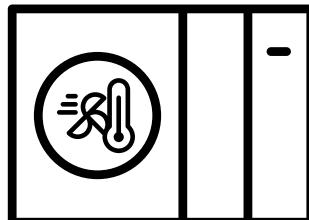


GRUNDIG

Heat Pump Monobloc Inverter

Service Manual



GHP-MM08

GHP-MM10

GHP-MM12

GHP-MM14

GHP-MM16

EN

01M-8508043600-2422-01
01M-8508053600-2422-01
01M-8508063600-2422-01
01M-8503073600-2422-01
01M-8503083600-2422-01

CE

Please read this user manual first!

Dear Valued Customer,

Thank you for preferring this Grundig appliance. We hope that you get the best results from your appliance which has been manufactured with high quality and state-of-the-art technology. For this reason, please read this entire user manual and all other accompanying documents carefully before using the appliance and keep it as a reference for future use. If you handover the appliance to someone else, give the user manual as well. Follow the instructions by paying attention to all the information and warnings in the user manual. Remember that this user manual may also apply to other models. Differences between models are explicitly described in the manual.

Meanings of the Symbols

Following symbols are used in various sections of this user manual:

	Important information or useful hints about usage.		This symbol shows that the operation manual should be read carefully.
	Warning for hazardous situations with regard to life and property.		This symbol shows that a service personnel should be handling this equipment with reference to the installation manual.
	Warning to actions that must never perform.		
	Warning for hot surfaces.		This symbol shows that this appliance used a flammable refrigerant. If the refrigerant is leaked and exposed to an external ignition source, there is a risk of fire. (For R32/R290 gas type)
	Do not cover it.		



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Part 1 General Features

1.1 Unit Capacities and Appearance

1.1.1 Unit Capacities

Table 1-1.1: Capacity range

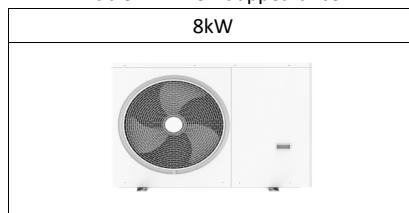
Factory Model	KS-80W/EN8BP	KS-100W/EN8BP	KS-120W/EN8BP	KS-140W/EN8BP	KS-160W/EN8BP
Model No.	GHP-MM 08	GHP-MM 10	GHP-MM 12	GHP-MM 14	GHP-MM 16

Notes:

1. The full model names can be obtained by substituting the asterisk in the model name format given in the left-hand column of the table above with the shortened model names given in the table. For example, the model name for the 14kW model is GHP-MM14.
2. The presence or omission of the letter E and S in the model names indicates:
E: with internal backup heater; omitted: without internal backup heater.
3. Power supply:
220-240V, 50Hz, 1-phase.

1.1.2 Appearance

Table 1-1.2: Unit appearance



10/12kW	14/16kW

Part 2 Component Layout and Refrigerant Circuit

2.1 Layout of Functional Components

GHP-MM08

Figure 2-1.1: top view

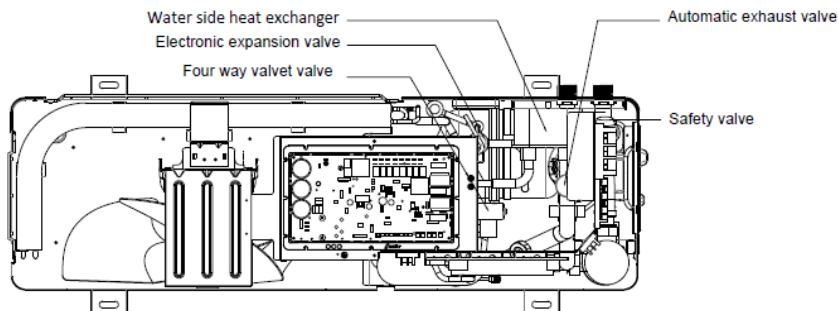
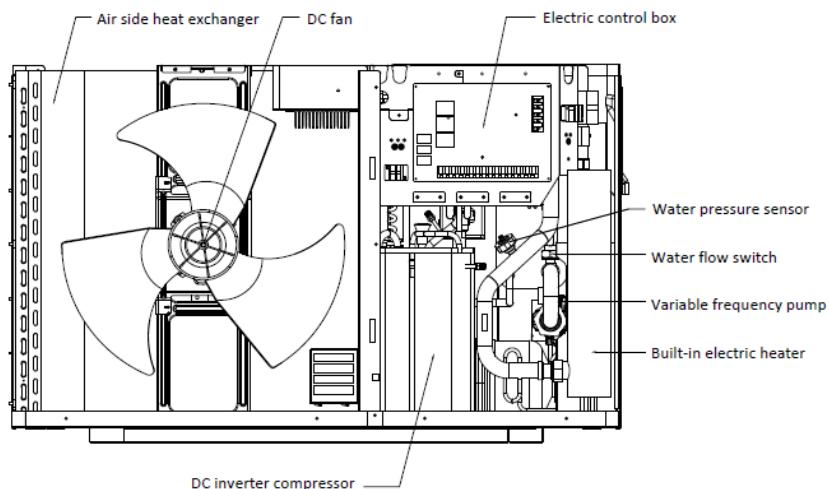


Figure 2-1.2: front view



GHP-MM10

Figure 2-1.3: top view

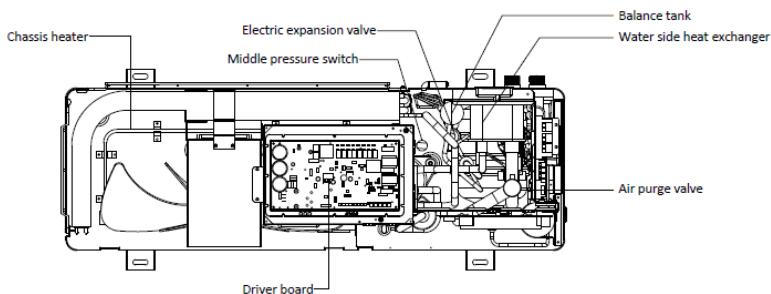
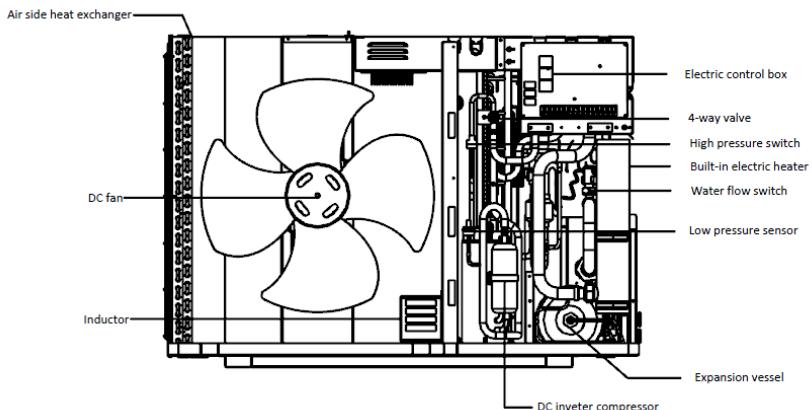


Figure 2-1.4: front view



GHP-MM12

Figure 2-1.5: top view

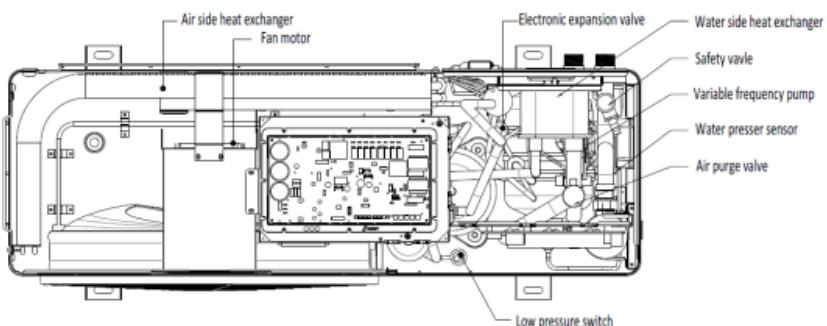
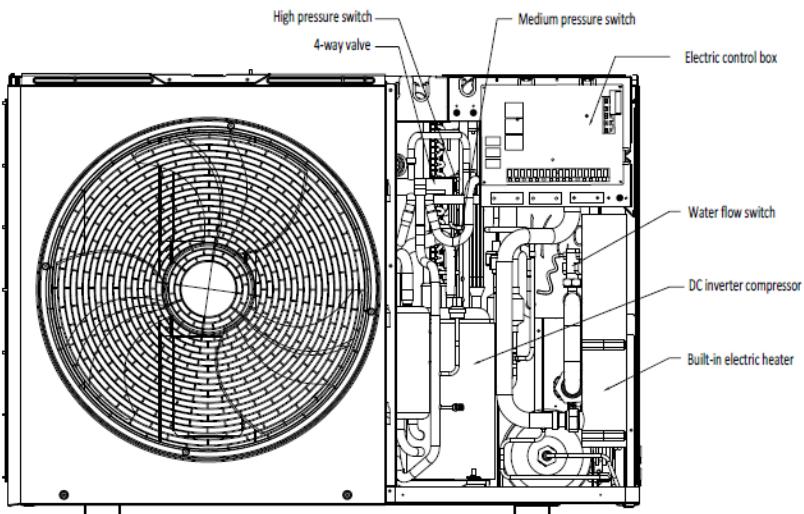


Figure 2-1.6: front view



GHP-MM14/ GHP-MM16

Figure 2-1.7: top view

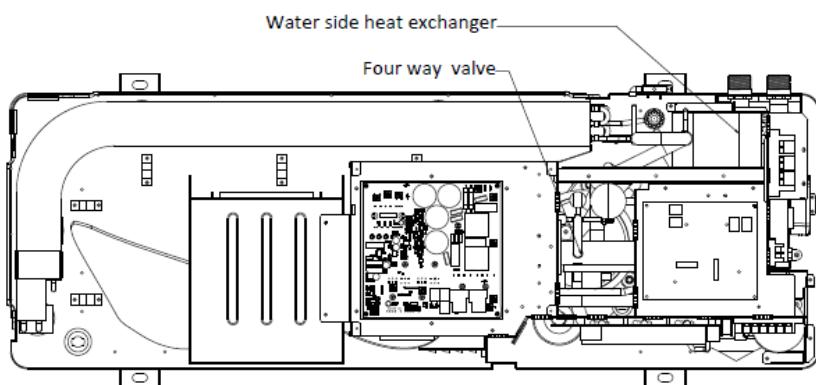
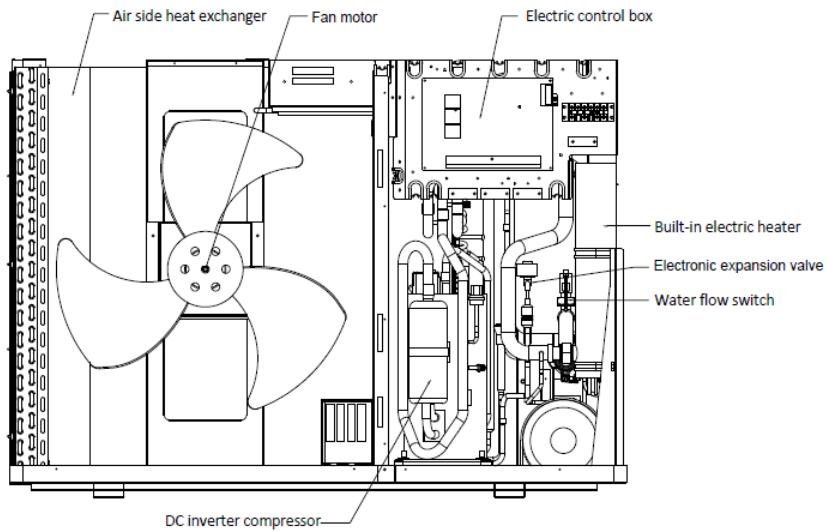
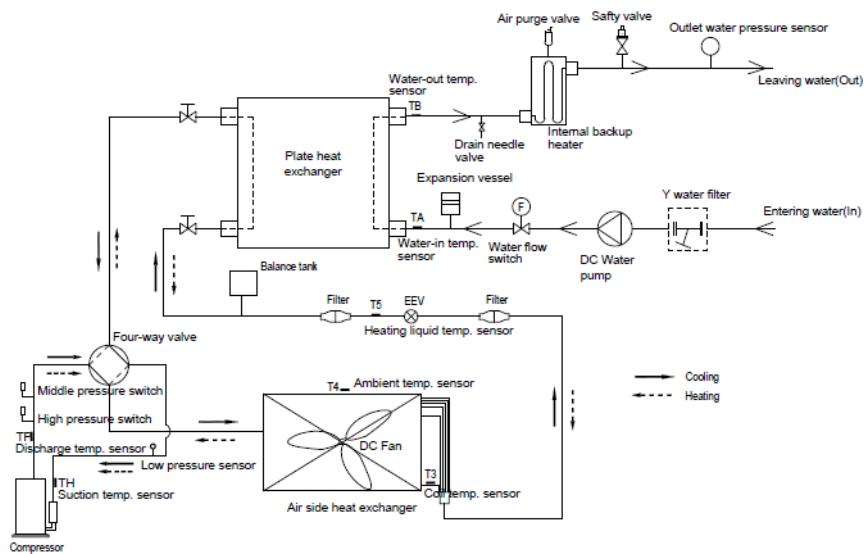


Figure 2-1.8: front view



2.2 Piping Diagram

Figure 2-2.1: Piping diagram



Key components:**1. Compressor**

Compress low temperature and low pressure refrigerant gas into high temperature and high pressure refrigerant gas.

2. Electronic expansion valve (EEV)

Control refrigerant flow and reduce refrigerant pressure.

3. 4-way valve

Control refrigerant flow direction. Open in cooling mode and closed in heating mode. When open, the air side heat exchanger functions as a condenser and water side heat exchanger functions as an evaporator; when closed, the air side heat exchanger functions as an evaporator and water side heat exchanger functions as a condenser.

4. High and middle pressure switch

Regulate refrigerant system pressure. When refrigerant system pressure rises above the upper limit, the high or middle pressure switches will open and then turn off heat pump.

5. Low pressure sensor

Regulate refrigerant system pressure. When refrigerant system pressure falls below the lower limit, low pressure sensor detects the limit value and then turns off heat pump.

6. Air purge valve

Automatically remove air from the water circuit.

7. Safety valve

Preventing excessive water pressure by opening at 43.5 psi (3 bar) and discharging water from the water circuit.

8. Expansion vessel

Balance water system pressure. (Expansion vessel volume: 5L)

9. Water flow switch

Detect water flow rate to protect compressor and water pump in the event of insufficient water flow.

10. Backup heater

Provide additional heating capacity when the heating capacity of the heat pump is insufficient due to very low outdoor temperature. Also protects the external water piping from freezing.

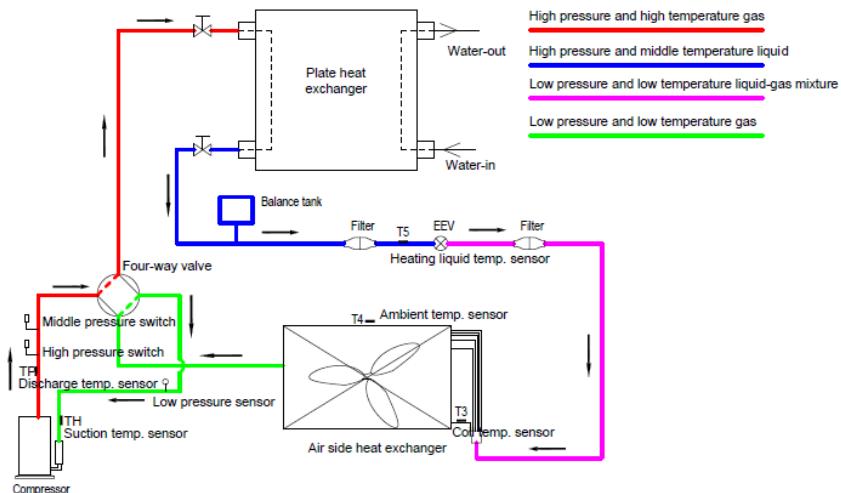
11. Internal water pump

Circulate water in the water circuit.

2.3 Refrigerant Flow Diagram

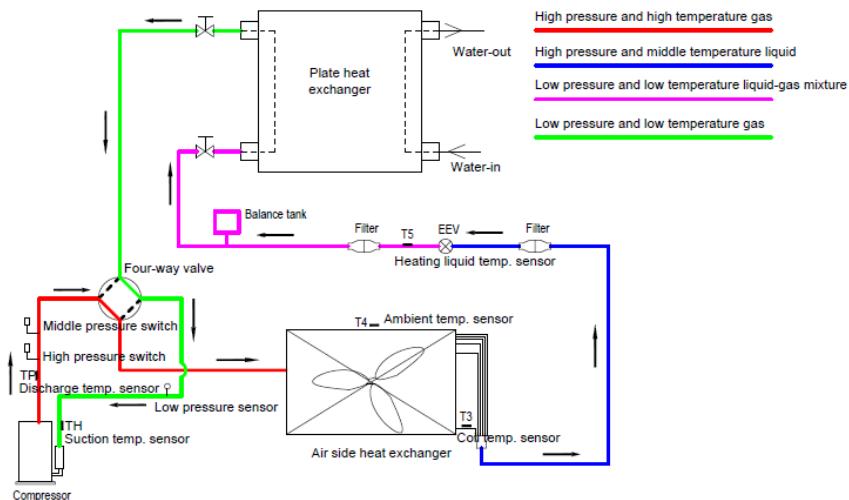
Heating and domestic hot water operation (8,16KW for example)

Figure 2-3.1: Refrigerant flow during heating or domestic hot water operation



Cooling and defrosting operation (8,16KW for example)

Figure 2-3.2: Refrigerant flow during cooling and defrosting operations



Part 3 Control

3.1 Stop Operation

The stop operation occurs for one of the following reasons:

3.1.1 Normal shutdown: The heat pump will stop running when the set temperature has been reached.

3.1.2 Abnormal shutdown: in order to protect the compressors, if an abnormal state occurs the system makes a “turn off” operation and an error code are displayed on the user interface.

3.2 Standby Control

3.2.1 Water Pump Control

When the outdoor unit is on standby, the internal and external circulator pumps run continuously.

3.2.2 Crankcase Heater Control

The crankcase heater is used to prevent refrigerant from mixing with compressor oil when the compressors are stopped. The crankcase heater is controlled according to outdoor ambient temperature and the compressor's on/off state. When the outdoor ambient temperature is at or above 7°C or the compressor is running, the crankcase heater is off; when the outdoor ambient temperature is below 5°C and the unit has just been powered on (either manually or when the power supply has been restored from a breakdown), the crankcase heater turns on and run by half an hour on half an hour off cycle. When the compressor has been stopped for more than 3 hours and the outdoor ambient temperature is below 5°C, the crankcase heater turns on and run for half an hour on half an hour off cycle.

3.3 Startup Control

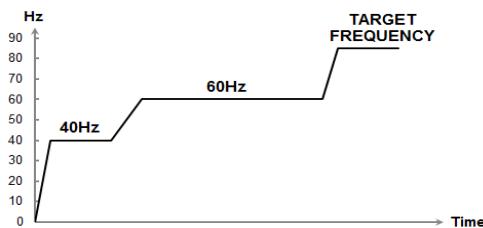
3.3.1 Compressor Startup Delay Control

In initial startup control or restart control (except in oil return operation and defrosting operation) or switching from on mode to another mode, compressor startup is delayed such that a 3 minute delay time has elapsed since the compressor last stopped, in order to prevent frequent compressor on/off and to equalize the pressure within the refrigerant system.

3.3.2 Compressor Startup Program

In initial startup control and restart control, compressor startup is controlled according to outdoor ambient temperature. Compressor startup follows the startup steps below until the target rotation speed is reached.

Figure 3-3.1: Compressor startup procedure



3.3.3 Startup Control for Heating and Domestic Hot Water Operation

Table 3-3.1: Component control during startup in heating and domestic hot water modes

Component	Control function and state
Inverter compressor	Compressor startup program by figure3-3.1
DC fan motor	Start the fan 10 seconds before the compressor starts, and then run half of the maximum speed, and then run at maximum speed 60s after the compressor startup
Electronic expansion valve	Position (steps) from 0 (fully closed) to 480 (fully open), controlled according to outdoor ambient temperature and in-water temperature
4-way valve	ON

3.3.4 Startup Control for Cooling Operation

Table 3-3.2: Component control during startup in cooling mode

Component	Control function and state
Inverter compressor	Compressor startup program by figure3-3.1
DC fan motor	Start the fan 10 seconds before the compressor starts, and then run half of the maximum speed, and then run at maximum speed 60s after the compressor startup
Electronic expansion valve	Position (steps) from 0 (fully closed) to 480 (fully open), controlled according to outdoor ambient temperature and in-water temperature
4-way valve	OFF

3.4 Normal Operation Control

3.4.1 Component Control during Normal Operation

Table 3-4.1: Component control during heating and domestic hot water operations

Component	Control function and state
Inverter compressor	Controlled according to load requirement from hydraulic module
DC fan motor	Controlled according to outdoor ambient temperature and outdoor heat exchanger pipe temperature
Electronic expansion valve	Position (steps) from 0 (fully closed) to 480 (fully open), controlled according to in-water temperature, out-water temperature and discharge temperature
4-way valve	ON

Table 3-4.2: Component control during cooling operation

Component	Control function and state
Inverter compressor	Controlled according to load requirement from hydraulic module
DC fan motor	Controlled according to outdoor ambient temperature and outdoor heat exchanger pipe temperature
Electronic expansion valve	Position (steps) from 0 (fully closed) to 480 (fully open), controlled according to in-water temperature, out-water temperature and discharge temperature
Four-way valve	OFF

3.4.2 Compressor Output Control

The compressor rotation speed is controlled according to the load requirement. The compressor follows a fixed starting procedure as shown in figure 3-3.1. After finishing the startup, the compressor runs at the target rotation speed.

