D5FSCAH / D5FLCAH
4-Way Cassette Ductless System
Sizes 09K to 48K

SERVICE MANUAL

TABLE OF CONTENTS

SAFETY CONSIDERATION

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

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

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

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

Read this manual thoroughly and follow all warnings or cautions included in the literature and attached to the unit. Consult local building codes and National Electrical Code (NEC) for special requirements. Recognize safety information. This is the safety-alert symbol ⚠. When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury.

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

⚠ WARNING

ELECTRICAL SHOCK HAZARD

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

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

⚠ 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

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

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

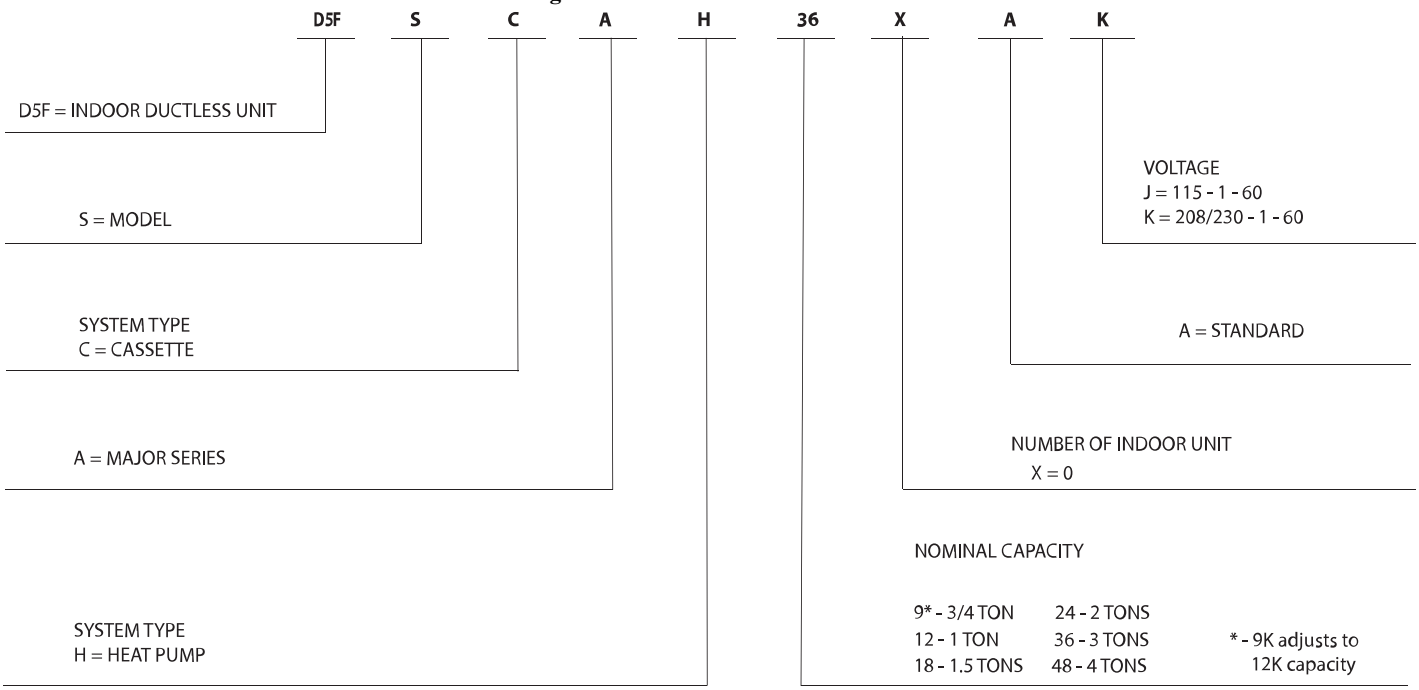
If more than the recommended length is buried, refrigerant may migrate to the cooler buried section during extended periods of system shutdown. This causes refrigerant slugging and could possibly damage the compressor at start-up.

INDOOR UNIT SIZES

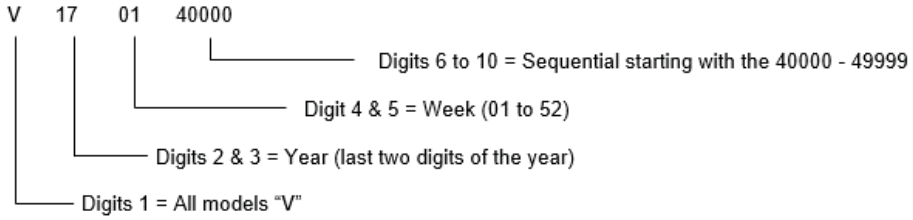
System Tons	Capacity (Btu/h)	Model	Voltage	Indoor units
0.75/1.00	9K/12K	2x2 Cassette	208V/230V	**D5FSCAH12XAK**
1.50	18K			**D5FSCAH18XAK**
2.00	24K	3x3 Cassette		**D5FSCAH24XAK**
3.00	36K			**D5FLCAH36XAK**
4.00	48K			**D5FLCAH48XAK**

MODEL NUMBER NOMENCLATURE

Fig. 1 – Model Number Nomenclature



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



All units manufactured by MIDEA must have unique serial numbers (they are not to match any other product MIDEA manufactures for Carrier).
The units will require serial numbers for traceability. Traceability is required for both safety and reliability. This is not meant to supersede any Consumer Product Safety Commission (CPSC) or other agency requirement.

Fig. 2 – Serial Number Nomenclature

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

INTRODUCTION

This service manual provides the necessary information to service, repair, and maintain the **D5FSCAH/D5FLCAH** family of heat pumps. This manual has an APPENDIX with data required to perform troubleshooting. Use the "TABLE of CONTENTS" to locate a desired topic.

⚠ WARNING

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.

⚠ WARNING

Only use the specified wire. If the wire is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard. The product must be properly grounded at the time of installation, or electric shock may occur.

For all electrical work, follow all local and national wiring standards, regulations, and the Installation Manual. Connect the cables tightly, and clamp them securely to prevent external forces from damaging the terminal. Improper electrical connections can overheat and cause fire, and may also cause shock. All electrical connections must be made according to the Electrical Connection Diagram located on the panels of the indoor and outdoor units.

All wiring must be properly arranged to ensure that the control board cover can close properly. If the control board cover is not closed properly, it can lead to corrosion and cause the connection points on the terminal to heat up, catch fire, or cause electrical shock.

Disconnection must be incorporated in the fixed wiring in accordance with NEC, CSA, and Local Codes. Do not share the electrical outlet with other appliances. Improper or insufficient power supply can cause fire or electric shock.

If connecting power to fixed wiring, an all-pole disconnection device which has at least 3mm clearances in all poles, and have a leakage current that may exceed 10mA, the residual current device (RCD) having a rated residual operating current not exceeding 30mA, and disconnection must be incorporated in the fixed wiring in accordance with NEC, CSA, and Local Codes.

⚠ WARNING

Turn of the unit and disconnect the power before performing any installation or repairing. Failure to do so can cause electric shock.

Installation must be performed by an authorized dealer or specialist. Defective installation can cause water leakage, electrical shock, or fire.

Installation must be performed according to the installation instructions.

Improper installation can cause water leakage, electrical shock, or fire.

Contact an authorized service technician for repair or maintenance of this unit. This appliance shall be installed in accordance with national wiring regulations.

Only use the included accessories, parts, and specified parts for installation. Using non-standard parts can cause water leakage, electrical shock, fire, and can cause the unit to fail.

Install the unit in a firm location that can support the unit's weight. If the chosen location cannot support the unit's weight, or the installation is not done properly, the unit may drop and cause serious injury and damage. Install drainage piping according to the instructions in this manual. Improper drainage may cause water damage to your home and property.

For units that have an auxiliary electric heater, do not install the unit within 3 feet (1 meter) of any combustible materials.

If combustible gas accumulates around the unit, it may cause fire.

Do not turn on the power until all work has been completed.

When moving or relocating the unit, consult experienced service technicians for disconnection and re-installation of the unit.

How to install the appliance to its support, please read the information for details in "indoor unit installation" and "outdoor unit installation" sections.

NOTE: The air conditioner's circuit board (PCB) is designed with a fuse to provide overcurrent protection. The specifications of the fuse are printed on the circuit board, for example: T3.15AL/250VAC, T5AL/250VAC, T3.15A/250VAC, T5A/ 250VAC, T20A/250VAC, T30A/250VAC,etc.

NOTE: Only the blast-proof ceramic fuse can be used.

⚠ WARNING

FOR FLAMMABLE REFRIGERANTS

Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.

The appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater).

Do not pierce or burn. Be aware that refrigerants may not contain an odor.

⚠ WARNING

PERSONAL INJURY AND PROPERTY DAMAGE HAZARD

For continued performance, reliability, and safety, the only approved accessories and replacement parts are those specified by the equipment manufacturer. The use of non-manufacturer approved parts and accessories could invalidate the equipment limited warranty and result in fire risk, equipment malfunction, and failure. Review the manufacturer's instructions and replacement parts catalogs available from your equipment supplier.

WARNING - RISK OF FIRE DUE TO FLAMMABLE REFRIGERANT USED. FOLLOW HANDLING INSTRUCTIONS CAREFULLY IN COMPLIANCE WITH NATIONAL REGULATIONS.

NOTE: Risk of Fire. Flammable refrigerant used. To be repaired only by trained service personnel. Do not puncture refrigerant tubing.

Table 1 — A (min)

hinst: Height Above Floor Level to Center of Indoor Unit / feet (meters

MC or Mrel Refrigerant Charge Amount pounds (kilograms)		5.9~7.2 (1.8~2.2)	7.5 (2.3)	7.9 (2.4)	8.5 (2.6)	9.2 (2.8)	9.8 (3.0)
	4.0 (1.8)	60 (5.53)	57 (5.29)	55 (5.07)	50 (4.68)	47 (4.34)	44 (4.05)
	4.4 (2.0)	66 (6.14)	63 (5.88)	61 (5.63)	56 (5.2)	52 (4.83)	48 (4.5)
	4.9 (2.2)	73 (6.76)	70 (6.46)	67 (6.19)	62 (5.72)	57 (5.31)	53 (4.95)
	5.3 (2.4)	79 (7.37)	76 (7.05)	73 (6.76)	67 (6.24)	62 (5.79)	58 (5.41)
	5.7 (2.6)	86 (7.99)	82 (7.64)	79 (7.32)	73 (6.76)	68 (6.27)	63 (5.86)
	6.2 (2.8)	93 (8.6)	89 (8.23)	85 (7.88)	78 (7.28)	73 (6.76)	68 (6.31)
	6.6 (3.0)	99 (9.21)	95 (8.81)	91 (8.45)	84 (7.8)	78 (7.24)	73 (6.76)
	7.1 (3.2)	106 (9.83)	101 (9.4)	97 (9.01)	90 (8.32)	83 (7.72)	78 (7.21)
	7.5 (3.4)	112 (10.44)	108 (9.99)	103 (9.57)	95 (8.84)	88 (8.2)	82 (7.66)
	7.9 (3.6)	119 (11.06)	114 (10.58)	109 (10.14)	101 (9.36)	94 (8.69)	87 (8.11)
	8.4 (3.8)	126 (11.67)	120 (11.16)	115 (10.7)	106 (9.88)	99 (9.17)	92 (8.56)
	8.8 (4.0)	132 (12.29)	126 (11.75)	121 (11.26)	112 (10.4)	104 (9.65)	97 (9.01)
	9.3 (4.2)	139 (12.9)	133 (12.34)	127 (11.82)	117 (10.91)	109 (10.14)	102 (9.46)
	9.7 (4.4)	145 (13.51)	139 (12.93)	133 (12.39)	123 (11.43)	114 (10.62)	107 (9.91)
	10.1 (4.6)	152 (14.13)	145 (13.51)	139 (12.95)	129 (11.95)	119 (11.1)	112 (10.36)
	10.6 (4.8)	159 (14.74)	152 (14.1)	145 (13.51)	134 (12.47)	125 (11.58)	116 (10.81)
	11.0 (5.0)	165 (15.36)	158 (14.69)	152 (14.08)	140 (12.99)	130 (12.07)	121 (11.26)

A-min: Required Minimum Room Area / Square Feet (Square Meters)

AREA FORMULA

Amin is the required minimum room area in ft^2 /m^2
mc is the actual refrigerant charge in the system in ft/kg
mREL is the refrigerant releasable charge in ft/kg
hinst is the height of the center of the appliance relative to the floor of the room after installation.
WARNING: The minimum room area or minimum room area of conditioned space is based on releasable charge or total system refrigerant charge.

For R454B refrigerant charge amount and minimum room area:

The indoor unit should be installed at least 5.9ft/1.8m above the floor, and the minimum room area for operation or storage should be as specified in Table 1.

PRECAUTIONS

To prevent personal injury, or property or unit damage, adhere to all precautionary measures and instructions outlined in this manual. Before servicing a unit, refer to this service manual and its relevant sections.

Failure to adhere to all precautionary measures listed in this section may result in personal injury, damage to the unit or to property, or in extreme cases, death.

IN CASE OF ACCIDENT OR EMERGENCY

⚠ WARNING

- If a gas leak is suspected, immediately turn off the gas and ventilate the area before turning the unit on.
- If strange sounds or smoke is detected from the unit, turn the breaker off and disconnect the power supply cable.
- If the unit comes into contact with liquid, contact an authorized service center.
- If liquid from the batteries makes contact with skin or clothing, immediately rinse or wash the area well with clean water.
- Do not insert hands or other objects into the air inlet or outlet while the unit is plugged in.
- Do not operate the unit with wet hands.
- Do not use a remote controller that has previously been exposed to battery damage or battery leakage.

⚠ CAUTION

- Clean and ventilate the unit at regular intervals when operating it near a stove or near similar devices.
- Do not use the unit during severe weather conditions. If possible, remove the product from the window before such occurrences.

PRE-INSTALLATION AND INSTALLATION

⚠ WARNING

- Use this unit only on a dedicated circuit.
- Damage to the installation area could cause the unit to fall, potentially resulting in personal injury, property damage, or product failure.
- Only qualified personnel should disassemble, install, remove, or repair the unit.
- Only a qualified electrician should perform electrical work. For more information, contact your dealer, seller, or an authorized

⚠ CAUTION

While unpacking be careful of sharp edges around the unit as well as the edges of the fins on the con-denser and evaporator.

OPERATION AND MAINTENANCE

⚠ WARNING

- Do not use defective or under-rated circuit breakers.
- Ensure the unit is properly grounded and that a dedicated circuit and breaker are installed.
- Do not modify or extend the power cable. Ensure the power cable is secure and not damaged during operation.
- Do not unplug the power supply plug during operation.
- Do not store or use flammable materials near the unit.
- Do not open the inlet grill of the unit during operation.
- Do not touch the electrostatic filter if the unit is equipped with one.
- Do not block the inlet or outlet of air flow to the unit.
- Do not use harsh detergents, solvents, or similar items to clean the unit. Use a soft cloth for cleaning.
- Do not touch the metal parts of the unit when removing the air filter as they are very sharp.
- Do not step on or place anything on the unit or outdoor units.
- Do not drink water drained from the unit
- Avoid direct skin contact with water drained from the unit.
- Use a firm stool or step ladder according to manufacturer procedures when cleaning or maintaining the unit.

⚠ CAUTION

- Do not install or operate the unit for an extended period of time in areas of high humidity or in an environment directly exposing it to sea wind or salt spray.
- Do not install the unit on a defective or damaged installation stand, or in an unsecured location.
- Ensure the unit is installed at a level position
- Do not install the unit where noise or air discharge created by the outdoor unit will negatively impact the environment or nearby residences.
- Do not expose skin directly to the air discharged by the unit for prolonged periods of time.
- Ensure the unit operates in areas water or other liquids.
- Ensure the drain hose is installed correctly to ensure proper water drainage.
- When lifting or transporting the unit, it is recommended that two or more people are used for this task.
- When the unit is not to be used for an extended time, disconnect the power supply or turn off the breaker.

WARNING FOR USING FLAMMABLE REFRIGERANT

1. Installation (Space)
   – That the installation of pipe-work shall be kept to a minimum.
   – That pipe-work shall be protected from physical damage.
   – Where refrigerant pipes shall be compliance with national gas regulations.
   – That mechanical connections shall be accessible for maintenance purposes.
   – In cases that require mechanical ventilation, ventilation openings shall be kept clear of obstruction.
   – When disposing of the product is used, be based on national regulations, properly processed.
2. Servicing

   Any person who is involved with working on or breaking into a refrigerant circuit should hold a current valid certificate from an industry-accredited assessment authority, which authorizes their competence to handle refrigerants safely in accordance with an industry recognized assessment specification.
3. Maintenance and repair requiring the assistance of other skilled personnel shall be carried out under the supervision of the person competent in the use of flammable refrigerants.
4. Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.
5. The appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater).
6. Be more careful that foreign matter (oil, water, etc.) does not enter the piping. Also, when storing the piping, securely seal the opening by pinching, taping, etc.
7. Do not pierce or burn.
8. Be aware that refrigerants may not contain an odor.
9. All working procedure that affects safety means shall only be carried by competent persons.
10. Appliance shall be stored in a well -ventilated area where the room size corresponds to the room area as specific for operation.
11. The appliance shall be stored so as to prevent mechanical damage from occurring.
12. Joints shall be tested with detection equipment with a capability of 5 g/year of refrigerant or better, with the equipment in standstill and under operation or under a pressure of at least these standstill or operation conditions after installation. Detachable joints shall NOT be used in the indoor side of the unit (brazed, welded joint could be used).
13. When a FLAMMABLE REFRIGERANT is used, the requirements for installation space of appliance and /or ventilation requirements are determined according to
   – the mass charge amount (M) used in the appliance,
   – the installation location,
   – the type of ventilation of the location or of the appliance.
   – piping material, pipe routing, and installation shall include protection from physical damage in operation and service, and be in compliance with national and local codes and standards, such as ASHRAE 15, IAPMO Uniform Mechanical Code, ICC International Mechanical Code, or CSA B52. All field joints shall be accessible for inspection prior to being covered or enclosed.
   – that protection devices, piping, and fittings shall be protected as far as possible against adverse environmental effects, for ex-ample, the danger of water collecting and freezing in relief pipes or the accumulation of dirt and debris;
   – that piping in refrigeration systems shall be so designed and installed to minimize the likelihood of hydraulic shock damaging the system;
   – that steel pipes and components shall be protected against corrosion with a rustproof coating before applying any insulation;
   – that precautions shall be taken to avoid excessive vibration or pulsation;
   – the minimum floor area of the room shall be mentioned in the form of a table or a single figure without reference to a formula;
   – after completion of field piping for split systems, the field pipe-work shall be pressure tested with an inert gas and then vacuum tested prior to refrigerant charging, according to the following requirements:
      – The minimum test pressure for the low side of the system shall be the low side design pressure and the minimum test pressure for the high side of the system shall be the high side design pressure, unless the high side of the system, cannot be isolated from the low side of the system in which case the entire system shall be pressure tested to the low side design pressure.
      – The test pressure after removal of pressure source shall be maintained for at least 1h with no decrease of pressure indicated by the test gauge, with test gauge resolution not exceeding 5% of the test pressure.
      – During the evacuation test, after achieving a vacuum level specified in the manual or less, the refrigeration system shall be isolated from the vacuum pump and the pressure shall not rise above 1500 microns within 10 min. The vacuum pressure level shall be specified in the manual, and shall be the lessor of 500 microns or the value required for compliance with national and local codes and standards, which may vary between residential, commercial, and industrial buildings.
   – field-made refrigerant joints indoors shall be tightness tested according to the following requirements: The test method shall have a sensitivity of 5 grams per year of refrigerant or better under a pressure of at least 0,25 times the maximum allowable pressure. No leak shall be detected.
   – correct the minimum room area of the space Amin by multiplying the altitude adjustment factor (AF) factor in the below table based on for building site ground level altitude (Halt) in meters.

Table 2 — Altitude Adjustment Factor

Halt	0	200	400	600	800	1000	1200	1400	1600
AF	1.00	1.00	1.00	1.00	1.02	1.05	1.07	1.10	1.12
Halt	1800	2000	2200	2400	2600	2800	3000	3200	
AF	1.15	1.18	1.21	1.25	1.28	1.32	1.36	1.40	

   – Warning: keep any required ventilation openings clear of obstruction;
   – Any servicing shall be performed only as recommended by the manufacturer
14. Qualification of workers

    Any maintenance, service and repair operations must be required qualification of the working personnel. Every working procedure that affects safety means shall only be carried out by competent persons that joined the training and achieved competence should be documented by a certificate. The training of these procedures is carried out by national training organizations or manufacturers that are accredited to teach the relevant national competency standards that may be set in legislation. All training shall follow the ANNEX HH requirements of UL 60335-2-40 4rd Edition.

    Examples for such working procedures are:

- breaking into the refrigerating circuit
- opening of sealed components
- opening of ventilated enclosures

INFORMATION SERVICING (FLAMMABLE MATERIALS)

CHECKS TO THE AREA

Prior to beginning work on systems containing flammable refrigerants, safety checks are necessary to ensure that the risk of ignition is minimized. For repair to the refrigerating system, the following precautions shall be complied with prior to conducting work on the system.

WORK PROCEDURE

Work shall be undertaken under a controlled procedure so as to minimize the risk of a flammable gas or vapor being present while the work is being performed.

GENERAL WORK AREA

All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. Work in confined spaces shall be avoided.

CHECKING FOR PRESENCE OF REFRIGERANT

- The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially flammable atmospheres.
- Ensure that the leak detection equipment being used is suitable for use with flammable refrigerants, i.e. no sparking, adequately sealed or intrinsically safe.

PRESENCE OF FIRE EXTINGUISHER

If any hot work is to be conducted on the refrigeration equipment or any associated parts, appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO2 fire extinguisher adjacent to the charging area.

NO IGNITION SOURCE

- No person carrying out work in relation to a refrigeration system which involves exposing any pipe work that contains or has contained flammable refrigerant shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion.
- All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which flammable refrigerant can possibly be released to the surrounding space.
- Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks.
- NO SMOKING signs shall be displayed.

VENTILATED AREA

Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.

CHECKS TO THE REFRIGERANT EQUIPMENT

Where electrical components are being changed, they shall be fit for the purpose and to the correct specification. At all times the manufacturer's maintenance and service guidelines shall be followed. If in doubt consult the manufacturer's technical department for assistance. The following checks shall be applied to installations using FLAMMABLE REFRIGERANTS:

- the actual refrigerant charge is in accordance with the room size within which the refrigerant containing parts are installed;
- the ventilation machinery and outlets are operating adequately and are not obstructed;
- if an indirect refrigerating circuit is being used, the secondary circuits shall be checked for the presence of refrigerant;
- marking to the equipment continues to be visible and legible, marking and signs that are illegible shall be corrected;
- refrigeration pipe or components are installed in a position where they are unlikely to be exposed to any substance which may corrode refrigerant containing components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being so corroded.

CHECK TO ELECTRICAL DEVICES

Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment so all parties are advised. Initial safety checks shall include:

- that capacitors are discharged: this shall be done in a safe manner to avoid possibility of sparking;
- that there no live electrical components and wiring are exposed while charging, recovering or purging the system;
- that there is continuity of earth bonding.

SEALED ELECTRICAL COMPONENTS SHALL BE REPLACED

- During repairs to sealed components, all electrical supplies shall be disconnected from the equipment being worked upon prior to any removal of sealed covers, etc.

  If it is absolutely necessary to have an electrical supply to equipment during servicing, then a permanently operating form of leak detection shall be located at the most critical point to warn of a potentially hazardous situation.
- Particular attention shall be paid to the following to ensure that by working on electrical components, the casing is not altered in such a way that the level of protection is affected. This shall include damage to cables, excessive number of connections, terminals not made to original specification, damage to seals, incorrect fitting of glands, etc.
  - Ensure that apparatus is mounted securely.
  - Ensure that seals or sealing materials have not degraded such that they no longer serve the purpose of preventing the ingress of flammable atmospheres. Replacement parts shall be in accordance with the manufacturer's specifications.

INTRISICALLY SAFE COMPONENTS MUST BE REPLACED

Do not apply any permanent inductive or capacitance loads to the circuit without ensuring that this will not exceed the permissible voltage and current permitted for the equipment in use. Intrinsically safe components are the only types that can be worked on while live in the presence of a flammable atmosphere. The test apparatus shall be at the correct rating. Replace components only with parts specified by the manufacturer. Other parts may result in the ignition of refrigerant in the atmosphere from a leak.

NOTE: The use of silicon sealant may inhibit the effectiveness of some types of leak detection equipment. Intrinsically safe components do not have to be isolated prior to working on them.

CABLING

Check that cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges or any other adverse environmental effects. The check shall also take into account the effects of aging or continual vibration from sources such as compressors or fans.

DETECTION OF FLAMMABLE REFRIGERANTS

- Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used.
- The following leak detection methods are deemed acceptable for refrigerant systems. Electronic leak detectors may be used to detect refrigerant leaks but, in the case of FLAMMABLE REFRIGERANTS, the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25% maximum) is confirmed. Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work.

NOTE Examples of leak detection fluids are

- bubble method,
- fluorescent method agents.

- If a leak is suspected, all naked flames shall be removed/extinguished.
- If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut of valves) in a part of the system remote from the leak. See the following instructions of removal of refrigerant.

REMOVAL AND EVACUATION

- When breaking into the refrigerant circuit to make repairs or for any other purpose, conventional procedures shall be used. However, it is important that best practice is followed since flammability is a consideration.
- The following procedure shall be adhered to:
  - –safely remove refrigerant following local and national regulations;
  - evacuate;
  - purge the circuit with inert gas (optional for A2L);
  - evacuate (optional for A2L);
  - continuously flush or purge with inert gas when using flame to open circuit; and open the circuit;
- The refrigerant charge shall be recovered into the correct recovery cylinders if venting is not allowed by local and national codes. For appliances containing flammable refrigerants, the system shall be purged with oxygen-free nitrogen to render the appliance safe for flammable refrigerants. This process might need to be repeated several times. Compressed air or oxygen shall not be used for purging refrigerant systems.
- For appliances containing flammable refrigerants, refrigerants purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum (optional for A2L). This process shall be repeated until no refrigerant is within the system (optional for A2L). When the final oxygen-free nitrogen charge is used, the system shall be vented down to atmospheric pressure to enable work to take place.
- The outlet for the vacuum pump shall not be close to any potential ignition sources, and ventilation shall be available.

CHARGING PROCEDURES

In addition to conventional charging procedures, the following requirements shall be followed:

- Works shall be undertaken with appropriate tools only (In case of uncertainty, please consult the manufacturer of the tools for use with flammable refrigerants)
- Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimize the amount of refrigerant contained in them.
- Cylinders shall be kept upright.
- Ensure that the refrigeration system is earthed prior to charging the system with refrigerant.
- Label the system when charging is complete (if not already). Extreme care shall be taken not to overfill the refrigeration system.
- Prior to recharging the system it shall be pressure tested with OFN. The system shall be leak tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site.

DECOMMISSIONING

Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its detail. It is recommended good practice that all refrigerants are recovered safely. Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of recovered refrigerant. It is essential that electrical power is available before the task is commenced.

- Become familiar with the equipment and its operation.
- Isolate system electrically.
- Before attempting the procedure ensure that:
  - mechanical handling equipment is available, if required, for handling refrigerant cylinders;
  - all personal protective equipment is available and being used correctly;
  - the recovery process is supervised at all times by a competent person;
  - recovery equipment and cylinders conform to the appropriate standards.
- Pump down refrigerant system, if possible.
- If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
- Make sure that cylinder is situated on the scales before recovery takes place.
- Start the recovery machine and operate in accordance with manufacturer’s instructions.
- Do not overfill cylinders. (No more than 80% volume liquid charge).
- Do not exceed the maximum working pressure of the cylinder, even temporarily.
- When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
- Recovered refrigerant shall not be charged into another refrigeration system unless it has been cleaned and checked.

LABELING

Equipment shall be labeled stating that it has been de-commissioned and emptied of refrigerant. The label shall be dated and signed. For appliances containing FLAMMABLE REFRIGERANTS, ensure that there are labels on the equipment stating the equipment contains FLAMMABLE REFRIGERANT.

RECOVERY

- When removing refrigerant from a system, either for servicing or decommissioning,
- it is recommended good practice that all refrigerants are removed safely.
- When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct number of cylinders for holding the total system charge is available. All cylinders to be used are designated for the recovered refrigerant and labeled for that refrigerant (i.e. special cylinders for the recovery of refrigerant). Cylinders shall be complete with pressure-relief valve and associated shut-of valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.
- The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of the flammable refrigerant. If in doubt the manufacturer should be consulted. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition.
- The recovered refrigerant shall be processed according to local legislation in the correct recovery cylinder, and the relevant waste transfer note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.
- If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The compressor body shall not be heated by an open flame or other ignition sources to accelerate this process. When oil is drained from a system, it shall be carried out safely.

TRANSPORTATION, MARKING AND STORAGE FOR UNITS

1. Transport of equipment containing flammable refrigerants
   Compliance with the transport regulations
2. Marking of equipment using signs
   Compliance with local regulations
3. Disposal of equipment using flammable refrigerants
   Compliance with national regulations
4. Storage of equipment/appliances
   The storage of equipment should be in accordance with the manufacturer’s instructions.
5. Storage of packed (unsold) equipment
   Storage package protection should be constructed such that mechanical damage to the equipment inside the package will not cause a leak of the refrigerant charge. The maximum number of pieces of equipment permitted to be stored together will be determined by local regulations.

