BCHC Ultima Series

MINI VRF Outdoor Unit

Service Manual

220-240V/1/50-60Hz

CONTENTS

Model:

BCHC030N0A4-DTM090
BCHC040N0A6-DTM115
BCHC050N0A7-DTM140
BCHC060N0A8-DTM160
BCHC070N0A9-DTM190
BCHC080N0A9-DTM200

Part 1

General Information

1 Indoor and Outdoor Unit Capacities

1.1 Indoor Units

Table 1-1.1: Indoor unit abbreviation codes

Abbreviation code	Type
BECM	Compact Four-way Cassette
BECS	Four-way Cassette
BE (LP-MP-HP)	Duct
BEWM	Wall-mounted

Table 1-1.2: Indoor unit capacity range

Capacity			Capacity index	BECM	BECS	BE (LP-MP-HP)	BEWM
kBtu/h	kW	HP					
5	1.5	0.5	5	5	—	5	5
6	1.8	0.6	6	—	—	6	—
7	2.2	0.8	7	7	—	7	7
9	2.8	1	9	9	9	9	9
12	3.6	1.25	12	12	12	12	12
15	4.5	1.6	15	15	15	15	15
18	5.6	2	18	18	18	18	18
21	6.3	2.25	21	21	—	—	—
24	7.1	2.5	24	—	24	24	24
28	8.0	3	28	—	28	28	28
32	9.0	3.2	32	—	32	32	—
36	10.0	3.6	36	—	36	—	—
40	11.2	4	40	—	40	40	—
43	12.5	4.5	43	—	—	43	—
48	14.0	5	48	—	48	48	—
56	16.0	6	56	—	56	56	—
60	18.0	6.5	60	—	60	—	—

Notes:
1. BCHC can only be connected with the Ultima indoor unit.

1.2 Outdoor Units

Table 1-1.3: Outdoor unit capacity range

Capacity (kBtu/h)	Model Name
28	BCHC030N0A4-DTM090)
36	BCHC040N0A6-DTM115
42	BCHC050N0A7-DTM140
48	BCHC060N0A8-DTM160
56	BCHC070N0A9-DTM190
60	BCHC080N0A9-DTM200

Notes:
1. BCHC series outdoor units could not be combined.

2 External Appearance

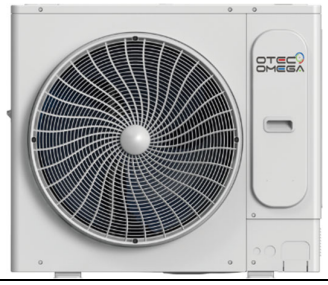
2.1 Indoor Units

Table 1-2.1: Indoor unit appearance

Compact Four-way Cassette BECM 	Four-way Cassette BECS 
Duct BE (LP-MP-HP) 	Wall-mounted BEWM 

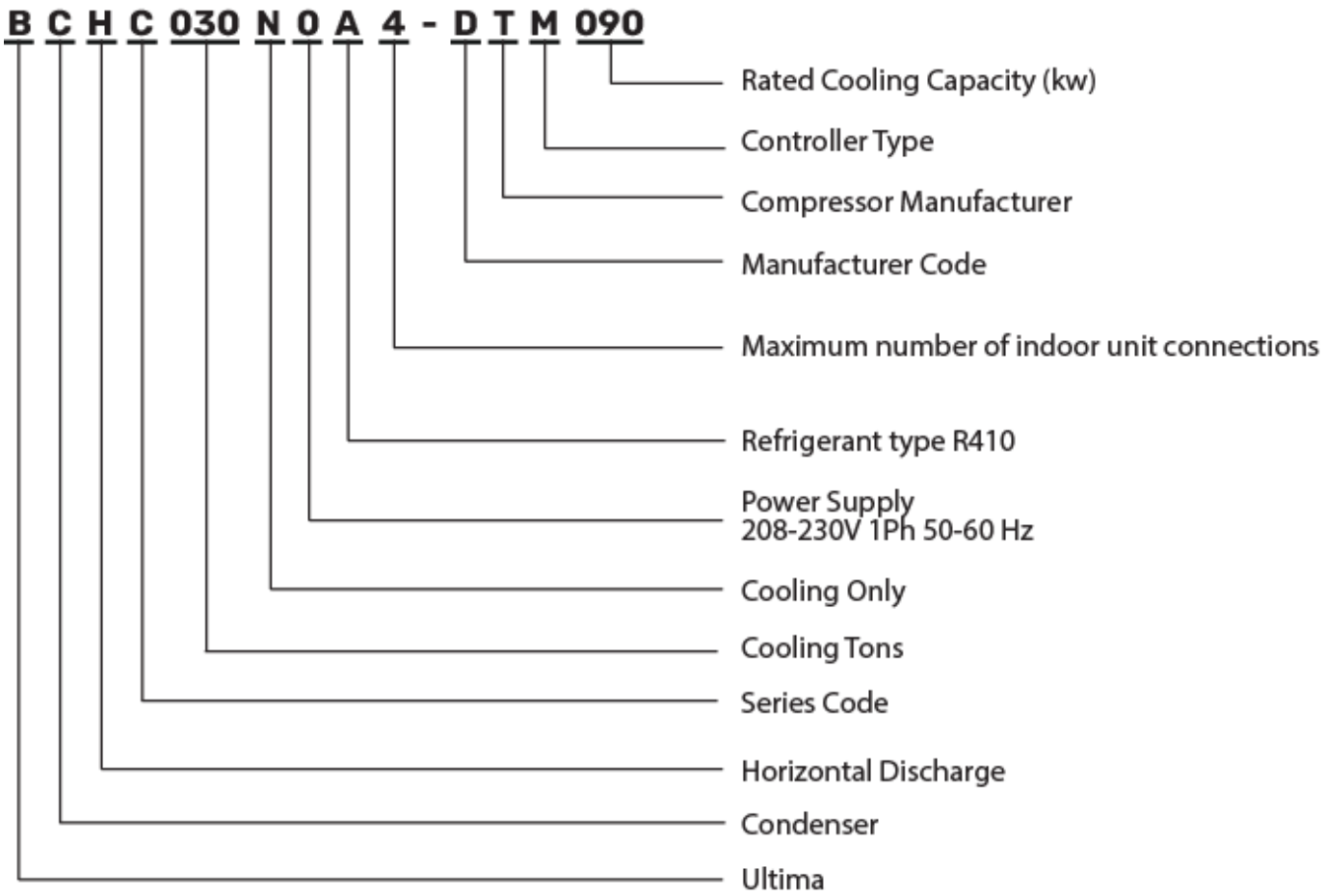
2.2 Outdoor Units

Table 1-2.2: Outdoor unit appearance

28/36/42kBtu/h	48/56/60kBtu/h
	

3 Nomenclature

3.1 Outdoor Units



4 Combination Ratio

$$\text{Combination ratio} = \frac{\text{Sum of capacity indexes of the indoor units}}{\text{Capacity index of the outdoor unit}}$$

Table 1-4.1: Indoor and outdoor unit combination ratio limitations

Type	Minimum combination ratio	Maximum combination ratio
Ultima Series outdoor units	50%	130%

Table 1-4.2: Combinations of Indoor and outdoor units

Outdoor unit capacity			Sum of capacity indexes of connected indoor units (standard indoor units only)	Number of connected indoor units
kBtu/h	kW	Capacity index		
28	8	8	4 to 10.4	1-4
36	10	10	5 to 13	1-6
42	12	12	6 to 15.6	1-7
48	14	14	7 to 18.2	1-8
56	16	16	8 to 20.8	1-9
60	17.5	17.5	8.75 to 22.75	1-9

5 Selection Procedure

5.1 Procedure

Step 1: Establish design conditions

Design temperature and humidity (indoor and outdoor)
Required heat load of each room
System peak load
Piping length, level differences
Indoor unit specifications (type and quantity)

Step 2: Select indoor units

Decide indoor unit safety factor

Select indoor unit models ensuring that:
Indoor unit capacity corrected for indoor air temperature WB[1] ≥ Required heat load × Indoor unit safety factor

Step 3: Select outdoor unit

Determine required total heat load on the outdoor unit

Use the sum of the peak load of each room

Use the system peak load

Provisionally select outdoor unit capacity based on combination ratio limitations

Confirm that the number of indoor units connected to the outdoor unit is within limitation

Correct cooling and heating capacities of the outdoor unit for the following items:
Outdoor air temperature / Indoor air temperature WB / Combination ratio / Piping length, level difference / Piping heat loss / Frost accumulation (for heating capacity only)

Is corrected outdoor unit capacity ≥ Required total heat load on outdoor unit?

No

Yes

VRF system selection is complete

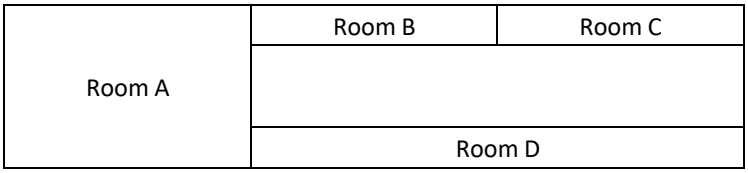
Notes:

- If the indoor design temperature falls between two temperatures listed in the indoor unit's capacity table, calculate the corrected capacity by interpolation. If the indoor unit selection is to be based on total heat load and sensible heat load, select indoor units which satisfy not only the total heat load requirements of each room but also the sensible heat load requirements of each room. As with total heat capacity, the sensible heat capacity of indoor units should be corrected for indoor temperature, interpolating where necessary. For the indoor unit capacity tables, refer to the indoor unit technical manuals.

5.2 Example

The following is a selection example based on total heat load for cooling.

Figure 1-5.1: Room plan



Step 1: Establish design conditions

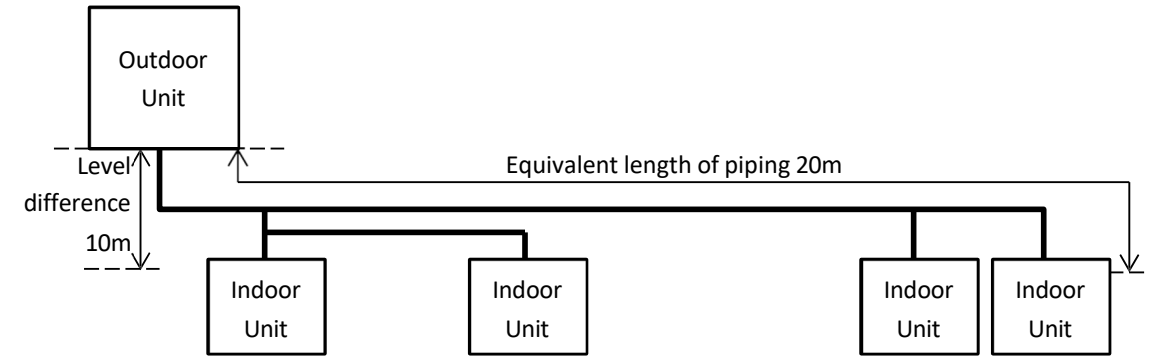
- Indoor air temperature 25°C DB, 18°C WB; outdoor air temperature 33°C DB.
- Determine peak load of each room and system peak load. As shown in Table 1-5.1, the system peak load is 10.5kW.

Table 1-5.1: Required heat load of each room (kW)

Time	Room A	Room B	Room C	Room D	Total
9:00	2.5	1.6	1.6	1.6	7.3
12:00	3.2	2.4	2.4	2.4	10.4
14:00	3.1	2.4	2.4	2.6	**10.5**
16:00	3.1	2.3	2.3	2.3	10

- The maximum piping lengths and level differences in this example are as given in Figure 1-5.2.

Figure 1-5.2: System diagram



- Indoor unit type for all rooms: Duct (T).

Step 2: Select indoor units

- In this example, a safety factor is not used (i.e. the safety factor is 1).
- Select indoor unit models using the duct cooling capacity table. Each indoor unit's corrected capacity needs to be greater than or equal to the peak load of the relevant room. The selected indoor units are shown in Table 1-5.3.

Table 1-5.2: Extract from duct (T) cooling capacity table

Model	Capacity index		Indoor air temperature													
			14°C WB		16°C WB		18°C WB		19°C WB		20°C WB		22°C WB		24°C WB	
			20°C DB		23°C DB		26°C DB		27°C DB		28°C DB		30°C DB		32°C DB	
	kBtu/h	kW×10	TC	SHC	TC	SHC	TC	SHC	TC	SHC	TC	SHC	TC	SHC	TC	SHC
T2	7	22	1.5	1.4	1.8	1.5	2.1	1.6	2.2	1.6	2.3	1.7	2.4	1.5	2.4	1.5
	9	28	1.9	1.7	2.3	1.9	2.6	2.1	2.8	2.1	3.0	2.1	3.1	2.0	3.1	1.9
	12	36	2.5	2.1	2.9	2.3	3.4	2.5	3.6	2.6	3.8	2.7	4.2	2.8	3.9	2.3
	15	45	3.1	2.6	3.7	2.8	4.2	3.1	4.5	3.2	4.8	3.2	4.9	3.1	5.1	2.9
	18	56	3.9	3.0	4.6	3.3	5.3	3.6	5.6	3.7	5.9	3.8	6.2	3.7	6.2	3.4
	24	71	4.9	3.9	5.8	4.3	6.7	4.7	7.1	4.9	7.5	4.8	7.8	4.6	7.8	4.3
	28	80	5.5	4.4	6.6	4.9	7.5	5.3	8.0	5.5	8.4	5.5	8.8	5.2	8.8	4.8
	32	90	6.2	5.3	7.3	5.8	8.4	6.3	9.0	6.4	9.6	6.5	9.9	6.1	9.9	5.7
	40	112	7.7	6.4	9.1	7.1	10.5	7.7	11.2	7.8	11.9	8.1	12.5	7.8	12.5	7.4
	48	140	9.7	7.8	11.3	8.6	13.2	9.6	14.0	9.8	14.8	9.8	15.7	9.7	15.4	8.8

Abbreviations:

TC: Total capacity (kW); SHC: Sensible heat capacity (kW)

Table 1-5.3: Selected indoor units

	Room A	Room B	Room C	Room D
Peak heat load (kW)	3.1	2.4	2.4	2.6
Selected indoor unit	BELP012N0A-DCV036	BELP010N0A-DCV028	BELP010N0A-DCV028	BELP010N0A-DCV028
Corrected TC (kW)	3.6	2.8	2.8	2.8

Step 3: Select outdoor unit

- Determine the required total heat load from the indoor units to the outdoor unit based on either the sum of the peak loads of each room or the system peak load. In this example, it is determined based on the system peak load. Therefore, the required heat load is 10.5kW.
- Provisionally select an outdoor unit using the sum of the capacity indexes (CIs) of the selected indoor units (as shown in Table 1-5.4), ensuring that the combination ratio is between 45% and 130%. Refer to Table 1-5.5. As the sum of CIs of the indoor units is 120, all outdoor units are potentially suitable except 8kW. Start from the smaller, which is the 10kW unit.

Table 1-5.4: Sum of indoor unit capacity indexes

Model	Capacity Index	No. of units
BELP012N0A-DCV036	36	1
BELP010N0A-DCV028	28	3

Sum of CIs	120

Table 1-5.5: Combinations of Indoor and outdoor units

Outdoor unit capacity		Sum of capacity indexes of connected indoor units (standard indoor units only)
kBtu/h	Capacity index	
28	8	4 to 10.4
36	10	5 to 13
42	12	6 to 15.6
48	14	7 to 18.2
56	16	8 to 20.8
60	17.5	8.75 to 22.75

- The number of connected indoor units is 4 and the maximum number of connected indoor units on the 10kW outdoor unit is 6, so the number of connected indoor units is within limitation.
- Calculate the corrected capacity of the outdoor unit:
  a) The sum of the indoor unit CIs is 120 and the CI of the 10kW outdoor unit is 100, so the combination ratio is 120 / 100 = 120%.
  b) Using the outdoor unit's cooling capacity table, interpolate to obtain the capacity ("B") corrected for outdoor air temperature, indoor air temperature, and combination ratio. Refer to Tables 1-5.6 and 1-5.7.

Table 1-5.6: Extract from Table 2-7.2 BCHC040N0A6-DTM115 cooling capacity

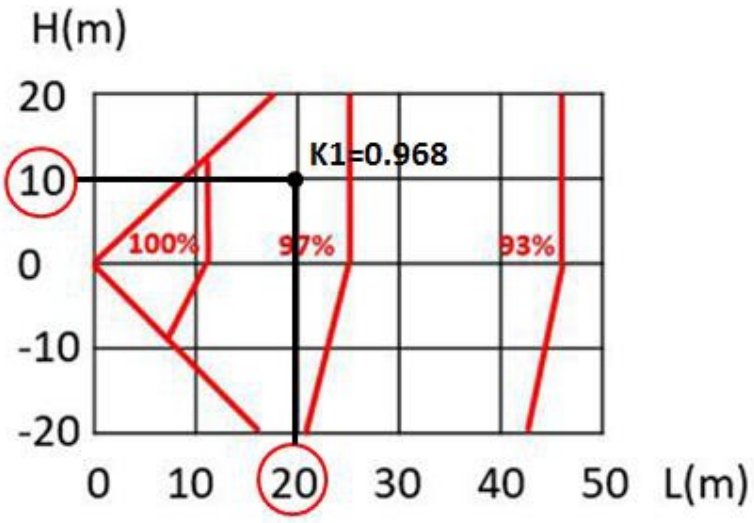
CR	
Outdoor air temp. (°C DB) *Indoor air temp.* *(°C DB / °C WB)*	
25.8 / 18.0	

Table 1-5.7: Cooling capacity calculated by interpolation

CR	
Outdoor air temp. (°C DB) *Indoor air temp.* *(°C DB / °C WB)*	
25.8 / 18.0	

c) Find the correction factor for piping length and level difference ("K1")

Figure 1-5.3: BCHC rate of change in cooling capacity



d) Calculate the corrected capacity of BCHC040N0A6-DTM115 ("C") by using K1:

$$C = B \times K1 = 10.44 \times 0.968 = 10.1kW$$

- The corrected capacity 10.1 kW is lower than required total heat load 10.5kW, so selection is not complete. Step 3 should be repeated from the point where the outdoor unit capacity is provisionally selected.

Repeat Step 3: Select outdoor unit

- Determine the required total heat load from the indoor units to the outdoor unit based on either the sum of the peak loads of each room or the system peak load. In this example, it is determined based on the system peak load. Therefore, the required heat load is 10.5kW.

- Provisionally select an outdoor unit using the sum of the capacity indexes (CIs) of the selected indoor units (as shown in Table 1-5.5), ensuring that the combination ratio is between 50% and 130%. Refer to Table 1-5.6. As the sum of CIs of the indoor units is 120. For the 10kW unit is not suitable, try to select 12kW unit.
- The number of connected indoor units is 4 and the maximum number of connected indoor units on the 12kW outdoor unit is 7, so the number of connected indoor units is within the limitation.
- Calculate the corrected capacity of the outdoor unit:
  a) The sum of the indoor unit CIs is 120 and the CI of the 12kW outdoor unit is 120, so the combination ratio is 120 / 120 = 100%.
  b) Using the outdoor unit's cooling capacity table, interpolate to obtain the capacity ("B") corrected for outdoor air temperature, indoor air temperature, and combination ratio. Refer to Tables 1-5.8 and 1-5.9.

Table 1-5.8: Extract from Table 2-7.3 BCHC050N0A7-DTM140 cooling capacity

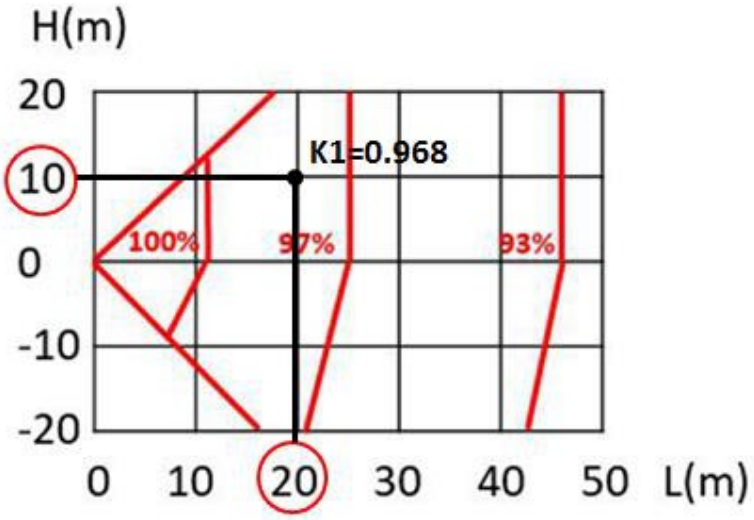
CR	
Outdoor air temp. (°C DB) *Indoor air temp. (°C DB / °C WB)*	
25.8 / 18.0	
TC	
PI	

Table 1-5.9: Cooling capacity calculated by interpolation

CR	
Outdoor air temp. (°C DB) *Indoor air temp. (°C DB / °C WB)*	
25.8 / 18.0	
TC	
PI	

  c) Find the correction factor for piping length and level difference ("K1")

Figure 1-5.4: BCHC rate of change in cooling capacity



  d) Calculate the corrected capacity of BCHC050N0A7-DTM140 ("C") by using K1:

$$C = B \times K1 = 11.2 \times 0.968 = 10.84kW$$

- The corrected capacity of 10.84 kW is larger than required total heat load 10.5kW, so selection is complete.