During normal operation the compressor speed is controlled according to inlet water temperature, target water temperature set by the user interface, the rate of change in inlet water temperature.

3.4.3 Compressor Step Control

The running speed of six-pole compressors (used on all models) in rotations per second (rps) is one third of the frequency (in Hz) of the electrical input to the compressor motor. The frequency of the electrical input to the compressor motors can be altered at a rate of 1Hz per second.

3.4.4 Four way Valve Control

The four-way valve is used to change the direction of refrigerant flow through the water side heat exchanger in order to switch between cooling and heating/DHW operations.

During heating and DHW operations, the four-way valve is on; during cooling and defrosting operations, the four-way valve is off.

3.4.5 DC Fan Control

Start the fan before the compressor starts, and fan runs at the initial speed. After the compressor runs a few minutes, the fan runs at a higher set speed.

3.4.6 Electronic Expansion Valve Control

The position of the electronic expansion valve (EEV) is controlled in steps from 0 (fully closed) to 480 (fully open).

- At power-on

EEV first closes fully, and then moves to the standby position. After a few seconds EEV moves to an initial running position, which is determined according to operating mode, inlet water temperature and outdoor ambient temperature. A few minutes further, EEV is controlled according to inlet water temperature, outlet water temperature, discharge temperature and compressor speed.

- When the unit is on standby

EEV keeps current position and delay a few seconds and opens fully.

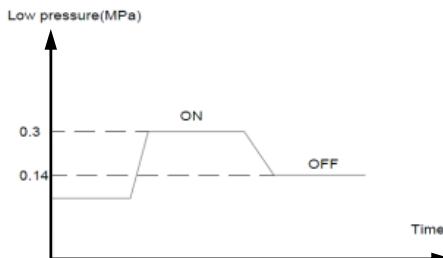
- When the unit stops

EEV keeps current position first and delay a few seconds and opens fully.

3.5 Protection Control

3.5.1 Low Pressure Protection Control

Figure 3-5.1: Low pressure protection control

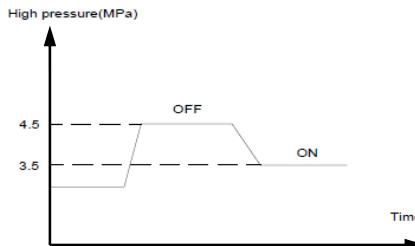


When the suction pressure drops below 0.14MPa the system displays P03 protection and the unit stops running. When the suction pressure rises above 0.3MPa, the compressor enters re-start control.

3.5.2 High Pressure Protection Control

This control protects the compress from the over-high refrigerant system pressure.

Figure 3-5.2: High pressure protection control

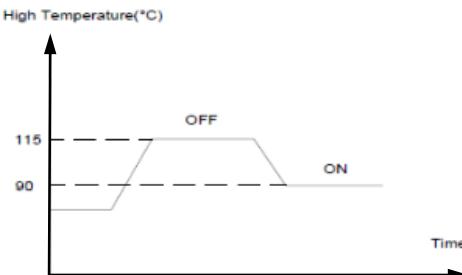


When the discharge pressure rises above 4.5MPa the system displays P02 protection and the unit stops running. When the discharge pressure drops below 3.5MPa, the compressor enters re-start control.

3.5.3 Discharge Temperature Protection Control

This control protects the compressor from abnormally high temperature.

Figure 3-5.3: High discharge temperature protection control



When the discharge temperature rises above 115°C the system displays P05 protection and the unit stops running. When the discharge temperature drops below 95°C, the compressor enters a re-start control.

3.5.4 Compressor Current Protection Control

This control protects the compressor from abnormally high currents. When the compressor current rises above maximum current the system displays E23 protection and the unit stops running. When the compressor current drops below maximum current, the compressor enters re-start control.

Table 3-5.1: Compressor current protection control

model	8-10kw	12kw 1ph	14-16kw 1ph
Maximum current (A)	14	18	25

3.5.5 DC Fan Motor Protection Control

Check the feedback signal one minute after the fan starts. If the motor speed is lower than the default minimum speed or there is no feedback for one minute, the motor fault P11 will be displayed. If it occurred 10 times within 2hours, the unit will shut down and be locked.

3.5.6 Water Side Heat Exchanger Anti-freeze Control

This control protects the water side heat exchanger from ice formation. The water side heat exchanger electric heater is controlled according to outdoor ambient temperature, inlet water temperature and outlet water temperature.

- When all the conditions below are met, the unit will turn on the water side heat exchanger electric heater:
 - the current operation mode of the unit is shutdown or standby;
 - outdoor ambient temperature is below 4°C;
 - inlet water temperature or outlet water temperature(the minor one) is below 4°C;
- When any one of the conditions below is met, the unit will turn off the water side heat exchanger electric heater:
 - the current operation of the unit is neither shutdown nor standby;
 - outdoor ambient temperature is above 6°C;
 - inlet water temperature or outlet water temperature(the minor one) is above 6°C;

3.5.7 Module Temperature Protection Control

This control protects the module from abnormally high temperatures. When the module temperature rises at or above the up limit value 96°C, the interface displays E29 protection code and the unit stops running.

3.6 Special Control

3.6.1 Oil Return Operation

In order to prevent the compressor from running out of oil, the oil return operation is conducted to recover oil that has flowed out of the compressor and into the refrigerant piping.

When the compressor cumulative operating time with running rotation speed less than 50Hz has been reached 3 hours, the unit will start an oil-return operation.

The oil return operation ceases when any one of the following three conditions occurs:

- Oil return operation duration has been reached 4 minutes.

- The unit will turn off because of the protection.
- “TURN OFF” command is received.

Table 3-6.1 Component control during oil-return operation

Component	Control functions and states
Compressor	Runs at oil return operation rotation speed
Electronic expansion valve	Fully open
DC fan motor	Controlled according to outdoor heat exchanger pipe temperature
4-way valve	OFF

3.6.2 Defrosting Operation

In order to recover heating capacity, the defrosting operation is conducted when the air side heat exchanger of the unit is performing as a condenser. The defrosting operation is controlled according to outdoor ambient temperature, air side heat exchanger refrigerant outlet temperature and the compressor running time.

Table 3-6.2: Component control during defrosting operation

Component	Control functions and states
Compressor	Runs at defrosting operation rotation speed
Electronic expansion valve	Fully open
DC fan motor	OFF
4-way valve	OFF

3.7 Role of Temperature Sensors in Control Functions

Figure 3-7.1: Location of the temperature sensors of all models 8-16kw

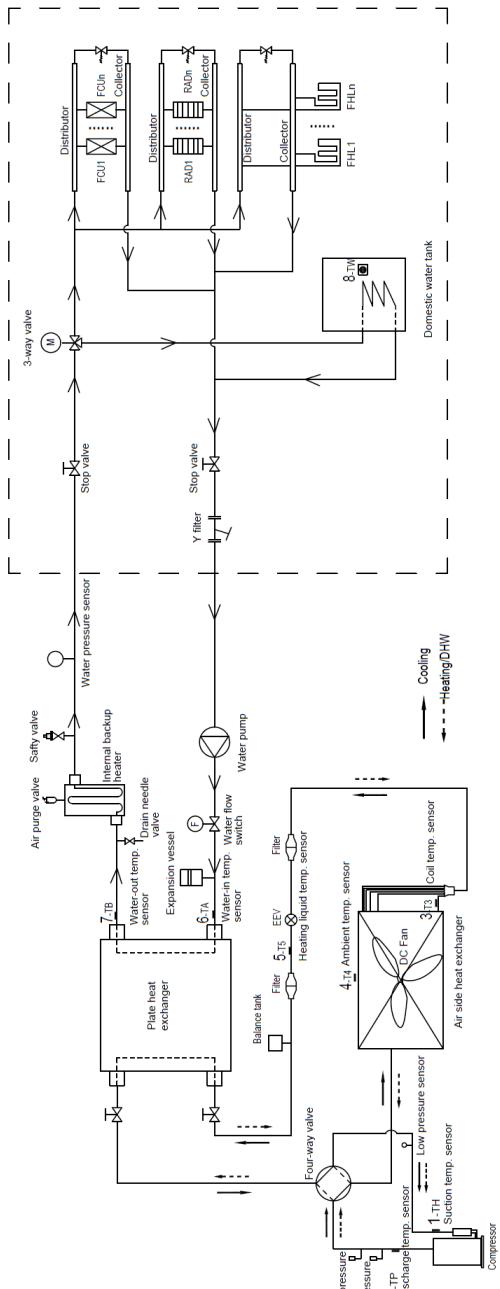


Table 3-7.1: All the temperature sensors

Item	Name	Label	Mode	Control functions	
1	Suction temp. sensor	TH	Cooling	Electronic expansion valve control	
			Heating	Electronic expansion valve control	
2	Discharge temp. sensor	TP	Cooling	Electronic expansion valve control	
				Discharge temp. protection control	
			Heating	Electronic expansion valve control	
				Discharge temp. protection control	
3	Coil temp. sensor	T3	Cooling	Electronic expansion valve control	
				DC fan control	
				Compressor output control	
			Heating	Electronic expansion valve control	
				DC fan control	
				Defrosting operation control	
			Cooling	Compressor startup control	
				Compressor output control	
4	Outdoor ambient temp. sensor	T4		Electronic expansion valve control	
				DC fan control	
				Crankcase heater control	
		Heating	Compressor startup control		
			Compressor output control		
			Electronic expansion valve control		
			DC fan control		
			Defrosting operation control		
			Crankcase heater control		
5	Liquid refrigerant temp. sensor	T5	Cooling	Anti-freezing protection control	
			Heating	/	
6	Inlet water temp. sensor	TA	Cooling	Anti-freezing protection control	
				Compressor on/off and output control	
				Oil-returning control	
				Electronic expansion valve control	
			Heating	Compressor on/off and output control	
				Oil-returning control	
				Defrosting operation control	
				Electronic expansion valve control	
7	Outlet water temp. sensor	TB	Cooling	Anti-freezing protection control	
				Electronic expansion valve control	
			Heating	Compressor output control	
				Defrosting operation control	
			Heating	Electronic expansion valve control	
8	Domestic water tank temp. sensor	TW	DHW	Compressor output/Backup electric heater control	

3.8 EEPROM Parameter Setting

Press “**M**” and “**Up**” two keys at the same time, and then enter the password “1212” to adjust EEPROM parameter value. Refer to the table below for the detailed setting.

Item	Name	Code	Default	Unit	Range	Accuracy
1	Air conditioning water temperature return difference	Ta	2	°C	1~5	1
2	Hot water temperature difference	Tb	5	°C	2~15	1
3	Cooling target exhaust temperature correction	TargetTPc	0	°C	-10~15	1
4	Heating superheat	SHh	-1	°C	-5~10	1
5	Compressor frequency in refrigeration test mode	LCF_C	68	Hz	20~120	1
6	Compressor frequency in heating test mode	LCF_H	68	Hz	20~120	1
7	Compressor frequency in hot water test mode	LCF_W	68	Hz	20~120	1
8	Cooling test mode EEV opening	EEV_C	250/5	P	(0~480)/5	1
9	Heating test mode EEV-1 opening	EEV_H	150/5	P	(0~480)/5	1
10	Hot water test mode EEV-1 opening	EEV_W	150/5	P	(0~480)/5	1
11	Defrost entry temperature	DST	-5	°C	-15~0	1
12	Defrost enters temperature difference	Dt	12	°C	0~15	1
13	Judgment time of first defrost	T1	40	min	20~90	1
14	Defrosting process EEV opening	Opl	480/5	P	(0~480)/5	1
15	Defrost compressor frequency	FD	12	Hz	30~120	1
16	Maximum operating frequency	Fmax	85	Hz	30~120	1
17	Power-off memory	PR	1	0/1	0-disable 1-enable	/
18	Silent mode frequency limit	Fs	55	Hz	30~120	1
19	Sterilization set temperature	Tx	65	°C	55~75	1
20	Disinfection duration time	Td	30	Min	20~120	1
21	Run mode priority	Mp	0	0/1/2	0-DHW 1-Space AC 2-Preempt	/

22	Compressor resonance point 1	FR1	0	Hz	0~120	1
23	Compressor resonance point 2	FR2	0	Hz	0~120	1
24	Compressor resonance point 3	FR3	0	Hz	0~120	1
25	Compressor resonance point 4	FR4	0	Hz	0~120	1
26	Ambient temperature for electric heating of water tank	Teh	4	°C	-10~40	1
27	Whether automatic temperature adjustment is effective	Auto heating Adjust enable	0	0/1	0-disable 1-enable	1
28	Temperature compensation high point	Hi_A	5	°C	0~20	1
29	Temperature compensation low point	Lo_A	0	°C	-20~0	1
30	Maximum temperature compensation	A	5	°C	0~10	1
31	Whether the high heating temperature shutdown is effective	To enable high temp. heating shutdown	0	0/1	0-disable 1-enable	1
32	Heating high temperature shutdown temperature setting	T4h	24	°C	10~30	1
33	PWM water pump brand	MPumpTyp	3	/	0-AC pump 1-OMT1 2-Grundfos 3-Wilo 4-OMT2	1
34	Pump running status in heating standby mode	H-Pump	3	0/1	0-On 1min OFF 3min 1-ON 1min OFF 10min 2-On 2min OFF 15min 3-Always On	1
35	Low temperature stop compressor temperature setting	T4L	-30	°C	-40~-21	1
36	Pipeline electric heating is effective or invalid	HD	0	0/1	0-enable 1-disable	1
37	Whether the cooling mode is effective	Cool on enable	0	0/1	0-enable 1-disable	1

38	Whether the high pressure 2 switch is effective (system parameter)	Middle pressure Switch enable	0	0/1	0-enable 1-disable	1
39	Minimum opening setting	MinEEV	80/5	P	(0~480)/5	1
40	Minimum water temperature requirement when entering defrost	Tdf	10	°C	0~40	1
41	Ambient temperature of pipeline electric heating	T4g	-20	°C	-40~20	1
42	Defrost exit temperature	Ft	15	°C	10~25	1
43	Maximum defrost operating time	FT	10	Min	1~20	1
44	Return oil into the lowest frequency	Fo	50	Hz	30~60	1
45	Test mode AC fan speed	TF	2	/	1-low speed 2-high speed	/
46	Chassis electric heating start temperature	BHon	-5	°C	-15~0	1
47	Minimum operating frequency	Fmin	25	Hz	20~100	1
48	Heating mode switch	HeatChange	0	/	0/1	/
49	Correction of heating target exhaust temperature	TargetTPh	0	°C	-10~15	1
50	EEPROM Reset	/	0	/	0-Normal 1-Reset	1
51	Standby water pump speed	SB-PWMout	35	%	10~100	1
52	Test mode DC fan speed	FspeedT	900/15	rpm	200~1000/15	1
53	Minimum DC fan speed	FanMin	250/15	rpm	200~500/15	1
54	Minimum DC fan speed	FanMax	825/15	rpm	500~1000/15	1
55	Maxmum DC fan speed	NoiseFan	650/15	rpm	300~1000/15	1
56	Cool coil pipe temp.	CondT	40	°C	20~60	1
57	Heat coil pipe temp.	EvapT	5	°C	-10~20	1
58	DC fan resonance point 1	SR1	0/15	rpm	0~1000/15	1

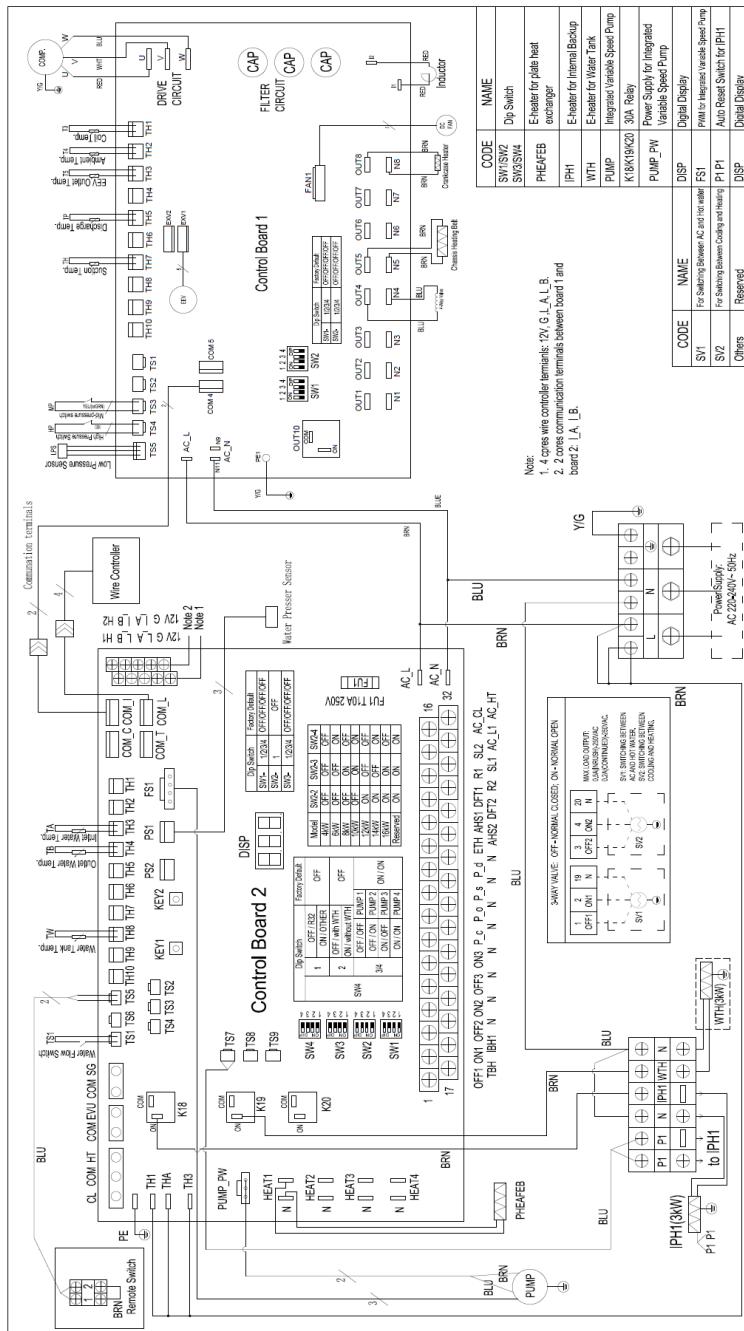
59	DC fan resonance point 2	SR2	0/15	rpm	0~1000/15	1
60	DC fan resonance point 3	SR3	0/15	rpm	0~1000/15	1
61	Test mode PWM pump speed	Test_P	100	%	50~100	1
62	PWM pump minimum speed	Min-PWMout	70	%	50~100	1
63	Trv is effective or not	enTrV	1	0/1	0-disable 1-enable	1
64	Four way switching fault judgment temperature difference	Trv	3	°C	0~10	1
65	EVI heat or DHW superheat	SHe	6	°C	-5~25	1
66	Cool test mode EEV-2 open	EEV_C	0/5	P	(0~480)/5	1
67	Heat test mode EEV-2 open	EEV_H	150/5	P	(0~480)/5	1
68	DHW test mode EEV-2 open	EEV_W	150/5	P	(0~480)/5	1
69	Commercial mode heating frequency	FreqTestH	60	Hz	20~100	1
70	Commercial mode heating EEV-1 open	EEVTestH-1	250/5	P	(0~480)/5	1
71	Commercial mode heating EEV-2 open	EEVTestH-2	150/5	P	(0~480)/5	1
72	Commercial mode cooling frequency	FreqTestC	40	Hz	20~100	1
73	Commercial mode cooling EEV-1 open	EEVTestC-1	300/5	P	(0~480)/5	1
74	Commercial mode cooling EEV-2 open	EEVTestC-2	0	P	(0~480)/5	1
75	Chassis heater on time	BaseHeatTime	6	10Min	0~100	1
76	Group control address	IP	0		0-15	1
77	Low pressure check type	LPS	1	/	0-low pressure switch 1- low pressure sensor	1
78	Pump running status in cooling standby mode	C-Pump	3	0/1	0-on 1min off 3min 1-on 1min off	1