SOUND PRESSURE

SYSTEM SIZE		9/12K	18K	24K	36K	48K
Indoor Sound Pressure Level dBa	High	43.5	44.5	45.0	52.0	52.0
	Medium	40.5	41	42.5	47.5	49.5
	Low	27.5	27.5	33.5	40.0	41.5
	Silent	26.0	23.5	29.5	38.0	38.0

SOUND PRESSURE TESTING METHOD

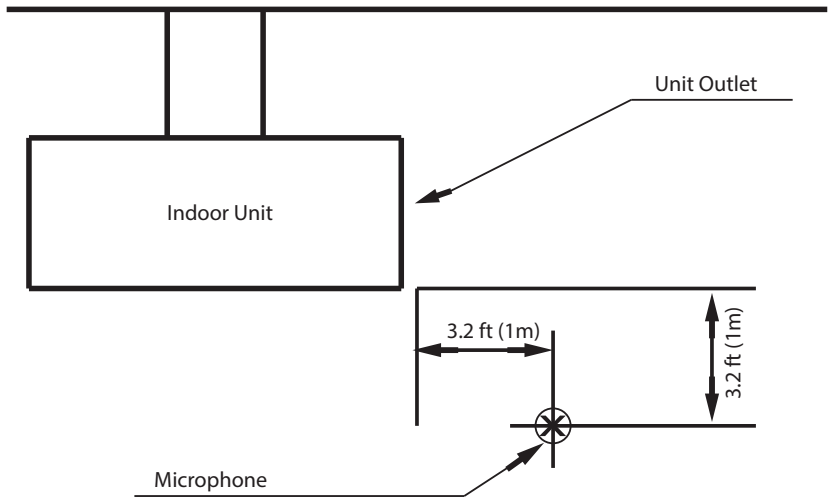


Fig. 3 – Sound Pressure Testing Method

AIR FLOW DATA

SYSTEM SIZE		9K/12K	18K	24K	36K	48K
Airflow Data CFM	HIGH	364.92	388.7	706.3	947.62	1118.3
	MEDIUM	306.06	318.0	635.67	853.44	1024.13
	LOW	194.23	194.3	547.38	753.38	806.36

AIR THROW DATA

Air Throw Data	ft(m)	9.84(3)	9.84(3)	13.12(4)	14.76(4.5)	14.76(4.5)

MOISTURE REMOVAL

Moisture Removal	L/h	1.45	2	2.36	4.3	6.13

PIPING SPECIFICATIONS

NAME	MODEL	LIQUID SIDE	GAS SIDE	REMARKS
Connecting Pipe Assembly	9K / 12K	Ø1/4in (Ø6.35mm)	Ø3/8in (Ø9.52mm)	Pipes are not included in the accessories so you will need to purchase them from the local dealer.
	18K	Ø1/4in (Ø6.35mm)	Ø1/2in (Ø12.7mm)	
	24K	Ø3/8in (Ø9.52mm)	Ø5/8in (Ø16mm)	
	36K	Ø3/8in (Ø9.52mm)	Ø3/4in (Ø19mm)	
	48K	Ø3/8in (Ø9.52mm)	Ø3/4in (Ø19mm)	

DIMENSIONS

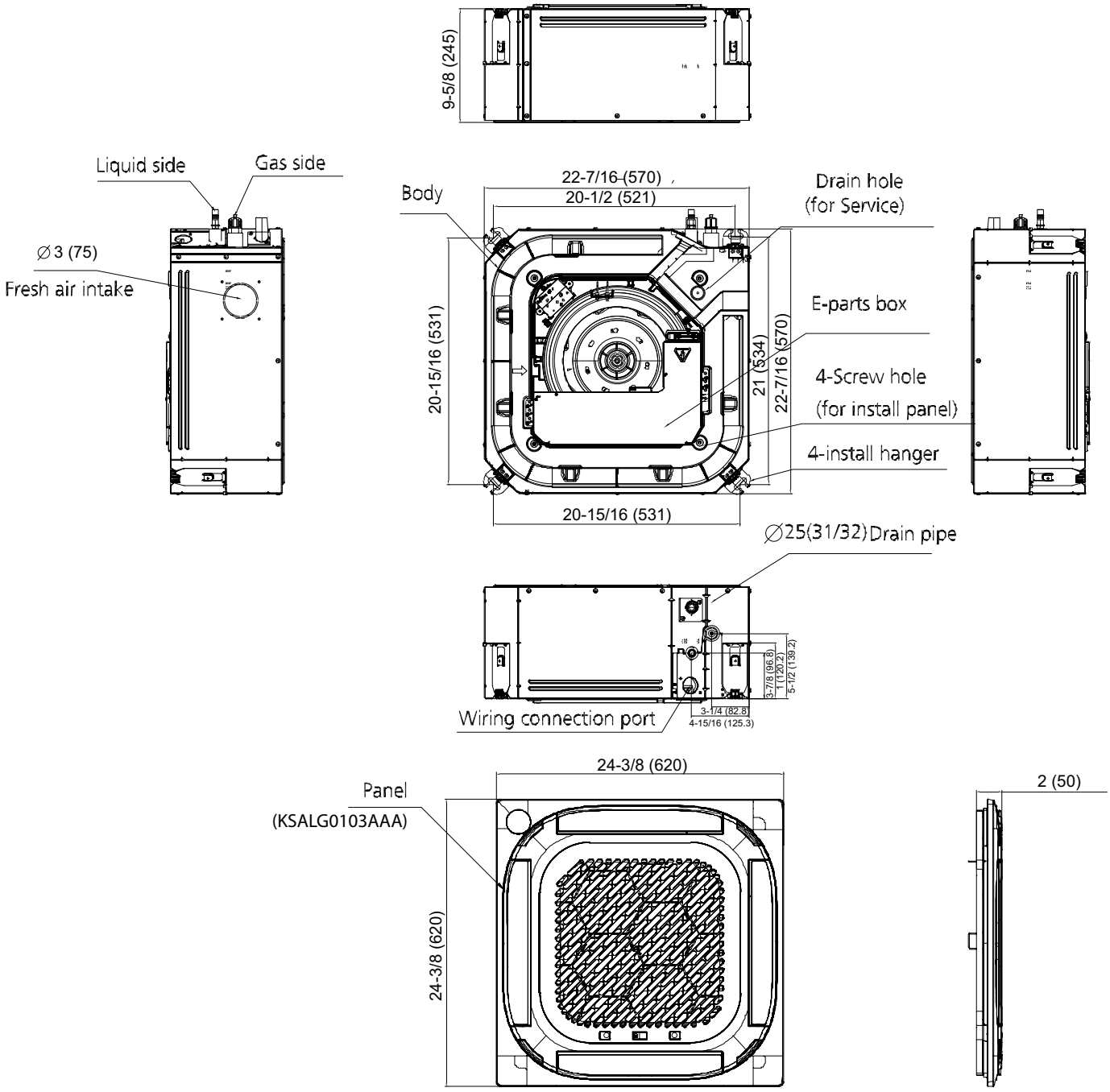
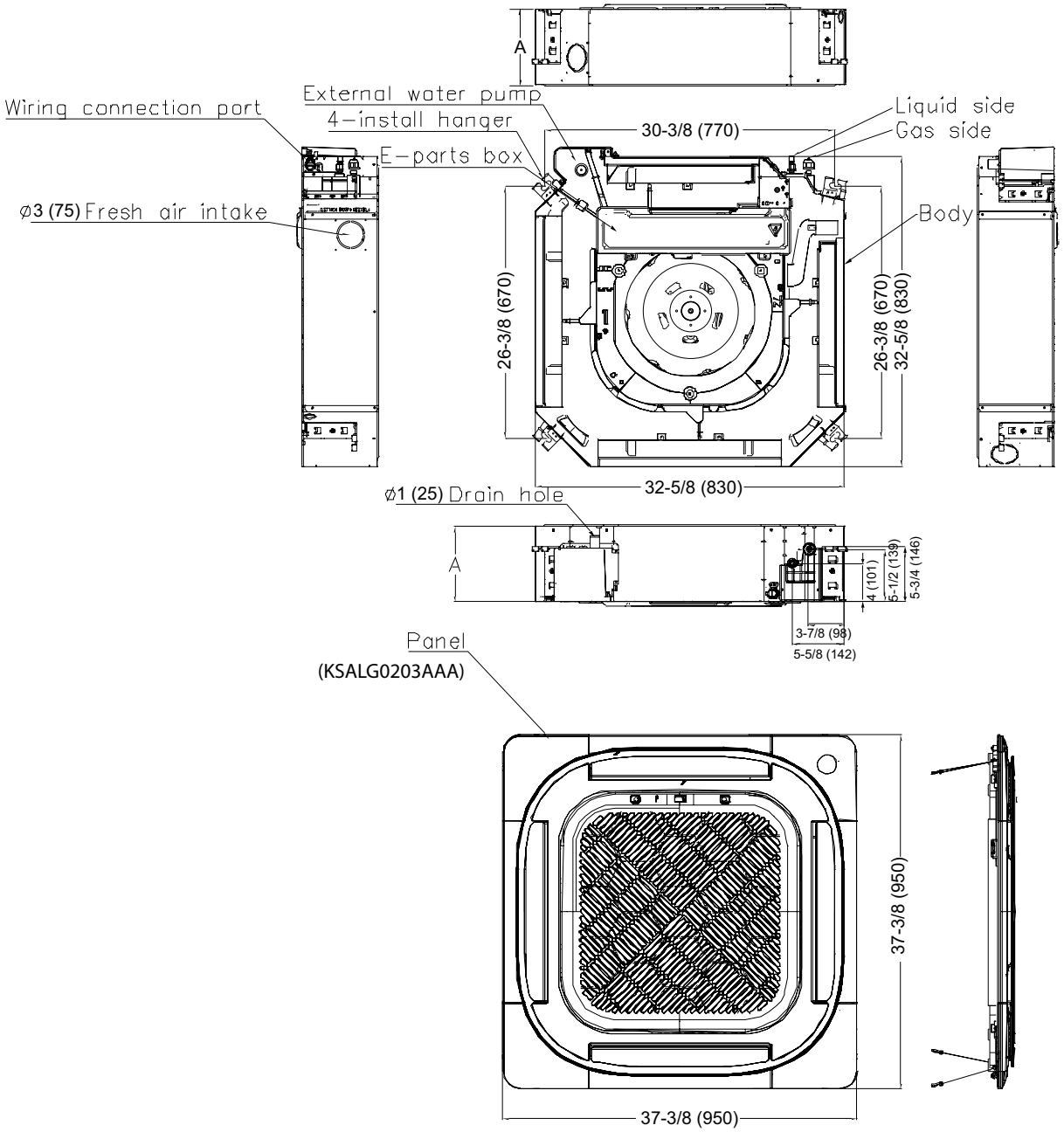


Fig. 4 —Dimensions (9K-18K)

DIMENSIONS (CONT.)



MODEL (KBtu/h)	Unit	A
24	inch	8-1/8
	mm	205
36	inch	9-5/8
	mm	245
48	inch	11-1/4
	mm	287

Fig. 5 —Dimensions (24K-48K)

Table 3 — Required Accessories - Grill Panels

Model	Description
45MBCQ01XXX3	Cassette panel for units 09–18
45MBCQ02XXX4	Cassette panel for units 24–48

WIRING

ELECTRICAL CONNECTORS

A. For remote control (ON-OFF) terminal port CN23 and jumper of JR6:

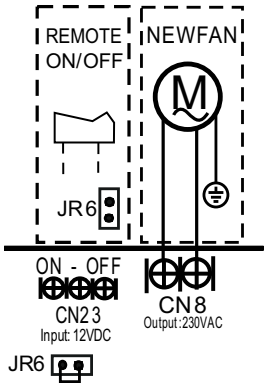


Fig. 6 —Remote control (ON-OFF) terminal port CN23 and jumper of JR6

1. Remove the jumper of JR6 to use the ON-OFF function.
2. When the CN23 contacts are open, the unit will shut off.
3. When the CN23 contacts are closed, the unit will operate.
4. When the contacts on CN23 are open, "CP" will be displayed on the display and wired controller.
5. The voltage of the port is 12V DC, design Max.current is 5mA.

B. For ALARM terminal port CN33

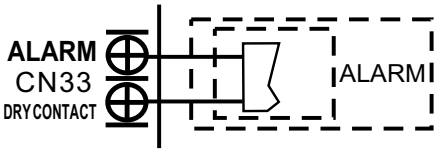


Fig. 7 —ALARM terminal port CN33

1. Provide the terminal port to connect ALARM, but no voltage of the terminal port, the power from the ALARM system (not from the unit).
2. Although design voltage can support higher voltage, but we strongly ask you connect the power less than 24V, current less than 0.5A.
3. When the unit has the problem, the ALARM contacts close, and the ALARM works.

C. For outside air terminal port CN8

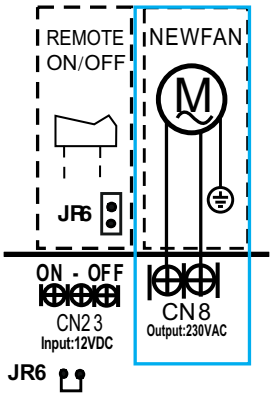


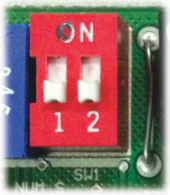
Fig. 8 —For outside air terminal port CN8

1. The output voltage is 208/230 VAC.
2. Do NOT exceed 1 Amp (200 Watts).
3. Power is supplied to CN8 when the indoor fan motor runs and turns off when the indoor fan stops.
4. When the unit enters force cooling mode or capacity testing mode, no power is supplied to CN8.

NOTE: Separate power must be provided for an outside air fan. CN8 should be only be used to energize a relay for activating an outside air fan.

Dip Switch

A. Dip switch SW1 is for selection of indoor fan stop temperature (TEL0) when it is in anti-cold wind action in heating mode.



Anti-cold air	
SW1	FAN MOTOR STOP-TEM
ON 1 2	24 Factory setting
ON 1 2	15
ON 1 2	8
ON 1 2	According to the EEPROM setting

Fig. 9 —Dip Switch SW1

Range: 75°F (24°C), 59°F (15°C), 46.5°F (8°C), According to EEPROM setting (reserved for special customizing).

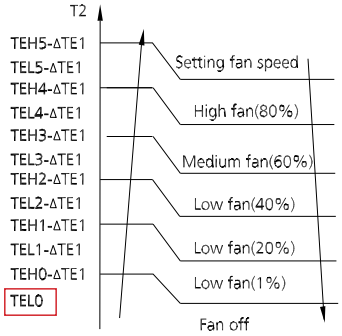


Fig. 10 —SW1 Range

B. Dip switch SW2/SW2-1 is for selection of indoor FAN ACTION if room temperature reaches the setpoint and the compressor stops.

SW2 / SW2-1	SWITCH	FOR FAN MOTER CONTRO L THEN NO POWER REQUES T.
ON STATE	ON	ON
MODE	FAN OFF	FAN ON
Factory Setting		✓

Fig. 11 —Dip Switch Induced - SW2/SW2-1 for selecting fan action

Range: OFF (anti-cold wind is available in heating mode), Keep running (No anti-cold wind function). Note: SW2 dip switch is only reserved physical part but without mode modification function, if want to make change on the factory setting, should use remote controller or wire controller to reset (depending on the model).

C. Dip switch SW2-2 is for selection of Breezeless function.

Range: OFF, ON.

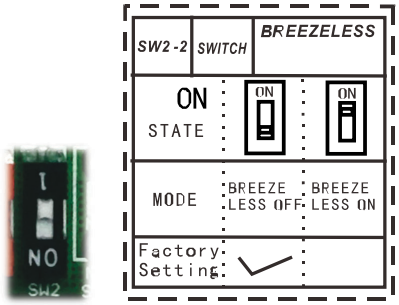


Fig. 12 —Dip Switch SW2-2 for selecting Breezeless function

D. Dip switch SW3 is for selection of auto-restart function. See Fig. 13.

Range: Active, inactive

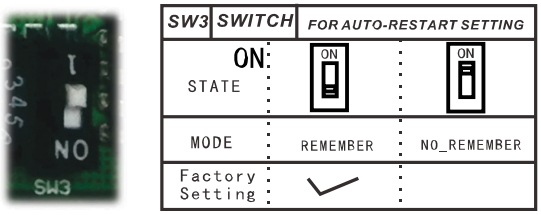


Fig. 13 —Dip Switch SW3 for selecting auto-restart

E. Dip switch SW6 is for selection of temperature compensation in heating mode. See Fig. 14.

This helps to reduce the real temperature difference between ceiling and floor so that the unit could run properly.

If the height of installation is lower, smaller value could be chosen. Range: 11°F (-11.7°C), 7°F (-13.9°C), 4°F (15.5°C), E function (reserved for special customizing)

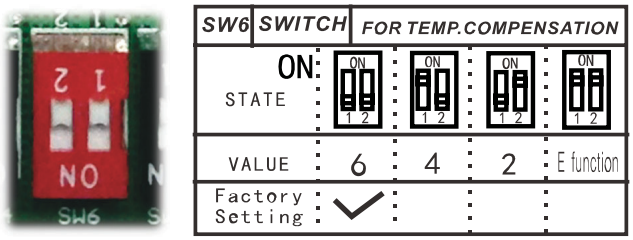


Fig. 14 —Dip Switch SW6 is for selection of temperature compensation

F. Dip switch SW8. Leave these switched at Factory Default (this feature not active).

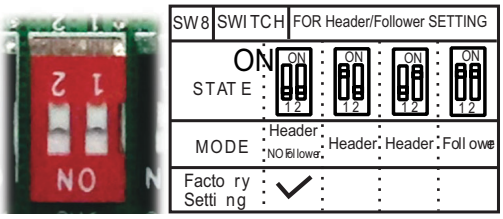


Fig. 15 —Dip Switch SW8 is for setting main or follower

G. Dip switch S1 and dial-switch S2 are for address setting when you want to control this unit by a central controller.

Range: 00-63

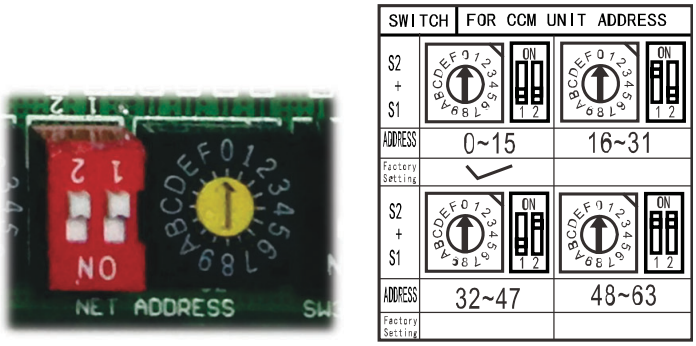


Fig. 16 —Dip Switch S1 and Dial Switch S2 for controlling with central controller

CAPACITY SETTING

12K to 9K Setting

The default capacity of 45MBCAQ12XA3 is 12K BTUH, to downsize it to a 9K model.

1. The default ENC1 setting for 12K unit is 0.

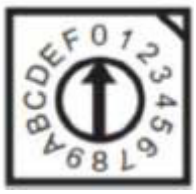


Fig. 17 —Default Setting for 12K

2. Disconnect the power first.
3. Open the electronic control box, change ENC1 to 2. Then close the electronic control box.

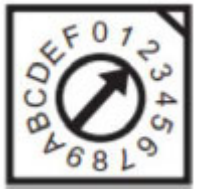


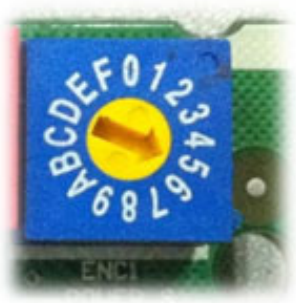
Fig. 18 —Capacity Setting (12K to 9K)

4. Connect the power again, the capacity of the unit has changed to 9K.

DIP SWITCH SETTINGS

No.	DIAL CODE	FUNCTION	ON	OFF	1 ON AND 2 OFF	1 ON AND 2 ON	1 OFF AND 2 ON	1 OFF AND 2 OFF
1	S1+Rotary Switch S2	Central control address selection	N/A	N/A	S2 + 48	S2 + 16	S2 + 32	S2
2	SW1	Indoor fan stop temperature (TEL0) for normal anti-cold air function in the HEATING mode	N/A	N/A	According to EEROM setting	15°C	8°C	[Default]24°C
3	SW3	Auto-restart setting	Do not remember the setting status	[Default] Remember the setting status	N/A	N/A	N/A	N/A
4	SW6	Heating temperature compensation	N/A	N/A	According to EEROM setting	4°C	2°C	[Default]6°C
5	Rotary Switch ENC1	Capacity selection	[Default] Auto detection: 9K: ENC1=2; 12K:ENC1=0					

NOTE: Capacity selection is applicable for 9K and 12K. All other capacity will be in factory setting.



FOR SETTING CAPACITY (DC MOTOR MODEL ONLY)										
ENC1										
CODE	0	1	2	3	4	5	6	7	8	9
POWER	✓AUTO	6K	9K	12K	16K	18K	20K	22K	24K	30K
FACTORY SETTING	ACCORDING TO RELATED MODEL.									

FOR SETTING CAPACITY (DC MOTOR MODEL ONLY)					
ENC1					
CODE	A	B	C	D	E
POWER	36K	42K	48K	55K	60K
FACTORY SETTING	ACCORDING TO RELATED MODEL.				

Fig. 19 —Dial Switch ENC1

ELECTRICAL WIRING

ELECTRICAL WIRING INSTALLATION

- All field wiring should be installed by a qualified technician.
- Air conditioning equipment should be grounded according to the local electrical regulations.
- Current leakage protection switch should be installed.
- Do not connect the power wire to the terminal of signal wire.
- Use the correct wire size in accordance with the Product Data for each indoor unit.
- Avoid using metal conduit to reduce issues with noise/EMI..
- Do not splice the control wires and only make wire connections in accordance with local and federal regulatory codes.
- The wiring with different voltage should not be in one wire conduit.
- Ensure that the wires correspond to the proper terminals between indoor and outdoor units.

NOTE: Reference the Outdoor Unit installation manual (Table 9) for additional information

CONNECTION DIAGRAMS

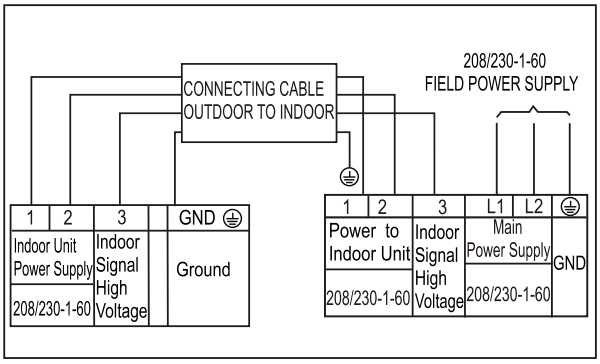


Fig. 20 — Connection Diagrams (Sizes 12−24)

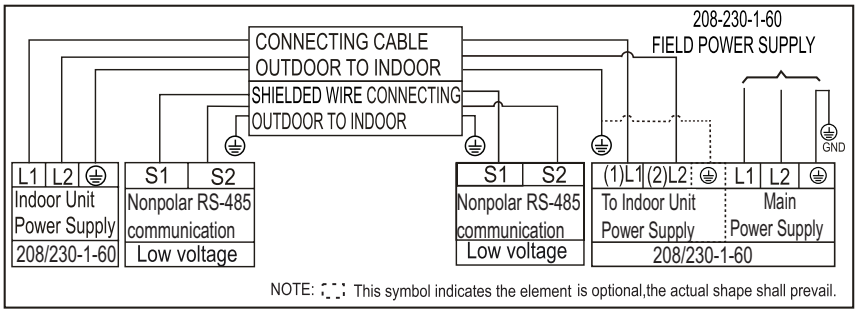


Fig. 21 — Connection Diagram (Size 36)

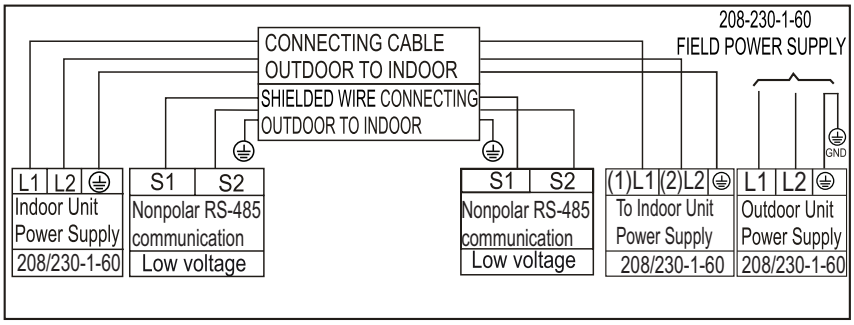


Fig. 22 — Connection Diagrams (Size 48)

NOTES:

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

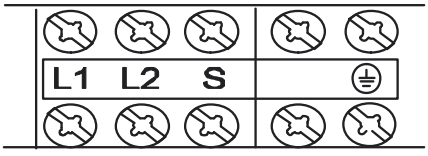


Fig. 23 —Control and Power Wiring on Indoor Unit (9K-24K ONLY)

WIRING DIAGRAMS

Legend:

Y/G	-	Yellow Green Conductor
PUMP	-	PUMP
TO CCM Comm. Bus	-	Central Controller
T1	-	Indoor Room Temperature
T2	-	Coil Temperature of Indoor Heat Exchanger

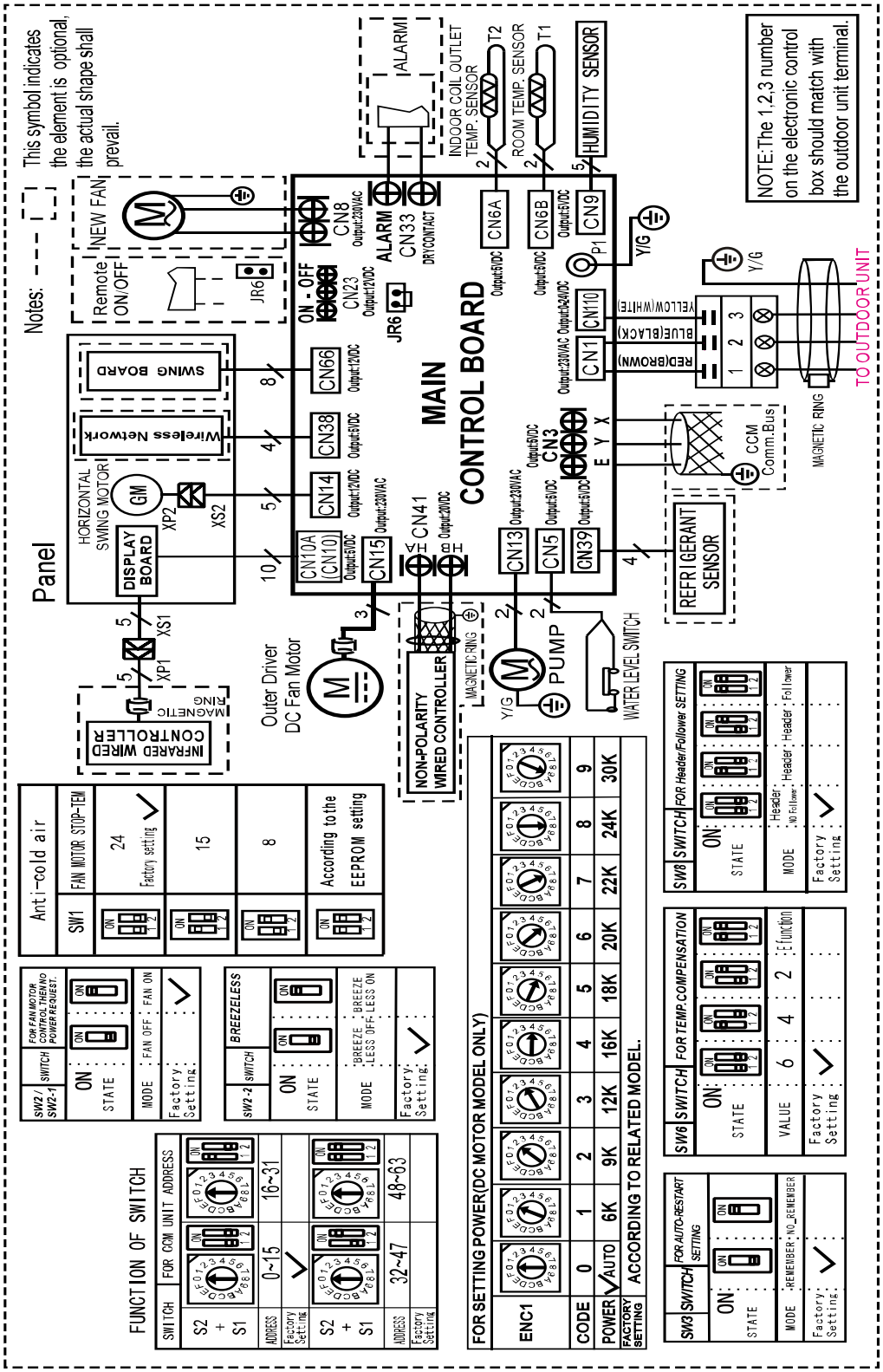


Fig. 24 —Indoor Unit Wiring Diagram (9K~18K)

Table 4 – Indoor Unit Wiring Terminals (9K~18K)

TERMINAL	FUNCTION DEFINITION
CN1	Input voltage 0~230V, indoor power supply input terminal
CN110	Output voltage 0~24V, internal and external unit communication line between Pin 2 of CN1 connection and Pin 3
CN9	Output voltage 5V, humidity sensor, detects indoor humidity
CN6A	Output voltage 5V, T2 temperature sensor, detects the temperature of the indoor unit evaporator copper tube
CN6B	Output voltage 5V, T1 temperature sensor, indoor unit fan inlet temperature
CN33	ALARM alarm output port
CN8	Output voltage 230V, fresh air fan output
CN23	Output voltage 12V, remote switch output
CN66	Output voltage 12V, fan plate stepper motor output
CN38	Output voltage 5V, wireless network module output
CN14	Output voltage 12V, horizontal swing motor output
CN10/CN10A	Output voltage 12V, display board output
CN15	Output voltage 325V, air flow fan output
CN41	Output voltage 20V, two-wire non-polarity wire controller output
CN13	Output voltage 230V, AC water pump output
CN5	Output voltage 5V, water level switch output
CN39	Output voltage 5V, dissipation sensor
CN3	Output voltage 5V, CCM.com.bus communication port