Part 2

Component Layout and Refrigerant Circuits

50/60Hz 1 Piping Diagrams

Figure 2-1.1: 28/36/42 model Piping diagram

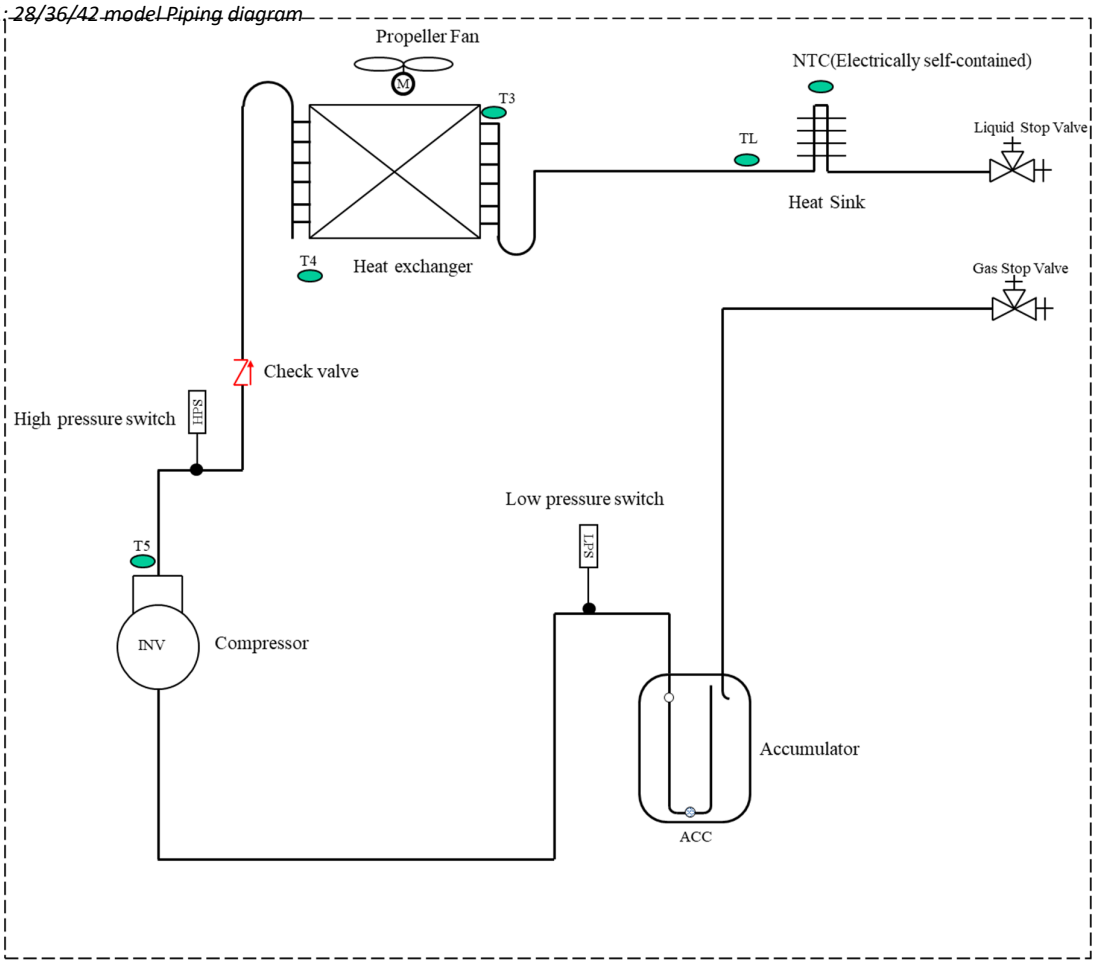
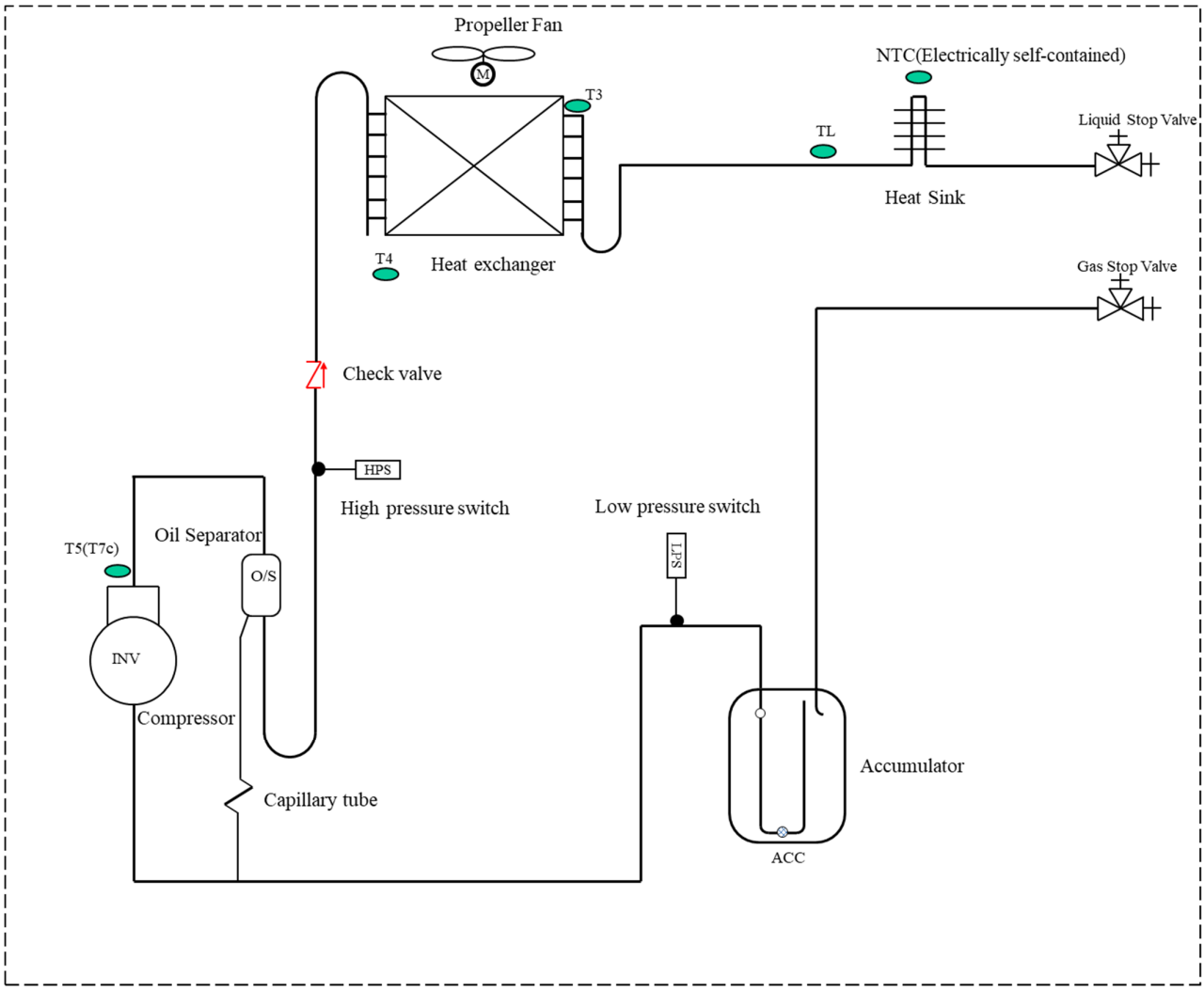


Figure 2-1.2: 48/56/60 model Piping diagram



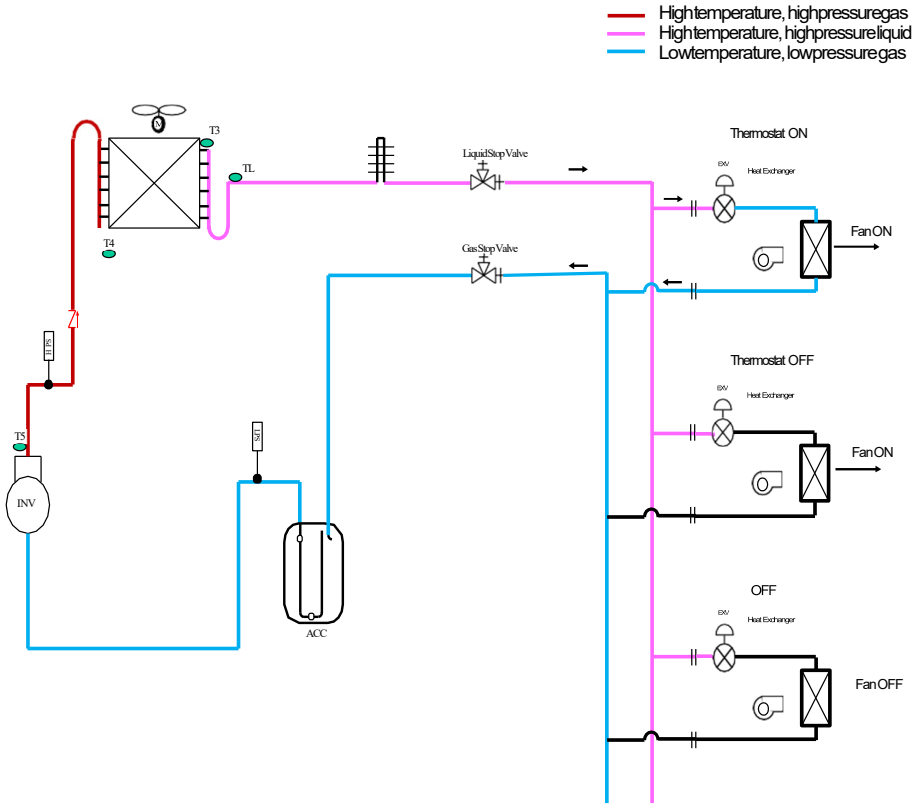
Key components:

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. **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 5 minutes, the compressor restarts.

2 Refrigerant Flow Diagrams

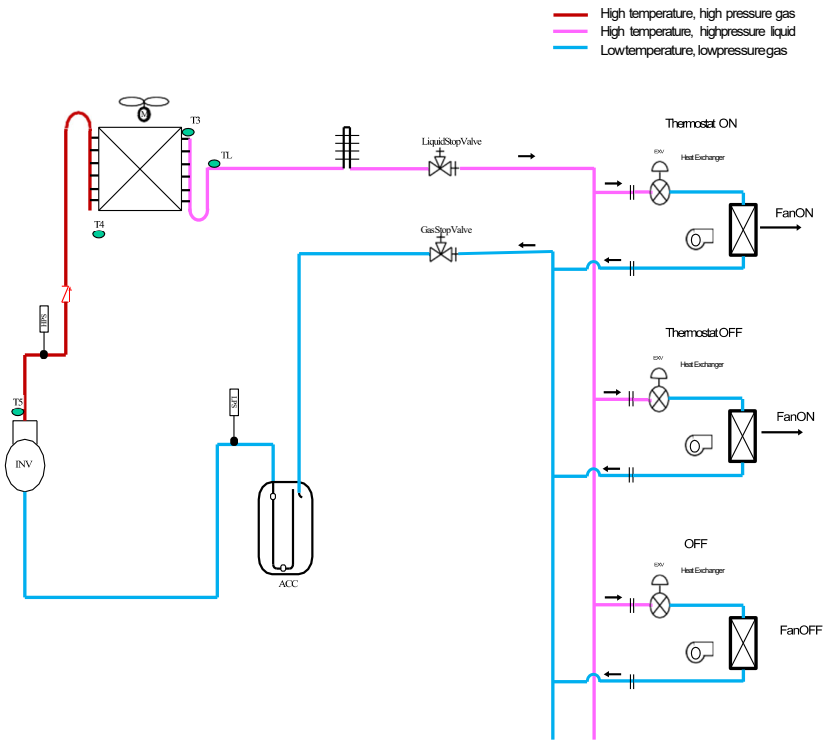
28/36/42 models cooling operation

Figure 2-2.1: Refrigerant flow during cooling operation



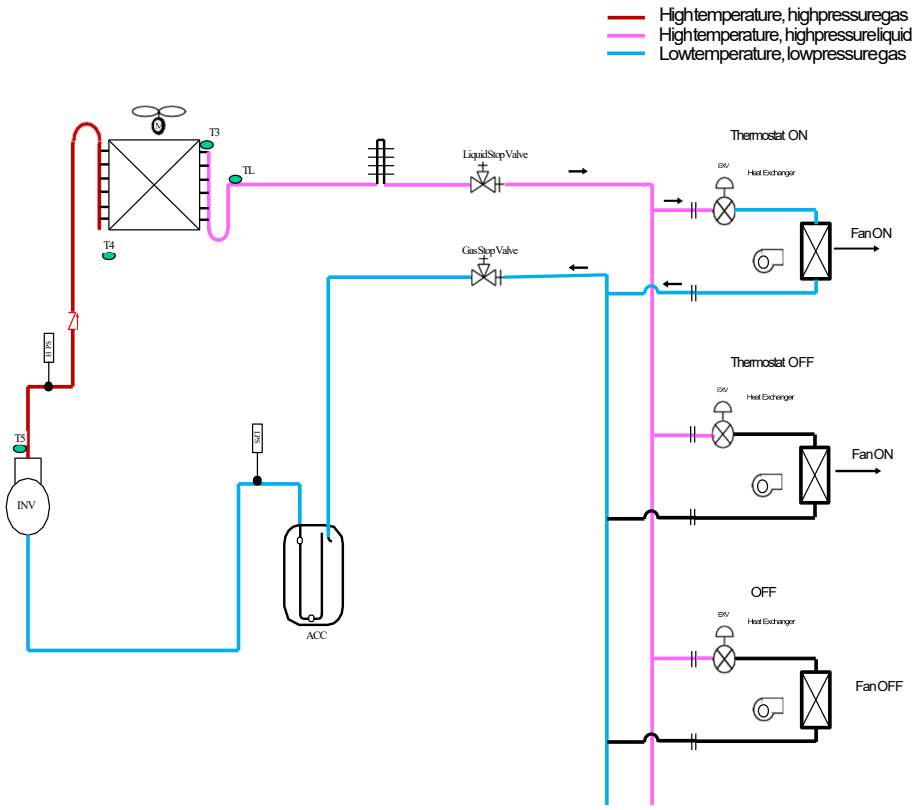
28/36/42 models oil return operation in cooling mode

Figure 2-2.4: Refrigerant flow during oil return operation in cooling mode



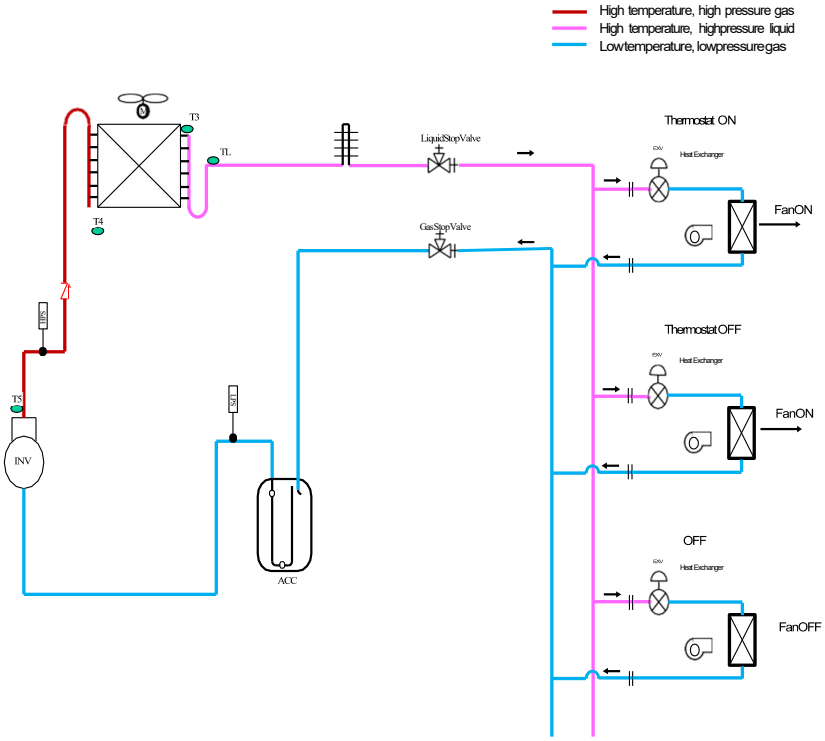
48/56/60 models cooling operation

Figure 2-2.1: 48/56/60 models refrigerant flow during cooling operation



48/56/60 models oil return operation in cooling mode

Figure 2-2.4: 48/56/60 models refrigerant flow during oil return operation in cooling mode



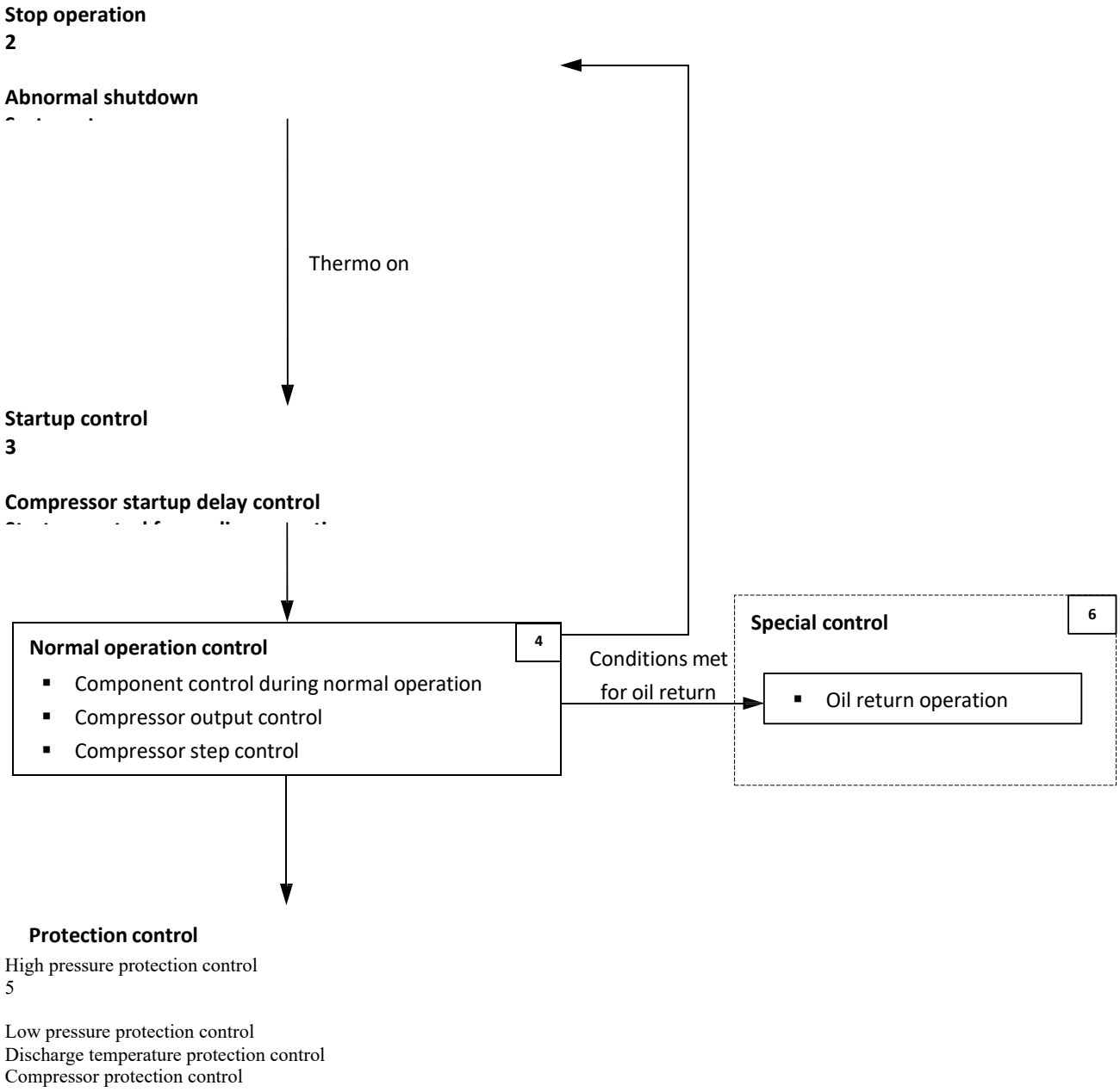
BCHC Ultima Series Service Manual

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.



Legend
Numbers in the top right-hand corners of boxes indicate the relevant section of text on the following pages.

2 Stop Operation

The stop operation occurs for one of the two 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

When the ODU is powered on again and the compressor delays about 7 minutes to start. After the compressor stops running, it takes about 4 minutes to restart, 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	28-60 model	Control functions and states
Inverter compressor	COMP	•	Controlled according to load requirement, operating frequency increased by 1 step / sec
DC fan motor	FAN	•	The outdoor unit fan start by 14 gears for 20 seconds before compressor start, and then maintain the fan speed for another 20 seconds when compressor start, finally the fan speed controlled according to heat exchanger temperature (T3), outdoor ambient temperature (T4), discharge temperature (T5) and compressor frequency.

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	28-60 model	Control functions and states
Inverter compressor	COMP	•	Controlled according to load requirement
DC fan motor	FAN	•	Fan speed controlled according to heat exchanger temperature (T3), outdoor ambient temperature (T4), discharge temperature (T5) and compressor frequency.

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

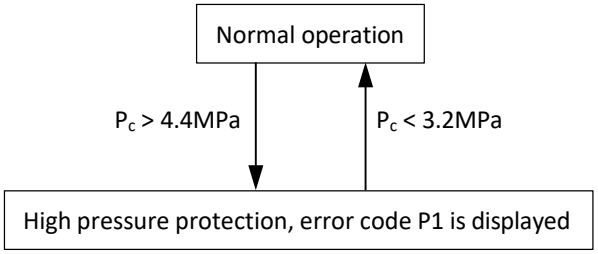
The running speed of the compressors in rotations per second (rps) is one third of the frequency (in Hz) of the electrical input to the compressor motors. The compressor speed can be altered in increments of 1 rps.

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



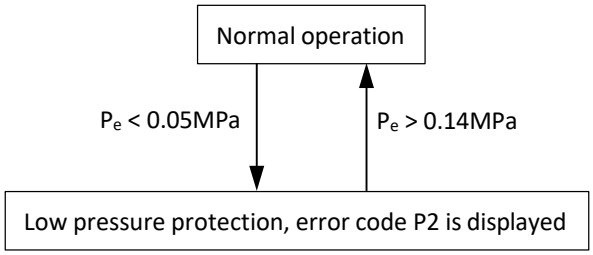
Notes:
1. P_c: Discharge pressure

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



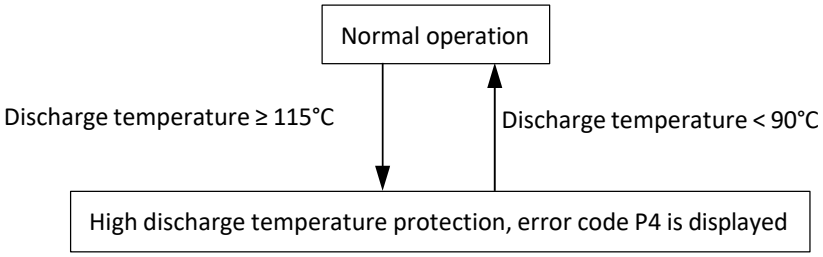
Notes:
1. P_e: Suction pressure

When suction pipe pressure drops below 0.05MPa the system displays P2 protection and the unit stops running. When the suction pipe pressure rises above 0.14MPa, the compressor enters re-start control.

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

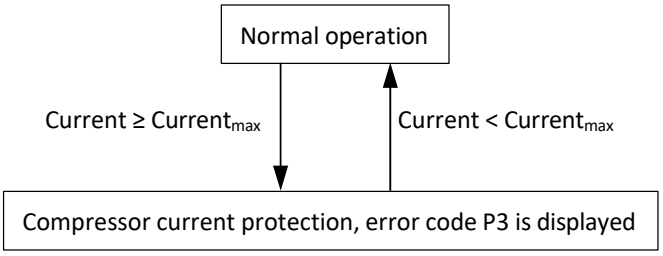


When the discharge temperature rises above or equal to 115°C the system displays P4 protection and the unit stops running. When the discharge temperature drops below 90°C, the compressor enters re-start control.

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



6 Standby Control

6.1 Oil Heater Mechanism Control

The oil heater mechanism is used to prevent refrigerant from mixing with compressor oil when the compressor is stopped. The oil heater mechanism is controlled according to outdoor ambient temperature, discharge temperature and the compressor on/off state. Using compressor windings as oil heating mechanism, when the outdoor ambient temperature is above 3°C or the compressor is running, the oil heater mechanism is off; when the outdoor ambient temperature is below 3°C, discharge temperature is below 20°C and either the compressor has been stopped for more than 3 hours or the unit has just been powered-on (either manually or when the power has returned following a power outage), the oil heater mechanism turns on.

Note: Oil heater mechanism control is internal to the compressor.

