40MBFAQ
Floor Console Ductless System
Size 12K

Service Manual

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SAFETY CONSIDERATIONS

Installing, starting up, and servicing air-conditioning equipment can be hazardous due to unit pressures, electrical components, and equipment location (roofs, elevated structures, etc.).

Only trained, qualified installers and service mechanics should install, start-up, and service this equipment.

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

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

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

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

Recognize safety information. This is the safety-alert symbol ⚠ . When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury. Understand these signal words: **DANGER**, **WARNING**, and **CAUTION**.

These words are used with the safety-alert symbol. **DANGER** identifies the most serious of hazards which will result in severe personal injury or death. **WARNING** signifies hazards which could result in personal injury or death. **CAUTION** is used to identify unsafe practices which may result in minor personal injury or product and property damage. **NOTE** is used to highlight suggestions which will result in enhanced installation, reliability, or operation.

⚠ WARNING

ELECTRICAL SHOCK HAZARD
Failure to follow this warning could result in personal injury or death. Before installing, modifying, or servicing the unit, the main electrical disconnect switch must be in the **OFF** position. There may be more than 1 disconnect switch. Lock out and tag the switch with a suitable warning label.

⚠ WARNING

EXPLOSION HAZARD
Failure to follow this warning could result in death, serious personal injury, and/or property damage.

Never use air or gases containing oxygen for leak testing or operating refrigerant compressors. Pressurized mixtures of air or gases containing oxygen can lead to an explosion.

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD
Failure to follow this caution may result in equipment damage or improper operation. **DO NOT** bury more than 36 in. (914 mm) of refrigerant pipe in the ground. If any section of pipe is buried, there must be a 6 in. (152 mm) vertical rise to the valve connections on the outdoor units. If more than the recommended length is buried, refrigerant may migrate to the cooler buried section during the extended periods of unit shutdown. This causes refrigerant slugging and could possibly damage the compressor at start-up.

INTRODUCTION

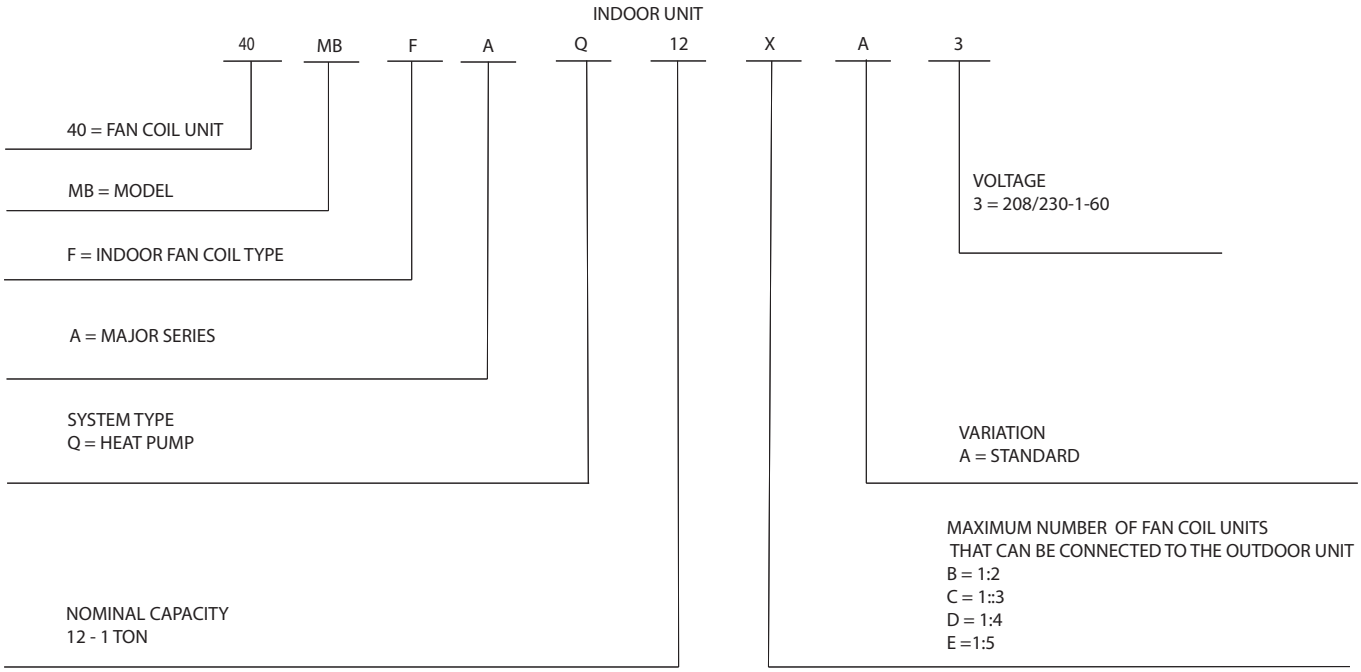
This service manual provides the necessary information to service, repair, and maintain the indoor units. This manual has an appendix (see "APPENDICES" on page 49 for data needed to perform troubleshooting). Use the Table of Contents to locate a desired topic.

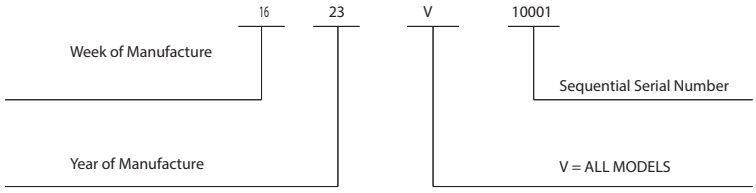
INDOOR UNIT SIZES

Table 1 — Indoor Unit Size

KBTUH	V-PH-HZ	MODEL NO.
12	208/230-60	40MBFAQ12XA3

MODEL NUMBER NOMENCLATURE





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

ELECTRICAL DATA

Table 2 — Electrical Data

INDOOR UNIT	INDOOR FAN				MAX FUSE CB AMP
	V-PH-HZ	FLA (A)	HP	SYSTEM POWER FACTOR (%)	
12K	208-230/1/60	0.5	1/55	95.6	Refer to outdoor unit installation instructions. Indoor unit is powered by the outdoor unit.

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

LEGEND
FLA - Full Load Amps

WIRING

All wires must be sized per NEC (National Electrical Code) or CEC (Canadian Electrical Code) and local codes. Use Electrical Data table MCA (minimum circuit amps) and MOCP (maximum over current protection) to correctly size the wires and the disconnect fuse or breakers respectively.

Recommended Connection Method for Power and Communication Wiring:

The main power is supplied to the outdoor unit. The field supplied 14/3 stranded wire with ground with a 600 volt insulation rating, power/ communication wiring from the outdoor unit to indoor unit consists of four (4) wires and provides the power for the indoor unit. Two wires are line voltage AC power, one is communication wiring (S) and the other is a ground wire. Wiring between indoor and outdoor unit is polarity sensitive. The use of BX wire is NOT recommended.

If installed in a high Electromagnetic field (EMF) area and communication issues exists, a 14/2 stranded shielded wire can be used to replace L2 and (S) between outdoor unit and indoor unit landing the shield onto ground in the outdoor unit only.

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

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

Wires should be sized based on NEC and local codes.

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

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

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

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

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

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

CONNECTION DIAGRAMS

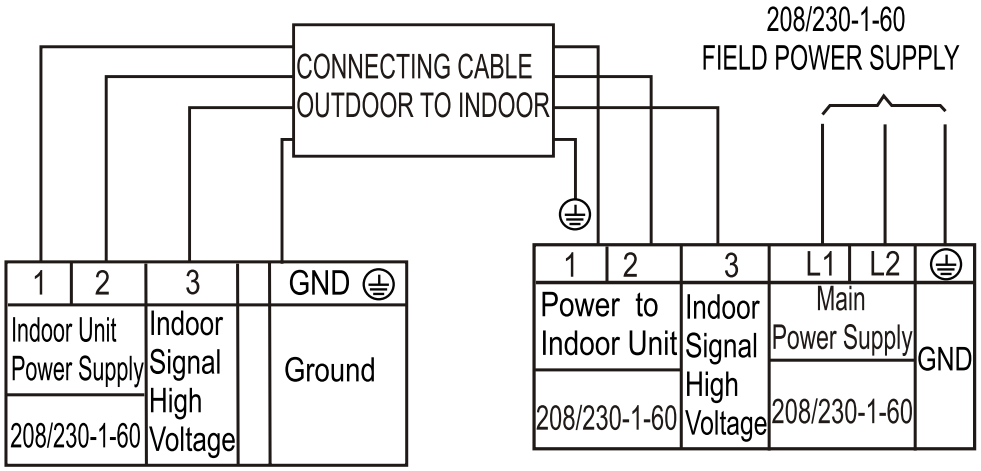


Fig. 1 — Connection Diagram - Size 12K

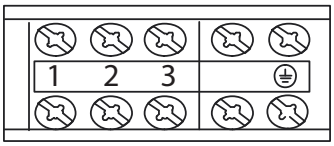


Fig. 2 — Control and Power Wiring

WIRING DIAGRAM

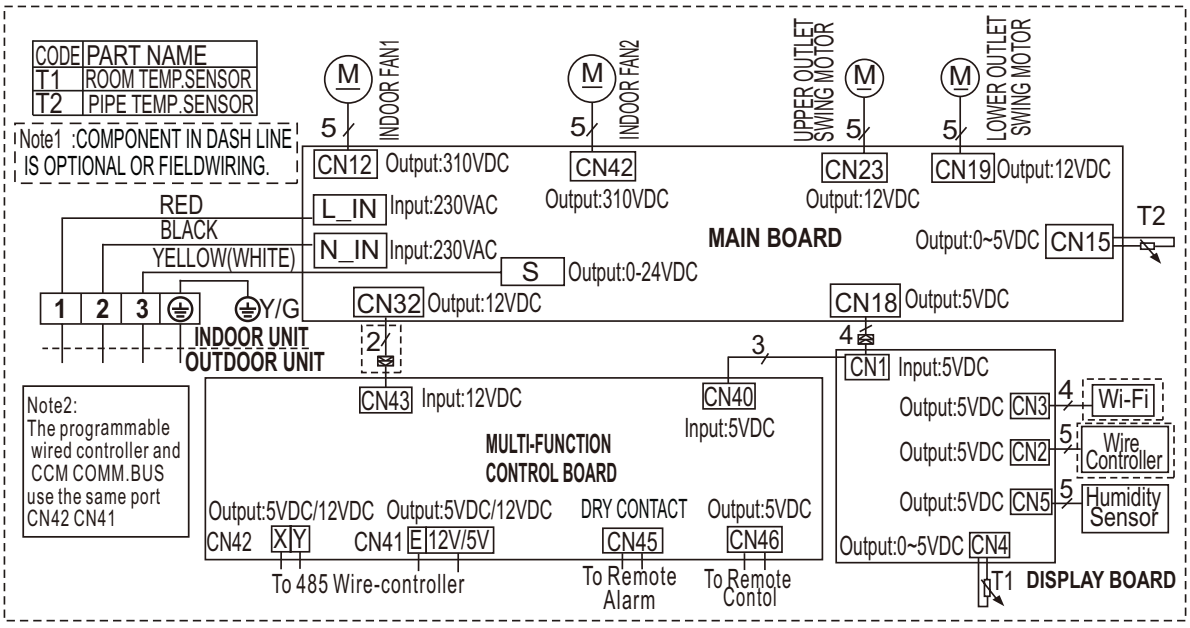


Fig. 3 — Wiring Diagram - Size 12K

REFRIGERANT CYCLE DIAGRAM

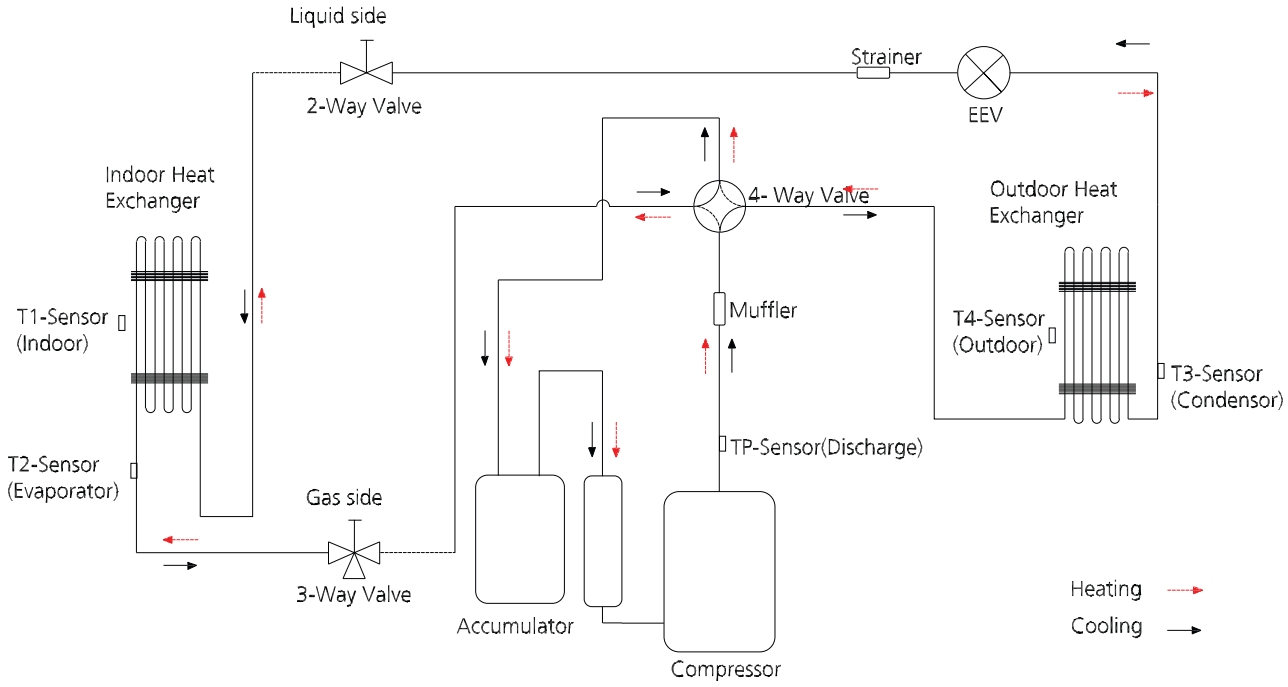


Fig. 4 — Refrigerant Cycle Diagram - Size 12K

Refrigerant Lines

General refrigerant line sizing:

1. The outdoor units are shipped with a full charge of R410A refrigerant. All charges, line sizing, and capacities are based on runs of 25 ft. (7.6 m). For runs over 25 ft. (7.6 m), review the product data.
2. Minimum refrigerant line length between the indoor and outdoor units is 10 ft. (3 m).
3. Refrigerant lines should not be buried in the ground. If it is necessary to bury the lines, not more than 36 in. (914 mm) should be buried. Provide a minimum 6 in. (152 mm) vertical rise to the service valves to prevent refrigerant migration.
4. Both lines must be insulated. Use a minimum of 1/2 in. (12.7 mm) thick insulation. Closed-cell insulation is recommended in all long-line applications.
5. Special consideration should be given to isolating the interconnecting tubing from the building structure. Isolate the tubing so vibration or noise is not transmitted into the structure.
6. For piping runs greater than 25 ft. (7.6 m), add refrigerant up to the allowable length as specified in the product data.

SYSTEM EVACUATION AND CHARGING

CAUTION

UNIT DAMAGE HAZARD

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

Never use the system compressor as a vacuum pump.

Refrigerant tubes and indoor coil should be evacuated using the recommended deep vacuum method of 500 microns. The alternate triple evacuation method may be used if the following procedure is followed. Always break a vacuum with dry nitrogen.

System Vacuum and Charge

Using Vacuum Pump

1. Completely tighten the flare nuts (A, B, C, D, E). Fully open all circuits service valves. Connect the manifold gage charge hose to the charge port of the low side Master service valve to evacuate all circuits at the same time (see Fig. 5).
2. Connect the charge hose to the vacuum pump.
3. Fully open the low side of the manifold gage (see Fig. 6).
4. Start the vacuum pump.
5. Evacuate using the triple evacuation method.
6. After evacuation is complete, fully close the low side of the manifold gage and stop the vacuum pump operation.
7. The factory charge contained in the outdoor unit is good for up to 25 ft. (8 m) of line length.
8. Disconnect the charge hose from the charge connection of the low side service valve.
9. Fully open the service valves (B and A).
10. Securely tighten the service valve caps.

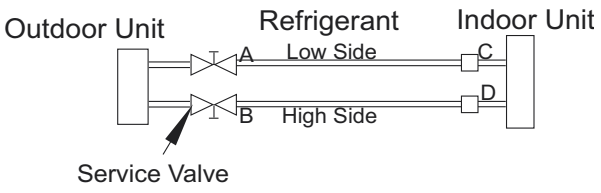


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Fig. 5 — Service Valve

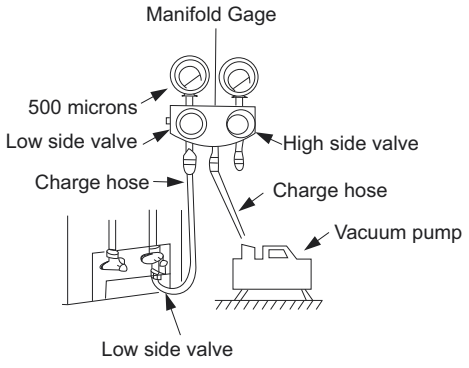

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Fig. 6 — Manifold

Deep Vacuum Method

The deep vacuum method requires a vacuum pump capable of pulling a vacuum of 500 microns and a vacuum gage capable of accurately measuring this vacuum depth. The deep vacuum method is the most positive way of ensuring a system is free of air and liquid water (see Fig. 7).

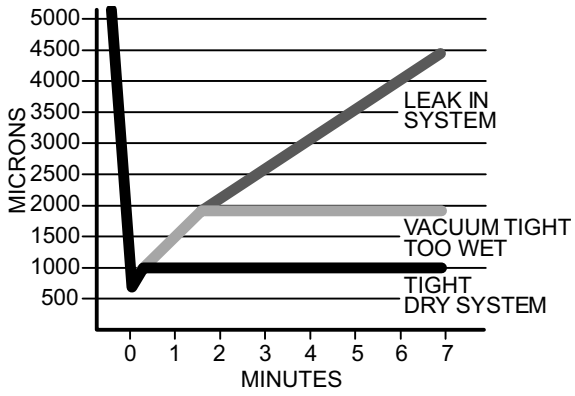

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Fig. 7 — Deep Vacuum Method

Triple Evacuation Method

The triple evacuation method should be used. Refer to Fig. 8 and proceed as follows:

1. Pump the system down to 1500 microns and allow the pump to continue operating for an additional 15 minutes.
2. Close the service valves and shut off the vacuum pump.
3. Connect a dry nitrogen cylinder and regulator to the system and break vacuum until the system reaches 2 psig.
4. Close the service valve and allow the system to stand for one hour. During this time, the dry nitrogen can diffuse throughout the system absorbing moisture.
5. Pump the system down to 1000 microns.
6. Break the vacuum with dry nitrogen (2 psig).
7. Pump the system down to 500 microns.
8. Perform the hold test for 30 minutes.