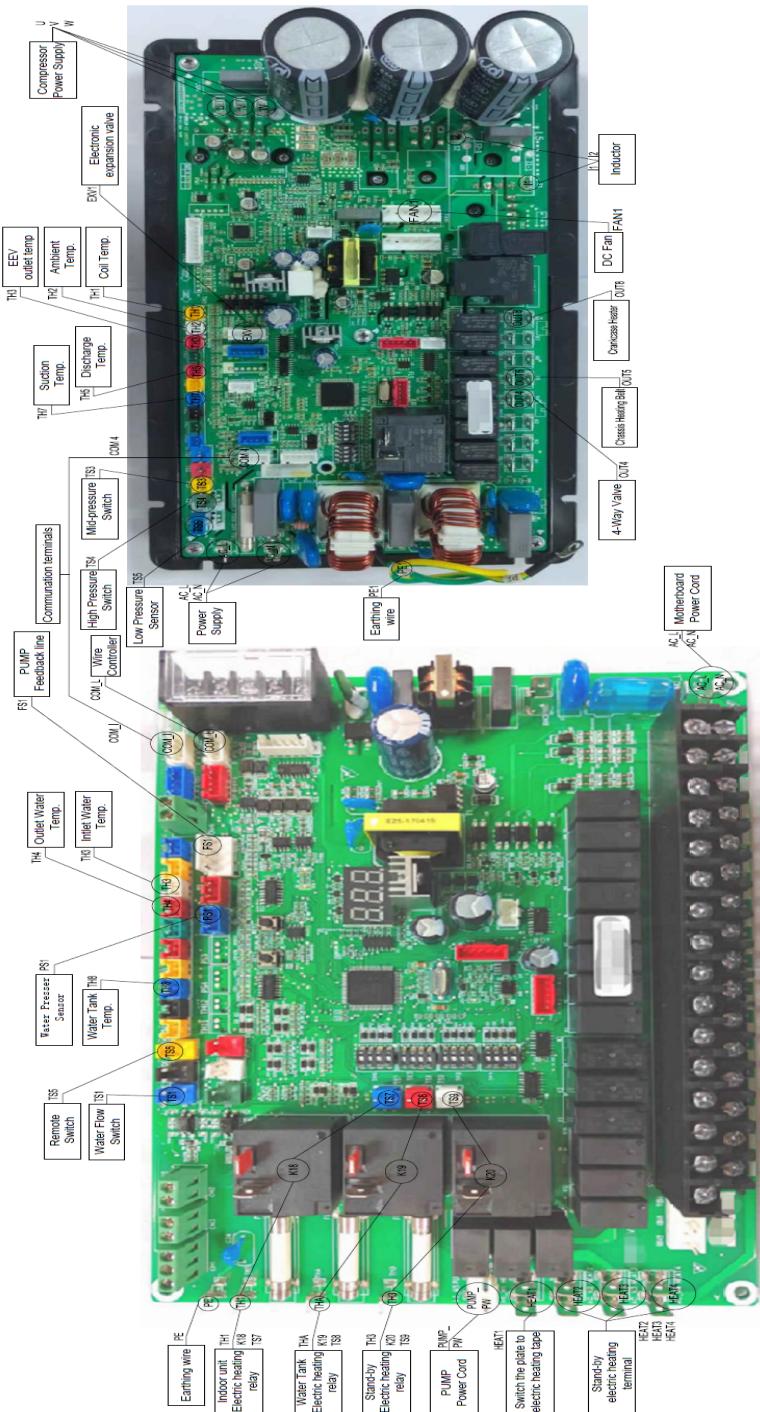
					10min 2-on 2min off 15min 3-Always on	
79	Chassis heater enable or disable	TH4	1	0/1	0-disable 1-enable	1
80	EVI-main cool superheat(<60Hz)	SHc1	4	°C	0~15	1
81	EVI-sub cool superheat (<60Hz)	SCe1	6	°C	0~15	1
82	EVI-main cool superheat (\geq 70Hz)	SHc2	5	°C	0~15	1
83	EVI-sub cool superheat (\geq 70Hz)	SCe2	6	°C	0~15	1
84	Heating superheat	SHIps	4	°C	0~15	1
85	EVI startup frequency	F-EVI	60	Hz	30~100	1
86	Heat four way valve on delay	4 Way-on time	10	S	1-100	1
87	Heat four way valve off delay	4 Way-Off time	120	S	0-120	1
88	Target water temperature type	In/Out_Change	0	/	0-TA Inlet water 1-TB Outlet water	1
89	Outlet water control differential coefficient	a	3	°C	1-10	1
90	Second compressor startup frequency	F-Start2	60	Hz	40-90	1
91	Heat pump off frequency	F-Stop	25	Hz	20-90	1
92	Defrost 4-way valve switch frequency	FD-Change	38	Hz	20-90	1
93	Compressor off delay	COMP-Off time	0	S	0-60	1
94	EEV off delay	EEV- Stop time	60	S	0-120	1
95	Test mode type	Test_Typ	0	/	0-normal 1-standard 2-ERP1 3-ERP2	1
96	T3 change rate when defrost	DeT	40/10	°C	(10-100)/10	1

97	T4 switch in TP protection	TP-Change	-15	°C	0～-30	1
98	Water pressure check enable	WPS	0	0/1	0-disable 1-enable	1
99	Compressor resonance point 5	FR5	0	Hz	0～120	1

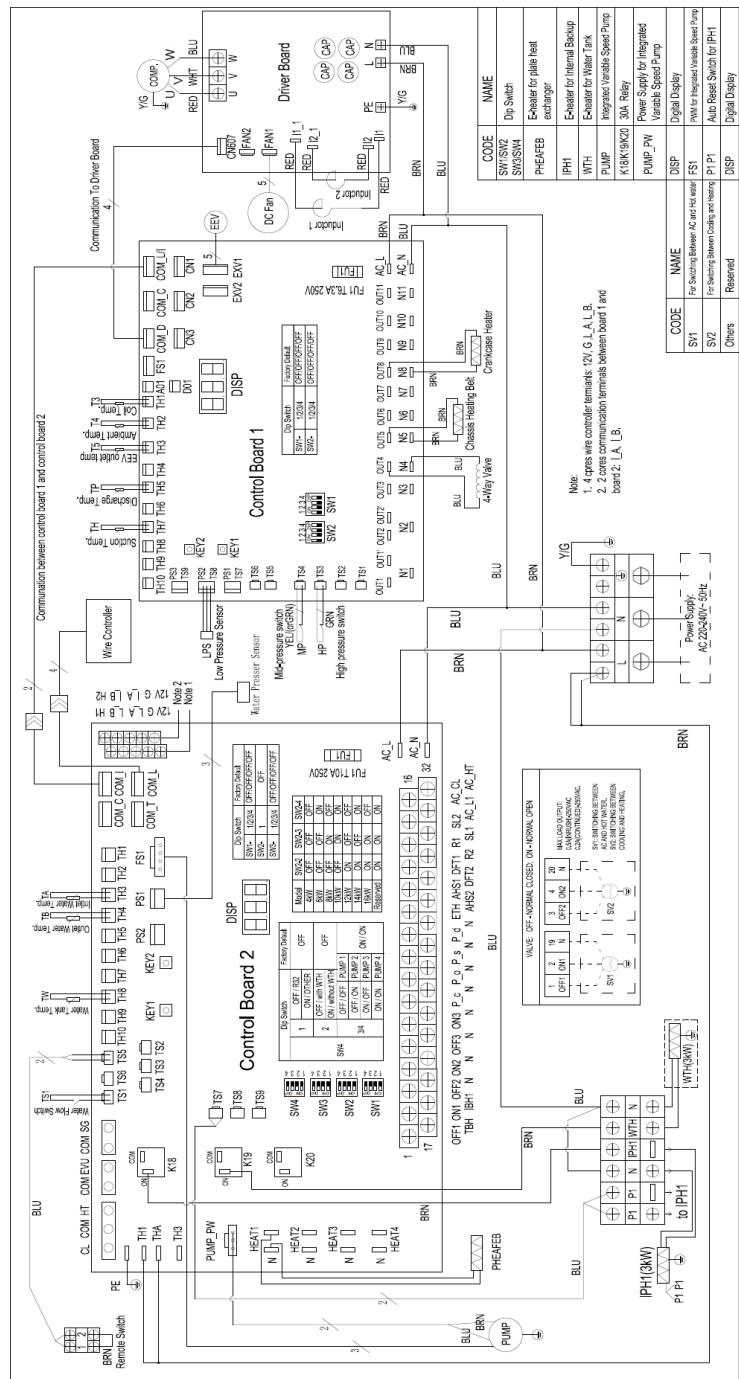
3.9 Electric Wiring Diagram

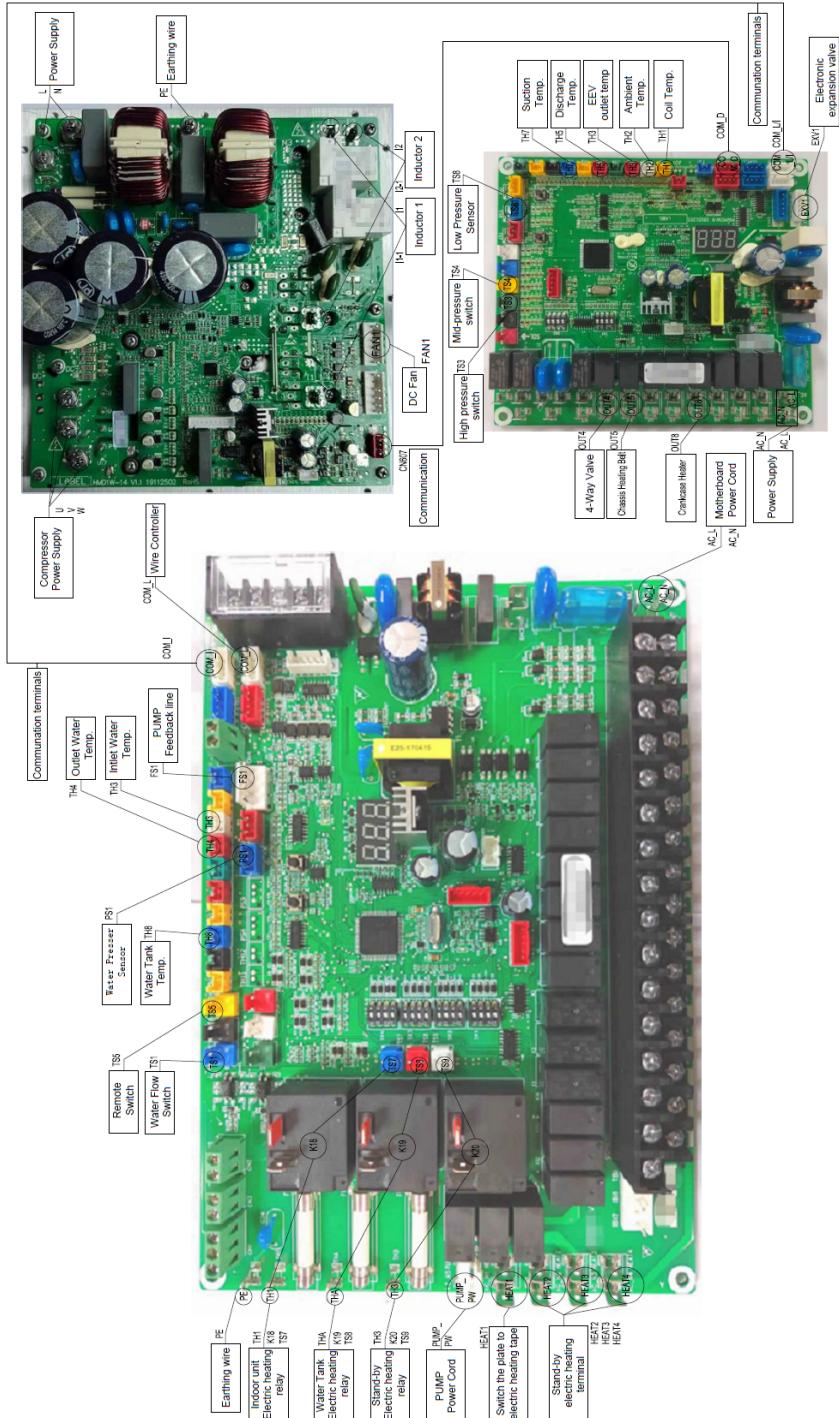
3.9.1 (GHP-MM08); (GHP-MM10); (GHP-MM12)





3.9.2 (GHP-MM14) ; (GHP-MM16)





Part 4 Troubleshooting

4.1 Unit Electric Control Box Layout

Figure 4-1.1: (GHP-MM08)

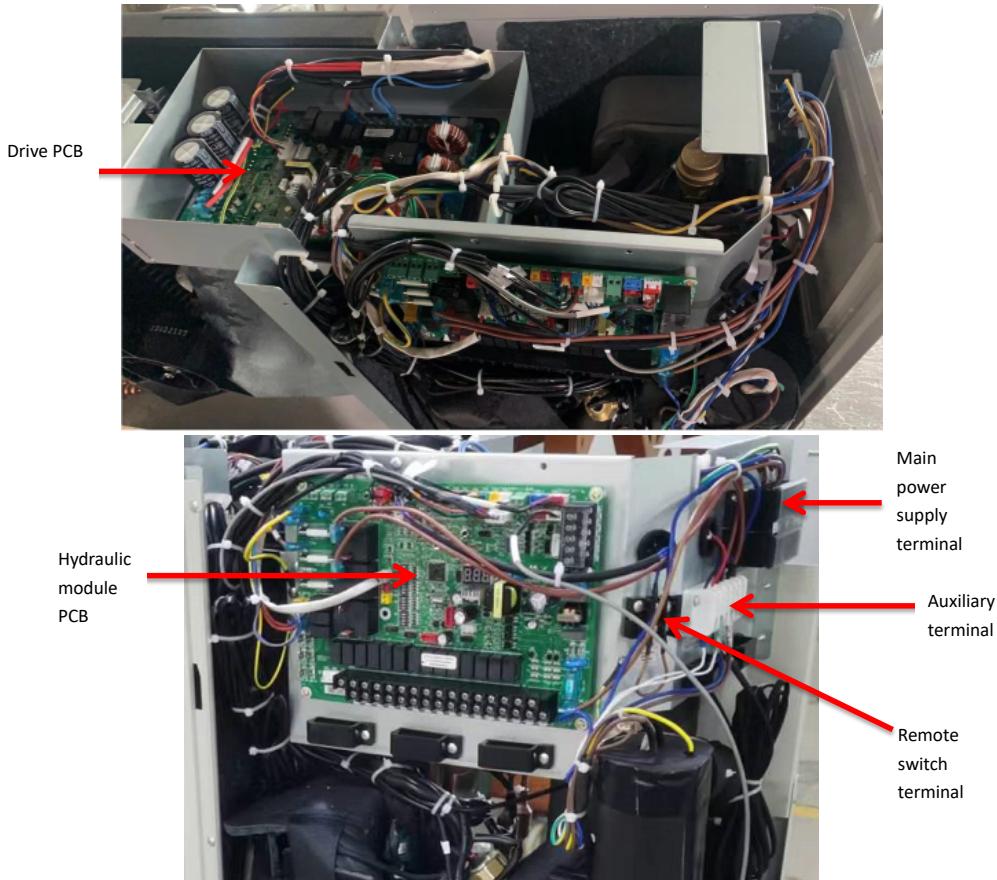


Figure 4-1.2: (GHP-MM10)/(GHP-MM12)

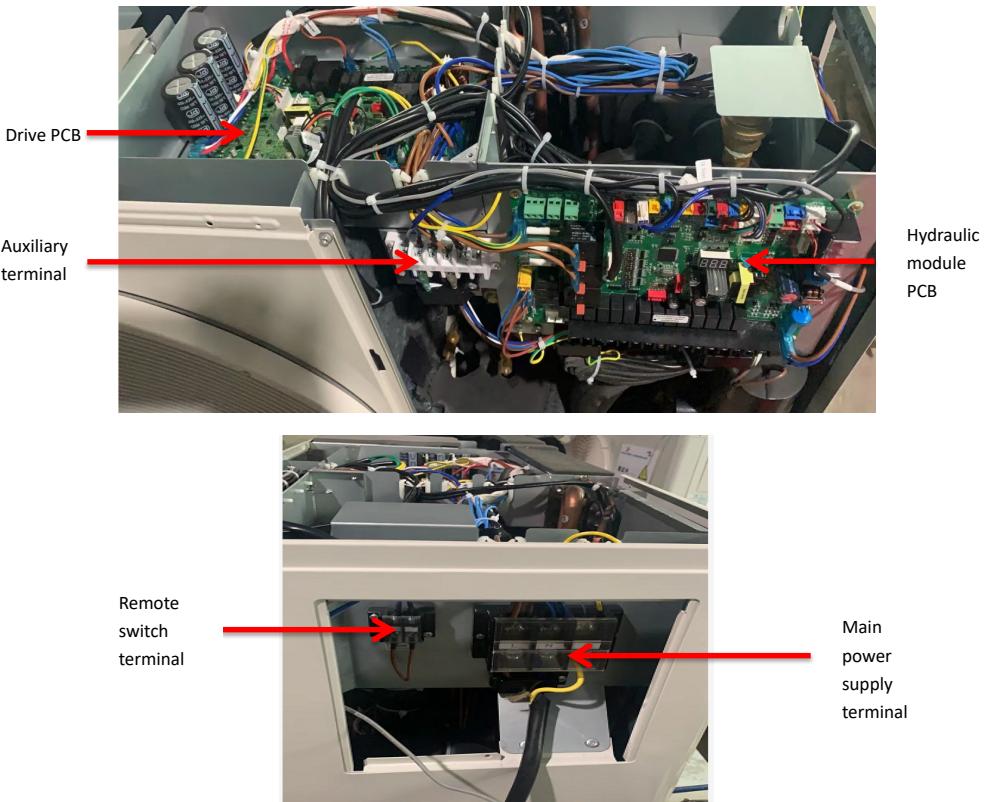
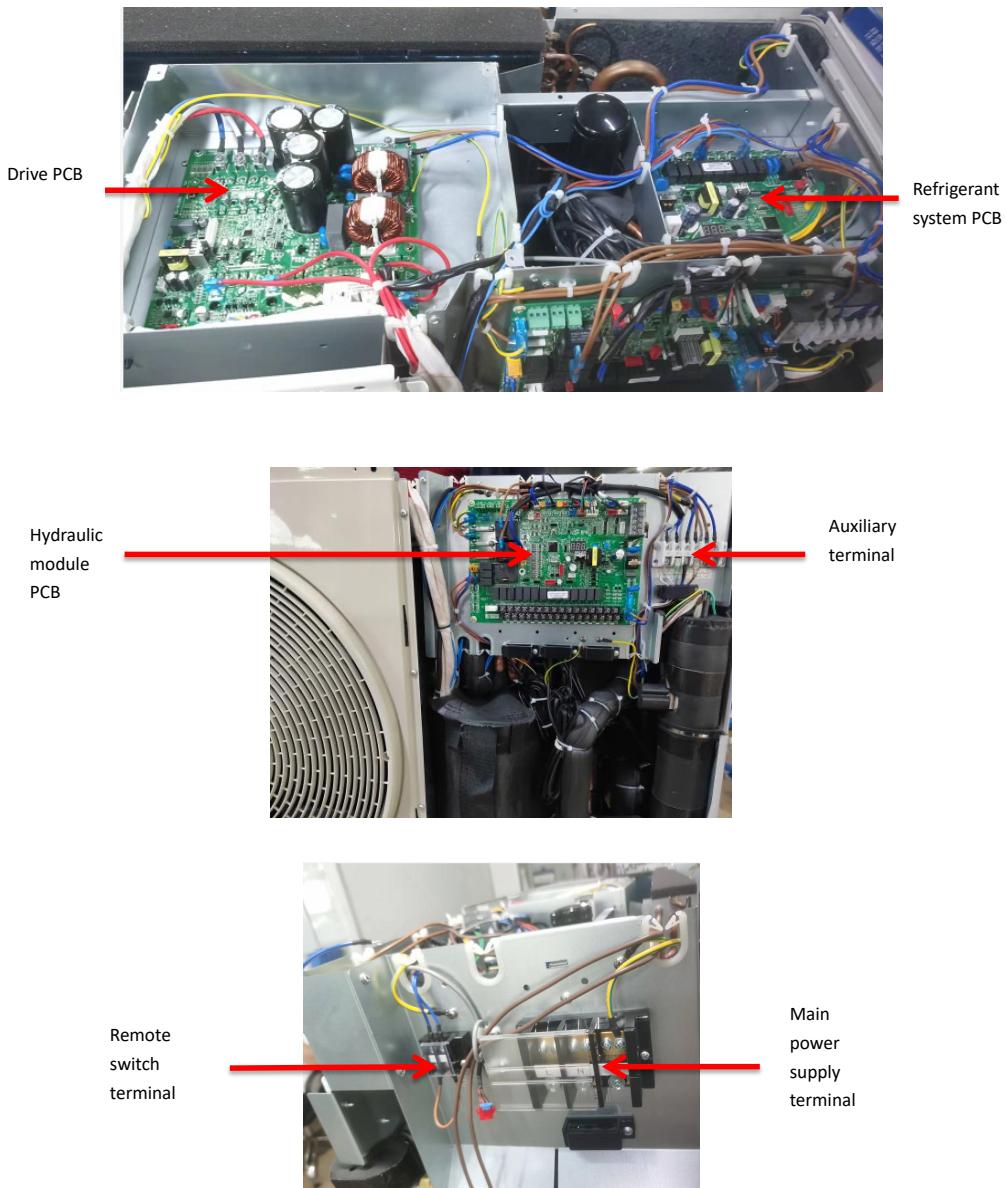


Figure 4-1.3: (GHP-MM14)/(GHP-MM16)



4.2 Unit PCBs

4.2.1 Types

Heat pump has two types of PCBs – one for the hydraulic system and the other for the refrigerant system. All models share the same hydraulic system PCB. The number of PCBs of each model is for reference to Table 4-2.1 below.

Table 4-2.1 PCB

Model/Number	8kw/10kw	12kw	14kw/16kw
Refrigerant system module	1	1	1
Inverter module			1
Hydraulic module PCB	1	1	1
Total	2	2	3

The locations of each PCB in the unit electric control boxes are shown in Figures 4-2.1, 4-2.2, 4-2.3, 4-2.4, 4-2.5. For 8/10/12kw, Inverter module and refrigerant system module constitute an integrated PCB which is called drive PCB. For 14/16kw, Drive PCB and refrigerant system PCB are separate.

