EN

SERVICE MANUAL

01 | 27 - 05 - 2024

YUKON R290 SERIES

MONOBLOCK HEAT PUMPS

SMHM-260P-3
SMHM-300P-3
SMHM-350P-3

S-THERM | sinclair HEAT PUMPS

IMPORTANT NOTE:

Read this manual carefully before installing or operating your new heat pump.
Make sure to save this manual for future reference.

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Part 1

General Information

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1 Product Lineup

Power Supply	380-415 V / 3 N / 50 Hz		
Model	SMHM-350P-3	SMHM-300P-3	SMHM-260P-3
Appearance			

Note:

Please note that photos are for reference, products may vary.

2 Nomenclature

S	M	H	M	-	350	P	-3
1	2	3	4		5	6	7

Legend		
No.	**Code**	**Remarks**
1	S	Brand: Sinclair
2	M	Structure: Mono
3	H	Unit type: heat pump
4	M	Yukon series
5	350	Capacity Code: 350: 35 kW. 300: 30 kW. 260: 26 kW
6	P	Refrigerant: R290
7	-3	3-phase, 380-415V, 50Hz

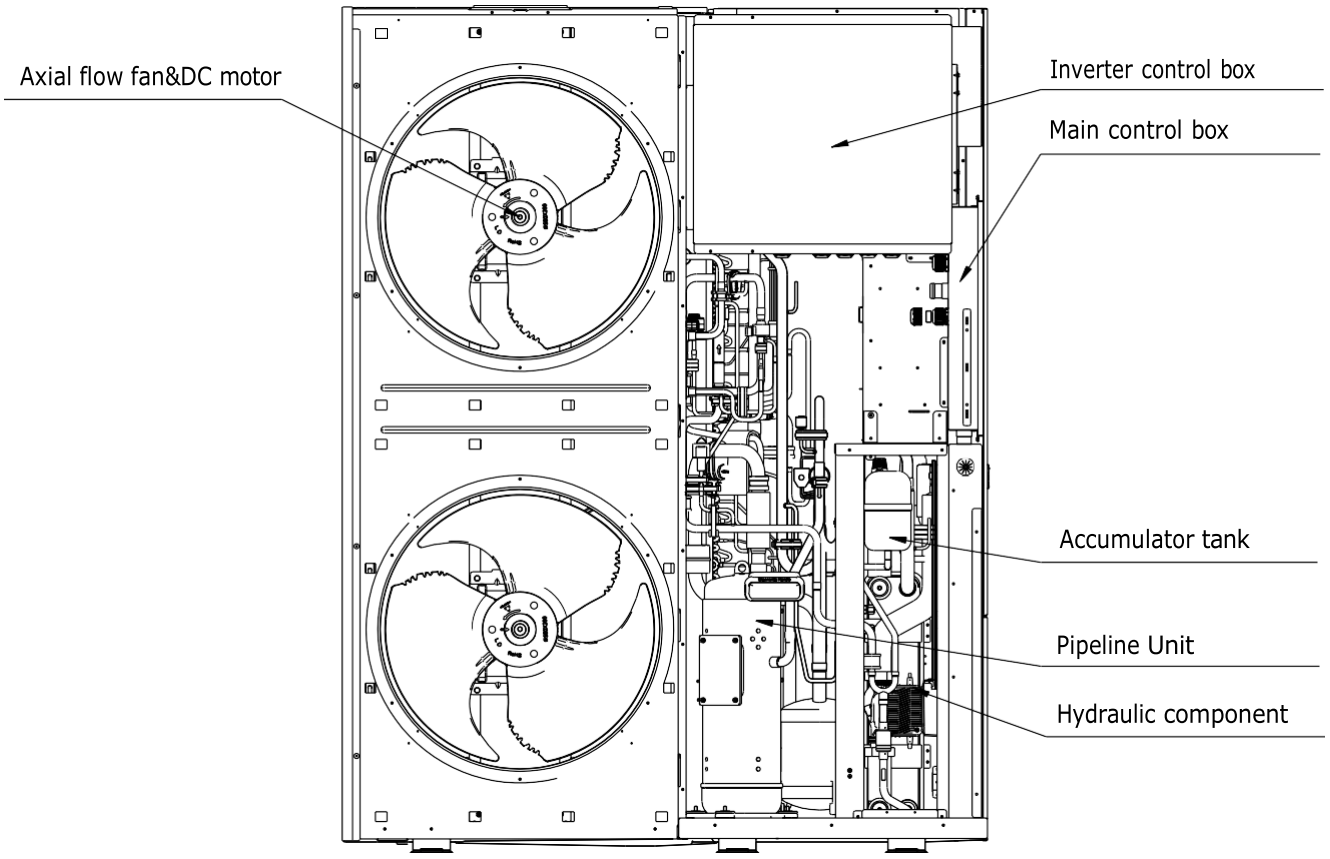
Part 2

Component Layout and Refrigerant Circuits

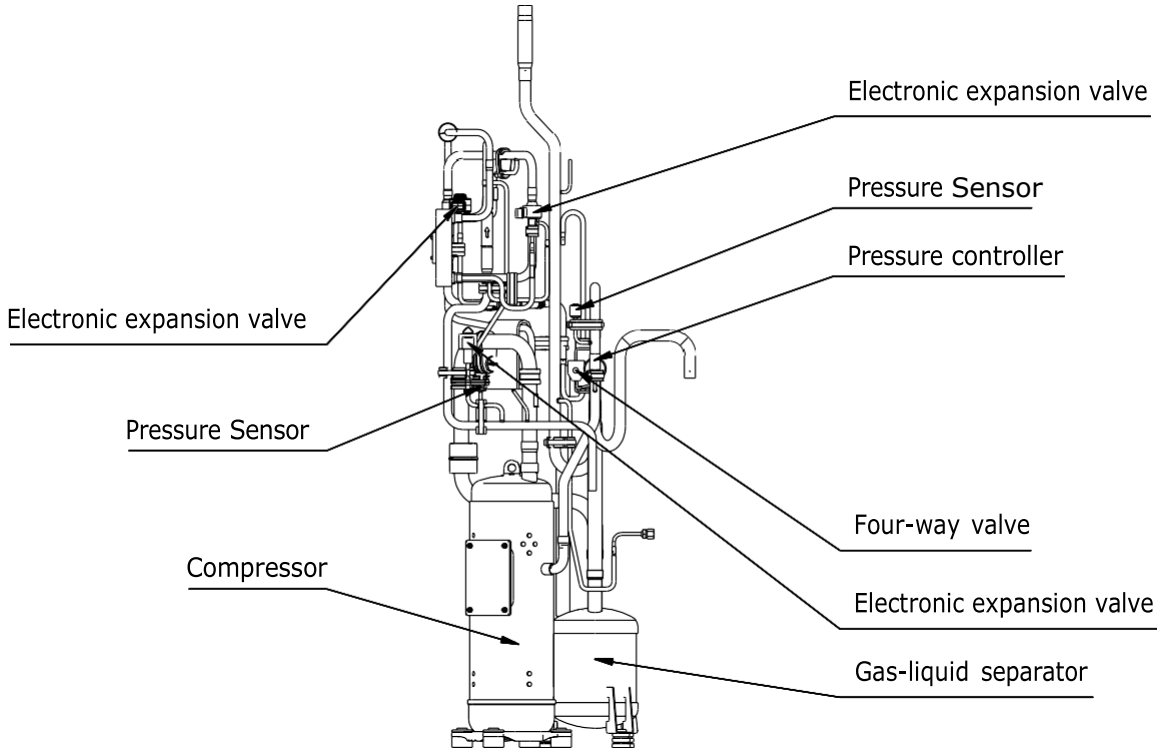
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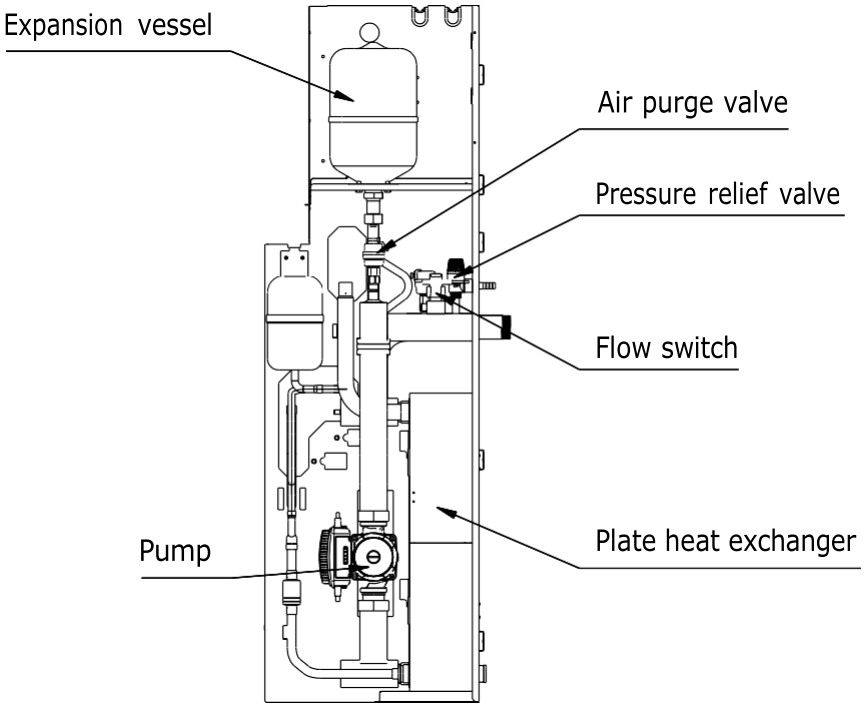
1 Layout of Functional Components



outdoor unit



Pipeline Unit



Hydraulic component

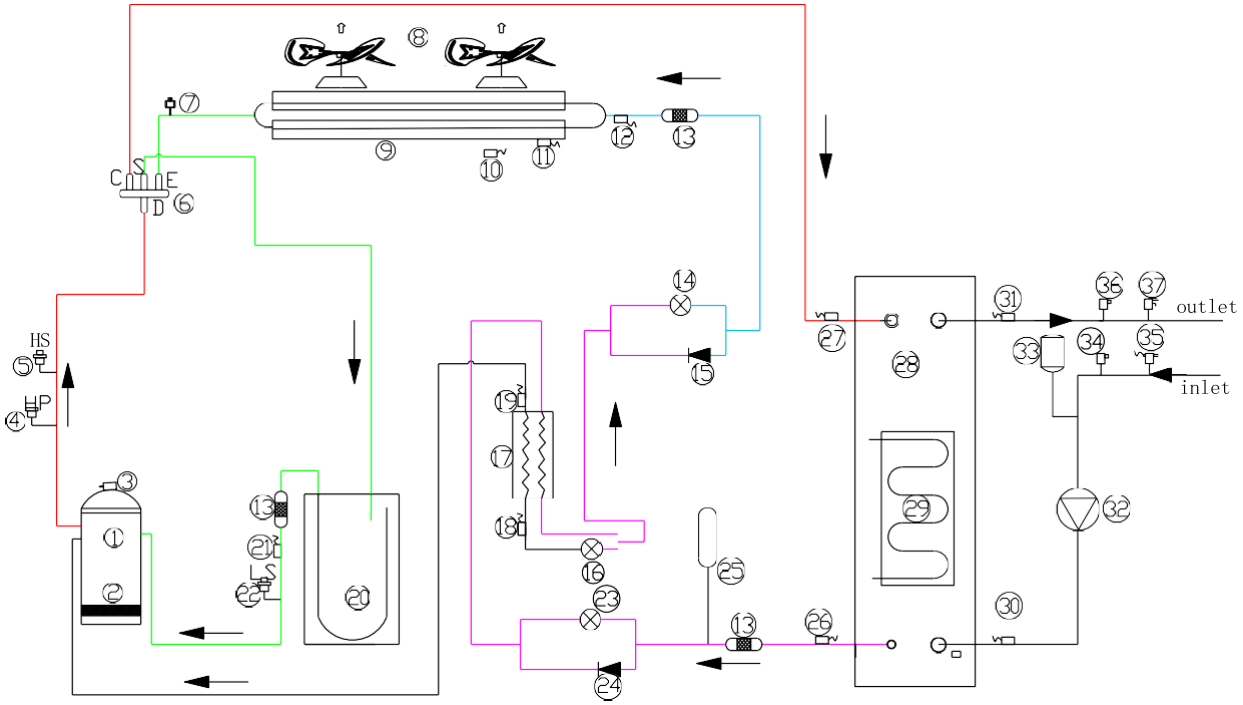
2 Piping Diagrams

Refrigerant piping graphic example:

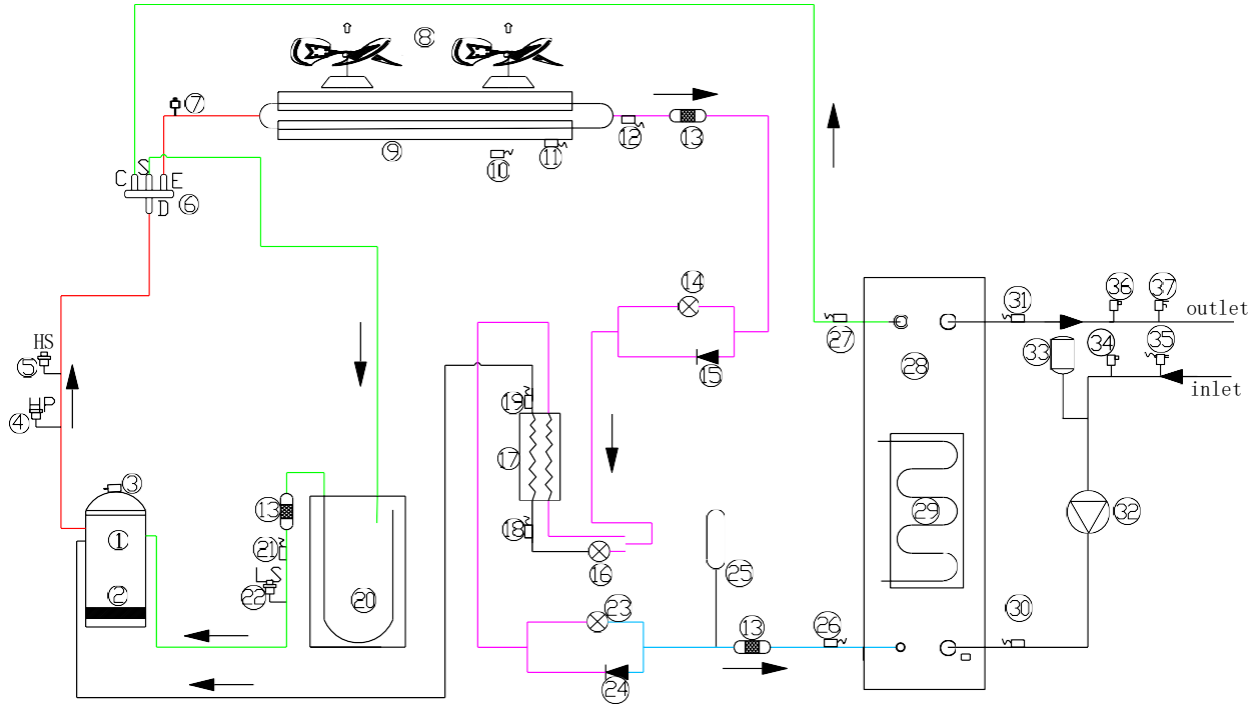
- High-temperature, high-pressure gas
- High-temperature, high-pressure liquid
- Low-temperature, low-pressure gas liquid mixture
- Low-temperature, low-pressure gas

Note: Direction of refrigerant flow depicted in diagram represents main refrigerant flow and is for illustration purposes only.

2.1 Heating mode



2.2 Cooling mode



2.3 Key components

Legend		
No.	**Symbol**	**Description**
1	COMP	DC inverter compressor
2	HEAT3	Crankcase heater
3	Tp	Discharge temperature sensor
4	HP	High-pressure switch
5	HS	High-pressure sensor
6	ST1	4-way valve
7	/	Pin valve (discharge side)
8	FAN A / B	DC fan A / DC fan B
9	/	Finned tube Heat exchanger
10	T4	Ambient temperature sensor
11	T3	Outdoor unit heat exchanger bottom temperature sensor
12	TL	Outdoor unit heat exchanger outlet temperature sensor
13	/	Filter
14	EEV1	Heating electronic expansion valve
15	/	One-way valve
16	EEV3	EVI electronic expansion valve
17	/	Plate heat exchanger (economizer)
18	T9I	Economizer inlet temperature sensor
19	T9O	Economizer outlet temperature sensor
20	/	Gas-liquid separator
21	Th	Compressor suction temperature sensor
22	LS	Low-pressure sensor
23	EEV2	Cooling electronic expansion valve
24	/	One-way valve
25	/	Accumulator tank
26	T2	Plate heat exchanger temperature sensor
27	T2B	Plate heat exchanger temperature sensor
28	/	Plate heat exchanger
29	/	Plate heat exchanger heat tape
30	TW_in	Inlet water temperature sensor
31	TW_out	Outlet water temperature sensor
32	/	Water pump
33	/	Expansion vessel
34	/	Automatic air vent valve
35	FS	Water flow switch
36	/	Automatic air vent valve
37	/	Safety valve

- **Compressor**

The refrigerant is compressed which also raise its temperature. The refrigerant enters the compressor as a low-pressure, low-temperature gas and exits the compressor as a high-pressure, high-temperature gas.

- **4-way valve**

To better control refrigerant flow, Yukon series features an upgraded 4-way valve default position which remains closed in heating mode (no electrical signal) and open in cooling mode. When closed, the air-side heat exchanger functions as an evaporator and water side heat exchanger functions as a condenser; when open, the air side heat exchanger functions as a condenser and water side heat exchanger function as an evaporator.

- **High-pressure switch**

A high-pressure switch regulates system pressure by shutting off the compressor in the event the refrigerant-system pressure exceeds the upper limit.

- **Air side heat exchanger(Finned tube heat exchanger)**

Heat is transferred from the refrigerant into the surrounding air by first passing through the tube coils where the heat is transferred to the fins via conduction. It then dissipates into the air forced through the heat exchanger.

- **Filter**

An air filter traps incoming dust, pet dander, fibers and other airborne contaminants, helping to protect interior heat pump components.

- **Electronic expansion valve (EXV)**

Controls refrigerant flow and reduces refrigerant pressure as necessary.

- **Accumulator tank**

Stores excess fluid refrigerant during system operation.

- **Plate heat exchanger**

Facilitates transfer of heat between two fluids. This type of exchange offers a significant advantage over conventional heat exchangers as fluids are exposed to a much larger surface area which better facilitates the transfer of heat while greatly accelerating temperature increase.

- **Water pump (Circulating pump)**

Circulates water throughout the water circuit.

- **Automatic air purge valve**

Automatically removes air from the water circuit.

- **Water flow switch**

Monitors the flow rate of water to detect insufficient flow to the compressor, preventing potential damage.

Part 3

Control and Field settings

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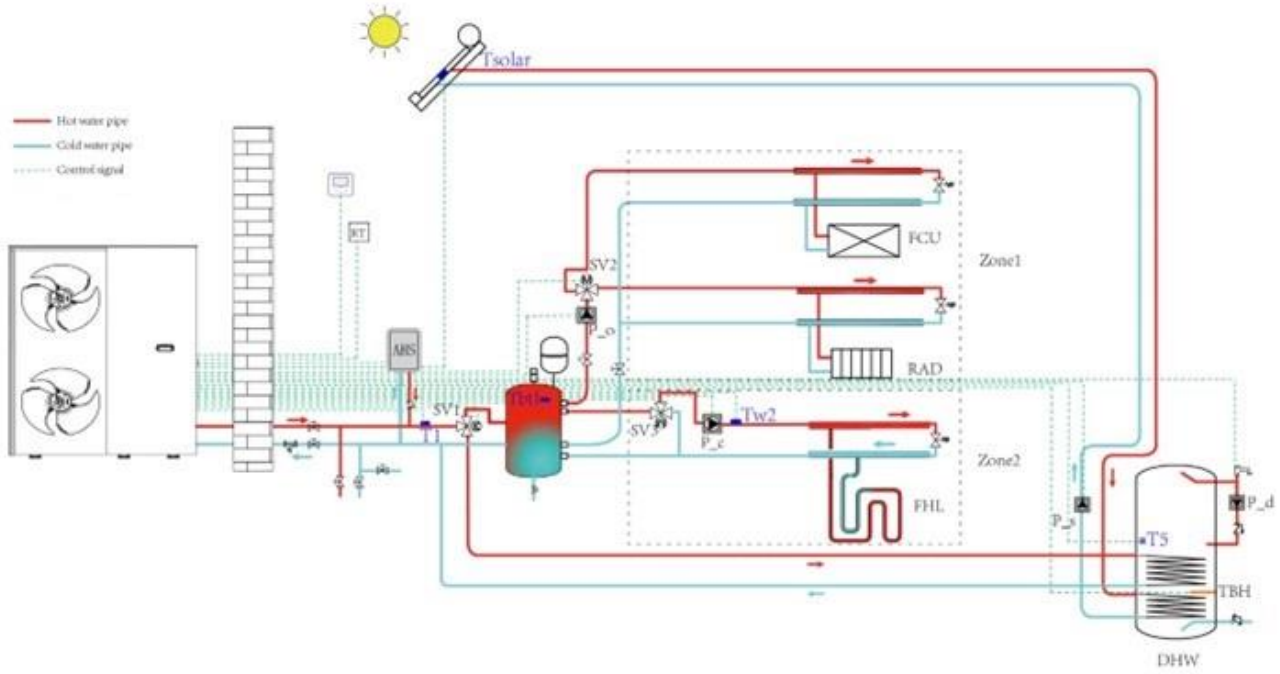
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Notice

- Refer to system diagram below for location of key components and sensors.
- The diagram below is for reference only. Actual installations will vary based on unique system configurations.



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

A crankcase heater is used to prevent refrigerant from mixing with compressor oil during compressor shutdown. The crankcase heater operation is determined by outdoor ambient temperature and whether the compressor is on or off. When outdoor ambient temperature is above 10°C or the compressor is running, the crankcase heater is off. When outdoor ambient temperature is at or below 8°C and the compressor has either been off for more than 3 hours or the unit has recently been powered on (either manually or following a power outage), the crankcase heater will activate.

2.2 Water Pump Control

1） HMI set “Water temperature” control type: If heating or cooling mode =ON, When unit in standby state, the internal and external circulator pumps keep running continuously.

2） HMI set “Room temperature” control type: If heating or cooling mode =ON, When unit in standby state, the internal and external circulator pumps will stop running.

3） HMI set “Water temperature” control type and “Tbt=YES”: If heating or cooling mode =ON, When unit in standby state, the internal circulator pump will stop running and external circulator pumps keep running continuously.

3 Startup Control

3.1 Compressor Startup Delay Control

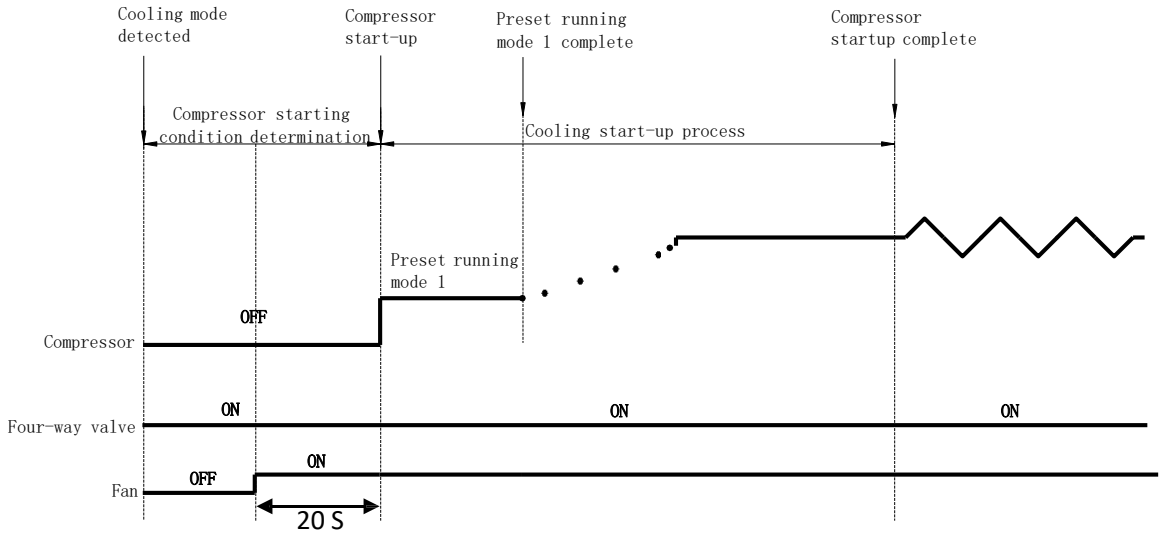
Startup control and restart control delay compressor startup by three minutes from the last stoppage in order to prevent the potentially harmful effects of frequent compressor on/off cycling and also ensures that pressure within the refrigerant system remains equalized. (Note: this feature will not affect oil return or defrosting operation)

3.2 Unit Startup

In initial startup or restart control, compressor startup is determined by outdoor ambient temperature and parameters input into one of two startup programs in order to reach the target rotation speed.

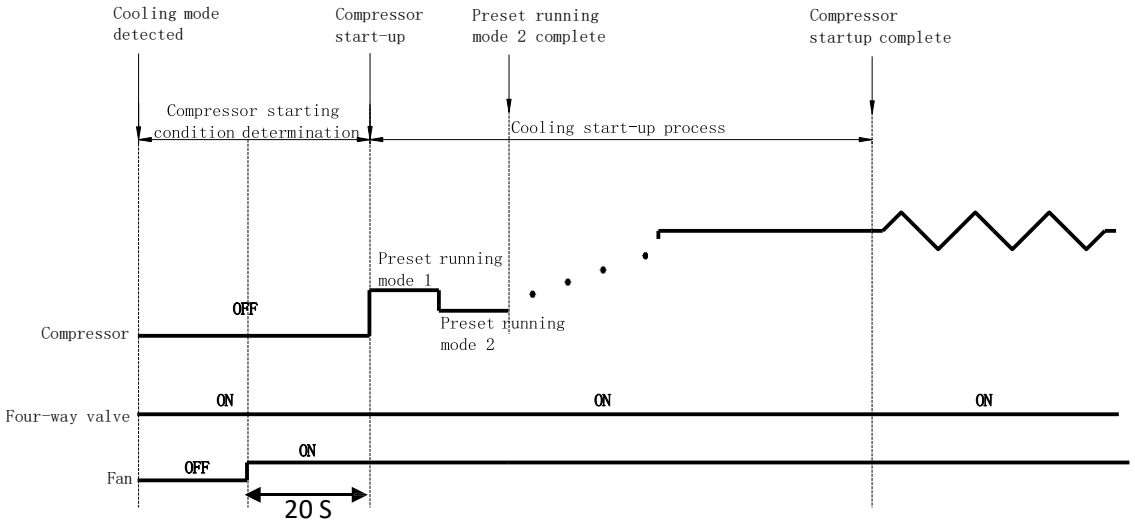
Cooling start mode 1

Compressor startup program when cooling mode ambient temperature is above 12°C



Cooling start mode 2

Compressor startup program when cooling mode ambient temperature is below 12°C



Note: Preset running mode 1 and Preset running mode 2 are the two frequencies at which the compressor operates

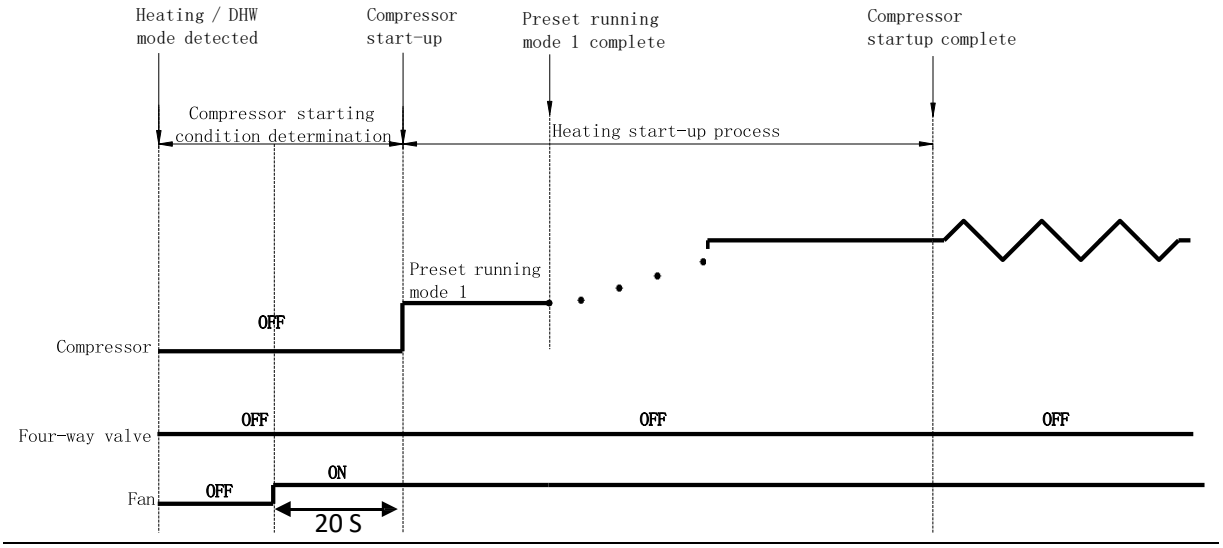
Component control during startup in cooling mode

Component	Wiring diagram label	26-35 kW	Control functions and status
Inverter compressor	COMP	•	Compressor startup program selected according to ambient temperature[1]
DC fan motor	FAN	•	Fan run at maximum speed[2]
Electronic expansion valve	EEV2	•	Increments from 0 (fully closed) to 480 (fully open), controlled according to outdoor ambient temperature, discharge temperature, suction superheat, compressor speed and refrigerant system pressure
Four-way valve	4-WAY	•	ON

Notes:
1. Refer to "Startup Control - Unit Startup".
2. Refer to "Normal Operation Control - Outdoor Fan Control"

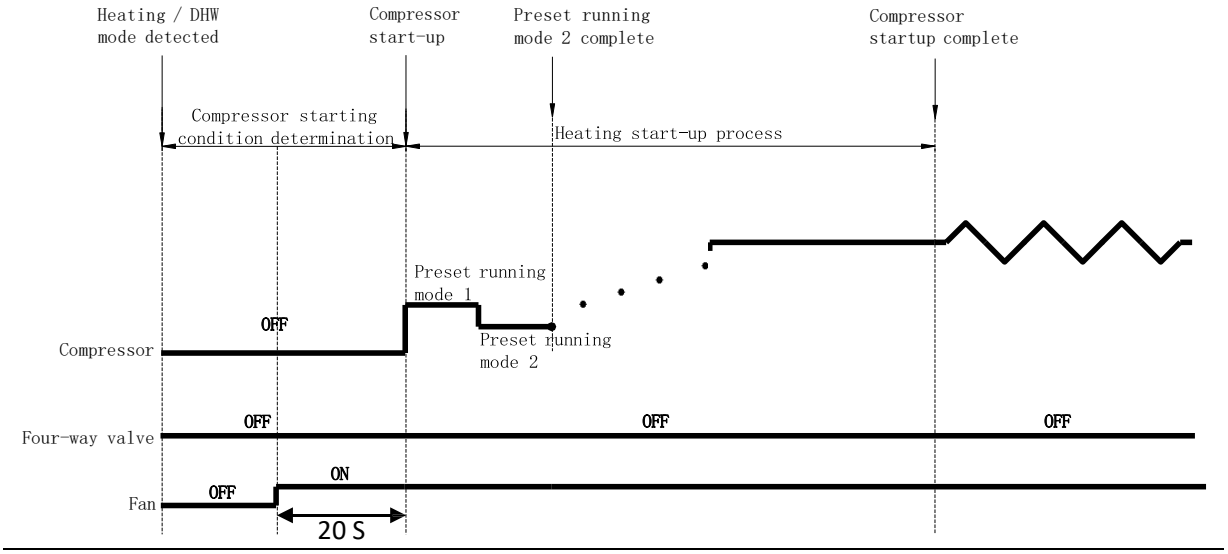
Heating start mode 1

Compressor startup program when heating mode ambient temperature is above 0°C



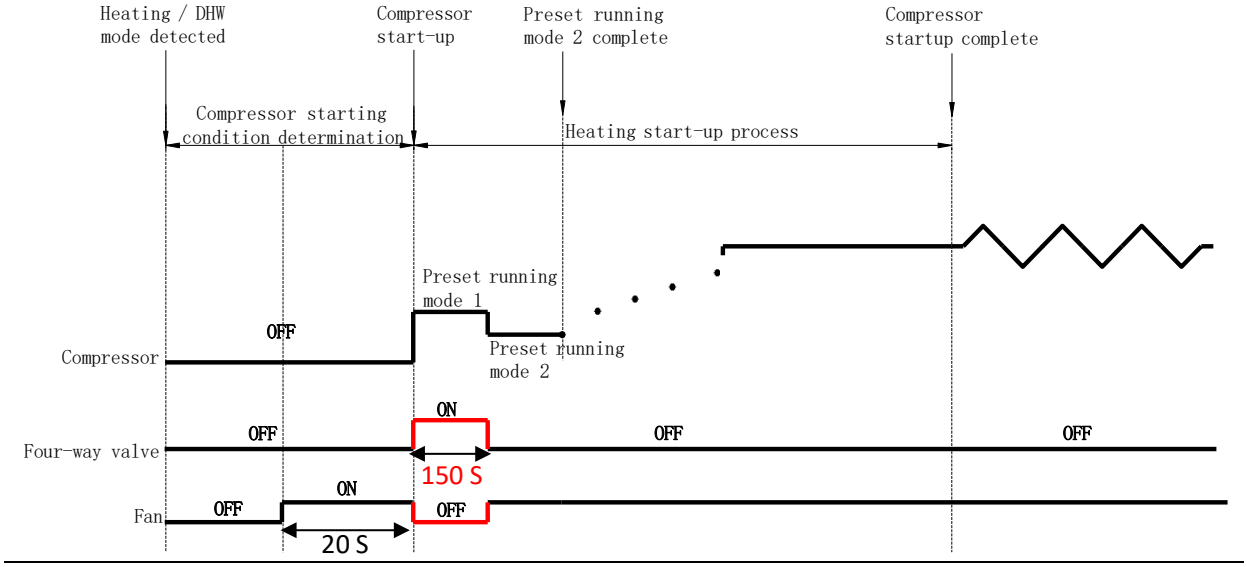
Heating start mode 2

Compressor startup program when heating mode ambient temperature is below 0°C



Heating start mode 3

Compressor startup program when heating mode ambient temperature is below -20°C and discharge temperature is below 5°C



Note: Preset running mode 1 and Preset running mode 2 are the two frequencies at which the compressor operates

Component control during startup in heating and domestic hot water modes

Component	Wiring diagram label	26-35 kW	Control functions and status
Inverter compressor	COMP	•	Compressor startup program selected according to ambient temperature[1]
DC fan motor	FAN	•	Fan runs at maximum speed[2]
Electronic expansion valve	EEV1	•	Increments from 0 (fully closed) to 480 (fully open), controlled according to outdoor ambient temperature, discharge temperature, suction superheat, compressor speed and refrigerant system pressure
Four-way valve	4-WAY	•	OFF

Notes:
1. Refer to “Startup Control -Unit Startup”.
2. Refer to “Normal Operation Control - Outdoor Fan Control”

4 Normal Operation Control

4.1 Component Control during Normal Operation

Component control during heating and domestic hot water (DHW) operations

Component	Wiring diagram label	26-35 kW	Control functions and status
Inverter compressor	COMP	•	Controlled according to load requirement determined by temperature and outdoor water temperature settings.
DC fan motor	FAN	•	Controlled according to outdoor heat exchanger pipe temperature
Electronic expansion valve	EEV1	•	Increments from 0 (fully closed) to 480 (fully open), controlled according to outdoor ambient temperature, discharge temperature, suction superheat, compressor speed , refrigerant system pressure and temperature
Four-way valve	4-WAY	•	OFF

Component control during cooling operation

Component	Wiring diagram label	26-35 kW	Control functions and status
Inverter compressor	COMP	•	Controlled according to load requirement determined by temperature and outdoor water temperature settings.
DC fan motor	FAN	•	Controlled according to outdoor heat exchanger pipe temperature
Electronic expansion valve	EEV2	•	Increments from 0 (fully closed) to 480 (fully open), controlled according to outdoor ambient temperature, discharge temperature, suction superheat, compressor speed and refrigerant system pressure
Four-way valve	4-WAY	•	ON

4.2 Compressor Output Control

The compressor rotation speed is influenced by the load requirement. Before compressor startup, the outdoor unit calculates the target speed based on the outdoor ambient temperature, set leaving water temperature, and actual leaving water temperature. It then runs the appropriate compressor startup program. (Refer to Part 3.2 “Compressor Startup Program”). After completion of the startup program, the compressor operates at the specified rotation speed. During operation, compressor speed is modulated based rate of water temperature change, refrigerant system pressure and the refrigerant temperature.

4.3 Compressor Frequency Control

The running speed of a four-pole compressor, measured in rotations per second (rps), is one third of the electrical input frequency in hertz (Hz) to the motor. The frequency of the electrical input to the compressor can be altered at a rate of 1Hz per second.

4.4 Four-way Valve Control

A four-way valve is employed to change the direction of the refrigerant flow through the water-side heat exchanger which enables switching between cooling and heating/DHW operations. The valve is open during cooling but closed during heating and DHW production.

4.5 Electronic Expansion Valve Control

Heating / Cooling electronic expansion valve (EEV1/EEV2)

The electronic expansion valve (EEV) is controlled in increments from 0 (fully closed) to 480 (fully open).

- At power-on:
  - The EEV first closes fully, then moves to the standby at the 480 increments position. After the compressor activates, the EEV control is determined by suction superheat discharge temperature, pressure, discharge temperature and compressor speed.
- When the outdoor unit is in standby mode:
  - The EEV is at the 480 increment.
- When the outdoor unit shut offs:
  - The EEV first moves to the 480 increment where it remains for 30 seconds. It then closes fully before moving to the standby position at the 480 increment.

EVI electronic expansion valve (EEV3)

The EVI electronic expansion valve is a control valve that controls the middle air supply of the compressor.

EEV3 controls the opening of the outlet superheat through the ECO board. EEV3 controls the outlet superheat between 2 °C and 5 °C. Efficient and reliable control through Proportion Integration Differentiation (PID) control. Determine that the compressor frequency is greater than 56 Hz and the exhaust superheat is greater than 15 °C, open the EEV3 valve. Close the EEV3, when the compressor frequency is low or the exhaust superheat is low.

4.6 Outdoor Fan Control

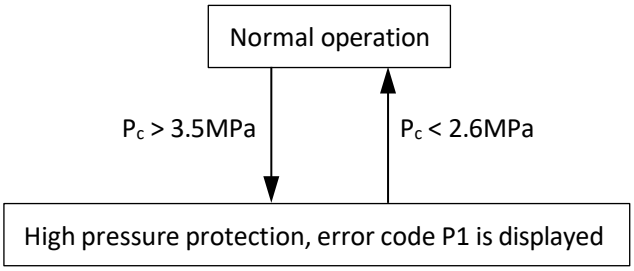
The outdoor unit fan speed can be adjusted in a series of incremental steps as shown below.

Fan speed control during operation					
Fan speed index	Upper Fan speed (rpm)	Lower Fan speed (rpm)	Fan speed index	Upper Fan speed (rpm)	Lower Fan speed (rpm)
W0	0	0	W17	460	460
W1	130	0	W18	490	490
W2	160	0	W19	520	520
W3	180	0	W20	550	550
W4	200	0	W21	580	580
W5	230	0	W22	610	610
W6	130	130	W23	640	640
W7	170	170	W24	670	670
W8	190	190	W25	700	700
W9	220	220	W26	730	730
W10	250	250	W27	760	760
W11	280	280	W28	790	790
W12	310	310	W29	810	810
W13	340	340	W30	850	850
W14	370	370	W31	880	880
W15	400	400	W32	920	920
W16	430	430	/	/	/

5 System protection features

5.1 High Pressure Protection

This feature protects the refrigerant system from abnormally high pressure and also protects the compressor from transient spikes in pressure.

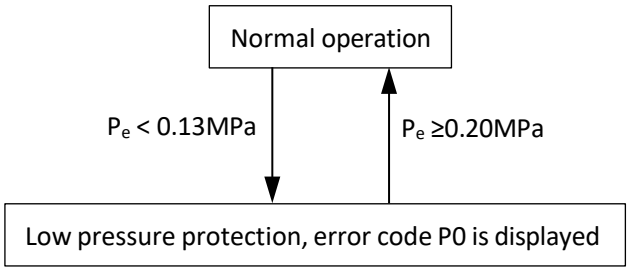


Notes:
1. P_c: Discharge pressure

When the discharge pressure rises above 3.5MPa the system displays the error code P1 and the unit shuts down. When the discharge pressure drops below 2.6MPa, the compressor restarts.

5.2 Low Pressure Protection

This feature protects the refrigerant system from abnormally low pressure and also protects the compressor from transient drops in pressure.



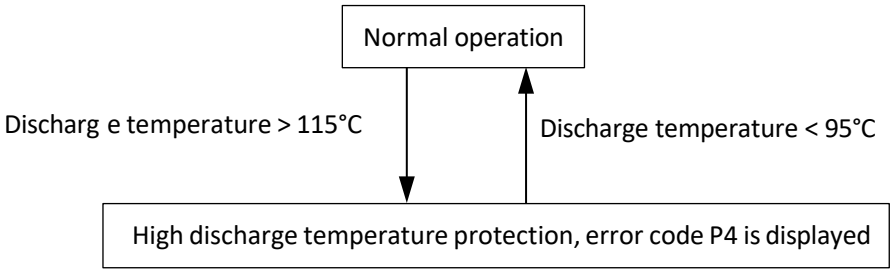
Notes:
1. P_e: Suction pressure

When the suction pressure drops below 0.13MPa the system displays the error code P0 and the unit shuts down. When the suction pressure rises above 0.2MPa, the compressor restart.

5.3 Discharge Temperature Protection

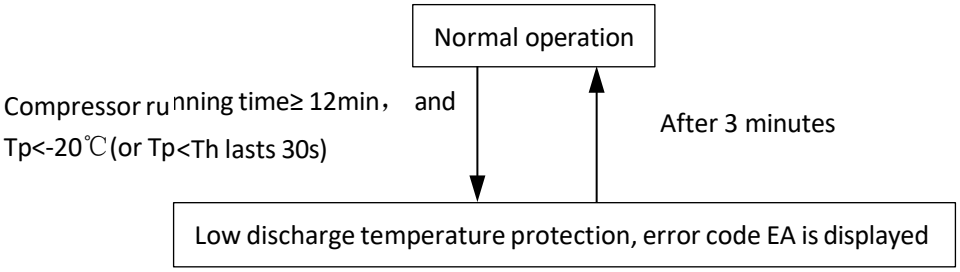
This control protects the compressor from abnormally high temperatures and transient spikes in temperature.

High discharge temperature protection control



When the discharge temperature rises above 115°C the system displays the error code P4 and the unit shuts down. When the discharge temperature drops below 95°C, the compressor enters re-start mode.

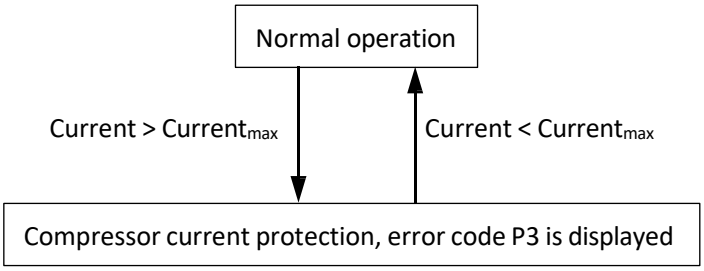
Low discharge temperature protection control



When the discharge temperature (Tp) is below suction temperature (Th) for more than 12 minutes after compressor operates, the system displays the error code EA and the unit shuts down. After 3 minutes the compressor enters re-start control.
Note: EA protection occurs 3 times within 2 hours, the outdoor unit cannot be restarted unless it is powered on again.

5.4 Compressor Current Protection

This control protects the compressor from abnormally high currents.

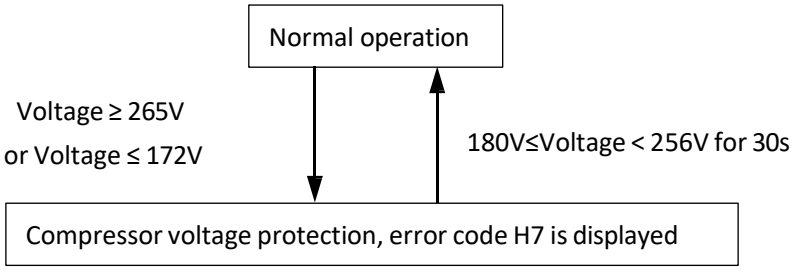


Model		26-35 kW
Current$_{max}$	Cool mode	33 A
	Heat or DHW mode	35 A

When the compressor current rises above Current$_{max}$ the system displays the error code P3 and the unit shuts down. When the compressor current drops below Current$_{max}$, the compressor enters re-start mode.

5.5 Voltage Protection

This protects the M-Thermal Split from abnormally high or abnormally low voltages.



When the phase voltage of AC power supply is at or above 265V, the system displays the error code H7 and the unit shuts down. When the phase voltage drops below 265V for more than 30 seconds, the refrigerant system restarts once the compressor re-start delay has elapsed. When the phase voltage is below 172V, the system displays the error code H7 and the unit shuts down. When the AC voltage rises to more than 180V, the refrigerant system restarts once the compressor re-start delay has elapsed.