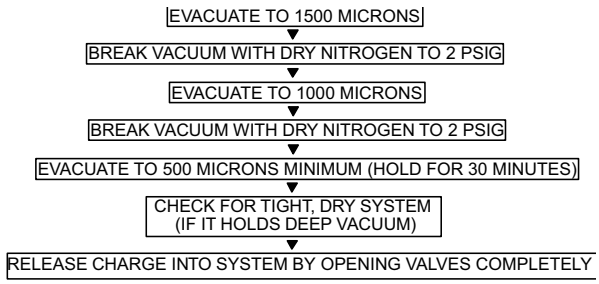

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Fig. 8 — Triple Evacuation Method

Final Tubing Check

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

Main Protection

Fan Speed is Out of Control

When the indoor fan speed remains too low (lower than 300RPM) for 50 seconds, the indoor fan will shut off then restarts 30 seconds later. If protection occurs three times when the fan motor restarts continuously, the unit stops and the LED displays the failure.

When the outdoor fan speed remains too low (lower than 100 RPM) or too high (higher than 1500 RPM) for 60 seconds, the unit stops and the LED displays the failure. The malfunction is cleared 30 seconds later.

Evaporator low temperature T2 protection

- T2 < 32°F (0°C), the compressor stops and restarts when T2 ³ 41°F (5°C).
- 32°F (0°C) ≤ T2 < 39.2°F (4°C), the compressor frequency is limited and decreased to the lower level.
- 39.2°F (4°C) ≤ T2 ≤ 44.6°F (7°C), the compressor maintains the current frequency
- T2 > 44.6°F (7°C), the compressor frequency is not limited.

Operation Modes and Functions

FAN Mode

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

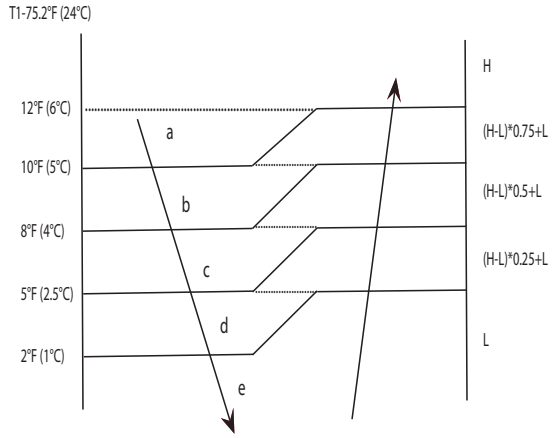

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Fig. 9 —Auto Fan

COOLING Mode

Indoor Fan Running Rules

In the **COOLING** mode, the indoor fan runs constantly and either speed (**high**, **medium**, **low** or **auto**) can be selected. When the setting temperature is reached, if the compressor stops running, the indoor fan motor runs at the minimum or setting speed. The indoor fan is controlled by the rules shown in Fig. 10.

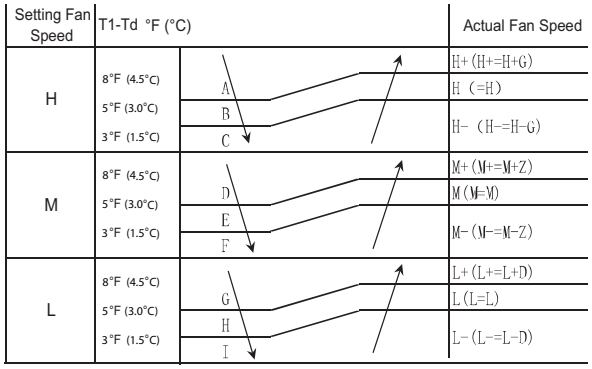

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Fig. 10 — Indoor Fan Running Rules

The **AUTO** fan is controlled by the rules shown in Fig. 11.

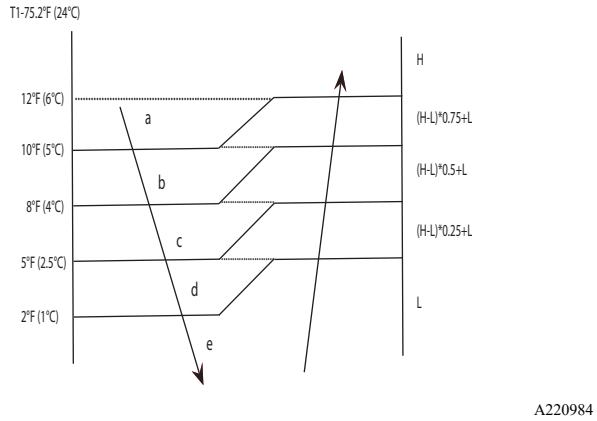


Fig. 11 — Indoor Fan Running Rules

Evaporator Temperature Protection

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

HEATING Mode

Indoor Fan Running Rules

When the compressor is on, the indoor fan can be set to high/med/low/ auto/mute. When the indoor unit coil temperature is low, the anti-cold air function starts and the indoor fan motor runs at a low speed and the speed can not be changed. When the temperature is lower than the setting value, the indoor fan motor stops.

When the indoor temp reaches the setting temperature, the compressor stops and the indoor fan motor runs at the minimum or setting speed (the anti-cold air function is valid). The indoor fan is controlled by the rules shown in Fig. 12.

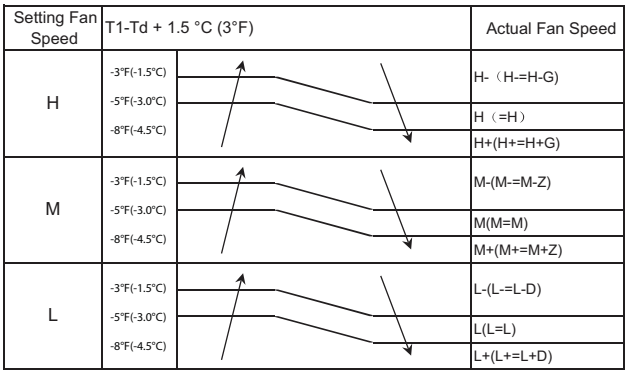


Fig. 12 — Indoor Fan Running Rules

Auto Fan Action in HEATING Mode

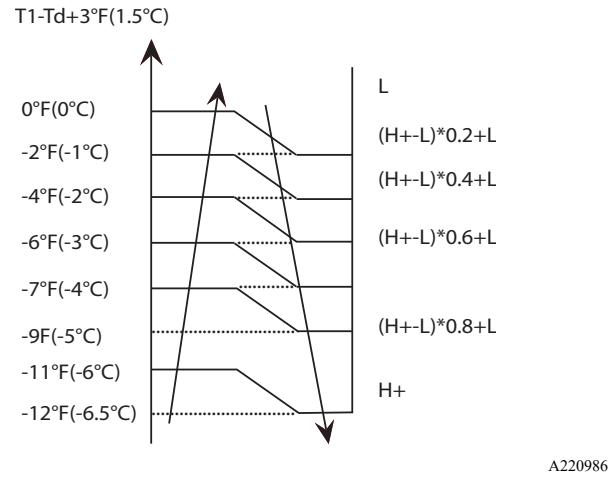


Fig. 13 — Auto Fan Action in HEATING Mode

DEFROST Mode

If any one of the following items is satisfied, the unit enters the **DEFROST** mode. After the compressor starts and runs, mark the minimum value of T3 from the 10th minute to the 15th minute as T30.

1. If the compressor runs for 29 minutes and **T3 < TCDI1, T3 ＋ T30SUBT3ONE ≦ T30**.
2. If the compressor runs for 35 minutes and **T3 < TCDI2, T3 ＋ T30SUBT3TWO ≦ T30**.
3. If the compressor runs for 29 minutes. and **T3 < TCDI3** for three minutes.
4. If the compressor runs for 120 minutes and **T3 < 5°F** (−15°C).

Defrost End

If any one of the following items is satisfied, the **DEFROST** mode ends and the machine reverts to the normal **HEATING** mode.

- T3 increases to a point higher than TCDE1.
- T3 maintains a point higher than TCDE2 for 80 seconds.
- Unit runs for 10 minutes in **DEFROST** mode.

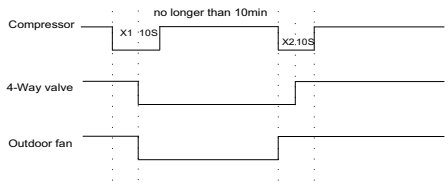


Fig. 14 — Defrost Action

Evaporator Coil Temperature Protection

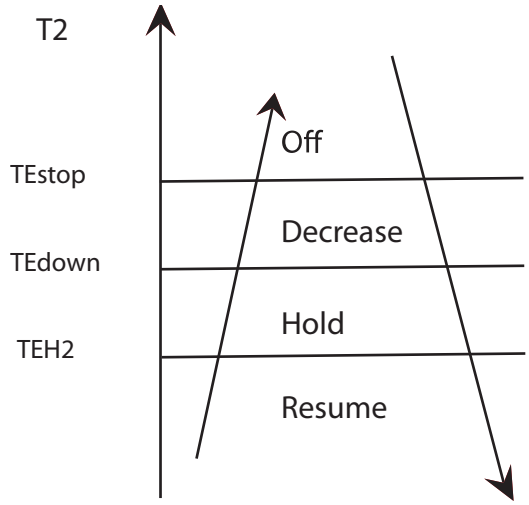


Fig. 15 — Evaporator Coil Temperature Protection

NOTE:

- **Off** − Compressor stops
- **Decrease** − Decrease running frequency to lower level
- **Hold** − Maintain the current frequency
- **Resume** − No frequency limit

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

Auto-Mode

This mode can be chosen with the remote control and the setting temperature can be changed between 62°F (17°C)~86°F (30°C).

In **AUTO** mode, the unit chooses the **COOLING**, **HEATING** or **FAN-ONLY** mode according to DT (DT =T1.Ts).

Table 3 — Auto Mode

ΔT=T1−Ts	Running Mode
ΔT>4°F (2°C)	Cooling
- 4 (-2°C) ≤ ΔT≤2°C (4°F)	Fan-Only
ΔT<-2°C (4°F)	Heating

The indoor fan runs under **AUTO** fan in the relevant mode. The louver operates the same as in the relevant mode. If the unit switches between the **HEATING** and **COOLING** modes, the compressor stops for 15 minutes and then chooses the mode according to T1−Ts. If the setting temperature is modified, the unit chooses the running function again.

DRYING Mode

Indoor Fan Speed is Fixed

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

Low Indoor Room Temperature Protection

In the **DRYING** mode, if the room temperature is lower than 50°F (10°C), the compressor stops and will not resume until the room temperature exceeds 53.6°F (12°C).

Timer Function

Timing range is 24 hours

- **TIMER ON:** The unit turns on automatically when reaching the setting time.
- **TIME OFF:** The unit turns off automatically when reaching the setting time.
- **TIMER ON/OFF:** The unit turns on automatically when reaching the setting “on” time, and then turns off automatically when reaching the setting “off” time.
- **TIMER OFF/ON:** The unit turns off automatically when reaching the setting “off” time, and then turns on automatically when reaching the setting “on” time.

The timer function will not change the unit’s current operation mode. Suppose the unit is off now; it will not start up first after setting the **TIMER OFF** function. When the setting time is reached, the timer **LED** turns off and the unit’s running mode is the same. The setting time is relative time. The unit exits the timer function if it experiences a malfunction.

Sleep Function

The **SLEEP** function is available in the **COOLING**, **HEATING** or **AUTO** mode.

The Operation process in the **SLEEP** mode is as follows:

- **When cooling, the setpoint rises 2°F (1°C) (to a maximum of 86°F (30°C) every one hour. Two (2) hours later, the room temperature stops rising and the indoor fan remains at a low speed.**
- **When heating, setpoint decreases 2°F (1°C) (to a minimum of 62°F (17°C) every one hour. Two (2) hours later, the setpoint stops decreasing and the indoor fan is set at the low speed.**

(**Anti−Cold** wind function has the priority).

Operation time in the **SLEEP** mode is seven (7) hours. After seven (7) hours, the unit exits the **SLEEP** mode and powers off.

FORCED OPERATION Function

When the unit is off, press **TOUCH** to engage the **FORCED AUTO** mode. Press **TOUCH** again within five seconds to engage the **FORCED COOLING** mode. In the **FORCED AUTO**, **FORCED COOLING** or any other operation mode, press **TOUCH** to turn off the unit.

FORCED OPERATION Mode

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

Operation Rules

FORCED COOLING Mode

The compressor runs at the F2 frequency and the indoor fan runs in the **BREEZE** mode. After running for 30 minutes. the machine enters **AUTO** mode at the 75.2°F (24°C) setting temperature.

FORCED AUTO Mode:

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

AUTO−RESTART Function

The indoor unit is equipped with an **AUTO−RESTART** function, which is carried out through an auto−restart module. In the event of a sudden power failure, the module memorizes the setting conditions prior to the power failure. The unit resumes the previous operation setting (not including the **SWING** function) automatically three (3) minutes after the power returns.

If the memorization condition is the **FORCED COOLING** mode, the unit runs in the **COOLING** mode for 30 minutes and switches to the **AUTO** mode at the 75°F (24°C) setpoint. If the unit is off before the power turns off and the unit is required to start up, the compressor delays the start up for 1 minute before powering on. In other instances, the compressor waits three (3) minutes before restarting.

FOLLOW ME

If the indoor PCB receives the signal, which results from pressing **FOLLOW ME** on the remote controller or wired remote controller, the buzzer emits a sound which indicates the **FOLLOW ME** function is initiated. However, when the indoor PCB receives a signal from the remote controller every three minutes, the buzzer will not respond. When the unit is running with the **FOLLOW ME** function, the PCB will control the unit according to the temperature from the **FOLLOW ME** signal, and the temperature collection function of the room temperature sensor is shielded.

When the **FOLLOW ME** function is available, the PCB controls the unit according to the room temperature from the remote controller and the setting temperature. The PCB changes the mode based on information from the remote controller signal, however it is not affected by the setting temperature.

If the unit is running under the **FOLLOW ME** function and the PCB does not receive a signal from the remote controller for seven minutes or after pressing **FOLLOW ME** again, the **FOLLOW ME** function turns off automatically, and the temperature controls the unit according to the room temperature detected from its own room temperature sensor and setting temperature.

Refrigerant Leak Detection

With this new technology, the display area displays **"EC"** when the outdoor unit detects a refrigerant leak. This function is only active in the **COOLING** mode. This function helps to prevent the compressor from being damaged by a refrigerant leak or a compressor overload.

- **Open Condition:** When the compressor is running, the value of the T2 coil temperature sensor has no to very little change.

46°F (8°C) Heating

When the compressor is running, the indoor fan motor runs without the **ANTI-COLD** air function. When the compressor is off, the indoor fan motor is off.

Silence Operation

Press **SILENCE** on the remote control to initiate the **SILENCE** function. When the **SILENCE** function is activated, the compressor running frequency remains lower than **F2** and the indoor unit emits a faint breeze, which reduces the noise to the lowest level and creates a quiet and comfortable space for the user.

Point Check Function

Press **LED DISPLAY** or **AIR DIRECTION** to check the next or front item's information. When the air conditioner enters the Information Enquiry status, it displays the code name in two seconds (see Table 4).

Table 4 — Information Enquiry

ENQUIRY INFORMATION	DISPLAYING CODE	MEANING
T1	T1	T1 temp.
T2	T2	T2 temp.
T3	T3	T3 temp.
T4	T4	T4 temp.
T2B	Tb	T2B temp.
T5	T5	T5 temp.
TH	TH	TH temp.
Targeted Frequency	FT	Targeted Frequency
Actual Frequency	Fr	Actual Frequency
Indoor fan speed	IF	Indoor fan speed
Outdoor fan speed	OF	Outdoor fan speed
EXV opening angle	LA	EXV opening angle
Compressor continuous running time	CT	Compressor continuous running time
Causes of compressor stop.	ST	Causes of compressor stop
Reserve	A0	
Reserve	A1	
Reserve	.b0	
Reserve	.b1	
Reserve	.b2	
Reserve	.b3	
Reserve	.b4	
Reserve	.b5	
Reserve	.b6	
Reserve	.d1	
Reserve	Ac	
Reserve	Uo	
Reserve	Td	

When the unit enters the Information Enquiry status, the code value appears for 25 seconds (see Table 5 on page 12).

Table 5 — Point Check

ENQUIRY INFORMATION	DISPLAY VALUE	MEANING	REMARK
T1,T2,T3,T4, T2B,TP,TH, Targeted Frequency, Actual Frequency	-1F,-1E,-1d,-1c,-1b,-1A	-25,-24,-23,-22,-21,-20	1. The displaying temperature is the actual value. 2. The temperature is °C no matter what kind of remote control is used. 3. T1,T2,T3,T4,T2B display range:-25~70, TP display range:-20~130. 4. Frequency display range: 0~159HZ. 5. If the actual value exceeds the range, it displays the maximum value or minimum value.
	-19—99	-19—99	
	A0,A1,…A9	100,101,…109	
	b0,b1,…b9	110,111,…119	
	c0,c1,…c9	120,121,…129	
	d0,d1,…d9	130,131,…139	
	E0,E1,…E9	140,141,…149	
	F0,F1,…F9	150,151,…159	
Indoor fan speed /Outdoor fan speed	0	OFF	
	1,2,3,4	Low speed, Medium speed, High speed, Turbo	For some big capacity motors
	14-FF	Actual fan speed = Display value turns to decimal value and then multiply by 10. The unit is RPM.	For some small capacity motors, the display value is from 14-F (hexadecimal), the corresponding fan speed range is from 200-2550 RPM.
EXV opening angle	0-FF	Actual EXV opening value = Display value turns to decimal value and then multiply by 2.	
Compressor continuous running time	0-FF	0-255 minutes	If the actual value exceeds the range, it displays the maximum value or minimum value.
Compressor stop causes	0-99	For a detailed meaning, please consult with an engineer.	Decimal display
Reserve	0-FF		

TROUBLESHOOTING

This section provides the required flow charts to troubleshoot problems that may arise.

NOTE: Information required in the diagnoses can be found either on the wiring diagrams or in the "APPENDICES" on page 49.

Required Tools:

The following tools are needed when diagnosing the units:

- **Digital multimeter**
- **Screw drivers (Phillips and straight head)**
- **Needle−nose pliers**
- **Refrigeration gauges**

Recommended Steps

1. Refer to the diagnostic flowcharts, see Table 6 on page 14 and determine the problem at hand.
2. Go to the chart, see "DIAGNOSIS AND SOLUTION" on page 15 and follow the steps in the chart for the selected problem.

For ease of service, systems are equipped with diagnostic code display LED's on both the indoor and outdoor units. The outdoor diagnostic display is on the outdoor unit board and is limited to very few errors. The indoor diagnostic display is a combination of flashing LED's on the display panel on the front of the unit. If possible always check the diagnostic codes displayed on the indoor unit first. The diagnostic codes for the indoor and outdoor units are listed in the appendix (see "APPENDICES" on page 49.

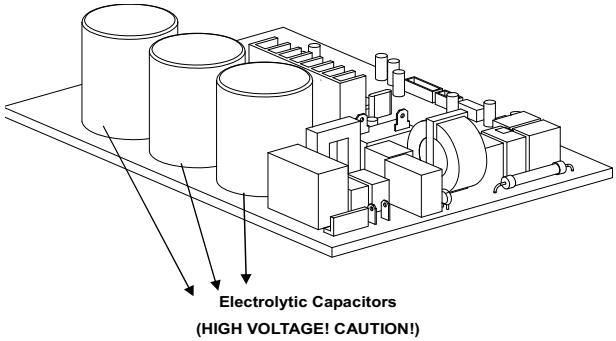
Problems may occur that are not covered by a diagnostic code, however are covered by the diagnostic flow charts. These problems are typical air conditioning mechanical or electrical issues that can be corrected using standard air conditioning repair techniques.

