R410A

Service Manual

Cooling Only Quantum Series

MDVOS-68CVR1B

MDVOS-76CVR1B

MDVOS-96CVR1B

CONTENTS

Part 1

General Information

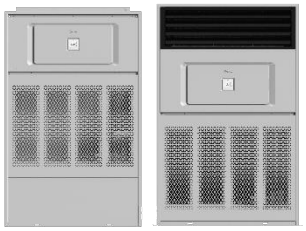
1 Indoor and Outdoor Unit Capacities

Outdoor Unit Model	Indoor Unit Type	Indoor Unit Capacity(kW)	Indoor Unit Model	Number of connectable indoor units	Branch Joint (Flexible branch header)
MDVOS-68HVR1A	High Static Pressure Duct	20	MDVID3-68HVR1D	1	/
	Medium Static Pressure Duct	10	MDVID2-36HVR1D	2	FQZHN-01D (DXFQT2-02)
	Four-way cassette	10	MDVIC4Y-36HVR1D		
	Ceiling & Floor	10	MCL2-36HVR1D		
	Wall-mounted	7.1	MDVIWMY-24HVR1D	3	FQZHN-01D+FQZHN-01D (DXFQT2-02+DXFQT2-02)
	Medium Static Pressure Duct	7.1	MDVID2-24HVR1D		
	Four-way cassette	7.1	MDVIC4Y-24HVR1D		
	Ceiling & Floor	7.1	MCL2-24HVR1D		
MDVOS-76HVR1A	High Static Pressure Duct	22.4	MDVID3-76HVR1D	1	/
	Floor Standing	22.4	MFSL-76HVR1D		
	Floor Standing	22.4	MFTL-76HVR1D		
	Medium Static Pressure Duct	11.2	MDVID2-40HVR1D	2	FQZHN-02D (DXFQT2-02)
	Four-way cassette	11.2	MDVIC4Y-40HVR1D		
	Ceiling & Floor	11.2	MCL2-40HVR1D		
	Wall-mounted	8	MDVIWMY-28HVR1D	3	FQZHN-02D+FQZHN-01D (DXFQT2-02+DXFQT2-02)
	Medium Static Pressure Duct	8	MDVID2-28HVR1D		
	Four-way cassette	8	MDVIC4Y-28HVR1D		
	Ceiling & Floor	8	MCL2-28HVR1D		
MDVOS-96HVR1A	High Static Pressure Duct	28	MDVID3-96HVR1D	1	/
	Floor Standing	28	MFSL-96HVR1D		
	Floor Standing	28	MFTL-96HVR1D		
	Medium Static Pressure Duct	14	MDVID2-48HVR1D	2	FQZHN-02D
	Four-way cassette	14	MDVIC4Y-48HVR1D		
	Ceiling & Floor	14	MCL2-48HVR1D		
	Medium Static Pressure Duct	10	MDVID2-36HVR1D	3	FQZHN-02D+FQZHN-01D
	Four-way cassette	10	MDVIC4Y-36HVR1D		
	Ceiling & Floor	10	MCL2-36HVR1D		
	Wall-mounted	7.1	MDVIWMY-24HVR1D	4	FQZHN-02D+FQZHN-01D+FQZHN-01D
	Medium Static Pressure Duct	7.1	MDVID2-24HVR1D		
	Four-way cassette	7.1	MDVIC4Y-24HVR1D		
	Ceiling & Floor	7.1	MCL2-24HVR1D		

2 External Appearance

2.1 Indoor Units

Table 1-2.1: Indoor unit appearance

Four-way Cassette 	Wall-mounted 
Medium Static Pressure Duct 	High Static Pressure Duct 
Ceiling & Floor 	Floor Standing 

2.2 Outdoor Units

Table 1-2.2: Outdoor unit appearance

MDVOS-68CVR1B MDVOS-76CVR1B MDVOS-96CVR1B


3 Nomenclature

3.1 Indoor Units

MDVI D3 - 68 H V R1 D
① ② ③ ④ ⑤ ⑥ ⑦

Legend		
No.	**Code**	**Remarks**
1	MDVI	MDV Indoor unit
2	D3	D3: High Static Pressure Duct WMY: Wall-mounted C: Ceiling & Floor C4Y: Four-way cassette D2: Medium Static Pressure Duct FST: Floor Standing – Top Discharge FS: Floor Standing – Side Discharge
3	192	Capacity index kBtu/h
4	H	Heat Pump
5	V	FAN DC inverter
6	R1	R410A
7	D	220-240V,1Ph,50/60Hz

3.2 Outdoor Units

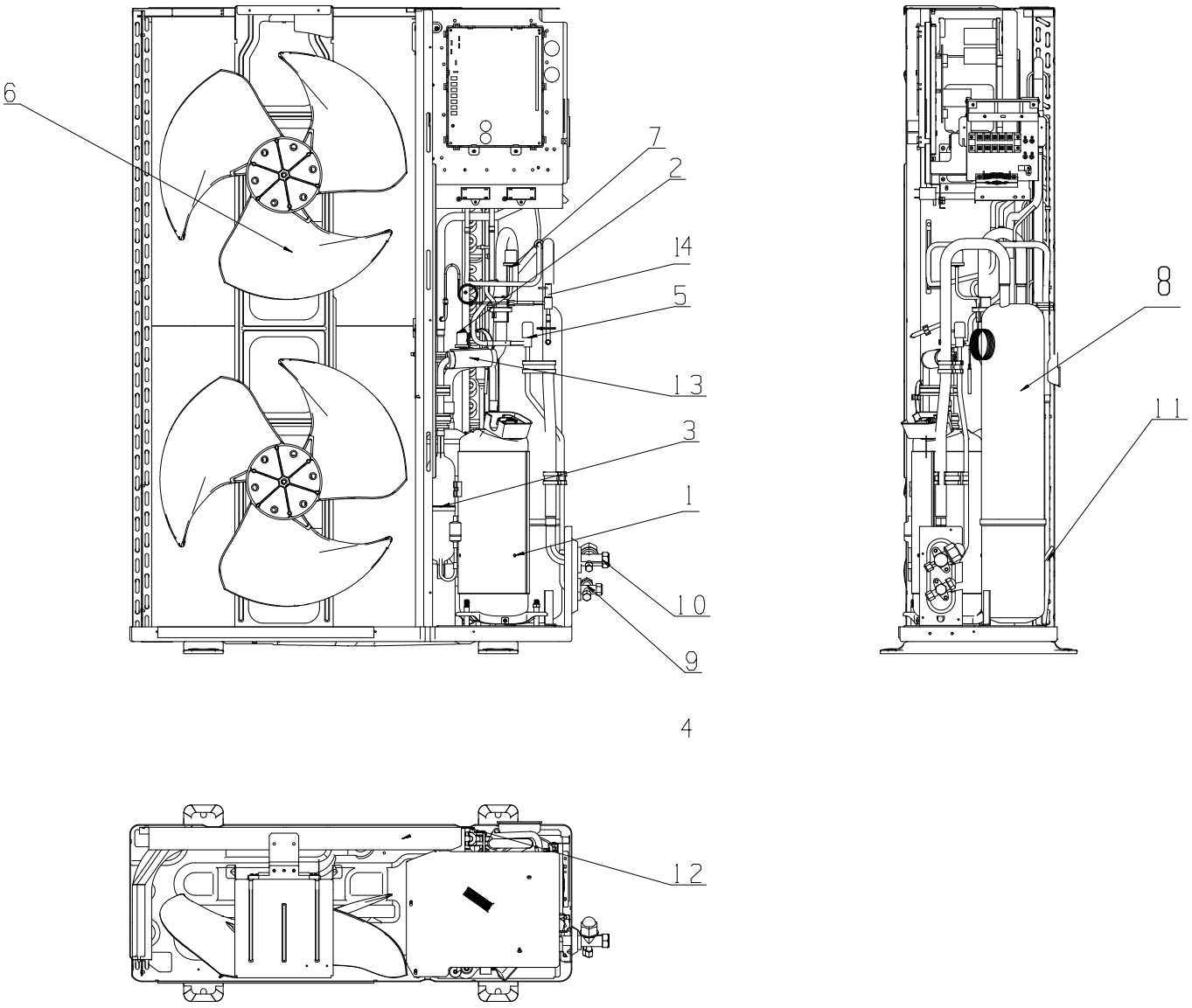
MDV O S - 68 C V R1 B
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

Legend		
No.	**Code**	**Remarks**
1	MDV	MDV
2	O	Outdoor unit
3	S	Side-discharge type
4	68	Capacity index kBtu/h
5	C	Cooling only
6	V	Full DC Inverter
7	R1	R410A
8	B	380-410V,3N,50/60Hz

Part 2

Component Layout and Refrigerant Circuits

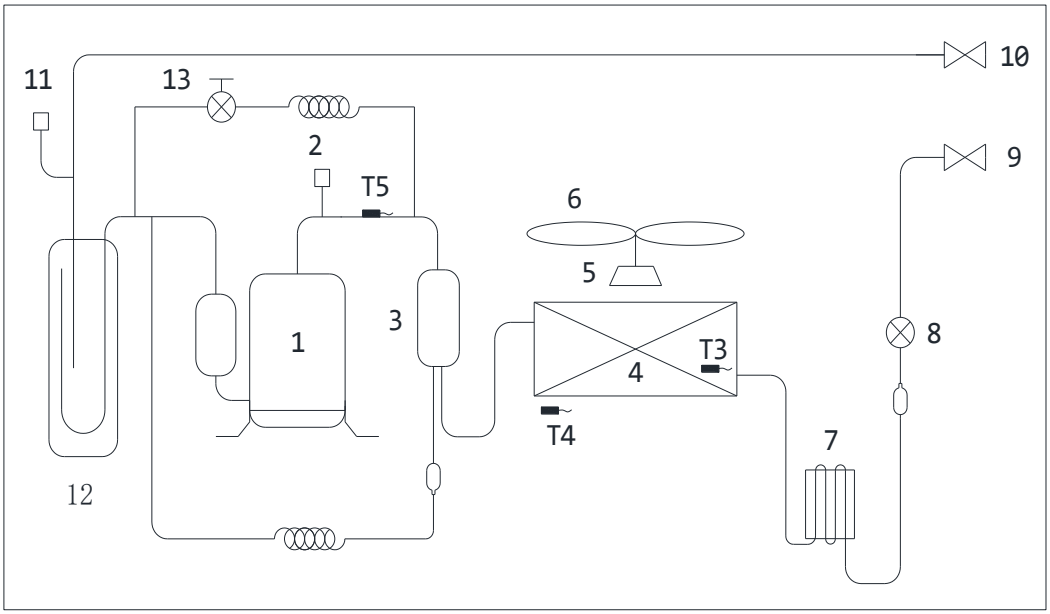
1 Layout of Functional Components



Number	Description
1	Compressor
2	High Pressure Switch
3	Oil Separator
4	Heat Exchanger
5	Electronic Expansion Valve
6	Fan
7	Low Pressure Switch
8	Accumulator
9	Stop Valve (Gas Side)
10	Stop Valve (Liquid Side)
11	Heat Exchanger Outlet Temperature Sensor
12	Outdoor Ambient Temperature Sensor
13	Discharge Temperature Sensor
14	Refrigerant Bypass Valve

2 Piping Diagrams

Figure 2-4.1: 7/8/10HP piping diagram



Legend				
No.	**Parts name**		**No.**	**Parts name**
1	Compressor		13	Solenoid valve SV7
2	High pressure switch		T3	Heat exchanger temperature sensor
3	Oil separator		T4	Outdoor ambient temperature sensor
4	Heat exchanger		T5	Discharge pipe temperature sensor
5	Fan motor			
6	Fan			
7	Heat exchanger cooling electric control box			
8	Electronic expansion valve (EXV)			
9	Stop valve (liquid side)			
10	Stop valve (gas side)			
11	Low pressure switch			
12	Accumulator			

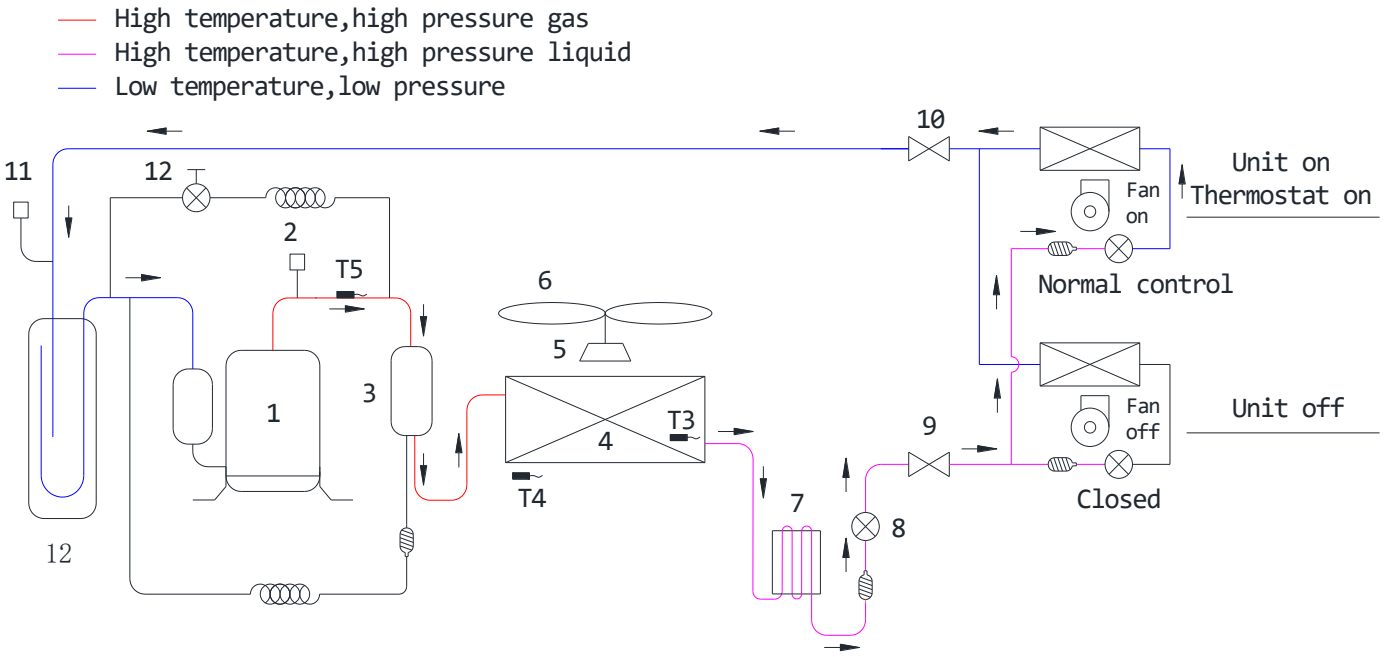
Key components:

1. **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%.
2. **Accumulator:**
   Stores liquid refrigerant and oil to protect compressor from liquid hammering.
3. **Electronic expansion valve (EXV):**
   Controls refrigerant flow and reduces refrigerant pressure.
4. **Solenoid valve SV7:**
   Allows refrigerant to return directly to the compressor. Opens when indoor air temperature is close to the set temperature to avoid frequent compressor on/off.
5. **High and low pressure switches:**
   Regulate system pressure. When system pressure rises above the upper limit or falls below the lower limit, the high or low pressure switches turn off, stopping the compressor. After 10 minutes, the compressor restarts

3 Refrigerant Flow Diagrams

Cooling operation

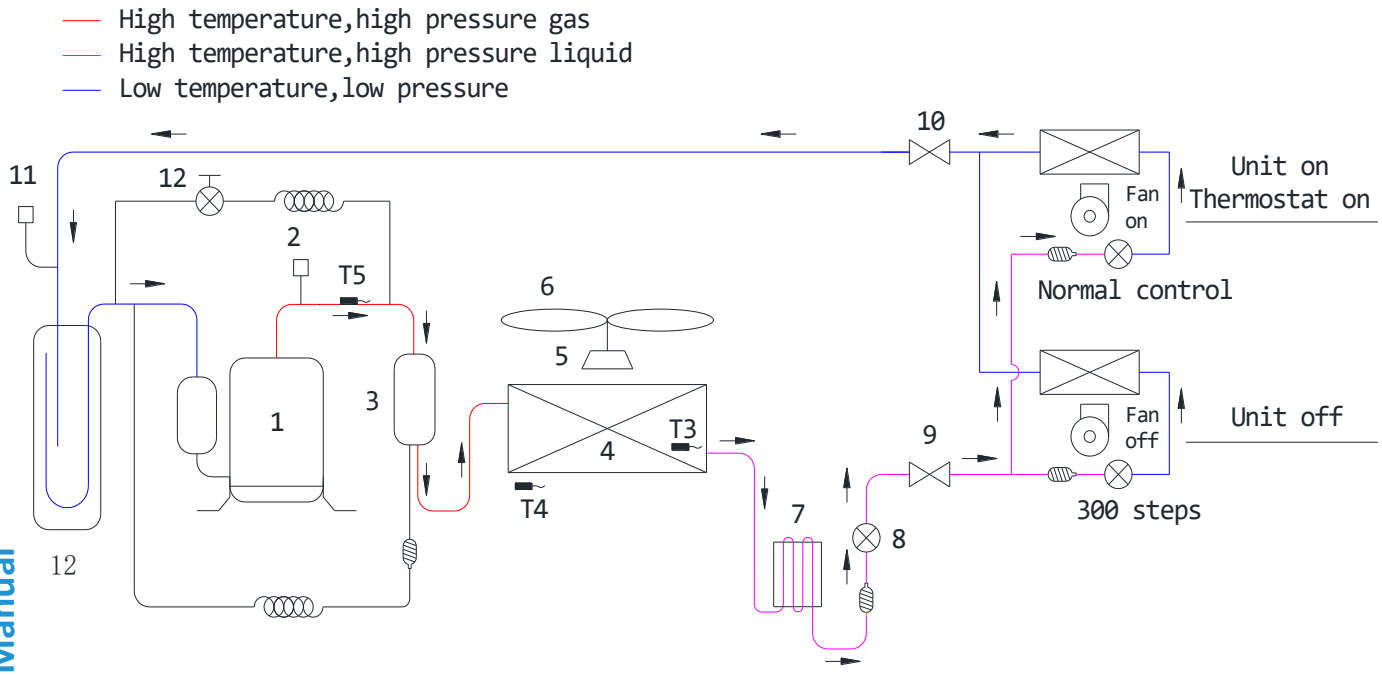
Figure 2-3.1: 7-10HP refrigerant flow during cooling operation



Legend				
No.	**Parts name**		**No.**	**Parts name**
1	Compressor		13	Solenoid valve SV7
2	High pressure switch		T3	Heat exchanger temperature sensor
3	Oil separator		T4	Outdoor ambient temperature sensor
4	Heat exchanger		T5	Discharge pipe temperature sensor
5	Fan motor			
6	Fan			
7	Heat exchanger cooling electric control box			
8	Electronic expansion valve (EXV)			
9	Stop valve (liquid side)			
10	Stop valve (gas side)			
11	Low pressure switch			
12	Accumulator			

Oil return operation in cooling mode

Figure 2-3.2: 7-10HP refrigerant flow during oil return operation in cooling mode



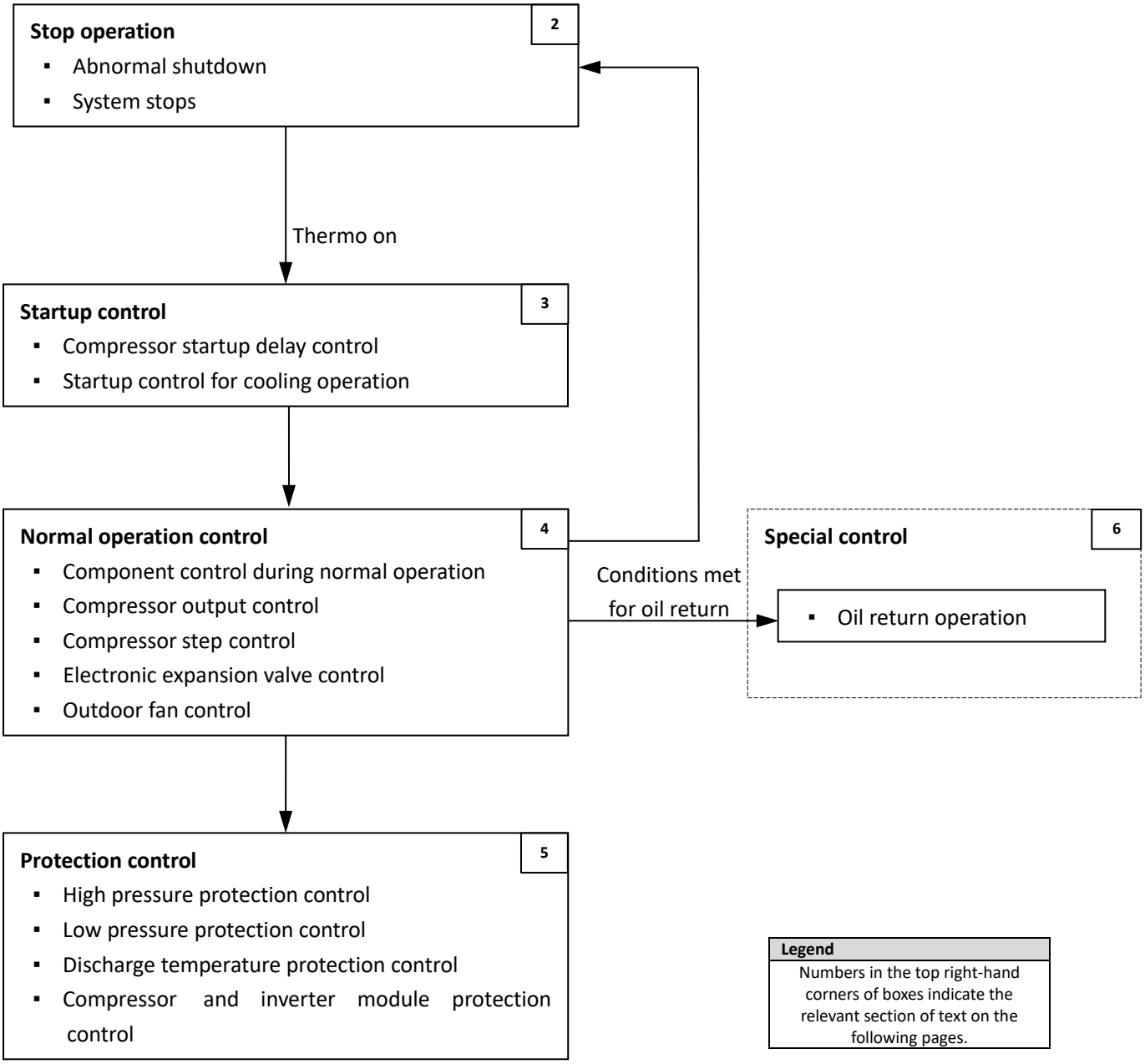
Legend				
No.	**Parts name**		**No.**	**Parts name**
1	Compressor		13	Solenoid valve SV7
2	High pressure switch		T3	Heat exchanger temperature sensor
3	Oil separator		T4	Outdoor ambient temperature sensor
4	Heat exchanger		T5	Discharge pipe temperature sensor
5	Fan motor			
6	Fan			
7	Heat exchanger cooling electric control box			
8	Electronic expansion valve (EXV)			
9	Stop valve (liquid side)			
10	Stop valve (gas side)			
11	Low pressure switch			
12	Accumulator			

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.



