

# D5CERAH/C

## Single Zone Outdoor Ductless Unit

### Sizes 9K to 36K

## SERVICE MANUAL

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### SAFETY CONSIDERATIONS

Installing, starting up, and servicing air-conditioning equipment can be hazardous due to system pressures, electrical components, and equipment location (roofs, elevated structures, etc.). Only trained, qualified installers and service mechanics should install, start-up, and service this equipment.

Untrained personnel can perform basic maintenance functions such as coil cleaning. All other operations should be performed by trained service personnel.

When working on the equipment, observe precautions in the product literature and on tags, stickers, and labels attached to the equipment.

Follow all safety codes. Wear safety glasses and work gloves. Keep a quenching cloth and fire extinguisher nearby when brazing. Use care in handling, rigging, and setting bulky equipment.

Read this manual thoroughly and follow all warnings or cautions included in the literature and attached to the unit. Consult local building codes and National Electrical Code (NEC) for special requirements.

Recognize safety information. This is the safety-alert symbol . When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury.

Understand these signal words: **DANGER**, **WARNING**, and **CAUTION**. These words are used with the safety-alert symbol.

**DANGER** identifies the most serious hazards which **will** result in severe personal injury or death. **WARNING** signifies hazards which **could** result in personal injury or death. **CAUTION** is used to identify unsafe practices which **may** result in minor personal injury or product and

property damage. **NOTE** is used to highlight suggestions which **will** result in enhanced installation, reliability, or operation.



### WARNING

#### ELECTRICAL SHOCK HAZARD

Failure to follow this warning could result in personal injury or death.

Before installing, modifying, or servicing system, main electrical disconnect switch must be in the **OFF** position. There may be more than 1 disconnect switch. Lock out and tag switch with a suitable warning label.



### WARNING

#### EXPLOSION HAZARD

Failure to follow this warning could result in death, serious personal injury, and/or property damage. Never use air or gases containing oxygen for leak testing or operating refrigerant compressors.

Pressurized mixtures of air or gases containing oxygen can lead to an explosion.



### CAUTION

#### EQUIPMENT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage or improper operation. Do not bury more than 36 in. (914 mm) of refrigerant pipe in the ground. If any section of pipe is buried, there must be a 6 in. (152 mm) vertical rise to the valve connections on the outdoor units.

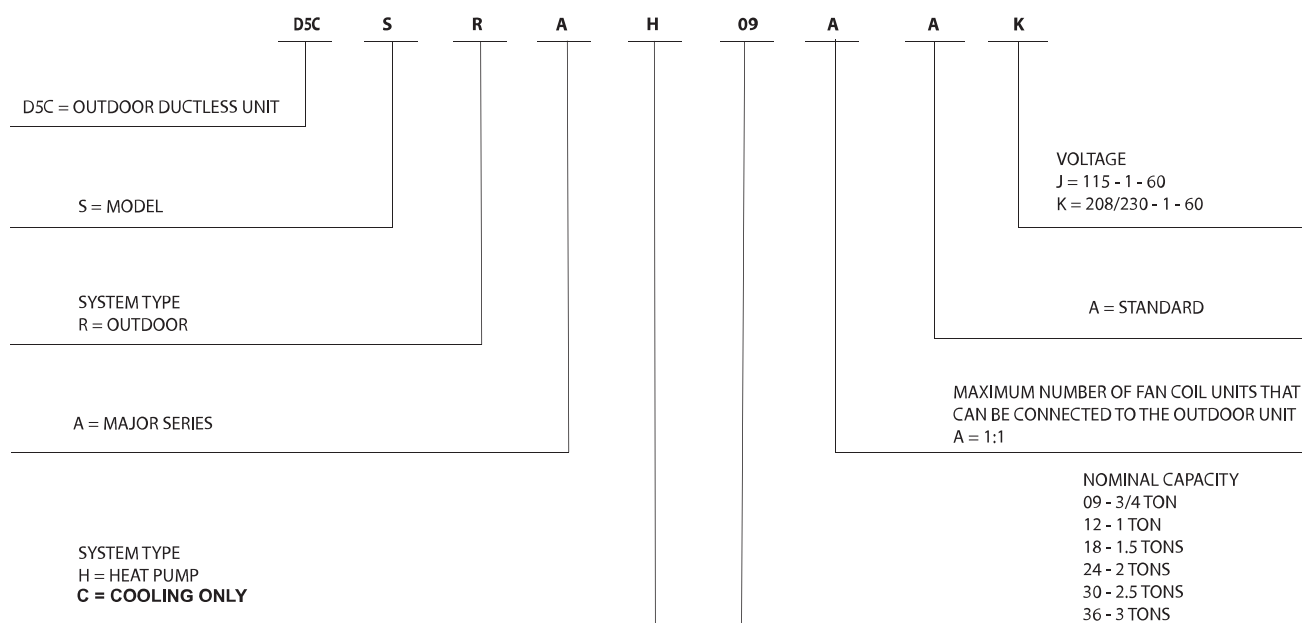
If more than the recommended length is buried, refrigerant may migrate to the cooler buried section during extended periods of system shutdown. This causes refrigerant slugging and could possibly damage the compressor at start-up.

### INTRODUCTION

This service manual provides the necessary information to service, repair, and maintain the D5CERA family of heat pumps. This manual has an "APPENDIX" on page 93 with data required to perform troubleshooting. Use the "TABLE OF CONTENTS" on page 1 to locate a desired topic.

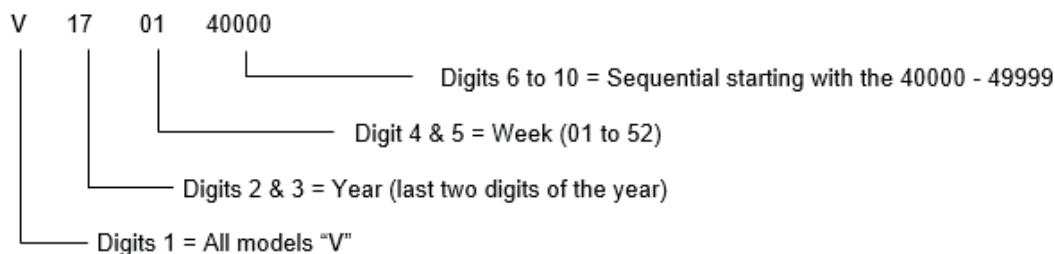
## MODEL NUMBER NOMENCLATURE

| SYSTEM TONS | BTUH   | VOLTAGE   | HEAT PUMP MODEL/ COOLING ONLY MODEL |
|-------------|--------|-----------|-------------------------------------|
| .75         | 9,000  | 115-1     | D5CERAH09AAJ / N/A                  |
| 1           | 12,000 | 115-1     | D5CERAH12AAJ / D5CERAA12AAJ         |
| 0.75        | 9,000  | 208/230-1 | D5CERAH09AAK / D5CERAA09AAK         |
| 1           | 12,000 | 208/230-1 | D5CERAH12AAK / D5CERAA12AAK         |
| 1.5         | 18,000 | 208/230-1 | D5CERAH18AAK / D5CERAA18AAK         |
| 2           | 24,000 | 208/230-1 | D5CERAH24AAK / D5CERAA24AAK         |
| 2.75        | 30,000 | 208/230-1 | D5CERAH30AAK / N/A                  |
| 3           | 36,000 | 208/230-1 | D5CERAH36AAK / N/A                  |



**Fig. 1 —Nomenclature**

For the ICP brand the SERIAL NUMBER will be date coded by a "V", year (last 2 digits of calendar year), week (2 digits, "01" thru "52") followed with a unique 5 digit sequential number that starts at "40000" and cannot exceed "49999". After reaching 49999 the numbers start over at 40000 again. The model number and serial numbers must comply with Carrier MFG-02.



**Fig. 2 —Serial Number Nomenclature**



Use of the AHRI Certified TM Mark indicates a manufacturer's participation in the program. For verification of certification for individual products, go to [www.ahridirectory.org](http://www.ahridirectory.org).

## ELECTRICAL DATA

Table 1 — Heat Pump Electrical Data

| OUTDOOR UNIT                   |     | 9K 115V  | 12K 115V | 09K          | 12K        | 18K        | 24K        | 30K        | 36K        |
|--------------------------------|-----|----------|----------|--------------|------------|------------|------------|------------|------------|
|                                |     | (115V)   | (115V)   | (208/230V)   | (208/230V) | (208/230V) | (208/230V) | (208/230V) | (208/230V) |
| Minimum Circuit Ampacity (MCA) | A   | 18       | 19       | 12           | 13         | 15         | 19         | 28         | 33         |
| MOP                            | A   | 20       | 20       | 15           | 15         | 20         | 20         | 30         | 35         |
| Voltage-Phase-Frequency        |     | 115-1-60 |          | 208/230-1-60 |            |            |            |            |            |
| Max – Min Voltage Range        |     | 127-104  |          | 253-187      |            |            |            |            |            |
| COOLING (HIGH WALL IDU)        |     |          |          |              |            |            |            |            |            |
| Rated cooling current          | (A) | 7.6      | 12.3     | 4.8          | 4.9        | 7          | 11.1       | 11         | 17         |
| Power consumption              | (A) | 720      | 1200     | 714          | 1111       | 1565       | 2474       | 2500       | 3830       |
| HEATING (HIGH WALL IDU)        |     |          |          |              |            |            |            |            |            |
| Rated Heating current          | (A) | 9.4      | 11.4     | 4            | 4.7        | 8          | 9.9        | 12.6       | 16         |
| Power consumption              | (W) | 930      | 1116     | 896          | 1053       | 1790       | 2275       | 2900       | 3580       |

\*Permissible limits of the voltage range at which the unit will operate satisfactorily.

## LEGEND

**FLA** - Full Load Amps

**MCA** - Minimum Circuit Amps

**MOP** - Maximum Overcurrent Protection

Table 2 — Cooling Only Electrical Data

| Outdoor Unit                                   |     | 12K 115V | 9K           | 12K        | 18K        | 24K        |
|------------------------------------------------|-----|----------|--------------|------------|------------|------------|
|                                                |     | (115V)   | (208/230V)   | (208/230V) | (208/230V) | (208/230V) |
| Minimum Circuit Ampacity (MCA)                 | A   | 19       | 9.9          | 14         | 16         | 19         |
| Maximum Overcurrent Protection Ampacity (MOPA) | A   | 20       | 15           | 15         | 20         | 20         |
| Voltage-Phase-Frequency                        |     | 115-1-60 | 208/230-1-60 |            |            |            |
| Max – Min Voltage Range                        |     | 127-104  | 253-187      |            |            |            |
| Cooling (with entry tier high wall CO IDU)     |     |          |              |            |            |            |
| Running current                                | (A) | 10.3     | 5.1          | 4.3        | 6.8        | 8.7        |
| Power consumption                              | (W) | 958      | 720          | 958        | 1549       | 2157       |

## WIRING

### ELECTRICAL WIRING INSTALLATION

Wiring for the outdoor unit must conform to NEC (National Electrical Code) or CEC (Canadian Electrical Code) and local codes. Use Electrical Data table MCA (minimum circuit amps) and MOCP (maximum over current protection) to correctly size the wires and the disconnect fuse or breakers respectively.

All field wiring construction should be finished by a qualified electrician.

Air conditioning equipment must be grounded according to the local electrical codes.

Provide electrical disconnect per local codes.

**NOTE: DO NOT connect the power wire to the terminal of the signal wire. Connection of power to any other terminal other than L1 or L2 will cause damage to the control board.**

Any control signal cable should be run separately from the power wiring.

Use of metallic conduit or shielded cable is recommended. Maintain a distance of 12 inches(300mm) from the power wiring.

**NOTE: DO NOT run the power wiring and control wiring in the same conduit.**

Size the wiring in accordance to the NEC / CEC. Select different colors for different wire according to relevant regulations.

Ensure that the wire color of the outdoor and the terminal number are the same as those of the indoor unit.

## ! CAUTION

### EQUIPMENT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage or improper operation.

Be sure to comply with local codes while running wire from the indoor unit to the outdoor unit.

Wires should be sized based on NEC and local codes.

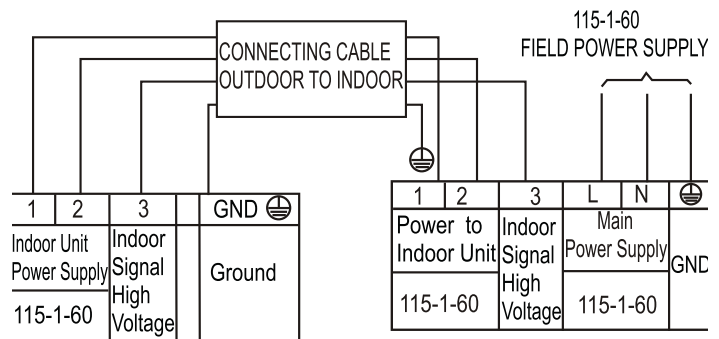
Every wire must be connected firmly. Loose wiring may cause the terminal to overheat or result in unit malfunction. A fire hazard may also exist. Ensure all wiring is tightly connected.

No wire should touch the refrigerant tubing, compressor or any moving parts.

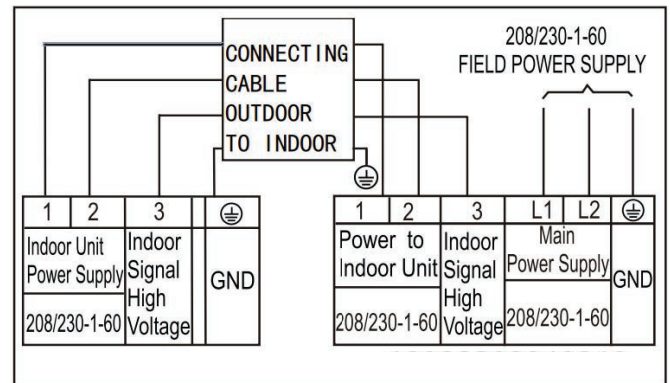
Disconnecting means must be provided and shall be located within sight and readily accessible from the air conditioner.

**NOTE:** Matches with multi-family and residential fan coils require separate power for the indoor and outdoor unit. A 24V interface kit is required for compatibility. Refer to the 24V Interface Kit installation manual.

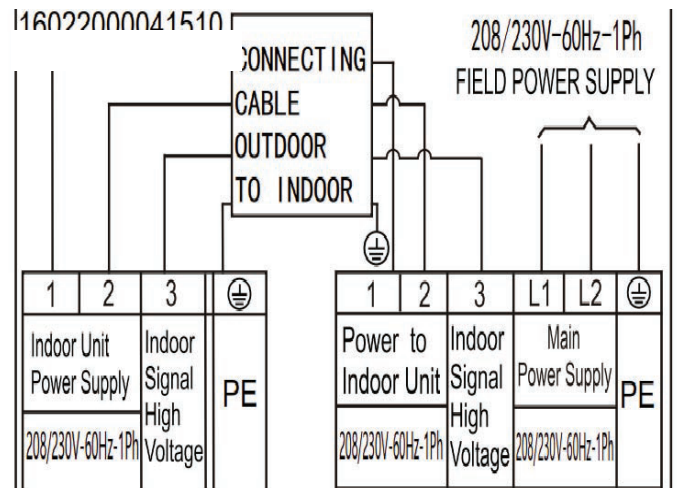
## CONNECTION DIAGRAMS



**Fig. 3 —9k - 12K (115V Heat Pump and Cooling Only)**



**Fig. 4 —9K - 24K (208V/230V Heat Pump and Cooling Only)**



**Fig. 5 —30K - 36K (208V/230V Heat Pump)**

### NOTE:

1. Do not use thermostat wire for any connection between indoor and outdoor units.
2. All connections between the indoor and outdoor units must be made as shown in Figures 3, 4. The connections are sensitive to polarity and will result in a fault code.

# WIRING DIAGRAMS - HEAT PUMP

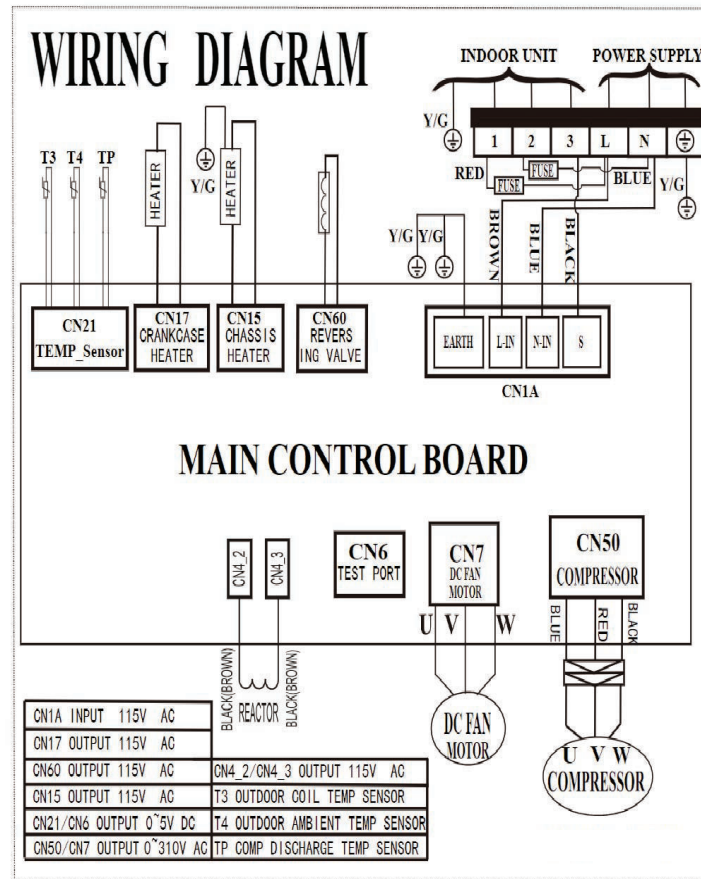


Fig. 6 —Wiring Diagram Sizes 9K and 12K (115V) - Heat Pump

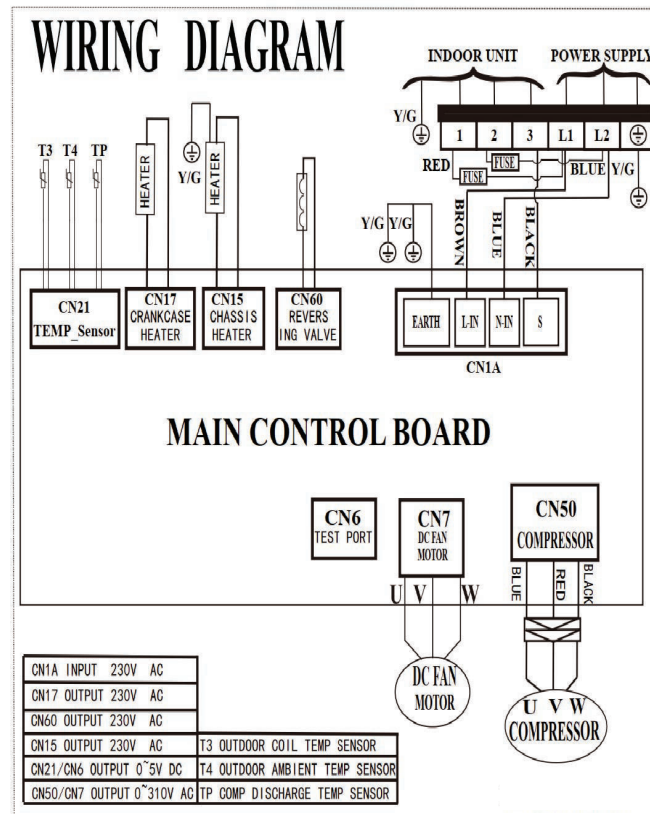


Fig. 7 —Wiring Diagram Sizes 09-18K (208-230V) Heat Pump

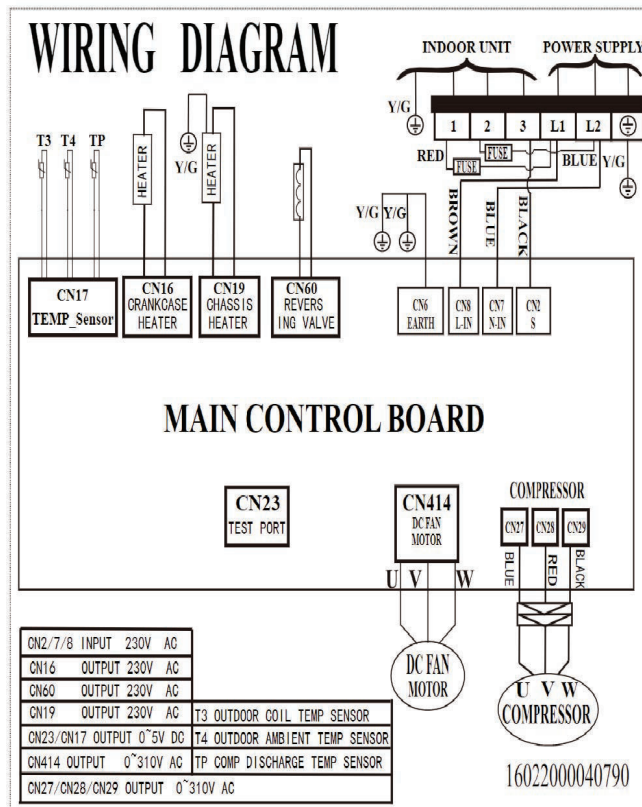


Fig. 8 —Wiring Diagram Size 24K (230V) - Heat Pump

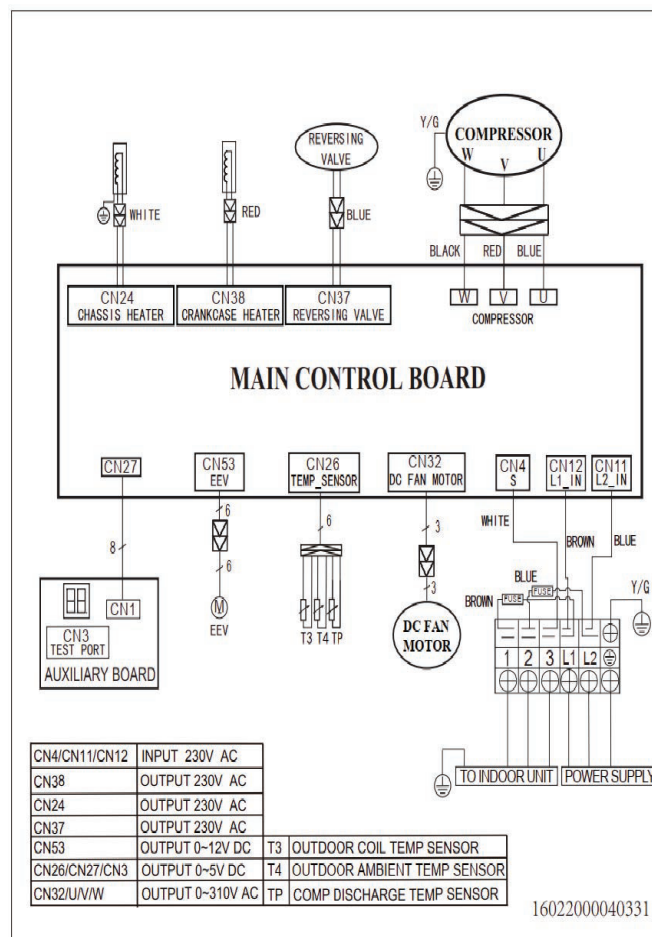


Fig. 9 —Wiring Diagram Size 30K (230V) - Heat Pump

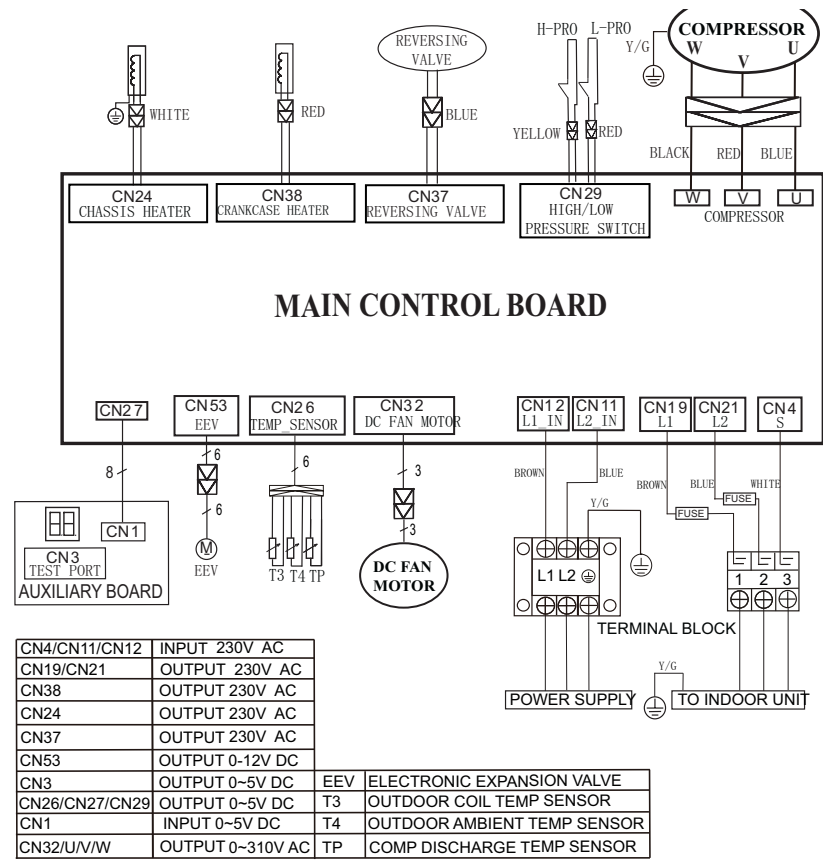
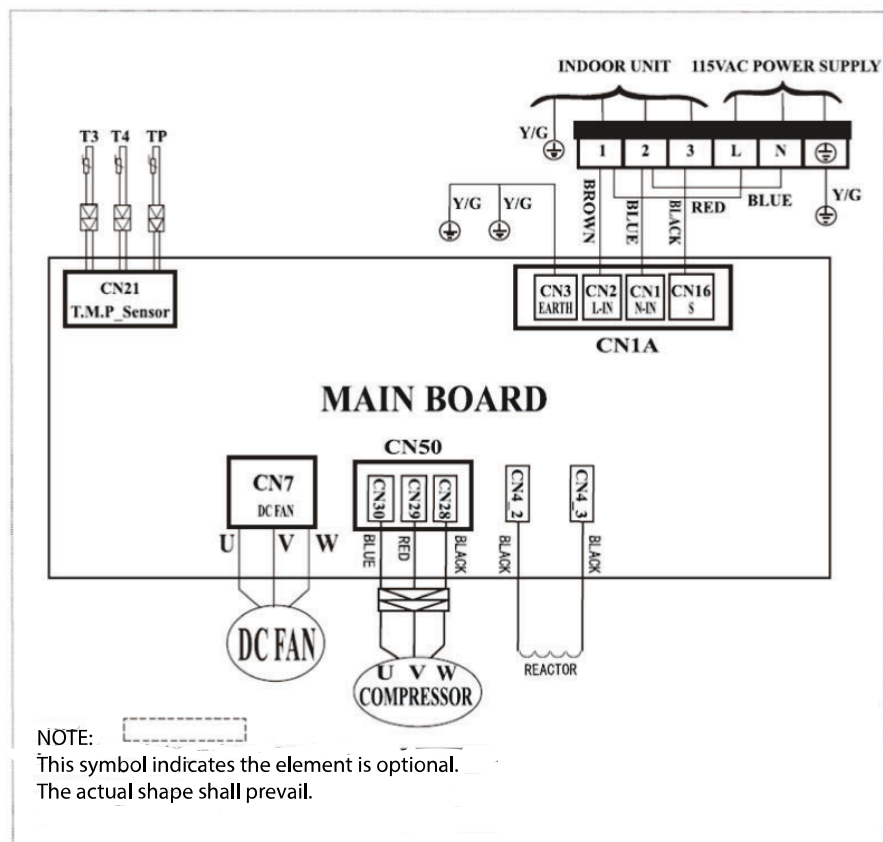
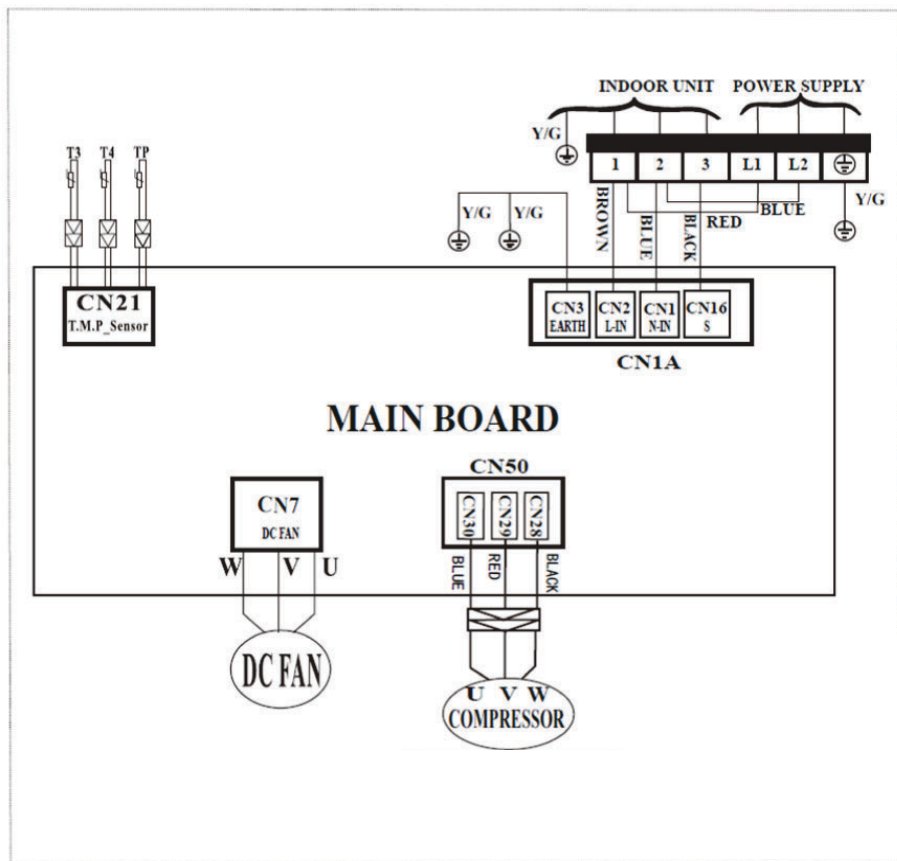


Fig. 10 —Wiring Diagram Size 36K (230V) - Heat Pump

## WIRING DIAGRAMS - COOLING ONLY



**Fig. 11 —Wiring Diagram Size 12K (115V) - Cooling Only**



**Fig. 12 —Wiring Diagram Sizes 12K/18K (208/230V) - Cooling Only**

Fig. 13 —Size 12K (115V) - Cooling Only

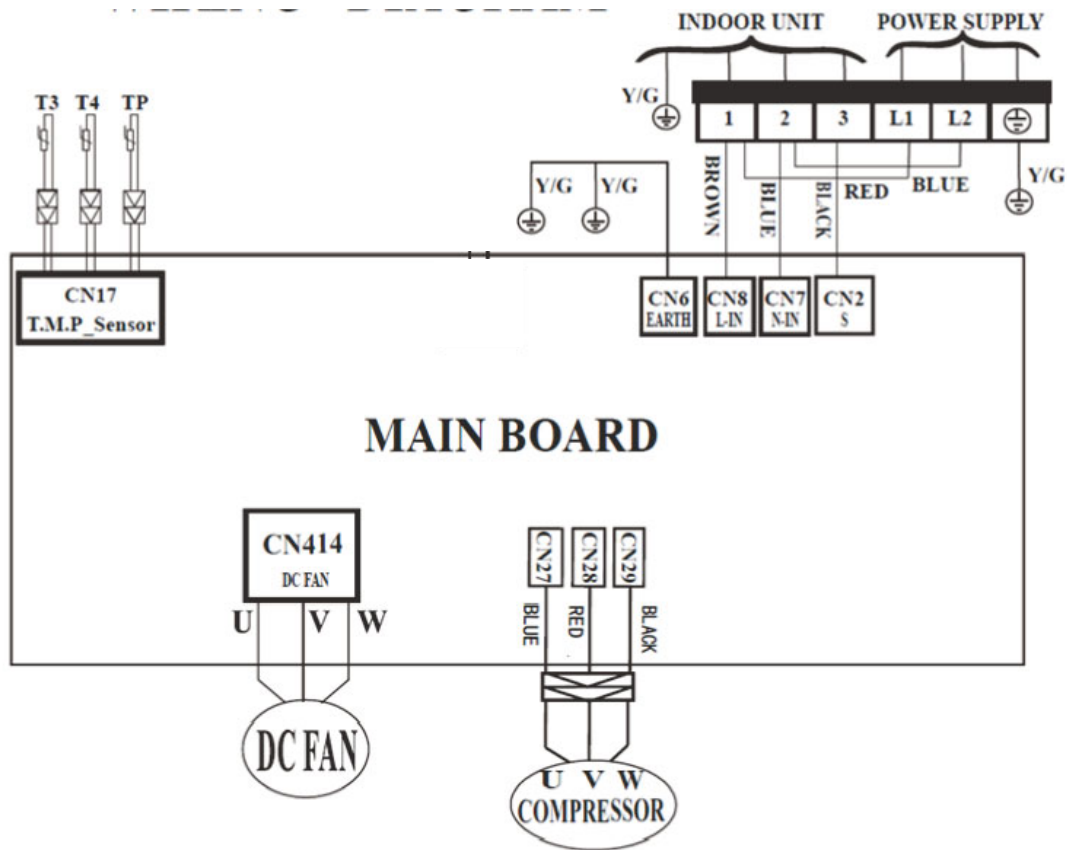
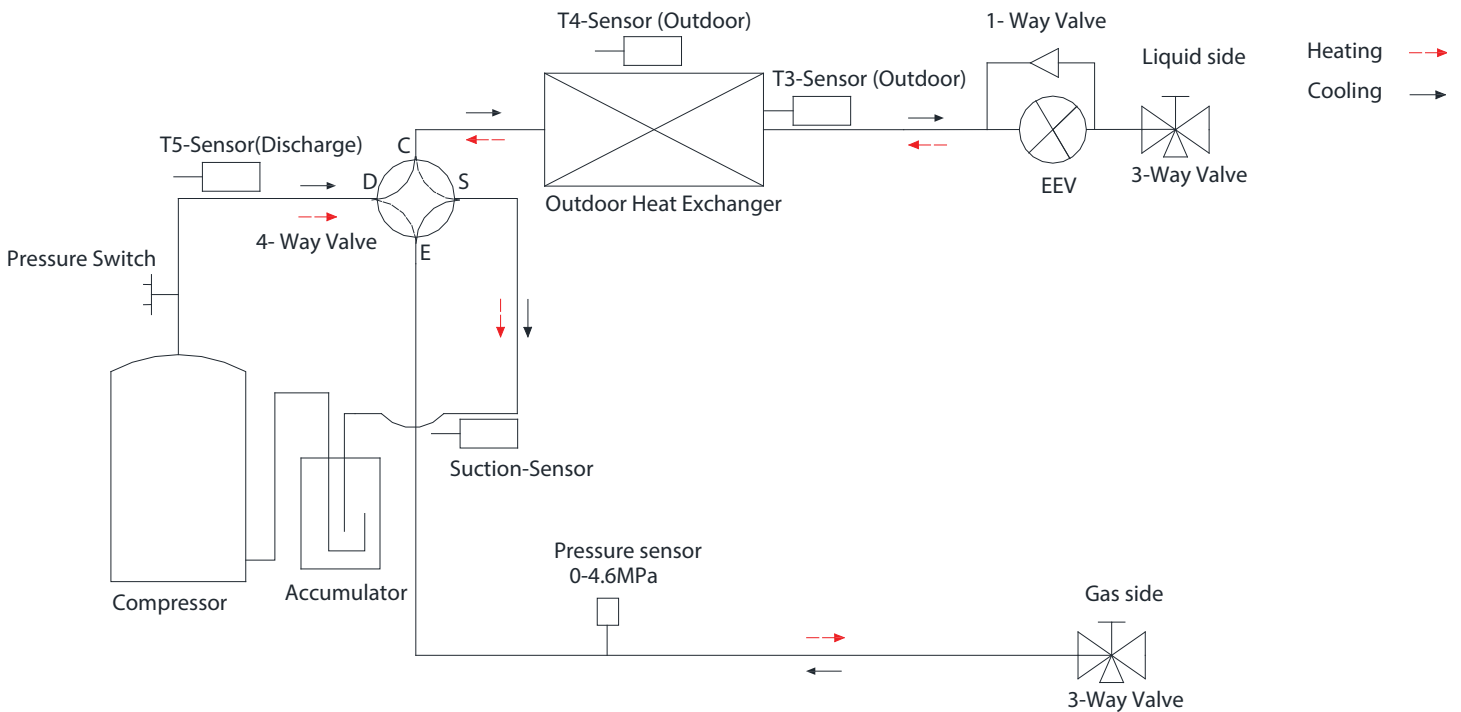
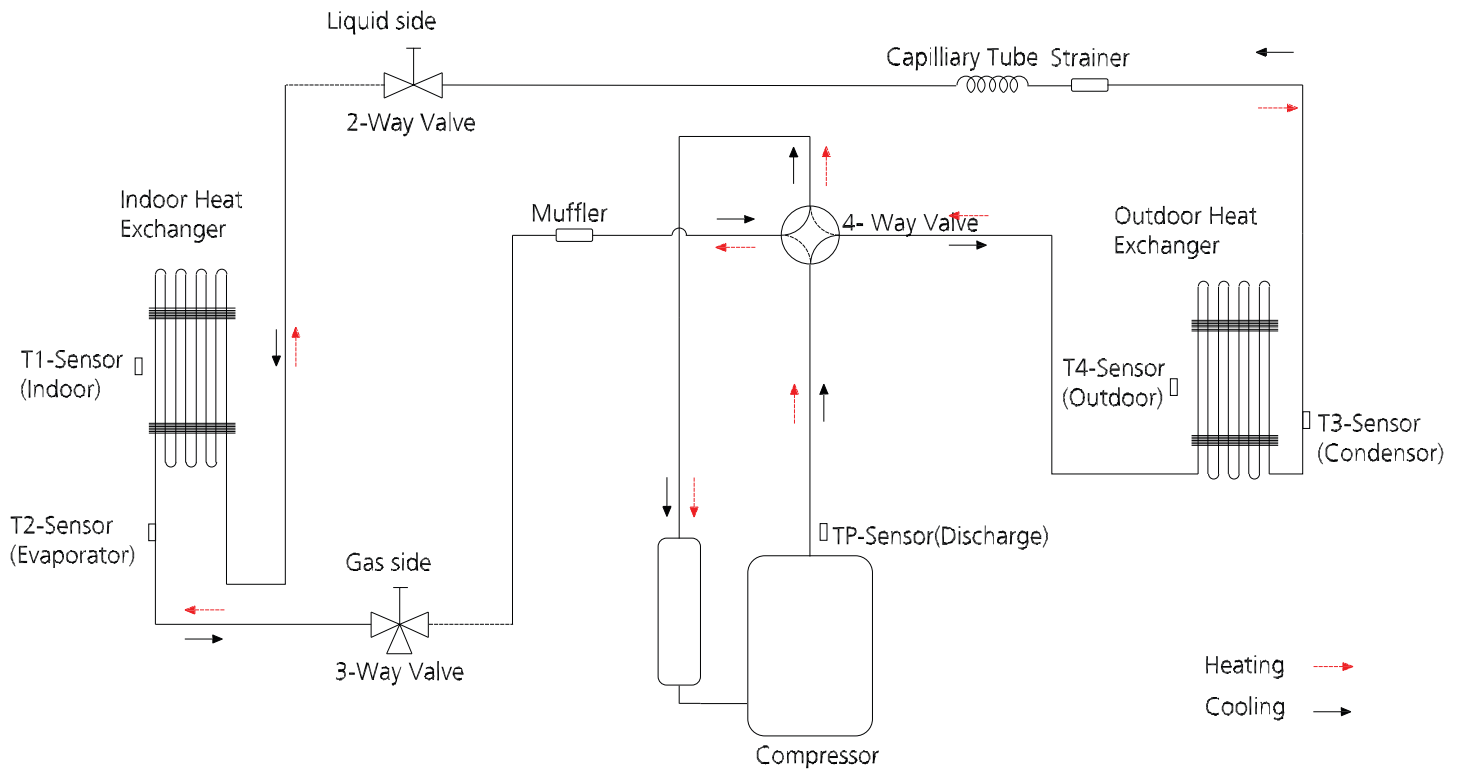


