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*Comfort-Cire*®

**Century**®

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**Service Manual**

# **VFH-B Series**

**Inverter Multi Zone Ductless Mini-Split**

A-VFH18DB-1

A-VFH24TB-1

# Attention

**ALL INVERTER MINI-SPLITS REQUIRE 14-4 STRANDED  
WIRE BETWEEN THE INDOOR AND OUTDOOR UNITS  
(NO EXCEPTIONS)**

## **14 AWG 4/C TRAY CABLE**

### **A14/4SRBTHHNBK**

**14 AWG (19/0147) BC 4/C, THHN CONDUCTORS POWER & CONTROL**

**TRAY CABLE TYPE TC CABLE FOR INSTALLATION IN  
ACCORDANCE WITH ARTICLE 336 AND OTHER APPLICABLE PARTS  
OF THE NATIONAL ELECTRIC CODE. 600V (UL) E123517 DIRECT  
BURIAL SUNLIGHT RESISTANT PVC JACKET**

10/25/16

**RoHS Compliant**

**MADE IN USA BLACK**

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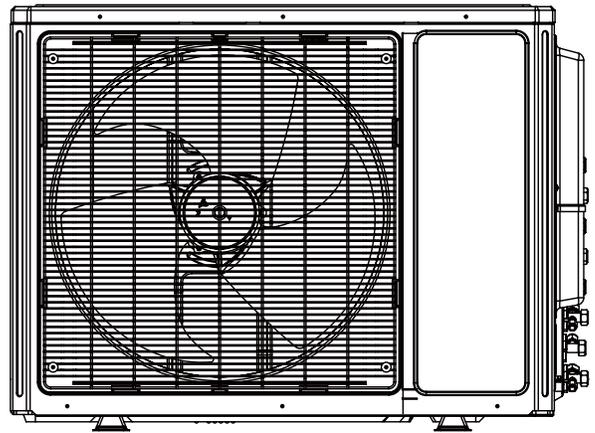
# Part I : Technical Information

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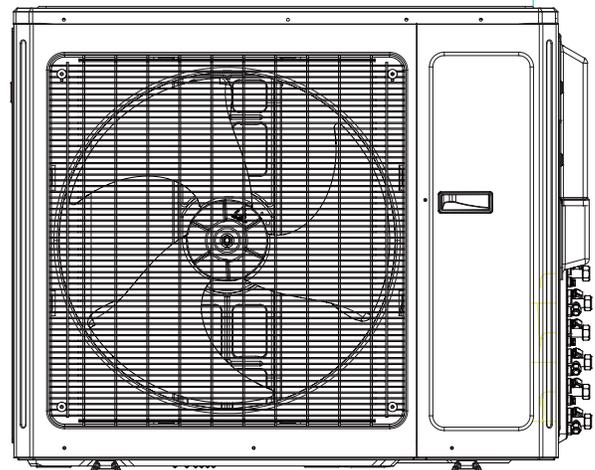
## 1. Summary

### Outdoor Unit

A-VFH18DB-1



A-VFH24TB-1



## 2. Specifications

|                              |   |           |                                 |                          |
|------------------------------|---|-----------|---------------------------------|--------------------------|
| Model                        |   |           | A-VFH18DB-1                     |                          |
| Product Code                 |   |           | CB228W07700_L61437              |                          |
| Power supply                 | Rated Voltage   | V~        | 208/230                         |                          |
|                              | Rated Frequency   | Hz        | 60                              |                          |
|                              | Phases  |           | 1                               |                          |
| Cooling capacity(max~min)    |   | Btu/h     | 18000(6155~6998)                |                          |
| Heating capacity(max~min)    |   | Btu/h     | 19000(8530~22600)               |                          |
| Cooling Power Input(max~min) |   | W         | 1440                            |                          |
| Heating Power Input(max~min) |   | W         | 1520                            |                          |
| Cooling Current Input        |   | A         | 6.26                            |                          |
| Heating Current Input        |   | A         | 6.61                            |                          |
| Rated Power Input            |   | W         | 2800                            |                          |
| Rated Current                |   | A         | 12.42                           |                          |
| EER                          |   | (Btu/h)/W | 12.5                            |                          |
| COP                          |   | (Btu/h)/W | 12.5                            |                          |
| Outdoor Unit                 | Compressor Trademark  |           | ZHUHAI LANDA COMPRESSOR CO.,LTD |                          |
|                              | Compressor Model  |           | QXA-B141zF030A                  |                          |
|                              | Compressor Refrigerant Oil Type                                 |           | RB68EP                          |                          |
|                              | Compressor Type   |           | Inverter Rotary                 |                          |
|                              | L.R.A   |           | A                               | /                        |
|                              | Compressor Rated Load Amp (RLA)                                 |           | A                               | 10.82                    |
|                              | Compressor Power Input  |           | W                               | 1440                     |
|                              | Compressor Thermal Protector                                    |           |                                 | 1NT11L-6233              |
|                              | Throttling Method   |           |                                 | Electron expansion valve |
|                              | Cooling Operation Ambient Temperature Range                     |           | °F                              | -0.4~118.4               |
|                              | Heating Operation Ambient Temperature Range                     |           | °F                              | -4~75.2                  |
|                              | Condenser Material  |           |                                 | Aluminum Fin-copper Tube |
|                              | Condenser Pipe Diameter   |           | inch                            | Φ9/32                    |
|                              | Rows-Fin Gap(mm)  |           | inch                            | 2-1/18                   |
|                              | Coil length (l) X height (H) X coil width (L)                   |           | inch                            | 33 1/2X1 /12X26          |
|                              | Fan Motor Speed (rpm) (H/M/L)                                   |           | rpm                             | 630                      |
|                              | Output of Fan Motor   |           | W                               | 60                       |
|                              | Fan Motor RLA   |           | A                               | 0.62                     |
|                              | Fan Motor Capacitor   |           | μF                              | /                        |
|                              | Air Flow Volume of Outdoor Unit                                 |           | CFM                             | 1883                     |
|                              | Fan Type-Piece  |           |                                 | Axial-flow               |
|                              | Fan Diameter  |           | inch                            | Φ20 1/2                  |
|                              | Defrosting Method   |           |                                 | Automatic Defrosting     |
|                              | Climate Type  |           |                                 | T1                       |
|                              | Isolation   |           |                                 | I                        |
|                              | Moisture Protection   |           |                                 | IPX4                     |
|                              | Permissible Excessive Operating Pressure for the Discharge Side |           | MPa                             | 4.3                      |
|                              | Permissible Excessive Operating Pressure for the Suction Side   |           | MPa                             | 2.5                      |
|                              | Dimension (W/H/D)   |           | inch                            | 38X27 9/16X15 39/64      |
|                              | Dimension of Package (L/W/H)                                    |           | inch                            | 40 13/32X18X29           |
|                              | Dimension of Package(L/W/H)                                     |           | inch                            | 40 1/2X18X29 1/2         |
|                              | Net Weight  |           | lb                              | 114.7                    |
| Gross Weight                 |   | lb        | 124.6                           |                          |
| Refrigerant Charge           |   |           | R410A                           |                          |
| Refrigerant Charge           |   | oz        | 56.45                           |                          |

|  |   |        |                  |
|--|---|--------|------------------|
| Outdoor<br>Unit                                    | Cross-sectional Area of Power Cable Conductor                           | sq in  | 0.0032           |
|  | Recommended Power Cable(Core)   | N      | 3                |
|  | Connection Pipe Connection Method                                       |        | Flare Connection |
|  | Not Additional Gas Connection Pipe Length                               | ft     | 32.8             |
|  | Connection Pipe Gas Additional Charge                                   | oz/ft. | 0.2              |
|  | Outer Diameter of Liquid Pipe1  | inch   | 1/4              |
|  | Outer Diameter of Liquid Pipe2  | inch   | 1/4              |
|  | Outer Diameter of Gas Pipe1   | inch   | 3/8              |
|  | Outer Diameter of Gas Pipe2   | inch   | 3/8              |
|  | Connection Pipe Max. Height Distance(indoor and indoor)                 | ft     | 32.8             |
|  | Connection Pipe Max. Height Distance(indoor and outdoor and indoor up)  | ft     | 32.8             |
|  | Connection Pipe Max. Height Distance(indoor and outdoor and outdoor up) | ft     | 32.8             |
|  | Max. equivalent connection pipe length(outdoor to last indoor)          | ft     | 32.8             |
| Connection Pipe Max. Length Distance(total length) | ft  | 65.6   |                  |

The above data is subject to change without notice; please refer to the nameplate of the unit.

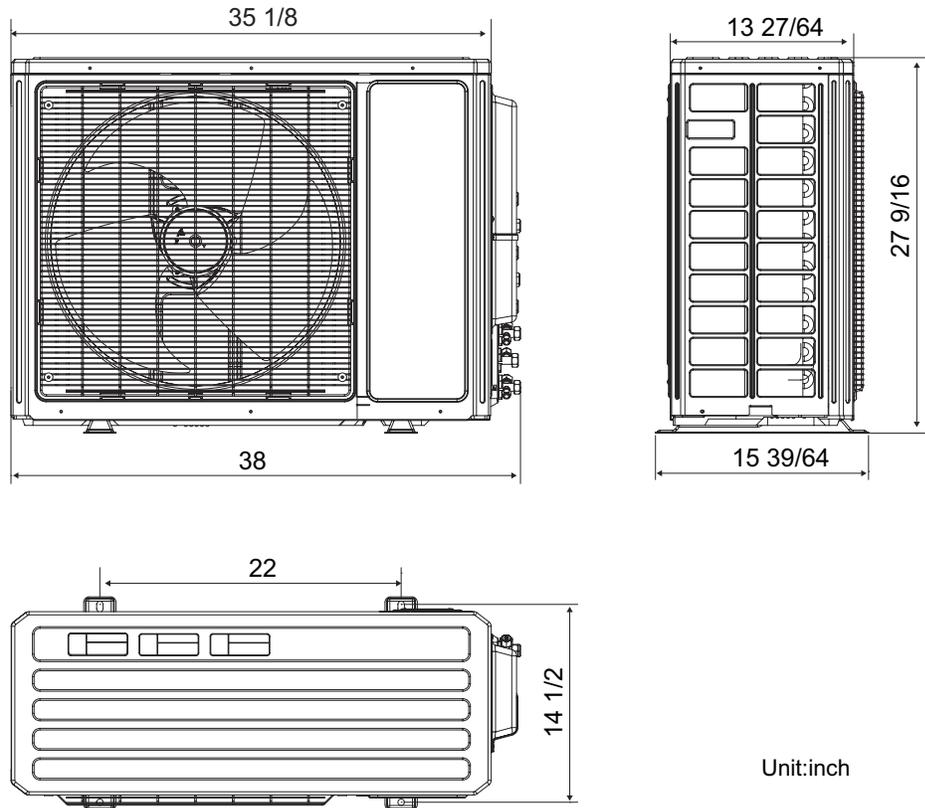
|                              |   |           |                                 |                           |
|------------------------------|---|-----------|---------------------------------|---------------------------|
| Model                        |   |           | A-VFH24TB-1                     |                           |
| Product Code                 |   |           | CB228W07800_L61437              |                           |
| Power supply                 | Rated Voltage   | V~        | 208/230                         |                           |
|                              | Rated Frequency   | Hz        | 60                              |                           |
|                              | Phases  |           | 1                               |                           |
| Cooling capacity(max~min)    |   | Btu/h     | 24000(7500~33000)               |                           |
| Heating capacity(max~min)    |   | Btu/h     | 26000(7500~35000)               |                           |
| Cooling Power Input(max~min) |   | W         | 1920                            |                           |
| Heating Power Input(max~min) |   | W         | 2050                            |                           |
| Cooling Current Input        |   | A         | 8.35                            |                           |
| Heating Current Input        |   | A         | 8.9                             |                           |
| Rated Power Input            |   | W         | 4550                            |                           |
| Rated Current                |   | A         | 20.19                           |                           |
| EER                          |   | (Btu/h)/W | 12.5                            |                           |
| COP                          |   | (Btu/h)/W | 12.7                            |                           |
| Outdoor Unit                 | Compressor Trademark  |           | ZHUHAI LANDA COMPRESSOR CO.,LTD |                           |
|                              | Compressor Model  |           | QXAS-D23zX090B                  |                           |
|                              | Compressor Refrigerant Oil Type                                 |           | RB68EP                          |                           |
|                              | Compressor Type   |           | Inverter Rotary                 |                           |
|                              | L.R.A   |           | A                               | /                         |
|                              | Compressor Rated Load Amp (RLA)                                 |           | A                               | 15.82                     |
|                              | Compressor Power Input  |           | W                               | 2550                      |
|                              | Compressor Thermal Protector                                    |           |                                 | 1NT11L-6233               |
|                              | Throttling Method   |           |                                 | Electron expansion valve  |
|                              | Cooling Operation Ambient Temperature Range                     |           | °F                              | -0.4~118.4                |
|                              | Heating Operation Ambient Temperature Range                     |           | °F                              | -4~75.2                   |
|                              | Condenser Material  |           |                                 | Aluminum Fin-copper Tube  |
|                              | Condenser Pipe Diameter   |           | inch                            | Φ2/7                      |
|                              | Rows-Fin Gap(mm)  |           | inch                            | 2-1/18                    |
|                              | Coil length (l) X height (H) X coil width (L)                   |           | inch                            | 38 21/32X1 1/2X29 7/16    |
|                              | Fan Motor Speed (rpm) (H/M/L)                                   |           | rpm                             | 800                       |
|                              | Output of Fan Motor   |           | W                               | 90                        |
|                              | Fan Motor RLA   |           | A                               | 0.59                      |
|                              | Fan Motor Capacitor   |           | μF                              | /                         |
|                              | Air Flow Volume of Outdoor Unit                                 |           | CFM                             | 2354                      |
|                              | Fan Type-Piece  |           |                                 | Axial-flow                |
|                              | Fan Diameter  |           | inch                            | Φ21 43/64-2 39/64         |
|                              | Defrosting Method   |           |                                 | Automatic Defrosting      |
|                              | Climate Type  |           |                                 | T1                        |
|                              | Isolation   |           |                                 | I                         |
|                              | Moisture Protection   |           |                                 | IPX4                      |
|                              | Permissible Excessive Operating Pressure for the Discharge Side |           | MPa                             | 4.3                       |
|                              | Permissible Excessive Operating Pressure for the Suction Side   |           | MPa                             | 2.5                       |
|                              | Dimension (W/H/D)   |           | inch                            | 38 37/64X31 7/64X17 21/64 |
|                              | Dimension of Package (L/W/H)                                    |           | inch                            | 42 1/2X19X33              |
| Dimension of Package(L/W/H)  |   | inch      | 42 43/64X19 13/64X33 43/64      |                           |
| Net Weight                   |   | lb        | 153.2                           |                           |
| Gross Weight                 |   | lb        | 164.3                           |                           |
| Refrigerant Charge           |   |           | R410A                           |                           |
| Refrigerant Charge           |   | oz        | 77.6                            |                           |

|   |  |        |                  |
|---|--|--------|------------------|
| Outdoor<br>Unit   | Cross-sectional Area of Power Cable Conductor                            | sq in  | 0.0051           |
|   | Recommended Power Cable (Core)   | N      | 3                |
|   | Connection Pipe Connection Method  | -      | Flare Connection |
|   | Not Additional Gas Connection Pipe Length                                | ft     | 98.4             |
|   | Connection Pipe Gas Additional Charge                                    | oz/ft. | 0.2              |
|   | Outer Diameter of Liquid Pipe1   | inch   | 1/4              |
|   | Outer Diameter of Liquid Pipe2   | inch   | 1/4              |
|   | Outer Diameter of Liquid Pipe2   | inch   | 1/4              |
|   | Outer Diameter of Gas Pipe1  | inch   | 3/8              |
|   | Outer Diameter of Gas Pipe2  | inch   | 3/8              |
|   | Outer Diameter of Gas Pipe2  | inch   | 3/8              |
|   | Connection Pipe Max. Height Distance (indoor and indoor)                 | ft     | 32.8             |
|   | Connection Pipe Max. Height Distance (indoor and outdoor and indoor up)  | ft     | 32.8             |
|   | Connection Pipe Max. Height Distance (indoor and outdoor and outdoor up) | ft     | 32.8             |
| Max. equivalent connection pipe length (outdoor to last indoor) | ft   | 65.6   |                  |
| Connection Pipe Max. Length Distance (total length)             | ft   | 196.8  |                  |

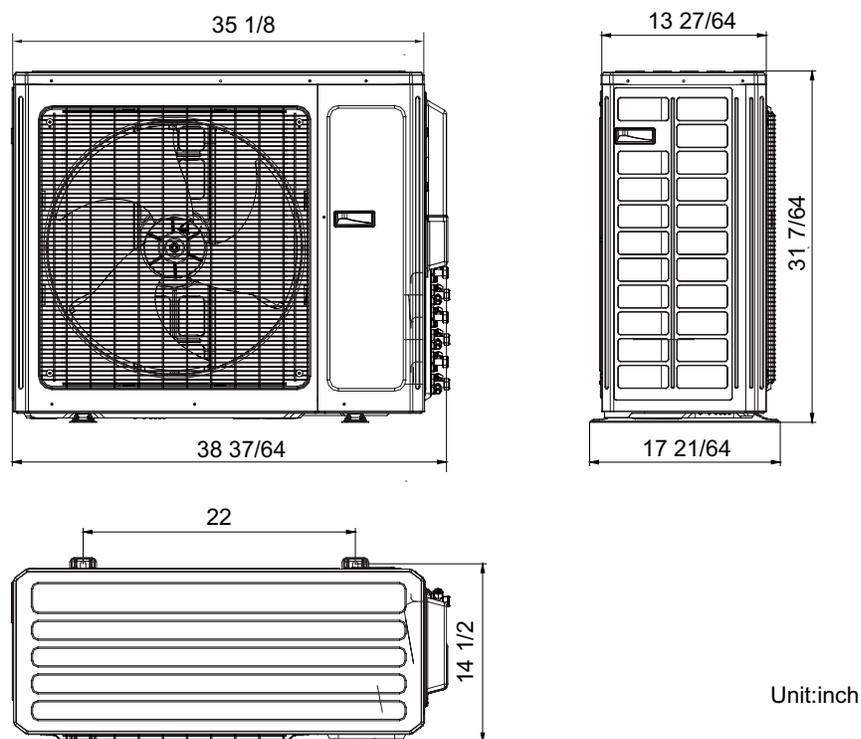
The above data is subject to change without notice; please refer to the nameplate of the unit.

### 3. Outline Dimension Diagram

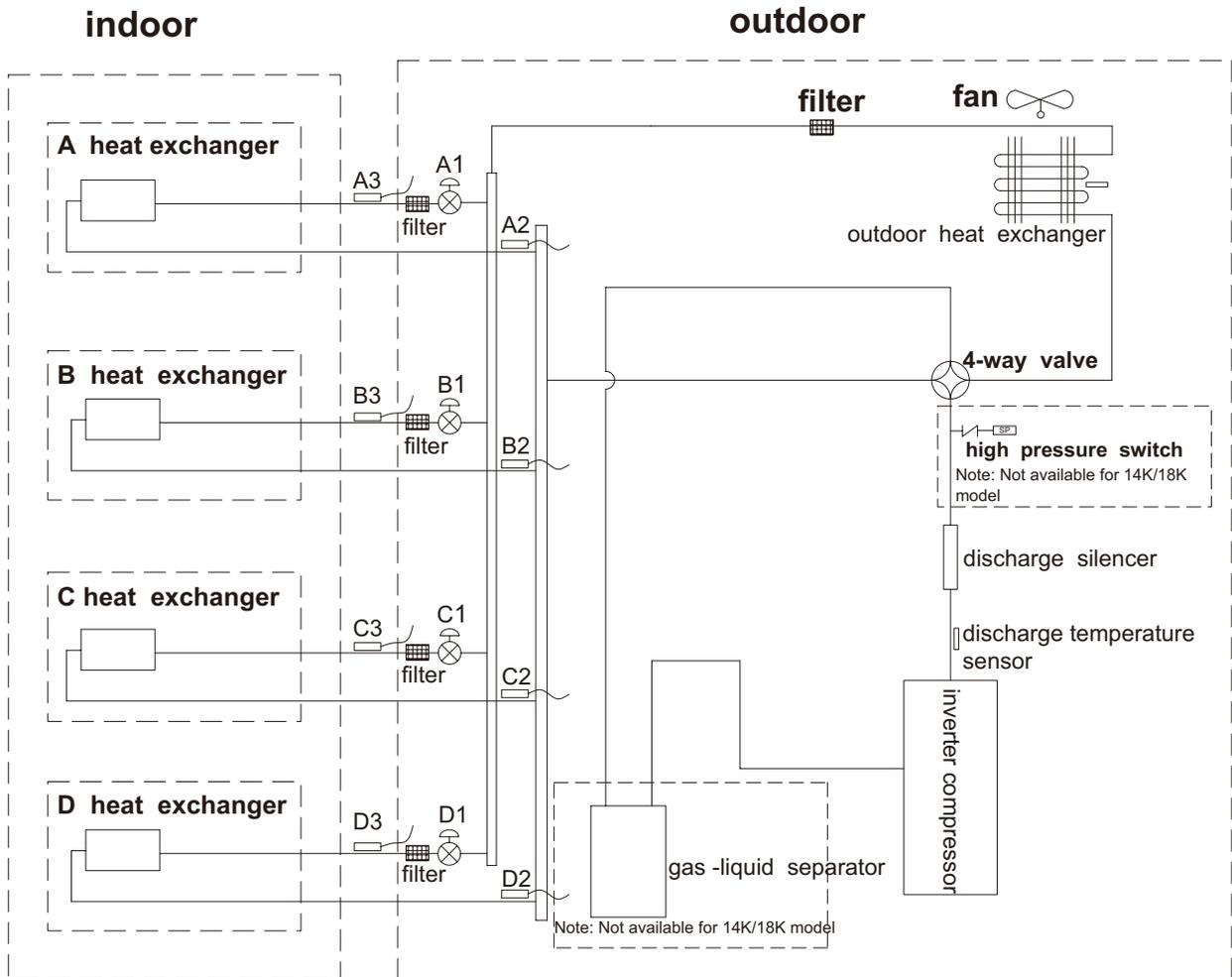
A-VFH18DB-1



A-VFH24TB-1



# 4. Refrigerant System Diagram



- A1:A-unit electronic expansion valve    B1:B-unit electronic expansion valve**
- C1:C-unit electronic expansion valve    D1:D-unit electronic expansion valve**
- A2:A-unit gas pipe temperature sensor    B2:B-unit gas pipe temperature sensor**
- C2:C-unit gas pipe temperature sensor    D2:D-unit gas pipe temperature sensor**
- A3:A-unit liquid pipe temperature sensor    B3:B-unit liquid pipe temperature sensor**
- C3:C-unit liquid pipe temperature sensor    D3:D-unit liquid pipe temperature sensor**