2 Stop Operation

The stop operation occurs for one of the three 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 outdoor unit digital displays.
2. The system stops when the set temperature has been reached.

3 Startup Control

3.1 Compressor Startup Delay Control

In initial startup control and in restart control (except in oil return operation and defrosting operation), compressor startup is delayed such that a minimum of 5 minutes has elapsed since the compressor stopped, in order to prevent frequent compressor on/off and to equalize the pressure within the refrigerant system.

3.2 Startup Control for Cooling Operation

Table 3-3.1: Component control during startup in cooling mode

Component	Wiring diagram label	7~10HP	Control functions and states
Inverter compressor	COMP	●	Controlled according to load requirement, operating frequency increased by 1 step / sec
Upper DC fan motor	FAN_UP	●	Fan speed[1] controlled according to ambient temperature (T4) : ▪ At initial speed for 20 seconds. ▪ controlled according to ambient temperature (T4): • T4 ≥ 27℃ => high speed. • T4 < 25℃ => low speed.
Lower DC fan motor	FAN_DOWN	●	
Electronic expansion valve	EEV1	●	Position (steps) from 0 (fully closed) to 480 (fully open), controlled according to discharge temperature
Solenoid valve (indoor units bypass)	SV7	●	controlled according to indoor heat exchanger refrigerant outlet temperature (T2B)

Notes:
1. Refer to Table 3-4.2 in Part 3, 4.5 “Outdoor Fan Control”.

4 Normal Operation Control

4.1 Component Control during Normal Operation

Table 3-4.1: Component control during normal cooling operation

Component	Wiring diagram label	7~10HP	Control functions and states
Inverter compressor	COMP	•	Controlled according to load requirement
Upper DC fan motor	FAN_UP	•	Fan speed[1] controlled according to ambient temperature (T4) and heat exchanger refrigerant temperature (T3):
Lower DC fan motor	FAN_DOWN	•	
Electronic expansion valve	EEV1	•	Position (steps) from 0 (fully closed) to 480 (fully open), controlled according to discharge temperature
Solenoid valve (indoor units bypass)	SV7	•	Controlled according to indoor heat exchanger refrigerant outlet temperature (T2B)

Notes:
1. Refer to Table 3-4.2 in Part 3, 4.5 “Outdoor Fan Control”.

4.2 Compressor Output Control

The compressor rotation speed is controlled according to the load requirement. Before compressor startup, the outdoor unit first estimates the indoor unit load requirement according to the nominal capacity of indoor units currently running, and then correct for ambient temperature. The compressors then start up according to the corrected load requirement.

During operation the compressors are controlled according to the nominal capacity of indoor units currently running and the indoor unit heat exchanger temperatures.

4.3 Compressor Step Control

The running speed of the compressors in rotations per second (rps) is one third of the frequency (in Hz) of the electrical input to the compressor motors. The compressor speed can be altered in increments of 1 rps.

4.4 Electronic Expansion Valve Control

The position of electronic expansion valves EXV is controlled in steps from 0 (fully closed) to 480 (fully open).

In cooling mode:

- When the outdoor unit is in standby:
  - EXV is at position 352 (steps).
- When the outdoor unit is running:
  - EXV is controlled according to discharge temperature.

4.5 Outdoor Fan Control

The speed of the outdoor unit fans is adjusted in steps, as shown in Table 3-4.2.

Table 3-4.2: Outdoor fan speed steps

Fan speed index	7~10HP	
	Upper fan[1]	Lower fan[2]
1	Low speed	Low speed
2	High speed	High speed
3	OFF	Low speed

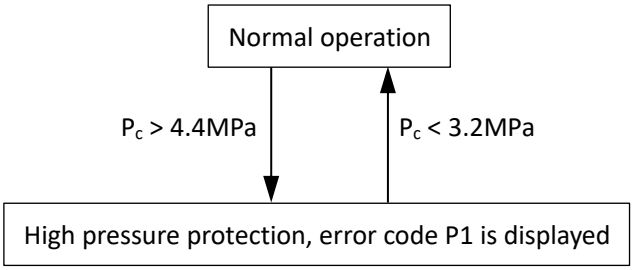
Notes:
1. The upper fan is labelled FAN_UP in the wiring diagram. Refer to the Engineering Data Book Part 2, 5 “Wiring diagram”.
2. The lower fan is labelled FAN_DOWN in the wiring diagram. Refer to the Engineering Data Book Part 2, 5 “Wiring diagram”.

5 Protection Control

5.1 High Pressure Protection Control

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

Figure 3-5.1: High pressure protection control



Notes:

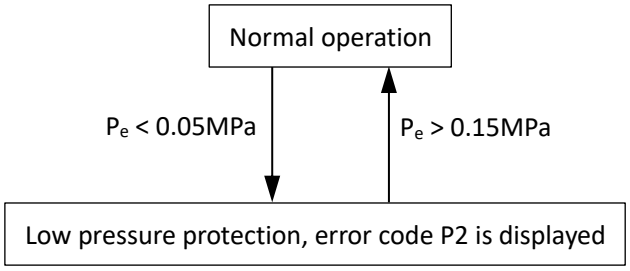
1. P_c: Discharge pressure

When the discharge pressure rises above 4.4MPa the system displays P1 protection and the unit stops running. When the discharge pressure drops below 3.2MPa, the compressor enters re-start control.

5.2 Low Pressure Protection Control

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

Figure 3-5.2: Low pressure protection control



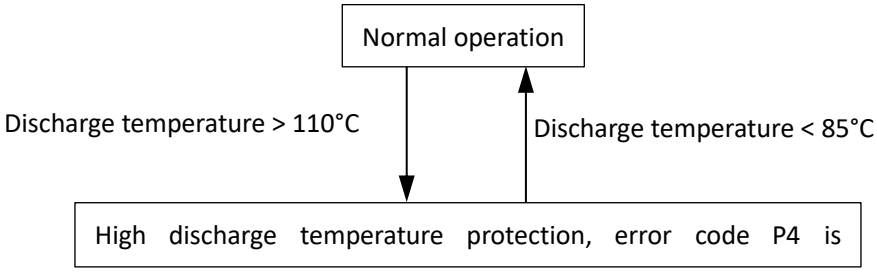
Notes:

1. P_e: Suction pressure

5.3 Discharge Temperature Protection Control

This control protects the compressors from abnormally high temperatures and transient spikes in temperature. It is performed for each compressor.

Figure 3-5.3: High discharge temperature protection control

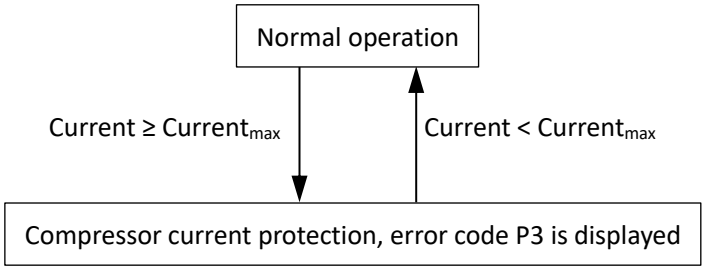


When the discharge temperature rises above 110°C the system displays P4 protection and the unit stops running. When the discharge temperature drops below 85°C, the compressor enters re-start control.

5.4 Compressor and Inverter Module Protection Control

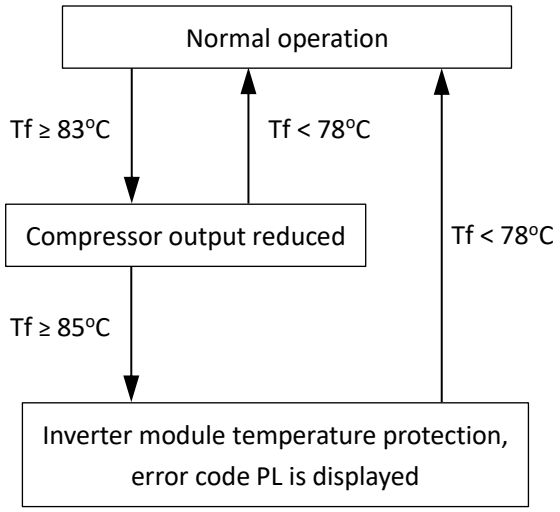
This control protects the compressors from abnormally high currents and protects the inverter modules from abnormally high temperatures.

Figure 3-5.4: Compressor current protection control



Compressor model	ATQ580D66UNT
Current$_{max}$	23A

Figure 3-5.5: Inverter module temperature protection control



Notes:

1. Tf: NTC temperature

6 Special Control

6.1 Oil Return Operation

In order to prevent compressors from running out of oil, the oil return operation is conducted to recover oil that has flowed out of the compressor(s) and into the piping system. This operation is performed for all units including units that are in standby.

Timing of oil return operation:

- When the initial cumulative operating time reaches 140 minutes and then every 8 hours.

Tables 3-6.1 and 3-6.2 show component control during oil return operation in cooling mode.

Table 3-6.1: Outdoor unit component control during oil return operation in cooling mode

Component	Wiring diagram label	7~10Hp	Control functions and states
Inverter compressor	COMP	●	68HZ
Upper DC fan motor	FAN_UP	●	Normal control
Lower DC fan motor	FAN_DOWN	●	
Electronic expansion valve	EEV1	●	Position 480 (steps)
Solenoid valve (indoor units bypass)	SV7	●	Normal control

Table 3-6.2: Indoor unit component control during oil return operation in cooling mode

Component	Unit state	Control functions and states
Fan	Thermo on	Remote controller setting
	Standby	Off
	Thermo off	Off
Electronic expansion valve	Thermo on	Normal control
	Standby	300 (steps)
	Thermo off	300 (steps)

Part 4

Field Settings

1 Outdoor Unit Field Settings

1.1 PCB Switches and Switch Settings

Figure 4-1.1: Outdoor unit main PCB switches

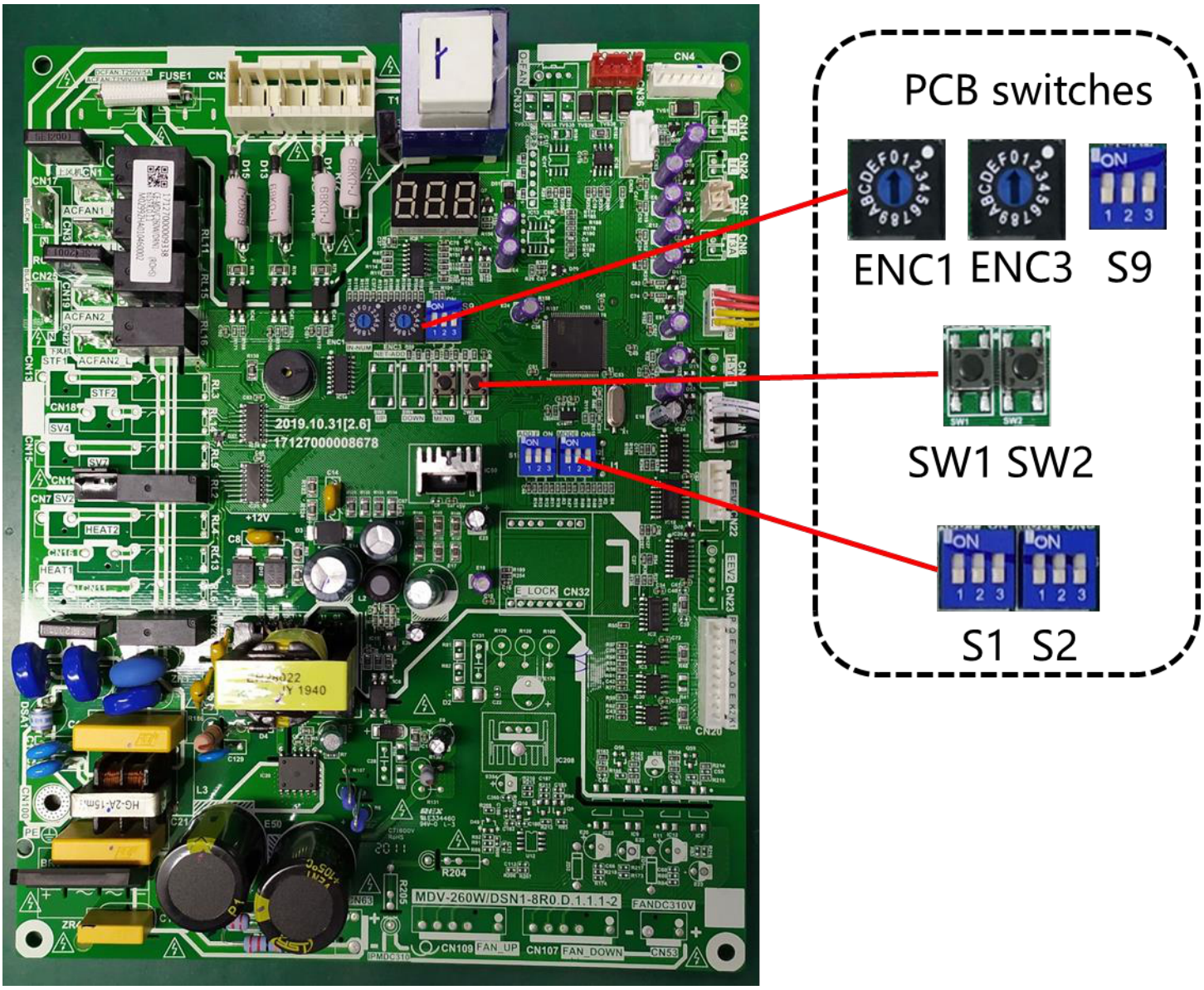
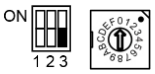
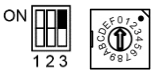


Table 4-1.1: Outdoor unit main PCB switch settings

Switch	Setting	Switch positions[1]	Description
ENC1 S9-3	Indoor unit address		The number of indoor units is in the range 0-15 0-9 on ENC1 indicate 0-9 indoor units; A-F on ENC1 indicate 10-15 indoor units
			The number of indoor units is in the range 16-31 0-9 on ENC1 indicate 16-25 indoor units; A-F on ENC1 indicate 26-31 indoor units
ENC3	Network address		Only 0, 1, 2, 3, 4, 5, 6, 7 should be selected (default is 0)
S1-1	Indoor unit generation		Automatic selection of the new or old protocol(default)
			Forced implementation of old IDU protocol
S1-2	Clear indoor unit addresses		Auto addressing (default)
			Clear indoor unit addresses
S1-3	Ways to control EEV		EEV of forced discharge temperature control(default)
			Reserved
S2	Reserved		Reserved
S9-1 & S9-2	Outdoor unit capacity (Factory set)		00: Outdoor Unit Capacity 7 HP 01: Outdoor Unit Capacity 8 HP 10: Reserved 11: Outdoor Unit Capacity 10 HP
SW1	Forced Cooling		Press the SW1 button for 5 seconds to enter the forced cooling mode, then press again for 5 seconds to exit
SW2	Spot Check Button		To check the outdoor unit parameters

Notes:

1. Black denotes the switch position.

Part 5

Electrical Components and Wiring Diagrams

1 Outdoor Unit Electric Control Box Layout

Figure 5-1.1: Front view of electric control box

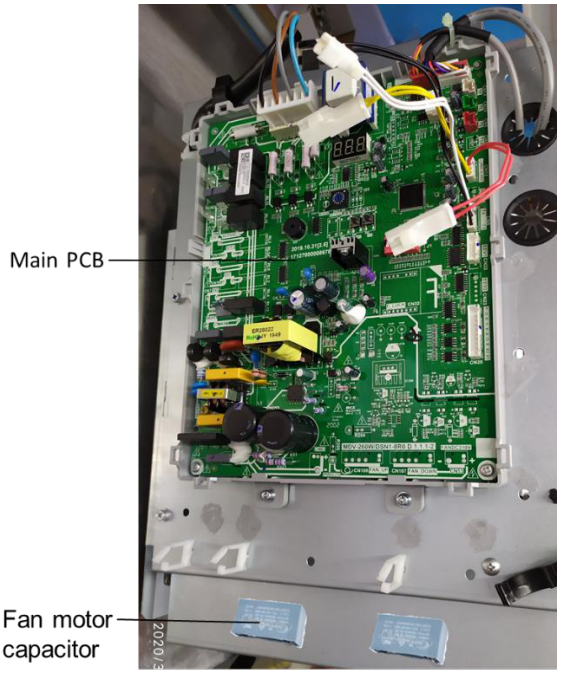


Figure 5-1.2: Side view of electric control box

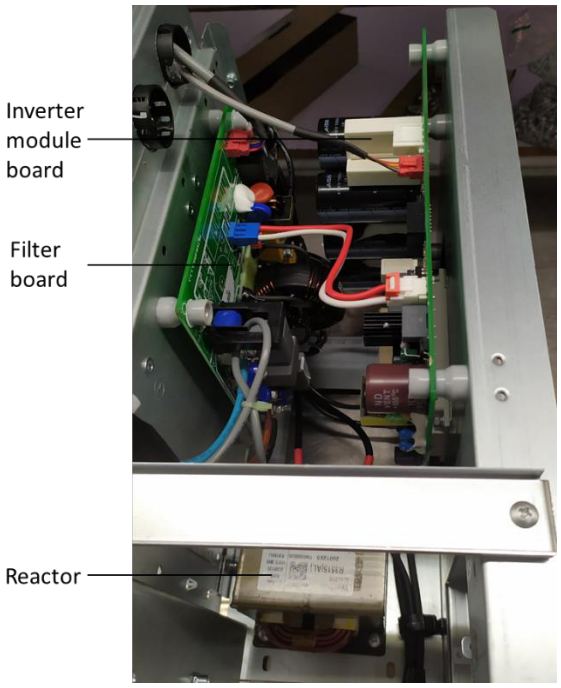
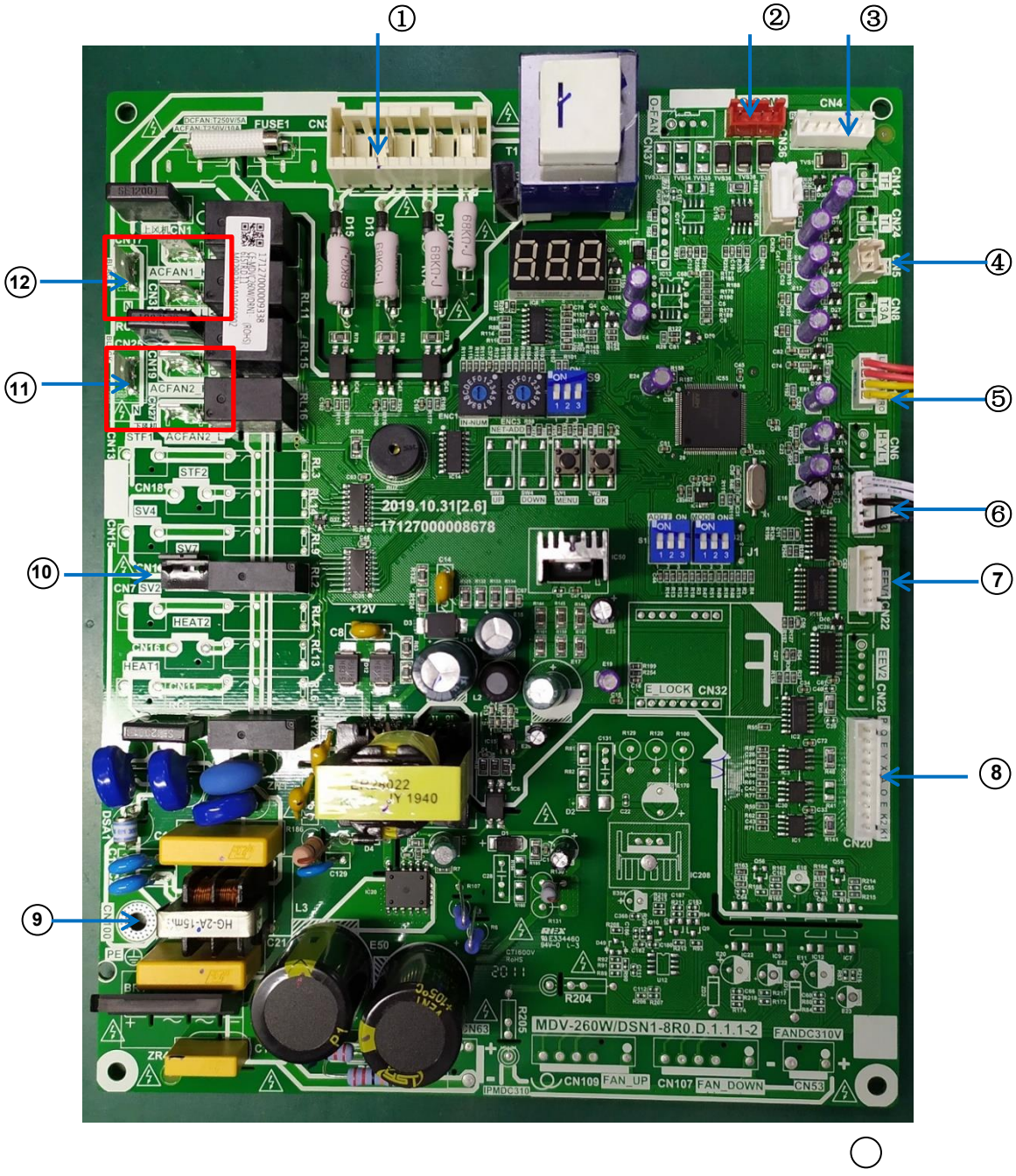