5.6 DC Fan Motor Protection

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 shuts down. 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.

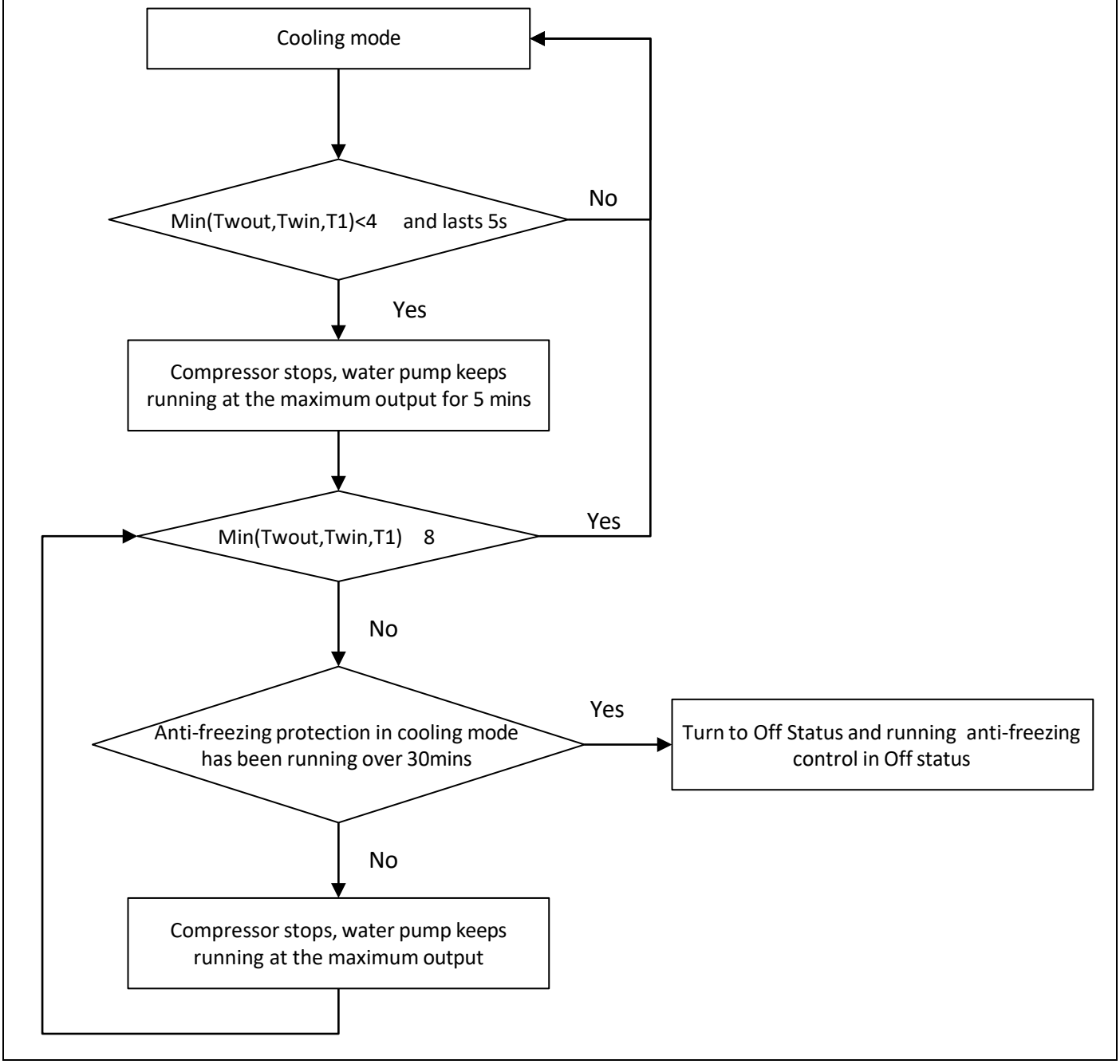
5.7 Anti-freezing Protection

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

In cooling mode, if inlet water temperature or leaving water temperature or auxiliary heat source leaving water temperature is below 4°C, the anti-freeze protection actions. In heating/DHW mode, if ambient temperature is below 3°C and inlet water temperature or leaving water temperature or auxiliary heat source leaving water temperature is below 4°C, the anti-freeze protection actions. In heating/DHW mode, leaving water temperature is below 2°C, the anti-freeze protection actions.

When water-side heat exchanger anti-freeze protection occurs the system displays error code Pb and the unit shuts down. .
Note: For the clear and concise understanding of anti-freeze protection, the diagram is illustrated as below.

Anti-freezing control in Cooling mode

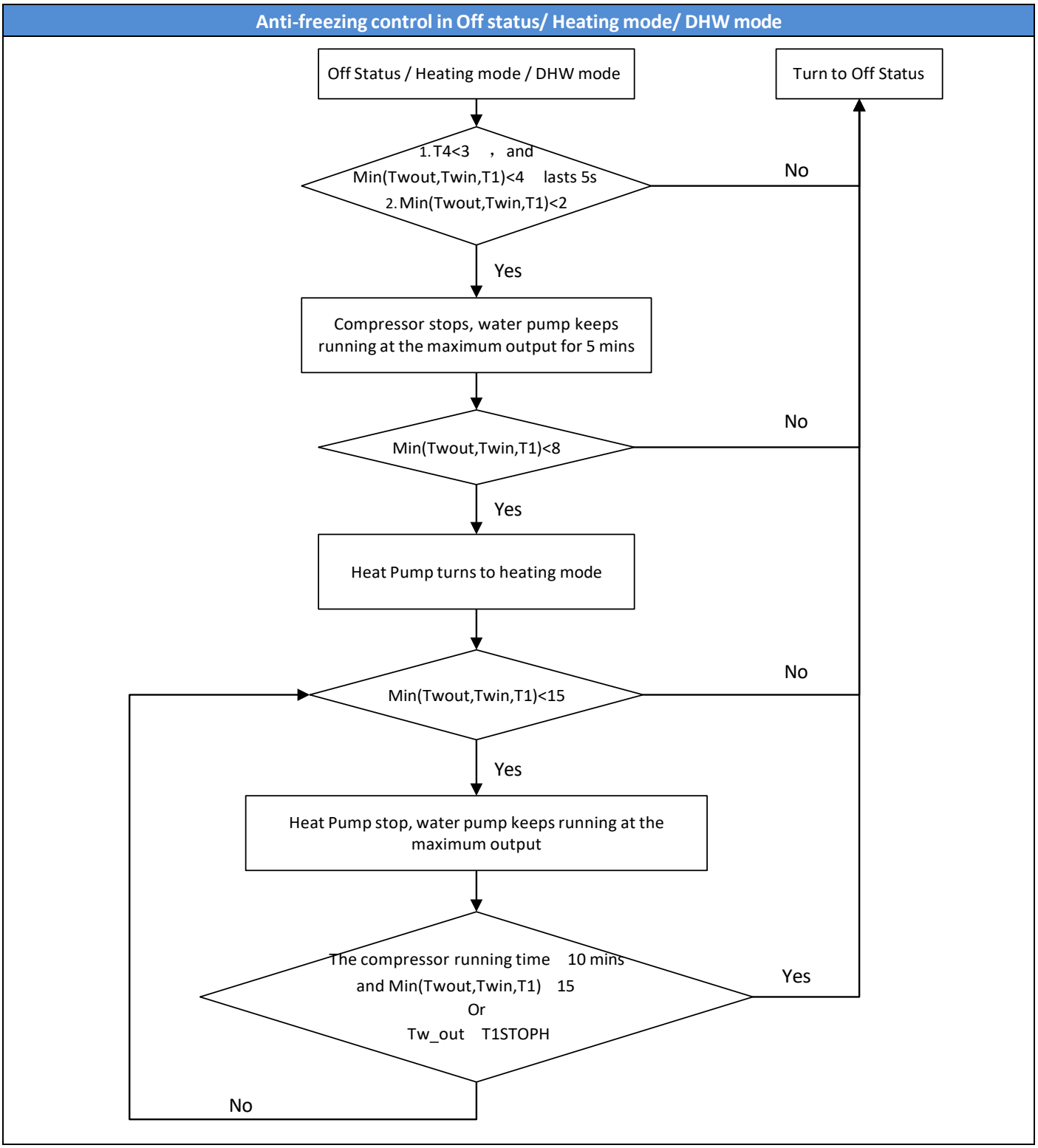


Tw_out: Plate heat exchanger outlet water temperature

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

6 Other Controls

6.1 Oil Return Function

In order to ensure the compressor maintains sufficient oil levels, an oil return function recovers oil that has flowed out of the compressor and into the refrigerant piping. When oil return is activated, the outdoor unit refrigerant system main PCB will display error code d0.

Oil return is activated when the following condition occurs:

- Compressor cumulative operating time with running rotation speed less than 42rps reaches 6 hours.

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

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

Component control during oil return operation in **cooling mode**.

Component	Wiring diagram label	26-35 kW	Control functions and status
Inverter compressor	COMP	•	Runs at oil return rotation speed
DC fan motor	FAN	•	Controlled according to cooling mode
Electronic expansion valve	EEV2	•	304 (steps)
Four-way valve	4-WAY	•	ON

Component control during oil return operation in **heating and DHW** modes.

Component	Wiring diagram label	26-35 kW	Control functions and status
Inverter compressor	COMP	•	Runs at oil return operation rotation speed
DC fan motor	FAN	•	Controlled according to heating mode
Electronic expansion valve	EEV1	•	304 (steps)
Four-way valve	4-WAY	•	OFF

6.2 Defrosting Function

In order to recover heating capacity, defrosting occurs when air-side heat exchanger of the outdoor unit acts as a condenser. Defrosting is automatically controlled based on the outdoor ambient temperature, the outlet temperature of the air-side heat exchanger refrigerant and the compressor run time.

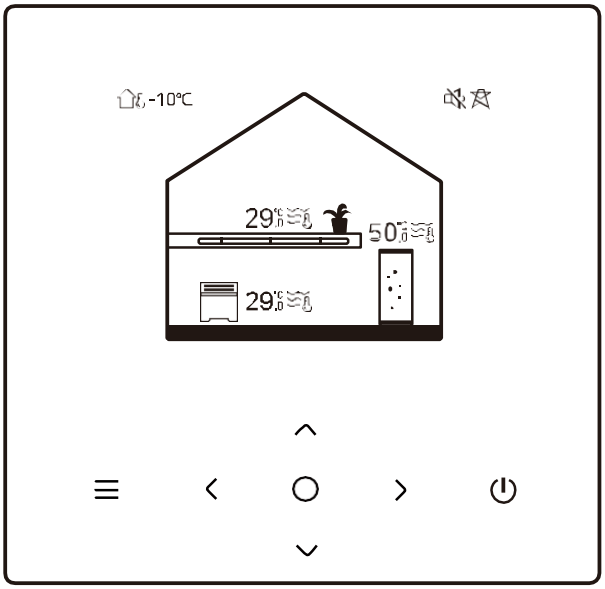
Component control during defrosting operation

Component	Wiring diagram label	26-35 kW	Control functions and status
Inverter compressor	COMP	•	Runs at defrosting operation rotation speed
DC fan motor	FAN	•	Off
Electronic expansion valve	EEV1	•	Fully open
Four-way valve	4-WAY	•	ON

7 User Interface Field Settings

7.1 Introduction

During installation, the installer determines settings based on configuration parameters, 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.

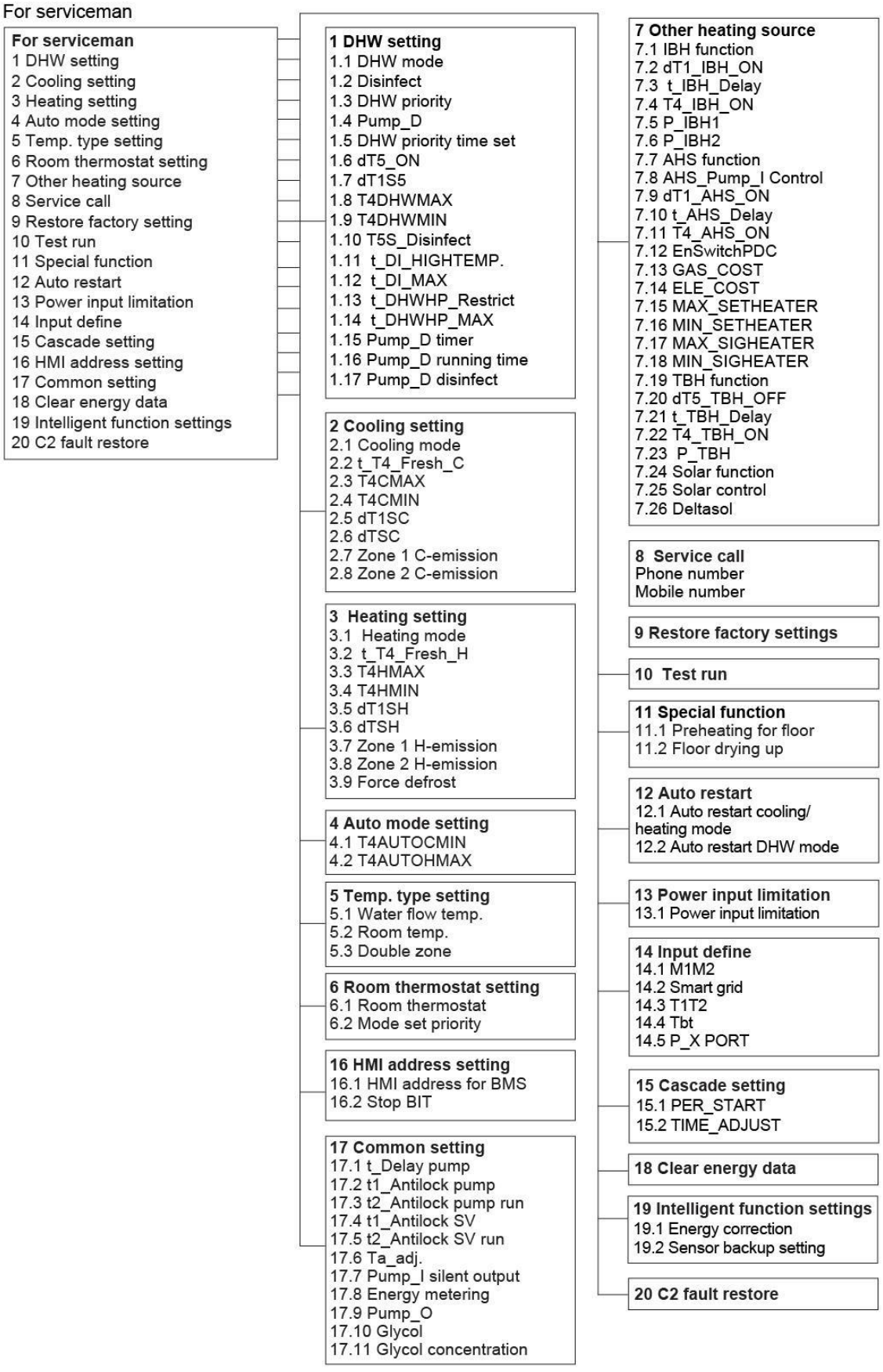


Icon	Name	Function
≡	Menu	From the home screen, press Return to the previous page Return to the previous page from a page other than the home screen
	Return	Hold for 2 seconds to return to the home page.(except in For serviceman mode, in USB function mode, in dry connector control mode)
○	Confirm	Confirm a selection Save settings Access the next page
⏻	ON/OFF	Turn on/off zone 1/zone 2/DHW indiviDoublely Press and hold for 3 seconds to turn on/off zone 1 / zone 2 / DHW all at once
^ < > v	Navigation	Press to activate the cursor which lets you settings. Holding for 1 second enables quick-start adjustments.

Combinations of buttons：

Press ≡ and › simultaneously for 3 seconds to enter the **FOR SERVICEMAN** menu.

7.2 Menu Structure



Functions may be disabled or unavailable and will not appear on the menu.

7.3 FOR SERVICEMAN Menu

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

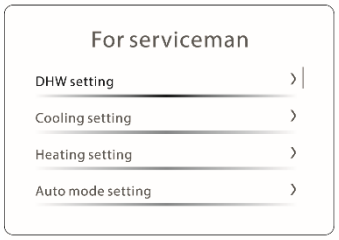
Press ≡ and › simultaneously for 3 seconds to enter the authorization page.

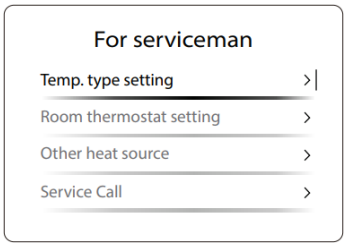


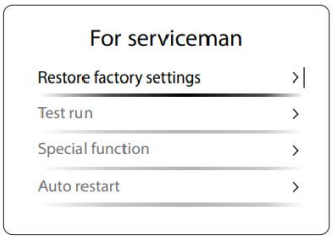
Press ‹ › to navigate cursor and press ◇ to adjust the numerical values. The password is 234. Press ↵ to enter **For serviceman** menu.

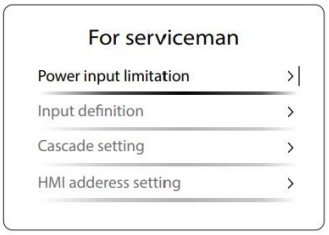


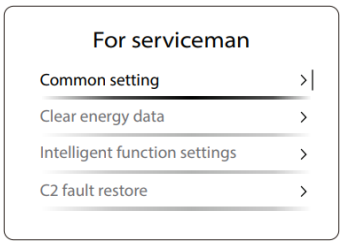
Then the following pages will be displayed:



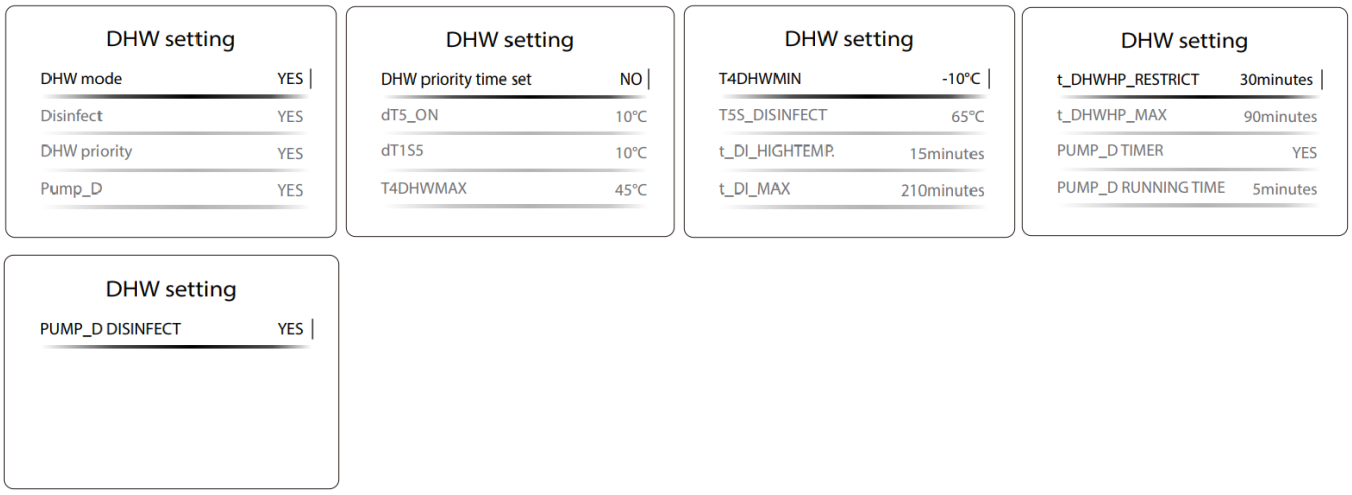








7.3.1 DHW heating setting



7.3.1.1 DHW mode

DHW mode is for configuring an installed DHW tank.

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 others **DHW setting,** all other settings in DHW setting will be invisible.

7.3.1.2 Disinfect, T5S_DISINFECT, t_DI_HIGHTEMP, t_DI_MAX

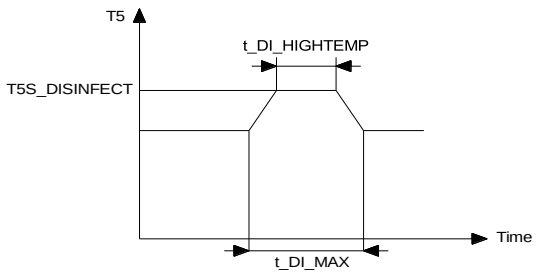
Disinfect defines whether disinfection function is activated.

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 how long that disinfection water target temperature is maintained..

t_DI_MAX defines maximum duration of entire disinfection cycle..



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 is given 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.

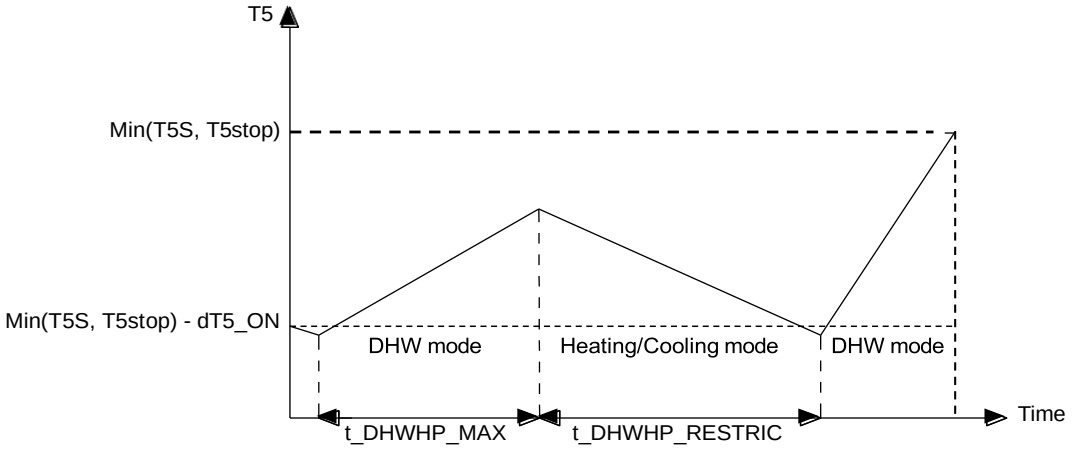
DHW priority time set defines whether **t_DHWHP_RESTRICT** (the operation time of heating/cooling mode) is to be considered before switching to DHW mode and conversely whether **t_DHWHP_MAX** (the operation time of DHW mode) is to be considered before switching to heating/cooling mode.

Setting	Description
YES	Enables setting of **t_DHWHP_RESTRICT, t_DHWHP_MAX**
NO	Disables 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.

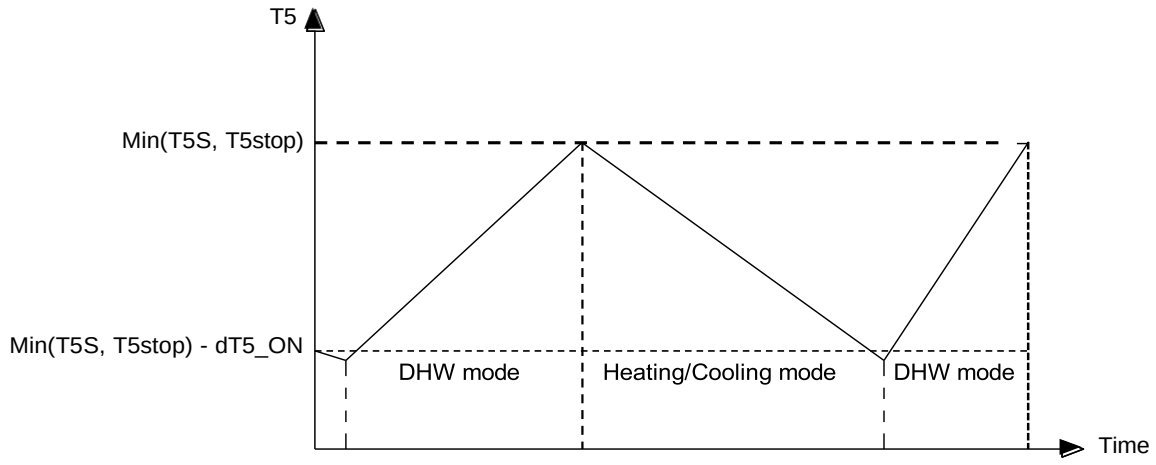
The diagram below illustrates the effects of **t_DHWHP_MAX** and **t_DHWHP_RESTRICT** when **DHW PRIORITY** and **DHW priority time set** are enabled.



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	&& DHW mode ON && T5<MIN(T5S, T5STOP)-dT5_ON && Heating/Cooling mode operates for A mins	|| DHW mode OFF || T5≥MIN(T5S, T5STOP) || DHW mode operates for B mins && Heating/Cooling mode ON
YES	NO	-	-	&& DHW mode ON && T5<MIN(T5S, T5STOP)-dT5_ON	|| DHW mode OFF || T5≥MIN(T5S, T5STOP) && Heating/Cooling mode ON
NO	-	-	-	&& DHW mode ON && T5<MIN(T5S, T5STOP)-1 && Heating/Cooling mode OFF	Heating/Cooling mode ON

Diagram below illustrates the effect of disabling **DHW priority time set**.



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

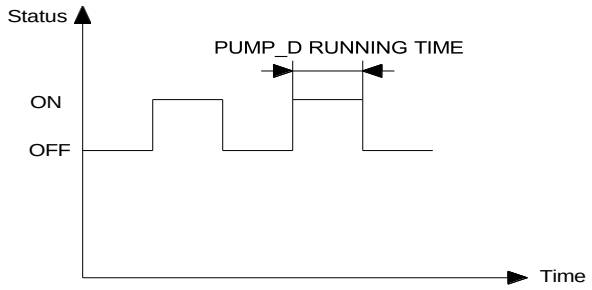
PUMP_D TIMER defines whether DHW pump operation schedule, which is defined in the user menu, is activated.

Setting	Description
YES	Enables DHW pump run with timer

NO	Disables DHW pump run with timer

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

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



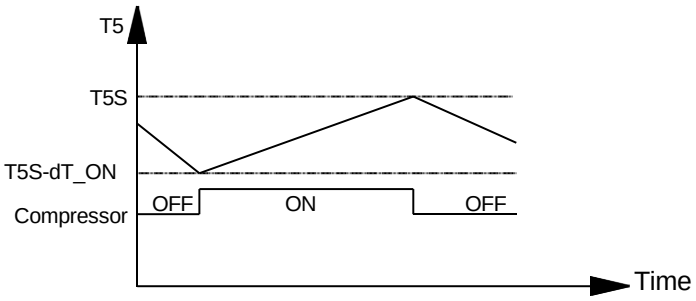
PUMP_D DISINFECT defines whether DHW pump operation is activated in disinfection mode.

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	Disables the DHW pump operation 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

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

T1S: Set leaving water 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

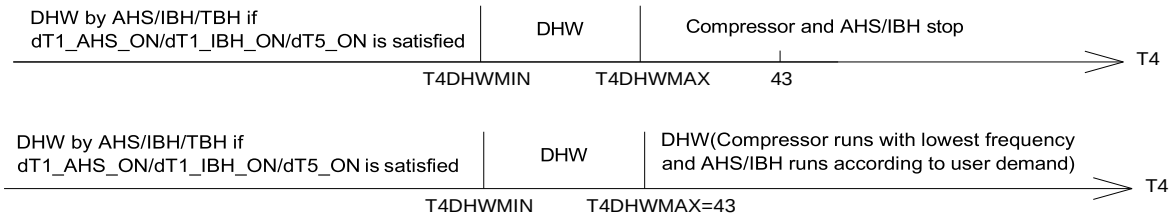
dT1S5: Temperature difference between Set leaving water temperature and tank water temperature modification value.

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.

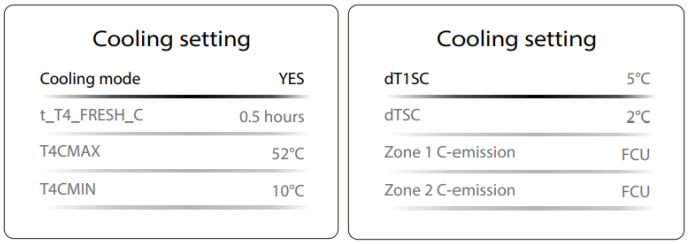
T4DHWMIN defines the ambient temperature below which heat pump stops, while AHS/IBH/TBH can run if dT1_AHS_ON/dT1_IBH_ON/dT5_ON is satisfied. (The minimum T4DHWMIN is set to -25 °C)

The diagram below illustrates the effects of **T4DHWMAX** and **T4DHWMIN.**



Abbreviations:
HP: Heat pump
TBH: DWH tank immersion heater
AHS: Auxiliary heat source
IBH: Electric heater

7.3.2 Cooling setting



7.3.2.1 Cooling mode

Cooling mode is for configuring cooling operation.

Setting	Description
YES	Enables cooling mode if space cooling terminals are installed.
NO	Disables 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

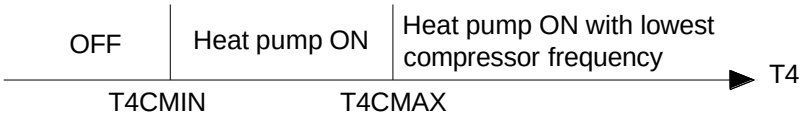
t_T4_FRESH_C defines the ambient temperature detection refresh cycle for climate curves.

7.3.2.3 T4CMAX, T4CMIN

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

T4CMIN defines ambient temperature below which heat pump will not operate.

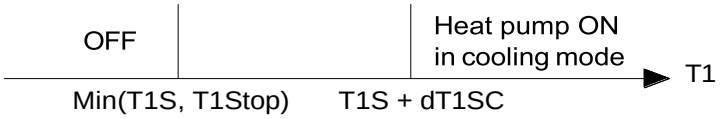
The diagram below illustrates the effects of **T4CMAX** and **T4CMIN.**



Abbreviations:
T4: Outdoor ambient temperature

7.3.2.4 dT1SC

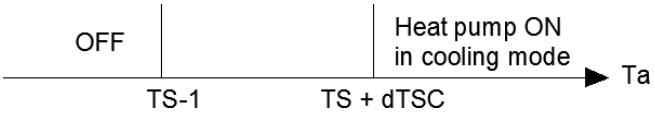
dT1SC defines water temperature hysteresis of activating heat pump.
When T1 – T1S ≥ dT1SC and heat pump is within operating ambient temperature range, heat pump provides chilled water to space cooling terminals.



Abbreviations:
T1: Leaving water temperature
T1S: Set leaving water 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.



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

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

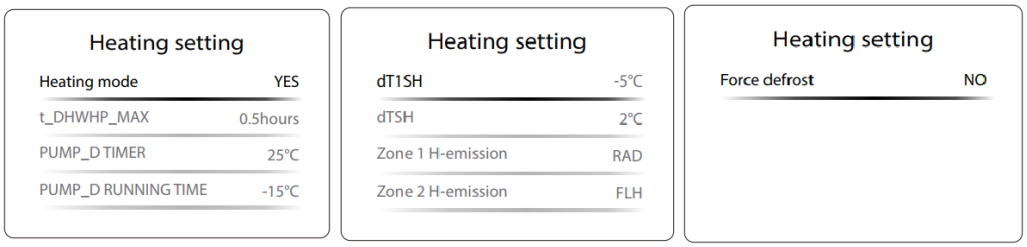
Zone 1 C-emission defines the terminal type of zone 1.

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 is for configuring heating operation.

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

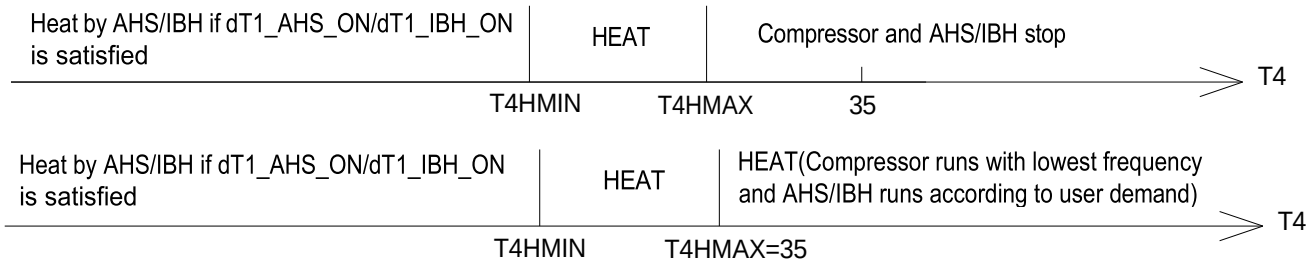
T4HMAX defines the ambient temperature above which heat pump and AHS/IBH may have different actions.

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.**



Abbreviations:

T4: Outdoor ambient temperature

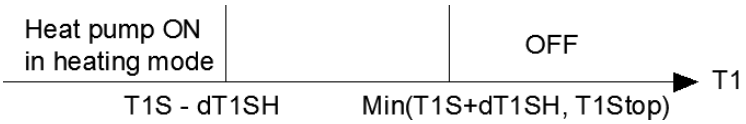
AHS: Additional heat source

IBH: Electric heater

7.3.3.4 dT1SH

dT1SH defines water temperature hysteresis of activating heat pump.

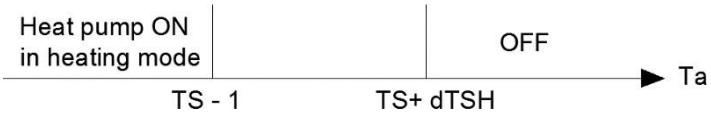
When T1≤T1S - dT1SH and heat pump is within operating ambient temperature range, heat pump provides hot water to the space heating terminals.



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



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

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

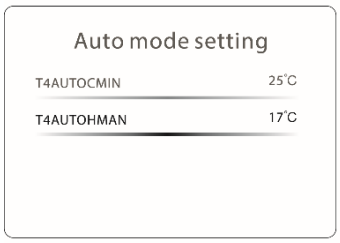
The same as Zone 1 C-emission and Zone 2 C-emission

7.3.3.7 Force defrost

Force defrost enabled 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	Disables **Force defrost** function
NO	Enables **Force defrost** function

7.3.4 Auto mode setting

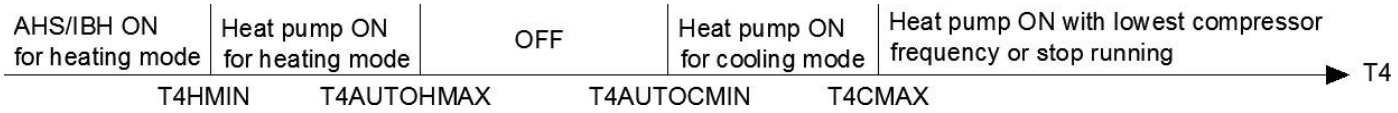


7.3.4.1 T4AUTOCMIN, T4AUTOHMAX

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

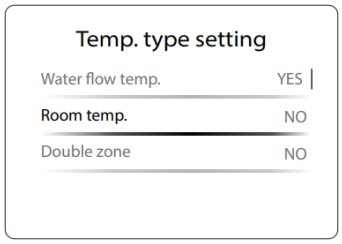
T4AUTOHMAX defines the ambient temperature above which the heat pump will not provide hot water for space heating in auto mode.

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

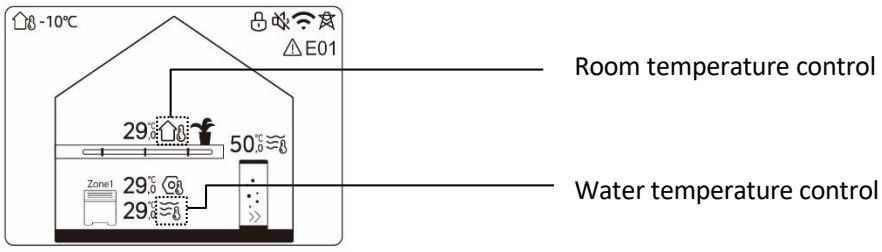


Abbreviations:
AHS: Additional heat source
IBH: Backup electric heater
T4CMAX: The ambient temperature above which heat pump operates with lowest compressor frequency
T4HMIN: The ambient temperature below which the heat pump will not operate in heating mode

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-zone control
NO	Single-zone control

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

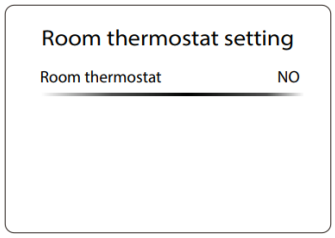
For single-zone control

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

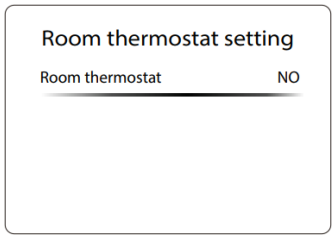


Room thermostat can be an alternate heat pump control solution.

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	• Define water temperature • Define mode (Only for heating mode)

	• Double zones control • All timers are invalid except DHW timers.	

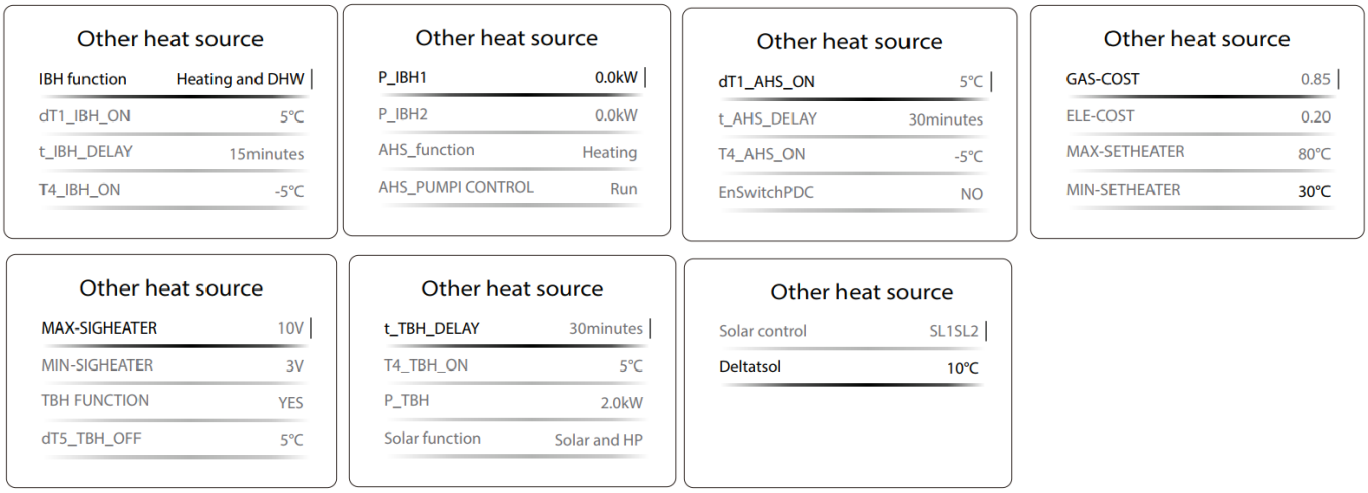
If **Room thermostat setting** is defined as MODE SET, the interface appears:



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

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

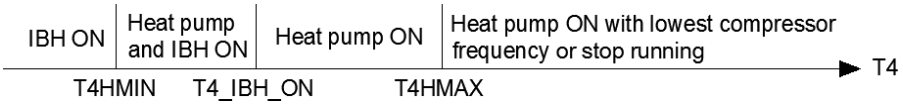
T1: Heat pump leaving water temperature

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.**



Abbreviations:
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 heat source function.

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

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

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

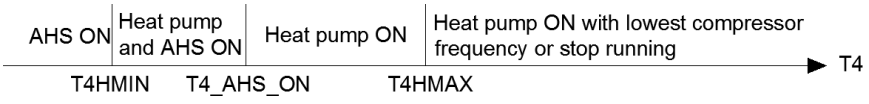
dT1_AHS_ON defines water temperature hysteresis of activating auxiliary heat source. When T1S - T1 ≥ dT1_AHS_ON the additional heat source is on.
T1S: Heat pump set leaving water temperature
T1: Heat pump leaving water temperature

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

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

Note: Only when dT1_AHS_ON, t_AHS_DELAY and T4_AHS_ON coincide will then auxiliary heat source turn on.

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



Abbreviations:
T4: Outdoor ambient temperature
AHS: Auxiliary heat 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 in heating mode with lowest compressor frequency.

7.3.7.3 EnSWITCHPDC, GAS_COST, ELE_COST

EnSWITCHPDC defines whether heat pump and additional heat 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 heat 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 heat 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 heat source "ON/OFF" signal, auxiliary heat source leaving water temperature automatically change as voltage changes.

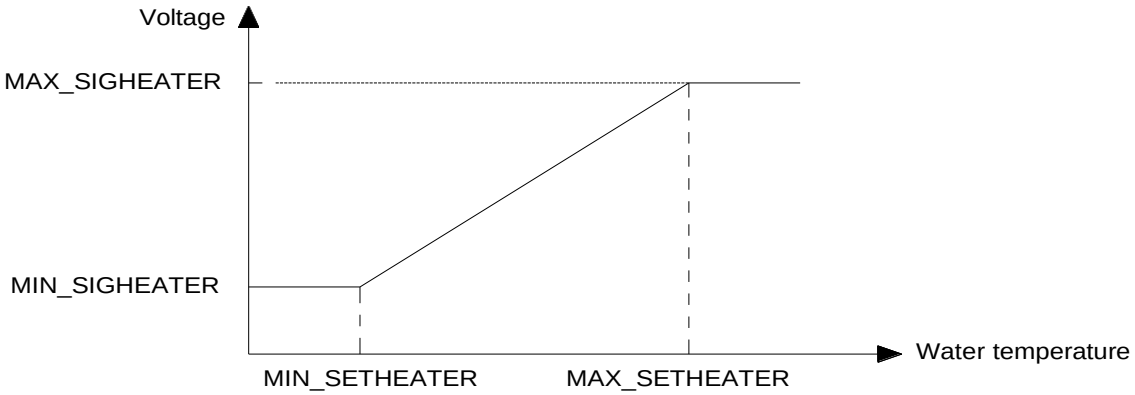
MAX_SETHEATER sets the maximum water temperature of auxiliary heat source.

MIN_SETHEATER sets the minimum water temperature of auxiliary heat source.

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

MIN_SIGHEATER sets the voltage corresponding to the minimum water set temperature of auxiliary heat 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	Disables tank booster heater function
NO	Enables 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

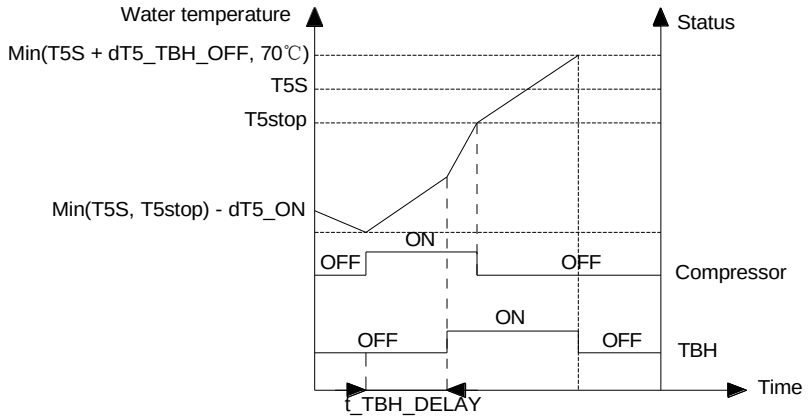
t_TBH_DELAY defines the delayed start-up time of tank booster heater. Tank booster heater will turn on **t_TBH_DELAY** minutes later after compressor starts.

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.

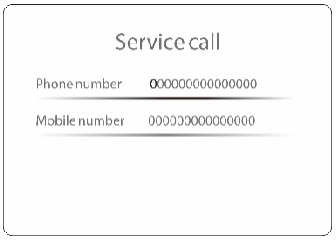
Solar control defines the control type of solar pump

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, the solar pump activates.

7.3.8 Service call



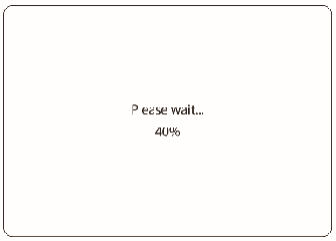
Phone number and **Mobile number** define after-sales service contact numbers. Press < > to navigate cursor and press ^ ˇ to adjust the numerical values. The maximum length of the phone numbers is 15 digits.

7.3.9 Restore factory settings

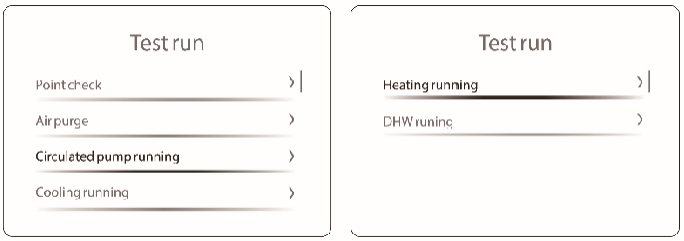


Restore factory settings is used to restore all the parameters (including energy metering data and WLAN setting) set in the user interface to factory defaults.

