Johnson Controls	HIGH WALL INVERTER	
Service Manual	New Released	Form: MHKFEEBXFORX-20210419

High Wall Inverter 50Hz
R-32

JHKF09/12/18/24ZEEBXFORX

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Part I : Technical Information

1. Summary

1-1 Appearance

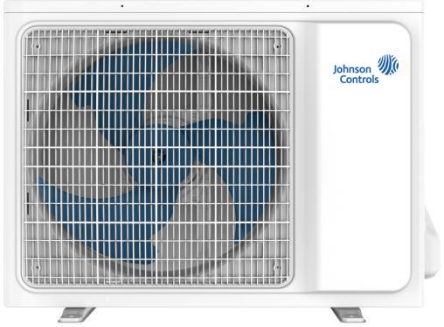
- **Indoor Unit**

- **Outdoor Unit**

9/12K

18K

24K



1-2 Model List

NO.	MODEL
1	JHKF09ZEEBXFORX
2	JHKF12ZEEBXFORX
3	JHKF18ZEEBXFORX
4	JHKF24ZEEBXFORX

2. Outline Dimension Diagram

The following data is for reference only and the actual size may vary.

- **Indoor Unit**

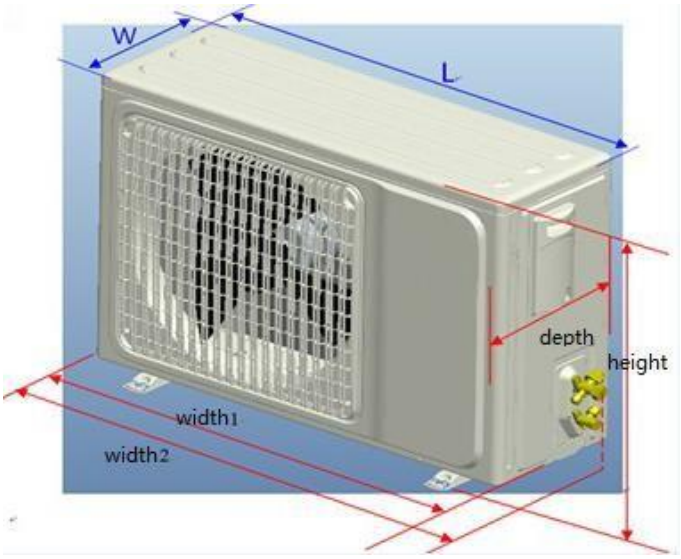
Cooling capacity	Boundary Dimension W×H×D (mm)	Package Size W×H×D (mm)
09K	750× 285× 200	820×347×277
12K	750× 285× 200	820×347×277
18K	900×310×225	970×382×302
24K	1082×330×233	1155× 397×312

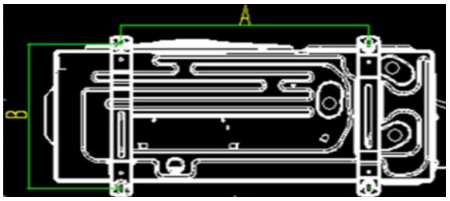
➢ **Outdoor Unit**

Platform	Boundary Dimension W1(W2)×H×D(mm)	Base footing center size A×B(mm)	Package Size W×H×D(mm)
1.3P	750× 285×200	540×280	850×620×370
1.8P	900× 310× 225	545×315	920×620×400
2.3P	945× 725× 435	630×350	1082× 330× 233

Note:

1. The main body size of the front shape after normal installation: width ×height × depth (mm). An example of the dimension measurement is shown in the figure.
   a) Width direction:
   Width 1: Not include the size of the stop valve.
   Width 2: Include the size of the stop valve.
   b) Height direction: including the height of the mounting foot;
   c) Depth direction: not include the size of mounting foot but include the size of the large-area parts such as panel grille
2. Base footing center size A ×B.

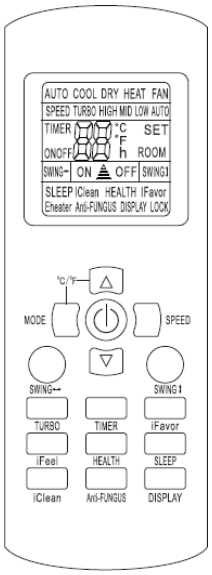




3. Function and Control

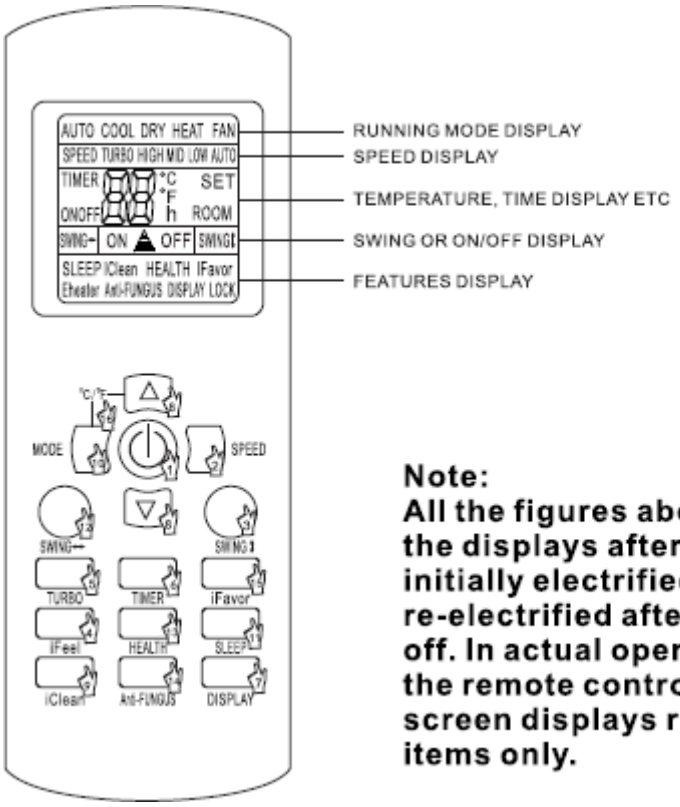
3-1 P-Style

1) Remote Controller Introductions



- Read this "instructions" carefully so that you can use the air-conditioner safely and correctly.
- Take good care of the "instructions" so that it can be referred to at any time.

➢ Buttons description



Note:
All the figures above are the displays after being initially electrified or re-electrified after power off. In actual operations, the remote controller screen displays related items only.

The cooling only units don't have the function of heating or electric heating. When the remote controller turns to such function buttons the units wi1l not result such effect.

*Please don't turn the remote controller to such buttons.

Note: The picture is general remote controller contains almost all of the function buttons. They may be slightly different from material abject (depend on model).

1. "ON/OFF" button

You can start or stop the air-conditioner by pressing this button.

2. "SPEED" button

You can select fan speed as the following:

→ Low → Mid → High → Auto ┐

3. "SWING" button

Press this button, the vertical wind direction vanes can rotate automatically, when you have the desired horizontal wind direction, press it again, the vertical wind direction vanes will be stopped at the situation of your choice.

4. “iFeel” button

When it displays "iFeel" button:

Press this button can be used to set the feeling function. The LCD shows the actual room temperature when the function set and it shows the setting temperature when the function cancelled. This function is invalid when the appliance at the Fan mode.

5. “TURBO” button

Only under the state of cooling or heating mode, press this button, the fan speed is adjusted to strong auto-maticlly and the LCD displays “TURBO” the “TURBO” function is started to reach the highest cooling or heating.

6. “TIMER” button

Setting the "ON" timer time:

a. When remote controller is at off state, press "TIMER" button the LCD displays ”TIMER ON" and the timer time ,the range of setting time is O.5h to 24h.

b. You can press the “△” or “▽ ” button to adjust the timer time, each touch will be set time to increase or reduce O.5h before 10 hours ago, after ten hours will be set time to increase or reduce 1h per pressing to enables your required timer.

c. Press “TIMER” button again, to set the timer on function.

d. You can set another function to insure the suitable state after air conditioner turn on (including mode temperature swing fan speed and etc). The LCD will displays all your setting and keep it when the timer reach to the set time, the air conditioner will be working according to your set automatically.

Setting the “OFF” timer time:

a. When remote controller is at on state, press “TIMER” button the LCD displays “TIMER OFF” and the timer time, the range of setting time is O.5h to 24h.

b. You can press the“△ ”or “▽ ” button to adjust the timer time each touch will be set time to increase or reduce O.5h before 10 hours ago, after ten hours will be set time to increase or reduce 1h per pressing, to enable your required timer.

c. Press "TIMER" button again, to set the timer off function.

7. “DISPLAY” button

You can let the LCD display working or not by pressing this button.

8. “△” or “▽” button

Press the “△”or “ ▽ ” button, you can set the temperature range from 16℃ to 32℃, display will change when you touch the button.

9. "iClean" button

a. When remote controller is at the off state, press "iClean" button, the wind guiding bars turn to initial positions for cooling, the A/C runs "iClean" function with max duration 35mins.The purpose of this function is to clean dust on evaporator and dry the inside water of evaporator and to prevent the evaporator going moldy due to water deposition and boasting strange smell.

b. After setting "iClean" function, press "iClean" button again to cancel "iClean" function or press "ON/OFF" button to cancel "iClean" function and start A/C.
c. The clean function will be stop working after 35 minutes running working without any operation.

Note: "iClean" function can be set in parallel with "time start" function; in this case "time start" function will be executed after "iClean" function.

10. "MODE" button

Which enables you to select different operation mode after each pressing, the operation mode will be changed. It shows in the following display.

AUTO →COOL→ DRY→ HEAT →FAN→ AUTO

Remark: cold wind type has no heating function.

11. "SLEEP" button

1. Press the "SLEEP -button to enter SLEEP mode.
2. Then in COOL or HEAT mode, the set temperature will be automatically controlled based on sleeping time.
3. The unit will automatically exit SLEEP function when the sleeping time is up.

Remark: press the MODE or ON/OFF button the remote controller clears sleeping mode away.

12. "SWING ⁼ " button

Press this button, the horizontal wind direction vanes can swing automatically when you have the desired vertical wind direction press it again the horizontal wind direction vanes will be stopped at the situation of your choice.

13. "HEALTH" button

Press this button, you can turn on or off the health function.

14. "Anti-FUNGUS" button

This A/C has special dry and anti-mold function which has "yes" or "no" two selections. This function is controlled by the remote controller under cooling dry and auto (cooling and dry) modes, the horizontal wind guiding bars are at the initial position for cooling. The A/C runs under heating mode (the cooling only A/C only runs under fan mode), he internal fan runs for three minutes with weak wind before stop. The purpose of this function is to dry the inside of the evaporator and to prevent the evaporator from going mouldy due to water deposition and thus dispersing strange smell.

Note:

1. This function has not been set in the factory. You may freely set and cancel this function. The setting method is: under "off" status of the A/C and the remote controller point the remote controller toward the A1C and continuously press "Anti-FUNGUS" pushbutton for one time the buzzer keep beeping five times again after five times beep indicating that this function is ready. In case this function has been set, unless the whole A1C is powered off or the function is manually cancelled, the A1C then has this function as default;

2. To cancel the function: 1.Power off the whole A/C; 2. Under "off" status of the A/C and the remote controller point the remote controller toward the A/C, and

continuously press “Anti-FUNGUS” pushbutton for one time , the buzzer keep beeping three times again after five times beep indicating that this function has been cancelled;

3. When this function is on, it is suggested not to restart the A/C before it is completely stop;

4. This function will not run in case of time stop or sleep stop.

15. “iFavor” button

The button is a shortcut, users could reserve the data of mode, wind speed, set temperature, swing and when pressing on it, it could operate in the mode users set before. Method:1.turn on the air conditioner make adjustment to the ideal mode you wanted.2.keep pressing the shortcut button for three seconds till the display screen give the signal that represents the shortcut button and glitter for three times then reserve the operation mode in the remote controller it's done. To take place of the previous operation mode just do it as shown above**.**

16. "℃/℉" button

The temperature is displayed by default in Celsius. To set the temperature display to Fahrenheit, Press "△" and “MODE" buttons at the same time for at least 3 seconds whether the remote controller is on or off .

Press “△” and "MODE" buttons at the same time again for at least 3 seconds to restore the temperature display to Celsius.

Note: Temperature display in Fahrenheit is not available for some models. When temperature is displayed in Fahrenheit on the remote controller, it might be in Celsius on the unit, the function and operation of which will not be affected.

These combined buttons are for remote controllers with ℃/℉ switching function only if there is no " " symbol on your remote controller, then switching function is not available.

2) Introduction for mode settings

★Fix batteries

1. Slide open the cover according the direction indicated by arrowhead.
2.Put into two brand new batteries (7#)position the batteries to right electric poles (+&-).
3. Put back the cover.

★Automatic operation mode

1. Press the ON/OFF button, the air-conditioner starts to operate.
2. Press the MODE button, select the automatic operation mode.
3. Press the SPEED button, you can select fan speed.

You can select fan speed from LOW, MID, HIGH, AUTO.

4. Press the button again, the air-conditioner stops.

★Cooling/Heating operation mode

(Cold wind type has no heating function)

1. Press the ON/OFF button, the air-conditioner starts to operate.
2. Press the MODE button, select the Cooling or Heating operation mode.
3. Press the "△" or "▽",set the temperature, temperature can be 5et at 1"C difference range from 16-32℃.
4. Press the SPEED button, you can select fan speed. You can select fan speed from LOW, MID, HIGH, AUTO.
5. Press the button again, the air-conditioner stops.

Note:

This manual introduces function for all of the remote control , maybe you press one button without any reaction, well, the air-conditioner you bought hasn't this function.

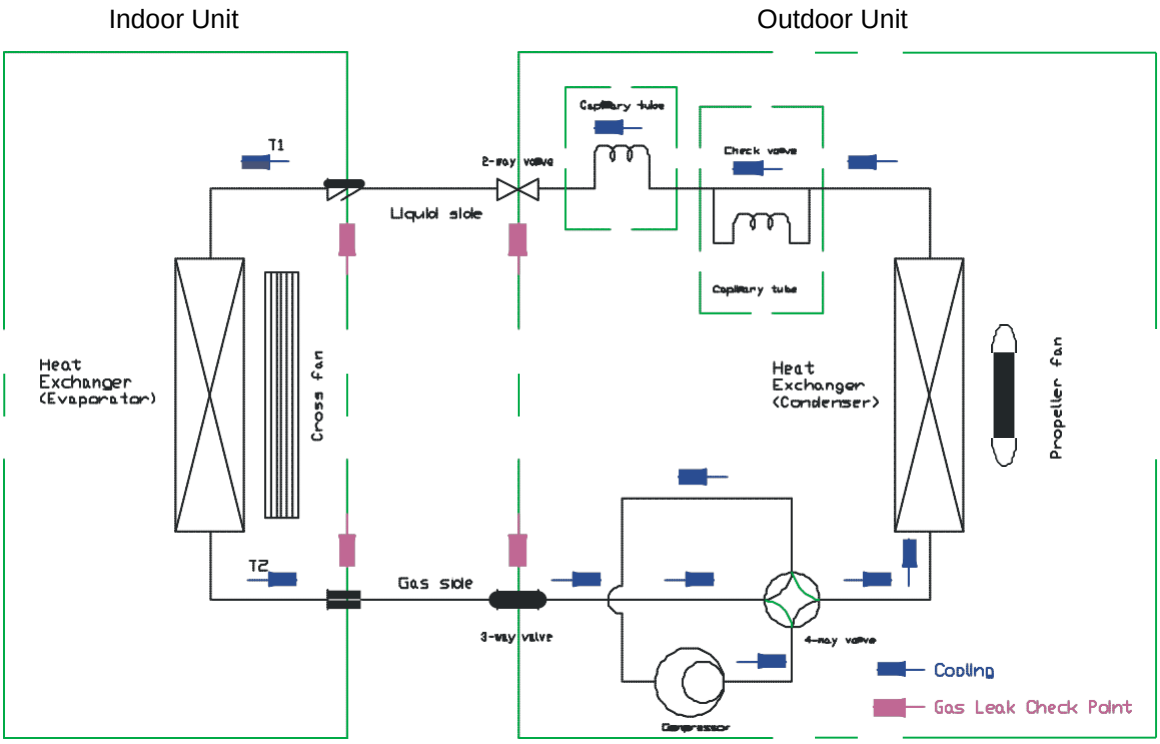
3) Attention

1. Aim the remote controller towards the receiver on the air-conditioner.
2. The remote controller should be within 8 meters away from the receiver.
3. No obstacles between the remote controller and receiver.
4.00 not drop or throw the remote controller.
5.00 not put the remote controller under the forceful sunrays or heating facilities and other heating sources.
6. Use two 7# batteries do not use the electric batteries.
7. Take the batteries out of remote controller before stop its using for long.
8. When the noise of transmitting signal can't be heard indoor unit or the transmission symbol on the display screen doesn't flare, batteries need be replaced.
9. If reset phenomenon occurs on pressing the button of the remote controller the electric quantity is deficient and new batteries need to be substituted.
10. The waste battery should be disposed properly.