Figure 5-1.3: Front view of power supply box

2 Outdoor Unit Main PCB

2.1 Ports

Figure 5-2.1: Outdoor unit main PCB ports[1]



Notes:

1. Label descriptions are given in Table 5-2.1.

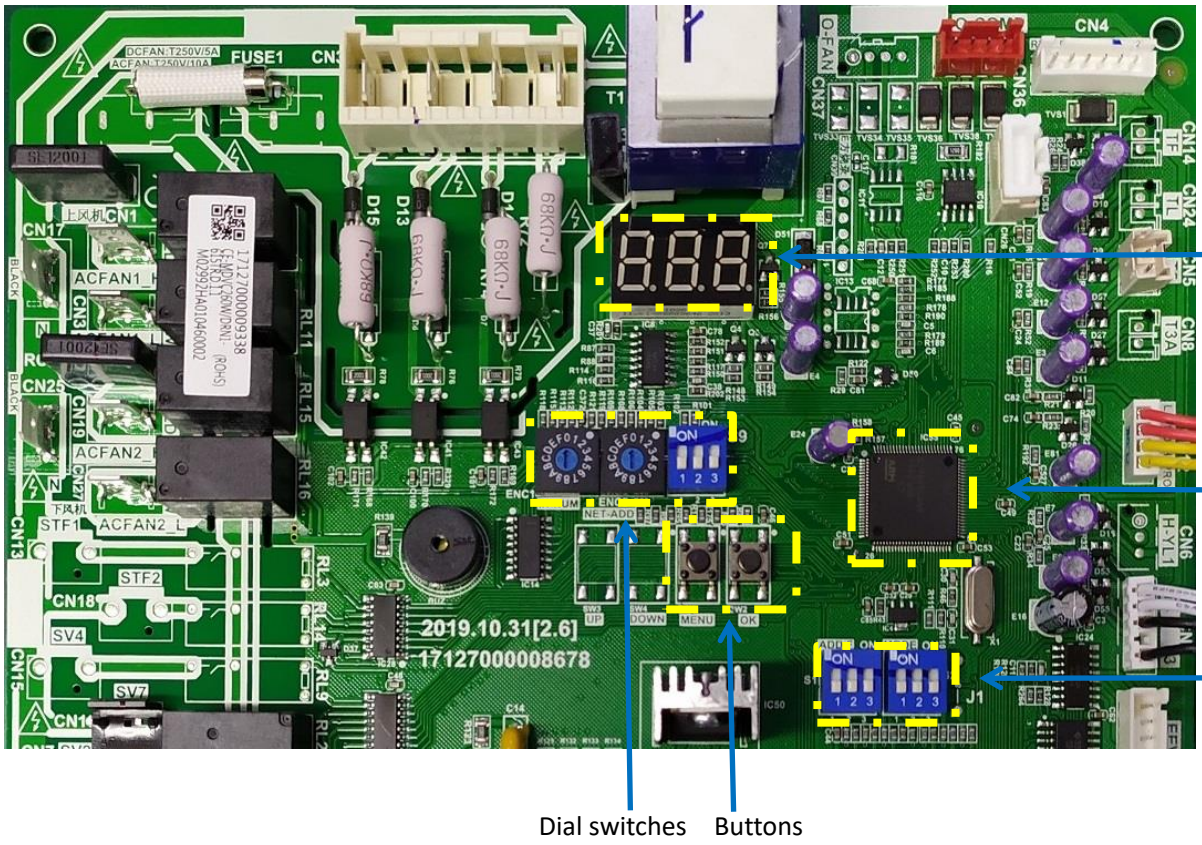
Table 5-2.1: Main PCB ports

Label in Figure 5-2.1	Port code	Content	Port voltage
1	CN30	Power input of main board	220V AC between A/B/C and N; 380V AC between A,B and C
2	CN36	Inverter module connection	0V or 5V DC
3	CN4	Control port of filter board	0V or 12V DC
4	CN5	Discharge pipe temperature sensor (T5) connection	0-5V DC (varying)
5	CN12	High pressure sensor and low pressure sensor connections	0-5V DC (varying)
6	CN9	Heat exchanger temperature sensor outlet (T3) and ambient temperature sensor (T4) connections	0-5V DC (varying)
7	CN22	EEV drive port	0V or 12V DC
8	CN20	Communication port	0-5V DC (varying)
9	CN100	Ground connection	
10	CN14	Solenoid valve ports	220V AC
11	CN1, CN3 CN17	Up ac fan control and power ports	220V AC
12	CN19, CN27 CN25	Down ac fan control and power ports	220V AC

2.2 Components

2.2.1 Layout

Figure 5-2.2: Outdoor unit main PCB components



2.2.2 Function of buttons SW1 to SW2

Table 5-2.2: Function of buttons SW1 to SW4

Button	Function	
SW1 (MENU)	Press SW1 for 5s to enter forced cooling, then press for 5s to exit	
SW2 (OK)	Sport check button	

2.2.4 OK system check button

Before pressing OK button, make sure that the system has been operating steadily for more than one hour. On pressing OK button, the parameters listed in Table 5-2.3 will be displayed in sequence.

Table 5-2.3: System check

DSP content	Parameters displayed on DSP	Remarks
Normal display	Display the current frequency (When frequency limited, the first letter display frequency limit type; When in standby mode, display online indoor unit number.	
1.--	Operating mode	Refer to Note 1
2.--	Operating FAN speed and FAN grade	Refer to Note 2
3.--	Total capacity of outdoor unit	
4.--	Total capacity requirement of indoor units	
5.--	Main heat exchanger pipe (T3) temperature (°C)	Actual value = value displayed
6.--	Outdoor ambient (T4) temperature (°C)	Actual value = value displayed
7.--	Inverter compressor discharge temperature (°C)	Actual value = value displayed
8.--	Invert module (TF) temperature (°C)	Actual value = value displayed
9.--	Refrigerant cooling pipe (TL) temperature (°C)	Displayed 25.
10.--	Compressor discharge pressure (MPa)	Actual value = value displayed × 0.1
11.--	Actual current (A)	Actual value = value displayed
12.--	Inverter compressor current (A)	Actual value = value displayed
13.--	Actual voltage (V)	Actual value = value displayed
14.--	DC bus voltage (V)	Actual value = value displayed
15.--	Indoor heat exchanger pipe (T2/T2B) temperature (°C)	Actual value = value displayed
16.--	Number of indoor units currently in communication with outdoor unit	Actual value = value displayed
17.--	Number of indoor units currently operating	Actual value = value displayed
18.--	Indoor unit model	
19.--	Outdoor unit address in the centralized controller	
20.--	Priority mode	Displayed 4, Cooling only.
21.--	Software version	
22.--	Most recent error or protection code	“nn“ is displayed if no error or protection events have occurred since start-up
23.--	Number of indoor units set by outdoor	
24.--	Display --	End

Notes:

1. 0-Standby; 2-Cooling;
2. 0-Shutdown the fan; 1-Low wind; 2-High wind; 3-Up fan shutdown / below fan is low wind

2.2.5 Digital display output

Table 5-2.6: Digital display output in different operating states

Outdoor unit state	Parameters displayed on DSP	
Standby	The number of indoor units in communication with the outdoor unit	
Normal operation	Frequency limitation code[1] and running speed of the compressor in rotations per second	
Error or protection	Error or protection code	
System check	Refer to Table 5-2.3	

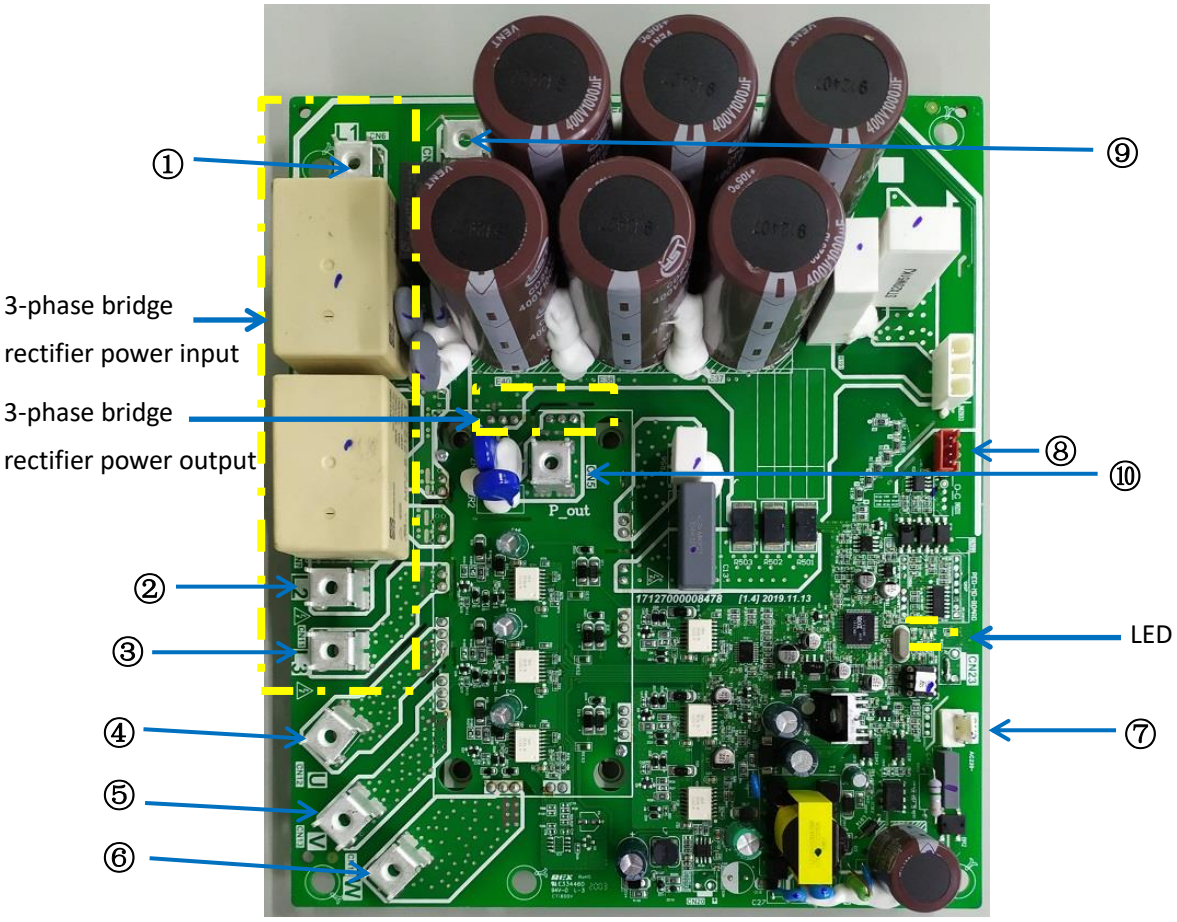
Notes:

1. Frequency limitation code:
   - P: Compressor discharge temperature frequency limitation; C: Pressure frequency limitation; A: Ambient temperature frequency limitation; F: Heat sink temperature frequency limitation; U: Voltage frequency limitation; H: Current frequency limitation; d: DC voltage frequency limitation.

3 Compressor Inverter Module

3.1 Ports

Figure 5-3.1: Outdoor unit inverter module ports[1]



Notes:

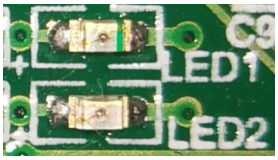
1. Label descriptions are given in Table 5-3.1.

Table 5-3.1: Inverter module ports

Label in Figure 5-2.1	Port code	Content	Port voltage
1	CN6	Power input L1 of inverter module	380V AC
2	CN7	Power input L2 of inverter module	380V AC
3	CN11	Power input L3 of inverter module	380V AC
4	CN12	Power output U of inverter module to compressor	Above 156V DC (varying according to frequency)
5	CN13	Power output V of inverter module to compressor	Above 156V DC (varying according to frequency)
6	CN14	Power output W of inverter module to compressor	Above 156V DC (varying according to frequency)
7	CN2	AC power supply input	220V AC
8	CN8	Main PCB connection	0-5V DC (varying)
9	CN1	DC bus input connect to reactor	350-640V DC (varying)
10	CN5	DC bus output connect to reactor	350-640V DC (varying)

3.1.1 LED indicators LED1 and LED2

Table 5-3.1: LED indicators LED1 and LED2

Indicator	LED indicator function and status	
LED 1	Inverter module operating indicator. Continuously on if the compressor is running normally and flashing if an inverter module error has occurred[1].	
LED 2	Inverter module error indicator. Continuously on if an inverter module error has occurred[1].	

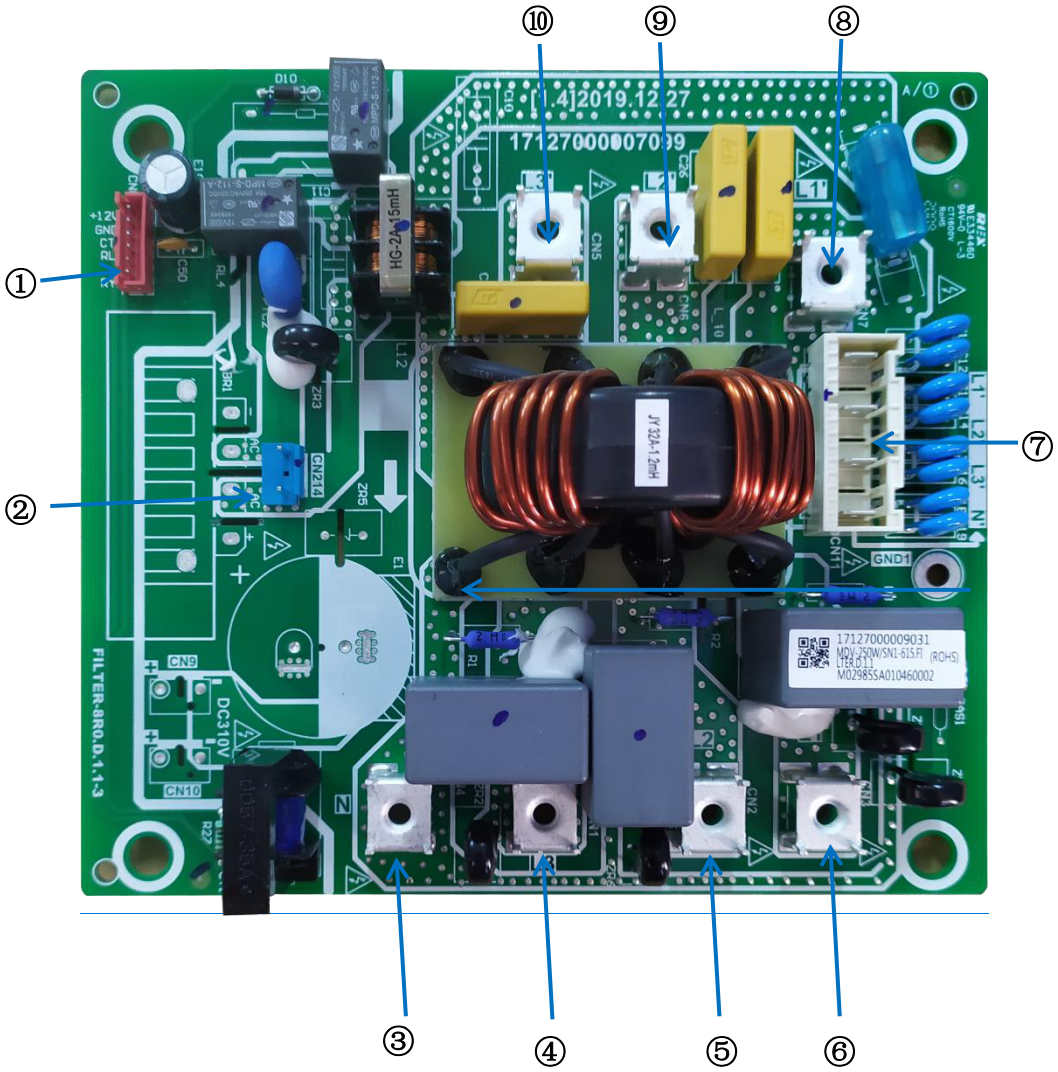
Note:

1. If an inverter module error occurs, refer to Part 6, “H4 Troubleshooting”. The error code is displayed on the digital display.

4 Filter Board

4.1 Ports

Figure 5-4.1: Outdoor unit filter board ports[1]



Notes:

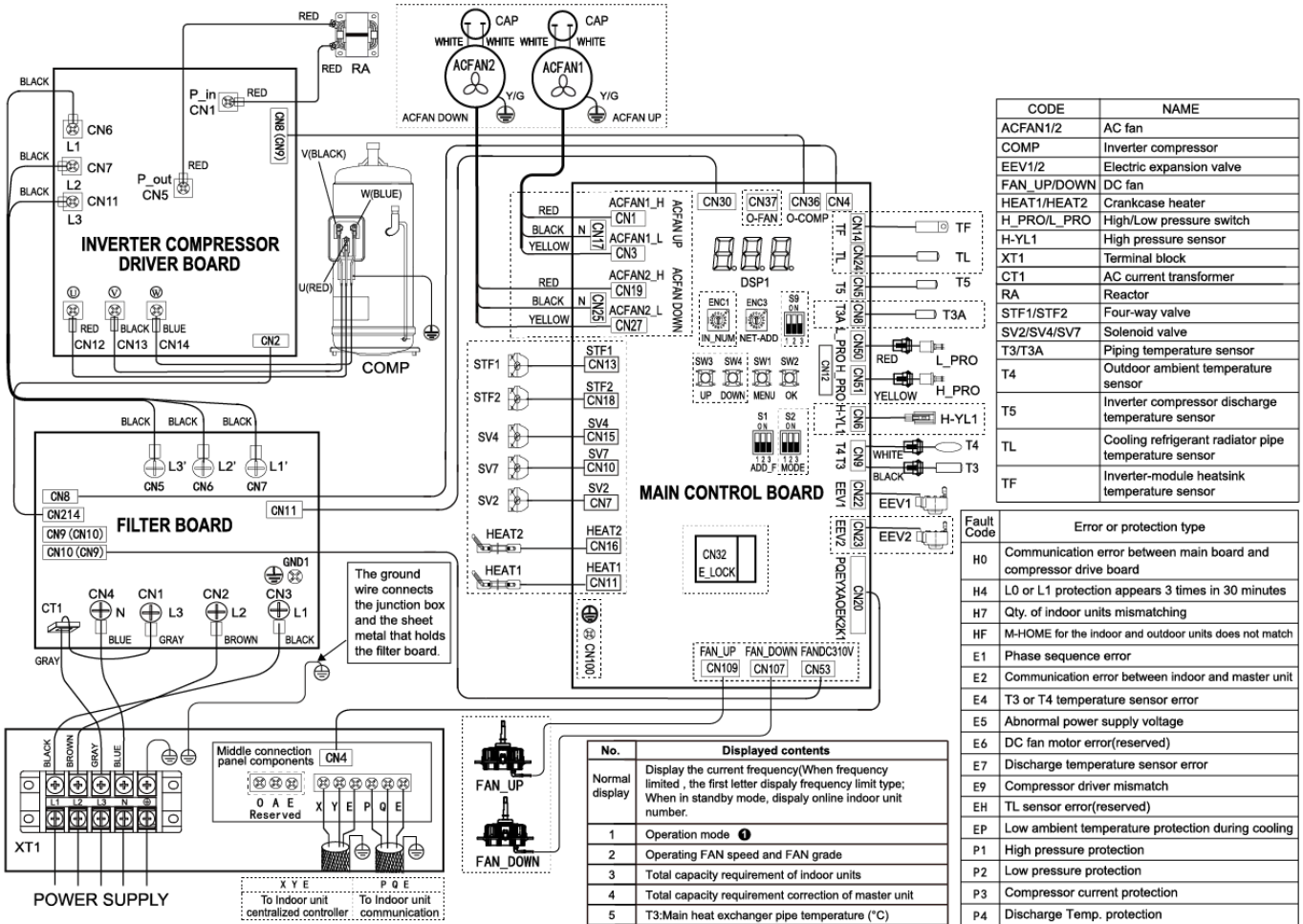
1. Label descriptions are given in Table 5-4.1.