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

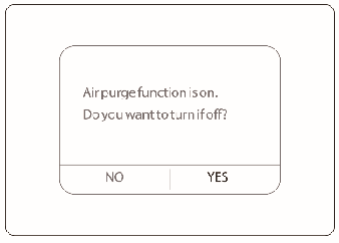


7.3.10 Test run

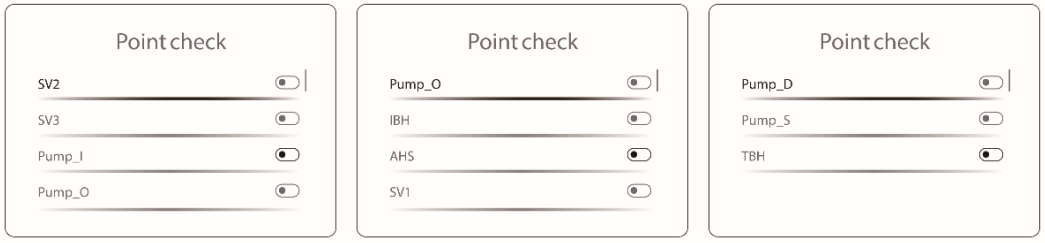


Test run is used to do the point check and check that air purge function, circulation pump, cooling mode, heating mode and DHW mode are all operating correctly. If any error code is displayed during the test run operation, the cause should be investigated.

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:



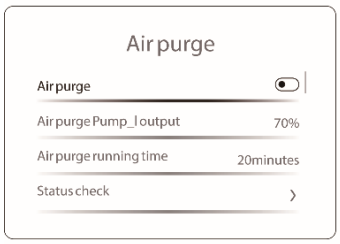
7.3.10.1 Point check



The **POINT CHECK** menu is used to check the operation of indiviDouble components. Use ^ ˇ 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

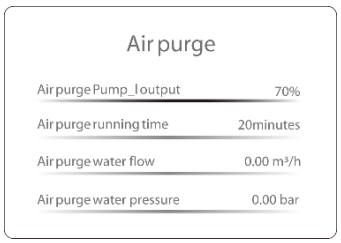


Once installation is complete, it is important to run the air purge function to remove any air which may be present in the water piping which could cause malfunctions during operation. Before running **Air purge** mode, make sure that the air purge valve is open. Pump_I will run according to the output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

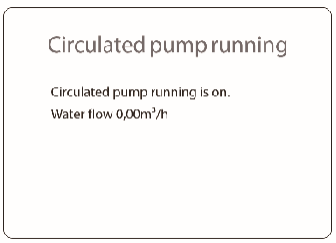
Air purge defines whether the function is activated.

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

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

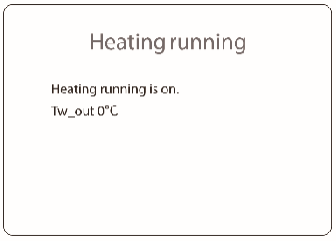
7.3.10.4 Cooling running



The **Cooling running** operation is used to check the operation of the system in space cooling mode.

During the **Cooling 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.

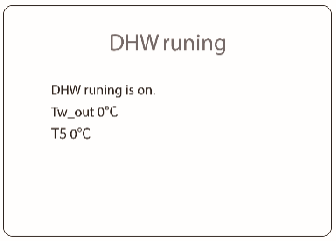
7.3.10.5 Heating running



The **Heating running** operation is used to check the operation of the system in space heating mode.

During **Heating running** operation, the default target outlet water temperature is 35°C. The IBH (backup heater) will turn on after the compressor runs for 10 min. The IBH will run for 3 minutes and then turn off. The heat pump will operate until the water temperature increases to a certain value or the next command is received.

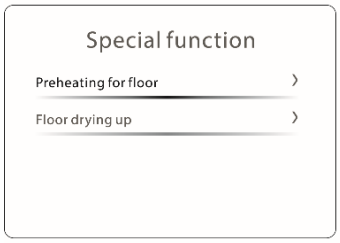
7.3.10.6 DHW running



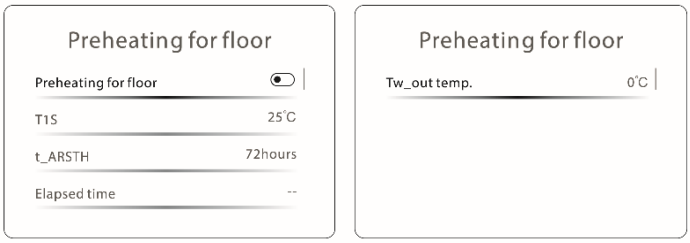
The **DHW running** operation is used to check the operation of the system in DHW mode.

During **DHW running** operation, 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. The heat pump will operate until the water temperature increases 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	Disables preheating for floor function
1	Enables preheating for floor function

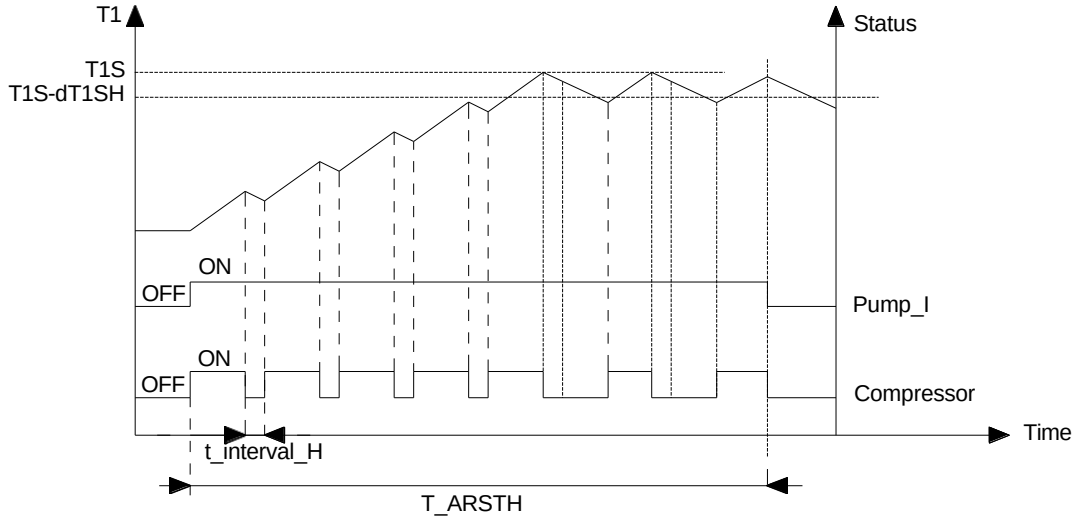
T1S defines heat pump leaving water temperature in preheating

T_ARSTH defines running time for first preheating of the floor

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

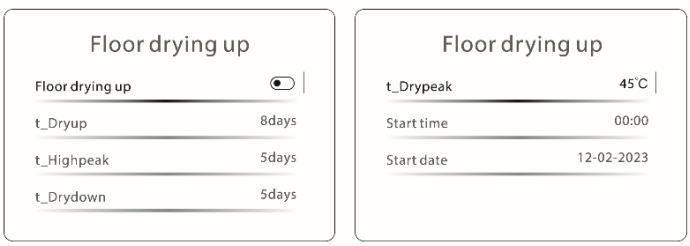
Tw_out temp. is the current leaving water temperature

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

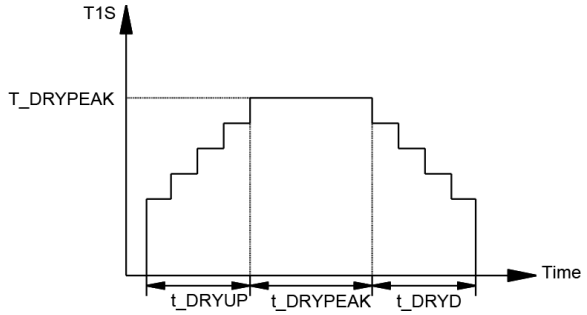


For newly-installed under-floor heating systems, floor drying up is necessary to remove moisture from the flooring and

subfloor to prevent warping or rupture. The heat pump provides mild heat to the concrete or other structural material around the underfloor water piping for a certain period of time to 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 heat source is available and configured to support space heating mode.

There are three phases to the floor drying up operation:

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



Floor drying up

Setting	Description
0	Disables floor draying up function
1	Enables floor draying up function

t_Dryup defines the duration of Phase 1.

t_Highpeak defines the duration of Phase 2.

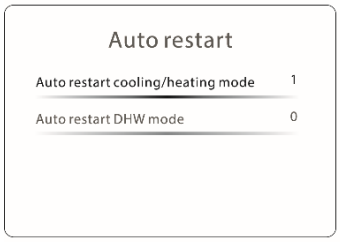
t_Drydown defines the duration of Phase 3.

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

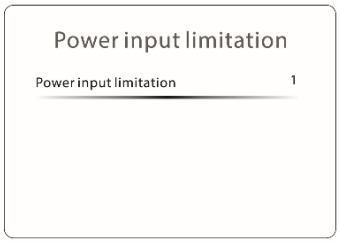
Setting	Description

NO	Disables auto restart cooling/heating mode
YES	Enables auto restart cooling/heating mode

Auto restart DHW mode

Setting	Description
NO	Disables auto restart DHW mode
YES	Enables auto restart DHW mode

7.3.13 Power input limitation

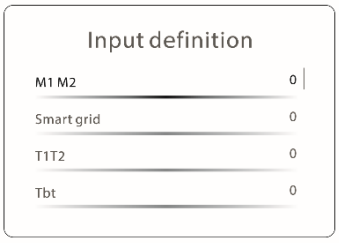


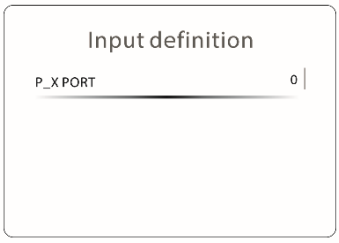
Power input limitation makes the unit suitable for a variety of current supplies. There are 8 configurations for user to choose according to the maximum allowable access current. If the unit will operate at larger current input, 1 should be selected. If the unit will operate at a lower current input,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

Power limitation function

Setting	Model		
	26kW	30kW	35kW
1	23A	26A	29A
2	22A	25A	28A
3	21A	24A	27A
4	20A	23A	26A
5	19A	22A	25A
6	18A	21A	24A
7	17A	20A	23A
8	16A	19A	22A

7.3.14 Input definition





INPUT DEFINE defines sensor and function preferences during 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 heat source

MBT Confidential

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

Setting	Description
NO	Disables Smart grid function
YES	Enables Smart grid function

T1 T2 defines control options of Port T1 T2

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

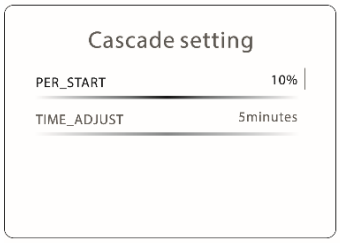
Tbt defines whether balance tank temperature sensors are installed in the balance tank.

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

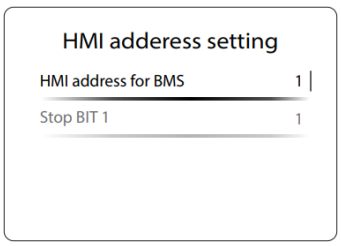


PER_START sets the start-up percentage of multiple units for the first time start-up after power on. For example:

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



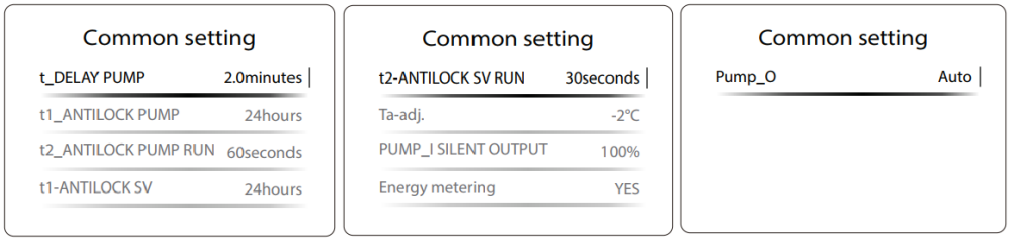
HMI ADDRESS FOR BMS sets the HMI address code for BMS (only valid for master controller)

STOP BIT sets 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.

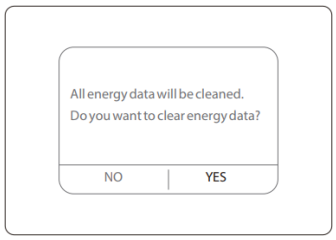
Setting	Description
NO	Disable energy metering function
YES	Enable energy metering function

7.3.17.6 Pump_O

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

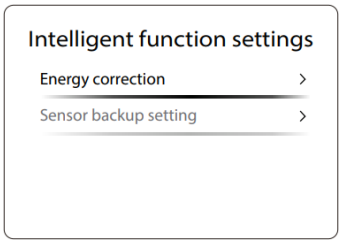
Setting	Description
ON	Pump_O keeps running
Auto	Pump_O operation is controlled by heat pump

7.3.18 Clear energy data

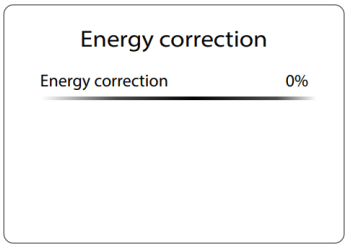


Once selecting YES, All energy metering data is clear.

7.3.19 Intelligent function settings



7.3.19.1 Energy correction

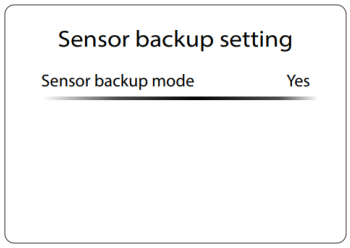


The actual installation scenario would be different from one to another. The energy metering calculation of the unit could deviate slightly due to the actual installation.

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**)

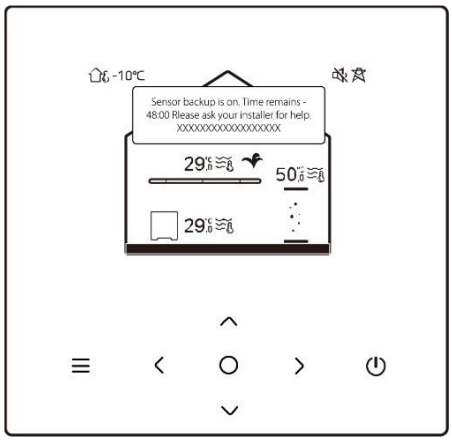
7.3.19.2 Sensor backup setting



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

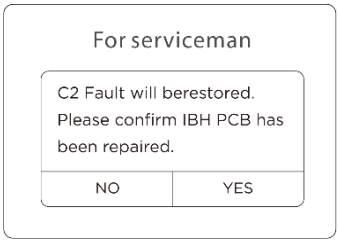
When Sensor backup setting function is activated, a bubble with text jumps out in the home page, in which the timer indicates for how long the unit can run normally before it shuts down.



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**:

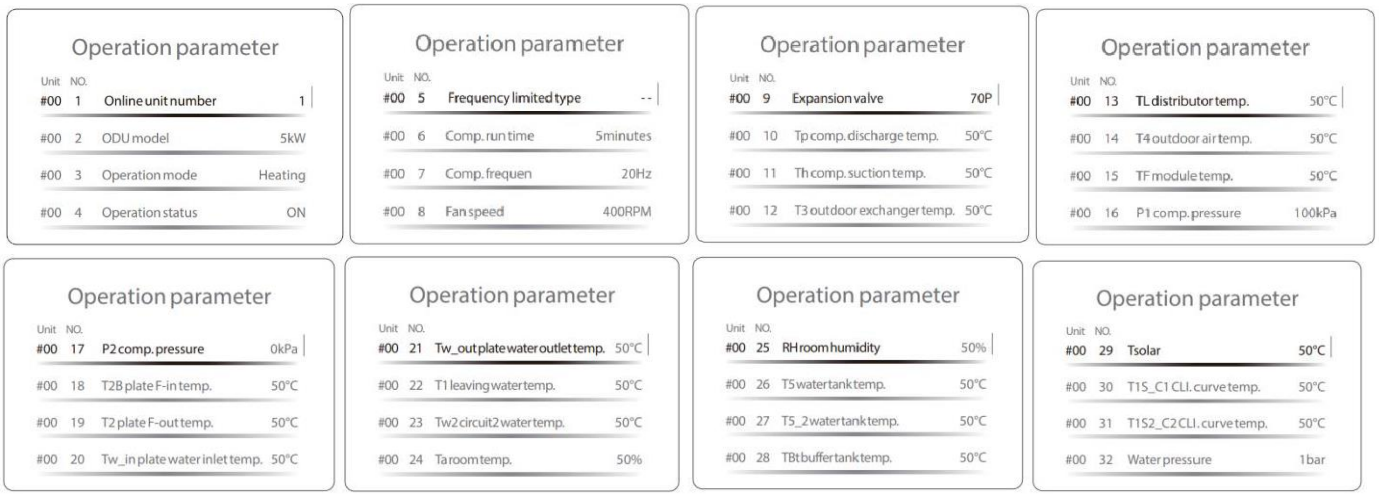
Step 1: Home page

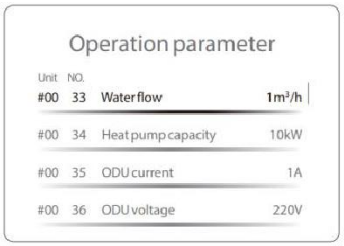
Step 2: Press "≡"

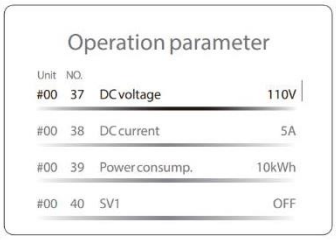
Step 3: Select "Unit status"

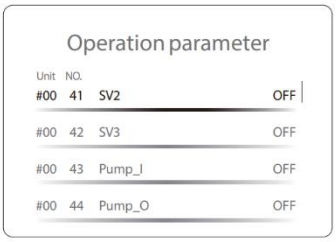
Step 4: Select "Operation parameter"

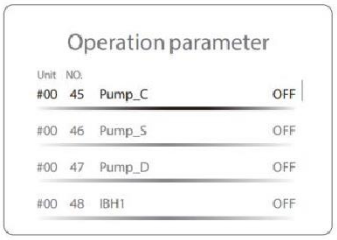
Step 5: Press ○

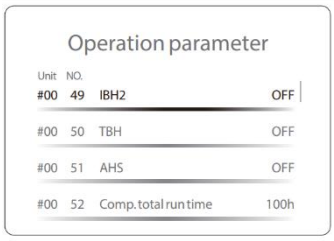


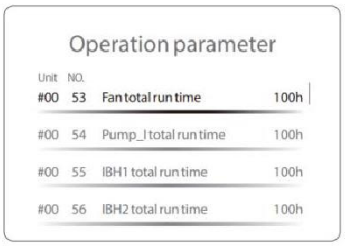

Operation parameter
Unit NO.
#00 33 Water flow 1m³/h
#00 34 Heat pump capacity 10kW
#00 35 ODU current 1A
#00 36 ODU voltage 220V

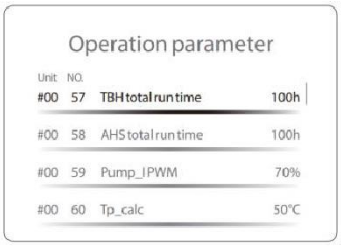

Operation parameter
Unit NO.
#00 37 DC voltage 110V
#00 38 DC current 5A
#00 39 Power consump. 10kWh
#00 40 SV1 OFF

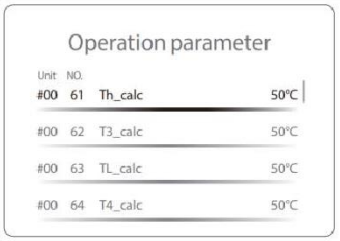

Operation parameter
Unit NO.
#00 41 SV2 OFF
#00 42 SV3 OFF
#00 43 Pump_I OFF
#00 44 Pump_O OFF

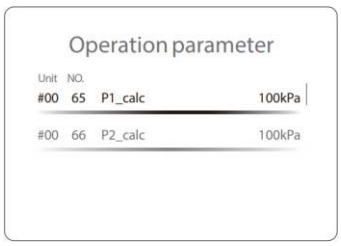

Operation parameter
Unit NO.
#00 45 Pump_C OFF
#00 46 Pump_S OFF
#00 47 Pump_D OFF
#00 48 IBH1 OFF


Operation parameter
Unit NO.
#00 49 IBH2 OFF
#00 50 TBH OFF
#00 51 AHS OFF
#00 52 Comp. total run time 100h


Operation parameter
Unit NO.
#00 53 Fan total run time 100h
#00 54 Pump_I total run time 100h
#00 55 IBH1 total run time 100h
#00 56 IBH2 total run time 100h


Operation parameter
Unit NO.
#00 57 TBH total run time 100h
#00 58 AHS total run time 100h
#00 59 Pump_I PWM 70%
#00 60 Tp_calc 50°C


Operation parameter
Unit NO.
#00 61 Th_calc 50°C
#00 62 T3_calc 50°C
#00 63 TL_calc 50°C
#00 64 T4_calc 50°C


Operation parameter
Unit NO.
#00 65 P1_calc 100kPa
#00 66 P2_calc 100kPa

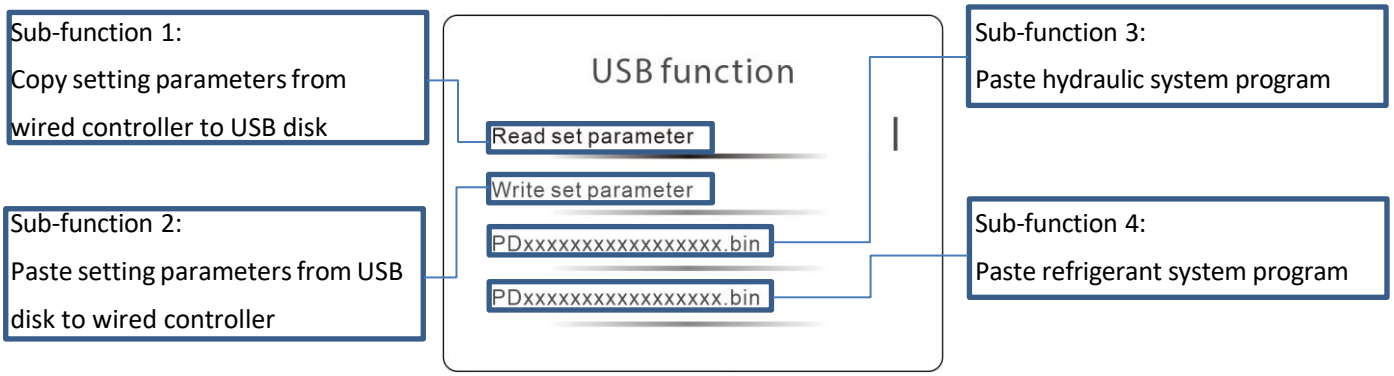
8 USB Function Field Settings

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

Main control PCB

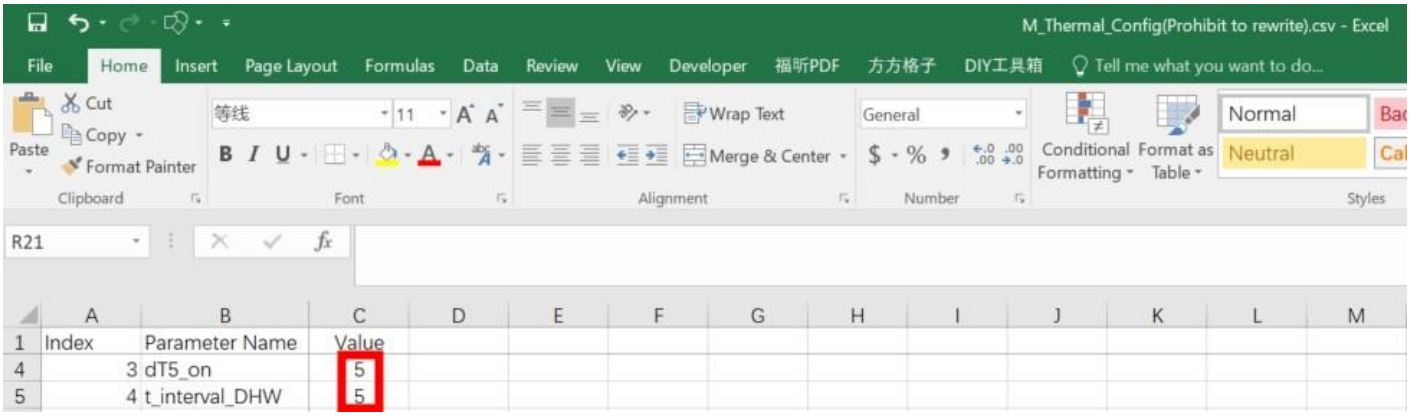


USB function interface



Sub-function 1:

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



Sub-function 2:

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

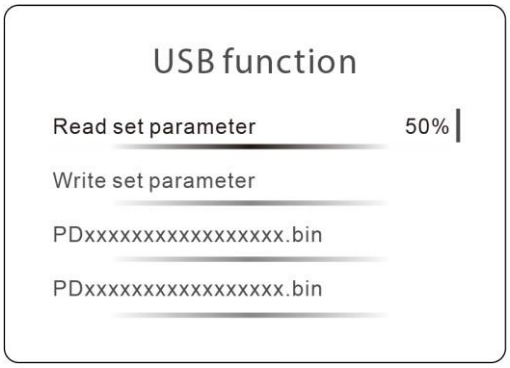
Sub-function 3:

Please make sure there is only one applicable hydraulic system program on the USB device 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. A progress indicator will then appear as shown below.



During this process, all buttons are non-operational.

When the process finishes, a pop-up window with the word “Success” will appear briefly and the unit stops. At this point, remove the USB device and restart the unit.

Should the process fail, pop-up window with the word “Fail” will appear briefly. The system program remains unchanged.

If the process stalls, please remove the USB device and reinsert it per the operation above.

Part 4
Diagnosis and Troubleshooting

1 Service Information 58
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3 Electric Control Box Layout 67
4 Outdoor Unit PCBs 68
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6 Troubleshooting 81
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8 Appendix to Part 4 138

1 Service Information

DANGER !

- These instructions are exclusively intended for qualified contractors and authorized installers
- Work on the refrigerant circuit with flammable refrigerant in safety group A3 may only be carried out by authorized 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 authorized by the installer.

1.1 Label for Refrigerant Presence

Equipment should be provided with a label stating that it has been de-commissioned and emptied of refrigerant. The label should be dated and signed. Ensure that proper labels are pasted on the equipment stating the equipment contains flammable refrigerant

1.2 Leak Detection Methods

The following leak detection methods are deemed acceptable for systems containing flammable refrigerants. An electronic leak detector should be used to detect flammable refrigerants, but its sensitivity may not be adequate, or the detector may need re-calibration. (Detection equipment should be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant. Leak detection equipment should be set at a percentage of the LFL of the refrigerant and should be calibrated to be suitable for the refrigerant employed. The appropriate percentage of gas (25% maximum) is confirmed. Leak detection fluids are suitable for use with most refrigerants but detergents containing chlorine should not be used as the chlorine may react with the refrigerant and corrode the copper pipes. If a leak is suspected, all naked flames should be removed or extinguished. If a leakage of refrigerant is found and brazing is required, all of the refrigerant should be recovered from the system, or isolated (by means of shut off valves) in a part of the system that is remote from the leak. Oxygen free nitrogen (OFN) should then be purged through the system both before and during the brazing process.

1.3 Check of Refrigeration Equipment

Where electrical components are to be changed, they should be fit for the intended purpose and comply with the correct specifications. Always follow the manufacturer's maintenance and service guidelines. In case of any doubt, consult the manufacturer's technical department for assistance. Check installations using flammable refrigerants.

- The amount of refrigerant to be charged depends on the size of the room where the refrigerant-containing parts are installed.
- The ventilation machinery and outlets should work adequately and be not obstructed.
- If an indirect refrigerating circuit is used, the secondary circuits should be checked for any refrigerant; Markings on the equipment should be visible and legible.
- Illegible markings and signs should be corrected.
- Refrigeration pipes or components should be installed in positions where they are unlikely to be exposed to any

substance that may corrode refrigerant-containing components, unless the components are constructed of materials that are inherently resistant to corrosion or are suitably protected from corrosion

1.4 Check of Electrical Devices

Repair and maintenance of electrical components should include initial safety checks and component inspection procedures. If a fault exists and could compromise safety, no electrical supply should 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 should be adopted. This should be reported to the owner of the equipment so all parties are advised. Repair and maintenance of electrical components should include initial safety checks and component inspection procedures. If a fault exists and could compromise safety, no electrical supply should 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 should be adopted. This should be reported to the owner of the equipment so all parties are advised. Initial safety checks should include the following:

- The capacitors should be discharged in a safe manner to avoid sparking risks
- No live electrical components and wiring can be exposed during the system charging, recovery or purging. Earth bonding should be continuous
- Earth bonding should be continuous

1.5 Repair of Sealed Components

1. During repair of sealed components, all electrical supplies should be disconnected from the equipment being worked upon prior to any removal of sealed covers. If it is absolutely necessary to have an electrical supply connected with the equipment during servicing, a permanently operating form of leak detection should be located at the most critical point to warn of a potentially hazardous situation.
2. Particular attention should be paid to the following to ensure that, by working on electrical components, the casing is not altered in such a way that Protection is compromised. This should include damage to cables, an excessive number of connections, terminals not made as per original specifications, damage to seals, and incorrect fitting of glands.
   - Ensure that all apparatuses are mounted securely.
   - Ensure that seals or sealing materials have not degraded such that they can no longer prevent the ingress of flammable atmospheres. Parts for replacement should be in accordance with the manufacturer s specifications.
   - The use of silicon sealant may inhibit the effectiveness of some types of leak detection equipment. Intrinsically safe components do not have to be isolated prior to working on them.

1.6 Repair of Intrinsically Safe Components

Do not apply any permanent inductive or capacitance loads to the circuit without ensuring that such loads will not exceed the permissible voltage or current permitted for the equipment in use. Intrinsically safe components are the only types that can be worked on when the components live in a flammable atmosphere. The test apparatus should be provided with the correct rating. Replace components only with parts specified by the manufacturer. Other parts may result in the ignition of refrigerant in the atmosphere caused by a leak.

1.7 Transportation and Marking

Transport the equipment containing flammable refrigerants in accordance with the transport regulations. Mark the equipment with signs in compliance with local regulations.

1.8 Disposal

1.8.1 General

- Components and accessories of the unit are not ordinary domestic wastes.
- The unit, compressors, and motors, etc. can only be disposed of by qualified specialists.
- This unit uses hydrofluorocarbon that can only be disposed of by qualified specialists

1.8.2 Packaging



- Dispose of the packaging properly.
- Observe all relevant regulations

1.8.3 Refrigerant Removal, Evacuation, Charge, Recovery, and Unit Decommissioning

WARNING !

Due to the feature of the R290 refrigerant, only carry out work when you have specific expert refrigeration knowledge and are competent for handling R290 refrigerant.
Work on the refrigerant circuit with flammable refrigerant in safety group A3 may only be carried out by authorized heating contractors.

1.8.3.1 Removal and evacuation

When breaking into the refrigerant circuit for repair or any other purpose, follow the conventional procedures. However, it is important to follow the best practice since flammability should be considered. Operate as per the following procedure:

- Remove refrigerant;
- Purge the circuit with inert gas;
- Evacuate;
- Purge the circuit again with inert gas;
- Open the circuit by cutting or brazing

The refrigerant charged should be recovered and put in correct recovery cylinders. The system should be flushed with OFN to guarantee the unit safety. This process may need to be repeated several times. Compressed air or oxygen should not be used.
Flushing should be achieved by filling the system with OFN until the working pressure is achieved before venting to the atmosphere, and recovering the system to a vacuum. This process should be repeated until no refrigerant exists in the system. Upon the final OFN charge, the system should be vented down to reach the atmospheric pressure to start the work.
This operation is absolutely vital if brazing operations on the pipe-work are to take place.
Ensure that the outlet of the vacuum pump is not closed to any ignition sources and adequate ventilation is available.

1.8.3.2 Charging procedures

In addition to conventional charging procedures, the following requirements should be followed:

- Ensure that contamination of different refrigerants does not occur when charging equipment is used. Hoses or lines should be as short as possible to minimize the amount of refrigerant contained in them.
- Earth the refrigeration system prior to charging the system with refrigerant.
- Label the system upon completion of the charging (if the system has not been labeled).
- Extreme care should be taken not to overfill the refrigeration system.
- Prior to recharging the system, test it with OFN. The system should be leak tested upon completion of charging but prior to commissioning. Carry out a follow-up leak test before leaving the site.

1.8.3.3 Recovery

When removing refrigerant from the system, either for service or decommissioning, we recommend you remove all refrigerants safely by following the best practice.
When transferring refrigerant into cylinders, only use appropriate refrigerant recovery cylinders. Ensure that a proper number of cylinders are available for accommodating all the refrigerant. All cylinders to be used are designated and labeled for the recovered refrigerant (i.e., special cylinders for the recovery of refrigerant). The cylinders should be complete with pressure relief valves and associated shut-off valves that work properly.
Empty recovery cylinders should be evacuated and, if possible, cooled before the recovery starts.
The recovery equipment should work properly with a set of instructions concerning the equipment at hand, and should be suitable for the recovery of flammable refrigerants. In addition, a set of calibrated weighting scales should be available and work properly. Hoses should be complete with leak-free disconnection couplings and in good conditions. Before using the

recovery equipment, check and verify that it works properly and has been properly maintained, and that any associated electrical components are sealed to prevent ignition in the event of a refrigerant leakage. Consult the manufacturer in case of any doubt.

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

If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to ensure that flammable refrigerant does not remain within the lubricant. Carry out the evacuation process before returning the compressor to the suppliers. To accelerate this process, you can only heat the compressor body electrically. Safety drain oil from the system.

1.8.3.4 Decommissioning

Prior to this procedure, the technician should be completely familiar with the equipment and all its details. It is recommended that all refrigerants be recovered safely. Prior to the recovery, an oil and refrigerant sample should be taken for case analysis before re-use of reclaimed refrigerant. Electrical power should be available before the task is commenced.

1. Be familiar with the equipment and its operation.
2. Isolate the system electrically
3. Before attempting the procedure ensure that:
   - Mechanical handling equipment is available, if required, for handling refrigerant cylinders.
   - All personal protective equipment should be available and used securely.
   - The recovery process should be supervised at all time by a competent person.
   - Recovery equipment and cylinders should conform to the appropriate standards.
4. Pump down the refrigerant system, if possible.
5. If a vacuum is not possible, provide a manifold to remove the refrigerant from various parts of the system.
6. Ensure that the cylinders are situated on the scales before the recovery starts.
7. Start the recovery machine and operate it in accordance with the manufacturer's instructions.
8. Do not overfill the cylinders (for no more than 80% of the volume).
9. Do not exceed the maximum working pressure of the cylinders, even temporarily.
10. When the cylinders have been filled securely and the process is completed, immediately remove the cylinders and the equipment from the site and close all isolation valves on the equipment.
11. The recovered refrigerant should not be re-used in any other refrigeration system unless it has been cleaned and checked.

1.9 R290 System Service

When repairing systems that use R290 refrigerant, the following warnings and operating requirements should be noted.

1.9.1 Warning about the R290 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 R290 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 minimize 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 minimize 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.

1.9.2 Qualification requirements for maintenance personnel



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 authorized installers

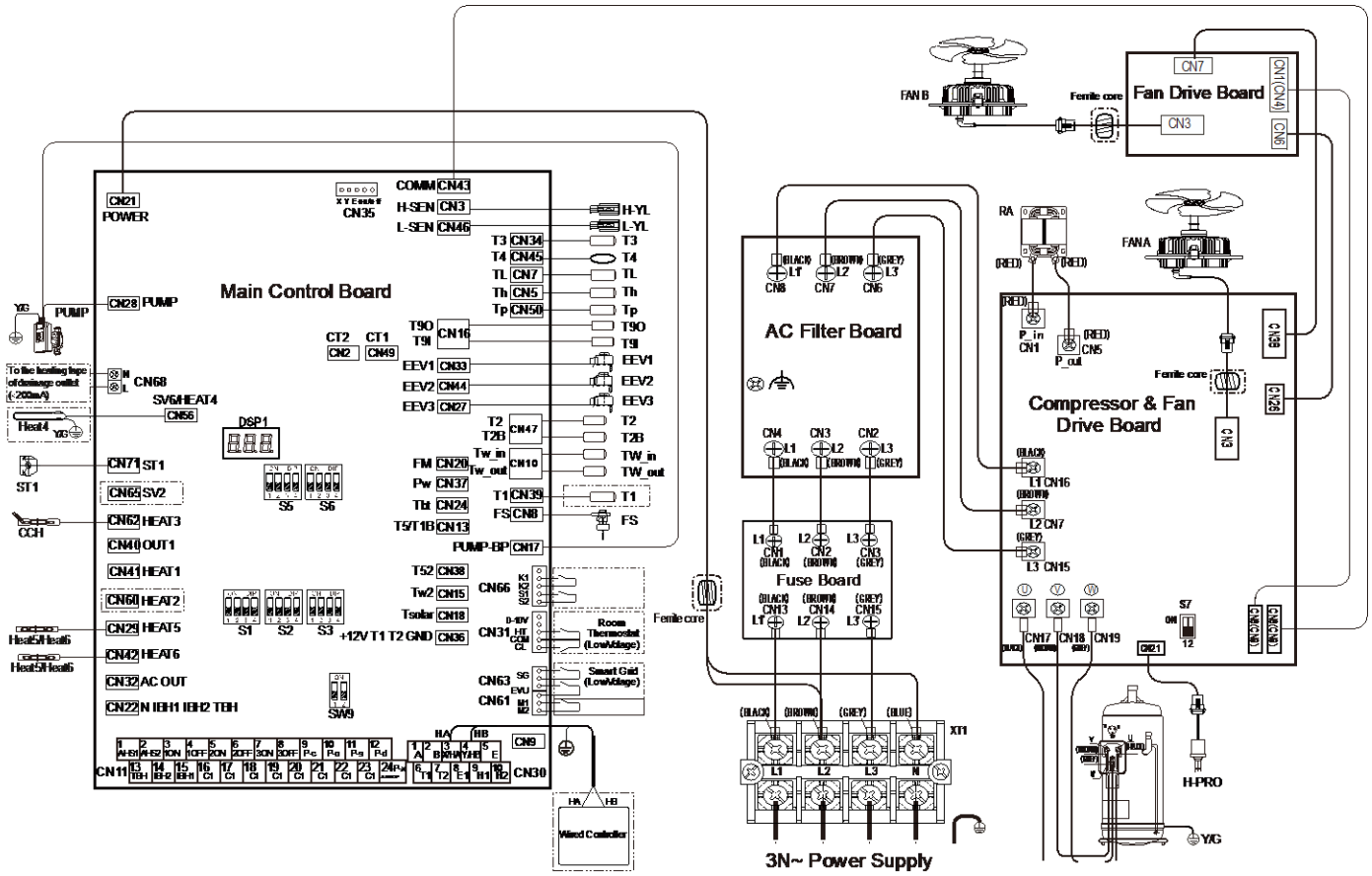
Work on the refrigerant circuit with flammable refrigerant in safety group A3 may only be carried out by authorized heating contractors. These heating contractors must be trained in accordance with EN 378 Part 4 or IEC 60335-2-40, Section HH. The certificate of competence from an industry accredited 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 authorized by the installer.