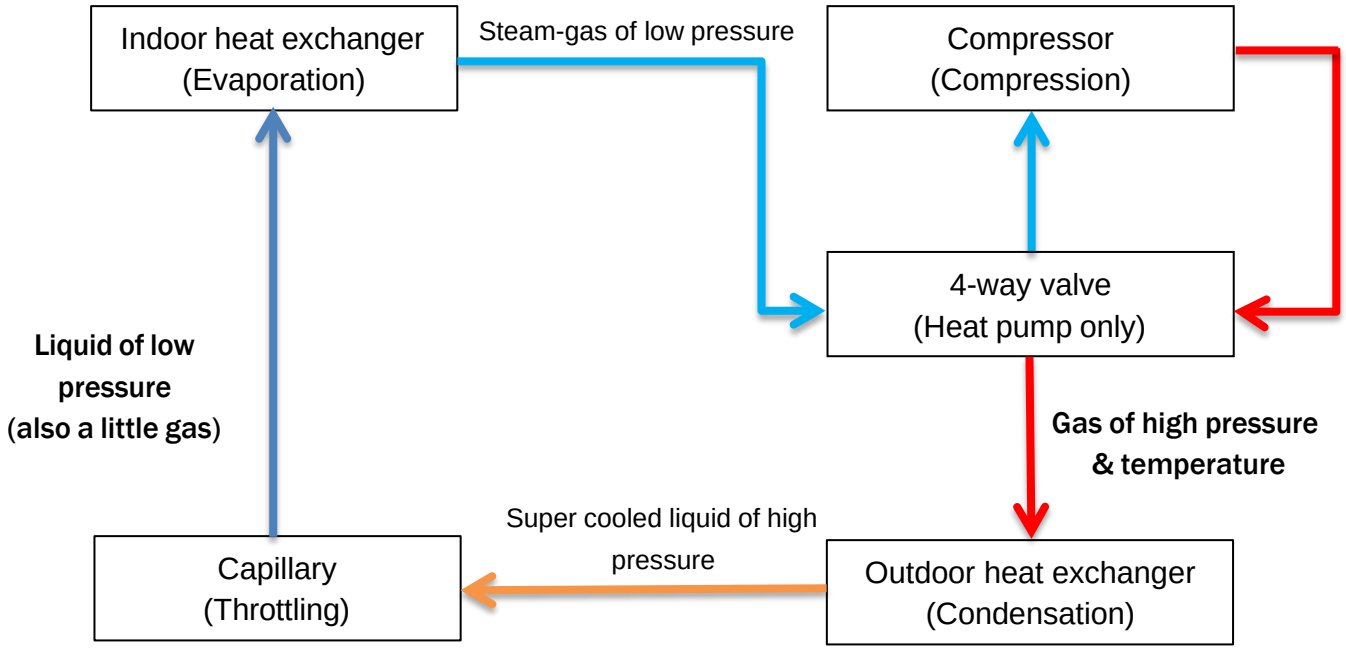
4. Refrigerant System Diagram

4-1 Cooling & Heating

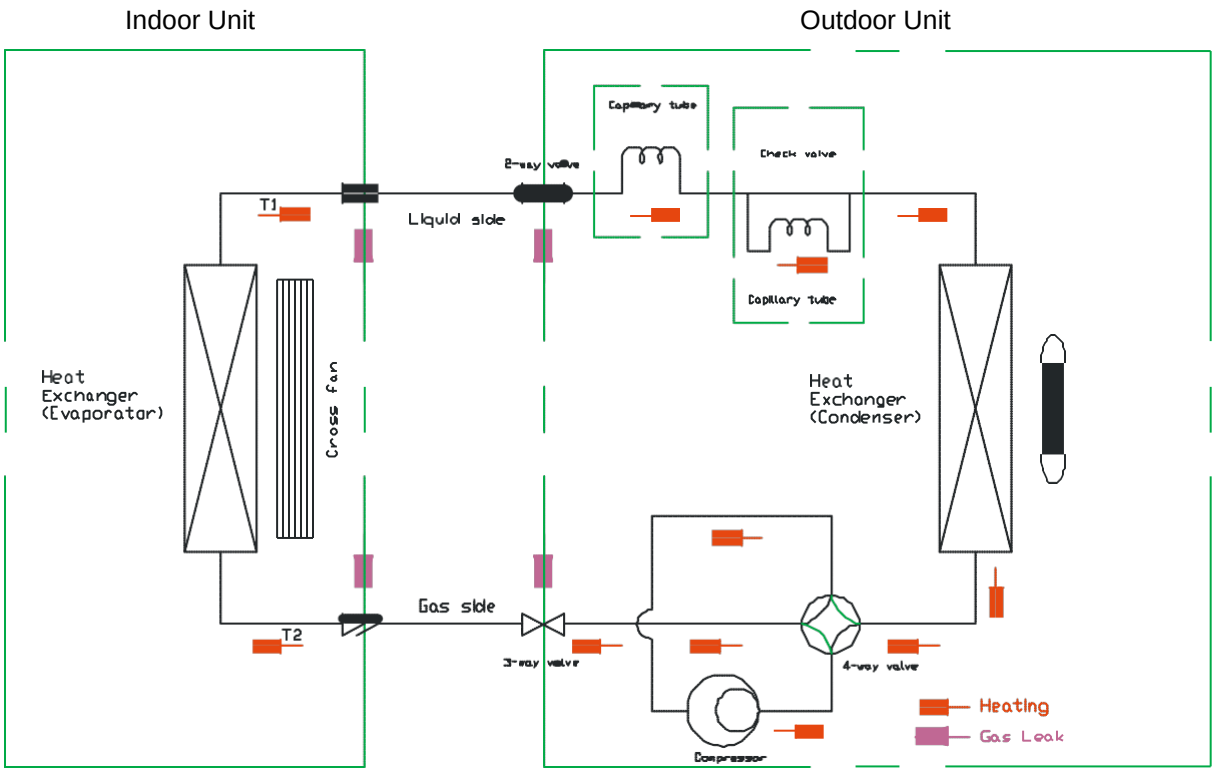
➢ Cooling Mode



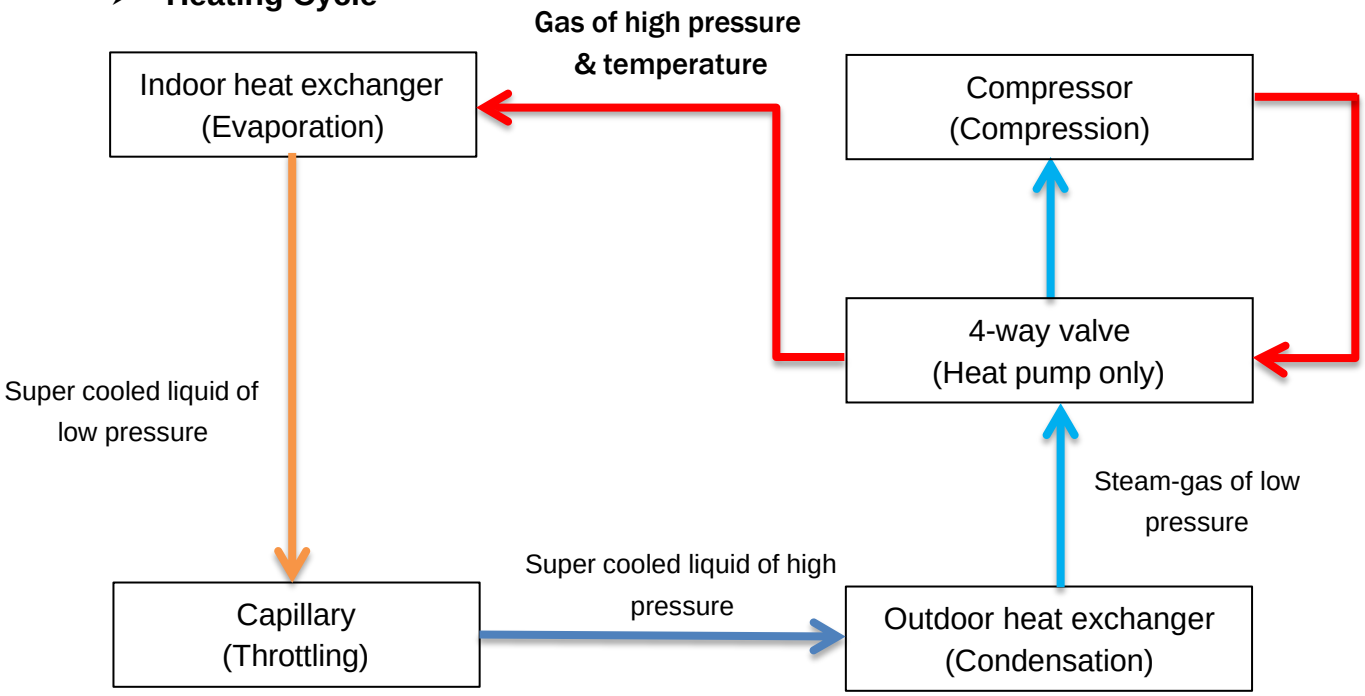
➢ Cooling Cycle



➢ Heating Mode



➢ Heating Cycle



Part II : Installation and Maintenance

5. Main Tools for Installation and Maintenance

Screwdriver , Wire stripper	Tapeline , Spirit level	Allen wrench , Wrench
		
Hammer , Electric hammer	**Water drill punch , Drill**	**Forming Drill**
		
Cutting Knife	**Belling Expander**	**Thermometer , Electro Probe**
		
Pressure Gage	**Pliers , Clip-on Ammeter**	**Vacuum Pump**
		
Soldering Set	**Refrigerant**	**Safety Belt , Safety Rope**
		

6. Installation

6-1 Notes for Installation

- **Important Notices**
- Before installation, please contact with local authorized maintenance center, if unit is not installed by the authorized maintenance center, the malfunction may not solved, due to discommodious contact.
- The air conditioner must be installed by professionals according to the national wiring rules and this manual.
- To move and install air conditioner to another place, please contact our local special service center.
- **Requirements For Installation Position**
- Avoid places of inflammable or explosive gas leakage or where there are strongly aggressive gases.
- Avoid places subject to strong artificial electric/magnetic fields.
- Avoid places subject to noise and resonance.
- Avoid severe natural conditions (e.g. heavy lampblack, strong sandy wind, direct sunshine or high temperature heat sources).
- Avoid places within the reach of children.
- Shorten the connection between the indoor and outdoor units.
- Select where it is easy to perform service and repair and where the ventilation good.
- The outdoor unit shall not be installed in any way that could occupy an aisle, stairway, exit, fire escape, catwalk or any other public area.
- The outdoor unit shall be installed as far as possible from the doors and windows of the neighbors as well as the green plants.
- **Requirements for operations at raised height**
- When carrying out installation at 2m or higher above the base level, safety belts must be worn and ropes of sufficient strength be securely fasten to the outdoor unit, to prevent falling that could cause personal injury or death as well as property loss.
- **Requirements of the mounting structure**
- The mounting rack must meet the relevant national or industrial standards in terms of strength with welding and connection areas rustproofed.
- The mounting rack and its load carry surface shall be able to withstand 4 times or above the weight of the unit, or 200kg, whichever is heavier.
- The mounting rack of the outdoor unit shall be fastened with expansion bolt.
- Ensure the secure installation regardless of what type of wall on which it is installed, to prevent potential dropping that could hurt people.
- **Electrical Safety Requirements**
- Be sure to use the rated voltage and air conditioners dedicated circuit for the power supply, and the power cord diameter must meet the national requirements.
- Be sure to use the rated voltage and air conditioners dedicated
- When the maximum current of air conditioner is ≥16A, it must use the air switch or leakage protection switch equipped with protection devices.
- The normal operating range is 90%-110% of the local rated voltage.
- The minimum clearance between the air conditioner and the combustibles is 1.5

m.

- The power cable enables communication between the indoor and outdoor units. You must first choose the right cable size before preparing it for connection.

Grounding Requirements

- The air conditioner is the type I electrical appliance and must ensure a reliable grounding.
- Do not connect the grounding wire to a gas pipe, water pipe,lightning rod, telephone line, or a circuit poorly grounded to the earth.
- The grounding wire is specially designed and shall not be used for other purpose, nor shall it be fastened with a common tapping screw.

Others

- The connection method of the air conditioner and the power cord and the interconnection method of each independent element shall be subject to the wiring diagram affixed to the machine.
- The model and rating value of the fuse shall be subject to the silkscreen on corresponding controller or fuse sleeve.

6-2 Installation of Indoor Unit

➢ **Installation Parts-checking**

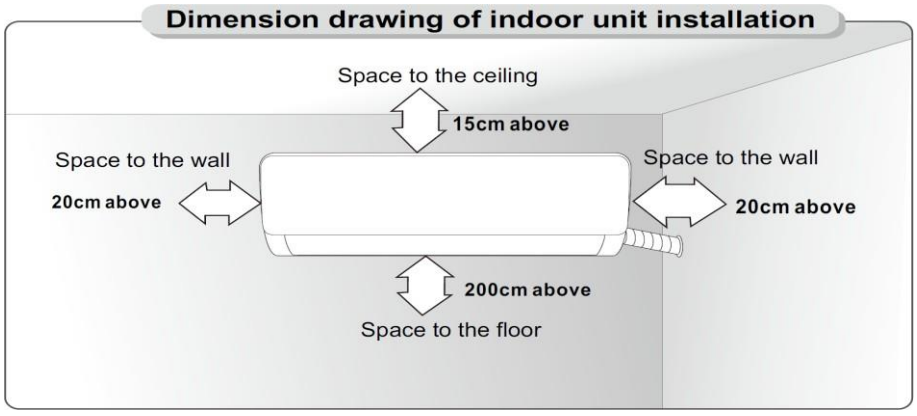
Packing list of the indoor unit

NO.	Name	Quantity	Unit
1	Indoor Unit	1	Set
2	Remote Controller	1	PC
3	Batteries(7#)	2	PC
4	Instructions	1	Set
5	Drain pipe	1	PC

NOTE:

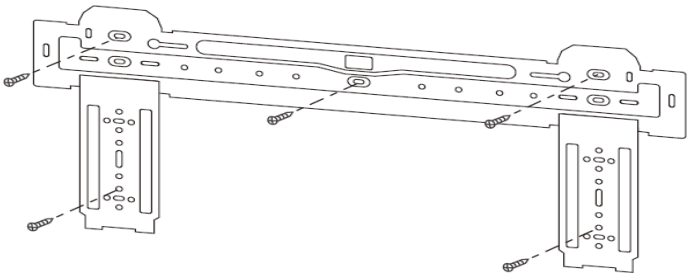
※ All accessories shall be subject to actual packaging material, and if there is any difference, please understand.

