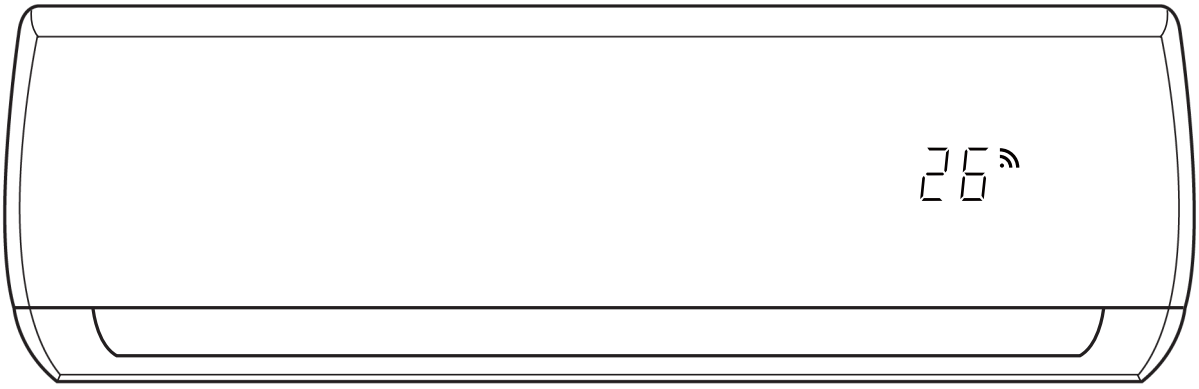
TITAN / ATLAS SERIES

SINGLE-ZONE

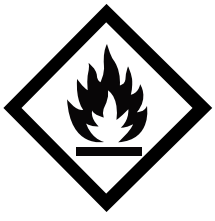


SERVICE MANUAL

MODELS:

DTS(09/12)W1A1, DTS(09/12/18/24)W2A1, DAP(06/09/12/18/24/33)W2A1 INDOOR
DTS(09/12)1H1A1, DTS(09/12/18/24)1H2A1, DAP(09/12/18/24/33)1H2A1 OUTDOOR

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.

1.1 In case of Accidents or Emergency

WARNING

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

CAUTION

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

1.2 Pre-Installation and Installation

WARNING

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

CAUTION

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

1.3 Operation and Maintenance

WARNING

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

CAUTION

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

WARNING For Using Flammable Refrigerant

1. Installation(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 authorises their competence to handle refrigerants safely in accordance with an industry recognised 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.
- Appliance shall be stored in a well ventilated area where the room size corresponds to the room area as specifiec for operation.
- Appliance shall be stored in a well ventilated area where the room size corresponds to the room area as specifiec 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.
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.
-- Any servicing shall be performed only as recommended by the manufacturer.
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. Information servicing(For flammable materials)

2.1 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.

2.2 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.

2.3 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.

2.4 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.

2.5 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.

2.6 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.

2.7 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.

2.8 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.

2.9 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.

2.10 Sealed electrical components shall be replaced

2.11 Intrinsically safe components must be replaced

2.12 Cabling

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

2.13 Detection of flammable refrigerants

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

NOTE Examples of leak detection fluids are

- bubble method,

- fluorescent method agents.

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

2.14 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.

2.15 Charging procedures

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

2.16 Decommissioning

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

- Become familiar with the equipment and its operation.
- Isolate system electrically.
- Before attempting the procedure ensure that:
  - mechanical handling equipment is available, if required, for handling refrigerant cylinders;
  - all personal protective equipment is available and being

used correctly;

- the recovery process is supervised at all times by a competent person;
- recovery equipment and cylinders conform to the appropriate standards.

- Pump down refrigerant system, if possible.
- If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
- Make sure that cylinder is situated on the scales before recovery takes place.
- Start the recovery machine and operate in accordance with manufacturer's instructions.
- Do not overfill cylinders. (No more than 80 % volume liquid charge).
- Do not exceed the maximum working pressure of the cylinder, even temporarily.
- When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
- Recovered refrigerant shall not be charged into another refrigeration system unless it has been cleaned and checked.

2.17 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.

2.18 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.

2.19 Transportation, marking and storage for units

1. Transport of equipment containing flammable refrigerants

   Compliance with the transport regulations

2. Marking of equipment using signs

   Compliance with local regulations

3. Disposal of equipment using flammable refrigerants

   Compliance with national regulations

4. Storage of equipment/appliances

The storage of equipment should be in accordance with the manufacturer's instructions.

5. Storage of packed (unsold) equipment

Storage package protection should be constructed such that mechanical damage to the equipment inside the package will not cause a leak of the refrigerant charge. The maximum number of pieces of equipment permitted to be stored together will be determined by local regulations.

Specifications

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1. Model Reference

Refer to the following table to determine the specific indoor and outdoor unit model.

Indoor Unit Model	Outdoor Unit Model	Capacity (Btu/h)	Power Supply
			115V~, 60Hz, 1Phase
DTS09W1A1	DTS091H1A1	9k Titan Series	
DTS12W1A1	DTS121H1A1	12k Titan Series	
DAP06W2A1		6k Atlas Series	208/230V~, 60Hz, 1Phase
DTS09W2A1	DTS091H2A1	9k Titan Series	
DAP09W2A1	DAP091H2A1	9k Atlas Series	
DTS12W2A1	DTS121H2A1	12k Titan Series	
DAP12W2A1	DAP091H2A1	12k Atlas Series	
DTS18W2A1	DTS181H2A1	18K Titan Series	
DAP18W2A1	DAP181H2A1	18K Atlas Series	
DTS24W2A1	DTS241H2A1	24K Titan Series	
DAP24W2A1	DAP24H2A1	24K Atlas Series	
DAP33W2A1	DAP331H2A1	33K Atlas Series	

2. Pipe Length and Drop Height

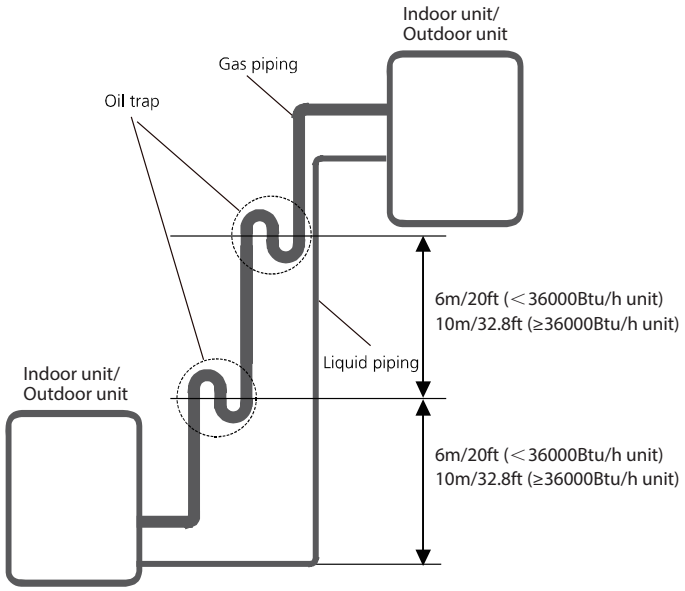
The length and elevation of connection pipe are shown in the table below. if the pipe length exceeds max pipe length, additional refrigerant should be charged to ensure nominal cooling/heating capacity.

Capacity(Btu/h)	Standard Length	Max Pipe Length	Max Elevation	Additional Refrigerant
9k/12k	7.5m (24.6ft)	25m (82.0ft)	15m (49.2ft)	15g/m (0.16oz/ft)
18k		30m (98.4ft)	20m (65.6ft)	
24k		50m (164.0ft)	25m (82.0ft)	30g/m (0.32oz/ft)
30k/33k		50m (164.0ft)	25m (82.0ft)	
36k		65m (213.3ft)	30m (98.4ft)	

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 pipe 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).

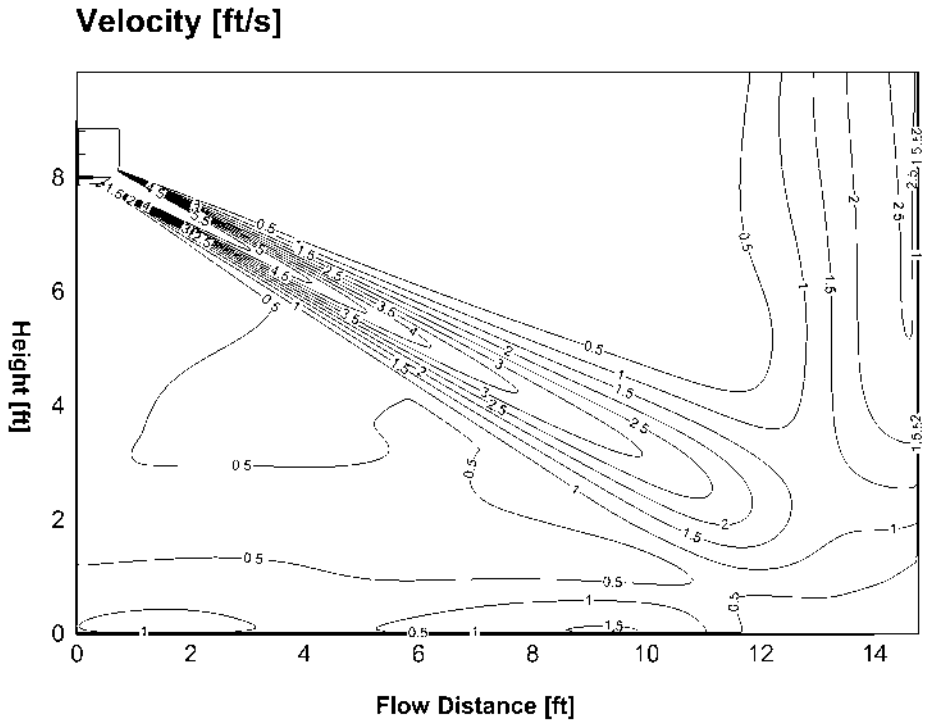


3. Air Velocity and Temperature Distributions

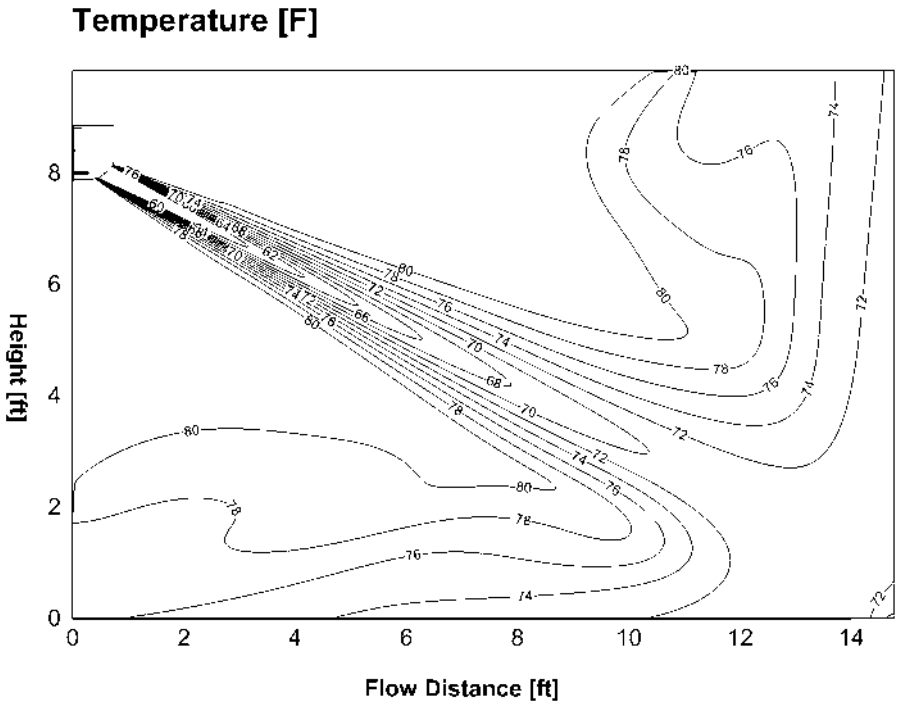
6k-Cooling(ID: 27°C/80.6°F, OD: 35°C/95°F)

Discharge Angle 27°

Airflow velocity distributions



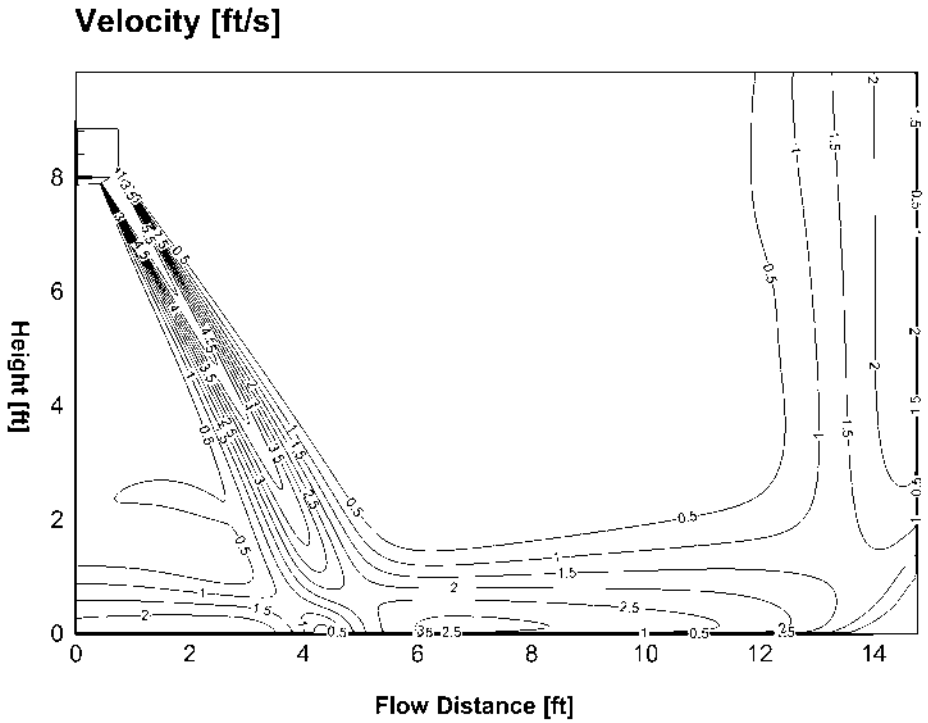
Temperature distributions



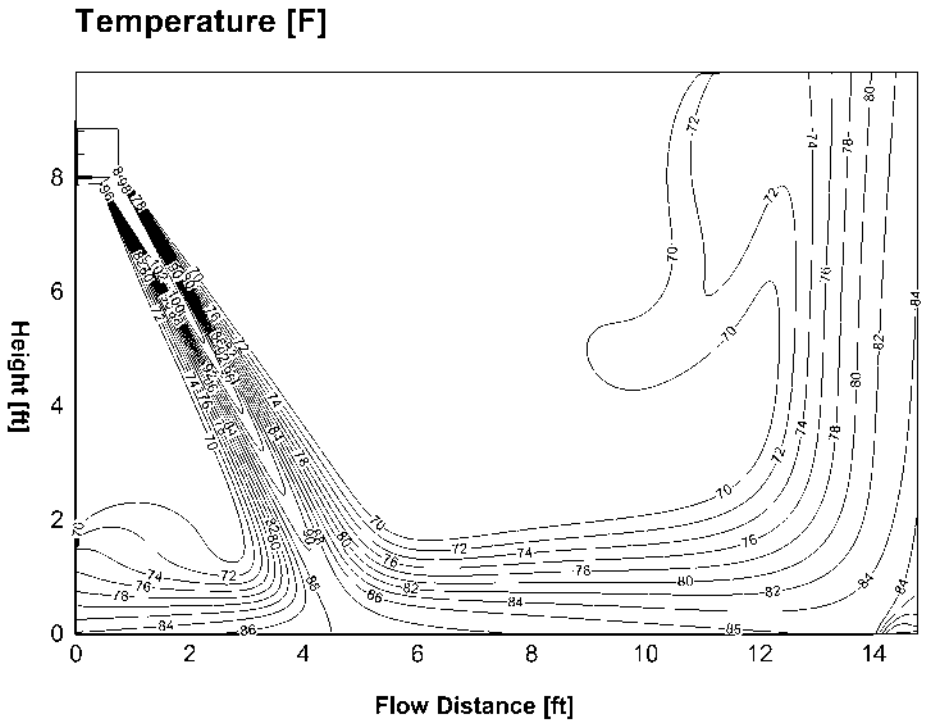
6k-Heating(ID: 20°C/68°F, OD: 7°C/44.6°F)

Discharge Angle 60°

Airflow velocity distributions



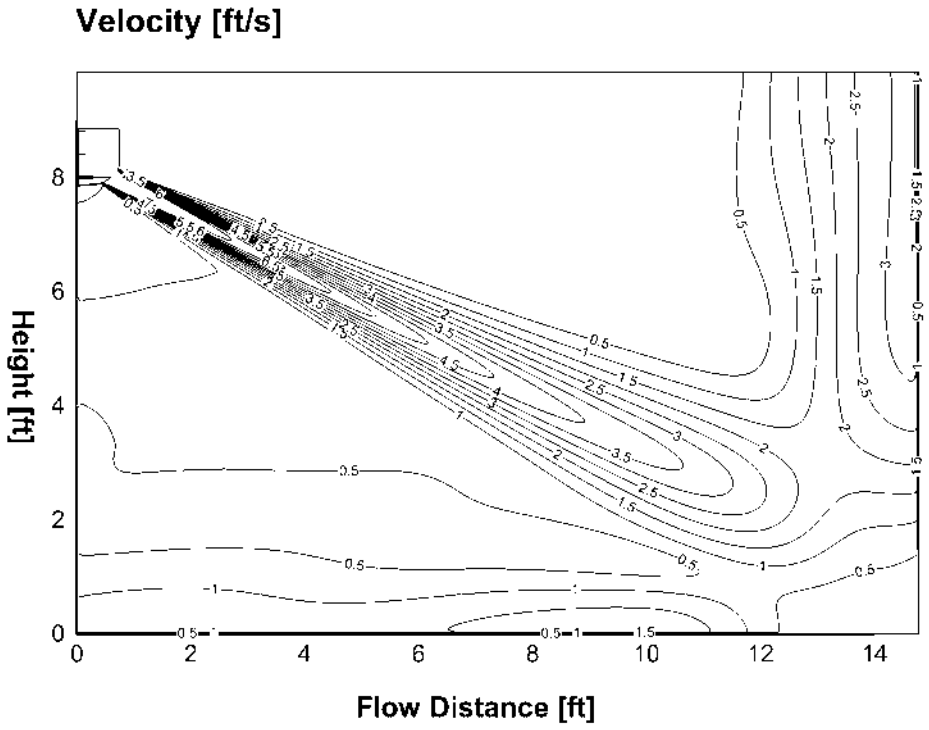
Temperature distributions



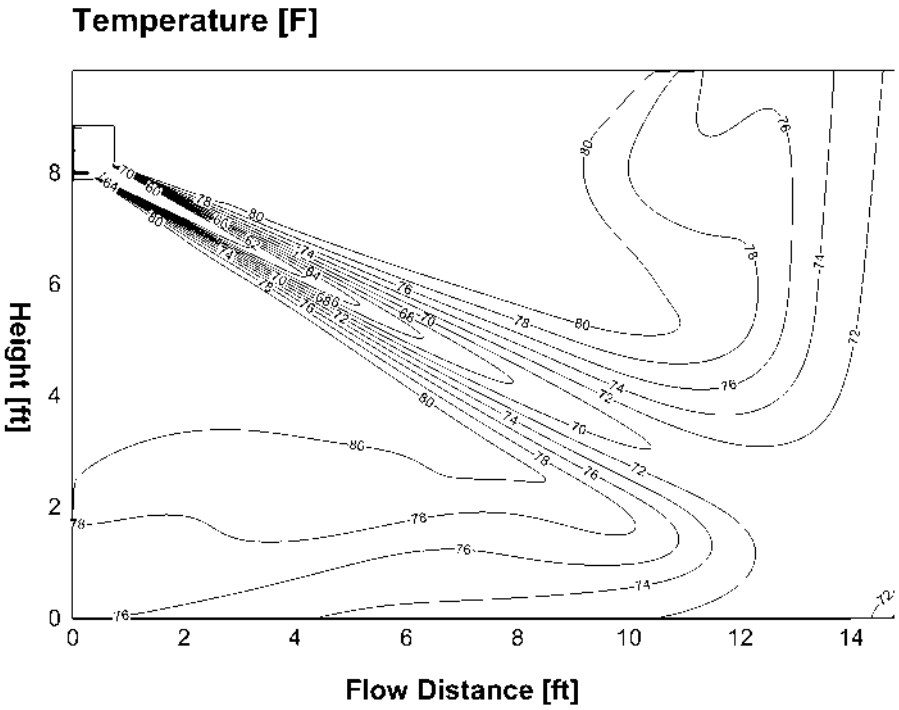
9k-Cooling(ID: 27°C/80.6°F, OD: 35°C/95°F)

Discharge Angle 27°

Airflow velocity distributions



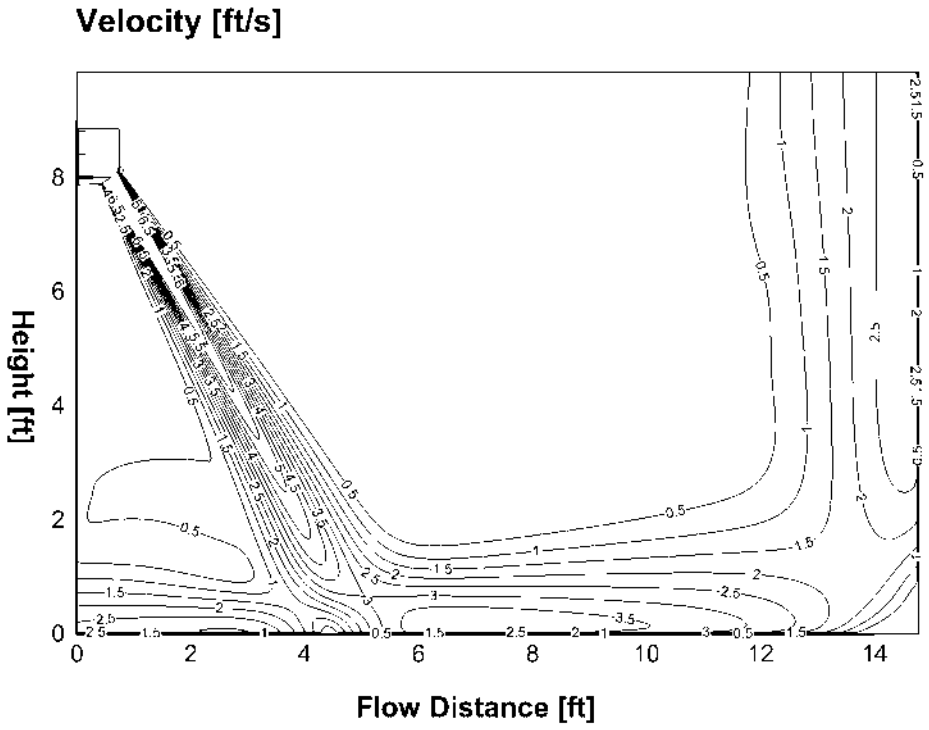
Temperature distributions



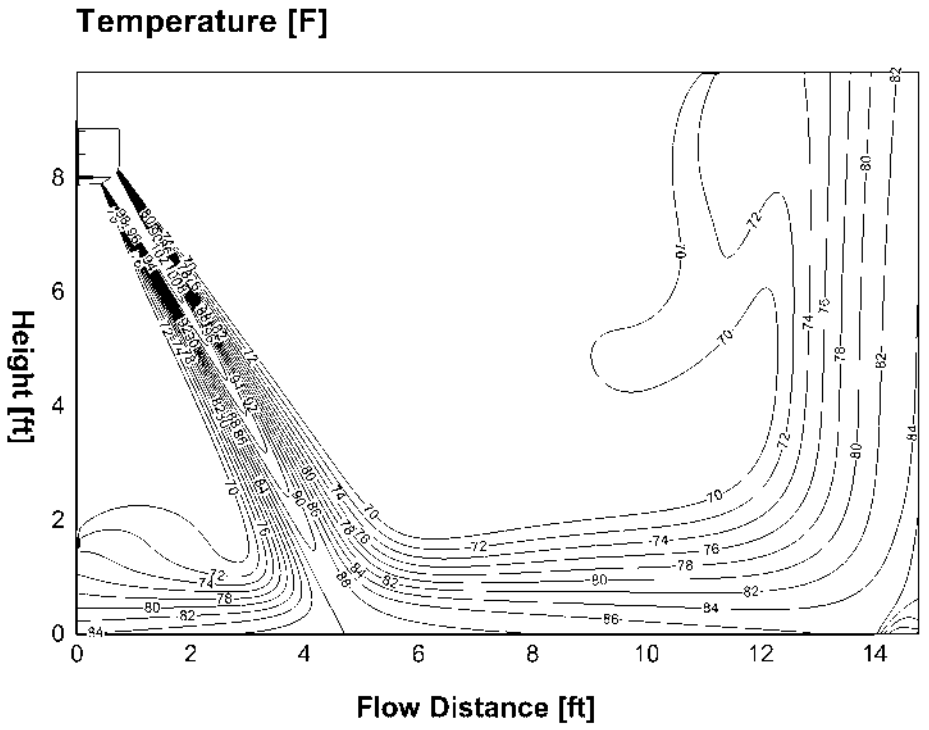
9k-Heating(ID: 20°C/68°F, OD: 7°C/44.6°F)

Discharge Angle 60°

Airflow velocity distributions



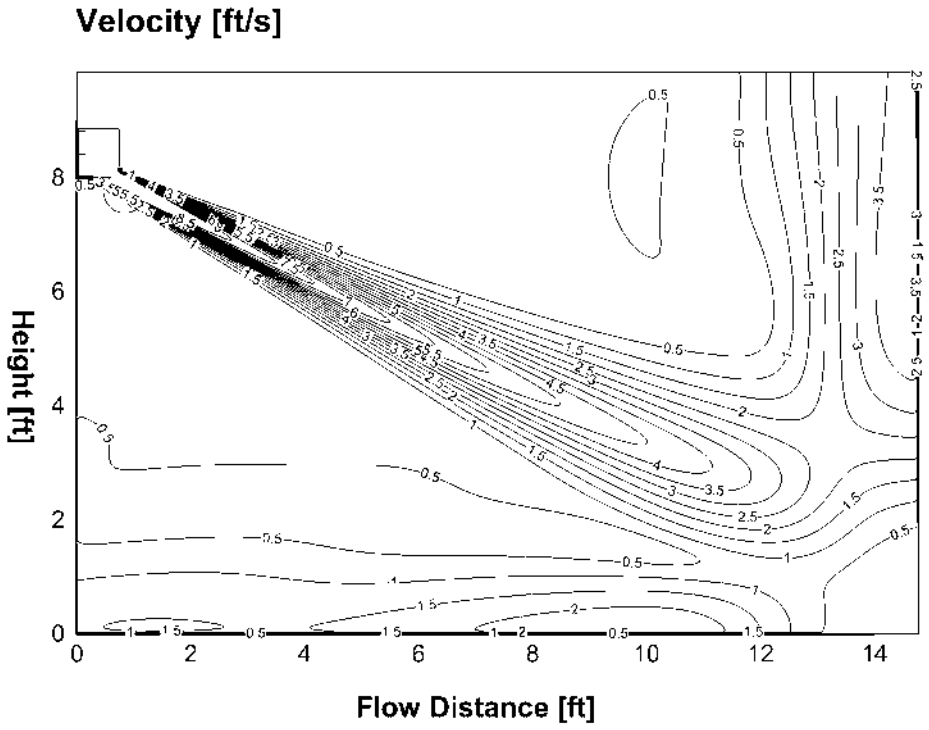
Temperature distributions



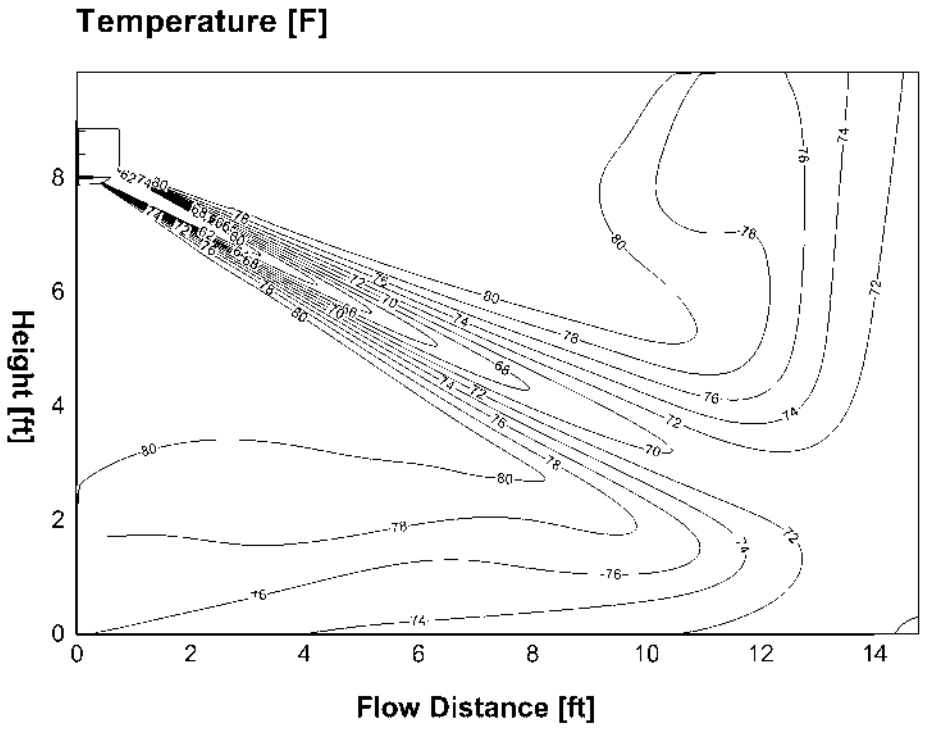
12k-Cooling(ID: 27°C/80.6°F, OD: 35°C/95°F)

Discharge Angle 27°

Airflow velocity distributions



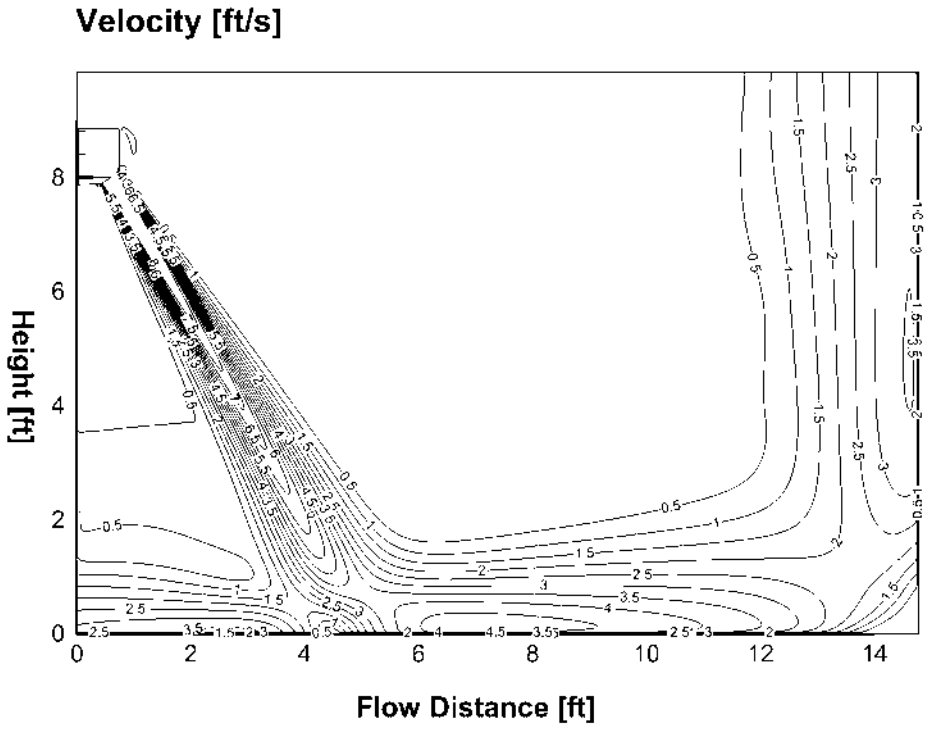
Temperature distributions



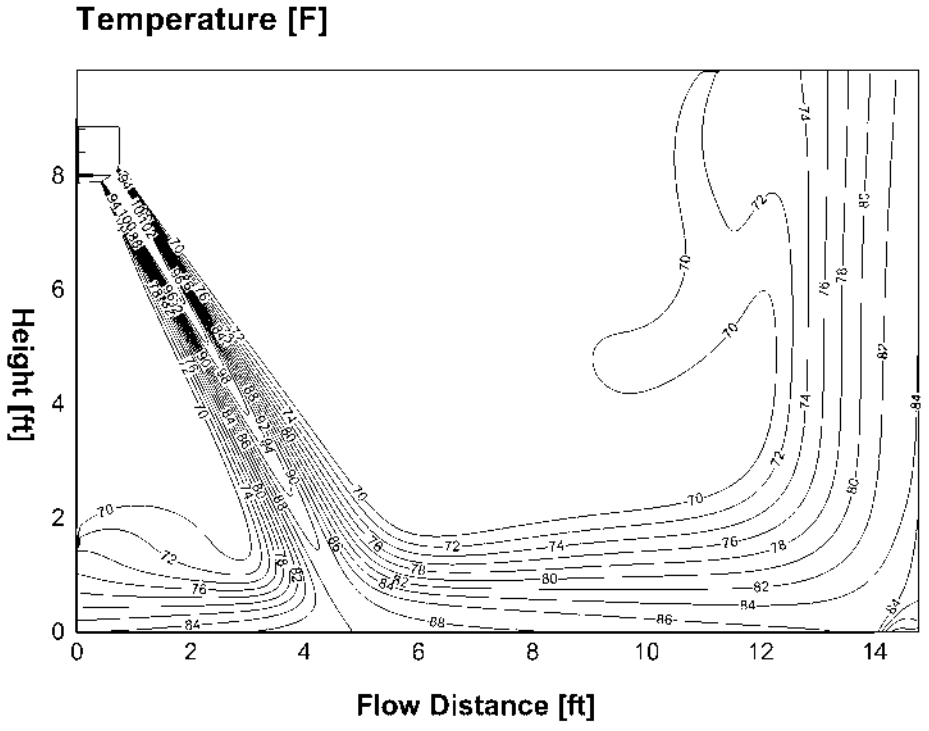
12k-Heating(ID: 20°C/68°F, OD: 7°C/44.6°F)

Discharge Angle 60°

Airflow velocity distributions



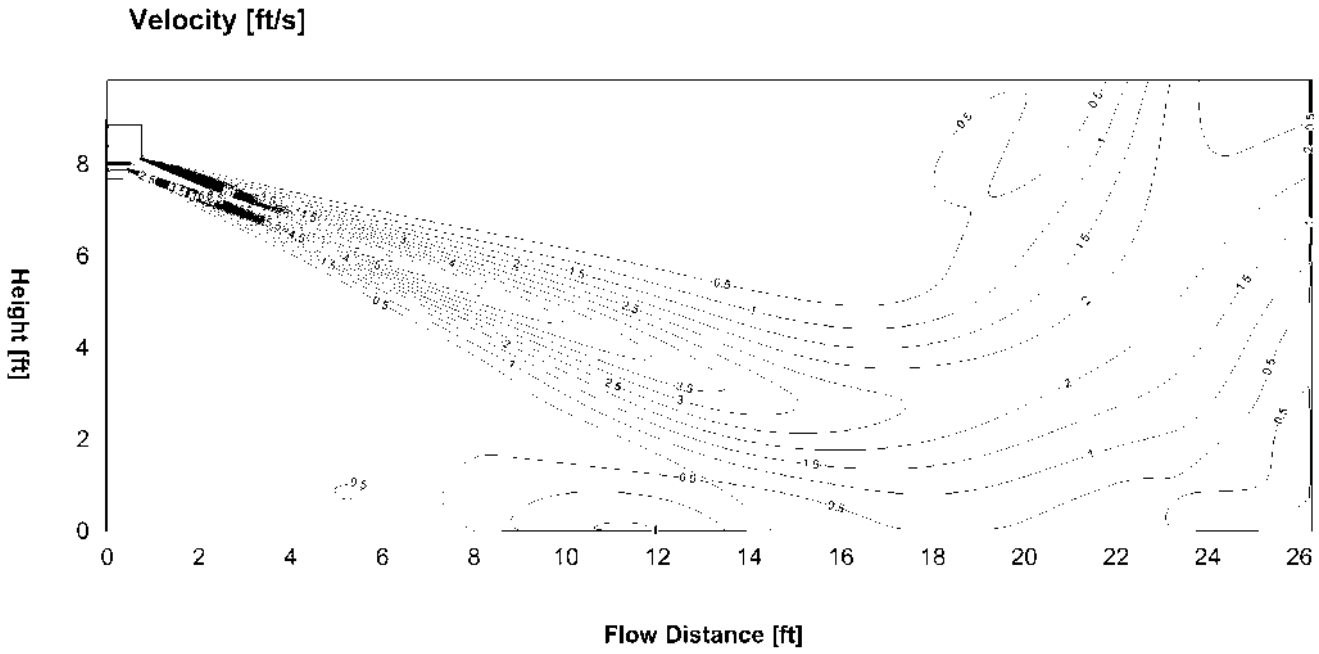
Temperature distributions



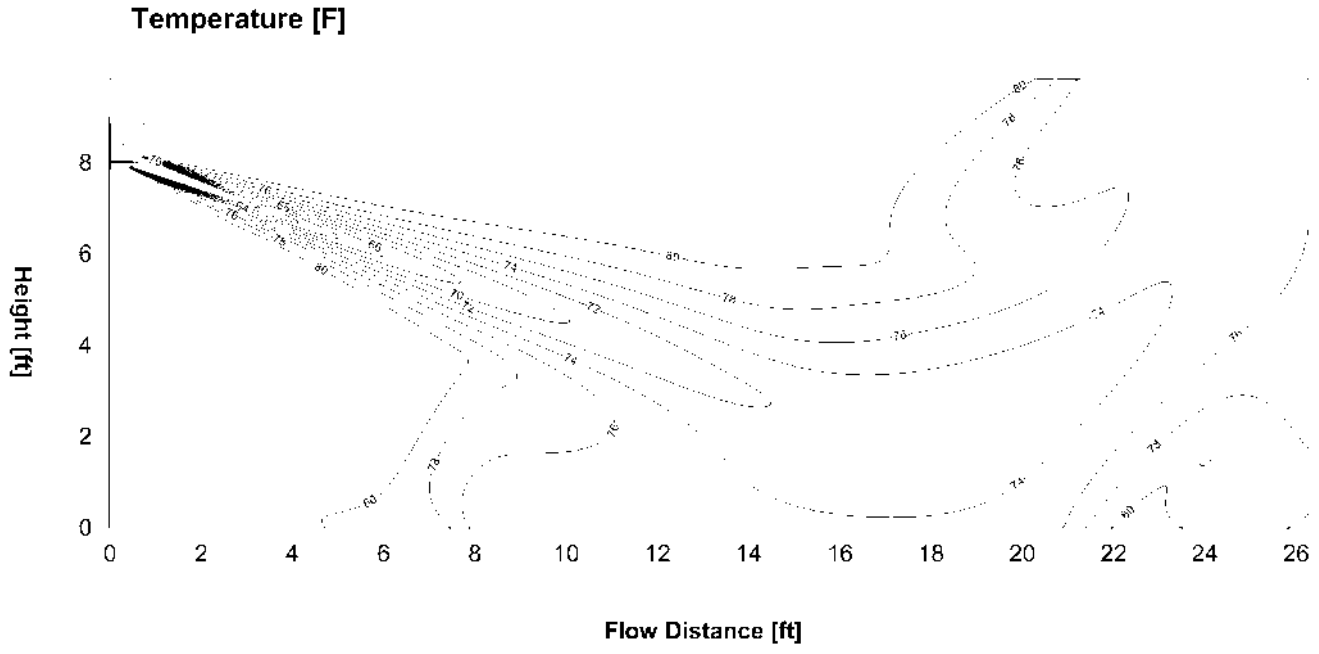
18k-Cooling(ID: 27°C/80.6°F, OD: 35°C/95°F)

