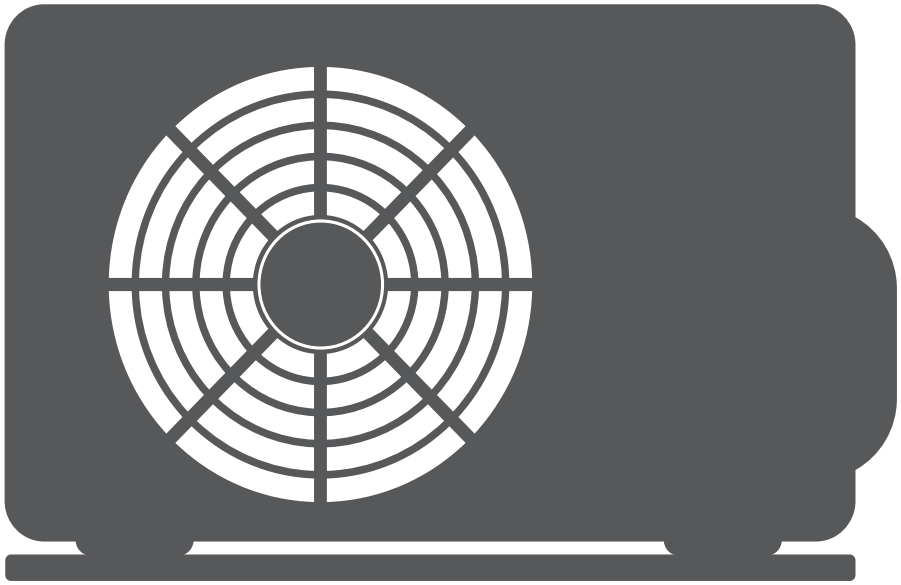
AIR CONDITIONING SYSTEMS

AIR-TO-WATER HEAT PUMP - MONOBLOCK

• **SERVICE MANUAL**



MODELS:

XFMH04S3
XFMH06S3
XFMH08S3
XFMH10S3
XFMH12S3
XFMH14S3
XFMH16S3
XFMH12T9
XFMH14T9
XFMH16T9

ENGLISH

CONTENTS

Part 1
General Features

1 Unit Capacities and Appearance

1.1 Unit Capacities

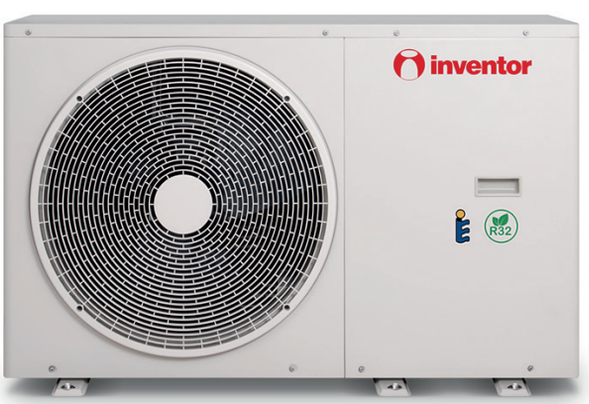
Table 1-1.1: Capacity range

Capacity	4kW	6kW	8kW	10kW	12kW	14kW	16kW
1-phase models	40W	60W	80W	100W	120W	140W	160W

Capacity	12kW	14kW	16kW
3-phase models	120W	140W	160W

1.2 Appearance

Table 1-1.2: Unit appearance



Part 2

Component Layout and Refrigerant Circuit

2.1. Layout of Functional Components

XFMH04S3/XFMH06S3/XFMH08S3

Figure 2-1.1: Top View

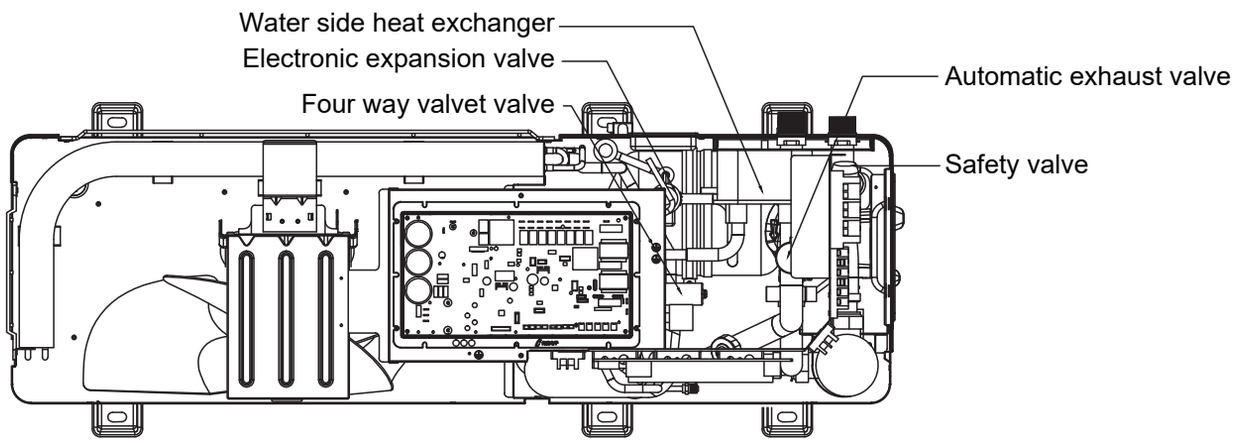
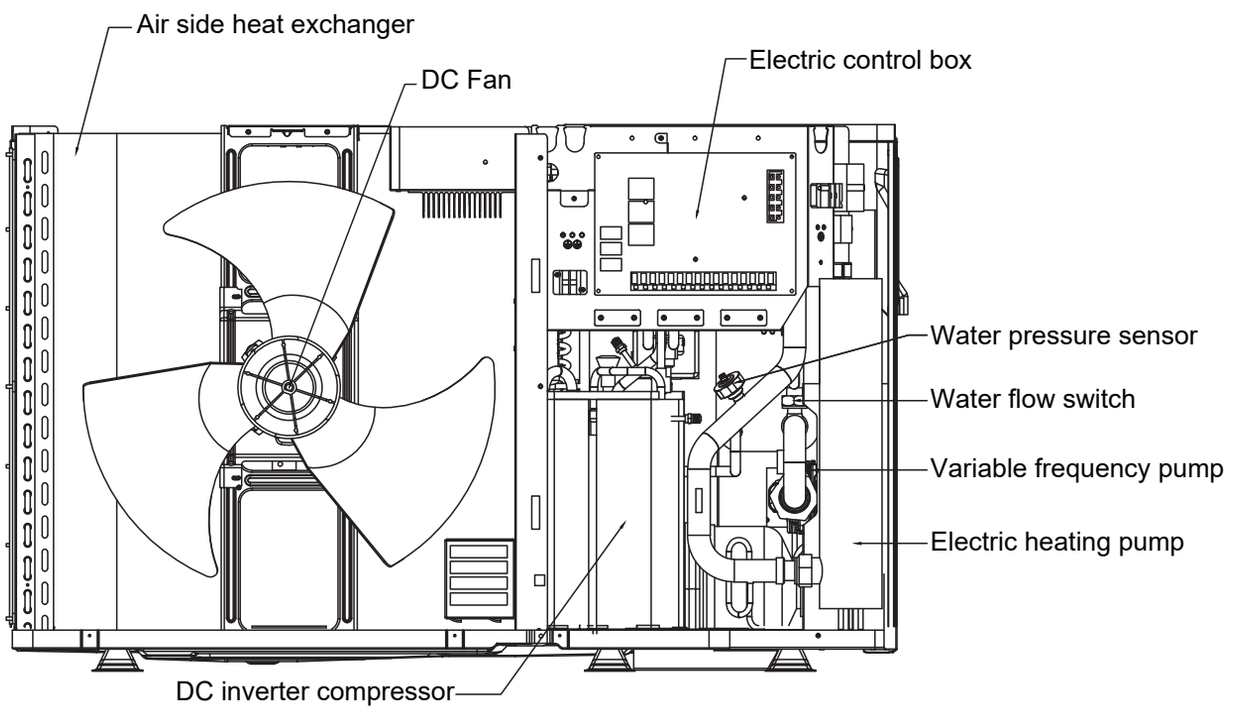


Figure 2-1.2: Front View



XFMH10S3

Figure 2-1.3: Top View

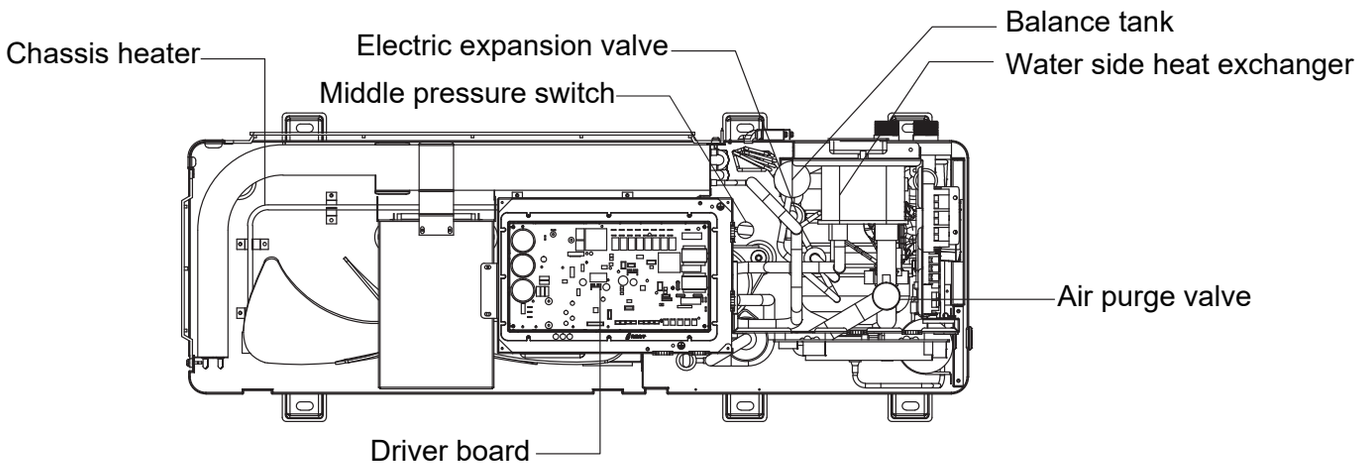
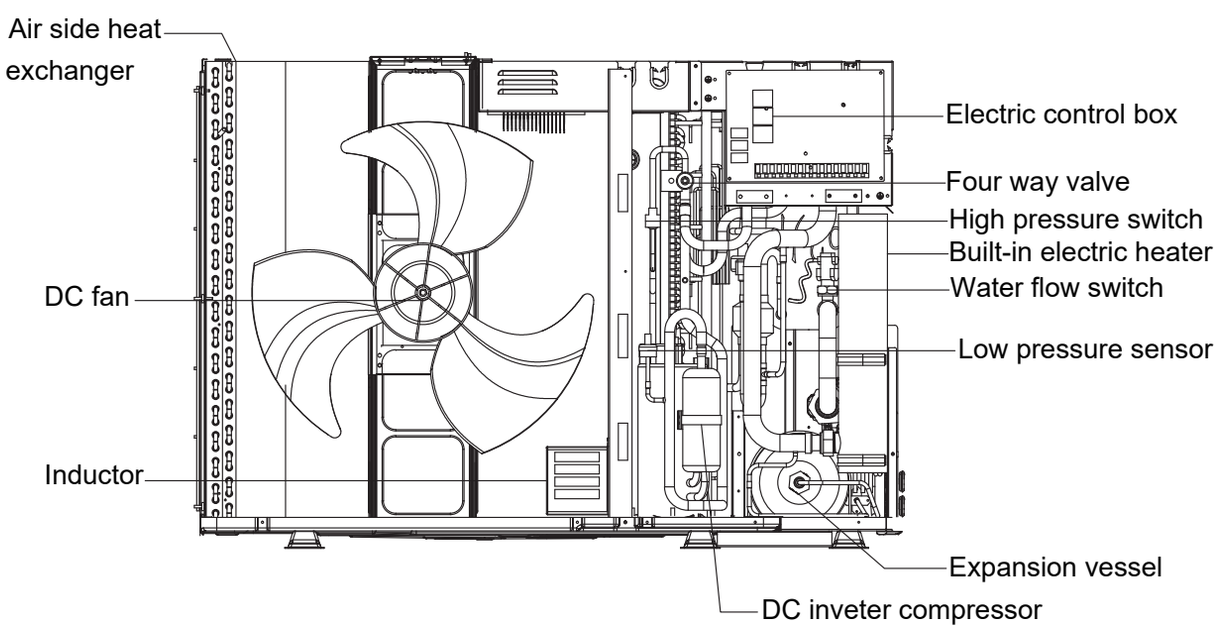


Figure 2-1.4: Front View



XFMH12S3

Figure 2-1.5: Top View

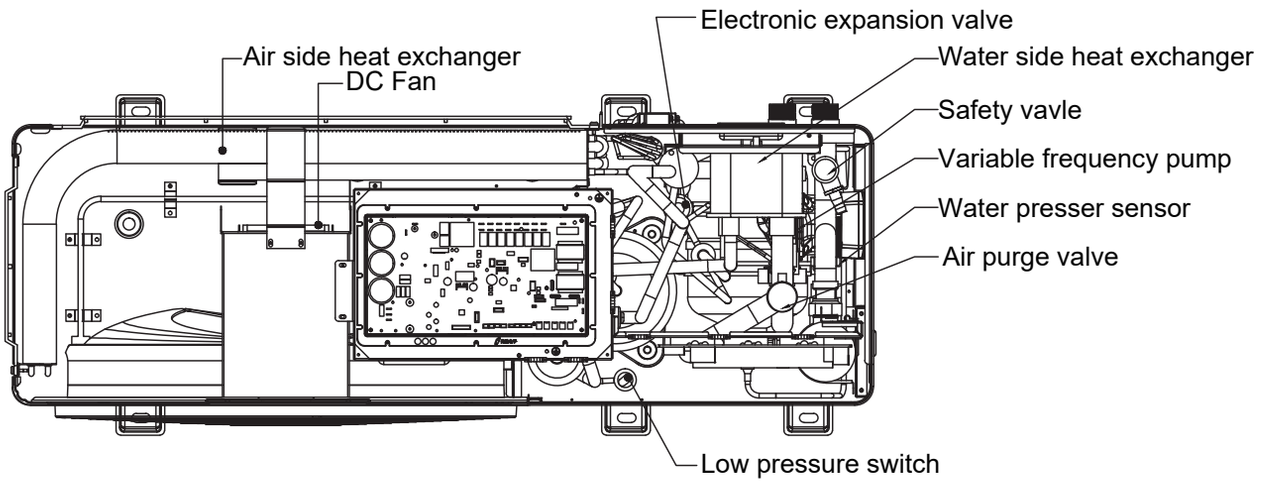
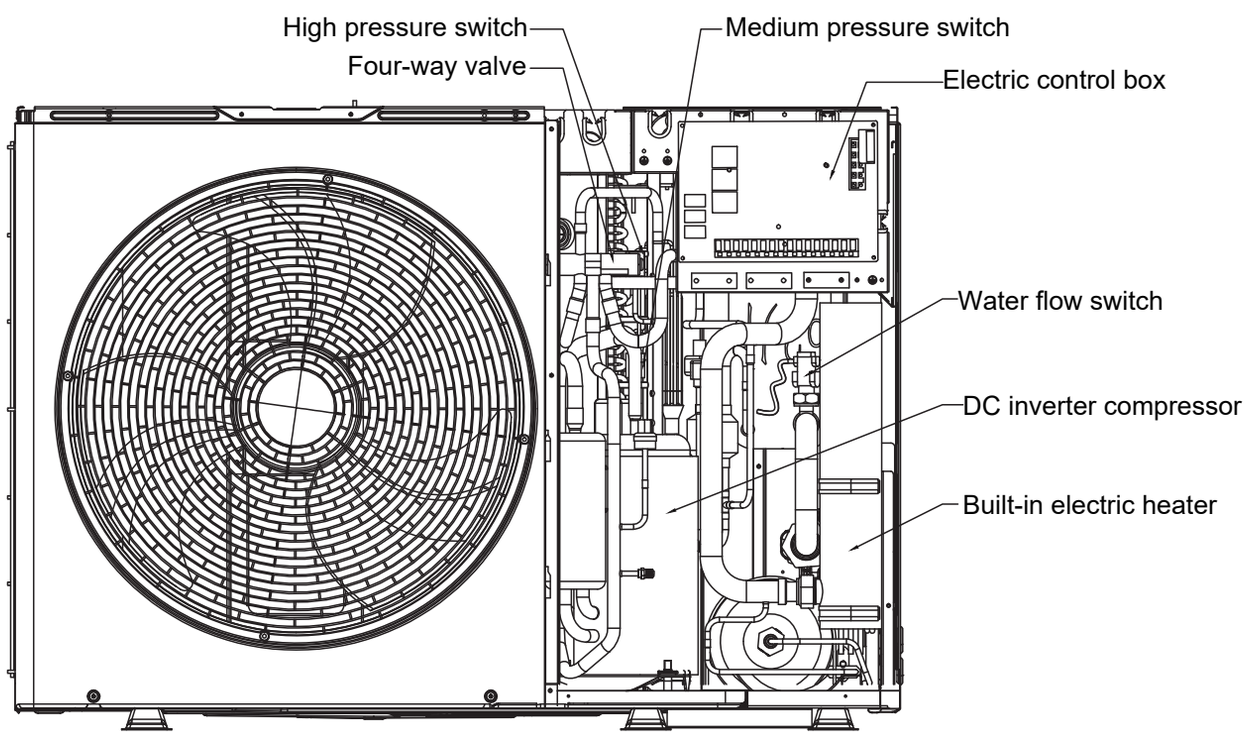


Figure 2-1.6: Front View



XFMH14S3/XFMH16S3

Figure 2-1.7: Top View

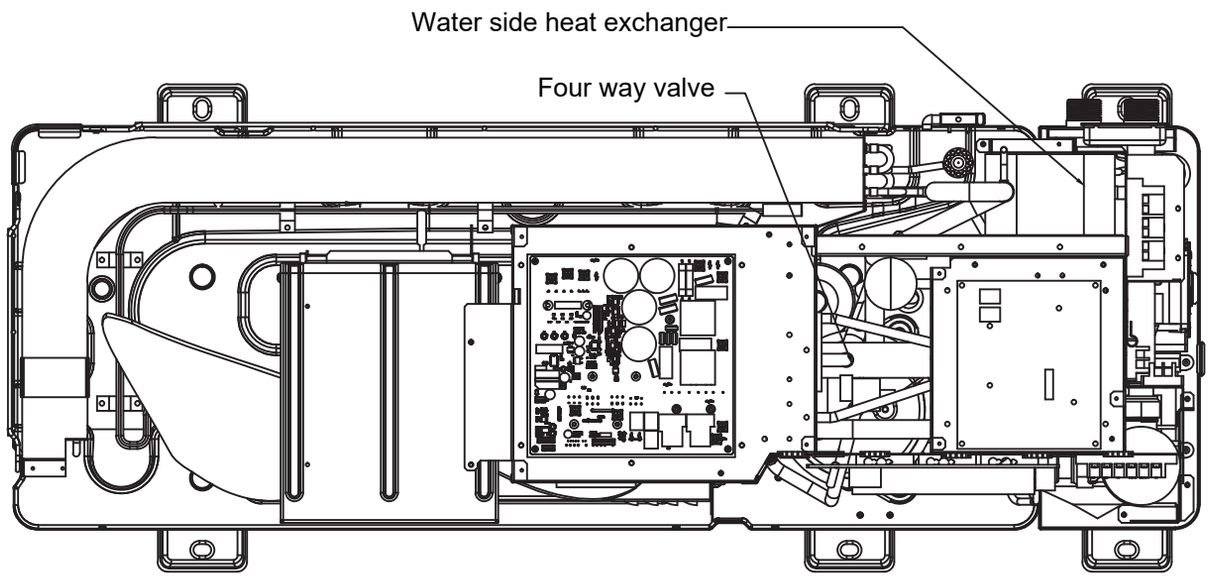
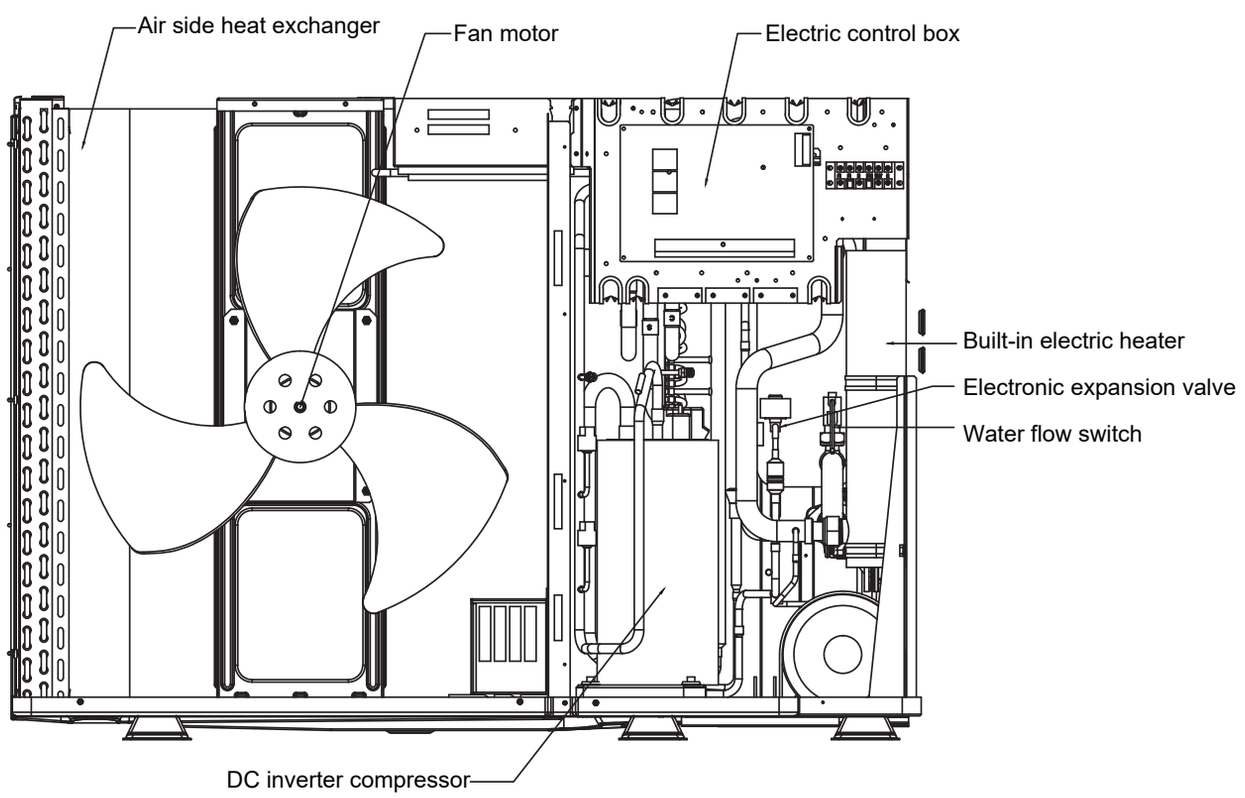


Figure 2-1.8: Front View



XFMH12T9

Figure 2-1.9: Top View

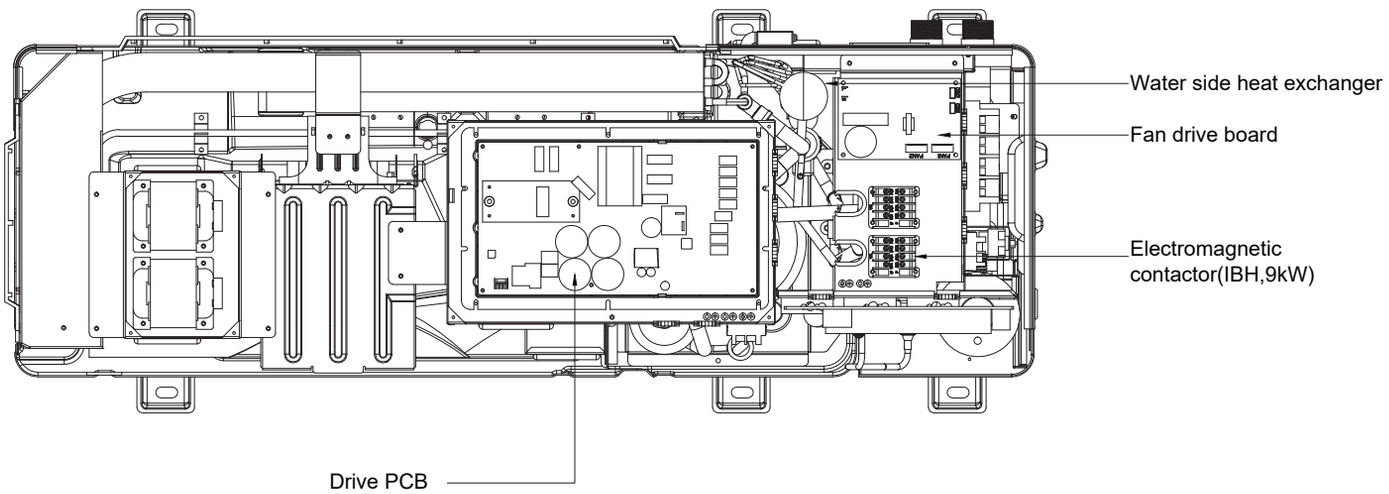
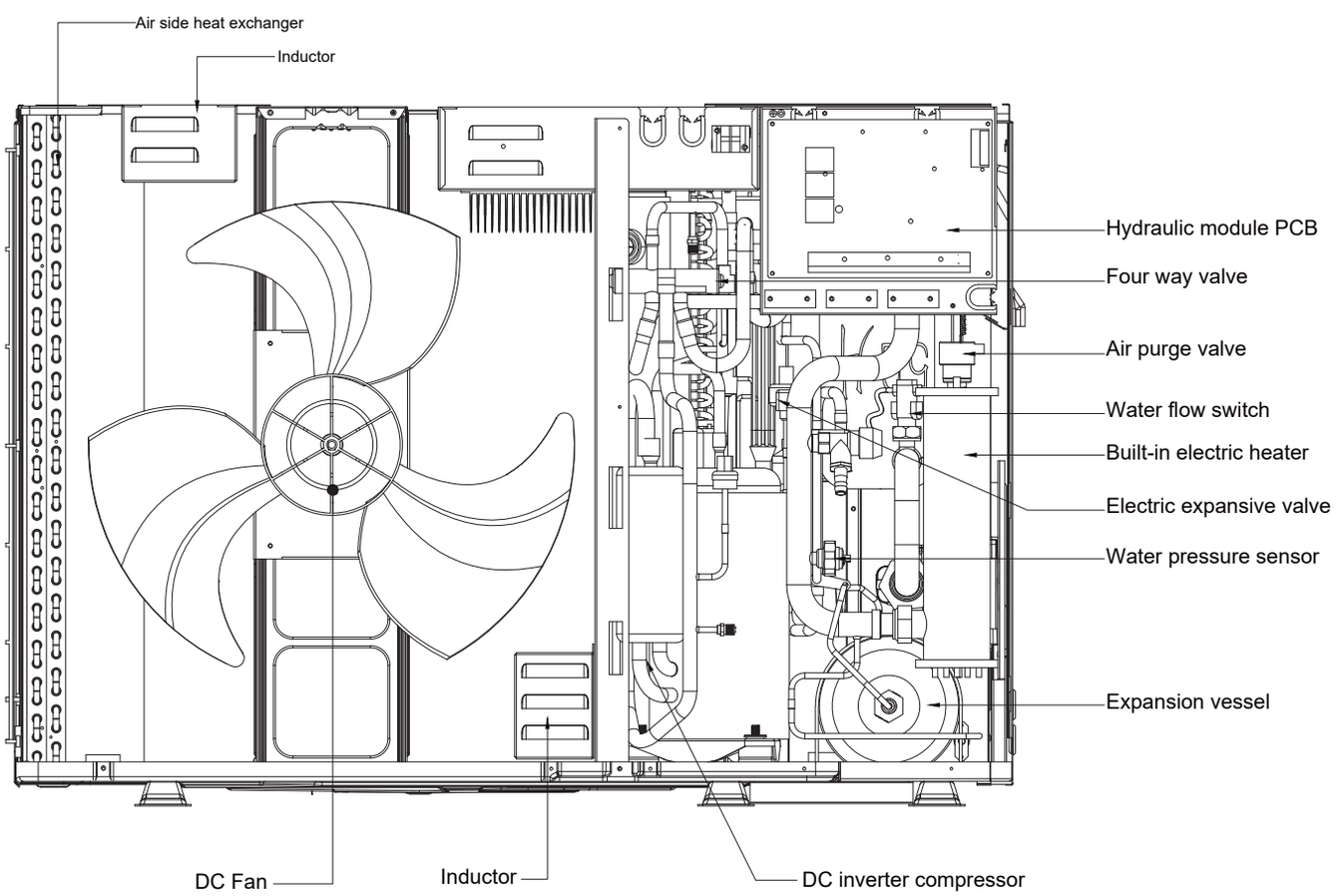