For problems requiring measurements at the control boards, note the following:

1. Always disconnect the main power.
2. When possible check the outdoor board first.
3. Start by removing the outdoor unit top cover.
4. Reconnect the main power.
5. Probe the outdoor board inputs and outputs with a digital multimeter referring to the wiring diagrams.
6. Connect the red probe to hot signal and the black probe to the ground or negative.
7. Note that some of the DC voltage signals are pulsating voltages for signal. this pulse should be rapidly moving at all times when there is a signal present.
8. If it is necessary to check the indoor unit board you must start by disconnecting the main power.
9. Next remove the front cover of the unit and then control box cover.
10. Carefully remove the indoor board from the control box, place it face up on a plastic surface (not metal).
11. Reconnect the main power and repeat steps 5, 6, and 7.
12. Disconnect main power before reinstalling board to avoid shock hazard and board damage.

Safety

Electricity remains in the capacitors even when the power supply is shut off. Do not forget to discharge the electricity in the capacitor.



A220989

Fig. 16 — Capacitors

For other models, connect discharge resistance (approx.100Ù 40W) or soldering iron (plug) between +, - terminals of the electrolytic capacitor on the contrary side of the outdoor PCB.

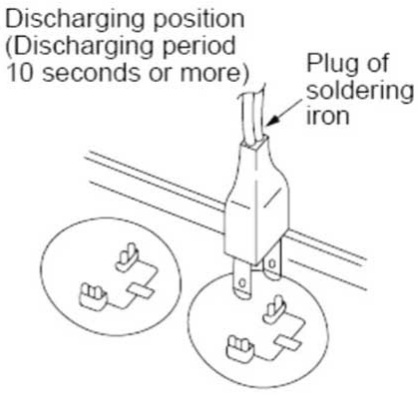


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Fig. 17 — Discharging Position

NOTE: Figure 17 is for reference only.

Indoor Unit Diagnostic Guide

Table 6 — Indoor Unit Error Display

OPERATION LAMP	TIMER LAMP	DISPLAY	ERROR INFORMATION	SOLUTION
1 time	OFF	E00/E0A	Indoor unit EEPROM parameter error	Page 15
2 times	OFF	EL 01	Indoor / outdoor unit communication error	Page 16
4 times	OFF	EH 03	The indoor fan speed is operating outside of the normal range	Page 18
4 times	OFF	EH 31	Upper indoor fan speed is operating outside of the normal range (for new console type)	Page 18
4 times	OFF	EH 32	Lower indoor fan speed is operating outside of the normal range (for new console type)	Page 18
6 times	OFF	EH 60	Indoor room temperature sensor T1 is in open circuit or has short circuited	Page 21
6 times	OFF	EH 61	Evaporator coil temperature sensor T2 is in open circuit or has short circuited	Page 21
8 times	OFF	EL 0C	Refrigerant leakage detection	Page 22
9 times	OFF	EH 0b	Communication error between display board and main board	Page 31
13 times	OFF	EH 0E	Water-level alarm malfunction	Page 23
5 times	ON	EC 51	Outdoor unit EEPROM parameter error	Page 15
5 times	OFF	EC 52	Condenser coil temperature sensor T3 is in open circuit or has short circuited	Page 21
5 times	OFF	EC 53	Outdoor room temperature sensor T4 is in open circuit or has short circuited	Page 21
5 times	OFF	EC 54	Compressor discharge temperature sensor TP is in open circuit or has short circuited	Page 21
5 times	OFF	EC 55	IGBT temperature sensor TH is in open circuit or has short circuited	--
5 times	OFF	EC 56	Evaporator coil outlet temperature sensor T2B is in open circuit or has short circuited (for free-match indoor units)	--
12 times	OFF	EC 07	The outdoor fan speed is operating outside of the normal range	Page 18
7 times	FLASH	PC 00	IPM malfunction or IGBT over-strong current protection	Page 24
2 times	FLASH	PC 01	Over voltage or over low voltage protection	Page 25
3 times	FLASH	PC 02	Top temperature protection of compressor or High temperature protection of IPM module	Page 29
7 times	FLASH	PC 03	High pressure protection or low pressure protection	Page 27
5 times	FLASH	PC 04	Inverter compressor drive error	Page 26
14 times	OFF	EC 0d	Outdoor unit malfunction	Page 30
15 times	OFF	FH 07	Communication malfunction between indoor unit and auto-lifting panel	Page 34
--	--	EH bA	Communication malfunction between external fan module and indoor unit (for some models)	Page 33
4 times	OFF	EH 3A	External fan DC bus voltage is too low protection	Page 33
4 times	OFF	EH 3b	External fan DC bus voltage is too high fault	Page 33
1 time	ON	--	Indoor units mode conflict (match with multi outdoor unit)	--
4 times	FLASH	PC 0L	Low ambient temperature protection	Page 30

NOTE: P3*

1. In the **HEATING** mode, if the outdoor temperature is lower than -13°F (-25°C) for 1 hour, the indoor unit displays a **P3** error code.
2. If the outdoor temperature is higher than -7.6°F (-22°C) for 10 minutes and the compressor stops for 1 hour or the outdoor temperature is higher than 23°F (-5°C) for 10 minutes, the unit returns to an operating mode.

*** Fault Symptom:** The display board shows a distorted code or a code that is not an error code found in the service manual nor a temperature reading.

Error Display on Two Way Communication Wired Controller

DISPLAY	MALFUNCTION OR PROTECTION	SOLUTION
EH b3	Communication error between wire controller and indoor unit (for the **KSACN0701AAA** series wired controller)	Page 32

DIAGNOSIS AND SOLUTION

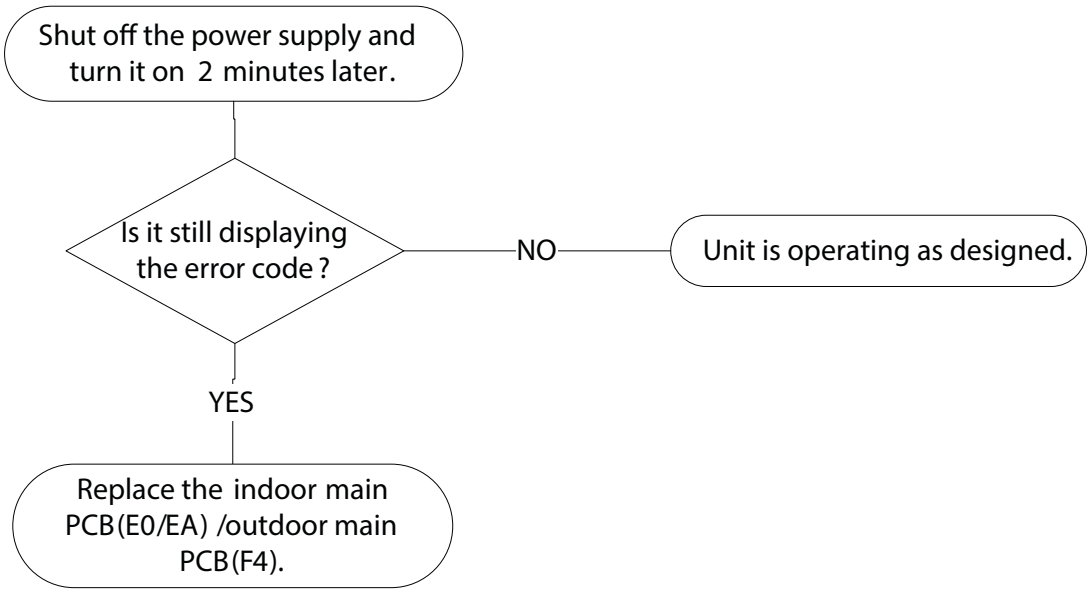
EH 00/EH 0A/EC 51 (EEPROM Parameter Error Diagnosis and Solution)

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

Recommended parts to prepare:

- **Indoor PCB**
- **Outdoor PCB**

Troubleshooting



REMARKS:

EEPROM: A read only memory whose contents can be erased and reprogrammed using a pulsed voltage. Review figures 18 and 19 for the location of the EEPROM chip on the indoor and outdoor PCB.

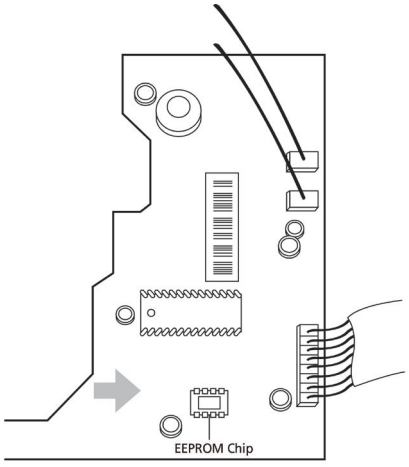


Fig. 18 — EEPROM Chip (Indoor)

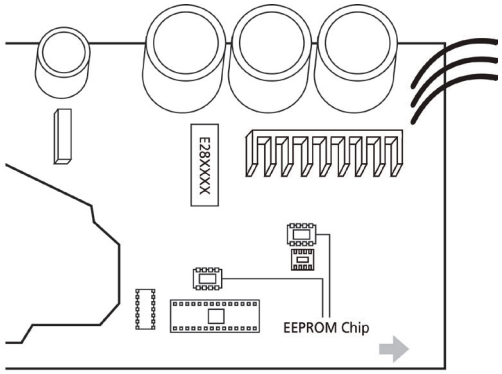


Fig. 19 — EEPROM Chip (Outdoor)

NOTE: For certain models, the outdoor PCB cannot be removed separately. In this case, the outdoor electric control box should be replaced as a whole. This images are only for reference and the actual appearance may vary. Troubleshooting and repair of the compressor driven chip EEPROM parameter error and communication error between the outdoor main chip and the compressor driven chip are the same as EC 51.

DIAGNOSIS AND SOLUTION (CONT.)

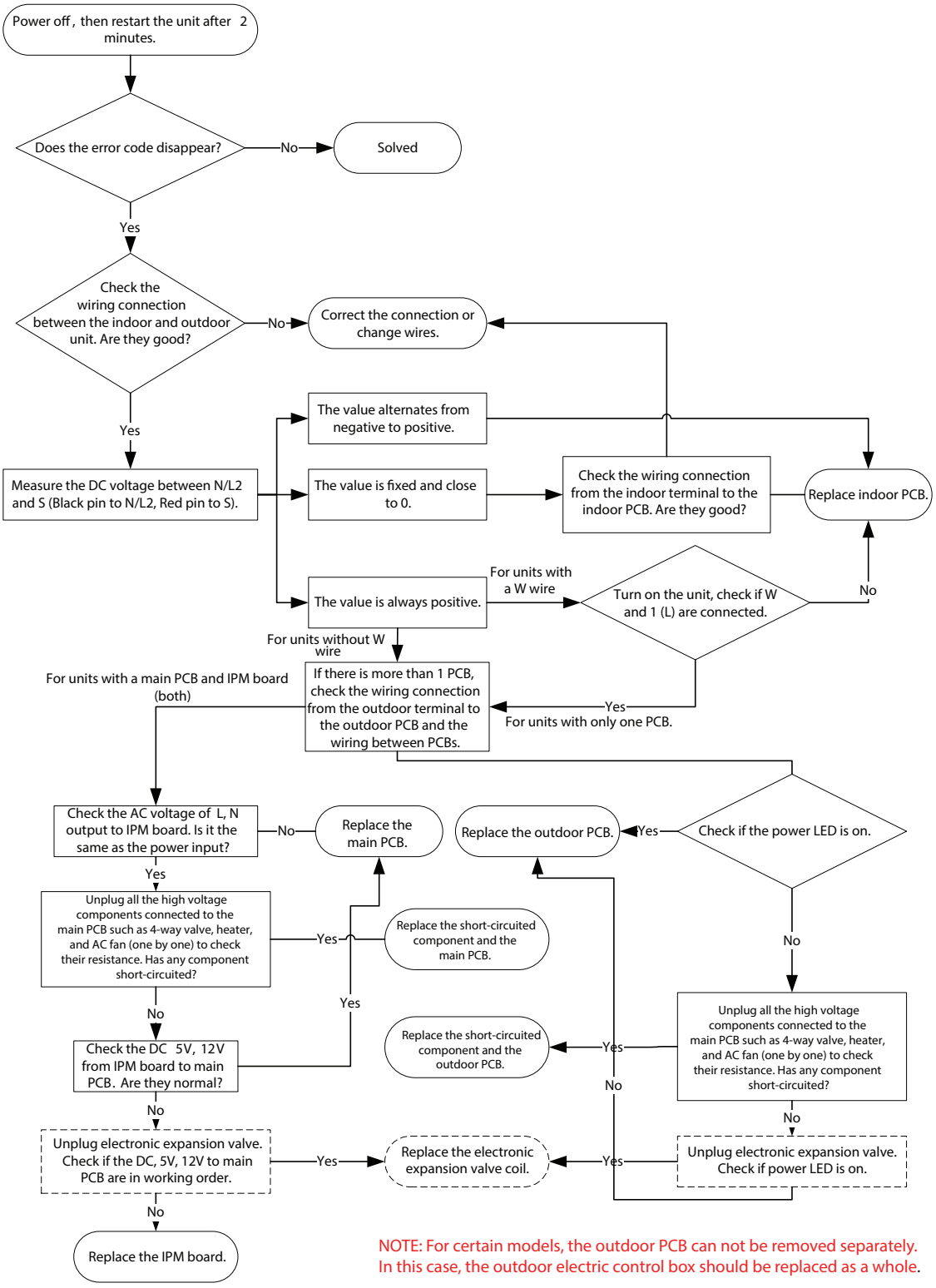
EL 01 (Indoor and Outdoor Unit Communication Error Diagnosis and Solution)

Description: Indoor unit cannot communicate with the outdoor unit

Recommended parts to prepare:

- **Indoor PCB**
- **Outdoor PCB**
- **Reactor**

Troubleshooting

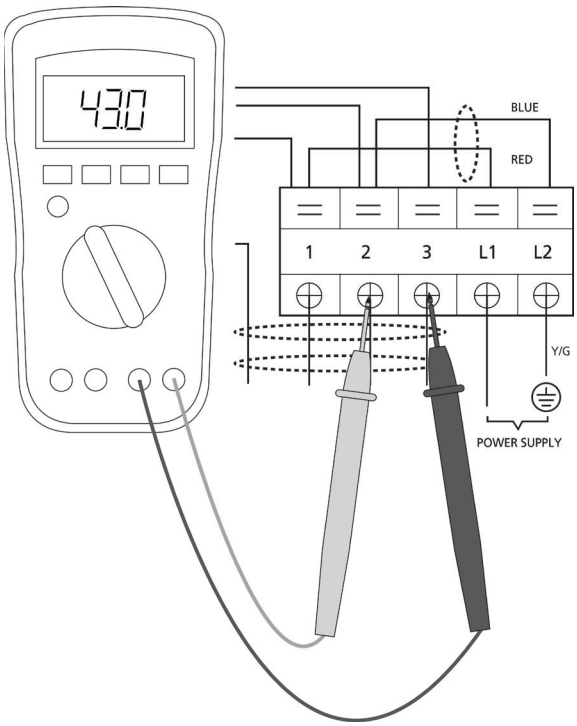


NOTE: For certain models, the outdoor PCB can not be removed separately. In this case, the outdoor electric control box should be replaced as a whole.

DIAGNOSIS AND SOLUTION (CONT.)

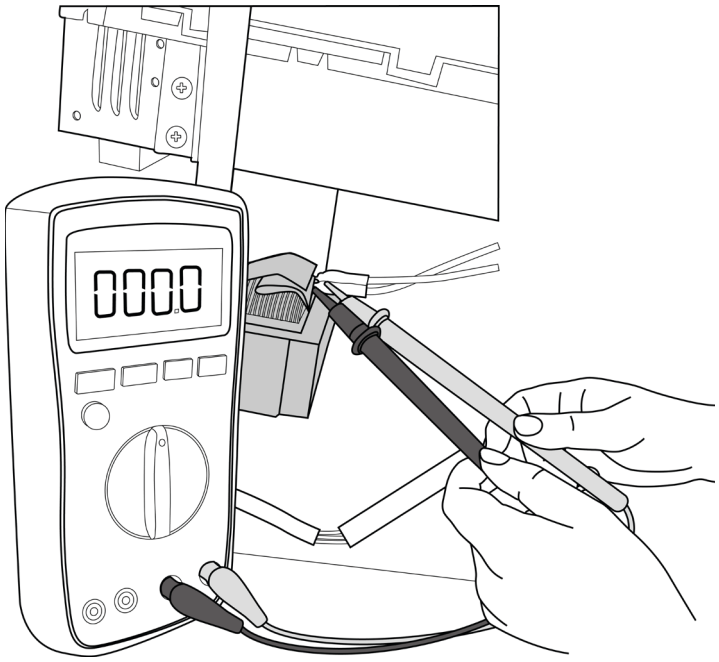
Remarks:

- **Use a multimeter to test the DC voltage between the 2 port (or S or L2 port) and the 3 port (or N or S port) of the outdoor unit. The red pin of the multimeter connects with the 2 port (or S or L2 port) while the black pin is for the 3 port (or N or S port).**
- **When the unit is operating normally, the voltage moves alternately between the positive values and negative values.**
- **If the outdoor unit malfunctions, the voltage was always the positive value.**
- **Alternately, if the indoor unit malfunctions, the voltage remains at a fixed value.**



S and N
or
L2 and S
or
2 and 3

- **Use a multimeter to test the reactor resistance which does not connect with the capacitor.**
- **The normal value should be around zero ohm. Otherwise, the reactor must has malfunctioned.**



DIAGNOSIS AND SOLUTION (CONT.)

