Midea

R32

Midea Building Technologies Division

Service Manual

Midea M thermal Hygge Split

CONTENTS

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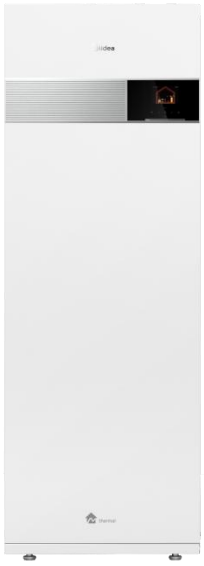
Part 1

General Information

1 Product Lineup

Type	Model	Power supply	Appearance
Outdoor unit	MHA-V12WD2N8-E	220-240V/1N/50Hz	
	MHA-V14WD2N8-E	220-240V/1N/50Hz	
	MHA-V16WD2N8-E	220-240V/1N/50Hz	
	MHA-V12WD2RN8-E	380-415V~3N-50Hz	
	MHA-V14WD2RN8-E	380-415V~3N-50Hz	
	MHA-V16WD2RN8-E	380-415V~3N-50Hz	
Hydraulic indoor unit without water tank	HB-A160CGN8-E	220-240V/1N/50Hz	
	HB-A160CD30GN8-E	220-240V/1N/50Hz (E-heater 230V/1N/50Hz)	
	HB-A160CDS60GN8-E	220-240V/1N/50Hz (E-heater 400V/3N/50Hz)	
	HB-A160CDS90GN8-E	220-240V/1N/50Hz (E-heater 400V/3N/50Hz)	
Hydraulic indoor unit with water tank	HBT-A160240CD30GN8-E	220-240V/1N/50Hz	
	HBT-A160240CDS60GN8-E	220-240V/1N/50Hz (E-heater 400V/3N/50Hz)	
	HBT-A160240CDS90GN8-E	220-240V/1N/50Hz (E-heater 400V/3N/50Hz)	

2 Nomenclature

2.1.1 Outdoor unit

M	H	A	-	V	16	W	D2	R	N8	-	E
1	2	3		4	5	6	7	8	9		10

Legend		
No.	Code	Remarks
1	M	Brand: Midea brand
2	H	Unit type: heat pump
3	A	Structure: Split
4	V	System type: Inverter
5	16	Capacity Code: 16: 16 kW
6	W	Cooling type: Air cooling
7	D2	Compressor and fan motor types: All DC
8	R	Power Supply of heat pump R: 3-phase, 380-415V, 50Hz； Omitted: 1-phase, 220-240V, 50Hz
9	N8	Refrigerant: R32
10	E	Design code

2.1.2 Hydraulic indoor unit without water tank

HB	-	A	160	C	G	N8	-	E
1		2	3	4	5	6		7

Legend		
No.	Code	Remarks
1	HB	Hydraulic indoor unit without water tank
2	A	Compatible ODU: Split
3	160	Compatible maximum capacity of outdoor unit 160: 16 kW
4	C	Heating type: Water cycle with water pump
5	G	Function: Floor heating
6	N8	Refrigerant: R32
7	E	Design code

2.1.3 Hydraulic indoor unit with water tank

HBT	-	A	160	240	C	D	30	G	N8	-	E
1		2	3	4	5	6	7	8	9		10

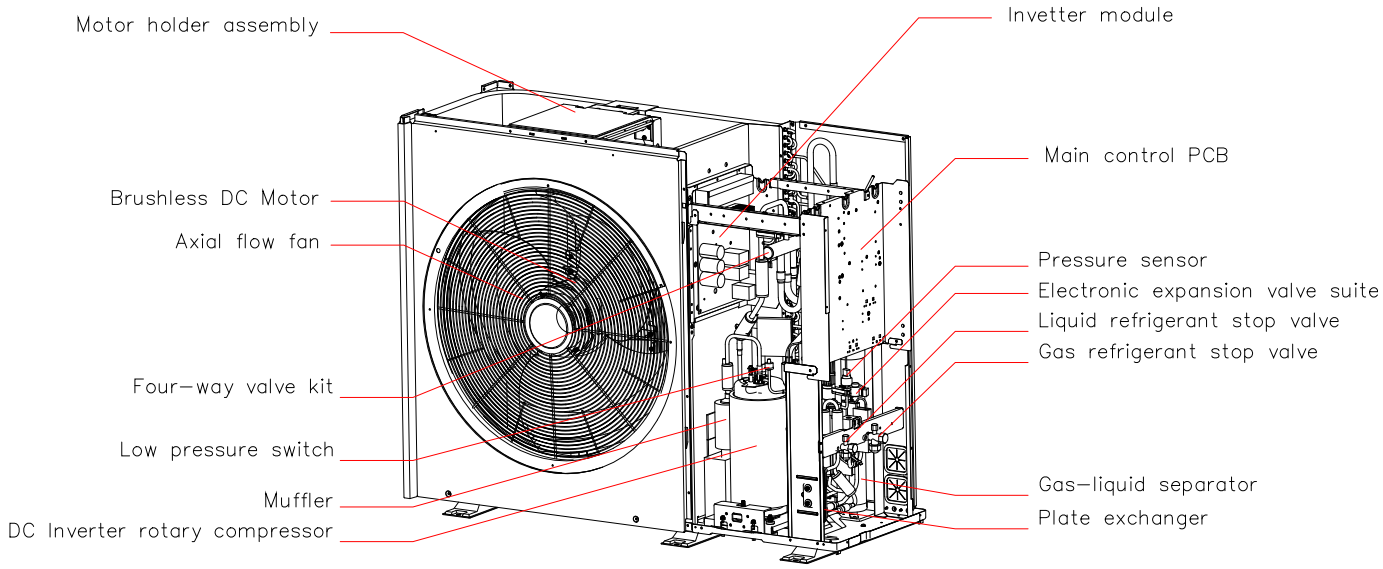
Legend		
No.	Code	Remarks
1	HBT	Hydraulic indoor unit with water tank
2	A	Compatible ODU: Split
3	160	Compatible maximum capacity of outdoor unit 160: 16 kW
4	240	Tank volume 240: 240L
5	C	Heating type: Water cycle with water pump
6	D	Special function: Unit with E-heater
7	30	E-heater capacity 30: 3kW
8	G	Other function G: Floor heating function
9	N8	Refrigerant: R32
10	E	Design code

Part 2

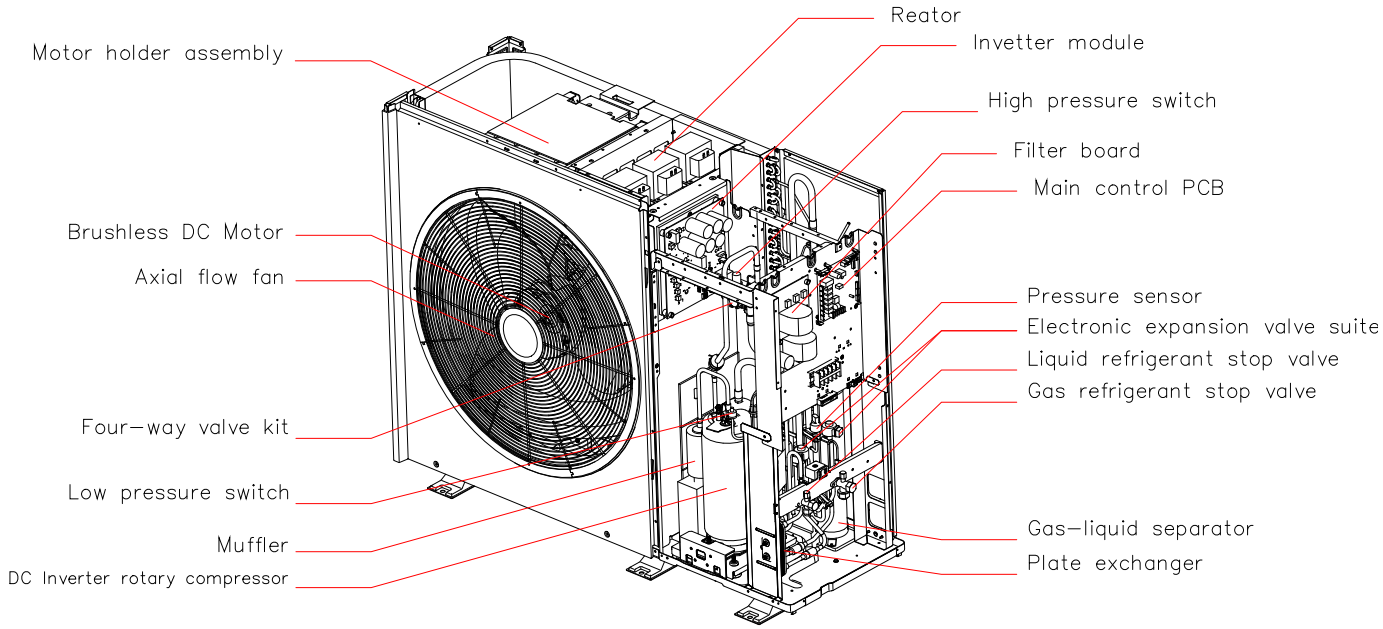
Component Layout and Refrigerant Circuits

1 Layout of Functional Components

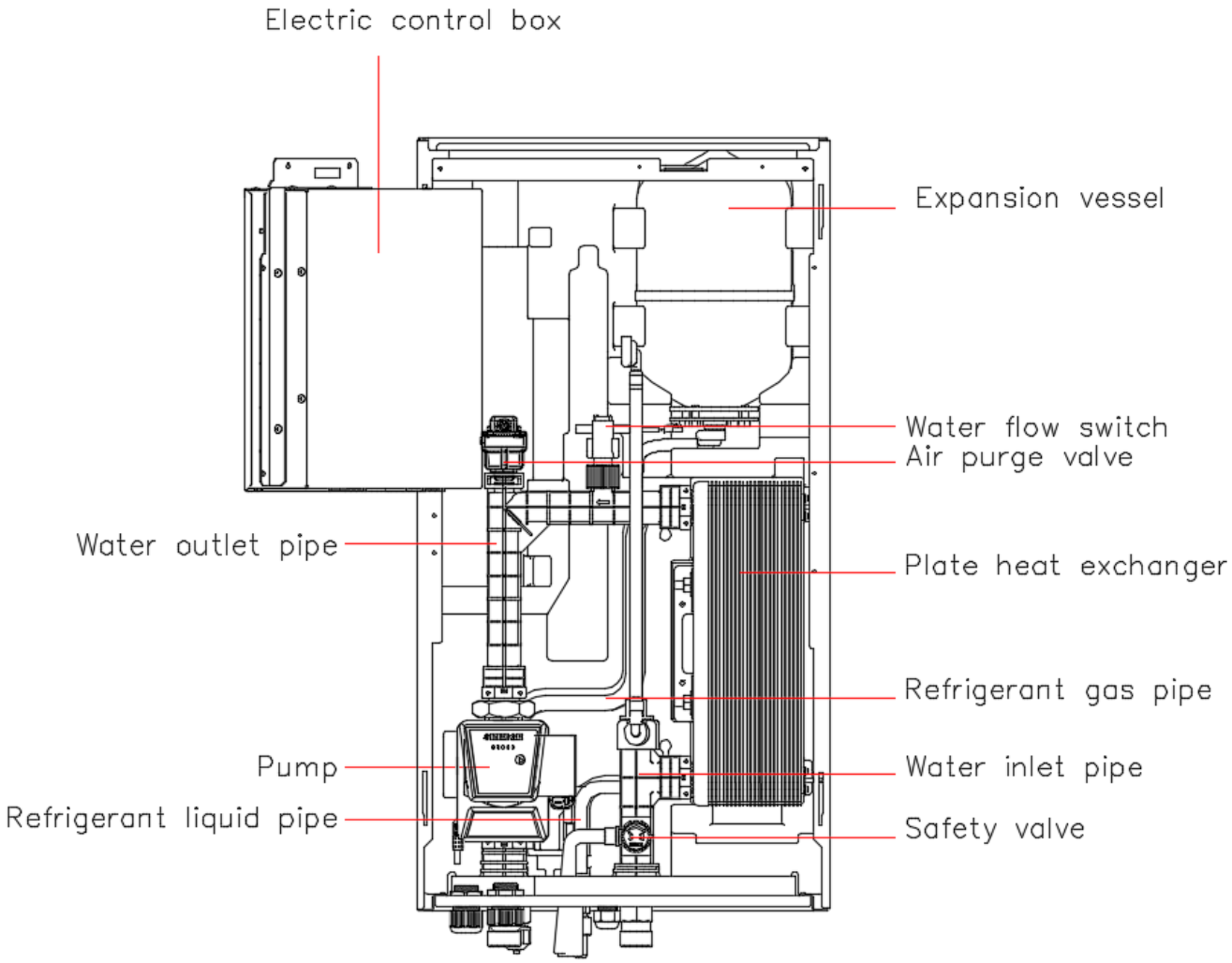
1ph 12~16kW outdoor unit



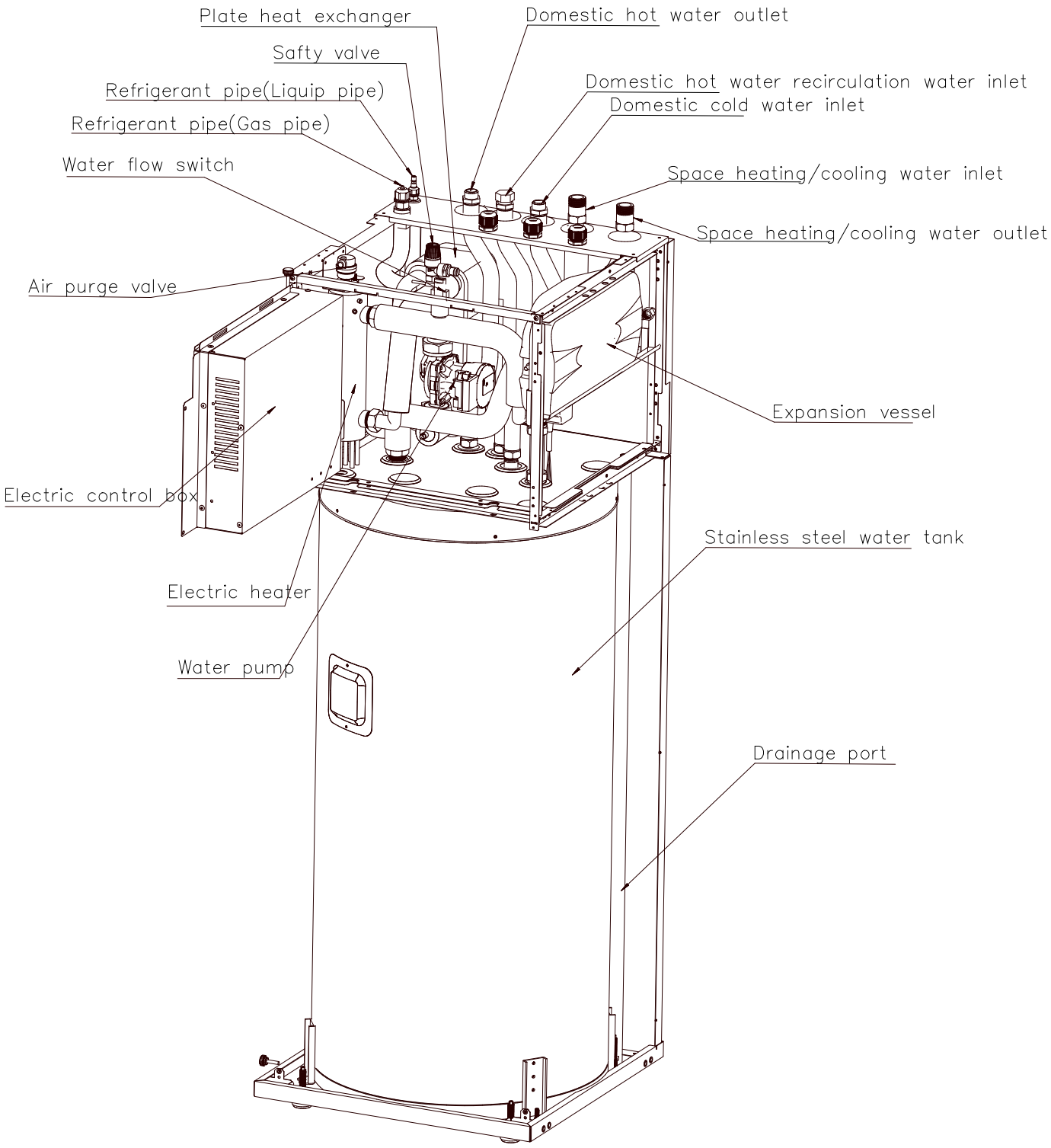
3ph 12~16kW outdoor unit



Hydraulic module 160



Hydraulic indoor unit with water tank HBT-A160240

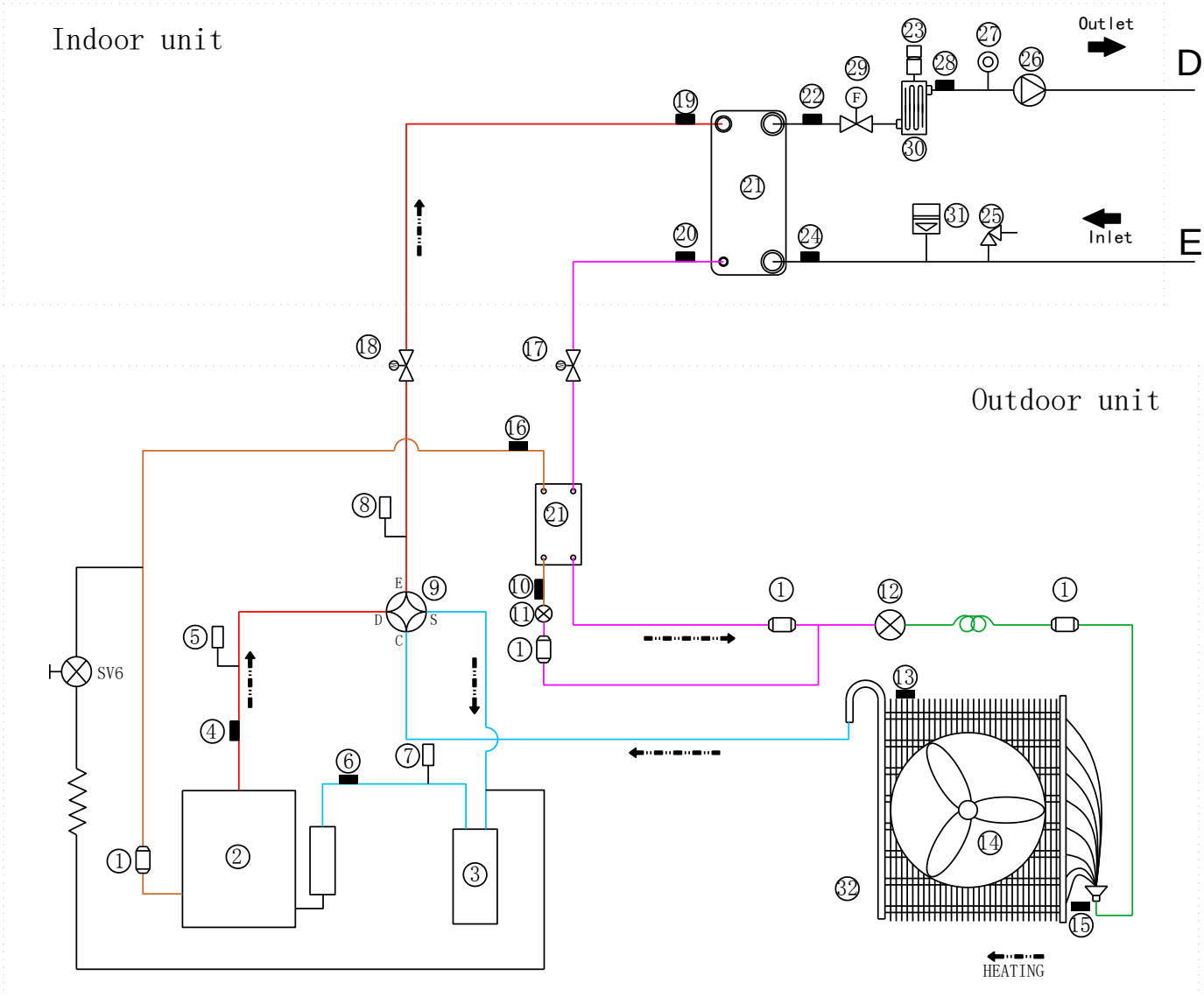


2 Piping Diagrams

Refrigerant piping graphic example:

- High temperature, high pressure gas
- Medium temperature, high pressure liquid
- Medium temperature, Medium pressure gas
- Low temperature, low pressure gas liquid mixture
- Low temperature, low pressure gas

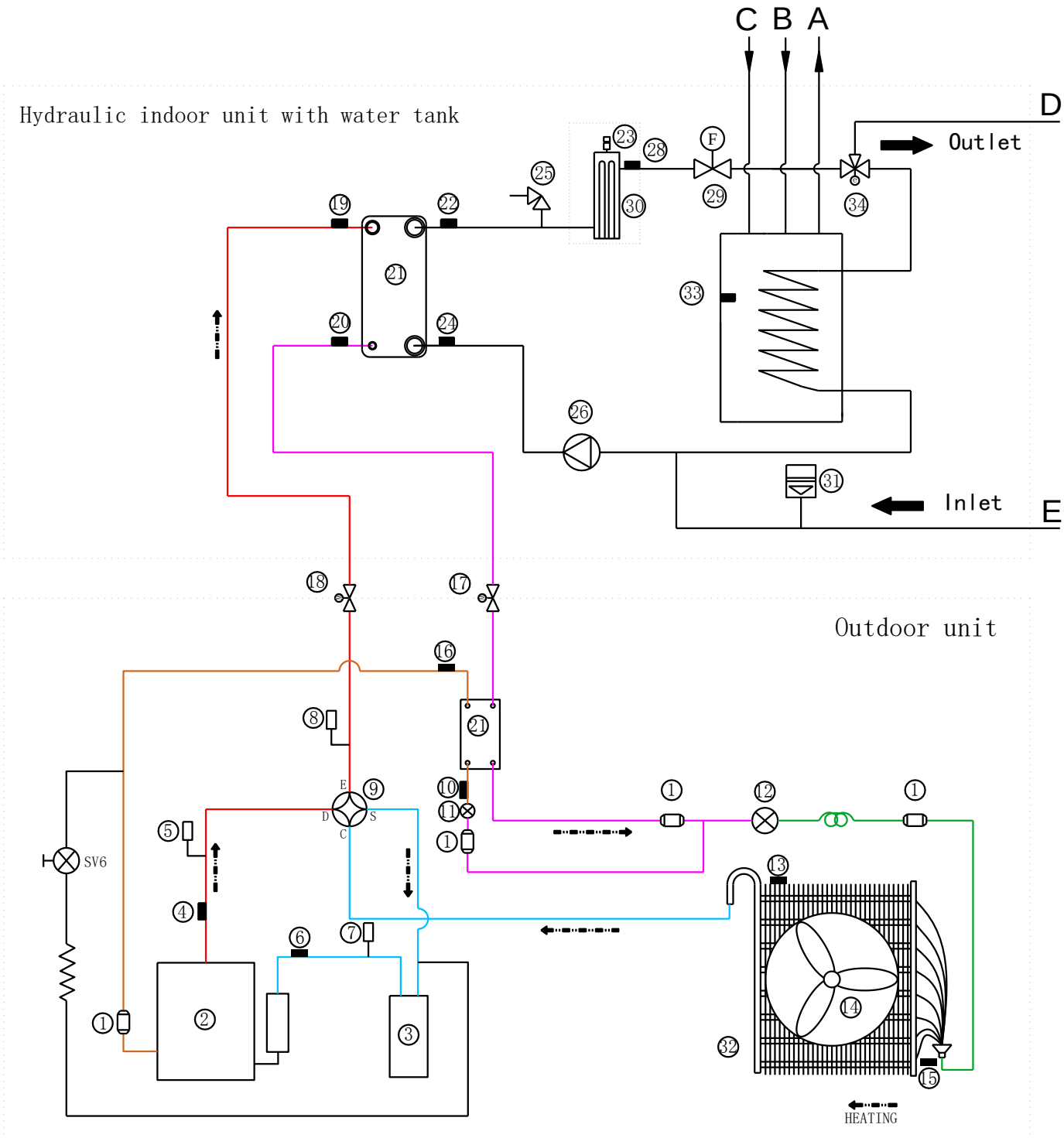
Heating/DHW mode



Refrigerant piping graphic example:

- High temperature, high pressure gas
- Medium temperature, high pressure liquid
- Medium temperature, Medium pressure gas
- Low temperature, low pressure gas liquid mixture
- Low temperature, low pressure gas

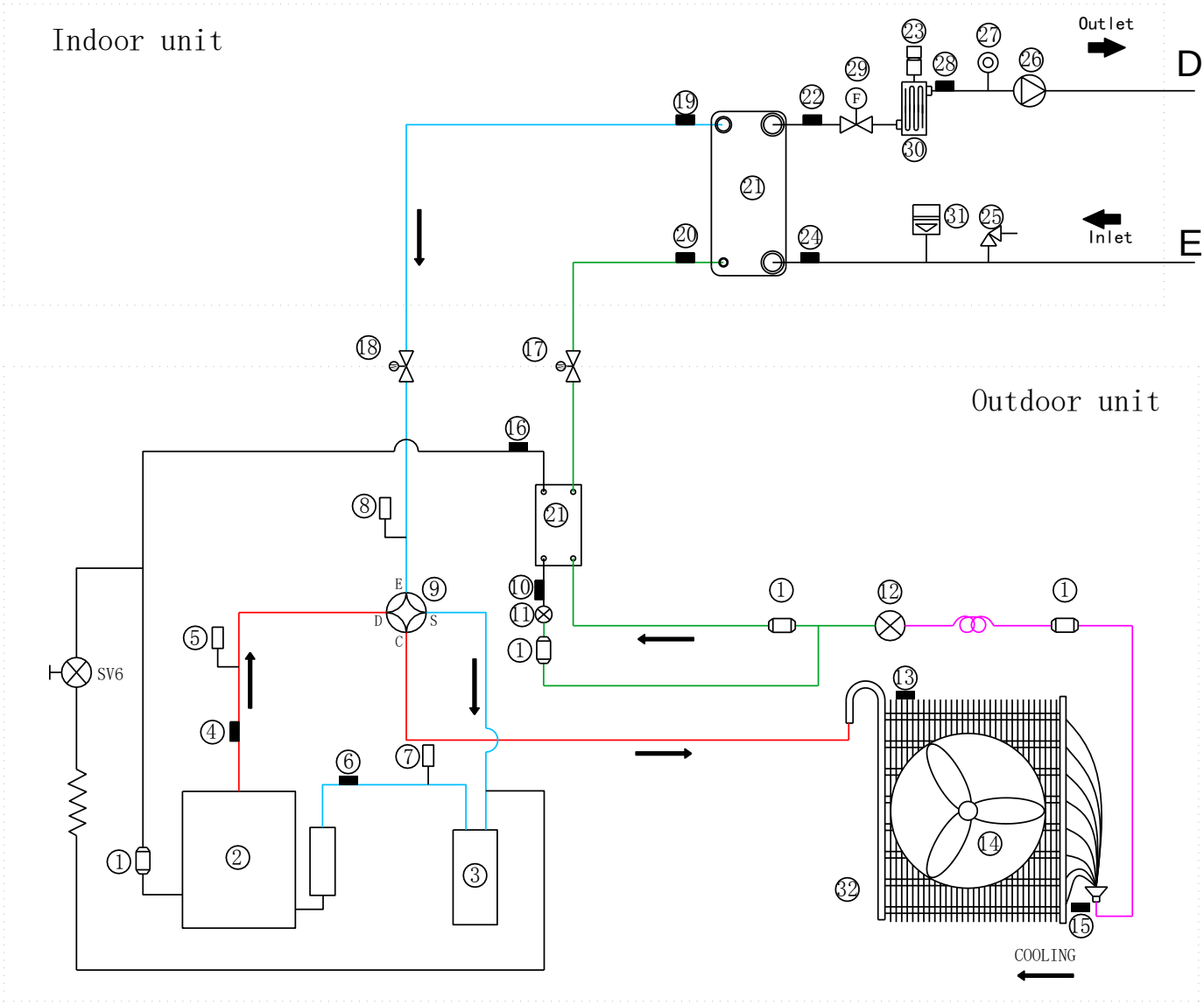
Heating/DHW mode



Refrigerant piping graphic example:

- High temperature, high pressure gas
- Medium temperature, high pressure liquid
- Low temperature, low pressure gas liquid mixture
- Low temperature, low pressure gas

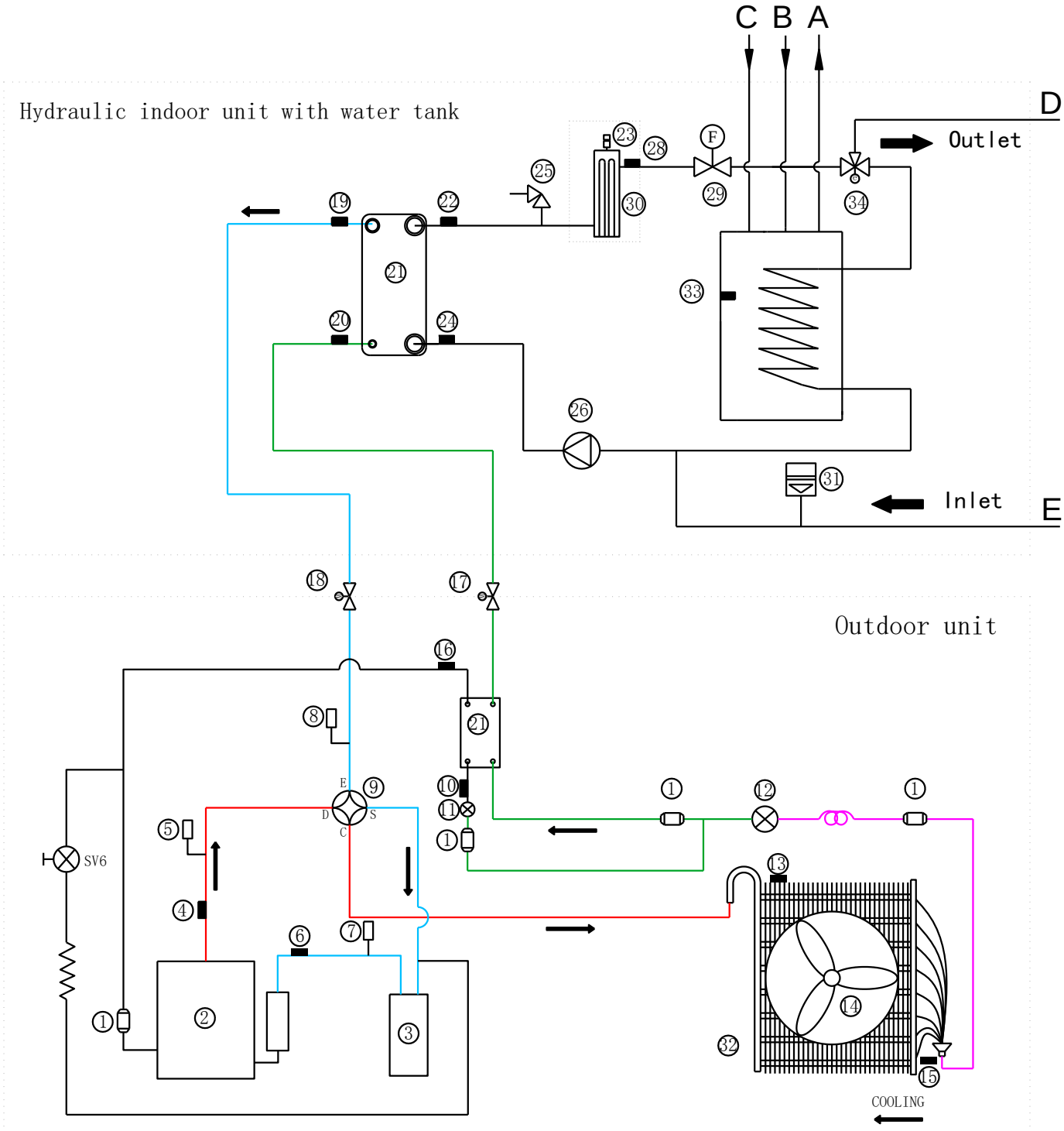
Cooling mode



Refrigerant piping graphic example:

- High temperature, high pressure gas
- Medium temperature, high pressure liquid
- Low temperature, low pressure gas liquid mixture
- Low temperature, low pressure gas

Cooling mode



Key components

1	Filter
2	Compressor
3	Liquid-gas separator
4	Tp (Compressor discharge) temperature sensor
5	High pressure switch
6	Th (Compressor suction) temperature sensor
7	Low pressure switch
8	Pressure sensor
9	4-Way valve
10	T9i temperature sensor
11	Electronic expansion valve 2
12	Electronic expansion valve 1
13	T4 (Outdoor ambient) temperature sensor
14	Fan
15	T3 (Outdoor unit heat exchanger bottom) temperature sensor
16	T9o temperature sensor
17	Liquid refrigerant stop valve
18	Gas refrigerant stop valve
19	T2B (Plate heat exchanger gas refrigerant) temperature sensor
20	T2 (Plate heat exchanger liquid refrigerant) temperature sensor
21	Plate heat exchanger
22	Tw_out (Plate heat exchanger water outlet) temperature sensor
23	Air purge valve
24	Tw_in (Plate heat exchanger water inlet) temperature sensor
25	Pressure relief valve
26	Water pump (Pump_I)
27	Water pressure sensor (Optional)
28	T1 (Backup heater outlet water) temperature sensor
29	Water flow switch
30	Internal backup heater(Optional)
31	Expansion vessel
32	Air side heat exchanger
33	Domestic water tank temperature sensor
34	3-Way valve
A	Domestic hot water outlet
B	Domestic hot water recirculaltion inlet
C	Domestic cold water inlet
D	Space heating/cooling water outlet
E	Space heating/cooling water inlet

- **Compressor：**

The refrigerant is compressed to very high pressures in the compressor, while its temperature is also raised. When the refrigerant enters a compressor, it is in a gaseous state at low pressure and low temperature and exits the compressor at high pressure and high temperature in a gaseous state.

- **4-way valve:**

To Control refrigerant flow direction. Hygge series has upgraded the default position of 4-way vlave , and made it to keep closed in heating mode and keep open in cooling mode. When closed, the air side heat exchanger functions as an evaporator

and water side heat exchanger functions as an condenser; when open, the air side heat exchanger functions as an condenser and water side heat exchanger function as an evaporator.

- **High pressure switch:**

To regulate refrigerant system pressure. When refrigerant system pressure rises above the upper limit, the high pressure switch turns off, stopping the compressor.

- **Low pressure switch:**

To regulate refrigerant system pressure. When refrigerant system pressure drops below the lower limit, the low pressure switch turns off, stopping the compressor.

- **Air side heat exchanger:**

To transfer heat between refrigerant and air. Refrigerant passes through the tube coils, conducts heat to the fins and dissipates heat to air forced through the heat exchanger.

- **Filter:**

To protect the inside of the heat pump from the dust and other contaminants that are found in the air, including hairs, pet dander and fibers. As the air passes through the filter, this dust and dirt gets caught to stop it from entering different parts of the system.

- **Electronic expansion valve 1(EXV1):**

Controls refrigerant flow and reduces refrigerant pressure.

- **Electronic expansion valve 2(EXV2):**

Controls refrigerant for throttling injection.

- **Plate heat exchanger:**

To transfer heat between two fluids. This has a major advantage over a conventional heat exchanger in that the fluids are exposed to a much larger surface area because the fluids are spread out over the plates. This facilitates the transfer of heat, and greatly increases the speed of the temperature change.

- **Water pump:**

To circulate water in the water circuit.

- **Pressure relief valve:**

To control or limit the pressure in a system; excessive pressure might otherwise build up and create a process upset, instrument or equipment failure, explosion, or fire.

- **Internal backup heater(Optional):**

To 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.

- **Air purge valve:**

To automatically remove air from the water circuit.

- **Water flow switch:**

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

- **Expansion vessel:**

To balance water system pressure. (Expansion vessel Nominal volume 8L, Actual volume 5L)

- **3-way valve**

Change the water circuit between DHW mode and heating/cooling mode.

Part 3

Control and Field settings

1 Shut-off Operation

The unit will automatically shut off if one of the following occurs:

- System abnormality: to protect the compressor, a thermal sensor will automatically shut the system off if it detects any abnormality that could potentially cause damage. An error code will show on both the outdoor unit PCB digital display and the user interface.
- Set temperature has been reached: system will shut off

2 Standby Control

2.1 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 on/off state. When the outdoor ambient temperature is above 8°C or the compressor is running, the crankcase heater is off; when the outdoor ambient temperature is at or below 5°C and either the compressor has been stopped for more than 3 hours or the unit has just been powered-on (either manually or when the power has returned following a power outage), the crankcase heater turns on.

2.2 Water Pump Control

When Heating/Cooling mode is ON and heat pump is on standby

For single zone control[1]

WATER FLOW TEMP.	ROOM TEMP.	DOUBLE ZONE	Zones control	Pump control
YES	NO	NO	Zone 1: Water temperature control	Pump_I and Pump_O keep running
NO	YES	NO	Zone 1: Room temperature control	Pump_I and Pump_O stop running

For double zone control[1]

WATER FLOW TEMP.		ROOM TEMP.	DOUBLE ZONE		Zones control	Pump control
YES		YES	YES	NO	Zone 1: Water temperature control Zone 2: Room temperature control	Pump_I and Pump_O keep running, Pump_C stops running.
YES	NO	NO	YES		Zone 1: Water temperature control Zone 2: Water temperature control	Pump_I, Pump_O and Pump_C keep running
YES	NO	YES	YES		Zone 1: Water temperature control Zone 2: Room temperature control	Pump_I and Pump_O keep running continuously, Pump_C stops running.

For Thermostat control[2], Pump_I, Pump_O and Pump_C keep running.

When “Tbt=YES[3]”, Pump_I stops running in all above situations.

Note:

1. Please refer to Part 3, 7.3.5 TEMP. TYPE SETTING for relevant setting.
2. Please refer to Part 3, 7.3.6 ROOM THERMOSTAT SETTING for relevant setting.
3. Please refer to Part 3, 7.3.14 INPUT DEFINE for relevant setting.
4. Pump_I: Internal circulator pump
   Pump_O: Zone 1 circulator pump
   Pump_C: Zone 2 circulator pump

3 Startup Control

3.1 Compressor Startup Delay Control

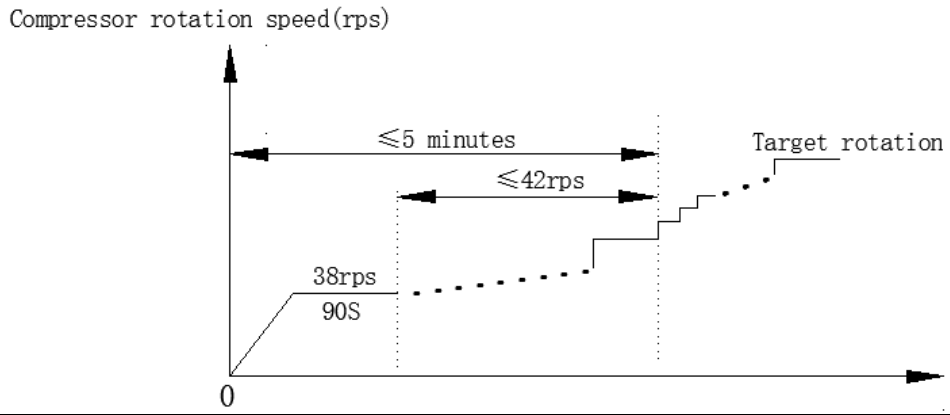
In initial startup control and in restart control (except in oil return operation and defrosting operation), compressor startup is delayed such that a minimum of the set re-start delay time 3minutes has elapsed since the compressor stopped, in order to prevent frequent compressor on/off and to equalize the pressure within the refrigerant system.

3.2 Compressor Startup Program

In initial startup control and in re-start control, compressor startup is controlled according to outdoor ambient temperature. Compressor startup follows one of two startup programs until the target rotation speed is reached.

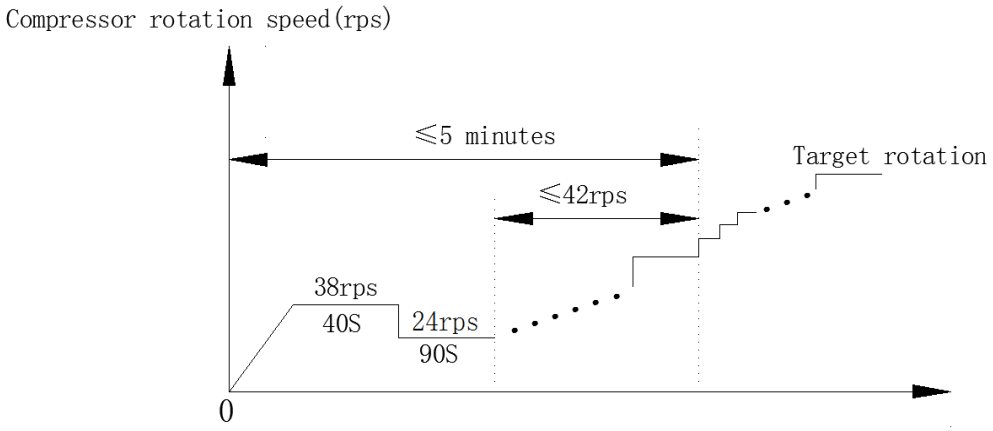
Cooling mode compressor startup program when ambient temperature is above 12°C
&
Heating mode compressor startup program when ambient temperature is above 0°C

12~16kw



Cooling mode compressor startup program when ambient temperature is below 12°C
&
Heating mode compressor startup program when ambient temperature is below 0°C

12~16kw



3.3 Component Startup Control

Component	Wiring diagram label	Control functions and states	
		Cooling mode	Heating and DHW mode
Inverter compressor	COMP	Refer to Part 4, 3.2 Compressor Startup Program	
DC fan motor	FAN	Fan run at maximum speed, refer to Part 4, 4.6 Fan Control	
Electronic expansion valve 1	EXV1	Position (steps) from 0 (fully closed) to 480 (fully open), controlled according to outdoor ambient temperature, discharge temperature, suction superheat, compressor speed and refrigerant system pressure	
Electronic expansion valve 2	EXV2	OFF	Position (steps) from 0 (fully closed) to 400 (fully open), controlled according to outdoor ambient temperature, discharge temperature, sub cooling, discharge superheat, compressor speed and refrigerant system pressure
4-way valve	4-WAY	OFF	ON

4 Normal Operation Control

4.1 Component Operation Control

Cooling mode			
Component	Wiring diagram label	Control functions and states	
		Cooling mode	Heating and DHW mode
Inverter compressor	COMP	Controlled according to load requirement from set temperature and outlet water temperature	
DC fan motor	FAN	Controlled according to outdoor heat exchanger pipe temperature	
Electronic expansion valve 1	EXV1	Position (steps) from 0 (fully closed) to 480 (fully open), controlled according to outdoor ambient temperature, discharge temperature, suction superheat, compressor speed and refrigerant system pressure	
Electronic expansion valve 2	EXV2	OFF	Position (steps) from 0 (fully closed) to 400 (fully open), controlled according to outdoor ambient temperature, discharge temperature, sub cooling, discharge superheat, compressor speed and refrigerant system pressure and temperature
4-way valve	4-WAY	OFF	ON

4.2 Compressor Output Control

The compressor rotation speed is controlled according to the load requirement. Before compressor startup, the outdoor unit determines the compressor target speed according to outdoor ambient temperature, leaving water set temperature and actual leaving water temperature and then runs the appropriate compressor startup program. Refer to Part 4, 3.2 Compressor Startup Program. Once the startup program is complete, the compressor runs at the target rotation speed. During operation the compressor speed is controlled according to the rate of change in water temperature, the refrigerant system pressure and the refrigerant temperature.

4.3 Compressor Frequency Control

The running speed of six-pole compressors 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 4-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 4-way valve is ON; during cooling and defrosting operations, the 4-way valve is OFF.

4.5 Electronic Expansion Valve 1 Control

The position of the electronic expansion valve 1 (EXV1) is controlled in steps from 0 (fully closed) to 480 (fully open).

When power-on, the EEV first closes fully, then moves to the standby position (480 (steps)). After compressor runs the EEV is controlled according to suction superheat discharge temperature, pressure, discharge temperature and compressor speed.

When heat pump is in standby, the EEV is at position 480 (steps).

When heat pump stops, the EEV first moves to 480 (steps) and remains for 30 seconds, then closes fully, then moves to the standby position (480 (steps)).

4.6 Electronic Expansion Valve 2 Control

The position of the electronic fuel injector expansion valve 2 (EXV2) is controlled in steps from 0 (fully closed) to 400 (fully open).

- At power-on:
  - The EXV first closes fully, then moves to the position (480 (steps)), then moves to the standby position (0 (steps)). After compressor runs the EXV is controlled according to sub cooling, discharge superheat, discharge temperature, pressure and compressor speed.
- When the outdoor unit is in standby:
  - The EXV is at position 0 (steps).
- When the outdoor unit stops:
  - The EXV first moves to 480 (steps) and remains for 30 seconds, then closes fully, then moves to the standby position (0 (steps)).

4.7 Fan Control

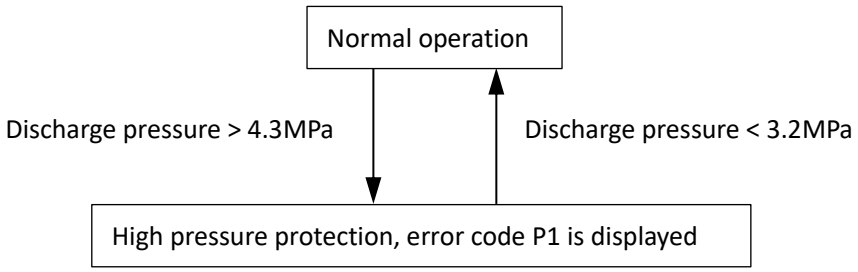
The speed of the fan is adjusted in steps, as shown below.

Fan speed index	Fan speed (rpm)	
	1ph 12/14/16kw	3ph 12/14/16kw
W1	150	150
W2	180	180
W3	200	200
W4	230	230
W5	250	250
W6	280	280
W7	300	300
W8	350	350
W9	380	380
W10	400	400
W11	430	430
W12	450	450
W13	480	480

5 Protection Control

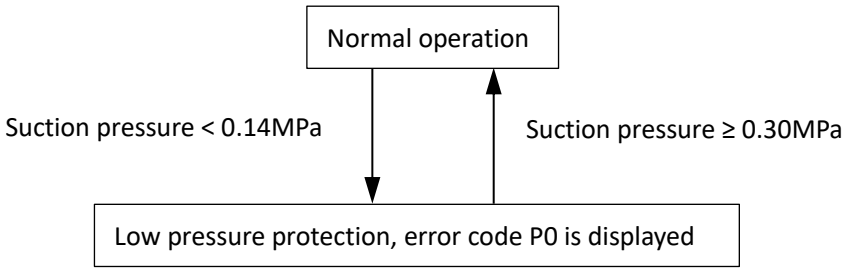
5.1 High Pressure Protection Control

This control protects the refrigerant system from abnormally high pressure and transient spikes in pressure.



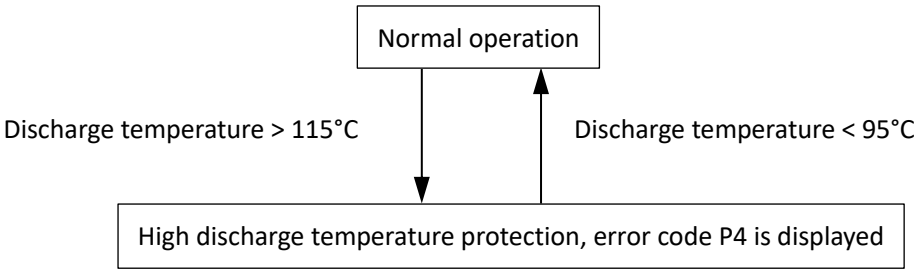
5.2 Low Pressure Protection Control

This control protects the refrigerant system from abnormally low pressure and transient drops in pressure.



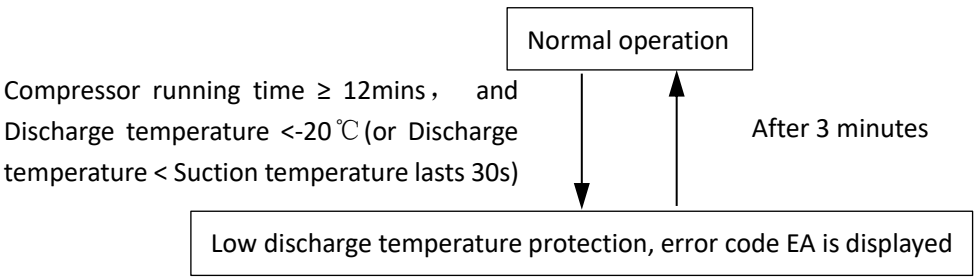
5.3 High Discharge Temperature Protection Control

This control protects the compressor from abnormally high temperatures and transient spikes in temperature.



5.4 Low Discharge Temperature Protection Control

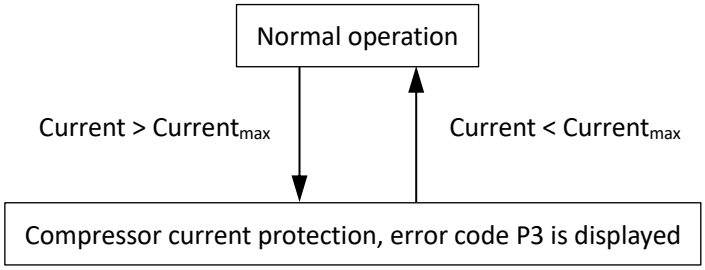
This control protects the compressor from abnormally low temperatures and transient drops in temperature.



Note: EA protection occurs 3 times within 2 hours, the heat pump can not be restarted unless it is powered on again.

5.5 Compressor Current Protection Control

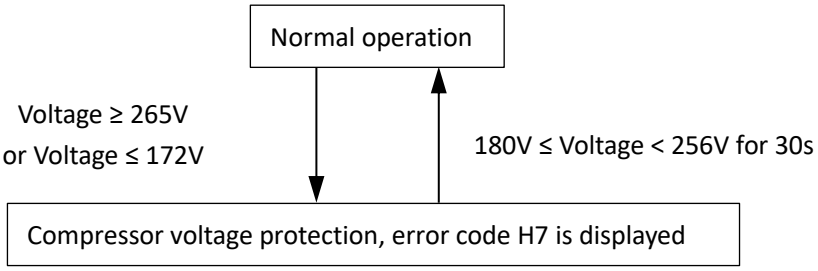
This control protects the compressor from abnormally high currents.



Model	1-ph 12-16kw	3-ph 12-16kw
Current$_{max}$	33A	14A

5.6 Compressor Voltage Protection Control

This control protects the heat pump from abnormally high or abnormally low voltages.



5.7 DC Fan Motor Protection Control

This control protects the DC fan motors from strong winds and abnormal power supply. DC fan motor protection occurs when any one of the following conditions are met:

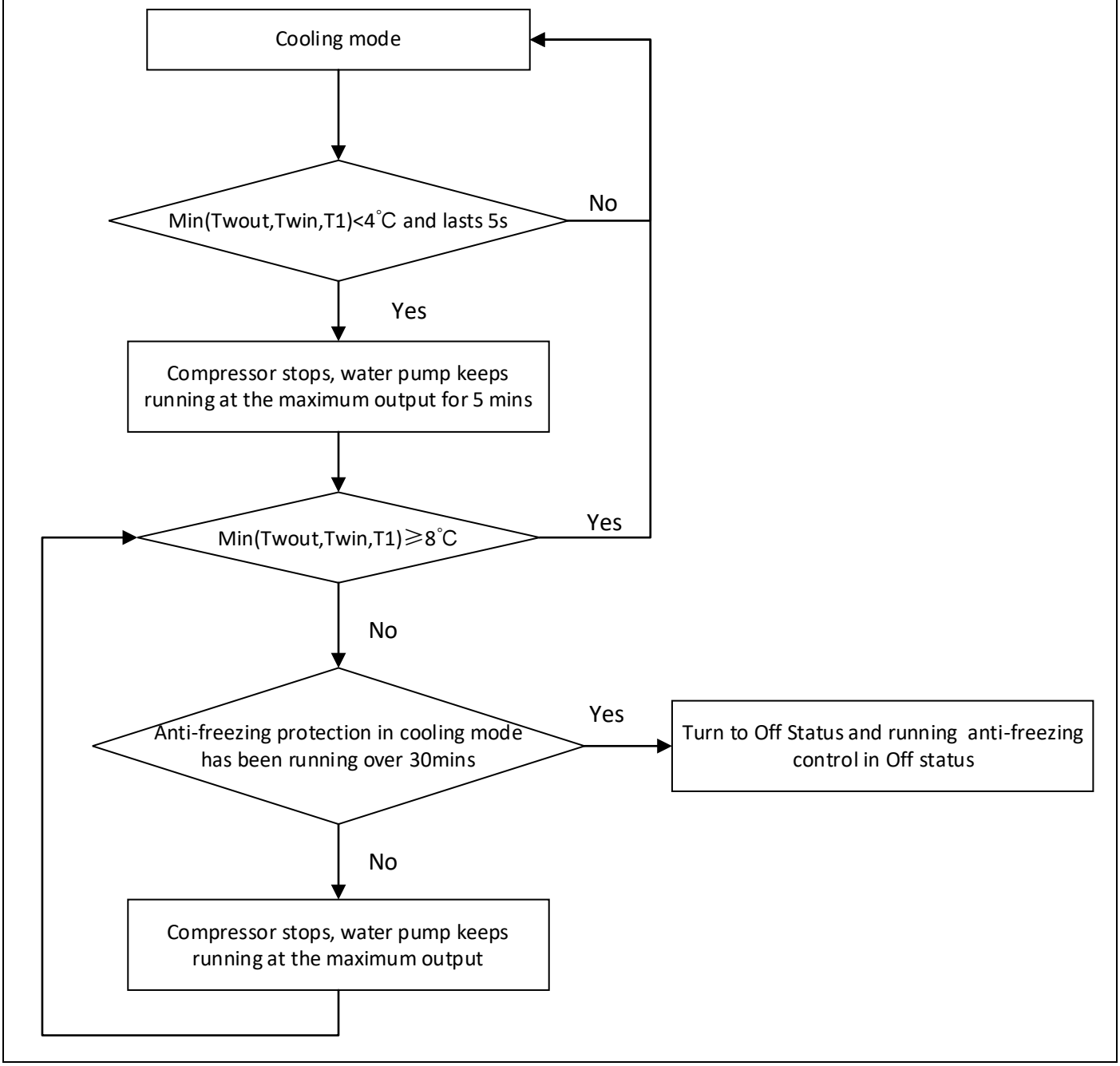
- Fan speed continues to be less than 50rpm more than 40S from the set fan step＞0
- Fan speed is lower than 50rpm for 3S,during normal operation

When DC fan motor protection control occurs the system displays the H6 error code and the unit stops running. After 30S, the unit restarts automatically. When H6 protection occurs 10 times in 120 minutes, the HH error is displayed. When an HH error occurs, a manual system restart is required before the system can resume operation.

5.8 Anti-freezing Protection Control

When water side heat exchanger anti-freeze protection occurs the system displays error code Pb and the unit stops running.