7 Special Control

7.1 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 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	28-60 model	Control functions and states
Inverter compressor	COMP	•	Fixed frequency
DC fan motor	FAN	•	Normal control as cooling operation

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	Remote controller setting
	Thermo off	Off

Part 4

Field Settings

Outdoor Unit Field Settings

Figure 4-1.1: 28 model outdoor unit main PCB

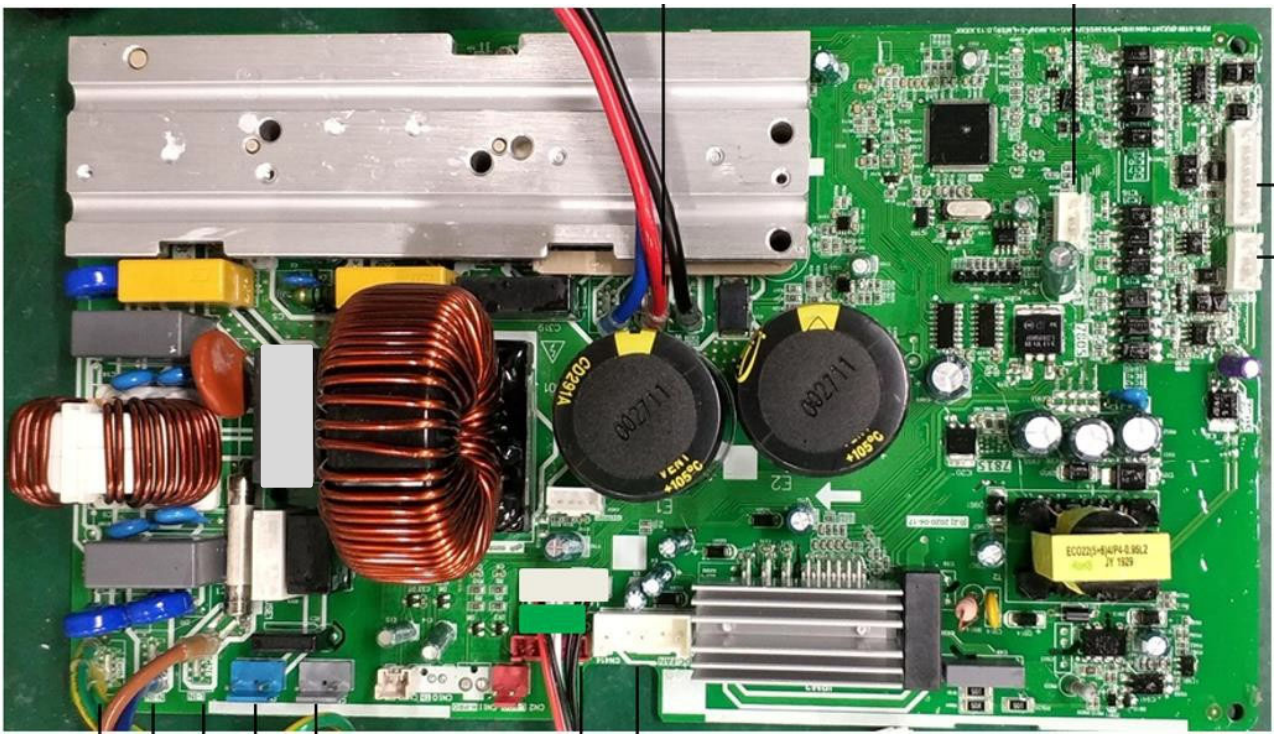


Figure 4-1.2: 28 model outdoor unit communication switchboard

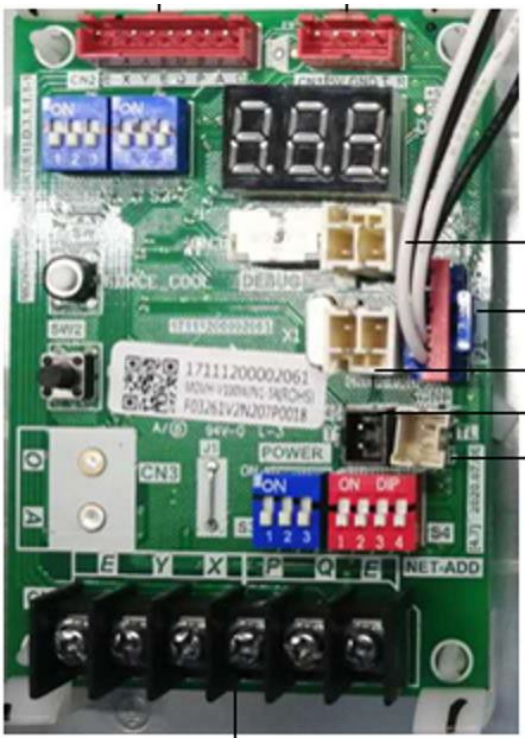


Table 4-1.1: 28 model outdoor unit main PCB switch settings

Switch	Setting	Switch positions[1]	Description
SW1	Force cooling		Press SW1 to enter the forced cooling function; Press it again to exit the forced cooling function.
SW2	Spot check		Spot check button
S1	S1-1		S1-1 is ON, Forced implementation of old indoor unit protocol S1-1 is OFF, Automatically adapting to indoor unit protocol(default)
	S1-2		S1-2 is ON, Forced clearing of indoor unit address S1-2 is OFF, Automatic addressing (default)
	S1-3		S1-3 is ON, Automatically judging EXV control mode of ODU in cooling mode S1-3 is OFF, ODU EXV of forced discharge temperature control in cooling mode (default)
S2	S2=000		First enabled priority mode(default)
	S2=100		Cooling priority mode
	S2=010		Automatic selection of priority mode
	S2=001		In response to cooling mode only
	S2=110		Reserved
	S2=011		Reserved
S3	S3=000		ODU capacity: 28kBtu/h
S4	S4=0000		Network address of ODU: 0(default)

Notes:

1. Black denotes the switch position.

Figure 4-1.3: 36/42 model outdoor unit main PCB

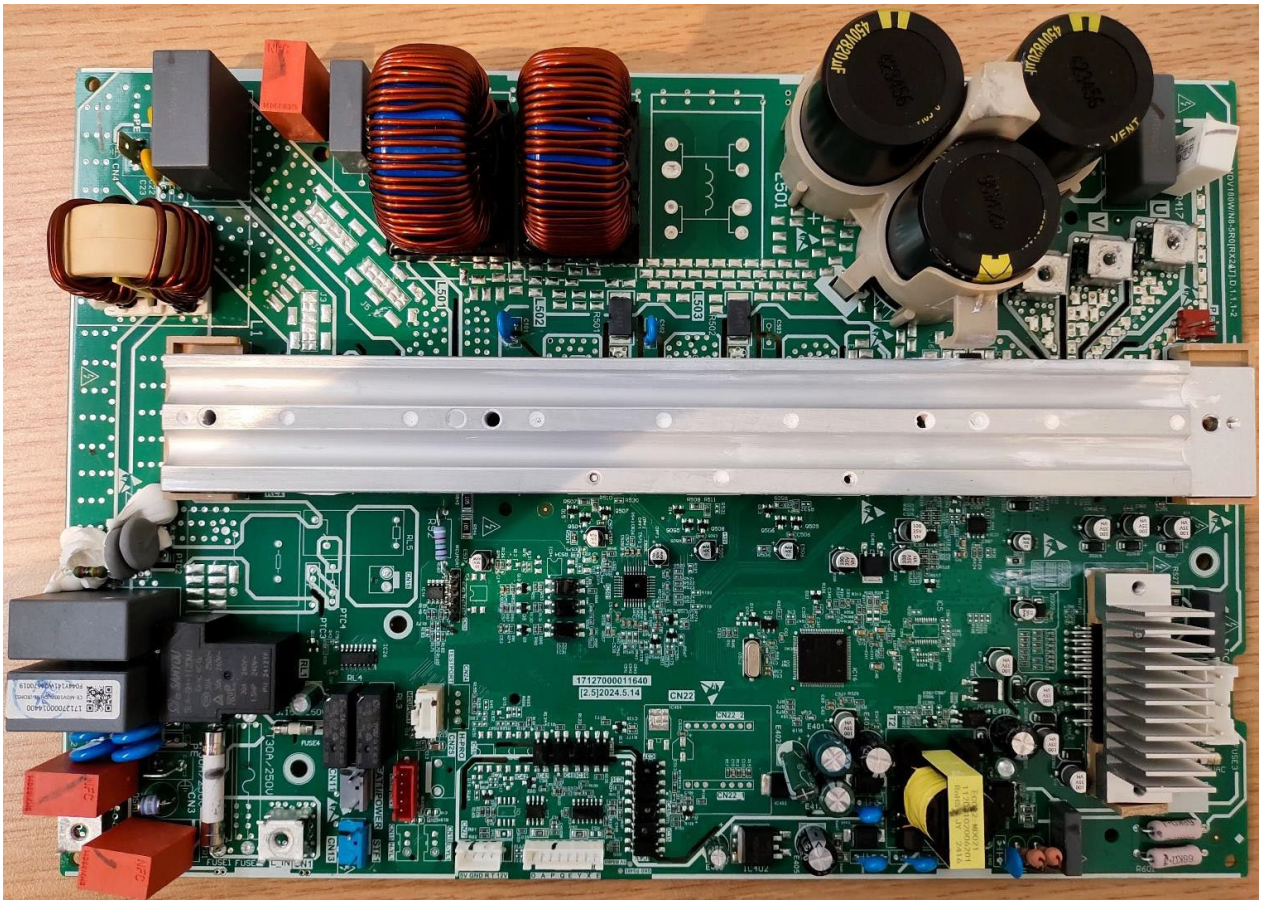


Figure 4-1.4: 36/42 model outdoor unit communication switchboard

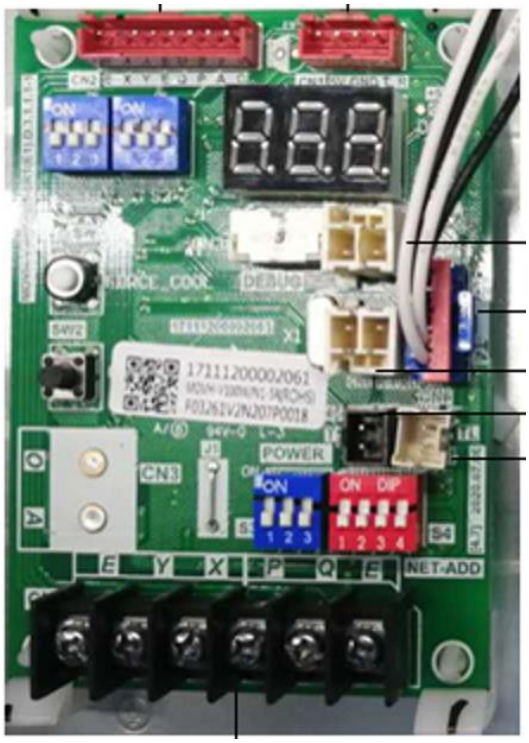


Table 4-1.2: 36/42 model outdoor unit main PCB switch settings

Switch	Setting	Switch positions[1]	Description
SW1	Force cooling		Press SW1 to enter the forced cooling function; press it again to exit the forced cooling function.
SW2	Spot check		Spot check button
S1	S1-1		S1-1 is ON, Forced implementation of old IDU protocol S1-1 is OFF, Automatic selection of the new or old protocol (default)
	S1-2		S1-2 is ON, Forced clearing of IDU address S1-2 is OFF, Automatic addressing(default)
	S1-3		S1-3 is ON, automatically judging EXV control mode of ODU in cooling mode S1-3 is OFF, ODU EXV of forced discharge temperature control in cooling mode(default)
S2	S2=000		First on priority mode (by default)
	S2=100		Cooling priority mode
	S2=101		VIP priority mode
	S2=010		Automatic priority mode
	S2=001		In response to cooling mode only
	S2=110		Reserved
	S2=011		Reserved
S3	S3=100		ODU capacity DIP: 36kBtu/h
	S3=010		ODU capacity DIP: 42kBtu/h

Table continued on next page…

Table 4-1.2: 36/42 model outdoor unit main PCB switch settings (continued)

Switch	Setting	Switch positions[1]	Description
S4	S4=0000		Network address of ODU: 0(default)
	S4=1000		Network address of ODU: 1
	S4=0100		Network address of ODU: 2
	S4=1100		Network address of ODU: 3
	S4=0010		Network address of ODU: 4
	S4=1010		Network address of ODU: 5
	S4=0110		Network address of ODU: 6
	S4=1110		Network address of ODU: 7

Notes:

1. Black denotes the switch position.
2. The capacity dial code has been set in the factory, and market operation is prohibited.

Figure 4-1.3: 48/56/60 model outdoor unit main PCB

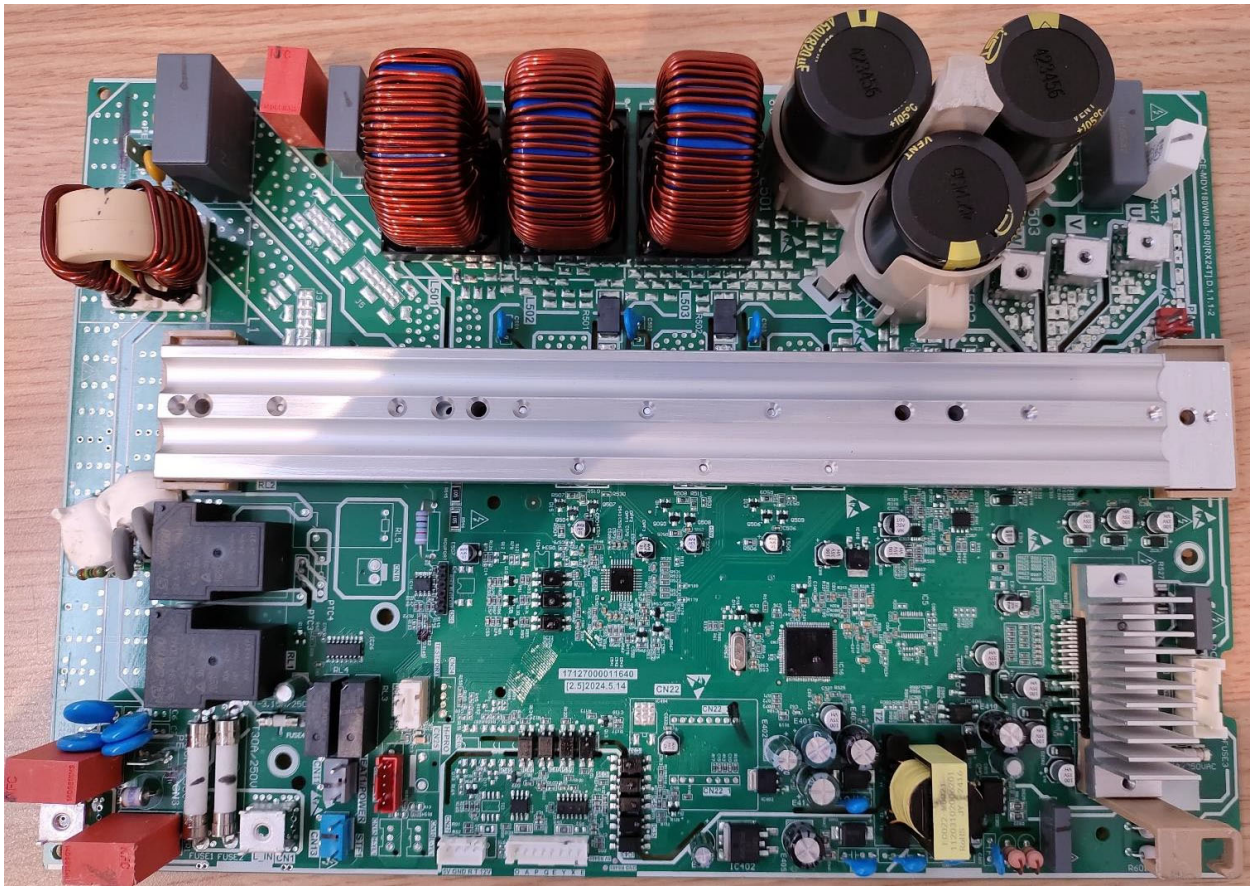


Figure 4-1.4: 48/56/60 model outdoor unit communication switchboard

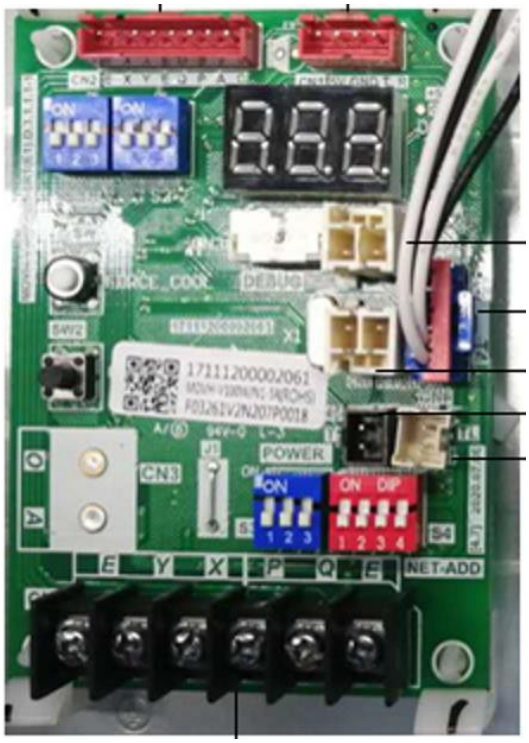


Table 4-1.2: 48/56/60 model outdoor unit main PCB switch settings

Switch	Setting	Switch positions[1]	Description
SW1	Force cooling		Press SW1 to enter the forced cooling function; press it again to exit the forced cooling function.
SW2	Spot check		Spot check button
S1	S1-1		S1-1 is ON, Forced implementation of old IDU protocol S1-1 is OFF, Automatic selection of the new or old protocol (default)
	S1-2		S1-2 is ON, Forced clearing of IDU address S1-2 is OFF, Automatic addressing(default)
	S1-3		S1-3 is ON, automatically judging EXV control mode of ODU in cooling mode S1-3 is OFF, ODU EXV of forced discharge temperature control in cooling mode(default)
S2	S2=000		First on priority mode (by default)
	S2=100		Cooling priority mode
	S2=101		VIP priority mode
	S2=010		Automatic priority mode
	S2=001		In response to cooling mode only
	S2=110		Reserved
	S2=011		Reserved
S3	S3=001		ODU capacity DIP: 48kBtu/h
	S3=101		ODU capacity DIP: 60kBtu/h

Table continued on next page…

Table 4-1.2: 36/42 model outdoor unit main PCB switch settings (continued)

Switch	Setting	Switch positions[1]	Description
S4	S4=0000		Network address of ODU: 0(default)
	S4=1000		Network address of ODU: 1
	S4=0100		Network address of ODU: 2
	S4=1100		Network address of ODU: 3
	S4=0010		Network address of ODU: 4
	S4=1010		Network address of ODU: 5
	S4=0110		Network address of ODU: 6
	S4=1110		Network address of ODU: 7

Notes:

1. Black denotes the switch position.
2. The capacity dial code has been set in the factory, and market operation is prohibited.

Table 4-1.3: Spot check display table (for all models)

No.	Parameters displayed on DSP	Remarks
0	Operating frequency	Actual value = value displayed
1	Operating mode	Refer to Note 1
2	Operating fan speed level	Refer to Note 2
3	Total capacity requirement of indoor units	
4	Total capacity requirement for the modified ODU	
5	T3 Condenser temperature(°C)	Actual value = value displayed
6	T4 Outdoor ambient temperature(°C)	Actual value = value displayed
7	T5 discharge temperature(°C)	Actual value = value displayed
8	TF invert module Temperature(°C)	Actual value = value displayed
9	TL refrigerant cooling tube temperature (°C)	Actual value = value displayed
10	EXVA position	Actual value = value displayed× 8
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) average temperature (°C)	Actual value = value displayed
16	T2A condenser temperature	Actual value = value displayed
17	Total number of IDUs	Actual value = value displayed
18	Number of Operating IDUs	
19	Model name	
20	System address	ODU address in the centralized control
21	Compressor error code	
22	Priority mode	Refer to Note 3
23	Discharge pressure	
24	Program version number	
25-34	Last 10 times error protection code[4]	Refer to Note 4
35	Display "--"	

Notes:

1. Operating mode:
   - 0: standby; 2: cooling; 4: forced cooling.
2. The fan speed index is related to the fan speed in rpm and can take any integer value in the range 0 (0-off) to 19 (fastest).

Fan speed index	Fan speed (rpm)					
	28	36	42	48	56	60
0	0	0	0	0	0	0
1	120	120	120	120	120	120
2	150	150	150	150	150	150
3	180	180	180	180	180	180
4	210	210	210	210	210	210
5	240	240	240	240	240	240
6	270	270	270	270	270	270
7	300	300	300	300	300	300
8	360	350	350	350	350	350
9	400	400	400	400	400	400
10	440	460	460	460	460	460
11	520	520	520	520	520	520
12	600	630	630	630	630	630
13	680	720	720	750	750	750
14	750	780	780	800	800	800
15	800	800	800	860	/	830
16	850	850	850	880	/	850
17	900	900	900	/	/	/
18	/	/	/	/	/	/
19	/	/	/	/	/	/

3. Priority mode:
   - 0: first ON priority; 1: cooling priority; 2: Automatic selection of priority mode; 4: cooling only;
4. "nn" is displayed if no error or protection events have occurred since start-up; it displays all error protection code if the number of error protection codes are less than 10 since start-up.

