Service Manual

WiSAN-YSE1 10.1 - 40.2

SM23E018GB-00 **05-23**

R32

CONTENTS

Part 1 General Information

1 Unit Capacities and External Appearance

Table 1-1.1: Aqua Tempo Super II unit capacity range and unit appearances

Capacity	up to 30kW	up to 60kW	up to 90kW
Model	10.1 - 14.1	16.2 - 22.2	30.2 - 35.2
Appearance			
Power supply	380-415V/3Ph/50Hz		

2 Water outlet temperature range

Table 1-2.1: Aqua Tempo Super II unit water outlet temperature range

Mode		Range
Cooling	Normal	5-20°C[1]
	Low water outlet	0-20°C(reserved)[2]
Heating	Normal	25-60°C

Notes:

1. When the ambient temperature is below 10°C, the water outlet temperature range is 10-20°C. When the ambient temperature is above 10°C,all the units water outlet temperature range is 5-20°C.
2. Use dial switch S12_3 on the main PCB to select the water outlet temperature range.

Part 2

Component Layout and Refrigerant Circuits

1 Layout of Functional Components

Size 10.1 – 14.1

Figure 2-1.1: front view

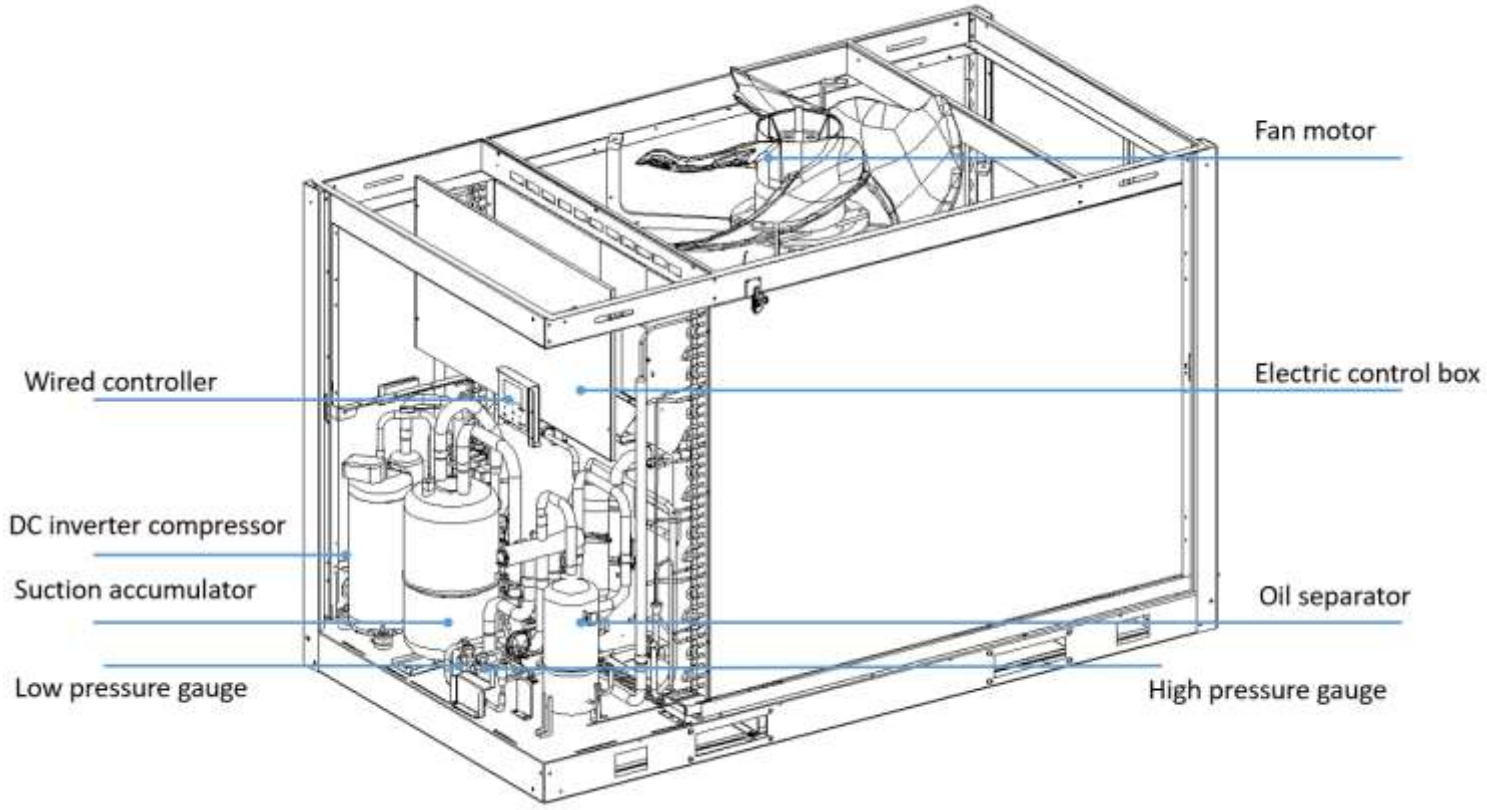


Figure 2-1.2: rear view

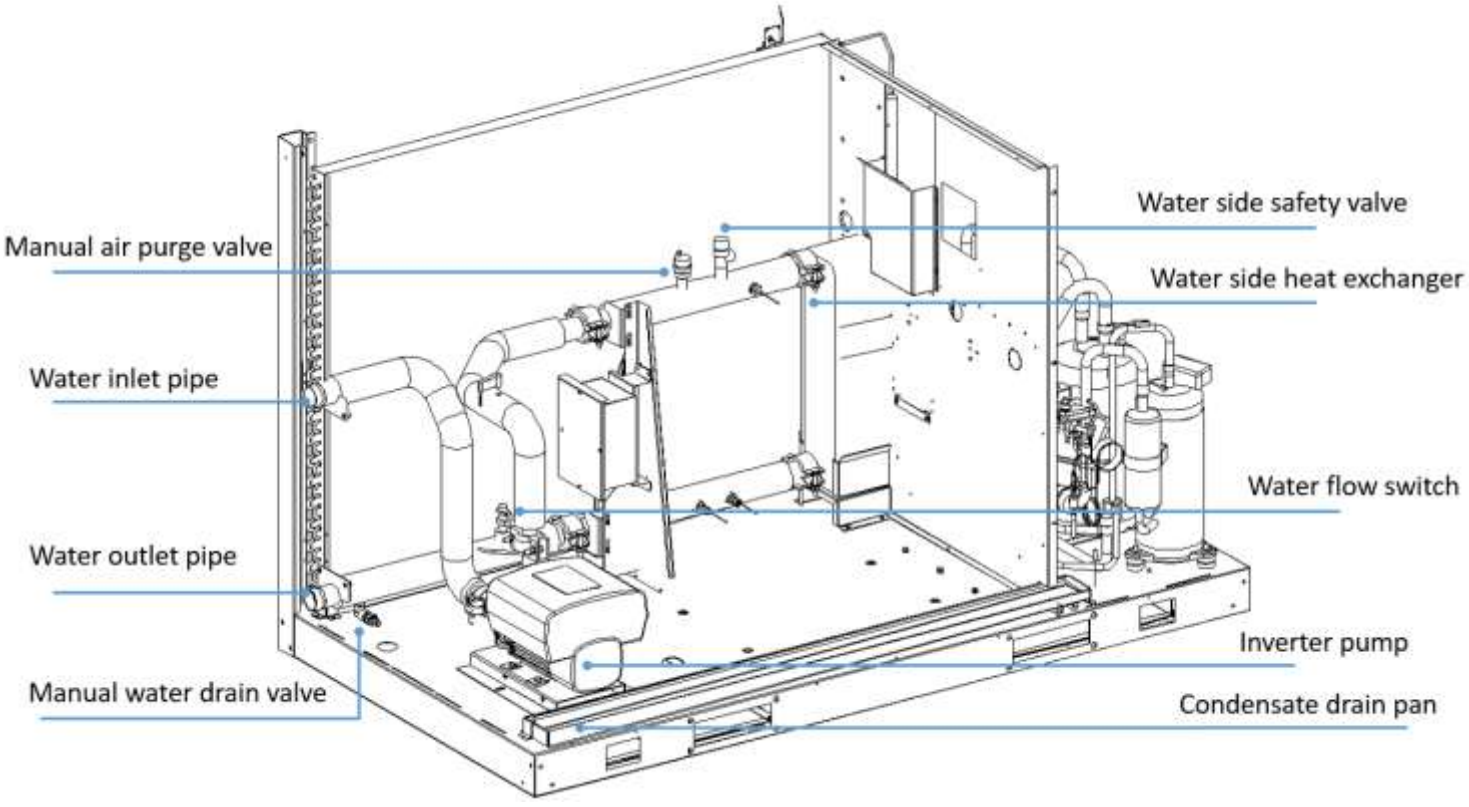
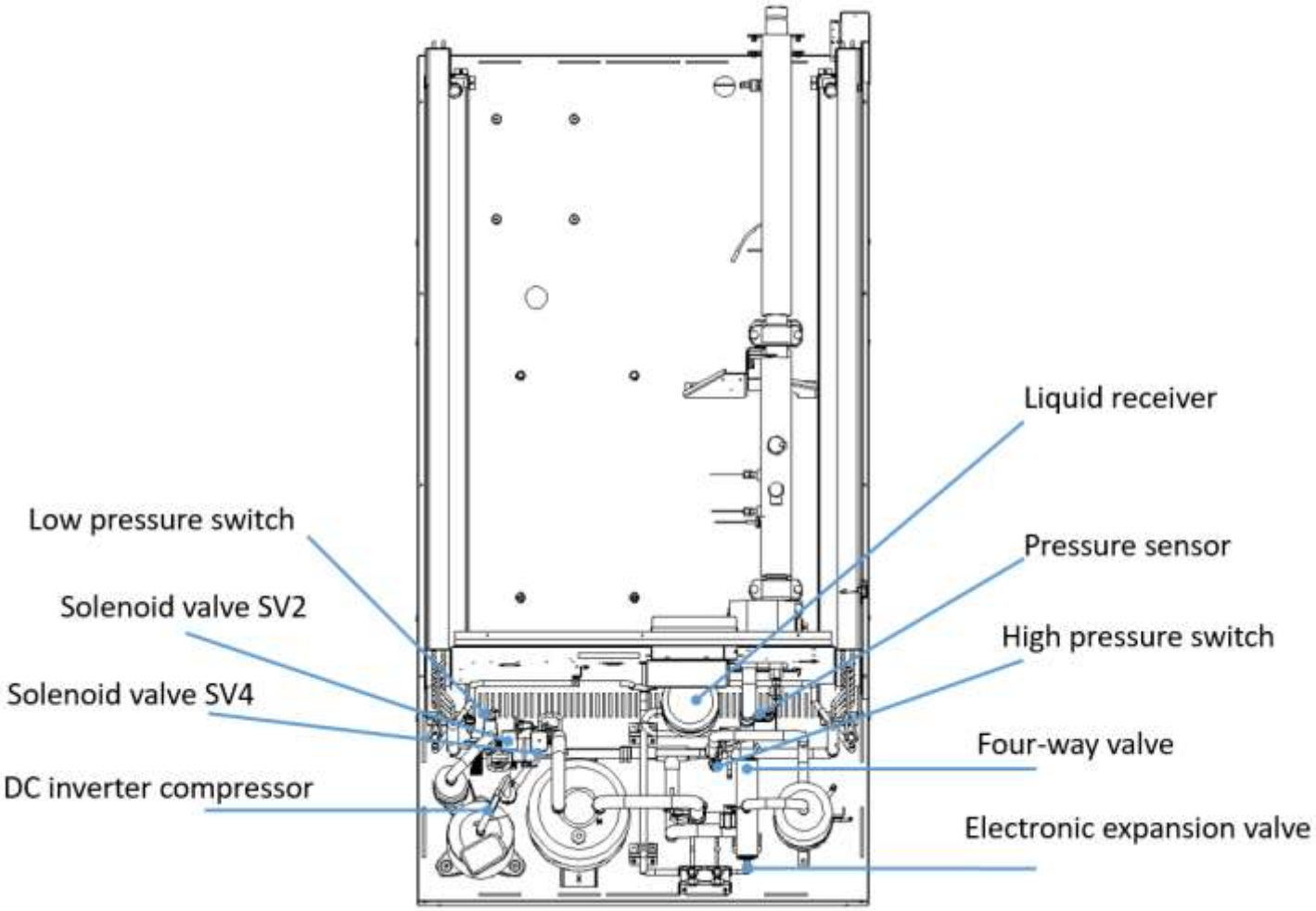


Figure 2-1.3: top view



Size 16.2 – 22.2

Figure 2-1.4: front view

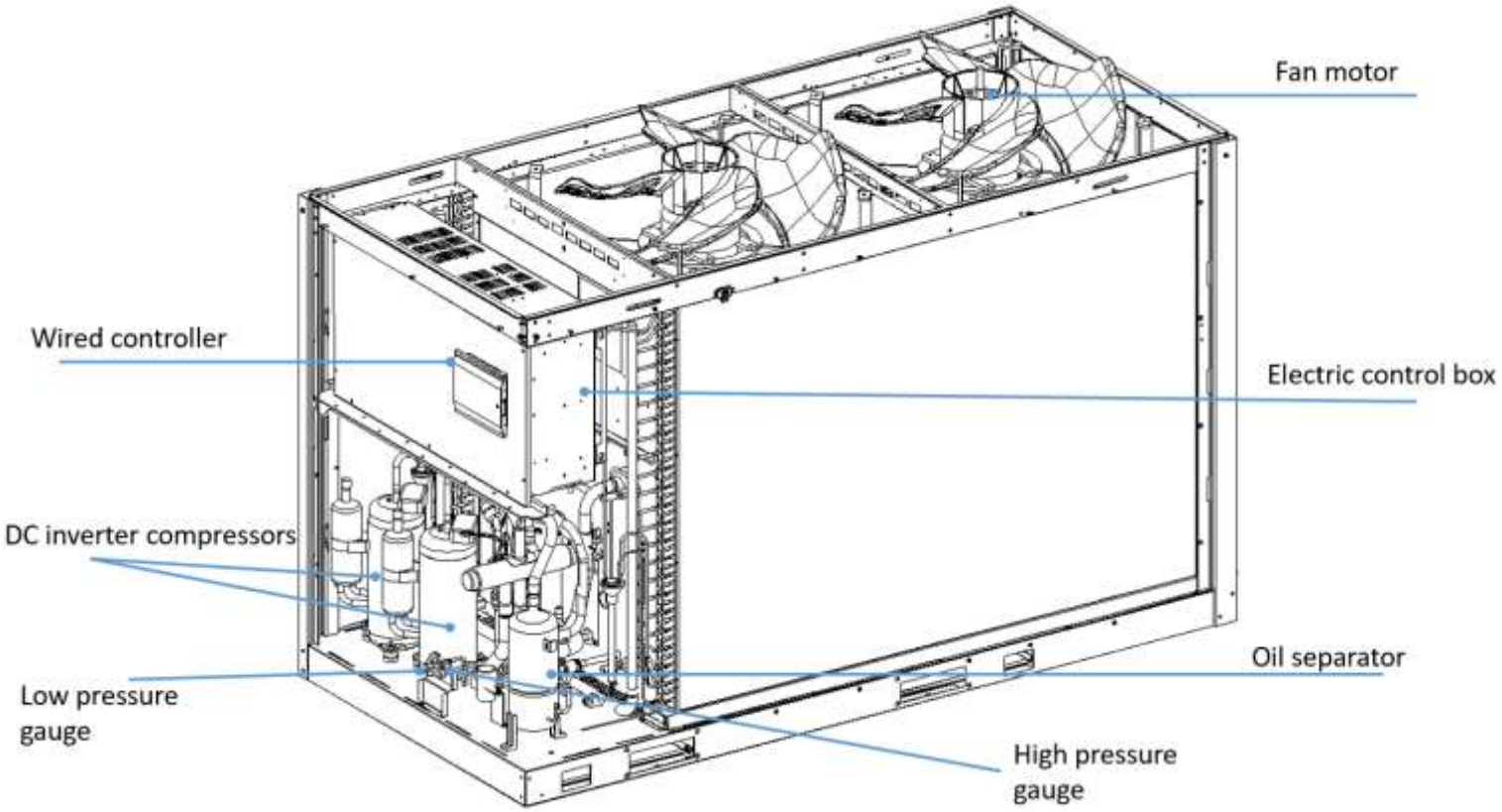


Figure 2-1.5: rear view

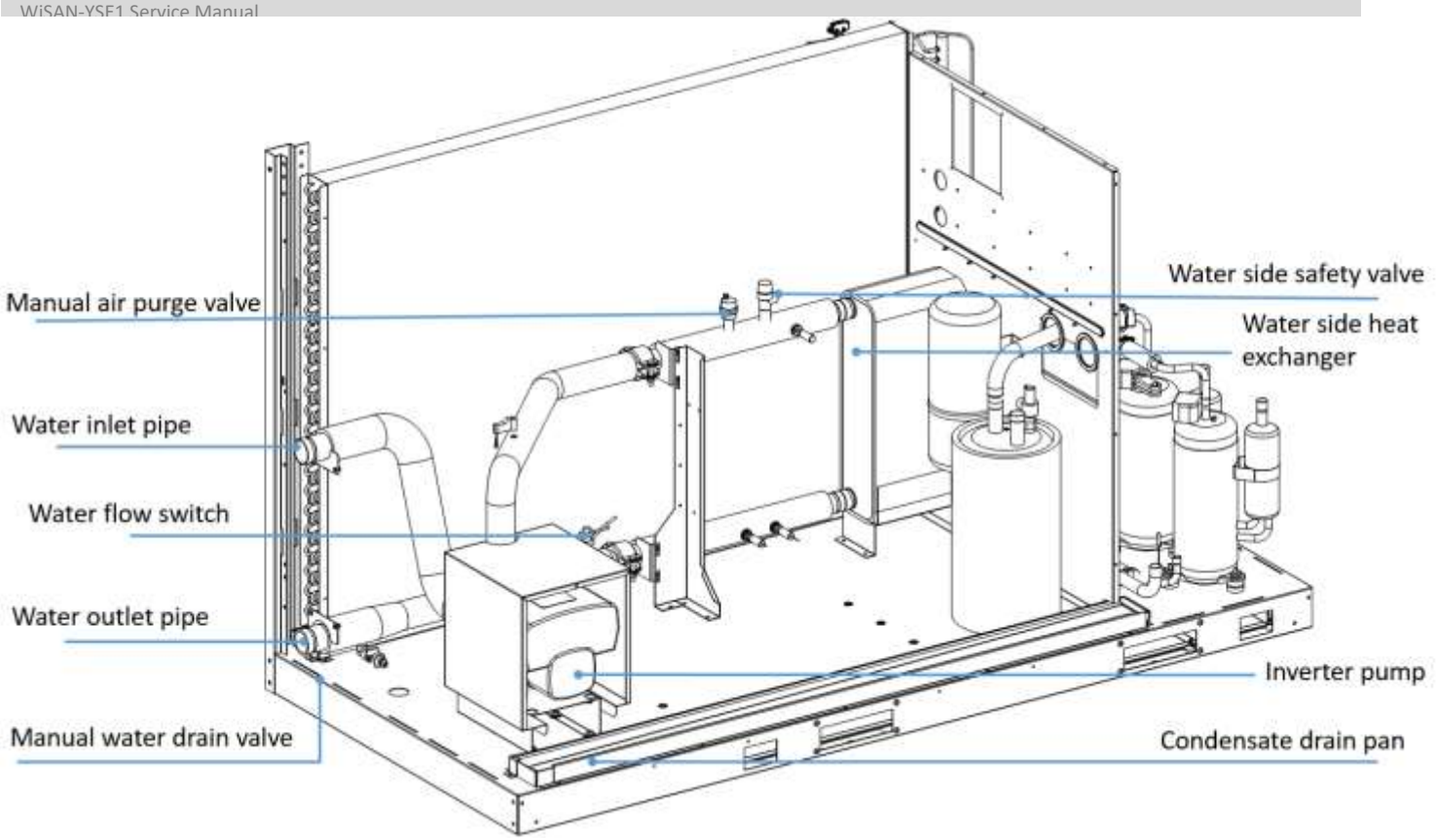
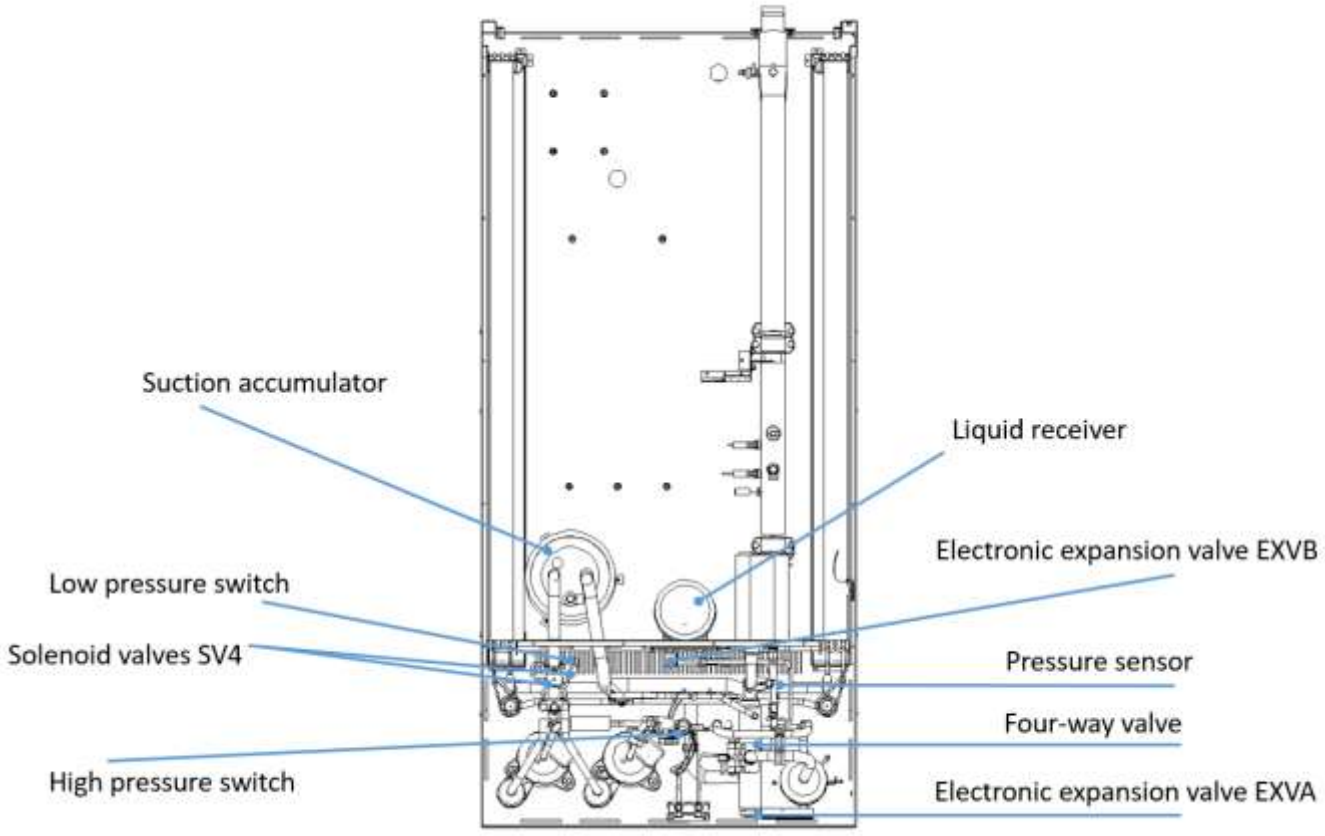


Figure 2-1.6: top view



Size 30.2 – 35.2

Figure 2.1.7: front view

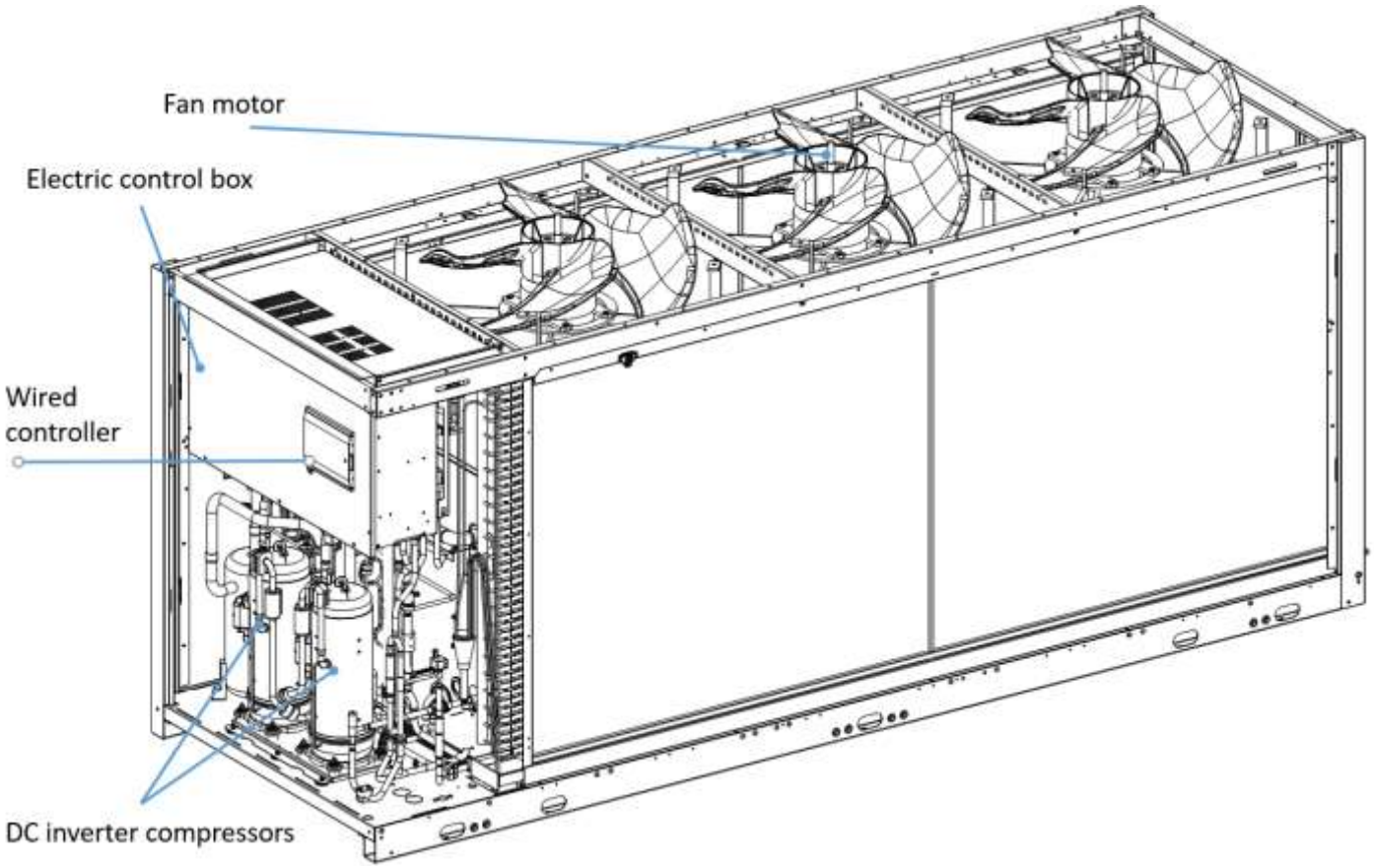


Figure 2.1.8: rear view

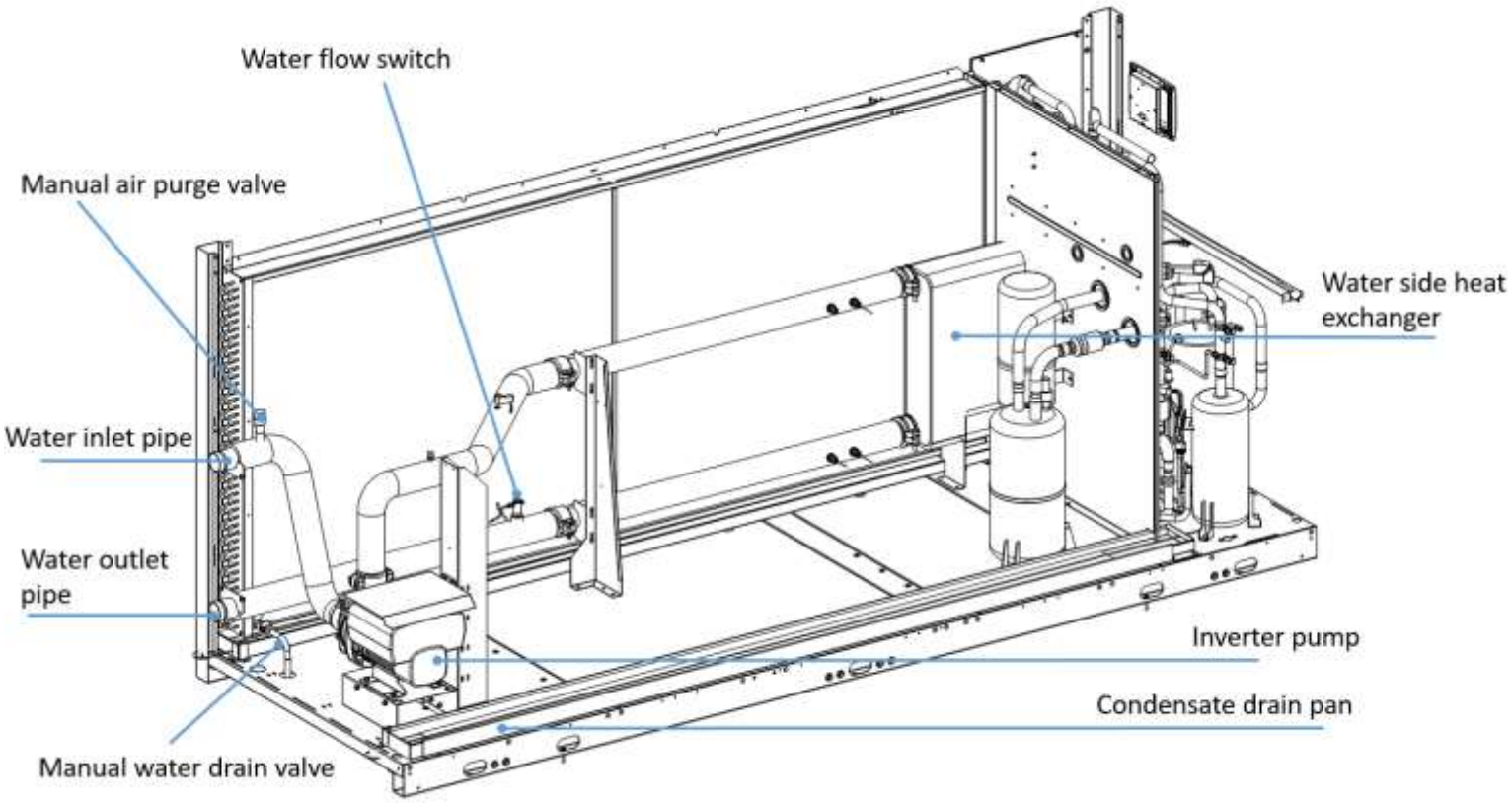
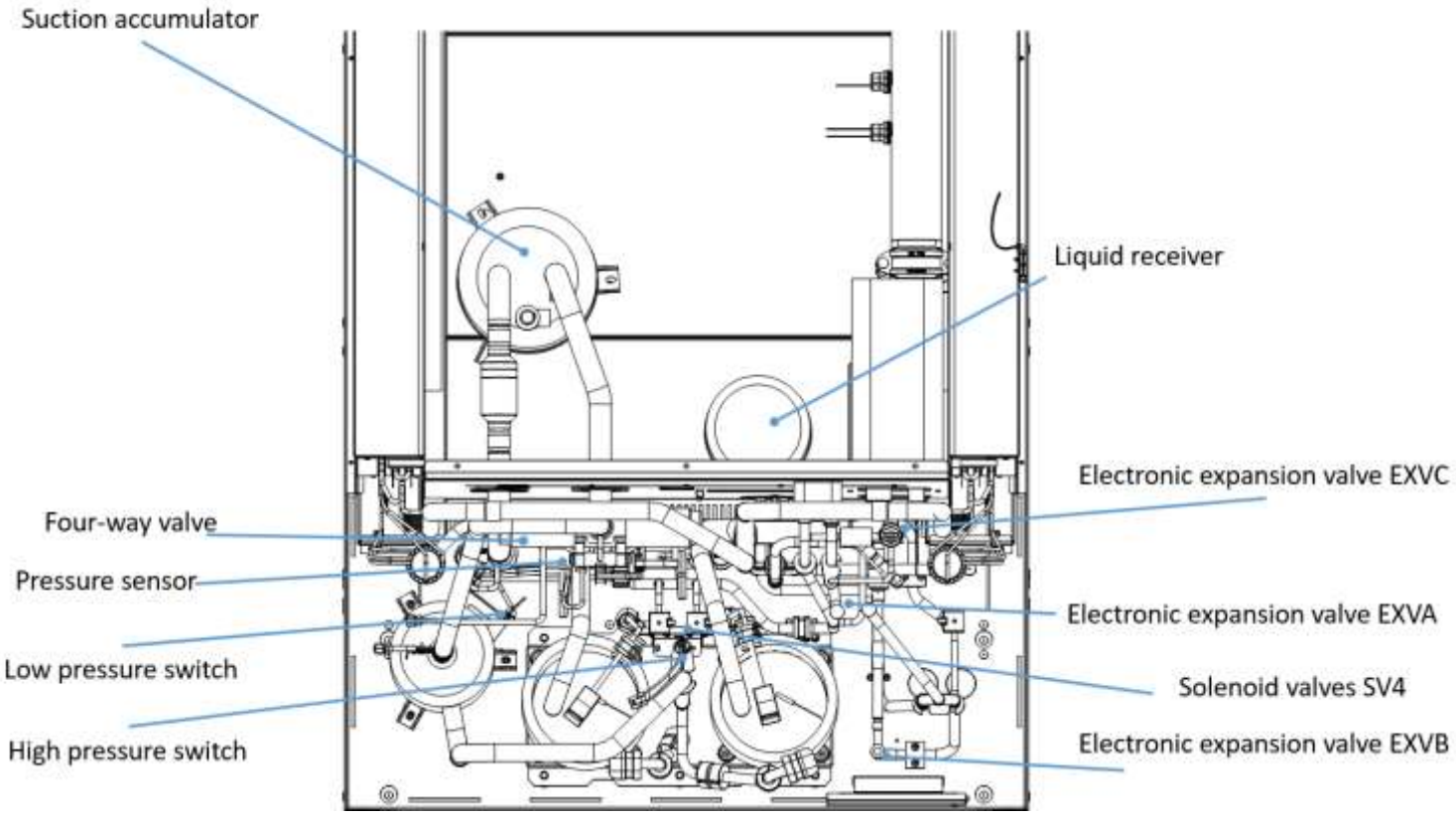


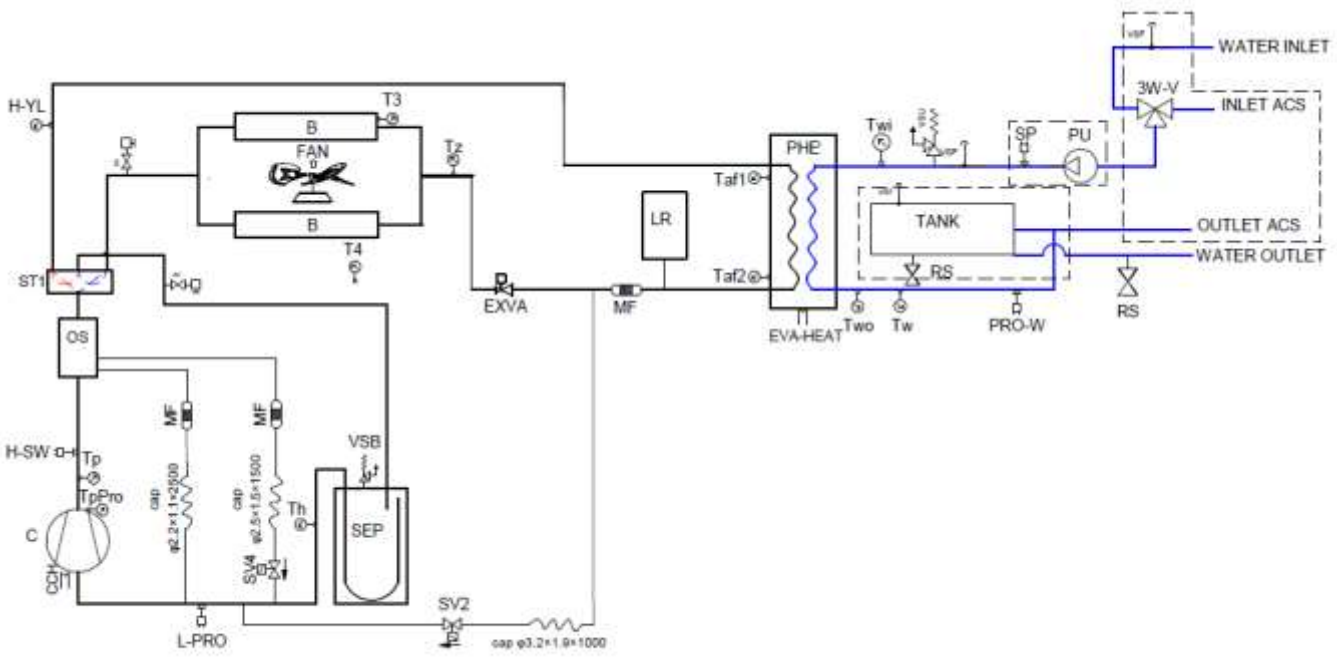
Figure 2.1.10: top view



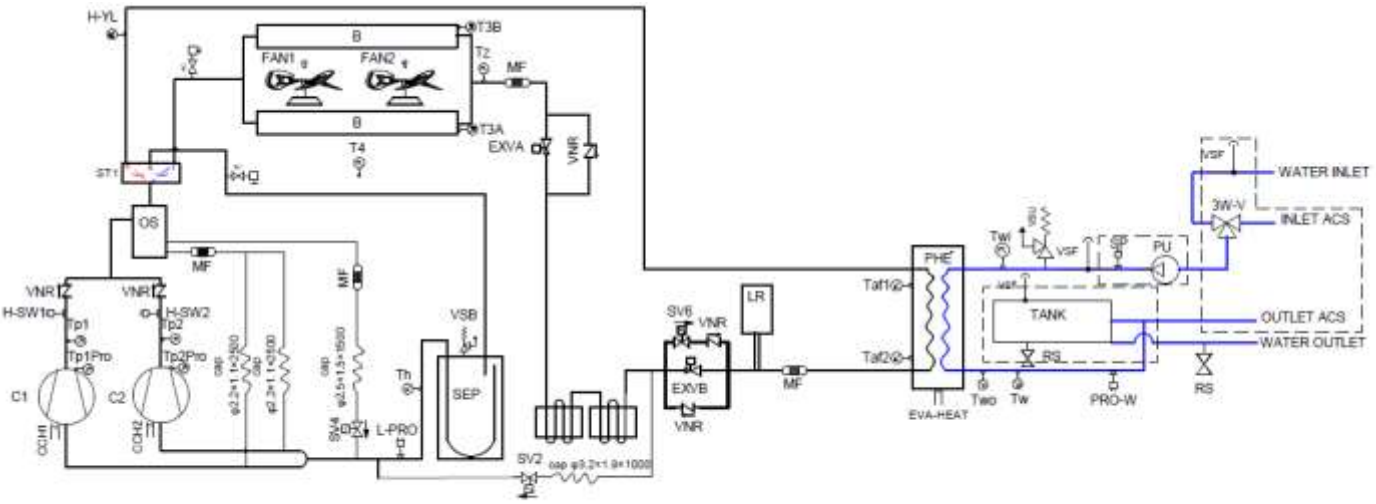
2 Piping Diagrams

UP TO 30 kW

Figure 2-2.1: piping diagram



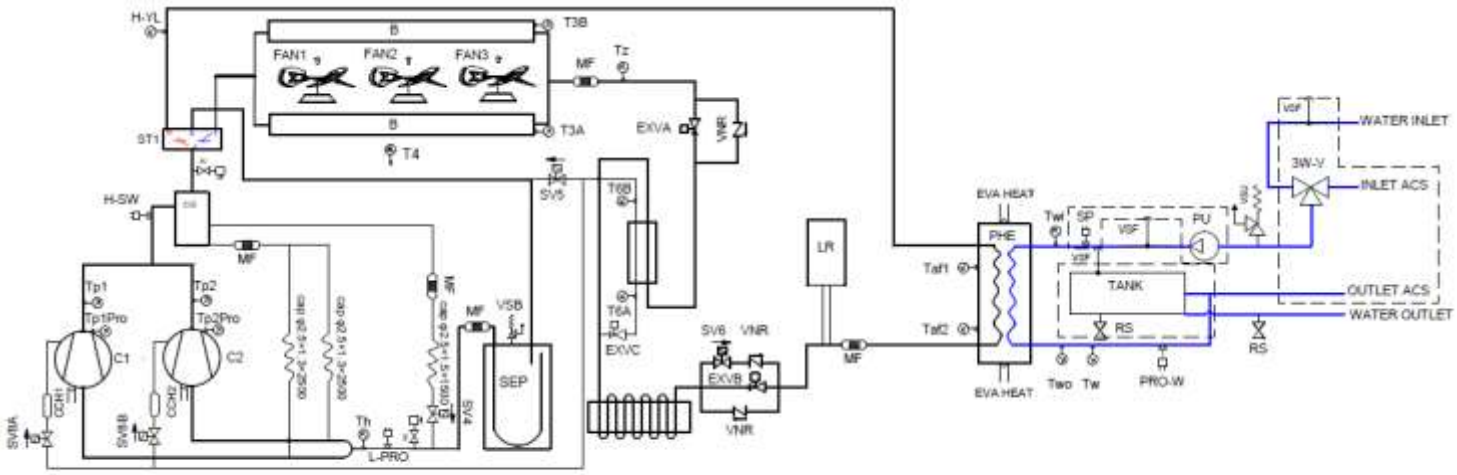
Functional components	
SYMBOLS	**DESCRIPTION**
AC	CHARGE ACCESS
B	FINNED PACK EXCHANGER
C	COMPRESSOR
CAP	CAPILLARY
CCH	CRAKCASE HEATER
EVA HEAT	EVAPORATOR HEATER
EXVA	ELECTRONIC EXPANSION VALVE
FAN	FAN
H-SW	HIGH PRESSURE SWITCH
H-YL	SYSTEM PRESSURE SENSOR
LR	LIQUID RECEIVER
L-PRO	LOW PRESSURE SWITCH
MF	MESH FILTER
OS	OIL SEPARATOR
PHE	PLATE HEAT EXCHANGER
SEP	LIQUID SEPARATOR
ST1	FOUR - WAY VALVE
SV2, SV4	SOLENOID VALVE
T3	FIN HEAT EXCHANGER OUTLET TEMPERATURE
T4	OUTDOOR AMBIENT TEMPERATURE PROBE
Taf1-Taf2	WATER SIDE ANTIFREEZE TEMPERATURE
Th	SYSTEM RETURN REFRIGERANT TEMPERATURE PROBE
Tp	INVERTER COMPRESSOR DISCHARGE TEMPERATURE
TpPro	DISCHARGE TEMPERATURE CONTROL SWITCH A
Tw	WATER TEMPERATURE PROBE
Twi	UNIT WATER INLET TEMPERATURE PROBE
Two	UNIT WATER OUTLET TEMPERATURE PROBE
VNR	NON-RETURN VALVE
VSB	LOW PRESSURE SAFETY VALVE
PRO-W	WATER FLOW SWITCH
VSF	AUTOMATIC RELIEF VALVE
VSU	WATER PRESSURE SAFETY VALVE
PU	PUMP
3W-V	THREE-WAY VALVE
RS	WATER SHUT-OFF VALVE
TANK	WATER TANK
SP	MIN WATER PRESSURE SWITCH



Functional components	
SYMBOLS	**DESCRIPTION**
AC	CHARGE ACCESS
B	FINNED PACK EXCHANGER
C	COMPRESSOR
CAP	CAPILLARY
CCH	CRAKCASE HEATER
EVA HEAT	EVAPORATOR HEATER
EXVA	ELECTRONIC EXPANSION VALVE
FAN	FAN
H-SW	HIGH PRESSURE SWITCH
H-YL	SYSTEM PRESSURE SENSOR
LR	LIQUID RECEIVER
L-PRO	LOW PRESSURE SWITCH
MF	MESH FILTER
OS	OIL SEPARATOR
PHE	PLATE HEAT EXCHANGER
SEP	LIQUID SEPARATOR
ST1	FOUR - WAY VALVE
SV2, SV4	SOLENOID VALVE
T3	FIN HEAT EXCHANGER OUTLET TEMPERATURE
T4	OUTDOOR AMBIENT TEMPERATURE PROBE
Taf1-Taf2	WATER SIDE ANTIFREEZE TEMPERATURE
Th	SYSTEM RETURN REFRIGERANT TEMPERATURE PROBE
Tp	INVERTER COMPRESSOR DISCHARGE TEMPERATURE
TpPro	DISCHARGE TEMPERATURE CONTROL SWITCH A
Tw	WATER TEMPERATURE PROBE
Twi	UNIT WATER INLET TEMPERATURE PROBE
Two	UNIT WATER OUTLET TEMPERATURE PROBE
VNR	NON-RETURN VALVE
VSB	LOW PRESSURE SAFETY VALVE
PRO-W	WATER FLOW SWITCH
VSF	AUTOMATIC RELIEF VALVE
VSU	WATER PRESSURE SAFETY VALVE
PU	PUMP
3W-V	THREE-WAY VALVE
RS	WATER SHUT-OFF VALVE
TANK	WATER TANK
SP	MIN WATER PRESSURE SWITCH

UP TO 90 KW

Figure: piping diagram



Functional components	
SYMBOLS	**DESCRIPTION**
AC	CHARGE ACCESS
B	FINNED PACK EXCHANGER
C	COMPRESSOR
CAP	CAPILLARY
ECO	ECONOMIZER
EVA HEAT	EVAPORATOR HEATER
CCH1, CCH2	CRANKCASE HEATER
EXVA, EXVB, EXVC	ELECTRONIC EXPANSION VALVE
FAN1, FAN2, FAN3	FAN
H-SW	HIGH PRESSURE SWITCH
H-YL	SYSTEM PRESSURE SENSOR
LR	LIQUID RECEIVER
L-PRO	LOW PRESSURE SWITCH
MF	MESH FILTER
OS	OIL SEPARATOR
PHE	PLATE EXCHANGER
SEP	LIQUID SEPARATOR
ST1	FOUR - WAY VALVE
SV4, SV5, SV6, SV8A, SV8B	SOLENOID VALVE
T3A, T3B	FIN HEAT EXCHANGER OUTLET TEMPERATURE
T4	OUTDOOR AMBIENT TEMPERATURE PROBE
T6A,T6B	ECONOMIZER IN-OUT TEMPERATURE PROBE
Taf1,Taf2	WATER SIDE ANTIFREEZE TEMPERATURE
Th	SYSTEM RETURN REFRIGERANT TEMPERATURE PROBE
Tp1,Tp2	INVERTER COMPRESSOR 1-2 DISCHARGE TEMPERATURE
Tp1Pro,Tp2Pro	DISCHARGE TEMPERATURE CONTROL SWITCH A
Tw	WATER TEMPERATURE PROBE
Twi	UNIT WATER INLET TEMPERATURE PROBE
Two	UNIT WATER OUTLET TEMPERATURE PROBE
VNR	NON-RETURN VALVE
VSB	LOW PRESSURE SAFETY VALVE
PRO-W	WATER FLOW SWITCH
VSU	WATER PRESSURE SAFETY VALVE
VSF	AUTOMATIC RELIEF VALVE
PU	PUMP
3W-V	THREE-WAY VALVE
RS	WATER SHUT-OFF VALVE
SP	MIN WATER PRESSURE SWITCH
TANK	WATER TANK

Key components:

1. **Compressor**
   Maintains pressure differential between high and low pressure sides of the refrigerant system.
2. **Fan:**
   Ventilates the air side heat exchanger.
3. **Oil separator:**
   Separates oil from gas refrigerant pumped out of the compressor and quickly returns it to the compressor. Separation efficiency is up to 99%.
4. **Liquid separator (suction accumulator):**
   Stores liquid refrigerant and oil to protect the compressor from liquid hammering.
5. **Electronic expansion valve (EXVA/B/C):**
   Controls refrigerant flow and reduces refrigerant pressure.
6. **Four-way valve:**
   Controls refrigerant flow direction. Closed in cooling mode and open in heating mode. When closed, the air side heat exchanger functions as a condenser and water side heat exchanger functions as an evaporator; when open, the air side heat exchanger functions as an evaporator and water side heat exchanger function as a condenser.
7. **High and low pressure switches:**
   Regulate refrigerant system pressure. When the refrigerant system pressure rises above the upper limit or falls below the lower limit, the high or low pressure switches turn off, stopping the compressor.
8. **Discharge temperature switch:**
   Protects the compressor from abnormally high temperatures and transient spikes in temperature.
9. **Air purge valve:**
   Automatically removes air from the water circuit.
10. **Safety valve:**
    Prevents excessive water pressure by opening at 43.5psi (3bar) and discharging water from the water circuit.
11. **Water flow switch:**
    Detects water flow rate to protect the compressor and water pump in the event of insufficient water flow.
12. **Water pump:**
    Circulates water in the water circuit.
13. **Pressure sensor:**
    Measures refrigerant system pressure.
14. **Crankcase heater:**
    Prevents refrigerant from mixing with compressor oil when the compressors are stopped.
15. **Water side heat exchanger electric heater:**
    Protects the water side heat exchanger from ice formation.
16. **Water flow switch electric heater:**
    Provides additional heating when heating capacity provided by the heat pump is insufficient due to low ambient temperatures, it also protects external water pipes from freezing.
17. **Solenoid valve SV4:**
    Returns oil to the compressor. It opens after 19 minutes of compressor operation, closes after 1 minutes, then opens again for 1 minutes at 19 minute increments.
18. **Plate heat exchanger:**
    In cooling mode, it can improve super-cooling degree and the super-cooled refrigerant can achieve better heat exchange in indoor side. In heating mode, the refrigerant comes from the plate heat exchanger going to the compressor can enhance the refrigerant enthalpy and improve the heating capacity in low ambient temperature. Refrigerant volume in plate heat exchanger is controlled according to temperature different between plate heat exchanger inlet and outlet.

