes ☐No	Replace or remove the blockage
			
3	Check the evaporator fan line connections, whether the connection is reliable, no skewed plugs, back pins	☐Yes ☐No	Tighten connections or correct wiring sequence
4	Check that the evaporator fan wiring is intact and free of damage and short circuits	☐Yes ☐No	Repair or replacement of wiring
5	Remove and disconnect the evaporator fan inserts one by one, and test for faults by switching on the machine once for each evaporator fan disconnected; 	☐Yes ☐No	Replacement of the appropriate evaporator fan

6	1,Disconnect the evaporator fan power connection plug; 2, Swap AO1 and AO2 pins in the PLC interface; 3, Ventilation mode run for a period of time failure occurs or not; 	☐Yes ☐No	Replacement of the appropriate evaporator fan
7	Replace the 2-in-1 and try it for a while, does the fault no longer occur	☐Yes ☐No	

25 EOH Evaporator fan inverter overheating

malfunctions coding	Fault name	Type of fault	fault principle
EOH	Evaporator fan inverter over heat up	Temperature Detection	This fault occurs when the inverter internal temperature sensor detection value reaches or exceeds the set maximum value.

move	methodologies	Inspection results	Treatment programme
1	Vehicle: Power on and verify that the air conditioning control panel displays EOH normally. trouble code	☐Yes ☐No	View historical faults

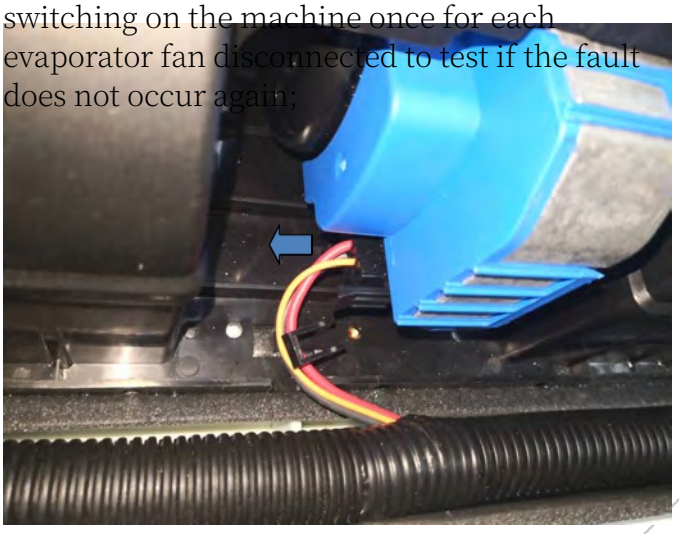
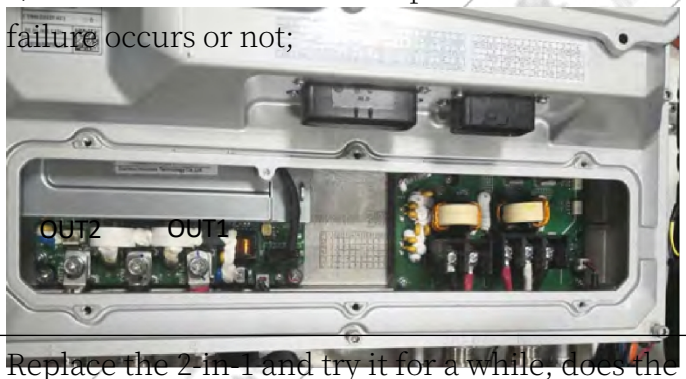
2	Switch on and run for a period of time to check whether the heat fan in the appliance compartment (including stand-alone fans and fans supplied with the appliance) is running. 	☐Yes ☐No	Replace the cooling fan or corresponding components
3	Check that the air inlet and outlet of the electrical compartment are clear and free from blockage 	☐Yes ☐No	Clear the blockage
4	Check that the electrical compartment insulation foam is intact and has not fallen off. 	☐Yes ☐No	Replace or reapply insulation foam

26 EOL Evaporator fan inverter overload

malfunctions coding	Fault name	Type of fault	fault principle

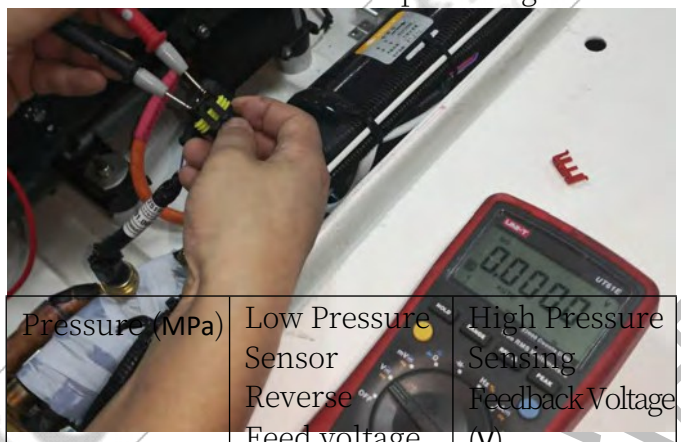
EOL	Evaporator fan inverter over year	Current detection class	This fault occurs when the 2-in-1 detects that the fan output current is greater than the rated fan current of 100A.

move	methodologies	Inspection results	Treatment programme
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays properly **LOC** trouble code	☐Yes ☐No	View historical faults
2	Check the appearance of the fan is intact, no damage, no blockage, fan blade rotation freely 	☐Yes ☐No	Replace or remove the blockage
3	Check the evaporator fan line connections, whether the connection is reliable, no skewed plugs, back pins	☐Yes ☐No	Tighten connections or correct wiring sequence
4	Check that the evaporator fan wiring is intact and free of damage and short circuits	☐Yes ☐No	Repair or replacement of wiring