Fig. 14 —Wiring Diagram Size 24K (208/230V) - Cooling Only

## REFRIGERANT CYCLE DIAGRAMS



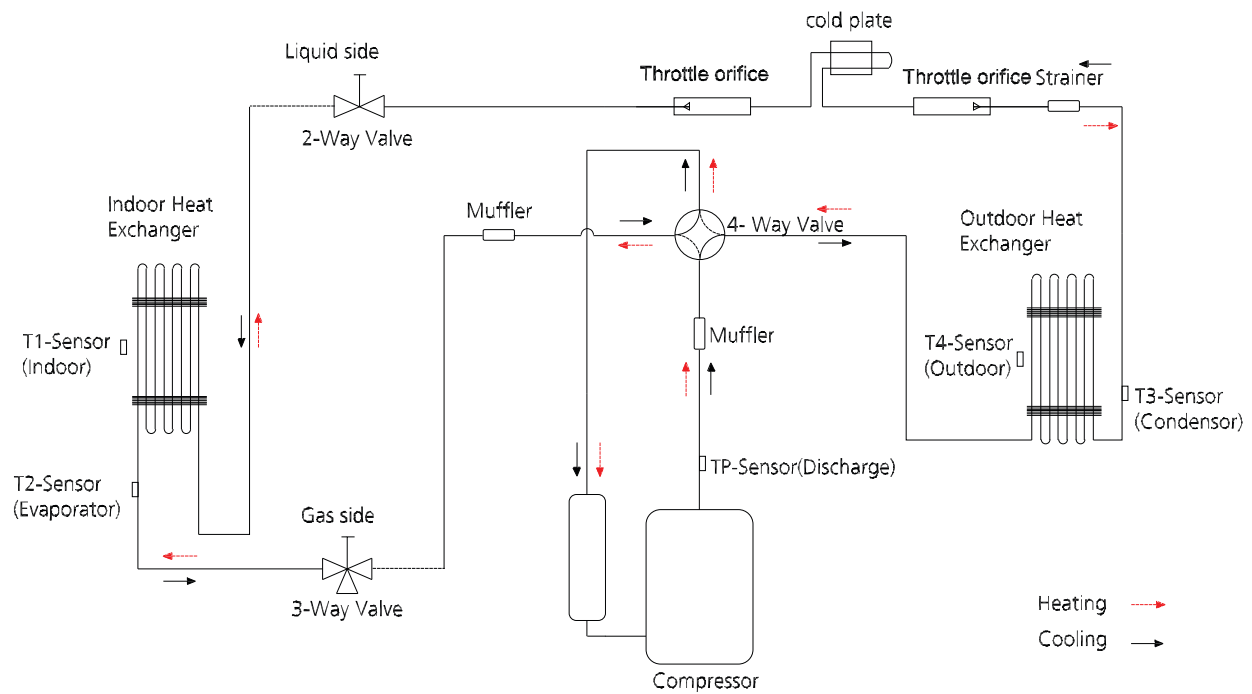


Fig. 17 —24K Heat Pump

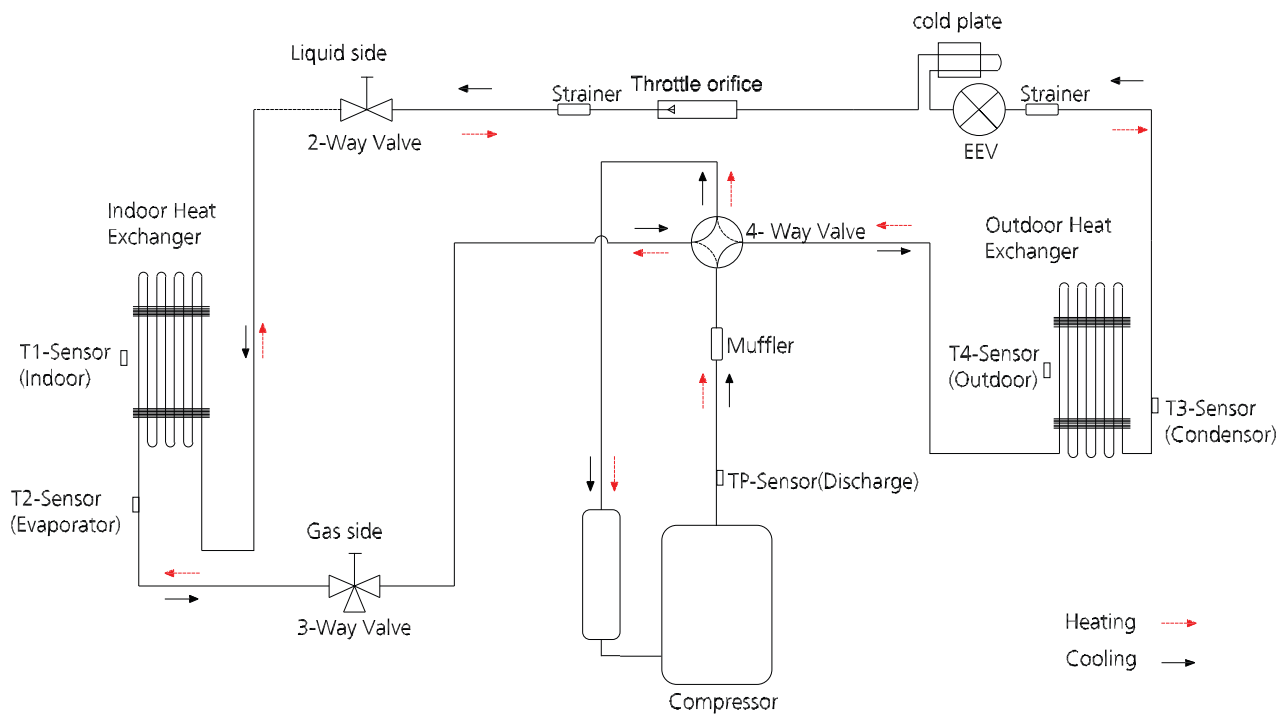
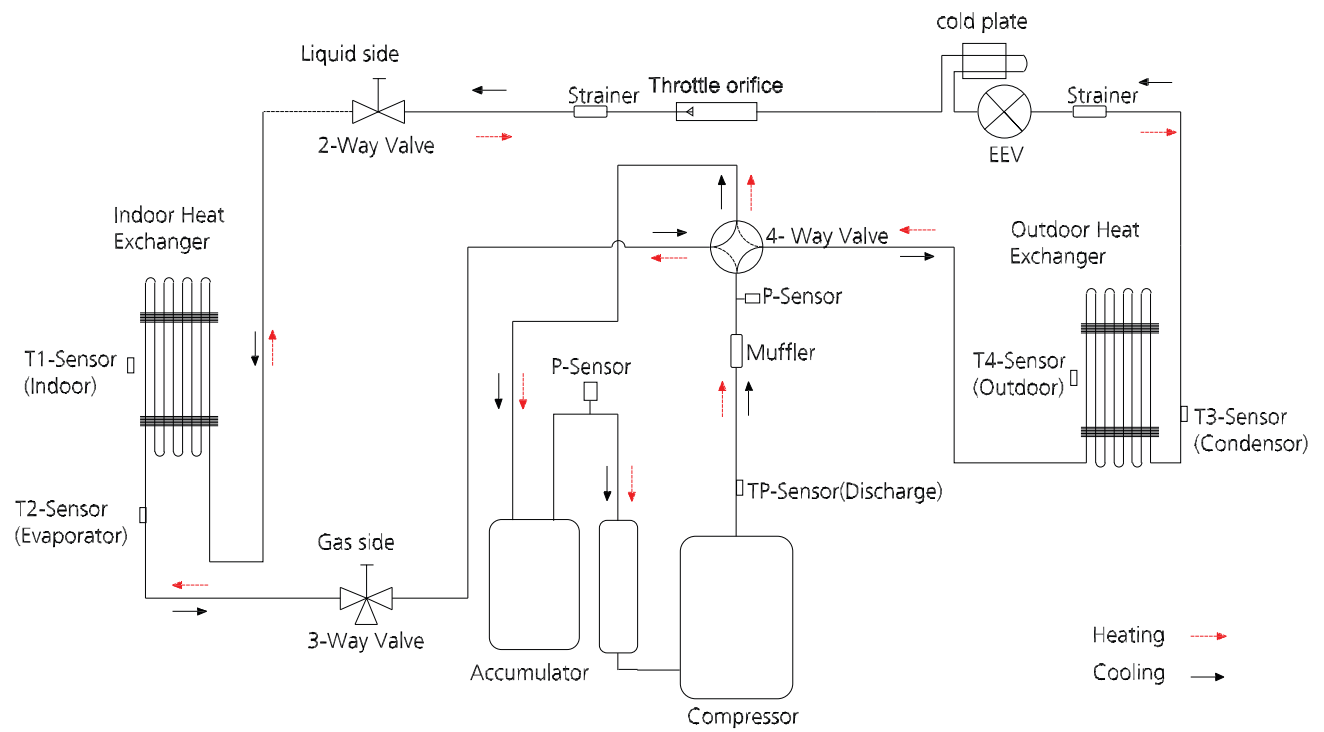


Fig. 18 —30K Heat Pump



**Fig. 19 —36K Heat Pump**

## REFRIGERANT CYCLE DIAGRAMS - COOLING ONLY

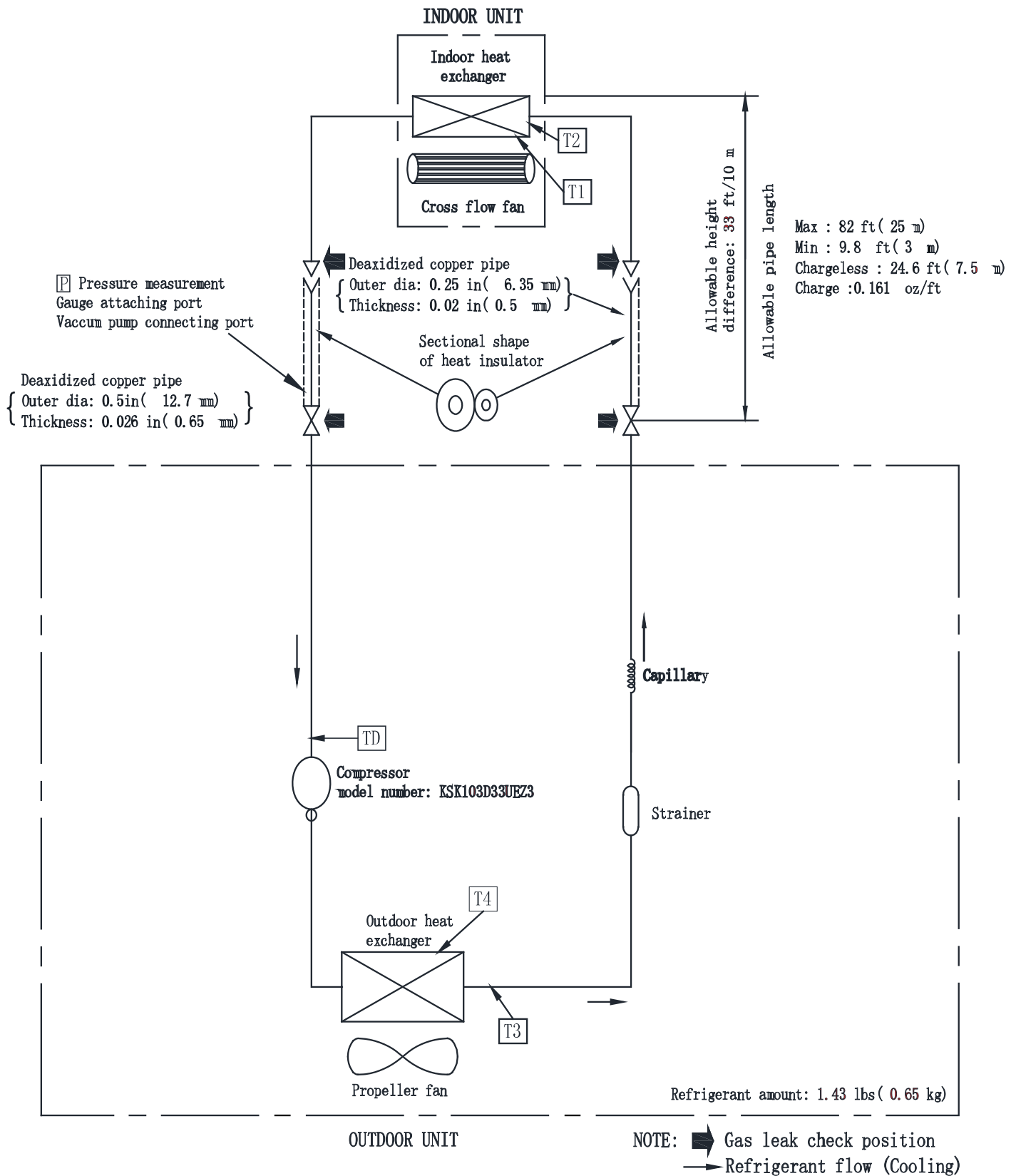


Fig. 20 —12K (115V) and 9-12K (208/230V) Cooling Only

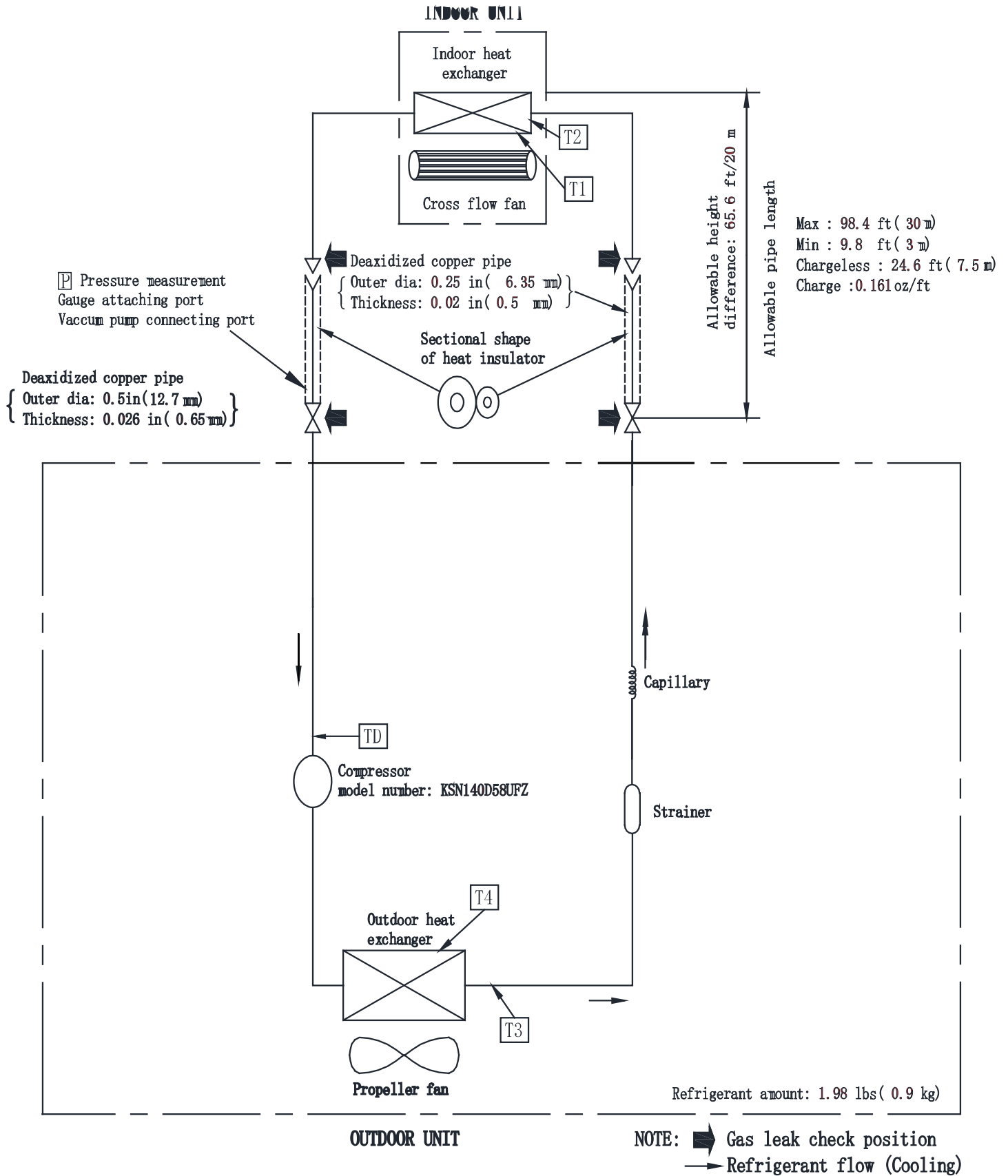


Fig. 21 —18K Cooling Only

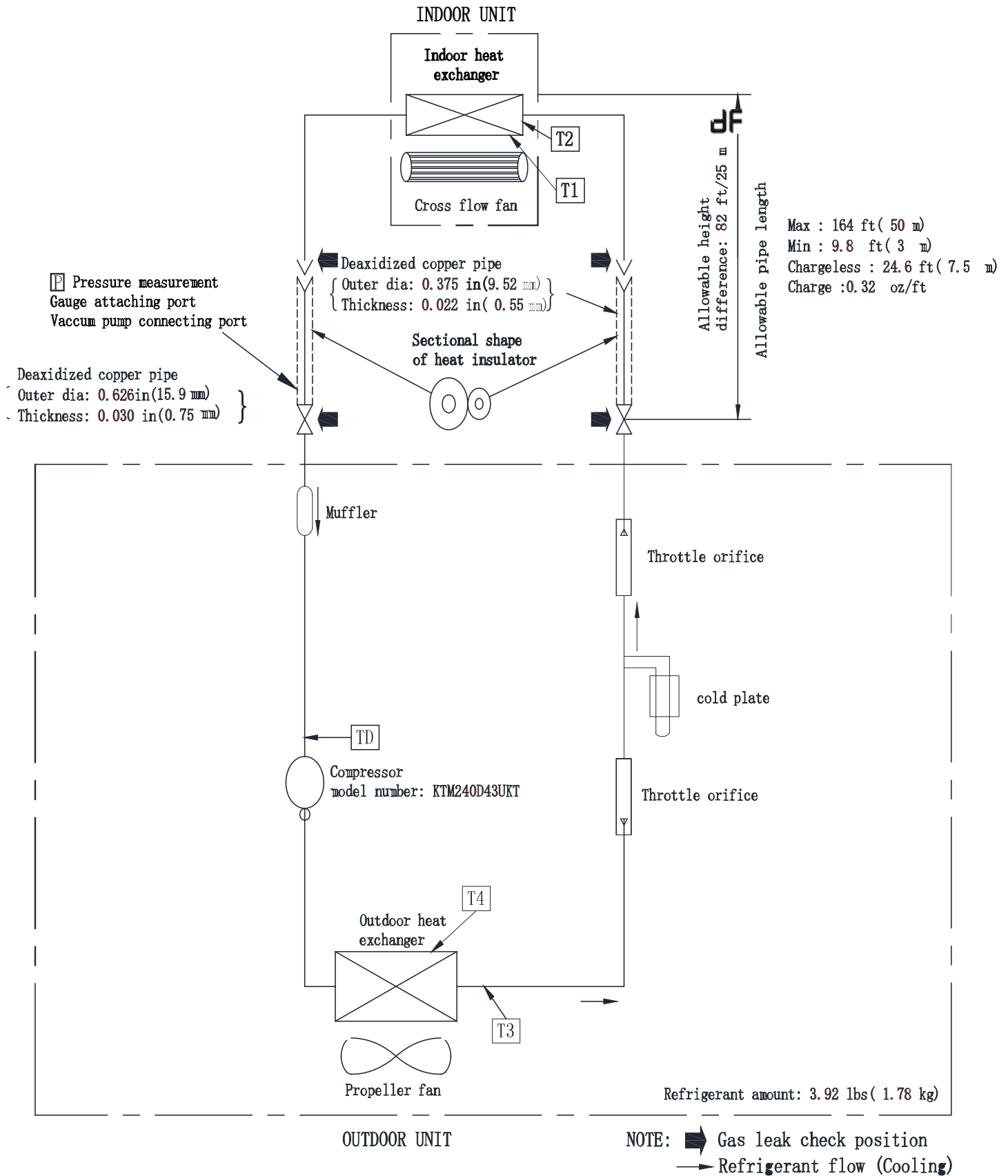


Fig. 22 —24K Cooling Only

## PIPING AND REFRIGERANT

**Table 3 — Heat Pump**

|                                    |                                                                     |             | 37MHRAQ09AA1  | 37MHRAQ12AA1  | 37MHRAQ09AA3  | 37MHRAQ12AA3  | 37MHRAQ18AA3  | 37MHRAQ24AA3   | 37MHRAQ30AA3   | 37MHRAQ36AA3   |
|------------------------------------|---------------------------------------------------------------------|-------------|---------------|---------------|---------------|---------------|---------------|----------------|----------------|----------------|
| Piping and Refrigerant Information | Refrigerant Type                                                    | Type        | R454B         | R454B         | R454B         | R454B         | R454B         | R454B          | R454B          | R454B          |
|                                    | Charge Amount                                                       | lb. (kg)    | 1.34(0.61)    | 1.52(0.69)    | 1.34(0.61)    | 1.54(0.7)     | 2.54(1.15)    | 3.35(1.52)     | 5.29(2.4)      | 7.05(3.2)      |
|                                    | Additional refrigerant charge                                       | Oz/ft (g/m) | 0.16(15)      | 0.16(15)      | 0.16(15)      | 0.16(15)      | 0.16(15)      | 0.32(30)       | 0.32(30)       | 0.32(30)       |
|                                    | Liquid Pipe (size - connection type)                                | In (mm)     | 1/4in(6.35mm) | 1/4in(6.35mm) | 1/4in(6.35mm) | 1/4in(6.35mm) | 1/4in(6.35mm) | 3/8in(9.52mm)  | 3/8in(9.52mm)  | 3/8in(9.52mm)  |
|                                    | Suction Pipe (size - connection type)                               | In (mm)     | 3/8in(9.52mm) | 3/8in(9.52mm) | 3/8in(9.52mm) | 3/8in(9.52mm) | 1/2in(12.7mm) | 5/8in((15.9mm) | 5/8in((15.9mm) | 5/8in((15.9mm) |
|                                    | Min. Piping Length                                                  | ft. (m)     | 10 (3)        | 10 (3)        | 10 (3)        | 10 (3)        | 10 (3)        | 10 (3)         | 10 (3)         | 10 (3)         |
|                                    | Standard Piping Length                                              | ft. (m)     | 24.6 (7.5)    | 24.6 (7.5)    | 24.6 (7.5)    | 24.6 (7.5)    | 24.6 (7.5)    | 24.6 (7.5)     | 24.6 (7.5)     | 24.6 (7.5)     |
|                                    | Max. Piping Length with no additional refrigerant charge per System | ft. (m)     | 24.6 (7.5)    | 24.6 (7.5)    | 24.6 (7.5)    | 24.6 (7.5)    | 24.6 (7.5)    | 24.6 (7.5)     | 24.6 (7.5)     | 24.6 (7.5)     |
|                                    | Total Maximum Piping Length per system                              | ft. (m)     | 82.02(25)     | 82.02(25)     | 82.02(25)     | 82.02(25)     | 98.42(30)     | 164.04(50)     | 164.04(50)     | 213.25(65)     |
|                                    | Max. outdoor-indoor height difference (OU higher than IU)           | ft. (m)     | 49.21(15)     | 49.21(15)     | 49.21(15)     | 49.21(15)     | 65.62(20)     | 82.02(25)      | 82.02(25)      | 98.43(30)      |
|                                    | Max. outdoor-indoor height difference (IU higher than OU)           | ft. (m)     | 49.21(15)     | 49.21(15)     | 49.21(15)     | 49.21(15)     | 65.62(20)     | 82.02(25)      | 82.02(25)      | 98.43(30)      |

**Table 4: Cooling Only**

| OUTDOOR MODEL                      |                                                                     |             | D5CERAA12AAJ   | D5CERAA09AAK      | D5CERAA12AAK      | D5CERAA18AAK      | D5CERAA24AAK      |
|------------------------------------|---------------------------------------------------------------------|-------------|----------------|-------------------|-------------------|-------------------|-------------------|
| POWER SUPPLY                       |                                                                     | V;Ph; Hz    | 115V;1Ph;60HZ  | 208/230V;1Ph;60HZ | 208/230V;1Ph;60HZ | 208/230V;1Ph;60HZ | 208/230V;1Ph;60HZ |
| PIPING AND REFRIGERANT INFORMATION | Refrigerant Type                                                    | Type        | R454B          | R454B             | R454B             | R454B             | R454B             |
|                                    | Charge Amount                                                       | lb. (kg)    | 1.23(0.56)     | 1.08(0.49)        | 1.23(0.56)        | 1.72(0.78)        | 2.01(0.91)        |
|                                    | Additional refrigerant charge                                       | Oz/ft (g/m) | 0.16(15)       | 0.16(15)          | 0.16(15)          | 0.16(15)          | 0.32(30)          |
|                                    | Liquid Pipe (size - connection type)                                | In (mm)     | 1/4in (6.35mm) | 1/4in (6.35mm)    | 1/4in (6.35mm)    | 1/4in (6.35mm)    | 3/8in (9.52mm)    |
|                                    | Suction Pipe (size - connection type)                               | In (mm)     | 3/8in (9.52mm) | 3/8in (9.52mm)    | 3/8in (9.52mm)    | 1/2in (12.7mm)    | 5/8in (15.9mm)    |
|                                    | Min. Piping Length                                                  | ft. (m)     | 10 (3)         | 10 (3)            | 10 (3)            | 10 (3)            | 10 (3)            |
|                                    | Standard Piping Length                                              | ft. (m)     | 24.6 (7.5)     | 24.6 (7.5)        | 24.6 (7.5)        | 24.6 (7.5)        | 24.6 (7.5)        |
|                                    | Max. Piping Length with no additional refrigerant charge per System | ft. (m)     | 24.6 (7.5)     | 24.6 (7.5)        | 24.6 (7.5)        | 24.6 (7.5)        | 24.6 (7.5)        |
|                                    | Total Maximum Piping Length per system                              | ft. (m)     | 82.02(25)      | 82.02(25)         | 82.02(25)         | 98.42(30)         | 164.04(50)        |
|                                    | Max. outdoor-indoor height difference (OU higher than IU)           | ft. (m)     | 49.21(15)      | 49.21(15)         | 49.21(15)         | 65.62(20)         | 82.02(25)         |
|                                    | Max. outdoor-indoor height difference (IU higher than OU)           | ft. (m)     | 49.21(15)      | 49.21(15)         | 49.21(15)         | 65.62(20)         | 82.02(25)         |

## SYSTEM EVACUATION AND CHARGING



### CAUTION

#### UNIT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage or improper operation.

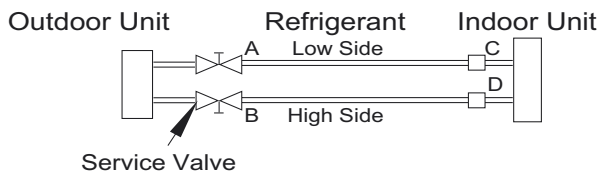
Never use the system compressor as a vacuum pump.

Refrigerant tubes and the indoor coil should be evacuated using the recommended 500 micron deep vacuum method. The alternate triple evacuation method may be used if the procedure outlined below is followed.

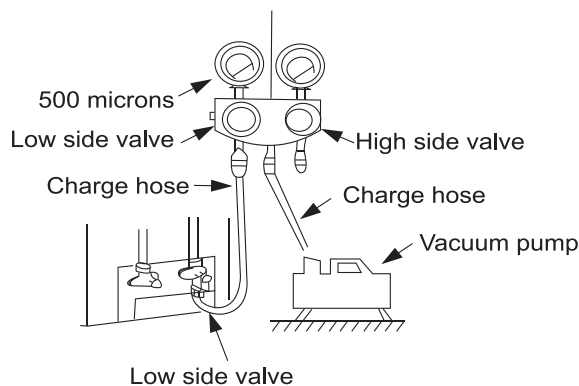
**NOTE:** Always break a vacuum with dry nitrogen.

### USING VACUUM PUMP

1. Completely tighten flare nuts A, B, C, D. Connect the manifold gage charge hose to a charge port of the low side service valve (see Fig. 24).
2. Connect the charge hose to vacuum pump.
3. Fully open the low side of manifold gage (see Fig. 23).
4. Start the vacuum pump.
5. Evacuate using either the deep vacuum or triple evacuation method.
6. After evacuation is complete, fully close the low side of manifold gage and stop the vacuum pump operation.
7. The factory charge contained in the outdoor unit is good for up to 25 ft. (8 m) of line length. For refrigerant lines longer than 25 ft. (8 m), add refrigerant, up to the allowable length.
8. Disconnect the charge hose from the charge connection of the low side service valve.
9. Fully open service valves B and A.
10. Securely tighten the service valve caps.



**Fig. 23 —Service Valve**



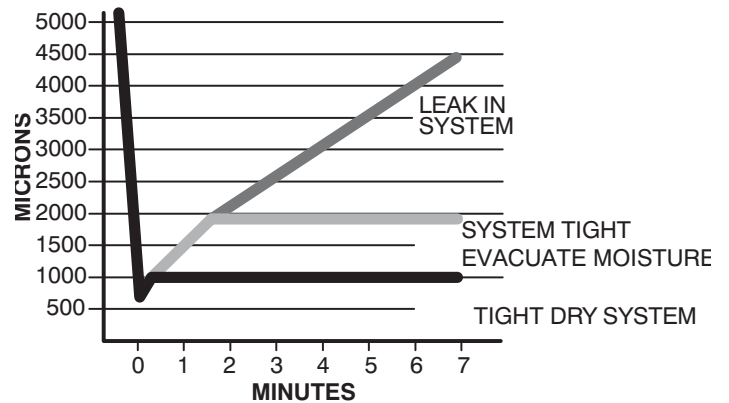
**Fig. 24 —Manifold**

### EVACUATION

Evacuation of the system will remove air or nitrogen (non-condensables) as well as moisture. A proper vacuum will assure a tight, dry system before charging with refrigerant. The two methods used to evacuate a system are the deep vacuum method and the triple vacuum method.

### DEEP VACUUM METHOD

The deep vacuum method requires a vacuum pump capable of pulling a vacuum of 500 micron and a vacuum gauge capable of accurately measuring this vacuum depth. This method is the most positive way of assuring a system is free of air and moisture (see Figure 25).

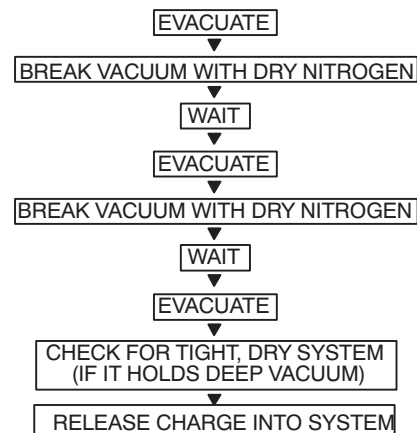


**Fig. 25 —Deep Vacuum Graph**

### TRIPLE EVACUATION METHOD

The triple evacuation method should be used when vacuum pump is not capable of pumping down to 500 microns and system does not contain any liquid water. Refer to Fig. 26 and proceed as follows:

1. Attach refrigeration gauges and evacuate system down to 28 inches of mercury and allow pump to continue operating for an additional 15 minutes.
2. Close service valves and shut off vacuum pump.
3. Connect a nitrogen cylinder and regulator to system and flow nitrogen until system pressure is 2 psig.
4. Close service valve and allow system to stand for 1 hour. During this time, dry nitrogen will be able to diffuse throughout the system absorbing moisture.
5. Repeat this procedure as indicated in Fig. 26. System is now free of any contaminants and water vapor.



**Fig. 26 —Triple Evacuation Method**

### FINAL TUBING CHECK

Check to be certain factory tubing on both the indoor and outdoor unit has not shifted during shipment. Ensure tubes are not rubbing against each other or any sheet metal. Pay close attention to the feeder tubes, making sure wire ties on feeder tubes are secure and tight.

## ELECTRONIC FUNCTIONS

### Abbreviation:

Table 5 – Unit element abbreviations

| Abbreviation                | Element                                                               |
|-----------------------------|-----------------------------------------------------------------------|
| T1                          | Indoor room temperature                                               |
| T2                          | Coil temperature of evaporator                                        |
| T3                          | Coil temperature of condenser                                         |
| T4                          | Outdoor ambient temperature                                           |
| TP                          | Compressor discharge temperature                                      |
| Tsc                         | Adjusted setting temperature                                          |
| CDIFTEMP                    | Cooling shutdown temperature                                          |
| HDIFTEMP2                   | Heating shutdown temperature                                          |
| TCDE1                       | Exit defrost temperature1                                             |
| TCDE2                       | Exit defrost temperature2<br>(maintain for a period of time)          |
| TIMING_DEFROST_<br>TIME_ADD | Enter defrost time                                                    |
| EE_TIME_DEFROST7_ST<br>RONG | Enter enhanced defrost time                                           |
| TCDE1_ADD_STRONG            | Exit enhanced defrost temperature1                                    |
| TCDE2_ADD_STRONG            | Exit enhanced defrost temperature2<br>(maintain for a period of time) |

**NOTE:** In this manual, terms such as CDIFTEMP, HDIFTEMP2, TCDE1, TCDE2, TIMING\_DEFROST\_TIME\_ADD...etc., are EEPROM parameter settings.

### MAIN PROTECTION

#### Three minute delay for compressor restart

Less than a 1 minute delay for the initial start-up and a 3 minute delay for subsequent starts.

#### Compressor high temperature cutout

The unit stops working when the compressor high temperature cutout opens, and restarts after the compressor high temperature cutout closes. Compressor discharge temperature protection Compressor discharge temp.  $T_5 > 239^\circ\text{F} (115^\circ\text{C})$  for 5s, compressor stops.

#### Fan speed is out of control

When the indoor fan speed is too low (300RPM) or too high (1500RPM) for a certain time, the unit stops and the LED displays the failure.

#### Inverter module protection

The inverter module has a protection function for current, voltage and temperature. If any of these protections engage, the corresponding code displays on the indoor unit and the unit stops working.

#### Indoor fan delayed open function

When the unit starts up, the louver is active immediately and the indoor fan opens 10s later. If the unit is running in the HEATING mode, the indoor fan is also controlled by the anti-cold wind function.

#### Compressor preheating functions

Preheat parameters: When the  $T_4$  (outdoor ambient temperature)  $< 37.4^\circ\text{F} (3^\circ\text{C})$ , the preheat function is activated.

#### Zero crossing detection error protection

If the AC detects that the time interval is not correct for a continuous 240s, the unit stops and the LED displays the failure. The correct zero crossing signal time interval should be between 6-13ms.

### Sensor protection at open circuit and breaking disconnection

If only one temperature sensor malfunctions, the air conditioner continues to work however the error code displays on the LED, in the event of any emergency use. If more than one temperature sensor malfunctions, the air conditioner stops working.

### Refrigerant leakage detection

This function is only active in the COOLING mode. The function helps prevent the compressor from being damaged by a refrigerant leakage or a compressor overload.

### Open condition:

When the compressor is active, the evaporator  $T_2$  coil temperature value has no or very little change.

## OPERATION MODES AND FUNCTIONS

### FAN Mode

1. Outdoor fan and compressor stop
2. Temperature setting function is disabled and no setting temperature appears.
3. Indoor fan can be set to high/med/low/auto
4. The louver operates the same as in the COOLING mode.
5. Auto fan

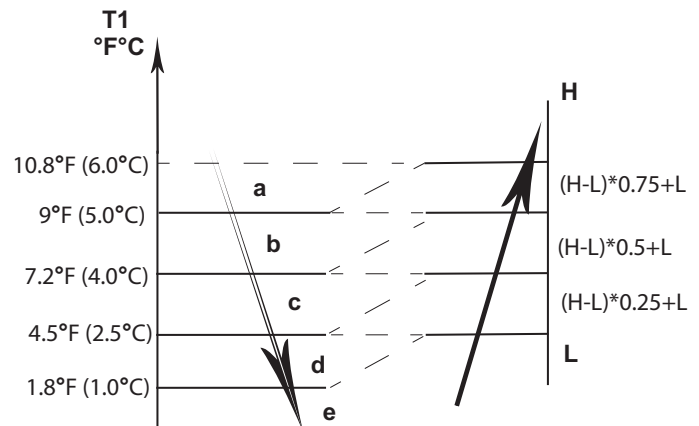


Fig. 27 —FAN Mode

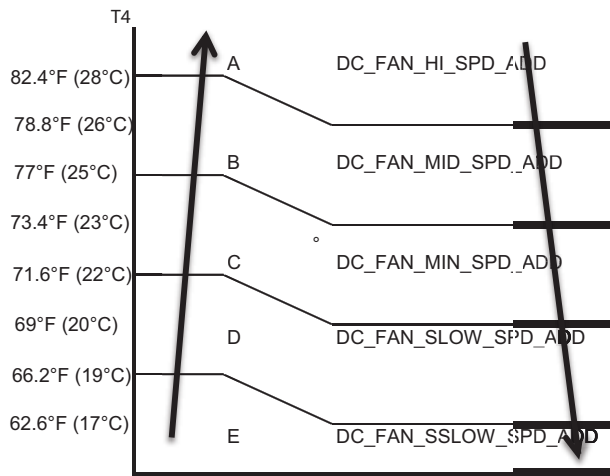
### COOLING Mode

#### Compressor Running Rules:

- When  $T_1 - T_s < -4^\circ\text{F} (-2^\circ\text{C})$ , the compressor stops.
- When  $T_1 - T_s > -1^\circ\text{F} (-0.5^\circ\text{C})$ , the compressor activates.
- When the unit runs in the QUIET mode, the compressor runs at a low frequency.
- When the current is more than the setting value, the current protection function activates, and the compressor stops.

#### Outdoor Fan Running Rules:

The outdoor unit runs at a different fan speed according to  $T_4$ . For different outdoor units, the fan speeds differ.



**Fig. 28 —Outdoor Fan Running Rules**

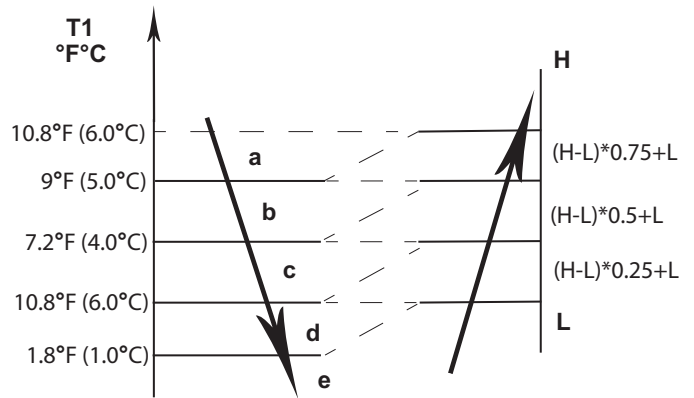
**Indoor Fan Running Rules:**

- In the COOLING mode, the indoor fan runs continuously and the user can select any of the following speeds: HIGH, MEDIUM, LOW and AUTO.
- When the setting temperature is reached, if the compressor stops operating, the indoor fan motor runs in the minimum or setting speed (see Fig. 29).

| Setting Fan Speed | T1-Td °F (°C) |   | Actual Fan Speed |
|-------------------|---------------|---|------------------|
| H                 | 8.1°F (4.5°C) | A | H + (H+=H+G)     |
|                   | 5.4°F (3.0°C) | B | H (=H)           |
|                   | 2.7°F (1.5°C) | C | H - (H-=H-G)     |
| M                 | 8.1°F (4.5°C) | D | M + (M+=M+Z)     |
|                   | 5.4°F (3.0°C) | E | M (M=M)          |
|                   | 2.7°F (1.5°C) | F | M - (M-=M-Z)     |
| L                 | 8.1°F (4.5°C) | G | L + (L+=L+D)     |
|                   | 5.4°F (3.0°C) | H | L (L=L)          |
|                   | 2.7°F (1.5°C) | I | L - (L-=L-D)     |

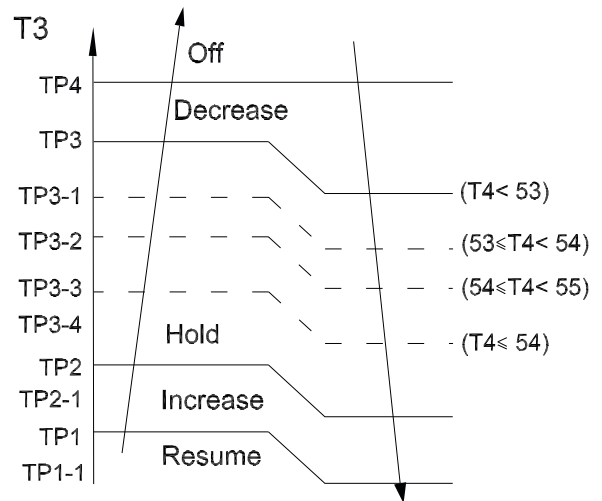
**Fig. 29 —Indoor Fan Running Rules**

The AUTO fan adheres to the following rules (see Fig. 31):



**Fig. 30 —AUTO FAN Running Rules**

**Compressor Temperature Protection**



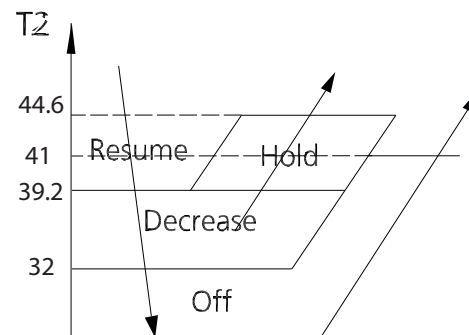
**Fig. 31 —Compressor Temperature Protection**

- Off: Compressor stops
- Decrease: Decrease the running frequency to the lower level
- Hold: Keep the current frequency
- Resume: No limitation for frequency

When the condenser temperature is higher than the setting value, the compressor stops.

**Evaporator Temperature Protection**

When the evaporator temperature is lower than the setting value the compressor stops.



**Fig. 32 —Evaporator Temperature Protection**

**HEATING Mode**

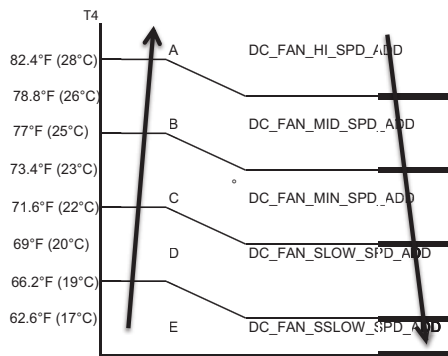
**Compressor Running Rules:**

- When  $T1-Ts > f'T$ , the compressor stops.
- When  $T1-Ts < f'T-1.5$ , the compressor is on.  $f'T$  is the programmed parameter for temperature compensation.

- When the AC runs in the MUTE mode, the compressor runs with a low frequency.
- When the current is more than the setting value, the current protection function activates and the compressor stops.

#### Outdoor Fan Running Rules:

The outdoor unit runs at a different fan speed according to T4. For different outdoor units, the fan speeds differ.



**Fig. 33 —Outdoor Fan Running Rules**

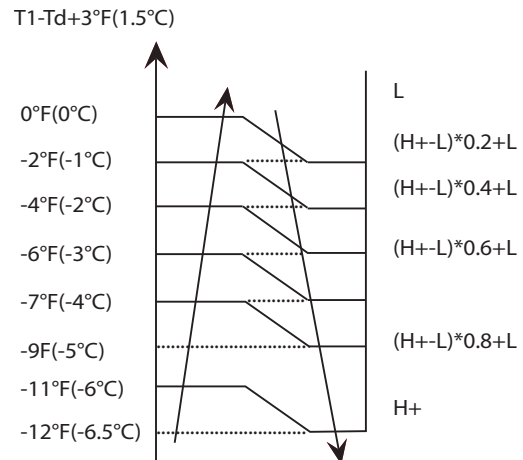
#### Indoor Fan Running Rules:

When the compressor is on, the user can set the indoor fan to either HIGH/MED/LOW/AUTO/MUTE. When the indoor unit coil temperature is low, the anti-cold air function starts and the indoor fan motor runs at the low speed. The speed can not be changed.

When the temperature is lower than the setting value, the indoor fan motor stops. When the indoor temperature reaches the setting temperature, the compressor stops, the indoor fan motor runs at the minimum speed or setting speed. The anti-cold air function is valid. The indoor fan is controlled as shown in Fig. 35.

| Setting Fan Speed | T1-Td+3°F (1.5 °C) |   | Actual Fan Speed |
|-------------------|--------------------|---|------------------|
| H                 | -2.7°F (-1.5°C)    | ↗ | H - (H=H-G)      |
|                   | -5.4°F (-3.0°C)    | ↘ | H (=H)           |
|                   | -8.1°F (-4.5°C)    | ↙ | H + (H+ =H+G)    |
| M                 | -2.7°F (-1.5°C)    | ↗ | M - (M=M-Z)      |
|                   | -5.4°F (-3.0°C)    | ↘ | M (M=M)          |
|                   | -8.1°F (-4.5°C)    | ↙ | M + (M+ =M+Z)    |
| L                 | -2.7°F (-1.5°C)    | ↗ | L - (L=L-D)      |
|                   | -5.4°F (-3.0°C)    | ↘ | L (L=L)          |
|                   | -8.1°F (-4.5°C)    | ↙ | L + (L+ =L+D)    |

**Fig. 34 —Indoor Fan Running Rules**



**Fig. 35 —Auto Fan Action in HEATING Mode**

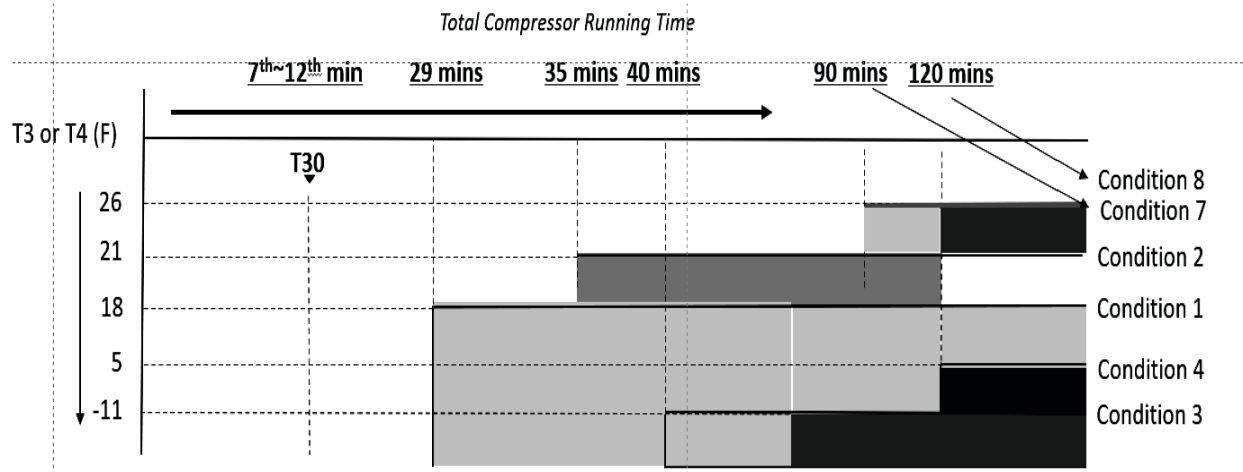
#### Defrosting mode

The unit enters defrosting mode according to the temperature value of condenser temperature (T3) and outdoor ambient temperature (T4) as well as the compressor running time.