➢ **Selection of Installation location**



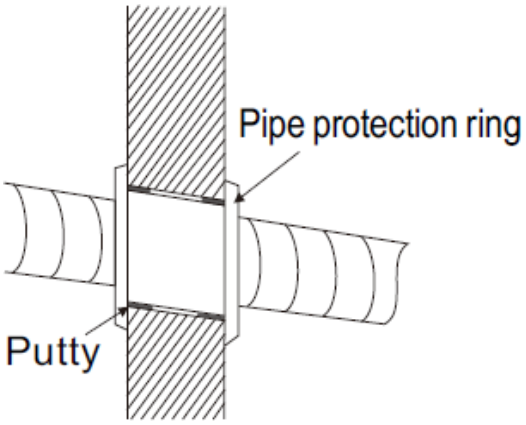
➢ **Mounting plate**

1. The wall for installation of the indoor unit shall be hard and firm, so as to prevent vibration.
2. Use the "+" type screw to fasten the peg board, horizontally mount the peg board on the wall, and ensure the lateral horizontal and longitudinal vertical.
3. Pull the peg board by hand after the installation, to confirm whether it is solid.



- **Wall-through Hole**

1. Make a hole with an electric hammer or a water drill at the predetermined position on the wall for piping, which shall slant outwardly by 5°-10°.
2. To protect the piping and the cables from being damaged running through the wall, and from the rodents that may inhabit in the hollow wall, a pipe protecting ring shall be installed and sealed with putty.



Note: Usually, the wall hole is Φ60mm~ Φ80mm. Avoid pre-buried power wire and hard wall when making the hole.

- **Route of Pipeline**

1. Depending on the position of the unit, the piping may be routed sideway from the left or the right (Fig 1), or vertically from the back(Fig 2)(depending on the pipe length of the indoor unit). In the case of sideway routing, cut off the outlet cutting stock of the opposite side.
2. The power cord may be routed separately from the piping. Cut off the outlet cutting stock and then run the power cord through the hole, keeping the remaining part as a protection from rodents.

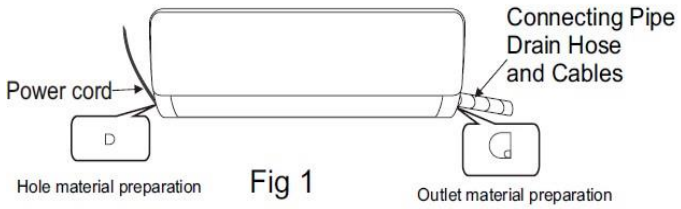


Fig 1

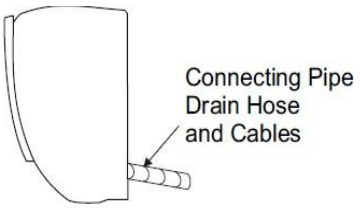


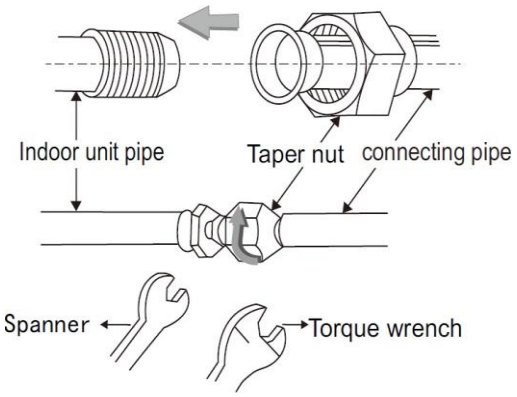
Fig 2

➢ Drain pipe connection

1. Remove the mountings and pull the indoor unit pipe out of the housing.
2. Connect the connecting pipe to the indoor unit:
Aim at the pipe center, tighten the Taper nut with fingers, and then tighten the T nut with a torque wrench, and the direction
is shown in diagram on the right. The torque
used is shown in the following table.

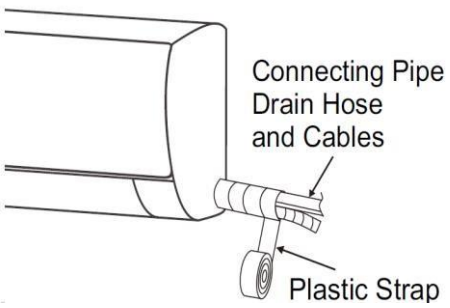
Tightening torque table

The size of pipe(mm)	Torque(N·m)
Φ6/Φ6.35	15 ~ 25
Φ9 /Φ9.5 2	35 ~ 40
Φ12/Φ12.7	45 ~ 60
Φ15.88	73 ~ 78
Φ19.05	75 ~ 80



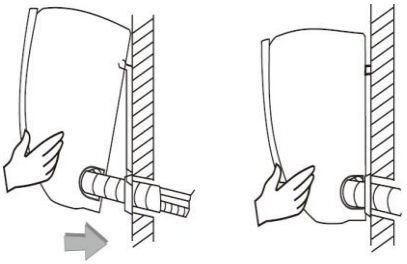
➢ Wrap the Piping

1. Use the insulation sleeve to wrap the joint part the indoor unit and the connection pipe, and then use insulating material to pack and seal insulation pipe, to prevent generation of condensate water on the joint part.
2. Connect the water outlet with drain pipes, and make the connection pipe, cables, and the drain hose straight.
3. Use plastic cable ties to wrap the connecting pipes, cables and drain hose. Run the pipe sloping downward.



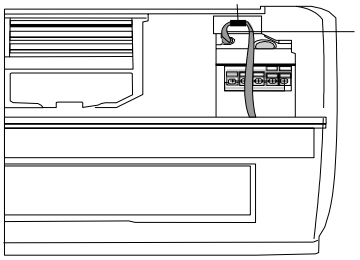
➢ Fixing the indoor unit

1. Hang the indoor unit on the peg board, and move the unit from left to right to ensure that the hook is properly positioned in the peg board.
2. Push toward the lower left side and the upper right side of the unit toward the peg board, until the hook is embedded in the slot and makes a "click" sound.



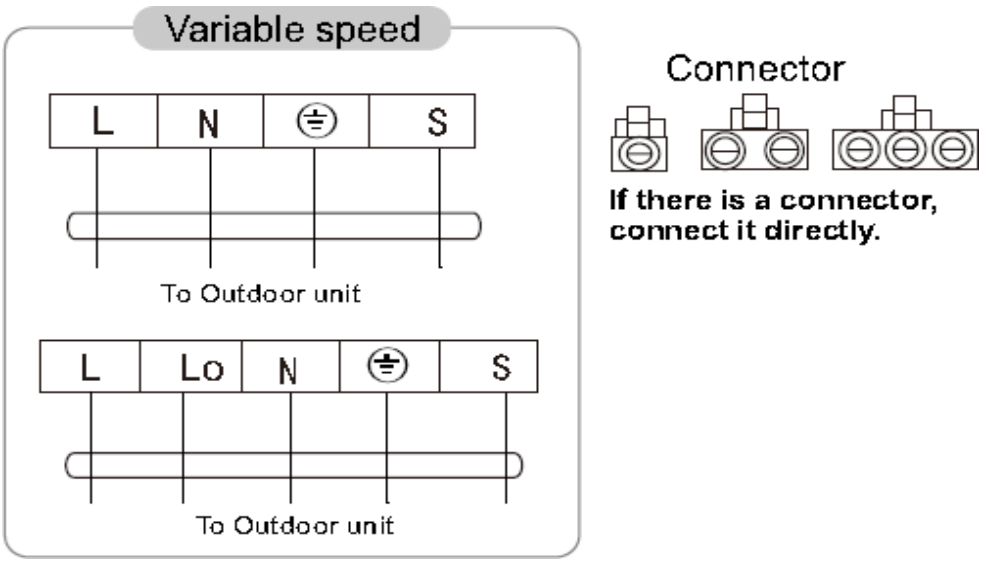
➢ Electric Connection Requirement

● Loosen the screws and remove from the unit.
● Connect the cables respectively to the corresponding terminals of the terminal board of the indoor unit (see the



wiring diagram), and if there are signals connected to the plug, just conduct butt joint.
●Ground wire: Remove the grounding screw out of the electric bracket, cover the grounding wire end onto the grounding screw and screw it into the grounding hole.
● Fix the cable reliably with fasteners (Pressing board).
● Put the E-parts cover back in its original place and fasten it with screws.

Wiring Diagram



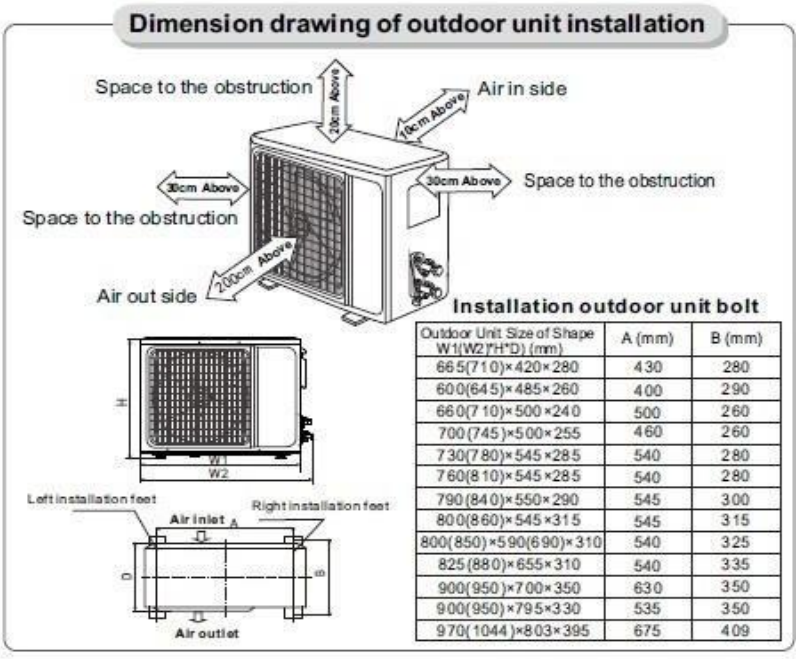
NOTE:
※ This manual usually includes the wiring mode for the different kind of A/C. We cannot exclude the possibility that some special type of wiring diagrams are not included.
※ The diagram are for reference only. If the entity is difference with this wiring diagram, please refer to the detailed wiring diagram adhered on the unit which you purchased.

6-3 Installation of outdoor Unit

➢ **Packing list of the outdoor unit**

NO.	Name	Quantity	Unit
1	Outdoor Unit	1	Set
2	Connecting pipe	2	PC
3	Plastic Strap	1	ROLL
4	Pipe Protection Ring	1	Set
5	Luting (putty)	1	PACKET

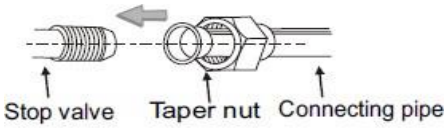
➢ **Selection of Installation location**



Installation outdoor unit bolt

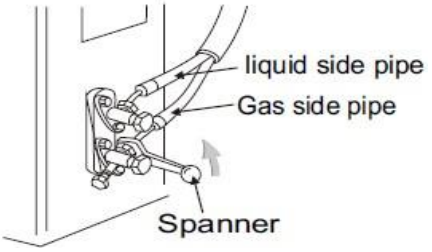
Outdoor Unit Size of Shape W1(W2)*H*D) (mm)	A (mm)	B (mm)
665(710)×420×280	430	280
600(645)×485×260	400	290
660(710)×500×240	500	260
700(745)×500×255	460	260
730(780)×545×285	540	280
760(810)×545×285	540	280
790(840)×550×290	545	300
800(860)×545×315	545	315
800(850)×590(690)×310	540	325
825(880)×655×310	540	335
900(950)×700×350	630	350
900(950)×795×330	535	350
970(1044)×803×395	675	409

➢ Install the connection pipe



Connect the Outdoor Unit with Connecting Pipe: Aim the counter-bore of the connecting pipe at the stop valve, and tighten the Taper nut with fingers. Then tighten the Taper nut with a torque wrench.

★When prolonging the piping, extra amount of refrigerant must be added so that the operation and performance of the air conditioner will not be compromised.

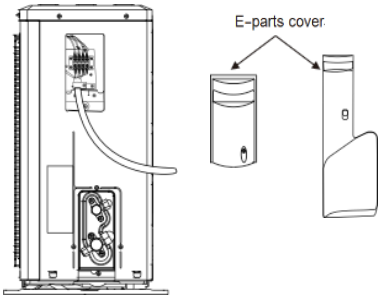


Piping length	Amount of refrigerant to be added	
≤5M	Not needed	
5- 15M	CC≤12000Btu	20g/m
	CC≥18000Btu	30g/m

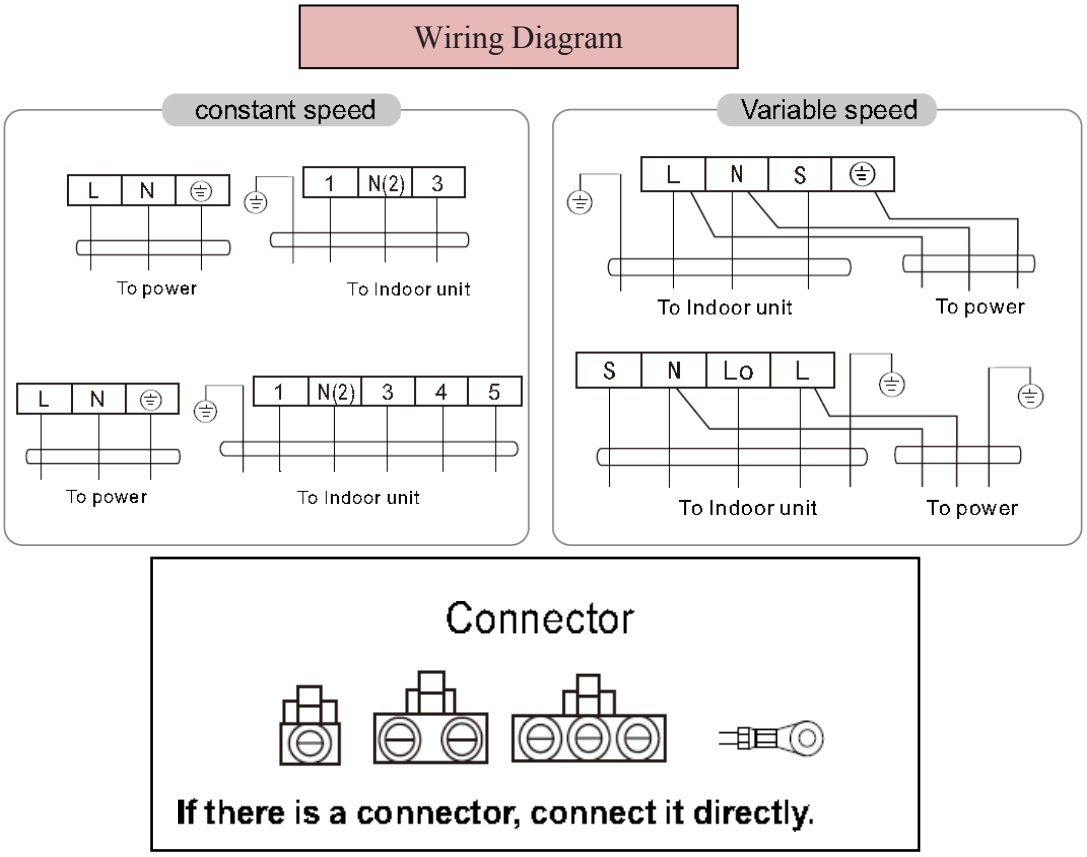
Note: This table is for reference only.