Table 5-4.1: Filter board ports

Label in Figure 5-4.1	Port code	Content	Port voltage
1	CN8	Control port of filter board	12V DC
2	CN214	Power supply to inverter board	220V AC
3	CN4	Power input N of filter board	220V AC between L1/L2/L3 and N; 380V AC between L1,L2 and L3
4	CN1	Power input L3 of filter board	220V AC between L1/L2/L3 and N; 380V AC between L1,L2 and L3
5	CN2	Power input L2 of filter board	220V AC between L1/L2/L3 and N; 380V AC between L1,L2 and L3
6	CN3	Power input L1 of filter board	220V AC between L1/L2/L3 and N; 380V AC between L1,L2 and L3
7	CN11	Power supply output to main PCB	220V AC between L1/L2/L3 and N; 380V AC between L1,L2 and L3
8	CN7	Power output L1’ of filter board	220V AC between L1/L2/L3 and N; 380V AC between L1,L2 and L3
9	CN6	Power output L2’ of filter board	220V AC between L1/L2/L3 and N; 380V AC between L1,L2 and L3
10	CN5	Power output L3’ of filter board	220V AC between L1/L2/L3 and N; 380V AC between L1,L2 and L3

5 Wiring Diagrams

Figure 5-5.1: Wiring diagram



CODE	NAME
ACFAN1/2	AC fan
COMP	Inverter compressor
EEV1/2	Electric expansion valve
FAN_UP/DOWN	DC fan
HEAT1/HEAT2	Crankcase heater
H_PRO/L_PRO	High/Low pressure switch
H-YL1	High pressure sensor
XT1	Terminal block
CT1	AC current transformer
RA	Reactor
STF1/STF2	Four-way valve
SV2/SV4/SV7	Solenoid valve
T3/T3A	Piping temperature sensor
T4	Outdoor ambient temperature sensor
T5	Inverter compressor discharge temperature sensor
TL	Cooling refrigerant radiator pipe temperature sensor
TF	Inverter-module heatsink temperature sensor

Fault Code	Error or protection type
H0	Communication error between main board and compressor drive board
H4	L0 or L1 protection appears 3 times in 30 minutes
H7	Qty. of indoor units mismatching
HF	M-HOME for the indoor and outdoor units does not match
E1	Phase sequence error
E2	Communication error between indoor and master unit
E4	T3 or T4 temperature sensor error
E5	Abnormal power supply voltage
E6	DC fan motor error(reserved)
E7	Discharge temperature sensor error
E9	Compressor driver mismatch
EH	TL sensor error(reserved)
EP	Low ambient temperature protection during cooling
P1	High pressure protection
P2	Low pressure protection
P3	Compressor current protection
P4	Discharge Temp. protection
P5	High Temp. protection of condenser
P6	Inverter module protection(reserved)
P8	Typhoon protection(reserved)
PE	Evaporator (T2) high temperature protection
PL	Inverter module temperature protection
L0	Inverter compressor module error
L1	DC bus low voltage protection
L2	DC bus high voltage protection
L4	MCE error
L5	Zero speed protection
L7	Phase sequence protection
L8	Compressor frequency variation greater than 15Hz within one second protection
L9	Actual compressor frequency differs from target frequency by more than 15Hz protection
F1	DC bus voltage error(reserved)

No.	Displayed contents
Normal display	Display the current frequency(When frequency limited , the first letter dispaly frequency limit type; When in standby mode, dispaly online indoor unit number.
1	Operation mode ❶
2	Operating FAN speed and FAN grade
3	Total capacity requirement of indoor units
4	Total capacity requirement correction of master unit
5	T3:Main heat exchanger pipe temperature (°C)
6	T4:Outdoor ambient temperature (°C)
7	T5:Compressor discharge temperature (°C)
8	TF:Module temperature (°C)
9	TL:Refrigerant radiator pipe temperature (°C)
10	Electronic expansion valve aperture
11	Actual current value(A)
12	Compressor current feedback(A)
13	Actual voltage value(V)
14	DC bus voltage detection
15	T2/T2B average temperature (°C)
16	Total number of indoor units
17	Number of indoor units currently operating
18	Indoor unit model
19	Outdoor unit address in the centralized controller
20	Priority mode ❷
21	Program version No.
22	Last error or protection code
23	Number of indoor units set by outdoor unit or display --
24	Display --

ENC1 & S9-3		0-F	The number of indoor units is set to 0 to 15. 0-9 on ENC1 indicate 0-9 indoor units; A-F on ENC1 indicate 10-15 indoor units
		0	
		0-F	The number of indoor units is set to 16 to 31. 0-9 on ENC1 indicate 16-25 indoor units; A-F on ENC1 indicate 26-31 indoor units
		1	
ENC3		0-7	Outdoor unit network address setting, Only 0 to 7 should be selected (0 by default).
S1-1		0	Automatic selection of the new or old protocol(default)
		1	Forced implementation of old IDU protocol
S1-2		0	Automatic addressing (default)
		1	Clear indoor unit addresses
S1-3		0	EEV of forced discharge temperature control(default)
		1	Reserved
S9-1 & S9-2		00	Outdoor unit capacity, 7HP
		01	Outdoor unit capacity, 8HP
		10	Outdoor unit capacity, 9HP
		11	Outdoor unit capacity, 10HP
SW1		Press SW1 for 5s to enter forced cooling, then press for 5s to exit	
SW2		Sport check button	

Note:
means 0, means 1.

ENC1 and S9 are only available for MDVC models

The wiring picture shown is for reference only, actual product may vary.

❶ Operation mode: 0-Standby; 2-Cooling;
❷ Priority mode : 4-Cooling only

Part 6

Diagnosis and Troubleshooting

1 Error Code Table

Table 6-1.1: Error code table

Error code1	Content	Remarks	Manual re-start required1
E1	Phase sequence error	Displayed on the outdoor unit PCB	Yes
E2	Communication error between indoor and outdoor units	Displayed on the outdoor unit PCB	No
E4	Outdoor heat exchanger temperature sensor (T3) error or outdoor ambient temperature sensor (T4) error	Displayed on the outdoor unit PCB	No
E5	Abnormal power supply voltage	Displayed on the outdoor unit PCB	No
E7	Outdoor compressor discharge temperature sensor (T5) error	Displayed on the outdoor unit PCB	No
E9	Compressor driver mismatch	Displayed on the outdoor unit PCB	No
EP	Low ambient temperature protection during cooling	Displayed on the outdoor unit PCB	No
H0	Communication error between main control chip and inverter driver chip	Displayed on the outdoor unit PCB	No
H4	Inverter module protection, L0/L1 protection appears three times in 30 minutes	Displayed on the outdoor unit PCB	Yes
H7	Number of indoor units detected by outdoor unit not same as number set on main PCB	Displayed on the outdoor unit PCB	No
HF	M-HOME for the indoor and outdoor units does not match	Displayed on the outdoor unit PCB	YES
P1	Discharge pipe high pressure protection	Displayed on the outdoor unit PCB	No
P2	Suction pipe low pressure protection	Displayed on the outdoor unit PCB	No
P3	Compressor current protection	Displayed on the outdoor unit PCB	No
P4	Discharge temperature protection	Displayed on the outdoor unit PCB	No
P5	Outdoor heat exchanger temperature protection	Displayed on the outdoor unit PCB	No
PE	Indoor heat exchanger temperature protection	Displayed on the outdoor unit PCB	No
PL	Heat sink high temperature protection	Displayed on the outdoor unit PCB	No
L0	Inverter module protection	Displayed on the outdoor unit PCB	Yes
L1	DC bus low voltage protection	Displayed on the outdoor unit PCB	Yes
L2	DC bus high voltage protection	Displayed on the outdoor unit PCB	Yes
L4	MCE error	Displayed on the outdoor unit PCB	Yes
L5	Zero speed protection	Displayed on the outdoor unit PCB	Yes
L7	Phase sequence error	Displayed on the outdoor unit PCB	Yes
L8	Compressor frequency variation greater than 15Hz within one second protection	Displayed on the outdoor unit PCB	Yes
L9	Actual compressor frequency differs from target frequency by more than 15Hz protection	Displayed on the outdoor unit PCB	Yes

Notes:

1. For some error codes, a manual restart is required before the system can resume operation.

2 Troubleshooting

2.1 Warning

Warning

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

2.2 E1: Phase sequence error

2.2.1 Digital display output

2.2.2 Description

- Phase sequence error.
- The system stops running.
- Error code is displayed on the outdoor unit PCB.

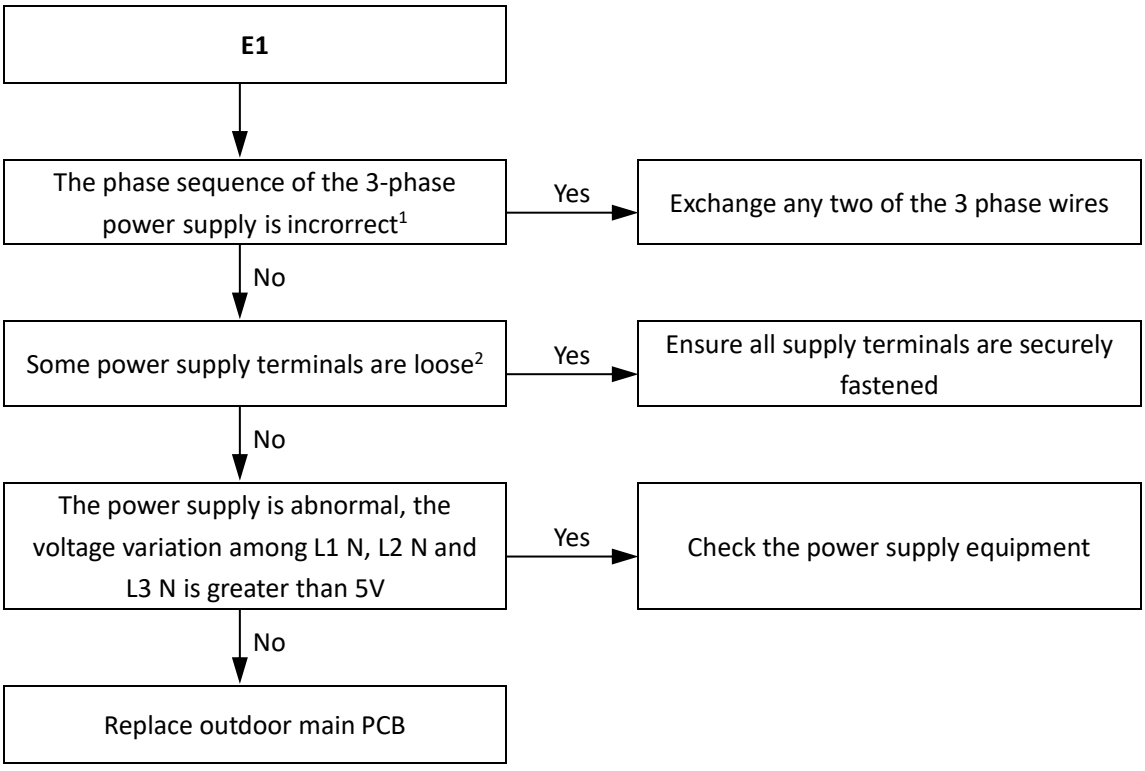
2.2.3 Trigger / recover condition

- Trigger condition: Wrong phase connection for 1.6s or phase missing for 48s.
- Recover condition: Correct phase connection.
- Reset method: Manually restart.

2.2.4 Possible causes

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

2.2.5 Procedure



Notes:

1. The L1, L2, L3 terminals of the 3-phase power supply should match compressor phase sequence requirements. If the phase sequence is inverted, the compressor will operate inversely.
2. Loose power supply terminals can cause the compressor to operate abnormally and compressor current to be very large.

2.3 E2: Communication error between indoor and outdoor unit

2.3.1 Digital display output

2.3.2 Description

- Communication error between indoor and outdoor unit.
- The system stops running.
- Error code is displayed on the outdoor unit PCB.

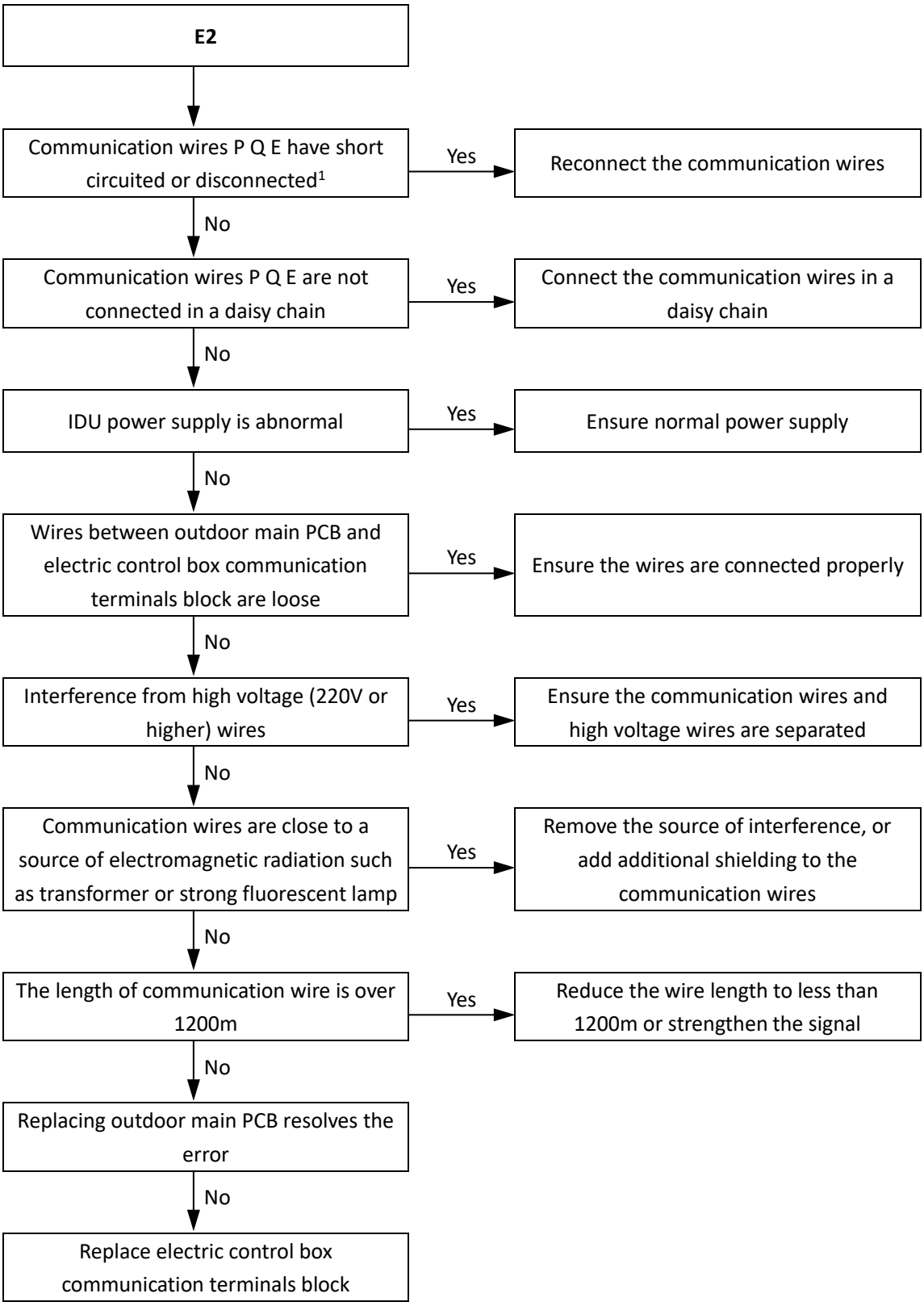
2.3.3 Trigger / recover condition

- Trigger condition: Indoor units and the outdoor unit cannot communicate for 2 minutes after the system is powered on for 20 minutes.
- Recover condition: Communication go back to normal.
- Reset method: Resume automatically.

2.3.4 Possible causes

- Communication wires between indoor and outdoor units not connected properly.
- Indoor unit power supply abnormal.
- Loosened wiring within electric control box.
- Interference from high voltage wires or other sources of electromagnetic radiation.
- Communication wire too long.
- Damaged main PCB or electric control box communication terminals block.

2.3.5 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.

2.4 E4: Temperature sensor (T3/T4) error

2.4.1 Digital display output

2.4.2 Description

- Outdoor heat exchanger temperature sensor (T3) error or outdoor ambient temperature sensor (T4) error.
- The system stops running.
- Error code is displayed on the outdoor unit PCB.

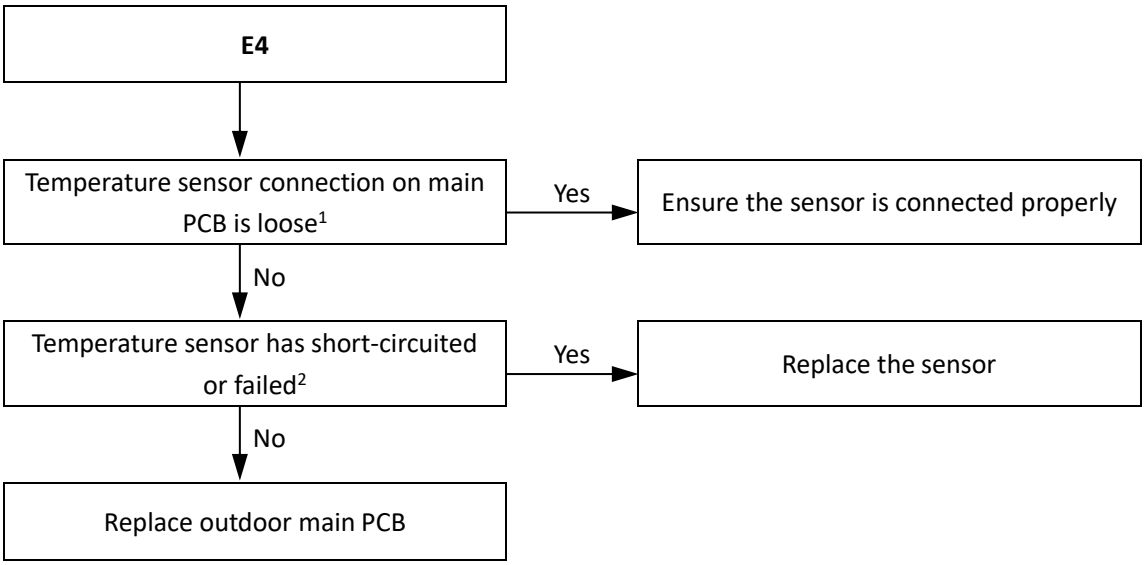
2.4.3 Trigger / recover condition

- Trigger condition: The main control board cannot receive the feedback signal of temperature sensor T3 or T4.
- Recover condition: The main control board can receive the feedback signal of temperature sensor T3 or T4.
- Reset method: Resume automatically.

2.4.4 Possible causes

- Temperature sensor not connected properly or has malfunctioned.
- Damaged main PCB.

2.4.5 Procedure



Notes:

1. Outdoor ambient temperature sensor (T4) and heat exchanger temperature sensor (T3) connection is port CN9 on the main PCB (labeled 10 in Figure 5-2.1 in Part 5, 2.1 “Ports”).
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 6-3.1 in Part 6, 3.1 “Temperature Sensor Resistance Characteristics”.

2.5 E5: Abnormal power supply voltage

2.5.1 Digital display output

2.5.2 Description

- Abnormal power supply voltage.
- The system stops running.
- Error code is displayed on the outdoor unit PCB.

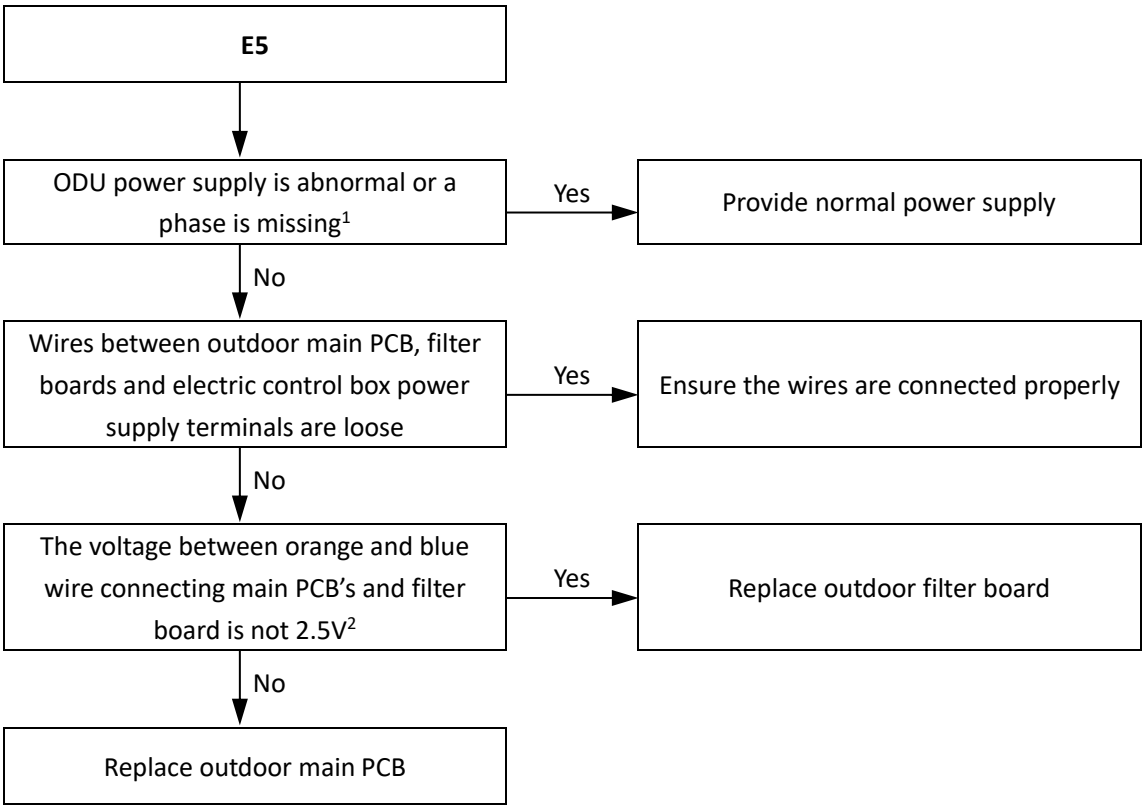
2.5.3 Trigger / recover condition

- Trigger condition: Outdoor unit power supply phase voltage < 172V.
- Recover condition: Outdoor unit power supply phase voltage is > 265V.
- Reset method: Resume automatically.

2.5.4 Possible causes

- Outdoor unit power supply voltage is abnormal or a phase is missing.
- Loosened wiring within electric control box.
- High voltage circuit error.
- Main PCB damaged.

2.5.5 Procedure



Notes:

1. The normal voltage between L1and N, L2 and N, and L3 and N is 172-265V.
2. Control port of filter board is CN4 on the main PCB (labeled 3 in Figure 5-2.1 in Part 5, 2.1 "Ports").

2.6 E7: Temperature sensor (T5) error

2.6.1 Digital display output

2.6.2 Description

- A compressor discharge pipe temperature sensor (T5) error.
- The system stops running.
- Error code is displayed on the outdoor unit PCB.