- In defrosting mode, the compressor continues to run, the indoor and outdoor motor will cease operation, the defrost light of the indoor unit will turn on, and the “dF” symbol is displayed.
- If any one of the following conditions is satisfied, defrosting ends and the machine switches to normal heating mode:
  - Condenser temperature (T3) rises above TCDE1.
  - Condenser temperature (T3) maintained above TCDE2 for 80 seconds.
- Unit runs for 15 minutes consecutively in defrosting mode.
- If Outdoor ambient temperature (T4) is lower than or equal to -7.6°F (-22°C) and compressor running time is more than TIMING\_DEFROST\_TIME, if any one of the following conditions is satisfied, defrosting ends and the machine switches to normal heating mode:
  - Unit runs for 10 minutes consecutively in defrosting mode.
  - Condenser temperature (T3) rises above 50°F/ 10°C.
- If any one of the following conditions is satisfied, the unit enters defrosting mode
  - If condenser temperature (T3) or outdoor ambient temperature (T4) is lower than -3°C for 30 seconds, Ts-T1 is lower than 5°C and compressor running time is more than EE\_TIME\_DEFROST7\_ADD.
  - If condenser temperature (T3) or outdoor ambient temperature (T4) is lower than -3°C for 30 seconds and compressor running time is more than EE\_TIME\_DEFROST7\_ADD+30 minutes.
- If any one of the following conditions is satisfied, defrosting ends and the machine switches to normal heating mode:
  - Condenser temperature (T3) rises above TCDE1 7.2°F/+4°C.
  - Condenser temperature (T3) maintained above TCDE2 7.2°F/+4°C for 80 seconds.
  - Unit runs for 15 minutes consecutively in defrosting mode.

#### Enhanced Defrost

Enhanced Defrost is a feature that is enabled by turning on dipswitch SW4 on the 24 volt ODU board. This feature is designed to be used for problem areas of defrosting (near water sources and areas of high humidity during cold outdoor conditions). When enabled, the total heating cumulative run time will be reduced to 40 minutes, allowing for defrosting to occur at the 40th minute providing the T3 or T4 temperature is 26°F or cooler at that time. The defrost termination temperature at T3 will also increase to 77°F to ensure better completion of defrost prior to terminating defrost.



|              |                                                                                                                                                                                          |                                                                                    |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| Condition 1  | Total compressor running time is 29 mins                                                                                                                                                 | $T3 \leq 18F$ , and $T3$ is less than/equal to $T30 - 4.5F$ (2.5C), and $T4 > -8F$ |
| Condition 2  | Total compressor running time is 35 mins                                                                                                                                                 | $T3 \leq 21F$ , and $T3$ less than/equal to $T30 - 5.4F$ (3C), and $T4 > -8F$      |
| Condition 3  | Total compressor running time is 29 mins                                                                                                                                                 | $T3 \leq -11F$ and last for 3 mins, and $T4 > -8F$                                 |
| Condition 4  | Total compressor running time is 120 mins                                                                                                                                                | $T3 \leq 5F$ and $T4 > -8F$                                                        |
| Condition 5  | Cumulative running 30 mins                                                                                                                                                               | $T4 - T3 > (0.5T4 + 5F)$ and $T3 \leq 10F$ , $T4 > -8F$                            |
| Condition 6  | Cumulative running 8 hours                                                                                                                                                               | $T4 \leq -8F$ , with $T4$ operating without malfunction                            |
| Condition 7  | Cumulative running time 90 mins and diff. of $T_s - T1 \leq 9F$<br>Cumulative running time 120 minutes (if $T_s - T1$ diff. above not applicable)                                        | $T3$ or $T4 \leq 26F$ last for 30 seconds                                          |
| *Condition 8 | If enhanced defrost is ON, cumulative running time is 40 minutes (T30 does not apply)<br>*Only applies to Crossover ODU's. Enable enhanced defrost by turning on dipswitch 4 in the ODU. | $T3$ or $T4 \leq 26F$ last for 30 seconds                                          |

\*\* T30: After the compressor starts up, take the lowest temperature of T3 between the 7th to the 12th minute.

## Defrost Exit Conditions

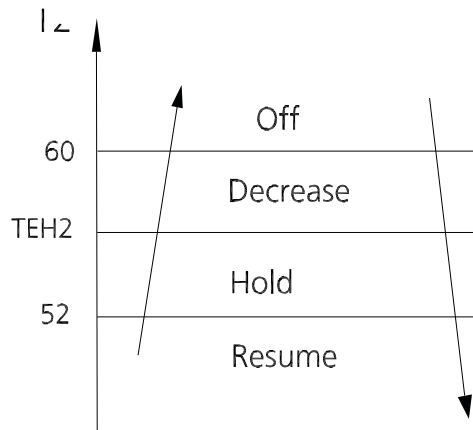
Any of the following conditions cancels the DEFROST mode and changes the unit's operating mode to NORMAL.

### HEATING

**NOTE:** T3 temperature refers to the sensor reading at the time when the DEFROST mode begins.

- T3 temperature rises above 59,,aF (15,,aC).
- T3 temperature remains above 46,,aF (8,,aC) for more than 80 seconds.
- The unit has been in the DEFROST mode for 10 minutes.
- The indoor unit defrost lamp illuminates and the **dF** logo appears.

## Evaporator Coil Temperature Protection - Heating



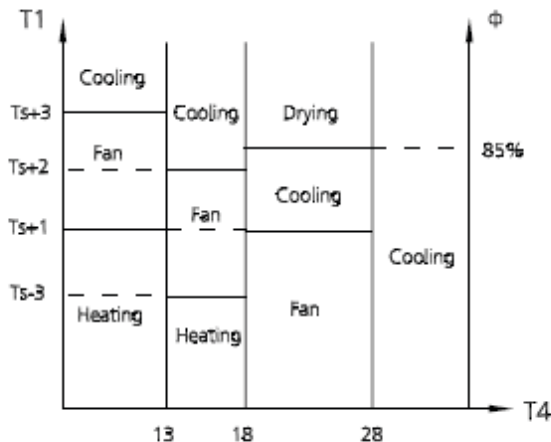
**Fig. 36 —Evaporator Coil Temperature Protection**

When the evaporator temperature is higher than the setting protection value, the compressor stops.

## AUTO Mode

AUTO mode can be selected with the remote controller and the setting temperature can be changed between 60.0°F~86°F (16°C~30°C).

In the AUTO mode, the unit chooses either the COOLING, HEATING or the FAN-ONLY mode accT2, T4 and relative humidity.



**Fig. 37 —AUTO Mode**

**Heating\*:** COOLING ONLY models run at fan speed. The indoor fan runs in the AUTO fan speed for the relevant mode. The louver operates the same as in the relevant mode.

If the unit switches mode between HEATING and COOLING, the compressor repeatedly stops for a certain time and then chooses the mode according to T1-Ts. If the setting temperature is modified, the unit selects a running function again.

## DRYING mode

The indoor fan speed is fixed at BREEZE and can not be changed. The louver angle is the same as in the COOLING mode.

**Low Indoor Room Temperature Protection** In the DRYING mode, if the room temperature is lower than 50°F(10°C),

the compressor stops and does not resume until the room temperature exceeds 53.6°F (12°C).

Evaporator anti-freezing protection, condenser high temperature protection and outdoor unit frequency limit are active and are the same as that in the COOLING mode. The outdoor fan operates the same as in COOLING mode.

## FORCED OPERATION Function

### Enter FORCED OPERATION function:

When the machine is off, press the auto function button at the indoor unit to engage the Forced Auto Mode. Press TOUCH again, within 5 seconds, to engage the FORCED COOLING mode. In FORCED AUTO, FORCED COOLING or any other operation mode, press TOUCH to turn off the unit.

In the FORCED OPERATION mode, all general protections and the remote controller are available.

### Operation Rules:

#### FORCED COOLING mode:

The compressor runs at the F2 frequency and the indoor fan runs as a breeze. After running for 30 minutes, the unit enters the AUTO mode at a 75.2°F (24°C) setting temperature.

#### FORCED AUTO mode:

The FORCED AUTO mode is the same as the normal AUTO mode with a 75.2°F (24°C) setting temperature.

#### AUTO-RESTART function

The indoor unit is equipped with an AUTO-RESTART function, which is carried out through an auto-restart module. In case of a sudden power failure, the module memorizes the setting conditions before the power failure. The unit resumes the previous operation setting (not including the swing function) automatically 3 minutes after the power returns.

If the memorization condition is the FORCED COOLING mode, the unit runs in the COOLING mode for 30 minutes and enters the AUTO mode as 75.2°F (24°C) setting temp.

If the air conditioner turns off before the unit powers off and the air conditioner is required to restart immediately, the compressor delays for 1 minute when the power is on. Under other conditions, the compressor has a 3 minute delay when it restarts.

#### Refrigerant Leakage Detection

With this new technology, the display area displays EL0C when the outdoor

unit detects a refrigerant leak.

#### 46°F (8°C) Heating

When the compressor is running, the indoor fan motor runs without the anti-cold air function. When the compressor is off, the indoor fan motor is off.

## INQUIRY MODE

### Accessing the INQUIRY Mode

#### CAUTION

Read and understand the function changes you wish to make in advance. Neither the indoor unit nor the remote control displays the new level of any of the changes made while in the INQUIRY mode. Be sure to document the changes you've made to the system's programming using the INQUIRY mode. Once you complete the changes and exit the INQUIRY mode, if additional changes are made to the programming, the system will not show the new previously set level(s).

For example, when you first access CODE 22, Heating Temperature Compensation, the remote control display defaults to 0. If you change it to -2, then save and exit out of the INQUIRY mode, the next time someone goes back in and accesses CODE 22, the remote's display will not display -2.

Instead it will show 0 because that's the default. If you are unsure of the previous changes, due to a lack of documentation, you could press the DOWN symbol to the maximum change range of -6, then press the UP symbol until you are back to 0, and make the new adjustments accordingly. Be sure to document the changes when you are done.

### Remote Controller Service Mode Functions

**NOTE:** While in the INQUIRY mode, refer to the following instructions to enter SERVICE mode for the applicable codes.

Below is a list of INQUIRY modes and serviceable functions.

- a. Before using the remote's service functions, turn OFF the indoor unit with the remote.
- b. Turn OFF the power to the outdoor unit for 2 minutes. Turn the power back ON.
- c. Remove the batteries from the remote and wait for the remote screen to clear. Within 30 seconds of replacing the batteries, use UP or DOWN to scroll through the INQUIRY modes.
- d. To enter the SERVICE mode for an applicable INQUIRY mode, press ON/OFF for 2 seconds.
- e. After SERVICE adjustments have been made, press ON/OFF for 2 seconds to exit the SERVICE mode and return to the INQUIRY mode.
- f. Once operations in the INQUIRY mode are complete, press ON/OFF and FAN SPEED for 2 seconds to exit. All buttons on the remote controller are disabled for 60 seconds.
- g. To ensure changes are locked, power down the outdoor unit for three (3) minutes after all the service mode changes are made.

1. Simultaneously press ON/OFF   and FAN SPEED  for 8 seconds.
  - a. The remote is now in the INQUIRY mode.
  - b. The remote control remains in the INQUIRY mode for 1 minute if no other button is pressed.
  - c. While in the INQUIRY Mode, the remote display cancels all icons except AUTO, COOL, DRY, HEAT and Battery Strength.
  - d. The remote control digital display defaults to 0 upon entering the INQUIRY mode.
  - e. In the INQUIRY mode, each digital code (from 0 to 30) is accessed by pressing the UP or DOWN arrows .
  - f. The INQUIRY information appears on the high wall indoor unit display in approximately 1 second after accessing the digital code. Press OK to send as well.
  - g. In the INQUIRY mode, all other buttons and operations are invalid except for UP, DOWN and OK or the operation to exit the INQUIRY mode.

## Service Inquiry Codes

| CODE | INQUIRY | INQUIRY DESCRIPTION              | SERVICE/ INQUIRY    | FOR SERVICE, PRESS ON/OFF FOR 2 SECONDS TO:                                                                                                                                                                                                                                              | SELECTION GUIDE/NOTES                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------|---------|----------------------------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0    |         | Error Code Check                 | SERVICE AND INQUIRY | Review error memory function. Displays "Ch". Press <b>OK</b> to send the query error code memory.                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 1    | T1      | Indoor Ambient Temperature       | SERVICE AND INQUIRY | Change the power off memory selection. This feature determines whether the unit memorizes the set conditions prior to a power failure.<br>Displays "Ch". Press <b>OK</b> to return the current setting. Press <b>UP</b> or <b>DOWN</b> to cycle through settings <b>1</b> and <b>0</b> . | Memory settings are off<br>Memory settings are on                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 2    | T2      | Indoor Coil Temperature          | SERVICE AND INQUIRY | Change the option to control the indoor fan operation after reaching the set temperature.<br><br>Displays "Ch". Press <b>OK</b> to return the current setting. Press <b>UP</b> or <b>DOWN</b> to cycle through settings 1 through 11. Next, press <b>OK</b> to confirm the selection.    | Stop the fan<br>Minimum fan speed<br>Set speed - intermittent<br>fan-off 4 minutes/on 1 min<br>Terminate after run time of 10 mins<br>Terminate after run time of 15 mins<br>Terminate after run time of 20 mins<br>Terminate after run time of 30 mins<br>Terminate after run time of 40 mins<br>Terminate after run time of 50 mins<br>Terminate after run time of 60 mins                                                                                                                  |
| 3    | T3      | Outdoor Coil Temperature         | SERVICE AND INQUIRY | Change the option to control the <b>COOLING</b> and <b>HEATING</b> modes available for use on the unit. Press <b>UP</b> or <b>DOWN</b> to cycle through the settings <b>CH</b> , <b>HH</b> , <b>CC</b> or <b>nU</b> . Press <b>OK</b> to confirm.                                        | <b>CH</b> - <b>COOLING</b> and <b>HEATING</b> : <b>AUTO</b> , <b>COOLING</b> , <b>DRY</b> , <b>HEATING</b> and <b>FAN</b> modes available<br><b>HH</b> - <b>HEATING</b> Only: <b>HEATING</b> and <b>FAN</b> modes available<br><b>CC</b> - <b>COOLING</b> without <b>AUTO</b> : <b>COOLING</b> , <b>DRY</b> and <b>FAN</b> modes available<br><b>nU</b> - <b>COOLING</b> and <b>HEATING</b> without <b>AUTO</b> : <b>COOLING</b> , <b>DRY</b> , <b>HEATING</b> and <b>FAN</b> modes available |
| 4    | T4      | Outdoor Ambient Temperature      | SERVICE AND INQUIRY | Change the selection of the lowest set temperature.<br><br>NOTE: Temperature range is 60°F ~ 75°F (16°C ~ 24°C). Press <b>UP</b> or <b>DOWN</b> to select temperature setting. Press <b>OK</b> to confirm.                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 5    | TP (T5) | Compressor Discharge Temperature | SERVICE AND INQUIRY | Change the selection of the highest set temperature.<br><br>NOTE: Temperature range is 77°F ~ 86°F (25°C ~ 30°C). Press <b>UP</b> or <b>DOWN</b> to select the temperature setting. Press <b>OK</b> to confirm.                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 6    | FT      | Compressor target frequency      | INQUIRY ONLY        |                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 7    | Fr      | Compressor run frequency         | INQUIRY ONLY        |                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 8    | dL      | Unit amperage                    | SERVICE AND INQUIRY | Change the static pressure selection.<br><br>Displays "Ch". Press <b>OK</b> to return the current setting. Press <b>UP</b> or <b>DOWN</b> to cycle through settings <b>0</b> through <b>4</b> or <b>AF</b> (constant air volume test). Press <b>OK</b> to confirm.                       | Only available on ducted/AHU units.<br><br>Refer to the ducted/AHU installation manuals for Fan performances at varying static pressures for airflow settings.                                                                                                                                                                                                                                                                                                                                |
| 9    | Uo      | Unit voltage                     | INQUIRY ONLY        |                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 10   | Sn      | Capacity test (special usage)    | INQUIRY ONLY        |                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 11   | ----    | Not available                    | INQUIRY ONLY        |                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 12   | Pr      | Indoor fan speed                 | SERVICE AND INQUIRY | Change the heating frequency lower limit selection. Displays "Ch". Press <b>OK</b> to return the current heating minimum frequency limit selection code. Press <b>UP</b> and <b>DOWN</b> to select the minimum heating frequency limit value. Press <b>OK</b> to confirm.                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

| CODE | INQUIRY | INQUIRY DESCRIPTION                      | SERVICE/ INQUIRY    | FOR SERVICE, PRESS ON/OFF FOR 2 SECONDS TO:                                                                                                                                                                                                                                                                                                                                       | SELECTION GUIDE/NOTES                                                                                                                                     |
|------|---------|------------------------------------------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| 13   | Lr      | Electronic Expansion Valve (EEV) opening | SERVICE AND INQUIRY | Change the maximum operating frequency of T4 Cooling Only intervals.<br><br>Displays " <b>Ch</b> ". Press <b>OK</b> to return the current operating frequency code of the T4 Cooling Only intervals. Press <b>UP</b> or <b>DOWN</b> to select the limit value and then press <b>OK</b> .                                                                                          |                                                                                                                                                           |
| 14   | ir      | Indoor fan speed                         | INQUIRY ONLY        |                                                                                                                                                                                                                                                                                                                                                                                   | Multiple the display number by 8 to calculate the actual RPM                                                                                              |
| 15   | HU      | Relative Humidity                        | INQUIRY ONLY        |                                                                                                                                                                                                                                                                                                                                                                                   | Available in INQUIRY mode for the high tier/new mid tier units that have an RH sensor.                                                                    |
| 16   | TT      | Setpoint compensation temperature        | INQUIRY ONLY        |                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                           |
| 17   | dT      | Dust concentration (not used)            | INQUIRY ONLY        |                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                           |
| 18   | WIFI    | Wi-Fi signal strength                    | INQUIRY ONLY        |                                                                                                                                                                                                                                                                                                                                                                                   | The value is measured in <b>dBm</b> . The display values are 0, 1, 2, 3 and 4 (4 is the highest and 0 is the lowest)                                      |
| 19   | ----    | Not available                            | SERVICE ONLY        | Change the cooling frequency upper limit selection in Hz.<br><br>Displays " <b>Ch</b> ". Press <b>OK</b> to return the current frequency limit. Press <b>UP</b> or <b>DOWN</b> to select the preferred frequency upper limit value (in Hz). Press <b>OK</b> to confirm.                                                                                                           | For example, the unit may be factory set to fluctuate between 40 and 84 Hz. If set to 50, the unit will now be limited to operating between 40 and 50 Hz. |
| 20   | oT      | Indoor fan target frequency              | SERVICE AND INQUIRY | Change the heating frequency upper limit selection in Hz.<br><br>Displays " <b>Ch</b> "; press <b>OK</b> to return the current frequency limit. Press <b>UP</b> or <b>DOWN</b> to select the preferred frequency upper limit value (in Hz). Press <b>OK</b> to confirm.                                                                                                           | For example, the unit may be factory set to fluctuate between 40 and 84 Hz. If set to 50, the unit is limited to operating between 40 and 50 Hz.          |
| 21   | ----    | Cooling Temperature Compensation         | SERVICE ONLY        | Change the cooling temperature compensation value.<br><br>Displays " <b>Ch</b> ". Press <b>OK</b> to return the current temperature compensation value code. Press <b>UP</b> or <b>DOWN</b> to select the cooling temperature difference compensation value. Press <b>OK</b> to confirm.                                                                                          | This setting is used to adjust for temperature differences due to the height of the unit install. The offset value can be set at a range of -6° to +6°.   |
| 22   | ----    | Heating Temperature Compensation         | SERVICE ONLY        | Change the heating temperature compensation value.<br><br>Displays " <b>Ch</b> ". Press <b>OK</b> to return the current temperature compensation value code. Press <b>UP</b> or <b>DOWN</b> to select the heating temperature difference compensation value. Press <b>OK</b> to confirm.                                                                                          | This setting is used to adjust for temperature differences due to the height of unit installation. The offset value can be set at a range of -6° to +6°.  |
| 23   | ----    | Maximum Cooling Fan Speed                | SERVICE ONLY        | Change the maximum cooling fan speed setting as it relates to RPM.<br><br>Displays " <b>Ch</b> ". Press <b>OK</b> to return the current maximum cooling fan speed setting. Press <b>UP</b> or <b>DOWN</b> to select the maximum cooling fan speed. Press <b>OK</b> to confirm.                                                                                                    | For example, the unit may be factory set to fluctuate between 300 and 1000 RPM. If set to 800, the unit is limited to operating between 300 and 800 RPM.  |
| 24   | ----    | Minimum Cooling Fan Speed                | SERVICE ONLY        | Change the minimum cooling fan speed setting as it relates to RPM.<br><br>NOTE: Changing this setting is not recommended as it may trigger unit protection protocols.<br><br>Displays " <b>Ch</b> ". Press <b>OK</b> to return the current minimum cooling fan speed setting. Press <b>UP</b> or <b>DOWN</b> to select the minimum cooling fan speed. Press <b>OK</b> to confirm. | For example, the unit may be factory set to fluctuate between 300 and 1000 RPM. If set to 500, the unit is limited to operating between 500 and 1000 RPM. |

| CODE | INQUIRY | INQUIRY DESCRIPTION       | SERVICE/ INQUIRY | FOR SERVICE,<br>PRESS ON/OFF FOR 2 SECONDS TO:                                                                                                                                                                                                                                                                                                                                  | SELECTION GUIDE/NOTES                                                                                                                                             |
|------|---------|---------------------------|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 25   | ----    | Maximum Heating Fan Speed | SERVICE ONLY     | <p>Change the maximum heating fan speed setting as it relates to RPM.</p> <p>Displays "Ch". Press <b>OK</b> to return the current maximum heating fan speed setting. Press <b>UP</b> or <b>DOWN</b> to select the maximum heating fan speed. Press <b>OK</b> to confirm.</p>                                                                                                    | For example, the unit may be factory set to fluctuate between 300 and 1000 RPM. If set to 800, the unit will now be limited to operating between 300 and 800 RPM. |
| 26   | ----    | Minimum Heating Fan Speed | SERVICE ONLY     | <p>Change the minimum heating fan speed setting as it relates to RPM.</p> <p>Note: Changing this setting is not recommended as it may trigger unit protection protocols.</p> <p>Displays "Ch". Press <b>OK</b> to return the current minimum heating fan speed setting. Press <b>UP</b> or <b>DOWN</b> to select the minimum heating fan speed. Press <b>OK</b> to confirm.</p> | For example, the unit may be factory set to fluctuate between 300 and 1000 RPM. If set to 500, the unit is limited to operating between 500 and 1000 RPM.         |
| 27   | ----    | Not available             |                  |                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                   |
| 28   | ----    | Not available             |                  |                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                   |
| 29   | ----    | Not available             |                  |                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                   |
| 30   | ----    | Not available             |                  |                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                   |

**To exit the Inquiry Mode:**

Press and hold together the On/Off and Fan buttons   for 2 seconds.

## GENERAL TROUBLESHOOTING

### SAFETY CAUTION



### WARNING

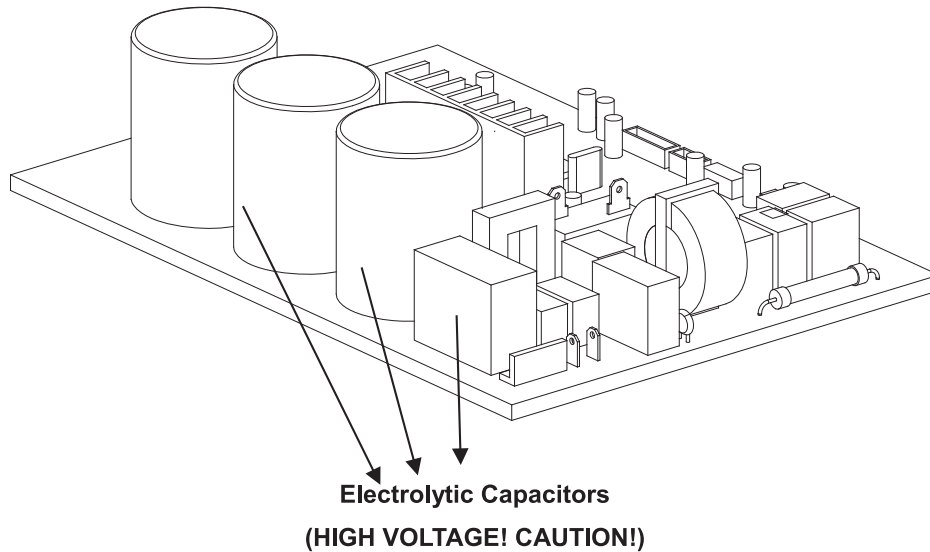
Be sure to turn off all power supplies or disconnect all wires to avoid electric shock. While checking indoor/outdoor PCB, equip yourself with anti-static gloves or wrist strap to avoid damage to the board.



### WARNING

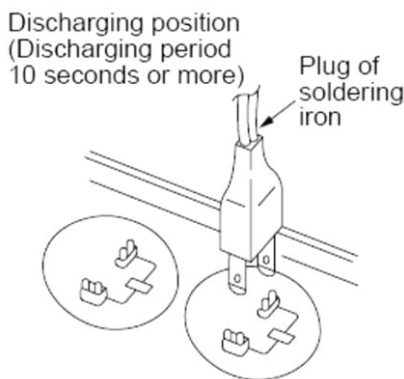
Electricity remains in capacitors even when the power supply is off. Ensure the capacitors are fully discharged before troubleshooting.

**NOTE: Remember to discharge the electrical power in capacitor.**



**Fig. 38 —Electrolytic Capacitors**

For other models, please connect discharge resistance (approximately 100 $\Omega$  40W) or a soldering iron (plug) between the +, - terminals of the electrolytic capacitor on the contrary side of the outdoor PCB.

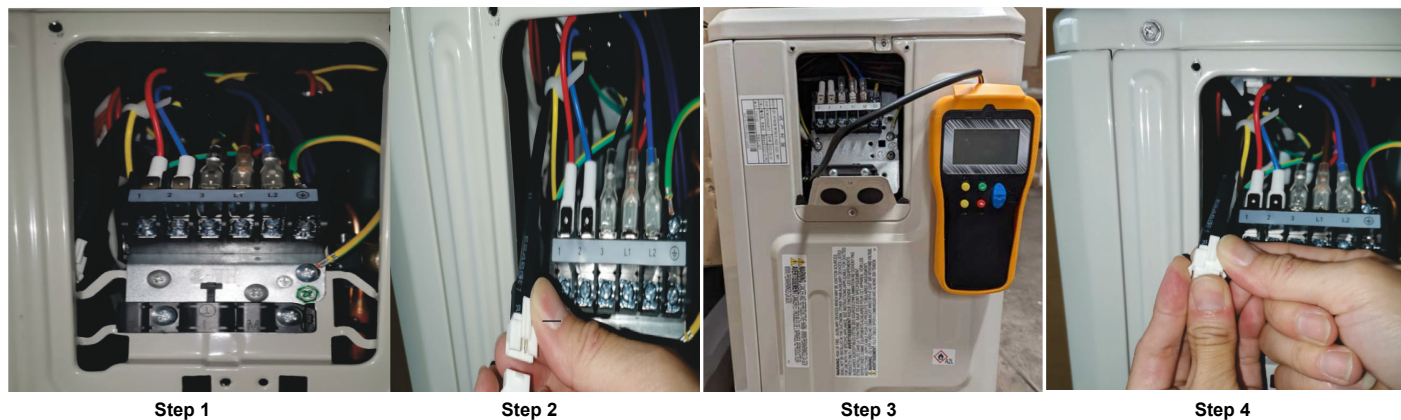


**Fig. 39 —Discharge Position**

**NOTE:** Figure is for reference only. The plug on your unit may differ.

**NOTE:** If using the inverter test tool for troubleshooting, shut off power, remove the electrical panel and locate the cable that is already connected to the test port on the outdoor unit. Connect the test tool to the cable with the connector provided with the test tool. After the maintenance is completed, insert the female end back into the port.

For the R454B single zone ODU with capacity less than 24K, there will be the test tool connector. For 24K HH and 30K-60K single zone ODU, there is a diagnosis/check board which has digital display on it, you can read the parameters from it directly.



**Fig. 40 —Inverter Test Tool Maintenance**

Connect the Dr. SMART tool to the white terminal as shown in Step 3 above.



**Fig. 41 —Dr. SMART Tool**

**NOTE:** These pictures is for reference only. Actual appearance may vary.

## ERROR CODES

### Error Display

| Display               | Indoor/Outdoor Code | Malfunction or Protection                                                           | Solution<br>(Refer to Page)    |
|-----------------------|---------------------|-------------------------------------------------------------------------------------|--------------------------------|
| d <sub>f</sub>        | N/A                 | Defrosting                                                                          | Normal Display, not error code |
| FC                    | N/A                 | Forced cooling                                                                      |                                |
| EH 03 / EC 07 / EC 71 | IDU & ODU           | Fan speed out of control                                                            | page 35                        |
| EC 51                 | ODU                 | EEPROM parameter error                                                              | page 31                        |
| EC 52                 | ODU                 | Coil temp. sensor(T3) error                                                         | page 38                        |
| EC 53                 | ODU                 | Ambient temp. sensor(T4) error                                                      | page 38                        |
| EC 54                 | ODU                 | COMP. discharge temp. sensor (TP) error                                             | page 38                        |
| EC 55                 | ODU                 | IPM module temperature sensor malfunction                                           | page 40                        |
| EL 0C                 | IDU & ODU           | System Lacks Refrigerant Diagnosis and Solution                                     | page 41                        |
| EH 00 / EH0A          | IDU & ODU           | EEPROM Malfunction Error Diagnosis and Solution                                     | page 31                        |
| EH02                  | IDU                 | Zero Crossing Detection Error                                                       | page 34                        |
| EH b3                 | IDU                 | Communication Malfunction Between Wire and Master Control                           | page 58                        |
| EH bA                 | IDU & ODU           | Communication Malfunction Between Wire and Master Control                           | page 58                        |
| EH 3b                 | IDU & ODU           | External Fan DC Bus Voltage is Too High                                             | page 58                        |
| EH 06                 | IDU                 | IDU Main Control Board and Display Board Communication Error Diagnosis and Solution | page 60                        |
| EH 0E                 | IDU                 | Water-Level Alarm Malfunction Diagnosis and Solution                                | page 42                        |
| EH 60 / EH 61         | IDU & ODU           | Open circuit or Short Circuit Of Temperature Sensor                                 | page 38                        |
| EC 57                 | ODU                 | Refrigerant pipe temperature sensor error                                           | page 38                        |
| EC 5C                 | ODU                 | Suction Transducer Failure                                                          | page 37                        |
| EL 01                 | IDU & ODU           | Communication error                                                                 | page 32                        |
| EL 16                 | ODU                 | Communication malfunction between adapter board and ODU main board                  | page 61                        |
| FL 09                 | IDU & ODU           | Mismatch between the new and old platforms diagnosis and solution                   | page 61                        |
| PC 00                 | ODU                 | IPM module protection                                                               | page 43                        |
| PC 02                 | ODU                 | Compressor top (or IPM) temp. protection                                            | page 45                        |
| PC 04                 | ODU                 | Inverter Compressor Drive Error Diagnosis and Solution                              | page 48                        |
| PC 06                 | ODU                 | Discharge temperature protection of compressor                                      | page 45                        |
| PC 08                 | ODU                 | Outdoor overcurrent protection                                                      | page 54                        |
| PC 0A                 | ODU                 | High temperature protection of condenser                                            | page 55                        |
| PC 0F                 | ODU                 | PFC module protection                                                               | page 56                        |
| PC 0L                 | ODU                 | Low Ambient Temperature Protection                                                  | page 58                        |
| PC 10                 | ODU                 | Low AC voltage protection                                                           | page 57                        |
| PC 11                 | ODU                 | Main control board DC bus high voltage protection                                   | page 57                        |
| PC 12                 | ODU                 | Main control board DC bus high voltage protection /341 MCE error                    | page 57                        |
| PC 03                 | IDU                 | * Pressure Protection (low or high pressure)                                        | page 46                        |
| PC 30                 | ODU                 | System high pressure protection                                                     | page 46                        |
| PC 31                 | ODU                 | Low Pressure Protection                                                             | page 46                        |
| PC 40                 | ODU                 | Communication error between ODU main chip and compressor driven chip                | page 49                        |
| PC 41                 | ODU                 | Compressor current sampling failure                                                 | page 50                        |
| PC 42                 | ODU                 | Compressor start failure of outdoor unit                                            | page 54                        |
| PC 43                 | ODU                 | Compressor lack phase protection                                                    | page 51                        |

| Display | Indoor/Outdoor Code | Malfunction or Protection                            | Solution<br>(Refer to Page) |
|---------|---------------------|------------------------------------------------------|-----------------------------|
| PC 44   | ODU                 | Zero speed protection                                | page 54                     |
| PC 45   | ODU                 | IR chip drive failure                                | page 52                     |
| PC 46   | ODU                 | Compressor speed has been out of control             | page 54                     |
| PC 49   | ODU                 | Compressor overcurrent failure                       | page 54                     |
| LC 06   | ODU                 | High temperature protection of Inverter module (IPM) | page 45                     |
| PH 90   | IDU & ODU           | High temperature protection of evaporator            | page 62                     |
| PH 91   | IDU & ODU           | Low temperature protection of evaporator             | page 63                     |

**NOTE:** PC03 Low pressure protection switch is open. Check the switch and repair or leak check the unit and recharge.

**NOTE:** For 30-36K outdoor units with a display board. If the outdoor unit does not have a display board, please refer to the indoor error code table in the 45MHHAQ/C Service Manual and diagnose by indoor error code at the indoor unit.

## TROUBLESHOOTING BY ERROR CODE

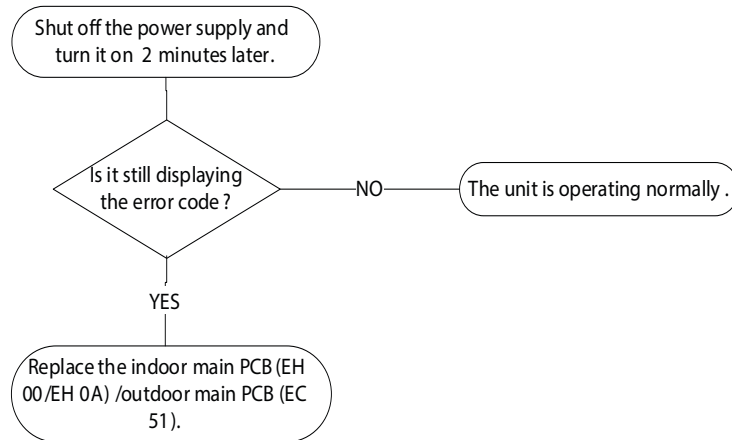
### EH 00/ EH 0A / EC 51 (EEPROM Malfunction Error Diagnosis and Solution)

**Description:** Indoor or outdoor PCB main chip does not receive feedback from EEPROM chip.

**Recommended parts to prepare:** Indoor PCB, Outdoor PCB

**Troubleshooting and repair:**

Troubleshooting and repair:

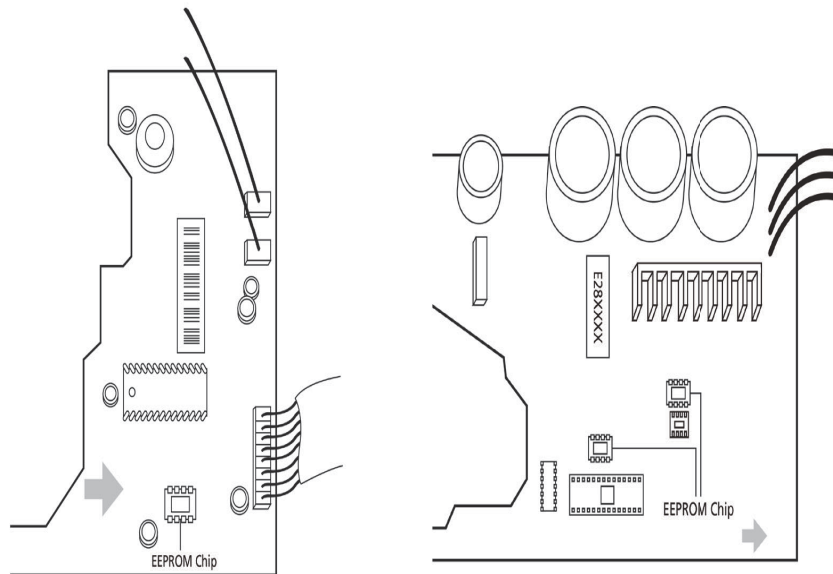


**Fig. 42 —EC 51**

**Remarks:**

**EEPROM:** A read-only memory whose contents can be erased and reprogrammed using a pulsed voltage.

The location of the EEPROM chip on the outdoor PCB is shown in the following image:



**Fig. 43 —Location of EPROM Chip**

**NOTE:** This picture is only for reference, actual appearance may vary.

**IMPORTANT:** Troubleshooting and repair of compressor driven chip EEPROM parameter error sand communication errors between outdoor main chip and compressor driven chip are same as EC 51.

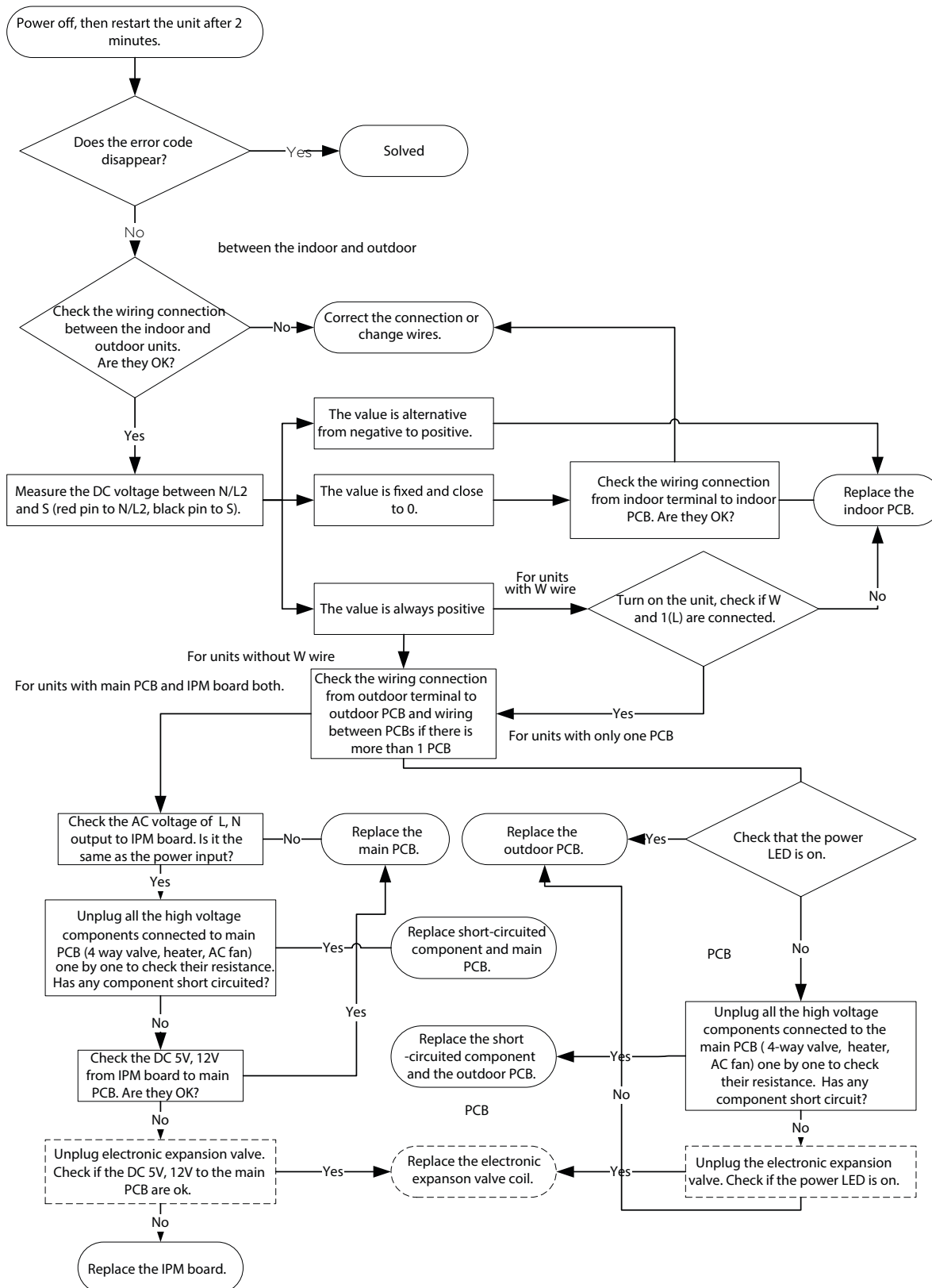
## EL 01 (Indoor and Outdoor Unit Communication Error Diagnosis and Solution)

**Description:** Indoor unit can not communicate with outdoor unit.

**Recommended parts to prepare:** Indoor PCB, Outdoor PCB

**Troubleshooting and repair:**

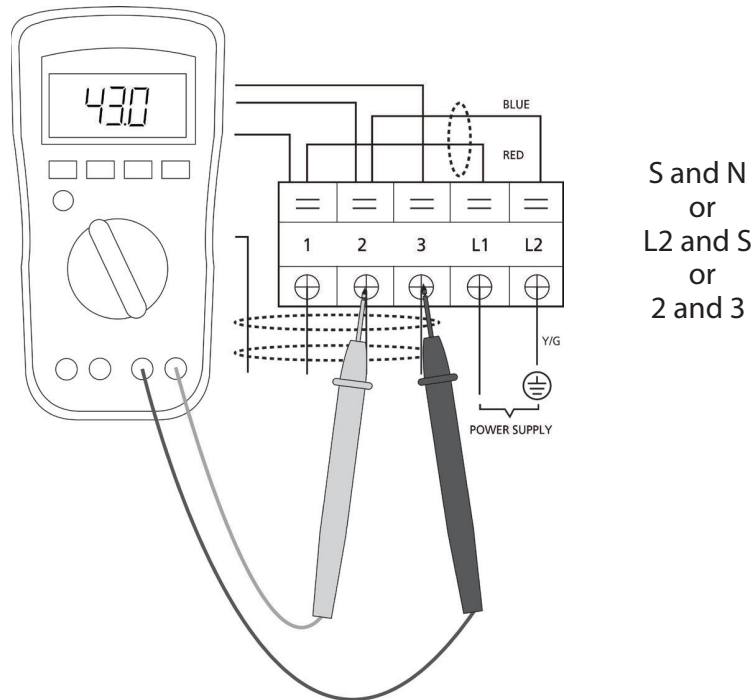
:



For certain models, outdoor PCB could not be removed separately. In this case, the outdoor electric control box should be replaced as a whole.

