TECHNICAL SERVICE MANUAL

Mr. Silence / Aqua Silence

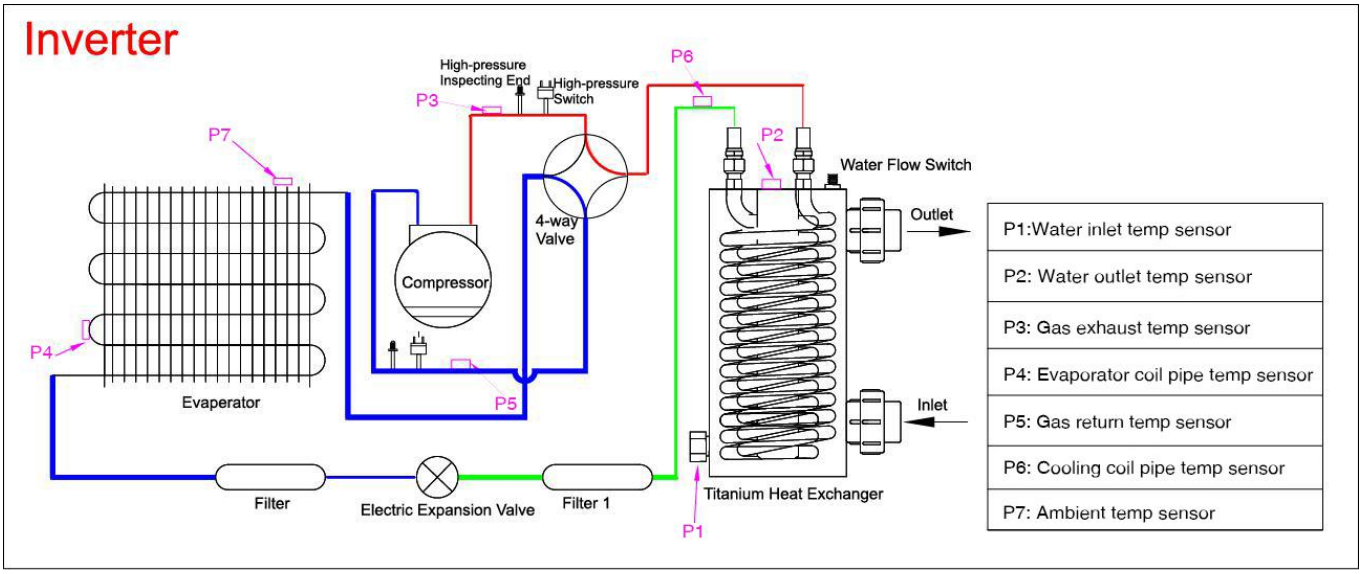
AQUARK

Content

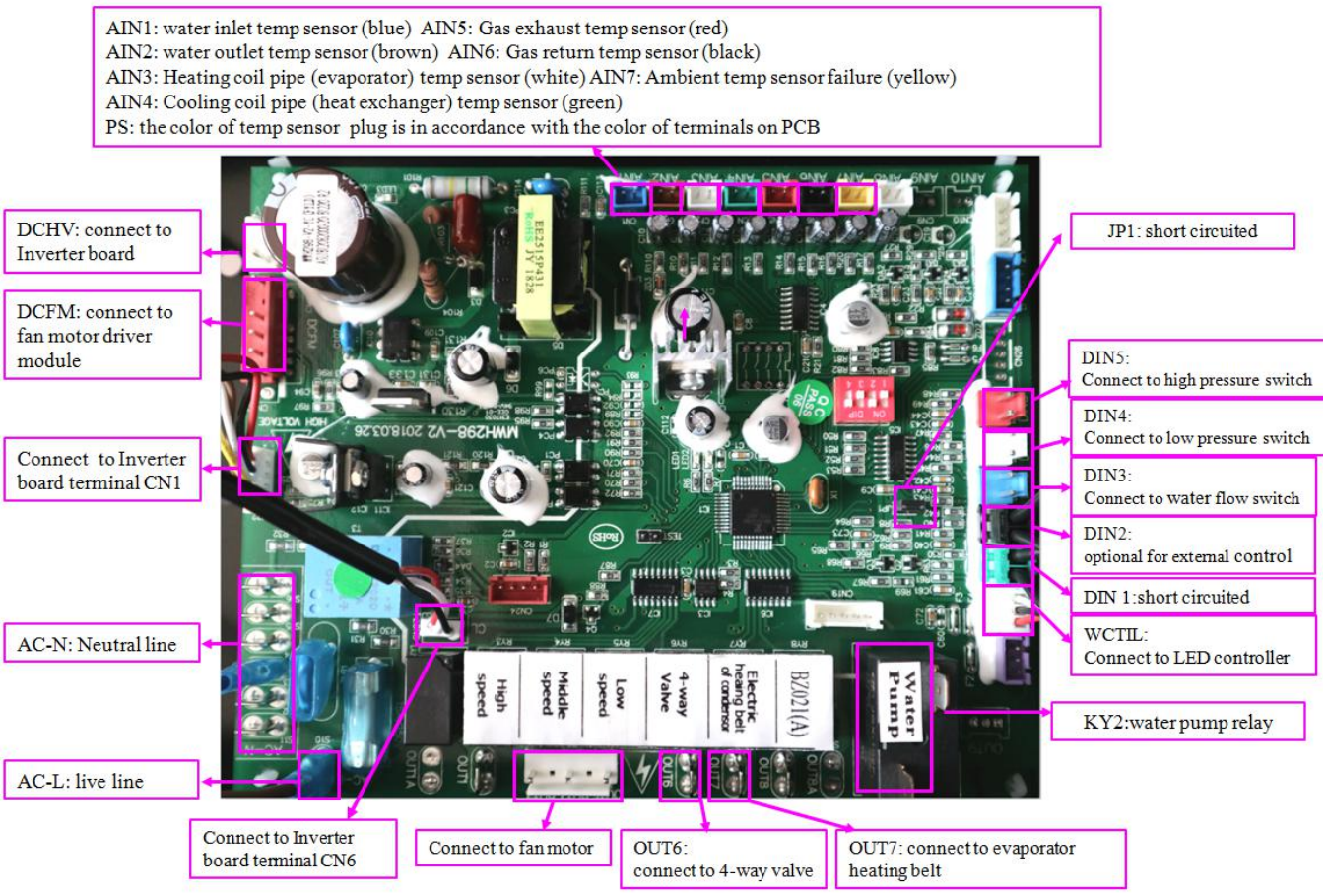
Chapter I : Generalization

1. Product diagram

The air source heat pump for swimming pool is mainly consisted of compressor, evaporator, throttling element, filter and titanium heat exchanger.