Part 5

Electrical Components and Wiring Diagrams

1 Outdoor Unit Electric Control Box Layout

Figure 5-1.1: Front view of 28 model electric control box

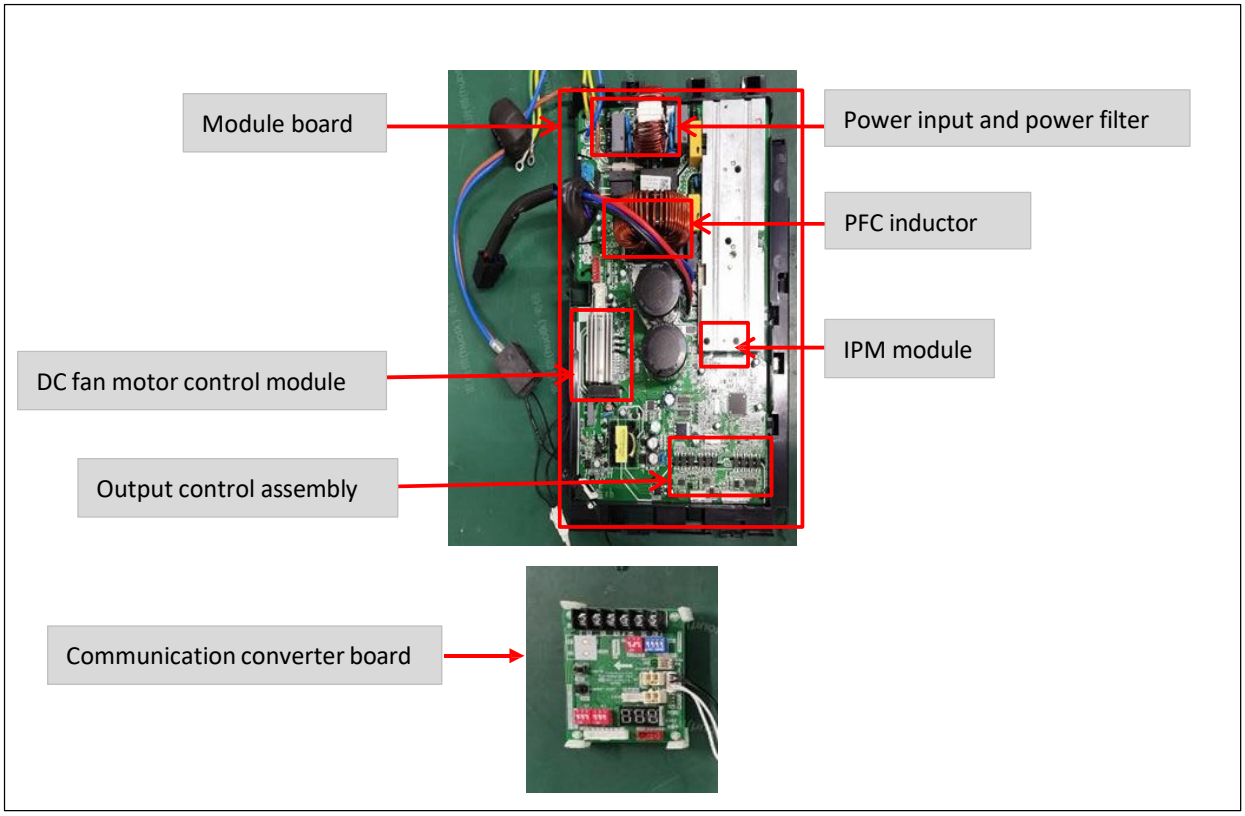


Figure 5-1.2: Front view of 36/42 model electric control box

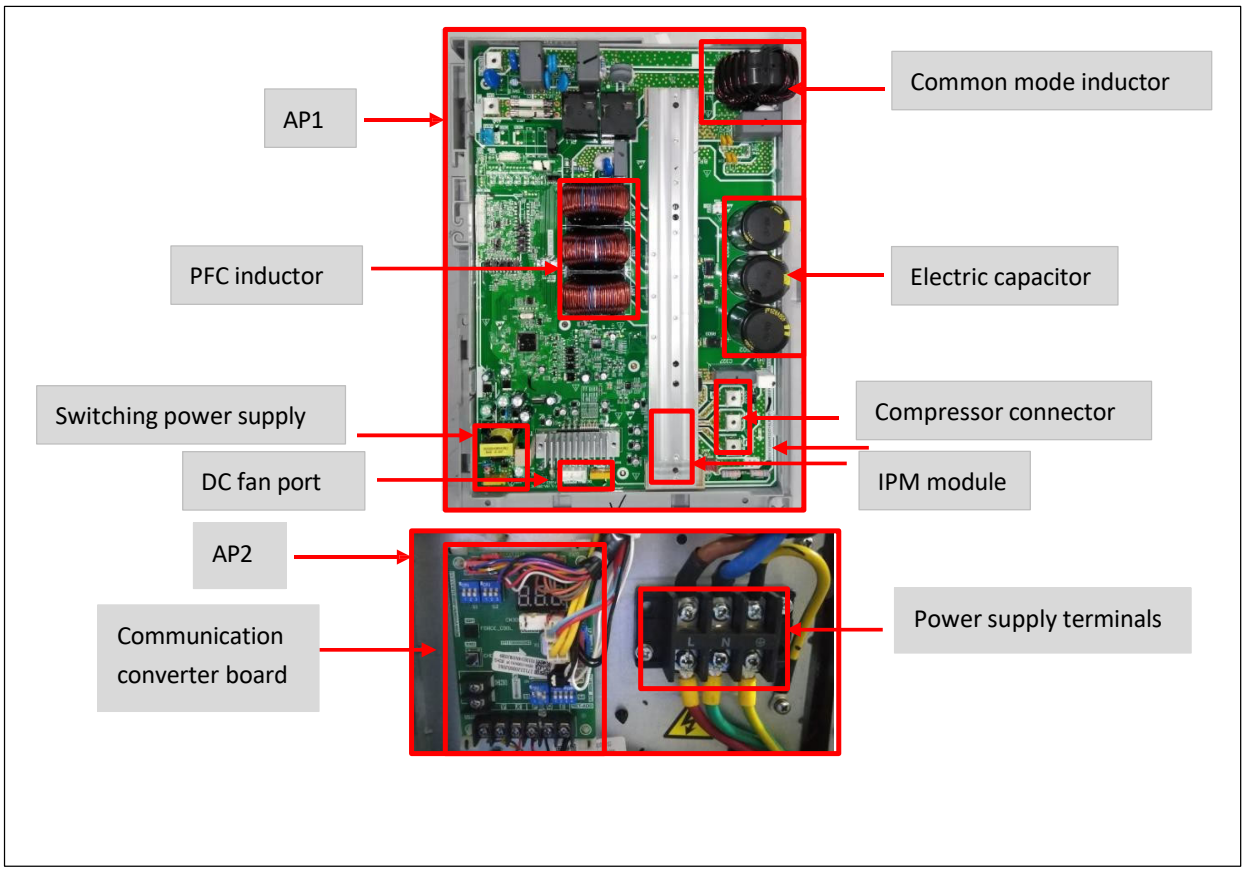
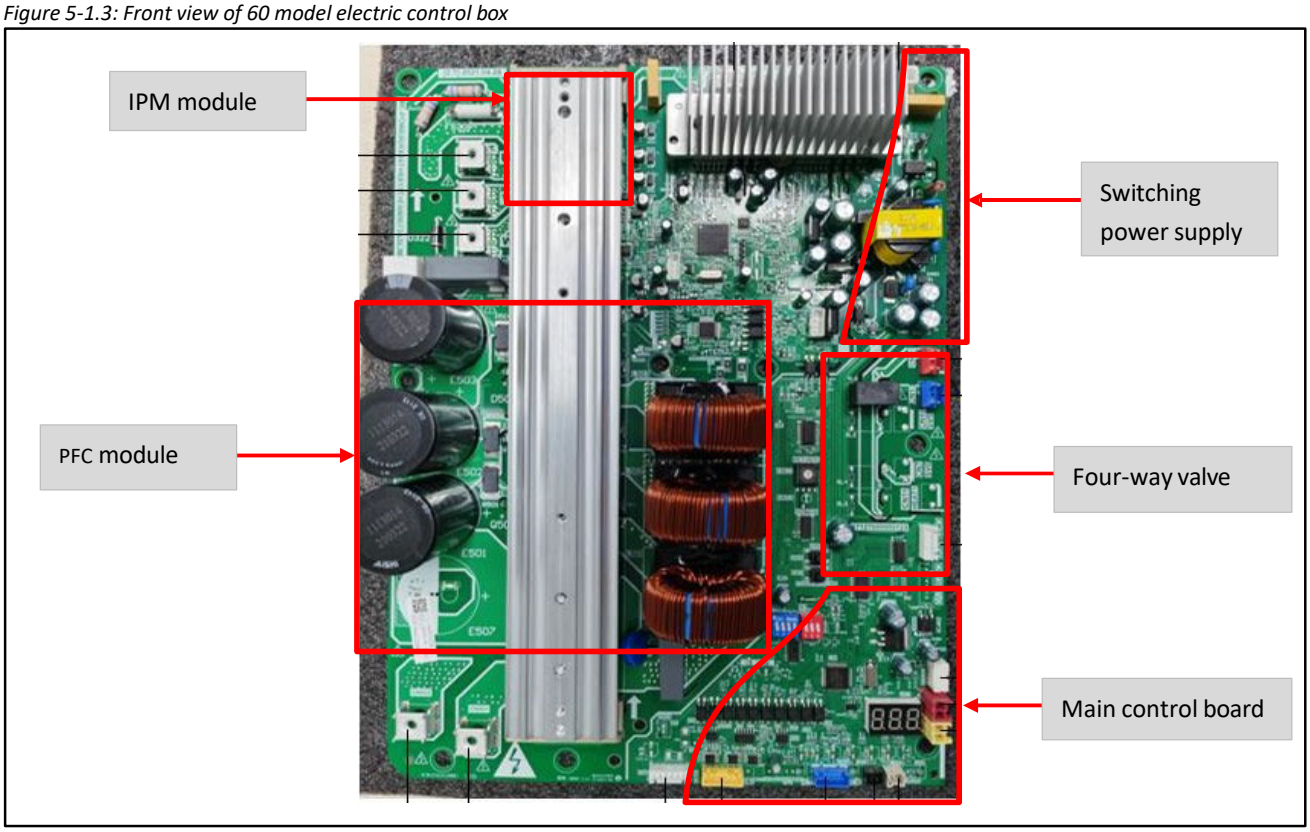


Figure 5-1.3: Front view of 60 model electric control box



2 Outdoor Unit Main PCB

2.1 Ports

Figure 5-2.1: 28 model outdoor unit main PCB ports

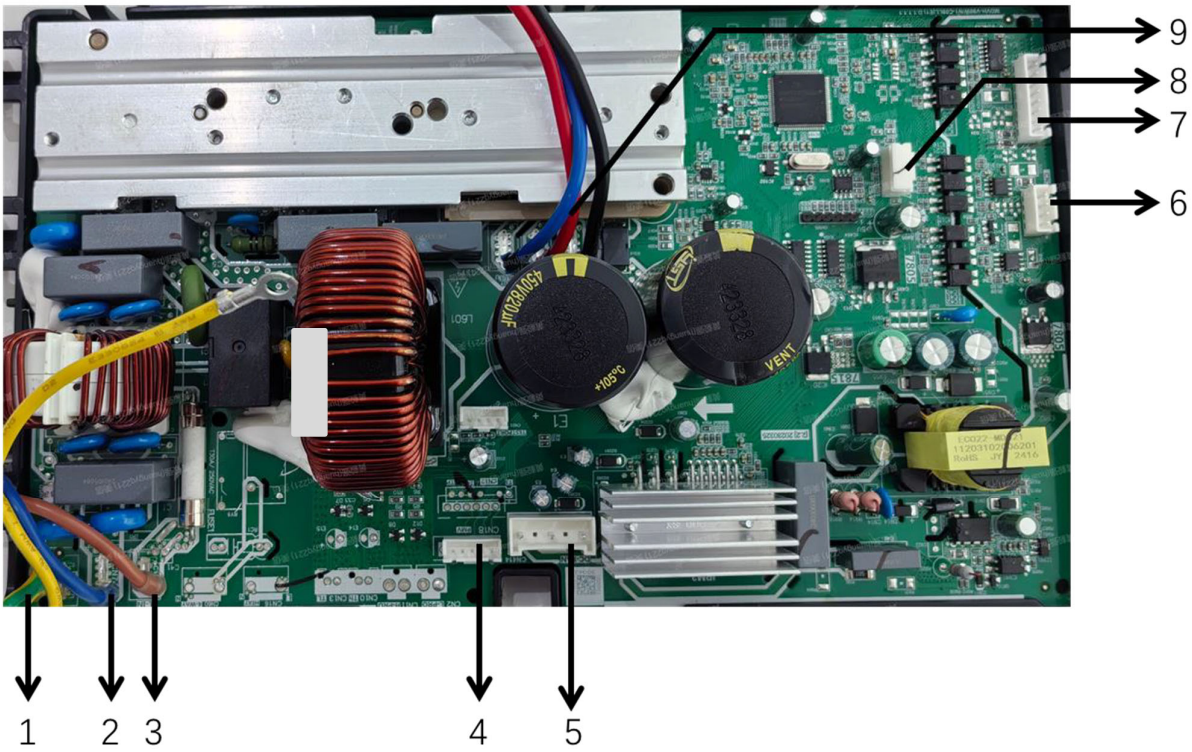


Table 5-2.1: 28 model main PCB ports

Label in Figure 5-1.1	Port code	Content	Port voltage
1	CN6/CN6-1	Earth	0V
2	N-IN	Power input-N	AC 220V
3	L-IN	Power input-L	AC 220 V
4	CN18	Electronic expansion valve port	Pin 1: DC12V; Other pins: Dynamic change
5	CN414	Fan motor port	DC 240-350V
6	CN30	Main board communication converter board communication port	DC 0-5V
7	CN5	Communication port between outdoor unit and indoor units; Energy meter communication port	DC 2.5-5V
8	CN507	Chip burning port	DC 5V
9	U/V/W	Compressor U/V/W output	DC 240-350V

Figure 5-2.2: 36/42 model outdoor unit main board ports

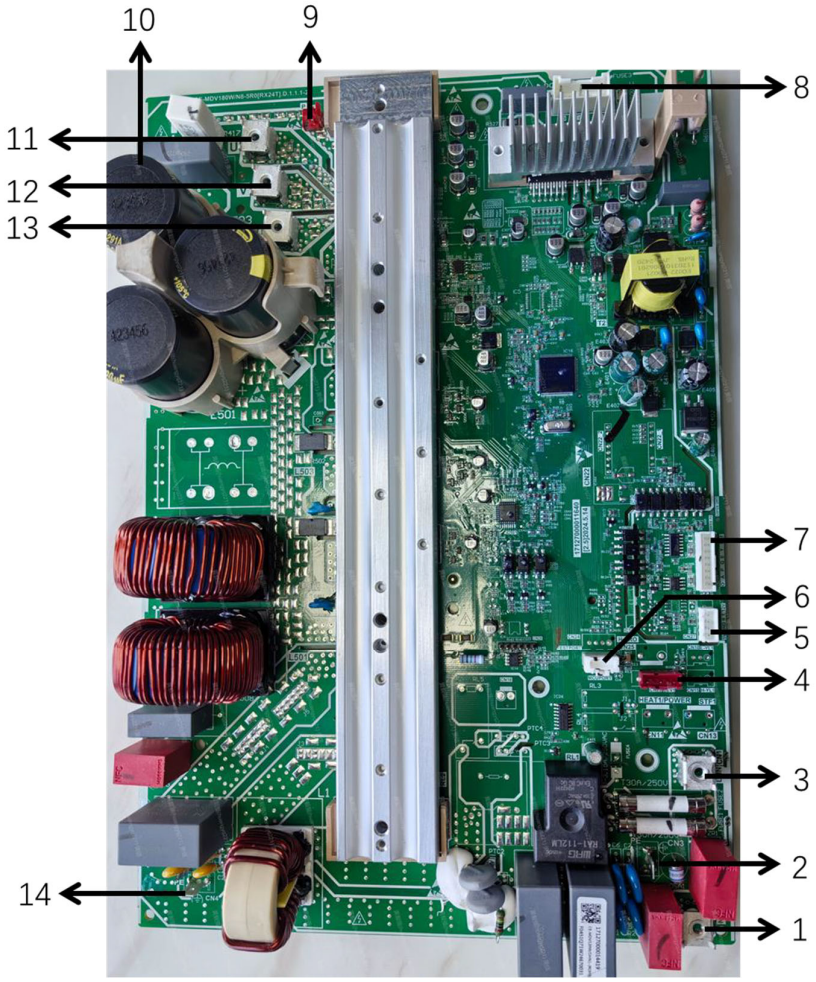


Table 5-2.2: 36/42 model outdoor unit main board ports

Label in Figure 5-1.2	Code	Content	Port voltage
1	CN1	Power input-N	AC 220V
2	CN3	Earth	0V
3	CN2	Power input-L	AC 220V
4	CN23	Electronic expansion valve port	Pin 1: DC12V; Other pins: Dynamic change
5	CN27	Main board communication converter board communication port	DC 0-5V
6	CN26	Online Programmable Port	DC 5V
7	CN5	Communication port between outdoor unit and indoor units; Energy meter communication port	DC 2.5-5V
8	CN32	DC fan port	DC 240-350V
9	CN17	Bus P, for factory testing only	0-380VDC
10	CN18	Bus N, for factory testing only	0-380VDC
11	U	Compressor's U phase voltage output port	DC 240-350V (in dynamic change)
12	V	Compressor's V phase voltage output port	DC 240-350V (in dynamic change)
13	W	Compressor's W phase voltage output port	DC 240-350V (in dynamic change)
14	CN4	Earth	0V

Figure 5-2.3: 48/56/60 model outdoor unit main board ports

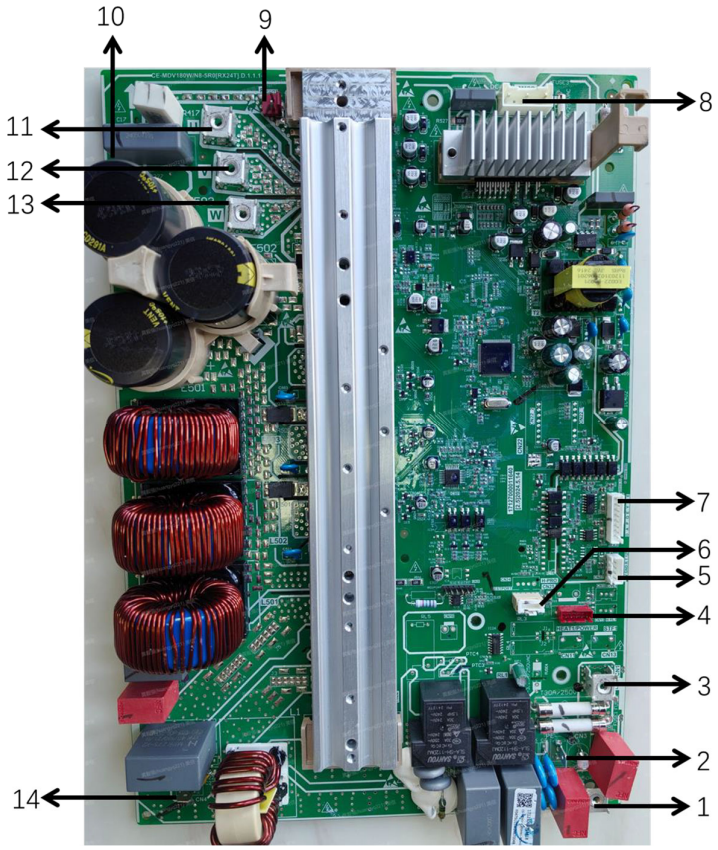


Table 5-2.4: 48/56/60 model outdoor unit main board ports

Label in Figure 5-1.2	Code	Content	Port voltage
1	CN1	Power input-N	AC 220V
2	CN3	Earth	0V
3	CN2	Power input-L	AC 220V
4	CN23	Electronic expansion valve port	Pin 1: DC12V; Other pins: Dynamic change
5	CN27	Main board communication converter board communication port	DC 0-5V
6	CN26	Online Programmable Port	DC 5V
7	CN5	Communication port between outdoor unit and indoor units; Energy meter communication port	DC 2.5-5V
8	CN32	DC fan port	DC 240-350V
9	CN17	Bus P, for factory testing only	0-380VDC
10	CN18	Bus N, for factory testing only	0-380VDC
11	U	Compressor's U phase voltage output port	DC 240-350V (in dynamic change)
12	V	Compressor's V phase voltage output port	DC 240-350V (in dynamic change)
13	W	Compressor's W phase voltage output port	DC 240-350V (in dynamic change)
14	CN4	Earth	0V

Figure 5-2.3: 28/32/42/48/56/60 model outdoor unit communication converter board PCB Ports

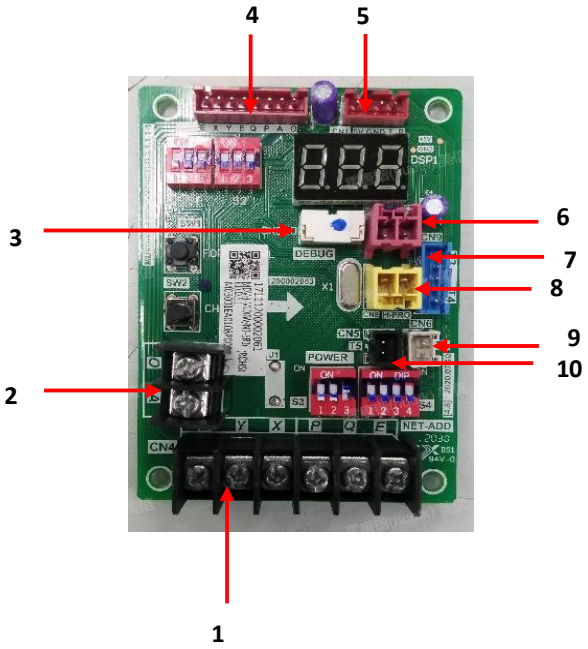


Table 5-2.3: 28/32/42/48/56/60 model communication converter board PCB ports

Label in Figure 5-1.3	Port code	Content	Port voltage
1	CN4	P Q E X Y E communication port	2.5-2.7V DC
2	CN6	Signal input port of Refrigerant radiator temperature	0-5V DC
3	CN5	Signal input port of Discharge temperature	0-5V DC
4	CN8	Signal input port of system high pressure detect switch	0-5V DC
5	CN9	T3/T4 port	0-5V DC
6	CN7	Signal input port of system low pressure detect switch	0 or 5V DC
7	CN1	Main board 5V power supply port; communication port between main board and module board	5V DC and 0~5V DC
8	CN2	P Q E X Y E communication port O A communication port	2.5-5V DC

2.2 Components

2.2.1 Function of buttons SW1 to SW2

Table 5-2.5: Function of buttons SW1 to SW2

Model	Button	Function	Picture
36-60	SW1	Force cooling button	
	SW2	Check button	

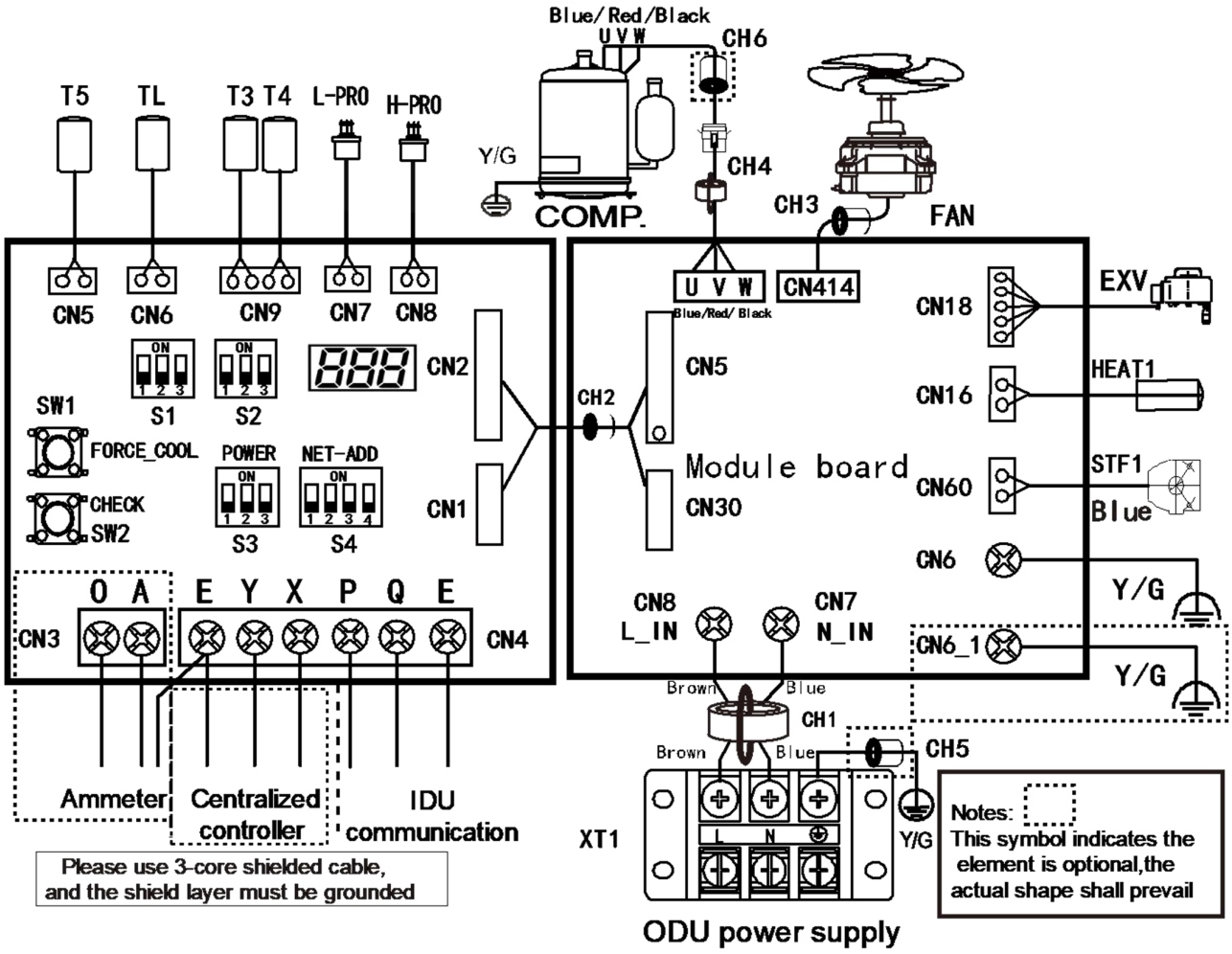
2.2.2 Digital display output

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	Compressor frequency	
Error or protection	Error or protection code	
System check	Refer to Table Table 4-1.3	