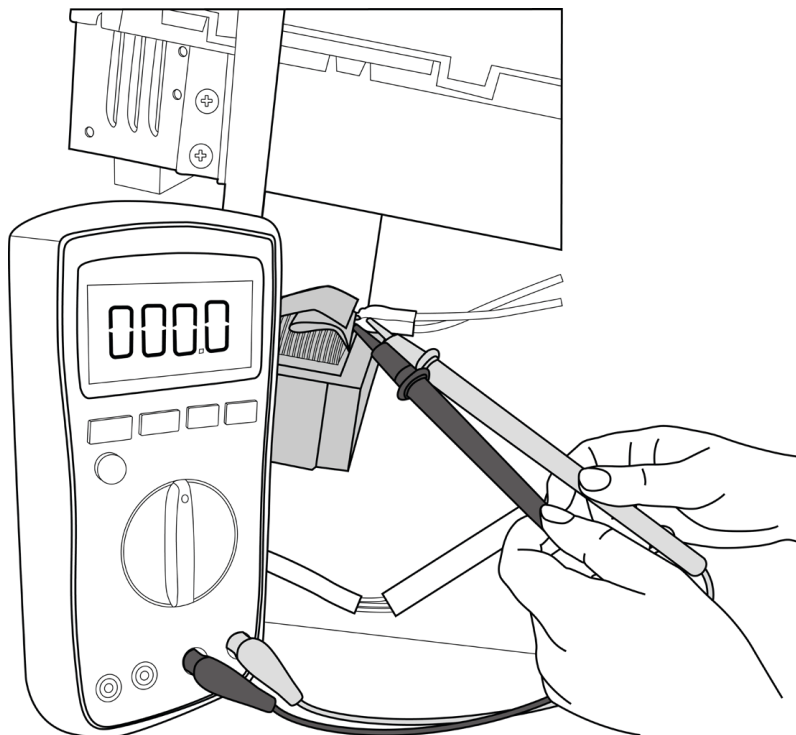
**EL 01 (Continued)****Remarks:**

- Use a multimeter to test the DC voltage between the 2 port (or S or L2 port) and 3 port (or N or S port) of the outdoor unit.
- The multimeter's red pin connects with the 2 port (or S or L2 port) while the black pin is for the 3 port (or N or S port). If the unit is running normally, the voltage moves alternately as positive values and negative values.
- If the outdoor unit malfunctions, the voltage remains a narrow positive value.
- If the indoor unit malfunctions, the voltage value will be fixed.

**Fig. 44 —Measure Voltage Between Ports**

Use a multimeter to test the reactor's resistance which does not connect with the capacitor.

- The normal value should be around zero ohm. Otherwise, the reactor has malfunctioned. Check the reactor to ensure it is not shorted to ground.

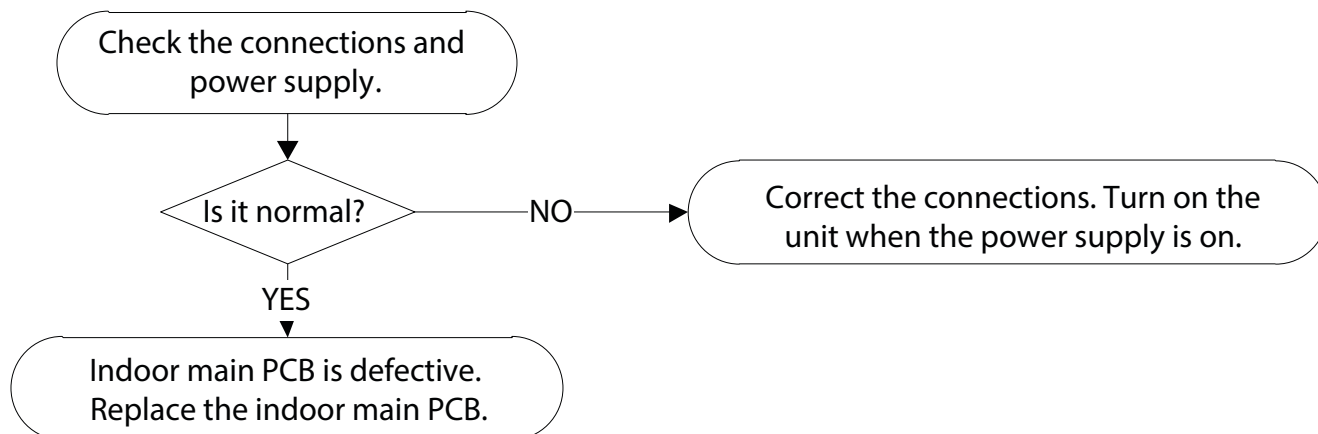
**Fig. 45 —Test Reactor Resistance**

## EH 02 Zero Crossing Detection Error Diagnosis and Solution

**Description:** When the PCB does not receive a zero crossing signal feedback for 4 minutes or the zero crossing signal time interval is abnormal.

**Recommended parts to repair:** Connection wires, Indoor main PCB

**Troubleshooting:**



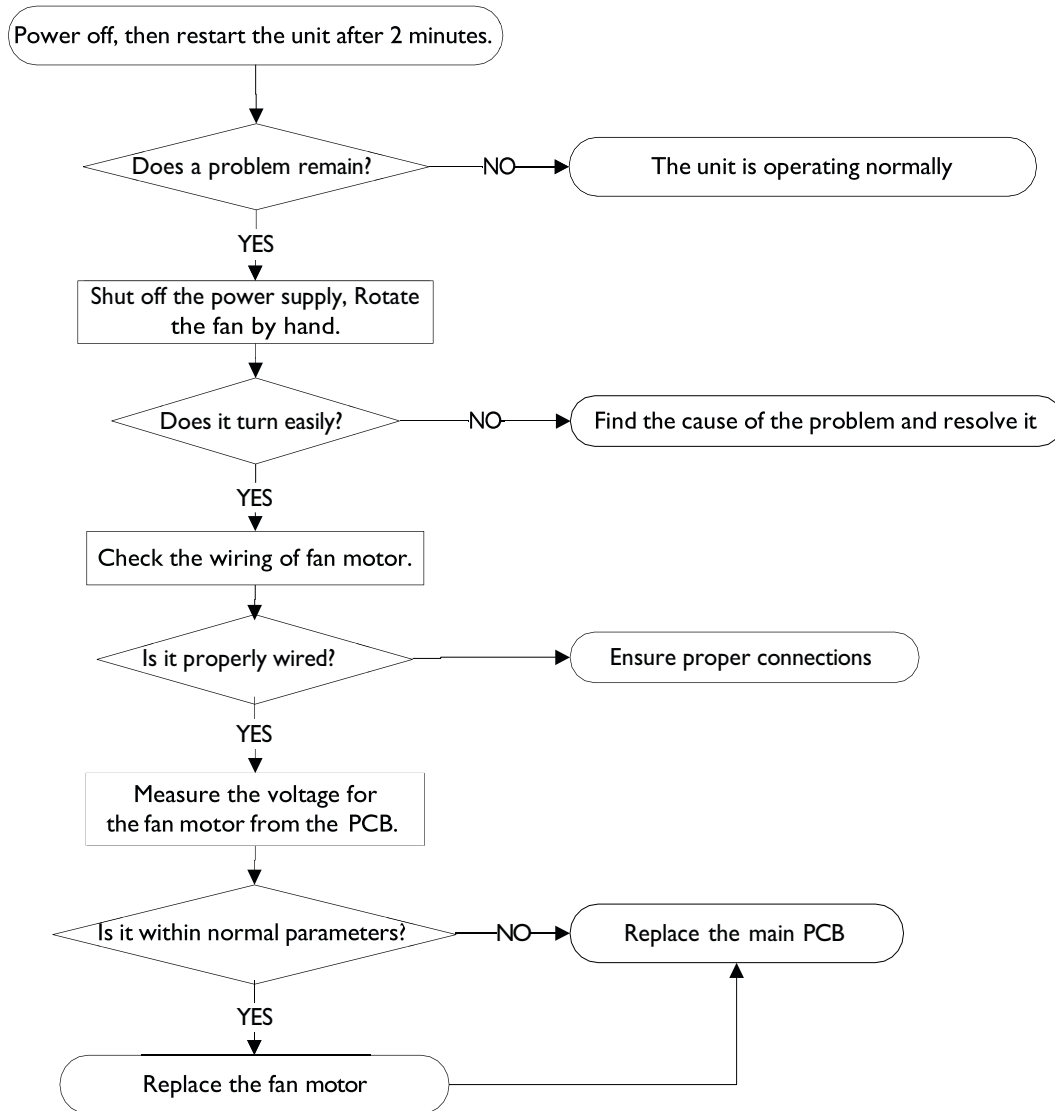
**NOTE:** A zero crossing detection error is only valid for a unit with an AC fan motor. For other models, this error does not apply.

**EH03 / EC 07/ EC 71(Fan Speed Is Operating Outside of Normal Range Diagnosis and Solution)**

**Description:** When indoor / outdoor fan speed keeps too low or too high for a certain time, the LED displays the failure code and the AC turns off.

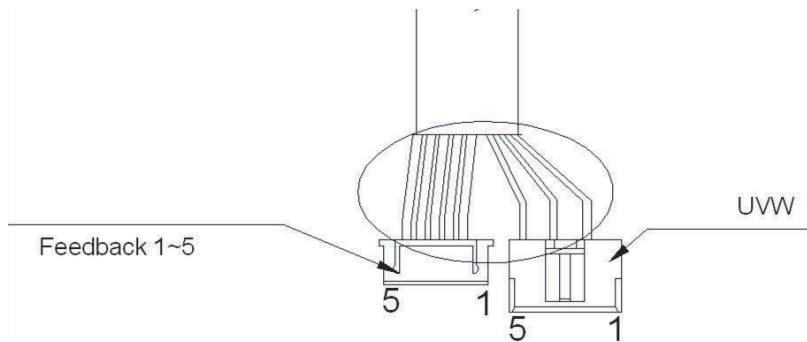
**Recommended parts to prepare:** Connection wires, Fan assembly, Fan motor, PCB

**Troubleshooting and repair:**



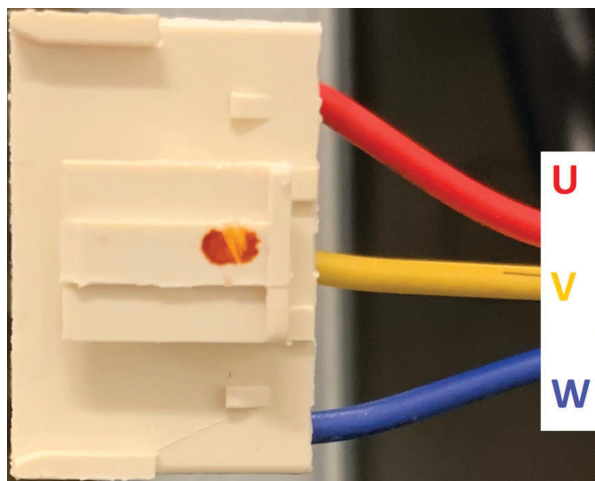
**Outdoor DC Fan Motor (DC motor that controls the chip on the PCB)**

1. Release the UVW connector. Measure the resistance of U-V, U-W, V-W. If the resistance is not equal to each other, the fan motor is faulty and must be replaced. Otherwise, proceed to step 2.
2. Power on the unit and when the unit is in standby, measure the pin4-5 voltage in the feedback signal connector. If the value is not 5V, change the PCB. Otherwise, proceed to step 3.
3. Rotate the fan by hand, measure the pin1-5, pin 2-5 and pin 3-5 voltage levels in the feedback signal connector. If any voltage is not in the positive voltage fluctuation, the fan motor is faulty and must be replaced.

**Fig. 46 —Outdoor DC Fan Motor (DC motor that controls the chip on the PCB)**

| NO.    | 1      | 2    | 3     | 4    | 5     |
|--------|--------|------|-------|------|-------|
| COLOR  | Orange | Grey | White | Pink | Black |
| SIGNAL | Hu     | Hv   | Hw    | Vcc  | GND   |

|        |     |      |        |
|--------|-----|------|--------|
| COLOR  | Red | Blue | Yellow |
| SIGNAL | W   | V    | U      |

**Fig. 47 —U-V-W Plug End**

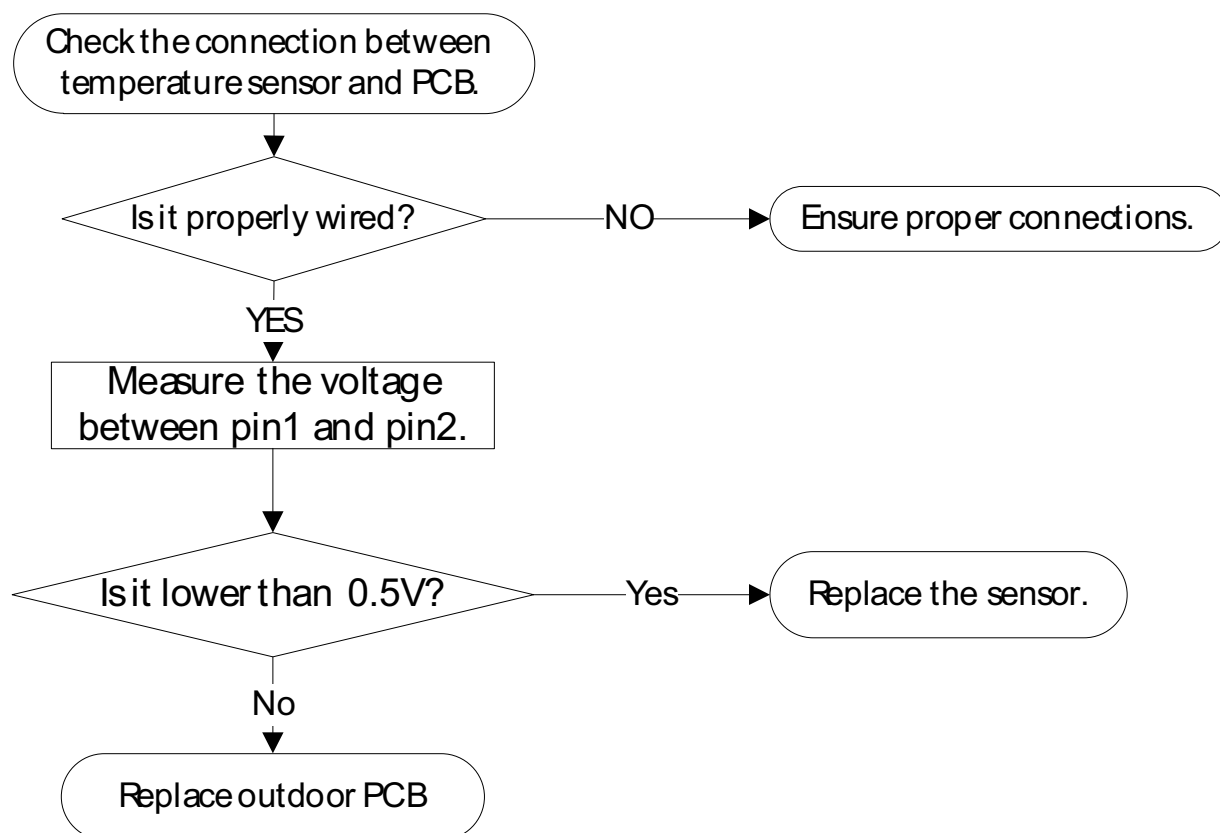
**EC 5C (Suction Transducer is in open circuit or has short circuited) (For crossover units) diagnosis and solution**

Description: If the sampling voltage is lower than 2V or higher than 254V, the LED displays the failure code.

Recommended parts to prepare:

- Connection wires
- Sensor
- Outdoor PCB

Troubleshooting and repair:



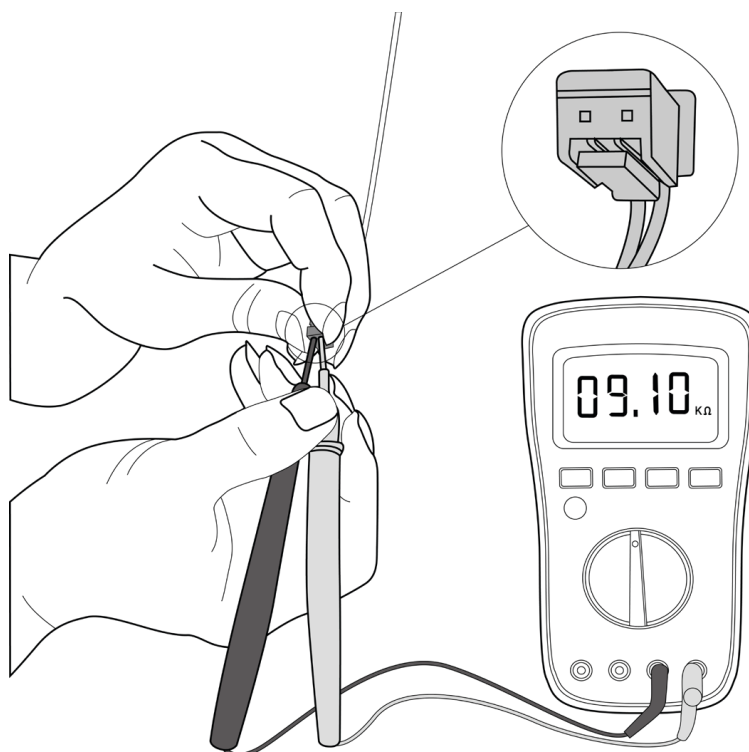
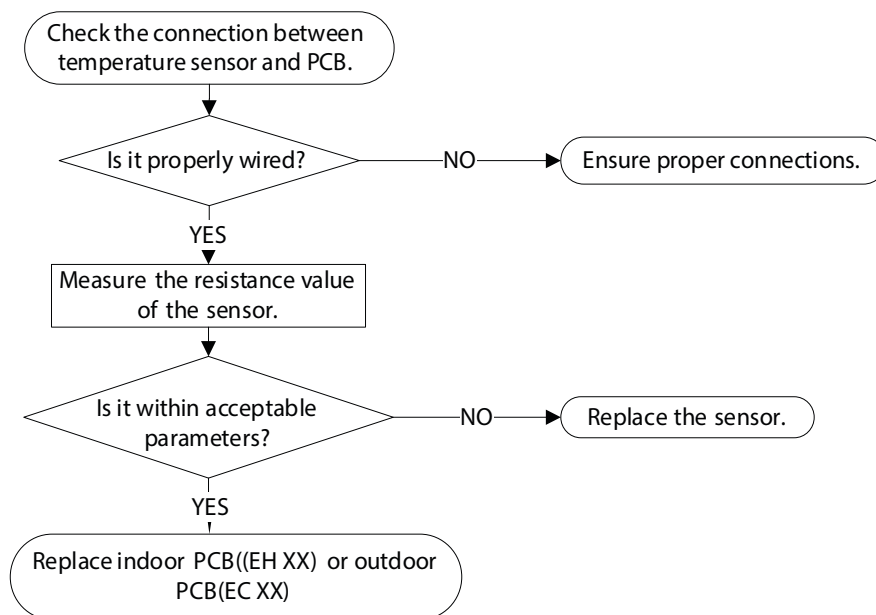
## EC 53/ EC 52/ EC 54/ EC 56/ EC 57/ EC 50/ EH 60/ EH 61(Open Circuit or Short Circuit of Temperature Sensor Diagnosis and Solution)

**Description:** If the sampling voltage is lower than 0.06V or higher than 4.94V, the LED displays the failure.

**Recommended parts to prepare:** Connection wires, Sensors, PCB

**Troubleshooting and repair:**

Refer to Appendix, page 94.



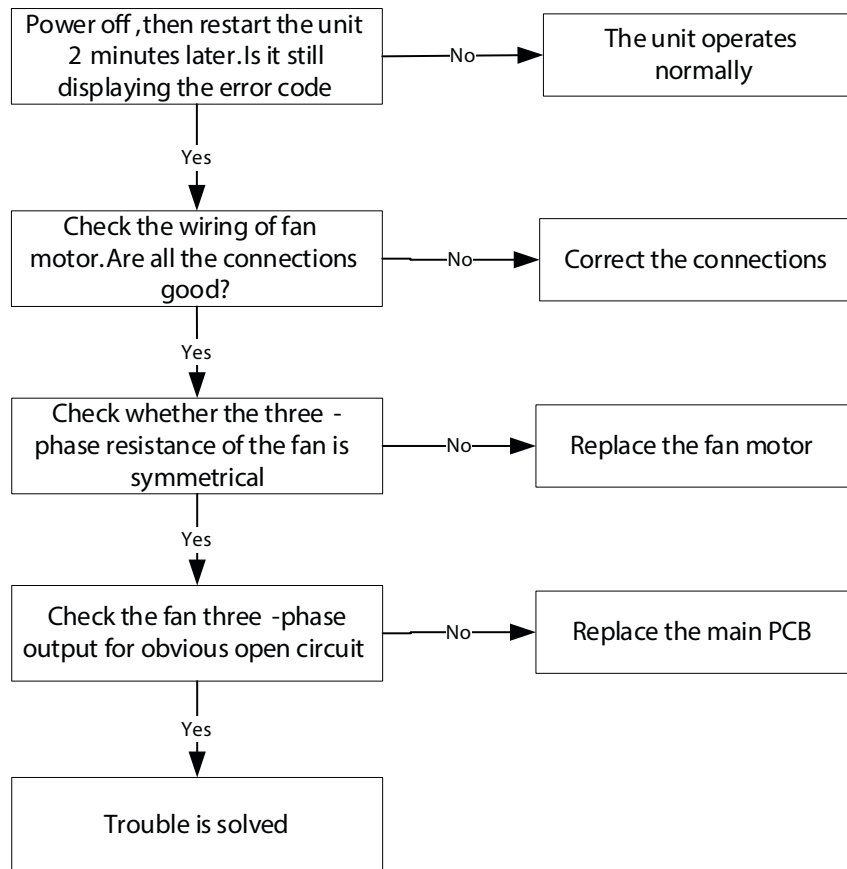
**NOTE:** This picture and the value are only for reference, actual appearance and value may vary.

## EC 72 Lack phase failure of ODU DC fan motor diagnosis and solution

**Description:** When the three-phase sampling current of the DC motor is abnormal, especially when the current of one or more phases is always small and almost 0, the LED displays the failure code.

**Recommended parts to prepare:** Connection wire, Fan motor, Outdoor PCB

**Troubleshooting and repair:**



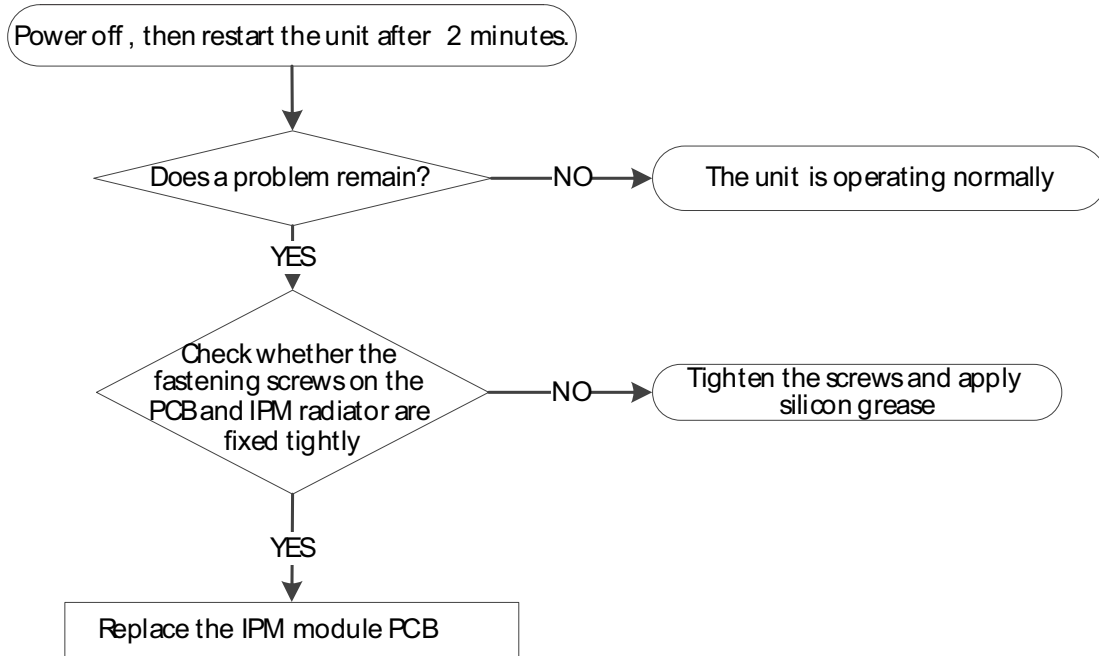
**EC 55 (ODU IPM module temperature sensor malfunction diagnosis and solution)**

**Description:** If the sampling voltage is 0V or 5V, the LED displays the failure code.

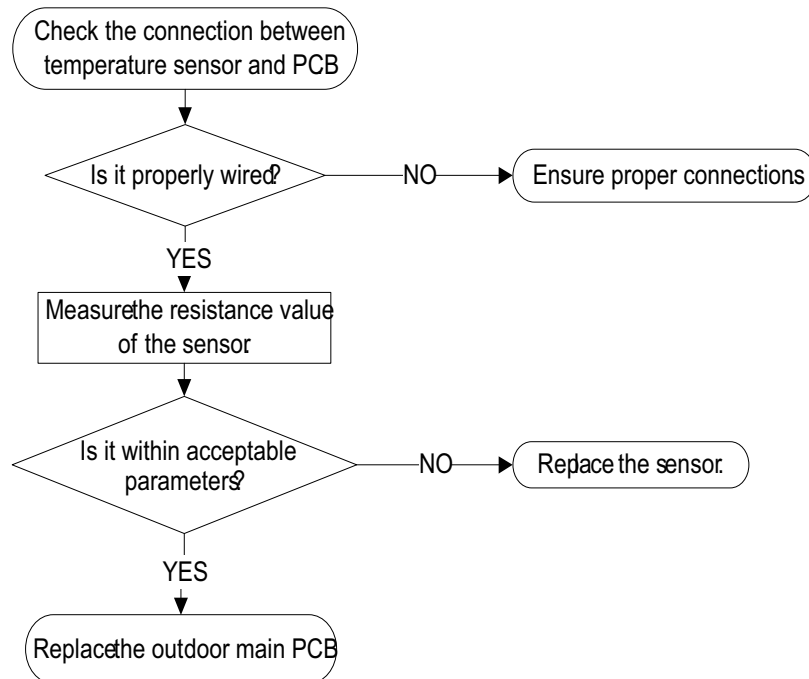
**Recommended parts to prepare:**

- IPM module PCB
- Connection wires
- Sensors
- Outdoor main PCB

**Troubleshooting and repair:** If the radiator has no sensor, follow the steps below to resolve:



If the radiator has a sensor(TH), follow the steps below:

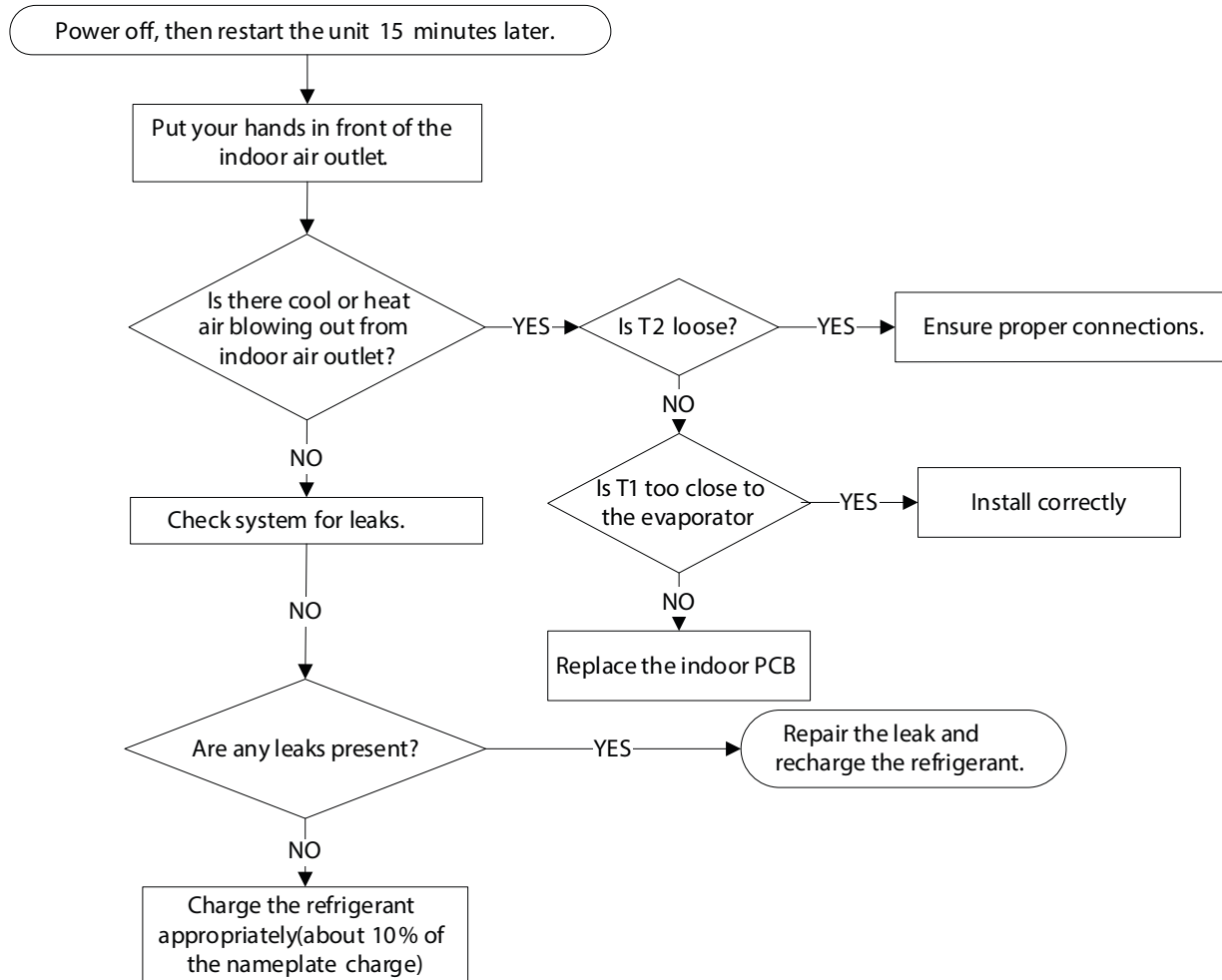


**EL 0C (System Lacks Refrigerant Diagnosis and Solution)**

**Description:** Judging the abnormality of the refrigeration system according to the number of compressor stops and the changes in operating parameters caused by excessive exhaust temperature.

**Recommended parts to prepare:** Indoor PCB, Additional refrigerant

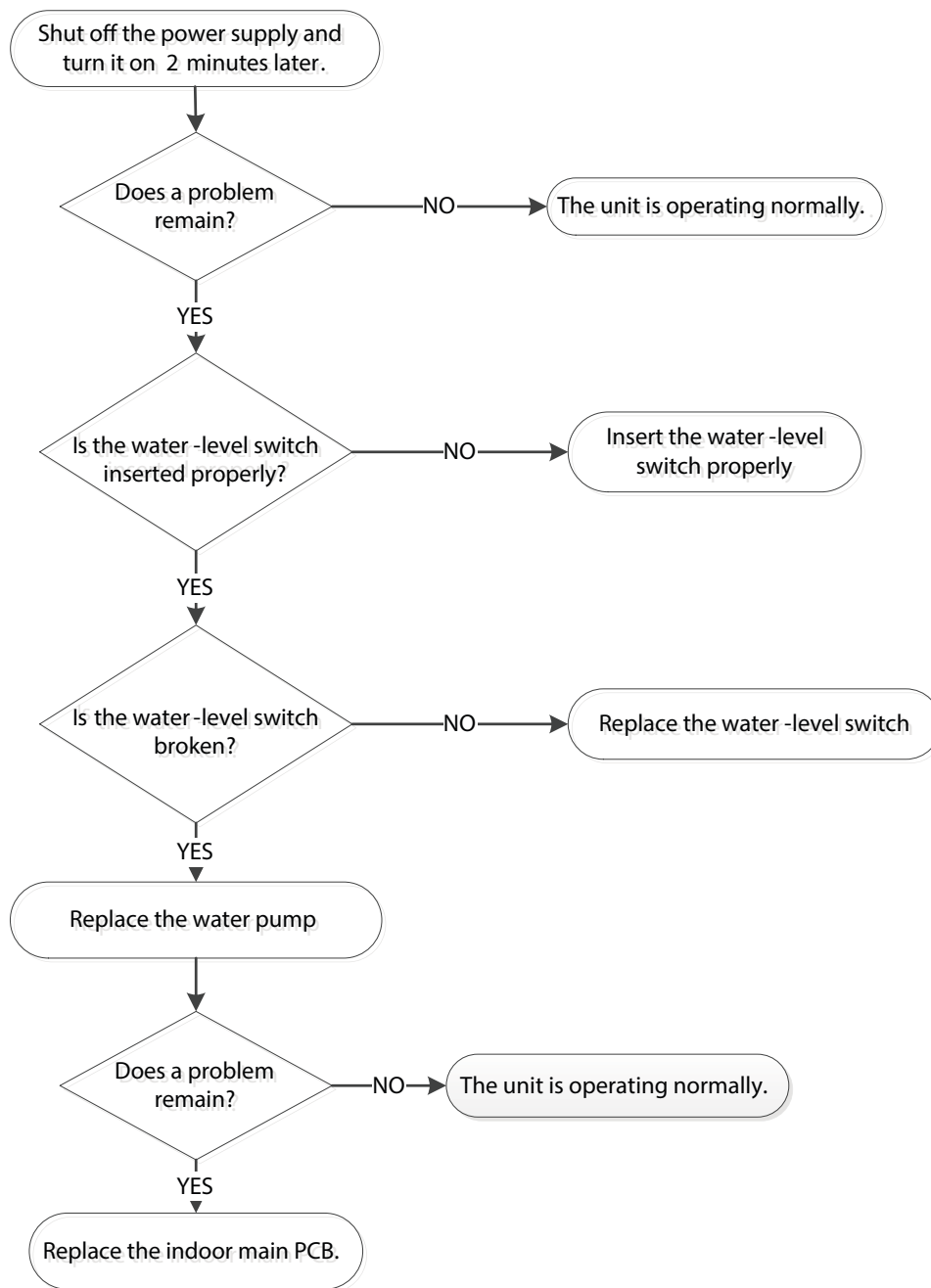
**Troubleshooting and repair:**



**EH 0E (Water-Level Alarm Malfunction Diagnosis and Solution)**

**Description:** If the sampling voltage is not 5V, the LED displays the failure code.

**Recommended parts to prepare:** Connection wires, Water-level switch, Water pump, Indoor PCB

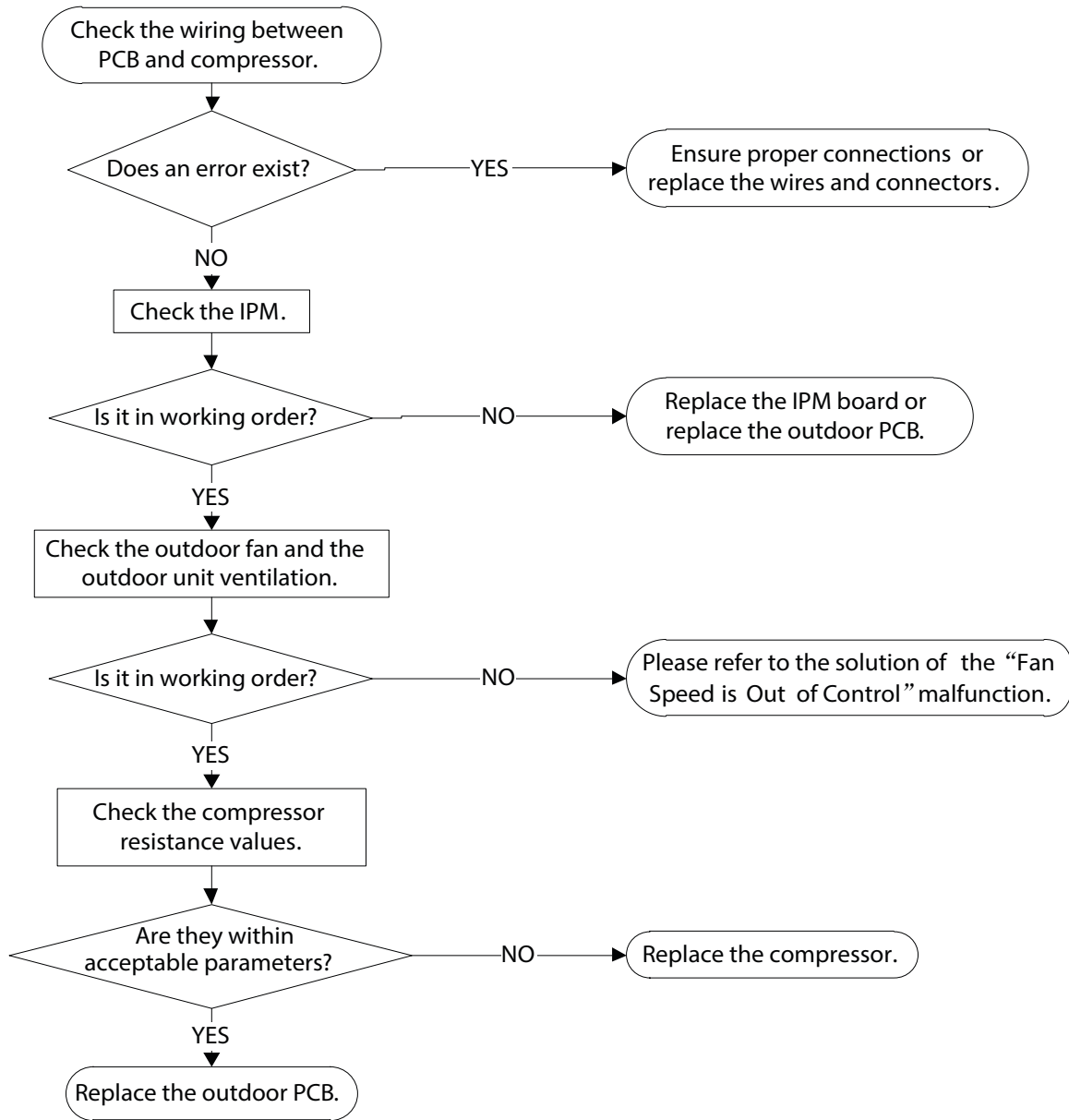


**PC 00 (ODU IPM Module Protection Diagnosis and Solution)**

**Description:** When the voltage signal the IPM sends to the compressor drive chip is abnormal, the display LED shows "PC 00" and the AC turn off.

**Recommended parts to prepare:** Connection wires, IPM module board, Outdoor fan assembly, Compressor, Outdoor PCB

**Troubleshooting and repair:**



**NOTE:** For certain models, the outdoor PCB can not be removed separately. In this case, the outdoor electric control box should be replaced as a whole.

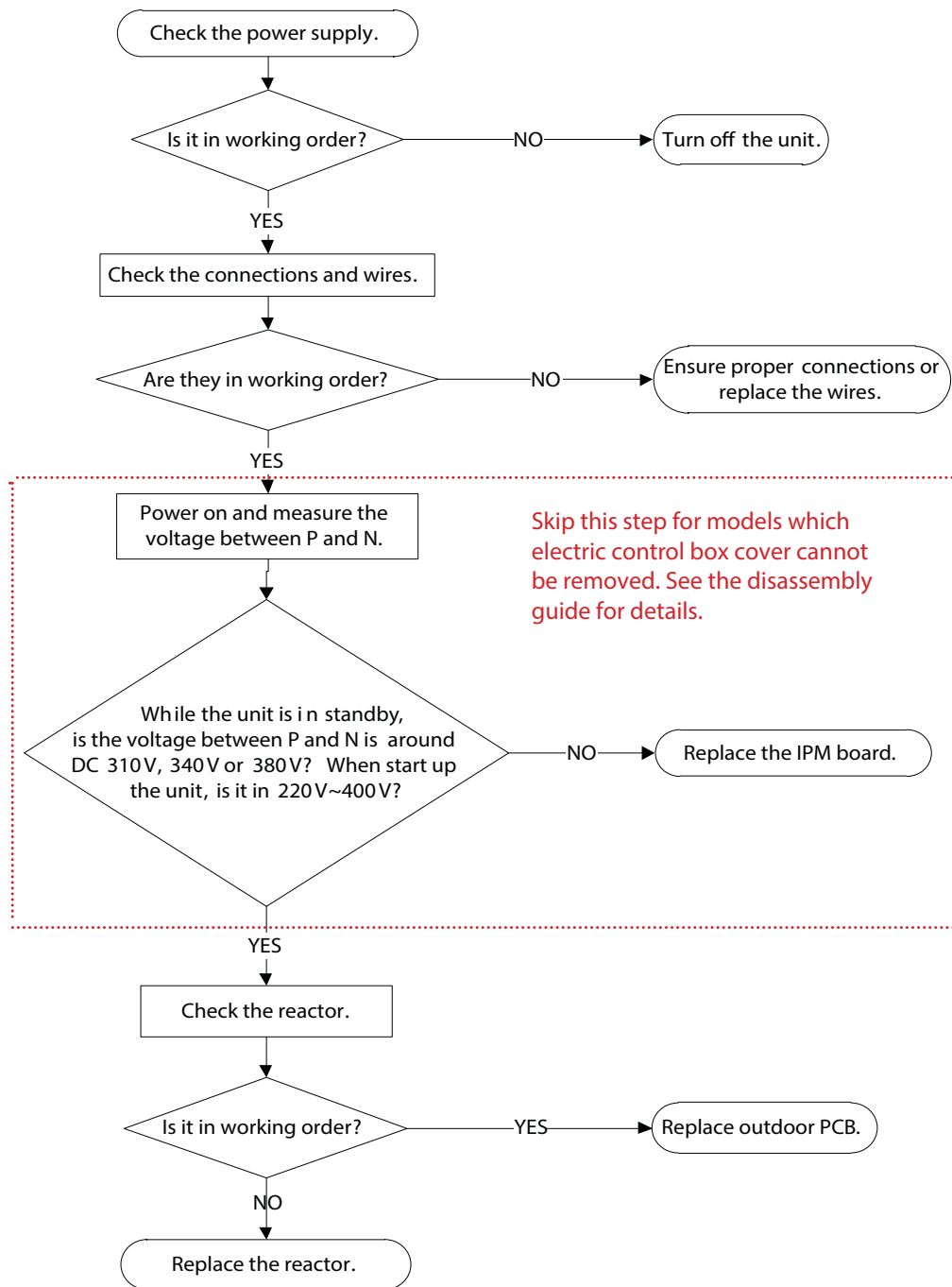
**PC 10 / PC 11 / PC 12 (ODU Voltage Protection Diagnosis and Solution)**

**PC 10 (Outdoor unit low AC voltage protection) / PC 11 (Outdoor unit main control board DC bus high voltage protection) / PC 12 (Outdoor unit main control board DC bus high voltage protection/341 MCE error) Diagnosis and Solution**

**Description:** Abnormal increases or decreases in voltage are detected by checking the specified voltage detection circuit.