5	Remove and disconnect the evaporator fan inserts one by one, and test the fault by switching on the machine once for each evaporator fan disconnected to test if the fault does not occur again; 	☐Yes ☐No	Replace the appropriate condensing fan
6	1,Disconnect the evaporator fan power connection plug; 2, Swap AO1 and AO2 pins in the PLC interface; 3, Ventilation mode run for a period of time failure occurs or not; 	☐Yes ☐No	Replacement of the appropriate evaporator fan
8	Replace the 2-in-1 and try it for a while, does the fault no longer occur	☐Yes ☐No	

27 C5F Pressure Sensor Failure

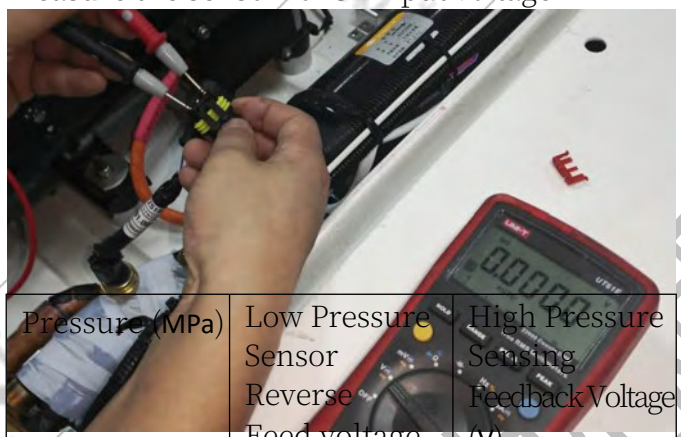
malfunctions coding	Fault name	Type of fault	fault principle	PLC
C5F	Pressure sensor failure	Voltage Detection	When 2-in-1 detects that the pressure sensor feedback voltage is out of the 0~5V range This fault occurs	5V, AI1, AICOM

move	methodologies	Inspection results	Treatment programme
1	Vehicle: power up and switch on the vehicle to verify that the air-conditioning control panel displays **C5F** normally.	☐Yes ☐No	View historical faults
3	Measure the sensor for 5V input voltage 	☐Yes ☐No	Check wiring from sensor to PLC
4	Measure whether the sensor feedback voltage is in the range of 0~5V	☐Yes ☐No	Replacement of the pressure sensor
5	Replace pressure transducer Check transducer to PLC feedback signal line		

Pressure (MPa)	Low Pressure Sensor Reverse Feed voltage (V)	High Pressure Sensing Feedback Voltage (V)
0~1.6	0.5~1.88	0.45~2.13
1.6~3.0	1.88~3.09	2.13~3.61
3.0~4.0	3.09~3.93	3.61~4.03

28 S1r Pressure sensor failure

malfunctions coding	Fault name	Type of fault	fault principle	PLC
S1r	Pressure sensor 1 fault	Voltage Detection	2-in-1 detected to pressure sensor 1 When the feedback voltage is out of the 0~5V range This fault occurs	5V, AI1, AICOM

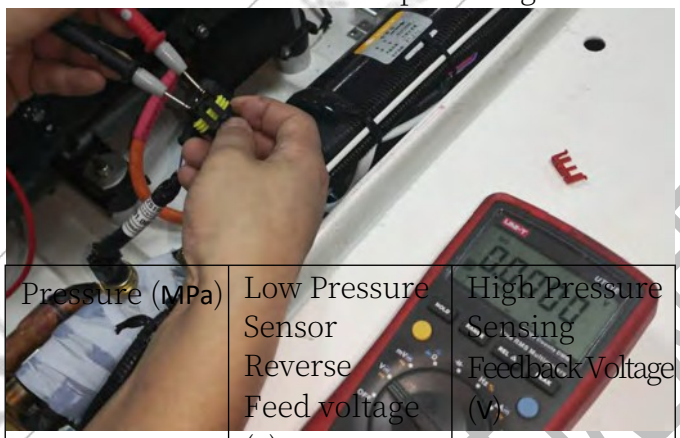
move	methodologies	Inspection results	Treatment programme
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays properly S1r	☐Yes ☐No	View historical faults
3	Measure the sensor for 5V input voltage 	☐Yes ☐No	Check wiring from sensor to PLC
4	Measure whether the sensor feedback voltage is in the range of 0~5V	☐Yes ☐No	Check sensor to PLC feedback signal line

Pressure (MPa)	Low Pressure Sensor Reverse Feed voltage (V)	High Pressure Sensing Feedback Voltage (V)
0~1.6	0.5~1.88	0.45~2.13
1.6~3.0	1.88~3.09	2.13~3.61
3.0~4.0	3.09~3.93	3.61~4.03

5	Check sensor to PLC feedback signal line		

29 S2r Pressure sensor failure

malfunctions coding	Fault name	Type of fault	fault principle	PLC foot position
S2r	Pressure sensor 2 fault	Voltage Detection	2-in-1 detects pressure sensor 1 feedback voltage exceeds 0~5V This fault occurs when the range	5V, AI2, AICOM

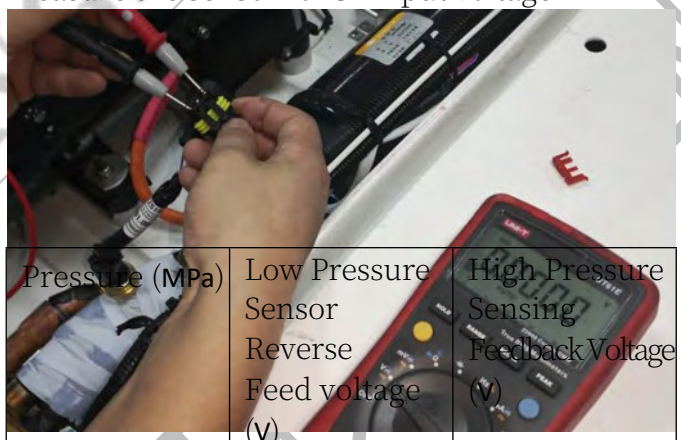
move	methodologies	Inspection results	Treatment programme
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays properly **S2r**	☐Yes ☐No	View historical faults
3	Measure the sensor for 5V input voltage 	☐Yes ☐No	Check wiring from Sensor 2 to PLC.
4	Measure whether the sensor feedback voltage is in the range of 0~5V	☐Yes ☐No	Replacement of pressure sensor 2