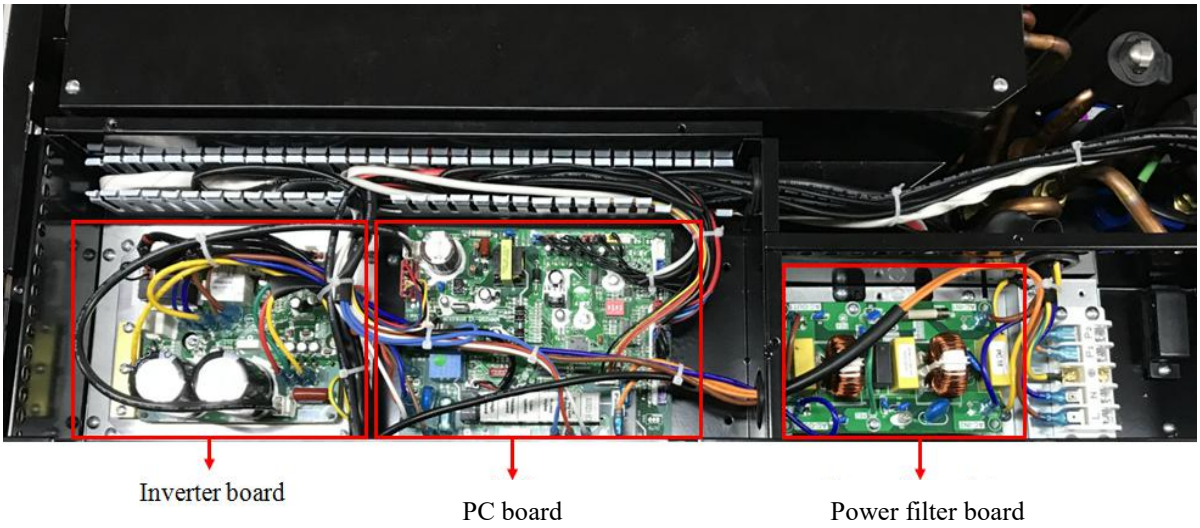


2. 2021 season PC board terminal introduction

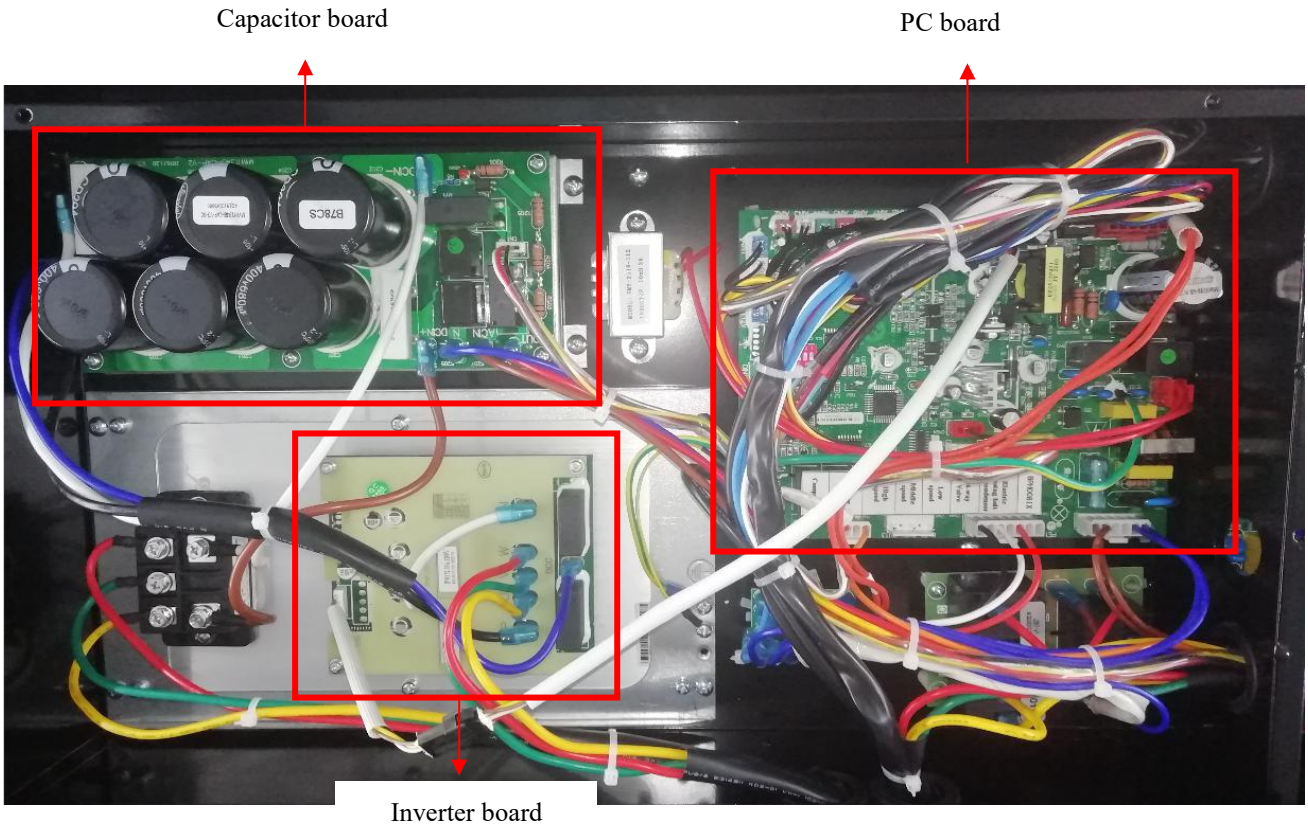


3. 2021 season electric box components layout

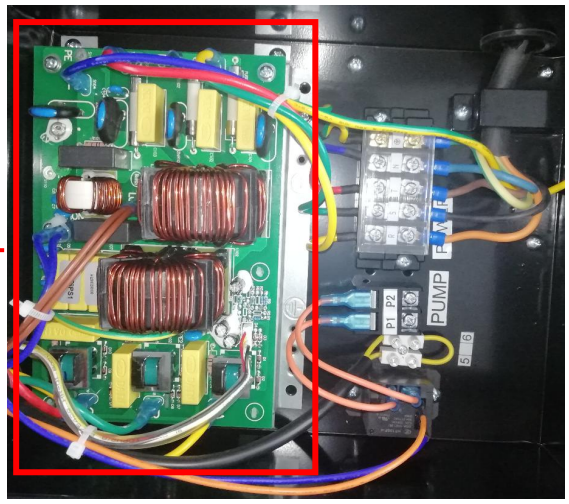
Single Phase



Three Phase



Power filter board



4. Safety Precautions

We have provided important safety messages in this manual and on your heater. Please always read and obey all safety messages.

A. Environment friendly R32 Refrigerant is used for this heat pump. All operations must be done by professional staff only in accordance with this manual. All repair practice by non-professional is prohibited.

B. Installation and any repairing should be conducted in the area with good ventilation. The ignition source is prohibited during the operation.

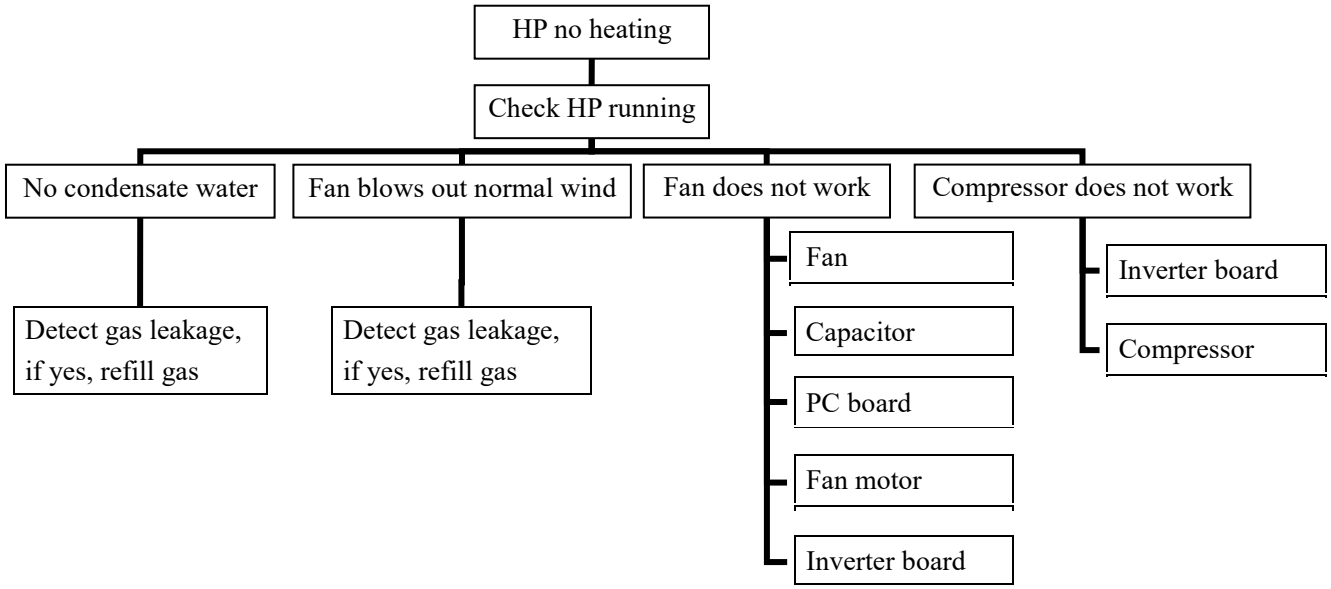
C. Safety inspection must be carried before the maintenance or repair for heat pumps with R32 gas in order to minimize the risk.

	a. Keep the heat pump away from fire source.
	b. It must be placed in well ventilated area; indoor or closed area is not allowed.
	c. Repair and disposal must be carried out by trained service personnel
	d. Vacuumize completely before welding. Welding can only be carried out by professional personnel in service center.

Chapter II : Common Fault

Error code	Description	Solution	Page
N/A	No heating	Checking HP running status	4~6
N/A	Defrosting Problems	1). Check installation environment 2). Manual defrosting 3). Detect leakage and refill gas	6~7

1. Heat Pump No Heating



After HP reach the set temp, it will stop, if the pool temp decrease more than 1℃, the HP will restart and heat. To check if there is any error code, if there is, please check according to after-service manual; if there is no error code, please check according to following steps:

1.1 Check if there is condensate water, as normally the running HP is with condensate water. If no condensate water, please detect gas leakage and refill gas.

Only qualified R32 gas technician is able to detect and refill the gas!

1.2 Check the wind blows out from HP: under heating mode, the wind is cold, under cooling mode, the wind is warm. If fan blows out normal temp wind, please check gas leakage and recharge

Only qualified R32 gas technician is able to detect and refill the gas!

1.3 Check if fan is working. If not, please check and clear out the fault step by step. If the problem still exists after one step, then please proceed to next step.

A. Check the fan is running properly, if not, please replace the fan

B. Check capacitor wire connection

C. Please replace PC board

D. Check if the fan motor is failure, if failure, please replace fan motor.

E. Replace the inverter board

1.4 Check if compressor is running normally. Please check and clear out the fault step by step. If the problem still exists after one step, then please proceed to next step.

A. Replace the inverter board

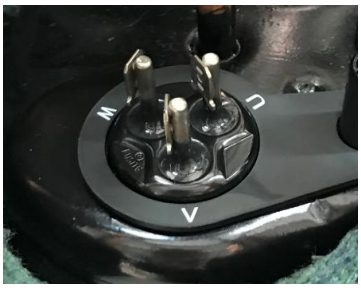
B. Compressor detection: Please detect the compressor in below 2 ways. If either occur, please replace compressor.

a) Check if the circuit of compressor is failure：

Warning: When conducting below operation, heat pump must be powered off!

The resistance is the same between any two terminals. If one of them is different, that means compressor fail in circuit, please replace compressor.

1st, Please adjust resistance grade to 200 Ω before use.



2nd, Three terminals of compressor
U(R) -Terminal of running winding
W(C) -Public terminals of two windings.
V(S)-Terminal of startup winding

3rd, As photos, if the resistance between any two terminals of compressor, that means the compressor is ok.
But if one of them is zero or infinite, that means failure, please replace compressor.

b) Check if the compressor gets stuck by clamp meter:

1st, If the compressor has any special sound

2nd, If no special sound, please detect the running current by clamp meter, if it is several times more than rate current, please replace compressor.