Anti-freezing control in Cooling mode

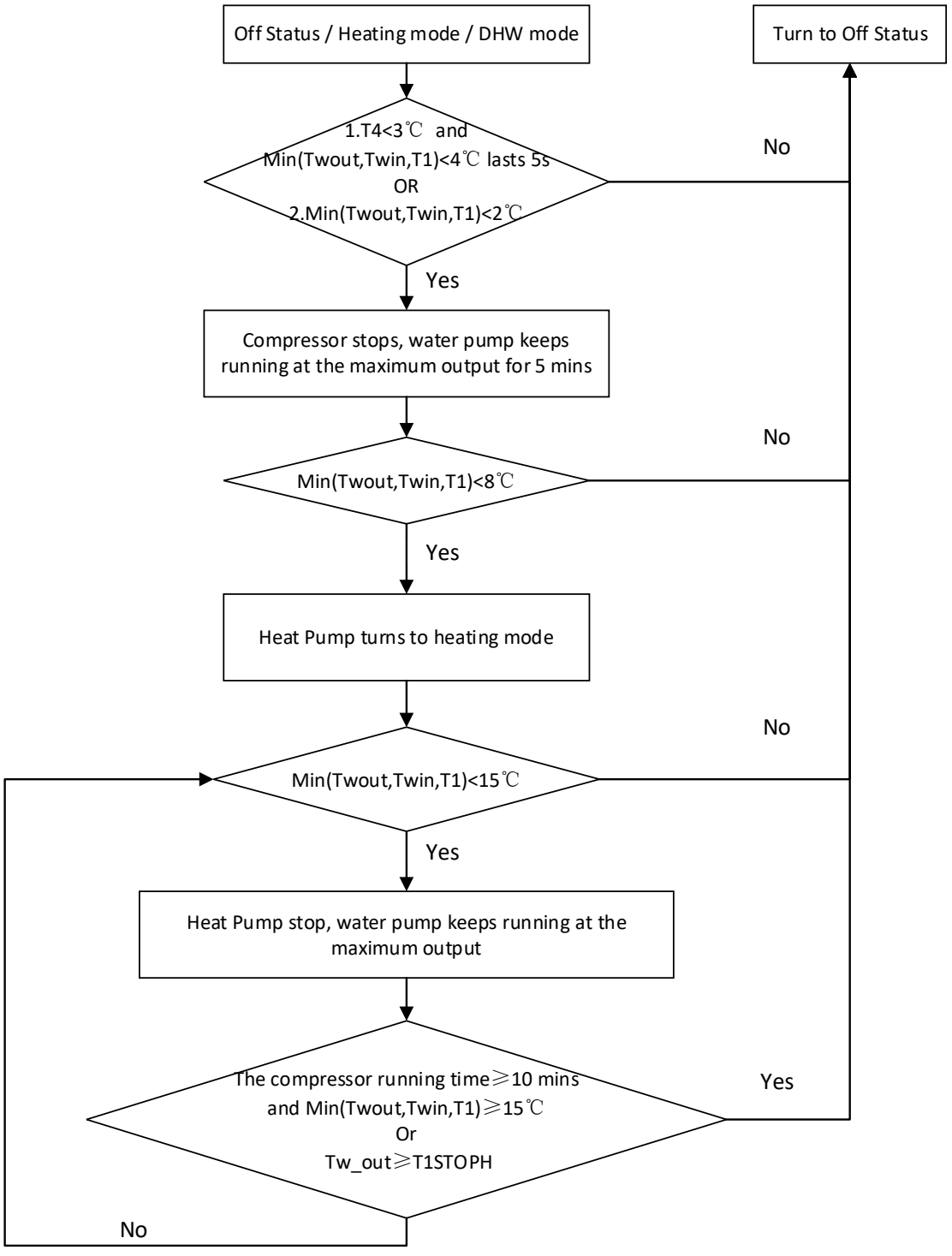


Tw_out: Plate heat exchanger outlet water temperature

Tw_in: Plate heat exchanger inlet water temperature

T1: Electric Heater/AHS water outlet temperature

Anti-freezing control in Off status/ Heating mode/ DHW mode



T4: Ambient temperature

Tw_out: Plate heat exchanger outlet water temperature

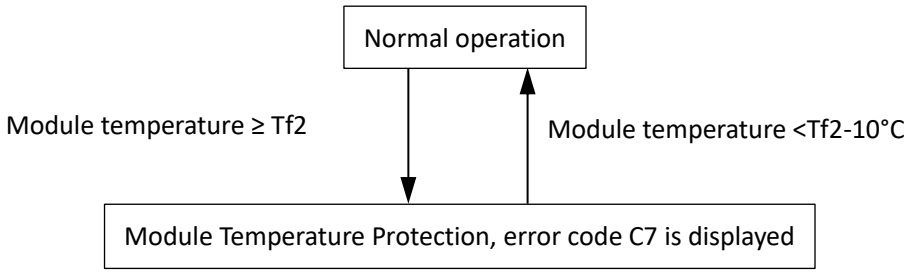
Tw_in: Plate heat exchanger inlet water temperature

T1: Electric Heater/AHS water outlet temperature

T1STOPH: The maximum temperature to stop compressor in heating mode

5.9 Module temperature protection control

This control protects the module from abnormally high temperatures.



Module temperature calculation value	12-16kW 1ph	12-16kW 3ph
Tf2	79℃	100℃

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 oil return operation is being conducted, the refrigerant system main PCB displays code d0.

The oil return operation starts when the compressor cumulative operating time with running rotation speed less than 42rps reaches 6 hours.

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

- Oil return operation duration reaches 5 minutes.
- Compressor stops.

Component control during oil return operation			
Component	Wiring diagram label	Control functions and states	
		cooling mode	heating and DHW mode
Inverter compressor	COMP	Runs at oil return operation rotation speed	
DC fan motor	FAN	Controlled according to cooling mode	Controlled according to heating mode
Electronic expansion valve 1	EXV1	304 (steps)	
Electronic expansion valve 2	EXV2	Off	
4-way valve	4-WAY	OFF	ON

6.2 Defrosting Operation

In order to recover heating capacity, the defrosting operation is conducted when the air side heat exchanger 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.

Component control during defrosting operation		
Component	**Wiring diagram label**	**Control functions and states**
Inverter compressor	COMP	Runs at defrosting operation rotation speed
DC fan motor	FAN	Off
Electronic expansion valve 1	EXV1	Fully open
Electronic expansion valve 2	EXV2	Off
4-way valve	4-WAY	OFF

6.3 Force cooling operation

The force cooling operation helps the refrigerant recovering before removal the water side heat exchanger. The force cool mode can be ended by pushing the button on the outdoor refrigerant system PCB named “force-cool” for 5s or this mode will be ended automatic if the system has operated force cool mode for more than 30 minutes.

Component control during force cooling operation		
Component	**Wiring diagram label**	**Control functions and states**
Inverter compressor	COMP	Runs at force cooling operation rotation speed
DC fan motor	FAN	Runs at force cooling operation speed
Electronic expansion valve 1	EXV1	304 (steps)
Electronic expansion valve 2	EXV2	Off
4-way valve	4-WAY	Off

6.4 Fast DHW operation

Fast DHW operation is used to quickly meet a requirement for domestic hot water.

Component control during Fast DHW operation		
Component	**Wiring diagram label**	**Control functions and states**
Inverter compressor	COMP	Controlled according to load requirement
DC fan motor	FAN	Controlled according to outdoor heat exchanger pipe temperature
Electronic expansion valve 1	EXV1	Position (steps) from 0 (fully closed) to 480 (fully open), controlled according to outdoor ambient temperature, discharge temperature, sub cooling, discharge superheat, compressor speed and refrigerant system pressure and temperature
Electronic expansion valve 2	EXV2	Position (steps) from 0 (fully closed) to 400 (fully open), controlled according to outdoor ambient temperature, discharge temperature, sub cooling, discharge superheat, compressor speed and refrigerant system pressure and temperature
4-way valve	4-WAY	ON
Tank booster heater	TBH	ON

6.5 Double zones control

Double zones control is to control temperature of each zone separately, which is only available for heating mode. In this case, the 3-way mixing valve (SV3) is controlled to adjust the water temperature of the low temperature zone by control the opening time and closing time of the valve. When the valve initially turns on, the opening time and closing time is same and then the time is controlled according to the difference between water temperature and setting water temperature of the controlling zone thus different type terminals will operate at its optimal temperature.

Please note that heat pump just have the controlling function, while the mixing valve, water pump of each zone need to be field supplied and connect to heat pump.

6.6 Smart grid control

Unit adjusts the operation according to different electrical signals to realize energy saving.

EVU signal	SG signal	Control
ON	ON	As long as the DHW mode is set to be valid, heat pump will operate in DHW mode priority and the DHW mode setting temperature will be change to 70℃. When T5＜69℃，the TBH is on When T5≥70℃，the TBH is off
ON	OFF	As long as the DHW mode is on, heat pump will operate in DHW mode priority. When T5＜T5S-2，the TBH is on When T5≥T5S+3，the TBH is off
OFF	ON	Normal operation according to customers' requirement.
OFF	OFF	Prohibit DHW mode, TBH and disinfect operation. Heat pump runs cooling/heating mode for "SG RUNNING TIME" which is set on wired controller and then turns off.

Note:

1. EVU signal and SG signal are provided from the Smart Grid system
2. T5S means water tank setting temperature

6.7 Balance tank temperature control

Balance tank temperature sensor is used to control on/off of heat pump. Balance tank stores energy and external pump works to provide cool/hot water for space cooling/heating whilst heat pump can run DHW mode to produce sanitary hot water at the same time or stops to save energy depends on the sanitary hot water demand.

6.8 Dry contract M1M2 control

M1M2 can be set in the wired controller for heat pump on/off control, TBH control, AHS control.

- For heat pump on/off control

When dry contract closes for 1s, heat pump stops and d8 code appears. When dry contract opens for 5s, heat pump is controlled according to wired controller or room thermostat setting.

- For TBH control

TBH is only controlled by M1M2. If dry contract closes and T5<65℃, then TBH turns on until water tank temperature reaches 70℃.

- For AHS control

When heat pump operates in heating mode, AHS on/off is only controlled by M1M2.

When heat pump operates in DHW mode, M1M2 control is not effective for AHS.

6.9 Tank booster heater

Heat pump will stop when T5(tank temperature) has reached the minimum of both T5S(tank setting temperature) and T5stop (highest tank temperature which can be reached under certain ambient temperature with heat pump only) and lasted for 5s. The value of T5stop is shown as below.

If T5S is higher than T5stop, then T5S can not be reached with heat pump only. In this case, tank booster heater is needed in order to reach T5S.

T5stop value:

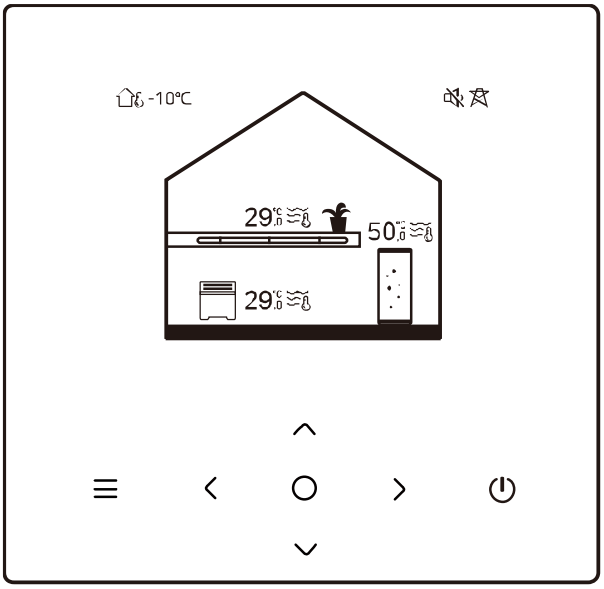
Ambient temperature(℃)	< -20	-20~-15	-15~-10	-10~-5	-5~0	0~5	5~10
T5stop(℃)	35	40	45	48	52	55	56

Ambient temperature(℃)	10~15	15~20	20~25	25~30	30~35	35~40	40~65
T5stop(℃)	57	56	55	52	50	48	45

7 User Interface Field Settings

7.1 Introduction

During installation, the parameters setting should be configured by the installer to suit the installation configuration, climate conditions and end-user preferences. The relevant settings are accessible and programmable through the FOR **SERVICEMAN** menu on the user interface. The user interface menus and settings can be navigated using the touch-sensitive keys.



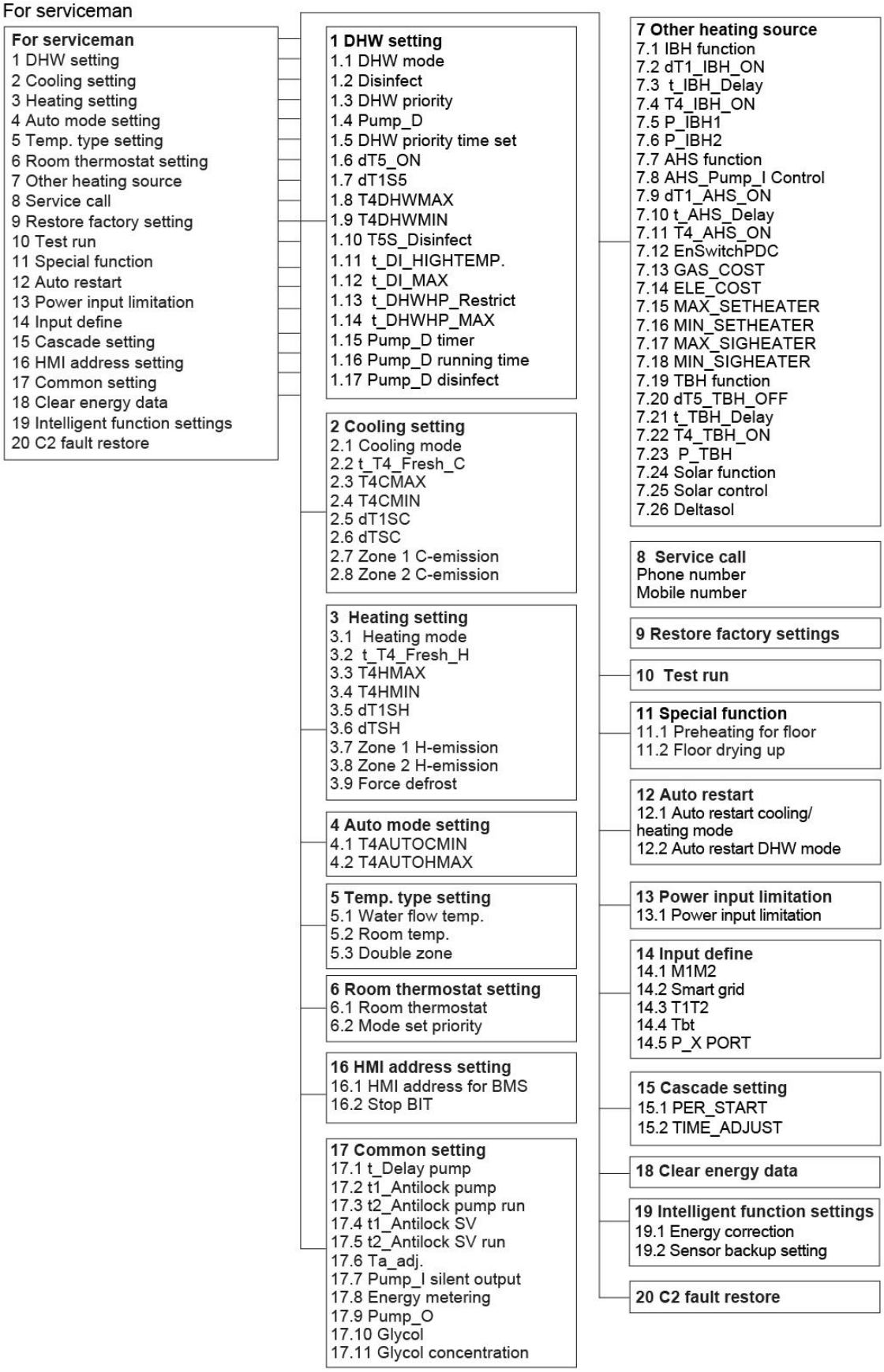
Keys	Function
≡	Menu
	Return
○	Confirm
⏻	ON/OFF
∧ ‹ › ∨	Navigation

Combinations of buttons：

Press ≡ and › simultaneously for 3 seconds to enter the **For serviceman** menu.

7.2 Menu Structure

For serviceman



There are some items that are invisible if the function is disabled or unavailable.

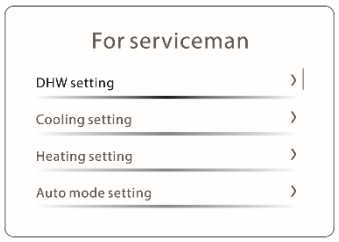
7.3 FOR SERVICEMAN Menu

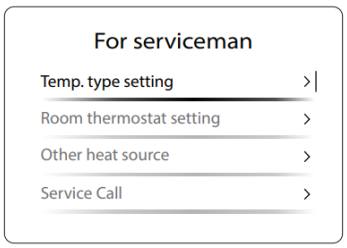
For serviceman allows installers to input the system configuration and set the system parameters.

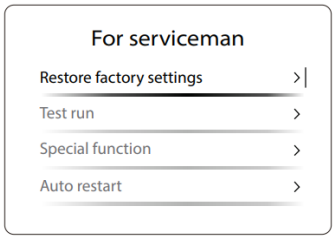
Press ≡ and › simultaneously for 3 seconds to enter the authorization page.

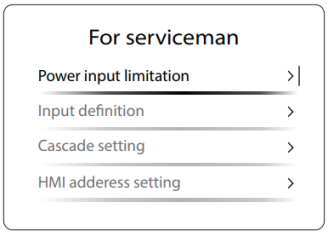
Press ‹› to navigate cursor and press ◇ to adjust the numerical values. The password is 234. Press ○ to enter **For serviceman** menu.

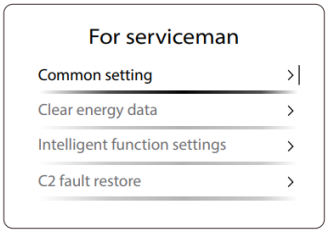
Then the following pages will be displayed:



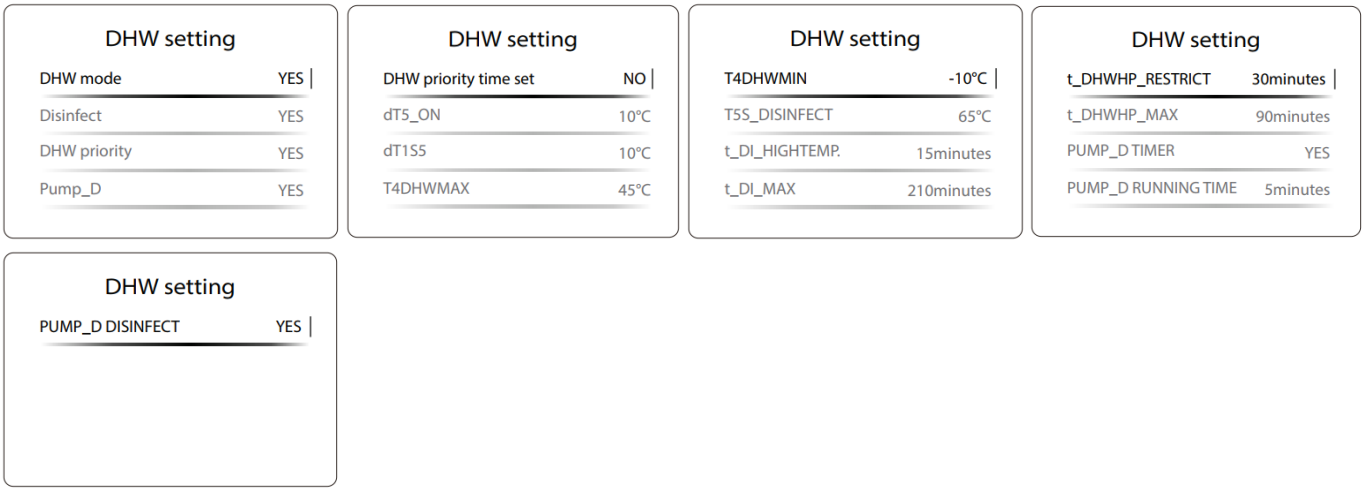








7.3.1 DHW heating setting



7.3.1.1 DHW mode

DHW mode defines whether hot water demand is needed.

Setting	Description
YES	Enable DHW mode if DHW tank is installed.
NO	Disable DHW mode if DHW tank is not installed. In this case, no need to define other settings in **DHW setting,** all other settings in DHW setting will be invisible.

7.3.1.2 Disinfect, T5S_DISINFECT, t_DI_HIGHTEMP, t_DI_MAX

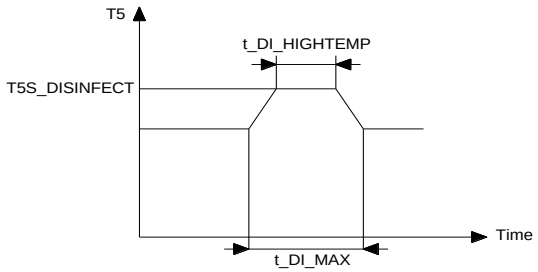
Disinfect defines whether disinfection function is activated.

Setting	Description
YES	Enable DHW tank disinfection function.
NO	Disable DHW tank disinfection function.

T5S_DISINFECT defines the target water temperature of water tank for disinfection function.

t_DI_HIGHTEMP defines Period that disinfection water target temperature maintains.

t_DI_MAX defines maximum duration of disinfection mode.



Abbreviations:
T5: DHW tank water temperature

7.3.1.3 DHW priority, DHW priority time set, t_DHWHP_RESTRICT, t_DHWHP_MAX

DHW priority defines whether domestic hot water or space heating/cooling takes priority.

Setting	Description
YES	When DHW demand and space heating/cooling demand both exist, heat pump will heat the water according to the setting of **DHW priority time set, t_DHWHP_RESTRICT, t_DHWHP_MAX**
NO	When DHW demand and space heating/cooling demand both exist, heat pump will heat the water after space heating/cooling demand is satisfied.

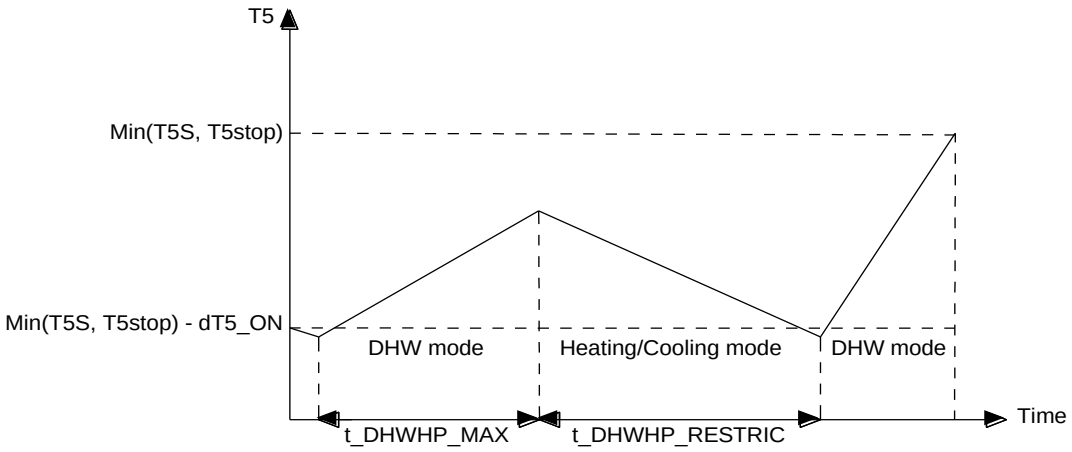
DHW priority time set defines whether **t_DHWHP_RESTRICT**(the_operation time of heating/cooling mode) is to be considered before switching to DHW mode and whether **t_DHWHP_MAX**(the operation time of DHW mode) is to be considered before switching to heating/cooling mode.

Setting	Description
YES	Enable the setting of **t_DHWHP_RESTRICT, t_DHWHP_MAX**
NO	Disable the setting of **t_DHWHP_RESTRICT, t_DHWHP_MAX**

t_DHWHP_RESTRICT defines the period that heat pump runs in space heating/cooling mode before switching to DHW mode if DHW requirement exists.

t_DHWHP_MAX defines the period that heat pump runs in DWH mode before switching to space heating/cooling mode if space heating/cooling requirement exists.

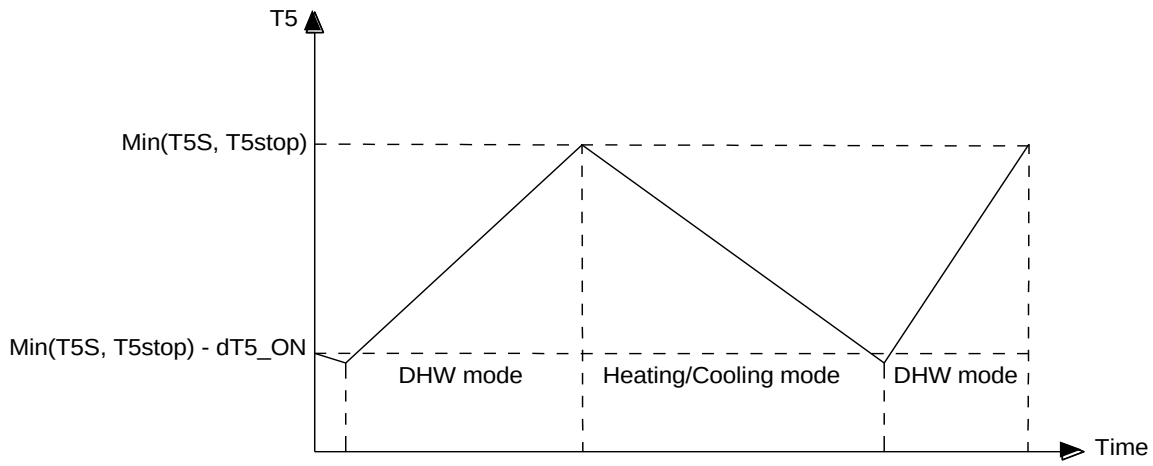
Diagram below illustrates the effects of **t_DHWHP_MAX** and **t_DHWHP_RESTRICT** when **DHW PRIORITY** and **DHW priority time set** are enabled.



Abbreviations:
T5: DHW tank water temperature
T5S: DHW tank set temperature
T5stop: Leaving water temperature operating limit of DHW mode

DHW PRIORITY	DHW PRIORITY TIME SET	t_DHWHP _RESTRICT	t_DHWHP _MAX	Heating/Cooling turns to DHW	DHW turns to Heating/Cooling
YES	YES	A min	B min	andand DHW mode ON andand T5<MIN(T5S, T5STOP)-dT5_ON andand Heating/Cooling mode operates for A mins	|| DHW mode OFF || T5≥MIN(T5S, T5STOP) || DHW mode operates for B mins andand Heating/Cooling mode ON
YES	NO	-	-	andand DHW mode ON andand T5<MIN(T5S, T5STOP)-dT5_ON	|| DHW mode OFF || T5≥MIN(T5S, T5STOP) andand Heating/Cooling mode ON
NO	-	-	-	andand DHW mode ON andand T5<MIN(T5S, T5STOP)-1 andand Heating/Cooling mode OFF	Heating/Cooling mode ON

Diagram below illustrates the effects when **DHW priority time set** is disabled.



Abbreviations:
T5: DHW tank water temperature
T5S: DHW tank set temperature
T5stop: Leaving water temperature operating limit of DHW mode

7.3.1.4 Pump_D, PUMP_D TIMER, PUMP_D RUNNING TIME, PUMP_D DISINFECT

DHW pump**(Pump_D)** is installed to circulate the water in the DHW pipe network.

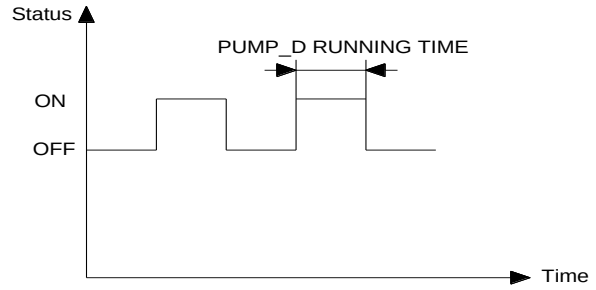
Setting	Description
YES	Installation with DHW pump.
NO	Installation without DHW pump.

PUMP_D TIMER defines whether DHW pump operation schedule which is defined in the user menu is activated.

Setting	Description
YES	Enable DHW pump run in timer.
NO	Disable DHW pump run in timer.

PUMP_D RUNNING TIME defines the period that DHW pump operates for each timer

Diagram below illustrates the effects of **PUMP_D RUNNING TIME** when **Pump_D** is installed and **PUMP_D TIMER** is enable.



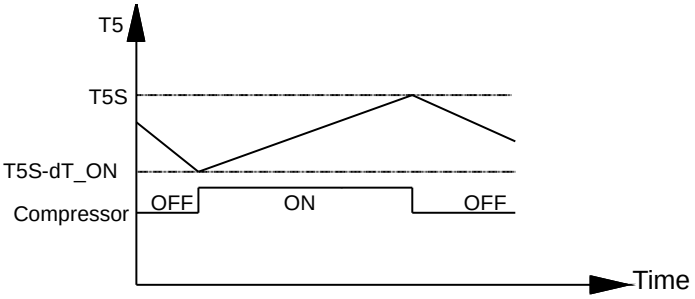
PUMP_D DISINFECT defines whether DHW pump operation is activated in disinfection mode.

Setting	Description
YES	When heat pump is in disinfection mode and T5S_DISINFECT - T5≤2, DHW pump operates **PUMP_D RUNNING TIME**+5 minutes T5S_DISINFECT: DHW tank disinfection set temperature T5: DHW tank temperature
NO	Disable the DHW pump operates when heat pump is in disinfection mode

7.3.1.5 dT5_ON

dT5_ON defines water temperature hysteresis of activating heat pump.

When T5S - T5 ≥ dT5_ON and heat pump is within operating ambient temperature range, heat pump provides hot water to the DHW tank.



Abbreviations:
T5: DHW tank water temperature
T5S: DHW set temperature

7.3.1.6 dT1S5

Leaving water set temperature(T1S) for DHW mode is calculated by formula: T1S = T5 + △dT1S5 + dT1S5

T1S: Leaving water set temperature

T5: DHW tank water temperature

△dT1S5: Temperature modification value related to DHW tank water temperature(T5)

T5	T5<30℃	30℃≤T5<43℃	43℃≤T5
△dT1S5	6	4	0

dT1S5: Temperature difference between leaving water set temperature and tank water temperature modification value.

7.3.1.7 T4DHWMAX, T4DHWMIN

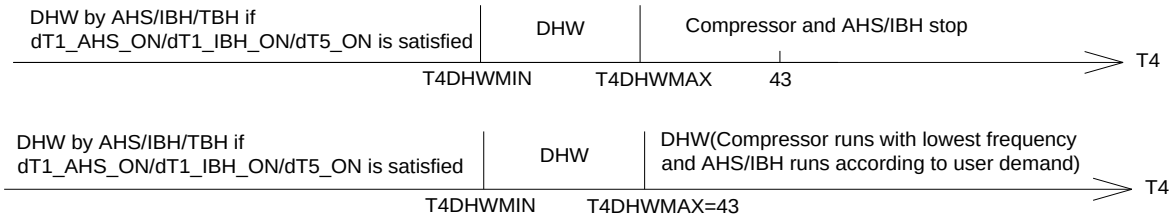
T4DHWMAX defines the ambient temperature above which heat pump and AHS/IBH may have different actions.

When T4DHWMAX≤T4 and T4DHWMAX<43, both compressor and AHS/IBH stop running.

When T4HMAX≤T4 and T4DHWMAX=43, compressor runs with lowest frequency and AHS/IBH runs according to user demand.

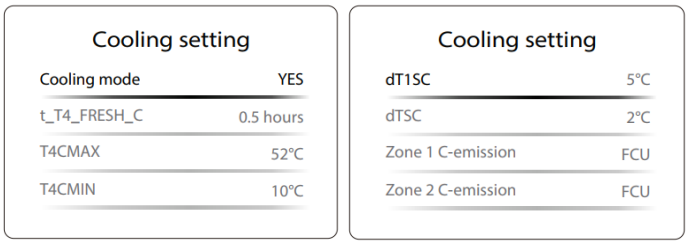
T4DHWMIN defines the ambient temperature below which heat pump stops, while AHS/IBH/TBH can run if dT1_AHS_ON/dT1_IBH_ON/dT5_ON is satisfied.

Diagram below illustrates the effects of **T4DHWMAX** and **T4DHWMIN.**



Abrreviations:
HP: Heat pump
TBH: DWH tank immersion heater
AHS: Auxiliary heating source
IBH: Electric heater

7.3.2 Cooling setting



7.3.2.1 Cooling mode

Cooling mode defines whether space cooling demand is needed.

Setting	Description
YES	Enable cooling mode if space cooling terminals are installed.
NO	Disable cooling mode if space cooling terminals are not installed. In this case, no need to define other settings in **Cooling mode, all other settings in Cooling mode will be invisible**.

7.3.2.2 t_T4_FRESH_C

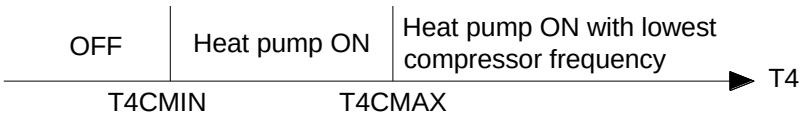
t_T4_FRESH_C defines the refresh cycle of detecting ambient temperature for climate curve.

7.3.2.3 T4CMAX, T4CMIN

T4CMAX defines ambient temperature above which heat pump operates with lowest compressor frequency.

T4CMIN defines ambient temperature below which heat pump not operates.

Diagram below illustrates the effects of **T4CMAX** and **T4CMIN.**



Abrreviations:

T4: Outdoor ambient temperature

7.3.2.4 dT1SC

dT1SC defines water temperature hysteresis of activating heat pump.

When T1 – T1S ≥ dT1SC and heat pump is within operating ambient temperature range, heat pump provides chilled water to space cooling terminals.

Abrreviations:

T1: Leaving water temperature

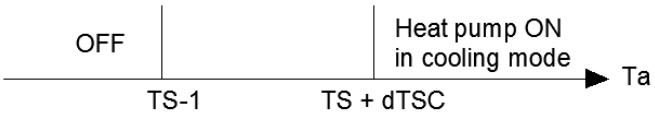
T1S: Leaving water set temperature

T1Stop: Leaving water temperature operating limit of cooling mode

7.3.2.5 dTSC

dTSC define room temperature hysteresis of activating heat pump. **dTSC** is only applicable if **YES** is selected for **Room temp.** in the **Temp. type setting**.

When Ta – TS ≥ dTSC and heat pump is within operating ambient temperature range, heat pump provides chilled water to space cooling terminals.



Abrreviations:
Ta: Actual room temperature
TS: Room setting temperature

7.3.2.6 Zone 1 C-emission, Zone 2 C-emission

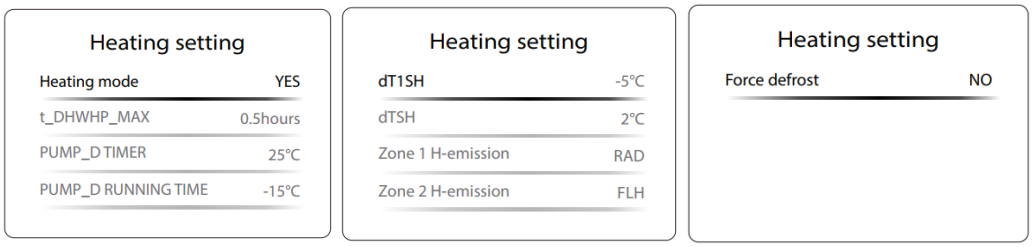
Zone 1 C-emission defines the terminal type of zone 1.

Setting	Description
FCU	Fan coil unit
FLH	Floor heating loop
RAD	Radiator

Zone 2 C-emission defines the terminal type of zone 2.

Setting	Description
FCU	Fan coil unit
FLH	Floor heating loop
RAD	Radiator

7.3.3 Heating setting



7.3.3.1 Heating mode

Heating mode defines whether space heating demand is needed.

Setting	Description
YES	Enable heating mode if space heating terminals are installed.
NO	Disable heating mode if space heating terminals are not installed. In this case, no need to define other settings in **Heating mode,** all other settings in Heating mode will be invisible.

7.3.3.2 t_T4_FRESH_H

t_T4_FRESH_H defines the refresh time of heating mode climate temperature curve.

7.3.3.3 T4HMAX, T4HMIN

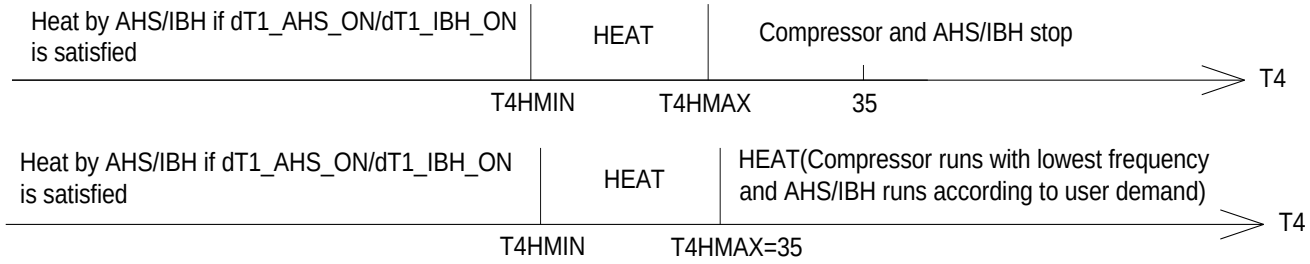
T4HMAX defines the ambient temperature above which heat pump and AHS/IBH may have different actions.

When T4HMAX≤T4 and T4HMAX<35, both compressor and AHS/IBH stop running.

When T4HMAX≤T4 and T4HMAX=35, compressor runs at lowest frequency and AHS/IBH runs according to user demand.

T4HMIN defines the ambient temperature below which heat pump stops, while AHS/IBH can run if dT1_AHS_ON/dT1_IBH_ON is satisfied.

Diagram below illustrates the effects of **T4HMAX** and **T4HMIN.**



Abrreviations:

T4: Outdoor ambient temperature

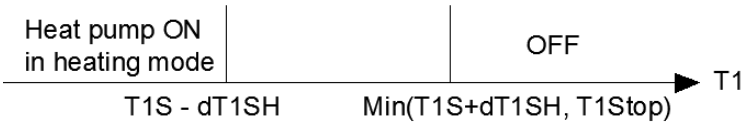
AHS: Additional heating source

IBH: Internal backup heater

7.3.3.4 dT1SH

dT1SH defines water temperature hysteresis of activating heat pump.

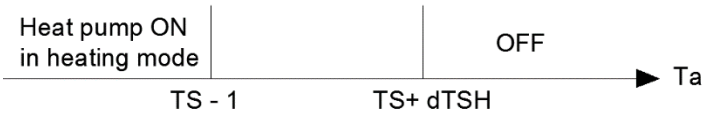
When T1≤T1S - dT1SH and heat pump is within operating ambient temperature range, heat pump provides hot water to the space heating terminals.



7.3.3.5 dTSH

dTSH defines room temperature hysteresis of stopping heat pump. **dTSH** is only applicable if **YES** is selected for **Room temp.** in the **Temp. type setting**.

When TS – Ta ≥ dTSH and heat pump is within operating ambient temperature range, heat pump provides hot water to the space heating terminals



Abrreviations:
Ta: Actual room temperature
TS: Room setting temperature

7.3.3.6 Zone 1 H-emission, Zone 2 H-emission

Zone 1 H-emission defines the terminal type of zone 1.

Setting	Description
FCU	Fan coil unit
FLH	Floor heating loop
RAD	Radiator

Zone 2 H-emission defines the terminal type of zone 2.

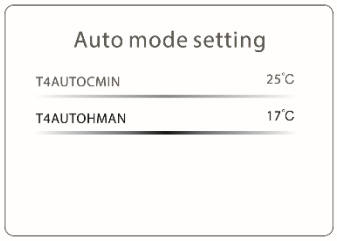
Setting	Description
FCU	Fan coil unit
FLH	Floor heating loop
RAD	Radiator

7.3.3.7 Force defrost

Force defrost enable heat pump enters defrost mode by manual operation when heat pump runs for 10min and air-side heat exchanger outlet temperature T3<0℃ lasts for more than 6min.

Setting	Description
YES	Disable **Force defrost** function
NO	Enable **Force defrost** function

7.3.4 Auto mode setting

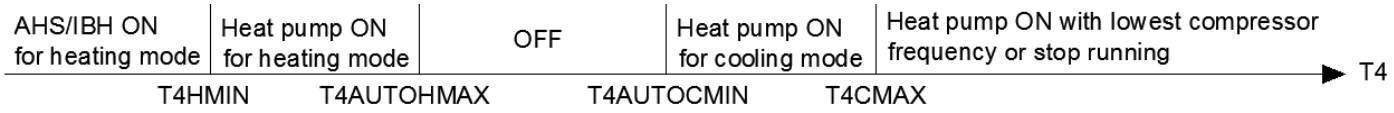


7.3.4.1 T4AUTOCMIN, T4AUTOHMAX

T4AUTOCMIN defines the ambient temperature below which the heat pump will not provide chilled water for space cooling in auto mode.

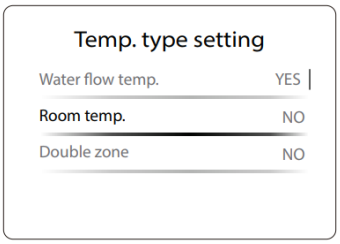
T4AUTOHMAX defines the ambient temperature above which the heat pump will not provide hot water for space heating in auto mode.

Diagram below illustrates the effects of **T4AUTOCMIN**, **T4AUTOHMAX, T4CMAX and T4HMIN.**

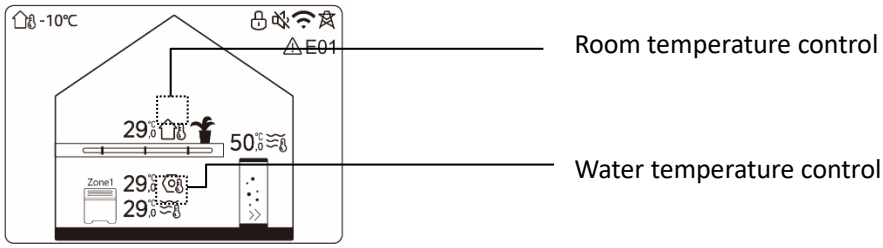


Abrreviations:
AHS: Additional heating source
IBH: Backup electric heater
T4CMAX: The ambient temperature above which heat pump operates with lowest compressor frequency.
T4HMIN: The ambient temperature below which the heat pump will not operate in heating mode.

7.3.5 Temp. type setting



The **Temp. type setting** is used for selecting whether the water flow temperature or room temperature is used to control the ON/OFF of the heat pump. In this case, **7.3.6 Room thermostat setting** should be defined as NO.



7.3.5.1 Water flow temp.

Water flow temp. defines whether heat pump is controlled by leaving water temperature.

Setting	Description
YES	Heat pump is controlled by leaving water temperature.
NO	Heat pump is not controlled by leaving water temperature.

7.3.5.2 Room temp.

Room temp. defines whether heat pump is controlled by room temperature detected by the temperature sensor inside the wired controller.

Setting	Description
YES	Heat pump is controlled by room temperature no matter what is the setting of **7.3.5.1 Water flow temp.** In this case, the target water flow temperature will be calculated from climate curves.
NO	Heat pump is not controlled by room temperature.

7.3.5.3 Double zone

Double zone defines the number of zones.

Setting	Description
YES	Double zones control
NO	Single zone control

Figure below illustrates the effects of different combinations in **Temp. type setting.**

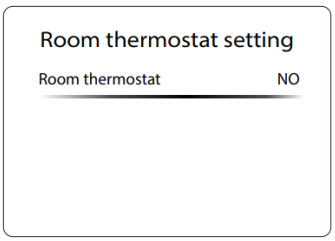
For single zone control

WATER FLOW TEMP.	ROOM TEMP.	DOUBLE ZONE	Zones control
YES	NO	NO	Zone 1: Water temperature control
NO	YES	NO	Zone 1: Room temperature control

For double zone control

WATER FLOW TEMP.	ROOM TEMP.	DOUBLE ZONE	Zones control
YES	YES	YES	Zone 1: Water temperature control
			Zone 2: Room temperature control
YES	NO	YES	Zone 1: Water temperature control
			Zone 2: Water temperature control

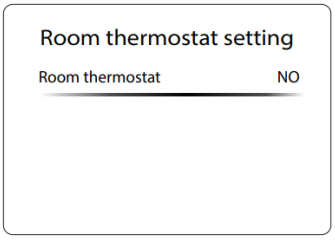
7.3.6 Room thermostat setting



Room thermostat can be as an alternative solution to control heat pump.

Setting	Description	Wired controller is used to
NO	• NON • Without room thermostats(means **Temp. type setting** is valid)	• Control heat pump ON/OFF • Define water temperature • Define mode(heating/cooling/auto mode)
MODE SET	• MODE SET • Room thermostat provides separate heating/cooling switch signal to control heat pump ON/OFF • One zone control • All timers are invalid except DHW timers.	• Define water temperature
ONE ZONE	• ONE ZONE • Room thermostat provides switch signal to control heat pump ON/OFF • One zone control • All timers are invalid except DHW timers.	• Define water temperature • Define mode(heating/cooling mode)
DOUBLE ZONE	• DOUBLE ZONE • Room thermostat provides switch signal to control heat pump ON/OFF • Double zones control • All timers are invalid except DHW timers.	• Define water temperature • Define mode(Only for heating mode)

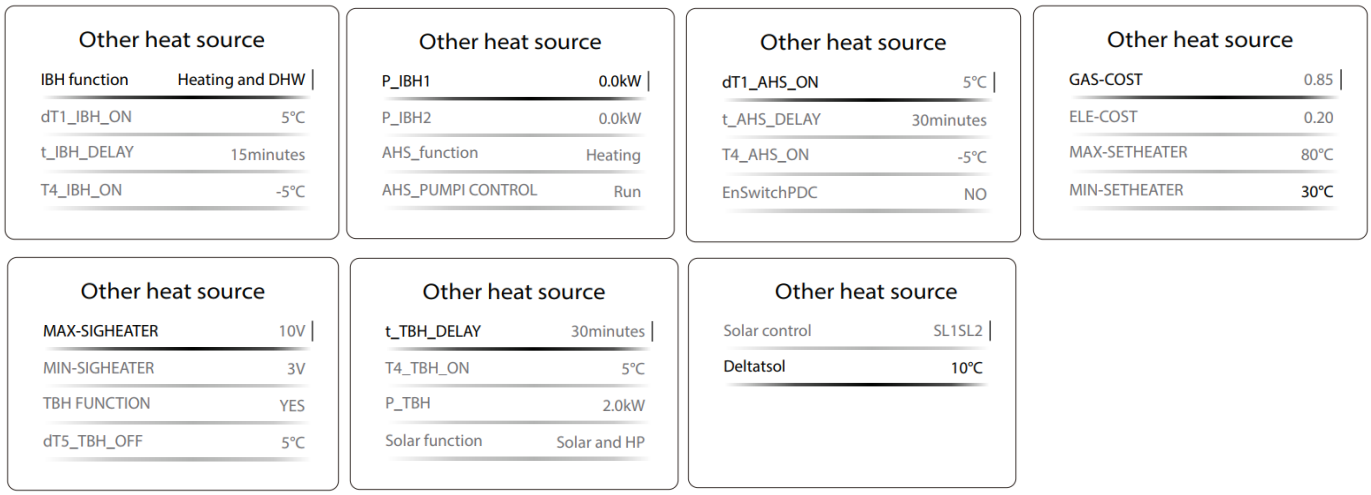
If **Room thermostat setting** is defined as MODE SET, the interface appears:



Mode set priority defines whether cooling mode or heating mode takes priority.

Setting	Description
Heating	When heating and cooling switch signal are closed simultaneously, heat pump runs in heating mode.
Cooling	When heating and cooling switch signal are closed simultaneously, heat pump runs in cooling mode.

7.3.7 Other Heat Source Menu



7.3.7.1 IBH FUNCTION, dT1_IBH_ON, t_IBH_DELAY, T4_IBH_ON, P_IBH1, P_IBH2

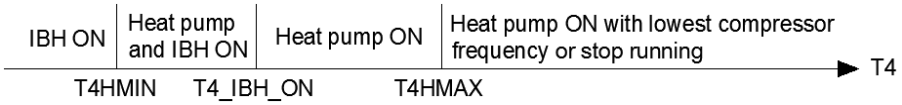
IBH FUNCTION defines backup heater function.

Setting	Description
YES	IBH is used for heating mode and DHW mode
NO	IBH is used for heating mode

dT1_IBH_ON defines water temperature hysteresis of activating electric heater. When T1S - T1 ≥ dT1_IBH_ON the backup electric heater is on.
T1S: Heat pump leaving water set temperature
T1: Heat pump leaving water temperature

t_IBH_DELAY defines the delayed start-up time of electric heater. Electric heater will turn on **t_IBH_DELAY** minutes later after compressor starts.

T4_IBH_ON defines the ambient temperature below which the backup electric heater is on.
Note: Only when dT1_IBH_ON, t_IBH_DELAY and T4_IBH_ON are met at the same time then electric heater turns on.
Diagram below illustrates the effects of **T4_IBH_ON, T4HMIN** and **T4HMAX.**



Abrreviations:
T4: Outdoor ambient temperature
IBH: Electric heater
T4HMIN: The ambient temperature below which the heat pump will not operate in heating mode.
T4HMAX: The ambient temperature above which the heat pump will operate heating mode with lowest compressor frequency.

P_IBH1 defines heating capacity of IBH1, which is used for energy consumption statistics.

P_IBH2 defines heating capacity of IBH2, which is used for energy consumption statistics.

7.3.7.2 AHS FUNCTION, AHS_PUMP_I CONTROL, dT1_AHS_ON, t_AHS_DELAY, T4_AHS_ON

AHS FUNCTION defines auxiliary heating source function.

Setting	Description
NO	Without Auxiliary heating source
Heating	Auxiliary heating source is used for heating mode
Heating and DHW	Auxiliary heating source is used for heating mode and DHW mode

AHS_PUMP_I CONTROL select the Pump_I operating status when only auxiliary heating source runs.

Setting	Description
Run	Pump_I runs when auxiliary heating source runs only.
Not run	Pump_I does not run when auxiliary heating source runs only. In this case, please confirm there is an additional pump running for auxiliary heating source.

dT1_AHS_ON defines water temperature hysteresis of activating auxiliary heating source. When T1S - T1 ≥ dT1_AHS_ON the additional heating source is on.

T1S: Heat pump leaving water set temperature

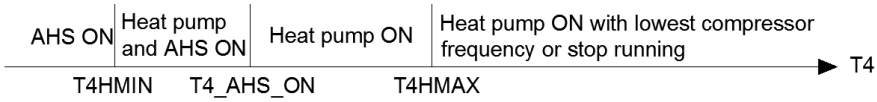
T1: Heat pump leaving water temperature

t_AHS_DELAY defines the delayed start-up time of auxiliary heating source. Auxiliary heating source will turn on **t_AHS_DELAY** minutes later after compressor starts.

T4_AHS_ON defines the ambient temperature below which the auxiliary heating source is on.

Note: Only when dT1_AHS_ON, t_AHS_DELAY and T4_AHS_ON are met at the same time then auxiliary heating source turns on.

Diagram below illustrates the effects of **T4_AHS_ON, T4HMIN** and **T4HMAX.**



Abrreviations:
T4: Outdoor ambient temperature
AHS: Auxiliary heating source
T4HMIN: The ambient temperature below which the heat pump will not operate in heating mode.
T4HMAX: The ambient temperature above which the heat pump will operate heating mode with lowest compressor frequency.

7.3.7.3 EnSWITCHPDC, GAS_COST, ELE_COST

EnSWITCHPDC defines whether heat pump and additional heating source switch automatically based on economic performance and system high efficiency.

Setting	Description
NO	Disable EnSWITCHPDC function, T4_AHS_ON need to be defined manually. Additional heating source may work with heat pump depends on the water temperature and heat pump status.
YES	Enable EnSWITCHPDC function, T4_AHS_ON is calculated according to price of gas and electricity and the efficiency of boiler and heat pump. Only Additional heating source works at ambient temperature of T4_AHS_ON because of the economic performance and system high efficiency.

GAS_COST defines gas price

ELE_COST defines electricity price

7.3.7.4 MAX_SETHEATER, MIN_SETHEATER, MAX_SIGHEATER, MIN_SIGHEATER

When “AHS1” port and “AHS2” port of main control PCB are connected with auxiliary heating source “ON/OFF” signal, auxiliary heating source leaving water temperature automatically change as voltage changes.

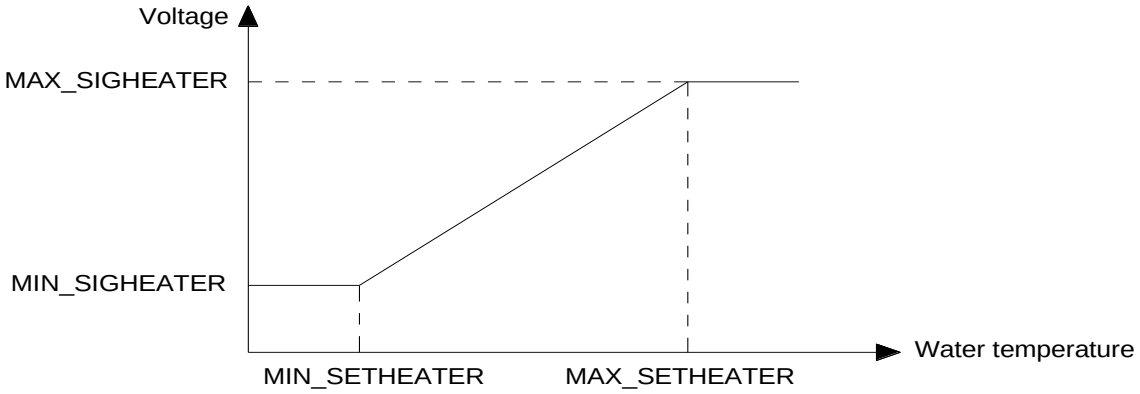
MAX_SETHEATER sets the maximum water temperature of auxiliary heating source.

MIN_SETHEATER sets the minimum water temperature of auxiliary heating source.

MAX_SIGHEATER sets the voltage corresponding to the maximum water set temperature of auxiliary heating source.

MIN_SIGHEATER sets the voltage corresponding to the minimum water set temperature of auxiliary heating source.

Diagram below illustrates the effects of **MAX_SETHEATER, MIN_SETHEATER, MAX_SIGHEATER** and **MIN_SIGHEATER.**



7.3.7.5 TBH FUNCTION, dT5_TBH_OFF, t_TBH_DELAY, T4_TBH_ON, P_TBH

TBH FUNCTION defines whether tank booster heater function is activated.

Setting	Description
YES	Disable tank booster heater function
NO	Enable tank booster heater function

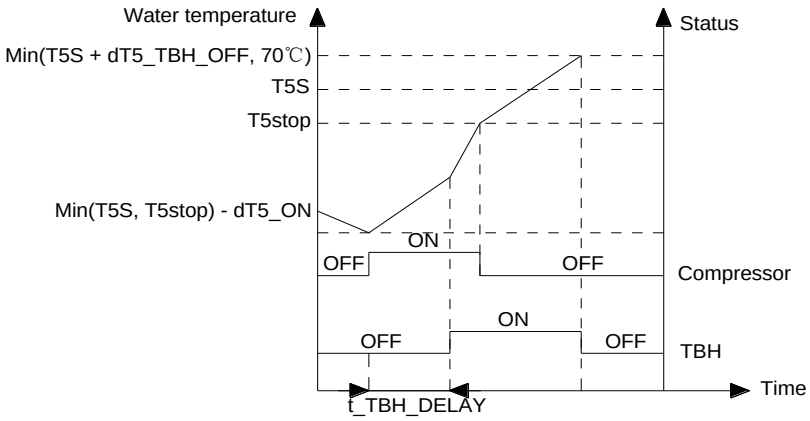
dT5_TBH_OFF defines water temperature hysteresis of inactivating tank booster heater when heat pump malfunctions.
When T5 > Min(T5S+dT5_TBH_OFF, 70°C), the tank booster heater is off.
T5S: Domestic hot water tank set temperature
t_TBH_DELAY defines the delayed start-up time of tank booster heater. Tank booster heater will turn on **t_TBH_DELAY** minutes later after compressor starts.

T4_TBH_ON defines the ambient temperature below which the tank booster heater is on.

Note: Only when t_TBH_DELAY, T4_TBH_ON are met at the same time then tank booster heater turns on.

P_TBH defines the power input of tank booster heater, which is used for energy consumption statistics.

Diagram below illustrates the operation of heat pump and tank booster heater of DHW mode.



Abbreviations:
T5S: DHW set temperature
T5stop: DHW mode leaving water temperature operating limit
TBH: Immersion heater

7.3.7.6 Solar function, Solar control, Deltasol

Solar function defines whether the heating system is equipped with solar function.

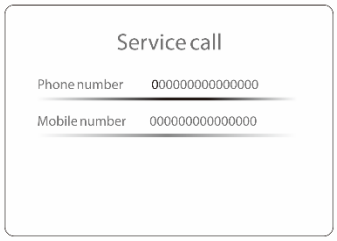
Setting	Description
NO	Without solar function.
Solar and HP	With solar function and heat pump.
Only solar	With only solar function.

Solar control defines the control type of solar pump

Setting	Description
Tsolar	Solar pump(Pump_S) is controlled by solar temperature sensor
SL1SL2	Solar pump(Pump_S) is controlled by SL1SL2 signal

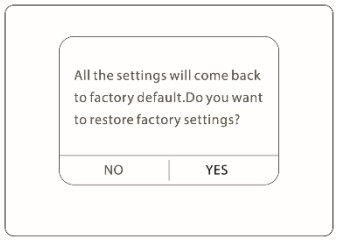
Deltasol defines temperature hysteresis of activating solar pump(Pump_s).
When Tsolar > T5 + **Deltasol**, T5 < 79℃ and DHW mode is ON, then solar pump activates.