# 5. Electrical Part

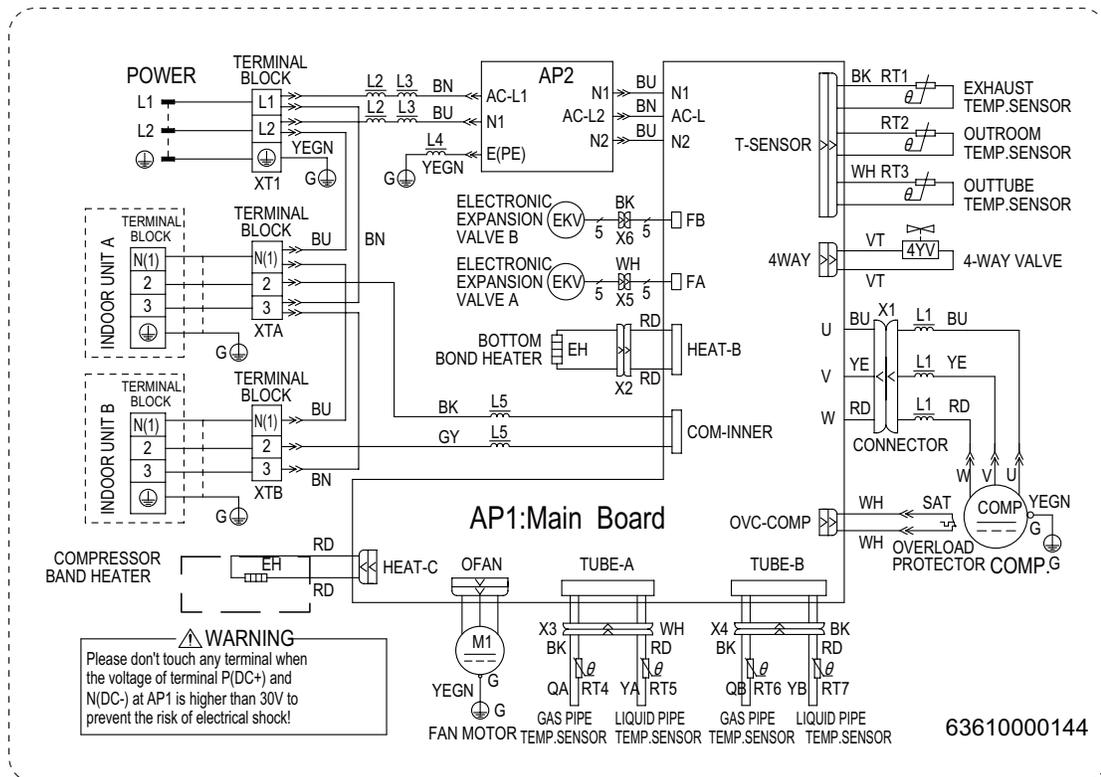
## 5.1 Wiring Diagram

### • Instruction

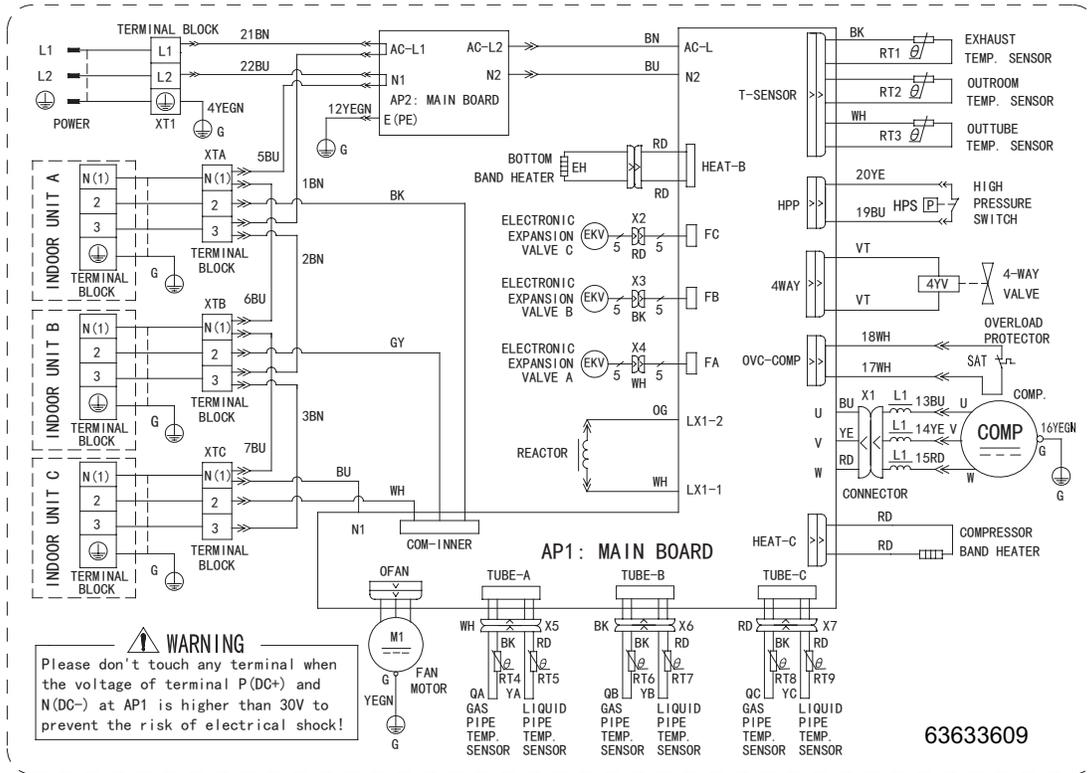
| Symbol | Symbol Color | Symbol | Symbol Color | Symbol | Name           |
|--------|--------------|--------|--------------|--------|----------------|
| WH     | White        | GN     | GREEN        | COMP   | Compressor     |
| YE     | Yellow       | BN     | Brown        | ⊕      | Grounding wire |
| RD     | Red          | BU     | Blue         |        |                |
| YEGN   | Yellow/Green | BK     | Black        |        |                |
| VT     | Violet       | OG     | Orange       |        |                |

### • Outdoor Unit

A-VFH18DB-1



A-VFH24TB-1

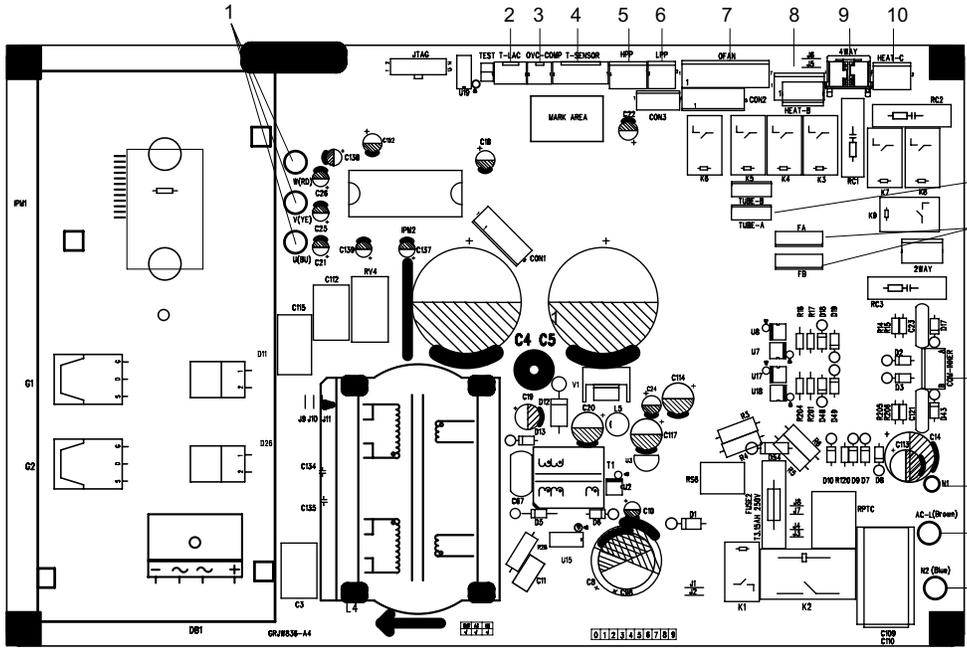


These circuit diagrams are subject to change without notice, please refer to the one supplied with the unit.

## 5.2 PCB Printed Diagram

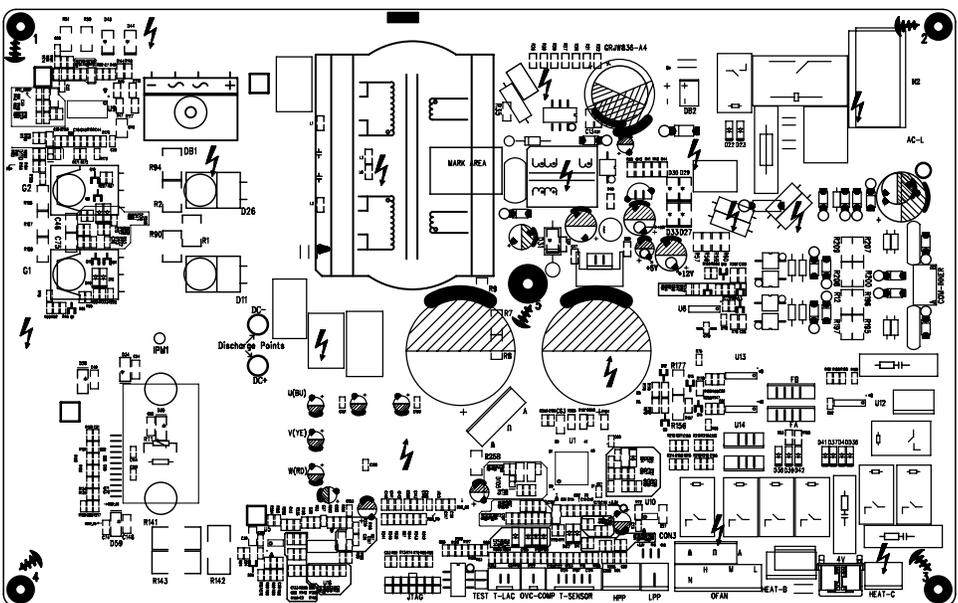
A-VFH18DB-1

### ● TOP VIEW



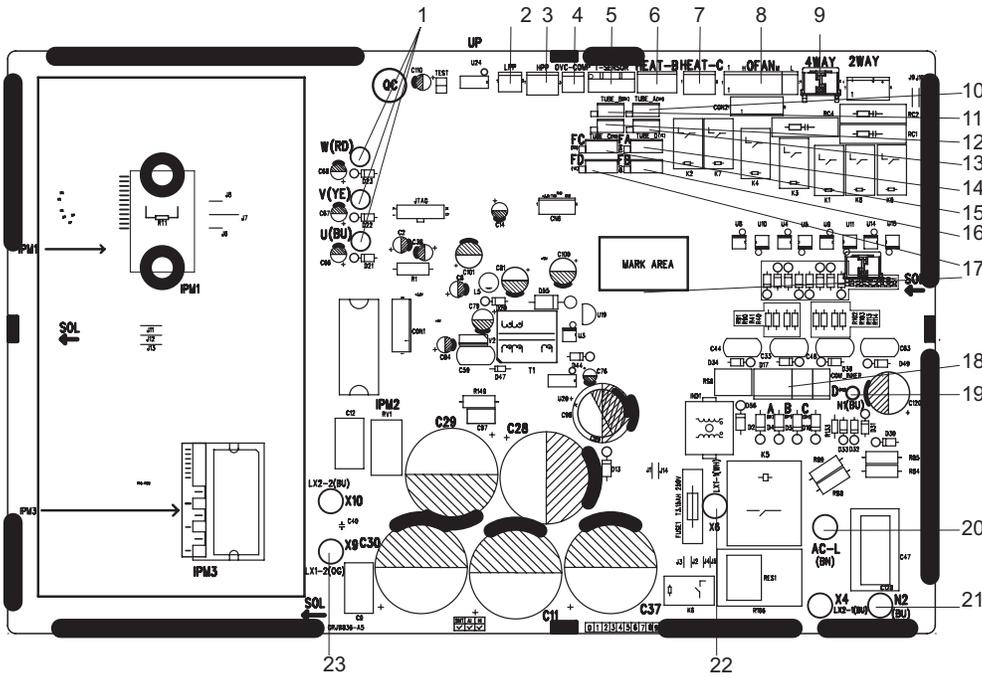
|    |  |
|----|--|
| 1  | Terminal of compressor   |
| 2  | Terminal of low-temperature cooling temperature sensor             |
| 3  | Overload protection terminal of compressor                         |
| 4  | Temperature sensor terminal of outdoor unit                        |
| 5  | High pressure protection terminal                                  |
| 6  | Low pressure protection terminal                                   |
| 7  | Terminal of outdoor unit   |
| 8  | Electric heating belt terminal of chassis                          |
| 9  | Terminal of 4-way valve  |
| 10 | Electric heating belt terminal of compressor                       |
| 11 | Terminal of temperature sensor wire for liquid valve and gas valve |
| 12 | Terminal of electronic expansion valve                             |
| 13 | Terminal of communication wire for indoor unit and outdoor unit    |
| 14 | Neutral wire terminal for communication                            |
| 15 | Live wire terminal   |
| 16 | Neutral wire terminal  |

### ● BOTTOM VIEW



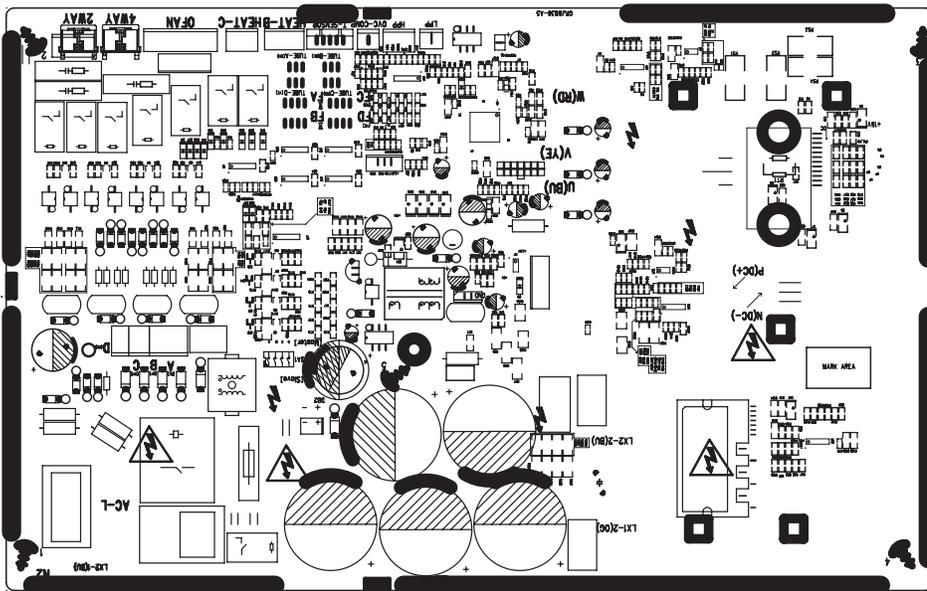
A-VFH24TB-1

● TOP VIEW



|    |  |
|----|--|
| 1  | Terminal of compressor                                       |
| 2  | Low pressure protection terminal                             |
| 3  | High pressure protection terminal                            |
| 4  | Overload protection terminal of compressor                   |
| 5  | Temperature sensor terminal of outdoor unit                  |
| 6  | Electric heating terminal of chassis                         |
| 7  | Electric heating terminal of compressor                      |
| 8  | Terminal of outdoor unit                                     |
| 9  | Terminal of 4-way valve                                      |
| 10 | Temperature sensor for liquid valve and gas valve for unit A |
| 11 | Temperature sensor for liquid valve and gas valve for unit B |
| 12 | Temperature sensor for liquid valve and gas valve for unit C |
| 13 | Temperature sensor for liquid valve and gas valve for unit D |
| 14 | Electronic expansion valve for unit A                        |
| 15 | Electronic expansion valve for unit C                        |
| 16 | Electronic expansion valve for unit B                        |
| 17 | Electronic expansion valve for unit D                        |
| 18 | Communication wire with indoor unit                          |
| 19 | Neutral wire for communication                               |
| 20 | Live wire  |
| 21 | Neutral wire   |
| 22 | Reactor wire 1   |
| 23 | Reactor wire 2   |

● BOTTOM VIEW



# 6. Function and Control

## 1 Basic functions of the system

### 1.1 Cooling Mode

#### 1.1.1 Cooling conditions and process:

If the compressor is in stop status and the unit is set to cooling operation, and one of the indoor units reaches the cooling operation condition; the electronic expansion valve, the outdoor fan and the compressor start operation. 1.1.2 Stop in cooling operation

#### 1.1.2.1 Compressor stops

The compressor stops immediately, the outdoor fan stops after 1min.

#### 1.1.2.2 If some of the indoor units reach the stop condition the compressor will not stop.

The compressor operates immediately according to the required frequency. For the indoor unit with no requirement, the corresponding electronic expansion valve will close.

#### 1.1.3 Cooling mode transfers to heating mode

When the unit transfers to heating mode, the 4-way valve is energized after the compressor stops for 2min. All other sequences are the same as stopping in cooling mode.

#### 1.1.4 4-way valve: in this mode, the 4-way valve is closed.

#### 1.1.5 Outdoor fan control in cooling mode

The outdoor fan starts 5s before the compressor. The outdoor fan will run in high speed for 3min after starting and then it will run in set speed. The fan shall run at every speed for at least 80s. (When the quantity of running indoor unit is changed, the unit will enter the control described in 1.3.5.1 and 1.3.5.2);

When the compressor stops, the outdoor fan runs at present speed and stops after 1min.

### 1.2 Dry Mode

#### 1.2.1 The dry conditions and process are the same as those in cooling mode;

#### 1.2.2 The status of 4-way valve: closed;

#### 1.2.3 The temperature setting range: 60 ~ 80°F;

#### 1.2.4 Protection function: the same as those in cooling mode;

#### 1.2.5 In dry mode, the maximum value A of the capacity requirement percentage of single unit is 90% of that in cooling mode. The open condition of the electronic expansion valve, outdoor fan and compressor is the same as those in cooling mode.

### 1.3 Heating Mode

#### 1.3.1 Cooling conditions and process:

When one of the indoor units reaches the heating operation condition, the unit starts heating operation.

#### 1.3.2 Stop in heating operation:

#### 1.3.2.1 When all the indoor units reach the stop condition, the compressor stops and the outdoor fan stops after 1min;

#### 1.3.2.2 Some of the indoor units reach the stop condition

The compressor reduces the frequency immediately and operates according to the required frequency;

#### 1.3.2.3 Heating mode transfers to cooling mode(dry mode), fan mode

a. The compressor stops; b. the power of 4-way valve is cut off after 2min; c. the outdoor fan stops after 1min; d. the status of 4-way valve: energized;

### 1.3.3 Outdoor fan control in heating mode

The outdoor fan starts 5s before the compressor and then it will run in high speed for 40s;

The fan shall run at every speed for at least 80s;

When the compressor stops, the outdoor fan stops after 1min.

### 1.3.4 Defrosting function

When the defrosting condition is met, the compressor stops; the electronic expansion valve of all indoor units open in big angle; the outdoor fan stops after 40s of the stop of compressor, meanwhile, the 4-way valve reverses the direction; after the 4-way valve reverses the direction, the compressor starts; then begins to calculate the time of defrosting, the frequency of the compressor rises to reach the defrosting frequency.

### 1.3.5 Oil-return control in heating mode

#### 1.3.5.1 Oil-return condition

The whole unit is operating in low frequency for a long time

#### 1.3.5.2 Oil-return process in heating mode

The indoor unit displays "H1"

#### 1.3.5.3 Oil-return finished condition in heating mode

The duration reaches 5min

## 1.4 Fan Mode

The compressor, the outdoor fan and the 4-way valve are closed; temperature setting range is 60~86°F.

## 2. Protection Function

### 2.1 Mode Conflict Protection of indoor unit

When the setting mode is different of different indoor unit, the unit runs in below status:

- a. The mode of the first operating indoor unit is the basic mode, then compare the mode of the other indoor units to see if there is a conflict. Cooling mode (dry mode) is in conflict with heating mode.
- b. Fan mode is in conflict with heating mode and the heating mode is the basic mode. No matter which indoor unit operates first, the unit will run in heating mode.

### 2.2 Overload protection function

When the discharge line temperature is a little low, the compressor raises the operation frequency; when the discharge line temperature is a little high, the compressor frequency is restricted or slows down the operation frequency; when the discharge line temperature is too high, the compressor protection stops running.

If the discharge temperature protection continuously appears for 6 times, the compressor can't resume running. The compressor can resume running after cutting off the power and then putting through the power. (if the running time of the compressor is longer than 7min, the protection times record will be cleared)

### 2.3 Discharge Protection Function

When the discharge temperature is a little low, the compressor raises the operation frequency; when the discharge temperature is a little high, the compressor frequency is restricted or slows down the operation frequency; when the discharge temperature is too high, the compressor protection stops running.

If the discharge temperature protection continuously appears for 6 times, the compressor can't resume running. The compressor can resume running after cutting off the power and then putting through the power. (if the running time of the compressor is longer than 7min, the protection times record will be cleared).

## 2.4 Communication malfunction

Detection of the quantity of installed indoor units:

After 3min of energizing, if the outdoor unit does not receive the communication data of any indoor unit, the outdoor unit will judge that indoor unit is not installed and will treat it as it is not installed. If the outdoor unit receives the communication data of that indoor unit later, the outdoor unit will treat that unit as it is installed.

## 2.5 Overcurrent Protection

a. Overcurrent protection of complete unit; b. phase wire current protection; c. compressor phase current protection

## 2.6 Compressor high-pressure protection

2.6.1 When the high-pressure switch is detected cut off for 3s continuously, the compressor will enter high-pressure protection and stops. Meanwhile, the outdoor unit will send the signal of "high-pressure protection" to the indoor units;

2.6.2 After the appearance of high-pressure protection, when the high-pressure switch is detected closed for 6s continuously, the compressor can resume running only after resetting the power.

## 2.7 Compressor overload protection

If the compressor overload switch trips, the indoor unit will display the corresponding malfunction as it stops when the indoor temperature reaching set temperature. When the compressor stops for more than 3min and the compressor overload switch is reset, the unit will resume operation status automatically. If the protection occurs more than 6 times the unit cannot resume operation status automatically, but can resume running only after cutting off the power and then putting through the power (if the running time of the compressor is longer than 30min, the protection times record will be cleared).

## 2.8 Compressor Phase-lacking Protection

When the compressor starts, if one of the three phases is detected open, the compressor will enter phase-lacking protection. The malfunction will be cleared after 1min, the unit will restart and then detect if there is still has phase-lacking protection. If the phase-lacking protection is detected for 6 times continuously, the compressor will not restart but can resume running only after cutting off the power and then putting through the power. If the running time of the compressor is longer than 7min, the protection times record will be cleared.

## 2.9 IPM Protection

2.9.1 When the IPM module protection is detected, the unit will stop as the indoor temperature reaching set temperature, PFC is closed, display IPM protection malfunction. After the compressor stops for 3min, the unit will resume operation status automatically; if the IPM protection is detected for more than 6 times continuously (If the running time of the compressor is longer than 7min, the protection times record will be cleared), the system will stop and send the signal of module protection to indoor unit. The unit can not resume operation status automatically, but can resume running only after resetting the power.

2.9.2 IPM module overheating protection

2.9.2.1 When  $T_{IPM} > 85^{\circ}\text{C}$ , prohibit to raise frequency;

2.9.2.2 When  $T_{IPM} \geq 90^{\circ}\text{C}$ , the operation frequency of compressor slows down by 15% every 90s according to the present capacity requirement of the complete unit. It will keep 90s after slowing down the frequency. After slowing down the frequency, if  $T_{IPM} \geq 90^{\circ}\text{C}$ , the unit will circulate the above movement until reaching the minimum frequency; if  $85^{\circ}\text{C} < T_{IPM} < 90^{\circ}\text{C}$ , the unit will run at this frequency; when  $T_{IPM} \leq 85^{\circ}\text{C}$ , the unit will run at the frequency according to the capacity requirement;

2.9.2.3 When  $T_{IPM} \geq 95^{\circ}\text{C}$ , the compressor stops. After the compressor stops for 3min, if  $T_{IPM} < 85^{\circ}\text{C}$ , the compressor and the outdoor fan will resume operation.

# Part II : Installation and Maintenance

## 7. Notes for Installation and Maintenance

### Safety Precautions: Important!

Please read the safety precautions carefully before installation and maintenance.

The following contents are very important for installation and maintenance.

Please follow the instructions below.

- The installation or maintenance must abide by the instructions.
- Comply with all national electrical codes and local electrical codes.
- Pay attention to the warnings and cautions in this manual.
- All installation and maintenance shall be performed by distributor or qualified person.
- All electric work must be performed by a licensed technician according to local regulations and the instructions given in this manual.
- Be cautious during installation and maintenance. Avoid incorrect operation to prevent electric shock, casualty and other accidents.



### Warnings

#### Electrical Safety Precautions:

1. Cut off the power supply to air conditioner before service and maintenance.
2. The air conditioner must use an isolated circuit and not share the same circuit with other appliances.
3. The air conditioner should be installed in a suitable location and ensure the power is accessible.
4. Make sure each wiring terminal is connected firmly during installation and maintenance.
5. Have the unit adequately grounded. The grounding wire cannot be used for other purposes.
6. Must apply protective accessories such as protective boards, cable-cross loops and wire clips.
7. The live wire, neutral wire and grounding wire of power supply must correspond to the live wire, neutral wire and grounding wire of the air conditioner.
8. The power cord and power connection wires cannot be pinched by hard objects.
9. If power cord or connection wire is broken, it must be replaced by a qualified person.

10. If the power cord or connection wire is not long enough, please get the specialized power cord or connection wire from the manufacture or distributor. Do not extend the wire by yourself.

11. A circuit breaker must be installed in the circuit. The breaker should be all-pole parting and the contact parting distance should be more than 1/8 inch.

12. Make sure all wires and pipes are connected properly and the valves are opened before energizing.

13. Check if there is electric leakage on the unit body. If yes, please eliminate the electric leakage.

14. Replace the fuse with a new one of the same specification if it is burnt; do not replace it with a copper wire or conducting wire.

15. If the unit is to be installed in a humid place, the circuit breaker must be installed.

#### Installation Safety Precautions:

1. Select the installation location according to the requirement of this manual. (See the requirements in installation part)
2. Handle unit transportation with care; the unit should not be carried by only one person if it is more than 44.09lb.
3. When installing the indoor unit and outdoor unit, a sufficient fixing bolt must be installed; make sure the installation support is firm.
4. Wear safety belt if the height of working is above 78-3/4".
5. Use equipped or appointed components during installation.
6. Make sure no foreign objects are left in the unit after finishing installation.

#### Refrigerant Safety Precautions:

1. Avoid contact between refrigerant and fire as it generates poisonous gas; Do not lengthen the connection pipe by welding.
2. Apply specified refrigerant only. Never mix with any other refrigerant. Never leave air in the refrigerant line as it may lead to rupture or other hazards.
3. Make sure no refrigerant gas is leaking when installation is completed.
4. If there is refrigerant leakage, please take sufficient measures to minimize the density of refrigerant.
5. Never touch the refrigerant piping or compressor without wearing gloves to avoid scald or frostbite.