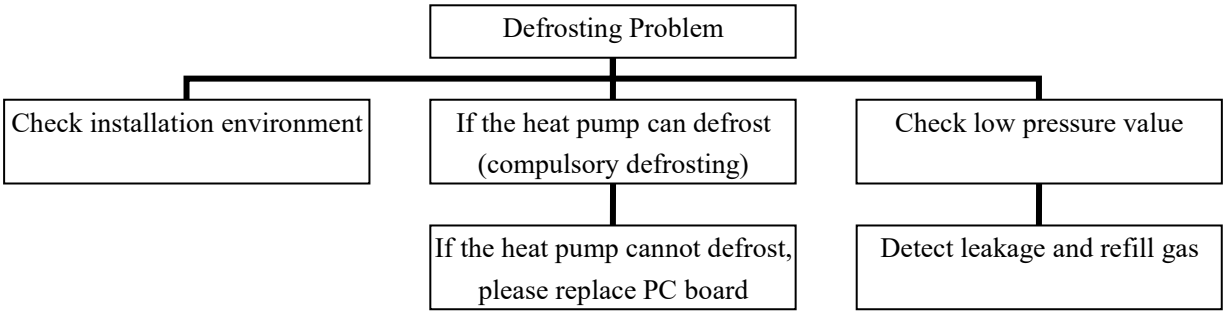
Detection of running current:
1, When power off, adjust clamp meter to applicable grade, and clamp the power cord of terminal L.
2, When power on, the detected current is several times more than rated current, and no cold wind blow out from fan, that means compressor get stuck. Please turn off the unit and replace compressor quickly to avoid potential safety hazard

· Rated current of different models for reference

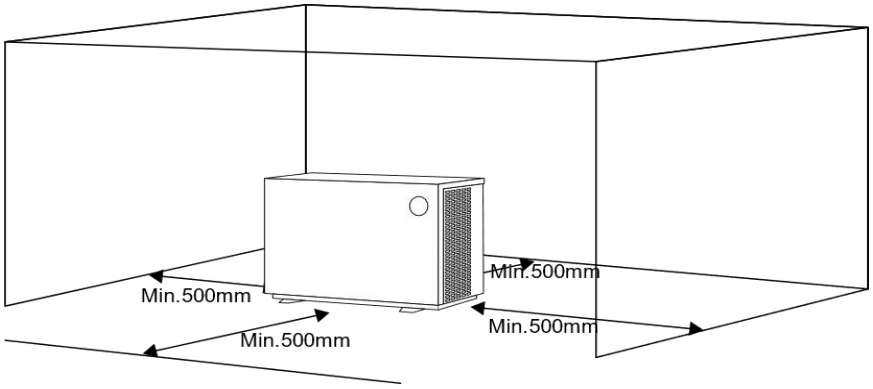
Model	MS70	MS90	MS110	MS130	MS150	MS170	MS210	MS210S	MS280	MS280S	MS350S
Rated input current (A)	0.61~4.83	0.83~5.98	0.96~7.13	1.13~7.83	1.22~9.32	1.44~10.9	1.66~12.7	0.55~4.20	2.15~16.53	0.71~5.51	0.95~7.01

1.5 If not belong to above situation (there is condense water, fan blows out cold/heating wind, fan does work, and compressor work), please power off the HP at least 5 minutes, and then restart it and set pool temp to 35 °C

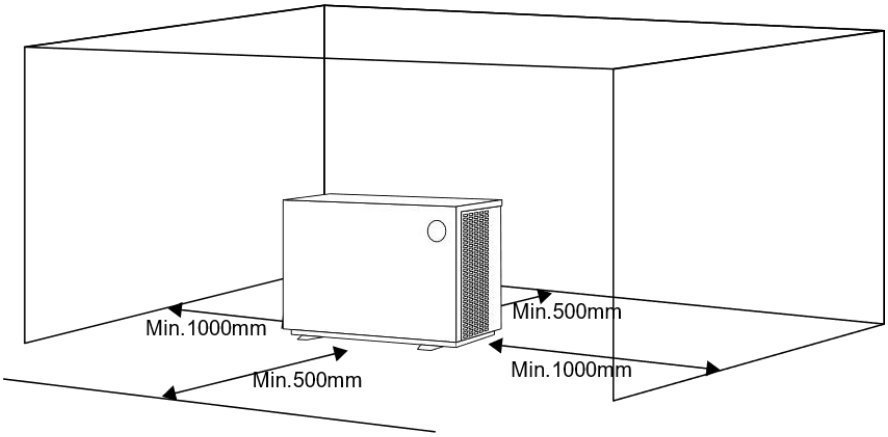
2. Defrosting Problem



2.1 Installation environment



(for 17kw and below models)



(for 21kw and above models)

A. Check if the heat pump is installed according to above requested distance.

B. Check if evaporator fins of heat pump are blocked.

2.2 Manual defrosting

A. Touch controller manual defrosting instruction

When touch controller lit up under heating code, press "" and" " continuously for 5 seconds to start up manual defrosting. "" on top left corner of screen flashing, "" will stop flashing after defrosting.

Note: Interval will be 30 minutes between two manual defrosting

B. Please replace PC board if manual defrosting cannot start up

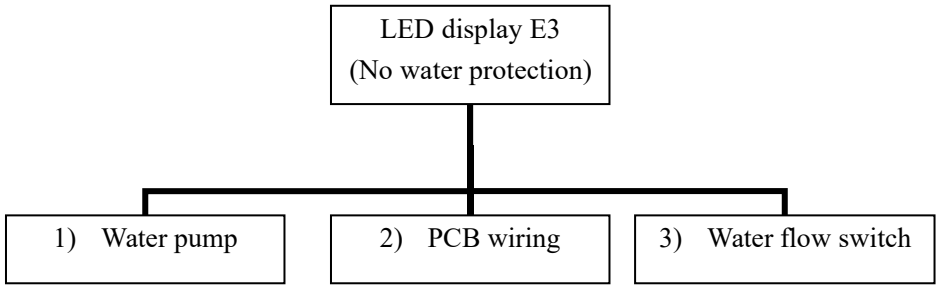
2.3 Detect leakage and refill gas

Only qualified R32 gas technician is able to detect and refill the gas !

Chapter III :Protection Code

Error code	Description	Solution	Page
E3	No water protection	1). Water pump 2). PC board wiring 3). Water flow switch	8~9
E5	Power supply excesses operation range (not failure)	1). Recover when back to the normal power 2). Replace PC board	10
E6	Excessive temp difference between inlet and outlet water (insufficient water flow protection)	Check water pump	10
Eb	Ambient temperature too high or too low protection (not failure)	Out of application range	10
Ed	Anti-freezing reminder (not failure)	Wait for automatic recovery	11

1. E3 solution



Warning: When conducting below operation, heat pump must be powered off!

1.1 Check water pump

A. If water pump is running well

B. If water flow is sufficient

C. If water pump is blocked

D. If by-pass is fully opened

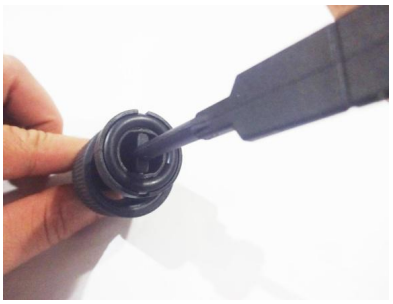
1.2 Check PC board wiring

A. Check if DIN3 of water flow switch on PC board is well connected. (DIN3, refers to page1, *Chapter I Generation, Section 2, PC board terminal introduction*)

B. Please replace water flow switch if above checking is ok

1.3 Water flow switch installation

A. Check if there is O-ring seal in the new water flow switch

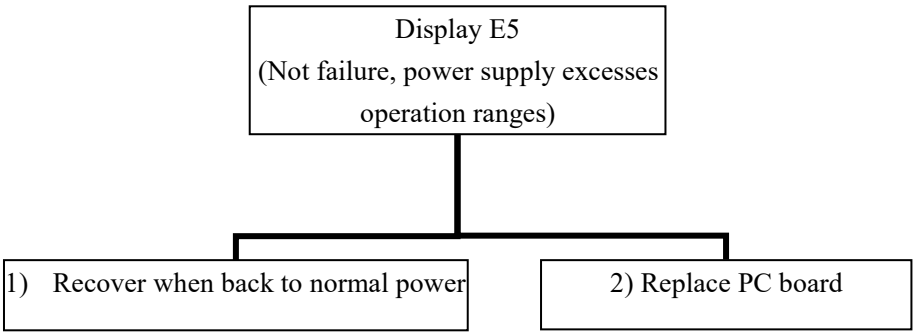


B. Insert water flow switch as photo, pay attention to the arrow direction.

C. Hold steady up-side, screw tight water flow switch with pliers

D. After installation

2. E5 Solution

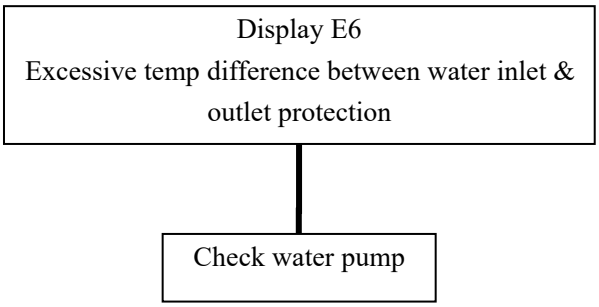


2.1 Single Phase: Display E5 when power voltage ≤170V or ≥270V, 180V~255V will recover

Three Phase: Display E5 when power voltage ≤330V or ≥530V, 345V~500V will recover

2.2 If still display E5 after power supply is normal, replace PC board

3. E6 solution



When water temp difference between inlet & outlet excesses 25℃, check water pump

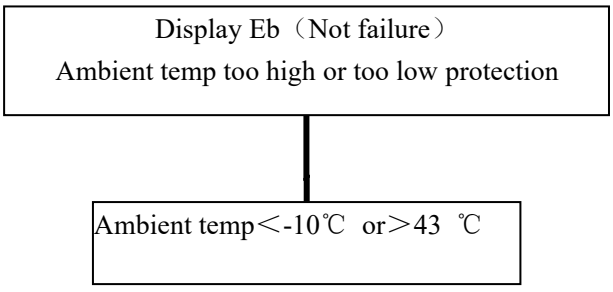
A. If water pump is running well

B. If water flow is sufficient

C. If water pump is blocked

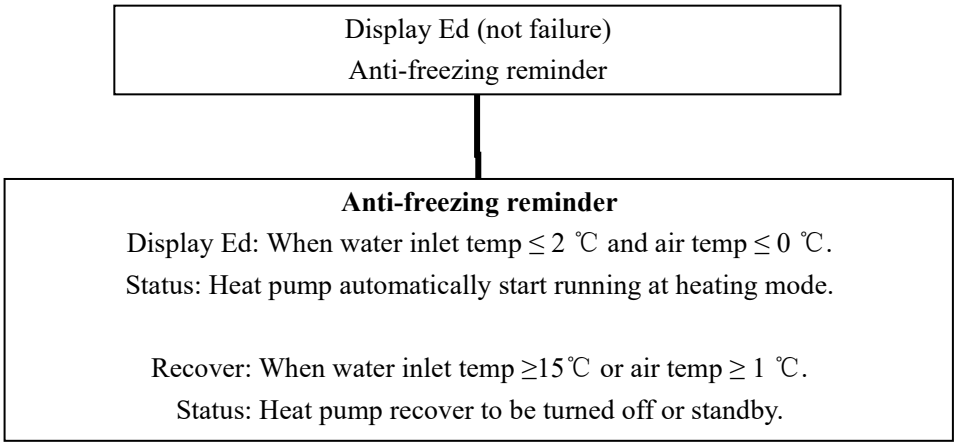
D. If by-pass is fully opened

4. Eb Solution



Solution: Wait until air temp is -10~43 ℃.