7.3.8 Service call



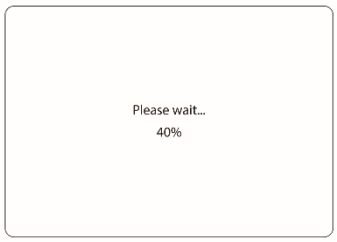
Phone number and **Mobile number** define after-sales service contact numbers. Press ‹ › to navigate cursor and press ^ ˇ to adjust the numerical values. The maximum length of the phone numbers is 15 digits.

7.3.9 Restore factory settings

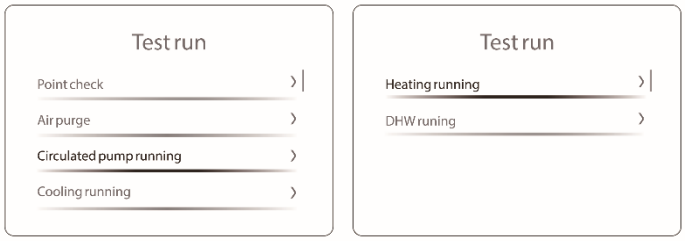


Restore factory settings is used to restore all the parameters (including energy metering data and WLAN setting) set in the user interface to factory defaults.

On selecting YES, the process of restoring all settings to factory defaults begins and progress is displayed as a percentage.

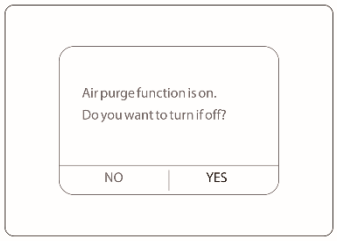


7.3.10 Test run

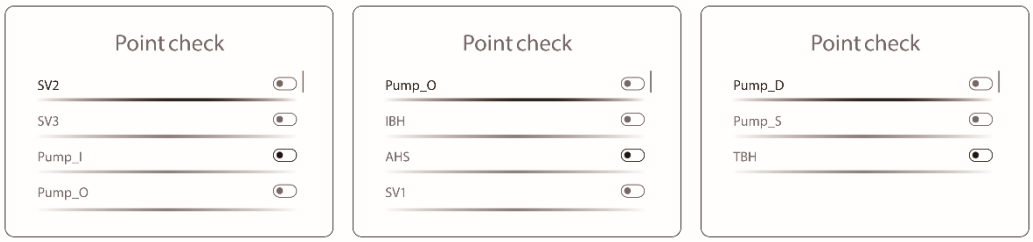


Test run is used to do the point check and check that air purge function, circulation pump, cooling mode, heating mode and DHW mode are all operating correctly. If any error code is displayed during the test run operation, the cause should be investigated.

During test run, all buttons except ○ are invalid. If you want to turn off the test run, please press ○. For example, when the unit is in air purge mode, after you press ○, the following page will be displayed:

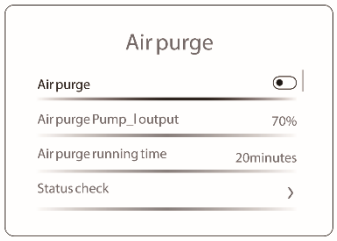


7.3.10.1 Point check



The **POINT CHECK** menu is used to check the operation of individual components. Use ∧ ∨ to scroll to the components you want to check and press ○ to toggle the on/off state of the component. If a valve does not turn on/off or a pump/heater does not operate when their on/off state is toggled, please check the connection between component and main PCB and make sure components' status is normal.

7.3.10.2 Air purge

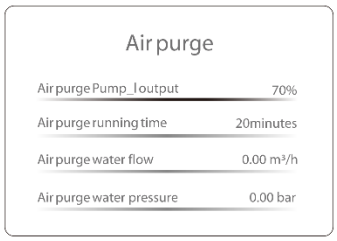


Once installation is complete, it is important to run the air purge function to remove any air which may be present in the water piping and which could cause malfunctions during operation. Before running **Air purge** mode, make sure that the air purge valve is open. Pump_I will run according to the output and running time that has been set.

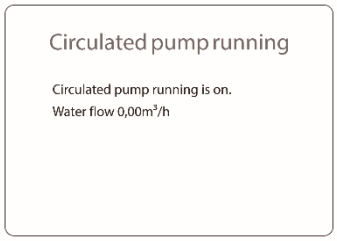
Air purge defines whether the function is activated.

Air purge Pump_I output defines the Pump_I output capacity.

Air purge running time defines the period that Pump_I operates during the air purge process.
Status check allows installers to check the real-time operation parameters of air purge operation.



7.3.10.3 Circulated pump running

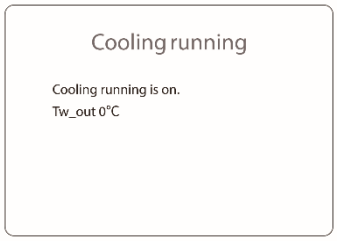


Circulated pump running operation is used to check the operation of the circulation pump.
When circulation pump running is turned on, all running components will stop.
Circulated pump running operation is used to check the operation of the circulation pump.
When circulation pump running is turned on, all running components will stop.
When the unit received signal that indicates Circulated pump running =ON:

- SV1 will be on after 30 secs;
- Pump_I will be on after 60 secs.
- Pump_I will be off after 240 secs.
- SV1 will be off and the SV2 will be on after 270 secs.
- Pump_I & pump_O will be on after after 30 secs

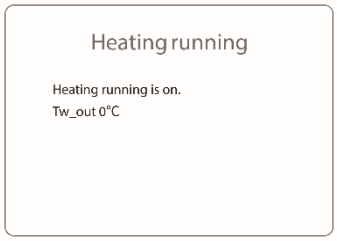
If E8 occurs during these processes, the unit will stop Circulated pump running mode immediately

7.3.10.4 Cooling running



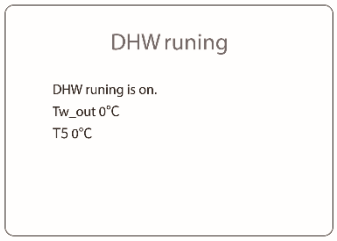
The **Cooing running** operation is used to check the operation of the system in space cooling mode.
During the **Cooing running** operation, the leaving water set temperature is 7°C. The current actual leaving water temperature is displayed on the user interface. The unit operates until the leaving water temperature drops to the set temperature or the next command is received.

7.3.10.5 Heating running



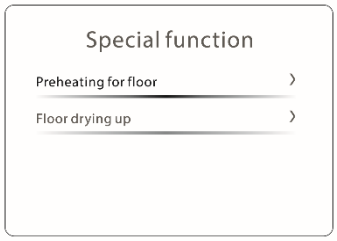
The **Heating running** operation is used to check the operation of the system in space heating mode.
During **Heating running** test running, the default target outlet water temperature is 35°C. The IBH (backup heater) will turn on after the compressor runs for 10 min. After the IBH runs for 3 minutes, the IBH will turn off. Heat pump will operate until the water temperature increase to a certain value or the next command is received.

7.3.10.6 DHW running

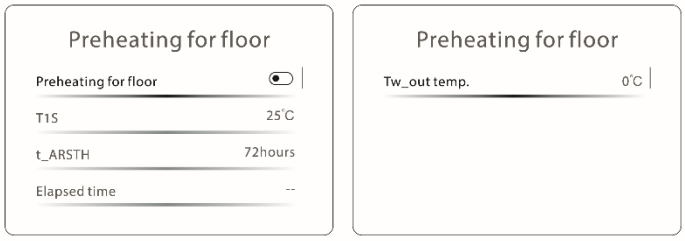


The **DHW running** operation is used to check the operation of the system in DHW mode.
During **DHW running** test running, the default target temperature of the domestic water is 55°C. The TBH(tank boost heater) will turn on after the compressor runs for 10min. The TBH will turn off 3 minutes later. Heat pump will operate until the water temperature increase to a certain value or the next command is received.

7.3.11 Special Function



7.3.11.1 Preheating for floor



Preheating for floor function provides mild heat to the underfloor water piping for the first time during seasonal heating, diminish the risk of damage to the floor and piping system.

Setting	Description
0	Disable preheating for floor function
1	Enable preheating for floor function

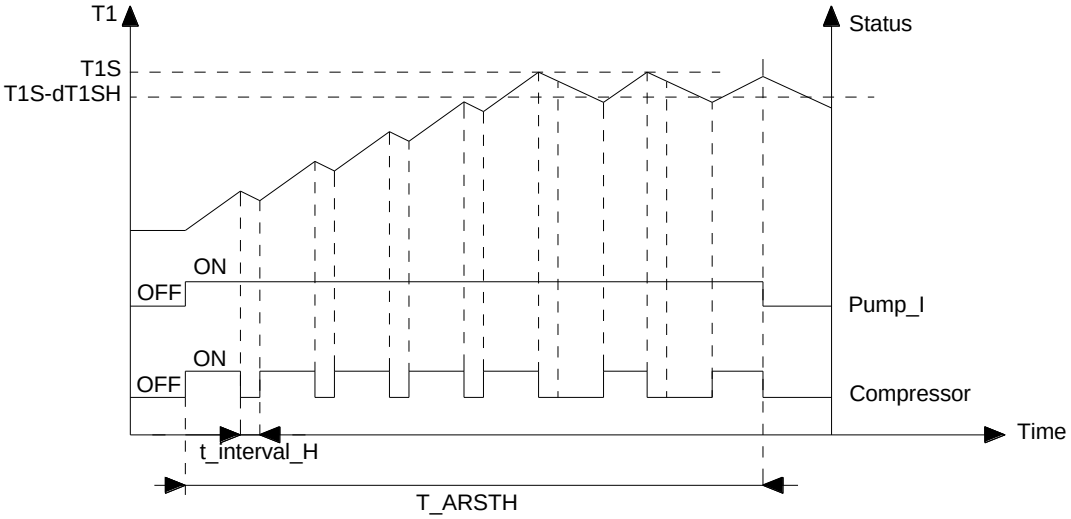
T1S defines heat pump leaving water temperature in preheating.

T_ARSTH defines running time for first preheating of the floor

Elapsed time is the period that **Preheating for floor function** had run.

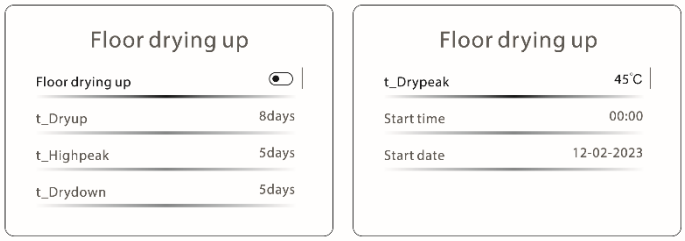
Tw_out temp. is the current leaving water temperature

Diagram below illustrates the operation of **Preheating for floor** function.



Abbreviations:
T1: Leaving water temperature
dT1SH: Water temperature hysteresis of activating heat pump.
t_interval_H: The delayed start-up time of compressor in heating mode.

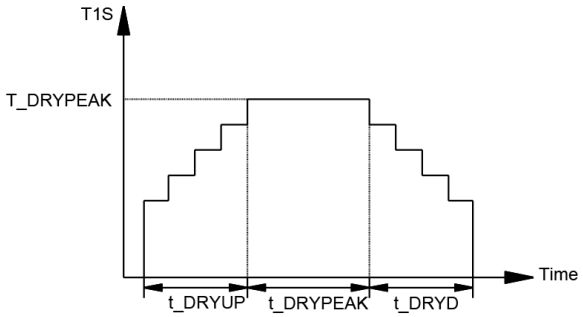
7.3.11.2 Floor drying up



For newly-installed under-floor heating systems, floor drying up is necessary to remove moisture from the floor slab and subfloor to prevent warping or rupture of the floor. Heat pump provides mild heat to the concrete or other structural material around the underfloor water piping in a certain period of time, accelerate the process of getting rid of moisture. During floor drying up operation, the temperature of the floor would be increased gradually. In the event of a heat pump malfunction, floor drying up mode will continue if a backup electric heater and/or auxiliary heating source is available and configured to support space heating mode.

There are three phases to the floor drying up operation:

- Phase 1: gradual temperature increase to the peak temperature
- Phase 2: maintain peak temperature
- Phase 3: gradual temperature decrease from the peak temperature



Floor drying up

Setting	Description
0	Disable floor draying up function
1	Enable floor draying up function

t_Dryup defines the duration of Phase 1.

t_Highpeak defines the duration of Phase 2.

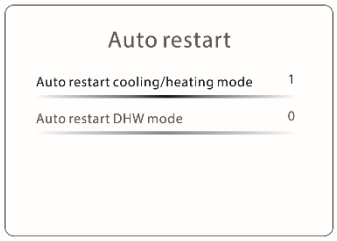
t_Drydown defines the duration of Phase 3.

t_Drypeak defines the heat pump leaving water temperature of Phase 2.

Start time defines the floor drying up operation start time.

Start date defines the floor drying up operation start date.

7.3.12 Auto restart



Auto restart sets whether or not the unit re-applies the mode and unit status settings when the power returns following a power failure.

If **7.3.6 Room thermostat setting** is defined as not 0, **Auto restart function** will not be applicable.

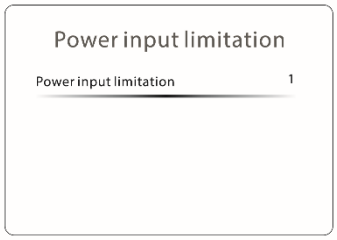
Auto restart cooling/heating mode

Setting	Description
NO	Disable auto restart cooling/heating mode
YES	Enable auto restart cooling/heating mode

Auto restart DHW mode

Setting	Description
NO	Disable auto restart DHW mode
YES	Enable auto restart DHW mode

7.3.13 Power input limitation



Power input limitation makes the machine suitable for a variety of current supplies. There are 8 configurations for user to choose according to the maximum allowable access current. If the unit will operate at larger current input, 1 should be selected. If the unit will operate at a lower current input, 2-8 should be selected and the power input and capacity will decrease.

Power limitation function

Setting	Model	
	Single phase 12~16kW	Three phase 12~16kW
1	32A	16A
2	30A	15A
3	28A	14A
4	26A	13A
5	24A	12A
6	22A	11A
7	20A	10A
8	18A	10A

7.3.14 Input definition

INPUT DEFINE defines sensors and functions to fulfill with installation.

M1 M2 defines the function of M1M2 port

Setting	Description
Remote ON/OFF	Remote ON/OFF control of heat pump
TBH ON/OFF	Remote ON/OFF control of tank booster heater
AHS ON/OFF	Remote ON/OFF control of auxiliary heating source

Smart grid defines whether SMART GRID control signal is connected to hydronic PCB.

Setting	Description
NO	Disable Smart grid function
YES	Enable Smart grid function

T1T2 defines control options of Port T1T2

Setting	Description
NO	Installation with MH-kit
RT/Ta_PCB	Installation without MH-kit

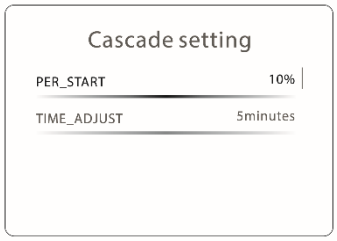
Tbt defines whether balance tank temperature sensors are installed in the balance tank.

Setting	Description
NO	Installation with balance tank temperature sensor(Tbt)
YES	Installation without balance tank temperature sensor(Tbt)

P_X PORT can be defined as defrosting signal or alarm signal according to customers' demand.

Setting	Description
Defrost	Defrosting signal
Alarm	Alarm signal

7.3.15 Cascade setting

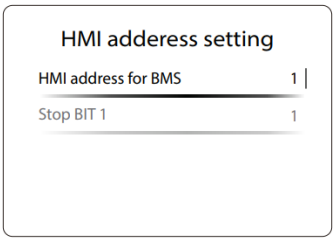


PER_START sets the start-up percentage of multiple units for the first time start-up after power on. For example:

Total units	PER_START	Starting units
6	50%	3
6	30%	2

TIME_ADJUST sets the judgment period of adding and subtracting units

7.3.16 HMI address setting

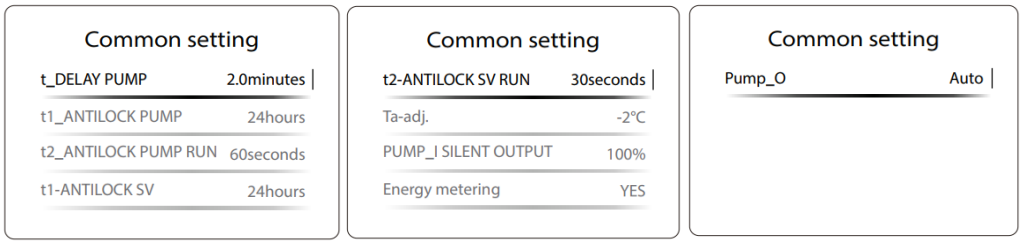


HMI ADDRESS FOR BMS sets the HMI address code for BMS.(only valid for master controller)

STOP BIT set upper computer stop bit(1: STOP BIT1; 2:STOP BIT2)

Setting	Description
1	Stop bit 1
2	Stop bit 2

7.3.17 Common setting



7.3.17.1 t_DELAY PUMP

t_DELAY PUMP defines the delayed stop time of Pump_I. Pump_I will stop **t_DELAY PUMP** minutes later after compressor stops base on system temperature equalization consideration.

7.3.17.2 t1_ANTILOCK PUMP, t2_ANTILOCK PUMP RUN, t1_ANTILOCK SV, t2_ANTILOCK SV RUN

Antilock operation prevent components from sticking to result in system fail.

t1_ANTILOCK PUMP defines the interval time that Pump_I, Pump_O and Pump_C runs in order to antilock

t2_ANTILOCK PUMP RUN defines the running time for Pump_I, Pump_O and Pump_C antilock operation

t1_ANTILOCK SV defines the interval time that SV1, SV2 and SV3 valve works in order to antilock

t2_ANTILOCK SV RUN defines the running time for SV1, SV2 and SV3 valve antilock operation

7.3.17.3 Ta-adj

Ta-adj is an correction value for room temperature sensor(Ta) which is inside the wired controller. The display room temperature value is equal to Ta + **Ta-adj.**

7.3.17.4 PUMP_I_SLIENT OUTPUT

PUMP_I_SLIENT OUTPUT can decrease water pump maximum output in order to decrease the noise of heat pump.

7.3.17.5 Energy metering

Energy metering allows user to check energy data of day, week, month and year.

Setting	Description
NO	Disable energy metering function
YES	Enable energy metering function

7.3.17.6 Pump_O

Pump_O defines Zone 1 pump(**Pump_O**) control type.

Setting	Description
ON	Pump_O keeps running
Auto	Pump_O operation is controlled by heat pump

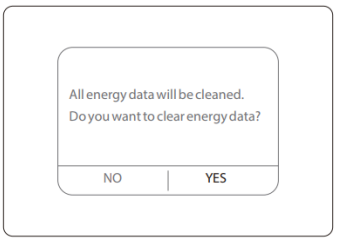
7.3.17.7 Glycol, Glycol concentration

Glycol defines whether the unit has added glycol.

Setting	Description
0	Without glycol
1	With glycol

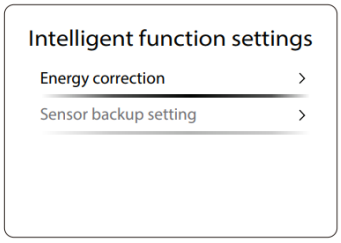
Glycol concentration Define the concentration of glycol added to the unit.
The concentration setting of glycol will affect the correction of the water flow of the unit

7.3.18 Clear energy data

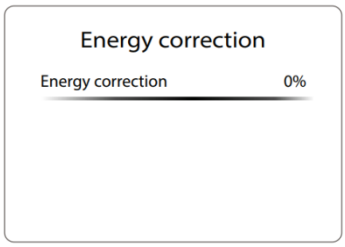


Once selecting YES, All energy metering data is clear.

7.3.19 Intelligent function settings

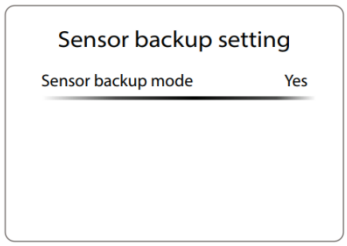


7.3.19.1 Energy correction



The actual installation scenario would be different from one to another. The energy metering calculation of the unit could deviate slightly due to the actual installation.
Energy correction is to offset the deviation of the energy metering calculation of the unit. Value from -50% to 50%, default is 0. It is applied for Heating, Cooling and DHW.
The final energy data = original data * (1+ **Energy correction**)

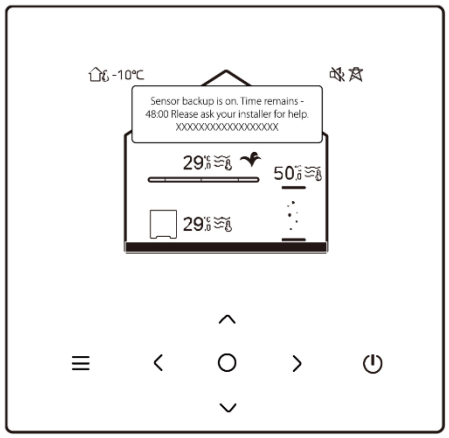
7.3.19.2 Sensor backup setting



Sensor backup setting defines whether the sensor backup function is active or not.

Setting	Description
NO	Disable Sensor backup setting function
YES	Enable Sensor backup setting function

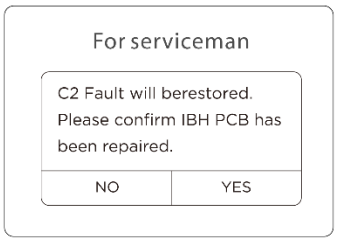
When Sensor backup setting function is activated, a bubble with text jumps out in the home page, in which the timer indicates for how long the unit can run normally before it shuts down.



If Sensor backup setting function is stopped, the bubble will hide automatically. If the timer runs out, the bubble hides and unit will shut down due to the existed error.

In cascade installation, Sensor backup setting function is available for master unit only.

7.3.20 C2 fault restore



For the unit with IBH(internal backup heater), when C2 error occurs, please follow C2 troubleshooting guide of Part4 Diagnosis and Troubleshooting. If necessary, select YES to restore C2 code.

7.4 Operation parameter

Operation parameter is for reviewing the operation parameters. The interface below is for reference and different units' state correspond to different parameter values.

Operation for entering **Operation parameter：**

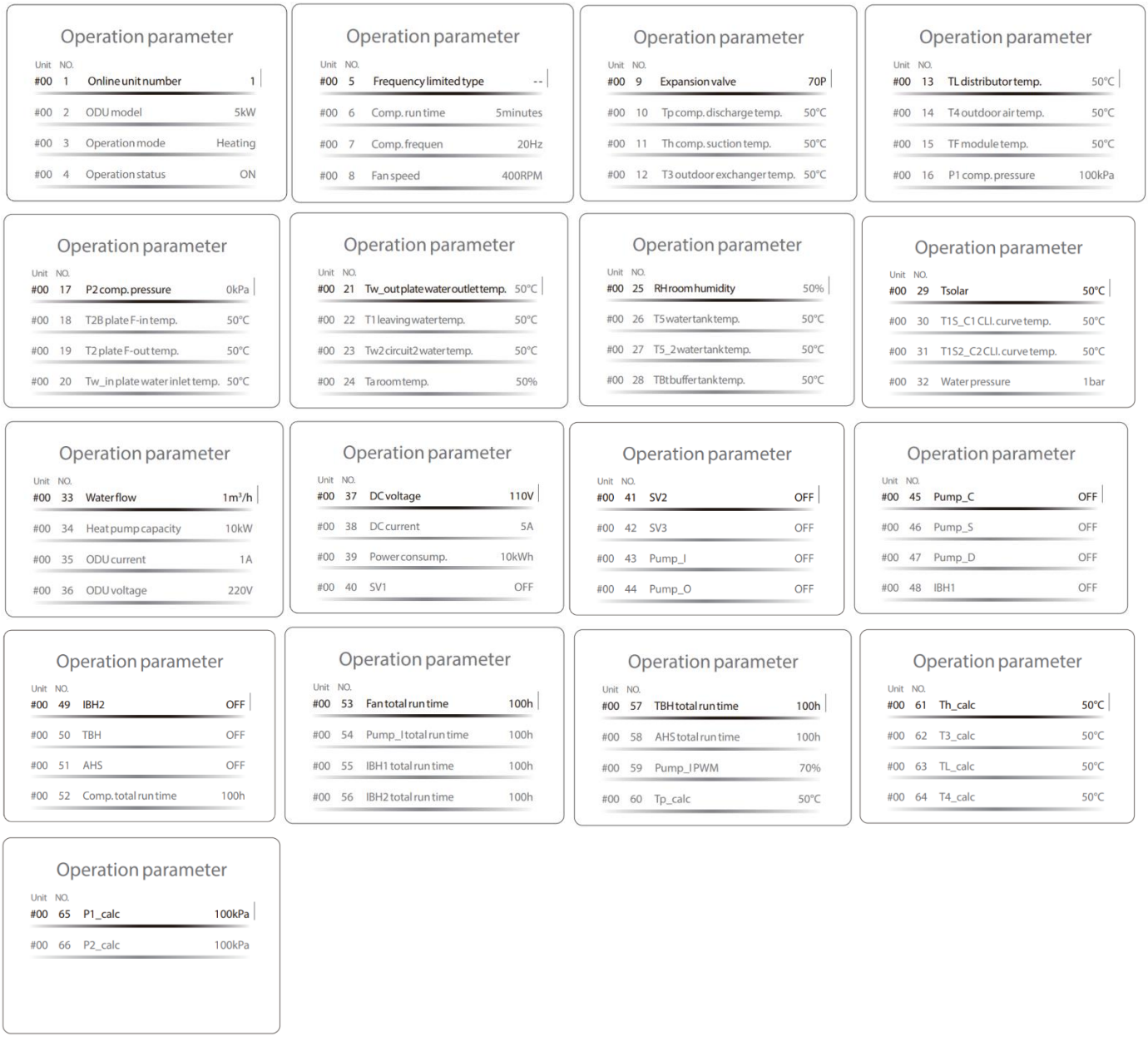
Step 1: Home page

Step 2: Press "≡"

Step 3: Select "Unit status"

Step 4: Select "Operation parameter"

Step 5: Press ○



Part of operation parameter may be disabled or unavailable and will not appear on the menu.

The following parameter ranges are used to roughly determine whether the system is running properly:

Discharge temperature(Tp) for heating/DHW mode	
T4＜-10℃	Twout+20＜Tp＜Tw_out+50
-10℃≤T4＜10℃	Twout+20＜Tp＜Tw_out+45
10℃≤T4＜25℃	Twout+15＜Tp＜Tw_out+40
T4≥25℃	Twout+15＜Tp＜Tw_out+35
Note: T4 means ambient temperature Tw_out means leaving water temperature.	

Discharge pressure(P1) for heating/DHW mode									
Tw_out(℃)	25	30	35	40	45	50	55	60	65
P1（kPa）	1700±150	2000±150	2300±150	2500±150	2800±150	3200±150	3600±150	3900±150	4200±150
Note: P1 is absolute pressure.									

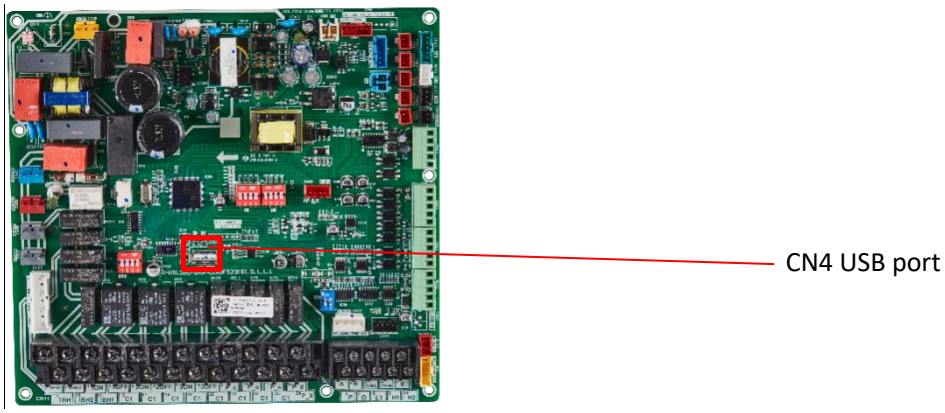
Discharge temperature(Tp) for cooling mode				
Tp	Fx＜28Hz	28Hz≤Fx＜38Hz	38Hz≤Fx＜46Hz	Fx≥46Hz
T4＜25℃	55±10	58±10	65±10	70±10
25℃≤T4＜30℃	58±10	65±10	70±10	75±10
30℃≤T4＜35℃	65±10	70±10	75±10	80±10
35℃≤T4＜40℃	70±10	75±10	80±10	82±10
40℃≤T4＜46℃	75±10	80±10	82±10	85±10
T4≥46℃	80±10	82±10	85±10	88±10
Note: Fx means compressor operating frequency.				

Suction pressure(P1) for cooling mode							
Tw_out(℃)	5～7	8～10	11～13	14～16	17～19	20～22	23～25
P1（kPa）	900±100	980±100	1080±100	1180±100	1280±100	1400±100	1570±100
Note: P1 is absolute pressure.							

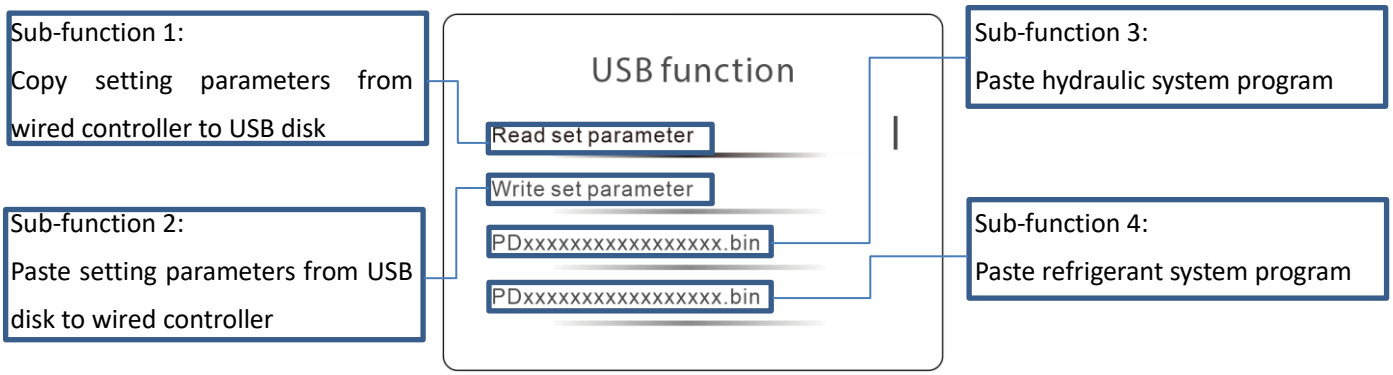
8 USB Function Field Settings

USB function helps you to transmit parameters and program easily. When USB disk connect to CN4 port of main control PCB, the USB function interface appears automatically on the wired controller.

Hydraulic module PCB

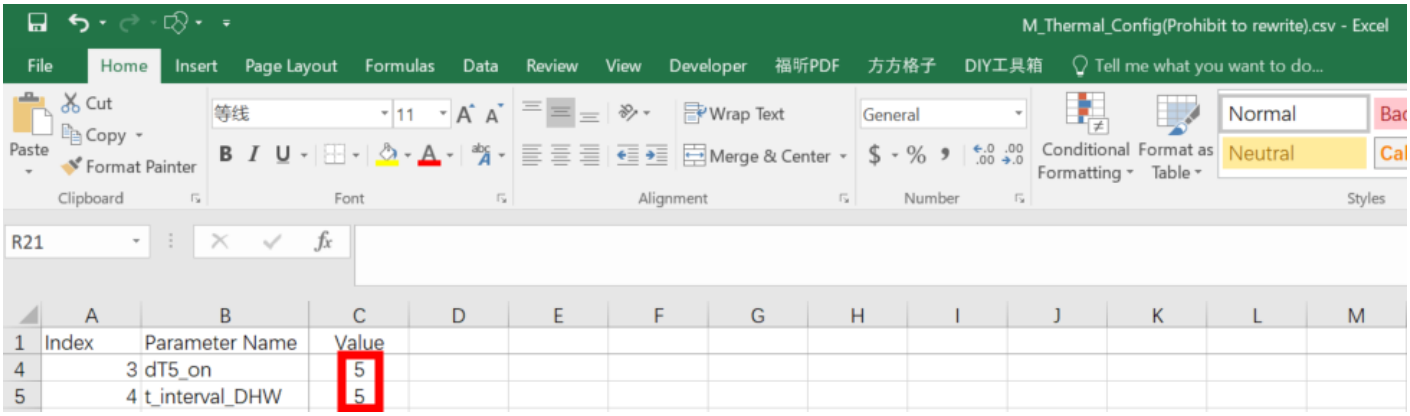


USB function interface



Sub-function 1:

Once the process finishes successfully, the parameter file “M_Thermal_Config(Prohibit to rewrite).csv” will be generated in the USB disk. If you want to change the parameter on computer, please remember only change the value of column C(red frame below) is allowed and do not change any other content or the file name.



Sub-function 2:

Please make sure there is only one parameter file in the USB disk before using this function.

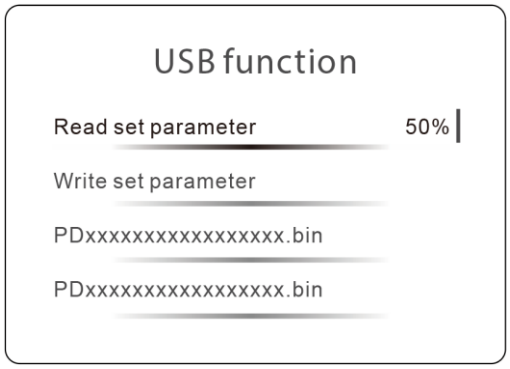
Sub-function 3:

Please make sure there is only one applicable hydraulic system program in the USB disk before using this function.

Sub-function 4:

Please make sure there is only one applicable refrigerant system program in the USB disk before using this function.

Press ^ v to choose the item and press ○ to confirm your choice, then the rate of process appears like below:



During the process, all the buttons are invalid.

When the process finishes, pop-up window with “Success” cue word appears briefly and unit stops. Please remove the USB disk and restart the unit.

When the process fails, pop-up window with “Fail” cue word appears briefly. The system program remains unchanged.

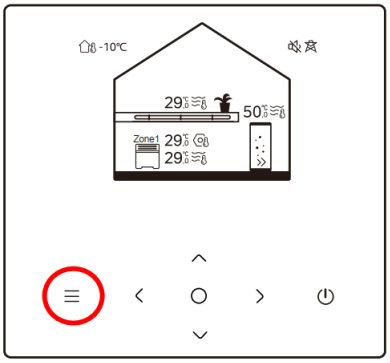
If the stalled process happens, please remove the USB disk and try to insert the USB disk according to operation above.

9 OTA function of 120L HMI

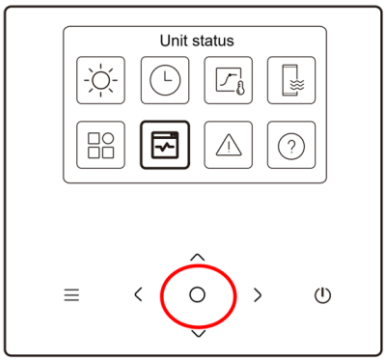
During the process of product development and upgrade, the control functions and logic of the product undergo iterative updates. When upgrading the firmware is necessary, OTA function helps you to upgrade the firmware of 120L wired controller easily and conveniently. Please refer to the following OTA guidelines for program upgrade.

9.1.1 Step 1：Check the HMI firmware version

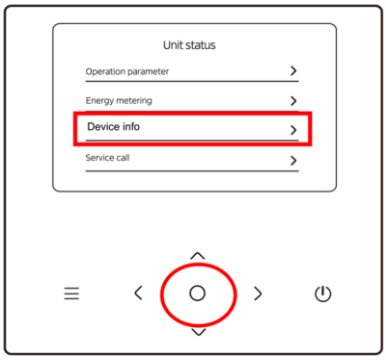
Press "≡" in wired controller homepage and into the menu.



Select the unit status icon and press “O“ into the status list.



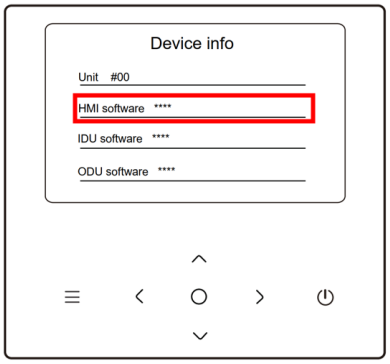
Select the “Device info” and check.



Check the wired controller firmware version by “ HMI software”.

Check whether the HIM software version is above V1.0.0.95

Select the corresponding OTA process based on the actual product program version.



9.1.2 OTA Procedure

HIM software version is above V1.0.0.95

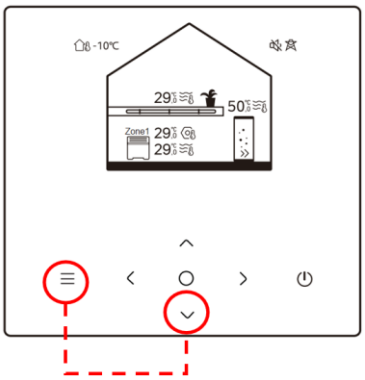
Wired controller had already finished the networking with phone App

No

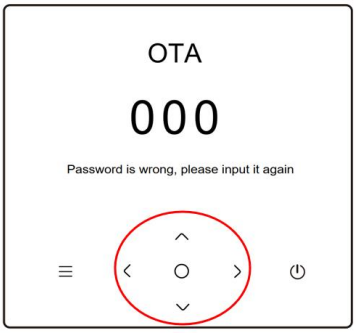
Set personal hotspot with smart phone, hotspot name as: SMARTOTA Password: ota12345. And place the smart phone near the wired controller.

Yes

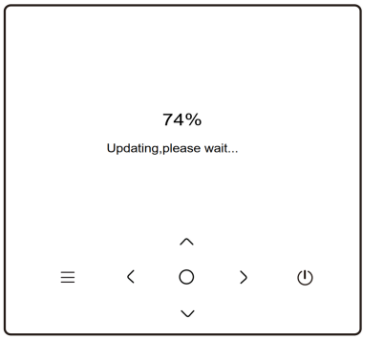
Long press "≡" and "V" for about 4 seconds in wire controller homepage.



use the arrow button to input the password as 999 and press "O" to confirm to start the OTA.



HIM will display "Updating, please wait...", a progress percentage will be shown.



When the OTA progress is finish, the HIM will auto restart. Refer to Step 1 and check whether the OTA is succeeded and software of the HIM had been updated.

HIM software version is not above V1.0.0.95

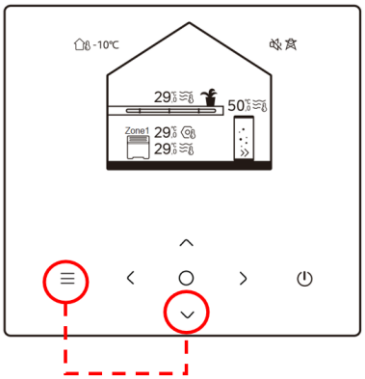
Wired controller had already finished the networking with phone App

No

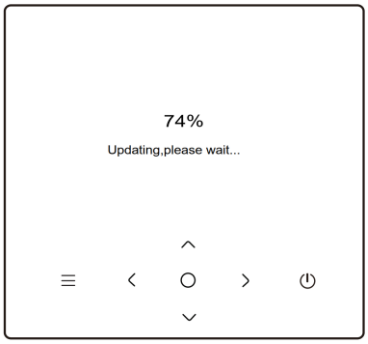
Set personal hotspot with smart phone, hotspot name as: SmartOTA Password: 12345678. And place the smart phone near the wired controller.

Yes

Long press "≡" and "V" for about 4 seconds in wire controller homepage.



HIM will display "Updating, please wait...", a progress percentage will be shown.



When the OTA progress is finish, the HIM will auto restart. Refer to Step 1 and check whether the OTA is succeeded and software of the HIM had been updated.

Part 4

Diagnosis and Troubleshooting

1 R32 System Service

Indoor units in this manual can be used with both R410A and R32 refrigerant systems. When repairing systems that use R32 refrigerant, the following warnings and operating requirements should be noted.

1.1 Warning about the R32 refrigerant

⚠ WARNING

The following information indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.

The following applies to R32 refrigerant systems.

Prior to beginning work on systems containing flammable refrigerants, safety checks are necessary to ensure that the risk of ignition is minimized.

For repair to the refrigerating system, the following precautions shall be complied with prior to conducting work on the system.

Work shall be undertaken under a controlled procedure so as to minimise the risk of a flammable gas or vapour being present while the work is being performed.

All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. Work in confined spaces shall be avoided. The area around the workspace shall be sectioned off. Ensure that the conditions within the area have been made safe by control of flammable material.

The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially flammable atmospheres.

Ensure that the leak detection equipment being used is suitable for use with flammable refrigerants, i.e. non-sparking, adequately sealed or intrinsically safe.

If any hot work is to be conducted on the refrigeration equipment or any associated parts, appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO2 fire extinguisher adjacent to the charging area.

No person carrying out work in relation to a refrigeration system which involves exposing any pipe work that contains or has contained flammable refrigerant shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion.

All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which flammable refrigerant can possibly be released to the surrounding space.

Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. "No Smoking" signs shall be displayed.

Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.

Where electrical components are being changed, they shall be fit for the purpose and to the correct specification. At all times the manufacturer's maintenance and service guidelines shall be followed. If in doubt consult the manufacturer's technical department for assistance.

The following checks shall be applied to installations using flammable refrigerants:

– the charge size is in accordance with the room size within which the refrigerant containing parts are installed;

– the ventilation machinery and outlets are operating adequately and are not obstructed;
– if an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant;
– marking to the equipment continues to be visible and legible. Markings and signs that are illegible shall be corrected;
– refrigeration pipe or components are installed in a position where they are unlikely to be exposed to any substance which may corrode refrigerant containing components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being so corroded.

Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures.

If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment so all parties are advised.

Initial safety checks shall include:

-that capacitors are discharged: this shall be done in a safe manner to avoid possibility of sparking;

-that no live electrical components and wiring are exposed while charging, recovering or purging the system;

-that there is continuity of earth bonding.

During repairs to sealed components, all electrical supplies shall be disconnected from the equipment being worked upon prior to any removal of sealed covers, etc. If it is absolutely necessary to have an electrical supply to equipment during servicing, then a permanently operating form of leak detection shall be located at the most critical point to warn of a potentially hazardous situation.

Particular attention shall be paid to the following to ensure that by working on electrical components, the casing is not altered in such a way that the level of protection is affected. This shall include damage to cables, excessive number of connections, terminals not made to original specification, damage to seals, incorrect fitting of glands, etc.

Ensure that seals or sealing materials have not degraded such that they no longer serve the purpose of preventing the ingress of flammable atmospheres.

Replacement parts shall be in accordance with the manufacturer's specifications.

Do not apply any permanent inductive or capacitance loads to the circuit without ensuring that this will not exceed the permissible voltage and current permitted for the equipment in use.

Intrinsically safe components are the only types that can be worked on while live in the presence of a flammable atmosphere. The test apparatus shall be at the correct rating.

Replace components only with parts specified by the manufacturer. Other parts may result in the ignition of refrigerant in the atmosphere from a leak.

Check that cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges or any other adverse environmental effects. The check shall also take into account the effects of ageing or continual vibration from sources such as compressors or fans.

When breaking into the refrigerant circuit to make repairs – or for any other purpose – conventional procedures shall be used. However, it is important that best practice is followed.

Since flammability is a consideration. The following procedure shall be adhered to:

- remove refrigerant;
- purge the circuit with inert gas;
- evacuate;
- purge again with inert gas;

- open the circuit by cutting or brazing.

The refrigerant charge shall be recovered into the correct recovery cylinders. The system shall be "flushed" with OFN to render the unit safe. This process may need to be repeated several times. Compressed air or oxygen shall not be used for this task.

Flushing shall be achieved by breaking the vacuum in the system with OFN and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum.

This process shall be repeated until no refrigerant is within the system. When the final OFN charge is used, the system shall be vented down to atmospheric pressure to enable work to take place.

This operation is absolutely vital if brazing operations on the pipe-work are to take place.

Ensure that the outlet for the vacuum pump is not close to any ignition sources and there is ventilation available. Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimise the amount of refrigerant contained in them. Prior to recharging the system it shall be pressure tested with OFN.

DD.12 Decommissioning:

Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its detail. It is recommended good practice that all refrigerants are recovered safely. Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of reclaimed refrigerant. It is essential that electrical power is available before the task is commenced.

a) Become familiar with the equipment and its operation.
b) Isolate system electrically.
c) Before attempting the procedure ensure that:

- mechanical handling equipment is available, if required, for handling refrigerant cylinders;
- all personal protective equipment is available and being used correctly;
- the recovery process is supervised at all times by a competent person;
- recovery equipment and cylinders conform to the appropriate standards.

d) Pump down refrigerant system, if possible.
e) If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
f) Make sure that cylinder is situated on the scales before recovery takes place.
g) Start the recovery machine and operate in accordance with manufacturer's instructions.
h) Do not overfill cylinders. (No more than 80 % volume liquid charge).
i) Do not exceed the maximum working pressure of the cylinder, even temporarily.
j) When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
k) Recovered refrigerant shall not be charged into another refrigeration system unless it has been cleaned and checked.

Equipment shall be labelled stating that it has been de-commissioned and emptied of refrigerant. The label shall be dated and signed. Ensure that there are labels on the equipment stating the equipment contains flammable refrigerant.

When removing refrigerant from a system, either for servicing or decommissioning, it is recommended good practice that all refrigerants are removed safely.

When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct number of cylinders for holding the total system charge are available. All cylinders to be used are designated for the recovered refrigerant and labelled for that refrigerant (i.e. special cylinders for the recovery of refrigerant). Cylinders shall be complete with pressure relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.

The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at

hand and shall be suitable for the recovery of flammable refrigerants. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition. Before using the recovery machine, check that it is in satisfactory working order, has been properly maintained and that any associated electrical components are sealed to prevent ignition in the event of a refrigerant release. Consult manufacturer if in doubt.

The recovered refrigerant shall be returned to the refrigerant supplier in the correct recovery cylinder, and the relevant Waste Transfer Note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.

If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The evacuation process shall be carried out prior to returning the compressor to the suppliers. Only electric heating to the compressor body shall be employed to accelerate this process. When oil is drained from a system, it shall be carried out safely.

Warning: disconnect the appliance from its power source during service and when replacing parts.

These units are partial unit air conditioners, complying with partial unit requirements of this International Standard, and must only be connected to other units that have been confirmed as complying to corresponding partial unit requirements of this International Standard.

1.2 Qualification requirements for maintenance personnel

⚠ DANGER

The following information indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

These instructions are exclusively intended for qualified contractors and authorised installers

Work on the refrigerant circuit with flammable refrigerant in safety group A2L may only be carried out by authorised heating contractors. These heating contractors must be trained in accordance with EN 378 Part 4 or IEC 60335-2-40, Section HH. The certificate of competence from an industry accredited body.

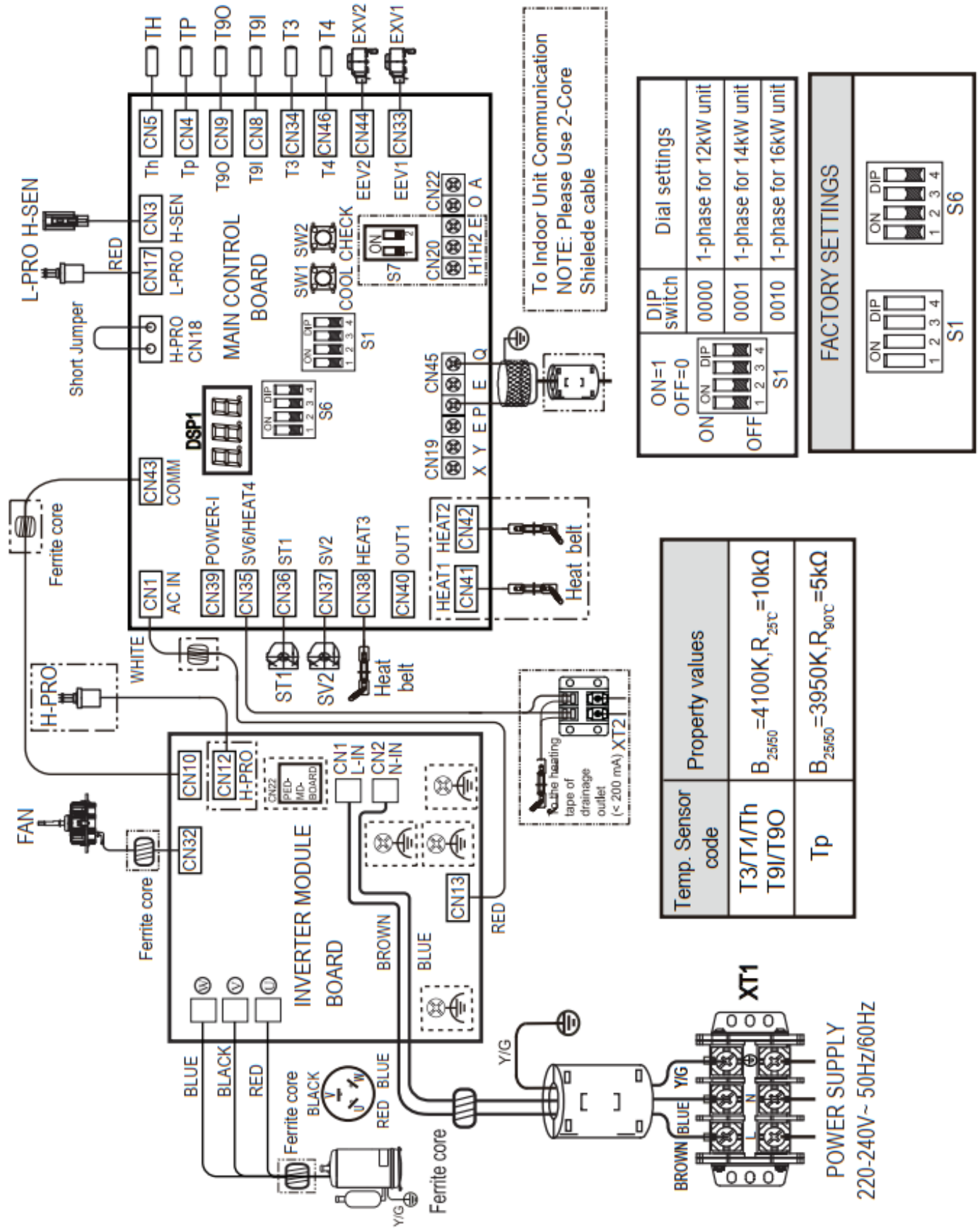
Brazing/soldering work on the refrigerant circuit may only be carried out by contractors certified in accordance with ISO 13585 and AD 2000, Datasheet HP 100R. And only by contractors qualified and certified for the processes to be carried out. The work must fall within the range of applications purchased and be carried out in accordance with the prescribed procedures. Soldering/brazing work on accumulator connections requires certification of personnel and processes by a notified body according to the Pressure Equipment Directive (2014/68/EU).

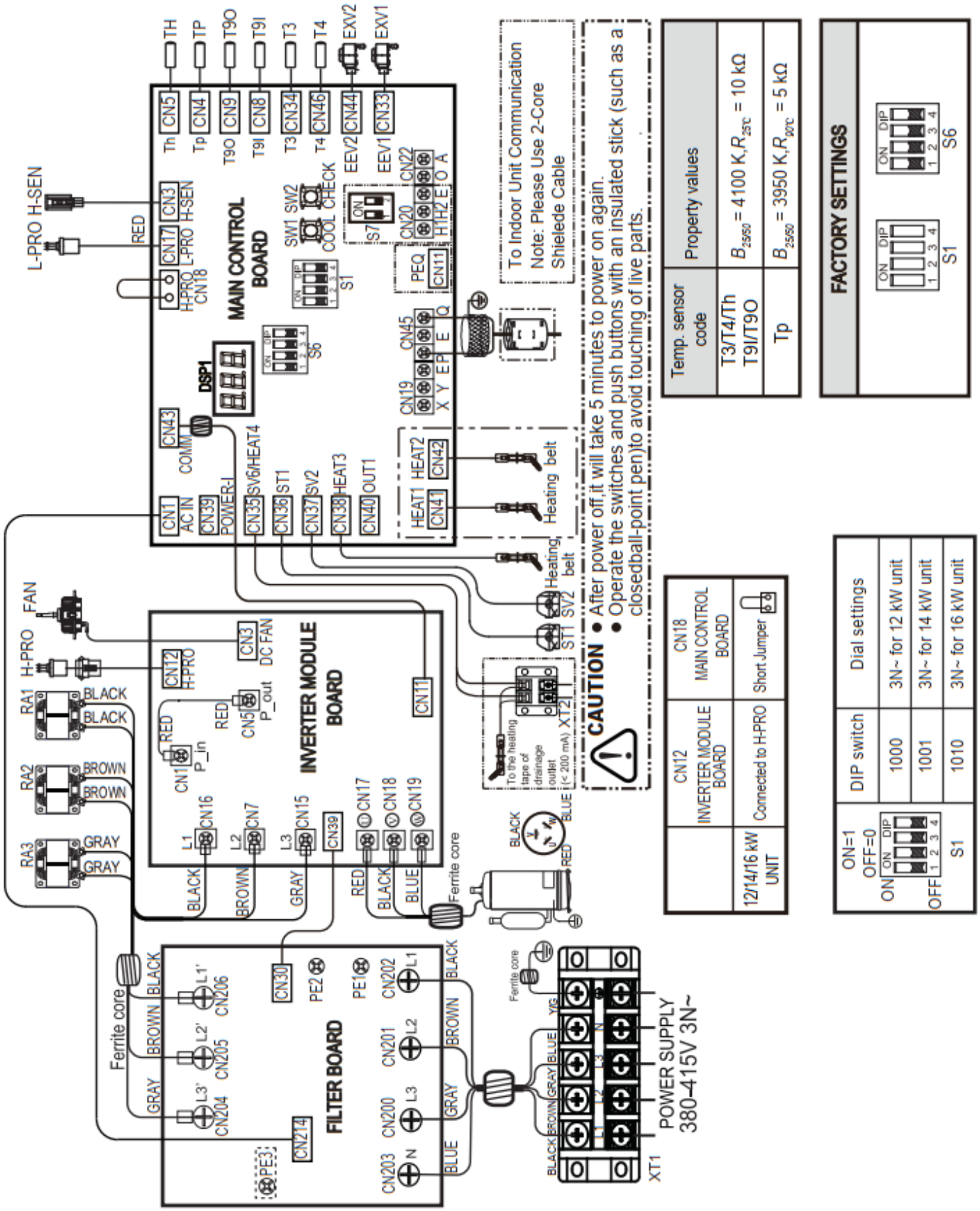
Work on electrical equipment may only be carried out by a qualified electrician.

Before initial commissioning, all safety relevant points must be checked by the particular certified heating contractors. The system must be commissioned by the system installer or a qualified person authorised by the installer.