19. Pressure gauge joint (high and low pressure side):

Charges or discharges refrigerant.

20. Capillary:

Throttles and reduces pressure in the liquid injection cooling pipe.

21. Solenoid valve SV2 (only for size 10.1-22.2):

Control the on-off of the liquid injection. It opens at the maximum discharge temperature reaching 105℃ while it closes at the maximum discharge temperature below 95℃ or both the maximum discharge temperature below 100℃ and minimum discharge temperature below 90℃ .

3 Refrigerant Flow Diagrams

Heating operation

Figure 2-3.1: Refrigerant flow during heating operation for sizes 10.1 – 14.1 kW

High temperature, high press gas
High temperature, high press liquid
Low temperature, low pressure

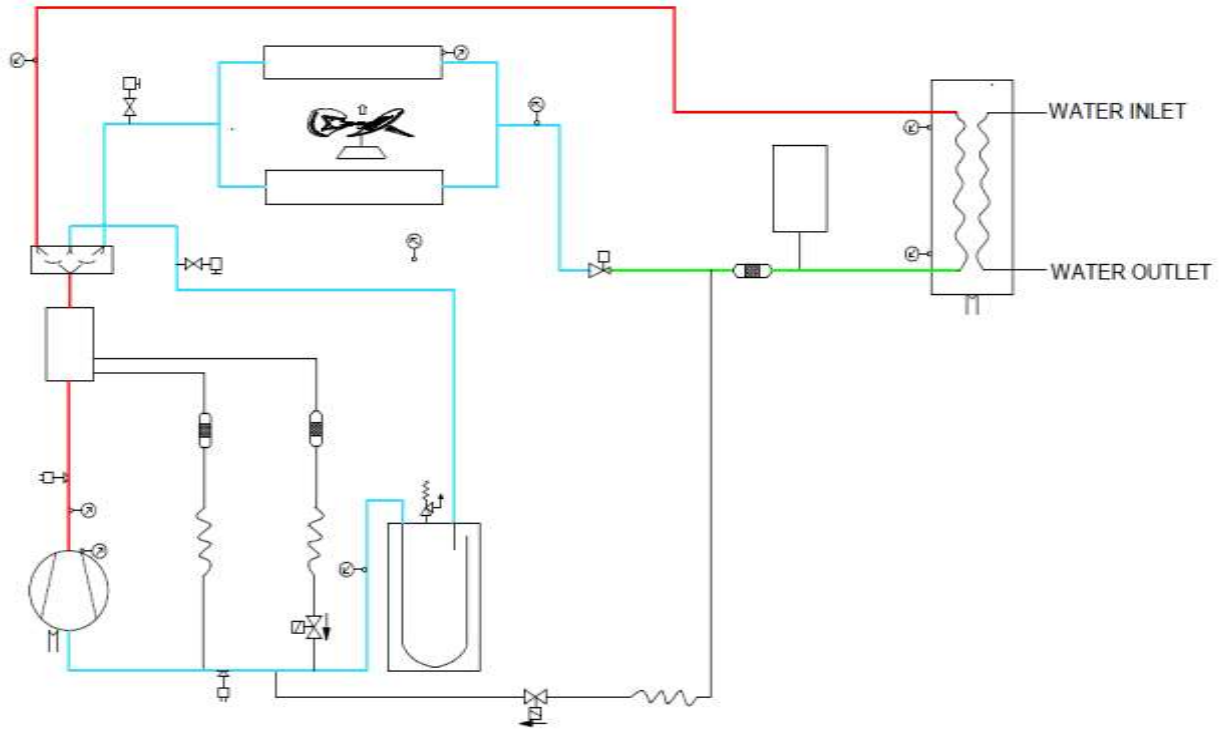


Figure 2-3.2: Refrigerant flow during heating operation for sizes 16.2 – 22.2

High temperature, high press gas
High temperature, high press liquid
Low temperature, low pressure

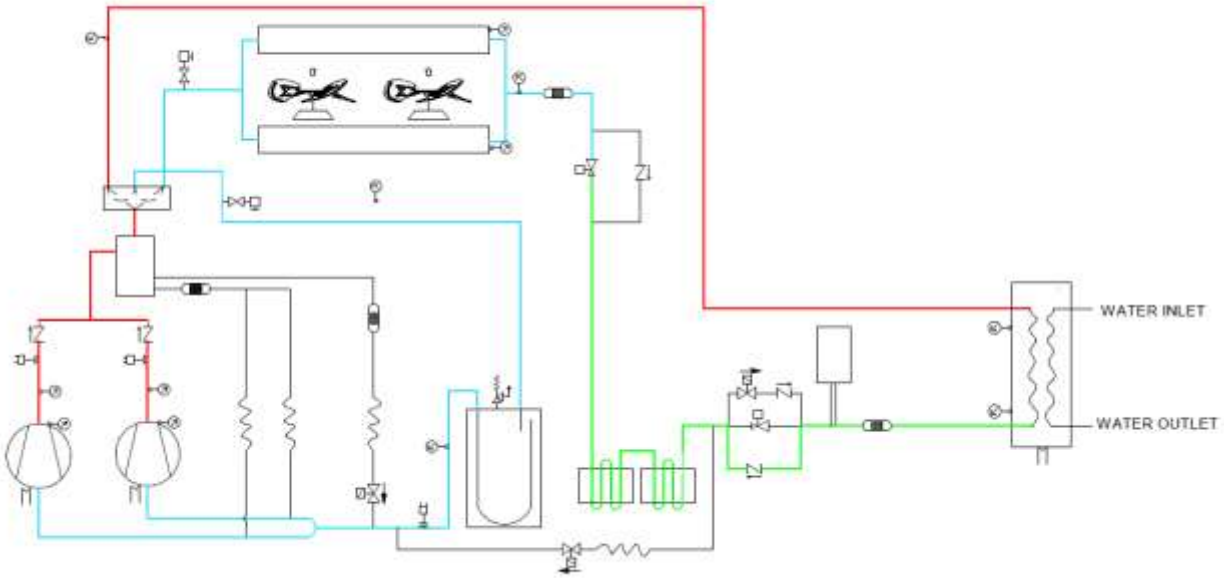
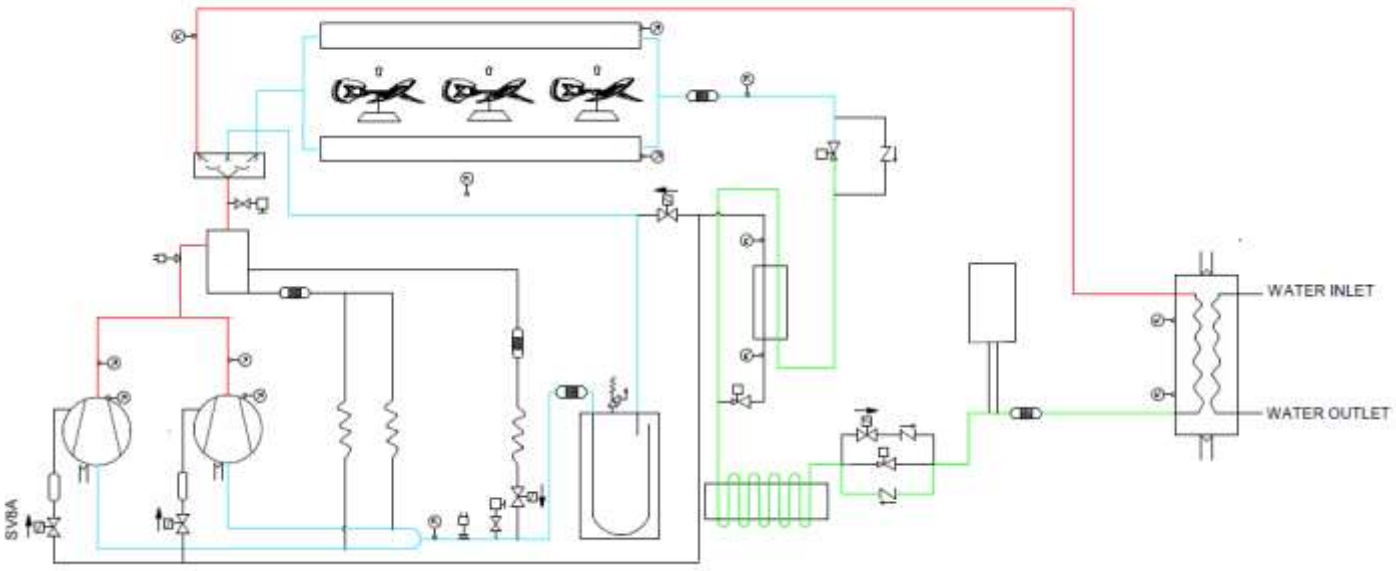


Figure 2-3.3: Refrigerant flow during heating operation for sizes 30.2 – 35.2

High temperature, high press gas
High temperature, high press liquid
Low temperature, low pressure



Cooling and defrosting operation

Figure 2-3.4: Refrigerant flow during cooling and defrosting operations for sizes 10.1 – 14.1

High temperature, high press gas
High temperature, high press liquid
Low temperature, low pressure

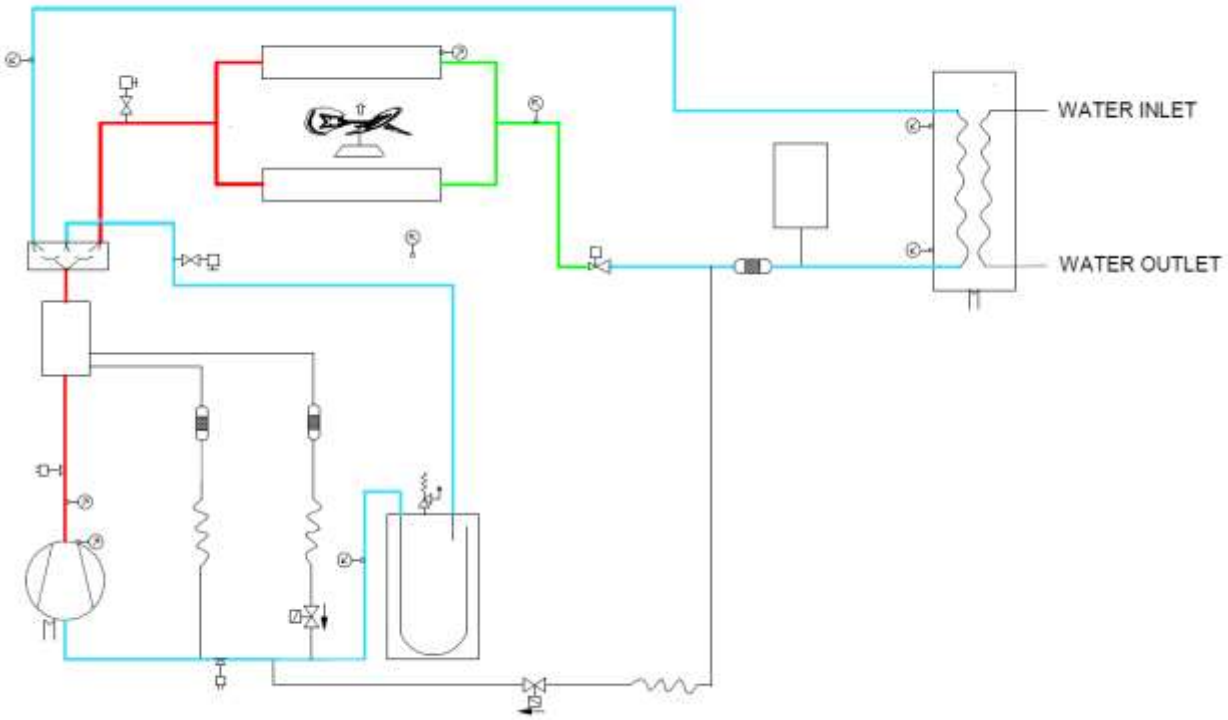


Figure 2-3.5: Refrigerant flow during cooling and defrosting operations for sizes 16.2 – 22.2

High temperature, high press gas
High temperature, high press liquid
Low temperature, low pressure

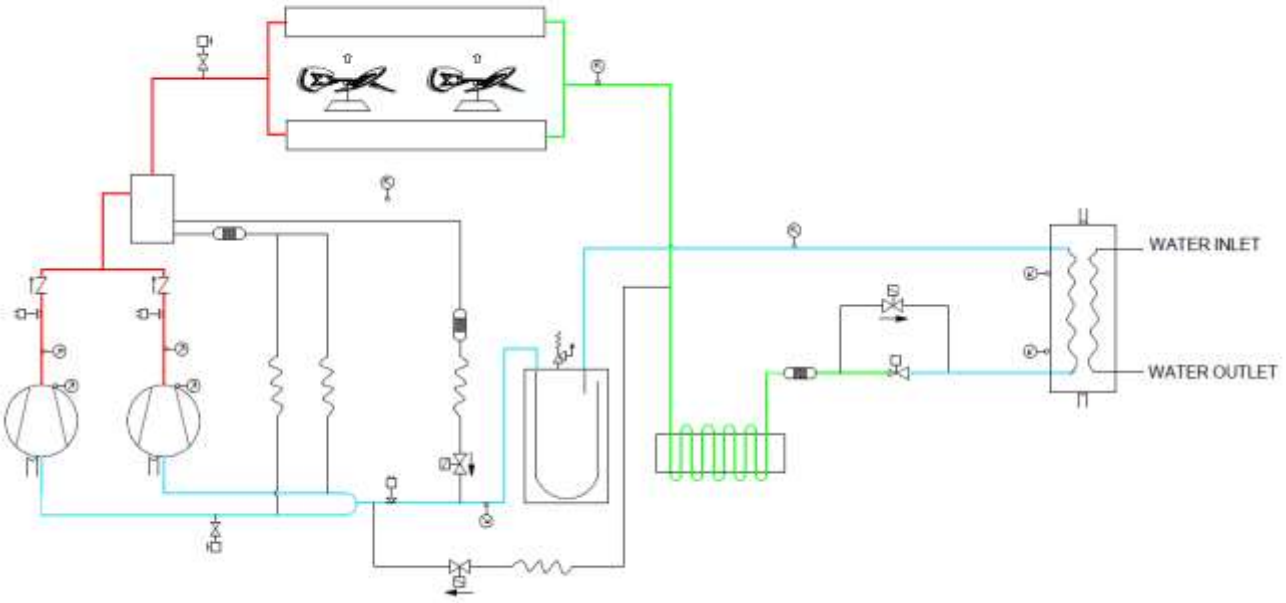
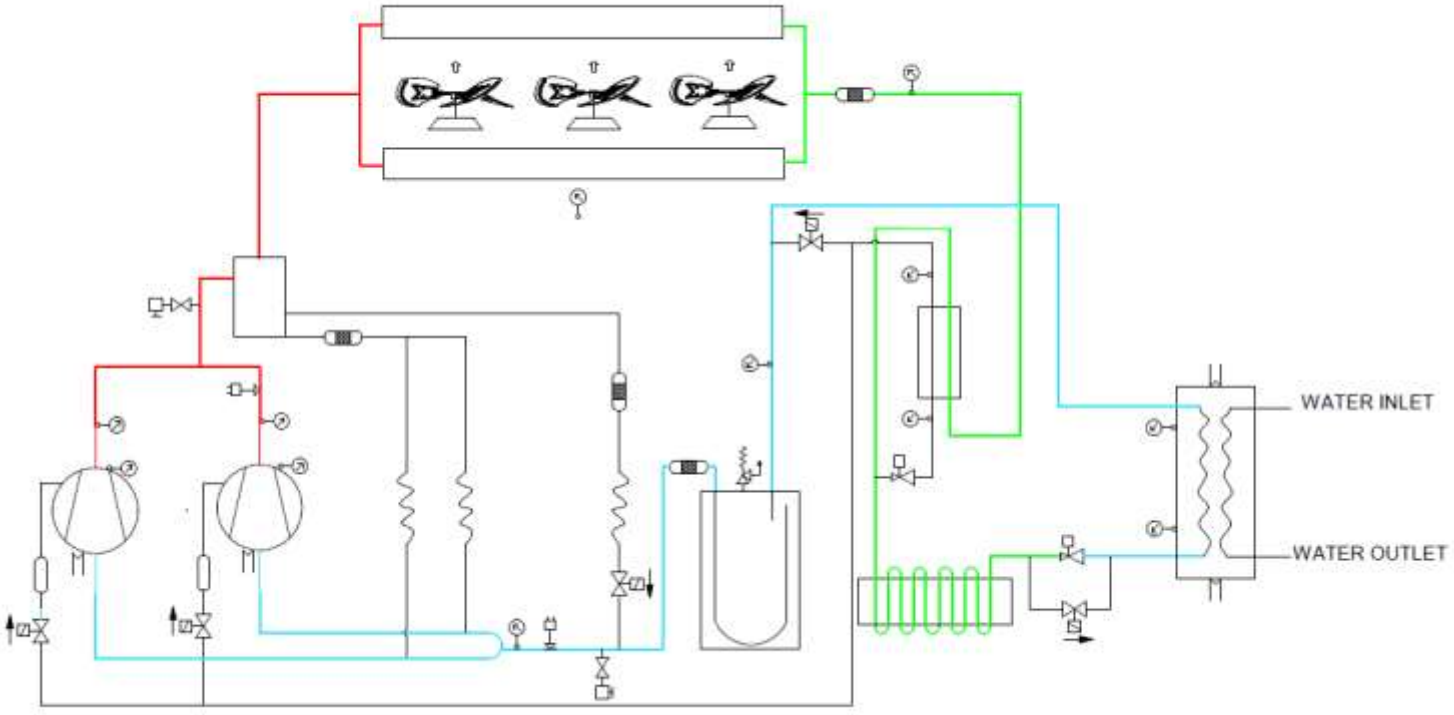


Figure 2-3.6: Refrigerant flow during cooling and defrosting operations for sizes 30.2 – 35.2

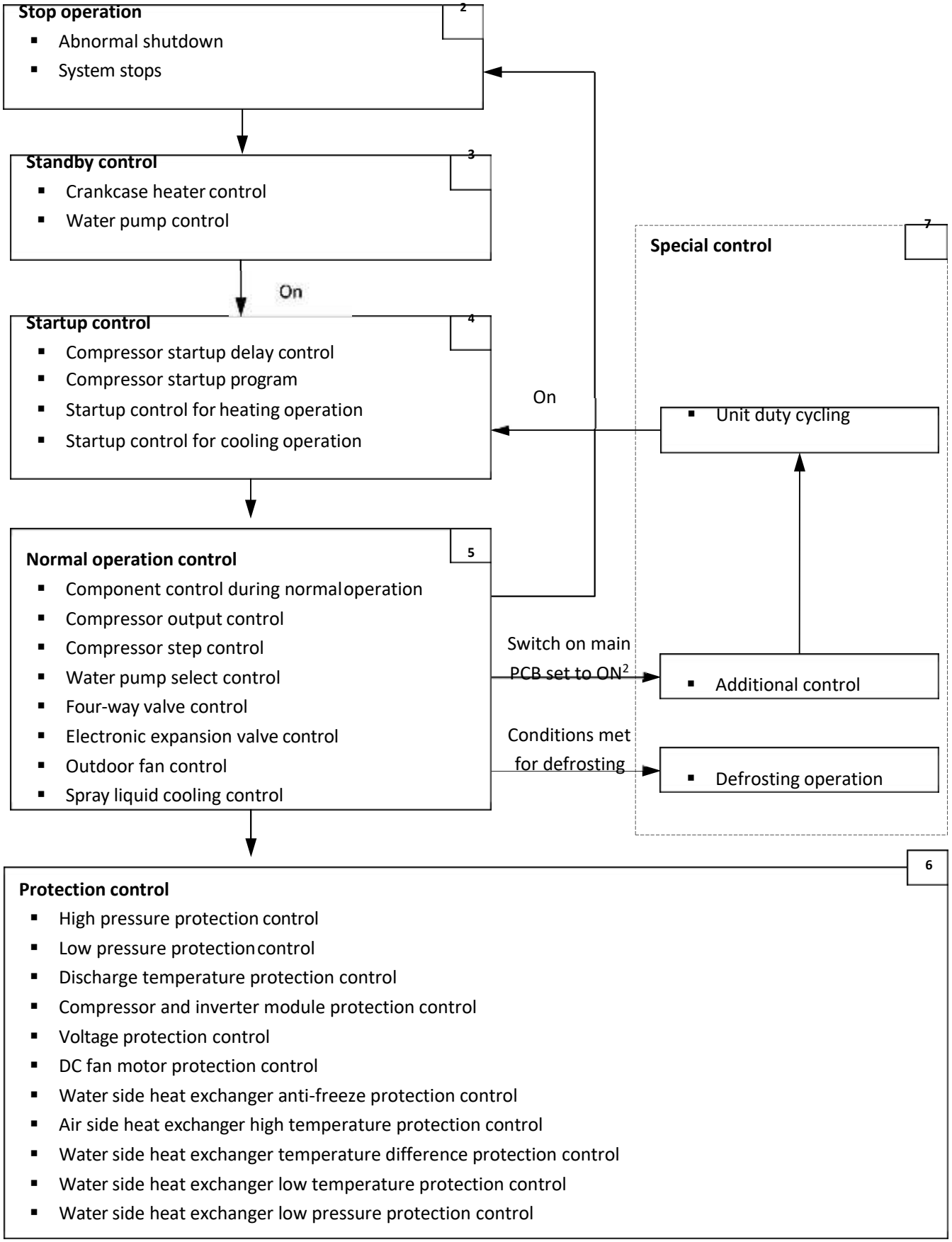
High temperature, high press gas
High temperature, high press liquid
Low temperature, low pressure



Part 3
Control

1 General Control Scheme Flowchart

Sections 3-2 to 3-7 on the following pages detail when each of the controls in the flowchart below is activated.



Note:

1. Numbers in the top right-hand corners of boxes indicate the relevant section of text on the following pages.
2. S5_3 to set additional control.

2 Stop Operation

The stop operation occurs for one of the following reasons:

1. Abnormal shutdown: in order to protect the compressors, if an abnormal state occurs the system makes a stop with thermo off operation and an error code is displayed on the unit's PCB digital displays and on the user interface.
2. The system stops when the set temperature has been reached.

3 Standby Control

3.1 Crankcase Heater Control

The crankcase heater is used to prevent refrigerant from mixing with compressor oil when the compressors are stopped. The crankcase heater is controlled according to the outdoor ambient temperature and discharge temperature. When the outdoor ambient temperature is above 40°C, the crankcase heater is off; when the outdoor ambient temperature is below 35°C, the crankcase heater is controlled according to discharge temperature. Refer to Figures 3-3.1 and 3-3.2.

Figure 3-3.1: Crankcase heater controlled according to outdoor ambient temperature

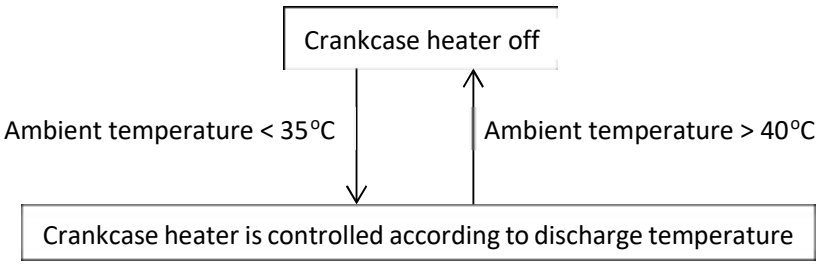
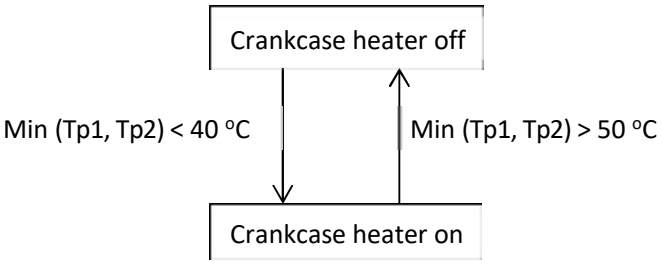


Figure 3-3.2: Crankcase heater controlled according to discharge temperature



Notes:

1. Tp1: discharge temperature sensor 1, Tp2: discharge temperature sensor 2.

3.2 Water Pump Control

When the unit is in standby, the circulator pumps run continuously or follows the ON/OFF time settings.

4 Startup Control

4.1 Compressor Startup Delay Control

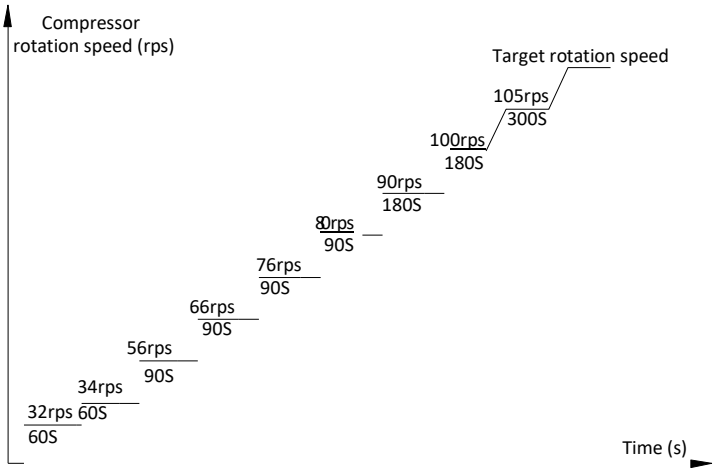
In initial startup control and restart control (except in defrosting operation), compressor startup is delayed such that a minimum 7 minutes has elapsed since the compressor stopped, in order to prevent frequency compressor on/off and to equalize the pressure within the refrigerant system.

4.2 Compressor Startup Program

In initial startup control and in re-start control, compressor startup is controlled according to outdoor ambient temperature and leaving water temperature. Compressor startup follows one of two startup programs until the target rotation speed is reached. Refer to Figures 3-4.1, 3-4.2, 3-4.3, 3-4.4.

During startup program power control according to setpoint is not active.

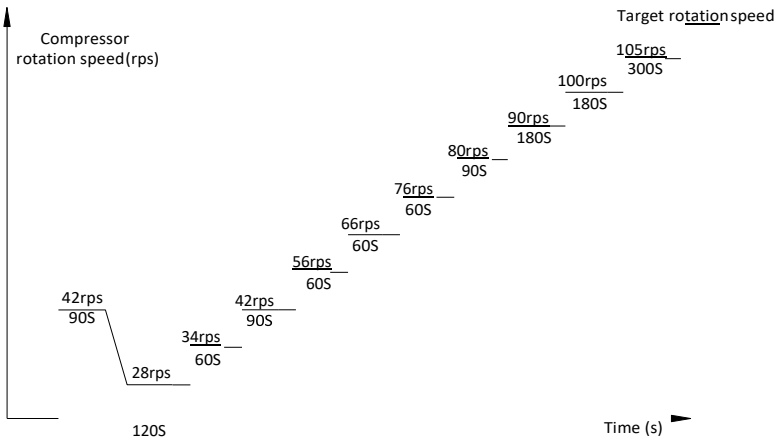
Figure 3-4.1: size 10.1-14.1 and 16.2-22.2 compressor startup program[1] when ambient temperature is above 10°C



Notes:

1. Once the first, 60-second stage of the program is complete, the program proceeds to the subsequent stages in a step-by-step fashion and exits when the target rotation speed has been reached.

Figure 3-4.2: size 10.1-14.1 and 16.2-22.2 compressor startup program[1] when ambient temperature is at or below 10°C



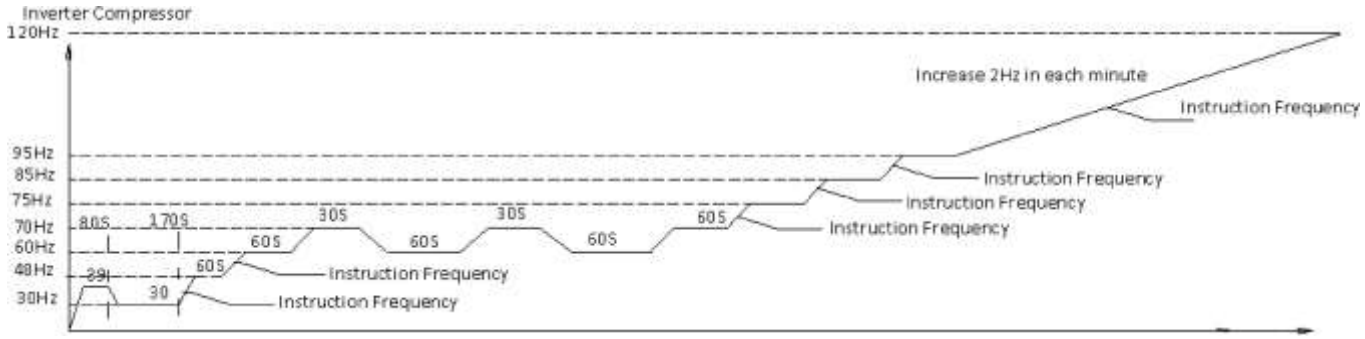
Notes:

1. Once the first, 90-second stage of the program is complete, the program proceeds to the subsequent stages in a step-by-step fashion and exits when the target rotation speed has been reached.

30.2-35.2 - Compressor Start-up

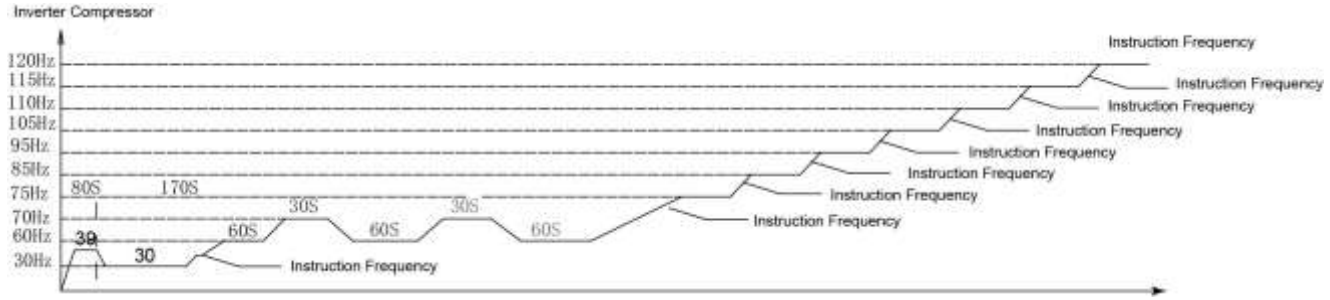
Cooling Start-up

System startup program: the following startup program is executed when the system is powered on:



Heating/Water Heating Start-up

System startup program: the following startup program is executed when the system is powered on:



4.3 Startup Control for Heating Operation

Table 3-4.1: Component control during startup in heating mode

Component	Wiring diagram label	10.1-14.1	16.2-22.2	30.2-35.2	Control functions and states
Inverter compressor A	COMP A	●	●	●	Controlled according to ambient temperature and leaving water temperature[1]
Inverter compressor B	COMP B		●	●	
DC fan motor A	FAN A	●	●	●	Controlled according to ambient temperature
DC fan motor B	FAN B	/	●	●	
DC fan motor C	FAN C	/	/	●	
Electronic expansion valve	EXV-A	●	●	●	Position (steps) 30kw: from 0 (fully closed) to 480 (fully open) 60/90kw: from 0 (fully closed) to 2880 (fully open) controlled according to discharge superheat.
Electronic expansion valve	EXV-B	/	●	●	Full open
Electronic expansion valve	EXV-C	/	/	●	closed
Four-way valve	STF1	●	●	●	On after the compressor startup for 10s
Solenoid valve (oil balance)	SV4	●	●	●	Closed for 200s, open for 600s, then closed
Water pump	PUPM	●	●	●	On
Water side heat exchanger heater	EVA-HEAT	●	●	●	Off
Water flow switch	Water switch	●	●	●	Off
Water flow switch heater	W-HEAT	●	●	●	Off
Electric auxiliary heater	HEAT	●	●	●	Controlled according to ambient temperature and total leaving water temperature.
Crank case heater	CCH	●	●	●	Controlled according to ambient temperature and discharge temperature
Solenoid valve (Spray liquid cooling)	SV2	●	●	/	Off
Solenoid valve	SV5	/	/	●	open
Solenoid valve	SV8A/SV8B	/	/	●	closed

Notes:

1. Refer to Figure 3-4.1, Figure 3-4.2 and in Part 3, 4.2 “Compressor Startup Program”.

4.4 Startup Control for Cooling Operation

Table 3-4.2: Component control during startup in cooling mode

Component	Wiring diagram label	10.1-14.1	16.2-22.2	30.2-35.2	Control functions and states
Inverter compressor A	COMP A	●	●	●	Controlled according to ambient temperature and leaving water temperature[1]
Inverter compressor B	COMP B		●	●	
DC fan motor A	FAN A	●	●	●	Controlled according to air side heat exchanger refrigerant total outlet temperature (Tz/7), ambient temperature and compressor speed.
DC fan motor B	FAN B	/	●	●	
DC fan motor C	FAN C	/	/	●	
Electronic expansion valve	EXV-A	●	●	●	Position (steps) 30kw:from 0 (fully closed) to 480 (fully open), controlled according to suction superheat. 60/90kw: full open
Electronic expansion valve	EXV-B	/	●	●	Position (steps) from 0 (fully closed) to 480 (fully open), controlled according to suction superheat.
Electronic expansion valve	EXV-C	/	/	●	closed
Four-way valve	STF1	●	●	●	Off
Solenoid valve (oil balance)	SV4	●	●	●	Closed for 200s, open for 600s, then closed
Water pump	PUPM	●	●	●	On

Water side heat exchanger heater	EVA-HEAT	●	●	●	Off
Water flow switch	Water switch	●	●	●	Off
Water flow switch heater	W-HEAT	●	●	●	Off
Electric auxiliary heat	HEAT	●	●	●	Controlled according to ambient temperature and total leaving water temperature.
Crank case heater	CCH	●	●	●	Controlled according to ambient temperature and discharge temperature
Solenoid valve (Spray liquid cooling)	SV2	●	●	●	Off
Solenoid valve	SV5	/	/	●	open
Solenoid valve	SV8A/SV8B	/	/	●	closed

Notes:
1. Refer to Figure 3-4.1, Figure 3-4.2 and in Part 3, 4.2 “Compressor Startup Program”.

5 Normal Operation Control

5.1 Component Control during Normal Operation

Table 3-5.1: Component control during heating operation

Component	Wiring diagram label	10.1-14.1	16.2-22.2	30.2-35.2	Control functions and states
Inverter compressor A	COMP A	●	●	●	Controlled according to leaving water temperature
Inverter compressor B	COMP B		●	●	
DC fan motor A	FAN A	●	●	●	Controlled according to discharge pressure
DC fan motor B	FAN B	/	●	●	
DC fan motor C	FAN C	/	/	●	
Electronic expansion valve	EXV-A	●	●	●	Position (steps) 30kw: from 0 (fully closed) to 480 (fully open) 60/90kw: from 0 (fully closed) to 2880 (fully open) controlled according to discharge superheat.
Electronic expansion valve	EXV-B	/	●	●	fully open
Electronic expansion valve	EXV-C	/	/	●	from 0 (fully closed) to 480 (fully open) controlled according to superheat
Four-way valve	STF1	●	●	●	On
Solenoid valve (oil balance)	SV4	●	●	●	Open for 3min every 2min
Water pump	PUPM	●	●	●	On
Water side heat exchanger heater	EVA-HEAT	●	●	●	Off
Water flow switch	Water switch	●	●	●	Off
Water flow switch heater	W-HEAT	●	●	●	Off
Electric auxiliary heater	HEAT	●	●	●	Controlled according to ambient temperature and total leaving water temperature.
Crank case heater	CCH	●	●	●	Controlled according to ambient temperature and discharge temperature
Solenoid valve (Spray liquidcooling)	SV2	●	●	/	Opens when discharge temperature over 105℃
Solenoid valve	SV5	/	/	●	closed
Solenoid valve	SV8A/SV8B	/	/	●	open

Table 3-5.2: Component control during cooling operation

Component	Wiring diagram label	10.1-14.1	16.2-22.2	30.2-35.2	Control functions and states
Inverter compressor A	COMP A	●	●	●	Controlled according to leaving water temperature
Inverter compressor B	COMP B		●	●	
DC fan motor A	FAN A	●	●	●	Controlled according to air side heat exchanger refrigerant total outlet temperature (Tz/7)
DC fan motor B	FAN B	/	●	●	
DC fan motor C	FAN C	/	/	●	

Electronic expansion valve	EXV-A	●	●	●	Position (steps) 30kW: from 0 (fully closed) to 480 (fully open), 60/90kw: fully open controlled according to suction superheat.
Electronic expansion valve	EXV-B	/	●	●	Position (steps) 60/90kw: from 0 (fully closed) to 2880 (fully open), controlled according to suction superheat.
Electronic expansion valve	EXV-C	/	/	●	from 0 (fully closed) to 480 (fully open) controlled according to superheat
Four-way valve	STF1	●	●	●	Off
Solenoid valve (oil balance)	SV4	●	●	●	Open for 3min every 2min
Water pump	PUPM	●	●	●	On
Water side heat exchanger heater	EVA-HEAT	●	●	●	Off
Water flow switch	Water switch	●	●	●	Off
Water flow switch heater	W-HEAT	●	●	●	Off
Electric auxiliary heater	HEAT	●	●	●	Controlled according to ambient temperature and total leaving water temperature.
Crank case heater	CCH	●	●	●	Controlled according to ambient temperature and discharge temperature
Solenoid valve (Spray liquid cooling)	SV2	●	●	/	Opens when discharge temperature over 105℃
Solenoid valve	SV5	/	/	●	open
Solenoid valve	SV8A/SV8B	/	/	●	closed

5.2 Compressor Output Control

The compressor rotation speed is controlled according to the load requirement. Before compressor startup, the unit determines the compressor target speed according to outdoor ambient temperature, discharge temperature and then runs the appropriate compressor startup program. Refer to Part 3, 4.2 “Compressor Startup Program”. Once the startup program is complete, the compressor runs at the target rotation speed.

The compressor speed is controlled according to two parts in normal operation:

In cooling mode: In a single system, the compressor speed is controlled according to the water outlet temperature and water outlet setting temperature. In a combination system, the compressor of master unit is controlled according total water outlet temperature and water outlet setting temperature, the compressor of the slave unit is controlled according to water inlet and water outlet temperature. Both in a single system and combination system, the compressor speed is limited by the inverter module temperature (Tf), ambient temperature, discharge temperature and air side heat exchanger refrigerant total outlet temperature (Tz/7).

In heating mode: In a single system, the compressor speed is controlled according to the water outlet temperature and water outlet setting temperature. In a combination system, all compressors are controlled according to the total water outlet temperature and the water outlet setting temperature. Both in a single system and combination system, the compressor speed is limited by inverter module temperature (Tf), ambient temperature, discharge temperature, discharge pressure.

5.3 Compressor Step Control

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

The compressor capacity control is performed when frequency is stable for at least 5 min: the frequency is adjusted according to Tws and Two every 60s till reach stable condition.

5.4 Water pump select control

When the dial switch S12_2 on the main PCB is switched ON, the system runs “one small pump per unit” mode, when

S12_2 is switched OFF, the system runs “one large pump controlled by master unit” mode.

- One pump control: only the master unit output pump signal, no pump signal output on the slave units.
- Multiple pump control: output pump signal on all units.
- S12_2 in one system must be switched to the same position or not error code FP will be displayed.

5.5 Four-way Valve Control

The four-way valve is used to change the direction of refrigerant flow through the water side heat exchanger in order to switch between cooling and heating operations. Refer to Figures 2-3.1 ,2-3.2, 2-3.3, 2-3.4, 2-3.5 in Part 2, 3 “Refrigerant Flow Diagrams”.

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

5.6 Electronic Expansion Valve Control

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

- At power-on:
- The EXV first closes fully, then moves to the standby position (352 (steps)). After 30seconds the EXV moves to an initial running position, which is determined according to the operating mode and outdoor ambient temperature.
- When the unit operate in cooling mode, after 60 seconds, the EXV is controlled according to suction superheat, water inlet temperature and compressor frequency.
- When the unit operates in heating mode, after a further 60 seconds, the EXV is controlled according to discharge superheat and compressor frequency, and uses the suction temperature, air side heater exchanger temperature, discharge temperature to modify the control.
- When the unit is in standby:
  - 30kw:The EXV is at position 352 (steps).
  - 60/90kw: The EXV is at position 2000 (steps).
- When the unit stops:
  - The EXV first closes fully, then moves to the standby position.

5.7 Outdoor Fan Control

The speed of the unit fan(s) is adjusted in steps, as shown in Table 3-5.3.