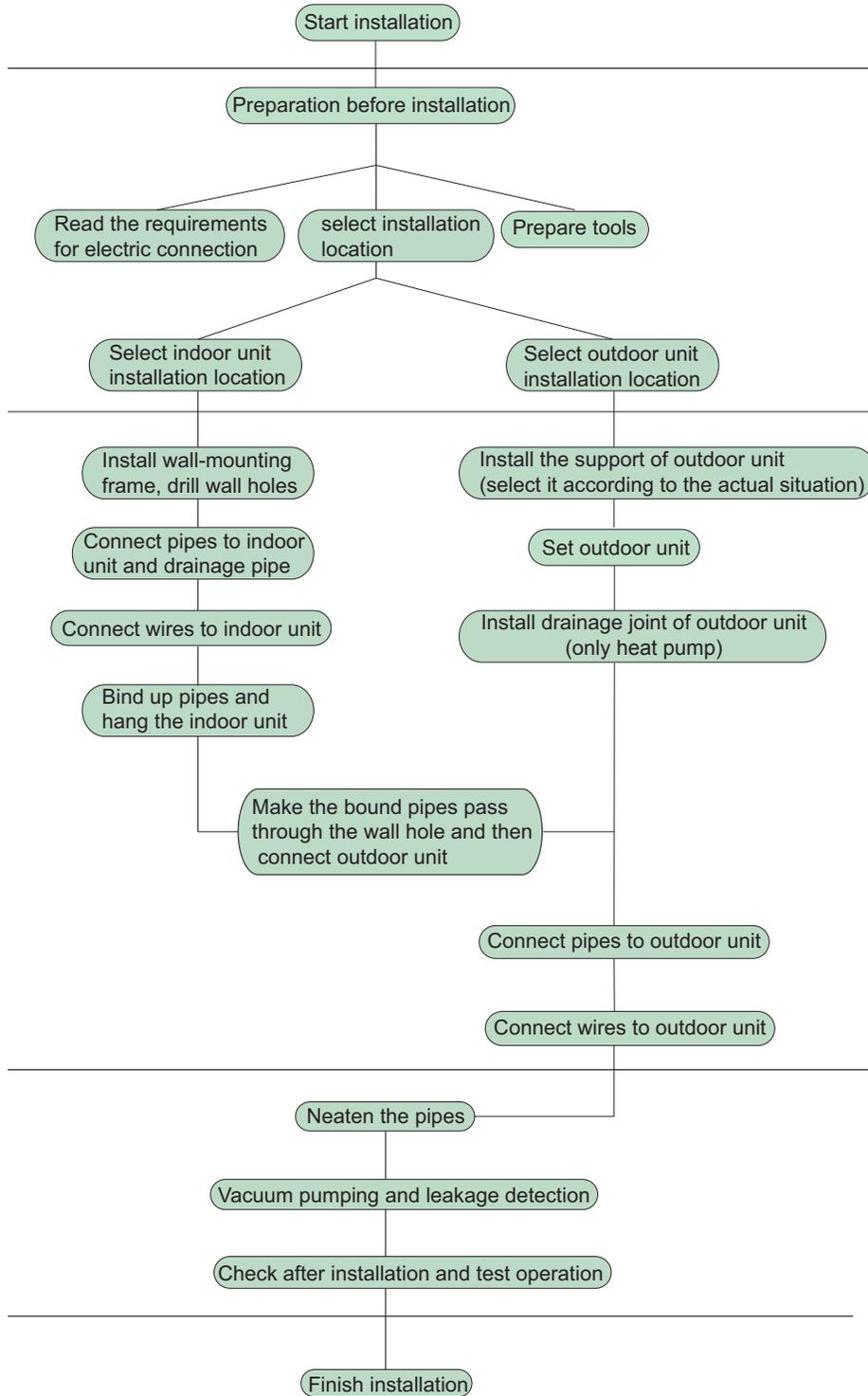
Improper installation may lead to fire hazard, explosion, electric shock or injury.

# Main Tools for Installation and Maintenance

|  |   |  |
|--|---|--|
| <p>1. Level meter, measuring tape</p>   | <p>2. Screw driver</p>                   | <p>3. Impact drill, drill head, electric drill</p>               |
| <p>4. Electroprobe</p>                  | <p>5. Universal meter</p>                | <p>6. Torque wrench, open-end wrench, inner hexagon spanner</p>  |
| <p>7. Electronic leakage detector</p>  | <p>8. Vacuum pump</p>                  | <p>9. Pressure meter</p>                                       |
| <p>10. Pipe pliers, pipe cutter</p>   | <p>11. Pipe expander, pipe bender</p>  | <p>12. Soldering appliance, refrigerant container</p>         |

# 8. Installation Manual

## Installation procedures



Note: this flow is only for reference; please find more detailed installation steps in this section.

## 8.1 Electrical Connections

1. Remove the handle at the right side plate of the outdoor unit (one screw).
2. Remove the cable clamp, connect the power connection cable with the terminal at the row of connection and fix the connection. The fitting line distributing must be consistent with the indoor unit. Wiring should match that of indoor unit.
3. Fix power connection wire with wire clamp.
4. Ensure wire has been attached firmly.
5. Install the handle.

 Include a disconnect switch with suitable capacity, please note table. It should protect against circuit-short and overload. (Caution: please do not use fuse only to protect the circuit)

 An all-pole disconnect switch having a contact separation of at least 1/8" between all poles should be connected in fixed wiring.

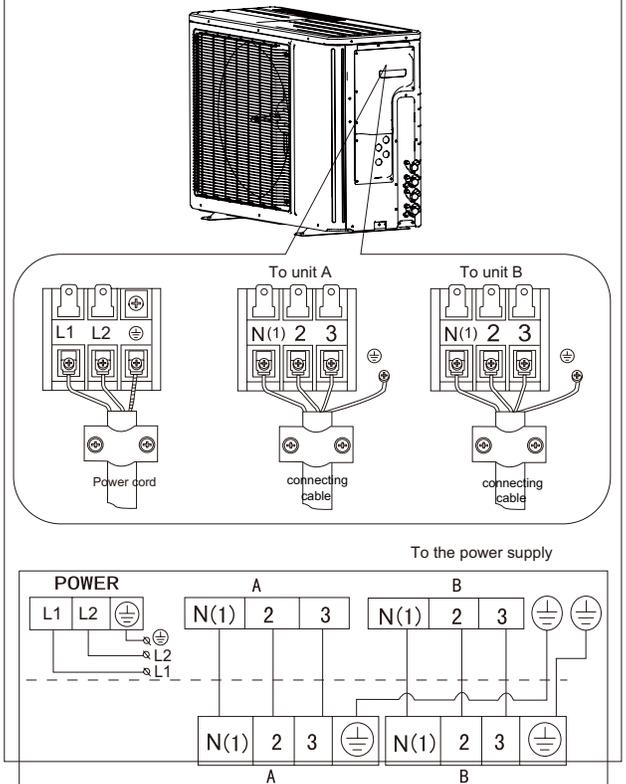
 A wrong wire connection may cause malfunction of some electric components. After fixing cable, ensure that leads between connection to fixed point have some space.

 The connection pipes and the connection wiring of the unit A and unit B must correspond to each other respectively.

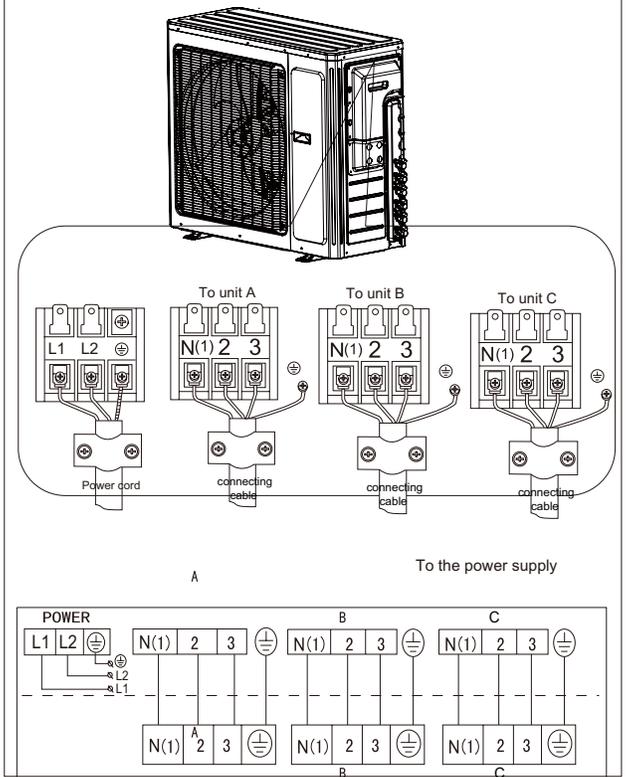
 The appliance shall be installed in accordance with national wiring regulations.

Note: the above figures are only intended to be a simple diagram of the appliance and may not correspond to the appearance of the units that have been purchased.

### A-VFH18DB-1



### A-VFH24TB-1



## 8.2 Installing the Outdoor Unit

### Location

Use bolts to secure the unit to a flat, solid floor.

When mounting the unit on a wall or the roof, make sure the support is firmly secured so that it cannot move in the event of intense vibrations or a strong wind.

Do not install the outdoor unit in a pit or air vent.

### Installing the pipes

Use suitable connecting pipes and equipment for the refrigerant R410A.

| Models(ft)   | A-VFH18DB-1 | A-VFH24TB-1 |
|--|-------------|-------------|
| Max. connection pipe length(ft)                        | 65.6        | 196.8       |
| Max. connection pipe length(Simpleone indoor unit)(ft) | 32.8        | 65.6        |

The refrigerant pipes must not exceed the maximum heights 16.4ft(18K) or 32.8ft(24K).

Wrap all the refrigerant pipes and joints.

Tighten the connections using two wrenches working in opposite directions.

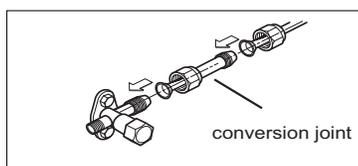
### Caution: Installation Must be Performed in Accordance with the NEC/CEC by Authorized Personnel Only.

Humid air left inside the refrigerant circuit can cause compressor malfunction. After having connected the indoor and outdoor units, bleed the air and humidity from the refrigerant circuit using a vacuum pump.

- (1) Unscrew and remove the caps from the 2-way and 3-way valves.
- (2) Unscrew and remove the cap from the service valve.
- (3) Connect the vacuum pump hose to the service valve.
- (4) Operate the vacuum pump for 10-15 minutes until an absolute vacuum of 10 mm Hg has been reached.
- (5) With the vacuum pump still in operation, close the low-pressure knob on the vacuum pump coupling. Stop the vacuum pump.
- (6) Open the 2-way valve by 1/4 turn and then close it after 10 seconds. Check all the joints for leaks using liquid soap or an electronic leak device.
- (7) Turn the body of the 2-way and 3-way valves. Disconnect the vacuum pump hose.
- (8) Replace and tighten all the caps on the valves.

| Hex nut diameter(inch) | Tightening torque(ft-lbf) |
|------------------------|---------------------------|
| Φ1/4                   | 11.10~4.75                |
| Φ3/8                   | 20.12~29.50               |
| Φ1/2                   | 33.19~40.56               |
| Φ5/8                   | 44.24~47.94               |
| Φ3/4                   | 51.32~55.31               |

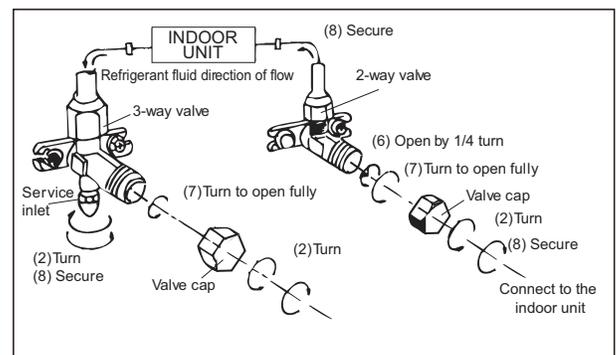
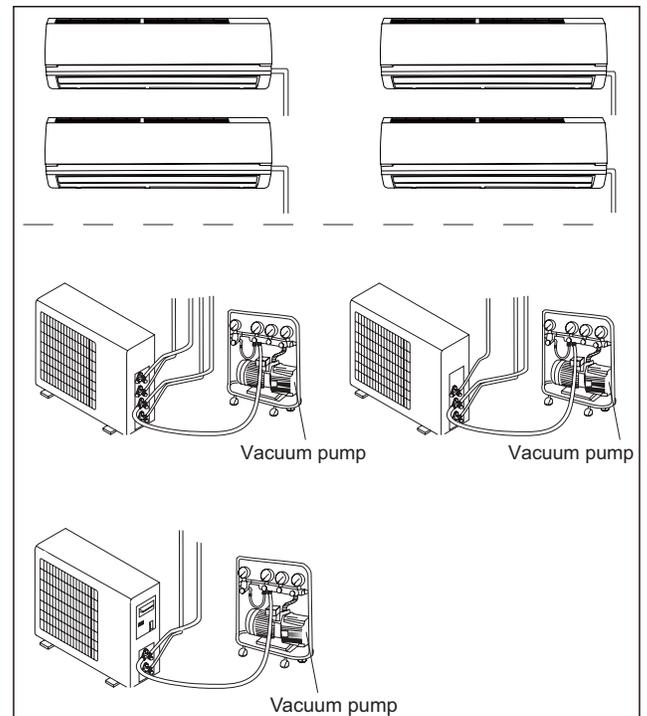
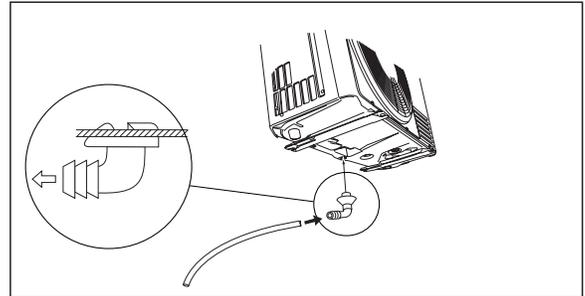
18K unit requires an adapter to be installed at the indoor unit



### Install the drain fitting and the drain hose(for model with heat pump only)

Condensation is produced and flows from the outdoor unit when the appliance is operating in the heating mode. In order not to disturb neighbours and to respect the environment, install a drain fitting and a drain hose to channel the condensate

water. Install the drain fitting and rubber washer on the outdoor unit chassis and connect a drain hose to it as shown in the figure.

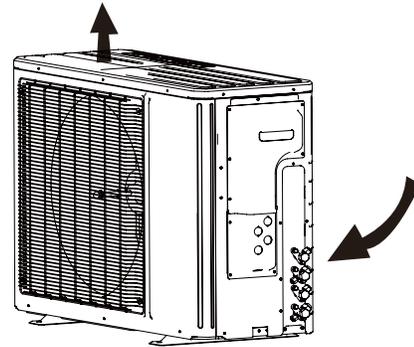


### 8.3 Installation Dimension Diagram

 Use suitable instruments for the refrigerant R410A.

- Do not use any other refrigerant than R410A.

 Do not use mineral oils to clean the unit.



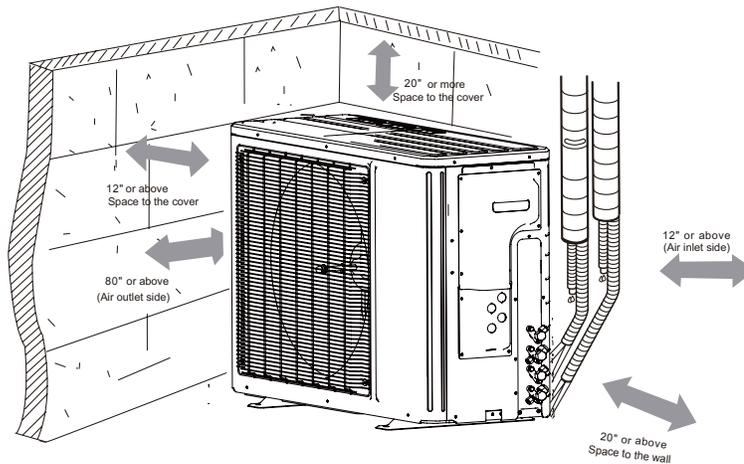
 The installation must be done by trained and qualified service personnel with reliability according to this manual.

 Contact service center before installation to avoid the malfunction due to unprofessional installation.

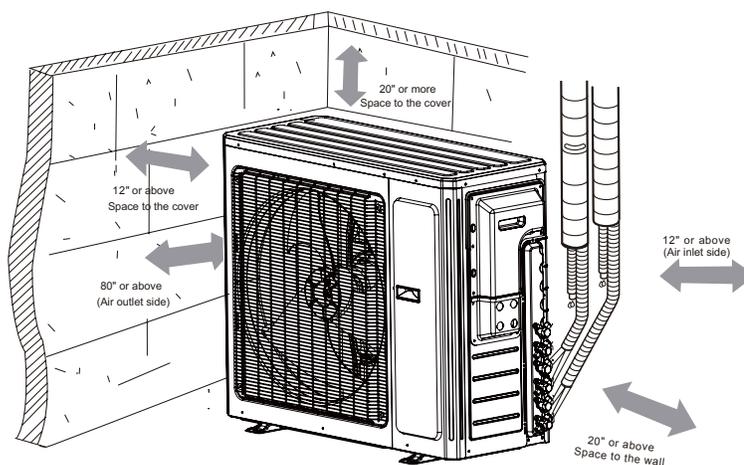
 When picking up and moving the units, you must be guided by trained and qualified person.

 Ensure that the recommended space is left around the appliance .

#### A-VFH18DB-1



#### A-VFH24TB-1



## 8.4 Check after Installation

| Check Items  | Problems Owing to Improper Installation                           |
|--|---|
| Is the installation reliable?  | The unit may drop, vibrate or make noises                         |
| Has the gas leakage been checked?  | May cause unsatisfactory cooling (heating) effect                 |
| Is the thermal insulation of the unit sufficient?                                      | May cause condensation and water dripping                         |
| Is the drainage smooth?  | May cause condensation and water dripping                         |
| Does the power supply voltage match the rated voltage specified on the nameplate?      | The unit may have broken down or the components may be burned out |
| Are the lines and pipelines correctly installed?                                       | The unit may bread down or the components may be burned out       |
| Has the unit been safely grounded?   | Risk of electrical leakage  |
| Do the indoor and outdoor units match?   | The unit will not run correctly                                   |
| Are there any obstacles near the air inlet and outlet of the indoor and outdoor units? | The unit may have broken down or the components may be burned out |
| Have the length of refrigerating pipe and refrigerant charge amount been recorded?     | This will assist in future servicing                              |

# 9. Troubleshooting

## 9.1 Flashing LED of Indoor/Outdoor Unit and Primary Judgement

### 1. Requirement of malfunction display

When several malfunctions happen at the same time, malfunction codes will be displayed circularly.

### 2. Malfunction display method

(1) Hardware malfunction: it will be displayed immediately, please refer to "Malfunction status sheet";

(2) Operation status: it will be displayed immediately, please refer to "Malfunction status sheet";

(3) Other malfunction: It will be displayed after the compressor has been stopped for 200s, please refer to "Malfunction status sheet".

(Note: when the compressor starts up again, malfunction display waiting time (200s) will be cleared.)

### 3. Malfunction display control

Indoor unit displays malfunction code as shown in the sheet below. ODU communication light will be off for 1s and then blink for 1s circularly.

### 4. Viewing malfunction code through remote controller

Enter viewing malfunction code: press light button 6 times within 3S to view malfunction code;

Exit viewing malfunction code: press light button 6 times within 3S or after the malfunction code is displayed for 5min.



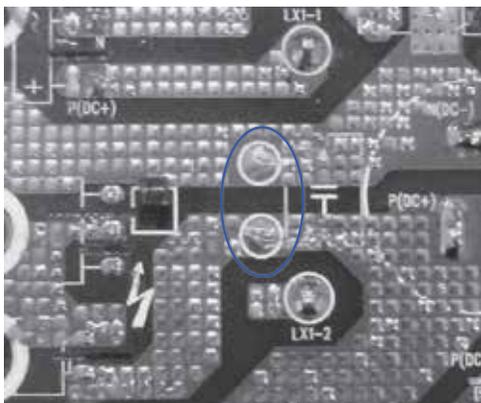
| Malfunction status sheet   |  |         |
|--|--|---------|
| Malfunction name   | Malfunction type   | Display |
| Zero cross detection circuit malfunction(for indoor unit)                                | Hardware malfunction   | U8      |
| Malfunction protection of jumper cap(for indoor unit)                                    | Hardware malfunction   | C5      |
| Feedback showing no IDU motor(for indoor unit)   | Hardware malfunction   | H6      |
| Indoor ambient temperature sensor is open/short circuited                                | Hardware malfunction   | F1      |
| Indoor evaporator temperature sensor is open/short circuited                             | Hardware malfunction   | F2      |
| Liquid valve temperature sensor is open/short circuited                                  | Hardware malfunction   | b5      |
| Gas valve temperature sensor is open/short circuited                                     | Hardware malfunction   | b7      |
| Modular temperature sensor is open/short circuited                                       | Hardware malfunction   | P7      |
| Outdoor ambient temperature sensor is open/short circuited                               | Hardware malfunction   | F3      |
| Outdoor condenser middle pipe temperature sensor is open/short circuited                 | Hardware malfunction   | F4      |
| Outdoor discharge temperature sensor is open/short circuited                             | Hardware malfunction   | F5      |
| Communication malfunction  | Hardware malfunction   | E6      |
| Malfunction of phase current detection circuit for compressor                            | Hardware malfunction   | U1      |
| Module high temperature protection   | Viewing malfunction code through remote controller within 200s; displayed directly on nixietube after 200s | P8      |
| Refrigerant lacking or blockage protection of system (not available for residential ODU) |  | F0      |
| Charging malfunction of capacitor  | Hardware malfunction   | PU      |
| High pressure protection of system   | Hardware malfunction   | E1      |
| Low pressure protection of svstem (reserved)   | Hardware malfunction   | E3      |

|   |  |    |
|---|--|----|
| Compressor overload protection  | Viewing malfunction code through remote controller within 200s; displayed directly on nixietube after 200s | H3 |
| Indoor unit and outdoor unit do not match   | Hardware malfunction   | LP |
| Malfunction of memory chip  | Hardware malfunction   | EE |
| Wrong connection of communication wire or malfunction of electronic expansion valve                     | Hardware malfunction   | dn |
| Malfunction protection of outdoor fan 1   | Hardware malfunction   | L3 |
| Detection status of wrong connection of communication wire or malfunction of electronic expansion valve | Operation status   | dd |
| Mode conflict   | Operation status   | E7 |
| Refrigerant recycling mode  | Operation status   | Fo |
| X-fan   | Operation status   | AL |
| Defrosting or oil return in heating mode  | Operation status   | H1 |
| Start failure of compressor   | Viewing malfunction code through remote controller within 200s; displayed directly on nixietube after 200s | Lc |
| High discharge temperature protection of compressor   |  | E4 |
| Overload protection   |  | E8 |
| Whole unit overcurrent protection   |  | E5 |
| Compressor phase current protection   |  | P5 |
| Compressor desynchronizing  |  | H7 |
| Compressor phase-lacking/phase-inverse protection   |  | Ld |
| IPM modular protection  |  | H5 |
| DC bus-bar low voltage protection   |  | PL |
| DC bus-bar high voltage protection  |  | PH |
| PFC protection  |  | HC |
| The four-way valve is abnormal  |  | U7 |

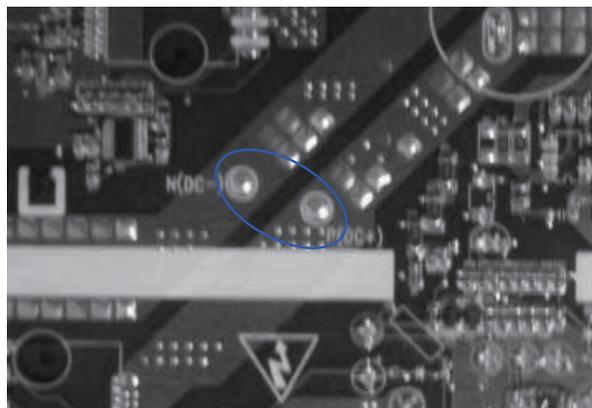
## 9.2 Malfunction Checking and Elimination

Note: discharge the points in below pictures with discharge resistance after opening the top cover and check if the voltage is below 20V with universal meter, then begin to check.