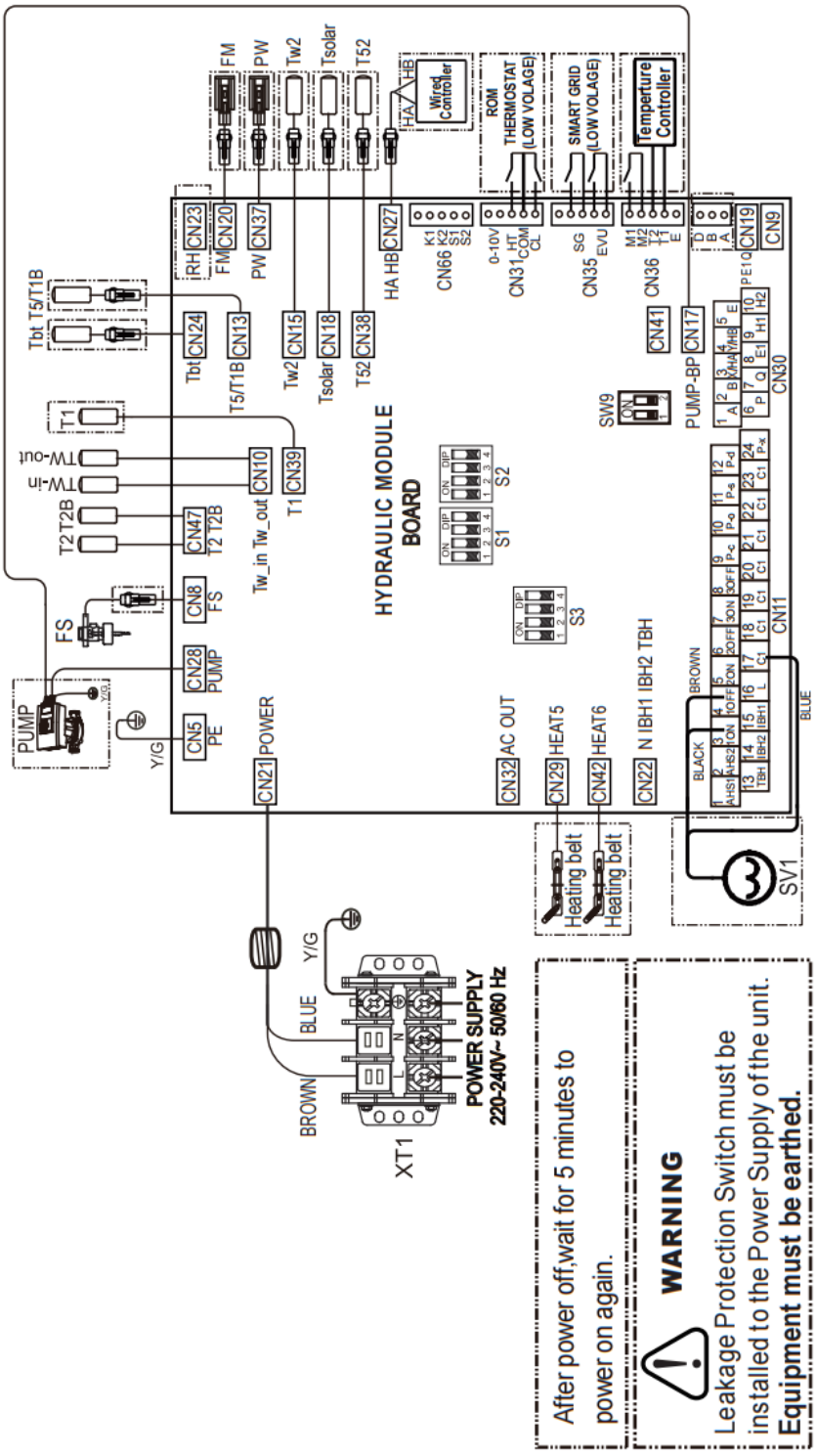
2 Electric wiring diagram

1Ph 12-16kW





Indoor unit (Version E)



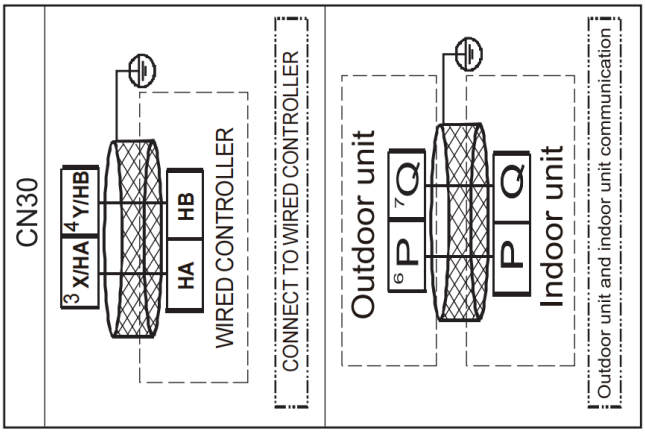


Figure 2: 3 kW IBH(One step control)

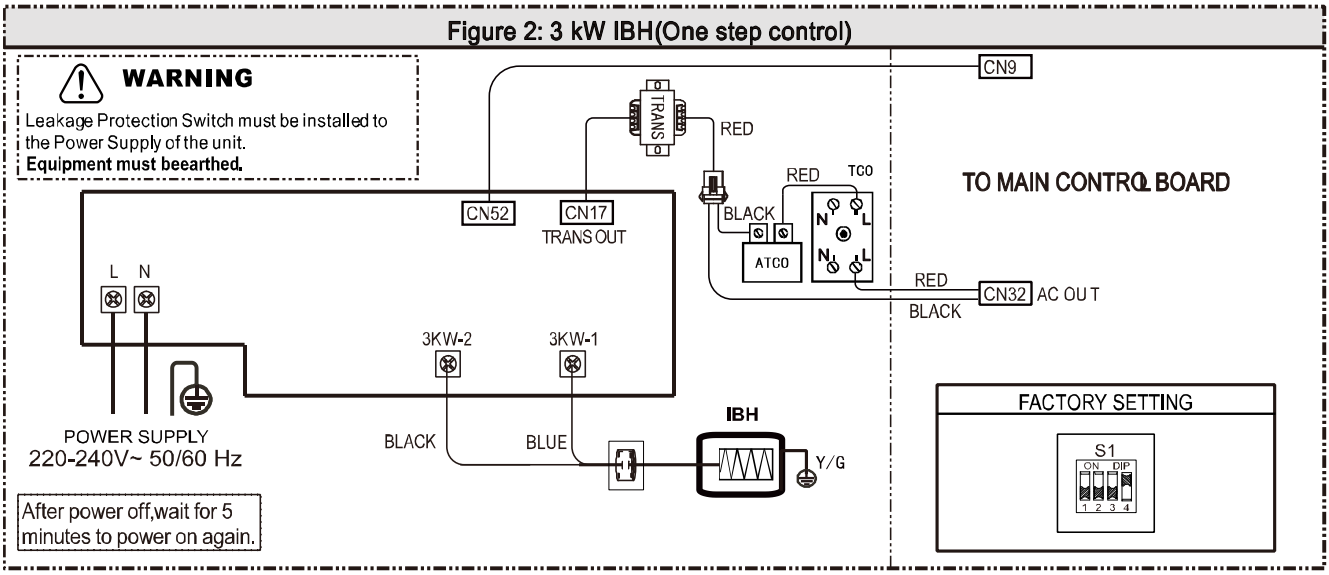
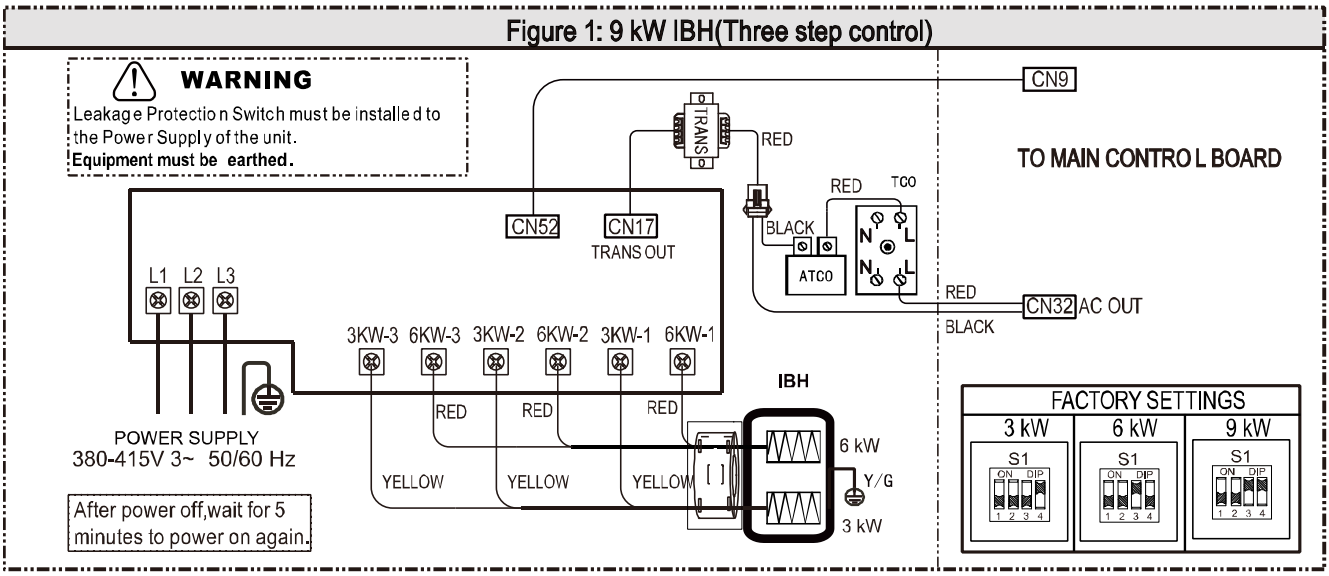
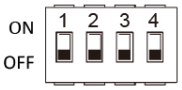
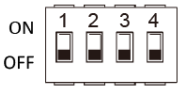
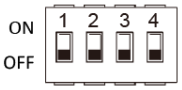
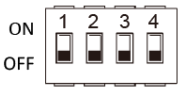
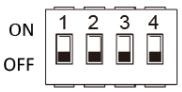


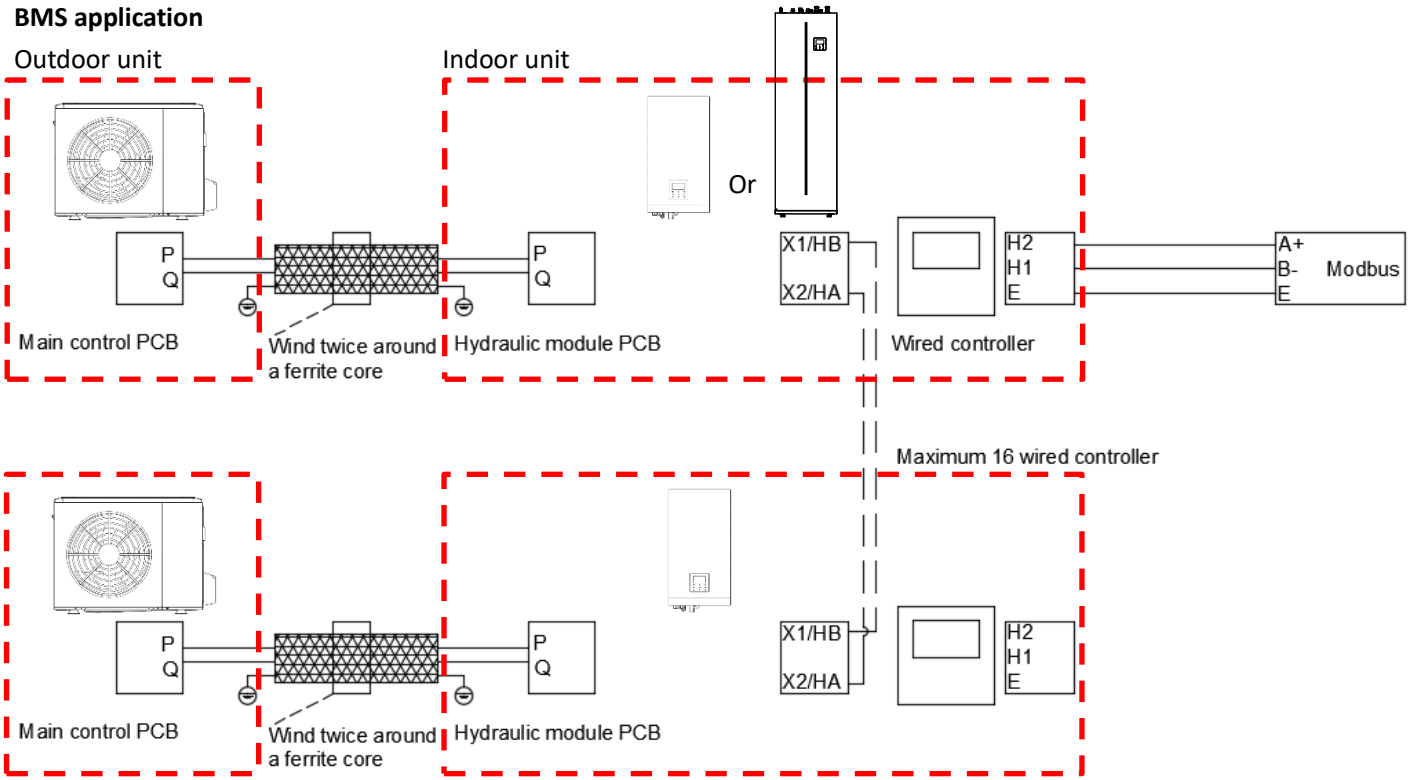
Figure 1: 9 kW IBH(Three step control)



DIP switch settings

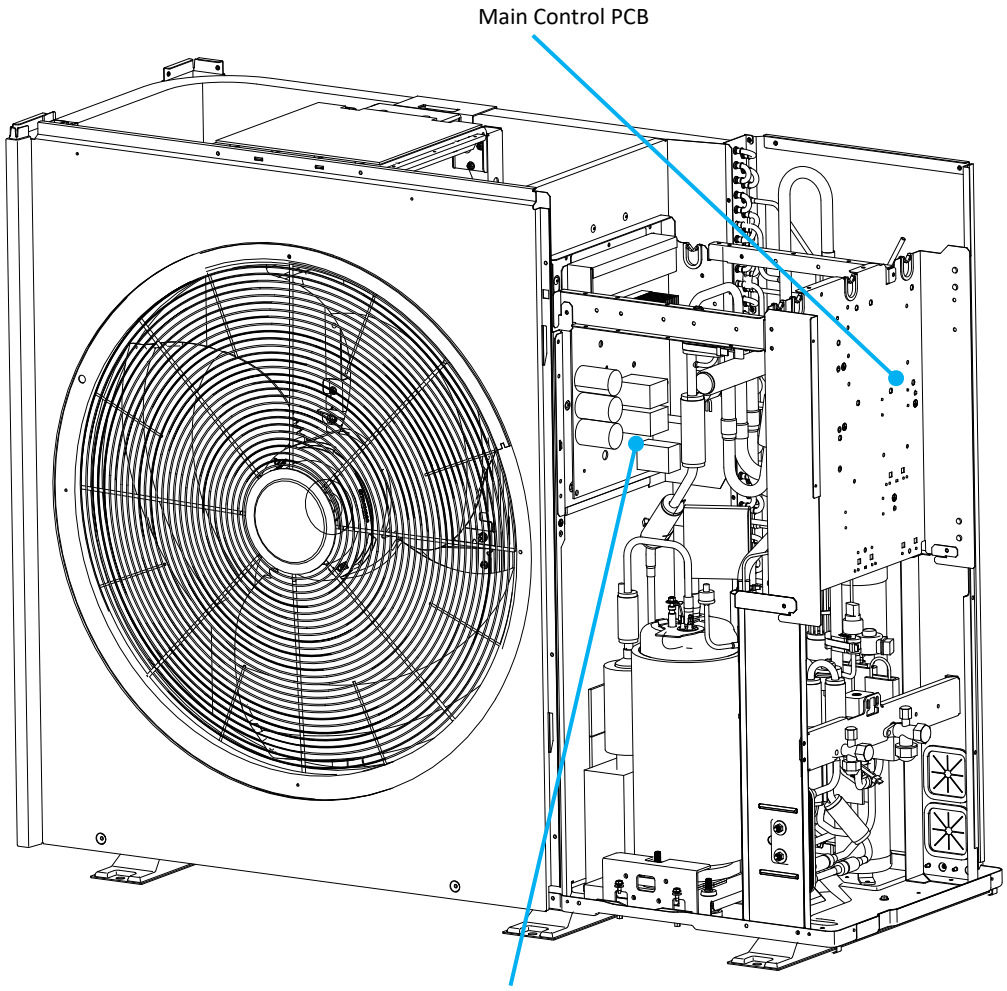
PCB	Switch		ON=1 OFF=0	Default factory setting
Hydro system	S1 	1	Reserved	0
		2	0 = Integrated electric heater 1 = External electric heater	0
		3/4	0/0 = No IBH 0/1 = With IBH(One-step control) 1/0 = With IBH(Two-step control) 1/1 = With IBH(Three-step control)	0/0
	S2 	1	0 = Not connect with MH-kit 1 = Connect with MH-kit	0
		2	Reserved	0
		3/4	0/0= Variable speed pump 1 0/1= Variable speed pump 2 1/0= Fixed speed pump 1/1= Reserved	0/0
	S3 	1/2/3/4	Reserved	0/0/0/0
Refrigerant system	S1 	1/2/3/4	0/0/0/0 = 1 phase for 12kW unit 0/0/0/1 = 1 phase for 14kW unit 0/0/1/0 = 1 phase for 16kW unit	Depends on units
	S1 	1/2/3/4	1/0/0/0 = 3 phase for 12kW unit 1/0/0/1 = 3 phase for 14kW unit 1/0/1/0 = 3 phase for 16kW unit	Depends on units

BMS application



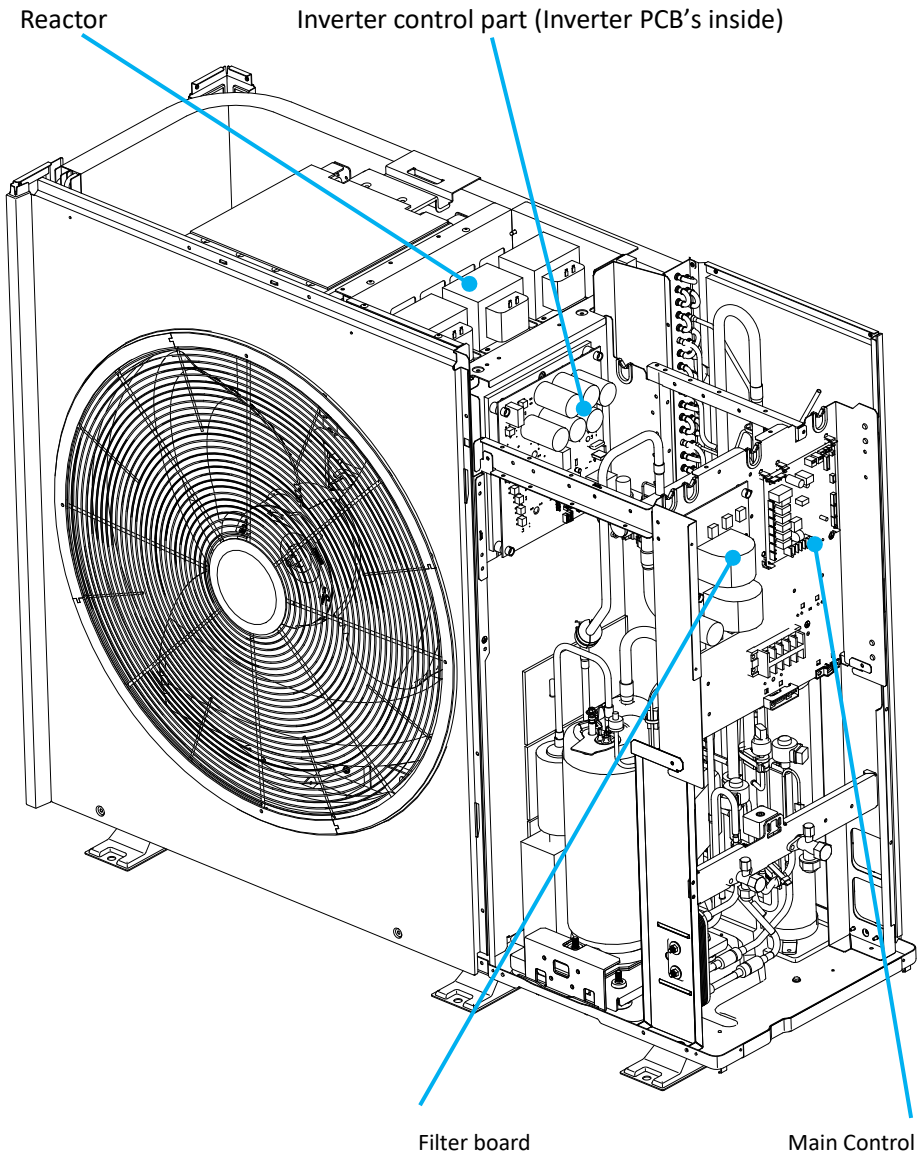
3 Electric Control Box Layout

1Ph 12-16kW

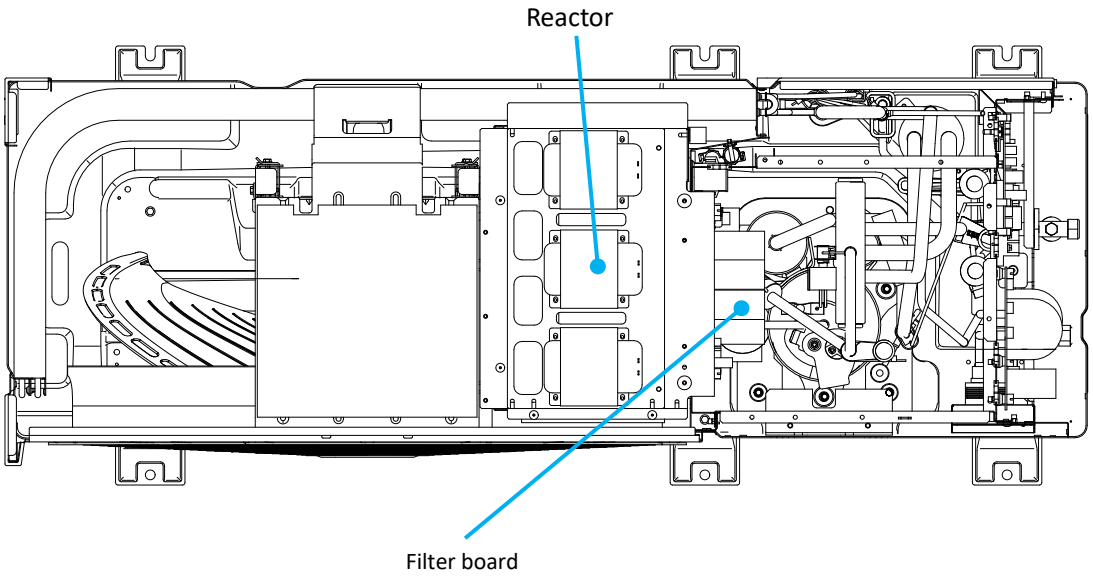


Note:The images is only used to indicate the distribution of electrical control, the appearance of the machine may vary.

3Ph 12-16kW



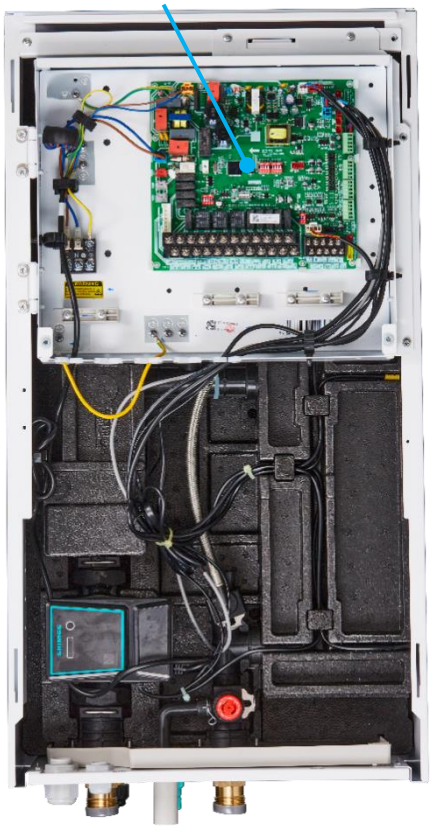
Note:The images is only used to indicate the distribution of electrical control, the appearance of the machine may vary.



Note:The images is only used to indicate the distribution of electrical control, the appearance of the machine may vary.

Hydraulic module 160

Hydraulic module PCB

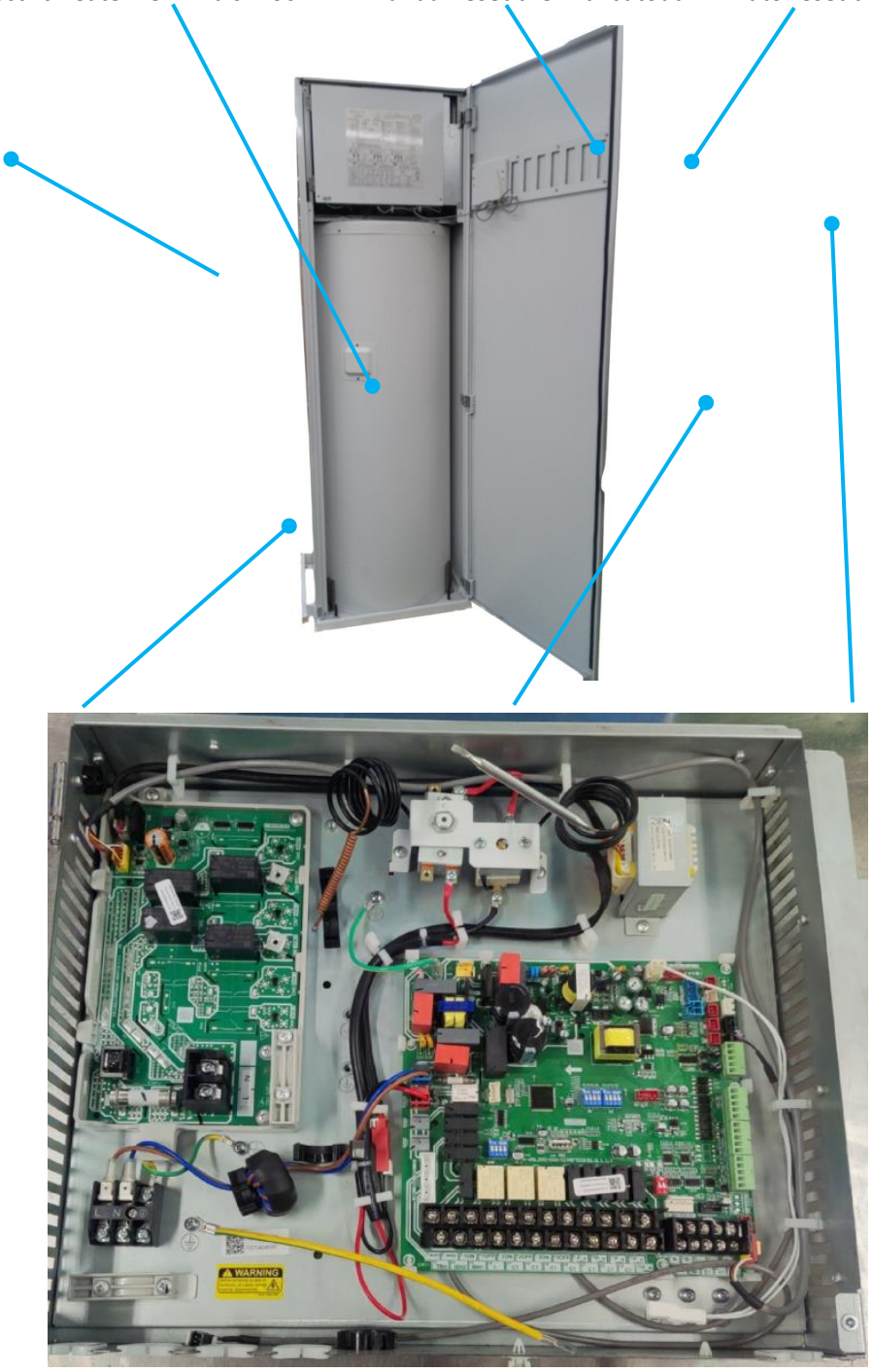


Indoor unit with water tank 160240

Backup electric heater Terminals Block

Manual reset thermal cutout

Auto reset thermal cutout



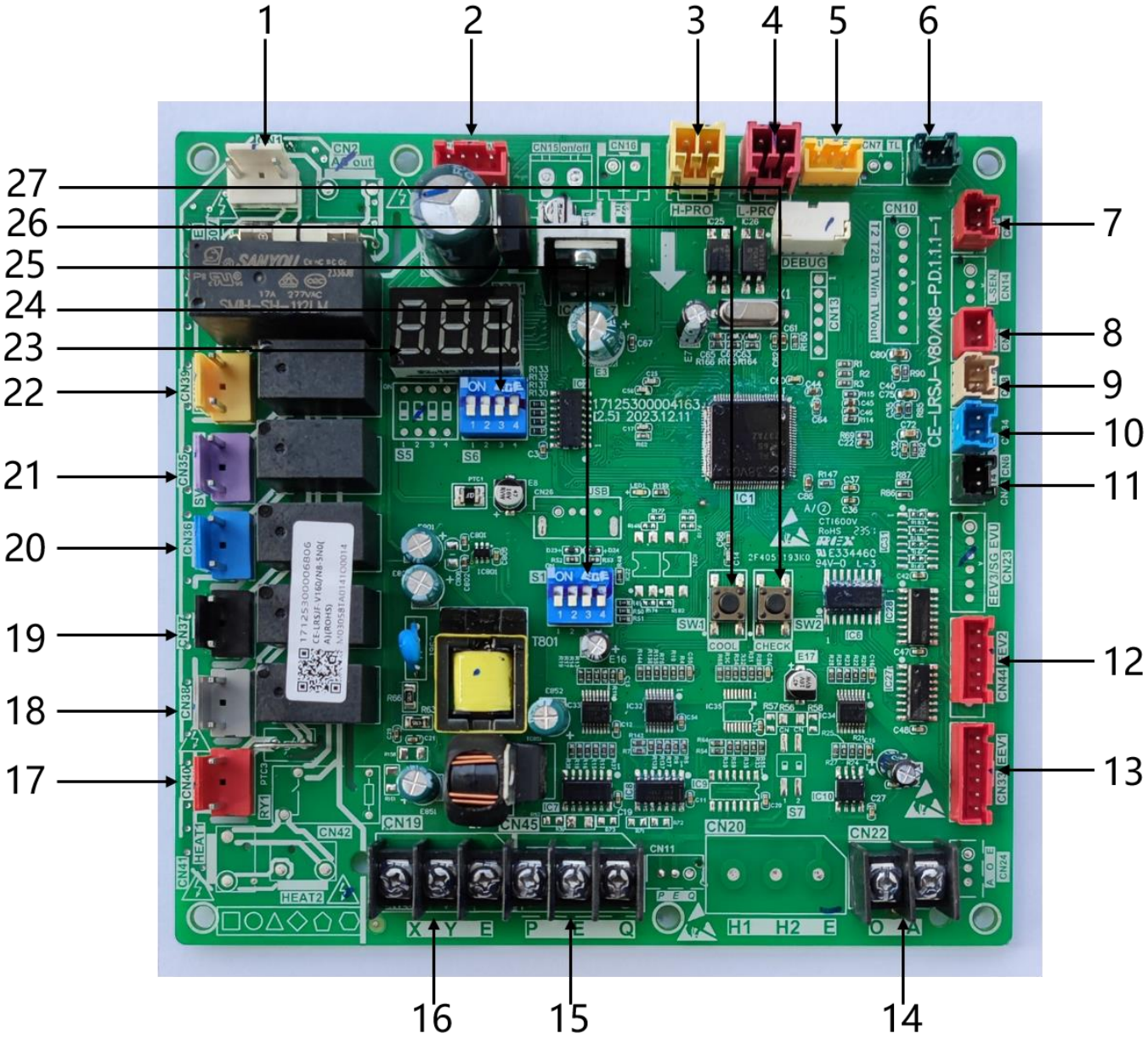
Indoor unit power supply terminals

Hydraulic module PCB

linear transformer

4 PCBs

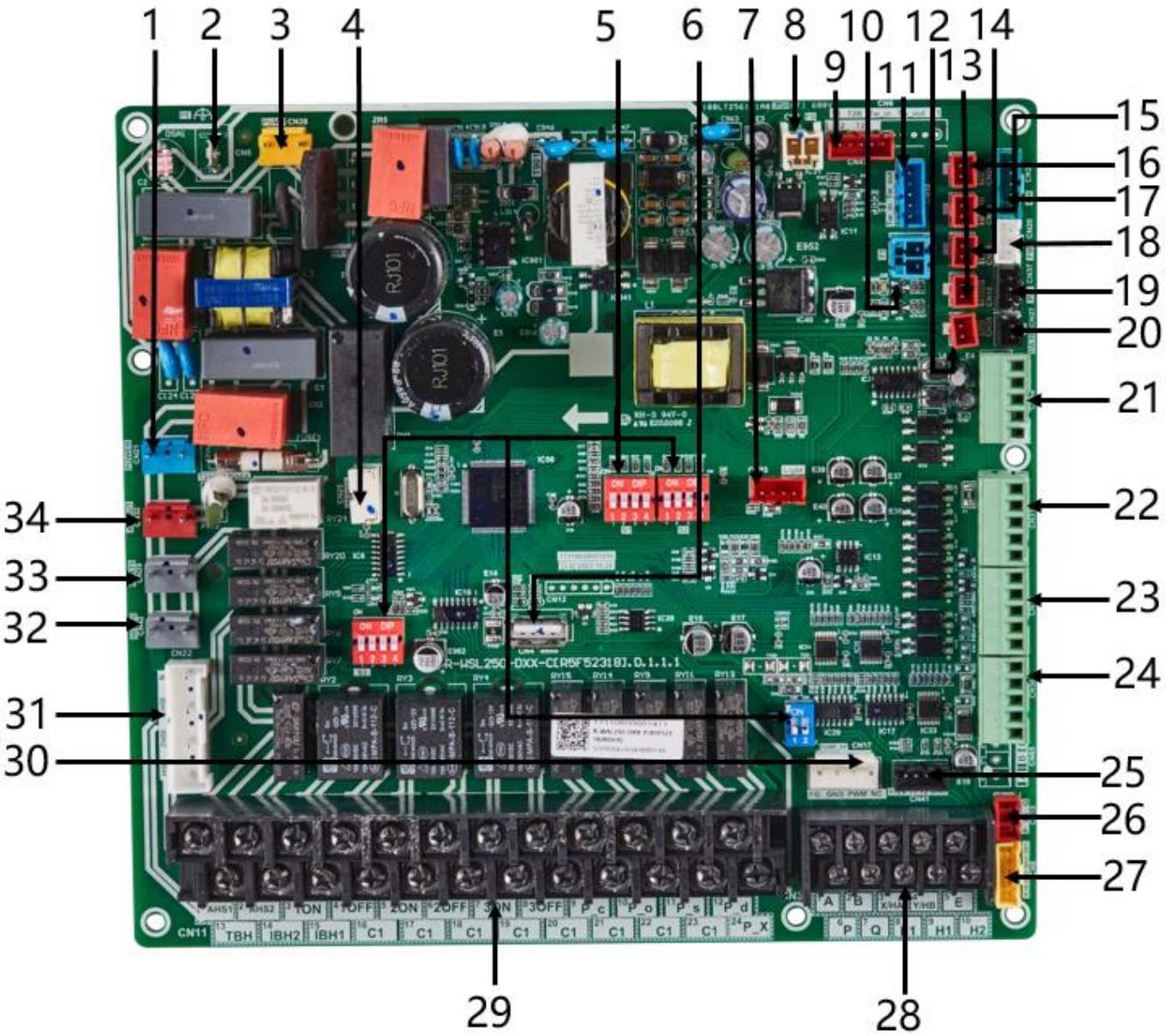
4.1 Main control PCB



Label	Port	Code	Content	Rated Voltage
1	CN1	AC IN	Power input port from Main control board	230V AC
2	CN43	COMM	Port for communication with Inverter module	12V DC（Floating）
3	CN18	H-PRO	Port for high pressure switch	0-3.3V DC
4	CN17	L-PRO	Port for low pressure switch	0-3.3V DC
5	CN3	H-SEN	Port for high pressure sensor	0-5V DC
6	CN5	Th	Port for Th temp.sensor	0-3.3V DC
7	CN4	Tp	Port for Tp temp.sensor	0-3.3V DC
8	CN9	T9O	Port for T9o temp.sensor	0-3.3V DC
9	CN8	T9I	Port for T9i temp.sensor	0-3.3V DC
10	CN34	T3	Port for T3 temp.sensor	0-3.3V DC
11	CN46	T4	Port for T4 temp.sensor	0-3.3V DC

Label	Port	Code	Content	Rated Voltage
12	CN44	EEV2	Port for electrical expansion valve2	0-12V DC
13	CN33	EEV1	Port for electrical expansion valve1	0-12V DC
14	CN22	OA	Port for communication with ammeter	0-5V DC
15	CN45	PEQ	Port for communication with hydro-box control board (PQE)	0-5V DC
16	CN19	XYE	Port for communication with indoor monitor(XYE)	0-5V DC
17	CN40	OUT1	Reserved	230V AC
18	CN38	HEAT3	Port for crankcase heating tape	230V AC
19	CN37	SV2	SV2 (Reserved)	230V AC
20	CN36	ST1	Port for 4-way valve	230V AC
21	CN35	SV6/HEAT4	Port for the heating tape of drainage outlet	230V AC
22	CN39	POWER-I	Reserved	230V AC
23	DSP1	DSP1	Digital display	0-3.3V DC
24	S6	/	Dip switch S6	0-3.3V DC
25	S1	/	Dip switch S1	0-3.3V DC
26	SW1	/	Port for Forced cooling	0-3.3V DC
27	SW2	/	Port for point check	0-3.3V DC

4.2 Hydraulic module PCB



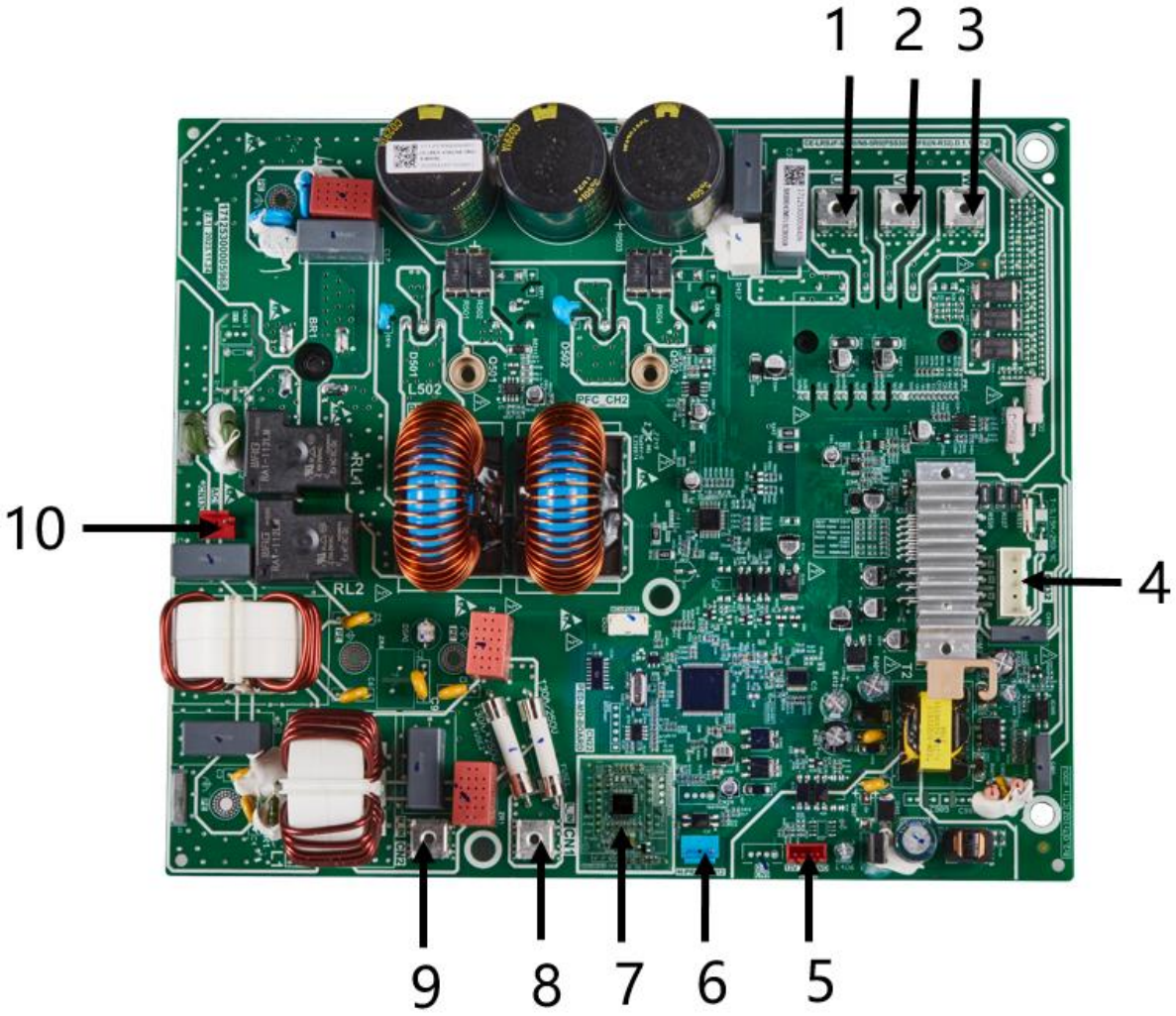
Label	Port	Code	Content	Rated Voltage
1	CN21	POWER	Port for power supply	230VAC
2	CN5	GND	Port for ground	0V
3	CN28	PUMP	Port for variable speed pump power input	230V AC
4	CN25	DEBUG	Port for IC programming	0-5V DC
5	S1/S2/S3/SW9	/	Dip switch	0-5V DC
6	CN4	USB	Port for USB programming	0-5V DC
7	CN33	Light	Port for breathing light	0-5V DC
8	CN8	FS	Port for flow switch	0-12V DC
9	CN47	T2	Port for refrigerant liquid side temperature (heating mode)	0-5V DC
		T2B	Port for temperature sensor of refrigerant gas side temperature	0-5V DC
10	CN39	T1	Port for temperature sensor of final outlet water temperature	0-5V DC
11	CN10	Tw_in	Port for temperature sensor of inlet water temperature of plate heat exchanger	0-5V DC
		Tw_out	Port for temperature sensor of outlet water temperature of plate heat exchanger	0-5V DC

Label	Port	Code	Content	Rated Voltage
12	CN38	T52	Port for temperature sensor	0-5V DC
13	CN18	Tsolar	Port for solar panel temp sensor	0-5V DC
14	CN10	Tw2	Port for outlet water for zone 2 temp. sensor	0-5V DC
15	CN13	T5/T1B	Port for domestic hot water tank temp. sensor	0-5V DC
16	CN24	Tbt	Port for temperature sensor of balance tank	0-5V DC
17	CN23	RH	Port for humidity sensor (Reserved)	0-5V DC
18	CN20	FM	Port for water flow sensor (Reserved)	0-5V DC
19	CN37	Pw	Port for water pressure sensor (Reserved)	0-5V DC
20	CN27	HA/HB	Port for communication with the HOME BUS wired controller	0-5V DC
21	CN66	K1 K2	Input port (Reserved)	0-5V DC
		S1 S2	Input port for solar energy(Reserved)	0-5V DC
22	CN31	10V GND	Output port for 0-10V	0-10V DC
		HT	Control port for room thermostat	0-5V DC
		COM	Power port for room thermostat	0-5V DC
		CL	Control port for room thermostat	0-5V DC
23	CN35	SG	Port for smart grid (grid signal)	0-5V DC
		EVU	Port for smart grid (photovoltaic signal)	0-12V DC
24	CN36	M1 M2	Port for remote switch	0-12V DC
		T1 T2	Port for thermostat transfer board	0-12V DC
25	CN41	+12V T1 T2 GND	Port for thermostat transfer board	0-12V DC
26	CN19	P Q	Communicate port between indoor unit and outdoor unit	0-5V DC
27	CN9	IB IA GND IBH2 IBH1	Port for electric auxiliary heating board	0-5V DC
28	CN30	3 4	Port for communication with the wired controller	0-18V DC
		6 7	Communicate port between hydraulic module board and main control board	0-5V DC
		9 10	Port for Internal machine Cascade	0-5V DC
29	CN11	1 2	Port for additional heat source	230V AC
		3 4 17	Port for SV1(3-way valve)	230V AC
		5 6 18	Port for SV2(3-way valve)	230V AC
		7 8 19	Port for SV3(3-way valve)	230V AC
		9 20	Port for zone 2 pump	230V AC
		10 21	Port for outside circulation pump	230V AC
		11 22	Port for solar energy pump	230V AC
		12 23	Port for DHW pipe pump	230V AC
		13 18	Control port for tank booster heater	230V AC
		14 18	Control port for internal backup heater 1	230V AC
		15 17	Control port for internal backup heater 2	230V AC
		24 23	Output port for alarm/Defrost run	230V AC
30	CN17	PUMP_BP	Port for variable speed pump communication	0-5V DC
31	CN22	IBH1	Control port for internal backup heater 1	230V AC
		IBH2	Control port for internal backup heater 2	230V AC
		TBH	Control port for tank booster heater	230V AC

Label	Port	Code	Content	Rated Voltage
32	CN42	HEAT6	Port for anti-freeze electric heating tape(internal)	230V AC
33	CN29	HEAT5	Port for anti-freeze electric heating tape(internal)	230V AC
34	CN32	AC OUT	Port for backup heater	230V AC

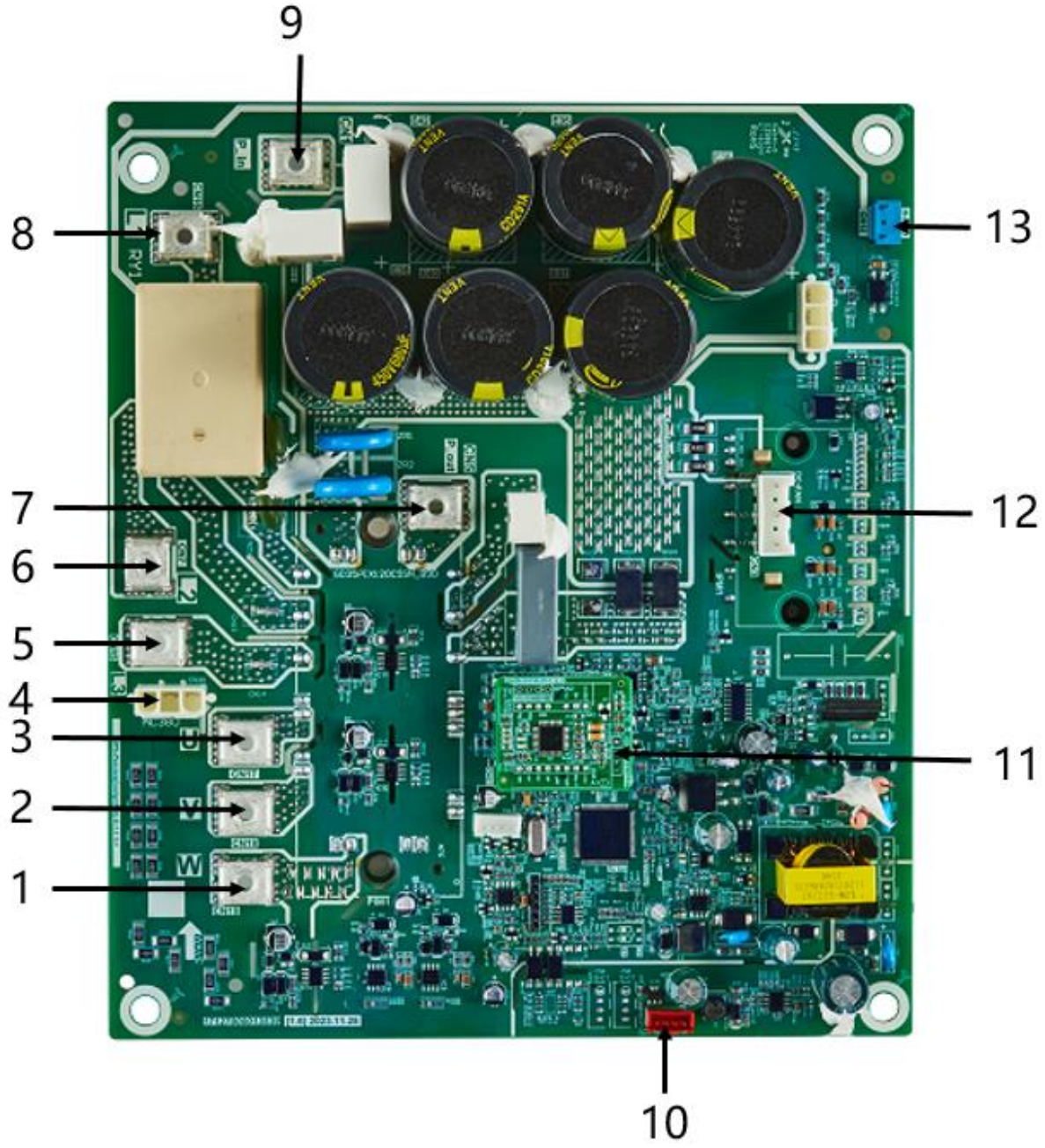
4.3 Inverter PCB

12-16kW 1Ph Inverter PCB



Label	Port	Code	Content	Rated Voltage
1	U	U	Compressor connection port U	380V AC
2	V	V	Compressor connection port V	380V AC
3	W	W	Compressor connection port W	380V AC
4	CN32	/	Port for fan	380V DC
5	CN10	12V T R GND	Port for communication with Main control board	12V DC
6	CN12	H-PRO	Port for high pressure switch	/
7	CN22_1 CN22_2	/	PED board	/
8	CN1	L_IN	Input port L for rectifier bridge	230V AC
9	CN2	N_IN	Input port N for rectifier bridge	230V AC
10	CN13	AC1	Port for power supply	230V AC

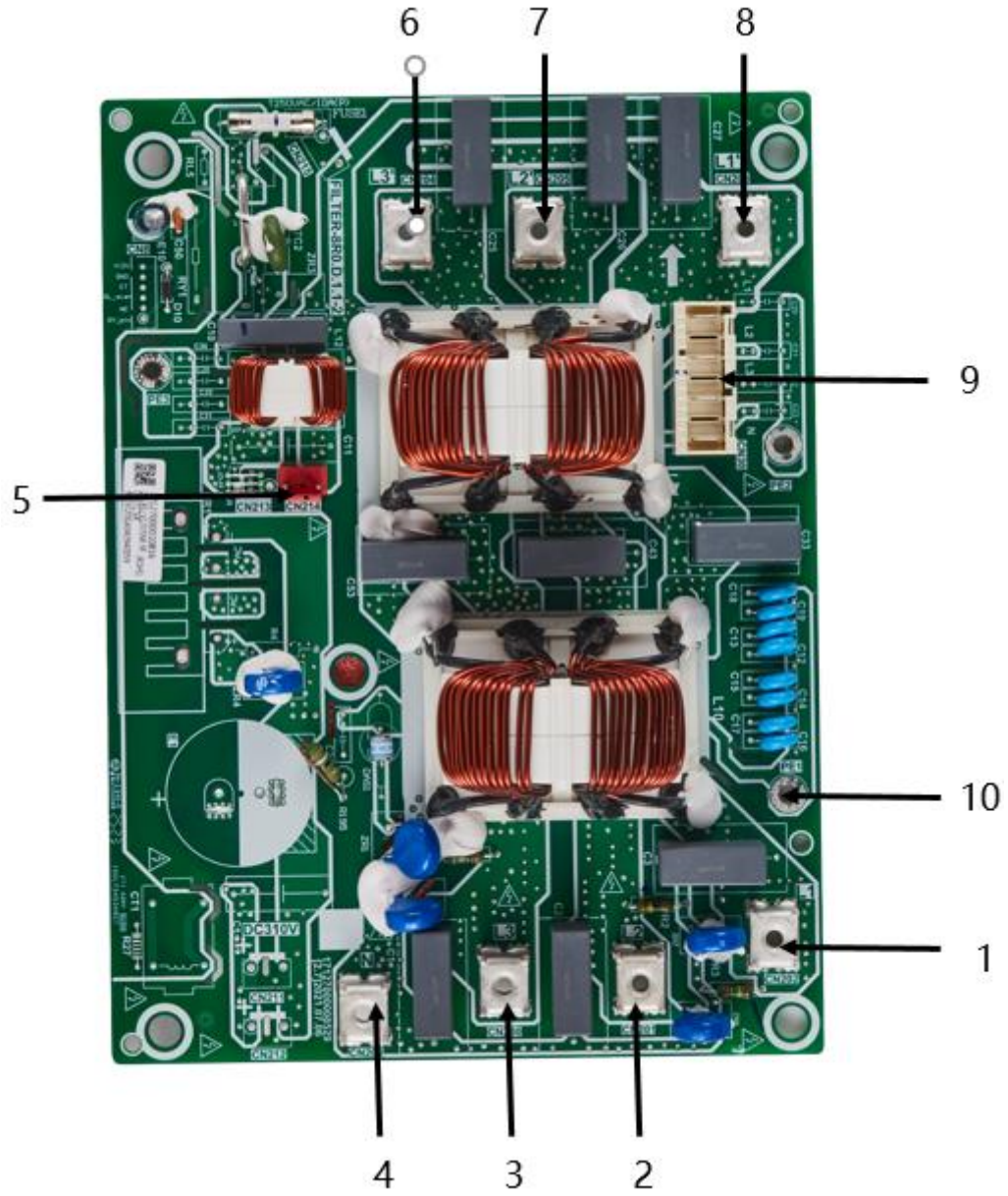
12~16kW 3Ph Inverter PCB



Label	Port	Code	Content	Rated Voltage
1	CN19	W	Compressor connection port W	540V AC
2	CN18	V	Compressor connection port V	540V AC
3	CN17	U	Compressor connection port U	540V AC
4	CN39	AC380	Port for voltage detection	380V AC
5	CN15	L3	Power Input port L3	380V AC
6	CN7	L2	Power Input port L2	380V AC
7	CN5	P_out	Input port P_out for IPM module	540V DC
8	CN16	L1	Power Input port L1	380V AC
9	CN1	P_in	Input port P_in for IPM module	540V DC
10	CN11	12V T R GND	Port for communication with main control board	12V DC
11	CN22	/	PED board	5V DC
12	CN3	DC-FAN	Port for communication with DC FAN	380V AC
13	CN12	H-PRO	Port for high pressure switch	0-12V DC

4.4 Filter PCB

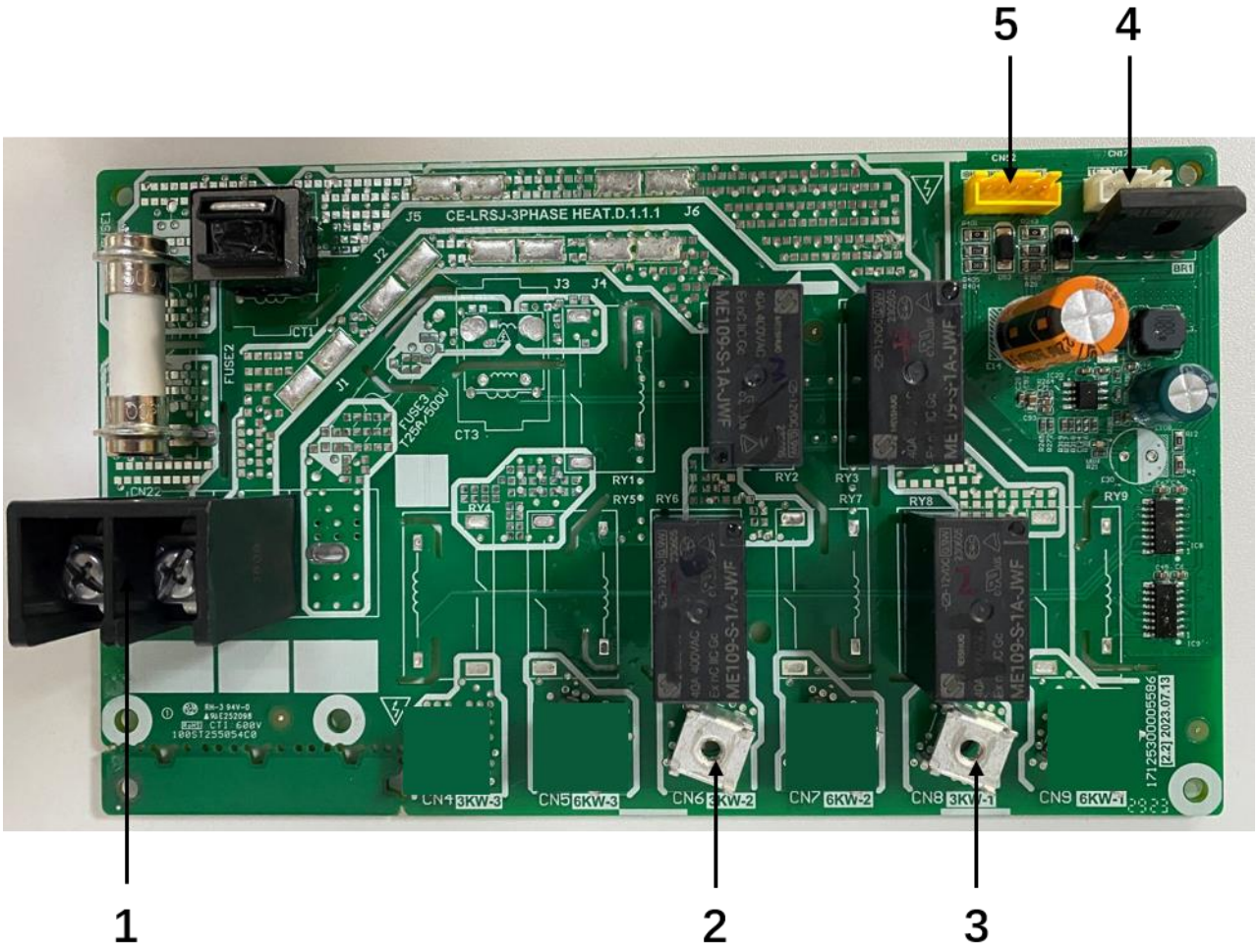
12~16kW 3Ph



Label	Port	Code	Content	Rated Voltage
1	CN202	L1	Power supply L1	380V AC
2	CN201	L2	Power supply L2	380V AC
3	CN200	L3	Power supply L3	380V AC
4	CN203	N	Power supply N	220V AC
5	CN214	/	Power supply port for main control board	220V AC
6	CN204	L3’	Power filtering output L3’	380V AC
7	CN205	L2’	Power filtering output L2’	380V AC
8	CN206	L1’	Power filtering output L1’	380V AC
9	CN30	/	Power for voltage detection	380V AC / 220V AC
10	/	PE1	Port for ground wire	0V