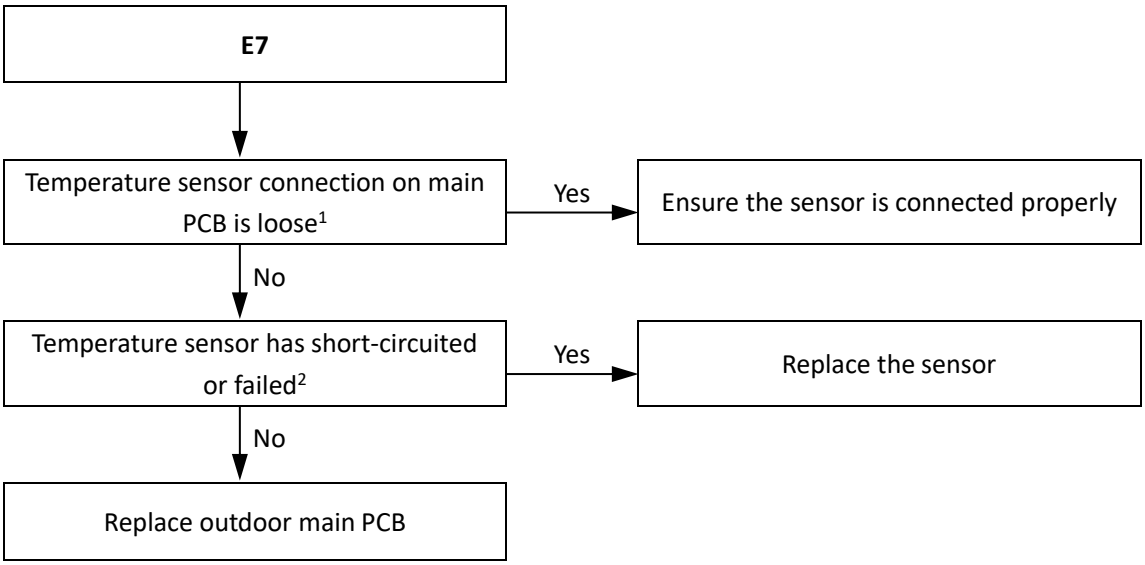
2.6.3 Trigger / recover condition

- Trigger condition: Discharge temperature < 10°C for 5 minutes after compressor startup for 15 minutes.
- Recover condition: Discharge temperature go back to normal.
- Reset method: Manually restart.

2.6.4 Possible causes

- Temperature sensor not connected properly or has malfunctioned.
- Damaged main PCB.

2.6.5 Procedure



Notes:

1. Compressor discharge pipe temperature sensor connection is port CN5 on the main PCB (labeled 6 in Figure 5-2.1 in Part 5, 2.1 “Ports”).
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 6-3.2 in Part 6, 3.1 “Temperature Sensor Resistance Characteristics”.

2.7 EP: Low ambient temperature protection during cooling

2.7.1 Digital display output

2.7.2 Description

- The outdoor ambient temperature sensor (T4) ≤10 °C,
- The system stops running.
- Error code is displayed on the outdoor unit PCB.

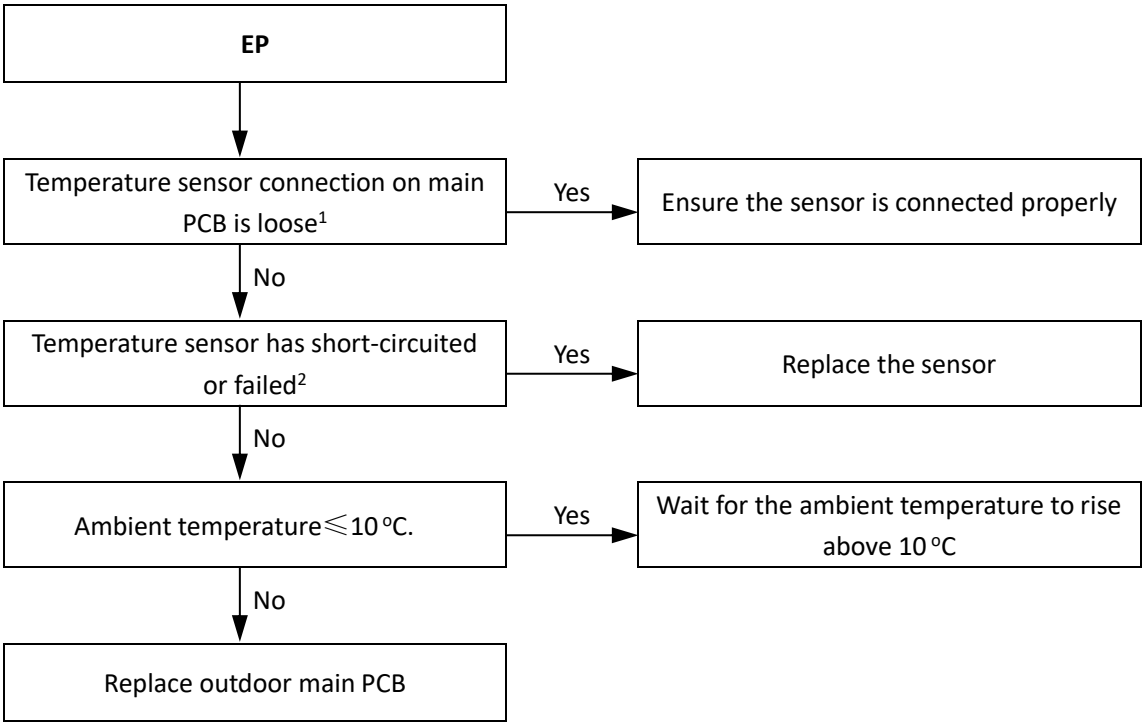
2.7.3 Trigger / recover condition

- Trigger condition: The outdoor ambient temperature sensor (T4) ≤10 °C,
- Recover condition: Ambient temperature go back to normal.
- Reset method: Resume automatically.

2.7.4 Possible causes

- Temperature sensor not connected properly or has malfunctioned.
- Damaged main PCB.
- Ambient temperature≤10 °C.

2.7.5 Procedure



Notes:

1. Ambient temperature sensor connection is port CN9 on the main PCB (labeled 6 in Figure 5-2.1 in Part 5, 2.1 “Ports”).
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 6-3.2 in Part 6, 3.1 “Temperature Sensor Resistance Characteristics”.

2.8 H0: Communication error

2.8.1 Digital display output

2.8.2 Description

- H0 indicates a communication error between the main control chip and the compressor inverter driver chip.
- The system stops running.
- Error code is displayed on the outdoor unit PCB.

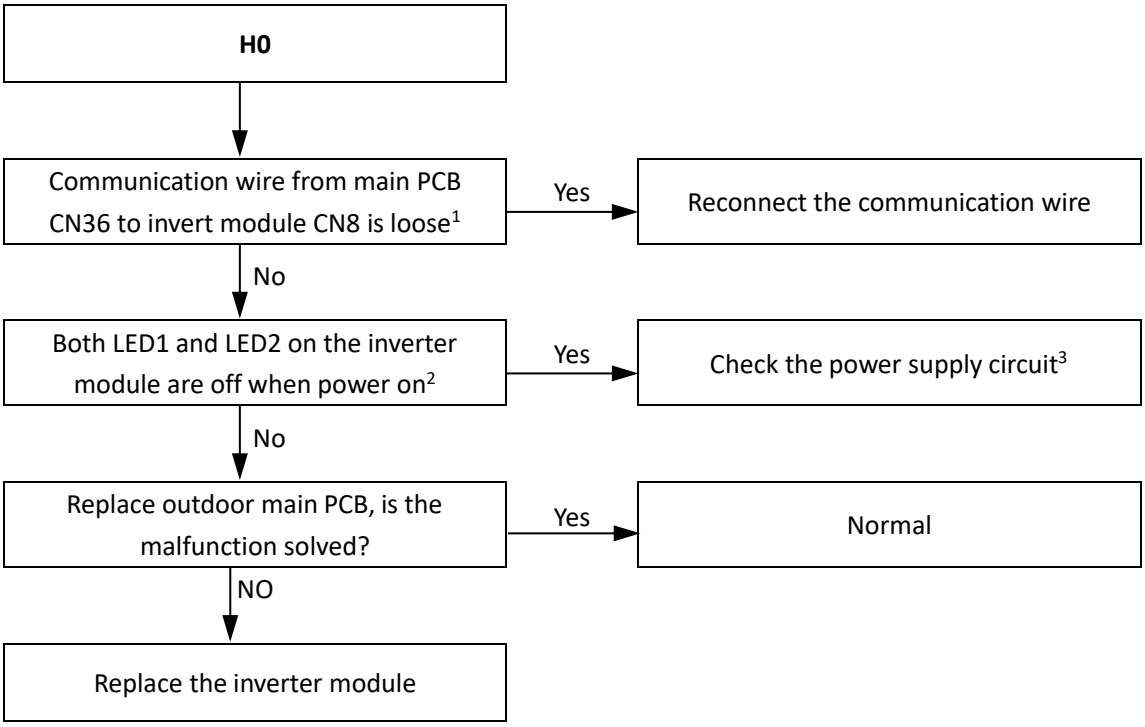
2.8.3 Trigger / recover condition

- 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.

2.8.4 Possible causes

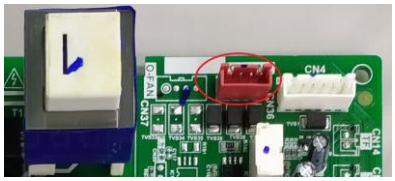
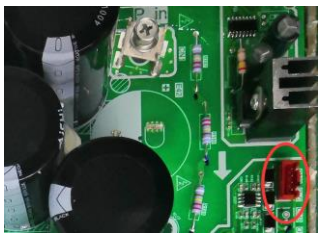
- Loosened communication wiring from the main PCB to the inverter module.
- Bridge rectifier damaged.
- Main PCB damaged.
- Compressor inverter module damaged.

2.8.5 Procedure



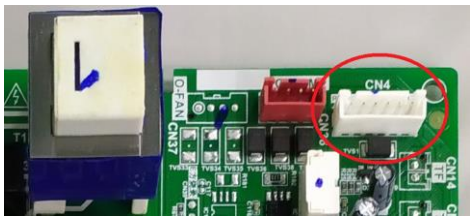
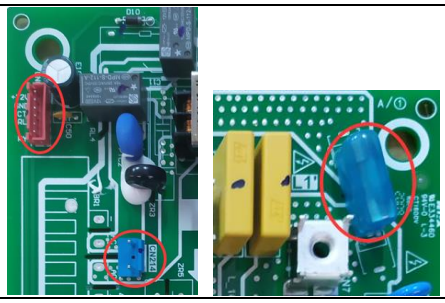
Notes:

1. Communication wire from outdoor main PCB CN36 to inverter module CN8.

Communication port CN36 on main PCB	Communication port CN8 on inverter module
	

2. LED1/2 on inverter module

3. Check the power supply for the compressor inverter module, port CN214 on filter board, the normal voltage should be 220V; check the connection cable from ODU main PCB port CN4 to filter board port CN8 which is 12V DC power control port. Check the fuse is good or not.

Communication port CN4 on main PCB	Communication port CN8 and Power supply to inverter board and fuse on filter board
	

2.9 H4: Inverter module protection

2.9.1 Digital display output

2.9.2 Description

- H4 indicates compressor inverter module protection.
- The system stops running.
- Error code is displayed on the outdoor unit PCB.

2.9.3 Trigger / recover condition

- Trigger condition: Compressor appears three inverter module protections.
- Recover condition: Inverter module goes back to normal.
- Reset method: Manually restart.

2.9.4 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.

2.9.5 Specific error codes for H4 inverter module protection

If an H4 error code is displayed, check the history error code to check the following specific error code: L0, L1, L2, L4, L5, L7, L8, L9.

Table 6-2.1: Specific error codes for error xH4

Specific error code[1]	Content
L0	Inverter module protection
L1	DC bus low voltage protection
L2	DC bus high voltage protection
L4	MCE error
L5	Zero speed protection
L7	Phase sequence error
L8	Compressor frequency variation greater than 15Hz within one second protection
L9	Actual compressor frequency differs from target frequency by more than 15Hz protection

The specific error codes L0, L1, L2 and L4 can also be obtained from the inverter module LED indicators. If an inverter module error has occurred, LED2 is continuously on and LED1 flashes.

Figure 6-2.2: LED indicators LED1 and LED2 on inverter module

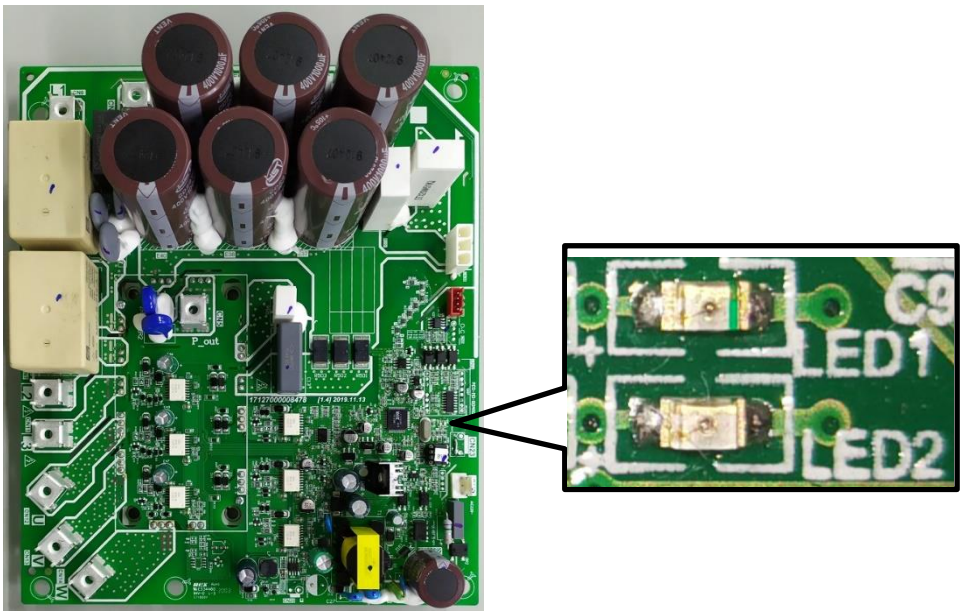
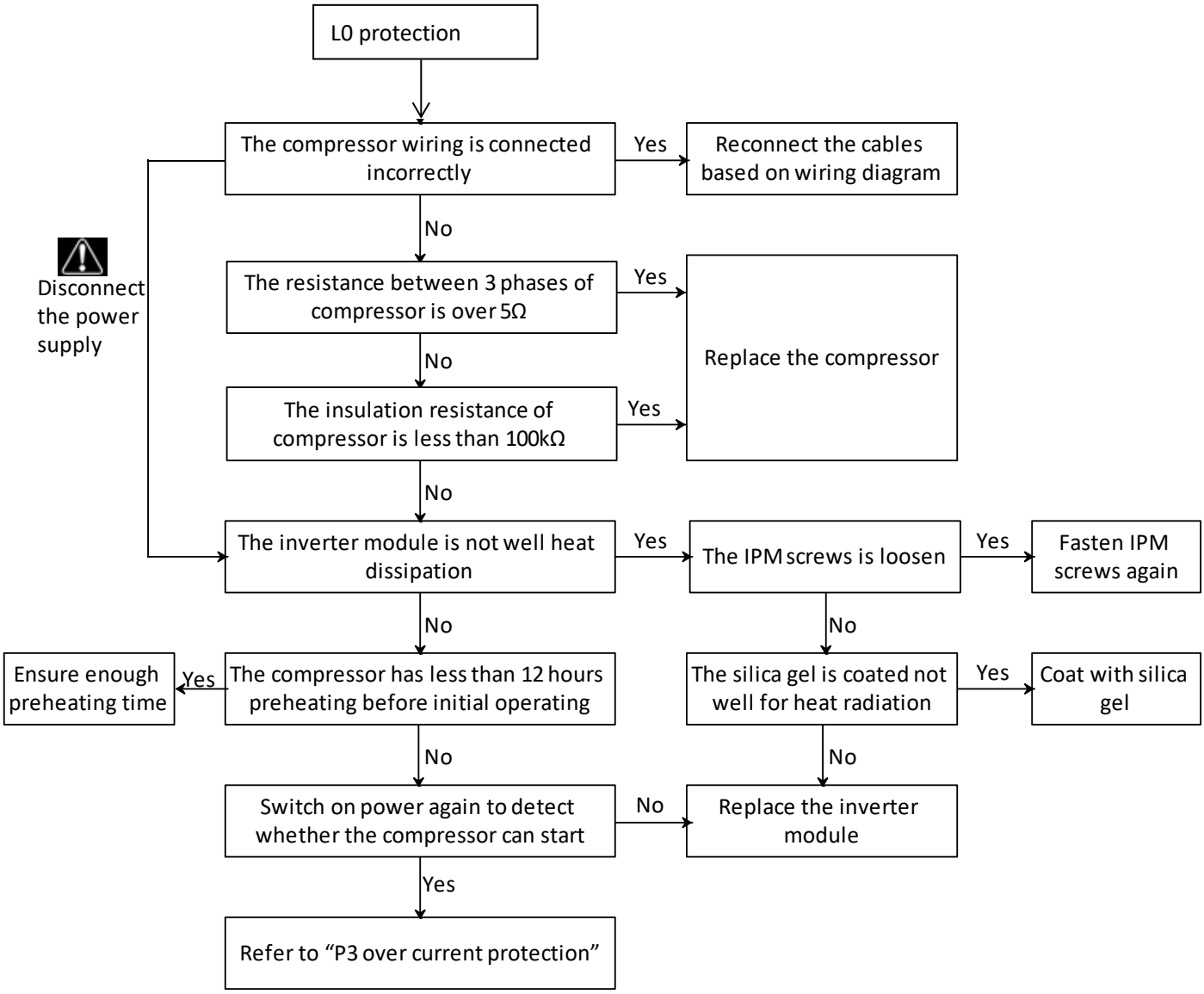


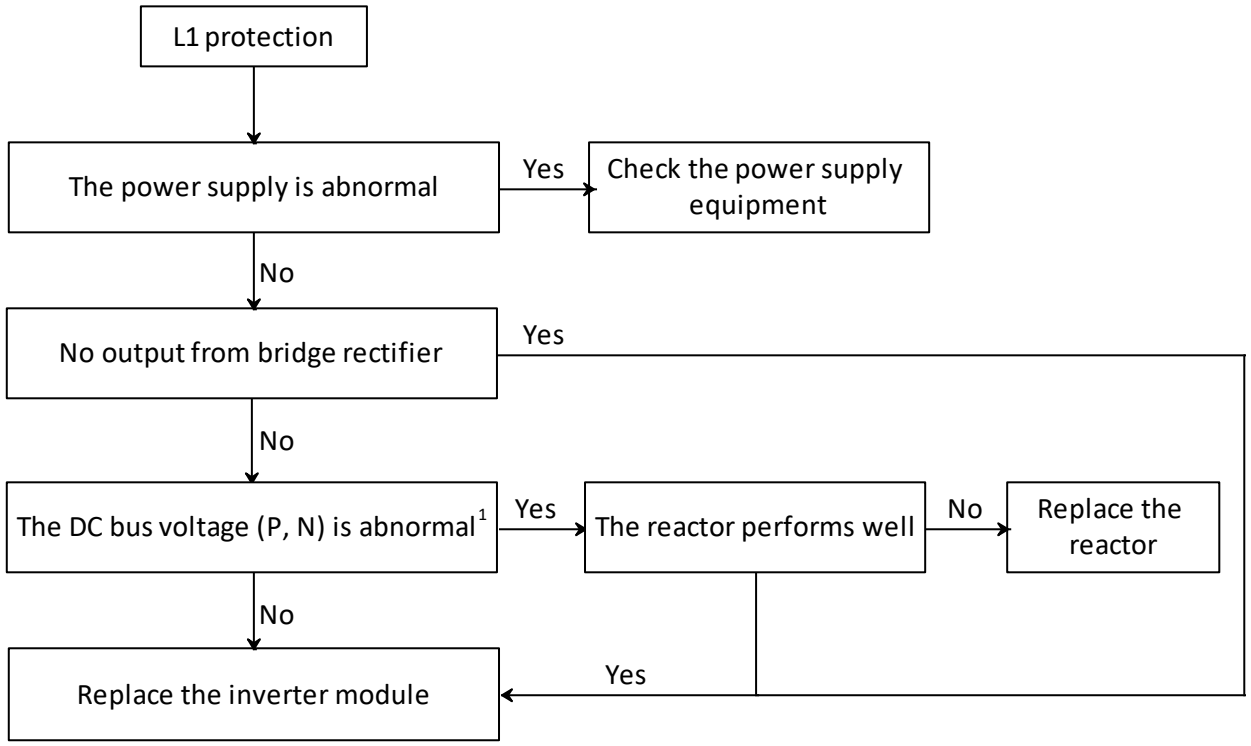
Table 2-6.2: Errors indicated on LED1

LED1 flashing pattern	Corresponding error
Flashes 8 times and stops for 1 second, then repeats	L0 - Inverter module protection
Flashes 9 times and stops for 1 second, then repeats	L1 - DC bus low voltage protection
Flashes 10 times and stops for 1 second, then repeats	L2 - DC bus high voltage protection
Flashes 12 times and stops for 1 second, then repeats	L4 - MCE error

2.9.6 L0: Inverter module protection



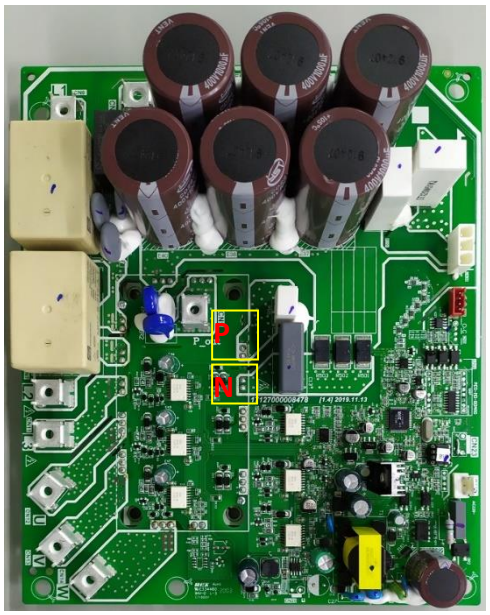
2.9.7 L1: DC bus low voltage protection



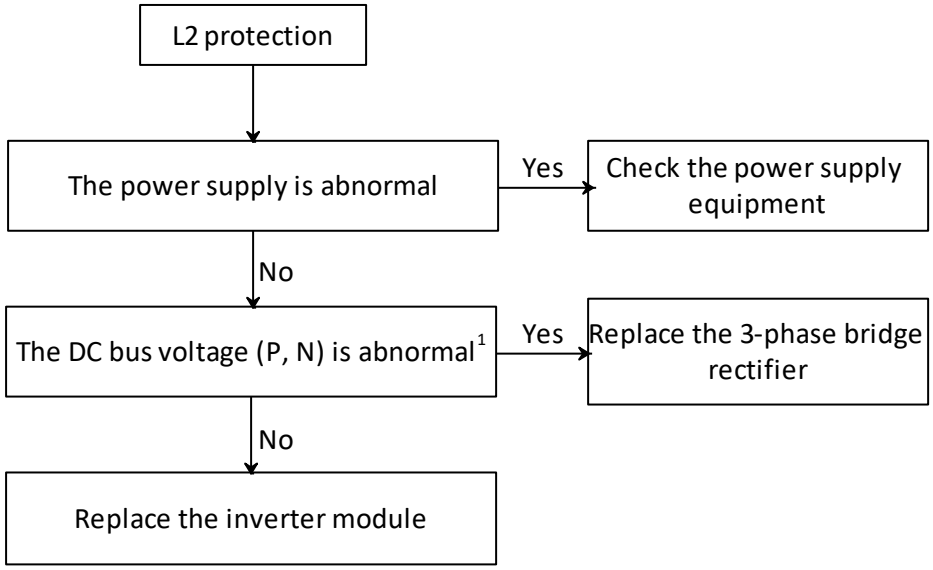
Note:

1. The normal DC voltage between terminals P and N on inverter module should be 450-650V. When the voltage is lower than 300V, L1 protection will be appeared.