Discharge Angle 20°

Airflow velocity distributions



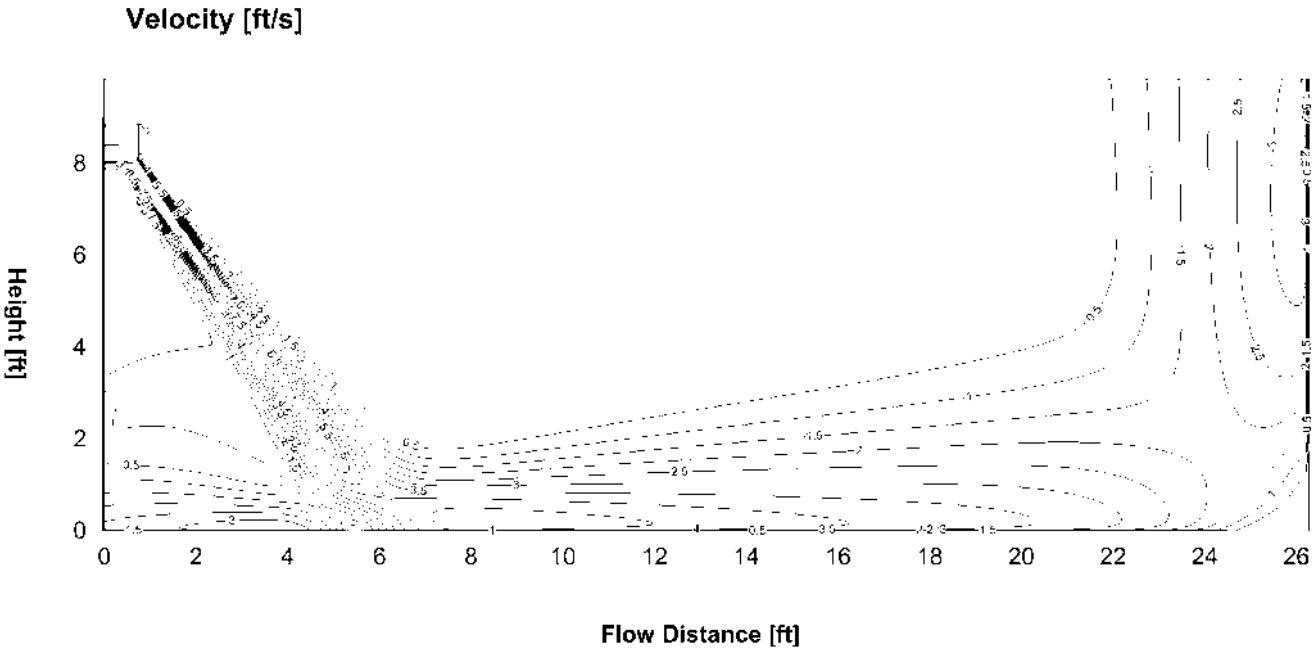
Temperature distributions



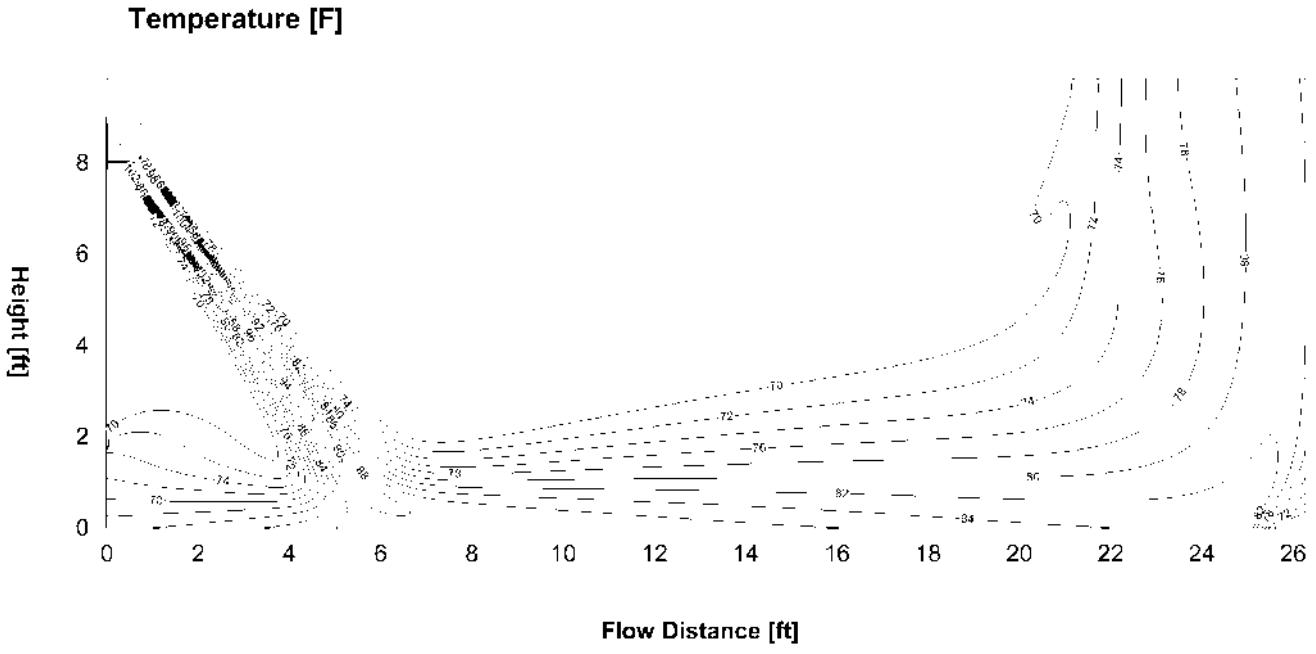
18k-Heating(ID: 20°C/68°F, OD: 7°C/44.6°F)

Discharge Angle 55°

Airflow velocity distributions



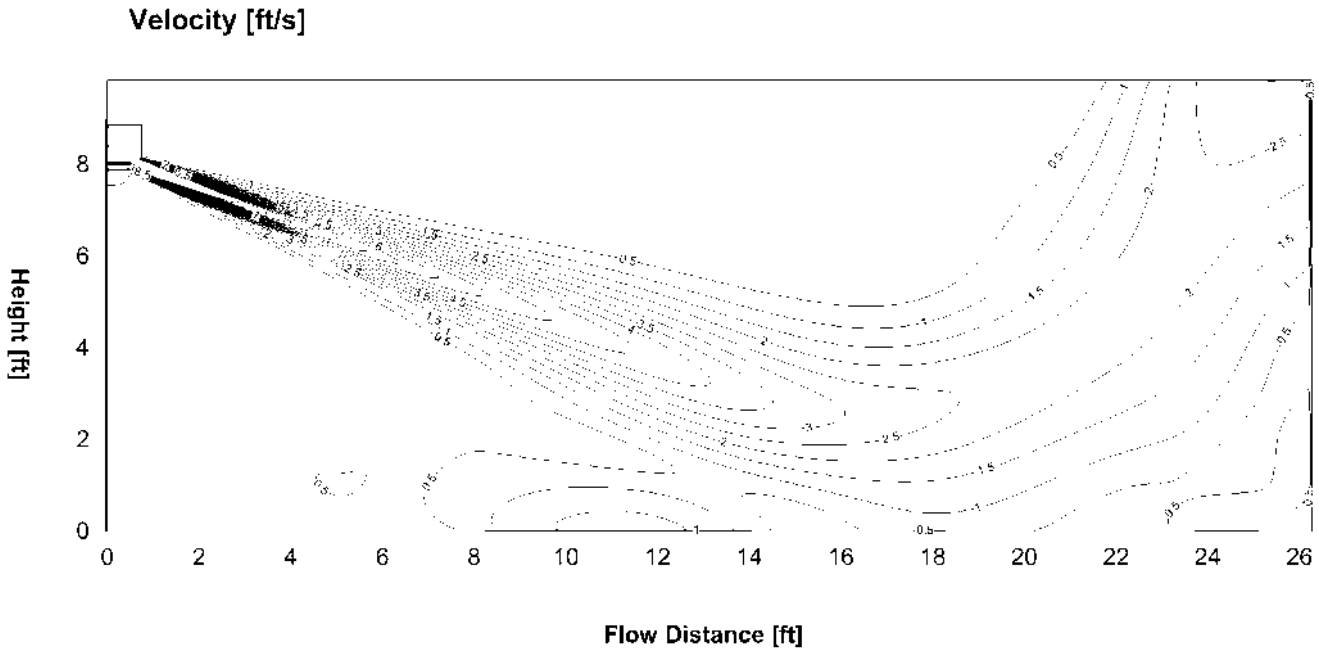
Temperature distributions



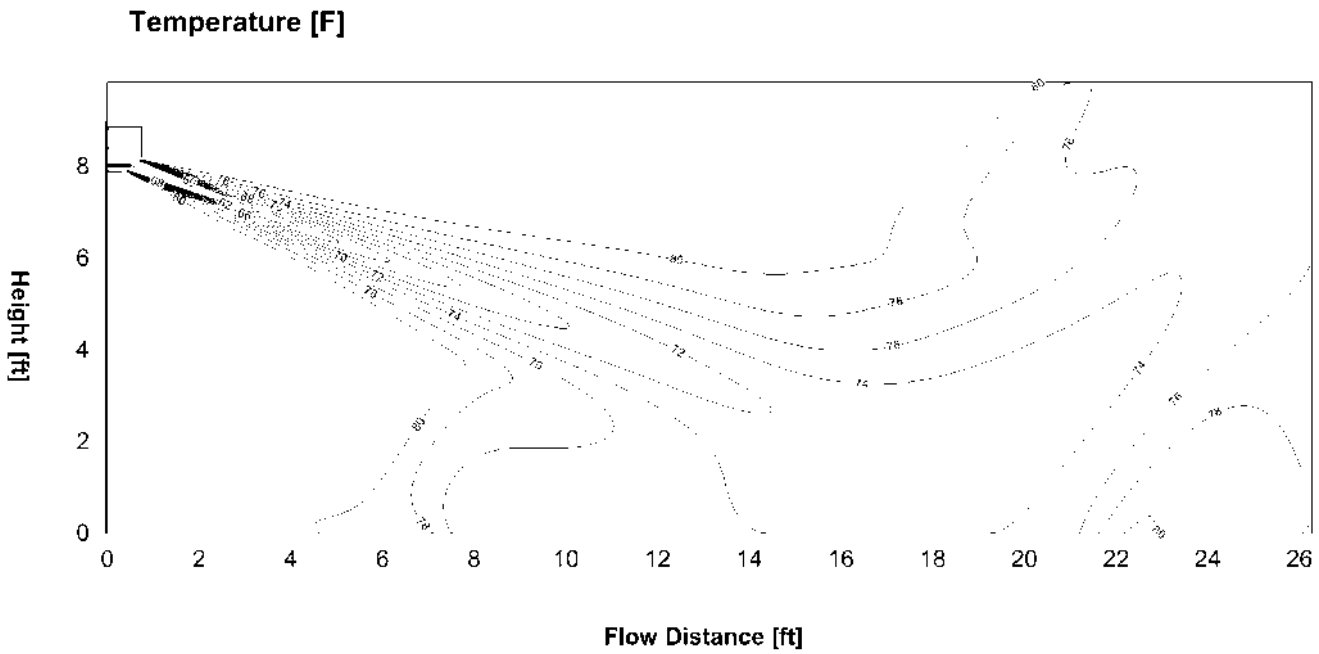
24k-Cooling(ID: 27°C/80.6°F, OD: 35°C/95°F)

Discharge Angle 20°

Airflow velocity distributions



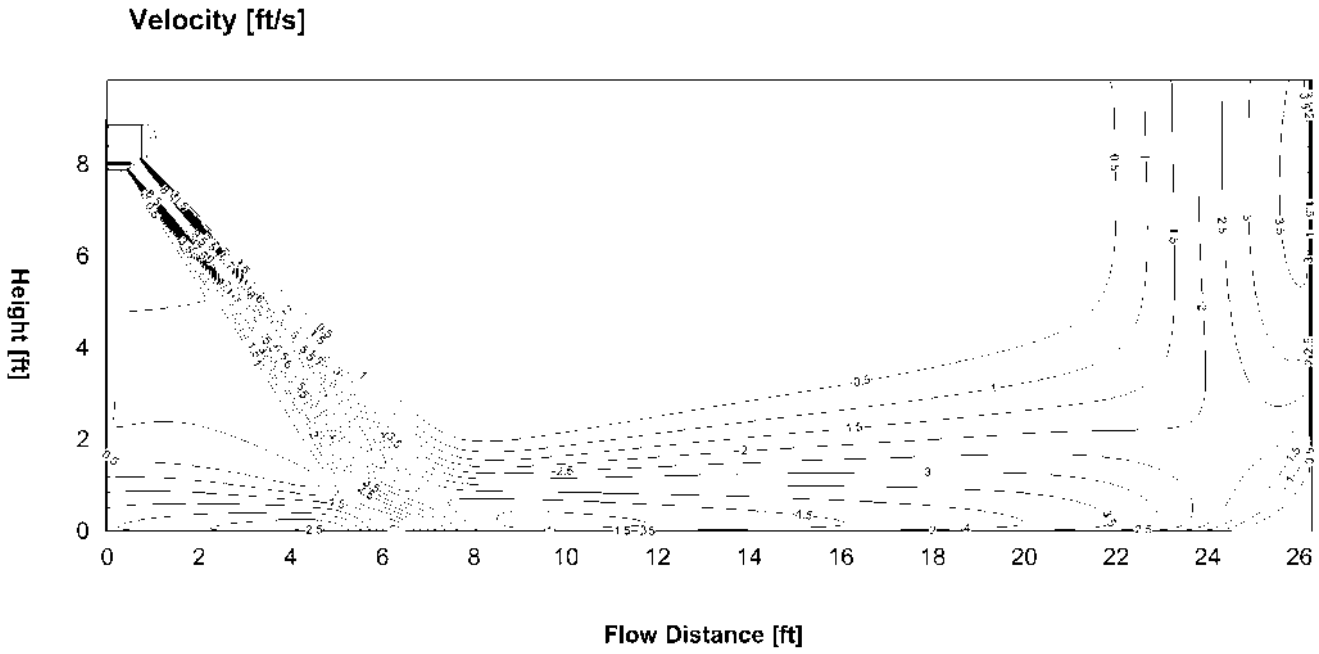
Temperature distributions



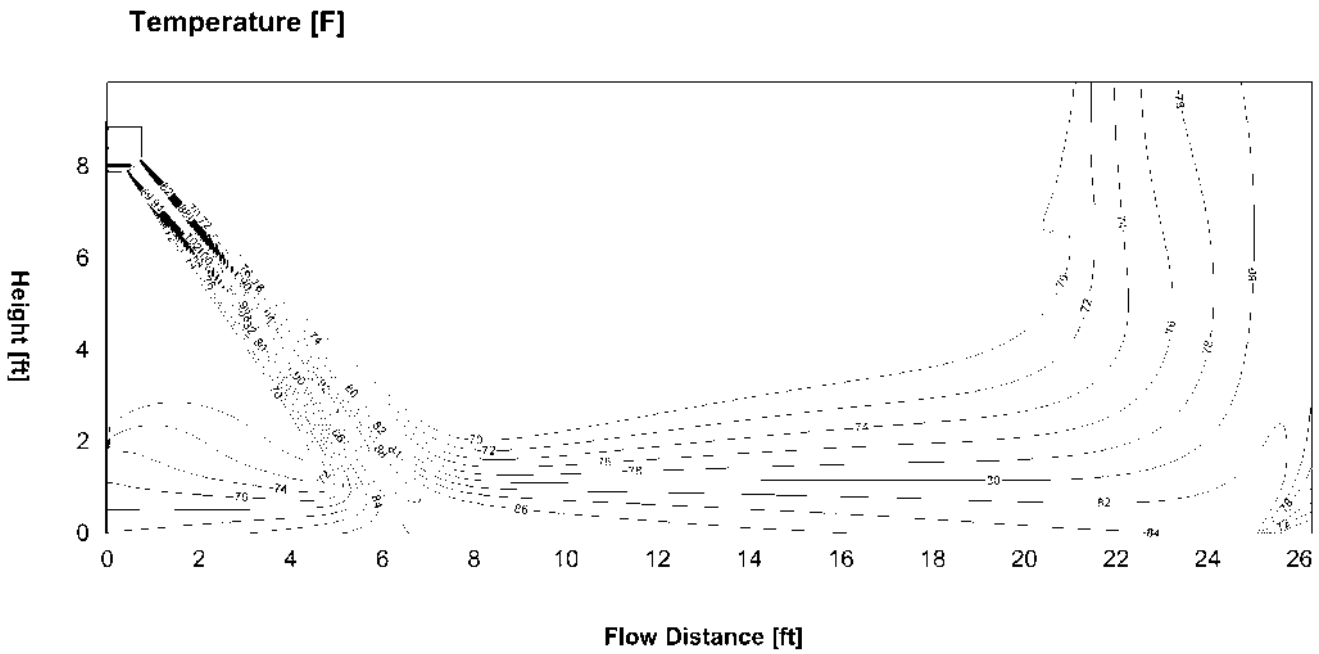
24k-Heating(ID: 20°C/68°F, OD: 7°C/44.6°F)

Discharge Angle 50°

Airflow velocity distributions



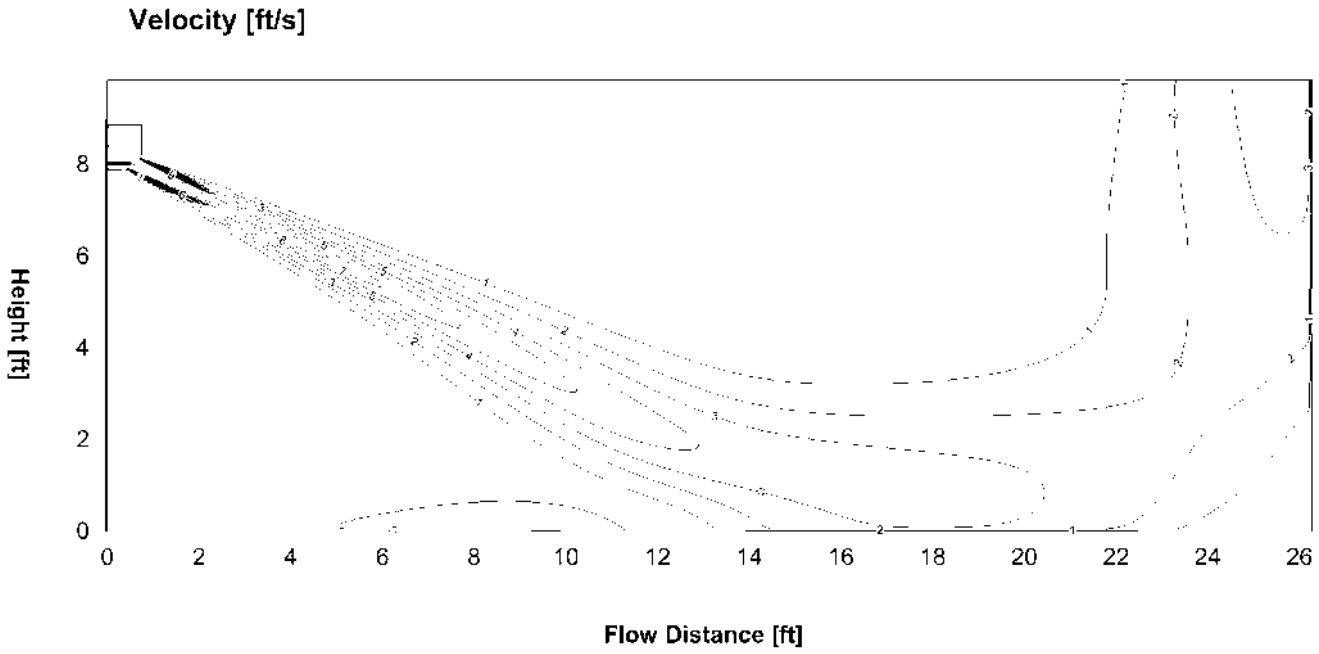
Temperature distributions



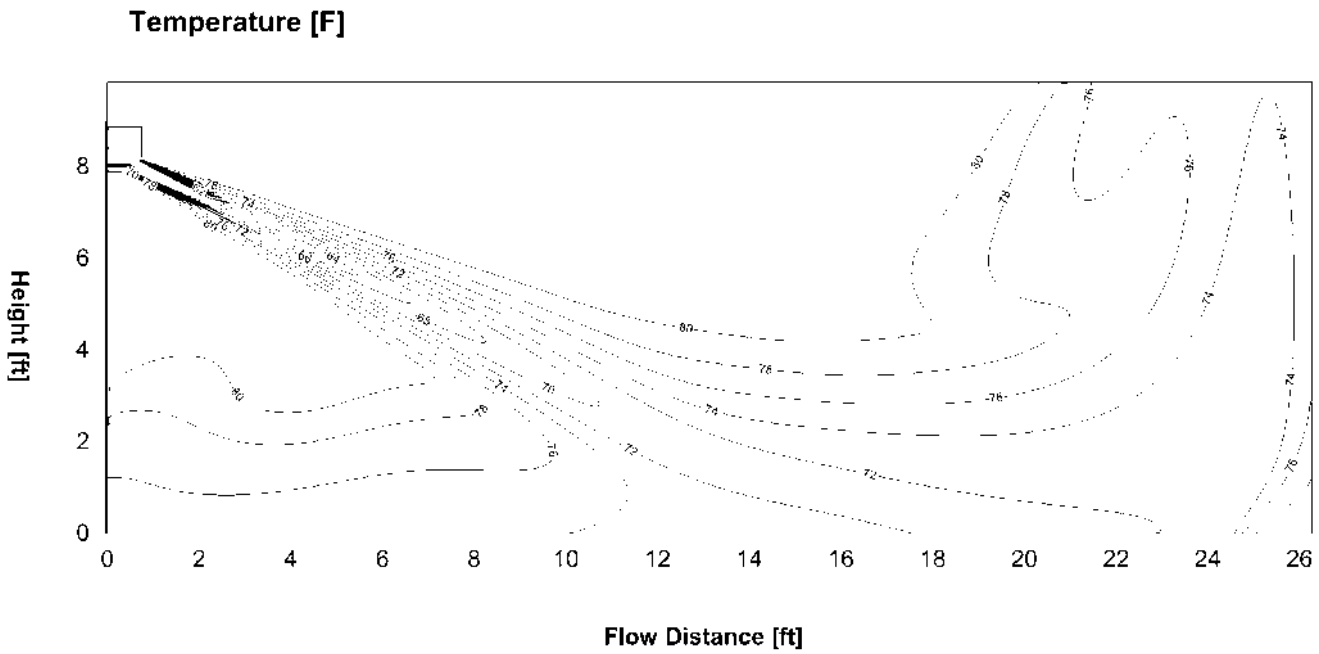
30k/33k-Cooling(ID: 27°C/80.6°F, OD: 35°C/95°F)

Discharge Angle 25°

Airflow velocity distributions



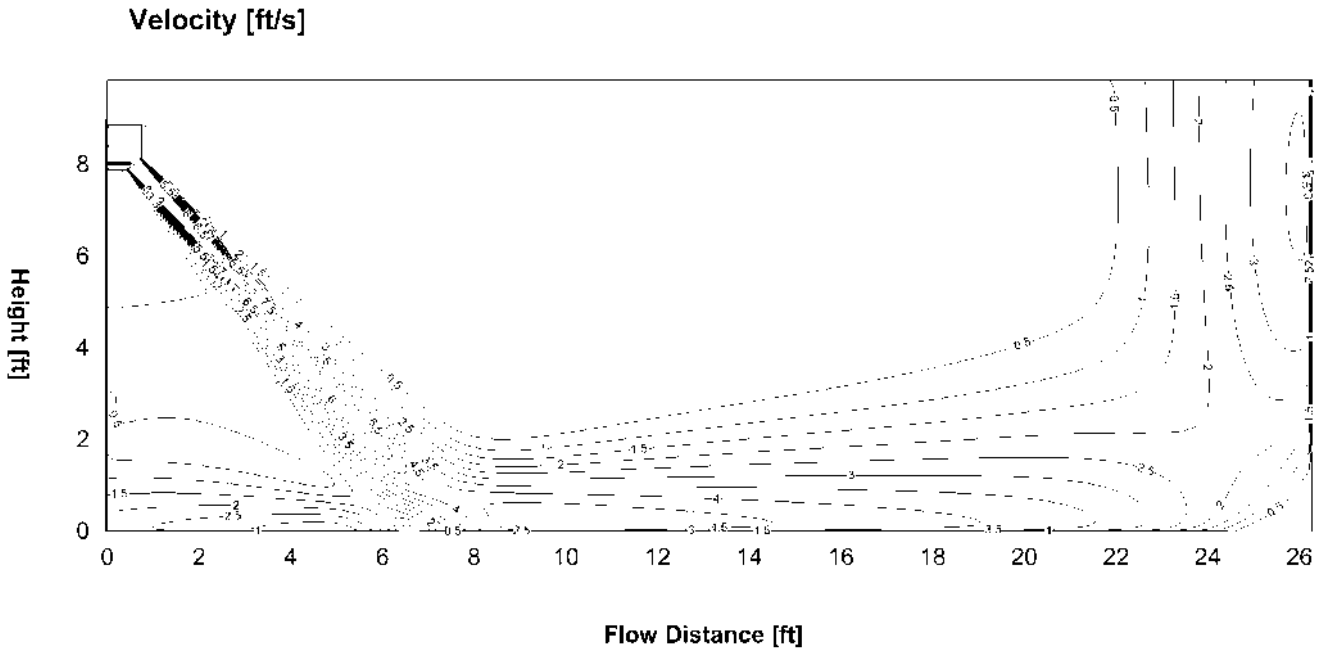
Temperature distributions



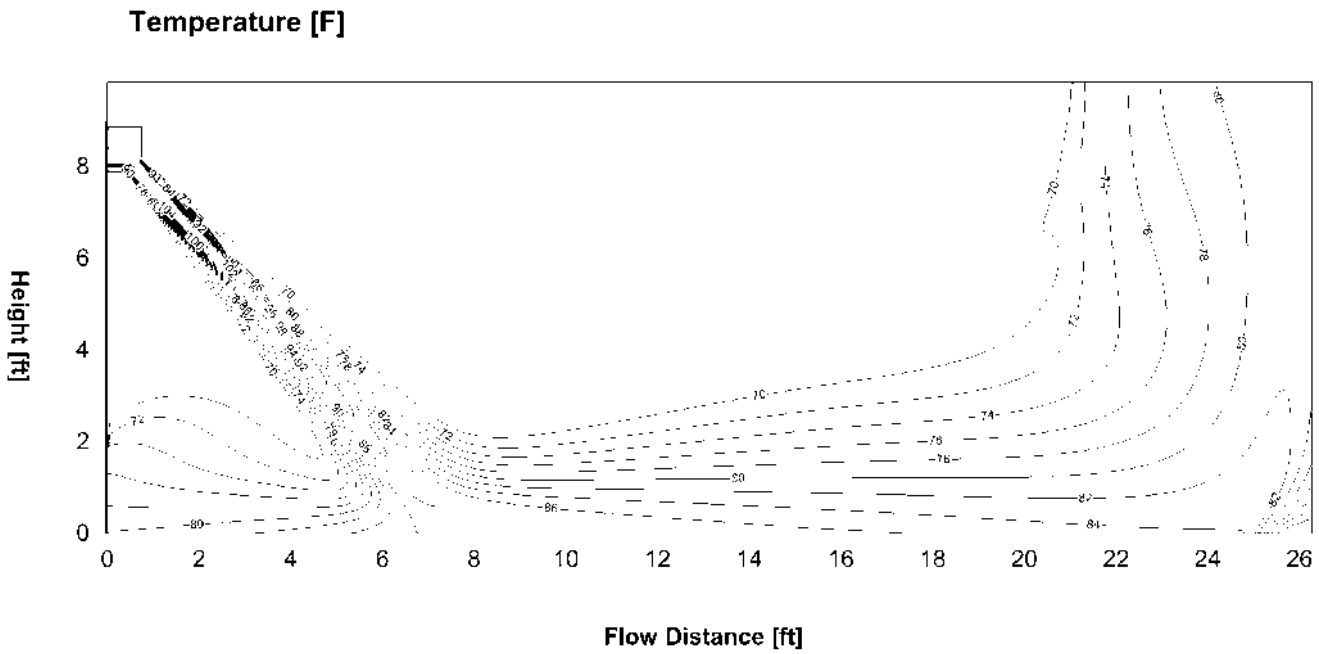
30k/33k-Heating(ID: 20°C/68°F, OD: 7°C/44.6°F)

Discharge Angle 48°

Airflow velocity distributions



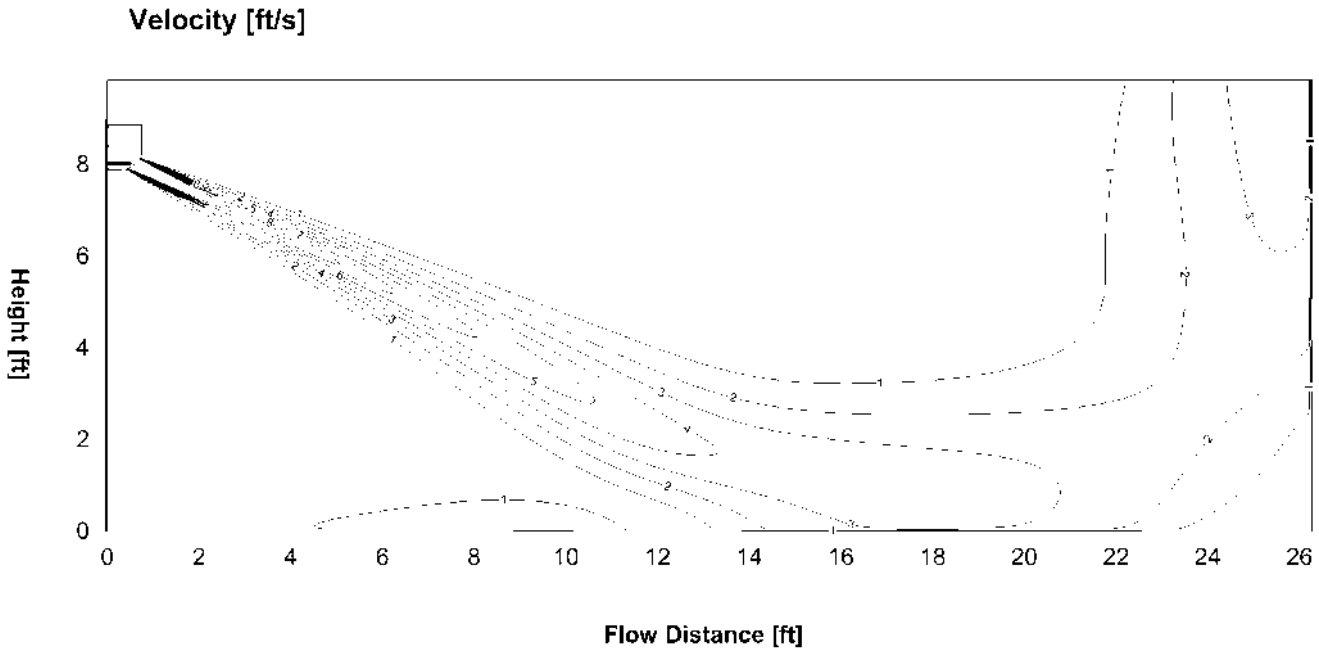
Temperature distributions



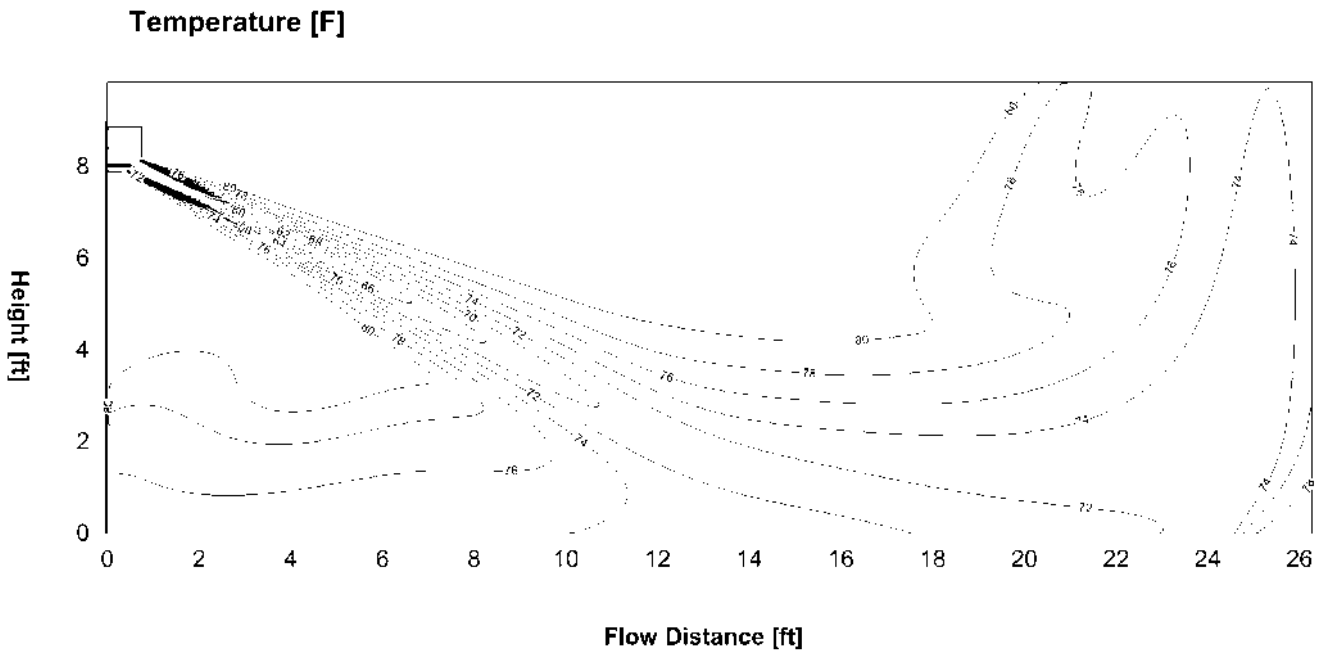
36k-Cooling(ID: 27°C/80.6°F, OD: 35°C/95°F)