18K:



24K:



1 IPM protection malfunction:

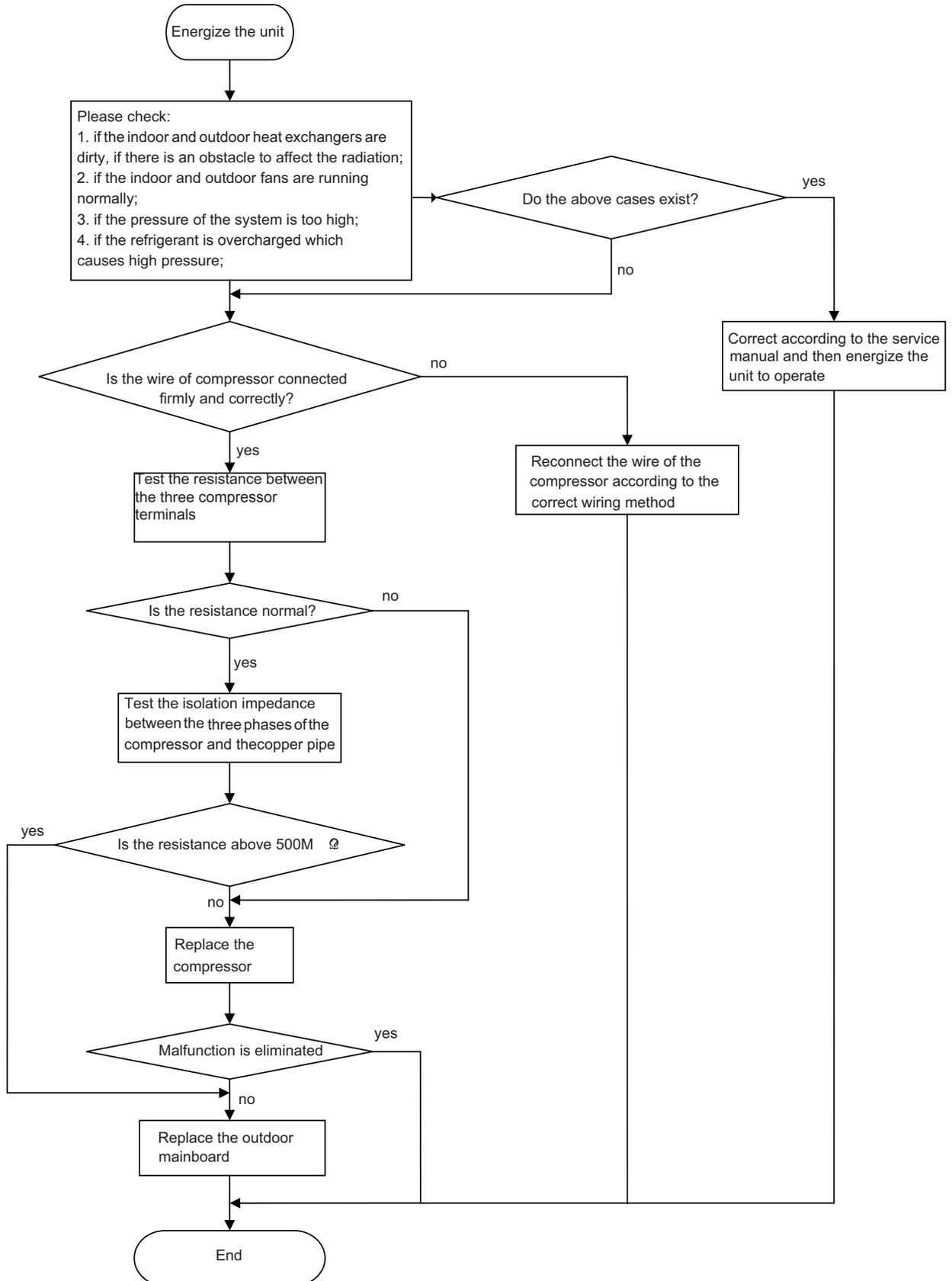
Main checking point:

- If the input voltage of the unit is within normal range?
- If the connection wire of compressor is connected well? Is it loose? Is the connection sequence correct?
- If the resistance of compressor coil is normal? If the isolation of compressor coil with copper pipe is good?
- If the unit is overloaded? If the heat radiation of the unit is good?
- If the refrigerant charge is suitable?

Flow chart:

- If the resistance of compressor coil is normal? If the isolation of compressor coil with copper pipe is good?
- If the unit is overloaded? If the heat radiation of the unit is good?
- If the refrigerant charge is suitable?

Flow chart:



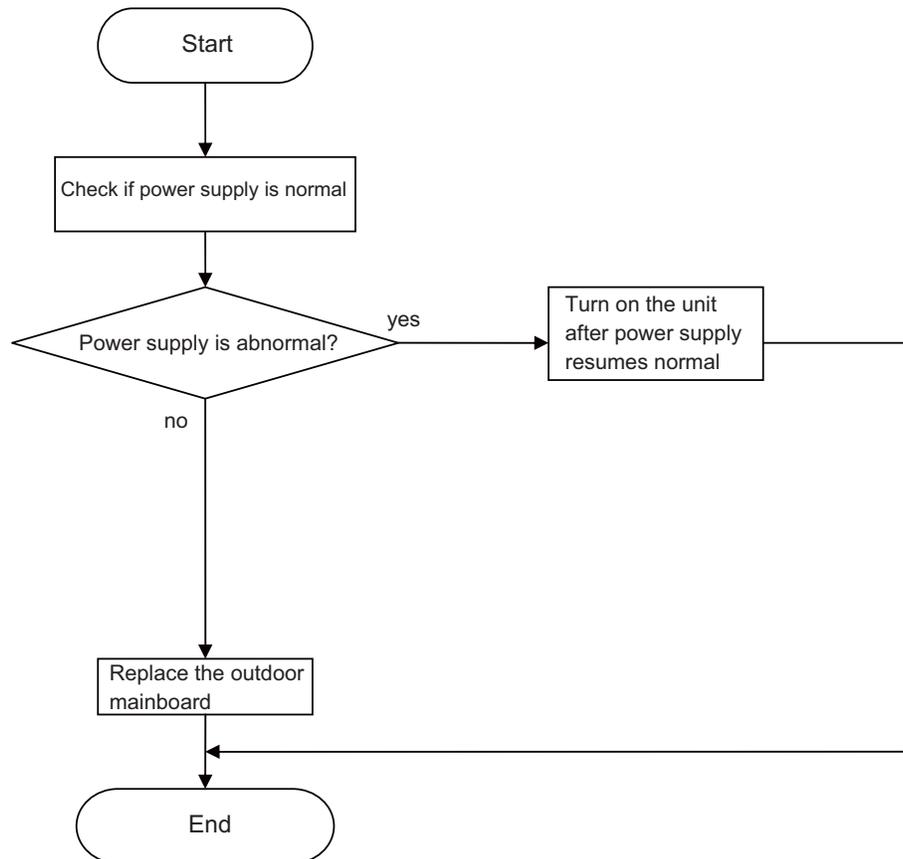
2. PFC protection malfunction, capacity charging malfunction

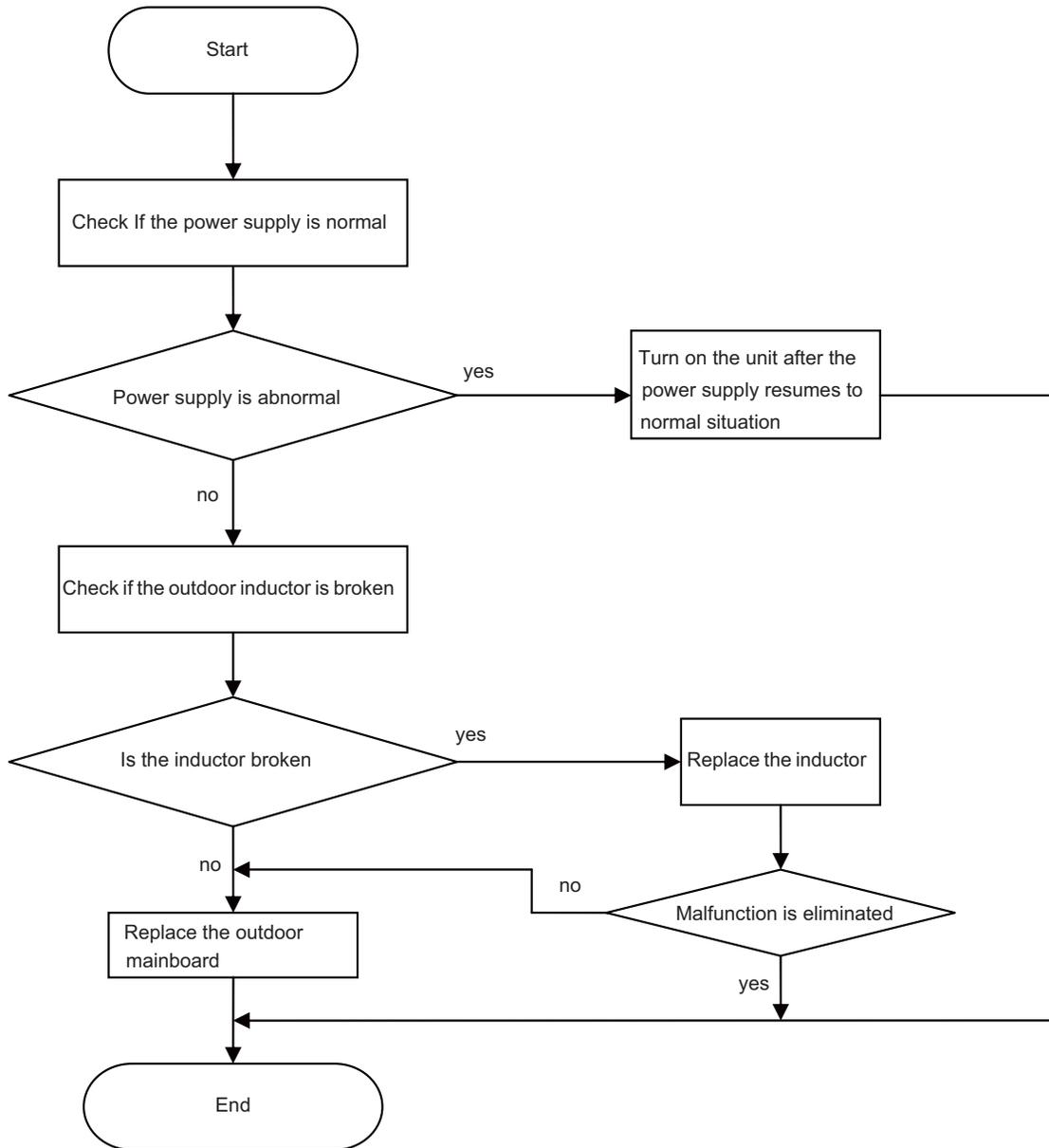
Main checking points:

- If the wiring of the induction is connected well and is the inductor broken;
- Is the main board broken;

Flow chart:

For A-VFH18DB-1



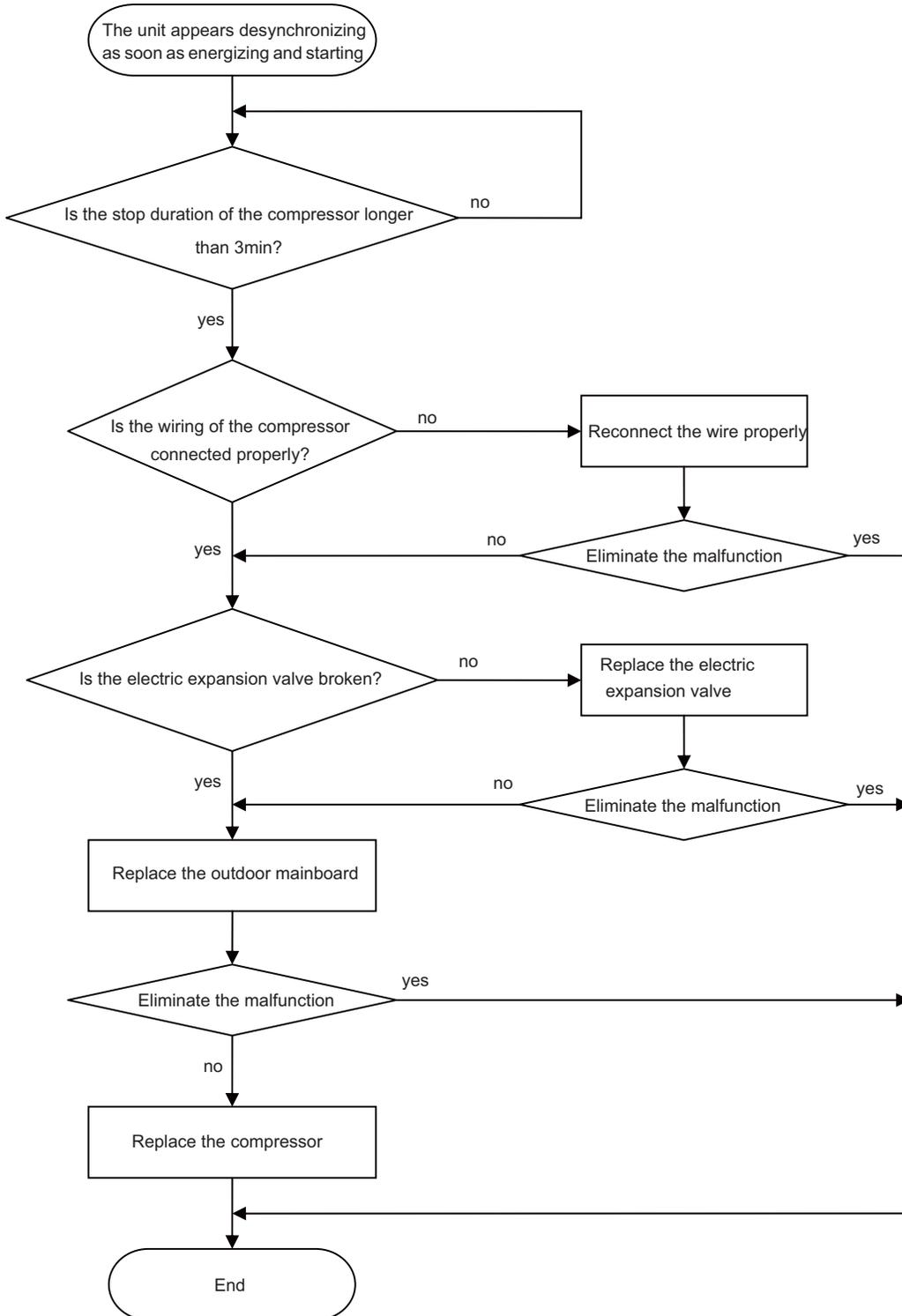


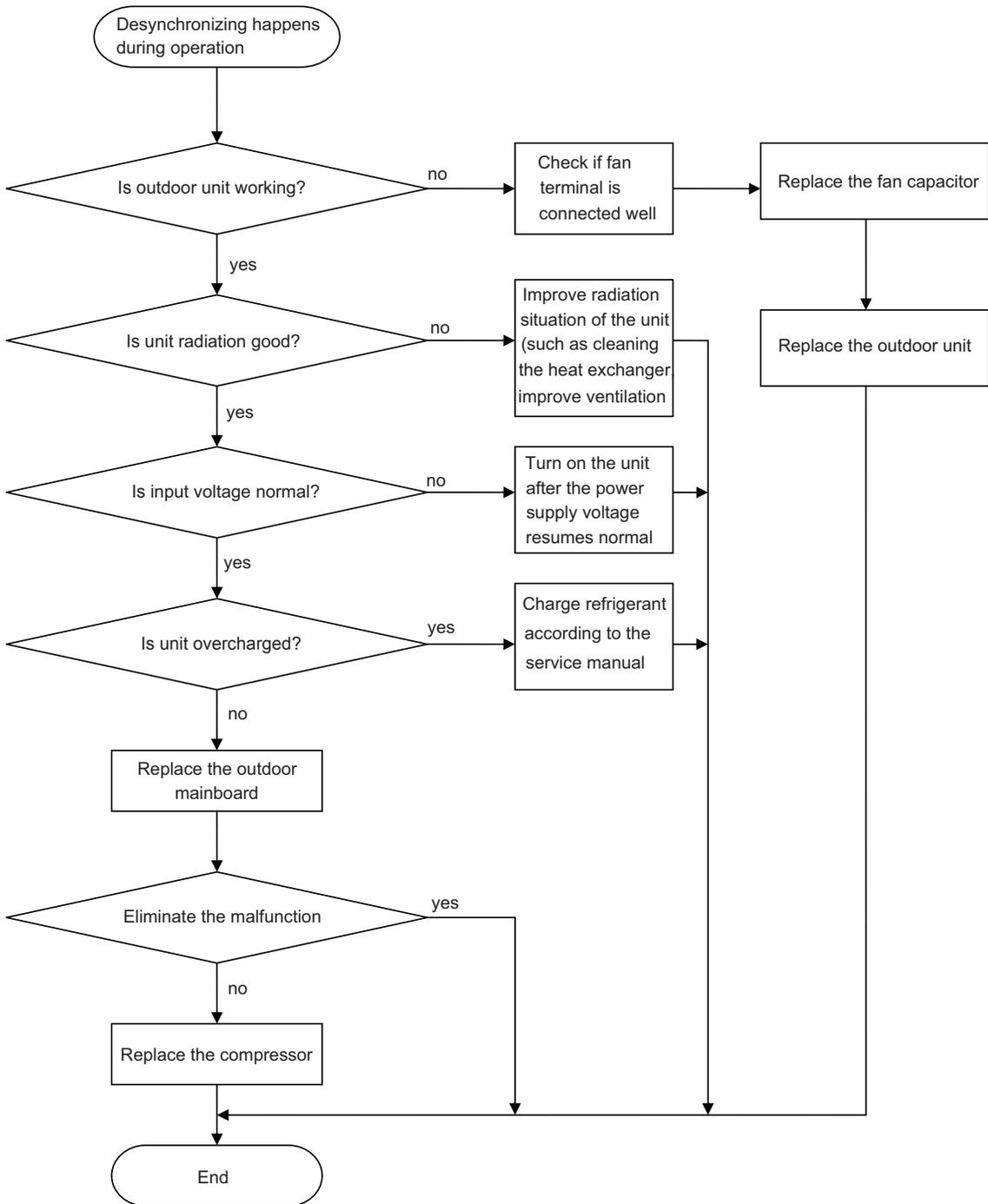
### 3. Compressor desynchronizing malfunction

Main checking points:

- If the pressure of the system is too high;
- If the electric expansion valve is working normally or it is broken;
- If the radiation of the unit is good;

Flow chart:



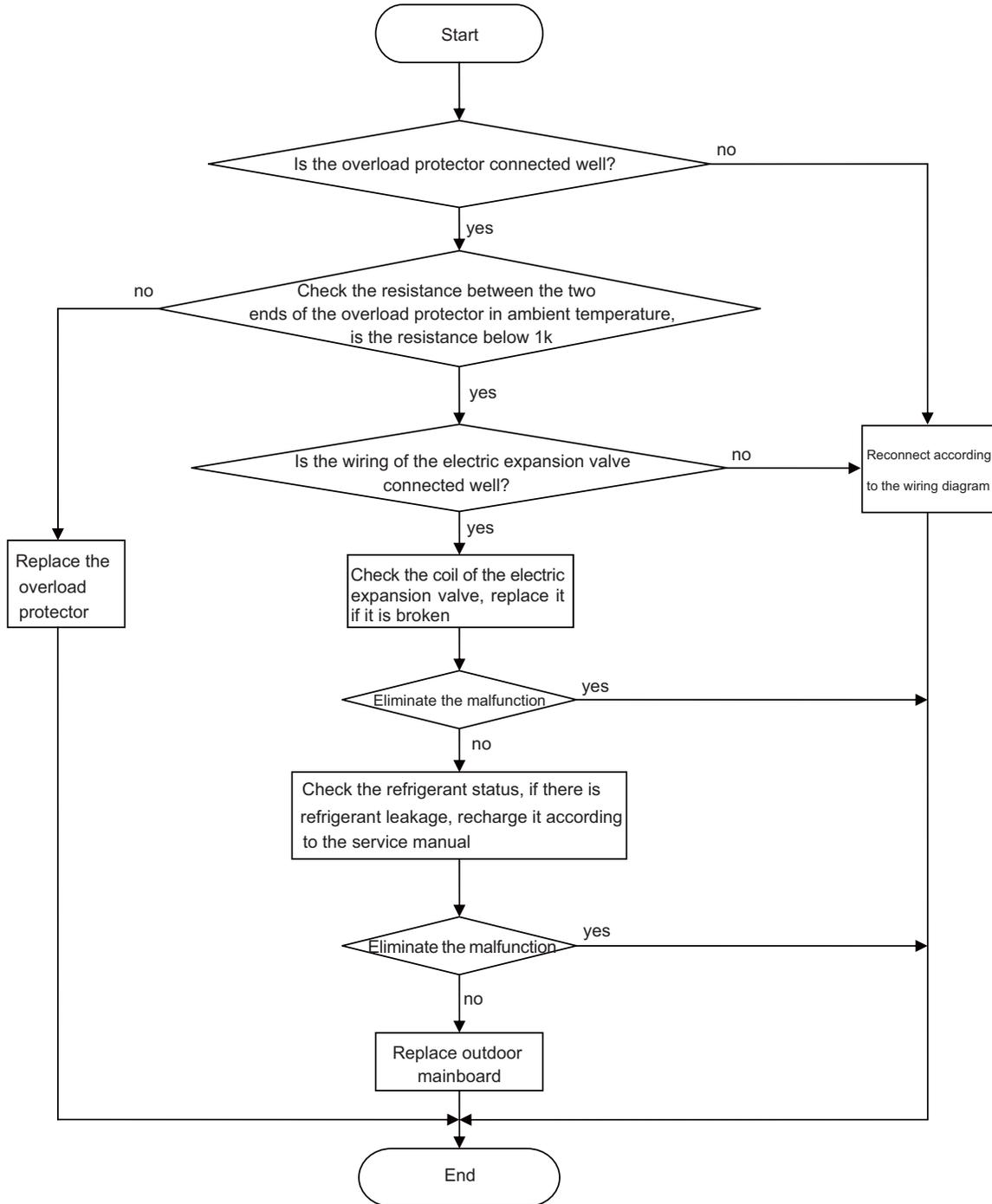


4. Compressor overload, discharge protection malfunction

Main checking points:

- Is the electric expansion valve connected well or broken;
- Is there refrigerant leakage;
- Is the overload protector broken;

Flow chart:



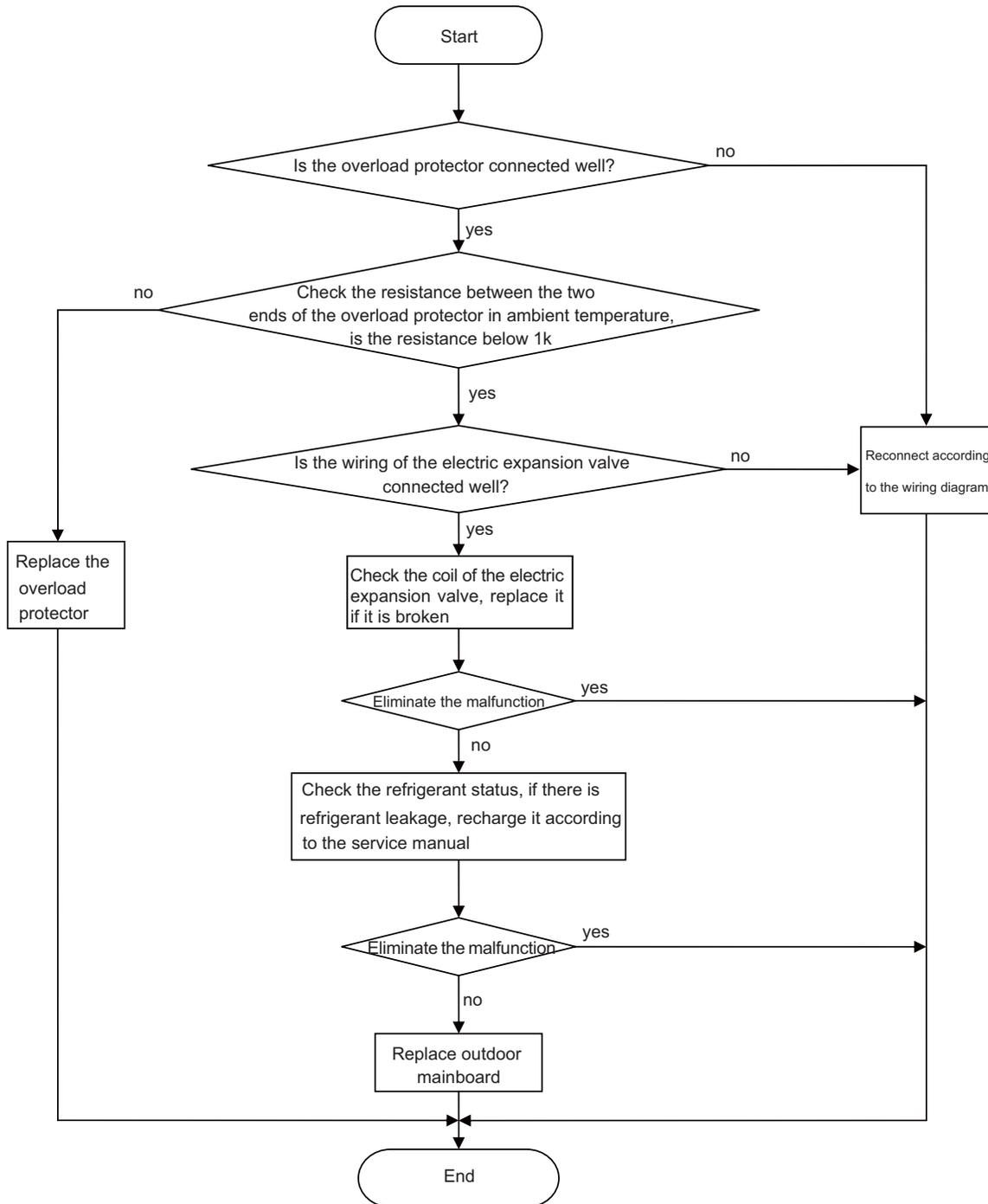
Note: the detection method of the coil of the electric expansion valve: there is five pieces of coil of the electric expansion valve, the resistance of one of them (the leftmost or the rightmost one) is almost the same as the resistance of other terminal (within 100 Ω). Judge the condition of the electronic expansion valve through detecting these resistance.