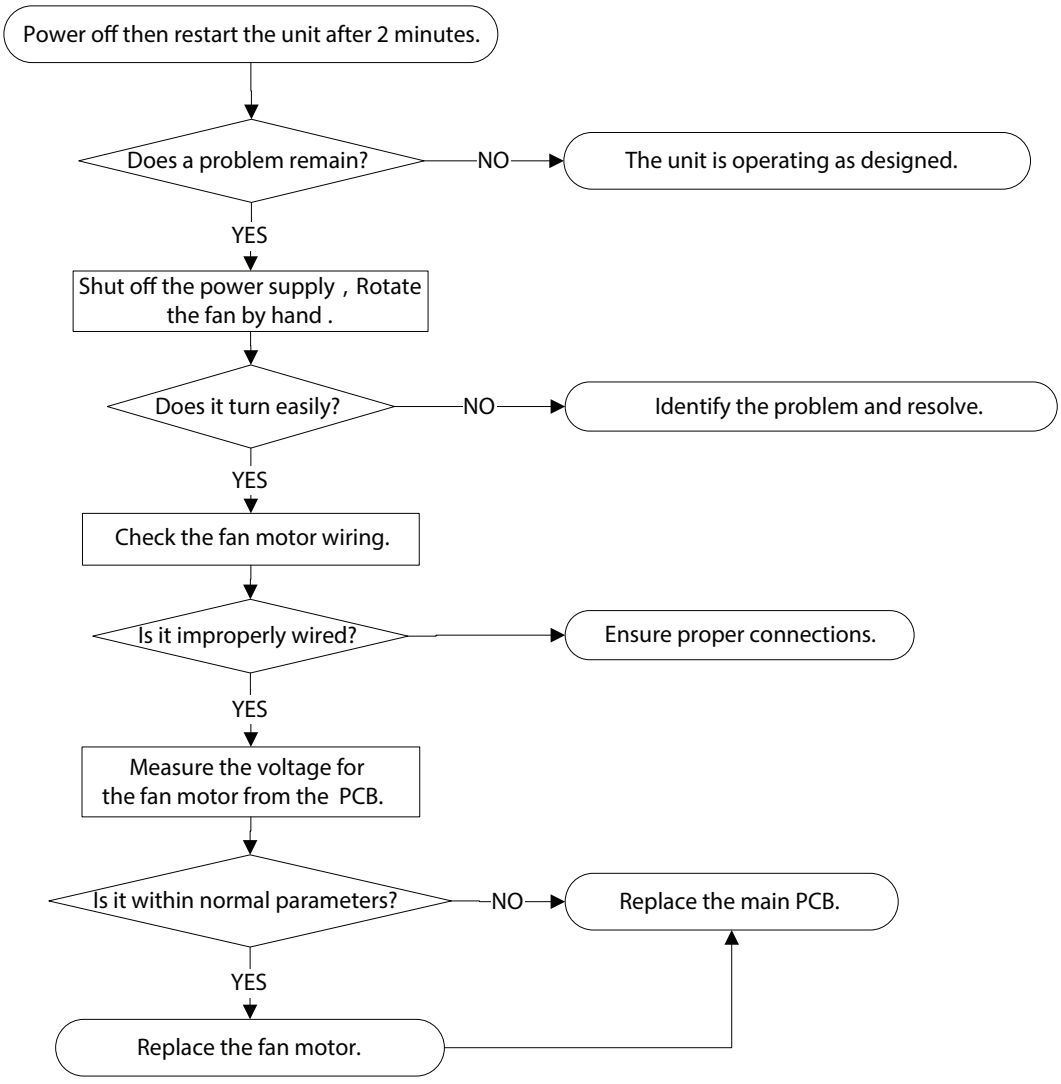
EH 03/EH 31/EH 32/EC 07 (Fan Speed Is Operating Outside of Normal Range Diagnosis and Solution)

Description: When the indoor / outdoor fan speed remains too slow or too fast for a certain amount of time, the unit ceases operating and the LED displays the failure.

Recommended parts to prepare:

- **Connection wires**
- **Fan assembly**
- **Fan motor**
- **PCB**

Troubleshooting



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

DIAGNOSIS AND SOLUTION (CONT.)

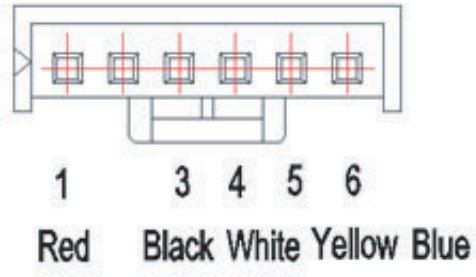
Index

1. Indoor or Outdoor DC Fan Motor (control chip is in fan motor)

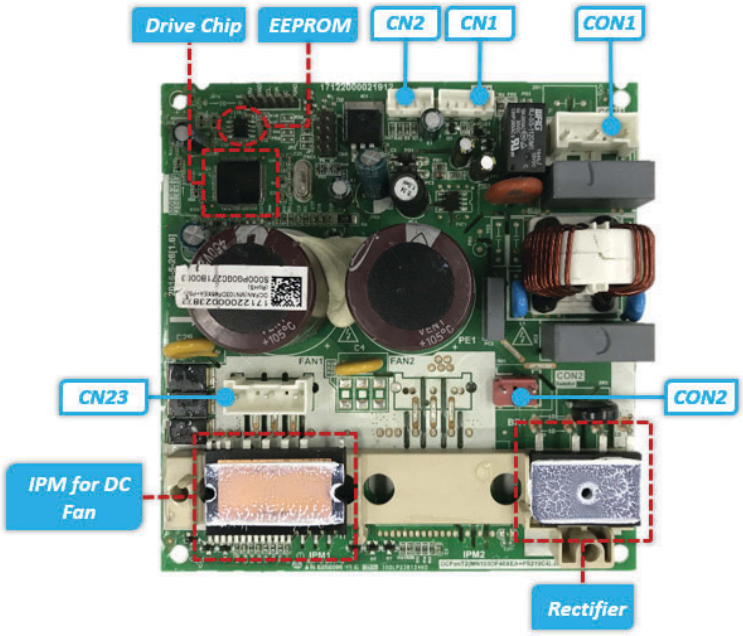
Power on the unit and when the unit is in the **STANDBY** mode, measure the voltage of pin1-pin3, pin4-pin3 in the fan motor connector. If the voltage value is not in the range shown in Table 7, the PCB has malfunctioned and needs to be replaced.

Table 7 — Signals

NO.	COLOR	SIGNAL	VOLTAGE
1	Red	Vs/Vm	192V~380V
2	---	---	---
3	Black	GND	0V
4	White	Vcc	13.5~16.5V
5	Yellow	Vsp	0~6.5V
6	Blue	FG	13.5~16.5V

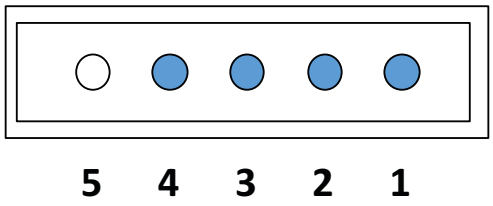


2. Indoor DC Fan IPM Board (Duct and Ceiling-floor Unit)



PORT	DESCRIPTION	PARAMETER	REMARK
CON1	Power input for the PCB	230V/AC	
CN1	Communication with main PCB	DC	
CN2	Test Port	5V/DC	For debugging board
CN23	UVW output for DC fan motor		
CON2	Ports for reactor		

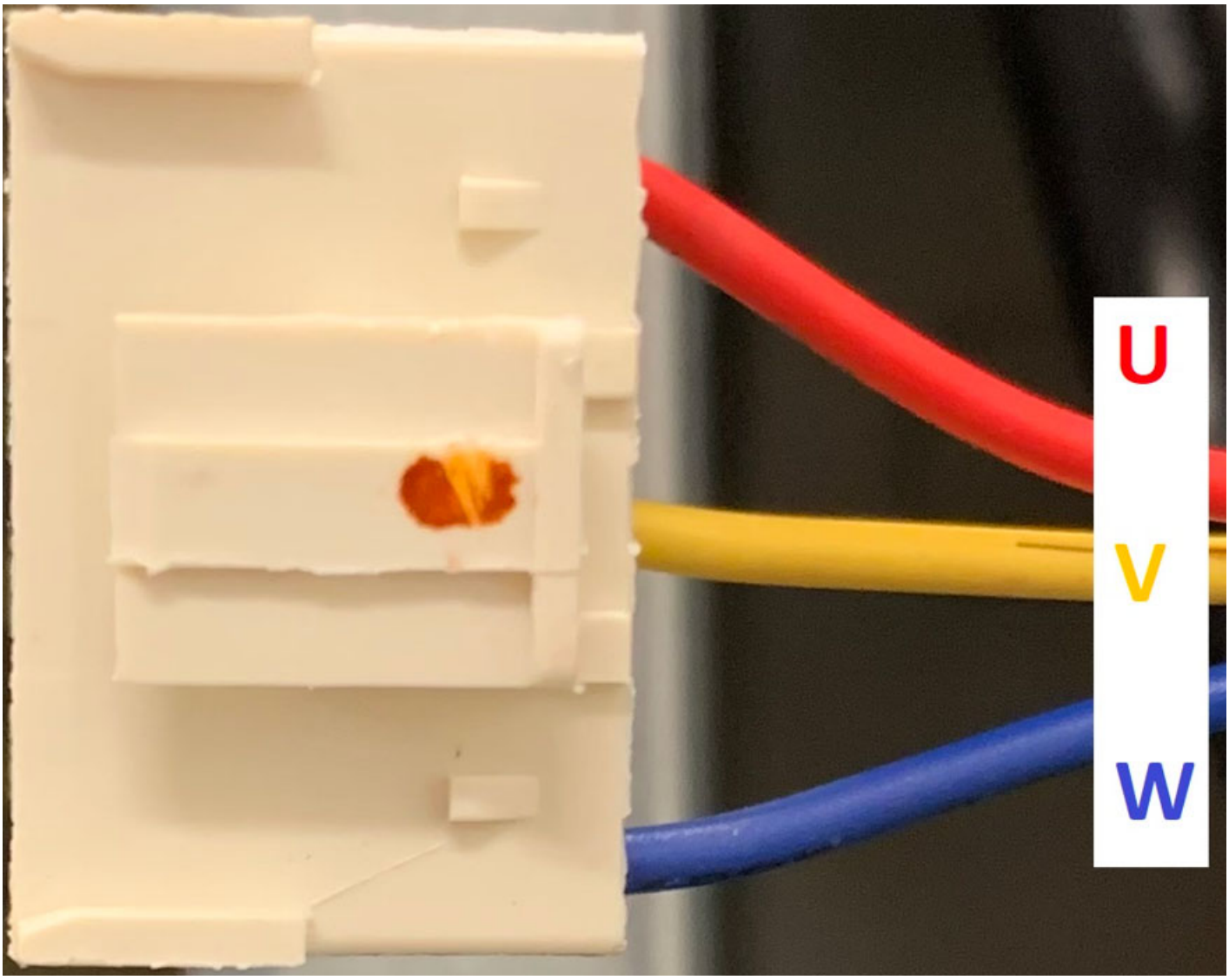
CN1 Communication with the Main PCB



NO	SIGNAL	VOLTAGE
1	Vcc	+15V
2	GND	
3	TXD	0~6V
4	RXD	0~15V
5	--	--

3. Outdoor DC Fan Motor (control chip is in outdoor PCB)

   Release the UVW connector. Measure the resistance of U-V, U-W, V-W. If the resistance is not equal to each other, the fan motor has malfunctioned and needs to be replaced. Otherwise the PCB has malfunctioned and needs to be replaced.



DIAGNOSIS AND SOLUTION (CONT.)

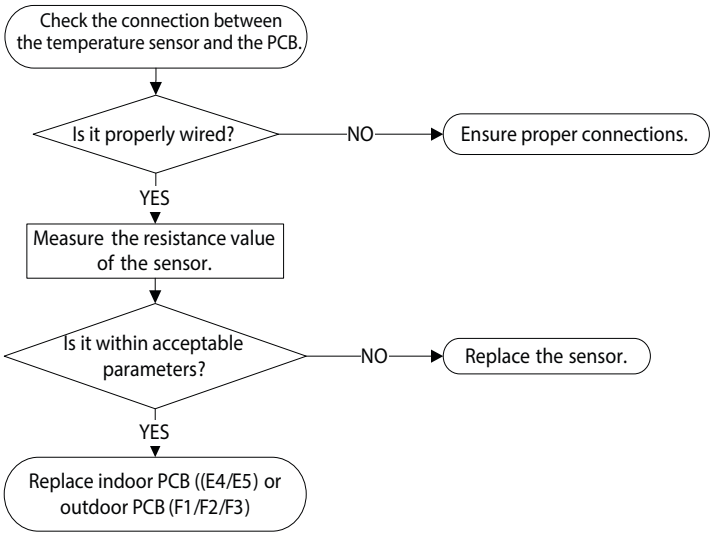
EH 60/EH 61/EC 53/EC 52/EC 54 (Open Circuit or Short Circuit of Temperature Sensor Diagnosis and Solution)

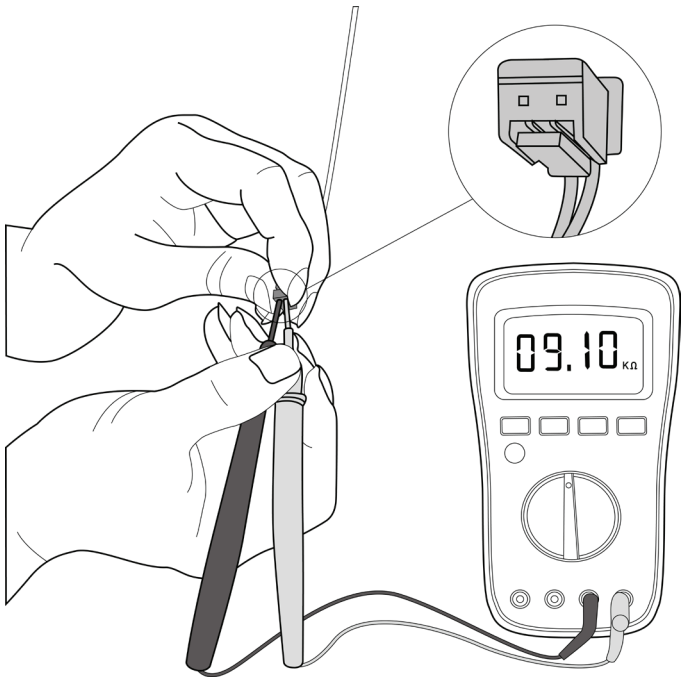
Description: If the sampling voltage is lower than 0.06V or higher than 4.94V, the LED displays a failure.

Recommended parts to prepare:

- **Connection wires**
- **Sensors**
- **PCB**

Troubleshooting





NOTE: For certain models, the outdoor PCB cannot be removed separately. In this case, the outdoor electric control box should be replaced as a whole. This images in this manual and the values are only for reference. Actual appearance and values may vary.

DIAGNOSIS AND SOLUTION (CONT.)

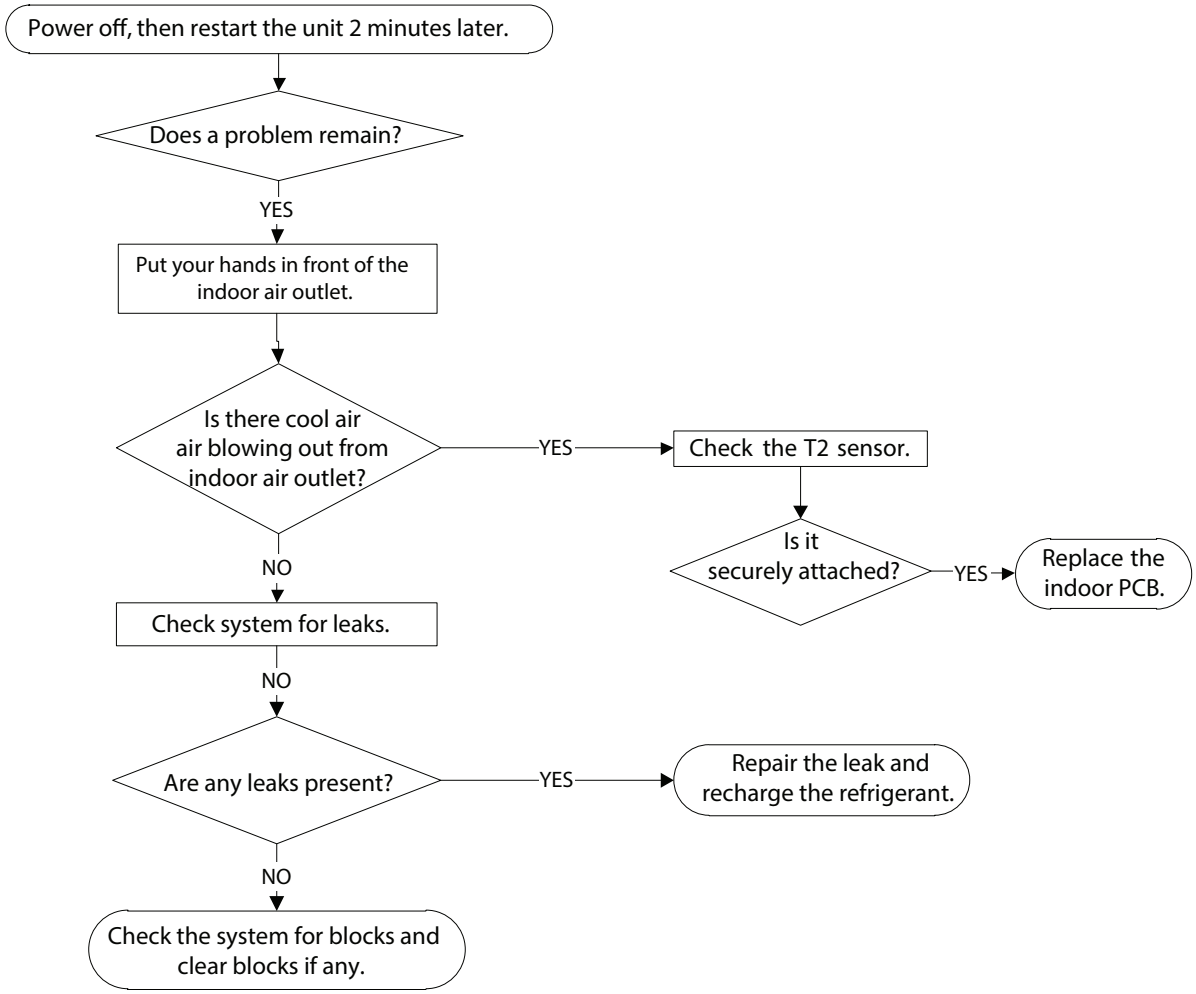
EL 0C (Refrigerant Leakage Detection Diagnosis and Solution)

Description: Define the evaporator coil temperature T2 of the compressor which starts running as Tcool. After unit start up and five minutes after the compressor starts up, if T2 < Tcool-1°C(1.8°F) does not maintain for 4 seconds and the compressor running frequency (higher than 50Hz) does not maintain for 3 minutes, and this situation occurs 3 times, the display area displays "EL 0C" and air conditioner unit turns off.