Discharge Angle 25°

Airflow velocity distributions



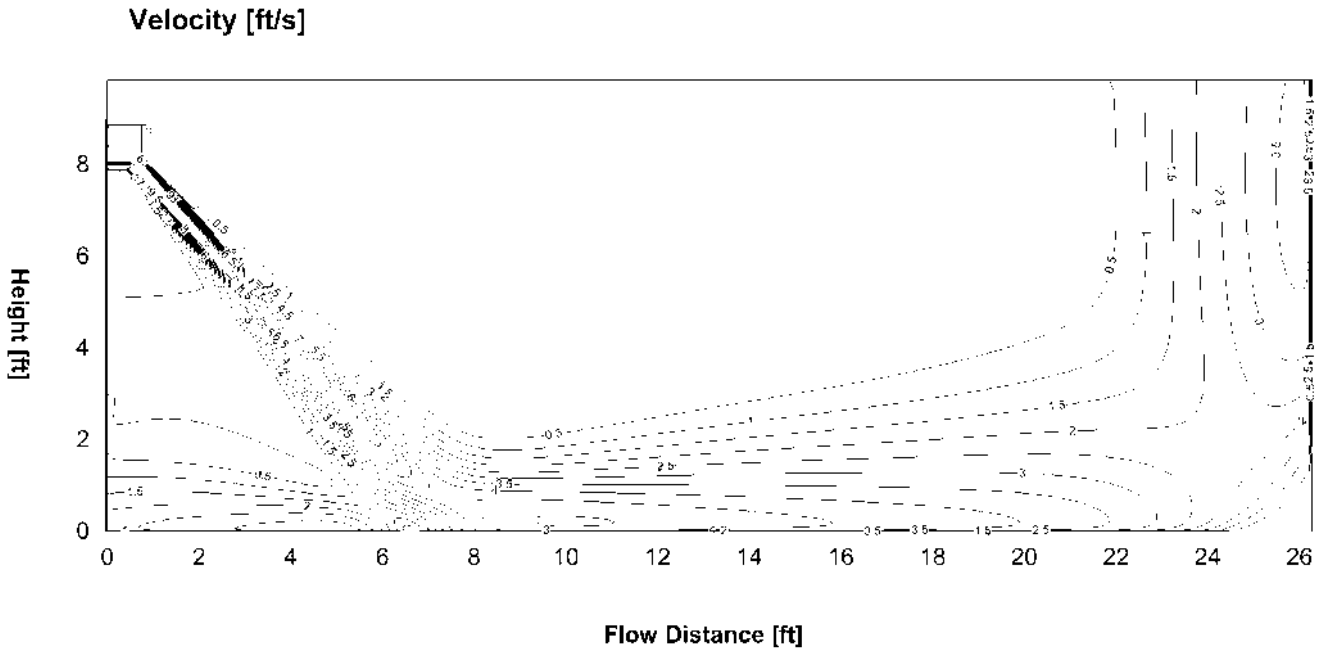
Temperature distributions



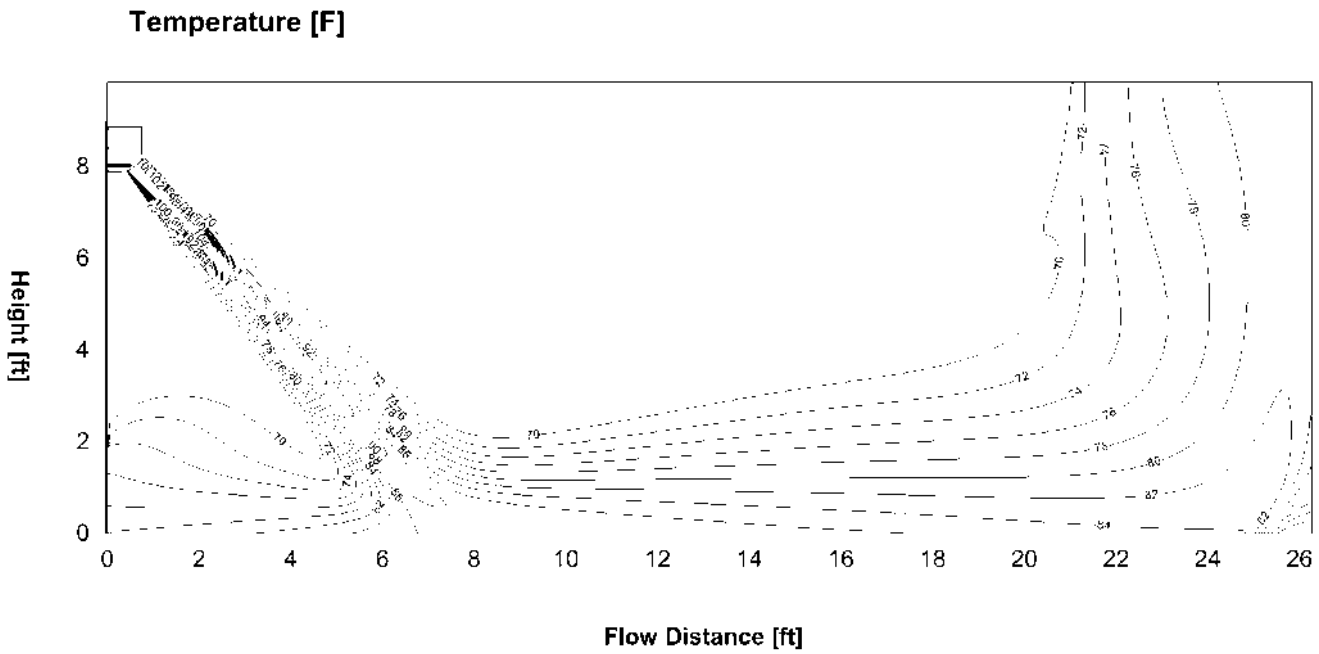
36k-Heating(ID: 20°C/68°F, OD: 7°C/44.6°F)

Discharge Angle 48°

Airflow velocity distributions

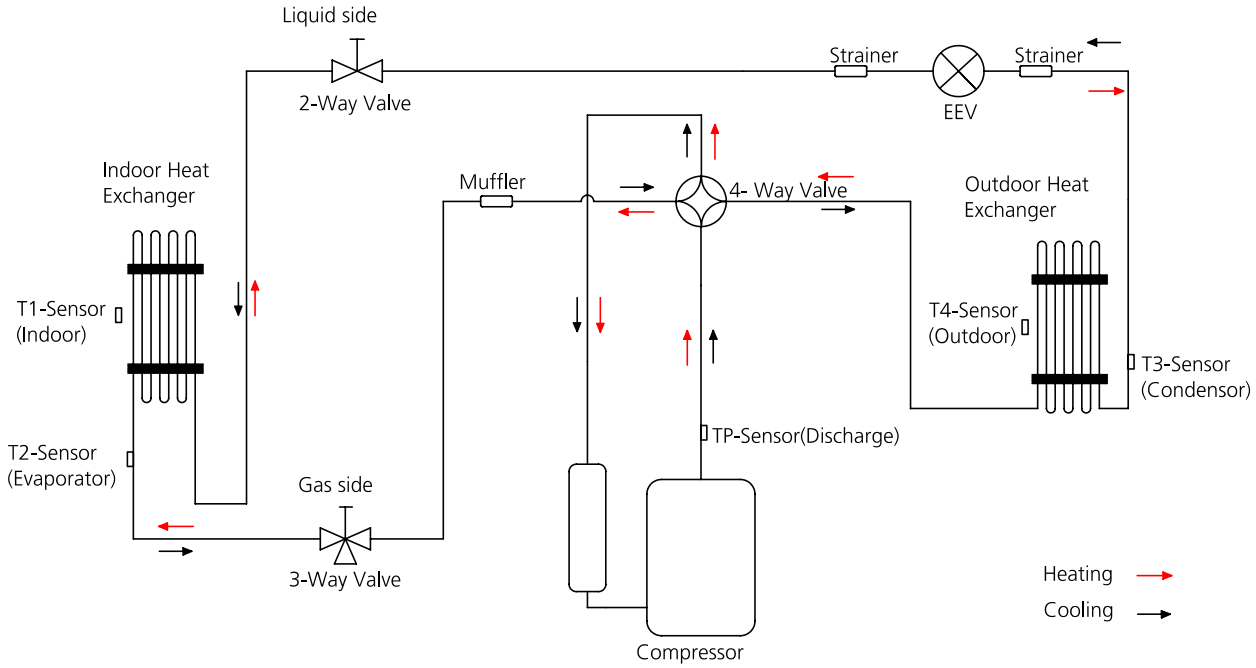


Temperature distributions

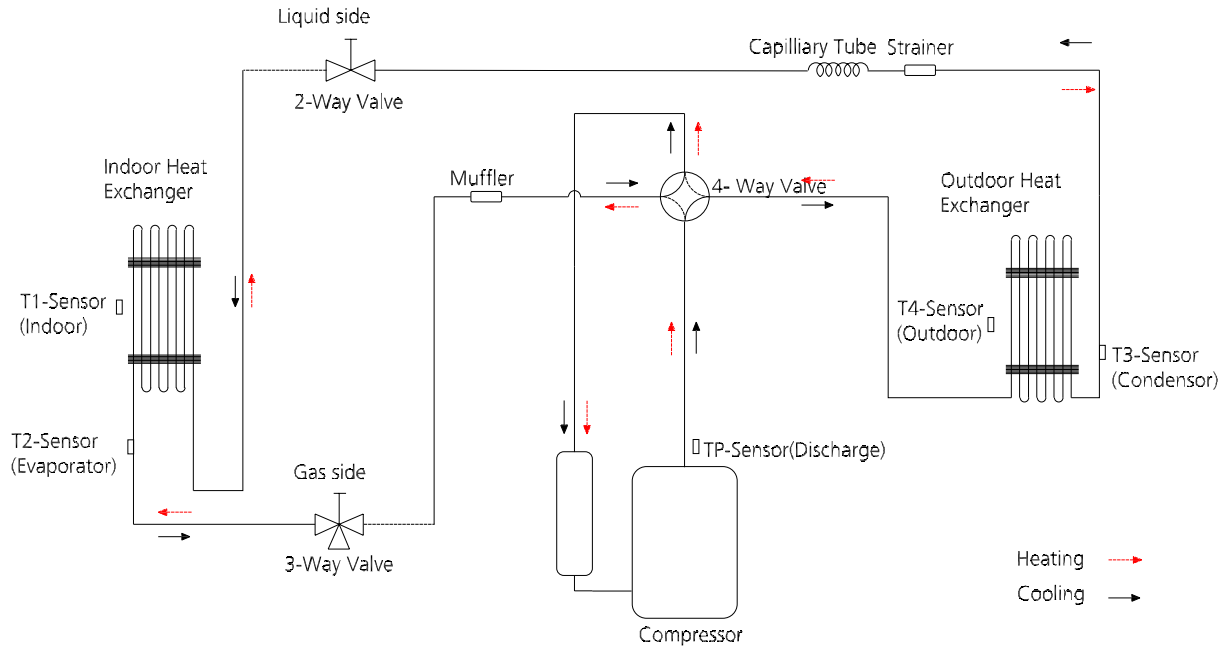


4. Refrigerant Cycle Diagrams

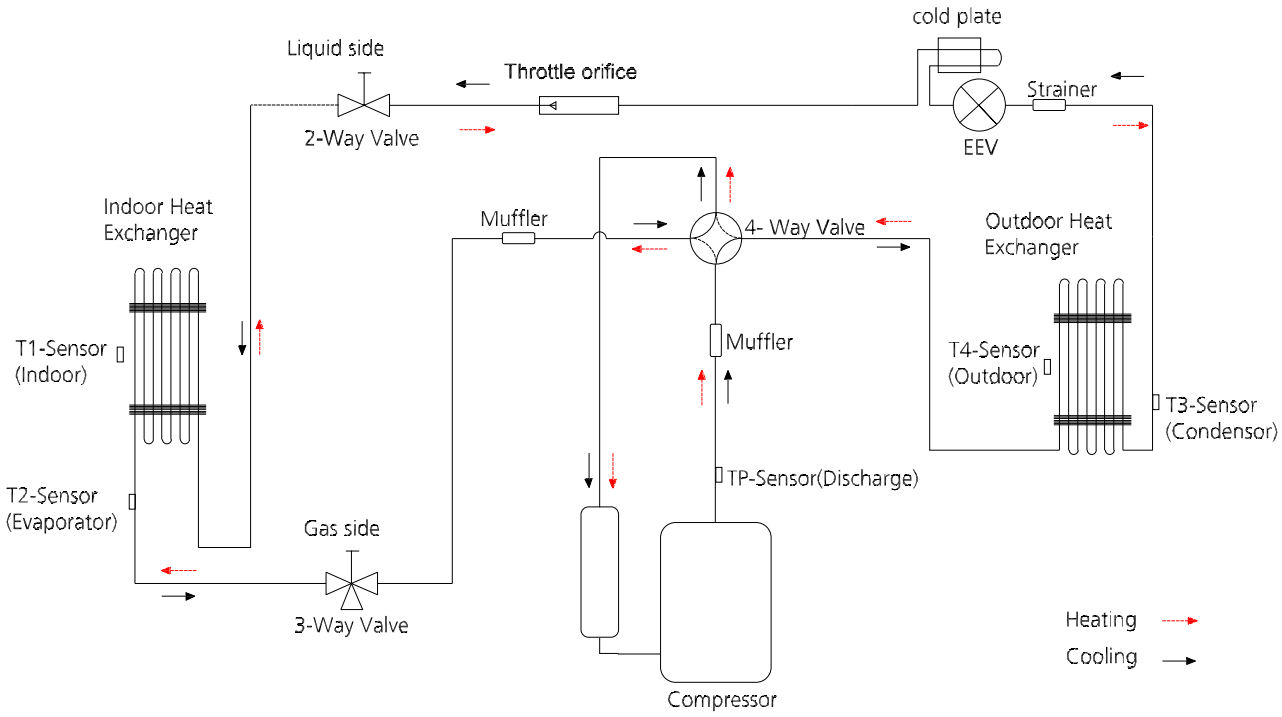
DAP091H2A1, DAP121H2A1



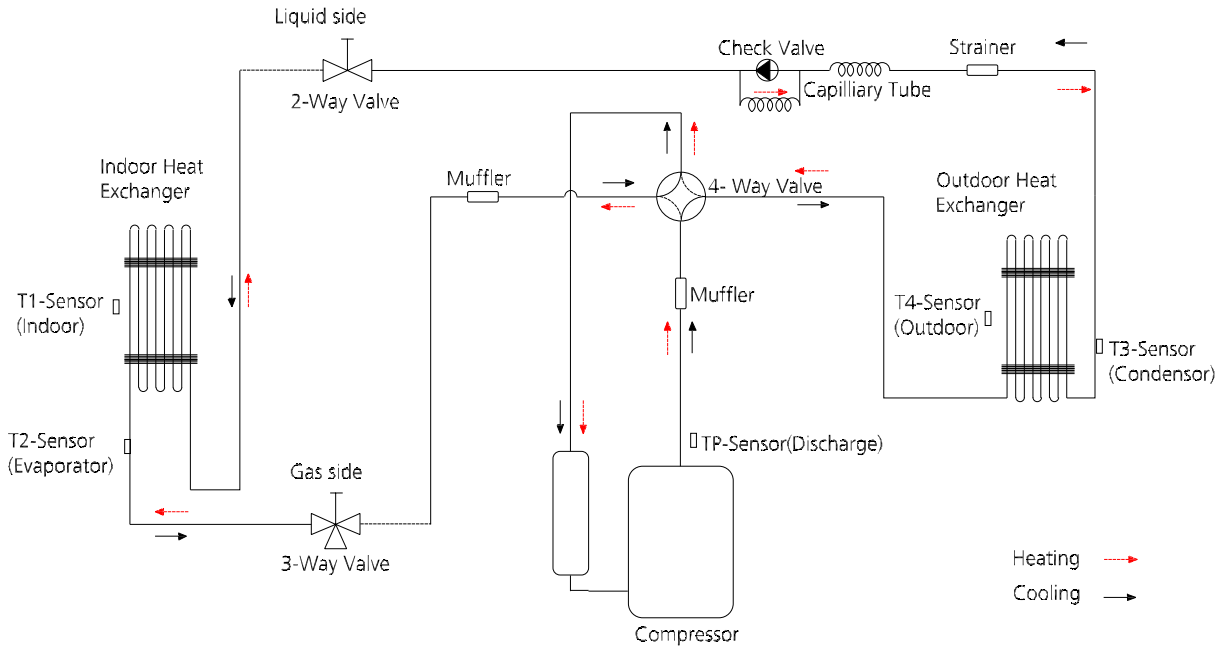
DTS091H1A1, DTS121H1A1, DTS091H2A1, DTS121H2A1



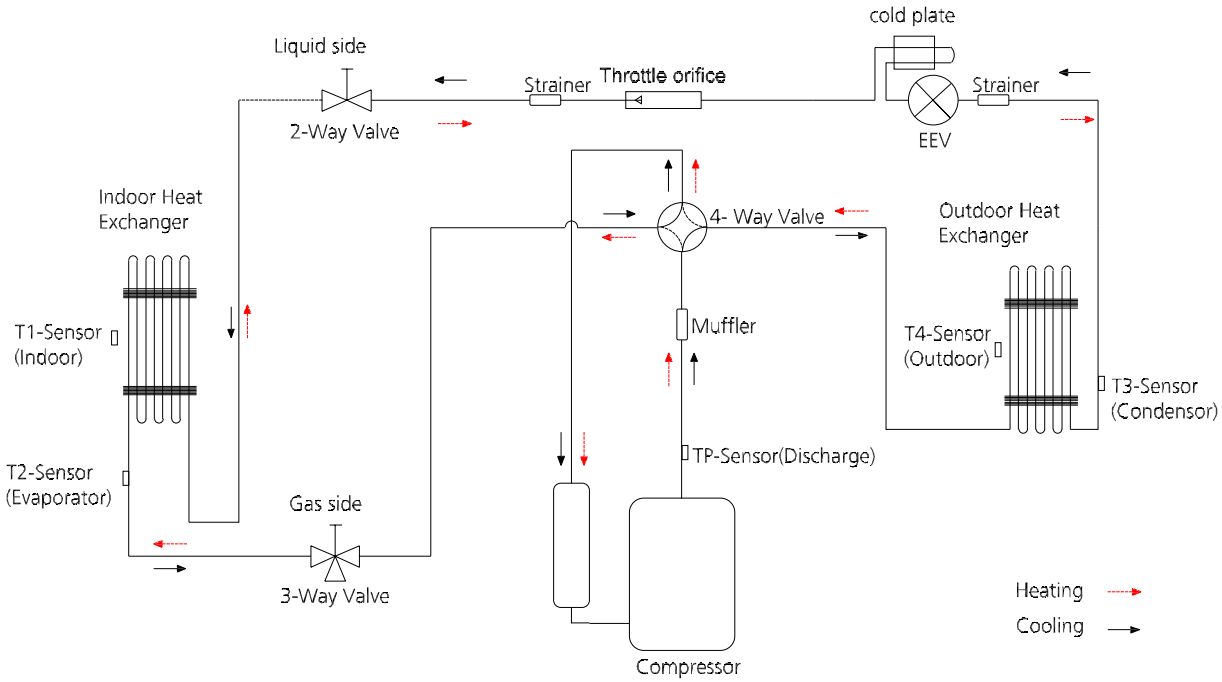
DAP181H2A1



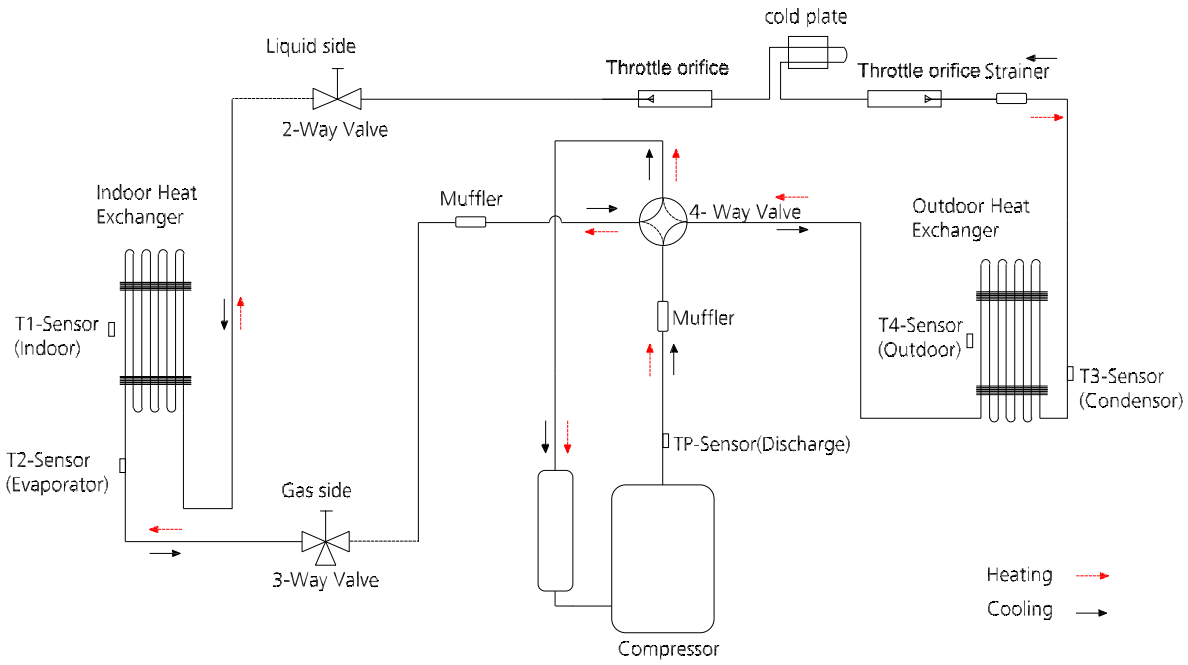
DTS181H2A1



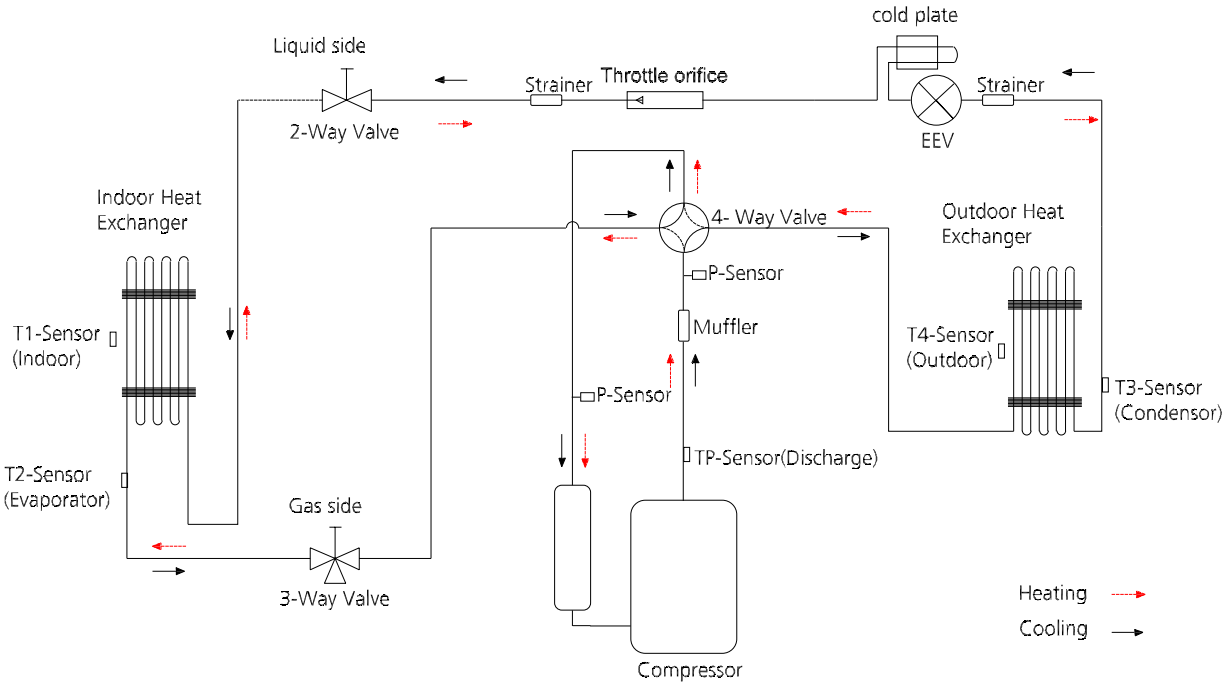
DAP241H2A1



DTS241H2A1



DAP331H2A1


cold plate
Liquid side
Strainer
Throttle orifice
Strainer
2-Way Valve
EEV
Indoor Heat Exchanger
4- Way Valve
Outdoor Heat Exchanger
P-Sensor
Muffler
T1-Sensor (Indoor)
T4-Sensor (Outdoor)
T3-Sensor (Condensor)
P-Sensor
TP-Sensor(Discharge)
T2-Sensor (Evaporator)
Gas side
3-Way Valve
Compressor
Heating
Cooling

5. Electrical Wiring Diagrams

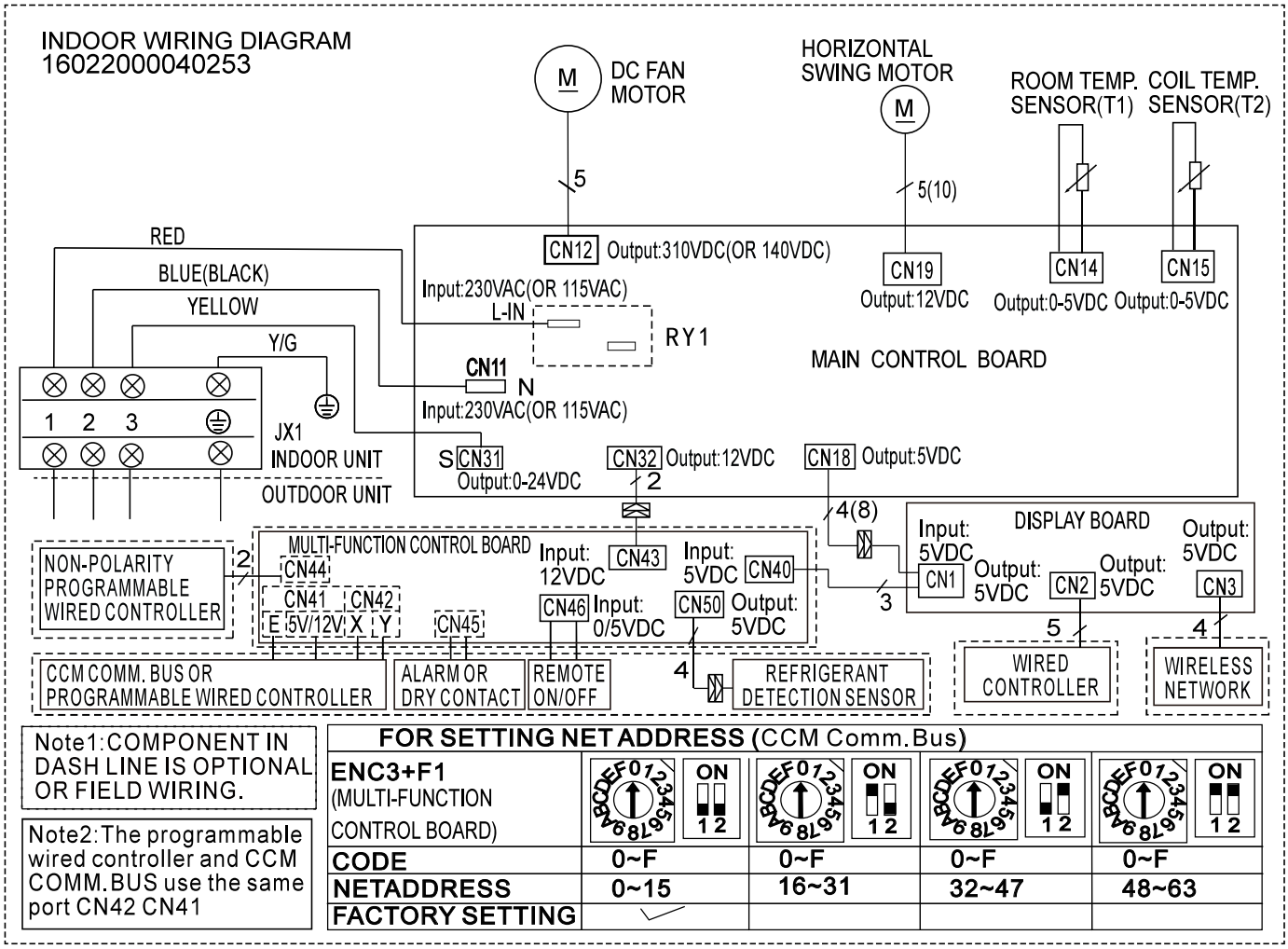
Indoor and outdoor unit wiring diagram

Indoor Unit		Outdoor Unit	
IDU Model	IDU Wiring Diagram	ODU Model	ODU Wiring Diagram
DTS09W1A1	16022000040253	DTS091H1A1	16022000040773
DTS12W1A1		DTS121H1A1	
DTS09W2A1		DTS091H2A1	16022000040610
DTS12W2A1		DTS121H2A1	
DTS18W2A1		DTS181H2A1	
DAP06W2A1			16022000040311
DAP09W2A1			
DAP12W2A1		DAP091H2A1	
		DAP121H2A1	
DAP18W2A1	16022000040232	DAP181H2A1	16022000040313
DAP24W2A1			
		DAP241H2A1	16022000040331
DTS24W2A1		DTS241H2A1	16022000040790
DAP33W2A1		DAP331H2A1	16022000040650

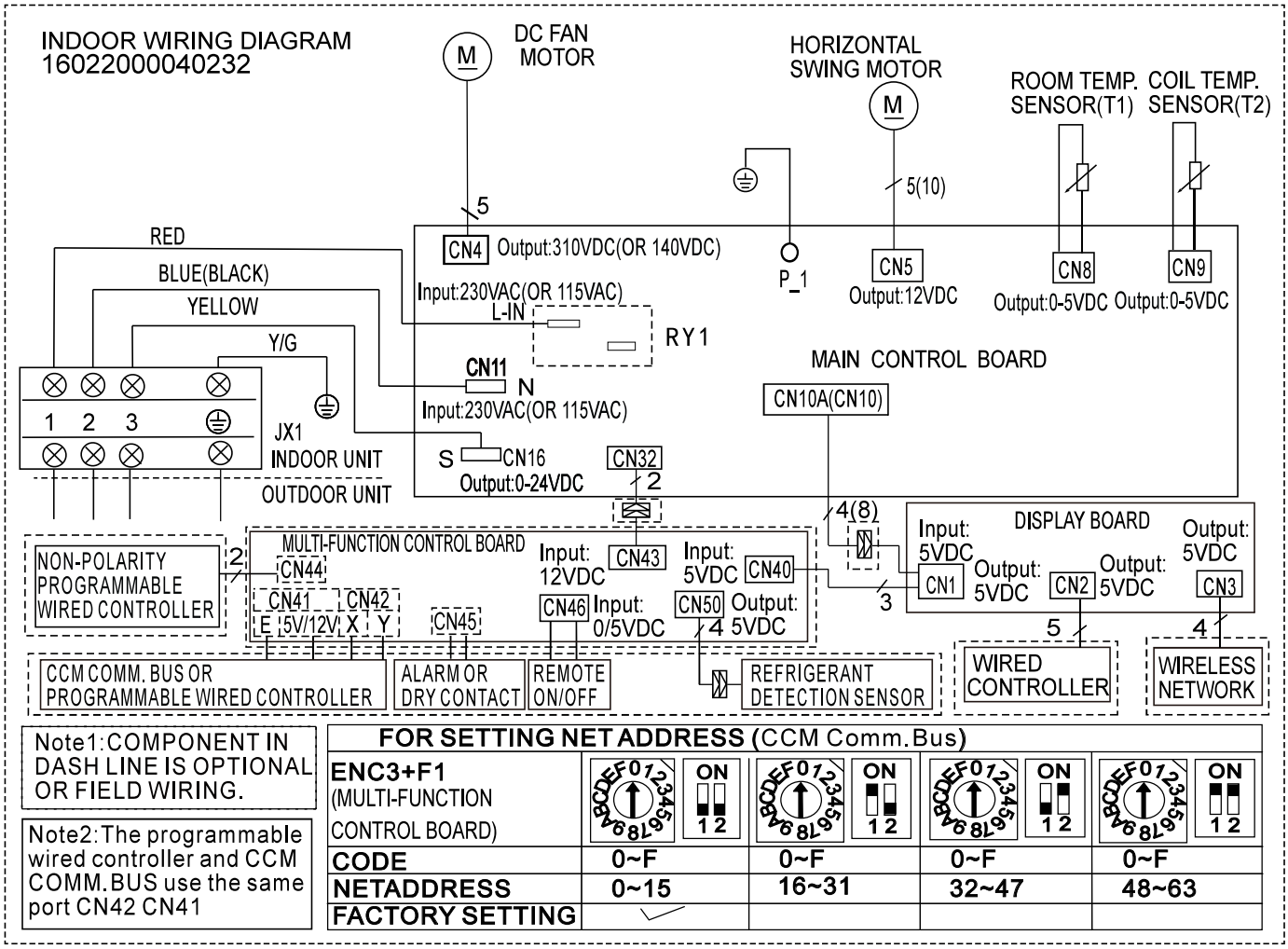
Outdoor unit printed circuit board diagram

Outdoor Unit	
ODU Model	**ODU Printed Circuit Board**
	17122000062141
DTS091H1A1	
DTS121H1A1	
DTS091H2A1	17122000057661
DTS121H2A1	
DTS181H2A1	
DAP091H2A1	
DAP121H2A1	
DTS181H2A1	17122000048064
DTS241H2A1	
	17122300007152
DAP241H2A1	
DAP331H2A1	

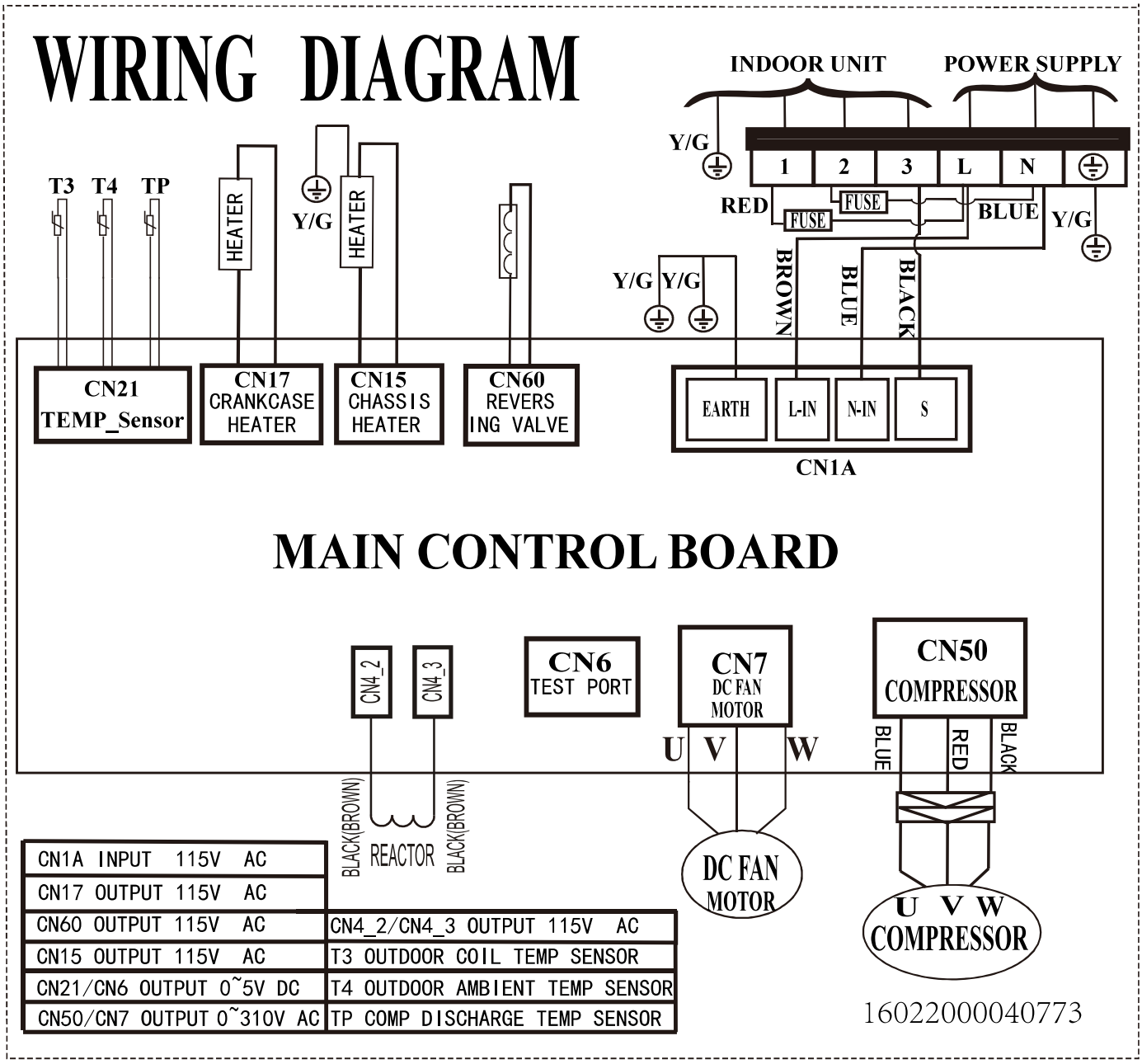
Indoor unit wiring diagram: 16022000040253



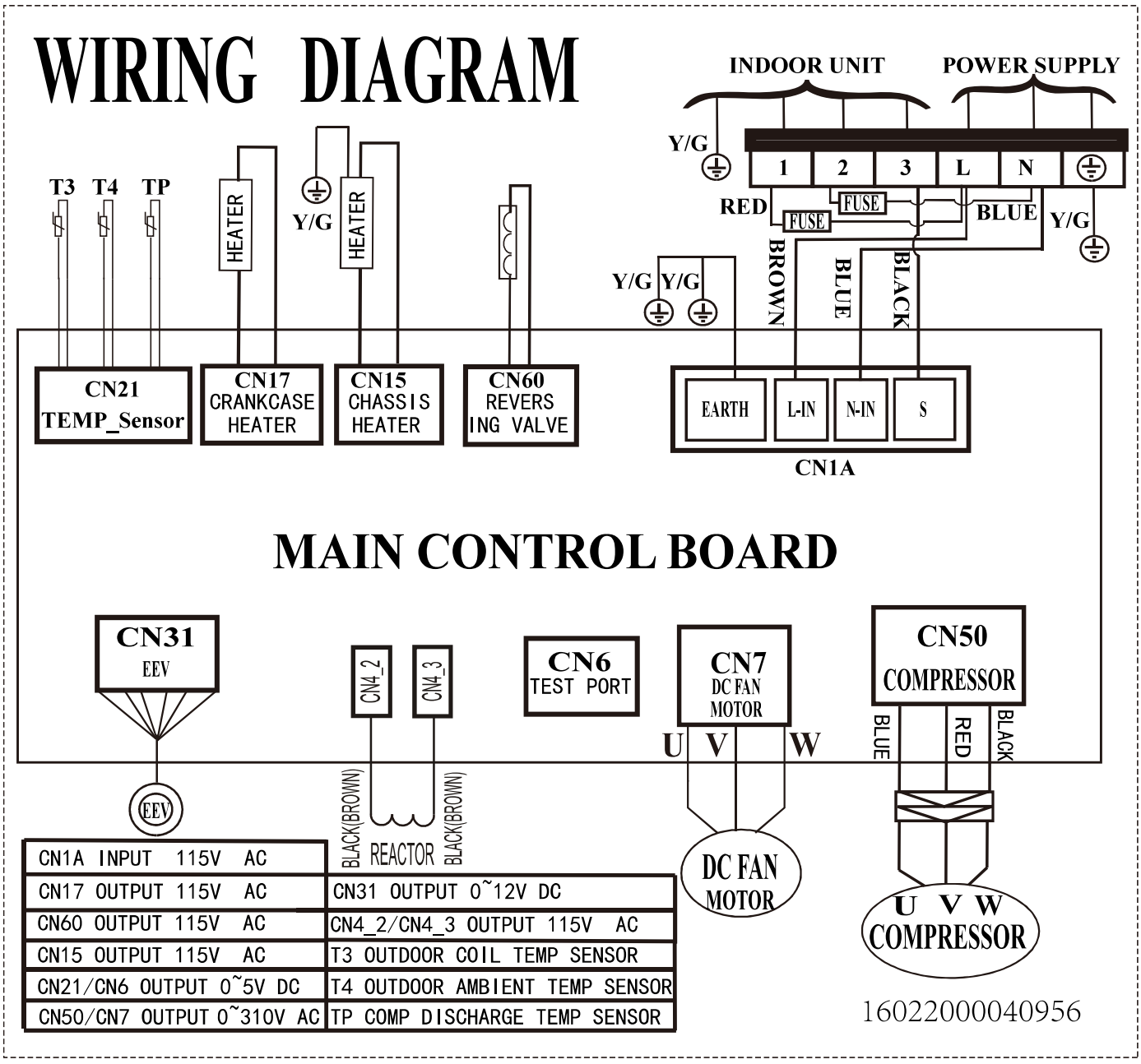
Indoor unit wiring diagram: 16022000040232