Table 3-5.3: Outdoor fan speed steps

Fan speed index	Fan speed (rpm)					
	10.1-14.1	16.2-22.2		30.2-35.2		
	FAN 1	FAN 1	FAN 2	FAN 1	FAN 2	FAN 3
0	0	0	0	0	0	0
1	150	0	150	0	150	0
2	170	0	190	0	190	0
3	190	0	210	0	230	0
4	210	0	230	0	270	0
5	230	0	250	0	330	0
6	250	150	150	150	150	150
7	270	150	170	150	170	150
8	290	150	190	150	150	170
9	310	170	190	190	170	190
10	330	210	190	210	190	210
11	350	230	210	230	210	230
12	370	250	230	250	230	250
13	400	270	250	270	250	270
14	430	290	270	290	270	290
15	60	310	290	310	290	310
16	490	330	310	330	310	330
17	520	350	330	350	330	350
18	550	370	350	370	350	370
19	580	400	370	400	370	400
20	610	430	400	430	400	430
21	640	470	430	470	430	470
22	670	510	470	510	470	510
23	700	550	510	550	510	550
24	720	600	550	600	550	600
25	740	650	600	650	600	650
26	760	700	650	700	650	700
27	780	750	700	750	700	750
28	780	800	750	800	750	800
29	800	830	800	820	820	820
30	800	850	830	840	840	840
31	820	870	850	860	860	860
32	820	890	870	880	880	880

5.8 Spray liquid cooling control

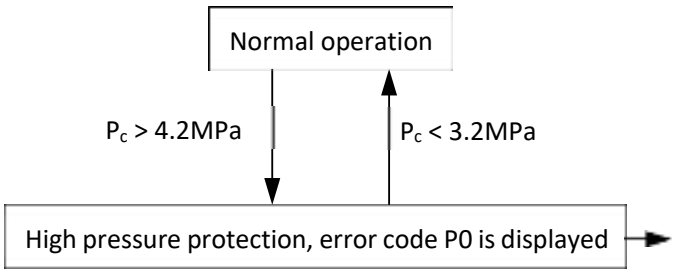
When the discharge temperature of compressor exceeds 105℃ , the solenoid valve opens and the discharge temperature reduces. When the discharge temperature is below 90℃ , the solenoid valve closes.

6 Protection Control

6.1 High Pressure Protection Control

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

Figure 3-6.1: High pressure protection control



When P0 protection occurs 3 times in 60 minutes, a manual system restart is required before the system can resume operation.

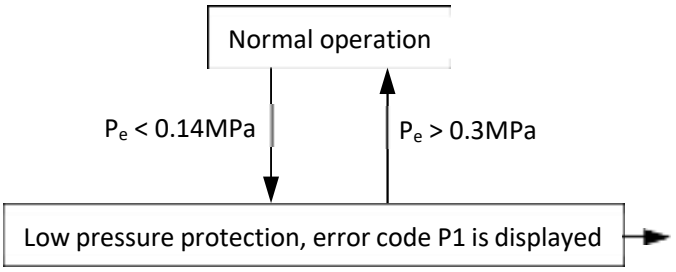
Notes:
1. P_c: Discharge pressure

When the discharge pressure rises above 4.2MPa the system displays P0 protection and all units stop running. When the discharge pressure drops below 3.2MPa, the compressor enters re-start control.

6.2 Low Pressure Protection Control

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

Figure 3-6.2: Low pressure protection control



When P1 protection occurs 3 times in 60 minutes, manual system restart is required before the system can resume operation.

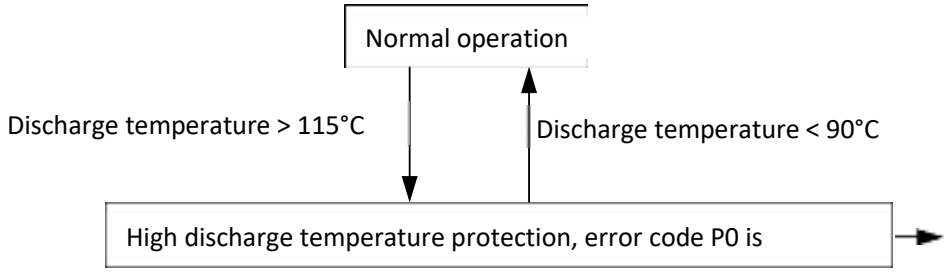
Notes:
1. P_e: Suction pressure

When the suction pressure drops below 0.14MPa the system displays P1 protection and all the units stop running. When the suction pressure rises above 0.3MPa, the compressor enters re-start control.

6.3 Discharge Temperature Protection Control

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

Figure 3-6.3: High discharge temperature protection control



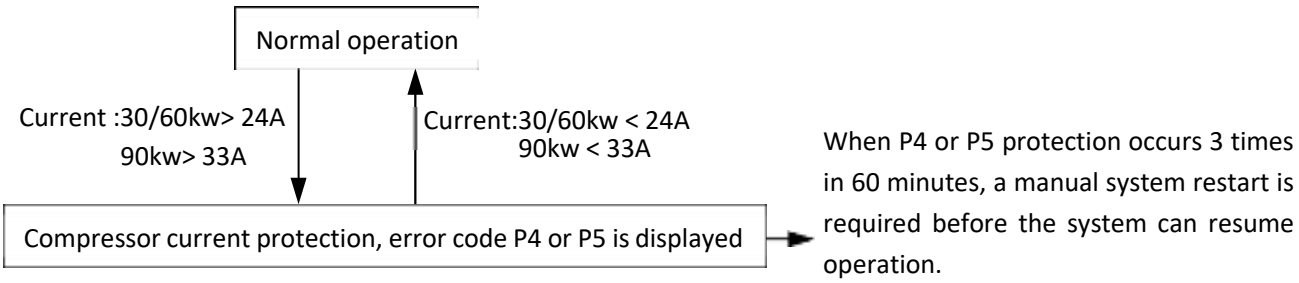
When P0 protection occurs 3 times in 60 minutes, ta manual system restart is required before the system can resume operation.

When the discharge temperature rises above 115°C the system displays P0 protection and all the units stop running. When the discharge temperature drops below 90°C, the compressor enters re-start control.

6.4 Compressor and Inverter Module Protection Control

This control protects the compressors from abnormally high currents and protects the inverter modules from abnormally high temperatures. It is performed for each compressor and inverter module.

Figure 3-6.4: Compressor current protection control

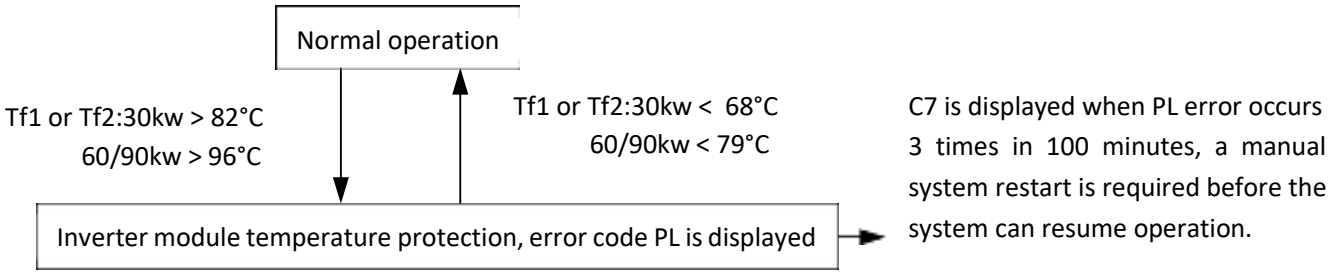


Notes:

1. P4 is the protection for the power supply phase B, P5 is the protection for the power supply phase C.

When the compressor current rises above limited value, the system displays P4 or P5 protection and all the units stop running. When the compressor current drops below limited value, the compressor enters re-start control.

Figure 3-6.5: Inverter module temperature protection control



Notes:

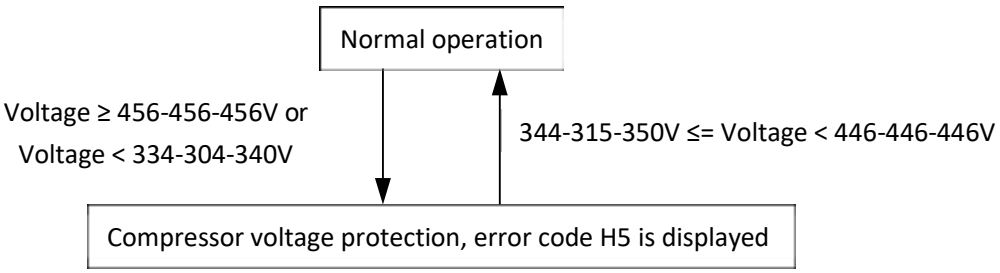
1. Tf1:Heat sink temperature 1; Tf2:Heat sink temperature 2

When the Tf1 or Tf2 temperature rises above upper limited value, the system displays PL protection and all the units stop running. When the Tf1 and Tf2 temperature drops below lower limited value, the compressor enters re-start control.

6.5 Voltage Protection Control

This control protects the units from abnormally high or abnormally low voltages.

Figure 3-6.6: Compressor voltage protection control



When the phase voltage of AC power supply is at or above 456V for more than 30 seconds, the system displays H5 protection and all the units stop running. When the phase voltage drops below 446V for more than 30 seconds, the units restart once the compressor re-start delay has elapsed. When the phase voltage is below 334-304-340V for more than 30 seconds, the system displays H5 protection and all the units stop running. When the AC voltage rises to at or above 344-315-350V for more than 30 seconds, the refrigerant system restarts once the compressor re-start delay has elapsed.

6.6 DC Fan Motor Protection Control

This control protects the DC fan motors from abnormal power supply. DC fan motor protection occurs when the fan module does not receive any feedback from the fan motor.

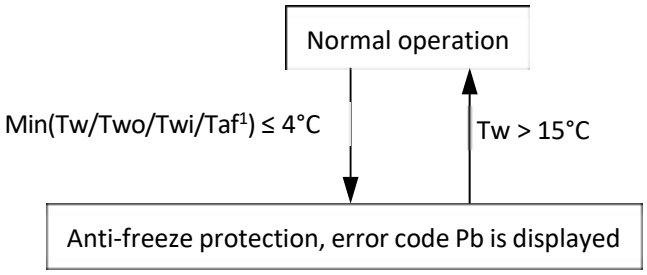
When DC fan motor protection control occurs the system displays the PU error code and the unit stops running. When PU protection occurs 2 times in 120 minutes, the FF error is displayed. When an FF error occurs, a manual system restart is required before the system can resume operation.

6.7 Water Side Heat Exchanger Anti-freeze Protection Control

This control protects the water side heat exchanger from ice formation. The water side heat exchanger electric heater is controlled according to water side heat exchanger anti-freezing temperature (Taf), water inlet temperature (Twi), water outlet temperature (Two) and total water outlet temperature (Tw).

When water side heat exchanger anti-freeze protection occurs the system displays error code Pb and all the units stop running.

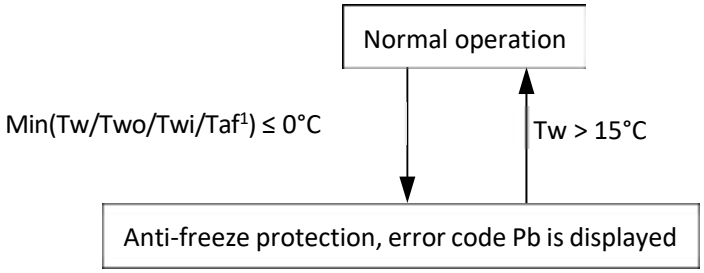
Figure 3-6.7: Anti-freeze protection control in normal cooling mode



Note:
1. Taf include Taf1 and Taf2.

In standby or normal cooling mode, either water side heat exchanger anti-freezing temperature (Taf), water inlet temperature (Twi), water outlet temperature (Two) or total water outlet temperature (Tw) is below 4°C, the unit will run heating mode, until the total water outlet temperature is above 15°C, and restart the normal operation.

Figure 3-6.8: Anti-freeze protection control in low water outlet cooling mode



Note:
1. Taf include Taf1 and Taf2.

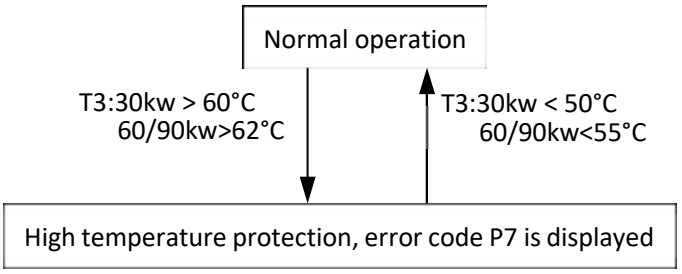
In low water outlet cooling mode, either water side heat exchanger anti-freezing temperature (Taf), water inlet temperature (Twi), water outlet temperature (Two) or total water outlet temperature (Tw) is below 0°C, the unit will run heating mode, until the total water outlet temperature is above 15°C, and restart the normal operation.

Note: If antifreeze is added, the lower limit of starting antifreeze protection can be lowered.

6.8 Air Side Heat Exchanger High Temperature Protection Control

This control protects the air side heat exchanger from high temperature.

Figure 3-6.9: Air side heat exchanger high temperature protection control [1]

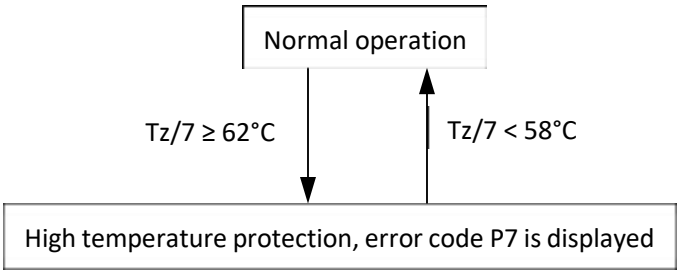


Note:

1. T3: Air side heat exchanger refrigerant outlet temperature

When the air side heat exchanger refrigerant outlet temperature (T3) rises above 60°C, the system displays P7 protection and all the units stop running. When the air side heat exchanger refrigerant outlet temperature (T3) drops below 50°C, the compressor enters re-start control.

Figure 3-6.10: Air side heat exchanger temperature protection control [2]



Note:

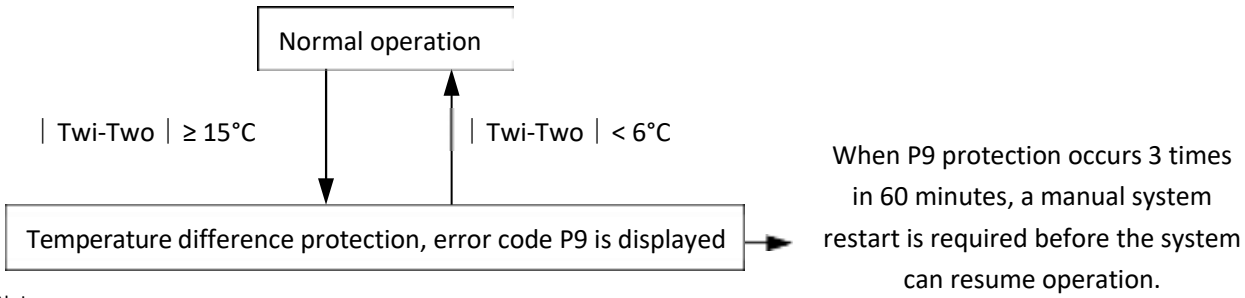
1. Tz/7: Air side heat exchanger refrigerant total outlet temperature

When the air side heat exchanger refrigerant total outlet temperature (Tz/7) temperature rises at or above 62°C, the system displays P7 protection and the unit stops running. When the air side heat exchanger refrigerant total outlet temperature (Tz/7) temperature drops below 58°C, the compressor enters re-start control.

6.9 Water Side Heat Exchanger Temperature Difference Protection Control

This control protects the water side heat exchanger from ice formation.

Figure 3-6.11: Water side heat exchanger temperature difference protection control



Notes:

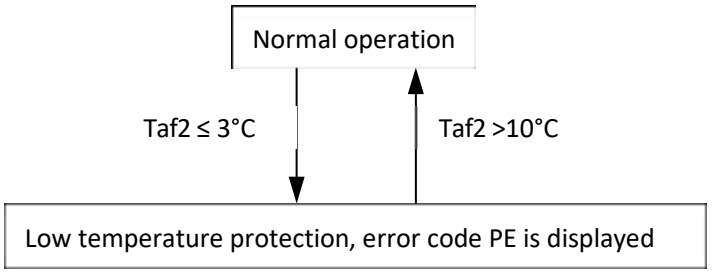
1. Twi: Water side heat exchanger inlet temperature
2. Two: Water side heat exchanger outlet temperature
3. The value of |Twi-Two| can be changed according to actual usage by HMI.

When the temperature difference rises at or above 15°C, the system displays P9 protection and all the units stop running. When the Temperature difference drops below 6°C, the compressor enters re-start control.

6.10 Water Side Heat Exchanger Low Temperature Protection Control

This control protects the water side heat exchanger from ice formation.

Figure 3-6.12: Water side heat exchanger low temperature protection control in normal cooling mode

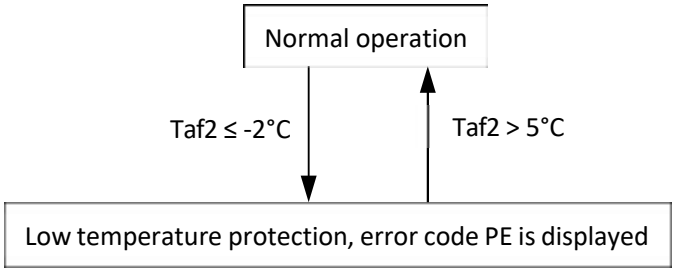


Notes:

Taf2: Water side heat exchanger anti-freezing temperature

When water side heat exchanger anti-freezing temperature2 (Taf2) is at or below 3°C for more than 3 seconds, the system displays PE protection and the corresponding unit stop running. When water side heat exchanger anti-freezing temperature2 (Taf2) rise to 10°C or higher and downtime of more than 3 minutes, the compressor enters re-start control. Use the user interface to clear the error.

Figure 3-6.13: Water side heat exchanger low temperature protection control in low outlet water mode

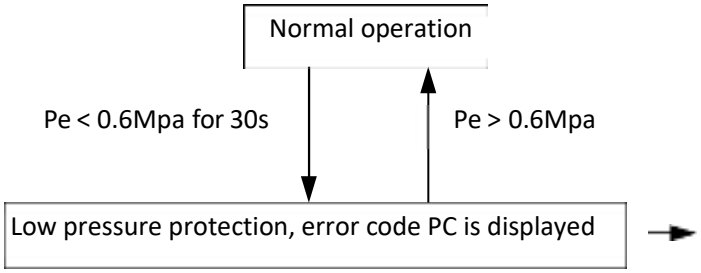


When water side heat exchanger anti-freezing temperature2 (Taf2) is at or below −2°C for more than 3 seconds, the system displays PE protection and orders the corresponding units to stop running. When water side heat exchanger anti-freezing temperature2 (Taf2) rise to 5°C or higher and downtime of more than 7 minutes, the compressor enters re-start control. Use the user interface to clear the error.

6.11 Water Side Heat Exchanger Low Pressure Protection Control

This control protects the water side heat exchanger from ice formation.

Figure 3-6.14: Water side heat exchanger low pressure protection control in normal cooling mode



When system displays PC protection and a manual system restart is required before the system can resume operation.

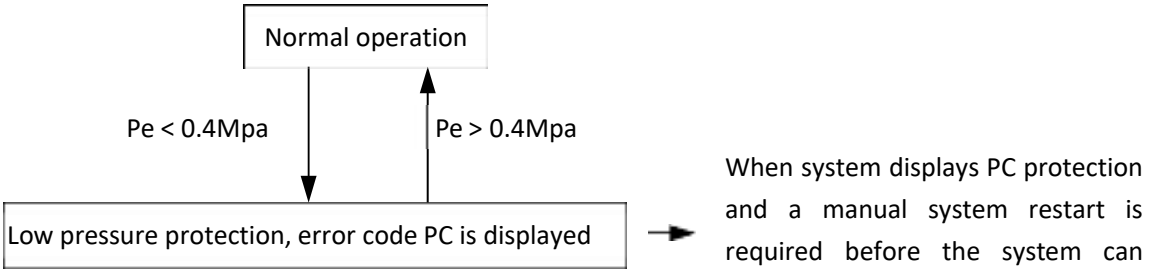
Notes:

1. Pe: Suction pressure

In normal cooling mode, when the suction pressure drops below 0.6Mpa for 30s, the system displays PC protection and all

the units stop running. When the suction pressure is above 0.6Mpa, the compressor enters re-start control. It will not display the PC error when the suction pressure drops below 0.6Mpa for 30s for the first time until the suction pressure drops below 0.6Mpa for 30s for the second time in 30 minutes.

Figure 3-6.15: Water side heat exchanger low pressure protection control in low outlet water cooling mode



Note:

1. Pe: Suction pressure

In low outlet water cooling mode, when the suction pressure drops below 0.4Mpa, the system displays PC protection and all the units stop running. When the suction pressure is above 0.4Mpa, the compressor enters re-start control. It will not display the PC error when the suction pressure drops below 0.4Mpa for the first time until the suction pressure drops below 0.4Mpa for the second time in 30 minutes.

7 Special Control

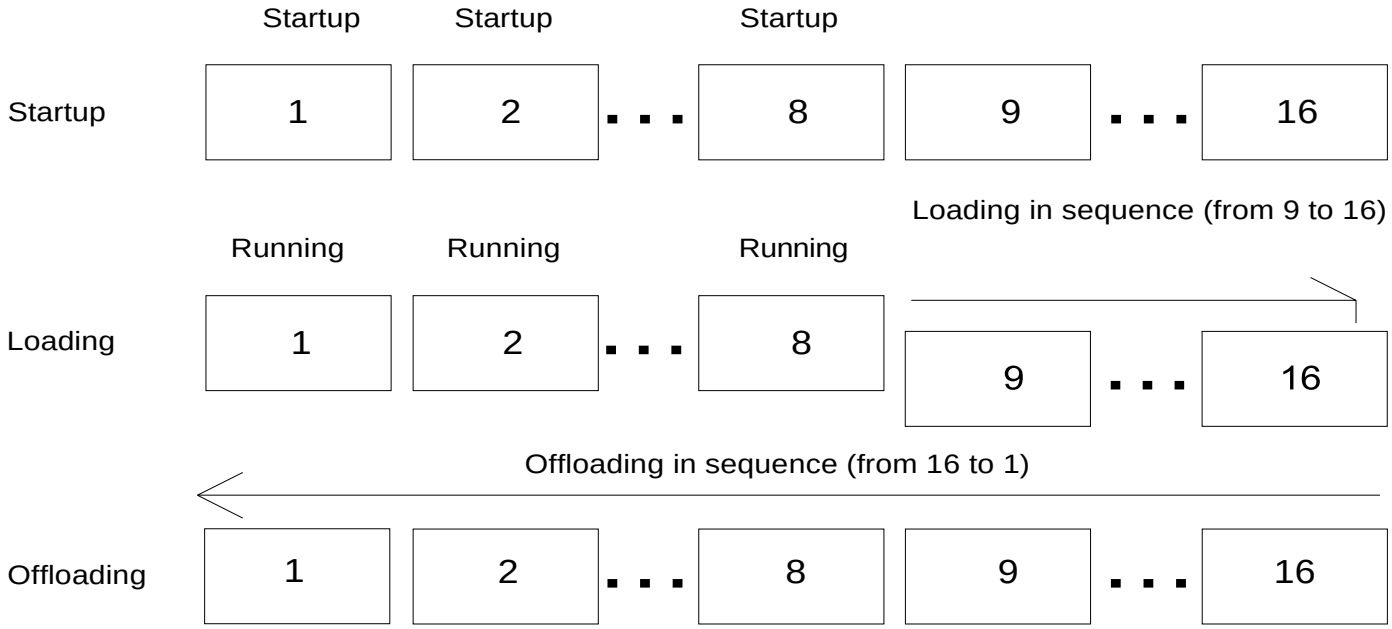
7.1 Loading and offloading for multiple units system

In systems with multiple units,

- When the units are powered on for the first time, if there is a load requirement, 50% of the units turn on, starting with the master unit. As the leaving water temperature approaches its set temperature, units shut down in succession, starting with the unit with the highest address. Once the set temperature has been reached, the master unit shuts down.
- The next time a load requirement exists, Start loading from the last one, and load in the order of addresses from large to small. When the unit satisfies the unloading conditions, the last-loaded unit will be unloaded first.

Figure 3-7.1 shows an example in a system with 16 units.

Figure 3-7.1: A system with 16 units[1]



Notes:
1. The address settings on the unit main PCBs for master unit and slave unit do not change.

7.2 Defrosting Operation

In order to recover heating capacity, the defrosting operation is conducted when the unit air side heat exchanger is performing as an evaporator. The defrosting operation is controlled according to outdoor ambient temperature T4), air side heat exchanger refrigerant outlet temperature (T3) and the compressor running time.
The condition to enter in defrosting mode are related to T3 and Twi: when T3<-2°C the unit enter in defrosting mode after a time related to Twi value (from 75 to 110 min).

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

- Defrosting operation duration reaches 10 minutes.
- The air side heat exchanger refrigerant outlet temperature reaches the target temperature (T3=15°C).
- The water outlet temperature is at or below 5°C.

Table 3-7.1: Component control during defrosting operation

Component	Wiring diagram label	10.1-14.1	16.2-22.2	30.2-35.2	Control functions and states
Inverter compressor A	COMP A	●	●	●	Controlled according to leaving water temperature
Inverter compressor B	COMP B	/	●	●	
DC fan motor A	FAN A	●	●	●	Off
DC fan motor B	FAN B	/	●	●	
DC fan motor C	FAN C	/	/	●	
Electronic expansion valve	EXV-A	●	●	●	Full open
Electronic expansion valve	EXV-B	/	●	●	Full open
Electronic expansion valve	EXV-C	/	/	●	96p
Four-way valve	STF1	●	●	●	Off
Solenoid valve (oil balance)	SV4	●	●	●	Open
Water pump	PUPM1	●	●	●	On
Water side heat exchanger heater	EVA-HEAT	●	●	●	Off
Water flow switch	/	●	●	●	Off
Water flow switch heater	W-HEAT1	●	●	●	Controlled according to ambient temperature, water inlet temperature and water outlet temperature
Electric auxiliary heater	HEAT	●	●	●	Controlled according to ambient temperature and total water outlet temperature after the compressor is on
Crank case heater	CCH	●	●	●	Controlled according to ambient temperature and discharge temperature
Solenoid valve (Spray liquid cooling)	SV2	●	●	/	Controlled according to discharge temperature
Solenoid valve	SV5	/	/	●	ON
Solenoid valve	SV8A/SV8B	/	/	●	OFF

7.3 Additional control

When dial switch S5_3 on main PCB is switched ON, additional control is valid. connect a controller or not is permissible.

When dial switch S5_3 is switched OFF, additional control is invalid. This function is only valid on the master unit.

When dial switch S5_3 is switched ON and disconnect a wired controller:

- The system ON/OFF state is controlled by the ON/OFF port (XT2 15-24 on the customer connections terminals). Connecting this port, system on, disconnecting this port, system off.
- The mode of the system is controlled by the Cool/Heat port (XT2 15-24 on the customer connections terminals).

Connecting this port, system running heating mode, disconnecting this port, system running cooling mode.

- The default water outlet temperature setting in heating mode is 45°C and in cooling mode is 7°C. The default hysteresis temperature setting is 2°C.
- The network icon on the wired controlled flashes, frequency and "rctr" alternate display on main PCB.

When dial switch S5_3 is switched ON and connect a wired controller, the wired controller is out of control.

The double set point is controlled by the TEMP-SW port. Connecting this port (XT2 20-25), the second set point is enabled, disconnecting the primary set point is enabled.

8 Unit set-up at commissioning

- **pump setting**
- **set point climate correction setting (temperature compensation)**
- **Backup heater setting (Heat1 and Heat2)**
- **Silent mode setting (also found in user manual)**
- **Energy saving mode setting (demand limit)**
- **Domestic hot water setting**

8.1 Setting of pump

There are four system configurations.

1. ***Configuration of stand-alone unit with inverter pump***

   a. If the unit has an inverter pump on board, first check that **Dip-Switch S12-2 is set ON** (up). In this case the unit will automatically control the pump, varying the flow-rate, maintaining a ΔT=5°C (value cannot be changed). Under Menu ➢Project Menu (under password) ➢Inv. pump ratio, the default values are Min. ratio = 80% Max. ratio = 100%. Once the unit has been installed, the Technical Support Service is responsible for assessing the system's pressure drops and consequently assessing the Min.ratio at which the inverter pump should operate. This value is crucial as it should indicate the minimum pump speed to ensure the minimum water flow-rate specified in the bulletin, otherwise flow alarms will be triggered when the unit limits compressor frequency.

   Periodic function setting

   With **Dip-Switch S12-2 set ON** Menu ➢Service Menu (under password) ➢Pump control ➢Pump on/off time. After reaching the set point and the post pumping time, the unit switches the pump off for the time in **Pump OFF Time** and switches it back on for the time in **Pump ON Time**. If there is no request to switch the compressors on during this period, the unit switches the pump off again. With **Pump OFF Time** = 0 the pump is always switched on.

   b. If a fixed flow-rate is required in the system, first check that Dip-Switch S12-2 is set ON (up).

   Under Menu ➢Project Menu (under password) ➢Inv. pump ratio

   Set the same value for Min. ratio and Max ratio. Min. ratio = Max. ratio The value must be defined so as to obtain the design delta T under nominal operating conditions.

2. **Configuration of multiple units in cascade, where each unit has an inverter pump on board.**
   - Set Dip-Switch S12-2 ON (up) for each unit: refer to point 1
3. **Configuration of multiple units in cascade, with a single system pump.**
   - Set Dip-Switch S12-2 OFF (down) for each unit.

     Menu ➢Service Menu (under service password) ➢**Inv pump setting** ➢**Switch on the pump** (set **Yes**) ➢**Ratio Pump** (set the pump speed according to the system's pressure drops so as to ensure the required flow-rate (higher than the minimum flow-rate required))
4. **Configuration of stand-alone units or units in cascade with ON-OFF pump on board**
   - Check that Dip-Switch S12-2 is set ON (up). In this case, there will be no modulating flow-rate to maintain ΔT=5°C.

General DIP switch setting overview:

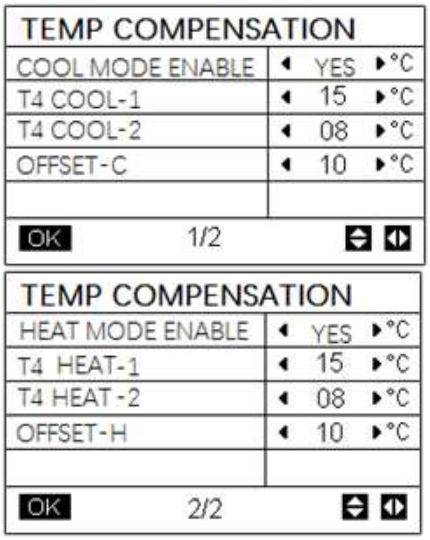
	Single unit	Cascade system
Pump on board	S12_2 ON	S12_2 ON
External pump	S12_2 ON	S12_2 OFF

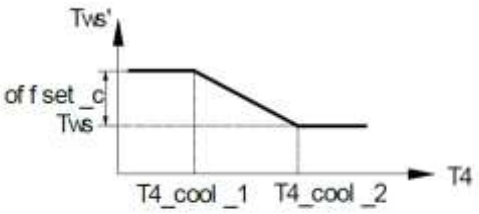
8.2 Temperature compensation

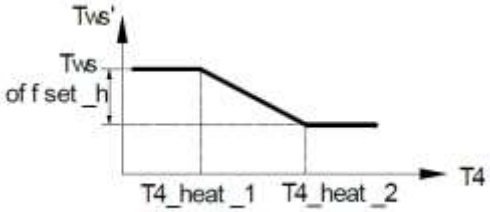
(under service password)

TEMPERATURE compensation

Press "▲" or "▼" to select “TEMPERATURE COMPENSATION” under the “SERVICE MENU” page. Press “↵” and enter submenu:







Press "▲" or "▼" to select item and press “◄ or “► to set value. Then press “ ” to confirm.

Title	Effect	Predetermined area	Defaults	Adjustment range
Cool mode enable	**Cooling is effective**	**Yes/No**	**NO**	**/**
T4_Cool_1	**T4 temperature 1**	15~30℃	**25℃**	**1**
T4_Cool_2	**T4 temperature 2**	35~45℃	**40℃**	**1**
Offset_C	**return temperature**	0~15℃	**10℃**	**1**
Heat mode enable	**Heating is effective**	**Yes/No**	**NO**	**/**
T4_Heat_1	**T4 temperature 1**	-15~10℃	**5℃**	**1**

T4_Heat_2	**T4 temperature 2**	15~30℃	**15℃**	**1**
Offset_H	**return temperature**	0~30℃	**10℃**	**1**

Periodic pump setting

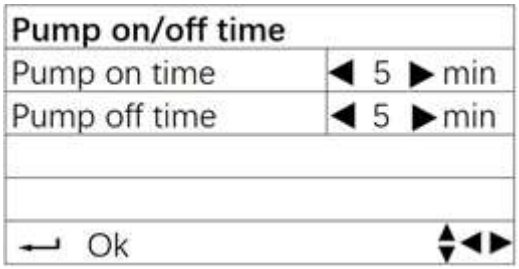


Figure 2.37. Water pump switch time setting interface

"Pump on time" sets the running time when the pump is forced on, the setting range is 5~60, the default is 5, and the adjustment range is 5; "Pump off time" sets the interval off time when the pump is forced on, the setting range is 0~60, the default is 0, and the adjustment range is 5.

8.3 Backup heater setting

HEAT1 (system)
The description below only refers to heat pump operation
Antifreeze electric Heating (function only valid for heaters with antifreeze mode)
If **Dip-Switch S6-1** is enabled **OFF** (down), the system enters the logic in which the antifreeze function is managed by the electric heater. This function is particularly useful when the unit has been switched OFF for a long time with low outdoor air temperatures. The heaters are activated at water temperatures below 6°C.

Integration with the heat pump
To activate the functions of the heat pump's additional heater, ensure that **Dip-Switch S6-1** is set **ON** (up) and Heat1 is enabled on the HMI under **Menu ➢Service Menu ➢Heat Control ➢Heat1 ➢Heat1 Enable** (set **Yes**). The other parameters must be configured according to requirements once their function, as described below, is understood.
Within 2 minutes of pump switch-on, the backup heater control is kept OFF, after which the following cases may occur:

a. Operation of the backup heater as a replacement to the heat pump
When the heat pump cannot operate due to a fault or is in protection (no compressor limitation), the backup heater switches on as a replacement to the heat pump when the water temperature is less than 3K below the set point and switches off once the water temperature has exceeded the 2K set point (value can be adjusted on the HMI).

b. Forcing Heat 1 switch-on
To force backup heater operation **Menu ➢Service Menu ➢Heat Control ➢Heat1 ➢Heat1 Enable ➢Force heat1 open** (Set **Yes**). This will start backup heater operation in manual mode. Once the set point is reached, the backup heater will switch off. The manual control only applies once, so even if the water temperature drops below the set point, it will not start automatically and will require a new manual control to start.

c. Operation of the backup heater at low air temperature
If the unit is operating in heat pump with an air temperature lower than 5°C (value can be adjusted on the HMI) but does not reach the set point within 90 minutes (value can be adjusted on the HMI), then the backup heater is integrated with the heat pump.

d. Activation of the backup heater in integration with the heat pump
If the set point is higher than the maximum set point of the unit's envelope, then the backup heater is activated to integrate the heat pump.

Title	Effect	Predetermined Area	Default
Heat1 Enable	System backup heater	No/Yes	No
T_Heat1_Delay	Activation time	60……240 min	90 min
DT_Heat1_OFF	∆ T off in relation to set point	2……10°C	5 °C
T4_Heat1_ON	Air temperature below which Heat1 is activated	-5……13°C	5°C

HEAT2 (for the DHW backup heater)

Check that Heat 2 is activated under **Menu ➢Service Menu ➢Heat Control ➢Heat2 ➢Heat2 Enable (**set **Yes).** If the unit is in alarm E6 (water tank probe error T5) or the domestic water temperature is higher than 71°C, the backup heater will not switch on.

a. **Operation of the backup heater as a replacement to the heat pump**
When the heat pump cannot operate due to a fault, is in protection (no compressor limitation) or the unit is out of envelope, then the backup heater switches on as a replacement to the heat pump when the water temperature is less than 5K (value can be adjusted on the HMI) below the set point and switches off once the water temperature has exceeded the 5K set point (value can be adjusted on the HMI).

b. **Forcing Heat 2 switch-on**
To force backup heater operation **Menu ➢ Service Menu ➢ Heat Control ➢ Heat2 ➢ Heat2 Enable ➢ Force heat2 open** (Set **Yes**). This will start backup heater operation in manual mode if T5<T5s-1. Once the set point is reached, the backup heater will switch off. The manual control only applies once, so even if the water temperature drops below the set point, it will not start automatically and will require a new manual control to start.

c. **Operation of the backup heater at low air temperature**
If the unit is operating in heat pump with an air temperature lower than 5°C (value can be adjusted on the HMI) but does not reach the set point within 90 minutes (value can be adjusted on the HMI), then the backup heater is integrated with the heat pump.

d. **Activation of the backup heater in integration with the heat pump**
If the DHW set point is higher than the maximum set point of the unit's envelope, then the backup heater is activated to integrate the heat pump.

e. **Heater operation when the tank temperature is too low**
If the water temperature inside the tank is T5<15°C, the heater activates instead of the compressor until T5>15°C

f. **Heater operation when the compressor is frequently switched ON-OFF in DHW mode.**
When the compressor runs more than 2 ON-OFF cycles in DHW mode, the backup heater activates to avoid too many ON-OFF cycles.

Title	Effect	Predetermined Area	Default
Heat2 Enable	System backup heater	No/Yes	No
T_Heat2_Delay	Activation time	60……240 min	90 min
DT_Heat2_OFF	∆ T off in relation to set point	2……10°C	5 °C
T4_Heat2_ON	Air temperature below which Heat2 is activated	-5……13°C	5°C

	Parameter role	Predetermined area	Defaults	Adjustment range
Heat1 enable	Electric heating 1 enable	Yes/No	No	/
T-Heat1-Delay	Heat1 opening delay	60~240 min	90min	5min
dTw_Heat1_Off	Stop hysteresis temperature	2~10°C	5°C	1℃
T4_Heat1_On	T4 start temperature	-5~20°C	5°C	1℃[SF1]
All heat2 disable	All electric heating 2 are not allowed to be turned on	Yes/No	No	/
Select address	Unit address selection	0~15	0	1
Heat2-Enable	Current address Electric heating 2 is on	Yes/No	No	/
T_Heat2_Delay	Delay opening time	60~240min	90min	5min
dT5_Heat2_Off	Stop hysteresis temperature	2~10℃	5℃	1
T4_Heat2_On	T4 allow opening temperature	-5~20℃	5℃	1
Select address	Address selection	0~15	0	1
Forced heat2 open	Force Heat2 on	Yes/No	No	/

[SF1]New items. Valid only when SW6-1 is ON

8.4 Silent mode (screenshots)

This menu is used to configure parameters related to the mute function. After entering, the interface is shown below

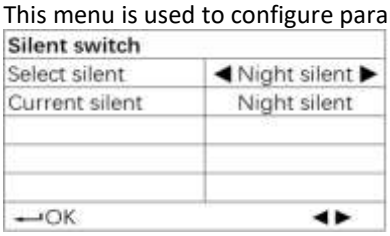


Figure 2.15. Quiet Mode Selection

Switch to set the silent mode (Standard, Silent, Super silent, Night silent1). After the mute mode is turned on, the mute icon ( ) is illuminated.

8.5 Energy saving/demand limit (da tastiera) SERVICE MANUAL

This menu is used to configure parameters related to system energy saving. After entering, as shown in Figure 2.42.

Energy saving switch	
Saving switch	◀80 ▶%
History setting	
06/06/2020 11:30a.m.	80 %
06/05/2020 11:30a.m.	80 %
06/04/2020 11:30a.m.	80 %
↵ Ok	◀▶

Figure 2.42. Energy saving configuration interface

The result of energy saving setting is converted into energy saving mode and sent to the system, and the corresponding relationship is shown in Table 2.8.

Saving switch	**100**	**90**	**80**	**70**	**60**	**50**	**40**	**40**
energy saving mode	1	2	3	4	5	6	7	8 (reserved)

Table 2.8. Energy saving setting parameter table

If the Energy Saving (Demand limit) control is enabled on the REMAU board it will overwrite the setting on the HMI

8.6 Energy monitoring

From the user menu **Menu** ➢User Menu ➢Query ➢State query

This submenu is used to query the brief running status information of each unit. The interface is shown in figure.
At page 2 the current and the total capacity are shown as well as the current and the total power consumption and the current efficiency.

State query	
Select address	◀ 11▶ #
Operation state	standby
Running mode	cool
Current silent mode	super silent
↵ Back 1/3	◀▶

State query	
Current capacity	100 KW
Current power	50 KW
Current efficiency	2
Total capacity	100 MW
↵ Back 2/3	◀▶

State query	
Total power	50 MW
↵ Back 3/3	◀▶

8.7 DHW priority

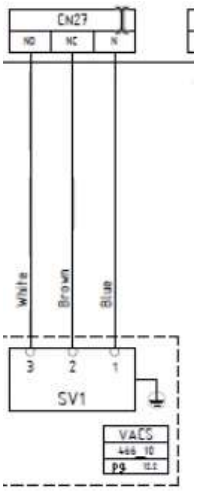
This menu is used to configure parameters related to hot water production. If the system has no hot water production function, you cannot enter this submenu.. After entering, the interface is shown in Figure 2.16.

Figure 2.16. Hot water configuration interface

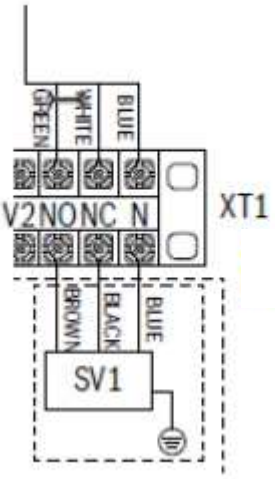
Switch configuration items and modify setting values by selecting keys (default value Select address=00, DHW switch=No, DHW first=No). When the DHW switch of address X=Yes, the lower unit address displays white characters on a black background, otherwise it displays black characters on a white background.

8.8 3 Way valve (manual and wiring diagram)

Wiring diagram:



Old manual (wrong)



.