Figure 6-2.3: P and N terminals on Inverter module



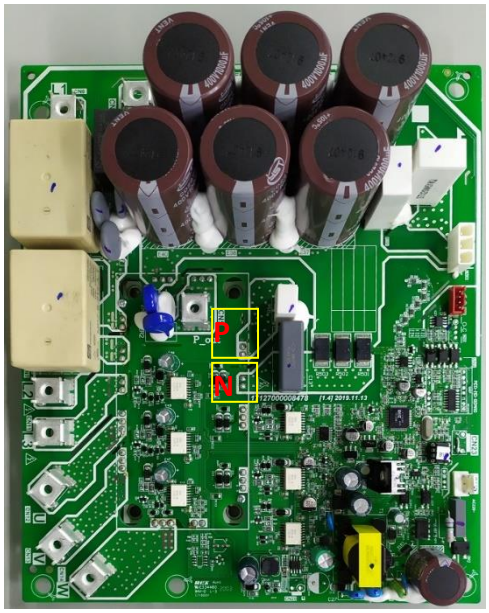
2.9.8 L2: DC bus high voltage protection



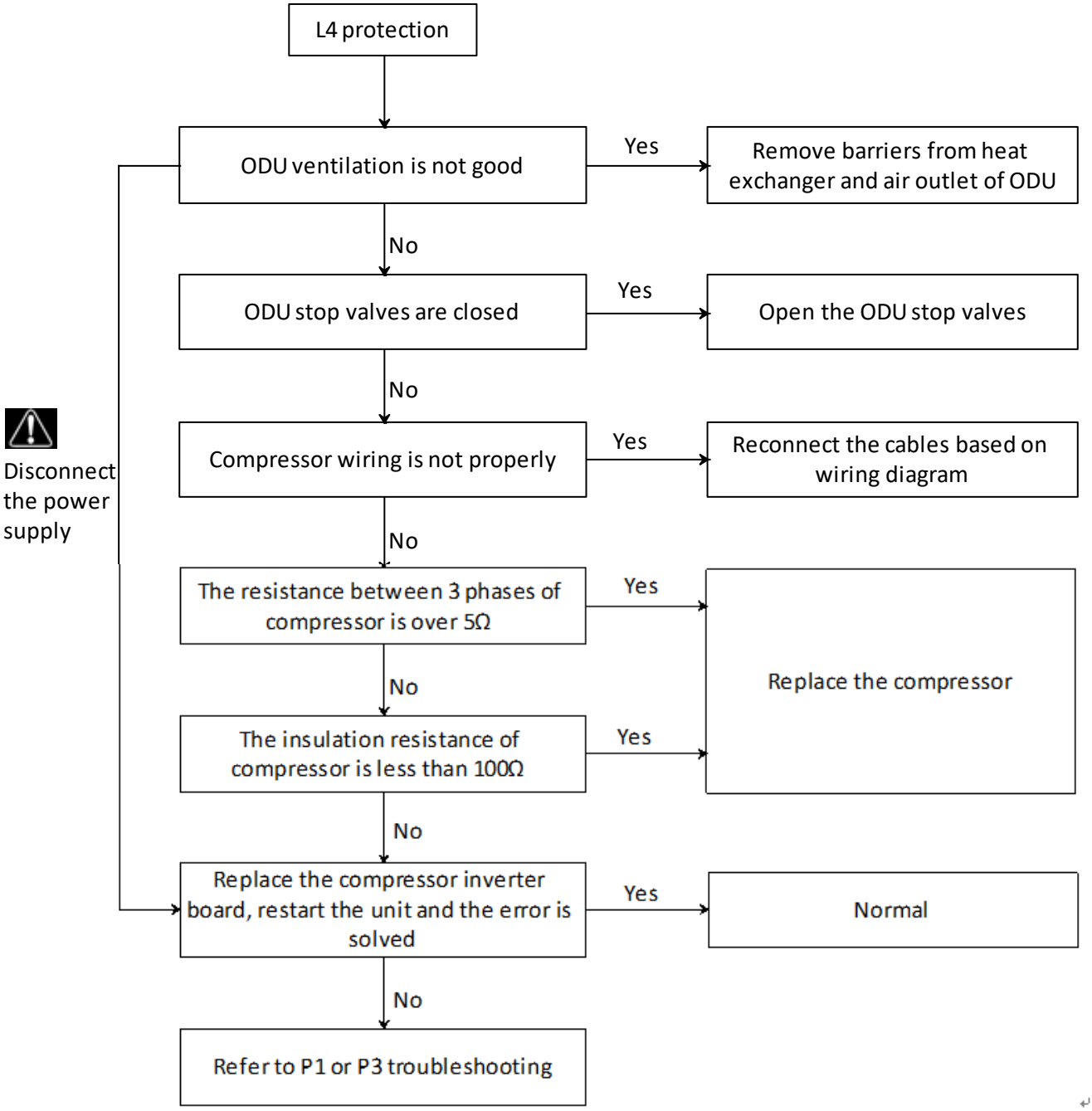
Note:

1. The normal DC voltage between terminals P and N on inverter module should be 450-650V. When the voltage is higher than 700V, L2 protection will be appeared.

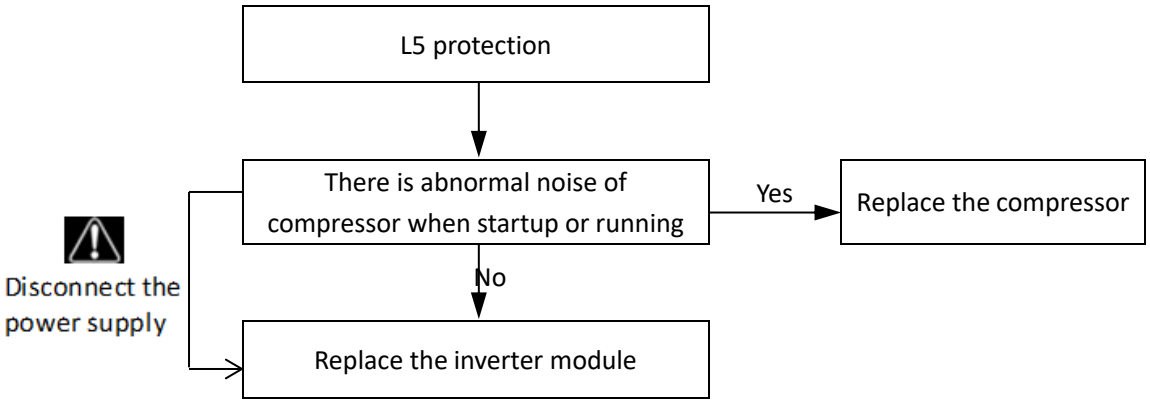
Figure 6-2.4: P and N terminals on Inverter module



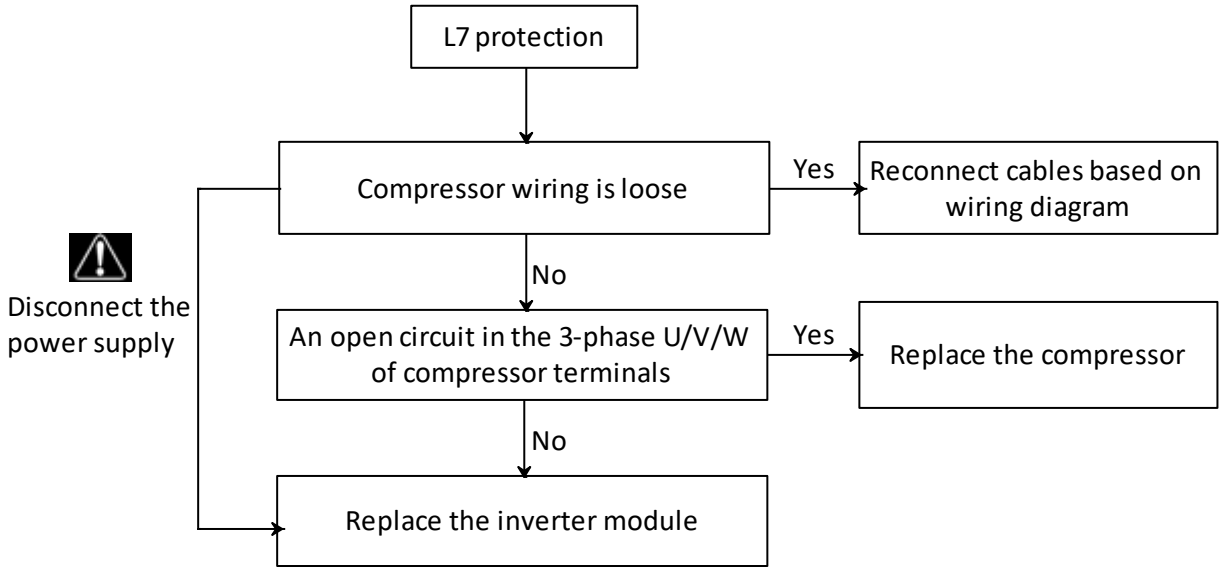
2.9.9 L4: MCE error



2.9.10 L5: Zero speed protection

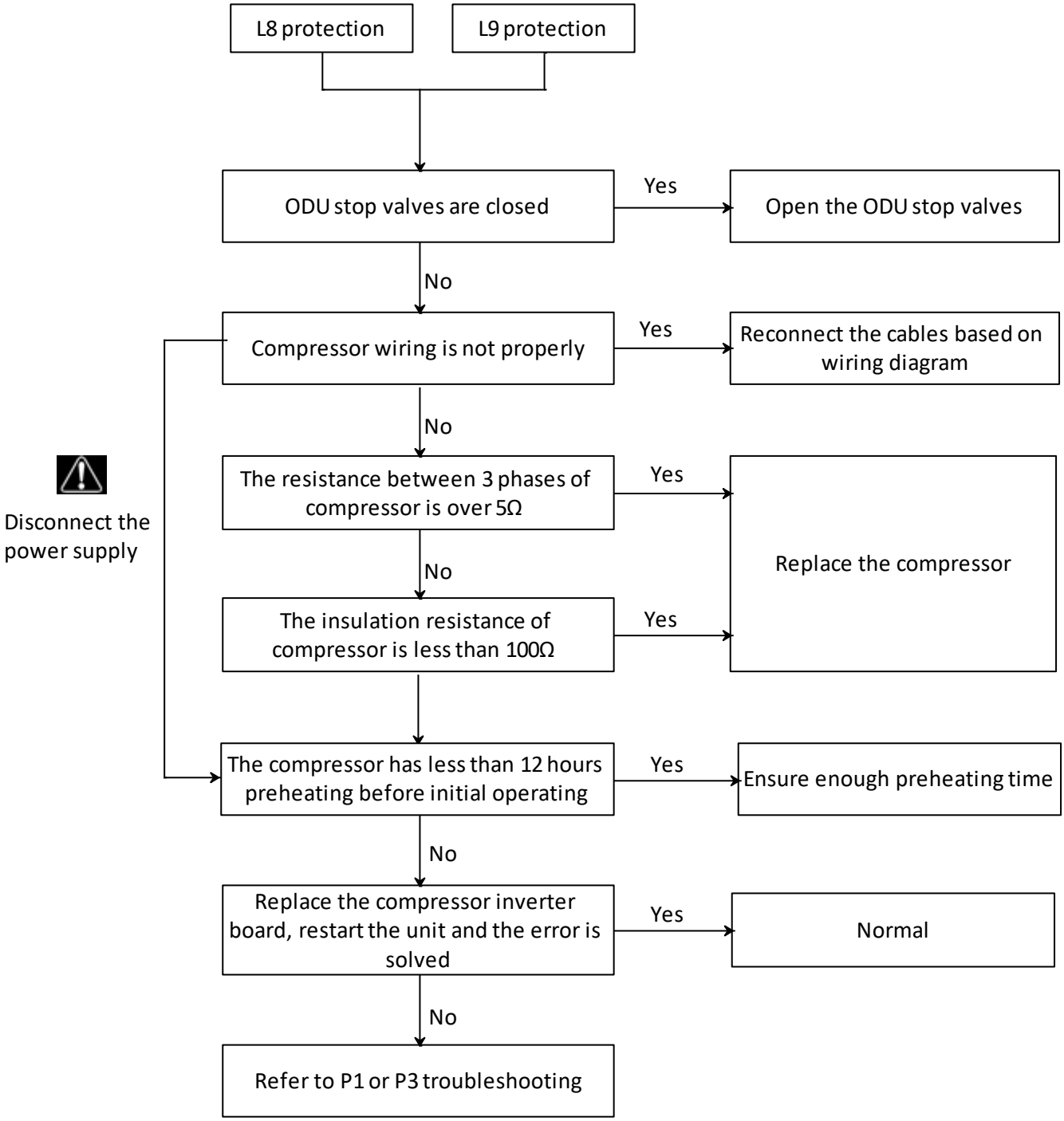


2.9.11 L7: Phase sequence error



2.9.12 L8: Compressor frequency variation greater than 15Hz within one second protection

L9: Actual compressor frequency differs from target frequency by more than 15Hz protection



2.9.13 Compressor replacement procedure

Figure 6-2.5: Draining oil from a compressor

Step 1: Remove faulty compressor and remove oil

- Remove the faulty compressor from the outdoor 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.

Step 2: Inspect oil from faulty compressor

- The oil should be clear and transparent. Slightly yellow oil is not an indication of any problems. However, if the oil is dark, black or contains impurities, the system has problems and the oil needs to be changed. Refer to Figure 6-2.7 for further details regarding inspecting compressor oil. (If the compressor oil has been spoiled, the compressor will not be being lubricated effectively. The scroll plate, crankshaft and bearings 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.)

Step 3: Check oil in other compressors in the system

- If the oil drained from the faulty compressor is clean, go to Step 6.
- If the oil drained from the faulty compressor is spoiled (lightly or heavily), go to Step 4.

Step 4: Replace oil separator and accumulator

- If the oil from a compressor is spoiled (lightly or heavily), drain the oil from the oil separator and accumulator in that unit and then replace them.

Step 5: Check filters(s)

- If the oil from a compressor is spoiled (lightly or heavily), check the filter between the gas stop valve and the 4-way valve in that unit. If it is blocked, clean with nitrogen or replace.

Step 6: Replace the faulty compressor and re-fit the other compressors

Figure 6-2.6: Compressor piping

- Replace the faulty compressor.
- If the oil had been spoiled and was drained from the non-faulty compressor in Step 3, use clean oil to clean them before re-fitting it into the unit. To clean, add oil into the compressor through the discharge pipe using a funnel, shake the compressor, and then drain the oil. Repeat several times and then re-fit the compressors into the units. (The discharge pipe is connected to the oil pool of the compressor by the inner oil balance pipe.)

Step 7: Add compressor oil

- Add 1.5L of oil to each of the compressors from which oil was drained in Step 3.
- Only use RB75EA oil. Different compressors require different types of oil. Using the wrong type of oil leads to various problems.
- Add additional 1.1L oil to the accumulator from which oil was drained in Step 4 such that the total amount of oil is 2.6L.

Step 8: Vacuum drying and refrigerant charging

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

Figure 6-2.7: Inspecting compressor oil

2.10 H7: Unmatched total number of indoor units

2.10.1 Digital display output

2.10.2 Description

- Number of indoor units detected by the outdoor unit not same as number set on main PCB.
- The system stops running.
- Error code is displayed on the outdoor unit PCB.

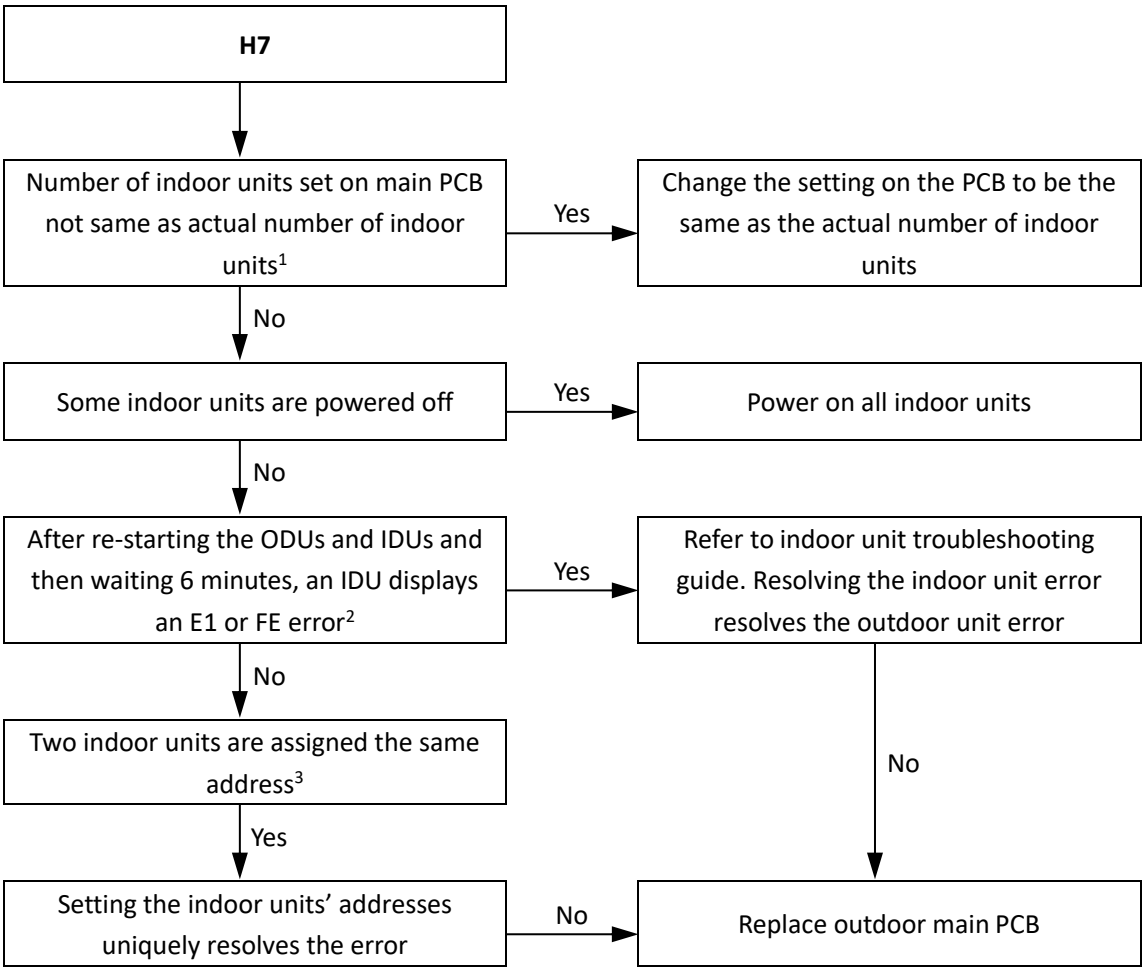
2.10.3 Trigger / recover condition

- Trigger condition: At least one indoor unit cannot be detected by the outdoor unit for more than 20 minutes for the first time powered on or at least one indoor unit cannot be detected by the outdoor unit for more than 3 minutes.
- Recover condition: Number of indoor units detected by the outdoor unit is same as number set on main PCB.
- Reset method: Resume automatically.

2.10.4 Possible causes

- Number of indoor units set on main PCB not same as actual number of indoor units.
- Some indoor units are powered off.
- Communication wires between indoor and outdoor units not connected properly.
- Indoor unit PCB damaged.
- Indoor unit without address or indoor unit address repeated.
- Main PCB damaged.

2.10.5 Procedure



Notes:

1. The number of indoor units can be set on switches ENC1 on the main PCB.
2. Indoor unit error code E1 indicates a communication error between indoor and outdoor unit. Indoor unit error code FE indicates that an indoor unit has not been assigned an address.
3. Indoor unit addresses can be checked and manually assigned using indoor unit remote/wired controllers. Alternatively, indoor unit addresses can be automatically assigned by the outdoor unit.

2.11 HF: The indoor and outdoor units does not match

2.11.1 Digital display output

2.11.2 Description

- The indoor and outdoor units does not match.
- The system stops running.
- Error code is displayed on the outdoor unit PCB.

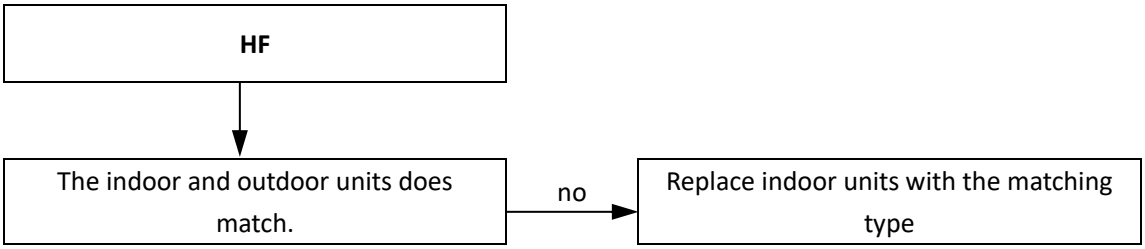
2.11.3 Trigger / recover condition

- Trigger condition: The indoor and outdoor units does not match.
- Recover condition: Replace with a matching type
- Reset method: Manually restart.

2.11.4 Possible causes

- The indoor and outdoor units do not match.

2.11.5 Procedure



2.12 P1: Discharge pipe high pressure protection

2.12.1 Digital display output

2.12.2 Description

- Discharge pipe high pressure protection.
- The system stops running.
- Error code is displayed on the outdoor unit PCB.

