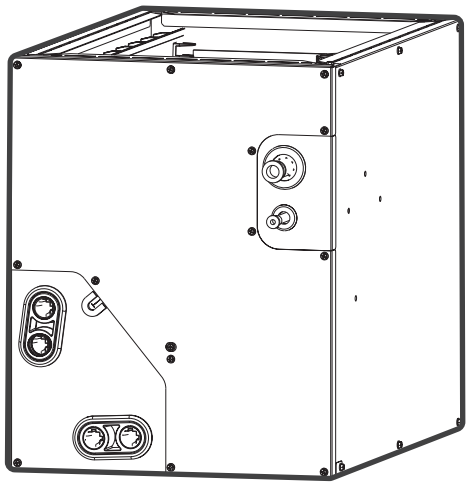
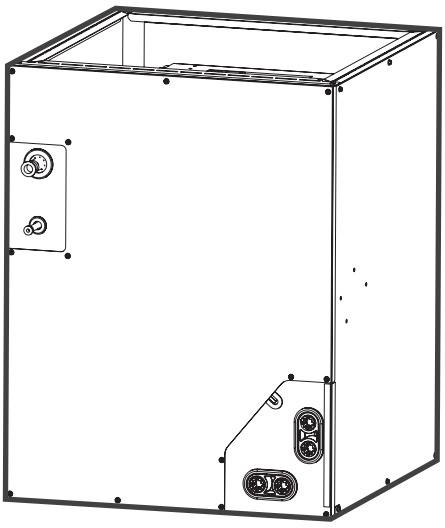
SENTINEL SERIES

PRO MULTI-POSITION CASED COIL





SERVICE MANUAL

MODELS:

DSP(1824/3036/4860)T(A/B/C)A1 INDOOR

Ver. 26A1



A2L

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Safety Precautions

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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.

WARNING indicates a potentially hazardous situation which if not avoided could result in serious personal injury, or death.

CAUTION indicates a potentially hazardous situation which if not avoided could result in minor or moderate personal injury, or unit damage.

ELECTRICAL 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 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 the NEC, CEC or 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 must be incorporated in the fixed wiring in accordance with the wiring rules.

WARNINGS FOR PRODUCT INSTALLATION

- Turn off the air conditioner and disconnect the power before performing any installation or repairs. Failure to do so can cause electric shock.
- Installation must be performed by an authorized dealer or specialist according to the installation instructions. Improper installation can cause water damage, electrical hazard or fire. Contact an authorized service technician for repair or maintenance.
- 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 1 meter (3 feet) of any combustible materials.
- For the units that have a wireless network function, the USB device access, replacement, maintenance operations must be carried out by professional staff.
- Do not install the unit in a location that may be exposed to combustible gas leaks. 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 air conditioner, consult experienced service technicians for disconnection and reinstallation of the unit.

WARNINGS FOR CLEANING AND MAINTENANCE

- Turn off the device and disconnect the power before cleaning. Failure to do so can cause electrical shock.
- Do not clean the air conditioner with excessive amounts of water.
- Do not clean the air conditioner with combustible cleaning agents. Combustible cleaning agents can cause fire or deformation.

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 authorise 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 any 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).

2. Information servicing(For flammable materials)

2.1 Installation(where refrigerant pipes are allowed)

- 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.

- 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.

- 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.

- 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.

- All working procedure that affects safety means shall only be carried by competent persons.

- Appliance shall be stored in a well ventilated area where the room size corresponds to the room area as specified for operation.

- 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).

- In cases that require mechanical ventilation, ventilation openings shall be kept clear of obstruction.

- LEAK DETECTION SYSTEM installed. Unit must be powered except for service.

For the unit with refrigerant sensor, when the refrigerant sensor detects refrigerant leakage, the indoor unit will display a error code and emit a buzzing sound, the compressor of outdoor unit will immediately stop, and the indoor fan will start running. The service life of the refrigerant sensor is 15 years. When the refrigerant sensor

malfunctions, the indoor unit will display the error code "FHCC".

The refrigerant sensor can not be repaired and can only be replaced by the manufacturer. It shall only be replaced with the sensor specified by the manufacturer.

2.2 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 efects, for example, 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 pipework shall be pressure tested with an inert gas and then vacuum tested prior to refrigerant charging, according to the following requirements:

a. 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 can not 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.

b. The test pressure after removal of pressure source shall be maintained for at least 1 h with no decrease of pressure indicated by the test gauge, with test gauge resolution not exceeding 5% of the test pressure.

c. 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.

2.3 Qualification of workers

Any maintenance, service and repair operations must be required qualification of the working personnel. Every working procedure that afects 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 4th Edition.

Examples for such working procedures are:

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

2.4 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.

2.5 Work procedure

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

2.6 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.

2.7 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.

2.8 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.

2.9 No ignition sources

- No person carrying out work in relation to a REFRIGERATING SYSTEM which involves exposing any pipe work 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 sufciently far away from the site of installation, repairing, removing and disposal, during which 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.

2.10 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.

2.11 Checks to the refrigeration 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.

2.12 Checks 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 if it's damage;
- Intrinsically safe components must be replaced if it's damage.

2.13 Wiring

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

2.14 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,

- 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.

2.15 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.

2.16 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 diferent 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 oxygen free nitrogen(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.

2.17 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.

a) Become familiar with the equipment and its operation.

b) Isolate system electrically

c) Before attempting the procedure ensure that:

- mechanical handling equipment is available, if required, for handling refrigerant cylinders;
- all personal protetive 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.

d) Pump down refrigerant system, if possible.

e) If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.

f) Make sure that cylinder is situated on the scales before recovery takes place.

g) Start the recovery machine and operate in accordance with instructions.

h) Do not overfill cylinders (no more than 80 % volume liquid charge)

i) Do not exceed the maximum working pressure of the cylinder, even temporarily.

j) 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 of.

k) Recovered refrigerant shall not be charged into another refrigeration system unless it has been cleaned and checked.

2.18 Labelling

- Equipment shall be labelled 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.

2.19 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 labelled 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.

2.20 Unventilated areas

- An unventilated area where the appliance using FLAMMABLE REFRIGERANTS is installed shall be so constructed that should any refrigerant leak, it will not stagnate so as to create a fire or explosion hazard.

- If appliances connected via an air duct system to one or more rooms with A2L REFRIGERANTS are installed in a room with an area less than Amin,that room shall be without continuously operating open flames (e.g. an operating gas appliance) or other POTENTIAL IGNITION SOURCES (for e.g. an operating electric heater, hot surfaces). A flame-producing device may be installed in the same space if the device is provided with an efective flame arrest.

- Auxiliary devices which may be a POTENTIAL IGNITION SOURCE shall not be installed in the duct work. Examples of such POTENTIAL IGNITION SOURCES are hot surfaces with a temperature exceeding 700 °C and electric switching devices.

- Only auxiliary devices(such as certificated heater kit) approved by the appliance manufacturer or declared suitable with the refrigerant shall be installed in connecting ductwork.

- For duct connected appliances, false ceilings or drop ceilings may be used as a return air plenum if a REFRIGERANT DETECTION SYSTEM is provided in the appliance and any external connections are also provided with a sensor immediately below the return air plenum duct joint.

- REFRIGERANT SENSORS for REFRIGERANT DETECTION SYSTEMS Shall Only be replaced with sensors specified by the appliance manufacture.

- LEAK DETECTION SYSTEM installed. Unit must be powered except for service.

2.21 Transportation, marking and storage for units that employ flammable refrigerants

a. General

The following information is provided for units that employ FLAMMABLE REFRIGERANTS.

b. Transport of equipment containing flammable refrigerants

Attention is drawn to the fact that additional transportation regulations may exist with respect to equipment containing flammable gas. The maximum number of pieces of equipment or the configuration of the equipment permitted to be transported together will be determined by the applicable transport regulations.

c. Marking of equipment using signs

Signs for similar appliances used in a work area are generally addressed by local regulations and give the minimum requirements for the provision of safety and/or health signs for a work location.

All required signs are to be maintained and employers should ensure that employees receive suitable and sufficient instruction and training on the meaning of appropriate safety signs and the actions that need to be taken in connection with these signs.

The effectiveness of signs should not be diminished by too many signs being placed together.

Any pictograms used should be as simple as possible and contain only essential details.

d. Disposal of equipment using flammable refrigerants

See national regulations.

e. Storage of equipment/appliances

The storage of the appliance should be in accordance with the applicable regulations or instructions,whichever is more stringent.

f. Storage of packed (unsold) equipment

Storage package protection should be constructed in such a way that mechanical damage to the equipment inside the package will not cause a leak of the REFRIGERANT CHARGE.

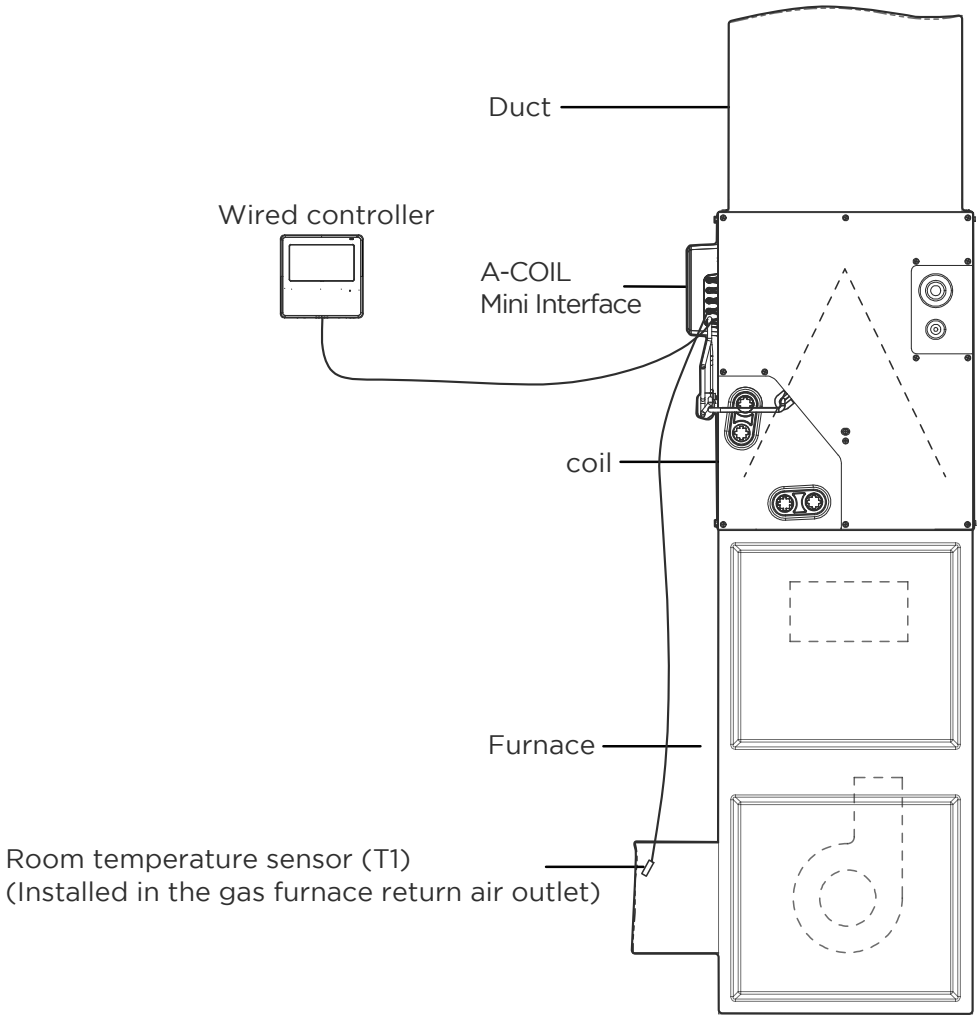
The maximum number of pieces of equipment permitted to be stored together will be determined by local regulations.

Indoor Unit-COIL

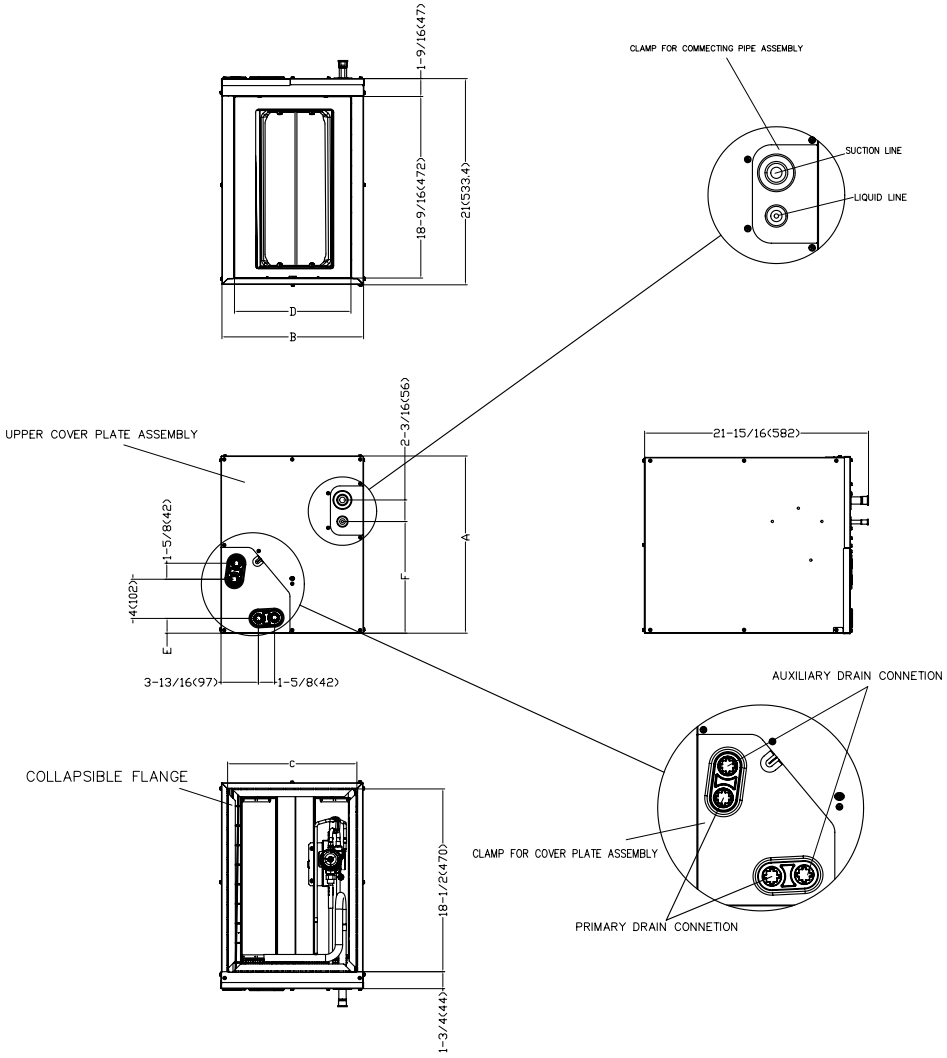
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1. System Introduction

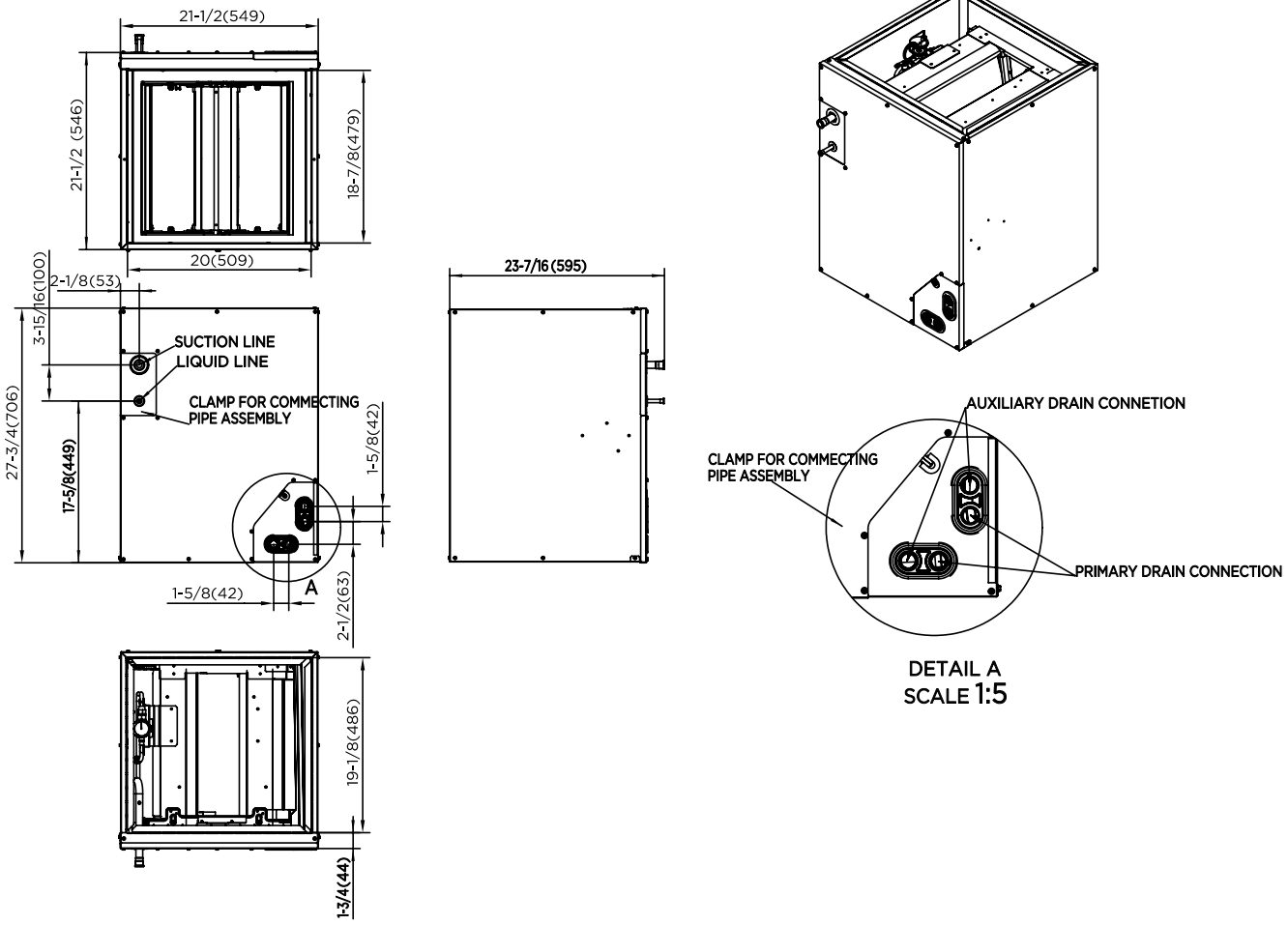


2. Dimensional Drawings



Dimensions \ Model		DAP1824ATA1		DAP1824BTA1		DAP3036ATA1		DAP3036BTA1		DAP3036CTA1		DAP4860CTA1	
		inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
A	Model Height	18	457	18	457	23-5/16	592	23-9/16	599	24	611	27-3/4	706
B	Model Width	14-1/2	368	17-1/2	445	14-1/2	368	17-1/2	445	21	534	21	534
C	Supply Air Opening Width	13-1/4	336	16-3/16	411	13-1/4	336	16-3/16	411	19-3/4	502	19-1/8	486
D	Return Air Opening Width	11-15/16	303	14-15/16	380	11-15/16	303	14-15/16	380	18-7/16	468	18-7/16	468
E	Condensate Drains Height	1-7/16	38	1-7/16	38	1-7/16	38	1-7/16	38	2-3/16	55	2-3/16	55
F	Liquid Line Height	11-3/8	290	11-3/8	290	17-15/16	455	16-3/8	417	17-1/2	445	17-1/2	445

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3. Clearances

Following clearances should be provided during installation

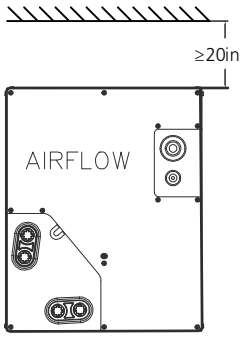
a. Maintenance and service access, including coil cleaning and coil assembly removal

b. Refrigerant piping and connections

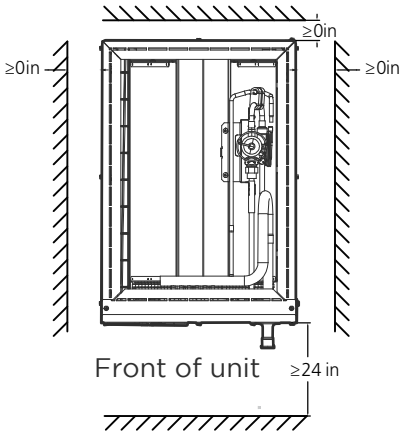
c. Condensate drain line

Ensure the proper installation, Select a solid and level site.

Ensure enough space required for installation and maintenance



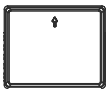
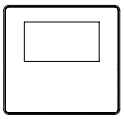
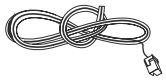
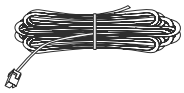
Front view of the indoor unit clearance (including air duct)



Top View of the indoor unit clearance (including air duct)

4. Accessories

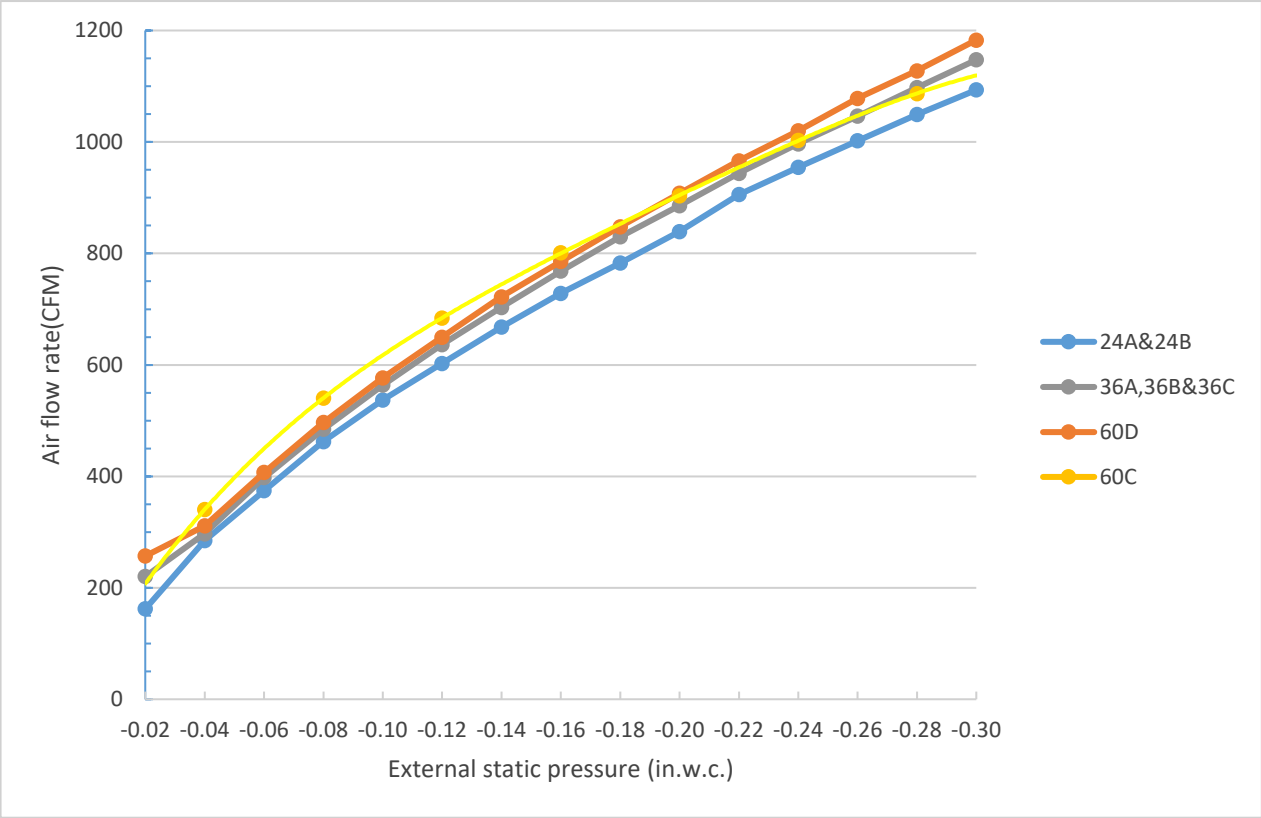
The air conditioning system comes with the following accessories. Use all of the installation parts and accessories to install the air conditioner. Improper installation may result in water leakage, electrical shock and fire, or equipment failure.