Figure 2-1.10: Front View



XFMH14T9/XFMH16T9

Figure 2-1.11: Top View

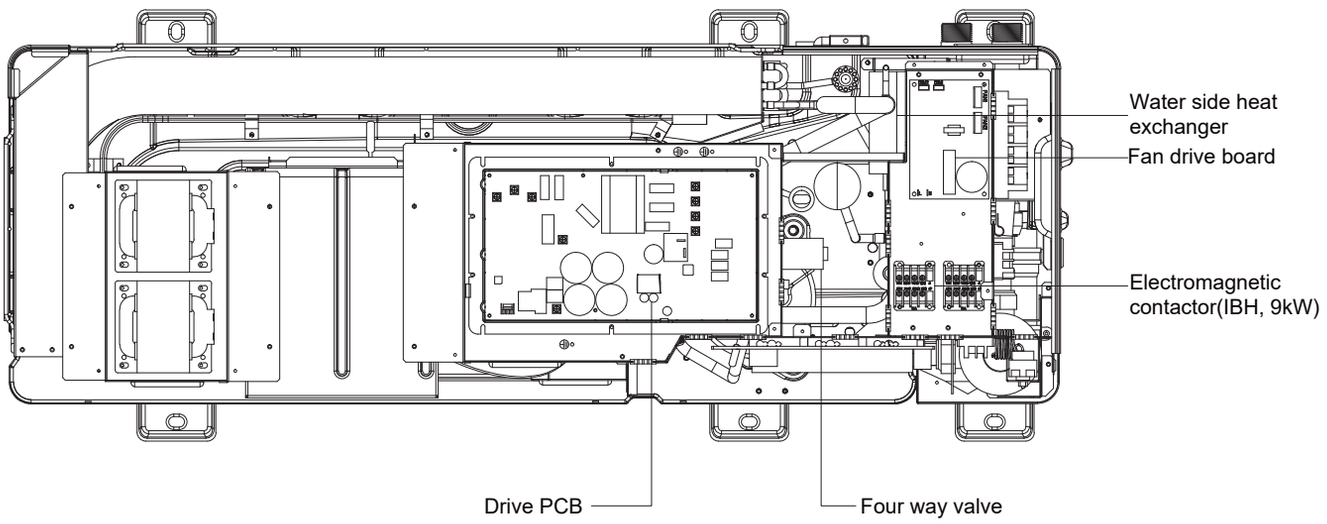
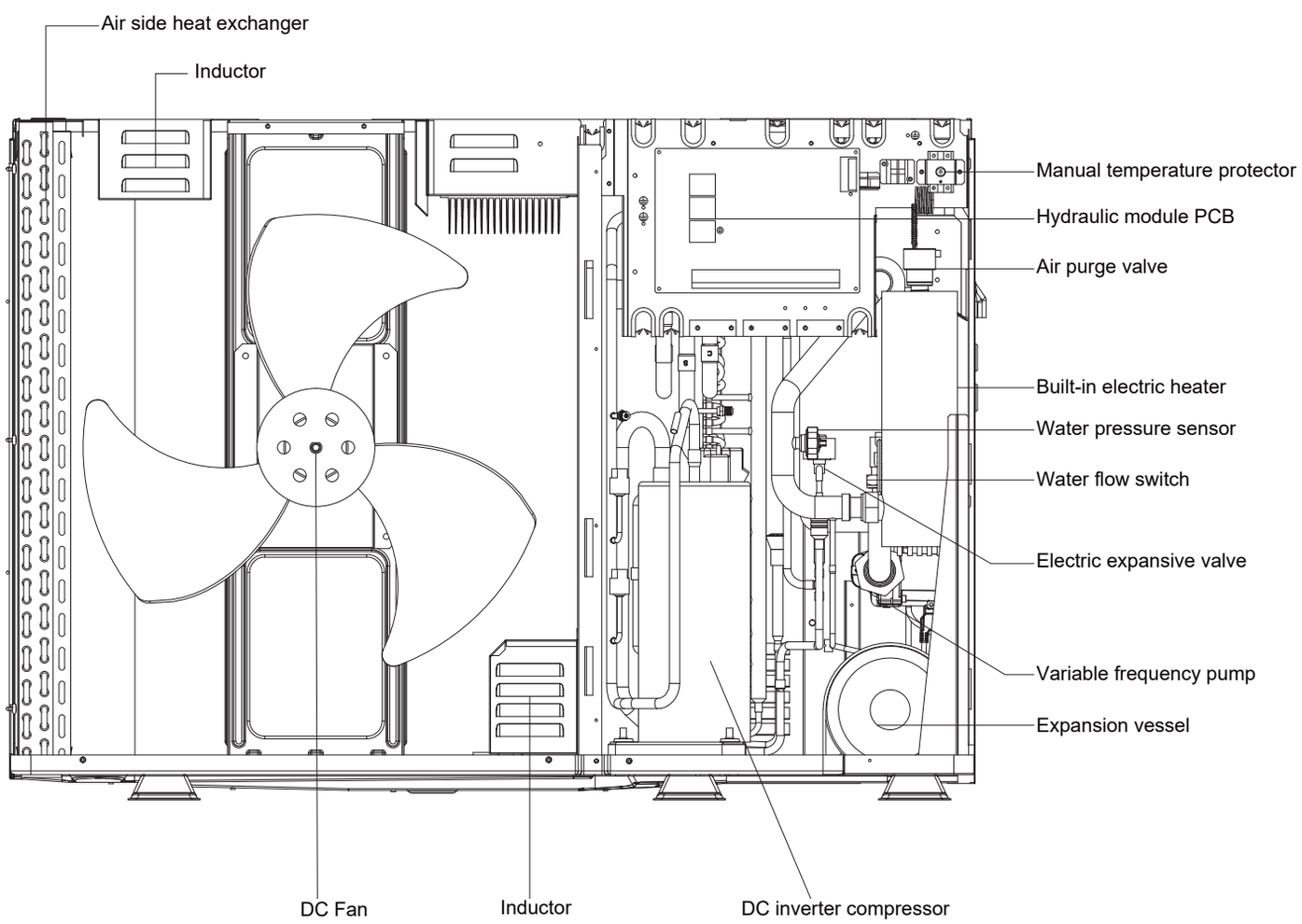
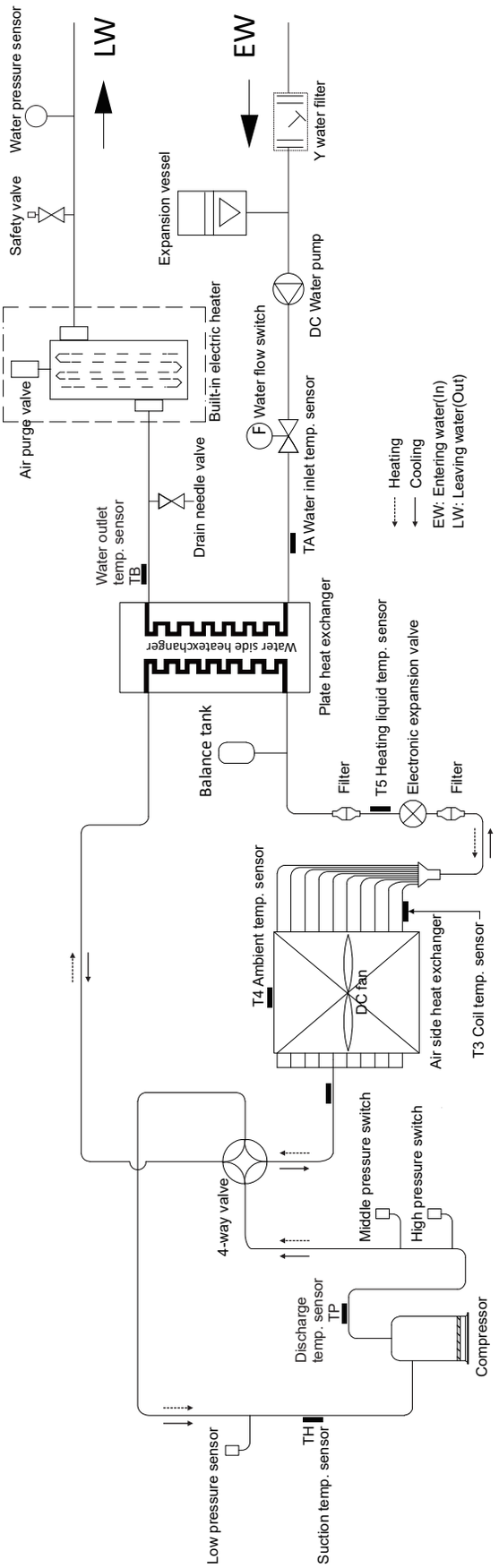


Figure 2-1.12: Front View



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 pressure switch**

   Regulate refrigerant system pressure. When refrigerant system pressure rises above the upper limit, the high 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.

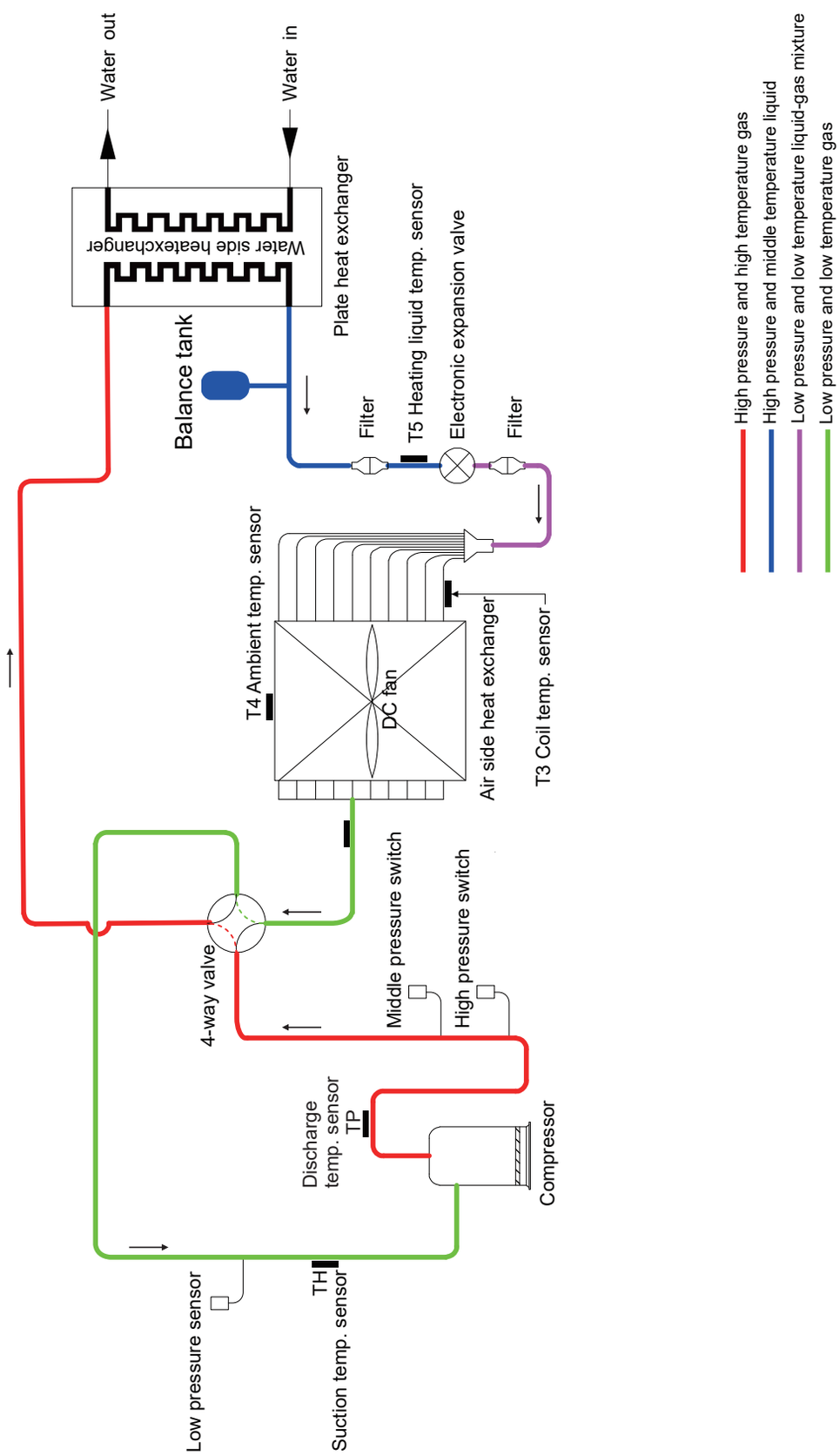
11. **Internal water pump**

    Circulate water in the water circuit.

3. Refrigerant Flow Diagram

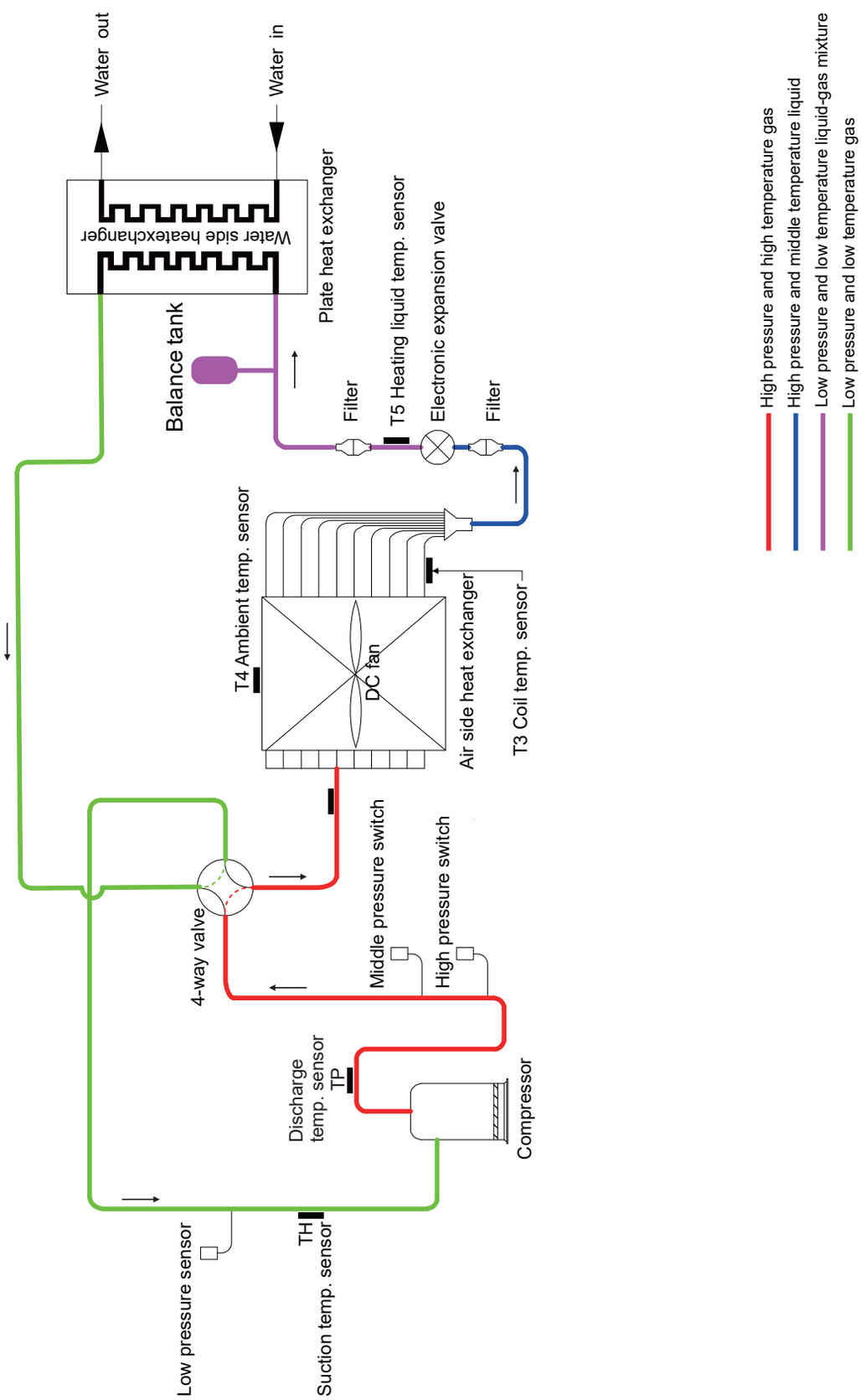
Heating and domestic hot water operation (4-16kW for example)

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



Cooling and defrosting operation (4-16kW for example)

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



Part 3
Control

1. Stop Operation

The stop operation occurs for one of the following reasons:

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

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 is displayed on the unit PCB digital displays and the user interface.

2. Standby Control

2.1 Water Pump Control

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

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. Startup Control

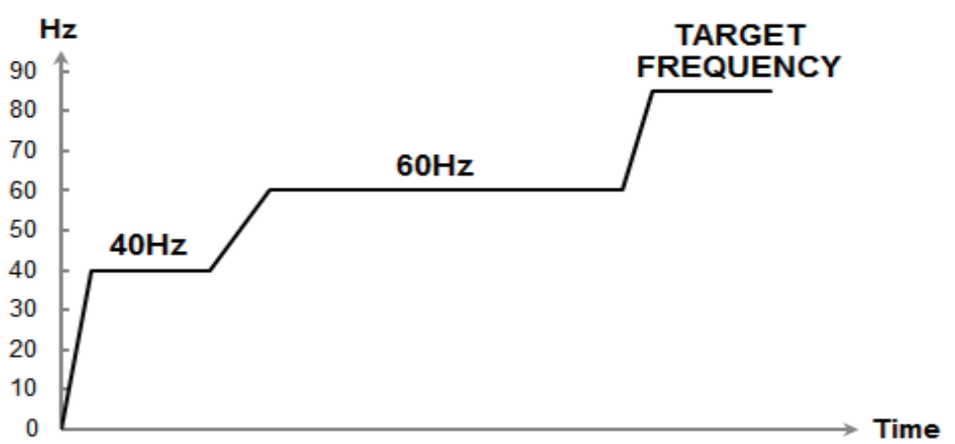
3.1 Compressor Startup Delay Control

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.

3.2 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 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 figure 3-3.1
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

3.4 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 figure 3-3.1
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

4. Normal Operation Control

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
4-way valve	OFF

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.

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.

4.4 4-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.

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.

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.

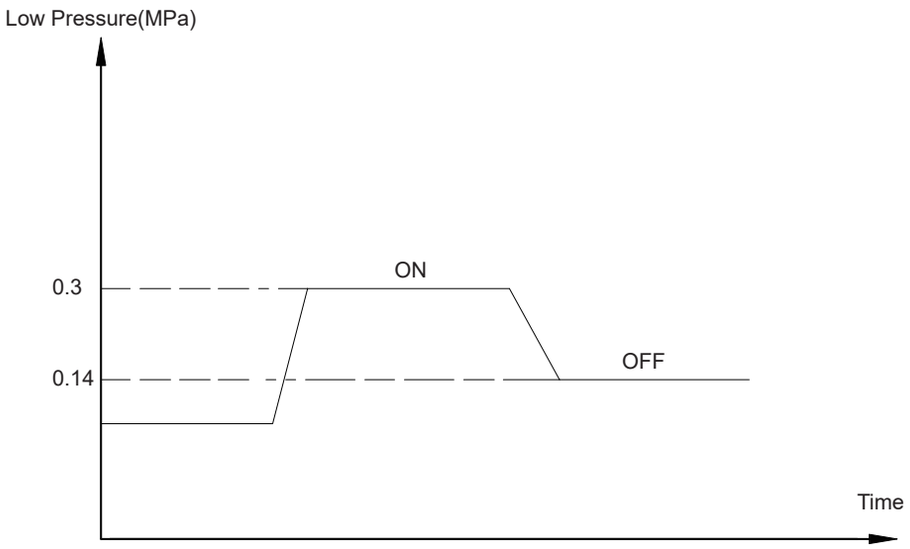
- **When the unit stops**

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

5. Protection Control

5.1 Low Pressure Protection Control

Figure 3-5.1: Low pressure protection control

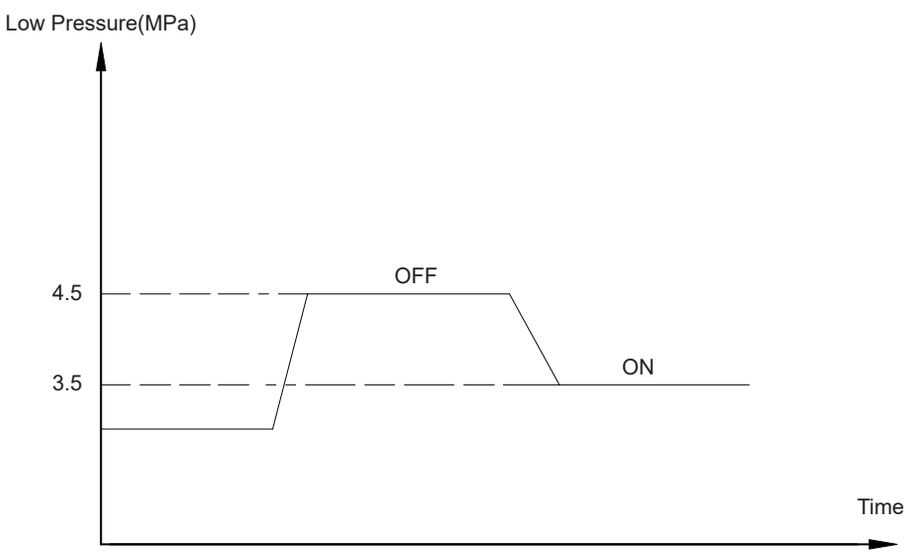


When the suction pressure drops below 0.14MPa the system displays P03 protection and the unit stops running. When the suction pressure rises above 0.3MPa, the compressor enters re-start control.

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

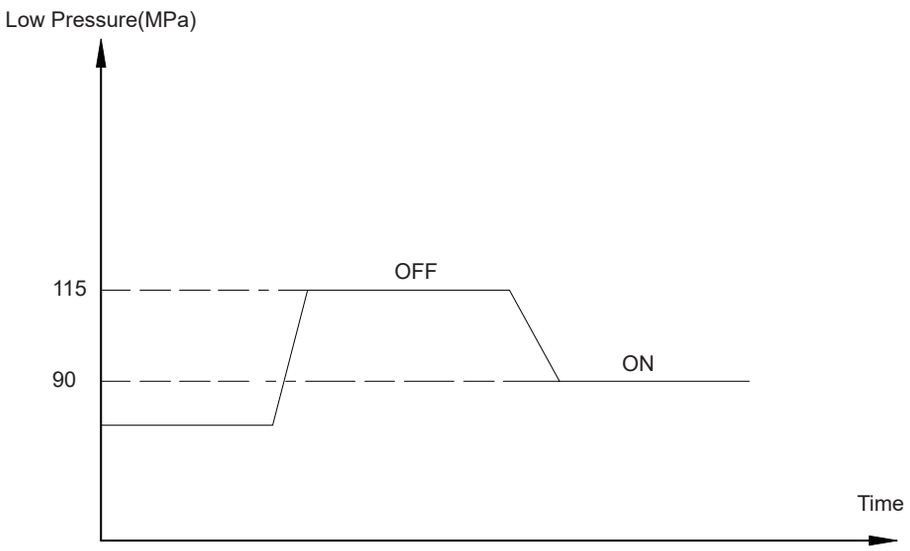


When the discharge pressure rises above 4.5MPa the system displays P02 protection and the unit stops running. When the discharge pressure drops below 3.5MPa, the compressor enters re-start control.

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.

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	4-6kw	8-10kw	12kw 1ph	14-16kw 1ph
Maximum current (A)	12	14	18	25

Model	12kW 3ph	14kW 3ph	16kW 3ph
Maximum Current(A)	12	14	16

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.

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;

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.

6. Special Control

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

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

7 Role of Temperature Sensors in Control Functions

Figure 3-7.1 Location of the temperature sensors of all models 4-16kw

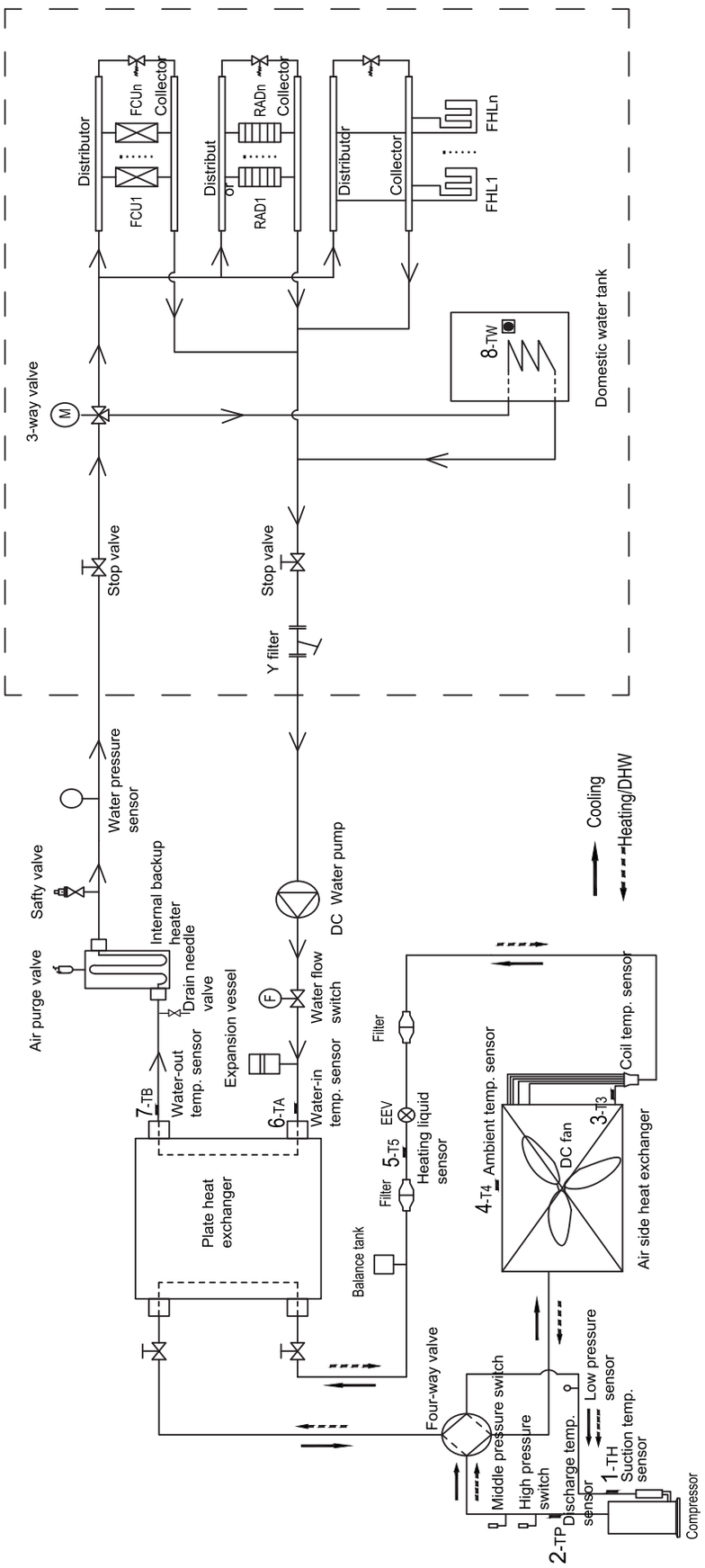


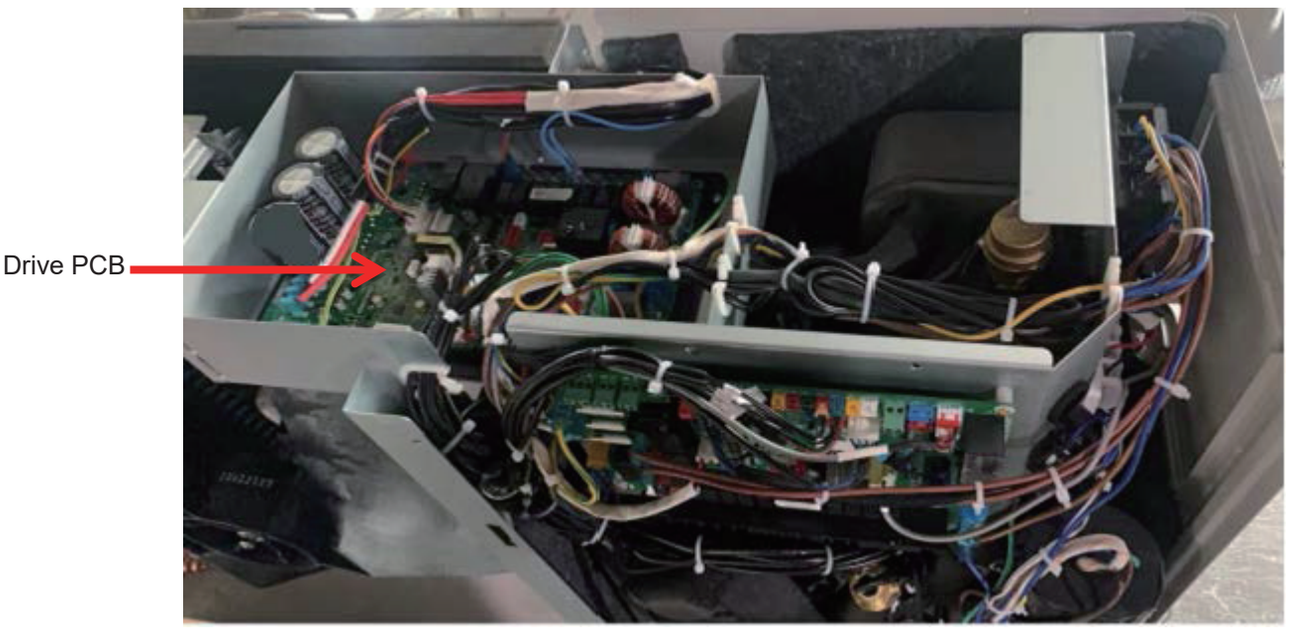
Table 3-7.1: All the temperature sensors

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
4	Outdoor ambient temp.sensor	T4	Cooling	Compressor startup control
				Compressor output control
				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
				Electronic expansion valve control
8	Domestic water tank temp.sensor	TW	DHW	Compressor output/Backup electric heater control

Part 4
Troubleshooting

1. Unit Electric Control Box Layout

Figure 4-1.1: XFMH04S3/XFMH06S3



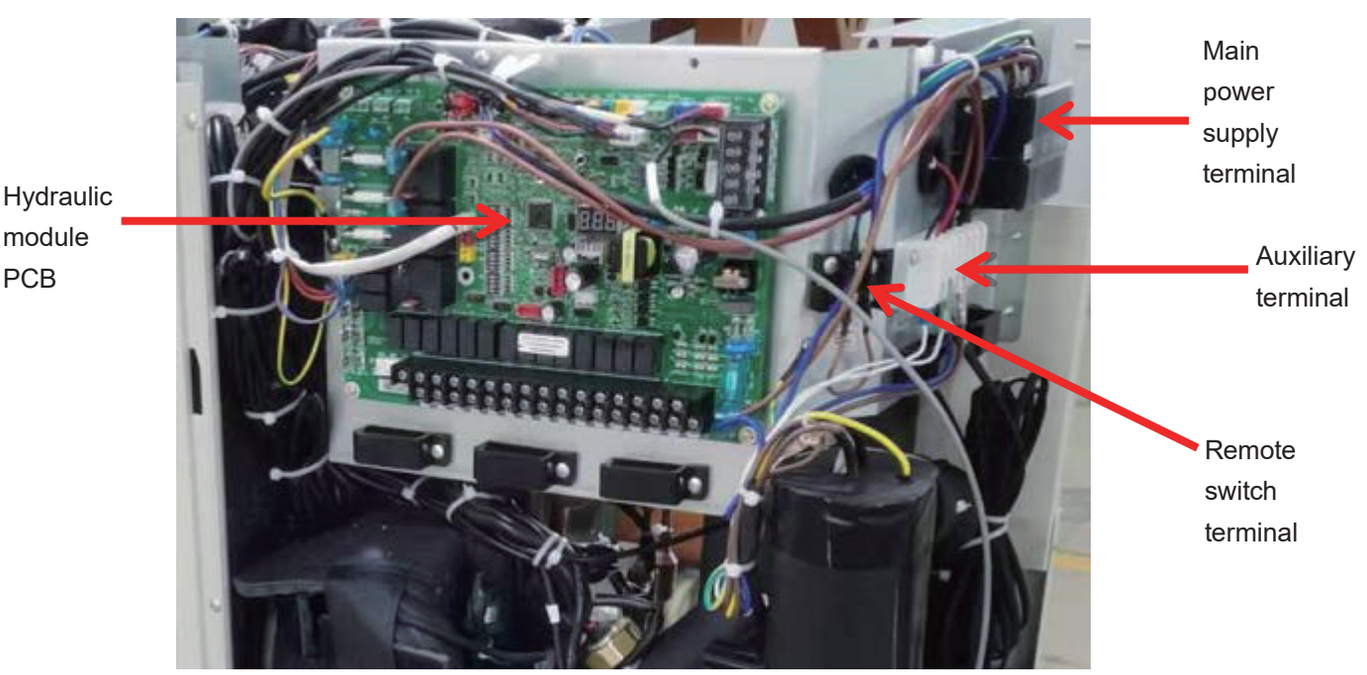
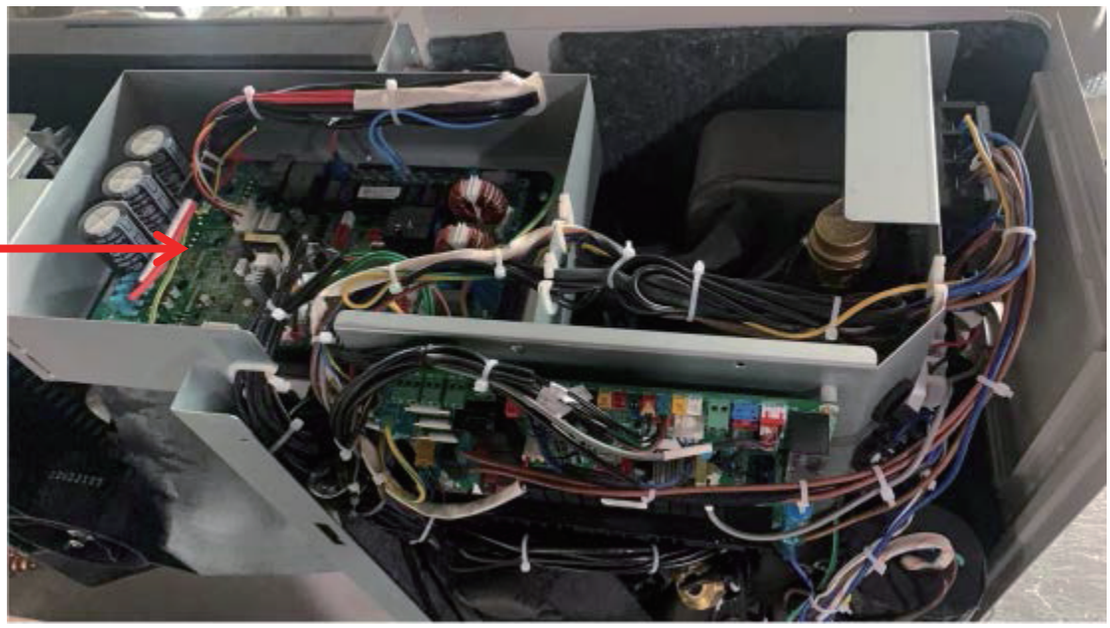