Pressure (MPa)	Low Pressure Sensor Reverse Feed voltage (V)	High Pressure Sensing Feedback Voltage (V)
0~1.6	0.5~1.88	0.45~2.03
1.6~3.0	1.88~3.09	2.13~3.61
3.0~4.0	3.09~3.93	3.61~4.03

5	Check Sensor 2 to PLC Feedback Signal Wire		

30 S3r Pressure sensor failure

malfunctions coding	Fault name	Type of fault	fault principle
S3r	pressure sensing Instrument 3 Failure	Voltage Detection	2-in-1 detects pressure sensor 3 feedback voltage exceeded This fault occurs in the 0~5V range

move	methodologies	Inspection results	Treatment programme
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays properly **S3r**	☐Yes ☐No	View historical faults
3	Measure the sensor for 5V input voltage 	☐Yes ☐No	Check wiring from Sensor 3 to PLC.

Pressure (MPa)	Low Pressure Sensor Reverse Feed voltage (V)	High Pressure Sensing Feedback Voltage (V)
0~1.6	0.5~1.88	0.45~2.13
1.6~3.0	1.88~3.09	2.13~3.61
3.0~4.0	3.09~3.93	3.61~4.03

4	Measure whether the sensor feedback voltage is in the range of 0~5V	□Yes □No	Replacement of pressure sensor 3
5	Check Sensor 3 to PLC Feedback Signal Wire		

31 S4r Pressure sensor failure

malfunctions coding	Fault name	Fault type	fault principle
S4r	pressure sensing 4 Faults	Voltage Detection	2-in-1 detects pressure transducer 4 feedback voltage exceeded This fault occurs in the 0~5V range

move	methodologies	Inspection results	Treatment programme
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays properly **S4r**	□Yes □No	View historical faults

Pressure (MPa)	Low Pressure Sensor Reverse Feed voltage (V)	High Pressure Sensing Feedback Voltage (V)
0~1.6	0.5~1.88	0.45~2.13
1.6~3.0	1.88~3.09	2.13~3.61
3.0~4.0	3.09~3.93	3.61~4.03

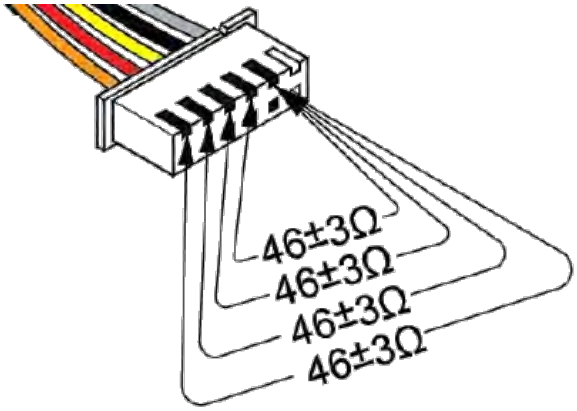
3	Measure the sensor for 5V input voltage 	☐Yes ☐No	Check wiring from Sensor 4 to PLC.
4	Measure the sensor feedback voltage to see if it is within range	☐Yes ☐No	Check Sensor 4 to PLC feedback signal wire
5	Replacement of pressure sensor 4		

	Coil 1		Coils 2		common (use) (Neutral)
guide wire colour	orange (colour)	pink	porn ography	ferrous	pessimistic

32 UHF Electronic Expansion Valve Failure

malfunctions coding	Fault name	Type of fault	fault principle	PLC foot position
UHF	Electronic Expansion Valve Failure	current detection	The problem occurs when the output current of the electronic expansion valve coil exceeds the range of the two-in-one detection.	MA+, MA-, MB+, MB-, +12V

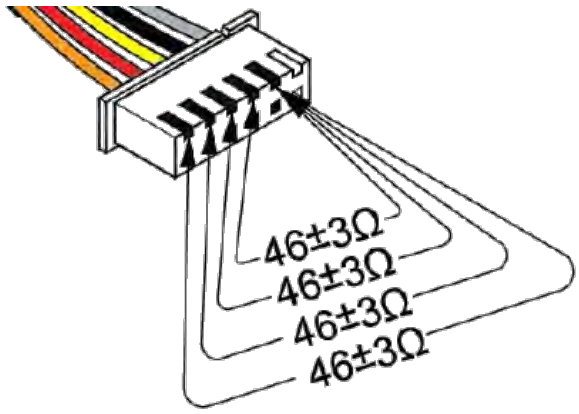
numerical value of electrical impedance	92Ω (±3)	92Ω (±3)	46Ω (±3)	block

move	methodologies	Inspection results	Treatment programme
1	Vehicle: power up and switch on to verify that the air conditioning control panel displays normally. HUF	☐Yes ☐No	View historical faults
2	Measuring electronic expansion valve coil resistance 	☐Yes ☐No	Replace electronic expansion valve coil
3	Check and repair miswiring and short circuits between the PLC and the expansion valve coil.		