**Recommended parts to prepare:** Power supply wires, IPM module board, PCB, Reactor

**Troubleshooting and repair:**



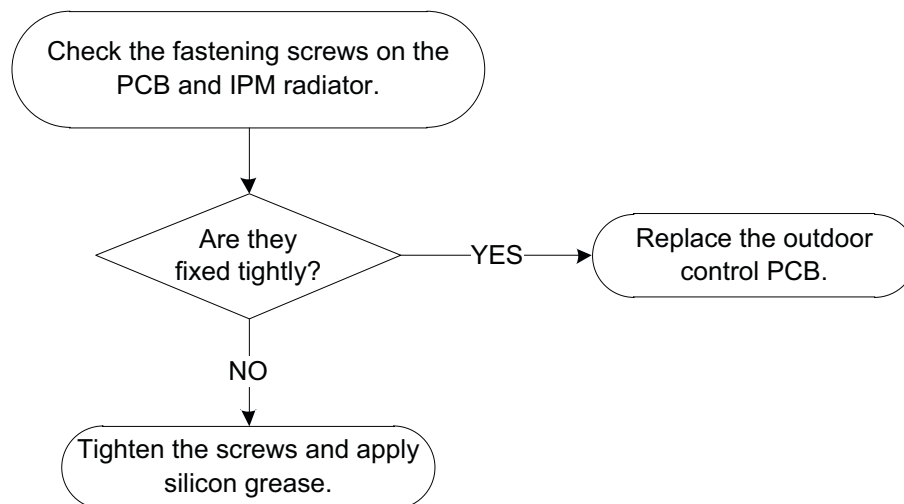
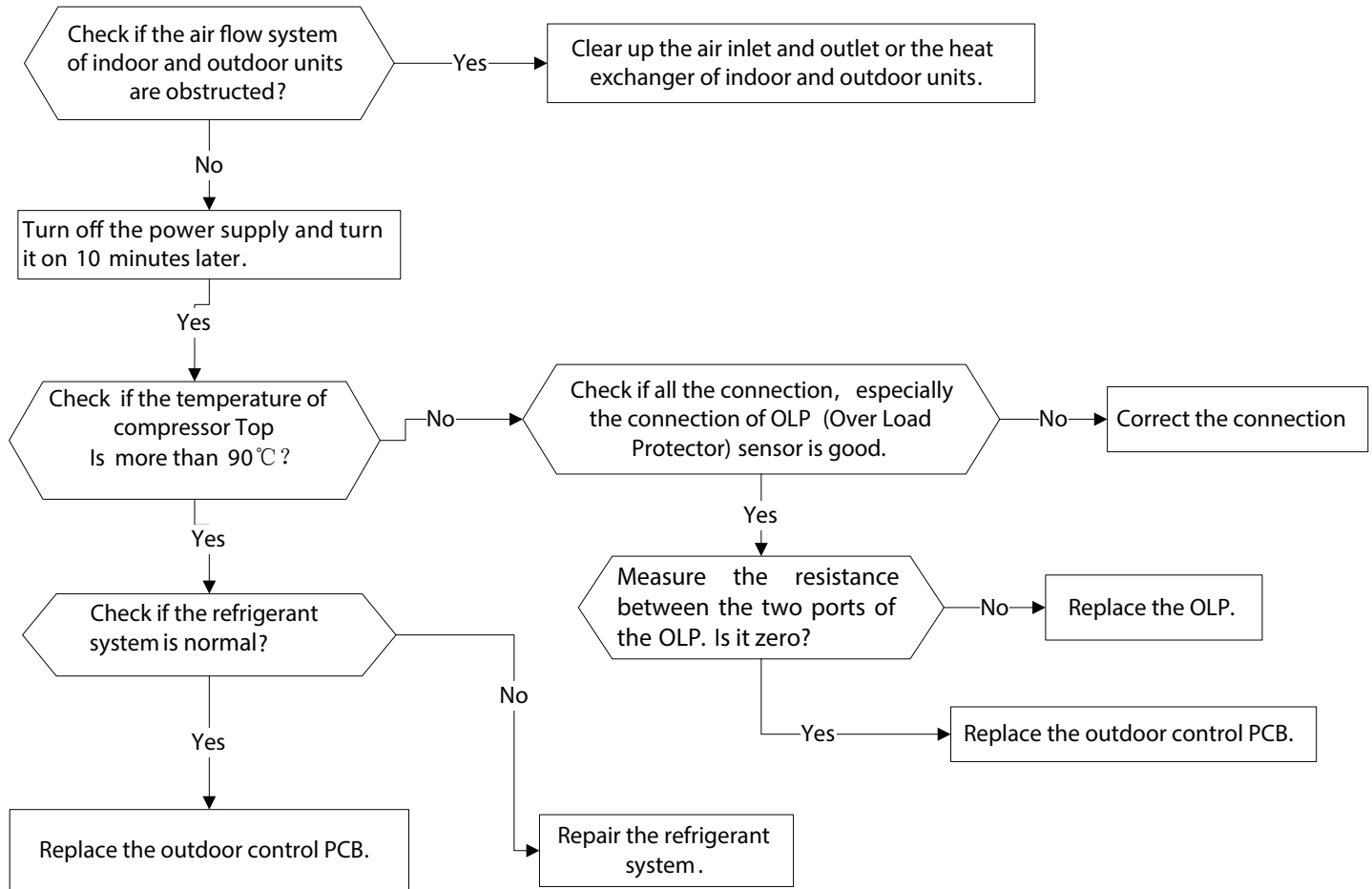
**NOTE:** For certain models, the outdoor PCB cannot be removed separately. In this case, the outdoor electric control box should be replaced as a whole.

**PC 02 / LC 06 (Compressor Top (or IPM) Temp. Protection Diagnosis and Solution)**

**Description:** For some models with overload protection, If the sampling voltage is not 5V, the LED will display the failure. If the temperature of IPM module is higher than a certain value, the LED displays the failure code.

**Recommended parts to prepare:** Connection wires, Outdoor PCB, IPM module board, High pressure protector, System blockages

**Troubleshooting and repair:**

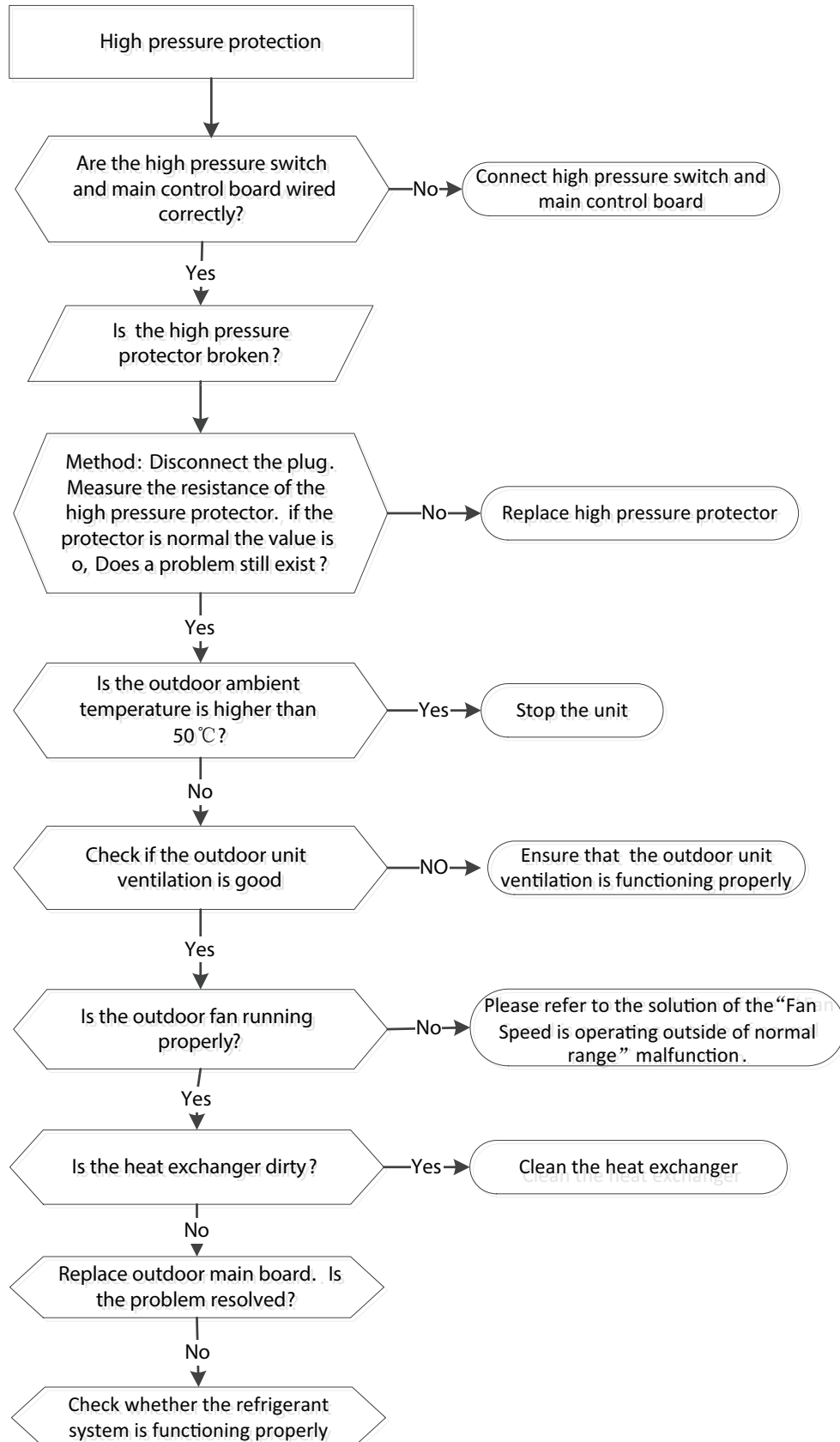


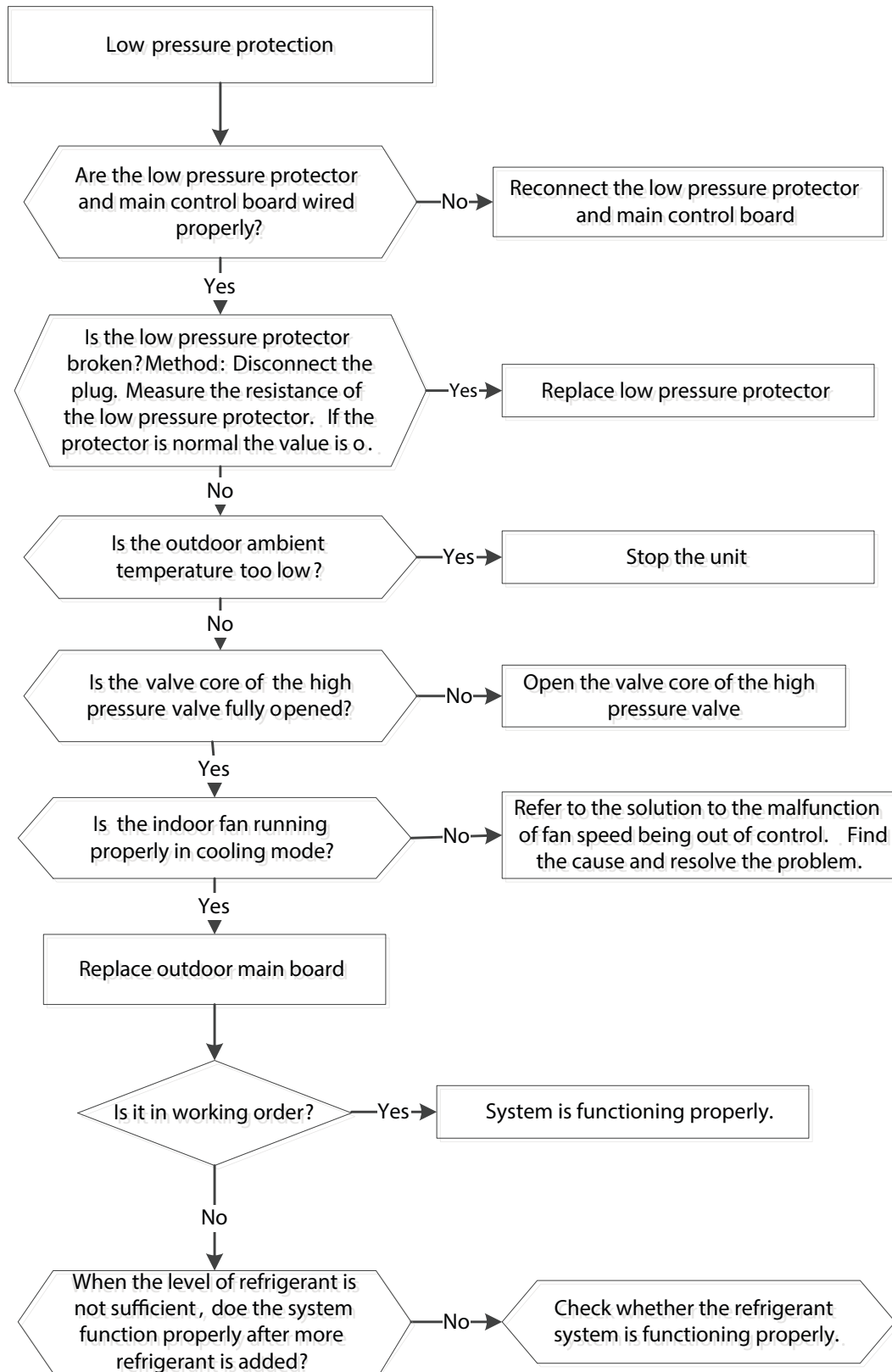
## PC 03 Pressure Protection (low or high pressure), PC 30 High Pressure Protection, PC 31 Low Pressure Protection (Diagnosis and Solution)

**Description:** Outdoor pressure switch cut off the system because high pressure is higher than 4.4 MPa or outdoor pressure switch cut off the system because low pressure is lower than 0.13 MPa, the LED displays the failure code.

**Recommended parts to prepare:** Connection wires, Pressure switch, Outdoor fan, Outdoor main PCB, Refrigerant

**Troubleshooting and repair:**



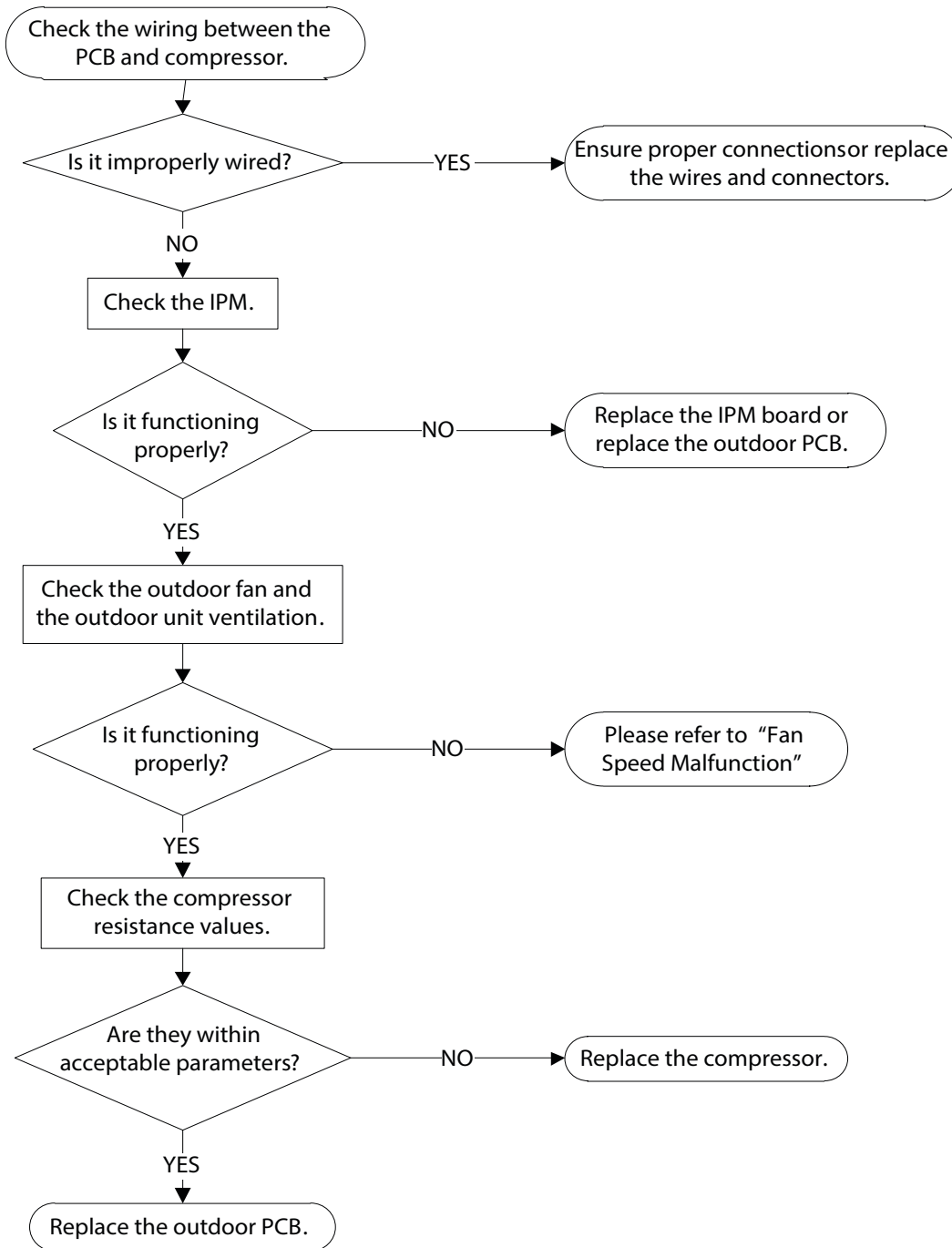


## PC 04 (Inverter Compressor Drive Error Diagnosis and Solution)

**Description:** An abnormal inverter compressor drive is detected by a special detection circuit, including communication signal detection, voltage detection, compressor rotation speed signal detection and so on.

**Recommended parts to prepare:** Connection wires, IPM module board, Outdoor fan assembly, Compressor, Outdoor PCB

**Troubleshooting and repair:**

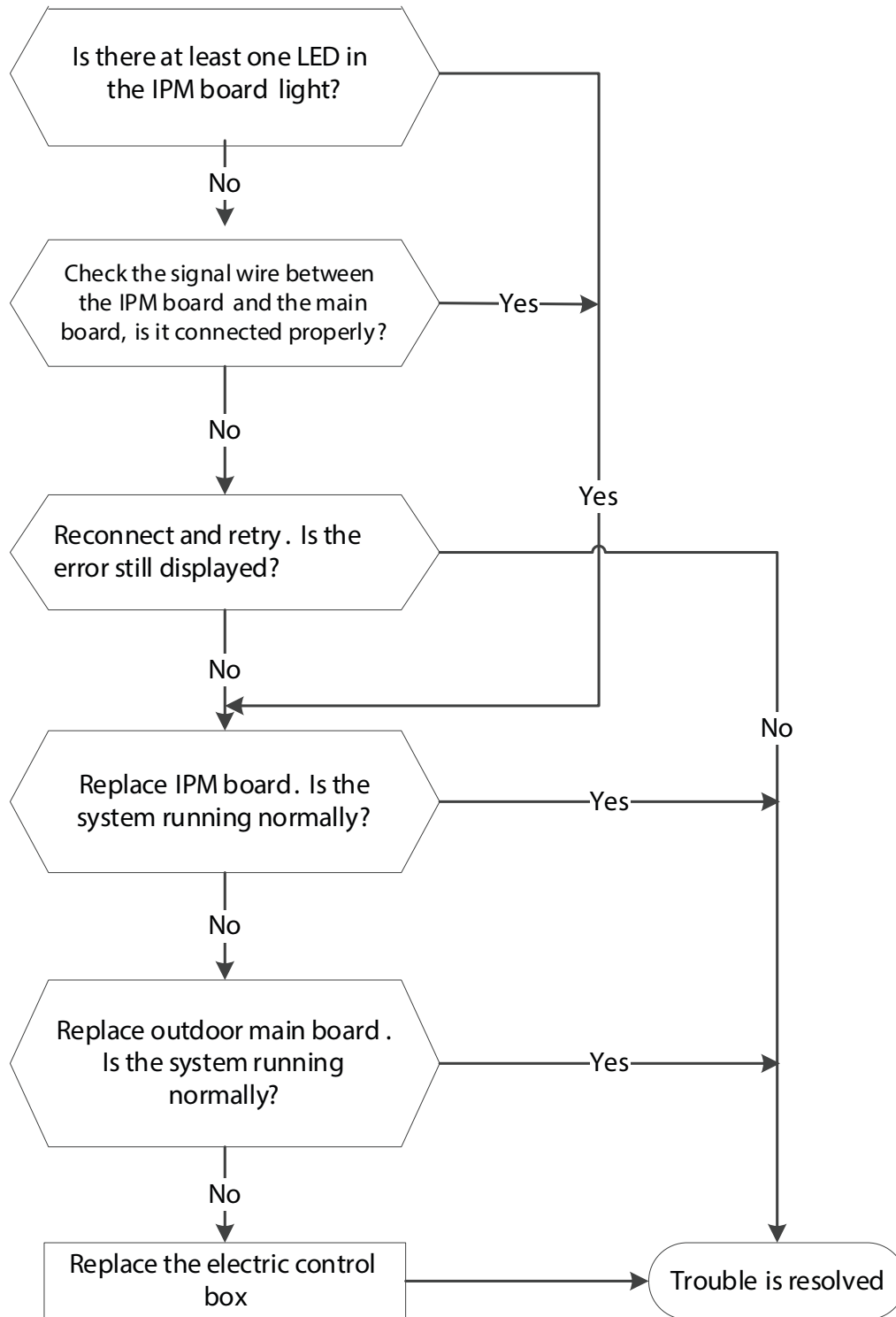


## PC 40 (Communication error between ODU main chip and compressor driven chip diagnosis and solution)

**Description:** The main PCB cannot detect the IPM board.

**Recommended parts to prepare:** Connection wires, Outdoor PCB, IPM module board, Electric control box

**Troubleshooting and repair:**

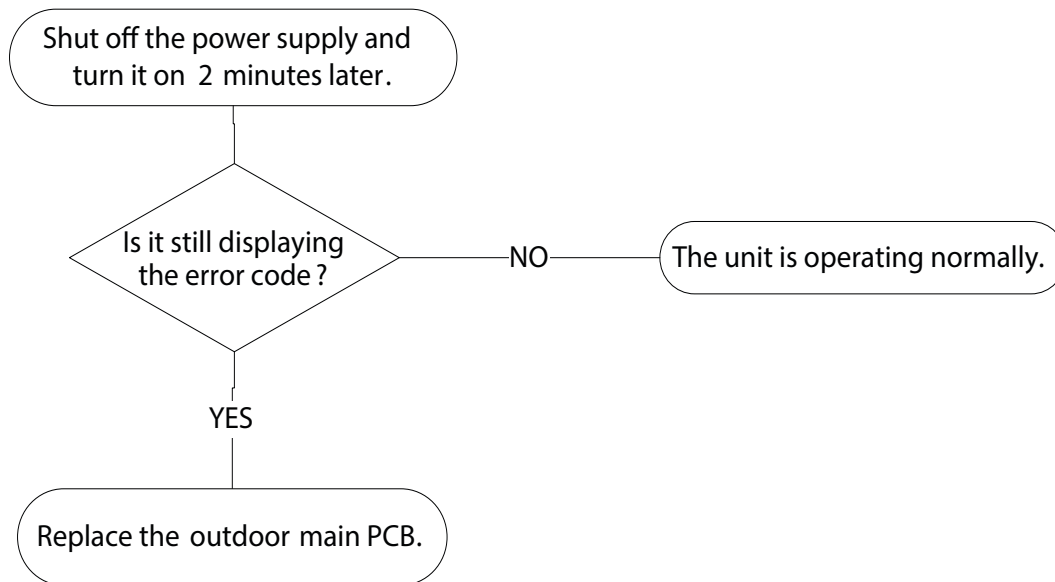


## PC 41 (Outdoor compressor current sampling circuit failure diagnosis and solution)

**Description:** Three-phase sampling offset voltage error, the static bias voltage is normally 2.5V.

**Recommended parts to prepare:** Outdoor main PCB

**Troubleshooting and repair:**

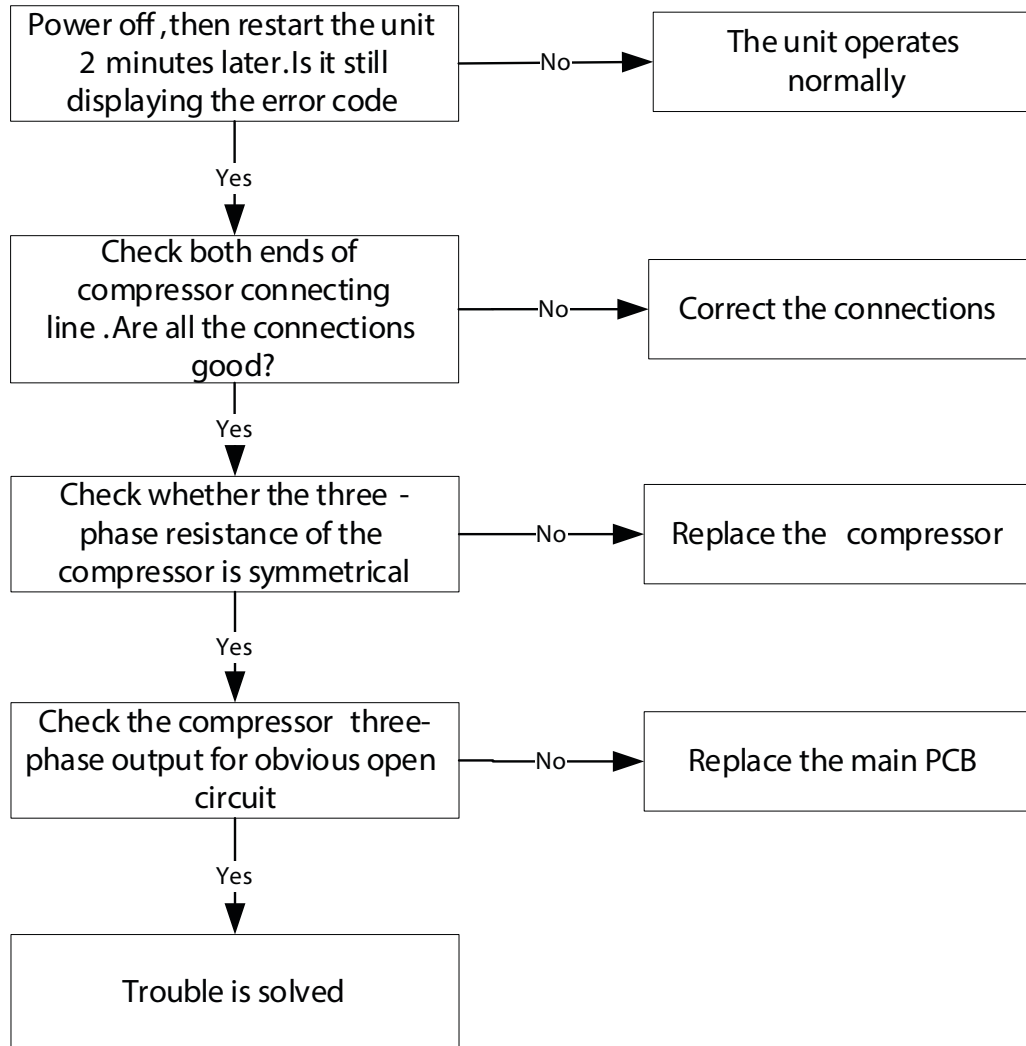


**PC 43 (ODU compressor lack phase protection diagnosis and solution)**

**Description:** When the three-phase sampling current of the compressor is abnormal, especially when the current of one or more phases is always small and almost 0, the LED displays the failure code.

**Recommended parts to prepare:** Connection wire, Compressor, Outdoor PCB

**Troubleshooting and repair:**

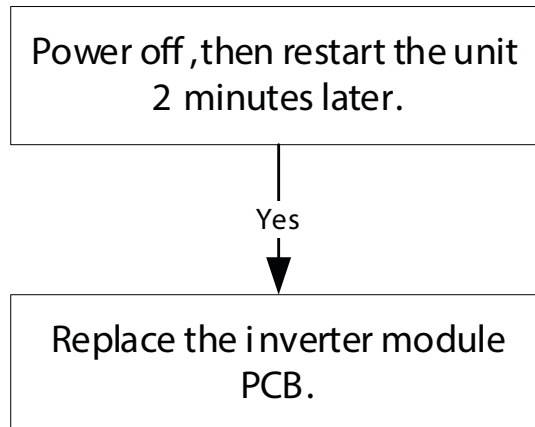


### PC 45 (ODU IR chip drive failure diagnosis and solution)

**Description:** When the IR chip detects its own parameter error, the LED displays the failure code when power on.

**Recommended parts to prepare:** Inverter module PCB.

**Troubleshooting and repair:**

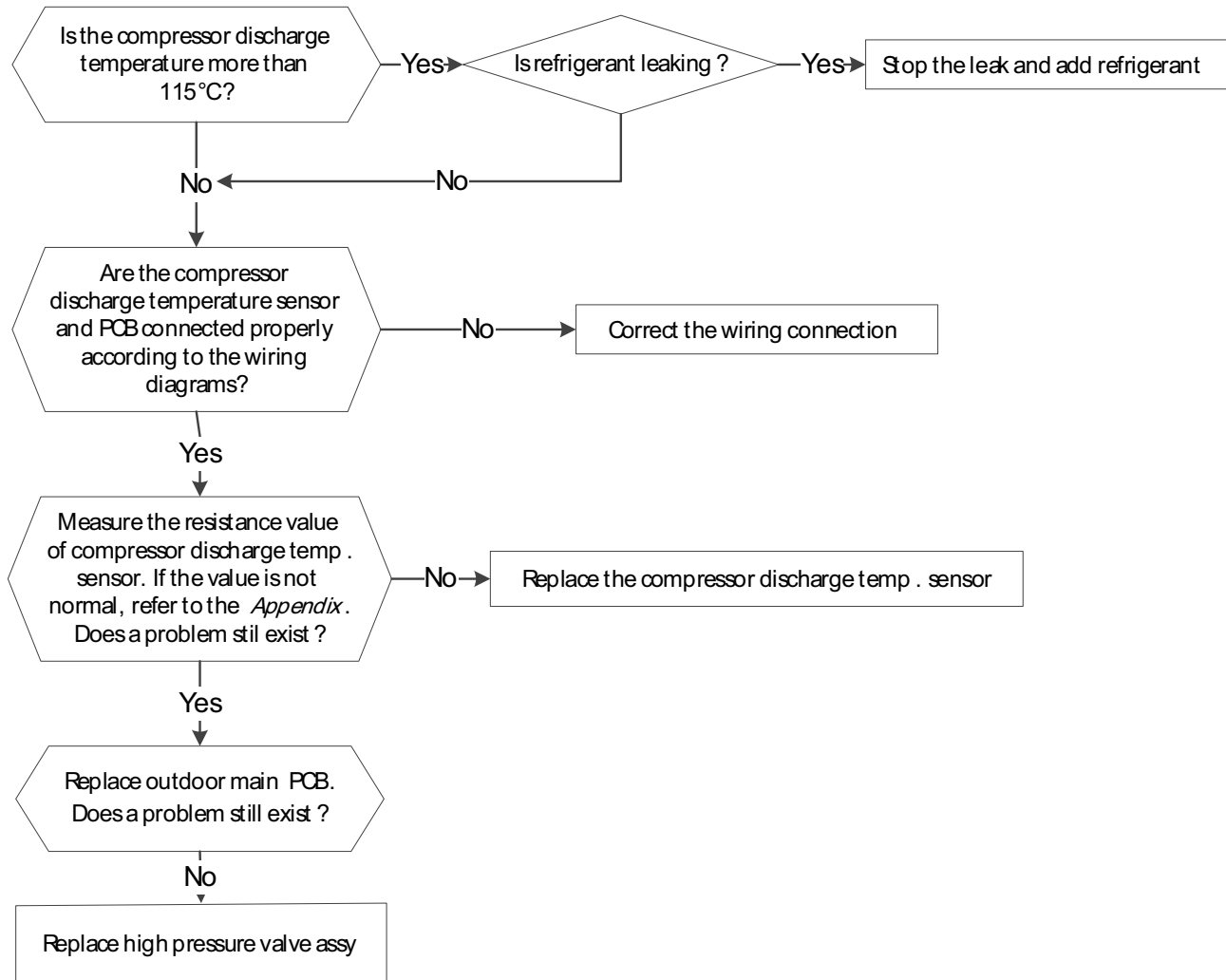


**PC 06 (Discharge temperature protection of compressor diagnosis and solution)**

**Description:** When the compressor discharge temperature (TP) is more than 115°C for 10 seconds, the compressor ceases operation and does not restart until TP is less than 90°C

**Recommended parts to prepare:** Connection wires, Outdoor PCB, Discharge temperature sensor, Refrigerant

**Troubleshooting and repair:**

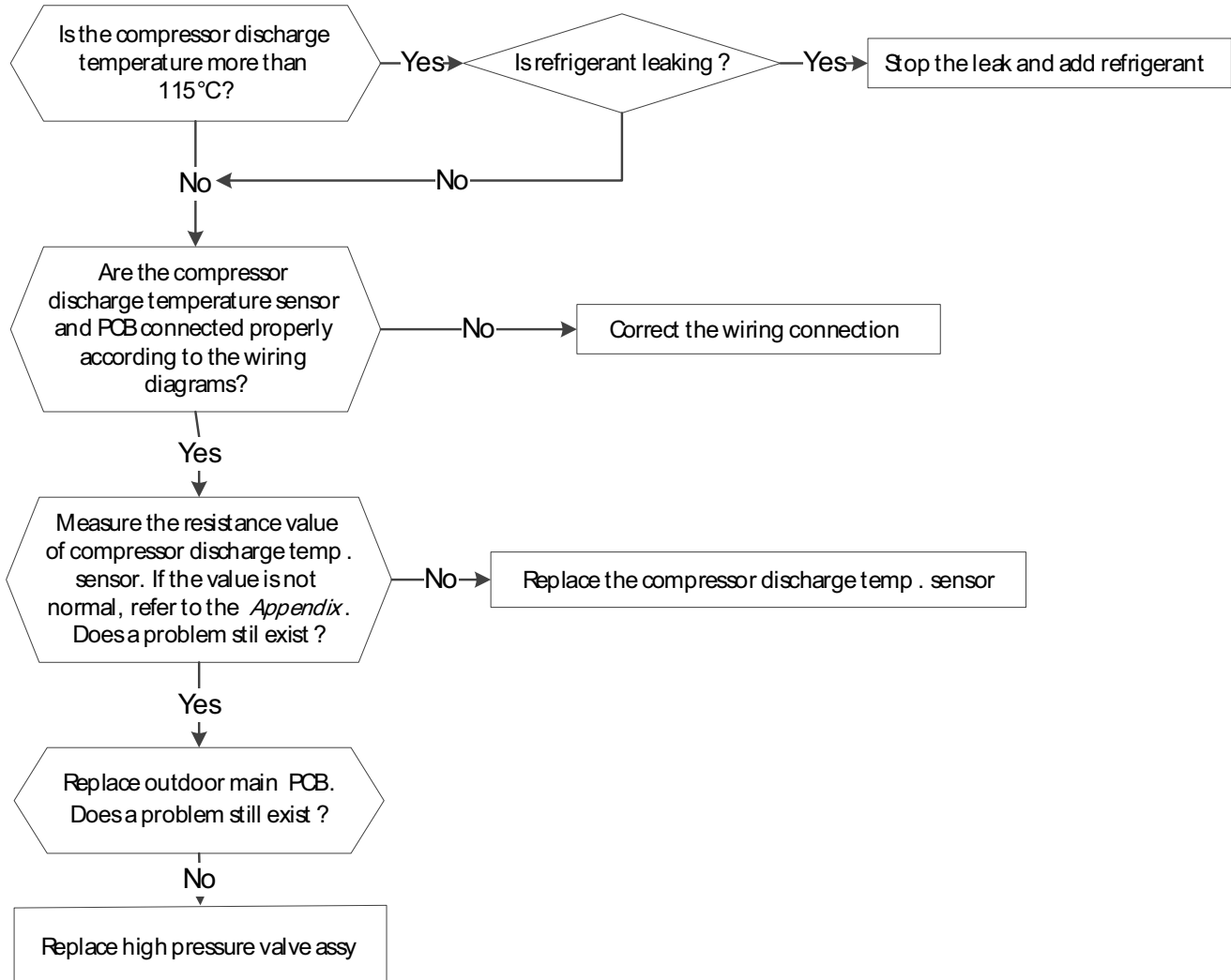


**PC 08 (Current overload protection)/ PC 42 (Compressor start failure of outdoor unit)/ PC 44 (ODU zero speed protection) / PC 46 (Compressor speed has been out of control)/ PC 49 (Compressor overcurrent failure)**

**Description:** An abnormal current rise is detected by checking the specified current detection circuit.

**Recommended parts to prepare:** Outdoor PCB, Connection wires, Bridge rectifier, PFC circuit or reactor, Refrigeration piping system, Pressure switch, Outdoor fan, PM module board

**Troubleshooting and repair:**

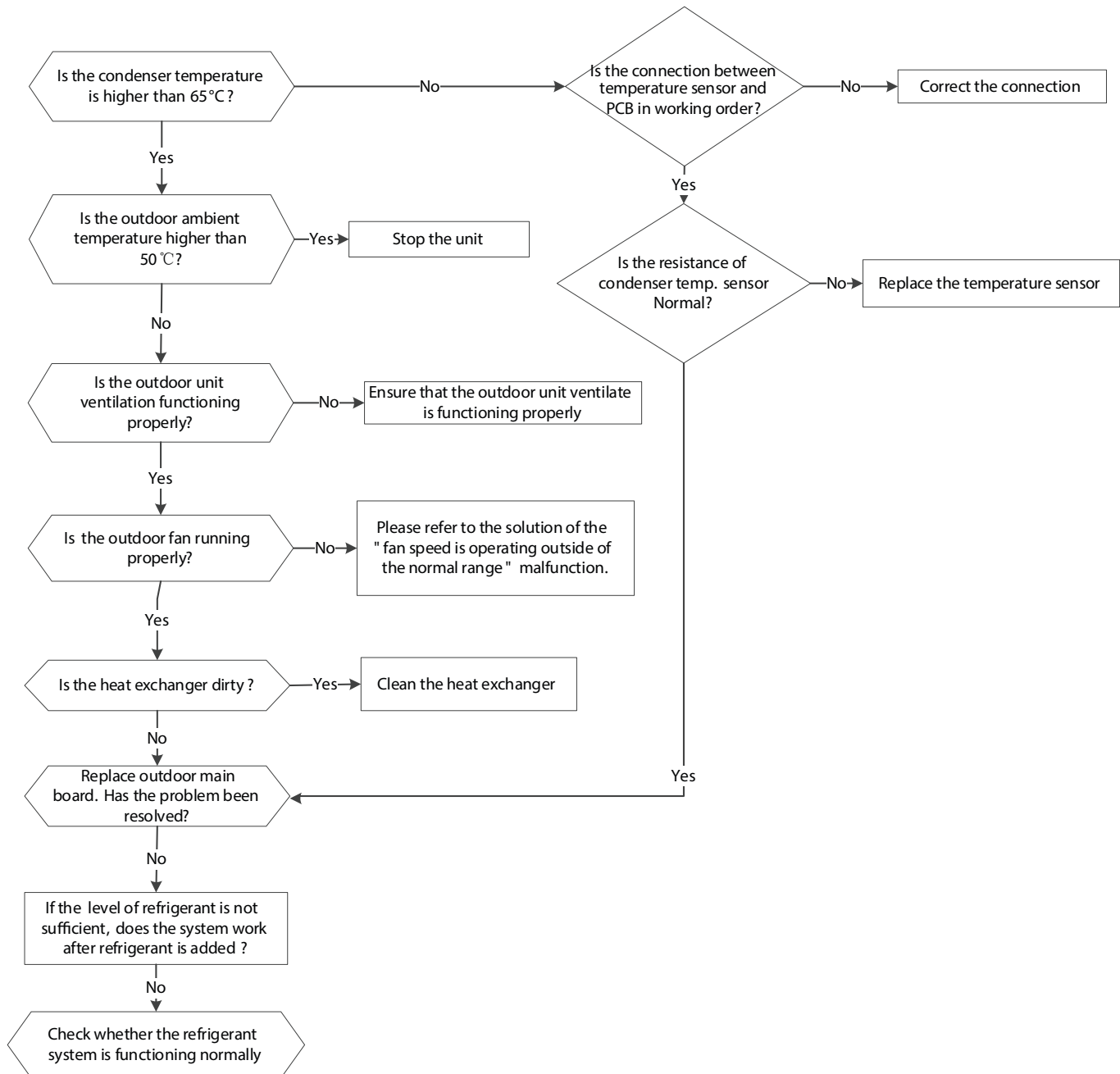


## PC 0A (High temperature protection of condenser diagnosis and solution)

**Description:** The unit will stop when condenser temperature is higher than 65°C, and runs again when it is less than 52°C

**Recommended parts to prepare:** Connection wires, Condenser temperature sensor, Outdoor fan, Outdoor main PCB, Refrigerant

**Troubleshooting and repair:**

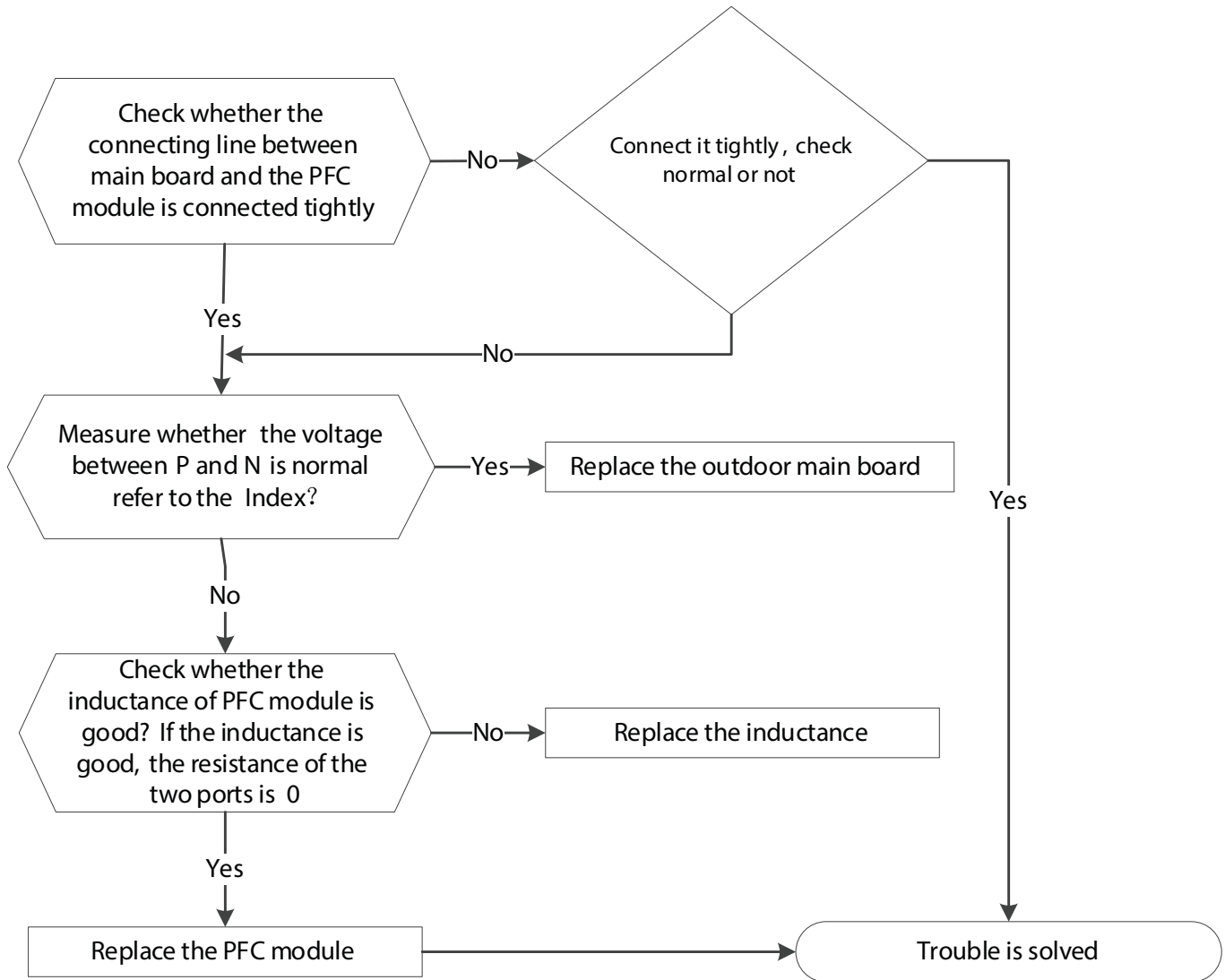


**PC 0F (PFC module protection diagnosis and solution)**

**Description:** Outdoor PCB detects PFC signal is low voltage or DC voltage is lower than 340V for 6s when quick check.

**Recommended parts to prepare:** Connection wires Outdoor PCB, Inductance, PFC circuit or IPM module board

**Troubleshooting and repair:**

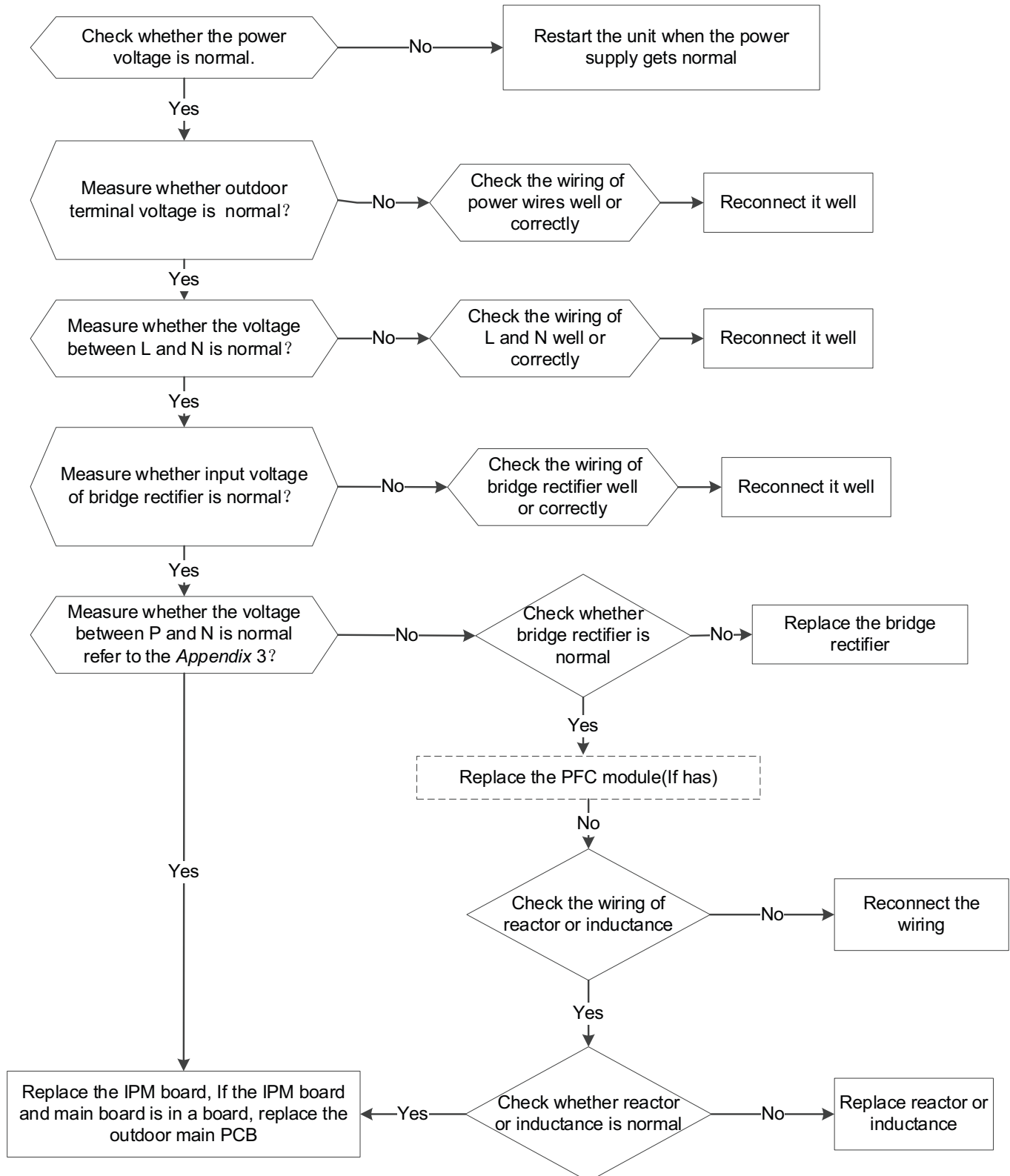


## PC 10 (ODU low AC voltage protection)/ PC 11 (ODU main control board DC bus high voltage protection)/ PC 12 (ODU main control board DC bus high voltage protection /341 MCE error) Diagnosis and Solution

**Description:** Abnormal increases or decreases in voltage are detected by checking the specified voltage detection circuit.