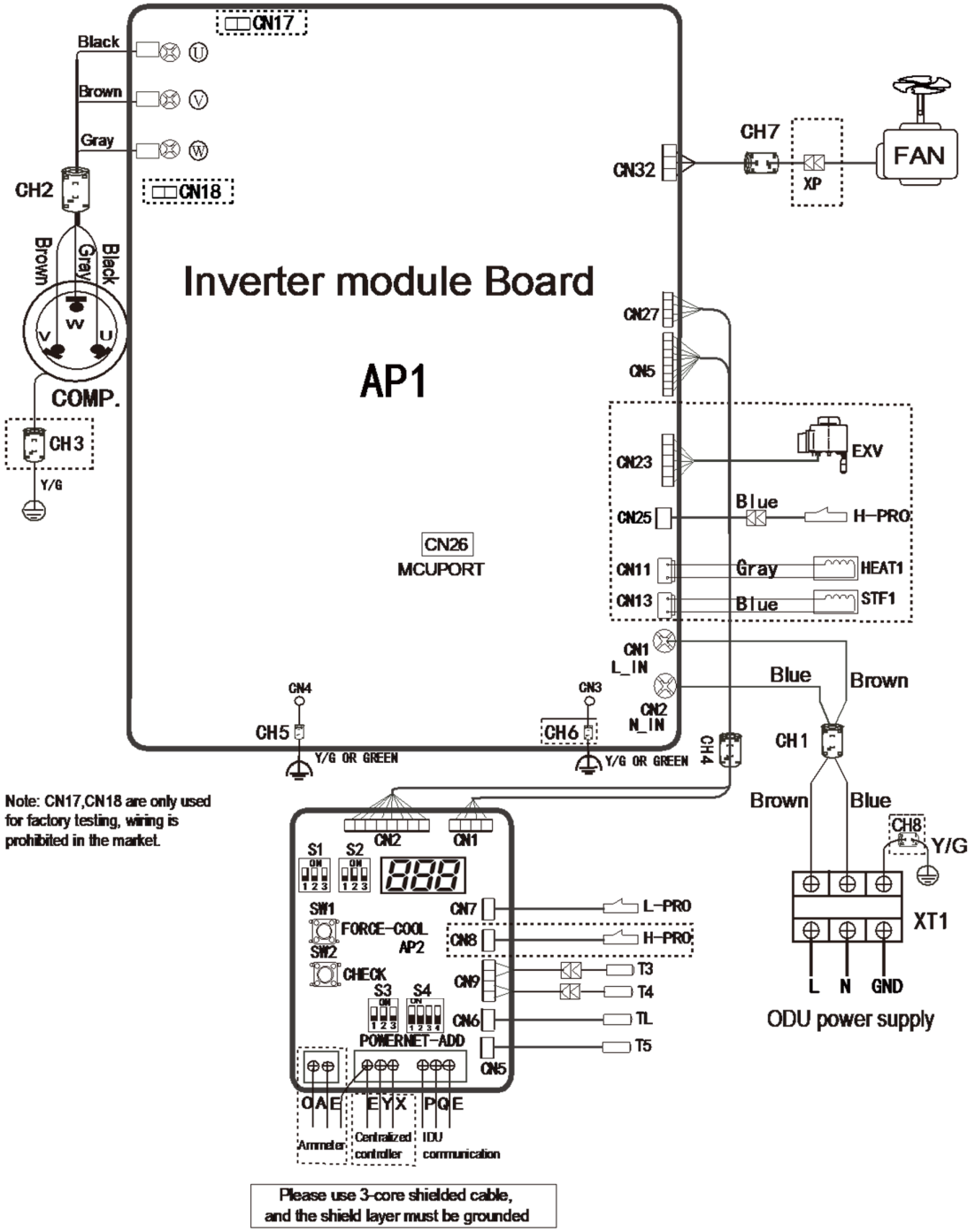
3 Wiring Diagrams

Figure 2-5.2: 28/36/42 model wiring diagram



Component code	Description	Component code	Description
CH1-CH5	Magnetic ring	T3	Outdoor heat exchanger temperature sensor
COMP.	Compressor	T4	Outdoor ambient temperature sensor
FAN	DC fan	T5	Discharge temperature sensor
EXV	Electronic expansion valve	TL	Refrigerant radiator temperature sensor
HEAT1	Crankcase heater	AP1	Main control board
STF1	Four-way valve	AP2	Spot check board
H-PRO	High pressure switch	XT1	Power supply terminal
L-PRO	Low pressure switch	XP	Connecting terminal

Figure 2-5.3: 48/56/60 model wiring diagram



Component code	Description	Component code	Description
CHI-CH8	Magnetic ring	T3	Outdoor heat exchanger temperature sensor
COMP.	Compressor	T4	Outdoor ambient temperature sensor
FAN	DC fan	T5	Discharge temperature sensor
EXV	Electronic expansion valve	TL	Refrigerant radiator temperature sensor
HEAT1	Crankcase heater	AP1	Main control board
STF1	Four-way valve	AP2	Spot check board
H-PRO	High pressure switch	XT1	Power supply terminal
L-PRO	Low pressure switch	XP	Connecting terminal

Part 6

Diagnosis and Troubleshooting

1 Error Code Table

Table 6-1.1: Error code table

Error code	Content	Note
C0	Communication fault between Inverter module Board and communication terminals block	All models
E2	Communication error between indoor and outdoor unit	All models
E4	T3 or T4 temperature sensor fault	All models
E5	Input voltage protection	All models
E6	DC fan protection	All models
Eb	E6 fault occurs more than six times in an hour.	All models
E9	EEPROM Error	All models
E.9.	Compressor parameters mismatch	All models
EF	PFC feedback resistance failure protection	All models
EH	Refrigerant radiator temperature sensor fault	All models
EP	Cooling ambient temperature lower than -16℃	All models
F1	DC bus voltage protection	All models
H4	L0 fault occurs three times in one hour.	All models
H7	The number of online indoor units have decreased/increased	All models
PL	Radiator surface temperature protection	All models
P1	System high pressure protection	All models
P2	System low pressure protection	All models
P3	Overcurrent protection	All models
P4	Discharge temperature T5 protection	All models
P5	Outdoor condenser temperature T3 protection	All models
L0	IPM module protection	All models
L1	DC generatrix low voltage protection	All models
L2	DC generatrix high voltage protection	All models
L3	Other driving errors	All models
L4	MCE error	All models
L5	Zero speed protection	All models
L7	Compressor phase lost protection	All models

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 C0: Communication fault between Inverter module Board and communication terminals block

2.2.1 Digital display output

C0

2.2.2 Description

- Communication fault between Inverter module Board and communication terminals block.
- The system stops running.
- Error code is displayed on the outdoor unit PCB.

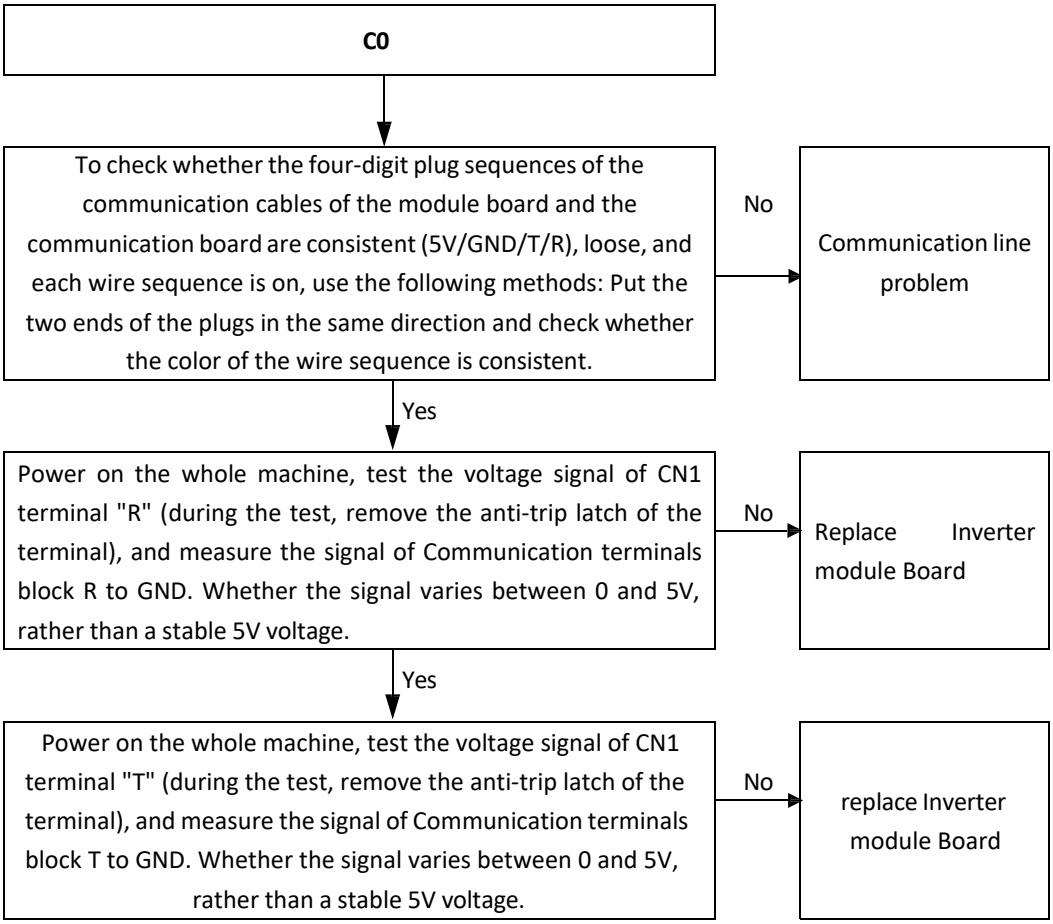
2.2.3 Trigger / recover condition

- Trigger condition: Communication terminals block and Inverter module board cannot communicate.
- Recover condition: Communication go back to normal.
- Reset method: Resume automatically.

2.2.4 Possible causes

- Interference from high voltage wires or other sources of electromagnetic radiation.
- Communication terminals block is damage.
- Communicate wire port is loose or connecter surface is corrosive, or water drop lead to poor contact.
- Communicate wire break or poor contact for reasons (such as rat beat, or bond and connection).

Procedure


C0
To check whether the four-digit plug sequences of the communication cables of the module board and the communication board are consistent (5V/GND/T/R), loose, and each wire sequence is on, use the following methods: Put the two ends of the plugs in the same direction and check whether the color of the wire sequence is consistent.
No
Communication line problem
Yes
Power on the whole machine, test the voltage signal of CN1 terminal "R" (during the test, remove the anti-trip latch of the terminal), and measure the signal of Communication terminals block R to GND. Whether the signal varies between 0 and 5V, rather than a stable 5V voltage.
No
Replace Inverter module Board
Yes
Power on the whole machine, test the voltage signal of CN1 terminal "T" (during the test, remove the anti-trip latch of the terminal), and measure the signal of Communication terminals block T to GND. Whether the signal varies between 0 and 5V, rather than a stable 5V voltage.
No
replace Inverter module Board

2.3 E2: Communication error between indoor and outdoor unit (For all models)

2.3.1 Digital display output

E2

2.3.2 Description

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

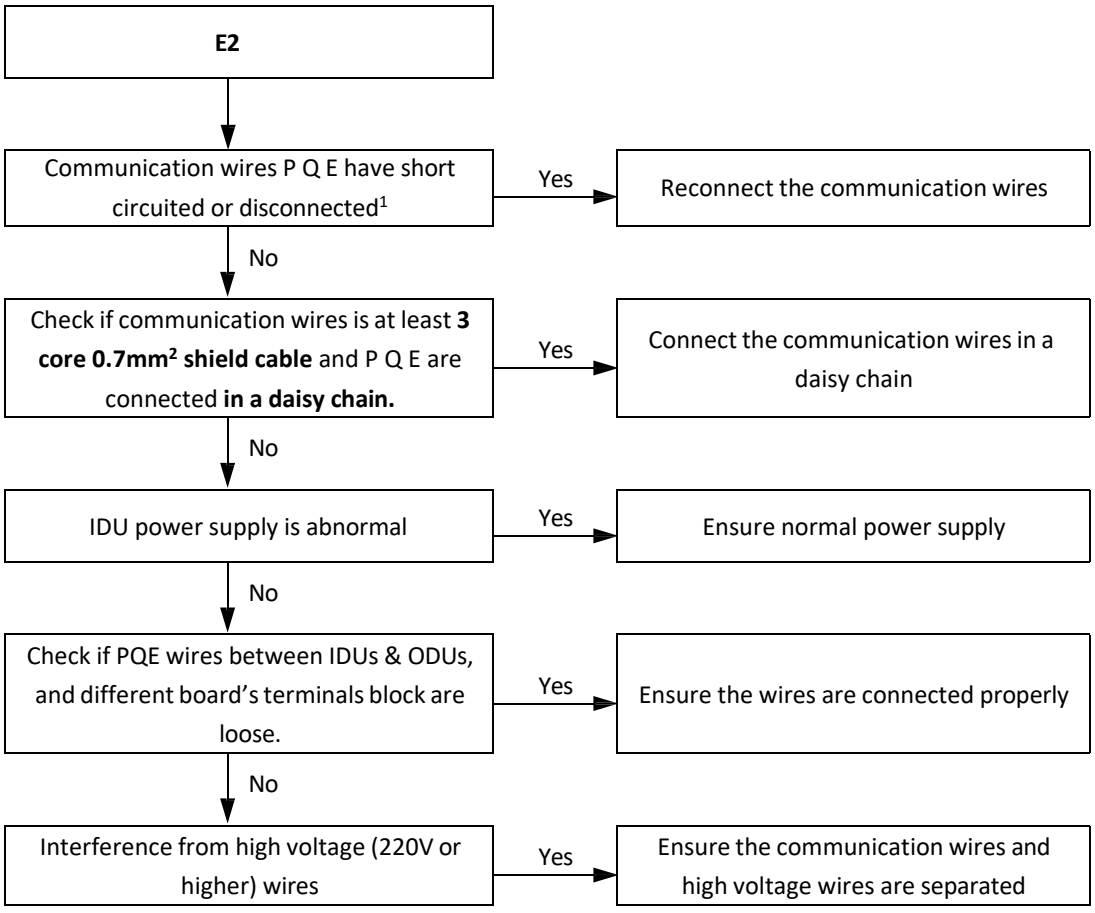
2.3.3 Trigger / recover condition

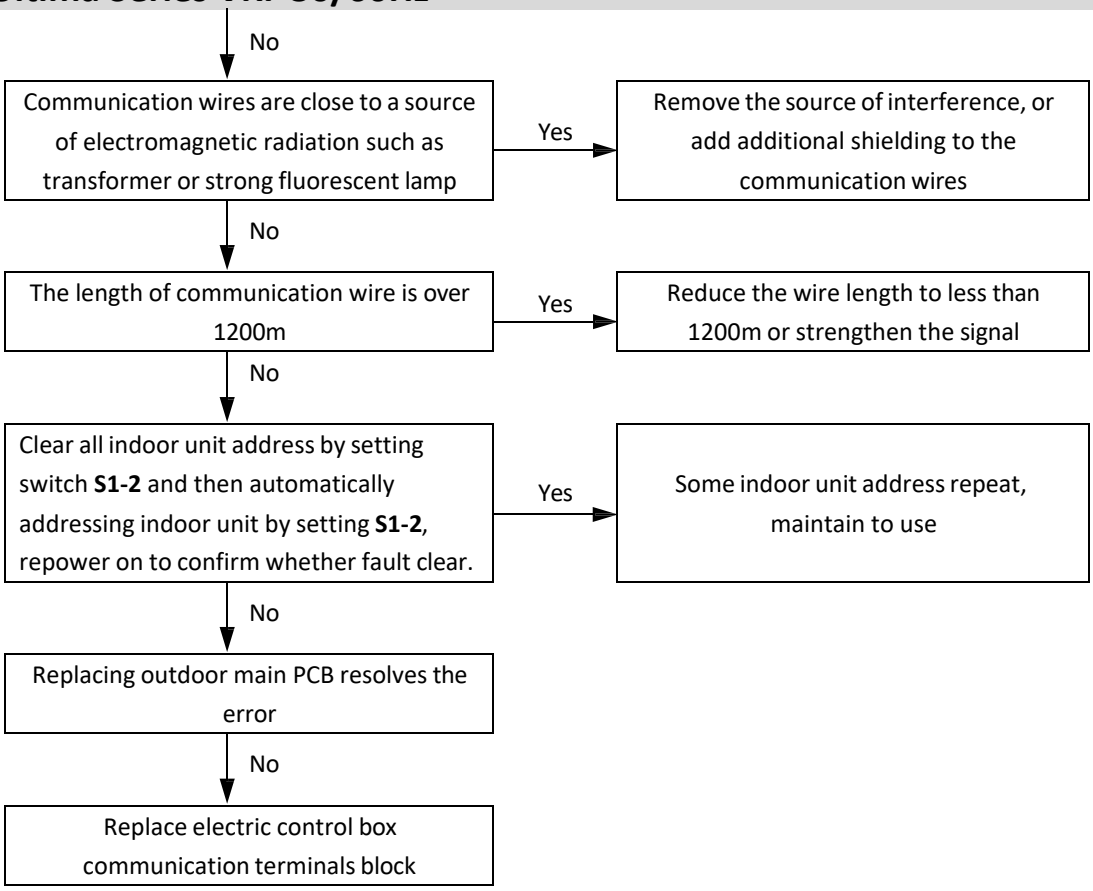
- Trigger condition: Indoor units and the outdoor unit cannot communicate for 2 minutes after the system is powered on for 20 minutes.
- Recover condition: Communication go back to normal.
- Reset method: Resume automatically.

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.
- Communication wire break or poor contact for reasons (such as rat beat, or bond and connection).

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.

- Press indoor unit's receiver button for 5 seconds, the indoor unit's communication address code is displayed.

Table 6-2.1: Communication address code

Director light	Running	Timer	Fan/defend cold fan	Warning
Code	8	4	2	1

- Press it for 10 seconds, power code is displayed. Check each unit's address code.

Table 6-2.2: Power code

Address	0	1	2	3	4	5	6	7	8	9
Capacity (×100W)	22	28	36	45	56	71	80	90	112	140
HP	0.8	1.0	1.2	1.6	2.0	2.5	3.0	3.2	4.0	5.0

For example:

Press the button for 5 seconds:

If the "running" and "warning" lights are normally on, that means the address code is 9=(8＋1)

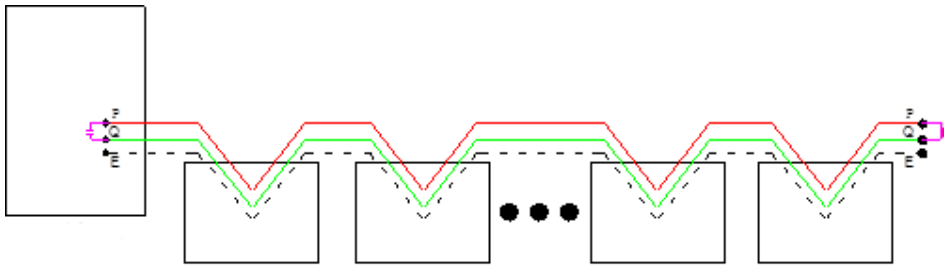
If the lights are blink, the address code should plus 16, so the address code is 25=16＋(8＋1)

Press the button for 10 seconds:

If the "timer" and "warning" lights are normally on, that means the capacity code is 5=(4＋1) and the capacity of indoor unit is 71×100W(2.5HP).

- If the signal is weak, connect a 120Ω resistor between P and Q of the farthest indoor unit, or connect a 0.5-1.5uF capacitor between P and Q of outdoor unit. Installation refers to Figure 6-2.1:

Figure 6-2.1: Indoor unit installation



Notes:

1. Communication wires should be shield wire and indoor units should be connected in series.

2.4 E4: Temperature sensor (T3/T4) fault (For all models)

2.4.1 Digital display output

E4

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.

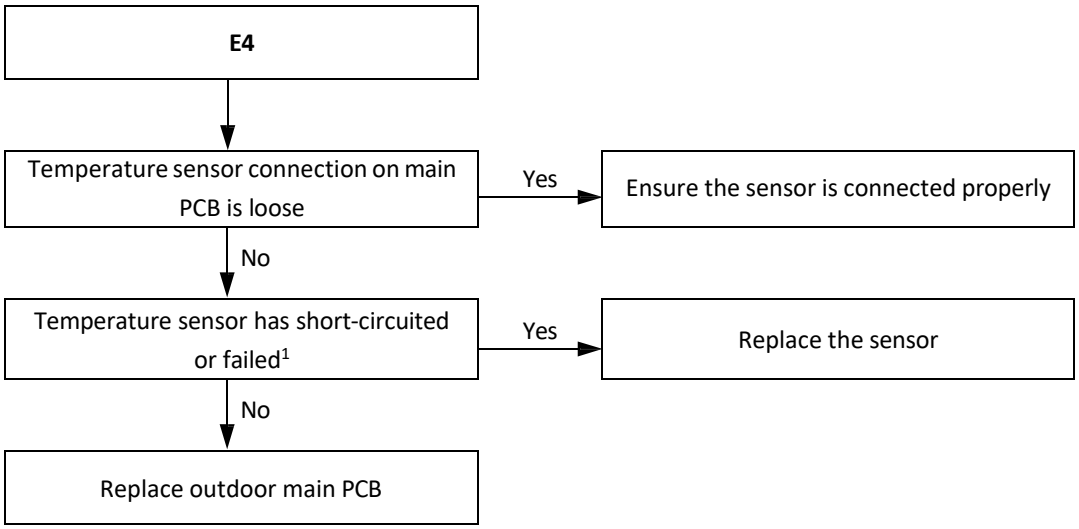
2.4.3 Trigger / recover condition

- 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.
- Temperature sensor port connect to the main board connecter is loose.
- Damaged main PCB.

2.4.5 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.