	Coil 1		Coil 2		common (use)
guidewire colour	orange (colour)	pink	pornographic	ferrous	pessimistic (Neutral)
numerical value of electrical impedance	92Ω (±3)		92Ω (±3)		46Ω (±3)

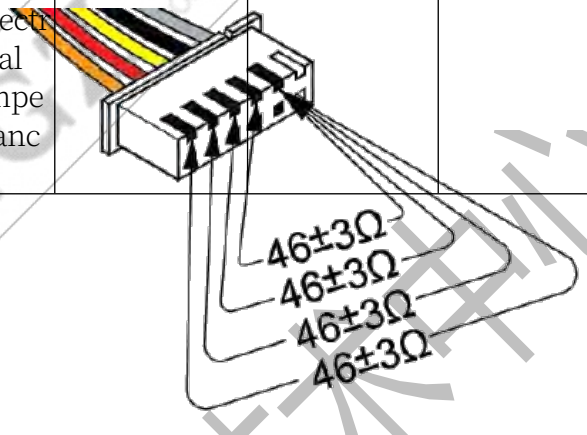
33 F1r Electronic Expansion Valve 1 Fault

malfunctions coding	Fault name	Fault type	fault principle	PLC Foot
F1r	Electronic Expansion Valve 1 Failure	current detection	2-in-1 detection occurs when the electronic expansion valve coil output current is out of range this fault	ev1a+, ev1a-, ev1b+, ev1b-, ecom

move	methodologies	Inspection results	Treatment programme
1	Vehicle: Power up and switch on the vehicle to verify that the air-conditioning control panel displays normally F1r	☐Yes ☐No	View historical faults
2	Measuring electronic expansion valve coil resistance 	☐Yes ☐No	Replace electronic expansion valve coil
3	Check and repair miswiring and short circuits between the PLC and the expansion valve coil.		

34 F2r Electronic Expansion Valve 2 Fault

malfunctions coding	Fault name	Fault type	fault principle	PLC foot position
F2r	Electronic Expansion Valve 2 Failure	current detection	2-in-1 detection occurs when the electronic expansion valve coil output current is out of range this fault	ev2a+, ev2a-, ev2b+, ev2b-, ecom

move	methodologies	Inspection results	Treatment programme
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays normally. F2r	☐Yes ☐No	View historical faults
2	Measuring electronic expansion valve coil resistance F2r 	☐Yes ☐No	Replace electronic expansion valve coil
3	Check and repair miswiring and short circuits between the PLC and the expansion valve coil.		

wire colour	Coil 1 (colour)		Coils 2		common (use) (Neutral)
	orange	pink	porn ography phic	ferro us	pessimistic
numerical value of electrical impedance	92Ω (±3)		92Ω (±3)		46Ω (±3)

35 F3r Inefficient Water Circulation Failure

malfunctions coding	Fault name	Type of fault	fault principle
F3r	Failure of inefficient water circulation	logical judgement	When the return air temperature is detected to be less than 10℃ after 3min of operation and the outlet water temperature minus the inlet water temperature is more than 10℃ for 20S. this fault

move	methodologies	Inspection results	Treatment programme
1	Vehicle: Power up and switch on the vehicle to verify that the air conditioning control panel displays normally F3r	□Yes □No	View historical faults
2	Take the manifold pressure gauge tube in forced plate change mode and drain the valve core at the plate change to see if any water comes out. 	□Yes □No	Check that the pump is running
3	Observe the status of the drainage tube to see if it appears to be columnar and flows out forcefully	□Yes □No	Continue to empty the drain tube until the drainage is columnar

36 F4r Water inlet and outlet reverse connection fault

malfunctions coding	Fault name	Type of fault	fault principle
F4r	Water inlet and outlet reverse polarity fault	logical judgement	After 3 min of operation, the temperature of the outlet water is greater than the temperature of the inlet water and the temperature of the inlet water is greater than the temperature of the outlet water. This fault occurs when the difference is greater than 1.5°C.

move	methodologies	Inspection results	Treatment programme
1	Vehicle: power up and switch on the vehicle to verify that the air conditioning control panel displays normally F4r	☐Yes ☐No	View historical faults
2	Unplug the water outlet temperature sensor and check if the water outlet temperature value is positive	☐Yes ☐No	Inlet and outlet water temperature sensors are reversed.
3	Multiple runs to observe if there is a change in the value of the outlet water temperature	☐Yes ☐No	Replacement of sensors with no value change
4	Communicate and assist vehicle personnel in making corrections to the water system		

37PFF Water pump failure

faulty generation classifier for length or distance (yard), happenings etc	Fault name	Type of fault	fault principle	PLC foot position
PFF	Water pump failure	Switching faults	When the PLC monitors the X5 input This fault occurs at 24V (water pump) (0V feedback)	X5
			When the PLC monitors that X5 is not entered This fault occurs at 24V (water pump) (24V feedback)	

move	methodologies	Inspection results	operating method
1	Vehicle: Power on and verify that the air conditioning control panel displays PFF normally.	☐Yes ☐No	View historical faults
2	Measure for 24V input to pump in 777 (forced plate change) mode.	☐Yes ☐No	Check and repair wiring and fuses
3	Pump operation with 24V input	☐Yes ☐No	Replacement of water pumps

4	Take the manifold pressure gauge tube in forced plate change mode and drain the valve core at the plate change to see if any water comes out. 	☐Yes ☐No	Purge air from the water system
5	Test whether the current during pump operation ≤ rated power/27	☐Yes ☐No	Check and remove water line blockages
6	Test pump for 24V feedback (faulty disconnected pumps) (reverse of fault feedback 24V model)	☐Yes ☐No	Replacement of water pumps
7	Check the wiring between PLC pin X5 and the pump.		