4. Compressor overload, discharge protection malfunction

Main checking points:

- Is the electric expansion valve connected well or broken;
- Is there refrigerant leakage;
- Is the overload protector broken;

Flow chart:



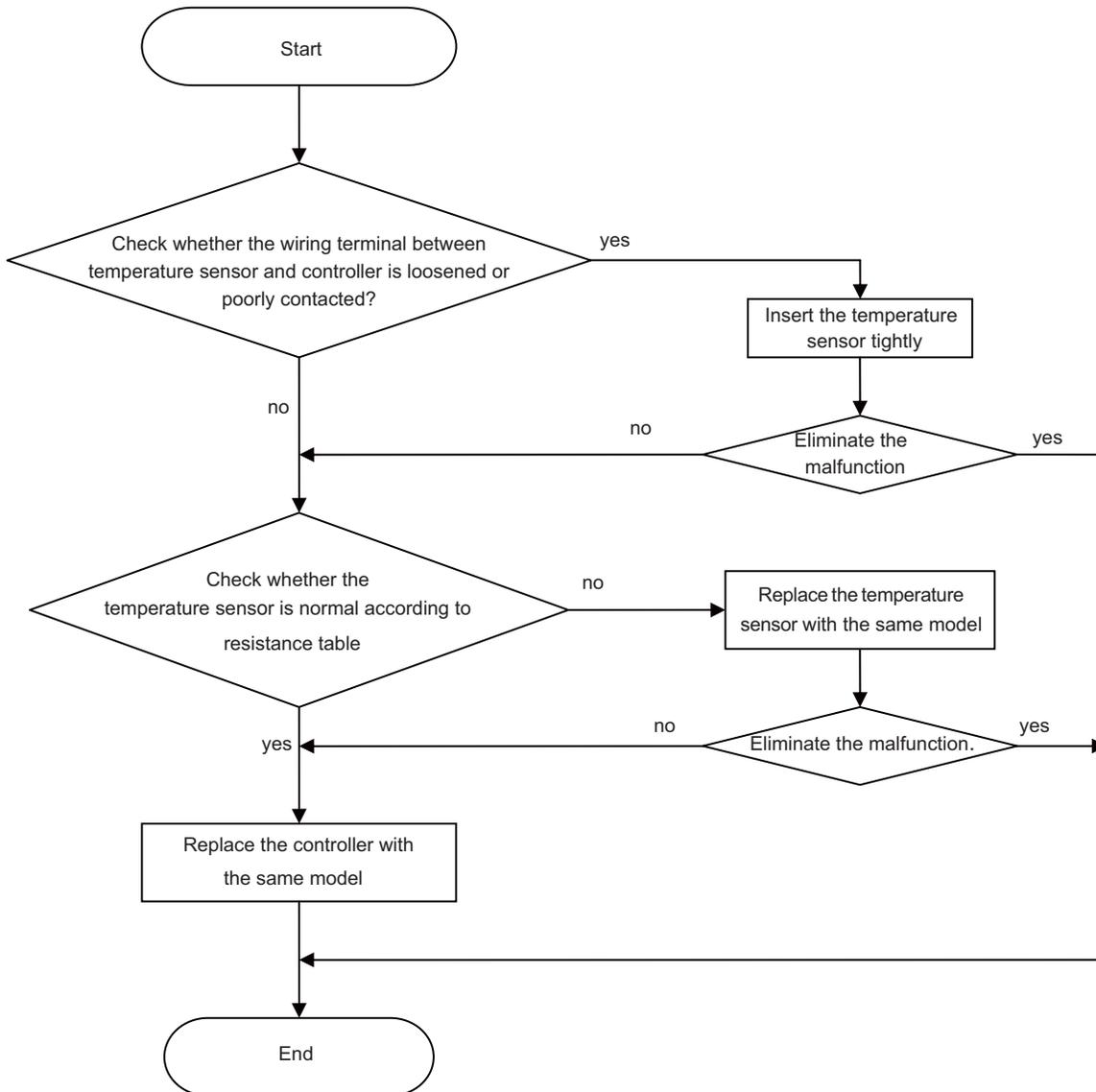
Note: the detection method of the coil of the electric expansion valve: there is five pieces of coil of the electric expansion valve, the resistance of one of them (the leftmost or the rightmost one) is almost the same as the resistance of other terminal (within 100 Ω). Judge the condition of the electronic expansion valve through detecting these resistance.

## 6. Temperature sensor malfunction

Main checking points:

- If the temperature sensor is damaged or broken
- If the terminal of the temperature sensor is loosened or not connected;
- If the mainboard is broken;

Flow chart:

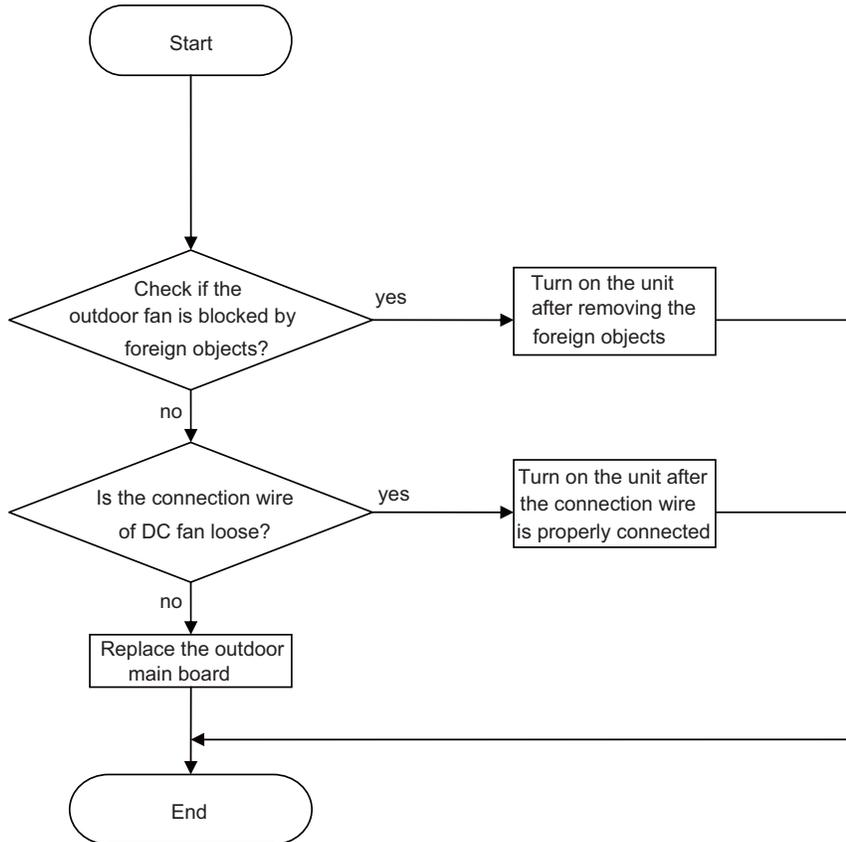


7. DC fan malfunction

Main checking points:

- If the outdoor fan is blocked by foreign objects;
- The connection wire of DC fan is connected reliably? Is it loose?

Flow chart:

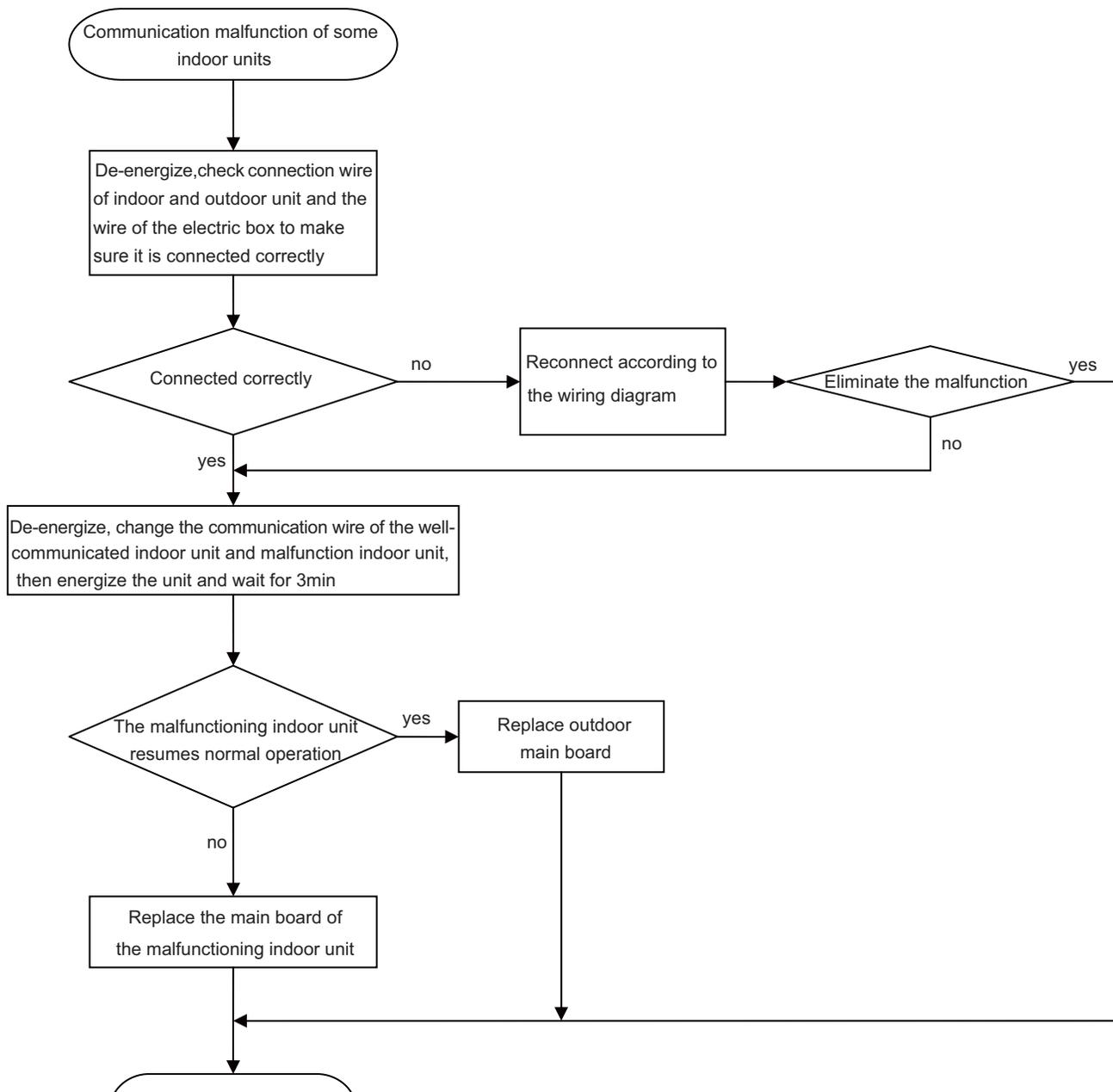


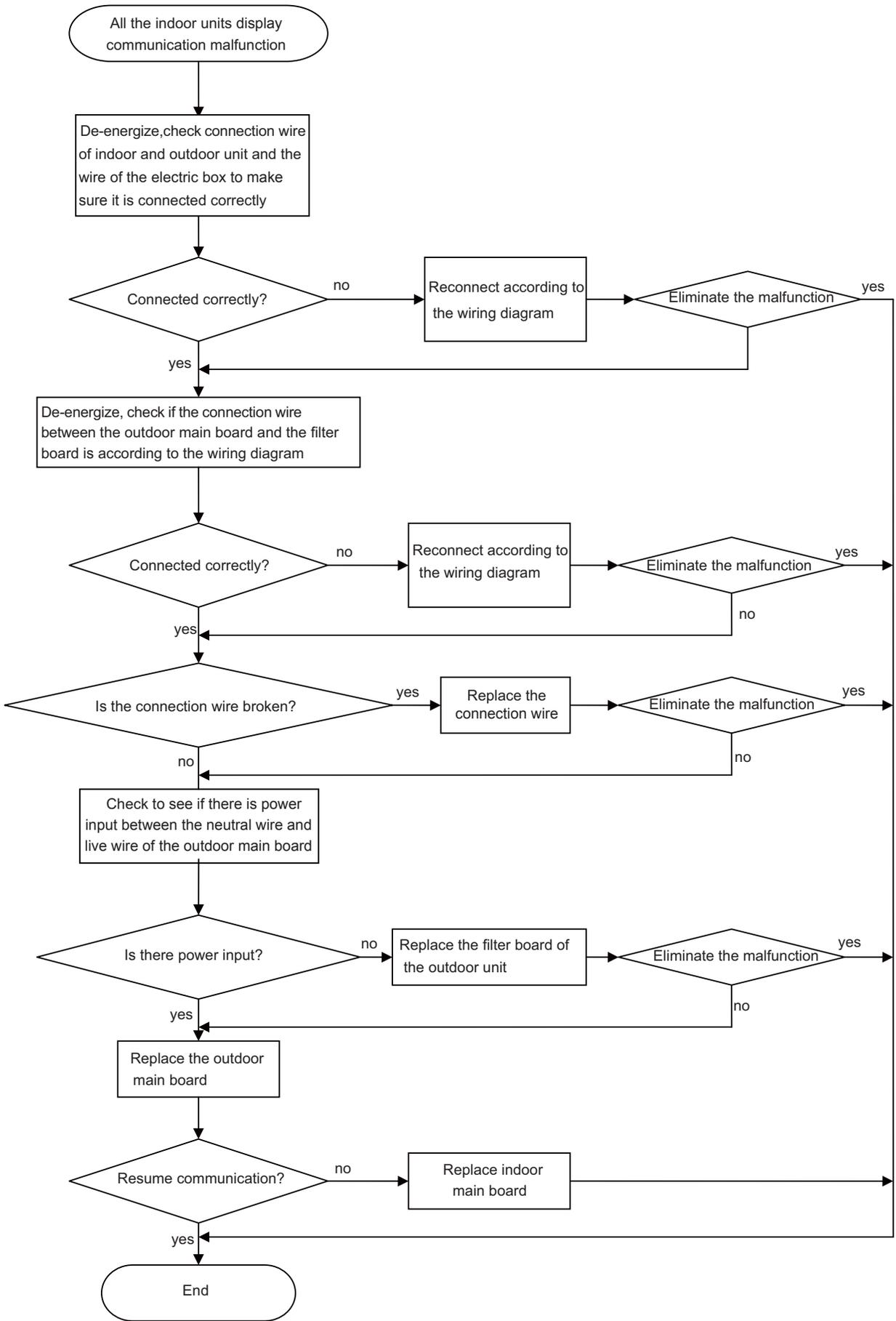
## 8. Communication malfunction

Main checking points:

- If the connection wire between the indoor unit and outdoor unit is connected well, if the wires inside the unit are connected well;
- If the indoor main board or outdoor main board is broken;

Flow chart:



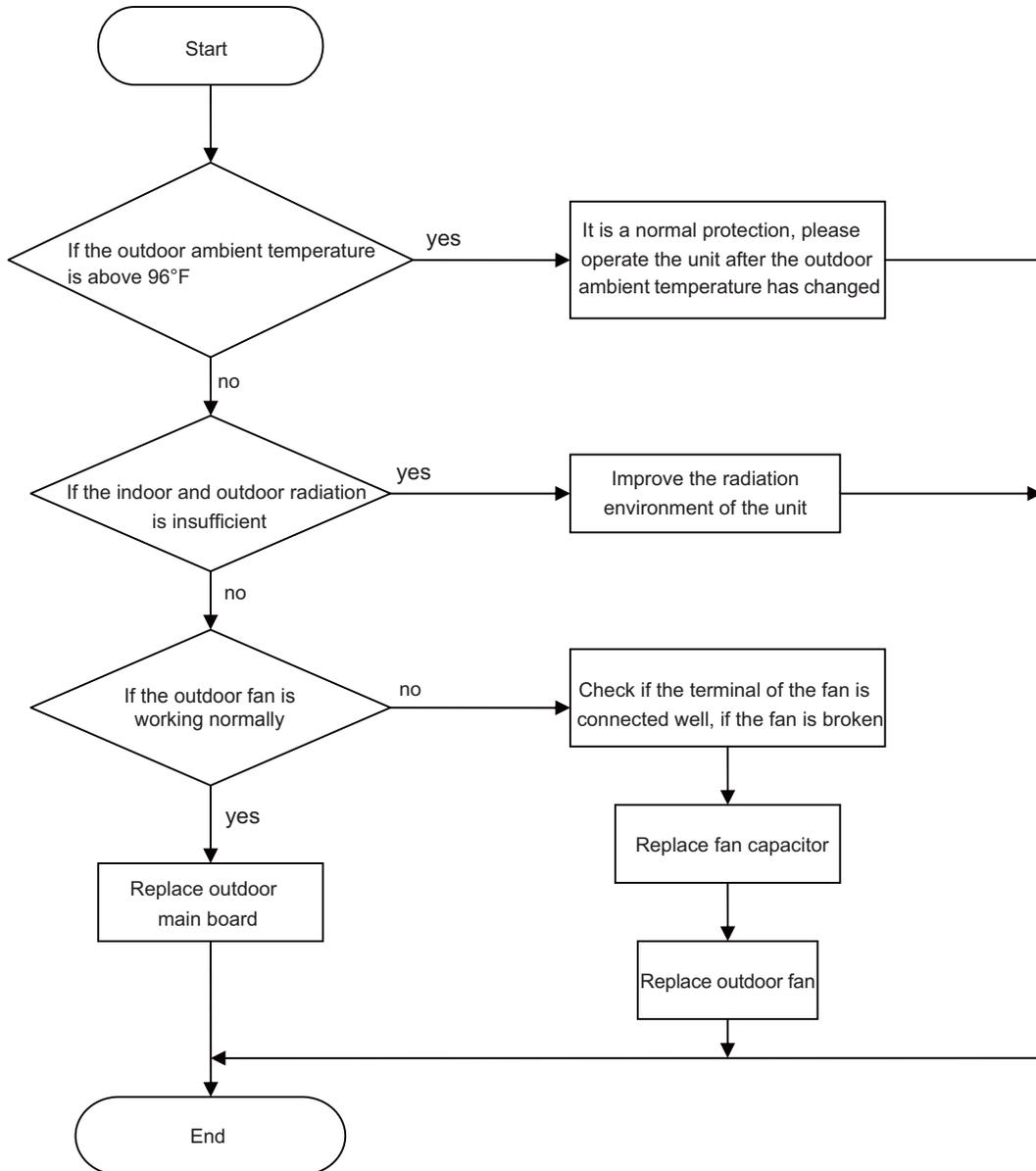


9. Anti-high temperature and overload malfunction

Main checking points:

- If the outdoor ambient temperature is within the normal range;
- If the indoor fan and outdoor fan are running normally;
- If the indoor and outdoor radiation environment is good;

Flow chart:



## 9.3 Maintenance Method for Normal Malfunction

### 1. Air Conditioner Cannot be Started Up

| Possible Causes   | Discriminating Method (Air conditioner Status)  | Troubleshooting   |
|---|---|---|
| No power supply, or poor connection for power plug  | After energization, operation indicator isn't bright and the buzzer does not emit sound                             | Confirm whether its due to power failure. If yes, wait for power recovery. If not, check power supply circuit.  |
| Wrong wire connection between indoor unit and outdoor unit, or poor connection for wiring terminals | Under normal power supply circumstances, operation indicator isnt bright after energization                         | Check the circuit according to circuit diagram and connect wires correctly. Make sure all wiring terminals are connected firmly   |
| Electric leakage for air conditioner  | After energization, room circuit breaker trips immediately  | Make sure the air conditioner is reliably grounded<br>Make sure wires of air conditioner are connected correctly<br>Check the wiring inside air conditioner. Check whether the insulation layer of power cord is damaged; if yes, replace the power cord. |
| Model selection for disconnect switch is improper   | After energization, disconnect switch trips off   | Select proper disconnect switch   |
| Malfunction of remote controller  | After energization, operation indicator is bright, while no display on remote controller or buttons have no action. | Replace batteries for remote controller<br>Repair or replace remote controller  |

### 2. Poor Cooling (Heating) for Air Conditioner

| Possible Causes  | Discriminating Method (Air conditioner Status)   | Troubleshooting   |
|--|--|---|
| Set temperature is improper  | Observe the set temperature on remote controller   | Adjust the set temperature  |
| Rotation speed of the IDU fan motor is set too low                 | Small wind blow  | Set the fan speed at high or medium                               |
| Filter of indoor unit is blocked                                   | Check the filter to see its blocked  | Clean the filter  |
| Installation position for indoor unit and outdoor unit is improper | Check whether the installation position is proper according to installation requirement for air conditioner  | Adjust the installation position, shield outdoor unit from sun.   |
| Refrigerant is leaking   | Discharged air temperature during cooling is higher than normal discharged wind temperature;<br>Discharged air temperature during heating is lower than normal discharged wind temperature;<br>Units pressure is much lower than regulated range   | Find out the leakage causes and repair. Add refrigerant.          |
| Malfunction of 4-way valve   | Blow cold wind during heating  | Replace the 4-way valve   |
| Malfunction of capillary   | Discharged air temperature during cooling is higher than normal discharged wind temperature;<br>Discharged air temperature during heating is lower than normal discharged wind temperature;<br>Unit pressure is much lower than regulated range. If refrigerant isnt leaking, part of capillary is blocked | Replace the capillary   |
| Flow volume of valve is insufficient                               | The pressure of valves is much lower than that stated in the specification   | Open the valve completely   |
| Malfunction of horizontal louver                                   | Horizontal louver can't swing  | Refer to point 3 of maintenance method for details                |
| Malfunction of the IDU fan motor                                   | The IDU fan motor can't operate  | Refer to troubleshooting for H6 for maintenance method in details |
| Malfunction of the ODU fan motor                                   | The ODU fan motor can't operate  | Refer to point 4 of maintenance method for details                |
| Malfunction of compressor  | Compressor can't operate   | Refer to point 5 of maintenance method for details                |

### 3. Horizontal Louver Cant Swing

| Possible Causes                           | Discriminating Method (Air conditioner Status)               | Troubleshooting   |
|---|--|---|
| Wrong wire connection, or poor connection | Check the wiring status according to circuit diagram         | Connect wires according to wiring diagram and make sure all wiring terminals are connected firmly |
| Stepping motor is damaged                 | Stepping motor can't operate                                 | Repair or replace stepping motor  |
| Main board is damaged                     | Others are all normal, while horizontal louver can't operate | Replace the main board with the same model  |

#### 4. ODU Fan Motor Cant Operate

| Possible causes                           | Discriminating method (air conditioner status)   | Troubleshooting  |
|---|--|--|
| Wrong wire connection, or poor connection | Check the wiring status according to circuit diagram   | Connect wires according to wiring diagram to make sure all wiring terminals are connected firmly |
| Capacitor of the ODU fan motor is damaged | Measure the capacity of fan capacitor with universal meter and find that the capacity is out of the deviation range indicated on the nameplate of fan capacitor. | Replace the capacitor of fan   |
| Power voltage - is a little low or high   | Use universal meter to measure the power supply voltage. The voltage is a little high or low   | Suggest to equip with voltage regulator  |
| Motor of outdoor unit is damaged          | When unit is on, cooling/heating performance is bad and ODU compressor generates a lot of noise and heat.  | Change compressor oil and refrigerant. If no better, replace the compressor with a new one       |

#### 5. Compressor Can't Operate

| Possible causes                           | Discriminating method (air conditioner status)   | Troubleshooting  |
|---|--|--|
| Wrong wire connection, or poor connection | Check the wiring status according to circuit diagram   | Connect wires according to wiring diagram to make sure all wiring terminals are connected firmly |
| Power voltage - is a little low or high   | Use universal meter to measure the power supply voltage. The voltage is a little high or low | Suggest to equip with voltage regulator  |
| Coil of compressor is burnt out           | Use universal meter to measure the resistance between compressor terminals and its 0         | Replace compressor   |
| Cylinder of compressor is blocked         | Compressor can't operate   | Replace compressor   |

#### 6. Air Conditioner is Leaking

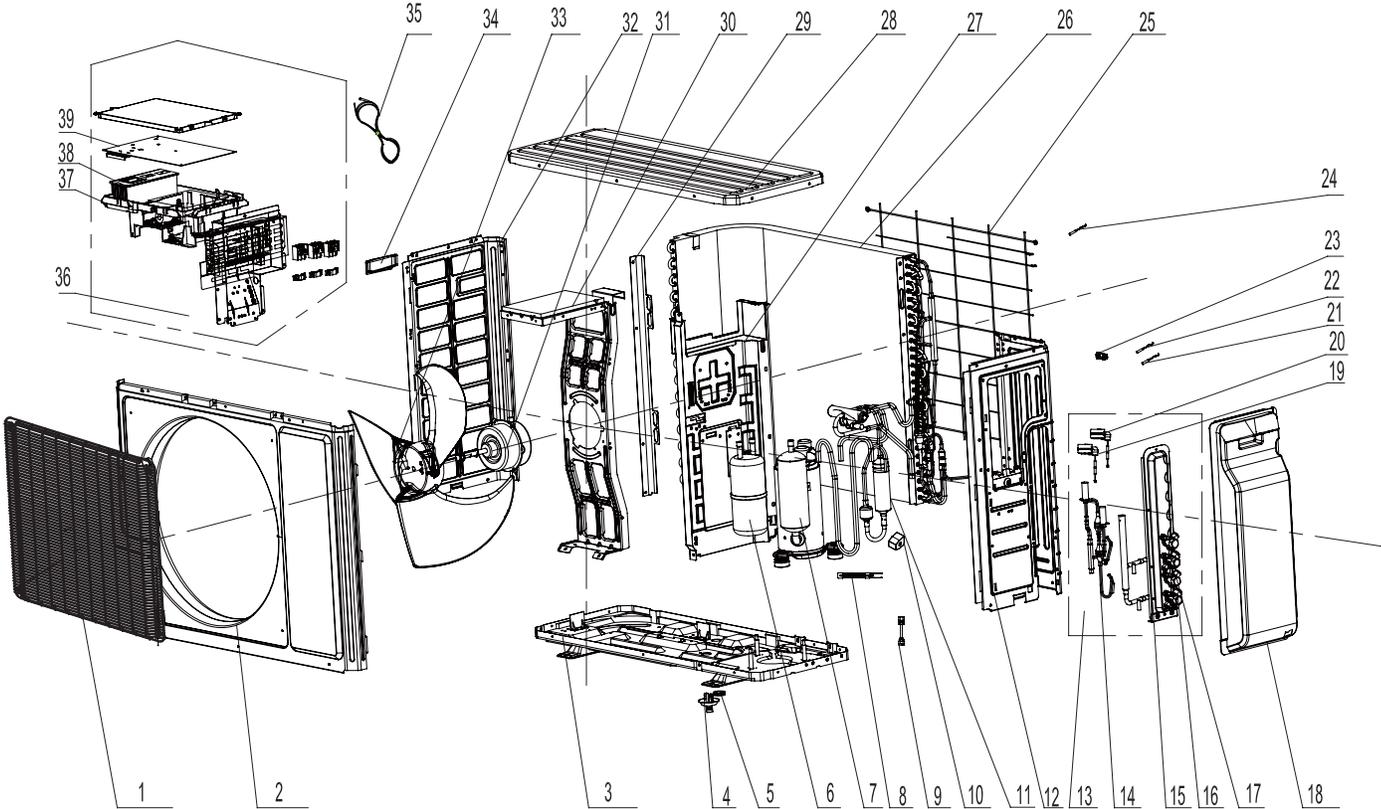
| Possible causes       | Discriminating method (air conditioner status)              | Troubleshooting                                     |
|-----------------------|---|---|
| Drain pipe is blocked | Water leaking from indoor unit                              | Eliminate the foreign objects inside the drain pipe |
| Drain pipe is broken  | Water leaking from drain pipe                               | Replace drain pipe                                  |
| Wrapping is not tight | Water leaking from the pipe connection place of indoor unit | Wrap it again and bundle it tightly                 |