2.5 E5: Abnormal power supply voltage (For all models)

2.5.1 Digital display output

E5

2.5.2 Description

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

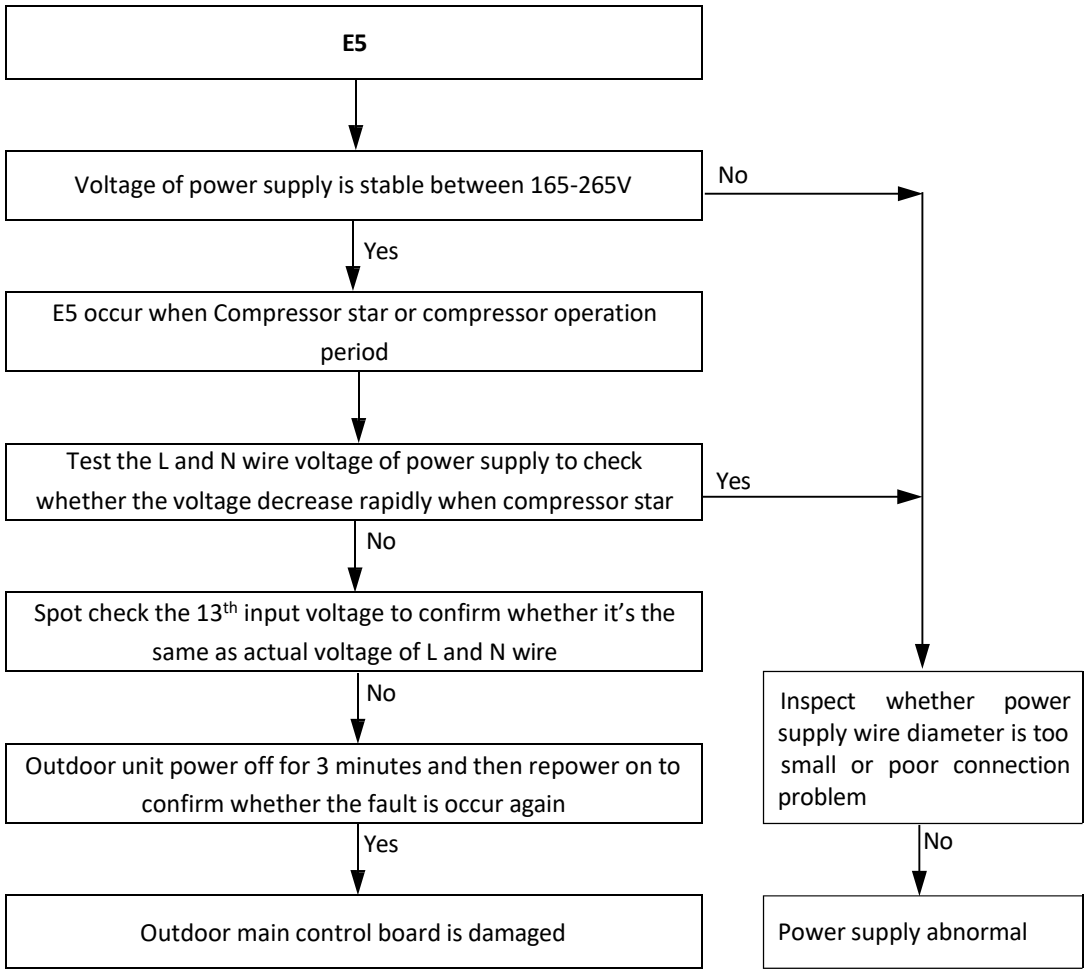
2.5.3 Trigger / recover condition

- Trigger condition: Outdoor unit power supply phase voltage < 165V or > 265V.
- Recover condition: Outdoor unit power supply phase voltage is within 175V ~265V.
- Reset method: Resume automatically.

2.5.4 Possible causes

- Outdoor unit power supply voltage is abnormal.
- Loosened wiring within electric control box.
- Power wire or air switch selection is too small.
- Main PCB damaged.

2.5.5 Procedure



2.6 E6: DC fan motor error; Eb: E6 protection appears 6 times in one hour (For all models)

2.6.1 Digital display output

E6 or Eb

2.6.2 Description

- E6:DC fan motor error; Eb: E6 protection appears 6 times in one hour
- The system stops running.
- Error code is displayed on the outdoor unit PCB.

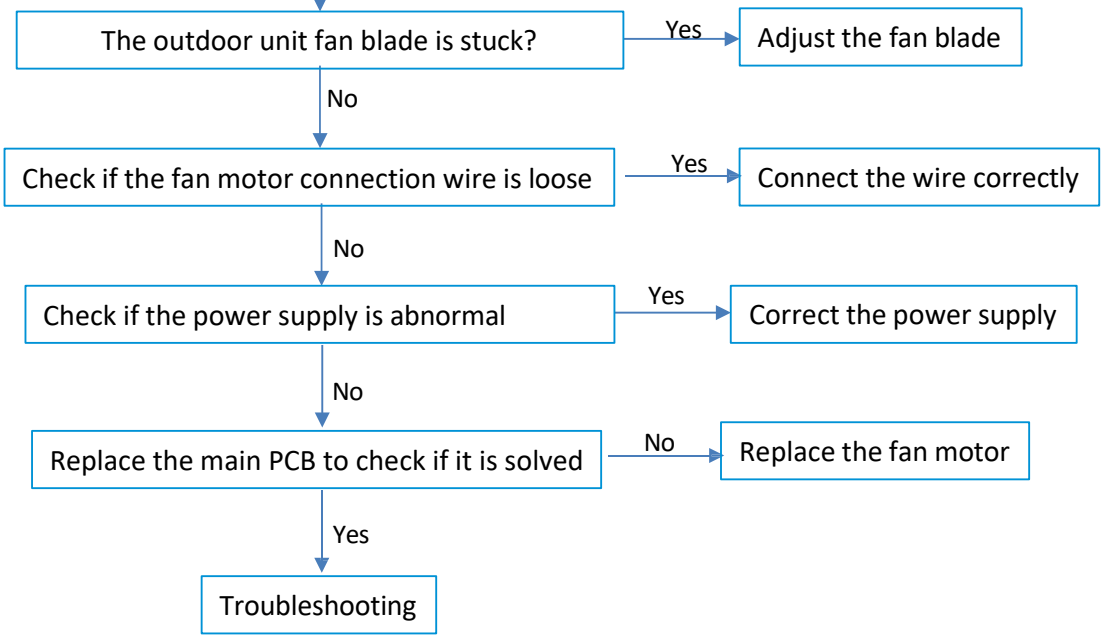
2.6.3 Trigger / recover condition

- Trigger condition:
  For E6 protection: Main control board can't receive the fan speed feedback signal.
  For Eb protection: E6 protection appears 6 times in one hour.
- Recover condition: The fan speed feedback signal is normal.
- Reset method:For E6 protection, Resume automatically; For Eb protection, Manually restart.

2.6.4 Possible causes

- Loosened wiring within electric control box.
- DC fan motor damaged.
- Main PCB damaged.

2.6.5 Procedure



2.7 E9: EEPROM error (For all models)

2.7.1 Digital display output

E9

2.7.2 Description

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

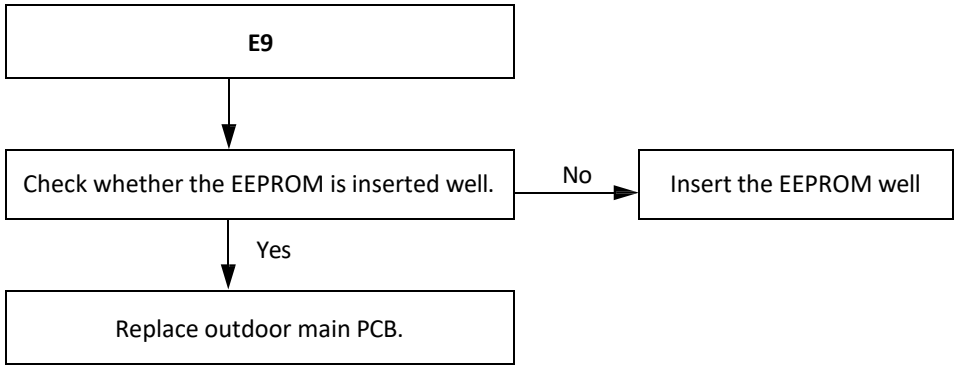
2.7.3 Trigger / recover condition

- Trigger condition: Unable to read the EEPROM when startup.
- Recover condition: EEPROM goes back to normal.
- Reset method: Manually restart.

2.7.4 Possible causes

- The EEPROM is not inserted well
- Damaged main PCB.

2.7.5 Procedure



2.8 E.9.: Compressor parameters mismatch (For all modes)

2.8.1 Digital display output

E.9.

2.8.2 Description

- Main control chip detect the power setting number mismatch the model, the unit will display E.9. error.
- The system stops running.
- Error code is displayed on the outdoor unit PCB.

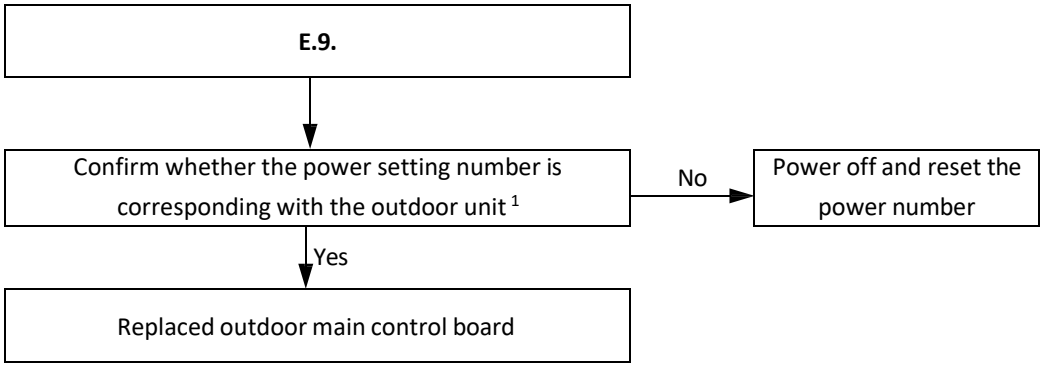
2.8.3 Trigger / recover condition

- Trigger condition: Main control chip detect the power setting number mismatch the model.
- Recover condition: Main control chip detect the power setting number match the model.
- Reset method: Manually restart.

2.8.4 Possible causes

- Power number setting mistake.
- Damaged main PCB.

2.8.5 Procedure



Notes:

1. Power setting switch is only for 100-160 model, 80 model don't need to setting
   Power setting switch for 100/120 mode is S3, S3=100 is corresponding to 100 model and S3=010 is corresponding to 120 model.
   Power setting switch for 140/160 mode is ENC2, ENC2=3 is corresponding to 140 model and ENCE=3 is corresponding to 160 model.

2.9 EF: PFC fault (Only for 36~48 model)

2.9.1 Digital display output

EF

2.9.2 Description

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

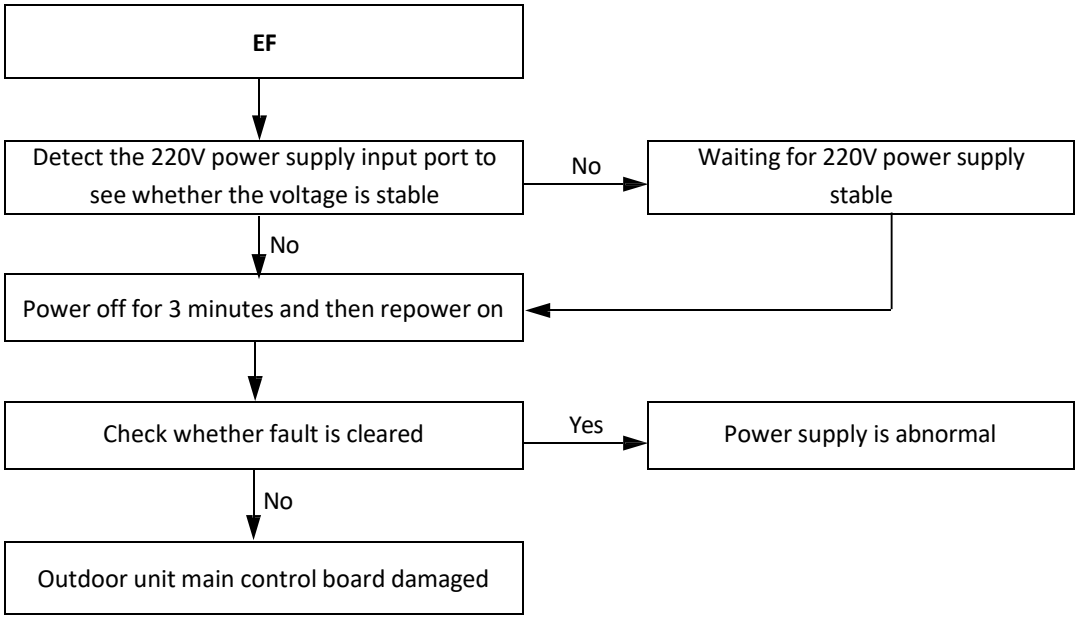
2.9.3 Trigger / recover condition

- Trigger condition: if DC generatrix voltage is over 450V for continue 3 S or over 500V in the first 5 s in PFC star period.
- Recover condition: DC generatrix voltage is normal in the first 5 s in PFC star period.
- Reset method: Manually restart.

2.9.4 Possible causes

- Main PCB damaged.
- Outdoor unit power supply voltage is abnormal.

2.9.5 Procedure



2.10 EH: Refrigerant radiator temperature sensor error (For all models)

2.10.1 Digital display output

EH

2.10.2 Description

- Refrigerant radiator temperature TL sensor error.
- The system stops running.
- Error code is displayed on outdoor unit PCB.

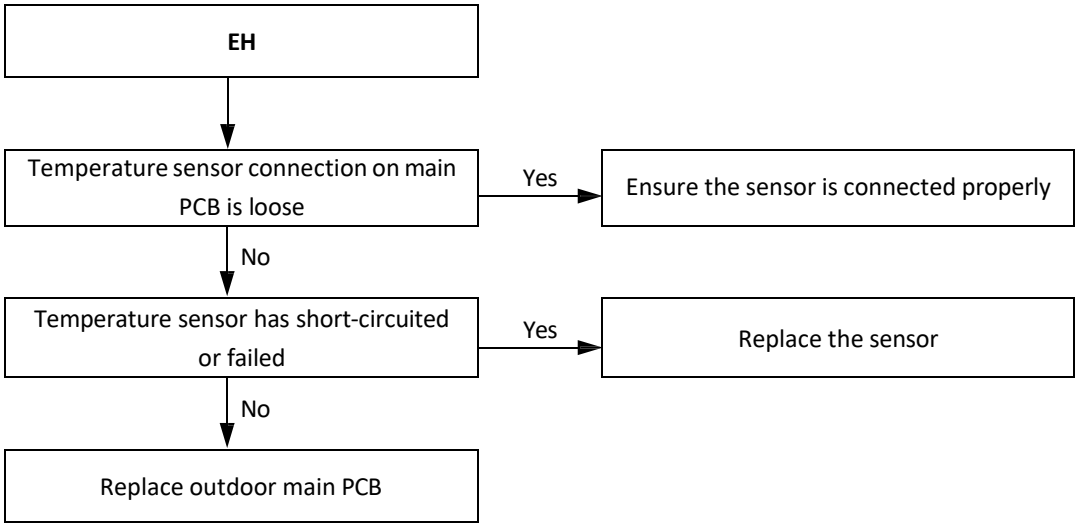
2.10.3 Trigger / recover condition

- Trigger condition: TL temperature sensor is open circuited (or connecter loose) or short circuited.
- Recover condition: The main control board can receive a normal feedback signal of TL sensor.
- Reset method: Resume automatically.

2.10.4 Possible causes

- TL temperature sensor damaged.
- TL temperature sensor connect to the main control board is loose.
- Main PCB damaged.

2.10.5 Procedure



2.11 EP: Outdoor ambient temperature is lower than -15℃ in cooling operation (For all models)

2.11.1 Digital display output

EP

2.11.2 Description

- Outdoor ambient temperature is lower than -15℃ in cooling operation.
- The system stops running.
- Error code is displayed on outdoor unit PCB.

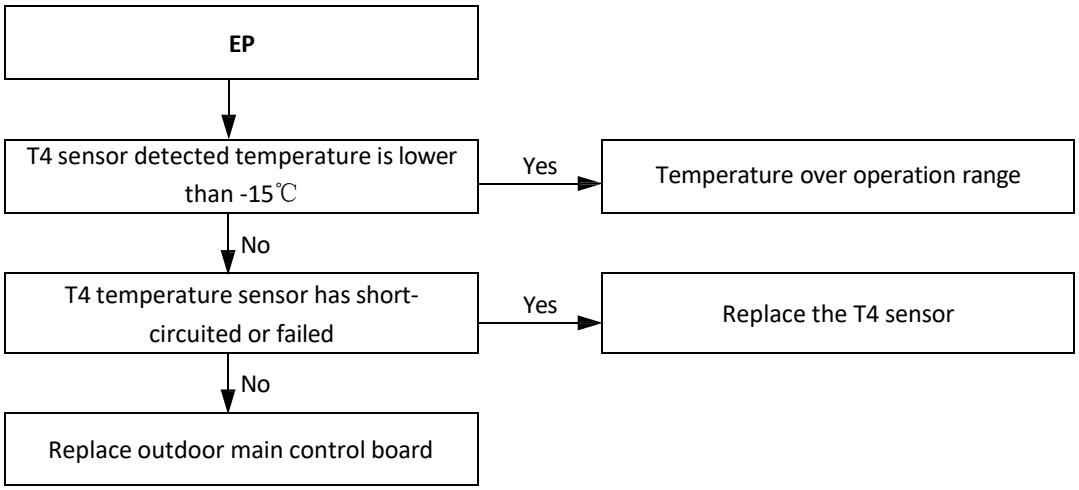
2.11.3 Trigger / recover condition

- Trigger condition: Outdoor ambient temperature is lower than -15℃ in cooling operation.
- Recover condition: Outdoor ambient temperature is over -15℃.
- Reset method: Resume automatically.

2.11.4 Possible causes

- TL temperature sensor damaged.
- TL temperature sensor connect to the main control board is loose.
- Main PCB damaged.

2.11.5 Procedure



2.12 F1: DC bus voltage protection (For all models)

2.12.1 Digital display output

F1

2.12.2 Description

- F1 indicates DC bus voltage protection.
- The system stops running.
- Error code is displayed on the outdoor unit PCB.

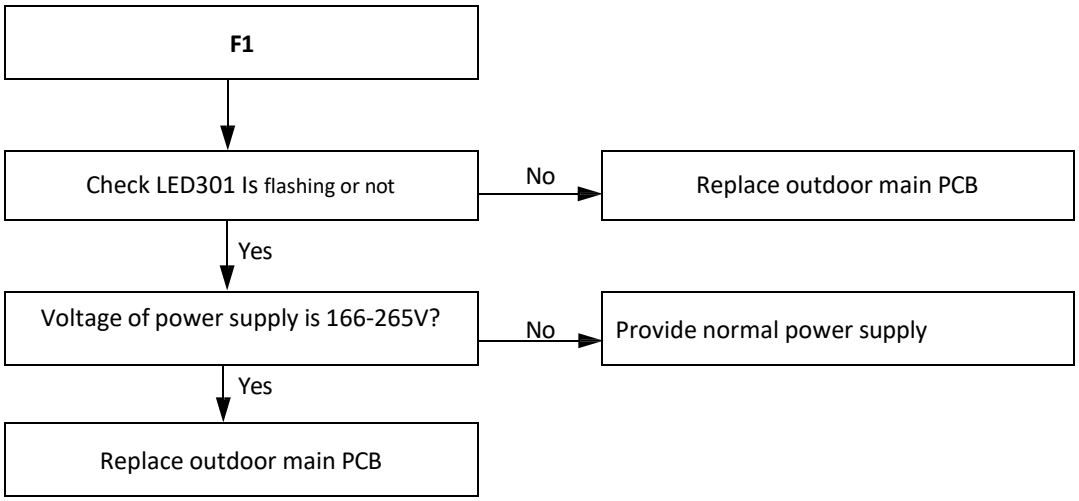
2.12.3 Trigger / recover condition

- Trigger condition: If IC55 main chip couldn't receive the DC generatrix voltage detection signal or the voltage less than 200VDC in the first 5 seconds period when power on, it would report F1 and the big relay is forbid to close.
- Recover condition: IC55 main chip can receive the DC generatrix voltage detection signal and the voltage over 200VDC .
- Reset method: Resume automatically.

2.12.4 Possible causes

- DC fan motor damaged.
- Main control board damaged.
- Outdoor unit power supply voltage is abnormal.

2.12.5 Procedure



2.13 H7: Number of indoor units detected is increase or decrease (For all models)

2.13.1 Digital display output

H7

2.13.2 Description

- Number of indoor unit detected is increase or decrease protection.
- The system stops running.
- Error code is displayed on the unit with the error.

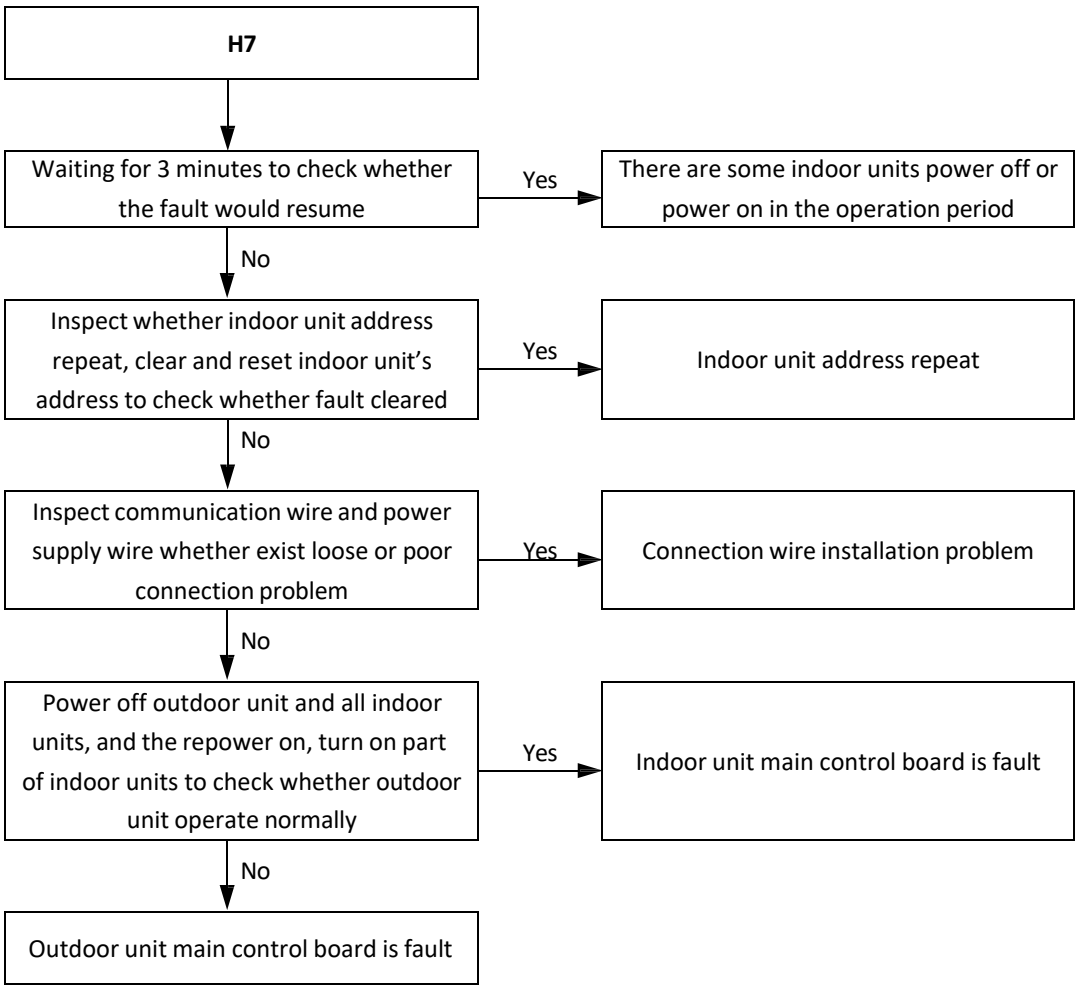
2.13.3 Trigger / recover condition

- Trigger condition: Number of indoor unit detected is increase or decrease.
- Recover condition: Number of indoor unit detected is the same as first power on.
- Reset method: Resume automatically.