38LLF Liquid Level Fault

malfunctions coding	Fault name	Type of fault	fault principle	PLC foot position
LLF	Liquid level	Switch type faults	This fault occurs when the PLC monitors that 24V is not being input to pin X4 (normal).	X4

	failure		(closed)	
			When the PLC monitors the X4 pin input This fault occurs at 24V (normal) (open)	

<table>
<tr><th>move</th><th>methodologies</th><th>Inspection results</th><th>operating method</th></tr>
<tr><td>1</td><td>Vehicle: power up and switch on the vehicle to verify that the air-conditioning control panel displays LLF normally.</td><td>☐Yes ☐No</td><td>View historical faults</td></tr>
<tr><td>2</td><td>Check that the kettle level is not below the lower limit when the pump is running</td><td>☐Yes ☐No</td><td></td></tr>
<tr><td>3</td><td>Measurement level switch with or without 24V input
<table><tr><th>level state</th><th>Level switch status</th><th>fault state</th></tr><tr><td>fluid shortage</td><td>turn off (electric switch)</td><td>malfunctions</td></tr><tr><td>normalcy</td><td>conduction</td><td>normalcy</td></tr></table></td><td>☐Yes ☐No</td><td>Check and repair the level switch and PLC (X4, COM0) bus route</td></tr>
<tr><td>4</td><td>Check that the level status is consistent with the level switch status
The above table is for normally closed level switches, normally open type fault status is the opposite of this</td><td>☐Yes ☐No</td><td>Check and repair the level switch and PLC (X4, COM0) Interline</td></tr>
<tr><td>5</td><td>Replacement of level switch</td><td></td><td></td></tr>
</table>

VII, Standalone Thermal Management Troubleshooting Chart

Essential Tools for Battery Thermal Management Repair

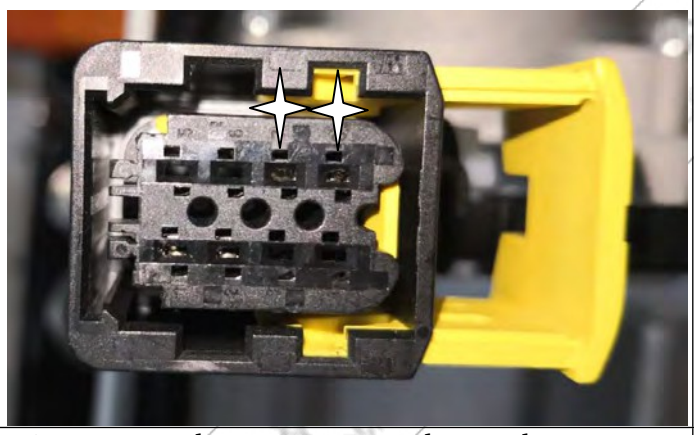
name (of a thing)	quantities
CAN_test	1
laptops	1 unit
Commissioning Panel (Thermal Management)	1

1 Busbar undervoltage fault

malfunctions coding	Fault name	Type of fault	fault principle
01 0x01	Busbar undervoltage malfunctions	Voltage Detection	This error occurs when the compressor test output voltage falls below 400V. block

move	methodologies	Inspection results	Treatment programme
1	Measure whether the HV+ and HV- input voltage is >400V.	☐ No. Yes.	Check the vehicle's power-up condition and communicate with the whole vehicle after-sales service if necessary.

2	Measure the voltage between the back end of the fuse and the HV-voltage in the unit for >400V.	☐ No. Yes.	Replacement of fuses after power failure
3	Access to debug panel and power on/transmit: ID: 0CFFFFDA Data: 03 00 00 32 00 00 00 00 00 Measure the voltage between CM+ and CM- after the pre-charging contactor is engaged. 400V	☐ No. Yes.	Replacement of High Voltage Electrical Board
4	Unplug the compressor high pressure plug-in Access to debug panel and power on/transmit: ID: 0CFFFFDA Data: 03 00 00 32 00 00 00 00 00 Measure the voltage between the compressor high-voltage plug-in 1 (negative) and 2 (positive) pins to see if it is >400V after the pre-charging contactor is engaged.	☐ No. Yes.	Repair or replace compressor high pressure harness

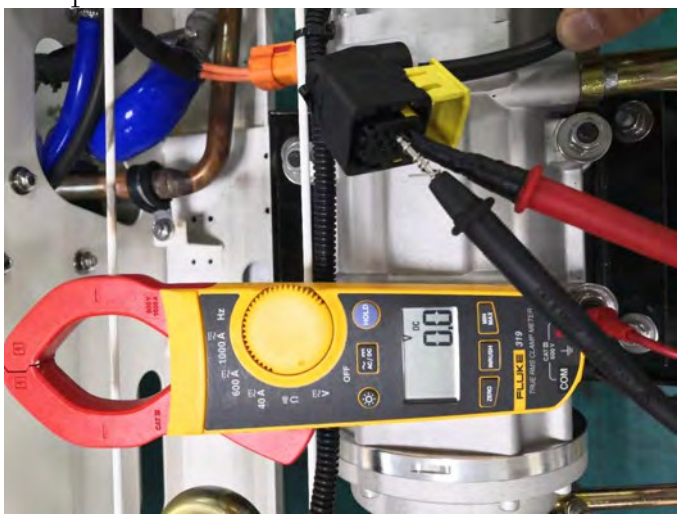
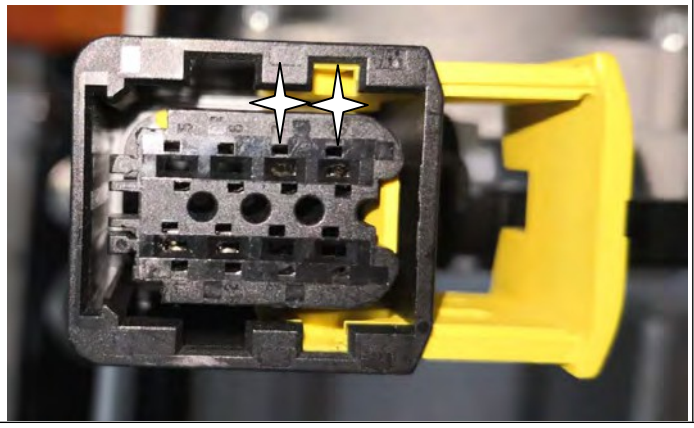
5	Measure the low voltage input of the HELI compressor between 18 and 32V.  	☐Yes ☐No	Checked and repaired wiring
6	Disconnect the compressor low voltage harness and measure the resistance of the compressor CAN wire (yellow and green) for 120Ω.	☐Yes ☐No	Replace the compressor after checking the low voltage wiring harness for correctness
7	Measure the resistance of the CAN lines (7 and 8) on the module side for 120Ω.	☐Yes ☐No	Replace the CAN module after checking the wiring