#### 7. Abnormal Sound and Vibration

| Possible causes  | Discriminating method (air conditioner status)                 | Troubleshooting   |
|--|--|---|
| When turning unit on or off, the panel and other parts will expand generating abnormal sound           | There is the sound of "PAPA"                                   | Normal phenomenon. Abnormal sound will disappear after a few minutes.   |
| When turning unit on or off, there is abnormal sound due to flow of refrigerant inside air conditioner | Water-running sound can be heard                               | Normal phenomenon. Abnormal sound will disappear after a few minutes.   |
| Foreign objects inside the indoor unit or thereere parts touching together inside the indoor unit      | There is an abnormal sound from indoor unit                    | Remove foreign objects. Adjust all parts position of indoor unit, tighten screws and stick damping material between connected parts.  |
| Foreign objects inside the outdoor unit or parts touching together inside the outdoor unit             | There is an abnormal sound from outdoor unit                   | Remove foreign objects. Adjust all parts position of outdoor unit, tighten screws and stick damping material between connected parts. |
| Short circuit inside the magnetic coil   | During heating, 4-way valve has abnormal electromagnetic sound | Replace magnetic coil.  |
| Abnormal shake of compressor   | Outdoor unit gives out abnormal sound                          | Adjust the support foot mat of compressor, tighten the bolts.   |
| Abnormal sound inside the compressor   | Abnormal sound inside the compressor                           | If too much refrigerant added during maintenance, please reduce refrigerant properly. Replace compressor for other circumstances.     |

# 10. Exploded View and Parts List

A-VFH18DB-1

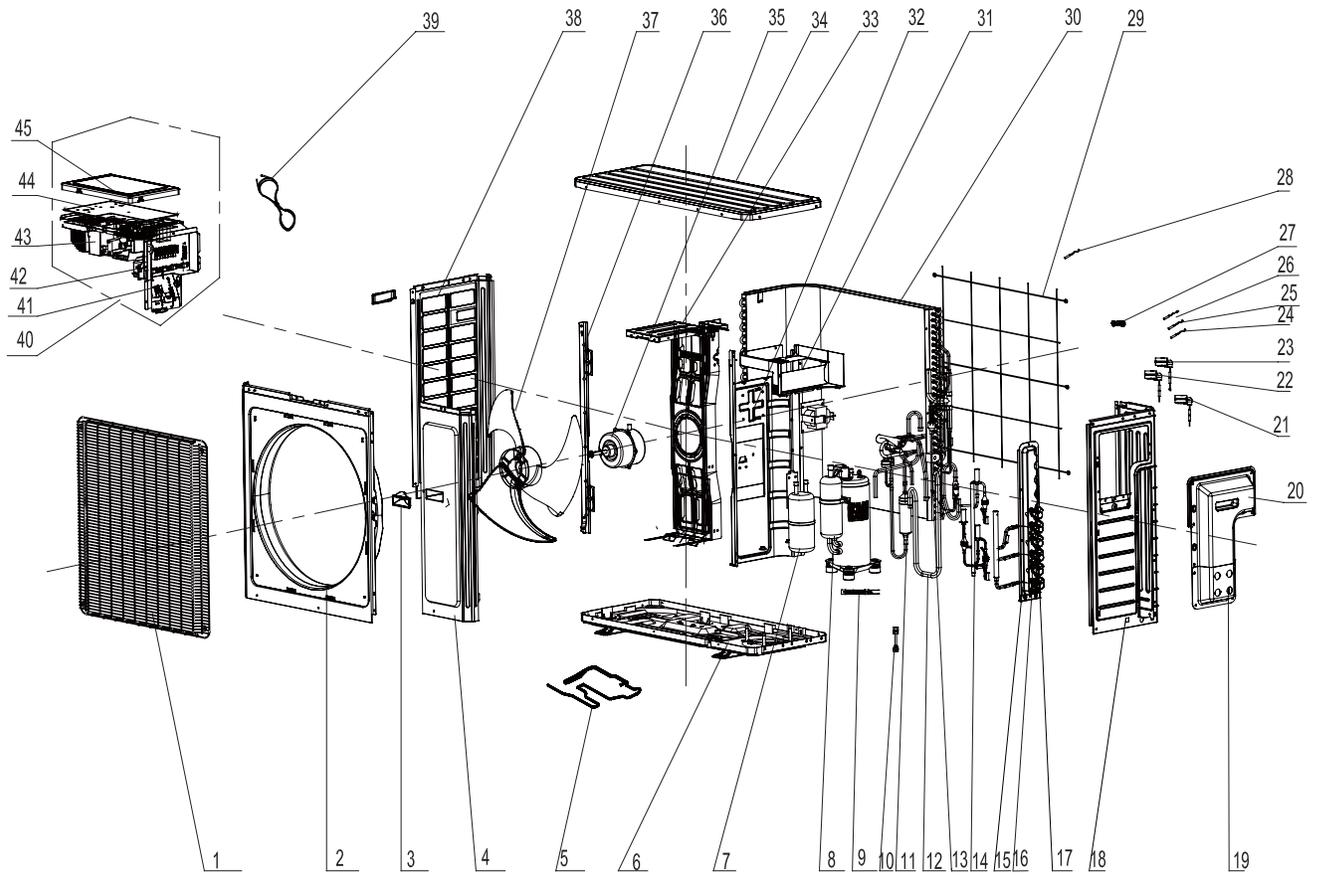


The component picture is only for reference; please refer to the actual product.

| NO. | Description                     | Part Code                  | Qty |
|-----|---------------------------------|----------------------------|-----|
|     |                                 | A-VFH18DB-1                |     |
|     |                                 | Product Code               |     |
|     |                                 | CB228W07700_L61437         |     |
| 1   | Front Grill                     | 01473049                   | 1   |
| 2   | Front Panel Assy                | 00000300024                | 1   |
| 3   | Chassis Sub-assy                | 02803263P                  | 1   |
| 4   | Drainage Connector              | 06123401                   | 1   |
| 5   | Drainage hole Cap               | 06813401/76713033/76713068 | 1   |
| 6   | Gas-liquid Separator Assy       | 07223048                   | 1   |
| 7   | Compressor and Fittings         | 00105249G                  | 1   |
| 8   | Electric Heater(Compressor)     | 7651300403                 | 1   |
| 9   | Tube Connector Sub-assy         | /                          | /   |
| 10  | Magnet Coil                     | 4300040045                 | 1   |
| 11  | 4-Way Valve Assy                | 03073328                   | 1   |
| 12  | Right Side Plate                | 0130326801P                | 1   |
| 13  | Valve Support Assy              | 03016300003                | 1   |
| 14  | Electronic Expansion Valve assy | 03017400020                | 1   |
| 15  | Valve Support Sub-Assy          | 0171312802P                | 1   |
| 16  | Cut off Valve                   | 07130239                   | 1   |
| 17  | Cut off Valve                   | 071302391                  | 1   |
| 18  | Valve Cover                     | /                          | /   |
| 19  | Electric Expand Valve Fitting   | 43000084                   | 1   |
| 20  | Electric Expand Valve Fitting   | 4300008401                 | 1   |
| 21  | Temperature Sensor              | 39000073                   | 1   |
| 22  | Temperature Sensor              | 3900007301                 | 1   |
| 23  | Wiring Clamp                    | 26115004                   | 1   |
| 24  | Temperature Sensor              | 39000073                   | 1   |
| 25  | Rear Grill                      | 01473043                   | 1   |
| 26  | Condenser Assy                  | 011002000279_L61437        | 1   |
| 27  | Clapboard Assy                  | 0123315301                 | 1   |
| 28  | Coping                          | 012049000007P              | 1   |
| 29  | Supporting Board(Condenser)     | 01795010                   | 1   |
| 30  | Motor Support Sub-Assy          | 01705067                   | 1   |
| 31  | Fan Motor                       | 1501506402                 | 1   |
| 32  | Left Side Plate                 | 01305093P                  | 1   |
| 33  | Axial Flow Fan                  | 10335008                   | 1   |
| 34  | Left Handle                     | 2623305301                 | 1   |
| 35  | Connecting Cable                | /                          | /   |
| 36  | Electric Box Assy               | 10000100023_L61437         | 1   |
| 37  | Electric Box                    | 20113027                   | 1   |
| 38  | Radiator                        | 49010252                   | 1   |
| 39  | Main Board                      | 30138000310                | 1   |

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# A-VFH24TB-1

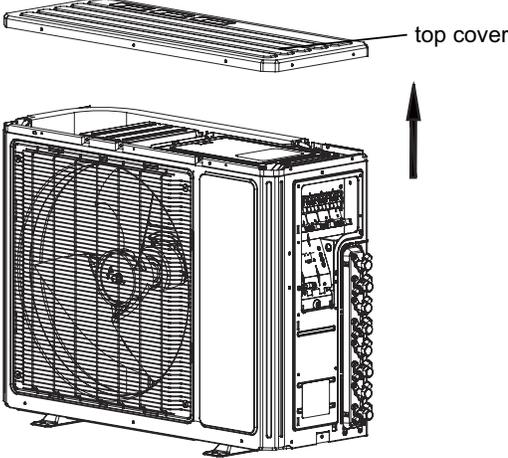
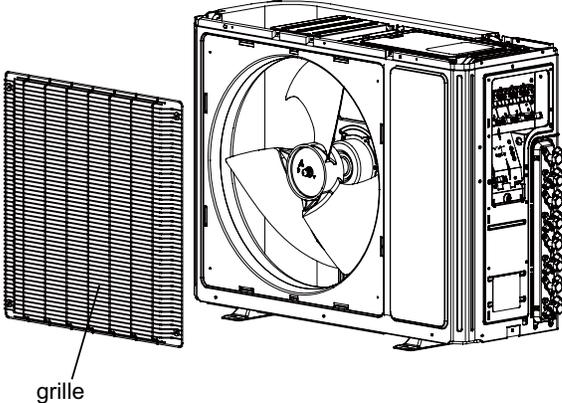
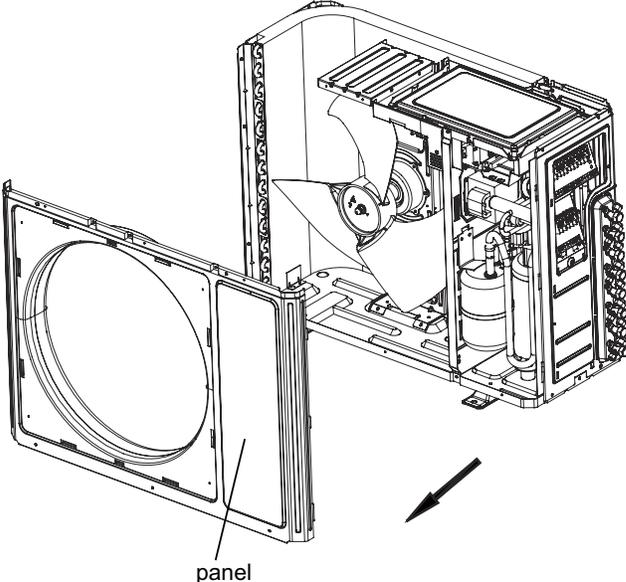


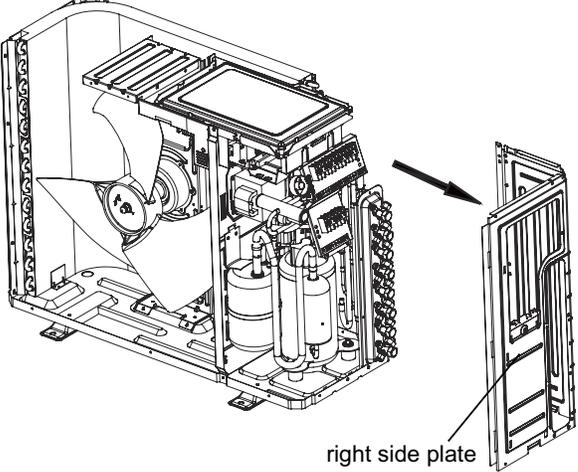
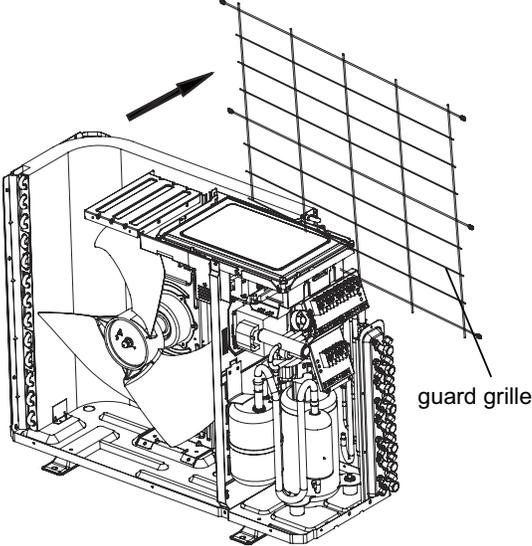
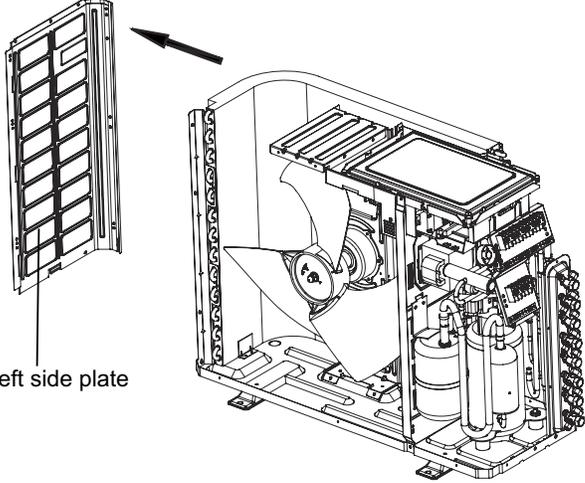
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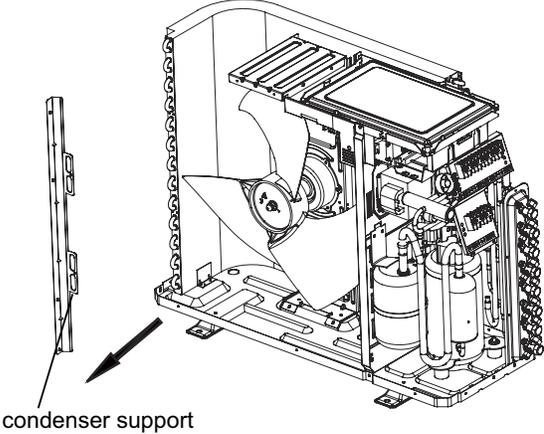
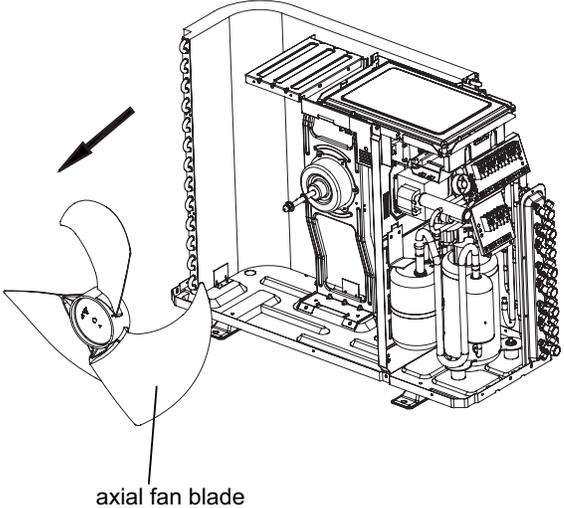
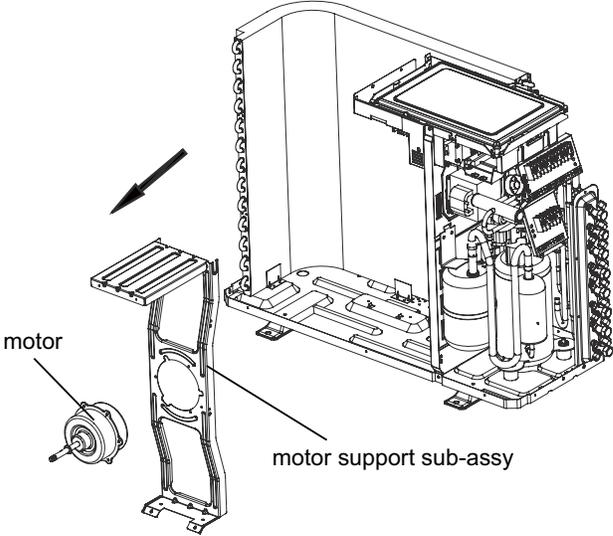
| NO. | Description                     | Part Code                          | Qty |
|-----|---------------------------------|------------------------------------|-----|
|     |                                 | A-VFH24TB-1                        |     |
|     |                                 | Product code<br>CB228W07800_L61437 |     |
| 1   | Front Grill                     | 01473050                           | 1   |
| 2   | Cabinet                         | 0143500401P                        | 1   |
| 3   | Left Handle                     | 02113031                           | 1   |
| 4   | Front Side Plate                | 01305086P                          | 1   |
| 5   | Electrical Heater (Chassis)     | 7651000411                         | 1   |
| 6   | Chassis Sub-assy                | 02803280P                          | 1   |
| 7   | Gas-liquid Separator            | 07223048                           | 1   |
| 8   | Compressor and Fittings         | 0010524501                         | 3   |
| 9   | Electric Heater(Compressor)     | 7651873215                         | 1   |
| 10  | Tube Connector Sub-assy         | 06643008                           | 1   |
| 11  | 4-Way Valve Assy                | 03015200001                        | 1   |
| 12  | Connection Pipe                 | 03509700042                        | 1   |
| 13  | Magnet Coil                     | 4300040045                         | 1   |
| 14  | Electronic Expansion Valve assy | 0713395301                         | 1   |
| 15  | Valve Support Assy              | 0713395401                         | 1   |
| 16  | Cut off Valve                   | 07130239                           | 1   |
| 17  | Cut off Valve                   | 07130239                           | 1   |
| 18  | Right Side Plate                | 0131410000901P                     | 1   |
| 19  | Wiring Cover Sub-assy           | 01264100034                        | 1   |
| 20  | Handle Assy                     | 02204100008                        | 1   |
| 21  | Electric Expand Valve Fitting   | 43000084                           | 1   |
| 22  | Electric Expand Valve Fitting   | 4300008401                         | 1   |
| 23  | Electric Expand Valve Fitting   | 4300008402                         | 1   |
| 24  | Temperature Sensor              | 3900030901                         | 1   |
| 25  | Temperature Sensor              | 39000073                           | 1   |
| 26  | Temperature Sensor              | 3900007305/3900007306              | 1   |
| 27  | Wiring Clamp                    | 26115004                           | 1   |
| 28  | Temperature Sensor              | 3900030901                         | 1   |
| 29  | Rear Grill                      | 01574100003                        | 1   |
| 30  | Condenser Assy                  | 0116398001_L61437                  | 1   |
| 31  | Electric Box (Fireproofing)     | 01413426                           | 1   |
| 32  | Clapboard Sub-Assy              | 01233190                           | 1   |
| 33  | Motor Support Sub-Assy          | 017012000017                       | 1   |
| 34  | Top Cover Sub-Assy              | 01255007                           | 1   |
| 35  | Fan Motor                       | 017012000017                       | 1   |
| 36  | Condenser Support Plate         | 01175092                           | 1   |
| 37  | Axial Flow Fan                  | 10335014                           | 1   |
| 38  | Left Side Plate                 | 01305043P                          | 1   |
| 39  | Connecting Cable                | /                                  | /   |
| 40  | Electric Box Assy               | 10000100020_L61437                 | 1   |
| 41  | Terminal Board                  | 42010178                           | 1   |
| 42  | Connection Support              | 01703211                           | 1   |
| 43  | Electric Box                    | 20113015                           | 1   |
| 44  | Main Board                      | 30138000311                        | 1   |
| 45  | Electric Box Cover Sub-Assy     | 02603217                           | 1   |

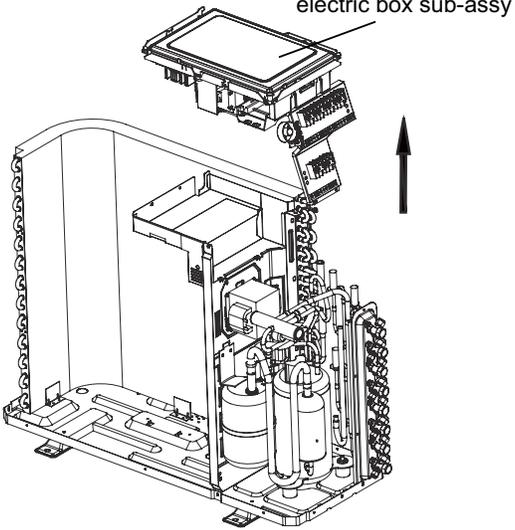
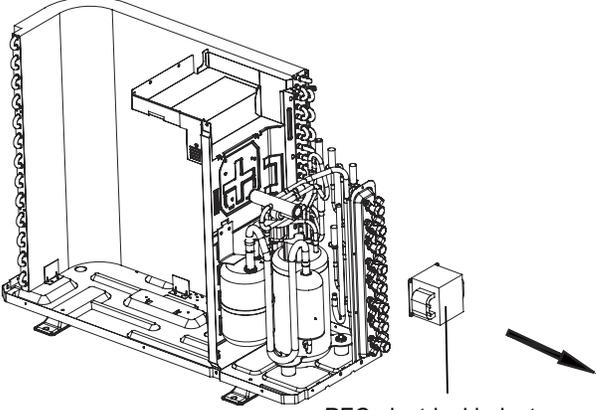
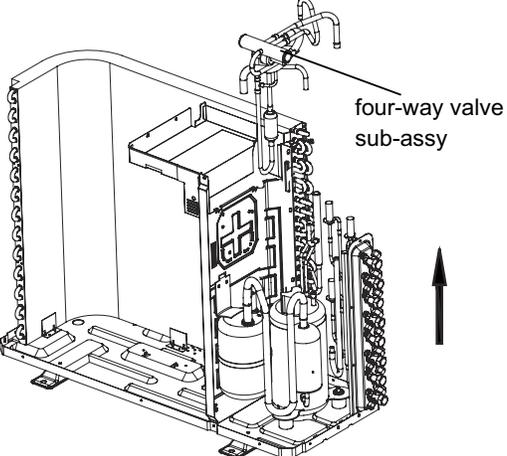
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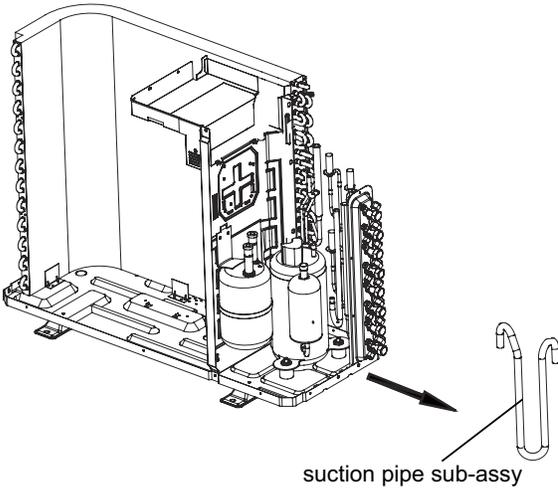
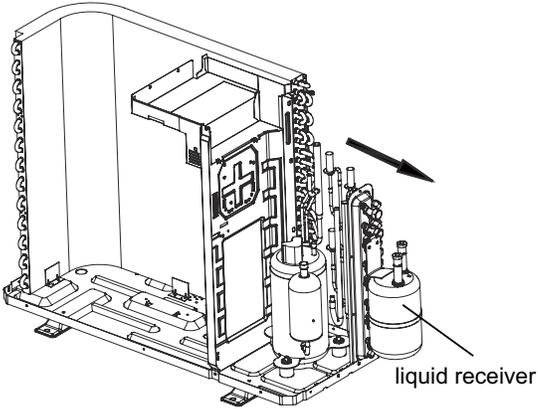
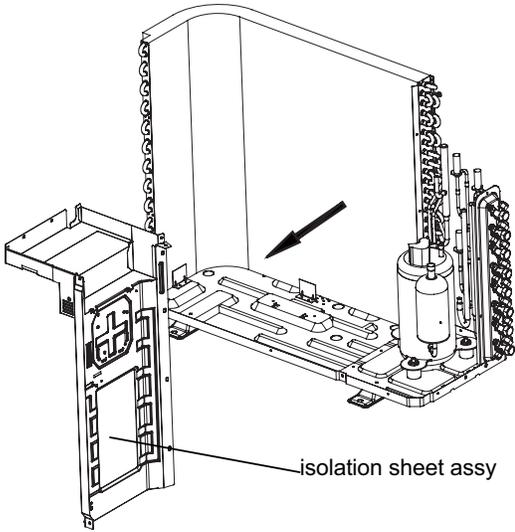