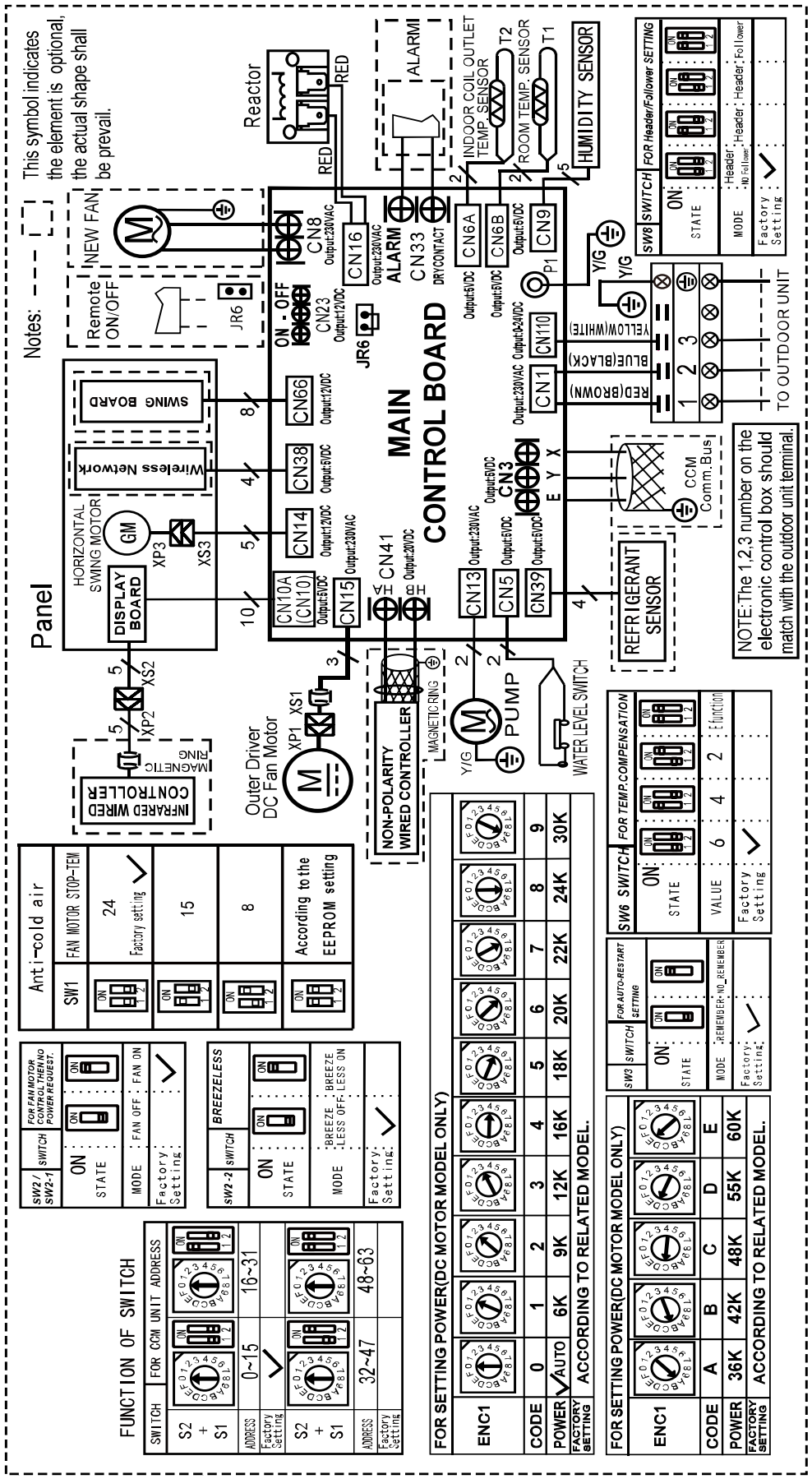


Fig. 25 —Indoor Unit Wiring Diagram (24K)

Table 5 – Indoor Unit Wiring Terminals (24K)

TERMINAL	FUNCTION DEFINITION
CN1	Input voltage 0~230V, indoor power supply input terminal
CN110	Output voltage 0~24V, internal and external unit communication line between Pin 2 of CN1 connection and Pin 3
CN9	Output voltage 5V, humidity sensor, detects indoor humidity
CN6A	Output voltage 5V, T2 temperature sensor, detects the temperature of the indoor unit evaporator copper tube
CN6B	Output voltage 5V, T1 temperature sensor, indoor unit fan inlet temperature
CN33	ALARM alarm output port
CN16	Output voltage 230V, reactor interface
CN8	Output voltage 230V, fresh air fan interface
CN23	Output voltage 12V, remote switch interface
CN66	Output voltage 12V, fan plate stepper motor interface
CN38	Output voltage 5V, wireless network module interface
CN14	Output voltage 12V, horizontal swing motor interface
CN10/CN10A	Output voltage 12V, display board interface
CN15	Output voltage 325V, air flow fan interface
CN41	Output voltage 20V, two-wire non-polarity wire controller interface
CN13	Output voltage 230V, AC water pump interface
CN5	Output voltage 5V, water level switch interface
CN39	Output voltage 5V, dissipation sensor
CN3	Output voltage 5V, CCM.com.bus communication port

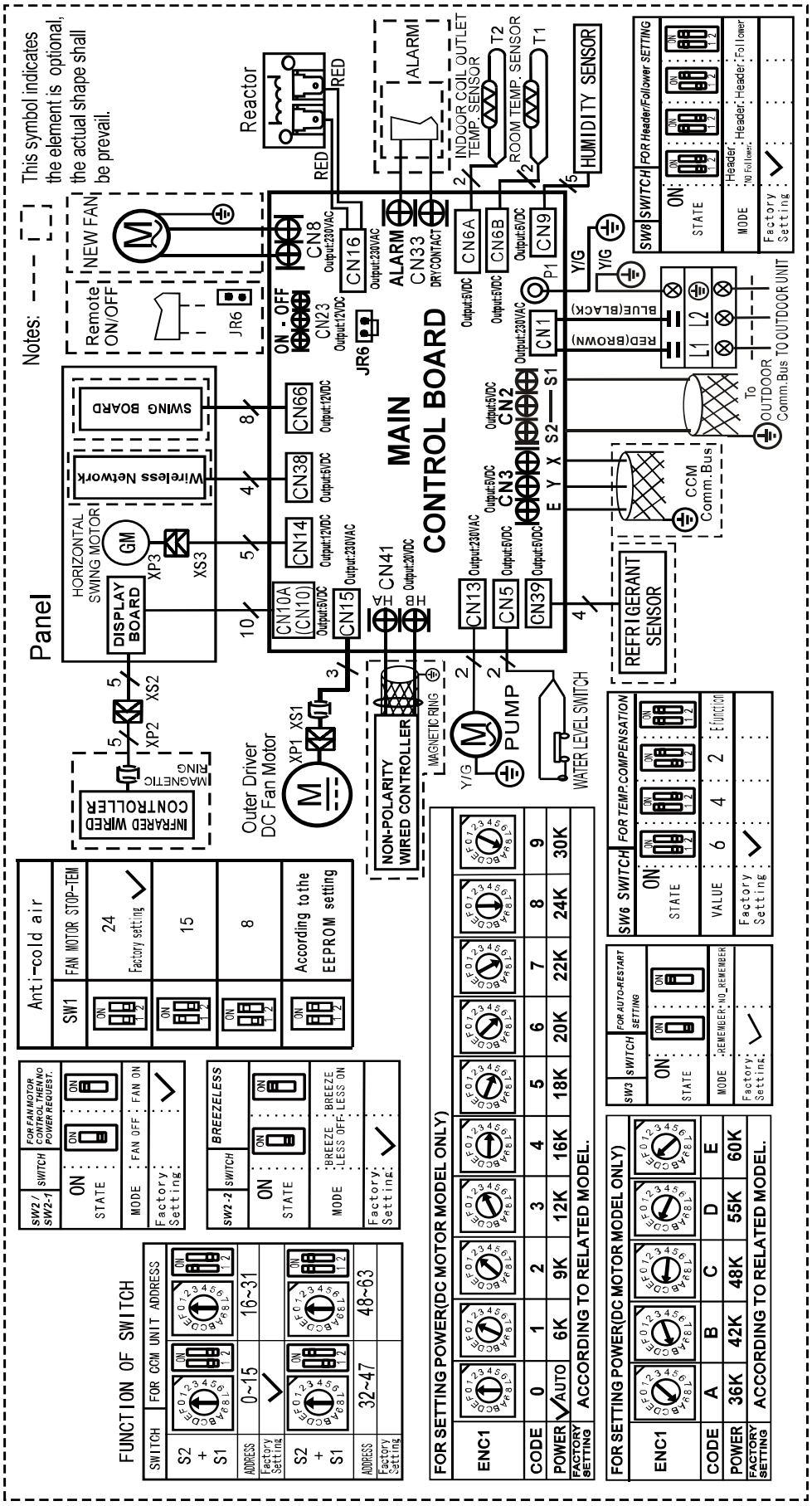


Fig. 26 —Indoor Unit Wiring Diagram (36K~48K)

Table 6 – Indoor Unit Wiring Terminals (36K~48K)

TERMINAL	FUNCTION DEFINITION
CN1	Input voltage 0~230V, indoor power supply input terminal
CN2	Output voltage 0~5V, internal and external unit communication line
CN9	Output voltage 5V, humidity sensor, detects indoor humidity
CN6A	Output voltage 5V, T2 temperature sensor, detects the temperature of the indoor unit evaporator copper tube
CN6B	Output voltage 5V, T1 temperature sensor, indoor unit fan inlet temperature
CN33	ALARM alarm output port
CN8	Output voltage 230V, fresh air fan interface
CN23	Output voltage 12V, remote switch interface
CN66	Output voltage 12V, fan plate stepper motor interface
CN38	Output voltage 5V, wireless network module interface
CN14	Output voltage 12V, horizontal swing motor interface
CN10/CN10A	Output voltage 12V, display board interface
CN15	Output voltage 325V, air flow fan interface
CN41	Output voltage 20V, two-wire non-polarity wire controller interface
CN13	Output voltage 230V, AC water pump interface
CN5	Output voltage 5V, water level switch interface
CN39	Output voltage 5V, dissipation sensor
CN3	Output voltage 5V, CCM.com.bus communication port

REFRIGERANT CYCLE DIAGRAM

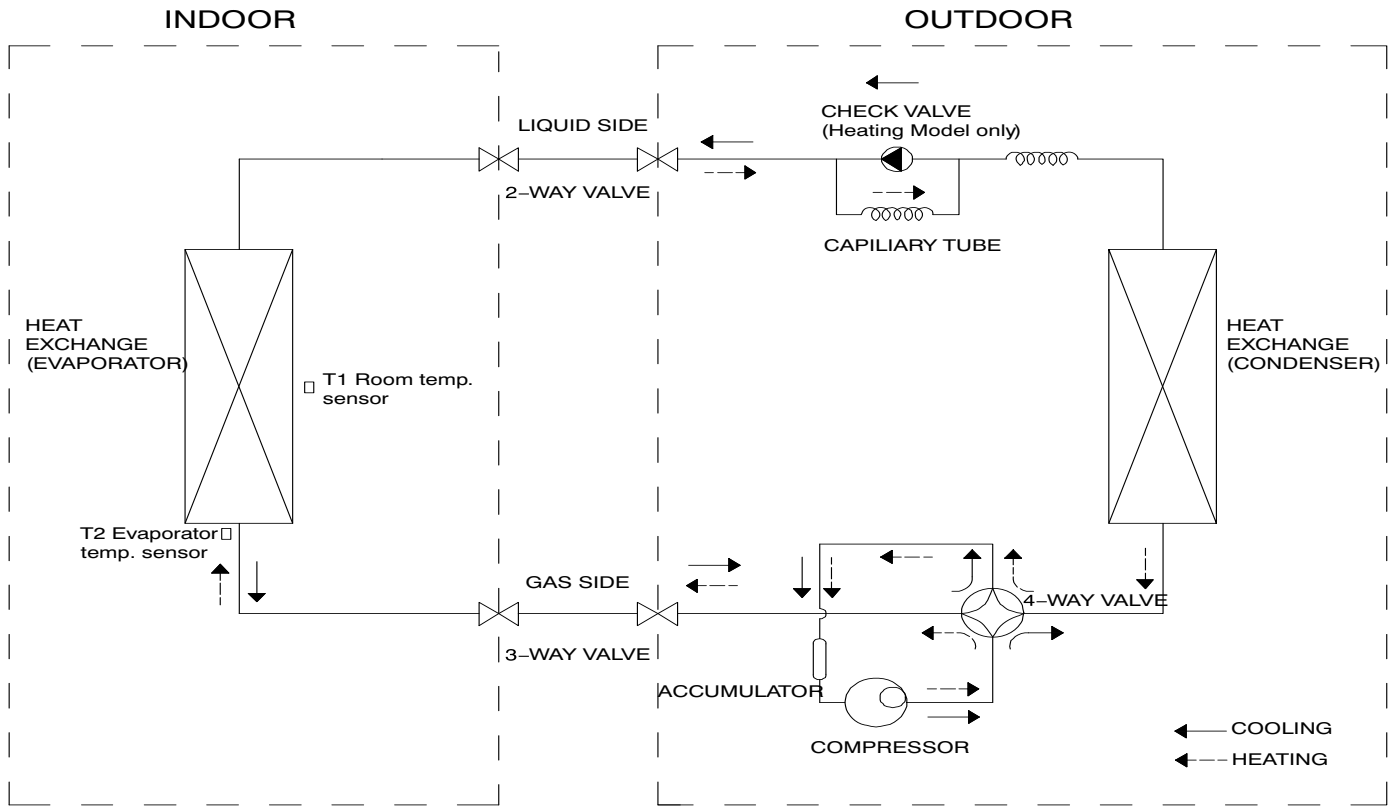


Fig. 27 —Refrigerant System Diagram

PRODUCT FEATURES

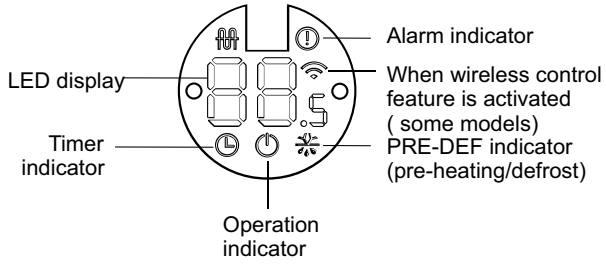


Fig. 28 —Display Function

NOTE: All cassette sizes include an LED display for operation, error codes, etc.

SAFETY FEATURES

Compressor three-minute delay at restart

Compressor functions are delayed for up to ten seconds upon the first startup of the unit, and are delayed for up to three minutes upon subsequent unit restarts.

Automatic shutoff based on discharge temperature

If the compressor discharge temperature exceeds a certain level for nine seconds, the compressor ceases operation.

Inverter module protection

The inverter module has an automatic shutoff mechanism based on the unit's current, voltage, and temperature.

If automatic shutoff is initiated, the corresponding error code is displayed on the indoor unit and the unit ceases operation.

Indoor fan delayed operation

- When the unit starts, the louver is automatically activated and the indoor fan will operate after a period of setting time or the louver is in place.
- If the unit is in heating mode, the indoor fan is regulated by the anti-cold wind function.

Compressor preheating

Preheating is automatically activated when T4 sensor is lower than setting temperature. When T1-Tsc is higher than 6.3°F, the fan speed is 100%.

Sensor redundancy and automatic shutoff

- If one temperature sensor malfunctions, the air conditioner continues operation and displays the corresponding error code, allowing for emergency use.
- When more than one temperature sensor is malfunctioning, the air conditioner ceases operation.

MODES AND FUNCTIONS

Table 7 — Basic Functions

Functions		Auto Mode		
Cases		Case 1	Case 2	Case 3
Models	9K~48K		✓	

NOTE: The detailed description of case 1 or case 2 is shown in the following function sections (from "Cooling Mode" to "Auto Mode").

Table 8 — Unit Element Abbreviations

Abbreviation	Element
T1	Indoor room temperature
T2	Coil temperature of evaporator
T3	Coil temperature of condenser
T4	Outdoor ambient temperature
TP	Compressor discharge temperature
Tsc	Adjusted setting temperature
CDIFTEMP	Cooling shutdown temperature
HDIFTEMP2	Heating shutdown temperature

CDIFTEMP, HDIFTEMP2, etc. are well-setting parameter of EEPROM.

FAN MODE

When fan mode is activated:

- The outdoor fan and compressor are stopped.
- Temperature control is disabled and no temperature setting is displayed.
- The indoor fan speed can be set to 1%~100% and auto.
- The louver operations are identical to those in cooling mode.
- Auto fan: In fan-only mode, AC operates the same as auto fan in cooling mode with the temperature set at 75°F (24°C).

COOLING MODE

Indoor Fan Control

1. In cooling mode, the indoor fan operates continuously. The fan speed can be set to 1%-100%, or low, medium, high and auto.
2. Auto fan action in cooling mode:

- Descent curve
  - When T1-Tsc is lower than to 6.3°F (3.5°C), fan speed reduces to 80%;
  - When T1-Tsc is lower than to 1.8°F (1°C), fan speed reduces to 60%;
  - When T1-Tsc is lower than to 0.9°F (0.5°C), fan speed reduces to 40%;
  - When T1-Tsc is lower than to 0°F (0°C), fan speed reduces to 20%;;
  - When T1-Tsc is lower than to -0.9°F (-0.5°C), fan speed reduces to 1%;.
- Rise curve
  - When T1-Tsc is higher than or equal 0°F (0°C), fan speed increases to 20%;;
  - When T1-Tsc is higher than or equal 0.9°F (0.5°C), fan speed increases to 40%;
  - When T1-Tsc is higher than or equal 1.8°F (1°C), fan speed increases to 60%;
  - When T1-Tsc is higher than or equal 2.7°F (1.5°C), fan speed increases to 80%;
  - When T1-Tsc is higher than or equal 7.2°F (4°C), fan speed increases to 100%.

Condenser Temperature Protection

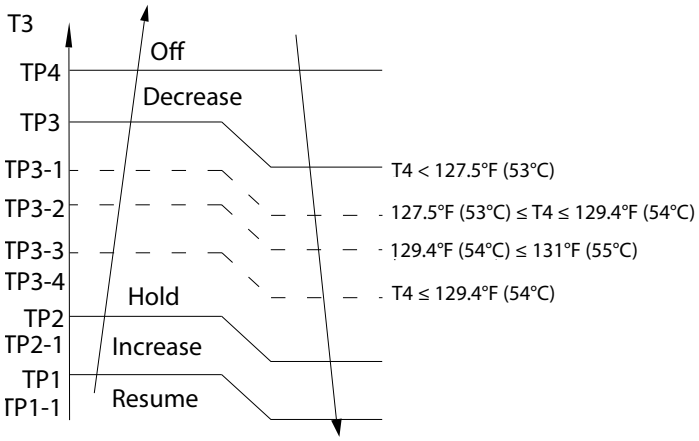


Fig. 29 —Condenser Temperature Protection

When the condenser temperature exceeds a configured value, the compressor ceases operation.

Evaporator Temperature Protection

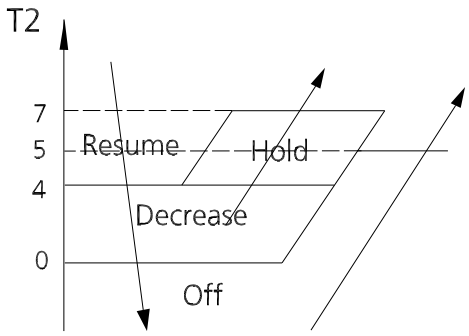


Fig. 30 —Evaporator Temperature Protection

- Off: Compressor stops.
- Decrease: Decrease the running frequency to the lower level per 1 minute.
- Hold: Keep the current frequency.
- Resume: No limitation for frequency.

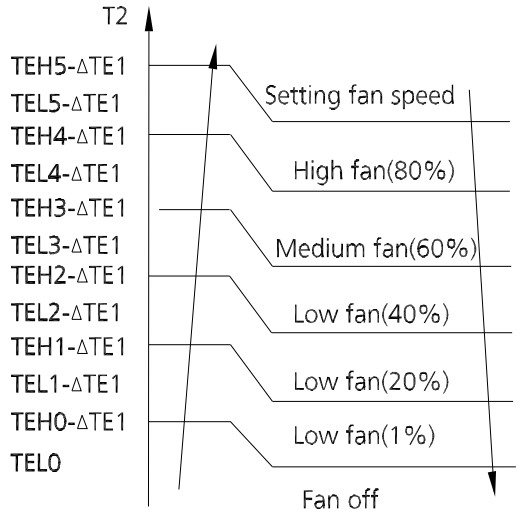
HEATING MODE (HEAT PUMP UNITS)

Indoor Fan Control:

1. In heating mode, the indoor fan operates continuously. The fan speed can be set to 1%-100% and auto.

– Anti-cold air function

– If the temperature difference of T2 changes during auto fan and causes the fan speed to change, run the current fan speed for 30 seconds first, the default interval is the interval before the fan speed changes, and then judge T2 according to the current interval after 30 seconds to get the final anti-cold air interval.



ΔTE1=0

Fig. 31 —T2 vs. Fan Speed

2. Auto fan action in heating mode:

• Rise curve
  – When T1-Tsc is higher than -2.7°F (-1.5°C), fan speed reduces to 80%;
  – When T1-Tsc is higher than 0°F (0°C), fan speed reduces to 60%;
  – When T1-Tsc is higher than 0.9°F (0.5°C), fan speed reduces to 40%;
  – When T1-Tsc is higher than 1.8°F (1°C), fan speed reduces to 20%.
• Descent curve
  – When T1-Tsc is lower than or equal to 0.9°F (0.5°C), fan speed increases to 40%;
  – When T1-Tsc is lower than or equal to 0°F (0°C), fan speed increases to 60%;
  – When T1-Tsc is lower than or equal to -2.7°F (-1.5°C), fan speed increases to 80%;
  – When T1-Tsc is lower than or equal to -5.4°F (-3°C), fan speed increases to 100%.

Evaporator Coil Temperature Protection

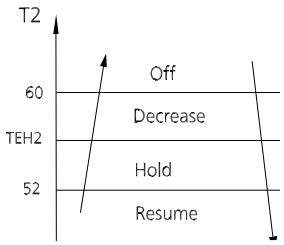


Fig. 32 —Evaporator Coil Temperature Protection

- Off: Compressor stops.
- Decrease: Decrease the running frequency to the lower level per 20 seconds.
- Hold: Keep the current frequency.
- Resume: No limitation for frequency.

AUTO-MODE

This mode can be selected with the remote controller and the temperature setting can be adjusted between 61°F (16°C) ~ 86°F (30°C).

In auto mode, the machine selects cooling, heating or fan-only mode on the basis of T1,Ts and Outdoor ambient temperature (T4).

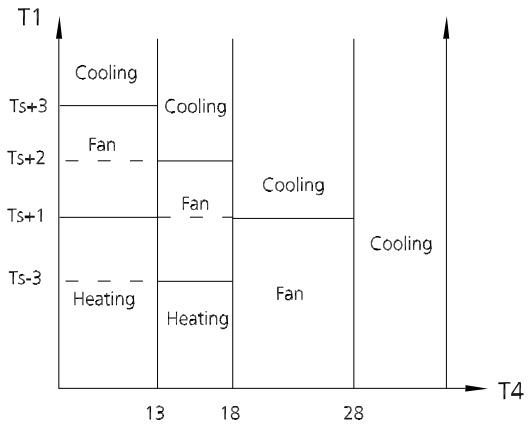


Fig. 33 —Auto-Mode

DRYING MODE

- In drying mode, AC operates the same as auto fan in cooling mode.
- All protections are activated and operate the same as they do that in cooling mode.
- Low Room Temperature Protection

If the room temperature is lower than 50°F (10°C), the compressor ceases operations and does not resume until room temperature exceeds 54°F (12°C).

FORCED OPERATION FUNCTION

Press the AUTO/COOL button, the AC will run as below sequence:

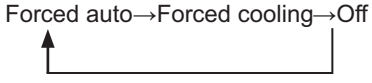


Fig. 34 —Forced Operation Function

- Forced cooling mode:

The compressor and outdoor fan continue to run and the indoor fan runs at breeze speed. After running for 30 minutes, the AC will switch to auto mode with a preset temperature of 75°F (24°C).

- Forced auto mode:

Forced auto mode operates the same as normal auto mode with a preset temperature of 75°F (24°C).

The unit exits forced operation when it receives the following signals:

- Switch off
- Changes in:
  - mode
  - fan speed
  - sleep mode
  - Follow me

TIMER FUNCTION

- The timing range is 24 hours.
- Timer On. The machine turns on automatically at the preset time.
- Timer Off. The machine turns off automatically at the preset time.
- Timer On/Off. The machine turns on automatically at the preset On Time, and then turns off automatically at the preset Off Time.
- Timer Off/On. The machine turns off automatically at the preset Off Time and then turns on automatically at the preset On Time.
- The timer does not change the unit operation mode. If the unit is off now, it does not start up immediately after the "timer off" function is set. When the setting time is reached, the timer LED switches off and the unit running mode remains unchanged.
- The timer uses relative time, not clock time.

SLEEP FUNCTION

- The sleep function is available in cooling, heating, or auto mode.
- The operational process for sleep mode is as follows:
  - When cooling, the temperature rises 2°F (1°C) every hour not to exceed 86°F (30°C). After 2 hours, the temperature stops rising and the indoor fan is fixed at low speed.
  - When heating, the temperature decreases 2°F (1°C) every hour not to exceed 61°F (16°C). After 2 hours, the temperature stops decreasing and the indoor fan is fixed at low speed. Anti-cold wind function takes priority.
- The operating time for sleep mode is 8 hours, after which, the unit exits this mode.
- The timer setting is available in this mode.

AUTO-RESTART FUNCTION

The indoor unit has an auto-restart module that allows the unit to restart automatically. The module automatically stores the current settings and in the case of a sudden power failure, will restore those setting automatically within 3 minutes after power returns.

46°F (8°C) HEATING (HEAT PUMP UNITS)

In heating mode, the temperature can be set to as low as 46°F (8°C), preventing the indoor area from freezing if unoccupied during severe cold weather.

FOLLOW ME

- Once the follow me function is active, the remote control will send a signal every 3 minutes, with no beeps. The unit automatically sets the temperature according to the measurements from the remote control.
- The unit will only change modes if the information from the remote control makes it necessary, not from the unit's temperature setting.
- If the unit does not receive a signal for 7 minutes or you press "Follow Me," the function turns off. The unit regulates temperature based on its own sensor and settings.

OPTIONAL FUNCTIONS

SILENCE (Multi-Zone systems do not have this function)

- Press “Silence” or keep pressing Fan button for more than 2 seconds on the remote control to enable the SILENCE function. While this function is active, the compressor frequency is maintained at a lower level than F3. The indoor unit will run at faint breeze(1%), which reduces noise to the lowest possible level.
- When match with multi outdoor unit, this function is disabled.

ECO FUNCTION (Multi-Zone Systems do not have this function)

- Used to enter the energy efficient mode.

  Under cooling mode, press ECO button, the remote controller will adjust the temperature automatically to 75°F (24°C), fan speed of Auto to save energy (but only if the set temperature is less than 75°F (24°C). If the set temperature is more than 75°F (24°C) and 86°F (30°C), press the ECO button, the fan speed will change to Auto, the set temperature will remain unchanged.
- When pressing the ECO button, or modifying the mode or adjusting the set temperature to less than 75°F (24°C), the AC will quit the ECO operation.
- Operation time in ECO mode is 8 hours. After 8 hours the AC quits this mode.

ELECTICAL ENERGY CONSUMPTION CONTROL FUNCTION (Multi-Zone Systems do not have this function)

- Press the “Gear” button on remote controller to enter the energy efficient mode in a sequence of following:

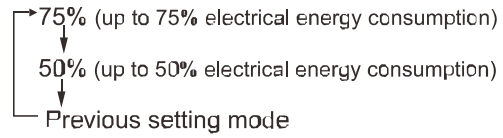


Fig. 35 —Electrical Energy Consumption Control Function

- Turn off the unit or activate ECO, sleep, Super cool, 46°F (8°C) Heating, Silence or self clean function will quit this function.

BREEZE AWAY FUNCTION (for some models) (Multi-Zone Systems do not have this function)

- This feature avoids direct airflow blowing on you.

NOTE: This feature is available under cooling mode, fan-only mode and drying mode.

ACTIVE CLEAN FUNCTION (for some models) (Multi-Zone Systems do not have this function)

- The Active Clean Technology washes away dust, mold, and grease that may cause odors when it adheres to the heat exchanger by automatically freezing and then rapidly thawing the frost. The internal wind wheel then keeps operating to blow-dry the evaporator, thus preventing the growth of mold and keeping the inside clean.
- When this function is turned on, the indoor unit display window appears “CL”, after 20 to 45 minutes, the unit will turn off automatically and cancel Active Clean function.