Figure 4-1.2: XFMH08S3



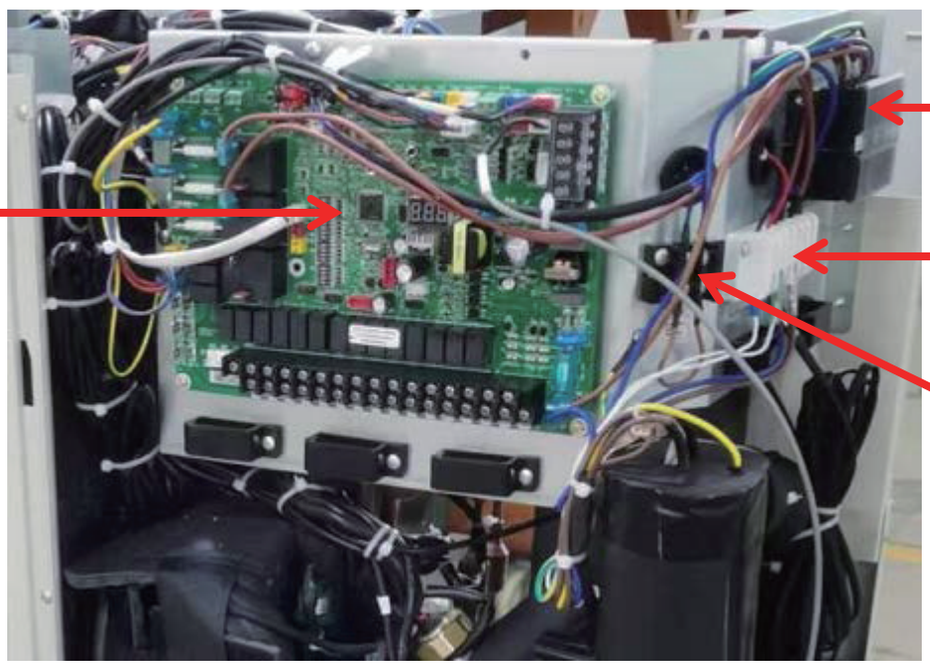
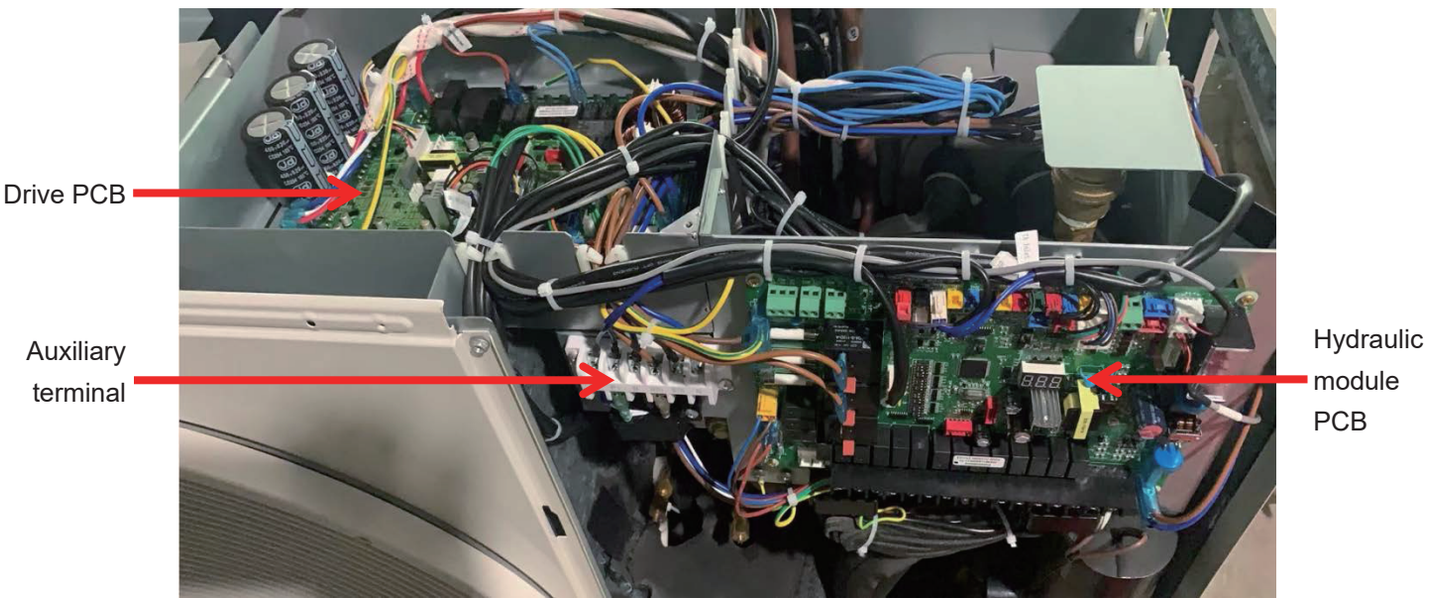


Figure 4-1.3: XFMH10S3/XFMH12S3



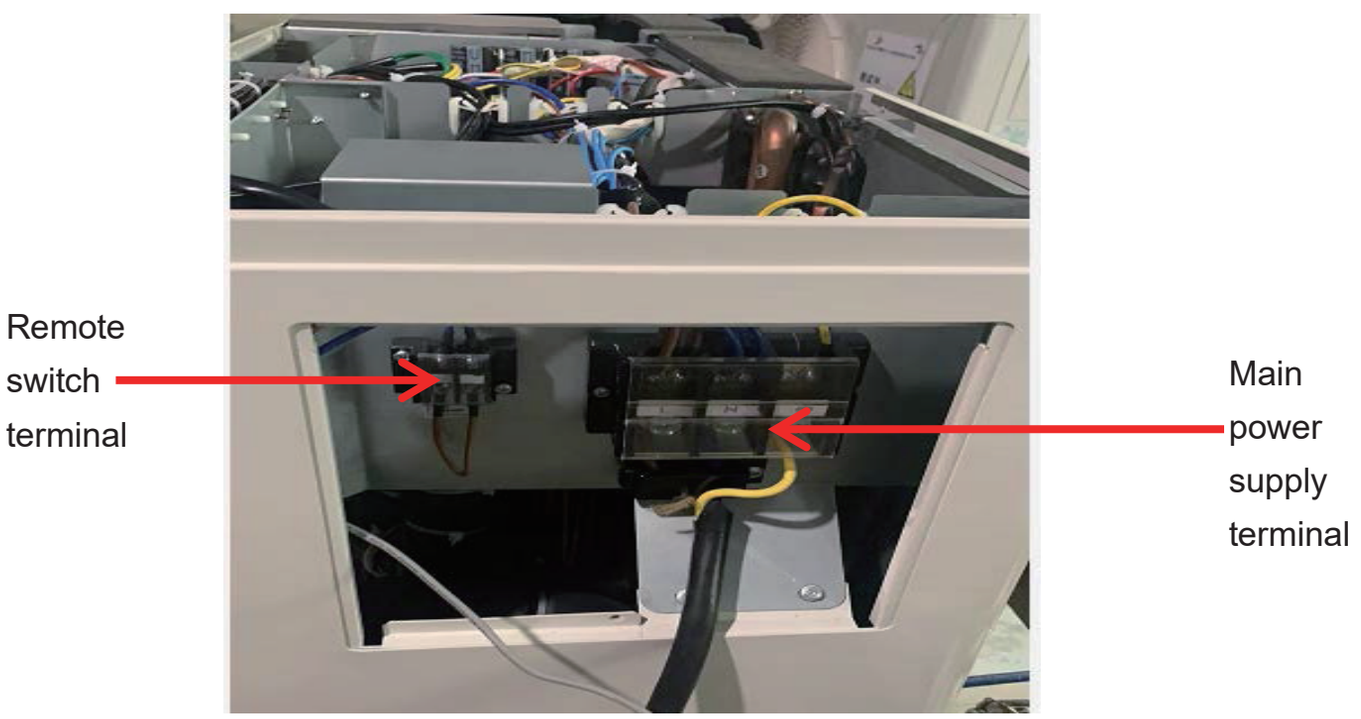
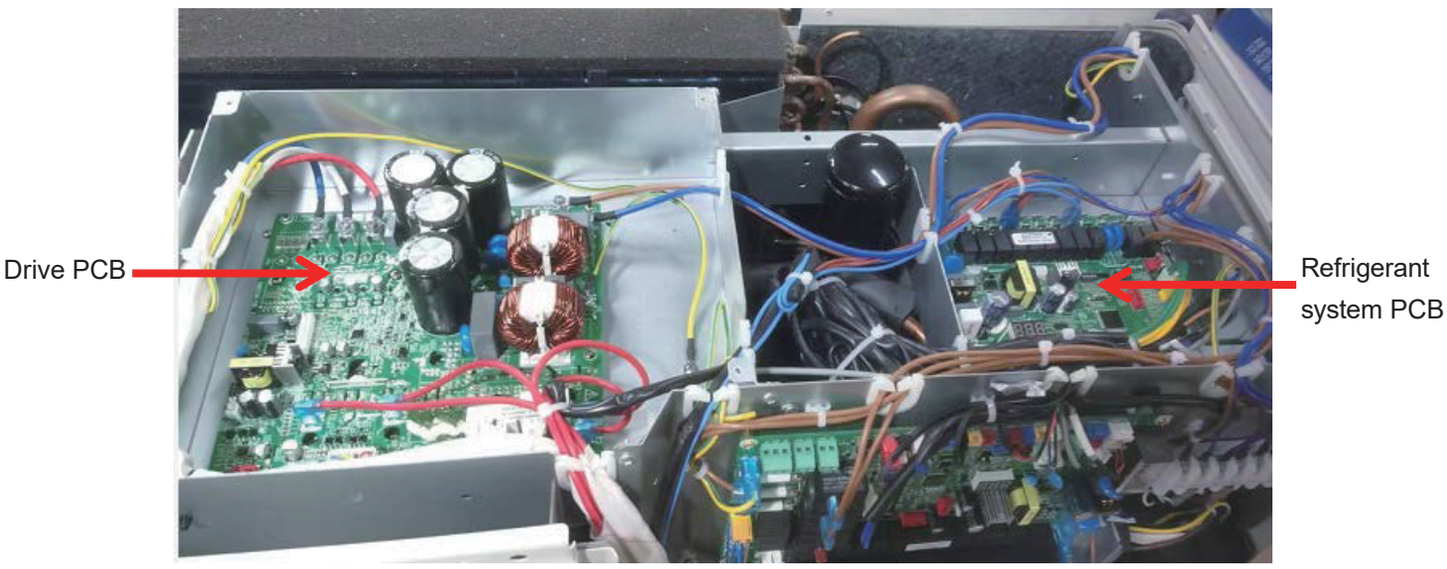
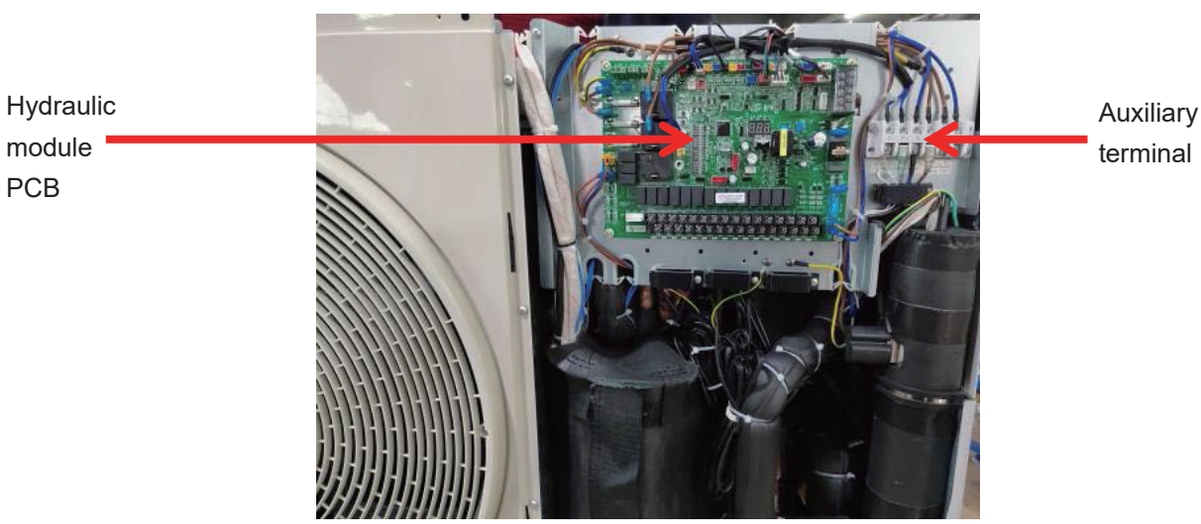


Figure 4-1.4: XFMH14S3/XFMH16S3





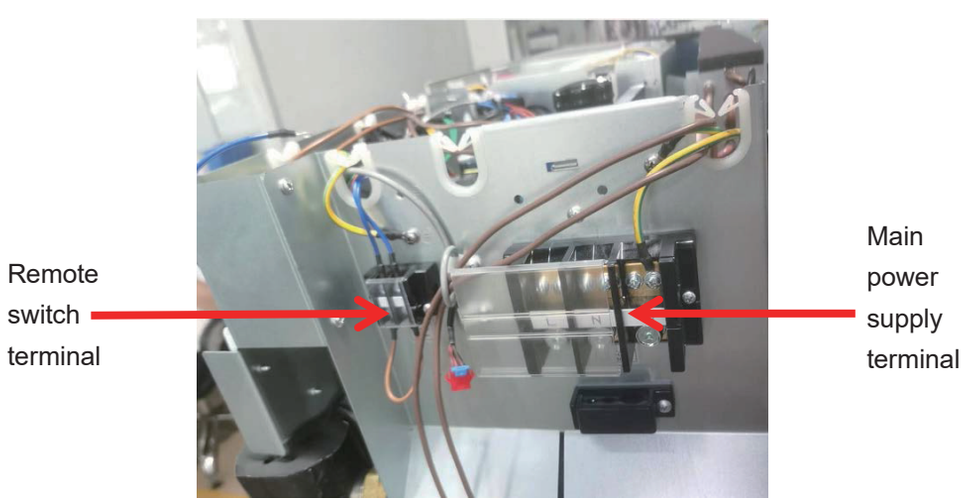
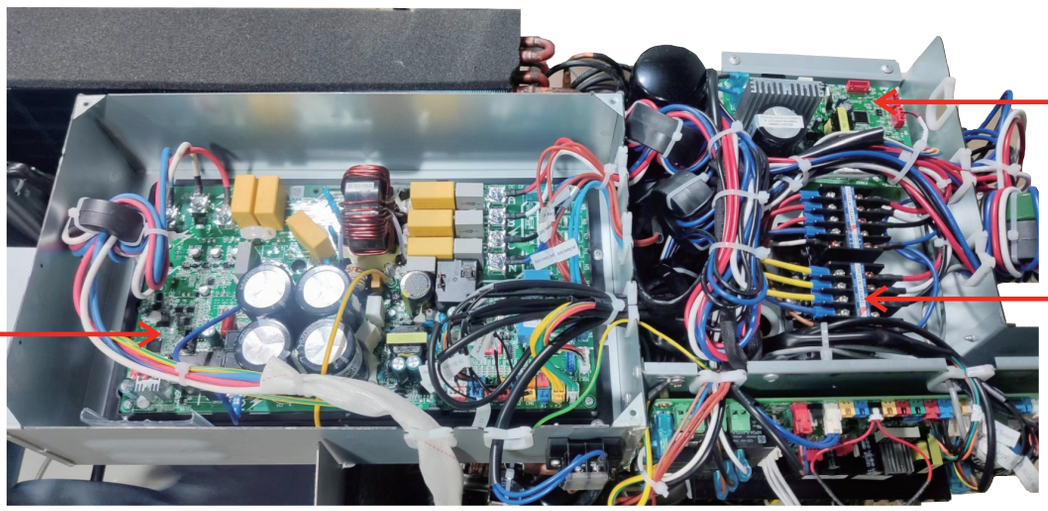
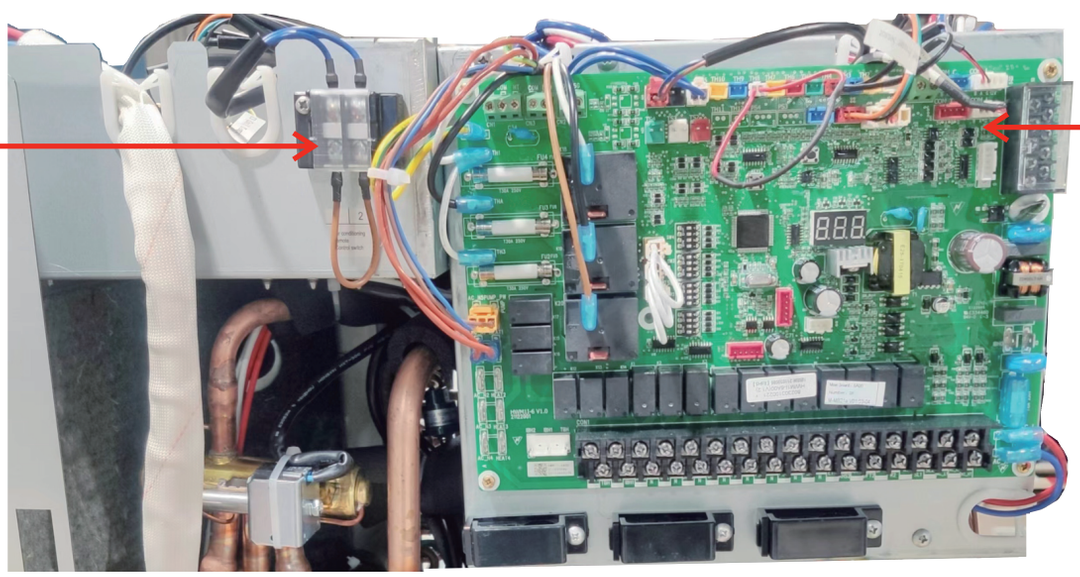


Figure 4-1.5: XFMH12T9





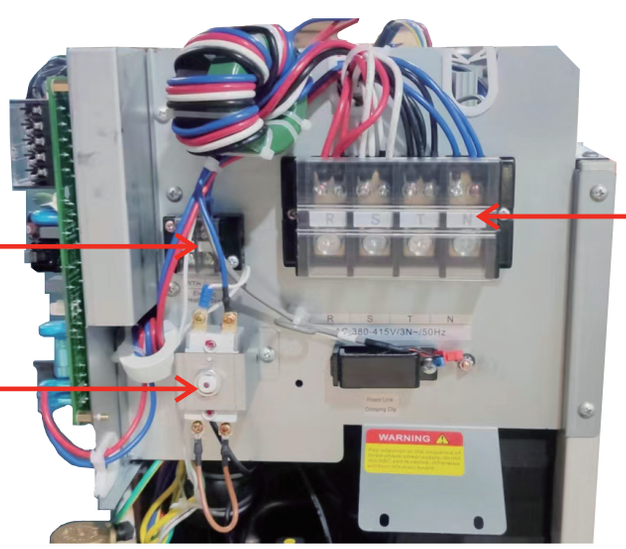
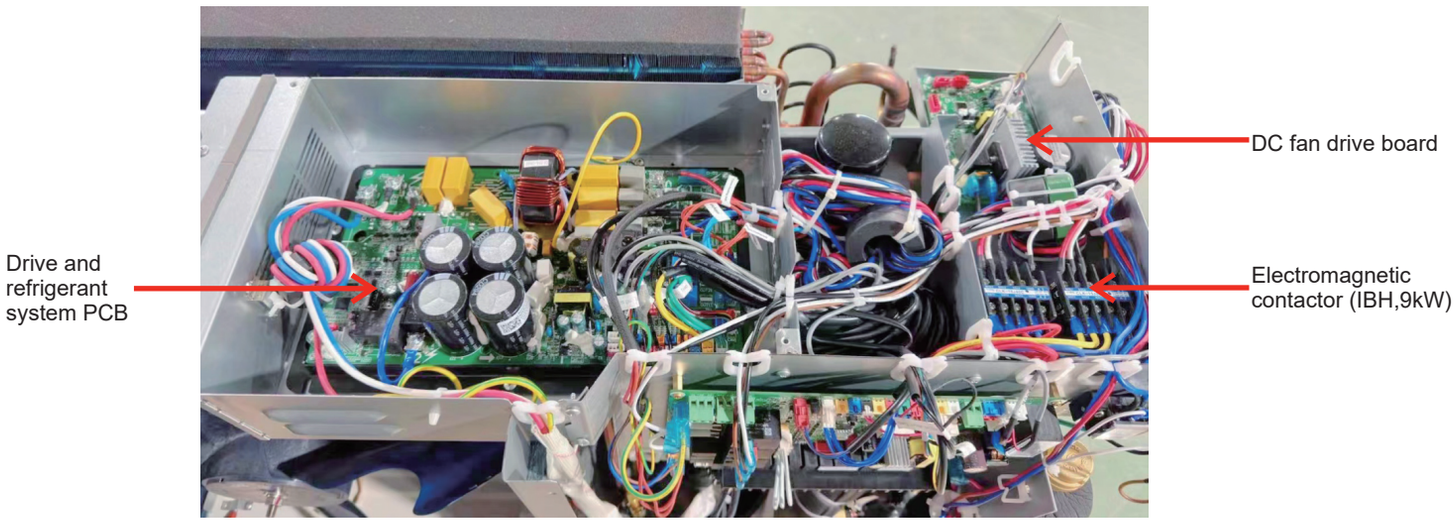
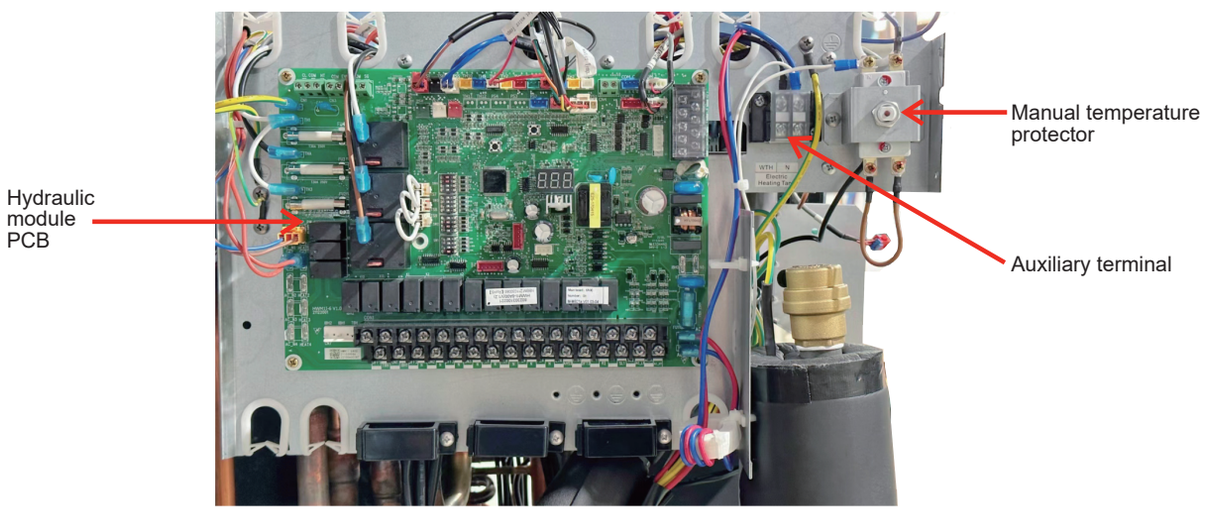
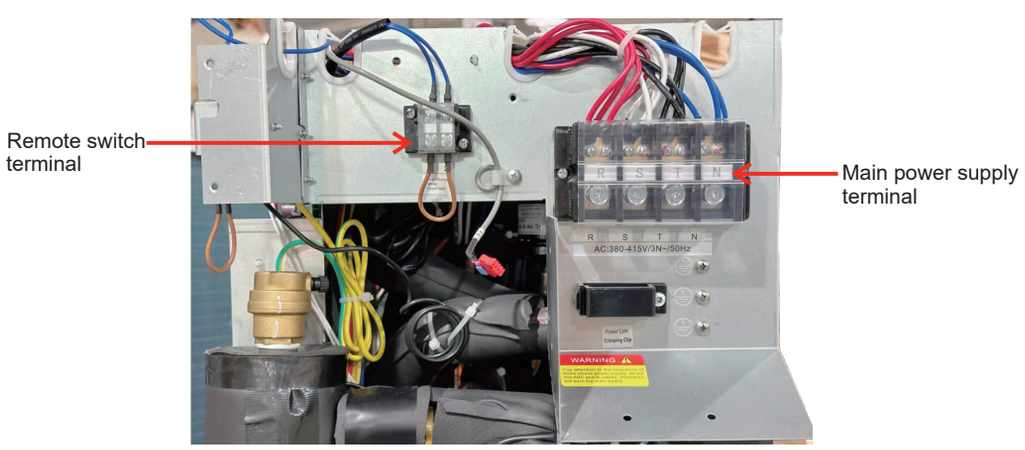


Figure 4-1.6 XFMH14T9/XFMH16T9







2. Unit PCBs

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.

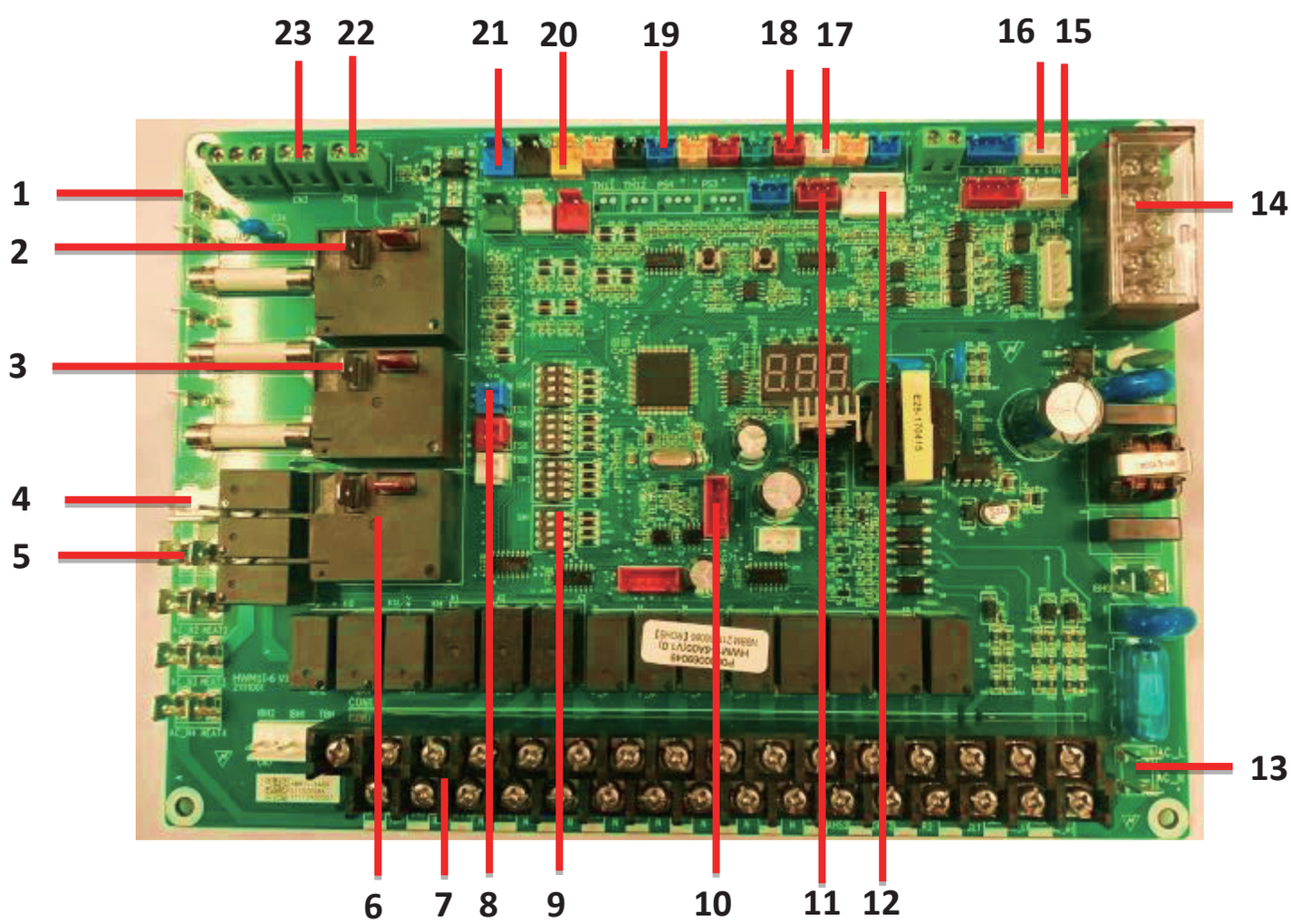
Tabel 4-2.1 PCB

Model/Number	4kW/6kW	8kW/10kW	12kW	14kW/16kW	10kW/12kW/14kW/16kW (3-Phase)
Refrigerant system module	1	1	1	1	1
Inverter module				1	
DC Fan drive board					1
Hydraulic module PCB	1	1	1	1	1
Total	2	2	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, 4-2.5,4-2.7. For 4/6/8/10/12kW and 3-phase 10/12/14/16kW, 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. For 3-phase 10/12/14/16kW DC Fan drive PCB and refrigerant system PCB are separate.