**Recommended parts to prepare:** Power supply wires, IPM module board, Outdoor PCB, Bridge rectifier, PFC circuit or reactor

**Troubleshooting and repair:**



## PC 0L (Low Ambient Temperature Protection)

**Description:** It is a protection function. When compressor is off, outdoor ambient temperature(T4) is lower than -35oC. for 10s, the AC will stop and display the failure code.

When compressor is on, outdoor ambient temperature(T4) is lower than -40oC.for 10s, the AC will stop and display the failure code.

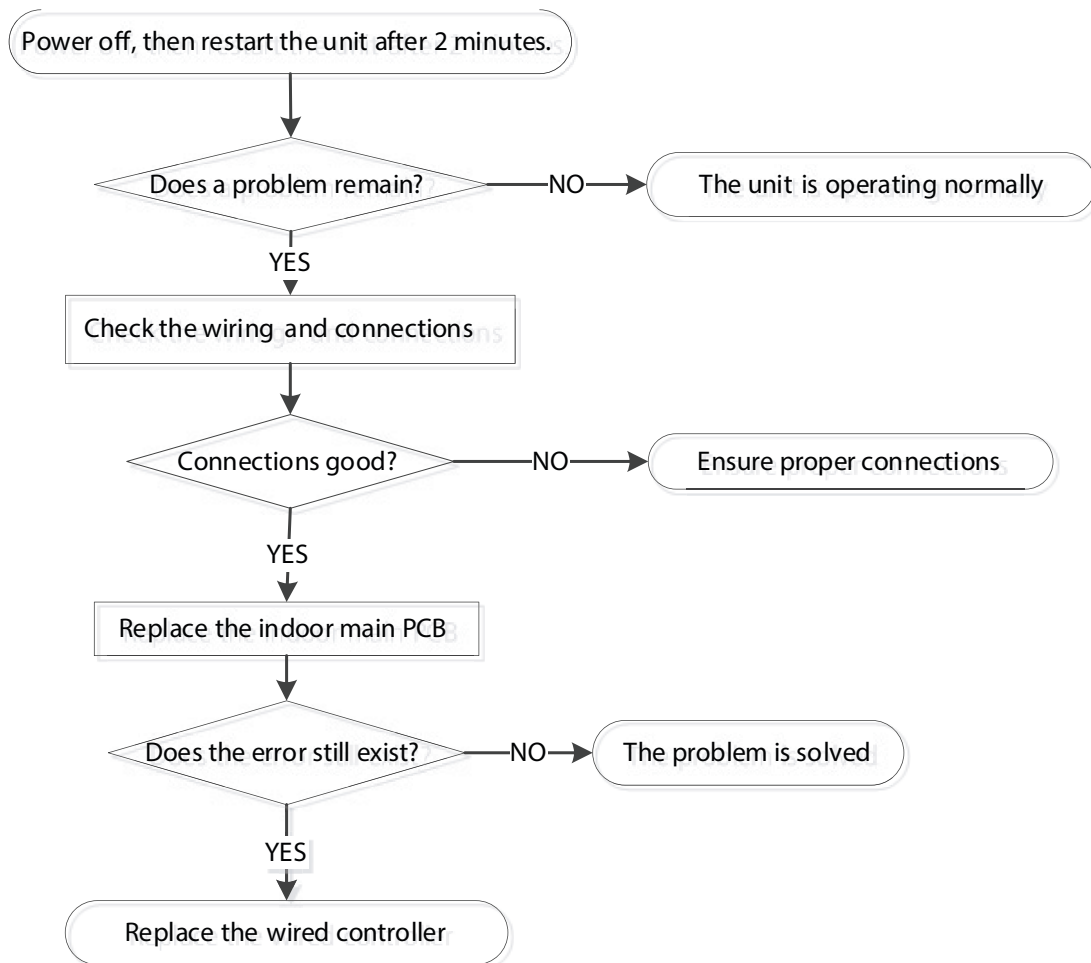
When outdoor ambient temperature(T4) is no lower than -32oC.for 10s, the unit will exit protection

## EH b3 (Communication Malfunction Between Wire and Master Control) Diagnosis and Solution

**Description:** If Indoor PCB does not receive feedback from wired controller, the error displays on the wired controller

**Recommended parts to prepare:** Connection wires, Indoor PCB, Wired controller

**Troubleshooting and repair:**



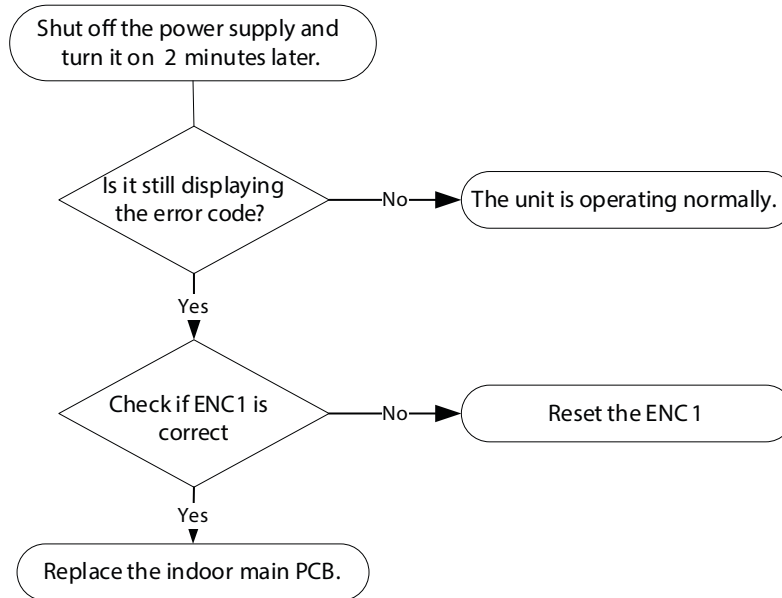
## EH bA (Communication Malfunction Between Indoor Unit and External Fan Module)/ EH 3A(External Fan DC Bus Voltage Is Too Low Protection)/ EH 3b (External Fan DC Bus Voltage is Too High) Fault)

### Diagnosis and Solution

**Description:** Indoor unit does not receive the feedback from external fan module during 150 seconds. or Indoor unit receives abnormal increases or decreases in voltage from external fan module.

**Recommended parts to prepare:** Indoor main PCB

**Troubleshooting and repair:**

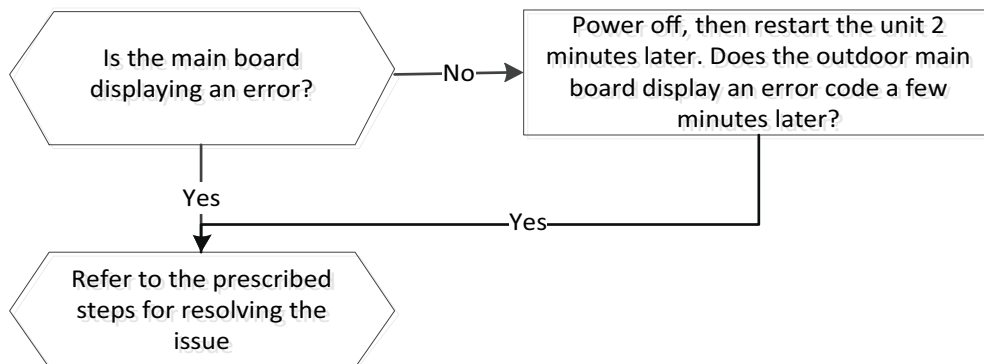


## EC 0d (ODU Malfunction Diagnosis and Solution)

**Description:** The indoor unit detects the outdoor unit in error.

**Recommended parts to prepare:** Outdoor unit

**Troubleshooting and repair:**

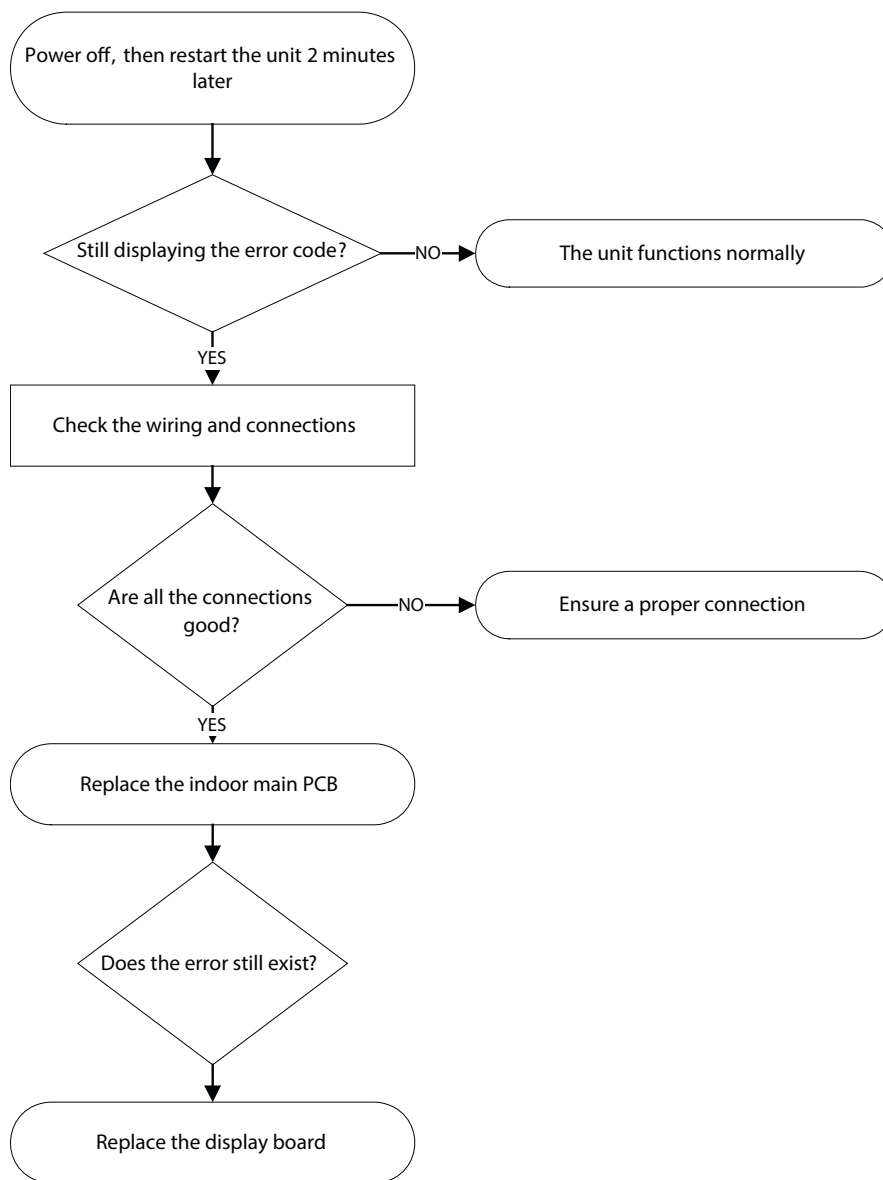


**EH 06 (IDU Main Control Board and Display Board Communication Error Diagnosis and Solution)**

**Description:** Indoor PCB does not receive feedback from the display board.

**Recommended parts to prepare:** Communication wire, Indoor PCB, Display board

**Troubleshooting and repair:**

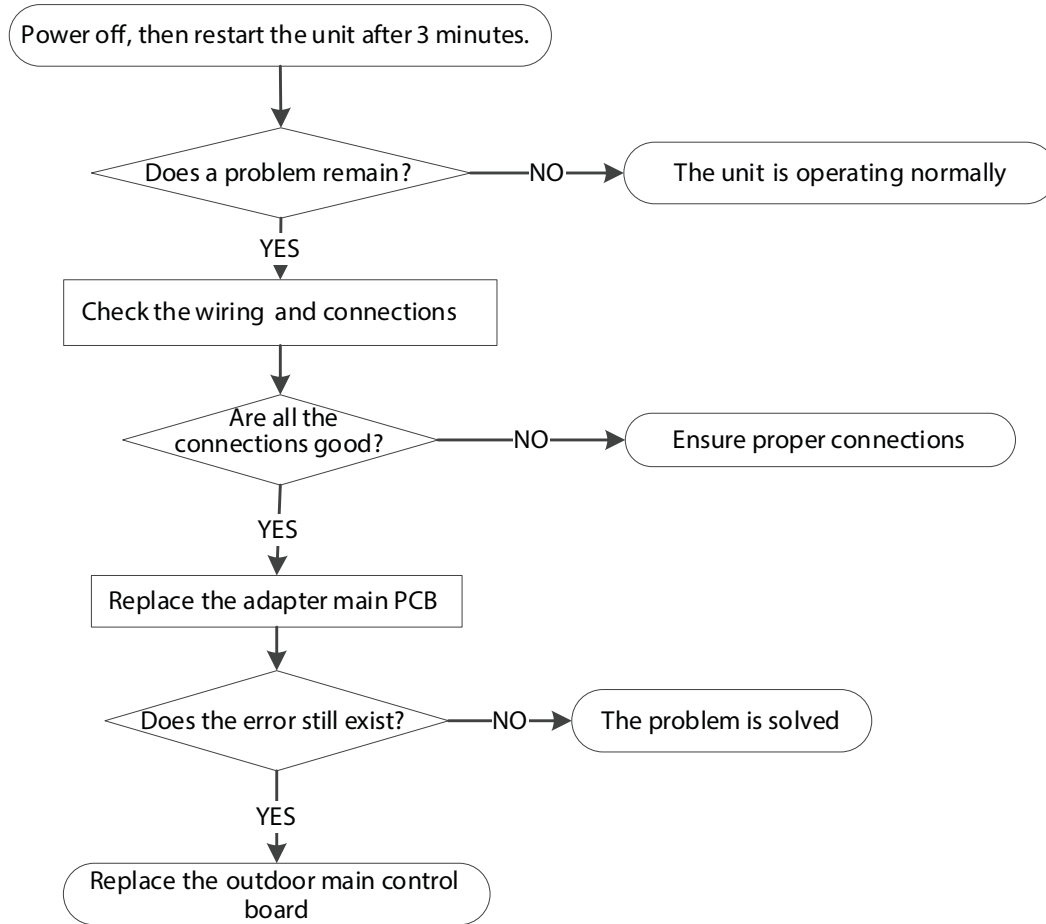


## EL 16 (Communication Malfunction Between Adapter Board and Outdoor Main Board Diagnosis and Solution)

**Description:** The adapter PCB cannot detect the main control board.

**Recommended parts to prepare:** Connection wires, Adapter board, Outdoor main PCB

**Troubleshooting and repair:**



## FL 09 (Mismatch between the new and old platforms diagnosis and solution)

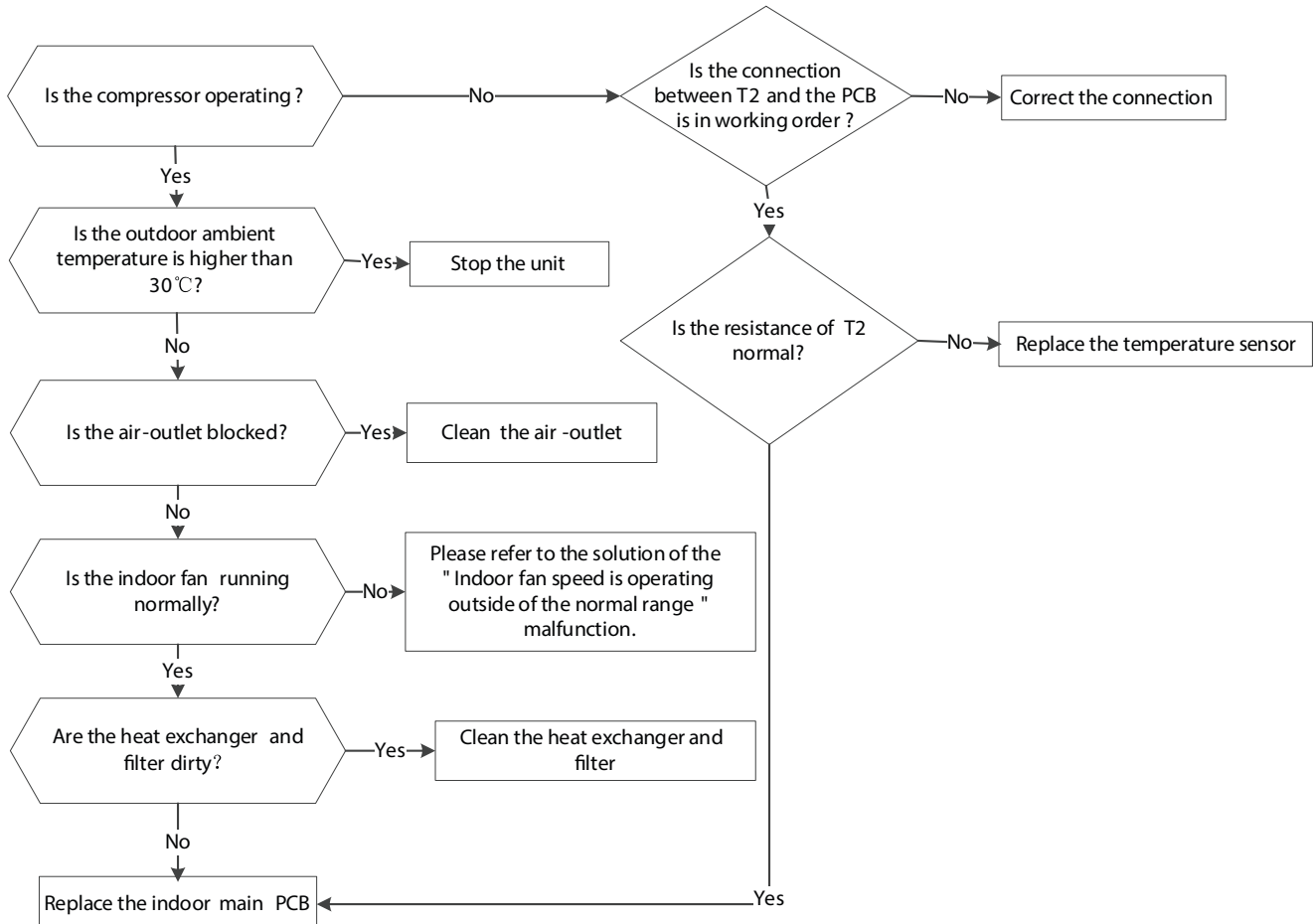
**Description:** Indoor and outdoor units are mismatched, the LED displays this code. Please replace the matching indoor or outdoor unit.

## PH 90 (High temperature protection of evaporator diagnosis and solution)

**Description:** When evaporator coil temperature is more than 60°C in heating mode, the unit stops. It starts again only when the evaporator coil temperature is less than 52°C.

**Recommended parts to prepare:** Connection wires, Evaporator coil temperature sensor (T2), Indoor fan, Indoor main PCB

### Troubleshooting and repair:

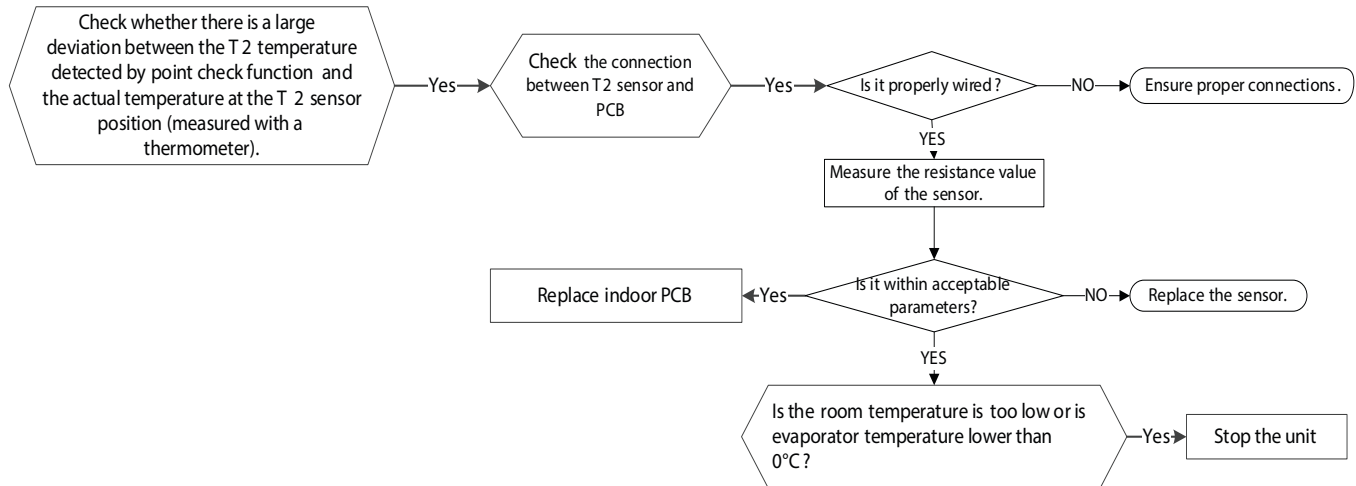


## PH 91 (Low temperature protection of evaporator diagnosis and solution)

**Description:** When evaporator coil temperature is lower than 0°C in cooling mode or drying mode, the unit stops. It starts again only when the evaporator coil temperature is more than 5°C.

**Recommended parts to prepare:** Connection wires, Evaporator coil temperature sensor (T2), Indoor main PCB

### Troubleshooting and repair:



## CHECK PROCEDURES

### Temperature Sensor Check

#### WARNING

##### ELECTRICAL SHOCK HAZARD

Be sure to turn off all power supplies or disconnect all wires to avoid electric shock. Operate after compressor and coil have returned to normal temperature in case of injury.

1. Disconnect the temperature sensor from the PCB.
2. Measure the sensor's resistance value with a multi-meter.
3. Check the corresponding temperature sensor resistance value table (see "Temperature Sensor Resistance Value Table for TP (°C - K)" on page 93 and "Other Temperature Sensors Resistance Value Table (°C - K)" on page 94).

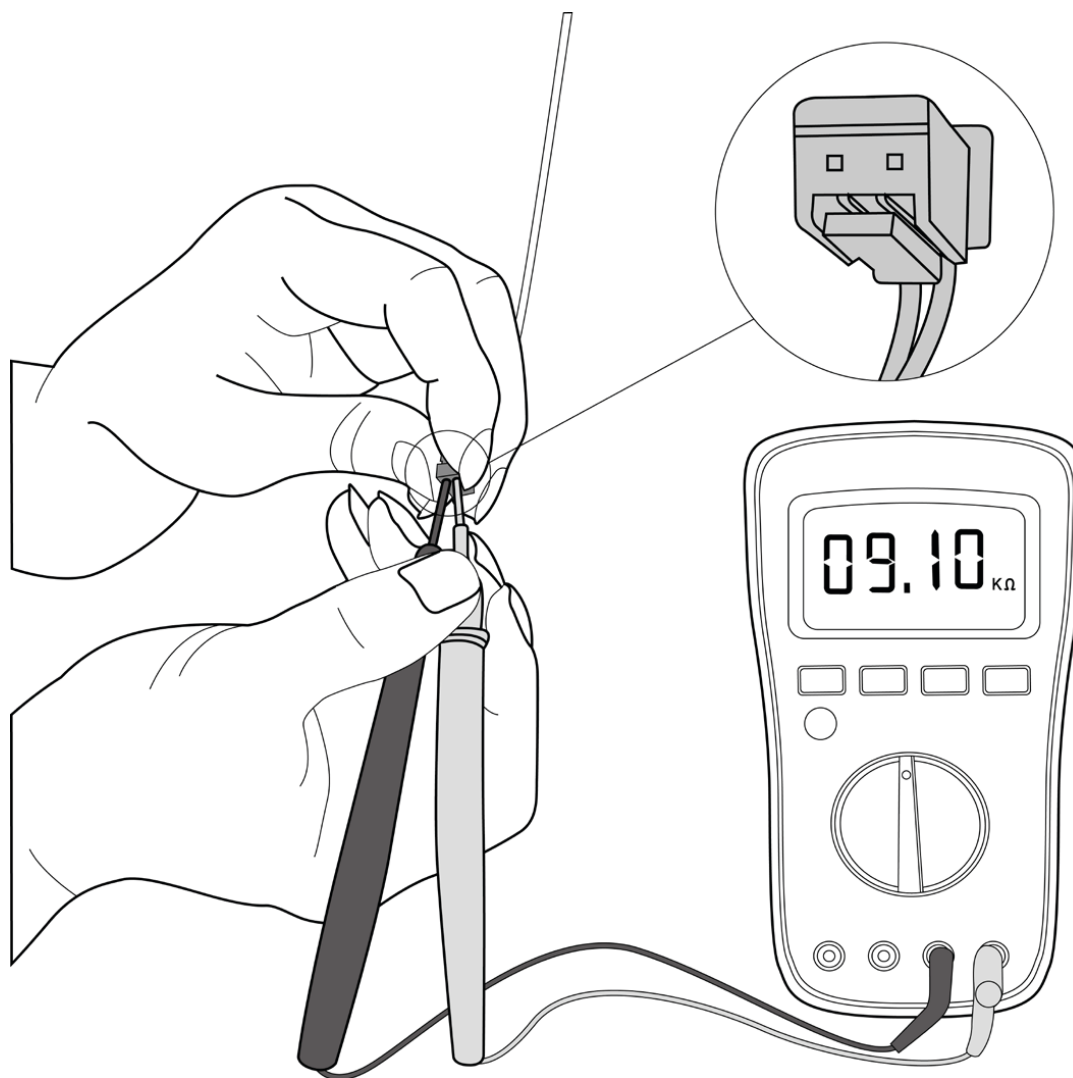


Fig. 48 —Measure the Sensor's Resistance Value

Compressor Check

- 1. Disconnect the compressor power cord from the outdoor PCB.
- 2. Measure the resistance value of each winding using a multi-meter.
- 3. Check the resistance value of each winding in tables 9 through 12:

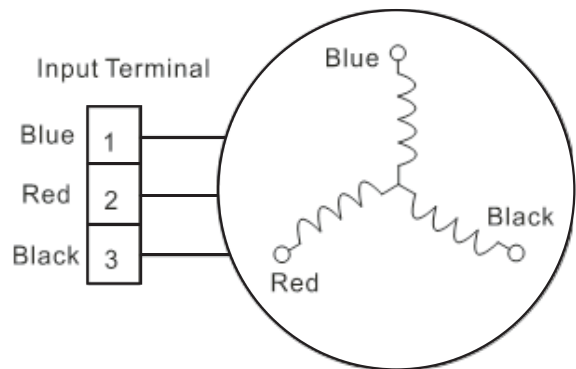


Fig. 49 —Compressor Check

Table 6 – Resistance Values

| Resistance Value | KSN140D58UFZ | KTF250D22UMT | KTM240D46UKT2 | KTF310D43UMT | MTH550UKPC8FU |
|------------------|--------------|--------------|---------------|--------------|---------------|
| Blue-Red         | 1.86Ω        | 0.75Ω        | 1.04Ω         | 0.65Ω        | 0.295Ω        |
| Blue-Black       |              |              |               |              |               |
| Red-Black        |              |              |               |              |               |

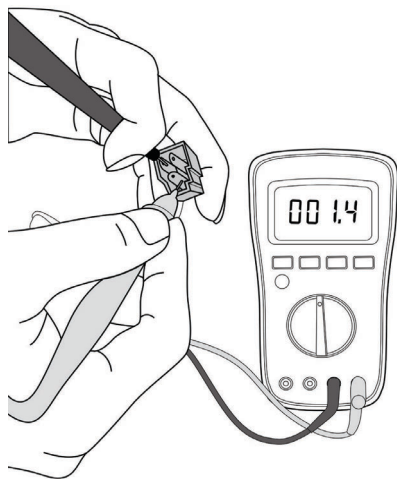


Fig. 50 —Resistance Check

**NOTE:** The picture and the value are only for reference, actual condition and specific value may vary.

IPM Continuity Check

⚠

WARNING

ELECTRICAL SHOCK HAZARD

Electricity remains in capacitors even when the power supply is off.  
Ensure the capacitors are fully discharged before troubleshooting.

1. Turn off outdoor unit and disconnect power supply.
2. Discharge electrolytic capacitors and ensure all energy-storage unit has been discharged.
3. Disassemble outdoor PCB or disassemble IPM board.
4. Measure the resistance value between P and U(V, W, N); U(V, W) and N.

Table 7 – Resistance Value

| Digital Tester |           | Resistance Value          | Digital Tester |           | Resistance Value          |
|----------------|-----------|---------------------------|----------------|-----------|---------------------------|
| (+) Red        | (-) Black | $\infty$<br>(Several MfÇ) | (+) Red        | (-) Black | $\infty$<br>(Several MfÇ) |
| P              | N         |                           | U              | N         |                           |
|                | U         |                           | V              |           |                           |
|                | V         |                           | W              |           |                           |
|                | W         |                           | -              |           |                           |

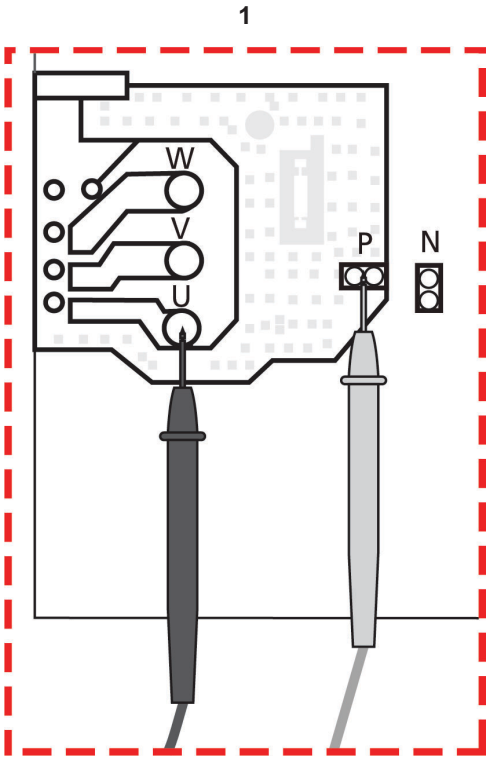


Fig. 51 —Resistance Value

Table 8 – Voltage Range

| 208-240V (1-phase)      |                                |                              |
|-------------------------|--------------------------------|------------------------------|
| In Standby              |                                |                              |
| Around 310VDC           |                                |                              |
| In Operation            |                                |                              |
| With passive PFC module | With partial active PFC module | With fully active PFC module |
| >200VDC                 | >310VDC                        | >370VDC                      |

4-Way Valve Check

- 1. Power on, use a digital tester to measure the voltage, when the unit operates in cooling, it is 0V. When the unit operates in heating, it is about equal to power supply voltage.  
If the value of the voltage is not in the range, the PCB must have problems and need to be replaced.

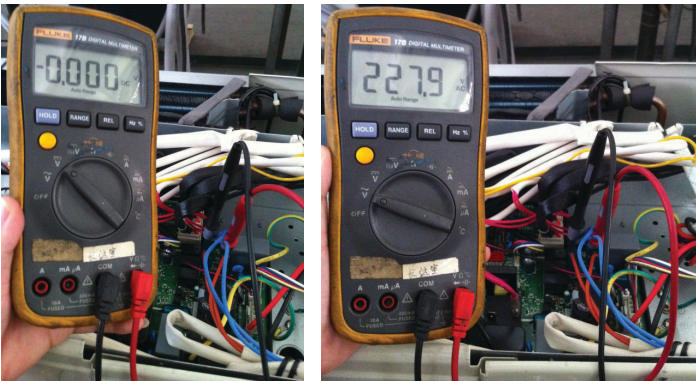


Fig. 52 —Measure the Voltage

- 2. Turn off the power, use a digital tester to measure the resistance. The value should be 1.8~2.5 KΩ.

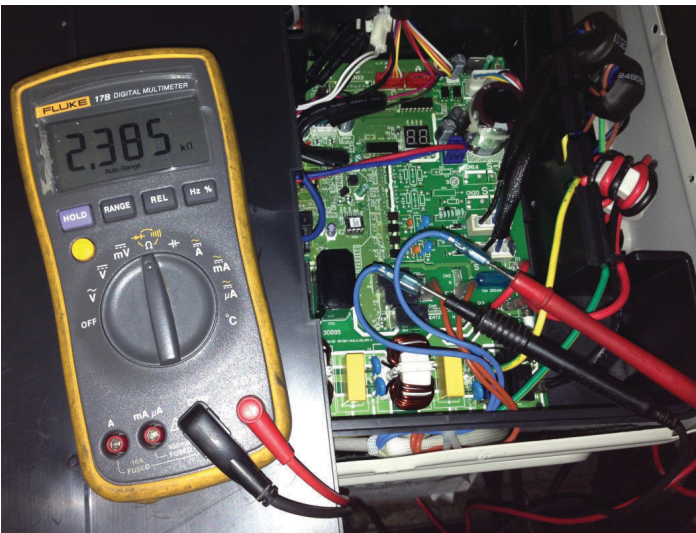


Fig. 53 —Use a Digital Tester to Measure Resistance

EXV Check

**WARNING**

**ELECTRICAL SHOCK HAZARD**  
Electricity remains in the capacitors even when the power is off.  
Ensure the capacitors are fully discharged before troubleshooting.

- 1. Turn off outdoor unit and disconnect power supply.
- 2. Disconnect the connectors of EXV.
- 3. Measure the resistance value between Red and Blue (Yellow); Brown and Orange (White).

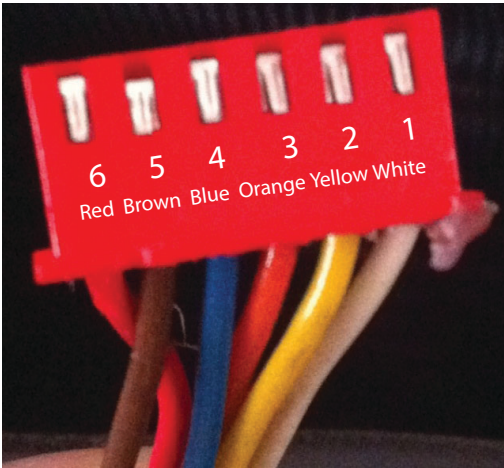


Fig. 54 —EXV Check

Resistance to EXV coil

| Color of Lead Wire | Normal Value |
|--------------------|--------------|
| Red-Blue           | About 500 Ω  |
| Red-Yellow         |              |
| Brown-Orange       |              |
| Brown-White        |              |

Main Parts Check

- 1. Temperature sensor checking  
Disconnect the temperature sensor from PCB, measure the resistance value with a tester.