TROUBLESHOOTING

SAFETY CAUTION

⚠ WARNING

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

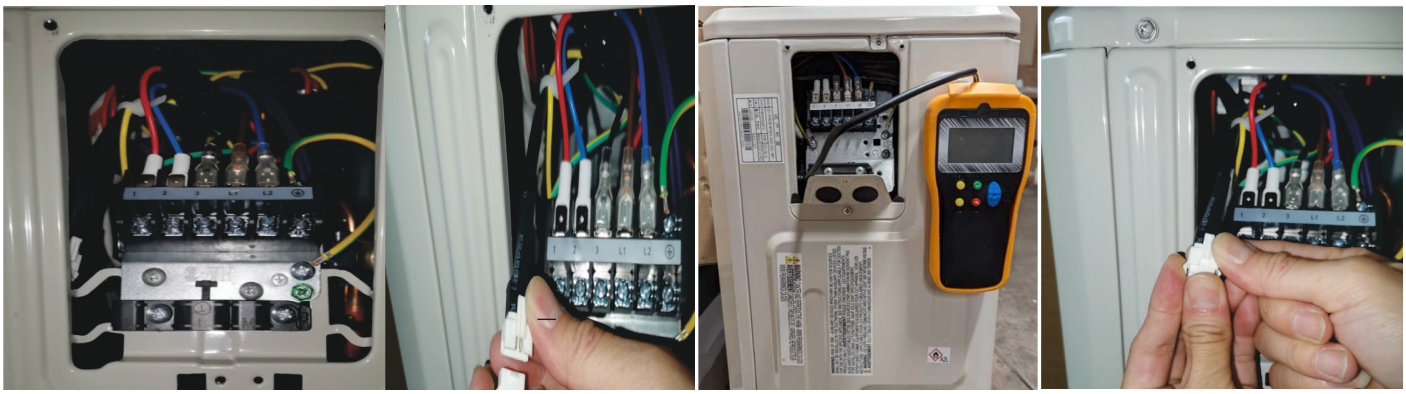
⚠ WARNING

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

When connected to a Multi-Zone ODU, please wait 10 minutes after turning off power for the capacitors to fully discharge before servicing.

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

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



Step 1 Step 2 Step 3 Step 4

Fig. 36 —Inverter Test Tool Maintenance

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

Fig. 37 —Dr. SMART Tool

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

GENERAL TROUBLESHOOTING

Error Display (Indoor Unit)

When the indoor unit encounters a recognized error, the operation lamp will flash in a corresponding series, the timer lamp may turn on or begin flashing, and an error code will be displayed. These error codes are described in the Table 9.

Table 9 — Error Codes

DISPLAY	MALFUNCTION AND PROTECTION INDICATION
EC07	ODU fan speed out of control
EC0d	ODU malfunction
EC51	ODU EEPROM parameter error
EC52	ODU coil temp sensor error
EC53	ODU ambient temp sensor error
EC54	COMP. discharge temp sensor error
EC56	IDU coil outlet temp sensor error
ECC1	Other IDU refrigerant sensor detects leakage (multi-zone)
EH00	IDU EEPROM malfunction
EH03	IDU fan speed out of control
EH0A	IDU EEPROM parameter error
EH0b	IDU main control and display boards communication error
EH0E	Water-level alarm malfunction
EH3A	External fan DC bus voltage is too low protection
EH3b	External fan DC bus voltage is too high fault
EH60	IDU room temp. sensor (T1) error
EH61	IDU coil temp. sensor (T2) error
EH62/EH66	Evaporator coil inlet temp. sensor (T2B) is in open circuit or short circuit
EH65	Evaporator coil inlet temp. sensor (T2A) is in open circuit or short circuit
EHbA	Communication error between indoor unit and external fan module
EHb3	Communication malfunction between wire and master control
EHC1	Refrigerant sensor detects leakage
EHC2	Refrigerant sensor is out of range and leakage is detected
EHC3	Refrigerant sensor is out of range
EL01	IDU & ODU communication error
EL0C	System lacks refrigerant
EL16	Communication malfunction between adapter board and outdoor main board
FHCC	Refrigerant sensor error
FL09	Mismatch between the new and old platforms
PC00	ODU IPM module protection
PC01	ODU voltage protection
PC02	Compressor top (or IPM) temp. protection
PC03/PC30/PC31	Pressure protection (low or high pressure)
PC04	Inverter compressor drive error
PC0L	Low ambient temp. protection
NOTE: The digital tube will show DF in defrost mode and FC in forced cooling mode. DF and FC are not error codes.	

Table 10 — Refrigerant Leak Detection Error Codes

FHCC	Refrigerant Sensor Error

For other errors:

The display board may show a garbled code or a code undefined by the service manual. Ensure that this code is not a temperature reading.

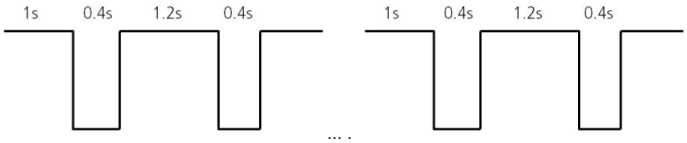


Fig. 38 —LED Flash Frequency

Table 11 — Error Display on Two Way Communication Wired Controller

Display	Malfunction or Protection	Solution
EH b3	Communication error between wire controller and indoor unit	page 50

The other error codes displayed on the wire controller are same from those on the unit.

ENGINEERING MODE

INFORMATION INQUIRY

Engineering mode is accessed through the RG10 remote that is included with the unit.

In order to enter to the engineering mode and check the data of the system (data checking mode), perform the following steps:

1. Make sure that the AC is on the standby status, or working normally in a non-locked conditions.
2. Press “Power” + “Fan” buttons together for 7s until the remote controller screen shows “0”, and also “Auto, Cool, Dry, Heat, Battery“ icons will be displayed at the same time.
3. Press “Up” or “Down” button to choose different channel number that you want to check (from 0-30) on the remote controller, and then the display will show the parameter value.

Table 12 — Channel Numbers (0-30) on Remote Controller and Display

Channel	Code	Meaning	Remarks
0		Error Code	Refer to next list of error code. Empty means no error
1	T1	Room temperature	Actual data, °C
2	T2	Indoor coil temperature	Actual data, °C
3	T3	Outdoor coil temperature	Actual data, °C
4	T4	Ambient temperature	Actual data, °C
5	TP	Discharge temperature	Actual data, °C
6	FT	Targeted frequency	Actual data
7	Fr	Actual frequency	Actual data
8	dL	Running current	3.2A=3
9	Ac	AC voltage	
10	Sn	Reserved	
11	od	Indoor operating mode	0-Off;1-Cooling;2-Heating;3-Fan only;4-Drying;5-Auto;7-defrosting;12-Active clean
12	Pr	Outdoor fan speed	Actual data/8
13	Lr	EXV opening steps	Actual data/8
14	Ir	Indoor fan speed	Actual data/8
15	Hu	Humidity (if a sensor there)	Actual data, %
16	TT	Set temperature including compensation	Actual data, °C
17	nA	Reserved	
18	nA	Reserved	
19	Uo	Outdoor DC bus voltage	
20	oT	Target Frequency calculated by indoor	Without limitation
21-30	nA	Reserved	

NOTES:

- The Channel number indicates a certain parameter value (Check the below table).
- The indoor unit display will show the code for 2s, and then the parameter value.
- In the engineering mode, the other keys or operations are invalid except for the following buttons “Power”, “Up”, “Down”, and “Ok”.
- In order to exit from the engineering mode, press “Power” + “Fan” buttons together for 2s to quit Checking and back to the home screen.
- The engineering mode will be exited if there is no valid input data for 60s.

SERVICE MODE SETTING

In order to enter to the engineering mode, and check the advanced function settings, Please make the following steps:

If you want to check the current functions set value (Presetting Page):

1. Disconnect the power supply from the unit, and wait for 2 minutes.
2. Connect the power supply again to the unit (the unit should be under the standby state).
3. Press “Power” + “Fan” buttons together for 8 seconds until the remote controller screen shows “0”, and also “Auto, Cool, Dry, Heat, Battery” icons will be displayed at the same time.
4. Press the “Up” or “Down” button to choose different channel number that you want to check (from 0-30) on the remote controller.
5. Press the “Power” button for 2s until the remote controller screen shows “Ch”.
6. Press the “OK” button to query the current function set value while the remote controller shows “CH”, and the function set value will be shown on the indoor unit display.

If you want to change the current functions set value:

1. Disconnect the power supply from the unit, and wait for 2 minutes.
2. Connect the power supply again to the unit (the unit should be under the standby state).
3. Press “Power” + “Fan” buttons together for 8 seconds until the remote controller screen shows “0”, and also “Auto, Cool, Dry, Heat, Battery” icons will be displayed at the same time.
4. Press “Up” or “Down” button to choose different channel number that you want to change (from 0-30) on the remote controller.
5. Press “Power” button for 2s until the remote controller screen shows “Ch”.
6. Press “Up” or “Down” button to choose the desired set value from the screen of the remote control.
7. Press “OK” to send the new set value to the indoor unit, and the indoor unit will display “CS”, which means that the new set value is uploaded successfully.
8. Disconnect the power supply again from the unit, and wait for 10 minutes, then connect it again.

NOTES:

- The Channel number indicates a certain function, and each number will be showed on the indoor unit screen indicates the current function set value (Check the below table).
- In the engineering mode, the other keys or operations are invalid except for the following buttons “Power”, “Up”, “Down”, and “Ok”.
- In order to set a new set value successfully, you need to finish the steps (from 2 to 7) within 1 minute only.
- The engineering mode will be exited if there is no valid input data for 60s.
- In order to exit from the engineering mode, Pleas follow the following steps:
  - **Press “Power” button for 2s press until the remote controller screen shows “0”.**
  - **Then Press “Power” + “Fan” buttons together for 2s to quit the engineering mode and back to the home screen.**

Table 13 — SERVICE MODE FUNCTIONS

Channel	Function	Parameter Value Meaning	Remarks
0	/	Nothing to set	
1	Auto-restart function	0 – Inactive 1 – Active	
2	Fan control when Ts reached	1- Fan stop 2 - Fan runs at lowest RPM 3 - Fan runs at setting RPM 4~11 - Fan stops for 4 minutes and runs for 1min	
3	Mode lock	CH–Cooling and heating (all modes) HH–Heating only (Heating + Fan only) CC–Cooling only (Cooling + Drying + Fan only) nU–Cooling and heating without Auto	Remote controller will change as well.
4	Lowest setting temperature	16-24	Remote controller will change as well.
5	Highest setting temperature	25-30	Remote controller will change as well.
6	Twins selection	0 – No twins 1 – Header unit 2 – Follower unit	
7	/	Nothing to set	
8	/	Nothing to set	9
9	/	Nothing to set	
10	/	Nothing to set	
11	Min. frequency limitation in cooling mode	10, 11, 12, …, 49, 50, -- (Cancel)	
12	Min. frequency limitation in heating mode	10, 11, 12, …, 49, 50, -- (Cancel)	
13	Max frequency selection in T4 limitation of Zone6	20, 21, 22, …, 149, 150, -- (Cancel)	
14	/	Nothing to set	
15	Frequency selection of outdoor forced-operation	10, 11, 12, …, 249, 250, -- (Cancel)	
16	One button reset	rS – Reset	
17	nA	Nothing to set	
18	/	Nothing to set	
19	Max. frequency selection in cooling mode	40, 41, 42, …, 83, 84, -- (Cancel)	
20	Max. frequency selection in heating mode	40, 41, 42, …, 83, 84, -- (Cancel)	Without limitation
21	Cooling temperature compensation	-3.0, -2.5, -2.0, …, 3.0, 3.5, -- (Cancel)	
22	Heating temperature compensation	-6.5, -6.0, -5.5, …, 0.5, 1.0, 1.5, …, 7.0, 7.5, -- (Cancel)	
23	Max. fan speed selection in cooling	-41, -40, -39, …, 19, 20, -- (Cancel)	
24	Min. fan speed selection in cooling	-41, -40, -39, …, 19, 20, -- (Cancel)	
25	Max. fan selection in heating	-41, -40, -39, …, 19, 20, -- (Cancel)	
26	Min. fan speed selection in heating	-41, -40, -39, …, 19, 20, -- (Cancel)	
27	Reserved	Nothing to set	
28	Reserved	Nothing to set	
29	Reserved	Nothing to set	
30	Reserved	Nothing to set	

QUICK MAINTENANCE BY ERROR CODE

PART REQUIRING REPLACEMENT	ERROR CODE							
	EL 01	EC 51	EC 52	EC 53	EC 54	EC 55	EC 5C	EC 57
Indoor PCB	✓	x	x	x	x	x	x	x
Outdoor PCB	✓	✓	✓	✓	✓	✓	✓	✓
ODU coil temp. sensor	x	x	✓	x	x	x	x	x
ODU ambient temp. sensor	x	x	x	✓	x	x	x	x
COMP. discharge temp. sensor	x	x	x	x	✓	x	x	x
IPM module temperature sensor	x	x	x	x	x	✓	x	x
Pressure sensor	x	x	x	x	x	x	✓	x
Refrigerant pipe temperature sensor	x	x	x	x	x	x	x	✓
Condenser temperature sensor	x	x	x	x	x	x	x	x
Reactor	✓	x	x	x	x	x	x	x
IPM module board	✓	x	x	x	x	x	x	x

PART REQUIRING REPLACEMENT	ERROR CODE								
	EC 07	PC 00	PC 10/PC 11/ PC 12	PC 02	PC 08 / PC 42 / PC 44/ PC 46/ PC 49	PC 0F	PC 41	PH 90	PH 91
Outdoor PCB	✓	✓	✓	✓	✓	✓	✓	x	x
Outdoor fan motor	✓	✓	x	x	✓	x	x	x	x
Reactor or inductance	x	✓	✓	x	✓	✓	x	x	x
Compressor	x	✓	x	x	x	x	x	x	x
IPM module board	x	✓	✓	x	✓	x	x	x	x
Bridge rectifier	x	✓	✓	x	✓	x	x	x	x
Evaporator coil temperature sensor	x	x	x	x	x	x	x	✓	✓
PFC module	x	x	x	x	x	✓	x	x	x
Additional refrigerant	x	x	x	x	x	x	x	x	x
Over load protector	x	x	x	✓	x	x	x	x	x
ODU ambient temp. sensor	x	x	x	x	x	x	x	x	x
Refrigerant pipe temperature sensor	x	x	x	x	x	x	x	x	x
Indoor fan	x	x	x	x	x	x	x	✓	x
Indoor PCB	x	x	x	x	x	x	x	✓	✓

QUICK MAINTENANCE BY ERROR CODE (continued)

Part requiring replacement	Error Code							
	PC 40	PC 43	PC 45	PC 06	PC 0a	PC 30	PC 31	EL 16
Outdoor PCB	√	√	x	√	√	√	√	√
Outdoor fan motor	x	x	x	x	√	√	√	x
ODU coil temp. sensor	x	x	x	x	√	x	x	x
COMP. discharge temp. sensor	x	x	x	√	x	x	x	x
Compressor	x	√	x	x	x	x	x	x
IPM module board	x	x	√	x	x	x	x	x
Additional refrigerant	x	x	x	√	√	x	√	x
Electric control box	√	x	x	x	x	x	x	x
High pressure switch	x	x	x	x	x	√	x	x
Low pressure switch	x	x	x	x	x	x	√	x
Adapter board	x	x	x	x	x	x	x	√

TROUBLESHOOTING BY ERROR CODE

EH 00/ EH 0A / EC 51
(EEPROM Malfunction error diagnosis and solution)

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

Recommended parts to prepare: Indoor PCB, Outdoor PCB

Troubleshooting and repair:

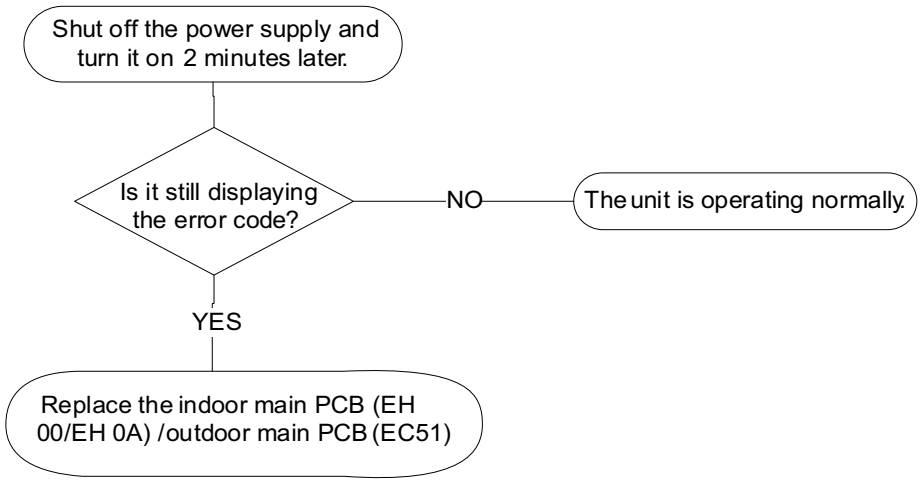


Fig. 39 —EH 00/ EH 0A / EC 51

Remarks:

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

The location of the EEPROM chip on the indoor and outdoor PCB is shown in the following two images:

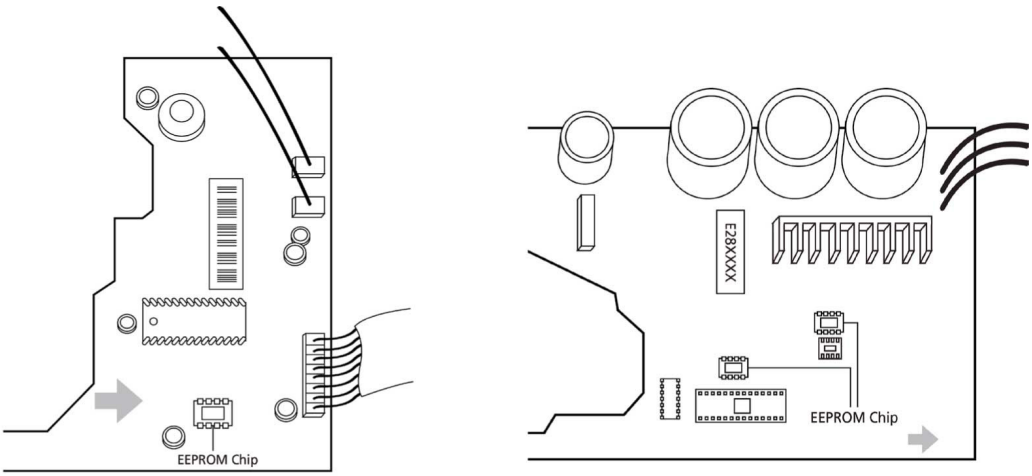


Fig. 40 —Location of EPROM Chip

This pictures are only for reference, actual appearance may vary.

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

EL 01
(Indoor and outdoor unit communication error diagnosis and solution)

Description: Indoor unit can not communicate with outdoor unit

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

Troubleshooting and repair: Current loop Communication (S Communication):

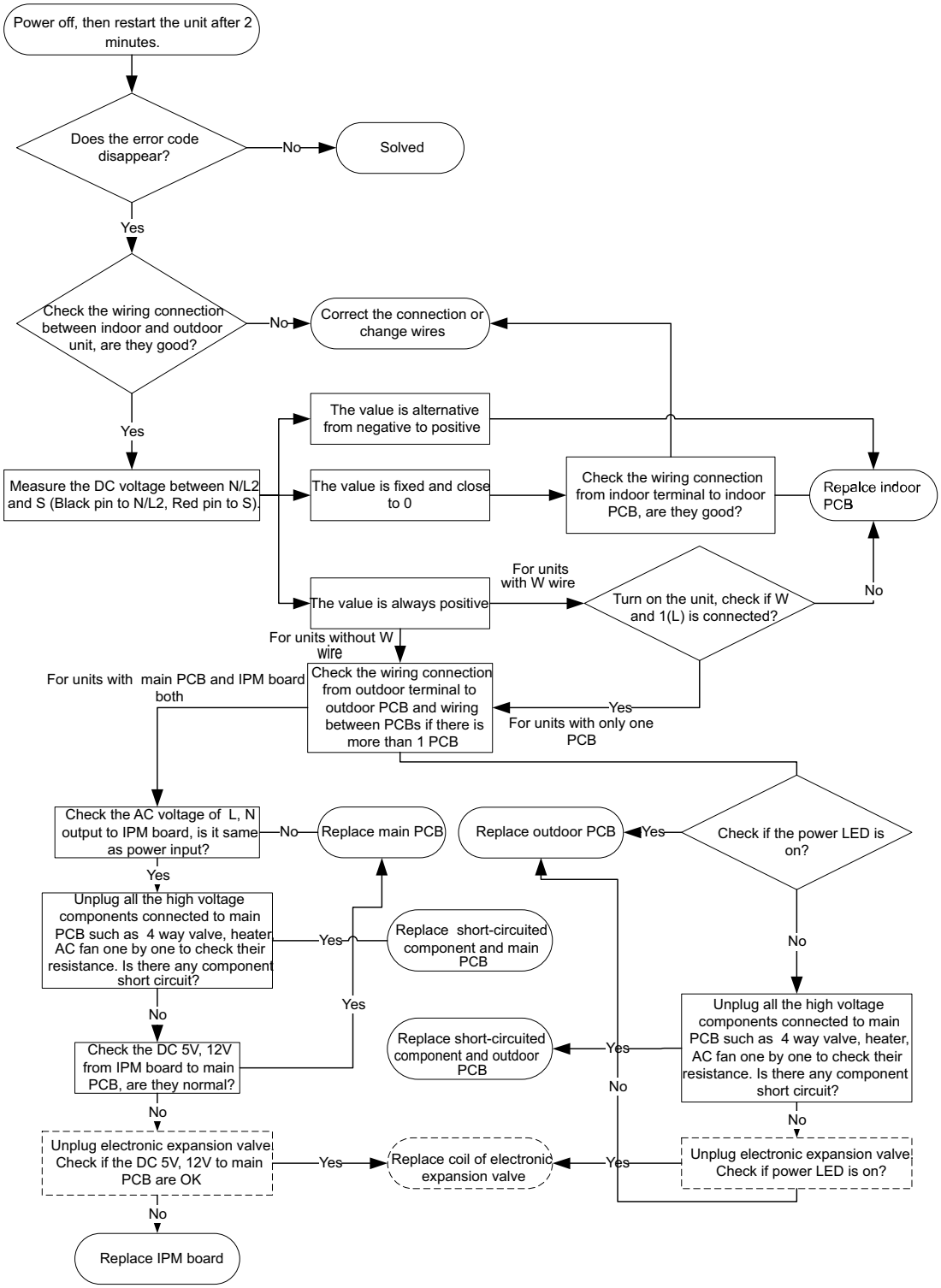


Fig. 41 —EL 01

Remarks:

- Use a multimeter to test the DC voltage between 2 port (or S or L2 port) and 3 port (or N or S port) of outdoor unit. The red pin of multimeter connects with 2 port (or S or L2 port) while the black pin is for 3 port (or N or S port).
- When AC is operating normally, the voltage is moving alternately as positive values and negative values

- If the outdoor unit has malfunction, the voltage has always been the positive value.
- While if the indoor unit has malfunction, the voltage has always been a certain value

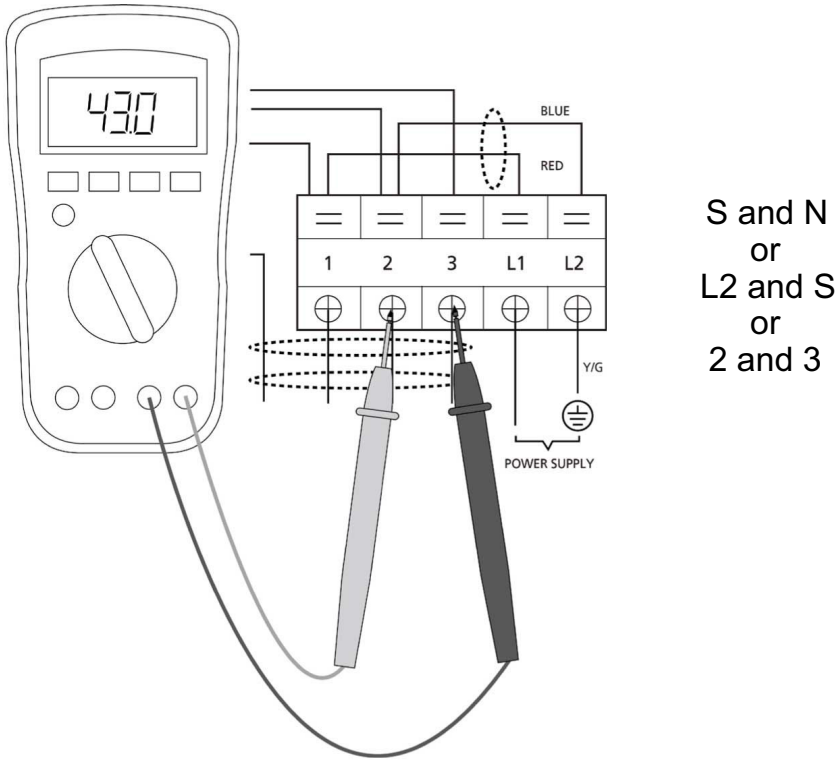


Fig. 42 —Test Outdoor Unit with Multimeter

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

Fig. 43 —Test Resistance of Reactor with Multimeter

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

485 COMMUNICATION (S1, S2 COMMUNICATION)

Recommended parts to prepare: Signal wires, Magnet ring, Indoor PCB, Outdoor PCB

Troubleshooting and repair:

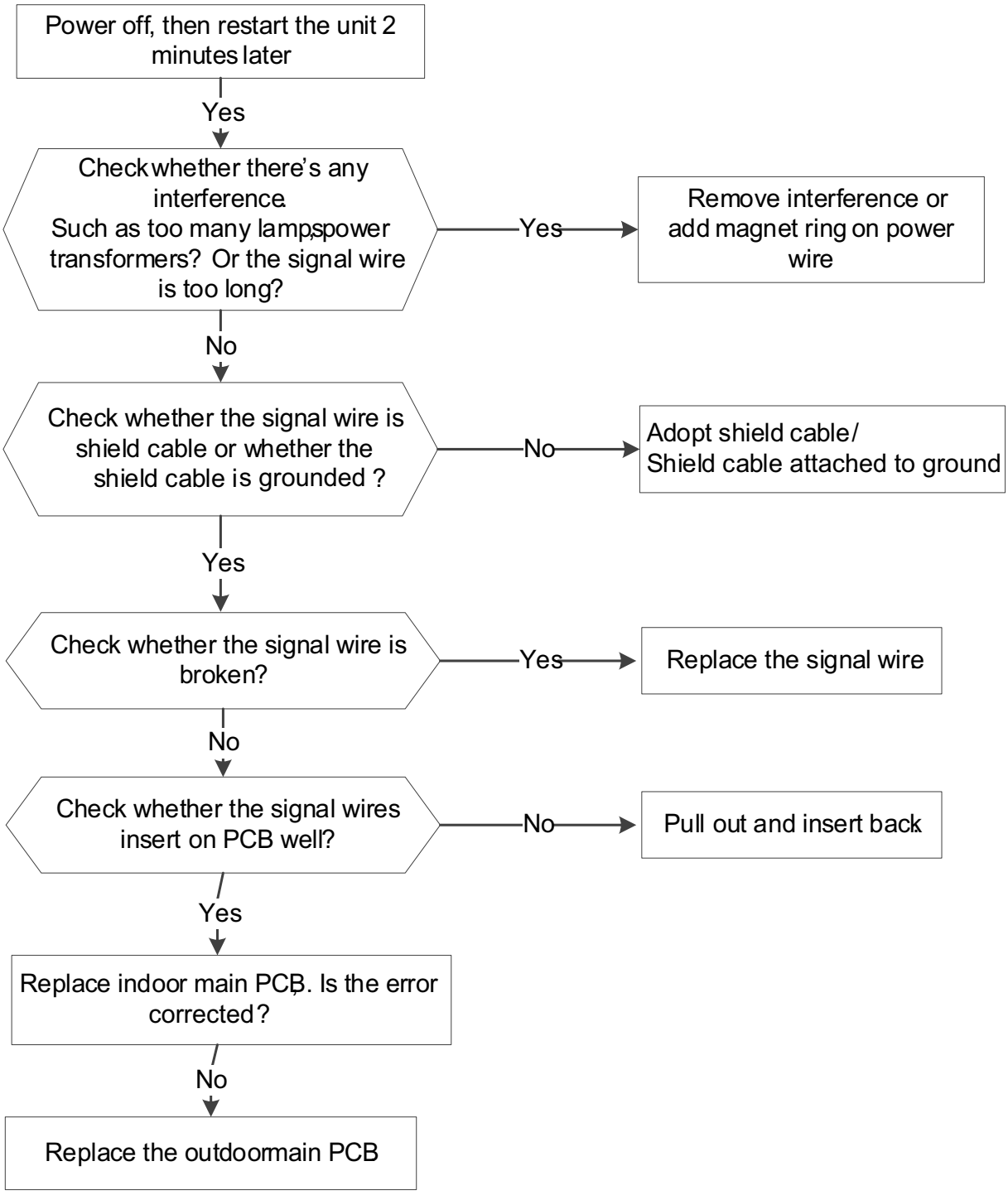


Fig. 44 —485 Communication Troubleshooting Flowchart

EH03 / EC07
(Fan speed out of control diagnosis and solution)

Description: When indoor / outdoor fan speed keeps too low or too high for a certain time, the unit ceases operation and the LED displays the failure.