➢ Wiring Connection

1. Loosen the screws and remove E-parts cover from the unit.
2. Connect the cables respectively to the corresponding terminals of the terminal board of the outdoor unit (see the wiring diagram),and if there are signals connected to the plug, just conduct butt joint.
3. Ground wire: Remove the grounding screw out of the electric bracket, cover the grounding wire end onto the grounding screw and screw it into the grounding hole.
4. Fix the cable reliably with fasteners (Pressing board).
5. Put the E-parts cover back in its original place and fasten it with screws.



➢ Wiring diagram



NOTE:

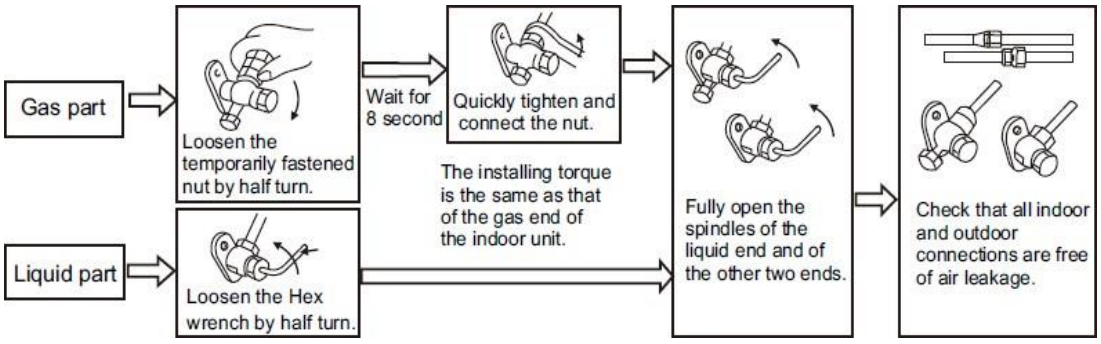
※ This manual is usually includes the wiring mode for the different kind of A/C. We cannot exclude the possibility that some special type of wiring diagrams are not included.

※ The diagram are for reference only. If the entity is difference with this wiring diagram, please refer to the detailed wiring diagram adhered on the unit which you purchased.

➢ Expelling the air

★Outdoor unit refrigerant discharging method

After the pipe side connection is complete, proceed as follows.

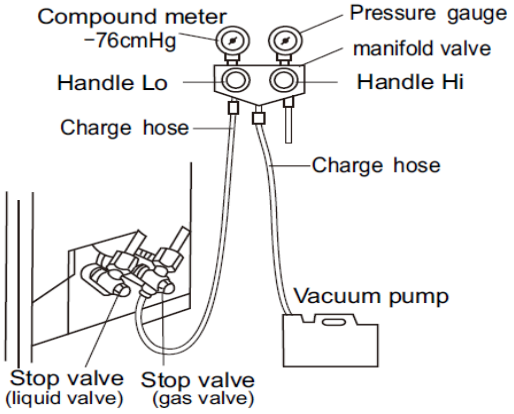


★Vacuum Pumping Method (R410A refrigerant evacuation must use the

vacuum pumping method)

Before working on the air conditioner, remove the cover of the stop valve(gas and liquid valves)and be sure to retighten it afterward.(to prevent the potential air leakage)

1. To prevent air leakage and spilling tighten all connecting nut of all flare tubes.
2. Connect the stop valve, charge hose, manifold valve, and vacuum pump.
3. Fully open the handle Lo of the manifold valve and apply vacuum for at least 15 minutes and check that the compound vacuum gauge reads -0.1MPa(-76cmHg).
4. After applying vacuum, fully open the stop valve with a hex wrench.
5. Check that both indoor and outdoor connections are free of air leakage.

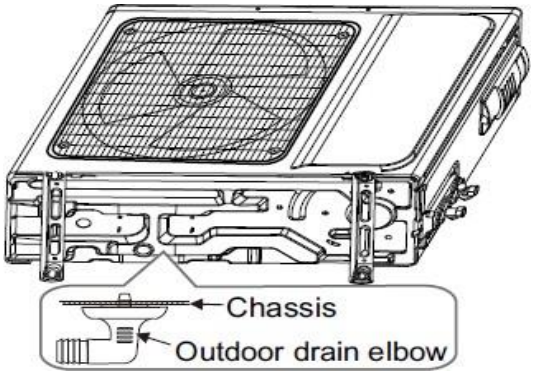


➢ **Outdoor condensation drainage(Heat pump type only)**

When the unit is heating, the condensing water and defrosting water can be out reliably through the drain house.

Installation：

Install the outdoor drain elbow in Φ25 hole on the base plate, and joint the drain hose to the elbow, so that the waste water formed in the outdoor unit can be drained out to a proper plate.



6-4 Check after installation and test operation

1. Check after installation

★ Electrical Safety Check

① If the supply voltage is as required.

② If there is any faulty or miss connection in each of the power, signal and grounding wires.

③ If the grounding wire of the air conditioner is securely grounded.

★ Installation Safety Check

① If the installation is secure.

② If the water drain is smooth.

③ If the wiring and piping are correctly installed.

④ Check that no foreign matter or tools are left inside the unit.

★ Leak test of the refrigerant

Depending on the installation method, the following methods may be used to check for suspect leak, on areas such as the four connections of the outdoor unit and the cores of the cut-off valves and t-valves:

① Bubble method: Apply of spray a uniform layer of soap water over the suspected leak spot and observe carefully for bubble.

② Instrument method: Checking for leak by pointing the probe of the leak detector according to the instruction to the suspect points of leak.

2. Test operation

★ Test preparation

※Verify that all piping and connection cables are well connected.

※Confirm that the values at the gas side the liquid-side are fully open.

※Connect the power cord to an independent power socket.

※Install batteries in remote control.

★ Test Operation method

① Turn on the power and push the ON/OFF switch button of the remote controller to start the air conditioner.

② Select COOL, HEAT (not available on cool-only models), SWING and other operation modes with the remote controller and see if the operation is ok.

7. Maintenance

7-1 Troubleshooting Guide

Many error codes many appears on this air conditionor, and this troubleshooting guide is prepared for the maintenance personnel to detect the error position and the parts to be replaced during the troubleshooting process. In this Guide, the Troubleshooting Method is guided by the Error Name, and the Reference Code under the General Index is the error code of the internal unit of the mainstream model supplied by the Company.

Example: "internal coil sensor error" is coded as E3 in the error code of the internal unit, but appears as flash-out via the trouble light of the external machine. However, their troubleshooting method is the same, and use the same table as well.

General index: fix speed air conditioners only involve E1, E2, E3 and E4

No.	Error Name	Reference Code
1	Overcurrent Protection of Indoor Unit	E0
2	Internal temperature sensor error	E1
3	External coil sensor error	E2
4	Internal coil sensor error	E3
5	Internal fan error of **wall mounted air conditioner**（PG motor）	E4
6	Internal fan error of **wall mounted air conditioner**（DC motor）	E4
7	Internal and external communication error	E5（5E）
8	Indoor EE Failure	Eb
9	External DC fan error (3-core terminal motor)	F0
10	Module protection error	F1
11	PFC protection error	F2
12	Compressor startup error	F3
13	Exhaust sensor error	F4
14	Pressing top head sensor error	F5
15	External temperature sensor error	F6
16	OVP or UVP error	F7
17	Main external control panel and module panel communication error	F8
18	Outdoor EE error	F9
19	Recirculated sensor error（four-way valve switch error）	FA
20	High-voltage Switch Protection	P2
21	Liquid Deficiency Protection	P3
22	Refrigeration Overload Protection	P4
23	Exhaust Protection	P5

24	Indoor High Temperature Protection	P6
25	Anti-freezing Protection in Refrigeration Room	P7
26	Overcurrent Protection	P8
27	Function protection prompt of frequency conversion external machine	See the Error List
28	Troubleshooting Guide on Category-L Failures (Subdivided Failures)	See the Error List

Example:

Explanation of error	**Cause:** explain the principle of the specific error. **Inspection path:** The basic order of troubleshooting. Related key position
Tools required for inspection	Tools that should be carried for such troubleshooting, and replacing parts that may be necessary for such error.
Frequent problematic part	Any possibly broken part related to the error may be the parts that need to be replaced.
Inspection procedure and key points	All the troubleshooting procedures for the reference of maintenance staff are prepared from simple to complex, from surface to internal, and from test to replacement. Although these key points do not cover all the error, and difficult or special problems are not included as well, but they can cover most of the common error.
Special attention	Here are some often-overlooked problems for the reference of the maintenance personnel.

The problems in the market are always more than we think, so it is necessary for the maintenance personnel to understand the principle of air conditioning operation, and to make a flexible judgment of the fault in combination with the actual conditions. We we qlcome the maintenance personnel to constantly put forward new problems in the actual work, record the solutions and enrich our troubleshooting guide list.

（1）E0- Overcurrent Protection of Indoor Unit

Explanation of error	Cause: The main control panel detects that the working current of the system exceeds the upper limit of protection, and will indicate "indoor unit overcurrent protectin:. The air conditioner stopps running for protection and displays the failure code E0. Inspection path: current transformer → power line → compressor line → connector assembly
Tools required for inspection	Current clamp and multimeter
Frequent problematic part	Indoor unit panel, power line, compressor and complete machine
Inspection procedure and key points	1. If it is a fixed-frequency model, observe whether the live line passes through the current transformer; if not, lay the line accordingly and reboot for inspection. 2. The current clamp is used to measure the working current and determine whether it is within the normal working current range of the nameplate. If normal working current is detected, it may be the fault of the current transformer and replace the main control panel of the indoor unit. 3. Measure whether the power supply voltage is within the normal operating voltage range; if the working voltage is not normal, it is necessary to consider whether the local grid voltage is stable. 4. If the working current exceeds the range and the working voltage is normal, the system may be blocked and the air-conditioning may be overloaded, which needs to be checked according to the actual situation.

（2）E1- internal temperature sensor error

Explanation of error	**Cause:** The detection of short circuit or open circuit of internal temperature sensor during the inspection of main control panel in the internal machine, indicated by "internal temperature sensor error". **Inspection path:** Sensor→Sensor wire→Connectors→Main internal control panel
Tools required for inspection	Multimeter, 15KΩ standard sensor（25℃）
Frequent problematic part	Internal temperature sensor, main internal control panel
Inspection procedure and key points	1. Check whether there's resistance problem, short circuit or open circuit in the sensor; the resistance value shall be within a reasonable range (15KΩ under the temperature of 25℃ for frequency conversion machine) 2. Check whether the sensor wire is broken. 3. Check whether the terminal connectors are well fixed; check whether the weld between the terminal and the main control panel is loose, and pull the terminal slightly for inspection if necessary. 4. Check whether the sensor is affected with damp. 5. In case no standard sensor is available at present, replace the internal temperature sensor by other sensor asides, and then check whether the error still exists; if the error disappears, replace the sensor; if the error still exists, check the main internal control panel and change if necessary.
Special attention	Most internal temperature sensors of the frequency conversion machine have a resistance value of 15KΩ. Do not use improper sensor during repairing and maintenance, or it may led to the wrong temperature sensing of the machine, the start error or shutdown error. You can switch the air conditioner to the "Blowing" mode, and judge the accuracy of sensor though environmental temperature displayed on the screen. In case a sensor with the resistance value over 15KΩ is used, the detected temperature will be much lower than the actual temperature, which may lead to the shutdown error under heating mode, or the startup error under cooling mode. In case a sensor with the resistance value below 15KΩ is used, the detected temperature will be much higher than the actual temperature, which may lead to the startup error under heating mode, or the shutdown error under cooling mode.

（3）E2 -external coil sensor error

Explanation of error	**Cause:** The detection of short circuit or open circuit of external coil sensor during the inspection of main external control panel, indicated by “external coil sensor error”. **Inspection path:** Sensor→Sensor wire→Connectors→Main external control panel
Tools required for inspection	Multimeter, 20KΩ standard sensor (25℃）
Frequent problematic part	External coil sensor, main external control panel
Inspection procedure and key points	1. Check whether there’s resistance problem, short circuit or open circuit in the sensor; the resistance value shall with a reasonable range (about 20KΩ for frequency conversion machine) 2. Check whether the sensor wire is broken. 3. Check whether the terminal connectors are well fixed; check whether the weld between the terminal and the main control panel is loose, and pull the terminal slightly for inspection if necessary. 4. Check whether the sensor is affected with damp. The coil sensor is quite easy to be affected with damp in case the lead of coil sensor is above the copper pipe. 5. In case no standard sensor is available at present, replace the temperature sensor of external coil by other sensor asides, and then check whether the error still exists; if the error disappears, replace the sensor; if the error still exists, check the main internal control panel and change if necessary.
Special attention	Most internal temperature sensors of the frequency conversion machine have a resistance value of 20KΩ. Do not use improper sensor during repairing and maintenance, or it may led to the start of protection mode due to wrong temperature sensing of the machine, or the protection error. In case a sensor with the resistance value over 20KΩ is used, the detected temperature will be much lower than the actual temperature, which may lead to the frequent entering of defrost mode, the illusory defrosting or the protection error during the cooling process. In case a sensor with the resistance value below 20KΩ is used, the detected temperature will be much higher than the actual temperature, which may lead to defrost error during the heating process, or the start of protection during the cooling process.

（4）E3 -internal coil sensor error

Explanation of error	**Cause:** The detection of short circuit or open circuit of internal coil sensor during the inspection of main internal control panel, indicated by “internal coil sensor error”. **Inspection path:** Sensor→Sensor wire→Connectors→Main internal control panel
Tools required for inspection	Multimeter,, 5KΩ or 20KΩ standard sensoe（25℃）
Frequent problematic part	Internal temperature sensor, main internal control panel
Inspection procedure and key points	1. Check whether there’s resistance problem, short circuit or open circuit in the sensor; the resistance value shall with a reasonable range (about 20KΩ for frequency conversion machine) 2. Check whether the sensor wire is broken. 3. Check whether the terminal connectors are well fixed; check whether the weld between the terminal and the main control panel is loose., and pull the terminal slightly for inspection if necessary. 4. Check whether the sensor is affected with damp. The coil sensor is quite easy to be affected with damp in case the lead of coil sensor is above the copper pipe. 5. In case no standard sensor is available at present, replace the temperature sensor of internal coil by other sensor asides, and then check whether the error still exists; if the error disappears, replace the sensor; if the error still exists, check the main internal control panel and change if necessary.
Special attention	Most internal temperature sensors of the frequency conversion machine have a resistance value of 20KΩ. Do not use improper sensor during repairing and maintenance, or it may led to the start of anti-frosting or overheat protection mode due to wrong temperature sensing of the machine. In case a sensor with the resistance value over 20KΩ is used, the detected temperature will be much lower than the actual temperature, which may lead to the high pressure of cold-blast protection system during the heating process, or the frequent start of anti-freezing protection during the cooling process. n case a sensor with the resistance value below 20KΩ is used, the detected temperature will be much higher than the actual temperature, which may lead to the frequent start of overheat protection mode during the heating or the overload protection during the cooling process.