5. Ed Solution



Note：

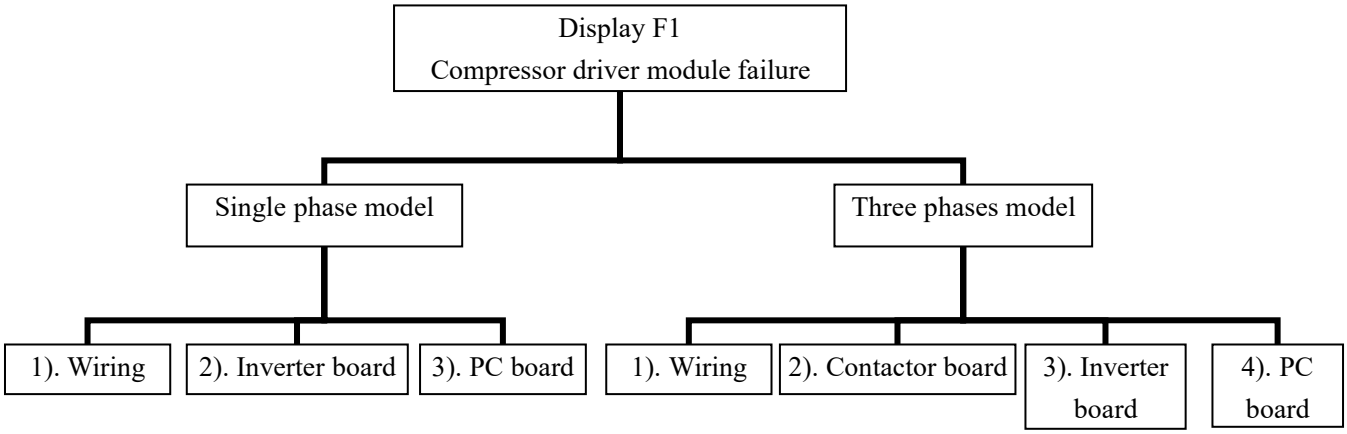
- Only when heat pump is powered on and water pump is running, heat pump can enter anti-freezing status, if there is no water goes through heat pump, then E3 will display, heat pump will stop.
- Ed displays only if heat pump is standby or turned off but with power on.

Chapter IV : Electrical system failure

Error code	Description	Solution	Page
F1	Compressor drive module failure	Single Phase Model 1). Wiring 2). Inverter board 3). PC board Three Phases Model 1). Wiring 2). Contactor board 3). Inverter board 4). PC board	13~14
F2	PFC module failure	1). Inverter board 2). PC board	15
F3	Compressor start failure	1). Compressor wiring 2). Inverter board 3). Compressor	15
F4	Compressor running failure	1). Compressor wiring 2). Inverter board 3). Compressor	15
F5	Inverter board over current protection	1). Wiring 2). Inverter board 3). PC board	16
F6	Inverter board overheat protection	1). Wiring 2). Inverter board 3). PC board	16
F7	Current protection	1). Power off and restart 2). Inverter board 3). Compressor	16
F8	Cooling plate overheat protection	1). Power off and restart 2). Check fan motor 3). Check cooling plate	17
F9	Fan motor failure	1). Wiring 2). PC board 3). Fan motor	17
Fb	Power filter board no-power protection	Single Phase Model: 1). Replace Inverter board Three Phases Model: 1). Replace power filter board	17
FA	PFC module over current protection	1). Power off and restart 2). Replace Inverter board	18
P0	Controller communication failure	1). Wiring	18

		2). Replace LCD controller 3). Replace PC board	
PA	Restart memory failure	Replace PC board	18
E4	3 phases sequence protection	1). Power& wiring 2). Power filter board	19

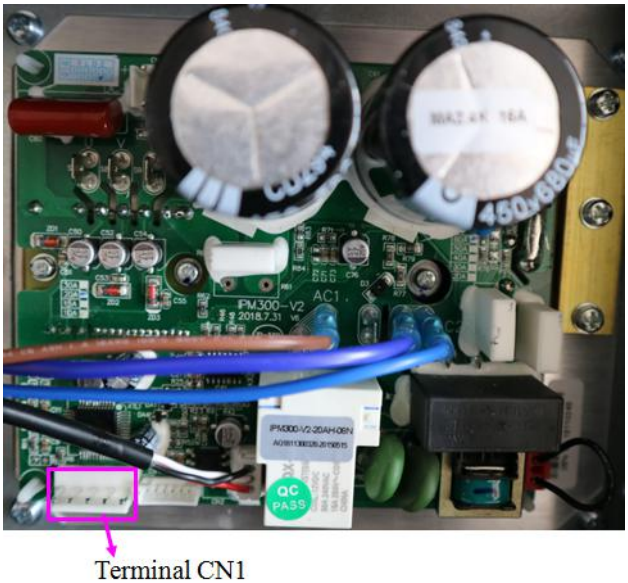
1. F1 Solution



⚠ Warning: When conducting below operation, heat pump must be powered off!

Single Phase Model

1.1 Please check if wiring of terminal CN1 or other terminals on inverter board is well connected.



1.2 If above checking is no problem, please replace inverter board.

1.3 If still display error code after replacing inverter board, please replace PC board.

Three Phases Model

1.1 Check if wiring on Inverter board is well connected

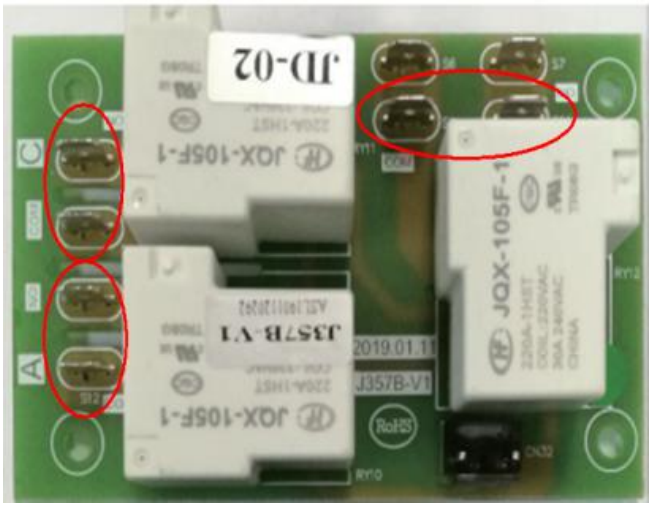
1.2 Check contactor board

⚠ This operation should be conducted with power connected, must be operated by professionals!

A. If OUT1 on PC board has 220V output (by voltmeter)

B. If CN32 on contactor board has 220V output(by voltmeter）

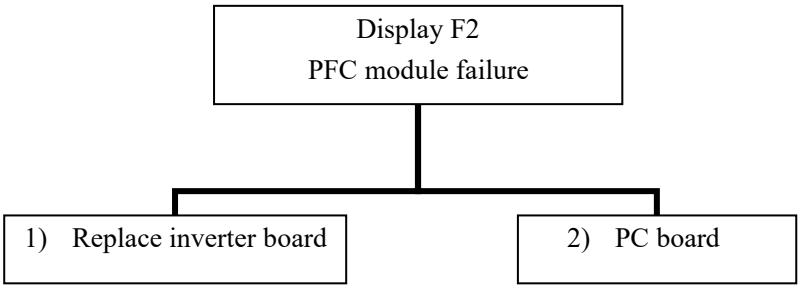
C. Check NO and CON are closed on contactor board



1.3 If above checking is no problem, please replace the inverter board

1.4 If still display error code after replacing inverter board, please replace PC board

2. F2 Solution

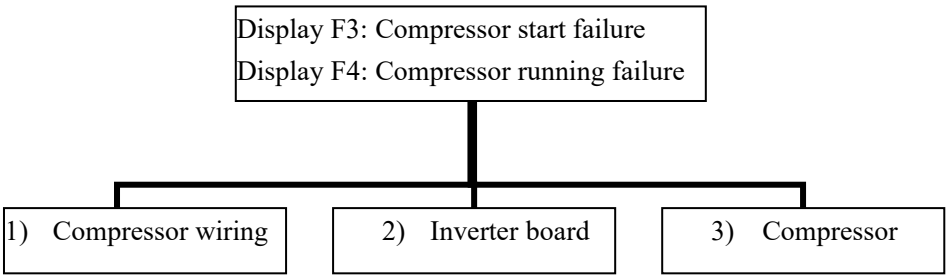


Warning: When conducting below operation, heat pump must be powered off!

2.1 Replace the inverter board first

2.2 If the error code still exists, please replace PC board

3. F3/F4 Solution



Warning: When conducting below operation, heat pump must be powered off!