Recommended parts to prepare:

• Connection wires

• Fan assembly

• Fan motor

• PCB

Troubleshooting and repair:

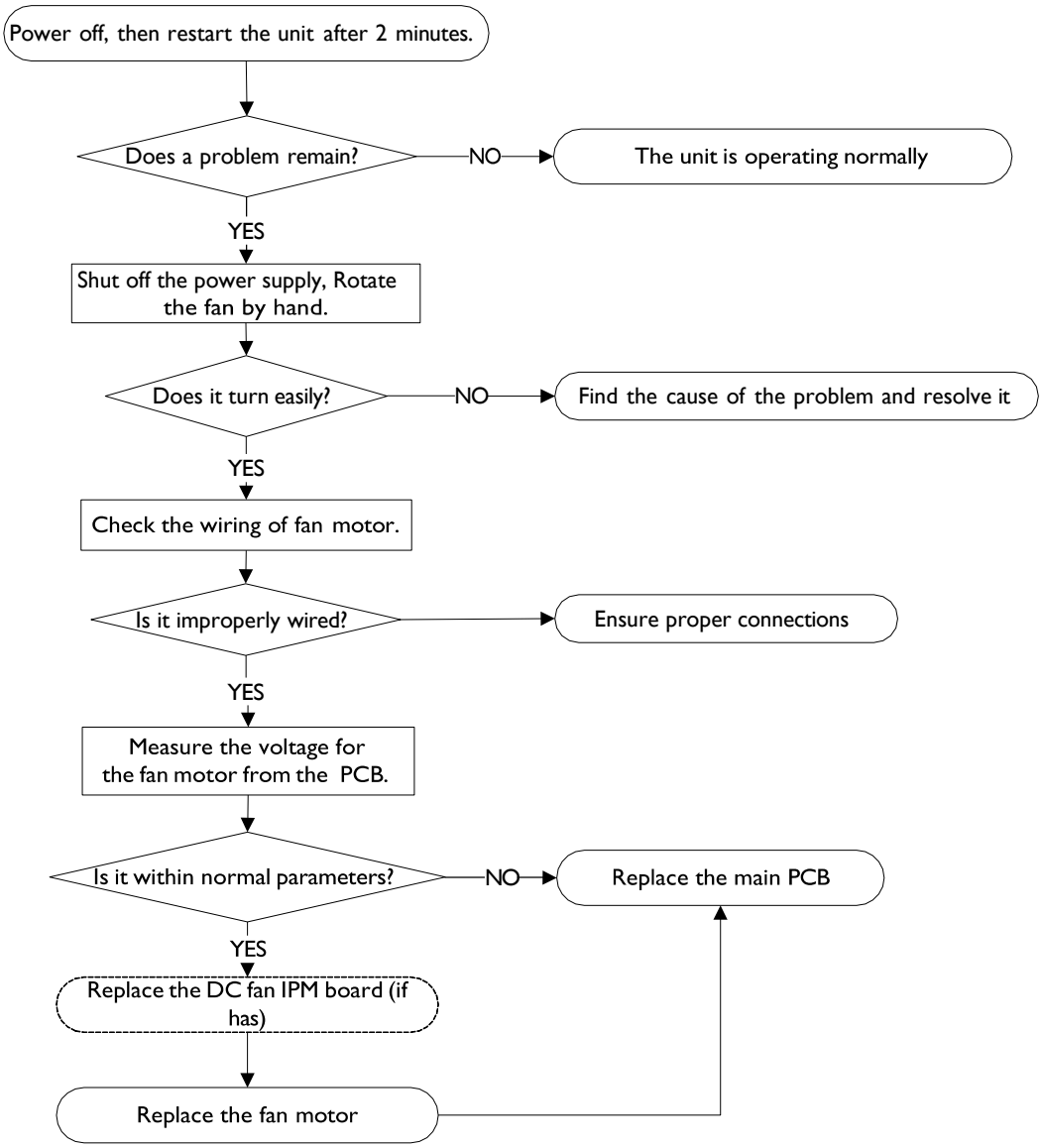


Fig. 45 —EH03 / EC07 Troubleshooting Flowchart

Index

1. Indoor or Outdoor DC Fan Motor (control chip is in fan motor)
   With the power on and when the unit is in standby, measure the voltage of pin1- pin3, pin4- pin3 in the fan motor connector. If the value of the voltage is not in the range shown in below table, the PCB needs to be replaced.

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

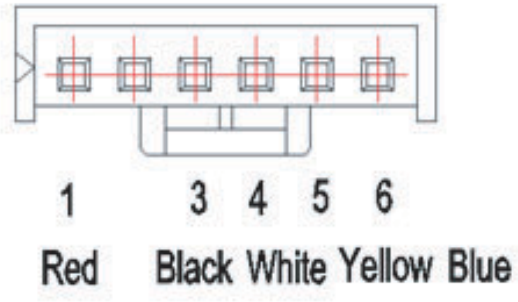


Fig. 46 —Fan Motor Connector, Pin Location

2. 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 resistances are not equal to each other, the fan motor needs to be replaced. Otherwise, the PCB needs to be replaced.

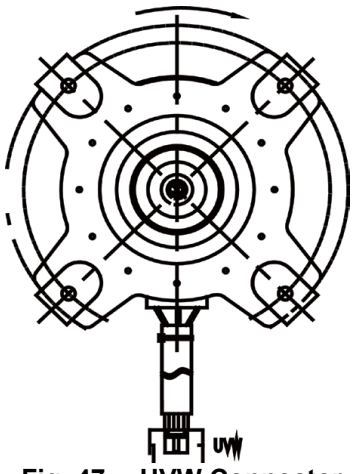


Fig. 47 —UVW Connector

EH60/EH61/EC53/EC52/EC54/EC56
(Open circuit or short circuit of temperature sensor diagnosis and solution)

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

Recommended parts to prepare:

• Connection wires

• Sensors

• PCB

Troubleshooting and repair:

Refer to Appendix, page 78.

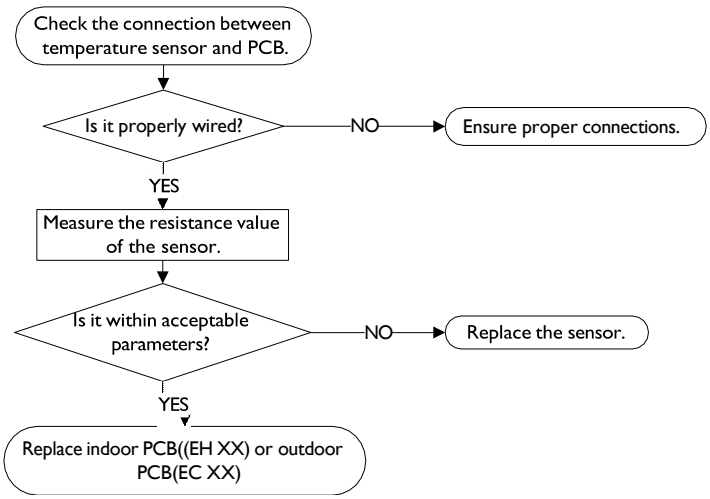


Fig. 48 —Temperature Sensor, Troubleshooting Flowchart

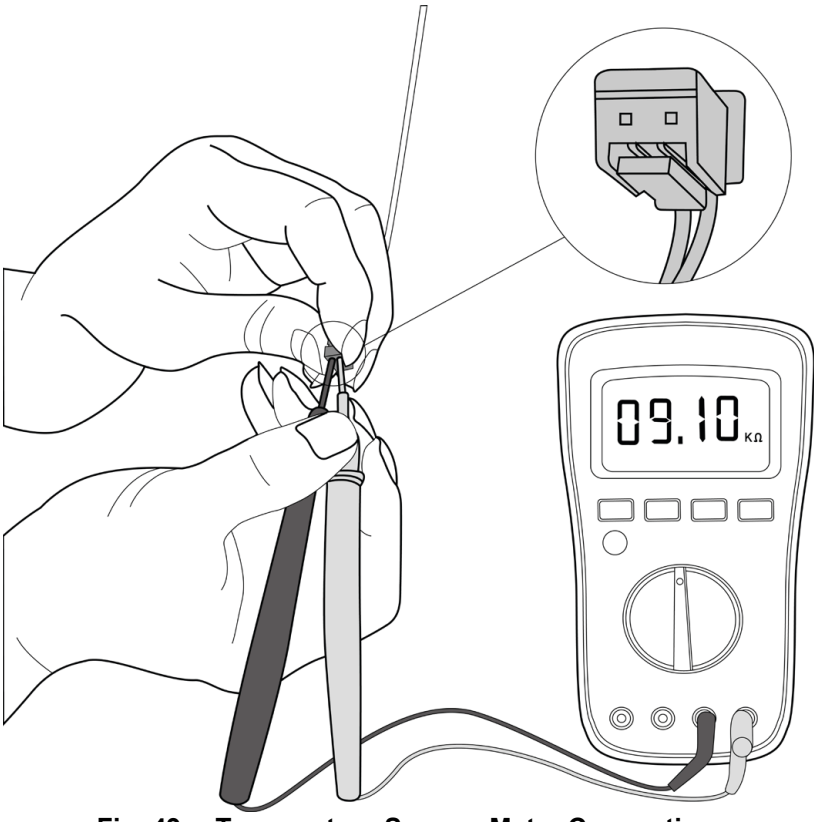


Fig. 49 —Temperature Sensor, Meter Connections

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

EL0C
(System lacks refrigerant diagnosis and solution)

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

Recommended parts to prepare:

• Indoor PCB

• Additional refrigerant

Troubleshooting and repair:

Refer to Appendix, page

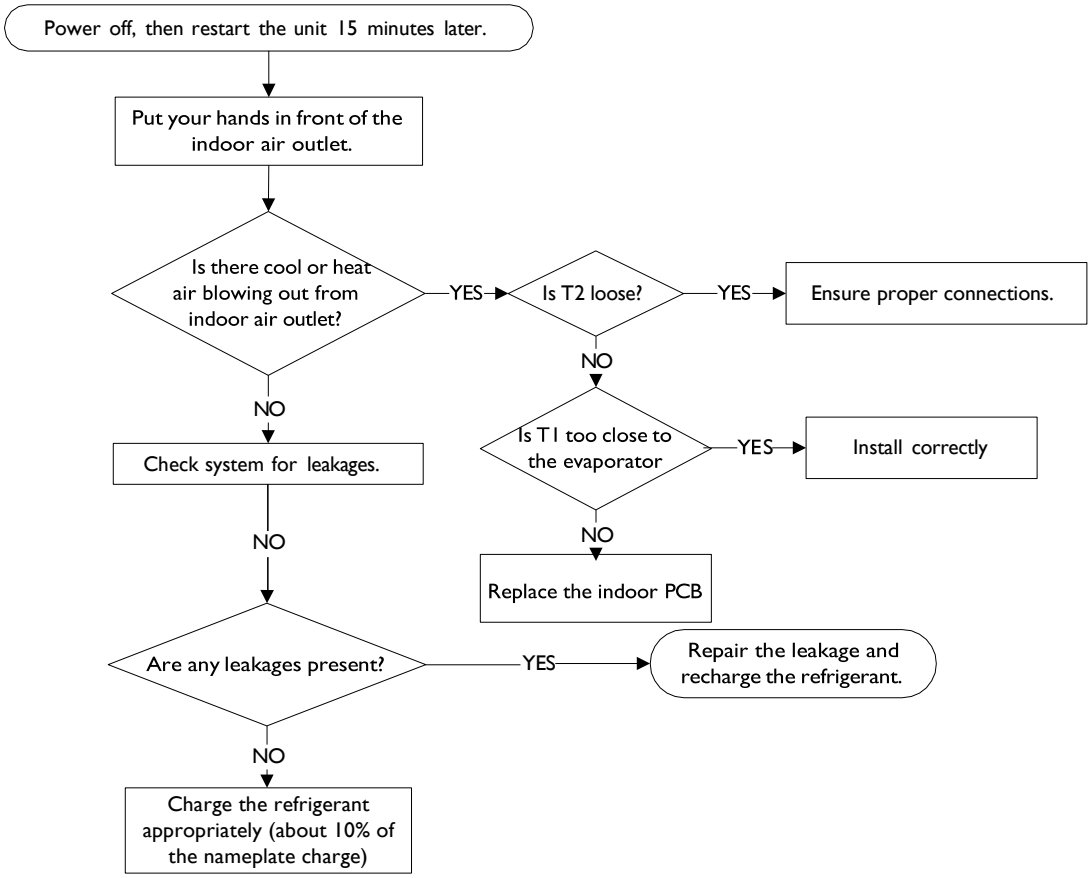


Fig. 50 —EL0C Troubleshooting Flowchart

EH0E
(Water-level alarm malfunction diagnosis and solution)

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

Recommended parts to prepare:

• Connection wires

• Water-level switch

• Water pump

• Indoor PCB

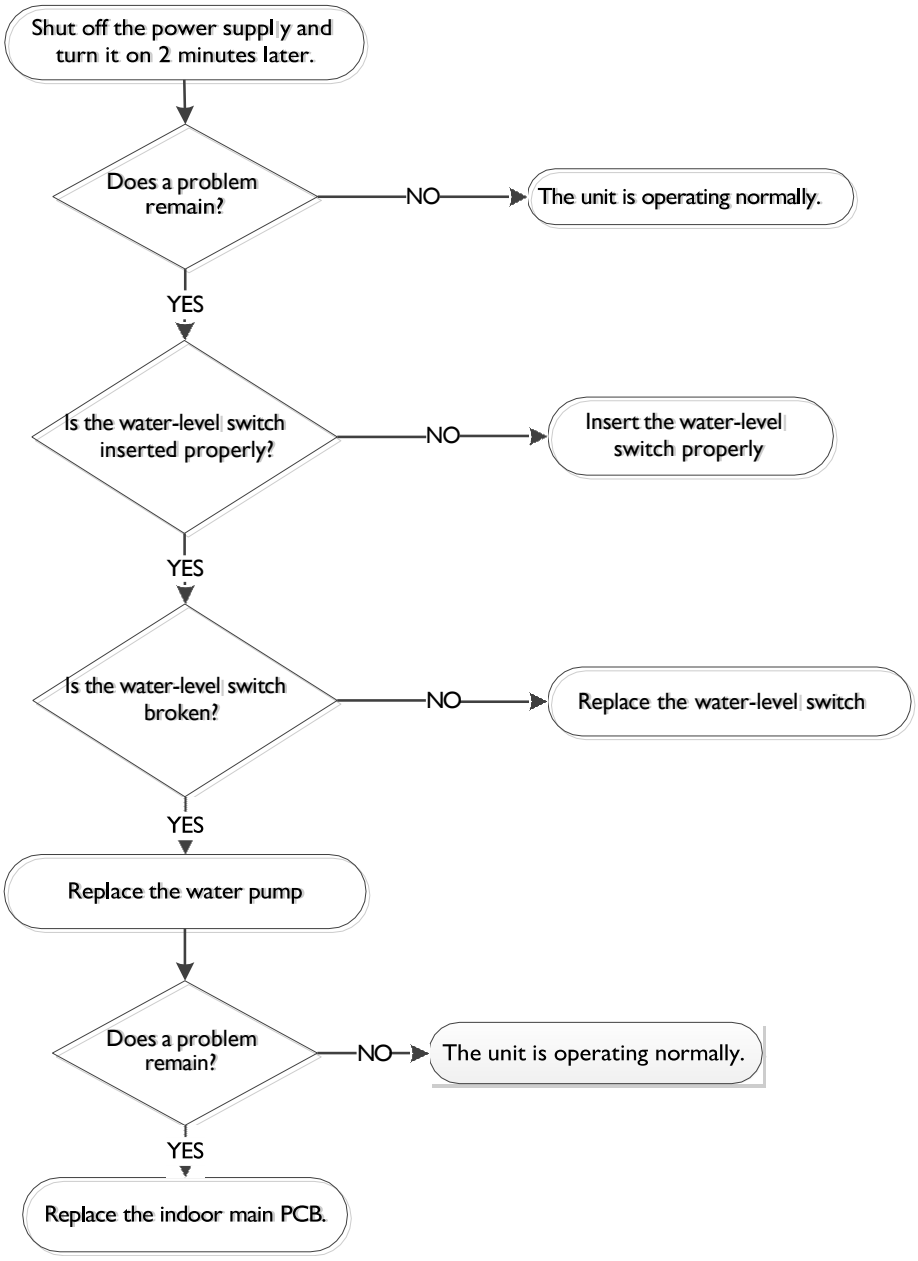


Fig. 51 —EH0E Troubleshooting Flowchart

PC00
(ODU IPM module protection diagnosis and solution)

Description: When the voltage signal the IPM sends to the compressor drive chip is abnormal, the display LED shows "PC00" and the AC turns off.

Recommended parts to prepare:

• Connection wires

• IPM module board

• Outdoor fan assembly

• Compressor

• Outdoor PCB

Troubleshooting and repair:

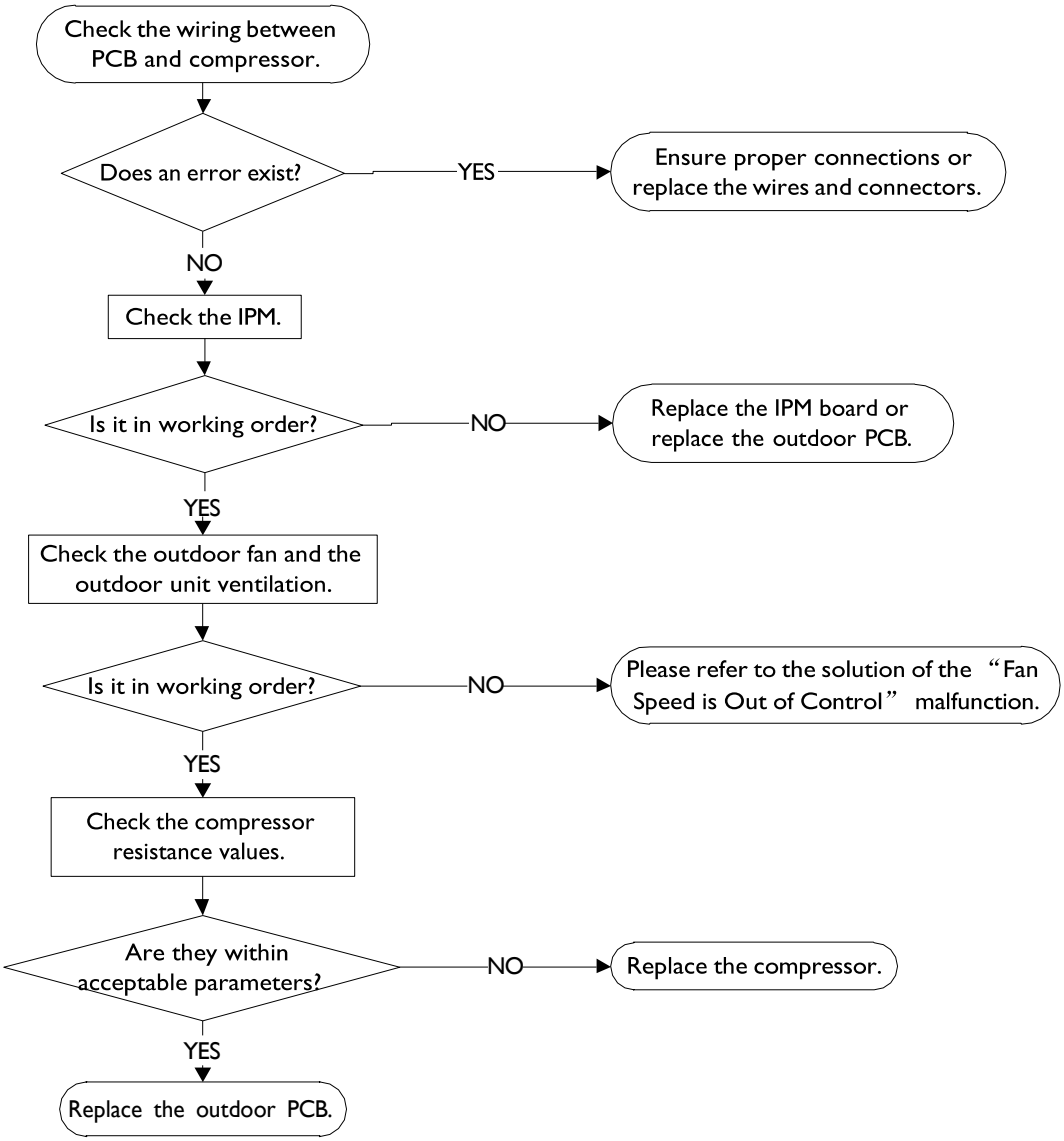


Fig. 52 —PC00 Troubleshooting Flowchart

PC01
(ODU 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 and repair:

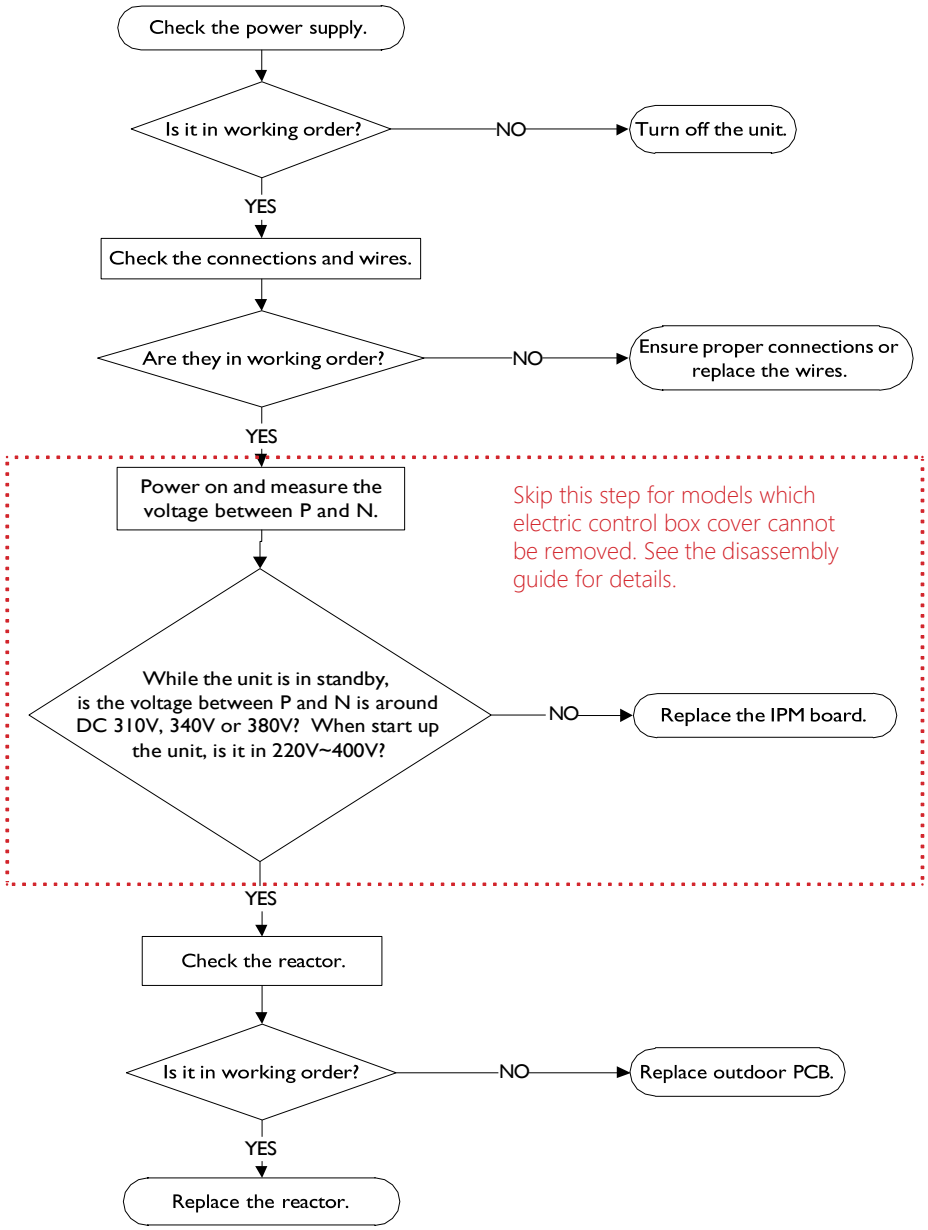


Fig. 53 —PC01 Troubleshooting Flowchart

PC04
(Inverter compressor drive error diagnosis and solution)

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

Recommended parts to prepare:

• Connection wires

• IPM module board

• Outdoor fan assembly

• Compressor

• Outdoor PCB

Troubleshooting and repair:

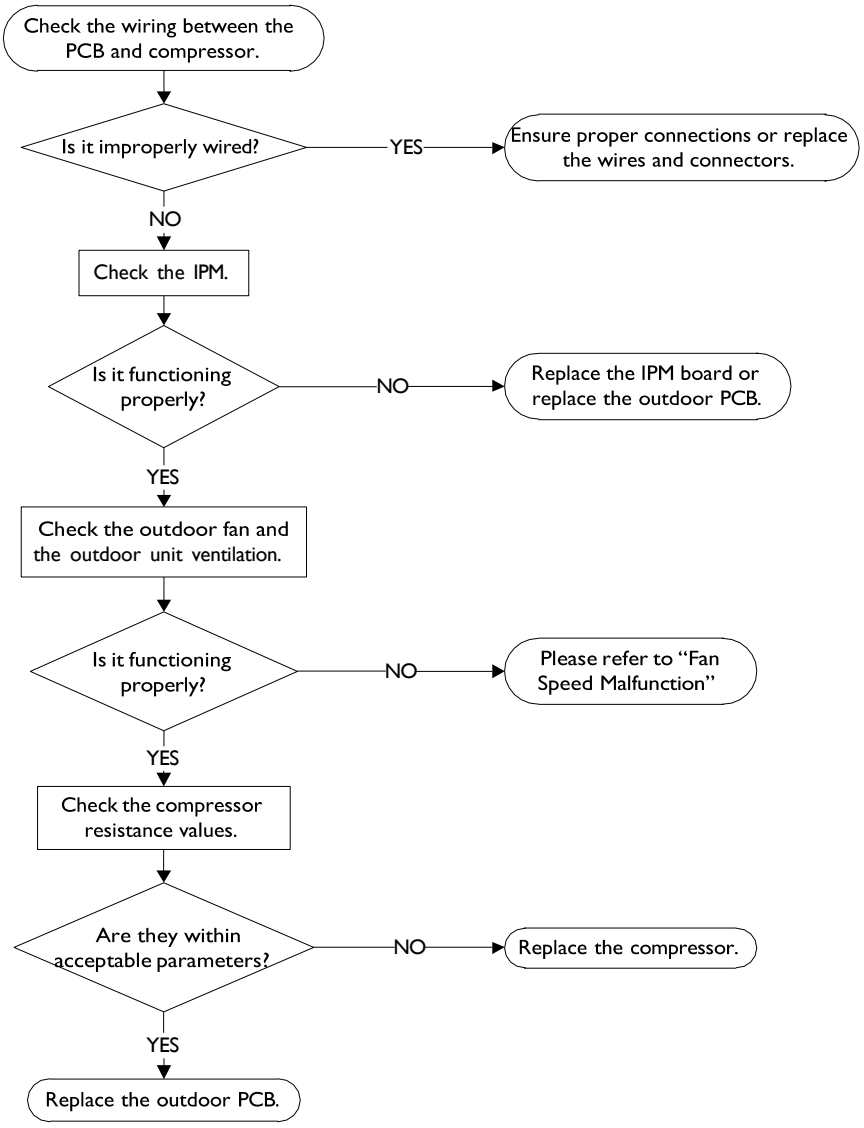


Fig. 54 —PC04 Troubleshooting Flowchart

PC03
(PC31 (low pressure) PC30 (high pressure) diagnosis and solution)

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

Recommended parts to prepare:

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

Troubleshooting and repair:

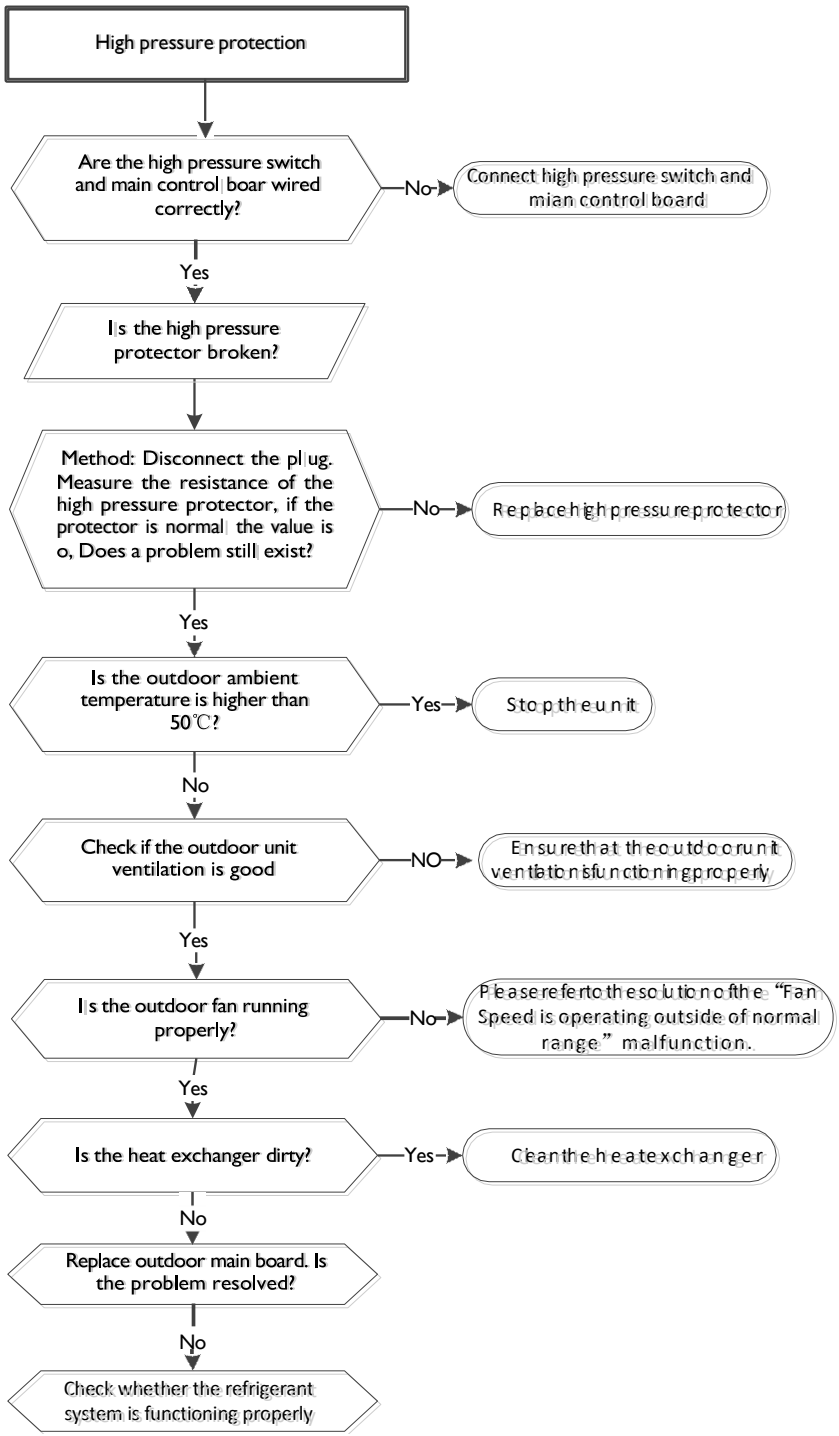
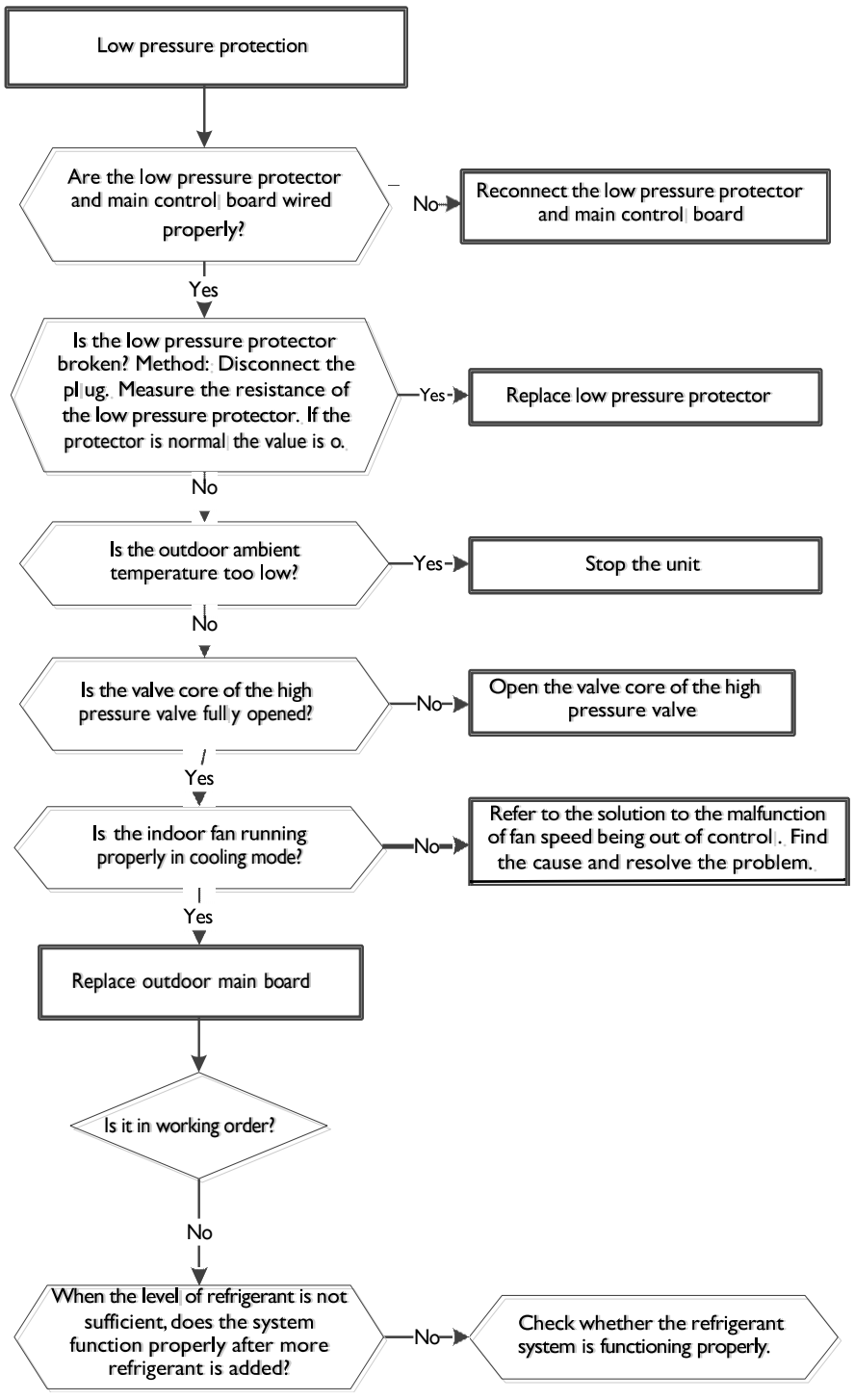


Fig. 55 —PC03 Troubleshooting Flowchart



PC03 Troubleshooting Flowchart (continued)

PC02
(Compressor top (or IPM) temperature protection diagnosis and solution)

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

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

Troubleshooting and repair:

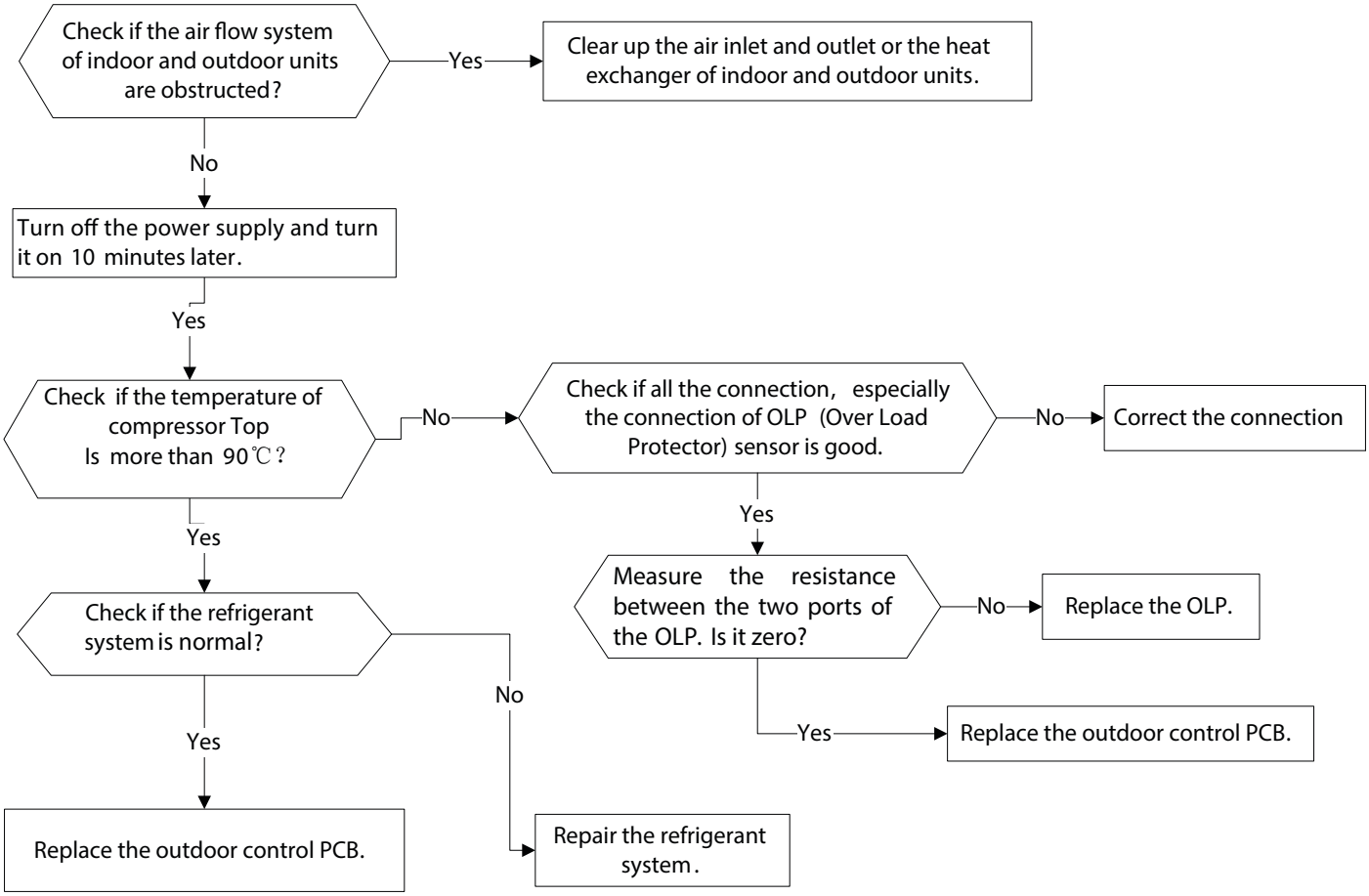


Fig. 56 —PC02 Troubleshooting Flowchart

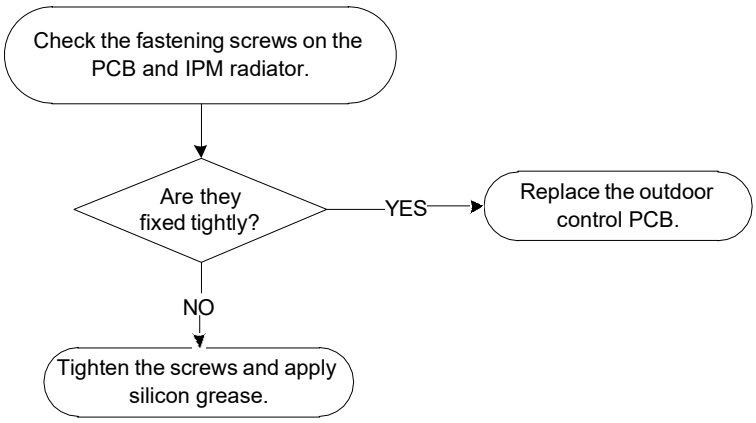


Fig. 57 —PC02 - PCB IPM, Check Fastening Screws

PC0L
(Low ambient temperature protection)

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

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

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

EH b3
(Communication malfunction between wire and master control) diagnosis and solution

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

Recommended parts to prepare:

• Connection wires

• Indoor PCB

• Wired controller

Troubleshooting and repair:

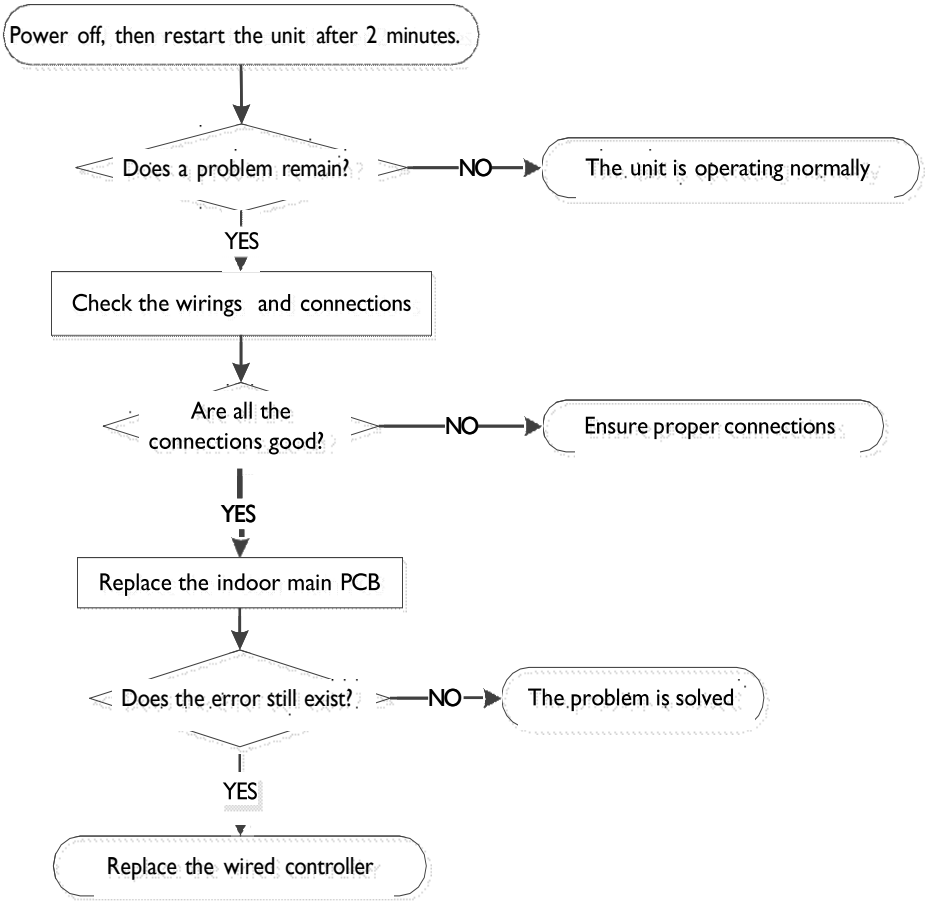


Fig. 58 —EH b3 Troubleshooting Flowchart

EH bA
(Communication error between the indoor unit and the external fan module) / EH3A (External fan DC bus voltage is too low protection) / EH3b (External fan DC bus voltage is too high fault) diagnosis and solution

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

Recommended parts to prepare:

• Indoor main PCB

Troubleshooting and repair:

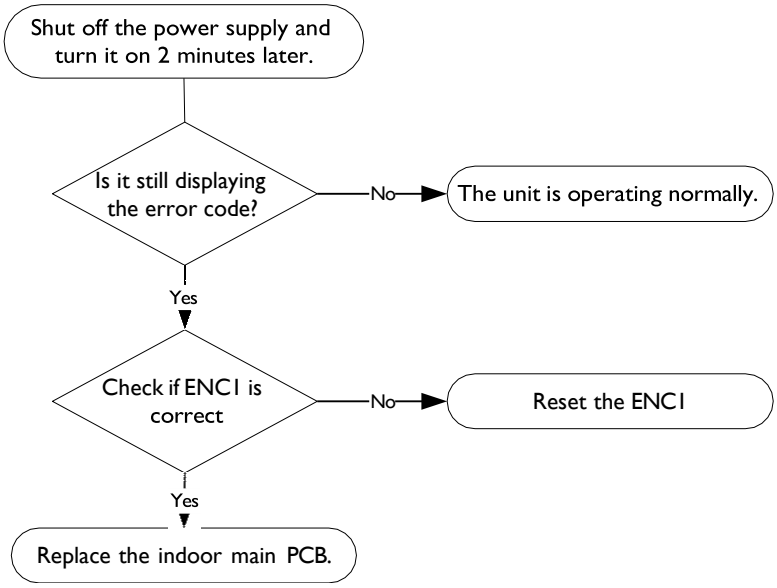


Fig. 59 —EH bA Troubleshooting Flowchart

FHCC
(Refrigerant sensor error) or
EHC3
(Refrigerant sensor is out of range) diagnosis and solution

Description: Indoor unit receives fault signal for 10s or indoor unit does not receive feedback from refrigerant sensor for 150s.

Recommended parts to prepare:

- **Connection wires**
- **Sensors**
- **Indoor main PCB**

Troubleshooting and repair:

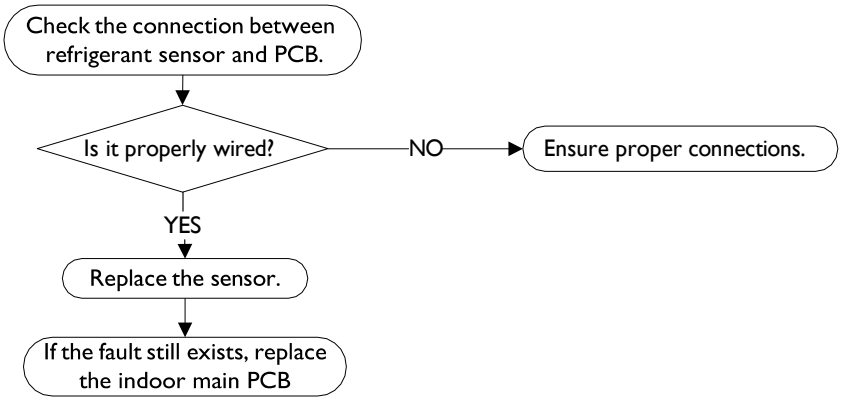


Fig. 60 —FHCC / EHC3 Troubleshooting Flowchart

EHC1
(Refrigerant sensor detects leakage) or
EHC2
(Refrigerant sensor is out of range and leakage is detected) diagnosis and solution

Description:

The refrigerant sensor detects a concentration higher than or equal to 10%*LFL for 10 seconds or the refrigerant sensor detects a concentration higher than or equal to 20%*LFL or the multi model receives the refrigerant leakage protection fault sent by the outdoor unit.

Multi-zone: Only the buzzer of the indoor unit that detects refrigerant leakage continues to sound the alarm, the shortest sound is 10 seconds, and the longest sound is 5 minutes (you can press any key such as remote control or wire control, APP and so on to eliminate the alarm), and the other non-refrigerant leakage fault indoor unit only displays "ECC1", but the buzzer does not sound.

Recommended parts to prepare:

• Additional refrigerant

Troubleshooting and repair:

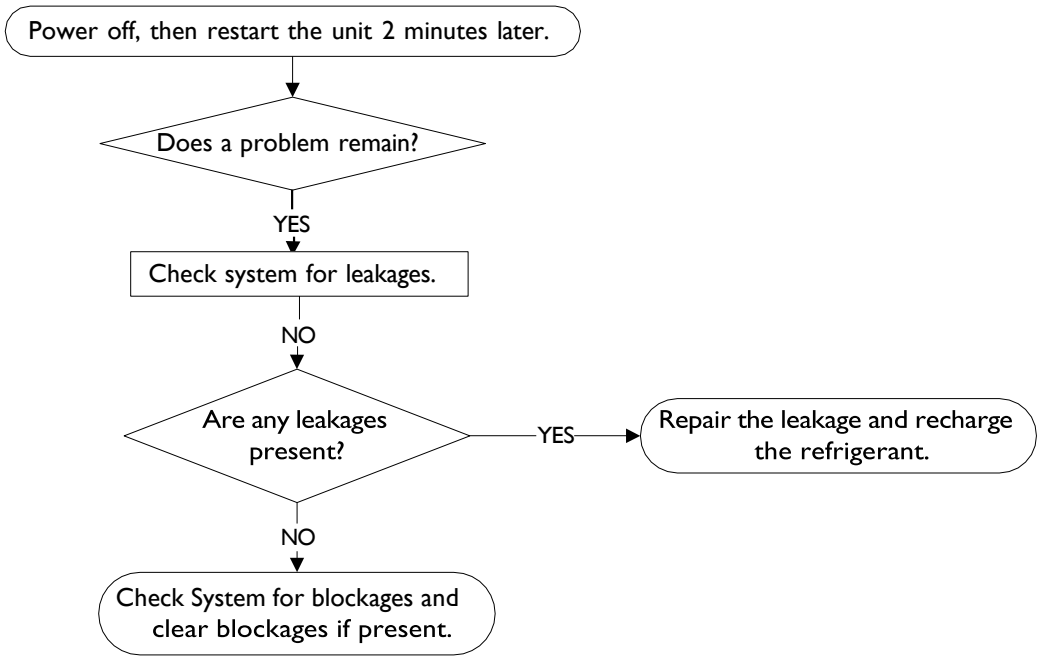


Fig. 61 —EHC1 / EHC2 Troubleshooting Flowchart

CHECK PROCEDURES

Temperature Sensor Check

⚠ WARNING

Electrical Shock Hazard

Be sure to turn off all power supplies or disconnect all wires to avoid electric shock.

Operate after compressor and coil have returned to normal temperature to avoid injury.

1. Disconnect temperature sensor from PCB (Refer to Indoor Disassembly and Outdoor Disassembly).
2. Measure the resistance value of the sensor using a multi-meter.
3. Check corresponding temperature sensor resistance value table (Refer to the Appendix).

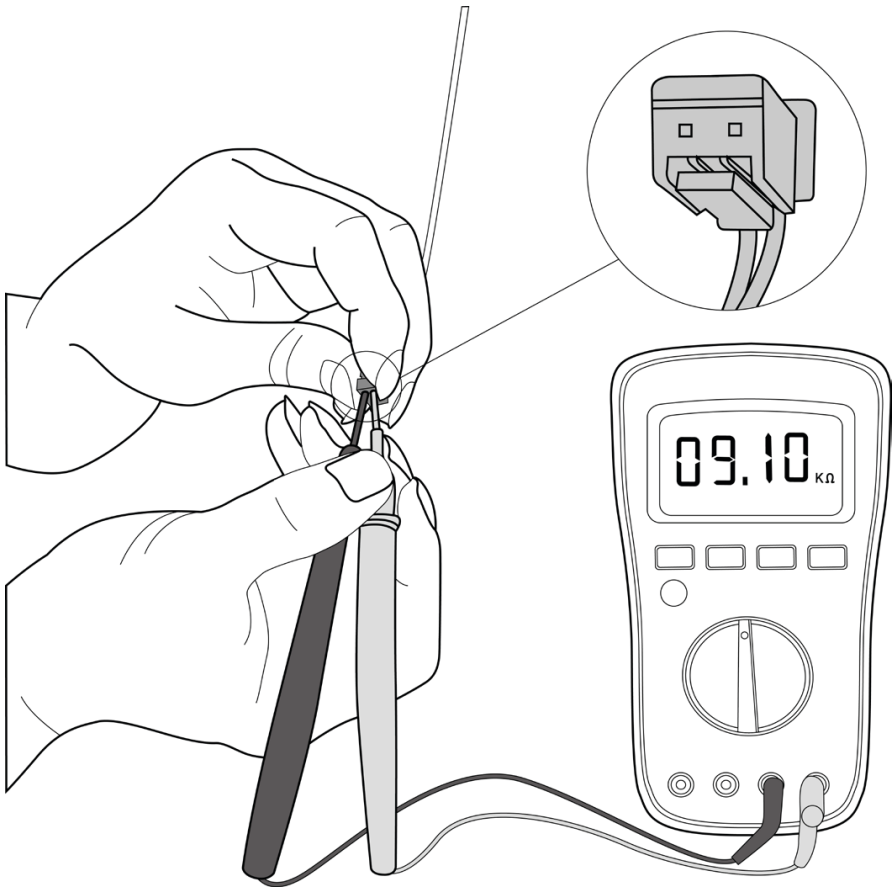


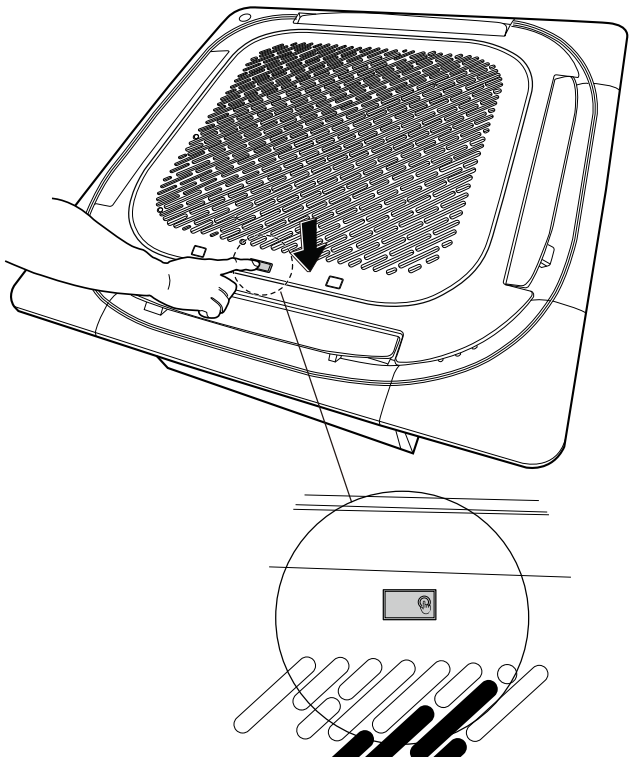
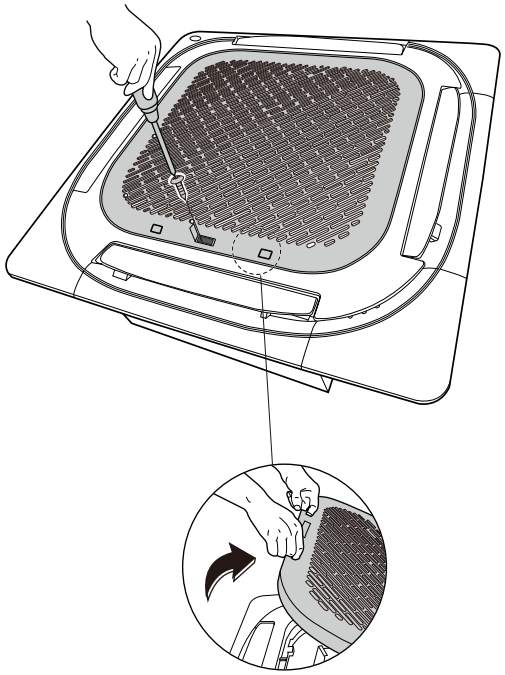
Fig. 62 —Temperature Sensor Check

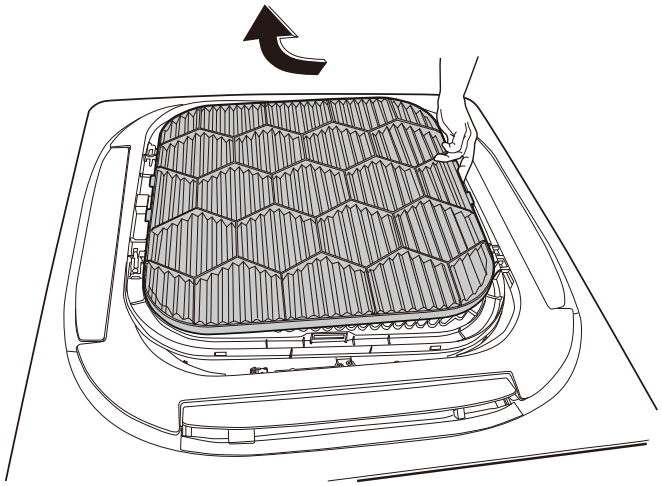
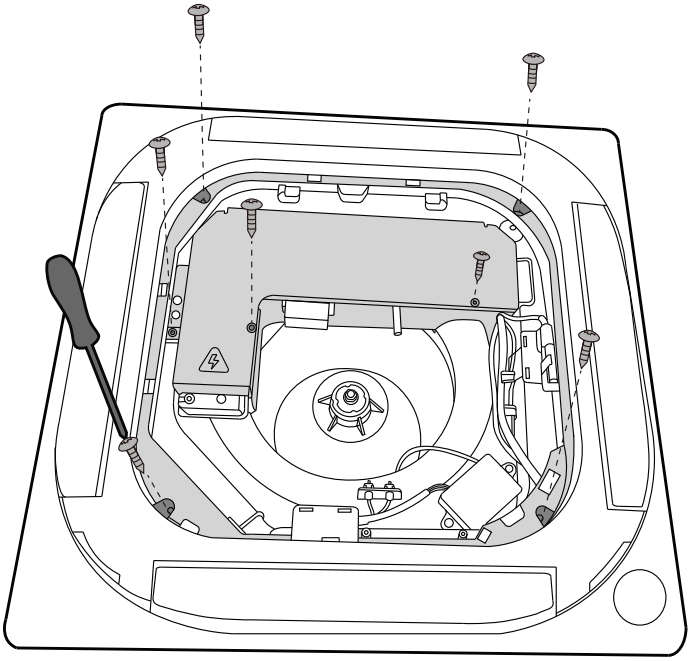
NOTE: The picture and the value are only for reference, actual condition and specific value may vary.