Recommended parts to prepare:

- **T2 sensor**
- **Indoor PCB**
- **Additional refrigerant**

Troubleshooting



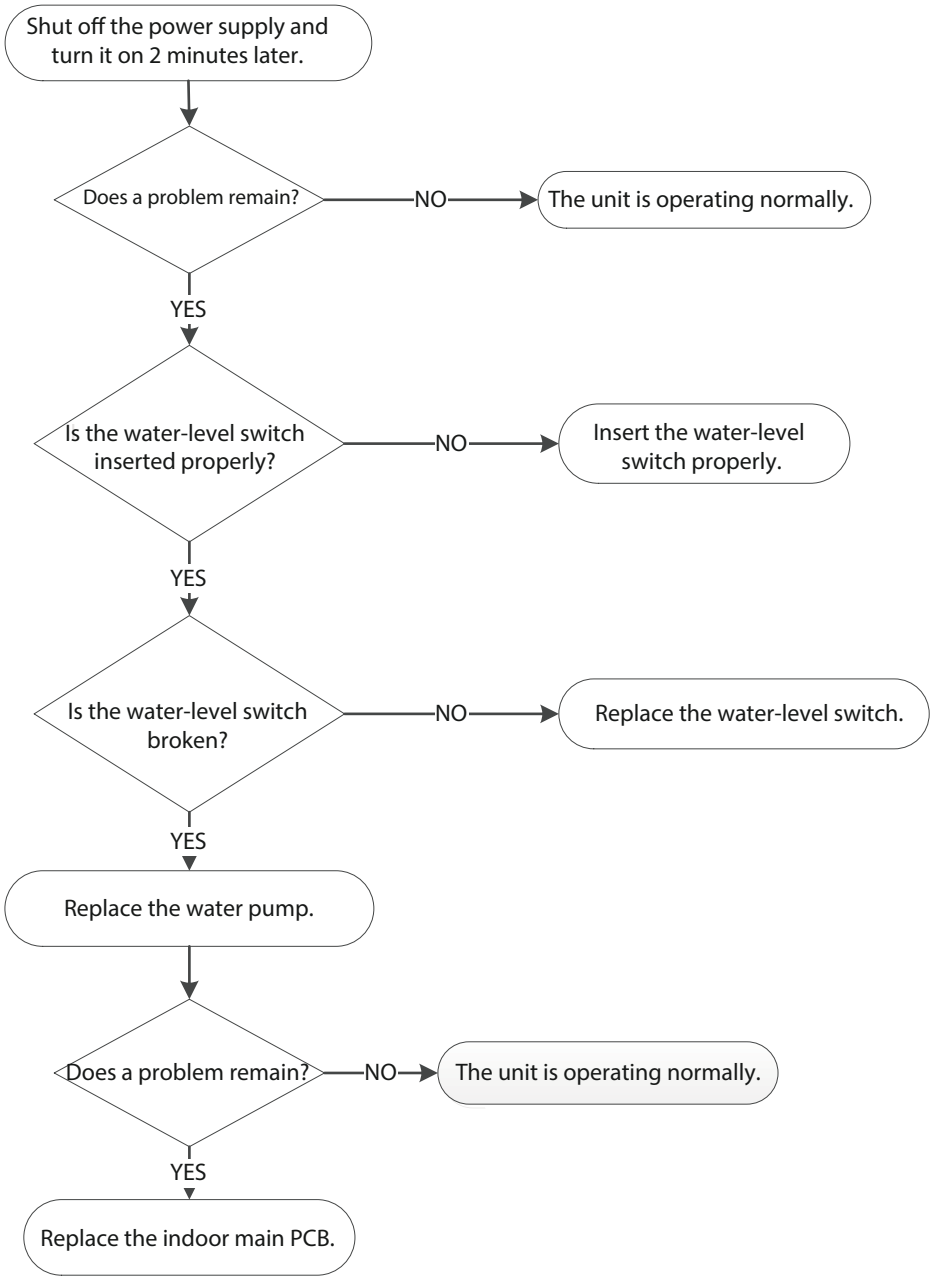
DIAGNOSIS AND SOLUTION (CONT.)

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

Recommended parts to prepare:

- **Connection wires**
- **Water-level switch**
- **Water pump**
- **Indoor PCB**

Troubleshooting



DIAGNOSIS AND SOLUTION (CONT.)

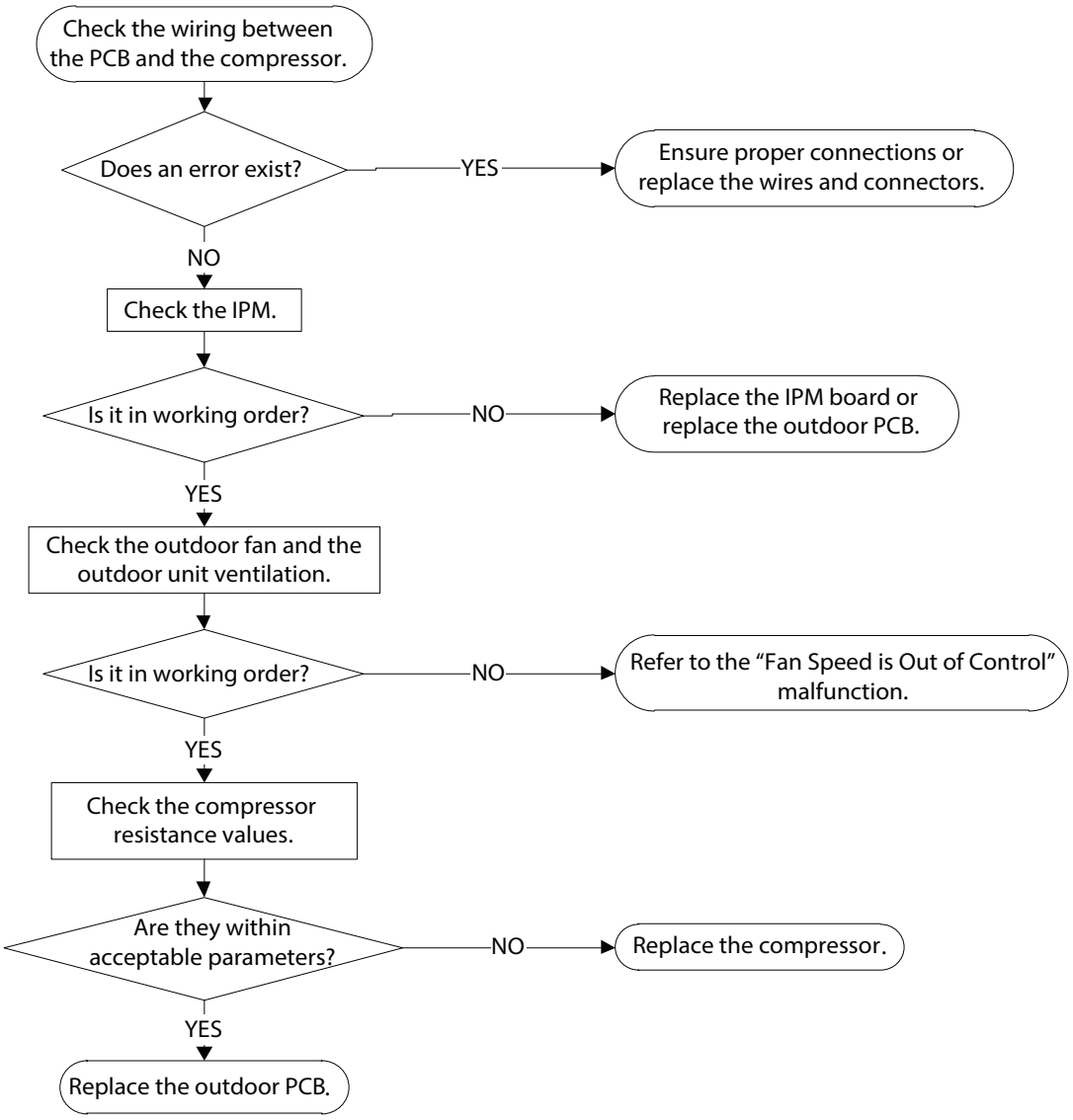
PC 00(IPM malfunction or IGBT over-strong current protection Diagnosis and Solution)

Description: When the voltage signal that the IPM sends to the compressor drive chip is abnormal, the display LED displays "PC 00" and the air conditioner turns off.

Recommended parts to prepare:

- **Connection wires**
- **IPM module board**
- **Outdoor fan assembly**
- **Compressor**
- **Outdoor PCB**

Troubleshooting



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

DIAGNOSIS AND SOLUTION (CONT.)

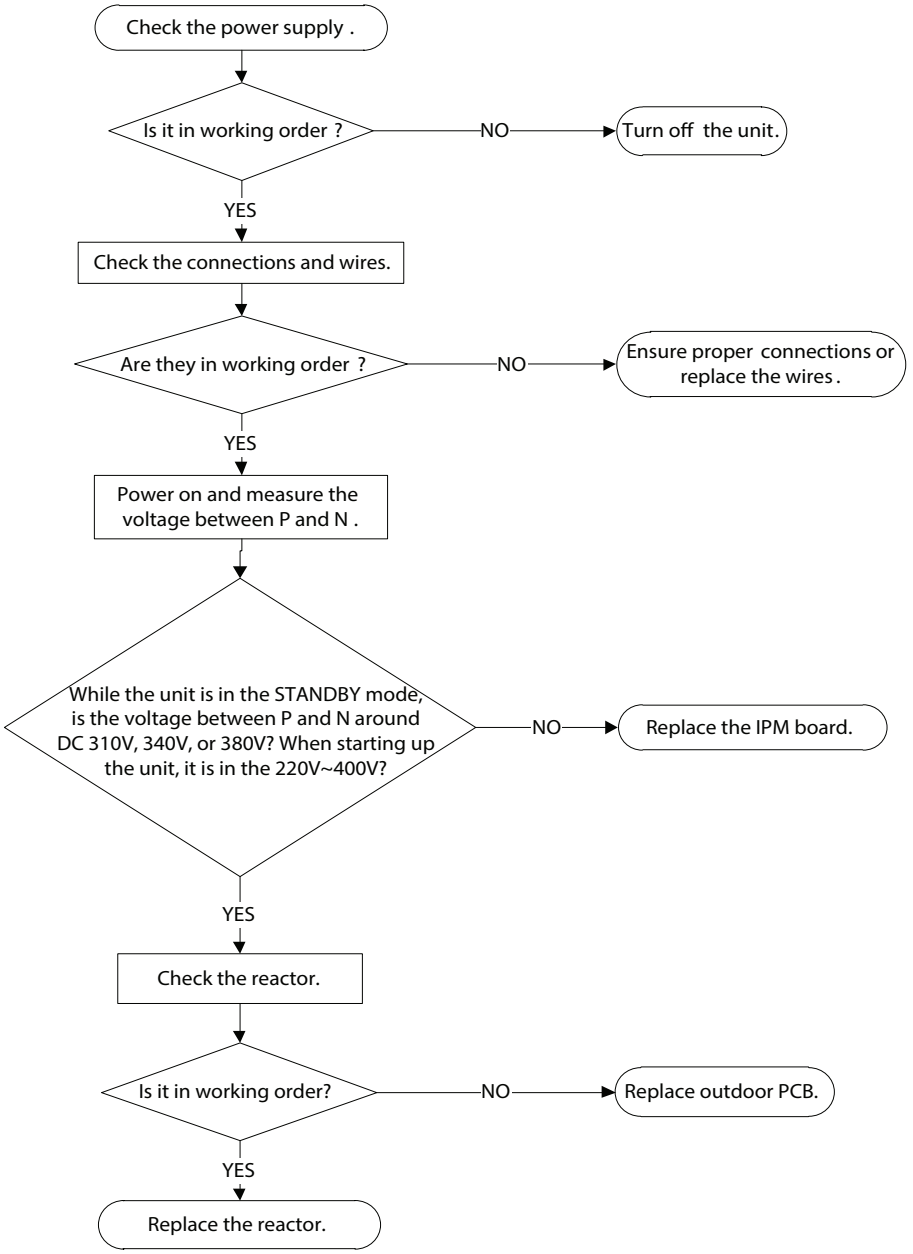
PC 01 (Over voltage or too low voltage protection Diagnosis and Solution)

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

Recommended parts to prepare:

- **Power supply wires**
- **IPM module board**
- **PCB**
- **Reactor**

Troubleshooting



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

DIAGNOSIS AND SOLUTION (CONT.)

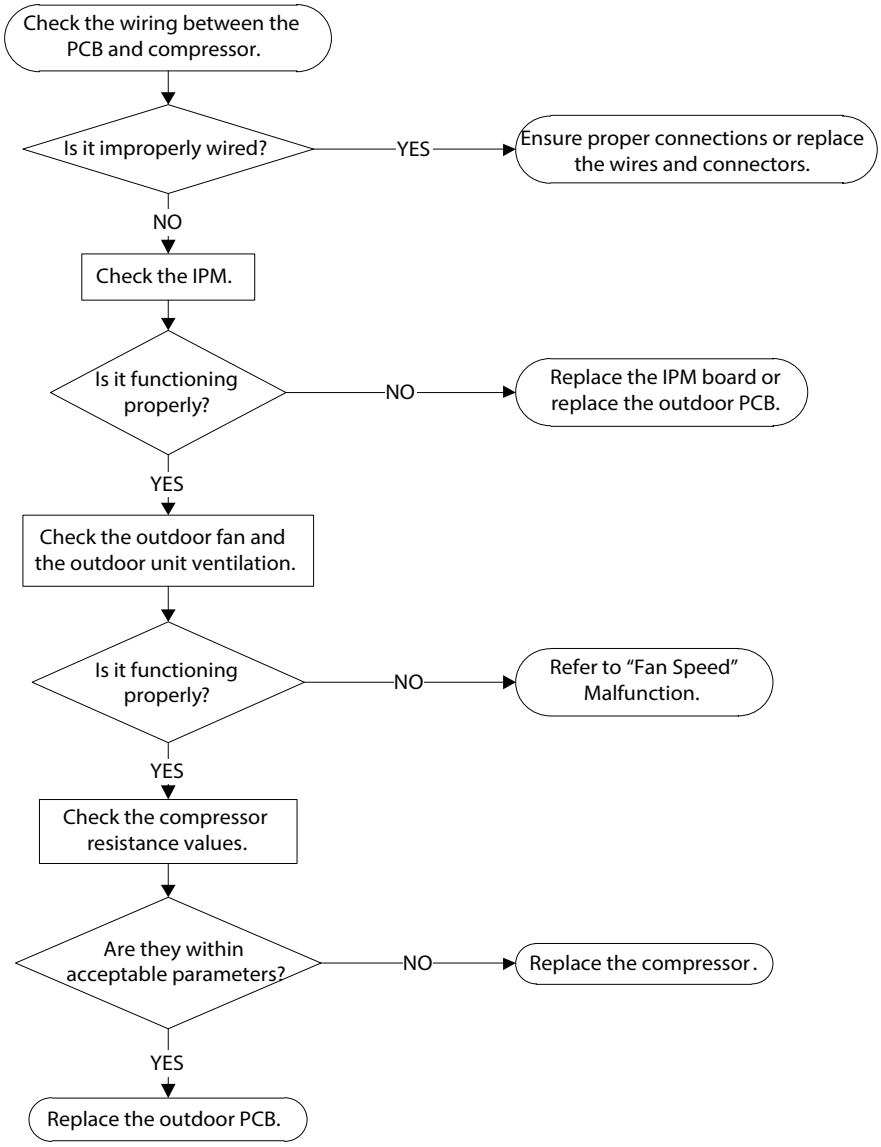
PC 04 (Inverter compressor drive error Diagnosis and Solution)

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

Recommended parts to prepare:

- **Connection wires**
- **IPM module board**
- **Outdoor fan assembly**
- **Compressor**
- **Outdoor PCB**

Troubleshooting



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

DIAGNOSIS AND SOLUTION (CONT.)

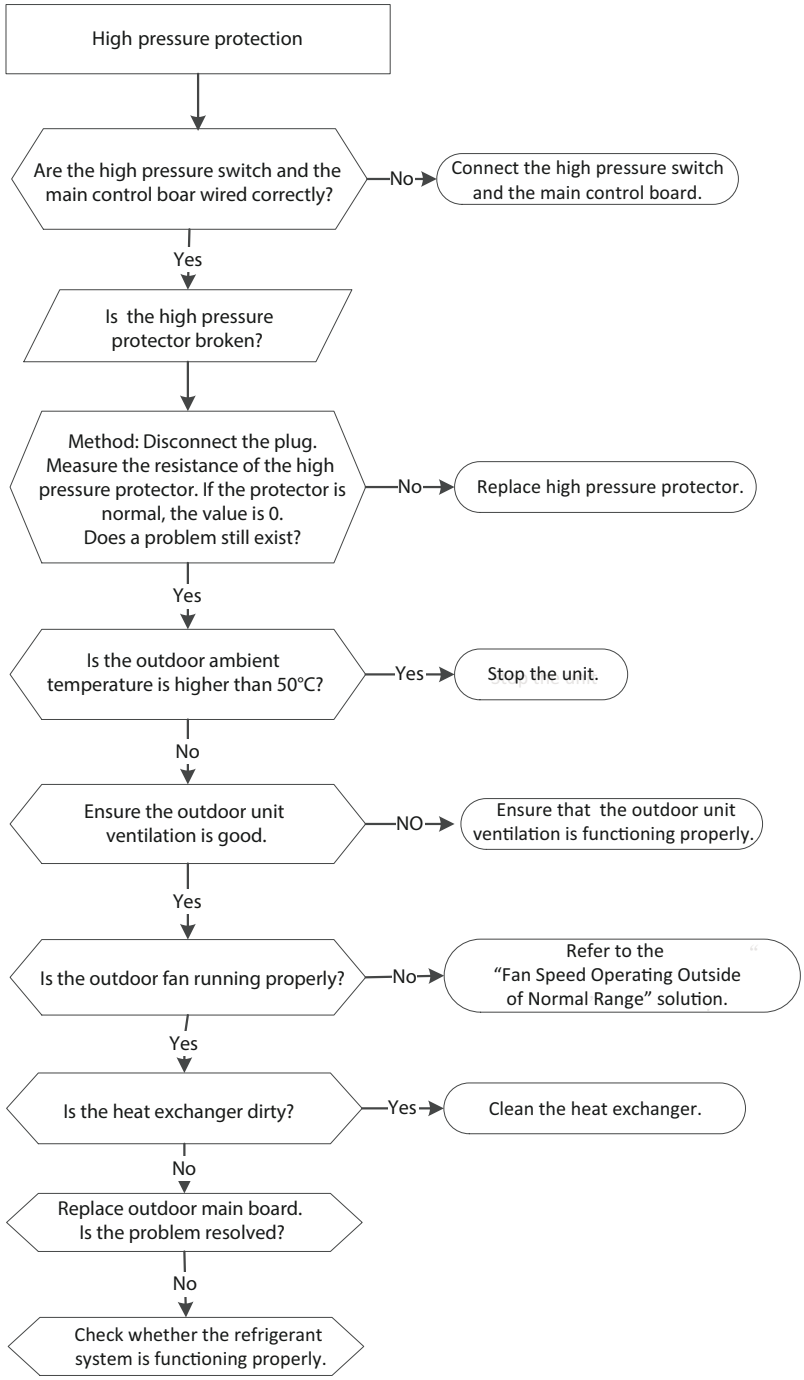
PC 03 (High pressure protection or Low Pressure Protection Diagnosis and Solution)

Description: The outdoor pressure switch cuts off the system because the high pressure is higher than 4.4 MPa or the outdoor pressure switch cuts off the system because the low pressure is lower than 0.13 MPa. In either case, the LED displays a failure code.