Name	Shape	Quantity	Remark
Manual		1	
A-COIL Mini Interface		1	With separate package (Part on top of foam)
Wired controller		1	With separate package
Screws		3	M4*25 (For mounting on the wall), in the control box package
Screws		4	M4*16, in the control box package
Anchors		3	(For mounting on the wall), in the control box package
Room Temp. Sensor (T1)		1	
Room Temp. Sensor(T1) (5m)		1	
Ferrite Clamp		1	
Cable ties		1	

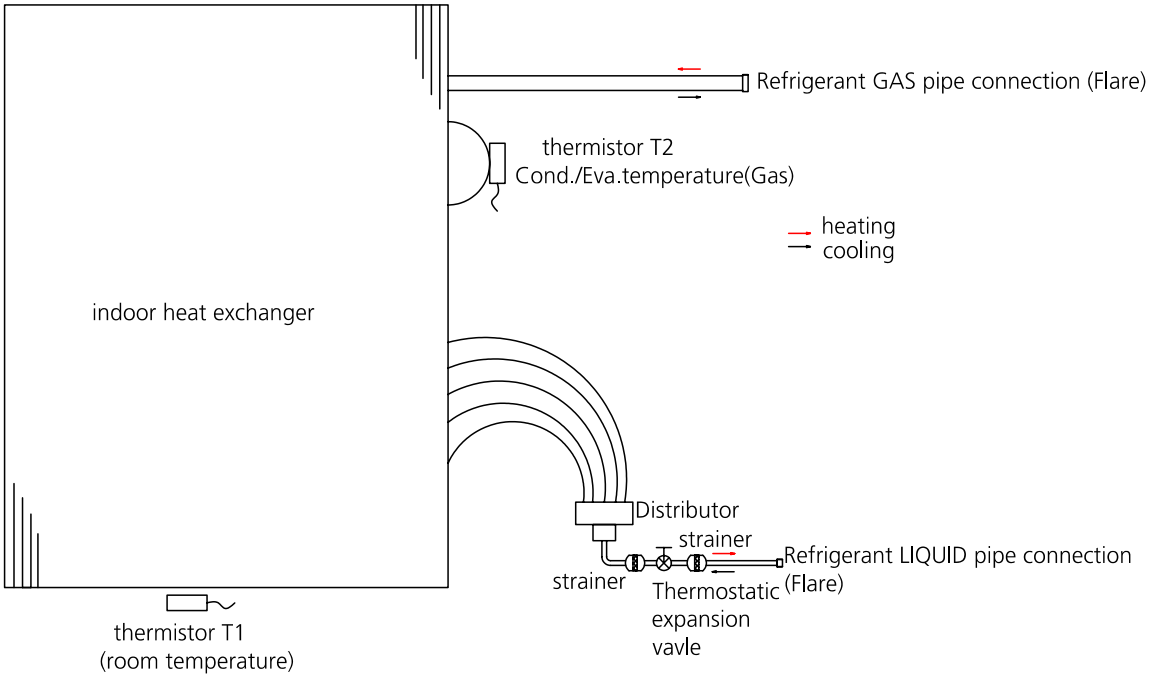
NOTICE:

The wired system control functions as an IR receiver for the handheld remote, if the remote is not used it must be retained with the indoor unit to adjust parameters, and for troubleshooting.

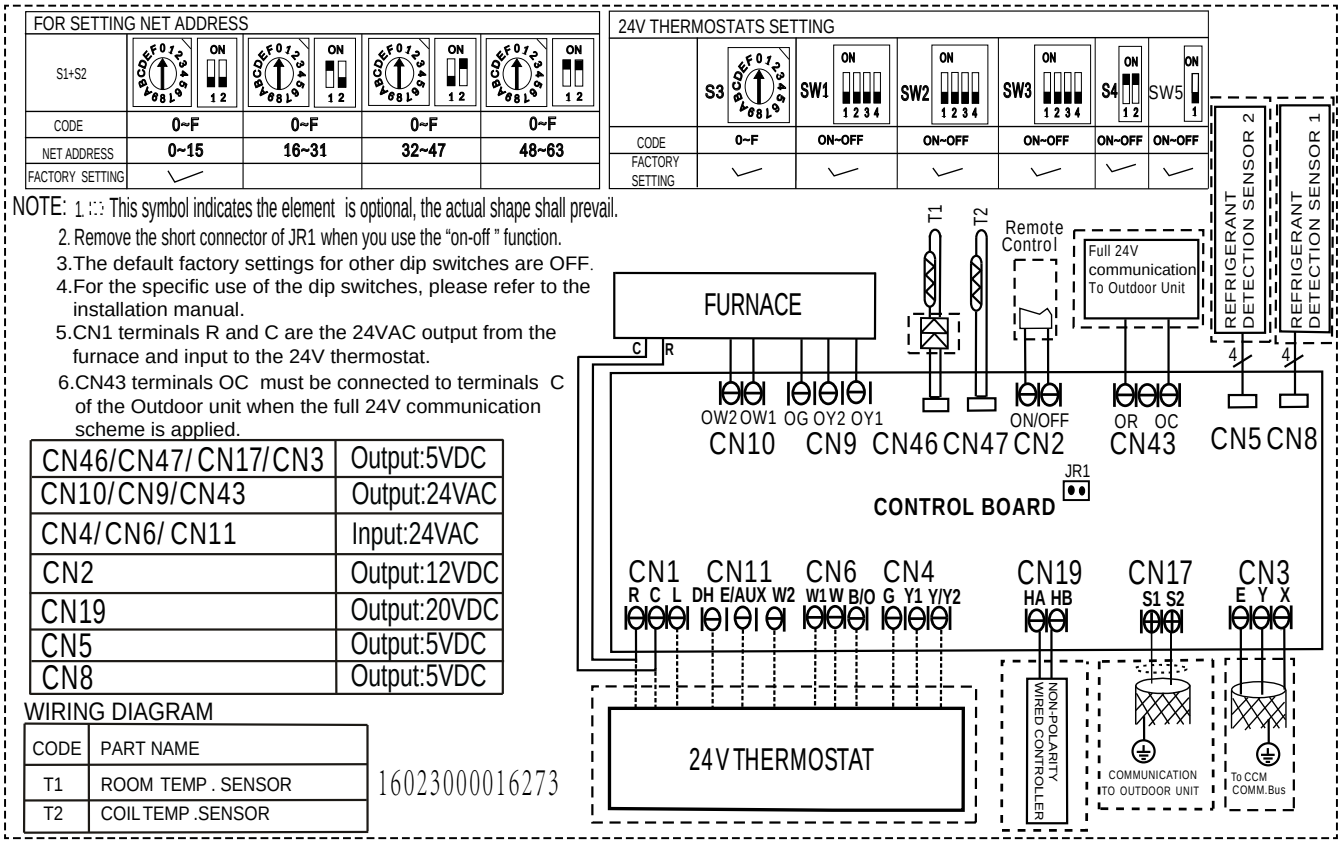
5. Fan Performance



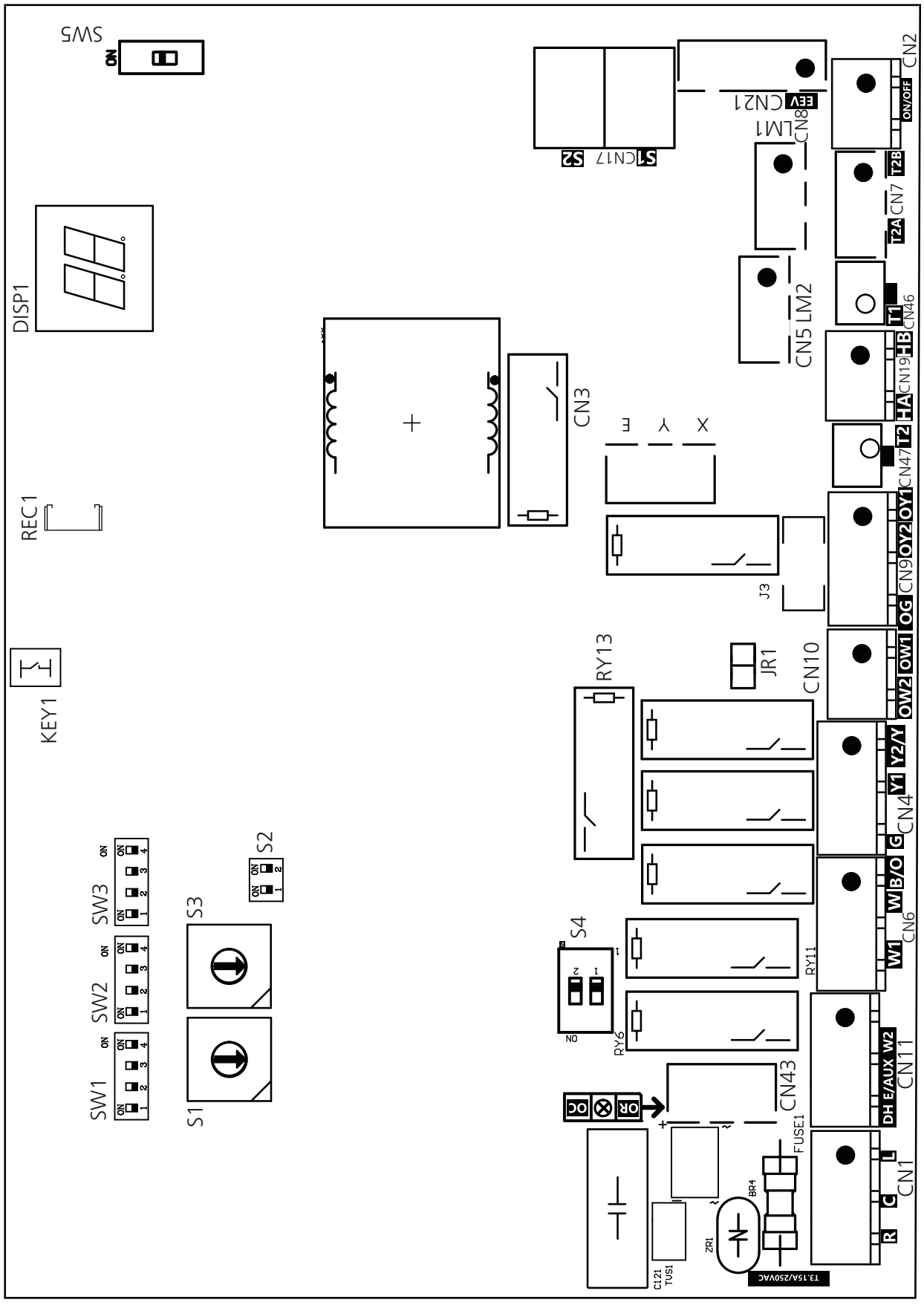
6. Refrigerant System Diagram

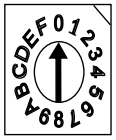
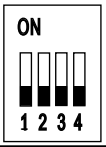
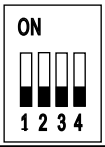
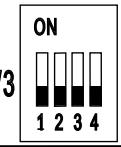
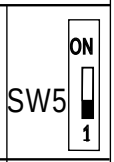


7. Wiring Diagram



8. DIP Switch Definitions



24V THERMOSTATS SETTING						
						
CODE	0~F	ON~OFF	ON~OFF	ON~OFF	ON~OFF	ON~OFF
FACTORY SETTING	✓	✓	✓	✓	✓	✓

A. Function DIP Switch Settings

The 24V thermostat mode needs to refer to the following settings

No.	Dial code	Function	ON	OFF(Default)	Note
Control Scenario		**Scenario 1: 24V Tstat, S1+S2**			
1	SW1-2	Anti-cold blow protection option	No	[Default] Yes	
2	SW1-3	Single cooling / heating and cooling options	Cooling	[Default] Cooling & Heating	
3	SW2-4	Compressor	The operation of heat pump is limited by the outdoor temperature, and the operation of auxiliary heat is not limited. The system makes judgments according to the following rules:1) The compressor can be operated when the outdoor temperature is ≥S3 DIP switch temperature +3.6°F (2°C). 2) The compressor cannot be operated when the outdoor temperature is lower than the S3 DIP switch temperature.	[Default] The operation of heat pump is limited by the outdoor temperature, and the operation of auxiliary heat is not limited. The system makes judgments based on the following rules:1) The compressor cannot be operated when the outdoor temperature is lower than the S3 DIP switch. 2) The compressor can be operated when the outdoor temperature is ≥S3 DIP switch temperature +3.6°F (2°C).	SW2-4 and S3 need to working together
4	Rotary Switch S3	Set outdoor temperature Limitation (for auxiliary heating or compressor)	Table A		
5	SW3-1	Maximum continuous runtime allowed before system automatically stages up capacity to satisfy set point. This adds 1 to 5°F to the user set point in the calculated control point to increase capacity and satisfy user set point	30 minutes	[Default] 90 minutes	
6	SW3-2	Cooling and heating Y/ Y2 temperature differential adjustment.	Compressor slower speed	[Default] Faster Compressor	Only affects compressor
7	S4-1	Default ON	[Default] For single stage supplemental heat,W1 and W2 are connected	For dual stage supplemental heat, W1 and W2 are controlled independently.	
8	S4-2	DH function selection	[Default] Dehumidification control not available	Dehumidification feature is enabled through thermostat	
9	SW5	Selection of the second Refrigerant Sensor	Both Refrigerant Sensor are used	Only use the first Refrigerant Sensor , interface is CN8	
Control Scenario		**Scenario 2: Wired Controller S1+S2**			
1	SW1-2	Anti-cold blow protection option	No	[Default] Yes	
2	SW1-3	Single cooling / heating and cooling options	Cooling	[Default] Cooling & Heating	

3	SW2-1	Temperature differential to active first stage furnace heating for HP+furnace mode	3.6°F (2°C)	[Default] 1.8°F (1°C)	
5	SW2-4	Compressor/Auxiliary heat outdoor ambient lockout	The operation of heat pump is limited by the outdoor temperature, and the operation of auxiliary heat is not limited. The system makes judgments according to the following rules:1) The compressor can be operated when the outdoor temperature is ≥S3 DIP switch temperature +2 °C. 2) The compressor cannot be operated when the outdoor temperature is lower than the S3 DIP switch temperature.	[Default] Only one heat pump or auxiliary heat can be operated .The system makes judgments according to the following rules:1) When the outdoor temperature is lower than the S3 DIP switch temperature,the compressor is not allowed to operated, but auxiliary heat is allowed to operated; 2) When the outdoor temperature is ≥S3 DIP switch temperature +2(°C), the compressor can be operated, but auxiliary heat cannot be operated.	SW2-4 and S3 need to working together
5	Rotary Switch S3	Set outdoor temperature Limitation (for auxiliary heating or compressor)	Table A		
6	SW3-3	Temperature differential to active second stage furnace heating for furnace only or HP+furnace mode.	5.4°F (3°C)	[Default] 3.6°F (2°C)	
7	SW5	Selection of the second Refrigerant Sensor	Both Refrigerant Sensor are used	Only use the first Refrigerant Sensor , interface is CN8	
Control Scenario		**Scenario 3: Full 24V**			
1	SW1-3	Single cooling / heating and cooling options	Cooling	[Default] Cooling & Heating	
2	S4-1	Default ON	[Default] For single stage supplemental heat,W1 and W2 are connected	For dual stage supplemental heat, W1 and W2 are controlled independently.	
3	S4-2	DH function selection	[Default] Dehumidification control not available	Dehumidification feature is enabled through thermostat	
4	SW5	Selection of the second Refrigerant Sensor	Both Refrigerant Sensor are used	Only use the first Refrigerant Sensor , interface is CN8	

Table A

S3	S3 (°F)	S3(°C)	S3	S3 (°F)	S3(°C)
0	OFF	OFF	8	10	-12
1	-22	-30	9	18	-8
2	-18	-28	A	25	-4
3	-15	-26	B	32	0
4	-11	-24	C	36	2
5	-8	-22	D	39	4
6	-4	-20	E	43	6
7	3	-16	F	46	8

Function combination table of SW1-1 and SW1-4

SW1	Control type	IDU and ODU Connection	Note
	Wired controller / 24V thermostat	(S1+S2) / 24V connection	Auto Discovery
	Wired controller	S1+S2	Scenario 2
	24V Thermostat	S1+S2	Scenario 1
	24V Thermostat	24V connection	Scenario 3

Installation

Contents

1. Location Selection
2. Indoor Unit Installation
3. Installation of MINI Interface
4. Refrigerant Pipe Installation
5. Engineering of Insulation
6. Engineering of Electrical Wiring

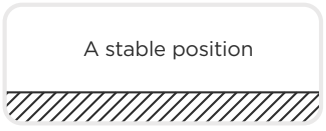
1. Location selection

1.1 Unit location selection can refer to installation manual.

1.2 DO NOT install the unit in the following locations:

- DO NOT install the indoor unit in a moist environment. Excessive moisture can corrode the equipment, electrical components, and cause electrical shorts.
- Areas with strong electromagnetic waves.
- Coastal areas with high salt content in the air.
- Areas with oil drilling or fracking.
- Areas that store flammable materials or gas.
- Areas where there may be detergent or other corrosive gases in the air, such as bathrooms, or laundry rooms.
- Areas where the air inlet and outlet may be obstructed.
- Danger of explosion. Keep flammable materials and vapors, such as gasoline, away from air handler.

1.3 WARNING: MUST BE INSTALLED IN A LOCATION THAT MEETS THE FOLLOWING REQUIREMENTS:

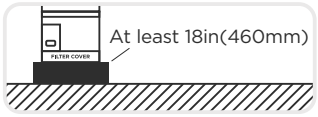


☑ Securely install the indoor unit on a structure that can support its weight. If the structure is too weak, the unit may fall and cause personal injury, unit and property damage, or death.



☑ Enough room for installation and maintenance.

☑ Enough room for the connecting pipe and drainpipe.



☑ Place air handler so that heating elements are at least 18in(460mm) above the floor for a garage installation. Failure to follow these instructions can result in death, explosion, or fire.



☑ The structure that the equipment is suspended from must support the weight of the indoor unit.

2. Indoor Unit Installation(A-COIL)

2.1 Installation And Trap Connection

1. See following figure for coil installation and drain connection.

2. Installation steps for cased coil:

A. Shut off or disconnect gas furnace's power and remove gas pipe if necessary.

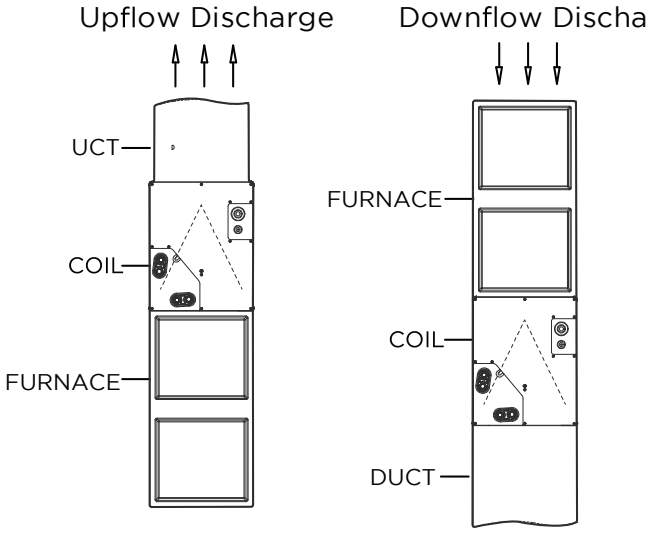
B. Disconnect and remove a sufficient portion of the supply ductwork to provide clearance for the cased coil.

C. Ensure that the coil is leveled well and seal the gap between coil and furnace. See Fig. 3-1. In case that coil and furnace sizes are not matched, use proper size of sheet metal or other material to fill the gap and seal the gap to prevent air leak.

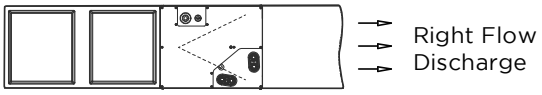
D. Reconnect the ductwork to the coil case, and seal any leakage.

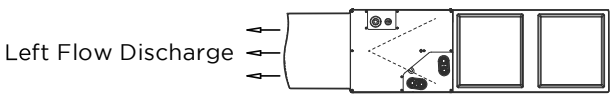
E. Reconnect Power line on gas furnace, turn on the furnace to check any sign of leakage.