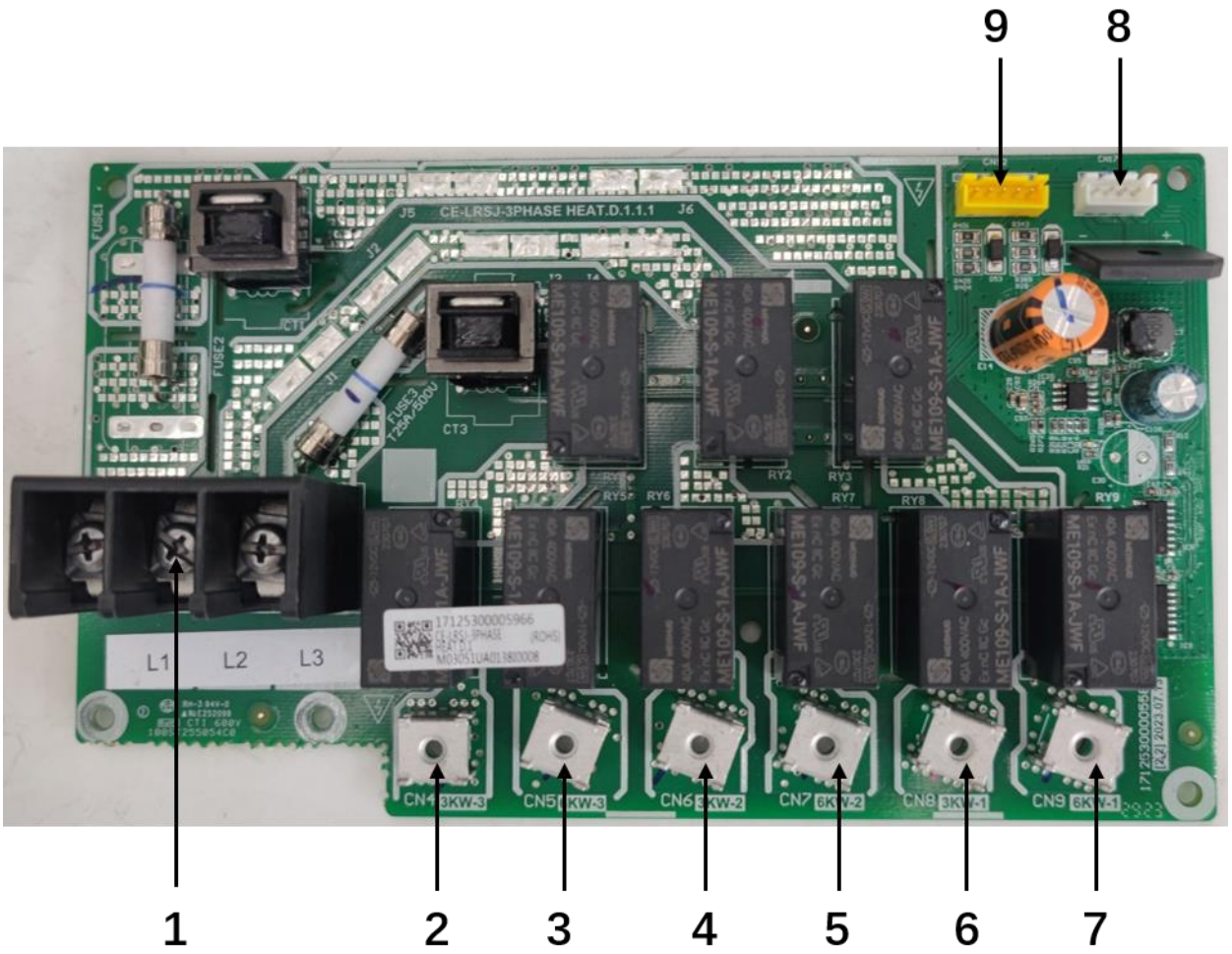
4.5 IBH PCB

1Ph 3kW IBH PCB



Label	Port	Code	Content	Voltage
1	CN22	L	Power input L of IBH PCB	Phase to phase voltage 230VAC
2	CN6	3KW-2	Power input N of 3KW IBH	Phase to phase voltage 230VAC
3	CN8	3KW-1	Power input L of 3KW IBH	Phase to phase voltage 230VAC
4	CN17	TRANS OUT	Transformer outputs to IBH	13.5VAC
5	CN52	IBH1 IBH2 GND IA IB	Main board and IBH control port	5VDC(variating);

3Ph 9kW IBH PCB



Label	Port	Code	Content	Voltage
1	CN22	L1 L2 L3	Power input L1/L2/L3 of IBH PCB	Phase to phase voltage 380VAC
2	CN4	3KW-3	Power input L3 of 3KW IBH	Phase to phase voltage 380VAC
3	CN5	6KW-3	Power input L3 of 6KW IBH	Phase to phase voltage 380VAC
4	CN6	3KW-2	Power input L2 of 3KW IBH	Phase to phase voltage 380VAC
5	CN7	6KW-2	Power input L2 of 6KW IBH	Phase to phase voltage 380VAC
6	CN8	3KW-1	Power input L1 of 3KW IBH	Phase to phase voltage 380VAC
7	CN9	6KW-1	Power input L1 of 6KW IBH	Phase to phase voltage 380VAC
8	CN17	TRANS OUT	Transformer outputs to IBH	13.5VAC
9	CN52	IBH1 IBH2 GND IA IB	Main board to IBH board control port	5VDC(variating);

5 Error Code Table

Water circuit error			
Error code	Description	Displayed on	Note
E0	Water flow malfunction(E0 is displayed after E8 has appeared 3 consecutive times.)	User Interface	
E8	Water flow malfunction	User Interface	

Communication error			
Error code	Description	Displayed on	Note
E2	Communication malfunction between controller and hydraulic module	User Interface and Main Control PCB	
EL	Communication fault between hydraulic module and MH-kit	User Interface	
H0	Communication malfunction between main control board and hydraulic module board	User Interface and Main Control PCB	
H1	Communication malfunction between main control board and inverter board	User Interface and Main Control PCB	
Hd	Communication fault between master unit and slave unit	User Interface and Main Control PCB	

Sensor error			
Error code	Description	Displayed on	Note
E3	Total outlet water temp.sensor(T1) malfunction	User Interface	
E4	Water tank temp.sensor (T5)malfunction	User Interface	
E5	Air side heat exchanger temperature sensor (T3)malfunction	User Interface and Main Control PCB	
E6	The ambient temperature sensor (T4)malfunction	User Interface and Main Control PCB	
E7	Hydraulic Separator upper temp.sensor(Tbt) malfunction	User Interface	
E9	Suction temperature sensor(Th) malfunction	User Interface and Main Control PCB	
EA	Discharge temperature sensor(Tp) malfunction	User Interface and Main Control PCB	
Eb	Solar temp. sensor(Tsolar) malfunction	User Interface	
Ed	Inlet water temp.sensor(Tw_in) malfunction	User Interface	
H2	Liquid refrigerant temp.sensor(T2) malfunction	User Interface	
H3	Gas refrigerant temp.sensor(T2B) malfunction	User Interface	
H5	Room temp.sensor(Ta)malfunction	User Interface	
H8	Pressure sensor malfunction	User Interface and Main Control PCB	
H9	Outlet water for zone 2 temp.sensor (Tw2) malfunction	User Interface	
HA	Outlet water temp.sensor (Tw_out) malfunction	User Interface	
F51	T9i refrigerant temp.sensor malfunction	User Interface and Main Control PCB	
F31	T9o refrigerant temp.sensor malfunction	User Interface and Main Control PCB	

Voltage error			
Error code	Description	Displayed on	Note
E1	Phase loss or neutral wire and live wire are connected reversely	User Interface and Main Control PCB	For 3Ph models
H7	Voltage protection	User Interface and Main Control PCB	

Protection code			
Error code	Description	Displayed on	Note

P0	Low pressure switch protection	User Interface and Main Control PCB	
P1	High pressure switch protection	User Interface and Main Control PCB	
P3	Compressor overcurrent protection	User Interface and Main Control PCB	
P4	Comp discharge temp. too high protection	User Interface and Main Control PCB	
Pd	High temperature protection of air side heat exchanger temperature(T3).	User Interface and Main Control PCB	
HP	Low pressure protection in cooling mode	User Interface and Main Control PCB	
bA	T4 sensor out of operation range protection	User Interface and Main Control PCB	
PP	| Tw_out-Tw_in | abnormal protection	User Interface and Main Control PCB	
Hb	Three times PP protection and Tw_out below 7 ℃	User Interface and Main Control PCB	
P5	|Tw_out-Tw_in| value too big protection	User Interface and Main Control PCB	
P01	High injection pressure protection	User Interface and Main Control PCB	
PF	Insufficient overheating protection	User Interface and Main Control PCB	

Inverter module error/ protection			
Error code	**Description**	**Displayed on**	**Note**
EE	Hydraulic module EEprom malfunction	User Interface and Main Control PCB	
F1	DC bus low voltage protection	User Interface and Main Control PCB	
F6	EXV1 fault	User Interface and Main Control PCB	
b01	EXV2 fault	User Interface and Main Control PCB	
C7	High temperature protection of inverter module	User Interface and Main Control PCB	
H4	Three times L0 protection	User Interface and Main Control PCB	
L0	Inverter or compressor protection	User Interface and Main Control PCB	
L1	DC bus low voltage protection	User Interface and Main Control PCB	
L2	DC bus high voltage protection	User Interface and Main Control PCB	
L3	Current sampling error of PFC circuit	User Interface and Main Control PCB	
L4	Rotating stall protection	User Interface and Main Control PCB	
L5	Zero speed protection	User Interface and Main Control PCB	
L7	Phase loss protection of compressor	User Interface and Main Control PCB	
LB	PFC protection	User Interface and Main Control PCB	
H6	The DC fan malfunction	User Interface and Main Control PCB	
HH	10 times H6 in 2 hours	User Interface and Main Control PCB	
HF	Inverter module board EE prom malfunction	User Interface and Main Control PCB	

Others			
Error code	**Description**	**Displayed on**	**Note**
Pb	Anti-freeze mode	Main Control PCB	
dF	Defrosting Operation	Main Control PCB	
d0	Oil Return Operation	Main Control PCB	
CL	Water pump communication wire fault	User Interface	

IBH-related error			
Error code	**Description**	**Displayed on**	**Note**
C2	IBH PCB fault	User Interface	For Units with IBH
C3	Current transformer failure or IBH open circuit protection	User Interface	For Units with IBH
C4	Current transformer failure or IBH open circuit fault (C4 appears when C3≥3 times)	User Interface	For Units with IBH

6 Troubleshooting

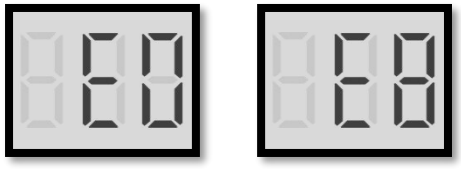
6.1 Warning

WARNING!

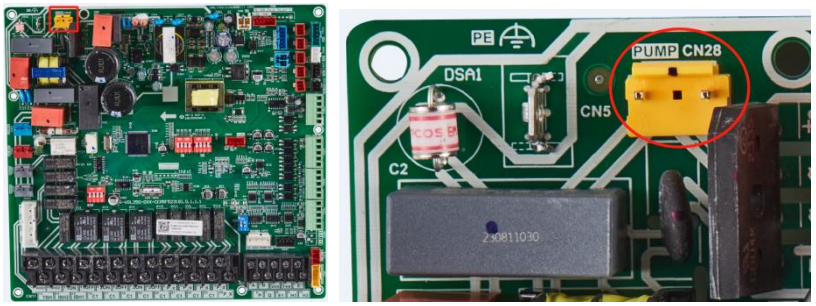
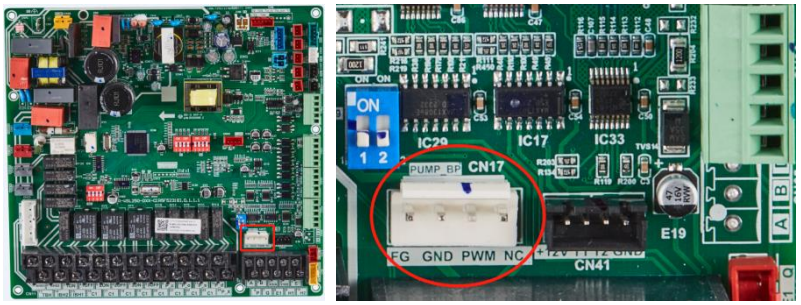
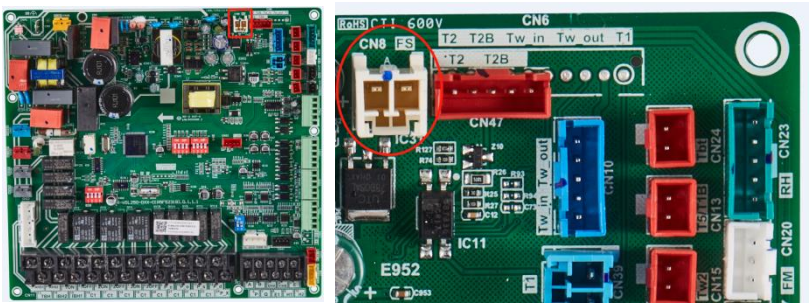
- All electrical work must be carried out by competent and suitably qualified, certified and accredited professionals and in accordance with all applicable legislation (all national, local and other laws, standards, codes, rules, regulations and other legislation that apply in a given situation).
- Power-off the outdoor units before connecting or disconnecting any connections or wiring, otherwise electric shock (which can cause physical injury or death) may occur or damage to components may occur.

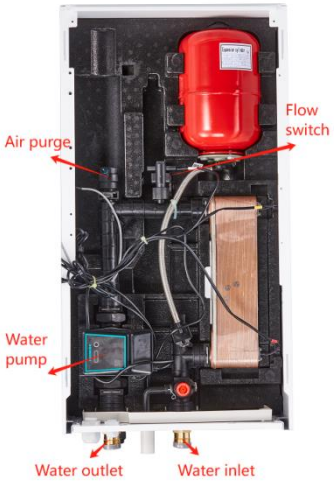
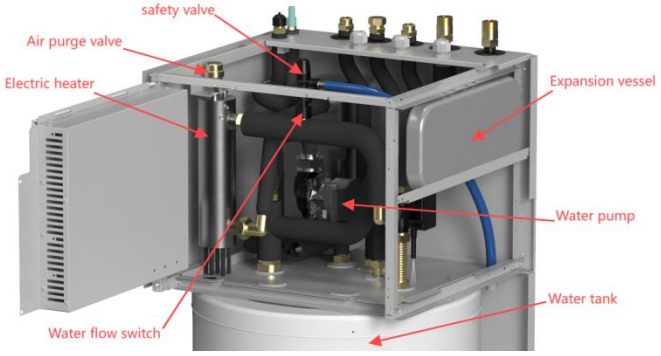
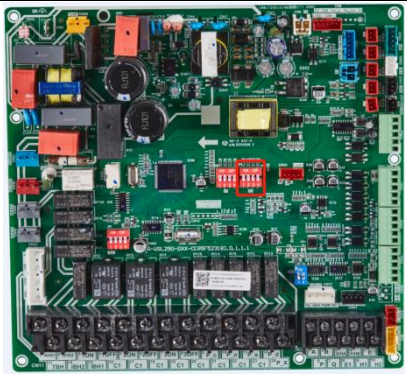
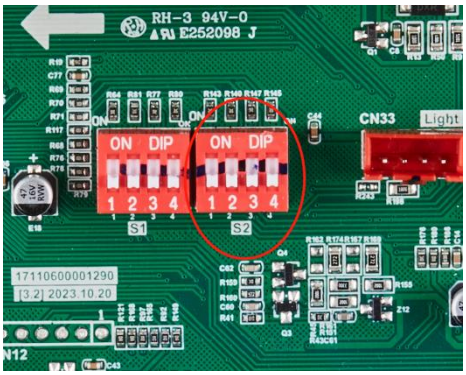
6.2 E0, E8 Troubleshooting

6.2.1 Digital display output



6.2.2 Description

Error code		E0	E8
Description		water flow failure	water flow protection
Triggering		5 times of No-water detection failures in a row before pump on Or 3 times of E8 in a row when do running-water detection after pump on	No-water detection failures within 5 times before pump on Or Water flow switch breaks 10 times in a row when do running-water detection after pump on
Relative ports and locations	CN28 PUMP (To supply power for water pump)		
	CN17 PUMP BP (feedback signal of water pump)		
	CN8 FS (signal of water flow switch)		

	Layout of main component	 
User Interface		E0(**%) /E8(**%) is displayed on the User Interface. The percentage indicates possible cause of water flow failure, which is illustrated as note 1.
Dip switch S2-3/4		  0/0: Variable speed pump 1(SHIMGE/ SHINHOO) 0/1: Variable speed pump 2 1/0: Fixed speed pump 1/1: Reserved

6.2.3 Procedure

E0 / E8: Water flow failure

Check the error code E0(**%) /E8(**%) displayed on the User Interface, and the percentage is between 5%-80%

No → Check the details of Note 1

Yes

Check the water pump indicator lights, and it shows water pump is normal
(SHINHOO water pump 2 green lights on indicate normal; SHIMGE water pump 5 lights on indicates normal)

No → Check the details of Note 2

Yes

Check the water circuit, and it is abnormal:
1. The ball valve which is connected to the unit is not opened
2.Water inlet and outlet pipe connected reversely.
3.Y-type filter is dirty block
4.The power cable(CN28) or feedback signal cable(CN17) is not connected properly
5.The water circuit was not filled first and not released air completely.

Yes →
1. Open the waterway ball valve which is connected to the unit
2.Make sure water inlet and outlet pipe connected correctly.
3.Clean the filter.
4.Connect the power cable or feedback signal cable correctly.
5.Fill the water circuit first and then release the air. If necessary, we can quickly release the air from the air purge valve by unscrewing black nut.

No

Check the Water flow switch, and it is damaged
1.Flow switch FS plug (CN8) is not connected properly.
2. The water flow in the pipe is not consistent with arrow on the flow switch.
3.Remove the water flow switch from the pipeline, manually dial the water flow switch rake to closed status, and use a digital multimeter with buzzer to measure. if it does not beep, the water flow switch damaged.

Yes →
1.Insert the plug of the water flow switch correctly
2. Adjust the direction of water flow in the pipe to be the same as the arrow on the flow switch
3. When you manually dial the water flow switch to the closed status, use a digital multimeter with buzzer to measure. If buzzer sounds, the water flow switch is normal. Otherwise, it's damaged and replace with a new water flow switch.

No

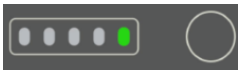
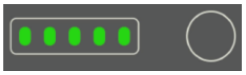
For more error information of water pump and flow switch, check the note 3/4 to solve the problem.
If the error still occurs, request after-sales service

Note 1 :

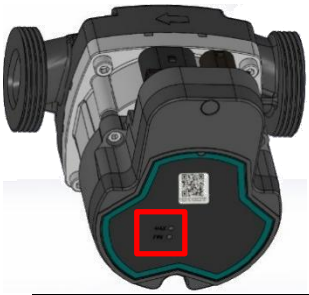
The meaning of percentage of water pump output(displayed on the user interface)			
Percentage	**Water pump model**	**Brand**	**Description**
0%	GPA25-9HW 130	SHINHOO	PWM connection port short circuited
	APM25-9-130/180	SHIMGE	PWM feedback signal loss
2%	GPA25-9HW 130	SHINHOO	Pump Standby
	APM25-9-130/180	SHIMGE	Pump Standby
80%	GPA25-9HW 130	SHINHOO	Reserved
	APM25-9-130/180	SHIMGE	Alarm, and Pump keeps running. When the voltage is 270V, the pump runs with fixed frequency and the water flow value is displayed as –. (Low voltage: 170-194V; High voltage: 250-270V)
85%	GPA25-9HW 130	SHINHOO	Voltage＜140V(±10V) protection, and pump stops running.
	APM25-9-130/180	SHIMGE	Alarm, and pump stops running (Low voltage: <170V/ High voltage: >270V)
90%	GPA25-9HW 130	SHINHOO	Pump stalling; over temperature protection, and pump stops running
	APM25-9-130/180	SHIMGE	Alarm (Pump idling , pump stalling) and pump stops running
95%	GPA25-9HW 130	SHINHOO	Phase loss; Over-current error, and pump stops running
	APM25-9-130/180	SHIMGE	Alarm; Phase loss; Over-current error, and pump stops running
100%	GPA25-9HW 130	SHINHOO	No PWM signal input
	APM25-9-130/180	SHIMGE	No PWM signal input

Note 2

Indicator lights on SHIMGE water pump :

Indicator lights on SHIMGE water pump		
Name	**Indicator lights**	**Description**
Motor stalling protection		When motor stalling happens, the pump tries to reboot every 5s, and indicator lights shows the error. After 5 times reboot, pump stops running
Overcurrent/ Undercurrent protection		When low voltage: <165V/ high voltage: >275V, pump stops running and indicator lights shows the error. When the voltage is back to 160V-270V, pump resume running
Phase loss protection		When phase loss happens, the pump tries to reboot every 1s, and indicator lights shows the error. After 5 times reboot, pump stops running
Overcurrent (Short circuit) protection		When overcurrent / overheat happens, the pump tries to reboot every 1s, and indicator lights shows the error. After 5 times reboot, pump stops running
Overheat protection		When power module overheat, pump stops running and indicator lights shows the error.
No PWM signal		No PWM signal
PWM signal speed regulation		Pump speed adjustment

Indicator lights on SHINHOO water pump :



Protection	Indicator	Description
Under voltage protection	The indicator flashes 2 times at the same time	If the input voltage is lower than 140V (±10V) and the duration exceeds 2S, the under-voltage protection will be triggered and the pump will be shut down.When the input voltage is restored to ≥150 (±10V), the pump works normally and restarts indefinitely.
Over-current protection	The indicator flashes 3 times at the same time	If the phase current is abnormal, the peak value of the corresponding phase current is greater than 1.8A, and the duration exceeds 5uS, the over-current protection will be triggered and the pump will shut down. The pump will reboot 8S after it shut down, unlimited reboots.
Phase-loss protection	The indicator flashes 4 times at the same time	Before the motor runs or before restarted from the protection, the two-phase windings are energized 0.4A current, continuous 2mS, the current value of the detected phase at this moment, if it is less than 0.1A, the phase loss protection will be triggered, and the pump will be shut down.The pump will reboot after 8S of shutdown, unlimited reboots.
Locked-rotor protection	The indicator flashes 5 times at the same time	If the speed of the pump is less than 500PM and the duration is more than 6S, the stall protection will be triggered and the pump will be stopped.The pump will reverses for 5S after 8S of shutdown, then stop for 1S, and reboot, unlimited reboots.
Over-temperature protection	The indicator flashes 8 times at the same time	If the surface temperature of the IPM is higher than 125±10%C, the over-temperature protection will be triggered and the pump will be shut down. When the IPM surface temperature is below 100±10%C and the pump resumes normal operation, unlimited reboots.
Overheat protection	The indicator light is on normally	If the surface temperature of the IPM module is higher than 115±10%C, the overheating protection will be triggered, and the water pump will drop to 0.5 times the rated power operation. When the IPM surface temperature is below 100±10%C and the pump resumes normal operation.

Note 3: The possible error and solutions of water pump

The possible causes of water pump failure and solutions		
Description	**Possible cause**	**Solution**
Error occurs at the first time running	Water pump leak	Replace the sealing ring
	Water inlet and outlet pipe connected reversely.	Connect the pipe correctly.
	The power cable (CN28) is not connected properly	Connect the power cable correctly.
	The feedback signal cable (CN17) is not connected properly	Connect the feedback signal cable correctly.
	The dip switch is not correct.	Correct the dip switch as the illustration above
Error occurs at the first time running or after running for a while	Pump idling	Fill the water circuit first and then release the air
	Pump stalling	Remove the water pump, rotate the impeller manually until it can move freely. And then install it back. (If it's too hard to rotate the impeller manually, replace the water pump)
	Power supply is abnormal	Check the power supply
Error occurs after running for a while	E8 occurs after water pump running for a while	Fill the water circuit first and then release the air.
Error occurs at the first time running or after running for a while	Motor stall, and it can not be rotated manually	Replace water pump
Error occurs at the first time running	Water pump connection is correct, the water pump icon on the User Interface is lit, while no indicator lights on water pump is lit.	Replace water pump

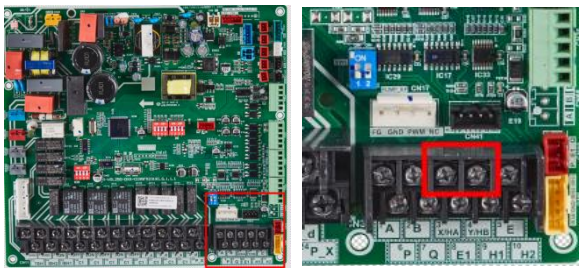
Note 4: The possible error and solutions of water flow switch failure

The possible causes of water flow switch failure and solutions		
Description	**Possible cause**	**Solution**
Error occurs at the first time running	The water flow in the pipe is not consistent with arrow on the flow switch.	Adjust the direction of water flow in the pipe to be the same as the arrow on the flow switch
	Flow switch FS plug (CN8) is not connected properly.	Insert the plug of the water flow switch correctly
	External pump starts before internal pump (PUMPI) starts	Start internal pump first, make sure water flow is sufficient for external pump
Error occurs at the first time running or after running for a while	Flow switch not installed properly	Reinstall the flow switch correctly
	Flow switch leak	Replace the sealing ring
	Flow switch rake blocked	Clean the obstacles
	Flow switch rake damaged	Replace the flow switch
	The flow switch contact can not be completely closed	Replace the flow switch
	The flow switch contact can not be completely open	Replace the flow switch
	The flow switch model did not match	Replace the flow switch

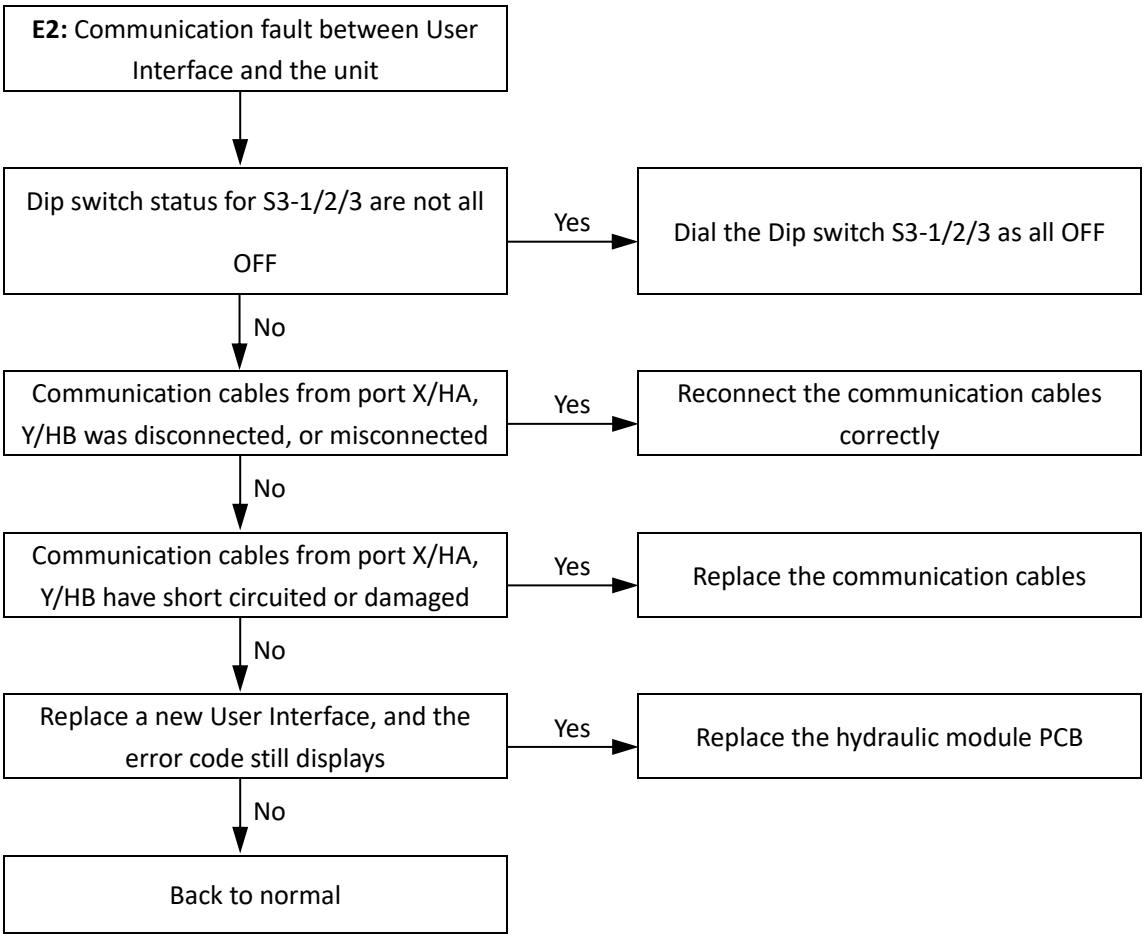
6.3 E2 Troubleshooting

6.3.1 Digital display output

6.3.2 Description

Error code		E2
Description		Communication fault between User Interface and Hydraulic module PCB
Triggering		Hydraulic module PCB side: Communication failure with User Interface lasts 2 mins Or User Interface side: No communication reply from Main Control PCB for 1 min
Relative ports and locations	CN30 X/HA、Y/HB	

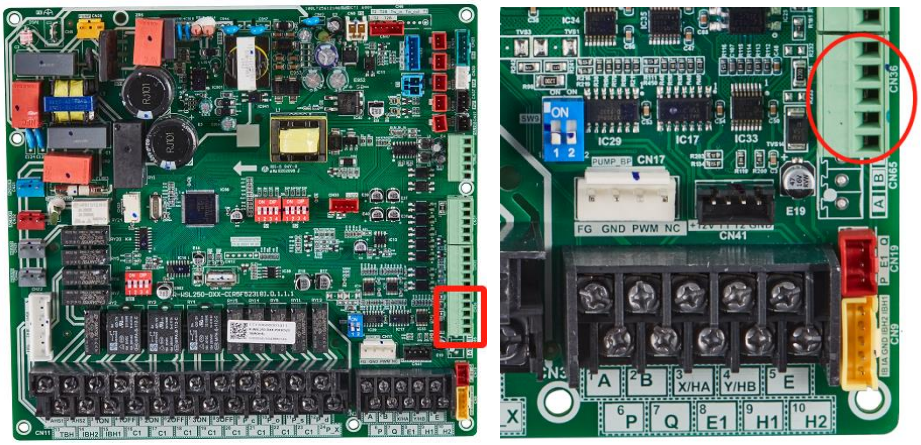
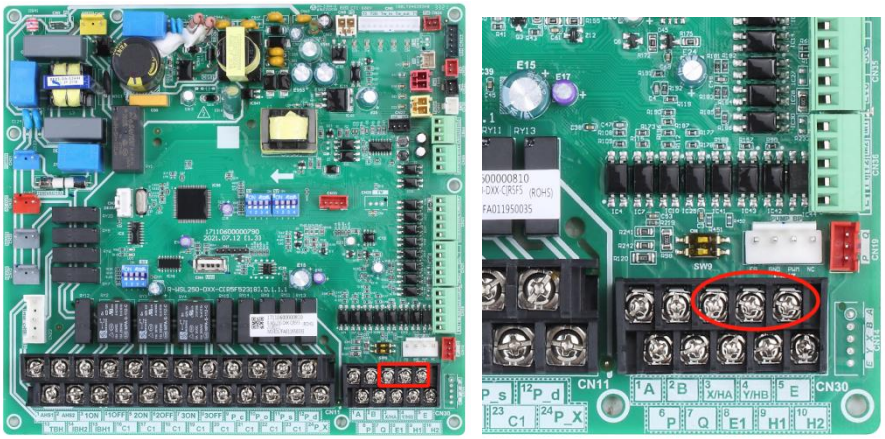
6.3.3 Procedure



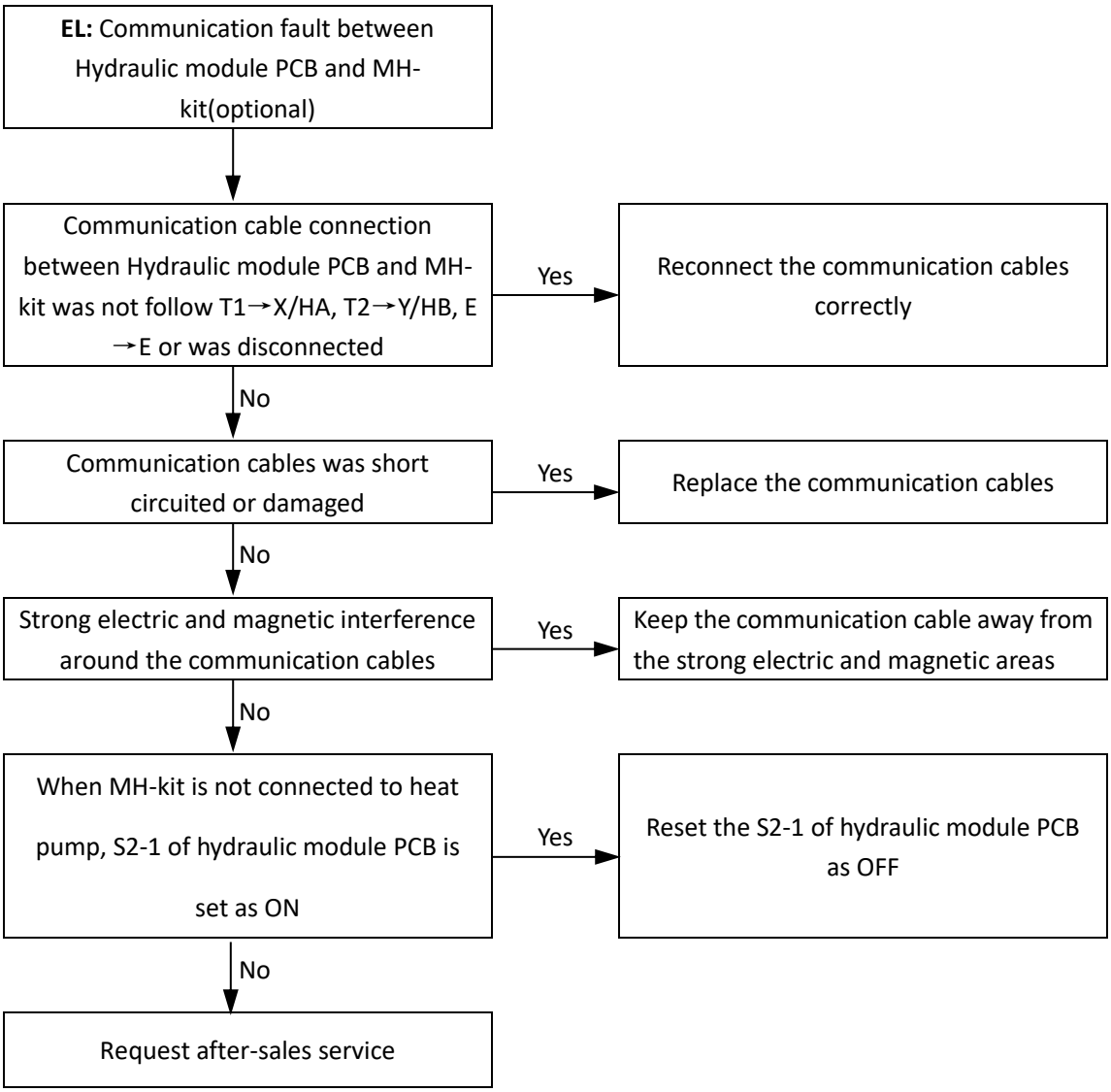
6.4 EL Troubleshooting

6.4.1 Digital display output

6.4.2 Description

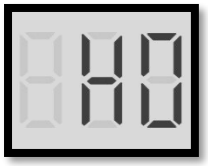
Error code		EL
Description		Communication fault between Hydraulic module PCB and MH-kit(optional)
Triggering		Communication failure between Hydraulic module PCB and MH-kit lasts 60s
Relative ports and Locations	Hydraulic module PCB CN36 T1, T2, E	
	MH-kit(optional) CN30 X/HA, Y/HB, E	

6.4.3 Procedure

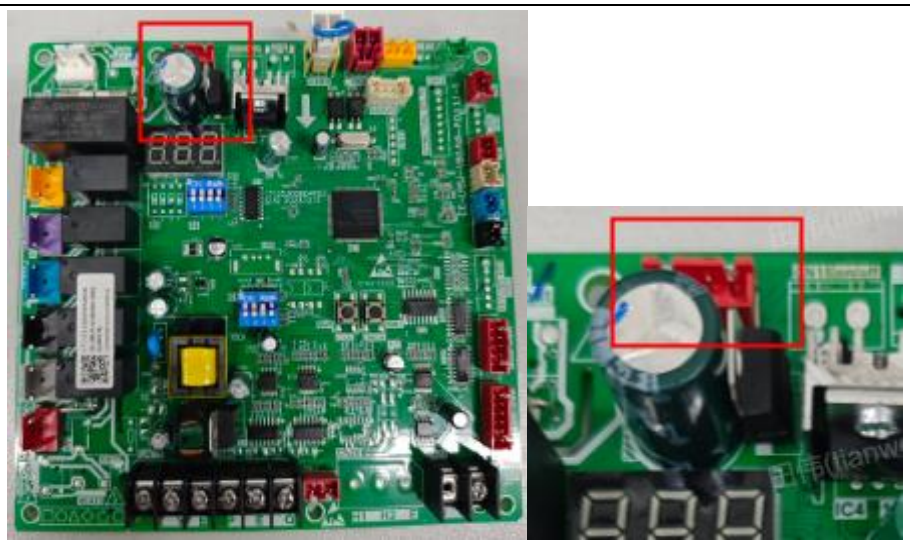


6.5 H0 Troubleshooting

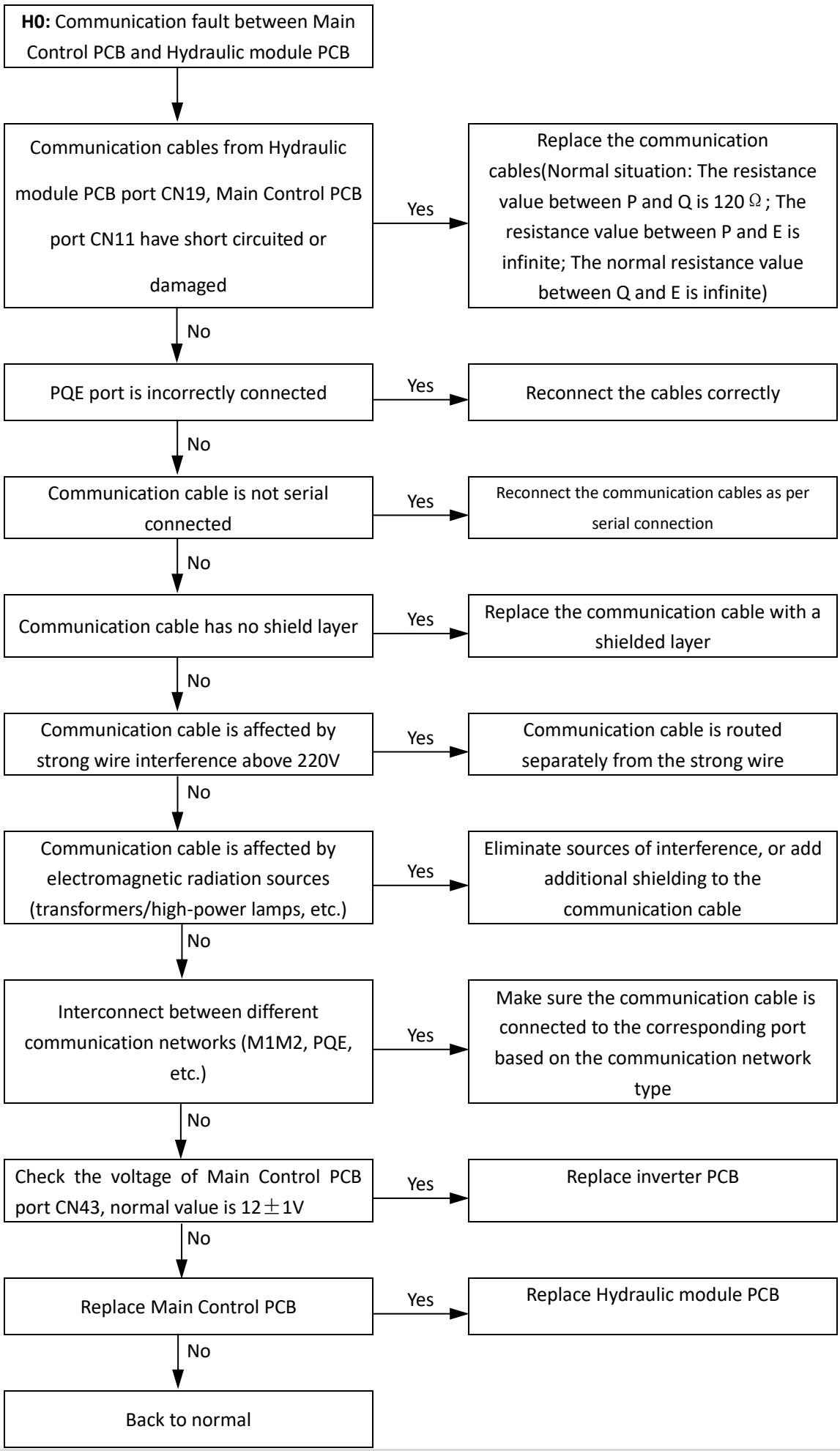
6.5.1 Digital display output



6.5.2 Description

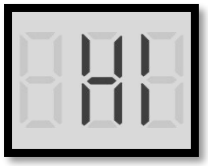
Error code		H0
Description		Communication fault between Main Control PCB and Hydraulic module PCB
Triggering		Communication failure lasts 1 min
Relative ports and Locations	Main control PCB CN43	

6.5.3 Procedure

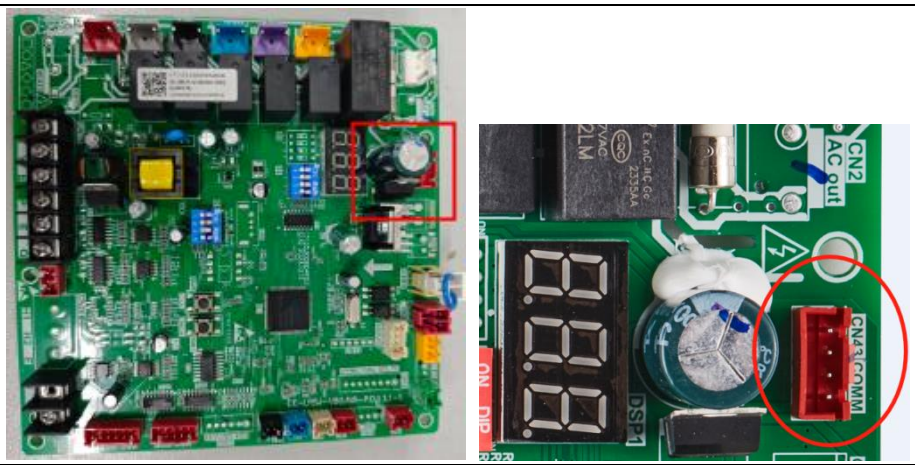
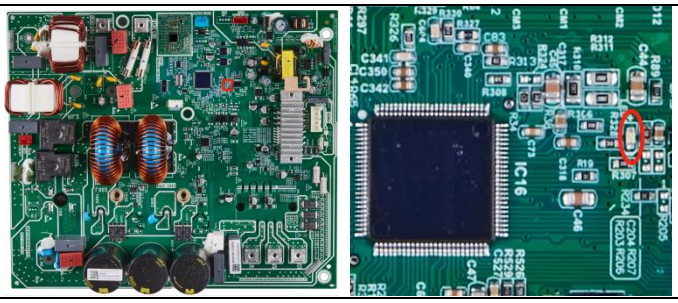
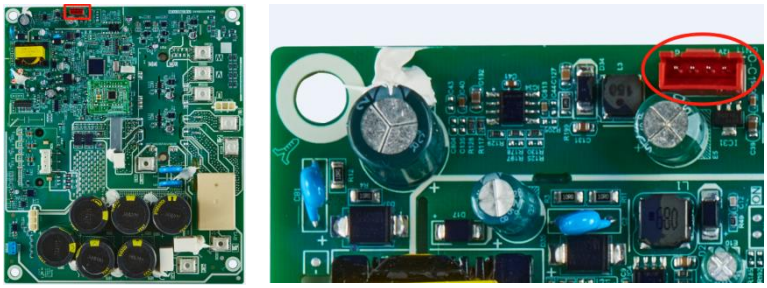


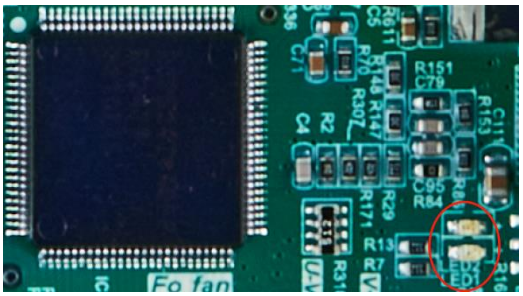
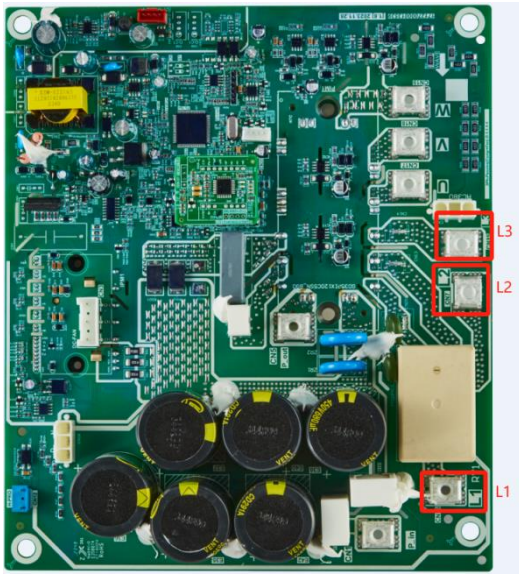
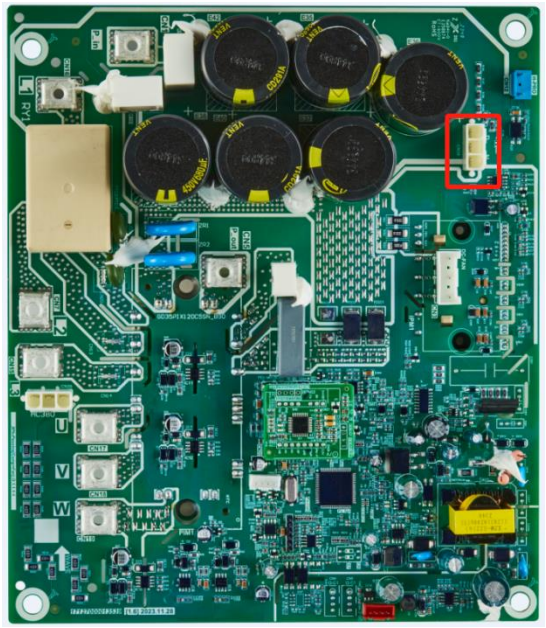
6.6 H1 Troubleshooting

6.6.1 Digital display output



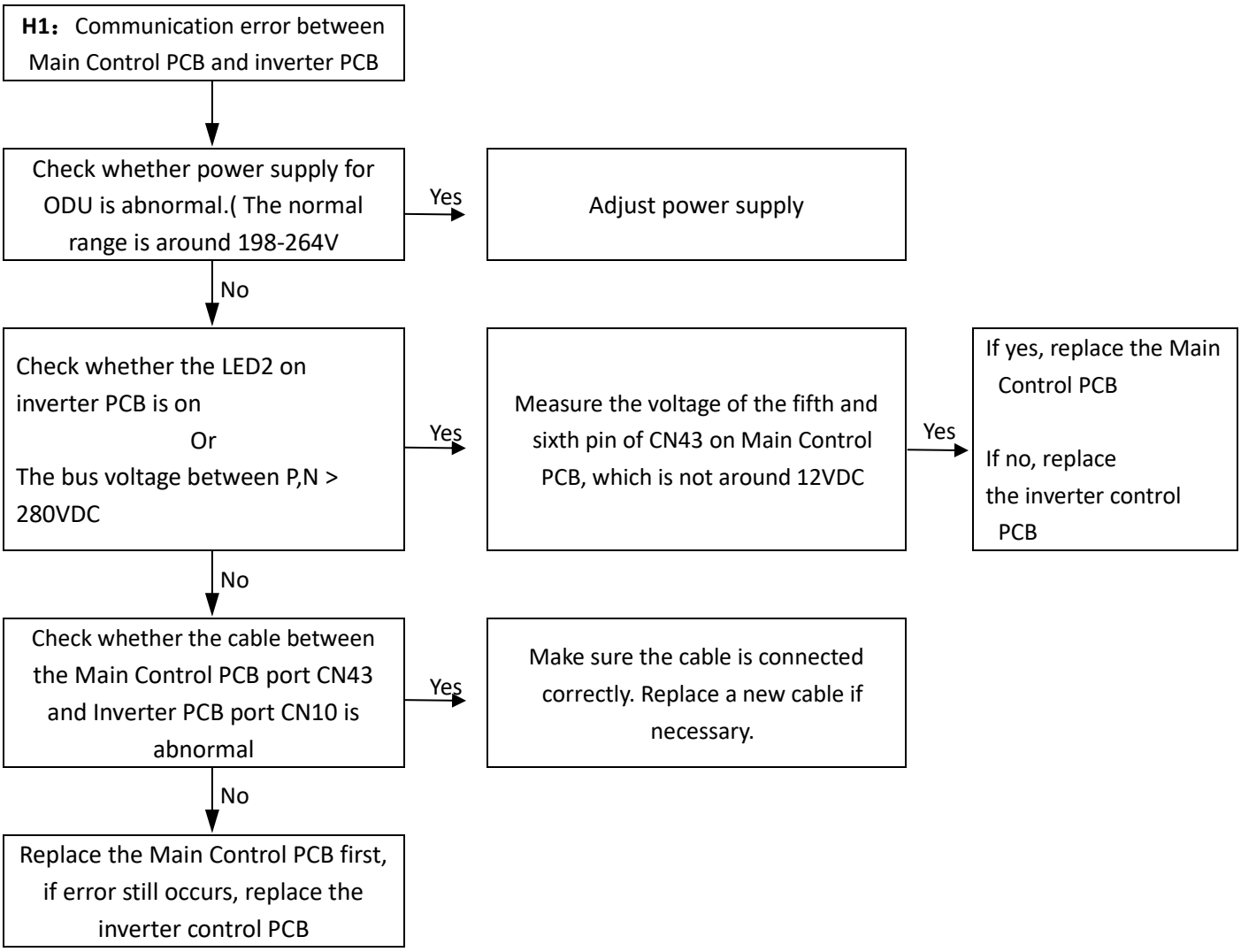
6.6.2 Description

Error code		H1
Description		Communication error between Main Control PCB and inverter PCB
Triggering		Communication failure lasts 1 min
Relative ports and locations	CN43 COMM (Main Control PCB)	
	CN10 12V T R GND 12~16kW 1N model (inverter PCB)	
	LED 12~16kW 1N model (inverter PCB)	
	CN11 12V T R GND 12~16kW 3N mode (inverter PCB)l	

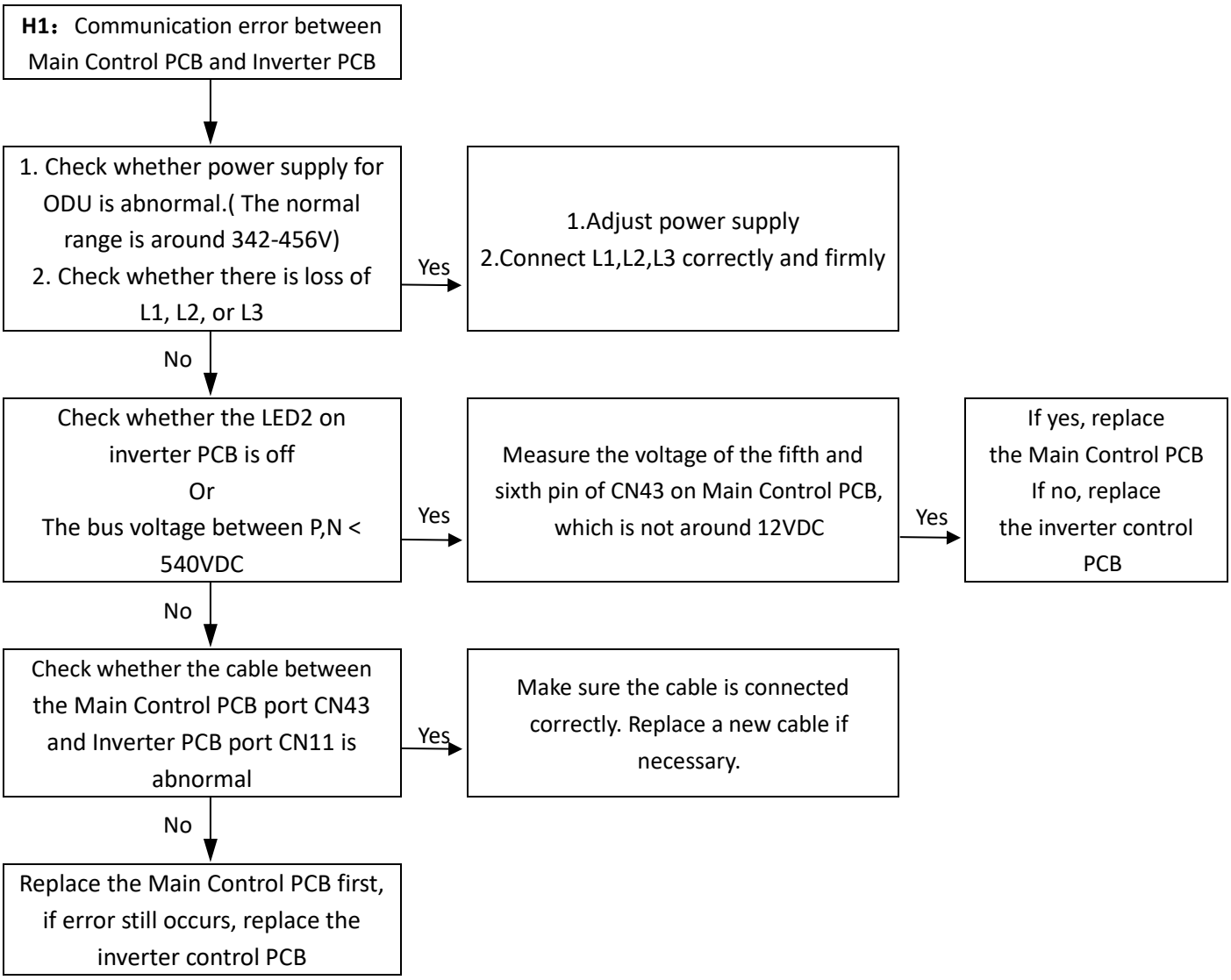
	LED 12~16kW 3N model (inverter PCB)	 
Relative ports and locations	L1 L2 L3 12~16kW 3N model (inverter PCB)	
	BUS voltage(P-N) 12~16kW 3N model (inverter PCB)	