3.1 Check if wiring between compressor and Inverter board is well connected

Terminals：U、V、W

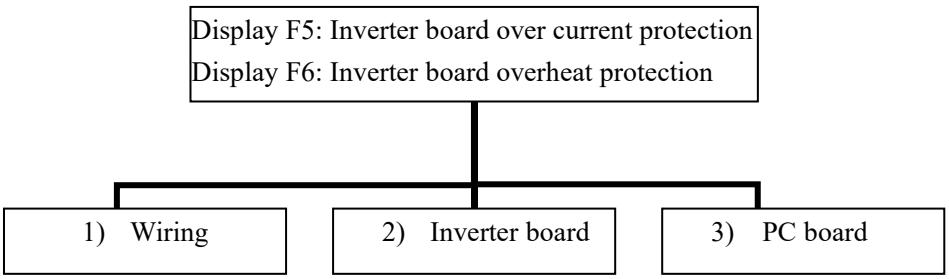
Inverter Board(Single Phase)

Inverter board (3phase)

3.2 If wiring is no problem, please replace Inverter board

3.3 If the error code still exists, please check compressor: values between any two terminals should be the same. If the values are not the same, that means the compressor is with problem, please replace a new compressor. Checking methods, please refers to page7. (*Chapter II Common Failure, Part 1.4-Check if compressor is working)*

4. F5/F6 Solution



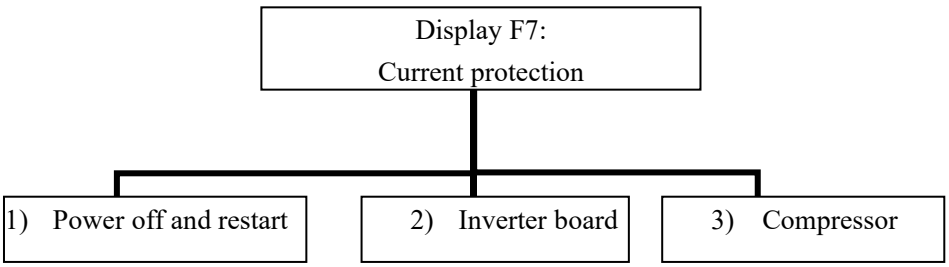
Warning: When conducting below operation, heat pump must be powered off!

4.1 Check if wiring of terminal CN1 is well connected (CIN1, refers to page 15, *Chapter IV Electrical system failure, Part 1.1 –wiring)*

4.2 If it well connected, please replace Inverter board

4.3 If the error code still exists, please replace PC board

5. F7 Solution



Warning: When conducting below operation, heat pump must be powered off!

If current is over max setting value, F7 will display. Normally when current reach max setting value, the HP will run by lower frequency. Restart at least 5 minutes after disconnection

5.1 Power off and restart

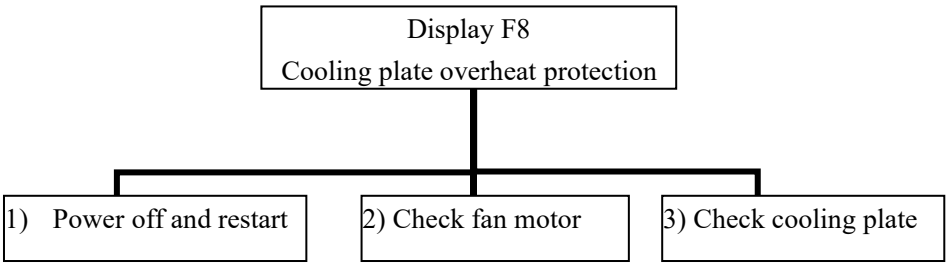
5.2 Replace inverter board

5.3 Check compressor

A. When compressor run, listen and check if any sound “Kaka”.

B. HP power off, check resistance of 3 terminals of compressor: check between any 2 terminals of compressor, if the three values are the same, the compressor is ok; otherwise compressor fail.

6. F8 Solution



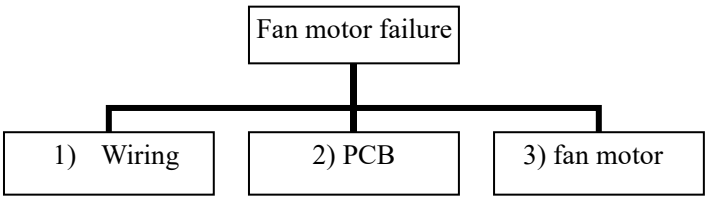
Alarm：Temp of cooling plate: Cooling ≥ 85℃, heating ≥ 75℃

6.1 Switch off at least 5 minutes and the temp of cooling plate ≤50℃

6.2 Check the fan motor is running well or not

6.3 Check if there is much accumulated dust on cooling plate, if yes, please clean it.

7. F9 Solution



Warning: When conducting below operation, heat pump must be powered off!

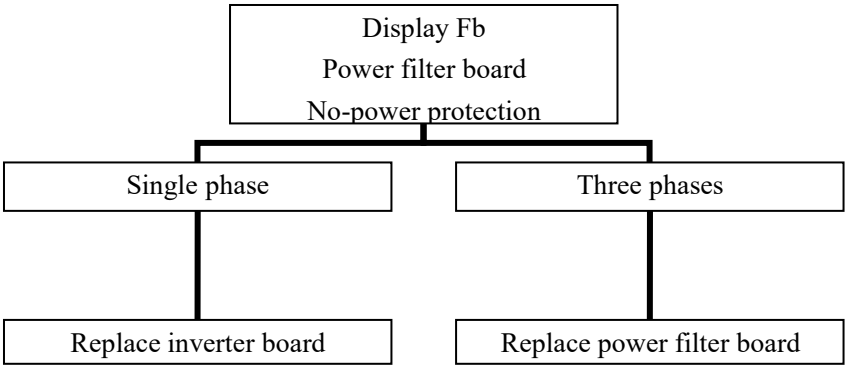
7.1 Wiring

Check if DCFM &JP1 terminals are well connected (DCFM &JP1, refers to page1, *Chapter I Generation, Section 2, PC board terminal introduction*)

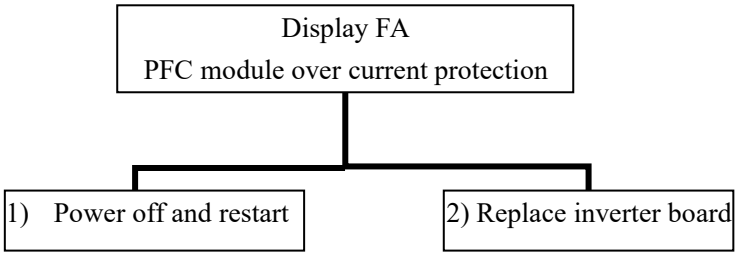
7.3 If the error code still exists, please replace PC board

7.4 If the error code still exists, please replace fan motor

8. Fb Solution



9. FA Solution

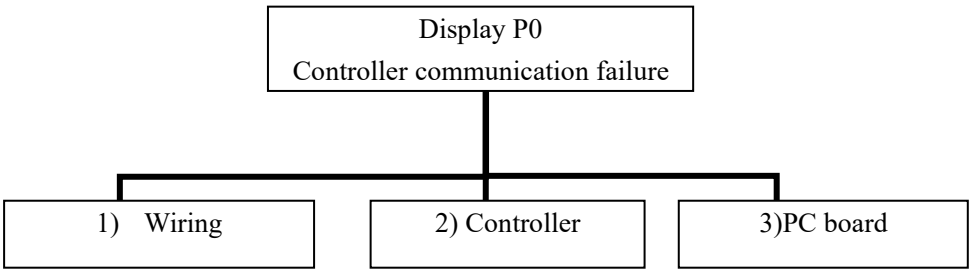


Warning: When conducting below operation, heat pump must be powered off!

9.1 Restart the HP at least 5 minutes after turning off

9.2 Replace inverter board

10. P0 Solution



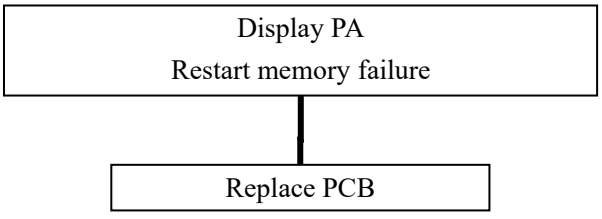
Warning: When conducting below operation, heat pump must be powered off!

10.1 Check if WCTIL wiring on PC board is well connected (WCTIL, refers to page1, *Chapter I Generation, Section 2, PC board terminal introduction*)

10.2 If the error code still exists, replace controller

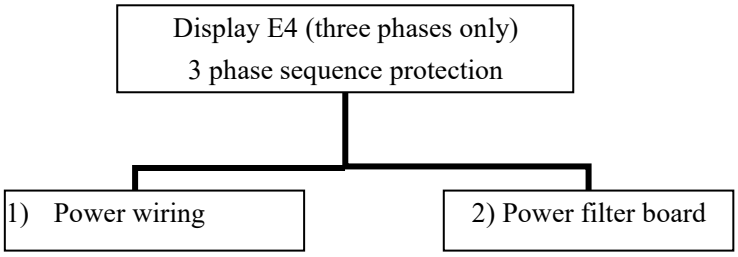
10.3 If the error code still exists, please replace PC board

11. PA Solution

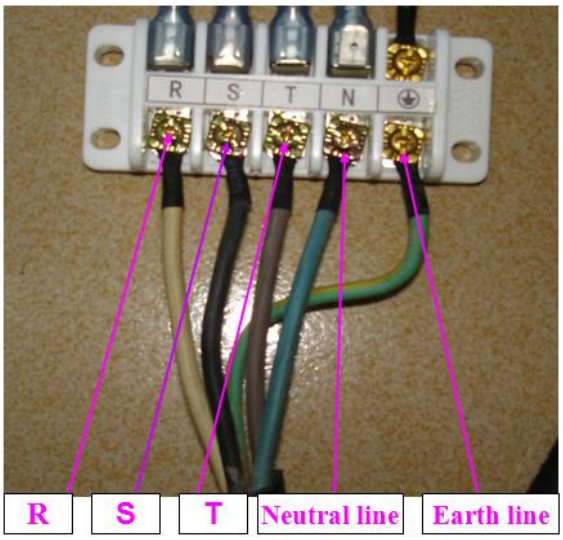


Warning: When conducting below operation, heat pump must be powered off!