2.2 Hydraulic Module PCB

Figure 4-2.1: PCB for Hydraulic Module



Cooling and defrosting operation (4-16KW for example)

Figure 4-2.2: Refrigerant flow during cooling and defrosting operations

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

2.3 Drive and refrigerant system PCB

Figure 4-2.2: XFMH04S3/XFMH06S3

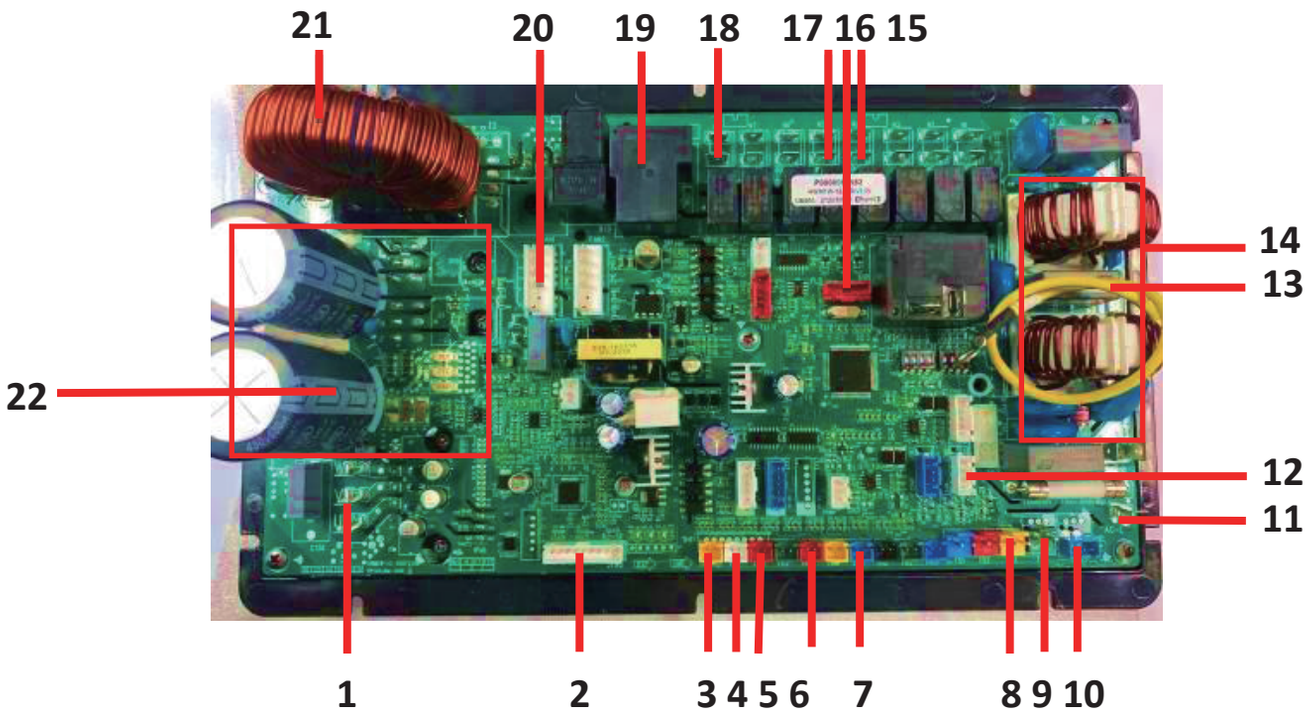


Table 4-2.3 XFMH04S3/XFMH06S3

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	4-way valve
16	FLS	PCB Program update
17	OUT 5	Chassis heater
18	OUT 8	Crankcase heater
19	K9	Relay
20	FAN1	DC fan
21	L5	Inductor
22	/	Drive components

Figure 4-2.3: XFMH08S3

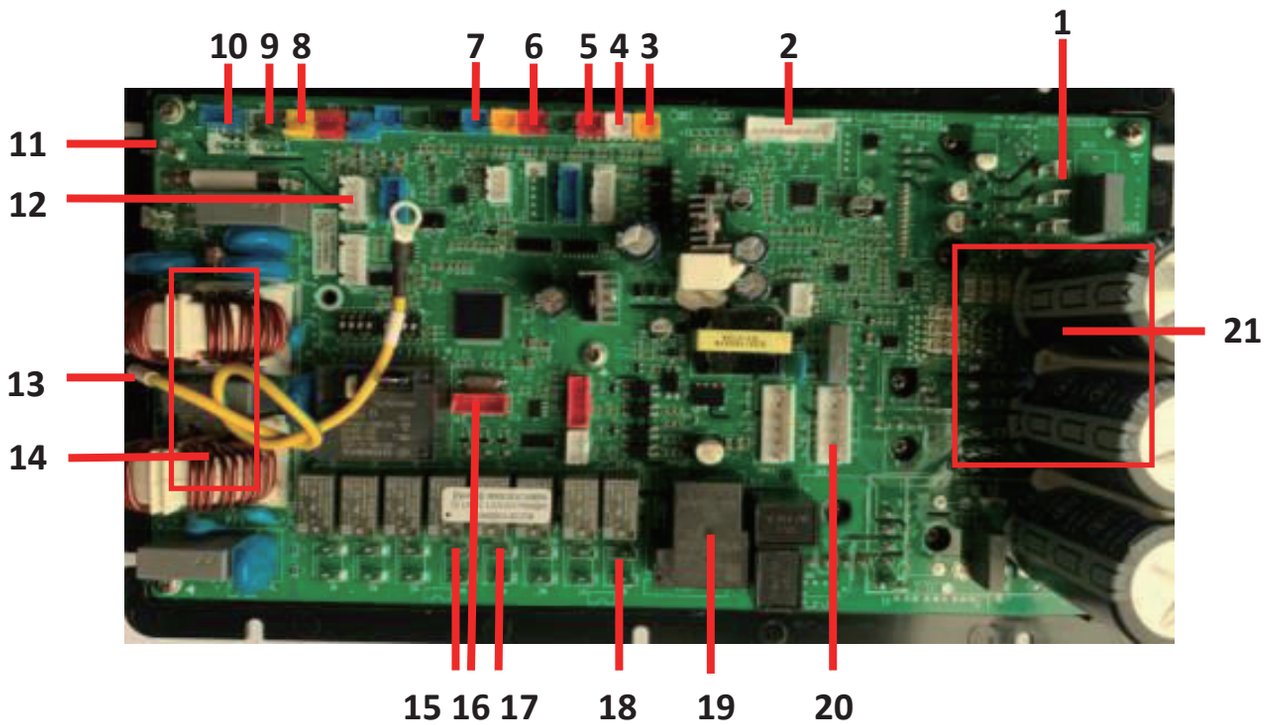


Table 4-2.4: XFMH08S3

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	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	L5	Drive components

Figure 4-2.4: XFMH10S3/XFMH12S3

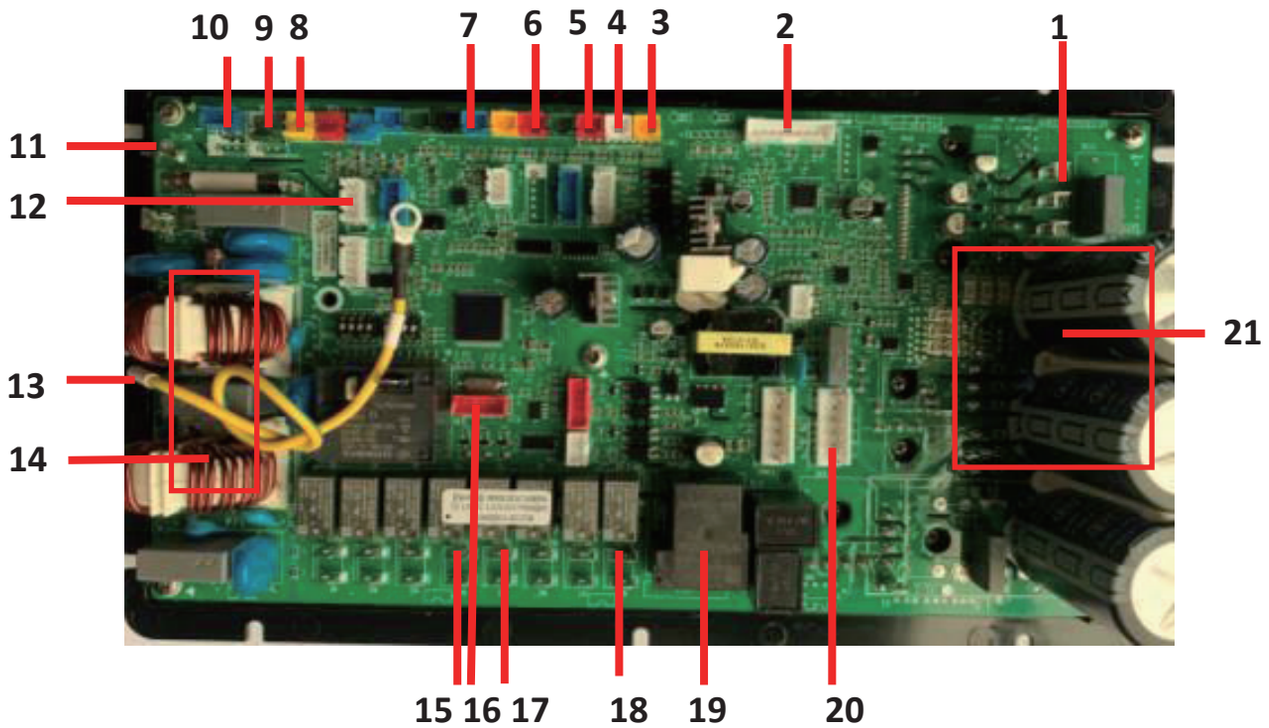


Table 4-2.5: XFMH10S3/XFMH12S3

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	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	L5	Drive components

Figure 4-2.5: XFMH14S3/XFMH16S3 Drive PCB

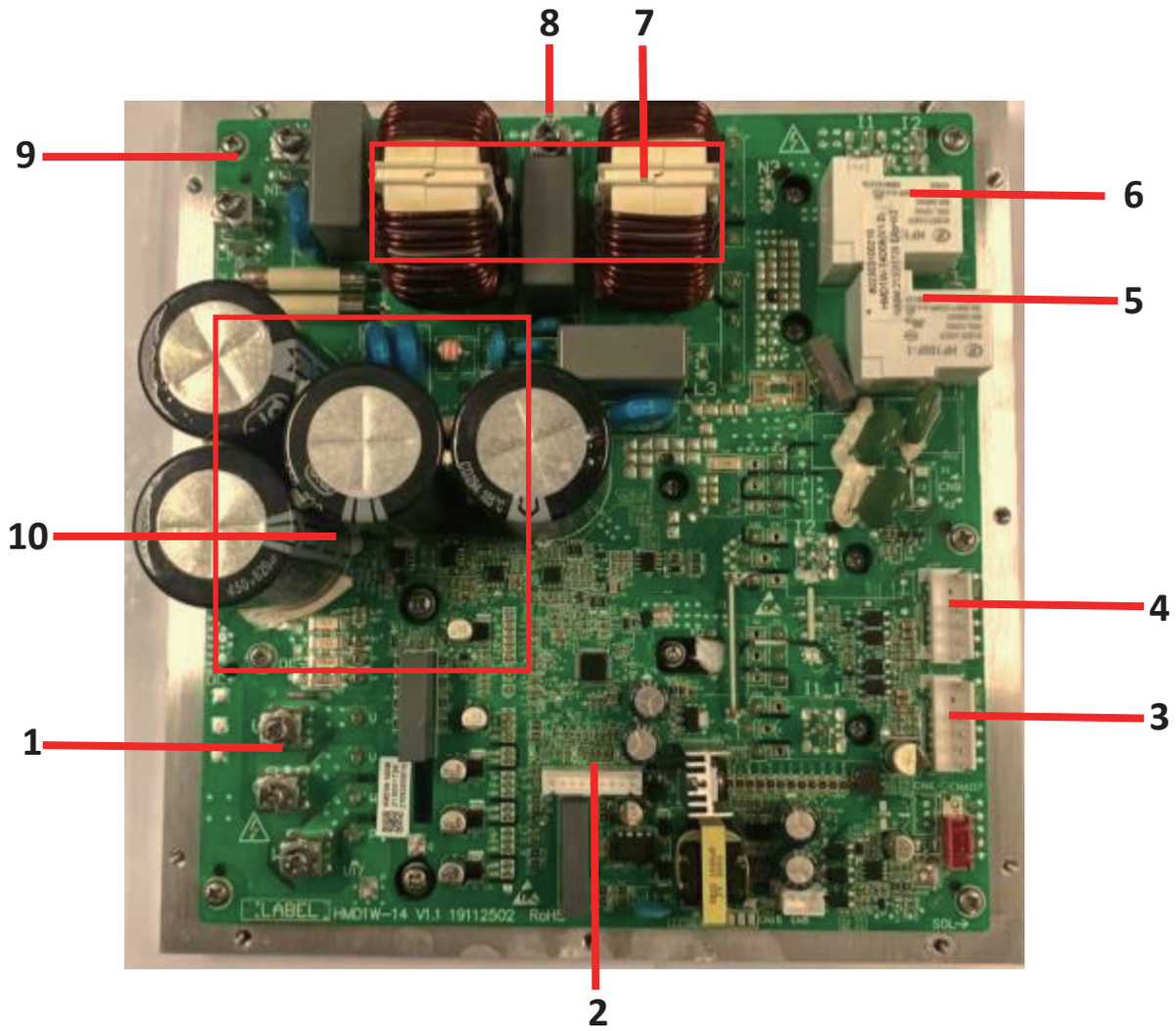


Table 4-2.6: XFMH14S3/XFMH16S3 Drive PCB

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 4-2.6: XFMH14S3/XFMH16S3 Refrigerant System PCB

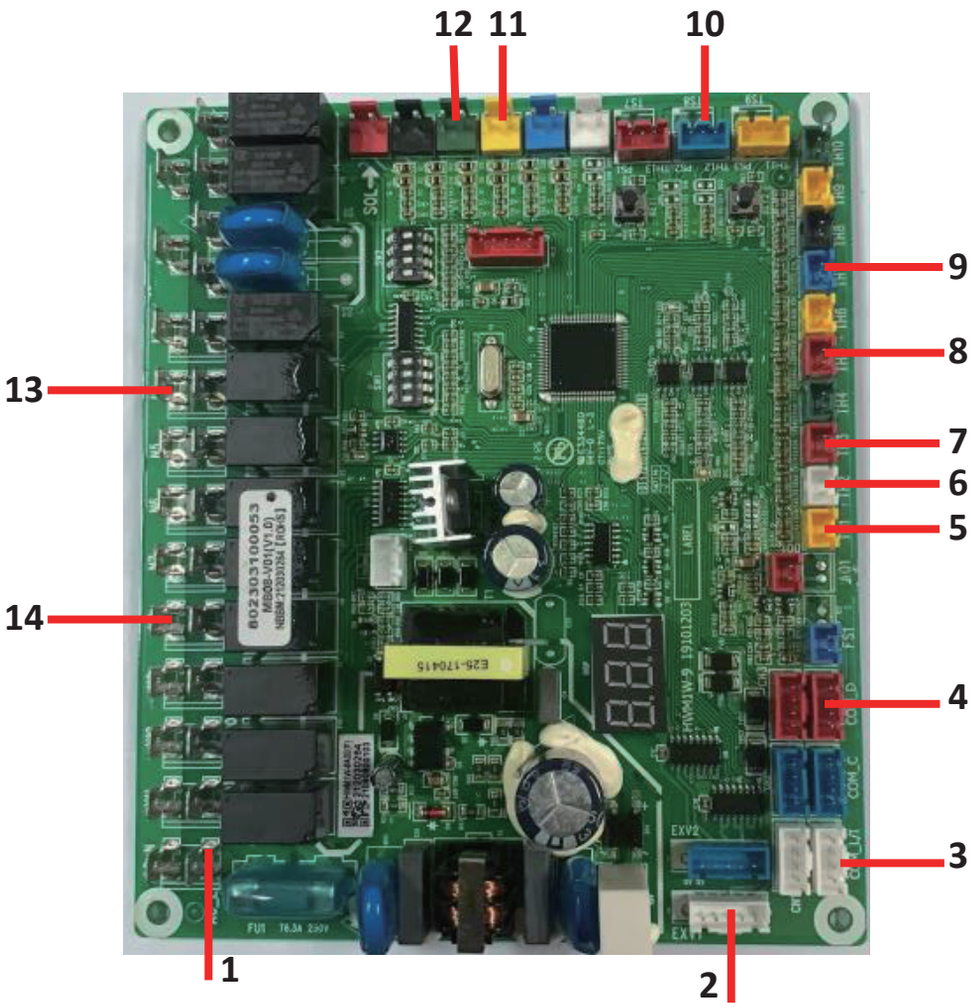


Table 4-2.7: XFMH14S3/XFMH16S3 Refrigerant System PCB

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

Figure 4-2.7: PCB A, XFMH12T9/XFMH14T9/XFMH16T9, Drive and Refrigerant System PCB

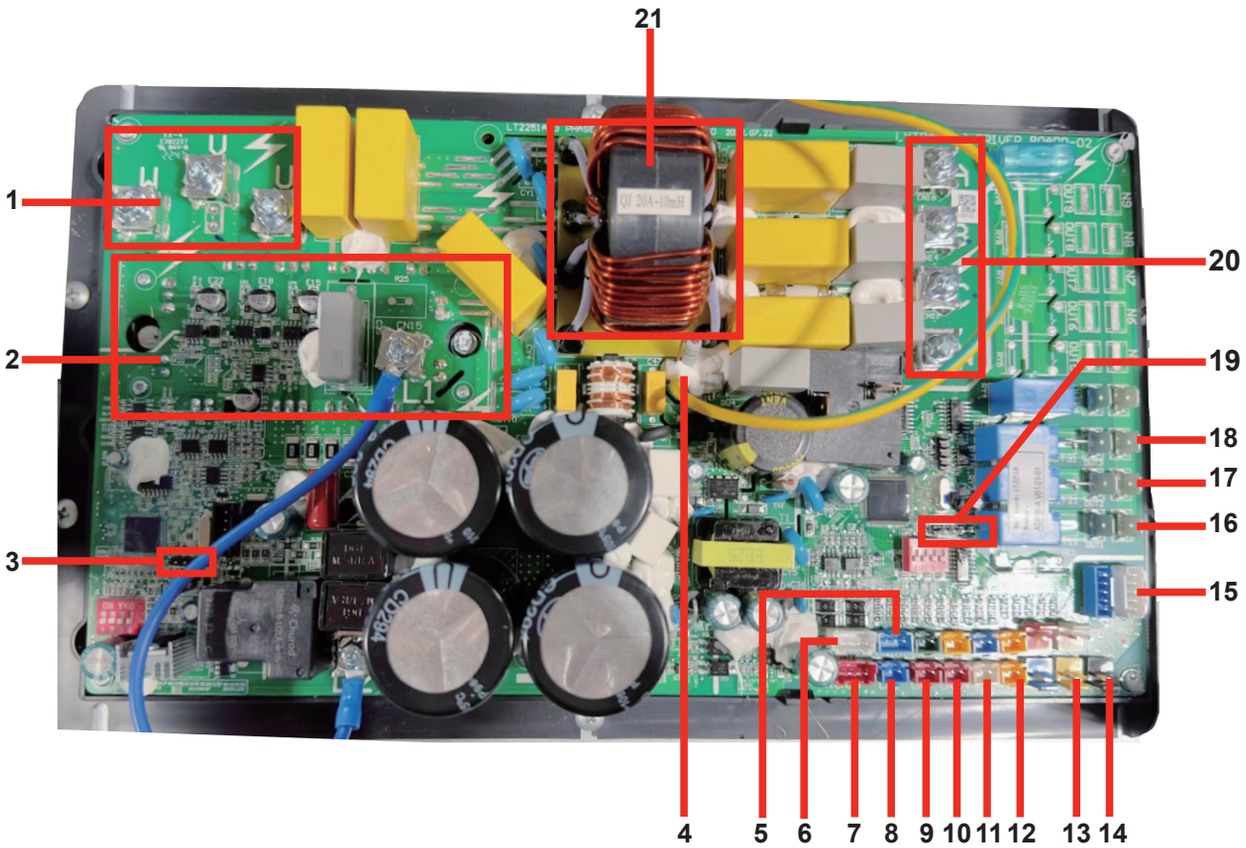


Table 4-2.8: XFMH12T9/XFMH14T9/XFMH16T9

Items	Port label	function
1	U/V/W	Compressor output
2	/	Drive components
3	JS3	Driver Update
4	PE1	Port for ground
5	CN10	LPS: Low pressure sensor
6	CN12	Communication with DC fan drive board
7	CN24	Communication with hydraulic module PCB
8	CN5	Suction temperature sensor
9	CN4	Discharge temperature sensor
10	CN3	Refrigerant liquid temperature sensor
11	CN2	Outdoor ambient temperature sensor
12	CN1	Coil temperature sensor
13	K3	HP2: Middle pressure switch
14	K5	HP1: High pressure switch
15	EXV1	Electric expansive valve
16	N1/OUT 1	4-way valve
17	N2/OUT 2	Chassis heater
18	N3/OUT 3	Crankcase heater
19	JS2	PCB program update
20	A/B/C/N	Power supply
21	/	Filter components

Figure 4-2.8: PCB B, XFMH12T9/XFMH14T9/XFMH16T9, DC fan and drive board

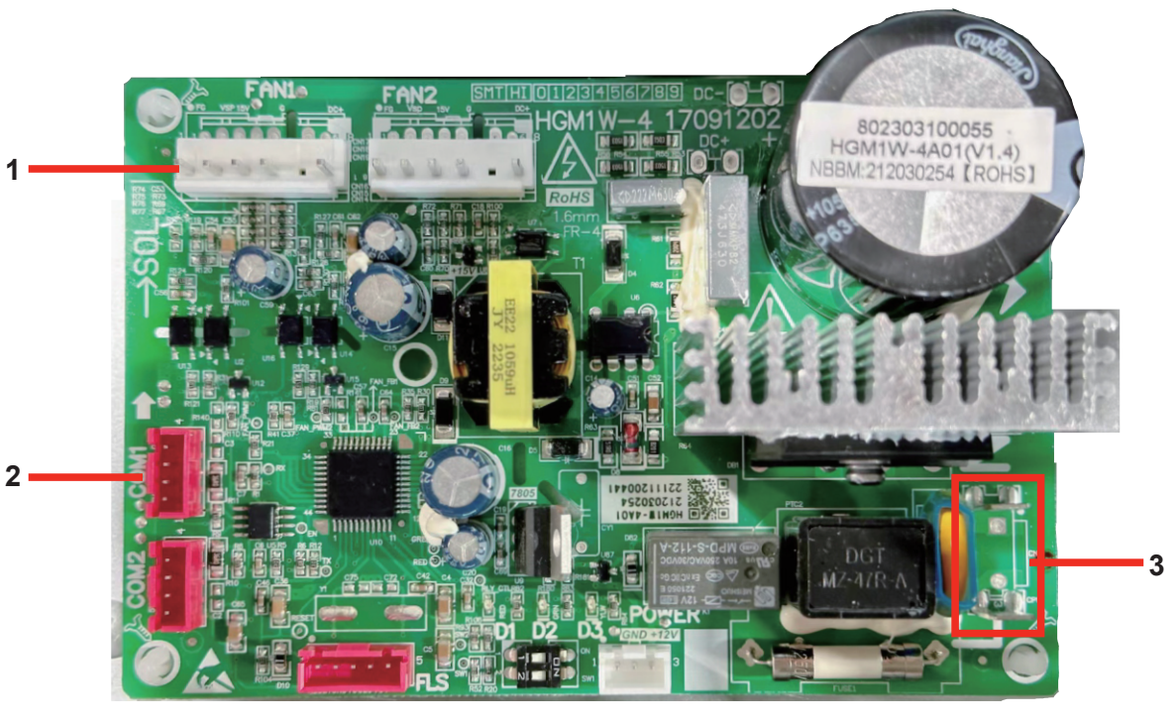


Table 4-2.9: XFMH12T9/XFMH14T9/XFMH16T9

Items	Port label	function
1	FAN 1	DC FAN
2	COM 1	Communication with Drive and refrigerant system PCB
3	L/N	Power supply

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 .Troubleshooting

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.

4.2 P01 diagnosis and analysis

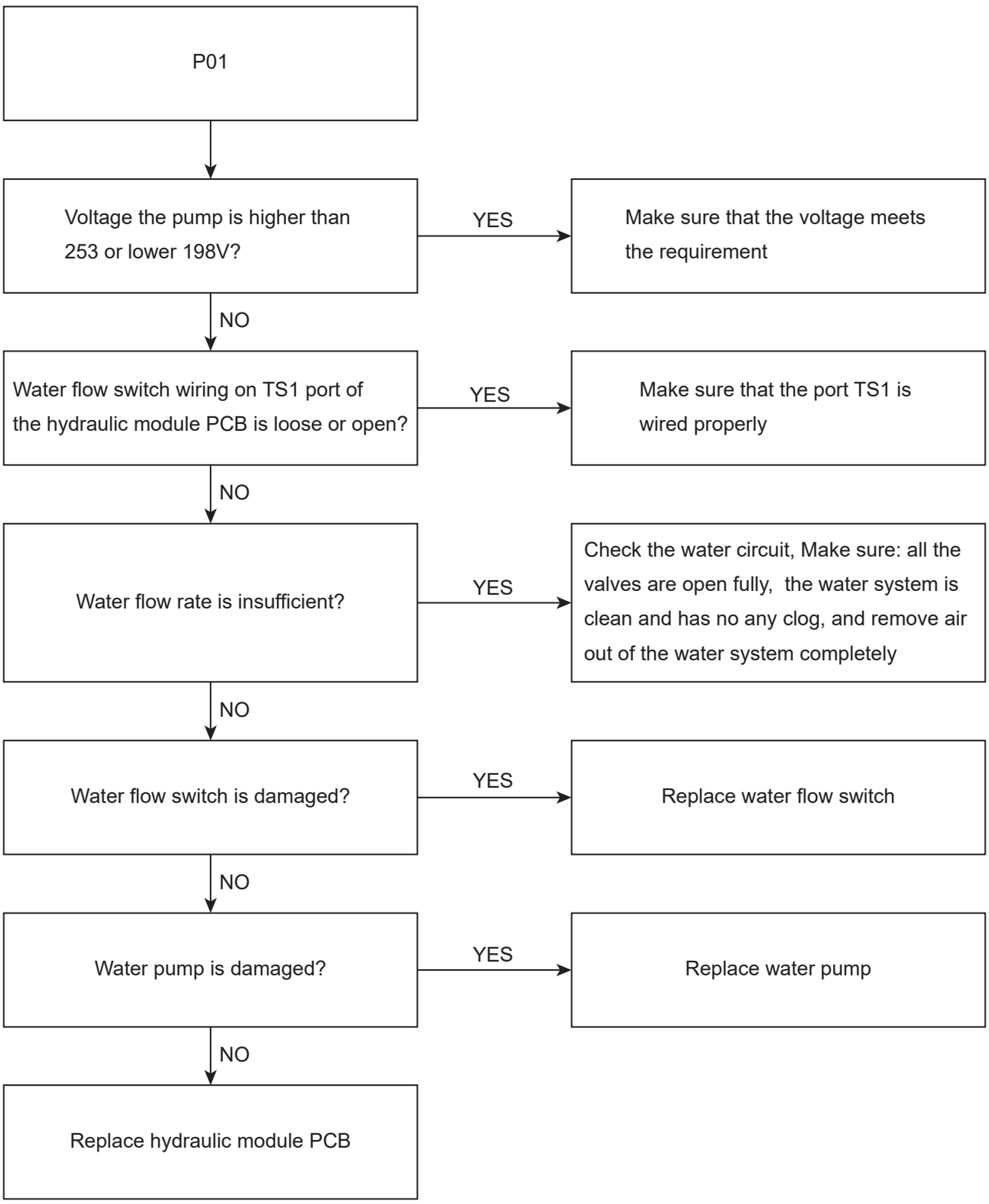
4.2.1 Diagnosis

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.

4.2.2 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.

4.2.3 Analysis and action



4.3 P02 diagnosis and analysis

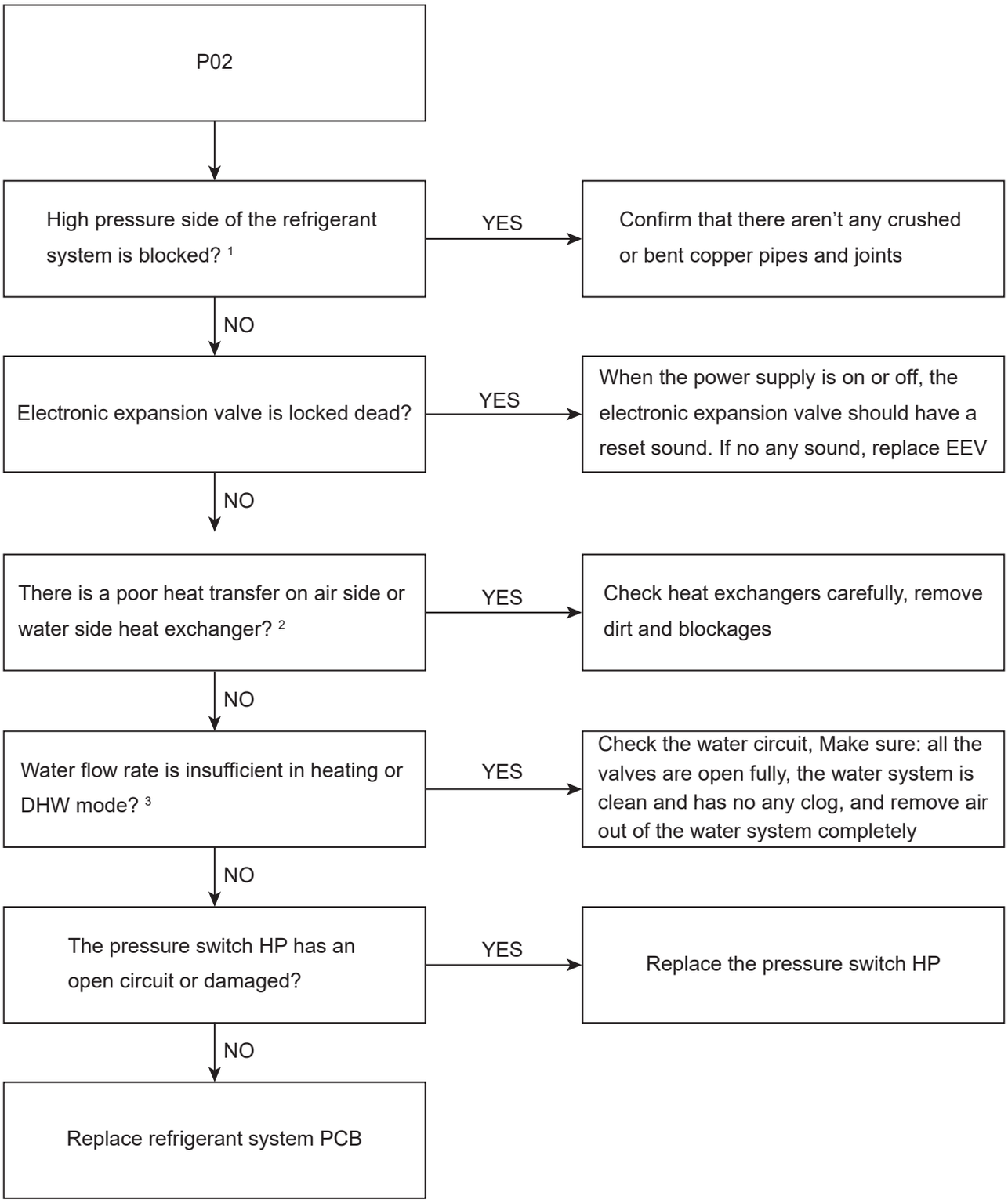
4.3.1 Diagnosis

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.