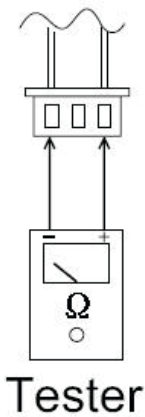
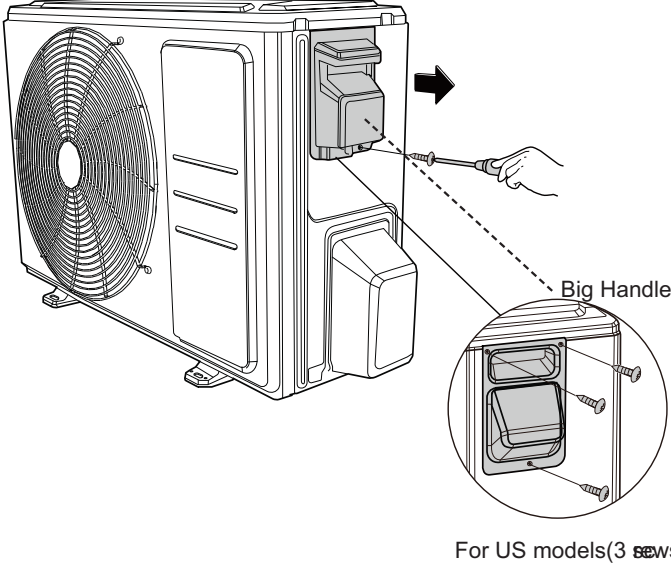
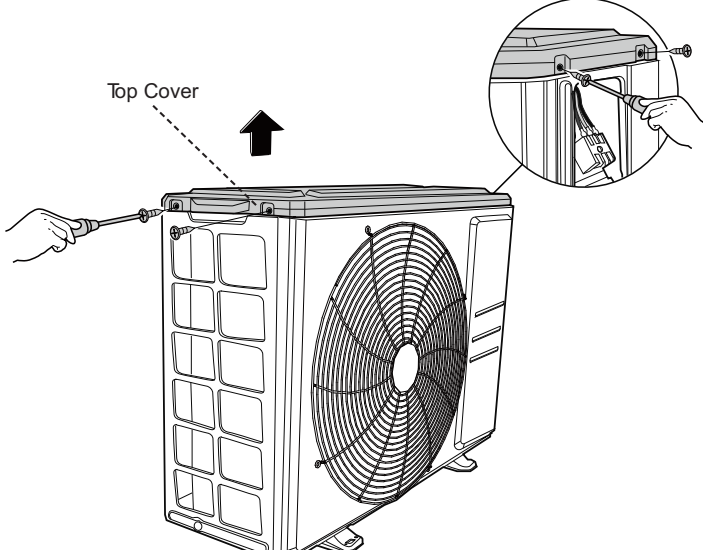
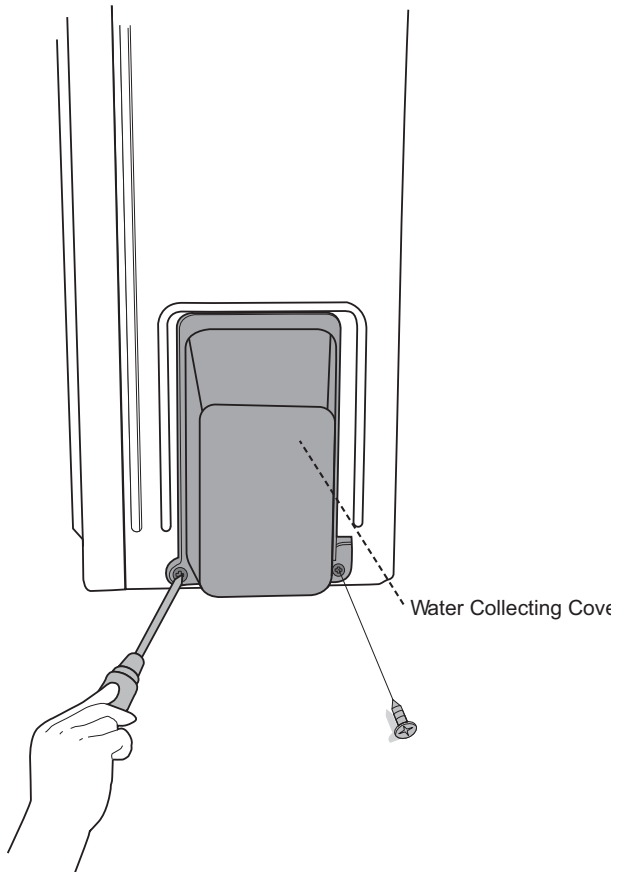
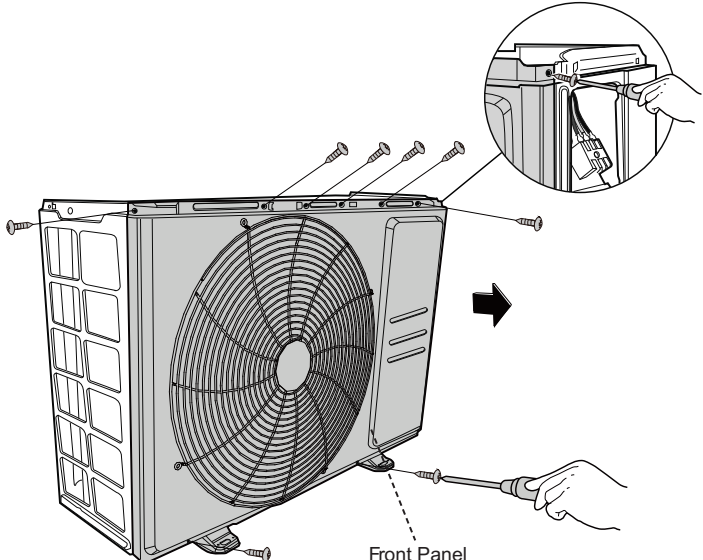


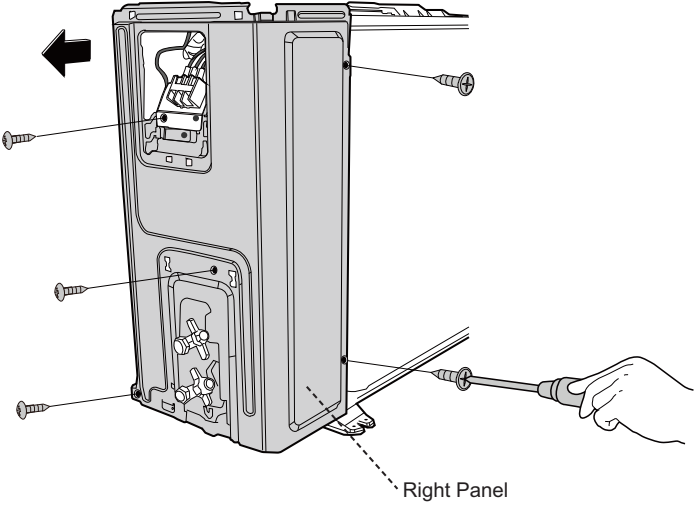
Fig. 55 —Sensor Test

- 2. Temperature sensors
  - a. Room temp. (T1) sensor,
  - b. Indoor coil temp. (T2) sensor,
  - c. Outdoor coil temp. (T3) sensor,
  - d. Outdoor ambient temp. (T4) sensor,
  - e. Compressor discharge temp. (T5) sensor.
  - f. Measure the resistance value of each winding by using the multi-meter.

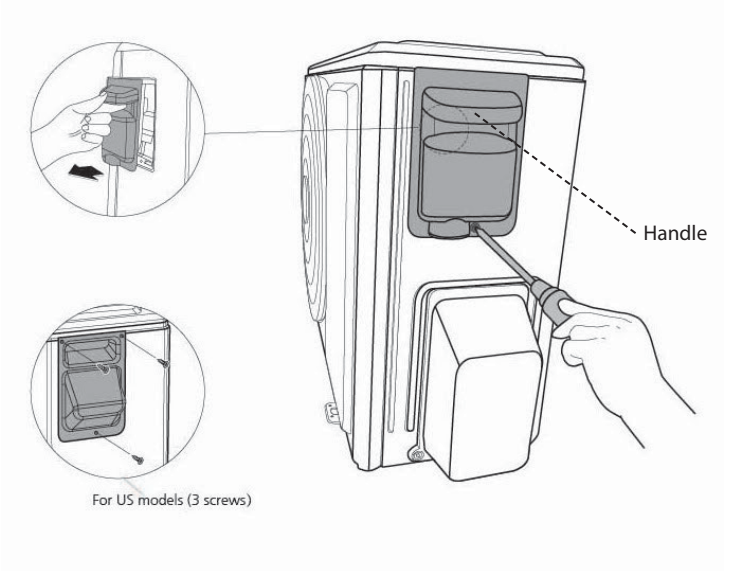
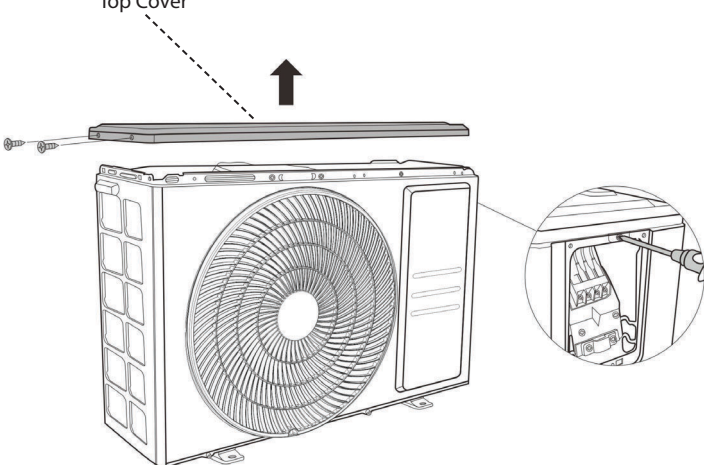
**DISASSEMBLY INSTRUCTIONS****12K (115V) and 9-12K (208/230V) Unit Disassembly - Panel Plate**

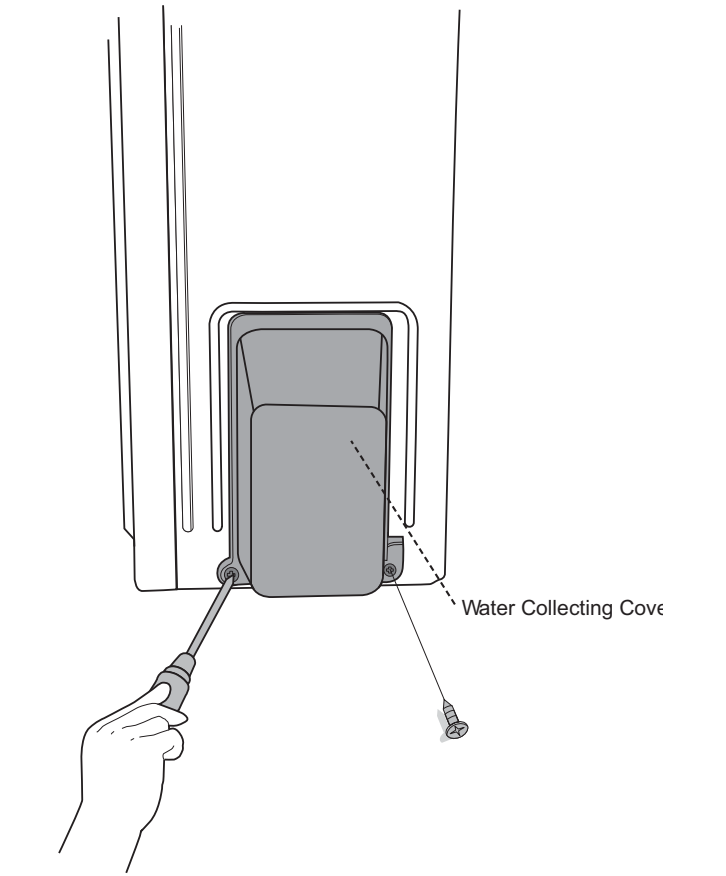
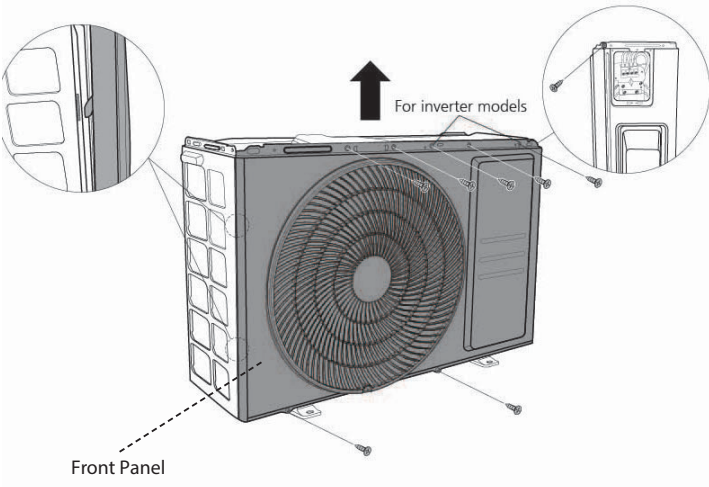
| PROCEDURES                                                                                                                                                             | ILLUSTRATION                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| <p>1. Turn off the air conditioner and the power breaker</p> <p>2. Remove the screw of the big handle and then remove the big handle (3 screws) (see illustration)</p> |  <p>Big Handle</p> <p>For US models(3 screws)</p> |
| <p>3. Remove the screws of the top cover and then remove the top cover (4 screws). One of the screws is located underneath the big handle. (see illustration)</p>      |  <p>Top Cover</p>                               |

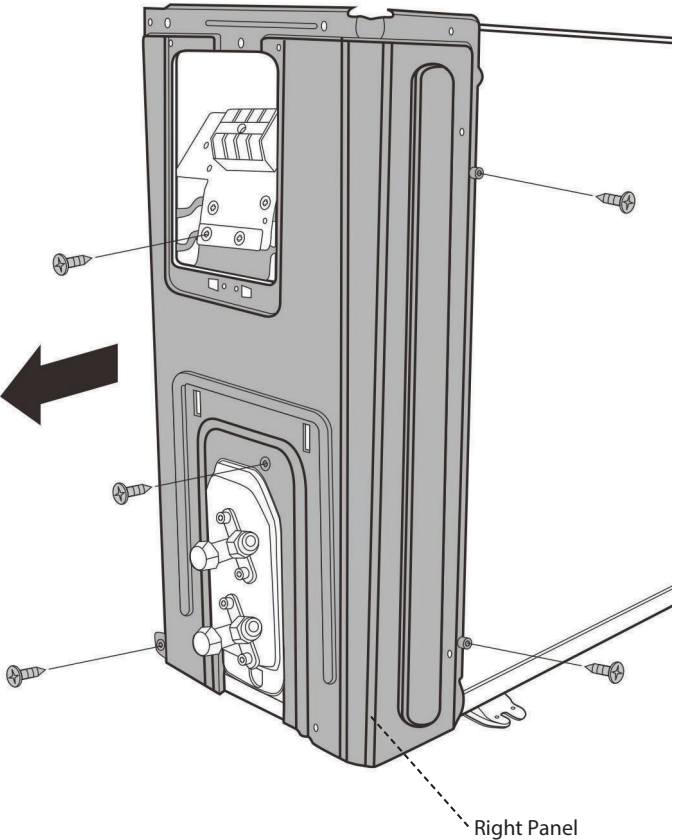
| PROCEDURES                                                                                                                                                  | ILLUSTRATION                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>4. Remove the screws of water collecting cover and then remove the water collecting cover (2 screws).(see illustration)</p>                              |  <p>The illustration shows a hand using a screwdriver to remove a screw from the bottom of the water collecting cover. A dashed line points to the cover, which is labeled "Water Collecting Cover".</p>                                                                                                 |
| <p>5. Remove the screws of the front panel and then remove the front panel (7 screws (on/off models) or 9 screws. (inverter models). (see illustration)</p> |  <p>The illustration shows a hand using a screwdriver to remove a screw from the front panel of the outdoor unit. A dashed line points to the front panel, which is labeled "Front Panel". An inset circular image shows a close-up of the top of the unit where the front panel is being detached.</p> |

| PROCEDURES                                                                                                   | ILLUSTRATION                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>6. Remove the screws of the right panel and then remove the right panel (5 screws) (see illustration)</p> |  <p>The illustration shows a side view of a rectangular electronic device. A hand is using a screwdriver to remove screws from the right panel. A dashed line indicates the 'Right Panel' to be removed. An arrow points left, indicating the direction of removal.</p> |

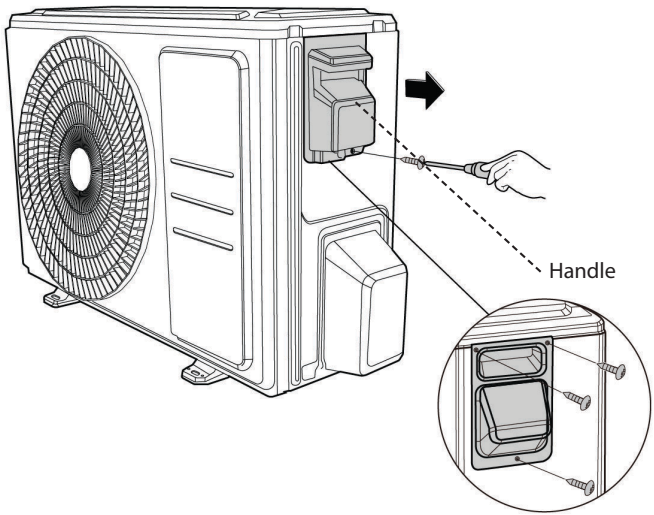
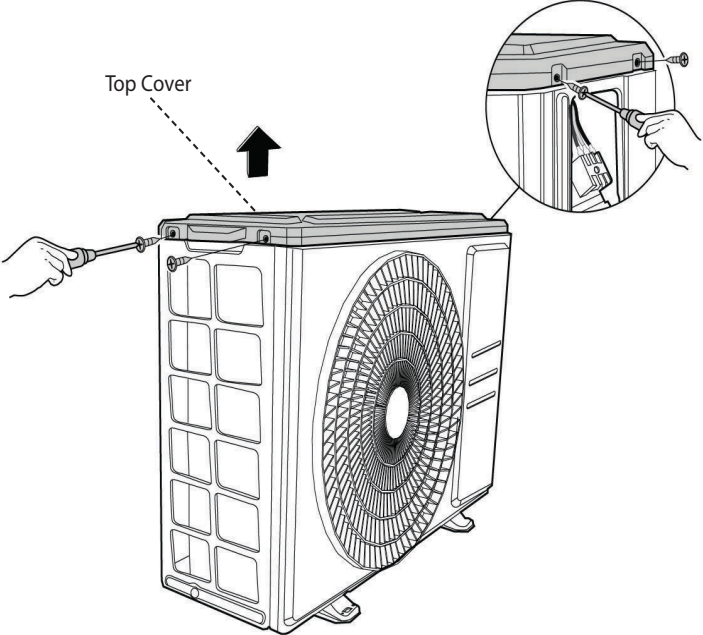
## 18K Unit Disassembly - Panel Plate

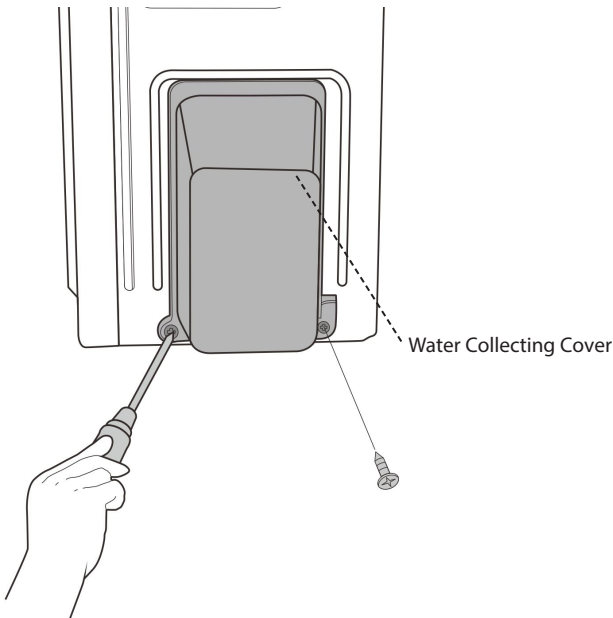
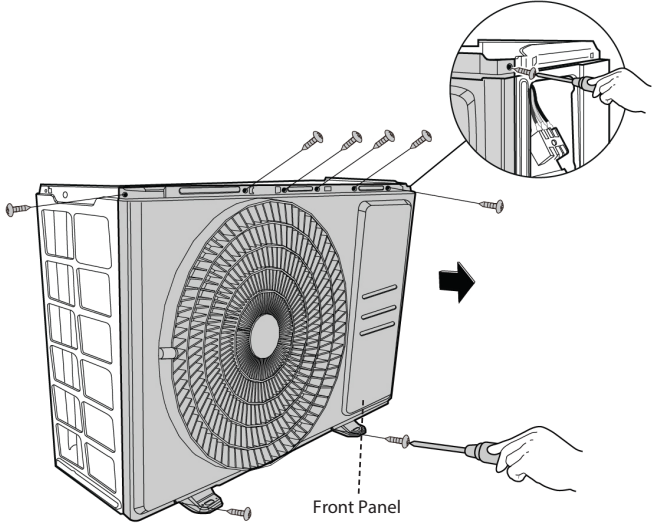
| PROCEDURES                                                                                                                                      | ILLUSTRATION                                                                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| <p>1. Turn off the air conditioner and the power breaker</p> <p>2. Remove the handle screw (1) then remove the handle. (see illustration)</p>   |  <p>Handle</p> <p>For US models (3 screws)</p> |
| <p>3. Remove the top cover screws (3) then remove the top cover. One of the screws is located underneath the big handle. (see illustration)</p> |  <p>Top Cover</p>                             |

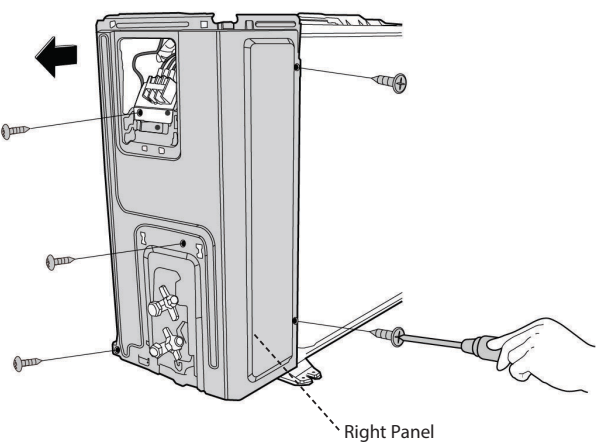
| PROCEDURES                                                                                                                                       | ILLUSTRATION                                                                                                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <p>4. Remove the screws of water collecting cover and then remove the water collecting cover (2 screws).(see illustration)</p>                   |  <p>Water Collecting Cover</p>                  |
| <p>5. Remove the front panel screws then remove the front panel (6 screws (on/off models) or 8 screws (inverter models)). (see illustration)</p> |  <p>For inverter models</p> <p>Front Panel</p> |

| PROCEDURES                                                                                                                              | ILLUSTRATION                                                                                                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <p data-bbox="99 653 675 705">6. Remove the screws of the right panel and then remove the right panel (5 screws) (see illustration)</p> |  <p data-bbox="1263 1098 1365 1123">Right Panel</p> |

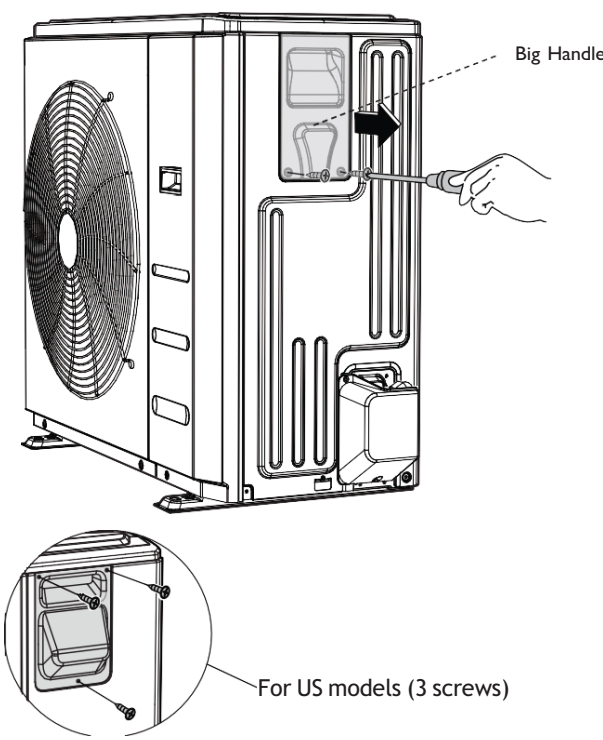
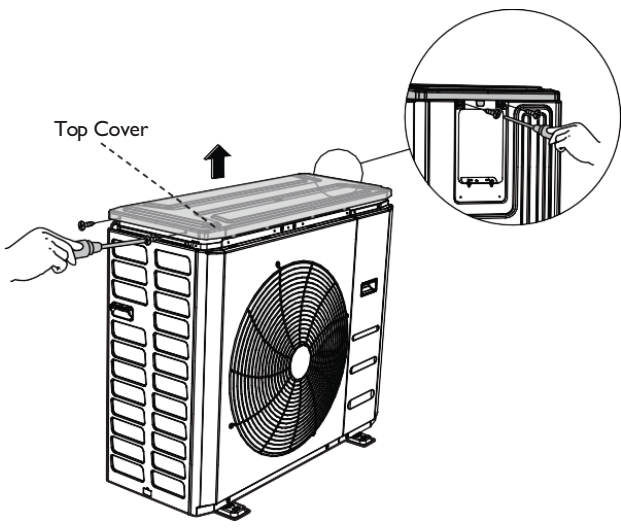
## 24K Unit Disassembly - Panel Plate

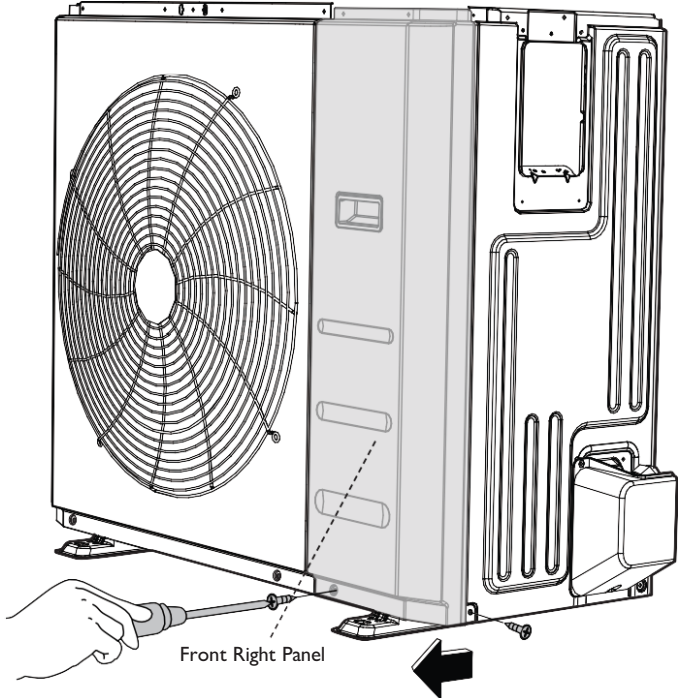
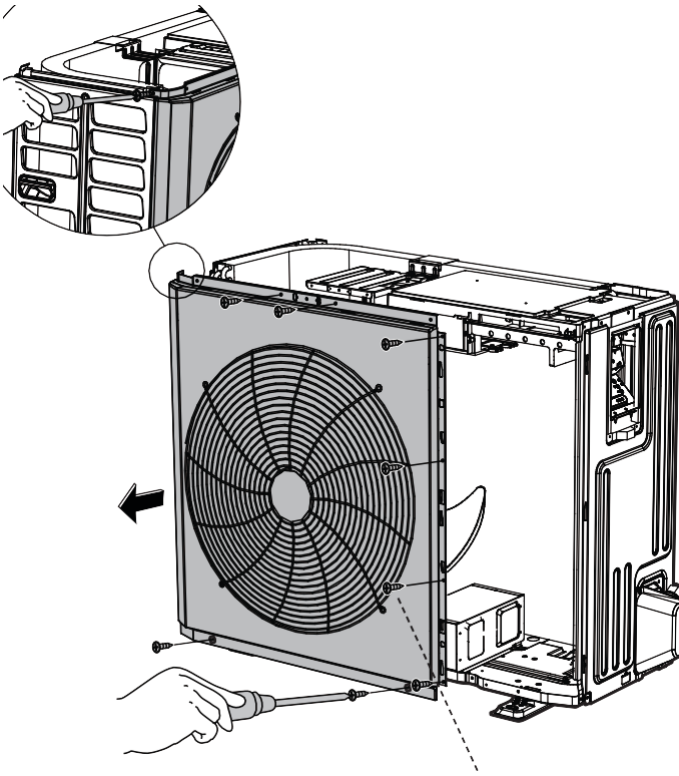
| PROCEDURES                                                                                                                                                        | ILLUSTRATION                                                                                         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| <p>1. Turn off the air conditioner and the power breaker.</p> <p>2. Remove the handle screw (1) then remove the handle. (see illustration)</p>                    |  <p>Handle</p>     |
| <p>3. Remove the screws of the top cover and then remove the top cover (4 screws). One of the screws is located underneath the big handle. (see illustration)</p> |  <p>Top Cover</p> |

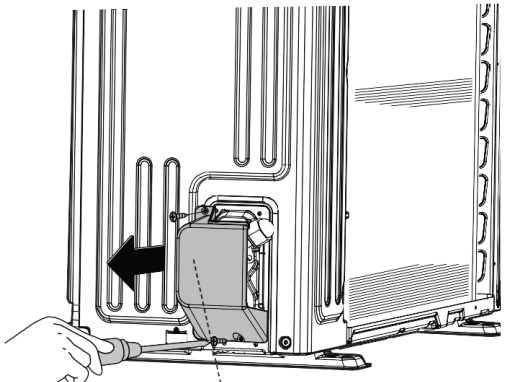
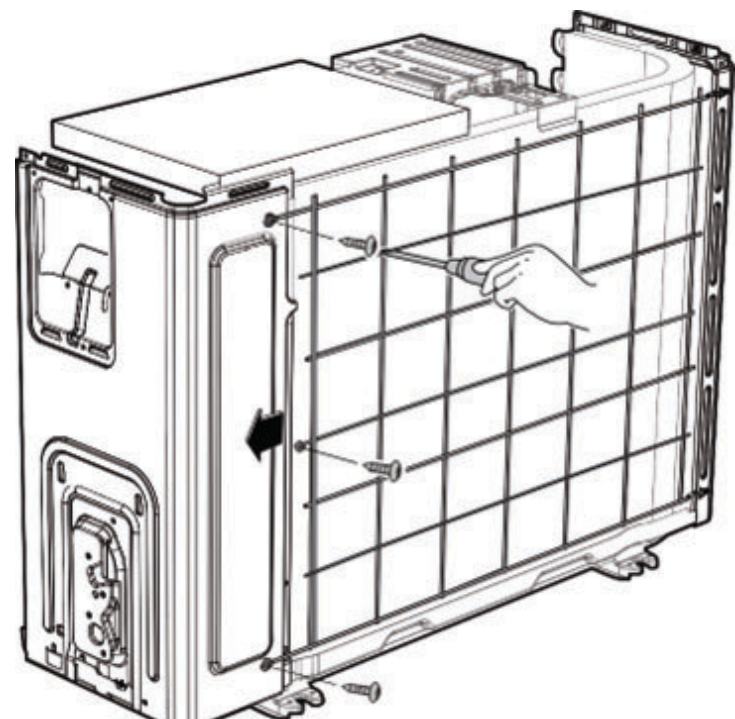
| PROCEDURES                                                                                                                                      | ILLUSTRATION                                                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| <p>4. Remove the water collecting cover screws (2) then remove the water collecting cover.(see illustration)</p>                                |  <p>Water Collecting Cover</p> |
| <p>5. Remove the front panel screws then remove the front panel (7 screws (on/off models) or 9 screws (inverter models). (see illustration)</p> |  <p>Front Panel</p>           |

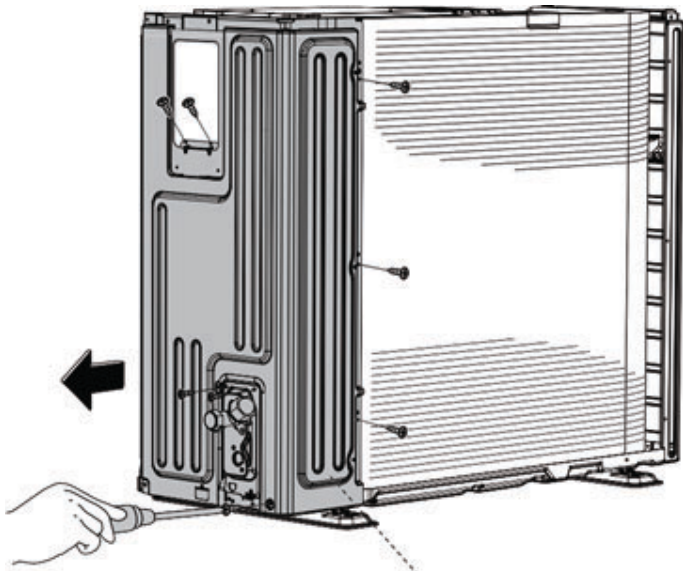
| PROCEDURES                                                                                  | ILLUSTRATION                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>6. Remove the right panel screws (5) then remove the right panel. (see illustration)</p> |  <p>The illustration shows a side view of a mechanical unit with a right panel. Five screws are shown being removed from the panel. A hand is using a screwdriver to remove one of the screws. A dashed line points to the right panel, which is labeled 'Right Panel'. A black arrow points to the left, indicating the direction of removal.</p> |

**30K - 36K Unit Disassembly - Panel Plate**

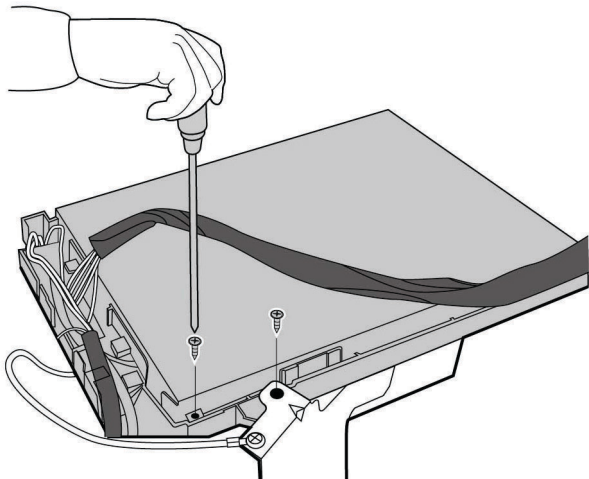
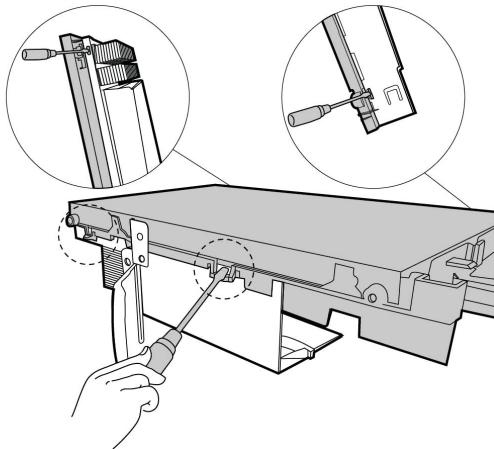
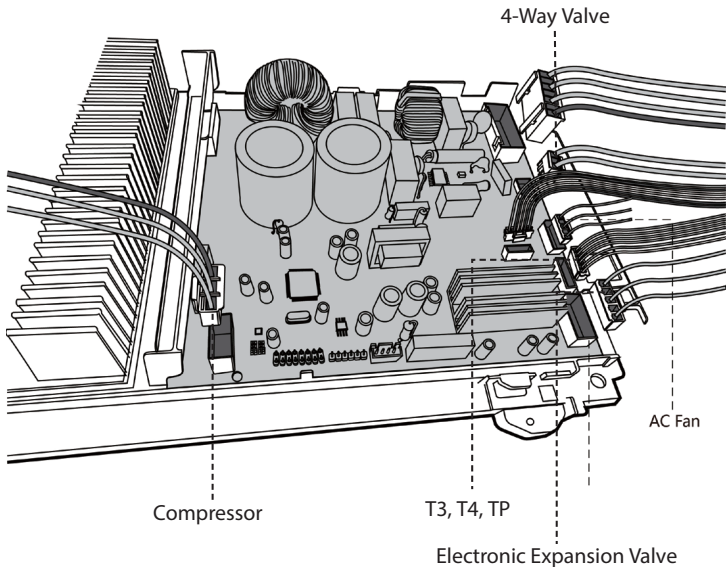
| PROCEDURES                                                                                                                                                             | ILLUSTRATION                                                                                                                         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| <p>1. Turn off the air conditioner and the power breaker</p> <p>2. Remove the screw of the big handle and then remove the big handle (2 screws) (see illustration)</p> |  <p>Big Handle</p> <p>For US models (3 screws)</p> |
| <p>3. Remove the screws of the top cover and then remove the top cover (4 screws). One of the screws is located underneath the big handle. (see illustration)</p>      |  <p>Top Cover</p>                                |

| PROCEDURES                                                                                                               | ILLUSTRATION                                                                        |
|--------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| <p>4. Remove the screws of the front right panel and then remove the front right panel (2 screws).(see illustration)</p> |   |
| <p>5. Remove the screws of the front panel and then remove the front panel (9 screws). (see illustration)</p>            |  |

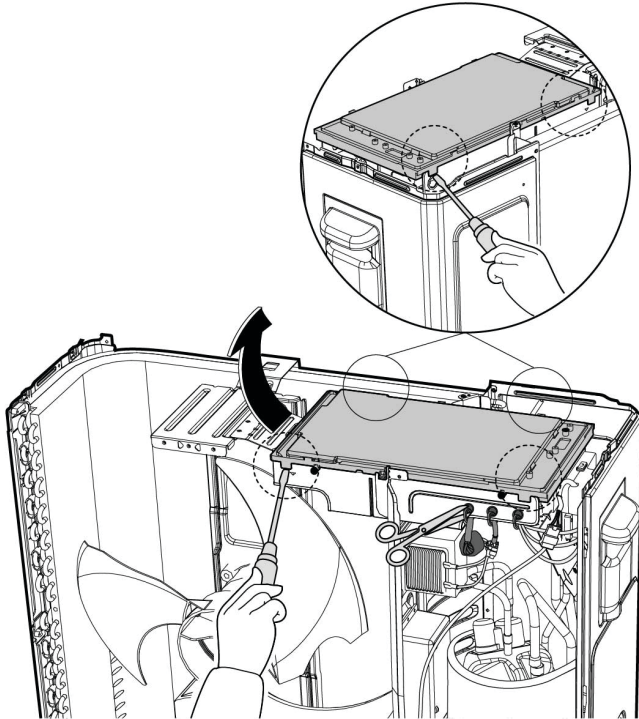
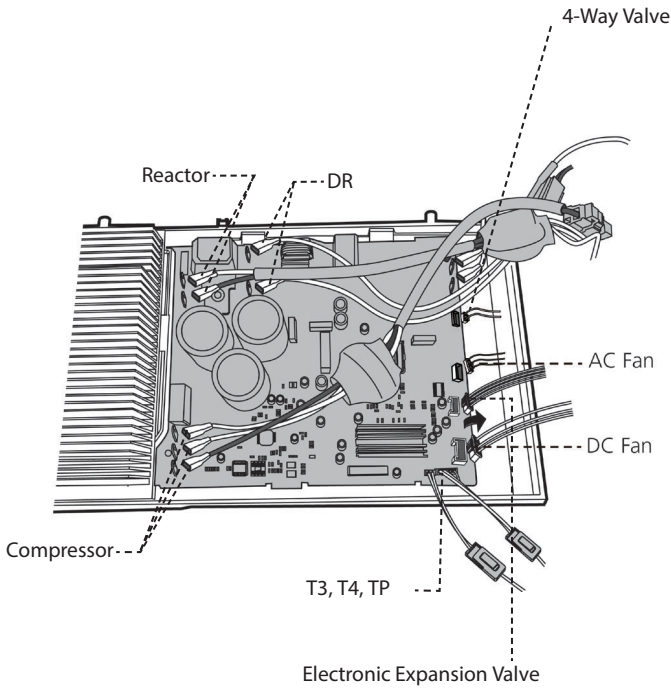
| PROCEDURES                                                                                                                     | ILLUSTRATION                                                                                                     |
|--------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| <p>6. Remove the screws of water collecting cover and then remove the water collecting cover (2 screws) (see illustration)</p> |  <p>Water Collecting Cover</p> |
| <p>7. For some models, remove the screws of the rear net and then remove the rear net (3 screws) (see illustration)</p>        |                               |

| PROCEDURES                                                                                | ILLUSTRATION                                                                                          |
|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| <p>8. Remove the screws of the right panel and then remove the right panel (8 screws)</p> |  <p>Right Panel</p> |

**9K - 12K (115V) Disassembly - Electrical Parts**

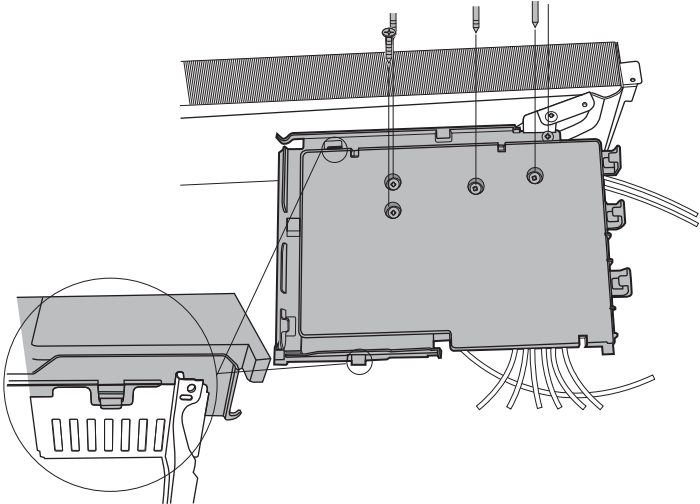
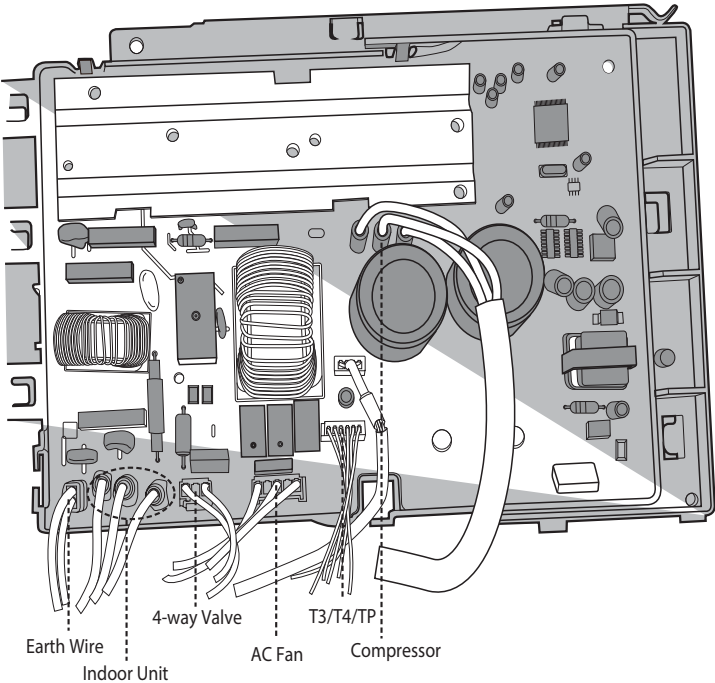
| PROCEDURES                                                                                                                                                                                                                                                                                                                                                                                                                                          | ILLUSTRATION                                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <p>1. Remove the top cover screws (2).(see illustration)</p>                                                                                                                                                                                                                                                                                                                                                                                        |    |
| <p>2. Unfix the hooks then open the electronic control box cover (4 hooks). (see illustration)</p>                                                                                                                                                                                                                                                                                                                                                  |   |
| <p>3. Disconnect the fan motor connector from the electronic control board.</p> <p>4. Remove the compressor connector.</p> <p>5. Pull out the two blue wires connected to the 4-way valve.</p> <p>6. Pull out the connectors of the condenser coil temp. sensor(T3), outdoor ambient temp. sensor(T4) and discharge temp. sensor (TP).</p> <p>7. Disconnect the electronic expansion valve wire.</p> <p>8. Remove the electronic control board.</p> |  |

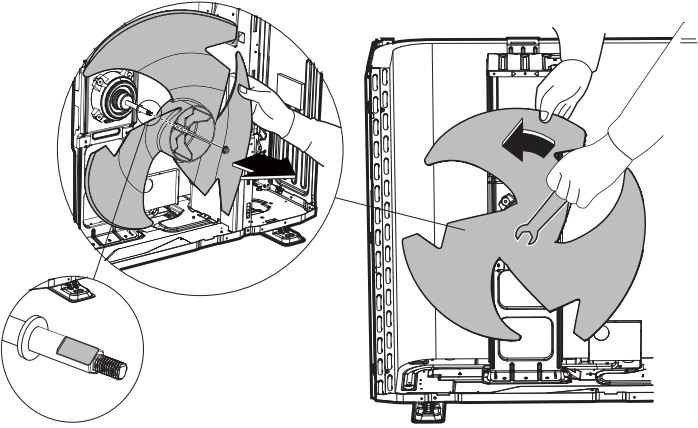
**9K - 18K (208V/230V) Disassembly - Electrical Parts**

| PROCEDURES                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ILLUSTRATION                                                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <p>1. Loosen the hooks (4) then open the electronic control box cover. (see illustration)</p>                                                                                                                                                                                                                                                                                                                                                                                  |    |
| <p>2. Disconnect the connector for the fan motor from the electronic control board. (see illustration)</p> <p>3. Remove the compressor connector.</p> <p>4. Pull out the two blue wires connected with the 4-way valve.</p> <p>5. Pull out connectors of the condenser coil temp. sensor (T3), outdoor ambient temp. sensor (T4) and discharge temp. sensor (TP).</p> <p>6. Disconnect the electronic expansion valve wire.</p> <p>7. Remove the electronic control board.</p> |  |