4.2.2 Hydraulic Module PCB

Figure 4-2.1: PCB for Hydraulic Module

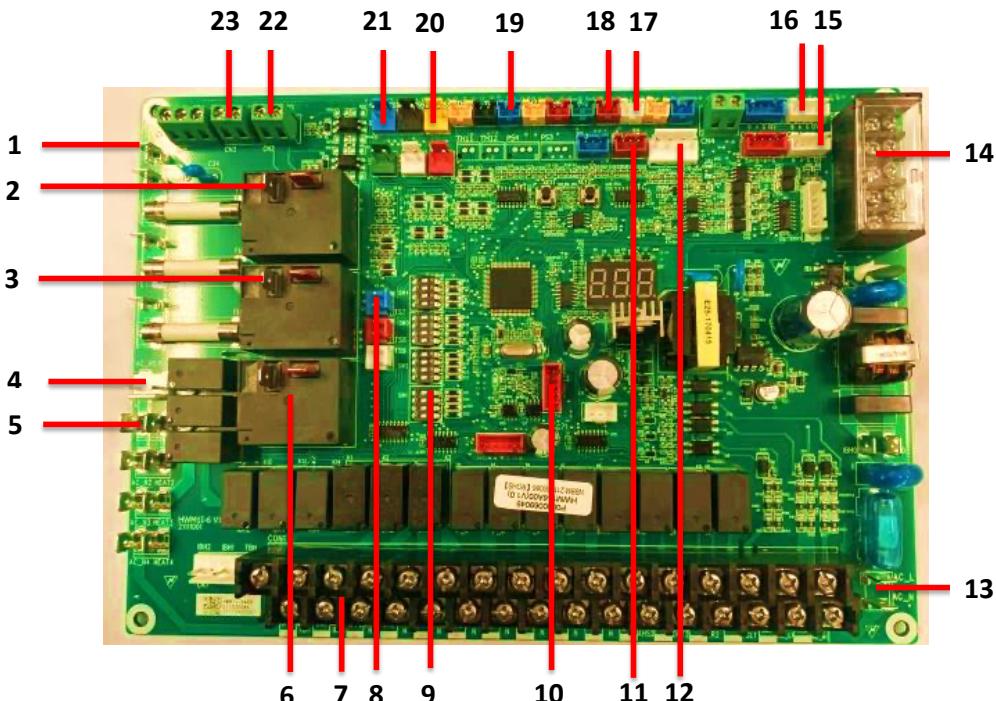
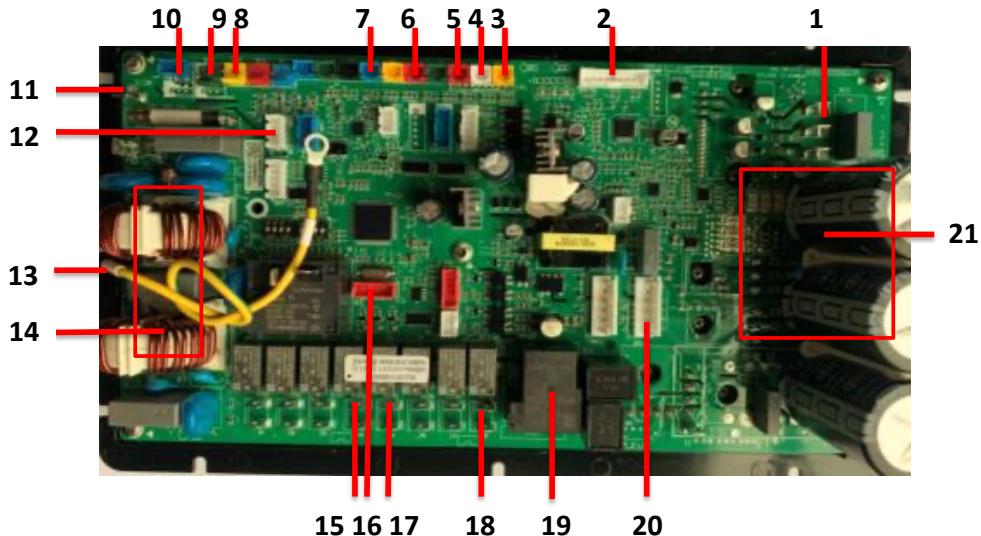


Table 4-2.2: Hydraulic module PCB

Items	Port label	function
1	PE	Port for ground
2	K18	Relay for internal backup heater(IBH,3kW)
3	K19	Relay for domestic water tank heater(3kW)
4	Pump	Power supply of internal pump
5	HEAT 1	Plate heat exchange anti-freezing heater
6	K20	Relay (Reserved,3kW)
7	CON1	Terminals(Reserved)
8	TS7	High temperature protection switch for IBH
9	SW1/2/3/4	Dip switch
10	FLS	Program update
11	PS1	Water pressure sensor
12	FS1	Internal pump speed feedback
13	AC	Power supply
14	U19	Communication ports
15	COM_L	Wired controller
16	COM_I	Communication port
17	TH3	Inlet water temperature
18	TH4	Outlet water temperature
19	TH8	Domestic water tank temperature
20	TS5	Remote switch
21	TS1	Water flow switch
22	SG	Reserved
23	EVU	Reserved

4.2.3 Drive and refrigerant system PCB

Figure 4-2.2: (GHP-MM08)



15 16 17 18 19 20

Table 4-2.3: (GHP-MM08)

Items	Port label	function
1	U/V/W	Compressor output
2	JTAG	Drive program update
3	TH1	Coil temperature sensor
4	TH2	Outdoor ambient temperature sensor
5	TH3	Refrigerant liquid temperature sensor
6	TH5	Discharge temperature sensor
7	TH7	Suction temperature sensor
8	TS3	HP2: Middle pressure switch
9	TS4	HP1: High pressure switch
10	TS5	LPS: low pressure sensor
11	AC	Power supply
12	COM4	Communication with hydraulic module PCB
13	PE1	Port for ground
14	/	Filter components
15	OUT4	4-way valve
16	FLS	PCB Program update
17	OUT 5	Chassis heater
18	OUT 8	Crankcase heater
19	K9	Relay for PFC
20	FAN1	DC fan
21	/	Drive components

Figure 4-2.3: (GHP-MM10)/(GHP-MM12)

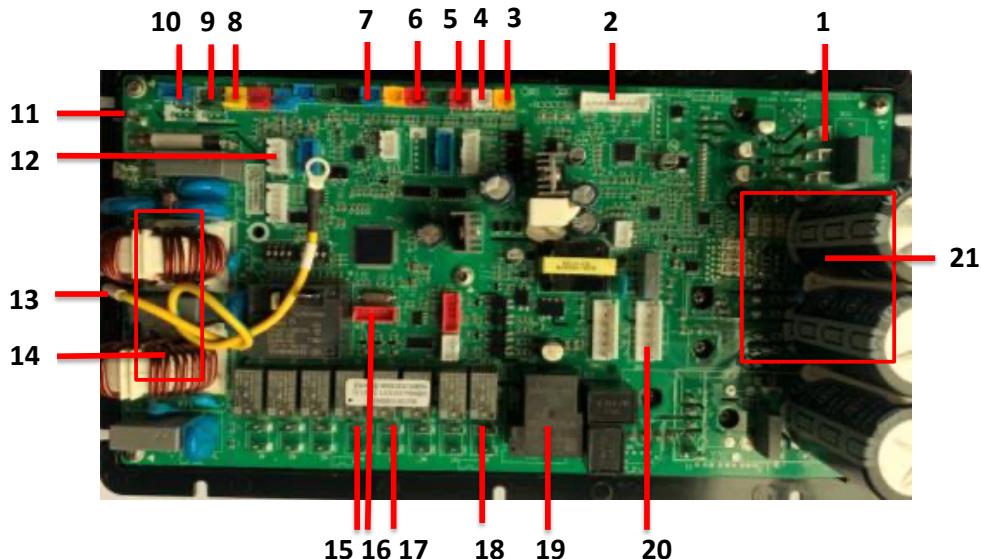


Table 4-2.4: (GHP-MM10)/(GHP-MM12)

Items	Port label	function
1	U/V/W	Compressor output
2	JTAG	Drive program update
3	TH1	Coil temperature sensor
4	TH2	Outdoor ambient temperature sensor
5	TH3	Refrigerant liquid temperature sensor
6	TH5	Discharge temperature sensor
7	TH7	Suction temperature sensor
8	TS3	HP2: Middle pressure switch
9	TS4	HP1: High pressure switch
10	TS5	LPS: low pressure sensor
11	AC	Power supply
12	COM4	Communication with hydraulic module PCB
13	PE1	Port for ground
14	/	Filter components
15	OUT 4	Four-way valve
16	FLS	PCB Program update
17	OUT 5	Chassis heater
18	OUT 8	Crankcase heater
19	K9	Relay for PFC
20	FAN1	DC fan
21	/	Drive components

Figure 4-2.4: (GHP-MM14)/(GHP-MM16) Drive PCB

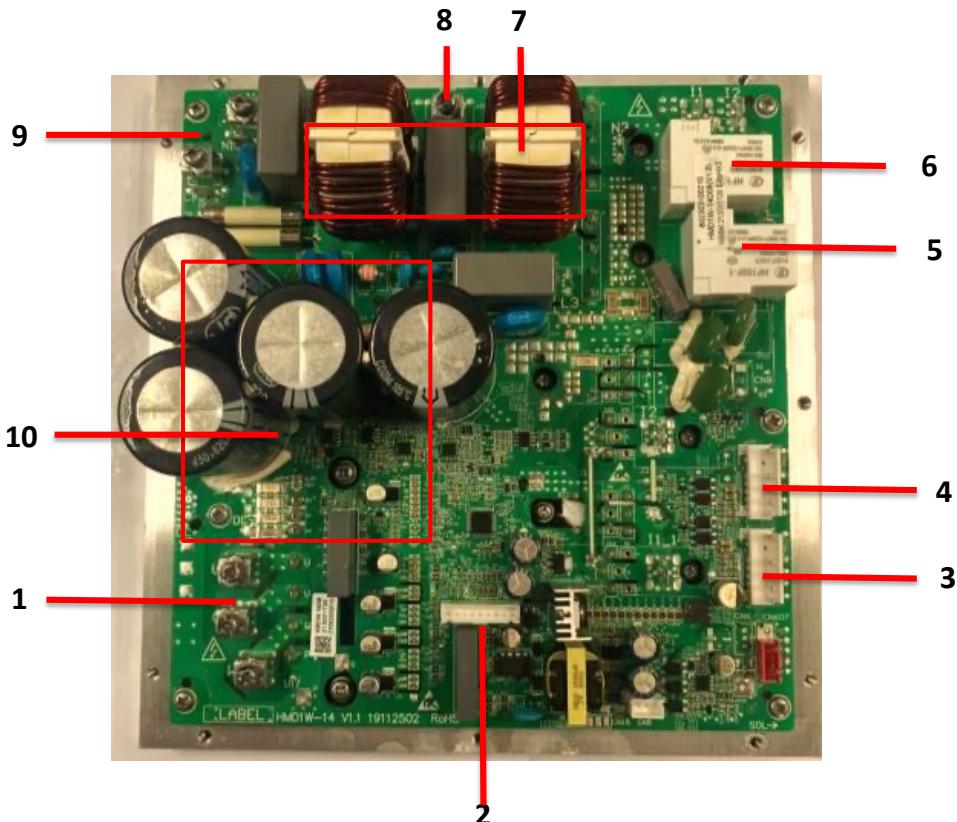


Table 4-2.5: (GHP-MM14)/(GHP-MM16) Drive PCB

Items	Port label	function
1	U/V/W	Compressor output
2	JTAG	Drive program update
3	FAN1	DC fan
4	FAN2	Reserved
5	K2	Relay for PFC
6	K1	Relay for PFC
7	/	Filter components
8	PE	Port for ground
9	AC	Power supply
10	/	Drive components

Figure 4-2.5: (GHP-MM14)/(GHP-MM16) Refrigerant System PCB

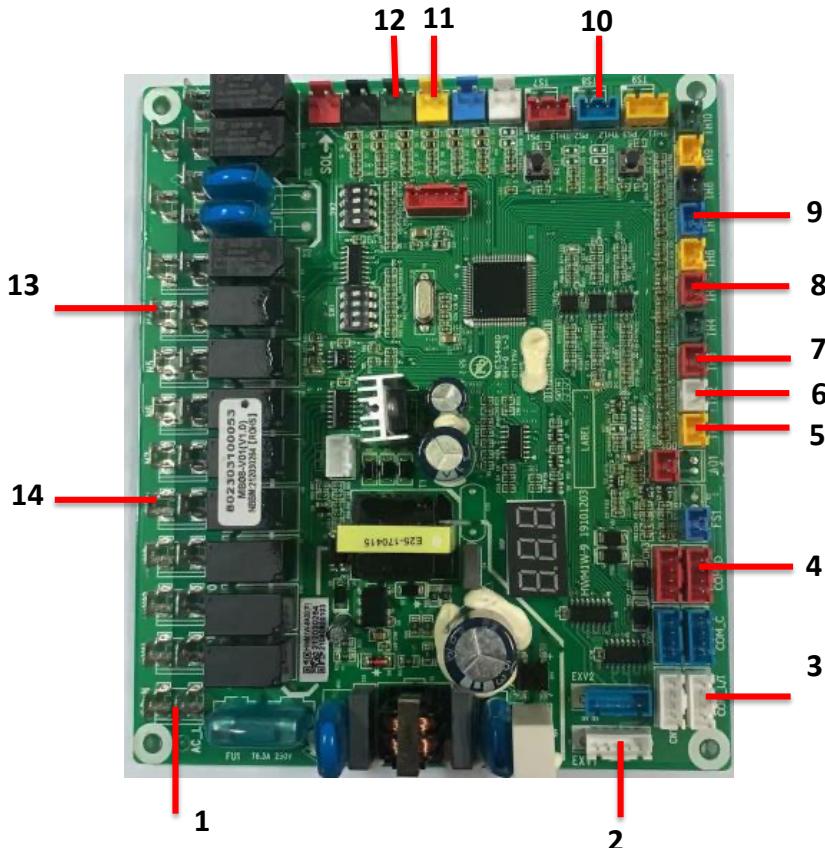


Table 4-2.6: (GHP-MM14)/(GHP-MM16) Refrigerant System PCB

Items	Port label	function
1	AC (L/N)	Power supply
2	EXV1	Electric expansive valve
3	COM_L/I	Communication with hydraulic module PCB
4	COM_D	Communication with inverter module PCB
5	TH1	T3: Coil temperature sensor
6	TH2	T4: Outdoor ambient temperature sensor
7	TH3	T5: liquid temperature sensor
8	TH5	TP: Discharge temperature sensor
9	TH7	TH: Suction temperature sensor
10	TS8	LPS: Low pressure sensor
11	TS4	HP2: Middle pressure switch
12	TS3	HP1: High pressure switch
13	Output 4	Four-way valve
14	Output 8	Crankcase heater

4.3 Error Code Table

Table 4-3.1: Error code table

Error code	Description	Remark
P01	Water flow failure	
P02	High refrigerant pressure protection	HP1, occurring during the operation
P03	Low refrigerant pressure protection	
P04	Coil overheating protection	T3 temp. is too high, only in cooling mode
P05	High discharge temperature protection	TP temp. is too high
P06	Too low outlet water temperature protection	TB temp. is too low, only in cooling mode
P07	Too low Refrigerant Liquid temp. protection	T5 temp. is too low, only in cooling mode
P08	Too high system pressure protection	HP2, occurring when the compressor is off
P10	Low refrigerant pressure protection	Only cooling mode
P11	DC fan 1 failure	
P12	Reserved	
P13	4-way valve shifting failure	
P21	Built-in DC water pump abnormal	
P24	Reserved	
P25	Outlet water pressure sensor error	
E01	Communication error between hydraulic module PCB and the user interface	
E02	Discharge temp. sensor error	TP sensor
E03	Coil temp. sensor error	T3 sensor
E04	Outdoor ambient temp. sensor error	T4 sensor
E05	Refrigerant liquid temp. sensor error	T5 sensor
E06	Suction temp. sensor error	TH sensor
E07	Domestic water temp. sensor error	TW sensor
E08	Inlet water temp. sensor error	TA sensor
E09	Outlet water temp. sensor error	TB sensor
E10	Communication between refrigerant system PCB and drive PCB failure	
E11	Reserved	
E12	Reserved	
E13	Reserved	
E14	Low pressure sensor error	Low pressure sensor: LPS
E15	Too low DC bus voltage	
E16	Too high DC bus voltage	
E17	Too high AC input peak current	
E18	Abnormal IPM module	
E19	Abnormal PFC module	
E20	Compressor startup failure	
E21	Compressor phase loss error	
E22	Inverter module Reset	E22 is a state which the compressor is resetting, no faulty

E23	Too high compressor current protection	
E24	Too high PFC module temp. protection	
E25	The current detection circuit failure	
E26	Out of step protection	
E27	PFC module temp. sensor error	
E28	Communication data error between refrigerant system PCB and inverter PCB	
E29	Too high IPM module temp.	
E30	IPM module temp. sensor error	
E31	Reserved	
E32	Inverter module debugging data	No error
E33	Inverter module debugging data	No error
E34	Abnormal AC input power supply	
E35	Inverter module debugging data	No error
E36	Reserved	
E37	Module current limiting frequency	No error
E38	Module voltage limiting frequency	No error

- These codes are displayed on the user interface.

4.4 Troubleshooting

4.4.1 Warning

- Improper installation or attachment of equipment or accessories could result in electric shock, short-circuit, leaks, fires or other damage to the unit.
- All electrical works must be carried out by competent and suitably qualified, certified and accredited professionals and in accordance with all applicable legislation (all national, local and other laws, standards, codes, rules, regulations and other legislation that apply in a given situation).
- If unsure of installation procedures or use, always contact your dealer for advice and information.

4.4.2 P01 diagnosis and analysis



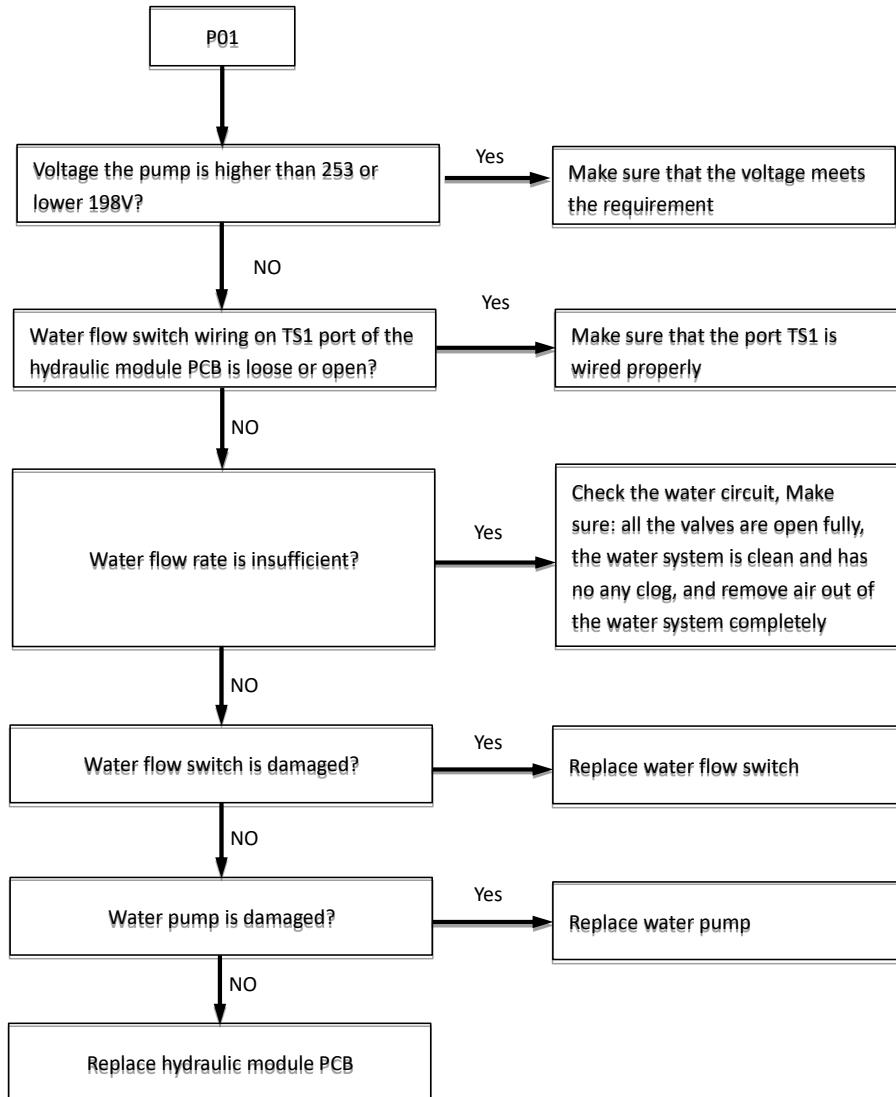
4.4.2.1 Diagnosis

Code P01 means heat pump tripped with the open of the contactor of water flow switch installed on the port TS1 of hydraulic module PCB with too low water flow rate. When code P01 occurs three times within half an hour, a manual power-off must be done before heat pump can resume next restart.

4.4.2.2 Possible causes

- Water flow switch wiring is loose or open.
- Water flow rate is too low.
- The components, such as water flow switch, water pump and hydraulic module PCB, are damaged.