4.3.2 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.

4.3.3 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 P03 diagnosis and analysis

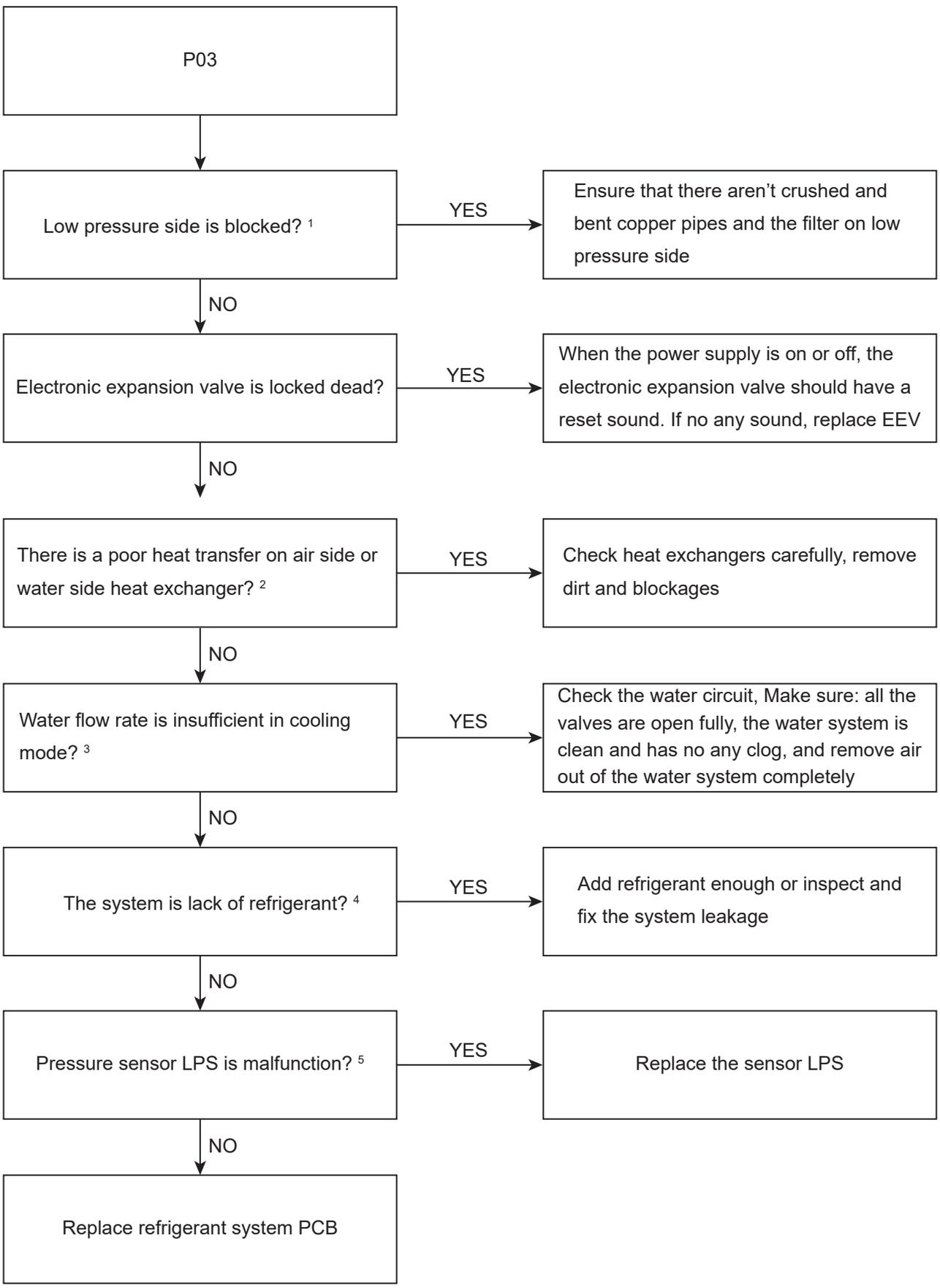
4.4.1 Diagnosis

Code P03 means 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.

4.4.2 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.

4.4.3 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.

4.5 P04 diagnosis and analysis

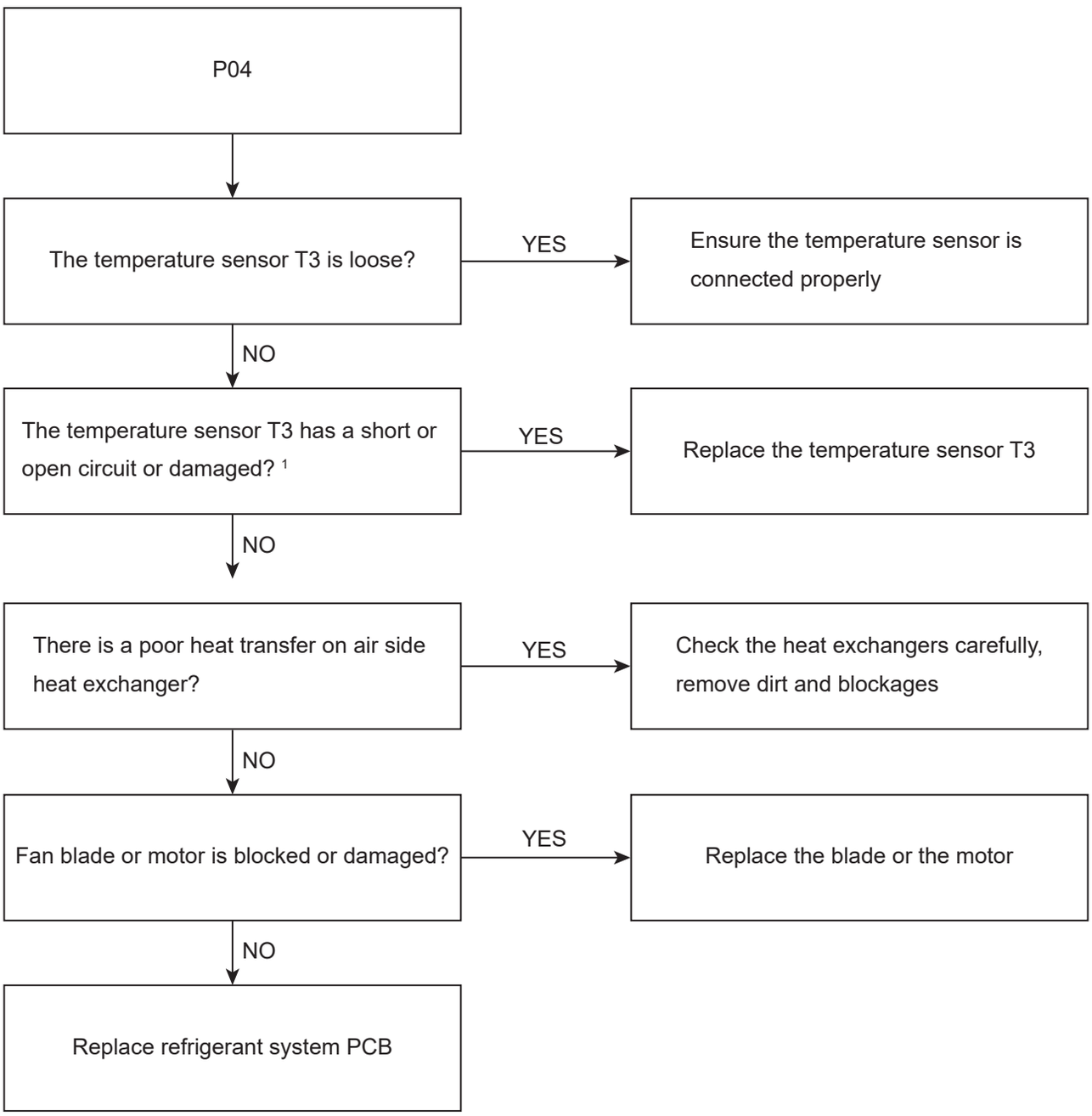
4.5.1 Diagnosis

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 P04disappears and heat pump will be ready for next startup.

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.

4.5.3 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, 5.1 "Temperature Sensor Resistance Characteristics".

4.6 P05 diagnosis and analysis

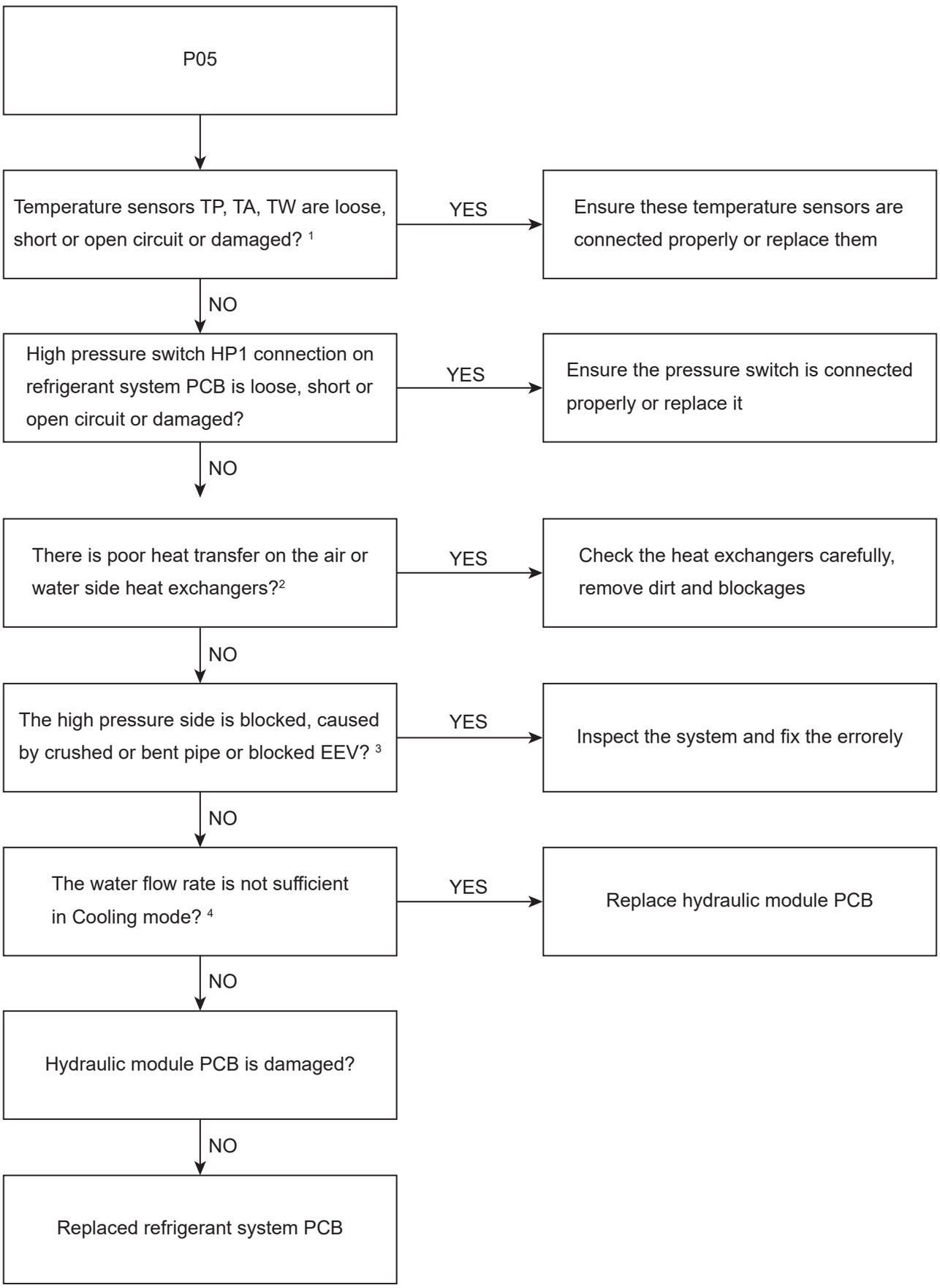
4.6.1 Diagnosis

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°Cfor 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 disappears and heat pump will be ready for next startup.

4.6.2 Possible causes

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

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, 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.

4.7 P06 diagnosis and analysis

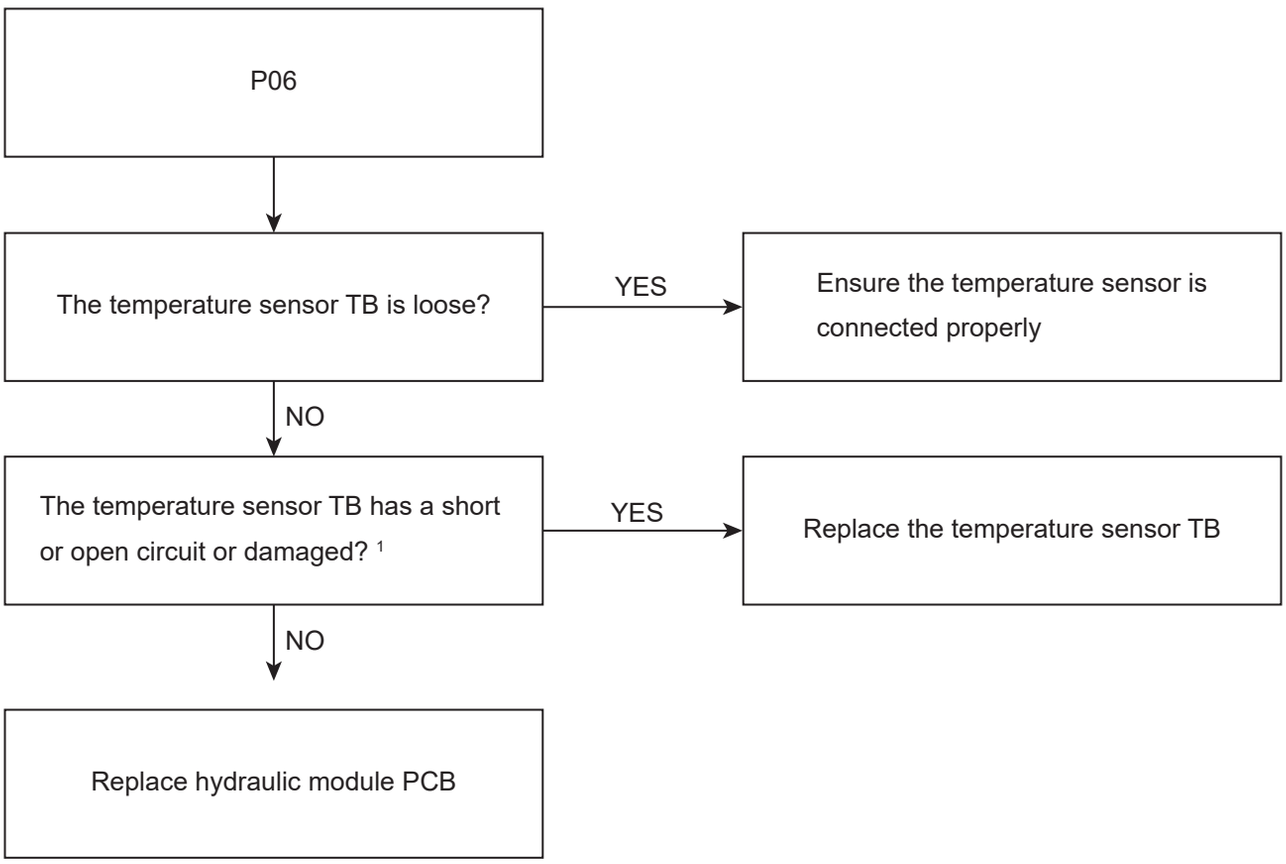
4.7.1 Diagnosis

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.

4.7.2 Possible causes

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

4.7.3 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, 5.1 "Temperature Sensor Resistance Characteristics".

4.8 P07 diagnosis and analysis

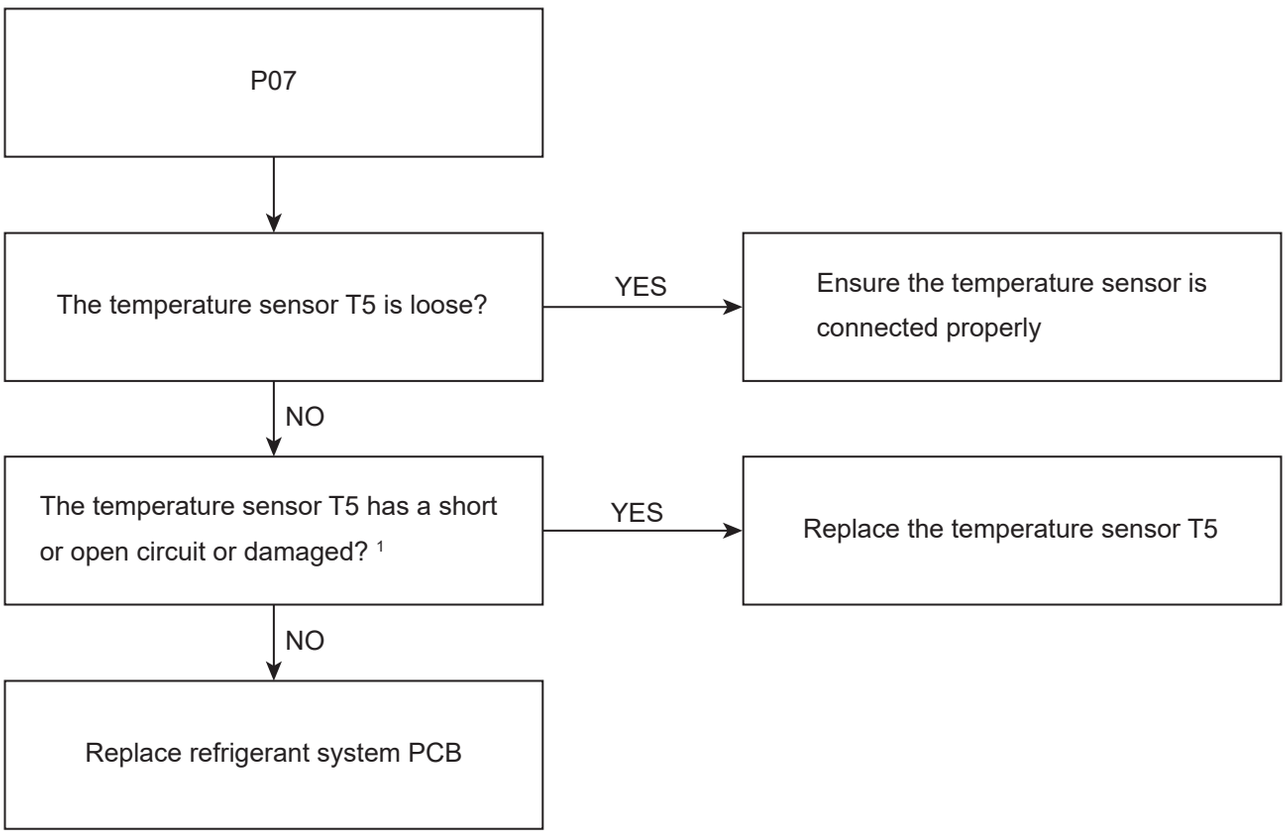
4.8.1 Diagnosis

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.

4.8.2 Possible causes

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

4.8.3 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, 5.1 "Temperature Sensor Resistance Characteristics".

4.9 P08 diagnosis and analysis

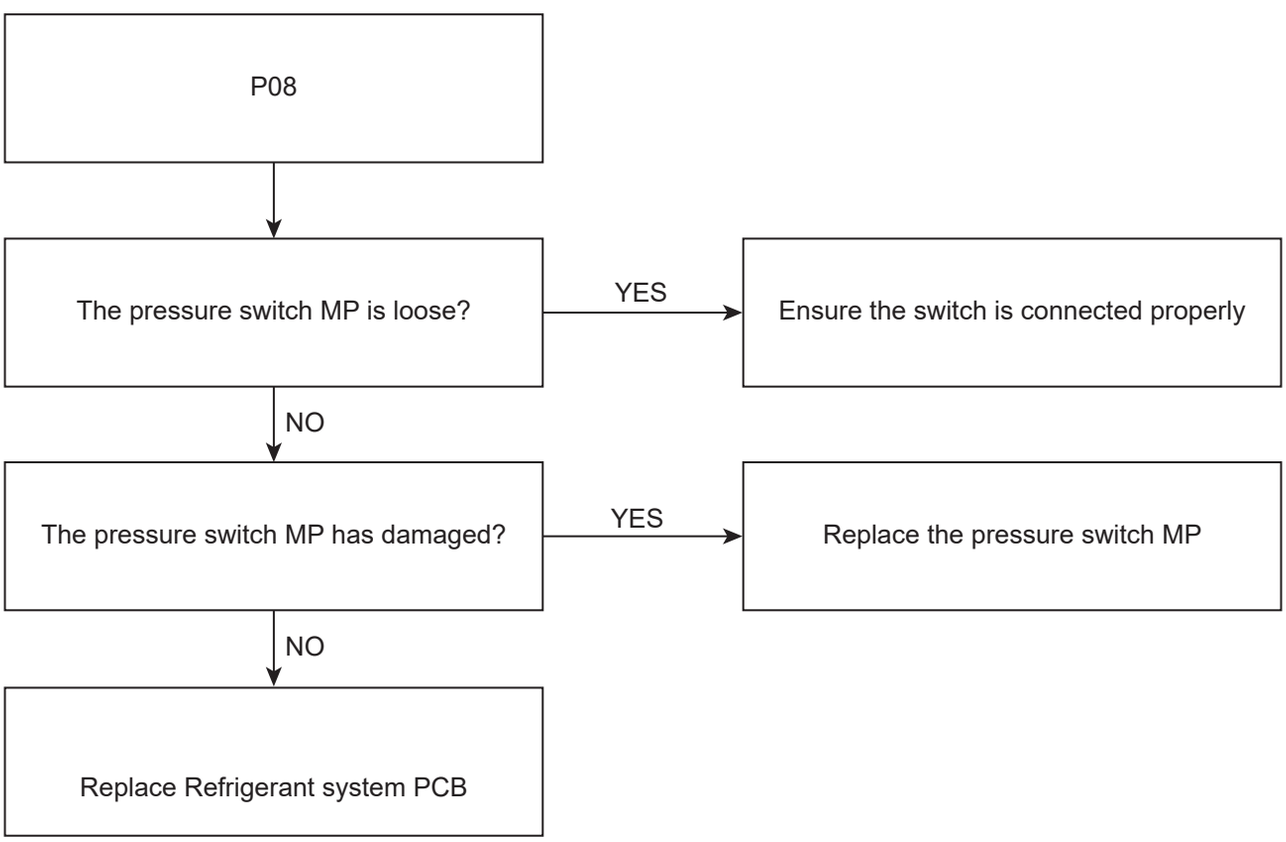
4.9.1 Diagnosis

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.

4.9.2 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.

4.9.3 Analysis and action



4.10 P10 diagnosis and analysis

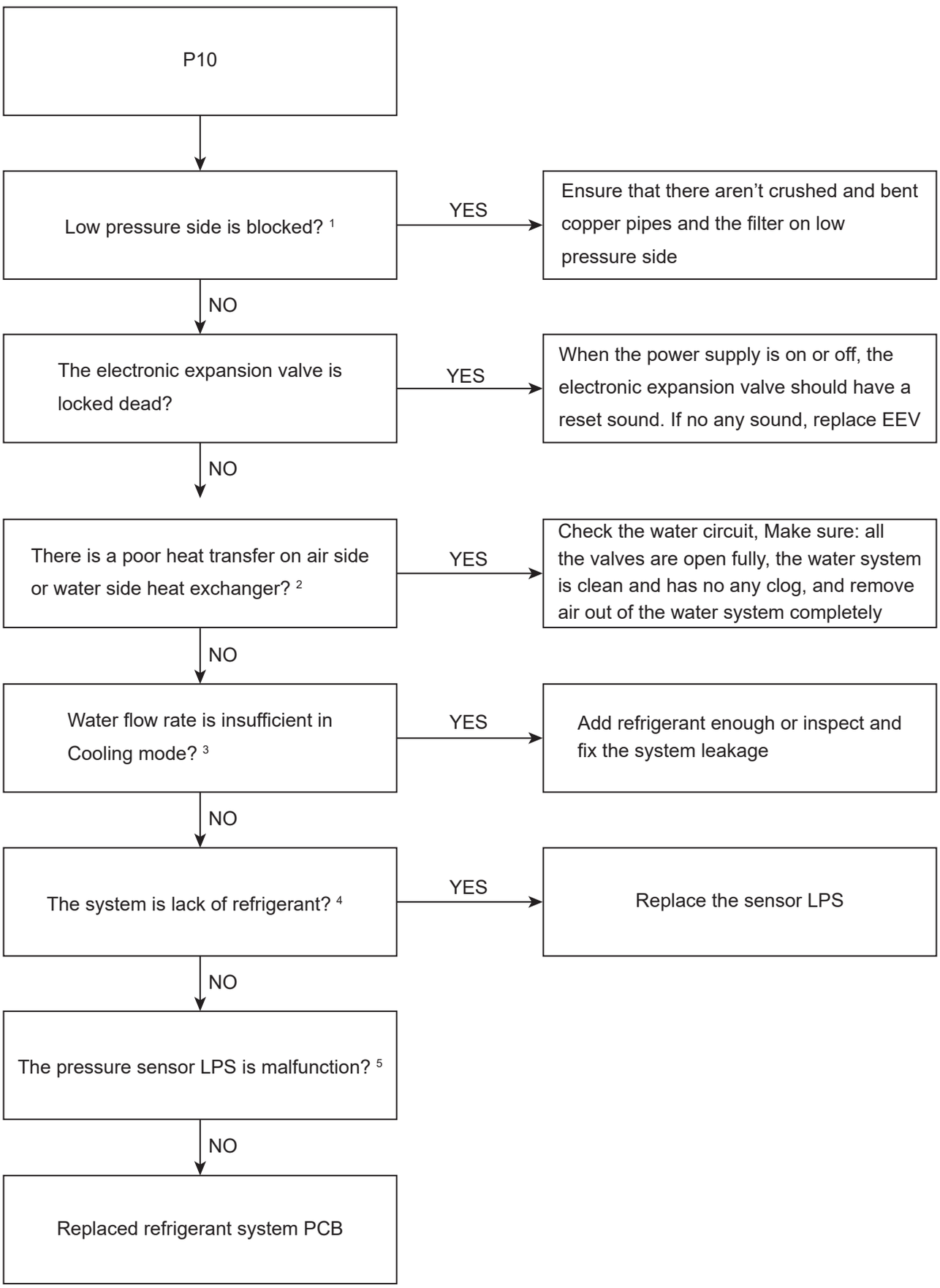
4.10.1 Diagnosis

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.

4.10.2 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.

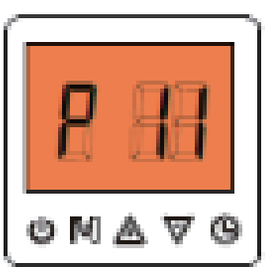
4.10.3 Analysis and action



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.

4.11 P11 diagnosis and analysis



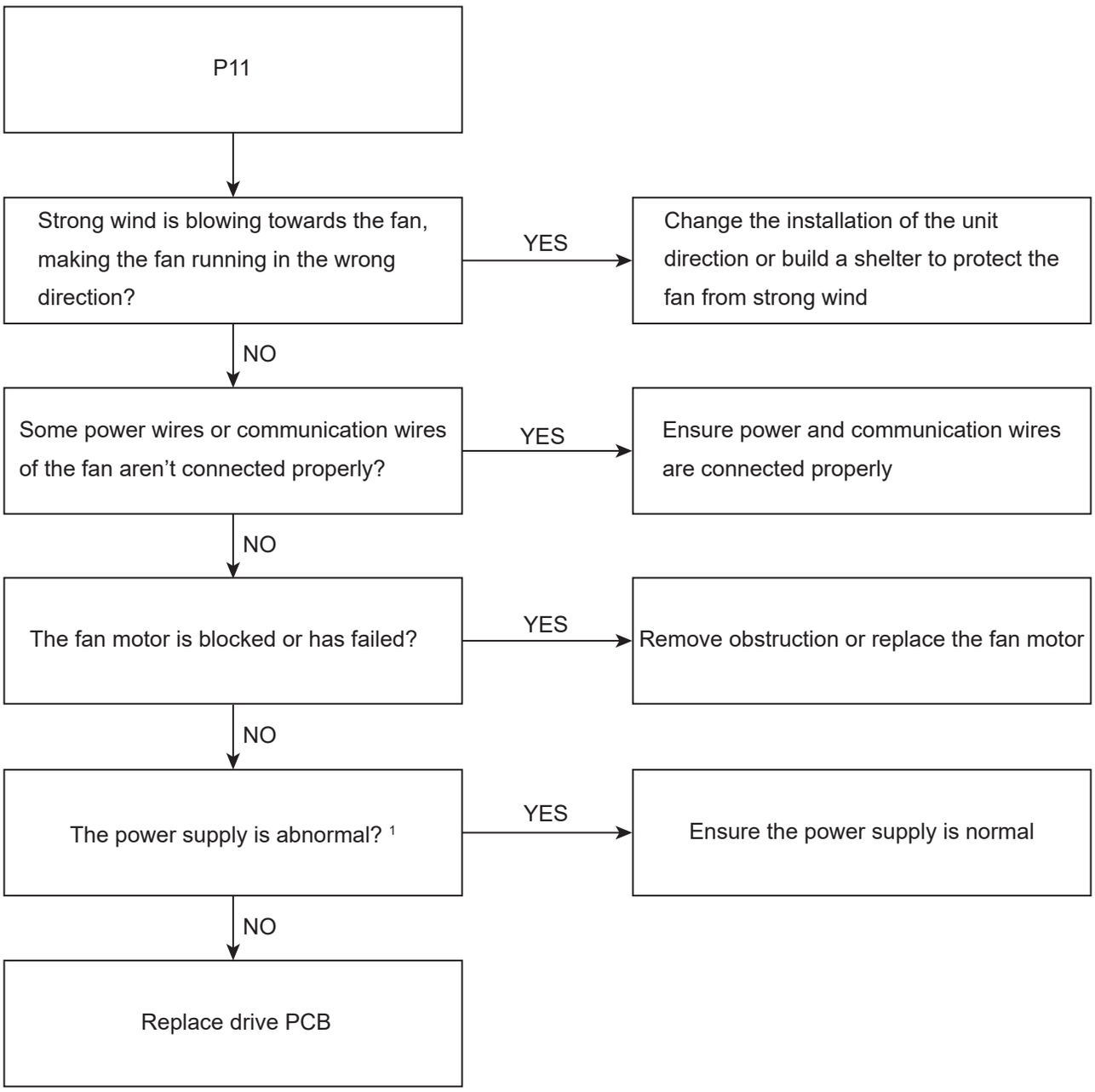
4.11.1 Diagnosis

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.