6.6.3 Procedure

For 1Ph models

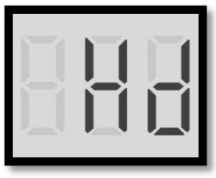


For 3Ph models

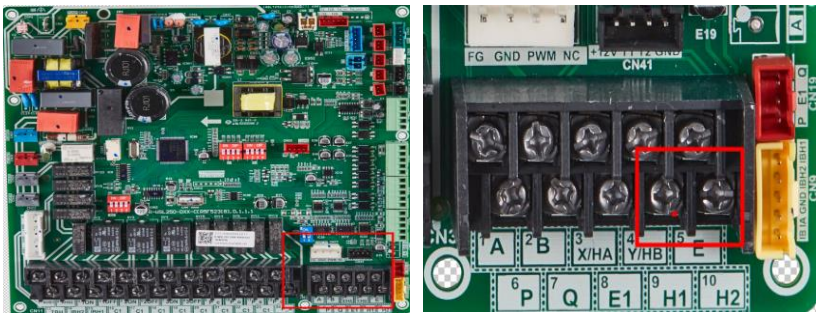
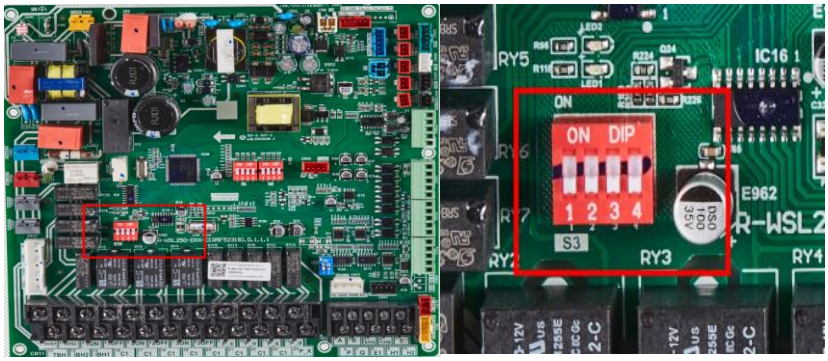


6.7 Hd Troubleshooting

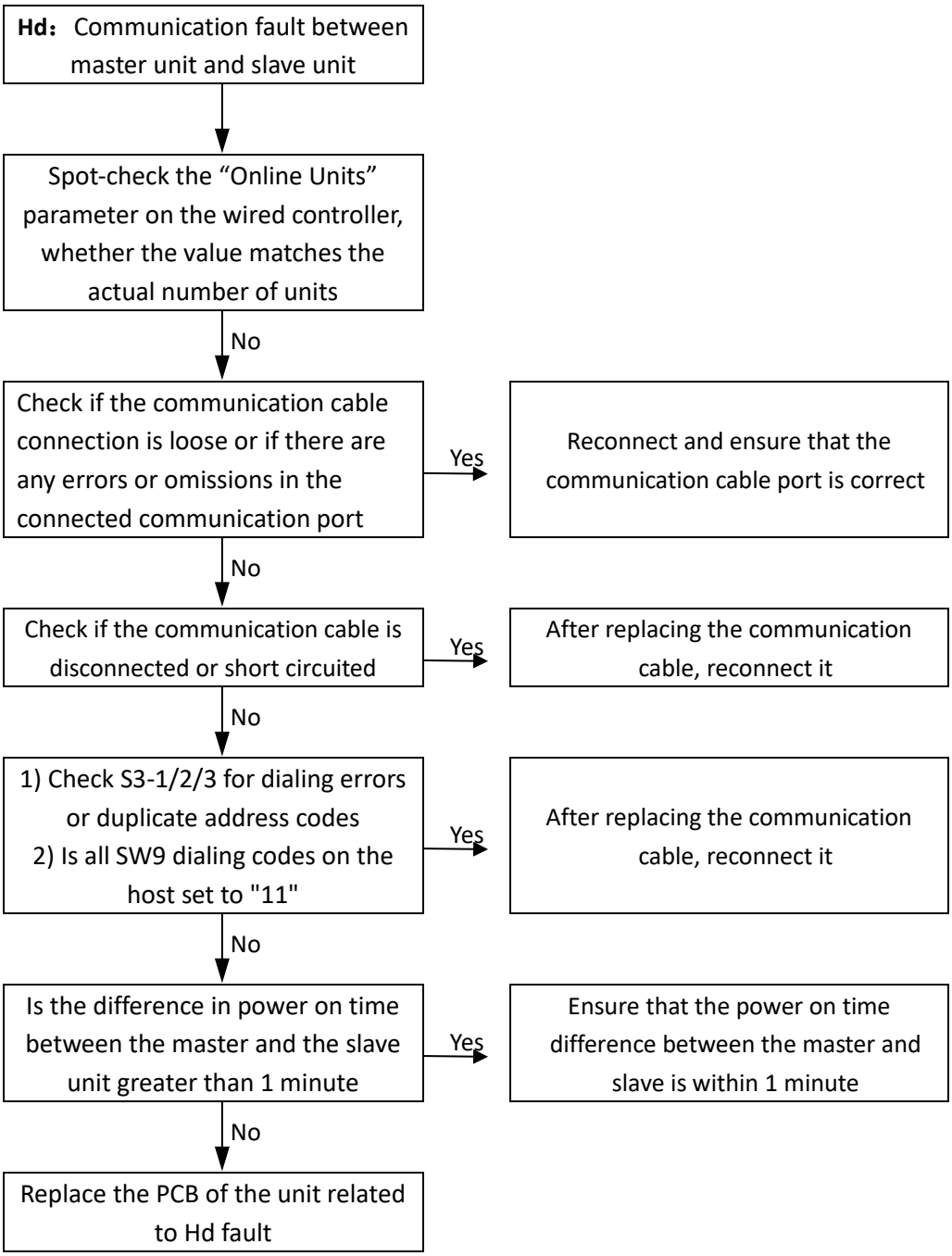
6.7.1 Digital display output



6.7.2 Description

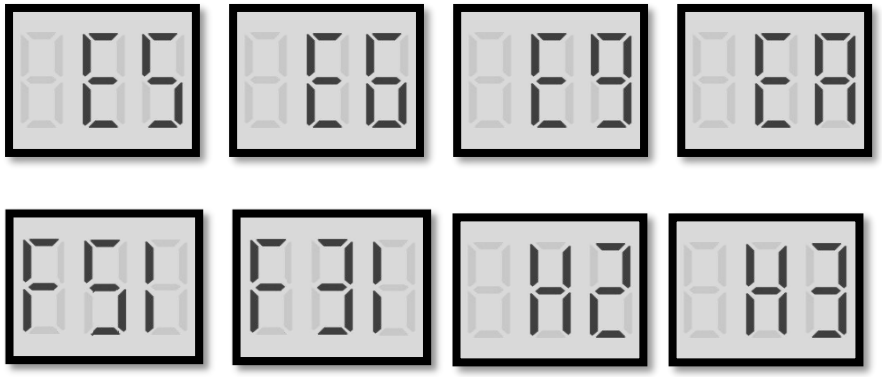
Error code		Hd
Description		Communication fault between master unit and slave unit
Triggering		Communication failure between master unit and slave unit in cascade system and lasts for more than 2 minutes
Relative ports and locations	CN30 E1/H1/H2 (Hydraulic module PCB)	
	S3 (Hydraulic module PCB) Unit address code S3-1/2/3 0/0/0=Address code 0 # (master) 1/0/0=Address Code 1 # (Slave) 0/1/0=Address Code 2 # (Slave) 0/0/1=Address Code 3 # (Slave) 1/1/0=Address Code 4 # (Slave) 1/0/1=Address Code 5 # (Slave) 0/1/1=Address Code 6 # (Slave) 1/1/1=Address Code 7 # (Slave)	

6.7.3 Procedure

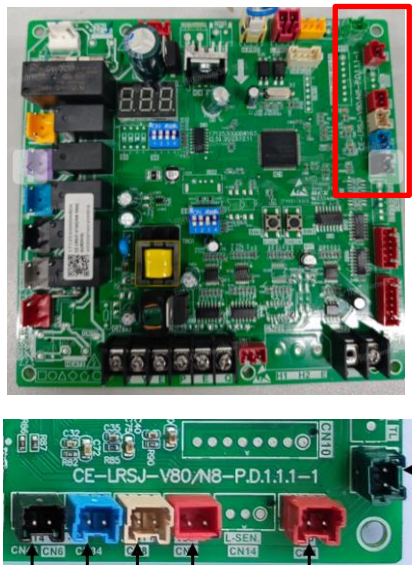
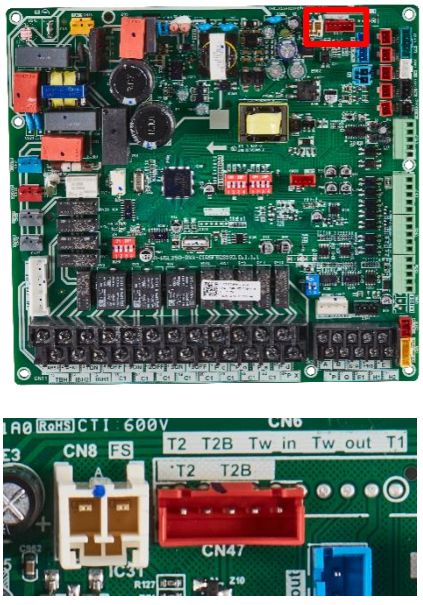


6.8 E5, E6, E9, EA,F51,F31, H2, H3 Troubleshooting

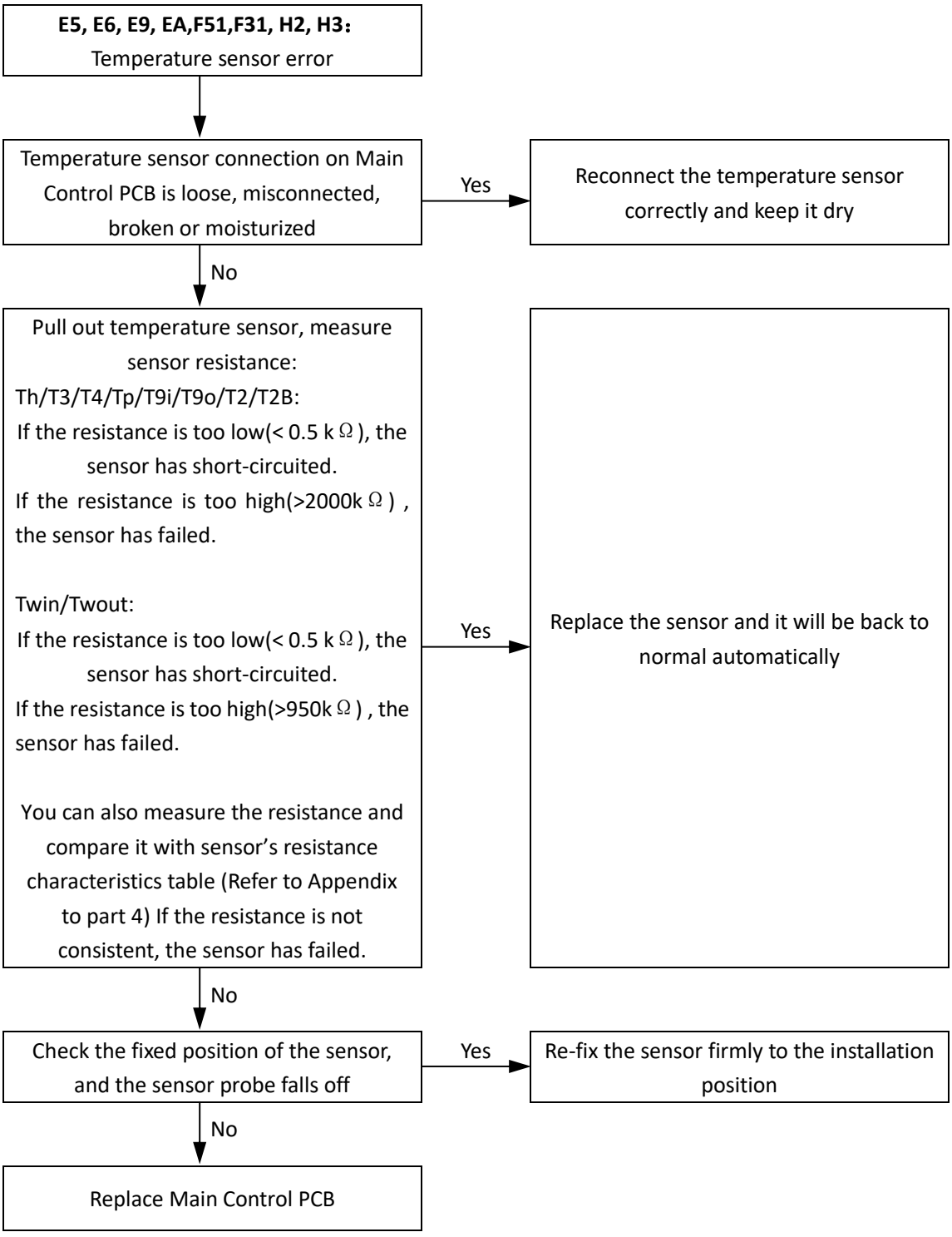
6.8.1 Digital display output



6.8.2 Description

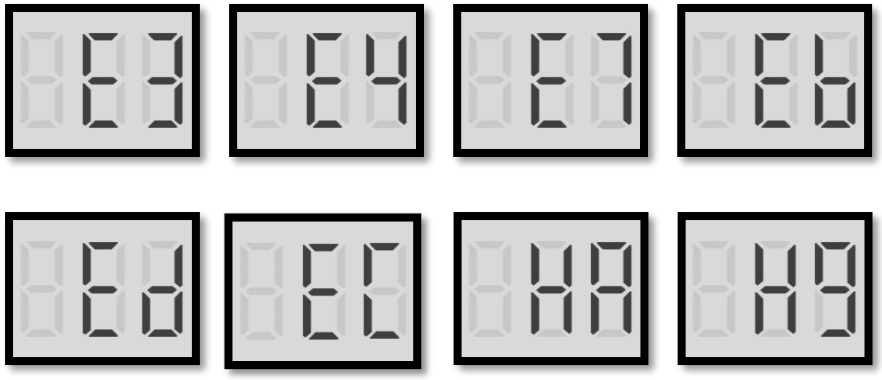
Code	Description	Port	Location
E5	T3 Outdoor unit heat exchanger bottom temperature sensor error	CN34	
E6	T4 Ambient temperature sensor error	CN46	
E9	Th Suction temperature sensor error	CN5	
EA	Tp Discharge temperature sensor error	CN4	
F51	T9i temperature sensor error	CN8	
F31	T9o temperature sensor error	CN9	
H2	T2 Plate heat exchanger liquid side refrigerant temperature sensor error	CN47	
H3	T2B Plate heat exchanger gas side refrigerant temperature sensor error		

6.8.3 Procedure

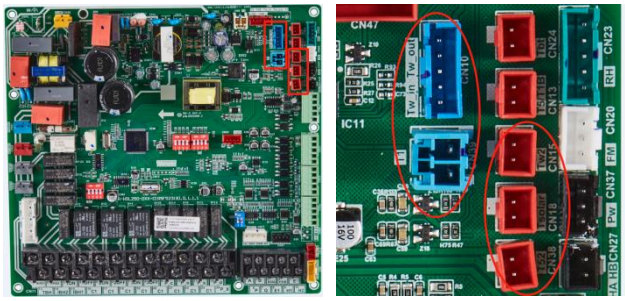


6.9 E3, E4, E7, Eb, Ed, HA, H9 Troubleshooting

6.9.1 Digital display output



6.9.2 Description

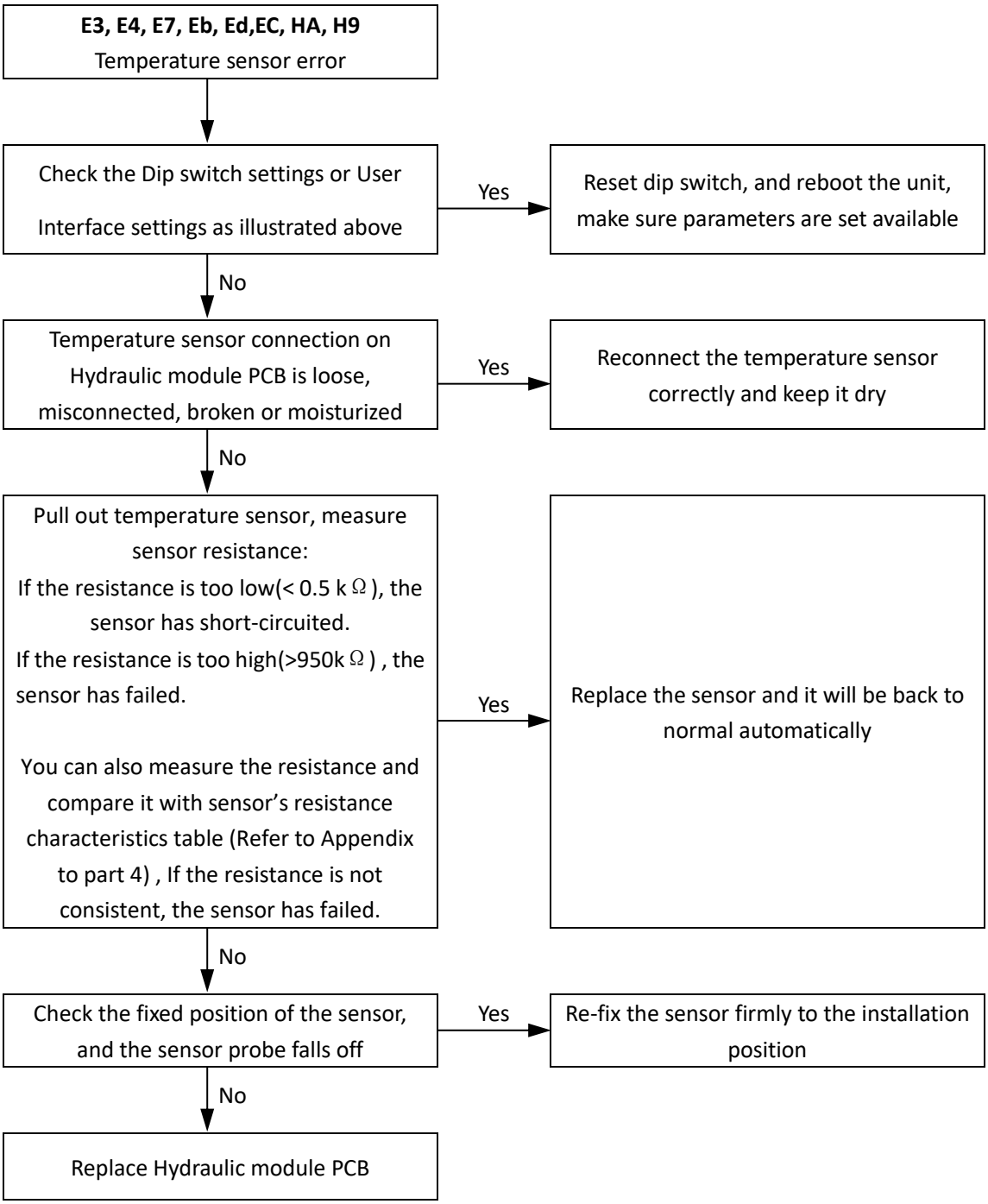
Code	Description	Port	Location (Hydraulic module PCB)
E3	T1 Electric Heater/AHS water outlet temperature sensor error	CN39	
E4	T5 Water tank temperature sensor error	CN13	
E7	Tbt Balance tank temperature sensor/ Final outlet water temperature sensor of cascade system error	CN24	
Eb	Tsolar Solar temperature sensor error	CN18	
Ed	Twin Plate heat exchanger inlet water temperature sensor error	CN10	
HA	Twout Plate heat exchanger outlet water temperature sensor error		
H9	Tw2 Zone 2 water temperature sensor error	CN15	
EC	T52 Water tank temperature sensor 2(reserve) error	CN38	
S1	IBH capacity Dip switch 0/0/1/0=3kW 0/1/1/0=6kW 1/1/1/0=9kW		

Note 1: Dip switch settings or User Interface settings

If error code appears, please make sure the DIP switch setting and parameters setting is right before doing troubleshooting

Code	Description
E3	For integrated electric heater model S1-2: 0=Integrated electric heater S1-3/4 : 0/1=3kW 1/0=6kW 1/1=9kW For external electric heater application S1-2: 1=External electric heater S1-3/4 : 0/0=No integrated electric heater User Interface- For Serviceman - Other heat source – IBH function=1 For AHS application User Interface- For Serviceman - Other heat source - AHS function=1
E4	User Interface- For Serviceman – DHW setting- DHW mode=1
E7	User Interface- For Serviceman- Input definition- Tbt=1
Eb	User Interface- For Serviceman - Other heat source - Solar function=1 & Solar control=1
H9	User Interface- For Serviceman –Temp. type setting – Double zone=1

6.9.3 Procedure



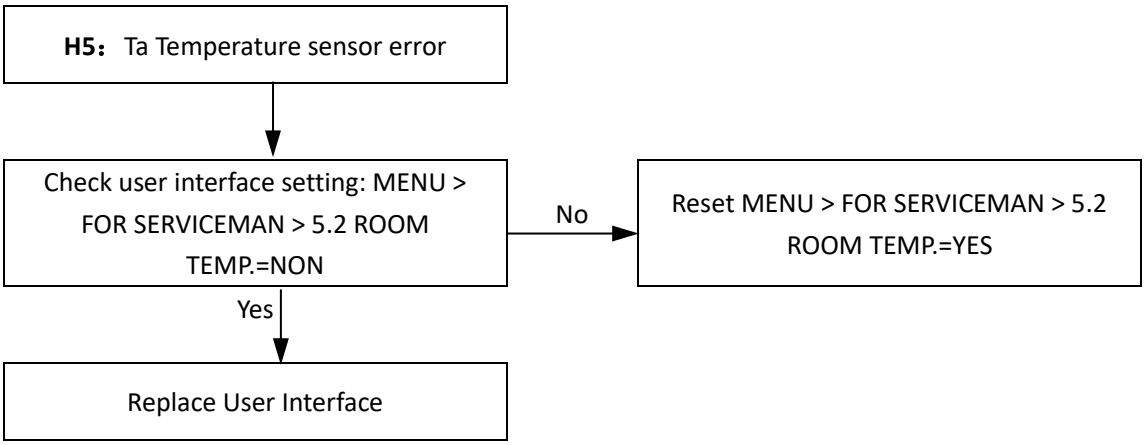
6.10 H5 Troubleshooting

6.10.1 Digital display output

6.10.2 Description

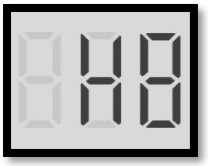
Code	Description	Location
H5	Ta room temperature sensor error	Inserted on User Interface PCB

6.10.3 Procedure

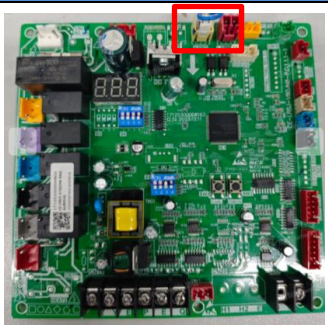
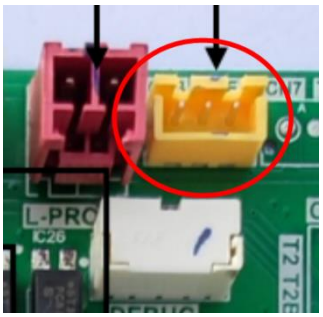


6.11 H8 Troubleshooting

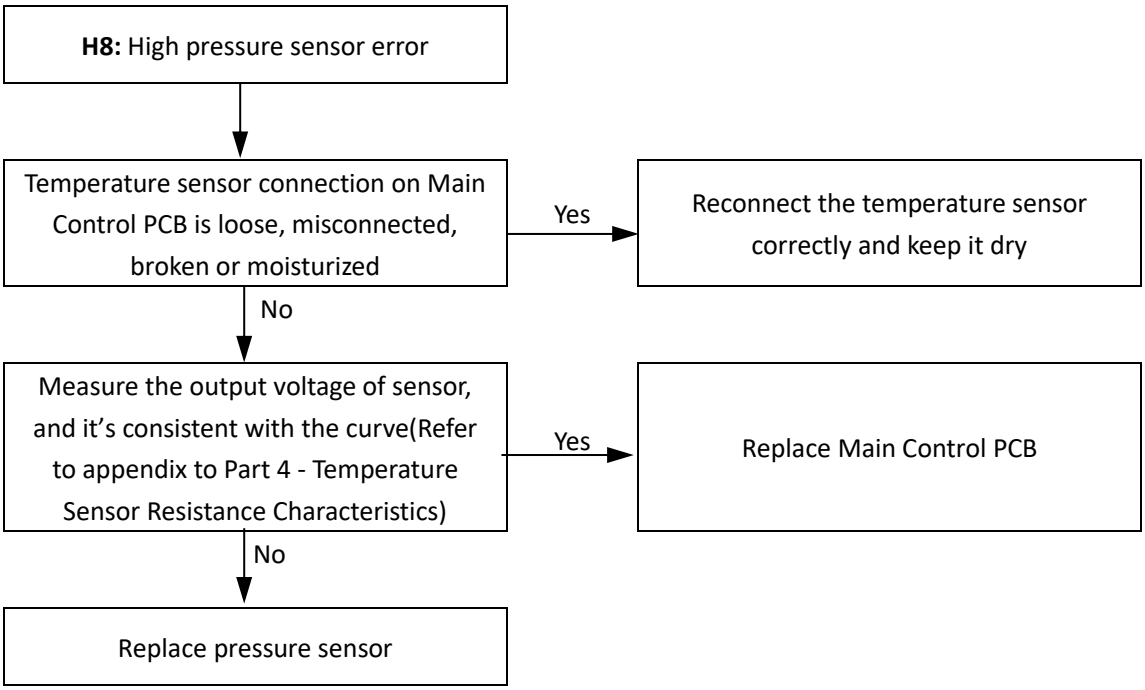
6.11.1 Digital display output



6.11.2 Description

Code	Description	Port	Location(Main Control PCB)
H8	High pressure sensor error	CN3	 

6.11.3 Procedure



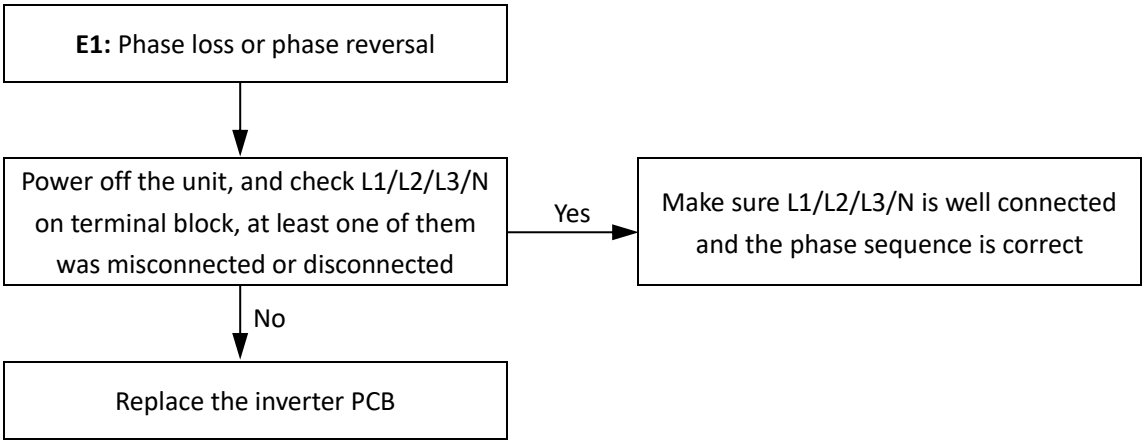
6.12 E1 Troubleshooting

6.12.1 Digital display output

6.12.2 Description

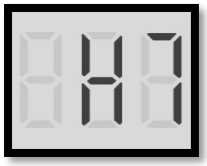
Error code	E1 (For 3Ph models)
Description	Phase loss or phase reversal
Triggering	At least one of L1/L2/L3/N misconnected or disconnected

6.12.3 Procedure



6.13 H7 Troubleshooting

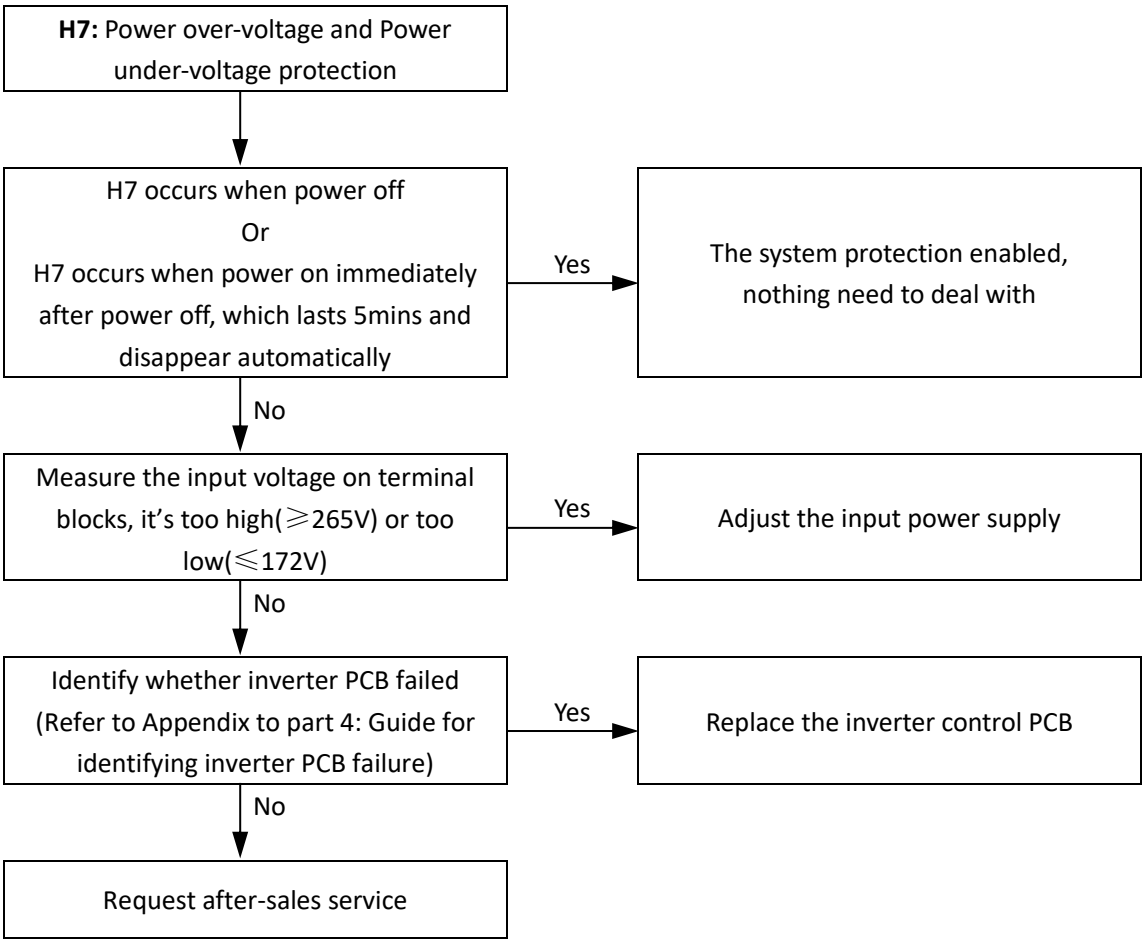
6.13.1 Digital display output



6.13.2 Description

Error code	H7
Description	Power over-voltage and Power under-voltage protection
Triggering	Input voltage<172V or Input voltage≥265V (The unit will back to normal if input voltage≥180V or input voltage ≤250V)

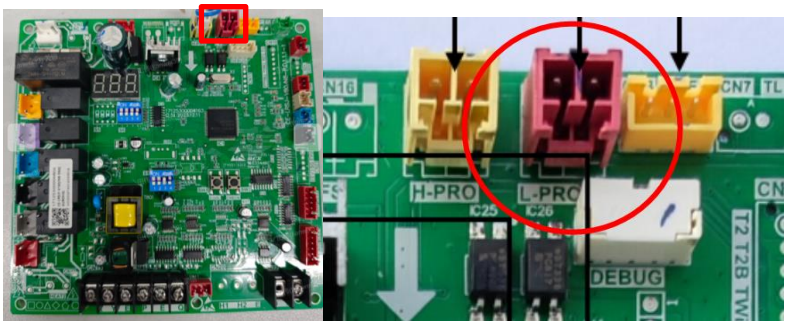
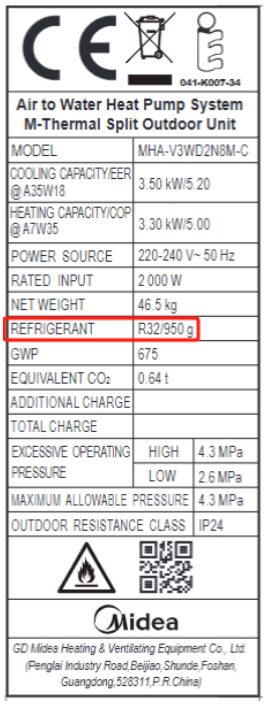
6.13.3 Procedure



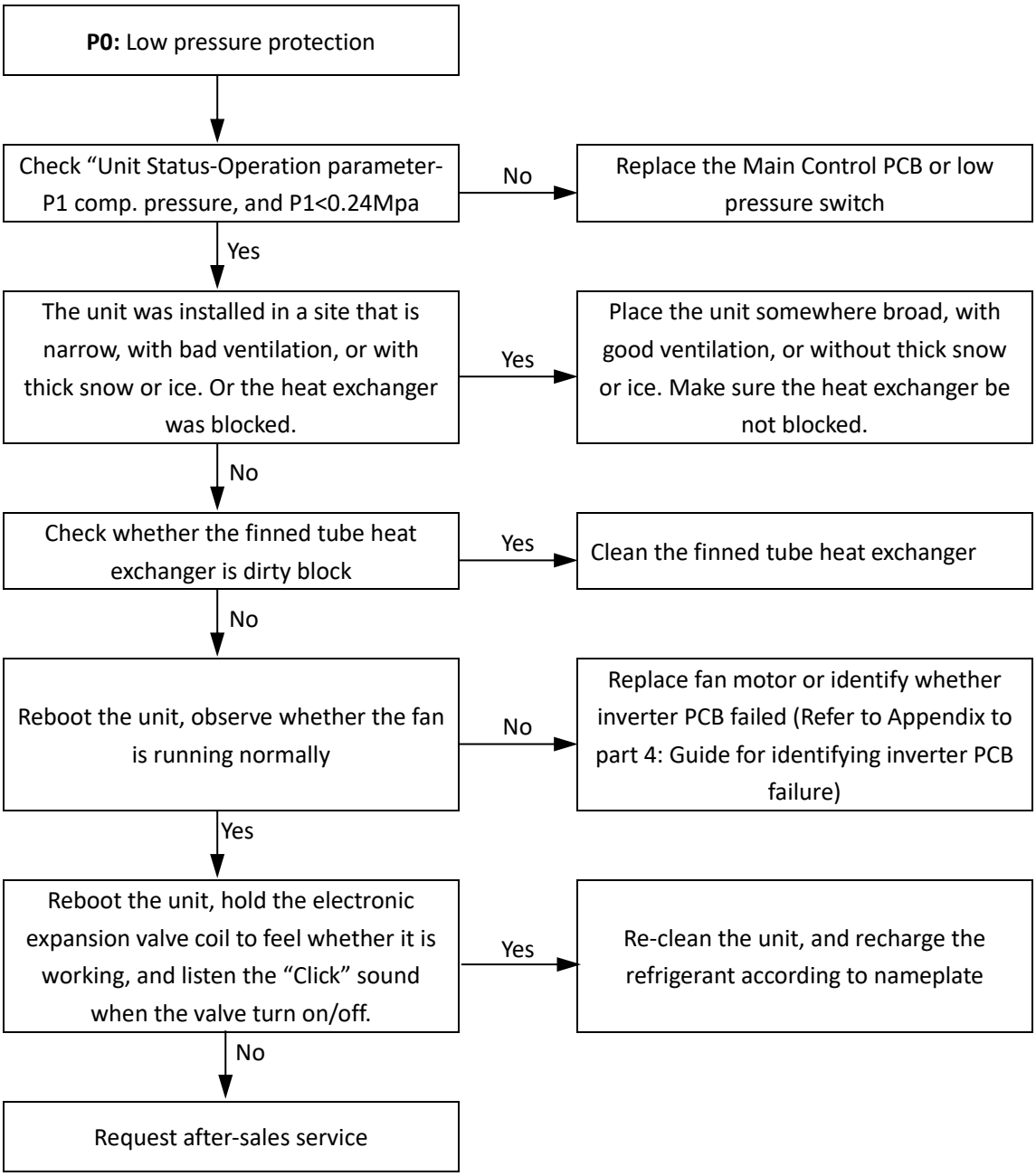
6.14 P0 Troubleshooting

6.14.1 Digital display output

6.14.2 Description

Error code	P0
Description	Low pressure switch protection
Triggering	The Main Control PCB detected that the low pressure switch signal off(pressure < 0.14Mpa)
Low pressure switch CN17	
Nameplate	Refer to Nameplate for rated refrigerant charge volume. The picture is for reference only. The actual product may vary. 

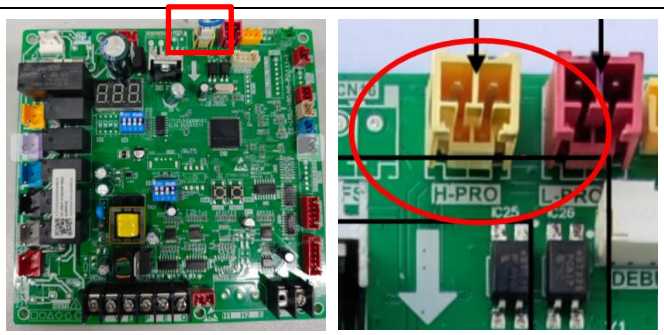
6.14.3 Procedure

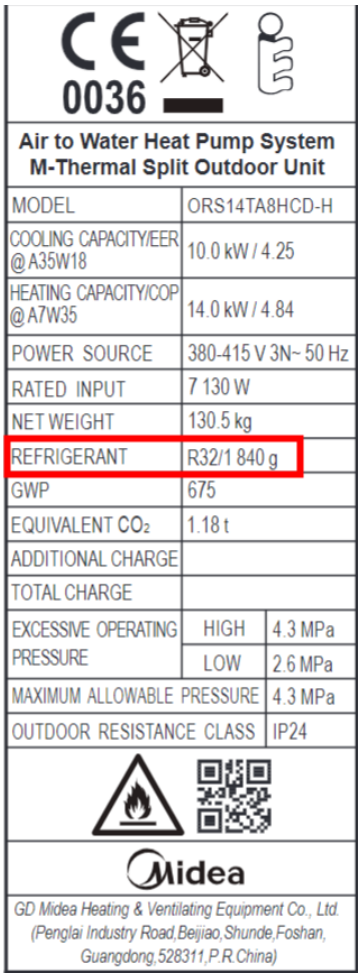


6.15 P1 Troubleshooting

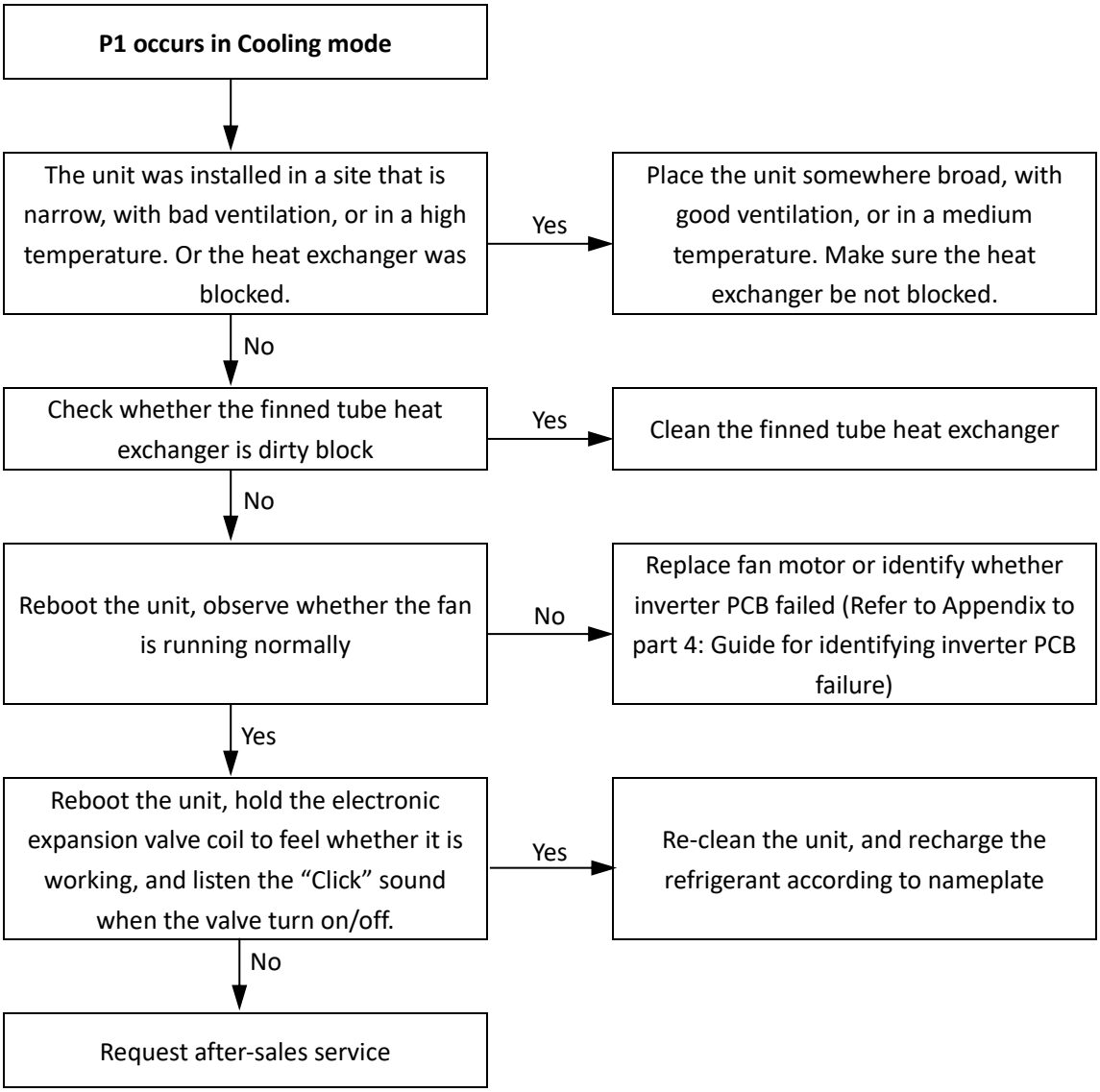
6.15.1 Digital display output

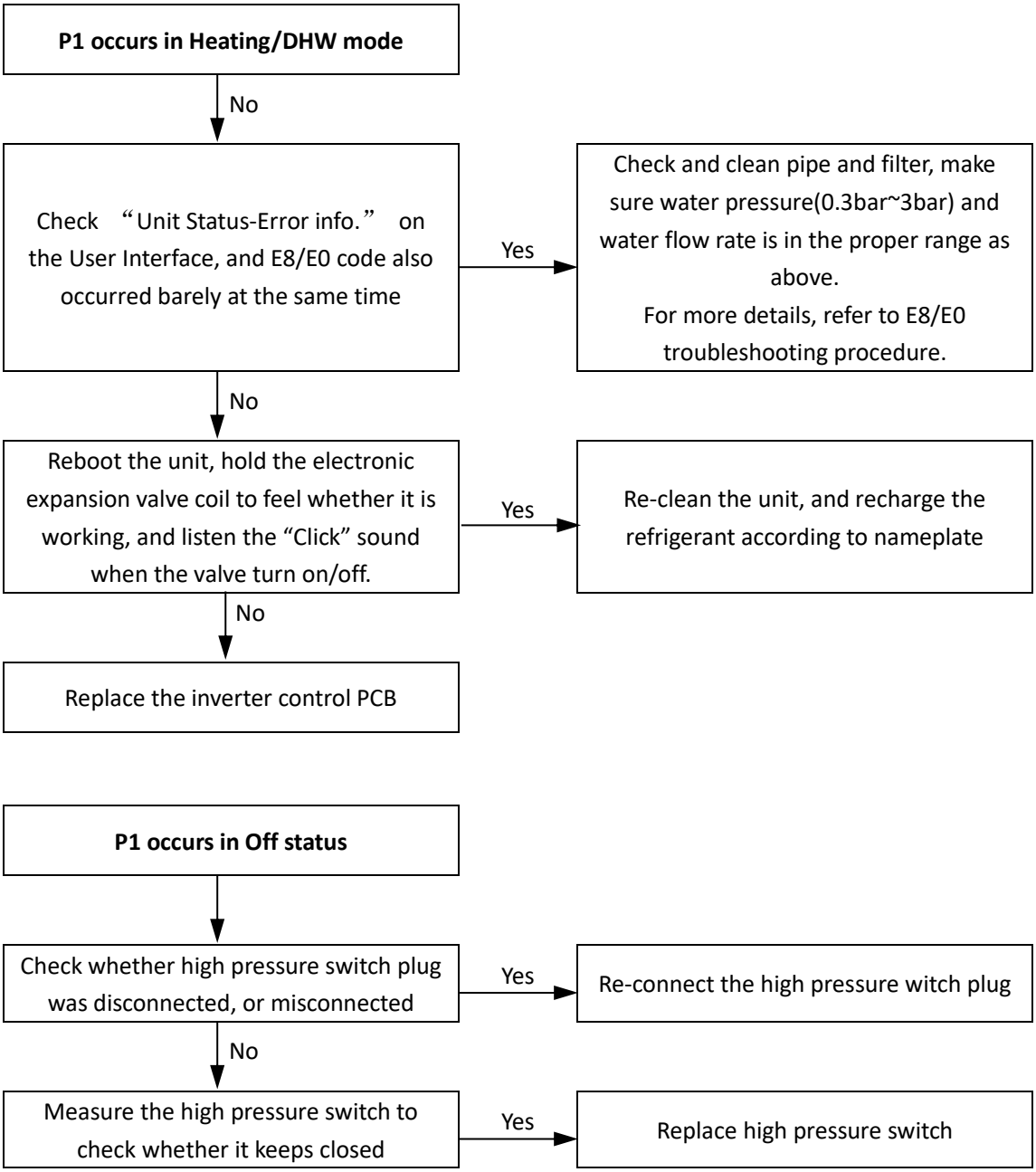
6.15.2 Description

Error code		P1
Description		High pressure switch protection
Triggering		The Main Control PCB detected that the high pressure was ≥ 3.5 Mpa
Relative ports and locations	CN18 12~16kW modes	
	CN12 12~16kW 1N models	
	CN12 12~16kW 3N models	

Nameplate	Refer to Nameplate for rated refrigerant charge volume. The picture is for reference only. The actual product may vary. 
Water flow	Hydraulic module 160 model: 0.5~3.0m³/h

6.15.3 Procedure



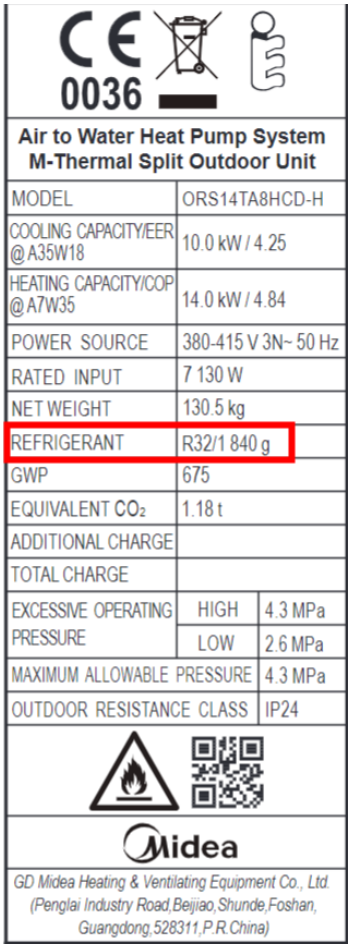


6.16 P3 Troubleshooting

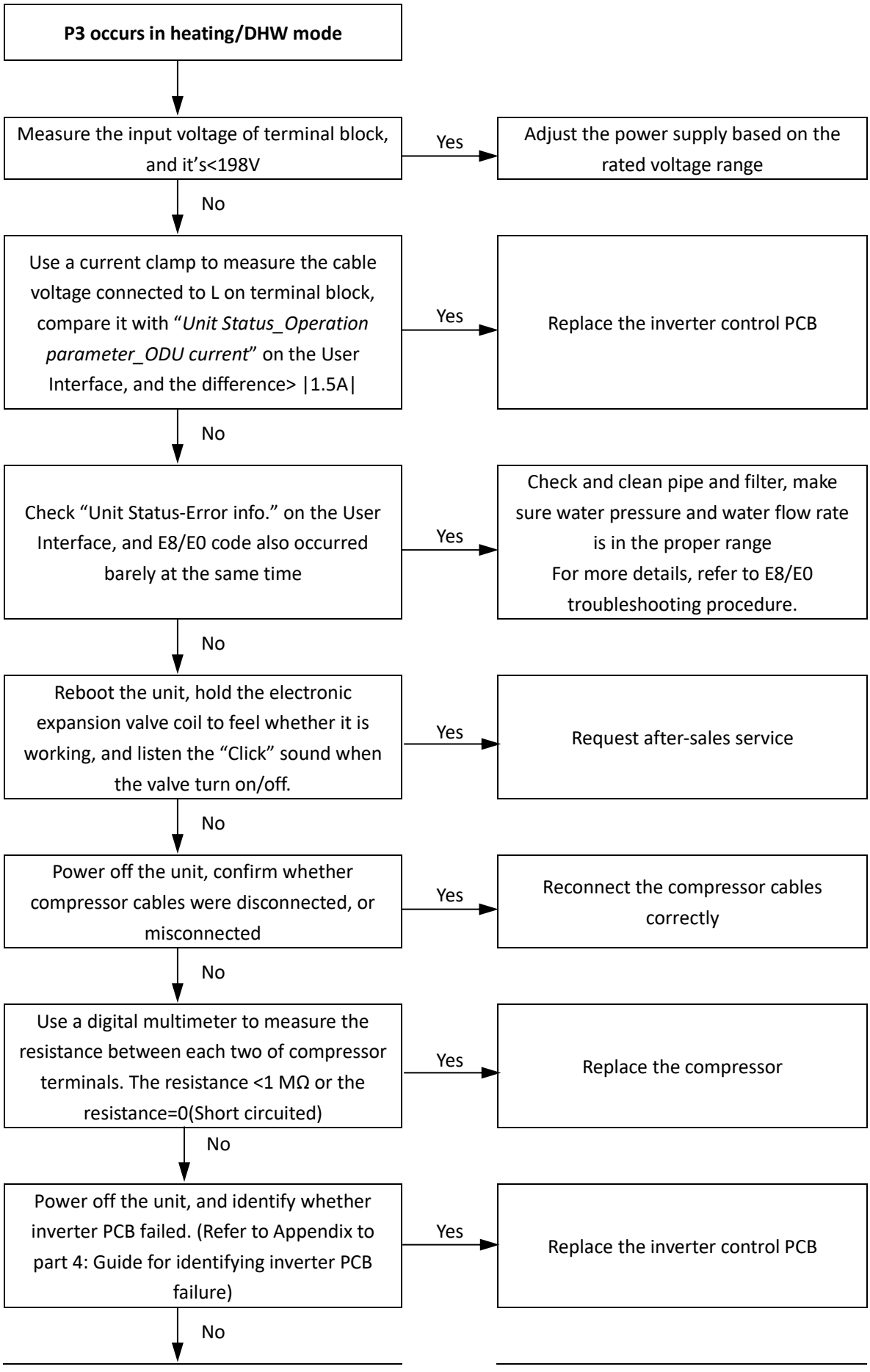
6.16.1 Digital display output

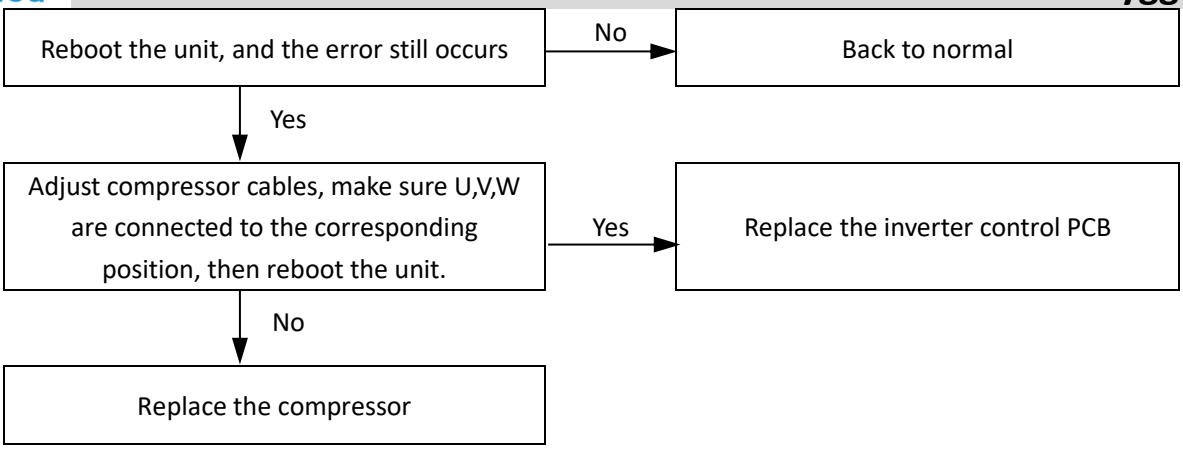
6.16.2 Description

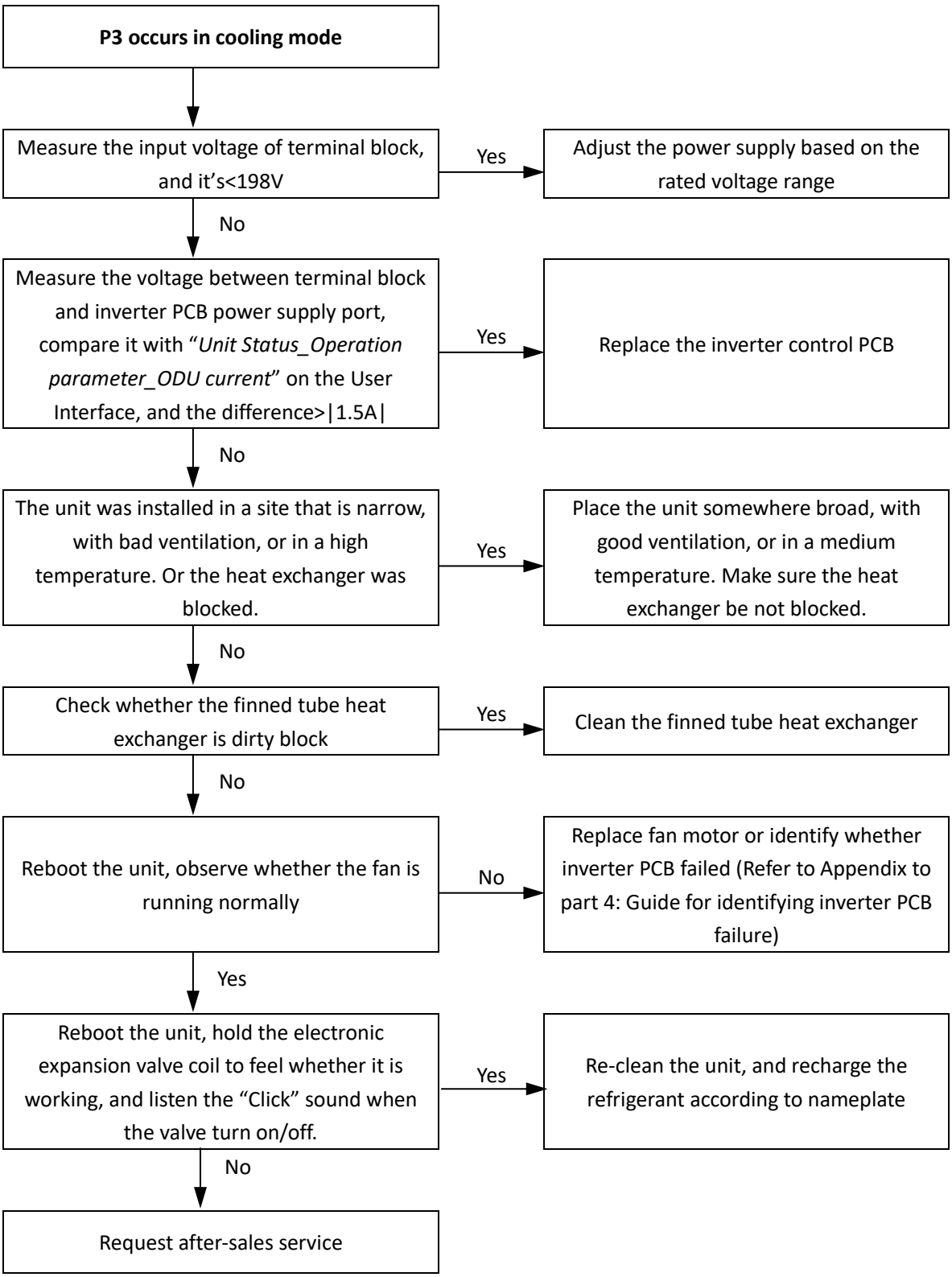
Error code	P3
Description	Over-current protection
Triggering	The Main Control PCB detected that the input current is higher than protection value Protection value A0 12~16kW 1N: 33A 12~16kW 3N: 14A
Nameplate	Refer to Nameplate for rated refrigerant charge volume. The picture is for reference only. The actual product may vary.