8	Replacement of compressor		

2 Busbar overvoltage fault

malfunctions coding	Fault name	Fault type	fault principle
02 0x02	Busbar overvoltage fault	Voltage Detection	This fault occurs when the compressor detection output voltage is >720V.

move	methodologies	Inspection results	Treatment programme
1	Measure whether the HV+ and HV- input voltage is >400V.	☐Yes ☐No	Check the vehicle's power-up condition and communicate with the whole vehicle after-sales service if necessary.
2	Measure the voltage between the back end of the fuse and the HV-voltage in the unit for >400V.	☐Yes ☐No	Replacement of fuses after power failure

3	Access to debug panel and power on/transmit: ID: 0CFFFFDA Data: 03 00 00 32 00 00 00 00 00 Measure the voltage between CM+ and CM- after the pre-charging contactor is engaged. 400V	☐Yes ☐No	Replacement of High Voltage Electrical Board
4	Unplug the compressor high pressure plug-in Access to debug panel and power on/transmit: ID: 0CFFFFDA Data: 03 00 00 32 00 00 00 00 00 Measure the voltage between the compressor high-voltage plug-in 1 (negative) and 2 (positive) pins to see if it is >400V after the pre-charging contactor is engaged.	☐Yes ☐No	Repair or replace compressor high pressure harness
5	Measure the low voltage input of the HELI compressor between 18 and 32V.  	☐Yes ☐No	Checked and repaired wiring

6	Disconnect the compressor low voltage harness and measure the resistance of the compressor CAN wire (yellow and green) for 120Ω.	☐Yes ☐No	Replace the compressor after checking the low voltage wiring harness for correctness
7	Measure the resistance of the CAN lines (7 and 8) on the module side for 120Ω.	☐Yes ☐No	Replace the CAN module after checking the wiring

8	Replacement of compressor		

3 24V Low voltage undervoltage fault

happening trouble code	fault name steelyard	fault type type (e.g. blood type)	fault principle	Module Footprint
03 0x03	24V Low undervoltage malfunctions	Voltage Detection	This fault occurs when the CAN module detects an input voltage <18V.	CN1-1 (VCC) CN1-2 (GND)

move	methodologies	Inspection results	operating method
1	Measure whether the input voltage between pin 1 (red) and pin 2 (black) of the module is <18V.	☐Yes ☐No	Replacement of CAN module (in software)
2	Check that the wiring is free of short-circuit and disconnection faults	☐Yes ☐No	Replacement of modules

3	Repair or replacement of wiring	☐Yes ☐No	

4 24V low voltage overvoltage fault

malfunctions coding	fault name steelyard	Type of fault	fault principle	Module Footprint
04 0x04	24V Low overpressure malfunctions	Voltage Detection	Occurs when the CAN module detects (pins 1 and 2) that the input voltage is >32V. this fault	CN1-1 (VCC) CN1-2 (GND)

move	methodologies	Inspection results	operating method
1	Measure whether the input voltage between pin 1 (red) and pin 2 (black) of the module is >32V.	☐Yes ☐No	Replacement of CAN module (in software)
2	Check that the wiring is free of short-circuit and disconnection faults	☐Yes ☐No	Replacement of modules
3	Repair or replacement of wiring	☐Yes ☐No	

5 Compressor failure

malfunction	Fault name	Type of fault	fault principle

s coding			
05 0x05	Compressor failure	current detection	This fault occurs when the compressor detects too much current

move	methodologies	Inspection results	operating method
1	Check compressor high pressure harness connection for reliability	☐Yes ☐No	Repair or Replacement of Wiring Harness
2	Measure whether the insulation resistance value of the compressor high voltage line to the body is >10MΩ.	☐Yes ☐No	Replacement or repair of devices at insulation value points
4	Replacement of compressor		

6 Water pump failure

happening trouble code	fault name steelyard	fault type type (e.g. blood type)	fault principle	Module Footprint
06 0x06	Water pump failure	Switch Type	Module CN2-12 24V detected This fault occurs during input	CN2-12

move	methodologies	Inspection results	operating method
1	Measurement of the pump in self-circulation/cooling mode with 24V input	☐Yes ☐No	Check wiring and fuses

3	Check that the pump is running by touching it	☐Yes ☐No	Excluding pump idle protection Replacement of water pumps
4	Measure whether the current during pump operation is the same as the rated current (rated power). (/27V) is significantly different	☐Yes ☐No	Check the wiring from the feedback signal to the PLC
5	Comparison of measured current and rated current		
6	Measure the water pump fault feedback line for no voltage output	☐Yes ☐No	Replacement of water pumps

Comparative results	Treatment
<Rated current-7A	Water system evacuation treatment
>Rated current	Plumbing system blockage troubleshooting

7 Refrigeration system pressure failure

	R134A	R407C
0~10℃		
10~30℃		

malfunctions coding				le	Module Footprint
07 0x07	Refrigeration system	Switch Type	Module CN2-10 No 0V detected This fault occurs during input		CN2-10 (HLP) CN1-2 (GND)

	press ure malfuncti ons			

move	methodologies	Inspection results	operating method
1	Tap into a manifold pressure gauge to see if the system balance pressure is within range	☐Yes ☐No	Refrigera nt leakage/o verfilling
2	Start the refrigeration mode operation, observe whether the system pressure appears ultra-low pressure,ultra-high pressure phenomenon Ultra-low pressure phenomenon (<0.5bar) — Low Pressure Failure Ultra-high pressure phenomenon (>26 bar) — High Pressure Failure	☐Yes ☐No	Evacuati on of waterwa y systems
3	Checking the cause of the malfunction		
4	Measure the pressure switch status in accordance with the following table	☐Yes ☐No	Replace the appropr iate pressur e switch