4.11.2 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.

4.11.3 Analysis and action



Notes:

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.

4.12 P13 diagnosis and analysis

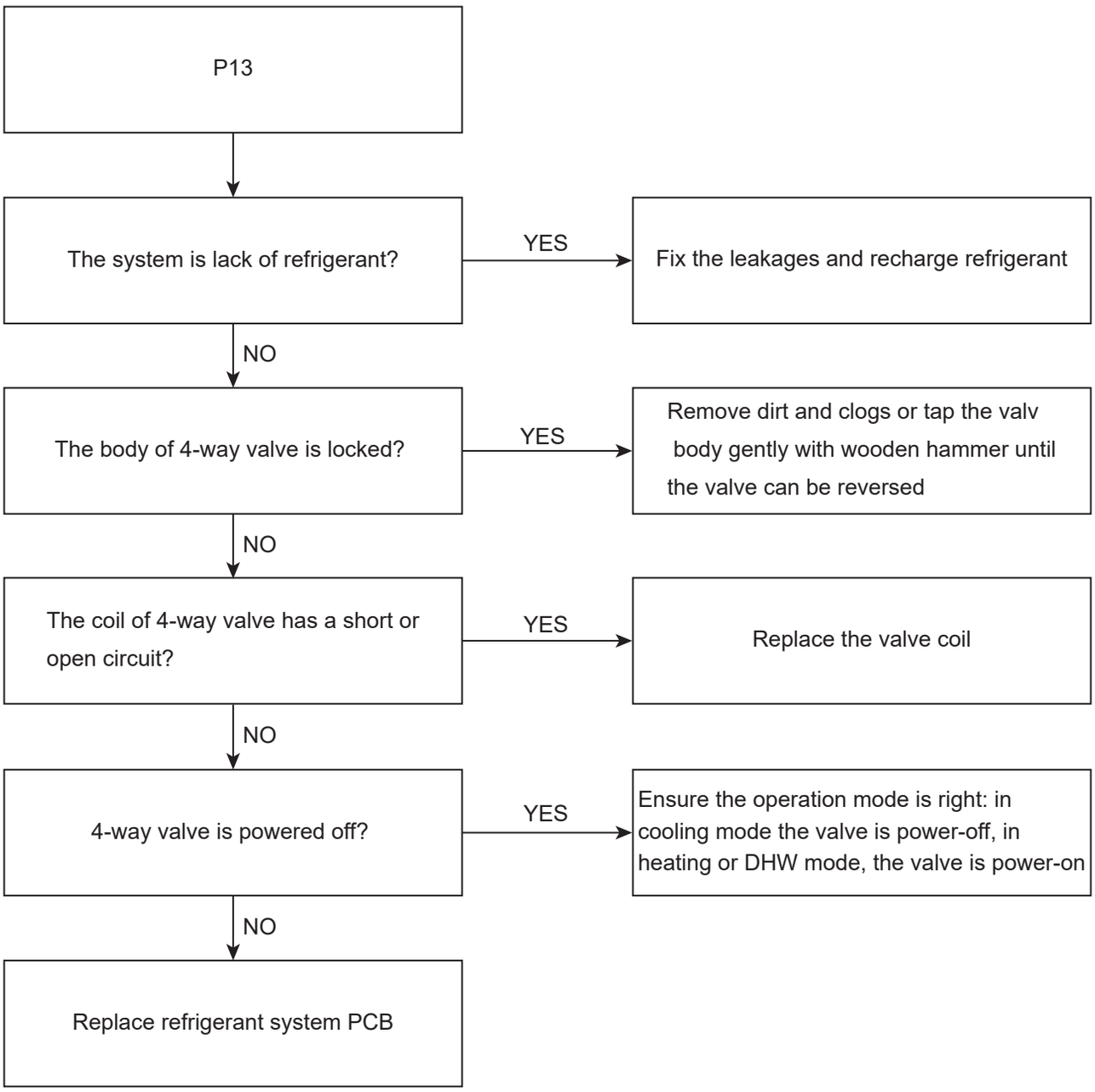
4.12.1 Diagnosis

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.

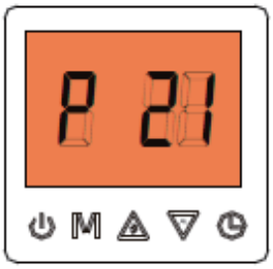
4.12.2 Possible causes

- 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.

4.12.3 Analysis and action



4.13 P21 diagnosis and analysis



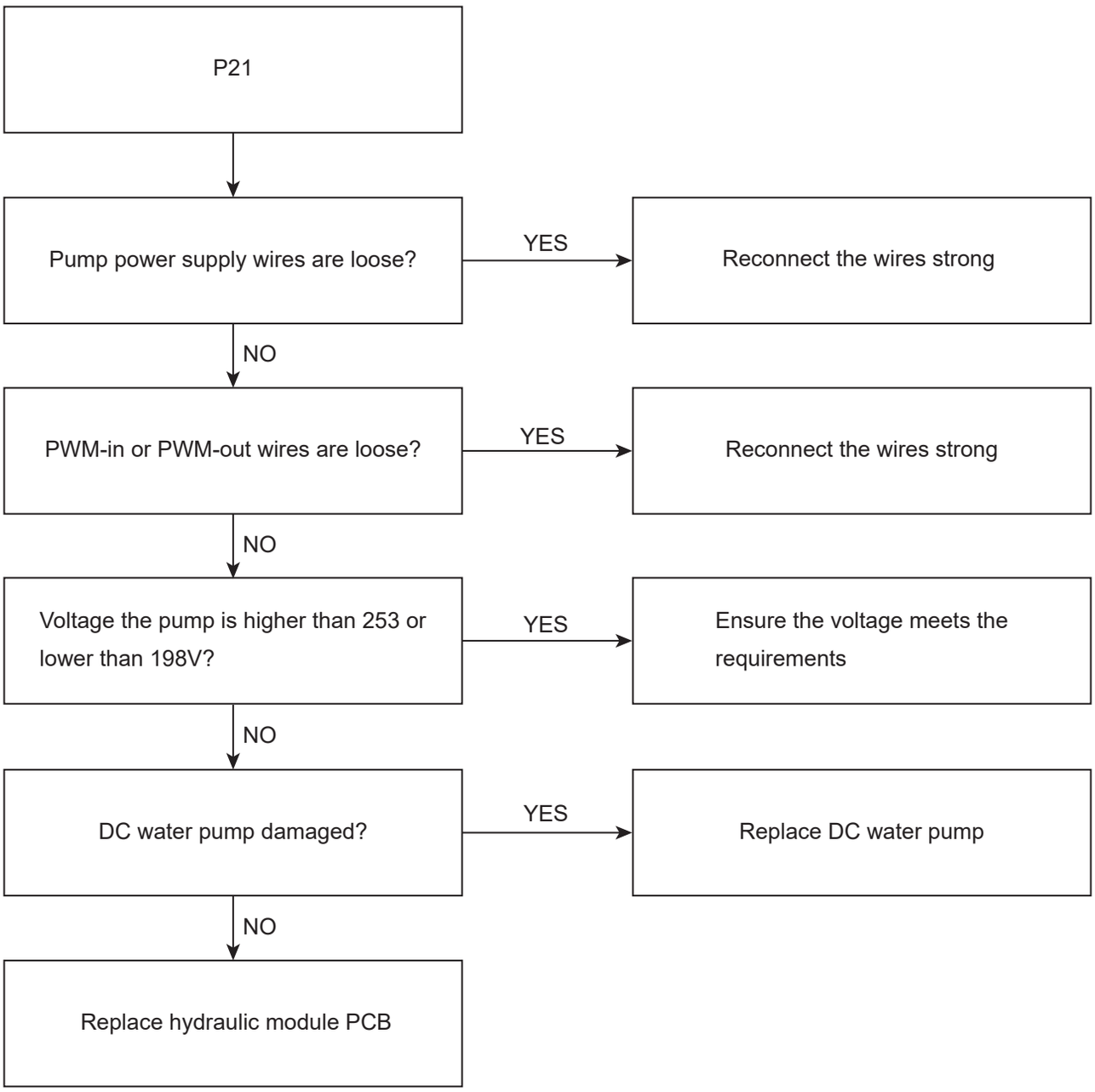
4.13.1 Diagnosis

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

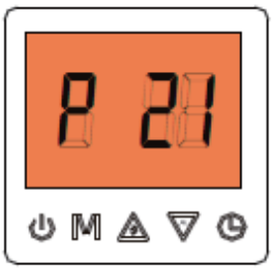
4.13.2 Possible causes

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

4.13.3 Analysis and action



4.14 P25 diagnosis and analysis



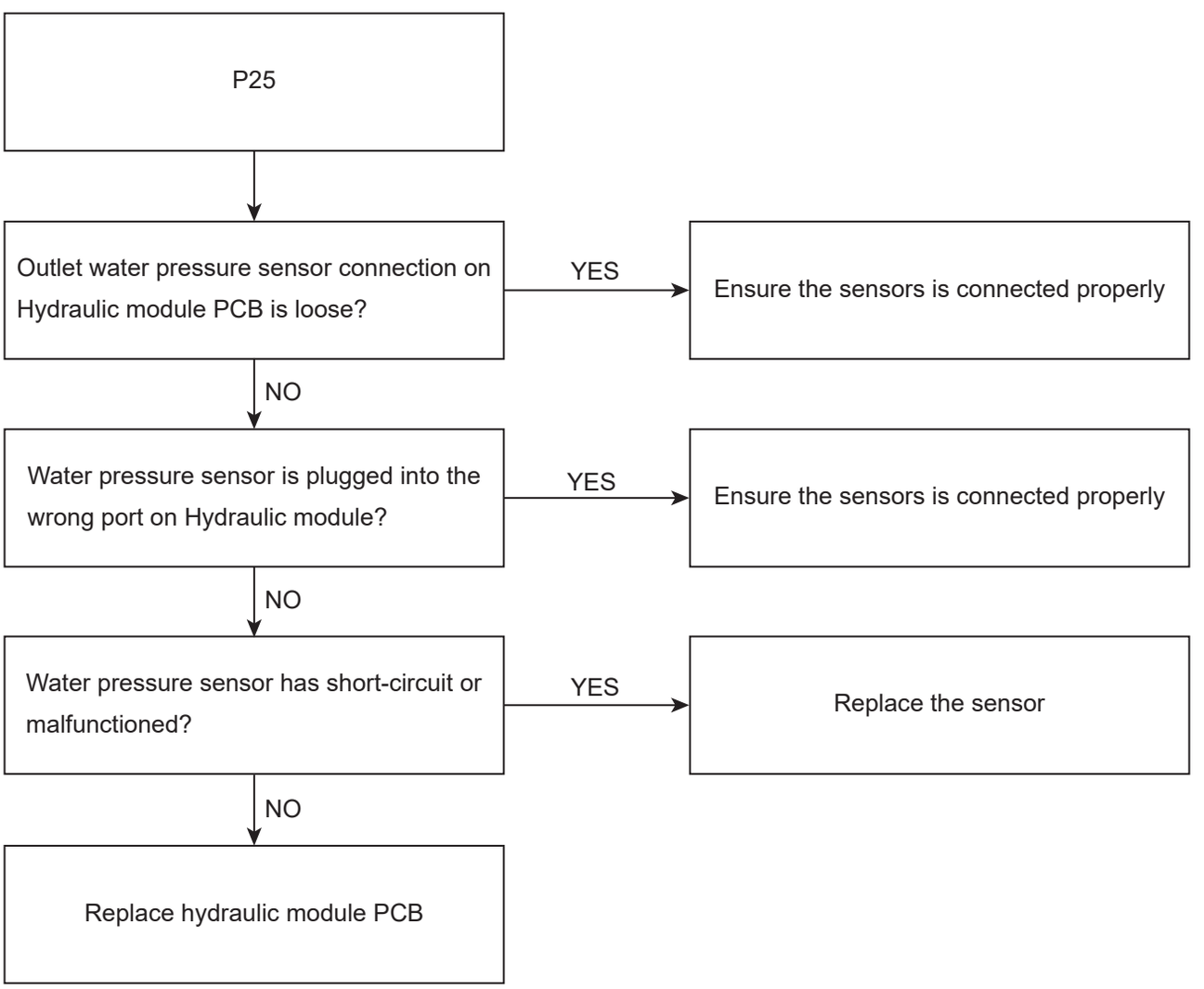
4.14.1 Diagnosis

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.

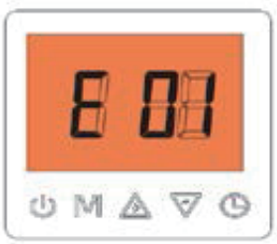
4.14.2 Possible causes

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

4.14.3 Analysis and action



4.15 E01 diagnosis and analysis



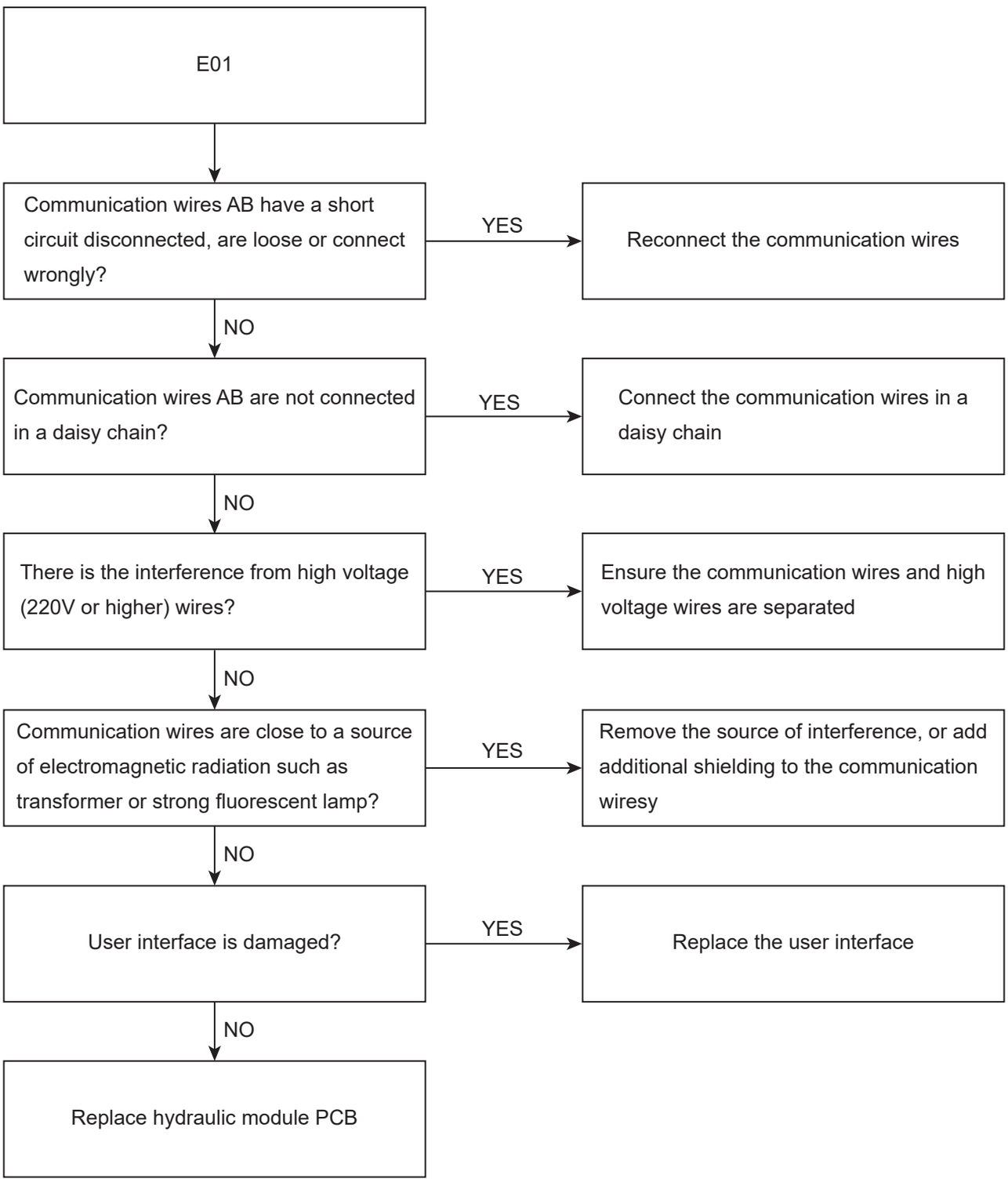
4.15.1 Diagnosis

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

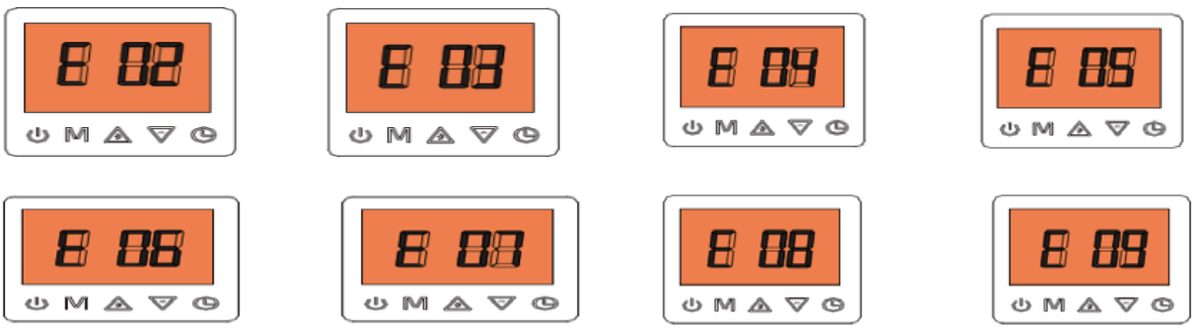
4.15.2 Possible causes

- 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.

4.15.3 Analysis and action



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



4.16.1 Diagnosis

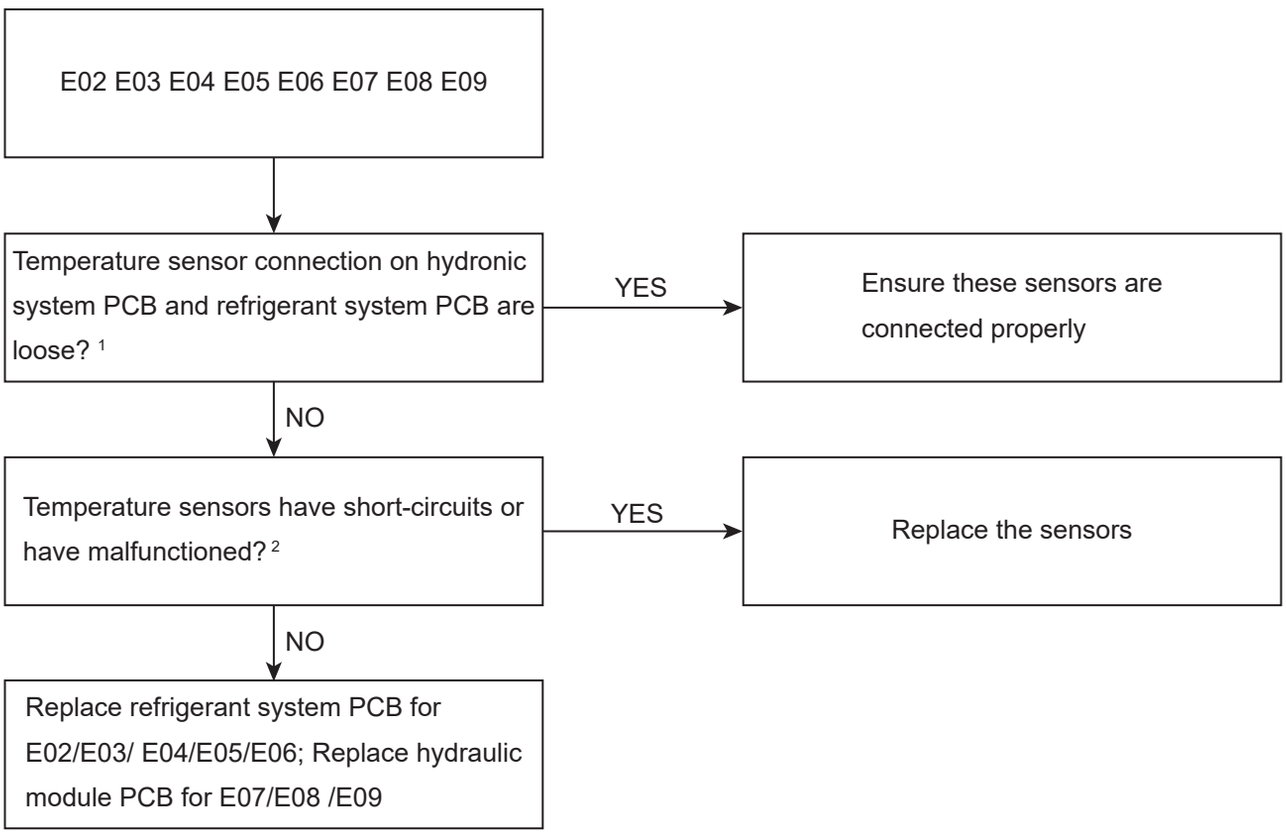
These codes indicate heat pump shut down because of the error of temperature sensors.

- 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.

4.16.2 Possible causes

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

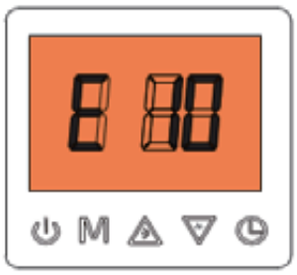
4.16.3 Analysis and action



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, 5.1 "Temperature Sensor Resistance Characteristics" for the resistance of sensors.

4.17 E10 diagnosis and analysis



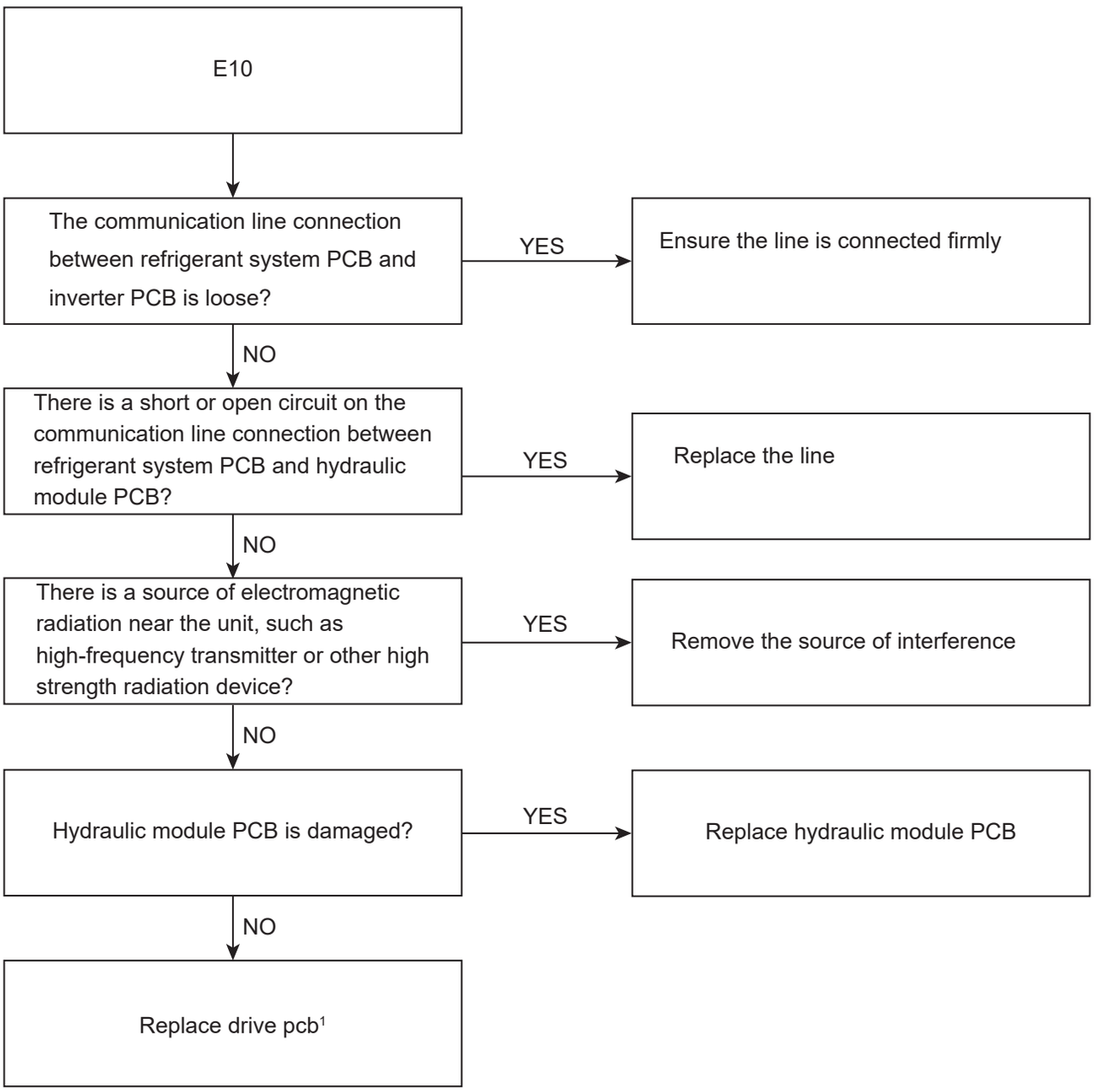
4.17.1 Diagnosis

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

4.17.2 Possible causes

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

4.17.3 Analysis and action



Notes:

1. For 14/16kW models, replace refrigerant system PCB. For 4/6/8/10/12Kw models, replace drive PCB.

4.18 E14 diagnosis and analysis

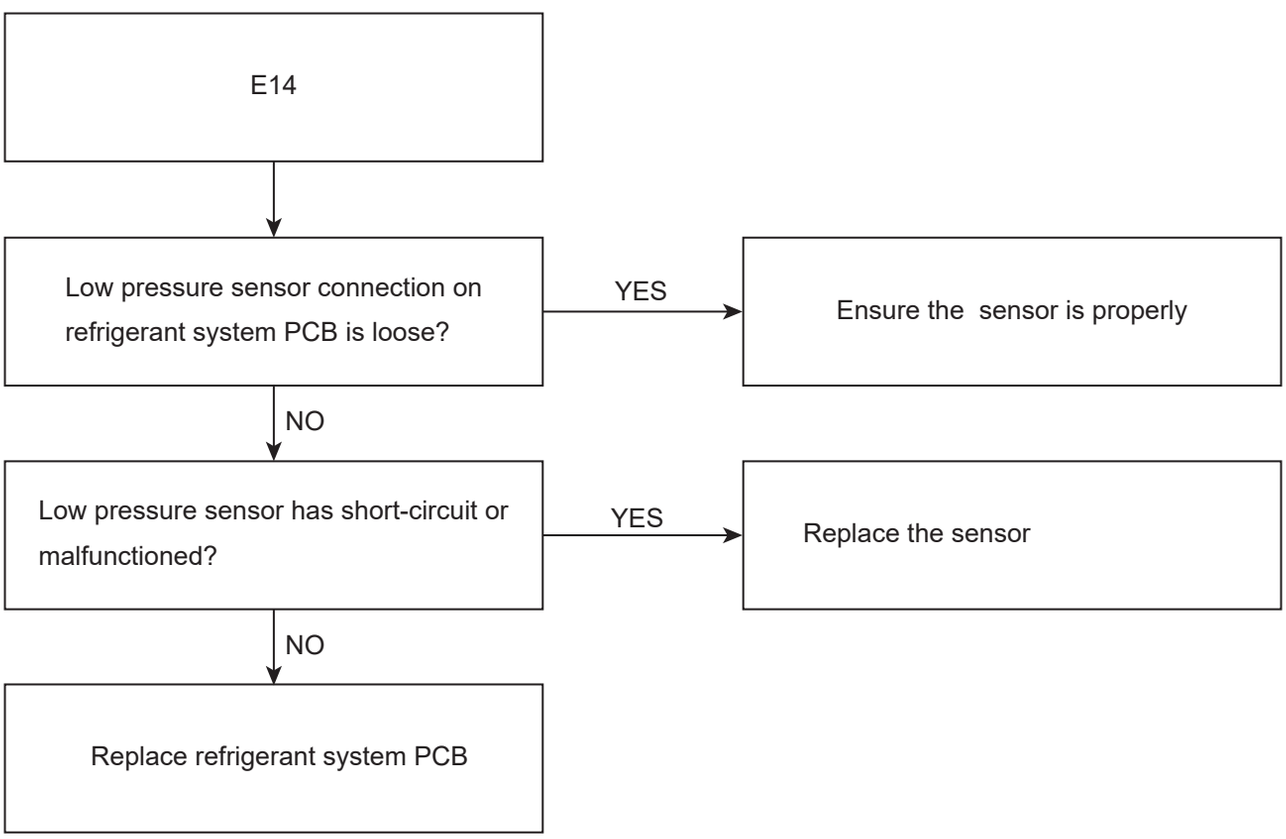
4.18.1 Diagnosis

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

4.18.2 Possible causes

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

4.18.3 Analysis and action



4.19 Inverter module troubleshooting for single-phase models

4.19.1Codes

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.