6.16.3 Procedure

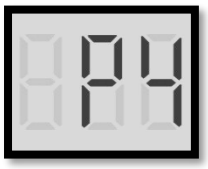




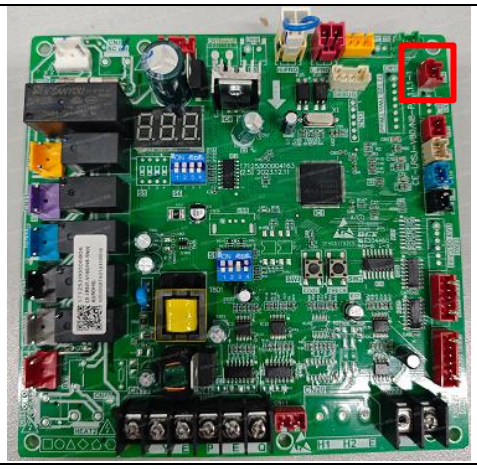


6.17 P4 Troubleshooting

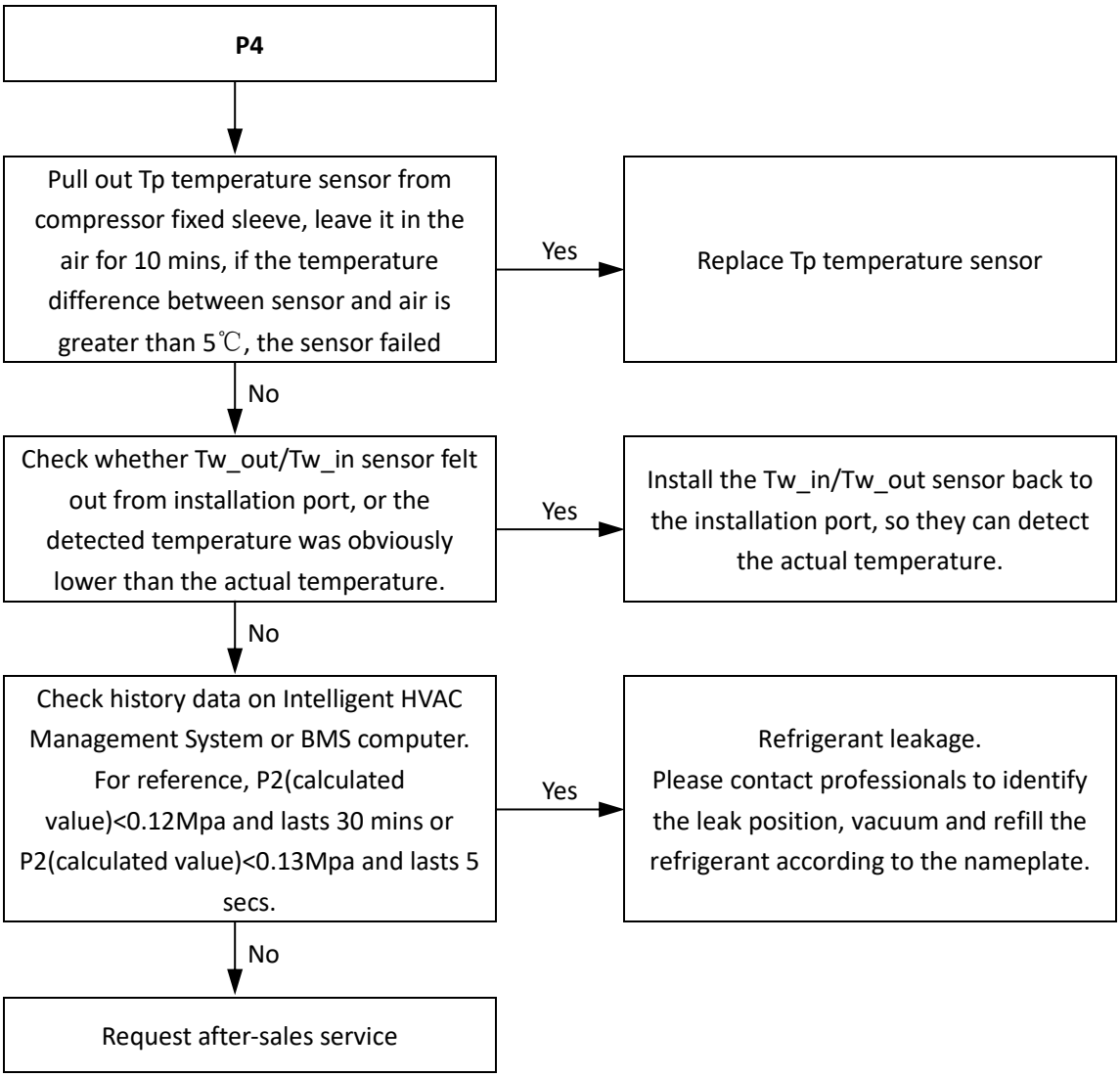
6.17.1 Digital display output



6.17.2 Description

Error code		P4
Description		The protection for over-high discharge temperature of compressor
Triggering		The Main Control PCB detected that the compressor discharge temperature was ≥115℃
Relative ports and locations	Tp discharge temp. sensor	 

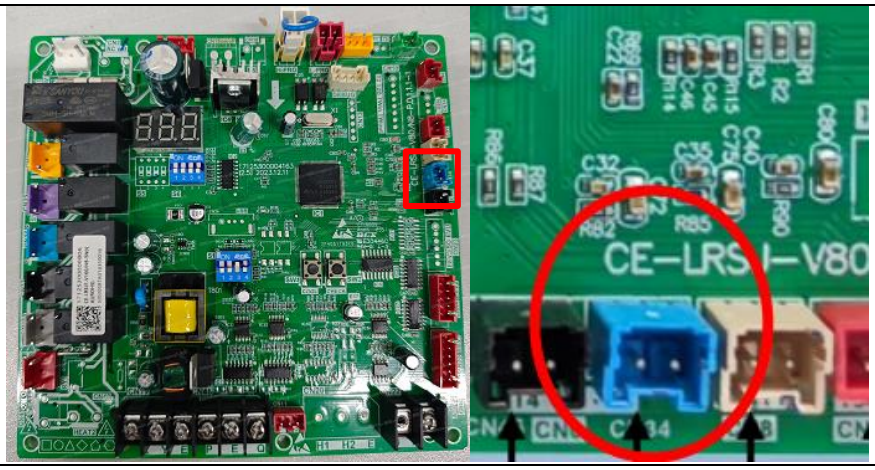
6.17.3 Procedure

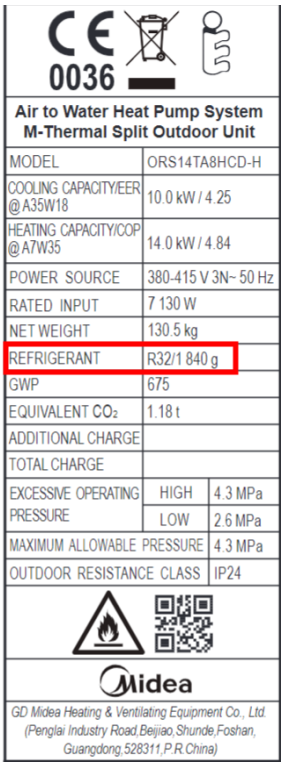


6.18 Pd Troubleshooting

6.18.1 Digital display output

6.18.2 Description

Error code	Pd
Description	The protection for over-high condensing temperature
Triggering	The Main Control PCB detected that the condensing temperature was ≥65℃
Relative ports and locations	
Nameplate	Refer to Nameplate for rated refrigerant charge volume. The picture is for reference only. The actual product may vary.

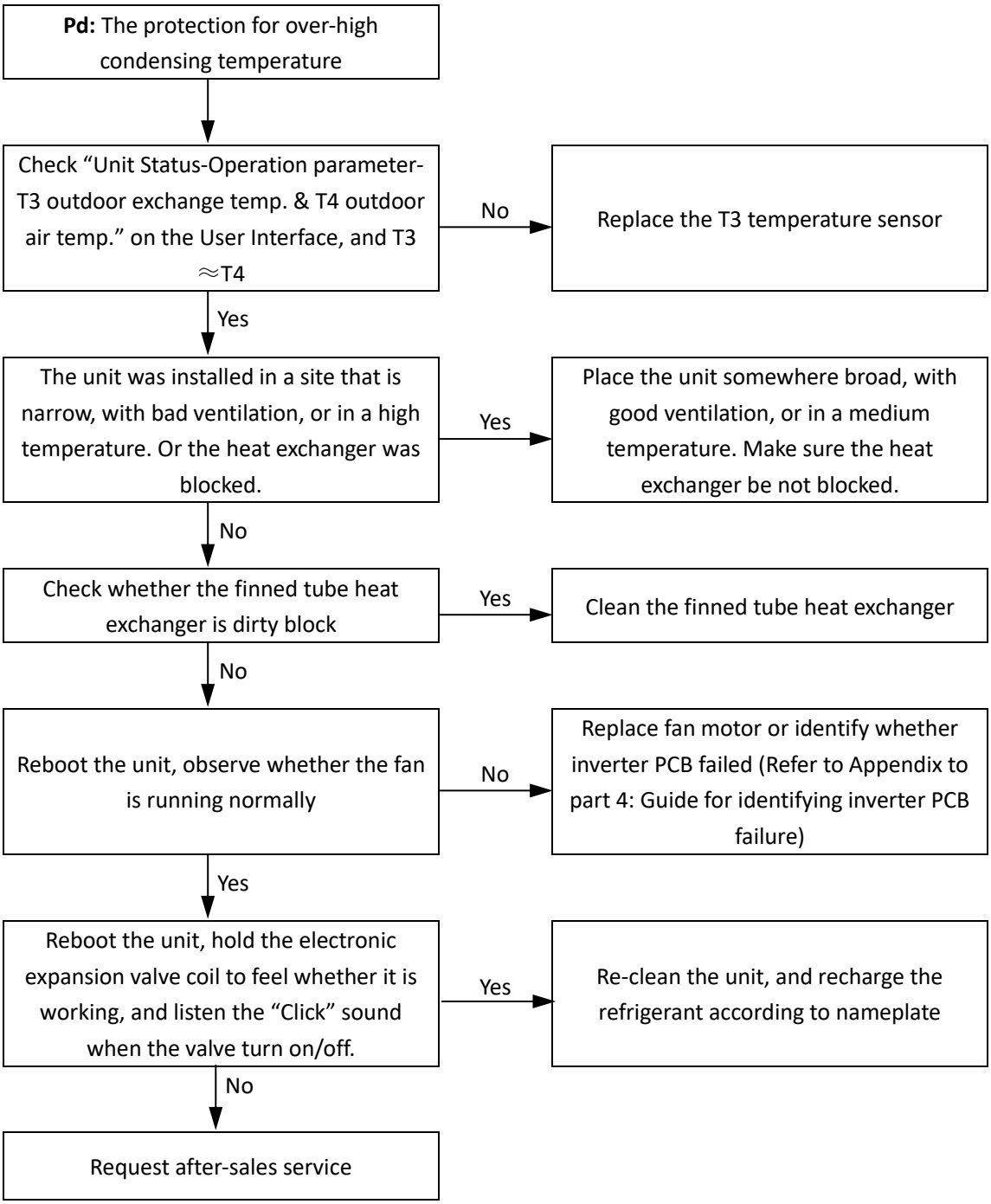


Air to Water Heat Pump System M-Thermal Split Outdoor Unit		
MODEL	ORS14TA8HCD-H	
COOLING CAPACITY/EER @A35W18	10.0 kW / 4.25	
HEATING CAPACITY/COP @A7W35	14.0 kW / 4.84	
POWER SOURCE	380-415 V 3N~ 50 Hz	
RATED INPUT	7 130 W	
NET WEIGHT	130.5 kg	
REFRIGERANT	R32/1 840 g	
GWP	675	
EQUIVALENT CO_2	1.18 t	
ADDITIONAL CHARGE		
TOTAL CHARGE		
EXCESSIVE OPERATING PRESSURE	HIGH	4.3 MPa
	LOW	2.6 MPa
MAXIMUM ALLOWABLE PRESSURE	4.3 MPa	
OUTDOOR RESISTANCE CLASS	IP24	

Midea

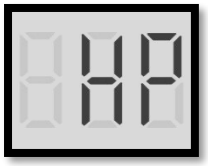
GD Midea Heating & Ventilating Equipment Co., Ltd. (Penglai Industry Road,Beijiao,Shunde,Foshan, Guangdong,528311,P.R.China)

6.18.3 Procedure



6.19 HP Troubleshooting

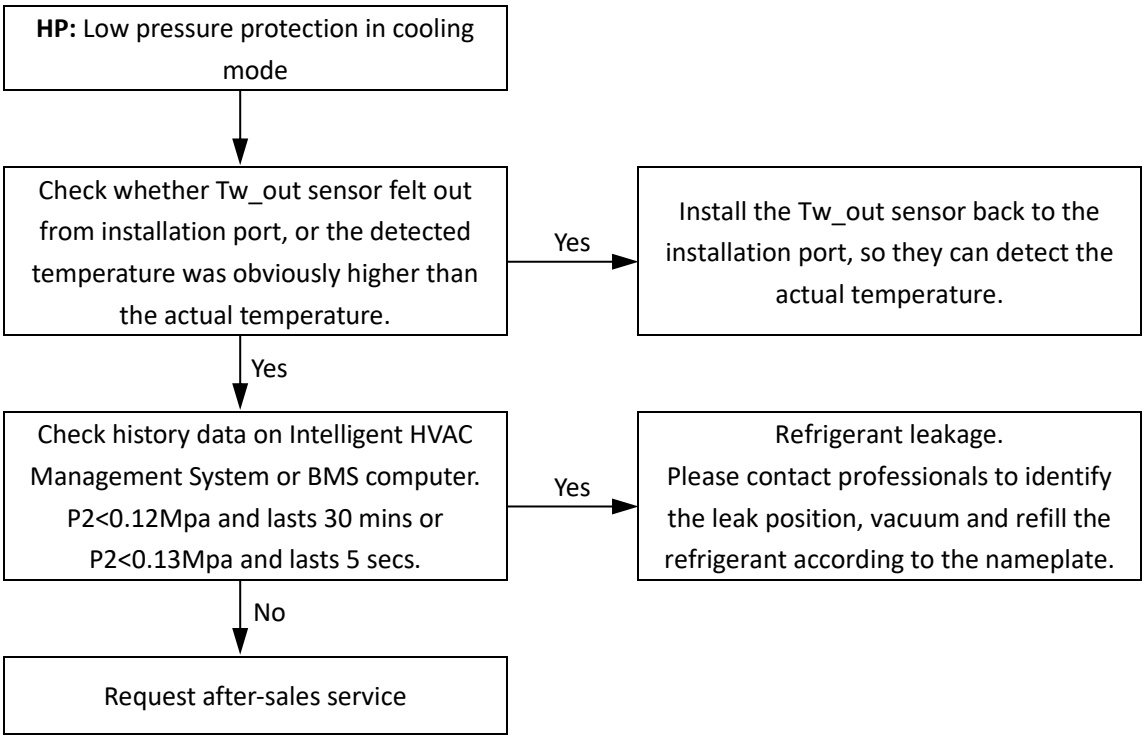
6.19.1 Digital display output



6.19.2 Description

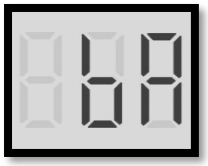
Error code	HP
Description	Low pressure protection in cooling mode
Triggering	The Main Control PCB detected that the suction pressure P1<0.6Mpa for 5 seconds in cooling mode

6.19.3 Procedure



6.20 bA Troubleshooting

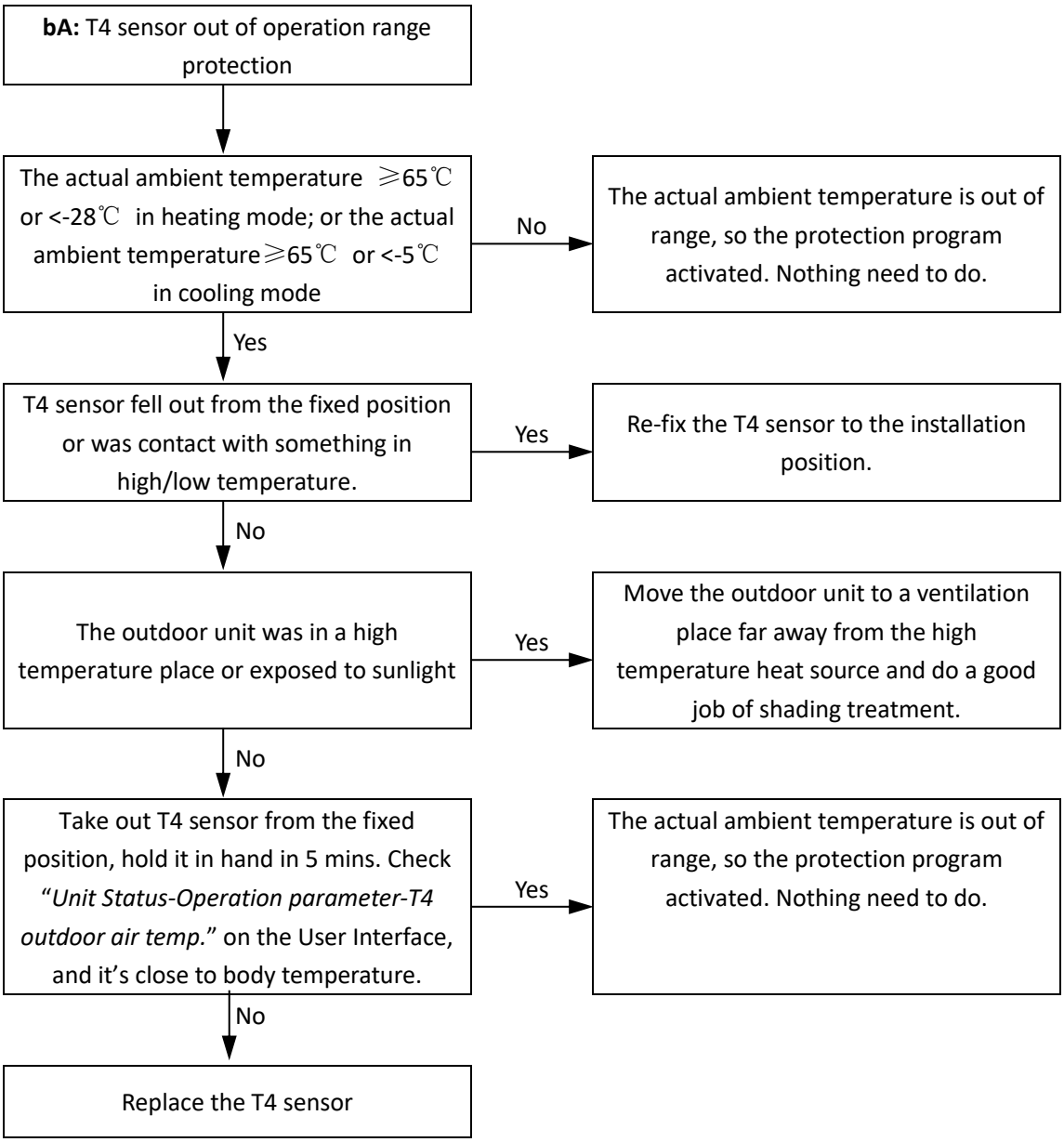
6.20.1 Digital display output



6.20.2 Description

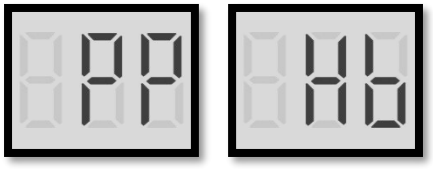
Error code	bA
Description	T4 sensor out of operation range protection
Triggering	In heating/ DHW mode, the error occurs when T4≥65℃ or T4<-28℃ In cooling mode, the error occurs when T4≥65℃ or T4<-5℃

6.20.3 Procedure

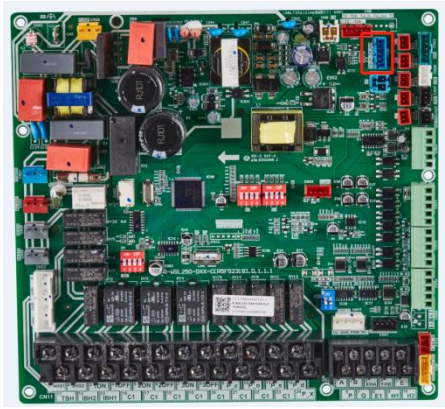
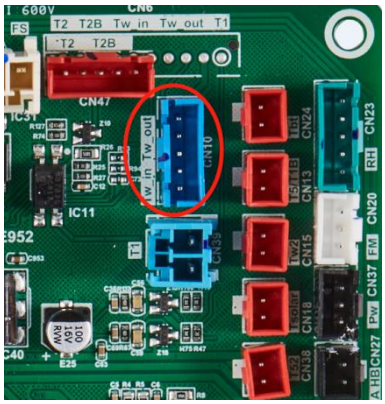
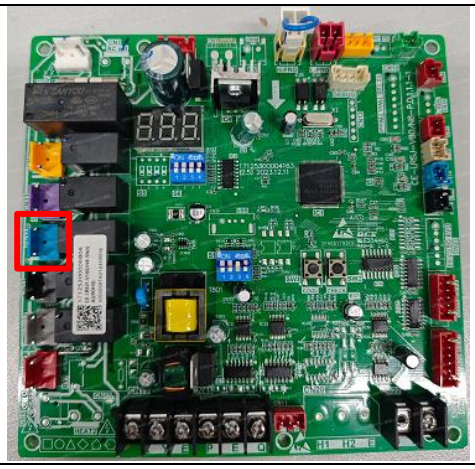
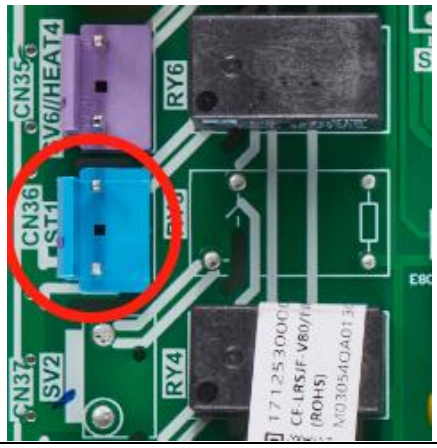


6.21 PP, Hb Troubleshooting

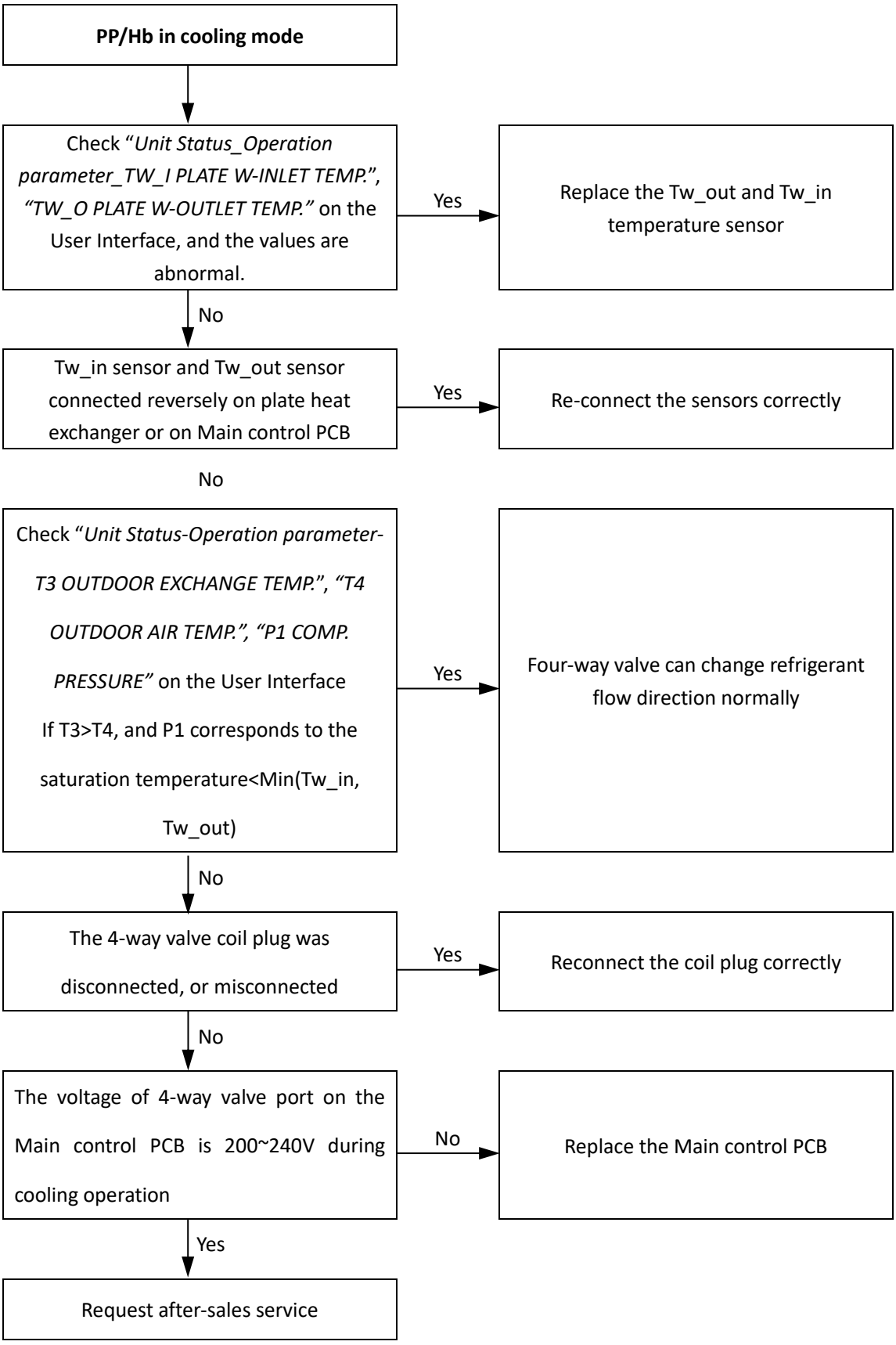
6.21.1 Digital display output

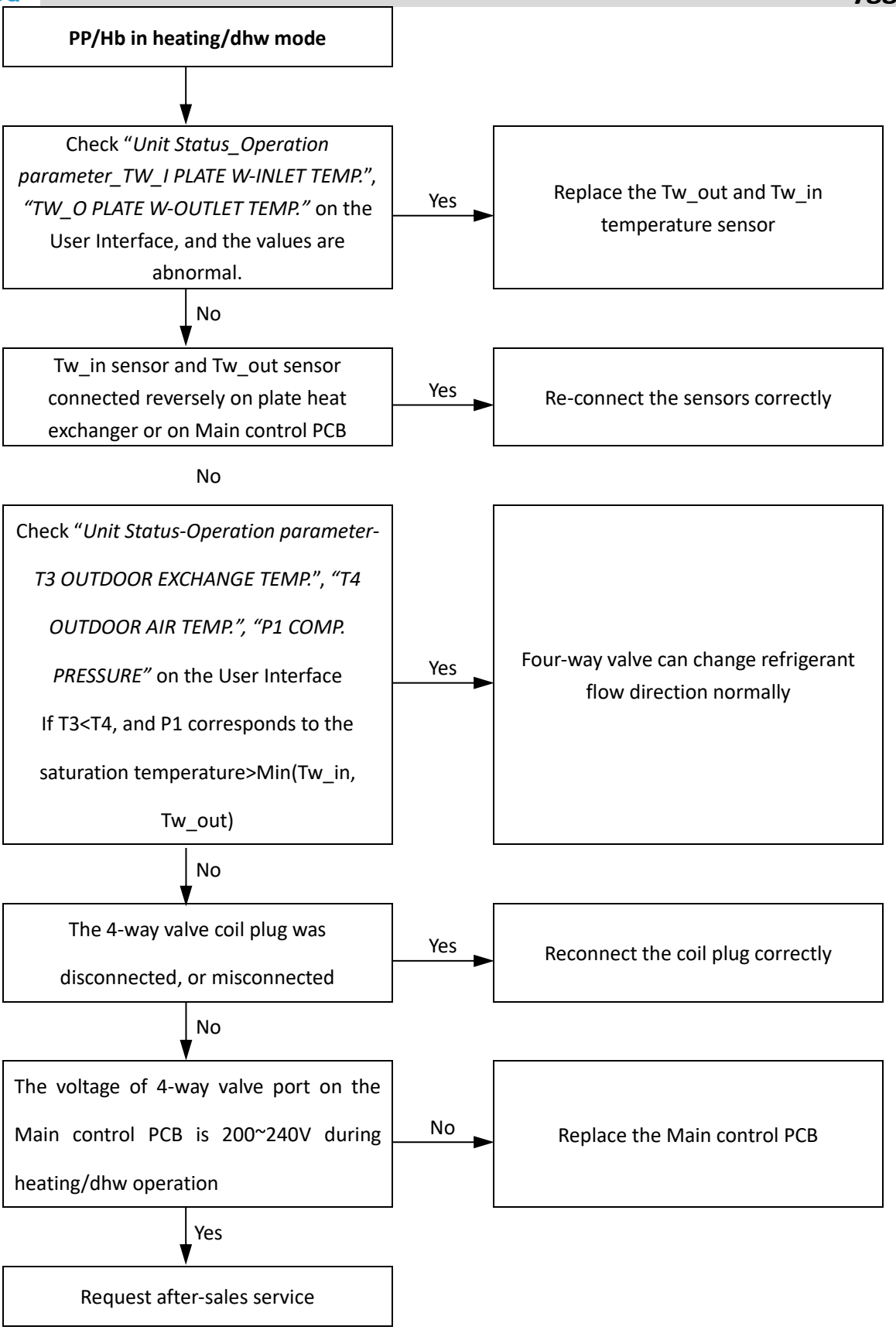


6.21.2 Description

Error code	PP	Hb
Description	The protection for abnormal temperature difference between outlet water and inlet water	3 times of PP and Twout<7℃
Triggering	Twout-Twin≥3℃ and lasts 15 mins in cooling mode Twin-Twout≥3℃ and lasts 15 mins in heating/DHW mode	
CN10 Tw_in, Tw_out Port for inlet water temperature sensor and outlet water temperature sensor on hydraulic module PCB	 	
CN36 ST1 Port for 4-way valve on Main Control PCB	 	

6.21.3 Procedure





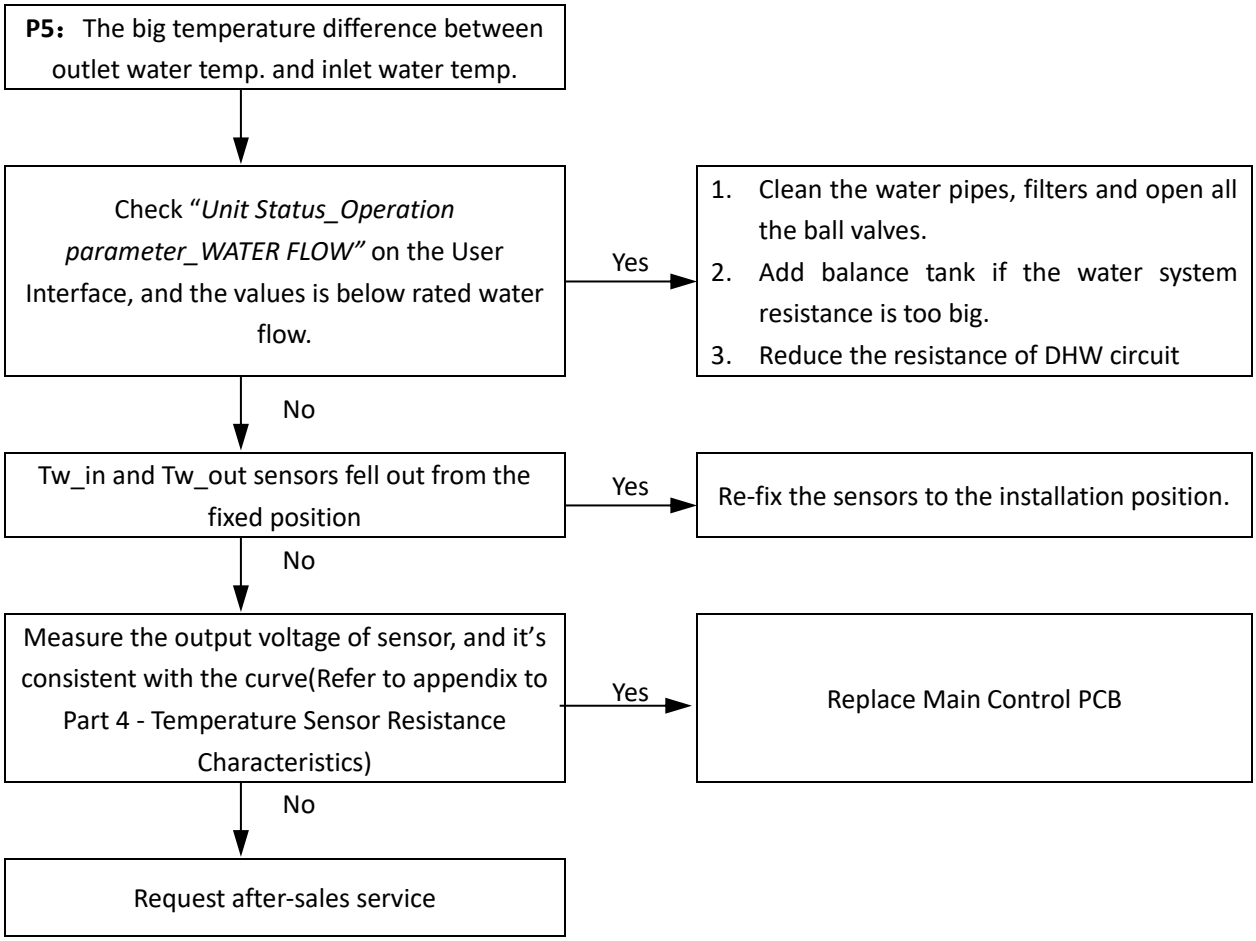
6.22 P5 Troubleshooting

6.22.1 Digital display output

6.22.2 Description

Error code	P5
Description	The big temperature difference between outlet water temp. and inlet water temp.
Triggering	Twout-Twin≥30℃ in heating/DHW mode Twout-Twin≥17℃ in cooling mode

6.22.3 Procedure



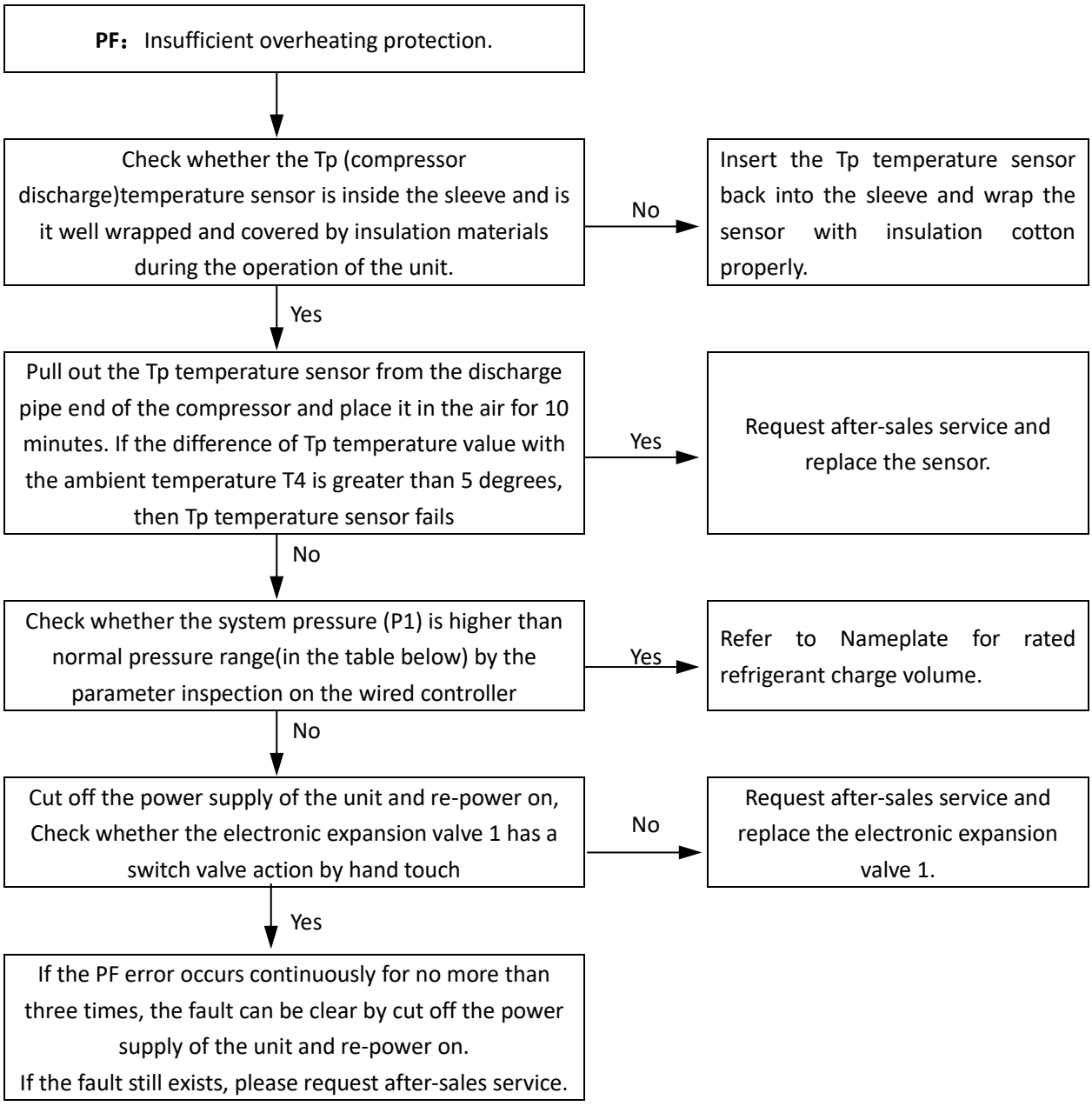
6.23 PF Troubleshooting

6.23.1 Digital display output

6.23.2 Description

Error code	PF
Description	Insufficient overheating protection.
Triggering	DSH ＜ 5 in heating/DHW/cooling mode

6.23.3 Procedure



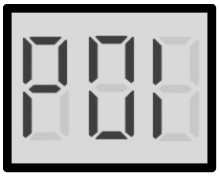
The following parameter ranges are used to roughly determine whether the system is running properly:

Discharge pressure(P1) for heating/DHW mode									
Tw_out(℃)	25	30	35	40	45	50	55	60	65
P1（kPa）	1700±150	2000±150	2300±150	2500±150	2800±150	3200±150	3600±150	3900±150	4200±150
Note: P1 is absolute pressure.									

Suction pressure(P1) for cooling mode							
Tw_out(℃)	5～7	8～10	11～13	14～16	17～19	20～22	23～25
P1（kPa）	900±100	980±100	1080±100	1180±100	1280±100	1400±100	1570±100
Note: P1 is absolute pressure.							

6.24 P01 Troubleshooting

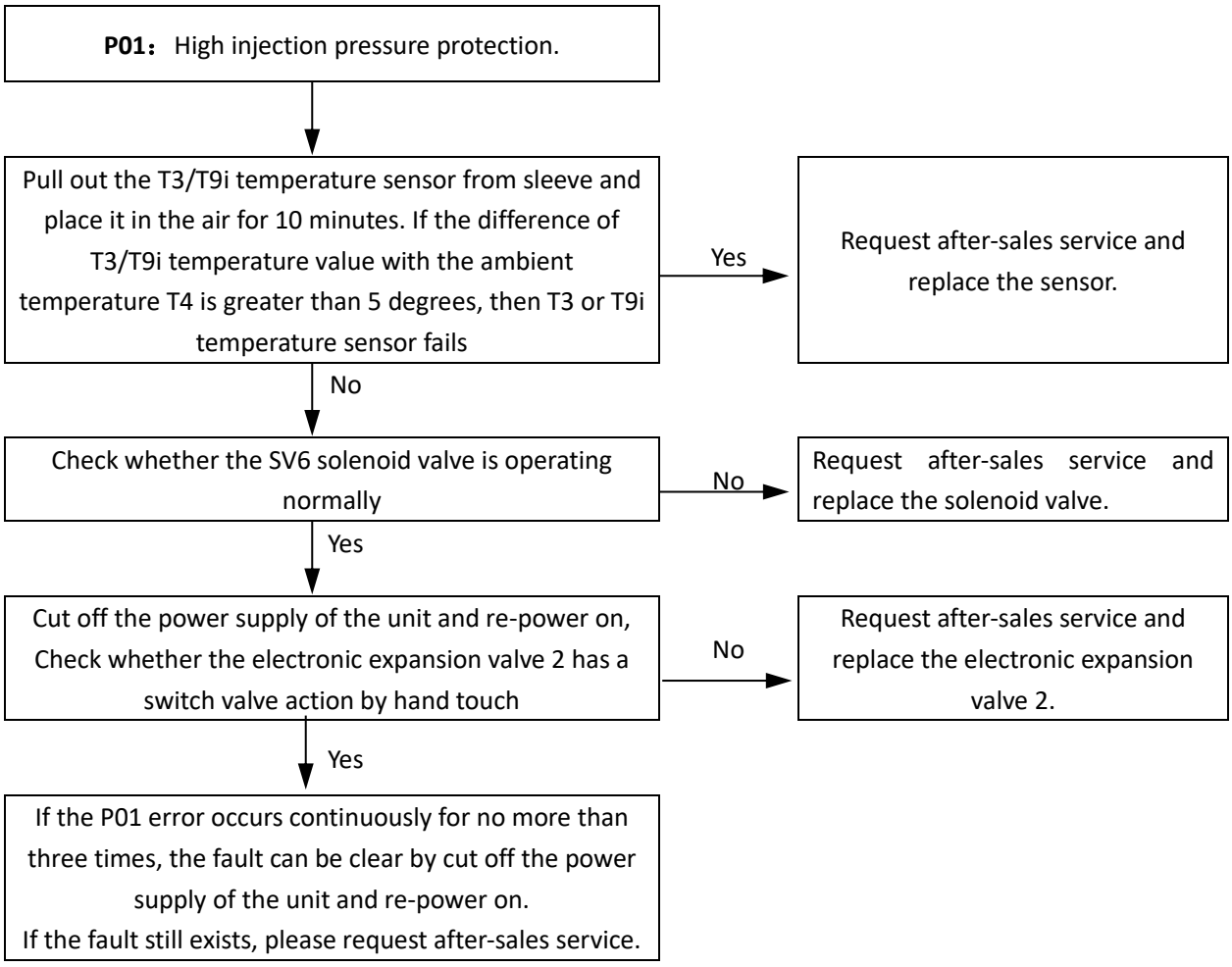
6.24.1 Digital display output



6.24.2 Description

Error code	P01
Description	High injection pressure protection.
Triggering	In heating/DHW mode, When SV6=ON, T3 ≥ -9 ℃, T9i ≥ 49 ℃; Or T3 < -9 ℃, T9i ≥ 33 ℃

6.24.3 Procedure



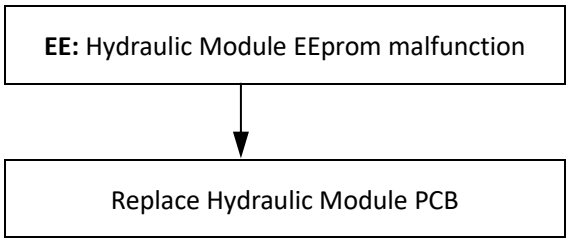
6.25 EE Troubleshooting

6.25.1 Digital display output

6.25.2 Description

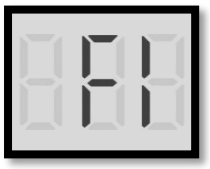
Error code	EE
Description	Hydraulic Module EEprom malfunction

6.25.3 Procedure



6.26 F1 Troubleshooting

6.26.1 Digital display output

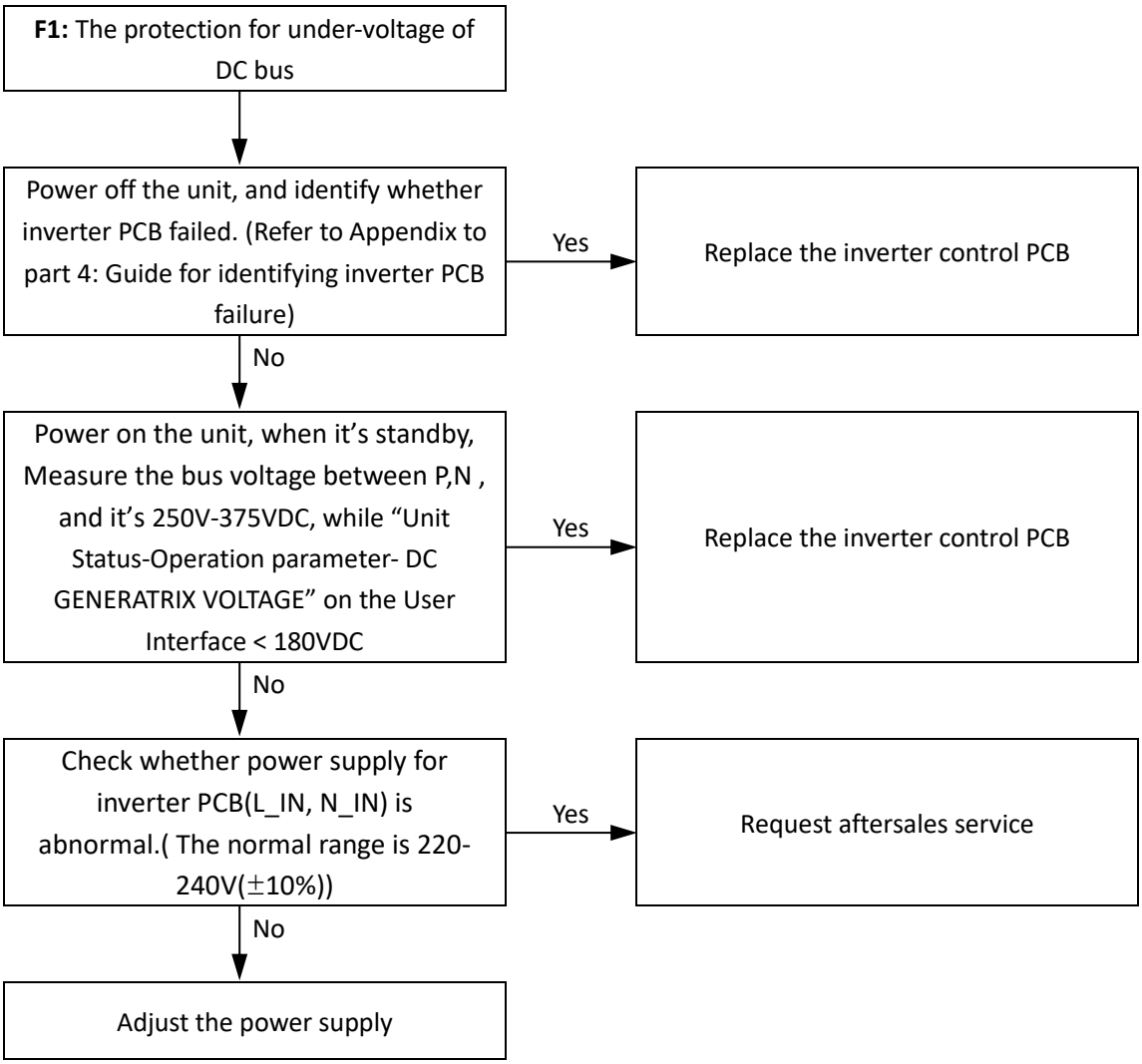


6.26.2 Description

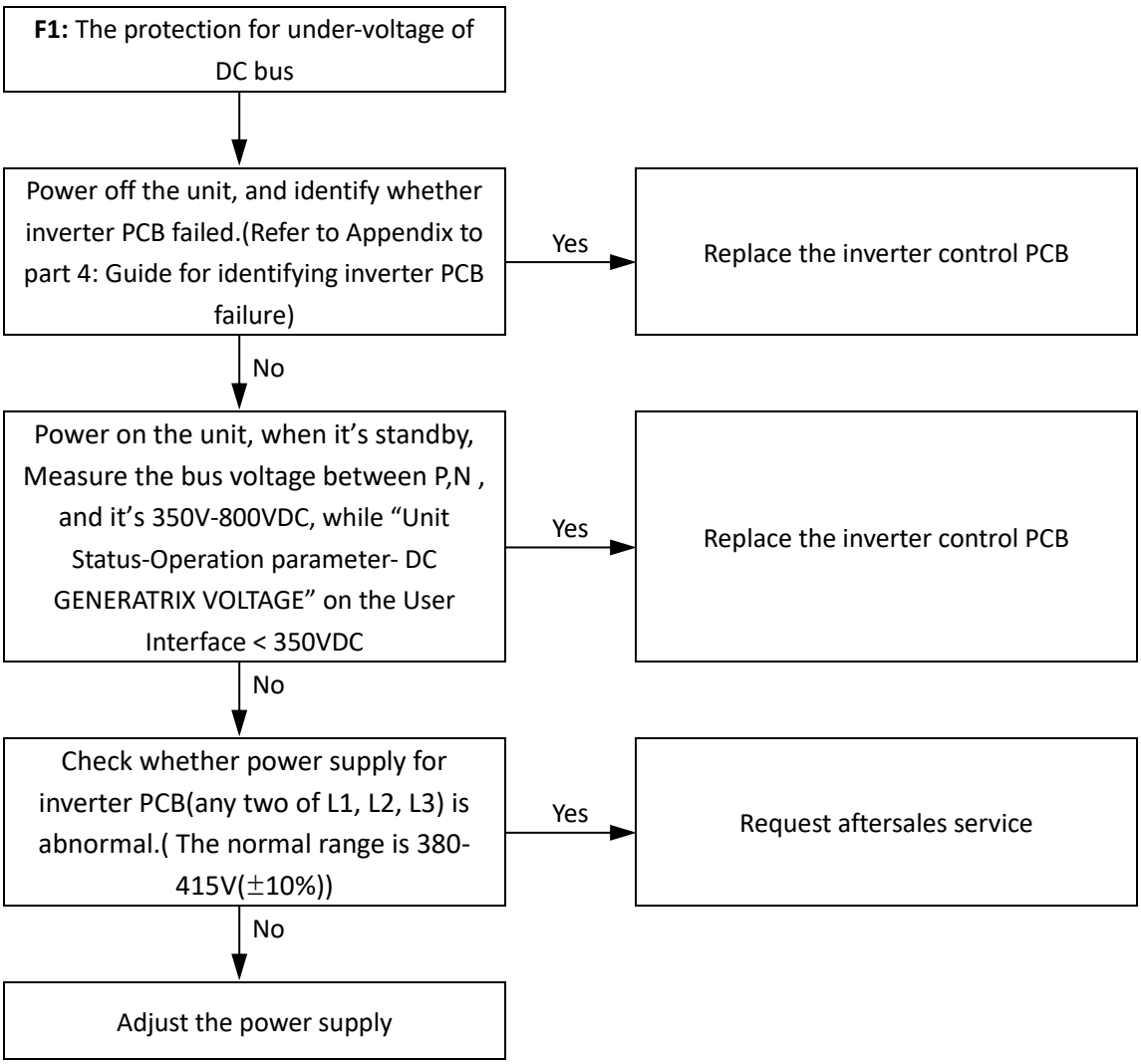
Error code	F1
Description	The protection for under-voltage of DC bus
Triggering	For single phase inverter PCB, the DC bus voltage≤180VDC For three phase inverter PCB, the DC bus voltage≤350VDC

6.26.3 Procedure

For single phase:

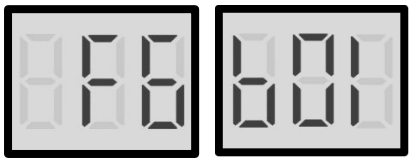


For three phase:



6.27 F6,b01 Troubleshooting

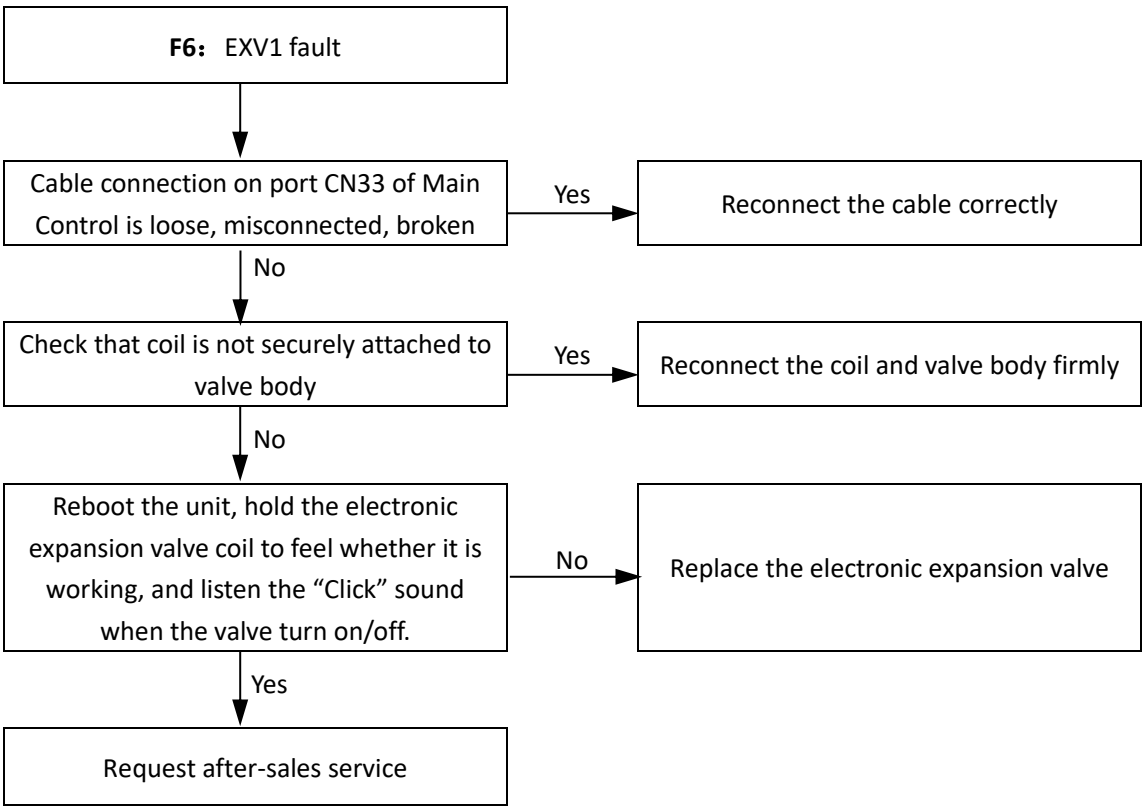
6.27.1 Digital display output

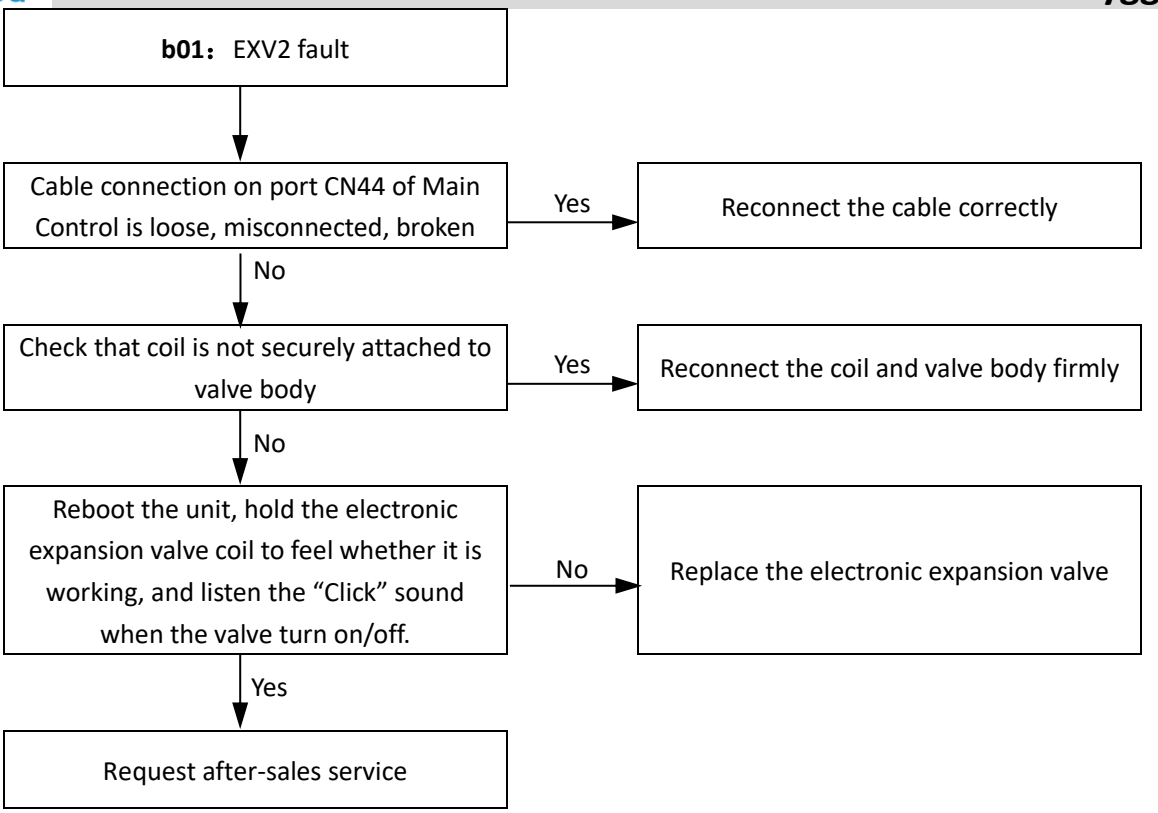


6.27.2 Description

Error code	Description
F6	EXV1 fault
b01	EXV2 fault

6.27.3 Procedure



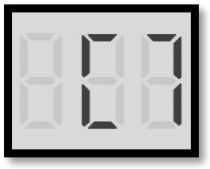


6.28 C7 Troubleshooting

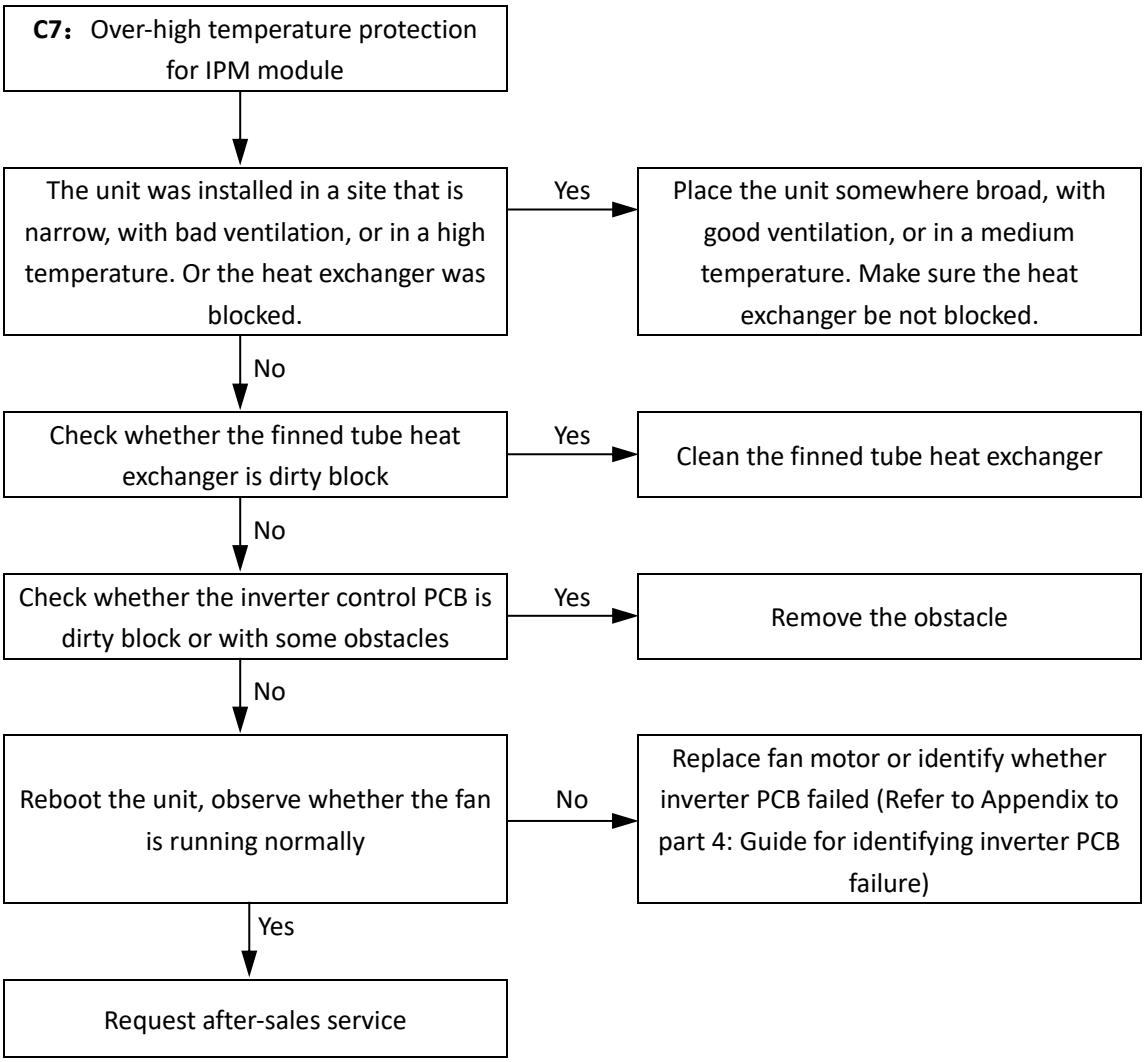
6.28.1 Description

Error code	C7
Description	Over-high temperature protection for IPM module
Triggering	For 12~16kW models, IPM module temperature ≥ 90℃