5	Measurement of pressure switch input voltage		

pressure failure	Failure causes listed
Low Pressure Failure	1, the pump is not running; 2, the water line system is failing to cycle; 3. The system is clogged;
High Pressure Failure	1, the condensing fan is not operating; 2. The system is clogged;

system pressure	Low Pressure Switch state of affairs	High Pressure Switch state of affairs
<0.05bar	turn off (electric switch)	
＞26bar		turn off (electric switch)

pressure switch mountain pass	Measurement results	troubleshooting
High Pressure Switch	Input 12V on pin 1	Normal wiring to PLC
	Pin 1 Input 0/Hold	Broken/short circuit with PLC kind
	Input 0V on pin 2	with low voltage switching lines normalcy
	Pin 2Input 12/Hold	with low voltage switching lines Break/Short Circuit
Low Pressure Switch	24V input on pin 1	High-voltage switching line positive ever
	Input on pin 1 0V/overhead	with high-voltage switching lines Break/Short Circuit

8 Defrost sensor failure

malfunctions coding	fault name steelyard	fault type type (e.g. blood type)	fault principle	Module Footprint
08 0x08	Defrost Sensor block	Resistance Detection	The module sends a message when it detects that the defrost temperature sensor resistance is out of the range of 0.6~108KΩ. failures of this kind occur	CN2-2 (RT1) CN2-1 (digital earth)

Sensor foot position	Measurement results	fault troubleshooting
1 Foot	3.3V	Positive wiring to PLC ever
	0V/suspension	Line break with PLC /short circuit
2 feet	0V	Positive wiring to PLC ever
	Not 0V	Line break with PLC /short circuit

move	methodologies	Inspection results	operating method
1	Measuring the sensor input voltage		
2	Measure the sensor resistance value to be within the range	☐Yes ☐No	Replace defrost temperature sensor

temperature range	Corresponding resistance range
90~50°C	0.5~2.0KΩ
40~20°C	2.9~6KΩ
10~-0°C	9.2~14.2KΩ
-7°C	20KΩ

9 CAN communication failure

malfunctions coding	fault name steelyard	fault type type (e.g. blood type)	fault principle	PLC foot position

09 0x09	CAN pass malfunction	Communication Detection	This fault occurs when a BMS control message is not received after wakeup	CN2(canh) cn-11 (canl)

move	methodologies	Inspection results	operating method
1	Check that the communication lines between the module and the vehicle are correct.	☐Yes ☐No	Repair connection lines
2	Communicating and assisting with full vehicle processing	☐Yes ☐No	

10 Faulty water discharge sensor

malfunctions coding	fault name	fault type	troubleshooting fault principle	PLC foot position
10 0x0A	Outflow Sensor block	Resistance Detection	When the module detects that the resistance value of the water outlet temperature sensor is out of the range of 0.6~108KΩ, it sends out a message. Corresponding failures will occur	CN2(CSWD) CN2-1 (digital earth)

Sensor foot position	Measurement results	
1 Foot steelyard	3.3V	Positive wiring to PLC ever
2 Feet	0V	Positive wiring to PLC ever
Not	0V	Line break with PLC /short circuit

temperature range	resistance range
90~50°C	0.5~2.0KΩ
40~20°C	2.9~6KΩ
10~-0°C	9.2~14.2KΩ
-7°C	20KΩ

move	methodologies	Inspection results	operating method

1	Measuring the sensor input voltage		
2	Measure the sensor resistance value to be within the range	☐Yes ☐No	Replacement of water outlet temperature sensor

11 Faulty water inlet sensor

malfunctions coding	fault name steelyard	fault type type (e.g. blood type)	fault principle	PLC foot position
11 0x0B	Water inlet sensor block	Resistance Detection	When the module detects that the resistance value of the water outlet temperature sensor is out of the range of 0.6~108KΩ, it sends out a message. failures of this kind occur	CN2-3 (JSWD) CN2-1 (digital earth)

Sensor foot position	Measurement results	If troubleshooting
1 Foot	3.3V	Positive wiring to PLC ever
	0V/suspension	Line break with PLC /short circuit
2 feet	0V	Positive wiring to PLC ever
	Not 0V	Line break with PLC /short circuit

move	methodologies		Inspection results	operating method
1	Measuring the sensor input voltage			
2	Measure the sensor resistance value to be within the range		☐Yes ☐No	Replacing the water inlet temperature sensor

temperature range	Corresponding resistance range
90~50°C	0.5~2.0KΩ
40~20°C	2.9~6KΩ
10~-0°C	9.2~14.2KΩ
-7°C	20KΩ

12 Low water level alarm

malfunctions coding	fault name steelyard	fault type type (e.g. blood type)	fault principle	PLC foot position

12 0x0C	Low water level alarm	switchgear	This fault occurs when there is no 0V input at the module pin position	CN2(YWGZ) CN1-2 (0V)

move	methodologies	Inspection results	operating method
1	Check that the kettle level is not below the lower limit when the pump is running	☐Yes ☐No	
2	Measurement of the level switch for 24V input (to ground when single wired)	☐Yes ☐No	Check and repair level switches and modules (CN2-9) interline
4	Measurement of level switch on state (to ground in case of single line) level state / switching state normalcy / conduction below the lower limit / turn off (electric switch) (The table is for normally closed level switch, normally open type is the opposite)	☐Yes ☐No	Replacement of level switch

13 Relay Bonding Failure

malfunctions coding	fault name steelyard	fault type type (e.g. blood type)	fault principle	PLC foot position
15 0x0F	Relay bonding block	switchgear	This fault occurs when there is no 0V input at the module pin position	CN2-8 (NLGZ) CN1-2 (0V)

move	methodologies	Inspection results	operating method
1	Check that the high voltage fuse is intact	☐Yes ☐No	Replace High Voltage Fuse
2	Measurement of the HV board HV+ and CM+ in the power off state	☐Yes ☐No	Replacement of High Voltage Board
4	Check the reliability of the wiring between the high voltage board CN3-5 and the module CN2-8.	☐Yes ☐No	Rehabilitation of lines
	Replacement of High Voltage Board		