Typical coil installation installation on furnace



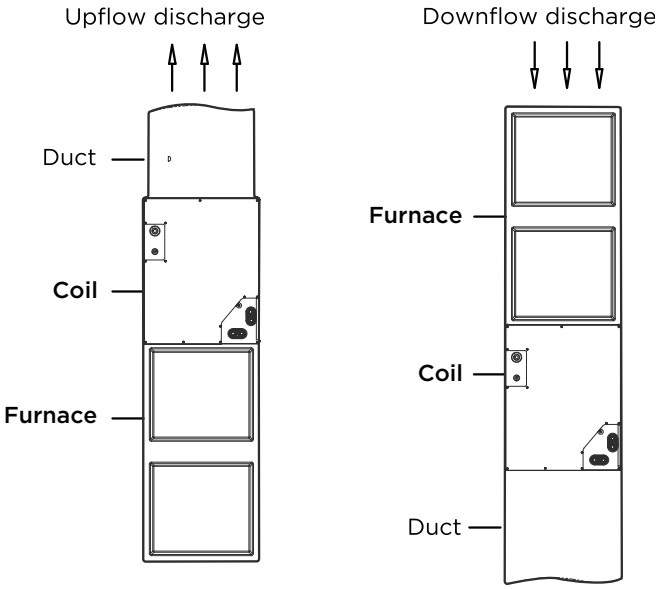
Vertical Upflow & Downflow Installation



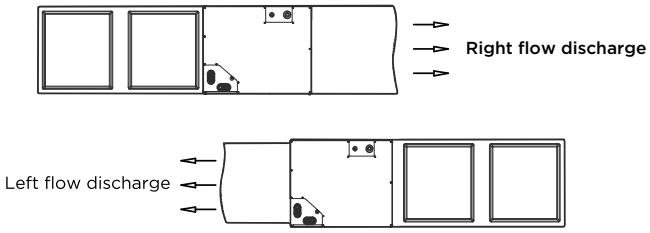


Horizontal Right & Left Installation

Model MVBM-60C28T6N10 coil installation on furnace



Vertical Upflow & Downflow Installation



Horizontal Right & Left Installation

2.2 Install evaporator coils

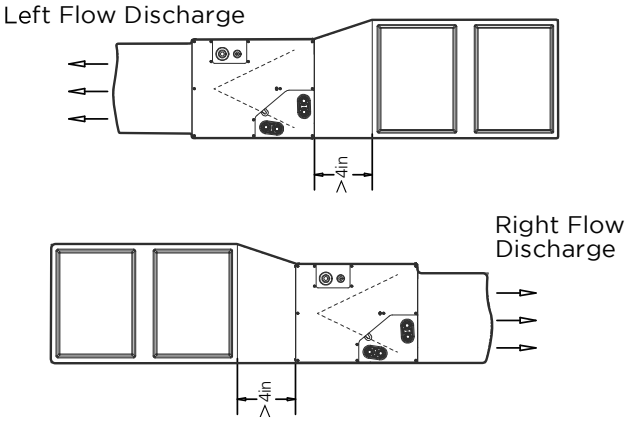
Upflow coil installation

The cased coil is designed to ft furnaces of the same width.

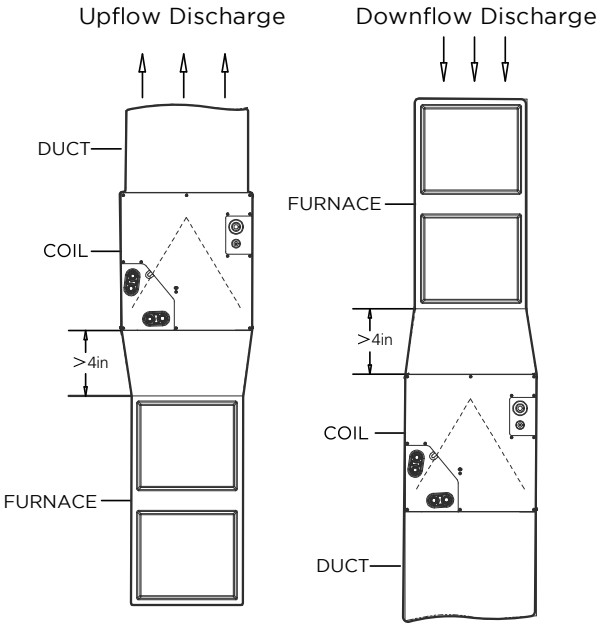
1. Set coil in place on upflow furnace discharge air opening.

2. Ensure coil is level for proper condensate drainage. Do not tip coil toward condensate drain. Coil casing need not be fastened or screwed to furnace.

3. When installing wider coil on narrow furnace, create field fabricated adapter.

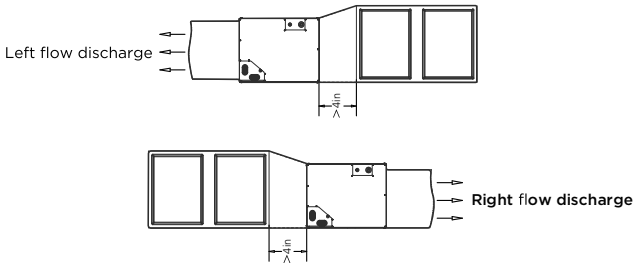


Horizontal Right & Left Installation

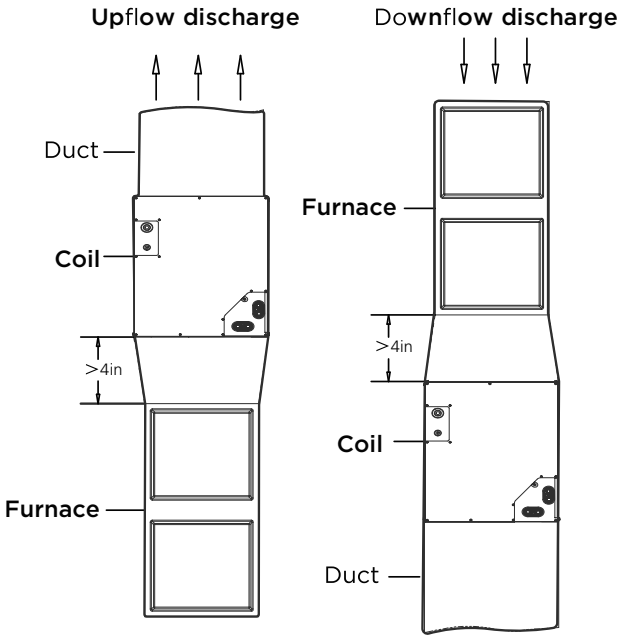


Vertical Upflow & Downflow Installation

Adapter(s) Installation When Coil Overhangs Furnace



Horizontal Right & Left Installation



Vertical Upflow & Downflow Installation

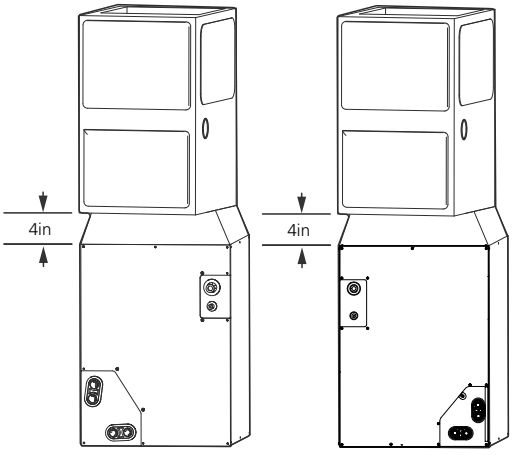
Adapter(s) installation when Model MVBM-60C28T6N10 coil overhangs furnace

NOTE: On upflow installations where the indoor coil is placed in an unconditioned space, a 6" wide piece of insulation should be applied and wrapped around the outside of coil casing and supply duct contact point.

NOTE: Consult the furnace installation instructions for any special requirements when installing the coil to the furnace.

Downflow Coil Installation

IMPORTANT: If the airflow is high due to ductwork or other causes, and there is a chance for water blow off, it is recommended that a 4-in. minimum field-supplied adapter be placed between the coil and the furnace to allow the air to distribute evenly to both coil slabs..



1. Set cased coil on supply duct opening.

2. Place field fabricated 4-in. minimum adapter on coil casing. Adapter should be tapered to fit coil/furnace combination when one of them is larger than the other.

3. Set furnace on adapter.

NOTE: In downflow installation with a 4-way multiplies furnace, break off perforated duct flanges on furnace. See furnace installation instructions.

Horizontal Coil Installation

The unit can be installed on a work platform, secured to roof truss in attic, suspended from hangers on floor joists in crawl space, or installed on blocks. It is designed to allow airflow in either direction, to mate with horizontal-left or horizontal-right furnace installations.

Ensure coil cabinet is level side to side and front to back. It is allowable to add up to 1/2-in. additional slope over length and depth of coil cabinet in the direction of drain pan connection.

Horizontal Right Installation

1. Use field fabricated attachment plates to secure coil to furnace.

2. Use self-tapping screws to mount attachment plates to coil casing.

3. Connect furnace snugly against coil casing.

4. Use self-tapping screws to attach furnace.

5. Seal joint between coil casing and furnace to create an air tight seal using locally approved materials.

6. If coil is wider than furnace, use 4-in minimum transition and self-tapping screws to attach furnace.

Horizontal Left Installation

1. Unbend the 4 tabs at the right side of the casing.

2. Connect furnace snugly against coil casing.

3. Use self-tapping screws to attach furnace.

4. Seal joint between coil casing and furnace to create air tight seal using locally approved materials.

5. If coil is wider than furnace, use 4-in. Minimum transition and self-tapping screws to attach furnace.

2.3 Condensate Drain Line Connection

⚠CAUTION

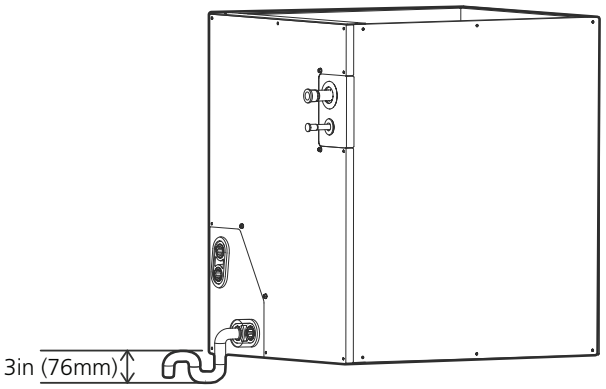
Failure to follow this caution may result in property damage. When installing over a finished ceiling and/or living area, install a field-fabricated secondary condensate pan under the entire unit.

The coil is designed to dispose of accumulated

water through built-in condensate drain fittings. It is recommended that PVC fittings be used on the condensate pan. Do not over-tighten. Finger tighten plus 1-1/2 turns. Be sure to install plastic plug in unused condensate drain fitting. Two 3/4 inch female threaded pipe connections are provided in each coil condensate pan. A trap is not necessary on the condensate line if on the supply air side of furnace. Consult local codes for additional restrictions or precautions. If local codes require a trap, then the following guidelines are suggested to assure proper drainage. Install a trap in condensate line of coil as close to the coil as possible. Make trap at least 3 inches (76 mm) deep and no higher than the bottom of unit condensate drain opening . Pitch condensate line 1 inch (25.4 mm) for every 10 ft. of length to an open drain or sump. Make sure that the outlet of each trap is below its connection to condensate pan to prevent condensate from overflowing the drain pan. Prime all traps, test for leaks, and insulate traps and lines if located above a living area.

WARNING

• Failure to follow this warning could result in personal injury or death. Provide trap with air gap in drain line when connecting to waste (sewer) line.



NOTE: If unit is located in or above a living space, where damage may result from condensate overflow, a field-supplied, external condensate pan should be installed underneath the entire unit, and a secondary condensate line (with appropriate trap) should be run from the unit into the pan. Any condensate in this external condensate pan should be drained to a noticeable place. As an alternative to using an external condensate pan, some localities may allow the running of a separate 3/4 inch (19 mm) condensate line (with appropriate trap) per local code to a place where the condensate will be noticeable. The owner of the structure must be informed that when condensate flows from secondary drain or external condensate pan, the unit requires servicing or water damage will occur. To further protect against water damage, install a float switch to shut the unit off if the water in the secondary pan gets too high.

2.4 Waste Line Connection

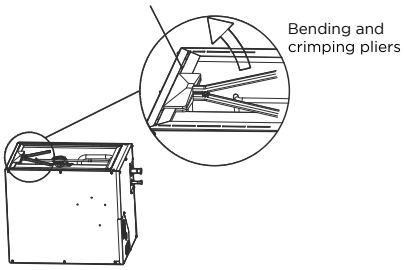
If the condensate line is to be connected to a waste (sewer) line, an open trap must be installed ahead of the waste line to prevent escape of sewer gases.

2.5 Air Duct Installation

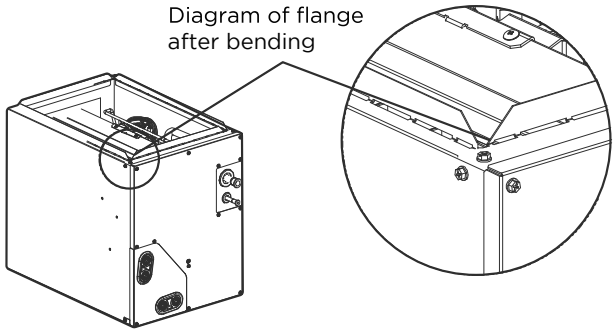
1. Flanged mounting

Step 1 :Use a tool to fold up the flange

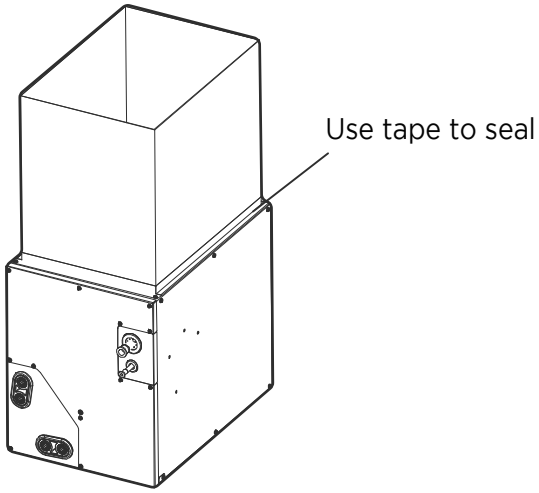
Clamp it in the middle of the hole and bend it up 90 degrees



Step 2:Fold the flanges around



Step3: Seal all sides with tape and keep warm with sponge.



3. Installation of MINI Interface

1. Choose Install Location

Priority should be given to installing on the front of the coil, or you can choose to install it on the side or on nearby walls as needed.

2. Dismantling panels

Figure 1: Installed on the side of the coil. (Vertical mounting, you can choose left or right)

Figure 2: Installed on the wall of the coil attach. (Horizontal mounting)

Figure 3: Installed on the wall of the coil attach.

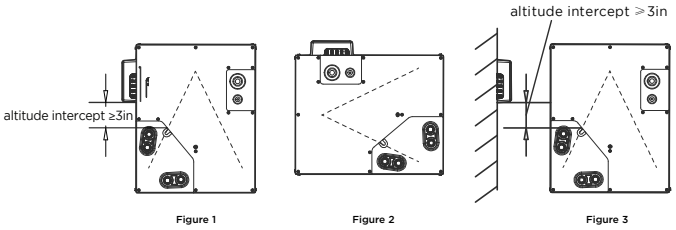
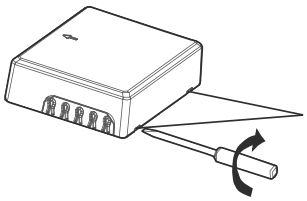


Figure 1 Figure 2 Figure 3

3. Dismantling the control box

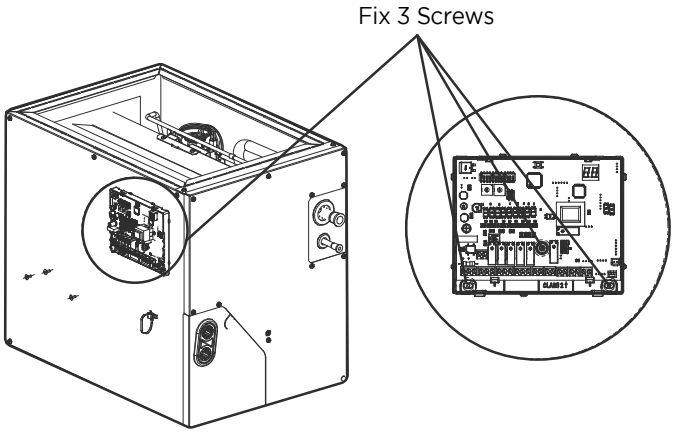
Using a screwdriver, pull at the two positions shown in the diagram.



Using a flat-head screwdriver, insert the two marked positions and gently rotate the screwdriver to open the cover.

4. Fixed Box

Fix 3 screws, 2 of which require drilling.



5. Cut of the cover wiring port



Use pliers to cut the upper cover, and cut the left position according to the diagram.



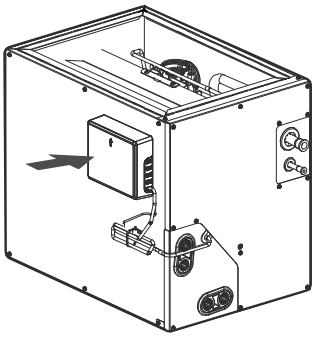
Close the cover photo



Cut off the appropriate part according to the position for wires outlet. If it is a single wire, you can cut a single wire hole, if there are multiple wires, you can cut off the cover along the maximum outline.

6. Close the lid

Close the cover to complete the installation of the control box.



4. Refrigerant Pipe Installation

4.1 Recommended copper pipe thickness

Pipe diameter (inch(mm))	Thickness(inch/mm)
Ø3/8 (Ø9.52)	0.028/0.7
Ø5/8 (Ø15.9)	0.03/0.75
Ø3/4 (Ø19)	0.031/0.8

4.2 Maximum length and drop height

Ensure that the length of the refrigerant pipe, the number of bends, and the drop height between the indoor and outdoor units meets the requirements shown in the following table.

Capacity (kBtu/h)	Max. Length (ft/m)	Max. Elevation (ft/m)
18	98.4/30	65.6/20
24~30	164/50	82/25
36~60	246/75	98.4/30

Caution:

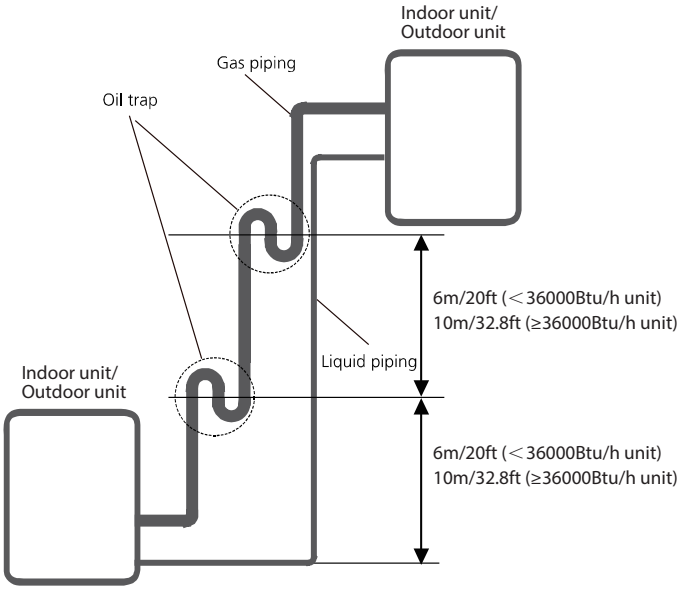
1. The capacity test is based on the standard length and the maximum permissive length is based on the system reliability.

2. Oil traps

-If oil flows back into the outdoor unit's compressor, this might cause liquid compression or deterioration of oil return. Oil traps in the rising gas piping can prevent this.

-An oil trap should be installed every 6m(20ft) of vertical suction line riser (<36000Btu/h unit).

-An oil trap should be installed every 10m(32.8ft) of vertical suction line riser (≥36000Btu/h unit).



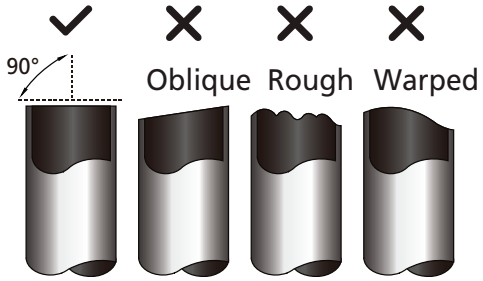
4.3 The procedure of connecting pipes

1. Choose the pipe size according to the specification table.

2. Confirm the cross way of the pipes.

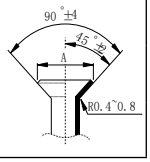
3. Measure the necessary pipe length.

4. Cut the selected pipe with pipe cutter
   - Make the section flat and smooth.



5. Insulate the copper pipe
   - Before test operation, the joint parts should not be heat insulated.

6. Flare the pipe
   - Insert a flare nut into the pipe before flaring the pipe
   - According to the following table to flare the pipe.

Pipe diameter (inch(mm))	Flare dimension A (inch/mm)		Flare shape
	Min	Max	
Ø3/8 (Ø9.52)	0.52/13.2	0.53/13.5	
Ø5/8 (Ø15.9)	0.76/19.2	0.78/19.7	
Ø3/4 (Ø19)	0.91/23.2	0.93/23.7	

- After flared the pipe, the opening part must be seal by end cover or adhesive tape to avoid duct or exogenous impurity come into the pipe.

7. Drill holes if the pipes need to pass the wall.

8. According to the field condition to bend the pipes so that it can pass the wall smoothly.

9. Bind and wrap the wire together with the insulated pipe if necessary.

10. Set the wall conduit.

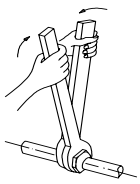
11. Set the supporter for the pipe.

12. Locate the pipe and fix it by supporter.

- For horizontal refrigerant pipe, the distance between supporters should not be exceed 1m.
- For vertical refrigerant pipe, the distance between supporters should not be exceed 1.5m.

13. Connect the pipe to indoor unit and outdoor unit by using two spanners.

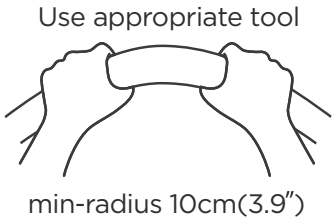
- Be sure to use two spanners and proper torque to fasten the nut, too large torque will damage the bellmouthing, and too small torque may cause leakage. Refer the following table for different pipe connection.

Pipe diameter (inch(mm))	Torque N.m(lb.ft)	Sketch map
Ø3/8 (Ø9.52)	32~39 (23.6~28.8)	
Ø5/8 (Ø15.9)	57~71 (42~52.4)	
Ø3/4 (Ø19)	67~101 (49.4~74.5)	

NOTE: MINIMUM BEND RADIUS

Carefully bend the tubing in the middle according to the diagram below.

DO NOT bend the tubing more than 90°or more than 3 times.



5 . Engineering of Insulation

5.1 Insulation of refrigerant pipe

1. Operational procedure of refrigerant pipe insulation

Cut the suitable pipe → insulation (except joint section) → flare the pipe → piping layout and connection→ vacuum drying → insulate the joint parts

2. Purpose of refrigerant pipe insulation

- During operation, temperature of gas pipe and liquid pipe shall be over-heating or over-cooling extremely. Therefore, it is necessary to carry out insulation; otherwise it shall debase the performance of unit and burn compressor.
- Gas pipe temperature is very low during cooling. If insulation is not enough, it shall form dew and cause leakage.
- Temperature of gas pipe is very high (generally 50-100°C/122-212°F) during heating. Insulation work must be carried out to prevent hurt by carelessness touching.

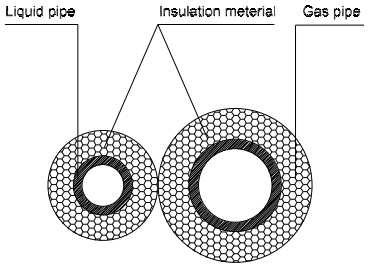
3. Insulation material selection for refrigerant pipe

- The burning performance should over 120°C/248°F
- According to the local law to choose insulation materials
- Recommended insulation casing thickness

Humidity<80%RH	Humidity ≥80%RH
10mm/0.39in	15mm/0.59in

4. Installation highlights of insulation construction

- Gas pipe and liquid pipe shall be insulated separately, if the gas pipe and liquid pipe were insulated together; it will decrease the performance of air conditioner.