（5）E4 -Internal fan error of wall mounted air conditioner（PG motor）

Explanation of error	**Cause:** PG motor is equipped with speed feedback signal line. When the feedback signal of speed is not received by the main internal control panel, it has no way to recognize the rotating speed of motor, which will be indicated as “Internal fan error”. Main causes for the disappearance of speed feedback signal are as follows: The fan is stucked; 2. The speed feedback component in the fan is broken; 3. Error of receiving circuit for the speed feedback signal from the main internal control panel.
Tools required for inspection	Multimeter, A PG motor in normal working condition
Frequent problematic part	Mechanical jam problem of internal fan, PG motor, main internal control panel
Inspection procedure and key points	1. Check whether the fan can work for a period of time before the error occurs. If yes, the reason of mechanical jam can be exclude. 2. Disconnect the power supply and move the fan blade of internal machine by hand to see if there’s any resistance. Some occasional internal fan error may relate to bearing coordination. 3. Reconnect the drive wire and speed feedback wire, thus to exclude any fan error due to connector loosening. 4. Check whether the plug-in terminal of speed feedback on the control panel is loose, and pull the terminal slightly for inspection if necessary. 5. Replace the motor in the faulted air conditioner with other PG motor (do not fix it with the fan for the time being), if the main control panel still indicates “internal fan error”, then replace the main internal control panel; if the error disappears, replace the internal fan.
Special attention	The main internal control panel will not indicates “internal fan error” when the internal fan is still rotating; sometimes such error will not be reported when obvious fan problems exist (such as the low-speed rotation due to damaged fan capacitors, or non-uniform rotating speed due to abnormal speed feedback. Therefore, patience of the maintenance staff is required for the troubleshooting of fan error. You shall compare it with the normal condition, and detect and solve the problem in a flexible way.

(6) E4- Internal fan error of wall mounted air conditioner (DC motor)

Explanation of error	**Cause:** The internal fan of some highly energy efficient models is DC motor using a green plug through which the main internal control panel can drive the motor and sense the current rotational speed feedback. When the main internal control panel cannot receive the rotational speed feedback signal of the motor, it will indicate "DC motor error". Disappearance of the rotational speed feedback signal may be caused by: 1 The motor is stuck and cannot work; 2 The speed feedback element inside the fan is destroyed; 3 There's something wrong with the speed feedback signal receiving circuit of the main internal control panel. **Inspection path:** Is DC motor stuck by foreign matter→motor destroyed → Motor terminal connectors→Main internal control panel
Tools required for inspection	Multimeter, a DC motor in normal working condition
Frequent problematic part	Mechanical jam of internal fan, internal DC motor, main internal control panel
Inspection procedure and key points	1. Check whether the fan accelerates to extremely high speed before the error occurs. If it can work for a period, the reason of mechanical jam can be excluded. 2. Plug and unplug the terminal of the DC motor again to exclude any fan error due to connector loosening, and pull the terminal slightly for inspection if necessary. 3. Replace the motor in the faulted air conditioner with other DC motor to plug in the main internal control panel (do not fix it with the fan for the time being), if the main control panel still indicates "DC motor error", then replace the main internal control panel; if the error disappears, replace the DC motor. 4. Multimeter can be used to distinguish whether it is main control panel problem or motor problem by: connect the motor with the main control panel and pay attention to the second (yellow) and fourth (black) wire from the outermost side among four lines of the terminal of the DC motor. After the air conditioner powers on in the cooling mode for a while, the voltage between the yellow and black wires should rise gradually and the motor should accelerates slowly, if the DC motor still won't rotate, then the DC motor is destroyed.
Special attention	**Five lead wires division:** Count from the outermost side of the four wires of the DC motor terminal, the first blue wire is the speed feedback wire with a voltage of 0.5-5V when the fan rotates; the second yellow wire is the motor driving wire with a voltage of 2.0-7.5V when the fan rotates; the second white wire is 15V power cord with a voltage of 15V in normal condition; the fourth black wire is 0V DC earth wire which is the benchmark of all the voltage tests; the fifth (red) wire is 310V wire which is strong with a voltage of 310V in normal condition, so be careful of electric shock.

(7) E5(5E) -Internal and external communication error

Explanation of error	**Cause:** The frequency converter needs internal and external communication.When the communication cannot be reached, the internal and external units will indicate “internal and external communication error”. Only “main internal control panel, connecting cable and main external control panel” are related to communication; but sometimes the communication error will be indicated when the external unit has no power and the internal unit cannot connect with the external unit due to other errors, then such situation shall be distinguished from “pure communication error” and treated in a different way. **Inspection path:** Check if the external unit can power on and work (normally, the indicator light will turn off after lighting for several seconds, relay picks up, and PTC won’t heat seriously) 1. Can power on and work: Are the internal unit and external unit matched→is the phase sequence of connecting wires of internal and external units correct (the live wire of the internal unit connects with that of the external unit, the null wire of the internal unit connects with that of the external unit)→Connecting wires touched well→Main internal control panel replacement→Main external control panel replacement 2. Cannot power on and work: Can AC 220V be delivered to the terminal block of the external unit→Can the bridge rectifier and module panel generate DC 310V→Can the main external control panel generate a low voltage power supply of DC 5V→Does the main external control panel show the status of periodical reset.
Tools required for inspection	Multimeter, main internal control panel in normal condition
Frequent problematic part	Connecting wire phase sequence and contact, main internal control panel, main external control panel, module panel
Inspection procedure and key points	1. Firstly, the IDU and the ODU should be matched and connected properly. 2. Observe the main external control panel, turn on the air conditioner, three lights are all lighted up then off and the relay pulls in. If not, it is power supply problem. 3. Connect the black signal line S to terminal N of ODU. Turn on the A/C, if "E5" is still reported, the main external control panel need to be replaced. If "E5" is still reported at this time, go to step 4. 4. Change a new main internal control panel, if the error code E5 remains, then the problem should be on the main external control panel.

Special attention	**When the external unit not power on:** If the internal terminal board does not transmit 220V power, replace the main internal control panel; if the external terminal board has 220V power, first check if (fuse, reactor and bridge rectifier) are normal. There is still something wrong, replace the whole set of external control unit; for the control unit composed of several function boards, try disconnecting the weak-current data wires among several control boards and then power the external unit on, if the main control panel can be powered on and initialized successfully, then it's the module panel problems; if the main external control panel still cannot be powered on and initialized, replace the main external control panel.

(8) Eb –Indoor EE Failure

Explanation of error	Cause: Many parameters need to be preset for the running of the indoor unit of the air conditioner and such parameters are placed in a data storage 8-feet chip, which is called "EEPROM" or "EE" for short. The motor on the internal main control panel can only work after reading the data stored in EE and if not read, the failure code "Outdoor EE Failure" will be indicated and raised in the indoor unit. Reasons for data not being read are as follows: 1. wrong EE chip data format; 2. EE chip is broken; 3. bad contact of EE or fault of EE reading circuit; 4. backward installation of EE chip. Inspection path: internal main control panel.
Tools required for inspection	/
Frequent problematic part	Bad contact of EE, internal main control panel.
Inspection procedure and key points	Replace the internal main control panel directly.

(9) F0- External DC fan error (3-core terminal motor)

Explanation of error	**Cause:** Our frequency changing external unit uses the 3-lead-wire DC motor, or "externally driven DC motor" for short, after 2012. It has no speed feedback circuit but 3 drive lead wires and its driving principle is similar to that of the compressor. The main control panel will indicate "external DC fan error" when it detects imbalanced current on the three lead wires of the driving motor. **Inspection path:** Is the DC fan stuck by foreign matters→Motor terminal connectors→Main external control panel→Motor
Tools required for inspection	Main external control panel in normal condition
Frequent problematic part	Mechanical jam of external fan, main external control panel, external DC motor
Inspection procedure and key points	1. First exclude the possibility of mechanical jam of external fan blades.。 2. Observe if the terminal of the fan is not connected firmly or the order of lead wires is correct. If the external fan of the newly installed air conditioner rotates reversely, first observe if the color order of the three lead wires is correct, or change the order of any two of the three lead wires of the motor to see if the fan can rotate in the forward direction. 3. The DC motor of this scheme is relatively simple and reliable, so the problem is more likely to be caused by the drive part of the fan of the main external control panel. The maintenance personnel may as well prepare matched main external control panel before maintenance. If the fan returns to normal after replacing the main control panel, then it's the main control panel problem; if it still indicates external DC motor error, then replace the external DC motor.
Special attention	Unlike the 5-core internal DC motor, there will be a process of fan blade position locking before the 3-core DC motor with external drive starts to rotate. The fan blades will shake mechanically for 3-5 seconds and then rotate slowly, which is normal phenomenon.

(10) F1 -Module protection error

Explanation of error	**Cause:** The power module is the part to directly drive the compressor to work. It can protect the machine in time when overcurrent, overvoltage or overheat occurs and stops the compressor from working. It will, at the same time, send "shutdown request" to the module panel. The error triggered by the "shutdown request" is called "module protection error". **Inspection path:** Supply voltage → Compressor wire, reactor wire → System blocked → Module panel damaged → Main external control panel destroyed → Compressor destroyed
Tools required for inspection	Multimeter, pressure gauge, megameter, module panel in normal condition
Frequent problematic part	Supply voltage, compressor wire, reactor, system pressure, module panel, main external control panel, compressor

Inspection procedure and key points	1. Is the order of compressor wires not correct, which makes the compressor rotate reversely? Try exchanging the compressor wires on U-V phase to see if the problem can be solved? 2. Check if the supply voltage is unstable and highly volatile, and test if the system pressure is normal. High system pressure will cause rotating problems to the compressor. 3. Is the module panel fixed to the radiator firmly? Will it cause pool cooling? Is the internal and external heat exchanger dirty, which lead to poor heat transfer and high system pressure? 4. If "module protection error" will be indicated immediately after starting up, it is almost certain that it's substantial error, having nothing to do with supply voltage and system pressure, it is suggested to observe if there is any component destroyed by strike arc near the module panel; use the multimeter to test if the resistances between any two compressor wires are the same. The resistances between any two compressor wires in normal condition are tiny resistances at ohm level and are basically equal; then use the megameter to measure if the resistance insulation of the three compressor wires against the earth wire is good (normally at MΩ level), and check if the reactor wire is well connected or the reactor is destroyed. 5. Test if the 15V and 5V (3.3V) power supply on the module panel is stable and exclude the module panel error caused by power supply of the main external control panel. 6. Methods for judging whether the power module is damaged: use the "diode position" of the multimeter to measure the features of P of the module panel against U-V-W three phases respectively. Measure the power module P-U, P-V and P-W, there is always infinite resistance at one side and fixed on-state voltage at the other side (generally 0.5V); measure the features between N-U, N-V and N-W in the same way, if short circuit occurs during any measurement, then the module is destroyed. 7. Replace with the module panel in normal condition for test. If the test is normal after changing the module panel, then the original module panel is destroyed. 8. After excluding problems of module, connecting wires, system and power supply, distinguish by ear. If there is only electromagnetic sound and the compressor does not work; or the sound of irregular running appears after the compressor works for a while and then it shuts down and indicates error; chances are that the compressor is blocked or destroyed, consider replacing the compressor.

(11) F2- PFC protection error

Explanation of error	**Cause:** PFC board is a component of the inverter air conditioner for power factor correction and voltage boosting. When the PFC board cannot perform power calibration as normal because of overcurrent and overvoltage, it will indicate "PFC protection error" and its function may also be integrated with the module panel or main control panel. **Inspection path:** Supply voltage→AC and DC power path→PFC board data wire→PFC board→Main control panel
Tools required for inspection	Multimeter, PFC board in normal condition
Frequent problematic part	Supply voltage, reactor, PFC board, module panel, main external control panel
Inspection procedure and key points	1. Check if the supply voltage is unstable and highly volatile or the voltage is too low (below AC 135V) 2. The reactor is one of core parts of PFC. Check if the reactor itself is destroyed and the reactor connecting wire is in poor connection, which makes PFC functions not performed. Do not remove the reactor and replace with short circuit by no means. 3. If "PFC protection error" will be indicated immediately after starting up, it is almost certain that it's substantial error, having nothing to do with supply voltage, it is suggested to observe if there is any component destroyed by strike arc near the module panel 4. Test if the 15V and 5V (3.3V) power supply on the PFC board is stable and exclude the PFC board error caused by power supply of the main external control panel. 5. Replace with the PFC board in normal condition for test. If the test is normal after changing the PFC board, then the original PFC board is destroyed. 6. The possibility that there is something wrong with 15V or 5V power of the module panel that causes the control power supply problem of the PFC board is not excluded. 7. Some module panels integrate PFC function and compressor drive function in one, so just replace with an integrated module panel. 8. For single-panel single-chip main control panels, if PFC protection error appears, and there is no problem in supply voltage, reactor connection or reactor, just replace the controller of the external unit.

(12) F3- Compressor out-of-step error

Explanation of error	**Cause:** The module panel will constantly test the current of lead wires of the compressor and calculate the position of the rotator of the compressor when driving the compressor to work. When the compressor deviates far from the normal operating status , it will indicate "compressor out-of-step error" because the current of the compressor wires is too high or it cannot detect the position of the rotator. This error always follows "module protection error", so they have similar inspection methods. **Inspection path:** supply voltage→Compressor wire, reactor wire→ System blocked→Module panel damaged→Main external control panel destroyed→Compressor destroyed
Tools required for inspection	Multimeter, pressure gauge, module panel in normal condition
Frequent problematic part	Supply voltage, compressor wire, reactor, system pressure, module panel, main external control panel, compressor
Inspection procedure and key points	1. Is the order of compressor wires not correct, which makes the compressor rotate reversely? Try exchanging the compressor wires on U-V phase to see if the problem can be solved? 2. Check if the supply voltage is unstable and highly volatile, and test if the system pressure is normal. High system pressure will cause rotating problems to the compressor. 3. Is the module panel fixed to the radiator firmly? Will it cause pool cooling? Is the internal and external heat exchanger dirty, which lead to poor heat transfer and high system pressure? 4. If "compressor out-of-step error" will be indicated immediately after starting up, it is almost certain that it's substantial error, having nothing to do with supply voltage and system pressure, it is suggested to observe if there is any component destroyed by strike arc near the module panel; use the multimeter to test if the resistances between any two compressor wires are the same. The resistances between any two compressor wires in normal condition are tiny resistances at ohm level and are basically equal; then use the megameter to measure if the resistance insulation of the three compressor wires against the earth wire is good (normally at MΩ level), and check if the reactor wire is well connected or the reactor is destroyed. Check if the DC voltage between P-N is too high (above 200V). 5. Test if the 15V and 5V (3.3V) power supply on the module panel is stable and exclude the module panel error caused by power supply of the main external control panel. 6. Replace with the module panel in normal condition for test. If the test is normal after changing the module panel, then the original module panel is destroyed. 7. After excluding problems of module, connecting wires, system and power supply, distinguish by ear. If there is only electromagnetic sound and the compressor does not work; or the sound of irregular running appears after the compressor works for a while and then it shuts down and indicates error; chances are that the compressor is blocked or destroyed, consider replacing the compressor.