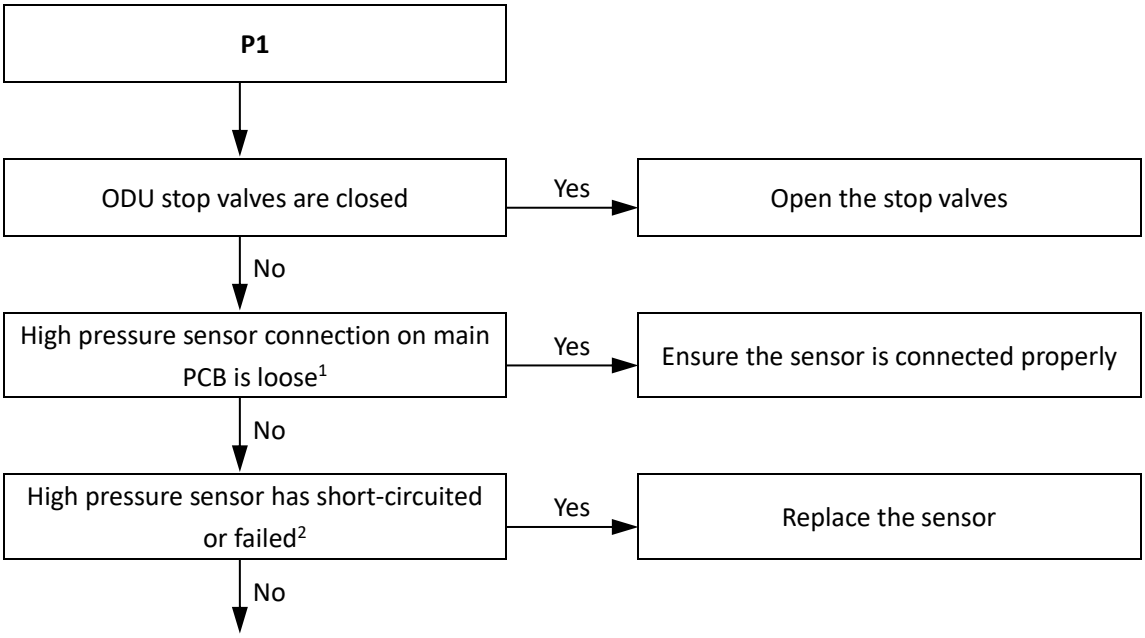
2.12.3 Trigger / recover condition

- Trigger condition: Discharge pressure ≥ 4.4MPa.
- Recover condition: Discharge pressure ≤ 3.2MPa.
- Reset method: Resume automatically.

2.12.4 Possible causes

- Outdoor unit stop valves are closed.
- Pressure sensor/switch not connected properly or has malfunctioned.
- Excess refrigerant.
- System contains air or nitrogen.
- High pressure side blockage.
- Poor condenser heat exchange.
- Main PCB damaged.

2.12.5 Procedure



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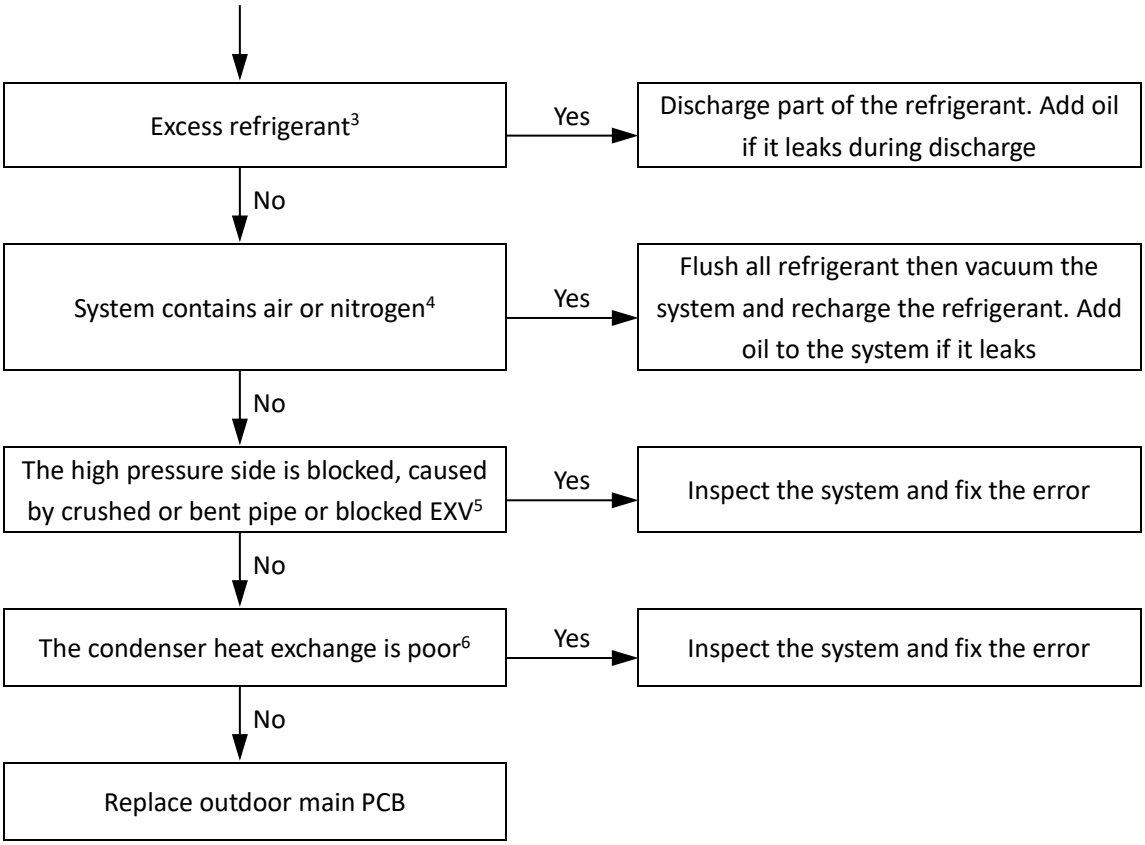


Notes:

1. The high pressure sensor connection is port CN12 on the main PCB (labeled 8 in Figure 5-2.1 in Part 5, 2.1 “Ports”).
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. Excess refrigerant causes discharge temperature to be lower than normal, discharge pressure to be higher than normal and suction pressure to be higher than normal. For normal system parameters refer to Table 6-3.4 in Part 6, 3.2 “Normal Operating Parameters of Refrigerant System”.
4. Air or nitrogen in the system causes discharge temperature to be higher than normal, discharge pressure to be higher than normal, compressor current to be higher than normal, abnormal compressor noise and an unsteady pressure meter reading. For normal system parameters refer to Table 6-3.4 in Part 6, 3.2 “Normal Operating Parameters of Refrigerant System”.
5. 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. For normal system parameters refer to Table 6-3.4 in Part 6, 3.2 “Normal Operating Parameters of Refrigerant System”.
6. In cooling mode check outdoor heat exchangers, fans and air outlets for dirt/blockages.

2.13 P2: Suction pipe low pressure protection

2.13.1 Digital display output

2.13.2 Description

- Suction pipe low pressure protection.
- The system stops running.
- Error code is displayed on outdoor unit PCB.

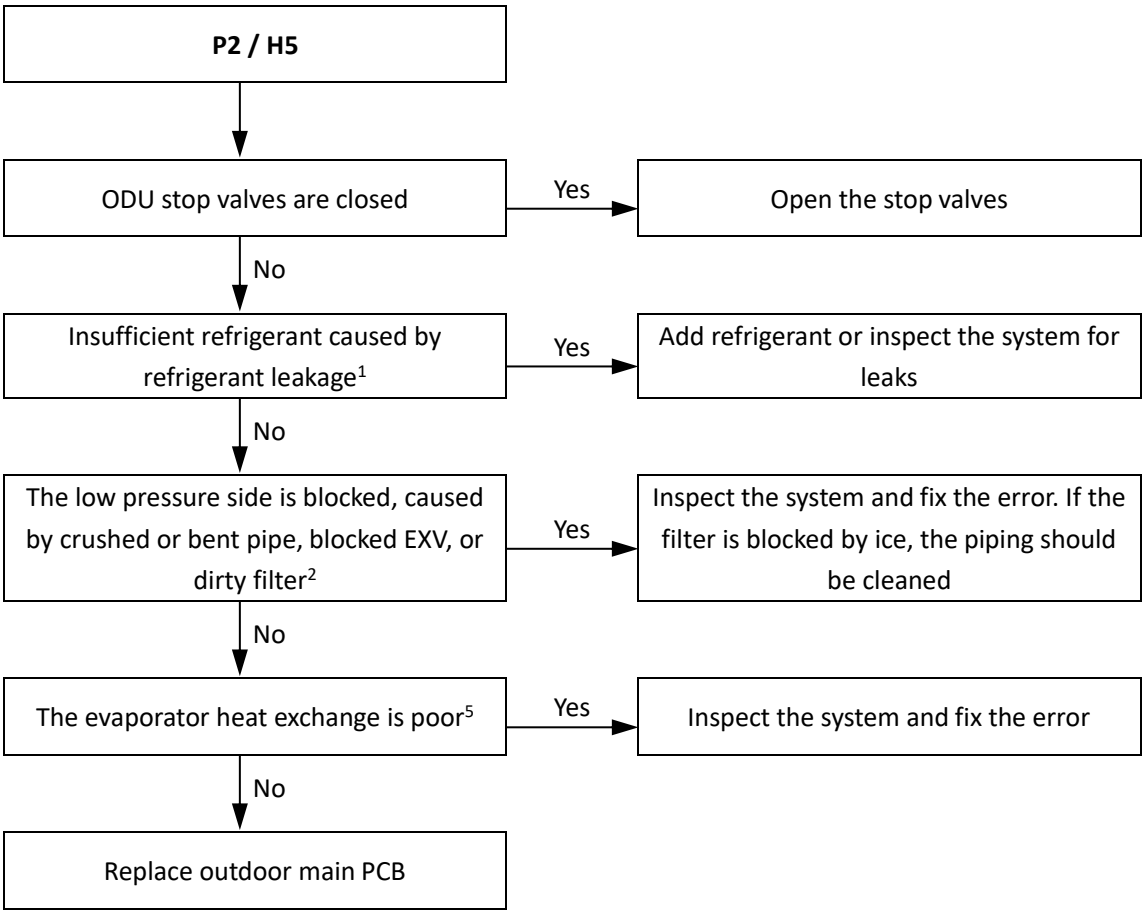
2.13.3 Trigger / recover condition

- Trigger condition:
  For P2 protection: Suction pressure ≤ 0.05MPa.
- Recover condition: Suction pressure ≥ 0.15MPa.
- Reset method:
  For P2 protection: Resume automatically.

2.13.4 Possible causes

- Outdoor unit stop valves are closed.
- Insufficient refrigerant.
- Low pressure side blockage.
- Poor evaporator heat exchange.
- Main PCB damaged.

2.13.5 Procedure



Notes:

1. 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. For normal system parameters refer to Table 6-3.4 in Part 6, 3.2 “Normal Operating Parameters of Refrigerant 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 refer to Table 6-3.4 in Part 6, 3.2 “Normal Operating Parameters of Refrigerant System”.
3. In cooling mode check indoor heat exchangers, fans and air outlets for dirt/blockages.

2.14 P3: Compressor current protection

2.14.1 Digital display output

2.14.2 Description

- P3 indicates current protection on compressor.
- The system stops running.
- Error code is displayed on the outdoor unit PCB.

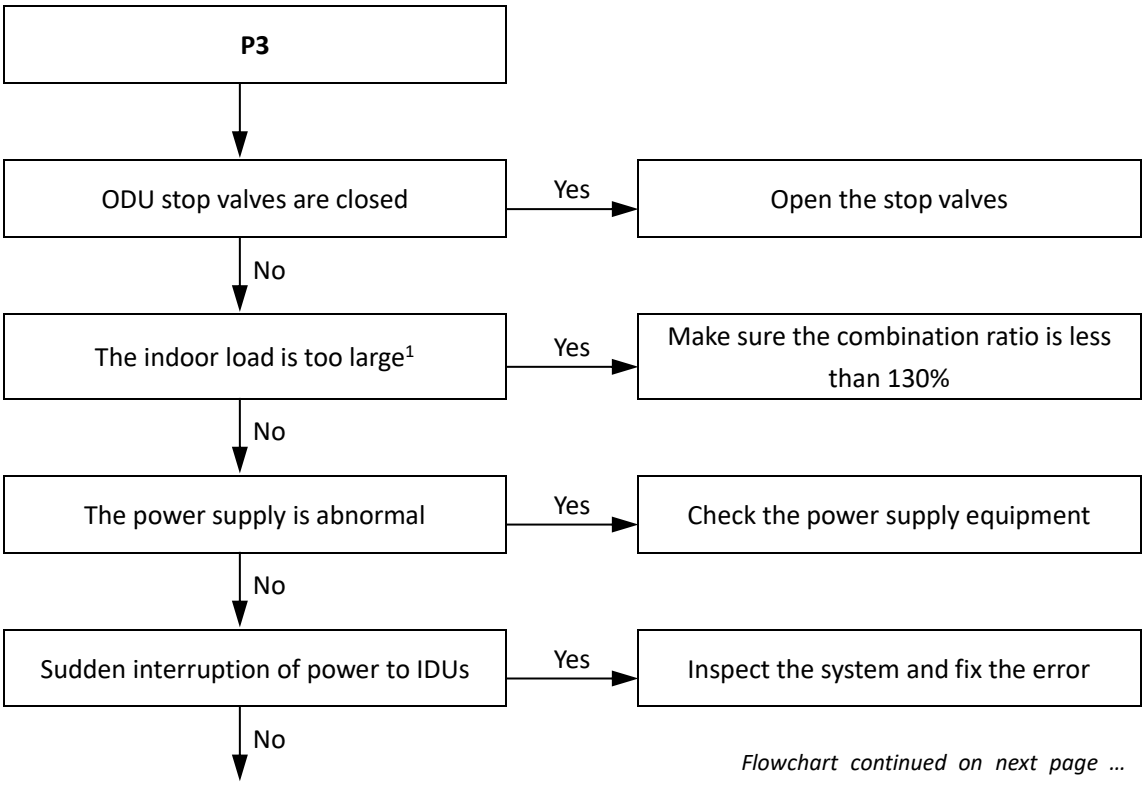
2.14.3 Trigger / recover condition

- Trigger condition: Current of compressor ATQ580D66UNT ≥ 23A.
- Recover condition: Current of compressor ATQ580D66UNT < 23A.
- Reset method: Resume automatically.

2.14.4 Possible causes

- Outdoor unit stop valves are closed.
- Indoor load too large.
- Power supply abnormal.
- Sudden interruption of power to IDUs.
- Excess refrigerant.
- System contains air or nitrogen.
- Poor condenser heat exchange.
- High pressure side blockage.
- Inverter module damaged.
- Compressor damaged.
- Main PCB damaged.

2.14.5 Procedure



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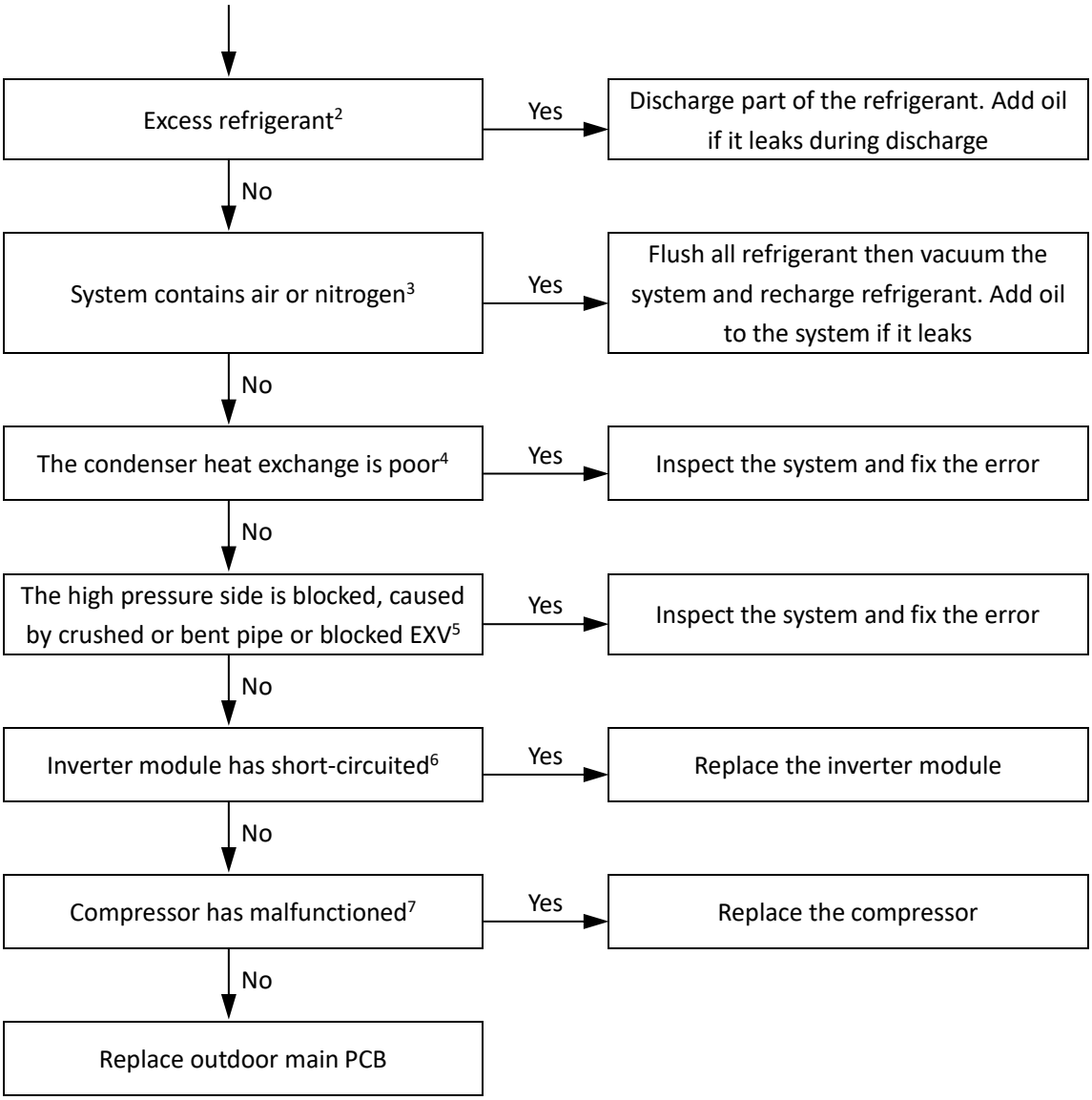


Notes:

1. An indoor load that is too large causes suction and discharge temperatures to be higher than normal. For normal system parameters refer to Table 6-3.4 in Part 6, 3.2 “Normal Operating Parameters of Refrigerant System”.
2. Excess refrigerant causes discharge temperature to be lower than normal, discharge pressure to be higher than normal and suction pressure to be higher than normal. For normal system parameters refer to Table 6-3.4 in Part 6, 3.2 “Normal Operating Parameters of Refrigerant System”.
3. Air or nitrogen in the system causes discharge temperature to be higher than normal, discharge pressure to be higher than normal, compressor current to be higher than normal, abnormal compressor noise and an unsteady pressure meter reading. For normal system parameters refer to Table 6-3.4 in Part 6, 3.2 “Normal Operating Parameters of Refrigerant System”.
4. In cooling mode check outdoor heat exchangers, fans and air outlets for dirt/blockages.
5. 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. For normal system parameters refer to Table 6-3.4 in Part 6, 3.2 “Normal Operating Parameters of Refrigerant System”.
6. Set a multi-meter to buzzer mode and test any two terminals of P N U V W of the inverter module. If the buzzer sounds, the inverter module has short-circuited.
7. The normal resistances of the inverter compressor are 0.7-1.5Ω among U V W and infinite between each of U V W and ground. If any of the resistances differ from these specifications, the compressor has malfunctioned.

2.15 P4: Discharge temperature protection

2.15.1 Digital display output

2.15.2 Description

- Discharge temperature protection.
- The system stops running.
- Error code is displayed on the unit with the error.

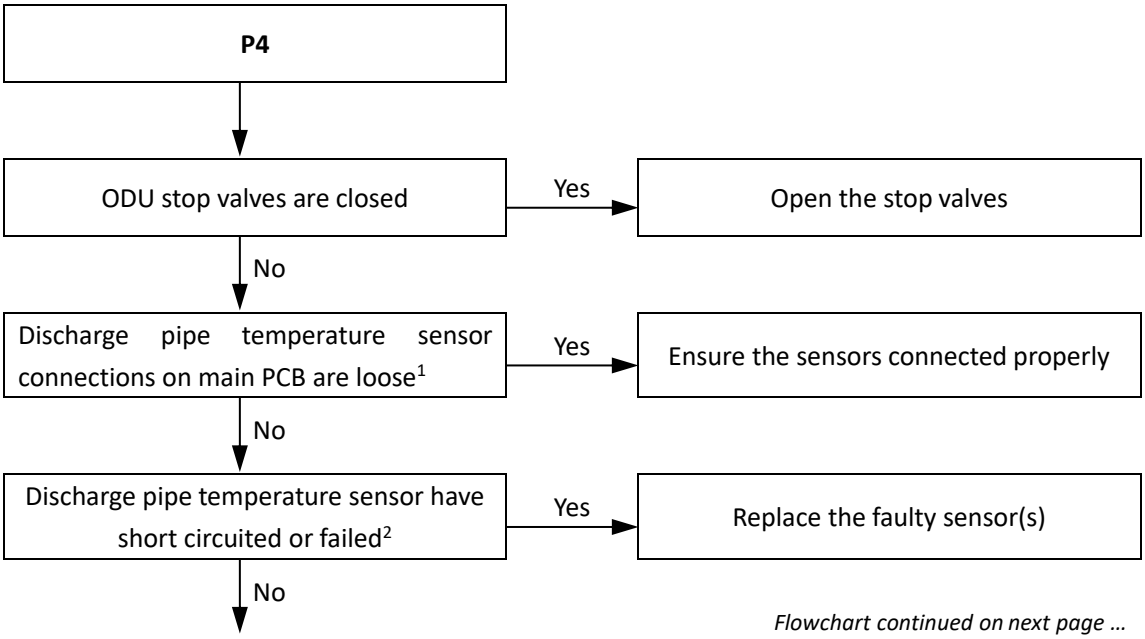
2.15.3 Trigger / recover condition

- Trigger condition:
  Discharge temperature (T5) > 110°C.
- Recover condition: Discharge temperature (T5) < 85 °C.
- Reset method:
  Resume automatically.