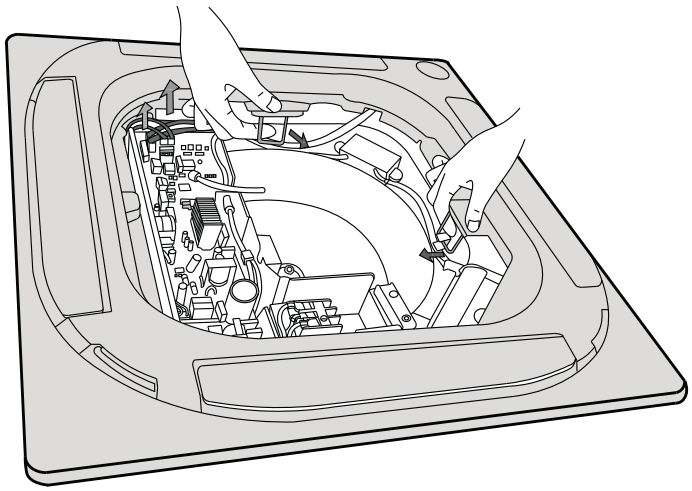
DISASSEMBLY INSTRUCTIONS

09K/ 12K/ 18K Size - Panel Disassembly

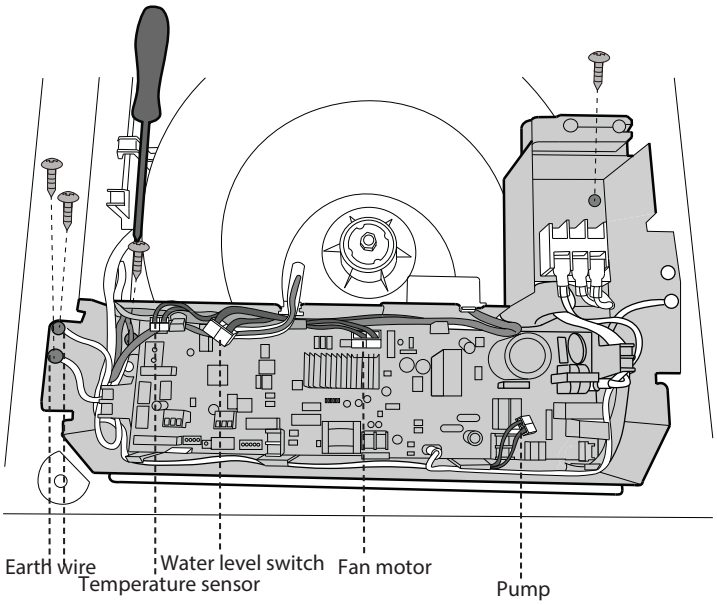
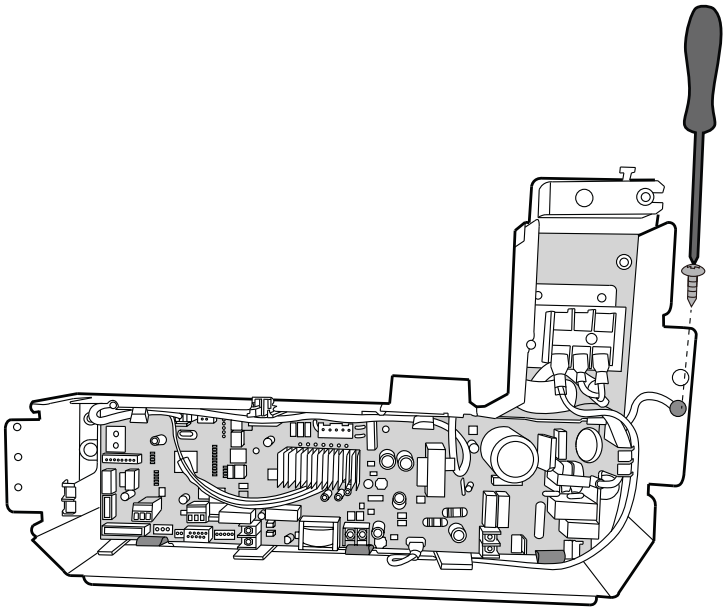
NOTE: This section is for reference, the photos may differ slightly from the actual unit.

PROCEDURES	ILLUSTRATION
1. Push one side of the grille clamp. (see illustration)	
2. Remove one screw then push two grille clamps to remove the air inlet grille assembly.((see illustration)	

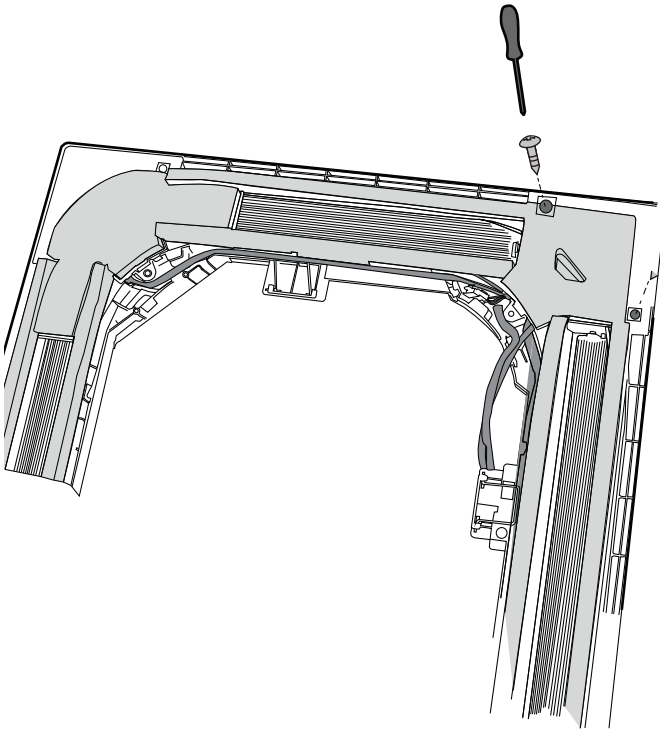
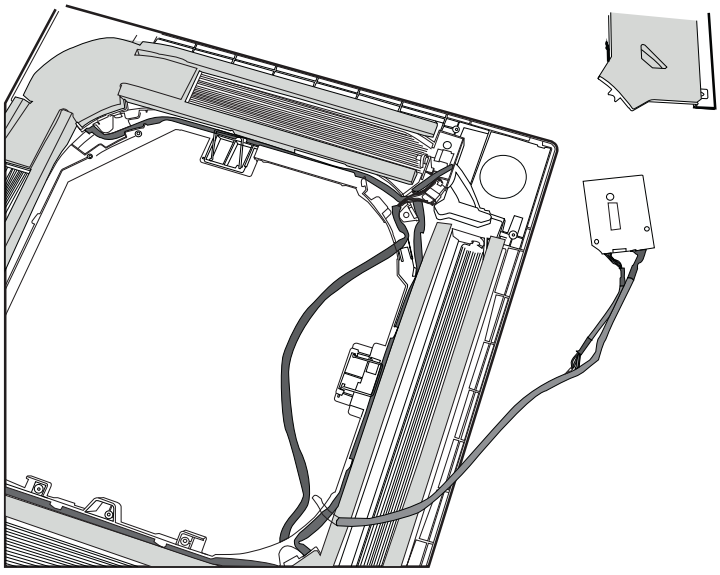
PROCEDURES	ILLUSTRATION
3. Turn over the air inlet grille assembly then pull up the filter..(see illustration)	
4. Remove 3 screws and remove the cover of electronic control box. (see illustration) 5. Remove 4 screws of the panel. (see illustration)	

PROCEDURES	ILLUSTRATION
6. Disconnect the connectors of display board and stepper motor. (see illustration) 7. Loosen two clasps with index finger and thumb and then remove the panel. (see illustration)	

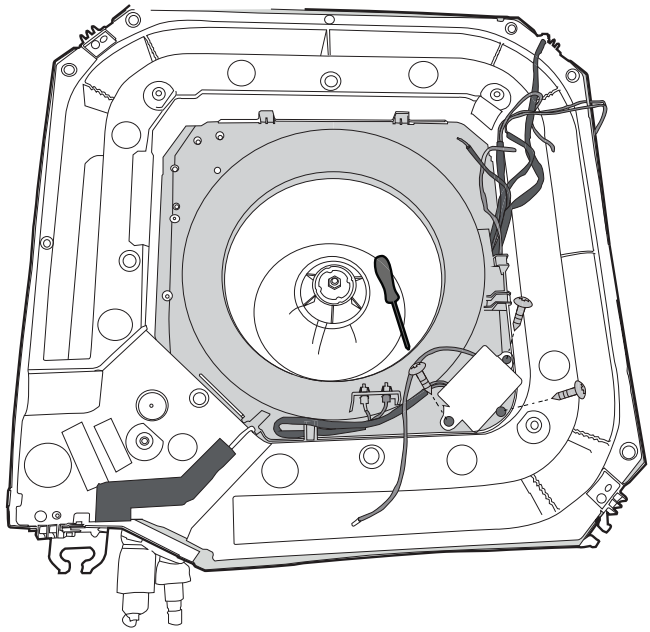
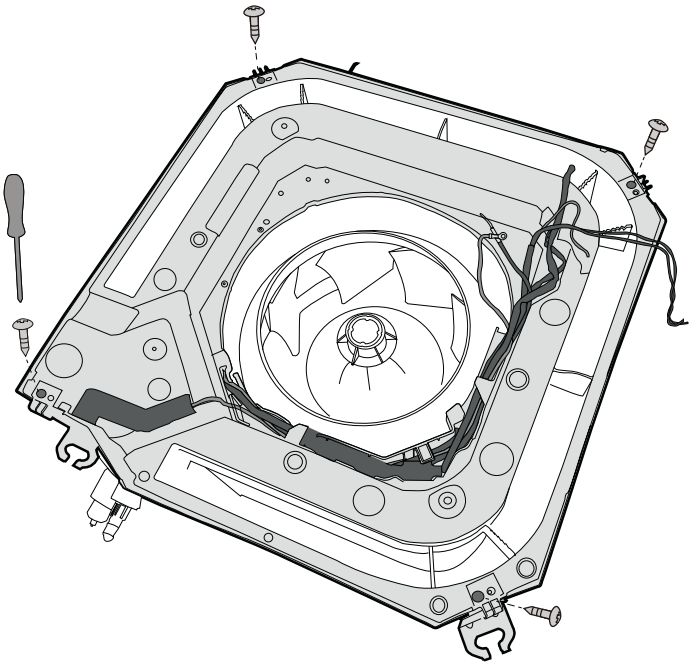
09K/ 12K/ 18K Size - Electrical Parts Disassembly (Anti-static gloves must be worn.)

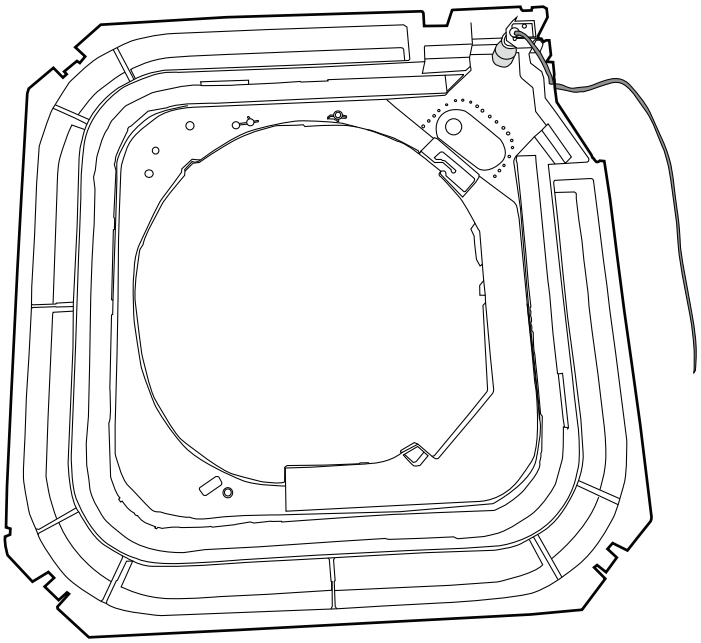
PROCEDURES	ILLUSTRATION
1. Remove 2 screws of electronic control box and 2 screws of earth wire. (see illustration) 2. Disconnect the connectors of temperature sensor, pump, motor and water level switch. (see illustration) 3. Remove the electronic control box subassembly. (see illustration)	
4. Release 3 clasps of the main control board and 1 screw of earth wire. (see illustration) 5. Remove the main control board subassembly. (see illustration)	

09K/ 12K/ 18K Size - Display Board Disassembly

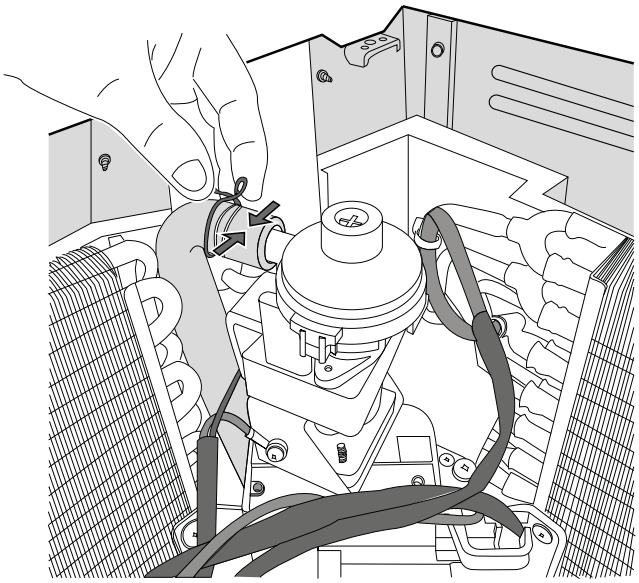
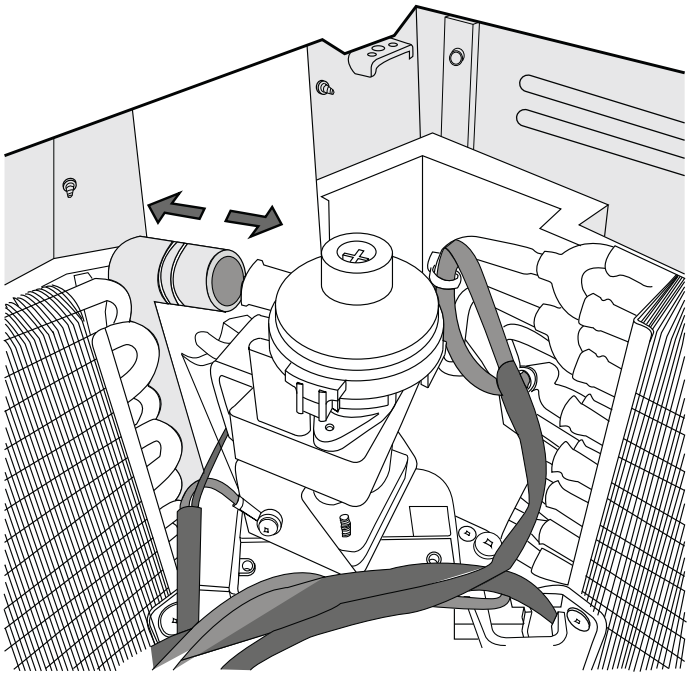
PROCEDURES	ILLUSTRATION
1. Remove 2 screws and then remove the installing cover (see illustration)	
2. Remove the display board subassembly. (see illustration)	

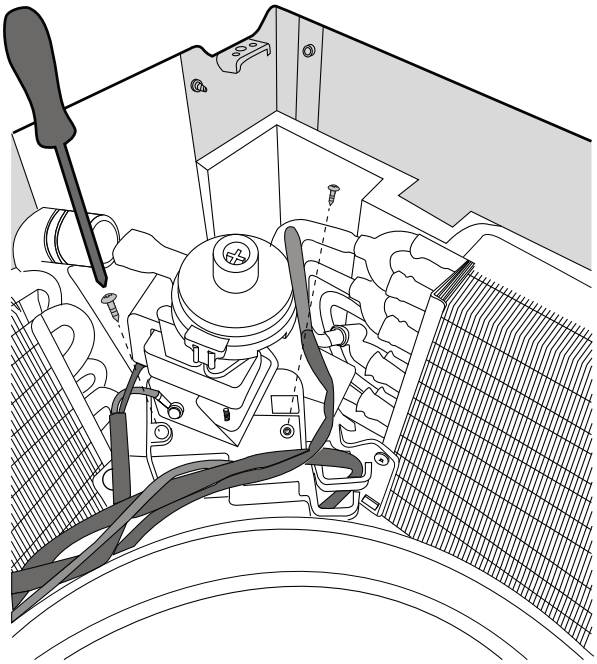
9K/ 12K/ 18K Size - Water Collector and Water Level Switch Disassembly

PROCEDURES	ILLUSTRATION
1. Remove the 1 screw of the ventilation ring.(see illustration) 1A. Remove the 2 screws of positive and negative ion generator (optional).	
2. Remove the 4 screws of the water collector subassembly. (see illustration)	

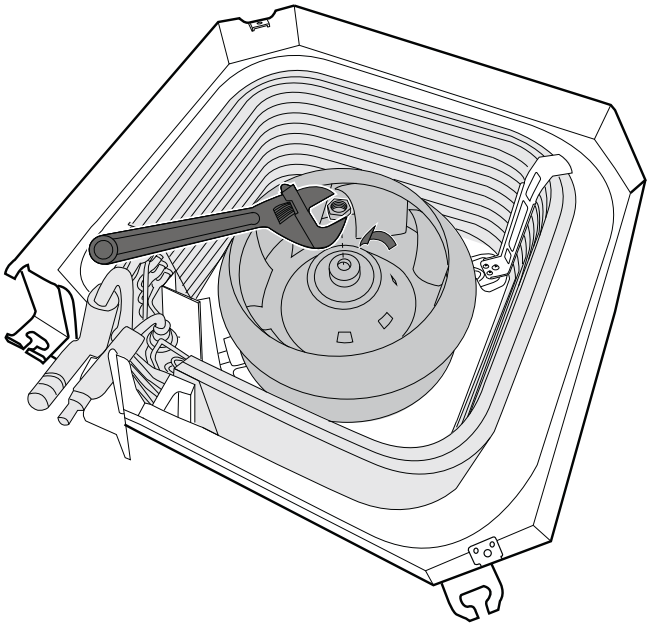
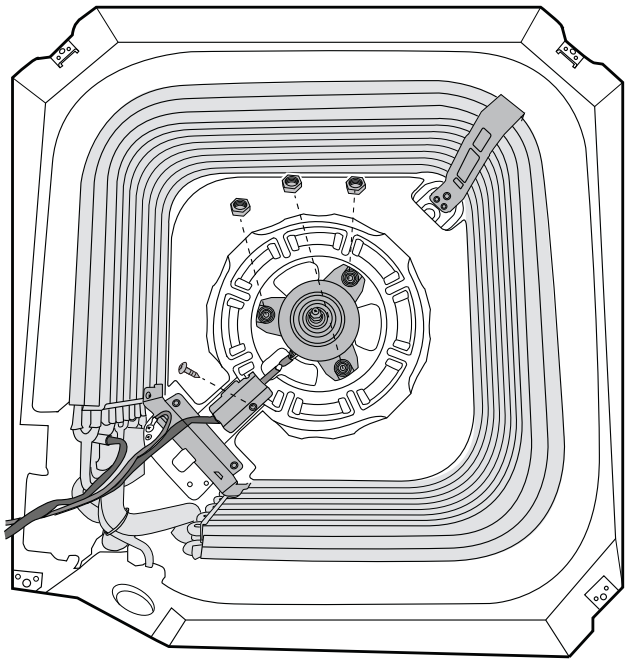
PROCEDURES	ILLUSTRATION
3. Turn over the water collector subassembly and remove the water level switch. (see illustration)	

9K/ 12K/ 18K Size - Water Pump Disassembly

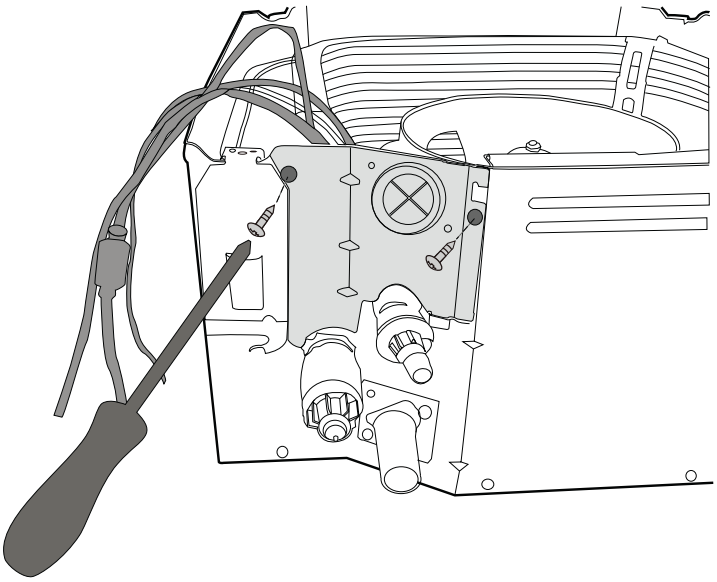
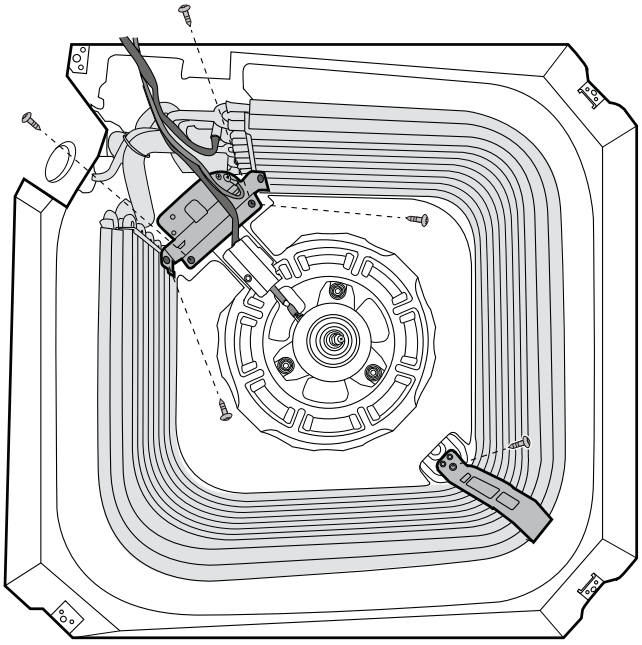
PROCEDURES	ILLUSTRATION
1. Pinch the metal wire in the direction shown in the figure to release it. (see illustration)	
2. Pull out the drain pipe. (see illustration)	

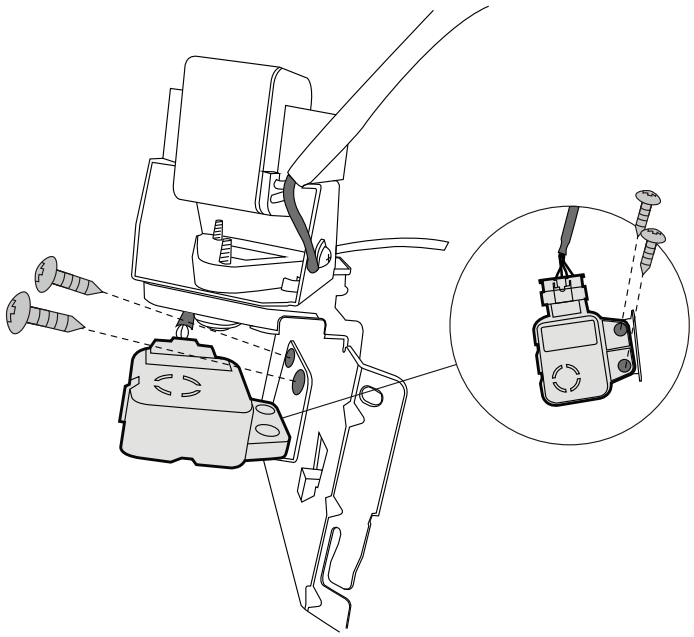
PROCEDURES	ILLUSTRATION
3. Remove 2 screws fixing water pump assembly. (see illustration)	

09K/ 12K/ 18K Size - Fan Motor and Fan Disassembly

PROCEDURES	ILLUSTRATION
1. Rotate the nut anticlockwise and then pull up the fan wheel. (see illustration)	
2. Remove 1 screw of fixing board and rotate three nuts anticlockwise. Then remove the fan motor. (see illustration)	

9K/ 12K/ 18K Size - Evaporator Disassembly

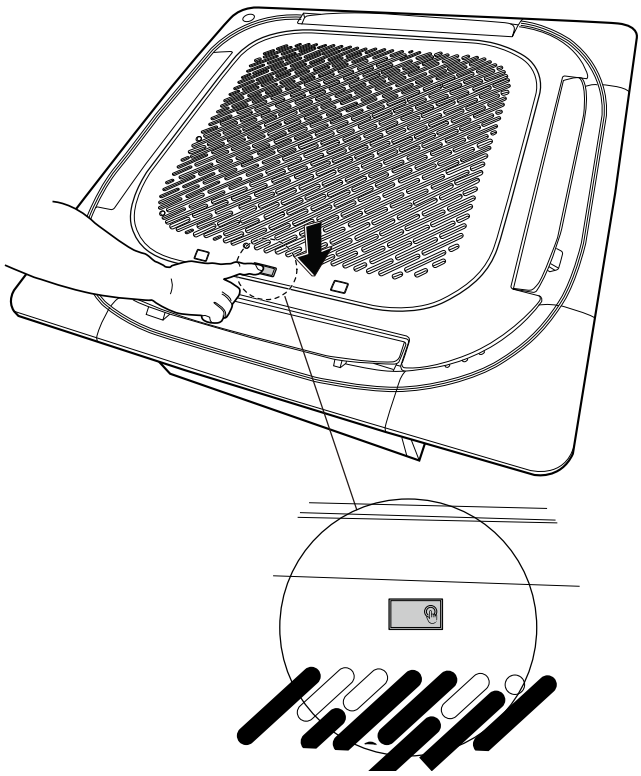
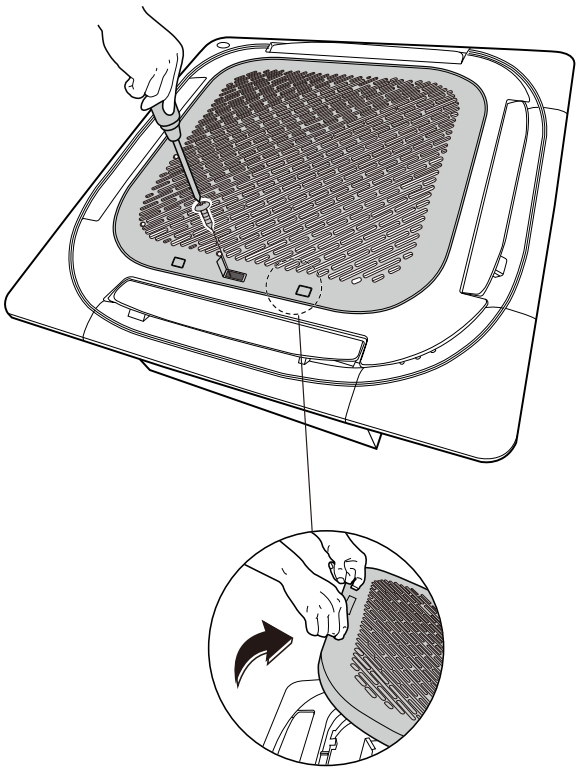
PROCEDURES	ILLUSTRATION
1. Remove 2 screws of pipe clamp board. (see illustration)	
2. Remove 4 screws of the evaporator connecting board and then remove it. (see illustration) 3. Remove 1 screw of the evaporator fixing hanger and then remove it. (see illustration)	

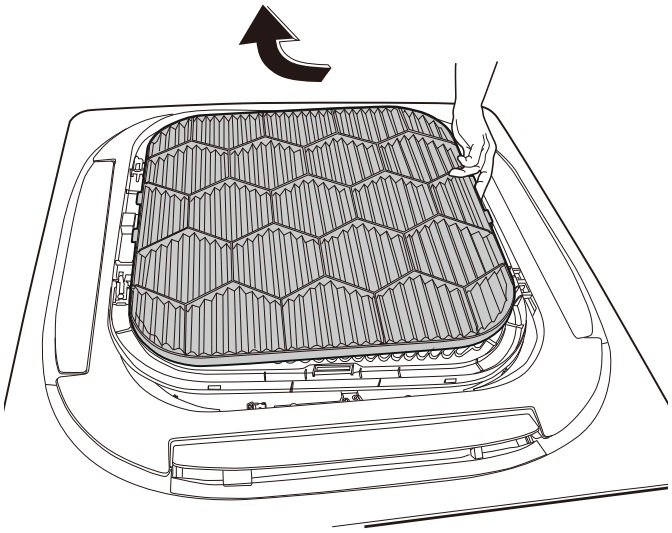
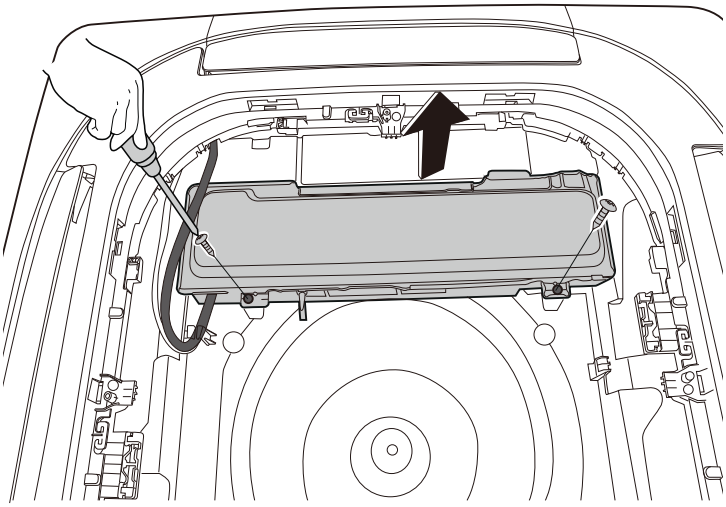
PROCEDURES	ILLUSTRATION
4. Remove 4 screws and remove the refrigerant sensor. (see illustration)	

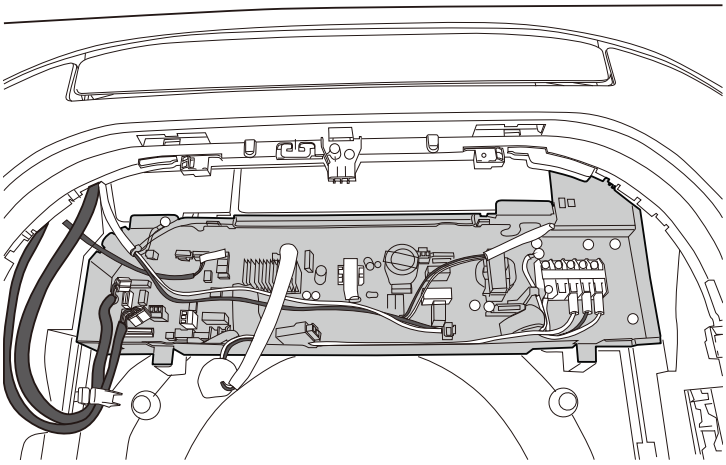
24K/ 36K/ 48K SIZE - DISASSEMBLY

24K/ 36K/ 48K Size - Panel Disassembly

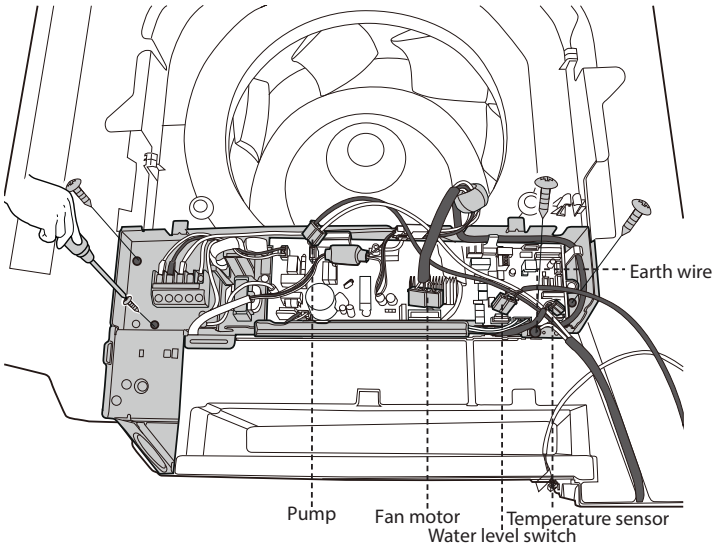
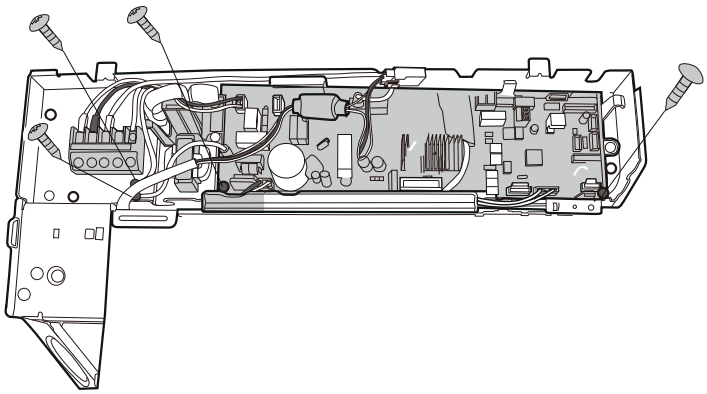
NOTE: This section is for reference, the photos may differ slightly from the actual unit.