- The insulation material at the joint pipe shall be 5~10cm/1.97~3.97in longer than the gap of the insulation material.
- The insulation material at the joint pipe shall be inserted into the gap of the insulation material.
- The insulation material at the joint pipe shall be banded to the gap pipe and liquid pipe tightly.
- The linking part should be use glue to paste together
- Be sure not bind the insulation material over-tight, it may extrude out the air in the material to cause bad insulation and cause easy aging of the material.

5.2 Insulation of drainage pipe

1. Operational procedure of refrigerant pipe insulation

Select the suitable pipe → insulation (except joint section) → piping layout and connection→ drainage test→ insulate the joint parts

2. Purpose of drainage pipe insulation

The temperature of condensate drainage water is very low. If insulation is not enough, it shall form dew and cause leakage to damage the house decoration.

3. Insulation material selection for drainage pipe

- The insulation material should be flame retardant material, the flame retardancy of the material should be selected according to the local law.
- Thickness of insulation layer is usually above 10mm/0.39in.
- Use specific glue to paste the seam of insulation material, and then bind with adhesive tape. The width of tape shall not be less than 5cm/1.97in. Make sure it is firm and avoid dew.

4. Installation and highlights of insulation construction

- The single pipe should be insulated before connecting to another pipe, the joint part should be insulated after the drainage test.
- There should be no insulation gap between the insulation material.

6. Engineering of Electrical Wring

1. Highlights of electrical wiring installation

- All wiring must comply with local and national electrical codes, regulations and must be installed by a licensed electrician.
- All electrical connections must be made according to the Electrical Connection Diagram located on the panels of the indoor and outdoor units.
- If there is a serious safety issue with the power supply, stop work immediately. Explain your reasoning to the client, and refuse to install the unit until the safety issue is properly resolved.
- Power voltage should be within 90-110% of rated voltage. Insufficient power supply can cause malfunction, electrical shock, or fire.
- Installation of an external surge suppressor at the outdoor disconnect is recommended.
- If connecting power to fixed wiring, a switch or circuit breaker that disconnects all poles and has a contact separation of at least 1/8in (3mm) must be incorporated in the fixed wiring. The qualified technician must use an approved circuit breaker or switch.
- Only connect the unit to an individual branch circuit. Do not connect another appliance to that Circuit.
- Make sure to properly ground the air conditioner.
- Every wire must be firmly connected. Loose wiring can cause the terminal to overheat, resulting in product malfunction and possible fire.
- Ensure that the color of the wires of outdoor and the terminal No. are same as those of indoor unit respectively.
- Do not let wires touch or rest against refrigerant tubing, the compressor, or any moving parts within the unit.
- To avoid getting an electric shock, never touch the electrical components soon after the power supply has been turned off. After turning of the power, always wait 10 minutes or more before you touch the electrical components.
- Make sure that you do not cross your electrical wiring with your signal wiring.
- This may cause distortion, interference or possibly damage to circuit boards.
- No other equipment should be connected to the same power circuit.
- Connect the outdoor wires before connecting the indoor wires.

WARNING

BEFORE PERFORMING ANY ELECTRICAL OR WIRING WORK, TURN OFF THE MAIN POWER TO THE SYSTEM.

2. Indoor wiring

The power to the unit must be disconnected before any wiring. Be sure to show application of ferrite clamp and room temp sensor and cable. Make note to review the different application (scenarios) options for proper wiring. Make sure strain relief and proper conduit are used when connecting to the box, recommended use of metal-clad cable.

NOTE: Use copper wire only. Separate the power supply leads and communication leads by the strain relief or segregate the power supply leads from communication leads.

Instruction for installation of the critical-to-safety wiring connection of the leak detection sensor or leak detection system to the furnace assembly. The wiring shall be not less than 18 AWG with a minimum insulation thickness of 1.58 mm or protected from damage. Critical-to-safety wiring is any field installed wiring necessary to fulfill the requirements of minimum room area in the event of detection of a leak.

The appliance shall not be installed on furnaces with an inductive electrical greater than Le as calculated as follows:

the switched electrical load (Le) in kVA is less than or equal to:

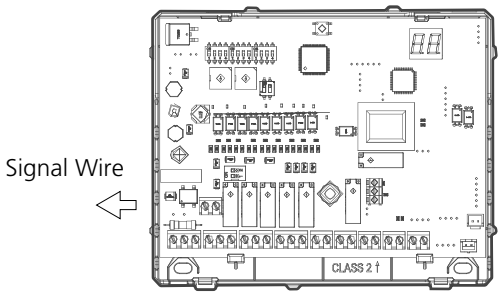
- Le = 5 x (6,7/Su)4 when breaking all phases;

- Le = 2,5 x (6,7/Su)4 when breaking two legs of a three-phase load, or when breaking one or two legs of a single-phase load.

Where Le is the switched inductive electrical load in kilo volt-amperes (kVA);

Su is the burning velocity of a refrigerant in centimeters per second (cm/s).

Detection of a leak shall turn on the indoor fan at the highest available speed or turn it on to not less than minimum airflow (Qhmin).



LINE GAUGE		
OUTDOOR-INDOOR SIGNAL WIRE	LINE DIAMETER(AWG)	20
24V SIGNAL WIRE	LINE DIAMETER(AWG)	18

RATINGS:

Electrical –INPUTS:

Input Type	Input Rating	Terminals	Recommend Wire Range / Torque
Power Input	24 V ac, 60 Hz, 300mA, Class 2	Terminal Block CN1-3(R), CN1-2(C)	14-22 AWG / 0.5 N·m
Remote Control Signal Input	12 V DC, SELV	CN2	14-22 AWG / 0.5 N·m

COMMUNICATION:

Type	Rating	Terminals	Recommend Wire Range / Torque
Communication Between Indoor and Outdoor Unit	5 V DC, Class 2, Limited Energy (<= 15 W)	CN17	14-22 AWG / 0.5 N·m
Communication Between Data Conversion Board and External Thermostat	24 V AC, 60 Hz, Class 2	CN4, CN6, CN11	
Communication Between Data Conversion Module PWB and Centralized Controller	5 V DC, Class 2	CN3	
External Communication	18 V DC, Class 2, Limited Energy (15 W)	CN19	
Communication Between Data Conversion Module PWB and Refrigerant Sensor	5 V DC, Class 2	CN5,CN8	

OUTPUTS:

Type	Rating	Terminals	Recommend Wire Range / Torque
Control Device for Furnace (Relay RY7, RY8)	24 V AC, 60 Hz, Class 2, General Use(Signal Use)	CN9	14-22 AWG / 0.5 N·m
Control Device for Furnace (Relay, RY9, RY10)		CN10	
Control Device for Outdoor Unit When full 24V communication (Relay, RY11)		CN43	

3. Specific wiring method

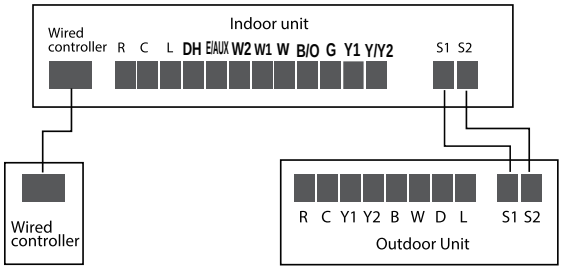
WARNING

Please refer to the wiring nameplate for the wiring method. Do not connect the power cord to the communication line, as this may damage the system.

NOTE: For method A & B equipment must have S1 & S2 communication between indoor and outdoor units.

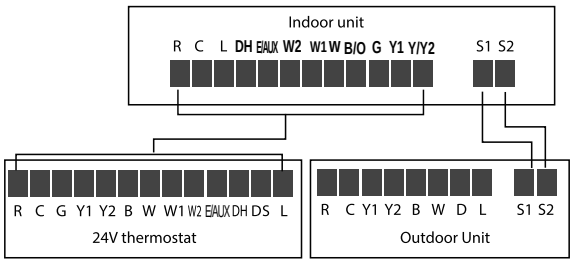
Connection method A:

Full communication:



Connection method B:

To use a 24V thermostat, you need to refer to the following wiring:



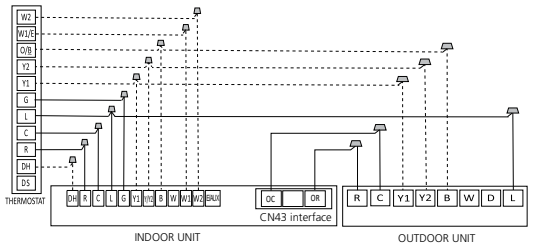
Connection method C:

The following wiring diagrams are suitable for the IDU and ODU with 24V thermostat.

Non-communication scheme wiring reference

- Wiring for 4H and 2C thermostat

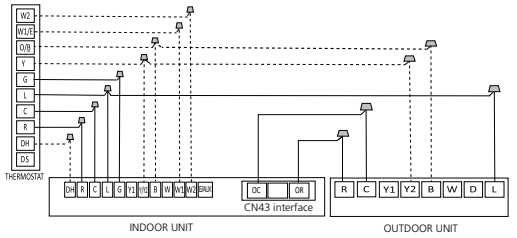
Note: CN43 terminals OC of A-COIL Mini Interface must be connected to outdoor unit when the full 24V communication scheme is applied. That will stop the operation of outdoor for safety if the refrigerant leakage happen.



S4-2 Default on, DH function off. Turn switch off to activate DH function.

S4-1 Default on, W1 and W2 shorted for single stage Aux heat operation. Turn off to separate stages.

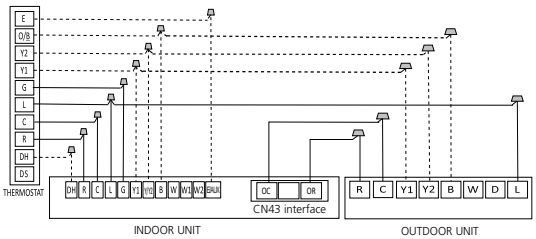
- Wiring for 3H and 1C thermostat



S4-2 Default on, DH function off. Turn switch off to activate DH function.

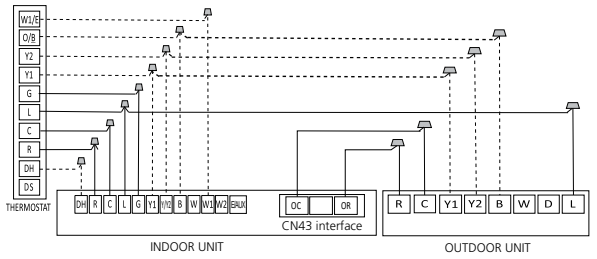
S4-1 Default on, W1 and W2 shorted for single stage Aux heat operation. Turn off to separate stages.

- Wiring for 3H and 2C thermostat



S4-2 Default on, DH function off. Turn switch off to activate DH function.

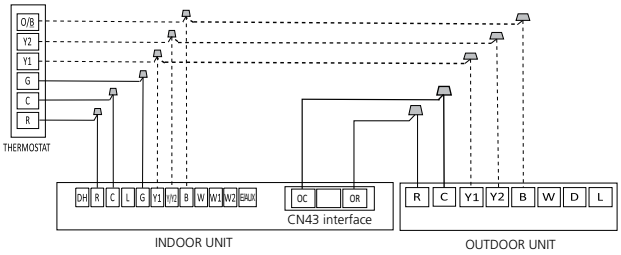
- Wiring for 3H and 2C thermostat



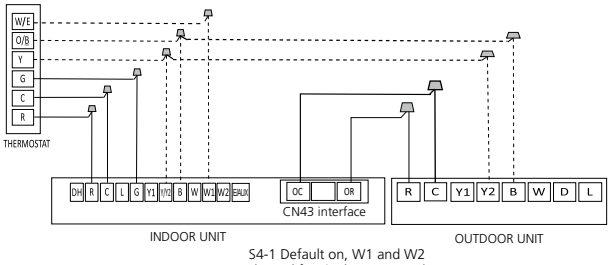
S4-2 Default on, DH function off. Turn switch off to activate DH function.

S4-1 Default on, W1 and W2 shorted for single stage Aux heat operation. Turn off to separate stages.

- Wiring for 2H and 2C thermostat

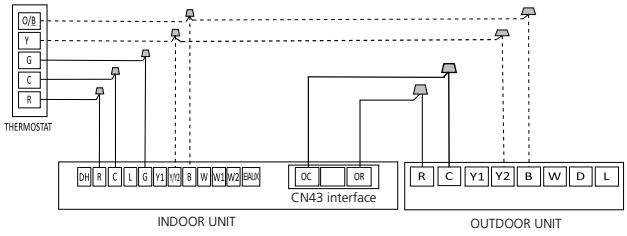


- Wiring for 2H and 1C thermostat



S4-1 Default on, W1 and W2 shorted for single stage Aux heat operation. Turn off to separate stages.

- Wiring for 1H and 1C thermostat



4. Control Signals To The Furnace

Control signals to the furnace are the standard thermostat control signals R,C,OW1,OW2,OG, OY1 and OY2.

Connector	Usage
R	Provides 24VAC power from the furnace to the board.
C	The 24VAC common wire between the furnace and the board.
OW1	First stage of furnace command line from the board to the furnace. If the furnaces that only have a W and do not have a W2, connect OW1 to the W of the furnace and make no connection with the OW2 signal wire.
OW2	Second stage of furnace command line from the board to the furnace. OW2 cannot be ON unless OW1 is already ON.
OY1/OG	For 1-speed configuration, connect the OG signal to G of the furnace. For 2-speed configuration, connect the OG signal to G of the furnace and connect the OY1 signal to Y1 of the furnace.
OY2	For 1-speed configuration, connect this signal to Y of the furnace. In this configuration, the OY2 signal turns on when fan is requested while in Cool mode or Heat mode using the heat pump. For 2-speed configuration, connect this signal to Y2 of the furnace. In this configuration, the OY2 signal turns on as follows: In Fan mode, Cool mode or Heat mode with HP when high speed fan is requested. In Auto Fan and Cool mode, the signal goes to high speed when the difference between room temperature and set point temperature is more than or equal to 1.5° C. The signal goes back to low speed when the temperature difference is less than 1° C. In Auto Fan and Heat mode with the HP, the signal goes to high speed when the difference between room temperature and set point temperature is less than or equal to -1.5° C. The signal goes back to low speed when the temperature difference is more than 0°C.

In addition:

Room temperature sensor to be installed in the return air

Duct temperature sensor to be installed on the COIL as specified

Product Features

Contents

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2. Safety Features (NON-24V control) 3

3. Basic Functions (NON-24V control) 3

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3.2 Fan Mode 3

3.3 Cooling Mode 3

3.4 Heating Mode(Heat Pump Units) 3

3.5 Auto Mode 4

3.7 Forced Operation Function 4

3.8 Timer Function 4

3.9 Sleep Function 5

3.10 Auto-Restart Function 5

1. 24V Signal Chart(Cooling & Heating)

Mode	Priority	G	Y1	Y/Y2	B	W	W1	W2	E/AUX	DH	Display
OFF	/	0	0	0	0	0	0	0	0	*	00
FAN	7	1	0	0	*	0	0	0	0	*	01
Cooling stage 1	6	*	1	0	0	0	0	0	0	1	02
Cooling stage 2		*	*	1	0	0	0	0	0	1	03
Dehumidification 1		*	1	0	0	0	0	0	0	0	04
Dehumidification 2		*	*	1	0	0	0	0	0	0	05
Heat pump stage 1	5	*	1	0	1	0	0	0	0	1	06
Heat pump stage 2		*	*	1	1	0	0	0	0	1	07
Heat pump stage 2		*	*	*	*	1	0	0	0	1	
Furnace	3	*	0	0	*	0	1	0	0	*	12
Furnace		*	0	0	*	0	0	1	0	*	
Furnace		*	0	0	*	0	1	1	0	*	12
Furnace	4	*	1	0	1	0	1	0	0	1	12
Furnace		*	1	0	1	0	0	1	0	1	
Furnace		*	*	1	1	0	1	0	0	1	
Furnace		*	*	*	*	1	1	0	0	1	
Furnace		*	*	1	1	0	0	1	0	1	
Furnace		*	*	*	*	1	0	1	0	1	
Furnace		*	1	0	1	0	1	1	0	1	12
Furnace		*	*	1	1	0	1	1	0	1	
Furnace		*	*	*	*	1	1	1	0	1	
Furnace	1	*	*	*	*	*	*	*	1	*	12
Heating zone control	2	*	1	0	1	0	*	*	0	0	13
Heating zone control		*	*	1	1	0	*	*	0	0	
Heating zone control		*	*	*	*	1	*	*	0	0	

NOTE:

1 : 24V signal 0 : No 24V signal *: 1 or 0

The A-COIL will turn off if the 24V input cannot meet the table.

2. Safety Features (NON-24V control)

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.

3. Basic Functions (NON-24V control)

3.1 Abbreviation

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
TS	Setting temperature
Tsc	Adjusted setting temperature

3.2 Fan Mode

When fan mode is activated:

- Temperature control is disabled and no temperature setting is displayed.
- Auto fan: In fan-only mode, AC operates the same as auto fan in cooling mode with the temperature set at 24°C(75°F).

3.3 Cooling Mode

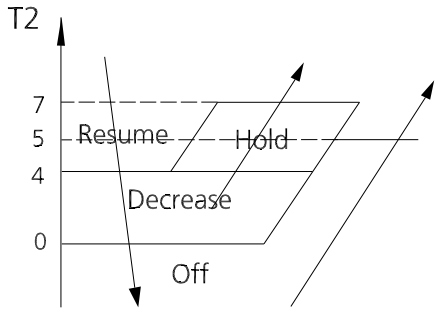
3.3.1 Indoor Fan Control

1) In cooling mode, the indoor fan operates continuously. The fan speed can be set to low, medium, high, turbo and auto.

2) Auto fan action in cooling mode:

- Descent curve
  - When T1-Tsc is lower than 3.5°C/6°F, fan speed reduces to high (OY1+OY2);
  - When T1-Tsc is lower than 1°C/2°F, fan speed reduces to medium (OY1);
  - When T1-Tsc is lower than 0.5°C/1°F, fan speed reduces to low (OY1).
- Rise curve
  - When T1-Tsc is higher than or equal to 1°C/2°F, fan speed increases to medium (OY1);
  - When T1-Tsc is higher than or equal to 1.5°C/3°F, fan speed increases to high (OY1+OY2);
  - When T1-Tsc is higher than or equal to 4°C/7°F, fan speed increases to turbo (OY1+OY2).

3.3.2 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.

3.4 Heating Mode(Heat Pump Units)

3.4.1 Indoor Fan Control:

1) In heating mode, the indoor fan operates continuously. The fan speed can be set to low, medium, high,turbo and auto.

- Anti-cold air function

1) Set machine: G1 G2 does not output within 1 minute of compressor stop or compressor turn on in single heat pump mode, and output the set fan after 1 minute of compressor opening.

2) Set machine: After exit defrosting, the fan is delayed for 30s before output.

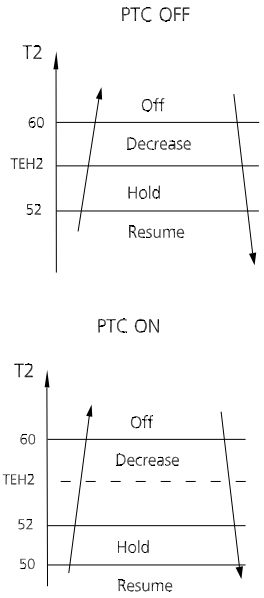
3) Single indoor machine: no anti-cold air function, according to the set fan output. (When the indoor unit is faulty, the set fan output will still be sent according to the display)

2) Auto fan action in heating mode:

- Rise curve
  - When T1-Tsc is higher than -1.5°C/-3°F, fan speed reduces to high (OY1+OY2);
  - When T1-Tsc is higher than 0°C/0°F, fan speed reduces to medium (OY1);
  - When T1-Tsc is higher than 0.5°C/1°F, fan speed reduces to low (OY1);
- Descent curve
  - When T1-Tsc is lower than or equal to 0°C/0°F, fan speed increases to medium;

- When T1-Tsc is lower than or equal to -1.5°C/-3°F, fan speed increases to high (OY1+OY2);
- When T1-Tsc is lower than or equal to -3°C/-5°F, fan speed increases to turbo (OY1+OY2).

3.4.2 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.

3.5 Auto Mode

- This mode can be selected with the remote controller and the temperature setting can be adjusted between 16°C~30°C(61°F~86°F).
- In auto mode, the machine selects cooling, heating, or fan-only mode on the basis of **Δ**T (**Δ**T =T1-TS).

ΔT	Running mode
ΔT>2°C(4°F)	Cooling
-3℃(-5°F)<ΔT≤2°C(4°F)	Fan-only
ΔT≤-3°C(-5°F)	Heating*

Heating*: In auto mode, cooling only models run the fan

- Indoor fan will run at auto fan speed.
- If the machine switches mode between heating and cooling, the compressor will keep stopping for certain time and then choose mode according to **Δ**T.

3.6 Drying Mode

3.6.1 Indoor Fan Control

1) In drying mode, the indoor fan operates continuously. The fan speed can be set to low, medium, high, turbo and auto.
2) Auto fan action in drying mode:
   - Descent curve
     - When T1-Tsc is lower than 3.5°C/6°F, fan speed reduces to high (OY1+OY2);
     - When T1-Tsc is lower than 1°C/2°F, fan speed reduces to medium (OY1);
     - When T1-Tsc is lower than 0.5°C/1°F, fan speed reduces to low (OG).
   - Rise curve
     - When T1-Tsc is higher than or equal to 1°C/2°F, fan speed increases to medium (OY1);
     - When T1-Tsc is higher than or equal to 1.5°C/3°F, fan speed increases to high (OY1+OY2);
     - When T1-Tsc is higher than or equal to 4°C/7°F, fan speed increases to turbo (OY1+OY2).

3.6.2 All protections are activated and operate the same as they do that in cooling mode.

3.6.3 Low Room Temperature Protection

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

3.7 Forced Operation Function

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

Forced auto →Forced cooling →Off

- 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 24°C(76°F).

- Forced auto mode:

Forced auto mode operates the same as normal auto mode with a preset temperature of 24°C(76°F).

- The unit exits forced operation when it receives the following signals:
  - Switch off
  - Receive the remote signal to change the running mode:

3.8 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

3.9 Sleep Function

- The sleep function is available in cooling, heating, auto mode or Heat pump + Electric heater.
- The operational process for sleep mode is as follows:
  - When cooling, the set temperature rises by 1°C/2°F (to not higher than 30°C/86°F) every hour. After 2 hours, the temperature stops rising and the indoor fan is fixed at low speed.
  - When heating, the set temperature decreases by 1°C/2°F(to not lower than 16°C/61°F) every hour. After 2 hours, the temperature stops decreasing and the indoor fan is fixed at low speed. Anti-cold wind function takes priority.
  - When in auto mode, the fan speed is also fixed at low speed. After 1 hour, if the actual operation mode is cooling mode, the set temperature will rise by 1°C/2°F, if it is heating mode, the set temperature will decrease by 1°C/2°F, if it is fan mode, the set temperature will not change, and the set temperature will not change after two hours of operation.
- The timer setting is available in this mode.