Recommended parts to prepare:

- **Connection wires**
- **Pressure switch**
- **Outdoor fan**
- **Outdoor main PCB**
- **Refrigerant**

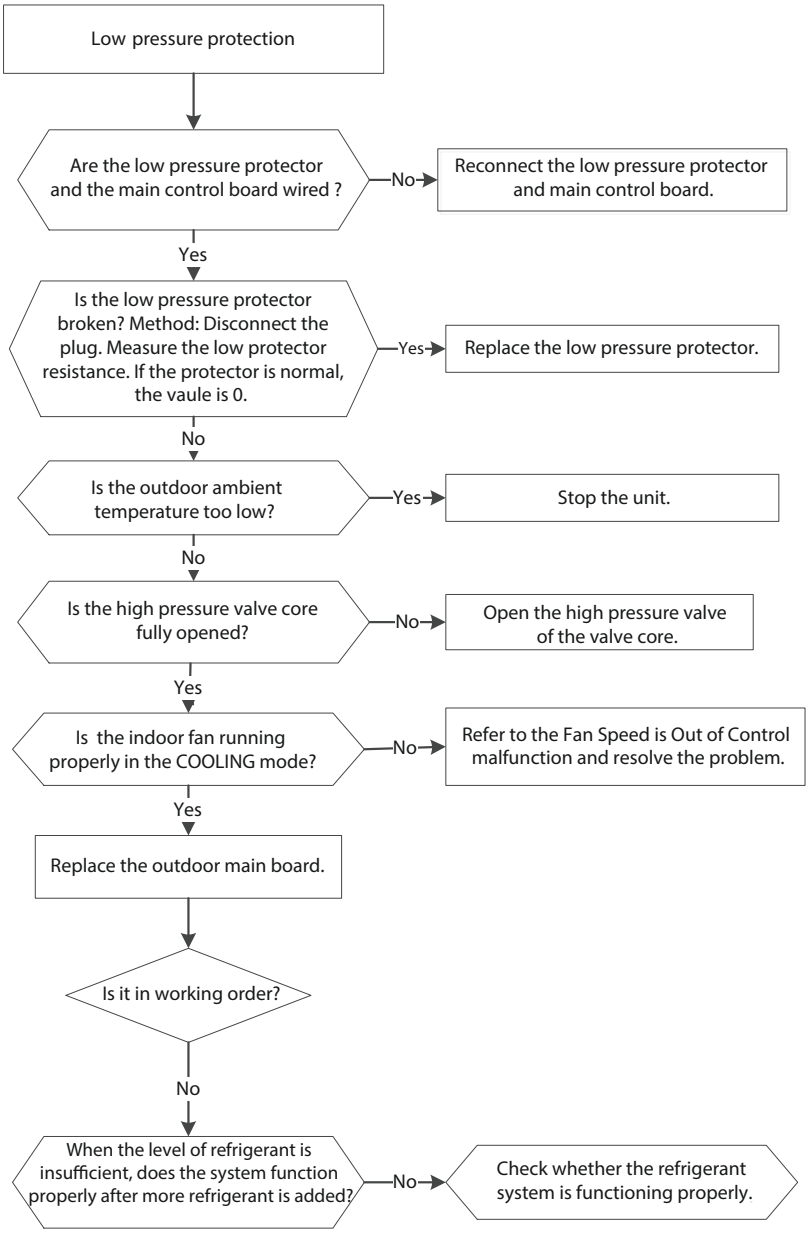
Troubleshooting



DIAGNOSIS AND SOLUTION (CONT.)

PC 03 (High pressure protection or Low Pressure Protection Diagnosis and Solution) (CONT)

Troubleshooting



DIAGNOSIS AND SOLUTION (CONT.)

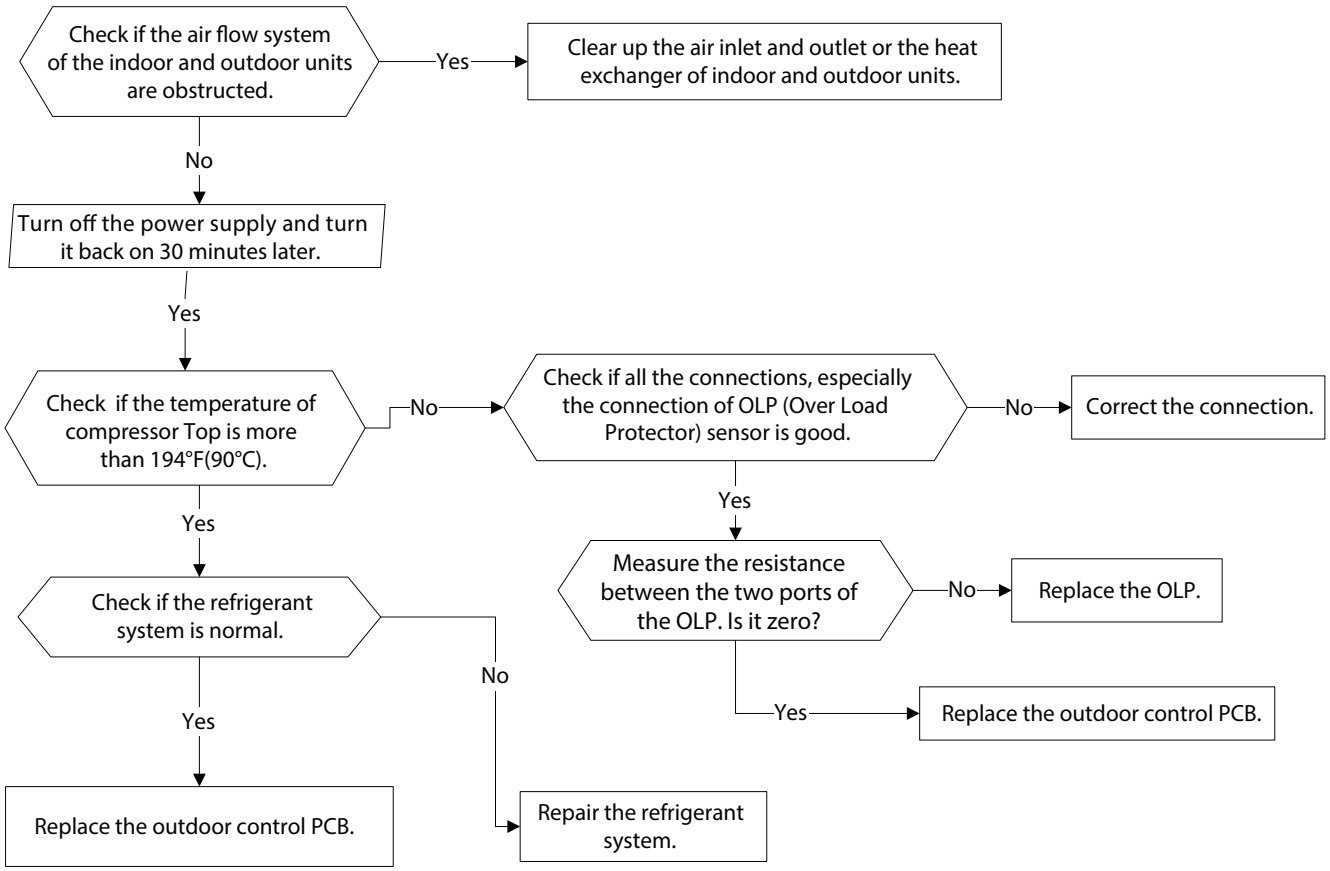
PC 02 (Top temperature protection of compressor or High temperature protection of IPM module Diagnosis and Solution)

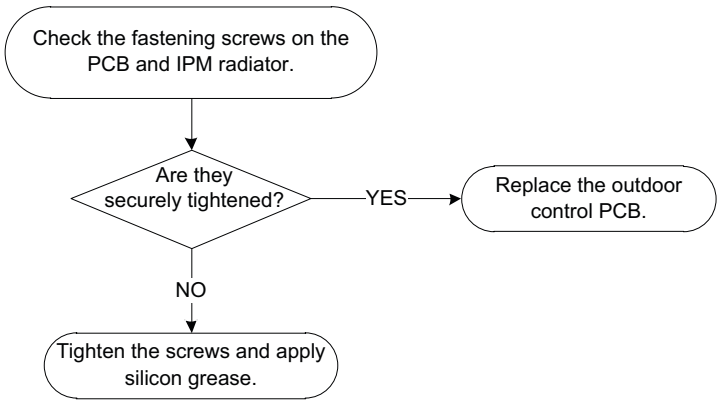
Description: For some models with overload protection, if the sampling voltage is not 5V, the LED displays a failure.
If the temperature of IPM module is higher than a certain value, the LED displays a failure code.

Recommended parts to prepare:

- **Connection wires**
- **Outdoor PCB**
- **IPM module board**
- **High pressure protector**
- **System blocks**

Troubleshooting





DIAGNOSIS AND SOLUTION (CONT.)

PC 0L (Low ambient temperature protection)

Description: This is a protection function. When the compressor is off, the outdoor ambient temperature(T4) is lower than -31°F (-35°C) for 10s, the air conditioner stops and displays the failure code.

When the compressor is on, the outdoor ambient temperature(T4) is lower than -40°F(-40°C).for 10s, the air conditioner stops and displays a failure code. When the outdoor ambient temperature (T4) is no lower than -25.6°F (-32°C) for 10s, the unit exits protection.

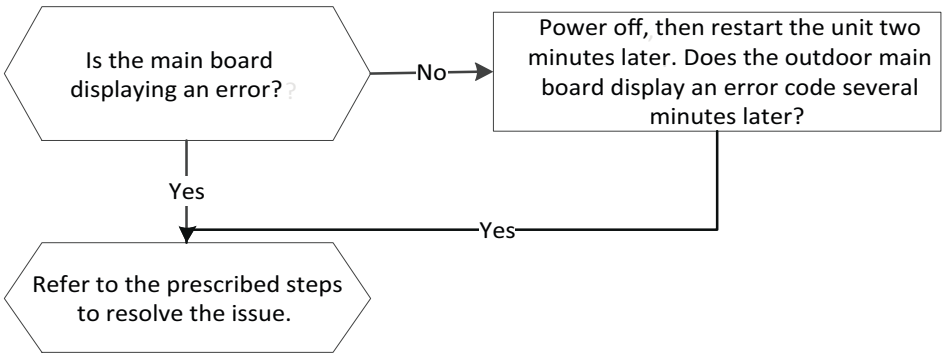
EC 0d（Outdoor unit malfunction Diagnosis and Solution)

Description: **The indoor unit detect the outdoor unit is error.**

Recommended parts to prepare:

- **Outdoor unit**

Troubleshooting



DIAGNOSIS AND SOLUTION (CONT.)

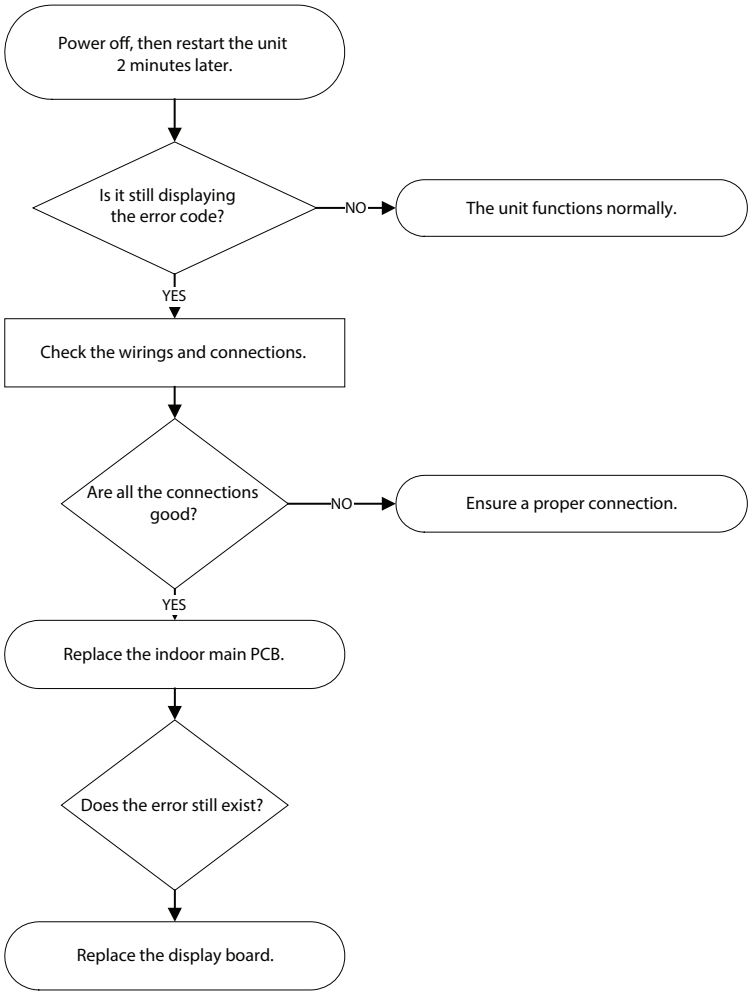
EH 0b (Communication error between display board and main board Diagnosis and Solution)

Description: The indoor PCB does not receive feedback from the display board

Recommended parts to prepare:

- **Communication wire**
- **Indoor PCB**
- **Display board**

Troubleshooting



DIAGNOSIS AND SOLUTION (CONT.)

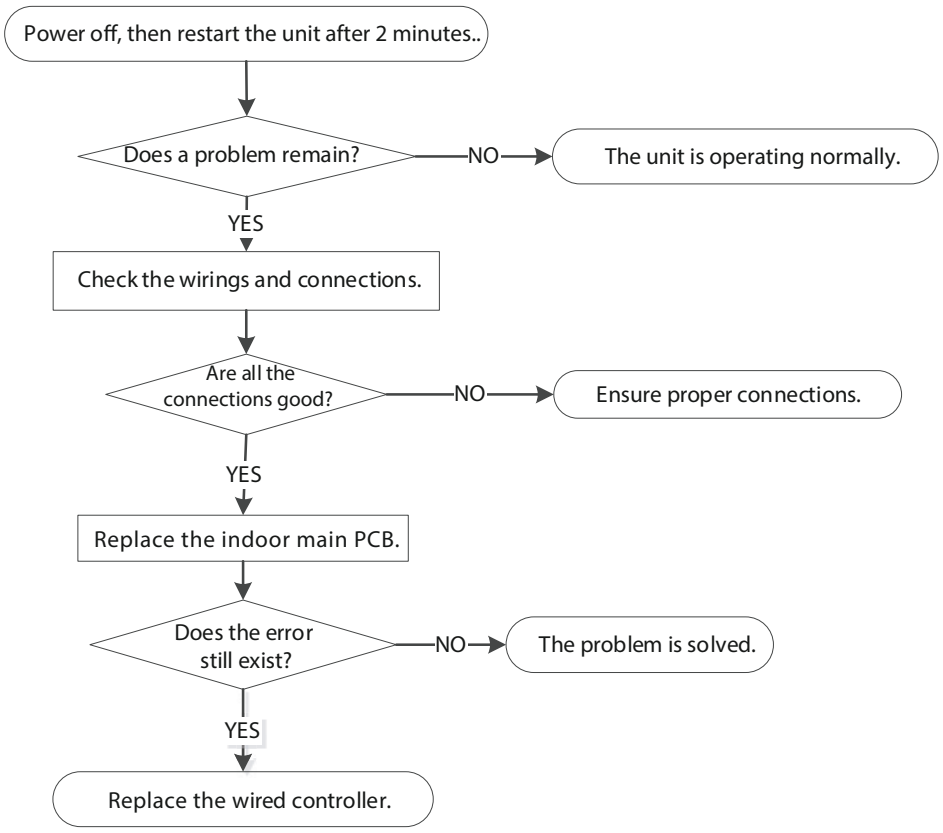
EH b3 (Communication error between wired controller and indoor unit Diagnosis and Solution)

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

Recommended parts to prepare:

- **Connection wires**
- **Indoor PCB**
- **Wired controller**

Troubleshooting



DIAGNOSIS AND SOLUTION (CONT.)

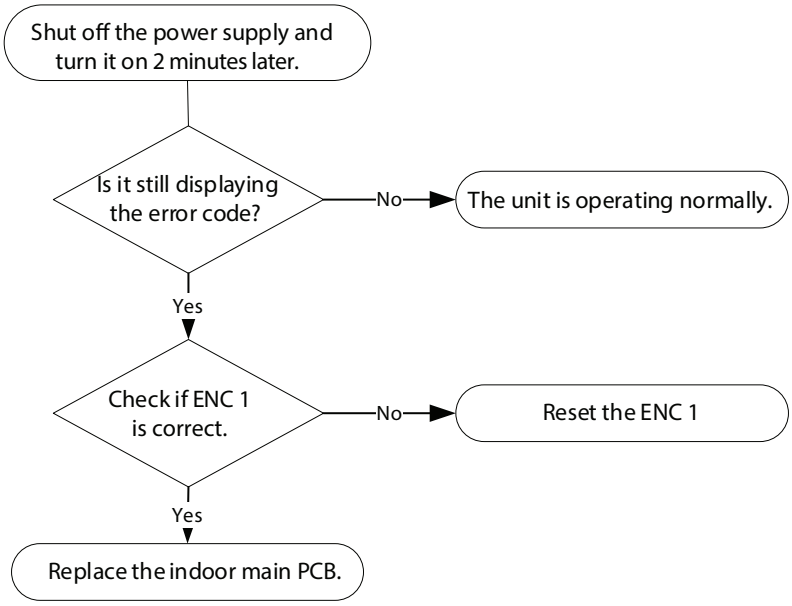
EH bA (Communication malfunction between the external fan module and indoor unit)/EH 3A(External fan DC bus voltage is too low protection)/ EH 3b (External fan DC bus voltage is too high fault Diagnosis and Solution)

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

Recommended parts to prepare:

- **Indoor main PCB**

Troubleshooting



DIAGNOSIS AND SOLUTION (CONT.)

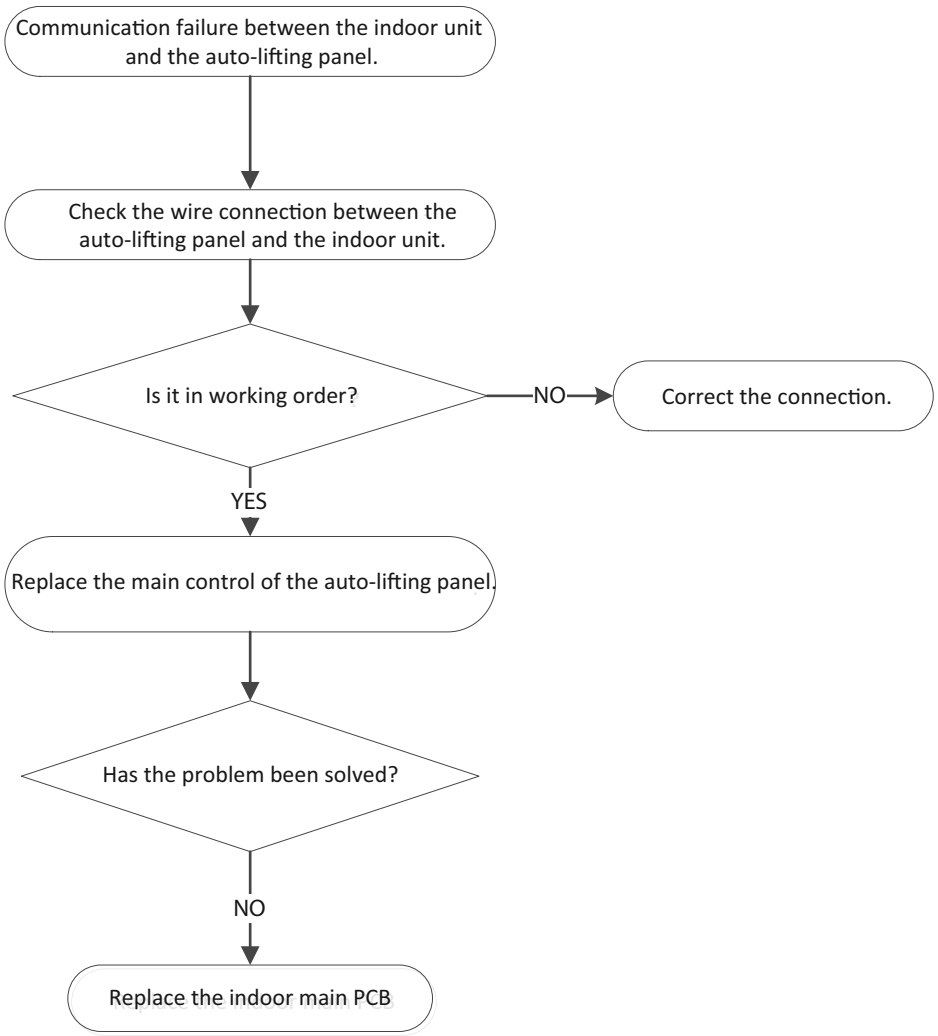
FH 07 (Communication malfunction between indoor unit and auto-lifting panel Diagnosis and Solution)

Description: The indoor PCB does not receive feedback from the PCB of the auto-lifting panel.