Special attention	For the “compressor out-of-step error” and “module protection error”, the former is calculated by the main chip of the module panel and the latter is detected by the power module itself. They are abnormal operating phenomenon of the compressor essentially. If there is uncertainty about either error, analyze both together with similar method. For inverter air conditioners that are in poor electrical environment or are old, occasional occurrence of such errors is a normal protection.

(13) F4- Exhaust sensor error

Explanation of error	**Cause:** The main external control panel will indicate “exhaust sensor error” and send it to the main internal control panel when it detects short circuit or open circuit of the exhaust sensor. **Inspection path:** Exhaust sensor→Sensor wire→Connectors→Main external control panel
Tools required for inspection	Multimeter, 50KΩ standard exhaust sensor (25℃)
Frequent problematic part	Exhaust sensor, main external control panel
Inspection procedure and key points	1. Check if there is any evident resistance problem in the sensor. Whether in short circuit or open circuit, the resistance should maintain in a reasonable range (about 50KΩ when the compressor is not working and between 3 KΩ and 30 KΩ after the compressor works for a while, the corresponding exhaust temperature should be 100℃ -38℃). 2. Check if the sensor wire or the sensor connecting wire is damaged. 3. Check if the connecting terminal is connected firmly, the weld between the terminal and the main control panel is loose; pull the terminal slightly for inspection if necessary. 4. Check whether the sensor is affected with damp. The coil sensor is quite easy to be affected with damp in case the lead wire of coil sensor is above the copper pipe. 5. If there is no standard sensor at hand, exchange the exhaust sensor with the one beside it to see if the error changes. If yes, there is something wrong with the sensor and it should be replaced; if it still indicates “external coil sensor error”, replace the main external control panel.
Special attention	Most exhaust sensors have a standard resistance of 50KΩ (25℃). Do not use improper sensor during maintenance, or the machine will sense the exhaust temperature mistakenly and enters the protection state frequently. For example, in the case where replace the 20KΩ coil sensor for the exhaust sensor by mistake, the exhaust temperature that the main external control panel senses will be higher than the actual exhaust temperature, which will make normal air conditioners enter the high exhaust temperature protection state frequently, and the compressor frequency threshold will rise and lead to shutdown of the compressor.

(14) F5 -Compressor top head sensor error

Explanation of error	**Cause:** The compressor top head sensor is a compressor top head temperature protection switch most of the time. It keeps closed (short circuit) when the compressor temperature is normal and switches off (open circuit) when the temperature is too high. The main external control panel will indicate "compressor top head sensor error" when it senses disconnection of the compressor top head protection switch. **Inspection path:** Compressor top head sensor (temperature protection switch)→Sensor wire→Connectors→Main external control panel
Tools required for inspection	Pressure gauge, multimeter
Frequent problematic part	System pressure, liquid deficiency, compressor top head sensor (temperature protection switch), main external control panel
Inspection procedure and key points	1. First check if the compressor top head temperature is too high (above 110℃) and causes action of the compressor top head sensor (temperature protection switch); reasons why the compressor top head temperature is too high may be: the system is deficient in liquid and the compressor idles; the system is blocked and the pressure of the compressor is too high. 2. After excluding the possibility of the system problem, please note that the temperature protection switch is closed normally. Test if the terminals of the sensor are in the short-circuit condition with the multimeter. In the case of open circuit, then there is something wrong with the sensor or lead wires. 3. Check if the sensor wire or the sensor connecting wire is damaged. 4. Check if the connecting terminal is connected firmly, the weld between the terminal and the main control panel is loose; pull the terminal slightly for inspection if necessary. 5. Disconnect the power supply and short circuit a metal with the compressor top head terminal of the main external control panel. If the compressor top head sensor error disappears after start up, then replace the sensor; if the error still occurs, it's probably the main control panel problem, replace the main external control panel.
Special attention	The compressor top head sensor is just a temperature switch which is highly reliable and is less likely to go wrong generally. Pay more attention to the system pressure and the compressor temperature.

（15）F6- external temperature sensor error

Explanation of error	**Cause:** The detection of short circuit or open circuit of external termperature sensor during the inspection of main external control panel, indicated by "external termperature sensor error". **Inspection path:** Sensor→Sensor wire→Connectors→Main external control panel
Tools required for inspection	Multimeter, 15KΩ standard sensor（25℃）
Frequent problematic part	External temperature sensor, main external control panel.
Inspection procedure and key points	1. Check whether there's resistance problem, short circuit or open circuit in the sensor; the resistance value shall be within a reasonable range (15KΩ under the temperature of 25℃). 2. Check whether the sensor wire is broken. 3. Check whether the terminal connectors are well fixed; check whether the weld between the terminal and the main control panel is loose, and pull the terminal slightly for inspection if necessary. 4. Check whether the sensor is affected with damp. 5. In case no standard sensor is available at present, replace the external temperature sensor with the other sensor asides, and then check whether the error still exists; if the error disappears, replace the sensor; if the error still exists, it's possible that the main control panel is faulted, change the main external control panel.
Special attention	Most of the standard resistance values of the external temperature sensors are 15KΩ (hen temeperature is at 25℃), and the higher the temeprautre is, the lower the resistance value is, and the lower the temperature is, the higher the resistance value is. Do not use improper sensor during repairing and maintenance, or it may led to the wrong temperature sensing of the machine.

(16) F7-OVP or UVP error

Explanation of error	**Cause:** All the inverter air conditioners are equipped with voltage inspection circuits, but differnt models of machines have differnt locations for the voltage inspection (on the modue panel or main external control panel). When the supply voltage is lower than 135V or higher than 275V, the inspectio circuit would detect over or under voltage protection signal and send it to the main external control panel and the main external control panel would raise the alarm "OVP or UVP error" and indicate it through the internal motor. Inspection path: supply voltage → internal direct current voltage → reactor wiring → module panel → main external control panel.
Tools required for inspection	Multimeter
Frequent problematic part	Supply voltage, reactor, moduel panel and main external control panel.
Inspection procedure and key points	1. First, check the supply environment of the user, especially shall check when the compressor of the air conditioner has been running for a while. The normal supply voltage shall be between 198V and 242V and the minimum work assurance range of the air conditioner shall be within 165V and 265V and it shall be especially noted that the voltage value shall not be decreased significantly after running of the compressor (voltage decreasing by over 25V), because if the supply voltage is decreased by a lot, it means the supply line capacity is insufficient and the user is usually suggested to replace the circuit or install a specizlied air conditioner supply voltage stabilizer. 2. For the external machines with PFC panels (without separate rectifier bridges), the operator shall ensure if the PFC function is on with the direct current voltage grade of the multimeter. When the compressor is running, voltage between P and N ends detected on the test module panel or main external control panel shall be over 200V and if the voltage is below that range, it is possible that the reactor is faulted or the PFC is broken. 3. When the air conditioner is switched on, if the compressor is not running but there is a alarm of "OVP or UVP error" and the power voltage detected with the multimeter is not below 150V, it's probably the voltage inspection circuit is faulted. The operator shall check and confirm the voltage inspection circuit is on which control panel first and then replace it. The regular replacement: for the external machine of single panel single chip, replace the external controller directly; and for the machine of two panels, replace the module panel.
Special attention	For some models, OVP or UVP error signal is delivered through the connector wires between the module panel and the main external control panel, thus it is possible the voltage signal is not delivered when the communication between teh module panle and the main external control panel is not good. It is possible that the error is fause raised but after some minutes that the error is finally confirmed as "Main external control panel and module pannel communication error", which shall be specially noted.

(17) F8-main external control panel and module panel communication error

(exclusive of external machine of single panel)

Explanation of error	**Cause:** Only the models with the module panels separated with the main external control panels may have this error. When the machine is running normally, the module panel and the main external control panel would coordinate with each other on the communication to work and when the communication is off, the main external control panel would raise the alarm of "main control panel and module panel communication error". Only "module panel, data line and main external control panel" are related to such communication. **Inspection path:** data line connection → module panel power →module panel →main external control panel
Tools required for inspection	Multimeter and regular module panel.
Frequent problematic part	Module panel and main control data line, module panel and main external control panel.
Inspection procedure and key points	1. First check if the communication connection line (mostly 4 chips) between the module panel and main contrl panel gets loose and if the connection is faulted. 2. Measure and check with a multimeter if the power from the main external control panel is normal and especially note that if the 5V (3.3V) power is led to the module panel. Eleminate the possibility that it's not running normally because there is no 5V (3.3V) power at the module panel. 3. The maintenance personnel shall replace the module panel of the faulted air conditioner with a regular module panel taken with him and if the communication error disappears when the external machine is switched on, it means the original module panel is faulted and if the error is still there, maybe the main external control panel shall be replaced.

(18) F9- outdoor EE error

Explanation of error	**Cause:** Many parameters need to be preset for the running of the external unit of the air conditioner and such parameters are placed in a data storage 8-feet chip, which is called "EEPROM" or "EE" for short. The motor on the main external control panel can only work after reading the data stored in EE and if not read, the alarm "outdoor EE error" would be reported and raised in the internal machine. Reasons for data not being read are as follows: 1. wrong EE chip data format; 2. EE chip is broken; 3. bad contact of EE or fault of EE reading circuit; 4. backward installation of EE chip. **Inspection path:** main external control panel.
Tools required for inspection	None.
Frequent problematic part	Bad contact of EE, main external control panel.

Inspection procedure and key points	1. Replace the main external control panel directly.

（19）FA- recirculated sensor error (only models of electronic expansion valves are involved)

Explanation of error	**Cause:** The recirculated sensors are only used on machine models of electronic expanssion valves and the back temperature value is considered as the basis for adjustment of the electronic expanssion valve and determination if the four-way valve changes the position normally during heating. When the main control panel detects open circuit or short circuit of the recirculated sensor, it would raise an alarm of "recirculated sensor error" and send it to the main internal control panel to indicate it. **Inspection path:** four-way valve →recirculated sensor → sensor wire → connectors → main external control panel
Tools required for inspection	Multimeter, pressure meter, normal 20KΩ recirculated sensor
Frequent problematic part	Four-way valve, recirculated sensor, main external control panel.
Inspection procedure and key points	1. If the error appears in heating but not in cooling, first check if the four-way valve failed to change the position or there is a back flow, which can be estimated by measuring the high and low pressures with the pressure meter; for the consideration of electricity control, we can use a multimeter. During heating, check if the four-way valve terminal can switch a circuit of 220V, if yes and the four-way valve still is faulted in the position changing, the four-way valve is faulted; and if there is no circuit over 220V in heating, it means the main external control valve is faulted. 2. If it is not the four-way valve that is faulted, check on the resistance value and short circuit problems and the resistance value shall be within a proper range (around 20KΩ at temperature of 25℃). 3. Check whether the terminal connectors are well fixed; check whether the weld between the terminal and the main control panel is loose, and pull the terminal slightly for inspection if necessary. 4. Check whether the sensor is affected with damp. For the recirculated sensor, if the led is on the above and thecopper pipe is below, it is possible to be damped. 5. The maintenance personnel can replace the possibly faulted recirculated sensor with a normal one and if the error disappears, it means the original recirculated sensor is faulated and needs to be replaced; and if the error is still there, consider to replace the main external control panel.

(20) P2 - High-voltage Switch Protection

Explanation of error	Cause: In standby state or when the equipment is running, the high-voltage switch is disconnected three times (within 20 minutes) and reported as "high-voltage switch protection"; Inspection path: high-voltage switch cable → connector → high-voltage switch → main control panel
Tools required for inspection	Multimeter, connectoin line and high-voltage swtich
Frequent problematic part	High-voltage swtich connectoin line, fluorine deficiency of unit and high-voltage swtich
Inspection procedure and key points	1. Check whether the plug-in terminals are firmly connected and whether the terminals and the main control panel are welded loosely. If necessary, gently pull them to check; 2. Use a multimeter to measure whether it is disconnected; 3. Use the multimeter to check the state of the high-voltage swtich and check whether it is in the OFF state (normally OFF, unusual disconnection); 4. If the pressure is normal and the high-voltage switch is kept open, it is positive that the pressure voltage is faulted; 5. If the pressure switch is normal and the connection line is tact and the failure is still reported, replace the corresponding main control panel.
Special attention	The reason why high-voltage switches are often disconnected is the leakage of equipment. When the high voltage switch is off, first check whether the air conditioner's pressure is normal. If it is normal but the failure is still displayed aftere replacing the external main control panel, it is possible that the connecting pipe may be too long or the external ambinet temperature is too low

(21) P3 –Liquid Deficiency Protection

Explanation of error	Cause: The liquid volume of the system is less than 30%, which leads to non-refrigeration and liquid shortage protection. Inspection path: whether the valves of the outdoor unit are opened → whether the evaporator, condenser, connectoin pipe are damanged or cracked → whether the environmental temperature sensor and the coil temperature sensor are damaged at the same time
Tools required for inspection	Hex nut, multimeter, pressure gauge
Frequent problematic part	Stop valve, evaporator, condenser and connection pipe
Inspection procedure and key points	1. Check the stop valve and turn it counterclockwise with hexagons to see if the valve is not open and the opening is not enough; 2. Check whether the evaporator, condenser and connection pipe are damaged or cracked, and focus on checking whether there is refrigerant leakage in the welding part and connection pipe joint; 3. Measure the temperature sensor with the multimeter at ambient temperature, and whether the coil temperature sensor has abnormal resistance at the same time.

(22) P4 –Refrigeration Overload Protection

Explanation of error	Cause: Outdoor coil sensor senses excessive temperature, prevents compressor from overloading, and reduces frequency. Inspection path: the system is dirty or blocked → the condenser is dirty → external coil sensor is faulated →AC fan not running → failure of divider resistance of controller
Tools required for inspection	Multimeter and pressure gauge
Frequent problematic part	Coil sensor, condenser and outdoor unit controller
Inspection procedure and key points	1. Check the coil sensor with a multimeter to see if the resistance value is normal (20KΩ standard sensor, 25℃) 2. Use a pressure gauge to detect system pressure. If the system pressure is high, it may cause internal dirty blockage or poor external heat transfer, which may lead to high coil temperature. 3. Observe whether the speed of AC fan is too low, which leads to poor heat transfer and high coil temperature. 4. Use a multimeter to check whether the voltage dividing resistance of temperature sensor circuit of external controller coil is abnormal. If you don't know how to measure it, try to replace the external controller to check whether it returns to normal state.

(23) P5–Exhaust Protection

Explanation of error	Cause: the exhaust sensor detects that the exhaust temperature is too high and triggers the exhaust protection shutdown. Inspection path: system pressure → indoor / outdoor air inlet → exhaust sensor → external panel
Tools required for inspection	Multimeter, pressure gauge, regular 50KΩ exhuast sensor (25℃)
Frequent problematic part	Indoor coil sensor
Inspection procedure and key points	1. Check if the system pressure is low, if is, usually it the shortage of liquid that leads to excessive exhasut temperature protection; 2. Check whether the indoor/outdoor air inlet is blocked, such as whether the evaporator or condenser is dirty or whether the filter is dirty or blocked and if inlet is affected, reove the shield. 3. Check whether the air volume at the tuyere is too small, observe whether the internal fan blades are dirty blocked, and if dirty blocked blades are found, clean the blades. 4. Measure the resistance drift of the exhaust sensor with a multimeter at ambient temperature.