6.28.2 Digital display output



6.28.3 Procedure



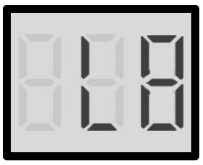
6.29 H4, L0, L3, L4, L5, L7 Troubleshooting

6.29.1 Digital display output





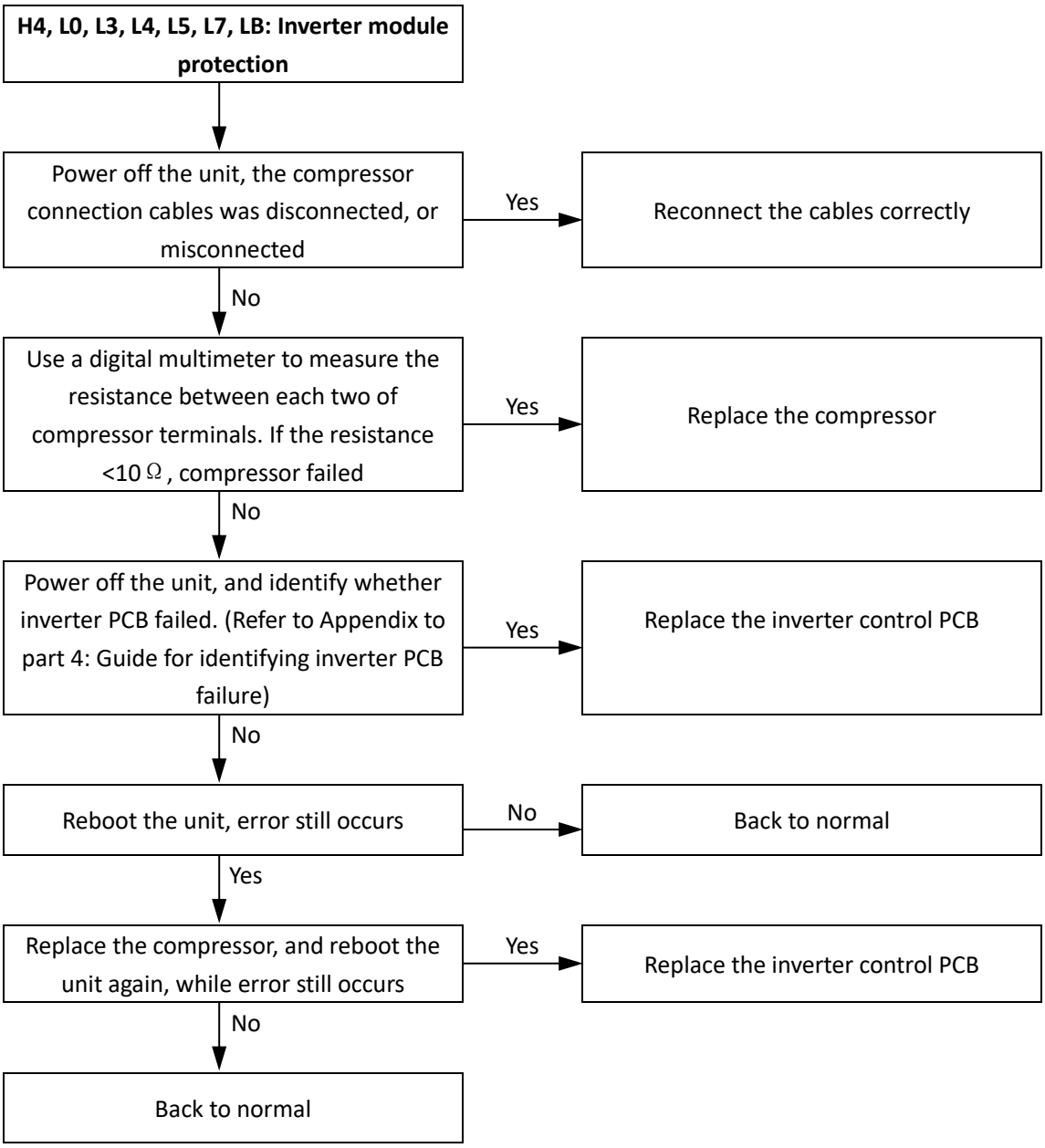




6.29.2 Description

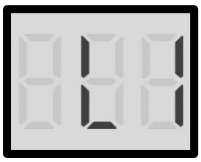
Error code	Description
H4	3 times of “L0” in 60 mins
L0	Inverter or compressor protection
L3	Current sampling error of PFC circuit
L4	Rotating stall protection
L5	Zero speed protection
L7	Phase loss protection of compressor
LB	PFC protection

6.29.3 Procedure



6.30 L1 Troubleshooting

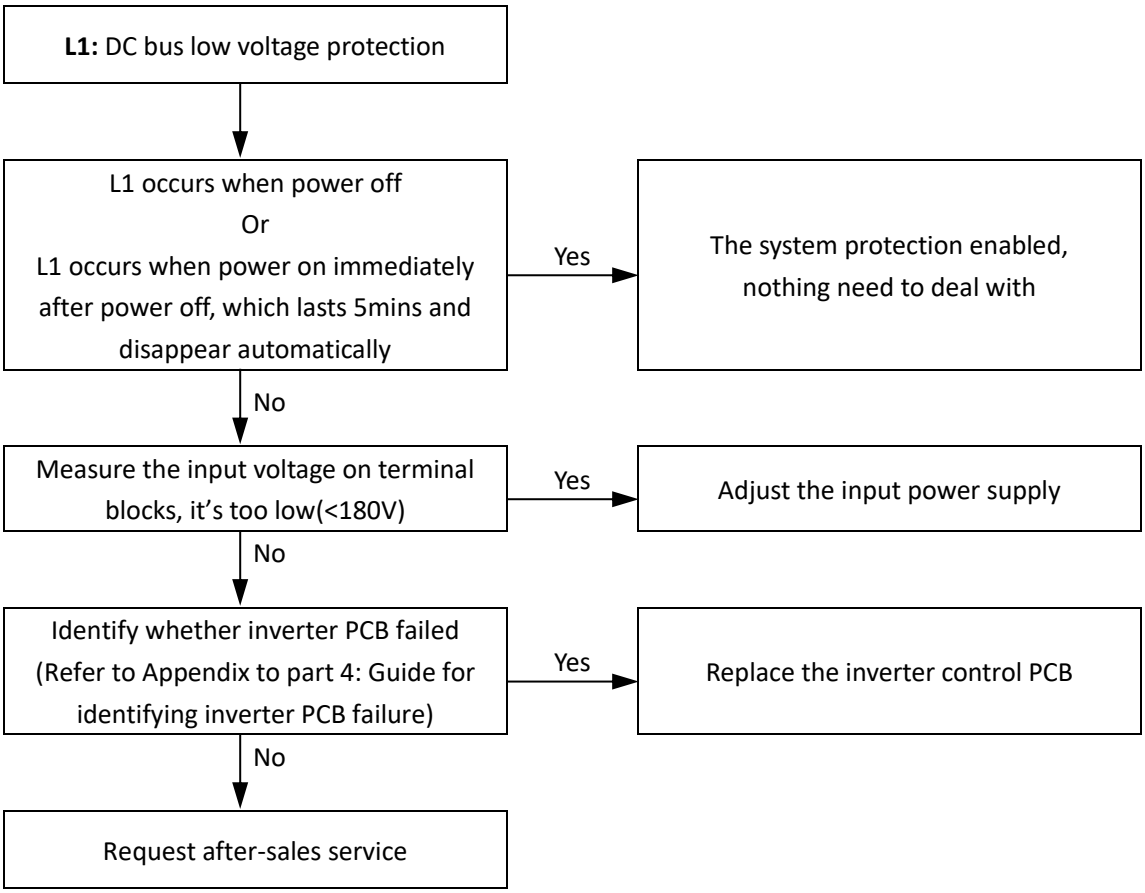
6.30.1 Digital display output



6.30.2 Description

Error code	L1
Description	DC bus low voltage protection
Triggering	Input voltage<180V (The unit will back to normal if input voltage≥180V)

6.30.3 Procedure



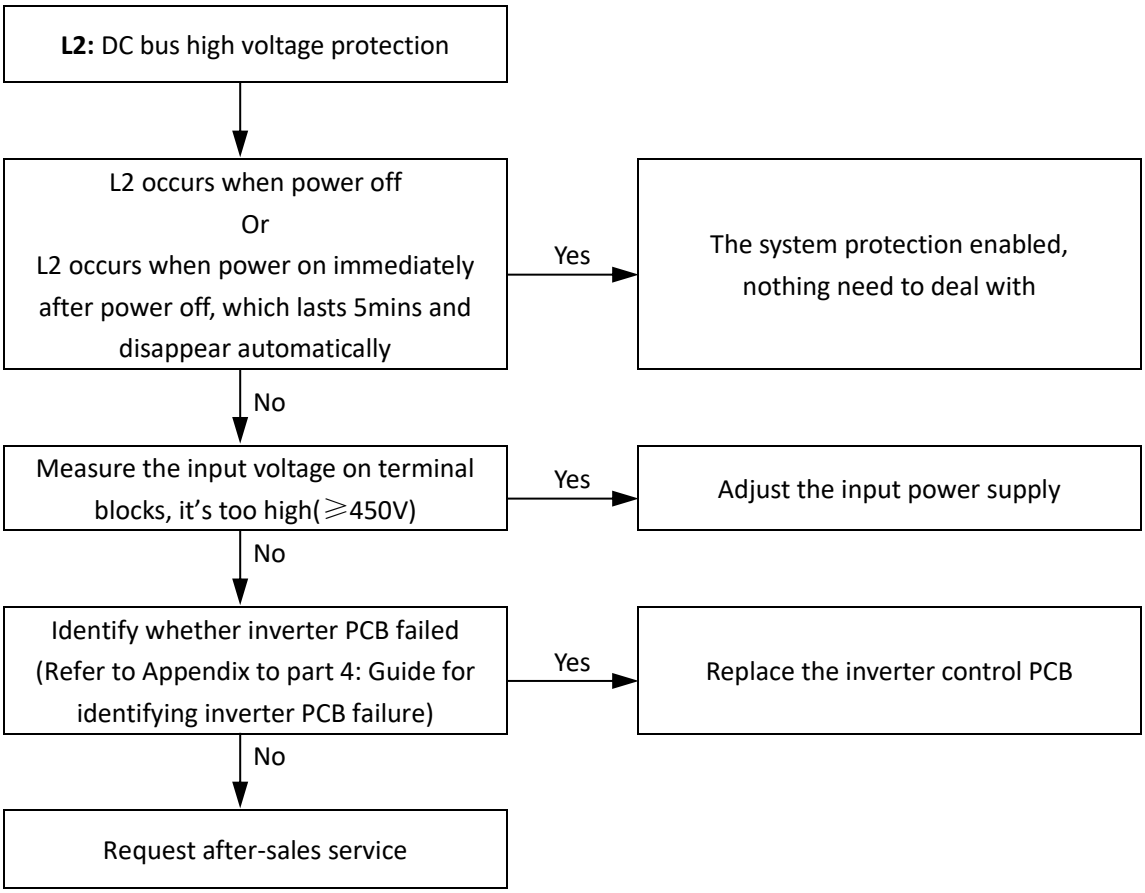
6.31 L2 Troubleshooting

6.31.1 Digital display output

6.31.2 Description

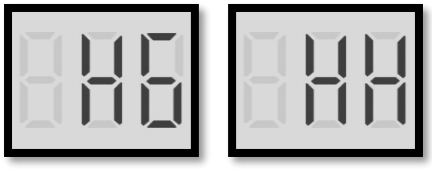
Error code	L2
Description	DC bus high voltage protection
Triggering	Input voltage≥450V (The unit will back to normal if input voltage < 450V)

6.31.3 Procedure



6.32 H6, HH Troubleshooting

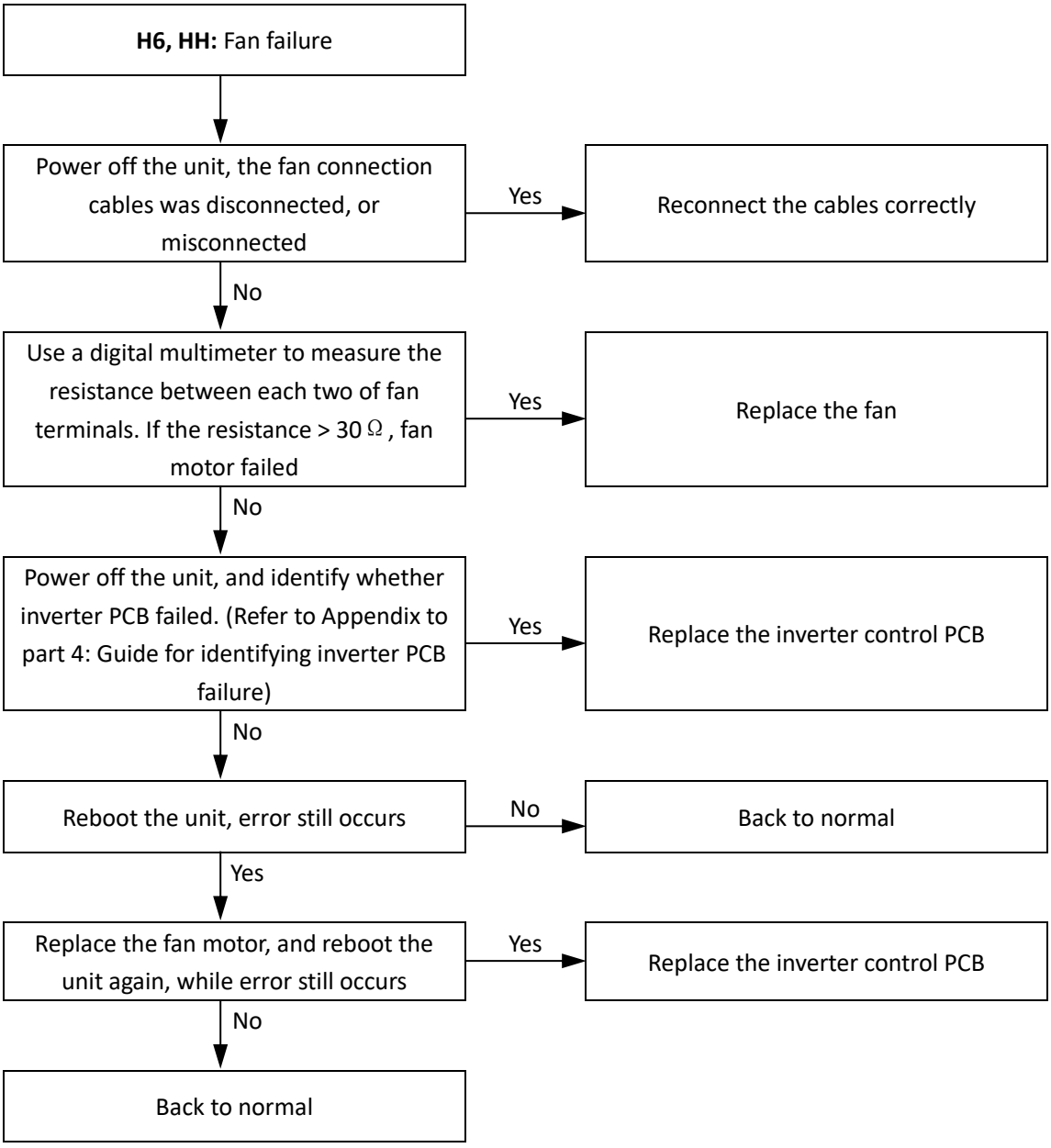
6.32.1 Digital display output



6.32.2 Description

Error code	Description
H6	Fan failure
HH	10 times of H6 in 120mins

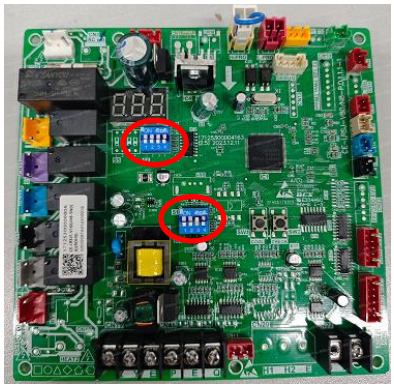
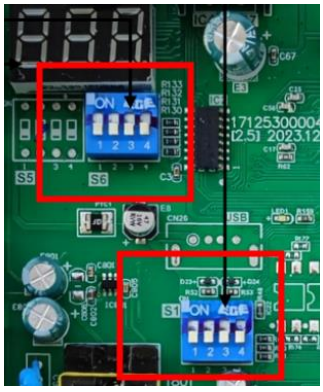
6.32.3 Procedure



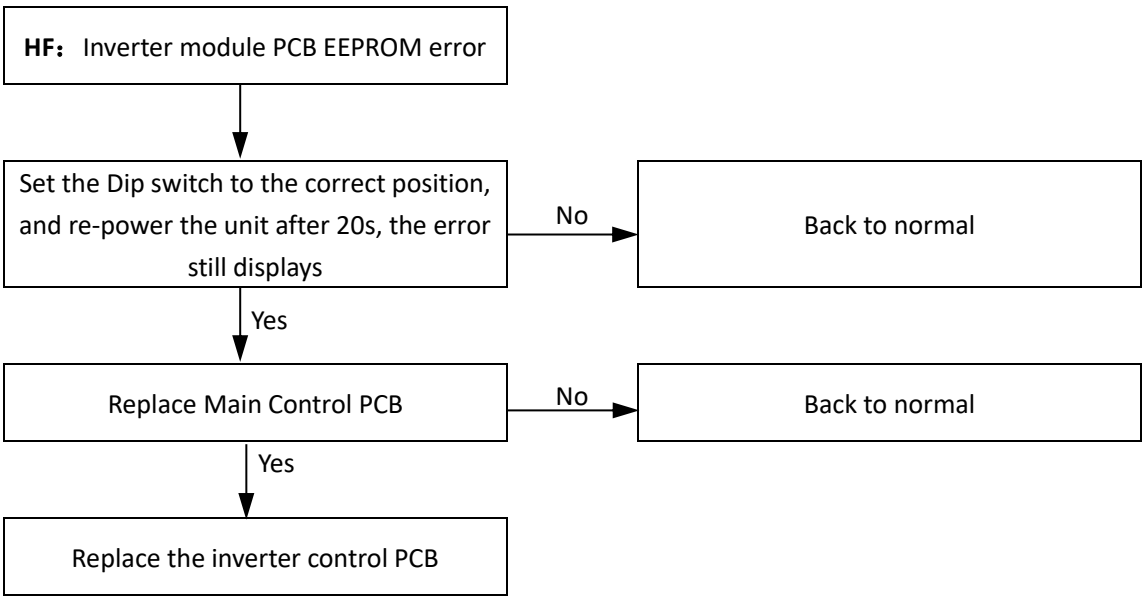
6.33 HF Troubleshooting

6.33.1 Digital display output

6.33.2 Description

Error code		HF
Description		Inverter module PCB EEPROM error
Triggering		The driving program of inverter PCB is detected as being mismatched with Dip switch
Relative ports and locations	Dip switch S5 S6	 
Correct Dip switch	S1	0/0/0/0-12kw; 0/0/0/1-14kw; 0/0/1/0-16kw 1/0/0/0-12kw 3N; 1/0/0/1-14kw 3N; 1/0/1/0-16kw 3N
	S6	0/0/0/0

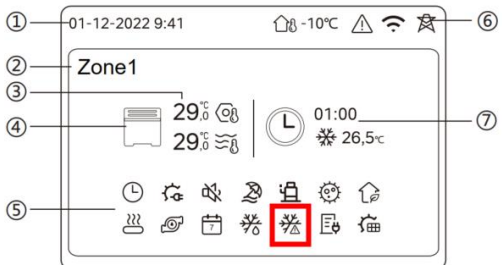
6.33.3 Procedure



6.34 Pb Troubleshooting

6.34.1 Digital display output

6.34.2 Description

Error code	Pb
Description	Pb is the indicator that shows the system is running in anti-freezing control
Triggering	Refer to Part 3 - Protection control – Anti-freezing protection control
User Interface	 It shows anti-freezing icon on the User Interface

6.35 dF Troubleshooting

6.35.1 Digital display output

6.35.2 Description

Error code	dF
Description	dF is the indicator that shows the system is running in defrosting control
Triggering	Refer to Part 3 - Special control – Defrosting operation control

6.36 d0 Troubleshooting

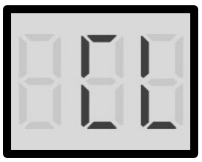
6.36.1 Digital display output

6.36.2 Description

Error code	d0
Description	d0 is the indicator that shows the system is running in oil return control
Triggering	Refer to Part 3 - Special control – Oil Return operation control

6.37 CL Troubleshooting

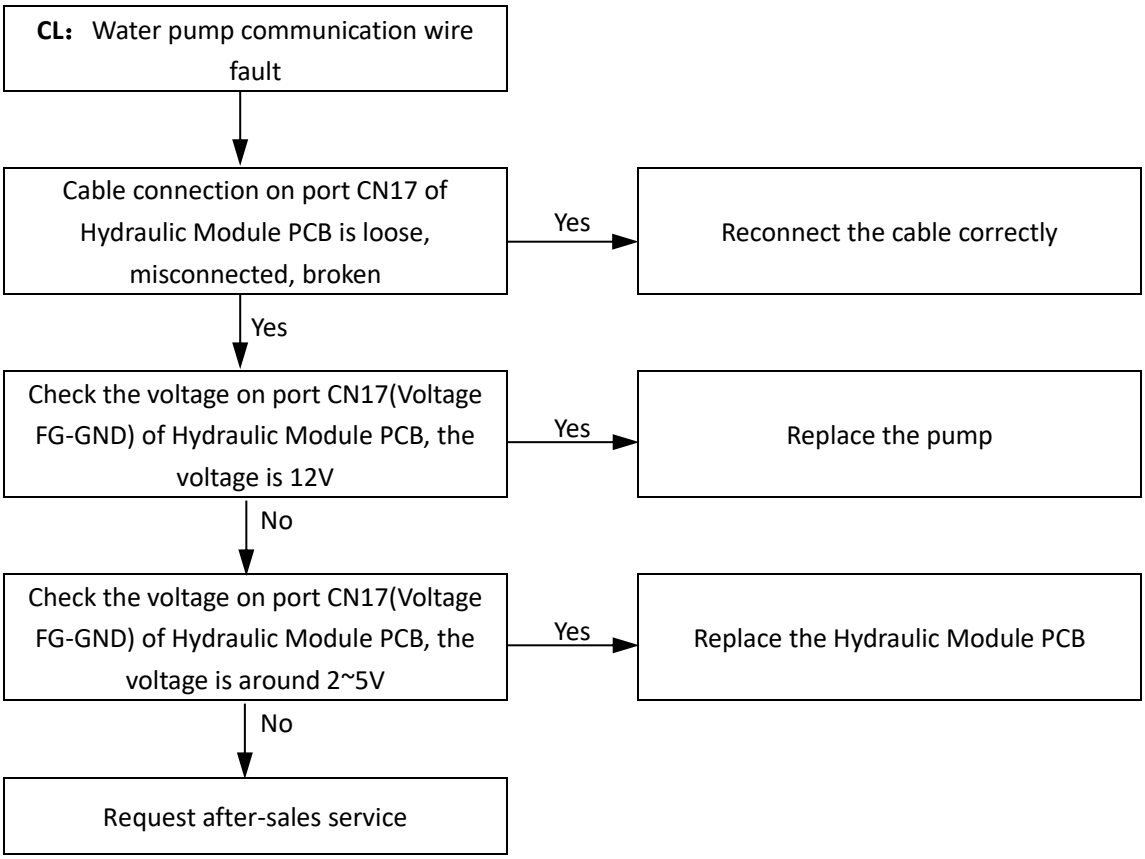
6.37.1 Digital display output



6.37.2 Description

Error code	CL
Description	Water pump communication wire fault

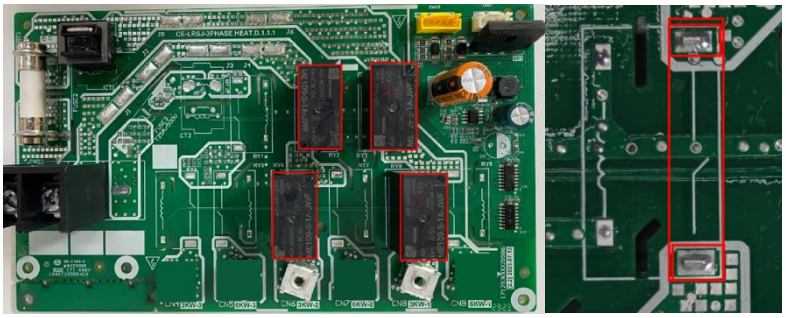
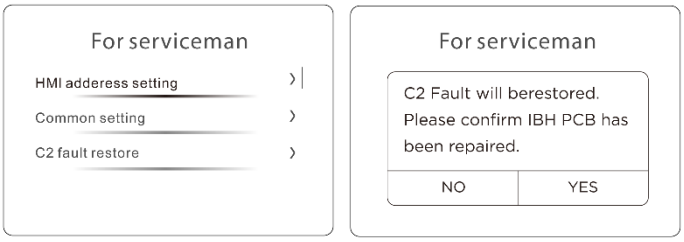
6.37.3 Procedure



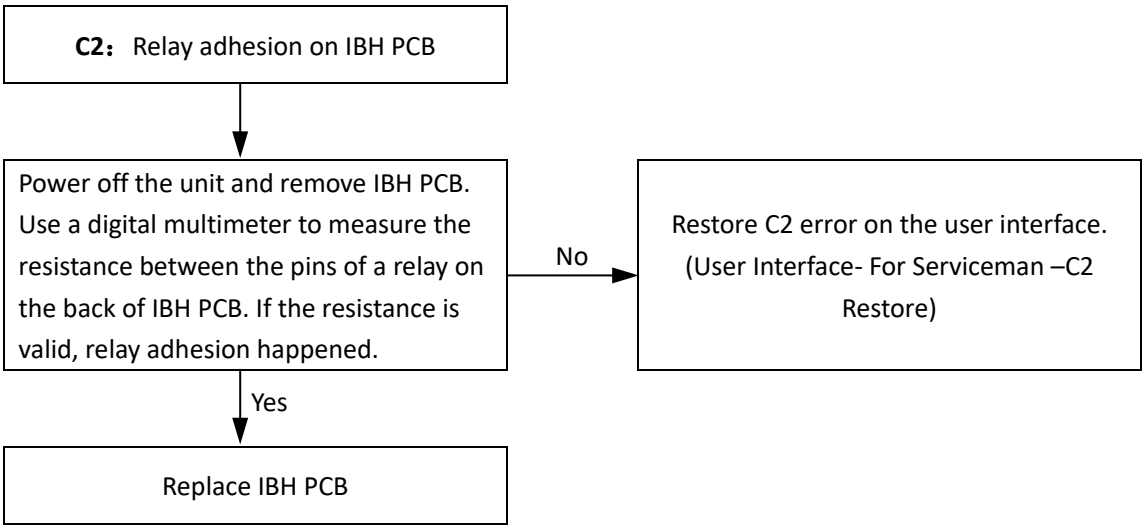
6.38 C2 Troubleshooting

6.38.1 Digital display output

6.38.2 Description

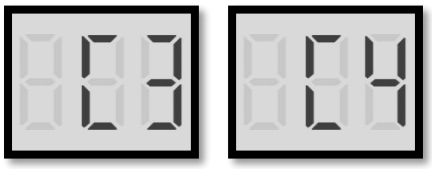
Error code		C2
Description		Relay adhesion on IBH PCB
Triggering		Relay: Poor contact, relay deformation, relay aging, etc. External factors : overcurrent, over high ambient temperature, etc.
Relative ports and locations	Relays and pins of a relay	
	User interface -For Serviceman-C2 restore	

6.38.3 Procedure

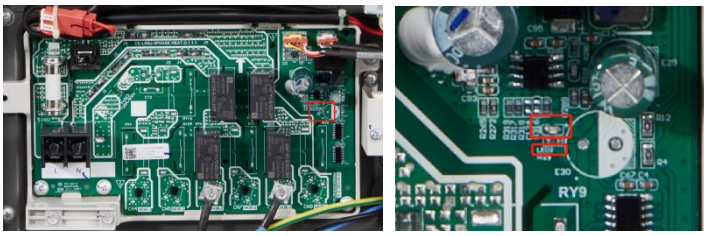
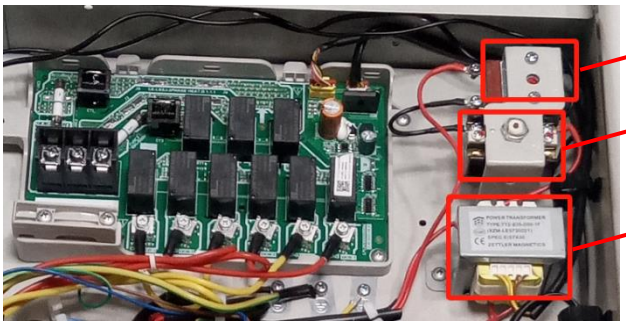
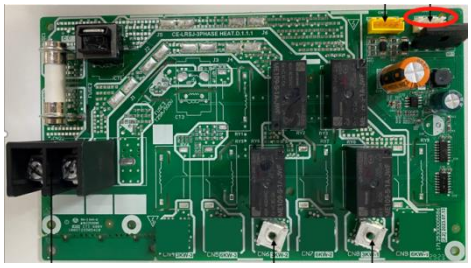
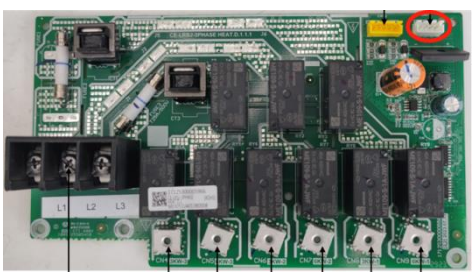


6.39 C3, C4 Troubleshooting

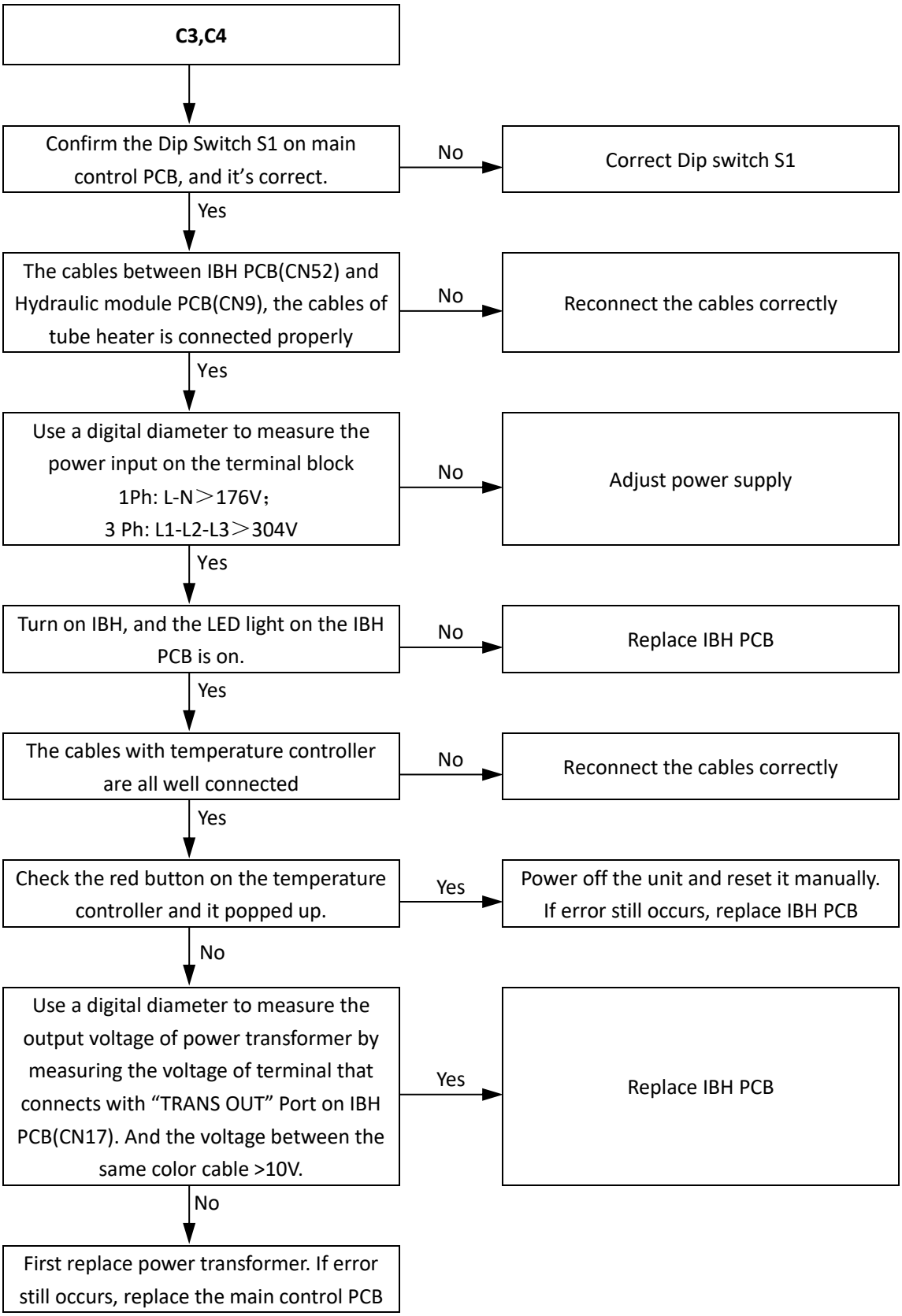
6.39.1 Digital display output



6.39.2 Description

Error code	C3	C4
Description	Current transformer failure or circuit failure of IBH PCB	C3≥3 times
Triggering	Incorrect Dip switch S1, cables with IBH connected improperly; Overvoltage, IBH failure etc.	
Correct Dip switch S1-1/2/3/4	Electric heater capacity of 3kW: 0/0/0/1 Electric heater capacity of 6kW: 0/0/1/0 Electric heater capacity of 9kW: 0/0/1/1	
IBH PCB LED light		
Thermostat and Transformer	 Automatic reset thermostat Manual reset thermostat Transformer	
"TRANS OUT" port on (1N 3kW)IBH PCB		
"TRANS OUT" port on (3N 9kW)IBH PCB		

6.39.3 Procedure



7 Temperature Sensor Resistance Characteristics

Tp Compressor discharge temperature sensor							
R90=5KΩ±3%，B25/50=3950K±3%							
Temperature (°C)	**Resistance (kΩ)**	**Temperature (°C)**	**Resistance (kΩ)**	**Temperature (°C)**	**Resistance (kΩ)**	**Temperature (°C)**	**Resistance (kΩ)**
-20	542.7	**20**	68.66	**60**	13.59	**100**	3.702
-19	511.9	**21**	65.62	**61**	13.11	**101**	3.595
-18	483.0	**22**	62.73	**62**	12.65	**102**	3.492
-17	455.9	**23**	59.98	**63**	12.21	**103**	3.392
-16	430.5	**24**	57.37	**64**	11.79	**104**	3.296
-15	406.7	**25**	54.89	**65**	11.38	**105**	3.203
-14	384.3	**26**	52.53	**66**	10.99	**106**	3.113
-13	363.3	**27**	50.28	**67**	10.61	**107**	3.025
-12	343.6	**28**	48.14	**68**	10.25	**108**	2.941
-11	325.1	**29**	46.11	**69**	9.902	**109**	2.860
-10	307.7	**30**	44.17	**70**	9.569	**110**	2.781
-9	291.3	**31**	42.33	**71**	9.248	**111**	2.704
-8	275.9	**32**	40.57	**72**	8.940	**112**	2.630
-7	261.4	**33**	38.89	**73**	8.643	**113**	2.559
-6	247.8	**34**	37.30	**74**	8.358	**114**	2.489
-5	234.9	**35**	35.78	**75**	8.084	**115**	2.422
-4	222.8	**36**	34.32	**76**	7.820	**116**	2.357
-3	211.4	**37**	32.94	**77**	7.566	**117**	2.294
-2	200.7	**38**	31.62	**78**	7.321	**118**	2.233
-1	190.5	**39**	30.36	**79**	7.086	**119**	2.174
0	180.9	**40**	29.15	**80**	6.859	**120**	2.117
1	171.9	**41**	28.00	**81**	6.641	**121**	2.061
2	163.3	**42**	26.90	**82**	6.430	**122**	2.007
3	155.2	**43**	25.86	**83**	6.228	**123**	1.955
4	147.6	**44**	24.85	**84**	6.033	**124**	1.905
5	140.4	**45**	23.89	**85**	5.844	**125**	1.856
6	133.5	**46**	22.89	**86**	5.663	**126**	1.808
7	127.1	**47**	22.10	**87**	5.488	**127**	1.762
8	121.0	**48**	21.26	**88**	5.320	**128**	1.717
9	115.2	**49**	20.46	**89**	5.157	**129**	1.674
10	109.8	**50**	19.69	**90**	5.000	**130**	1.632
11	104.6	**51**	18.96	**91**	4.849		
12	99.69	**52**	18.26	**92**	4.703		
13	95.05	**53**	17.58	**93**	4.562		
14	90.66	**54**	16.94	**94**	4.426		
15	86.49	**55**	16.32	**95**	4.294		
16	82.54	**56**	15.73	**96**	4.167		
17	78.79	**57**	15.16	**97**	4.045		
18	75.24	**58**	14.62	**98**	3.927		
19	71.86	**59**	14.09	**99**	3.812		

T4 Ambient temperature sensor	Th Refrigerant suction temperature sensor
T2 Plate heat exchanger liquid side refrigerant temperature sensor	T2B Plate heat exchanger gas side refrigerant temperature sensor
T3 Outdoor unit heat exchanger outlet temperature sensor	T9i Plate heat exchanger refrigerant inlet temperature sensor
T9o Plate heat exchanger refrigerant outlet temperature sensor	

R25=10KΩ±3%，B25/50=4100K±3%

Temperature (°C)	Resistance (kΩ)	Temperature (°C)	Resistance (kΩ)	Temperature (°C)	Resistance (kΩ)	Temperature (°C)	Resistance (kΩ)
-25	144.266	**15**	16.079	**55**	2.841	**95**	0.708
-24	135.601	**16**	15.313	**56**	2.734	**96**	0.686
-23	127.507	**17**	14.588	**57**	2.632	**97**	0.666
-22	119.941	**18**	13.902	**58**	2.534	**98**	0.646
-21	112.867	**19**	13.251	**59**	2.44	**99**	0.627
-20	106.732	**20**	12.635	**60**	2.35	**100**	0.609
-19	100.552	**21**	12.05	**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	**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**	1.69		
-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**	5.63	**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	31.12	**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**	3.59	**89**	0.855		
10	20.61	**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**	0.73		

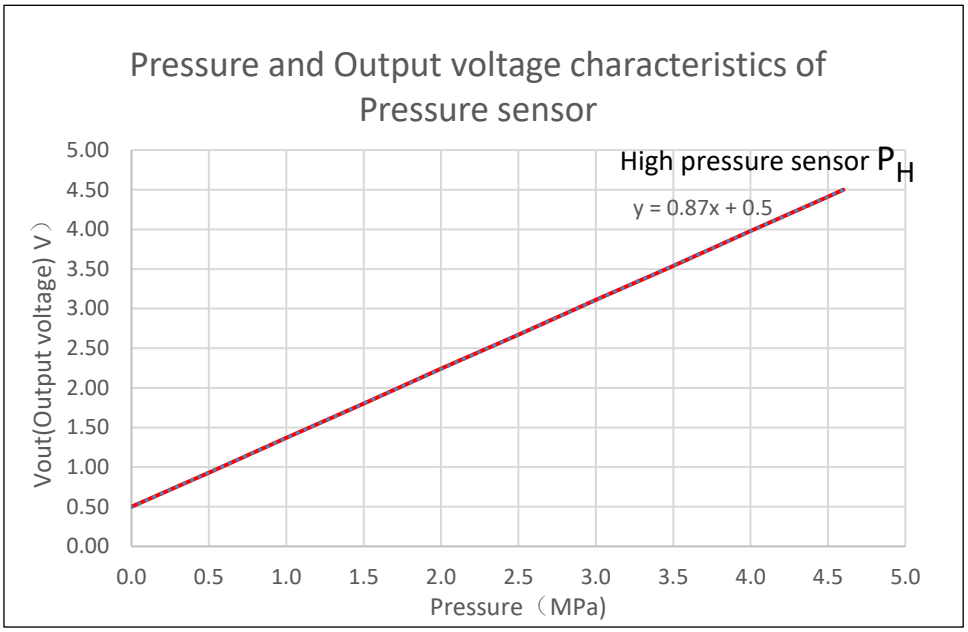
Applied to

TW_in Plate heat exchanger inlet water temperature sensor
TW_out Plate heat exchanger outlet water temperature sensor
T5 Water tank temperature sensor
T1 Backup heater outlet water temp. Sensor
Tsolar solar panel temp sensor
T52 Water tank temperature sensor 2
Tbt Balance tank temperature sensor

R50=17.6KΩ±3%，B0/100=3970K±2%

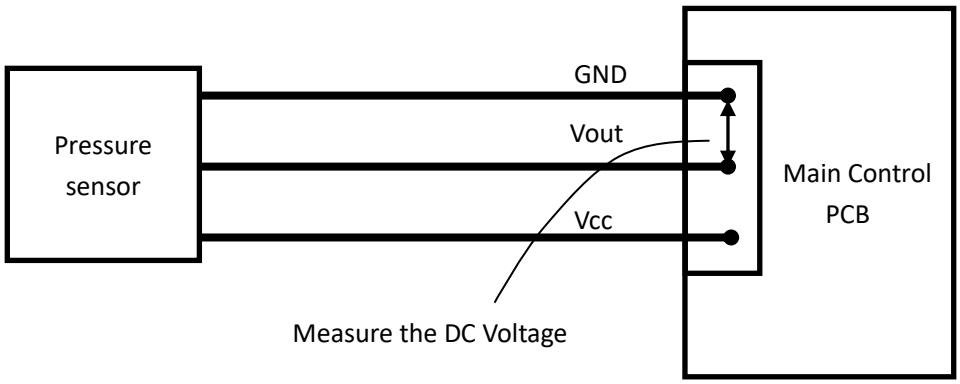
Temperature (°C)	Resistance (kΩ)	Temperature (°C)	Resistance (kΩ)	Temperature (°C)	Resistance (kΩ)	Temperature (°C)	Resistance (kΩ)
-30	867.29	10	98.227	50	17.600	90	4.4381
-29	815.80	11	93.634	51	16.943	91	4.3022
-28	767.68	12	89.278	52	16.315	92	4.1711
-27	722.68	13	85.146	53	15.713	93	4.0446
-26	680.54	14	81.225	54	15.136	94	3.9225
-25	641.07	15	77.504	55	14.583	95	3.8046
-24	604.08	16	73.972	56	14.054	96	3.6908
-23	569.39	17	70.619	57	13.546	97	3.5810
-22	536.85	18	67.434	58	13.059	98	3.4748
-21	506.33	19	64.409	59	12.592	99	3.3724
-20	477.69	20	61.535	60	12.144	100	3.2734
-19	450.81	21	58.804	61	11.715	101	3.1777
-18	425.59	22	56.209	62	11.302	102	3.0853
-17	401.91	23	53.742	63	10.906	103	2.9960
-16	379.69	24	51.396	64	10.526	104	2.9096
-15	358.83	25	49.165	65	10.161	105	2.8262
-14	339.24	26	47.043	66	9.8105		
-13	320.85	27	45.025	67	9.4736		
-12	303.56	28	43.104	68	9.1498		
-11	287.33	29	41.276	69	8.8387		
-10	272.06	30	39.535	70	8.5396		
-9	257.71	31	37.878	71	8.2520		
-8	244.21	32	36.299	72	7.9755		
-7	231.51	33	34.796	73	7.7094		
-6	219.55	34	33.363	74	7.4536		
-5	208.28	35	31.977	75	7.2073		
-4	197.67	36	30.695	76	6.9704		
-3	187.66	37	29.453	77	6.7423		
-2	178.22	38	28.269	78	6.5228		
-1	168.31	39	27.139	79	6.3114		
0	160.90	40	26.061	80	6.1078		
1	152.96	41	25.031	81	5.9117		
2	145.45	42	24.048	82	5.7228		
3	138.35	43	23.109	83	5.5409		
4	131.64	44	22.212	84	5.3655		
5	125.28	45	21.355	85	5.1965		
6	119.27	46	20.536	86	5.0336		
7	113.58	47	19.752	87	4.8765		
8	108.18	48	19.003	88	4.7251		
9	103.07	49	18.286	89	4.5790		

8 Pressure and Output voltage characteristics of Pressure sensor



Output voltage formula of high pressure sensor： Vout(H)=0.87×P_H+0.5

Measure the output voltage of pressure sensor



9 Guide for identifying inverter PCB failure

Before measuring the inverter PCB, please confirm steps below in advance :

1) Cut off the power supply ;

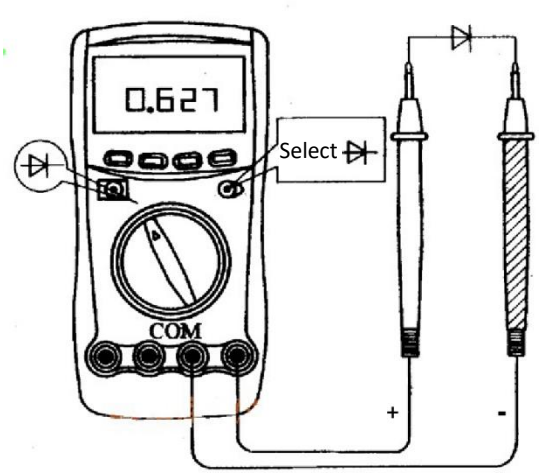
2) Wait for 10 mins for capacitor discharging in order to avoid the electric shock

3) Remove all connections wires

4) To identify whether inverter PCB of 1Ph models failed, follow the guide to test inverter circuit. If any one of test value abnormal, the 1 Ph inverter PCB failed.

To identify whether inverter PCB of 3Ph models failed, follow the guide to test inverter circuit and three phase bridge rectifiler. If any one of test value abnormal, the 3 Ph inverter PCB failed.

Preparing tools : multimeter (secondary tube is available)



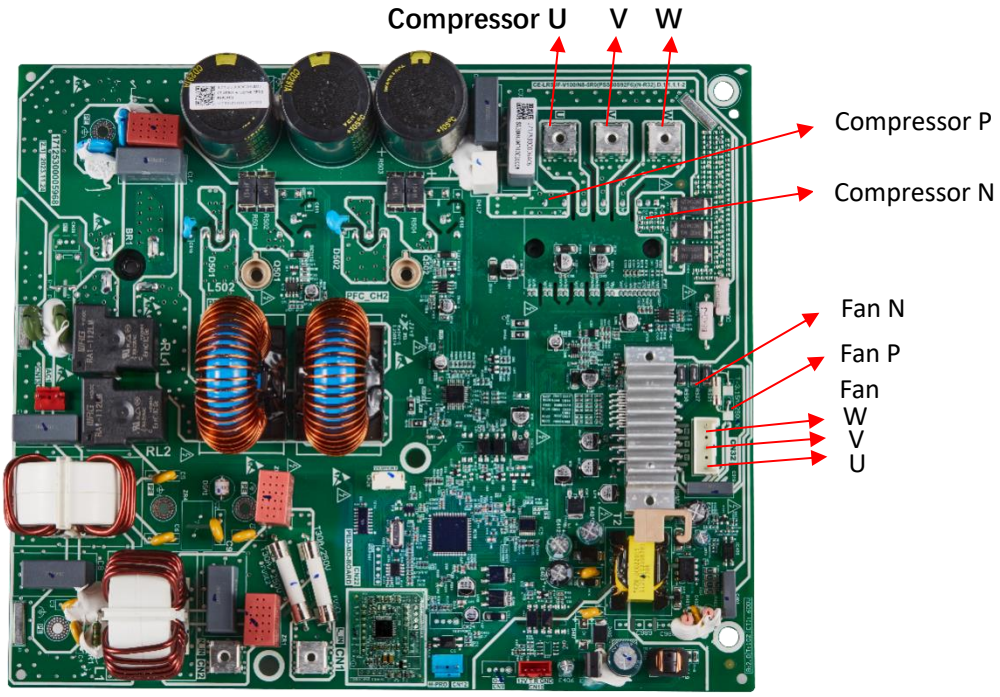
Inverter circuit (Fan module/ Compressor module):

Order	Test point		Normal	Abnormal
	+(Red)	-（Black）		
1	U	P	0.3-0.7V	0 /infinite
2	V	P		
3	W	P		
4	N	U		
5	N	V		
6	N	W		
Note: 1. If any one of test value abnormal, the inverter PCB failed. Request aftersales service and replace the inverter control PCB.				

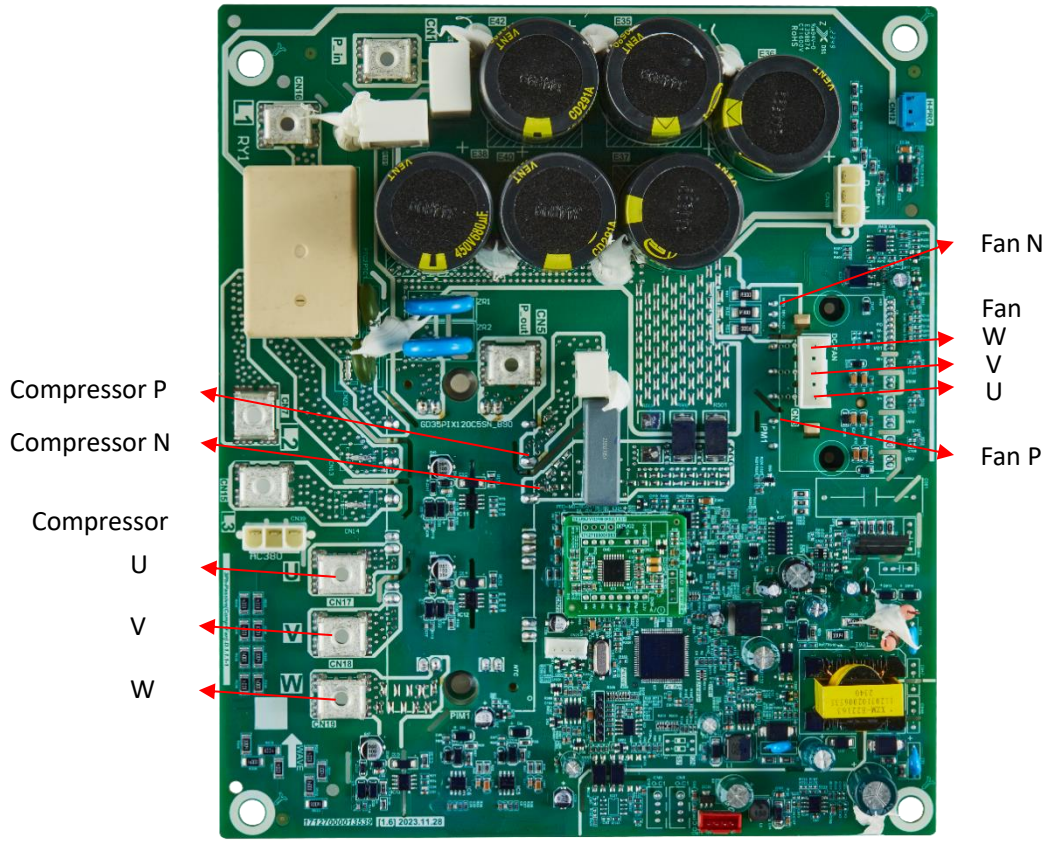
Three phase bridge rectifiler:

Order	Test point		Normal	Abnormal
	+(Red)	-（Black）		
1	L1	P	0.3-0.7V	0 /infinite
2	L2	P		
3	L3	P		
4	N	L1		
5	N	L2		
6	N	L3		
Note: If any one of test value is abnormal, the inverter PCB failed. Request after-sales service and replace the inverter control PCB.				

12~16kW One Phase



12~16kW Three Phase



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