Recommended parts to prepare:

- **Connection wires**
- **PCB of auto-lifting panel**
- **Indoor PCB**

Troubleshooting



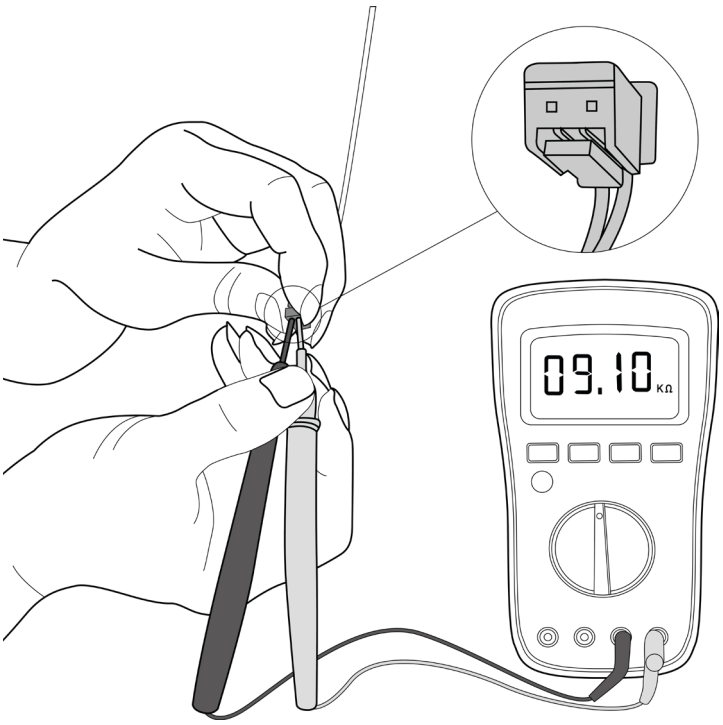
Check Procedures

Temperature Sensor Check

WARNING

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

1. Disconnect the temperature sensor from PCB.
2. Measure the resistance value of the sensor using a multi-meter.
3. Check the corresponding temperature sensor resistance value table (refer to “DISASSEMBLY INSTRUCTIONS” on page 39).



Compressor Check

1. Disconnect the compressor power cord from outdoor PCB (refer to “DISASSEMBLY INSTRUCTIONS” on page 39).
2. Measure the resistance value of each winding using a multi-meter.
3. Check the resistance value of each winding in the Tables 8 - 10.

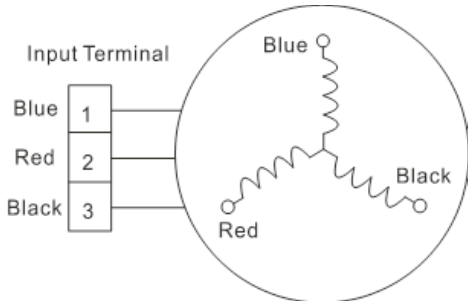


Table 8 — Resistance Value

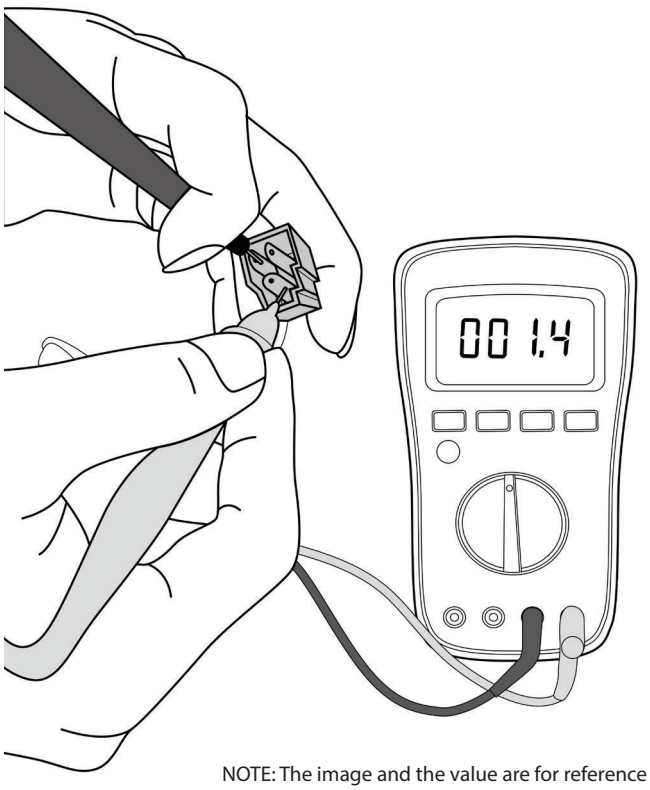
RESISTANCE VALUE	KSN98D64UFZ3	KSN140D21UFZ	KTM240D43UKT	KTM240D57UMT
Blue-Red	2.7Ω	1.28Ω	1.03Ω	0.62Ω
Blue-Black				
Red-Black				

Table 9 — Resistance Value

RESISTANCE VALUE	KTF250D22UMT ATF235D22TMT	KSN140D58UFZ	KTF310D43UMT ATF310D43TMT	KTQ420D1UMU ATQ420D1SN5A1
Blue-Red	0.75Ω	1.86Ω	0.65Ω	0.37Ω
Blue-Black				
Red-Black				

Table 10 — Resistance Value

RESISTANCE VALUE	ATM150D23TFZ	ATH307CDRC8DUL	KSK103D33UEZ3	KTN110D42UFZ
Blue-Red	1.72Ω	1.09Ω	2.13Ω	1.82Ω
Blue-Black				
Red-Black				



NOTE: The image and the value are for reference only.

IPM Continuity Check

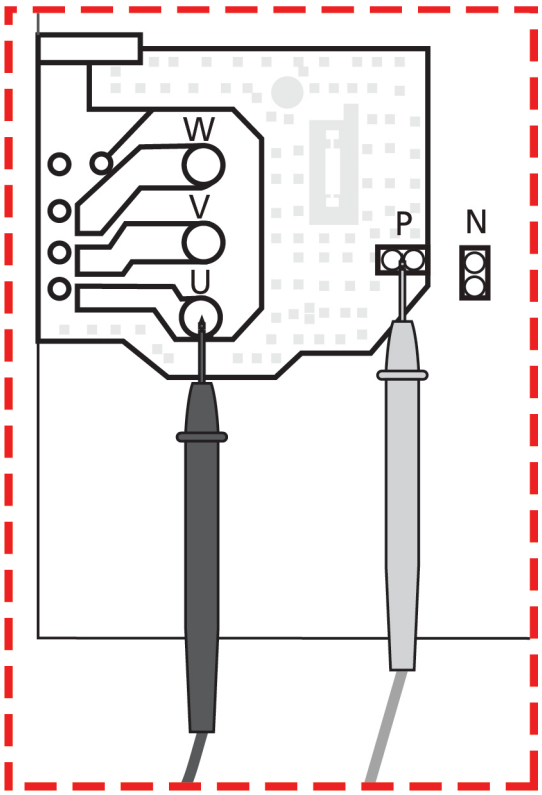
⚠ WARNING

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

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

Table 11 — Digital Tester

DIGITAL TESTER		RESISTANCE VALUE	DIGITAL TESTER		RESISTANCE VALUE
(+)Red	(-)Black		(+)Red	(-)Black	
P	N	∞ Several MΩ	U	N	∞ Several MΩ
	U		V		
	V		W		
	W		-		



Main Parts Check

Temperature Sensor Checking

Disconnect the temperature sensor from the PCB, measure the resistance value with a tester.

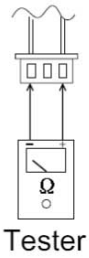


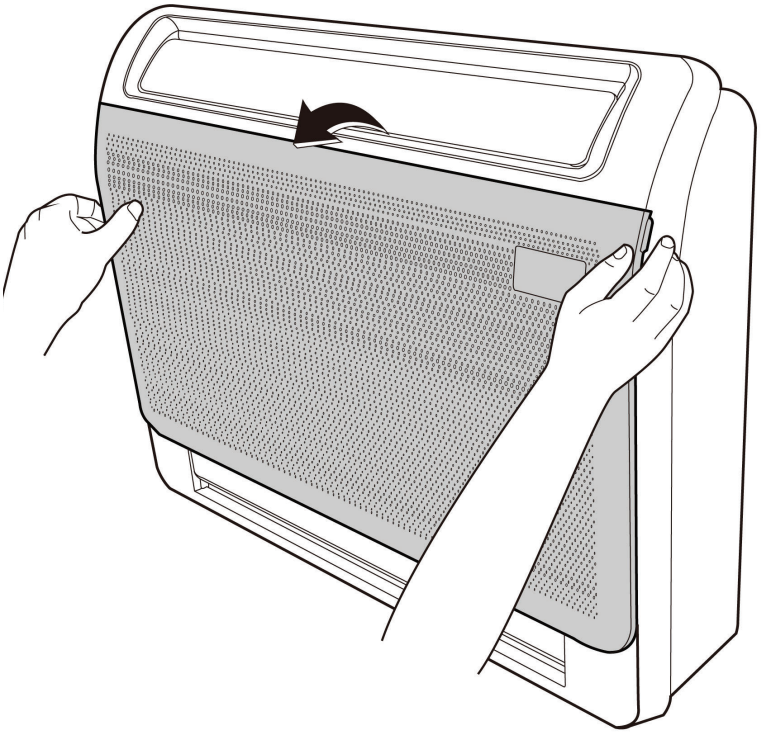
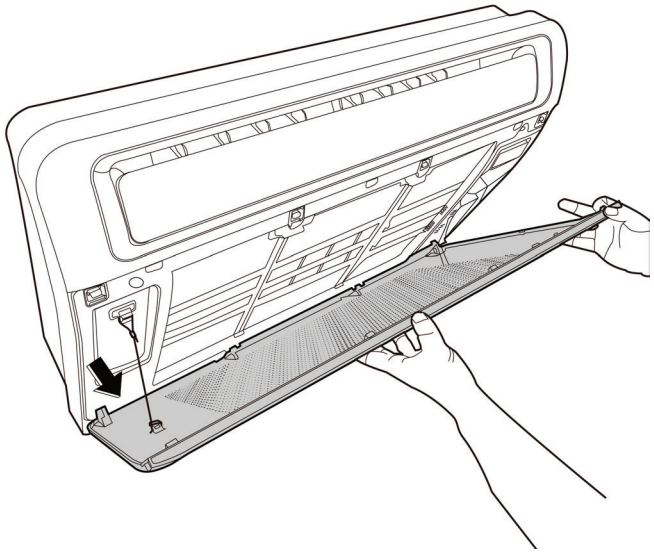
Fig. 20 —Tester

Temperature Sensors

Room temp.(T1) sensor,
Indoor coil temp.(T2) sensor,
Outdoor coil temp.(T3) sensor,
Outdoor ambient temp.(T4) sensor,
Compressor discharge temp.(T5) sensor.
Measure the resistance value of each winding by using the multi-meter.

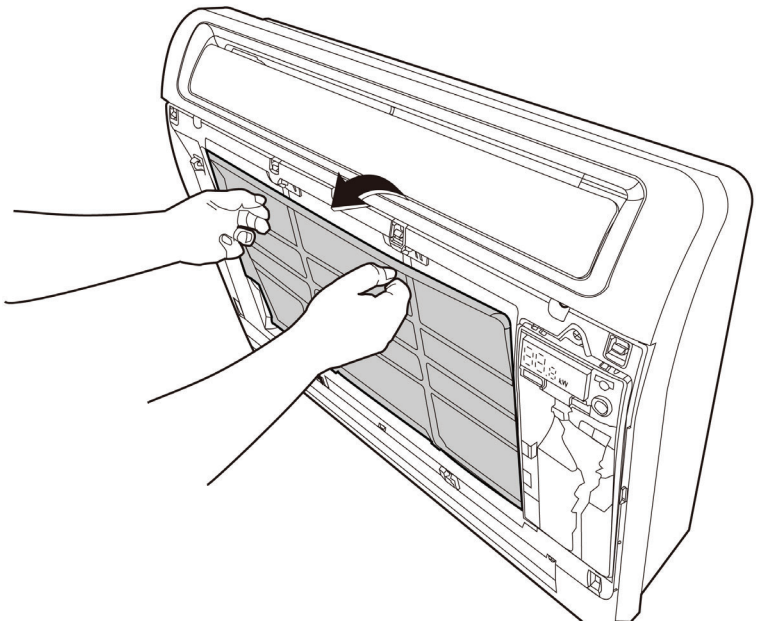
DISASSEMBLY INSTRUCTIONS

Filter

Procedure	Illustration
1) Hold both sides of the front panel and open the front panel.	
2) Remove the string from the hook.	

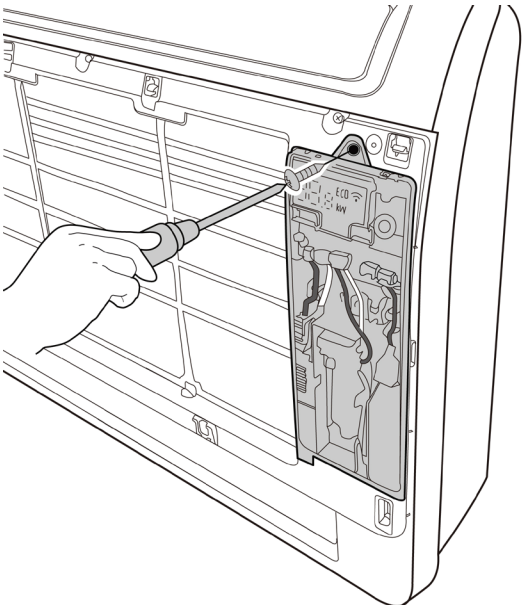
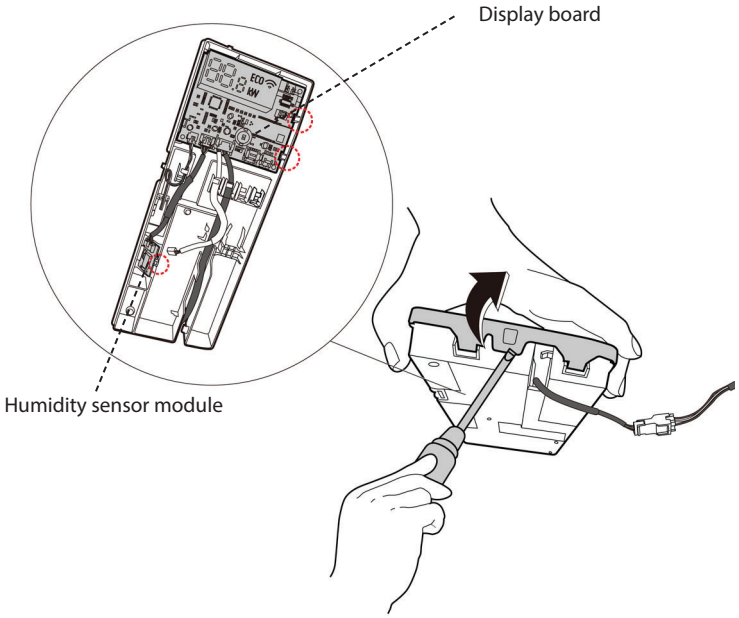
DISASSEMBLY INSTRUCTIONS (CONT)

Filter (CONT)

Procedure	Illustration
3) Pull out the filter.	

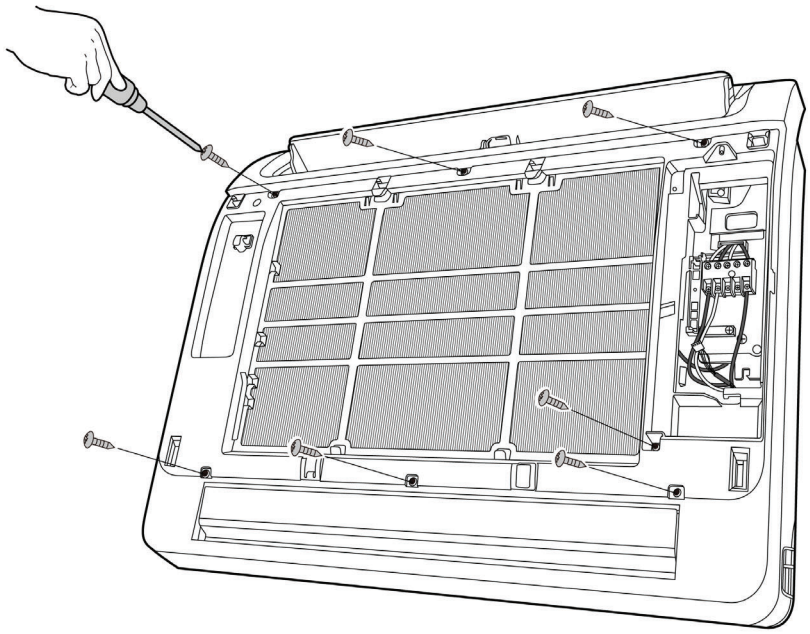
DISASSEMBLY INSTRUCTIONS (CONT)

Display Board

Procedure	Illustration
1) Remove 1 screw then remove the display box subassembly.	
2) Pry open the display light box. 3) Remove the display board and the humidity sensor module.	

DISASSEMBLY INSTRUCTIONS (CONT)

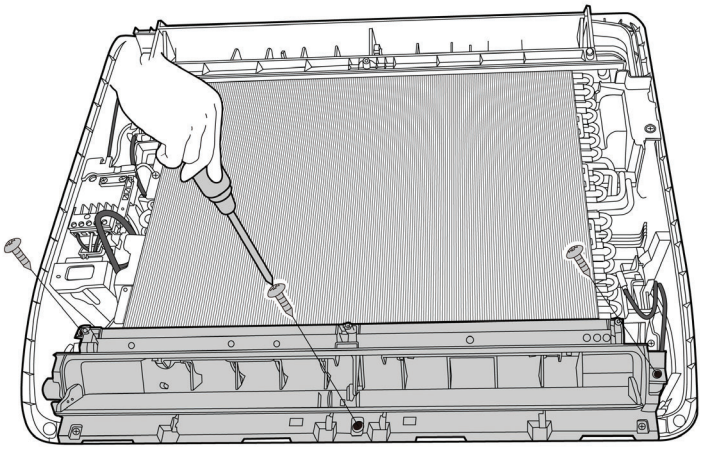
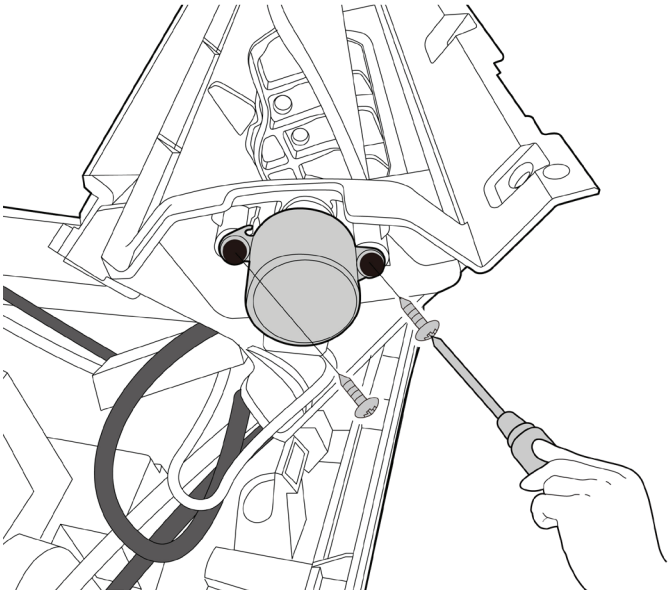
Panel Frame Subassembly

Procedure	Illustration
1) Remove the 7 screws then remove the panel frame subassembly.	