2 Electric wiring diagram



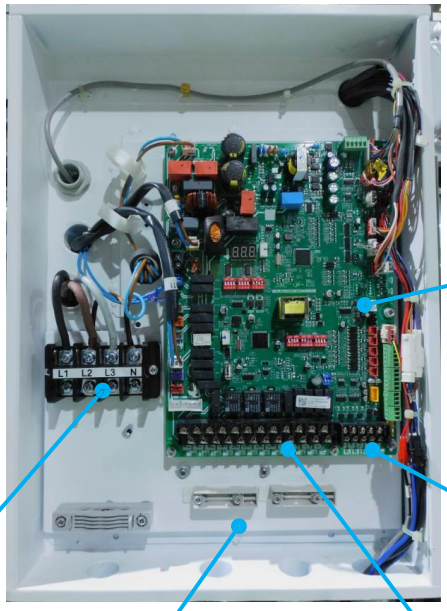
CN11

1	2	3	4	5	6	7	8	9	10	11	12	
AHS		SV1		SV2		SV3		P_c	P_o	P_s	P_d	⚠

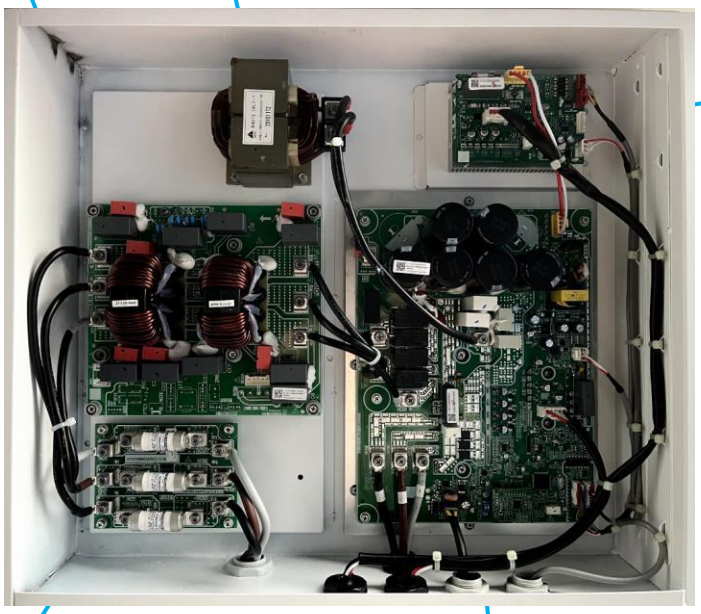
	13	14	15	16	17	18	19	20	21	22	23	24
⚠	TBH	IBH2	IBH1	C1 (TBH) (IBH2)	C1 (IBH1) (SV1)	C1 (SV2)	C1 (SV3)	C1 (P_c)	C1 (P_o)	C1 (P_s)	C1 (P_d)	P-x ALARM DEF

3 Electric Control Box Layout

Low voltage box

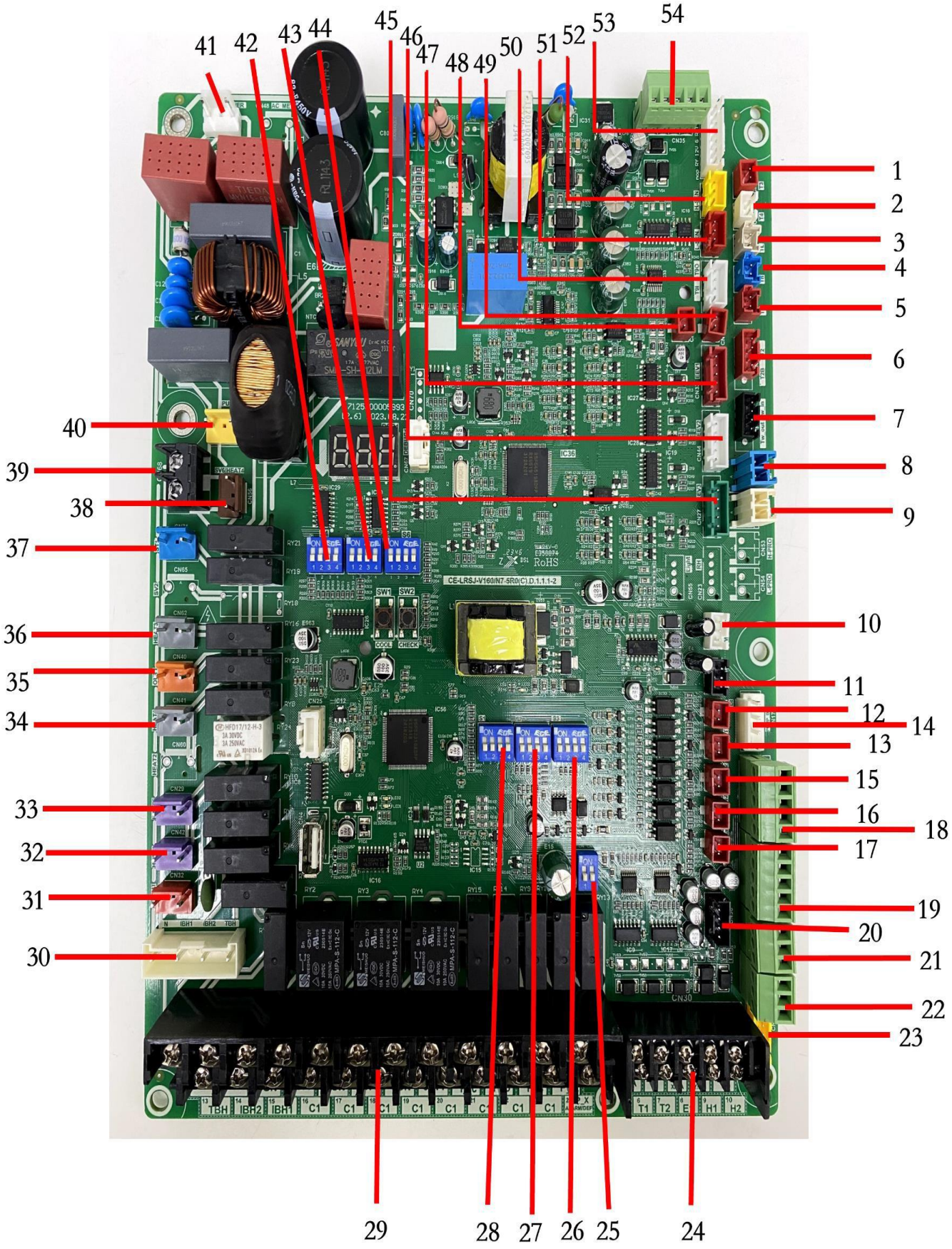


High voltage box



4 Outdoor Unit PCBs

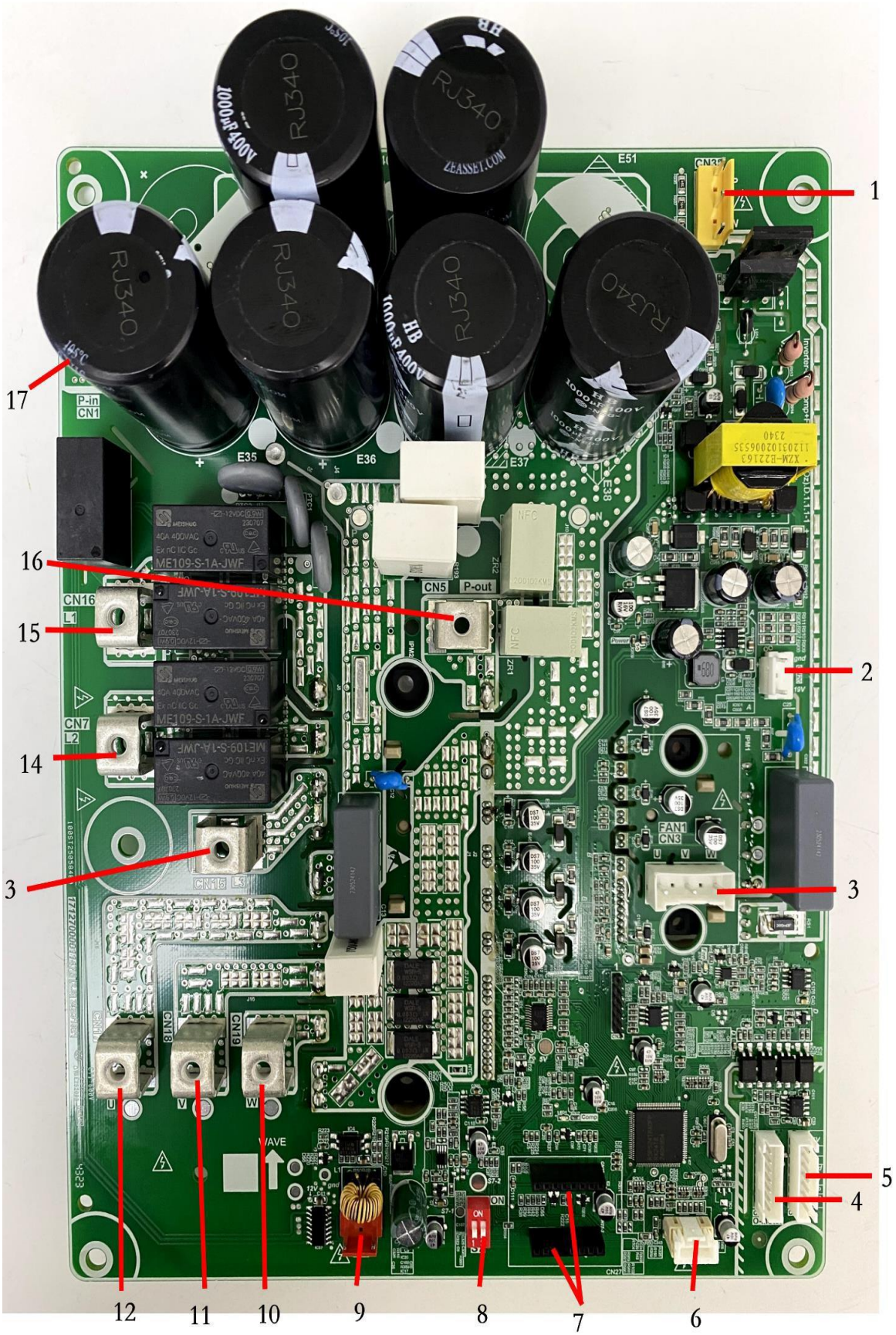
4.1 Main Control PCB



Label	Code	Port	Content	Rated Voltage
1	CN34	T3	Port for T3 temp. sensor	DC 3.3 V
2	CN45	T4	Port for T4 temp. sensor	DC 3.3 V
3	CN7	TL	Port for TL temp. sensor	DC 3.3 V
4	CN5	Th	Port for Th temp. sensor	DC 3.3 V
5	CN50	Tp	Port for Tp temp. sensor	DC 3.3 V
6	CN47	T2B/T2	Port for T2&T2B temp. sensor	DC 5 V
7	CN10	Tw_out / Tw_in	Port for Two & Twi temp. sensor	DC 5 V
8	CN39	T1	Port for T1 temp. sensor	DC 5 V
9	CN8	FS	Port for water switch	DC 12 V
10	CN20	FM	Reserved	DC 5 V
11	CN37	PW	Port for temperature sensor of water pressure	DC 5 V
12	CN24	Tbt	Port for Tbt temp. sensor	DC 5 V
13	CN13	T5/T1B	Port for T5/T1B temp. sensor	DC 5 V
14	CN17	PUMP_BP	Port for internal pump	/
15	CN38	T52	Port for T52 temp. sensor	DC 5 V
16	CN15	Tw2	Port for Tw2 temp. sensor	DC 5 V
17	CN18	Tsolar	Port for Tsolar temp. sensor	DC 5 V
18	CN66	S2 S1 K2 K1	switch input K1/K2,solar energy input S1/S2	DC 5 V
19	CN31	CL COM HT 0 -10V	Output port for 0-10V(0-10V)Control port for room thermostat (heating mode)(HT) /Power port for room thermostat(COM)/Control port for room thermostat (cooling mode)(CL)	DC 5 V
20	CN36	12V T1 T2 GND	Port for thermostat transfer board	DC 12 V
21	CN63	SG EVU	Port for smart grid (photovoltaic signal)(SG)/Port for smart grid (grid signal)(EVU)	DC 12 V
22	CN61	M1 M2	Port for remote switch	DC 12 V
23	CN9	IB IA GND IBH2 IBH1	Control port for internal backup heater1/2 (reserved)	/
24	CN30	A B X/HA Y/HB E T1 T2 E1 H1 H2	Port for communication with the wired controller(Port,3,4),Port for thermostat transfer board (Port 6.7) ， Port for Internal machine Parallel(Port 8,9,10)	AB: DC 12 V X/HA Y/HB: DC 18 V T1 T2 E1 H1 H2: DC 5 V
25	SW9	SW9	Dip switch	DC 5 V
26	S3	S3	Dip switch	DC 5 V
27	S2	S2	Dip switch	DC 5 V
28	S1	S1	Dip switch	DC 5 V
29	CN11	/	Additional heat source(Port1,2)，Port for SV1(3-way valve)(Port3,4)，，Port for SV2(3-way valve)(Port5,6)，Port for SV3(3-way valve)(Port7,8)，Port for zone 2 pump(P_c)/ zone 1 pump(P_o)/ solar energy pump(P_s)/ pipe pump(P_d)(Port9,10,11,12)，Control port for tank booster heater (Port13)，Control port for internal backup heater 1（Port14），Control port for internal backup heater 2（Port15），Reserved(Port24)	AC 230 V
30	CN22	N IBH1 BH2 TBH	Control port for backup heater/booster heater	AC 230 V
31	CN32	AC OUT	Port for transformer power input	AC 230 V
32	CN42	HEAT6	Port for anti-freeze electric heating tape	AC 230 V

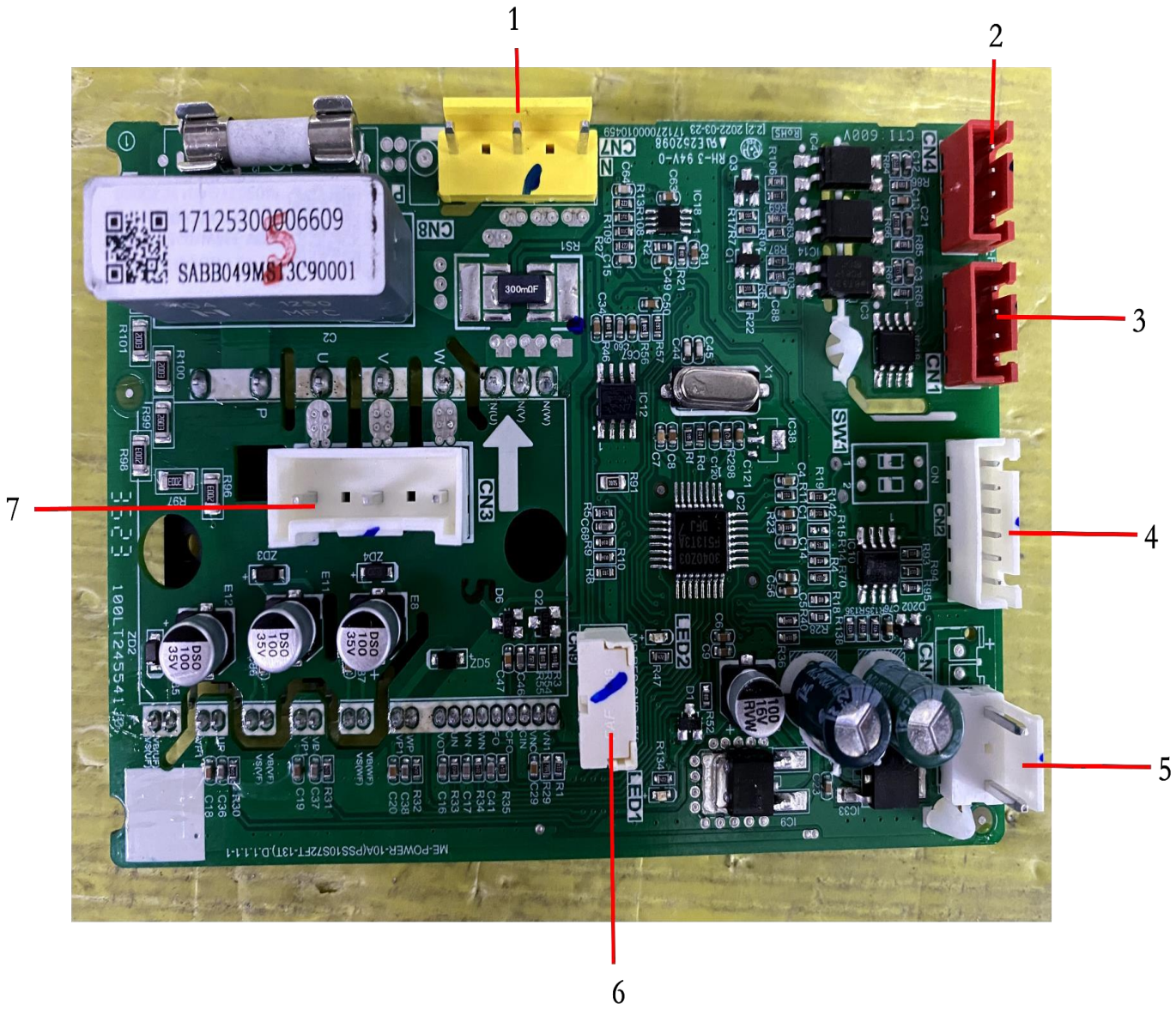
33	CN29	HEAT5	Port for anti-freeze electric heating tape	AC 230 V
34	CN41	HEAT1	Reserved	AC 230 V
35	CN40	OUT1	Reserved	AC 230 V
36	CN62	HEAT3	Port for anti-freeze electric heating tape	DC 12 V
37	CN71	ST1	Port for four-way valve	AC 230 V
38	CN56	SV6	Port for the heating tape of drainage outlet	AC 230 V
39	CN68	HEAT4	Port for the heating tape of drainage outlet	AC 230 V
40	CN28	PUMP	Port for the water pump	AC 230 V
41	CN21	POWER	Port for power supply	AC 230 V
42	S4	S4	Dip switch	DC 3.3 V
43	S5	S5	Dip switch	DC 3.3 V
44	S6	S6	Dip switch	DC 3.3 V
45	CN27	EEV3	Port for electrical expansion valve 3	DC 12 V
46	CN44	EEV2	Port for electrical expansion valve 2	DC 12 V
47	CN33	EEV1	Port for electrical expansion valve 1	DC 12 V
48	CT2	CN2	Port for power supply monitor	DC 3.3 V
49	CT1	CN49	Port for power supply monitor	DC 3.3 V
50	CN16	T9I/T9O	Port for T9I/T9O temp. sensor	DC 3.3 V
51	CN46	L-SEN	Port for low pressure sensor	DC 5 V
52	CN3	H-SEN	Port for high pressure sensor	DC 5 V
53	CN43	COMM	Port for communication with Inverter module	DC 5 V
54	CN35	RS485, on/off	Reserved	DC 5 V

4.2 Compressor & fan inverter PCB



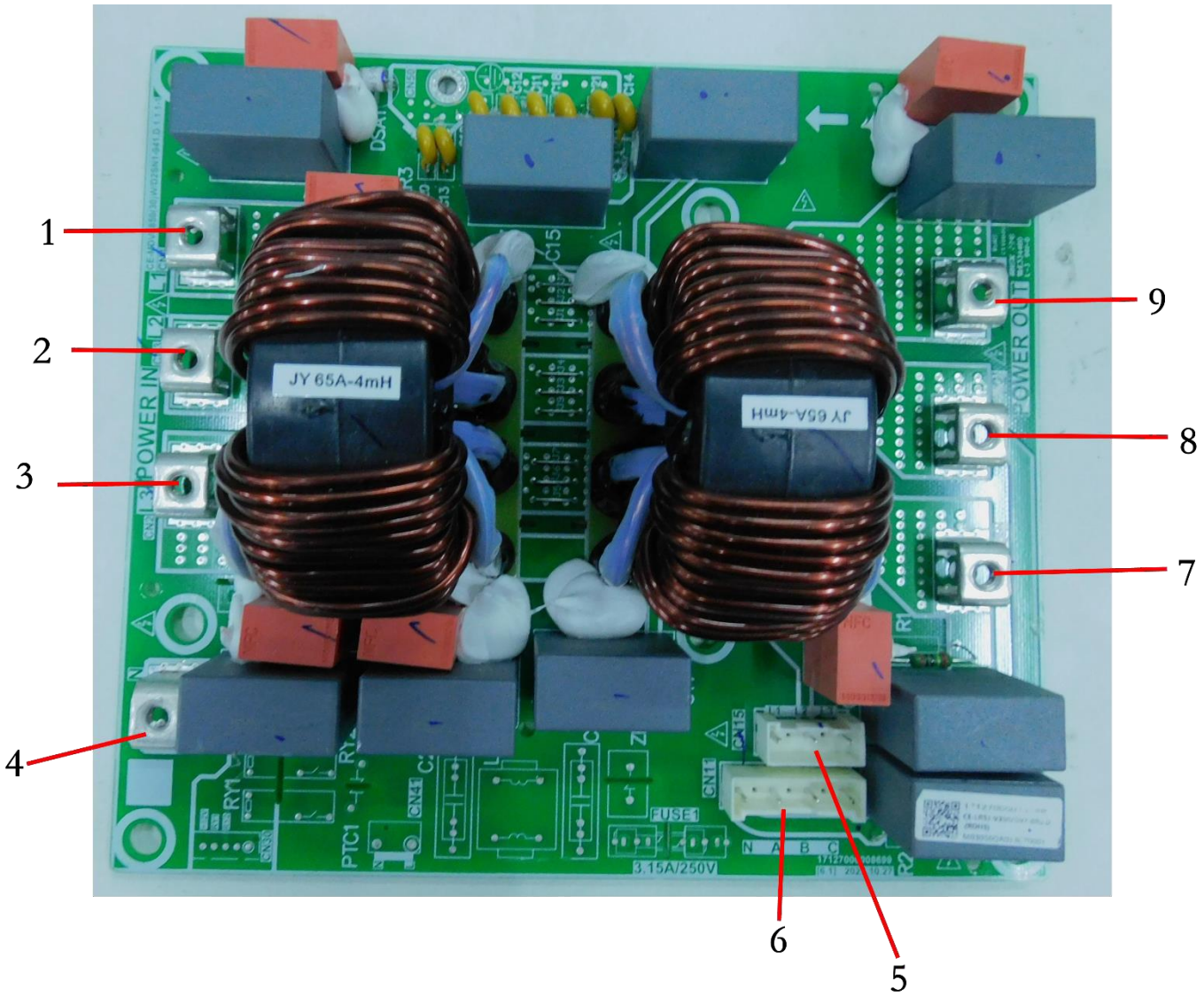
Label	Code	Port	Content	Voltage
1	CN38	P N	DC fan power output port	DC 565 V
2	CN26	19V GND	Fan module board power supply port	DC 19 V
3	CN3	UVW	Port output for fan	Phase to phase voltage AC 46-460 V
4	CN8	O-Motor	PTC relay control port/communication port	DC 12 V / DC 5 V
5	CN9	O-Motor	PTC relay control port/communication port	DC 12 V / DC 5 V
6	CN25	/	/	/
7	CN27	/	PED board socket	/
8	S7	/	Module address DIP switch	/
9	CN21	H-Pro	High pressure switch	/
10	CN19	W	Power output for compressor	Phase to phase voltage AC 46-460 V
11	CN18	V		Phase to phase voltage AC 46-460 V
12	CN17	U		Phase to phase voltage AC 46-460 V
13	CN15	L3	Power input port	Phase to phase voltage AC 380V
14	CN7	L2		Phase to phase voltage AC 380V
15	CN16	L1		Phase to phase voltage AC 380V
16	CN5	P-out	Output for reactor	/
17	CN1	P-in	Input from reactor	/

4.3 Fan inverter PCB



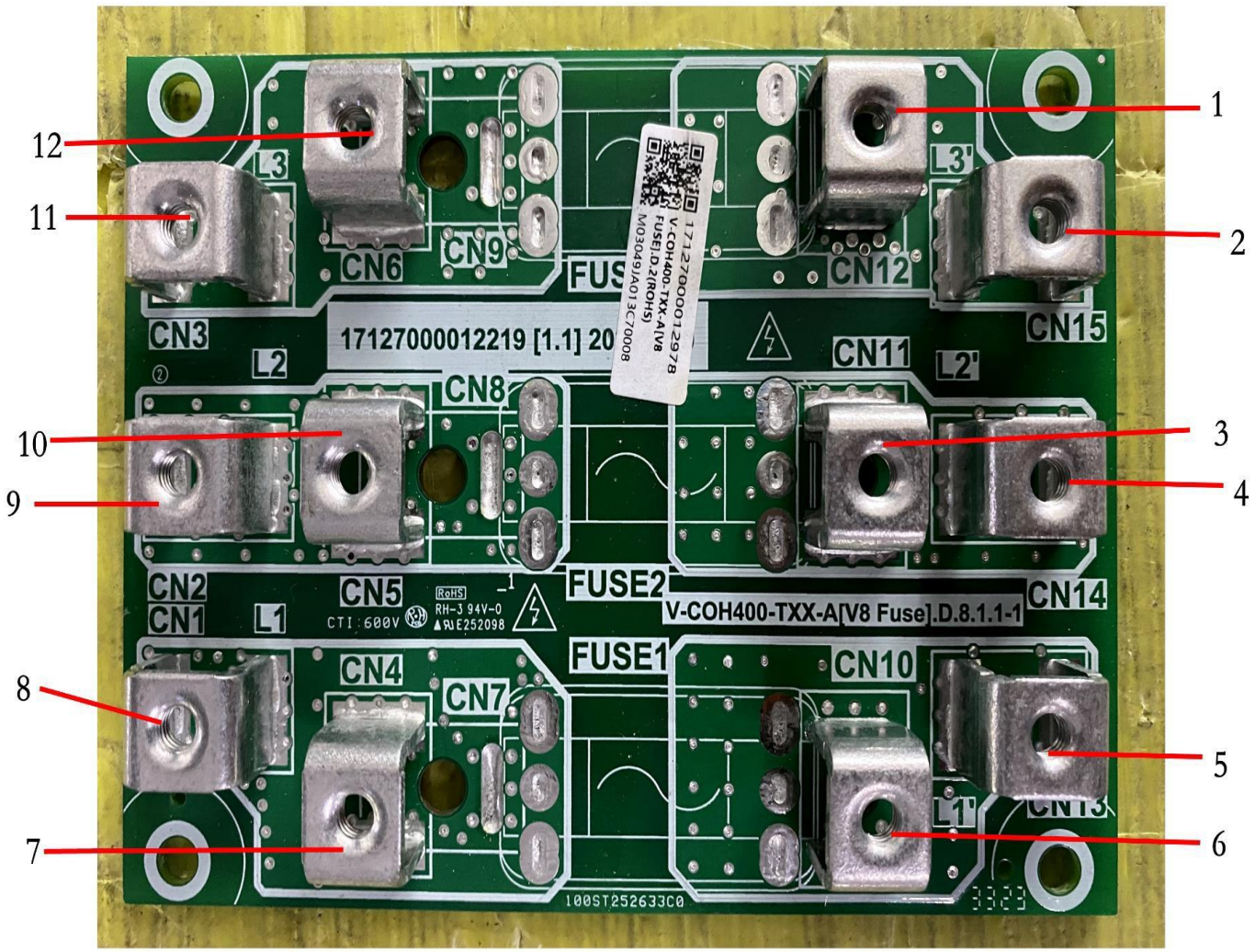
Label	Code	Port	Content	Voltage
1	CN7	/	Port for power supply	DC 565 V
2	CN4	/	Fan module communication port	DC 5 V
3	CN1	/	Fan module communication port	DC 5 V
4	CN2	/	EEPROM programming port	DC 5 V
5	CN6	/	Port for fan intervet PCB power supply	DC 19 V
6	CN9	DEBUG	Programming port	DC 5 V
7	CN3	U V W	DC fan power ports	Phase to phase voltage AC 46-460 V

4.4 Filter PCB



Label	Code	Port	Content	Voltage
1	CN4	L1	Power input L1	AC 380-415 V
2	CN3	L2	Power input L2	
3	CN2	L3	Power input L3	
4	CN1	N	Reserved	/
5	CN15	L1L2L3	Reserved	AC 380-415 V
6	CN11	N A B C	Reserved	AC 380-415 V
7	CN6	L3’	Output power L3'	AC 380-415 V
8	CN7	L2'	Output power L2'	
9	CN8	L1'	Output power L1'	

4.5 Fuse PCB



Label	Code	Port	Content	Voltage
1	CN12	/	Fuse 1-1	AC 230 V
2	CN15	L3'	Input power L3'	AC 230 V
3	CN11	/	Fuse 2-1	AC 230 V
4	CN14	L2'	Input power L2'	AC 230 V
5	CN13	L1'	Input power L1'	AC 230 V
6	CN10	/	Fuse 3-1	AC 230 V
7	CN4	/	Fuse 3-2	AC 230 V
8	CN1	L1	Output power L1	AC 230 V
9	CN2	L2	Output power L2	AC 230 V
10	CN5	/	Fuse 2-2	AC 230 V
11	CN3	L3	Output power L3	AC 230 V
12	CN6	/	Fuse 1-2	AC 230 V

4.6 Digital Display Output

Digital display output in different operating states

Outdoor unit state	Parameters displayed on Main Control PCB DSP1
On standby	0
Normal operation	The current frequency of compressor
Error or protection	Error or protection code



4.7 Cascade setting and Modbus function

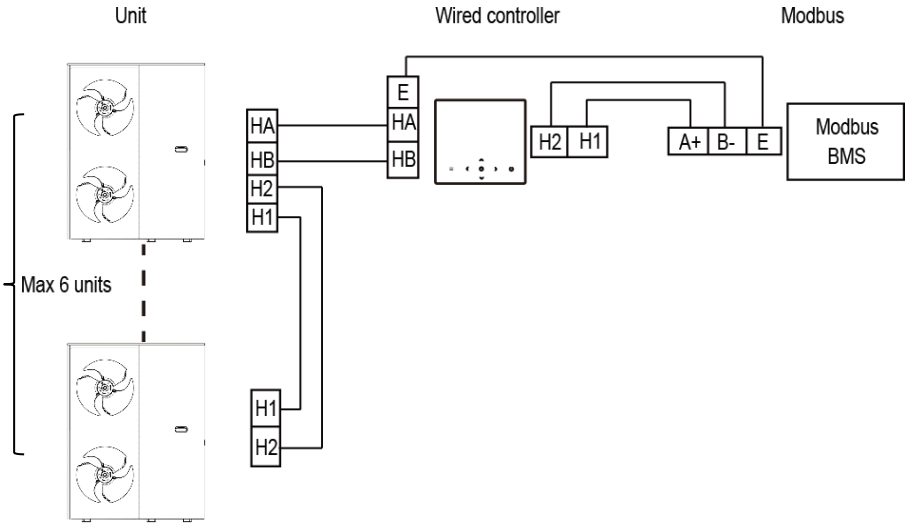
The DIP switch S3 on Main Control PCB is used for setting the Modbus address. By defaulting the units have this DIP switch positioned=0/0/0

Dip switch

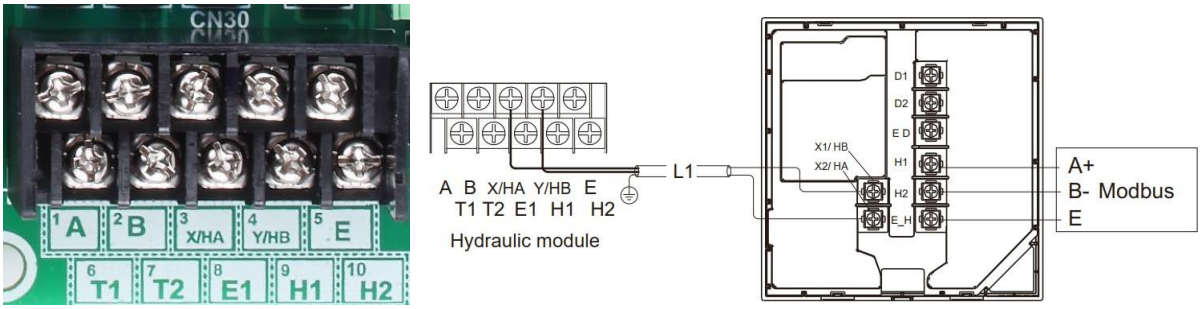
Dip switch ON=1 OFF=0			Factory settings
S3	1/2/3	0/0/0=address 0#(master unit) 1/0/0=address 1#(slave unit) 0/1/0=address 2#(slave unit) 0/0/1=address 3#(slave unit) 1/1/0=address 4#(slave unit) 1/0/1=address 5#(slave unit)	1:OFF 2:OFF 3:OFF
	4	Reserved	4:OFF



Cascade and Modbus Connection



Modbus Wiring



4.8 DIP Switch Settings

DIP switch S1, S2, S3, S4, S5 and S6 are located on the main control PCB Keep factory Settings.

4.9 Point check button

Point check button SW1 and SW2 are located on the main control PCB.

Point check button is for the use of research and development personnel, and should not be touched under normal circumstances.

5 Error Code Table

Water circuit error			
Error code	Description	Displayed on	
E0	water flow failure (10 times of E8)	User Interface and Main Control PCB	
E8	water flow protection	User Interface and Main Control PCB	
Communication error			
Error code	Description	Displayed on	
E2	Communication fault between User Interface and Main Control PCB	User Interface and Main Control PCB	
H0	Communication error of Main Control PCB	User Interface and Main Control PCB	
H1	Communication error between Main Control PCB and inverter PCB	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	
E3	T1 Electric Heater/AHS water outlet temperature sensor error	User Interface and Main Control PCB	
E4	T5 Water tank temperature sensor error	User Interface and Main Control PCB	
E5	T3 Outdoor unit heat exchanger bottom temperature sensor error	User Interface and Main Control PCB	
E6	T4 Ambient temperature sensor error	User Interface and Main Control PCB	
E7	Tbt Balance tank temperature sensor/ Final outlet water temperature of cascade system sensor error	User Interface and Main Control PCB	
E9	Th Return-air temperature sensor error	User Interface and Main Control PCB	
EA	Tp Discharge temperature sensor error	User Interface and Main Control PCB	
Eb	Tsolar Solar panel temperature sensor error	User Interface and Main Control PCB	
EC	T5_2 Water tank temperature sensor error (Reserved)	User Interface and Main Control PCB	
Ed	Tw_in Plate heat exchanger inlet water temperature sensor error	User Interface and Main Control PCB	
FC1	TL Outdoor unit heat exchanger outlet temperature sensor error	User Interface and Main Control PCB	
H2	T2 Plate heat exchanger outlet refrigerant temperature sensor error	User Interface and Main Control PCB	
H3	T2B Plate heat exchanger inlet refrigerant temperature sensor error	User Interface and Main Control PCB	
H5	Ta room temperature sensor error	User Interface and Main Control PCB	
H8	H-SEN High-pressure sensor error	User Interface and Main Control PCB	
H9	Tw2 Zone 2 water flow temperature sensor error	User Interface and Main Control PCB	
HA	Tw_out Plate heat exchanger outlet water temperature sensor error	User Interface and Main Control PCB	
P21	L-SEN Low-pressure sensor error	User Interface and Main Control PCB	
P27	H-SEN and L-SEN connected reversely (Detect when compressor is off)	User Interface and Main Control PCB	
F51	Temperature sensor(T9O) fault	User Interface and Main Control PCB	
F31	Temperature sensor(T9I) fault	User Interface and Main Control PCB	
F6	EXV1 fault	User Interface and Main Control PCB	
F61	EXV2 fault	User Interface and Main Control PCB	
F62	EXV3 fault	User Interface and Main Control PCB	

Voltage error			
Error code	Description	Displayed on	
E1	Phase loss or phase reversal.	User Interface and Main Control PCB	For 3Ph units
H7	Power overvoltage and Power under voltage protection	User Interface and Main Control PCB	
FE	Lack of L2 phase fault.	User Interface and Main Control PCB	
Protection code			
Error code	Description	Displayed on	
P0	Low-pressure protection	User Interface and Main Control PCB	
P1	High-pressure switch protection	User Interface and Main Control PCB	
P3	Overcurrent protection	User Interface and Main Control PCB	
P4	Compressor protection against excessively-high discharge temperature	User Interface and Main Control PCB	
Pd	Protection for over-high condensing temperature in cooling mode	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	Protection for abnormal temperature difference between outlet water and inlet water	User Interface and Main Control PCB	
Hb	PP occurs 3 times in heating/DHW mode	User Interface and Main Control PCB	
P5	The big temperature difference between outlet water temp. and inlet water temp.	User Interface and Main Control PCB	
Inverter module error/ protection			
Error code	Description	Displayed on	
C7	Over-high temperature protection for IPM module	User Interface and Main Control PCB	
H4	3 times of “L1*” in 60 minutes	User Interface and Main Control PCB	
L1E	Hardware overcurrent protection	Main Control PCB	
L11	Phase current instantaneous overcurrent protection	Main Control PCB	
L12	Phase current continuous 30s overcurrent protection	Main Control PCB	
L2E	Over-temperature protection	Main Control PCB	
L3E	Bus voltage too low error	Main Control PCB	
L31	Bus voltage too high error	Main Control PCB	
L32	Bus voltage excessively high error	Main Control PCB	
L34	Phase loss error of three-phase power supply	Main Control PCB	For 3Ph units
L35	L2 phase mismatch fault	Main Control PCB	For 3Ph units
L43	Abnormal phase current sampling bias	Main Control PCB	
L45	Fan motor code mismatch error	Main Control PCB	
L46	IPM protection (FO)	Main Control PCB	
L47	Module type mismatch	Main Control PCB	
L5E	Motor failed to start	Main Control PCB	
L52	Motor stalling protection	Main Control PCB	
L6E	Phase loss protection	Main Control PCB	
L61	compressor terminals short circuit protection	Main Control PCB	
L65	IPM short circuit protection	Main Control PCB	
LBE	Action of high-pressure switch	Main Control PCB	
LB7	PED bH error	Main Control PCB	
H6	Fan 1 failure	User Interface and Main Control PCB	

H61	Fan 2 failure	User Interface and Main Control PCB	
HH	10 times of H6 / H61 in 120min	User Interface and Main Control PCB	
J1E	Hardware overcurrent protection	Main Control PCB	
J11	Phase current instantaneous overcurrent protection	Main Control PCB	
J12	Phase current continuous 30s overcurrent protection	Main Control PCB	
J2E	Over-temperature protection	Main Control PCB	
J3E	Bus voltage too low error	Main Control PCB	
J31	Bus voltage too high error	Main Control PCB	
J32	Bus voltage excessively high error	Main Control PCB	
J43	Abnormal phase current sampling bias	Main Control PCB	
J45	Fan motor code mismatch error	Main Control PCB	
J46	IPM Protection (FO)	Main Control PCB	
J47	Module type mismatch (after module resistance tested)	Main Control PCB	
J5E	Motor failed to start	Main Control PCB	
J52	Motor stalling protection	Main Control PCB	
J6E	Phase loss protection	Main Control PCB	
J61	Fan terminals short circuit protection	Main Control PCB	
J65	IPM short circuit protection	Main Control PCB	
HF	Drive does not match model	User Interface and Main Control PCB	
Others			
Error code	**Description**	**Displayed on**	
Pb	Pb is the indicator that shows the system is running in anti-freezing control	Main Control PCB	

6 Troubleshooting

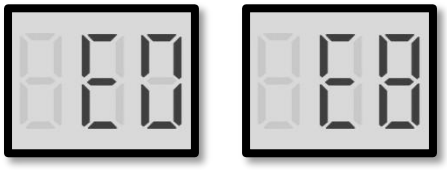
6.1 Warning

WARNING!

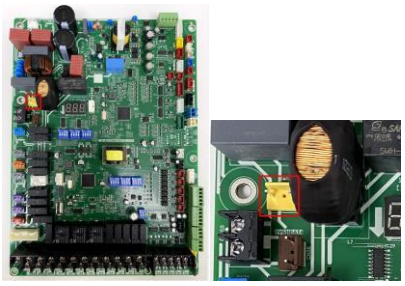
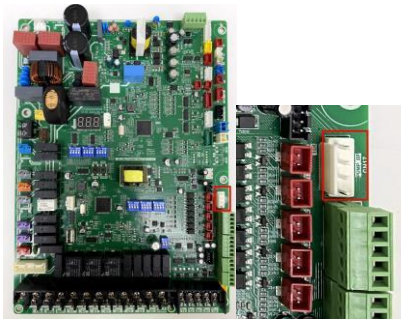
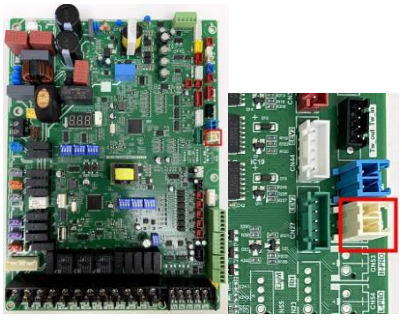
- All electrical work must be carried out by competent and suitably qualified, certified and accredited professionals and in accordance with all applicable legislation (all national, local and other laws, standards, codes, rules, regulations and other legislation that apply in a given situation).
- Power-off 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

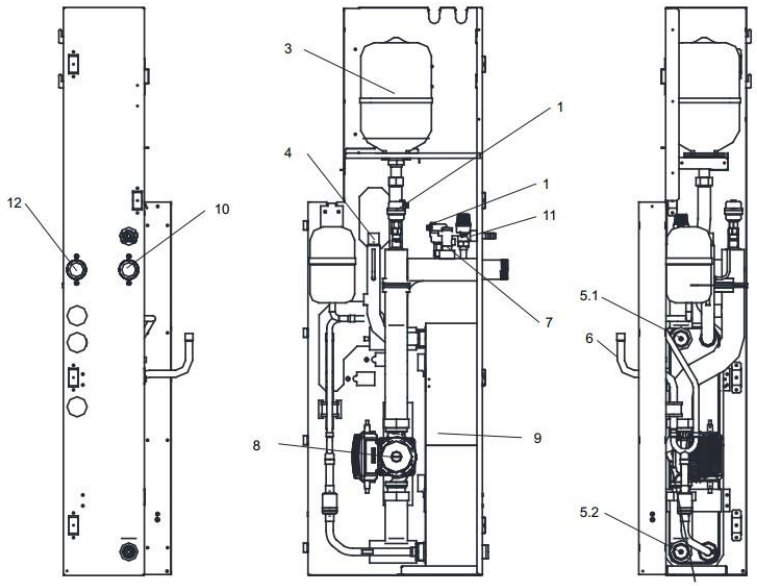
6.2.1 Digital display output



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 10 times of E8 in a row when do running-water detection after pump on	No-water detection failures before pump on or water flow switch breaks after pump on within 10 times
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



Code	Code	Code	Code
1	Automatic air purge valve	7	Flow switch
2	Backup heater	8	Pump
3	Expansion vessel	9	Plate heat exchanger
4	Refrigerant gas pipe	10	Water outlet pipe
5	Temperature sensor	11	Pressure relief valve
6	Refrigerant liquid pipe	12	Water inlet pipe

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.



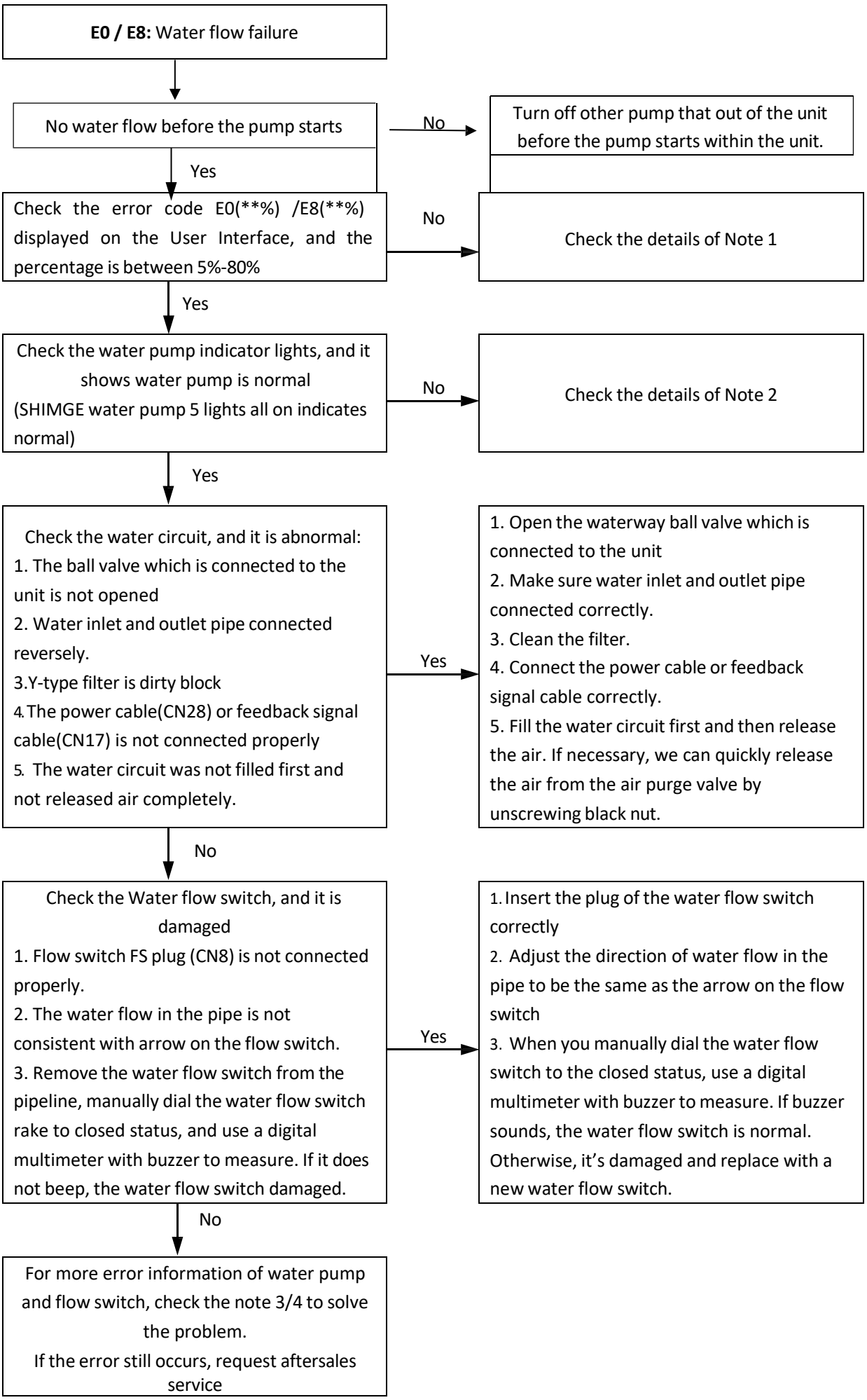
Correct Dip switch





S2	1/2	Reserved	1:OFF 2:OFF
	3/4	0/0=variable speed pump 1 0/1=variable speed pump 2 1/0=Fixed speed pump 1/1=Reserved	3:OFF 4:OFF

6.2.3 Procedure



Note 1:

The meaning of percentage of water pump output(displayed on the user interface)			
Percentage	**Water pump model**	**Brand**	**Description**
0-70%	APF25-12-130E FPWM1	SHIMGE	Pump works normally, feedbacks 0-4.0m^3 /h flow information (Q=0.057PWMout, Q: m^3/h, PWMout: %)
85%	APF25-12-130E FPWM1	SHIMGE	Alarm（Undervoltage＜160V or Phase loss or Overcurrent or Overheat）, and pump stops running
90%	APF25-12-130E FPWM1	SHIMGE	Alarm（Motor stalling protection）, and pump stops running
95%	APF25-12-130E FPWM1	SHIMGE	Pump Standby

Note 2 – Indicator lights on SHIMGE water pump :

Indicator lights on SHIMGE water pump		
Name	**Indicator lights**	**Description**
Motor stalling protection		When the electric pump rotor shaft is stuck, the electric pump displays a fault code, feedback 90% positive duty cycle and attempts to restart. It restarts every 1 second and stops after restarting 255 times.
Phase loss protection		When the electric pump phase failure occurs, the electric pump displays a fault code, feedback 85% positive duty cycle and attempts to restart. It restarts every 1 second and stops after restarting 255 times.
Overcurrent protection		When a short-circuit fault occurs in the electric pump, the electric pump is shut down for protection, feedback is 85% positive duty cycle, the panel displays a fault code, and the machine shuts down without restarting.
Overheat protection		When the power module overheats, the electric pump shuts down for protection, feedback 85% positive duty cycle, the panel displays a fault code, and shuts down for protection.
Undervoltage protection		When the input voltage is less than 160V, the electric pump shuts down for protection, feedback 85% positive duty cycle, the panel displays a fault code, and shuts down for protection.