12. E4 Solution



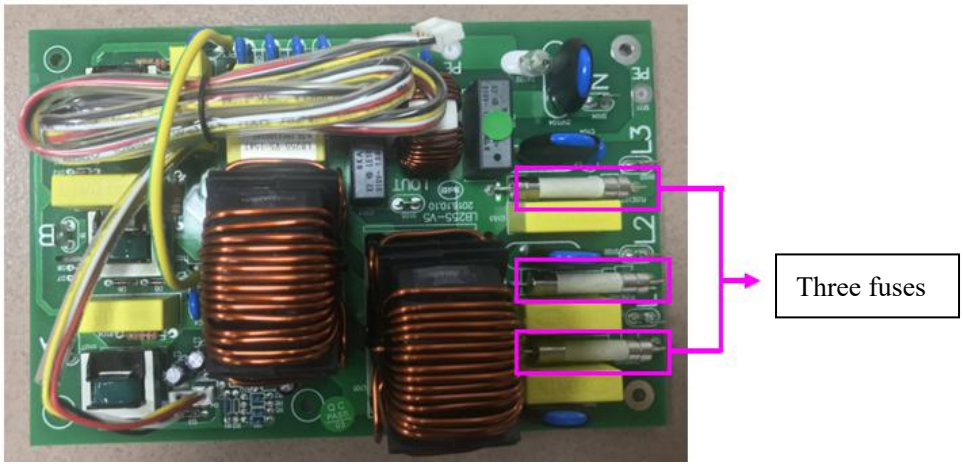
12.1 Check power wiring



R.S.T 3 live lines, if one of them has no power:

Please check if three phases voltage is normal or R.S.T wiring is not well connected at electric box.

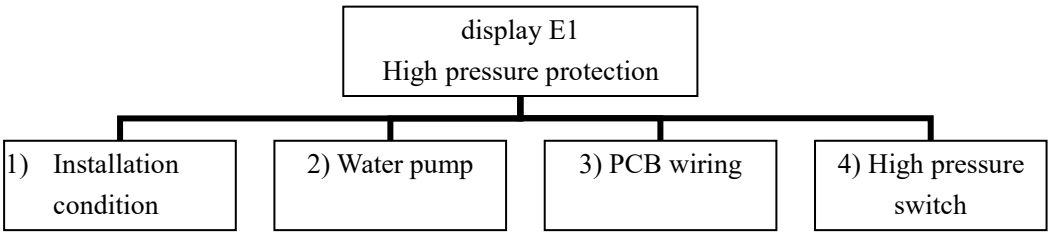
12.2 Check if three fuses on power filter plate are melted. If the checking is ok and E4 still exists, please replace power filter plate.



Chapter V : Piping system failure

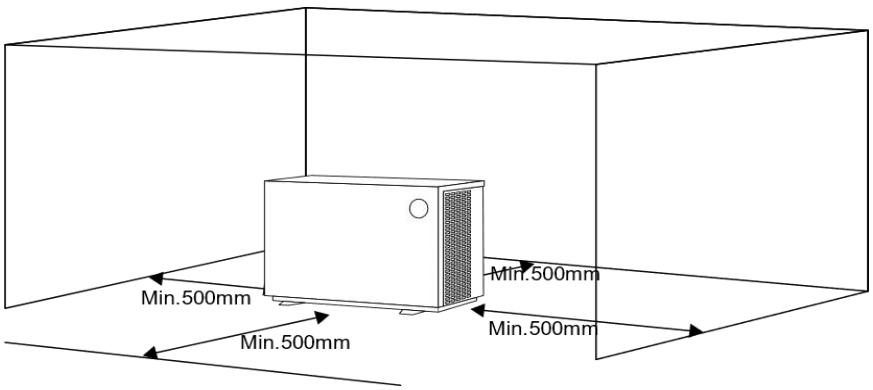
Error code	Description	Solution	Page
E1	High pressure protection	1). Installation condition 2). Water pump 3). Wiring 4). High pressure switch	20~21
E2	Low pressure protection	1). Wiring 2). Detect gas leakage 3). Low pressure switch	21~22
E8	High exhaust temp protection	1). Installation condition 2). Water pump 3). Detect gas leakage 4). Gas exhaust temp sensor	22
EA	Heat exchanger overheat protection /Evaporator overheat protection (only at cooling mode)	1). Installation condition 2). Fan 3). Fan motor	23

1. E1 Solution

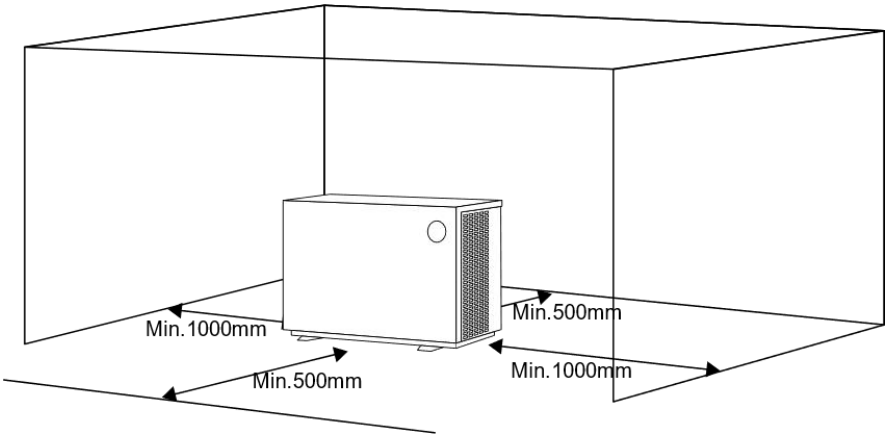


Warning: When conducting below operation, heat pump must be powered off!

1.1 Installation condition



(for 17kw and below models)



(for 21kw and above models)

A. Check if heat pump is installed according to above distance

B. Check if heat pump evaporator fins are blocked

1.2 Check water pump

A. If water pump is running well

B. If water flow is sufficient

C. If water pump is blocked

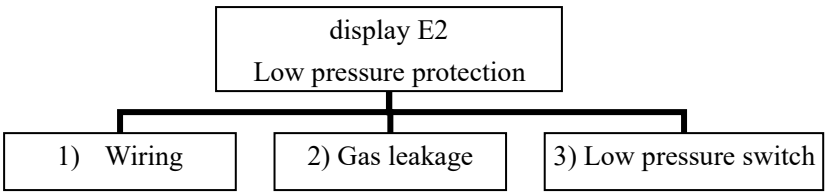
D. Check if water pump valve is fully opened

1.3 Check if DIN5 wiring on PC board is well connected. (DIN5, refers to page1, *Chapter I Generation, Section 2, PC board terminal introduction*)

1.4 Check high pressure switch

If wiring on PC board is ok, please replace high pressure switch (photo). If problem still unsolved, maybe heat pump gas circulation system blocked, please replace a new HP.

2. E2 Solution



Warning: When conducting below operation, heat pump must be powered o

2.1 Check if DIN4 wiring on PC board is well connected (DIN4, refers to page1, *Chapter I Generation, Section 2, PC board terminal introduction*)

2.2 Gas leakage detecting & refilling

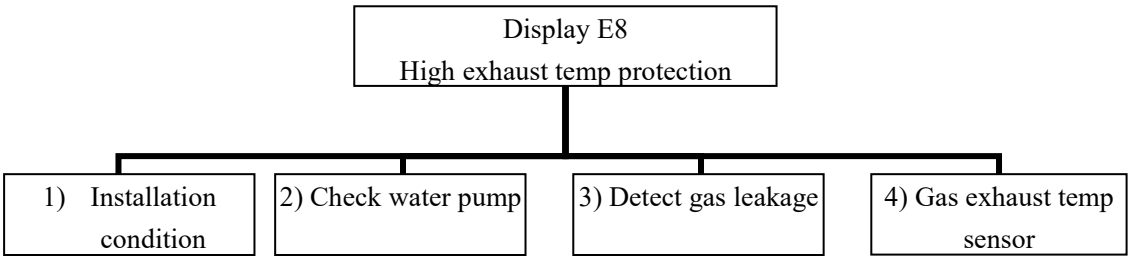
Gas leakage detecting and refilling methods pls refers to page3. (Chapter II Common Fault, Part 1.1-gas *leakage & refill)*

Only qualified R32 gas technician is able to detect and refill the gas !

2.3 Check low pressure switch

If the error code still exists, please replace low pressure switch (photo)

3. E8 solution



Warning: When conducting below operation, heat pump must be powered off!

3.1 Check installation condition

Checking methods, refers to page 20. *(Chapter V Piping system failure, Part 1.1-Installation condition)*

3.2 Check water pump

A. If water pump is running well

B. If water flow is sufficient

C. If water pump is blocked

D. Check if water pump valve is fully opened. If it is blocked, it will lead to water inlet and outlet temp too high, and gas exhaust temp overheat, then E8 display.

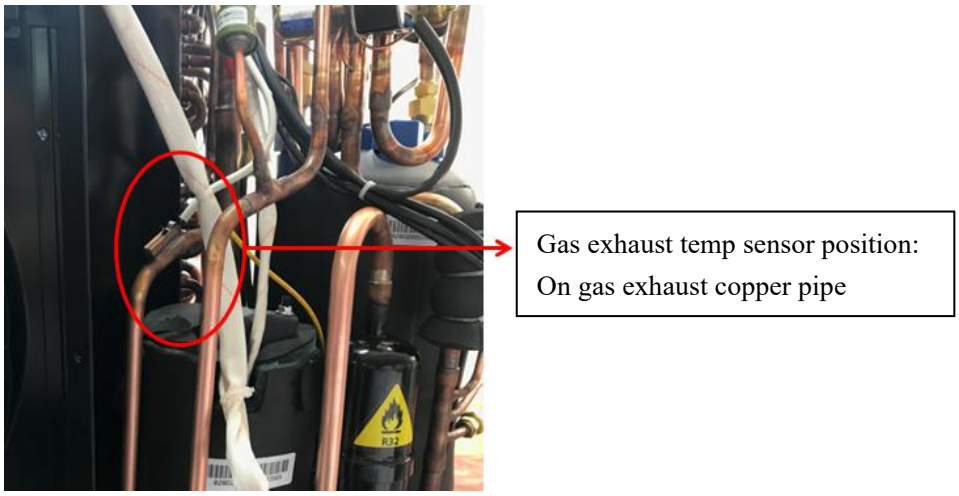
3.3 Gas leakage detecting

Only qualified R32 gas technician is able to detect and refill the gas !