DISASSEMBLY INSTRUCTIONS (CONT)

Upper Air Outlet Frame Assembly

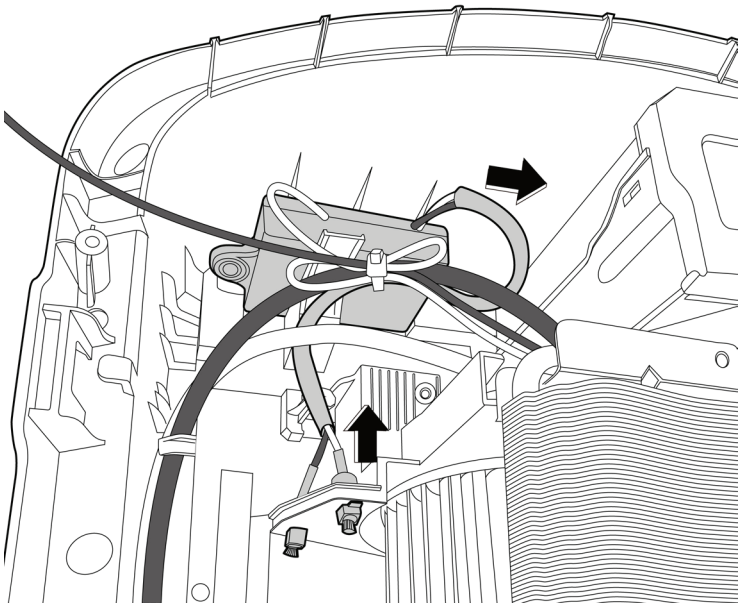
NOTE: Remove the front panel and panel frame subassembly before disassembling the upper air outlet frame assembly.

Procedure	Illustration
1) Remove 3 screws then remove the upper air outlet frame assembly.	
2) Remove 2 screws then remove the upper the stepper motor.	

DISASSEMBLY INSTRUCTIONS (CONT)

Upper Air Outlet Frame Assembly (CONT)

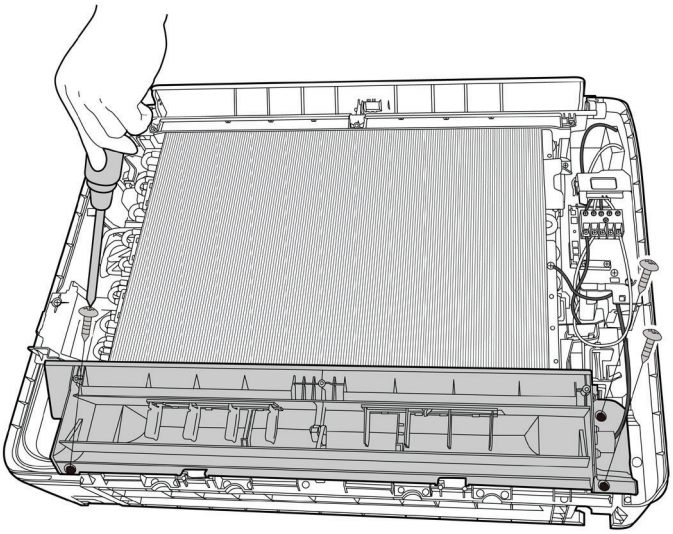
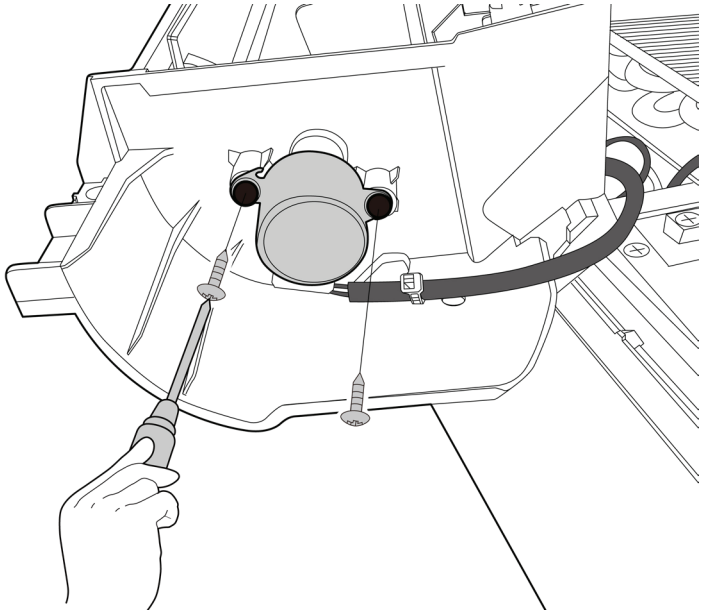
NOTE: Remove the panel before disassembling the electronic control box subassembly.

Procedure	Illustration
3) Remove the positive and negative ion generator by pulling upward, and pull out the positive and negative ion emitter.	

DISASSEMBLY INSTRUCTIONS (CONT)

Lower Air Outlet Frame Assembly

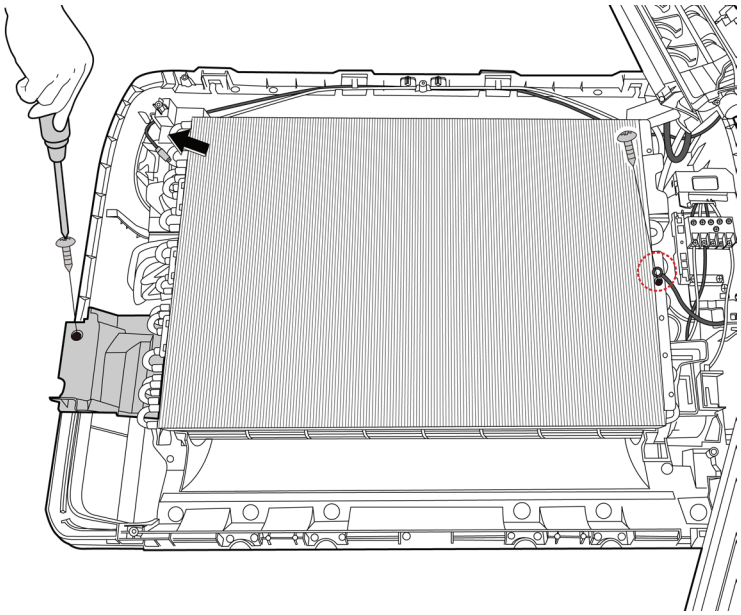
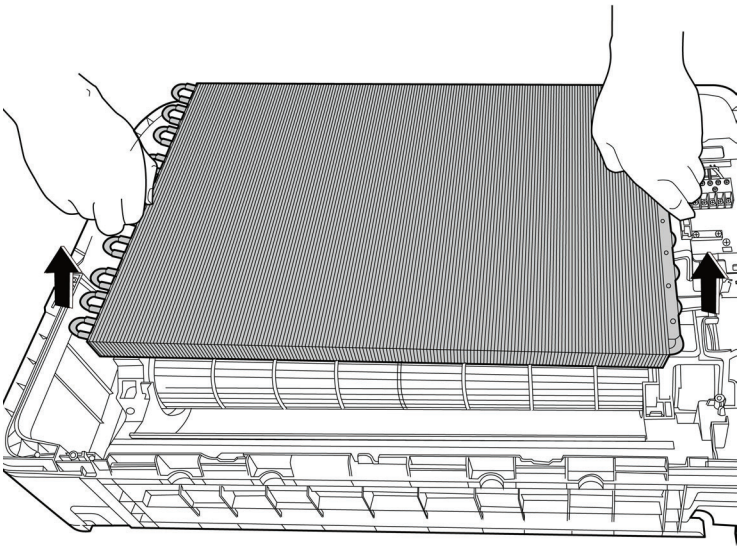
NOTE: Remove the front panel and panel frame subassembly before disassembling the lower air outlet frame assembly.

Procedure	Illustration
1) Remove 3 screws then remove the lower air outlet frame assembly.	
2) Remove 2 screws then remove the lower the stepper motor.	

DISASSEMBLY INSTRUCTIONS (CONT)

Evaporator

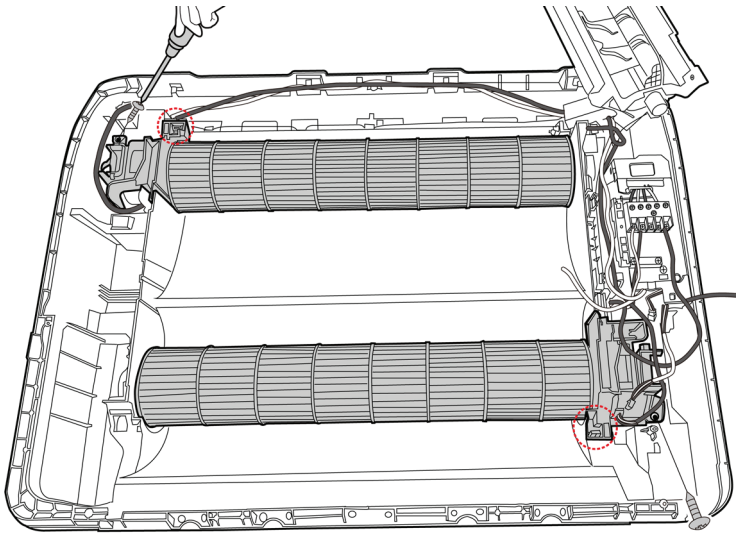
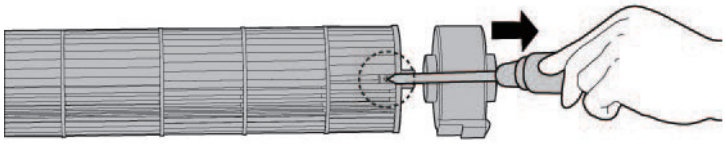
NOTE: Remove the front panel, panel frame subassembly, upper air outlet frame assembly and lower air outlet frame assembly before disassembling the evaporator.

Procedure	Illustration
1) Remove 1 screw then remove the auxiliary water pan. Remove one screw used for the ground connection. Pull out the coil temperature sensor.	
2) Remove the evaporator subassembly.	

DISASSEMBLY INSTRUCTIONS (CONT)

Fan and Fan Motor

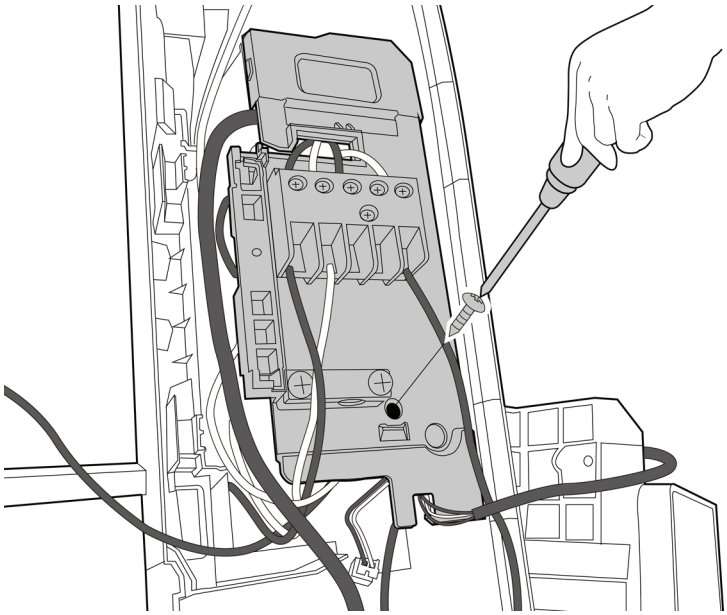
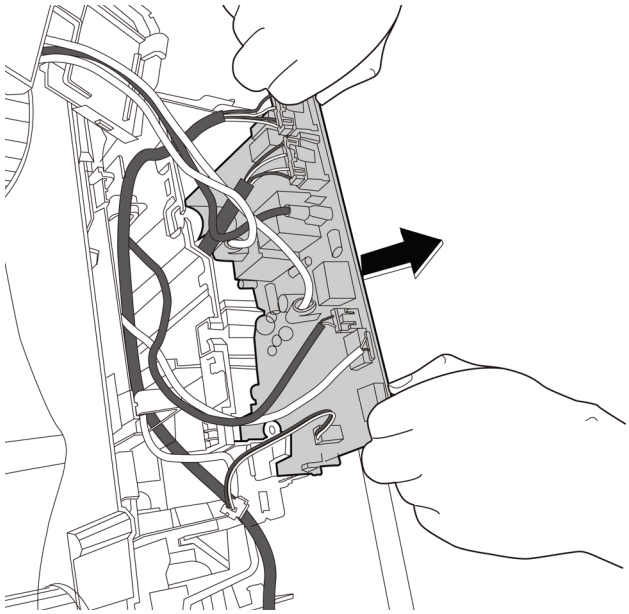
NOTE: Remove the evaporator subassembly before the disassembling fan.

Procedure	Illustration
1) Remove 1 screw and 1 hook, then remove the motor cover (there are two motor cover). 2) Pull out the fan motor and fan assembly from the side.	
3) Remove the screw then remove the fan motor.	

DISASSEMBLY INSTRUCTIONS (CONT)

Electrical Parts (Anti-static gloves must be worn)

NOTE: Remove the front panel and the panel frame subassembly before disassembling the electrical parts.

Procedure	Illustration
1) Remove 1 screw and remove the electronic control box cover.	
2) Pull out the electrical main board.	

APPENDICES

Appendix 1

Table 12 — Temperature Sensor Resistance Value Table for T1,T2,T3 and T4 (°C – K)

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

Appendix 2

Table 13 — Temperature Sensor Resistance Value Table for TP (for some units) (°C--K)

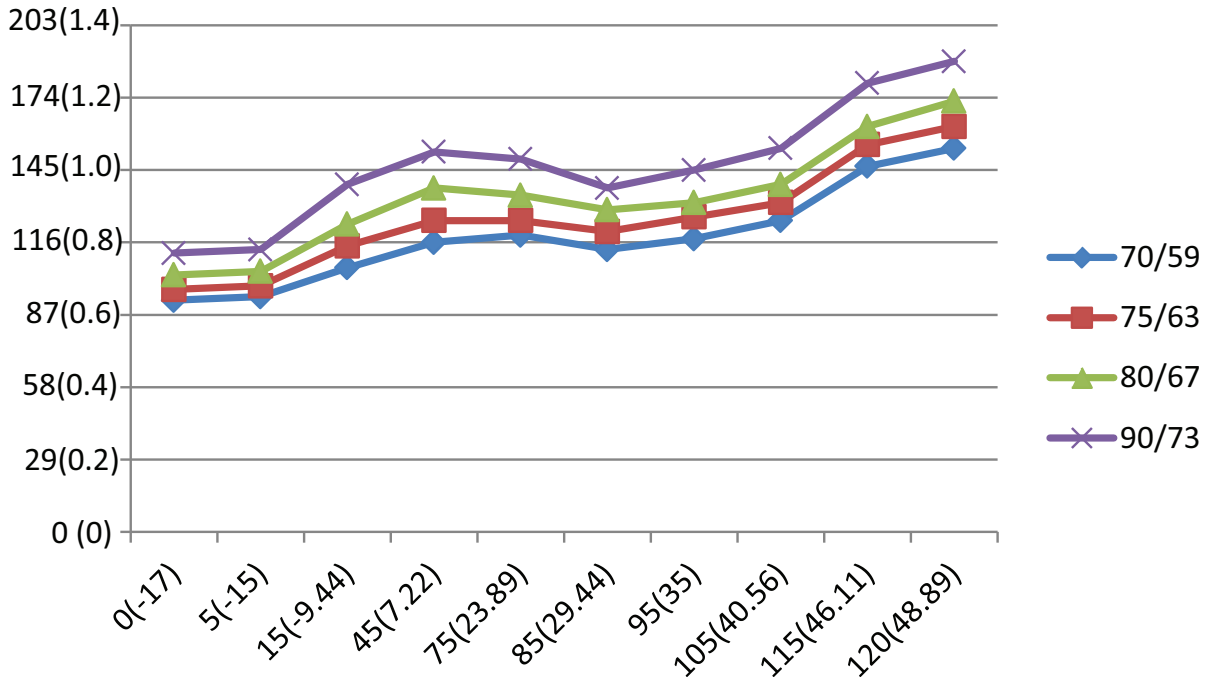
°C	°F	K OHM	°C	°F	K OHM	°C	°F	K OHM	°C	°F	K OHM
-20	-4	542.7	20	68	68.66	60	140	13.59	100	212	3.702
-19	-2	511.9	21	70	65.62	61	142	13.11	101	214	3.595
-18	0	483	22	72	62.73	62	144	12.65	102	216	3.492
-17	1	455.9	23	73	59.98	63	145	12.21	103	217	3.392
-16	3	430.5	24	75	57.37	64	147	11.79	104	219	3.296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

Pressure on the Service Port

Cooling Chart (R410A)

Table 14 — Cooling Chart

°F(°C)	ODU(DB) / IDU(DB/WB)	0 (-17)	5 (-15)	15 (-9.44)	45 (7.22)	75 (23.89)	85 (29.44)	95 (35)	105 (40.56)	115 (46.11)	120 (48.89)
PSI	70/59 (21.11/15)	93	94	106	116	119	113	117	125	147	154
	75/63 (23.89/17.22)	97	99	115	125	124	120	126	132	155	162
	80/67 (26.67/19.44)	103	104	123	138	135	129	132	140	162	173
	90/73 (32.22/22.78)	112	113	139	152	149	138	145	154	180	189
MPa	70/59 (21.11/15)	0.64	0.65	0.73	0.8	0.82	0.78	0.81	0.86	1.01	1.06
	75/63 (23.89/17.22)	0.67	0.68	0.79	0.86	0.86	0.83	0.87	0.91	1.07	1.12
	80/67 (26.67/19.44)	0.71	0.72	0.85	0.95	0.93	0.89	0.91	0.96	1.12	1.19
	90/73 (32.22/22.78)	0.77	0.78	0.96	1.05	1.03	0.95	1	1.06	1.24	1.3



Heating Chart (R410A)

Table 15 — Heating Chart

°F(°C)	ODU(DB/WB) / IDU(DB)	57/53 (13.89/11.67)	47/43 (8.33/6.11)	37/33 (2.78/0.56)	27/23 (-2.78/-5)	17/13 (-8.33/-10.56)	0/-2 (-17/-19)	-17/-18 (-27/-28)
PSI	55(12.78)	439	413	367	330	302	268	239
	65(18.33)	471	435	386	368	339	297	276
	75(23.89)	489	457	403	381	362	312	290
MPa	55(12.78)	3.03	2.85	2.53	2.28	2.08	1.85	1.65
	65(18.33)	3.25	3.00	2.66	2.54	2.33	2.05	1.90
	75(23.89)	3.38	3.15	2.78	2.63	2.49	2.15	2.00