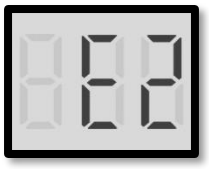
Note 3: The possible error and solutions of water pump

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

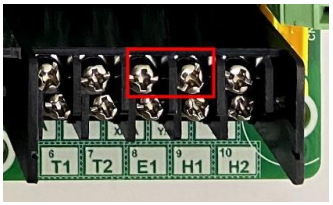
6.3 E2 Troubleshooting

6.3.1

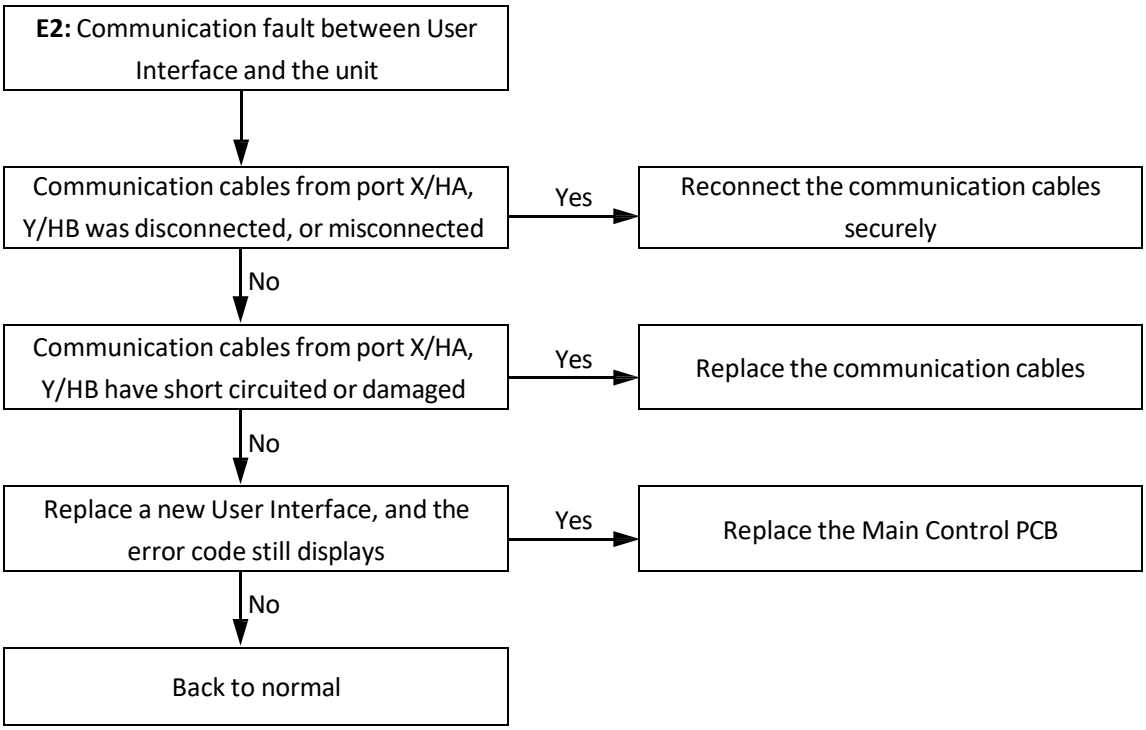
Digital display output



6.3.2 Description

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

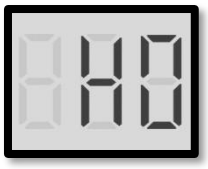
6.3.3 Procedure



6.4 H0 Troubleshooting

6.4.1

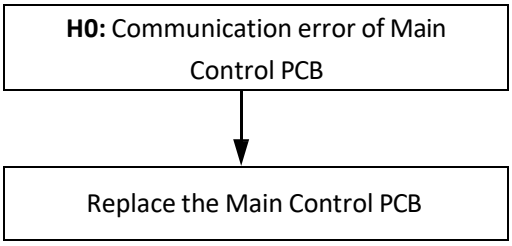
Digital display output



6.4.2 Description

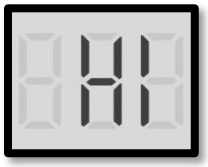
Error code	H0
Description	Communication error of Main Control PCB
Triggering	Communication failure lasts 1 min

6.4.3 Procedure

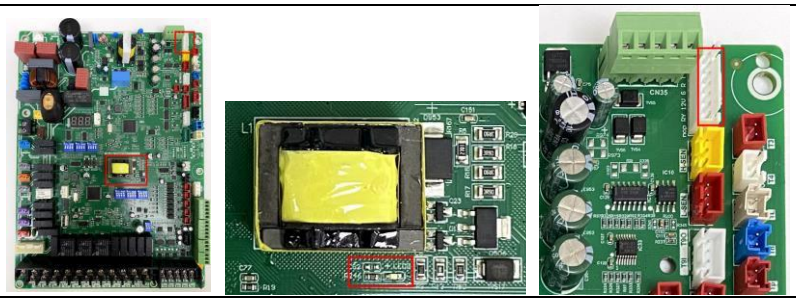
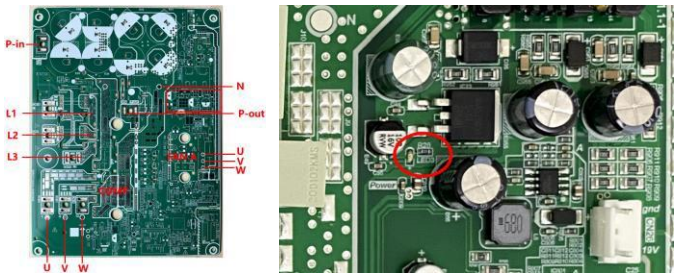


6.5 H1 Troubleshooting

6.5.1 Digital display output

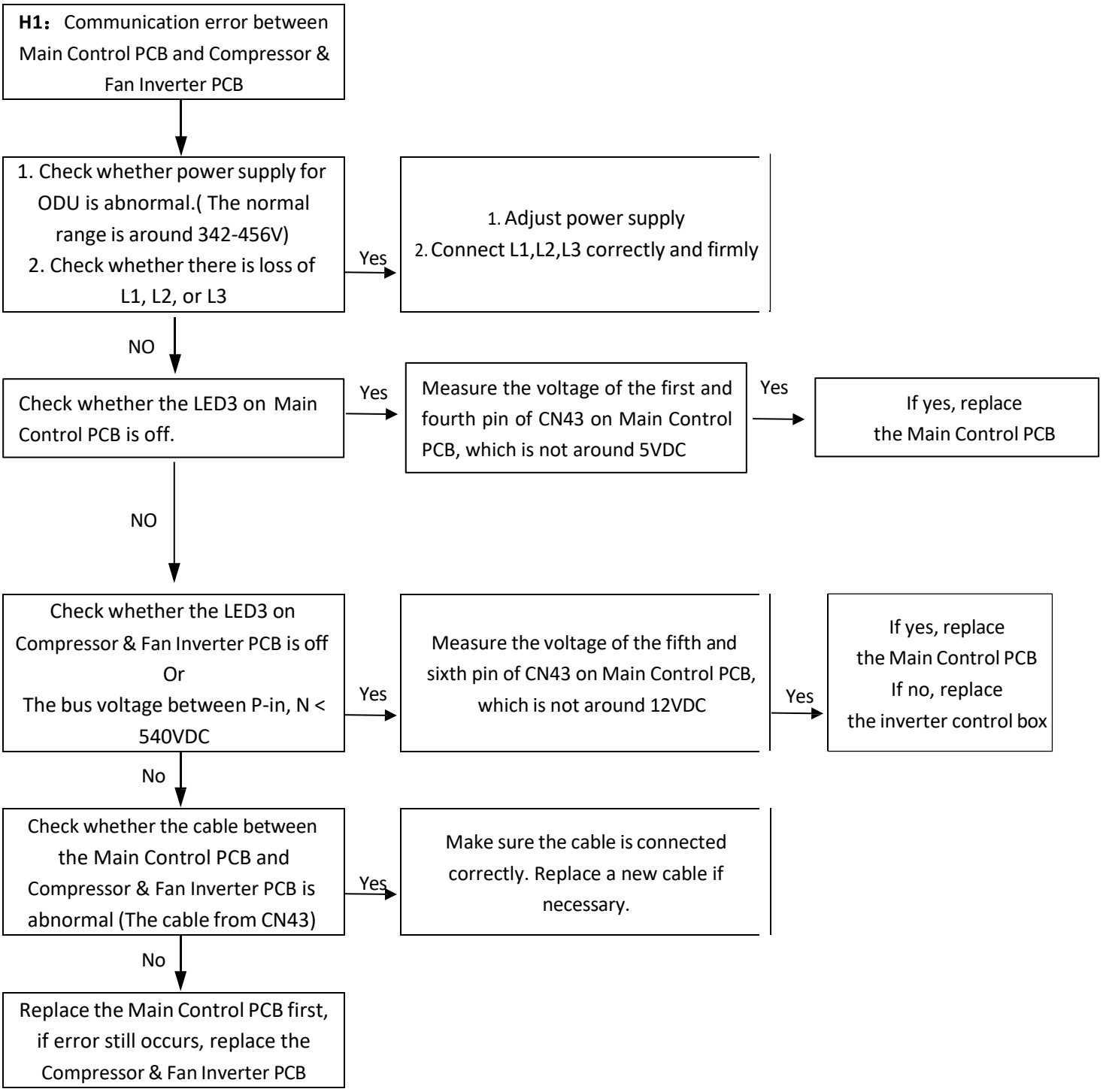


6.5.2 Description

Error code		H1
Description		Communication error between Main Control PCB and Compressor & Fan Inverter PCB
Triggering		Check the communication after power-on 1 min. If no communication is detected, the error is triggered
Relative ports and locations	LED3 & CN43 COMM (Main Control PCB)	
	LED3 & BUS voltage(P-in/N) (Compressor & Fan Inverter PCB)	

6.5.3 **Procedure**

For 3Ph models

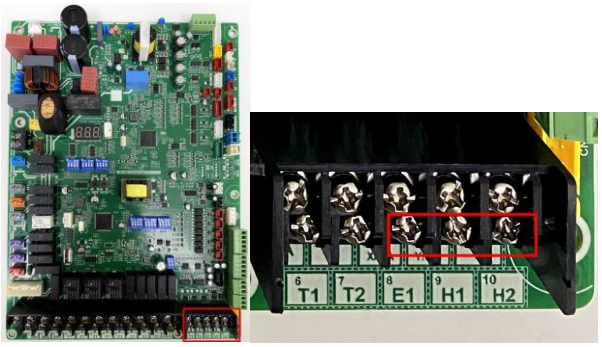
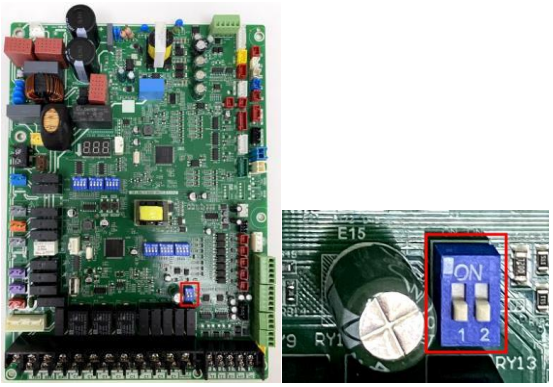


6.6 Hd Troubleshooting

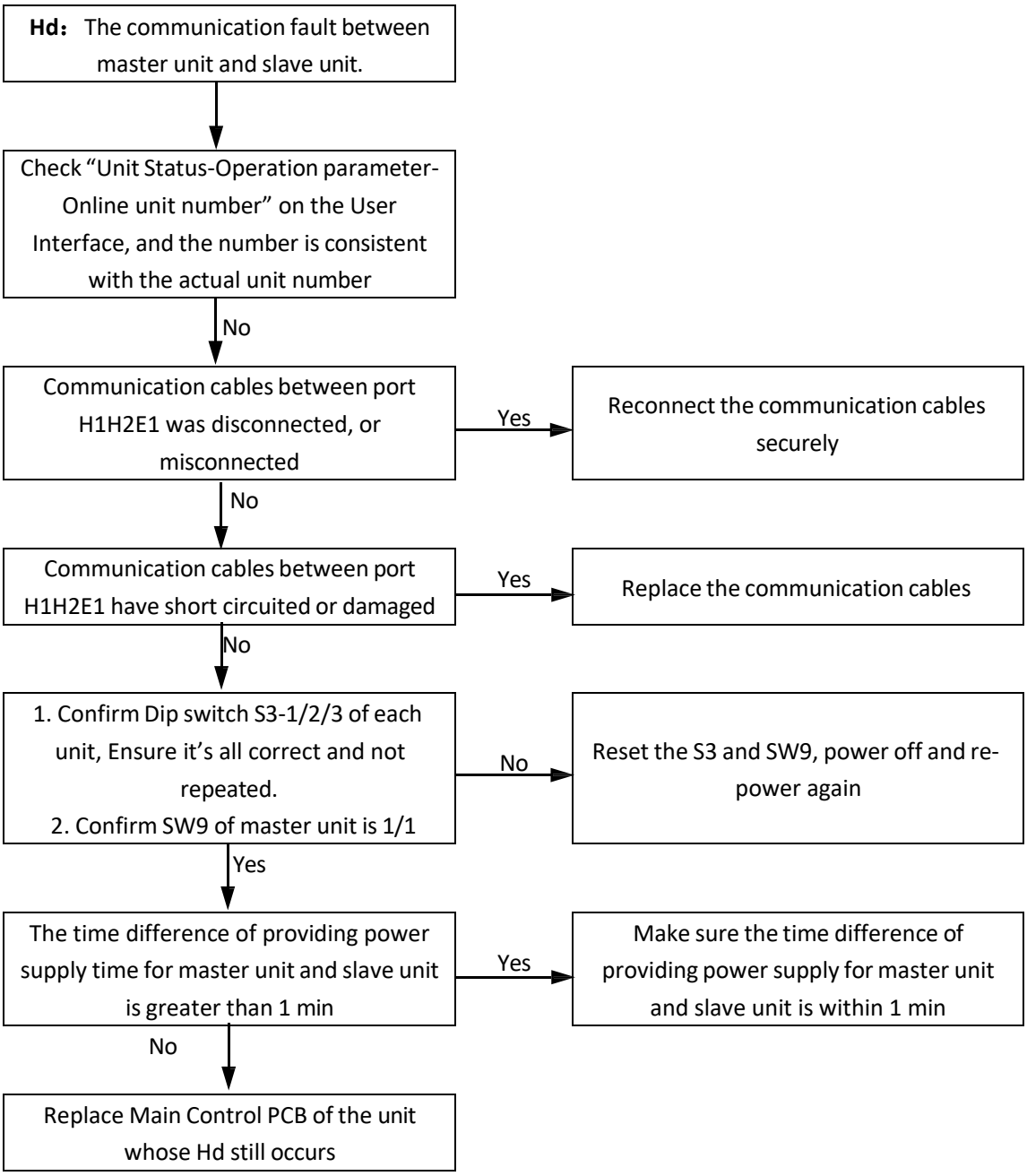
6.6.1 Digital display output



6.6.2 Description

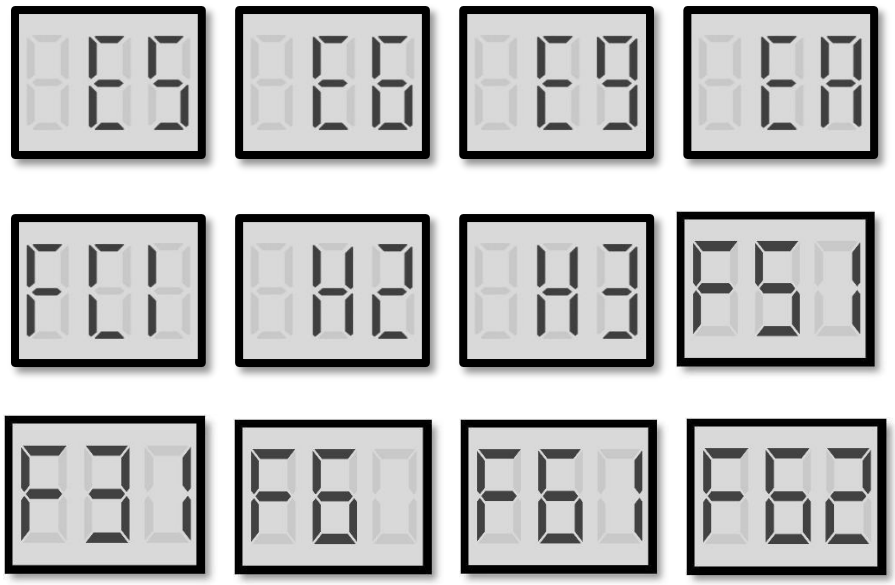
Error code		Hd
Description		Communication fault between master unit and slave unit.
Triggering		For cascade system, the communication failure between master unit and slave unit lasts 2min and above
Relative ports and locations	Communication port E1/H1/H2	
	Dip switch S3-1/2/3 0/0/0=address 0#（Master） 1/0/0=address 1#（Slave） 0/1/0=address 2#（Slave） 0/0/1=address 3#（Slave） 1/1/0=address 4#（Slave） 1/0/1=address 5#（Slave）	
	SW9 0/0= default setting	

6.6.3 **Procedure**



6.7 E5, E6, E9, EA, FC1, H2, H3, F51, F31, F6, F61, F62 Troubleshooting

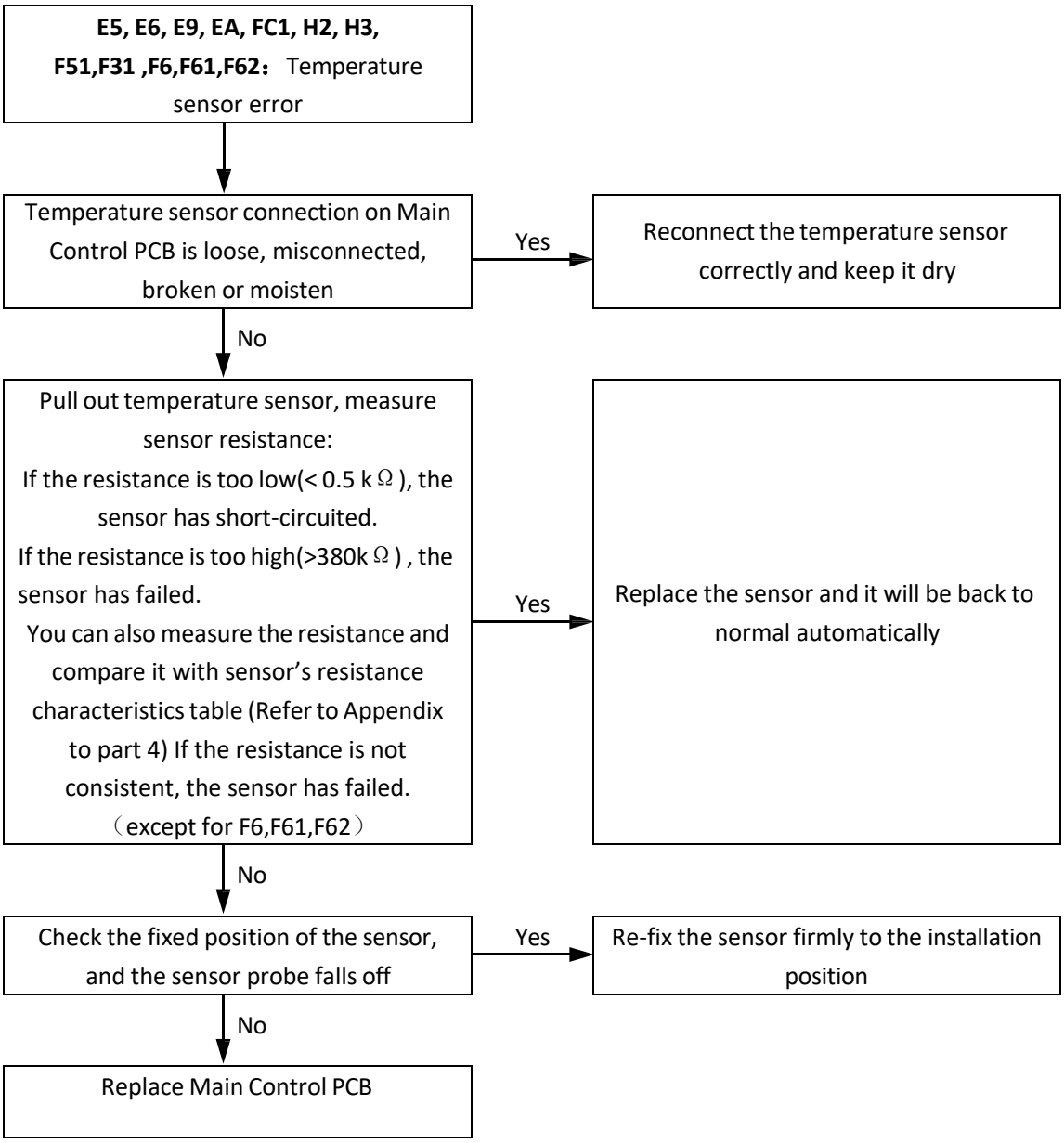
6.7.1 Digital display output



6.7.2 Description

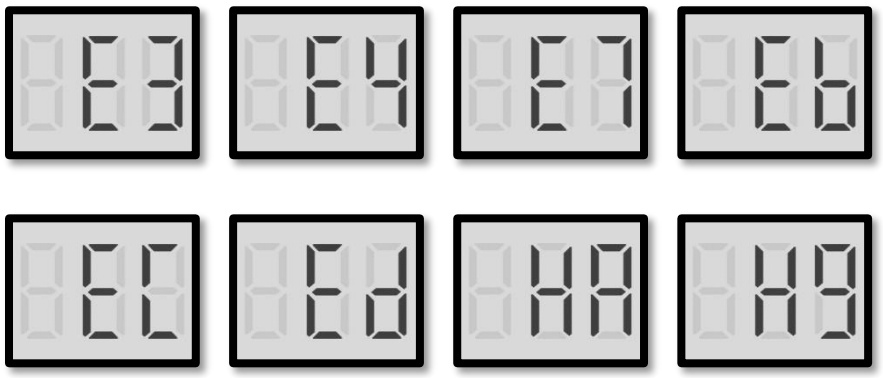
Code	Description	Port	Locations
E5	T3 Outdoor unit heat exchanger bottom temperature sensor error	CN34	
E6	T4 Ambient temperature sensor error	CN45	
E9	Th Return-air temperature sensor error	CN5	
EA	Tp Discharge temperature sensor error	CN50	
FC1	TL Outdoor unit heat exchanger outlet temperature sensor error	CN7	
H2	T2 Plate heat exchanger outlet refrigerant temperature sensor error	CN47	
H3	T2B Plate heat exchanger inlet refrigerant temperature sensor error		
F51	Temperature sensor(T9O) fault	CN16	
F31	Temperature sensor(T9I) fault		
F6	EXV1 fault	CN33	
F61	EXV2 fault	CN44	
F62	EXV3 fault	CN27	

6.7.3 Procedure

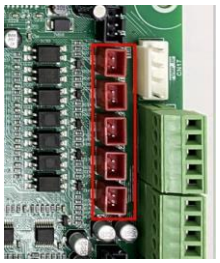


6.8 E3, E4, E7, Eb, EC, Ed, HA, H9 Troubleshooting

6.8.1 Digital display output



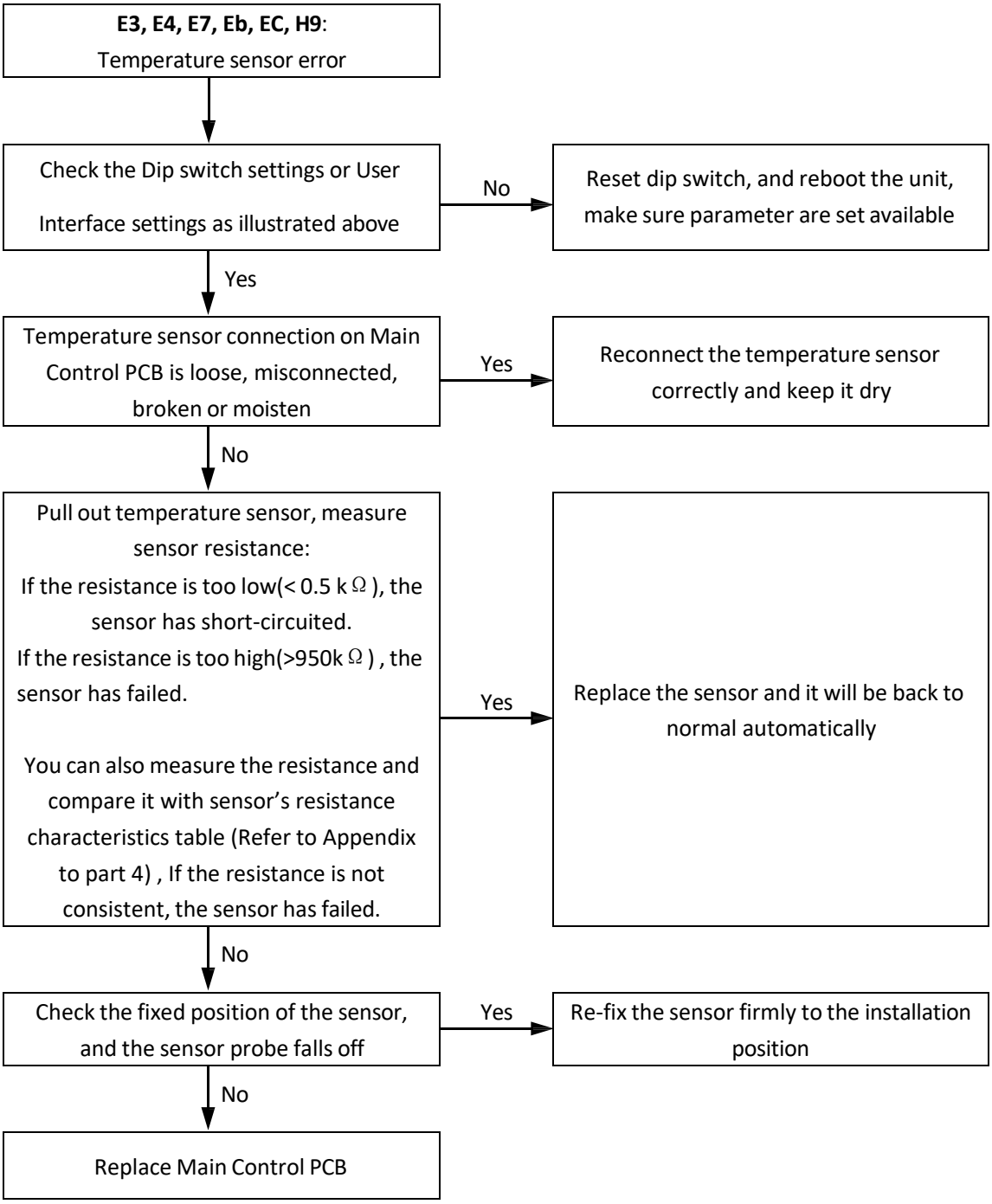
6.8.2 Description

Code	Description	Port	Location (Main Control PCB)
E3	T1 Electric Heater/AHS water outlet temperature sensor error	CN39	  
E4	T5 Water tank temperature sensor error	CN13	
E7	Tbt1 Balance tank temperature sensor/ Final outlet water temperature of cascade system sensor error	CN24	
Eb	Tsolar Solar panel temperature sensor error	CN18	
EC	T5_2 Water tank temperature sensor error (Reserved)	CN38	
Ed	Tw_in Plate heat exchanger inlet water temperature sensor error	CN10	
HA	Tw_out Plate heat exchanger outlet water temperature sensor error		
H9	Tw2 Zone 2 water flow temperature sensor error	CN15	

Note 1: Dip switch settings or User Interface settings

Code	Description
Ed	Main Control PCB can not detect the right sensor value.
HA	
E3	IBH function is on (Dip switch S1-3/4 is set IBH available, and User Interface- For Serviceman - Other heat source – IBH function=1), while Main Control PCB can not detect the right **T1** sensor value. AHS function is on (User Interface- For Serviceman - Other heat source - AHS function=1), while Main Control PCB can not detect the right **T1** sensor value.
E4	DHW mode is on (User Interface- For Serviceman – DHW setting- DHW mode=1), while Main Control PCB can not detect the right **T5** sensor value.
E7	Tbt is on (User Interface- For Serviceman- Input definition- Tbt=1), while Main Control PCB can not detect the right **Tbt** sensor value.
Eb	Solar function is on and Solar control is on (User Interface- For Serviceman - Other heat source - Solar function=1 & Solar control=1), while Main Control PCB can not detect the right **Tsolar** sensor value.
EC	T5_2 is on (User Interface- For Serviceman- Input definition- Tbt=1), while Main Control PCB can not detect the right **T5_2** sensor value. (Reserved)
H9	Double zone is on (User Interface- For Serviceman –Temp. type setting – Double zone=1), while Main Control PCB can not detect the right **Tw2** sensor value.

6.8.3 Procedure



6.9 H5 Troubleshooting

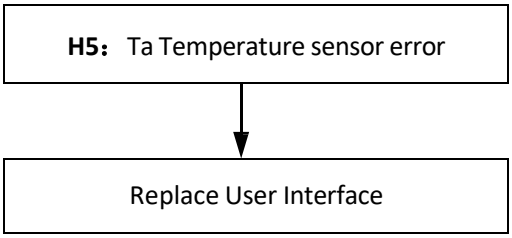
6.9.1 Digital display output



6.9.2 Description

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

6.9.3 Procedure

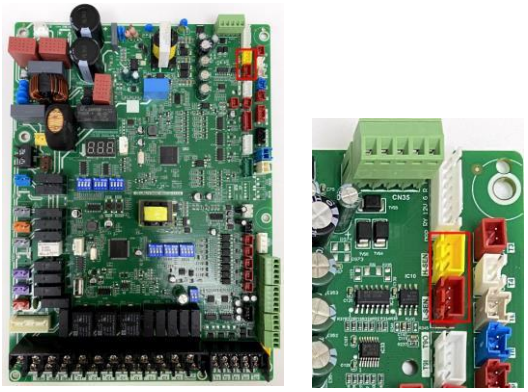


6.10 H8, P21, P27 Troubleshooting

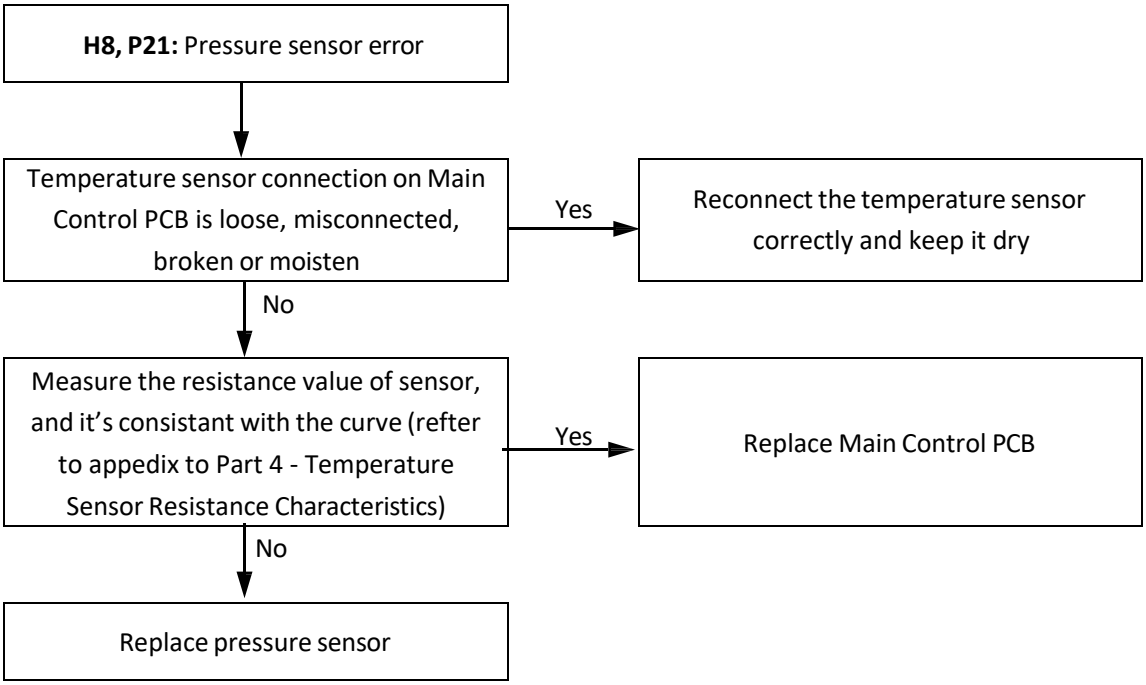
6.10.1 Digital display output

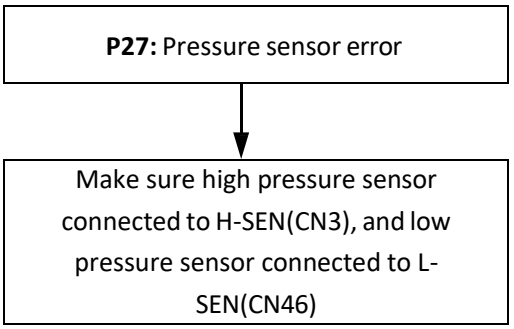


6.10.2 Description

Code	Description	Port	Location(Main Control PCB)
H8	H-SEN High pressure sensor error	CN3	
P21	L-SEN Low pressure sensor error	CN46	
P27	H-SEN and L-SEN connected reversely (Detect when compressor is off)	CN3/ CN46	

6.10.3 Procedure



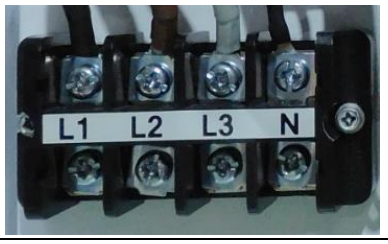


6.11 E1 Troubleshooting

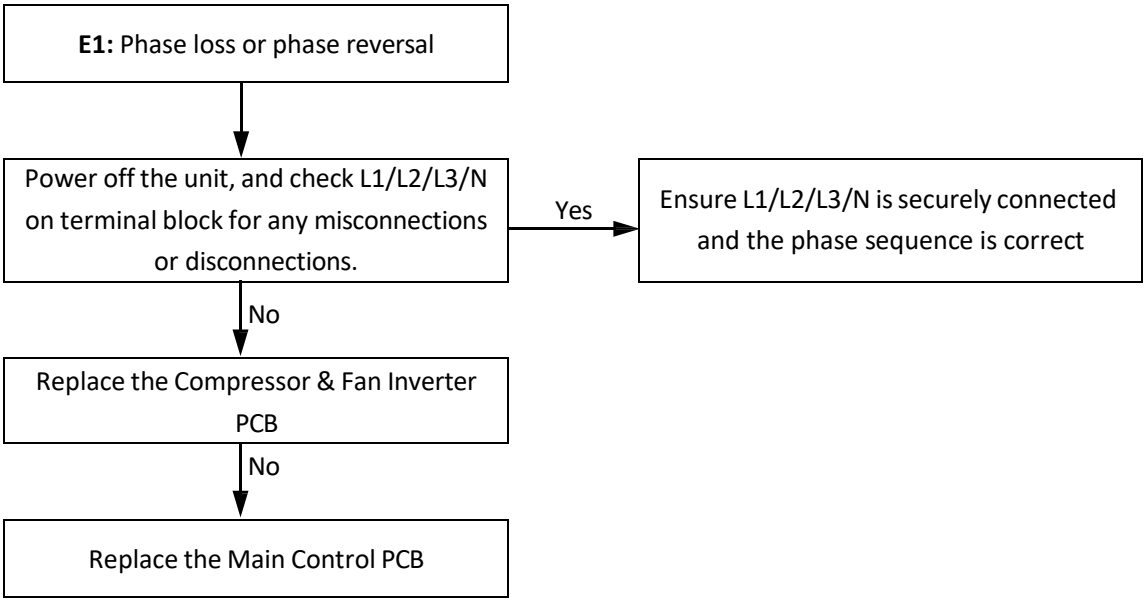
6.11.1 Digital display output



6.11.2 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
Relative ports and locations	Terminal blocks	 

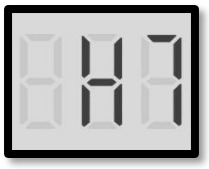
6.11.3 Procedure



6.12 H7 Troubleshooting

6.12.1

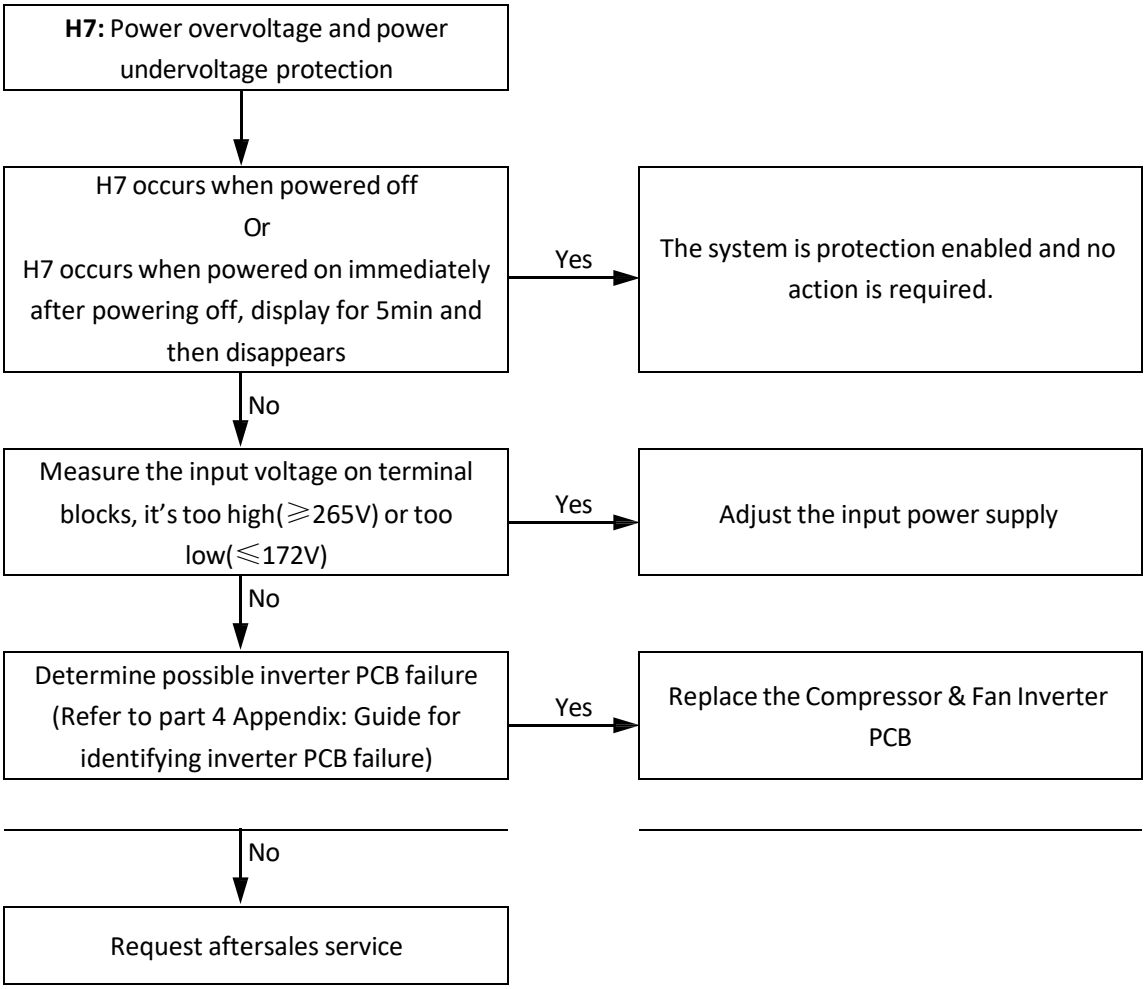
Digital display output



6.12.2 Description

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

6.12.3 Procedure



6.13 FE Troubleshooting

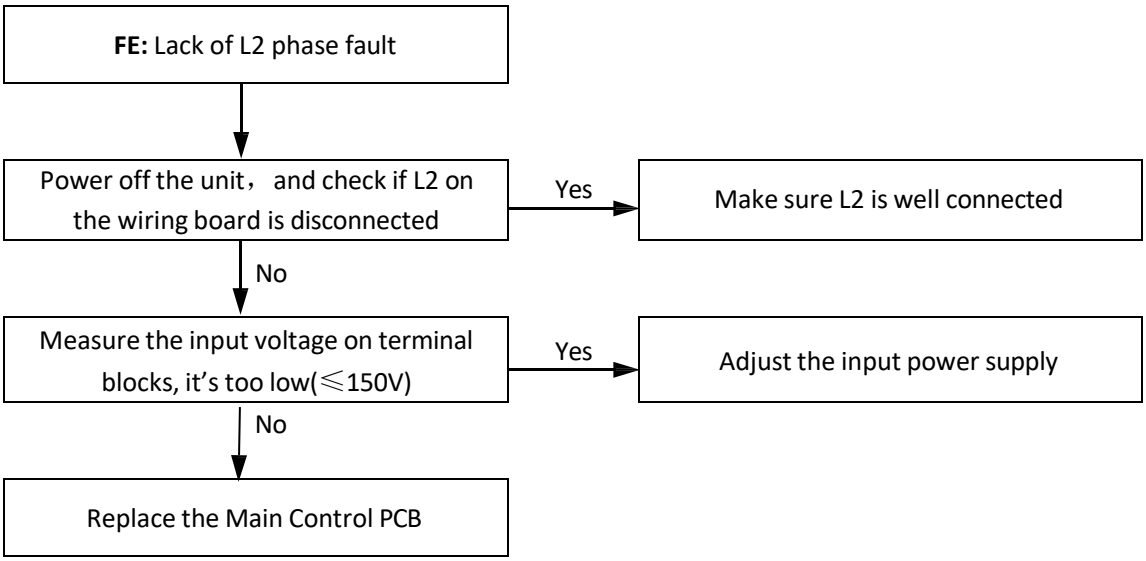
6.13.1 Digital display output



6.13.2 Description

Error code	FE
Description	Lack of L2 phase fault
Triggering	Input voltage≤150V (The unit will back to normal if input voltage≥160V)

6.13.3 Procedure



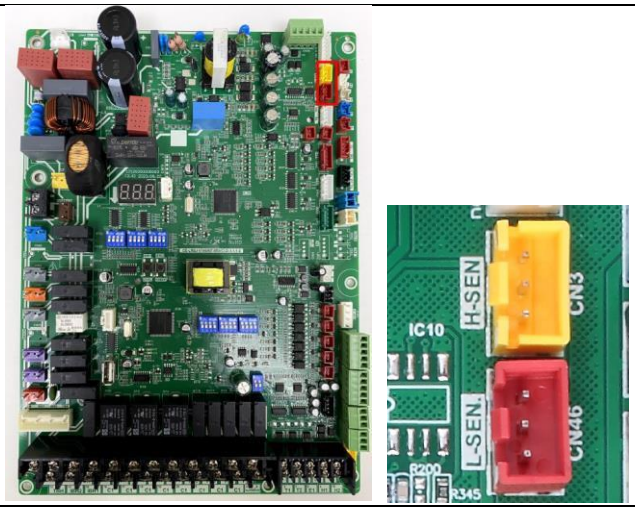
6.14 P0 Troubleshooting

6.14.1

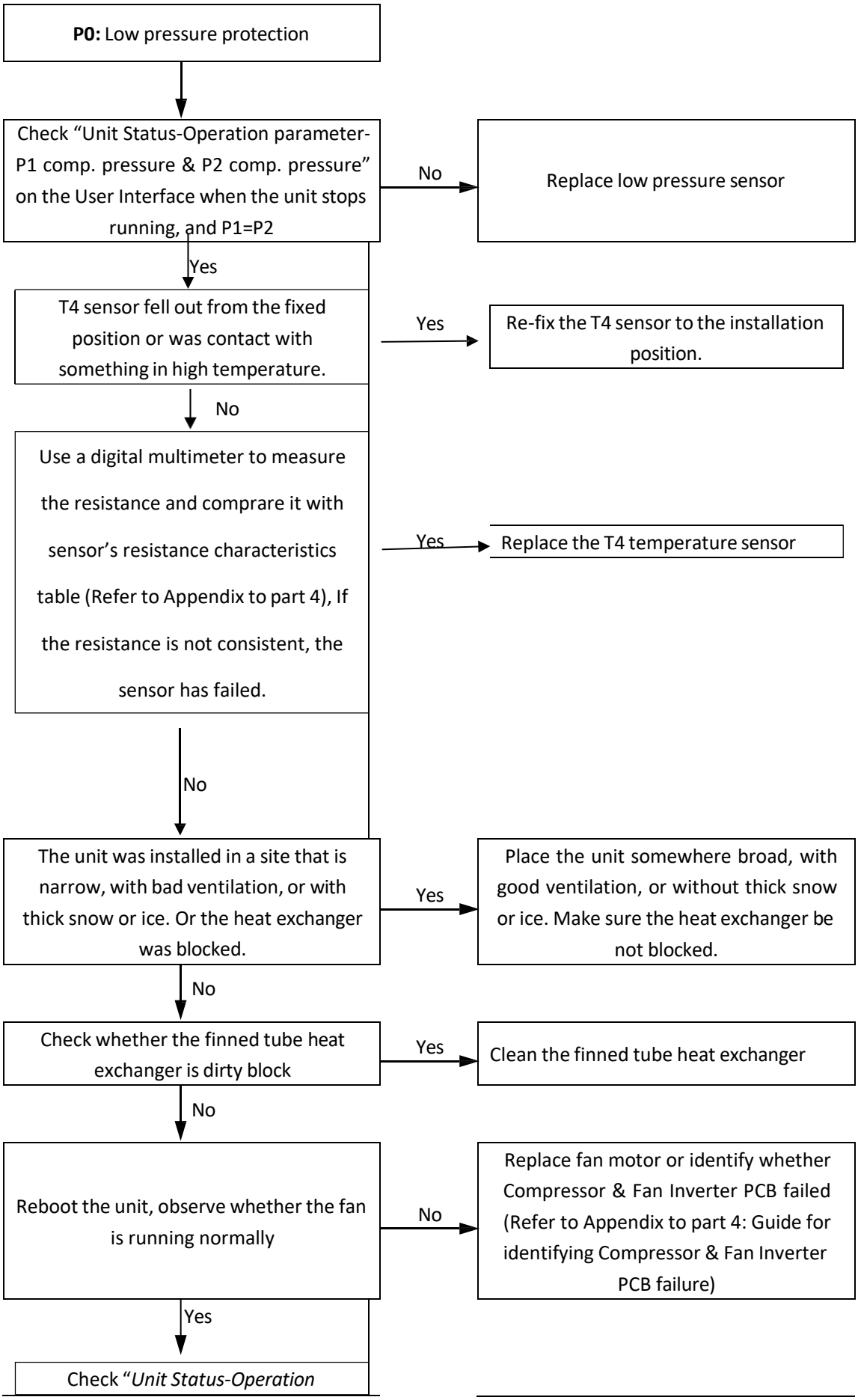
Digital display output

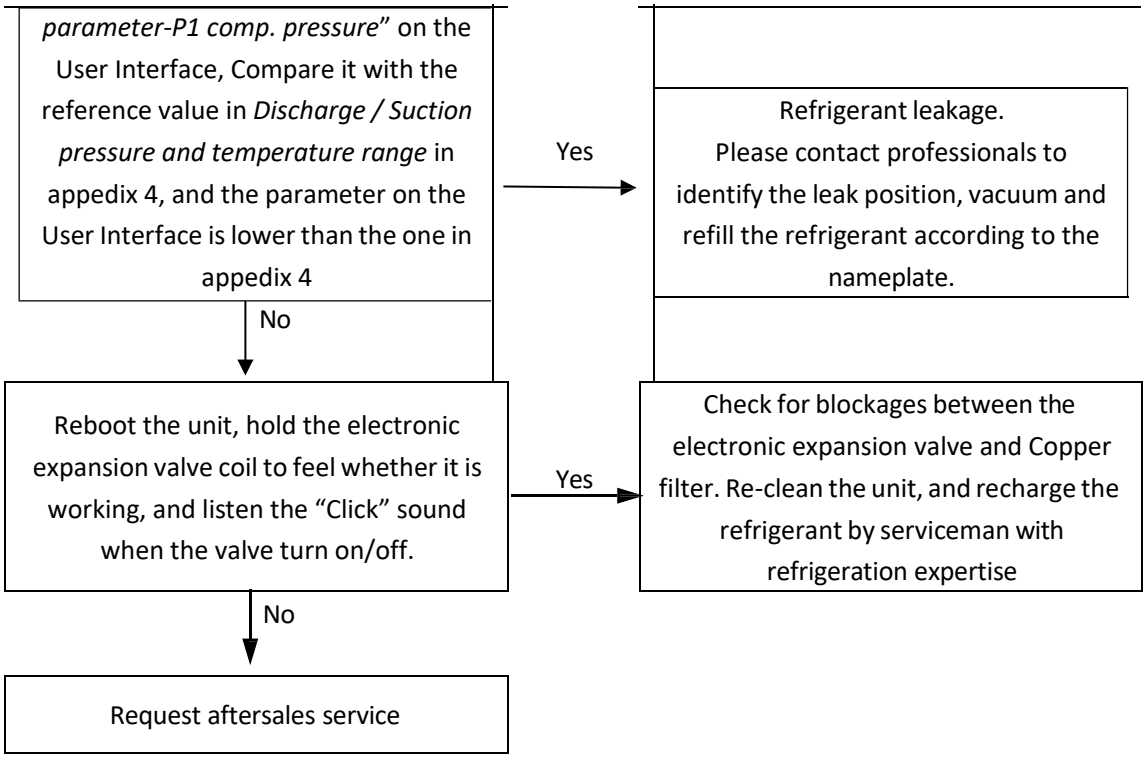


6.14.2 Description

Error code	P0
Description	Low-pressure protection
Triggering	1、The Main Control PCB detected that the low pressure was < 0.12Mpa and lasts 30 min 2、The Main Control PCB detected that the low pressure was < 0.13Mpa and lasts 5 seconds ,and compressor stopped running and lasts 2 min at the same time. 3、The Main Control PCB detected that the low pressure was < 0.13Mpa and lasts 5 seconds, and compressor is already running and lasts, and T4<-10℃， and the unit is in running except defrost and forced cooling operation.
H-SEN and L-SEN Locations	