Part 4
Diagnosis and Troubleshooting

1 Unit Electric Control Box Layout

Size 10.1-14.1

Figure 4-1.1: Electric control box front view- top layer

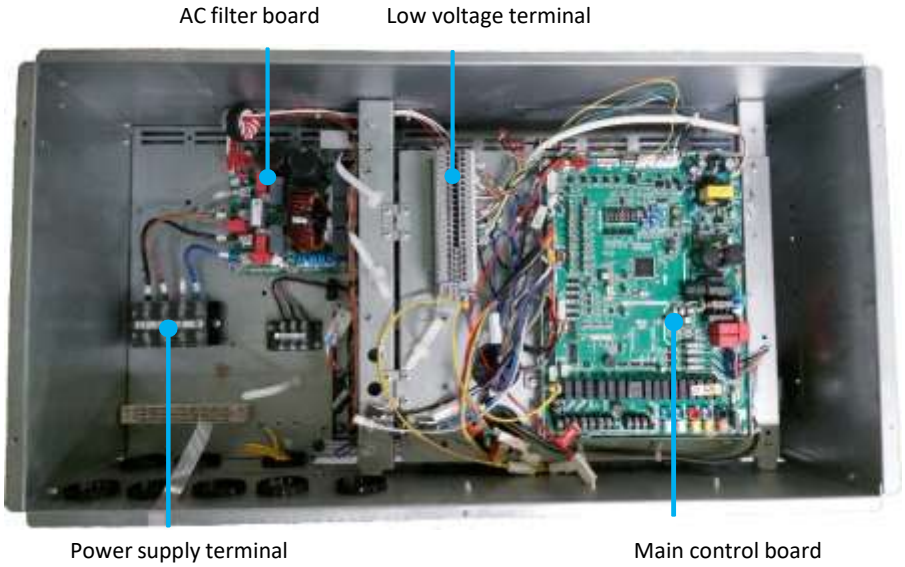
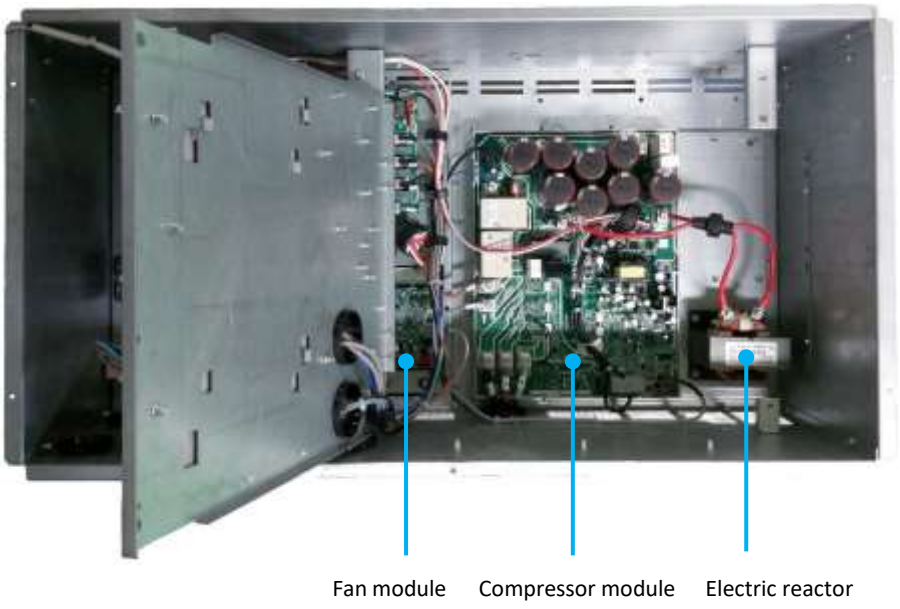


Figure 4-1.2: Electric control box front view-bottom layer



Size 16.2-22.2

Figure 4-1.3: Electric control box front view-top layer

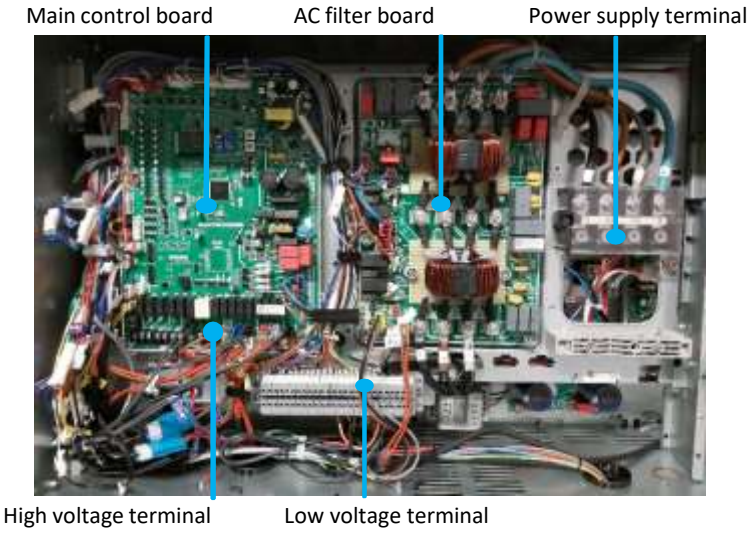
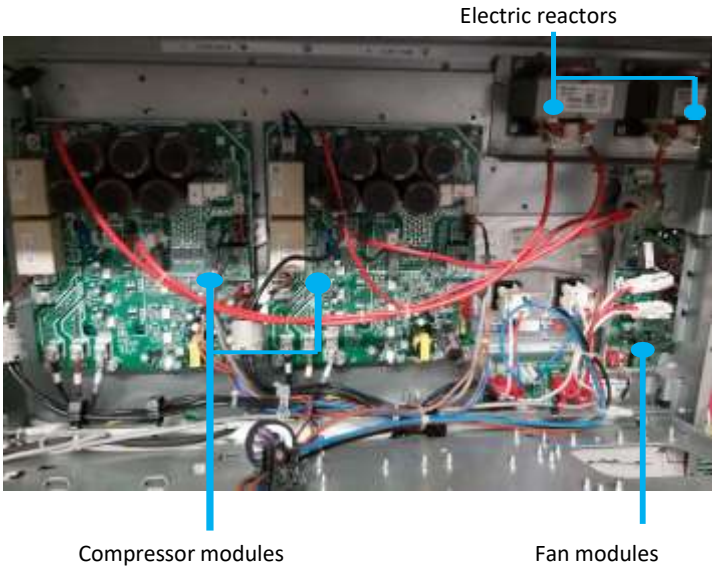


Figure 4-1.4: Electric control box side view-bottom layer



Size 30.2-35.2

Figure 4-1.5: Electric control box front view-top layer

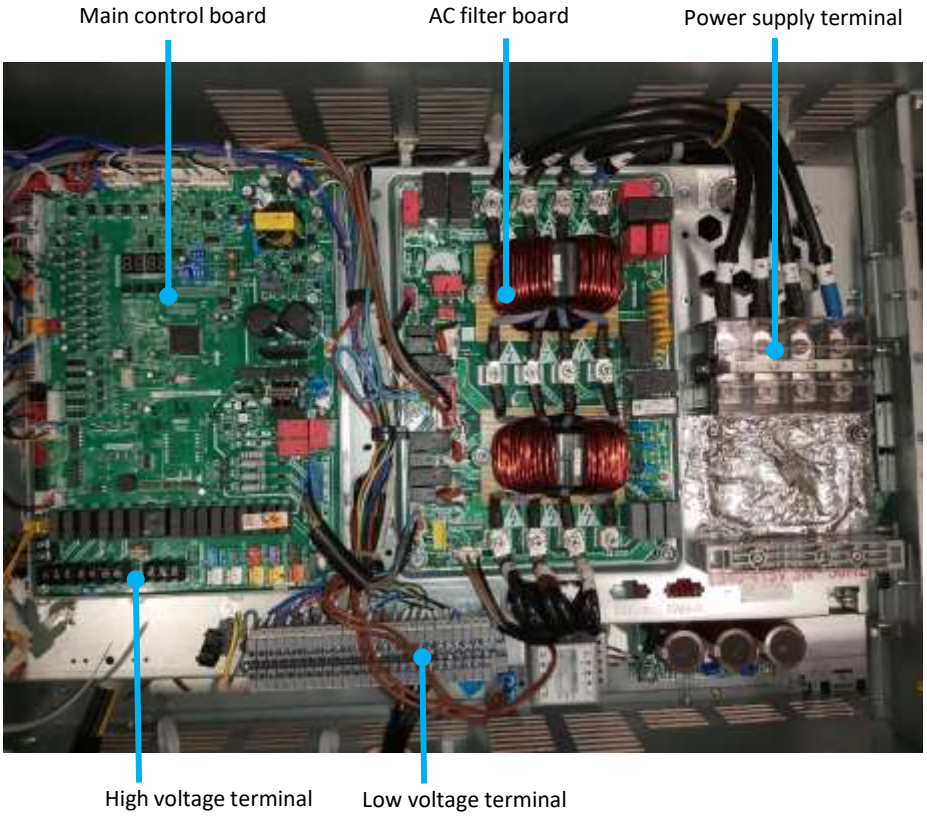
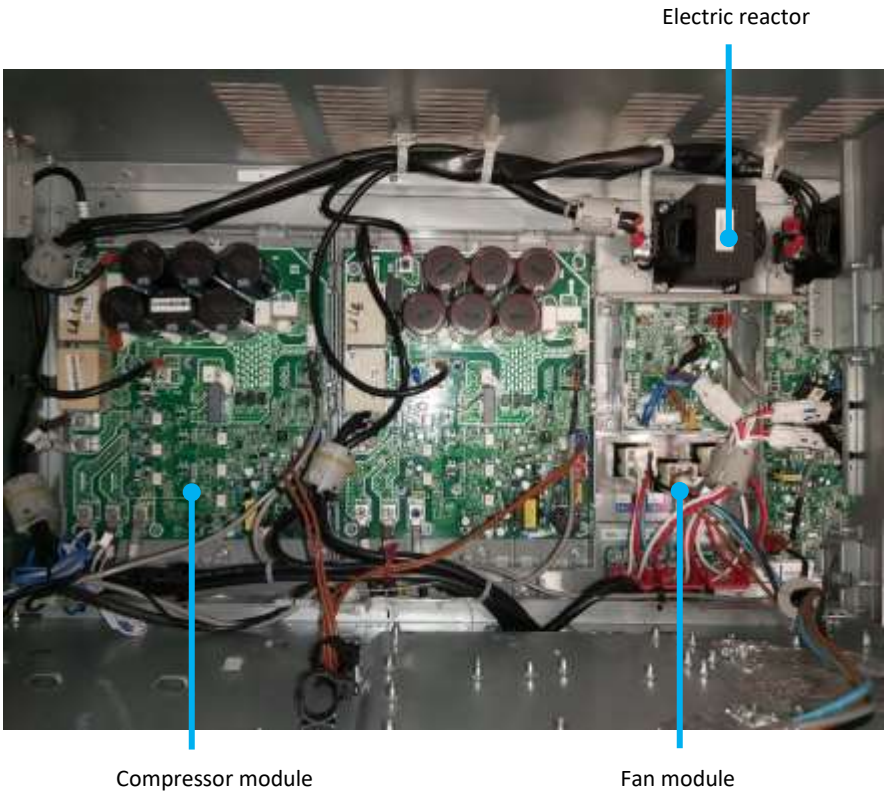


Figure 4-1.6: Electric control box side view-bottom layer



2 Unit PCBs

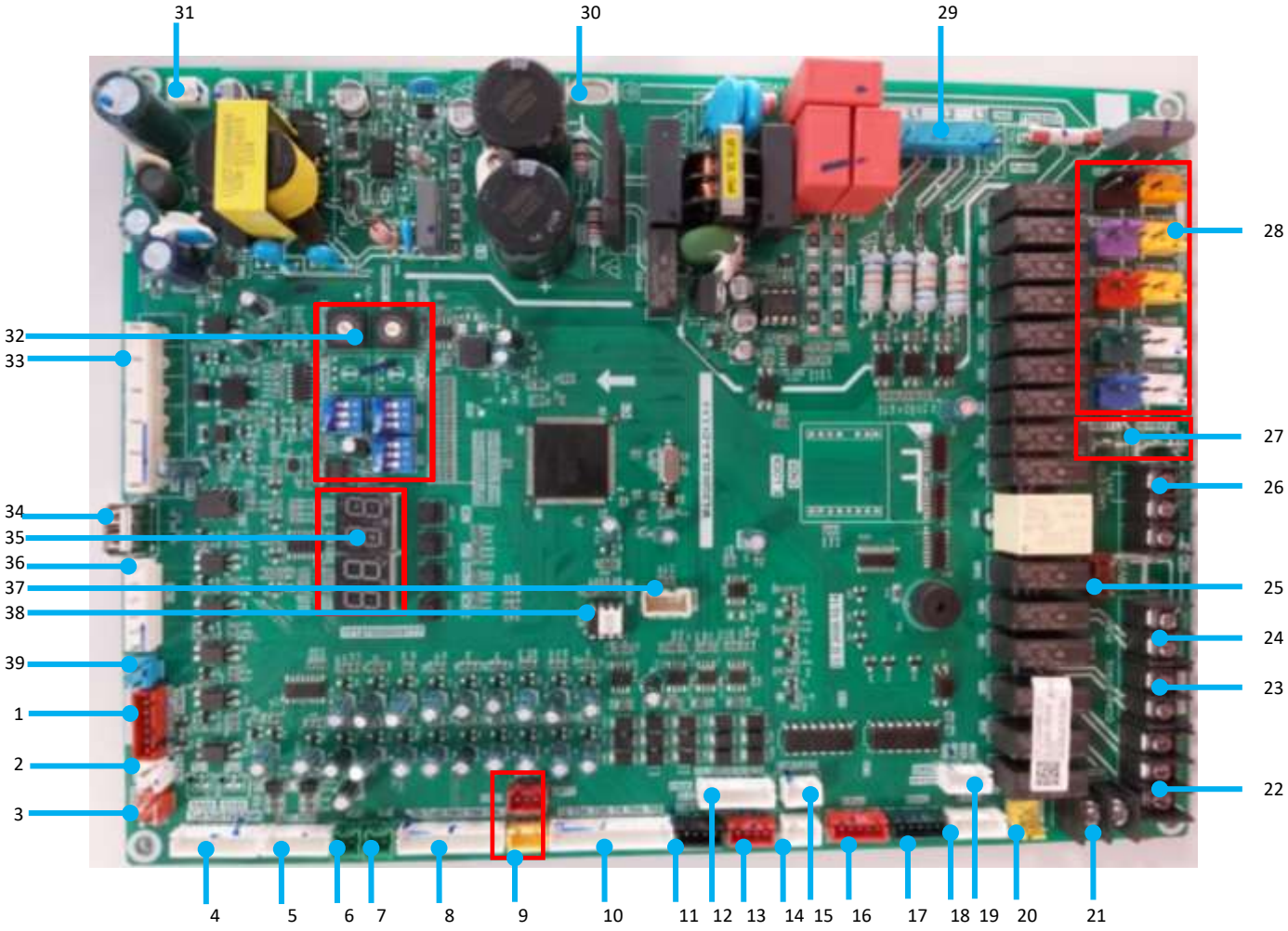
2.1 Types

The units have four PCBs – main control board, three phase AC filter board, DC fan inverter module board and compressor inverter module board.

The locations of each PCB in the unit electric control boxes are shown in Figures 4-1.1 to 4-1.6 in Part 4, "Unit Electric Control Box Layout". 1

2.2 Main PCB

Figure 4-2.1: Unit main PCB for 10.1-35.2



Note:

1. Label descriptions are given in Table 4-2.1

Table 4-2.1:Unit main PCB

Label in Figure 4-2.1	Code	Content	Voltage
1	CN58	Signal output port for filter board relay	0 or 12V DC
2	CN91	Reserve port	0 or 12V DC
3	CN19	ON/OFF signal input port for system low pressure	0 or 5V DC
4	CN69	Temperature detection port (Tp1/Tp2/Tz/7/Taf1)	0~5V DC
5	CN15	Current inspection port of the inverter compressor A、 compressor B	0~5V DC
6	CN10	Heatsink temp. detection port of inverter module B	0~5V DC
7	CN3	Heatsink temp. detection port of inverter module A	0~5V DC
8	CN31	Temperature detection port (Th/Taf2/Two/Twi/Tw)	0~5V DC
9	CN16 CN17	Input port for system high pressure detection Input port for system low pressure detection	0~5V DC
10	CN1	Temperature detection port (T4/T3A/T3B/T5/T6A/T6B)	0~5V DC
11	CN65	Communication port between Main board and compressor inverter module	0~5V DC
12	CN28	Connection port of auxiliary board（Reserve）	0~5V DC
13	CN64	Communication port between Main board and fan inverter module	0~5V DC
14	CN61	Communication port between main board and HMI	0~5V DC
15	CN60	Communication port between units	0~5V DC
16	CN70	Actuation port of EXV A	0 or 12V DC
17	CN72	Actuation port of EXV C	0 or 12V DC
18	CN71	Actuation port of EXV B	0 or 12V DC
19	CN52	Signal output port for filter board relay	0 or 12V DC
20	CN20	ON/OFF signal input port for system discharge temperature	0 or 12V DC
21	CN85	Output port for alarm	0 or 230V AC
22	CN26	Output port for auxiliary heaters of pipeline	0 or 230V AC
23	CN33	Output port for compressor state	0 or 230V AC
24	CN25	Output port for pump	0 or 230V AC
25	CN86	Output port for valve SV2	0 or 230V AC
26	CN27 CN87	Output port for valve SV1 Output port for Hot-Water	0 or 230V AC
27	CN4 CN11	Output port for electrical heater of water switch	0 or 230V AC
28	CN5 CN13 CN42 CN43 CN6 CN41 CN40 CN47 CN12 CN80	Output port for valve and electrical heater of crankcase and plate exchanger	0 or 230V AC
29	CN32	Input of three-phase four-wire power supply	L1&N：230V AC L2&N：230V AC L3&N：230V AC
30	CN100	PE port	0V AC
31	CN74	The power supply port of the HMI .(DC9V)	9V DC
32	ENC2 ENC4 S5 S6 S12	Out setting switch	0 or 5V DC

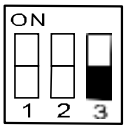
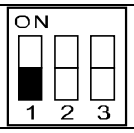
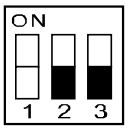
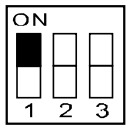
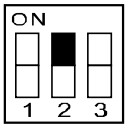
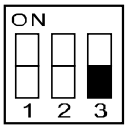
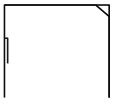
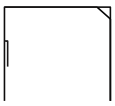
Table continued on next page……

Table 4-2.1:Unit main PCB

33	CN48	CN48-5/6 Pump-V 0-10V output CN48-3/4 V1 V2 performance capacity limitation 0-10V input without polarity CN48-1/2 TEMP SWITCH on/off input	IN & OUT
34	CN18	USB INTERFACE for software updating	5V DC
35	DSP1 DSP2	Digital tube display	0 or 5V DC
36	CN8	Port for water flow switch	0 or 12V DC
37	CN300	Program burn in port(WizPro200RS programming device)	-
38	IC10	EEPROM	5V DC
39	CN21	Terminal for Water Pressure Switch	0 or 12V DC

2.2.1 Main PCB field setting

Table 4-2.2: Main PCB switch settings

Switch		Description	Default factory setting
S5-3		Normal control	OFF
		Remote control[1]	-
S6-1		OFF_HEAT1 connect to Electric heating of pipes	OFF
		ON_HEAT1 connect to Auxiliary electric heating or Gas Boiler	-
S6-2/3		RESERVED it is mandatory to keep the factory setting	OFF OFF
			-
S12-1		RESERVED it is mandatory to keep the factory setting	
S12-2		OFF Single water pump control	-
		ON Multiple water pumps control	ON
S12-3		Normal cooling mode[2]	OFF
		Low-temperature cooling mode[2]	-
ENC2		DIP switch of unit capacity **it is mandatory to keep the factory setting**	0: 23kw 1: 26kw 2: 30kw 3: 40kw 4: 50kw 5: 60kw 6: 70kw 7: 80kw
ENC4		DIP switch of unit network address 0: master unit 1,2,3…F: slave units	0

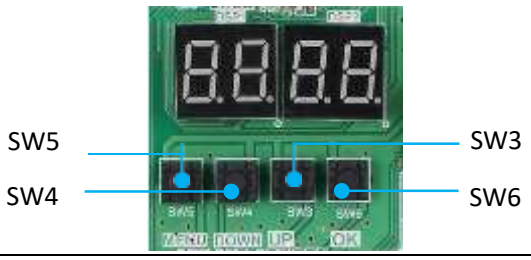
Note:

1. Please refer to "Part 3, 7.3 Additional control" for detail operation method of using remote control.
2. Low water outlet temperature range: 0°C to 20°C; normal water outlet temperature range: 5°C to 20°C.

2.2.2 Function of buttons SW3 to SW6

Table 4-2.3: Function of buttons SW3 to SW6

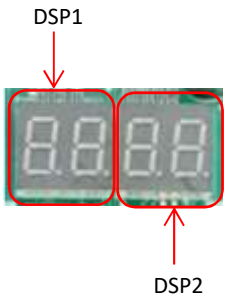
Button	Function
SW3	Up
SW4	Down
SW5	Menu
SW6	Ok



2.2.3 Digital display output

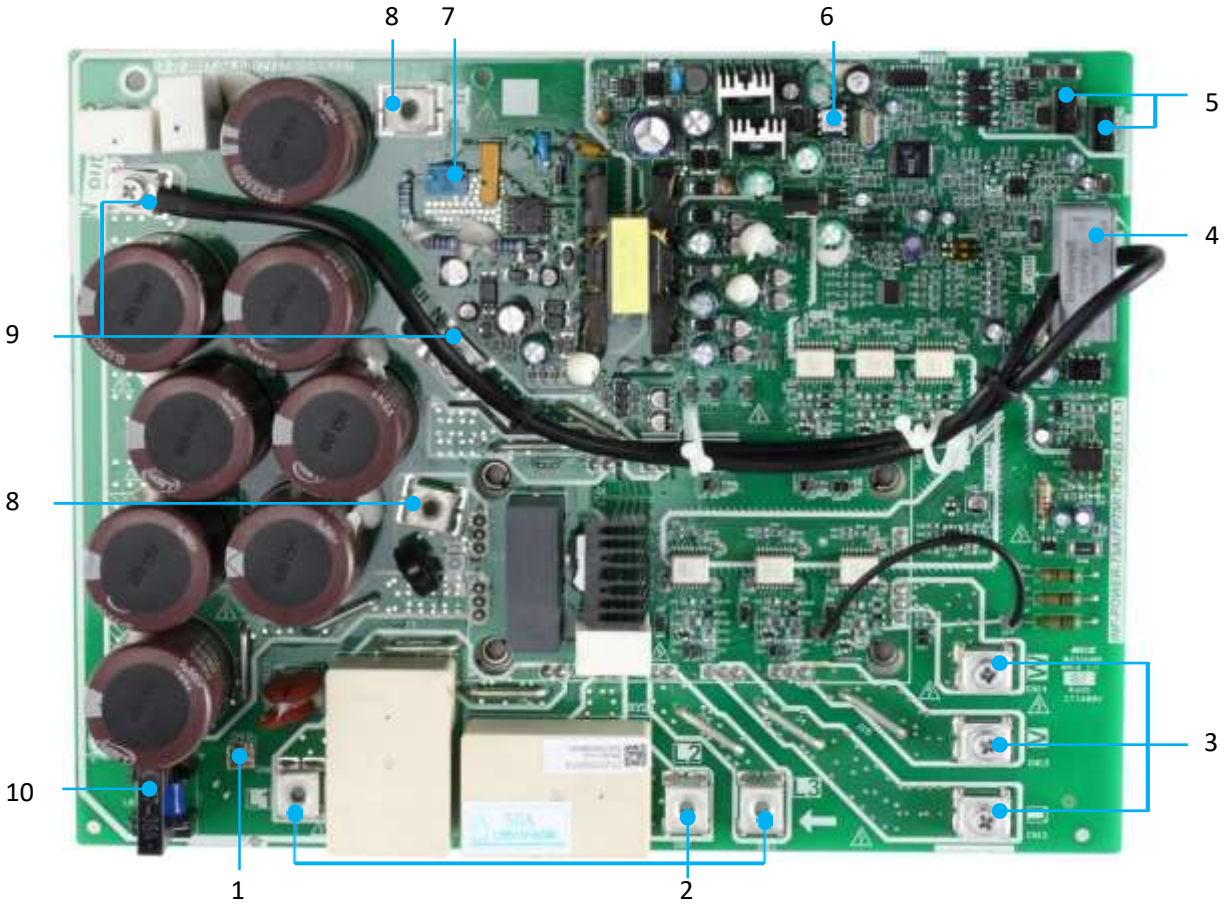
Table 4-2.4: Digital display output in different operating states

Unit state		Parameters displayed on DSP1	Parameters displayed on DSP2
Standby		0	1
Normal operation	For single compressor units	None	Running speed of compressor
	For dual compressor units	Running speed of compressor A in rotations per second	Running speed of compressor B in rotations per second
Error or protection		-- or placeholder	Error or protection code



2.3 Compressor Inverter Module Board

Figure 4-2.2a: Compressor inverter module PCB version Size 10.1-14.1



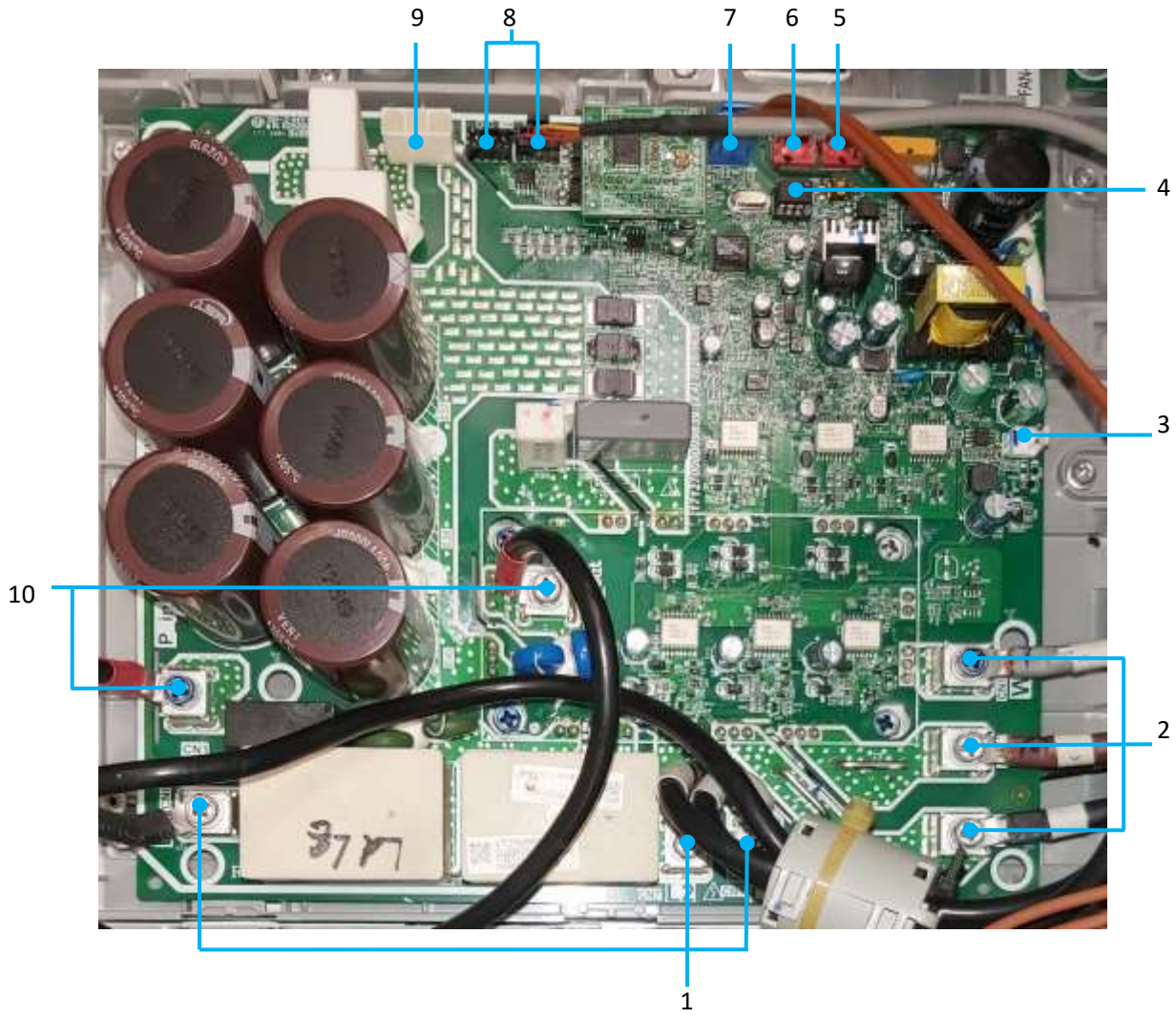
Notes:

1. Label descriptions are given in Table 4-2.5a.

Table 4-2.5a: Compressor inverter module PCB

Label in Figure 4-2.2a	Code	Content	Voltage
1	CN10	Port for current detection port(CN15) of main control board	0~5V DC
2	L1 L2 L3	Port for three-phase power supply of filter board	400V AC
3	U V W	Port for compressor connection	0~400V AC
4	CN17	DC bus current transformer	0~0.34V DC
5	CN8 CN9	Communication port between compressor invert modules or communication port between compressor invert module and main control board	0~5V DC
6	IC25	EEPROM	5V DC
7	CN2	Port for power supply	310V DC
8	CN1 CN5	Port for electric reactor	560V DC
9	CN3	Port for DC bus	560V DC
10	L8	Current measuring transformer	0~5V DC

Figure 4-2.2b: Compressor inverter module PCB version Size 16.2-35.2



Notes:

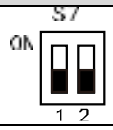
1. Label descriptions are given in Table 4-2.5b.

Table 4-2.5b: Compressor inverter module PCB

Label in Figure 4-2.2b	Code	Content	Voltage
1	L1 L2 L3	Port for three-phase power supply of filter board	400V AC
2	U V W	Port for compressor connection	0~400V AC
3	CN20	Low voltage power supply for fan driven board	18-22V DC
4	IC25	EEPROM	5V DC
5	CN3	230Vac supply	230Vac
6	CN2	230Vac supply, parallel with CN3	230Vac
7	CN23	High Pressure Switch Check	0-12V DC
8	CN8 CN9	Communication port between compressor invert modules or communication port between compressor invert module and main control board	0~5V DC
9	CN38	Port for DC bus	560V DC
10	CN1 CN5	Port for electric reactor	560V DC

2.3.1 Compressor Inverter Module PCB field setting

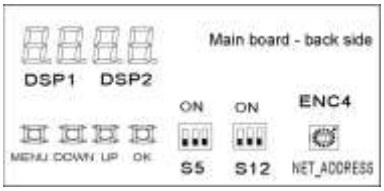
Table 4-2.6: Compressor inverter module PCB switch settings

Switch	Description
	000: size 10.1-14.1 compressor inverter module address setting
	000: size 16.2-35.2 compressor A inverter module address setting
	001: size 16.2-35.2 compressor B inverter module address setting

STATUSES DISPLAY

If the keyboard is remote, it is possible to read the unit statuses also from the display on the main board.

Press UP on the main board.



	Standby: unit address (88 to the left) + online number (88 to the right)On: frequency defrosting: dFdF
0.xx	**unit address**
1.xx	**capacity of unit**
2.xx	**number of units online**
3.xx	**T4 correction (reserved and display "1")**
4.xx	**Mode (8: Off; 0: Standby; 1: Cooling; 2: Heating)**
5.xx	**fan gear (0-35)**
6.xx	**fan gear (reserved and display "0")**
7.xx	**coil temperature: Min(T3a, T3b)**
8.xx	**T4: outside air temperature**

9.xx	T5: DHW temperature
10.xx	Taf1: Water tank antifreeze temperature, antifreeze protection
11.xx	Taf2: exchanger outlet temperature, antifreeze protection
12.xx	Tw: common outlet water temperature, after the last unit
13.xx	Twi: inlet water
14.xx	Two: outlet water
15.xx	Tz: Total condenser outlet temperature
16.xx	Heat recovery sensor temperature (reserved to display "--")
17.xx	TP1 discharge temperature
18.xx	TP2 discharge temperature
19.xx	Tfin1 the temperature of driver board
20.xx	Tfin2 the temperature of driver board
21.xx	Tdsh discharge superheat
22.xx	Compressor current A
23.xx	Compressor current B
24.xx	Reserved display"--"
25.xx	electronic expansion valve opening A (/20)
26.xx	electronic expansion valve opening B (/20)
27.xx	electronic expansion valve opening C (/4)
28.xx	high pressure (heaing mode)
L.xx	low pressure(cooling mode or standby mode)
30.xx	Tssh suction superheat
31.xx	Th suction temperature
32.xx	Silent mode
33.xx	static pressure (reserved)
34.xx	DC voltage A (reserved)
35.xx	DC voltage B (reserved)
xx.xx	Reason for frequency limitation: BIT0: T4 frequency limit BIT1: Tp frequency limit BIT2: Tz frequency limit BIT3: Tfin frequency limit BIT4: Two Frequency Limit in cooling mode BIT5: High pressure of system frequency limit in heating mode BIT6: Current Limit BIT7: Voltage limit BIT8: DC current of compressor limit BIT9: low pressure of system frequency limit in cooling mode BIT10: Two frequency limit in heating mode BIT11: Tdsh frequency limit in heating mode BIT12: Power Restriction Mode BIT13: Silent Mode BIT14: Reserved BIT15: Reserved
37.xx	defrosting status (1st digit: T4 selection solution; 2nd digit: at intervals; 3rd and 4th digit

	defrosting on timer)
38.xx	**EEPROM error: 1: Error; 0: No error**
39.xx	**Defrosting plan**
40.xx	**initial frequency**
41.xx	**Tc: Saturation temperature corresponding to high pressure in heating mode**
42.xx	**Te: Saturation temperature corresponding to low pressure in cooling mode**
43.xx	**T6a: exchanger inlet temperature**
44.xx	**T6b: exchanger outlet temperature**
45.xx	**software version**
46.xx	**last error**
47.xx	**----**

1.2 Fan Module Board

Figure 4-2.3: Fan module PCB for all models

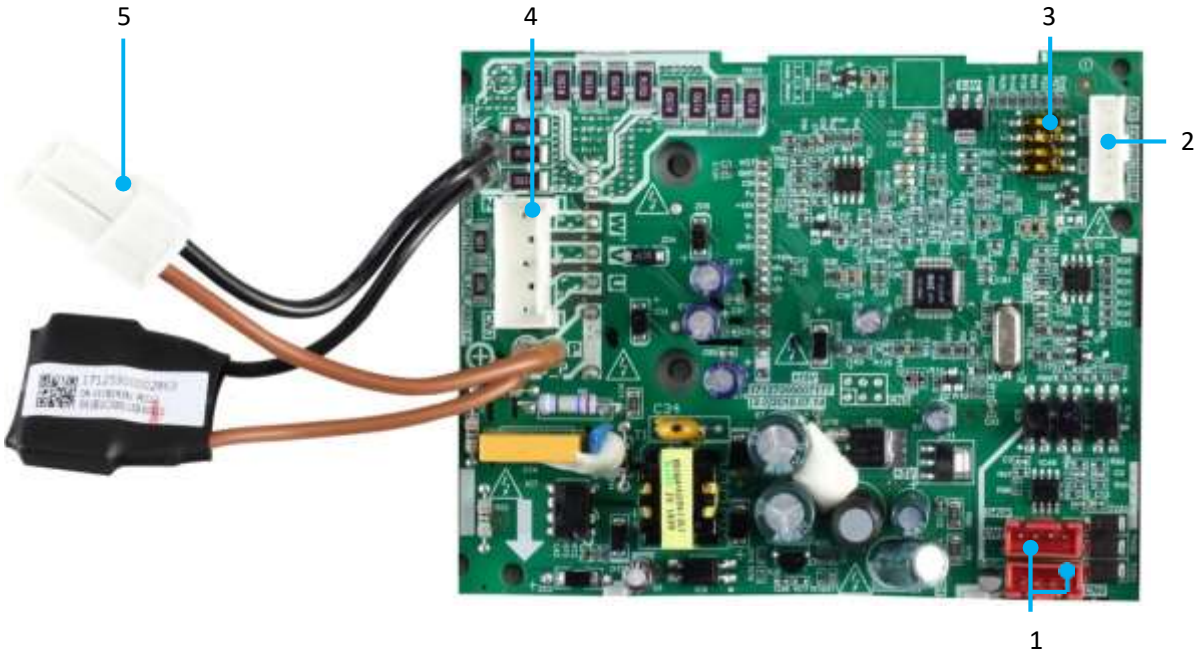


Table 4-2.7: Fan module PCB

Label in Figure 4-2.5	Code	Content	Voltage
1	CN1 CN4	Communication port for inverter module Communication port between fan modules or communication port between fan module and main control board	0~5V DC
2	CN2	EEPROM debug port	0~5V DC
3	SW1	Address dialing code for fan module	0~5V DC
4	CN3	Port for fan motor	0~400V AC
5	P N	Port for power supply	310V DC

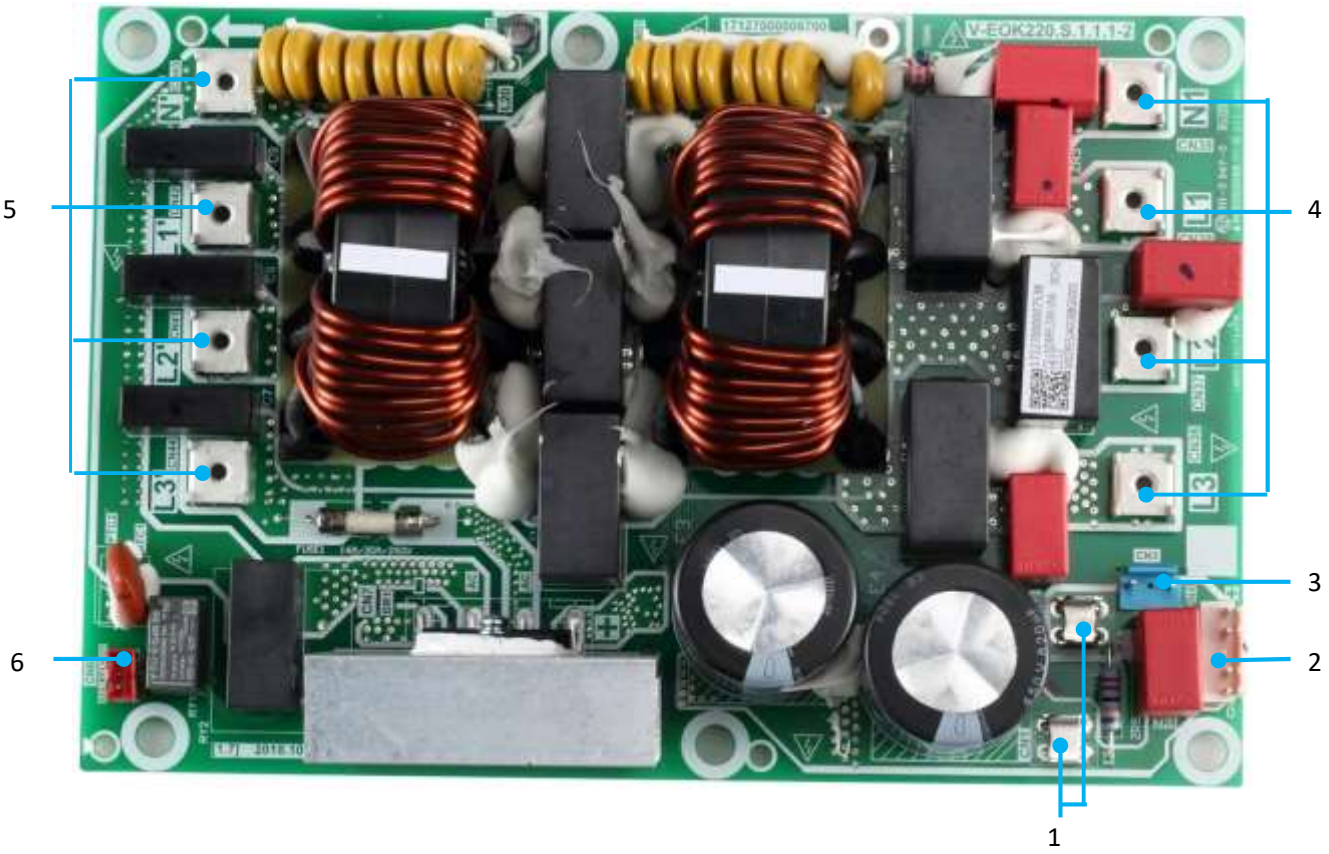
2.4.1 Fan Module PCB field setting

Table 4-2.8: Fan module PCB switch settings for all models

Switch		Description
SW1 	SW1-1 SW1-2	00: size 10.1-14.1 fan module address setting
		00: size 16.2-22.2 fan module A address setting
		01: size 16.2-22.2 fan module B address setting
	SW1-3 SW1-4	Reserved
	SW1-2-3-4 SW1-2-3-4 SW1-2-3-4	0000: size 30.2-35.2 fan module A address setting 0100: size 30.2-35.2 fan module B address setting 0111: size 30.2-35.2 fan module C address setting

1.3 AC Filter Board

Figure 4-2.4: AC filter board[1] for size 10.1-14.1



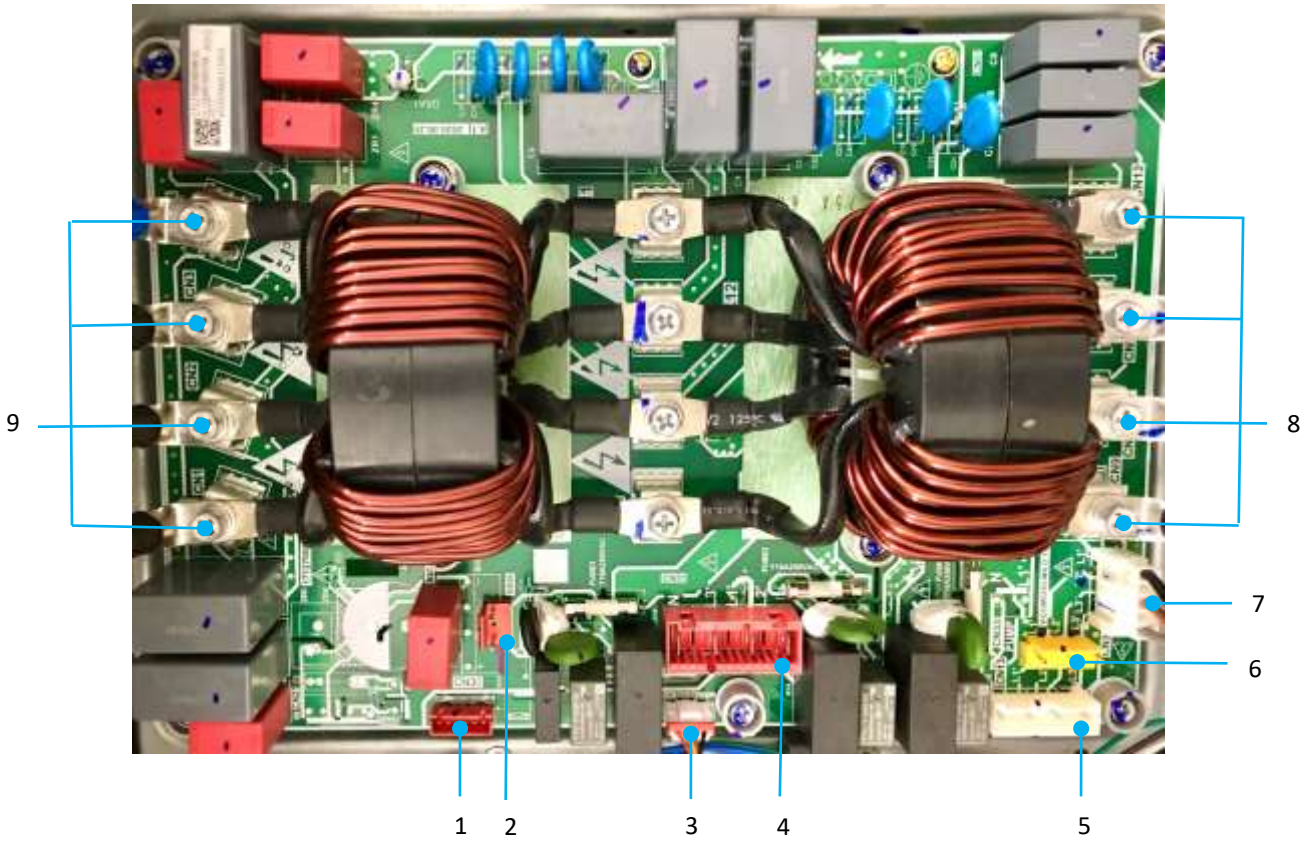
Notes:

1. Label descriptions are given in Table 4-2.9.

Table 4-2.9: AC filter board for size 10.1-14.1

Label in Figure 4-2.6	Code	Content	Voltage
1	CN1 CN2	Port for fan module PCB	310V DC
2	CN4	Port for power supply of compressor inverter module	310V DC
3	CN3	Port for high pressure switch	0 or 310V DC
4	CN36 CN37 CN38 CN39	Three-phase power input	L1&N:230V~ L2&N:230V~ L3&N:230V~
5	CN45 CN42 CN41 CN44	Three-phase power output	L1&N:230V~ L2&N:230V~ L3&N:230V~
6	CN6	Port for relay signal control port of main control board	0 or 12V DC

Figure 4-2.5: AC filter board[1] for size 16.2-35.2



Notes:
1. Label descriptions are given in Table 4-2.10.

Table 4-2.10: AC filter board for size 16.2-35.2

Label in Figure 4-2.5	Code	Content	Voltage
1	CN30	Relay signal Terminal from main control board(CN21)	310V DC
2	CN36	Terminal for power supply of compressor inverter board	12V DC
3	CN52	Relay signal Terminal from main control board(CN52)	12V DC
4	CN31	AC Power supply for fan	L1&N:230V~ L2&N:230V~ L3&N:230V~
5	CN13	Terminal for power supply of main control board	L1&N:230V~ L2&N:230V~ L3&N:230V~
6	CN34	Terminal for pump	L1&N:230V~ L2&N:230V~ L3&N:230V~
7	CN32	Terminal for three-phase protector	L1&N:230V~ L2&N:230V~ L3&N:230V~
8	CN9 CN10 CN11 CN12	Three-phase power output	L1&N:230V~ L2&N:230V~ L3&N:230V~

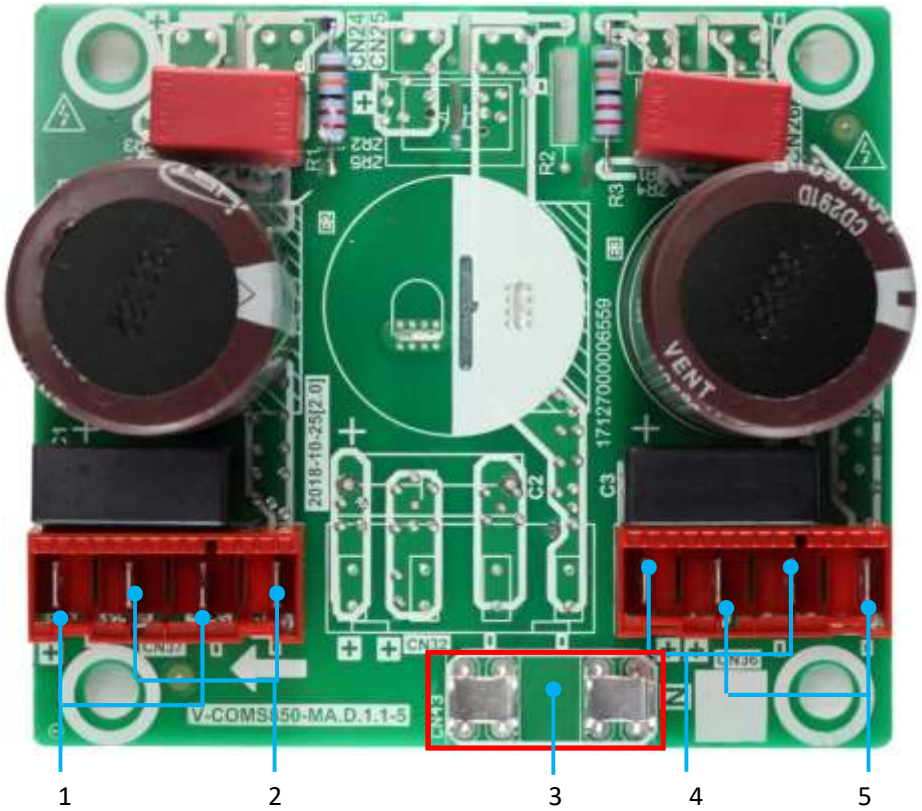
Table continued on next page ...