4.4.2.3 Analysis and action



4.4.3 P02 diagnosis and analysis



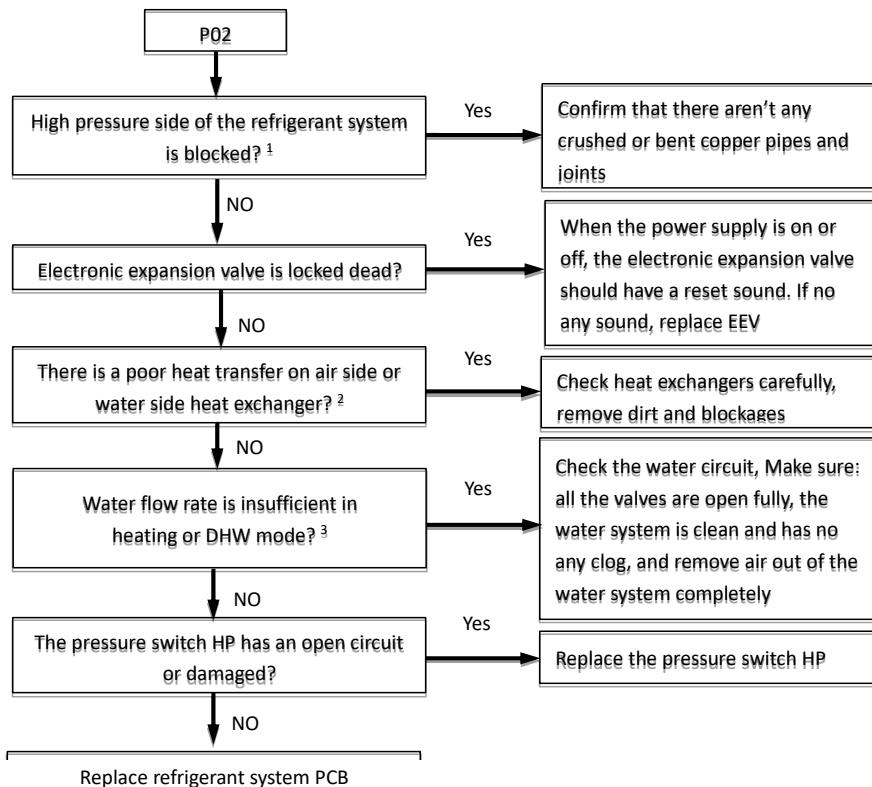
4.4.3.1 Diagnosis

Code P02 means heat pump tripped with the open of the pressure switch (HP1, installed on the discharge pipe) contactor with too high pressure. When the discharge pressure rises above 4.5MPa, the pressure switch HP (labeled on the port TS3 of the refrigerant system PCB) opens and the interface will display the code P02 and heat pump will shut down. When discharge pressure drops below 3.5MPa, HP closes and Code P02 disappears, and heat pump will be ready for next startup.

4.4.3.2 Possible causes

- Pressure switch HP is not connected properly or has malfunctioned.
- Too much refrigerant in the system.
- Refrigerant system contains non-condensable gas, such as air or nitrogen, etc.
- High pressure side of the refrigerant system is clogged.
- Poor heat transfer on heat exchanger on high pressure side.
- Refrigerant system PCB is damaged.

4.4.3.3 Analysis and action



Notes:

1. The blockage of high pressure side of the refrigerant system will lead to higher discharge temperature, higher discharge pressure and lower suction pipe pressure.
2. In heating and DHW mode check water side heat exchanger, water piping, circulator pumps and water flow switch for dirt and blockages. In cooling mode check air side heat exchanger, the fan and air outlets for dirt and blockages.
3. Check the outlet pressure of the water system. If the pressure is lower than 1 bar, water flow rate is insufficient.

4.4.4 P03 diagnosis and analysis



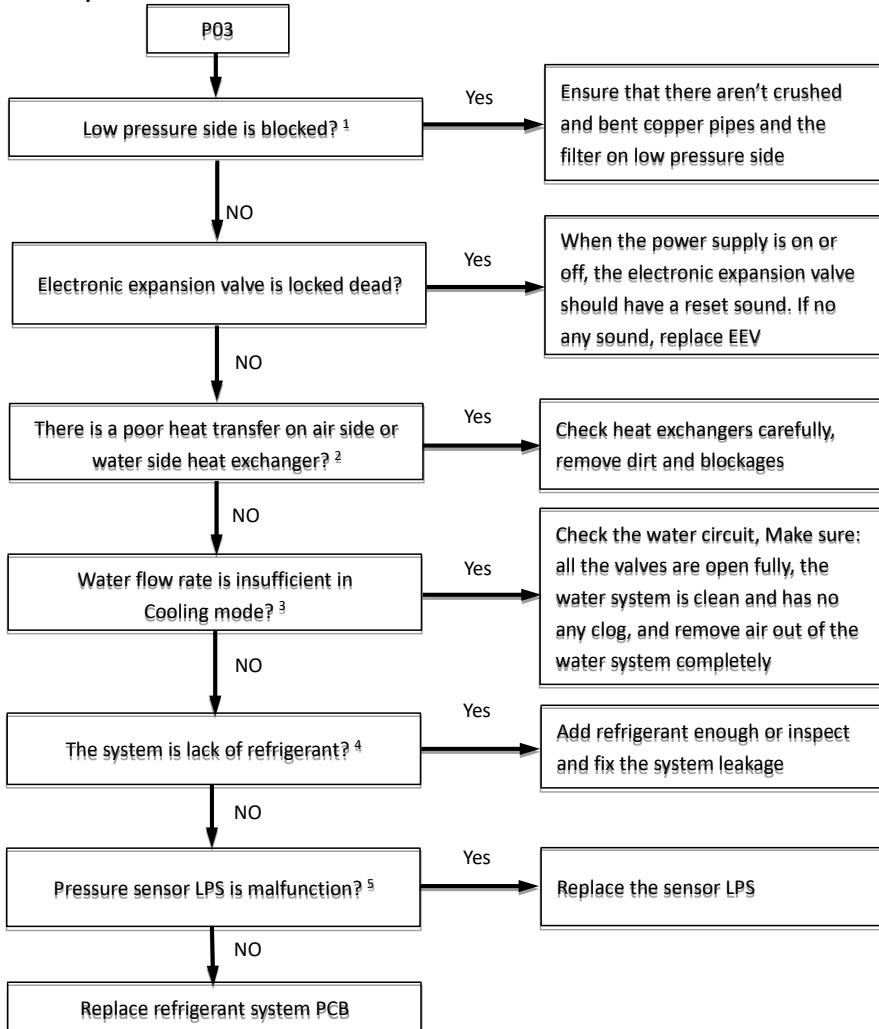
4.4.4.1 Diagnosis

Code P03means heat pump tripped with too low pressure detected by LPS (the pressure sensor installed on the suction pipe of the compressor, labeled on the port TS8 of the refrigerant system PCB). When the suction pressure falls below 0.14MPa for ten seconds, the interface displays the code P03 and the heat pump will shut down. When the suction pressure rises above 0.30MPa, Code P03disappears and the heat pump will be ready for next startup. When code P03has occurred 3 times within an hour, a manual power-off must be done before heat pump can resume next restart.

4.4.4.2 Possible causes

- The system is lack refrigerant.
- There is a blockage on low pressure side of the refrigerant system.
- There is a poor heat transfer on low pressure side of the refrigerant system.
- The water flow rate is insufficient when running in cooling mode.
- LPS is faulty.
- The refrigerant system PCB is damaged.

4.4.4.3 Analysis and action



Notes:

1. Low pressure side blockages lead to higher discharge temperature, lower suction pressure, lower compressor current, and a frosting occurs on the suction pipe.
2. Check the air side heat exchanger, the fan and air outlets for dirt and blockages.
3. Check water side heat exchanger, water piping, circulator pumps and water flow switch for dirt and blockages.
4. The lack of refrigerant will lead to high discharge temperature, lower discharge and suction pressures and compressor current, and may frost on the suction pipe. These issues will disappear once sufficient refrigerant has been charged into the system.
5. Measure the resistance among the three terminals of the pressure sensor. If the resistance is of the order of mega Ohms or infinite, the pressure sensor has failed.

4.4.5 P04 diagnosis and analysis



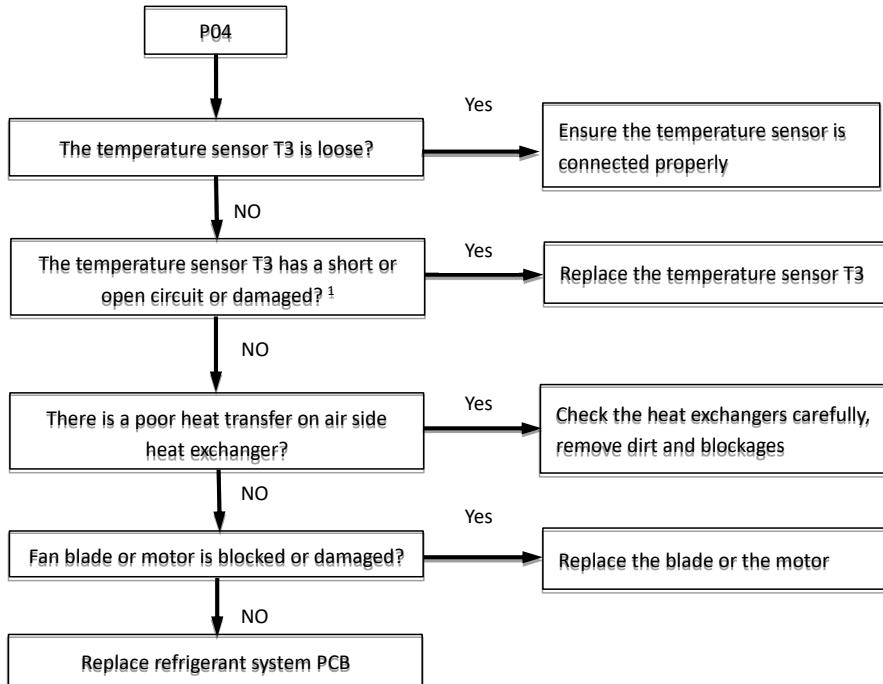
4.4.5.1 Diagnosis

Code P04 is only possible in cooling mode. Code P04 means heat pump tripped with too high temperature detected by the temperature sensor T3 installed on refrigerant outlet liquid pipe of the air side heat exchanger only running on cooling mode. When the temperature detected by the sensor T3 is higher than 65°C for more than one minute, the interface displays the code P04 and heat pump will shut down. When the temperature detected by the sensor T3 drops below 52°C, Code P04 disappears and heat pump will be ready for next startup.

4.4.5.2 Possible causes

- Temperature sensor T3 is not connected properly or has malfunctioned.
- Poor heat transfer on air side heat exchange.
- The motor or blades of the fan is damaged.
- Refrigerant system PCB damaged.

4.4.5.3 Analysis and action



Note:

1. Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor's resistance characteristic table, the sensor has failed. Refer to Part 4, 4-5.1 "Temperature Sensor Resistance Characteristics".

4.4.6 P05 diagnosis and analysis



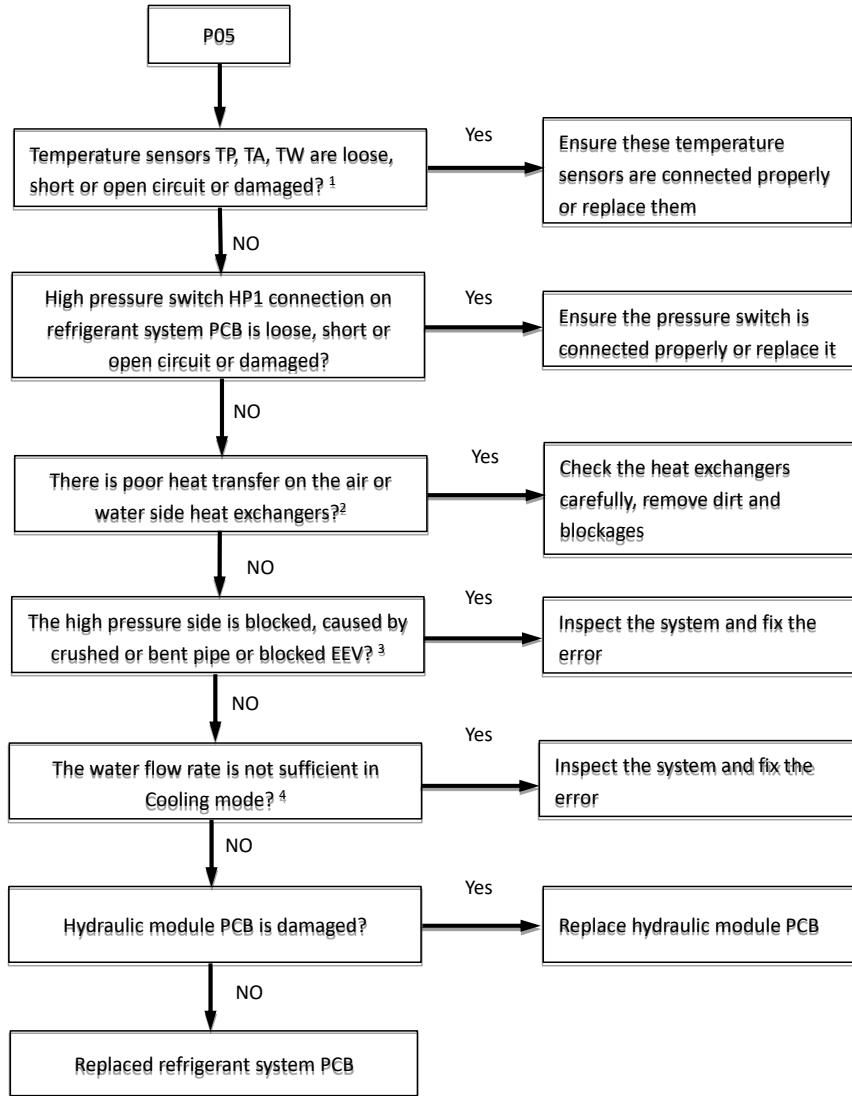
4.4.6.1 Diagnosis

Code P05 means heat pump tripped with too high temperature detected by the temperature sensor TP installed on the discharge pipe of the compressor outlet. When outdoor ambient temperature T4 is below minus 15°C and the temperature detected by TP is higher than 115°C for more than 30 seconds, or When outdoor ambient temperature T4 is above minus 15°C and the temperature detected by TP is higher than 110°C for more than 30 seconds, the interface will display code P05 and heat pump will shut down. After 10 minutes, the compressor is allowed to start again when TP drops below 90°C, Code P05 will disappear and heat pump will be ready for next startup.

4.4.6.2 Possible causes

- Temperature sensor TP is error.
- High pressure side blockage.
- Poor condenser heat exchange.
- Refrigerant system PCB is damaged.

4.4.6.3 Analysis and action



Notes:

1. Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor's resistance characteristic table, the sensor has failed. Refer to Part 4, 4.5.1 "Temperature Sensor Resistance Characteristics".
2. Check air or water side heat exchanger, the fan and air outlets for dirt and blockages.
3. High pressure side blockage causes discharge temperature to be higher than normal, discharge pressure to be higher than normal and suction pressure to be lower than normal.
4. Check the water side heat exchanger, water piping, circulator pumps and water flow switch for dirt and blockages.

4.4.7 P06 diagnosis and analysis



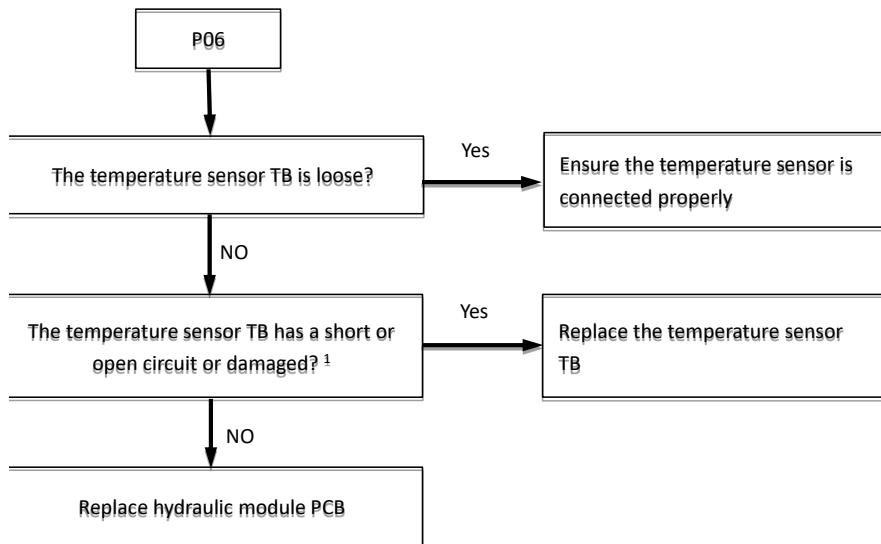
4.4.7.1 Diagnosis

Code P06 is only possible in cooling mode. CodeP06 means heat pump tripped with too low outlet water temperature detected by the temperature sensor TB installed on the outlet pipe of water side heat exchanger. If TB has been lower than 4°C for 120 seconds, Heat pump will shut down and the interface will display the faulty code P06. When TB is above 8°C for one minute, Heat pump will be ready for next startup.

4.4.7.2 Possible causes

- Temperature sensor TB isn't connected properly or has malfunctioned.
- Hydraulic module PCB damaged.

4.4.7.3 Analysis and action



Note:

1. Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor's resistance characteristic table, the sensor has failed. Refer to Part 4, 4-5.1 "Temperature Sensor Resistance Characteristics".

4.4.8 P07 diagnosis and analysis



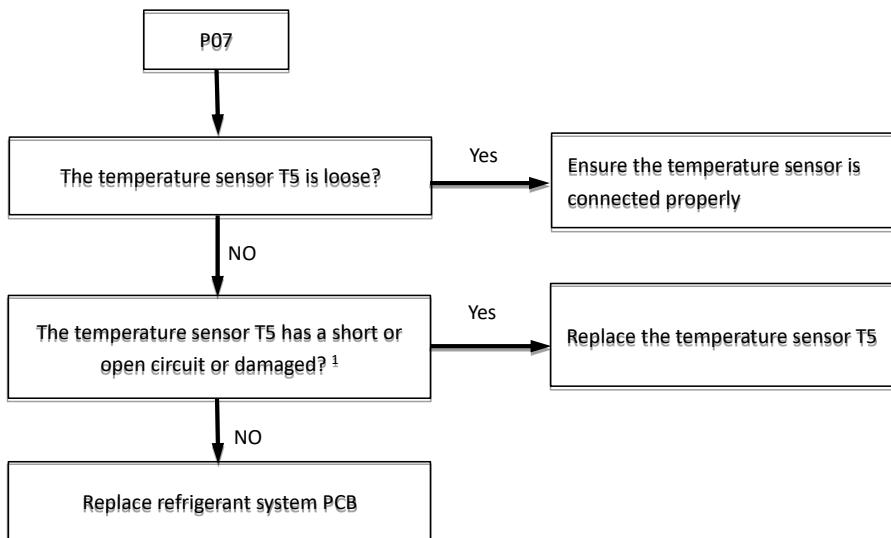
4.4.8.1 Diagnosis

Code P07 is only possible in cooling mode. Code P07 means heat pump tripped with too low outlet temperature detected by the temperature sensor T5 installed on the outlet pipe of electronic expansion valve in cooling mode. If T5 has been lower than 2°C for 120 seconds, Heat pump will shut down and the interface will display the faulty code P06. When T5 is above 8°C for ten minutes, Heat pump will be ready for next startup.

4.4.8.2 Possible causes

- Temperature sensor T5 isn't connected properly or has malfunctioned.
- Refrigerant system PCB is damaged.

4.4.8.3 Analysis and action



Note:

1. Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor's resistance characteristic table, the sensor has failed. Refer to Part 4, 4-5.1 "Temperature Sensor Resistance Characteristics".

4.4.9 P08 diagnosis and analysis



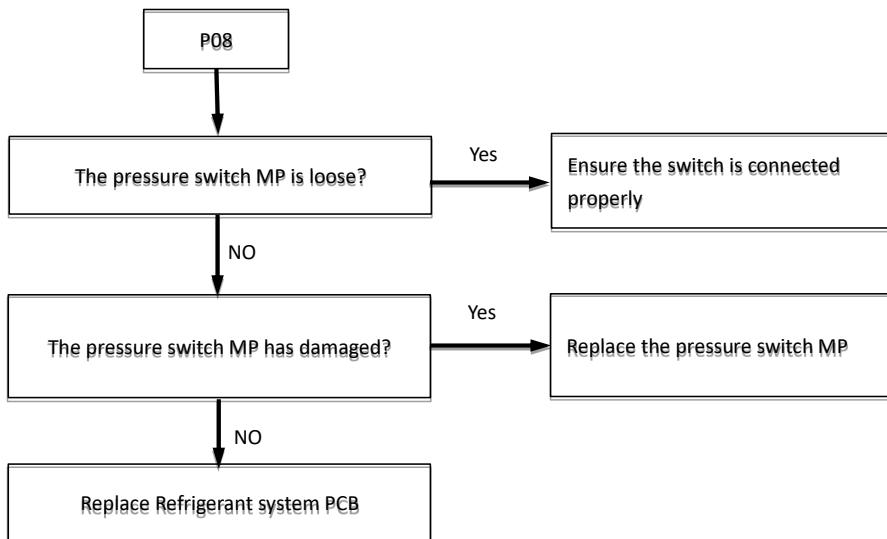
4.4.9.1 Diagnosis

When Heat pump shuts down and the contactor of the middle pressure switch MP installed on the discharge pipe of the compressor keeps open for 3 seconds, the interface will display the code P08 and heat pump still keeps in the shutdown state until the contactor of the pressure switch HP2 closes. When the pressure is above 4.2MPa, the contactor of the middle pressure switch MP will open. When the pressure is below 3.8MPa, the contactor will close.