3.4 Gas exhaust temp sensor

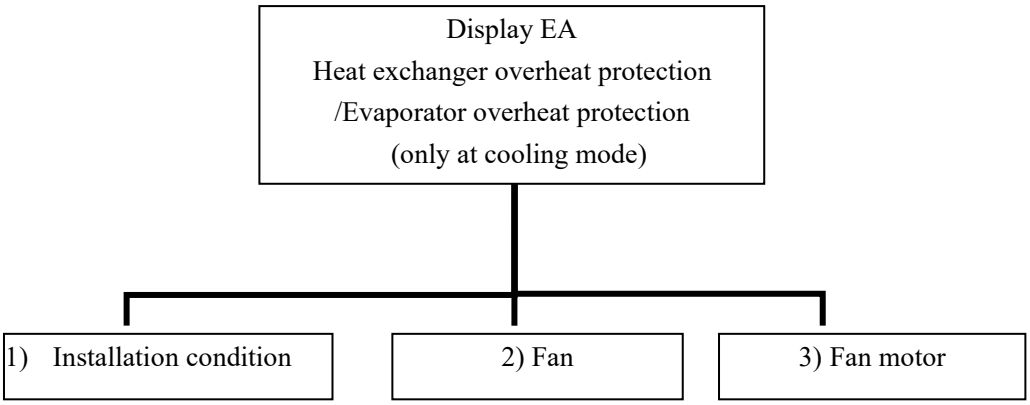
A. Check if wiring of AIN5 is well connected. (AIN5, refers to page1, *Chapter I, PC board terminal introduction*)

B. Check if gas exhaust temp sensor is well connected.



C. If the error code still exists, please replace gas exhaust temp sensor.

4. EA Solution



Warning: When conducting below operation, heat pump must be powered off!

4.1 Check installation condition (checking methods, refers to page22, *Chapter V Piping system failure, 1.1-Installation condition)*

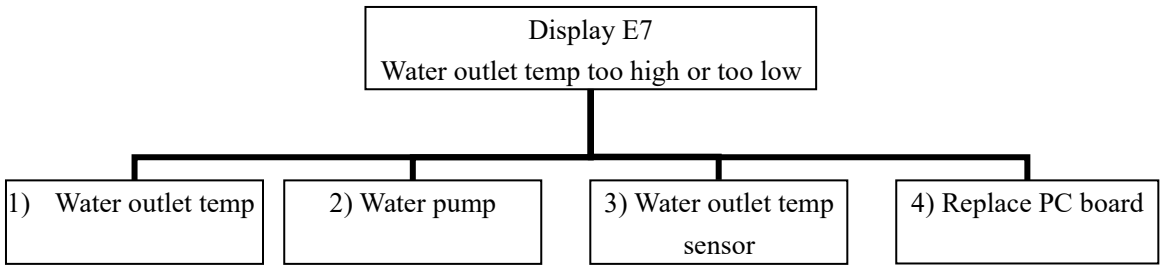
4.2 If the error code still exists, check if fan is broken.

4.3 If the error code still exists, replace fan motor.

Chapter VI : Water system failure

Error code	Description	Solution	Page
E7	Water outlet temp too high or too low protection	1). Water outlet temp 2). Water pump 3). Water outlet temp sensor 4). Replace PC board	24

1. E7 solution



Warning: When conducting below operation, heat pump must be powered off!

1.1 Water outlet temp checking

Check water outlet temp: Cooling: water outlet temp ≤2℃, Heating: water outlet temp ≥55℃

1.2 Check water pump

A. If water pump is running well

B. If water flow is sufficient

C. If water pump is blocked

D. Check if water pump valve is fully opened

1.3 Check water outlet temp sensor

A. Check if water outlet temp sensor terminal AIN2 is well connected. (AIN2, refers to page1, *Chapter I, PC board terminal introduction*)

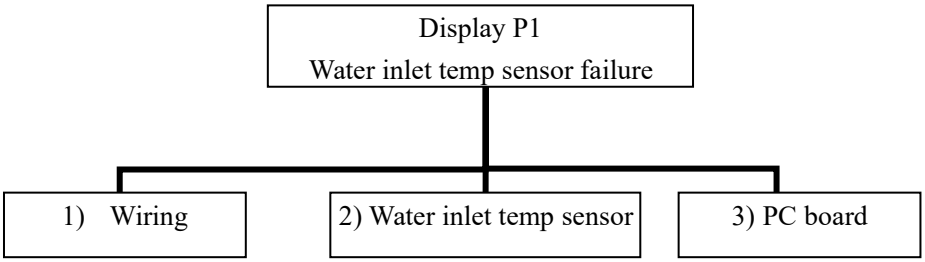
B. If the error code still exists, please replace water outlet temp sensor

1.4 If the error code still exists, please replace PC board

Chapter VII : Temperature sensor failure

Error code	Description	Solution	Page
P1	Water inlet temp sensor failure	1). Wiring 2). Water inlet temp sensor 3). Replace PC board	25
P2	Water outlet temp sensor failure	1). Wiring 2). Water outlet temp sensor 3). Replace PC board	26
P3	Gas exhaust temp sensor failure	1). Wiring 2). Gas exhaust temp sensor failure 3). Replace PC board	27
P4	Evaporator coil pipe temp sensor failure	1). Wiring 2). Evaporator coil pipe temp sensor 3). Replace PC board	27
P5	Gas return temp sensor failure	1). Wiring 2). Gas return temp sensor 3). Replace PC board	28
P6	Cooling coil pipe temp sensor failure	1). Wiring 2). Cooling coil pipe temp sensor 3). Replace PC board	29
P7	Ambient temp sensor failure	1). Wiring 2). Ambient temp sensor 3). Replace PC board	29~30
P8	Cooling plate temp sensor failure	Replace inverter board	30
P9	Current sensor failure	1). Replace inverter board for single phase model 2). Replace power filter plate for 3 phases model	30

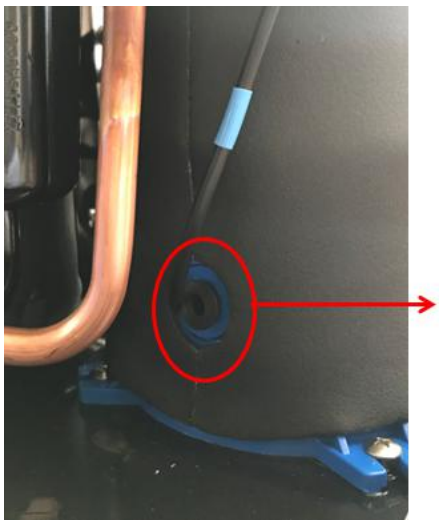
1. P1 solution



Warning: When conducting below operation, heat pump must be powered off!

1.1 Check if water inlet temp sensor wiring AIN1 is well connected. (AIN1, refers to page1, *Chapter I Generation, Section 2, PC board terminal introduction*)

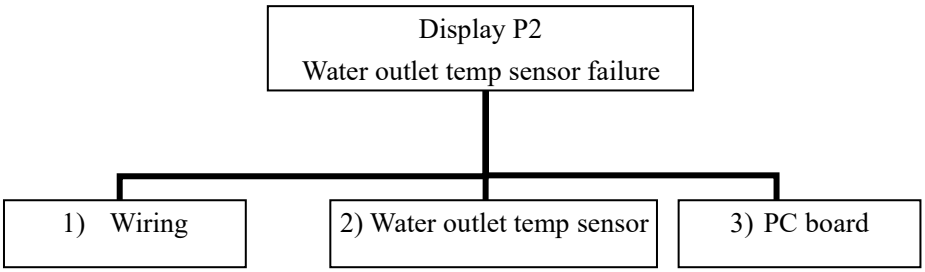
1.2 If the error code still exists, please replace water inlet temp sensor



Water inlet temp sensor position:
Down side of heat exchanger

1.3 If still display P1 after replacing water inlet temp sensor, please replace PC board.

2. P2 solution



Warning: When conducting below operation, heat pump must be powered off!

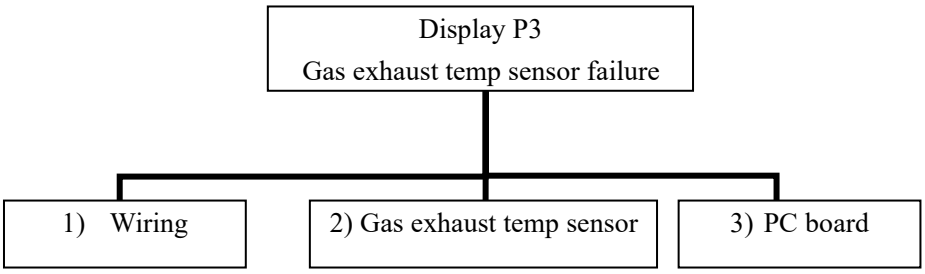
2.1 Check if water outlet temp sensor wiring AIN2 is well connected. (AIN2, refers to page1, *Chapter I Generation, Section 2, PC board terminal introduction*)

2.2 If the error code still exists, please replace water outlet temp sensor

Water outlet temp sensor position:
Above heat exchanger

2.3 If still P2 after replacing water inlet temp sensor, please replace PC board.

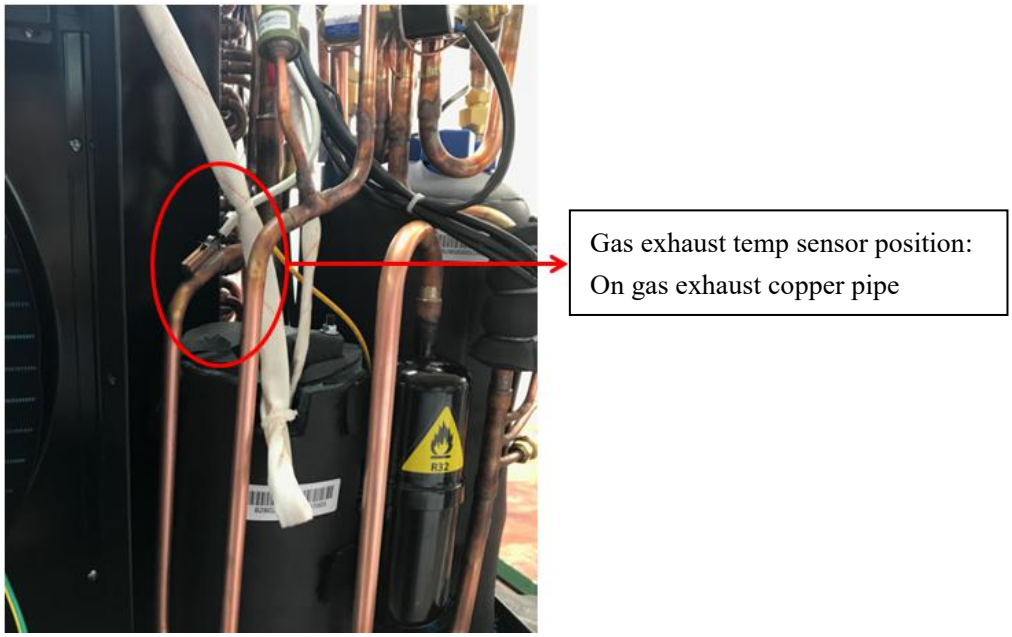
3. P3 solution



Warning: When conducting below operation, heat pump must be powered off!