6.14.3 Procedure



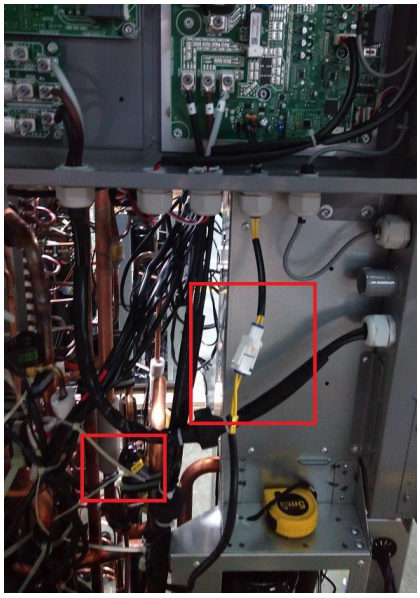

parameter-P1 comp. pressure" on the User Interface, Compare it with the reference value in *Discharge / Suction pressure and temperature range* in appedix 4, and the parameter on the User Interface is lower than the one in appedix 4
Yes
Refrigerant leakage.
Please contact professionals to identify the leak position, vacuum and refill the refrigerant according to the nameplate.
No
Reboot the unit, hold the electronic expansion valve coil to feel whether it is working, and listen the "Click" sound when the valve turn on/off.
Yes
Check for blockages between the electronic expansion valve and Copper filter. Re-clean the unit, and recharge the refrigerant by serviceman with refrigeration expertise
No
Request aftersales service

6.15 P1 Troubleshooting

6.15.1 Digital display output

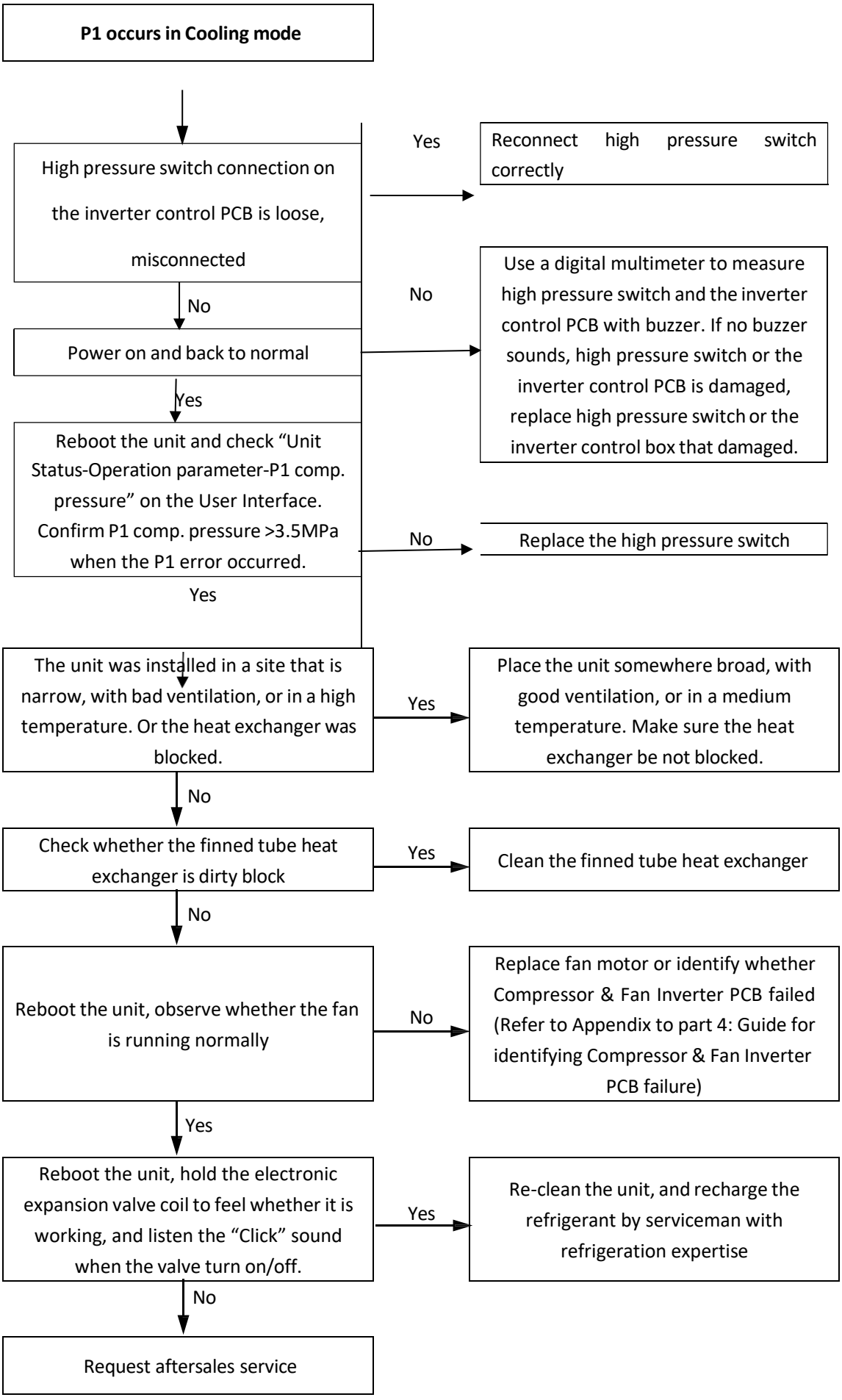


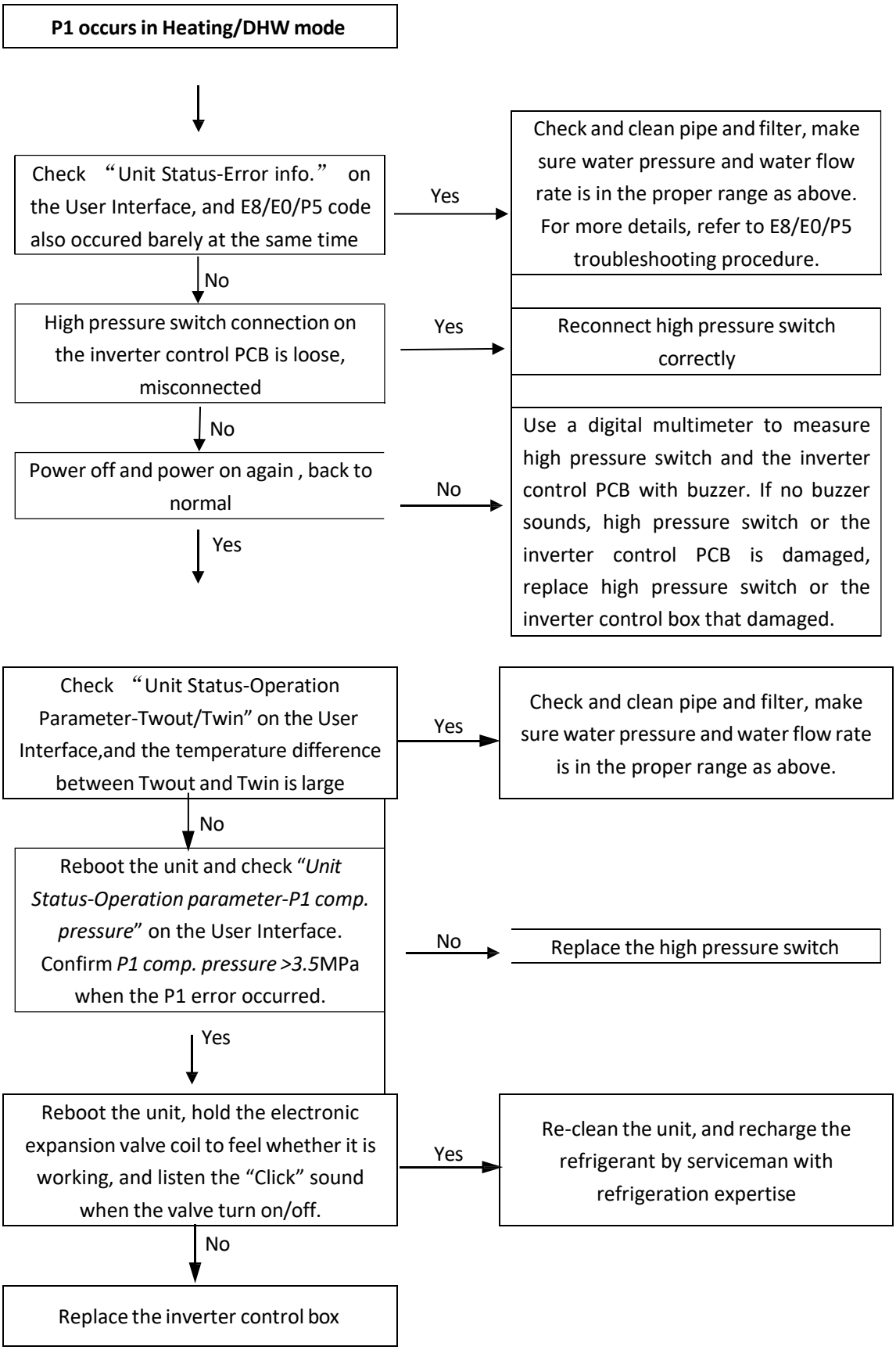
6.15.2 Description

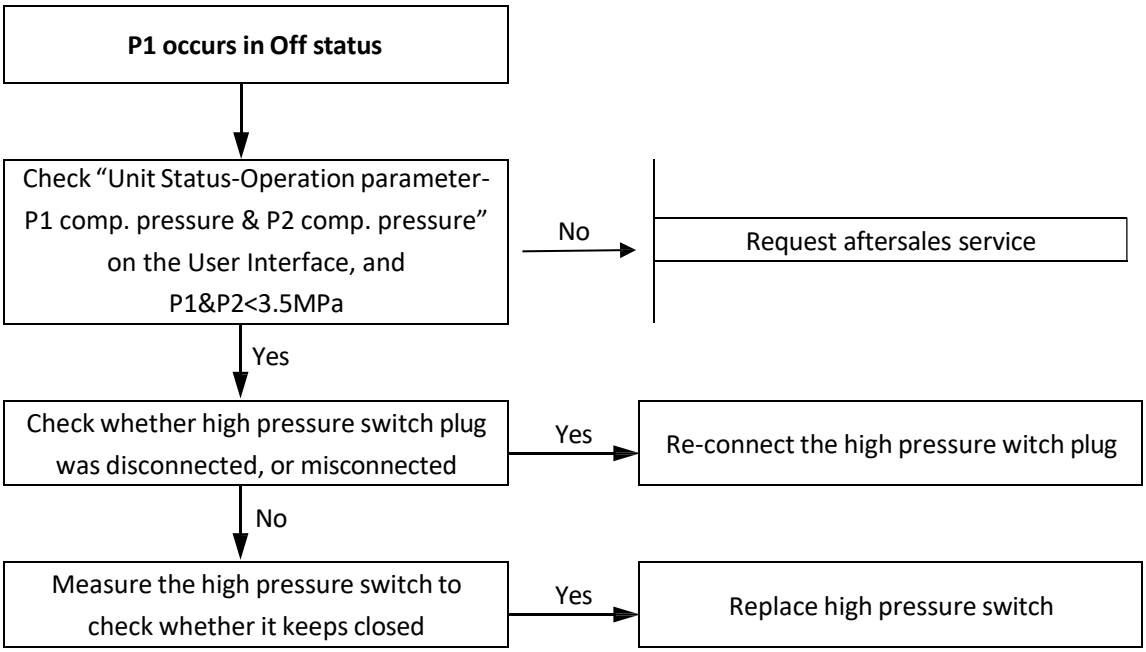
Error code	P1
Description	High pressure switch protection
Triggering	The Main Control PCB detected that the high pressure was ⩾ 3.5 Mpa
High pressure switch location	The location of high pressure switch refer to Part 2 Component Layout and Refrigerant Circuits
High pressure switch plug	
Make sure water pressure and water flow rate is in the proper range	The proper water pressure range:(0.3bar-3bar) The proper water flow rate range

Unit	Flow rate range (m^3/h)
26 kW	1.2-5.4
30 kW	1.2-6.2
35 kW	1.2-7.2

6.15.3 Procedure




P1 occurs in Heating/DHW mode
Check "Unit Status-Error info." on the User Interface, and E8/E0/P5 code also occured barely at the same time
Yes
Check and clean pipe and filter, make sure water pressure and water flow rate is in the proper range as above. For more details, refer to E8/E0/P5 troubleshooting procedure.
No
High pressure switch connection on the inverter control PCB is loose, misconnected
Yes
Reconnect high pressure switch correctly
No
Power off and power on again , back to normal
No
Use a digital multimeter to measure high pressure switch and the inverter control PCB with buzzer. If no buzzer sounds, high pressure switch or the inverter control PCB is damaged, replace high pressure switch or the inverter control box that damaged.
Yes
Check "Unit Status-Operation Parameter-Twout/Twin" on the User Interface,and the temperature difference between Twout and Twin is large
Yes
Check and clean pipe and filter, make sure water pressure and water flow rate is in the proper range as above.
No
Reboot the unit and check "Unit Status-Operation parameter-P1 comp. pressure" on the User Interface. Confirm P1 comp. pressure >3.5MPa when the P1 error occurred.
No
Replace the high pressure switch
Yes
Reboot the unit, hold the electronic expansion valve coil to feel whether it is working, and listen the "Click" sound when the valve turn on/off.
Yes
Re-clean the unit, and recharge the refrigerant by serviceman with refrigeration expertise
No
Replace the inverter control box


P1 occurs in Off status
Check "Unit Status-Operation parameter-P1 comp. pressure & P2 comp. pressure" on the User Interface, and P1&P2<3.5MPa
No
Request aftersales service
Yes
Check whether high pressure switch plug was disconnected, or misconnected
Yes
Re-connect the high pressure witch plug
No
Measure the high pressure switch to check whether it keeps closed
Yes
Replace high pressure switch

6.16 P3 Troubleshooting

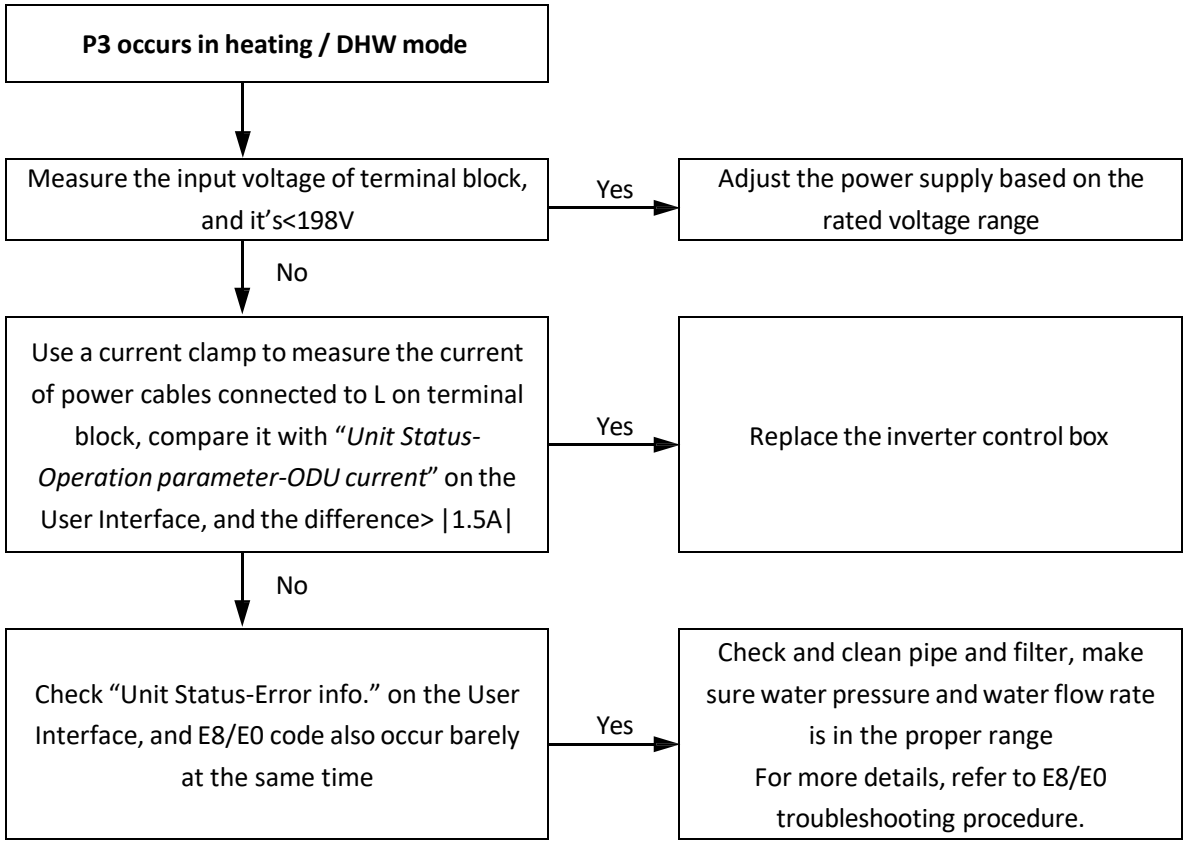
6.16.1 Digital display output

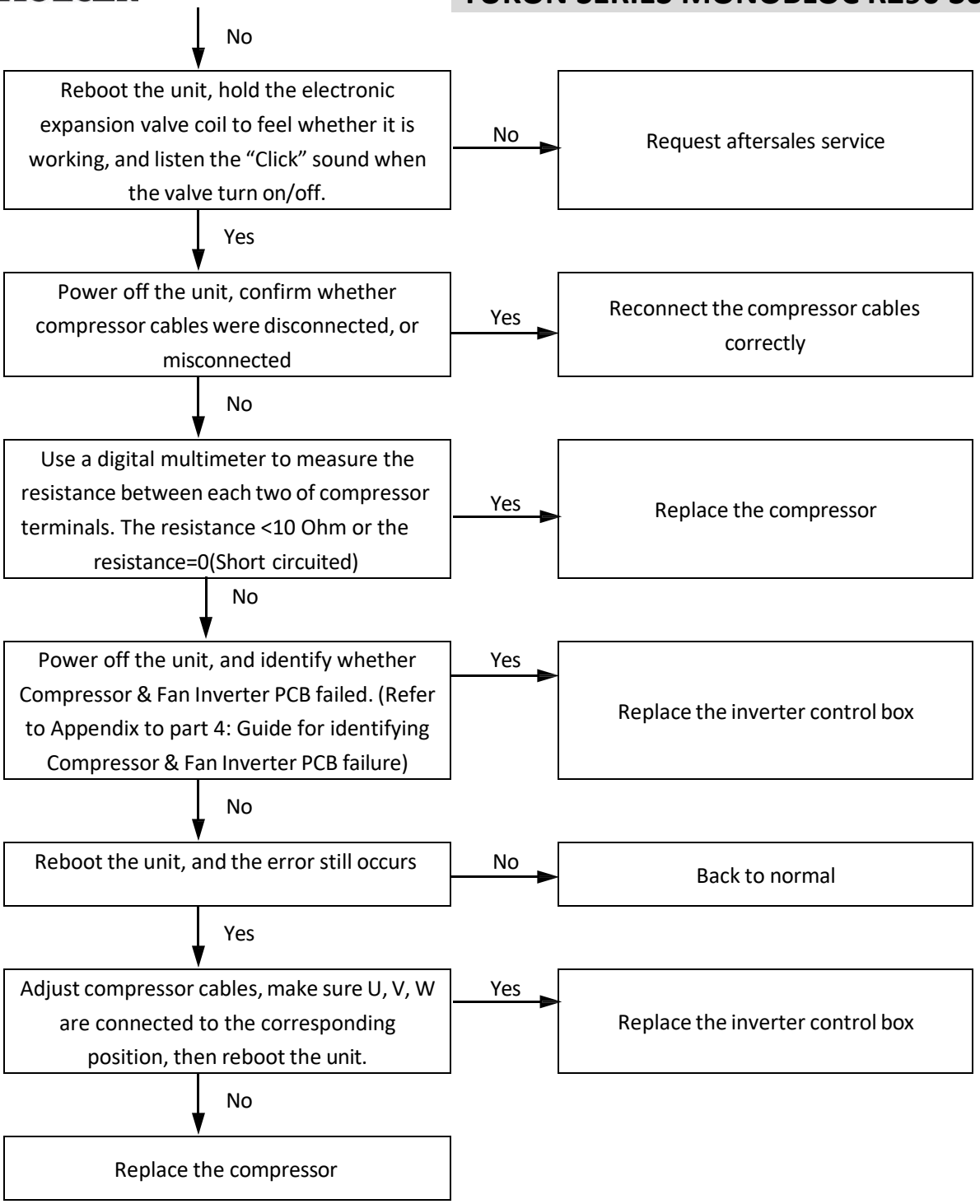


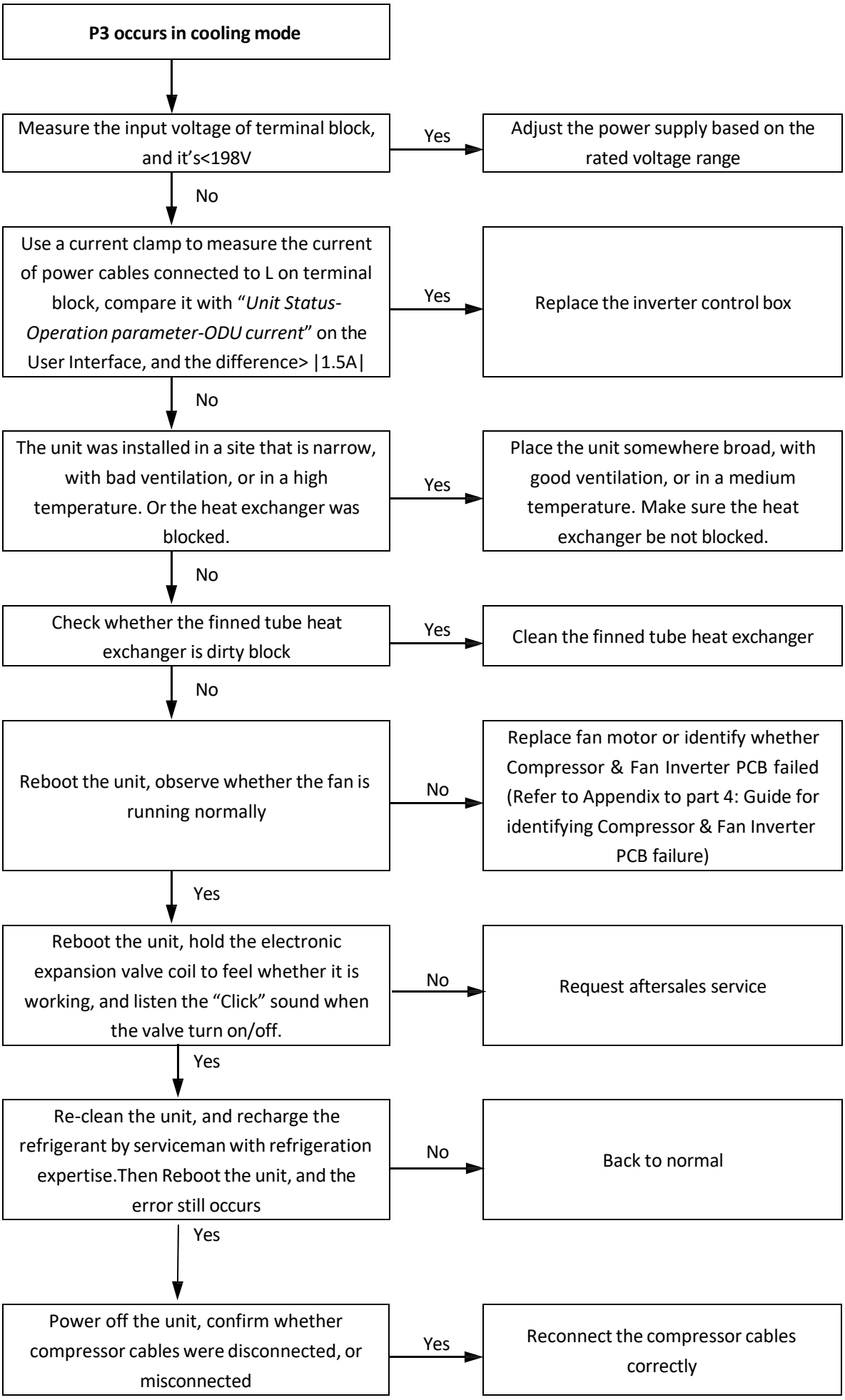
6.16.2 Description

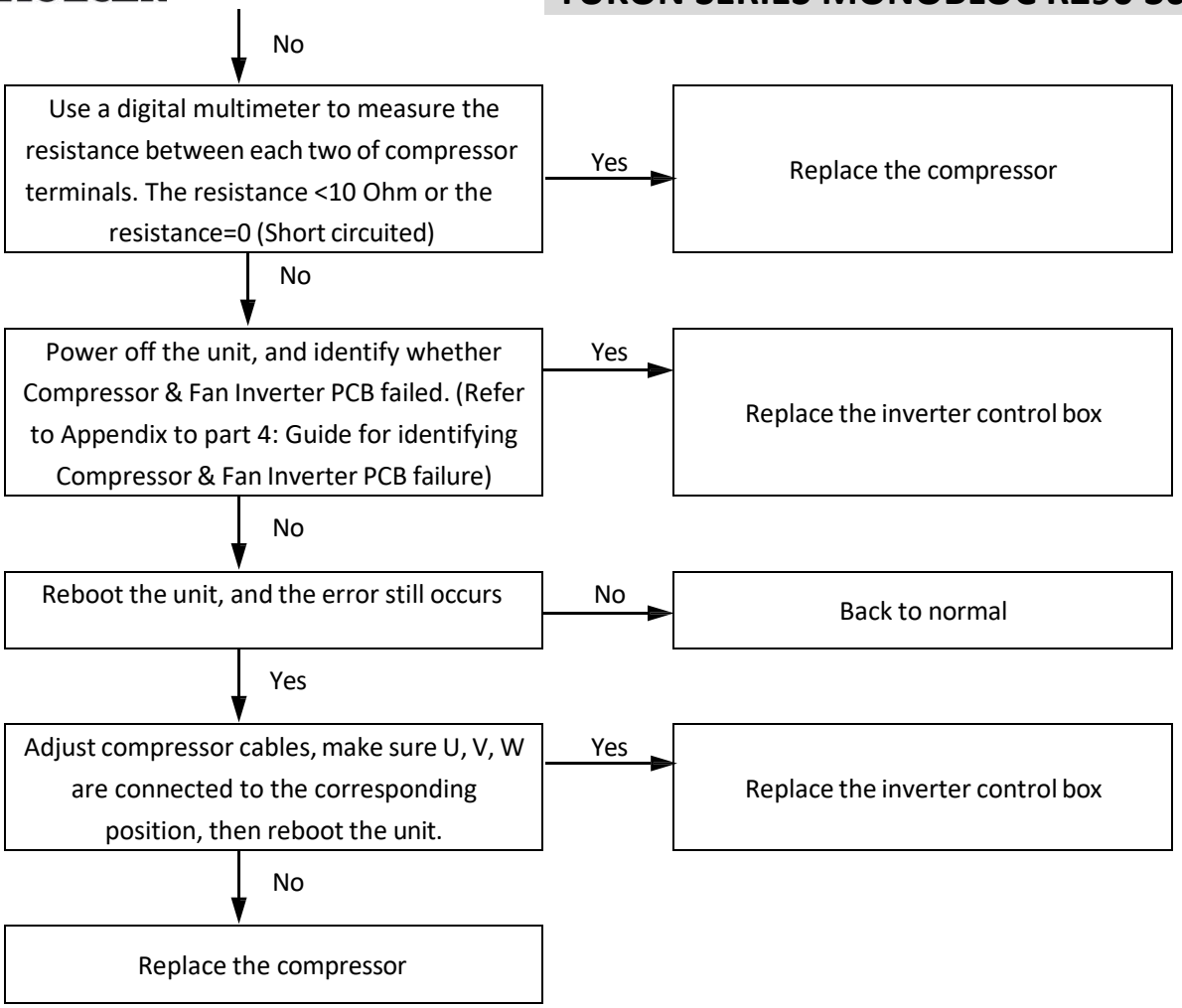
Error code	P3
Description	Overcurrent protection
Triggering	The Main Control PCB detected that the input current is higher than protection value
Teminal block	 

6.16.3 Procedure




No
Reboot the unit, hold the electronic expansion valve coil to feel whether it is working, and listen the “Click” sound when the valve turn on/off.
No
Request aftersales service
Yes
Power off the unit, confirm whether compressor cables were disconnected, or misconnected
Yes
Reconnect the compressor cables correctly
No
Use a digital multimeter to measure the resistance between each two of compressor terminals. The resistance <10 Ohm or the resistance=0(Short circuited)
Yes
Replace the compressor
No
Power off the unit, and identify whether Compressor & Fan Inverter PCB failed. (Refer to Appendix to part 4: Guide for identifying Compressor & Fan Inverter PCB failure)
Yes
Replace the inverter control box
No
Reboot the unit, and the error still occurs
No
Back to normal
Yes
Adjust compressor cables, make sure U, V, W are connected to the corresponding position, then reboot the unit.
Yes
Replace the inverter control box
No
Replace the compressor


P3 occurs in cooling mode
Measure the input voltage of terminal block, and it's<198V
Yes
Adjust the power supply based on the rated voltage range
No
Use a current clamp to measure the current of power cables connected to L on terminal block, compare it with "Unit Status-Operation parameter-ODU current" on the User Interface, and the difference> |1.5A|
Yes
Replace the inverter control box
No
The unit was installed in a site that is narrow, with bad ventilation, or in a high temperature. Or the heat exchanger was blocked.
Yes
Place the unit somewhere broad, with good ventilation, or in a medium temperature. Make sure the heat exchanger be not blocked.
No
Check whether the finned tube heat exchanger is dirty block
Yes
Clean the finned tube heat exchanger
No
Reboot the unit, observe whether the fan is running normally
No
Replace fan motor or identify whether Compressor & Fan Inverter PCB failed (Refer to Appendix to part 4: Guide for identifying Compressor & Fan Inverter PCB failure)
Yes
Reboot the unit, hold the electronic expansion valve coil to feel whether it is working, and listen the "Click" sound when the valve turn on/off.
No
Request aftersales service
Yes
Re-clean the unit, and recharge the refrigerant by serviceman with refrigeration expertise.Then Reboot the unit, and the error still occurs
No
Back to normal
Yes
Power off the unit, confirm whether compressor cables were disconnected, or misconnected
Yes
Reconnect the compressor cables correctly

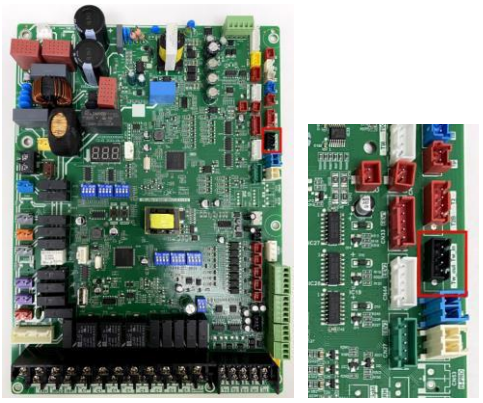
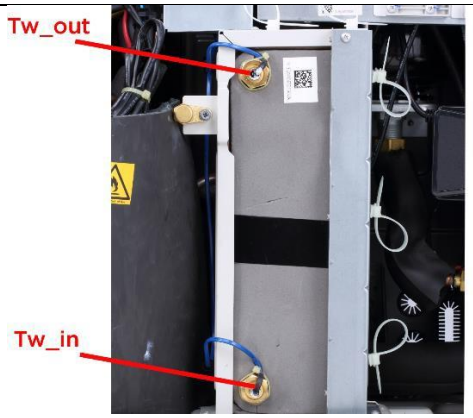

No
Use a digital multimeter to measure the resistance between each two of compressor terminals. The resistance <10 Ohm or the resistance=0 (Short circuited)
Yes
Replace the compressor
No
Power off the unit, and identify whether Compressor & Fan Inverter PCB failed. (Refer to Appendix to part 4: Guide for identifying Compressor & Fan Inverter PCB failure)
Yes
Replace the inverter control box
No
Reboot the unit, and the error still occurs
No
Back to normal
Yes
Adjust compressor cables, make sure U, V, W are connected to the corresponding position, then reboot the unit.
Yes
Replace the inverter control box
No
Replace the compressor

6.17 P4 Troubleshooting

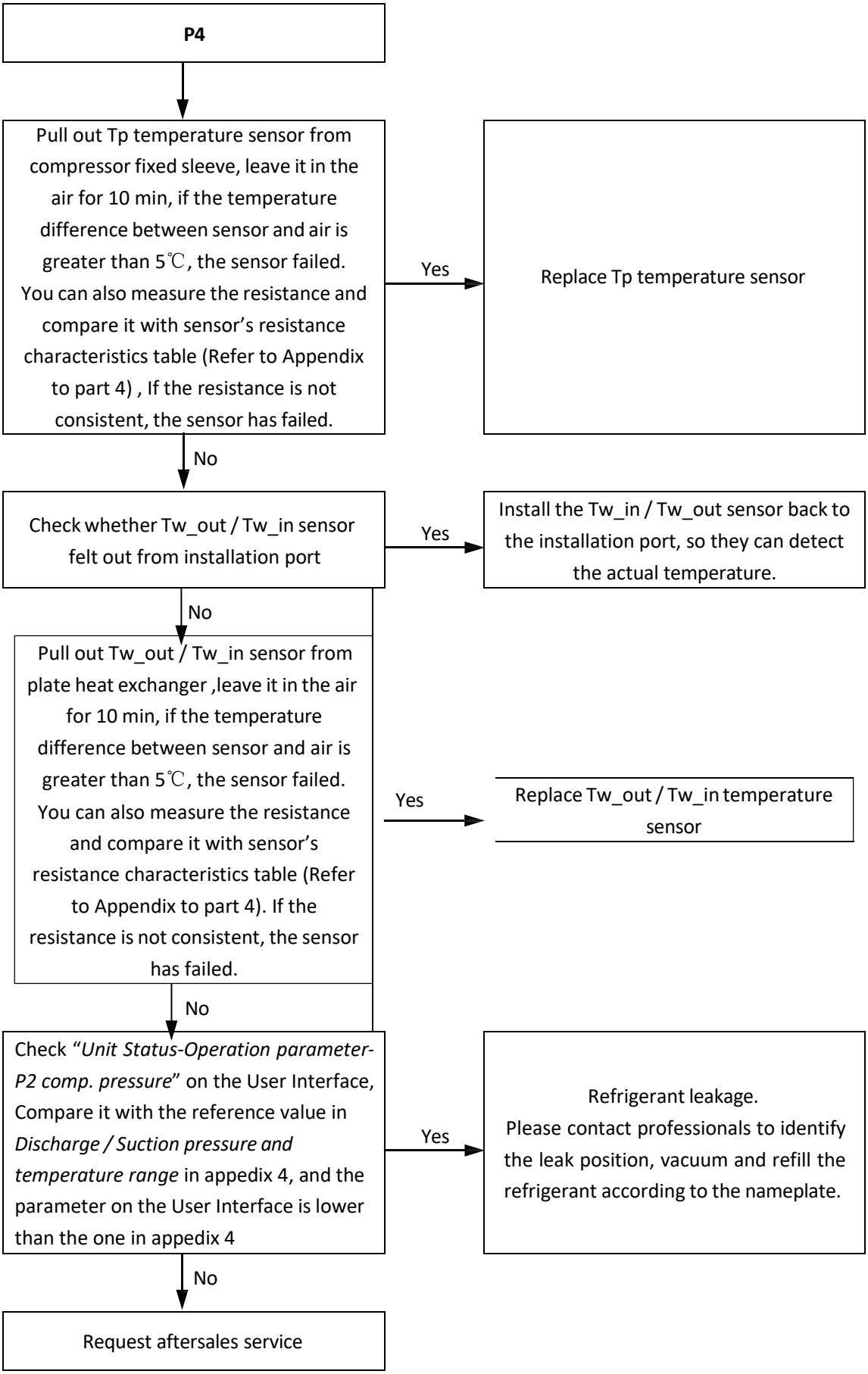
6.17.1 Digital display output



6.17.2 Description

Error code		P4
Description		The protection for overheat discharge temperature of Compressor
Triggering		The Main Control PCB detected that the compressor discharge temperature was ⩾ 115℃
Relative ports and locations	Tp	 You can find Tp sensor by the sensor cable from Tp port
	Tw_in Tw_out	

6.17.3 Procedure

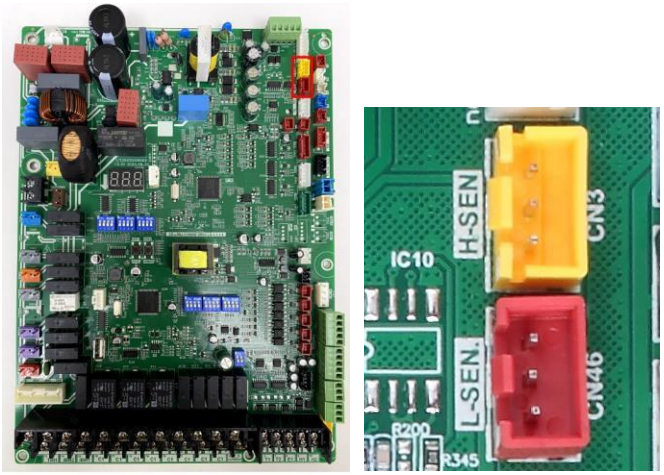


6.18 Pd Troubleshooting

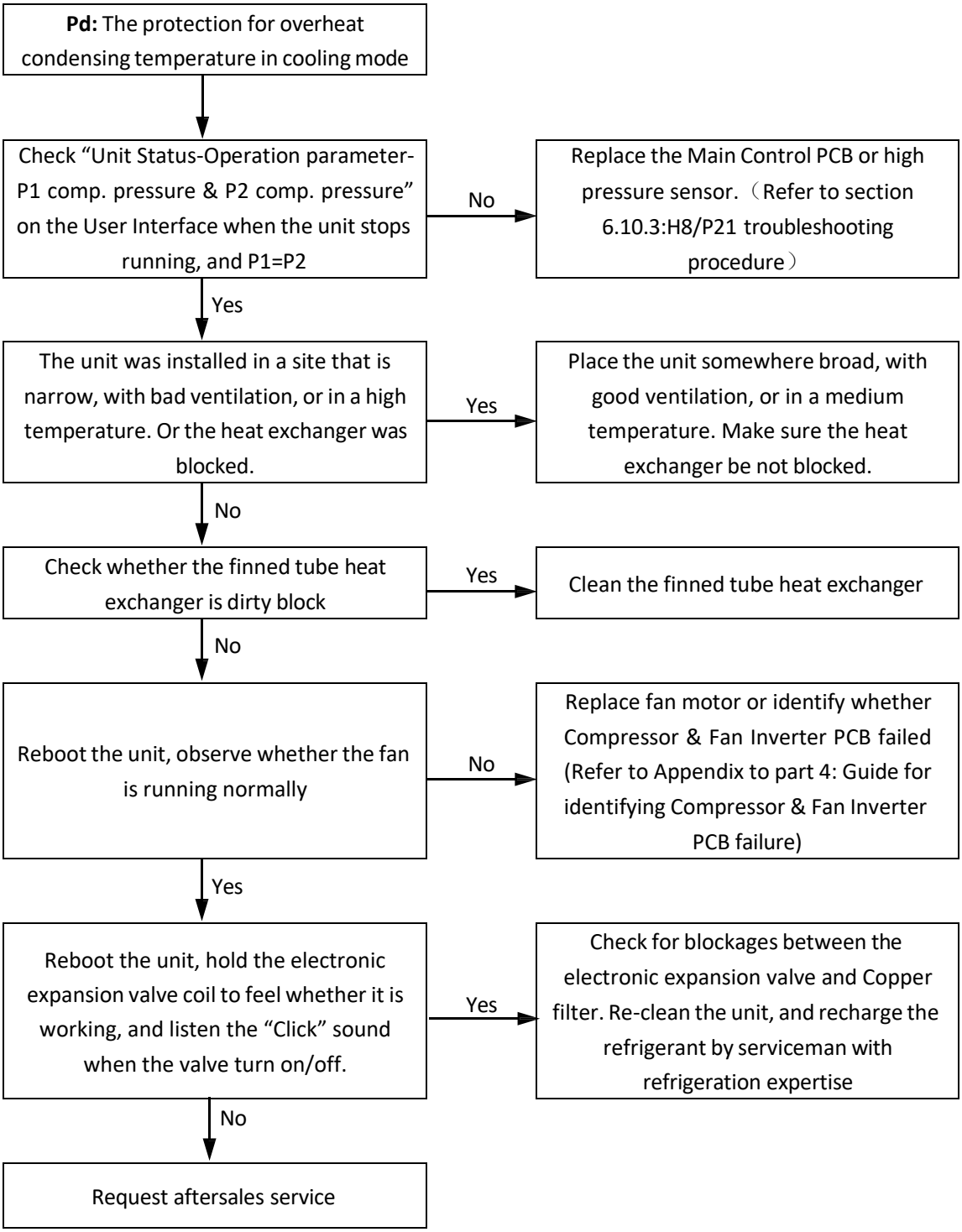
6.18.1 Digital display output



6.18.2 Description

Error code	Pd
Description	The protection for overheat condensing temperature
Triggering	The Main Control PCB detected that it's in cooling mode and the condensing temperature was ≥65℃
Relative ports and locations	

6.18.3 Procedure

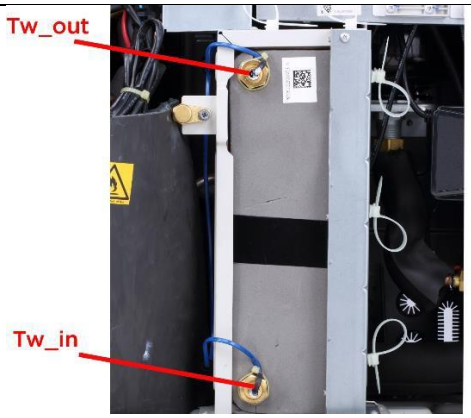


6.19 HP Troubleshooting

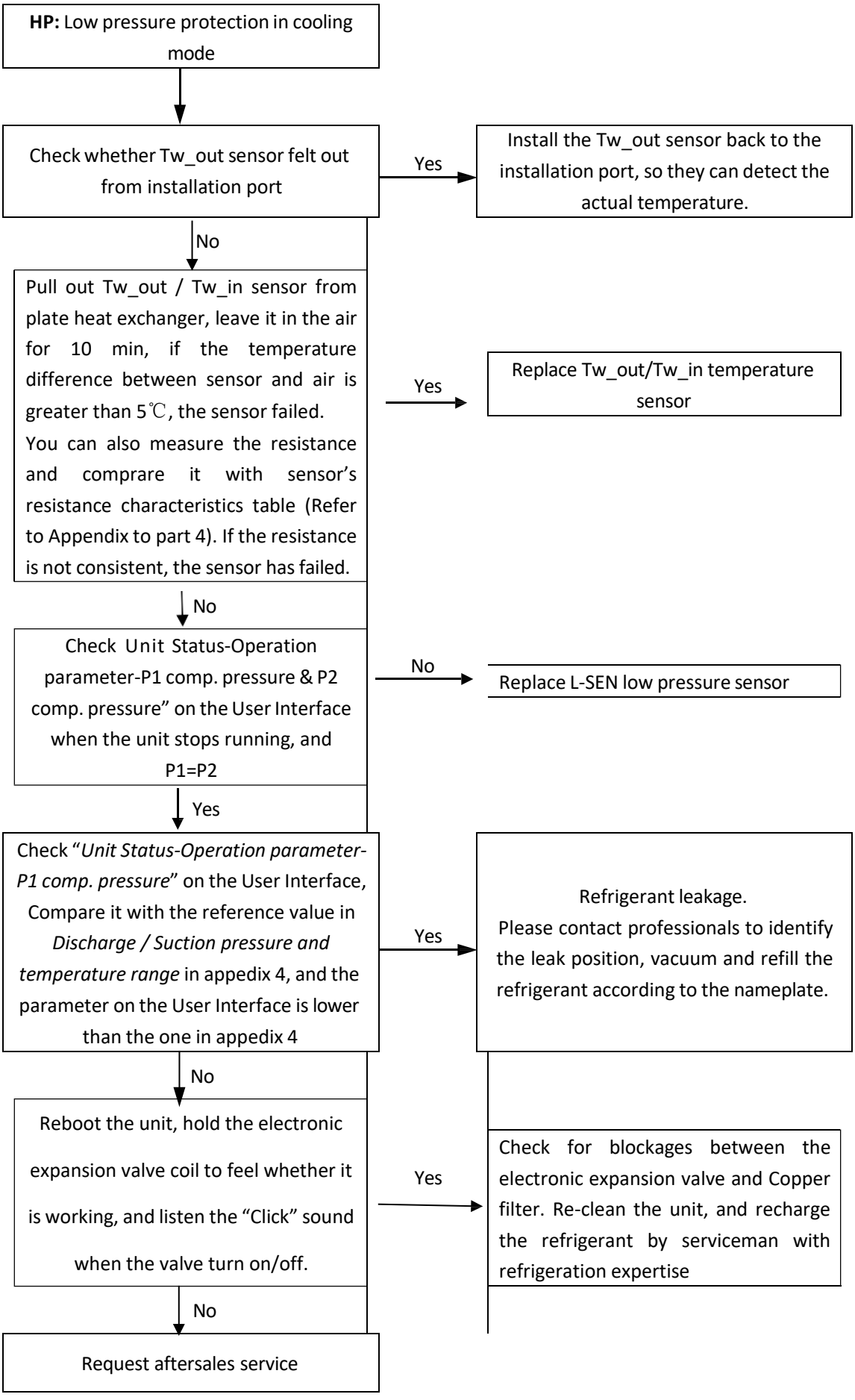
6.19.1 Digital display output



6.19.2 Description

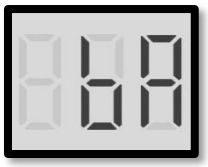
Error code	HP
Description	Low pressure protection in cooling mode
Triggering	The Main Control PCB detected that the suction pressure P2<0.35Mpa for 5 seconds in cooling mode and compressor running over 300 seconds.
Tw_in Tw_out	