4.4.9.2 Possible causes

- The port TS4 of the pressure switch MP (Middle Pressure) on refrigerant system PCB is not connected properly or has malfunctioned.
- Refrigerant system PCB is damaged.

4.4.9.3 Analysis and action



4.4.10 P10 diagnosis and analysis



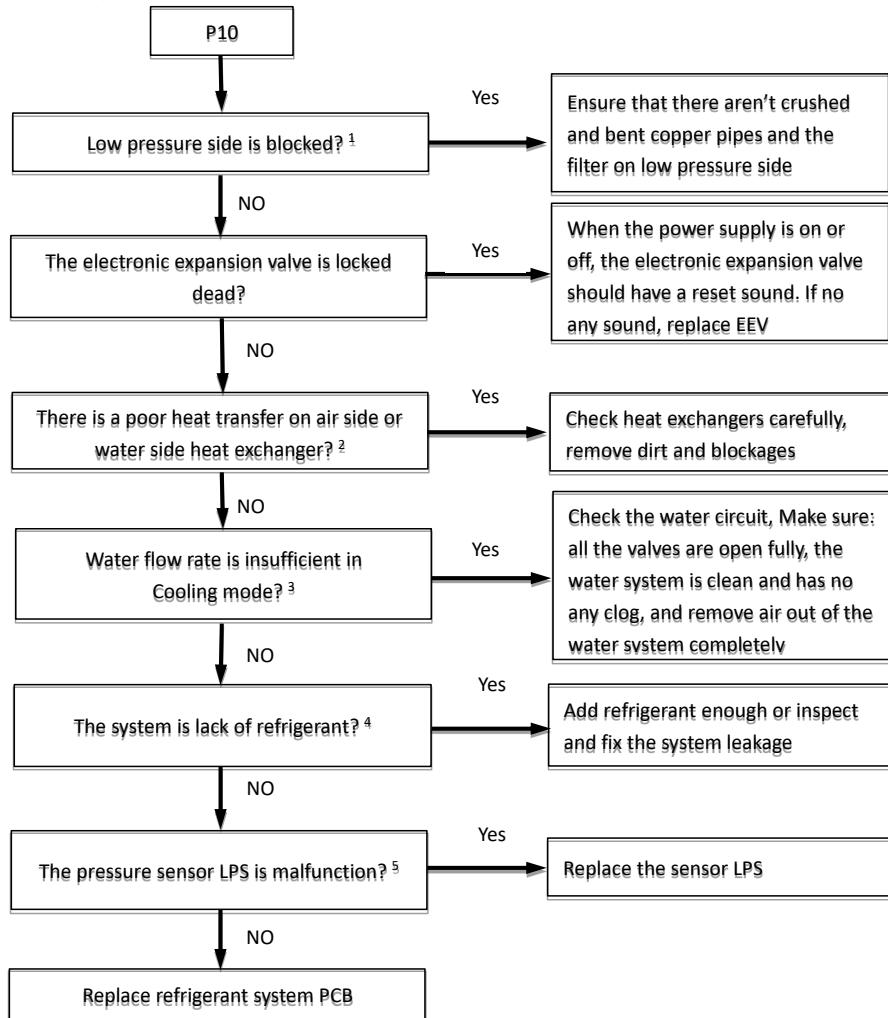
4.4.10.1 Diagnosis

After heat pump run for one minute in cooling mode, if the pressure detected by LPS is below 0.7MPa for 2 minutes, heat pump will shut down and the interface will display the code P10. In ten minutes heat pump will be allowed to start again. If Code P10 occurred for three times within one hour, heat pump will shut down. A manual power-off must be done before next restart.

4.4.10.2 Possible causes

- The system is lack of refrigerant.
- There is the blockage on low pressure side of the refrigerant system.
- There is a poor heat transfer on low pressure side of the refrigerant system.
- Water flow rate is insufficient.
- LPS is faulty.
- Refrigerant system PCB is damaged.

4.4.10.3 Analysis and action



Notes:

1. Low pressure side blockages lead to higher discharge temperature, lower suction pressure, lower compressor current, and a frosting to occur on the suction pipe.
2. Check air side heat exchanger, the fan and air outlets for dirt and blockages.
3. Check water side heat exchanger, water piping, circulator pumps and water flow switch for dirt and blockages.
4. The lack of refrigerant will lead to high discharge temperature, lower discharge and suction pressures and compressor current, and may frost on the suction pipe. These issues will disappear once sufficient refrigerant has been charged into the system.
5. Measure the resistance among the three terminals of the pressure sensor. If the resistance is of the order of mega ohms or infinite, the pressure sensor has failed.

4.4.11 P11 diagnosis and analysis



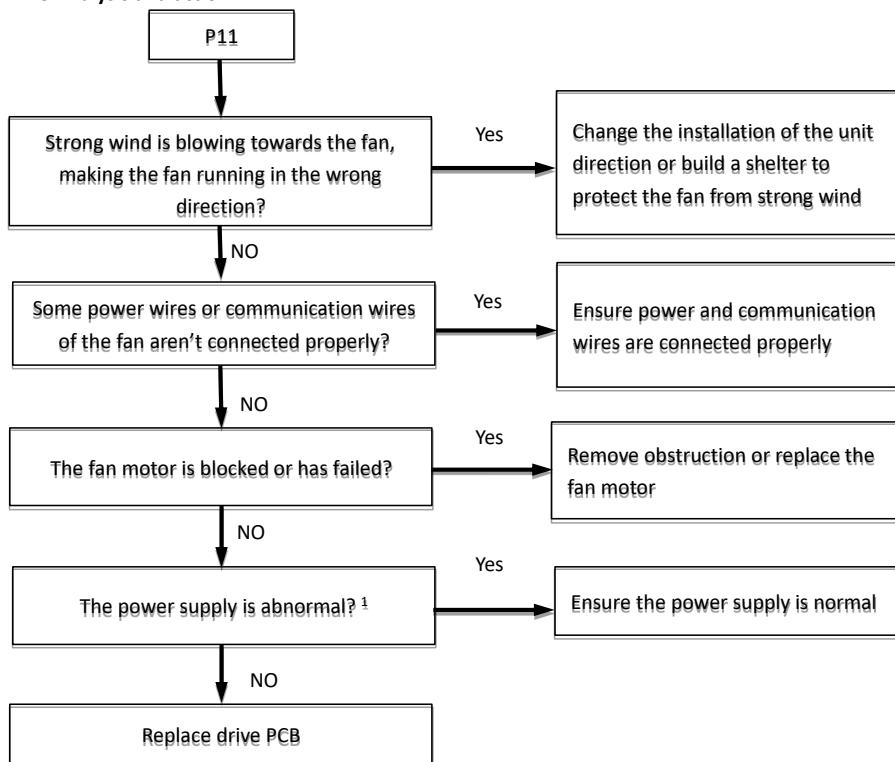
4.4.11.1 Diagnosis

Code P11 indicates a DC fan error. If Code P11 occurred ten times within two hours, heat pump will shut down. A manual power-off restart must be done before next startup. P11 error should be addressed promptly in order to protect heat pump from being damaged.

4.4.11.2 Possible causes

- Power or communication wires are not connected properly.
- High wind speed.
- Fan motor blocked or has malfunctioned.
- Abnormal power supply.
- Drive PCB is damaged.

4.4.11.3 Analysis and action



Note:

1. For single-phase power supply models, check the voltage between "DC+" and "DC-" on the inverter module PCB. The normal range is 277V to 354V. If the voltage is outside this range, the inverter module PCB is damaged.

4.4.12 P13 diagnosis and analysis



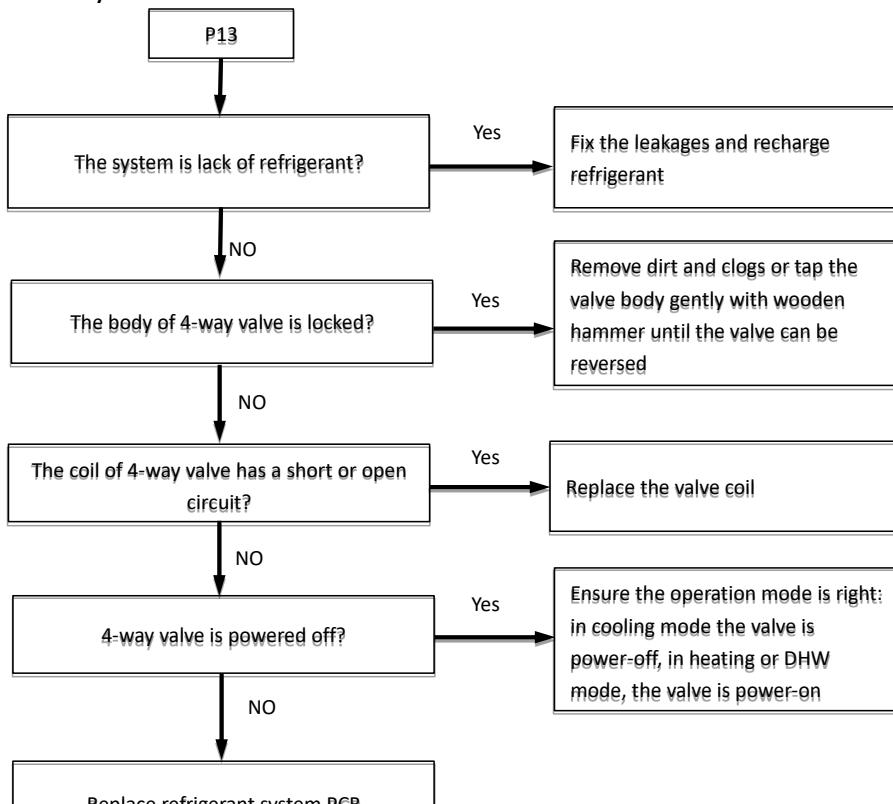
4.4.12.1 Diagnosis

When heat pump operates in heating or DHW mode, if “the inlet water temperature TA is higher than the outlet water temperature TB” is detected for 60 seconds, the heat pump will stop but the interface doesn’t display the code P13. After 3 minutes, heat pump will restart. If such “stop first and then restart” happened three times in succession, heat pump will trip and locked, the interface will display the code P13. A manual power-off must be done before next restart.

4.4.12.2 Possible causes

- The system is lack of refrigerant.
- The body of 4-way valve is locked.
- The coil of 4-way valve malfunctioned.
- 4-way valve is powered off.
- Refrigerant system PCB is damaged.

4.4.12.3 Analysis and action



4.4.13 P21 diagnosis and analysis



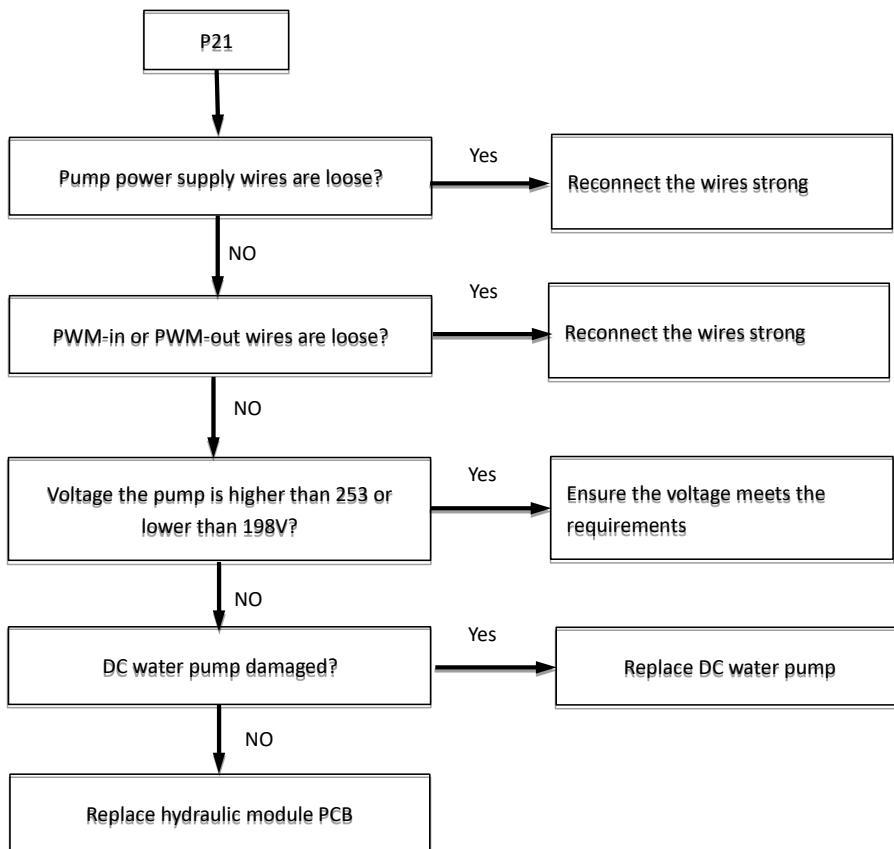
4.4.13.1 Diagnosis

Code P21 indicates built-in DC water pump worked itself abnormally.

4.4.13.2 Possible causes

- Pump power off.
- Pump power supply is abnormal.
- Pump PWM output interface damaged.
- Pump is stopped due to permanent failure.

4.4.12.3 Analysis and action



4.4.14 P25 diagnosis and analysis



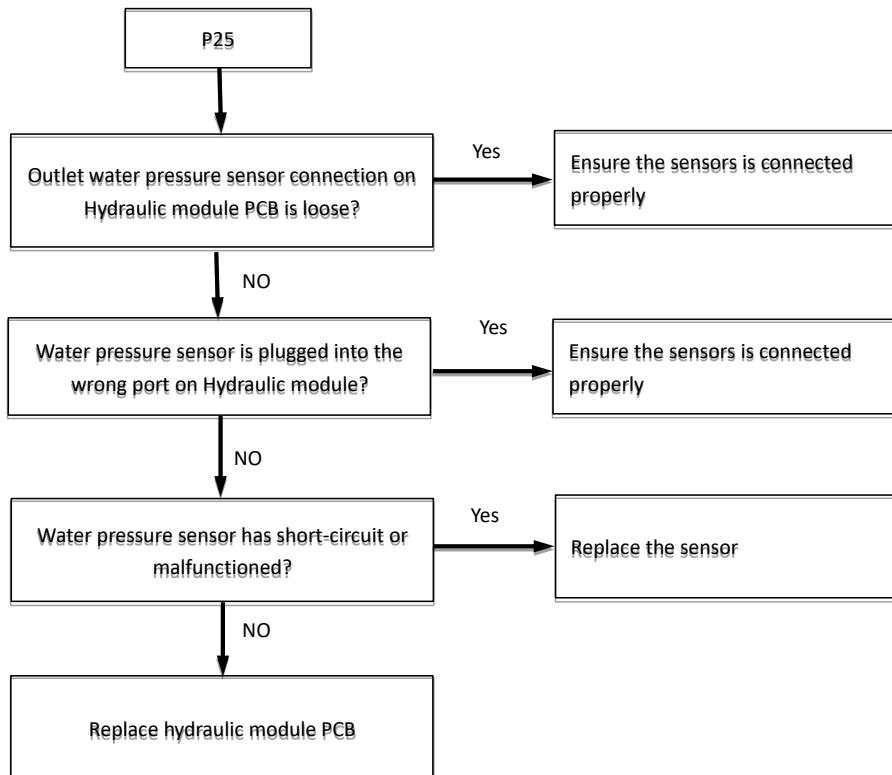
4.4.14.1 Diagnosis

Code P25 indicates outlet water pressure sensor had an error. If there are no other errors except for the water pressure sensor error, Heat pump will continue to operate.

4.4.14.2 Possible causes

- Outlet water pressure sensor is not connected properly
- Outlet water pressure sensor has malfunctioned.

4.4.14.3 Analysis and action



4.4.15 E01 diagnosis and analysis



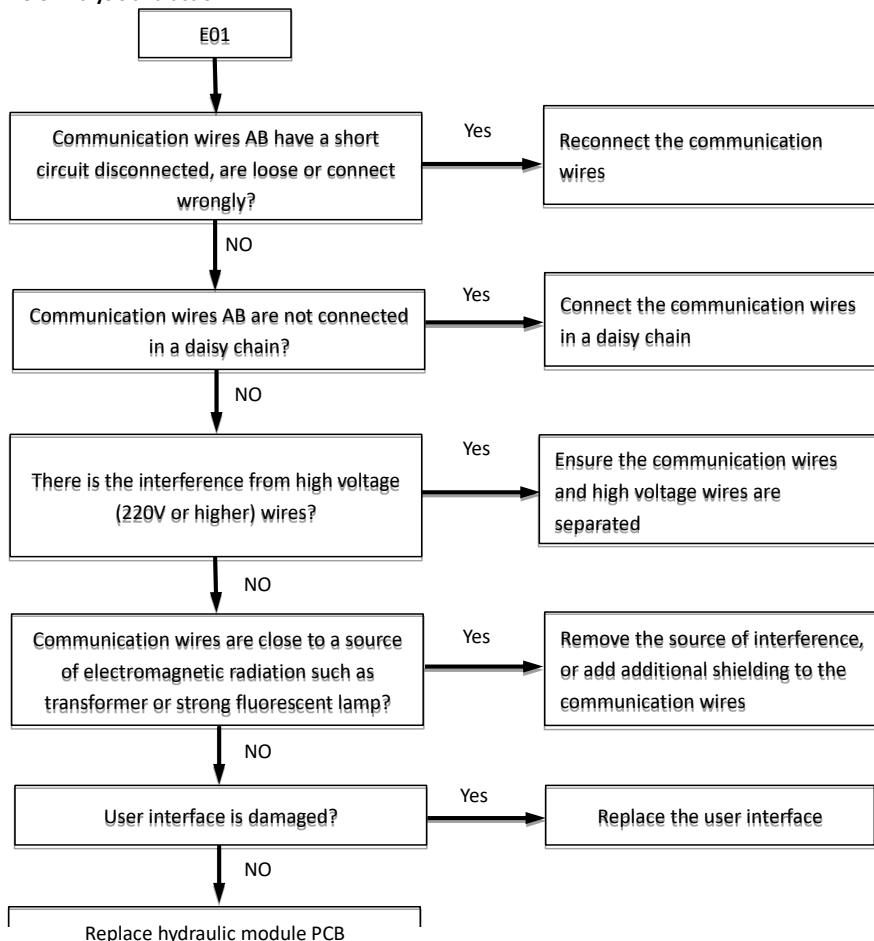
4.4.15.1 Diagnosis

Code E01 indicates heat pump shut down because of the communication error between hydraulic module PCB and the user interface.

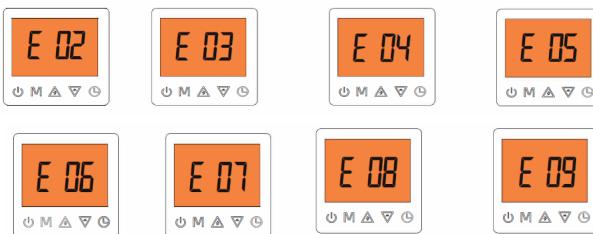
4.4.15.2 Possible causes

- Communication wires between outdoor unit and user interface are not connected properly.
- Communication wiring A and B terminals is disconnected.
- Loosened wiring within the electric control box.
- Interference from high voltage wires or other sources of electromagnetic radiation.
- Damaged main PCB or electric control box communication terminals block.

4.4.15.3 Analysis and action



4.4.16 E02 E03 E04 E05 E06 E07 E08 E09 diagnosis and analysis



4.4.16.1 Diagnosis

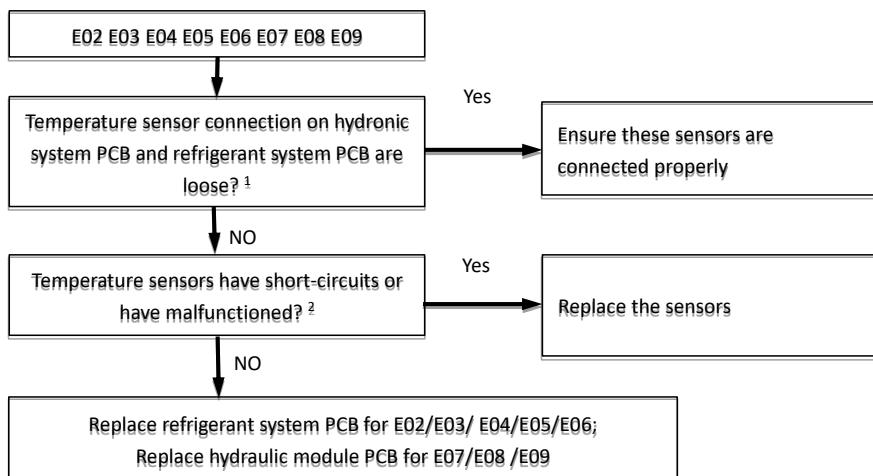
These codes indicate heat pump shut down because of the error of temperature sensors.

- E02 indicates discharge temperature sensor TP appeared an error.
- E03 indicates coil temperature sensor T3 appeared an error.
- E04 indicates outdoor ambient temperature sensor T4 appeared an error.
- E05 indicates liquid temperature sensor T5appeared an error.
- E06 indicates suction temperature sensor TH appeared an error.
- E07 indicates domestic water tank temperature sensor TW appeared an error.
- E08 indicates inlet water temperature sensor TA appeared an error.
- E09 indicates outlet water temperature sensor TB appeared an error.

4.4.16.2 Possible causes

- Temperature sensors are not connected properly or have malfunctioned.
- Refrigerant system PCB or hydraulic module PCB is damaged.

4.4.16.3 Analysis and action



Notes:

1. Refer to Part 3, 7 Figure 3-7.1 for the location of temperature sensors.
2. Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor's resistance characteristics table, the sensor has failed. Refer to Part 4, 4-5.1 "Temperature Sensor Resistance Characteristics" for the resistance of sensors.