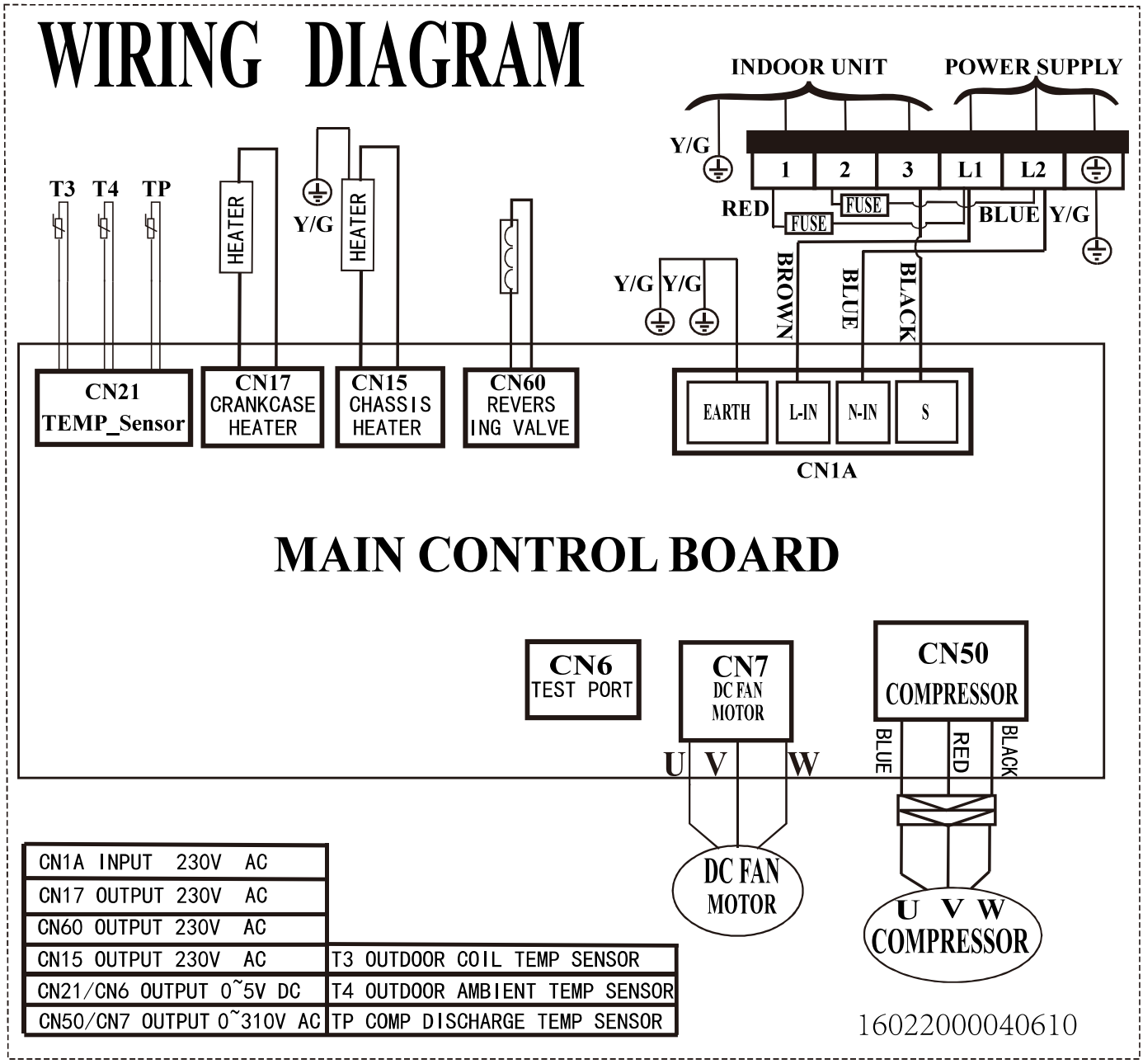
Outdoor unit wiring diagram: 16022000040773



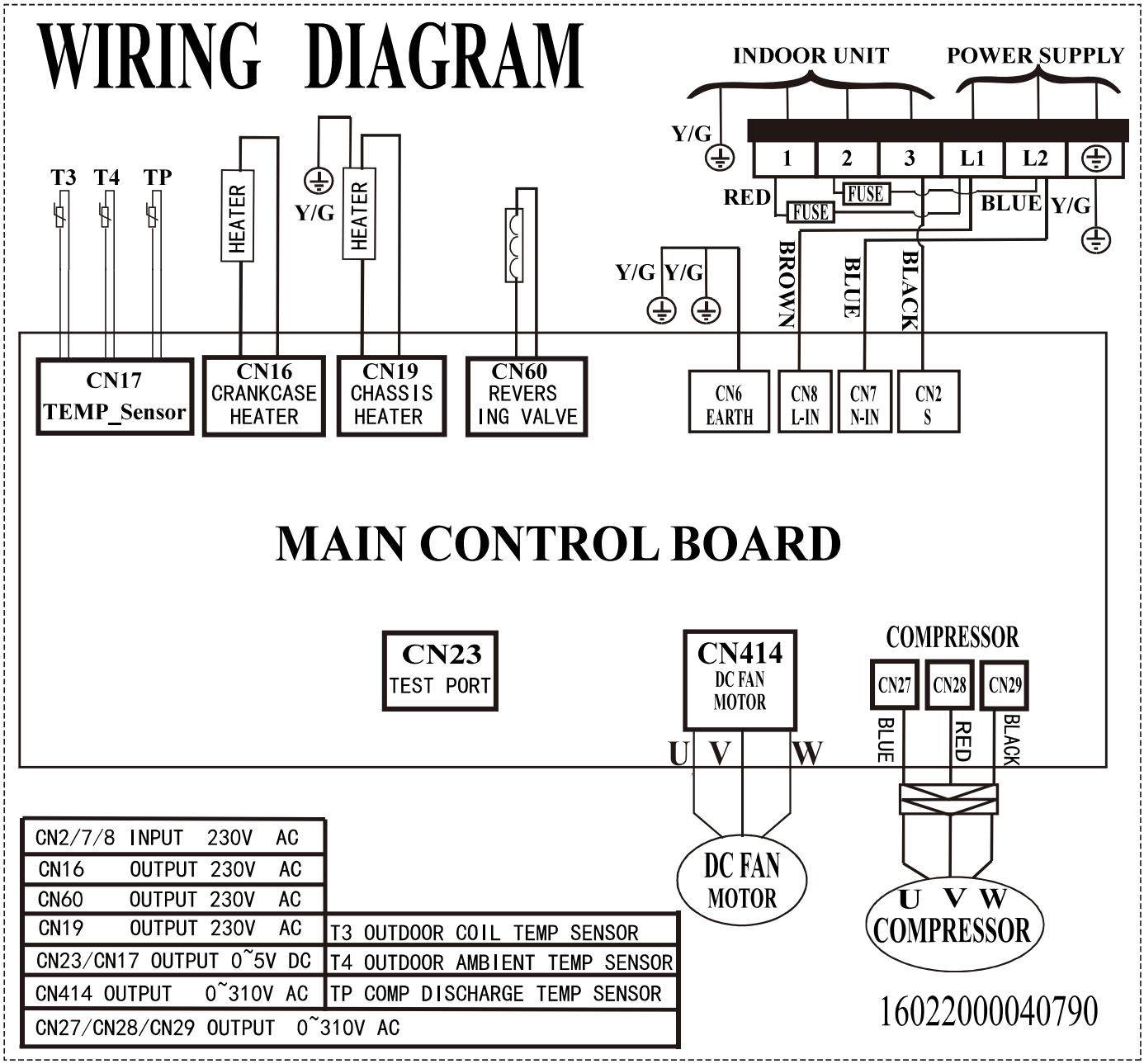
Outdoor unit wiring diagram: 16022000040956



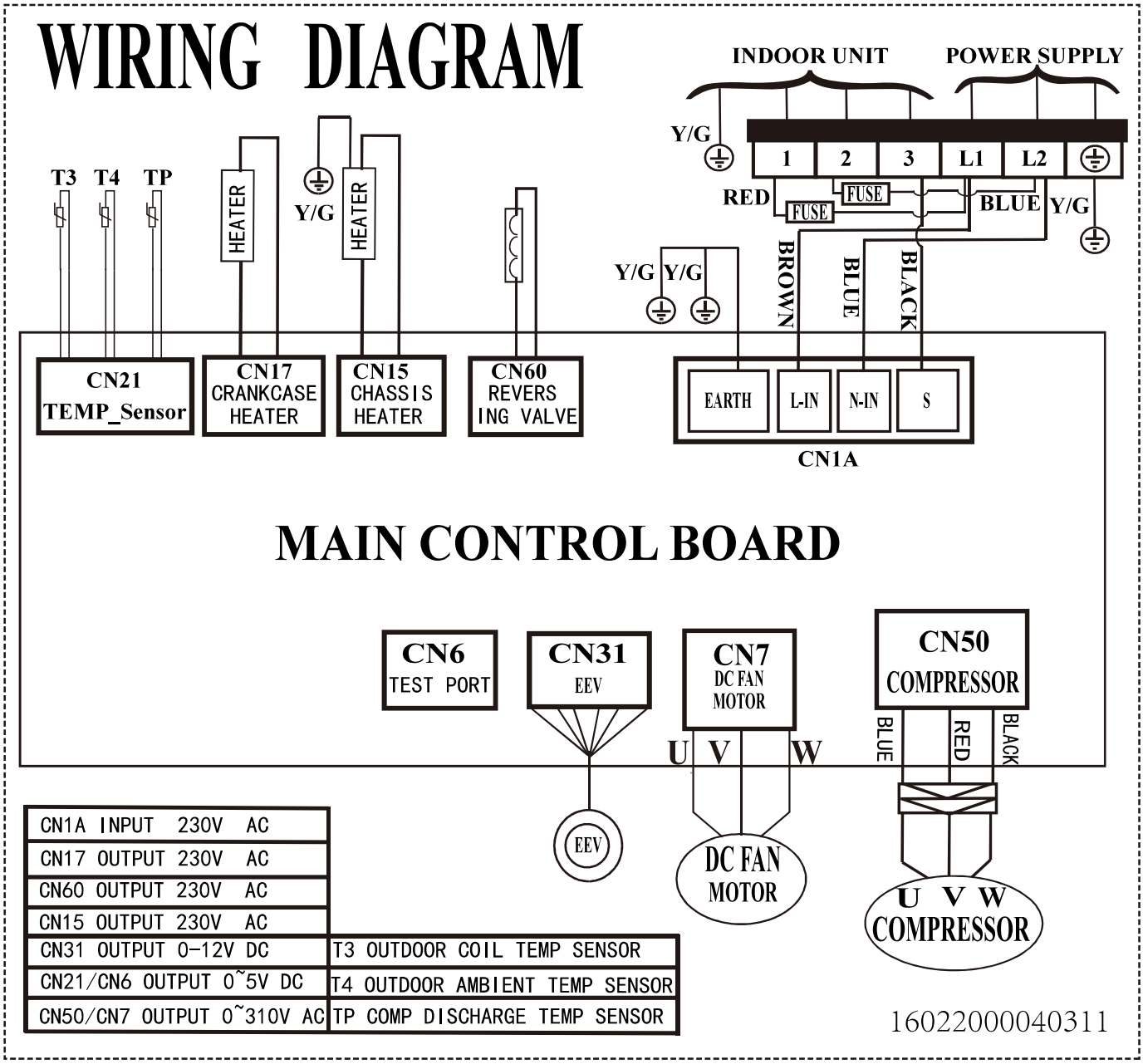
Outdoor unit wiring diagram: 16022000040610



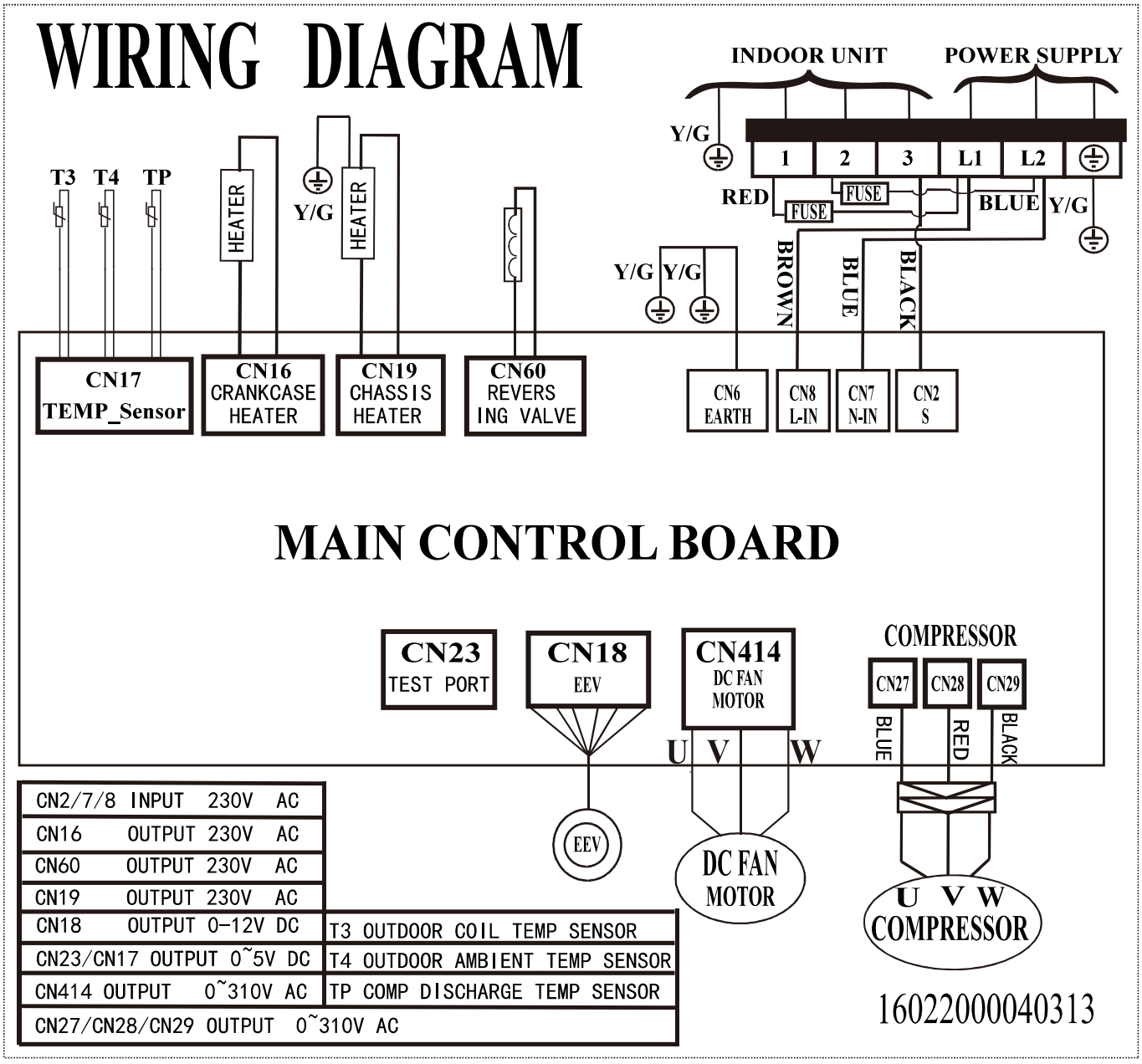
Outdoor unit wiring diagram: 16022000040790



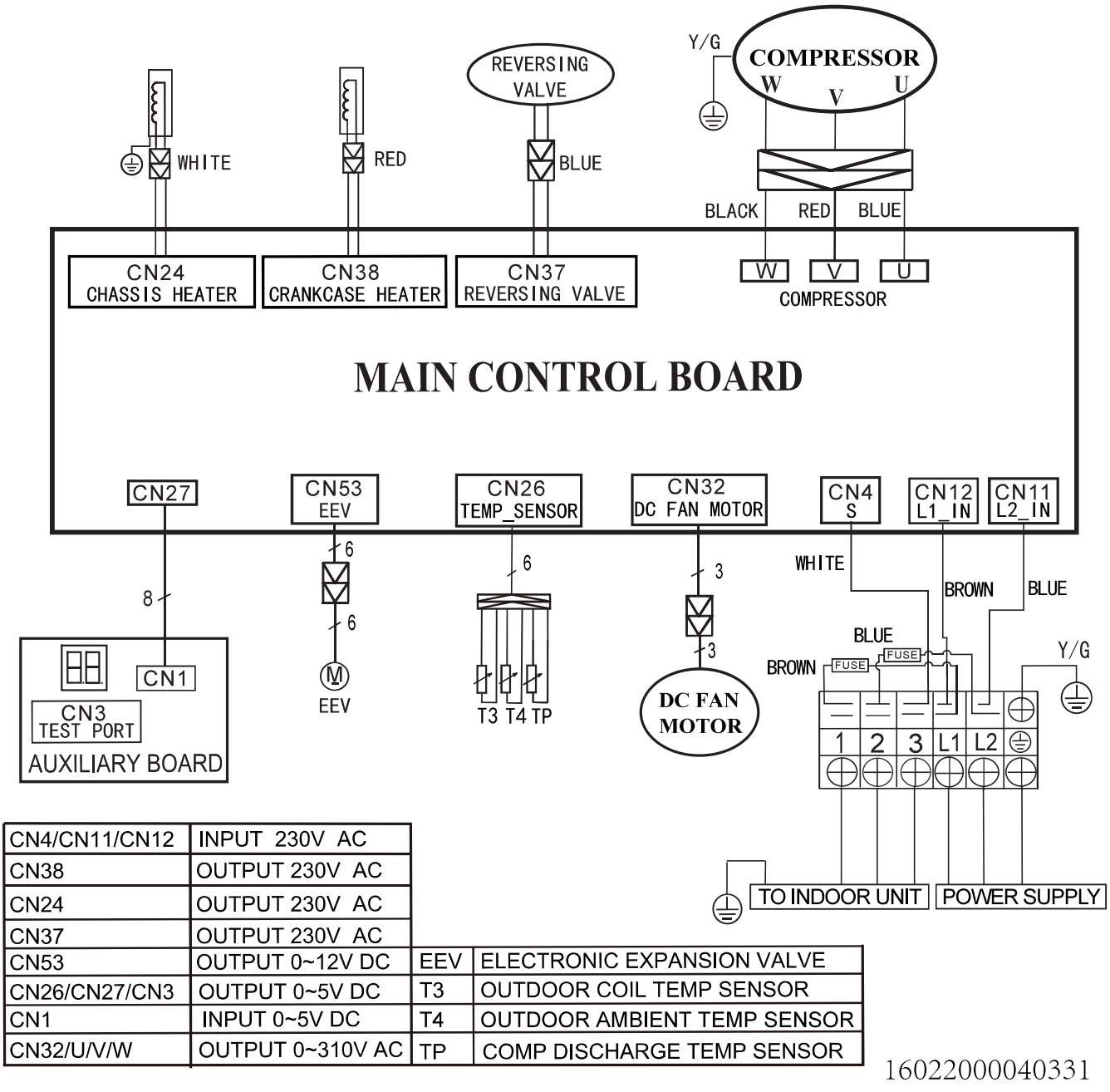
Outdoor unit wiring diagram: 16022000040311



Outdoor unit wiring diagram: 16022000040313



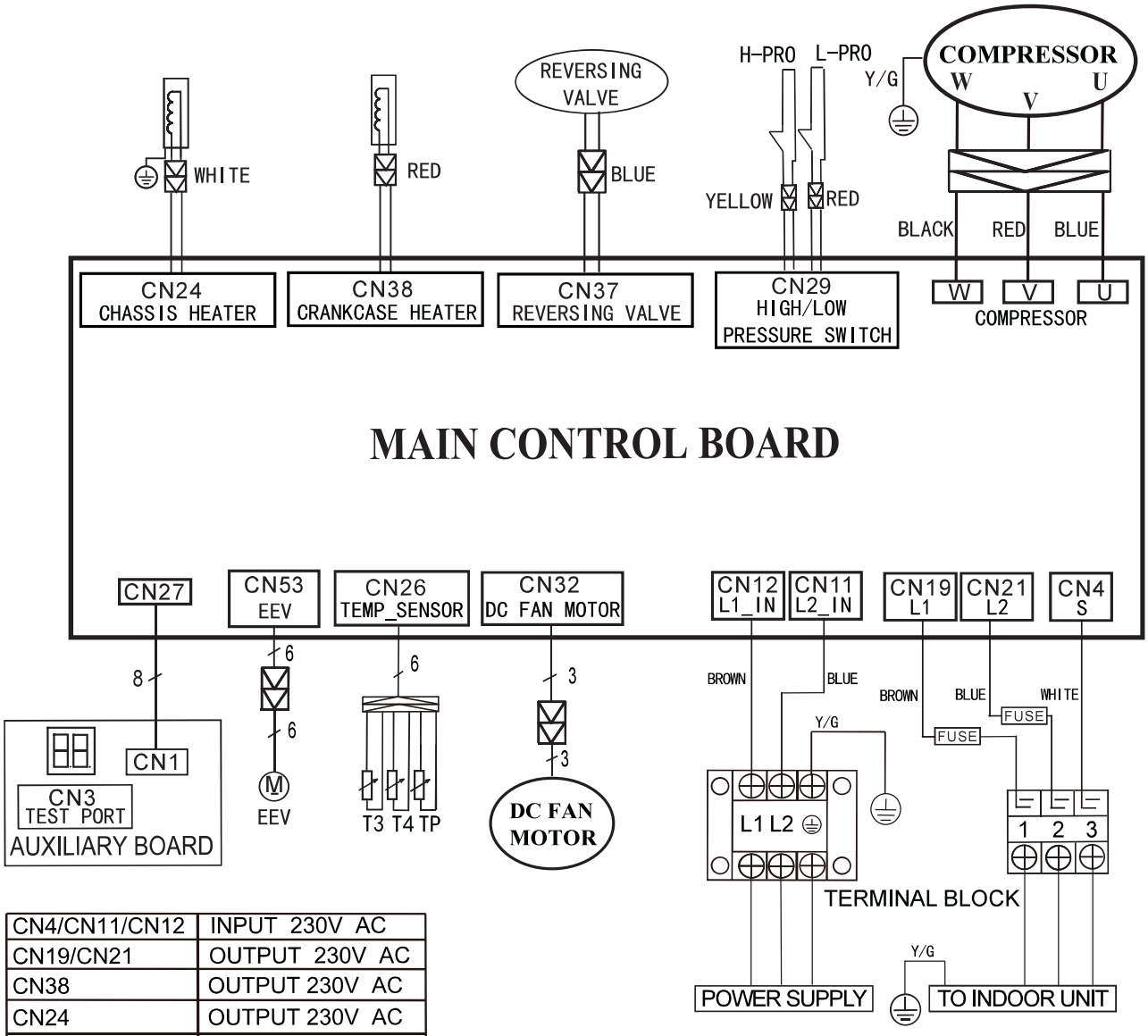
Outdoor unit wiring diagram: 16022000040331



CN4/CN11/CN12	INPUT 230V AC		
CN38	OUTPUT 230V AC		
CN24	OUTPUT 230V AC		
CN37	OUTPUT 230V AC		
CN53	OUTPUT 0~12V DC	EEV	ELECTRONIC EXPANSION VALVE
CN26/CN27/CN3	OUTPUT 0~5V DC	T3	OUTDOOR COIL TEMP SENSOR
CN1	INPUT 0~5V DC	T4	OUTDOOR AMBIENT TEMP SENSOR
CN32/U/V/W	OUTPUT 0~310V AC	TP	COMP DISCHARGE TEMP SENSOR

16022000040331

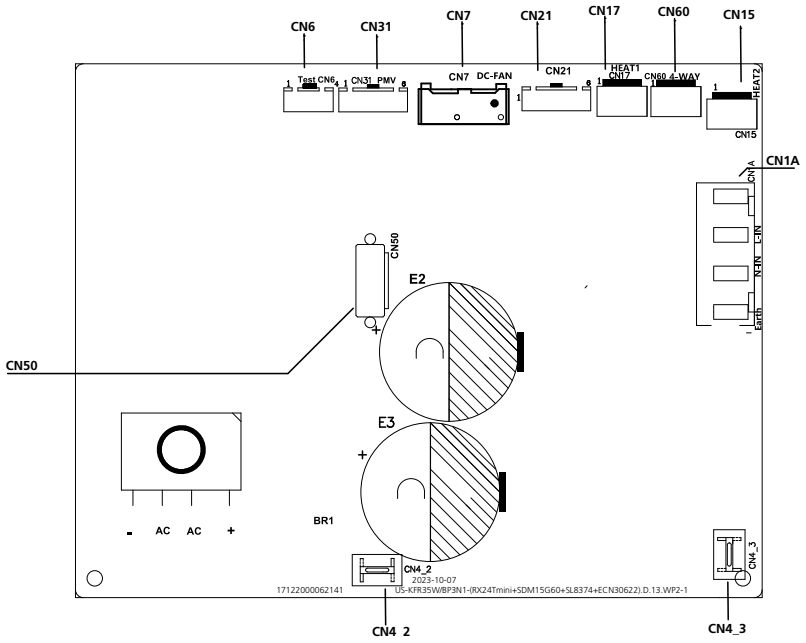
Outdoor unit wiring diagram: 16022000040650



CN4/CN11/CN12	INPUT 230V AC		
CN19/CN21	OUTPUT 230V AC		
CN38	OUTPUT 230V AC		
CN24	OUTPUT 230V AC		
CN37	OUTPUT 230V AC		
CN53	OUTPUT 0-12V DC		
CN3	OUTPUT 0~5V DC	EEV	ELECTRONIC EXPANSION VALVE
CN26/CN27/CN29	OUTPUT 0~5V DC	T3	OUTDOOR COIL TEMP SENSOR
CN1	INPUT 0~5V DC	T4	OUTDOOR AMBIENT TEMP SENSOR
CN32/U/V/W	OUTPUT 0~310V AC	TP	COMP DISCHARGE TEMP SENSOR

16022000040650

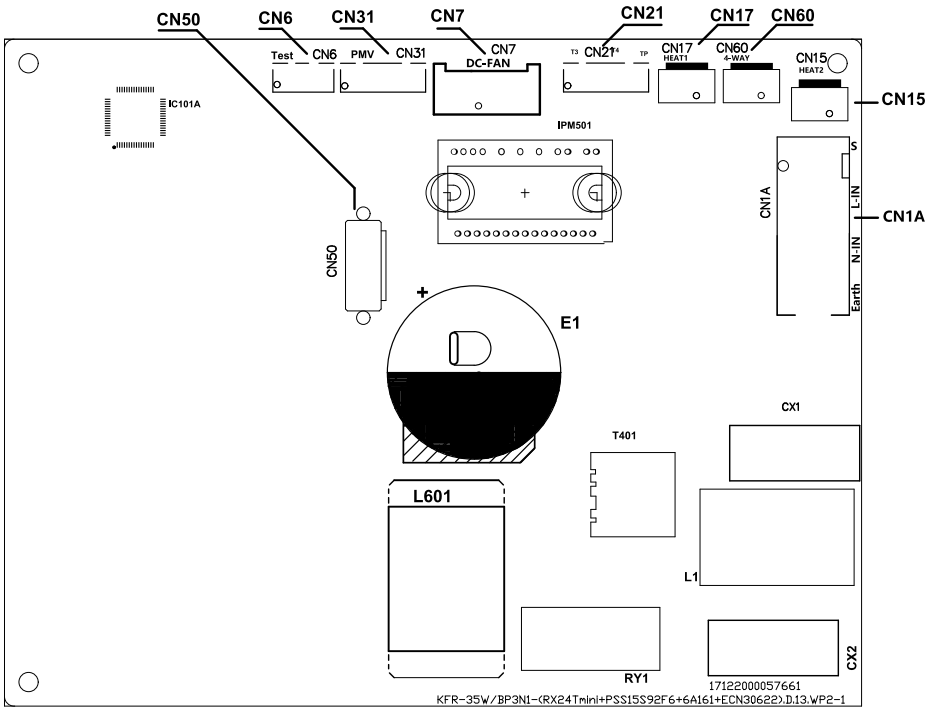
Outdoor unit printed circuit board diagram: 17122000062141



Port	Description	Parameter
CN6	Port for test board	5V/DC
CN31	Power output for EEV	12V/DC
CN7	Port for DC fan	0-310V/AC
CN21	Power output for condenser (T3), ambient (T4) and discharge (Tp) temperature sensors	5V/DC
CN17	Power output for compressor heater	230V/AC
CN60	Power output for 4-way valve	230V/AC
CN15	Power output for chassis heater	230V/AC
CN1A	Port for power cable (E,N,L,S)	
CN4_2	Connection ports for reactor	115V/AC
CN4_3		
CN50	Port for Compressor	0-310V/AC

Note: This section is for reference only. Please take practicality as standard.

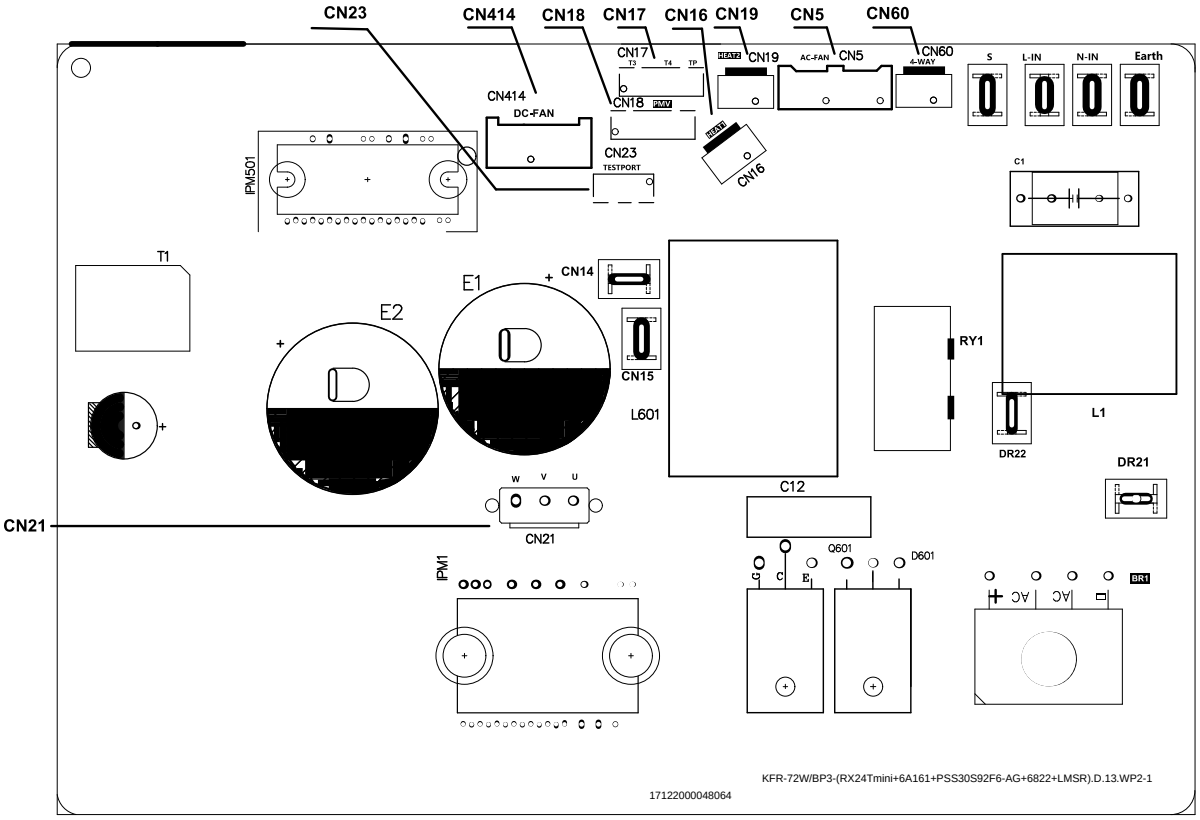
Outdoor unit printed circuit board diagram: 17122000057661



Port		Description	Parameter
CN50		Port for compressor	0-310V/AC
CN6		Port for test board	5V/DC
CN31		Power output for electronic expansion valve	12V/DC
CN7		Power output for DC fan	0-310V/AC
CN21		Power output for condenser (T3), ambient (T4) and discharge (Tp) temperature sensors	5V/DC
CN17		Power output for compressor heater	240V/AC
CN60		Power output for 4-way valve	240V/AC
CN15		Power output for chassis heater	240V/AC
CN1A	CN16	Port for communication cable S	
	CN2	Port for live wire	240V/AC
	CN1	Port for neutral wire	
	CN3	Port for earth wire	

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

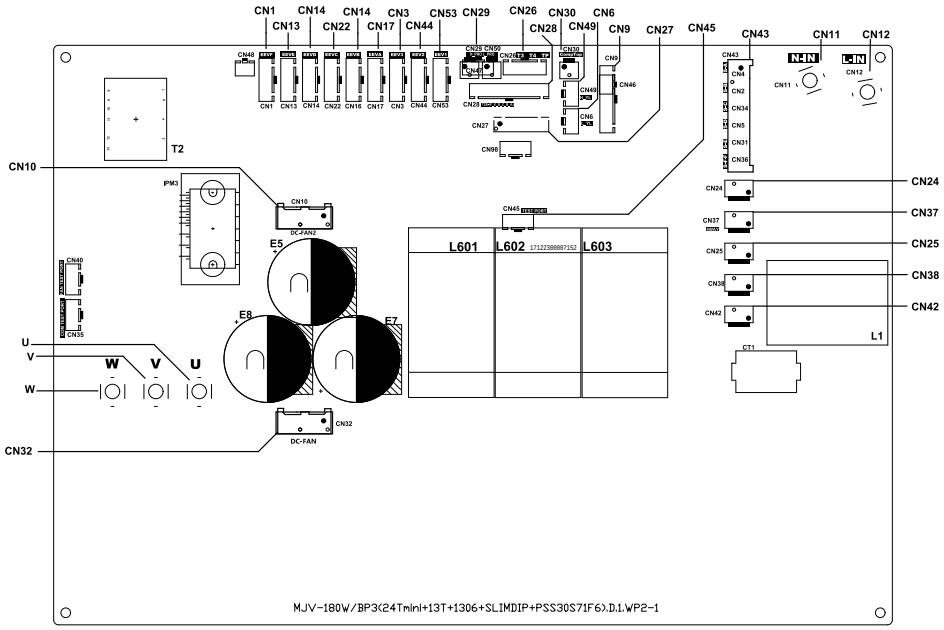
Outdoor unit printed circuit board diagram: 17122000048064_17122000048066



Port	Description	Parameter
CN23	Port for test board	5V/DC
CN414	Port for DC fan	0-310V/AC
CN18	Power output for electronic expansion valve	12V/DC
CN17	Power output for condenser (T3), ambient (T4) and discharge (Tp) temperature sensors	5V/DC
CN16	Power output for compressor heater	230V/AC
CN19	Power output for chassis heater	230V/AC
CN5	Power output for AC fan	230V/AC
CN60	Power output for 4-way valve	230V/AC
CN21	Port for compressor	0-310V/AC

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

Outdoor unit printed circuit board diagram: 17122300007152



Port	Description	Parameter		Port	Description	Parameter
CN1, CN13, CN14, CN22, CN16, CN17, CN3, CN44, CN53	Power output for electronic expansion valve	12V/DC		CN43	Communication ports to indoor unit (S for A-F)	Input: 0~230V/AC
CN29	Port for high-pressure and low-pressure switches	Input: 5V/ DC		CN11,12	Power input for this PCB	230V/AC
CN26	Power output for condenser(T3), ambient (T4) and discharge(TP) temperature sensors	5V/DC		CN24	Power output for chassis heater	230V/AC
CN28	Power output for evaporator (T2B) temperature sensor of IDU A-F	5V/DC		CN37	Power output for 4-way valve 1	230V/AC
CN30	Port for compressor top high temperature protector	Input: 5V/ DC		CN25	Power output for 4-way valve 2	230V/AC
CN49/CN6	Port for Hi-pressure and low-pressure sensors	5V/DC		CN38	Power output for compressor heater	230V/AC
CN9	Power output for EVI temperature sensors (T5-T8)	5V/DC		CN42	Power output for 4-way valve 3	230V/AC
CN27	Communication port with key board	5V/DC		U, V, W	Output for compressor	0-310V/AC
CN45	Port for DR module (Test port)	5V/DC		CN32/CN10	Output for DC fan	0-310V/AC

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

Product Features

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1. Display Function

Unit display functions



Display	Function
	When Wireless Control feature is activated(For APP control units)
	Displays temperature, operation feature and Error codes
 (for 3s when)	• TIMER ON is set. (if the unit is OFF,  remains on when TIMER ON is set). • SWING, TURBO or SILENCE feature is turned on.
 (for 3s when)	• TIMER OFF is set. • SWING, TURBO or SILENCE feature is turned off.
	When defrosting.
	When Active Clean feature is turned on.
	When (8°C) heating feature is turned on.

2. Safety Features

Compressor three-minute delay at restart

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

Automatic shutoff based on discharge temperature

If the compressor discharge temperature exceeds a certain level for a period of time, the compressor ceases operation.