2.13.4 Possible causes

- Communication wire or power supply wire connection problem.
- Indoor unit main control board damaged.
- Outdoor unit main control board damaged.

2.13.5 Procedure



2.14 P1: Discharge pipe high pressure protection (For all models)

2.14.1 Digital display output

P1

2.14.2 Description

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

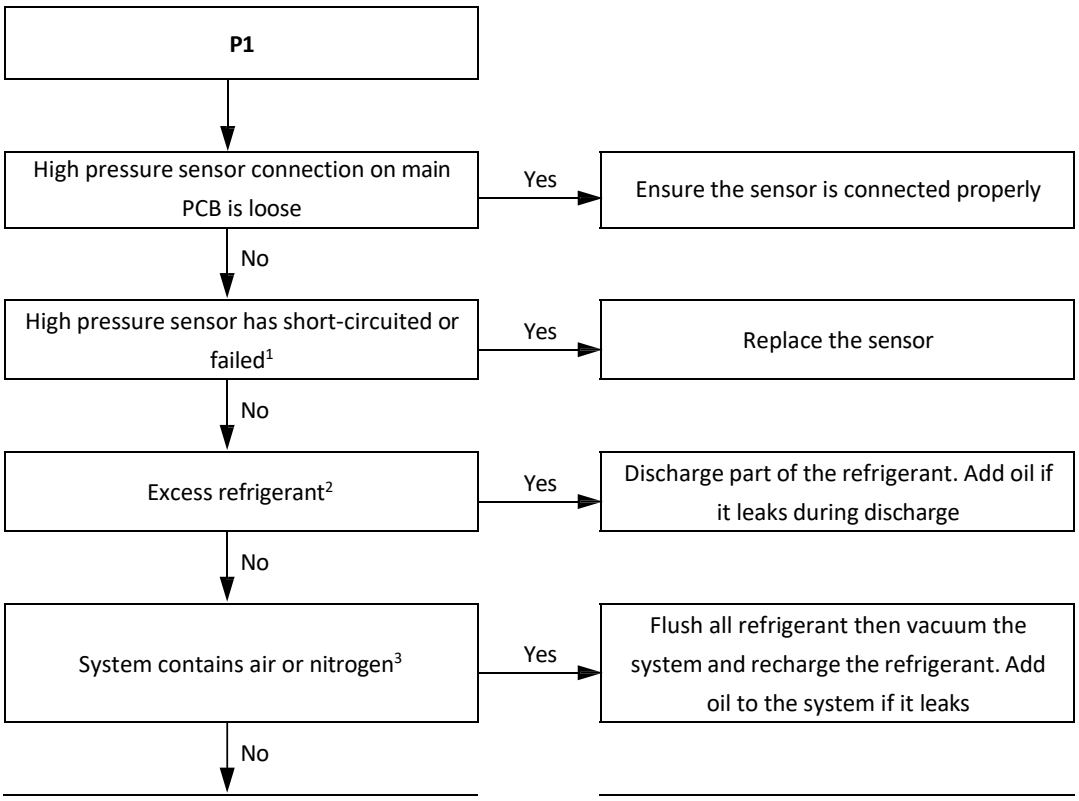
2.14.3 Trigger / recover condition

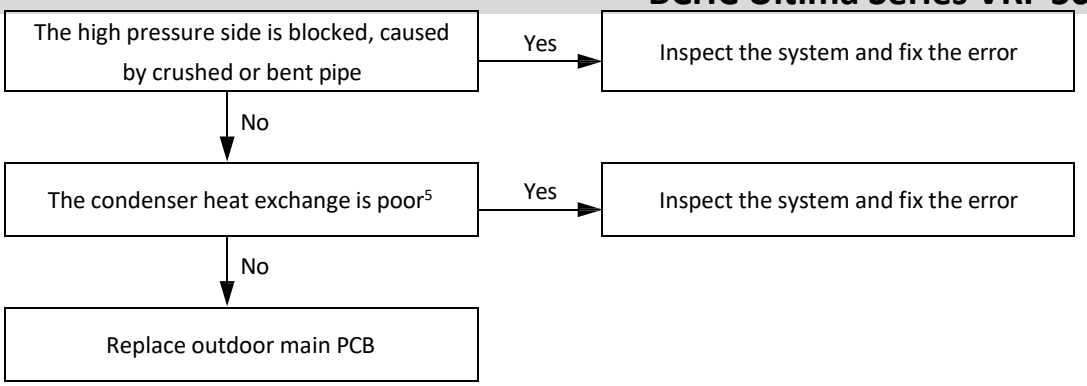
- Trigger condition: Discharge pressure ≥ 4.3MPa.
- Recover condition: Discharge pressure ≤ 3.2MPa.
- Reset method: Resume automatically.

2.14.4 Possible causes

- 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.

2.14.5 Procedure





Notes:

1. 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.
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.
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.
4. 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.
5. check outdoor heat exchangers, fans and air outlets for dirt/blockages.

2.15 P2: Suction pipe low pressure protection (For all models)

2.15.1 Digital display output

P2

2.15.2 Description

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

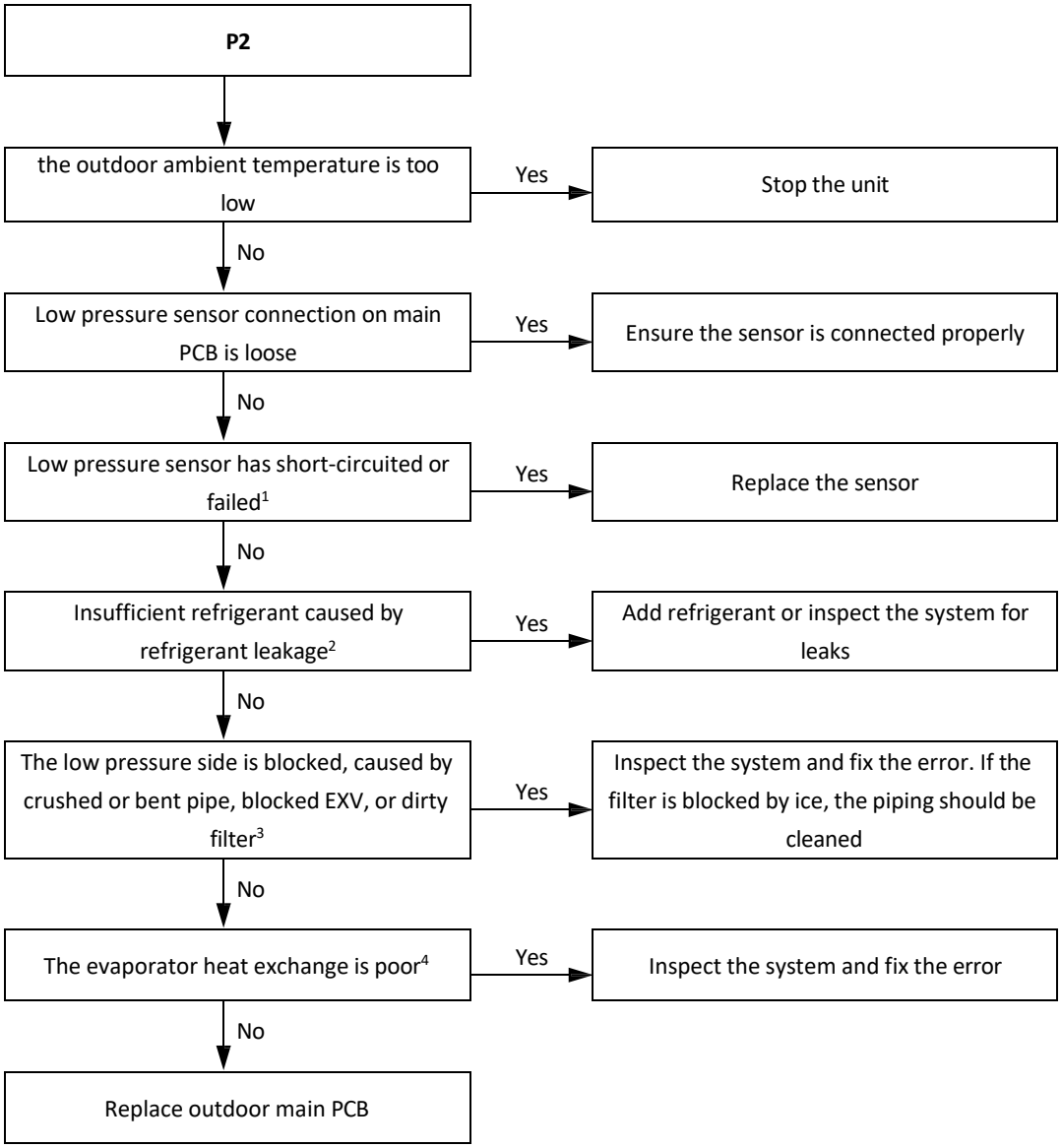
2.15.3 Trigger / recover condition

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

2.15.4 Possible causes

- Insufficient refrigerant.
- Low pressure side blockage.
- Poor evaporator heat exchange.
- Main PCB damaged.

2.15.5 Procedure



Notes:

1. 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.
2. 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.
3. 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.
4. check indoor heat exchangers, fans and air outlets for dirt/blockages.

2.17 P3: Compressor current protection (For all models)

2.15.6 Digital display output

P3

2.15.7 Description

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

2.15.8 Trigger / recover condition

- Trigger condition: Current of compressor ≥ C[1].
- Recover condition: Current of compressor < C[1].
- Reset method: Resume automatically.

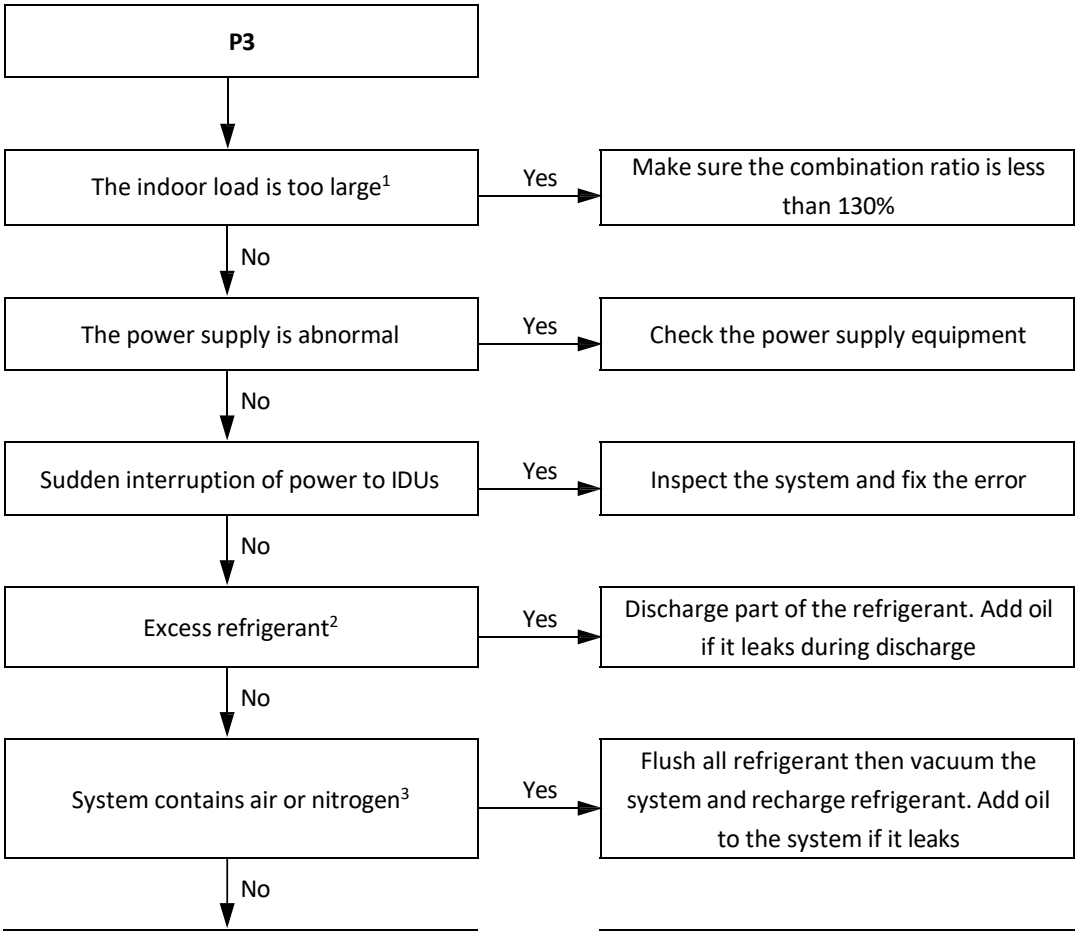
Notes:

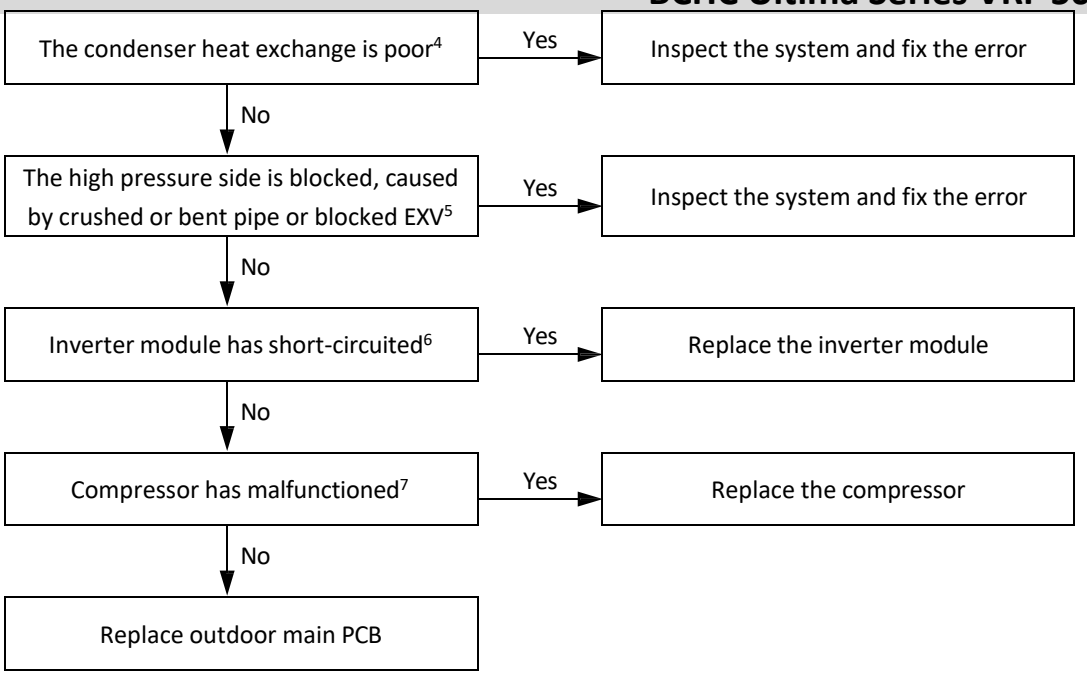
1. 28 model in cooling mode C=19A, 36 model in cooling mode C=24A, 42 model in cooling mode C=29A, 48/56/6 model in cooling mode C=33A.

2.15.9 Possible causes

- 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.

2.15.10 Procedure





Notes:

1. An indoor load that is too large causes suction and discharge temperatures to be higher than normal.
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.
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.
4. 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.
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 0.5-1.5Ω 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.

2.18 P4: Discharge temperature protection (For all models)

2.18.1 Digital display output

P4

2.18.2 Description

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

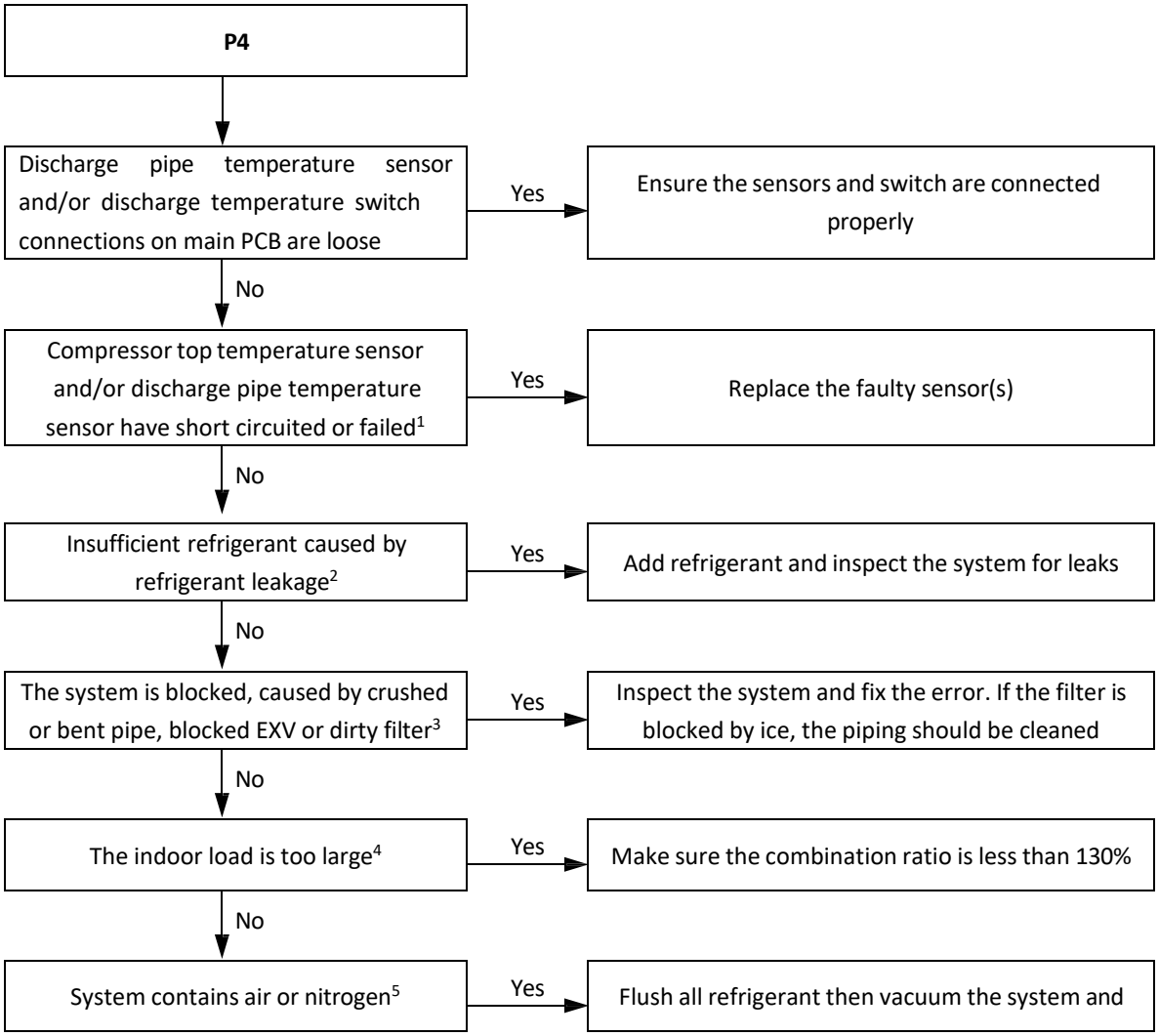
2.18.3 Trigger / recover condition

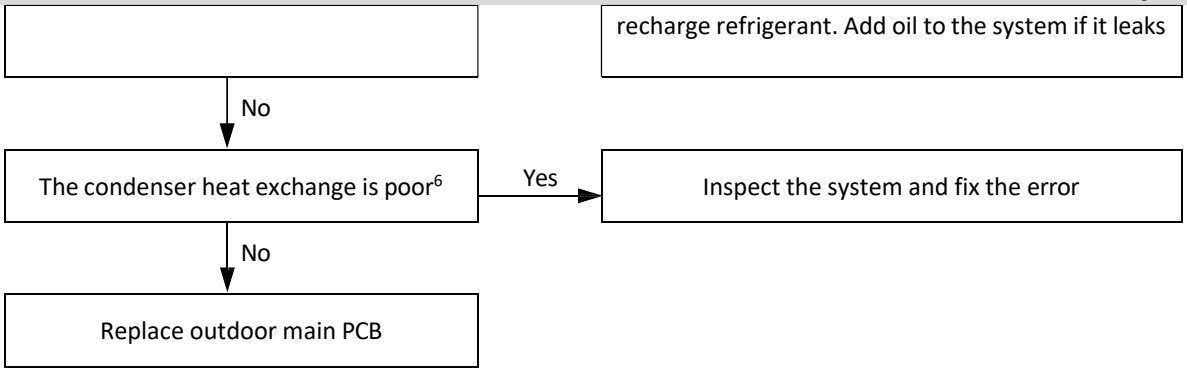
- Trigger condition: Discharge temperature (T5) > 115°C.
- Recover condition: Discharge temperature (T5) < 90°C.
- Reset method: Resume automatically.

2.18.4 Possible causes

- Temperature sensor/switch 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.

2.18.5 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.
2. 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..
3. 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.
4. An indoor load that is too large causes suction and discharge temperatures to be higher than normal.
5. 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.
6. In cooling mode check outdoor heat exchangers, fans and air outlets for dirt/blockages.