Table 4-2.10: AC filter board for size 16.2-35.2 (continued)

9	CN1 CN2 CN3 CN4	Three-phase power input	L1&N:230V~ L2&N:230V~ L3&N:230V~

1.4 Fan Module Power Board

Figure 4-2.6: Fan module power board[1] for size 16.2-35.2



Notes:

1. Label descriptions are given in Table 4-2.11.

Table 4-2.11: Fan power board for size 16.2-35.2

Label in Figure 4-2.6	Code	Content	Voltage
1	CN37	Port output for fan A rectifier bridge	310V DC
2	CN37	Port input for fan A inverter module board	310V DC
3	CN43	N	Neutral
4	CN36	Port output for fan B rectifier bridge	310V DC
5	CN36	Port input for fan B inverter module board	310V DC

*Table 4-**3**.1: Error Code Table (continued)*

3 Error Code Table

Table 4-3.1: Error Code Table

Error code	Serial number[1]	Content	Remarks
E0	1	Main control parameter memory EEPROM failure	Displayed on main PCB and user interface
E1	2	Phase sequence failure of main control board check	Displayed on main PCB and user interface
E2	3	Communication failure between master and the HMI	Displayed on main PCB and user interface
	3	Communication failure between master and the slave	Displayed on main PCB and user interface
E3	4	Total water outlet temperature sensor (Tw) failure (displayed on master unit only)	Displayed on main PCB and user interface
E4	5	Unit water outlet temperature sensor (Two) failure	Displayed on main PCB and user interface
E5	6	1E5 condenser tube temperature sensor T3A failure	Displayed on main PCB and user interface
	6	2E5 condenser tube temperature sensor T3B failure	Displayed on main PCB and user interface
E7	8	Ambient temperature sensor (T4) failure	Displayed on main PCB and user interface
E6	7	Water tank temperature sensor T5 error	Displayed on main PCB and user interface
E8	9	Power supply phase sequence protector output error	Displayed on main PCB and user interface
E9	10	Water flow detection failure	Displayed on main PCB and user interface
2E9	10	Water pressure detection failure	Displayed on main PCB and user interface
Eb	12	1Eb --> Taf1 the pipe of the tank antifreeze protection sensor error	Displayed on main PCB and user interface
	12	2Eb --> Taf2 cooling evaporator low-temperature anti-freeze protection sensor failure	Displayed on main PCB and user interface
EC	13	Slave unit module reduction	Displayed on user interface
Ed	14	1Ed --> A system discharge temperature sensor failure	Displayed on main PCB and user interface
	14	2Ed --> B system discharge temperature sensor failure	Displayed on main PCB and user interface
EF	16	Unit water return temperature sensor (Twi) failure	Displayed on main PCB and user interface
EH	17	System self-check failure alarm	Displayed on main PCB and user interface
EP	19	Discharge temperature sensor failure alarm	Displayed on main PCB and user interface
EU	20	Tz/7 Coil final outlet temperature sensor error	Displayed on main PCB and user interface

*Table 4-**3**.1: Error Code Table (continued)*

P0	21	System high-pressure protection or discharge temperature protection	Displayed on main PCB and user interface
P1	22	System low pressure protection	Displayed on main PCB and user interface
P2	23	Tz/7 Coil final outlet temperature too high	Displayed on main PCB and user interface
P3	24	T4 ambient temperature too high in cooling mode	Displayed on main PCB and user interface
P4	25	System A current protection	Displayed on main PCB and user interface
P5	26	System B current protection	Displayed on main PCB and user interface
P6	27	Inverter module failure	Displayed on main PCB and user interface
P7	28	High temperature protection of system condenser	Displayed on main PCB and user interface
P9	30	Water inlet and outlet temperature difference protection	Displayed on main PCB and user interface
1Pb	32	Insufficient electric heating for anti-freezing protection in winter.	Displayed on main PCB and user interface
2Pb	32	Winter anti-freezing protection electric heating is seriously insufficient.	Displayed on main PCB and user interface
PC	33	Evaporator pressure too low in cooling	Displayed on main PCB and user interface
PE	35	Cooling evaporator low temperature antifreeze protection	Displayed on main PCB and user interface
PH	37	T4 ambient temperature too high in heating mode	Displayed on main PCB and user interface
PL	38	Inverter module temperature Tf too high temperature protection	Displayed on main PCB and user interface
xPU	40	DC fan module protection	Displayed on main PCB and user interface
H5	46	Voltage too high or too low	Displayed on main PCB and user interface
xH9	50	Compressor inverter module is not matched	Displayed on main PCB and user interface
xHE	55	Electronic expansion valve not detected	Displayed on main PCB and user interface
xF0	61	IPM module communication failure	Displayed on main PCB
F2	63	Discharge sensor falls off or discharge is insufficiently superheated.	Displayed on main PCB and user interface
xF4	65	L0 or L1 protection occurs 3 times in 60 minutes	Displayed on main PCB and user interface
xF6	67	DC bus voltage error (PTC)	Displayed on main PCB and user interface
xF9	70	Inverter module temperature sensor error	Displayed on main PCB and user interface

*Table 4-**3**.1: Error Code Table (continued)*

Fb	72	Pressure sensor error	Displayed on main PCB and user interface
Fd	74	Suction temperature sensor error	Displayed on main PCB and user interface
xFF	76	DC fan failure	Displayed on main PCB and user interface
FP	79	DIP inconsistency of multiple water pumps	Displayed on main PCB and user interface
C7	88	If PL occurs 3 times, the system reports the C7 failure	Displayed on main PCB and user interface
L0	101	Compressor inverter module protection	Displayed on only user interface
L1	102	DC bus low voltage protection	Displayed on only user interface
L2	103	DC bus high voltage protection	Displayed on only user interface
L4	105	MCE error	Displayed on only user interface
L5	106	Zero speed protection	Displayed on only user interface
L7	108	Phase sequence lost protection	Displayed on only user interface
L8	109	Compressor frequency change over 15Hz	Displayed on only user interface
L9	110	Compressor frequency difference 15Hz	Displayed on only user interface
dF	136	Defrosting prompt	Displayed on main PCB and user interface
xBH	157	Module relay sticking or 908 chip self-check failure	

Note:

1. When the error code appears, the error code corresponding to the error code can be obtained through the H1H2 port by using the host computer to query the wired controller register.

4 Troubleshooting

4.1 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 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.

4.2 E0/H9 Troubleshooting

4.2.1 Digital display output

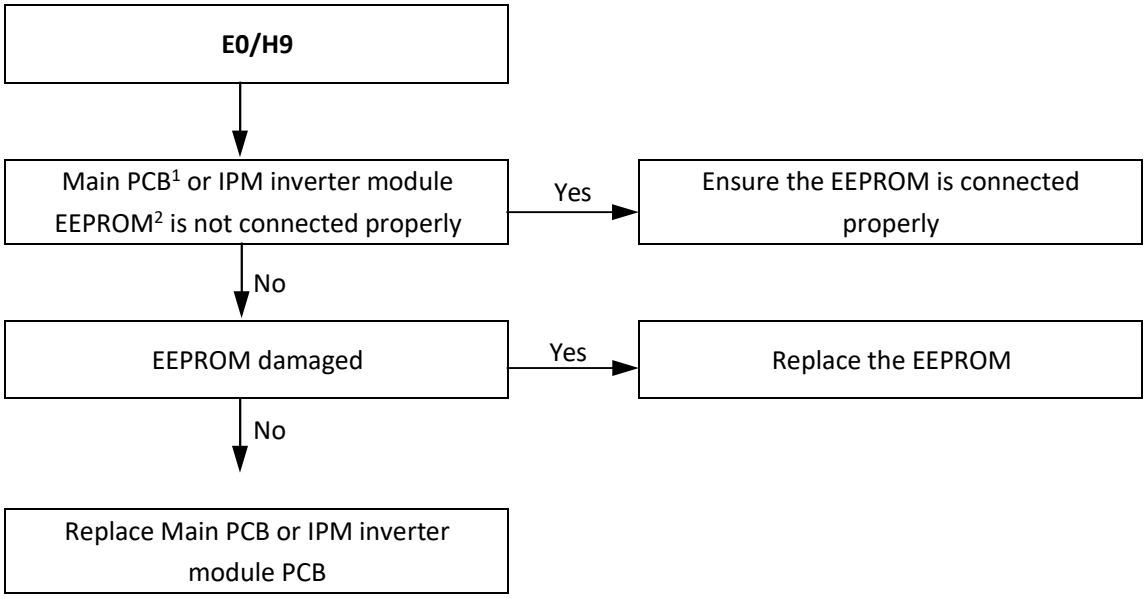
4.2.2 Description

- 1E0 indicates main PCB EEPROM error.
- 1H9 indicates IPM inverter module (compressor A) EEPROM error.
- 2H9 indicates IPM inverter module (compressor B) EEPROM error.
- All units stop running.
- Error code is displayed on main PCB and user interface.

4.2.3 Possible causes

- Main PCB or IPM inverter module EEPROM is not connected properly.
- Main PCB or IPM inverter module damaged.
- EEPROM damaged.

4.2.4 Procedure



Notes:

1. Main PCB EEPROM is designated IC10 on the main PCBs (labeled 38 in Figure 4-2.1 in Part 4, 2.2 “Main PCB”).
2. Compressor inverter module PCB EEPROM is designated IC25 on compressor inverter module PCB (labeled 6 in Figure 4-2.2a and labeled 4 in Figure 4-2.2b in Part 4, 2.3 “Compressor inverter module PCB”).

4.3 E1 Troubleshooting

4.3.1 Digital display output

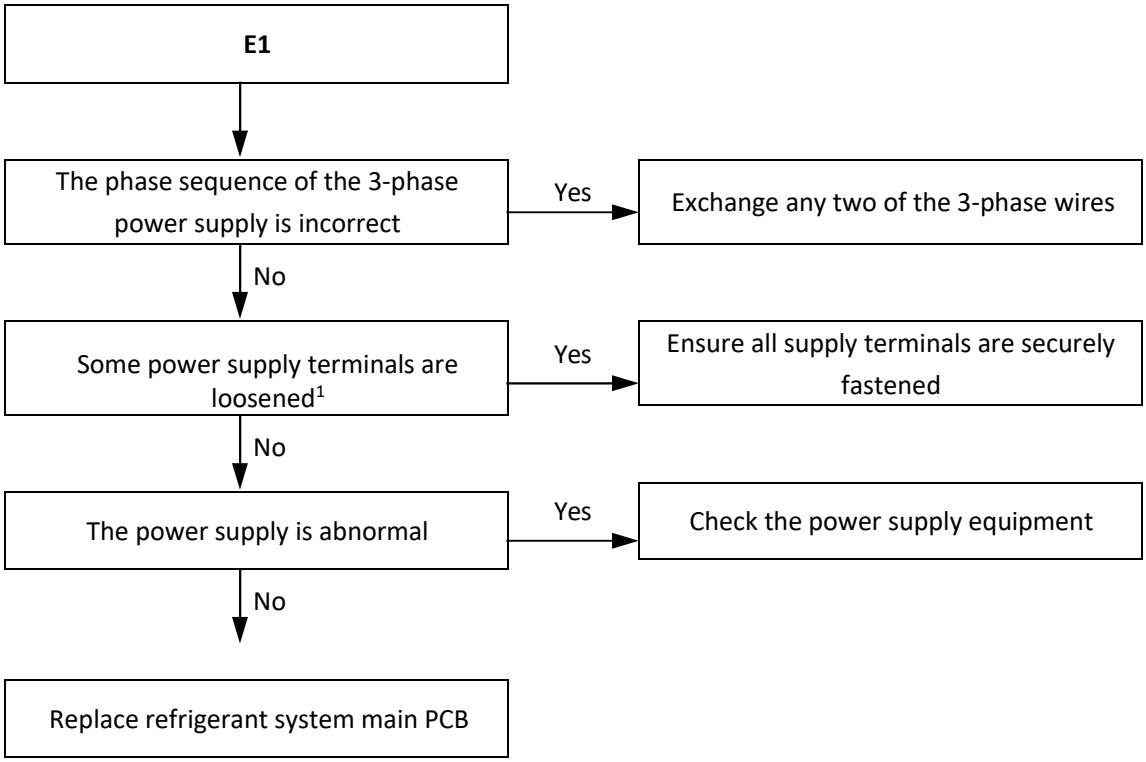
4.3.2 Description

- Phase sequence error.
- Unit stops running.
- Error code is displayed on main PCB and user interface.

4.3.3 Possible causes

- Power supply phases not connected in correct sequence.
- Power supply terminals loosened.
- Power supply abnormal.
- Main PCB damaged.

4.3.4 Procedure



Notes:

1. Loosened power supply terminals can cause the compressors to operate abnormally and compressor current to be very large.

4.4 E2 Troubleshooting

4.4.1 Digital display output

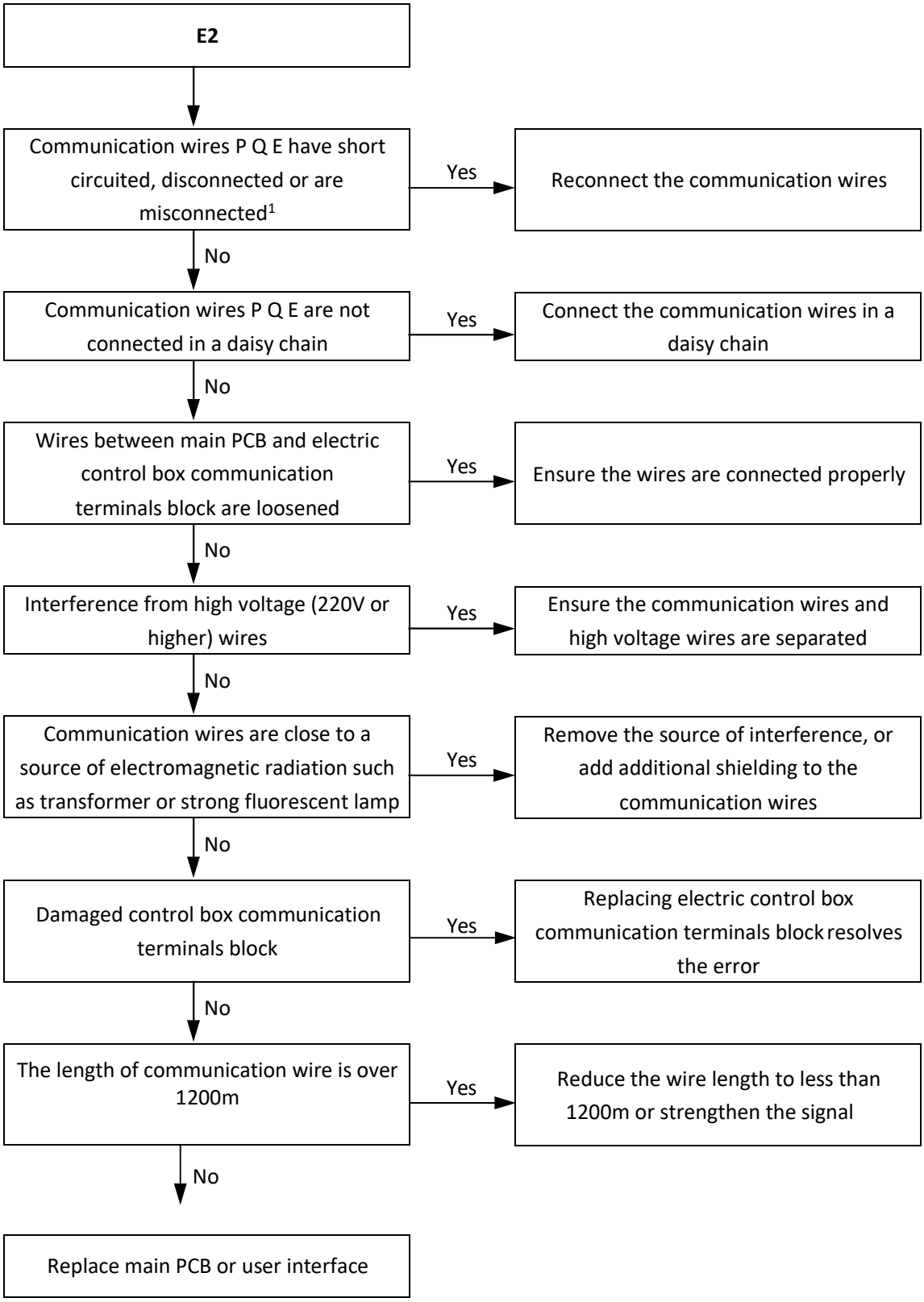
4.4.2 Description

- Communication error between unit and user interface.
- All units stop running.
- Error code is displayed on main PCB and user interface.

4.4.3 Possible causes

- Communication wires between unit and user interface are not connected properly.
- Communication wiring P Q E terminals misconnected.
- Loosened wiring within electric control box.
- Interference from high voltage wires or other sources of electromagnetic radiation.
- Communication wire is too long.
- Damaged main PCB, user interface or electric control box communication terminals block.

4.4.4 Procedure

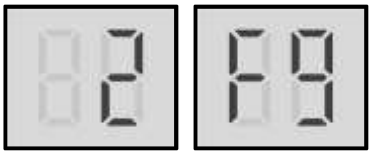


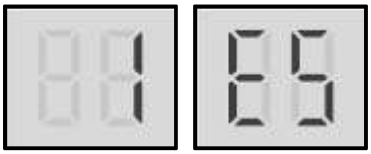
Notes:

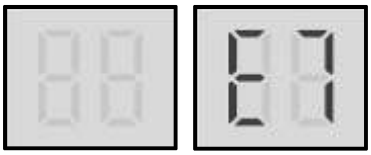
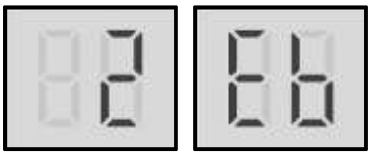
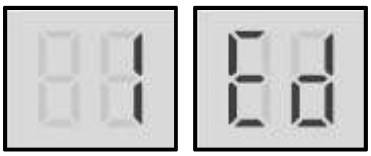
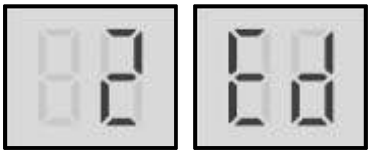
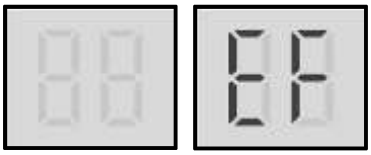
1. Measure the resistance among P, Q and E. The normal resistance between P and Q is 120Ω, between P and E is infinite, between Q and E is infinite. Communication wiring has polarity. Ensure that the P wire is connected to P terminals and the Q wire is connected to Q terminals.

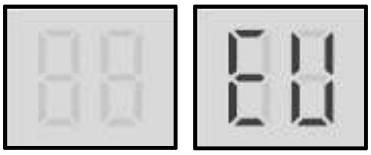
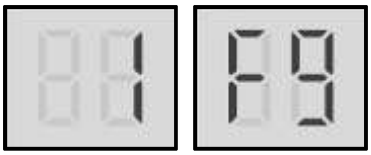
4.5 E3, E4, E5, E7, Eb, Ed, EF, EP, EU, F9,Fb, Fd Troubleshooting

4.5.1 Digital display output

4.5.2 Description

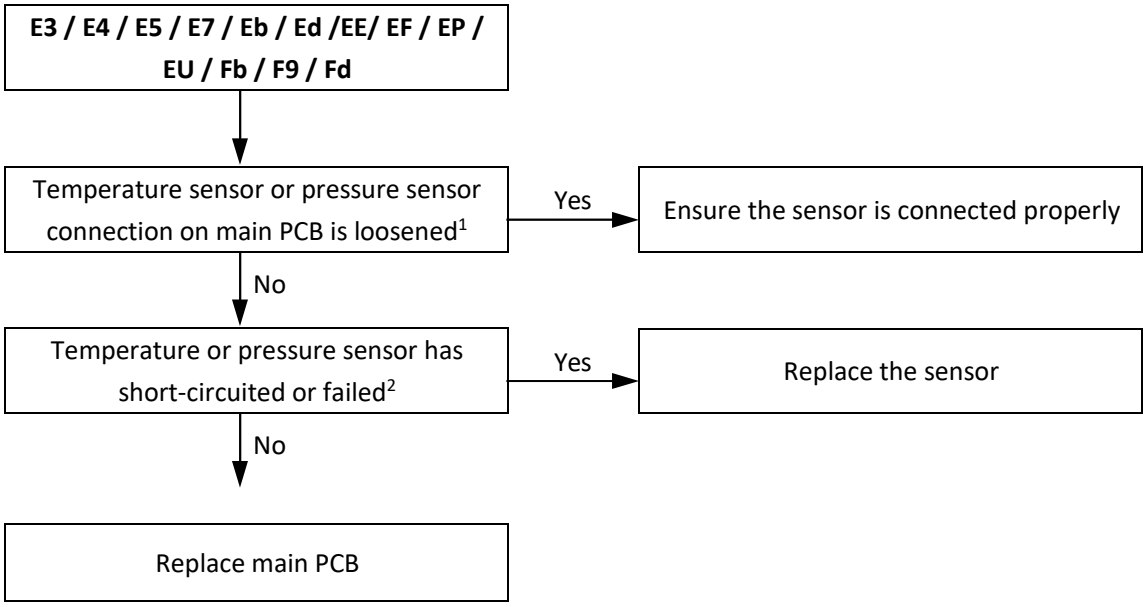
E3	indicates a combined water outlet temperature sensor error
E4	indicates a water outlet temperature sensor error
1E5	indicates an air side heat exchanger refrigerant outlet temperature sensor T3A error
E7	indicates an outdoor ambient temperature sensor error
2Eb	indicates a water side heat exchanger anti-freezing temperature sensor Taf2 error
1Ed	indicates a discharge pipe temperature sensor of system A error
2Ed	indicates a discharge pipe temperature sensor of system B error
EF	indicates a water inlet temperature sensor error
EP	indicates a discharge pipe temperature sensor failure alarm
EU	indicates an air side heat exchanger refrigerant total outlet temperature sensor Tz/7 error
1F9	indicates inverter module temperature sensor(Tf1) error
2F9	indicates inverter module temperature sensor(Tf2) error
Fb	indicates a pressure sensor error
Fd	indicates an air suction temperature sensor error

All stop running.
Error code is displayed on main PCB and user interface.

4.5.3 Possible causes

- Temperature sensor or pressure sensor are not connected properly or malfunctioned.
- Main PCB Damaged.

4.5.4 Procedure



Notes:

1. The sensors are connected to port CN1, CN16/CN17, CN31, CN3, CN10 and CN69 on the main PCB (labeled 10, 9, 8, 7, 6, 4 in Figure 2.1 in Part 4, 2.2 "Main PCB").
2. Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor's resistance characteristics table, the sensor has failed. Refer to Table 5-5.1 or 5-5.2 or 5-5.3 in Part 5, 5.1 "Temperature Sensor Resistance Characteristics".

4.6 E8 Troubleshooting

4.6.1 Digital display output

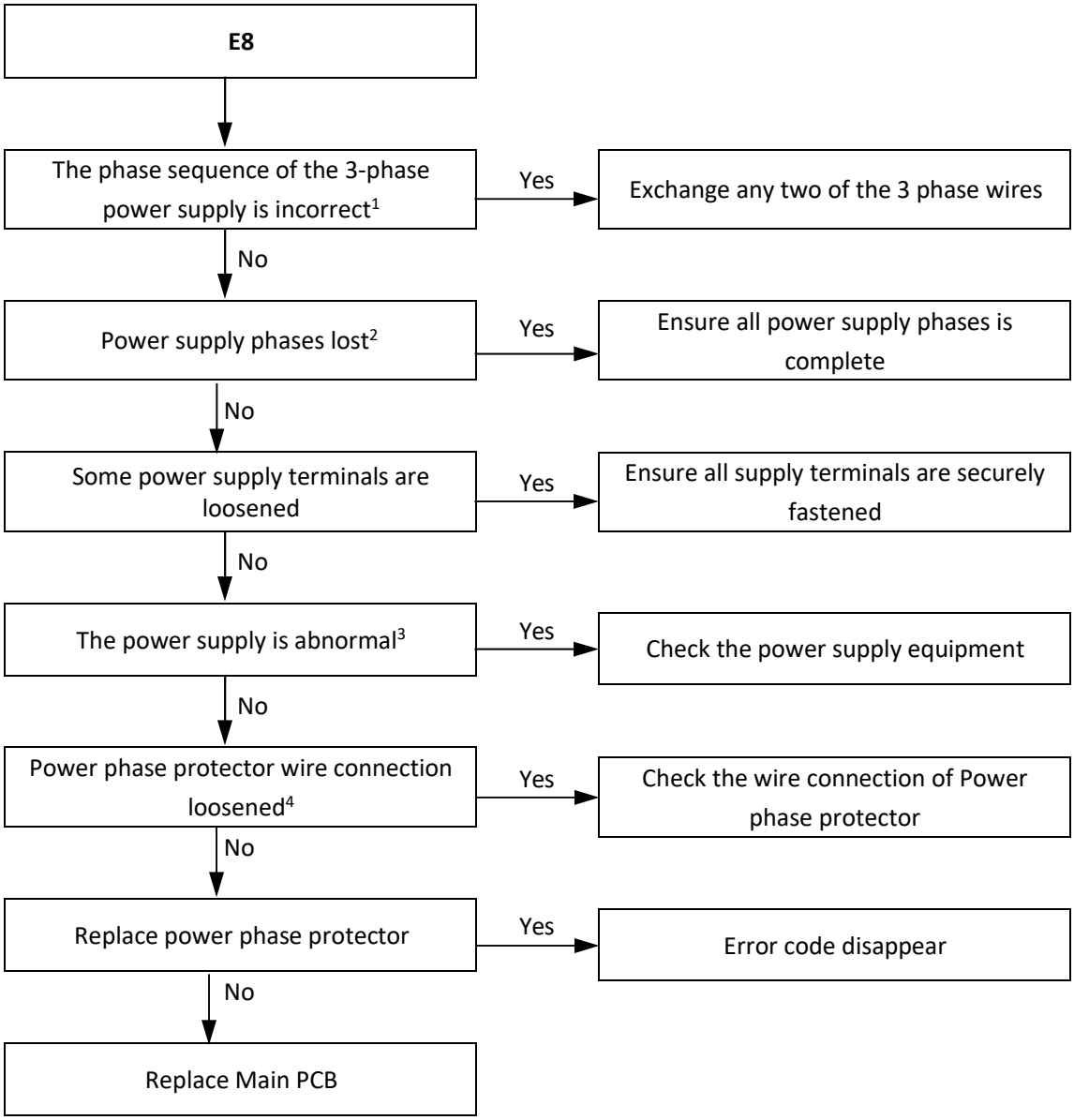
4.6.2 Description

- Power phase protector output error
- When this error occurs in the main unit, all units stop running. When this error occurs in the slave unit, the slave unit stop running.
- Error code is displayed on main PCB and user interface.

4.6.3 Possible causes

- Power supply phases not connected in correct sequence or lost.
- Power supply terminals or power phase protector wire connection loosened.
- Power supply abnormal.
- Damaged main PCB.
- Damaged power phase protector.

4.6.4 Procedure

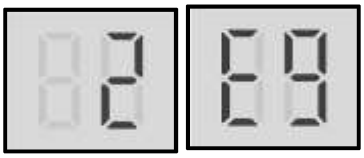


Notes:

1. The red LED on the power phase protector will on.
2. The red LED on the power phase protector will flash with 1HZ.
3. The red LED on the power phase protector will flash with 3HZ.
4. Loosened power supply terminals can cause the compressors to operate abnormally and compressor current to be very large.

4.7 E9 Troubleshooting

4.7.1 Digital display output



4.7.2 Description

- Water flow failure.
- E9 indicates a water flow switch error. When an E9 error occurs 3 times in 60 minutes, a manual system restart is required before the system can resume operation.
- All units stop running.
- Error code is displayed on main PCB and user interface.

4.7.3 Possible causes

- The wire circuit is short connected or open.
- Water flow rate is too low.
- Water flow switch is dirty or damaged.
- Main PCB is damaged.

2E9 Troubleshooting

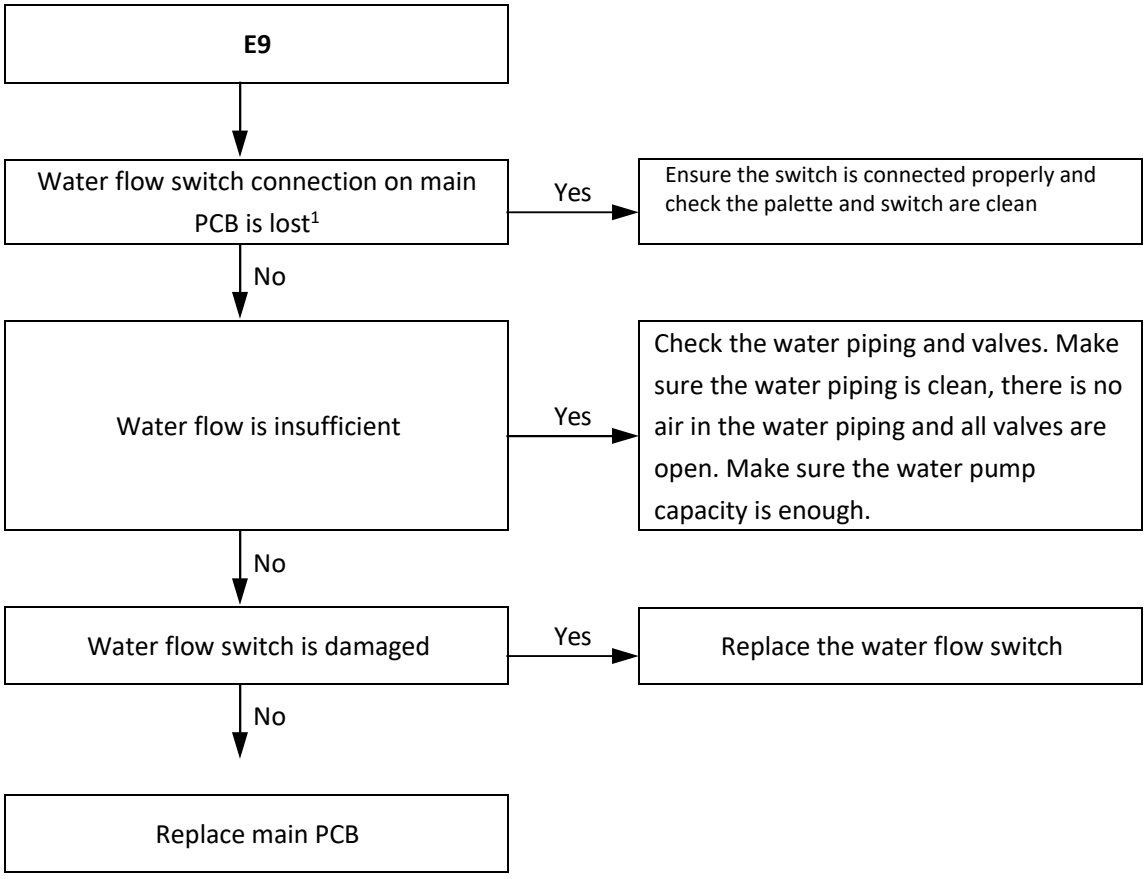
4.7.2 Description

- Water pressure failure.
- 2E9 indicates a water pressure switch error. When a 2E9 error occurs 3 times in 60 minutes, a manual system restart is required before the system can resume operation.
- All units stop running.
- Error code is displayed on main PCB and user interface.

4.7.3 Possible causes

- The wire circuit is short connected or open.
- Water pressure in the system is too low.
- Water pressure switch is damaged.
- Main PCB is damaged.

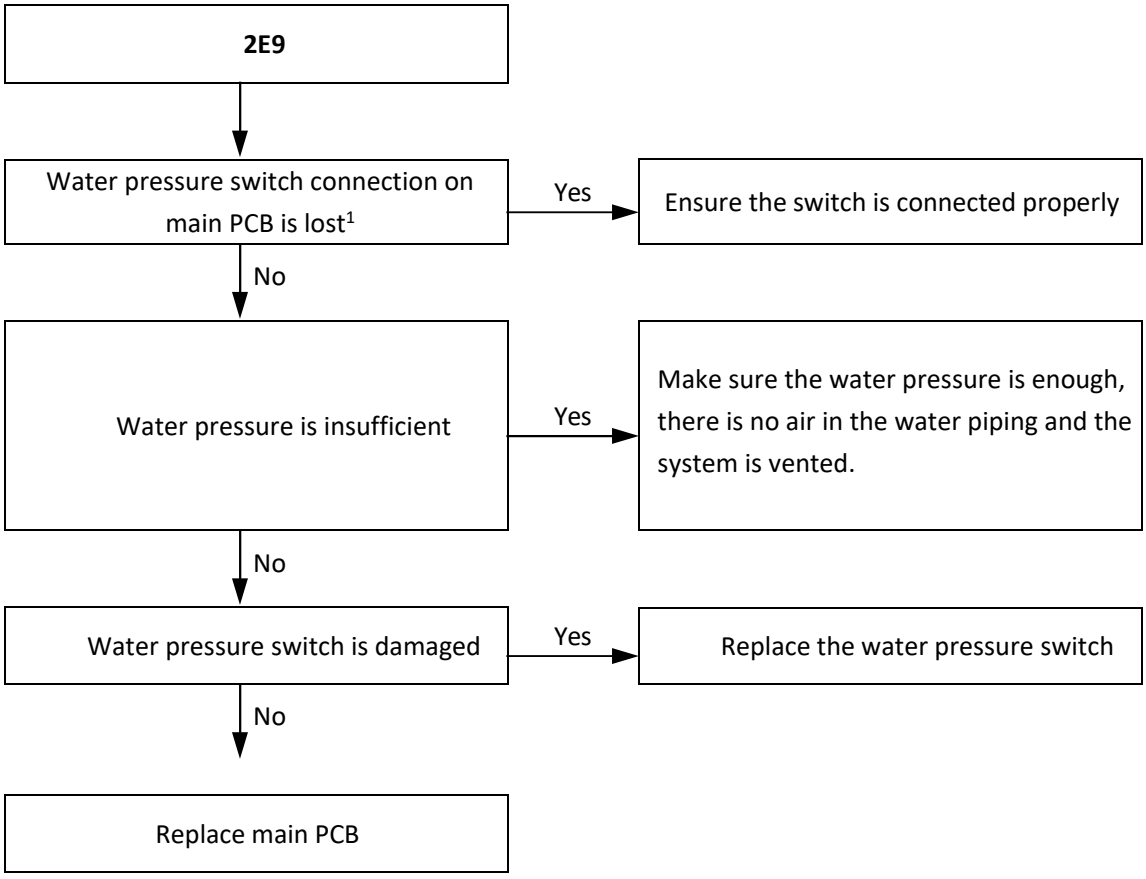
4.7.4 Procedure



Notes:

1. Water flow switch connection is port CN8 on the main PCB (labeled 36 in Figure 4-2.1 in Part 4, 2.2 “Main PCB”).

4.7.4 Procedure



Notes:

1. Water pressure switch connection is port CN21 on the main PCB (labeled 39 in Figure 4-2.1 in Part 4, 2.2 “Main PCB”).

4.8 EC Troubleshooting

4.8.1 Digital display output

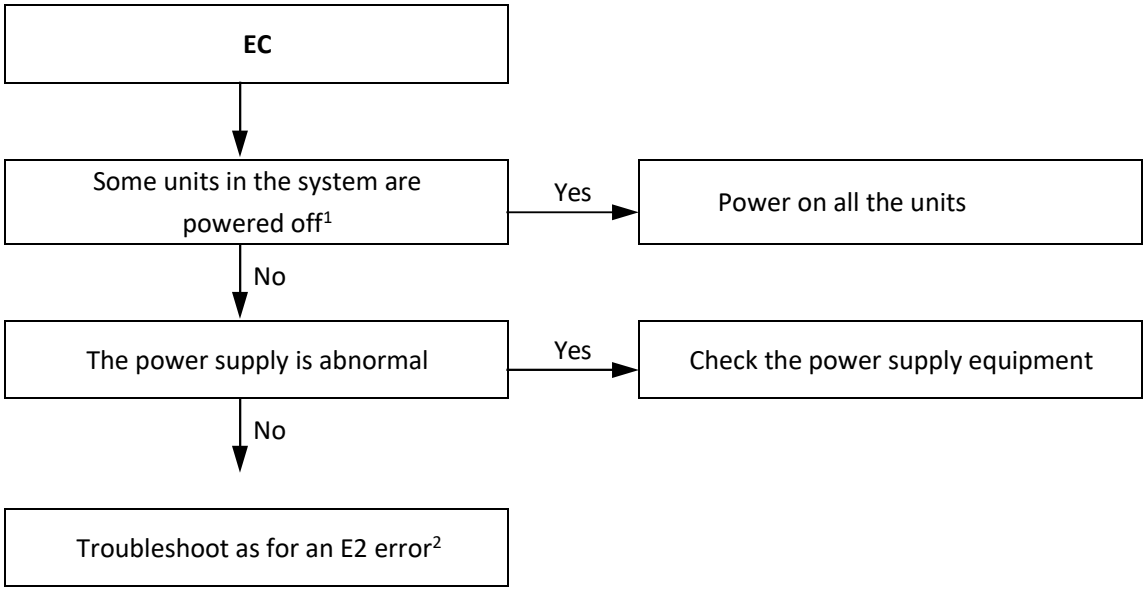
4.8.2 Description

- EC indicates that the number of slave units detected by master unit has decreased.
- All units stop running.
- Error code is only displayed on the user interface.

4.8.3 Possible causes

- Some units are powered off.
- Power supply abnormal.
- Incorrect unit address setting.
- Communication wires between units not connected properly.
- Loosened wiring within electric control box.
- Damaged main PCB or electric control box communication terminals block.

4.8.4 Procedure



Notes:

1. Check digital display on the main PCB. If digital display is on, the main PCB is powered on, if digital display is off, the main PCB is powered off. For size 16.2-35.2 L, refer to Figure 4-2.1 in Part 4, 2.2 “Main PCB”
2. See Part 4, 4.4 “E2 Troubleshooting”.

4.9 EH Troubleshooting

4.9.1 Digital display output

4.9.2 Description

- EH indicates system self-check in the factory, it will not display in the normal operating.

4.10 P0 Troubleshooting

4.10.1 Digital display output

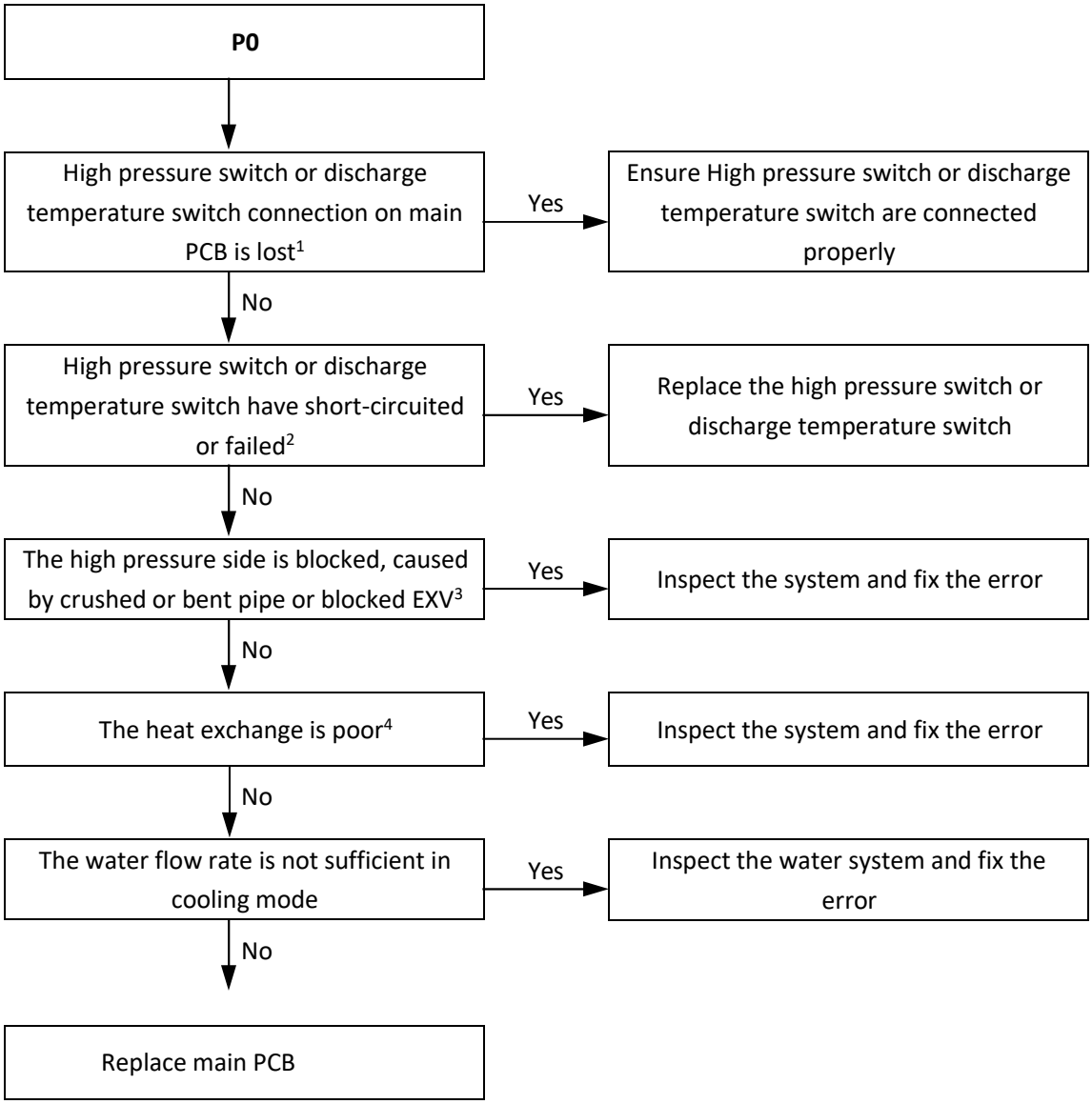
4.10.2 Description

- Discharge pipe high pressure or discharge temperature switch protection. When the discharge pressure rises above 4.2MPa or discharge temperature rises above 115°C, the system displays P0 protection and all units stop running. When the discharge pressure falls below 3.2MPa or discharge temperature fall below 90°C, P0 is removed and normal operation resumes. When P0 error occurs 3 times in 60 minutes, a manual system restart is required before the system can resume operation.
- Error code is displayed on main PCB and user interface.

4.10.3 Possible causes

- High pressure switch or discharge temperature switch not connected properly or has malfunctioned.
- Excess refrigerant.
- System contains air or nitrogen.
- High pressure side blockage.
- Poor condenser heat exchange.
- Main PCB is damaged.

4.10.4 Procedure



Notes:

1. High pressure switch connection is CN23 on compressor board for size 16.2-35.2, or CN3 on the AC filter board for size 10.1-14.1 (labeled 3 and 2 in Figure 4-2.1 in Part 4, 2.2 "Main PCB").
2. Measure the resistance among the three terminals of the pressure sensor. If the resistance is of the order of mega Ohms or infinite, the pressure sensor has failed.
3. High pressure side blockage causes discharge temperature to be higher than normal, discharge pressure to be higher than normal and suction pressure to be lower than normal.
4. In heating mode check water side heat exchanger, water piping, circulator pumps and water flow switch for dirt/blockages. In cooling mode check air side heat exchanger, fan(s) and air outlets for dirt/blockages.

4.11 P1 Troubleshooting

4.11.1 Digital display output

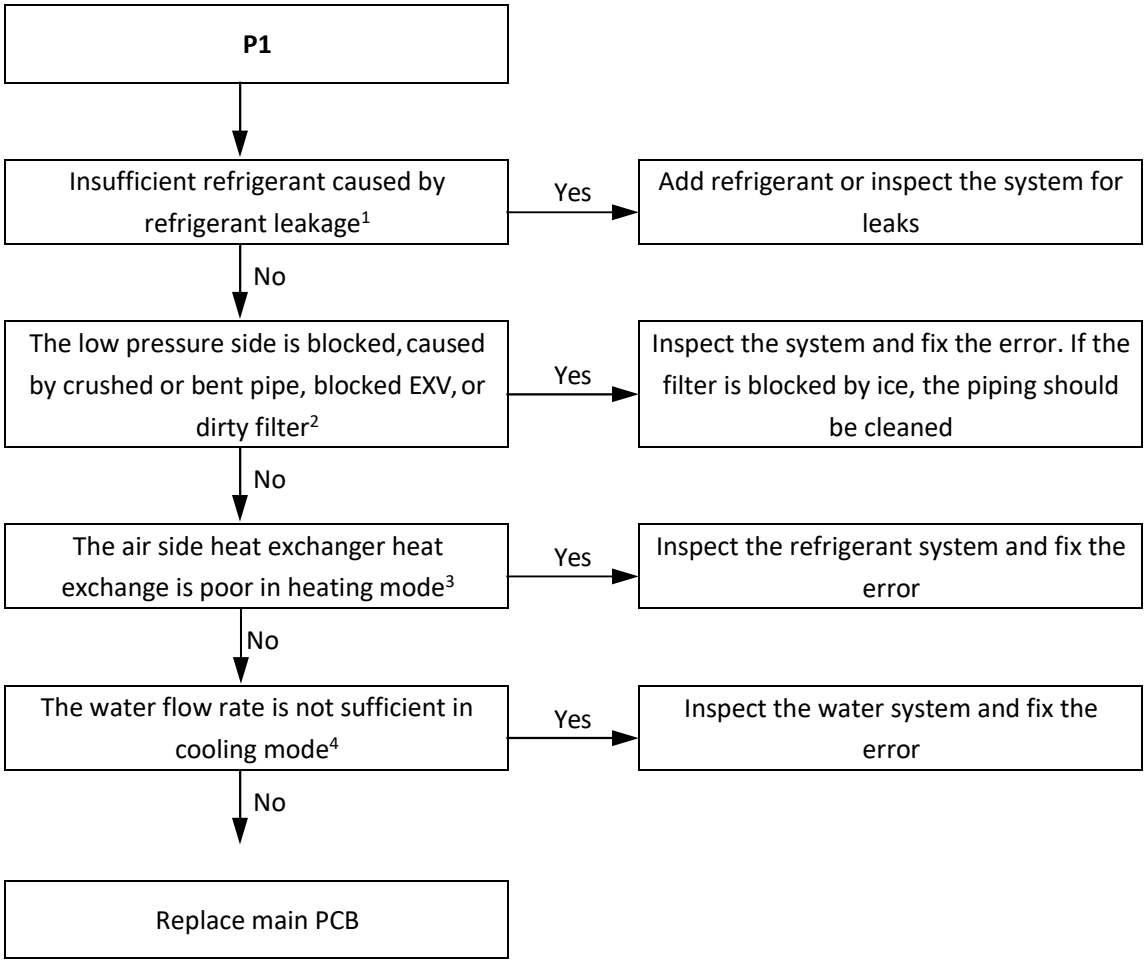
4.11.2 Description

- P1 indicates suction pipe low pressure protection. When the suction pressure falls below 0.14MPa, the system displays P1 protection and all units stop running. When the pressure rises above 0.3MPa, P1 is removed and normal operation resumes. When P1 error occurs 3 times in 60 minutes, a manual system restart is required before the system can resume operation.
- Error code is displayed on main PCB and user interface.