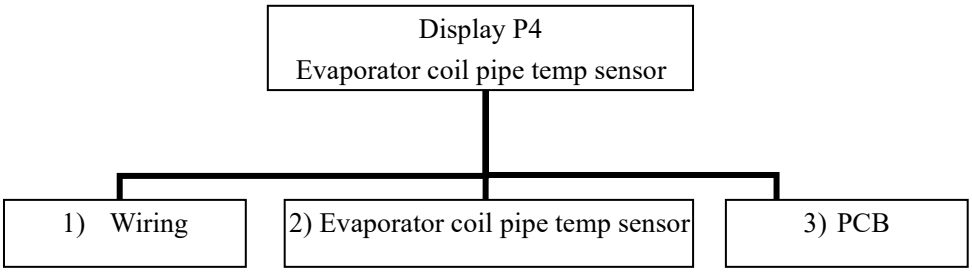
3.1 Check if gas exhaust temp sensor wiring AIN5 is well connected. (AIN5, refers to page1, *Chapter I Generation, Section 2, PC board terminal introduction*)

3.2 If the error code still exists, please replace gas exhaust temp sensor.



3.3 If still P3 after replacing water inlet temp sensor, please replace PC board.

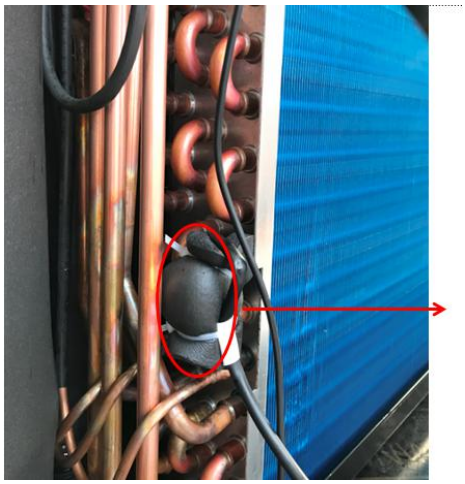
4. P4 Solution



Warning: When conducting below operation, heat pump must be powered off!

4.1 Please check if heating coil pipe temp sensor AIN3 wiring is well connected. (AIN3, refers to page1, *Chapter I Generation, Section 2, PC board terminal introduction*)

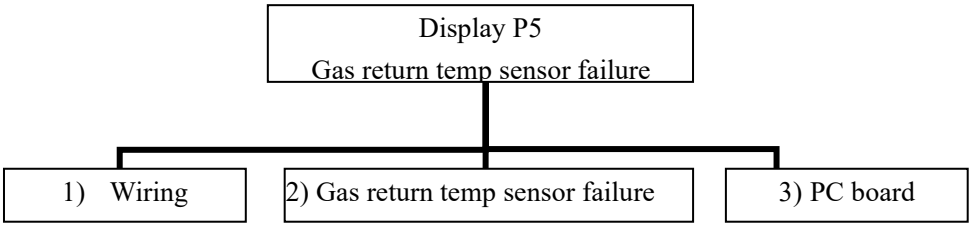
4.2 If the error code still exists, please replace heating coil pipe temp sensor.



Evaporator coil pipe position: the bottom of evaporator coil pipe

4.3 If still P4 after replacing water inlet temp sensor, please replace PC board.

5. P5 Solution



Warning: When conducting below operation, heat pump must be powered off!

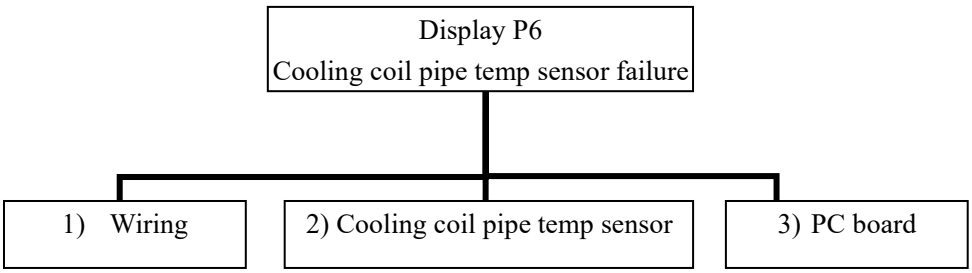
5.1 Please check if gas return temp sensor AIN6 wiring is well connected. (AIN6, refers to page1, *Chapter I Generation, Section 2, PC board terminal introduction*)

5.2 If the error code still exists, please replace gas return temp sensor

Gas return temp sensor position: near low pressure switch

5.3 If still P5 after replacing gas return temp sensor, please replace PC board.

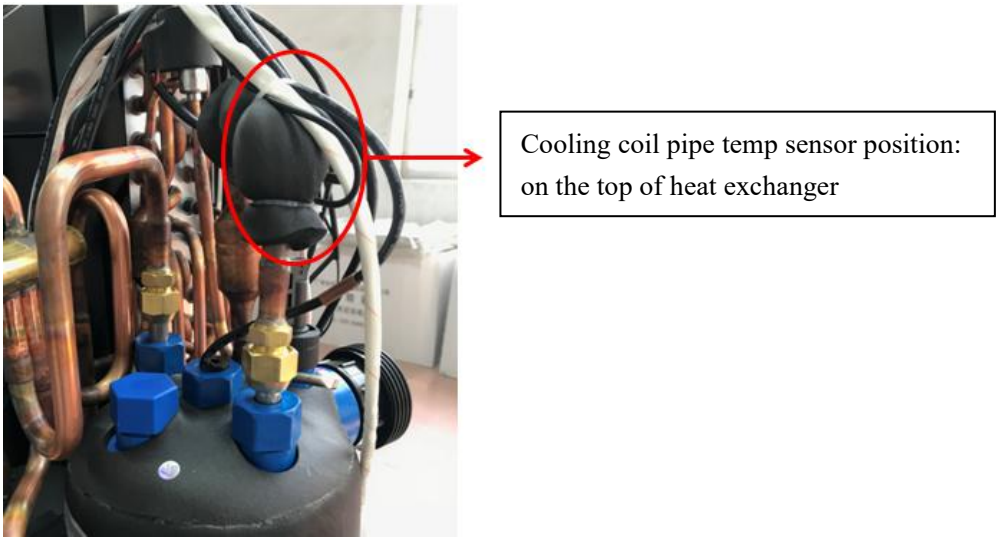
6. P6 Solution



⚠ Warning: When conducting below operation, heat pump must be powered off!

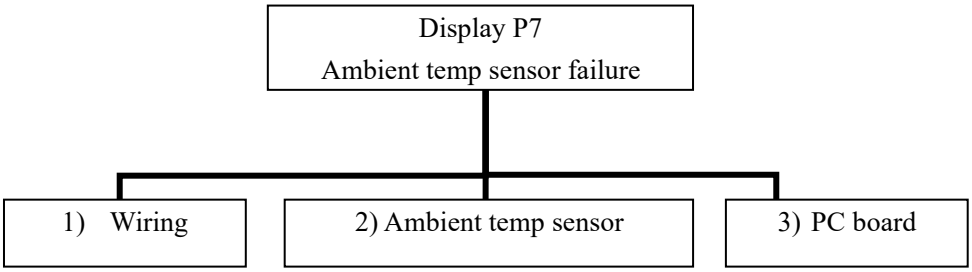
6.1 Please check if cooling coil pipe temp sensor AIN4 wiring is well connected. (AIN4, refers to page1, *Chapter I Generation, Section 2, PC board terminal introduction*)

6.2 If the error code still exists, please replace cooling coil pipe temp sensor.



6.3 If still P6 after replacing gas return temp sensor, please replace PC board.

7. P7 Solution

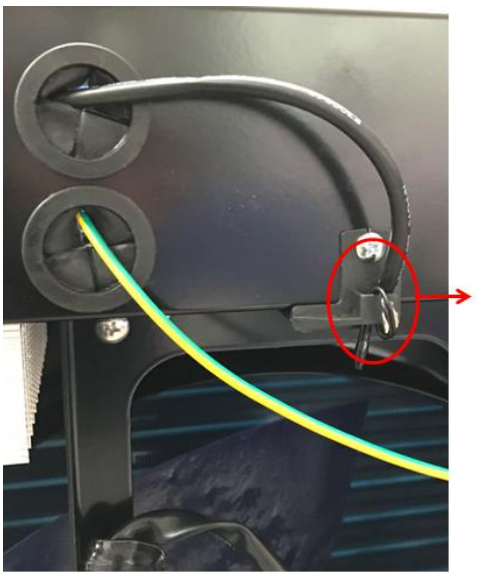


⚠ Warning: When conducting below operation, heat pump must be powered off!

7.1 Please check if ambient temp sensor AIN7 wiring is well connected. (AIN7, refers to page1, *Chapter I*

Generation, Section 2, PC board terminal introduction)

7.2 If the error code still exists, please replace ambient temp sensor.



Ambient temp sensor position
Above the fan motor

7.3 If still P7 after replacing gas return temp sensor, please replace PC board.

8. P8 Solution

Display P8
Cooling plate temp sensor failure

Replace Inverter board

⚠ Warning: When conducting below operation, heat pump must be powered off!

9. P9 Solution

Display P9
Current sensor failure

Single phase	Three phases
Replace inverter board	Replace power filter board

⚠ Warning: When conducting below operation, heat pump must be powered off!