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 datal	/	/	/
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	/	/	/

Notes:

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 4/6/8/10/12kW

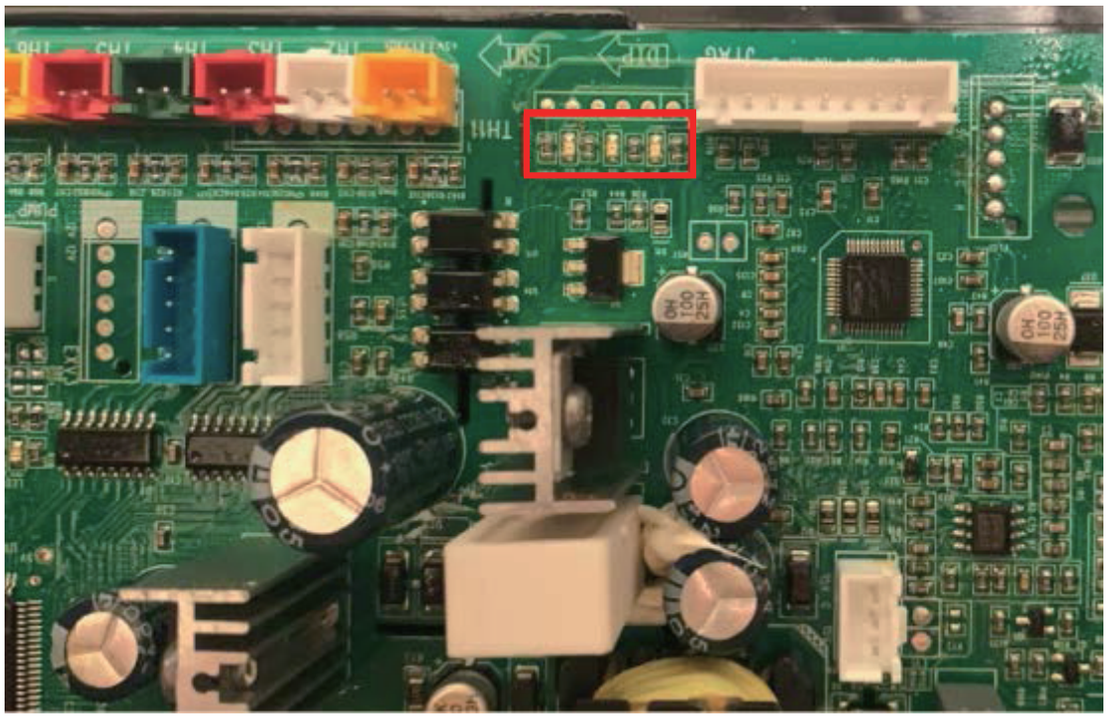


Figure 4.19-2 Location of 3 led lights on the inverter module PCB for 14/16kW

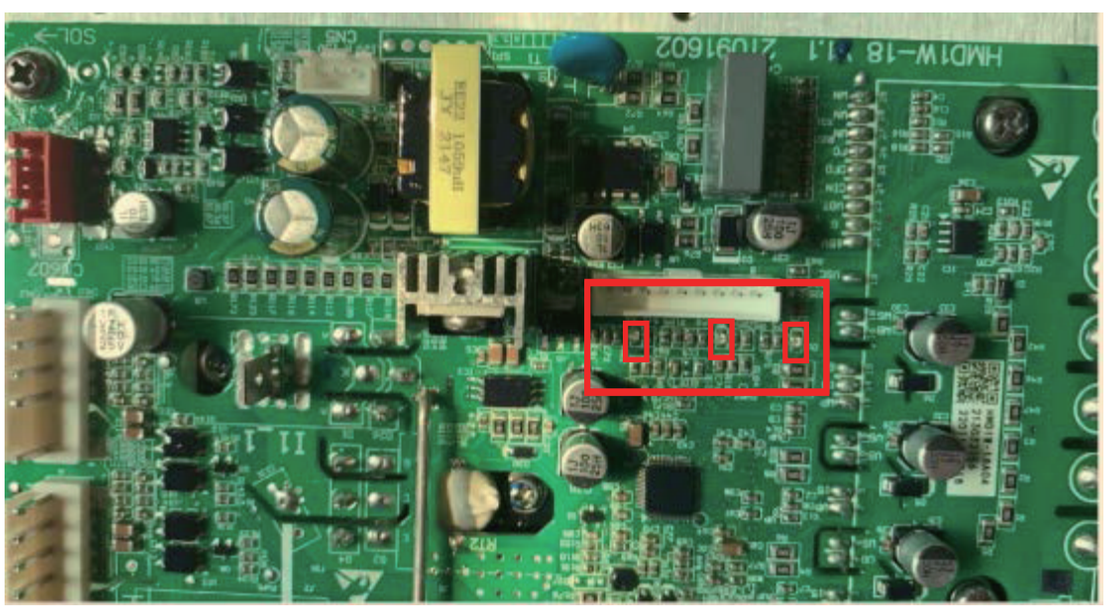
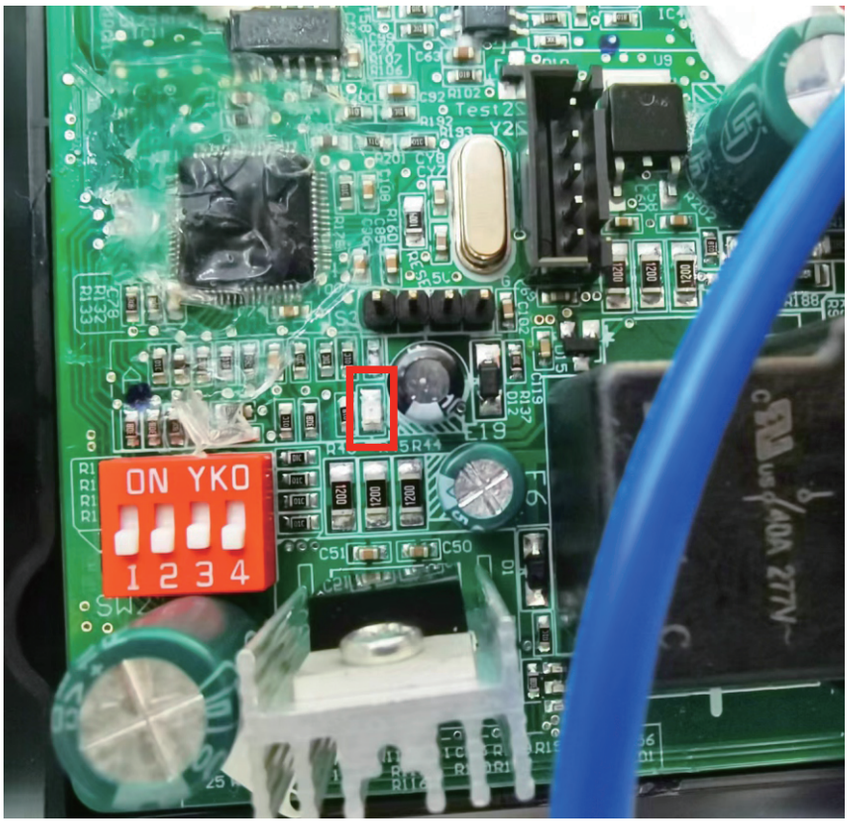
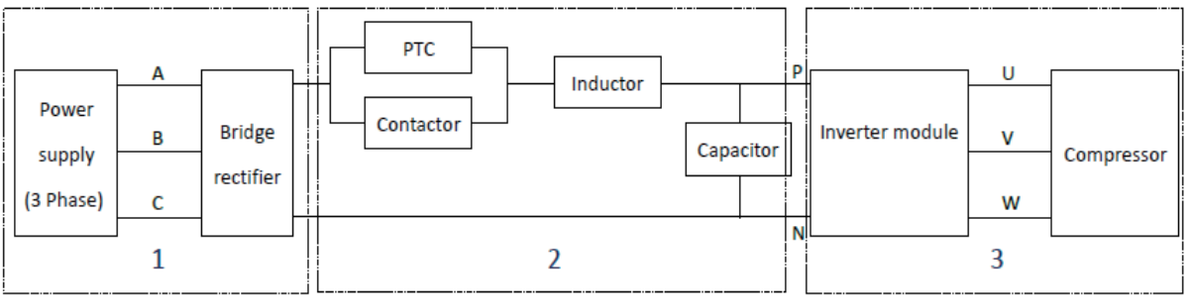


Figure 4.19-3 Location of 1 led lights on the inverter module PAB for 12/14/16kW



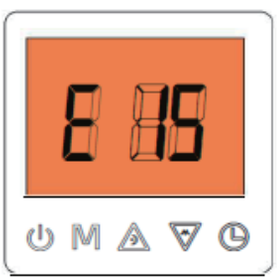
4.19.3 Principle of DC inverter

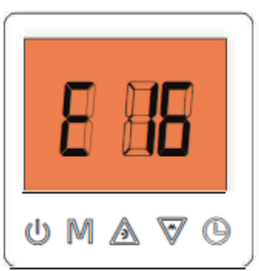
Figure 4.19-4 Principle of DC inverter



1. Contactor is open, the current across the PTC to charge capacitor. After a few seconds, the contactor closed.
2. Single phase (220V AC, AB) or three-phase (380V, ABC) 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.

4.19.4 E15 and E16 diagnosis and analysis





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.

4.19.4.2 Possible causes

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

Figure 4.19-5 Location of DC bus voltage terminals for 4/6/8/10/12kW

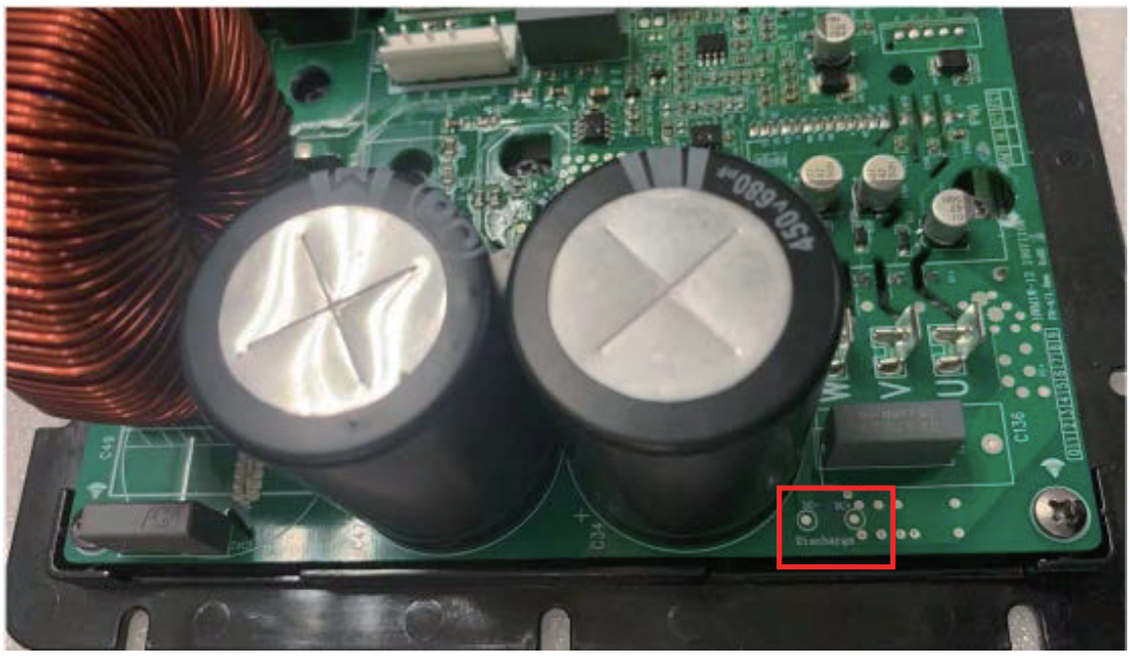
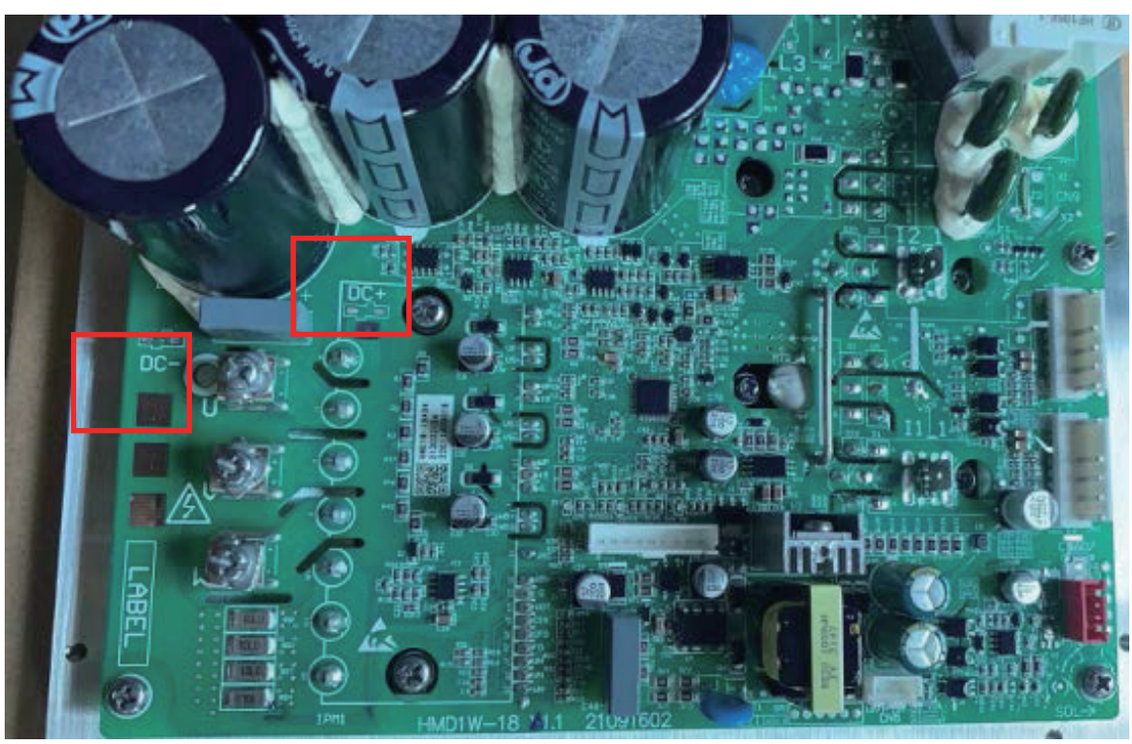
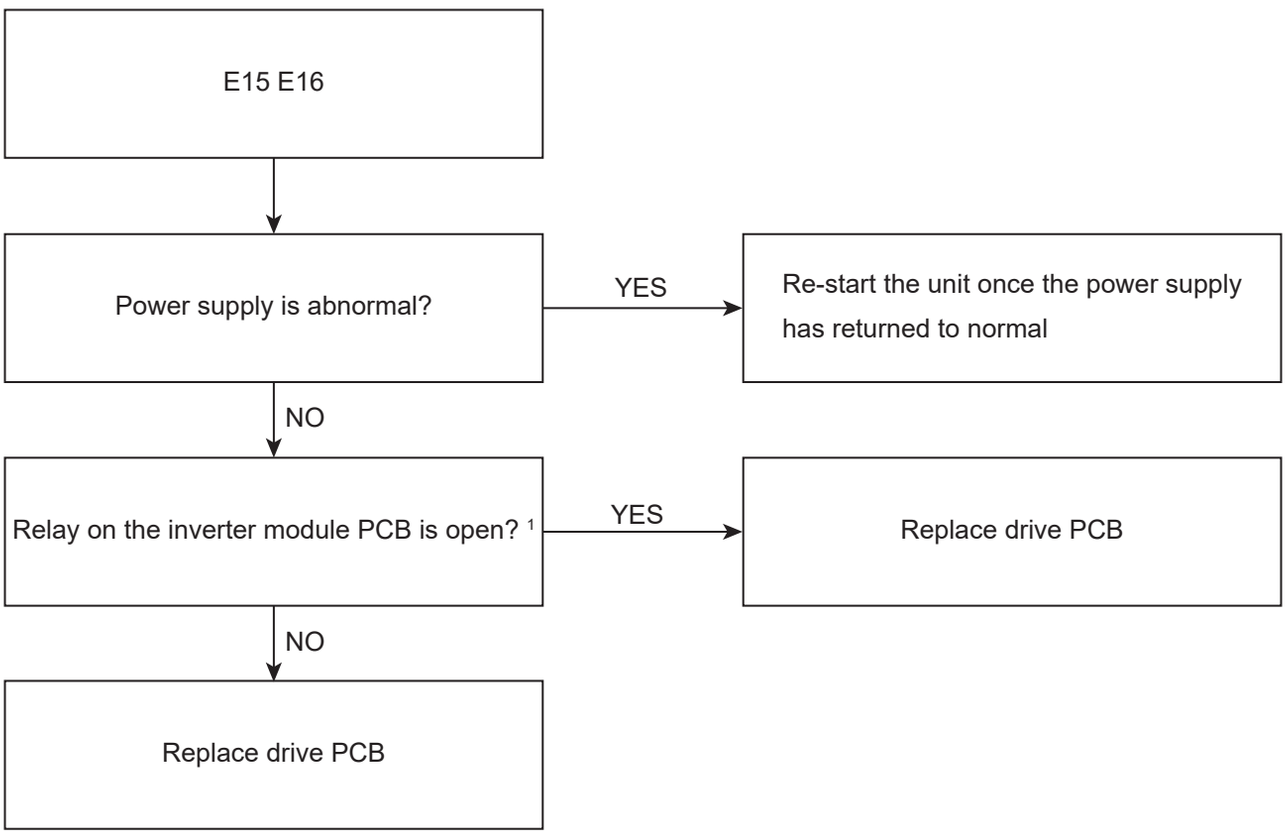


Figure 4.19-6 Location of DC bus voltage terminals for 14/16kW



4.19.4.3 Analysis and action



Notes:

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

4.19.5 E17 diagnosis and analysis

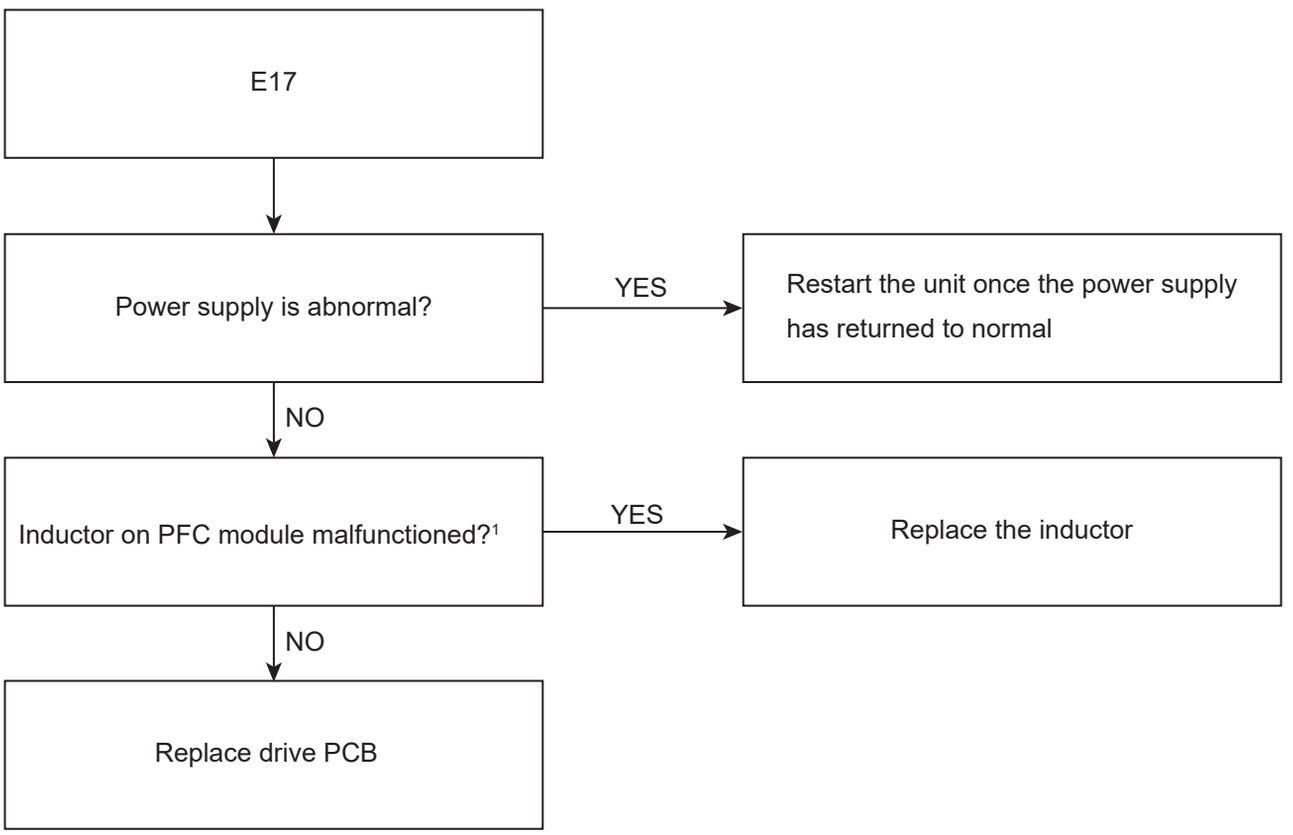
4.19.5.1 Diagnosis

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

4.19.5.2 Possible causes

- 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.

4.19.5..3 Analysis and action



Notes:

1. For 4/6kW models, Refer to Figure 4-2.2 for the location of the inductor.
2. For 8/10//12/14/16kW, refer to Figure 4.19-7 below for the location of the inductor.
3. 3-Phase for 10//12/14/16kW, refer to Figure 4.19-8 below for the location of the inductor.

Figure 4.19-7

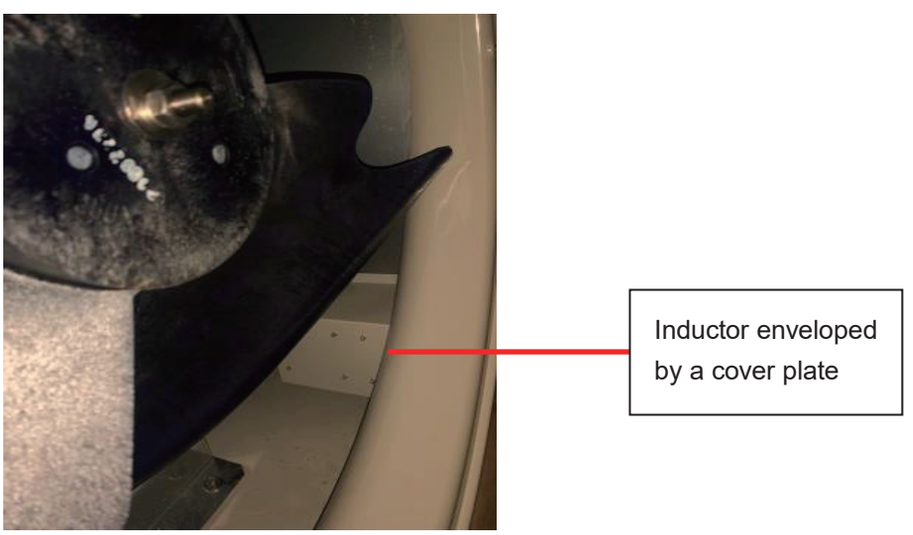
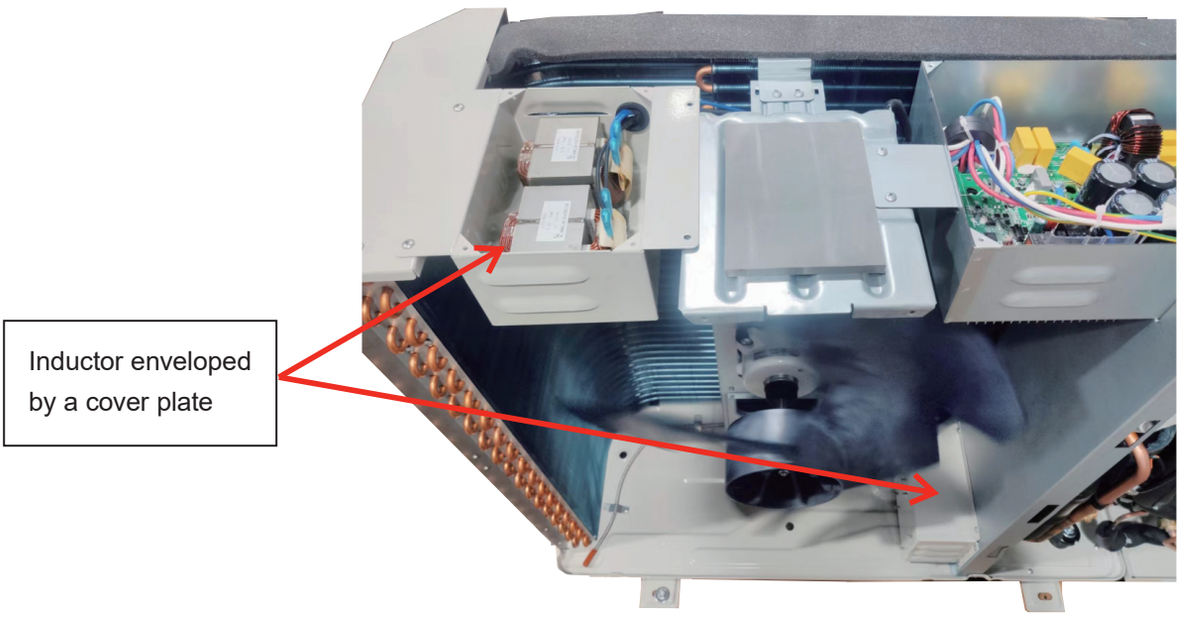
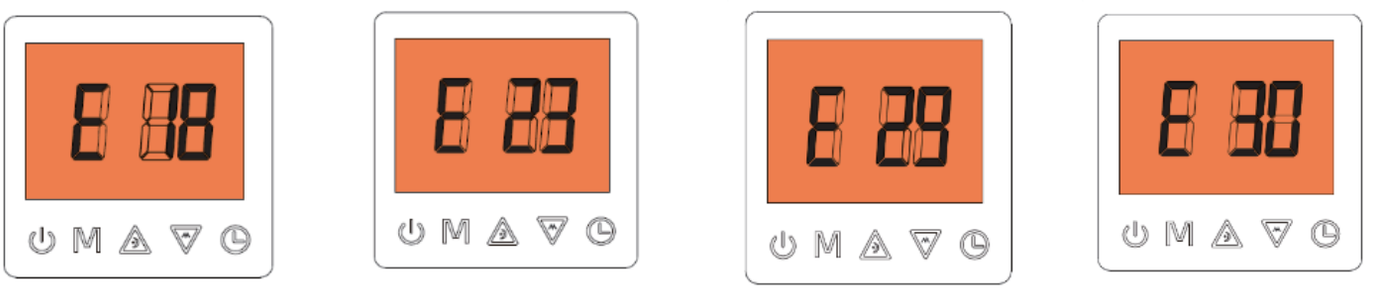


Figure 4.19-8



4.19.6 E18 E23 E29 E30 diagnosis and analysis



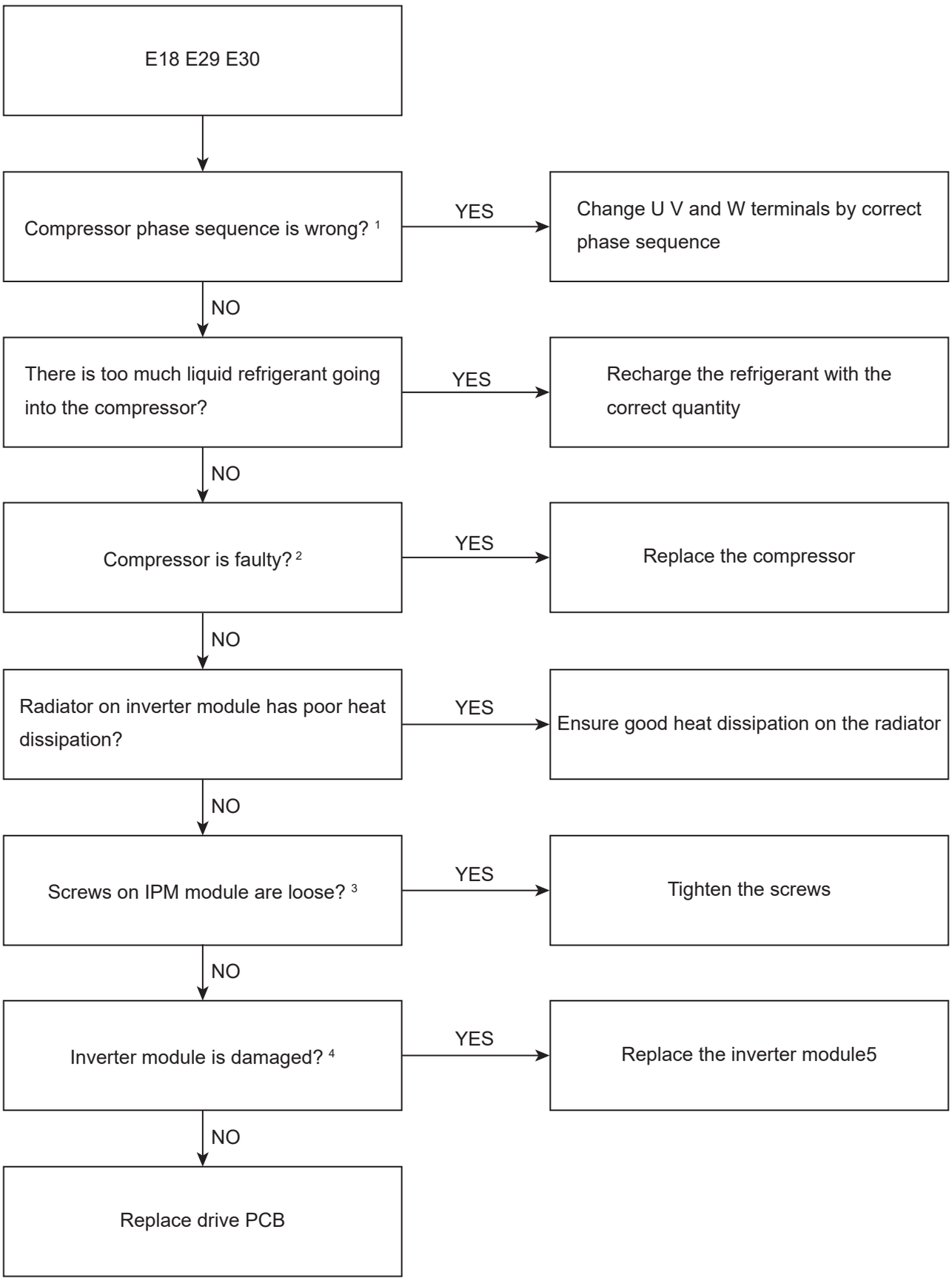
4.19.6.1 Diagnosis

- 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.

4.19.6.2 Possible causes

- 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.