4.11.3 Possible causes

- Low pressure switch not connected properly or has malfunctioned.
- Insufficient refrigerant.
- Low pressure side blockage.
- Poor evaporator heat exchange in heating mode.
- Insufficient water flow in cooling mode.
- Main PCB damaged.

4.11.4 Procedure



Notes:

1. To check for insufficient refrigerant:
   An insufficiency of refrigerant causes compressor discharge temperature to be higher than normal, discharge and suction pressures to be lower than normal and compressor current to be lower than normal, and may cause frosting to occur on the suction pipe. These issues disappear once sufficient refrigerant has been charged into the system.
2. A low pressure side blockage causes compressor discharge temperature to be higher than normal, suction pressure to be lower than normal and compressor current to be lower than normal, and may cause frosting to occur on the suction pipe. For normal system parameters.
3. Check air side heat exchanger, fan(s) and air outlets for dirt/blockages.
4. Check water side heat exchanger, water piping, circulator pumps and water flow switch for dirt/blockages.

4.12 P4, P5 Troubleshooting

4.12.1 Digital display output

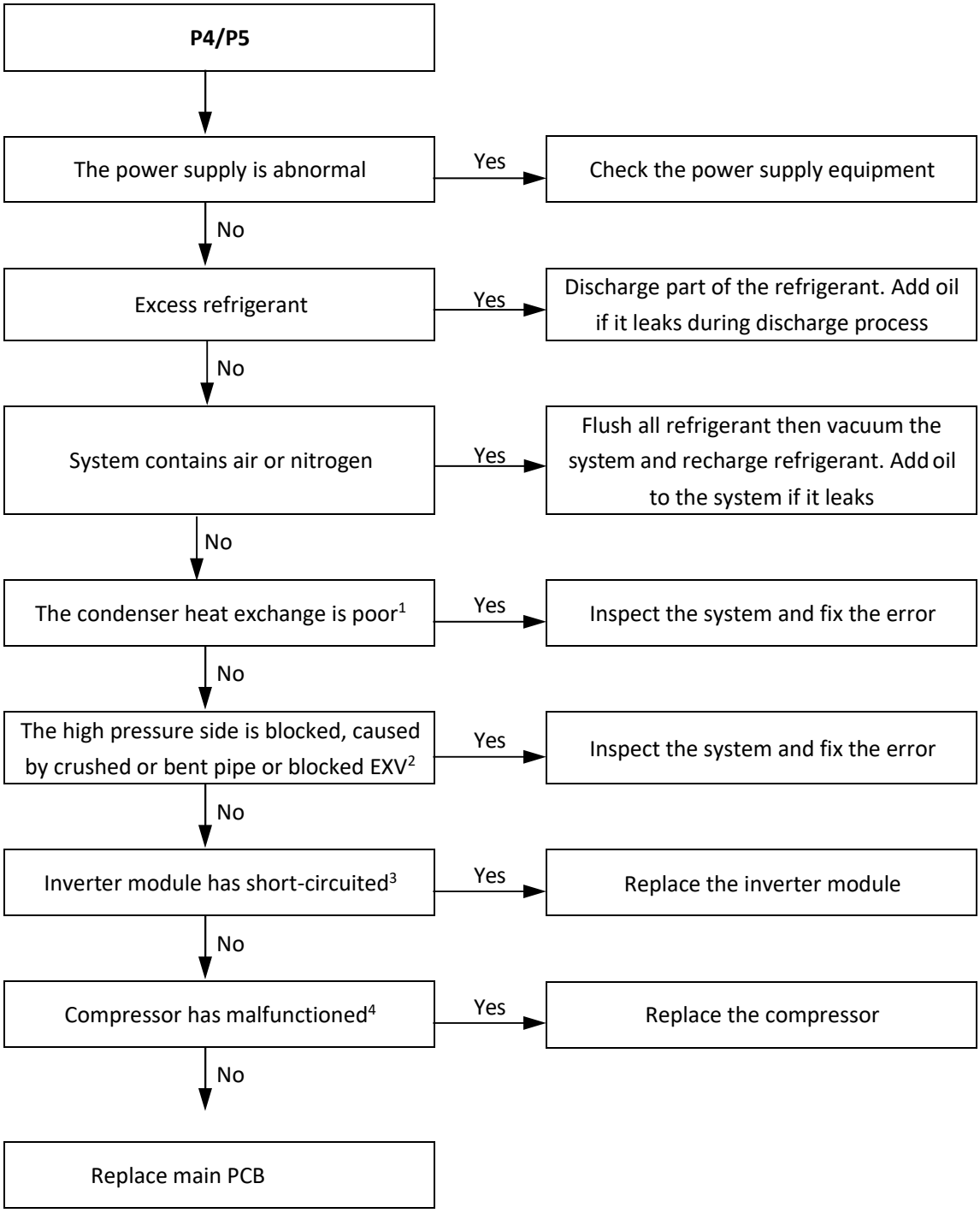
4.12.2 Description

- P4 indicates current protection on Phase A of system A.
- P5 indicates current protection on Phase A of system B.
- When the compressor current rises above the protection value 24A, the system displays P4 or P5 protection and all units stop running. When the current returns to the normal range, P4 or P5 is removed and normal operation resumes. When P4 or P5 error occurs 3 times in 60 minutes, a manual system restart is required before the system can resume operation.
- Error code is displayed on main PCB and user interface.

4.12.3 Possible causes

- Power supply abnormal.
- Poor condenser heat exchange.
- High pressure side blockage.
- Excess refrigerant.
- System contains air or nitrogen.
- Inverter module damaged.
- Compressor damaged.
- Main PCB damaged.

4.12.4 Procedure



Notes:

1. In heating mode check water side heat exchanger, water piping, circulator pumps and water flow switch for dirt/blockages. In cooling mode check air side heat exchanger, fan(s) and air outlets for dirt/blockages.
2. High pressure side blockage causes discharge temperature to be higher than normal, discharge pressure to be higher than normal and suction pressure to be lower than normal.
3. Set a multi-meter to buzzer mode and test any two terminals of P N and U V W of the inverter module. If the buzzer sounds, the inverter module has short-circuited.
4. The normal resistances of the inverter compressor are 0.3-2Ω among U V W and infinite between each of U V W and ground. If any of the resistances differ from these specifications, the compressor has malfunctioned.

4.13 P6 Troubleshooting

4.13.1 Digital display output

4.13.2 Description

- P6 indicates compressor inverter module protection.
- When P6 error occurs, a manual system restart is required before the system can resume operation. The cause of P6 error should be addressed promptly in order to avoid system damage.
- All units stop running.
- Error code is displayed on the main PCB and user interface.

4.13.3 Possible causes

- Inverter module protection.
- DC bus low or high voltage protection.
- MCE error.
- Zero speed protection.
- Phase sequence error.
- Excessive compressor frequency variation.
- Actual compressor frequency differs from target frequency.

4.13.4 Specific error codes for P6 inverter module protection

If a P6 error code is displayed, press button SW3 until one of the following specific error codes is displayed on the digital display: xL0, xL1, xL2, xL4, xL5, xL7, xL8, xL9. Refer to Figure 4-4.1 and Table 4-4.1.

Figure 4-4.1: Button SW3 on main PCB

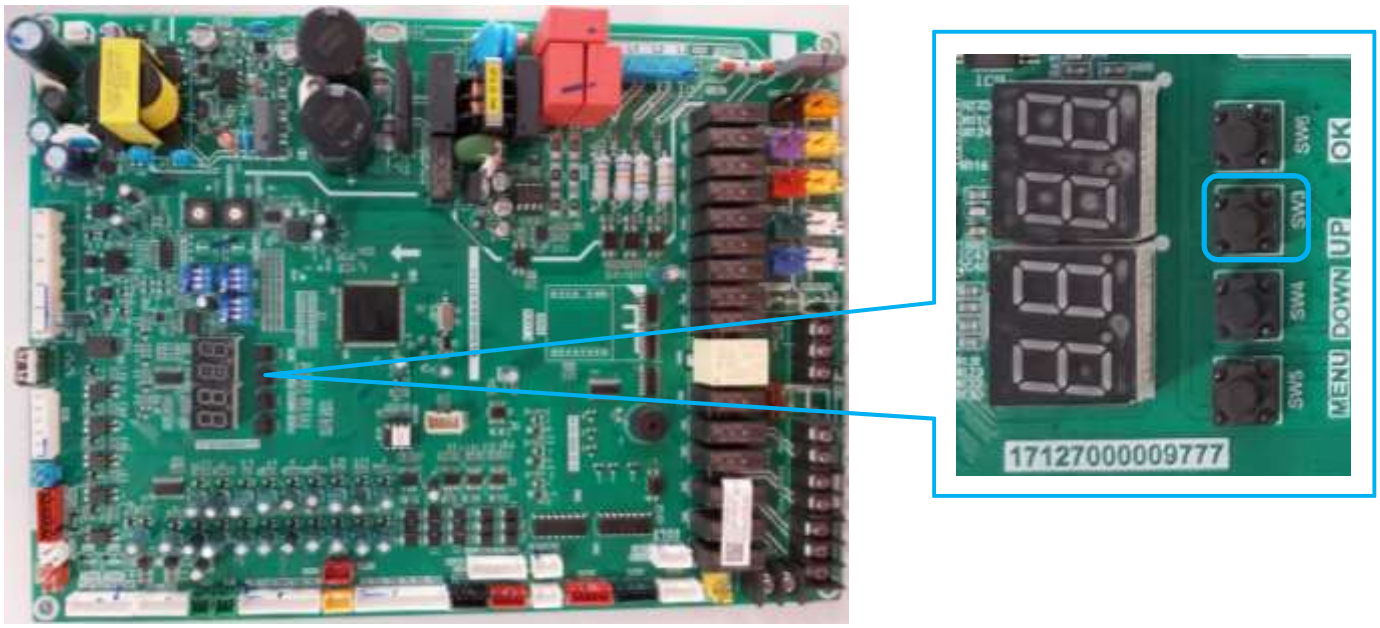


Table 4-4.1: Specific error codes for error xH4

Specific error code[1]	Content
xL0	Inverter module protection
xL1	DC bus low voltage protection
xL2	DC bus high voltage protection
xL4	MCE error
xL5	Zero speed protection
xL7	Phase sequence error
xL8	Compressor frequency variation greater than 15Hz within one second protection
xL9	Actual compressor frequency differs from target frequency by more than 15Hz protection

Notes:

1. 'x' is a placeholder for the compressor system (compressor and related electrical components), with 1 representing compressor system A and 2 representing compressor system B.

The specific error codes xL0, xL1, xL2, xL4, xL5 and xL7 can also be obtained from the inverter module LED indicators. If an inverter module error has occurred, LED1 flashes. Refer to Figure 4-4.2 and Table 4-4.2.

Figure 4-4.2: LED indicators LED1 on main PCB

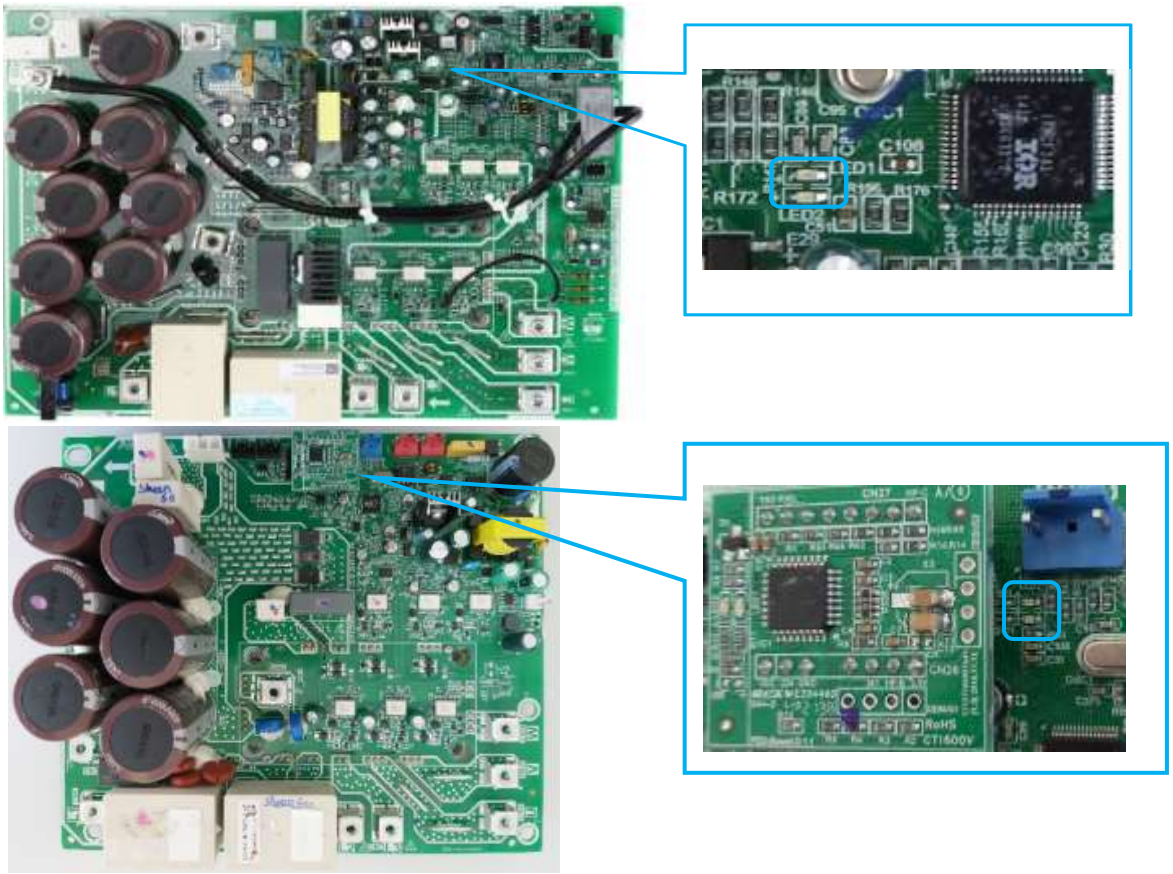


Table 4-4.2: Errors indicated on LED1

LED1 flashing pattern	Corresponding error
Flashes 8 times and stops for 1 second, then repeats	xL0 - Inverter module protection
Flashes 9 times and stops for 1 second, then repeats	xL1 - DC bus low voltage protection
Flashes 10 times and stops for 1 second, then repeats	xL2 - DC bus high voltage protection
Flashes 12 times and stops for 1 second, then repeats	xL4 - MCE error
Flashes 13 times and stops for 1 second, then repeats	xL5 - Zero speed protection
Flashes 15 times and stops for 1 second, then repeats	xL7 - Phase sequence error

4.13.5 First troubleshooting step

To troubleshoot xP6 errors, firstly ensure that the DC bus wire is connected correctly.

The DC bus wire should run from the N terminal on the inverter module, through the current sensor (in the direction indicated by the arrow on the current sensor), and end at the N terminal on the DC filter board for size 10.1-14.1.

The DC bus wire also should be connected to reactor tightly in serial, and check the sequence of 3 phase power input for compressor.

Figure 4-4.3a: DC detection wire connection method (10.1 - 14.1)

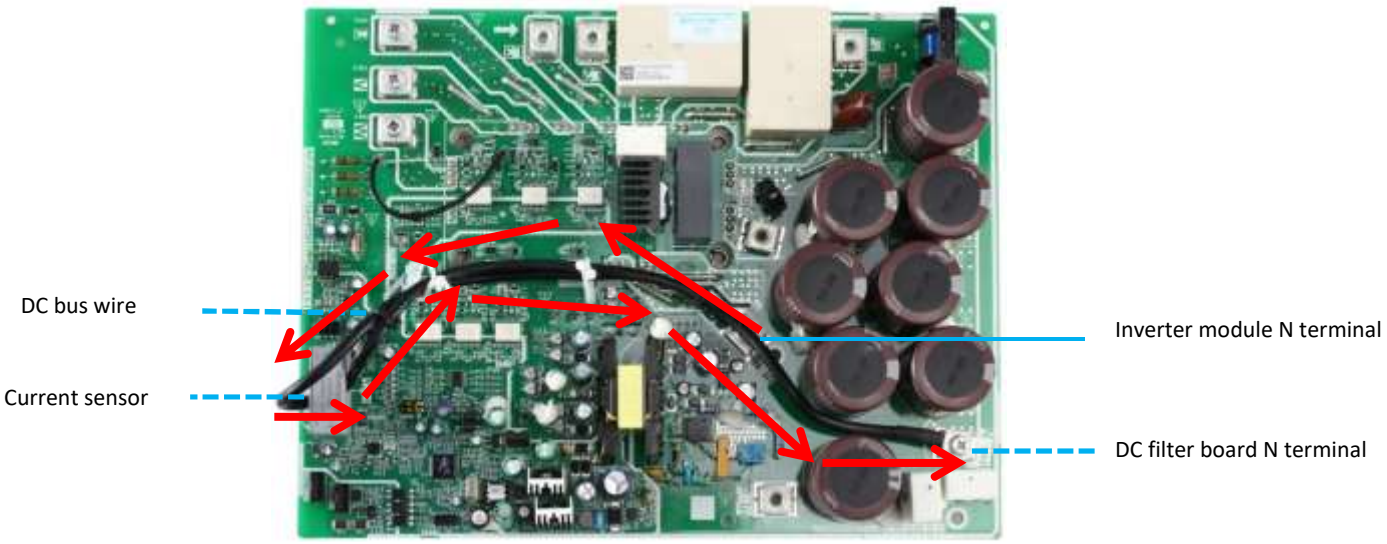
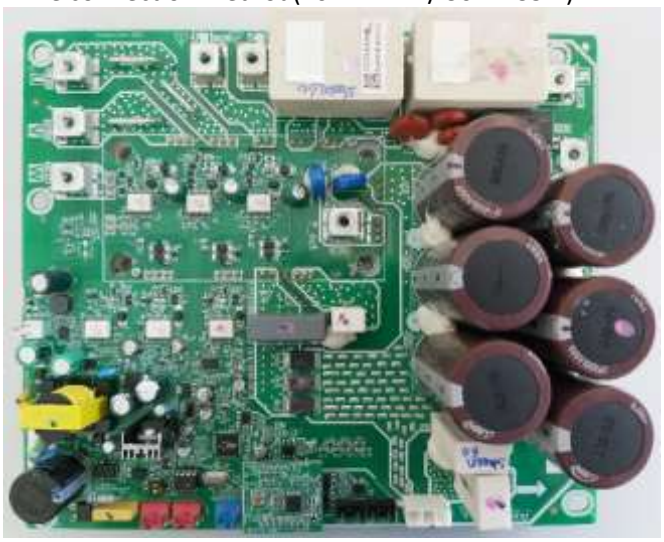


Figure 4-4.3b: DC detection wire connection method(16.2 - 22.2 / 30.2 - 35.2)



4.13.6 xL0 troubleshooting

Step 1: Check compressor

- Check that compressor wiring is all connected properly.
- The normal resistances of the inverter compressor are shown below among U V W and in MΩ range/infinite between each of U V W and ground. If any of the resistances differ from these specifications, the compressor has malfunctioned.

Compressor	Resistance
LVB65F	0.50Ω ±10% (at 20°C)
DA80PHDG-D1Y6	0.40Ω ±7% (at 20°C)

Figure 4-4.4: Measuring resistances among compressor terminals

Figure 4-4.5: Measuring resistances between compressor terminals and ground

- If the resistances are normal, go to Step 2.

Step 2: Check inverter module

- The DC voltage between terminals P1 and N1 should be 1.414 times the local power supply voltage. The DC voltage between terminals P and N should be 537-586V (power supply voltage specification: 380~415V 3N~). If either voltage is not in the normal range, troubleshoot as for xL1 or xL2 errors. Refer to Part 4, 4.13.7 “xL1/xL4 troubleshooting” or Part 4, 4.13.8 “xL2 troubleshooting”.
- Disconnect the terminals U, V, W from the inverter compressor. Measure the resistance among terminals P, N, U, V, W. All the resistances should be huge resistance(roughly up to several MΩ). If any of them are lower than tens of Kohm , the inverter module is damaged and should be replaced.

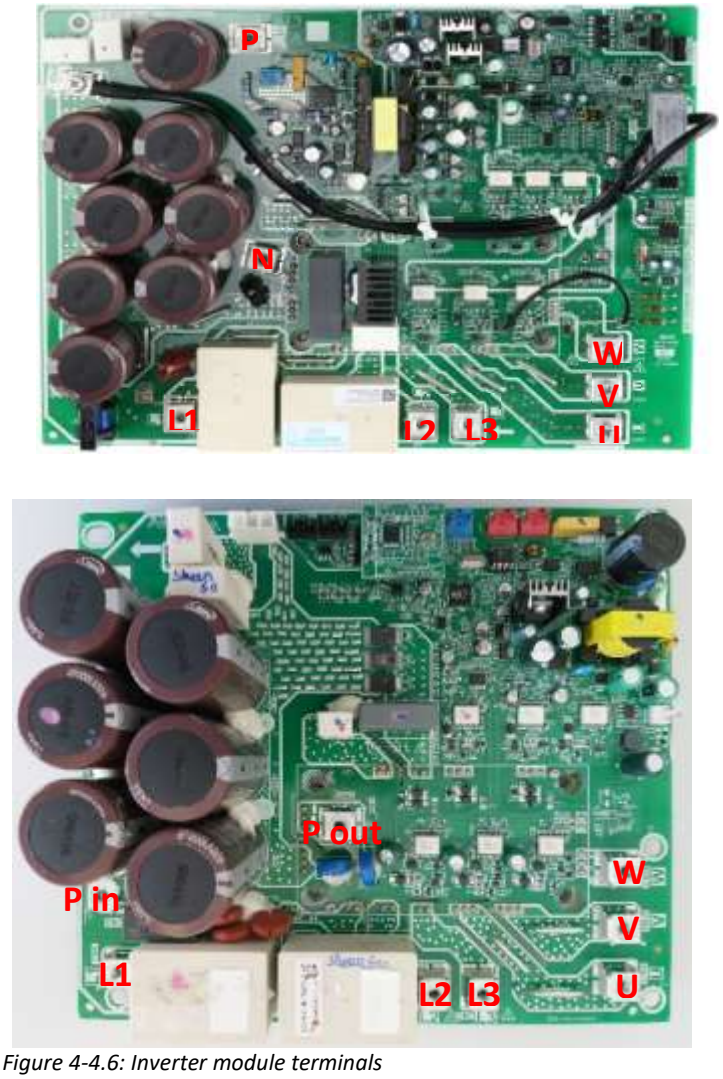


Figure 4-4.6: Inverter module terminals

4.13.7 xL1/xL4 troubleshooting

Step 1: Check inverter module

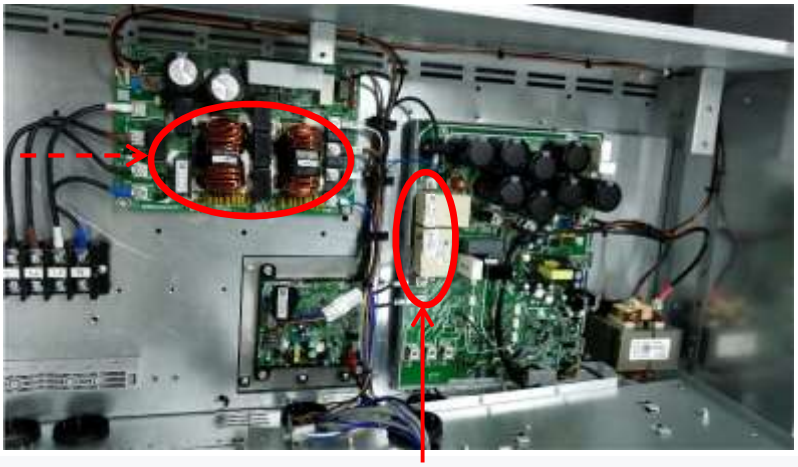
- Check the DC voltage between terminals P and N. The normal value is 537-586V (power supply voltage specification: 380~415V 3N~). If the voltage is lower than 300V, go to Step 2.

Figure 4-4.7: Inverter module terminals

Step 2: Check rectifier wiring circuit

- If the wires are loosened, fasten the wires. If the wires are OK, replace the main PCB.

Figure 4-4.8: Rectifier and AC filter board in electric control box

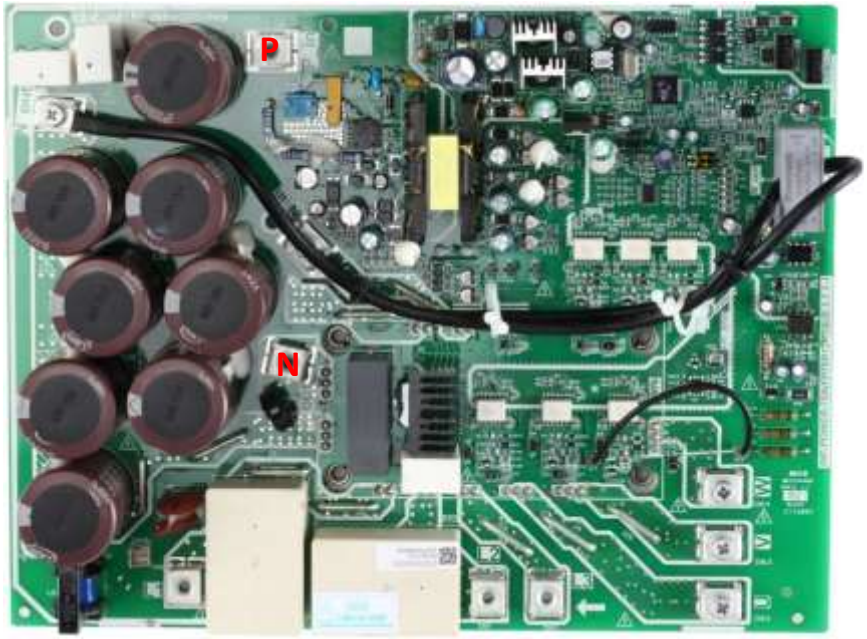


4.13.8 xL2 troubleshooting

Step 1: Check inverter module

- Check the DC voltage between terminals P and N. The normal value is 537-586V (power supply voltage specification: 380~415V 3N~), if the voltage is higher than 800V, go to Step 2.

Figure 4-4.9: Inverter module terminals



Step 2: Check inverter module

- Check the voltage between terminals P and N on the capacitor board. The normal value is 537-586V (power supply voltage specification:380~415V 3N~). If the voltage is not in the normal range, there is a problem with the electrolytic capacitor power supply. Check the power supply for high or unstable voltage. If the power supply voltage value is normal, then the main PCB has malfunctioned and needs to be replaced.

4.13.9 xL8/xL9 troubleshooting

Step 1: Check compressor

- The normal resistances of the inverter compressor are 0.3-2Ω among U V W and in MΩ range/infinite between each of U V W and ground. If any of the resistances differ from these specifications, the compressor has malfunctioned.
- Refer to Figures 4-4.4 and 4-4.5 in Part 4, 4.13.6 “xL0 troubleshooting”. If the resistance values are normal, go to Step 2.

Step 2: Check compressor and main PCB

- If there is another unit nearby (either in the same system or another system) that is operating normally, its electric control box can be used to determine whether the xL8/xL9 error is being caused by a compressor fault or a main PCB fault:
  - If using another unit in the same system as the unit with the error to perform the test, set it as the master unit (address 0); if using a unit in another system, use the master unit.
  - Disconnect the power wires of the compressor referenced in the xL8/xL9 error code.
  - In the unit that is operating normally, disconnect the power wires that connect a compressor to the electric control box and use them to connect the compressor with the xL8/xL9 error to the electric control box of the unit that is operating normally. Ensure that the U, V, W terminals are connected in the right order, and then start the system that is operating normally.
  - If the compressor with the xL8/xL9 error runs normally, replace the main PCB of the unit with the xL8/xL9 error and ensure the wiring is correct; if the compressor with the xL8/xL9 error still does not run normally, it needs to be replaced. Refer to Part 4, 4.13.10 “Compressor replacement procedure”.

  Figure 4-4.10: Connecting compressor to an error-free unit

- If there is no error-free unit nearby:
  - Replace the main PCB of the unit with the xL8/xL9 error and ensure the wiring is correct. If the compressor with the xL8/xL9 error runs normally, a fault with the main PCB was causing the xL8/xL9 error; if the compressor with the xL8/xL9 error still does not run normally, it needs to be replaced. Refer to Part 4, 4.12.10 “Compressor replacement procedure”.

4.13.10 Compressor replacement procedure

Figure 4-4.10: Draining oil from a compressor

Step 1: Remove faulty compressor and remove oil

- Remove the faulty compressor from the unit.
- Before removing the oil, shake the compressor so as to not allow impurities to remain settled at the bottom.
- Drain the oil out of the compressor and retain it for inspection. Normally the oil can be drained out from the compressor discharge pipe. Refer to Figure 4-4.12.

Step 2: Inspect oil from faulty compressor

- If the oil is clear and transparent, go to Step 6. Slightly yellow oil is not an indication of any problems.
- If the oil is dark, black or contains impurities, the system has problems and the oil needs to be changed and go to Step 3. (If the compressor oil has been spoiled, the compressor will not be being lubricated effectively. The moving parts will wear. Abrasion will lead to a larger load and higher current. More electric energy will get dissipated as heat and the temperature of the motor will become increasingly high. Finally, compressor damage or burnout will result)

Figure 4-4.11: Inspecting compressor oil

Step 3: Replace oil separator, accumulator and high pressure tank

- If the oil from a compressor is spoiled, replace oil separator, accumulator and high pressure tank.

Step 4: Check filter

- If the oil from a compressor is spoiled, check filters in the unit. If it is blocked, clean with nitrogen or replace.

Step 5: Clear the oil in the system

- If the oil from a compressor is spoiled, clear the oil in the system by nitrogen to ensure there is no spoiled oil in it.

Step 6: Replace compressor

- If the oil drained from the faulty compressor is clean and transparent in Step 2, replace the faulty compressor.

- If the oil drained from the faulty compressor is spoiled in Step 3, replace the faulty compressor and other compressor in the system. (size 10.1-14.1 has one compressor; size 16.2-35.2 has two compressors)

Step 7: Vacuum drying and refrigerant charging

- Once all the compressors and other components have been fully connected, vacuum dry the system and recharge refrigerant.

4.14 P7 Troubleshooting

4.14.1 Digital display output

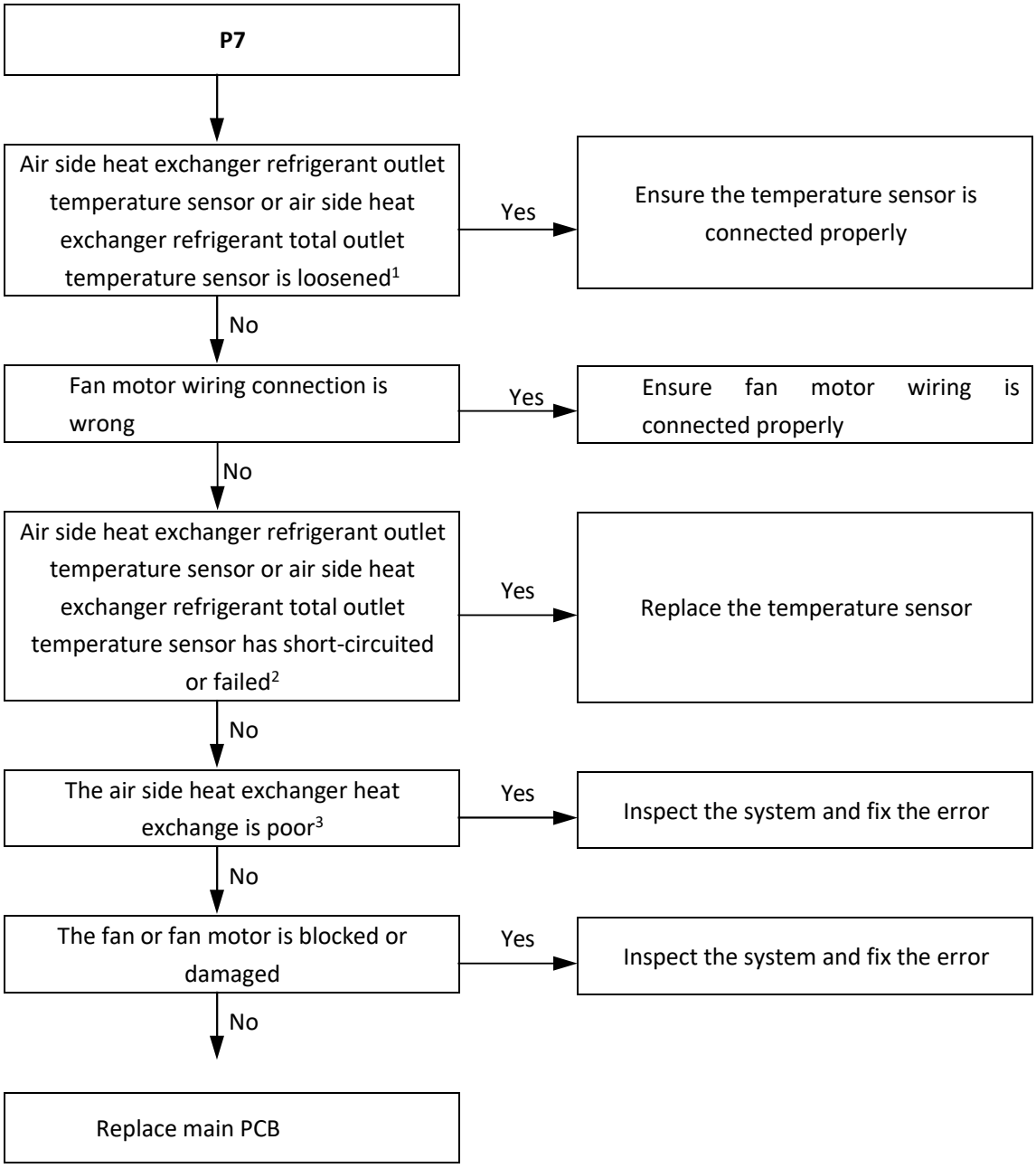
4.14.2 Description

- High temperature protection of air side heat exchanger refrigerant outlet temperature sensor or air side heat exchanger refrigerant total outlet temperature sensor in cooling mode. When the air side heat exchanger refrigerant outlet temperature is higher than 60°C or air side heat exchanger refrigerant total outlet temperature is higher than 61°C for more than 3 seconds, the system displays P7 protection and all units stop running. When the air side heat exchanger refrigerant outlet temperature drops below 50°C or air side heat exchanger refrigerant total outlet temperature drops below 58°C, P7 is removed and normal operation resumes.
- All units stop running.
- Error code is displayed on main PCB and user interface.

4.14.3 Possible causes

- Air side heat exchanger refrigerant outlet temperature sensor or air side heat exchanger refrigerant total outlet temperature sensor not connected properly or has malfunctioned.
- Fan motor wiring connection is wrong.
- Poor condenser heat exchange.
- Fan motor damaged.
- Main PCB damaged.

4.14.4 Procedure



Notes:

1. Air side heat exchanger refrigerant outlet temperature sensor and air side heat exchanger refrigerant total outlet temperature sensor connection port is CN1 and CN69 on the main PCB (labeled 10 and 4 in Figure 4-2.1 in Part 4, 2.2 “Main PCB”).
2. Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor’s resistance characteristics table, the sensor has failed. Refer to Table 5-5.1 in Part 5, 5.1 “Temperature Sensor Resistance Characteristics”.
3. Check air side heat exchanger, fan(s) and air outlets for dirt/blockages.

4.15 P9 Troubleshooting

4.15.1 Digital display output

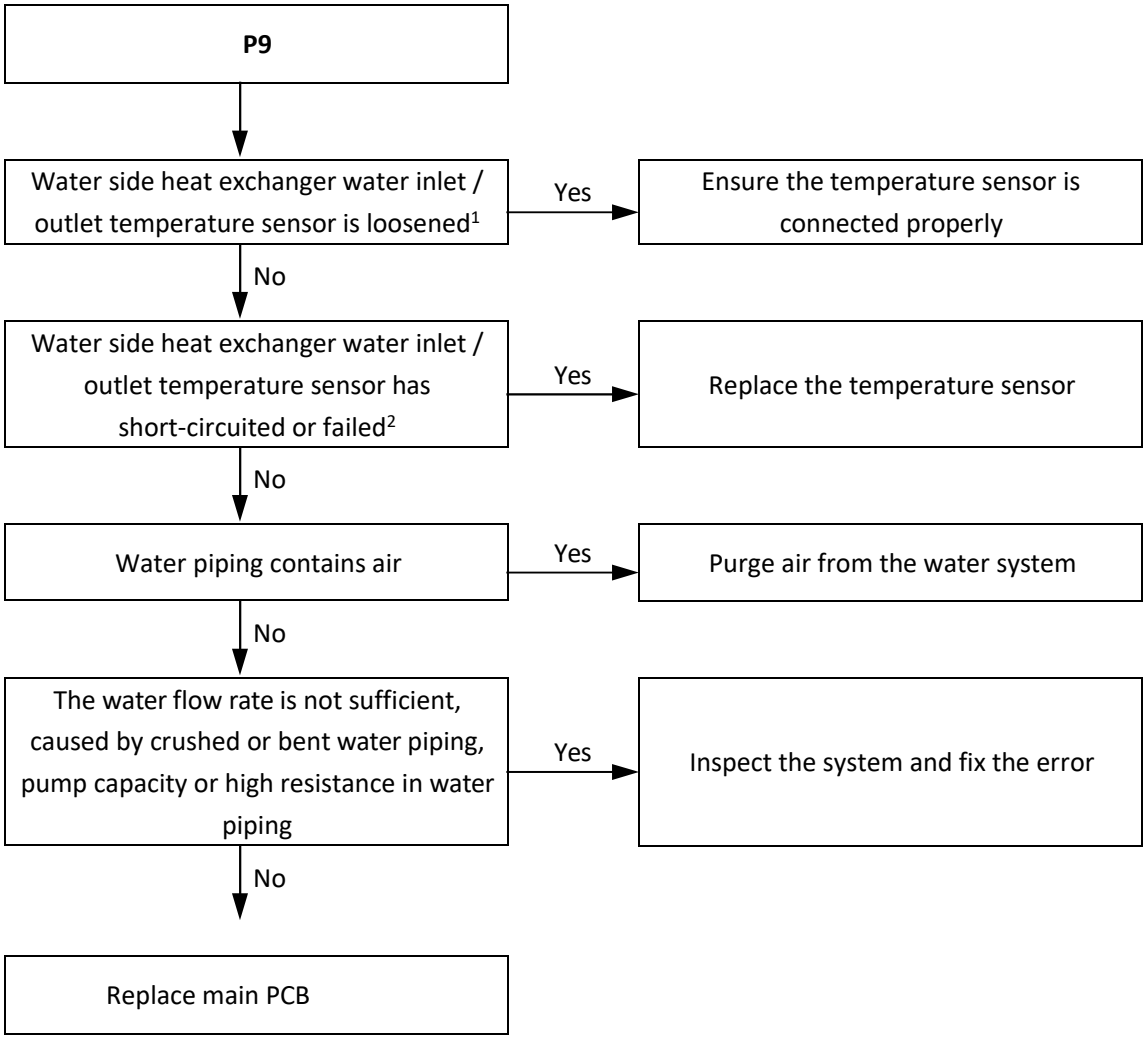
4.15.2 Description

- High temperature difference between water side heat exchanger water inlet and water outlet temperatures protection.
- All units stop running.
- Error code is displayed on main PCB and user interface.

4.15.3 Possible causes

- Temperature sensor not connected properly or has malfunctioned.
- Water piping contains air.
- Insufficient water flow.
- Main PCB damaged.

4.15.4 Procedure



Notes:

1. Water side heat exchanger water inlet temperature sensor and water side heat exchanger water outlet temperature sensor connections are port CN31 on the main PCB (labeled 8 in Figure 4-2.1 in Part 4, 2.2 "Main PCB").
2. Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor's resistance characteristics table, the sensor has failed. Refer to Table 5-5.1 in Part 5, 5.1 "Temperature Sensor Resistance Characteristics".

4.16 Pb Troubleshooting

4.16.1 Digital display output

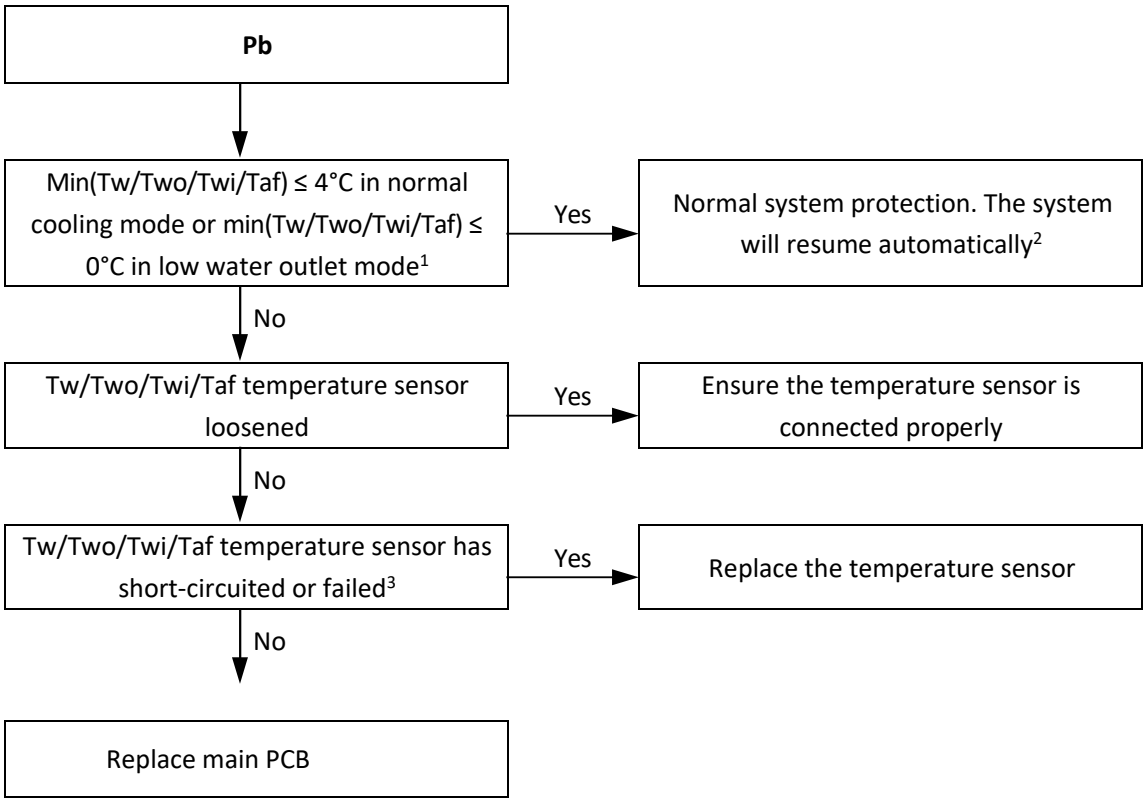
4.16.2 Description

- Water side heat exchanger anti-freeze protection.
- All units stop running.
- Error code is displayed on main PCB and **ANTI.FREEZE** icon is displayed on user interface.

4.16.3 Possible causes

- Normal system protection.
- Temperature sensor not connected properly or has malfunctioned.
- Main PCB damaged.

4.16.4 Procedure



Notes:

1. Combined water outlet temperature sensor (Tw), Water side heat exchanger water outlet temperature sensor(Two), water side heat exchanger water inlet temperature sensor (Twi) and water side heat exchanger anti-freezing temperature sensor (Taf, include Taf1 and Taf2) connections are ports CN69 and CN31 on the main PCB (labeled 4 and 8 in in Figure 4-2.1 in Part 4, 2.2 "Main PCB").
2. Refer to Part 3, 6.7 "Water Side Heat Exchanger Anti-freeze Protection Control".
3. Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor's resistance characteristics table, the sensor has failed. Refer to Table 5-5.1 in Part 5, 5.1 "Temperature Sensor Resistance Characteristics".