6.19.3 Procedure



6.20 bA Troubleshooting

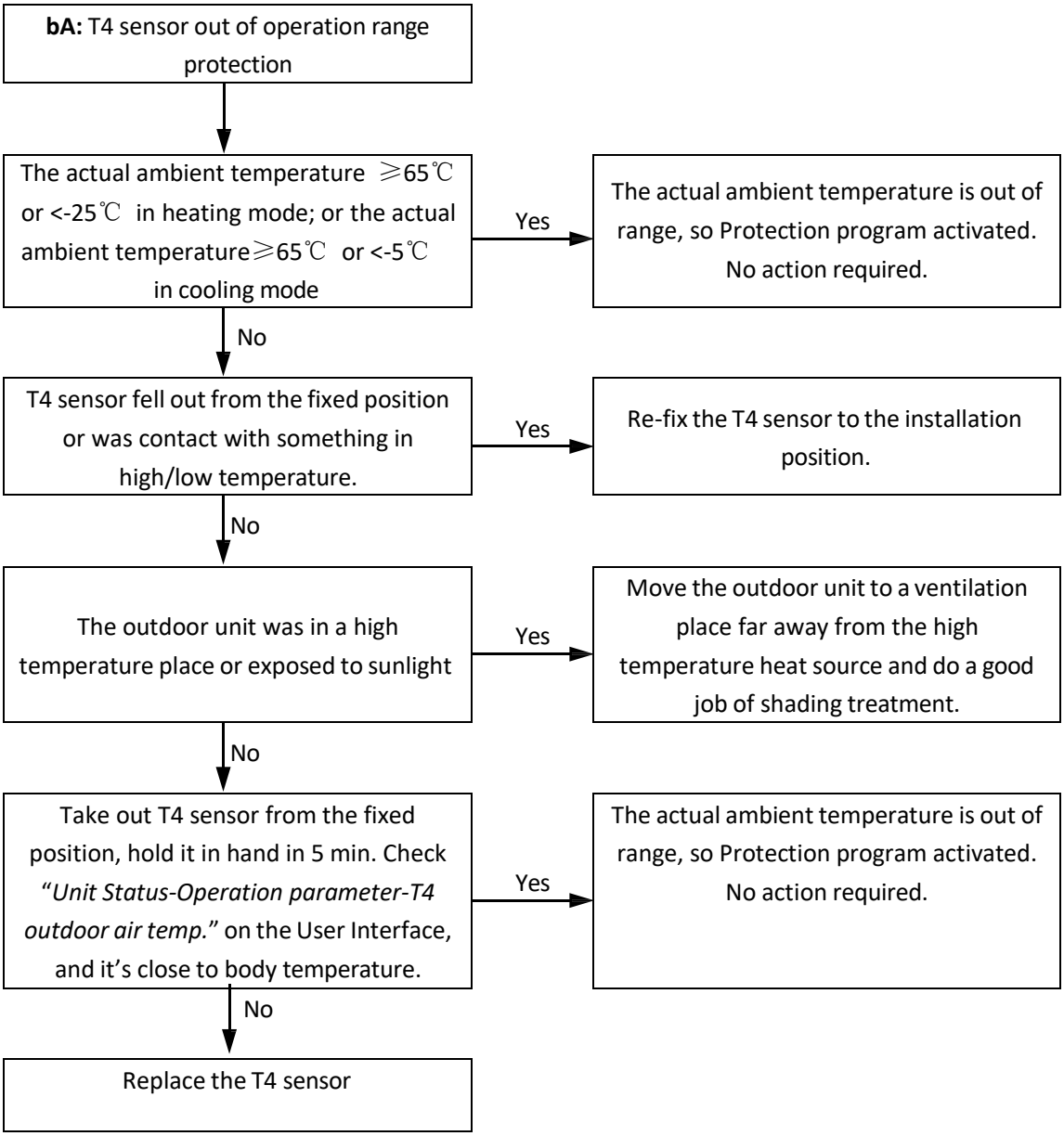
6.20.1 Digital display output



6.20.2 Description

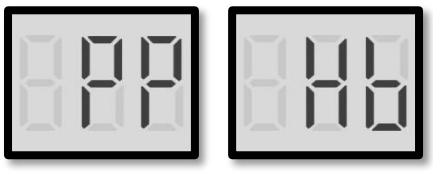
Error code	bA
Description	T4 sensor out of operation range protection
Triggering	In heating/ DHW mode, the error occurs when T4≥65℃ or T4<-25℃ In cooling mode, the error occurs when T4≥65℃ or T4<-5℃
T4	

6.20.3 Procedure

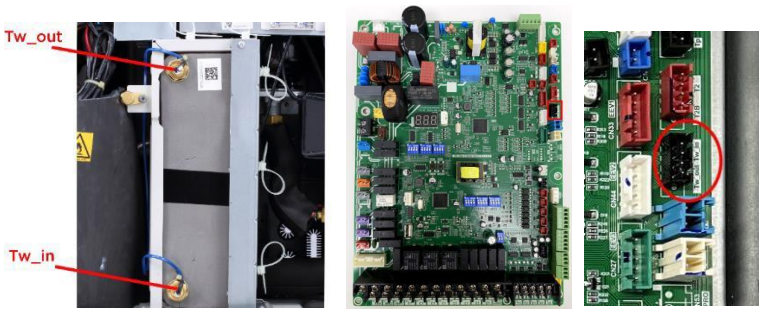
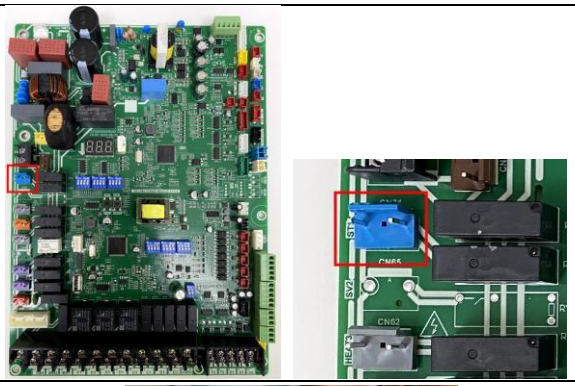


6.21 PP, Hb Troubleshooting

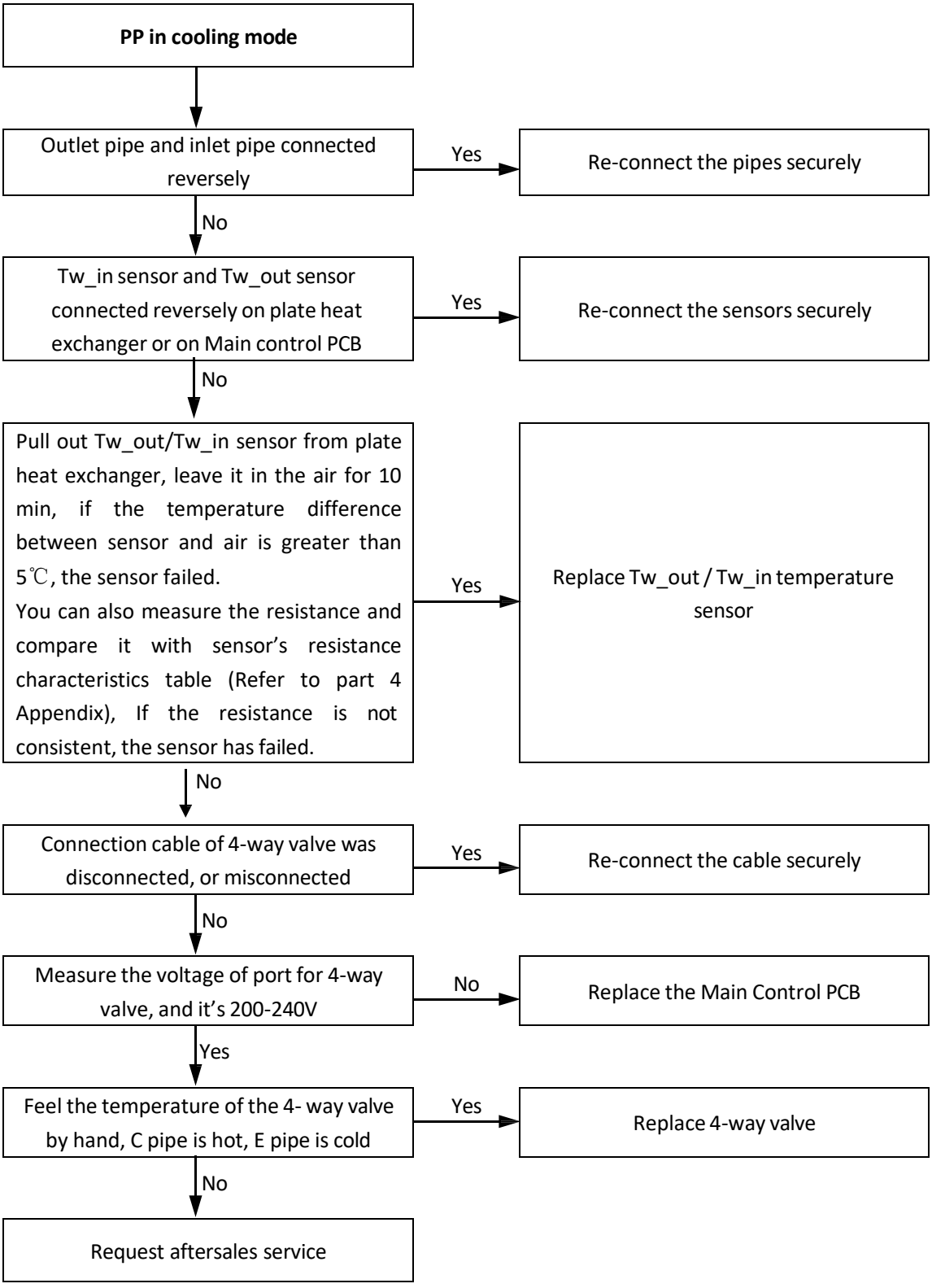
6.21.1 Digital display output

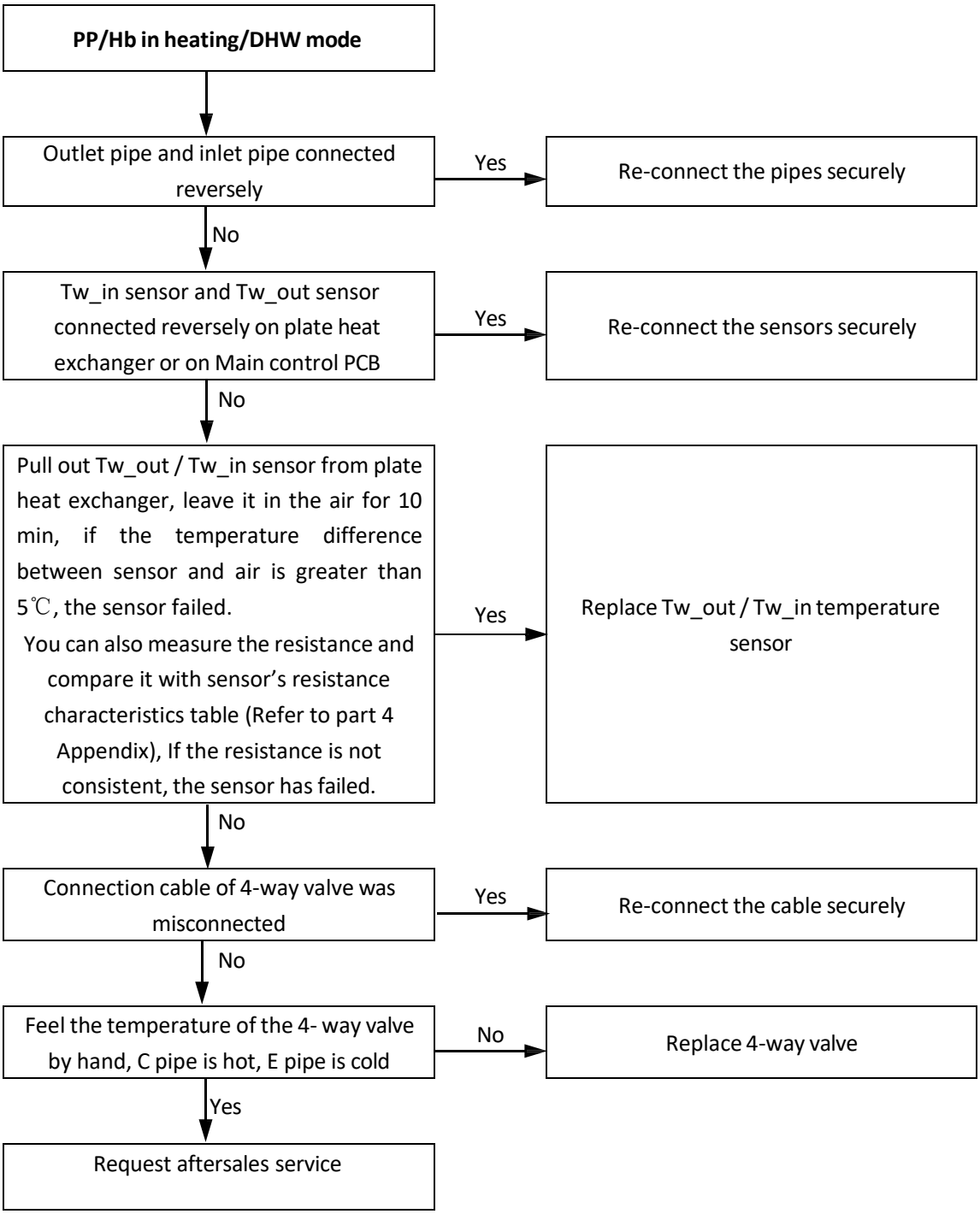


6.21.2 Description

Error code	PP	Hb
Description	The protection for abnormal temperature difference between outlet water and inlet water	3 times of PP in heating/DHW mode
Triggering	Twout-Twin≥3℃ and lasts 15 min in cooling mode Twin-Twout≥3℃ and lasts 15 min in heating/DHW mode	3 times of PP in heating/DHW mode; When Twout<7℃ occurs, the number of PP failures increases by one
Outlet pipe and inlet pipe		
Tw_in Tw_out		
CN71 ST1 Port for 4-way valve		
For-way valve E S C		

6.21.3 Procedure




PP/Hb in heating/DHW mode
Outlet pipe and inlet pipe connected reversely
Yes
Re-connect the pipes securely
No
Tw_in sensor and Tw_out sensor connected reversely on plate heat exchanger or on Main control PCB
Yes
Re-connect the sensors securely
No
Pull out Tw_out / Tw_in sensor from plate heat exchanger, leave it in the air for 10 min, if the temperature difference between sensor and air is greater than 5℃, the sensor failed.
You can also measure the resistance and compare it with sensor's resistance characteristics table (Refer to part 4 Appendix), If the resistance is not consistent, the sensor has failed.
Yes
Replace Tw_out / Tw_in temperature sensor
No
Connection cable of 4-way valve was misconnected
Yes
Re-connect the cable securely
No
Feel the temperature of the 4- way valve by hand, C pipe is hot, E pipe is cold
No
Replace 4-way valve
Yes
Request aftersales service

6.22 P5 Troubleshooting

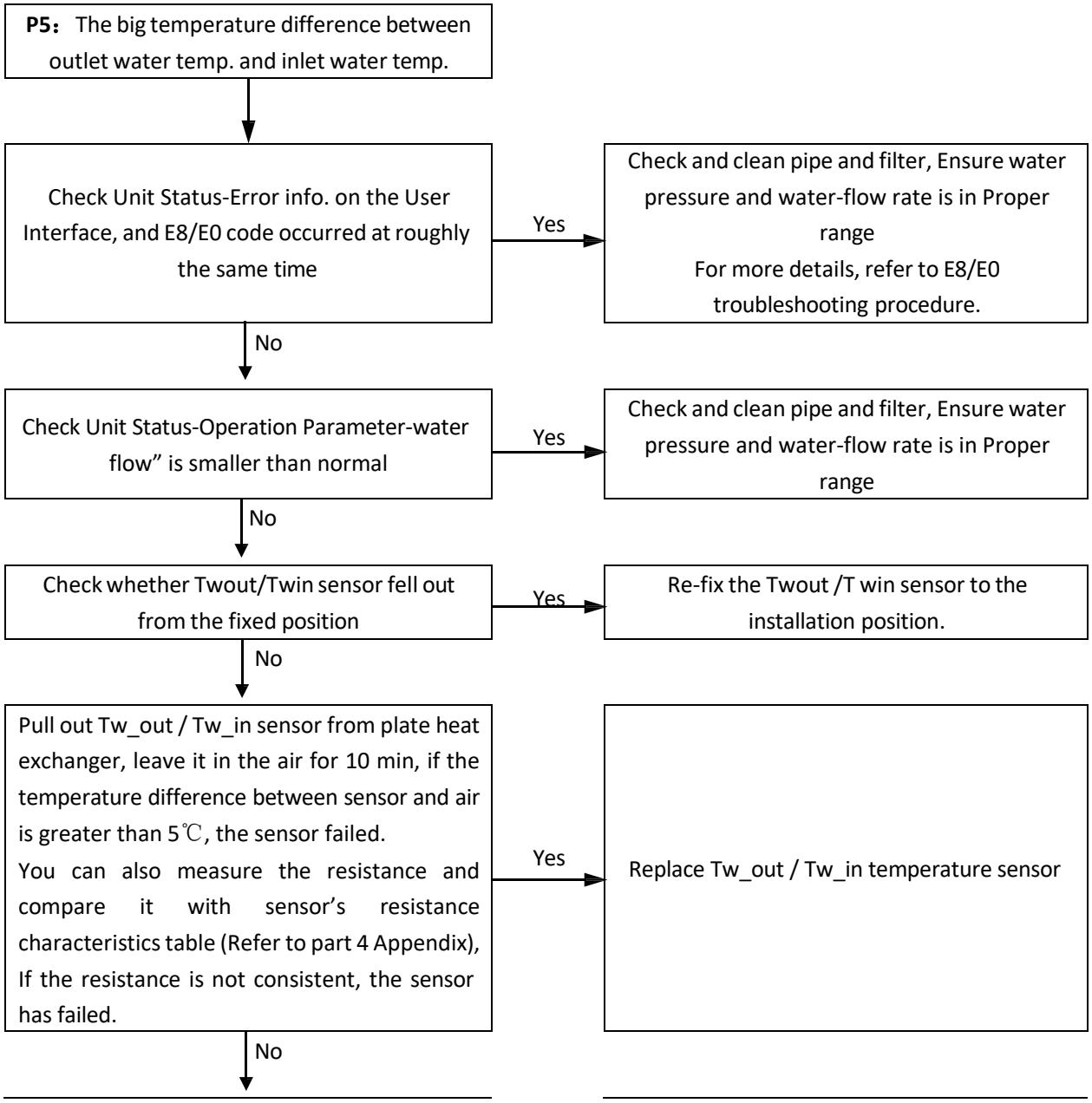
6.22.1 Digital display output

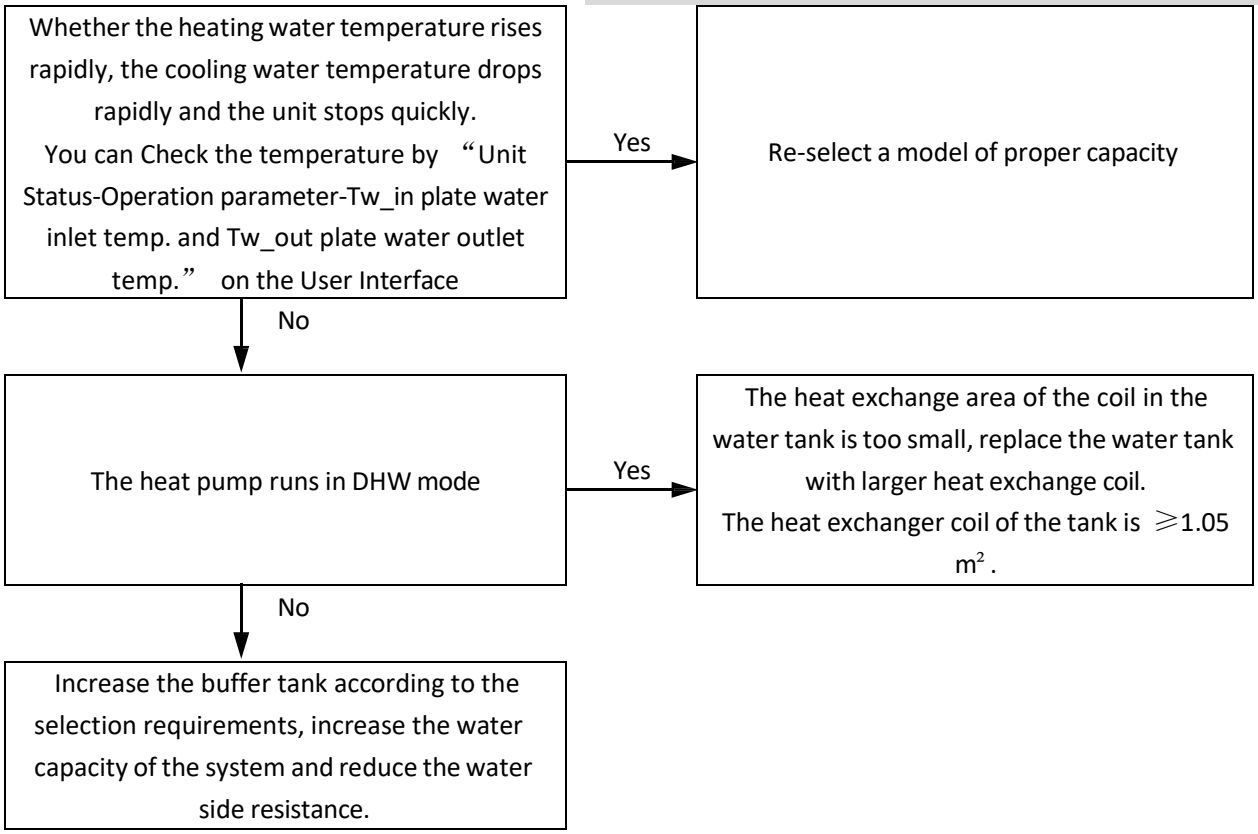


6.22.2 Description

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



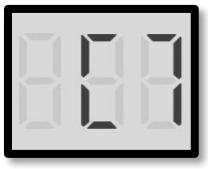

Whether the heating water temperature rises rapidly, the cooling water temperature drops rapidly and the unit stops quickly.
You can Check the temperature by "Unit Status-Operation parameter-Tw_in plate water inlet temp. and Tw_out plate water outlet temp." on the User Interface
Yes
Re-select a model of proper capacity
No
The heat pump runs in DHW mode
Yes
The heat exchange area of the coil in the water tank is too small, replace the water tank with larger heat exchange coil.
The heat exchanger coil of the tank is ⩾1.05 m².
No
Increase the buffer tank according to the selection requirements, increase the water capacity of the system and reduce the water side resistance.

6.23 C7 Troubleshooting

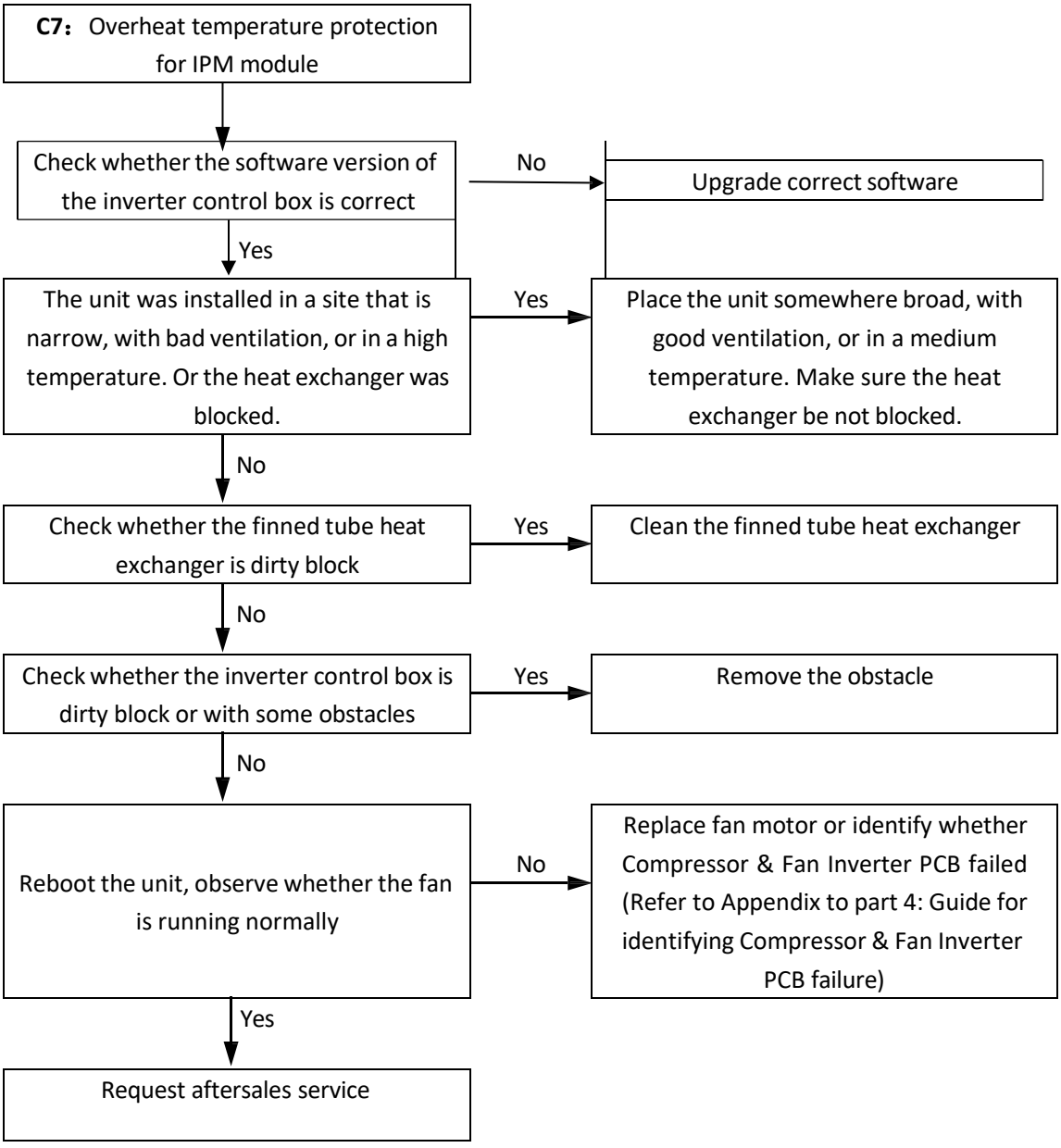
6.23.1 Description

Error code	C7
Description	Overheat temperature protection for IPM module
Triggering	IPM module temperature ⩾ 95℃

6.23.2 Digital display output

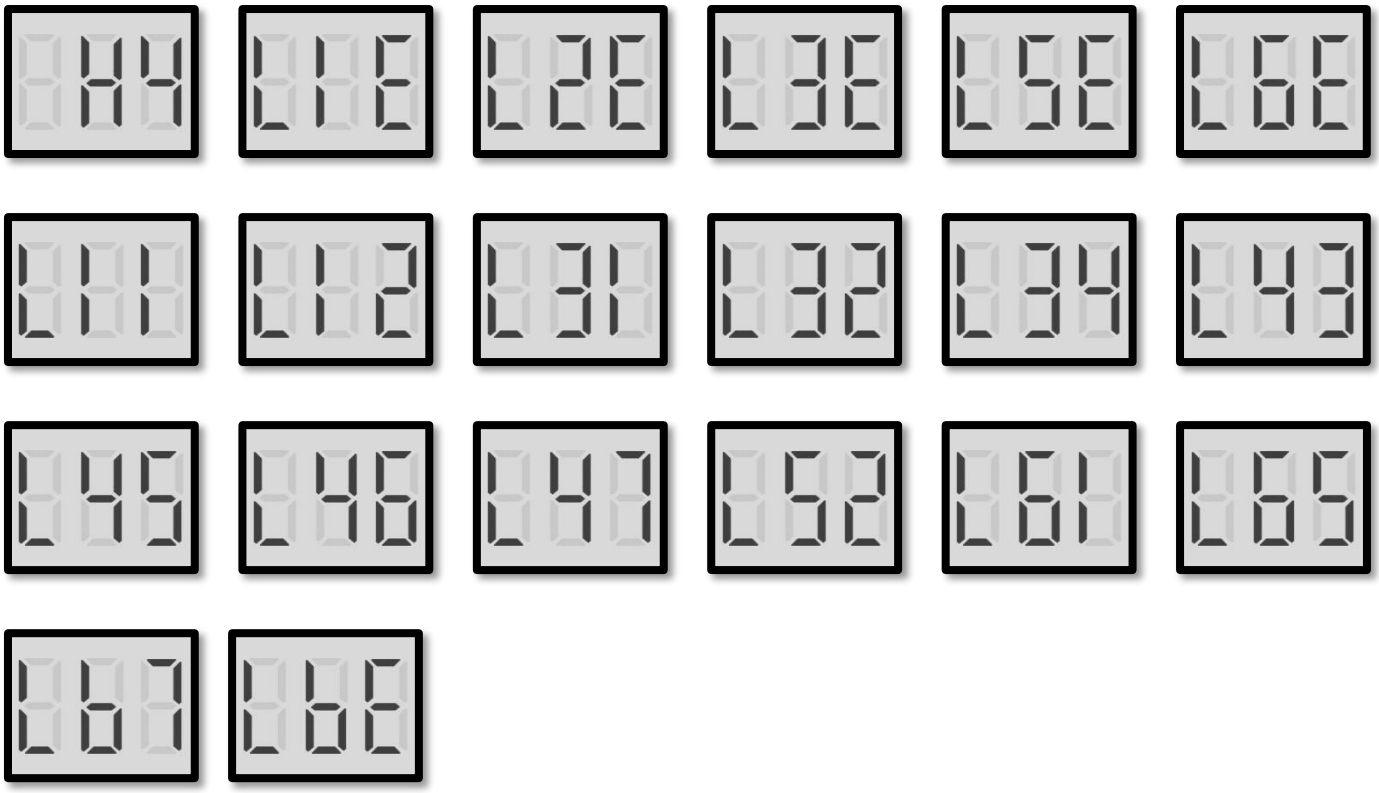


6.23.3 Procedure



6.24 H4, L** Troubleshooting

6.24.1 Digital display output



6.24.2 Description

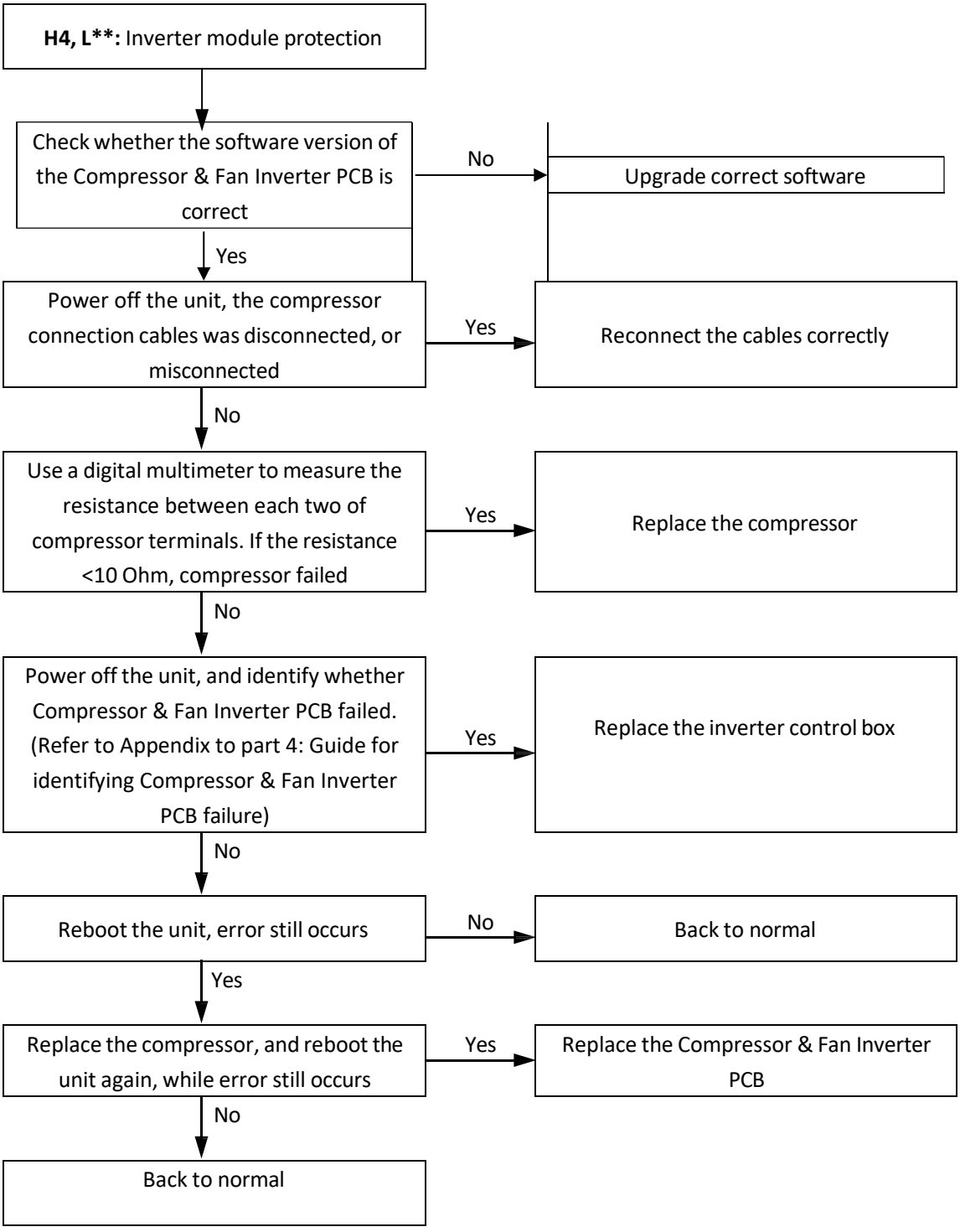
Error code	Description	Note
H4	3 times of “L1*” in 60 min	
L**	Inverter module protection	Check the specific code on digital display panel on the Main Control PCB

The specific L** code table:

Error code	Description	Note
L1E	Hardware overcurrent protection	
L11	Phase current instantaneous overcurrent protection	
L12	Phase current continuous 30s overcurrent protection	
L2E	Over-temperature protection	
L3E	Bus voltage too low error	
L31	Bus voltage too high error	
L32	Bus voltage excessively high error	
L34	Phase loss error of three-phase power supply	For 3Ph models
L43	Abnormal phase current sampling bias	
L45	Fan motor code mismatch error	
L46	IPM protection (FO)	
L47	Module type mismatch	
L5E	Motor failed to start	
L52	Motor stalling protection	
L6E	Phase loss protection	

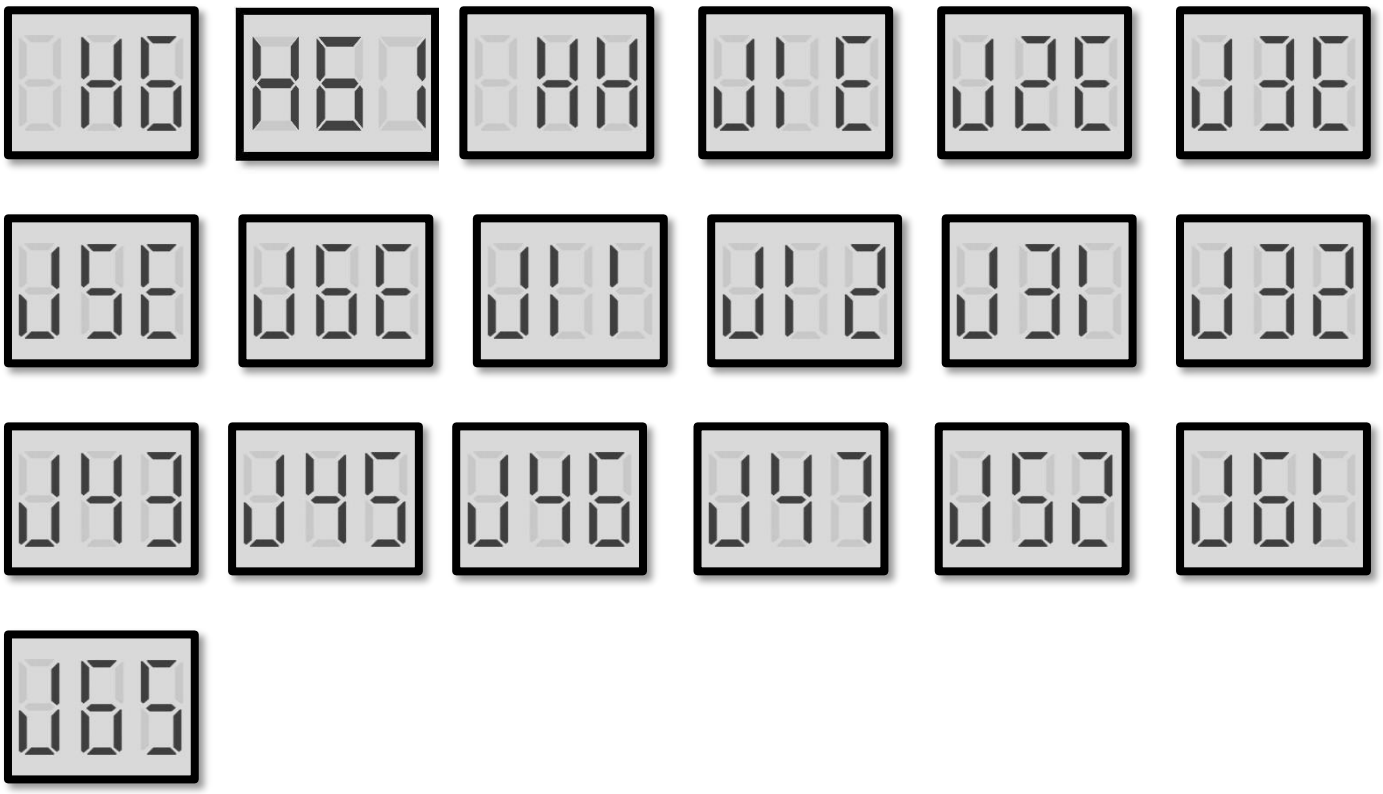
L61	Compressor terminals short circuit protection	
L65	IPM short circuit protection	
LBE	Action of high pressure switch	
LB7	PED bH error	

6.24.3 Procedure



H6, H61 HH, J** Troubleshooting

6.24.4 Digital display output



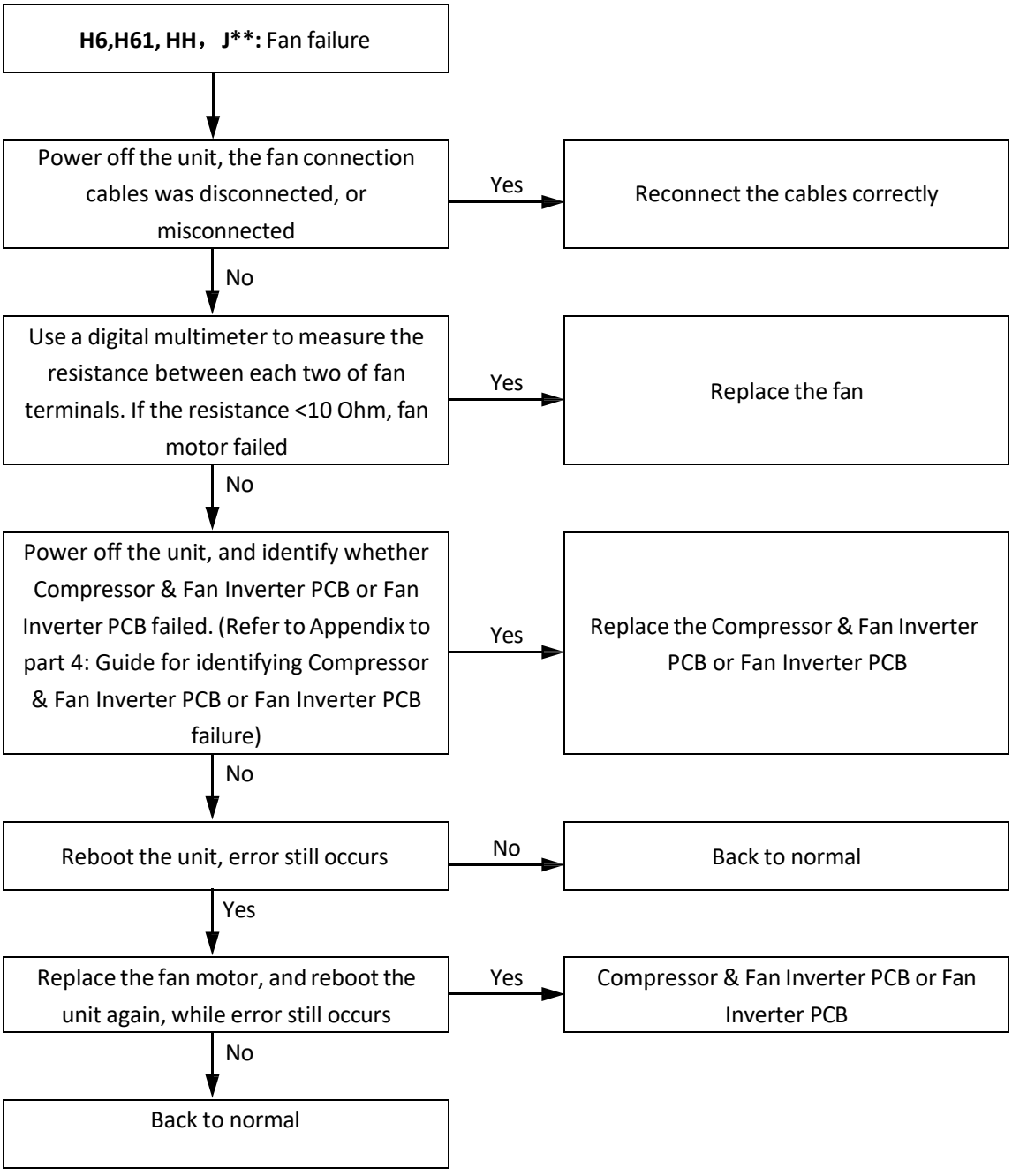
6.24.5 Description

Error code	Description	Note
H6 / H61	Fan failure	/
HH	10 times of H6 / H61 in 120min	/
J**	Fan module failure	Check the specific code on digital display panel on the Main Control PCB

The specific J** code table:

Error code	Description
J1E	Hardware overcurrent protection
J11	Phase current instantaneous overcurrent protection
J12	Phase current continuous 30s overcurrent protection
J2E	Over-temperature protection
J3E	Bus voltage too low error
J31	Bus voltage too high error
J32	Bus voltage excessively high error
J43	Abnormal phase current sampling bias
J45	Fan motor code mismatch error
J46	IPM protection (FO)
J47	Module type mismatch (after module resistance tested)
J5E	Motor failed to start
J52	Motor stalling protection
J6E	Phase loss protection
J61	Fan terminals short circuit protection
J65	IPM short circuit protection

6.24.6 Procedure

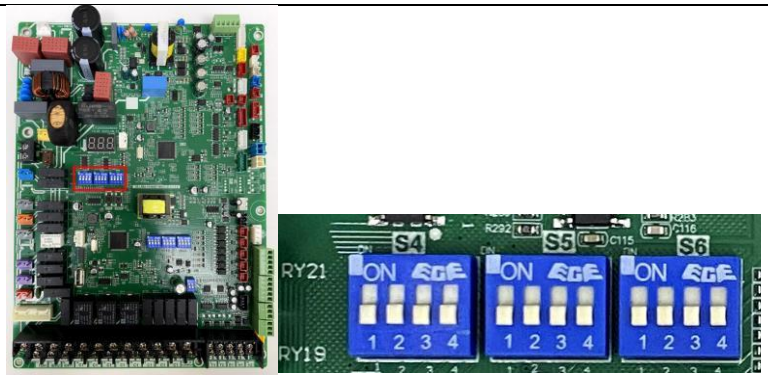
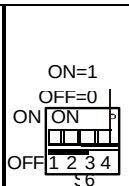


6.25 HF Troubleshooting

6.25.1 Digital display output

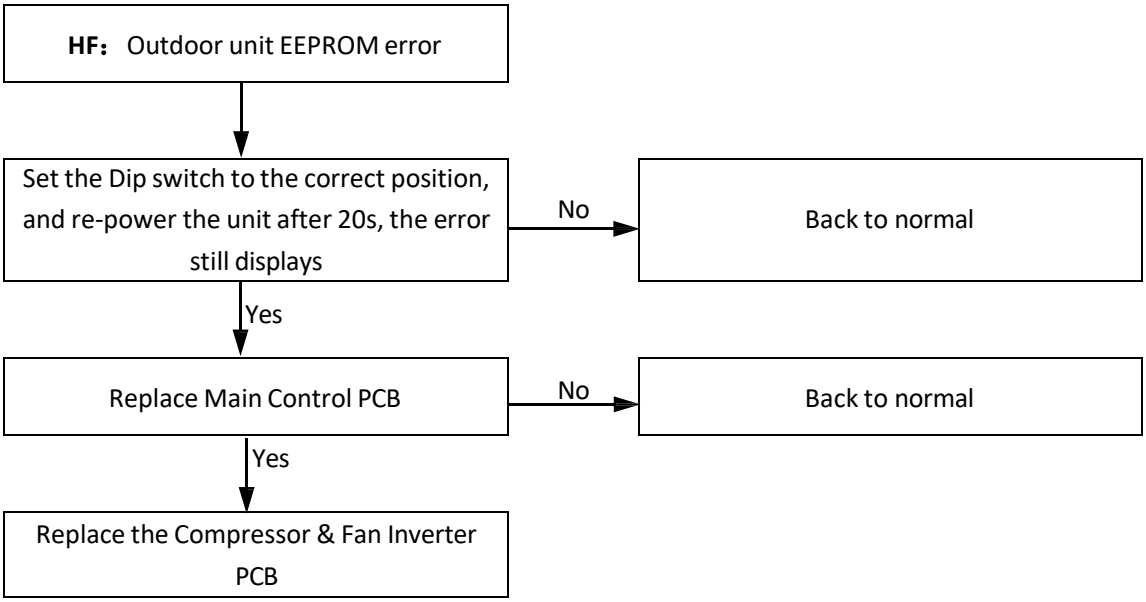


6.25.2 Description

<table>
<tr><th colspan="2">Error code</th><th>HF</th></tr>
<tr><td colspan="2">Description</td><td>Drive does not match model</td></tr>
<tr><td colspan="2">Triggering</td><td>The driving program of Compressor & Fan Inverter PCB is detected as being mismatched with Dip switch</td></tr>
<tr><td rowspan="2">Relative ports and locations</td><td>Dip switch S5 S6</td><td>
</td></tr>
<tr><td rowspan="2">Correct Dip switch</td><td>S5</td><td>Yukon series:0/0/0/0</td></tr>
<tr><td>S6
(26/30/35 kW)</td><td>

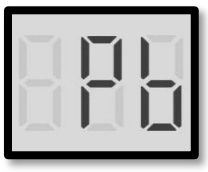
<table>
<tr><th>DIP switch</th><th>Dial settings</th></tr>
<tr><td>0011</td><td>3-phase for 26kW unit</td></tr>
<tr><td>0100</td><td>3-phase for 30kW unit</td></tr>
<tr><td>0101</td><td>3-phase for 35kW unit</td></tr>
<tr><td>0110</td><td>3-phase for 40kW unit</td></tr>
</table>
40kW unit under development</td></tr>
</table>

6.25.3 Procedure

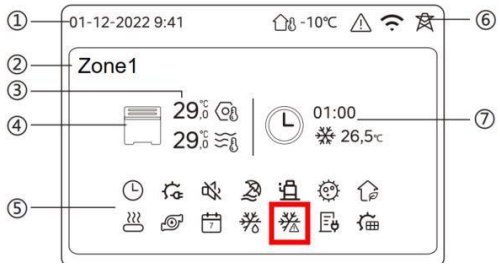


6.26 Pb Troubleshooting

6.26.1 Digital display output



6.26.2 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

7 Discharge / Suction pressure and temperature range

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

Discharge temperature (Tp) on heating/DHW mode	
T4＜-10℃	Twout+10＜Tp＜Twout+30
-10℃≤T4＜10℃	Twout+10＜Tp＜Twout+30
10℃≤T4＜25℃	Twout+10＜Tp＜Twout+25
T4≥25℃	Twout+10＜Tp＜Twout+25
Note: T4: ambient temperature Tw_out: leaving water temperature.	