4.19.6.3 Analysis and action



Notes:

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 4kw-6kw, refer to Figure 4.19.7 for the layout of inverter module. For 8kw-12kw, refer to Figure 4.19.8 for the layout of inverter module. For 14kw-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 4.19-10 4/6kw

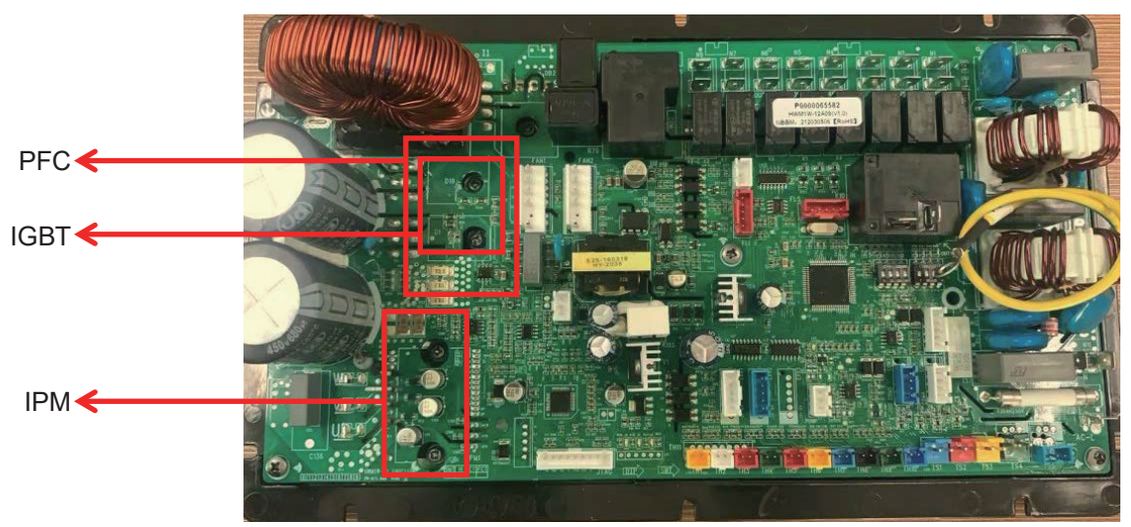


Figure 4.19-11 8/10/12kw

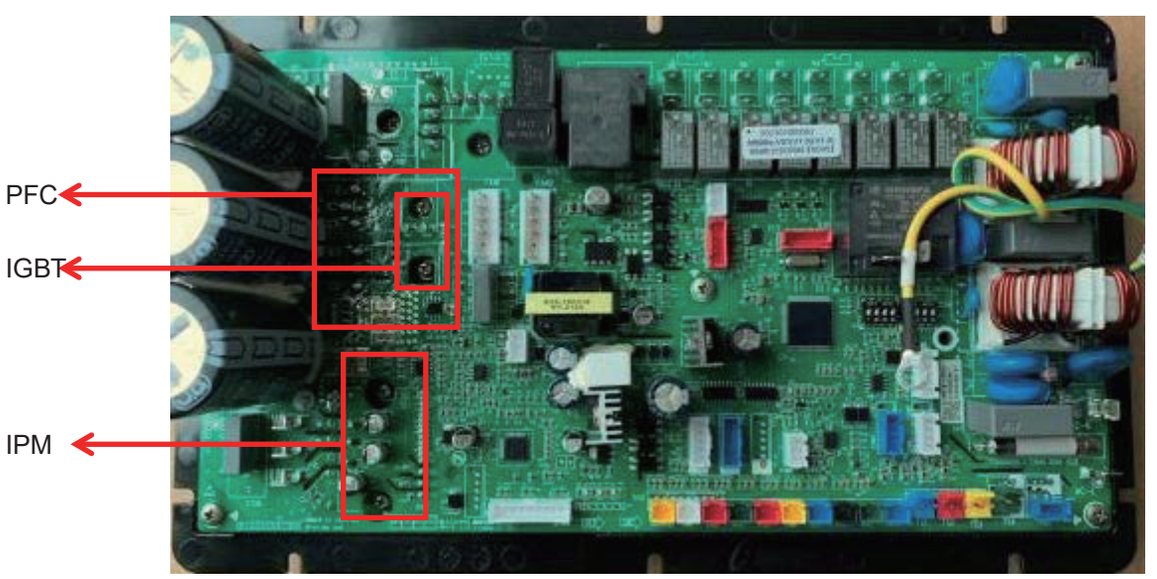
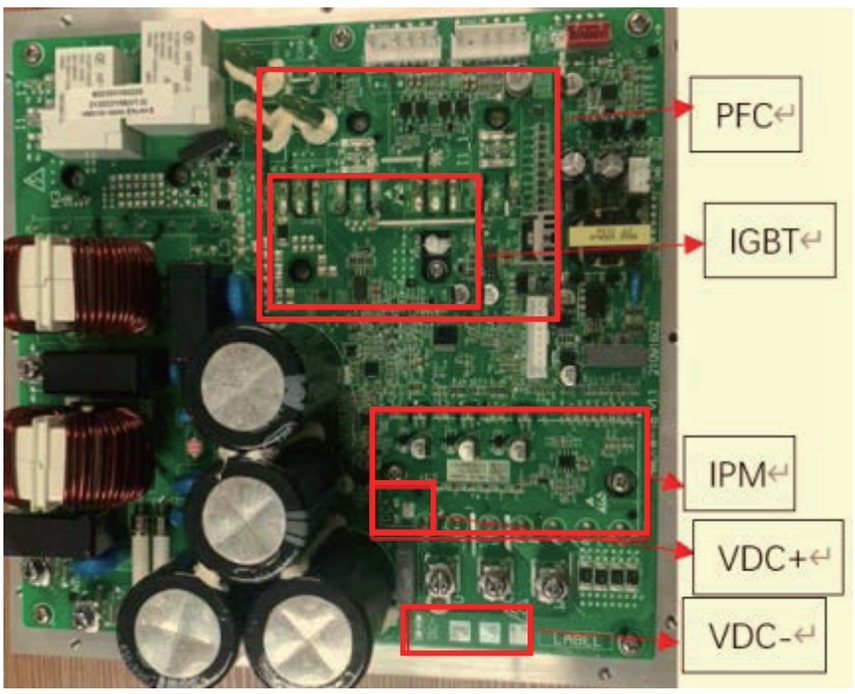
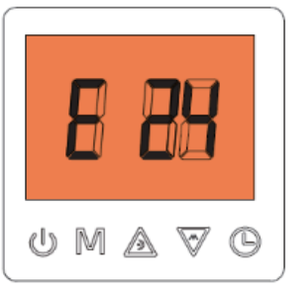
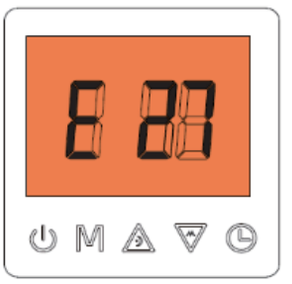


Figure 4.19-12 14/16kw



4.20 E19 E24 E27 diagnosis and analysis





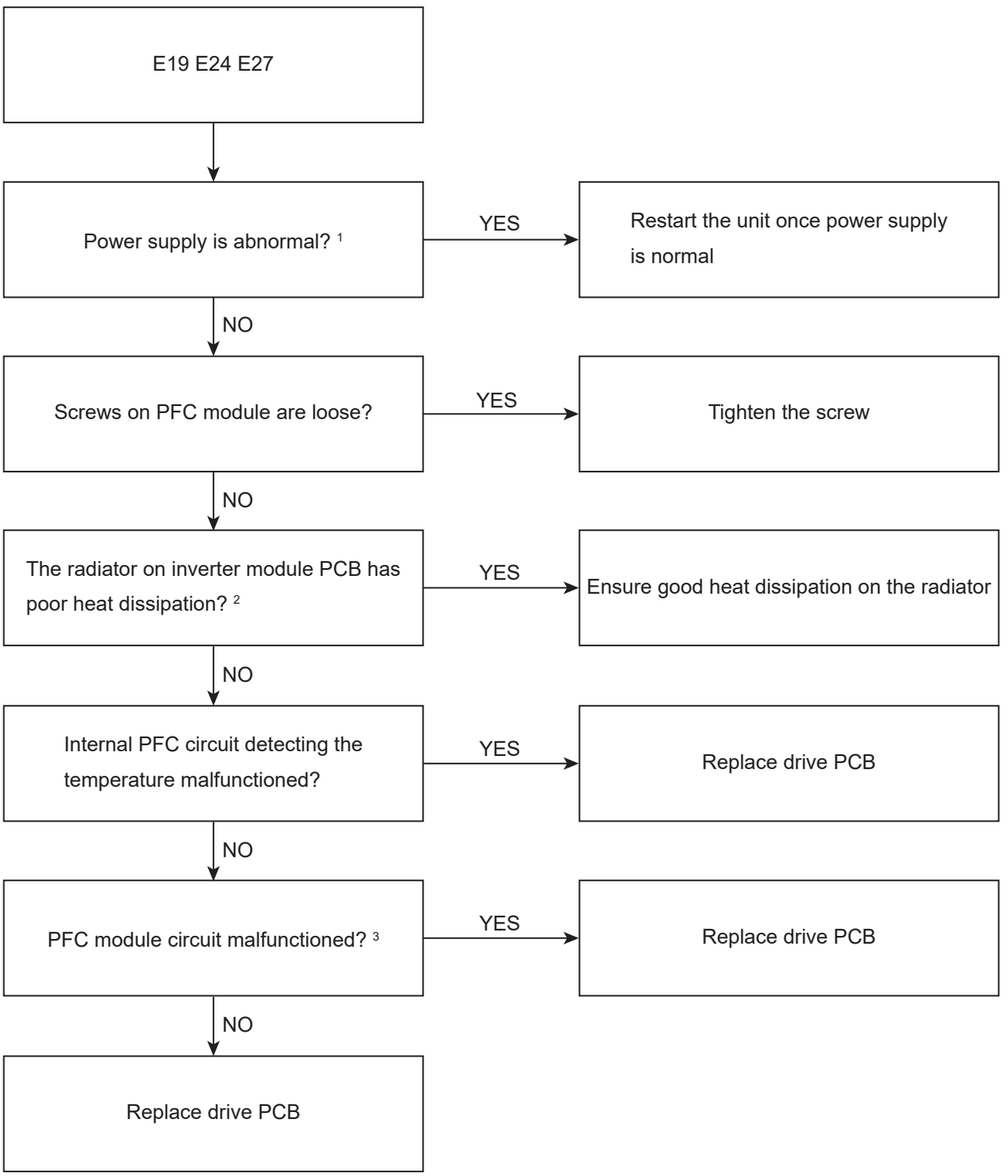
4.20.1 Diagnosis

- 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.

4.20.2 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.

4.20.3 Analysis and action



4.21 E20 E21 diagnosis and analysis

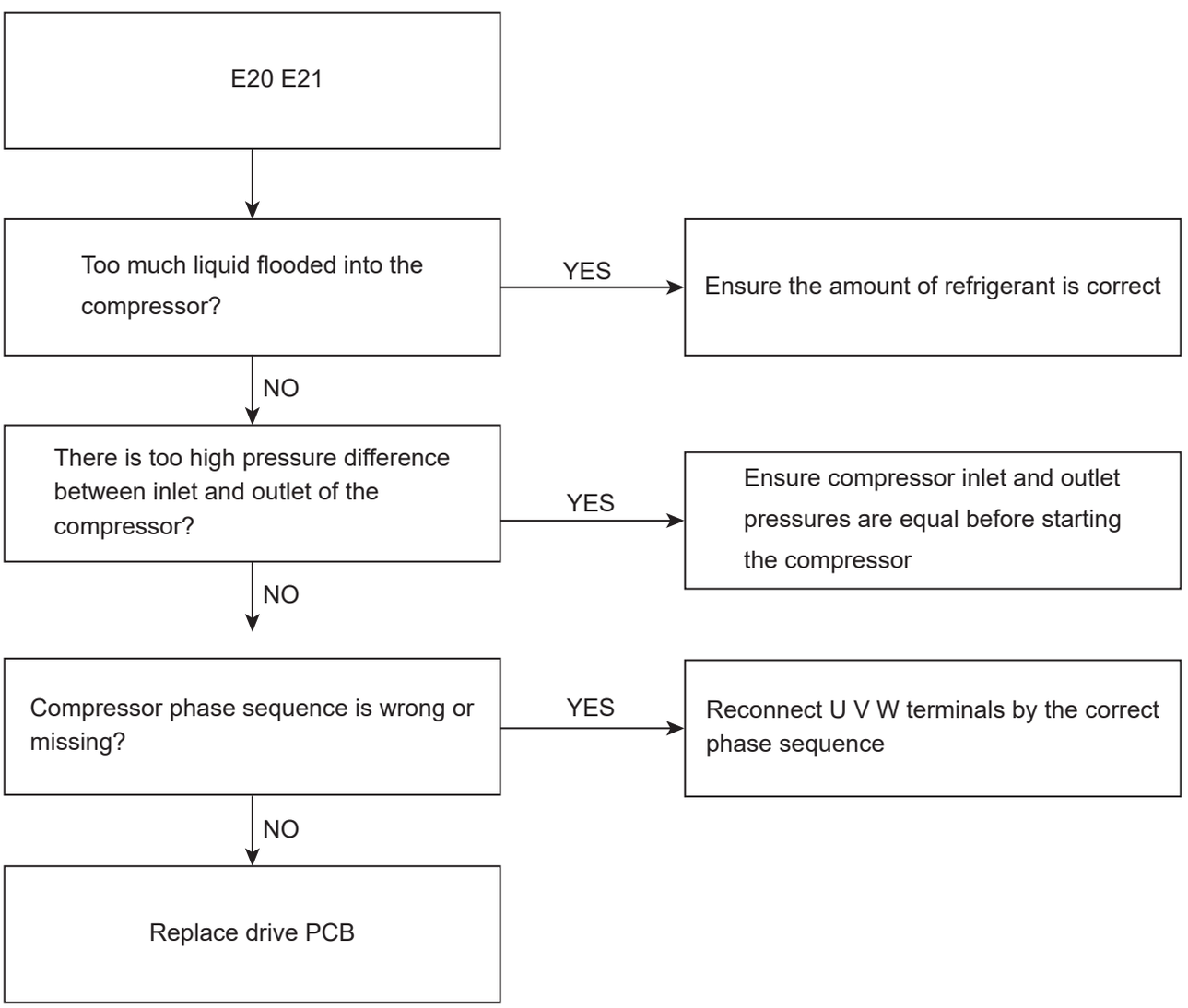
4.21.1 Diagnosis

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.

4.21.2 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.

4.21.3 Analysis and action



4.22 E25 diagnosis and analysis

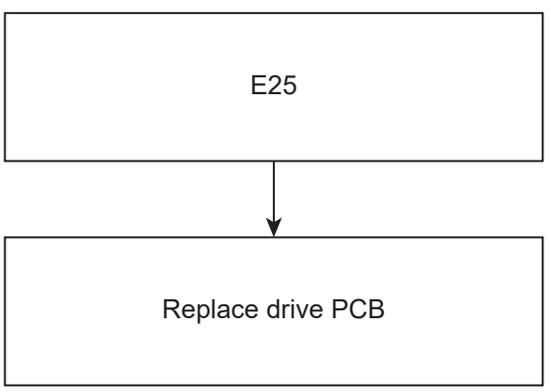
4.22.1 Diagnosis

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

4.22.2 Possible causes

Drive PCB is damaged.

4.22.3 Analysis and action



4.23 E26 diagnosis, analysis and action

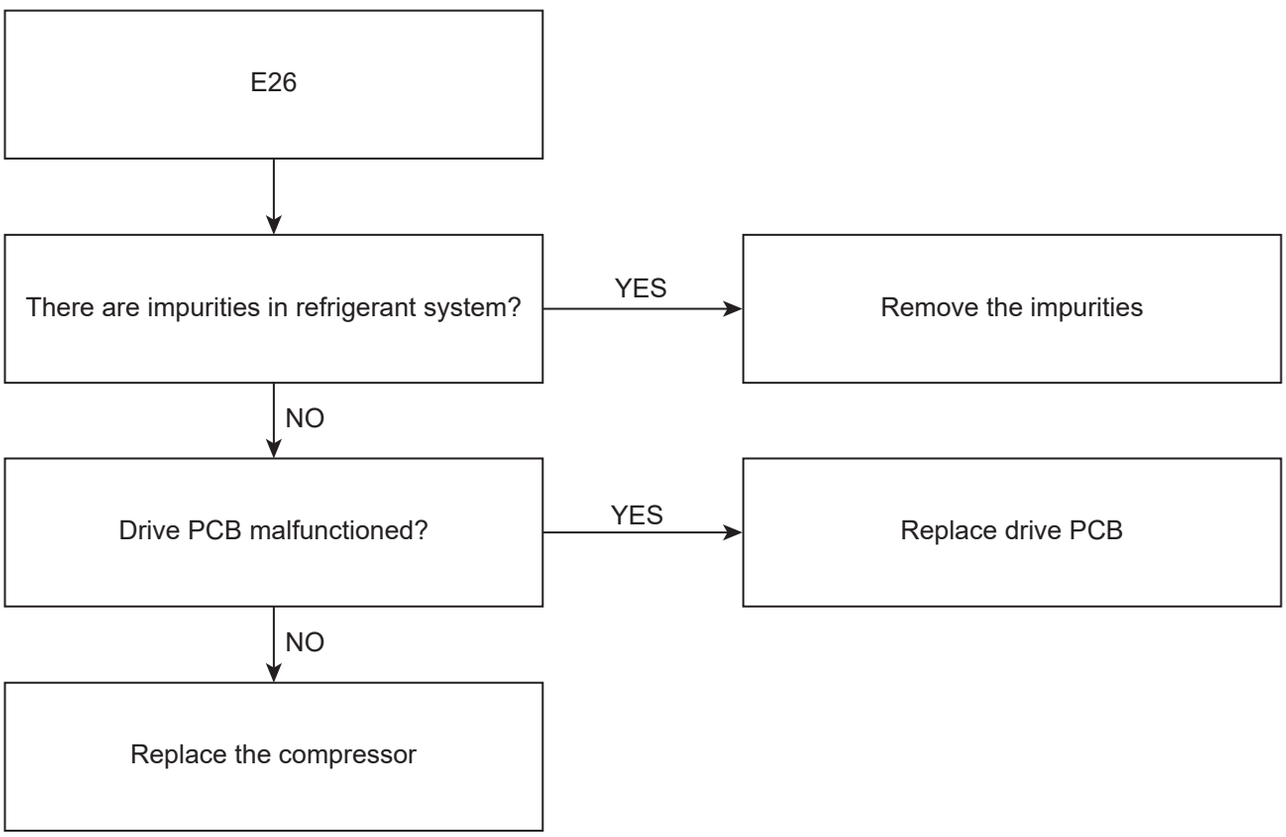
4.23.1 Diagnosis

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

4.23.2 Possible causes

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

4.23.3 Analysis and action



4.24 E28 diagnosis, analysis and action

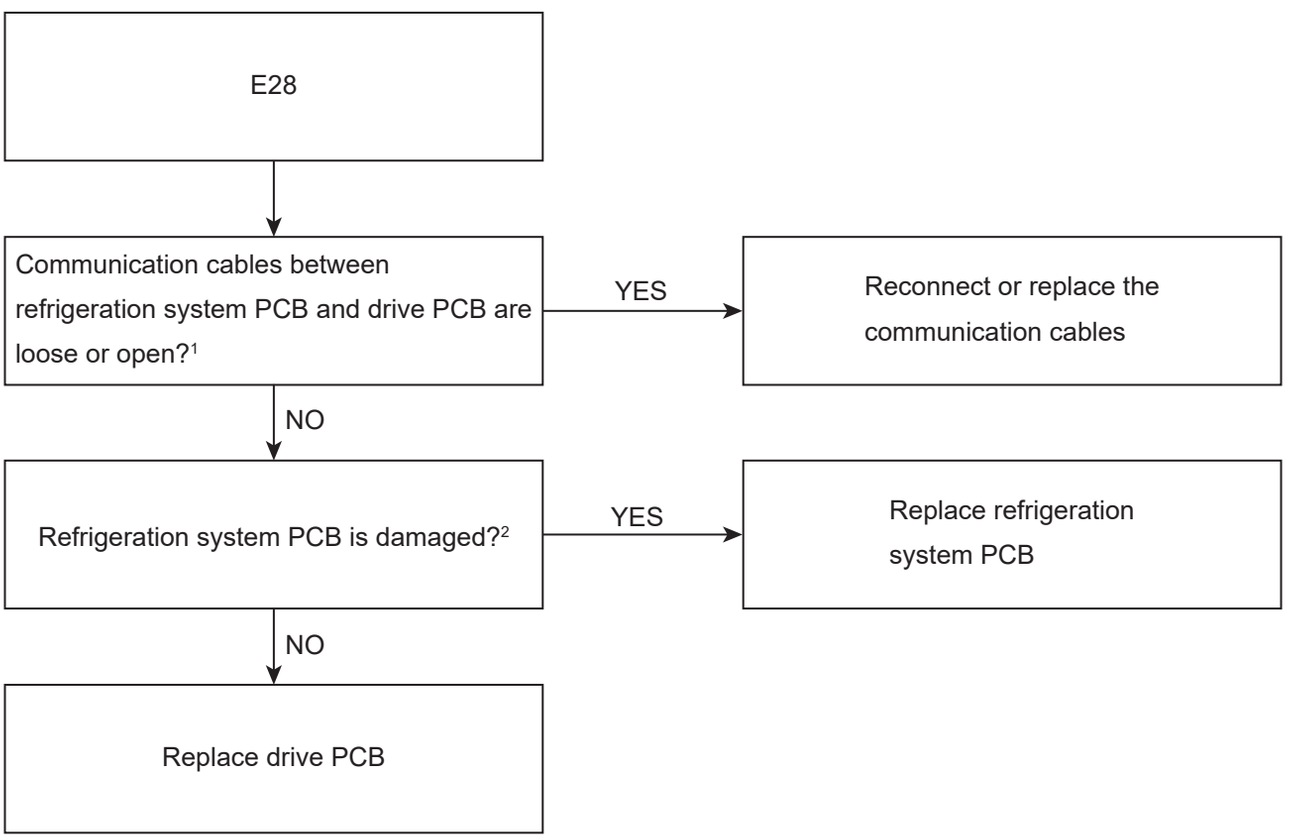
4.24.1 Diagnosis

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

4.24.2 Possible causes

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

4.24.3 Analysis and action



Notes:

1. Apply to 14/16kW models, for 4/6/8/10/12kW models no separator communication lines.

2. Apply to 14/16kW models, for 4/6/8/10/12kW models no separator refrigeration system PCB.

4.25 E34 diagnosis, analysis and action

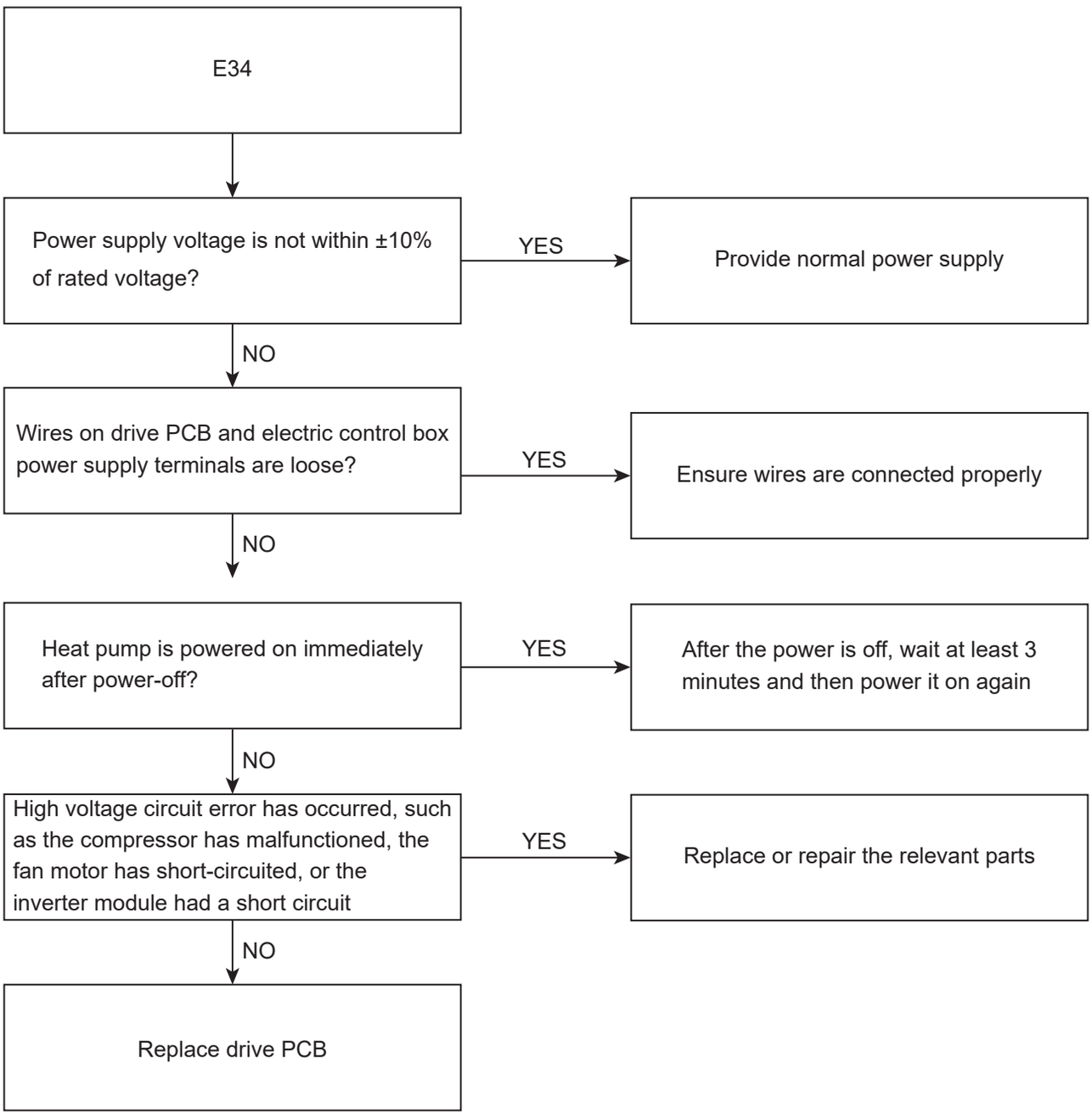
4.25.1 Diagnosis

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

4.25.2 Possible causes

- Actual power supply voltage is not within ±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.

4.25.3 Analysis and action

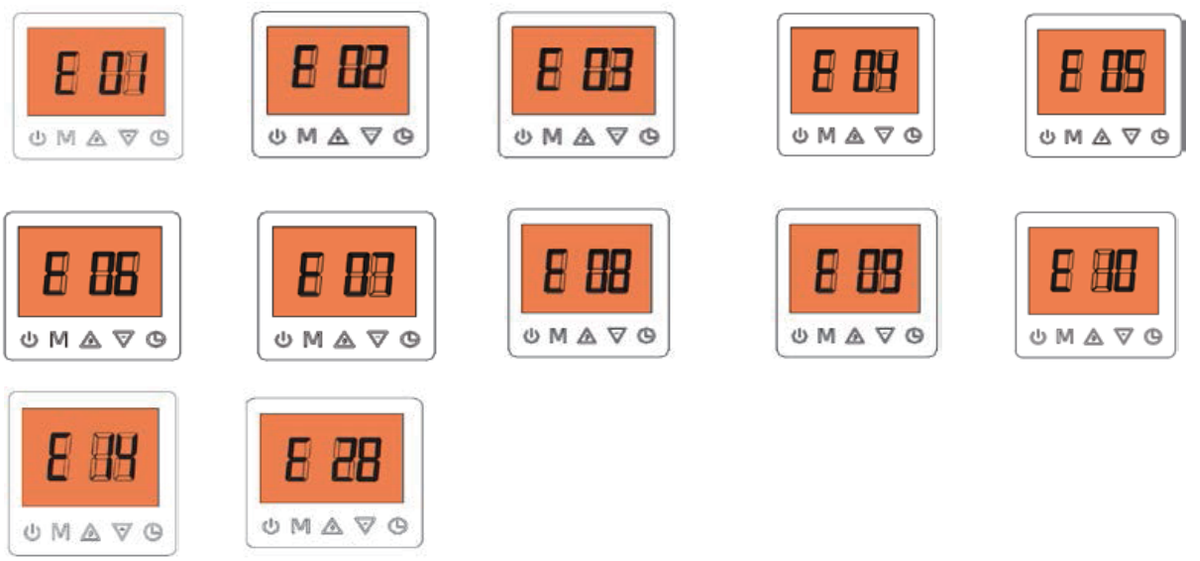


4.26 E22 E32 E33 E35 E37 analysis

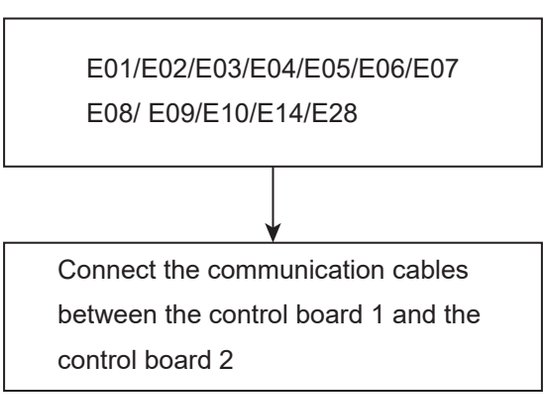
These codes mean the controller is performing some kind of specific action; they are neither error nor failure.

- E22 will occur if the inverter module is resetting.
- E32 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.

4.26 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.



5. Appendixes to Part 4

5.1: Temperature Sensor Resistance Characteristics

Table 5-5.1: inlet water temperature sensor TA, outlet water temperature sensor TB, coiltemperature sensor T3, outdoor ambient temperature sensor T4, liquid temperature sensor T5, and suction temperature sensor TH resistance characteristics

Temp. (℃)	Resistance (kΩ)	Temp. (℃)	Resistance (kΩ)	Temp. (℃)	Resistance (kΩ)	Temp. (℃)	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 5-5.2: Domestic water tank temperature sensor TW and discharge pipe temperature sensor TP resistance characteristics

Temp. (℃)	Resistance (kΩ)	Temp. (℃)	Resistance (kΩ)	Temp. (℃)	Resistance (kΩ)	Temp. (℃)	Resistance (kΩ)
-30	952.951	**9**	116.582	**48**	21.633	**87**	5.503
-29	896.036	**10**	111.12	**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
-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**	63.75	**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**	11.55	**104**	3.251
-12	339.406	**27**	51.129	**66**	11.15	**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**	33.51	**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

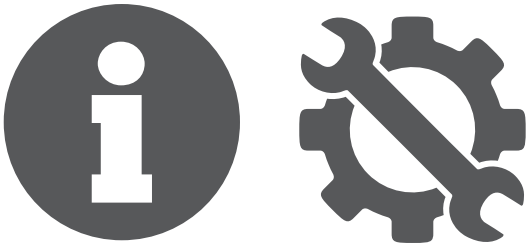
2	164.3	**41**	28.49	**80**	6.914	**119**	2.115
3	156.319	**42**	27.373	**81**	6.689	**120**	2.058
4	148.765	**43**	26.306	**82**	6.473	**121**	2.002
5	141.613	**44**	25.286	**83**	6.264	**122**	1.949
6	134.839	**45**	24.311	**84**	6.063	**123**	1.897
7	128.423	**46**	23.378	**85**	5.869	**124**	1.846
8	122.343	**47**	22.487	**86**	5.683	**125**	1.797
126	1.75	**130**	1.575	**134**	1.421	**138**	1.283
127	1.704	**131**	1.535	**135**	1.385	**139**	1.251
128	1.66	**132**	1.496	**136**	1.35	**140**	1.22

NOTES

NOTES

AIR CONDITIONING SYSTEMS

AIR-TO-WATER HEAT PUMP - MONOBLOCK



V1.0.122022

Please check the applicable models, F-GAS and manufacturer information
from the “Owner’s Manual - Product Fiche” in the packaging of the outdoor unit. (European Union products only).

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