4.17 PC Troubleshooting

4.17.1 Digital display output

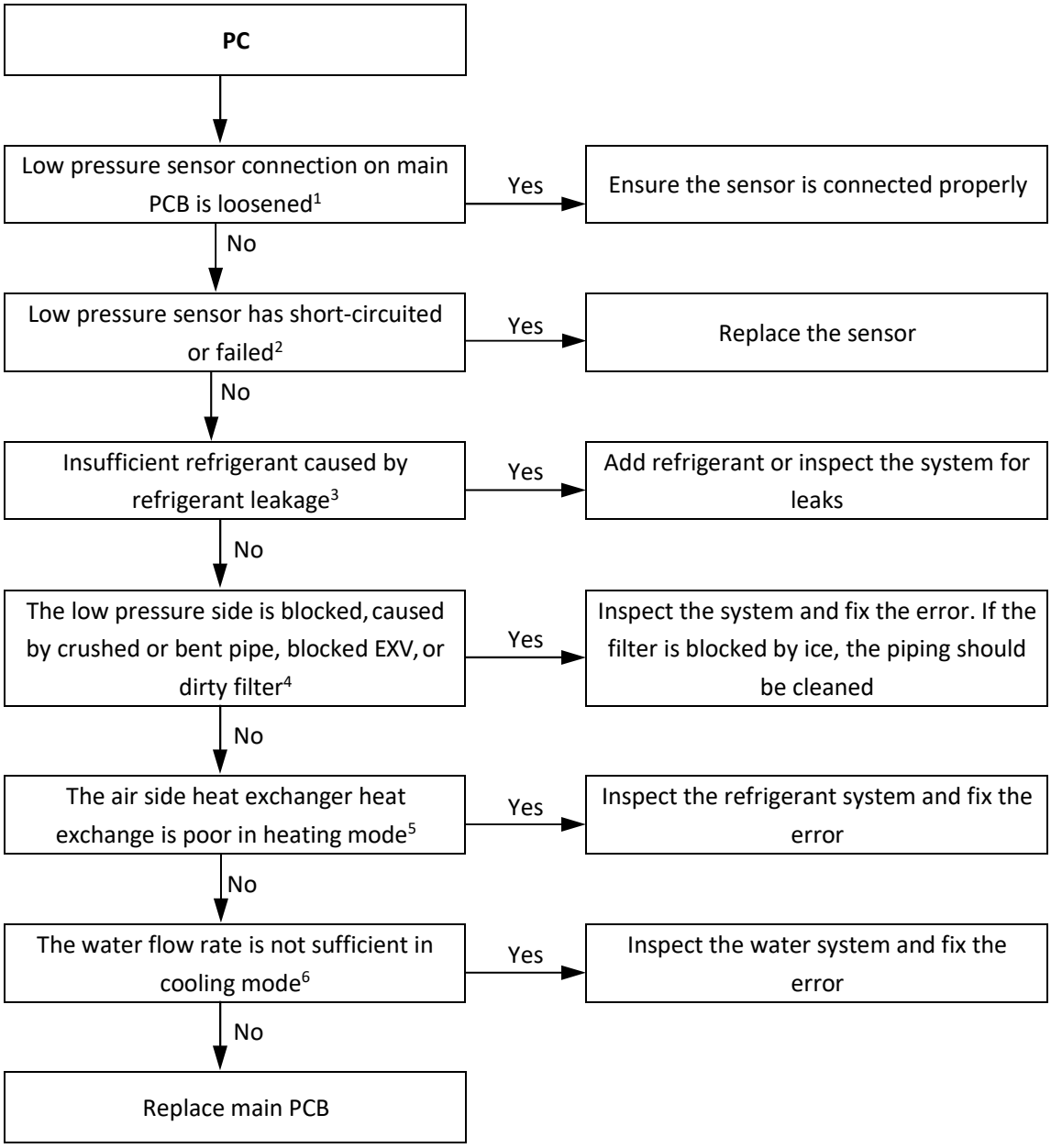
4.17.2 Description

- Water side heat exchanger low pressure protection.
- All units stop running.
- Error code is displayed on main PCB and user interface.

4.17.3 Possible causes

- Low pressure switch not connected properly or has malfunctioned.
- Insufficient refrigerant.
- Low pressure side blockage.
- Poor evaporator heat exchange in heating mode.
- Insufficient water flow in cooling mode.
- Main PCB damaged.

4.17.4 Procedure



Notes:

1. Low pressure sensor connection is port CN17 on the main PCB (labeled 9 in in Figure 4-2.1 in Part 4, 2.2 “Main PCB”).
2. Measure the resistance among the three terminals of the pressure sensor. If the resistance is of the order of mega Ohms or infinite, the pressure sensor has failed.
3. To check for insufficient refrigerant: An insufficiency of refrigerant causes compressor discharge temperature to be higher than normal, discharge and suction pressures to be lower than normal and compressor current to be lower than normal, and may cause frosting to occur on the suction pipe. These issues disappear once sufficient refrigerant has been charged into the system.
4. A low pressure side blockage causes compressor discharge temperature to be higher than normal, suction pressure to be lower than normal and compressor current to be lower than normal, and may cause frosting to occur on the suction pipe. For normal system parameters.
5. Check air side heat exchanger, fan(s) and air outlets for dirt/blockages.
6. Check water side heat exchanger, water piping, circulator pumps and water flow switch for dirt/blockages.

4.18 PH Troubleshooting

4.18.1 Digital display output

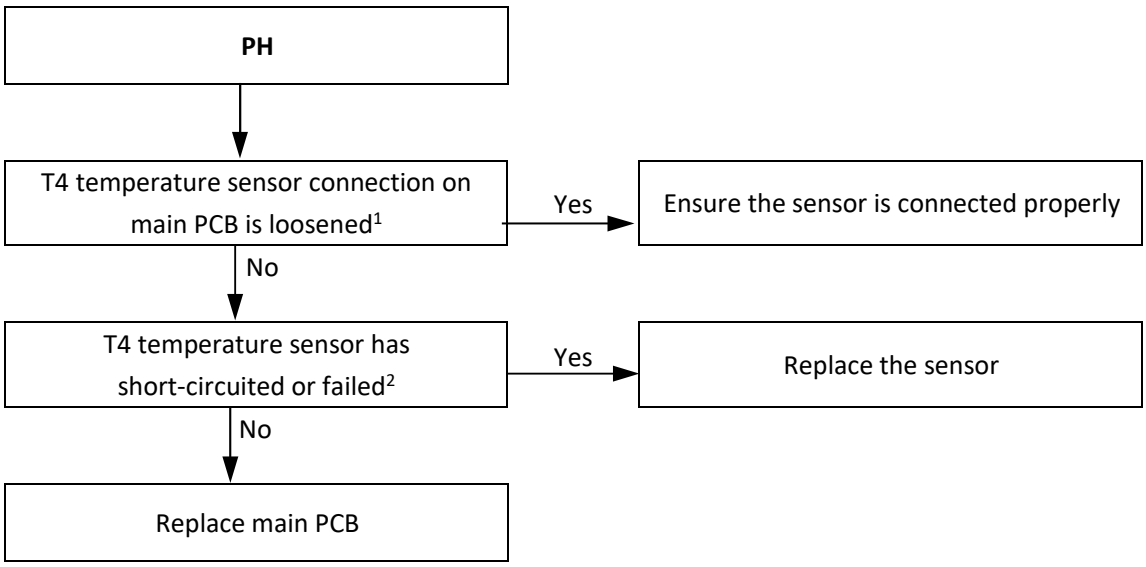
4.18.2 Description

- Ambient temperature too high protection in heating mode.
- All units stop running.
- Error code is displayed on main PCB and user interface.

4.18.3 Possible causes

- Temperature sensor not connected properly or has malfunctioned.
- Actual ambient temperature is higher than 43°C.
- Main PCB damaged.

4.18.4 Procedure



Notes:

1. Temperature detection is port CN1 on the main PCB (labeled 10 in in Figure 4-2.1 in Part 4, 2.2 “Main PCB”).
2. Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor’s resistance characteristics table, the sensor has failed. Refer to Table 5-5.1 in Part 5, 5.1 “Temperature Sensor Resistance Characteristics”.

4.19 PE Troubleshooting

4.19.1 Digital display output

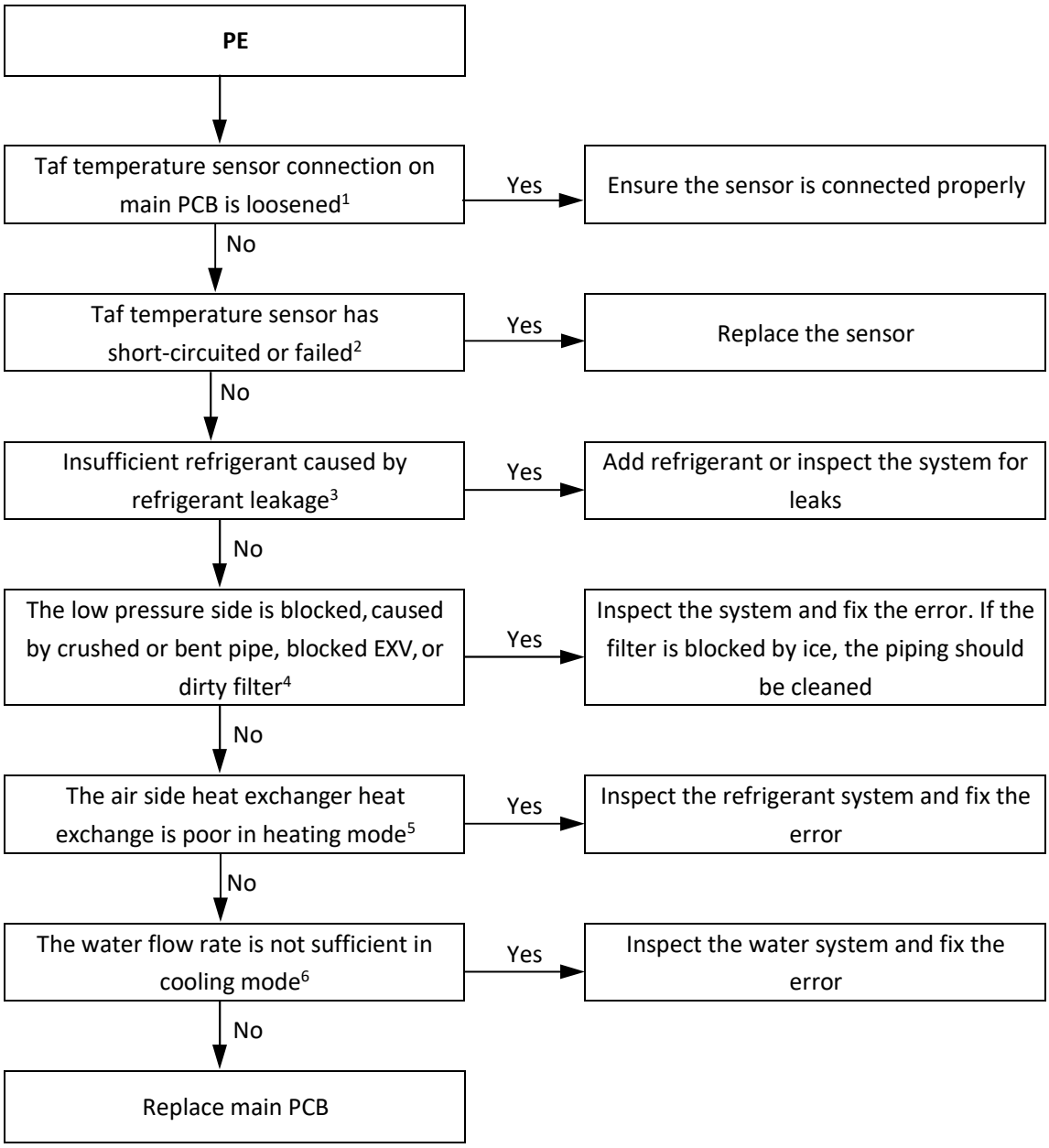
4.19.2 Description

- Water side heat exchanger low temperature protection.
- All units stop running.
- Error code is displayed on main PCB and user interface.

4.19.3 Possible causes

- Temperature sensor not connected properly or has malfunctioned.
- Insufficient refrigerant.
- Low pressure side blockage.
- Poor evaporator heat exchange in heating mode.
- Insufficient water flow in cooling mode.
- Main PCB damaged.

4.19.4 Procedure

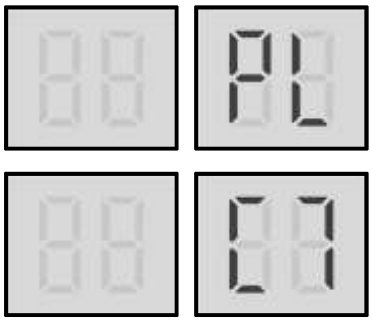


Notes:

1. Water side heat exchanger anti-freezing temperature sensor (Taf, include Taf1 and Taf2) connection are ports CN69 and CN31 on the main PCB (labeled 4 and 8 in in Figure 4-2.1 in Part 4, 2.2 “Main PCB”).
2. Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor’s resistance characteristics table, the sensor has failed. Refer Table 5-5.3 in Part 5, 5.1 “Temperature Sensor Resistance Characteristics”.
3. To check for insufficient refrigerant: an insufficiency of refrigerant causes compressor discharge temperature to be higher than normal, discharge and suction pressures to be lower than normal and compressor current to be lower than normal, and may cause frosting to occur on the suction pipe. These issues disappear once sufficient refrigerant has been charged into the system.
4. A low pressure side blockage causes compressor discharge temperature to be higher than normal, suction pressure to be lower than normal and compressor current to be lower than normal, and may cause frosting to occur on the suction pipe. For normal system parameters.
5. Check air side heat exchanger, fan(s) and air outlets for dirt/blockages.
6. Check water side heat exchanger, water piping, circulator pumps and water flow switch for dirt/blockages.

4.20 PL/C7 Troubleshooting

4.20.1 Digital display output



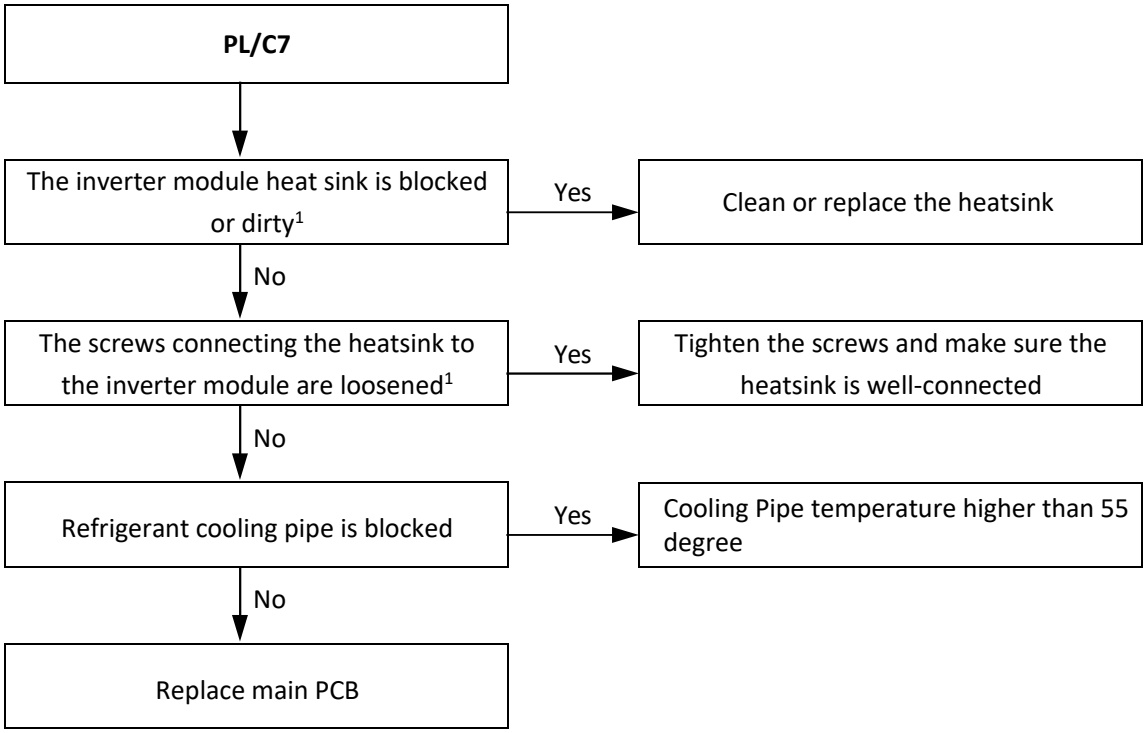
4.20.2 Description

- PL indicates inverter module temperature protection. When the main inverter module temperature rises above 82°C, the system displays PL protection and all the units stop running. When the inverter module temperature drops below 60°C, the compressor enters re-start control
- When a PL error occurs 3 times in 100 minutes, C7 will display, a manual system restart is required before the system can resume operation.
- Error code is displayed on the main PCB and user interface.

4.20.3 Possible causes

- Blocked, dirty or loose heat sink.
- Refrigerant cooling pipe is blocked
- Main PCB damaged.

4.20.4 Procedure



Notes:

1. Refer to Figures 4-1.2 , 4-1.4 and 4-1.6 in Part 4, 1 “Unit Electric Control Box Layout”.
2. Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor’s resistance characteristics table, the sensor has failed. Refer to Table 5-5.3 in Part 5, 5.1 “Temperature Sensor Resistance Characteristics”.

4.21 PU/FF Troubleshooting

4.21.1 Digital display output

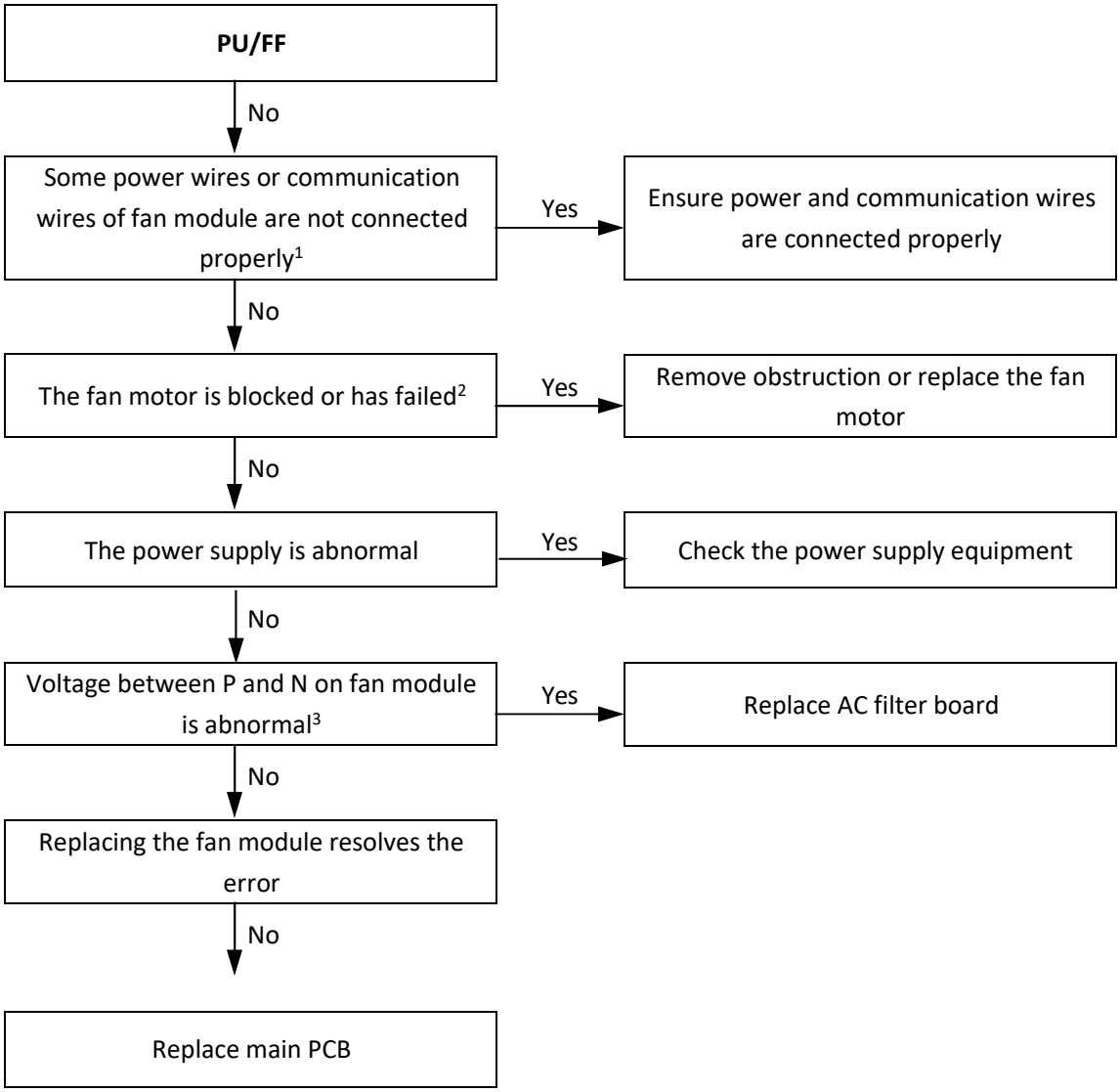
4.21.2 Description

- 1PU/FF indicates fan module A protection.
- 2PU /FF indicates fan module B protection.
- When PU error occurs 10 times in 120 minutes, FF will display, a manual system restart is required before the system can resume operation.
- All units stop running.
- Error code is only displayed on the main PCB and user interface.

4.21.3 Possible causes

- Switch SW1 incorrectly set.
- Power or communication wires not connected properly.
- Fan motor blocked or has failed.
- Power supply abnormal.
- AC filter board damaged.
- Fan module damaged.
- Inverter module PCB damaged.

4.21.4 Procedure

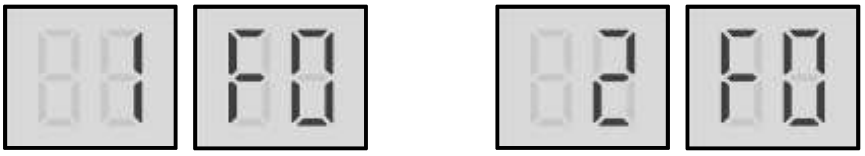


Notes:

1. Refer to Figures 4-1.2, 4-1.4 and 4-1.6 in Part 4, 1 “Unit Electric Control Box Layout”.
2. Refer to Part 2, 1 “Layout of Functional Components”.
3. The normal voltage between P and N on the fan module is 310~340V DC. Refer to Figures 4-1.2 and 4-1.4 in Part 4, 1 “Unit Electric Control Box Layout” and to Figure 4-2.6 in Part 4, 2.6 “Fan module power board”

4.22 F0 Troubleshooting

4.22.1 Digital display output



In the error code, 1 representing compressor system A and 2 representing compressor system B.

4.22.2 Description

- 1F0 indicates a communication error between the main control chip and the compressor A inverter driver chip.
- 2F0 indicates a communication error between the main control chip and the compressor B inverter driver chip.
- All units stop running.
- Error code is only displayed on the unit with the error.

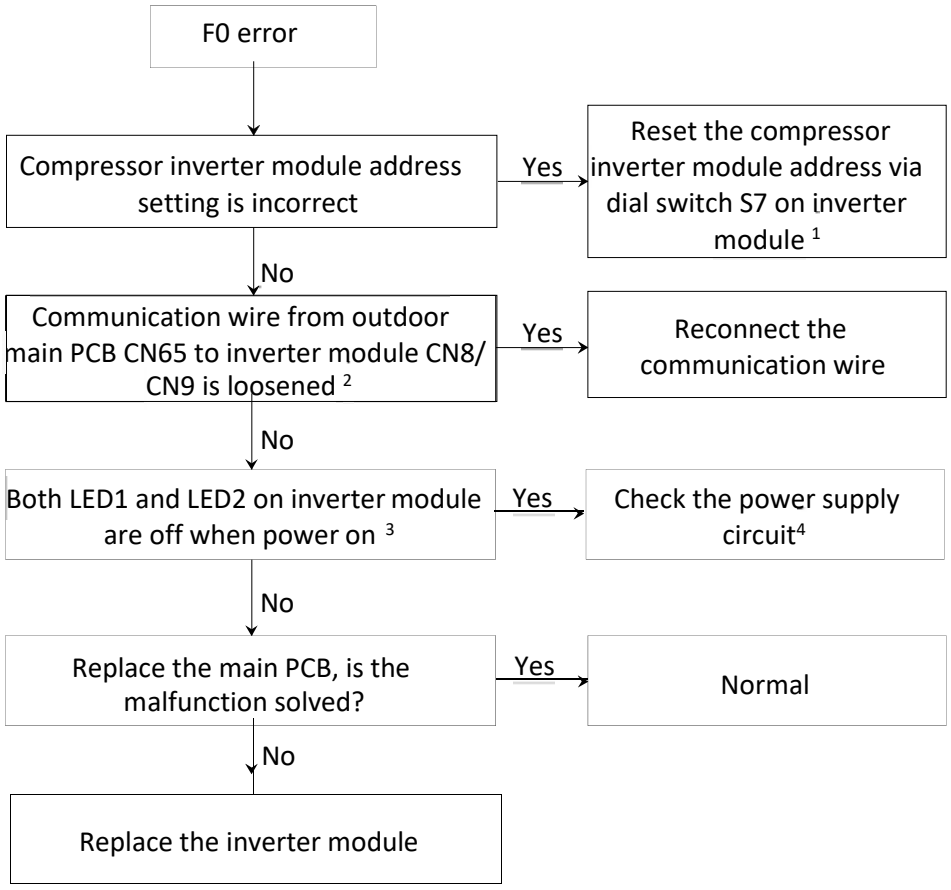
4.22.3 Trigger / recover condition

- Trigger condition: Main control chip and inverter driver chip cannot communication for 2 minutes.
- Recover condition: Communication go back to normal.
- Reset method: Resume automatically.

4.22.4 Possible causes

- Incorrect compressor inverter module address setting.
- Loosened communication wiring from the main PCB to the inverter module.
- Bridge rectifier damaged.
- Main PCB damaged.
- Compressor inverter module damaged.

4.22.5 Procedure

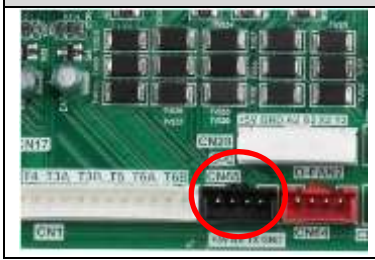
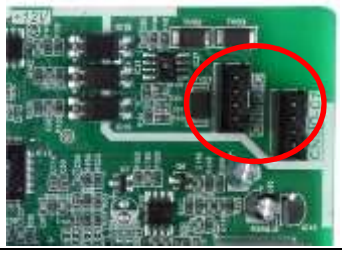


Notes:

1. Compressor inverter module address is set through dial switch S7 on the inverter module. The compressor inverter module A/B location refers to the wiring diagram.

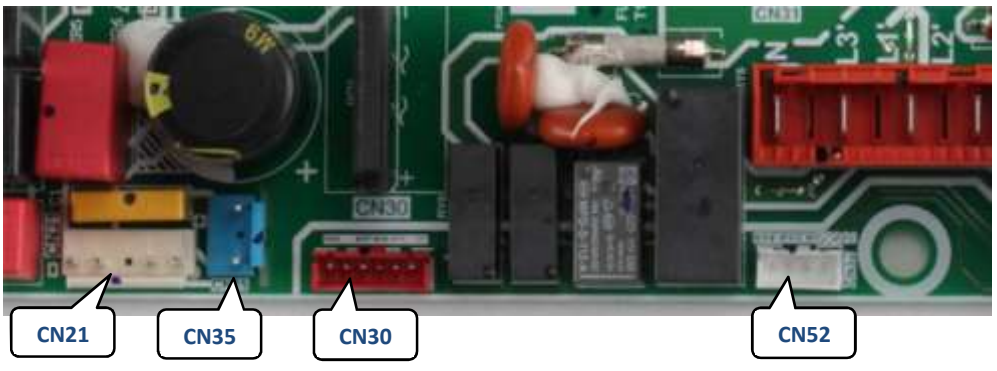
S7 on inverter module	Inverter module address
	00 for compressor inverter module A
	01 for compressor inverter module B

2. Communication wire from outdoor main PCB CN65 to inverter module CN8/CN9.

Communication port CN65 on main PCB	Communication port CN8/CN9 on inverter module
	

3. LED1/2 on inverter module

Check the power supply for the compressor inverter module, port CN4 on filter board (size 10.1-14.1) or port CN21 on filter board (size 16.2-22.2), the normal voltage should be DC310~340V; check the high pressure switch connection port CN3 on filter board of size 10.1-14.1 and port CN35 on filter board of size 16.2-22.2 , the normal resistance should be zero; Check the single phase bridge and fuse on filter board; for size 10.1-14.1, check the connection cable from main PCB port CN58 to filter board port CN6 ; for size 16.2-35.2 , check the connection cable from main PCB port CN58 to filter board port CN30 and check the connection cable from main PCB port CN52 to filter board port CN52.



4.23 H5 Troubleshooting

4.23.1 Digital display output

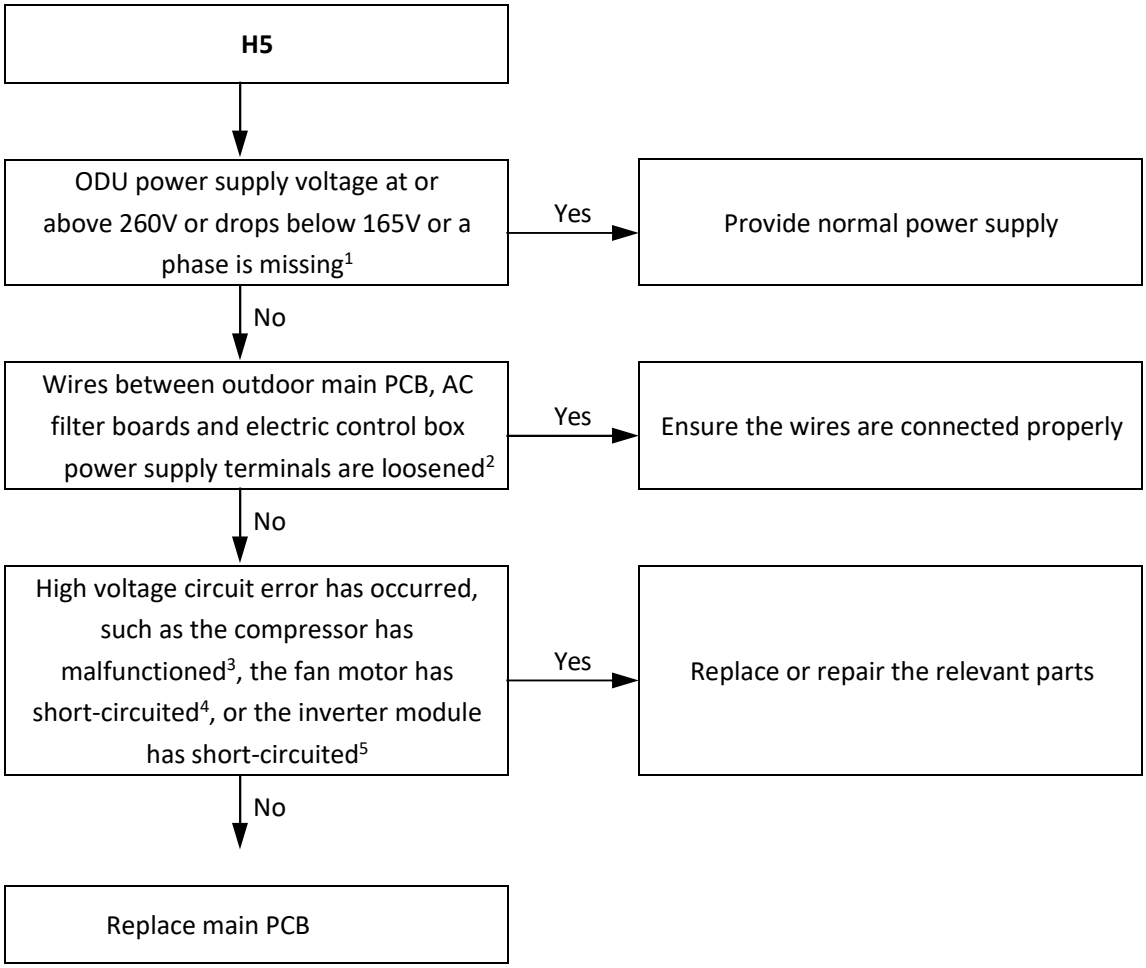
4.23.2 Description

- Abnormal power supply voltage.
- All units stop running.
- Error code is only displayed on main PCB and user interface.

4.23.3 Possible causes

- Unit power supply voltage at or above 260V or drops below 165V or a phase is missing.
- Loosened wiring within electric control box.
- High voltage circuit error.
- Main PCB damaged.

4.23.4 Procedure

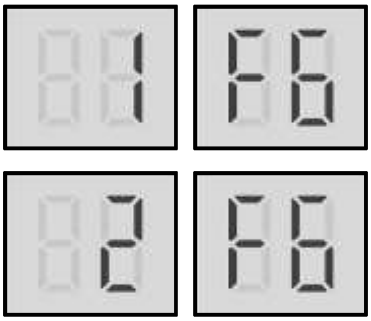


Notes:

1. The normal voltage between A and N, B and N, and C and N is 165-265V, depends on the area the unit was installed
2. Refer to Figures 4-1.1 to 4-1.4 in Part 4, 1 “Unit Electric Control Box Layout”.
3. The normal resistances of the inverter compressor are 0.3-2Ω among U V W and in MΩ range/infinite between each of U V W and ground. If any of the resistances differ from these specifications, the compressor has malfunctioned.
4. The normal resistances of the fan motor coil among U V W are less than 10Ω. If a measured resistance is 0Ω, the fan motor has short-circuited. Refer to Part 2, 1 “Layout of Functional Components”.
5. Set a multi-meter to buzzer mode and test any two terminals of P N and U V W of the inverter module. If the buzzer sounds, the inverter module has short-circuited. Refer to Figures 4-1.2and 4-1.4 in Part 4, 1 “Unit Electric Control Box Layout”.

4.24 F6 Troubleshooting

4.24.1 Digital display output



4.24.2 Description

- DC bus voltage protection.
- Only occurred in standby status.
- Error code is displayed on main PCB and user interface.

4.24.3 Possible causes

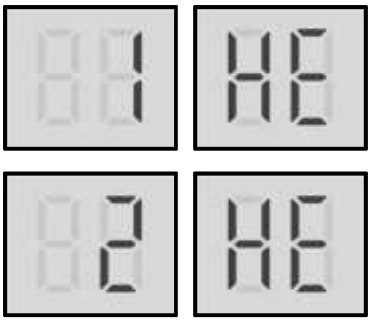
- Abnormal power supply voltage
- Loosened wiring within electric control box.
- High voltage circuit error.
- AC filter board damaged.
- 3-phase bridge rectifier damaged.
- Compressor Inverter module damaged.

4.24.4 Procedure

F6 refer to P6 protection troubleshooting: xL1 and xL2.

4.25 HE Troubleshooting

4.25.1 Digital display output



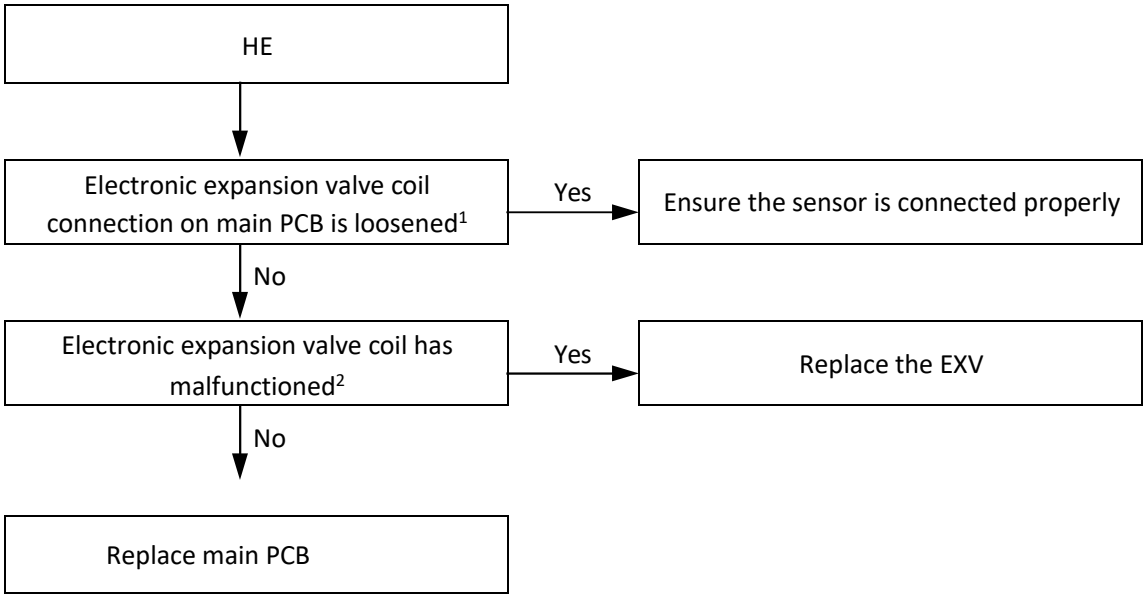
4.25.2 Description

- Electronic expansion valve connection error.
- All units stop running.
- Error code is only displayed on the unit with the error.

4.25.3 Possible causes

- Electronic expansion valve coil not connected properly or has malfunctioned.
- Damaged main PCB.

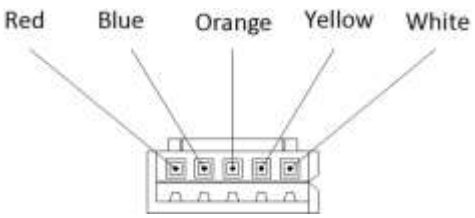
4.25.4 Procedure



Notes:

1. Electronic expansion valve coil connections are ports CN70 CN71 CN72 on the main PCB (labeled 16 in Figure 4-2.1 in Part 4, 2.2 "Main PCB").
2. The normal resistances between EXV coil wiring terminals RED and white / yellow / orange / blue are 40-50Ω. If any of the resistances differ from the value, the EXV coil has malfunctioned.

Figure 4-4.22: EXV coil wiring terminals



4.26 F2 Troubleshooting

4.26.1 Digital display output

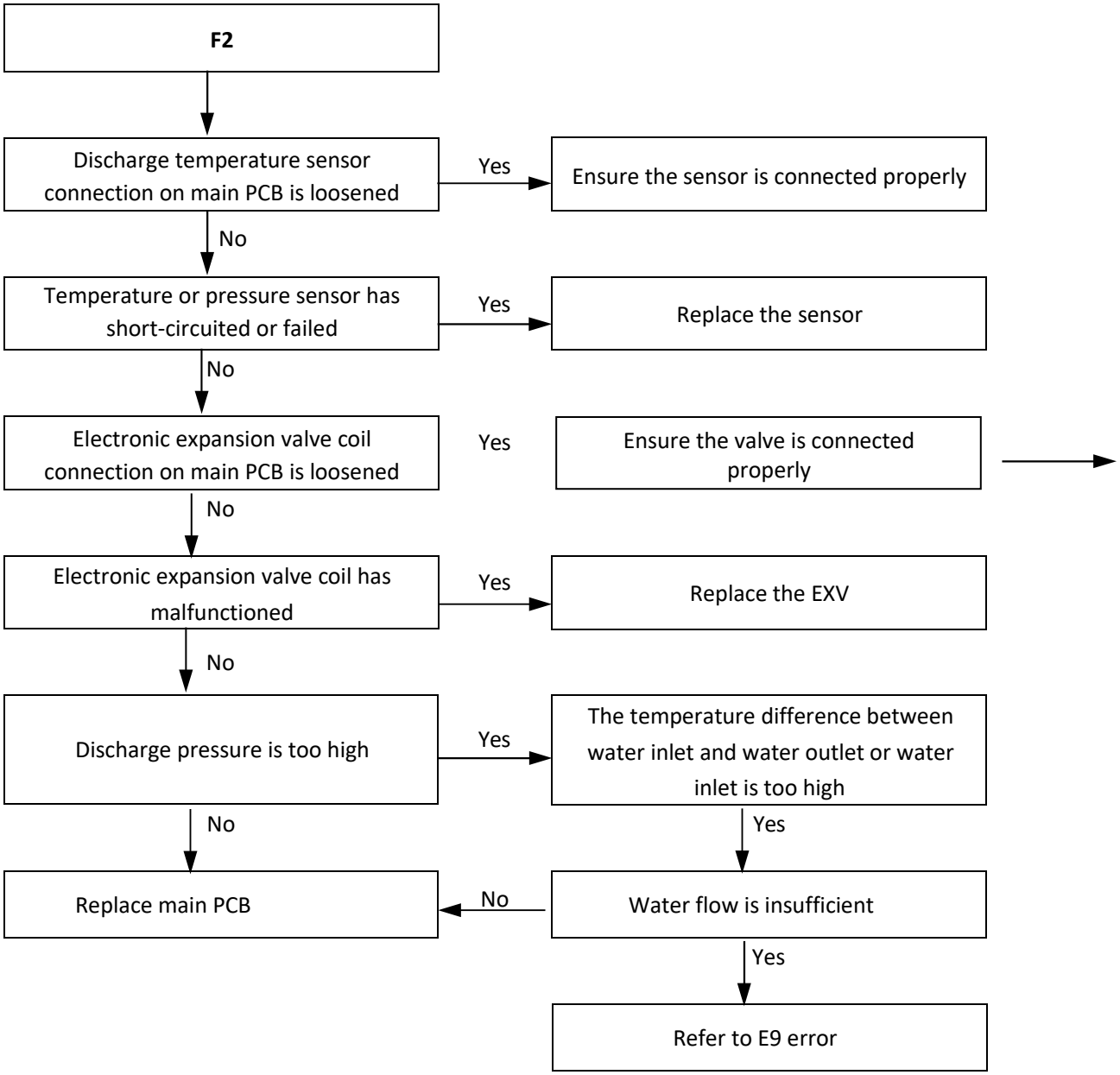
4.26.2 Description

- Insufficient protection of discharge superheat.
- All units stop running.
- Error code is only displayed on main PCB and user interface.

4.26.3 Possible causes

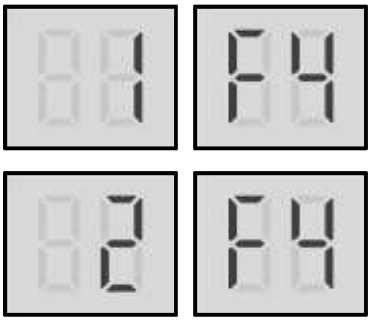
- Discharge pipe temperature sensor connected properly or has malfunctioned.
- Electronic expansion valve coil not connected properly or has malfunctioned.
- Damaged main PCB.

4.26.4 Procedure



4.27 F4 Troubleshooting

4.27.1 Digital display output



4.27.2 Description

- When a L0 or L1 error occurs 3 times in 60 minutes, F4 will display, a manual system restart is required before the system can resume operation.

4.27.3 Possible causes

- Refer to L0 or L1 error troubleshooting.

4.27.4 Procedure

- Refer to L0 or L1 error troubleshooting.

4.28 FP Troubleshooting

4.28.1 Digital display output

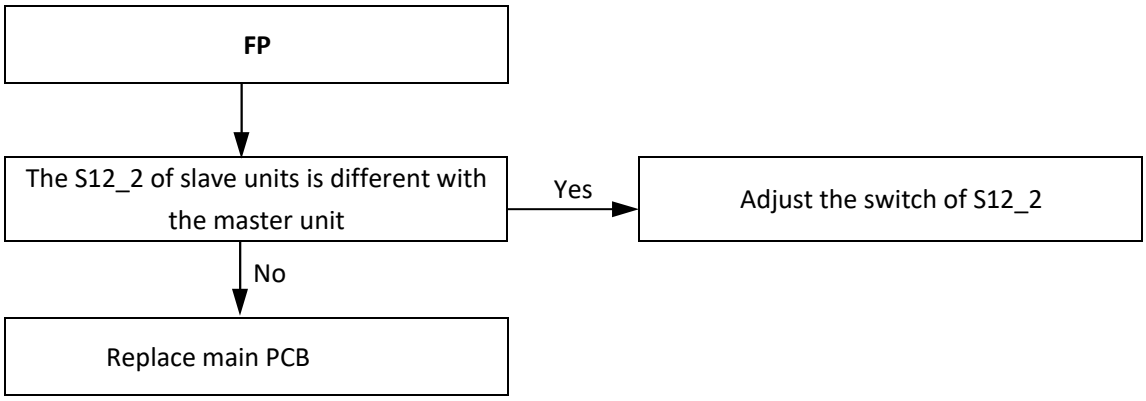
4.28.2 Description

- FP indicates pump in a combination system dial to different status. When the FP displayed, a manual system restart is required before the system can resume operation.
- All units stop running.
- Error code is only displayed on main PCB and user interface.

4.28.3 Possible causes

- The S12_2 of slave units is different with the master unit.
- Main PCB damaged.

4.28.4 Procedure



4.29 P3 Troubleshooting

4.29.1 Digital display output

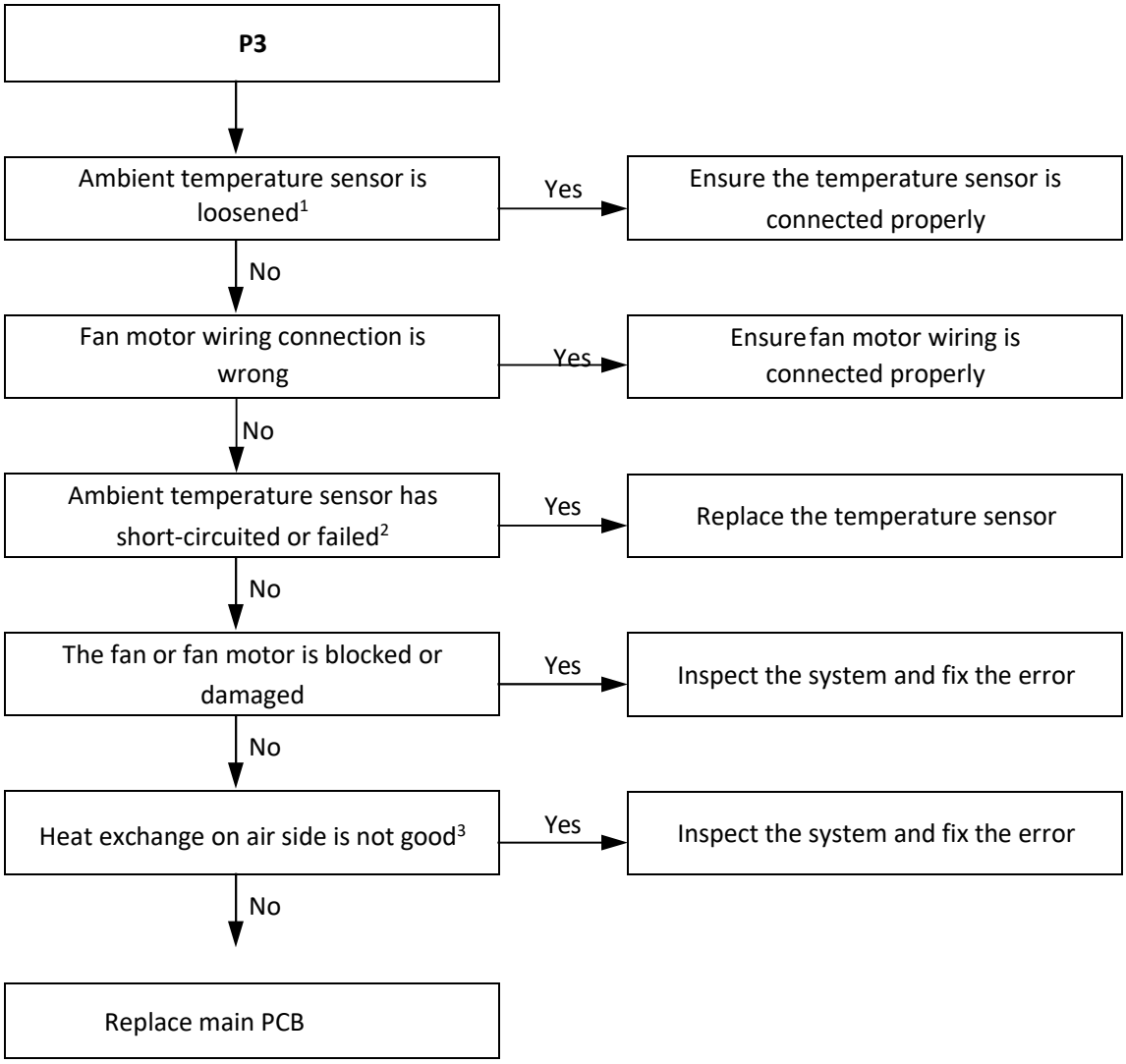
4.29.2 Description

- High temperature protection of ambient temperature sensor in cooling mode. When the ambient temperature is higher than 65°C, the system displays P3 protection and all units stop running. When the ambient temperature returns drops below 58°C, P3 is removed and normal operation resumes.
- All units stop running.
- Error code is displayed on main PCB and user interface.