3.10 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.

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7. Check Procedures

1. Safety Caution

WARNING

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

WARNING

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

2. General Troubleshooting

2.1 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 following table:

Display	Error Information	Solution
EC07	ODU fan speed out of control	TS21
EC0d	ODU malfunction	TS38
EC5I	ODU EEPROM parameter error	TS19
EC52	ODU coil temp. sensor (T3) error	TS23
EC53	ODU ambient temp. sensor (T4) error	TS23
EC54	COMP. discharge temp. sensor(TP) error	TS23
EC56	IDU coil outlet temp. sensor(T2B) errorMulti-zone)	TS23
EC0I	Other IDU refrigerant sensor detects leakage (Multi-zone)	TS35
EH00	IDU EEPROM malfunction	TS19
EH03	IDU fan speed out of control	TS21
EH0R	IDU EEPROM parameter error	TS19
EH0b	IDU main control board and display board communication error	TS39
EH0E	Water-level alarm malfunction	TS25
EH3R	External fan DC bus voltage is too low protection	TS35
EH3b	External fan DC bus voltage is too high fault	TS35
EH60	IDU room temp. sensor (T1) error	TS23
EH6I	IDU coil temp. sensor(T2) error	TS23
EHbR	Communication malfunction between indoor unit and external fan module	TS35
EHCI	Refrigerant sensor detects leakage	TS37
EHC2	Refrigerant sensor is out of range and leakage is detected	TS37
EHC3	Refrigerant sensor is out of range	TS36

EL01	IDU & ODU communication error	TS20
EL0C	System lacks refrigerant	TS23
EL16	Communication malfunction between adapter board and outdoor main board	TS40
FHCC	Refrigerant sensor error	TS36
FL09	Mismatch between the new and old platforms	TS40
PC00	ODU IPM module protection	TS26
PC01	ODU voltage protection	TS27
PC02	Compressor top (or IPM) temp. protection	TS32
PC03	Pressure protection (low or high pressure)	TS29
PC04	Inverter compressor drive error	TS28
PC0L	Low ambient temperature protection	TS33
----	IDUs mode conflict(Multi-zone)	--

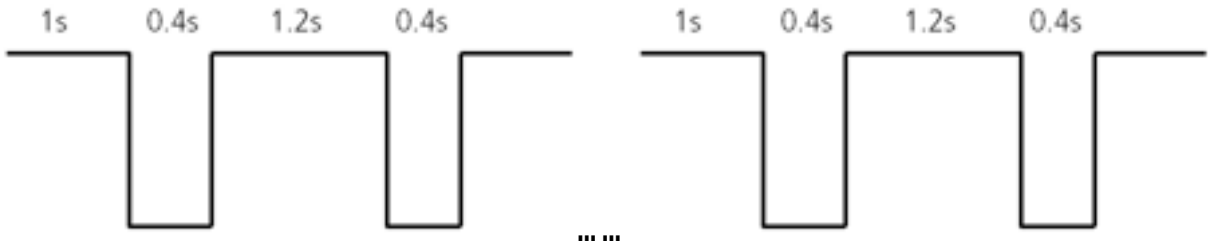
For other errors:

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.

Troubleshooting:

Test the unit using the remote control. If the unit does not respond to the remote, the indoor PCB requires replacement. If the unit responds, the display board requires replacement.

LED flash frequency:



2.2 Error Display on Two Way Communication Wired Controller

Display	Malfunction or Protection	Solution
EH03	Communication malfunction between wire and master control((for KJR-120X/KJR-120M/ KJR-120N series wired controller)	TS34

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

3. Engineering Mode

3.1 Information Inquiry

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

- Make sure that the AC is on the standby status, or working normally in a non-locked conditions.
- 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.
- 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

Channel	Code	Meaning	Remark
0		Error code	Refer to next list of error code Empty means no error
1	T1	Room temperature	Actual data, °C/°F
2	T2	Indoor coil temperature	Actual data,°C/°F
3	T3	Outdoor coil temperature	Actual data, °C/°F
4	T4	Ambient temperature	Actual data, °C/°F
5	TP	Discharge temperature	Actual data,°C/°F
6	FT	Targeted frequency	Actual data
7	Fr	Actual frequency	Actual data
8	dU	Running current	3.2A=3
9	AC	AC voltage	
10	Sn	Reserved	
11	--	Reserved	
12	Pr	Indoor set fan speed	1:low; 2:middle; 3:high; 4: turbo (OW1/OW2)
13	Lr	EXV opening steps	Actual data/8
14	fr	Indoor fan speed	1:low; 2:middle; 3:high; 4: turbo (OW1/OW2)
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	Ub	Outdoor DC bus voltage	
20	oT	Target Frequency calculated by indoor	Without limitation
21~30	nA	Reserved	

Please note that:

1-The Channel number indicates a certain parameter value (Check the below table).

2-The indoor unit display will show the code for 2s, and then the parameter value.

3-In the engineering mode, the other keys or operations are invalid except for the following buttons "Power", "Up", "Down" , and "Ok".

4-In order to exit from the engineering mode, press "Power" + "Fan" buttons together for 2s to quit Checking and back to the home screen.

5-The engineering mode will be exited if there is no valid input data for 60s.

Error code of engineer mode

Display	Error Information
EH00	IDU EEPROM malfunction
EH0A	IDU EEPROM parameter error
EL01	IDU & ODU communication error
EH bA	Communication error between indoor unit and external fan module
EH30	Parameters error of indoor external fan
EH35	Phase failure of indoor external fan
EH36	Indoor external fan current sampling bias fault
EH37	Indoor external fan zero speed failure
EH38	Indoor external fan stall failure
EH39	Out of step failure of indoor external fan
EH3A	Low voltage protection of indoor external fan DC bus
EH3b	Indoor external fan DC bus voltage is too high fault
EH3E	Indoor external fan overcurrent fault
EH3F	Indoor external fan module protection/hardware overcurrent protection
EH03	IDU fan speed out of control
EC51	ODU EEPROM parameter error
EC52	ODU coil temp. sensor (T3) error
EC53	ODU ambient temp. sensor (T4) error
EC54	COMP. discharge temp. sensor(TP) error
EC55	IGBT temperature sensor TH is in open circuit or short circuit
EC0d	Outdoor unit malfunction
EH60	IDU room temp. sensor (T1) error
EH61	IDU coil temp. sensor(T2) error
EC71	Outdoor external fan overcurrent fault
EC75	Outdoor external fan module protection/hardware overcurrent protection
EC72	Outdoor external fan phase failure
EC74	Outdoor external fan current sampling bias fault
EC73	Zero speed failure of outdoor unit DC fan
EC07	ODU fan speed out of control(
EH bS	Intelligent eye communication failure
EL0C	Refrigerant leak detected
EH0E	Water-level alarm malfunction
EH0F	Intelligent eye malfunction
FH07	Communication malfunction between indoor unit and auto-lifting panel
PC00	ODU IPM module protection
PC10	Over low voltage protection
PC11	Over voltage protection
PC12	DC voltage protection
PC02	Top temperature protection of compressor or High temperature protection of IPM module
PC40	Communication error between outdoor main chip and compressor driven chip

PC41	Current Input detection protection
PC42	Compressor start error
PC43	Lack of phase (3 phase) protection
PC44	Outdoor unit zero speed protection
PC45	341PWM error
PC46	Compressor speed malfunction
PC49	Compressor over current protection
PC06	Compressor discharge temperature protection
PC08	Outdoor current protection
PH09	Anti-cold air in heating mode
PC0F	PFC module malfunction
PC30	System overpressure protection
PC31	System pressure is too low protection
PC03	Pressure protection
PC0L	Outdoor low ambient temperature protection
PH90	Evaporator coil temperature over high protection
PH91	Evaporator coil temperature over low Protection
PC0R	Condenser high temperature protection
PH0C	Indoor unit humidity sensor failure
LH00	Frequency limit caused by T2
LH30	Indoor external fan current limit
LH31	Indoor external fan voltage limit
LC01	Frequency limit caused by T3
LC02	Frequency limit caused by TP
LC05	Frequency limit caused by voltage
LC03	Frequency limit caused by current
LC06	Frequency limit caused by PFC
LC30	Frequency limit caused by high pressure
LC31	Frequency limit caused by low pressure
LH07	Frequency limit caused by remote controller
--	IDUs mode conflict(match with multi outdoor unit)
nR	No malfunction and protection

3.2 Advanced Function 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- Firstly, you need to disconnect the power supply from the unit, and wait for 1 minute.

2- Then connect the power supply again to the unit (the unit should be under the standby state).

3- 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.

4- Press "Up" or "Down" button to choose different channel number that you want to check (from 0-30) on the remote controller.

5- Then Press "Power" button for 2s until the remote controller screen shows "Ch" .

6- Press "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- Firstly, you need to disconnect the power supply from the unit, and wait for 1 minute.

2- Then connect the power supply again to the unit (the unit should be under the standby state).

3- 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.

4- Press "Up" or "Down" button to choose different channel number that you want to change (from 0-30) on the remote controller.

5- Then 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- Then 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- Finally, disconnect the power supply again from the unit, and wait for 10 minutes, then connect it again.

Please note that:

1- 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).

2- In the engineering mode, the other keys or operations are invalid except for the following buttons "Power", "Up", "Down" , and "Ok".

3- In order to set a new set value successfully, you need to finish the steps (from 2 to 7) within 1 minute only.

4- The engineering mode will be exited if there is no valid input data for 60s.

5- 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.

Channel	Function	Parameter Value Meaning	Remark
0	/	Nothing to set	
1	Auto-restart function	0 – Inactive 1 – Active	24V control is invalid
2	Fan control when Ts reached	1- Fan stop 2 - Fan runs at lowest RPM 3 - Fan runs at setting RPM 4 - Fan stops for 4 mins and runs for 1mins 5 - Fan stops for 8 mins and runs for 1mins 6 - Fan stops for 16 mins and runs for 1mins 7 - Fan stops for 24 mins and runs for 1mins 8 - Fan stops for 48 mins and runs for 1mins 9 - Fan stops for 15 mins and runs for 2.5mins 10 - Fan stops for 30 mins and runs for 2.5mins 11 - Fan stops for 60 mins and runs for 2.5 12- Fan runs at setting RPM, but stop if choose Automatic speed 13- Fan runs at the lowest speed, but stop if choose Automatic speed	24V control is invalid
3	Mode lock	CH–Cooling and heating (all modes) CC–Cooling only (Cooling + Drying + Fan only)	Remote controller will change as well.
4	Lowest setting temperature	16-24	Remote controller will change as well. 24V control is invalid
5	Highest setting temperature	25-30	Remote controller will change as well. 24V control is invalid
6	Reserved	Nothing to set	
7	/	Nothing to set	
8	/	Nothing to set	
9	/	Nothing to set	
10	/	Nothing to set	
11	Min. frequency limitation in cooling mode	10, 11, 12, …, 49, 50, -- (Cancel)	Single indoor unit is invalid
12	Min. frequency limitation in heating mode	10, 11, 12, …, 49, 50, -- (Cancel)	Single indoor unit is invalid
13	/	Nothing to set	
14	/	Nothing to set	
15	Frequency selection of outdoor forced-operation	10, 11, 12, …, 249, 250, -- (Cancel)	Single indoor unit is invalid
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)	Single indoor unit is invalid
20	/	Nothing to set	
21	Cooling temperature compensation	-3.0, -2.5, -2.0, …, 3.0, 3.5, -- (Cancel)	24V control is invalid
22	Heating temperature compensation	-6.5, -6.0, -5.5, …, 0.5, 1.0, 1.5, …, 7.0, 7.5, -- (Cancel)	24V control is invalid
23	Reserved	Nothing to set	
24	Reserved	Nothing to set	
25	Reserved	Nothing to set	
26	Reserved	Nothing to set	
27	Defrosting type	A0–Normal defrosting A1-Enhanced defrosting	Single indoor unit is invalid
28	Reserved	Nothing to set	
29	Reserved	Nothing to set	
30	Reserved	Nothing to set	

4. Error Diagnosis and Troubleshooting Without Error Code

WARNING

Be sure to turn off unit before any maintenance to prevent damage or injury.

4.1 Remote maintenance

SUGGESTION: When troubles occur, please check the following points with customers before field maintenance.

No.	Problem	Solution
1	Unit will not start	TS14 - TS15
2	The power switch is on but fans will not start	TS14 - TS15
3	The temperature on the display board cannot be set	TS14 - TS15
4	Unit is on but the wind is not cold(hot)	TS14 - TS15
5	Unit runs, but shortly stops	TS14 - TS15
6	The unit starts up and stops frequently	TS14 - TS15
7	Unit runs continuously but insufficient cooling(heating)	TS14 - TS15
8	Cool can not change to heat	TS14 - TS15
9	Unit is noisy	TS14 - TS15

4.2 Field maintenance

	Problem	Solution
1	Unit will not start	TS16 - TS17
2	Compressor will not start but fans run	TS16 - TS17
3	Compressor and condenser (outdoor) fan will not start	TS16 - TS17
4	Evaporator (indoor) fan will not start	TS16 - TS17
5	Condenser (Outdoor) fan will not start	TS16 - TS17
6	Unit runs, but shortly stops	TS16 - TS17
7	Compressor short-cycles due to overload	TS16 - TS17
8	High discharge pressure	TS16 - TS17
9	Low discharge pressure	TS16 - TS17
10	High suction pressure	TS16 - TS17
11	Low suction pressure	TS16 - TS17
12	Unit runs continuously but insufficient cooling	TS16 - TS17
13	Too cool	TS16 - TS17
14	Compressor is noisy	TS16 - TS17
15	Horizontal louver can not revolve	TS16 - TS17

1.Remote Maintenance	Electrical Circuit							Refrigerant Circuit							
Possible causes of trouble	Power failure	The main power tripped	Loose connections	Faulty transformer	The voltage is too high or too low	The remote control is powered off	Broken remote control	Dirty air filter	Dirty condenser fins	The setting temperature is higher/lower than the room's(cooling/heating)	The ambient temperature is too high/low when the mode is cooling/heating	Fan mode	SILENCE function is activated(optional function)	Frosting and defrosting frequently	
Unit will not start	☆	☆	☆	☆											
The power switch is on but fans will not start			☆	☆	☆										
The temperature on the display board cannot be set						☆	☆								
Unit is on but the wind is not cold(hot)										☆	☆	☆			
Unit runs, but shortly stops					☆					☆	☆				
The unit starts up and stops frequently					☆						☆			☆	
Unit runs continuously but insufficient cooling(heating)								☆	☆	☆	☆		☆		
Cool can not change to heat															
Unit is noisy															
Test method / remedy	Test voltage	Close the power switch	Inspect connections - tighten	Change the transformer	Test voltage	Replace the battery of the remote control	Replace the remote control	Clean or replace	Clean	Adjust the setting temperature	Turn the AC later	Adjust to cool mode	Turn off SILENCE function.	Turn the AC later	

1.Remote Maintenance	Others					
Possible causes of trouble	Heavy load condition	Loosen hold down bolts and / or screws	Bad airproof	The air inlet or outlet of either unit is blocked	Interference from cell phone towers and remote boosters	Shipping plates remain attached
Unit will not start						
The power switch is on but fans will not start					☆	
The temperature on the display board cannot be set						
Unit is on but the wind is not cold(hot)						
Unit runs, but shortly stops						
The unit starts up and stops frequently				☆		
Unit runs continuously but insufficient cooling(heating)	☆		☆	☆		
Cool can not change to heat						
Unit is noisy		☆				☆
Test method / remedy	Check heat load	Tighten bolts or screws	Close all the windows and doors	Remove the obstacles	Reconnect the power or press **ON/OFF** button on remote control to restart operation	Remove them

2.Field Maintenance	Refrigerant Circuit																			Others					
Possible causes of trouble	Compressor stuck	Shortage of refrigerant	Restricted liquid line	Dirty air filter	Dirty evaporator coil	Insufficient air through evaporator coil	Overcharge of refrigerant	Dirty or partially blocked condenser	Air or incompressible gas in refrigerant cycle	Short cycling of condensing air	High temperature condensing medium	Insufficient condensing medium	Broken compressor internal parts	Inefficient compressor	Expansion valve obstructed	Expansion valve or capillary tube closed completely	Leaking power element on expansion valve	Poor installation of feeler bulb	Heavy load condition	Loosen hold down bolts and / or screws	Shipping plates remain attached	Poor choices of capacity	Contact of piping with other piping or external plate
Unit will not start																									
Compressor will not start but fans run	☆																								
Compressor and condenser (outdoor) fan will not start																									
Evaporator (indoor) fan will not start																									
Condenser (Outdoor) fan will not start																									
Unit runs, but shortly stops		☆	☆				☆	☆								☆	☆								
Compressor short-cycles due to overload		☆					☆	☆																	
High discharge pressure							☆	☆	☆	☆	☆	☆													
Low discharge pressure		☆												☆											
High suction pressure							☆							☆				☆	☆						
Low suction pressure		☆	☆	☆	☆	☆									☆	☆	☆								
Unit runs continuously but insufficient cooling		☆	☆	☆	☆	☆		☆	☆	☆				☆					☆			☆			
Too cool																									
Compressor is noisy							☆						☆							☆	☆		☆		
Horizontal louver can not revolve																									
Test method / remedy	Replace the compressor	Leak test	Replace restricted part	Clean or replace	Clean coil	Check fan	Change charged refrigerant volume	Clean condenser or remove obstacle	Purge, evacuate and recharge	Remove obstruction to air flow	Remove obstruction in air or water flow	Remove obstruction in air or water flow	Replace compressor	Test compressor efficiency	Replace valve	Replace valve	Replace valve	Fix feeler bulb	Check heat load	Tighten bolts or screws	Remove them	Choose AC of lager capacity or add the number of AC	Rectify piping so as not to contact each other or with external plate		

2.Field Maintenance	Electrical Circuit														
Possible causes of trouble	Power failure	Blown fuse or varistor	Loose connections	Shorted or broken wires	Safety device opens	Faulty thermostat / room temperature sensor	Wrong setting place of temperature sensor	Faulty transformer	Shorted or open capacitor	Faulty magnetic contactor for compressor	Faulty magnetic contactor for fan	Low voltage	Faulty stepping motor	Shorted or grounded compressor	Shorted or grounded fan motor
Unit will not start	☆	☆	☆	☆	☆			☆							
Compressor will not start but fans run				☆		☆			☆	☆				☆	
Compressor and condenser (outdoor) fan will not start				☆		☆				☆					
Evaporator (indoor) fan will not start				☆					☆		☆				☆
Condenser (Outdoor) fan will not start				☆		☆			☆		☆				☆
Unit runs, but shortly stops										☆		☆			
Compressor short-cycles due to overload										☆		☆			
High discharge pressure															
Low discharge pressure															
High suction pressure															
Low suction pressure															
Unit runs continuously but insufficient cooling															
Too cool						☆	☆								
Compressor is noisy															
Horizontal louver can not revolve			☆	☆									☆		
Test method / remedy	Test voltage	Inspect fuse type & size	Inspect connections - tighten	Test circuits with tester	Test continuity of safety device	Test continuity of thermostat / sensor & wiring	Place the temperature sensor at the central of the air inlet grille	Check control circuit with tester	Check capacitor with tester	Test continuity of coil & contacts	Test continuity of coil & contacts	Test voltage	Replace the stepping motor	Check resistance with multimeter	Check resistance with multimeter

5. Quick Maintenance by Error Code

If you do not have the time to test which specific parts are faulty, you can directly change the required parts according the error code.

You can find the parts to replace by error code in the following table.

Part requiring replacement	Error Code								
	EH00/EH0R	EL01	EH03	EH60	EH61	EL0C	EHC1/EHC2	EH0E	EH0b
Indoor PCB	√	√	√	√	√	√	x	√	√
Outdoor PCB	x	√	x	x	x	x	x	x	x
Indoor fan motor	x	x	√	x	x	x	x	x	x
T1 sensor	x	x	x	√	x	x	x	x	x
T2 sensor	x	x	x	x	√	√	x	√	x
T2B sensor	x	x	x	x	x	x	x	x	x
T2A sensor	x	x	x	x	x	x	x	x	x
Magnet ring	x	√	x	x	x	x	x	x	x
Compressor	x	x	x	x	x	x	x	x	x
Additional refrigerant	x	x	x	x	x	√	√	√	x
Water-level switch	x	x	x	x	x	x	x	√	x
Water pump	x	x	x	x	x	x	x	√	x
Display board	x	x	x	x	x	x	x	x	√

Part requiring replacement	EC54	EC51	EC52	EC53	EC56	EC07	PC00	PC01	PC02	PC04	PC03	FHCC/ EHC3
Indoor PCB	x	x	x	x	x	x	x	x	x	x	x	√
Outdoor PCB	√	√	√	√	√	√	√	√	√	√	√	x
Outdoor fan motor	x	x	x	x	x	√	√	x	√	√	x	x
T3 sensor	x	x	√	x	x	x	x	x	x	x	x	x
T4 sensor	x	x	x	√	x	x	x	x	x	x	x	x
TP sensor	√	x	x	x	x	x	x	x	x	x	x	x
T2B sensor	x	x	x	x	√	x	x	x	x	x	x	x
Refrigerant sensor	x	x	x	x	x	x	x	x	x	x	x	√
Reactor sensor	x	x	x	x	x	x	x	√	x	x	x	x
Compressor	x	x	x	x	x	x	√	x	x	√	x	x
IPM module board	x	x	x	x	x	x	√	√	√	√	x	x
Pressure protector	x	x	x	x	x	x	x	x	x	x	√	x
Additional refrigerant	x	x	x		x	x	x	x	x	x	√	x

6. Troubleshooting by Error Code

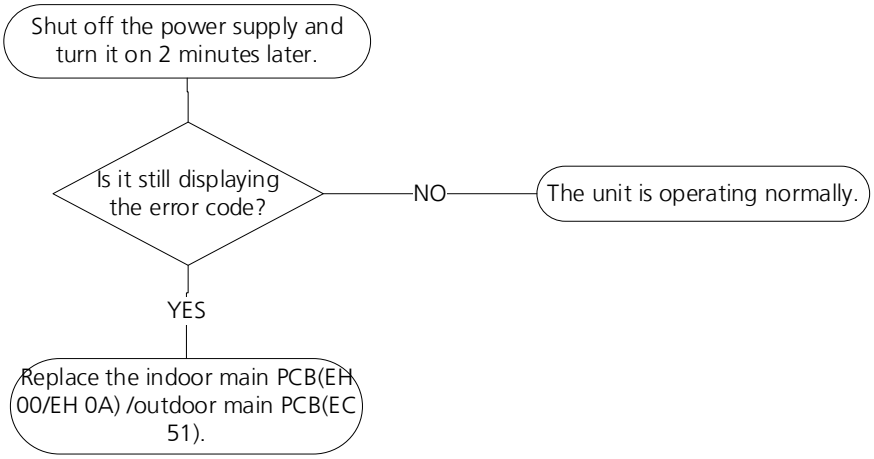
6.1 EH00/ EH0A / EC51 (EEPROM Malfunction Error Diagnosis and Solution)

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

Recommended parts to prepare:

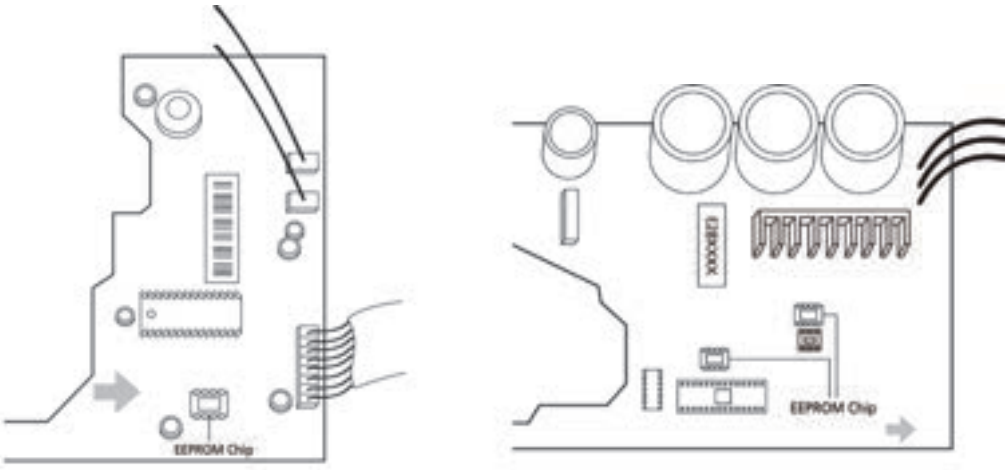
- Indoor PCB
- Outdoor PCB

Troubleshooting and repair:



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:



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 EC51.