Automatic shutoff based on fan speed

If the indoor fan speed registers below 200RPM or over 2100RPM for an extended period of time, the unit ceases operation and the corresponding error code is displayed on the indoor unit.

Inverter module protection

The inverter module has an automatic shutoff mechanism based on the unit's current, voltage, and temperature. If automatic shutoff is initiated, the corresponding error code is displayed on the indoor unit and the unit ceases operation.

Indoor fan delayed operation

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

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

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
Tsc	Adjusted setting temperature
TP	Compressor discharge temperature
CDIFTEMP	Cooling shutdown temperature
HDIFTEMP2	Heating shutdown temperature
TCDI1	Enter defrost temperature
TCDE1	Exit defrost temperature1
TCDE2	Exit defrost temperature2 (maintain for a period of time)
TIMING_ DEFROST_TIME	Enter defrost time

In this manual, such as CDIFTEMP, HDIFTEMP2, TCDE1, TCDE2, TIMING_DEFROST_TIME...etc., they are well-setting parameter of EEPROM.

3.2 Fan Mode

When fan mode is activated:

- The outdoor fan and compressor cease operation.
- Temperature control is disabled and indoor room temperature is displayed.
- The indoor fan speed can be set to 1%~100%, or auto.
- The louver operations are identical to those in cooling mode.
- Auto fan: In fan-only mode, AC operates the same as auto fan in cooling mode with the temperature set at 24°C(75°F).(Tsc =24°C(75°F))

3.3 Cooling Mode

3.3.1 Compressor Control

Reach the configured temperature:

1) When the compressor runs continuously for within 120 minutes.

- If the following conditions are satisfied, the compressor ceases operation.
  - Calculated frequency(fb) is less than minimum limit frequency(FminC).
  - Compressor runs at FminC more than 10 minutes
  - T1 is lower than or equal to (Tsc-CDIFTEMP-0.5°C(1°F))

Note: CDIFTEMP is EEPROM setting parameter. It is 2°C(4°F) usually.

2) When the compressor runs continuously for more than 120 minutes.

- If the following conditions are satisfied, the compressor ceases operation.
  - Calculated frequency(fb) is less than minimum limit frequency(FminC).
  - Compressor runs at FminC more than 10 minutes.
  - T1 is lower than or equal to (Tsc-CDIFTEMP).

Note: CDIFTEMP is EEPROM setting parameter. It is 2°C(4°F) usually.

3) If one of the following conditions is satisfied, not judge protective time.

- Compressor running frequency(fr) is more than test frequency(TestFre).
- Compressor running frequency is equal to test frequency, T4 is more than 15°C(59°F) or T4 fault.
- Change setting temperature.
- Turn on/off turbo or sleep function
- Various frequency limit shutdown occurs.

3.3.2 Indoor Fan Control

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

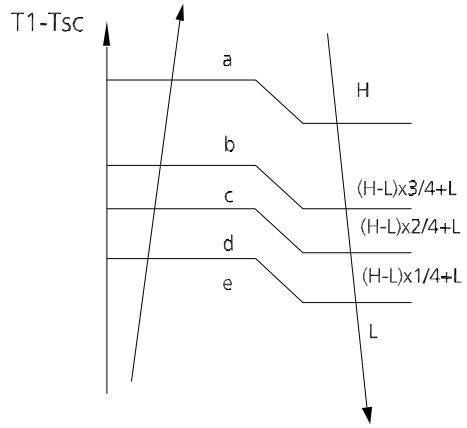
2) Auto fan

For DC fan motor units:

- Descent curve
  - When T1-Tsc is lower than 3.5°C(6°F), fan speed reduces to 80%;
  - When T1-Tsc is lower than 1°C(2°F), fan speed reduces to 60%;
  - When T1-Tsc is lower than 0.5°C(1°F), fan speed reduces to 40%;
  - When T1-Tsc is lower than 0°C(0°F), fan speed reduces to 20%;
  - When T1-Tsc is lower than -0.5°C(-1°F), fan speed reduces to 1%.
- Rise curve

- When T1-Tsc is higher than or equal to 0°C(0°F), fan speed increases to 20%;
- When T1-Tsc is higher than or equal to 0.5°C(1°F), fan speed increases to 40%;
- When T1-Tsc is higher than or equal to 1°C(2°F), fan speed increases to 60%;
- When T1-Tsc is higher than or equal to 1.5°C(3°F), fan speed increases to 80%;
- When T1-Tsc is higher than or equal to 4°C(7°F), fan speed increases to 100%.

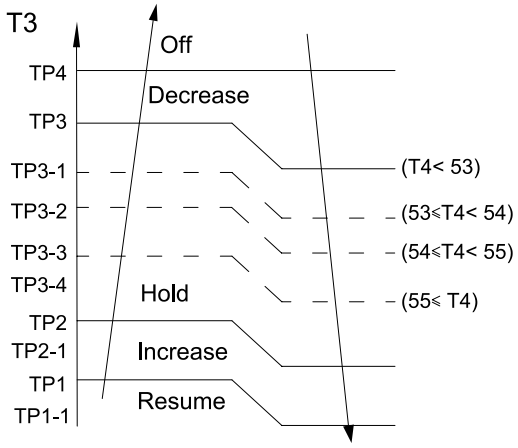
For AC fan motor units:



3.3.3 Outdoor Fan Control

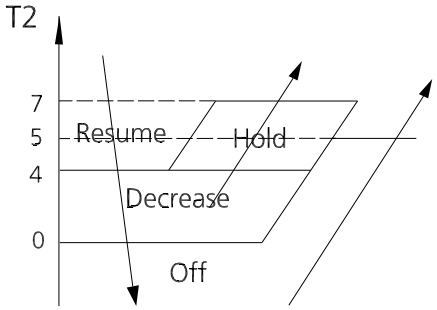
- The outdoor unit will be run at different fan speed according to T4 and compressor running frequency..
- For different outdoor units, the fan speeds are different.

3.3.4 Condenser Temperature Protection



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

3.3.5 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 Compressor Control

1) Reach the configured temperature

- If the following conditions are satisfied, the compressor ceases operation.
  - Calculated frequency(fb) is less than minimum limit frequency(FminH).
  - Compressor runs at FminH more than 10 minutes.
  - T1 is higher than or equal to Tsc+ HDIFTEMP2.

Note: HDIFTEMP2 is EEPROM setting parameter. It is 2°C(4°F) usually.

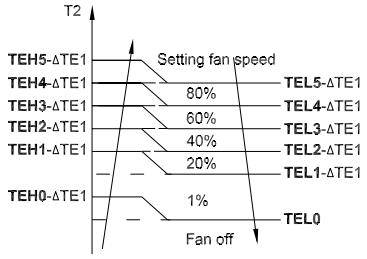
- If one of the following conditions is satisfied, not judge protective time.
  - Compressor running frequency(fr) is more than test frequency(TestFre).
  - When compressor running frequency is equal to test frequency, T4 is more than 15°C(59°F) or T4 fault.
  - Change setting temperature.
  - Turn on/off turbo or sleep function.

2) When the current is higher than the predefined safe value, surge protection is activated, causing the compressor to cease operations.

3.4.2 Indoor Fan Control:

1) In heating mode, the indoor fan operates continuously. The fan speed can be set to 1%-100%, or mute.And the anti-cold wind function has the priority.

- Anti-cold air function
  - The indoor fan is controlled by the indoor temperature T1 and indoor unit coil temperature T2.



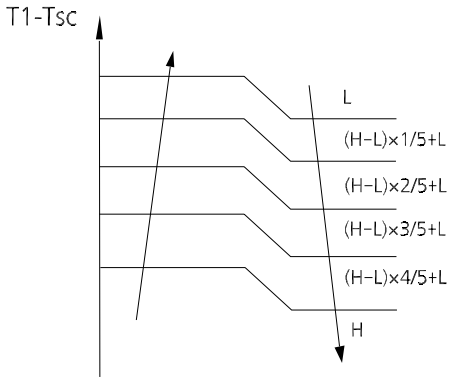
T1 ≥ 19°C(66°F)	ΔTE1=0
15°C(59°F)≤T1<19°C(66°F)	ΔTE1=19°C−T1 (66°F-T1)
T1<15°C(59°F)	ΔTE1=4°C(7°F)

2) Auto fan

For DC fan motor units:

- Rise curve
  - When T1-Tsc is higher than -1.5°C(-3°F), fan speed reduces to 80%;
  - When T1-Tsc is higher than 0°C(0°F), fan speed reduces to 60%;
  - When T1-Tsc is higher than 0.5°C(1°F), fan speed reduces to 40%;
  - When T1-Tsc is higher than 1°C(2°F), fan speed reduces to 20%.
- Descent curve
  - When T1-Tsc is lower than or equal to 0.5°C(1°F), fan speed increases to 40%;
  - When T1-Tsc is lower than or equal to 0°C(0°F), fan speed increases to 60%;
  - When T1-Tsc is lower than or equal to -1.5°C(-3°F), fan speed increases to 80%;
  - When T1-Tsc is lower than or equal to -3°C(5°F), fan speed increases to 100%.

For AC fan motor units:



3.4.3 Outdoor Fan Control:

- The outdoor unit will be run at different fan speed according to T4 and compressor running frequency.
- For different outdoor units, the fan speeds are different.

3.4.4 Defrosting mode

- If any one of the following conditions is satisfied, AC will enter the defrosting mode.

After the compressor starts up and keeps running, take the lowest temp of T3 (from the period 7th minutes to 12nd minutes) as T30.

Condition 1: If the compressor cumulate running time is up to 29 minutes and T3< TCDI1 and T3 ≤ T30-T30SUBT30ONE and T4<-22°C(DEFROST_T4_ADD)

Condition 2: If the compressor cumulate running time is up to 35 minutes and T3< TCDI2 and T3 ≤ T30-T30SUBT30TWO and T4<-22°C(DEFROST_T4_ADD)

Condition 3: If the compressor cumulate running time is up to 29 minutes and T3< -24 (TCDI3_ADD) for 3 minutes. and T4>-22°C(DEFROST_T4_ADD)

Condition 4: For the model active this condition If the compressor cumulate running time is up to 120 minutes and T3<-15°C and T4<-22°C

Condition 5: This is just for the first time defrost after power on condition,on the scenario when first time defrost or power off and power back or turn on from standyby need to check the ice accumulate situation(the defrost time reckon reset),when compressor cumulate running time is up to 30 minutes T4-T3 > (0.5T4 + KDELTT_ADD) and T3 < TCDIN5_ADD, T4<-22°C,

Condition 6: For the model active this condition If the compressor cumulate running time is up to TIMING_DEFROST_TIME (Hour) and T4≤-22°C(DEFROST_T4_ADD),the T4 without malfunction

Condition 7:When T3 or T4 lower that -3°C (last for 30 seconds) cumulate running for (EE_TIME_DEFROST7_ADD) minutes with Ts-T1 ≤ 5°C(not need based on T30 keep running with minimum 10th minutes)

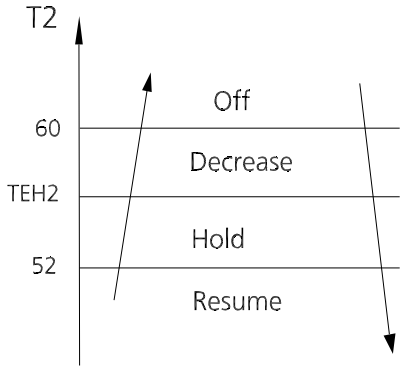
Condition 8: When T3 or T4 lower that -3°C (last for 30 seconds) cumulate running for (EE_TIME_DEFROST7_ADD+30) minutes (not need based on T30 keep running with minimum 10th minutes)

- In defrosting mode, the compressor continues to run, the indoor and outdoor motor will cease operation, the defrost light of the indoor unit will turn on, and the "dF" symbol is displayed.
- Condition 1~5, If any one of the following conditions is satisfied, defrosting ends and the machine switches to normal heating mode:

- T3 rises above TCDE1.
- T3 maintained above TCDE2 for 80 seconds.
- Unit runs for 15 minutes consecutively in defrosting mode.

- Condition 6, if any one of the following conditions is satisfied, defrosting ends and the machine switches to normal heating mode:
  - Unit runs for 10 minutes consecutively in defrosting mode.
  - T3 rises above 10°C(50°F).
- Condition 7~8, If any one of the following conditions is satisfied, defrosting ends and the machine switches to normal heating mode:
  - T3 rises above TCDE1+4°C/7°F.
  - T3 maintained above TCDE2+4°C/7°F for 80 seconds.
  - Unit runs for 15 minutes consecutively in defrosting mode.

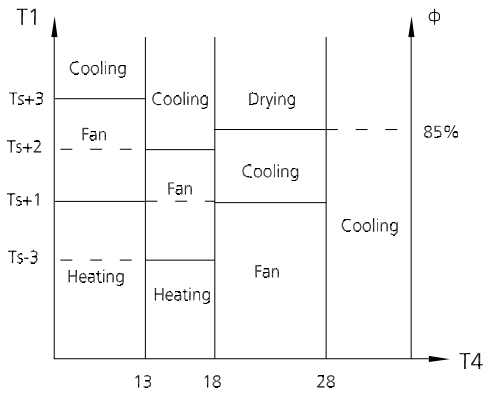
3.4.5 Evaporator Temperature Protection



- 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 setting temperature can be changed between 16°C~30°C(60°F~86°F).
- In auto mode, the machine selects cooling, heating, auto-drying or fan-only mode on the basis of T1,Ts, T4 and relative humidity.



- If the setting temperature is modified, the machine selects a new running function.

4 Drying mode

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

If the room temperature is lower than 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

- Forced cooling mode:

The compressor and outdoor fan continue to run(fixed at rated frequency), and the indoor fan runs at rated 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 on
  - Switch off
  - Timer on
  - Timer off
  - Sleep mode
  - Follow me
  - Changes in:
    - mode
    - fan speed
    - setting temperature

- Forced defrosting mode:
  - Press AUTO/COOL button continuously for 5s under forced cooling mode to enter this mode.
  - Indoor fan will stop, defrosting lamp will light on.
  - Quit this mode and turn off the unit when:
    - quit normal defrosting
    - turn off by RC
    - Press AUTO/COOL button continuously for 5s again

3.8 Timer function

- Timing range is 24 hours.
- Timer on. The machine will turn on automatically when reaching the setting time.
- Timer off. The machine will turn off automatically when reaching the setting time.
- Timer on/off. The machine will turn on automatically when reaching the setting "on" time, and then turn off automatically when reaching the setting "off" time.
- Timer off/on. The machine will turn off automatically when reaching the setting "off" time, and then turn on automatically when reaching the setting "on" time.
- The timer function will not change the AC current operation mode. Suppose AC is off now, it will not start up firstly after setting the "timer off" function. And when reaching the setting time, the timer LED will be off and the AC running mode has not been changed.
- The setting time is relative time.
- The AC will quit the timer function when it has malfunction

3.9 Sleep function

- The sleep function is available in cooling, heating, or auto mode.
- The operational process for sleep mode is as follows:
  - When cooling, the temperature rises 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 temperature decreases 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.
- The operating time for sleep mode is 8 hours, after which, the unit exits this mode.
- 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.
- If there is a power failure while the unit is running, the compressor starts 3 minutes after the unit restarts. If the unit was already off before the power failure, the unit stands by.

3.11 Active Clean function

- The Active Clean Technology washes away dust, mold, and grease that may cause odors when it adheres to the heat exchanger by automatically freezing and then rapidly thawing the frost. The internal wind wheel then keeps operating to blow-dry the evaporator, thus preventing the growth of mold and keeping the inside clean.
- When this function is turned on, the indoor unit display window appears "CL", after 20 to 130 minutes, the unit will turn off automatically and cancel Active Clean function.

3.12 Follow me(Optional)

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

3.13 8°C Heating(Optional)

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

3.14 Silence (Optional)

Press "Silence" on the remote control to enable the SILENCE function. While this function is active, the indoor unit will run at faint breeze(1% fan speed), which reduces

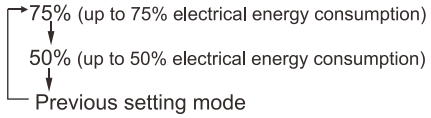
noise to the lowest possible level.

3.15 ECO function (Optional)

- Used to enter the energy efficient mode.
  - Under cooling mode, press ECO button, the remote controller will adjust the temperature automatically to 24°C/75°F, fan speed of Auto to save energy (but only if the set temperature is less than 24°C/75°F). If the set temperature is more than 24°C/75°F and 30°C/86°F, press the ECO button, the fan speed will change to Auto, the set temperature will remain unchanged.
- When AC receives signals, such as switch off, Turbo operation , Silence operation , Self clean operation , Forced cooling operation, mode setting, Sleeping mode, or adjusting the set temperature to less than 24°C/76°F,it will quit the ECO operation.
- Operation time in ECO mode is 8 hours. After 8 hours the AC quits this mode.
- When there's any one temperature sensor in malfunction, the AC will quit ECO mode .
- Indoor fan will run at auto fan when enter into the ECO mode .The setting temperature and setting fan speed can be changed through remote controller signal.

3.16 Electrical energy consumption control function (Optional)

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



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

3.17 Breeze Away function (Optional)

- This feature avoids direct airflow blowing on the body and makes you feel indulging in silky coolness.
- NOTE: This feature is available under cooling mode, fan-only mode and drying mode.

3.18 Wireless Control (Optional)

- Wireless control allows you to control your air conditioner using your mobile phone and a Wireless connection.
- For the USB device access, replacement, maintenance operations must be carried out by professional staff.

Maintenance

Contents

1. First Time Installation Check 2

2 Refrigerant Recharge 4

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3.1 Indoor Unit 5

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1. First Time Installation Check

Air and moisture trapped in the refrigerant system affects the performance of the air conditioner by:

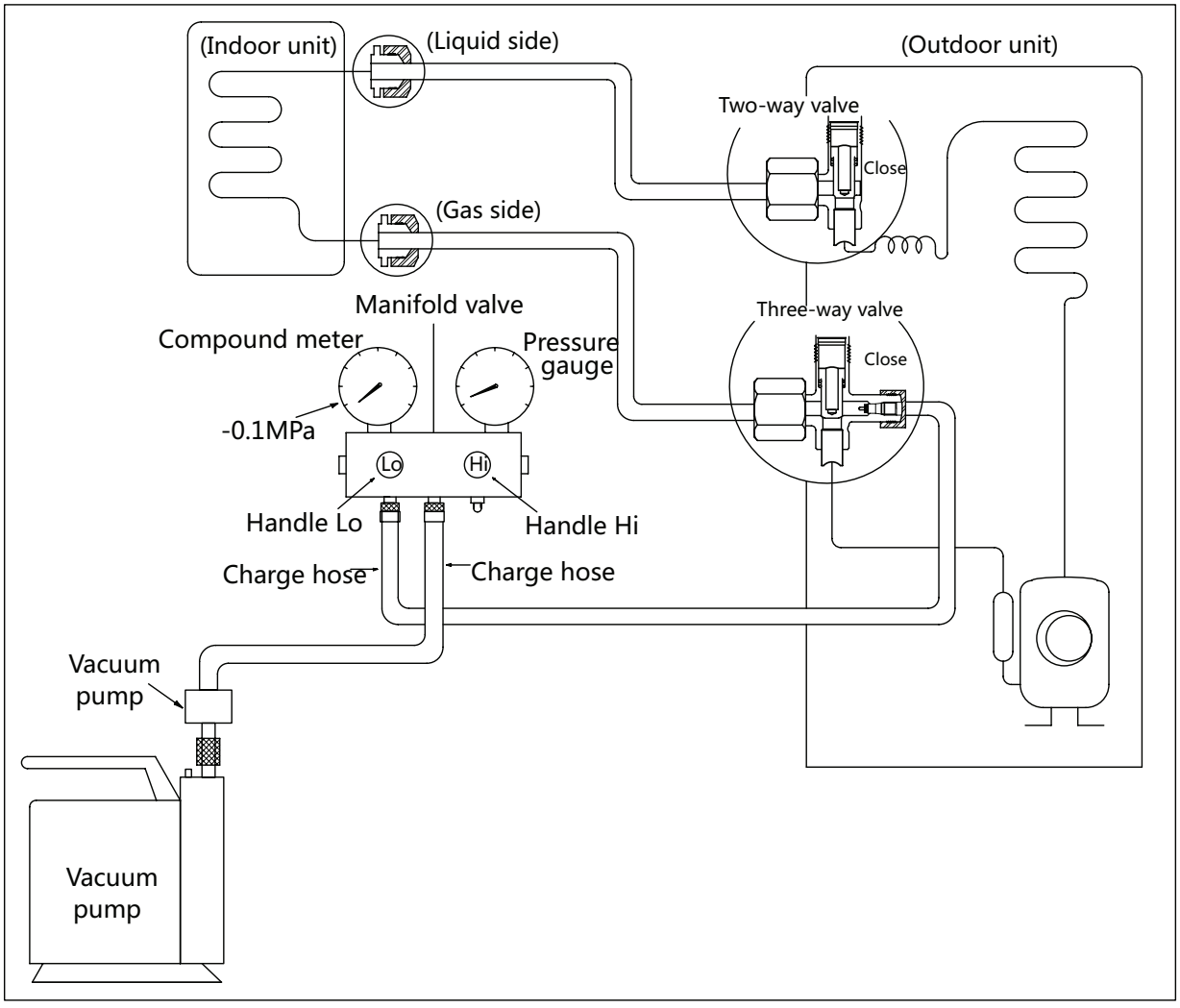
- Increasing pressure in the system.
- Increasing the operating current.
- Decreasing the cooling or heating efficiency.
- Congesting the capillary tubing due to ice build-up in the refrigerant circuit.
- Corroding the refrigerant system.

To prevent air and moisture from affecting the air conditioner's performance, the indoor unit, as well as the pipes between the indoor and outdoor unit, must be be leak tested and evacuated.

Leak test (soap water method)

Use a soft brush to apply soapy water or a neutral liquid detergent onto the indoor unit connections and outdoor unit connections. If there is gas leakage, bubbles will form on the connection.

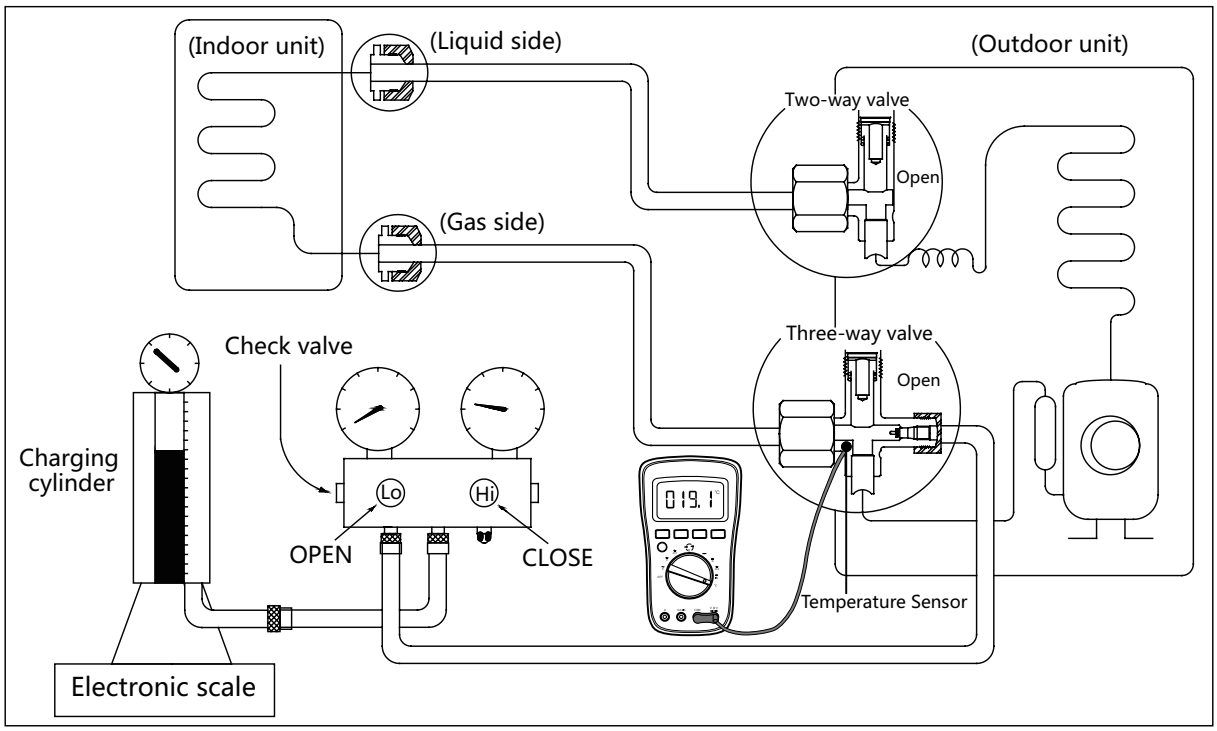
Air purging with vacuum pump



Procedure:

1. Tighten the flare nuts of the indoor and outdoor units, and confirm that both the 2- and 3-way valves are closed.
2. Connect the charge hose with the push pin of Handle Lo to the gas service port of the 3-way valve.
3. Connect another charge hose to the vacuum pump.
4. Fully open the Handle Lo manifold valve.
5. Using the vacuum pump, evacuate the system for 30 minutes.
   a. Check whether the compound meter indicates -0.1 MPa (14.5 Psi).
      - If the meter does not indicate -0.1 MPa (14.5 Psi) after 30 minutes, continue evacuating for an additional 20 minutes.
      - If the pressure does not achieve -0.1 MPa (14.5 Psi) after 50 minutes, check for leakage.
      - If the pressure successfully reaches -0.1 MPa (14.5 Psi), fully close the Handle Lo valve, then cease vacuum pump operations.
   b. Wait for 5 minutes then check whether the gauge needle moves after turning off the vacuum pump. If the gauge needle moves backward, check wether there is gas leakage.
6. Loosen the flare nut of the 3-way valve for 6 or 7 seconds and then tighten the flare nut again.
   a. Confirm the pressure display in the pressure indicator is slightly higher than the atmospheric pressure.
   b. Remove the charge hose from the 3-way valve.
7. Fully open the 2- and 3-way valves and tighten the cap of the 2- and 3-way valves.

2. Refrigerant Recharge



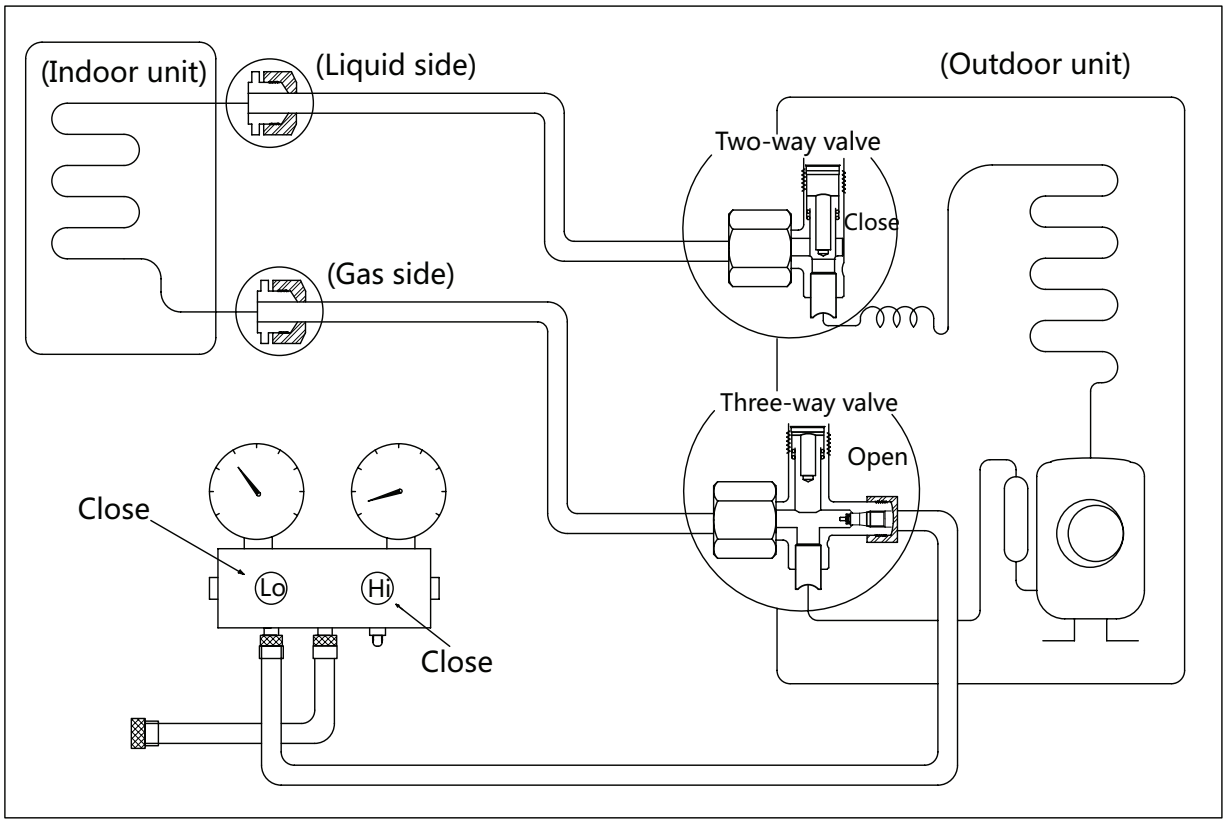
Procedure:

1. Close both 2- and 3-way valves.
2. Slightly connect the Handle Lo charge hose to the 3-way service port.
3. Connect the charge hose to the valve at the bottom of the cylinder.
4. If the refrigerant is R410A/R32, invert the cylinder to ensure a complete liquid charge.
5. Open the valve at the bottom of the cylinder for 5 seconds to purge the air in the charge hose, then fully tighten the charge hose with push pin Handle Lo to the service port of 3-way valve..
6. Place the charging cylinder onto an electronic scale and record the starting weight.
7. Fully open the Handle Lo manifold valve, 2- and 3-way valves.
8. Operate the air conditioner in cooling mode to charge the system with liquid refrigerant.
9. When the electronic scale displays the correct weight (refer to the gauge and the pressure of the low side to confirm, the value of pressure refers to chapter Appendix), turn off the air conditioner, then disconnect the charge hose from the 3-way service port immediately..
10. Mount the caps of service port and 2- and 3-way valves.
11. Use a torque wrench to tighten the caps to a torque of 18 N.m.
12. Check for gas leakage.

3. Re-Installation

3.1 Indoor Unit

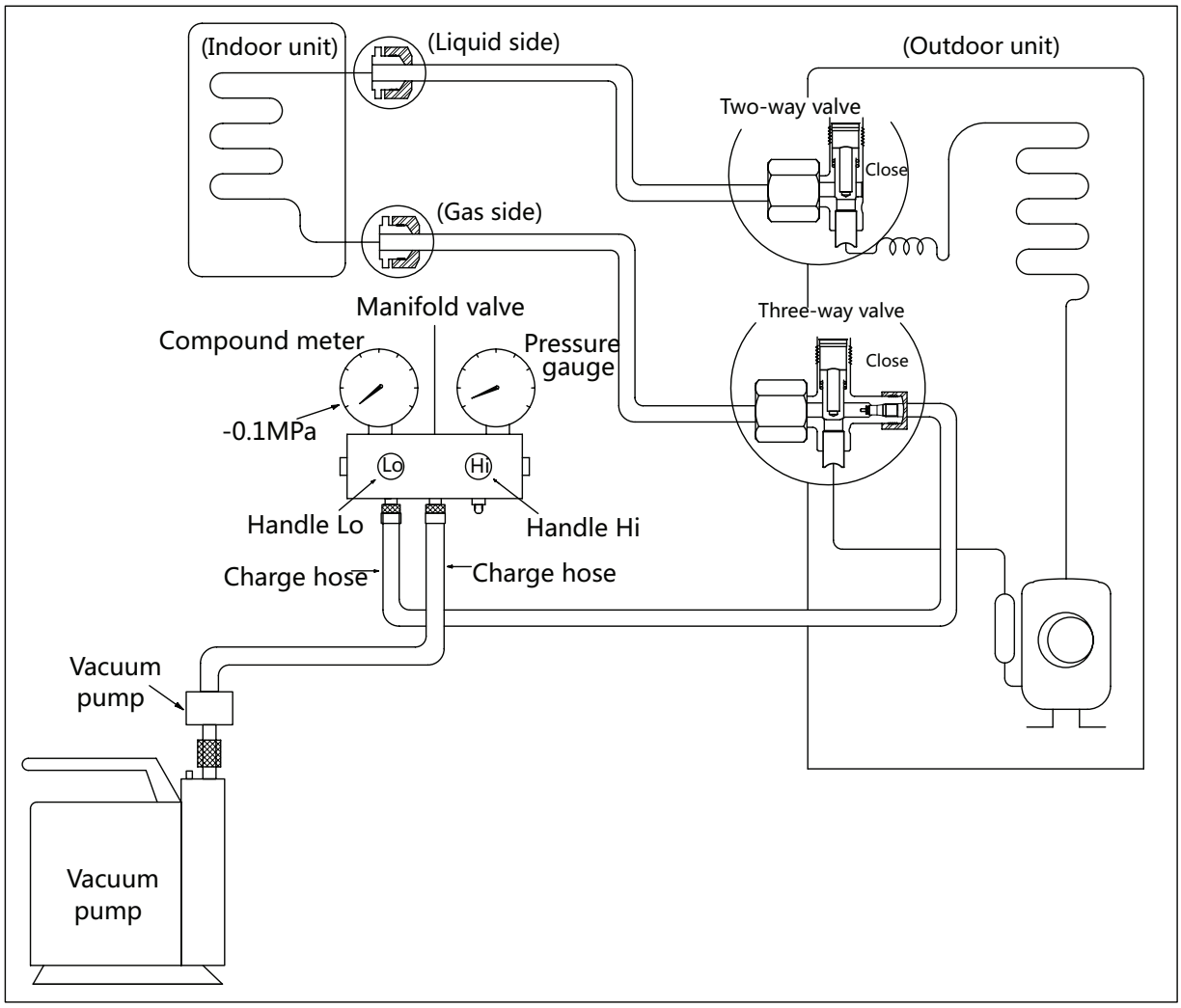
Collecting the refrigerant into the outdoor unit



Procedure:

1. Confirm that the 2- and 3-way valves are opened.
2. Connect the charge hose with the push pin of Handle Lo to the 3-way valve's gas service port.
3. Open the Handle Lo manifold valve to purge air from the charge hose for 5 seconds and then close it quickly.
4. Close the 2-way valve.
5. Operate the air conditioner in cooling mode. Cease operations when the gauge reaches 0.1 MPa (14.5 Psi).
6. Close the 3-way valve so that the gauge rests between 0.3 MPa (43.5 Psi) and 0.5 MPa (72.5 Psi).
7. Disconnect the charge set and mount the caps of service port and 2- and 3-way valves.
8. Use a torque wrench to tighten the caps to a torque of 18 N.m.
9. Check for gas leakage.

Air purging with vacuum pump



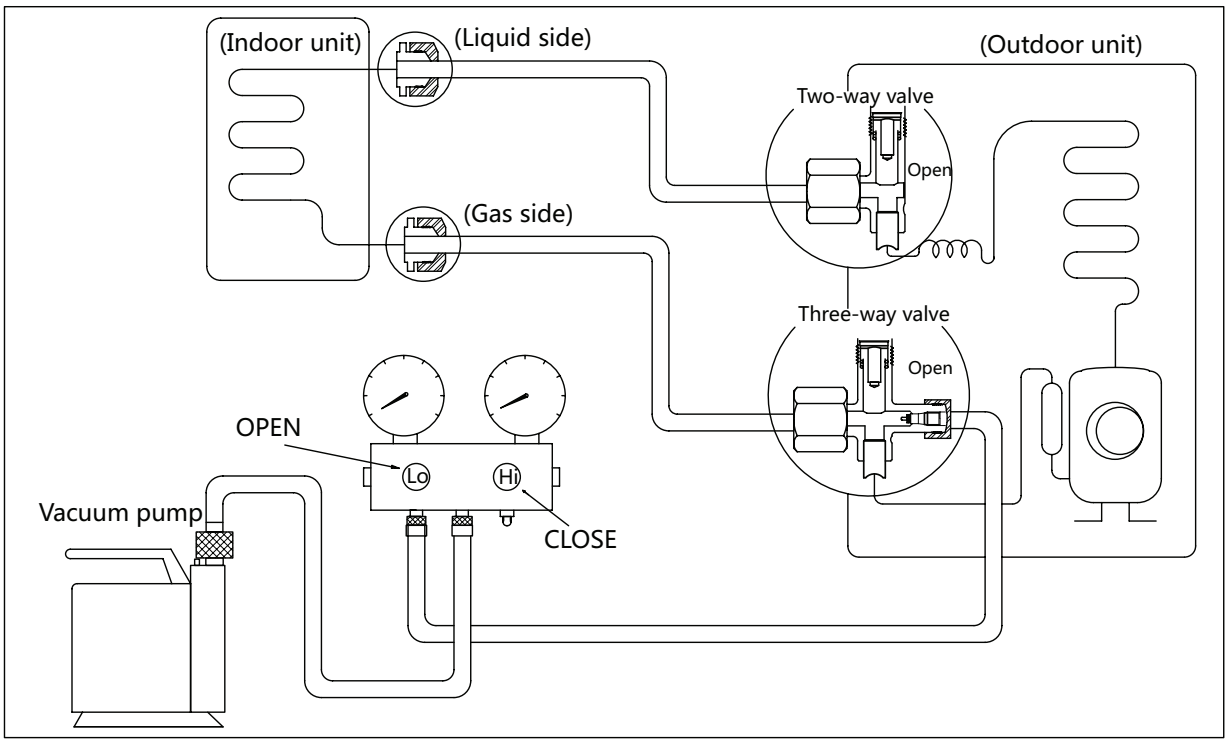
Procedure:

1. Tighten the flare nuts of the indoor and outdoor units, and confirm that both the 2- and 3-way valves are closed.
2. Connect the charge hose with the push pin of Handle Lo to the gas service port of the 3-way valve.
3. Connect another charge hose to the vacuum pump.
4. Fully open the Handle Lo manifold valve.
5. Using the vacuum pump, evacuate the system for 30 minutes.
   a. Check whether the compound meter indicates -0.1 MPa (14.5 Psi).
      - If the meter does not indicate -0.1 MPa (14.5 Psi) after 30 minutes, continue evacuating for an additional 20 minutes.
      - If the pressure does not achieve -0.1 MPa (14.5 Psi) after 50 minutes, check for leakage.
      - If the pressure successfully reaches -0.1 MPa (14.5 Psi), fully close the Handle Lo valve, then cease vacuum pump operations.

   b. Wait for 5 minutes then check whether the gauge needle moves after turning off the vacuum pump. If the gauge needle moves backward, check wether there is gas leakage.
6. Loosen the flare nut of the 3-way valve for 6 or 7 seconds and then tighten the flare nut again.
   a. Confirm the pressure display in the pressure indicator is slightly higher than the atmospheric pressure.
   b. Remove the charge hose from the 3-way valve.
7. Fully open the 2- and 3-way valves and tighten the cap of the 2- and 3-way valves.