4.29.3 Possible causes

- Ambient temperature sensor is not connected properly or has malfunctioned.
- Fan motor wiring connection is wrong.
- Poor condenser heat exchange.
- Fan motor damaged.
- Main PCB damaged.

4.29.4 Procedure



Notes:

1. Ambient temperature sensor connection port is CN1 on the main PCB (labeled 10 in Figure 4-2.1 in Part 4, 2.2 "Main PCB").
2. Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor's resistance characteristics table, the sensor has failed. Refer to Table 5-5.1 in Part 5, 5.1 "Temperature Sensor Resistance Characteristics".
3. Check air side heat exchanger, fan(s) and air outlets for dirt/blockages.

5 Appendix to Part 5

5.1 Temperature Sensor Resistance Characteristics

Table 5-5.1: Outdoor ambient temperature sensor and outdoor heat exchanger or plate heat exchanger temperature sensor resistance characteristics

Temperature (°C)	Resistance (kΩ)	Temperature (°C)	Resistance (kΩ)	Temperature (°C)	Resistance (kΩ)	Temperature (°C)	Resistance (kΩ)
-20	115.3	**20**	12.64	**60**	2.358	**100**	0.6297
-19	108.1	**21**	12.06	**61**	2.272	**101**	0.6115
-18	101.5	**22**	11.50	**62**	2.191	**102**	0.5939
-17	96.34	**23**	10.97	**63**	2.112	**103**	0.5768
-16	89.59	**24**	10.47	**64**	2.037	**104**	0.5604
-15	84.22	**25**	10.00	**65**	1.965	**105**	0.5445
-14	79.31	**26**	9.551	**66**	1.896	**106**	0.5291
-13	74.54	**27**	9.124	**67**	1.830	**107**	0.5143
-12	70.17	**28**	8.720	**68**	1.766	**108**	0.4999
-11	66.09	**29**	8.336	**69**	1.705	**109**	0.4860
-10	62.28	**30**	7.971	**70**	1.647	**110**	0.4726
-9	58.71	**31**	7.624	**71**	1.591	**111**	0.4596
-8	56.37	**32**	7.295	**72**	1.537	**112**	0.4470
-7	52.24	**33**	6.981	**73**	1.485	**113**	0.4348
-6	49.32	**34**	6.684	**74**	1.435	**114**	0.4230
-5	46.57	**35**	6.400	**75**	1.387	**115**	0.4116
-4	44.00	**36**	6.131	**76**	1.341	**116**	0.4006
-3	41.59	**37**	5.874	**77**	1.291	**117**	0.3899
-2	39.82	**38**	5.630	**78**	1.254	**118**	0.3796
-1	37.20	**39**	5.397	**79**	1.2133	**119**	0.3695
0	35.20	**40**	5.175	**80**	1.174	**120**	0.3598
1	33.33	**41**	4.964	**81**	1.136	**121**	0.3504
2	31.56	**42**	4.763	**82**	1.100	**122**	0.3413
3	29.91	**43**	4.571	**83**	1.064	**123**	0.3325
4	28.35	**44**	4.387	**84**	1.031	**124**	0.3239
5	26.88	**45**	4.213	**85**	0.9982	**125**	0.3156
6	25.50	**46**	4.046	**86**	0.9668	**126**	0.3075
7	24.19	**47**	3.887	**87**	0.9366	**127**	0.2997
8	22.57	**48**	3.735	**88**	0.9075	**128**	0.2922
9	21.81	**49**	3.590	**89**	0.8795	**129**	0.2848
10	20.72	**50**	3.451	**90**	0.8525	**130**	0.2777
11	19.69	**51**	3.318	**91**	0.8264	**131**	0.2708
12	18.72	**52**	3.192	**92**	0.8013	**132**	0.2641
13	17.80	**53**	3.071	**93**	0.7771	**133**	0.2576
14	16.93	**54**	2.959	**94**	0.7537	**134**	0.2513
15	16.12	**55**	2.844	**95**	0.7312	**135**	0.2451
16	15.34	**56**	2.738	**96**	0.7094	**136**	0.2392
17	14.62	**57**	2.637	**97**	0.6884	**137**	0.2334
18	13.92	**58**	2.540	**98**	0.6682	**138**	0.2278
19	13.26	**59**	2.447	**99**	0.6486	**139**	0.2223

Table 5-5.2: Compressor top temperature sensor and discharge pipe temperature sensor resistance characteristics

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

Table 5-5.3: Inverter module temperature sensor resistance characteristics

Temperature (°C)	Resistance (kΩ)	Temperature (°C)	Resistance (kΩ)	Temperature (°C)	Resistance (kΩ)	Temperature (°C)	Resistance (kΩ)
-30	971.4	**10**	109.0	**50**	19.70	**90**	5.000
-29	912.8	**11**	103.9	**51**	18.97	**91**	4.855
-28	858.2	**12**	99.02	**52**	18.26	**92**	4.705
-27	807.3	**13**	94.44	**53**	17.59	**93**	4.566
-26	759.7	**14**	90.11	**54**	16.94	**94**	4.431
-25	715.3	**15**	86.00	**55**	16.32	**95**	4.301
-24	673.6	**16**	82.09	**56**	15.73	**96**	4.176
-23	634.7	**17**	78.38	**57**	15.16	**97**	4.055
-22	598.2	**18**	74.87	**58**	14.62	**98**	3.938
-21	564.1	**19**	71.53	**59**	14.10	**99**	3.825
-20	532.2	**20**	68.36	**60**	13.60	**100**	3.716
-19	502.2	**21**	65.34	**61**	13.12	**101**	3.613
-18	474.1	**22**	62.47	**62**	12.65	**102**	3.514
-17	447.7	**23**	59.75	**63**	12.22	**103**	3.418
-16	423.0	**24**	57.17	**64**	11.79	**104**	3.326
-15	399.8	**25**	54.71	**65**	11.39	**105**	3.235
-14	378.0	**26**	52.36	**66**	10.99	**106**	3.148
-13	357.5	**27**	50.13	**67**	10.62	**107**	3.063
-12	338.2	**28**	48.01	**68**	10.25	**108**	2.982
-11	320.1	**29**	45.99	**69**	9.909	**109**	2.902
-10	303.1	**30**	44.07	**70**	9.576	**110**	2.826
-9	287.1	**31**	42.23	**71**	9.253	**111**	2.747
-8	272.0	**32**	40.48	**72**	8.947	**112**	2.672
-7	257.8	**33**	38.81	**73**	8.646	**113**	2.599
-6	244.4	**34**	37.23	**74**	8.362	**114**	2.528
-5	231.9	**35**	35.71	**75**	8.089	**115**	2.460
-4	220.0	**36**	34.27	**76**	7.821	**116**	2.390
-3	208.7	**37**	32.89	**77**	7.569	**117**	2.322
-2	198.2	**38**	31.58	**78**	7.323	**118**	2.256
-1	188.2	**39**	30.33	**79**	7.088	**119**	2.193
0	178.8	**40**	29.13	**80**	6.858	**120**	2.132
1	169.9	**41**	27.98	**81**	6.640	**121**	2.073
2	161.5	**42**	26.89	**82**	6.432	**122**	2.017
3	153.6	**43**	25.85	**83**	6.230	**123**	1.962
4	146.1	**44**	24.85	**84**	6.033	**124**	1.910
5	139.1	**45**	23.90	**85**	5.847	**125**	1.859
6	132.3	**46**	22.98	**86**	5.667		
7	126.0	**47**	22.10	**87**	5.492		
8	120.0	**48**	21.26	**88**	5.322		
9	114.3	**49**	20.47	**89**	5.159		

5.2 Normal Operating Parameters of Refrigerant System

Under the following conditions, the operating parameters given in Tables 5-5.4 and 5-5.5 should be observed:

- If the outdoor ambient temperature is high, the system is being run in normal cooling mode with the following settings: temperature 5°C.
- If the outdoor ambient temperature is low, the system is being run in heating mode with the following settings: temperature 55°C.
- The system has been running normally for more than 30 minutes.

Table 5-5.4: Unit in normal cooling mode operating parameters

Outdoor ambient temperature	**°C**	< 10	10 to 25	25 to 35	35 to 43	
Average discharge temperature	**°C**	60-90	65-95	70-99	75-108	
Average discharge superheat	**°C**	28-38	28-40	29-42	30-46	
Discharge pressure	**MPa**	1.8-2.9	1.9-3.2	2.0-3.8	2.6-3.9	
Average suction superheat	**°C**	3-7	4-9	5-11	6-12	
Suction pressure	**MPa**	0.6-0.9	0.7-1.0	0.8-1.2	1.0-1.3	
Average suction temperature	**°C**	7-18	7-20	8-22	10-25	
T3	**°C**	0-15	15-35	30-48	48-54	
Tz/7	**°C**	20-25	12-30	28-46	44-52	
Taf	**°C**	5-25	5-25	5-25	5-25	
T6A/B	**°C**	-2-17	0-20	3-35	5-40	
Twi	**°C**	10-25	10-25	10-25	10-25	
Two	**°C**	5-20	5-20	5-20	5-20	
Tw	**°C**	5-20	5-20	5-20	5-20	
DC fan motor current	**A**	0.2-6	2-6	3-6	4-6	
DC inverter compressor current	**A**	6-12	2-16	3-17	4-18	

Table 5-5.5: Unit in heating mode operating parameters

Outdoor ambient temperature	**°C**	< -10	-10 to 0	0 to 7	7 to 20	> 20
Average discharge temperature	**°C**	50-104	55-103	60-103	65-102	70-100
Average discharge superheat	**°C**	35-55	35-55	32-50	34-50	35-50
Discharge pressure	**MPa**	1.8-2.9	1.9-2.9	1.9-3.4	2.2-3.6	2.4-3.9
Average suction superheat	**°C**	-2-0	-2-2	-1-4	0-6	1-8
Suction pressure	**MPa**	0.2-0.5	0.3-0.7	0.4-0.9	0.6-1.2	0.8-1.4
Average suction temperature	**°C**	-22 to -11	-16 to 2	-10 to 5	0 to 15	5 to 18
T3	**°C**	-20 to -11	-16 to 0	-10 to 2	1 to 12	5 to 15
Tz/7	**°C**	-19 to -4	-14 to 1	-5 to -2	1 to 6	2 to 10
Taf	**°C**	20-45	20-50	20-54	20-54	20-54
T6A/B	**°C**	-2-20	0-25	3-35	8-40	13-43
Twi	**°C**	20-40	20-45	20-50	20-50	20-50
Two	**°C**	25-45	25-50	25-54	25-54	25-54
Tw	**°C**	25-45	25-50	25-54	25-54	25-54
DC fan motor current	**A**	5-6	4-6	2-6	0.5-6	0.3-6
DC inverter compressor current	**A**	1-15	1-16	1-17	2-18	2-18

6 - ADJUSTMENTS

UNLOCK	To lockout / unlock.
▲ ▼	To modify current setpoint
MENU	To open the various menus from the HOME screen
▲ ▼ ◄ ►	To move the cursor, change the selection or change the set value. The parameter can be quickly changed with a long press.
OK	To confirm an operation.
ON/OFF	To set the ON / OFF function.
BACK	To return to the previous level. Press to exit the current page and return to the previous page. Long press to return straight to the home screen.

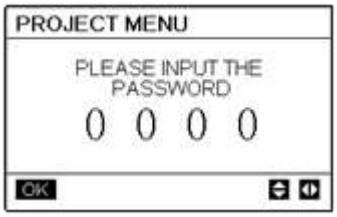
Menu structure

Press “🔓” for 3 seconds to unlock the keypad.

Setting PROJECT MENU (pwd: 5432)

◆ Entering the password:

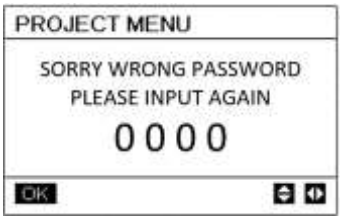
Select "PROJECT MENU", and press "↵" to enter the menu. The screen prompts the user to enter the password, as shown below:



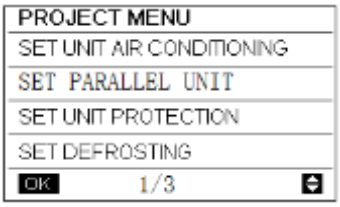
The initial password must be obtained by a professional. Press the "▲" and "▼" buttons to change the number to enter, and press the "◄" and "►" buttons to change the bit code to enter. After the number is entered, the display is not changed. After entering the password, press the "↵" button to enter the interface; press the "⮌" button to go back to the previous interface; the display is as follows if the input is incorrect:

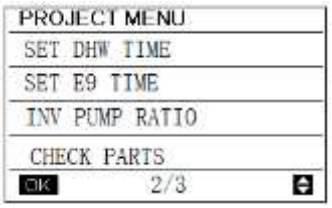
NOTE

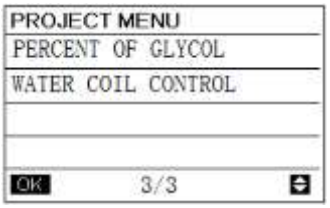
Non-professionals are not allowed to change the parameters, otherwise it may cause abnormal failures.



The query interface as follows is displayed if the input is correct:

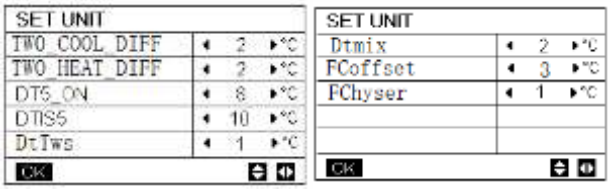






Set unit air-conditioning:

Press "▼" and "▲" buttons to select the "SET UNIT AIR-CONDITIONING" in the "PROJECT MENU" interface, and press the "↵" button to enter the interface. The interface display is as follows:



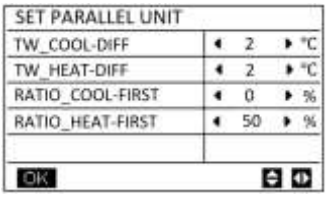
Press "▲" or "▼" to select item and press “◄” or “►” to set suitable temperature or time. Press “ ” to confirm. Back to homepage if there is no operation within 60s.

Detailed setup information:

	Setting range	Default value	Adjustment value	Note
Two_COOL_DIFF	1∽5℃	2℃	1℃	
Two_HEAT_DIFF	1∽5℃	2℃	1℃	
dT5_ON	2∽10℃	8℃	1℃	DHW
Dt1s5	5∽20℃	10℃	1℃	

◆ Set parallel unit:

Select “SET PARALLEL UNIT” and press “ ” to entry. Display as follows:



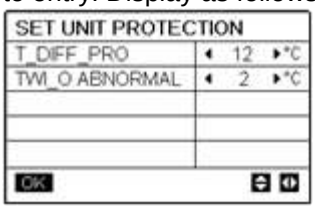
Press "▲" or "▼" to select item to be set and press "◄" or " ►" to set value. Press " " to confirm. Back to homepage if there is no operation within 60s.

Detailed setup information:

	Setting range
Tw_Cool_diff	1~5℃
Tw_Heat_diff	1~5℃
Ratio_cool_first	5~100%
Ratio_heat_first	5~100%

◆ Set unit protection:

Select "SET UNIT PROTECTION" and press " " to entry. Display as follows:



Press "▲" or "▼" to select item to be set and press "◄ " or " ► " to set value. Press "↵" to confirm. Back to homepage if there is no operation within 60s.

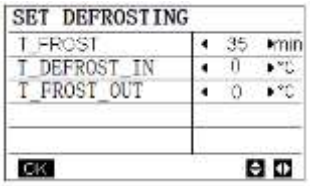
Detailed setup information:

	Setting range
T_DIFF_PRO	8~15℃
TWI-O ABNORMAL	1~5℃

◆ Set defrosting:

Select "SET DEFROSTING" and press "↵" to entry.

Display as follows:



Press "▲" or "▼" to select item to be set and press "◄" or " ►" to set value. Press "↵" to confirm. Back to homepage if there is no operation within 60s.

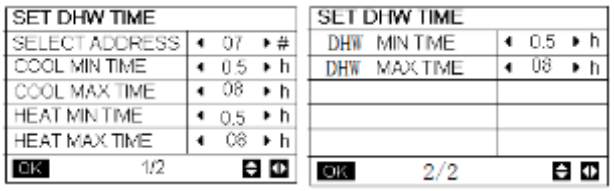
Detailed setup information:

	Setting range
T_FROST	20~180min
T_DEFROST_IN	-5~5℃
T_FROST_OUT	-10~10℃

◆ DHW time setting:

Select "SET DHW TIME" and press "↵" to entry.

Display as follows:



Press "▲" or "▼" to select item to be set and press "◄" or " ►" to set value. Press "↵" to confirm. Back to homepage if there is no operation within 60s.

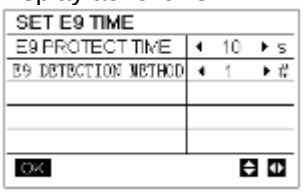
Detailed setup information:

	Setting range
SELECT ADDRESS	0~15
COOL MIN TIME 0.5h	0.5~24h
COOL MAX TIME	0.5~24h
HEAT MIN TIME	0.5~24h
HEAT MAX TIME	0.5~24h
HOT WATER MIN TIME	0.5~24h
HOT WATER MAX TIME	0.5~24h

◆E9 Error time setting:

Select "SET E9 TIME" and press "↵" to entry.

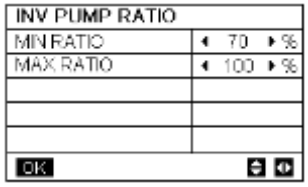
Display as follows:



Press "▲" or "▼" to select item to be set and press " ◄ " or " ► " to set value (setting range 2-20s, default 5s, adjust interval 1s). Press "↵" to confirm. Back to homepage if there is no operation within 60s. The setting range of "E9 DETECTION METHOD" is 1-2, default 1 (Method1: detect after pump starting. Method 2: detect before and after pump starting.)

◆ **Inverter pump output setting:**

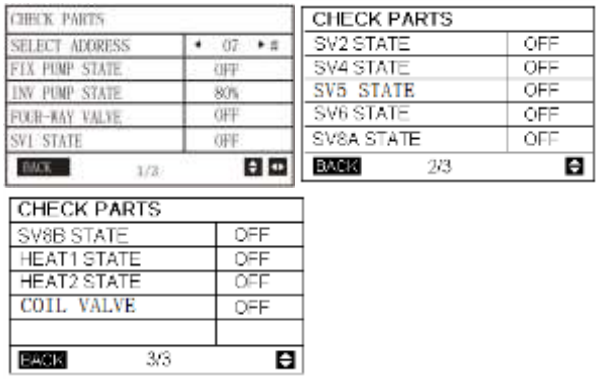
Select “INV PUMP RATIO” and entry the following page to select pump: use in the case of multiple pumps, do not send instructions for single pump.



Press "▲" or "▼" to select item to be set and press “◄” or “►” to set value. Press “↵” to confirm. Back to homepage if there is no operation within 60s. MINRATIO setting should ensure its flow meet the requirement of the whole unit, otherwise the unit may be damaged.

◆ **CHECK PARTS**

Select “CHECK PARTS” and press “↵” to entry submenu. Display as follows:

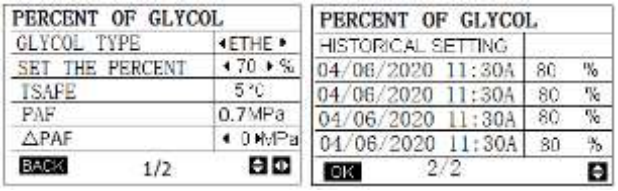


Press "▲" or "▼" to view 13 state. Press “⮌” to return to the previous page.

◆ **PERCENT OF GLYCOL**

Applicable models: low temperature cooling only and FC models, (lower outlet water temperature); heat pump(water side, low temperature antifreeze)

Select “PERCENT OF GLYCOL” and press “↵” to entry submenu. Display as follows:

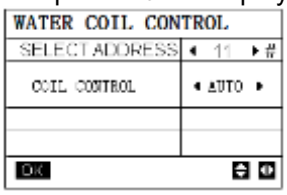


Press "▲" or "▼" to select item to be set and press “◄” or “►” to set value. Press “↵” to confirm. Back to homepage if there is no operation within 60s. Up to 16 historical setting records.

	Setting range
GLYCOL TYPE	ETHE/PROP
SET THE PERCENT	0∽50%
TSAFE	DISPLAY
PAF	DISPLAY
△PAF	0∽0.2MPa
HISTORICAL SETTING	04/06/2020 12:00A
HISTORICAL SETTING	04/06/2020 12:00A
HISTORICAL SETTING	04/06/2020 12:00A

◆ **Water Coil Control**

Press "▲" and "▼" to select “WATER COIL CONTROL” and press “↵”. Display as follows:

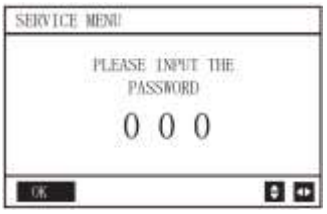


Press "▲" and "▼" to select “COIL CONTROL” and press “◄” or “ ►” to select control mode: AUTO (automatically control), MANUALON (with water coil), MANUALOFF (without water coil). Press “↵” to save. Press “⮌” to exit this page. Note: Water Coil Control is only applicable to FC models.

Setting SERVICE MENU (pwd 234)

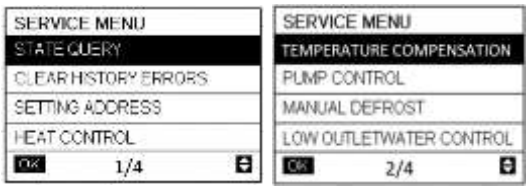
◆ Entering the password:

Select "SERVICE MENU", and press the "↵" button to enter the menu. The screen prompts the user to enter the password, as shown below:



Press "▲" and "▼" buttons to change the number to enter, and press "◄" and "►" buttons to change the bit code to enter. After the number is entered, the display is not changed. After entering the password, press "↵" button to enter the interface or Press "⮌" button to go back to the previous interface. Display as follows if the input is incorrect:

The query interface as follows is displayed if the input is correct:



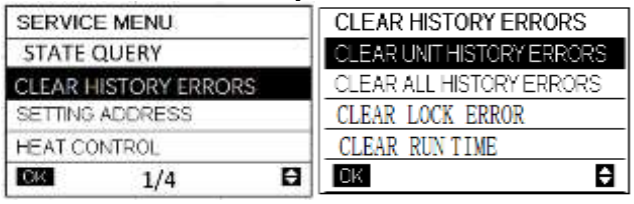
◆ **State query**

Press "▲" or "▼" to select “STATE QUERY” under “SERVICE MENU” page. Then press “↵” to enter submenu.

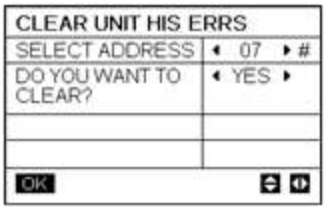
Press “◄” or “►” to select the address of module to view (the offline address is skipped automatically). There are 11 pages and 49 state values. Press "▲" or "▼" buttons to select the different pages.

◆ **Clear history errors:**

Press "▲" or "▼" to select “CLEAR HISTORY ERRORS” and confirm by “↵”.

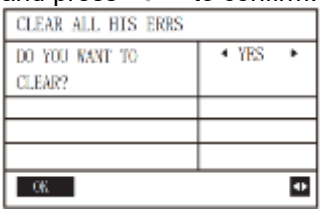


Press "▲" or "▼" to select “CLEAR UNIT HISTORY ERRORS” and press “↵” to confirm. Display as follows:

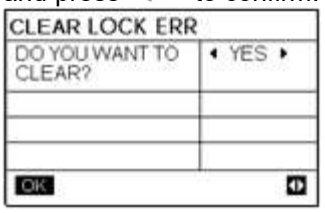


Press "▲" or "▼" to select “SELECT ADDRESS” and press “◄” or “►” to select address value. Press "▲" or "▼" to select clear or not, and press “◄” or “►” to select YES or NO, and press “↵” to confirm.

Press"▲" or "▼" to select “CLEAR ALL HIS ERRS” and press “↵” to confirm. Display as follows:

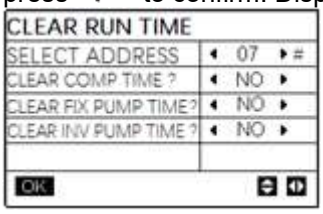


Press"▲" or "▼" to select “CLEAR LOCK ERROR” and press “↵” to confirm. Display as follows:



Press “◄” or “►” to select YES or NO, and press “↵” to confirm.

Press "▲" or "▼" to select “CLEAR RUN TIME” and press “↵” to confirm. Display as follows:

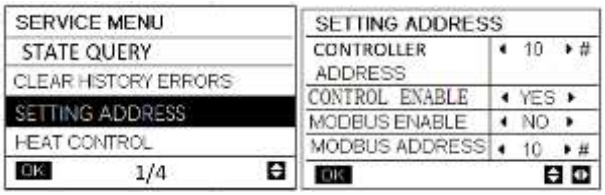


Press "▲" or "▼" to select “SELECT ADDRESS”, press “◄” or “►” to select address value. Press "▲" or "▼" to select clear or not, and press “◄” or “►” to select YES or NO, and press “↵” to confirm.

◆ **Setting address:**

Press "▲" or "▼" under “SERVICE MENU” page to select “SETTING ADDRESS” (Can also enter by combining buttons pressing “⊖”, “►” for 3s).

Press “↵” and enter submenu.

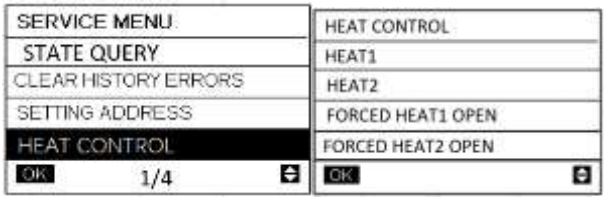


Press "▲" or "▼" to select item and press “◄” or “►” to set value. Then press “↵” to confirm and “⮌” to back.

◆ **Heat control**

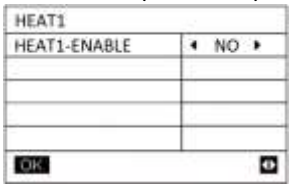
HEAT1 means pipe electric heating in cooling/heating mode. HEAT2 means tank electric heating or gas boiler in DHW mode.

Press "▲" or "▼" to select “HEAT CONTROL” under “SERVICE MENU” page. Press “↵” and enter submenu.

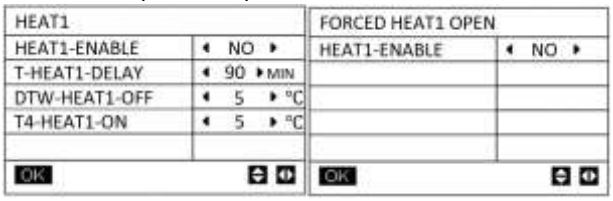


Press "▲" or "▼" to select item to be set. Press “↵” and enter submenu.

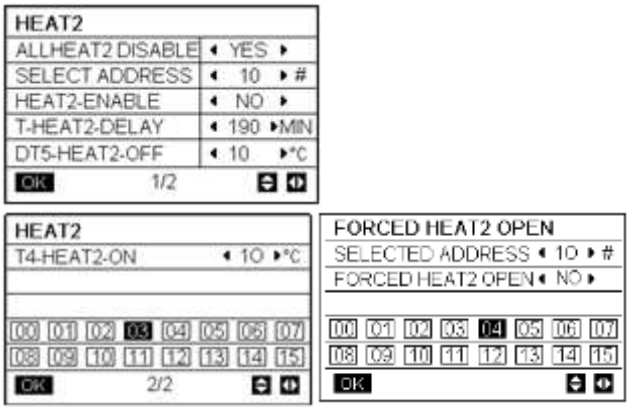
HEAT1 dial (S6-1 OFF):



HEAT1 dial (S6-1 ON):



HEAT2:

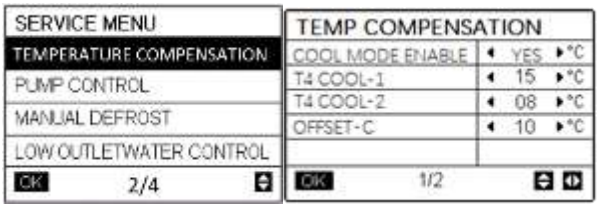


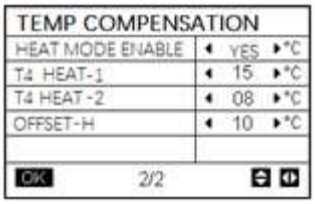
Press "▲" or "▼" to select item and press “◄” or “►” to set value. Then press “↵” to confirm and “⮌” to back.

◆ **TEMPERATURE compensation**

Press "▲" or "▼" to select “TEMPERATURE COMPENSATION” under “SERVICE MENU” page.

Press “↵” and enter submenu.:

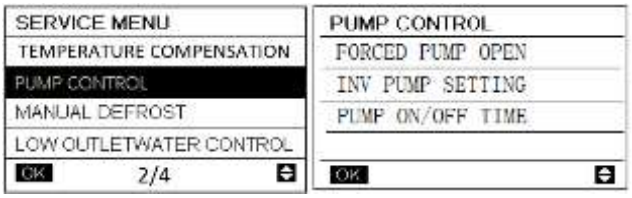




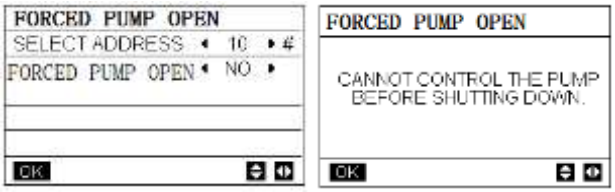
Press "▲" or "▼" to select item and press “◄” or “►” to set value. Then press “↵” to confirm.

◆ **Pump Control:**

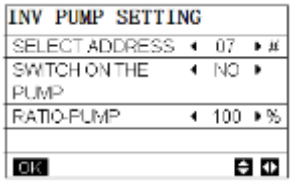
Press "▲" or "▼" to select “PUMP CONTROL” under “SERVICE MENU” page. Press “↵” and enter submenu.



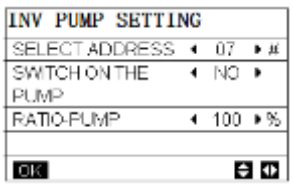
Press "▲" or "▼ to select “FORCED PUMP OPEN”. Press “↵” and enter submenu.



Under “FORCED PUMP OPEN” page, press "▲" or "▼" to select item and press “ ◄ ” or “ ► ” to set value. Press “↵” to confirm or “⮌” to go back. If the unit at that address is ON, the pump cannot be controlled by the wired controlled. Display as above. Under “INV PUMP OPEN” page, press "▲" or "▼" to select item and press “ ◄ ” or “ ► ” to set value. Press “↵” to confirm or “⮌” to go back.



Note: Can only be set under a single pump. The setting range of RATIO-PUMP is 30%-100%. It should ensure its flow meet the requirement of whole unit, otherwise the unit may be damaged. Under “PUMP CONTROL” page, press "▲" or "▼" to select item and press “ ◄ ” or “ ► ” to set value. Press “↵” to confirm or “⮌” to back.

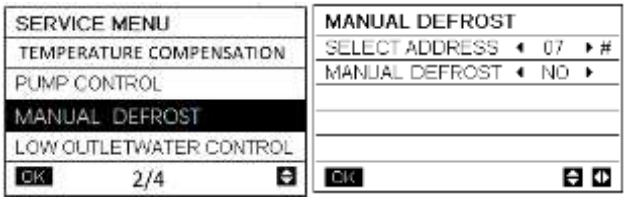


Parameter setting requirements are as follows:

	Set range	Default value	Adjustment range
PUMP ON TIME	5∽60min	5	5
PUMP OFF TIME	0∽60min	0	5

◆ **Manual Defrost:**

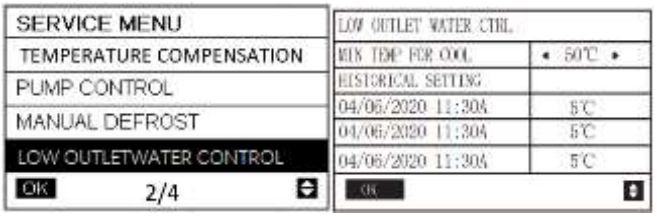
Press "▲" or "▼" to select “MANUAL DEFROST” under “SERVICE MENU” page. Press “↵” and enter submenu.



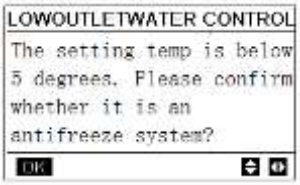
Press "▲" or "▼" to select item to be set and press “◄” or “►” to set value. Press “↵” to confirm or “⮌” to go back. If the external unit successfully enters the defrost mode after the “MANUAL DEFROST” is turned on, the defrost icon will be displayed at homepage of the wired controller.

◆ **Low outlet water temperature control**

Press "▲" or "▼" to select “LOW OUTLETWATER CONTROL” under “SERVICE MENU” page. Press “↵” and enter submenu. Suitable for HP-UNIT.

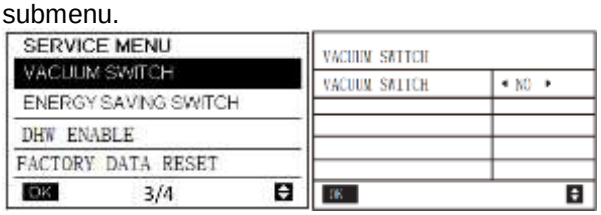


Press “◄” or “►” to set value. Press “↵” to confirm or “⮌” to back. At this page, the historical minimum water outlet temperature setting (setting range 0-20℃) can be viewed. When the setting temperature is less than 5℃, a prompt box will pop up:



◆ **Vacuum mode**

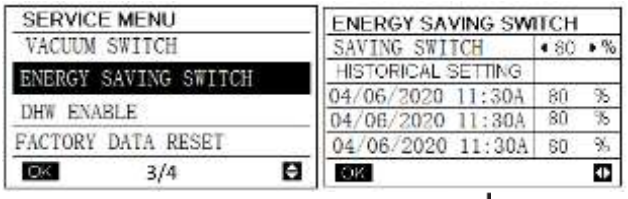
Press "▲" or "▼" to select “VACUUM SWITCH” under “SERVICE MENU” page. Press “↵” and enter submenu.



Press “◄” or “►” to set YES or NO. Then press “↵” to confirm. Power off and restart is required to exit it.

◆ **Energy saving mode**

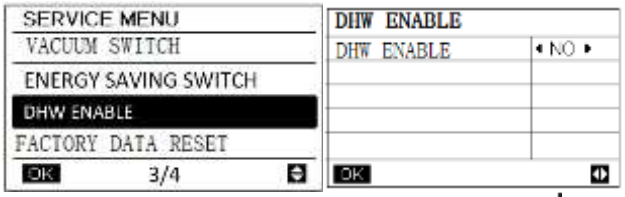
Press "▲" or "▼" to select “ENERGY SAVING SWITCH” under “SERVICE MENU” page. Press “↵” and enter submenu.



Press “◄” or “►” to set value. Press “↵” to confirm or “⮌” to go back.

◆ **DHW ENABLE**

Press "▲" or "▼" to select “DHW ENABLE” under “SERVICE MENU” page. Press “↵” and enter submenu.

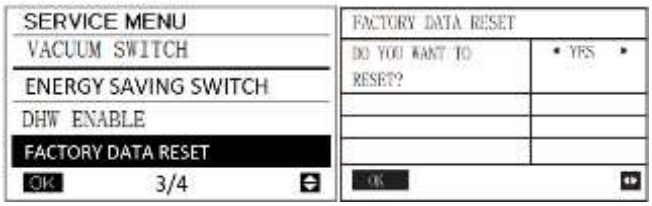


Press "▲" or "▼" to set YES or NO. Press “↵” to confirm or “⮌” to back.

Note: DHW ENABLE is only available for custom made DHW models.

◆ **FACTORY DATA RESET:**

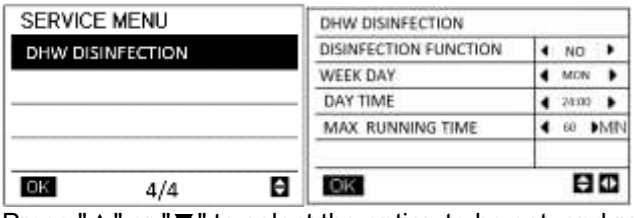
Press "▲" or "▼" to select “FACTORY DATA RESET” under “SERVICE MENU” page. Press “↵” and enter submenu.



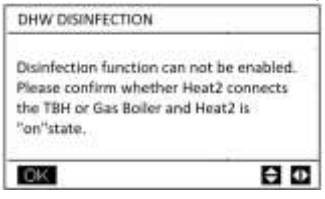
Press "▲" or "▼" to select corresponding item and press “◄” or “ ►” to select restore or not. Press “↵” to confirm or “⮌” to go back.

◆ **DHW DISINFECTION**

Press "▲" or "▼" to select DHW DISINFECTION on the SERVICE MENU interface. Press “↵” and enter submenu.



Press "▲" or "▼" to select the option to be set, and press “◄” or “ ►” to set the desired value or state, and press the "↵" key to confirm. When setting DISINFECTION FUNCTION to "YES" state, a prompt box will pop up:



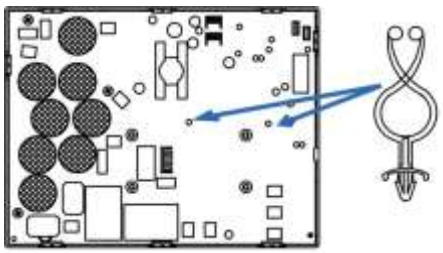
7 How to install the Inverter board:

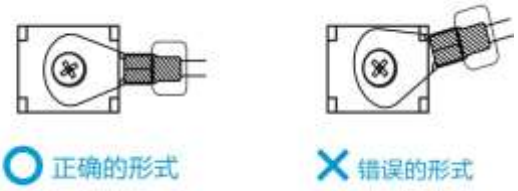
1. Open the front panel of the electric control box before installing the Inverter board, take a picture of the original settings and wiring positions, and record the position of the cables and the terminals;
2. Check whether the Midea code on the surface of the inverter is the same as that of the replaced inverter board;
3. Since different IPM modules have different mounting torques, check whether the IPM module is correct according to the unit model. The IPM module specification on Sheen/Storm30/60/90unit, Large/Thunder, screw size and torque used by the unit are as follows:

model	IPM Specifications for compressor	Compressor IPM screw size	Fan IPM screw size	Compressor IPM screw torque N.m	Fan IPM screw torque N.m	Compressor cable screw torque N.m
Sheen 30	50A	M5	M3	1.5-1.8	1.0- 1.2	1.5-1.8
Sheen 60	50A*2	M5	M3	1.5-1.8	1.0- 1.2	1.5-1.8
Sheen 90	75A*2	M5	M3	1.5-1.8	1.0- 1.2	1.5-1.8

LNB/LVB65FAEMC compressor DC80PHDG-D.1Y2compressor

4. Remove the Inverter board to be replaced, and keep the cooling surface of the radiator clean without dust, impurities, etc. adhering to the surface;
5. Place the new inverter board according to the mounting holes on the radiator. When picking up the inverter board, pls hold board by the side of the PCB, and it is forbidden to grab the components on the board directly; A newly installed inverter board for Sheen 30 should be Pre-installed the DC bus (current flows from N_in to N_out), and fix it.





6. The surface of the IPM module is evenly coated with thermal conductive silicone grease, the operation method is as follows:

   ① Before pouring thermal grease, please ensure that heat dissipation surface of the IPM and surface of the radiator are free of impurities, and the flatness and smoothness of the radiator are less than 30um. Spread the thermal grease evenly on the two heat dissipation surface sides, the thickness of thermal grease is 100 μm. It is not that the more you pour, get more heat dissipated.

② After coating the thermal grease surface and before installation, please keep the two heat dissipation surfaces free from any attachments to avoid impurities adhering to the heat dissipation surface and causing poor heat dissipation.

③ Every time an inverter board with thermal grease is installed, please clean both sides of the thermal grease before fixing the board, and re-lay the thermal grease. Do not let the heat sink surface come into contact with any other objects.

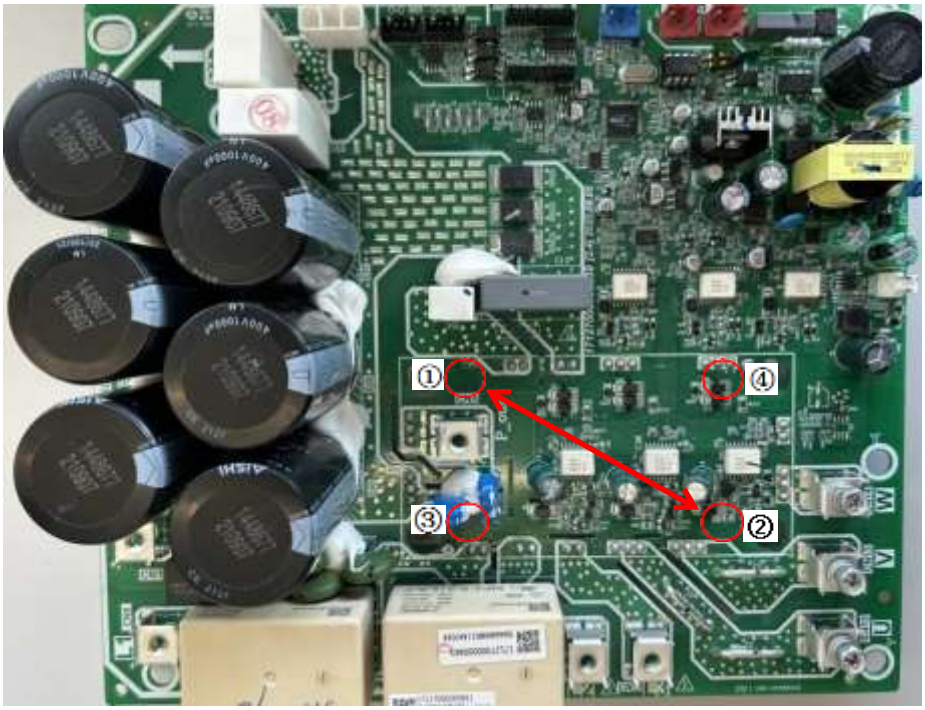
7. Fixed and tightened screws on IPM,

When assembling the screws, the screw driver is at 90° to the inverter board.

And then the other screws to be fixed on the PCBA and the sheet metal base;

① Regarding to Single IPM module fixation: the first screw should be installed slowly, and if necessary, it should be installed by pre- tightening, especially for IPM modules with current not greater than 10A;

② Regarding to multiple IPM modules fixation: Prioritize the assembly of the two screws at the longer diagonal positions, and engages in the pre- tightening.



Sheen/Storm 30/60/90 inverter the board

Pre-tightened sequence:①→②→③→④

Final fastening sequency:①→②→③→④

The fixing torque value of wiring screw on board is determined according to the size of screw, where M4 reference torque 1.0- 1.2 Nm, M5 reference torque 1.5- 1.8 Nm.
The above torque requirements are tightening torques. If pre-tightening is required according to actual assembly requirements, the pre-tightening torque is 20%-30% of the tightening torque

8. Refer to the guidelines on the wiring diagram to connect the force and weak cables, and the lugs are fixed to prevent pressing against raised platform of the terminal;
9. Refer to the picture in the 1st step, restore the wiring and settings, confirm the corresponding address of the board, After the check that everything is correct, close the upper front panel and fix the screws;

Precautions during disassembly and assembly of the Inverter board:

1. Power off for 10 minutes before removing the inverter board;
2. Do not press forcibly when disassembling or installing the Inverter board;
3. When installing the Inverter board, it is necessary to pay attention not to hide cable of the temperature sensor under the board, and fix them first in order ①→②→③→④ ,4 screws are in the position, and then fix the PCB and screws of the plastic case;
4. All the screws in the electric control box cannot be mixed with the screws from the other structural fixtures;
5. The wiring of the force electricity port on the board must be carefully and repeatedly confirmed, and fake connections are prohibited!

CLIVET SPA
Via Camp Lonc 25, Z.I. Villapaiera - 32032 Feltre (BL) - Italy
Tel. + 39 0439 3131 - Fax + 39 0439 313300 - info@clivet.it
www.clivet.com