2.19 P5: Outdoor heat exchanger temperature protection (For all models)

2.19.1 Digital display output

P5

2.19.2 Description

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

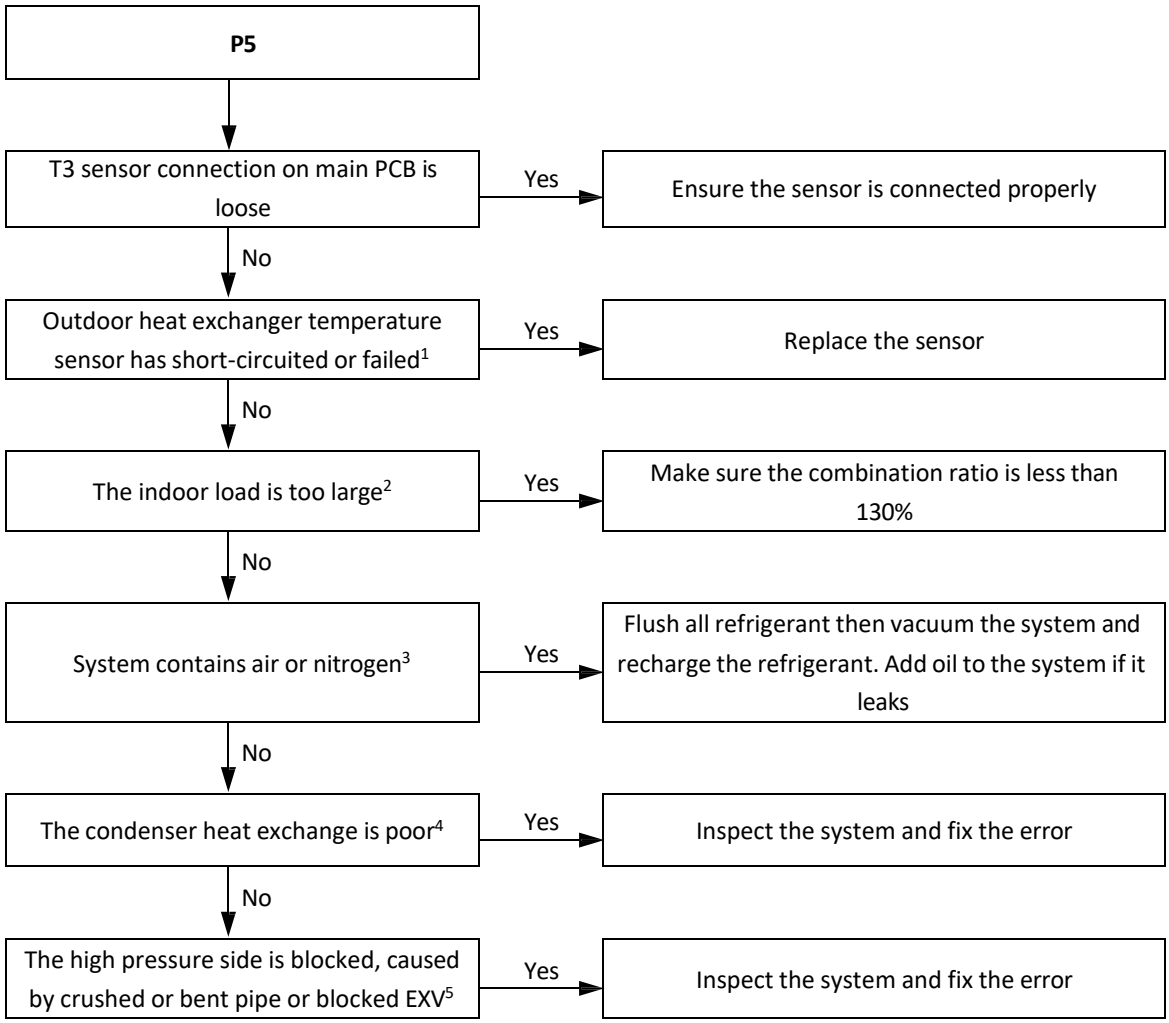
2.19.3 Trigger / recover condition

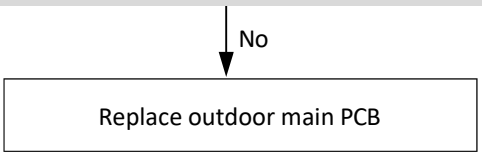
- Trigger condition: Outdoor heat exchanger temperature (T3)≥ 63.5°C.
- Recover condition: Outdoor heat exchanger temperature (T3) < 57°C.
- Reset method: Resume automatically.

2.19.4 Possible causes

- T3 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.

2.19.5 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.
2. An indoor load that is too large causes suction and discharge temperatures to be higher than normal.
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.
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.

2.20 PE: Evaporator high temperature protection (For all models)

2.20.1 Digital display output

PE

2.20.2 Description

- Evaporator high temperature protection
- The system stops running.
- Error code is displayed on the outdoor unit PCB.

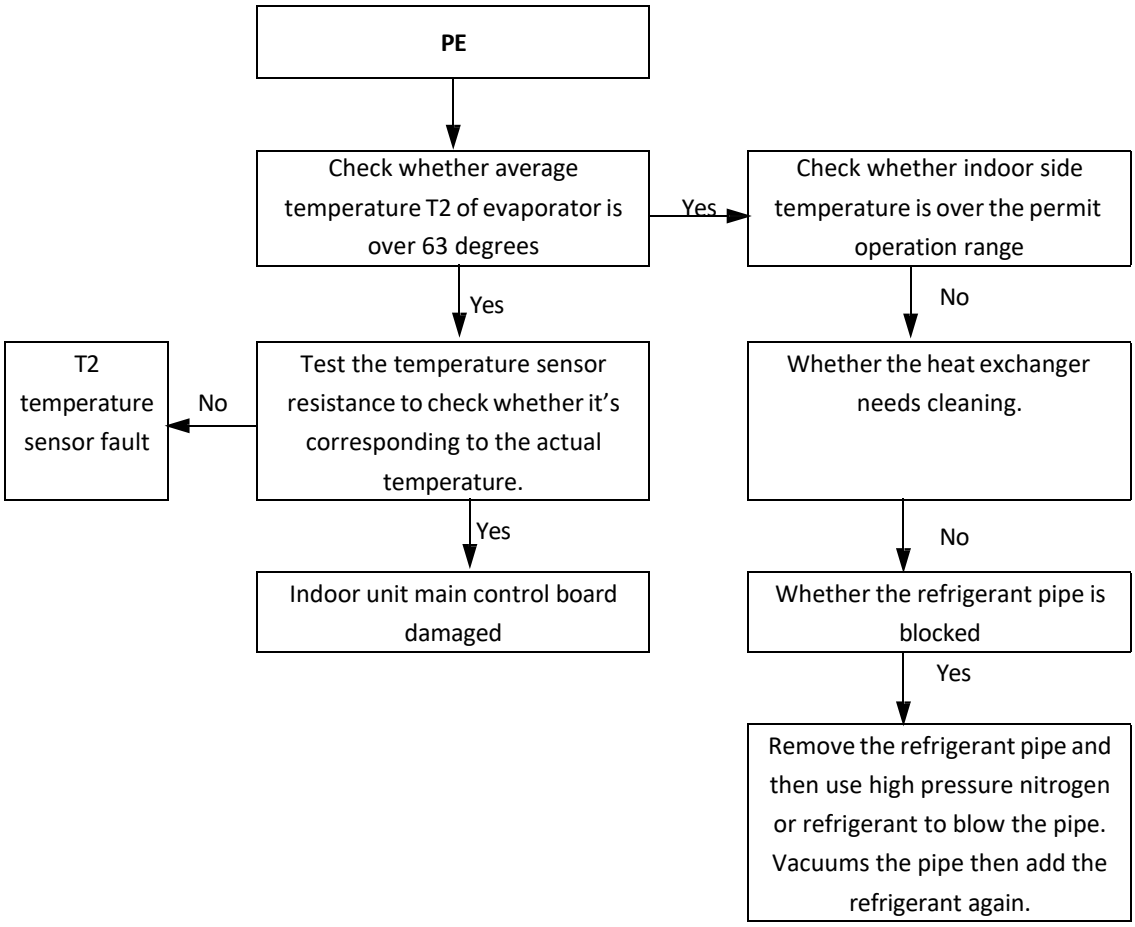
2.20.3 Trigger / recover condition

- Trigger condition:
  The middle average temperature of the evaporator is higher than 63°C for 20 seconds
- Recover condition: Pipe temperature < 50°C.
- Reset method: Resume automatically.

2.20.4 Possible causes

- Indoor temperature is too high.
- Temperature sensor not connected properly or has malfunctioned.
- System blockage.
- Poor condenser heat exchange.
- Indoor unit Main PCB damaged

2.20.5 Procedure



2.21 PL: Radiator surface high temperature protection (For all models)

2.21.1 Digital display output

PL

2.21.2 Description

- Radiator surface high temperature protection.
- The system stops running.
- Error code is displayed on outdoor unit PCB.

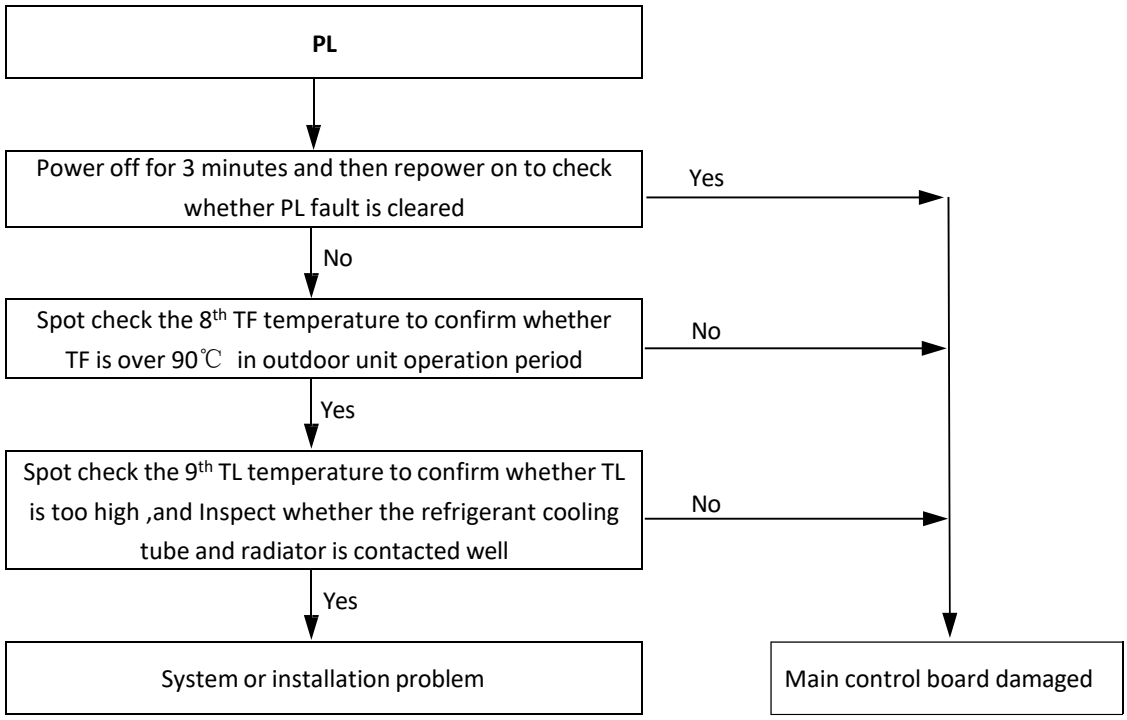
2.21.3 Trigger / recover condition

- Trigger condition: Radiator surface temperature TF≥90℃.
- Recover condition: Radiator surface temperature TF≤84℃.
- Reset method: Resume automatically.

2.21.4 Possible causes

- Refrigerant leakage/ Poor condenser heat exchange/ System blockage.
- The connection between refrigerant cooling tube and radiator is loose.
- Main PCB damaged.

2.21.5 Procedure



2.22 L3: Other driving errors

2.22.1 Digital display output

L3

2.22.2 Description

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

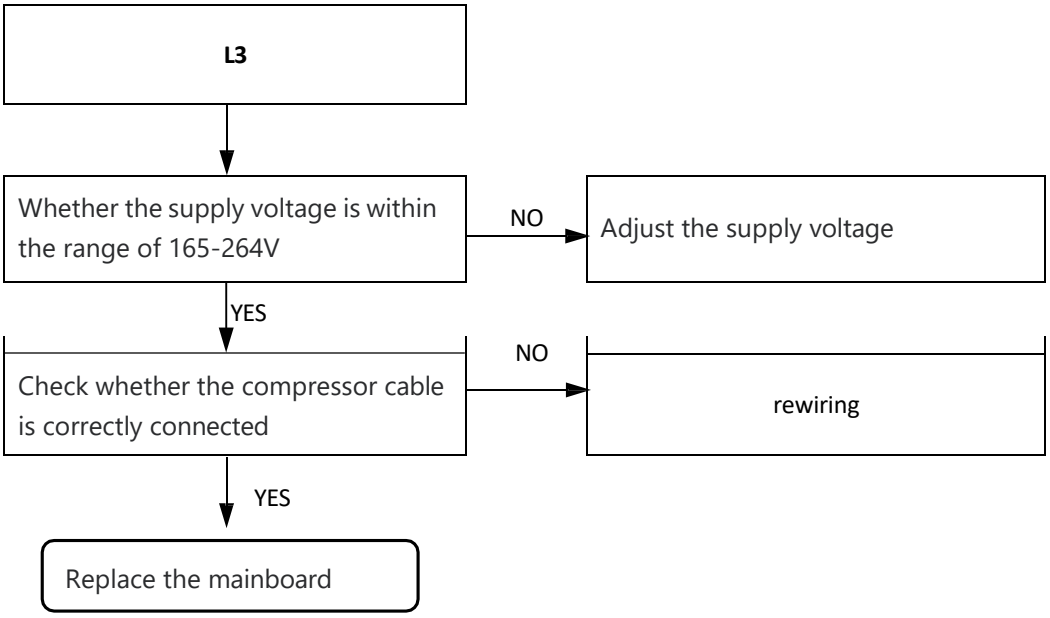
2.22.3 Trigger / recover condition

- Trigger condition: PFCOvercurrent protection, IPM overtemperature
- Reset method: Manually restart.

2.22.4 Possible causes

- Compressor is abnormal.
- Power supply is abnormal.
- Outdoor unit main control board damaged.

2.22.5 Procedure



2.23 L7: Compressor phase sequence error

2.23.1 Digital display output

L7

2.23.2 Description

- Compressor phase sequence error.
- compressor stop running after failure, in a minute if the fault disappear, the compressor to start again.
- Error code is displayed on the outdoor unit PCB.

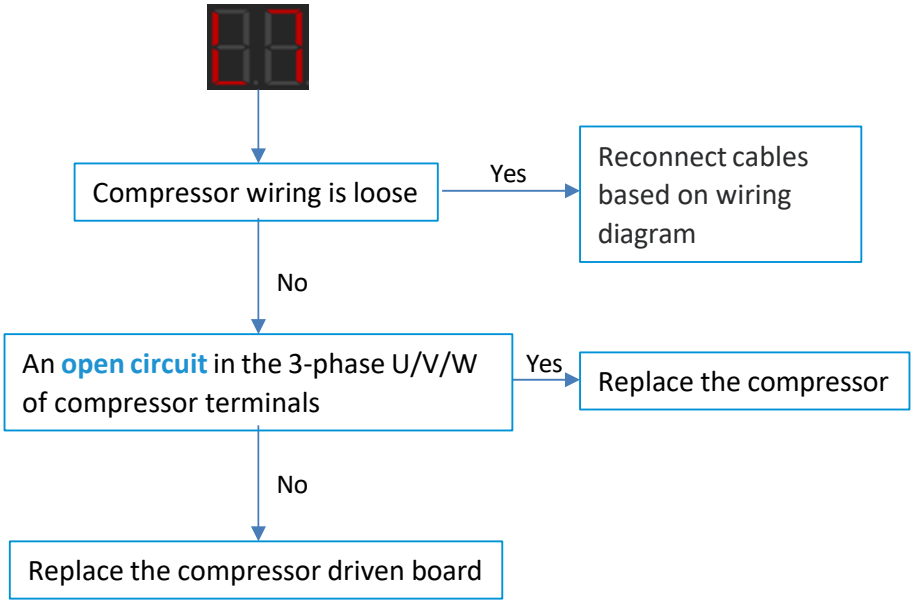
2.23.3 Trigger / recover condition

- Trigger condition: The compressor cable is not connected or is in poor contact

2.23.4 Possible causes

- compressor line contact undesirable or terminal screw didn't matter.
- compressor driven plate.

2.23.5 Procedure



2.24 L0/L4/L5/L8/L9: L category of inverter module protection (L0 for all models, L4/L5/L8/L9 for 100-160 model)

2.24.1 Digital display output

L0/L1/L2/L4/L5

2.24.2 Description

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

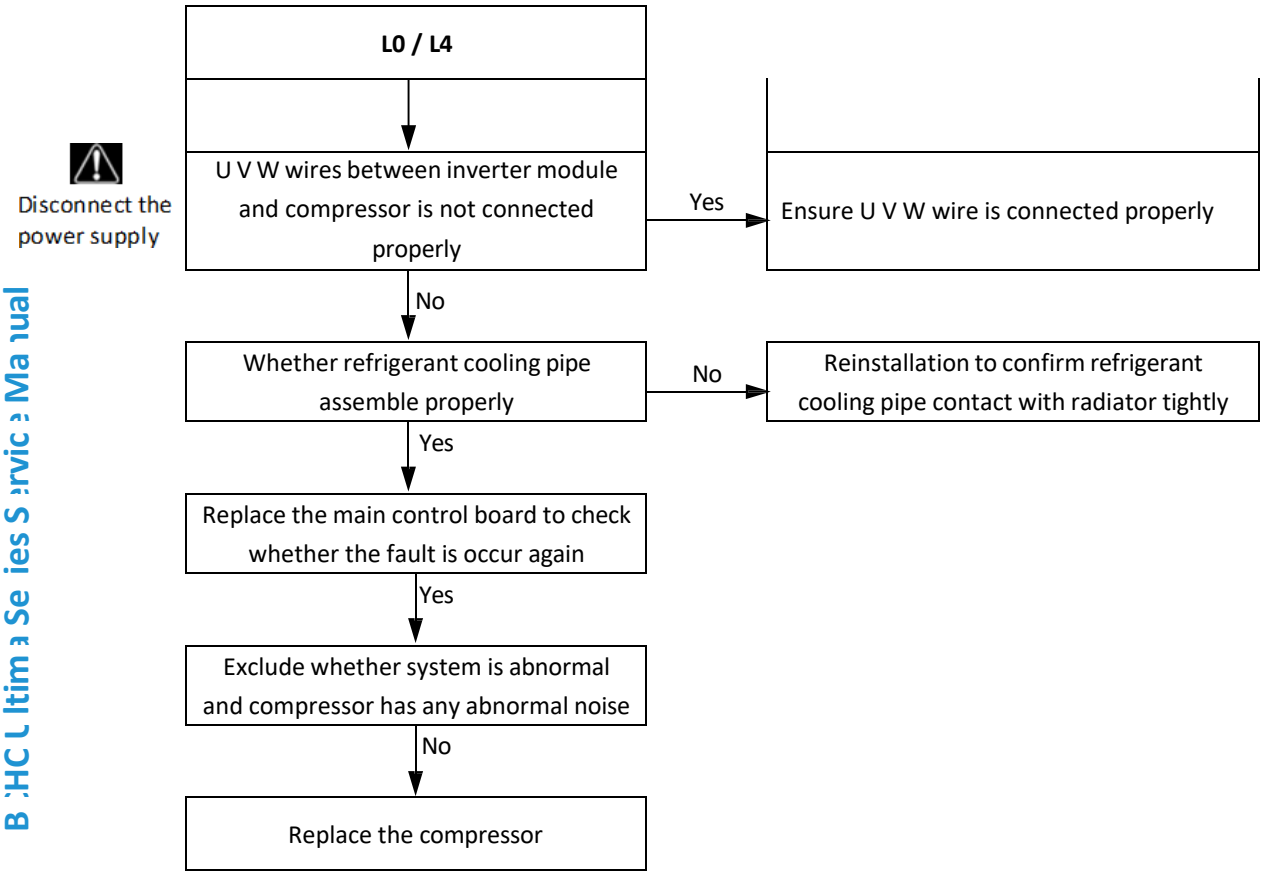
2.24.3 Trigger / recover condition

- Trigger condition: Inverter module or compressor is abnormal.
- Recover condition: Inverter module and compressor goes back to normal.
- Reset method: Manually restart.

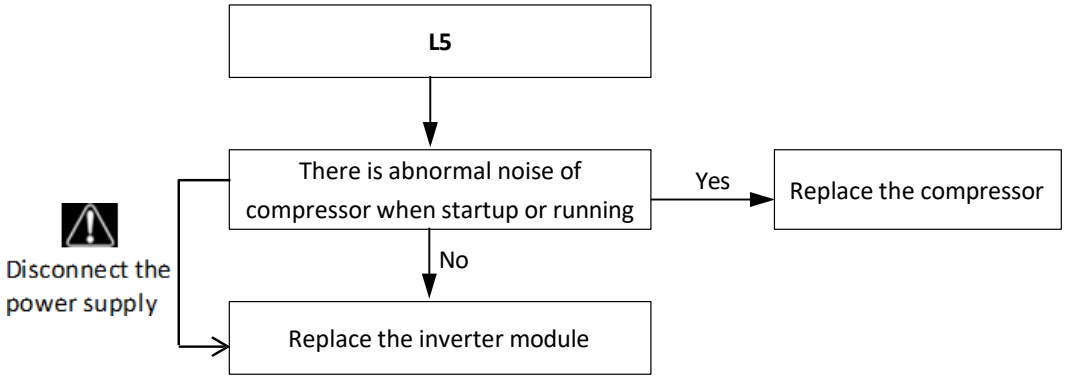
2.24.4 Possible causes

- Power supply is abnormal.
- Refrigerant cooling module is abnormal.
- Compressor is abnormal.
- Outdoor unit main control board damaged.

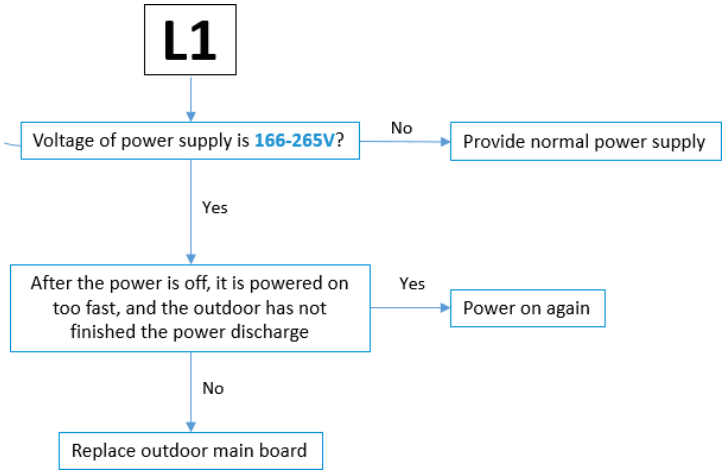
2.24.5 L0/L4: Procedure



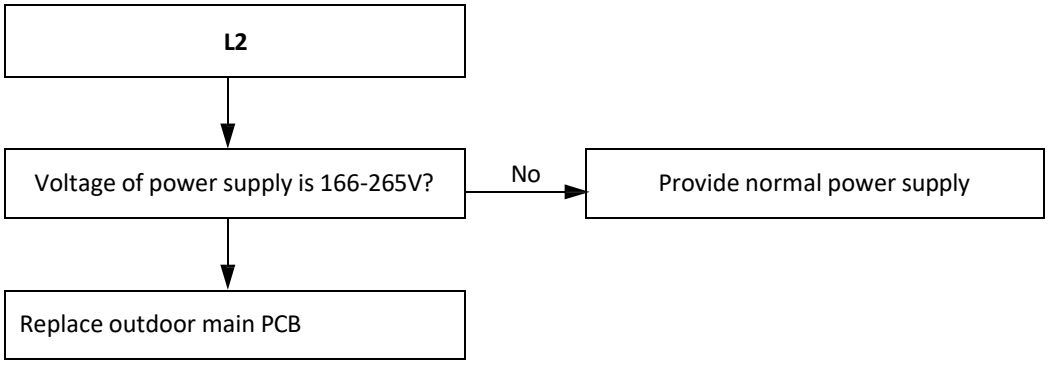
2.24.6 L5: Zero speed protection



2.24.7 L1: Procedure



2.24.8 L2 : Procedure



2.24.9 Compressor replacement procedure

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. (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

- 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 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 oil to the accumulator from which oil was drained in Step 4.

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.

Ver. 2024-08

Midea Building Technologies Division
Midea Group

Add.: Midea Headquarters Building, 6 Midea Avenue, Shunde, Foshan, Guangdong, China
Postal code: 528311
mbt.midea.com / global.midea.com

ENVIRONMENTAL
TECHNOLOGIES LLC.
Showroom & Technology Center
11380 Interchange Circle North
Miramar, Florida 33025. USA
Tel: +1 (888) 840-7550
Fax: +1 (954) 212-8280
info@otecomega.com
www.otecomega.com

OTEC
AIR CONDITIONING
The Art of Comfort
www.otecomega.com