14 CMP CAN communication failure

malfunctions coding	fault name	fault type			PLC foot position
17 0x11	CMP CAN pass malfunction	Communication Detection	This fault occurs when the module does not receive a compressor telegram	compressor side: Communication Resistance 120Ω To the inter-compressor line road normal 0Ω modular side: 120Ω To inter-module lines normalcy 0Ω Abnormal wiring to compressor/compressor exception To inter-module lines Exception/Module Exception	CN1-8 (CANH, CN1-8, CN1-8, CN1-8) CM) CN-7 (CANL. CM)

move	methodologies	Inspection results	operating method

1	Measure the compressor for 24V input	☐Yes ☐No	Repairing lines to restore power to compressors
2	Disconnect the harness insert between the compressor and the module during power failure and measure the communication resistance.		

3	Measure the communication resistance of the module and compressor respectively Communication Resistance / troubleshooting compactors: 120Ω — Positive machine communication resistance ever; 0Ω — Replacement of compressor		
4	Replacement method: replace the module to try to run whether the fault disappears module (in software): 120Ω — Communication resistance is normal; 0Ω — Replacement of modules	☐Yes ☐No	Replacement of compressor

15 Anti-freezing protection

malfunctions coding	fault name steelyard	fault type type (e.g. blood type)	fault principle	PLC foot position
18 0x12	Anti-freezing protection	Temperature Detection	This fault occurs when the defrost temperature is below -5°C	CN2-2 (RT1) CN2-1 (digital earth)

move	methodologies	Inspection results	operating method
1	Measure the sensor resistance value to be within the range temperature range / Corresponding resistance range 90~50°C: 0.5~2.0KΩ 40~20°C: 2.9~6KΩ 10~-0°C: 9.2~14.2KΩ -7°C: 20KΩ	☐Yes ☐No	Replace defrost temperature sensor
2	Defrost temperature is too low and can be eliminated after recovery		

16 Pre-charge Failure Fault

malfunctions coding	fault name steelyard	fault type type (e.g. blood type)	fault principle	PLC foot position
21 0x15	Pre-charge Failure Fault	Voltage Detection	Compressor detection voltage during pre-charging < This fault occurs at 400V	

move	methodologies	Inspection results	Treatment programme
1	Measure whether the HV+ and HV- input voltage is >400V.	☐ No. Yes.	Check the vehicle's power-up condition and communicate with the whole vehicle after-sales service if necessary.
2	Measure the voltage between the back end of the fuse and the HV-voltage in the unit for >400V.	☐ No. Yes.	Replacement of fuses after power failure
3	Access to debug panel and power on/transmit: ID: 0CFFFFDA Data: 03 00 00 32 00 00 00 00 00 Measure the voltage between CM+ and CM- after the pre-charging contactor is engaged. 400V	☐ No. Yes.	Replacement of High Voltage Electrical Board
4	Unplug the compressor high pressure plug-in Access to debug panel and power on/transmit: ID: 0CFFFFDA Data: 03 00 00 32 00 00 00 00 00 Measure the voltage between the compressor high-voltage plug-in 1 (negative)and 2 (positive) pins to see if it is >400V after the pre-charging contactor is engaged.	☐ No. Yes.	Repair or replace compressor high pressure harness

5	Replacement of compressor		

17 High voltage reversal fault

malfunctions coding	fault name steelyard	fault type type (e.g. blood type)	fault principle	PLC foot position
23 0x17	High voltage reversal fault	switchgear	This fault occurs when there is no 0V input at the module pin position	CN2-7 (FJ) CN1-2 (0V)

move	methodologies	Inspection results	operating method
1	Measure HV+ (HV input positive) and HV- (HV input negative) for correct HV polarity.	☐Yes ☐No	Repair/replacement of wiring harness
4	Check the reliability of the wiring between the high voltage board CN3-6 and the module CN2-7.	☐Yes ☐No	Rehabilitation of lines
	Replacement of High Voltage Board		

Sensor foot position	Measurement results	troubleshooting
1 Foot	3.3V	Positive wiring to PLC ever
	0V/suspension	Line break with PLC /short circuit
2 feet	0V	Positive wiring to PLC ever
	Not 0V	Line break with PLC /short circuit

18 Ambient temperature failure

malfunctions coding	fault name steelyard	fault type type (e.g. blood type)	fault principle	PLC foot position

temperature range	Corresponding resistance range
90~50°C	0.5~2.0KΩ
40~20°C	2.9~6KΩ
10~-0°C	9.2~14.2KΩ
-7°C	20KΩ

25 0x19	Ambient temperature failure	Resistance Detection	When the module detects that the resistance value of the water outlet temperature sensor is out of the range of 0.6~108KΩ, it sends out a message. failures of this kind occur	CN2-5 (JSWD) CN2-1 (digital earth)

move	methodologies	Inspection results	operating method
1	Measuring the sensor input voltage		
2	Measure the sensor resistance value to be within the range	☐Yes ☐No	Replacing the ambient temperature sensor

concluding remarks

This repair manual covers the construction, working principle, application method of bus air-conditioning products (including use, maintenance, repair) and other knowledge, the combination of theoretical knowledge plus practical experience, compared with the previous textbook has been greatly improved, is a practical bus air conditioning maintenance textbook, but compared to some well-known foreign counterparts, we are also aware of the inadequacy of the content of the textbook, with the accumulation of our experience, in the bus air conditioning maintenance technology research and training and education, the editors hope that in the future in the passenger car With the accumulation of our experience and investment in the research and training of bus air-conditioning technology, the editors hope that in the future, they will be able to make more contributions in the preparation of teaching materials in the field of air-conditioning application technology (use, maintenance and repair) so that more readers can be benefited.

compiler

On 12 January 2021