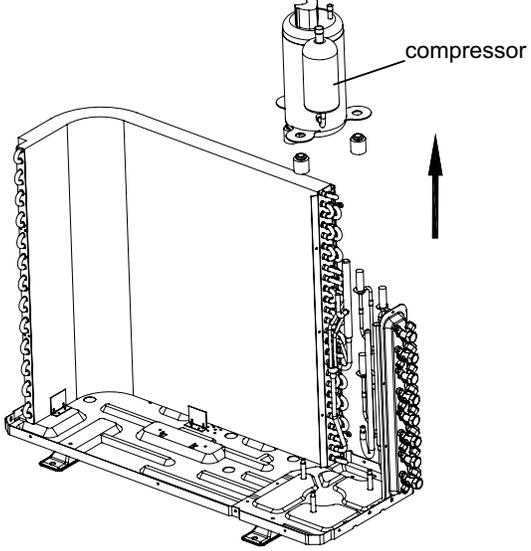
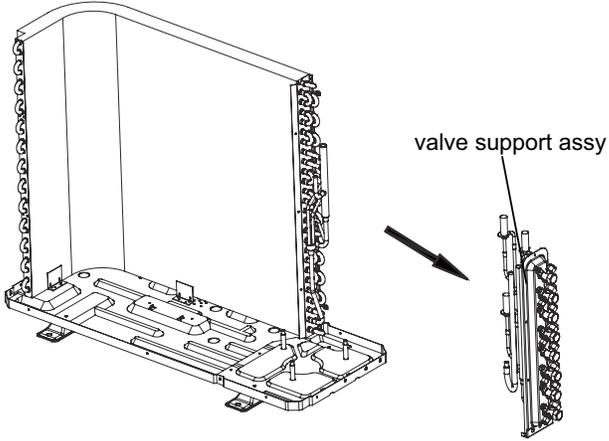
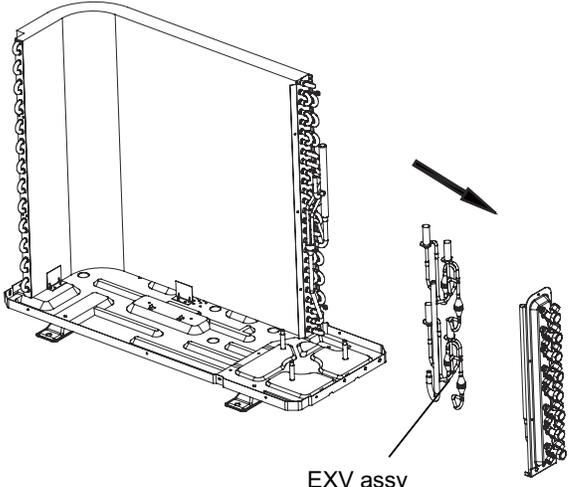
| Steps              | Procedure   |
|--------------------|---|
| 2.Remove top cover | <p data-bbox="248 436 781 491">Remove the screws fixing top cover, panel and left &amp; right side plate, to remove top cover.</p>  |
| 3.Remove grille    | <p data-bbox="248 1026 790 1081">Remove the screws fixing grille and panel, to remove the grille on the panel.</p>                 |
| 4.Remove panel     | <p data-bbox="248 1631 773 1686">Remove the screws fixing panel, chassis and motor support, to remove the panel.</p>              |

| Steps                            | Procedure  |
|----------------------------------|--|
| <p>5.Remove right side plate</p> | <p>Remove the screws fixing right side plate, valve support and guard grille, to remove the right side plate.</p>  <p>right side plate</p> |
| <p>6.Remove guard grille</p>     | <p>Remove the screws fixing guard grille and left side plate to remove guard grille.</p>  <p>guard grille</p>                             |
| <p>7.Remove left side plate</p>  | <p>Remove the screws fixing chassis and condenser support, to remove the left side plate.</p>  <p>left side plate</p>                    |

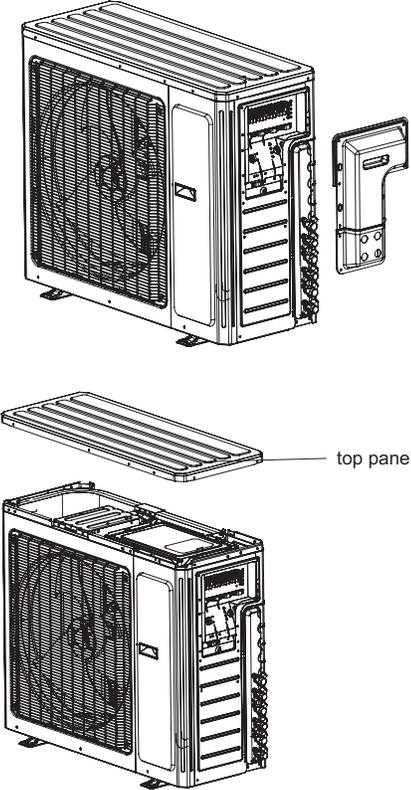
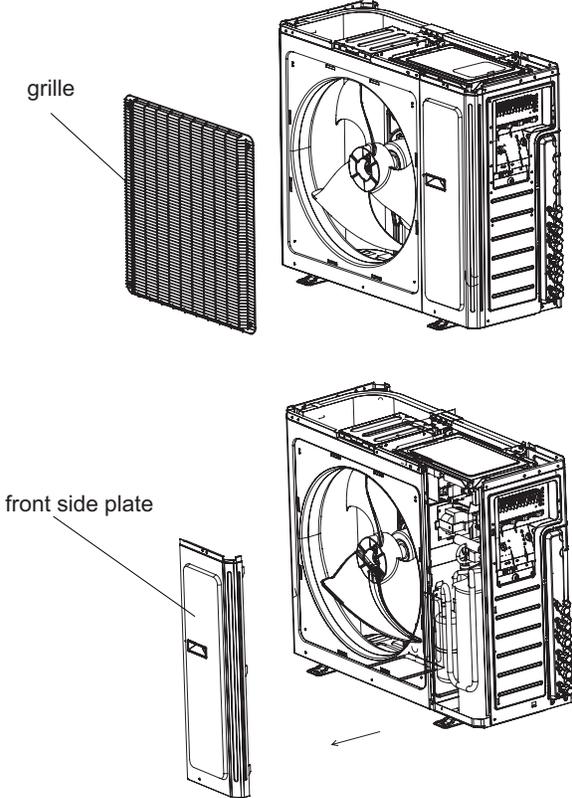
| Steps                                      | Procedure   |
|--|---|
| 8.Remove condenser support                 | <p data-bbox="250 428 763 485">Remove the screws fixing support and chassis, to remove the condenser support.</p>  <p data-bbox="873 701 1068 730">condenser support</p>  |
| 9.Remove axial fan blade                   | <p data-bbox="250 1031 800 1087">Remove the screw nuts fixing fan blade with spanner, to remove the fan blade.</p>  <p data-bbox="980 1289 1130 1318">axial fan blade</p>  |
| 10.Remove motor and motor support sub-assy | <p data-bbox="250 1640 812 1759">Remove the tapping screws fixing motor, pull out the pin of leading wire for motor and remove the screws fixing motor support and chassis, to remove the motor and motor support sub-assy.</p>  <p data-bbox="837 1751 899 1780">motor</p> <p data-bbox="1105 1864 1352 1894">motor support sub-assy</p> |

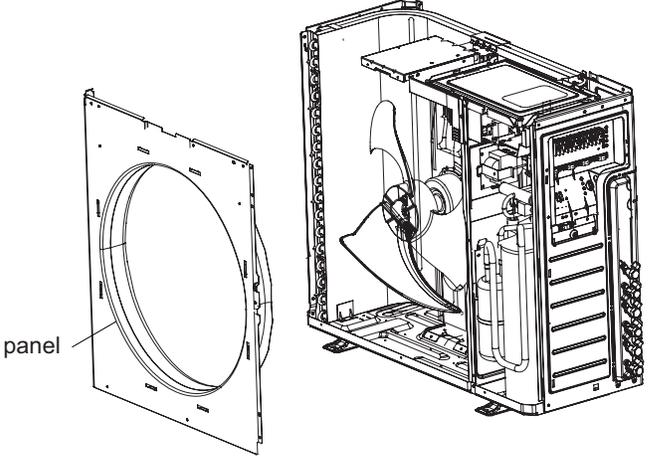
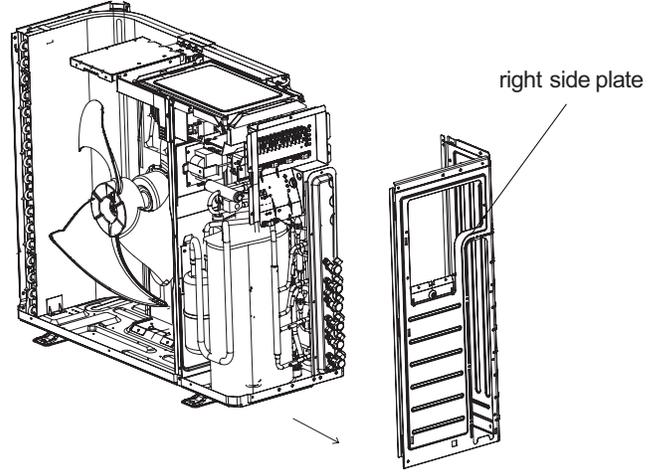
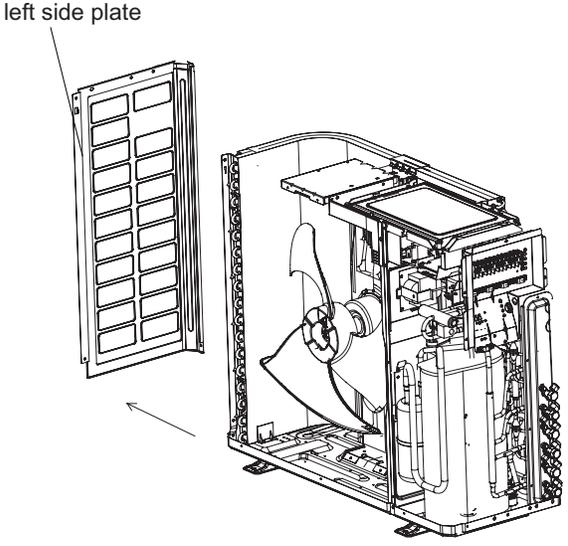
| Steps                                      | Procedure   |
|--|---|
| <p>11.Remove electric box sub-assy</p>     | <p>Remove the tapping screws fixing isolation sheet, loosen the wire binds, pull out the terminal, lift to remove the electric box sub-assy.</p>  <p style="text-align: right;">electric box sub-assy</p>   |
| <p>12.Remove PFC electrical inductance</p> | <p>Remove the screws fixing PFC electrical inductance and isolation sheet, to remove the PFC electrical inductance.</p>  <p style="text-align: right;">PFC electrical inductance</p>   |
| <p>13.Remove four-way valve sub-assy</p>   | <p>Welding cut the welding point jointing the four-way valve with blowtorch to remove the four-way valve sub-assy. (Note: please make sure theres no refrigerant in the unit before remove any tube or compressor)</p>  <p style="text-align: right;">four-way valve sub-assy</p> |

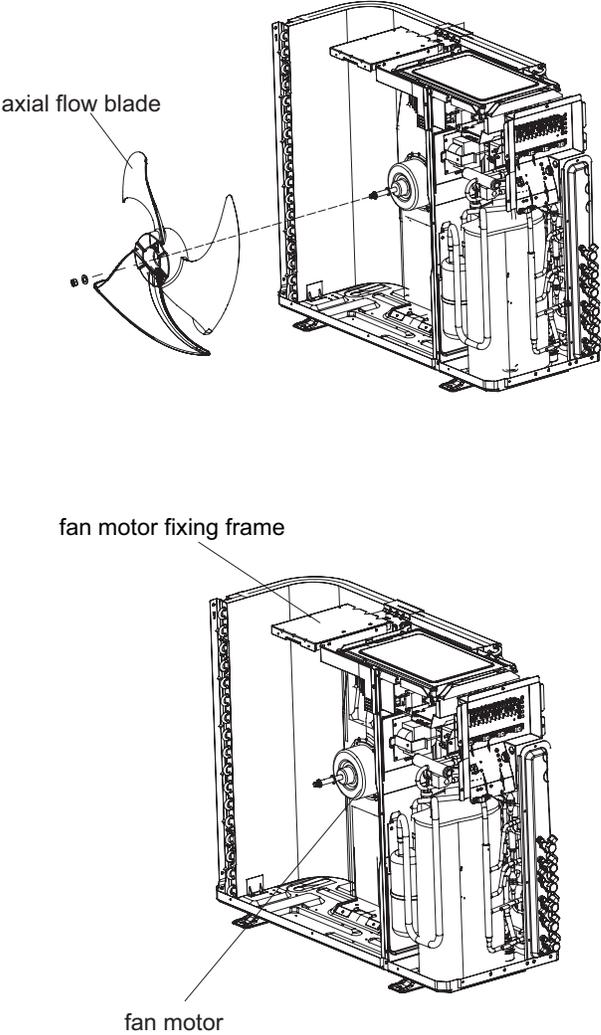
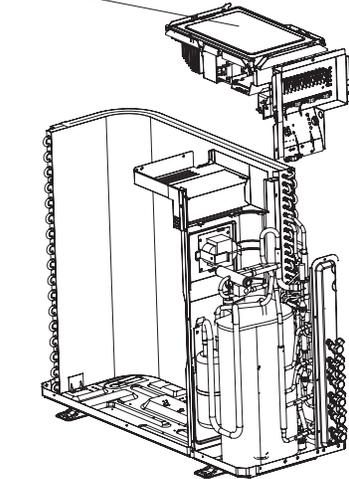
| Steps                                     | Procedure   |
|---|---|
| <p>14.Remove suction pipe sub-assy</p>    | <p>Welding cut the welding point jointing the suction pipe sub-assy, compressor and liquid receiver, to remove the suction pipe sub-assy.</p>  <p>suction pipe sub-assy</p> |
| <p>15.Remove liquid receiver</p>          | <p>Remove the screws fixing isolation sheet and liquid receiver and lift to remove the liquid receiver.</p>  <p>liquid receiver</p>  |
| <p>16.Remove the isolation sheet assy</p> | <p>Remove the screws fixing isolation sheet and condenser side plate, to remove the isolation sheet assy.</p>  <p>isolation sheet assy</p>                                |

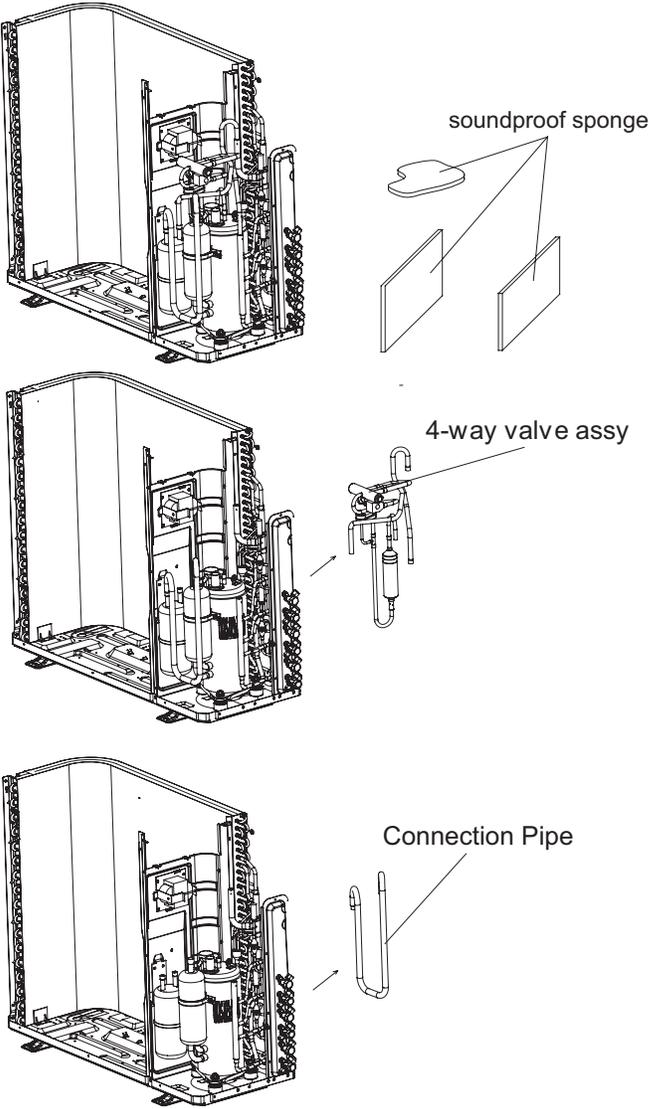
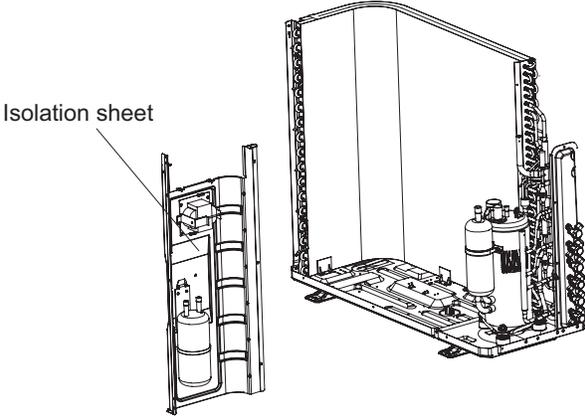
| Steps                               | Procedure  |
|-------------------------------------|--|
| <p>17.Remove compressor</p>         | <p>Remove the screw nuts fixing compressor feet and chassis with spanner, as well as the foot cushion, to remove the compressor.</p>   |
| <p>18.Remove valve support assy</p> | <p>Remove the screws fixing valve support assy and chassis sub-assy, to remove the valve support assy.</p>    |
| <p>19.Remove EXV assy</p>           | <p>Welding cut the welding point jointing EXV sub-assy and refrigerant collection pipe, to remove the EXV assy. (Note: fully pack the big valve with wet cloth when welding cutting, to avoid high temperature damage of valve)</p>  |

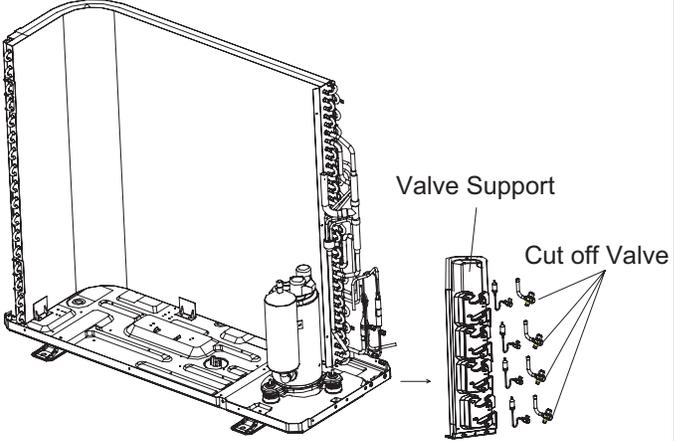
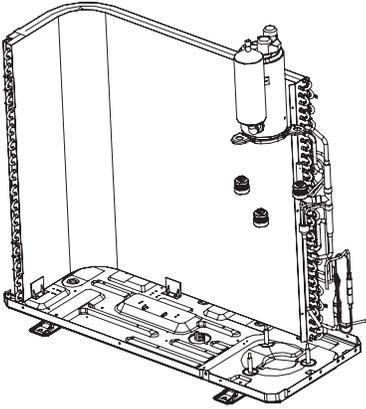
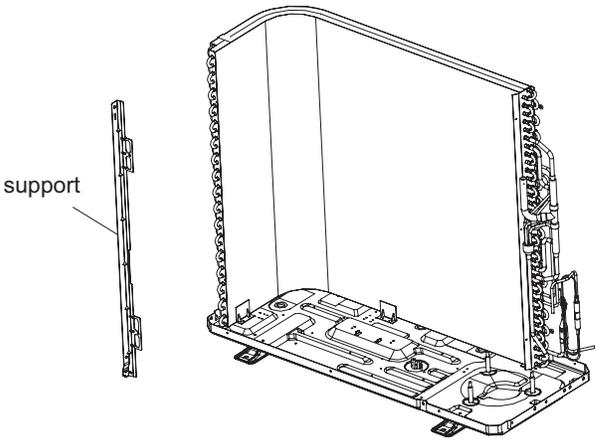
## A-VFH24TB-1

| Steps   | Procedure   |
|---|---|
| <p data-bbox="147 338 524 365">1. Remove valve cover and top panel</p> <p data-bbox="175 449 695 499">a Twist off the screws used for fixing and valve cover , pull valve cover up ward to remove it.</p> <p data-bbox="175 779 686 884">b Remove the 3 screws connecting the top panel with the front panel and the right side plate, and then remove the top panel.</p> |  <p>The diagram illustrates the first two steps of the procedure. In the first step, the valve cover is shown being twisted off the top of the unit. In the second step, the top panel is shown being removed from the front and right side plates. Labels 'top panel' and 'grille' are used to identify the components.</p> |
| <p data-bbox="147 1163 578 1190">2. Remove grille, front side plate and panel.</p> <p data-bbox="175 1253 686 1318">a Remove the 2 screws connecting the grille and the panel, and then remove the grille.</p> <p data-bbox="175 1610 716 1688">b Remove the 1 screw connecting the front side plate and the panel, and then remove the front side plate.</p>             |  <p>The diagram illustrates the next two steps of the procedure. In the third step, the grille is shown being removed from the front panel. In the fourth step, the front side plate is shown being removed from the front panel. Labels 'grille' and 'front side plate' are used to identify the components.</p>           |