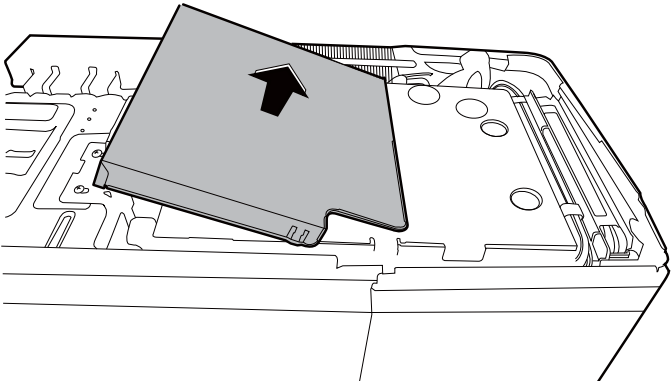
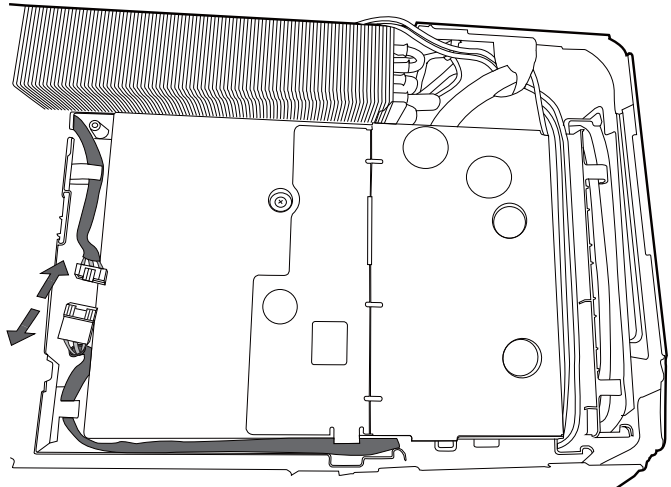
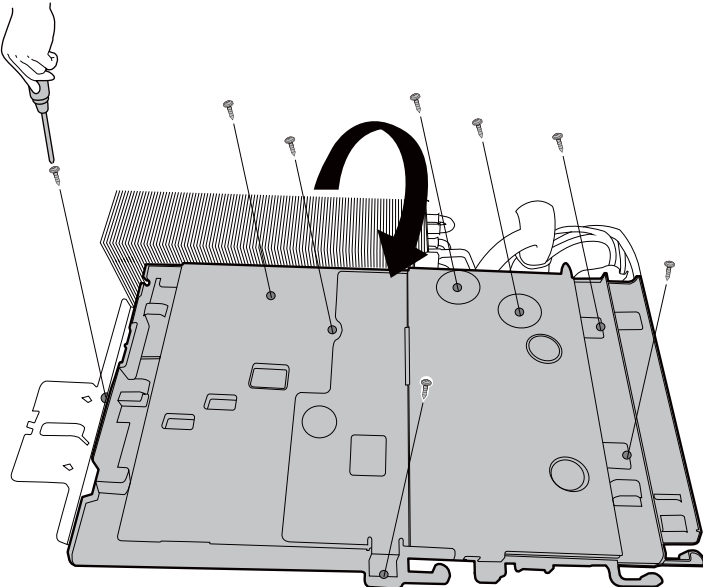
24K (208V/230V) Disassembly - Electrical Parts

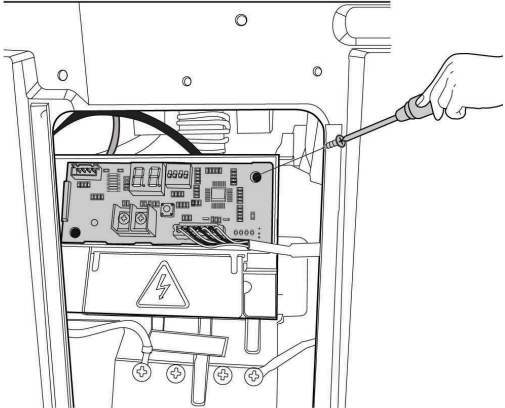
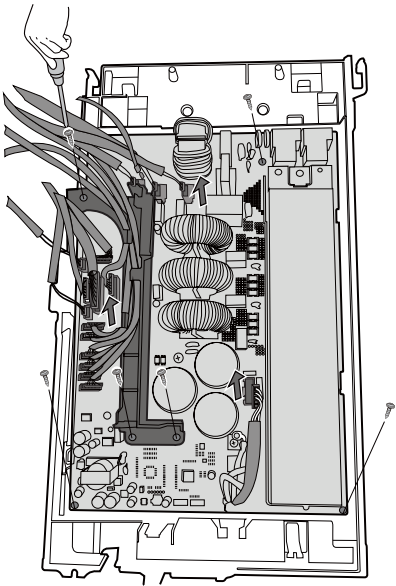
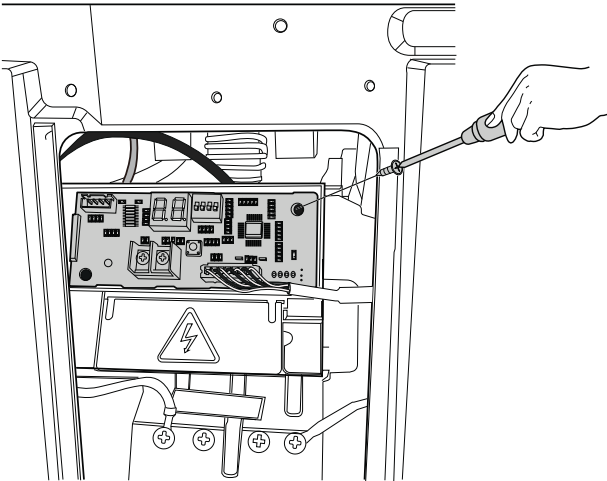
WARNING: Anti-static gloves must be worn when you disassemble the electronic box.

| PROCEDURES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ILLUSTRATION                                                                        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| <p>1. Remove the 5 screws and unfix two hooks.(see illustration)</p> <p><b>NOTE:</b> Electric control box cover cannot be removed, so the voltage between P and N cannot be measured.</p> <p><b>NOTE:</b> For some models, there might be a wiring diagram covering the screw.</p>                                                                                                                                                                                                                                                                                                                                                                                                      |   |
| <p>2. Disconnect the connector for fan motor from the electronic control board (see illustration)</p> <p>3. Remove the connector for the compressor</p> <p>4. Pull out the two blue wires connected with the four way valve</p> <p>5. Pull out connectors of the condenser coil temp. sensor (T3),outdoor ambient temp. sensor (T4) and discharge temp. sensor (TP).</p> <p>6. Disconnect the electronic expansion valve wire.</p> <p>7. Remove the connector for the DR and reactor.</p> <p>8. Then remove the electronic control board.</p> <p><b>NOTE:</b> When replacing the electronic control board with a new one, pay attention to applying thermal paste on the heat sink.</p> |  |

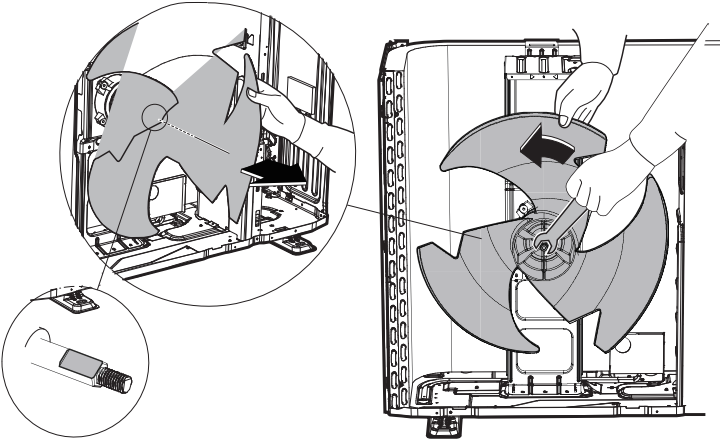
| PROCEDURES                                                                           | ILLUSTRATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>9. Remove the nut securing the fan with a spanner.</p> <p>10. Remove the fan.</p> |  <p>The illustration consists of three parts. The top-left part is a circular inset showing a close-up of a hand using a spanner to turn a nut on a fan. The bottom-left part is another circular inset showing a close-up of the fan's mounting bracket. The right part is a larger illustration showing a hand using a spanner to remove the nut from the fan, which is mounted on a vertical metal frame.</p> |

30k - 36K (208V/230V) Disassembly - Electrical Parts

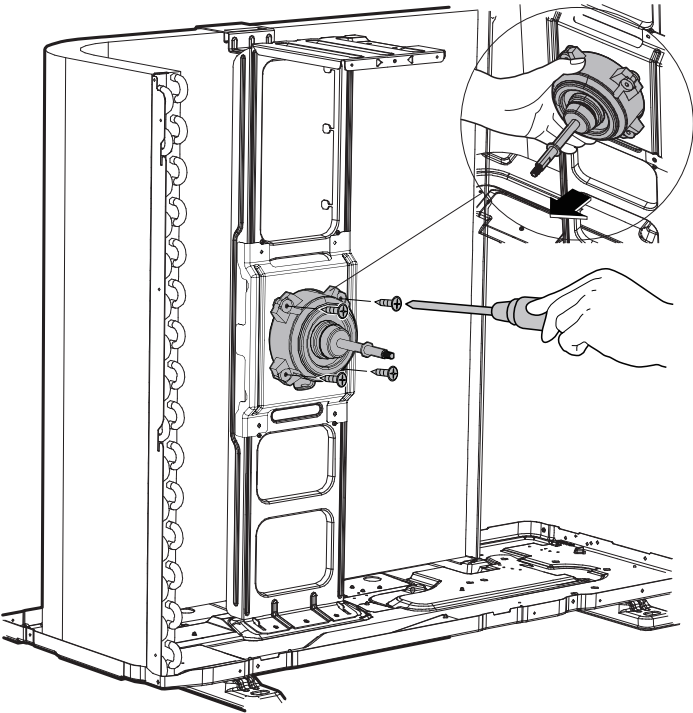
| PROCEDURES                                                                             | ILLUSTRATION                                                                         |
|----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 1. Remove the cover of electrical control box..(. (see illustration).                  |    |
| 2. Disconnect the fan motor connector. (see. (see illustration)                        |   |
| 3. Remove eight fixing screws.<br>4. Turn over the electronic control box subassembly. |  |

| PROCEDURES                                                                                                                                                                                            | ILLUSTRATION                                                                         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <p>5. Pull out the connector, remove one screw and remove the key board subassembly on the terminal board.</p>                                                                                        |    |
| <p>6. Remove 3 screws and then remove the bracket.</p> <p>7. Disconnect the connectors from the electronic control board.</p> <p>8. Remove 3 screws and then remove the electronic control board.</p> |   |
| <p>9. Pull out the connector, remove one screw and then remove the key board subassembly on terminal board.</p>                                                                                       |  |

All Size Units, Disassembly - Fan Assembly

| PROCEDURES                                                                                                     | ILLUSTRATION                                                                       |
|----------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| <div>1. Remove the nut securing the fan with a spanner.</div> <div>2. Remove the fan. (see illustration)</div> |  |

**All Size Units, Disassembly - Fan Motor**

| PROCEDURES                                                                                                        | ILLUSTRATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>1. Remove the fixing screws of the fan motor (4 screws)</p> <p>2. Remove the fan motor. (see illustration)</p> |  A technical line drawing of a unit's internal structure. A fan motor is mounted on a vertical frame. A hand is shown using a screwdriver to remove one of four screws securing the motor. An inset circular image provides a magnified view of the motor's mounting bracket and the screw being removed. The unit's outer casing is partially open, revealing the internal components and wiring. |

All Size Units, Disassembly - Sound Blanket

| PROCEDURES                                                     | ILLUSTRATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Remove the sound blanket (side and top)) (see illustration) | <p>The illustration shows a side view of a mechanical unit with two cylindrical components. A hand is shown pulling a rectangular sound blanket away from the side of the unit, indicated by a black arrow. A dashed line outlines the blanket's position on the side. Another black arrow points to the top of the unit, where a circular sound blanket is shown being removed. A dashed line outlines the blanket's position on the top. Labels with dashed leader lines point to these areas: 'Sound Blanket(top) (Applicable to models with blanket)' and 'Sound Blanket(side) (Applicable to models with blanket)'.</p> |

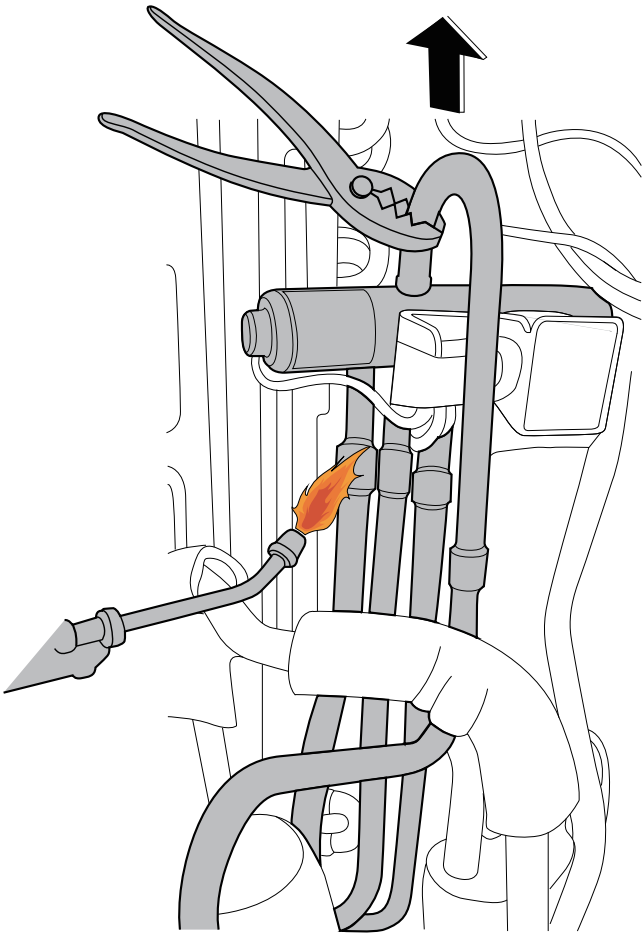
All Size Units, Disassembly - Four-Way Valve (For Heat Pump Models

! WARNING

**FIRE HAZARD**

Evacuate the system and confirm that there is no refrigerant left in the system before removing the four-way valve and the compressor. (For R32 & R290, you should evacuate the system with the vacuum pump; flush the system with nitrogen; then repeat the two steps before heating up the brazed parts. The operations above should be implemented by professionals.)

**NOTE:** Remove the panel plate, connection of four-way valve on PCB (refer to “12K (115V) and 9-12K (208/230V) Unit Disassembly - Panel Plate” on page 68, “18K Unit Disassembly - Panel Plate” on page 71, “24K Unit Disassembly - Panel Plate” on page 74, or “24K Unit Disassembly - Panel Plate” on page 74 and “24K (208V/230V) Disassembly - Electrical Parts” on page 83) before disassembling sound blanket.

| PROCEDURES                                                                                                                                                                                       | ILLUSTRATION                                                                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| <div>1. Heat up the brazed parts and then detach the the four-way valve and the piper. (see illustration)</div> <div>2. Remove the four-way valve assembly with pliers. (see illustration)</div> |  |

All Size Units, Disassembly - Compressor

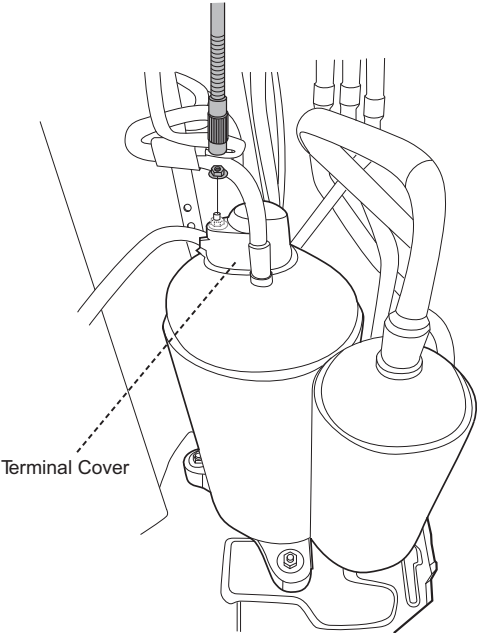
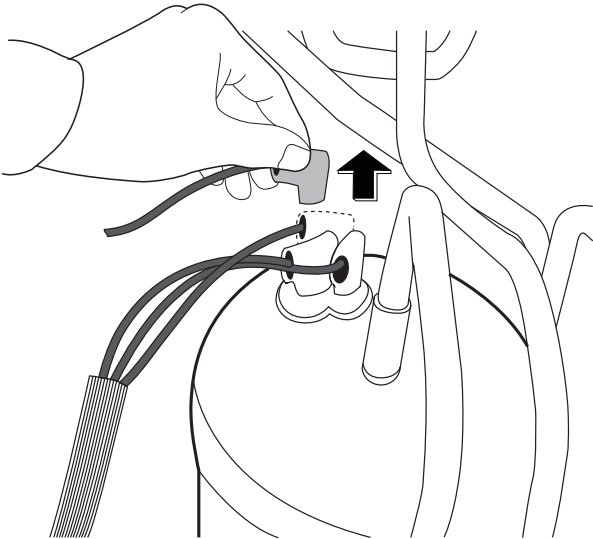


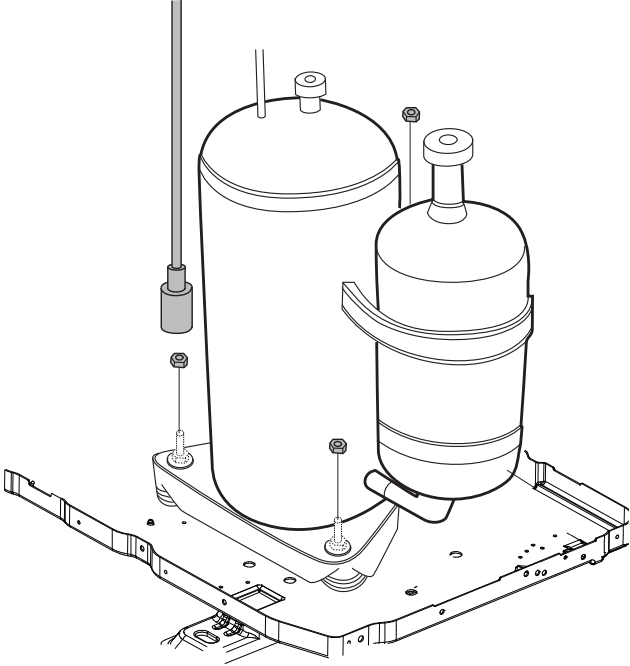
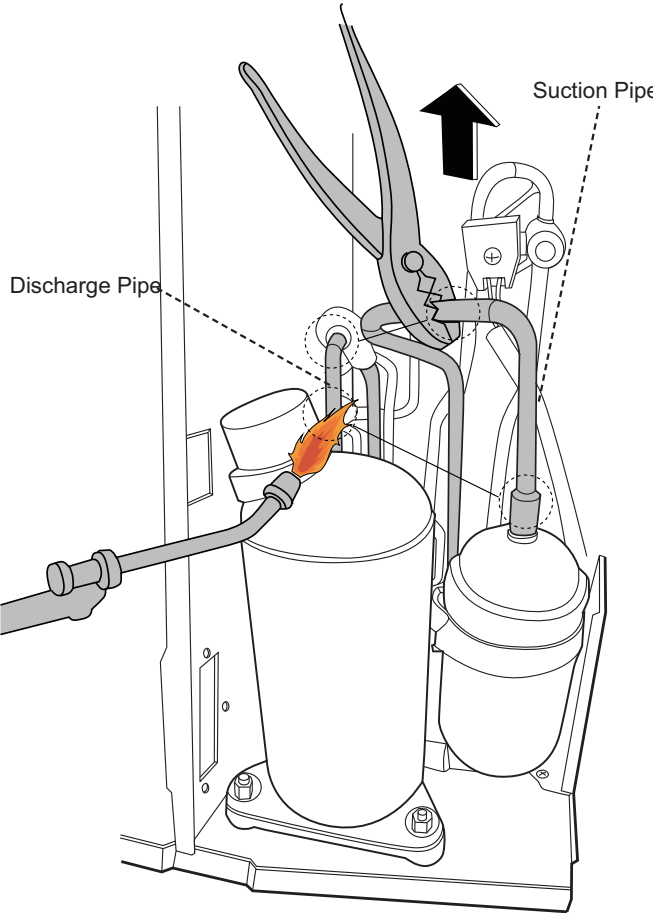
WARNING

EXPLOSION RISK

Evacuate the system and confirm that there is no refrigerant left in the system before removing the four-way valve and the compressor. (For R32 & R290, you should evacuate the system with the vacuum pump; flush the system with nitrogen; then repeat the two steps before heating up the brazed parts. The operations above should be implemented by professionals.)

**NOTE:** Remove the panel plate, connection of four-way valve on PCB (refer to “12K (115V) and 9-12K (208/230V) Unit Disassembly - Panel Plate” on page 68, “18K Unit Disassembly - Panel Plate” on page 71, “24K Unit Disassembly - Panel Plate” on page 74, or “24K Unit Disassembly - Panel Plate” on page 74 and “24K (208V/230V) Disassembly - Electrical Parts” on page 83) before disassembling sound blanket.

| PROCEDURES                                                                                  | ILLUSTRATION                                                                         |
|---------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 1. Remove the flange nut of terminal cover and remove the terminal cover (see illustration) |   |
| 2. Disconnect the connectors (see illustration)                                             |  |

| PROCEDURES                                                                                                                                                                                              | ILLUSTRATION                                                                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| <p>3. Remove the hex nuts and washers securing the compressor, located on the bottom plate. (see illustration)</p>                                                                                      |   |
| <p>4. Heat up the brazed parts and then remove the discharge pipe and the suction pipe. (see illustration)</p> <p>5. Lift the compressor from the base pan assembly with pliers. (see illustration)</p> |  |

**APPENDIX****Temperature Sensor Resistance Value Table for TP (°C - K)**

| °C  | °F | K Ohm | °C | °F  | K Ohm | °C | °F  | K Ohm | °C  | °F  | K Ohm |
|-----|----|-------|----|-----|-------|----|-----|-------|-----|-----|-------|
| -20 | -4 | 542.7 | 20 | 68  | 68.66 | 60 | 140 | 13.59 | 100 | 212 | 3.702 |
| -19 | -2 | 511.9 | 21 | 70  | 65.62 | 61 | 142 | 13.11 | 101 | 214 | 3.595 |
| -18 | 0  | 483   | 22 | 72  | 62.73 | 62 | 144 | 12.65 | 102 | 216 | 3.492 |
| -17 | 1  | 455.9 | 23 | 73  | 59.98 | 63 | 145 | 12.21 | 103 | 217 | 3.392 |
| -16 | 3  | 430.5 | 24 | 75  | 57.37 | 64 | 147 | 11.79 | 104 | 219 | 3.296 |
| -15 | 5  | 406.7 | 25 | 77  | 54.89 | 65 | 149 | 11.38 | 105 | 221 | 3.203 |
| -14 | 7  | 384.3 | 26 | 79  | 52.53 | 66 | 151 | 10.99 | 106 | 223 | 3.113 |
| -13 | 9  | 363.3 | 27 | 81  | 50.28 | 67 | 153 | 10.61 | 107 | 225 | 3.025 |
| -12 | 10 | 343.6 | 28 | 82  | 48.14 | 68 | 154 | 10.25 | 108 | 226 | 2.941 |
| -11 | 12 | 325.1 | 29 | 84  | 46.11 | 69 | 156 | 9.902 | 109 | 228 | 2.86  |
| -10 | 14 | 307.7 | 30 | 86  | 44.17 | 70 | 158 | 9.569 | 110 | 230 | 2.781 |
| -9  | 16 | 291.3 | 31 | 88  | 42.33 | 71 | 160 | 9.248 | 111 | 232 | 2.704 |
| -8  | 18 | 275.9 | 32 | 90  | 40.57 | 72 | 162 | 8.94  | 112 | 234 | 2.63  |
| -7  | 19 | 261.4 | 33 | 91  | 38.89 | 73 | 163 | 8.643 | 113 | 235 | 2.559 |
| -6  | 21 | 247.8 | 34 | 93  | 37.3  | 74 | 165 | 8.358 | 114 | 237 | 2.489 |
| -5  | 23 | 234.9 | 35 | 95  | 35.78 | 75 | 167 | 8.084 | 115 | 239 | 2.422 |
| -4  | 25 | 222.8 | 36 | 97  | 34.32 | 76 | 169 | 7.82  | 116 | 241 | 2.357 |
| -3  | 27 | 211.4 | 37 | 99  | 32.94 | 77 | 171 | 7.566 | 117 | 243 | 2.294 |
| -2  | 28 | 200.7 | 38 | 100 | 31.62 | 78 | 172 | 7.321 | 118 | 244 | 2.233 |
| -1  | 30 | 190.5 | 39 | 102 | 30.36 | 79 | 174 | 7.086 | 119 | 246 | 2.174 |
| 0   | 32 | 180.9 | 40 | 104 | 29.15 | 80 | 176 | 6.859 | 120 | 248 | 2.117 |
| 1   | 34 | 171.9 | 41 | 106 | 28    | 81 | 178 | 6.641 | 121 | 250 | 2.061 |
| 2   | 36 | 163.3 | 42 | 108 | 26.9  | 82 | 180 | 6.43  | 122 | 252 | 2.007 |
| 3   | 37 | 155.2 | 43 | 109 | 25.86 | 83 | 181 | 6.228 | 123 | 253 | 1.955 |
| 4   | 39 | 147.6 | 44 | 111 | 24.85 | 84 | 183 | 6.033 | 124 | 255 | 1.905 |
| 5   | 41 | 140.4 | 45 | 113 | 23.89 | 85 | 185 | 5.844 | 125 | 257 | 1.856 |
| 6   | 43 | 133.5 | 46 | 115 | 22.89 | 86 | 187 | 5.663 | 126 | 259 | 1.808 |
| 7   | 45 | 127.1 | 47 | 117 | 22.1  | 87 | 189 | 5.488 | 127 | 261 | 1.762 |
| 8   | 46 | 121   | 48 | 118 | 21.26 | 88 | 190 | 5.32  | 128 | 262 | 1.717 |
| 9   | 48 | 115.2 | 49 | 120 | 20.46 | 89 | 192 | 5.157 | 129 | 264 | 1.674 |
| 10  | 50 | 109.8 | 50 | 122 | 19.69 | 90 | 194 | 5     | 130 | 266 | 1.632 |
| 11  | 52 | 104.6 | 51 | 124 | 18.96 | 91 | 196 | 4.849 | ?   | ?   | ?     |
| 12  | 54 | 99.69 | 52 | 126 | 18.26 | 92 | 198 | 4.703 | ?   | ?   | ?     |
| 13  | 55 | 95.05 | 53 | 127 | 17.58 | 93 | 199 | 4.562 | ?   | ?   | ?     |
| 14  | 57 | 90.66 | 54 | 129 | 16.94 | 94 | 201 | 4.426 | ?   | ?   | ?     |
| 15  | 59 | 86.49 | 55 | 131 | 16.32 | 95 | 203 | 4.294 | ?   | ?   | ?     |
| 16  | 61 | 82.54 | 56 | 133 | 15.73 | 96 | 205 | 4.167 | ?   | ?   | ?     |
| 17  | 63 | 78.79 | 57 | 135 | 15.16 | 97 | 207 | 4.045 | ?   | ?   | ?     |
| 18  | 64 | 75.24 | 58 | 136 | 14.62 | 98 | 208 | 3.927 | ?   | ?   | ?     |
| 19  | 66 | 71.86 | 59 | 138 | 14.09 | 99 | 210 | 3.812 | ?   | ?   | ?     |

## Other Temperature Sensors Resistance Value Table (°C - K)

| °C  | °F | K Ohm   | °C | °F  | K Ohm   | °C | °F  | K Ohm   | °C  | °F  | K Ohm   |
|-----|----|---------|----|-----|---------|----|-----|---------|-----|-----|---------|
| -20 | -4 | 115.266 | 20 | 68  | 12.6431 | 60 | 140 | 2.35774 | 100 | 212 | 0.62973 |
| -19 | -2 | 108.146 | 21 | 70  | 12.0561 | 61 | 142 | 2.27249 | 101 | 214 | 0.61148 |
| -18 | 0  | 101.517 | 22 | 72  | 11.5    | 62 | 144 | 2.19073 | 102 | 216 | 0.59386 |
| -17 | 1  | 96.3423 | 23 | 73  | 10.9731 | 63 | 145 | 2.11241 | 103 | 217 | 0.57683 |
| -16 | 3  | 89.5865 | 24 | 75  | 10.4736 | 64 | 147 | 2.03732 | 104 | 219 | 0.56038 |
| -15 | 5  | 84.219  | 25 | 77  | 10      | 65 | 149 | 1.96532 | 105 | 221 | 0.54448 |
| -14 | 7  | 79.311  | 26 | 79  | 9.55074 | 66 | 151 | 1.89627 | 106 | 223 | 0.52912 |
| -13 | 9  | 74.536  | 27 | 81  | 9.12445 | 67 | 153 | 1.83003 | 107 | 225 | 0.51426 |
| -12 | 10 | 70.1698 | 28 | 82  | 8.71983 | 68 | 154 | 1.76647 | 108 | 226 | 0.49989 |
| -11 | 12 | 66.0898 | 29 | 84  | 8.33566 | 69 | 156 | 1.70547 | 109 | 228 | 0.486   |
| -10 | 14 | 62.2756 | 30 | 86  | 7.97078 | 70 | 158 | 1.64691 | 110 | 230 | 0.47256 |
| -9  | 16 | 58.7079 | 31 | 88  | 7.62411 | 71 | 160 | 1.59068 | 111 | 232 | 0.45957 |
| -8  | 18 | 56.3694 | 32 | 90  | 7.29464 | 72 | 162 | 1.53668 | 112 | 234 | 0.44699 |
| -7  | 19 | 52.2438 | 33 | 91  | 6.98142 | 73 | 163 | 1.48481 | 113 | 235 | 0.43482 |
| -6  | 21 | 49.3161 | 34 | 93  | 6.68355 | 74 | 165 | 1.43498 | 114 | 237 | 0.42304 |
| -5  | 23 | 46.5725 | 35 | 95  | 6.40021 | 75 | 167 | 1.38703 | 115 | 239 | 0.41164 |
| -4  | 25 | 44      | 36 | 97  | 6.13059 | 76 | 169 | 1.34105 | 116 | 241 | 0.4006  |
| -3  | 27 | 41.5878 | 37 | 99  | 5.87359 | 77 | 171 | 1.29078 | 117 | 243 | 0.38991 |
| -2  | 28 | 39.8239 | 38 | 100 | 5.62961 | 78 | 172 | 1.25423 | 118 | 244 | 0.37956 |
| -1  | 30 | 37.1988 | 39 | 102 | 5.39689 | 79 | 174 | 1.2133  | 119 | 246 | 0.36954 |
| 0   | 32 | 35.2024 | 40 | 104 | 5.17519 | 80 | 176 | 1.17393 | 120 | 248 | 0.35982 |
| 1   | 34 | 33.3269 | 41 | 106 | 4.96392 | 81 | 178 | 1.13604 | 121 | 250 | 0.35042 |
| 2   | 36 | 31.5635 | 42 | 108 | 4.76253 | 82 | 180 | 1.09958 | 122 | 252 | 0.3413  |
| 3   | 37 | 29.9058 | 43 | 109 | 4.5705  | 83 | 181 | 1.06448 | 123 | 253 | 0.33246 |
| 4   | 39 | 28.3459 | 44 | 111 | 4.38736 | 84 | 183 | 1.03069 | 124 | 255 | 0.3239  |
| 5   | 41 | 26.8778 | 45 | 113 | 4.21263 | 85 | 185 | 0.99815 | 125 | 257 | 0.31559 |
| 6   | 43 | 25.4954 | 46 | 115 | 4.04589 | 86 | 187 | 0.96681 | 126 | 259 | 0.30754 |
| 7   | 45 | 24.1932 | 47 | 117 | 3.88673 | 87 | 189 | 0.93662 | 127 | 261 | 0.29974 |
| 8   | 46 | 22.5662 | 48 | 118 | 3.73476 | 88 | 190 | 0.90753 | 128 | 262 | 0.29216 |
| 9   | 48 | 21.8094 | 49 | 120 | 3.58962 | 89 | 192 | 0.8795  | 129 | 264 | 0.28482 |
| 10  | 50 | 20.7184 | 50 | 122 | 3.45097 | 90 | 194 | 0.85248 | 130 | 266 | 0.2777  |
| 11  | 52 | 19.6891 | 51 | 124 | 3.31847 | 91 | 196 | 0.82643 | 131 | 268 | 0.27078 |
| 12  | 54 | 18.7177 | 52 | 126 | 3.19183 | 92 | 198 | 0.80132 | 132 | 270 | 0.26408 |
| 13  | 55 | 17.8005 | 53 | 127 | 3.07075 | 93 | 199 | 0.77709 | 133 | 271 | 0.25757 |
| 14  | 57 | 16.9341 | 54 | 129 | 2.95896 | 94 | 201 | 0.75373 | 134 | 273 | 0.25125 |
| 15  | 59 | 16.1156 | 55 | 131 | 2.84421 | 95 | 203 | 0.73119 | 135 | 275 | 0.24512 |
| 16  | 61 | 15.3418 | 56 | 133 | 2.73823 | 96 | 205 | 0.70944 | 136 | 277 | 0.23916 |
| 17  | 63 | 14.6181 | 57 | 135 | 2.63682 | 97 | 207 | 0.68844 | 137 | 279 | 0.23338 |
| 18  | 64 | 13.918  | 58 | 136 | 2.53973 | 98 | 208 | 0.66818 | 138 | 280 | 0.22776 |
| 19  | 66 | 13.2631 | 59 | 138 | 2.44677 | 99 | 210 | 0.64862 | 139 | 282 | 0.22231 |

**System Pressure Table-R454B**

| Pressure |      |       | Temperature |       | Pressure |       |        | Temperature |       |
|----------|------|-------|-------------|-------|----------|-------|--------|-------------|-------|
| Kpa      | bar  | PSI   | °C          | °F    | Kpa      | bar   | PSI    | °C          | °F    |
| 58.196   | 0.58 | 8.44  | -60         | -76   | 935.23   | 9.35  | 135.64 | 8           | 46.4  |
| 61.517   | 0.62 | 8.92  | -59         | -74.2 | 963.75   | 9.64  | 139.78 | 9           | 48.2  |
| 64.988   | 0.65 | 9.43  | -58         | -72.4 | 992.93   | 9.93  | 144.01 | 10          | 50    |
| 68.615   | 0.69 | 9.95  | -57         | -70.6 | 1022.8   | 10.23 | 148.34 | 11          | 51.8  |
| 72.402   | 0.72 | 10.50 | -56         | -68.8 | 1053.3   | 10.53 | 152.76 | 12          | 53.6  |
| 76.354   | 0.76 | 11.07 | -55         | -67   | 1084.5   | 10.85 | 157.29 | 13          | 55.4  |
| 80.478   | 0.80 | 11.67 | -54         | -65.2 | 1116.4   | 11.16 | 161.91 | 14          | 57.2  |
| 84.776   | 0.85 | 12.30 | -53         | -63.4 | 1149     | 11.49 | 166.64 | 15          | 59    |
| 89.256   | 0.89 | 12.95 | -52         | -61.6 | 1182.3   | 11.82 | 171.47 | 16          | 60.8  |
| 93.923   | 0.94 | 13.62 | -51         | -59.8 | 1216.3   | 12.16 | 176.40 | 17          | 62.6  |
| 98.781   | 0.99 | 14.33 | -50         | -58   | 1251.1   | 12.51 | 181.45 | 18          | 64.4  |
| 103.84   | 1.04 | 15.06 | -49         | -56.2 | 1286.6   | 12.87 | 186.60 | 19          | 66.2  |
| 109.1    | 1.09 | 15.82 | -48         | -54.4 | 1322.8   | 13.23 | 191.85 | 20          | 68    |
| 114.56   | 1.15 | 16.61 | -47         | -52.6 | 1359.9   | 13.60 | 197.23 | 21          | 69.8  |
| 120.25   | 1.20 | 17.44 | -46         | -50.8 | 1397.7   | 13.98 | 202.71 | 22          | 71.6  |
| 126.15   | 1.26 | 18.30 | -45         | -49   | 1436.3   | 14.36 | 208.31 | 23          | 73.4  |
| 132.28   | 1.32 | 19.18 | -44         | -47.2 | 1475.7   | 14.76 | 214.02 | 24          | 75.2  |
| 138.64   | 1.39 | 20.11 | -43         | -45.4 | 1515.9   | 15.16 | 219.85 | 25          | 77    |
| 145.24   | 1.45 | 21.06 | -42         | -43.6 | 1557     | 15.57 | 225.82 | 26          | 78.8  |
| 152.09   | 1.52 | 22.06 | -41         | -41.8 | 1598.9   | 15.99 | 231.89 | 27          | 80.6  |
| 159.18   | 1.59 | 23.09 | -40         | -40   | 1641.6   | 16.42 | 238.09 | 28          | 82.4  |
| 166.54   | 1.67 | 24.15 | -39         | -38.2 | 1685.2   | 16.85 | 244.41 | 29          | 84.2  |
| 174.15   | 1.74 | 25.26 | -38         | -36.4 | 1729.7   | 17.30 | 250.86 | 30          | 86    |
| 182.04   | 1.82 | 26.40 | -37         | -34.6 | 1775     | 17.75 | 257.43 | 31          | 87.8  |
| 190.2    | 1.90 | 27.59 | -36         | -32.8 | 1821.3   | 18.21 | 264.15 | 32          | 89.6  |
| 198.65   | 1.99 | 28.81 | -35         | -31   | 1868.4   | 18.68 | 270.98 | 33          | 91.4  |
| 207.39   | 2.07 | 30.08 | -34         | -29.2 | 1916.5   | 19.17 | 277.95 | 34          | 93.2  |
| 216.42   | 2.16 | 31.39 | -33         | -27.4 | 1965.6   | 19.66 | 285.08 | 35          | 95    |
| 225.76   | 2.26 | 32.74 | -32         | -25.6 | 2015.5   | 20.16 | 292.31 | 36          | 96.8  |
| 235.41   | 2.35 | 34.14 | -31         | -23.8 | 2066.5   | 20.67 | 299.71 | 37          | 98.6  |
| 245.37   | 2.45 | 35.59 | -30         | -22   | 2118.4   | 21.18 | 307.24 | 38          | 100.4 |
| 255.67   | 2.56 | 37.08 | -29         | -20.2 | 2171.3   | 21.71 | 314.91 | 39          | 102.2 |
| 266.29   | 2.66 | 38.62 | -28         | -18.4 | 2225.2   | 22.25 | 322.73 | 40          | 104   |
| 277.25   | 2.77 | 40.21 | -27         | -16.6 | 2280.2   | 22.80 | 330.70 | 41          | 105.8 |
| 288.56   | 2.89 | 41.85 | -26         | -14.8 | 2336.1   | 23.36 | 338.81 | 42          | 107.6 |
| 300.22   | 3.00 | 43.54 | -25         | -13   | 2393.2   | 23.93 | 347.09 | 43          | 109.4 |
| 312.24   | 3.12 | 45.28 | -24         | -11.2 | 2451.3   | 24.51 | 355.52 | 44          | 111.2 |
| 324.63   | 3.25 | 47.08 | -23         | -9.4  | 2510.4   | 25.10 | 364.09 | 45          | 113   |
| 337.39   | 3.37 | 48.93 | -22         | -7.6  | 2570.7   | 25.71 | 372.84 | 46          | 114.8 |
| 350.54   | 3.51 | 50.84 | -21         | -5.8  | 2632.1   | 26.32 | 381.74 | 47          | 116.6 |
| 364.08   | 3.64 | 52.80 | -20         | -4    | 2694.7   | 26.95 | 390.82 | 48          | 118.4 |
| 378.02   | 3.78 | 54.83 | -19         | -2.2  | 2758.3   | 27.58 | 400.04 | 49          | 120.2 |
| 392.37   | 3.92 | 56.91 | -18         | -0.4  | 2823.2   | 28.23 | 409.46 | 50          | 122   |
| 407.13   | 4.07 | 59.05 | -17         | 1.4   | 2889.3   | 28.89 | 419.04 | 51          | 123.8 |

**System Pressure Table-R454B (Continued)**

| Pressure |      |        | Temperature |      | Pressure |       |        | Temperature |       |
|----------|------|--------|-------------|------|----------|-------|--------|-------------|-------|
| Kpa      | bar  | PSI    | °C          | °F   | Kpa      | bar   | PSI    | °C          | °F    |
| 422.31   | 4.22 | 61.25  | -16         | 3.2  | 2956.5   | 29.57 | 428.79 | 52          | 125.6 |
| 437.92   | 4.38 | 63.51  | -15         | 5    | 3025     | 30.25 | 438.72 | 53          | 127.4 |
| 453.98   | 4.54 | 65.84  | -14         | 6.8  | 3094.7   | 30.95 | 448.83 | 54          | 129.2 |
| 470.47   | 4.70 | 68.23  | -13         | 8.6  | 3165.7   | 31.66 | 459.13 | 55          | 131   |
| 487.43   | 4.87 | 70.69  | -12         | 10.4 | 3238.1   | 32.38 | 469.63 | 56          | 132.8 |
| 504.84   | 5.05 | 73.22  | -11         | 12.2 | 3311.7   | 33.12 | 480.30 | 57          | 134.6 |
| 522.73   | 5.23 | 75.81  | -10         | 14   | 3386.7   | 33.87 | 491.18 | 58          | 136.4 |
| 541.1    | 5.41 | 78.48  | -9          | 15.8 | 3463     | 34.63 | 502.25 | 59          | 138.2 |
| 559.95   | 5.60 | 81.21  | -8          | 17.6 | 3540.7   | 35.41 | 513.52 | 60          | 140   |
| 579.31   | 5.79 | 84.02  | -7          | 19.4 | 3619.9   | 36.20 | 525.00 | 61          | 141.8 |
| 599.16   | 5.99 | 86.90  | -6          | 21.2 | 3700.5   | 37.01 | 536.69 | 62          | 143.6 |
| 619.54   | 6.20 | 89.85  | -5          | 23   | 3782.7   | 37.83 | 548.61 | 63          | 145.4 |
| 640.43   | 6.40 | 92.88  | -4          | 24.8 | 3866.3   | 38.66 | 560.74 | 64          | 147.2 |
| 661.86   | 6.62 | 95.99  | -3          | 26.6 | 3951.5   | 39.52 | 573.10 | 65          | 149   |
| 683.82   | 6.84 | 99.18  | -2          | 28.4 | 4038.3   | 40.38 | 585.69 | 66          | 150.8 |
| 706.34   | 7.06 | 102.44 | -1          | 30.2 | 4126.8   | 41.27 | 598.52 | 67          | 152.6 |
| 729.41   | 7.29 | 105.79 | 0           | 32   | 4217     | 42.17 | 611.60 | 68          | 154.4 |
| 753.06   | 7.53 | 109.22 | 1           | 33.8 | 4309     | 43.09 | 624.95 | 69          | 156.2 |
| 777.28   | 7.77 | 112.73 | 2           | 35.6 | 4402.9   | 44.03 | 638.56 | 70          | 158   |
| 802.08   | 8.02 | 116.33 | 3           | 37.4 | 4498.7   | 44.99 | 652.46 | 71          | 159.8 |
| 827.48   | 8.27 | 120.01 | 4           | 39.2 | 4596.5   | 45.97 | 666.64 | 72          | 161.6 |
| 853.49   | 8.53 | 123.78 | 5           | 41   | 4696.5   | 46.97 | 681.15 | 73          | 163.4 |
| 880.11   | 8.80 | 127.64 | 6           | 42.8 | 4798.9   | 47.99 | 696.00 | 74          | 165.2 |
| 907.35   | 9.07 | 131.60 | 7           | 44.6 | 4904.1   | 49.04 | 711.25 | 75          | 167   |