3.2 Outdoor Unit

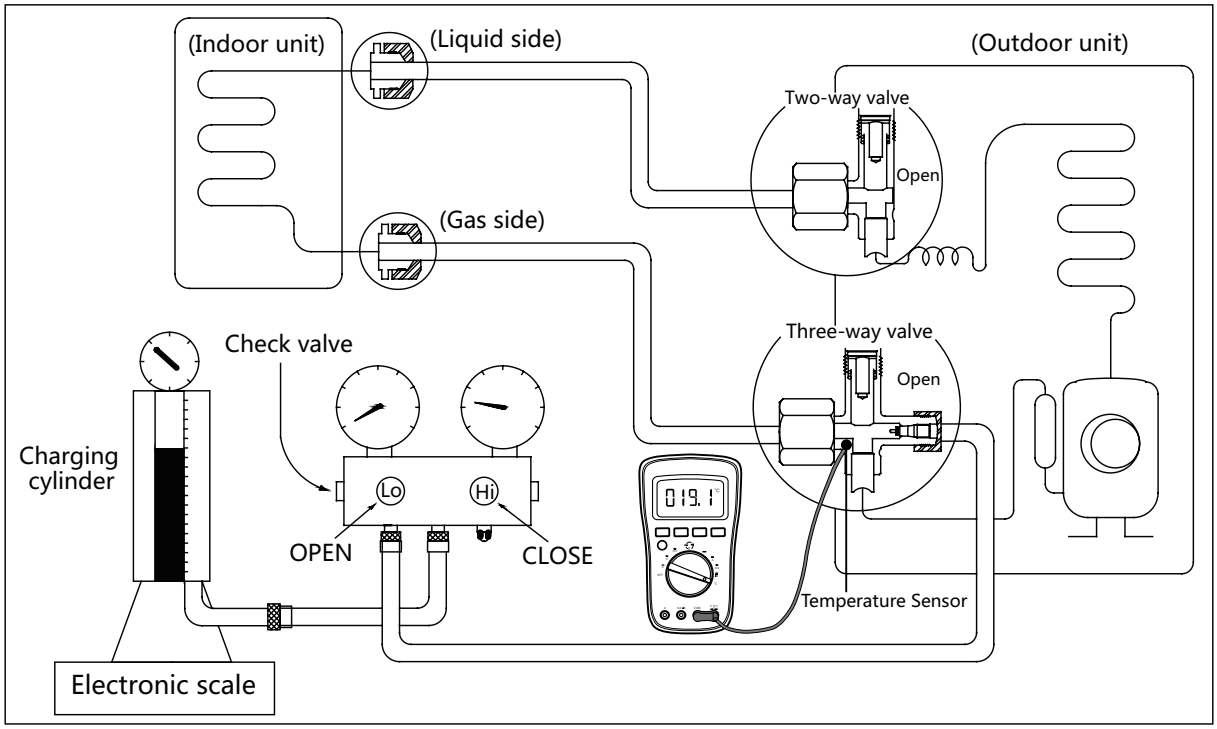
Evacuation for the whole system



Procedure:

1. Confirm that the 2- and 3-way valves are opened.
2. Connect the vacuum pump to the 3-way valve's service port.
3. Evacuate the system for approximately one hour. Confirm that the compound meter indicates -0.1 MPa (14.5Psi).
4. Close the valve (Low side) on the charge set and turn off the vacuum pump.
5. Wait for 5 minutes then check whether the gauge needle moves after turning off the vacuum pump. If the gauge needle moves backward, check whether there is gas leakage.
6. Disconnect the charge hose from the vacuum pump.
7. Mount the caps of service port and 2- and 3-way valves.
8. Use a torque wrench to tighten the caps to a torque of 18 N.m.

Refrigerant charging



Procedure:

1. Close both 2- and 3-way valves.
2. Slightly connect the Handle Lo charge hose to the 3-way service port.
3. Connect the charge hose to the valve at the bottom of the cylinder.
4. If the refrigerant is R410A/R32, invert the cylinder to ensure a complete liquid charge.
5. Open the valve at the bottom of the cylinder for 5 seconds to purge the air in the charge hose, then fully tighten the charge hose with push pin Handle Lo to the service port of 3-way valve..
6. Place the charging cylinder onto an electronic scale and record the starting weight.
7. Fully open the Handle Lo manifold valve, 2- and 3-way valves.
8. Operate the air conditioner in cooling mode to charge the system with liquid refrigerant.
9. When the electronic scale displays the correct weight (refer to the gauge and the pressure of the low side to confirm, the value of pressure refers to chapter Appendix), turn off the air conditioner, then disconnect the charge hose from the 3-way service port immediately..
10. Mount the caps of service port and 2- and 3-way valves.
11. Use a torque wrench to tighten the caps to a torque of 18 N.m.
12. Check for gas leakage.

Note: 1. Mechanical connectors used indoors shall comply with local regulations.

2. When mechanical connectors are reused indoors, sealing parts shall be renewed. When flared joints are reused indoors, the flare part shall be re-fabricated.

Troubleshooting

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9. 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.

NOTE: If using the inverter test tool maintenance, remove the big handle, take out the detection cable, take out female end of the cable and connect the inverter test tool. After the maintenance is completed, insert the female end back into the port.



Note: This picture is for reference only. Actual appearance may vary.

2. General Troubleshooting

2.1 Error Display (Indoor Unit)

When the indoor unit encounters a recognized error on different models, an error code will be displayed;
These error codes are described in the following tables:

Display	Information	Solution
dF	Defrost	Normal Display, not error code
CL	Active clean	
FP	Heating in room temperature under 8°C	
FC	Forced cooling	
AP	AP mode of WIFI connection	
CP	Remote switched off	
EH00	IDU EEPROM malfunction	Page 20
EH0A	Indoor EEPROM parameter error	Page 20
EL01	IDU & ODU communication error	Page 22
EH02	Zero-crossing signal detection error	Page 24
EH03	IDU fan speed out of control	Page 25
EC51	ODU EEPROM parameter error	Page 21
EC52	ODU coil temp. sensor (T3) error	Page 30
EC53	ODU ambient temp. sensor (T4) error	Page 30
EC54	COMP. discharge temp. sensor (TP) error	Page 30
EC56	IDU coil outlet temp. sensor (T2B) error(Multi-zone)	Page 30
EH60	IDU room temp. sensor (T1) error	Page 29
EH61	IDU pipe temp. (T2) sensor error	Page 29
EC07	ODU fan speed out of control	Page 27
EH0b	IDU main control board and display board communication error	Page 32
FHCC	Refrigerant sensor error	Page 34
EHC1	Refrigerant sensor detects leakage	Page 34
EHC2	Refrigerant sensor is out of range and leakage is detected	Page 35
EHC3	Refrigerant sensor is out of range	Page 34
EC01	Other IDU refrigerant sensor detects leakage (Multi-zone)	Page 34
EL0C	System lacks refrigerant	Page 31
PC00	ODU IPM module protection	Page 36
PC01	ODU voltage protection	Page 38
PC02	Compressor top (or IPM) temp. protection	Page 39
PC04	Inverter compressor drive error	Page 36

PC03	Pressure protection(low or high pressure)(for some models)	Page 40
PCOL	Low ambient temperature protection(for some models)	Page 43
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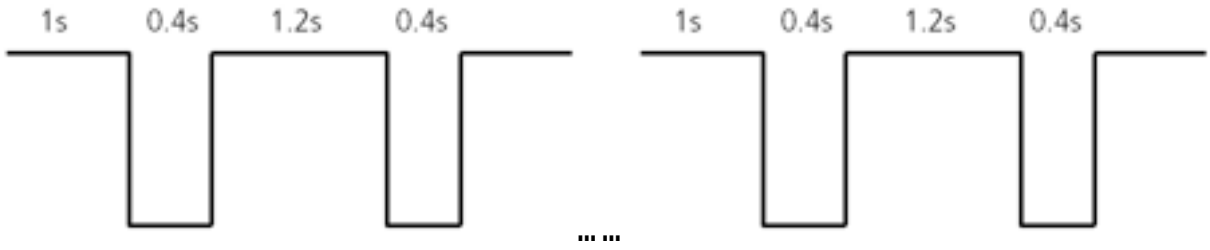
For other errors:

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.

88 flash frequency:



2.2 Error Display (Outdoor Unit with auxiliary board)

Display	Malfunction or Protection	Solution
dF	Defrost	Normal Display, not error code
FC	Forced cooling	
EC51	ODU EEPROM parameter error	Page 21
EL01	IDU & ODU communication error	Page 22
PC40	Communication error between outdoor main chip and compressor driven chip	Page 46
PC08	ODU overcurrent protection	Page 33
PC10	ODU low AC voltage protection	Page 38
PC11	ODU main control board DC bus high voltage protection	Page 38
PC12	ODU main control board DC bus low voltage protection/341 MCE error	Page 38
PC00	ODU IPM module protection	Page 36
PC0F	PFC module protection	Page 45
EC71	Over current failure of ODU DC fan motor	Page 27
EC72	Lack phase failure of ODU DC fan motor	Page 48
EC07	ODU fan speed out of control	Page 27
PC42	Compressor start failure of outdoor unit	Page 33
PC43	ODU compressor lack phase protection	Page 49
PC44	ODU zero speed protection	Page 33
PC45	ODU IR chip drive failure	Page 43
PC46	Compressor speed has been out of control	Page 33
PC49	Compressor overcurrent failure	Page 33
PC30	System high pressure protection	Page 40
PC31	System low pressure protection	Page 40
PC0R	High temperature protection of condenser	Page 44
PC06	Discharge temperature protection of compressor	Page 47
LC06	High temperature protection of Inverter module (IPM)	Page 36
PC02	Compressor top (or IPM) temp. protection	Page 36
PH90	High temperature protection of evaporator	Page 50
PH91	Low temperature protection of evaporator	Page 51
EC52	ODU coil temp. sensor (T3) error	Page 30
EC53	ODU ambient temp. sensor (T4) error	Page 30
EC54	COMP. discharge temp. sensor (TP) error	Page 30
EC50	Open or short circuit of outdoor unit temperature sensor(T3,T4.TP)	Page 30
PC0L	Low ambient temperature protection(for some models)	Page 43

3. Outdoor Unit Point Check Function

- A check switch is included on the auxiliary board.
- Push SW1 to check the unit's status while running. The digital display shows the following codes each time the SW1 is pushed.

Number of Presses	Display	Remark
00	Normal display	Display running frequency, running state or malfunction code
01	Indoor unit capacity demand code	S communication models display "--"
02	Amendatory capacity demand code	
03	The frequency after the capacity requirement transfer	
04	The frequency after the frequency limit	
05	The frequency of sending to 341 chip	
06	Indoor unit evaporator temperature	If the temp. is lower than -9 degree, the digital display tube will show "-9".If the temp. is higher than 70 degree, the digital display tube will show "70".
07	Condenser pipe temp.(T3)	
08	Outdoor ambient temp.(T4)	
09	Compressor discharge temp.(TP)	The display value is between 0~199°C. If the temp. is lower than 0°C, the digital display tube will show "0".If the temp. is higher than 99°C,light the decimal point of the high digit tube. (For example, the digital display tube show "0.5",so 0.5 multipled by 10 to become 5, then added to 100 to become 105°C.)
10	AD value of current	The display value is hex number. For example, the digital display tube shows "Cd", so C*161+d*160=12*16+13=205, it means AD value is 205.
11	AD value of voltage	
12	Indoor unit running mode code	Standby:0,Cooling:1, Heating:2, Fan only: 3, Drying:4, Forced cooling:6, Defrosting:7
13	Outdoor unit running mode code	Standby:0,Cooling:1, Heating:2, Fan only: 3, Drying:4, Forced cooling:6, Defrosting:7
14	EXV open angle	Actual data/4. If the value is higher than 99, light the decimal point of the high digit tube. For example, the digital display tube show "2.0",so 2.0 multipled by 10 to become 20, then added to 100 to become 120,it means the EXV open angle is 120×4=480p.)
15	Frequency limit symbol	Bit7 Frequency limit caused by IGBT radiator Bit6 Frequency limit caused by PFC Bit5 Frequency limit caused by high temperature of T2. Bit4 Frequency limit caused by low temperature of T2. Bit3 Frequency limit caused by T3. Bit2 Frequency limit caused by TP. Bit1 Frequency limit caused by current Bit0 Frequency limit caused by voltage The display value is hex number. For example, the digital display tube show 2A, the corresponding binary is 101010, so Bit5=1, Bit3=1, and Bit1=1 It means frequency limit caused by T2, T3 and current.
16	DC fan motor speed	0:off 1:Turbo 2:High 3:Medium 4:Low 5: Breeze 6: Super breeze 7:other
17	IGBT radiator temp.	The display value is between 0~130 degree. If the temp. is lower than 0°C, the digital display tube will show "0".If the temp. is higher than 99 degree, light the decimal point of the high digit tube. (For example, the digital display tube show "0.5",so 0.5 multipled by 10 to become 5, then added to 100 to become 105°C.)
18	Indoor unit number	The indoor unit can communicate with outdoor unit well.
19	Evaporator pipe temp. T2 of 1# indoor unit	S communication models display "--"
20	Evaporator pipe temp. T2 of 2# indoor unit	
21	Evaporator pipe temp. T2 of 3# indoor unit	
22	1# Indoor unit capacity demand code	
23	2# Indoor unit capacity demand code	
24	3# Indoor unit capacity demand code	
25	Room temp. T1 of 1# indoor unit	
26	Room temp. T1 of 2# indoor unit	
27	Average room temp. T1	If the temp. is lower than 0 degree, the digital display tube will show "0".If the temp. is higher than 70 degree, the digital display tube will show "70". If the indoor unit is not connected, the digital display tube will show: "--"
28	Reason of stop	
29	Evaporator pipe temp. T2B of 1# indoor unit	S communication models display "--"
30	Evaporator pipe temp. T2B of 2# indoor unit	

4. Complain Record Form

Complain Record Form

Request No.: Date:

Installation Date: Service Date:

Customer Information			
Name		Telephone No.	
Home Address			
Email			
Product Information			
Indoor Unit Model		Outdoor Unit Model	
Serial No. of indoor unit			
Serial No. of outdoor unit			
Working Mode	☐Cooling ☐Heating ☐Fan only ☐Dry		
Setting temperature	_____°C / °F	Fan speed	☐Turbo ☐High ☐Medium ☐Low ☐Auto
Temperature of air inlet	_____°C / °F	Temperature of air outlet	_____°C / °F
Installation / Condition Information			
Indoor temperature	_____°C / °F	Indoor humidity	_____%RH
Outdoor temperature	_____°C / °F	Outdoor humidity	_____%RH
Length of Connecting pipe		Pipe diameter	Gas pipe: Liquid pipe:
Length of Wiring		wire diameter	
System Running Pressure	_____MPa or _____Bar or _____PSI		
Room size (L*W*H)			
Photo of Installation of Indoor unit (Photo #1)		Photo of Installation of Outdoor unit (Photo #2)	
Failure Description			
Error Code of Indoor unit		Code of Outdoor PCB	
Unit does not start			
Remote control does not work			
Indoor display shows nothing			
No cooling or heating at all			
Less cooling or heating			
Unit starts but stops shortly			
High noise			
High vibration			

Parameter Checking information by Remote controller			
Displaying code	Displaying code meaning	Display value	Display value meaning
T1	Room temperature		
T2	Indoor coil temperature		
T3	Outdoor coil temperature		
T4	Ambient temperature		
TP	Discharge temperature		
FT	Targeted Frequency		
Fr	Actual Frequency		
dL	Compressor current		
Uo	Outdoor AC voltage		
Sn	Indoor capacity test	/	N/A
--	Reserve	/	N/A
Pr	Outdoor fan speed		
Lr	EXV opening steps		
ir	Indoor fan speed		
HU	Indoor humidity		
TT	Adjusted setting temperature		
DT	Reserve	/	N/A
iF	Reserve	/	N/A
nA	Reserve	/	N/A
oT	GA algorithm frequency		

Approval from Manufacturer	
☐Approved	
☐More Proof needed	
☐Rejected	

5. Engineering Mode Entry and Setting Methods

5.1 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
2	T2	Indoor coil temperature	Actual data,°C
3	T3	Outdoor coil temperature	Actual data, °C
4	T4	Ambient temperature	Actual data, °C
5	TP	Discharge temperature	Actual data,°C
6	FT	Targeted frequency	Actual data
7	Fr	Actual frequency	Actual data
8	dL	Running current	3.2A=3
9	Uo	AC voltage	220V=22*
10	Sn	Reserved	
11	nA	Reserved	
12	Pr	Outdoor fan speed	Actual data/8
13	Lr	EXV opening steps	Actual data/8
14	Ir	Indoor fan speed	Actual data/8
15	Hu	Humidity (if a sensor there)	Actual data, %
16	TT	Set temperature including compensation	Actual data, °C
17	DT	Reserved	
18	tF	Reserved	
19	nA	Reserved	
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	Indoor EEPROM parameter error
EL01	IDU & ODU communication error
EH02	Zero-crossing signal detection error
EH31	DC voltage is too low of indoor DC fan motor (with DC fan driver board)
EH32	DC voltage is too high of indoor DC fan motor (with DC fan driver board)
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	ODU IPM module temp. sensor(TH) error
EC56	Evaporator coil outlet temperature sensor T2B is in open circuit or short circuit (Multi-zone)
EH60	IDU room temp. sensor (T1) error
EH61	Evaporator coil temperature sensor T2 is in open circuit or short circuit
EC07	ODU fan speed out of control
EH0b	IDU main control board and display board communication error
EHC1	Refrigerant sensor detects leakage
FHA2	Communication error between indoor unit and refrigerant sensor
FHA3	Refrigerant sensor internal error
FHA4	Refrigerant sensor permanent error
FHA5	Refrigerant sensor self-check failed
FHA6	Refrigerant sensor low voltage error
FHCC	Refrigerant sensor error
EHC2	Refrigerant sensor is out of range and leakage is detected
EHC3	Refrigerant sensor is out of range
EC01	Other IDU refrigerant sensor detects leakage (Multi-zone)
EL0C	System lacks refrigerant
FH0P	Wireless module self-test failure
FL09	Indoor and outdoor mismatch malfunction
PC00	ODU IPM module protection
PC10	ODU low AC voltage protection
PC11	ODU main control board DC bus high voltage protection
PC12	ODU main control board DC bus low voltage protection/341 MCE error
PC02	Compressor top (or IPM) temp. protection
PC40	Communication error between outdoor main chip and compressor driven chip

PC41	Compressor current sampling circuit failure
PC42	Compressor start failure of outdoor unit
PC43	ODU compressor lack phase protection
PC44	ODU zero speed protection
PC45	ODU IR chip drive failure
PC46	Compressor speed has been out of control
PC49	Compressor overcurrent failure
PC06	Discharge temperature protection of compressor
PC08	ODU Current protection
PH09	Anti-cold air in heating mode
PC0F	PFC module protection
PC30	System overpressure protection
PC31	System pressure is too low protection
PC03	Pressure protection(low or high pressure)
PC0L	Outdoor low temp. protection
PH90	High temperature protection of evaporator
PH91	Low temperature protection of evaporator
PC0A	High temperature protection of condenser
PH0C	Indoor unit humidity sensor malfunction
LH00	Evaporator temp. freq.limited(L0)
LC01	Condenser coil temp. (T3) freq. limited
LC02	ODU exhaust temp. (TP) freq. limited
LC05	Voltage freq. limited
LC03	Current freq. limited
LC06	IPM module temp. freq. limited
LH07	Remote control frequency limitation in effect
----	IDUs mode conflict(Multi-zone)
nR	No fault or protection

5.2 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	Capacity setting (Btu/h)	5-60k	The actual range is determined by the remote controller
1	Auto-restart function	0 – Inactive 1 – Active	
2	Fan control when Ts reached	1- Fan stop 2 - Fan runs at lowest RPM 3 - Fan runs at setting RPM 4 - Fan stops for 4 mins and runs for 1min 5 - Fan stops for 8 mins and runs for 1min 6 - Fan stops for 16 mins and runs for 1min 7 - Fan stops for 24 mins and runs for 1min 8 - Fan stops for 48 mins and runs for 1min 9 - Fan stops for 15 mins and runs for 2.5min 10 - Fan stops for 30 mins and runs for 2.5min 11 - Fan stops for 60 mins and runs for 2.5min 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	
3	Mode lock	CH–Cooling and heating (all modes) HH–Heating only (Heating + Fan only) CC–Cooling only (Cooling + Drying + Fan only) nU–Cooling and heating without Auto	Remote controller will change as well.
4	Lowest setting temperature	16-24	Remote controller will change as well.
5	Highest setting temperature	25-30	Remote controller will change as well.
6	Mode priority selection for multi units	H – Heating first C – Cooling first A – Master unit	
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)	
12	Min. frequency limitation in heating mode	10, 11, 12, …, 49, 50, -- (Cancel)	
13	Max frequency selection in T4 limitation of Zone6	20, 21, 22, …, 149, 150, -- (Cancel)	

14	/	Nothing to set	
15	Frequency selection of outdoor forced-operation	10, 11, 12, …, 249, 250, -- (Cancel)	Do not display C0, CS
16	One button reset	rS – Reset	
17	nA	Nothing to set	
18	Capacity setting(kW)	23,26,32,35,51,72,120,-- (Cancel)	
19	Max. frequency selection in cooling mode	40, 41, 42, …, 83, 84, -- (Cancel)	
20	Max. frequency selection in heating mode	40, 41, 42, …, 83, 84, -- (Cancel)	Without limitation
21	Cooling temperature compensation	-3.0, -2.5, -2.0, …, 3.0, 3.5, -- (Cancel)	
22	Heating temperature compensation	-6.5, -6.0, -5.5, …, 0.5, 1.0, 1.5, …, 7.0, 7.5, -- (Cancel)	
23	Max. fan speed selection in cooling	-41, -40, -39, …, 19, 20, -- (Cancel)	Fan speed will add set data*8.
24	Min. fan speed selection in cooling	-41, -40, -39, …, 19, 20, -- (Cancel)	
25	Max. fan selection in heating	-41, -40, -39, …, 19, 20, -- (Cancel)	
26	Min. fan speed selection in heating	-41, -40, -39, …, 19, 20, -- (Cancel)	
27	Reserved	Nothing to set	
28	Anti-cold air Stop Fan Temperature	16~28	
29	Reserved	Nothing to set	
30	Reserved	Nothing to set	

6. Error Diagnosis and Troubleshooting Without Error Code

WARNING

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

6.1 Remote maintenance

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

1.Remote Maintenance	Electrical Circuit										Refrigerant Circuit							Others				
Possible causes of trouble	Power failure	The main power tripped	Loose connections	Shorted or broken wires	Safety device opens	Faulty transformer	Low voltage	The remote control is powered off	Broken the remote control	Fan mode	Dirty air filte	Dirty condenser fins	Dirty evaporator coil	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	Frosting and defrosting frequently	High pressure of system	Heavy load condition	Loosen hold down bolts and / or screws	Bad airproof	The outlet of the outdoor unit was blocked	Shipping plates remain attached
Unit will not start	☆	☆	☆	☆	☆	☆																
the power switch is on but fans will not start			☆	☆	☆																	
the tempreture on the playboard cannot be setted								☆	☆													
Unit is on but the wind is not cold(hot)				☆	☆					☆				☆	☆							
Unit runs, but shortly stops							☆							☆	☆		☆					
the unit startup and stop 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	Test circuits with tester	Test continuity of safety device	Change the transformer	Test voltage	Replace the battery of the remote control	Replace the remote control	Adjust to cool mode	Clean or replace	Clean	Clean coil	Adjust the setting temperature	Turn on the AC later	Turn on the AC later	Turn on the AC later	Check heat load	Tighten bolts or screws	Close all the windows and doors	Remove the obstacles	Remove them

6.2 Field maintenance

2.Field Maintenance	Electrical Circuit														Refrigerant Circuit																Others				
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	Faulty magnetic contactor for compressor	Faulty magnetic contactor for fan	Low voltage	Faulty stepping motor	Shorted or grounded compressor	Shorted or grounded fan motor	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 noncodensable 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	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	Test coninuity of coil & contacts	Test coninuity of coil & contacts	Test voltage	Replace the stepping motor	Check resistance with meger tester	Check resistance with meger tester	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 folow	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

7. 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/ EH0A	EL01	EH02	EH03	EH60	EH61	EH0b	EL0C	EC56	FHCC
Indoor PCB	✓	✓	✓	✓	✓	✓	✓	✓	x	✓
Outdoor PCB	x	✓	x	x	x	x	x	x	✓	x
Display board	x	x	x	x	x	x	✓	x	x	x
Indoor fan motor	x	x	x	✓	x	x	x	x	x	x
T1 sensor	x	x	x	x	✓	x	x	x	x	x
T2 Sensor	x	x	x	x	x	✓	x	✓	x	x
T2B Sensor	x	x	x	x	x	x	x	x	✓	x
Refrigerant sensor	x	x	x	x	x	x	x	x	x	✓
Reactor	x	✓	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	x	✓	x	x

Part requiring replacement	EC53	EC52	EC54	EC51	EC07	PC00	PC01	PC02	PC03	PC04
Outdoor PCB	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Indoor fan motor	x	x	x	x	x	x	x	x	x	x
Outdoor fan motor	x	x	x	x	✓	✓	x	✓	x	✓
T3 Sensor	x	✓	x	x	x	x	x	x	x	x
T4 Sensor	✓	x	x	x	x	x	x	x	x	x
TP Sensor	x	x	✓	x	x	x	x	x	x	x
Reactor	x	x	x	x	x	x	✓	x	x	x
Compressor	x	x	x	x	x	✓	x	x	x	✓
IPM module board	x	x	x	x	x	✓	✓	✓	x	✓
High pressure protector	x	x	x	x	x	x	x	✓	x	x
Low pressure protector	x	x	x	x	x	x	x	x	✓	x
Additional refrigerant	x	x	x	x	x	x	x	x	✓	x

Part requiring replacement	PC06	PC08/44/49	PC0A	PC0F	PC40
Outdoor PCB	✓	✓	✓	✓	✓
Outdoor fan motor	x	✓	✓	x	x
T3 Sensor	x	x	✓	x	x
TP Sensor	✓	x	x	x	x
Pressure sensor	x	x	x	x	x
Reactor	x	✓	x	✓	x
Compressor	x	x	x	x	x
IPM module board	x	✓	x	x	✓
High pressure valve assy	✓	x	x	x	x
High pressure protector	x	x	x	x	x
Low pressure protector	x	x	x	x	x
Additional refrigerant	✓	x	✓	x	x
Electric control box	x	x	x	x	✓

Part requiring replacement	PC41	PC43	PC10/11/12	PC30	PC31
Outdoor PCB	✓	✓	✓	✓	✓
Outdoor fan motor	x	x	x	✓	x
T3 Sensor	x	x	x	x	x
TP Sensor	x	x	x	x	x
Pressure sensor	x	x	x	x	x
Reactor	x	x	✓	x	x
Compressor	x	✓	x	x	x
IPM module board	x	x	✓	x	x
High pressure valve assy	x	x	x	x	x
High pressure protector	x	x	x	✓	x
Low pressure protector	x	x	x	x	✓
Additional refrigerant	x	x	x	x	✓

8. Troubleshooting by Error Code

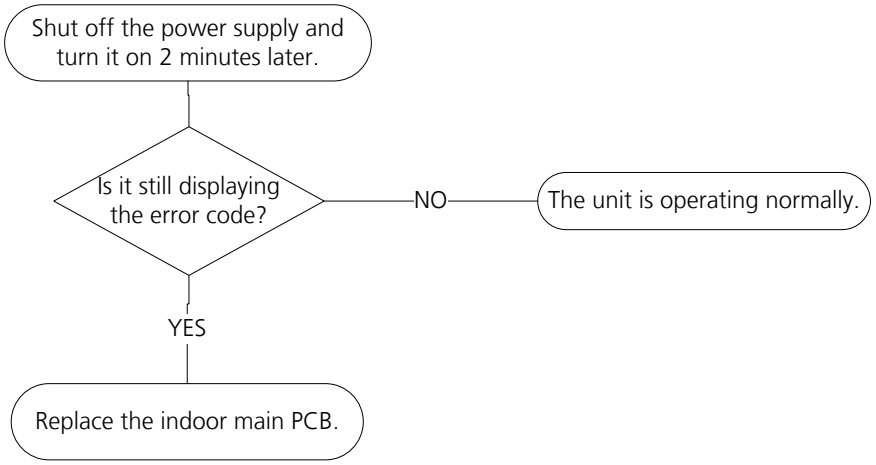
8.1 EH00/ EH0A(IDU EEPROM malfunction or IDU EEPROM parameter error) diagnosis and solution

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

Recommended parts to prepare:

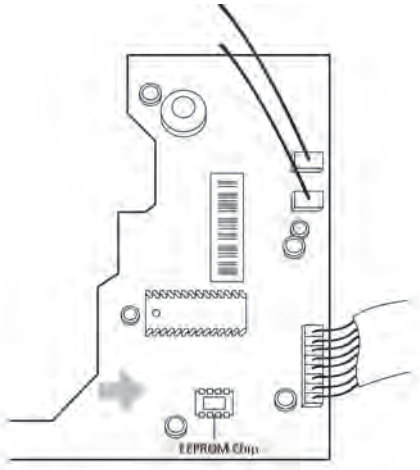
- Indoor PCB

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 PCB is shown in the following image:



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

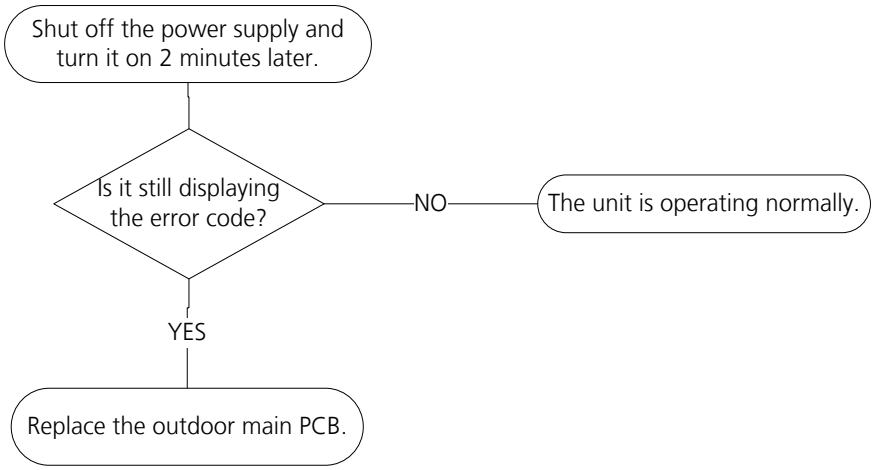
8.2 EC51(ODU EEPROM parameter error) diagnosis and solution

Description: Outdoor PCB main chip does not receive feedback from EEPROM chip.

Recommended parts to prepare:

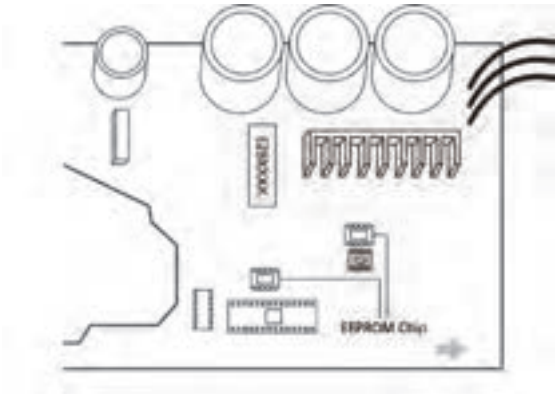
- Outdoor PCB

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 outdoor PCB is shown in the following image:



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

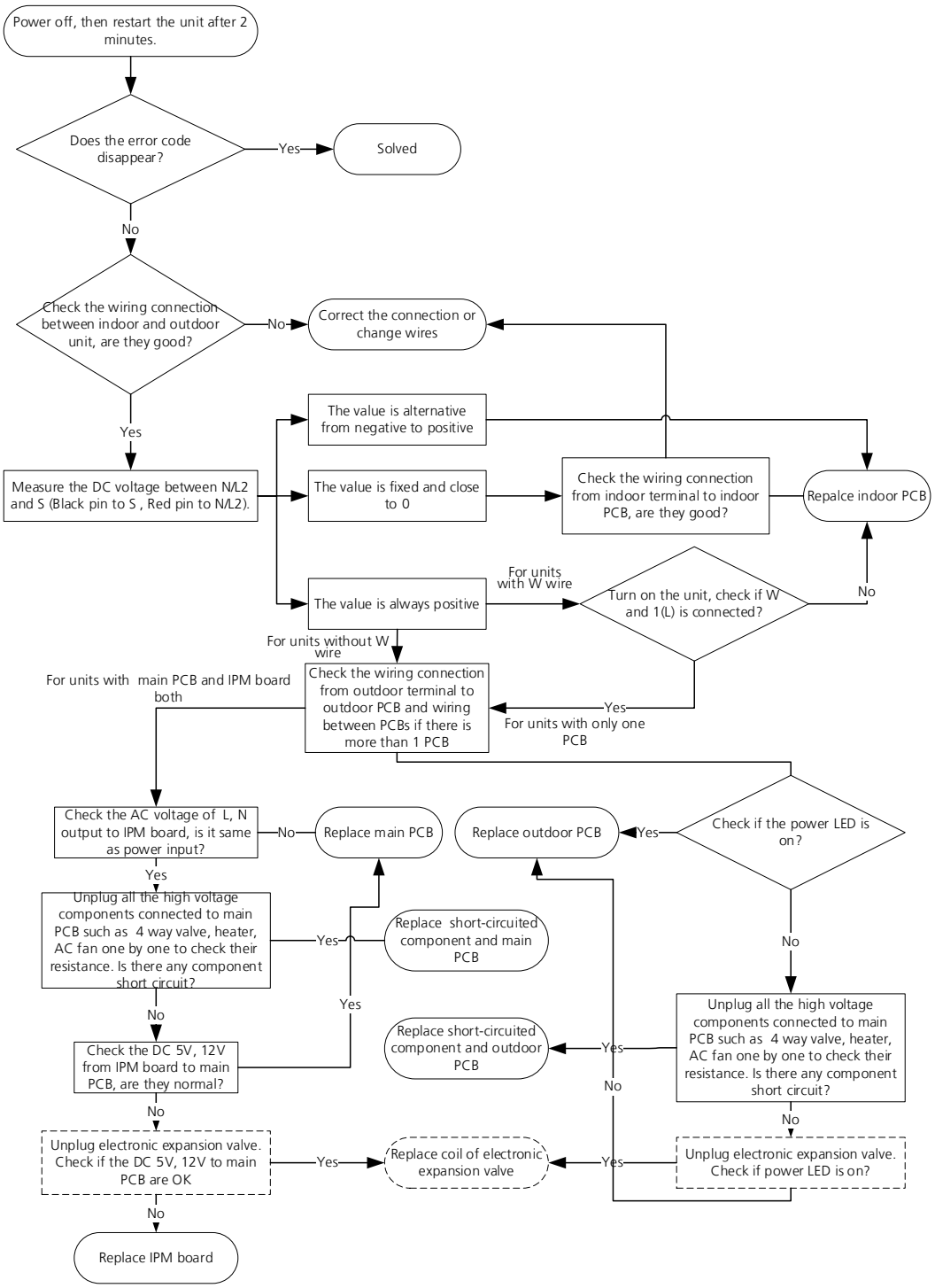
8.3 EL01(IDU & ODU communication error) diagnosis and solution

Description: Indoor unit can not communicate with outdoor unit

Recommended parts to prepare:

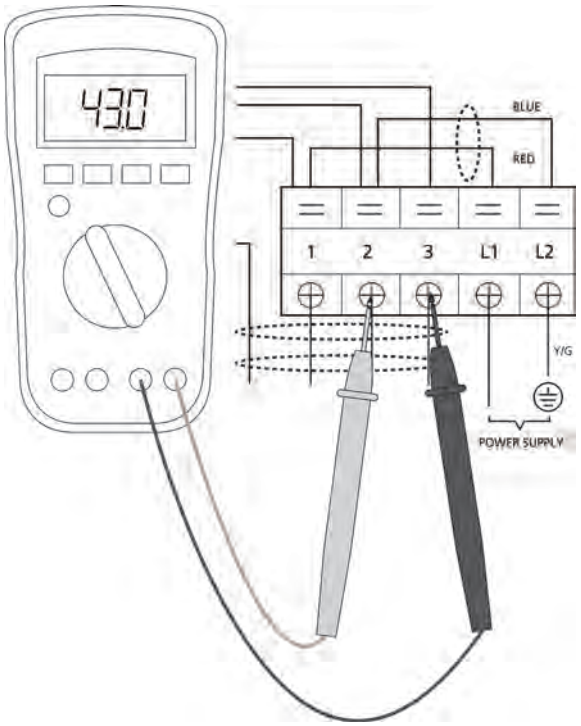
- Indoor PCB
- Outdoor PCB
- Short-circuited component

Troubleshooting and repair:



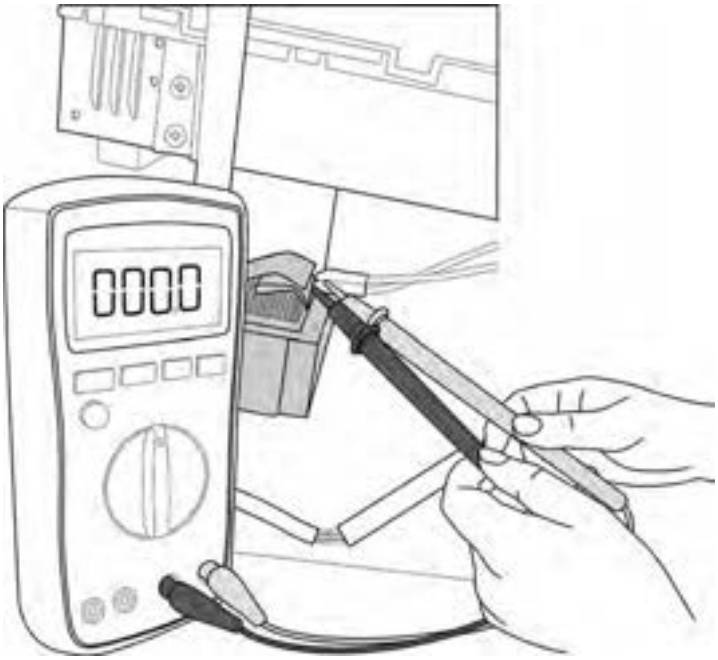
Remarks:

- Use a multimeter to test the DC voltage between 2 port(or S or L2 port) and 3 port(or N or S port) of outdoor unit. The red pin of multimeter connects with 2 port(or S or L2 port) while the black pin is for 3 port(or N or S port) .
- When AC is normal running, the voltage will move alternately between -25V to 25V.
- If the outdoor unit has malfunction, the voltage will move alternately with positive value.
- While if the indoor unit has malfunction, the voltage will be a certain value.