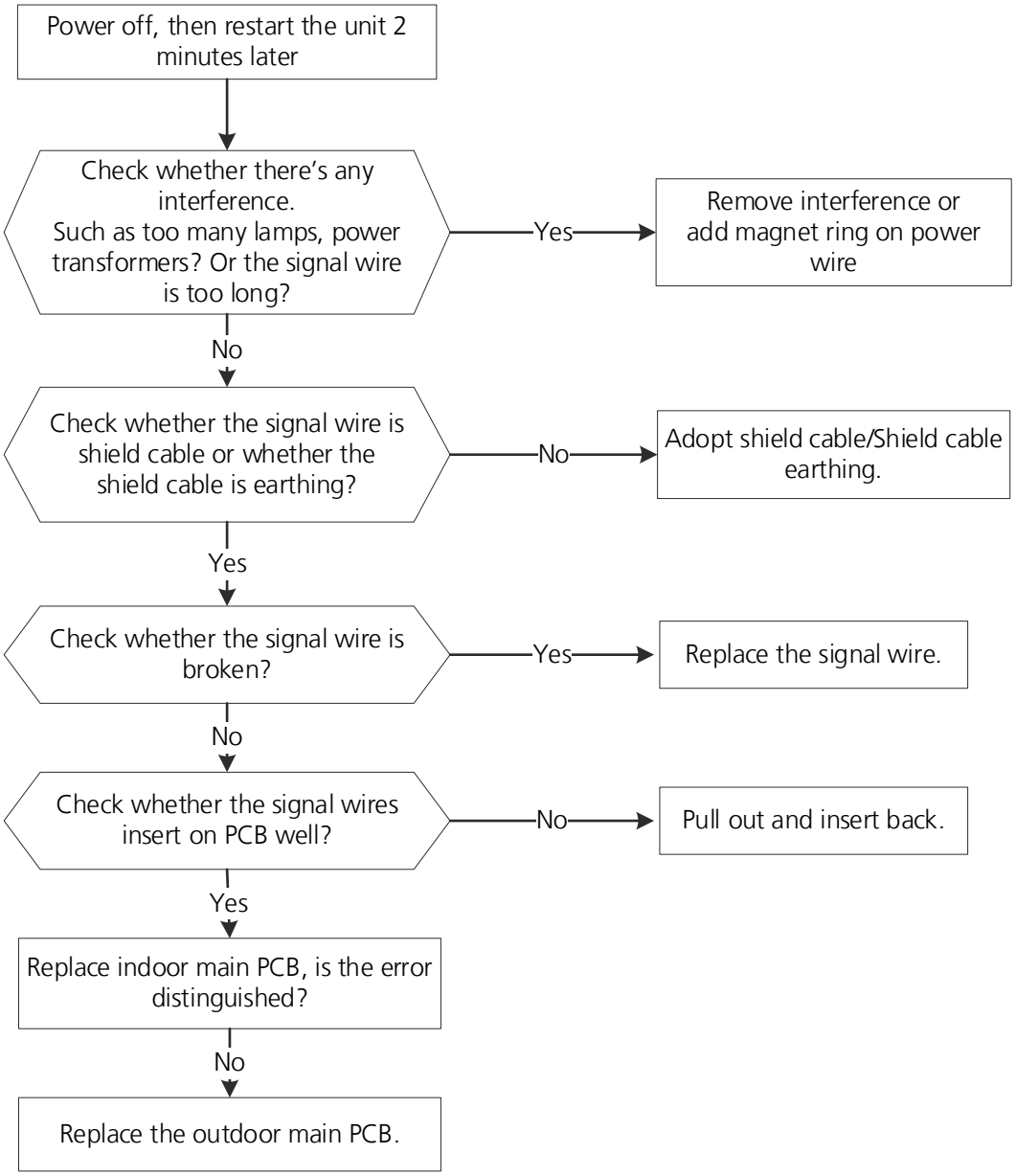
6.2 EL01 (Indoor and Outdoor Unit Communication Error Diagnosis and Solution)

Description: Indoor unit can not communicate with outdoor unit

Recommended parts to prepare:

- Signal wires
- Magnet ring
- Indoor PCB
- Outdoor PCB

Troubleshooting and repair:



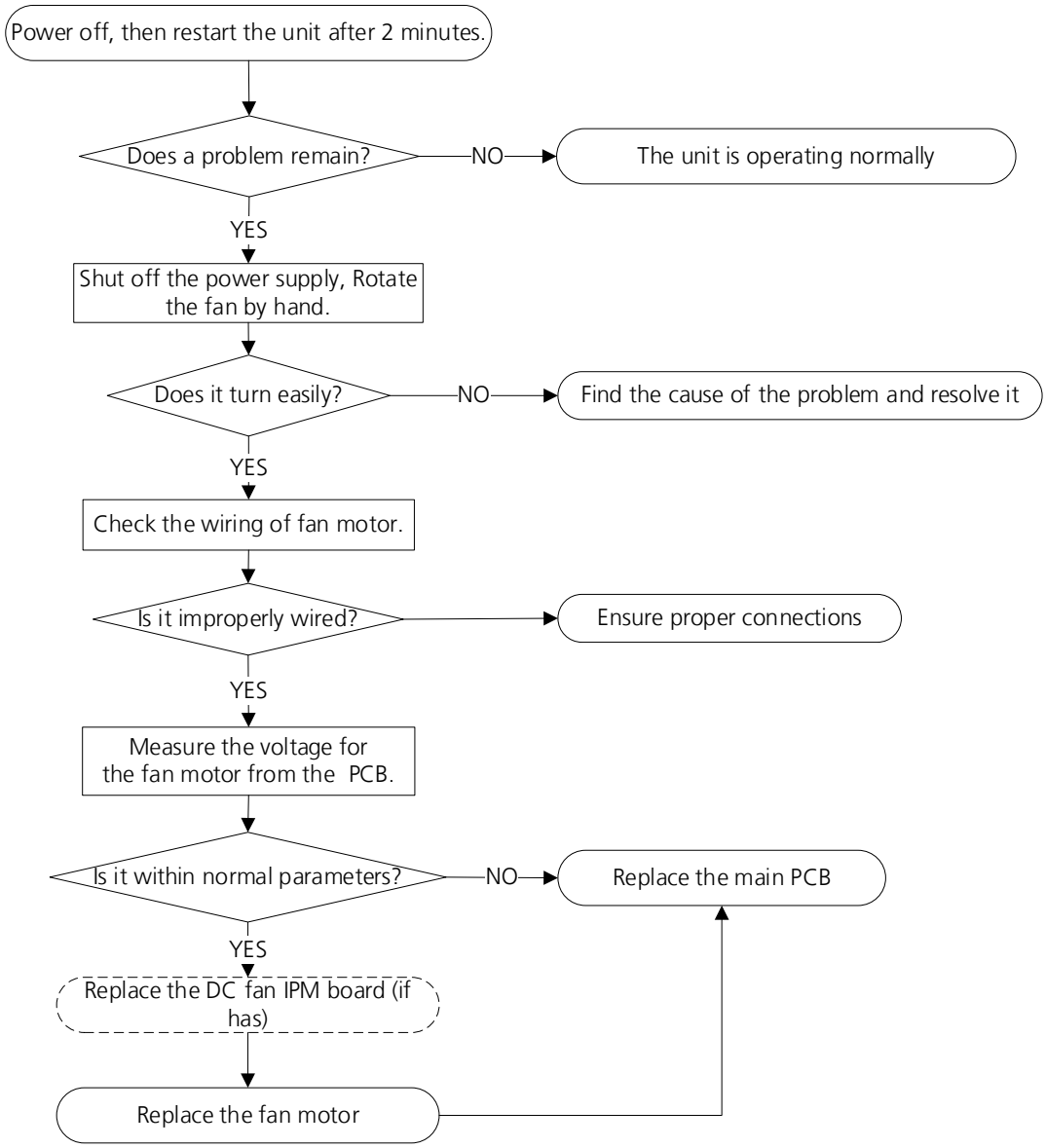
6.3 EH03 / EC07 (Fan Speed Is Operating Outside of Normal Range Diagnosis and Solution)

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

Recommended parts to prepare:

- Connection wires
- Fan assembly
- Fan motor
- PCB

Troubleshooting and repair:

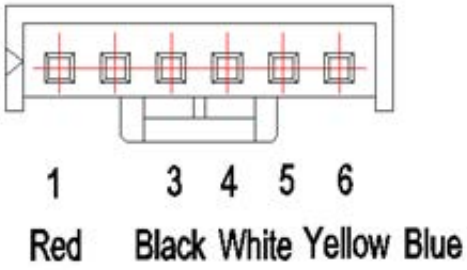


Index:

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

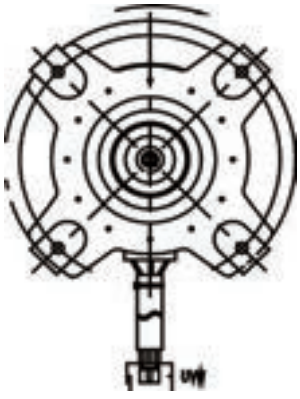
Power on and when the unit is in standby, measure the voltage of pin1-pin3, pin4-pin3 in fan motor connector. If the value of the voltage is not in the range showing in below table, the PCB must has problems and need to be replaced.

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



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 resistance is not equal to each other, the fan motor must has problems and need to be replaced. otherwise the PCB must has problems and need to be replaced.



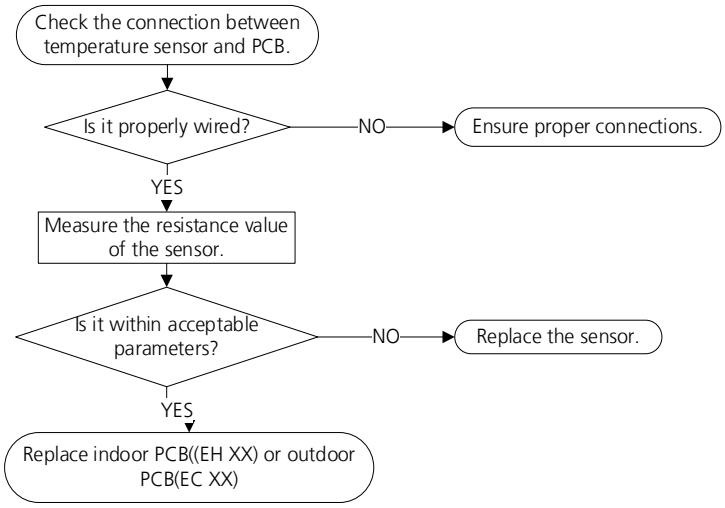
6.4 EH60/EH61/EC53/EC52/EC54/EC56 (Open Circuit or Short Circuit of Temperature Sensor Diagnosis and Solution)

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:





This picture and the value are only for reference, actual appearance and value may vary

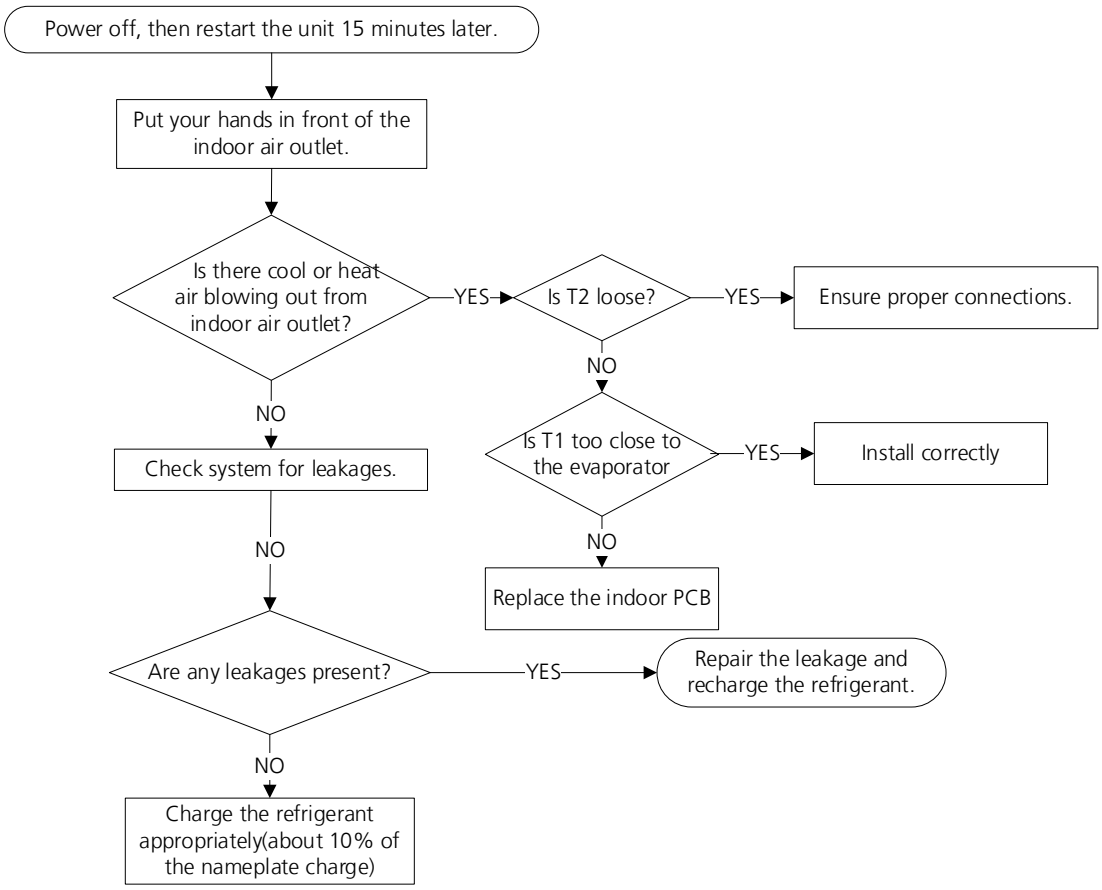
6.5 EL0C (System lacks refrigerant Diagnosis and Solution)

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:

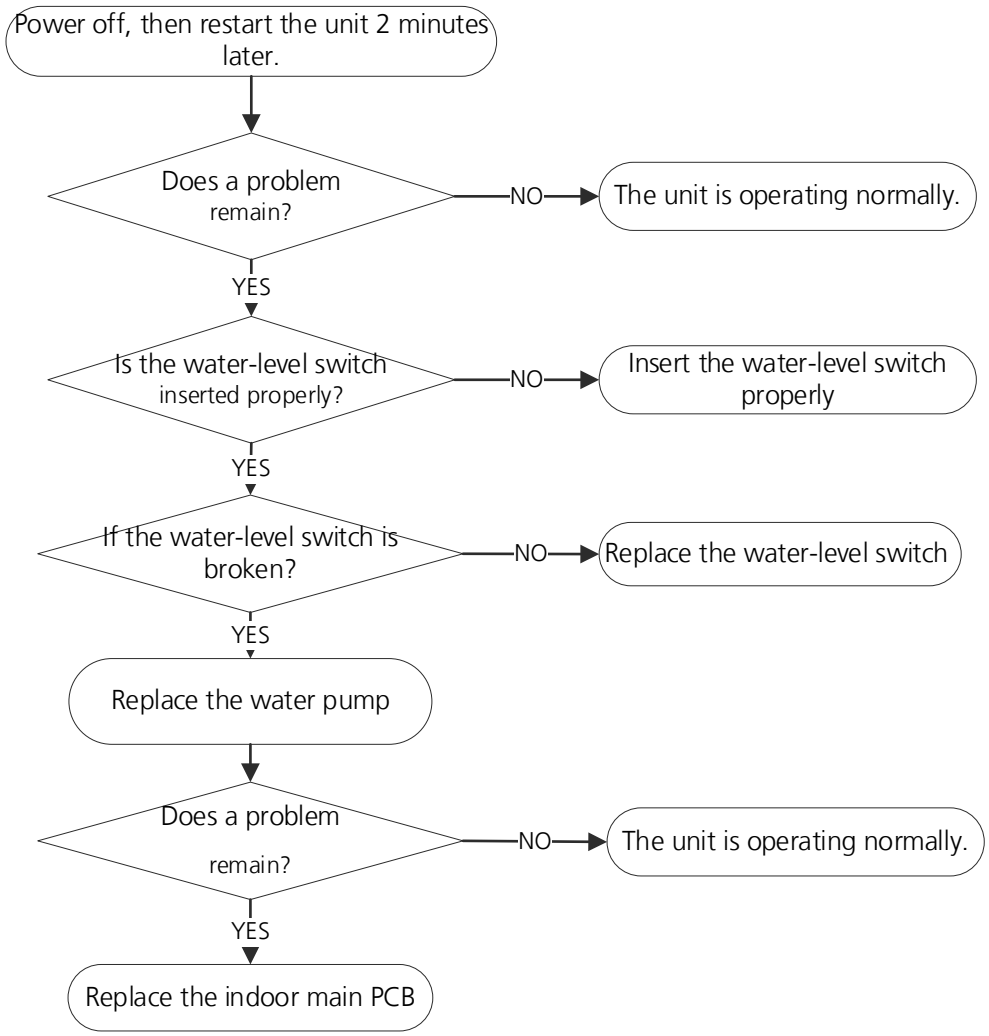


6.6 EH0E(Water-Level Alarm Malfunction Diagnosis and Solution)

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



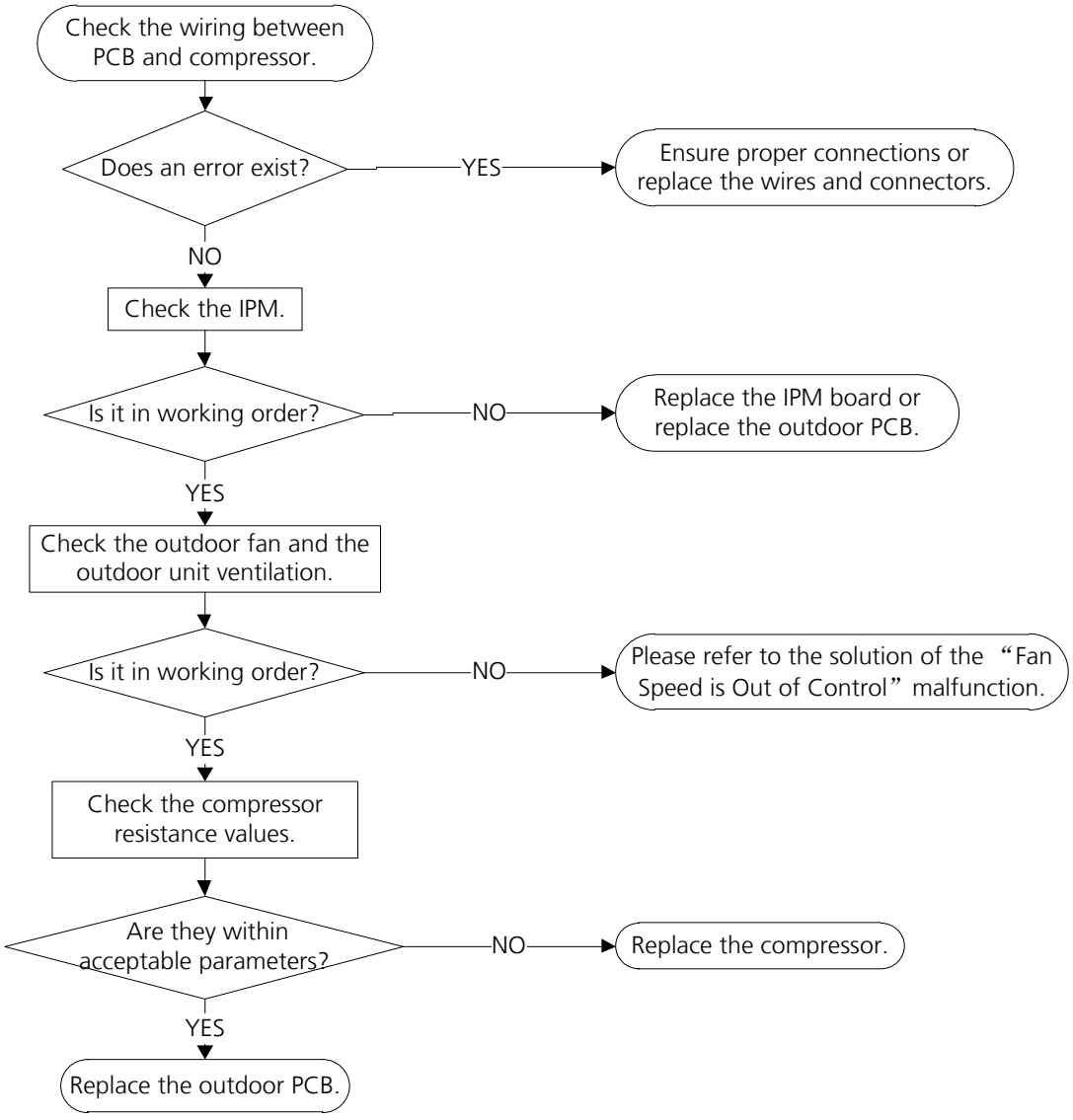
6.7 PC00(ODU IPM module protection Diagnosis and Solution)

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

Recommended parts to prepare:

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

Troubleshooting and repair:



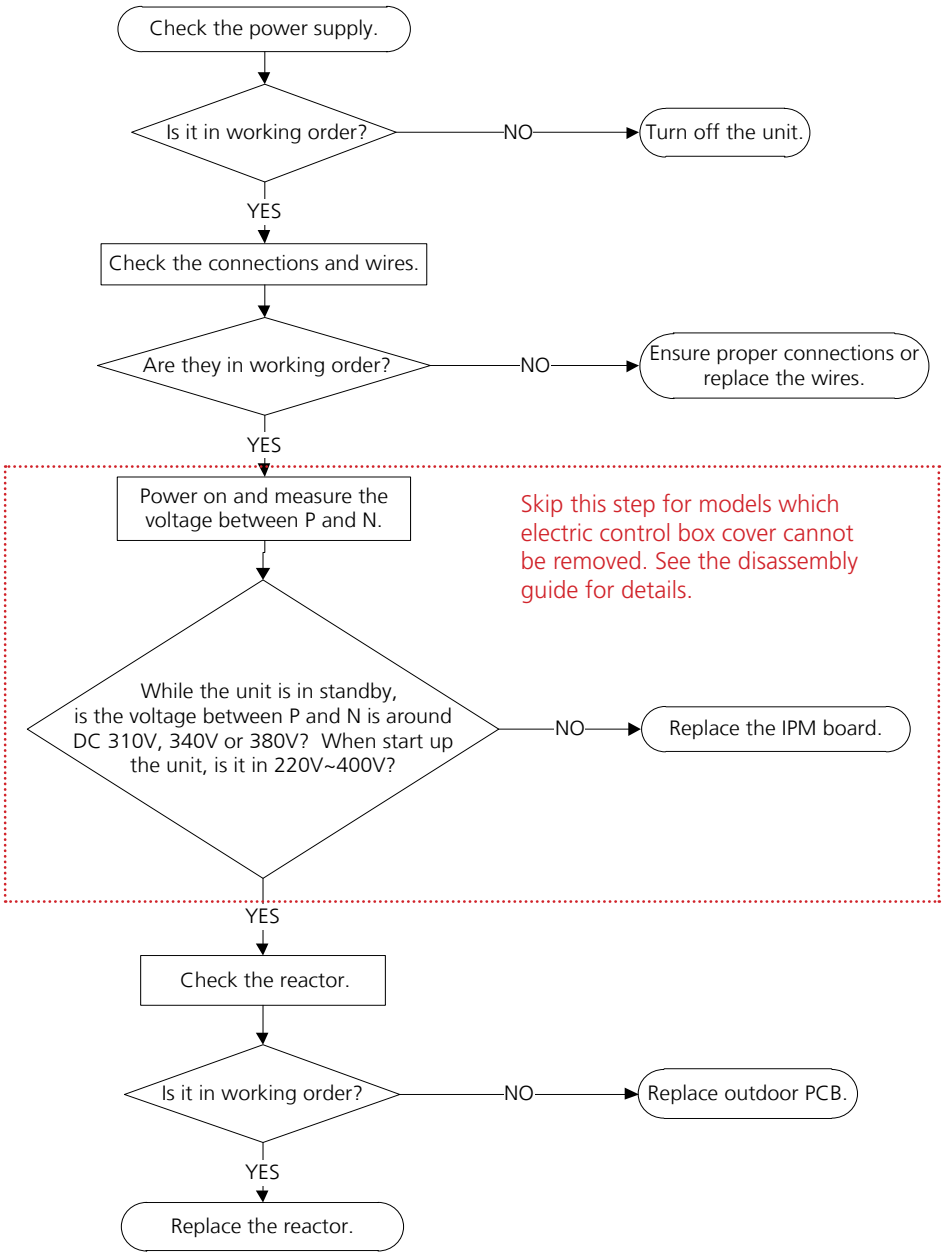
6.8 PC01(ODU voltage protection Diagnosis and Solution)

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:



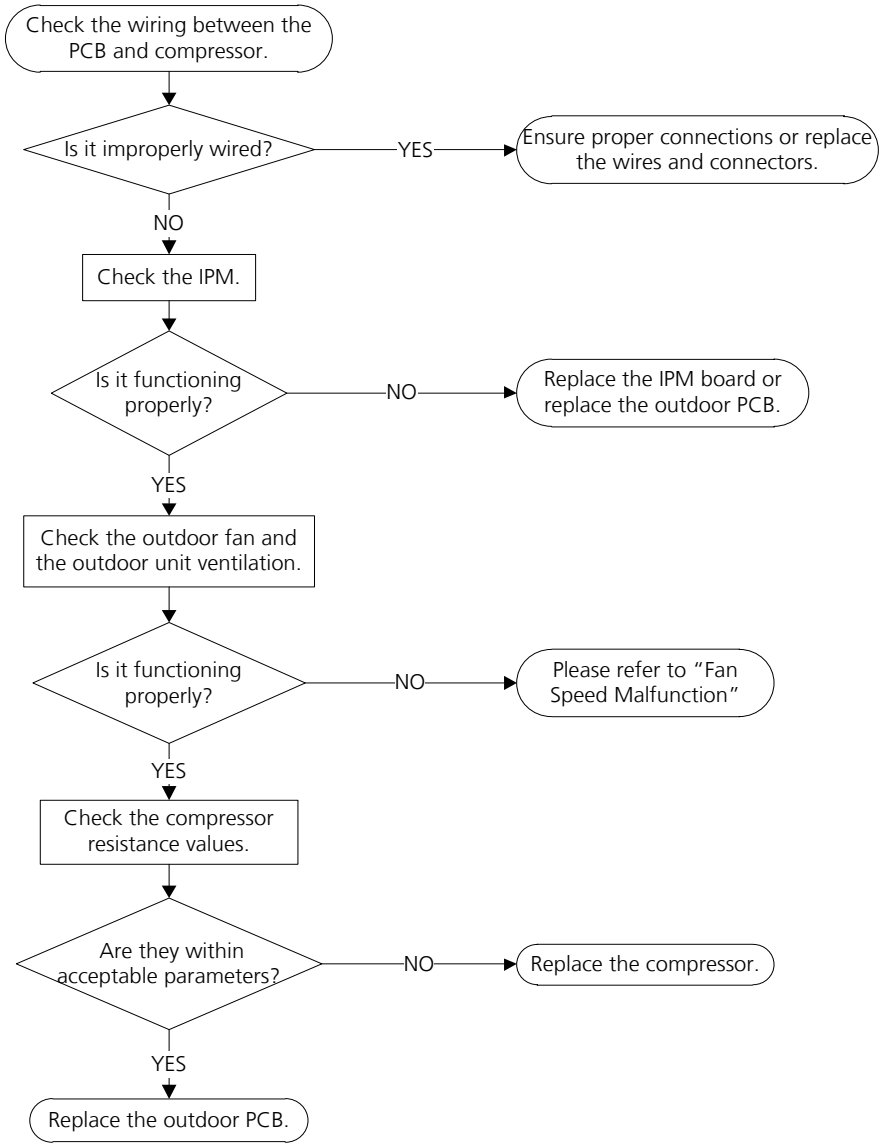
6.9 PC04(Inverter compressor drive error Diagnosis and Solution)

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:

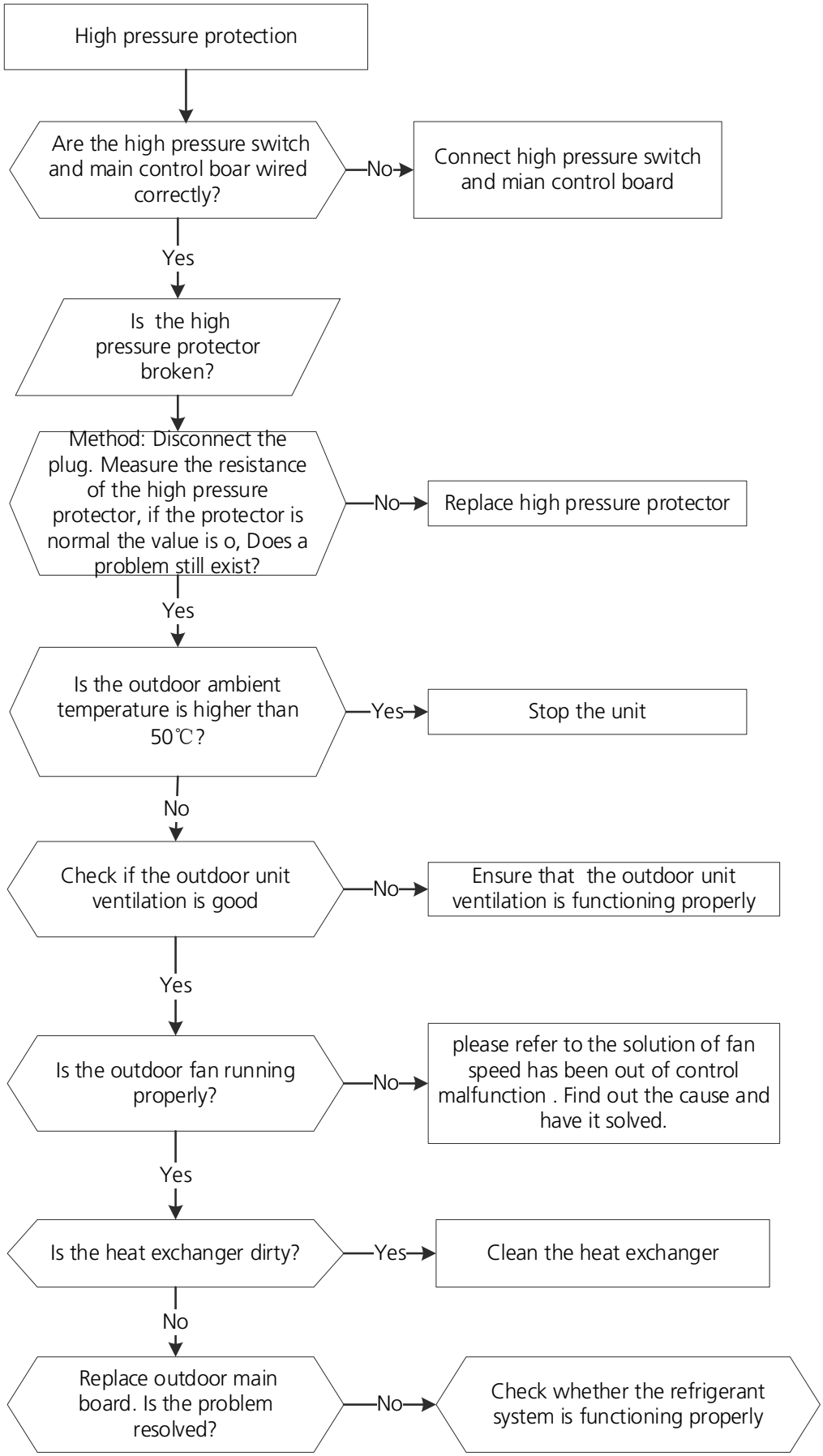


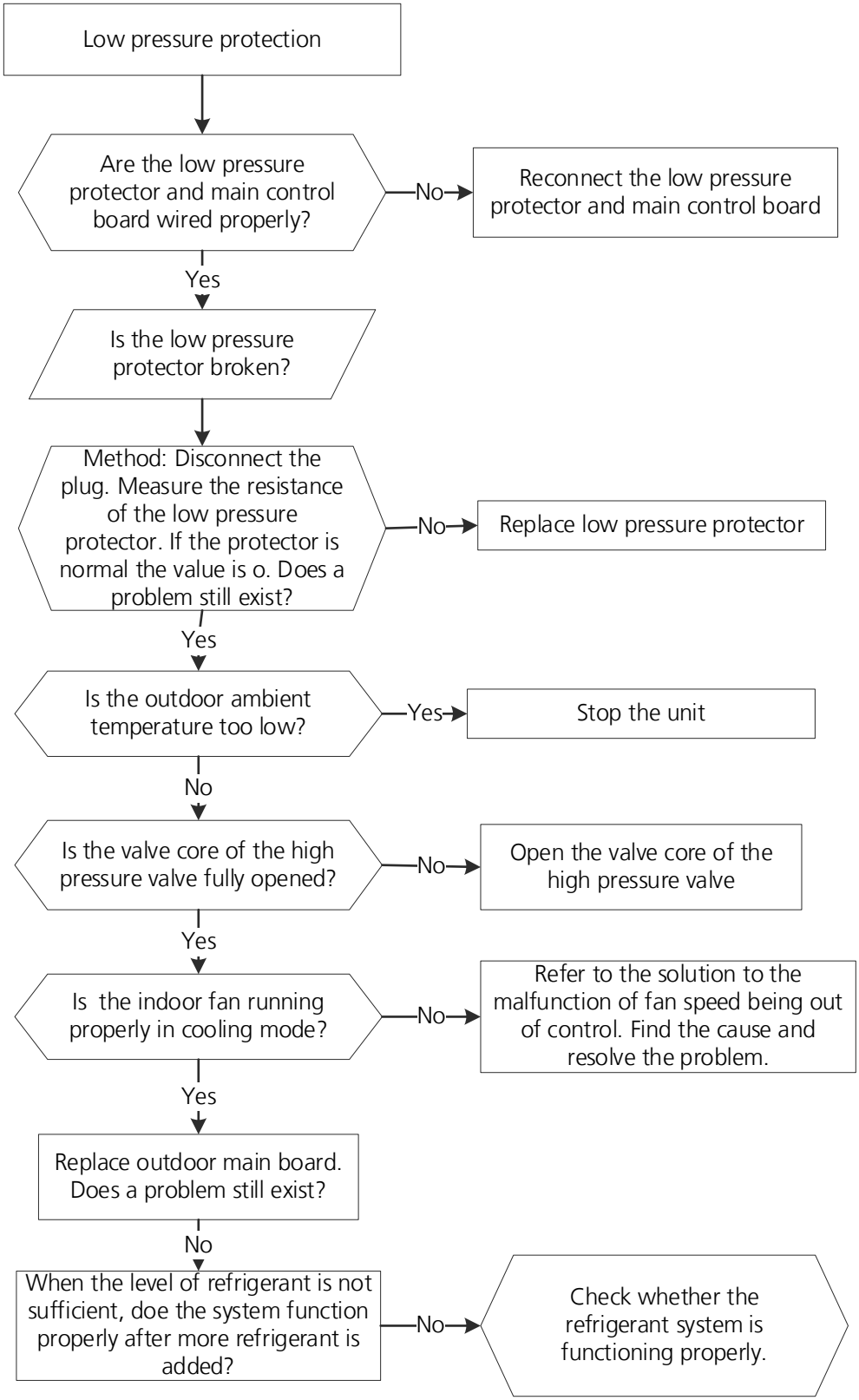
6.10 PC03(Pressure protection(low or high pressure) Diagnosis and Solution)

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:


High pressure protection
Are the high pressure switch and main control boar wired correctly?
No
Connect high pressure switch and mian control board
Yes
Is the high pressure protector broken?
Method: Disconnect the plug. Measure the resistance of the high pressure protector, if the protector is normal the value is o, Does a problem still exist?
No
Replace high pressure protector
Yes
Is the outdoor ambient temperature is higher than 50℃?
Yes
Stop the unit
No
Check if the outdoor unit ventilation is good
No
Ensure that the outdoor unit ventilation is functioning properly
Yes
Is the outdoor fan running properly?
No
please refer to the solution of fan speed has been out of control malfunction . Find out the cause and have it solved.
Yes
Is the heat exchanger dirty?
Yes
Clean the heat exchanger
No
Replace outdoor main board. Is the problem resolved?
No
Check whether the refrigerant system is functioning properly


Low pressure protection
Are the low pressure protector and main control board wired properly?
No
Reconnect the low pressure protector and main control board
Yes
Is the low pressure protector broken?
Method: Disconnect the plug. Measure the resistance of the low pressure protector. If the protector is normal the value is o. Does a problem still exist?
No
Replace low pressure protector
Yes
Is the outdoor ambient temperature too low?
Yes
Stop the unit
No
Is the valve core of the high pressure valve fully opened?
No
Open the valve core of the high pressure valve
Yes
Is the indoor fan running properly in cooling mode?
No
Refer to the solution to the malfunction of fan speed being out of control. Find the cause and resolve the problem.
Yes
Replace outdoor main board. Does a problem still exist?
No
When the level of refrigerant is not sufficient, doe the system function properly after more refrigerant is added?
No
Check whether the refrigerant system is functioning properly.

6.11 PC02(Compressor top (or IPM) temp. protection diagnosis and solution)

Description: For some models with overload protection, If the sampling voltage is not 5V, the LED will display the failure.

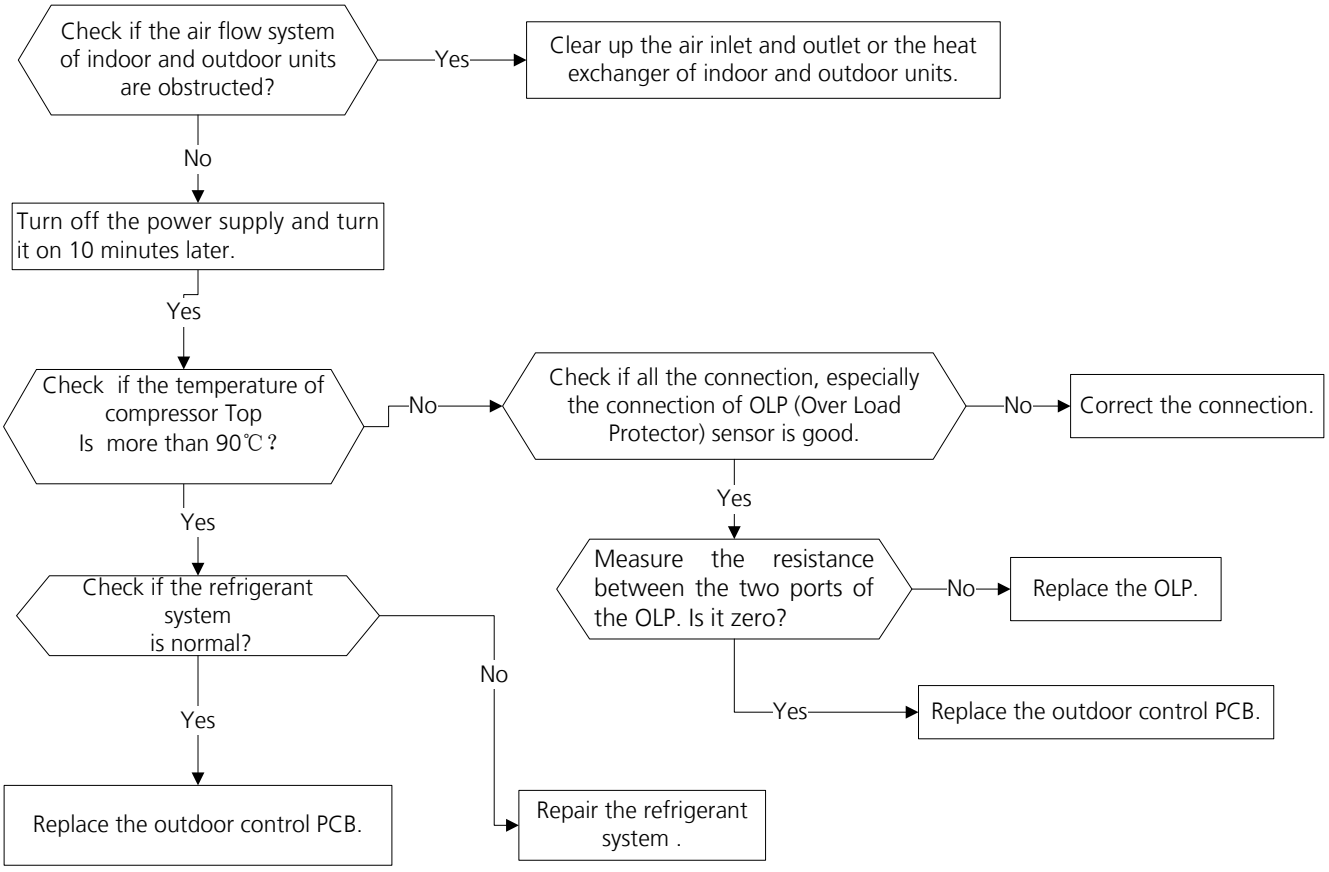
If the temperature of IPM module is higher than a certain value, the LED displays the failure code.

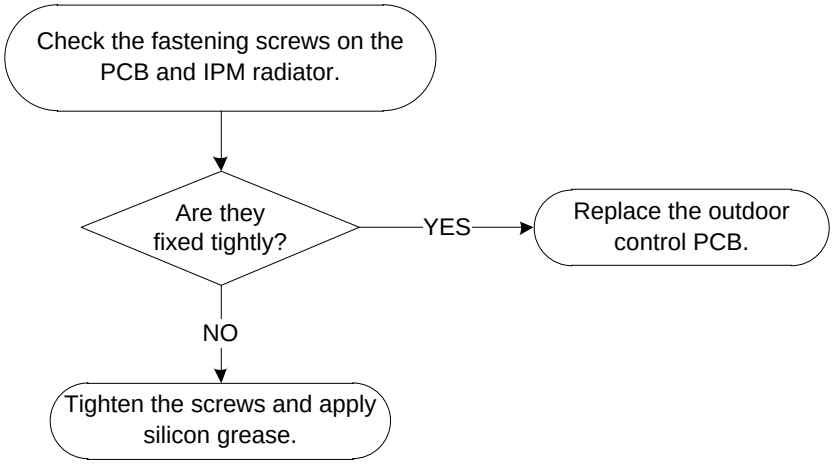
Models without overload protector should be diagnosed according to the second flowchart.

Recommended parts to prepare:

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

Troubleshooting and repair:





6.12 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.