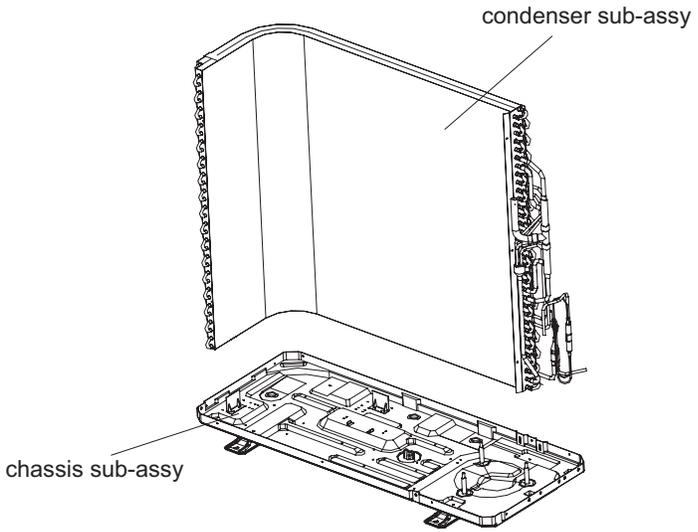
| Steps  | Procedure   |  |
|--|---|--|
| c  | <p>Remove the 5 screws connecting the panel with the chassis and the motor support, and then remove the panel.</p>  |    |
| 3. Remove right side plate and left side plate |   |  |
| a  | <p>Remove the screws connecting the right side plate with the chassis, the valve support and the electric box, and then remove the right side plate assy.</p> |   |
| b  | <p>Remove the screws connecting the left side plate and the chassis, and then remove the left side plate assy.</p>  |  |

| Steps  | Procedure   |   |
|--|---|---|
| <p data-bbox="126 258 586 285">4. Remove fan motor and axial flow blade</p> <p data-bbox="147 457 164 485">a</p> <p data-bbox="248 443 703 506">Remove the nuts fixing the blade and then remove the axial flow blade.</p> <p data-bbox="155 1098 172 1125">b</p> <p data-bbox="245 1098 691 1325">Remove the 4 tapping screws fixing the motor; disconnect the leading wire insert of the motor and then remove the motor. Remove the 2 tapping screws fixing the motor support and then pull the motor support upwards to remove it.</p> |   |  <p data-bbox="857 436 1016 464">axial flow blade</p> <p data-bbox="914 856 1141 884">fan motor fixing frame</p> <p data-bbox="979 1350 1081 1377">fan motor</p> |
| <p data-bbox="126 1451 386 1478">5. Remove electric box</p>  | <p data-bbox="245 1619 691 1766">Remove the screws fixing the electric box sub-assy; loosen the wire bundle; pull out the wiring terminals and then pull the electric box upwards to remove it.</p> |  <p data-bbox="1052 1465 1174 1493">electric box</p>   |

| Steps  | Procedure   |
|--|---|
| <p data-bbox="126 258 708 289">6.Remove soundproof sponge and 4-way valve assy</p> <p data-bbox="151 401 764 443">a Since the piping ports on the soundproof sponge are torn easily, remove the soundproof sponge carefully</p> <p data-bbox="151 884 716 995">b Recover the refrigerant completely;unsolder the pipelines connecting the compressor and the condenser assembly, and then remove the 4-way valve assembly.</p> |  <p>The diagrams illustrate the removal process in three stages:</p> <ul style="list-style-type: none"> <li><b>Top diagram:</b> Shows the soundproof sponge being removed from the unit. A callout labeled "soundproof sponge" points to the sponge and its two rectangular panels.</li> <li><b>Middle diagram:</b> Shows the 4-way valve assembly being removed. A callout labeled "4-way valve assy" points to the valve and its associated piping.</li> <li><b>Bottom diagram:</b> Shows a connection pipe being removed. A callout labeled "Connection Pipe" points to the U-shaped pipe.</li> </ul> |
| <p data-bbox="126 1419 410 1451">7. Remove Isolation sheet</p>   | <p data-bbox="220 1577 732 1629">Remove the 3 screws fixing the isolation sheet and then remove the Isolation sheet.</p>  <p>The diagram shows the isolation sheet being removed from the unit. A callout labeled "Isolation sheet" points to the sheet and the screws it is attached to.</p>   |

| Steps                                     | Procedure   |  |
|---|---|--|
| 8. Remove Cut off Valve and Valve Support |   |  |
|   | <p>Remove the 2 bolts fixing the valve subassemblies. Unsolder the welding joint connecting the gas valve and the return air pipe. Remove the gas valve. (Note: When unsoldering the soldering joint, wrap the gas valve with wet cloth completely to avoid damage to the valve caused by high temperature.) Unsolder the welding joint connecting the liquid valve and the connecting pipe. Remove the liquid valve. Remove screws fixing valve support and then remove the valve support; remove the screw fixing the condenser and then pull the condenser upwards to remove it.</p> |    |
| 9. Remove compressor                      |   |  |
|   | <p>Remove the 3 foot nuts fixing the compressor and then remove the compressor.</p>   |   |
| 10. Remove support                        |   |  |
| a   | <p>Remove the screws connecting the support and condenser assy, and then remove the support.</p>  |  |

| Steps                        |  |
|------------------------------|--|
| 11.Remove condenser sub-assy |  |
|                              | <p data-bbox="224 478 701 548">Remove the chassis sub-assy and condenser sub-assy.</p> |



# Appendix:

## Appendix 1: Reference Sheet of Celsius and Fahrenheit

Conversion formula for Fahrenheit degree and Celsius degree:  $T_f = T_c \times 1.8 + 32$

Set temperature

| Fahrenheit display temperature (°F) | Fahrenheit (°F) | Celsius (°C) | Fahrenheit display temperature (°F) | Fahrenheit (°F) | Celsius (°C) | Fahrenheit display temperature (°F) | Fahrenheit (°F) | Celsius (°C) |
|-------------------------------------|-----------------|--------------|-------------------------------------|-----------------|--------------|-------------------------------------|-----------------|--------------|
| 61                                  | 60.8            | 16           | 69/70                               | 69.8            | 21           | 78/79                               | 78.8            | 26           |
| 62/63                               | 62.6            | 17           | 71/72                               | 71.6            | 22           | 80/81                               | 80.6            | 27           |
| 64/65                               | 64.4            | 18           | 73/74                               | 73.4            | 23           | 82/83                               | 82.4            | 28           |
| 66/67                               | 66.2            | 19           | 75/76                               | 75.2            | 24           | 84/85                               | 84.2            | 29           |
| 68                                  | 68              | 20           | 77                                  | 77              | 25           | 86                                  | 86              | 30           |

Ambient temperature

| Fahrenheit display temperature (°F) | Fahrenheit (°F) | Celsius (°C) | Fahrenheit display temperature (°F) | Fahrenheit (°F) | Celsius (°C) | Fahrenheit display temperature (°F) | Fahrenheit (°F) | Celsius (°C) |
|-------------------------------------|-----------------|--------------|-------------------------------------|-----------------|--------------|-------------------------------------|-----------------|--------------|
| 32/33                               | 32              | 0            | 55/56                               | 55.4            | 13           | 79/80                               | 78.8            | 26           |
| 34/35                               | 33.8            | 1            | 57/58                               | 57.2            | 14           | 81                                  | 80.6            | 27           |
| 36                                  | 35.6            | 2            | 59/60                               | 59              | 15           | 82/83                               | 82.4            | 28           |
| 37/38                               | 37.4            | 3            | 61/62                               | 60.8            | 16           | 84/85                               | 84.2            | 29           |
| 39/40                               | 39.2            | 4            | 63                                  | 62.6            | 17           | 86/87                               | 86              | 30           |
| 41/42                               | 41              | 5            | 64/65                               | 64.4            | 18           | 88/89                               | 87.8            | 31           |
| 43/44                               | 42.8            | 6            | 66/67                               | 66.2            | 19           | 90                                  | 89.6            | 32           |
| 45                                  | 44.6            | 7            | 68/69                               | 68              | 20           | 91/92                               | 91.4            | 33           |
| 46/47                               | 46.4            | 8            | 70/71                               | 69.8            | 21           | 93/94                               | 93.2            | 34           |
| 48/49                               | 48.2            | 9            | 72                                  | 71.6            | 22           | 95/96                               | 95              | 35           |
| 50/51                               | 50              | 10           | 73/74                               | 73.4            | 23           | 97/98                               | 96.8            | 36           |
| 52/53                               | 51.8            | 11           | 75/76                               | 75.2            | 24           | 99                                  | 98.6            | 37           |
| 54                                  | 53.6            | 12           | 77/78                               | 77              | 25           |                                     |                 |              |

## Appendix 2: Configuration of Connection Pipe

- Standard length of connection pipe
  - 16.4ft, 24.6ft, 26.2ft.
- Min. length of connection pipe is 10ft.
- Max. length of connection pipe and max. high difference.
- The additional refrigerant oil and refrigerant charging required after lengthening connection pipe
  - After the length of connection pipe is prolonged for 32.8ft at the basis of standard length, you should add 5ml of refrigerant oil for each additional 16.4ft of connection pipe.
  - The calculation method of additional refrigerant charging amount (on the basis of liquid pipe):
    - Basing on the length of standard pipe, add refrigerant according to the requirement as shown in the table. The additional refrigerant charging amount per meter is different according to the diameter of liquid pipe. See the following sheet.
    - Additional refrigerant charging amount = prolonged length of liquid pipe X additional refrigerant charging amount per meter

| Additional refrigerant charging amount for R22, R407C, R410A and R134a |                |                       |                             |
|--|----------------|-----------------------|-----------------------------|
| Diameter of connection pipe  |                | Outdoor unit throttle |                             |
| Liquid pipe(inch)  | Gas pipe(inch) | Cooling only(oz/ft.)  | Cooling and heating(oz/ft.) |
| Φ0.23  | Φ0.37 or Φ0.47 | 0.53                  | 0.71                        |
| Φ0.23 or Φ0.37   | Φ0.63 or Φ0.75 | 0.53                  | 0.71                        |
| Φ0.47  | Φ0.75 or Φ0.84 | 1.06                  | 4.23                        |
| Φ0.63  | Φ1.0 or Φ1.25  | 2.12                  | 4.23                        |
| Φ0.75  | /              | 8.82                  | 8.82                        |
| Φ0.84  | /              | 12.34                 | 12.34                       |

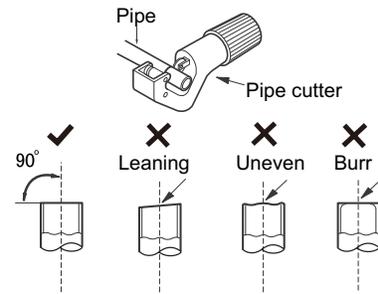
## Appendix 3: Pipe Flaring Method

**⚠ Note:**

**Improper pipe flaring is the main cause of refrigerant leakage. Please expand the pipe according to the following steps:**

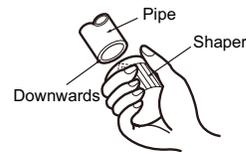
**A: Cut the pipe**

- Confirm the pipe length according to the distance of indoor unit and outdoor unit.
- Cut the required pipe with pipe cutter.



**B: Remove the burrs**

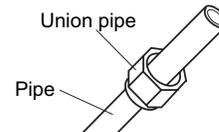
- Remove the burrs with shaper and prevent the burrs from getting into the pipe.



**C: Put on suitable insulating pipe**

**D: Put on the union nut**

- Remove the union nut on the indoor connection pipe and outdoor valve; install the union nut on the pipe.



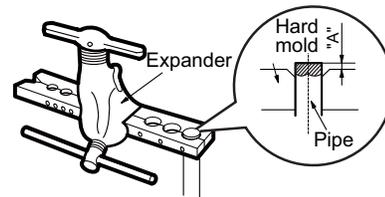
**E: Flare the port**

- Flare the port with expander.

**⚠ Note:**

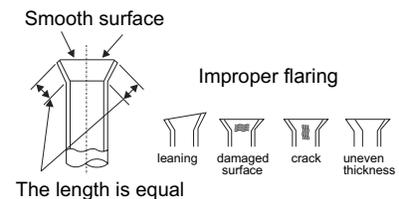
- "A" is different according to the diameter, please refer to the sheet below:

| Outer diameter(inch) | A(inch) |      |
|----------------------|---------|------|
|                      | Max     | Min  |
| Φ1/4                 | 2/39    | 1/36 |
| Φ3/8                 | 1/16    | 1/51 |
| Φ1/2                 | 1/14    | 1/51 |
| Φ5/8                 | 5/53    | 2/23 |



**F: Inspection**

- Check the quality of flaring port. If there is any blemish, flare the port again according to the steps above.



## Appendix 4: List of Resistance for Temperature Sensor

Resistance Table of Ambient Temperature Sensor for Indoor and Outdoor (15K)

| Temp.(°F) | Resistance(kΩ) | Temp.(°F) | Resistance(kΩ) | Temp.(°F) | Resistance(kΩ) | Temp.(°F) | Resistance(kΩ) |
|-----------|----------------|-----------|----------------|-----------|----------------|-----------|----------------|
| -2.2      | 138.1          | 68        | 18.75          | 138.2     | 3.848          | 208.4     | 1.071          |
| -0.4      | 128.6          | 69.8      | 17.93          | 140       | 3.711          | 210.2     | 1.039          |
| 1.4       | 121.6          | 71.6      | 17.14          | 141.8     | 3.579          | 212       | 1.009          |
| 3.2       | 115            | 73.4      | 16.39          | 143.6     | 3.454          | 213.8     | 0.98           |
| 5         | 108.7          | 75.2      | 15.68          | 145.4     | 3.333          | 215.6     | 0.952          |
| 6.8       | 102.9          | 77        | 15             | 147.2     | 3.217          | 217.4     | 0.925          |
| 8.6       | 97.4           | 78.8      | 14.36          | 149       | 3.105          | 219.2     | 0.898          |
| 10.4      | 92.22          | 80.6      | 13.74          | 150.8     | 2.998          | 221       | 0.873          |
| 12.2      | 87.35          | 82.4      | 13.16          | 152.6     | 2.896          | 222.8     | 0.848          |
| 14        | 82.75          | 84.2      | 12.6           | 154.4     | 2.797          | 224.6     | 0.825          |
| 15.8      | 78.43          | 86        | 12.07          | 156.2     | 2.702          | 226.4     | 0.802          |
| 17.6      | 74.35          | 87.8      | 11.57          | 158       | 2.611          | 228.2     | 0.779          |
| 19.4      | 70.5           | 89.6      | 11.09          | 159.8     | 2.523          | 230       | 0.758          |
| 21.2      | 66.88          | 91.4      | 10.63          | 161.6     | 2.439          | 231.8     | 0.737          |
| 23        | 63.46          | 93.2      | 10.2           | 163.4     | 2.358          | 233.6     | 0.717          |
| 24.8      | 60.23          | 95        | 9.779          | 165.2     | 2.28           | 235.4     | 0.697          |
| 26.6      | 57.18          | 96.8      | 9.382          | 167       | 2.206          | 237.2     | 0.678          |
| 28.4      | 54.31          | 98.6      | 9.003          | 168.8     | 2.133          | 239       | 0.66           |
| 30.2      | 51.59          | 100.4     | 8.642          | 170.6     | 2.064          | 240.8     | 0.642          |
| 32        | 49.02          | 102.2     | 8.297          | 172.4     | 1.997          | 242.6     | 0.625          |
| 33.8      | 46.6           | 104       | 7.967          | 174.2     | 1.933          | 244.4     | 0.608          |
| 35.6      | 44.31          | 105.8     | 7.653          | 176       | 1.871          | 246.2     | 0.592          |
| 37.4      | 42.14          | 107.6     | 7.352          | 177.8     | 1.811          | 248       | 0.577          |
| 39.2      | 40.09          | 109.4     | 7.065          | 179.6     | 1.754          | 249.8     | 0.561          |
| 41        | 38.15          | 111.2     | 6.791          | 181.4     | 1.699          | 251.6     | 0.547          |
| 42.8      | 36.32          | 113       | 6.529          | 183.2     | 1.645          | 253.4     | 0.532          |
| 44.6      | 34.58          | 114.8     | 6.278          | 185       | 1.594          | 255.2     | 0.519          |
| 46.4      | 32.94          | 116.6     | 6.038          | 186.8     | 1.544          | 257       | 0.505          |
| 48.2      | 31.38          | 118.4     | 5.809          | 188.6     | 1.497          | 258.8     | 0.492          |
| 50        | 29.9           | 120.2     | 5.589          | 190.4     | 1.451          | 260.6     | 0.48           |
| 51.8      | 28.51          | 122       | 5.379          | 192.2     | 1.408          | 262.4     | 0.467          |
| 53.6      | 27.18          | 123.8     | 5.197          | 194       | 1.363          | 264.2     | 0.456          |
| 55.4      | 25.92          | 125.6     | 4.986          | 195.8     | 1.322          | 266       | 0.444          |
| 57.2      | 24.73          | 127.4     | 4.802          | 197.6     | 1.282          | 267.8     | 0.433          |
| 59        | 23.6           | 129.2     | 4.625          | 199.4     | 1.244          | 269.6     | 0.422          |
| 60.8      | 22.53          | 131       | 4.456          | 201.2     | 1.207          | 271.4     | 0.412          |
| 62.6      | 21.51          | 132.8     | 4.294          | 203       | 1.171          | 273.2     | 0.401          |
| 64.4      | 20.54          | 134.6     | 4.139          | 204.8     | 1.136          | 275       | 0.391          |
| 66.2      | 19.63          | 136.4     | 3.99           | 206.6     | 1.103          | 276.8     | 0.382          |

**Resistance Table of Tube Temperature Sensors for Indoor and Outdoor (20K)**

| Temp.(°F) | Resistance(kΩ) | Temp.(°F) | Resistance(kΩ) | Temp.(°F) | Resistance(kΩ) | Temp.(°F) | Resistance(kΩ) |
|-----------|----------------|-----------|----------------|-----------|----------------|-----------|----------------|
| -2.2      | 181.4          | 68        | 25.01          | 138.2     | 5.13           | 208.4     | 1.427          |
| -0.4      | 171.4          | 69.8      | 23.9           | 140       | 4.948          | 210.2     | 1.386          |
| 1.4       | 162.1          | 71.6      | 22.85          | 141.8     | 4.773          | 212       | 1.346          |
| 3.2       | 153.3          | 73.4      | 21.85          | 143.6     | 4.605          | 213.8     | 1.307          |
| 5         | 145            | 75.2      | 20.9           | 145.4     | 4.443          | 215.6     | 1.269          |
| 6.8       | 137.2          | 77        | 20             | 147.2     | 4.289          | 217.4     | 1.233          |
| 8.6       | 129.9          | 78.8      | 19.14          | 149       | 4.14           | 219.2     | 1.198          |
| 10.4      | 123            | 80.6      | 18.13          | 150.8     | 3.998          | 221       | 1.164          |
| 12.2      | 116.5          | 82.4      | 17.55          | 152.6     | 3.861          | 222.8     | 1.131          |
| 14        | 110.3          | 84.2      | 16.8           | 154.4     | 3.729          | 224.6     | 1.099          |
| 15.8      | 104.6          | 86        | 16.1           | 156.2     | 3.603          | 226.4     | 1.069          |
| 17.6      | 99.13          | 87.8      | 15.43          | 158       | 3.481          | 228.2     | 1.039          |
| 19.4      | 94             | 89.6      | 14.79          | 159.8     | 3.364          | 230       | 1.01           |
| 21.2      | 89.17          | 91.4      | 14.18          | 161.6     | 3.252          | 231.8     | 0.983          |
| 23        | 84.61          | 93.2      | 13.59          | 163.4     | 3.144          | 233.6     | 0.956          |
| 24.8      | 80.31          | 95        | 13.04          | 165.2     | 3.04           | 235.4     | 0.93           |
| 26.6      | 76.24          | 96.8      | 12.51          | 167       | 2.94           | 237.2     | 0.904          |
| 28.4      | 72.41          | 98.6      | 12             | 168.8     | 2.844          | 239       | 0.88           |
| 30.2      | 68.79          | 100.4     | 11.52          | 170.6     | 2.752          | 240.8     | 0.856          |
| 32        | 65.37          | 102.2     | 11.06          | 172.4     | 2.663          | 242.6     | 0.833          |
| 33.8      | 62.13          | 104       | 10.62          | 174.2     | 2.577          | 244.4     | 0.811          |
| 35.6      | 59.08          | 105.8     | 10.2           | 176       | 2.495          | 246.2     | 0.77           |
| 37.4      | 56.19          | 107.6     | 9.803          | 177.8     | 2.415          | 248       | 0.769          |
| 39.2      | 53.46          | 109.4     | 9.42           | 179.6     | 2.339          | 249.8     | 0.746          |
| 41        | 50.87          | 111.2     | 9.054          | 181.4     | 2.265          | 251.6     | 0.729          |
| 42.8      | 48.42          | 113       | 8.705          | 183.2     | 2.194          | 253.4     | 0.71           |
| 44.6      | 46.11          | 114.8     | 8.37           | 185       | 2.125          | 255.2     | 0.692          |
| 46.4      | 43.92          | 116.6     | 8.051          | 186.8     | 2.059          | 257       | 0.674          |
| 48.2      | 41.84          | 118.4     | 7.745          | 188.6     | 1.996          | 258.8     | 0.658          |
| 50        | 39.87          | 120.2     | 7.453          | 190.4     | 1.934          | 260.6     | 0.64           |
| 51.8      | 38.01          | 122       | 7.173          | 192.2     | 1.875          | 262.4     | 0.623          |
| 53.6      | 36.24          | 123.8     | 6.905          | 194       | 1.818          | 264.2     | 0.607          |
| 55.4      | 34.57          | 125.6     | 6.648          | 195.8     | 1.736          | 266       | 0.592          |
| 57.2      | 32.98          | 127.4     | 6.403          | 197.6     | 1.71           | 267.8     | 0.577          |
| 59        | 31.47          | 129.2     | 6.167          | 199.4     | 1.658          | 269.6     | 0.563          |
| 60.8      | 30.04          | 131       | 5.942          | 201.2     | 1.609          | 271.4     | 0.549          |
| 62.6      | 28.68          | 132.8     | 5.726          | 203       | 1.561          | 273.2     | 0.535          |
| 64.4      | 27.39          | 134.6     | 5.519          | 204.8     | 1.515          | 275       | 0.521          |
| 66.2      | 26.17          | 136.4     | 5.32           | 206.6     | 1.47           | 276.8     | 0.509          |

**Resistance Table of Discharge Temperature Sensor for Outdoor(50K)**

| Temp.(°F) | Resistance(kΩ) | Temp.(°F) | Resistance(kΩ) | Temp.(°F) | Resistance(kΩ) | Temp.(°F) | Resistance(kΩ) |
|-----------|----------------|-----------|----------------|-----------|----------------|-----------|----------------|
| -20.2     | 853.5          | 50        | 98             | 120.2     | 18.34          | 190.4     | 4.754          |
| -18.4     | 799.8          | 51.8      | 93.42          | 122       | 17.65          | 192.2     | 4.609          |
| -16.6     | 750            | 53.6      | 89.07          | 123.8     | 16.99          | 194       | 4.469          |
| -14.8     | 703.8          | 55.4      | 84.95          | 125.6     | 16.36          | 195.8     | 4.334          |
| -13       | 660.8          | 57.2      | 81.05          | 127.4     | 15.75          | 197.6     | 4.204          |
| -11.2     | 620.8          | 59        | 77.35          | 129.2     | 15.17          | 199.4     | 4.079          |
| -9.4      | 580.6          | 60.8      | 73.83          | 131       | 14.62          | 201.2     | 3.958          |
| -7.6      | 548.9          | 62.6      | 70.5           | 132.8     | 14.09          | 203       | 3.841          |
| -5.8      | 516.6          | 64.4      | 67.34          | 134.6     | 13.58          | 204.8     | 3.728          |
| -4        | 486.5          | 66.2      | 64.33          | 136.4     | 13.09          | 206.6     | 3.619          |
| -2.2      | 458.3          | 68        | 61.48          | 138.2     | 12.62          | 208.4     | 3.514          |
| -0.4      | 432            | 69.8      | 58.77          | 140       | 12.17          | 210.2     | 3.413          |
| 1.4       | 407.4          | 71.6      | 56.19          | 141.8     | 11.74          | 212       | 3.315          |
| 3.2       | 384.5          | 73.4      | 53.74          | 143.6     | 11.32          | 213.8     | 3.22           |
| 5         | 362.9          | 75.2      | 51.41          | 145.4     | 10.93          | 215.6     | 3.129          |
| 6.8       | 342.8          | 77        | 49.19          | 147.2     | 10.54          | 217.4     | 3.04           |
| 8.6       | 323.9          | 78.8      | 47.08          | 149       | 10.18          | 219.2     | 2.955          |
| 10.4      | 306.2          | 80.6      | 45.07          | 150.8     | 9.827          | 221       | 2.872          |
| 12.2      | 289.6          | 82.4      | 43.16          | 152.6     | 9.489          | 222.8     | 2.792          |
| 14        | 274            | 84.2      | 41.34          | 154.4     | 9.165          | 224.6     | 2.715          |
| 15.8      | 259.3          | 86        | 39.61          | 156.2     | 8.854          | 226.4     | 2.64           |
| 17.6      | 245.6          | 87.8      | 37.96          | 158       | 8.555          | 228.2     | 2.568          |
| 19.4      | 232.6          | 89.6      | 36.38          | 159.8     | 8.268          | 230       | 2.498          |
| 21.2      | 220.5          | 91.4      | 34.88          | 161.6     | 7.991          | 231.8     | 2.431          |
| 23        | 209            | 93.2      | 33.45          | 163.4     | 7.726          | 233.6     | 2.365          |
| 24.8      | 198.3          | 95        | 32.09          | 165.2     | 7.47           | 235.4     | 2.302          |
| 26.6      | 199.1          | 96.8      | 30.79          | 167       | 7.224          | 237.2     | 2.241          |
| 28.4      | 178.5          | 98.6      | 29.54          | 168.8     | 6.998          | 239       | 2.182          |
| 30.2      | 169.5          | 100.4     | 28.36          | 170.6     | 6.761          | 240.8     | 2.124          |
| 32        | 161            | 102.2     | 27.23          | 172.4     | 6.542          | 242.6     | 2.069          |
| 33.8      | 153            | 104       | 26.15          | 174.2     | 6.331          | 244.4     | 2.015          |
| 35.6      | 145.4          | 105.8     | 25.11          | 176       | 6.129          | 246.2     | 1.963          |
| 37.4      | 138.3          | 107.6     | 24.13          | 177.8     | 5.933          | 248       | 1.912          |
| 39.2      | 131.5          | 109.4     | 23.19          | 179.6     | 5.746          | 249.8     | 1.863          |
| 41        | 125.1          | 111.2     | 22.29          | 181.4     | 5.565          | 251.6     | 1.816          |
| 42.8      | 119.1          | 113       | 21.43          | 183.2     | 5.39           | 253.4     | 1.77           |
| 44.6      | 113.4          | 114.8     | 20.6           | 185       | 5.222          | 255.2     | 1.725          |
| 46.4      | 108            | 116.6     | 19.81          | 186.8     | 5.06           | 257       | 1.682          |
| 48.2      | 102.8          | 118.4     | 19.06          | 188.6     | 4.904          | 258.8     | 1.64           |

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Due to ongoing product improvements, specifications and dimensions are subject to change and correction without notice or incurring obligations. Determining the application and suitability for use of any product is the responsibility of the installer. Additionally, the installer is responsible for verifying dimensional data on the actual product prior to beginning any installation preparations.

Incentive and rebate programs have precise requirements as to product performance and certification. All products meet applicable regulations in effect on date of manufacture; however, certifications are not necessarily granted for the life of a product. Therefore, it is the responsibility of the applicant to determine whether a specific model qualifies for these incentive/rebate programs.