2.15.4 Possible causes

- Outdoor unit stop valves are closed.
- Temperature sensor not connected properly or has malfunctioned.
- Insufficient refrigerant.
- System blockage.
- Indoor load too large.
- System contains air or nitrogen.
- Poor condenser heat exchange.
- Main PCB damaged.

2.15.5 Procedure



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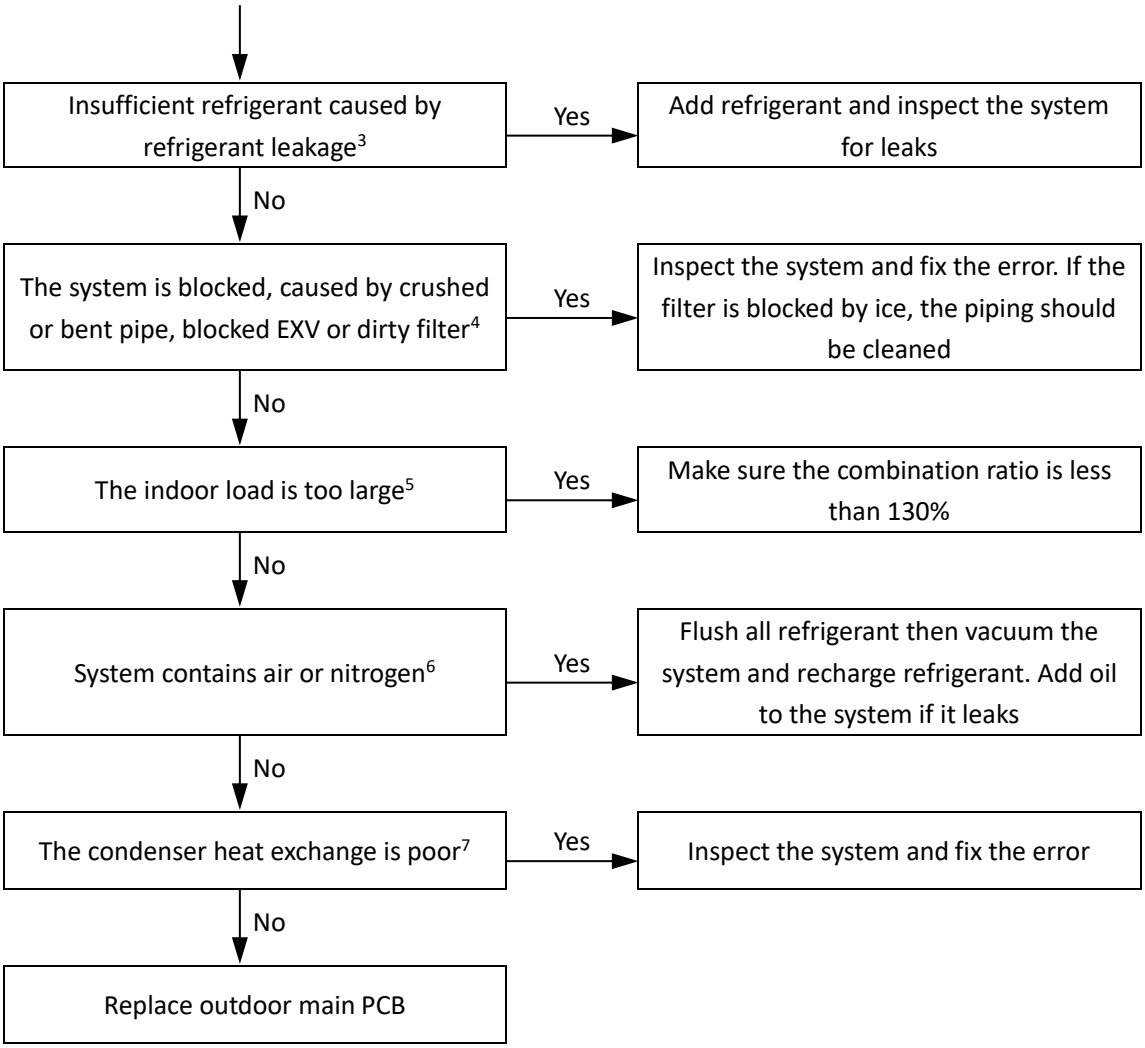


Notes:

1. Discharge pipe temperature sensor connections is ports CN5 on the main PCB (labeled 3 and 4, respectively, in Figure 5-2.1 in Part 5, 2.1 “Ports”).
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 6-3.2 in Part 6, 3.1 “Temperature Sensor Resistance Characteristics”.
3. 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. For normal system parameters refer to Table 6-3.4 in Part 6, 3.2 “Normal Operating Parameters of Refrigerant 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 refer to Table 6-3.4 and in Part 6, 3.2 “Normal Operating Parameters of Refrigerant System”.
5. An indoor load that is too large causes suction and discharge temperatures to be higher than normal. For normal system parameters refer to Table 6-3.4 in Part 6, 3.2 “Normal Operating Parameters of Refrigerant System”.
6. Air or nitrogen in the system causes discharge temperature to be higher than normal, discharge pressure to be higher than normal, compressor current to be higher than normal, abnormal compressor noise and an unsteady pressure meter reading. For normal system parameters refer to Table 6-3.4 in Part 6, 3.2 “Normal Operating Parameters of Refrigerant System”.
7. In cooling mode check outdoor heat exchangers, fans and air outlets for dirt/blockages.

2.16 P5: Outdoor heat exchanger temperature protection

2.16.1 Digital display output

2.16.2 Description

- Outdoor heat exchanger temperature protection.
- The system stops running.
- Error code is displayed on the unit with the error.

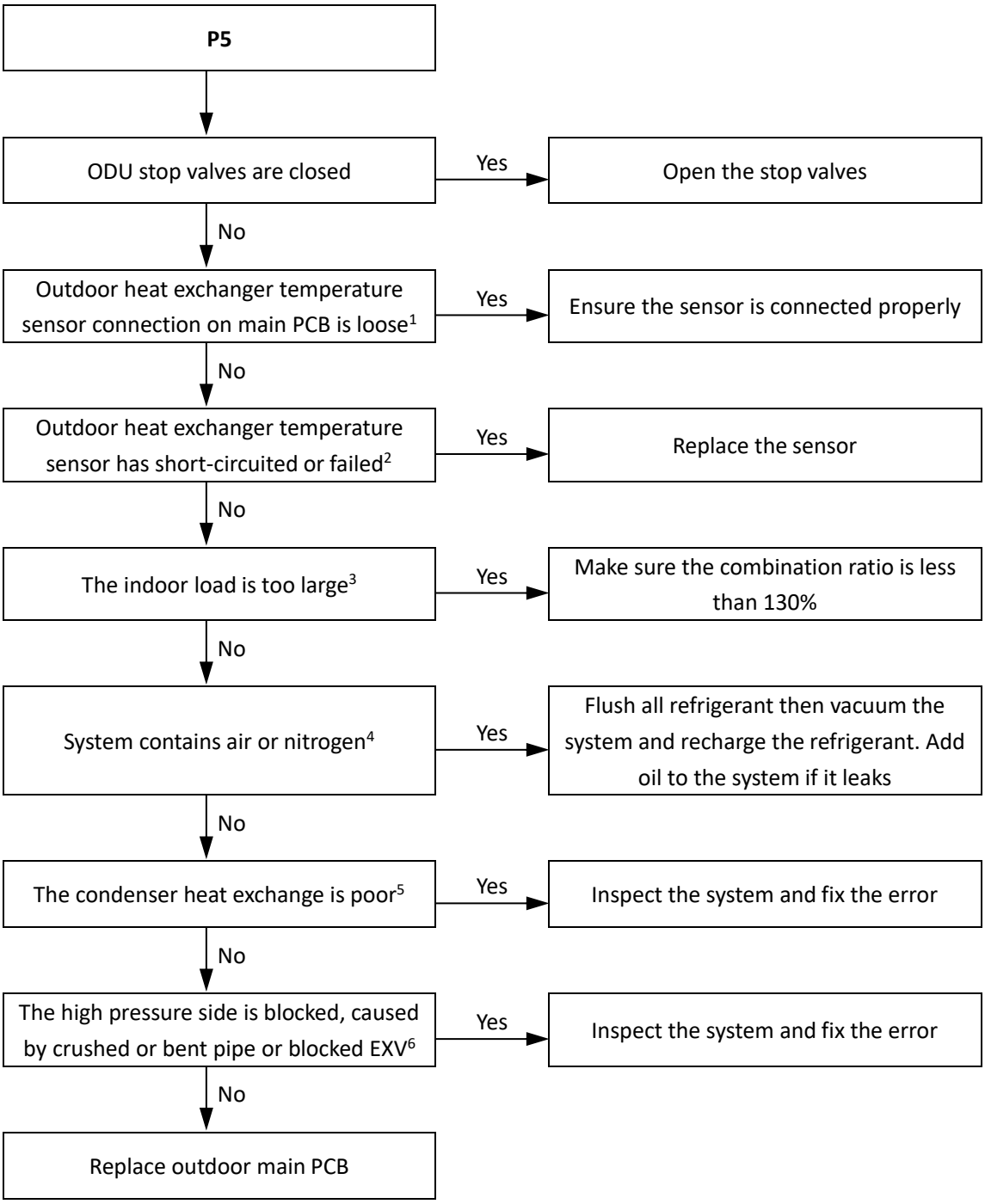
2.16.3 Trigger / recover condition

- Trigger condition: Outdoor heat exchanger temperature (T3) ≥ 65°C.
- Recover condition: Outdoor heat exchanger temperature (T3) < 55 °C.
- Reset method: Resume automatically.

2.16.4 Possible causes

- Outdoor unit stop valves are closed.
- Temperature sensor not connected properly or has malfunctioned.
- Indoor load too large.
- System contains air or nitrogen.
- Poor condenser heat exchange.
- High pressure side blockage.
- Main PCB damaged.

2.16.5 Procedure



Notes:

1. Outdoor heat exchanger temperature sensor connection is port CN9 on the main PCB (labeled 11 in Figure 5-2.1 in Part 5, 2.1 “Ports”).
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 6-3.1 in Part 6, 3.1 “Temperature Sensor Resistance Characteristics”
3. An indoor load that is too large causes suction and discharge temperatures to be higher than normal. For normal system parameters refer to Table 6-3.4 in Part 6, 3.2 “Normal Operating Parameters of Refrigerant System”.
4. Air or nitrogen in the system causes discharge temperature to be higher than normal, discharge pressure to be higher than normal, compressor current to be higher than normal, abnormal compressor noise and an unsteady pressure meter reading. For normal system parameters refer to Table 6-3.4 in Part 6, 3.2 “Normal Operating Parameters of Refrigerant System”.
5. In cooling mode check outdoor heat exchangers, fans and air outlets for dirt/blockages.
6. 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. For normal system parameters refer to Table 6-3.4 in Part 6, 3.2 “Normal Operating Parameters of Refrigerant System”.

2.17 PE: Indoor heat exchanger temperature protection

2.17.1 Digital display output

2.17.2 Description

- The system stops running.
- Error code is displayed on the outdoor unit PCB.

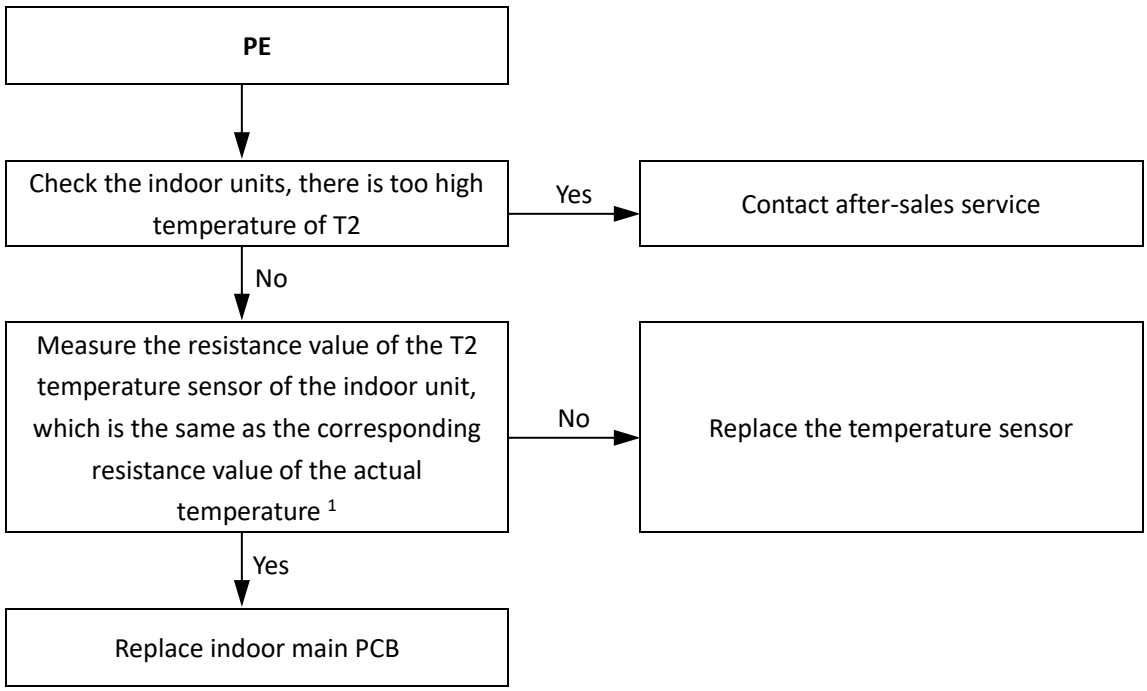
2.17.3 Trigger / recover condition

- Trigger condition: Indoor heat exchanger mid-point temperature sensor (T2) ≤2°C for more than 40 minutes or ≤0°C for more than 10 minutes.
- Recover condition: Indoor heat exchanger mid-point temperature sensor (T2)≥8°C for more than 10 minutes
- Reset method: Resume automatically.

2.17.4 Possible causes

- Indoor heat exchanger mid-point temperature too high.
- The temperature sensor is damaged.

2.17.5 Procedure



Notes:

1. Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor's resistance characteristics table, the sensor has failed. Refer to Table 6-3.1 in Part 6, 3.1 "Temperature Sensor Resistance Characteristics"

2.18 PL: Inverter module temperature protection

2.18.1 Digital display output

2.18.2 Description

- PL indicates inverter module temperature protection.
- The system stops running.
- Error code is displayed on the outdoor unit PCB.

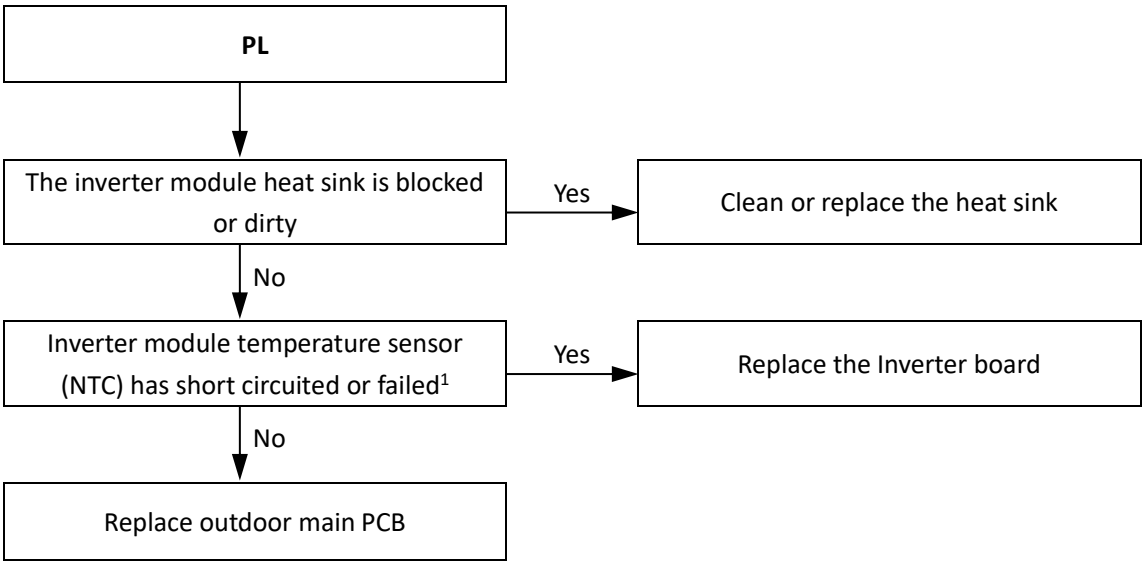
2.18.3 Trigger / recover condition

- Trigger condition:
  Inverter module heat sink temperature (Tf) ≥ 72°C.
- Recover condition:
  Inverter module heat sink temperature (Tf) ≤ 65°C
- Reset method:
  Resume automatically.

2.18.4 Possible causes

- Blocked, dirty or loose heat sink.
- Temperature sensor (NTC) has malfunctioned.
- Main PCB damaged.

2.18.5 Procedure



Notes:

1. Heat sink temperature sensor (NTC) is inside the PIM module. Measure sensor resistance pin 16 and 17 on PIM module, as shown below picture. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor's resistance characteristics table, the sensor has failed. Refer to Part 6, 3.1 "Temperature Sensor Resistance Characteristics".

3 Appendix to Part 6

3.1 Temperature Sensor Resistance Characteristics

Table 6-3.1: Outdoor ambient temperature sensor, outdoor heat exchanger temperature sensor, and indoor 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 6-3.2: Compressor discharge pipe temperature sensor resistance characteristics

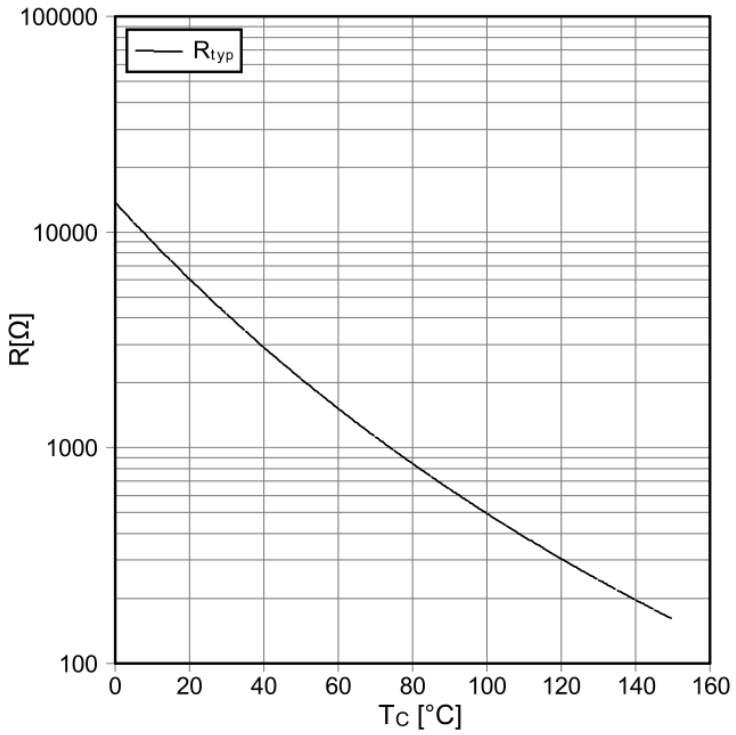
Temperature (°C)	Resistance (kΩ)	Temperature (°C)	Resistance (kΩ)	Temperature (°C)	Resistance (kΩ)	Temperature (°C)	Resistance (kΩ)
-20	542.7	**20**	68.66	**60**	13.59	**100**	3.702
-19	511.9	**21**	65.62	**61**	13.11	**101**	3.595
-18	483.0	**22**	62.73	**62**	12.65	**102**	3.492
-17	455.9	**23**	59.98	**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 6-3.3: Heat sink temperature sensor（NTC）resistance characteristics

NTC-Widerstand / NTC-thermistor

Charakteristische Werte / characteristic values			min.	typ.	max.	
Nennwiderstand rated resistance	T_C = 25°C	R_{25}		5,00		kΩ
Abweichung von R_{100} deviation of R_{100}	T_C = 100°C, R_{100} = 493 Ω	ΔR/R	-5		5	%
Verlustleistung power dissipation	T_C = 25°C	P_{25}			20,0	mW
B-Wert B-value	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298,15\ K))]$	$B_{25/50}$		3375		K
B-Wert B-value	$R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298,15\ K))]$	$B_{25/80}$		3411		K
B-Wert B-value	$R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298,15\ K))]$	$B_{25/100}$		3433		K

NTC-temperature characteristic (typical)
R = f (T)



3.2 Normal Operating Parameters of Refrigerant System

Under the following conditions, the operating parameters given in Tables 6-3.4 should be observed:

- The outdoor unit can detect all the indoor units.
- The number of indoor units displayed on DSP is steady and is equal to the actual number of indoor units installed.
- All stop valves are open and all indoor unit EXVs are connected to their unit's PCB.
- All the indoor units are currently running.
- If the outdoor ambient temperature is high, the system is being run in cooling mode with the following settings: temperature 17°C; fan speed high.
- If the outdoor ambient temperature is low, the system is being run in heating mode with the following settings: temperature 30°C; fan speed high.
- The system has been running normally for more than 30 minutes.

Table 6-3.4: Outdoor unit cooling mode operating parameters

Outdoor ambient temperature	**°C**	< 10	10 to 26	26 to 33	33 to 44	> 44
Average discharge temperature	**°C**	58-74	60-78	65-82	67-92	72-92
Average discharge superheat	**°C**	17-30	17-33	17-34	17-36	12-30
Discharge pressure	**MPa**	2.0-2.6	2.3-2.8	2.4-3.6	2.6-3.8	3.3-4.2
Suction pressure	**MPa**	0.6-0.8	0.7-0.9	0.8-1.0	0.8-1.2	1.0-1.4
DC inverter compressor current	**A**	7-16	10-20	12-23	15-23	18-23

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