S and N or L2 and S or 2 and 3

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



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

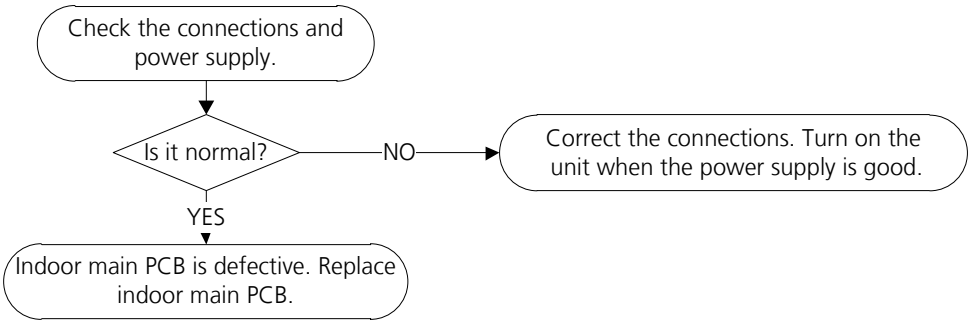
8.4 EH02(Zero crossing detection error) diagnosis and solution

Description: When PCB does not receive zero crossing signal feedback for 4 minutes or the zero crossing signal time interval is abnormal.

Recommended parts to prepare:

- Connection wires
- Indoor main PCB

Troubleshooting and repair:



Note: Zero crossing detection error is only valid for the unit with AC fan motor, for other models, this error is invalid.

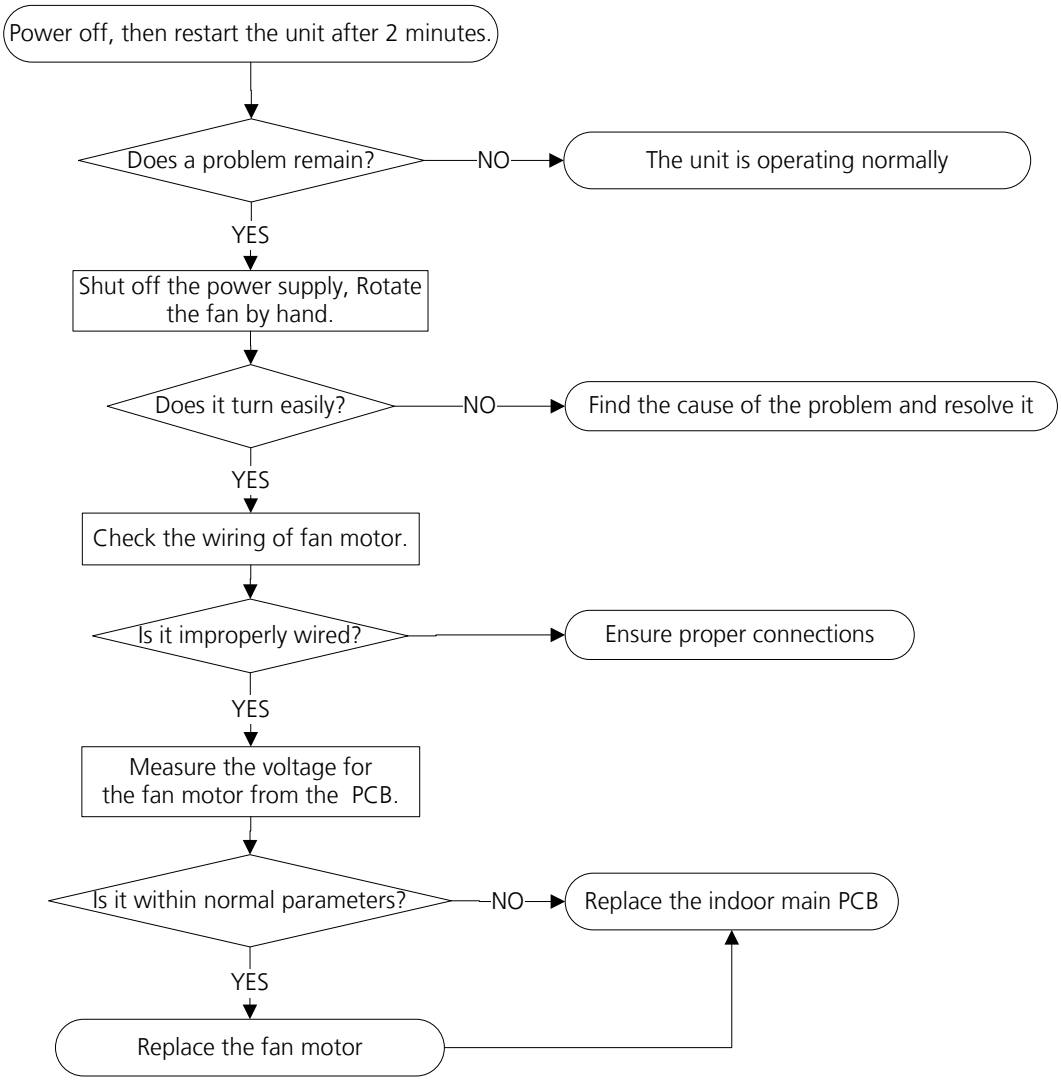
8.5 EH03(The Indoor fan speed is operating outside of normal range) diagnosis and solution

Description: When indoor fan speed keeps too low or too high for a certain time, the LED displays the failure code and the AC turns off.

Recommended parts to prepare:

- Connection wires
- Fan assembly
- Fan motor
- Indoor main PCB

Troubleshooting and repair:



Index:

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

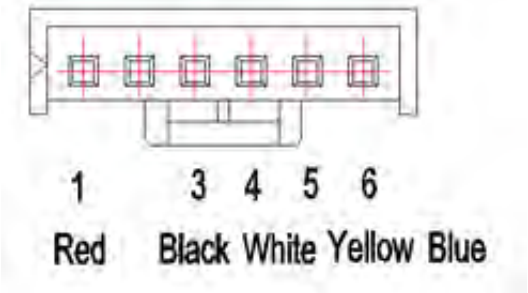
Power on and when the unit is in standby, measure the voltage of pin1-pin3, pin4-pin3 in fan motor connector. If the value of the voltage is not in the range showing in below table, the PCB must has problems and need to be replaced.

- DC motor voltage input and output (voltage: 220-240V~):

No.	Color	Signal	Voltage
1	Red	Vs/Vm	192V~380V
2	---	---	---
3	Black	GND	0V
4	White	Vcc	14-17.5V
5	Yellow	Vsp	0~5.6V
6	Blue	FG	14-17.5V

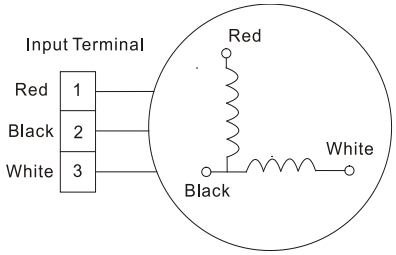
- DC motor voltage input and output (voltage: 115V~):

No.	Color	Signal	Voltage
1	Red	Vs/Vm	140V~190V
2	---	---	---
3	Black	GND	0V
4	White	Vcc	14-17.5V
5	Yellow	Vsp	0~5.6V
6	Blue	FG	14-17.5V



2. Indoor AC Motor

1) Power on and set the unit running in fan mode at high fan speed. After running for 15 seconds, measure the voltage of pin1 and pin2. If the value of the voltage is less than 100V(208~240V power supply) or 50V (115V power supply), the PCB must has problems and need to be replaced.



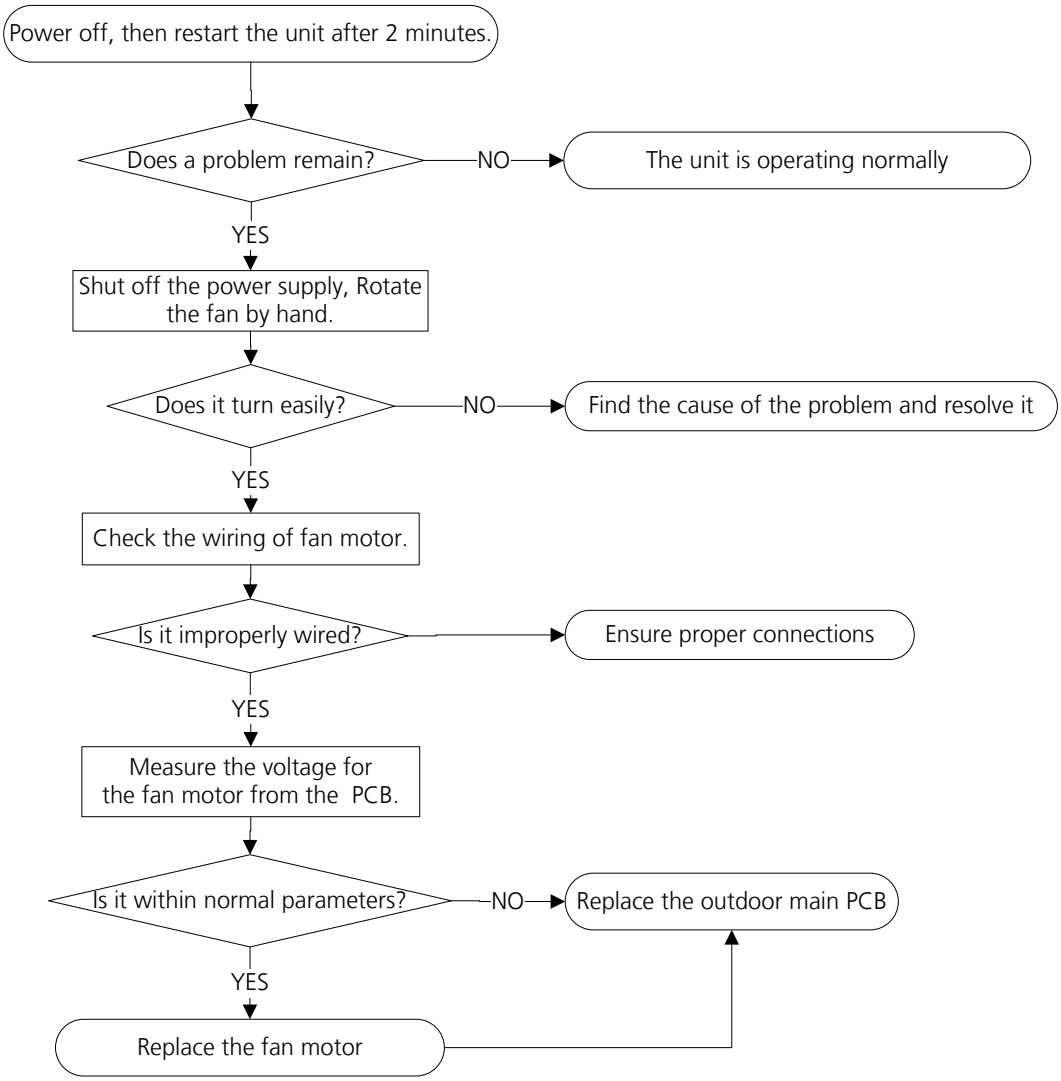
8.6 EC07/EC71(The outdoor fan speed is operating outside of normal range or Over current failure of ODU DC fan motor) diagnosis and solution

Description: When outdoor fan speed keeps too low or too high for a certain time, the LED displays the failure code and the AC turns off.

Recommended parts to prepare:

- Connection wires
- Fan assembly
- Fan motor
- Outdoor main PCB

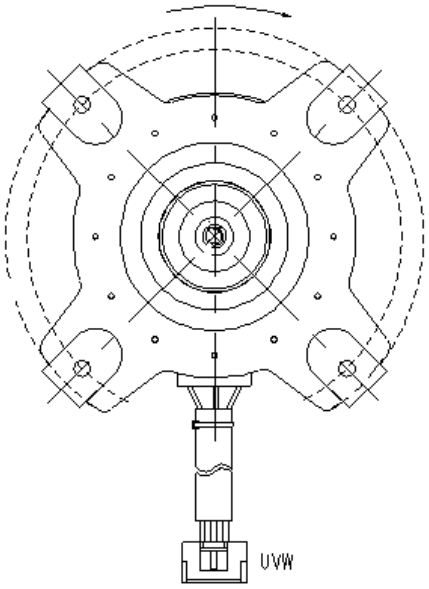
Troubleshooting and repair:



Index:

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

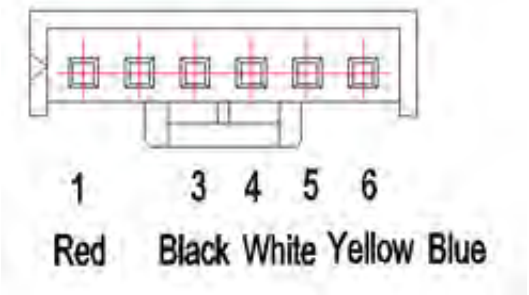
Release the UVW connector. Measure the resistance of U-V, U-W, V-W. If the resistance is not equal to each other, the fan motor must has problems and need to be replaced. otherwise the PCB must has problems and need to be replaced.



2. DC Fan Motor(control chip is in fan motor, single fan)

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



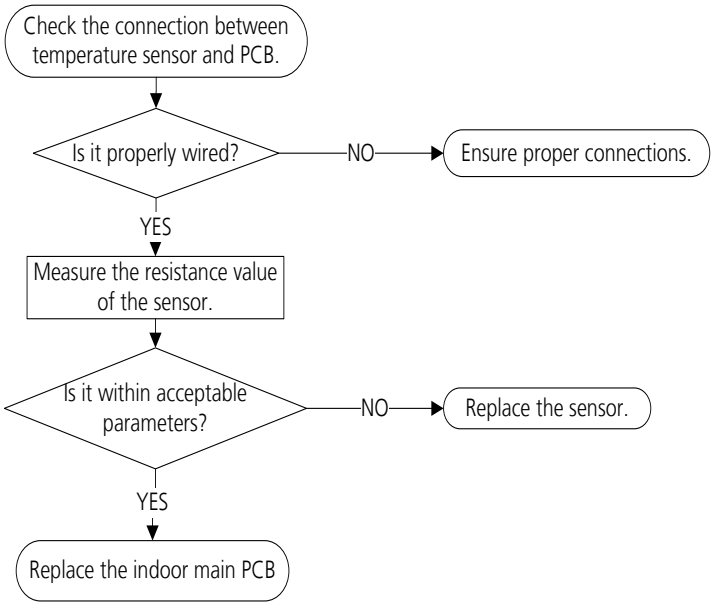
8.7 EH60/EH61(Open circuit or short circuit of indoor temperature sensor(T1, T2)) diagnosis and solution

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

Recommended parts to prepare:

- Connection wires
- Sensors
- Indoor main PCB

Troubleshooting and repair:





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

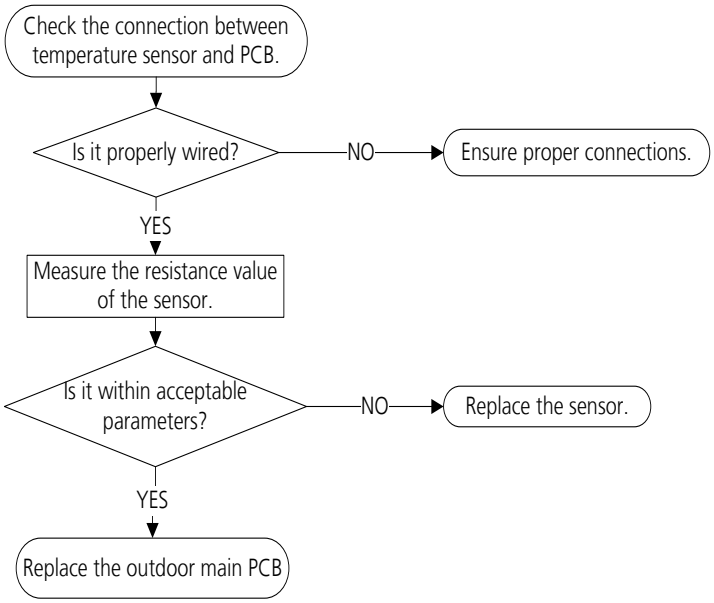
8.8 EC52/EC53/EC54/EC56/EC50(Open circuit or short circuit of outdoor temperature sensor(T3, T4, TP, T2B)) diagnosis and solution

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

Recommended parts to prepare:

- Connection wires
- Sensors
- Outdoor main PCB

Troubleshooting and repair:





For certain models, outdoor unit uses combination sensor, T3,T4 and TP are the same of sensor. This picture and the value are only for reference, actual appearance and value may vary.

8.9 EL0C(System lacks refrigerant) diagnosis and solution

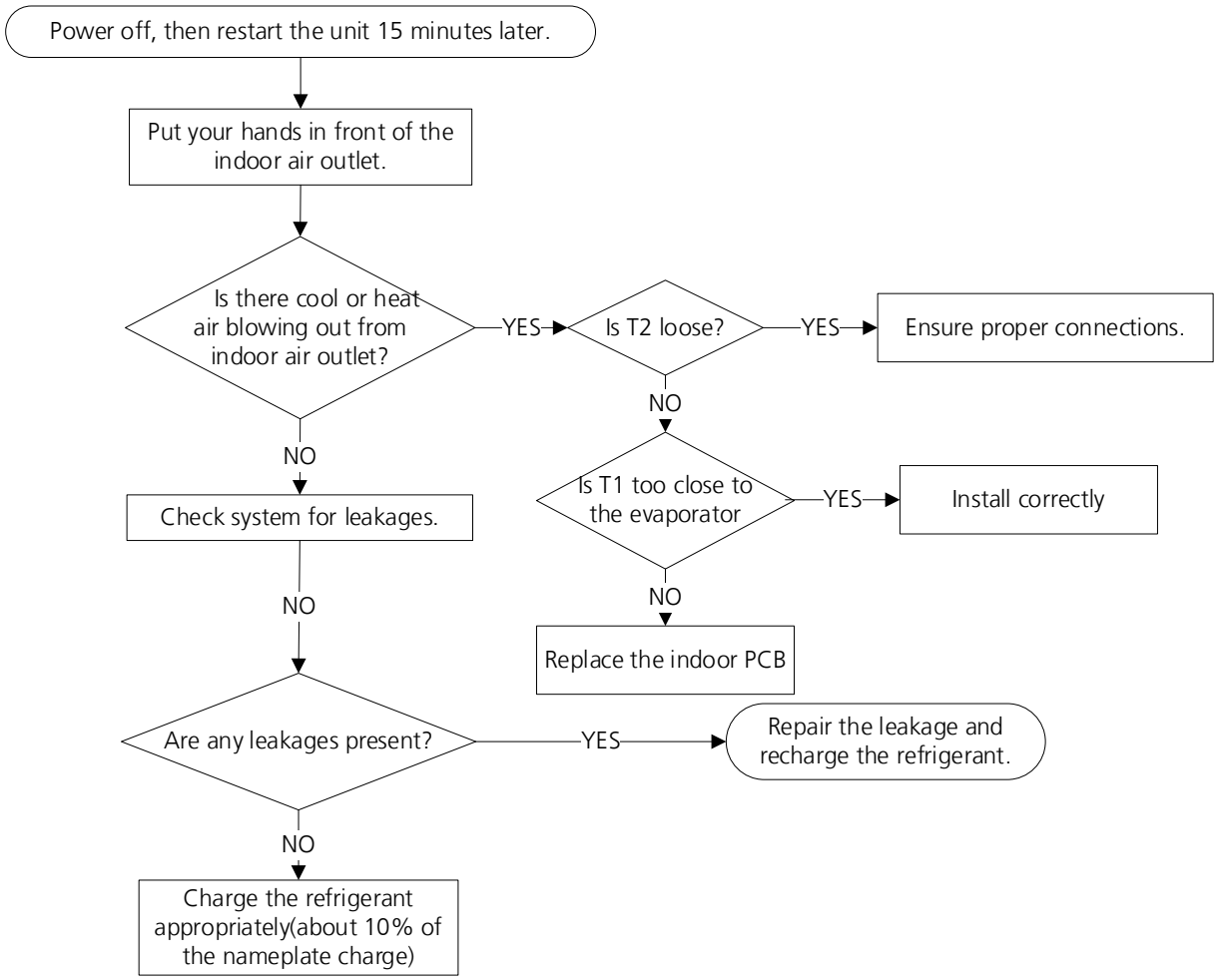
Description:

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:



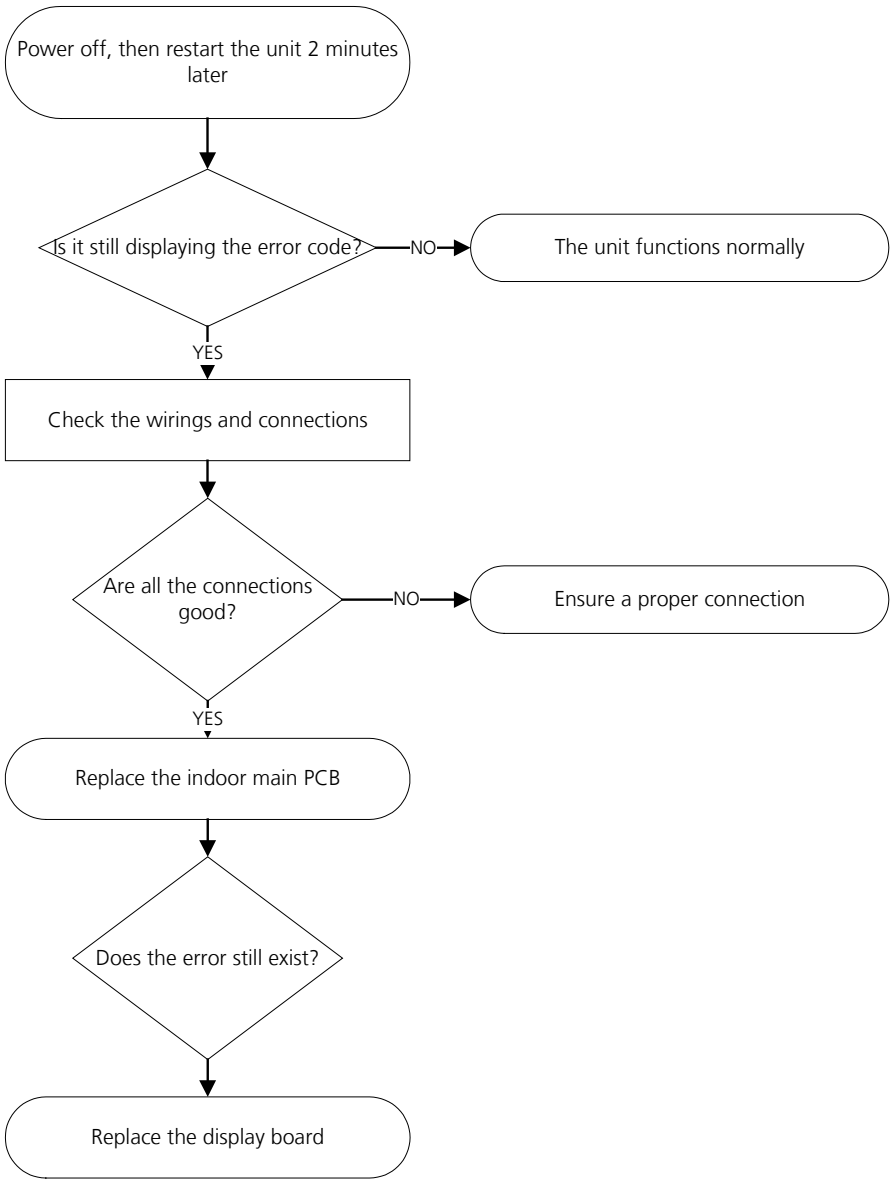
8.10 EH0b(IDU main control board and display board communication error) diagnosis and solution

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

Recommended parts to prepare:

- Communication wire
- Indoor PCB
- Display board

Troubleshooting and repair:



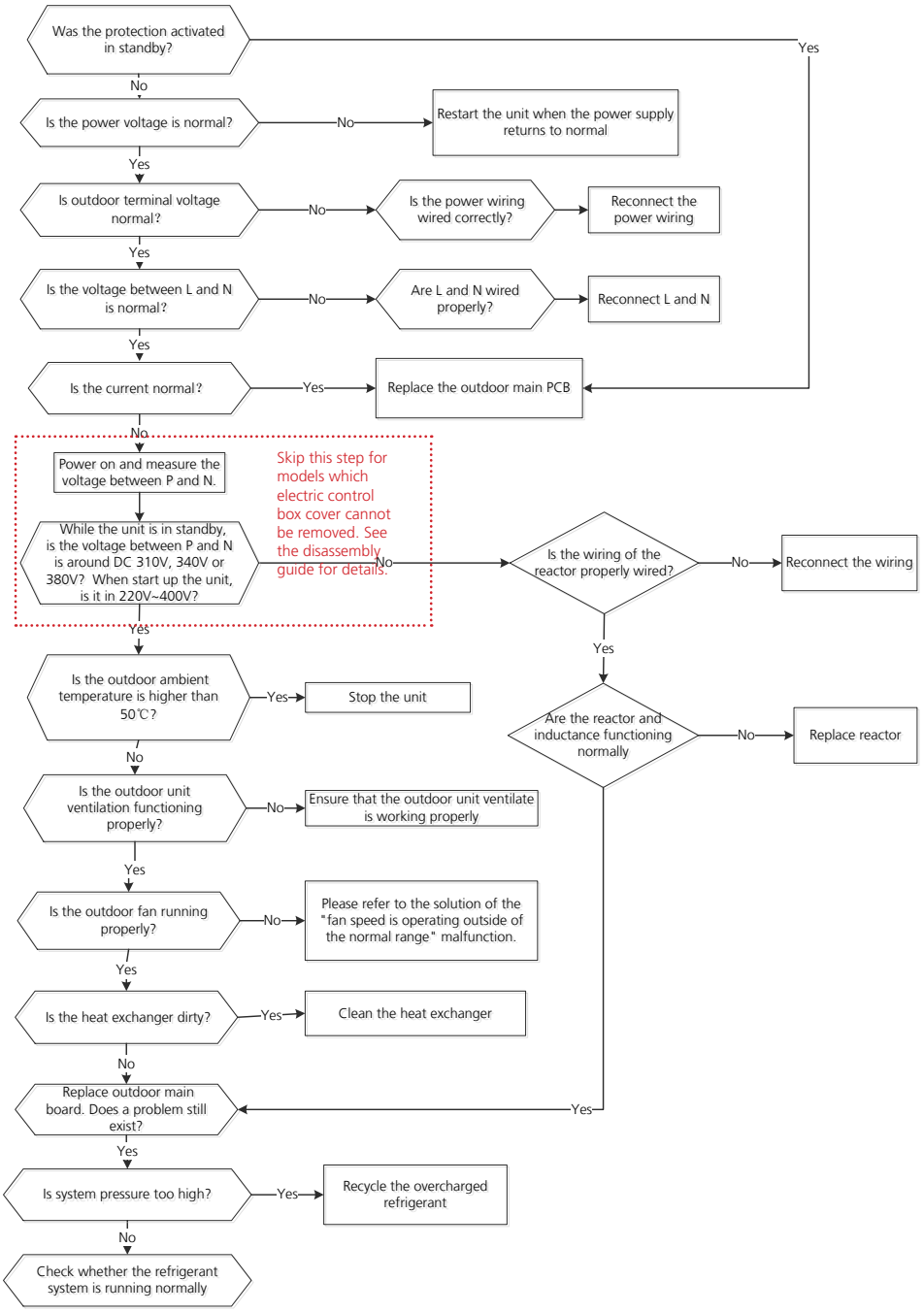
8.11 PC08(Current overload protection)/PC42(Compressor start failure of outdoor unit)/ PC44(ODU zero speed protection) /PC46(Compressor speed has been out of control)/ PC49(Compressor overcurrent failure) diagnosis and solution

Description: An abnormal current rise is detected by checking the specified current detection circuit.

Recommended parts to prepare:

- Connection wires
- Reactor
- Outdoor fan
- Outdoor PCB

Troubleshooting and repair:



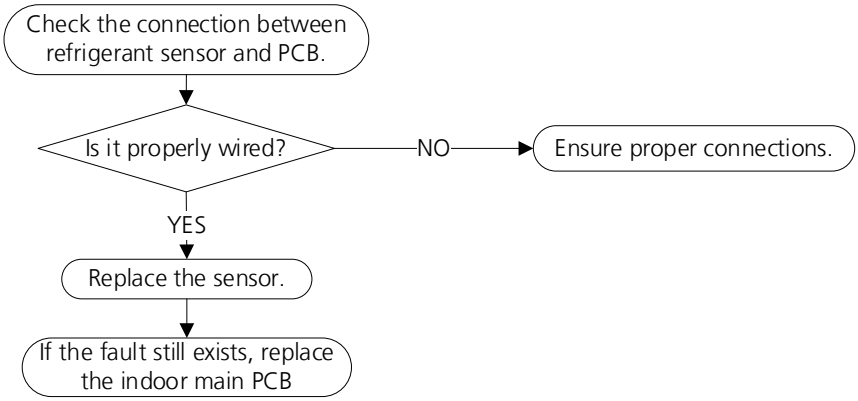
8.12 FHCC(Refrigerant sensor error) or EHC3(Refrigerant sensor is out of range) diagnosis

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:



8.13 EHC1(Refrigerant sensor detects leakage) diagnosis and solution

Description:

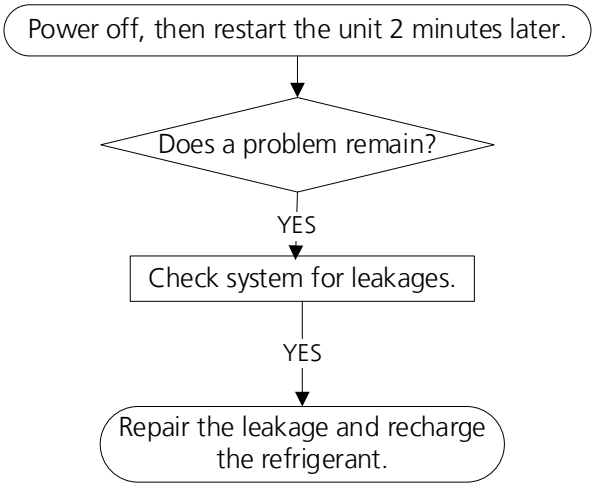
The refrigerant sensor detects a concentration higher than or equal to 10%*LFL for 10 seconds or the refrigerant sensor detects a concentration higher than or equal to 25%*LFL or the multi model receives the refrigerant leakage protection fault sent by the outdoor unit.

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:



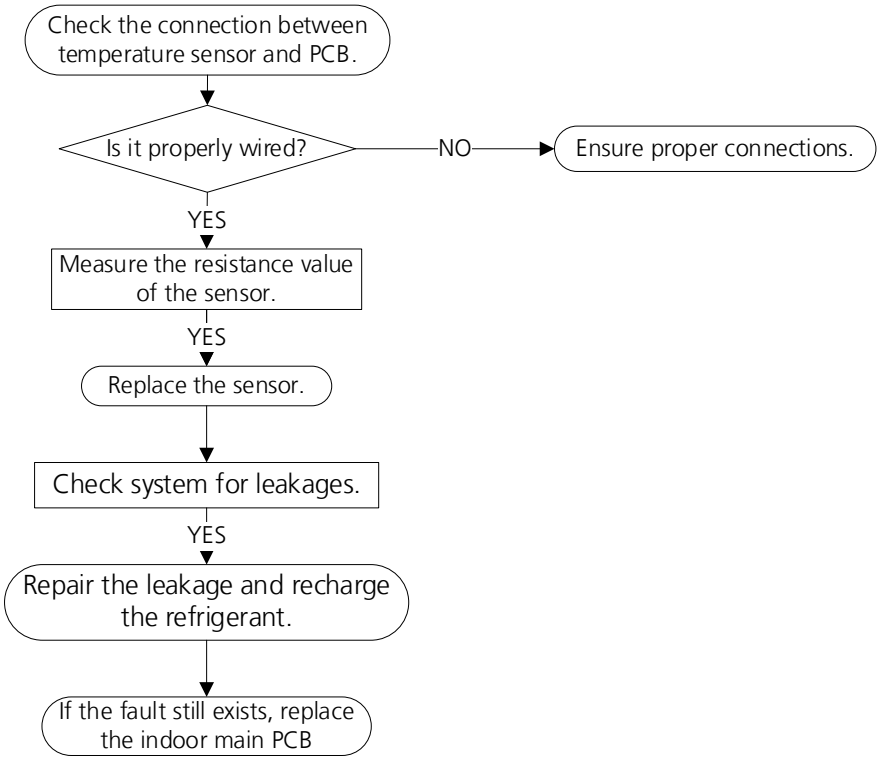
8.14 EHC2(Refrigerant sensor is out of range and leakage is detected) diagnosis and solution

Description: Indoor unit receives fault signal and LFL is more than or equal to 0.

Recommended parts to prepare:

- Connection wires
- Sensors
- Indoor main PCB
- Additional refrigerant

Troubleshooting and repair:



8.15 PC00(ODU IPM module protection)/PC04(Inverter compressor drive error) Diagnosis and Solution

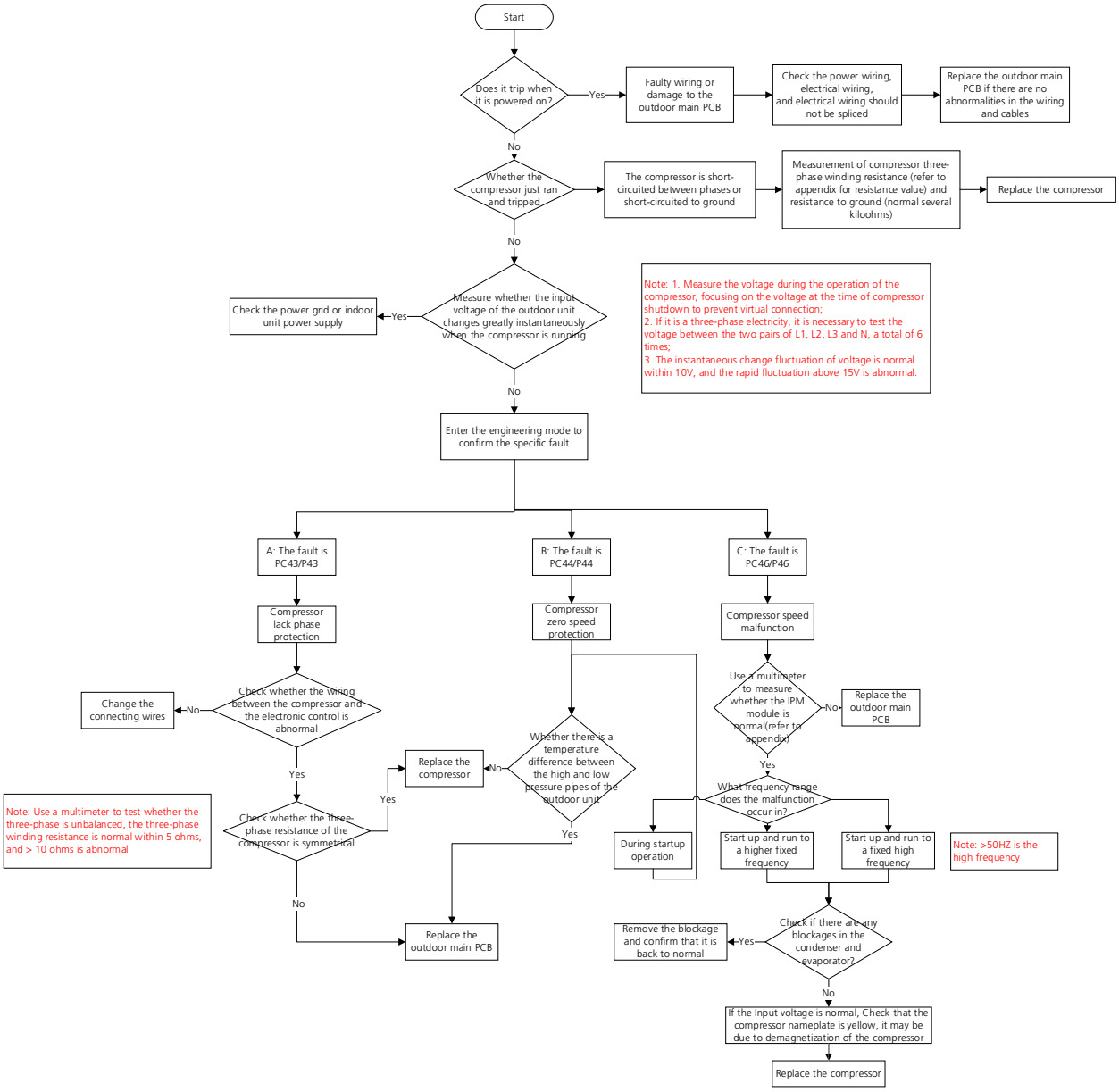
Description: When the voltage signal the IPM sends to the compressor drive chip is abnormal, the display LED shows "PC00" and the AC turn off.