Discharge temperature (Tp) on cooling mode				
Tp Value (℃)	Fx＜44Hz	44Hz≤Fx＜62Hz	62Hz≤Fx＜72Hz	Fx≥72Hz
T4＜25℃	50±10	55±10	60±10	65±10
25℃≤T4＜30℃	55±10	60±10	65±10	70±10
30℃≤T4＜35℃	60±10	65±10	70±10	75±10
35℃≤T4＜40℃	65±10	70±10	75±10	80±10
40℃≤T4＜46℃	70±10	75±10	80±10	85±10
T4≥46℃	70±10	75±10	80±10	85±10
Note: T4: ambient temperature Fx: compressor frequency				

Discharge pressure(P1) for heating/DHW mode						
Tw_out(℃)	25	30	35	40	45	50
P1（kPa）	1000±100	1150±100	1300±100	1450±100	1600±100	1800±100
Tw_out(℃)	55	60	65	70	75	
P1（kPa）	2000±150	2200±150	2450±150	2700±150	3000±150	
Note: P1 is absolute pressure.						

Suction pressure(P2) for cooling mode							
Tw_out(℃)	5～7	8～10	11～13	14～16	17～19	20～22	23～25
P2（kPa）	520±50	570±50	610±50	670±50	740±50	780±50	830±50
Note: P2 is absolute pressure.							

8 Appendix to Part 4

8.1 Temperature Sensor Resistance Characteristics

Applied to
T3 Outdoor unit heat exchanger bottom temperature sensor T4 Ambient temperature sensor Th Return-air temperature sensor T2 Plate heat exchanger outlet refrigerant temperature sensor T2B Plate heat exchanger inlet refrigerant temperature sensor TL Outdoor unit heat exchanger outlet temperature sensor T9i Economizer inlet temperature sensor T9o Economizer outlet temperature sensor
R25℃=10KΩ±3%，B25/50=4100K±3%

Temp. (℃)	Resistance (kΩ)			Temp. (℃)	Resistance (kΩ)		
	Rmax	R（t）Normal	Rmin		Rmax	R（t）Normal	Rmin
-40	433.108	383.315	336.854	-8	57.649	53.458	49.492
-39	404.038	358.094	315.212	-7	54.456	50.575	46.899
-38	377.08	334.677	295.088	-6	51.456	47.862	44.455
-37	352.071	312.924	276.365	-5	48.636	45.308	42.15
-36	328.859	292.709	258.939	-4	45.984	42.903	39.977
-35	307.306	273.916	242.714	-3	43.49	40.638	37.927
-34	287.285	256.435	227.599	-2	41.144	38.504	35.992
-33	268.678	240.17	213.514	-1	38.935	36.492	34.165
-32	251.38	225.029	200.382	0	36.857	34.596	32.44
-31	235.291	210.929	188.133	1	34.898	32.807	30.81
-30	220.32	197.792	176.705	2	33.055	31.12	29.271
-29	206.384	185.547	166.037	3	31.317	29.528	27.815
-28	193.407	174.131	156.075	4	29.681	28.026	26.44
-27	181.317	163.481	146.768	5	28.138	26.608	25.14
-26	170.049	153.543	138.071	6	26.682	25.268	23.909
-25	159.543	144.266	129.939	7	25.31	24.003	22.745
-24	149.745	135.601	122.333	8	24.016	22.808	21.644
-23	140.602	127.507	115.216	9	22.794	21.678	20.601
-22	132.067	119.941	108.555	10	21.641	20.61	19.614
-21	124.098	112.867	102.318	11	20.553	19.601	18.68
-20	116.539	106.732	96.92	12	19.525	18.646	17.794
-19	110.231	100.552	91.451	13	18.554	17.743	16.955
-18	103.743	94.769	86.328	14	17.636	16.888	16.16
-17	97.673	89.353	81.525	15	16.769	16.079	15.406
-16	91.99	84.278	77.017	16	15.949	15.313	14.691
-15	86.669	79.521	72.788	17	15.174	14.588	14.014
-14	81.684	75.059	68.815	18	14.442	13.902	13.372
-13	77.013	70.873	65.083	19	13.748	13.251	12.762
-12	72.632	66.943	61.574	20	13.093	12.635	12.183
-11	68.523	63.252	58.274	21	12.471	12.05	11.634
-10	64.668	59.784	55.169	22	11.883	11.496	11.112
-9	61.048	56.524	52.246	23	11.327	10.971	10.617

Continue on next page...

Temp. (°C)	Resistance (kΩ)			Temp. (°C)	Resistance (kΩ)		
	Rmax	R（t）Normal	Rmin		Rmax	R（t）Normal	Rmin
24	10.8	10.473	10.147	65	2.077	1.953	1.833
25	10.3	10	9.7	66	2.004	1.883	1.766
26	9.848	9.551	9.255	67	1.934	1.816	1.702
27	9.418	9.125	8.834	68	1.867	1.752	1.641
28	9.01	8.721	8.434	69	1.802	1.69	1.582
29	8.621	8.337	8.055	70	1.74	1.631	1.525
30	8.252	7.972	7.695	71	1.68	1.574	1.471
31	7.9	7.625	7.353	72	1.622	1.519	1.419
32	7.566	7.296	7.029	73	1.567	1.466	1.369
33	7.247	6.982	6.721	74	1.514	1.416	1.321
34	6.944	6.684	6.428	75	1.463	1.367	1.275
35	6.656	6.401	6.15	76	1.414	1.321	1.23
36	6.381	6.131	5.886	77	1.367	1.276	1.188
37	6.119	5.874	5.634	78	1.321	1.233	1.147
38	5.87	5.63	5.395	79	1.277	1.191	1.108
39	5.631	5.397	5.167	80	1.235	1.151	1.07
40	5.404	5.175	4.951	81	1.195	1.113	1.034
41	5.188	4.964	4.745	82	1.156	1.076	0.999
42	4.982	4.763	4.549	83	1.118	1.041	0.966
43	4.785	4.571	4.362	84	1.082	1.007	0.934
44	4.596	4.387	4.183	85	1.047	0.974	0.903
45	4.417	4.213	4.014	86	1.014	0.942	0.874
46	4.246	4.046	3.851	87	0.982	0.912	0.845
47	4.082	3.887	3.697	88	0.951	0.883	0.818
48	3.925	3.735	3.55	89	0.921	0.855	0.791
49	3.776	3.59	3.409	90	0.892	0.828	0.766
50	3.632	3.451	3.274	91	0.864	0.802	0.742
51	3.495	3.318	3.146	92	0.838	0.777	0.719
52	3.363	3.191	3.023	93	0.812	0.753	0.696
53	3.237	3.069	2.905	94	0.787	0.73	0.675
54	3.116	2.952	2.793	95	0.763	0.708	0.654
55	3.001	2.841	2.685	96	0.74	0.686	0.634
56	2.89	2.734	2.582	97	0.718	0.666	0.615
57	2.784	2.632	2.484	98	0.697	0.646	0.597
58	2.682	2.534	2.39	99	0.677	0.627	0.579
59	2.585	2.44	2.299	100	0.657	0.609	0.562
60	2.491	2.35	2.213	101	0.638	0.591	0.546
61	2.401	2.264	2.13	102	0.62	0.574	0.53
62	2.315	2.181	2.051	103	0.602	0.558	0.515
63	2.233	2.102	1.975	104	0.585	0.542	0.501
64	2.154	2.026	1.903	105	0.569	0.527	0.485

End

Applied to
Tp Discharge temperature sensor

R90℃=5KΩ±3%， B25/50=3950K±3%

Temp. (°C)	Resistance (kΩ)			Temp. (°C)	Resistance (kΩ)		
	Rmax	R（t）Normal	Rmin		Rmax	R（t）Normal	Rmin
-40	2002.628	1642.059	1281.49	-8	318.604	271.634	224.664
-39	1881.964	1544.968	1207.972	-7	302.08	257.867	213.653
-38	1769.292	1454.213	1139.134	-6	286.483	244.857	203.232
-37	1664.009	1369.32	1074.631	-5	271.757	232.561	193.365
-36	1565.57	1289.862	1014.154	-4	257.852	220.937	184.022
-35	1473.481	1215.451	957.421	-3	244.717	209.945	175.173
-34	1387.282	1145.725	904.168	-2	232.309	199.55	166.79
-33	1306.554	1080.355	854.156	-1	220.585	189.716	158.848
-32	1230.918	1019.042	807.166	0	209.504	180.412	151.321
-31	1160.015	961.505	762.994	1	199.029	171.607	144.186
-30	1093.521	907.487	721.452	2	189.125	163.273	137.422
-29	1031.137	856.752	682.368	3	179.759	155.383	131.007
-28	972.588	809.086	645.583	4	170.899	147.911	124.923
-27	917.615	764.281	610.947	5	162.517	140.835	119.152
-26	865.981	722.152	578.323	6	154.585	134.13	113.675
-25	817.469	682.528	547.586	7	147.077	127.778	108.478
-24	771.875	645.245	518.616	8	139.97	121.757	103.544
-23	729.009	610.156	491.303	9	133.239	116.049	98.859
-22	688.698	577.121	465.544	10	126.864	110.638	94.411
-21	650.778	546.012	441.246	11	120.825	105.505	90.185
-20	615.097	516.708	418.318	12	115.103	100.636	86.17
-19	581.515	489.096	396.678	13	109.679	96.017	82.354
-18	549.899	463.073	376.247	14	104.537	91.633	78.728
-17	520.129	438.542	356.955	15	99.662	87.471	75.28
-16	492.089	415.411	338.733	16	95.038	83.52	72.001
-15	465.672	393.595	321.518	17	90.652	79.767	68.882
-14	440.779	373.014	305.25	18	86.489	76.202	65.915
-13	417.316	353.595	289.874	19	82.539	72.815	63.091
-12	395.197	335.268	275.339	20	78.789	69.596	60.404
-11	374.34	317.967	261.594	21	75.228	66.537	57.845
-10	354.669	301.632	248.595	22	71.846	63.627	55.409
-9	336.113	286.206	236.298	23	68.633	60.86	53.088

Continue on next page...

Temp. (°C)	Resistance (kΩ)			Temp. (°C)	Resistance (kΩ)		
	Rmax	R（t）Normal	Rmin		Rmax	R（t）Normal	Rmin
24	65.58	58.228	50.877	66	11.858	11.134	10.411
25	62.678	55.724	48.77	67	11.432	10.749	10.066
26	59.919	53.34	46.762	68	11.024	10.38	9.735
27	57.295	51.071	44.847	69	10.632	10.024	9.416
28	54.8	48.91	43.021	70	10.255	9.682	9.109
29	52.426	46.853	41.279	71	9.894	9.354	8.814
30	50.167	44.892	39.617	72	9.546	9.038	8.53
31	48.016	43.024	38.031	73	9.213	8.734	8.255
32	45.969	41.243	36.517	74	8.892	8.442	7.992
33	44.019	39.546	35.072	75	8.584	8.161	7.737
34	42.162	37.927	33.692	76	8.288	7.89	7.492
35	40.392	36.383	32.373	77	8.003	7.629	7.256
36	38.706	34.91	31.113	78	7.729	7.379	7.028
37	37.098	33.504	29.909	79	7.466	7.137	6.809
38	35.566	32.162	28.758	80	7.213	6.905	6.597
39	34.104	30.881	27.657	81	6.969	6.681	6.393
40	32.709	29.657	26.605	82	6.735	6.466	6.196
41	31.379	28.488	25.598	83	6.509	6.258	6.006
42	30.109	27.372	24.634	84	6.292	6.058	5.823
43	28.896	26.304	23.712	85	6.084	5.865	5.646
44	27.739	25.284	22.829	86	5.883	5.679	5.476
45	26.633	24.309	21.984	87	5.689	5.5	5.311
46	25.577	23.376	21.174	88	5.502	5.327	5.152
47	24.568	22.483	20.399	89	5.323	5.161	4.998
48	23.603	21.629	19.656	90	5.15	5	4.85
49	22.681	20.812	18.943	91	4.996	4.845	4.694
50	21.799	20.03	18.261	92	4.847	4.696	4.545
51	20.956	19.281	17.606	93	4.703	4.552	4.4
52	20.149	18.563	16.978	94	4.564	4.412	4.261
53	19.377	17.876	16.375	95	4.43	4.278	4.127
54	18.638	17.218	15.797	96	4.3	4.149	3.997
55	17.931	16.587	15.243	97	4.175	4.024	3.872
56	17.254	15.982	14.71	98	4.054	3.903	3.752
57	16.606	15.402	14.199	99	3.937	3.787	3.636
58	15.984	14.846	13.708	100	3.824	3.674	3.524
59	15.389	14.313	13.236	101	3.715	3.565	3.416
60	14.819	13.801	12.783	102	3.609	3.46	3.312
61	14.272	13.31	12.348	103	3.507	3.359	3.211
62	13.748	12.839	11.929	104	3.409	3.261	3.114
63	13.246	12.387	11.527	105	3.313	3.167	3.02
64	12.764	11.952	11.14	106	3.221	3.075	2.929
65	12.302	11.535	10.768	107	3.131	2.987	2.842

Continue on next page...

Temp. (°C)	Resistance (kΩ)			Temp. (°C)	Resistance (kΩ)		
	Rmax	R（t）Normal	Rmin		Rmax	R（t）Normal	Rmin
108	3.045	2.901	2.758	130	1.707	1.59	1.473
109	2.962	2.819	2.676	131	1.665	1.55	1.434
110	2.881	2.739	2.597	132	1.625	1.511	1.397
111	2.802	2.662	2.521	133	1.586	1.473	1.36
112	2.727	2.587	2.448	134	1.548	1.436	1.324
113	2.653	2.515	2.377	135	1.511	1.401	1.29
114	2.582	2.445	2.308	136	1.475	1.366	1.257
115	2.514	2.378	2.242	137	1.44	1.332	1.225
116	2.447	2.313	2.178	138	1.407	1.3	1.193
117	2.383	2.249	2.116	139	1.374	1.268	1.163
118	2.32	2.188	2.056	140	1.342	1.238	1.133
119	2.26	2.129	1.998	141	1.311	1.208	1.105
120	2.201	2.072	1.942	142	1.281	1.179	1.077
121	2.145	2.016	1.888	143	1.252	1.151	1.051
122	2.09	1.963	1.836	144	1.224	1.124	1.024
123	2.037	1.911	1.785	145	1.196	1.098	0.999
124	1.985	1.86	1.736	146	1.169	1.072	0.975
125	1.935	1.812	1.689	147	1.143	1.047	0.951
126	1.887	1.765	1.643	148	1.118	1.023	0.928
127	1.84	1.719	1.598	149	1.093	0.999	0.905
128	1.794	1.675	1.555	150	1.069	0.977	0.884
129	1.75	1.632	1.514	/	/	/	/

End

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
TW2 Zone 2 water flow temperature sensor

R50℃=17.6KΩ±3%， B0/100=3970K±2%

Temp. (℃)	Resistance (kΩ)			Temp. (℃)	Resistance (kΩ)		
	Rmax	R（t）Normal	Rmin		Rmax	R（t）Normal	Rmin
-40	1822.916	1608.351	1393.786	-8	263.273	242.131	220.989
-39	1705.939	1507.271	1308.602	-7	249.357	229.593	209.828
-38	1596.976	1412.994	1229.013	-6	236.255	217.774	199.293
-37	1495.47	1325.058	1154.647	-5	223.915	206.63	189.345
-36	1400.897	1243.025	1085.152	-4	212.289	196.119	179.949
-35	1312.771	1166.486	1020.2	-3	201.332	186.201	171.07
-34	1230.637	1095.061	959.485	-2	191.001	176.84	162.678
-33	1154.07	1028.393	902.717	-1	181.258	168.001	154.744
-32	1082.675	966.151	849.626	0	172.066	159.653	147.24
-31	1016.084	908.023	799.962	1	163.391	151.766	140.141
-30	953.957	853.724	753.491	2	155.2	144.311	133.422
-29	896.053	802.986	709.918	3	147.466	137.264	127.062
-28	842.002	755.557	669.113	4	140.159	130.599	121.038
-27	791.53	711.21	630.889	5	133.253	124.293	115.332
-26	744.384	669.728	595.072	6	126.725	118.326	109.926
-25	700.328	630.913	561.498	7	120.554	112.679	104.803
-24	659.144	594.58	530.015	8	114.715	107.33	99.945
-23	620.629	560.556	500.483	9	109.191	102.265	95.338
-22	584.595	528.683	472.771	10	103.963	97.466	90.969
-21	550.871	498.814	446.757	11	99.013	92.918	86.822
-20	519.295	470.812	422.328	12	94.327	88.607	82.888
-19	489.718	444.548	399.379	13	89.887	84.519	79.152
-18	462.003	419.907	377.812	14	85.679	80.642	75.604
-17	436.022	396.779	357.537	15	81.692	76.963	72.234
-16	411.657	375.063	338.468	16	77.911	73.471	69.032
-15	388.797	354.662	320.527	17	74.326	70.157	65.989
-14	367.343	335.492	303.641	18	70.925	67.011	63.097
-13	347.198	317.47	287.743	19	67.699	64.023	60.347
-12	328.275	300.521	272.767	20	64.636	61.184	57.731
-11	310.495	284.576	258.658	21	61.729	58.486	55.243
-10	293.78	269.569	245.359	22	58.967	55.921	52.875
-9	278.06	255.439	232.818	23	56.345	53.483	50.621

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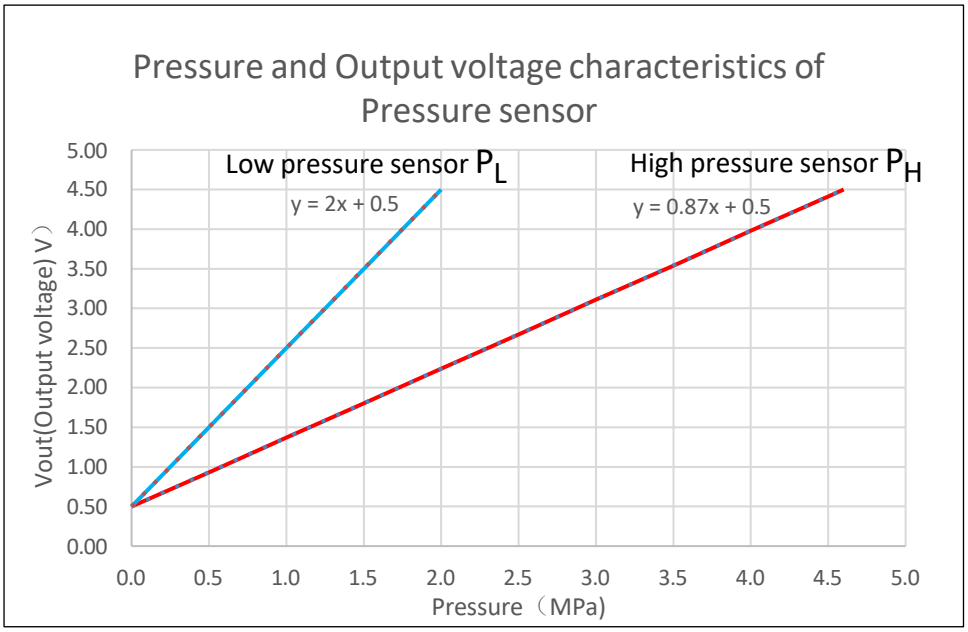
Temp. (°C)	Resistance (kΩ)			Temp. (°C)	Resistance (kΩ)		
	Rmax	R（t）Normal	Rmin		Rmax	R（t）Normal	Rmin
24	53.854	51.165	48.476	66	10.231	9.818	9.405
25	51.485	48.959	46.432	67	9.887	9.481	9.075
26	49.234	46.86	44.486	68	9.556	9.157	8.758
27	47.094	44.863	42.632	69	9.237	8.846	8.454
28	45.058	42.961	40.865	70	8.932	8.547	8.163
29	43.121	41.151	39.181	71	8.637	8.259	7.882
30	41.278	39.427	37.575	72	8.354	7.983	7.613
31	39.524	37.784	36.044	73	8.08	7.717	7.354
32	37.854	36.219	34.583	74	7.818	7.461	7.105
33	36.263	34.726	33.189	75	7.565	7.215	6.866
34	34.748	33.304	31.86	76	7.322	6.978	6.635
35	33.305	31.947	30.59	77	7.087	6.75	6.414
36	31.929	30.653	29.378	78	6.861	6.531	6.201
37	30.617	29.419	28.22	79	6.643	6.319	5.995
38	29.367	28.241	27.114	80	6.433	6.115	5.798
39	28.174	27.115	26.057	81	6.23	5.919	5.608
40	27.036	26.042	25.048	82	6.035	5.73	5.425
41	25.949	25.015	24.082	83	5.847	5.548	5.249
42	24.913	24.036	23.159	84	5.666	5.372	5.079
43	23.924	23.1	22.276	85	5.491	5.204	4.916
44	22.979	22.206	21.432	86	5.323	5.041	4.759
45	22.076	21.35	20.624	87	5.16	4.884	4.608
46	21.213	20.532	19.85	88	5.003	4.732	4.462
47	20.389	19.749	19.11	89	4.852	4.587	4.322
48	19.602	19.001	18.401	90	4.706	4.446	4.186
49	18.848	18.285	17.722	91	4.565	4.31	4.056
50	18.128	17.6	17.072	92	4.429	4.179	3.929
51	17.466	16.944	16.422	93	4.298	4.053	3.809
52	16.831	16.316	15.801	94	4.172	3.932	3.692
53	16.223	15.714	15.206	95	4.049	3.814	3.579
54	15.641	15.139	14.638	96	3.932	3.701	3.471
55	15.081	14.586	14.092	97	3.817	3.591	3.365
56	14.545	14.058	13.571	98	3.708	3.486	3.265
57	14.03	13.55	13.07	99	3.601	3.384	3.167
58	13.537	13.064	12.591	100	3.499	3.286	3.073
59	13.063	12.597	12.132	101	3.4	3.191	2.983
60	12.608	12.15	11.692	102	3.303	3.098	2.894
61	12.171	11.721	11.27	103	3.21	3.009	2.809
62	11.752	11.309	10.866	104	3.12	2.923	2.727
63	11.349	10.913	10.478	105	3.032	2.84	2.647
64	10.962	10.533	10.105	106	2.948	2.759	2.571
65	10.589	10.168	9.748	107	2.866	2.681	2.497

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Temp. (°C)	Resistance (kΩ)			Temp. (°C)	Resistance (kΩ)		
	Rmax	R（t）Normal	Rmin		Rmax	R（t）Normal	Rmin
108	2.787	2.606	2.425	130	1.553	1.436	1.318
109	2.711	2.533	2.356	131	1.515	1.399	1.284
110	2.637	2.463	2.288	132	1.477	1.364	1.251
111	2.565	2.394	2.224	133	1.44	1.329	1.219
112	2.496	2.328	2.161	134	1.405	1.296	1.187
113	2.428	2.264	2.1	135	1.37	1.264	1.157
114	2.363	2.202	2.041	136	1.337	1.232	1.127
115	2.3	2.142	1.985	137	1.304	1.202	1.099
116	2.239	2.084	1.93	138	1.273	1.172	1.071
117	2.179	2.028	1.876	139	1.242	1.143	1.044
118	2.122	1.973	1.825	140	1.212	1.115	1.018
119	2.066	1.92	1.775	141	1.183	1.088	0.993
120	2.012	1.869	1.726	142	1.155	1.061	0.968
121	1.96	1.82	1.68	143	1.127	1.036	0.944
122	1.909	1.772	1.634	144	1.101	1.011	0.921
123	1.86	1.725	1.59	145	1.075	0.986	0.898
124	1.812	1.68	1.548	146	1.05	0.963	0.876
125	1.765	1.636	1.506	147	1.025	0.94	0.855
126	1.72	1.593	1.466	148	1.001	0.918	0.834
127	1.677	1.552	1.428	149	0.978	0.896	0.814
128	1.634	1.512	1.39	150	0.955	0.875	0.794
129	1.593	1.473	1.354	/	/	/	/

End

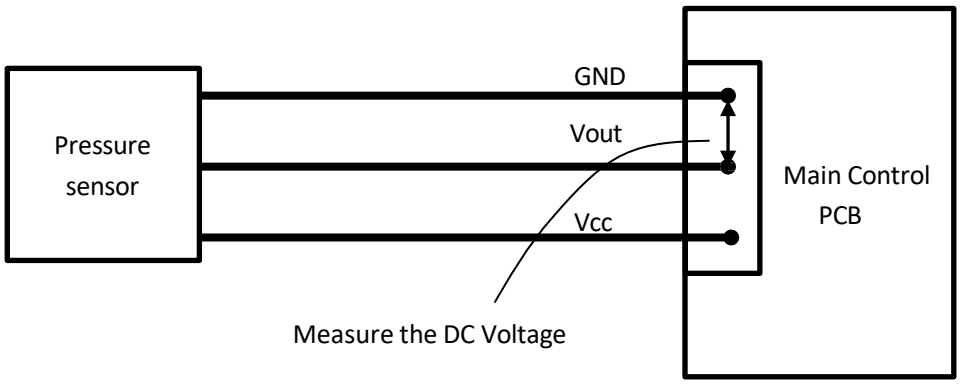
8.2 Pressure and Output voltage characteristics of Pressure sensor



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

Output voltage formula of low-pressure sensor： Vout(L)=2×P_L+0.5

Measure the output voltage of pressure sensor

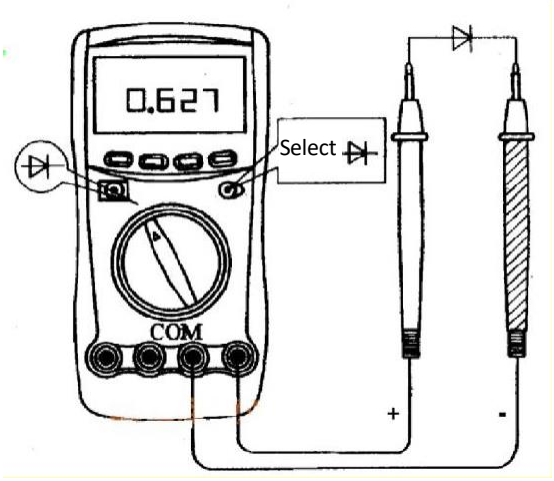


8.3 Guide for identifying Compressor & Fan Inverter PCB or Fan Inverter PCB failure

Before measuring the Compressor & Fan Inverter PCB or Fan Inverter PCB, please confirm steps below in advance:

1) Cut off the power supply.
2) Wait for 10 min for capacitor discharging in order to avoid the electric shock.
3) Remove all connections wires.
4) To identify whether Compressor & Fan Inverter PCB failed, follow the guide to test inverter circuit and three phase bridge rectifier. If any one of test value abnormal, the Compressor & Fan Inverter PCB failed.
5) To identify whether Fan Inverter PCB failed, follow the guide to test inverter circuitrectifier. If any one of test value abnormal,theFan Inverter PCB failed.

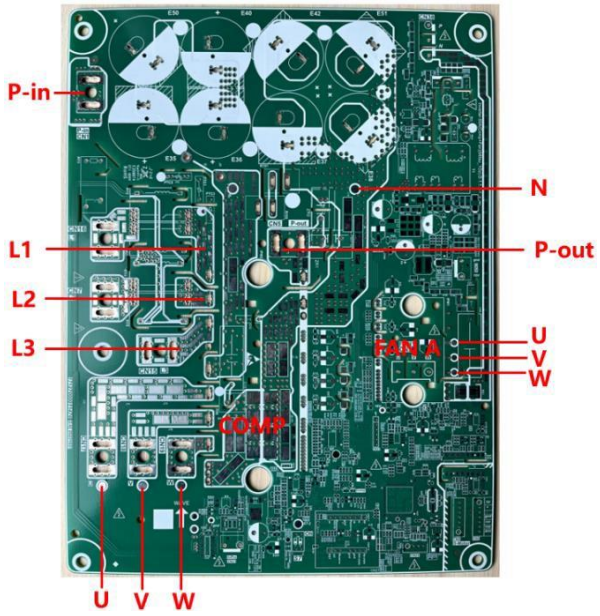
Preparing tools: multimeter (secondary tube is available)



Compressor & Fan Inverter PCB

Inverter circuit (Fan module/ Compressor module):

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



Compressor & Fan Inverter PCB

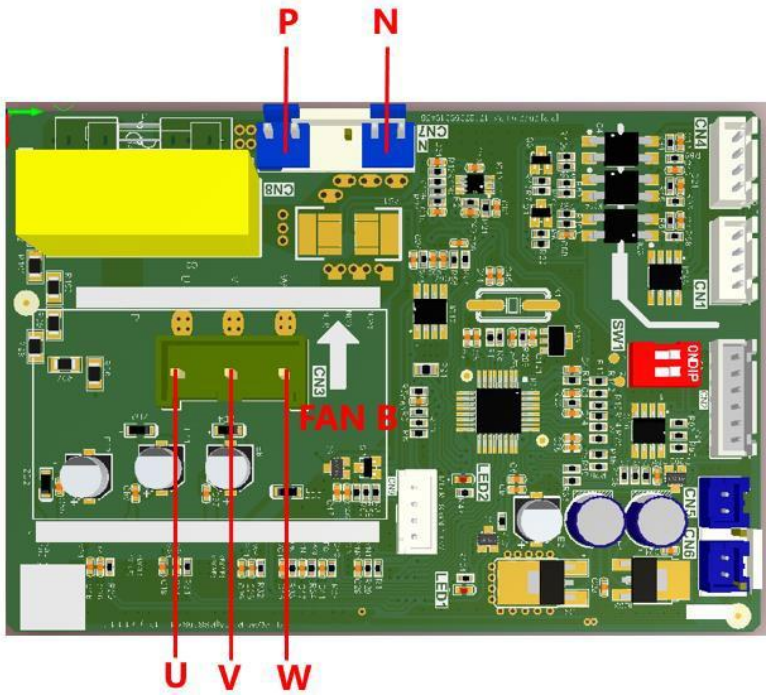
Three phase bridge rectifier:

Order	Test point		Normal	Abnormal
	+(Red)	-（Black）		
1	L1	P-out	0.3 V -0.7 V	0 / Infinite
2	L2	P-out		
3	L3	P-out		
4	N	L1		
5	N	L2		
6	N	L3		
Note: 1. If any one of test value abnormal, the Compressor & Fan Inverter PCB failed. Request aftersales service and replace the Compressor & Fan Inverter PCB.				

Fan Inverter PCB

Inverter circuit (The second Fan module):

Order	Test point		Normal	Abnormal
	+(Red)	-（Black）		
1	U	P	0.3 V -0.7 V	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 Fan Inverter PCB failed. Request aftersales service and replace the Fan Inverter PCB.				



Fan Inverter PCB

General information

Characteristics of R290 refrigerant

Environmental protection: R290 is an environmentally friendly refrigerant with a global warming potential (GWP) of 3 and no ozone depletion potential (ODP).

High efficiency: R290 has good heat transfer properties and provides efficient refrigeration and air conditioning. It features a wide range of applications (up to -40°C).

Safety: R290 refrigerant (propane) is a colorless, odorless gas used in refrigeration and air conditioning equipment. It is non-toxic and highly flammable when mixed with air at a concentration of 0.021 to 0.095. R290 is heavier than air at the same temperature and pressure and often reaches higher concentrations near the ground. The gas has no odor, but it can be easily detected by commercially available gas detectors and leak detection devices, and its risk can be eliminated through effective preventative measures.

Basic information on R290 heat pumps

The new generation of R290 heat pumps now adopts a monolithic structure design. This means that the refrigeration circuit of the unit is hermetically sealed, the refrigeration circuit is completely inside the heating system, and it is fully charged with R290 refrigerant when delivered. The refrigerant charging amount for a single heat pump is 2900 g. More details can be found on Sinclair's official website.

Explanation of common symbols on the heat pump

	WARNING	This symbol shows that this appliance used a flammable refrigerant. If the refrigerant is leaked and exposed to an external ignition source, there is a risk of fire.
	CAUTION	No open flame; Fire, open ignition sources, and smoking are prohibited.
	CAUTION	This symbol shows that service personnel should be handling this equipment with reference to the installation manual.
	CAUTION	This symbol shows that information is available, such as the operating manual or installation manual.

Transportation precautions

Transportation regulations: ADR, IMDG, IATA

ADR regulations: Equipment containing less than 12 kg of flammable refrigerant is not subject to transportation regulations if it is designed with protection (i.e., it meets the appropriate safety standards). If the refrigerant amount exceeds 12 kg, the equipment is subject to the regulations for any containers for flammable gases.

IMDG regulations: R290 is classified as a flammable gas and defined as 2.1 class: it does not produce obvious flames or explosions during combustion, but produces heat and gas within its flammable range. The explosion limit of this gas is relatively high, and once exceeded, it can cause dangerous explosions. It is required that the shipper provides the corresponding MSDS for the product, which stands for Material Safety Data Sheet. The maximum filling quantity for flammable refrigerants is limited to 12 kg.

IATA regulations: These regulations prohibit the transportation of equipment charged with more than 0.1 kg of combustible refrigerant by a passenger plane or cargo aircraft. If air transportation is required, up to 150 kg of flammable refrigerant can be carried in cylinders, so that the system can be charged on site.

Basic requirements for transportation

1. For finished machines, the carrier vehicle cannot be fully enclosed during transportation.
2. Red-and-white reflective strips should be pasted at the sides and rear of the carrier vehicle to alert other vehicles to keep a safe distance. The vehicle should not get close to the high-temperature area during transportation. Take heat dissipation measures when the temperature inside the compartment is too high.
3. Refrigerants and products to be repaired are not allowed to be transported in the open air, and the compartment should be equipped with an anti-static device.
4. A combustible agent leakage alarm device, an anti-static device, and a fire extinguishing device should be equipped.

Storage precautions

Basic requirements for warehouse

1. The warehouse should be equipped with ventilation equipment. Before entering the warehouse, the personnel should first turn on the ventilation equipment. Explosion-proof ventilation equipment and electrical appliances should be used in the warehouse. When conditions do not permit, at least explosion-proof exhaust fans should be used. All electrical appliances should be installed at a height of over 1.5 meters.
2. The warehouse should be illuminated, spacious, open, well-ventilated, equipped with ventilation equipment, and located in a place without heat sources.
3. When a refrigerant leak is detected, the ventilation equipment must be turned on immediately.

Warehouse management requirements

	Only desk telephones will be set up for communication within the warehouse. No mobile phones are allowed.
	A combustible gas leakage detection device should be installed in the warehouse.
	Product placement requirements: One side of the box surface must have a visible fireproof label and cannot be obstructed by other products.
	The warehouse should be equipped with dry powder or carbon dioxide fire extinguishers and other fire-fighting equipment suitable for extinguishing electrical fires.

Refrigerant leakage handling plan

Rapidly evacuate people from the contaminated leakage area to a windward location and isolate them until the gas is fully dissipated. Cut off the fire source. Emergency responders should wear a self-contained breathing apparatus and an anti-static fire protection suit. Cut off the gas source, spray water mist for dilution and dissolution, or take extraction (indoor) or strong ventilation (outdoor) measures. If possible, use explosion-proof exhaust fans to transfer the leaked gas to an open place or install an appropriate nozzle to burn it off. Optionally, move the container with air leakage to an open place. Note that containers that gush air or which have air leakage cannot be used again, and technical measures should be taken to eliminate the remaining gas.

Installation and commissioning precautions

1. Installation environment check: The heat pump is not allowed to be installed in an enclosed building space.
2. Unpacking check: The product should be unpacked and inspected in a well-ventilated area. A concentration detector should be prepared before heat pump unpacking to check for damage and abnormal appearance.
3. Installation height check: Not less than 1.0 m for window units, not less than 1.8 m for split wall-mounted units, and not less than 2.2 m for ceiling-mounted units.
4. Grounding check: The user's power supply should be grounded with a grounding resistance of no more than 4Ω. The air conditioner grounding wires must be firmly connected to the metal shells of the heat pump and ODU and thoroughly checked using a multimeter. Arrange a dedicated power supply line and connect it directly to the air conditioner's power supply.
5. Support installation: The support must be subjected to a test and a corrosion resistance test at more than 4 times the weight of the unit before use.
6. heat pump fixing: When installing the heat pump, place the refrigerant piping connectors outdoors if possible. When fixing a wall-mounted heat pump, the distance between the two

sides of the unit and the wall should be more than 65 cm, the bottom of the unit must be more than 1.8 m above the ground, and an installation height of more than 15 cm should be maintained on the top of the heat pump.

7. ODU installation: The clearance between the ODU and the inner wall should not be less than 75 cm. Connect the heat pump power cable, signal cable, and ODU's electrical part and take proper insulation measures. Be sure to make a ground connection.
8. ODU refrigerant pressure check: Check whether the compressor's discharge pressure and air return pressure are within a reasonable range (air return: 0.4–0.6 MPa; discharge: 1.5–2.0 MPa).
9. IDU and ODU connection pipes: It is prohibited to use removable connections for heat pump pipes. Avoid laying the connection pipes in an area with any sources of flame.
10. System vacuumizing: Use a dedicated vacuum pump for combustible refrigerants to vacuumize the system pipelines. It is prohibited to use refrigerants for vacuumizing.
11. Test run: Test runs must be performed after the installation is complete. During test runs, perform leakage inspections for pipe connections. Tightly seal the room where the heat pump is located and check for refrigerant leaks.
12. Electrical inspection: Perform a grounding check on the heat pump sheet metal. Power off and perform an insulation resistance test on the entire unit. The live line + null line insulation resistance to ground should be greater than 10 MΩ.

Precautions for maintenance requirements

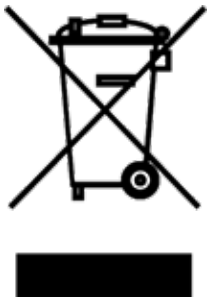
Installation safety principles

1. The premises for installation should be kept ventilated.
2. Open flame or a high-temperature heat source with a temperature higher than 370°C, such as welding or smoking, are prohibited.
3. Take anti-static measures.
4. Choose a place that is convenient for installation and maintenance, which should not be an environment that is close to heat sources or exposed to flammable or explosive materials.
5. During the installation of the heat pump, in the event of refrigerant leakage, immediately close the ODU valve. All personnel should leave the room and handle the leakage 15 minutes later. Damaged products must be transported back to the maintenance point for processing. Welding is prohibited on the user's premises.
6. Choose a place where a uniform air inlet and outlet of the heat pump can be guaranteed.
7. Keep both sides of the area underneath the unit away from electric appliances, power switches, sockets, and other items.

Tools required

 Vacuum pump	When performing pipeline welding or replacing refrigerant during charging, it is necessary to use an explosion-proof vacuum pump.
 Charging equipment	The refrigerant must be charged using dedicated explosion-proof charging equipment. Accuracy requirement: The deviation of the charging amount is less than 5 g.
 Concentration detector	1. Repair facilities should be equipped with fixed R290 flammable refrigerant concentration detectors, which should be connected to safety protection/alarm systems. The error rate should not exceed 5%. 2. The installation site should be equipped with portable R290 flammable refrigerant concentration detectors (catalytic combustion/electronic/infrared), which can achieve two-stage audio and visual alarms. The error rate should not exceed 10%. 3. Detectors need to be calibrated every 30 days. 4. Before using the detector, functional checks and confirmations should be carried out.
 Fire extinguisher	During installation and repair, a fire extinguisher should be carried. There should be two or more dry powder, carbon dioxide, or foam fire extinguishers available at the repair site, placed in designated locations, with prominent identification, and easily accessible.

NOTE CONCERNING PROTECTION OF ENVIRONMENT



This product must not be disposed of via normal household waste after its service life, but must be taken to a collection station for the recycling of electrical and electronic devices. The symbol on the product, the operating instructions or the packaging indicate such disposal procedures. The materials are recyclable in accordance with their respective symbols. By means of re-use, material recycling or any other form of recycling old appliances you are making an important contribution to the protection of our environment. Please ask your local council where your nearest disposal station is located.

INFORMATION CONCERNING USED REFRIGERANT MEDIUM

This unit is containing fluorinated gases included in the Kyoto protocol.
The maintenance and the liquidation must be carried out by qualified personnel.

Type of refrigerant: R290
The quantity of the refrigerant: Please see the unit label.
The value GWP: 3 (1 kg R290 = 0,003 t CO_2 eq)
GWP = Global Warming Potential

 Appliance filled with flammable gas R290.

In case of quality problem or other please contact your local supplier or authorized service center.
Emergency number: 112

PRODUCER

SINCLAIR CORPORATION Ltd.
16 Great Queen Street
WC2B 5AH London
United Kingdom
www.sinclair-world.com

This product was manufactured in China (Made in China).

REPRESENTATIVE

SINCLAIR Global Group s.r.o.
Purkynova 45
612 00 Brno
Czech Republic

TECHNICAL SUPPORT

SINCLAIR Global Group s.r.o.
Purkynova 45
612 00 Brno
Czech Republic
Tel.: +420 800 100 285 | Fax: +420 541 590 124
www.sinclair-solutions.com | info@sinclair-solutions.com

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