4.4.17 E10 diagnosis and analysis



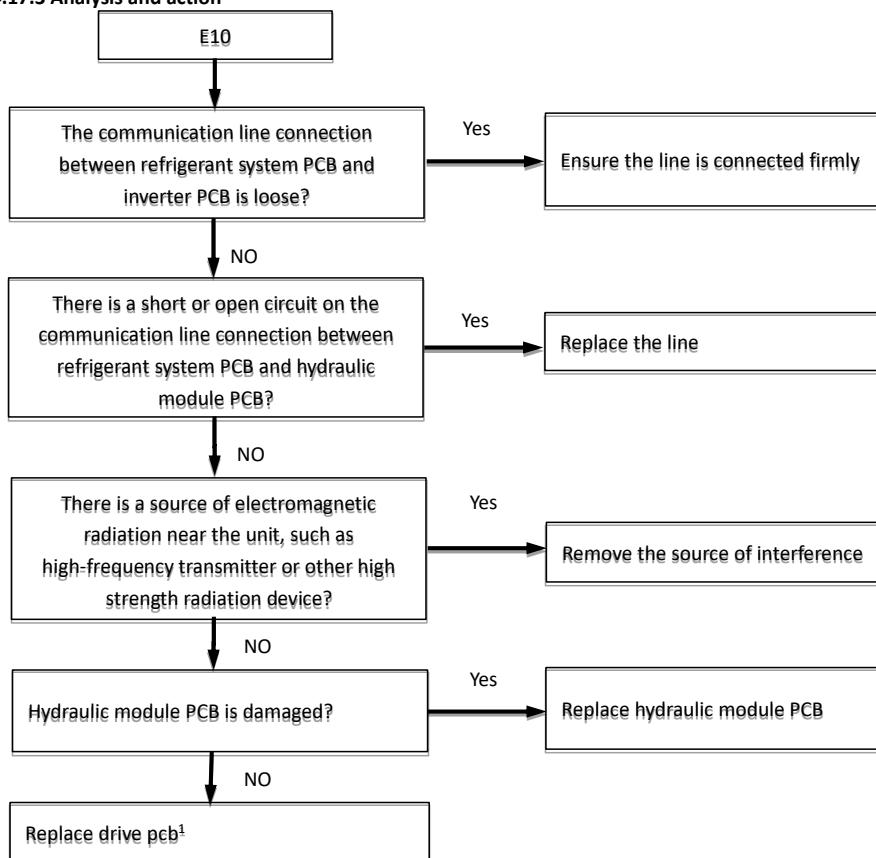
4.4.17.1 Diagnosis

Code E10 indicates heat pump shut down because of the communication error between refrigerant system PCB chip and hydraulic module PCB chip.

4.4.17.2 Possible causes

- Power supply abnormal.
- Transformer malfunction.
- Interference from a source of electromagnetic radiation.
- Refrigerant system PCB or hydraulic module PCB damaged

4.4.17.3 Analysis and action



Note:

1. For 14/16kW models, replace refrigerant system PCB. For 8/10/12Kw models, replace drive PCB.

4.4.18 E14 diagnosis and analysis



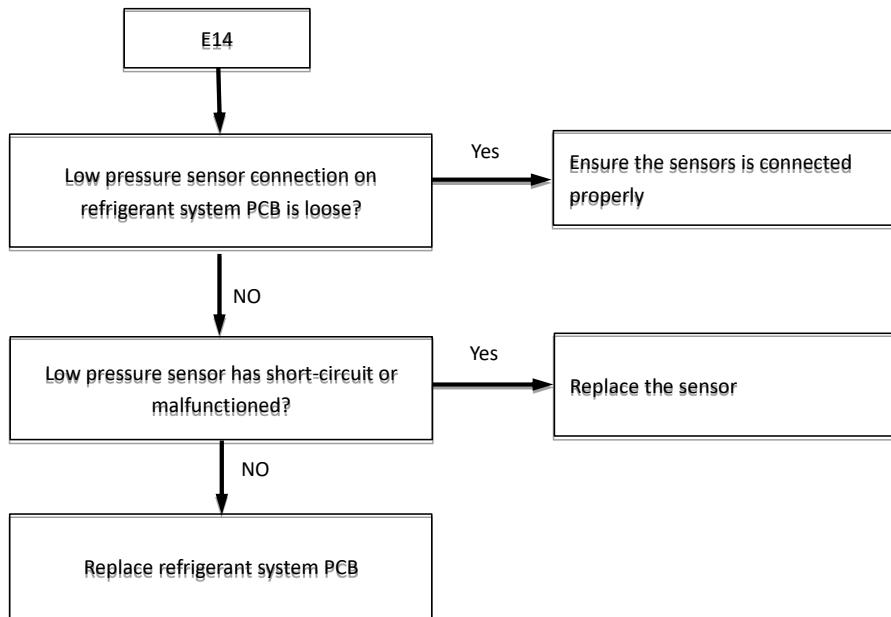
4.4.18.1 Diagnosis

Code E14 indicates heat pump shut down because of the error of low pressure sensor LPS.

4.4.18.2 Possible causes

- Low pressure sensor is not connected properly
- Low pressure sensor has malfunctioned.

4.4.18.3 Analysis and action



4.4.19 Inverter module troubleshooting for single-phase models

4.4.19.1 Codes

The codes displayed on the user interface are below: E15, E16, E17, E18, E19, E20, E21, E22, E23, E24, E25, E26, E27, E28, E29, E30, E31, E32, E33, E34, E35, E36, E37, and E38. Refer to Table 4-19.1 for these codes.

Table 4-19.1Table of codes

Error code	Content	D1(RED) ²	D2(GREEN) ²	D3(YELLOW) ²
E15	Too low DC bus voltage	OFF	ON	ON
E16	Too high DC bus voltage	Flash	ON	ON
E17	Too high AC input peak current	OFF	Flash	ON
E18	Abnormal IPM module	ON	Flash	OFF
E19	Abnormal PFC module	OFF	ON	Flash
E20	Compressor startup failure	ON	ON	Flash
E21	Compressor phase loss error	ON	Flash	ON
E22 ¹	Inverter module reset	/	/	/
E23	Too high compressor current protection	Flash	Flash	Flash
E24	Too high PFC module temp. protection	Flash	ON	Flash
E25	The current detection circuit failure	ON	ON	OFF
E26	Out of step protection	ON	ON	ON
E27	PFC module temp. sensor error	Flash	ON	OFF
E28	Communication data error between refrigerant system PCB and inverter PCB	Flash	Flash	OFF
E29	Too high IPM module temp	ON	Flash	Flash
E30	IPM module temp. sensor error	ON	OFF	Flash
E32 ¹	Inverter module debugging data	/	/	/
E33 ¹	Inverter module debugging data	/	/	/
E34	Abnormal AC input power supply	Flash	OFF	ON
E35 ¹	Inverter module debugging data	/	/	/
E37 ¹	Module current limiting frequency	/	/	/
E38 ¹	Module voltage limiting frequency	/	/	/

Note:

1. E22, E32, E33, E35, E37 and E38 are not errors and heat pump does not shut down. The other codes are all errors, heat pump will shut down.
 2. The combination of the show states of 3 led lights corresponds to different error codes. In standby: D1-OFF, D2-Flash and D3-OFF; In normal operation: D1- Flash, D2- OFF and D3-OFF.
- Refer to Figure 4-19.1and Figure 4-19.2 for the location of each led.

Figure 4-19.1 Location of 3 led lights on the inverter module PCB for 8/10/12kW:

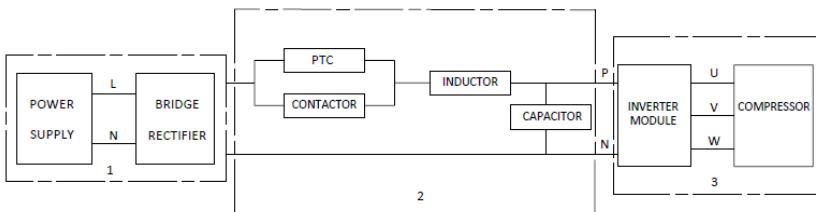


Figure 4-19.2 Location of 3 led lights on the inverter module PCB for 14/16kW:



4.4.19.3 Principle of DC inverter

Figure 4-19.3 Principle of DC inverter



1. Contactor is open, the current across the PTC to charge capacitor. After a few seconds, the contactor closed.
2. Single phase (220VAC, LN) power supply change to DC power supply after bridge rectifier. This part includes PFC module.
3. The capacitor outputs a steady power supply for inverter module P and N terminals. In standby the voltage between P and N terminal on inverter module is about 1.4 time of AC power supply.
4. After heat pump is powered on, drive PCB charges the capacitors through PTC resistance and bridge rectifier, the switching power supply starts to work, and then drive PCB chip starts to work. After the chip of drive board starts to work, the signal led will be on for 5s, waiting for main control PCB to send the boot instruction. After a delay of 12s, drive PCB judges the bus voltage, and when the conditions are met, the charging relay is delayed and closed. Once the relay is closed, it will not actively shut off until the input power is abnormal or the bus voltage is too low to cause the control power of the relay to be off. If the charging circuit occurs a failure there is no error code.

4.4.19.4 E15 and E16 diagnosis and analysis



4.4.19.4.1 Diagnosis

The normal DC voltage between terminals P (DC+) and N (DC-) on inverter module PCB is 1.4 time of AC power supply in standby state. The DC voltage is 370V when the fan motor is running. If the voltage is lower than 180V, the unit displays E15 and shuts down. If the voltage is higher than 430V, the unit displays E16 and shuts down.

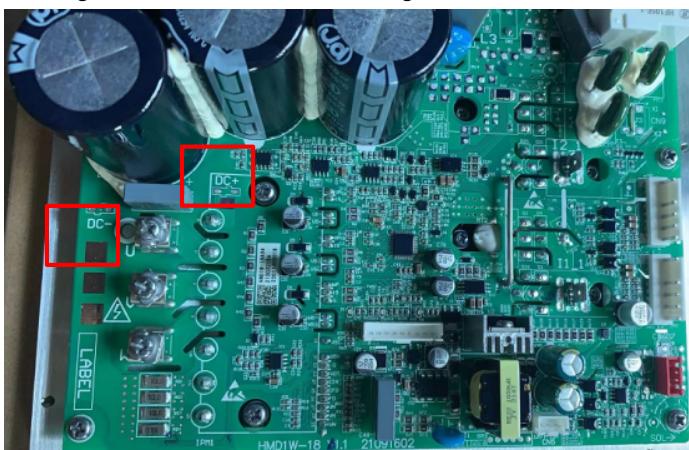
4.4.19.4.2 Possible causes

- Power supply is abnormal.
- Relay on the inverter module PCB is open.
- Drive PCB is damaged.

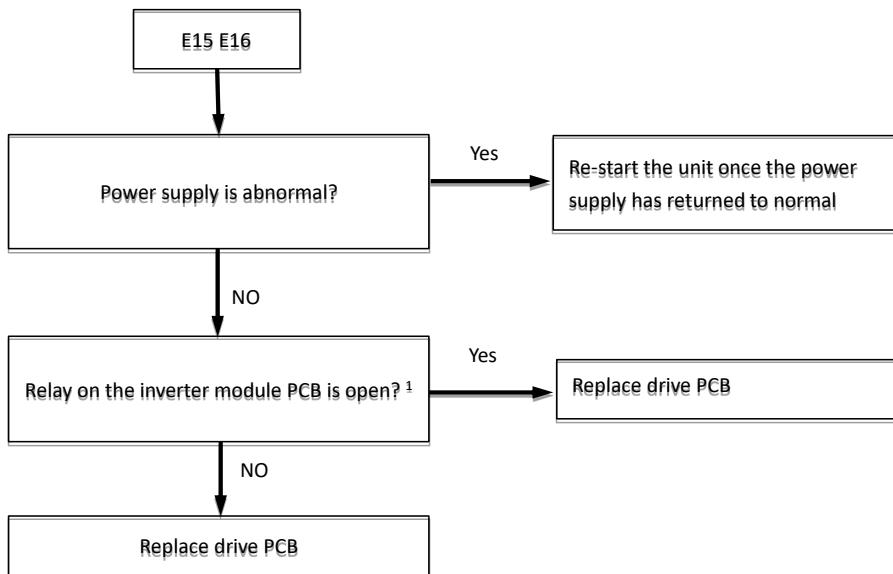
Figure 4-19.4 Location of DC bus voltage terminals for 8/10/12kW:



Figure 4-19.5 Location of DC bus voltage terminals for 14/16kW:



4.4.19.4.2 Analysis and action



Note:

1. Refer to Figure4-2.2/2.3/2.4/2.5 for the location of the relays.

4.4.19.5 E17 Diagnosis and analysis



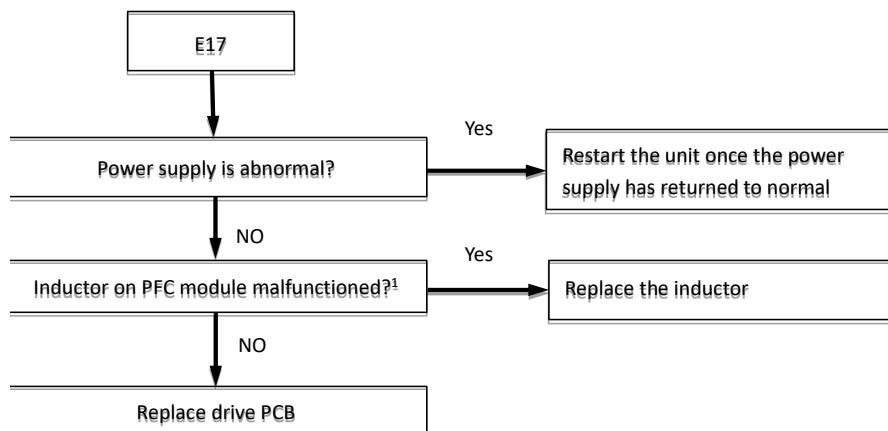
4.4.19.5.1 Diagnosis

E17 occurs when the instantaneous input current peak of the DC bus is over high.

4.4.19.5.2 Possible cause

- The input power supply is abnormal, and the voltage suddenly decreases to cause the input current to increase.
- Inductor on PFC module malfunctioned.
- Inverter module PCB malfunctioned.

4.4.19.5.3 Analysis and action



Note:

1. For 8/10/12/14/16kw, refer to Figure4-19.6 below for the location of the inductor.

Figure4-19.6



Inductor enveloped
by a cover plate

4.4.19.6 E18 E23 E29 E30 Diagnosis and analysis



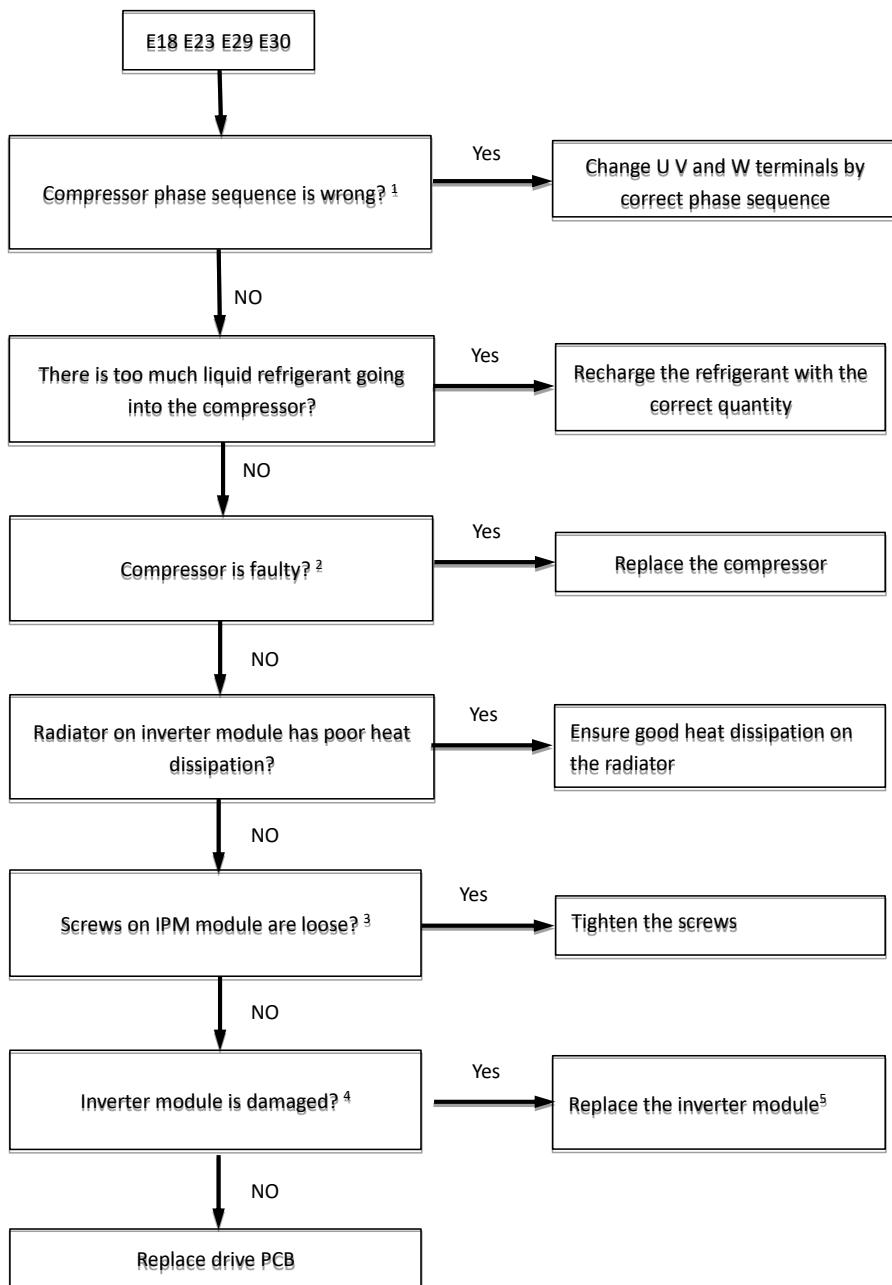
4.4.19.6.1 Diagnosis

- Code E18 will occur when IPM module is abnormal.
- Code E23 will occur when the instantaneous peak current of any phase of three phases the compressor U, V and W is over high.
- Code E29 will occur when the internal circuit of IPM detecting temperature is abnormal.
- Code E30 will occur when IPM module overheats.

4.4.19.6.2 Possible cause

- The compressor phase sequence is incorrectly connected.
- Too much refrigerant liquid flooded into the compressor.
- The compressor malfunctioned.
- Screws on the inverter module are loose.
- The radiator on inverter module PCB has poor heat dissipation.
- The inverter module PCB malfunctioned.

4.4.19.6.3 Analysis and action



Note:

1. Connect the U V W wire from the inverter module to the correct compressor terminals, as indicated by the labels on the compressor.
2. The normal resistances of the inverter compressor are 0.35-1.5Ω among U V W and infinite between each of U V W and ground. If any of the resistances differ from these specifications, the compressor has malfunctioned.
3. For 8/10/12kw, refer to Figure 4-19.8 for the layout of inverter module. For 14/16kw, refer to Figure 4-19.9 for the layout of inverter module.
4. Measure the resistance between each of U, V and W and each of P and N on the inverter module. All the resistances should be infinite. If any of them are not infinite, the inverter module is damaged and should be replaced.
5. When replacing an inverter module, a layer of thermally conductive silica gel should be painted on the IPM module, IGBT, diode bridge rectifier (on the reverse side of the inverter module PCB).