(24) P6–Indoor High Temperature Protection

Explanation of error	Cause: Protection shutdown due to temperature of indoor coil. Inspection path: indoor air inlet → indoor unit filter → indoor fan − indoor coil sensor
Tools required for inspection	Multimeter, pressure gauge, regular 20KΩ exhuast sensor (25℃)
Frequent problematic part	1. Check whether the indoor air inlet is blocked or not, if it affects the wind, remove the shield; 2.Check whether the filter is dirty or not. If dirty blockage is found in the filter, clean the filter. 3. Check if the air volume at teh tuyere is too small and if the indoor unit fan is blocked, if is, clean the fan. 4. Measure the drift of the inner disk sensor with a multimeter at ambient temperature.
Inspection procedure and key points	P6 usually refers to the high temperature protection of the internal heating coil due to poor air inlet.

(25) P7–Anti-freezing Protection in Refrigeration Room

Explanation of error	Cause: Protection shutdown due to temperature of indoor coil. Inspection path: indoor air inlet → indoor unit filter → indoor fan − indoor coil sensor
Tools required for inspection	Multimeter, pressure gauge, regular 20KΩ exhuast sensor (25℃)
Frequent problematic part	Indoor coil sensor
Inspection procedure and key points	1. Check whether the indoor air inlet is blocked or not, if it affects the wind, remove the shield; 2.Check whether the filter is dirty or not. If dirty blockage is found in the filter, clean the filter. 3. Check if the air volume at teh tuyere is too small and if the indoor unit fan is blocked, if is, clean the fan. 4. Measure the drift of the inner disk sensor with a multimeter at ambient temperature.
Special attention	P7 usually refers to the anti-freezing protection of the refrigeration room due to poor air inlet.

(26) P8–Overcurrent Protection

Explanation of error	Cause: Controller detects AC bus current exceeding the set protection value, then limits and reduces the frequency. Inspection path: system blockage → grid voltage→ outdoor unit controller
Tools required for inspection	Multimeter, pressure gauge
Frequent problematic part	Grid voltage and outdoor unit controller
Inspection procedure and key points	1. Use a mutlimeter to detect and check if the bus voltage is too low, causing the overcurrent protection. 2. Use a pressure gauge to check whether the pressure of the system exceeds the standard. If the pressure exceeds the standard, it may lead to dirty blockage of the system. 3. Replace the outdoor unit controller and if the unit returns to normal, it is the problem of the controller.
Special attention	Generally, such protection occurs at high load, but should not occur at low load and low temperature, and the priority of this protection is after the protection of refrigeration against overload and exhaust.

（27）Function protection prompt of frequency conversion external machine

Explanation of error	**Cause:** In the regular running of the air conditioner, for some nonfaulted status, it may need the compressor to shut down or limit or lower the frequency so as to protect the normal operating of the entire cooling system (eg. defrosting, slight undercooling, over pressure, overcurrent, etc.). These problems are not considered as errors and would not be reflected in the internal machine, however as to make sure the maintenance personnel is familar with the running status of the air conditioner, three indicator lights are used on the main external control panel for reference of the maintenance personnel. **Including:** over current protection, cooling overload protection, indoor heating high temperature protection, indoor cooling freezing protection, over pressure and under pressure protection.
Tools required for inspection	Multimeter.
Frequent problematic part	Regular protection, system blockage, power supply not as usual, resistance value of sensor drifts or is used wrong.
Inspection procedure and key points	1. Defrosting: with a defrosting signal, meaning the air conditioner is under defrosting procedure and it is normal, but if there is frequent defrosting, it shall be specifically noted if heat exchange of the external unit is faulted, if the fan revolving speed is low and if the resistance value of the coil sensor is drifted or the temperature is inaccurately measured or it is damaged. 2. Over current protection: it is more possible to appear under high temperature cooling status and the over current of compressor is usually reflected by over high load of the compressor. It is normal if such protection appears under a very high temperature cooling status but not under low temperature low load status. 3. Cooling overload protection: it is more possible when the frequency conversion machine is under a high temperature cooling status. When the outdoor coil sensor senses the temperature is too high, as to provent the compressor from overload, it would possitively lower the frequency and it is normal for the protection under the high temperature cooling status. 4. Indoor high temperature heating protection: it is more possible when the frequency conversion machine is under a high temperature heating status. When the indoor coil sensor senses the temperature is too high, as to provent the compressor from overload, it would possitively lower the frequency and it is normal for the protection in a warm room. 5. Indoor cooling freezing protection: it is more possible to appear under a low temperature cooling status. When the indoor coil sensor senses the temperature is too low, as to prevent the heat exchanger of the internal machine from frosting, it would possitively lower the frequency and it is normal for the protection in a low temperature room.

	6. Over or under pressure protection: this protection is a pilot protection for the "over or under pressure error". When the power pressure is too high or too low but not so high or so low to reach limit for shutting down (within 165V-265V), it would limit and lower the frequency first to reduce the air conditioner's needs for the power to keep teh air conditioner running. This protection is for the adaption to a unstable power environment and when there is such protection prompt, it usually means it is possible for "OVP and UVP error" and the maintenance personnel shall especially note. 7. Cooling overload protection, indoor high temperature heating protection and indoor coolign freezing protection are also possible related to the drift of the resistance value of the sensor.

(28) Troubleshooting Guide on Category-L Failures (Subdivided Failures)

Category-L failures are actually the subdivided failures of F1. For the convenience of fast troubleshooting in the after-sales service, the actual troubleshooting methods are consistent with F1.

No.	Failure Code	Failure Name	Primary Troubleshooting Parts
1	L0	DC Over/Under-voltage Failure	Outdoor unit controller / power grid
2	L1	Overcurrent Protection on Phase Current of Compressor	Outdoor unit controller / power grid / compressor / compressor wire
3	L2	Out-of Step Failure of Compressor	Outdoor unit controller / power grid / compressor / system pressure
4	L3	Phase Failure of Compressor	Outdoor unit controller / power grid / compressor / compressor wire
5	L4	Driver Module IPM Failure of Compressor	Outdoor unit controller / power grid / compressor
6	L5	PFC Overcurrent Hardware Protection	Outdoor unit controller / power grid
7	L6	PFC Overcurrent Software Protection	Outdoor unit controller / power grid
8	L7	AD Abnormal Protection in Current Detection	Outdoor unit controller
9	L8	Shunt Resistance Imbalance Failure	Outdoor unit controller
10	L9	IPM Temperature Sensor Failure	Outdoor unit controller
11	LA	Compressor Startup Failure	Outdoor unit controller / power grid / compressor / compressor wire
12	LC	AD Abnormal Protection in PFC Current Detection	Outdoor unit controller

7-2 Display error code of outdoor unit's indicator lights

Display by the 3 LED indicator lights on the control panel of the outdoor unit:
○ for off; ● for on; ★ for flashing.

No.	LED1	LED2	LED3	Error Name	Probable Trouble Location
1	○	○	○	Normal (outdoor unit standby)	Normal, all three lights off for standby status.
2	★	★	★	Normal (compressor running)	Normal, all three lights flash while compressor running.
3	●	●	●	Forced service (test mode)	Normal
4	★	★	●	Module protection error	Power voltage, compressor cable, reactor, module panel, main external control panel, compressor.
5	★	★	○	PFC protection error	Power voltage, reactor, module panel, main external control panel.
6	★	●	★	Compressor out-of-step error	Power voltage, compressor cable, module panel, main external control panel, compressor.
7	★	○	★	Exhaust air sensor error	System pressure, exhaust air sensor, main external control panel.
8	●	★	★	External coil sensor error	External coil sensor, main external control panel.
9	○	★	★	External room temperature sensor error	External room temperature sensor, main external control panel.
10	★	●	●	Indoor and outdoor unit communication error	Connection wire, main internal control panel, main external control panel, EE reverse connection, module panel.
11	★	●	○	Main external control panel and module panel communication error	Connection wire of module and main control data, module panel, main external control panel
12	★	○	●	Outdoor EE error	Main external control panel
13	★	○	○	Outdoor DC fan error	Mechanical jam of external fan, external DC fan, main external control panel.
14	●	★	●	Internal room temperature	Internal room temperature sensor, main internal control panel.

				sensor error	
15	●	★	○	Internal coil sensor error	Internal coil sensor, main internal control panel.
16	○	★	●	Indoor fan error	Mechanical jam of fan, internal fan, main internal control panel.
17	○	★	○	Refer to tooling display for other errors	Entire set of external controller.
18	●	●	★	Compressor cap sensor error	System pressure, compressor cap sensor (protection switch), main external control panel.
19	●	○	★	Recirculated sensor error	Recirculated sensor, four-way valve switch error, main external control panel.
20	○	●	★	※ Compressor overpower protection	Power voltage, module panel, main external control panel.
21	○	○	★	※ Over current protection	Power voltage, system pressure, module panel, main external control panel.
22	●	●	○	Exhaust sensor error	System pressure, exhaust sensor, main external control panel.
23	●	○	●	※ Cooling overload protection	Condenser, external fan, capillary, external coil sensor, main external control panel.
24	○	●	●	※ Indoor high temperature heating protection	Evaporator, internal fan, thin unit connection pipe, internal coil sensor, main internal control panel.
25	●	○	○	※ Indoor cooling freezing protection	Evaporator, internal fan, capillary, internal coil sensor, main internal control panel.
26	○	●	○	Compressor shell temperature protection	Same as "18 Compressor cap sensor error".
27	○	○	●	※ OVP or UPV error	Power voltage, reactor, module panel, main external control panel.

7-3 Troubleshooting for Normal Malfunction

➢ The Foremost Inspecting Items

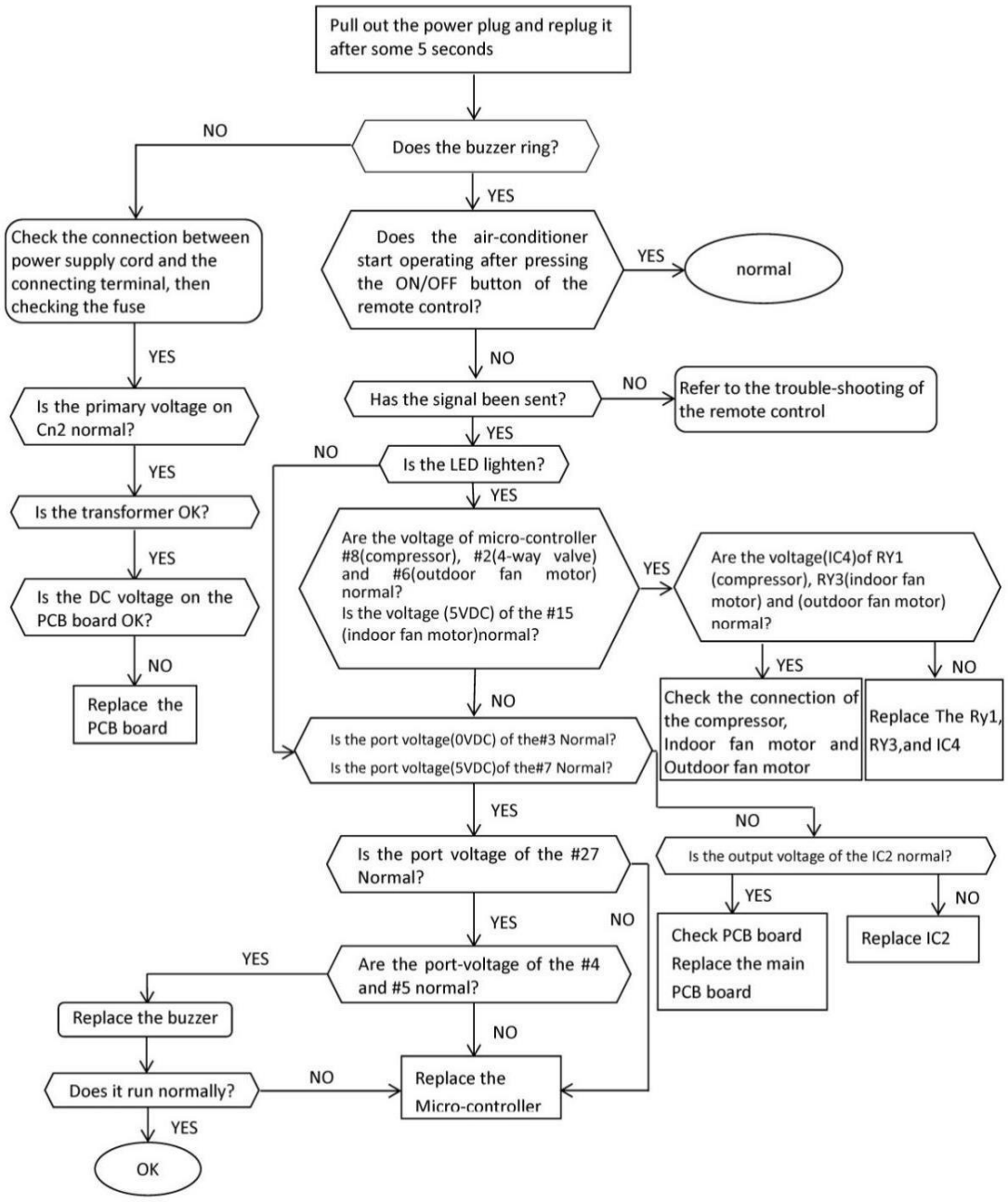
① The input voltage must be within +10% tolerance of the rated Voltage. If it is not the case, the air-conditioner will probably not work normally.
② Check the connecting cord between indoor unit and outdoor unit to see if it is properly connected. The connecting must be done according to the wiring diagram, please also notice that even different models may have the connecting cord of the same specification. Please check if the marks at the connecting terminal and the marks on the cord can match, otherwise, the air-conditioner will not work normally.
③ If the following phenomena are found, the problem is not from the air-conditioner itself.

NO.	Problems	Causes
1	The motor is heard operating but the air-conditioner does not work when the indoor unit is powered on	Since the air-conditioner is powered on, it will come to working condition as long as you press the ON/OFF button of the remote control and the Signal is well received.
2	The compressor stops running but the indoor fan motor keeps working when it is at cooling mode with the indoor temperature higher than set temperature.	If you turn off the air-conditioner and restart it immediately, it will return to normal in 3 minutes, after that, the air-conditioner will automatically adjust the indoor fan speed to what you set.
3	The compressor works discontinuously at dehumidifying mode.	The air-conditioner will automatically control the working of the compressor according to the inside temperature.
4	The air-conditioner does not work while the LED display is on.	The TIMER is set with the A/C; it will be in hold on condition. If the TIMER setting is cancelled, the air-conditioner will return to normal working condition.
5	The compressor works discontinuously at cooling and dehumidifying mode, and the indoor fan motor slows down.	The compressor stops internally or the fan motor slows down to prevent the indoor heat exchanger from being frozen.