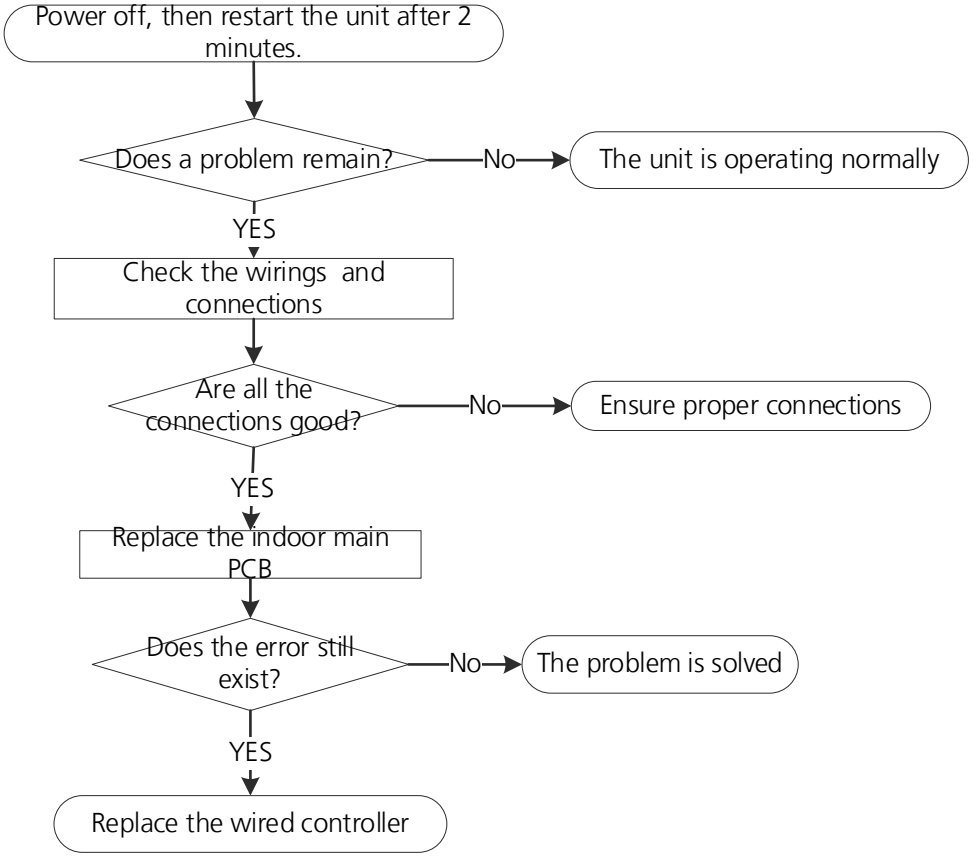
6.13 EHb3 (Communication malfunction between wire and master control) Diagnosis and Solution

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:



6.14 EHbA(Communication malfunction between indoor unit and 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

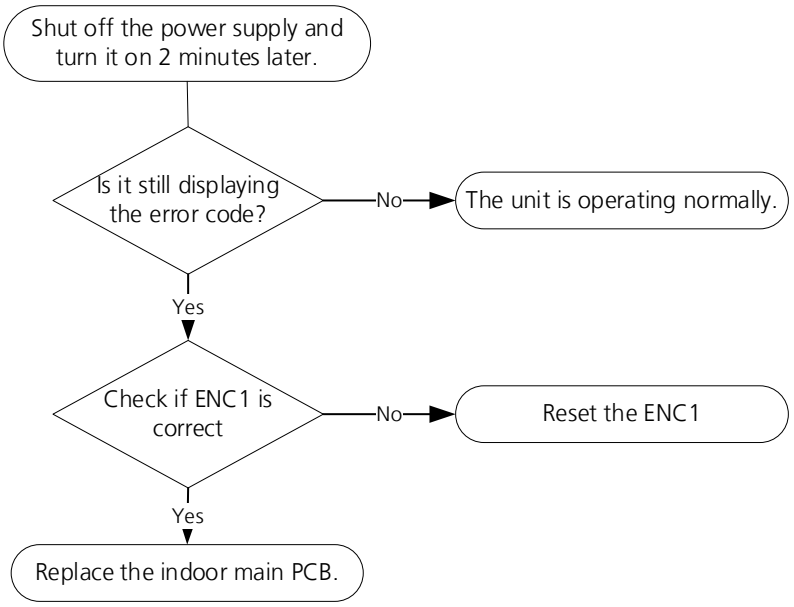
Description: Indoor unit does not receive the feedback from external fan module during 150 seconds.

or Indoor unit receives abnormal increases or decreases in voltage from external fan module.

Recommended parts to prepare:

- Indoor main PCB

Troubleshooting and repair:



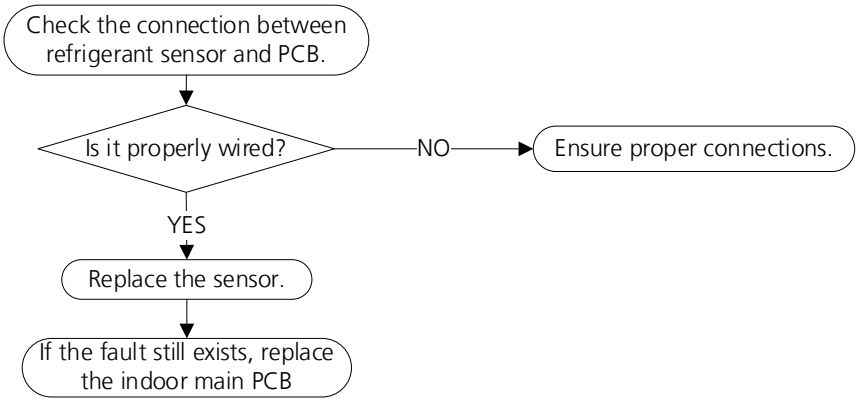
6.15 FHCC(Refrigerant sensor error) or EHC3(Refrigerant sensor is out of range) diagnosis and solution

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:



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

Description:

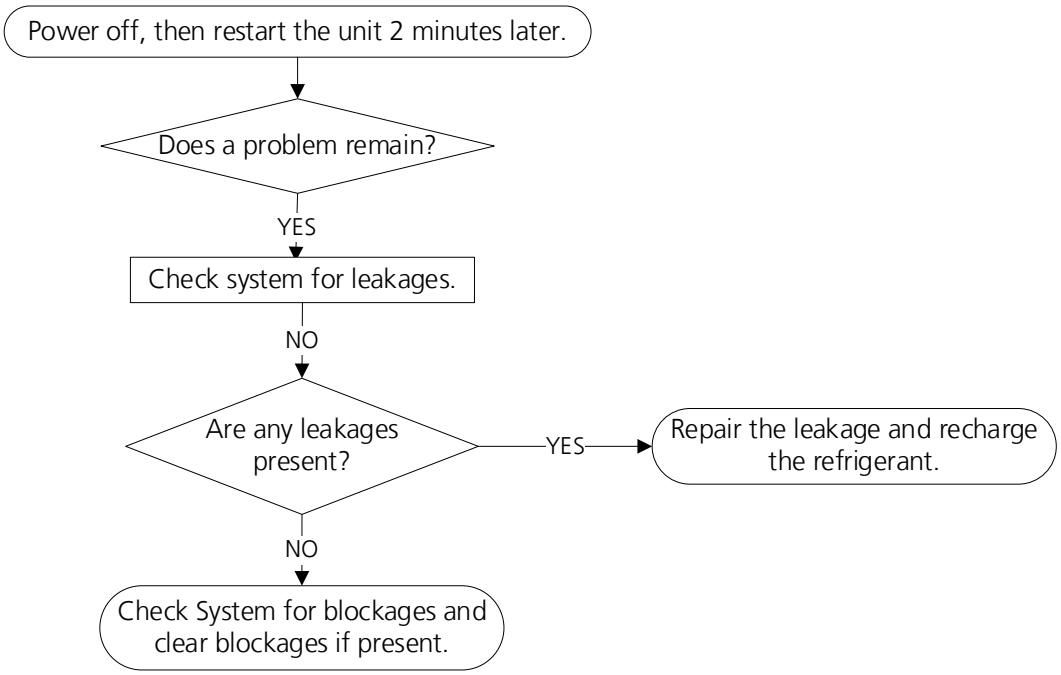
The refrigerant sensor detects a concentration higher than or equal to 10%*LFL for 10 seconds or the refrigerant sensor detects a concentration higher than or equal to 20%*LFL or the multi model receives the refrigerant leakage protection fault sent by the outdoor unit.

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:



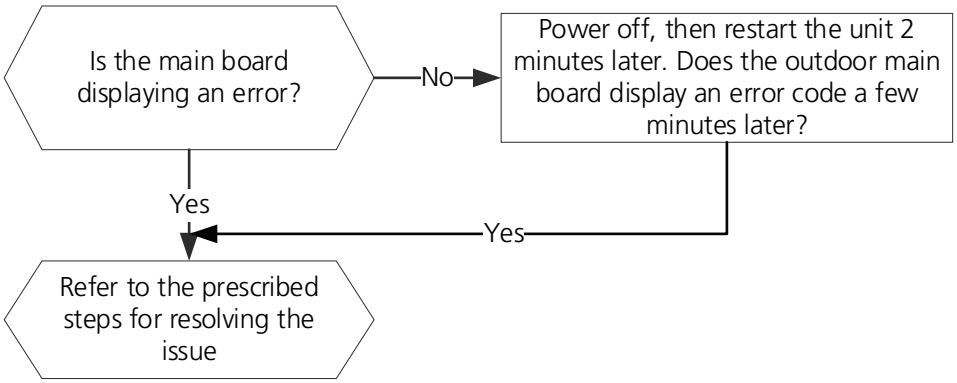
6.17 EC0d(ODU malfunction Diagnosis and Solution)

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

Recommended parts to prepare:

- Outdoor unit

Troubleshooting and repair:



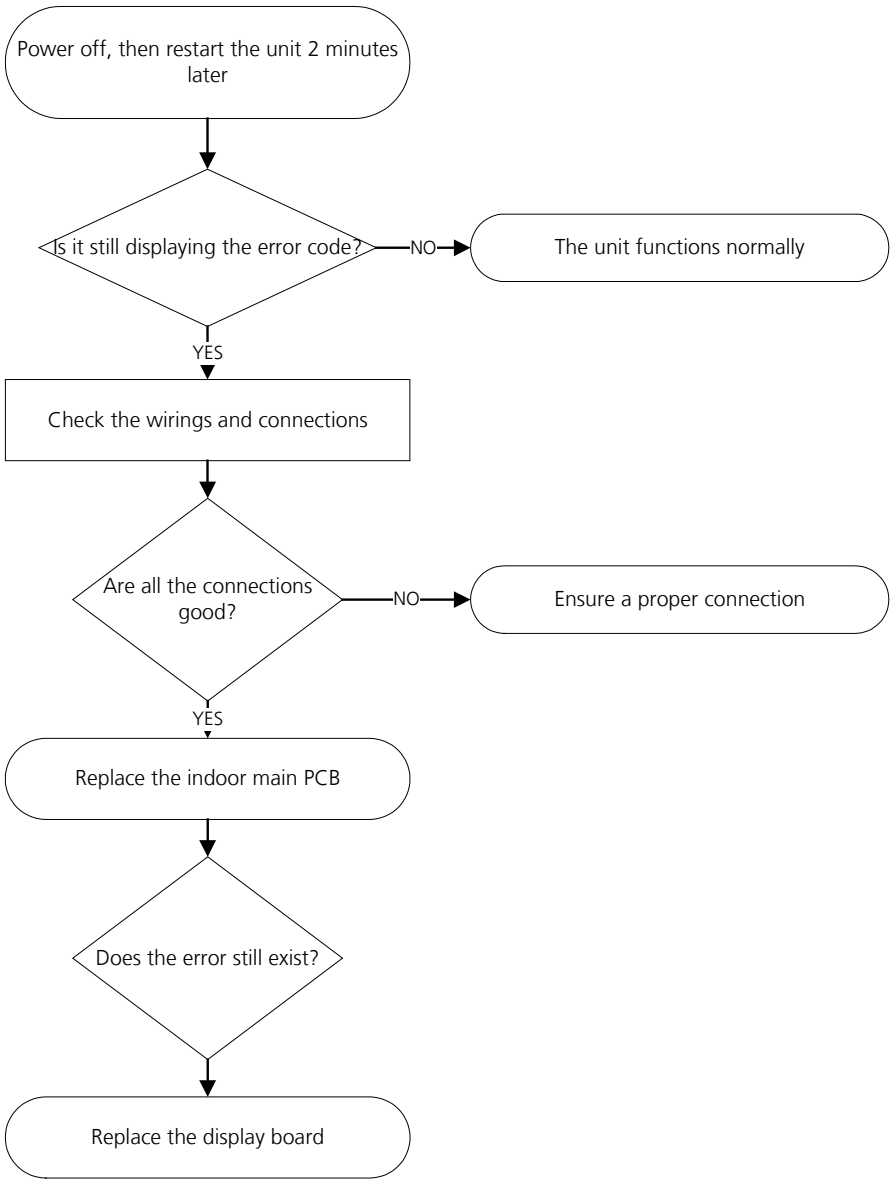
6.18 EH0b(IDU main control board and display board communication error diagnosis and solution)

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

Recommended parts to prepare:

- Communication wire
- Indoor PCB
- Display board

Troubleshooting and repair:



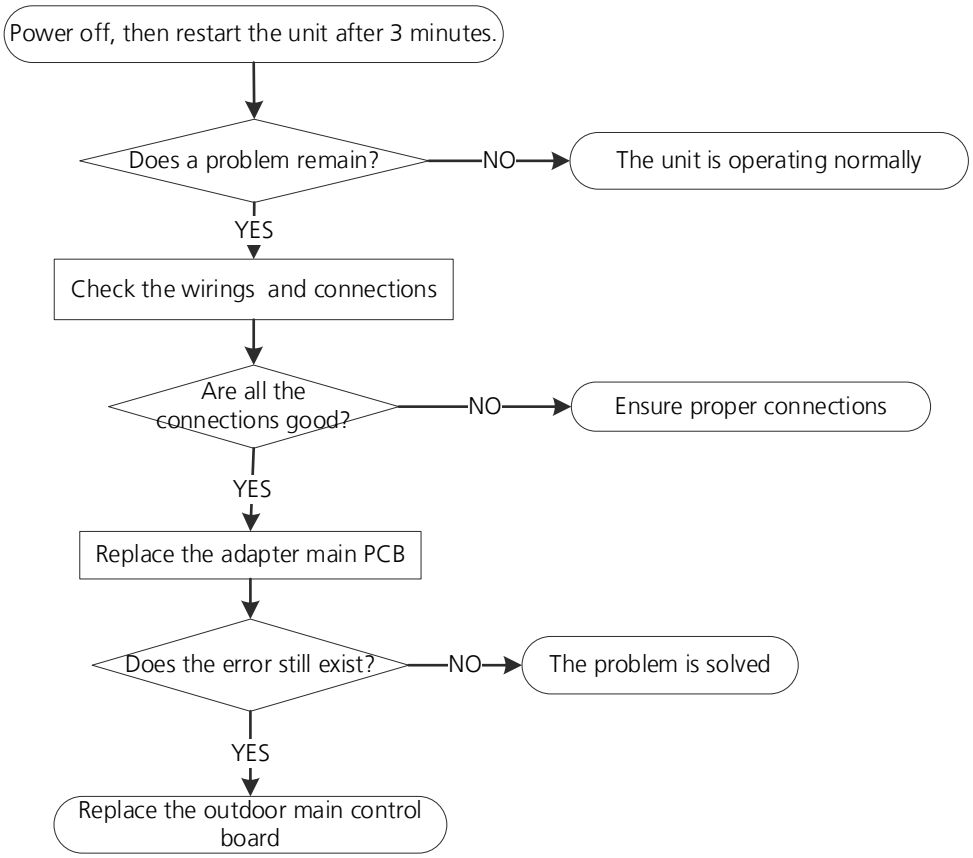
6.19 EL16(Communication malfunction between adapter board and outdoor main board diagnosis and solution)

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

Recommended parts to prepare:

- Connection wires
- Adapter board
- Outdoor main PCB

Troubleshooting and repair:



6.20 FL09(Mismatch between the new and old platforms diagnosis and solution)

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

7. Check Procedures

7.1 Temperature Sensor Check

WARNING

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

1. Disconnect 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 Chapter 8. Appendix).



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

Appendix

Contents

i) Temperature Sensor Resistance Value Table for TP (°C --K) 2

ii) Other Temperature Sensors Resistance Value Table (°C – K) 3

iii) Pressure On Service Port 4

iV) System Pressure Table 6

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

°C	°F	K Ohm	°C	°F	K Ohm	°C	°F	K Ohm	°C	°F	K Ohm
°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			

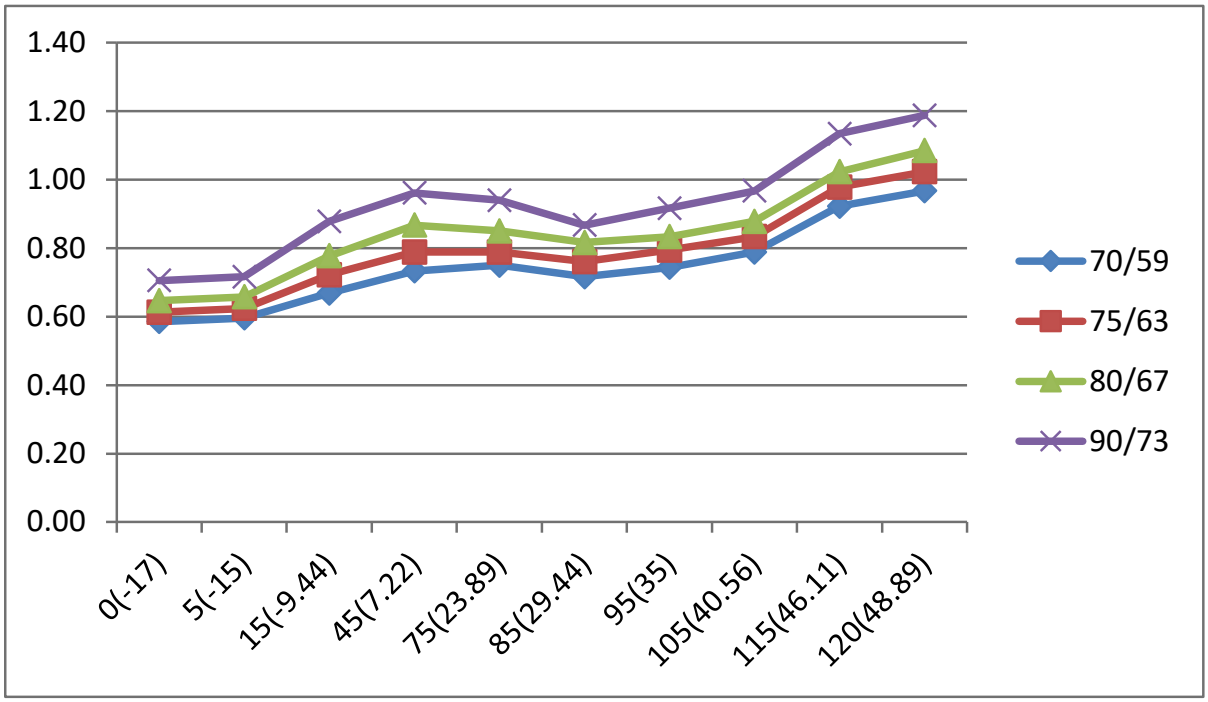
ii) Other Temperature Sensors Resistance Value Table (°C – K)

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

iii) Pressure On Service Port

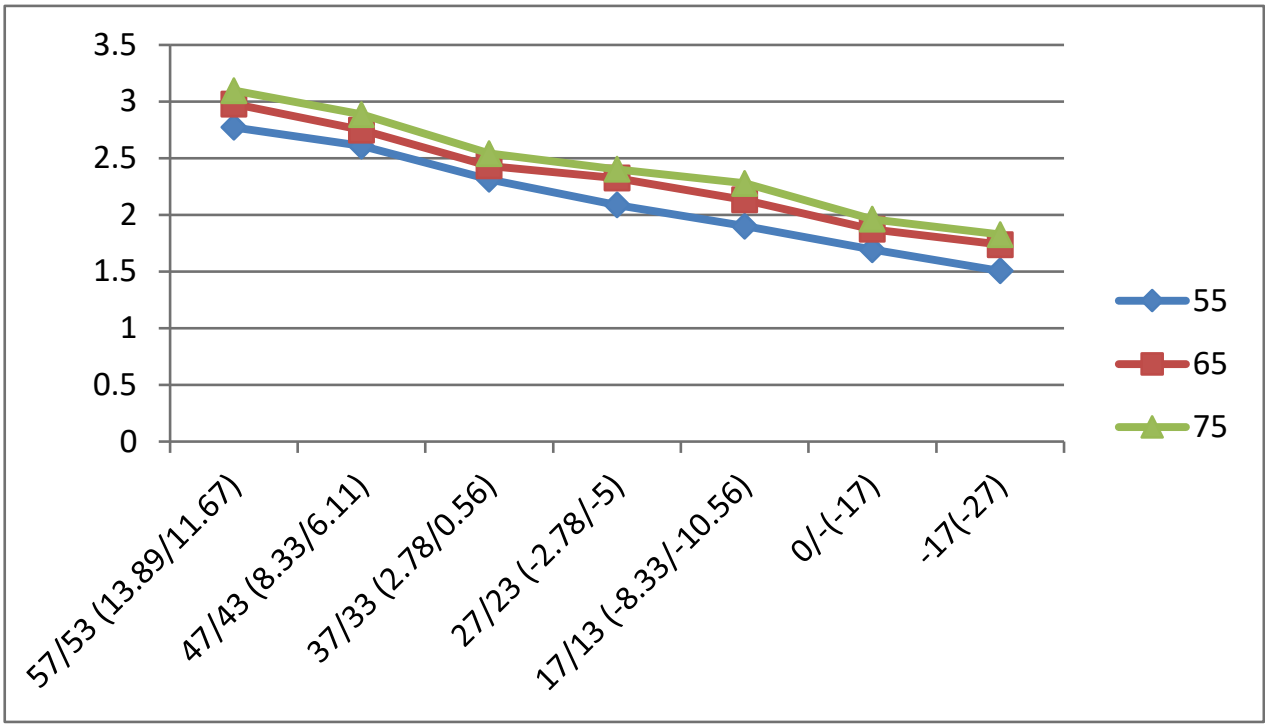
Cooling chart(R454B):

°F(°C)	ODU(DB) / IDU(DB/WB)	0(-17)	5(-15)	15 (-9.44)	45 (7.22)	75 (23.89)	85 (29.44)	95 (35)	105 (40.56)	115 (46.11)	120 (48.89)
BAR	70/59 (21.11/15)	5.9	6.0	6.7	7.3	7.5	7.2	7.4	7.9	9.2	9.7
	75/63 (23.89/17.22)	6.1	6.2	7.2	7.9	7.9	7.6	7.9	8.3	9.8	10.2
	80/67 (26.67/19.44)	6.5	6.6	7.8	8.7	8.5	8.2	8.3	8.8	10.2	10.8
	90/73 (32.22/22.78)	7.1	7.2	8.8	9.6	9.4	8.7	9.2	9.7	11.3	11.9
PSI	70/59 (21.11/15)	85	86	97	106	109	104	108	114	134	140
	75/63 (23.89/17.22)	89	90	105	114	114	110	115	121	142	148
	80/67 (26.67/19.44)	94	95	113	126	123	118	121	127	148	157
	90/73 (32.22/22.78)	102	104	127	139	136	126	133	140	164	172
MPa	70/59 (21.11/15)	0.59	0.60	0.67	0.73	0.75	0.72	0.74	0.79	0.92	0.97
	75/63 (23.89/17.22)	0.61	0.62	0.72	0.79	0.79	0.76	0.79	0.83	0.98	1.02
	80/67 (26.67/19.44)	0.65	0.66	0.78	0.87	0.85	0.82	0.83	0.88	1.02	1.08
	90/73 (32.22/22.78)	0.71	0.72	0.88	0.96	0.94	0.87	0.92	0.97	1.13	1.19



Heating chart(R454B):

°F(°C)	ODU(DB/WB) / IDU(DB)	57/53 (13.89/11.67)	47/43 (8.33/6.11)	37/33 (2.78/0.56)	27/23 (-2.78/-5)	17/13 (-8.33/-10.56)	0/- (-17)	-17 (-27)
BAR	55(12.78)	27.7	26.1	23.1	20.9	19.0	16.9	15.1
	65(18.33)	29.8	27.5	24.3	23.2	21.3	18.7	17.4
	75(23.89)	31.0	28.8	25.4	24.0	22.8	19.6	18.3
PSI	55(12.78)	402	378	335	303	275	245	218
	65(18.33)	432	398	352	337	309	271	252
	75(23.89)	449	418	368	348	330	284	265
MPa	55(12.78)	2.77	2.61	2.31	2.09	1.90	1.69	1.51
	65(18.33)	2.98	2.75	2.43	2.32	2.13	1.87	1.74
	75(23.89)	3.10	2.88	2.54	2.40	2.28	1.96	1.83



iV) 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
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