Figure 4-19.8 8/10/12kw

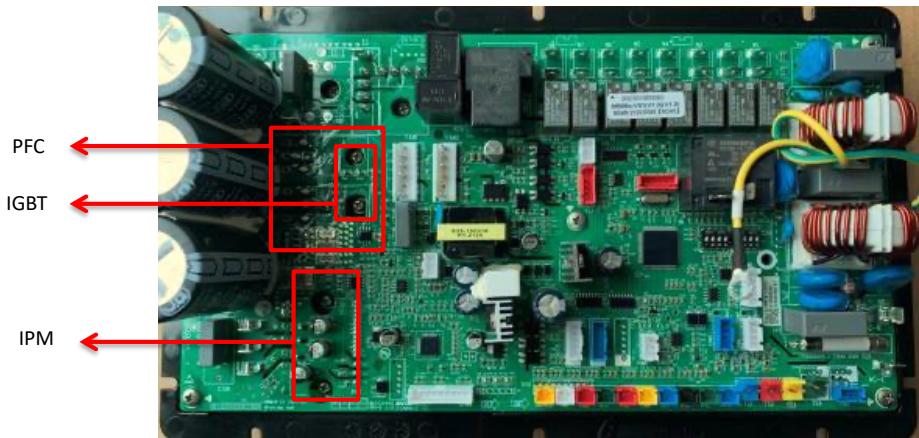
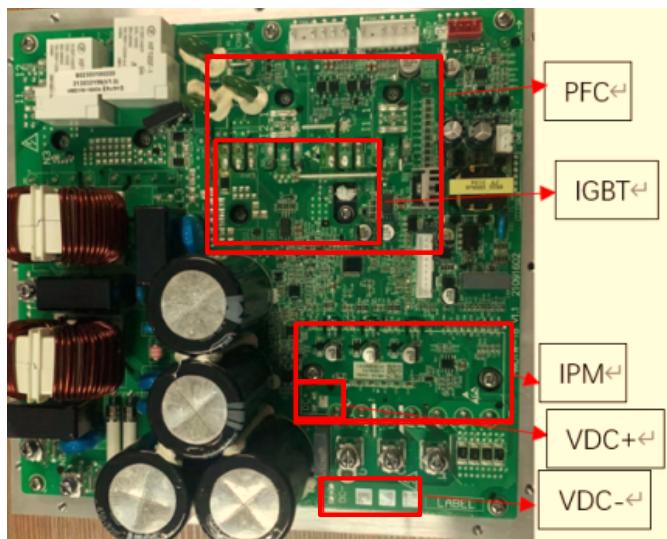


Figure 4-19.9 14/16kw



4.4.20 E19 E24 E27 Diagnosis and analysis



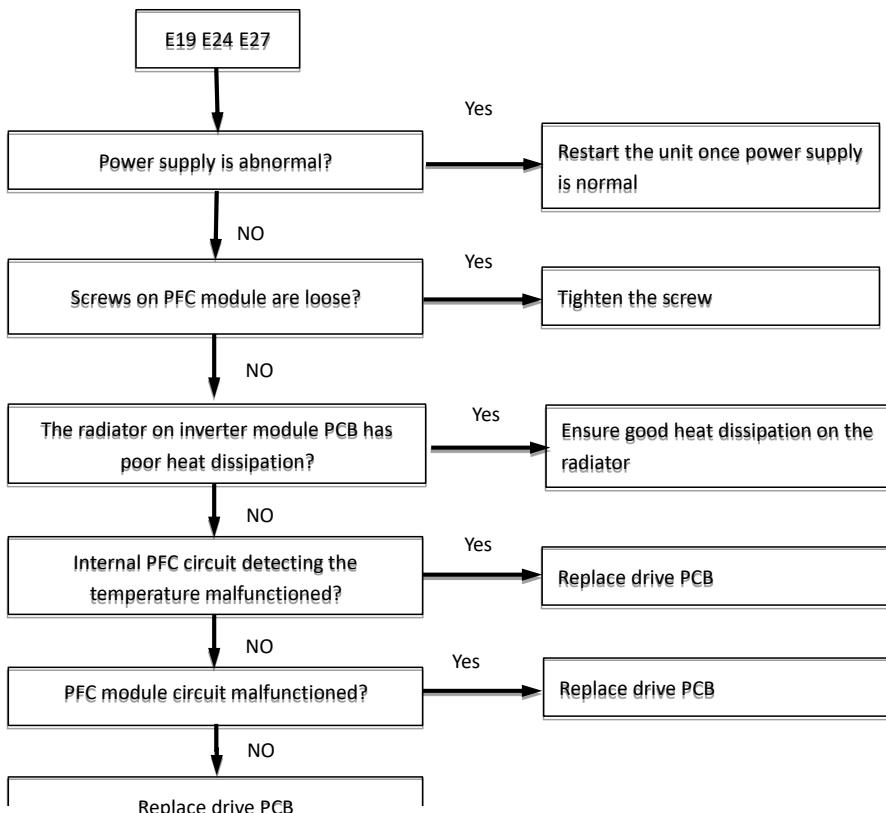
4.4.20.1 Diagnosis

- E19 will occur when PFC module is abnormal.
- E24 will occur when PFC module temperature is too high.
- E27 will occur when the circuit of PFC module detecting temperature is abnormal.

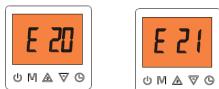
4.4.20.2 Possible causes

- The input power supply is abnormal.
- Screws on PFC module are loose.
- Internal PFC circuit detecting the temperature malfunctioned.
- The radiator on PFC module has poor heat dissipation.
- PFC module circuit malfunctioned.
- Inverter module PCB is damaged.

4.4.20.3 Analysis and action



4.4.21 E20 E21 Diagnosis and analysis



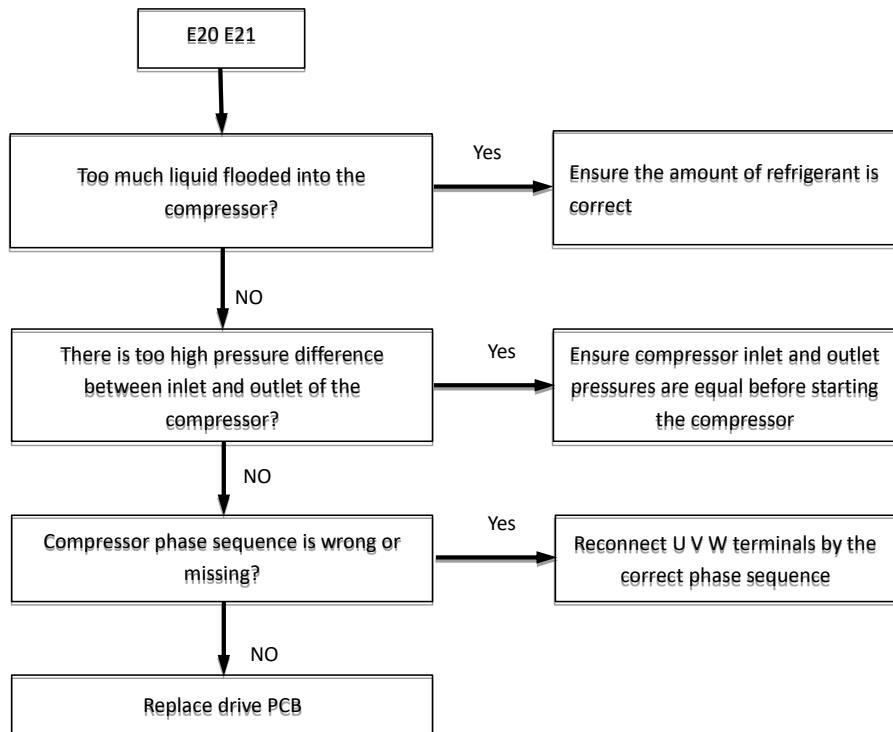
4.4.21.1 Diagnosis

Code E20 will occur when the compressor startup failed. When one or two phases are missing from the compressor phase line U V and W, Code E21 will occur.

4.4.21.2 Possible causes

- Too much liquid flooded into the compressor.
- There is too high pressure difference between inlet and outlet of the compressor.
- There is a wrong compressor phase sequence.

4.4.21.3 Analysis and action



4.4.22 E25 Diagnosis, analysis and action



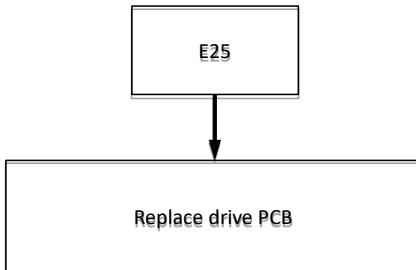
4.4.22.1 Diagnosis

Code E25 will occur when the circuit of detecting total input current of IPM module malfunctions.

4.4.22.2 Possible causes

Drive PCB is damaged.

4.4.22.3 Analysis and action



4.4.23 E26 Diagnosis, analysis and action



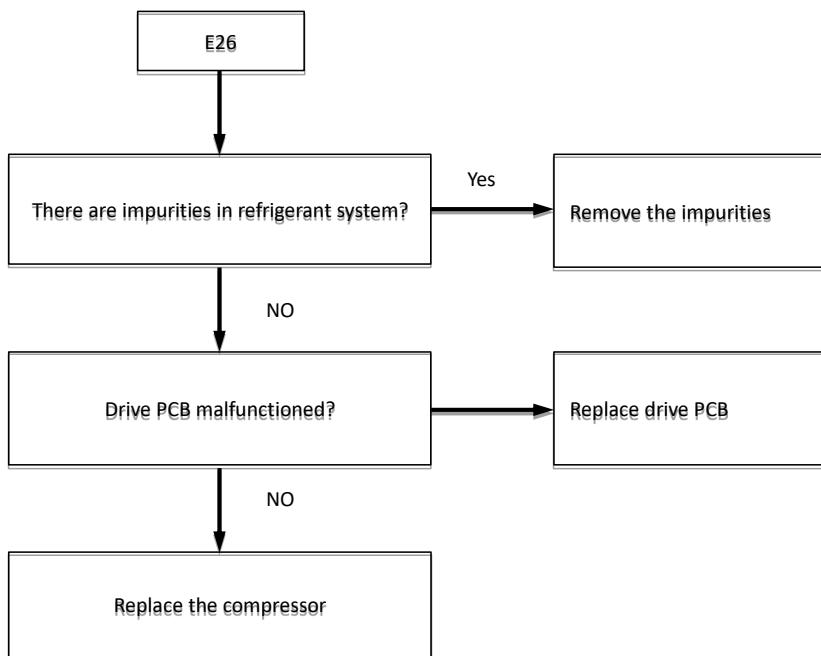
4.4.23.1 Diagnosis

Code E26 will occur when the actual running speed of the compressor deviated from the set speed, which is also called “out of step”.

4.4.23.2 Possible causes

- There are impurities in the compressor which may cause the frequency to be unstable.
- Drive PCB is damaged

4.4.23.3 Analysis and action



4.4.24 E28 Diagnosis, analysis and action



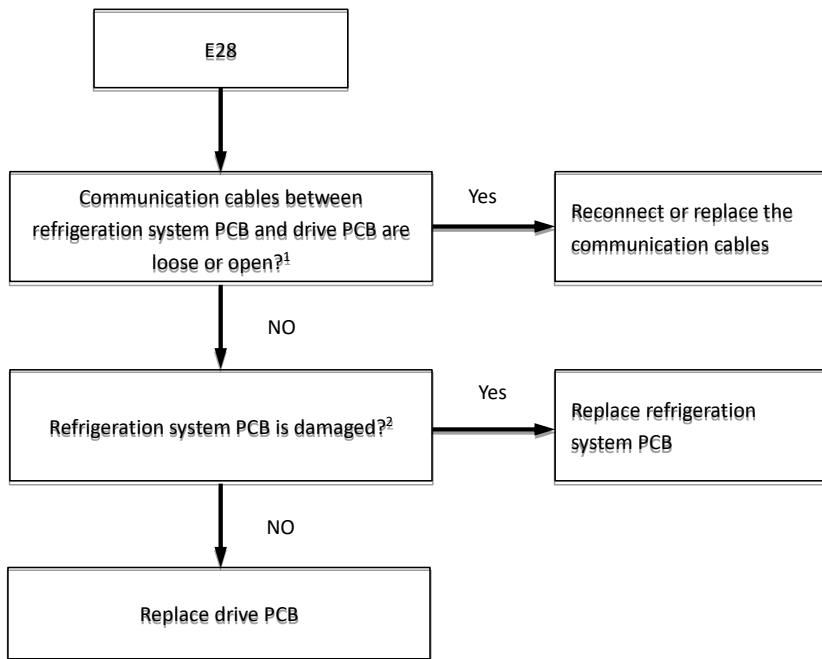
4.4.24.1 Diagnosis

Code E28 will occur when drive PCB receives no data or error data from refrigeration system PCB in 30 seconds.

4.4.24.2 Possible causes

- The communication cables with the main control PCB are loose or open.
- Drive PCB is damaged.

4.4.24.3 Analysis and action



Note:

1. Apply to 14/16kW models, for 8/10/12kW models no separator communication lines.
2. Apply to 14/16kW models, for 8/10/12kW models no separator refrigeration system PCB.

4.4.25 E34 Diagnosis, analysis and action



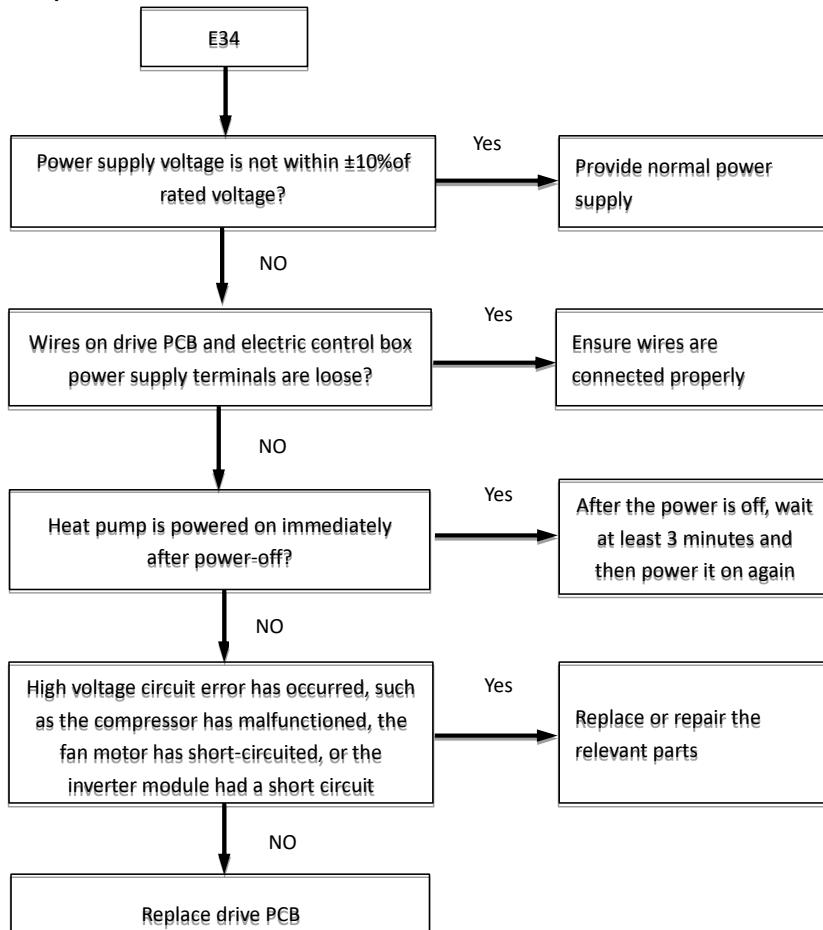
4.4.25.1 Diagnosis

Code E34 will occur when there is an abnormal main circuit voltage.

4.4.25.2 Possible causes

- Actual power supply voltage is not within $\pm 10\%$ of rated voltage.
- Heat pump is powered on immediately after power-off.
- Loosened wiring within electric control box.
- High voltage circuit error.
- Drive PCB is damaged.

4.4.25.3 Analysis and action



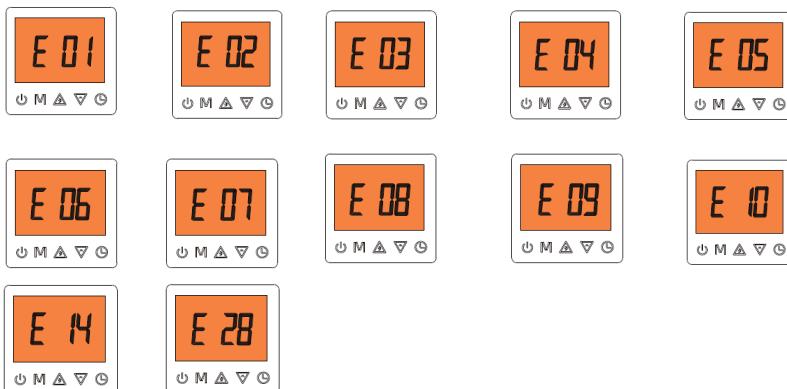
4.4.26 E22 E32 E33 E35 E37 E38 analysis



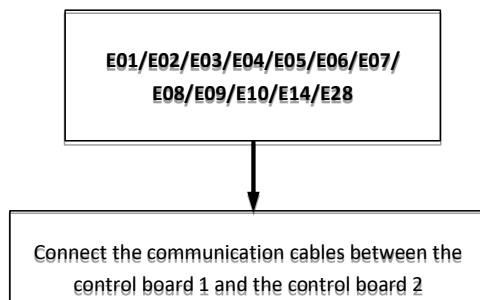
These codes mean the controller is performing some kind of specific action; they are neither error nor failure.

- E22 will occur if the inverter module is resetting.
- E32 E33 and E35 will occur if the inverter module is debugging the data.
- E37 will occur if the compressor frequency is limited because of the input current of the inverter module.
- E38 will occur if the compressor frequency is limited because of the input voltage of the inverter module.

4.4.27 E01/E02/E03/E04/E05/E06/E07/ E08/E09/E10/E14/E28 analysis



Before starting heat pump, if the communication cables with two cores (A and B) between the control board 1 and the control board 2 are not connected, all these errors above will occur on the user interface and don't start heat pump. First of all, you must confirm that the communication cables (A and B) between these two control boards have been connected correctly to start heat pump.



4.5 Appendixes to Part 4

4.5.1 Temperature Sensor Resistance Characteristics

Table 4-20.1: inlet water temperature sensor TA, outlet water temperature sensor TB, coil temperature sensor T3, outdoor ambient temperature sensor T4, liquid temperature sensor T5, and suction temperature sensor TH resistance characteristics

Temp. (°C)	Resistance (kΩ)	Temp. (°C)	Resistance (kΩ)	Temp. (°C)	Resistance (kΩ)	Temp (°C)	Resistance (kΩ)
-20	106.732	20	12.635	60	2.350	100	0.609
-19	100.552	21	12.050	61	2.264	101	0.591
-18	94.769	22	11.496	62	2.181	102	0.574
-17	89.353	23	10.971	63	2.102	103	0.558
-16	84.278	24	10.473	64	2.026	104	0.542
-15	79.521	25	10.000	65	1.953	105	0.527
-14	75.059	26	9.551	66	1.883		
-13	70.873	27	9.125	67	1.816		
-12	66.943	28	8.721	68	1.752		
-11	63.252	29	8.337	69	1.690		
-10	59.784	30	7.972	70	1.631		
-9	56.524	31	7.625	71	1.574		
-8	53.458	32	7.296	72	1.519		
-7	50.575	33	6.982	73	1.466		
-6	47.862	34	6.684	74	1.416		
-5	45.308	35	6.401	75	1.367		
-4	42.903	36	6.131	76	1.321		
-3	40.638	37	5.874	77	1.276		
-2	38.504	38	5.630	78	1.233		
-1	36.492	39	5.397	79	1.191		
0	34.596	40	5.175	80	1.151		
1	32.807	41	4.964	81	1.113		
2	31.120	42	4.763	82	1.076		
3	29.528	43	4.571	83	1.041		
4	28.026	44	4.387	84	1.007		
5	26.608	45	4.213	85	0.974		
6	25.268	46	4.046	86	0.942		
7	24.003	47	3.887	87	0.912		
8	22.808	48	3.735	88	0.883		
9	21.678	49	3.590	89	0.855		
10	20.610	50	3.451	90	0.828		
11	19.601	51	3.318	91	0.802		
12	18.646	52	3.191	92	0.777		
13	17.743	53	3.069	93	0.753		
14	16.888	54	2.952	94	0.730		
15	16.079	55	2.841	95	0.708		

16	15.313	56	2.734	96	0.686		
17	14.588	57	2.632	97	0.666		
18	13.902	58	2.534	98	0.646		
19	13.251	59	2.440	99	0.627		

Table 4-20.2: Domestic water tank temperature sensor TW and discharge pipe temperature sensor TP resistance characteristics

Temp. (°C)	Resistance (kΩ)	Temp. (°C)	Resistance (kΩ)	Temp. (°C)	Resistance (kΩ)	Temp (°C)	Resistance (kΩ)
-30	952.951	9	116.582	48	21.633	87	5.503
-29	896.036	10	111.120	49	20.817	88	5.329
-28	843.054	11	105.942	50	20.036	89	5.162
-27	793.682	12	101.031	51	19.288	90	5.000
-26	747.627	13	96.372	52	18.571	91	4.844
-25	704.627	14	91.952	53	17.885	92	4.694
-24	664.442	15	87.758	54	17.227	93	4.549
-23	626.856	16	83.776	55	16.597	94	4.409
-22	591.673	17	79.996	56	15.993	95	4.274
-21	558.714	18	76.406	57	15.414	96	4.144
-20	527.817	19	72.996	58	14.859	97	4.018
-19	498.833	20	69.756	59	14.326	98	3.896
-18	471.626	21	66.677	60	13.815	99	3.779
-17	446.072	22	63.750	61	13.324	100	3.666
-16	422.057	23	60.967	62	12.854	101	3.557
-15	399.475	24	58.321	63	12.401	102	3.451
-14	378.231	25	55.803	64	11.967	103	3.349
-13	358.235	26	53.408	65	11.550	104	3.251
-12	339.406	27	51.129	66	11.150	105	3.156
-11	321.666	28	48.959	67	10.765	106	3.064
-10	304.948	29	46.893	68	10.395	107	2.975
-9	289.185	30	44.926	69	10.039	108	2.889
-8	274.317	31	43.051	70	9.697	109	2.806
-7	260.288	32	41.265	71	9.368	110	2.726
-6	247.047	33	39.563	72	9.052	111	2.649
-5	234.545	34	37.941	73	8.748	112	2.574
-4	222.737	35	36.393	74	8.455	113	2.502
-3	211.581	36	34.918	75	8.173	114	2.433
-2	201.038	37	33.510	76	7.902	115	2.365
-1	191.071	38	32.166	77	7.641	116	2.299
0	181.647	39	30.884	78	7.389	117	2.237
1	172.733	40	29.659	79	7.147	118	2.176
2	164.300	41	28.490	80	6.914	119	2.115
3	156.319	42	27.373	81	6.689	120	2.058

4	148.765	43	26.306	82	6.473	121	2.002
5	141.613	44	25.286	83	6.264	122	1.949
6	134.839	45	24.311	84	6.063	123	1.897
7	128.423	46	23.378	85	5.869	124	1.846
8	122.343	47	22.487	86	5.683	125	1.797
126	1.750	130	1.575	134	1.421	138	1.283
127	1.704	131	1.535	135	1.385	139	1.251
128	1.660	132	1.496	136	1.350	140	1.220
129	1.617	133	1.458	137	1.316		

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