PROCEDURES	ILLUSTRATION
1. Push one side of the grille clamp. (see illustration)	
2. Remove one screw then push two grille clamps to remove the air inlet grille assembly. (see illustration)	

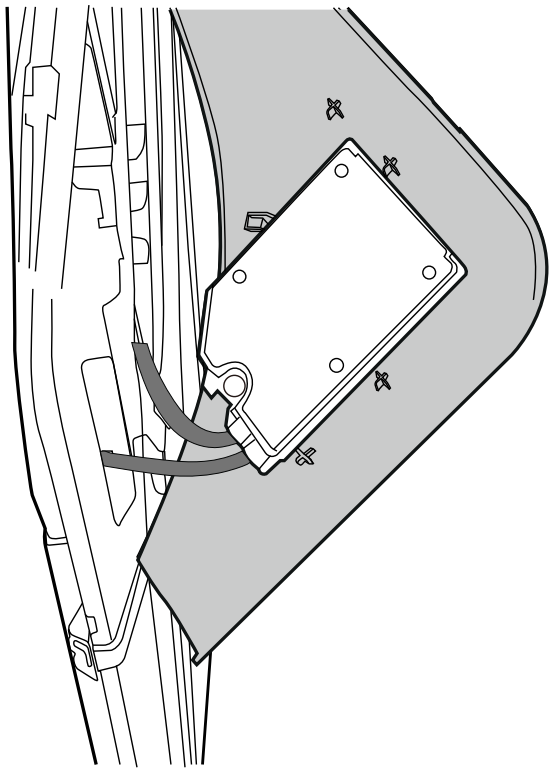
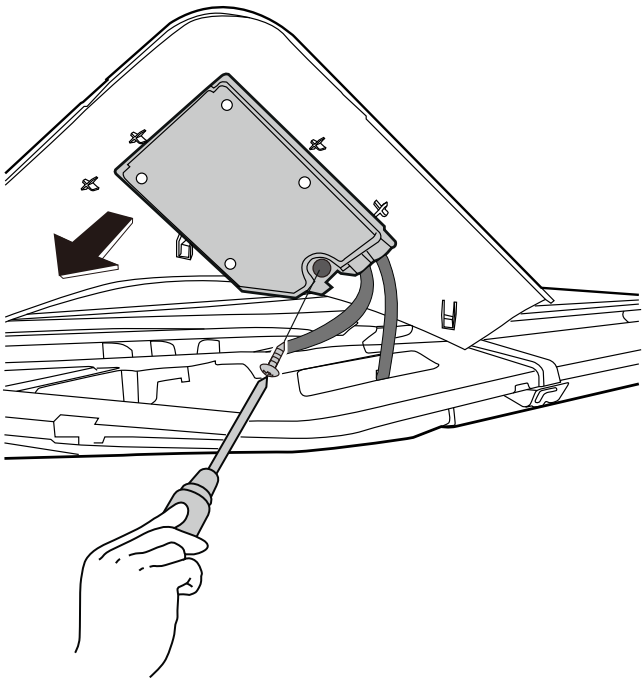
PROCEDURES	ILLUSTRATION
3. Turn over the air inlet grille assembly then pull up the filter..(see illustration)	
4. Remove 2 screws and remove the cover of electronic control box. (see illustration)	

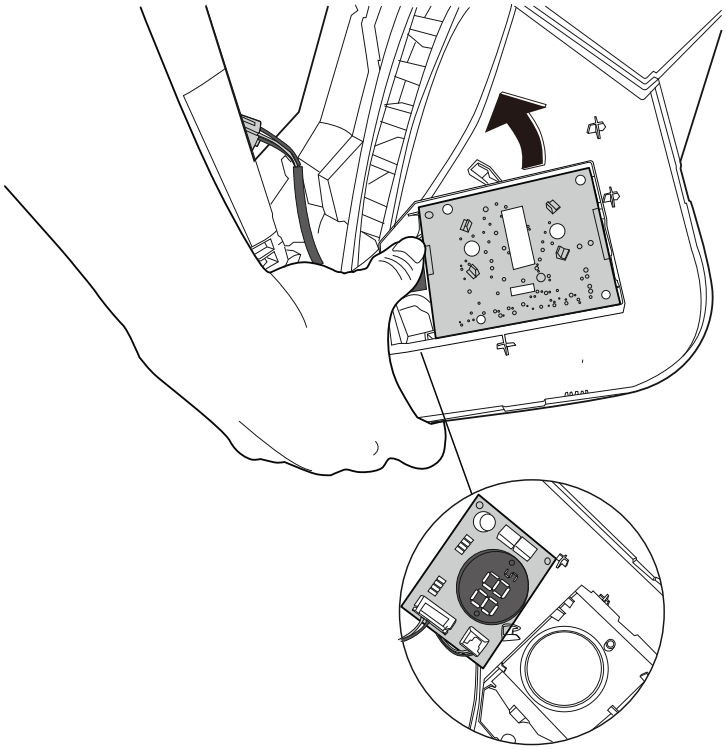
PROCEDURES	ILLUSTRATION
5. Disconnect the connectors of display board and stepper motor and release the panel. (see illustration)	

24K/ 36K/ 48K Size - Electrical Parts Disassembly (Anti-static gloves must be worn.)

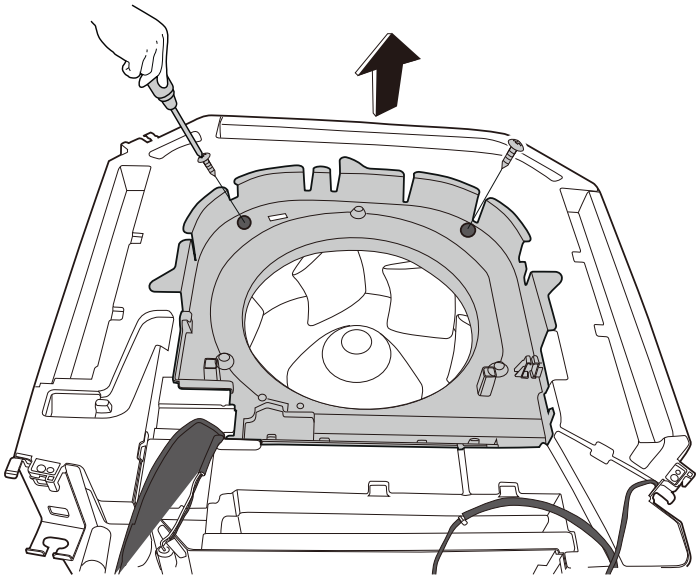
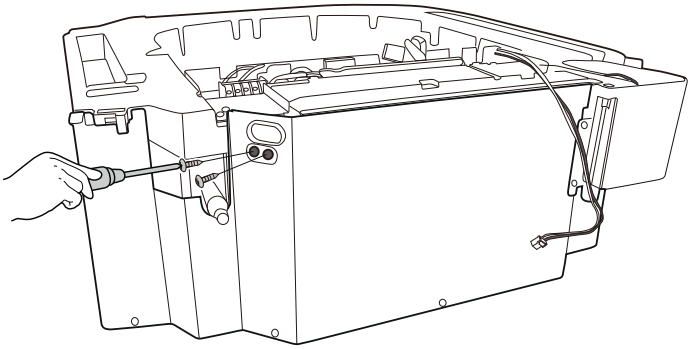
PROCEDURES	ILLUSTRATION
1. Remove 3 screws of electronic control box and 1 screws of earth wire. (see illustration) 2. Disconnect the connectors of temperature sensor, pump, motor and water level switch. (see illustration) 3. Remove the electronic control box subassembly. (see illustration)	
4. Remove 2 screws of the main control board and 2 screws of earth wire. (see illustration) 5. Disconnect connectors and then remove the main control board. (see illustration)	

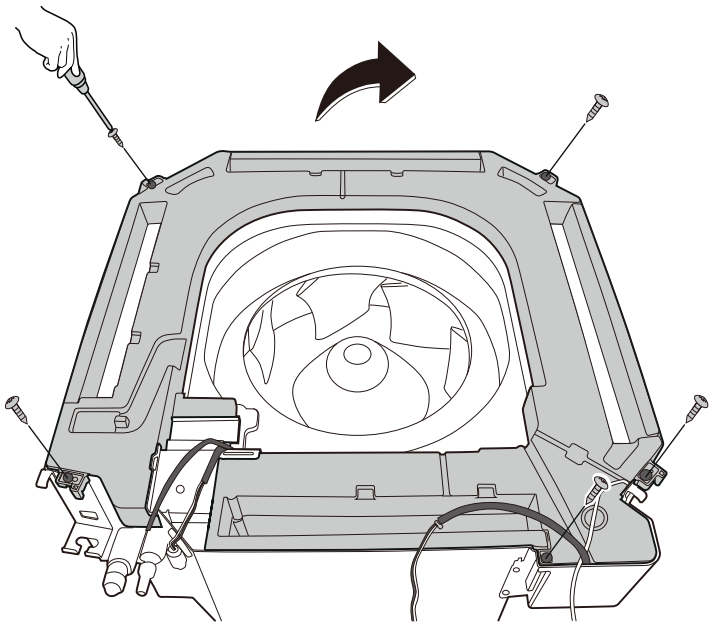
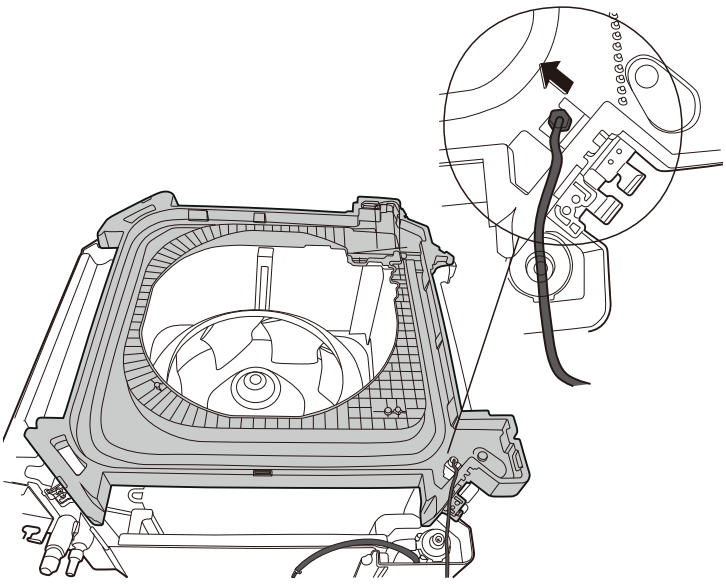
24K/ 36K/ 48K Size - Display Board Disassembly

PROCEDURES	ILLUSTRATION
1. Open the install cover assembly (with display board) (see illustration)	
2. Remove 1 screw of display window board. (see illustration)	

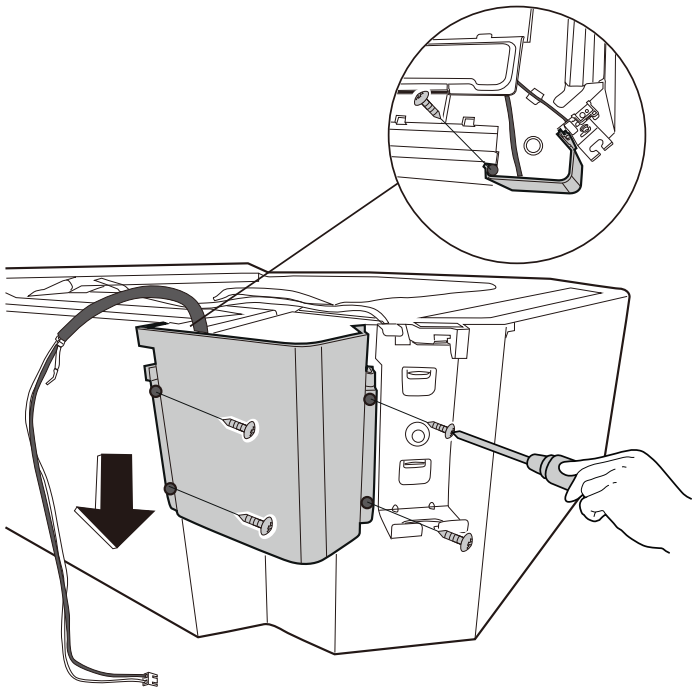
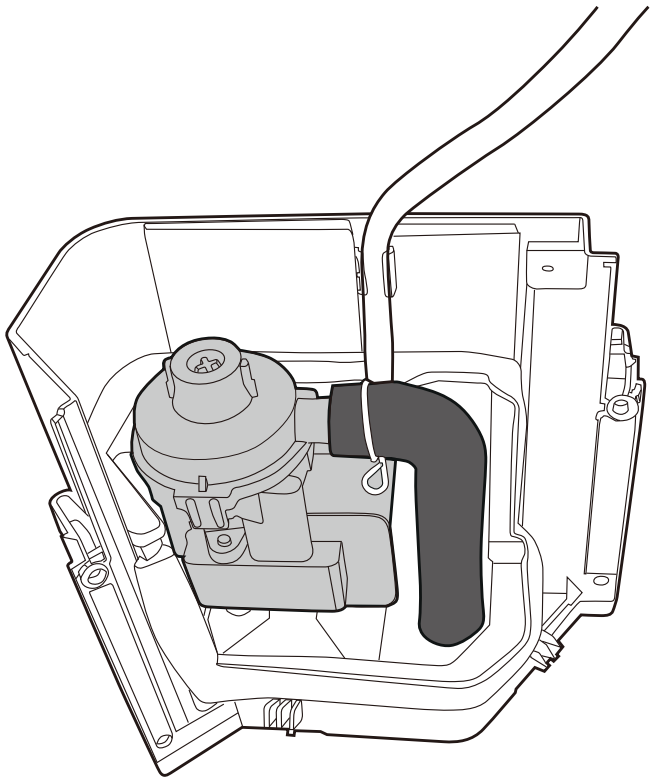
PROCEDURES	ILLUSTRATION
3. Turn over the display board, push the switch to remove the display board. (see illustration)	

24K/ 36K/ 48K Size - Water Collector and Water Level Switch Disassembly

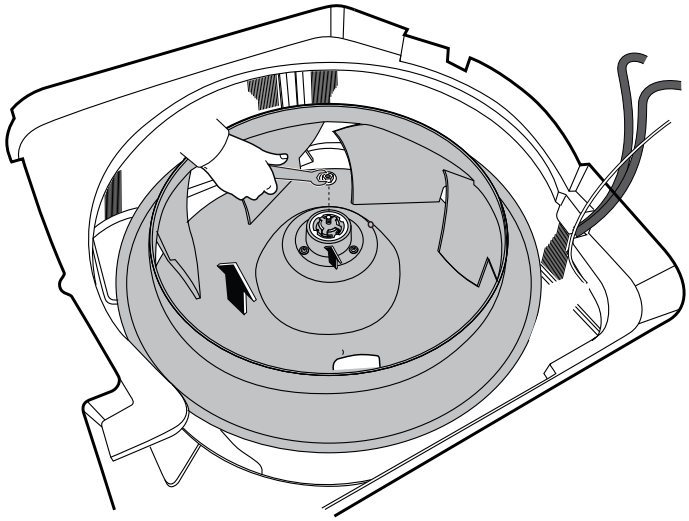
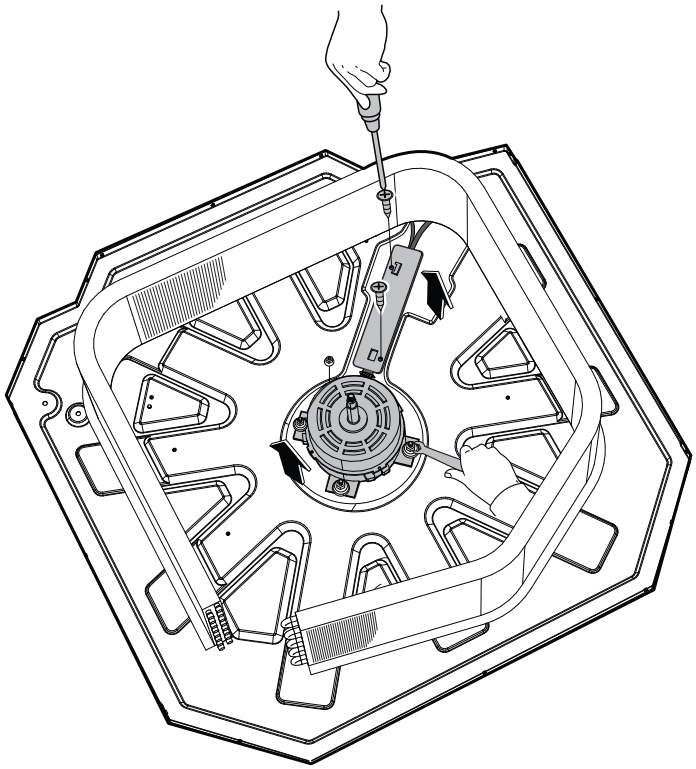
PROCEDURES	ILLUSTRATION
1. Remove the 2 screws of the ventilation ring.(see illustration)	
2. Remove the 2 screws fixing the water collector. (see illustration)	

PROCEDURES	ILLUSTRATION
3. Remove the 5 screws of the water collector subassembly. (see illustration)	
4. Turn over the water collector subassembly and remove the water level switch. (see illustration)	

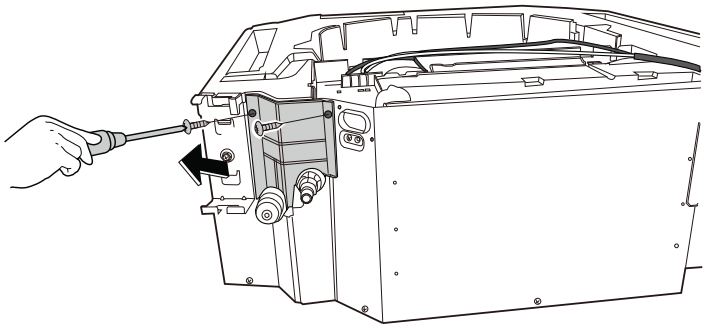
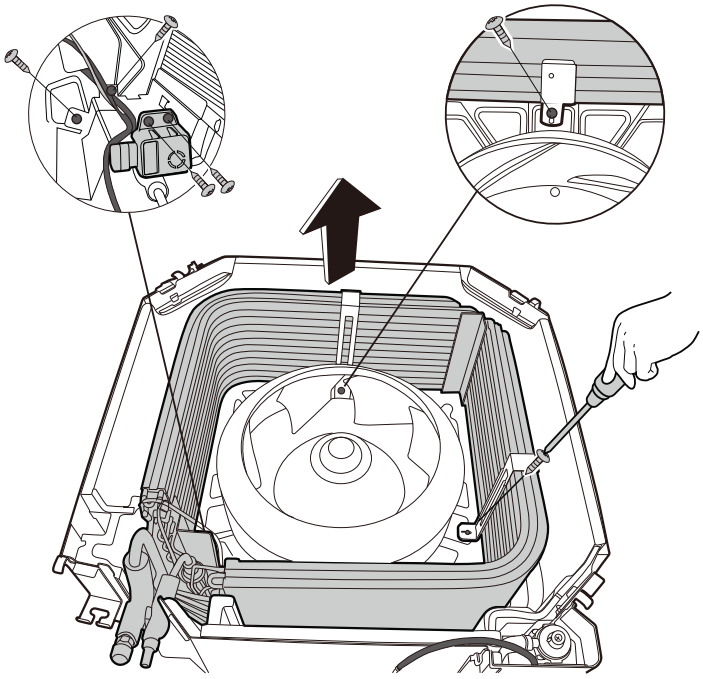
24K/ 36K/ 48K Size - Water Pump Disassembly

PROCEDURES	ILLUSTRATION
1. Remove 5 screws fixing external water pump box assembly. (see illustration)	
2. Remove the water pump box assembly. (see illustration)	

24K/ 36K/ 48K Size - Fan Motor and Fan Disassembly

PROCEDURES	ILLUSTRATION
1. Remove the nut of the fan and then pull up the fan. (see illustration)	
2. Remove 1 screw of fixing board and three nuts counterclockwise. Then remove the fan motor. (see illustration)	

24K/ 36K/ 48K Size - Evaporator Disassembly

PROCEDURES	ILLUSTRATION
1. Remove 2 screws of pipe clamp board. (see illustration)	
2. Remove 2 screws and remove the refrigerant sensor.((see illustration) 3. Remove 2 screws of the evaporator fixing board and then remove it. (see illustration) 4. Remove 2 screws of the evaporator fixing hangers and then remove it.	

APPENDIX

1. **Temperature Sensor Resistance Value Table for TP** Table 14
2. **Other Temperature Sensors Resistance Value Table** Table 15
3. **System Pressure Table** Table 16

Table 14 – Temperature Sensor Resistance Value Table for TP

°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	—	—	—

Table 15 – Other Temperature Sensors Resistance Value Table

°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

Table 16 – System Pressure Table-R454B

Pressure			Temperature		Pressure			Temperature	
Kpa	bar	PSI	°C	°F	Kpa	bar	PSI	°C	°F
58.196	0.58	8.44	-60	-76	935.23	9.35	135.64	8	46.4
61.517	0.62	8.92	-59	-74.2	963.75	9.64	139.78	9	48.2
64.988	0.65	9.43	-58	-72.4	992.93	9.93	144.01	10	50
68.615	0.69	9.95	-57	-70.6	1022.8	10.23	148.34	11	51.8
72.402	0.72	10.50	-56	-68.8	1053.3	10.53	152.76	12	53.6
76.354	0.76	11.07	-55	-67	1084.5	10.85	157.29	13	55.4
80.478	0.80	11.67	-54	-65.2	1116.4	11.16	161.91	14	57.2
84.776	0.85	12.30	-53	-63.4	1149	11.49	166.64	15	59
89.256	0.89	12.95	-52	-61.6	1182.3	11.82	171.47	16	60.8
93.923	0.94	13.62	-51	-59.8	1216.3	12.16	176.40	17	62.6
98.781	0.99	14.33	-50	-58	1251.1	12.51	181.45	18	64.4
103.84	1.04	15.06	-49	-56.2	1286.6	12.87	186.60	19	66.2
109.1	1.09	15.82	-48	-54.4	1322.8	13.23	191.85	20	68
114.56	1.15	16.61	-47	-52.6	1359.9	13.60	197.23	21	69.8
120.25	1.20	17.44	-46	-50.8	1397.7	13.98	202.71	22	71.6
126.15	1.26	18.30	-45	-49	1436.3	14.36	208.31	23	73.4
132.28	1.32	19.18	-44	-47.2	1475.7	14.76	214.02	24	75.2
138.64	1.39	20.11	-43	-45.4	1515.9	15.16	219.85	25	77
145.24	1.45	21.06	-42	-43.6	1557	15.57	225.82	26	78.8
152.09	1.52	22.06	-41	-41.8	1598.9	15.99	231.89	27	80.6
159.18	1.59	23.09	-40	-40	1641.6	16.42	238.09	28	82.4
166.54	1.67	24.15	-39	-38.2	1685.2	16.85	244.41	29	84.2
174.15	1.74	25.26	-38	-36.4	1729.7	17.30	250.86	30	86
182.04	1.82	26.40	-37	-34.6	1775	17.75	257.43	31	87.8
190.2	1.90	27.59	-36	-32.8	1821.3	18.21	264.15	32	89.6
198.65	1.99	28.81	-35	-31	1868.4	18.68	270.98	33	91.4
207.39	2.07	30.08	-34	-29.2	1916.5	19.17	277.95	34	93.2
216.42	2.16	31.39	-33	-27.4	1965.6	19.66	285.08	35	95
225.76	2.26	32.74	-32	-25.6	2015.5	20.16	292.31	36	96.8
235.41	2.35	34.14	-31	-23.8	2066.5	20.67	299.71	37	98.6
245.37	2.45	35.59	-30	-22	2118.4	21.18	307.24	38	100.4
255.67	2.56	37.08	-29	-20.2	2171.3	21.71	314.91	39	102.2
266.29	2.66	38.62	-28	-18.4	2225.2	22.25	322.73	40	104
277.25	2.77	40.21	-27	-16.6	2280.2	22.80	330.70	41	105.8
288.56	2.89	41.85	-26	-14.8	2336.1	23.36	338.81	42	107.6
300.22	3.00	43.54	-25	-13	2393.2	23.93	347.09	43	109.4
312.24	3.12	45.28	-24	-11.2	2451.3	24.51	355.52	44	111.2
324.63	3.25	47.08	-23	-9.4	2510.4	25.10	364.09	45	113
337.39	3.37	48.93	-22	-7.6	2570.7	25.71	372.84	46	114.8
350.54	3.51	50.84	-21	-5.8	2632.1	26.32	381.74	47	116.6
364.08	3.64	52.80	-20	-4	2694.7	26.95	390.82	48	118.4
378.02	3.78	54.83	-19	-2.2	2758.3	27.58	400.04	49	120.2
392.37	3.92	56.91	-18	-0.4	2823.2	28.23	409.46	50	122
407.13	4.07	59.05	-17	1.4	2889.3	28.89	419.04	51	123.8
422.31	4.22	61.25	-16	3.2	2956.5	29.57	428.79	52	125.6
437.92	4.38	63.51	-15	5	3025	30.25	438.72	53	127.4
453.98	4.54	65.84	-14	6.8	3094.7	30.95	448.83	54	129.2
470.47	4.70	68.23	-13	8.6	3165.7	31.66	459.13	55	131
487.43	4.87	70.69	-12	10.4	3238.1	32.38	469.63	56	132.8

Table 16 – System Pressure Table-R454B (Continued)

Pressure			Temperature		Pressure			Temperature	
Kpa	bar	PSI	°C	°F	Kpa	bar	PSI	°C	°F
504.84	5.05	73.22	-11	12.2	3311.7	33.12	480.30	57	134.6
522.73	5.23	75.81	-10	14	3386.7	33.87	491.18	58	136.4
541.1	5.41	78.48	-9	15.8	3463	34.63	502.25	59	138.2
559.95	5.60	81.21	-8	17.6	3540.7	35.41	513.52	60	140
579.31	5.79	84.02	-7	19.4	3619.9	36.20	525.00	61	141.8
599.16	5.99	86.90	-6	21.2	3700.5	37.01	536.69	62	143.6
619.54	6.20	89.85	-5	23	3782.7	37.83	548.61	63	145.4
640.43	6.40	92.88	-4	24.8	3866.3	38.66	560.74	64	147.2
661.86	6.62	95.99	-3	26.6	3951.5	39.52	573.10	65	149
683.82	6.84	99.18	-2	28.4	4038.3	40.38	585.69	66	150.8
706.34	7.06	102.44	-1	30.2	4126.8	41.27	598.52	67	152.6
729.41	7.29	105.79	0	32	4217	42.17	611.60	68	154.4
753.06	7.53	109.22	1	33.8	4309	43.09	624.95	69	156.2
777.28	7.77	112.73	2	35.6	4402.9	44.03	638.56	70	158
802.08	8.02	116.33	3	37.4	4498.7	44.99	652.46	71	159.8
827.48	8.27	120.01	4	39.2	4596.5	45.97	666.64	72	161.6
853.49	8.53	123.78	5	41	4696.5	46.97	681.15	73	163.4
880.11	8.80	127.64	6	42.8	4798.9	47.99	696.00	74	165.2
907.35	9.07	131.60	7	44.6	4904.1	49.04	711.25	75	167