➢ Fault Diagnosis by Symptom

①No Power Display

(1) Items
a) Check if the input voltage is correct?
b) Check if the AC power supply connecting is correct?
c) Check if the output voltage of the manostat L7805 (IC2) is correct?
(2) Trouble shooting procedure



②The Indoor Fan Motor Does Not Work

(1) Items

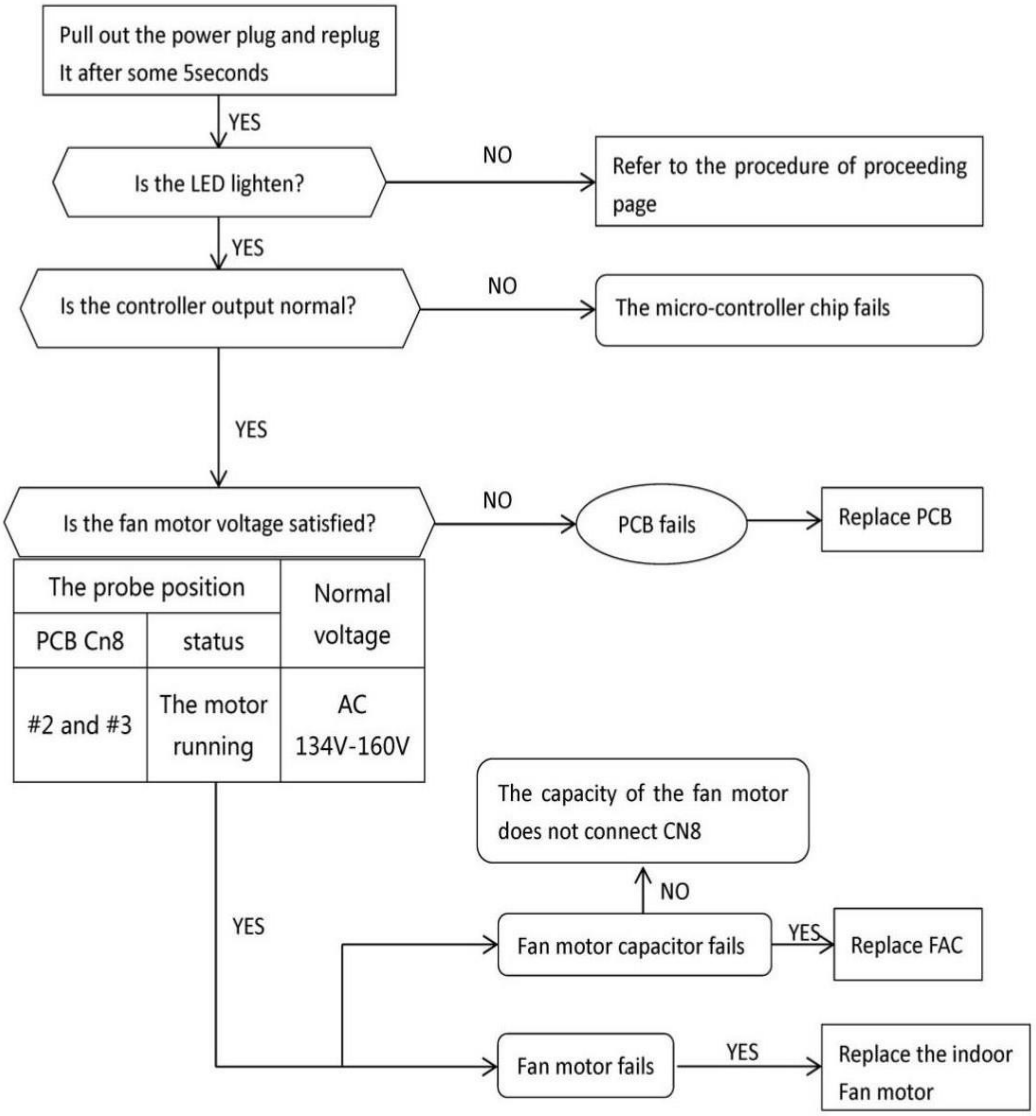
a) Check if the indoor fan motor is connected correctly to the connector (CN8)?

b) Check if the AC input voltage is correct?

c) Check if the IC of indoor fan motor is connected correctly to the connector (CN2)?

d) Check if the capacity of indoor fan motor is connected correctly to the connector (CN8)?

(2) Trouble shooting procedure



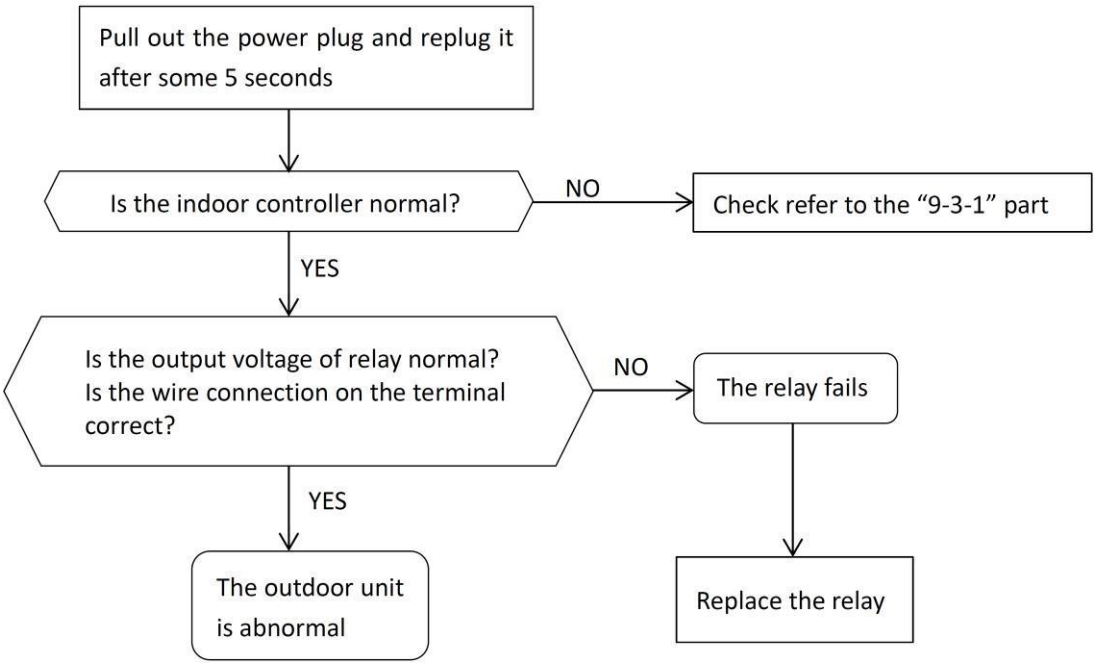
③The Outdoor Unit Does Not Work

(1) Items

a) Check if the input voltage is correct?

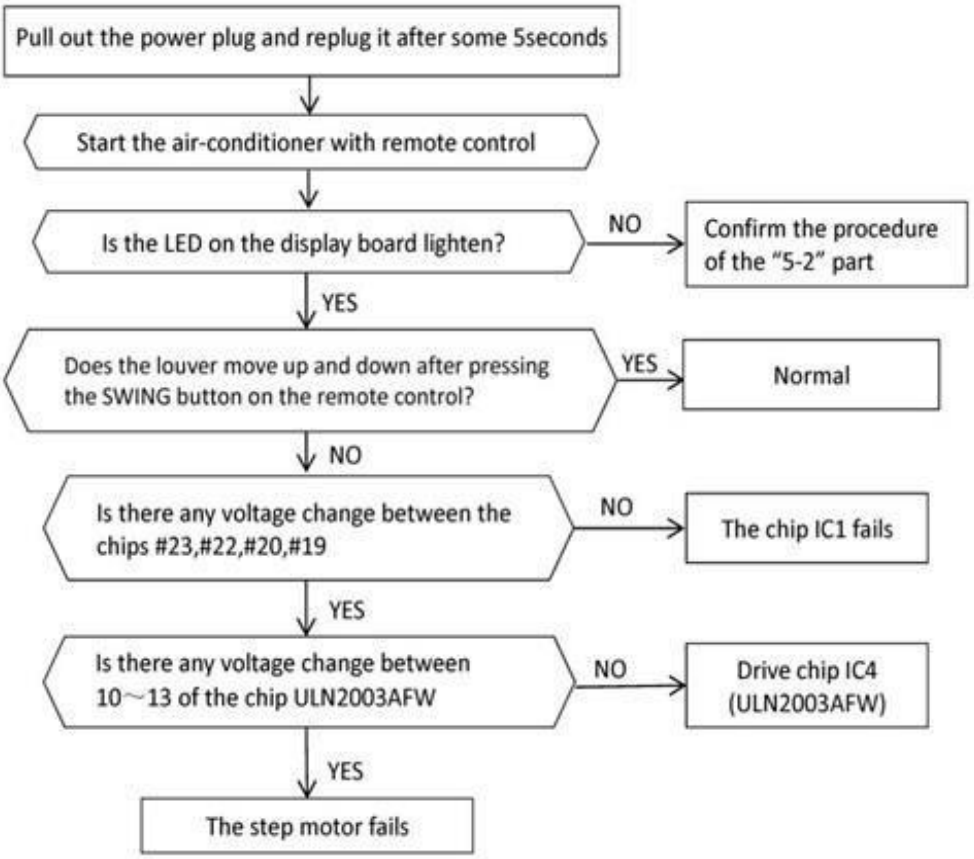
b) Check if the wire connection of the outdoor connecting terminal is correct?

(2) Trouble shooting procedure



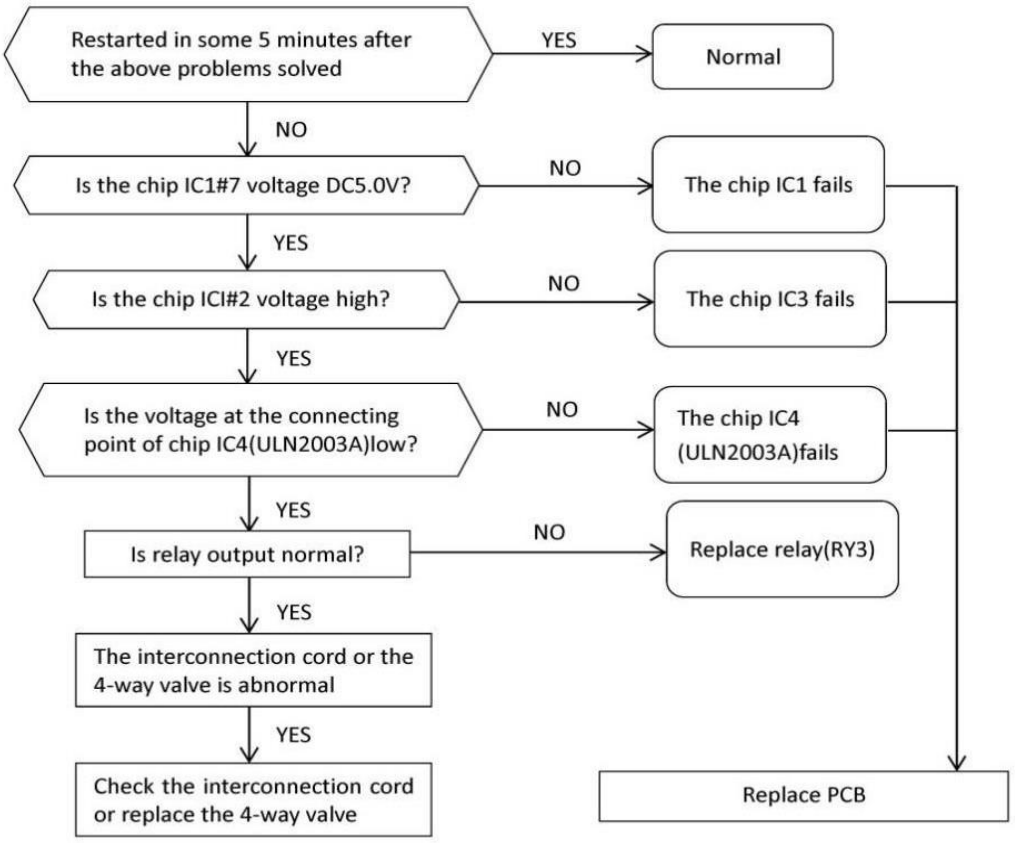
④The Step Motor Does Not Work

(1) Items
a) Check if the input voltage is correct?
b) Check if the step motor controlling the up-down movement firmly connected to Cn2?
(2) Trouble shooting procedure



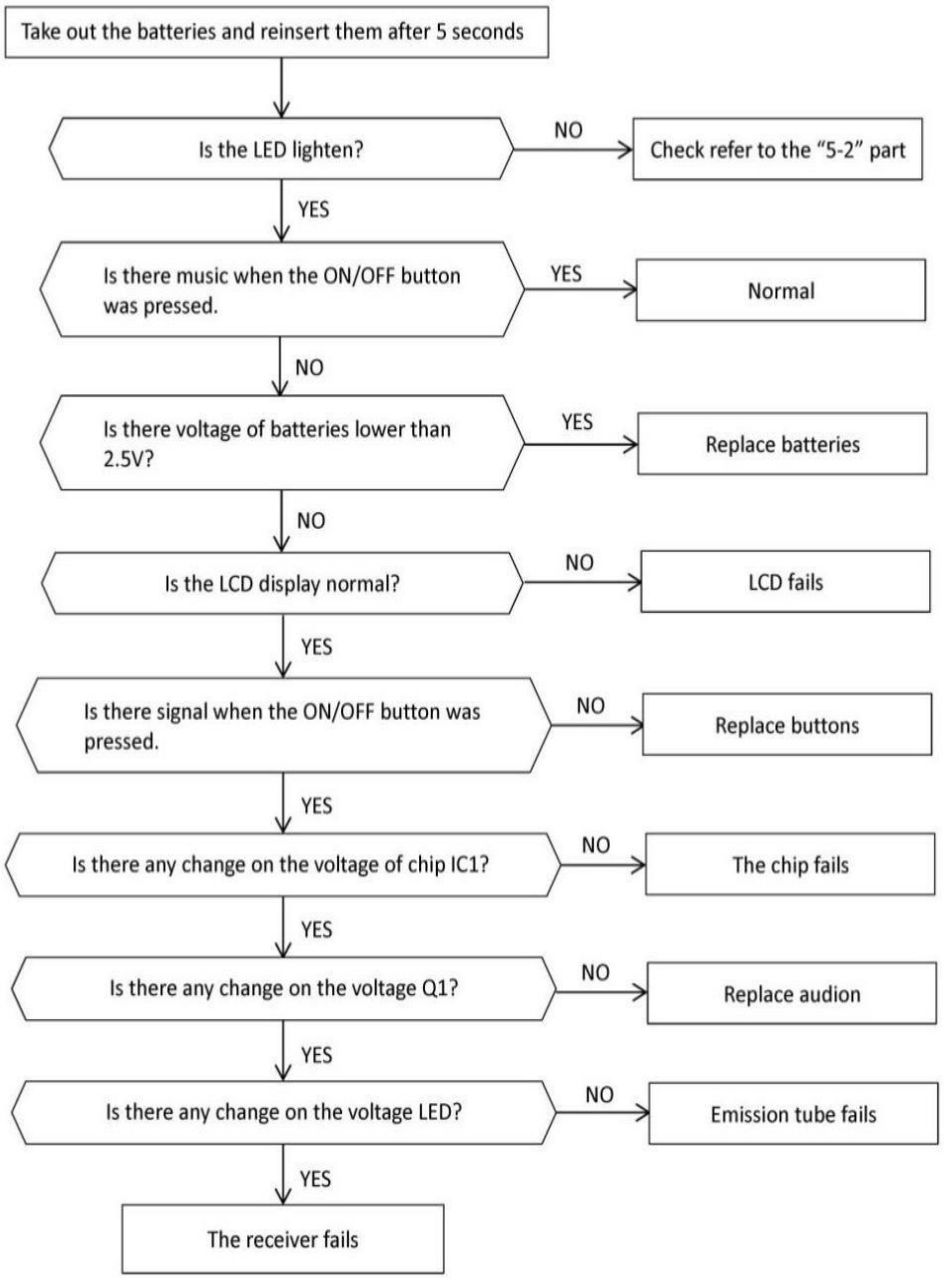
⑤Heating Mode Can Work, But No Hot Air Blow

(1) Check if the set temperature is lower than the indoor temperature?
(2) Check if the indoor PCB is connected to the terminal correctly?



⑥ Remote Control Can Not Work

Trouble shooting procedure



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