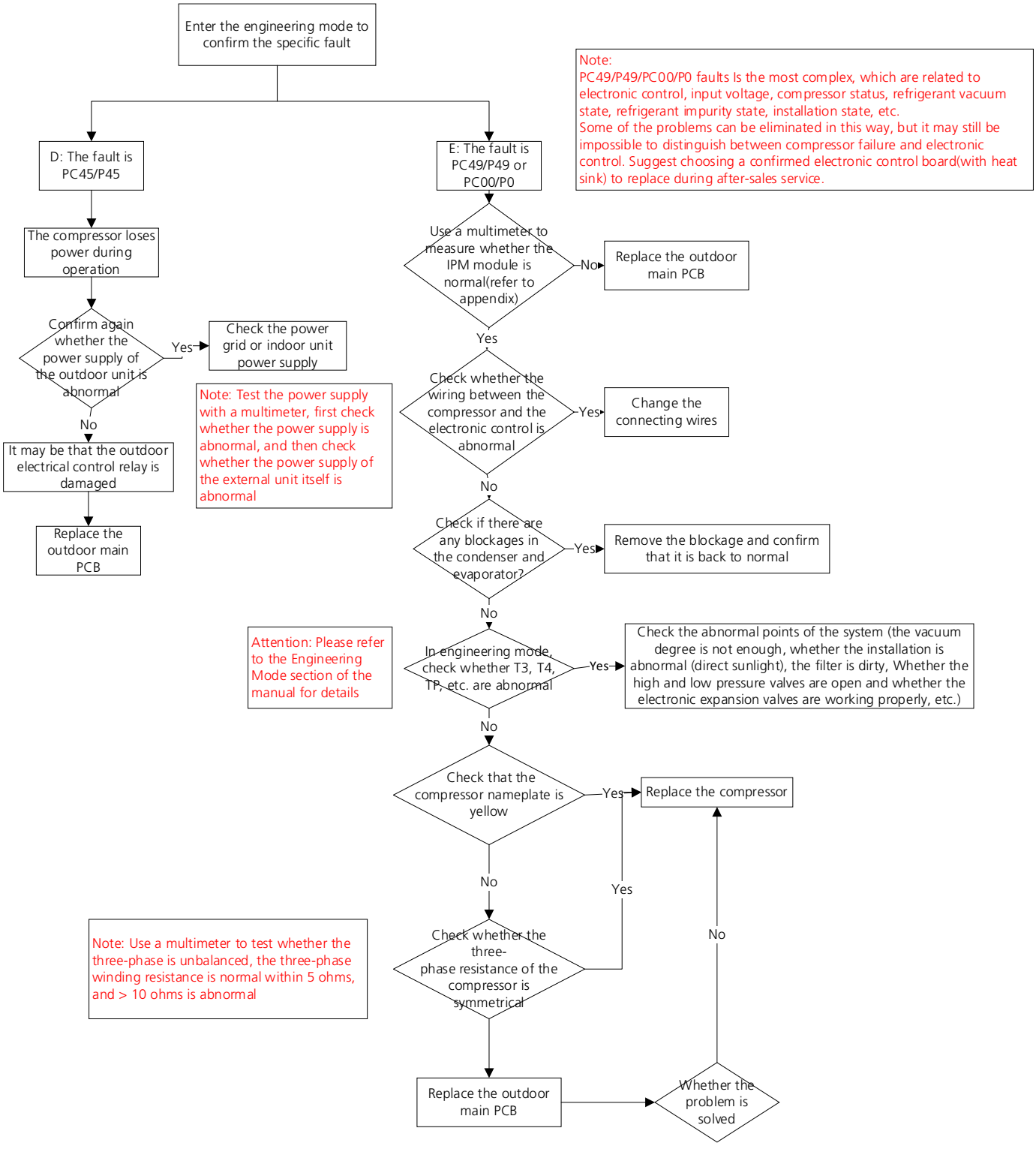
Or an abnormal inverter compressor drive is detected by a special detection circuit, including communication signal detection, voltage detection, compressor rotation speed signal detection and so on.

Recommended parts to prepare:

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

Troubleshooting and repair:




Enter the engineering mode to confirm the specific fault
D: The fault is PC45/P45
E: The fault is PC49/P49 or PC00/P0
Note:
PC49/P49/PC00/P0 faults Is the most complex, which are related to electronic control, input voltage, compressor status, refrigerant vacuum state, refrigerant impurity state, installation state, etc.
Some of the problems can be eliminated in this way, but it may still be impossible to distinguish between compressor failure and electronic control. Suggest choosing a confirmed electronic control board(with heat sink) to replace during after-sales service.
The compressor loses power during operation
Confirm again whether the power supply of the outdoor unit is abnormal
Yes
Check the power grid or indoor unit power supply
Note: Test the power supply with a multimeter, first check whether the power supply is abnormal, and then check whether the power supply of the external unit itself is abnormal
No
It may be that the outdoor electrical control relay is damaged
Replace the outdoor main PCB
Use a multimeter to measure whether the IPM module is normal(refer to appendix)
No
Replace the outdoor main PCB
Yes
Check whether the wiring between the compressor and the electronic control is abnormal
Yes
Change the connecting wires
No
Check if there are any blockages in the condenser and evaporator?
Yes
Remove the blockage and confirm that it is back to normal
No
Attention: Please refer to the Engineering Mode section of the manual for details
In engineering mode, check whether T3, T4, TP, etc. are abnormal
Yes
Check the abnormal points of the system (the vacuum degree is not enough, whether the installation is abnormal (direct sunlight), the filter is dirty, Whether the high and low pressure valves are open and whether the electronic expansion valves are working properly, etc.)
No
Check that the compressor nameplate is yellow
Yes
Replace the compressor
No
Yes
Note: Use a multimeter to test whether the three-phase is unbalanced, the three-phase winding resistance is normal within 5 ohms, and > 10 ohms is abnormal
Check whether the three-phase resistance of the compressor is symmetrical
No
Replace the outdoor main PCB
Whether the problem is solved

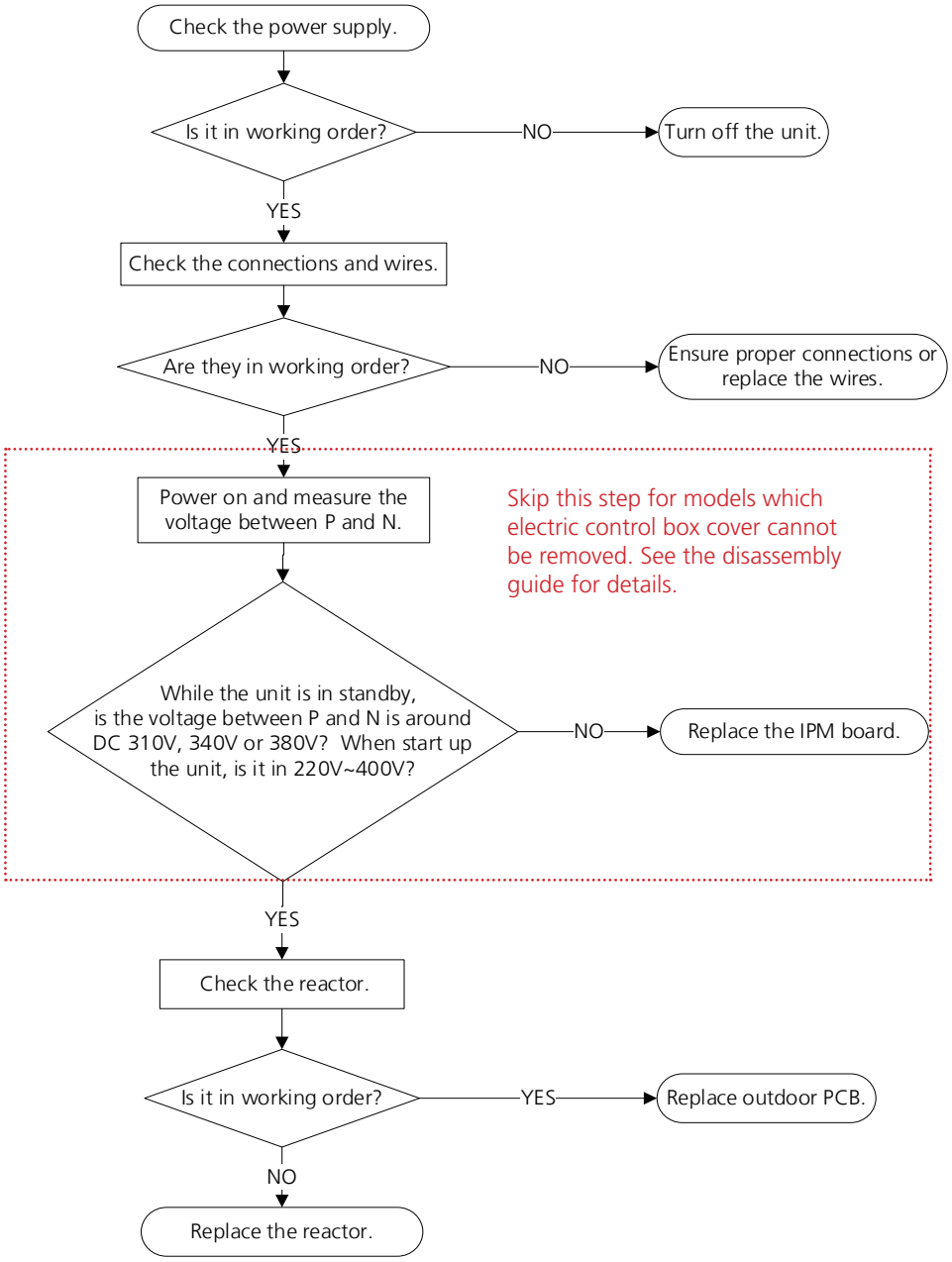
8.16 PC01(ODU voltage protection)/PC10(ODU low AC voltage protection)/PC11(ODU main control board DC bus high voltage protection)/PC12(ODU main control board DC bus low voltage protection/341 MCE error) diagnosis and solution

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:



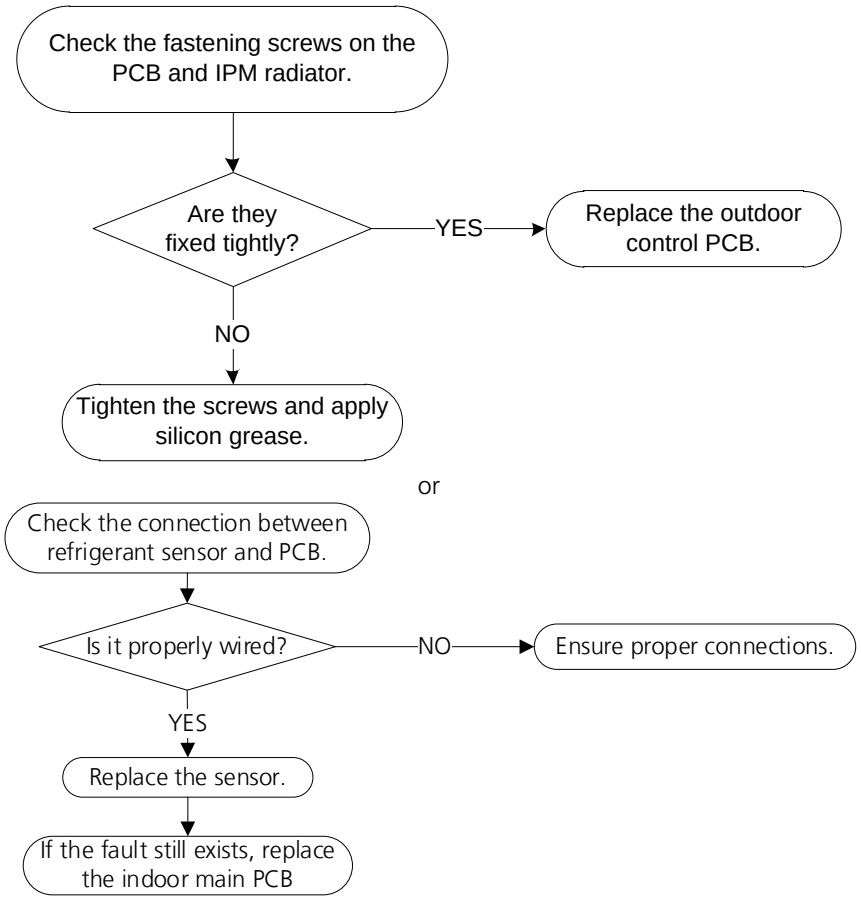
8.17 PC02/LC06 (Compressor top(or IPM) temp. protection/Refrigerant sensor error) diagnosis and solution

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

Recommended parts to prepare:

- Connection wires
- Outdoor PCB
- Refrigerant sensor

Troubleshooting and repair:



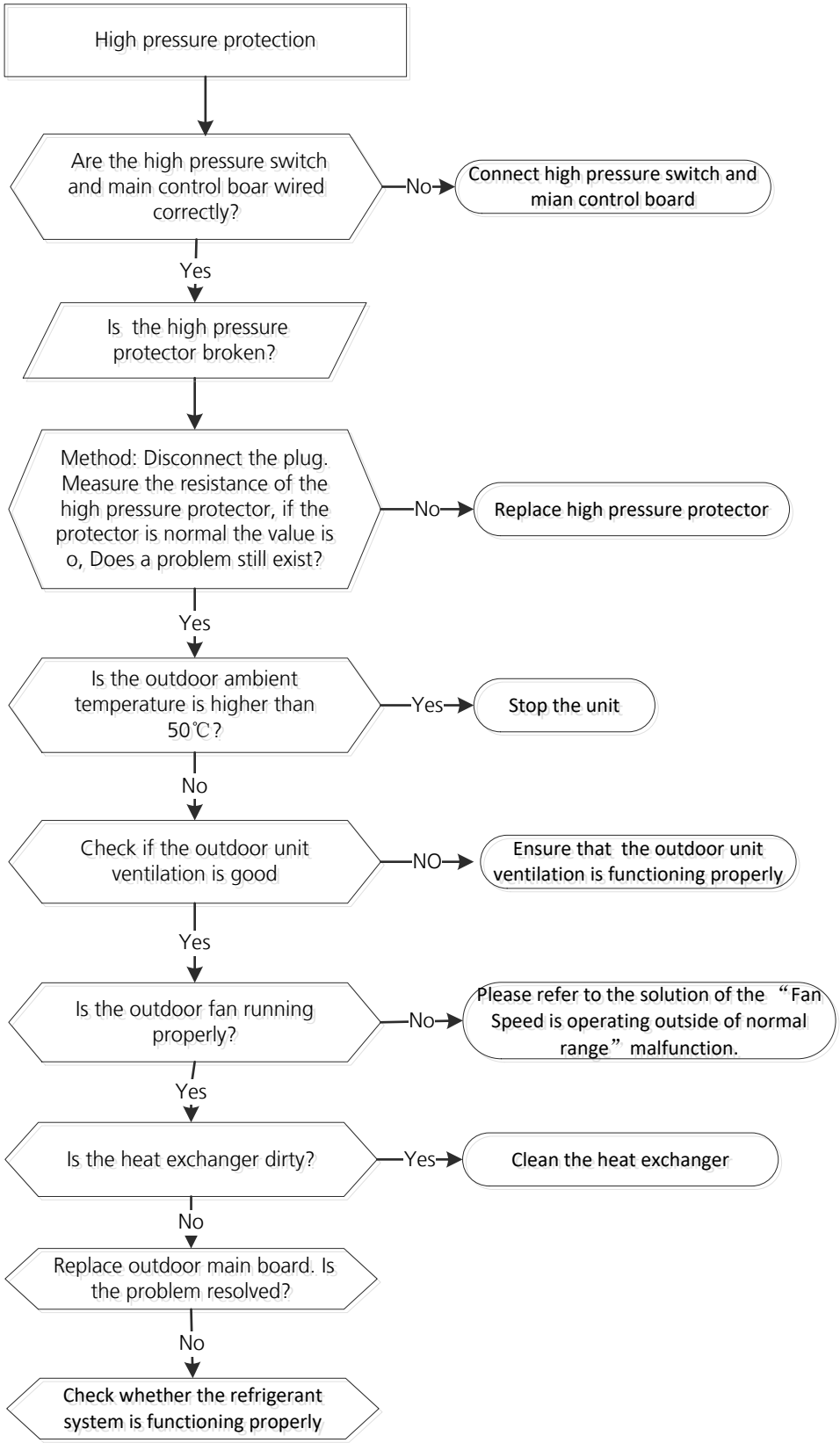
8.18 PC03/PC30/PC31(Pressure protection(low or high pressure) diagnosis and solution

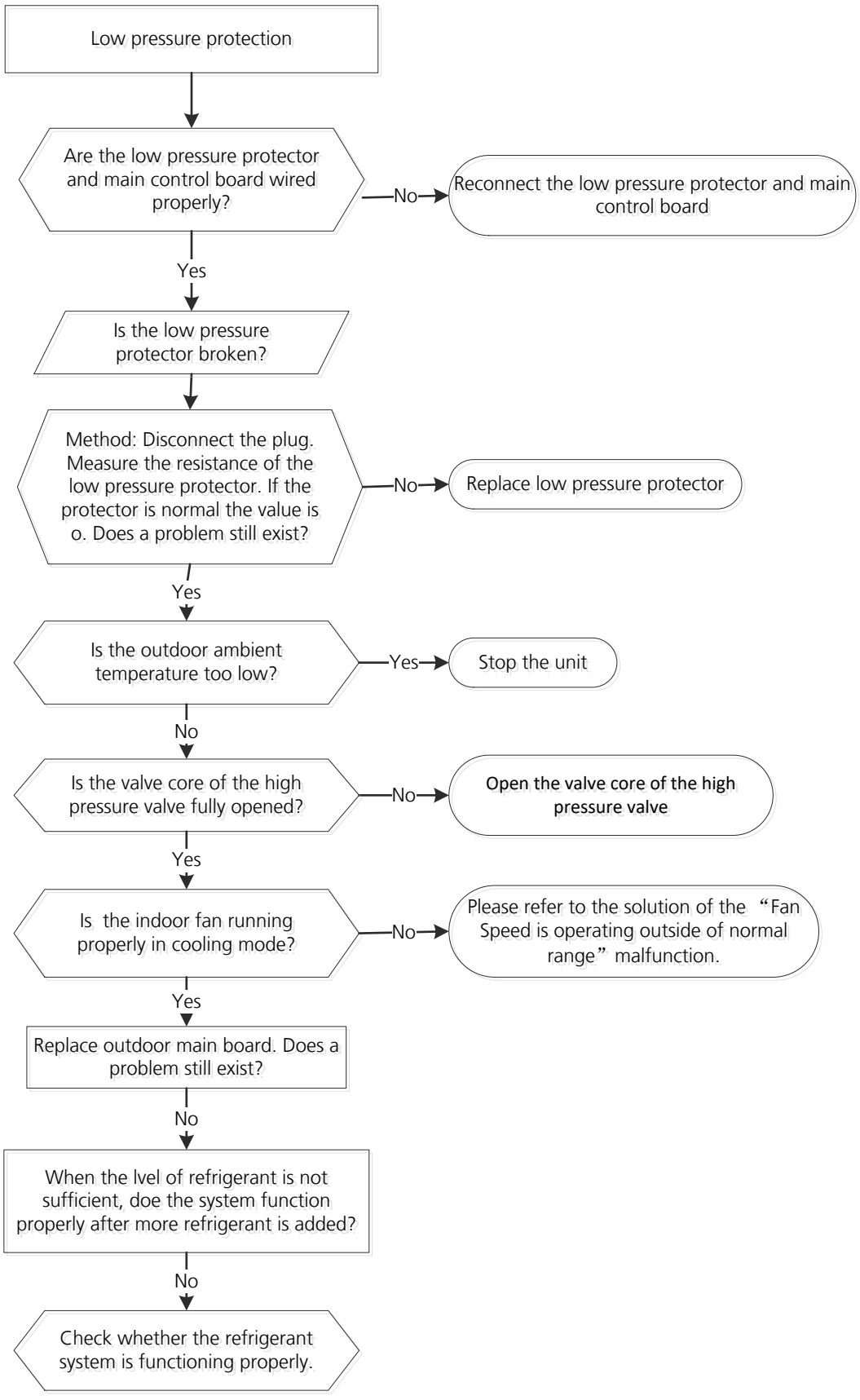
Description: Outdoor pressure switch cut off the system because high pressure is higher than 4.4 MPa or outdoor pressure switch cut off the system because low pressure is lower than 0.13 MPa, the LED displays the failure code.

Recommended parts to prepare:

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

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 the "Fan Speed is operating outside of normal range" malfunction.
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
Please refer to the solution of the "Fan Speed is operating outside of normal range" malfunction.
Yes
Replace outdoor main board. Does a problem still exist?
No
When the lvel of refrigerant is not sufficient, doe the system function properly after more refrigerant is added?
No
Check whether the refrigerant system is functioning properly.

8.19 IDUs mode conflict (match with multi outdoor unit)

Description: The indoor units cannot work cooling mode and heating at same time. Heating mode has a priority.

- Suppose Indoor unit A working in cooling mode or fan mode, and indoor unit B is set to heating mode, then A will change to off and B will work in heating mode.
- Suppose Indoor unit A working in heating mode, and indoor unit B is set to cooling mode or fan mode, then B will change to stand by and A will be no change.

	Cooling mode	Heating Mode	Fan	Off
Cooling mode	No	Yes	No	No
Heating Mode	Yes	No	Yes	No
Fan	No	Yes	No	No
Off	No	No	No	No

Note:

No: No mode conflict

Yes: Mode conflict

8.20 PC0L(Low 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.

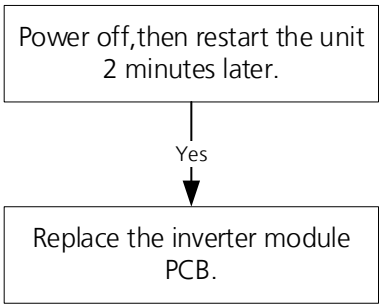
8.21 PC45(ODU IR chip drive failure) diagnosis and solution

Description: When the IR chip detects its own parameter error, the LED displays the failure code when power on.

Recommended parts to prepare:

- Inverter module PCB.

Troubleshooting and repair:



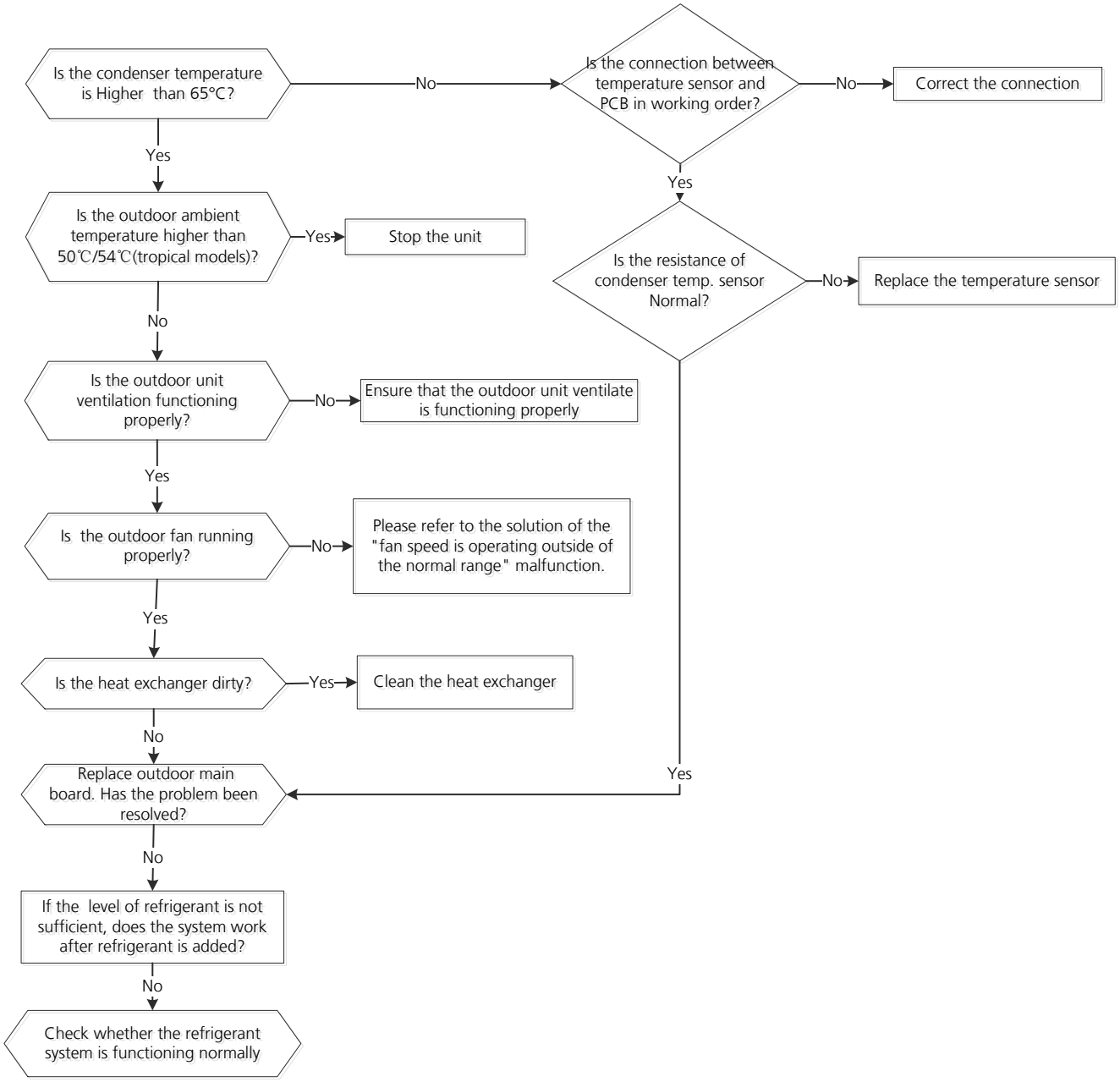
8.22 PC0A(High temperature protection of condenser) diagnosis and solution

Description: The unit will stop when condenser temperature is higher than 65°C, and runs again when it is less than 52°C.

Recommended parts to prepare:

- Connection wires
- Condenser temperature sensor
- Outdoor fan
- Outdoor main PCB
- Refrigerant

Troubleshooting and repair:



8.23 PC0F(PFC module protection) diagnosis and solution

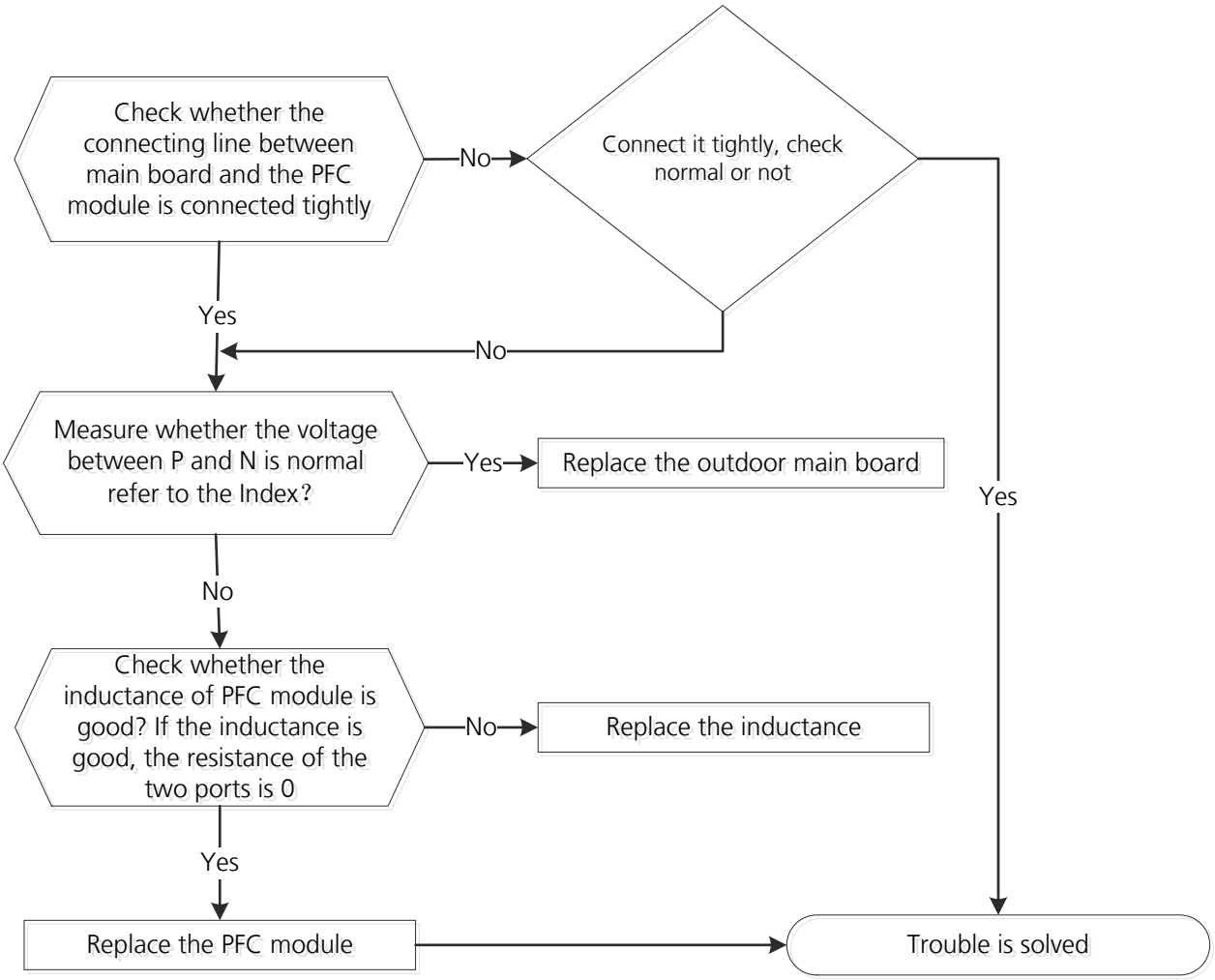
Description: When the voltage signal that IPM send to compressor drive chip is abnormal, the LED displays the failure code and the AC turns off.

Recommended parts to prepare:

- Connection wires
- Inductance
- Outdoor main PCB
- PFC module

Troubleshooting and repair:

At first test the resistance between every two ports of U, V, W of IPM and P, N. If any result of them is 0 or close to 0, the IPM is defective. Otherwise, please follow the procedure below:



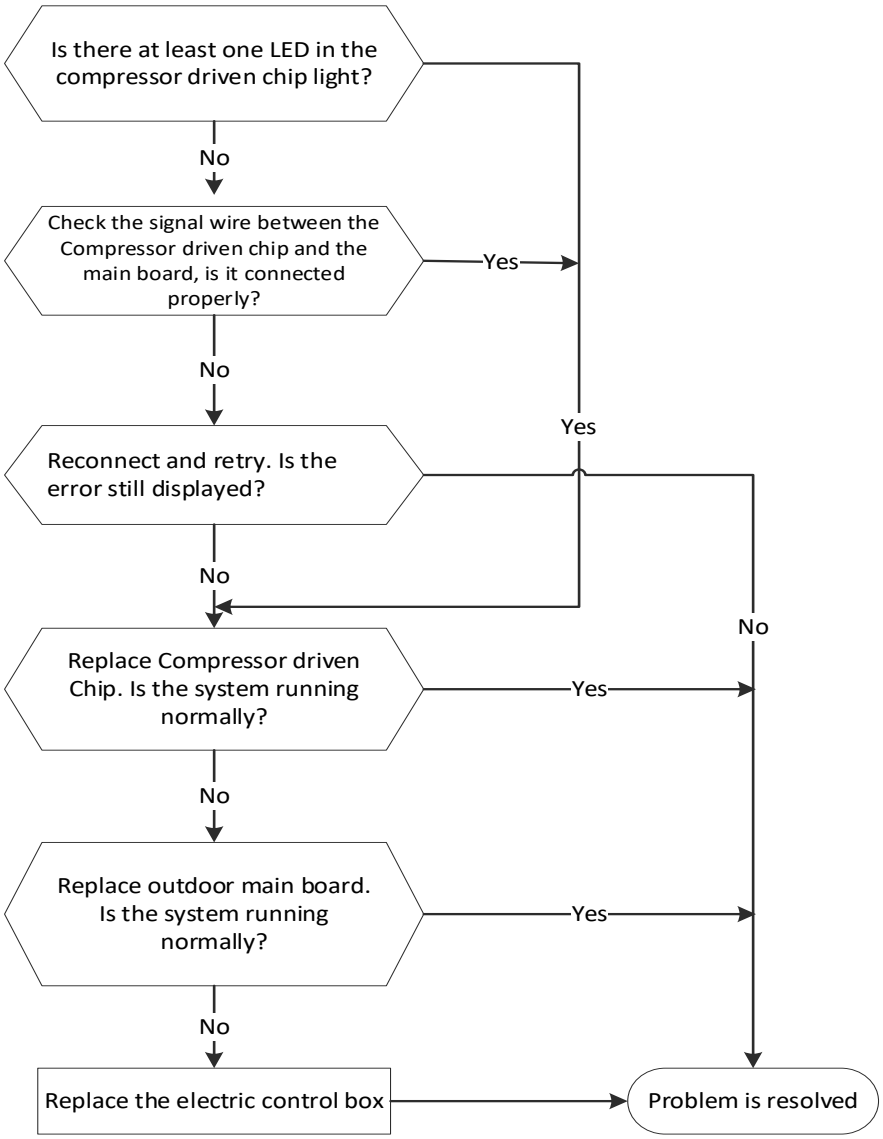
8.24 PC40(Communication error between outdoor main chip and compressor driven chip) diagnosis and solution

Description: The main PCB cannot detect the IPM board.

Recommended parts to prepare:

- Connection wires
- IPM board
- Outdoor main PCB
- Electric control box

Troubleshooting and repair:



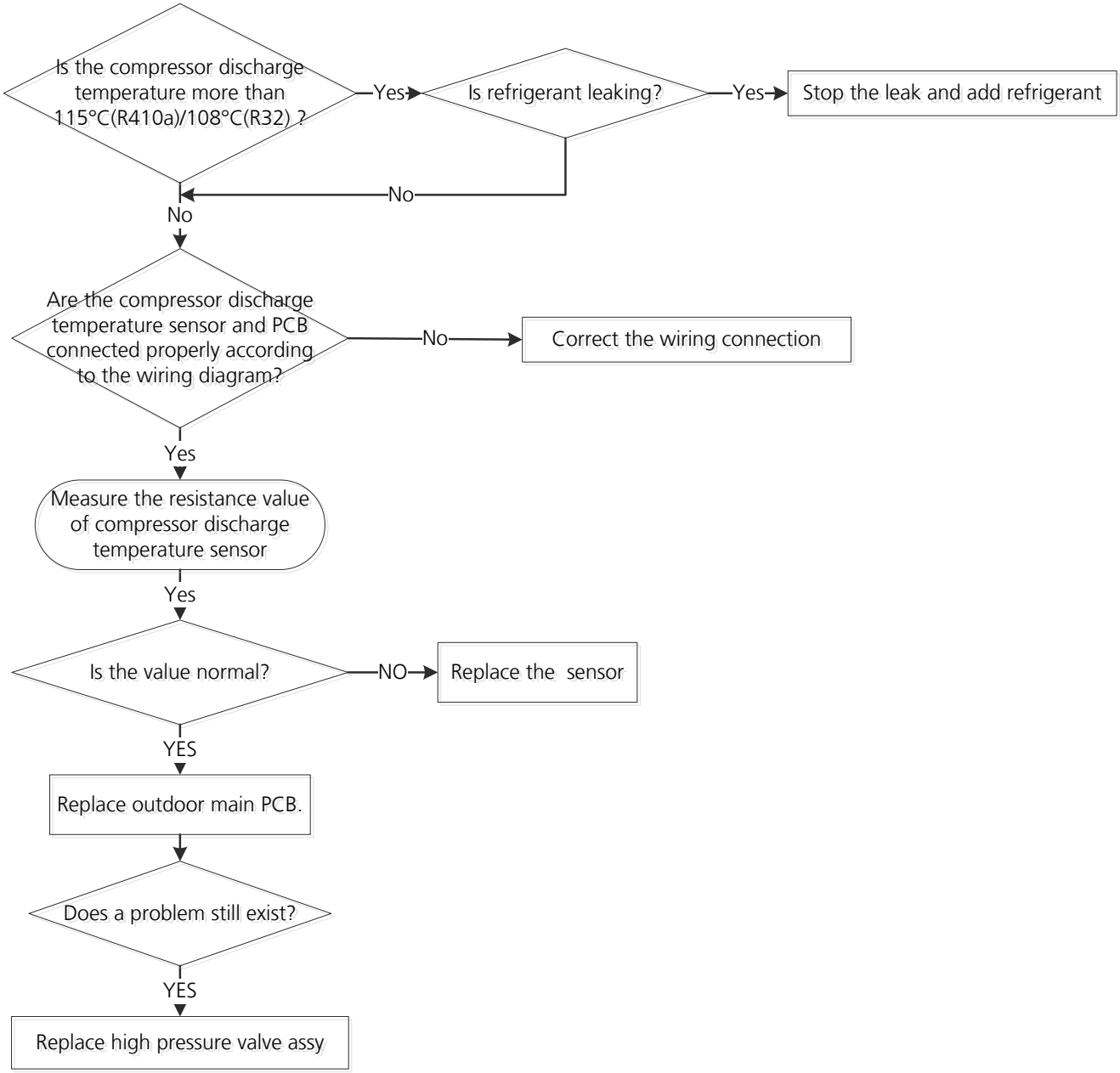
8.25 PC06(Discharge temperature protection of compressor) diagnosis and solution

Description: If the compressor discharge temperature exceeds a certain level for nine seconds, the compressor ceases operation, the LED displays the failure code

Recommended parts to prepare:

- Connection wires
- Discharge temperature sensor
- Additional refrigerant
- Outdoor main PCB

Troubleshooting and repair:



Note: For certain models, outdoor unit uses combination sensor, T3,T4 and TP are the same of sensor. This picture and the value are only for reference, actual appearance and value may vary.

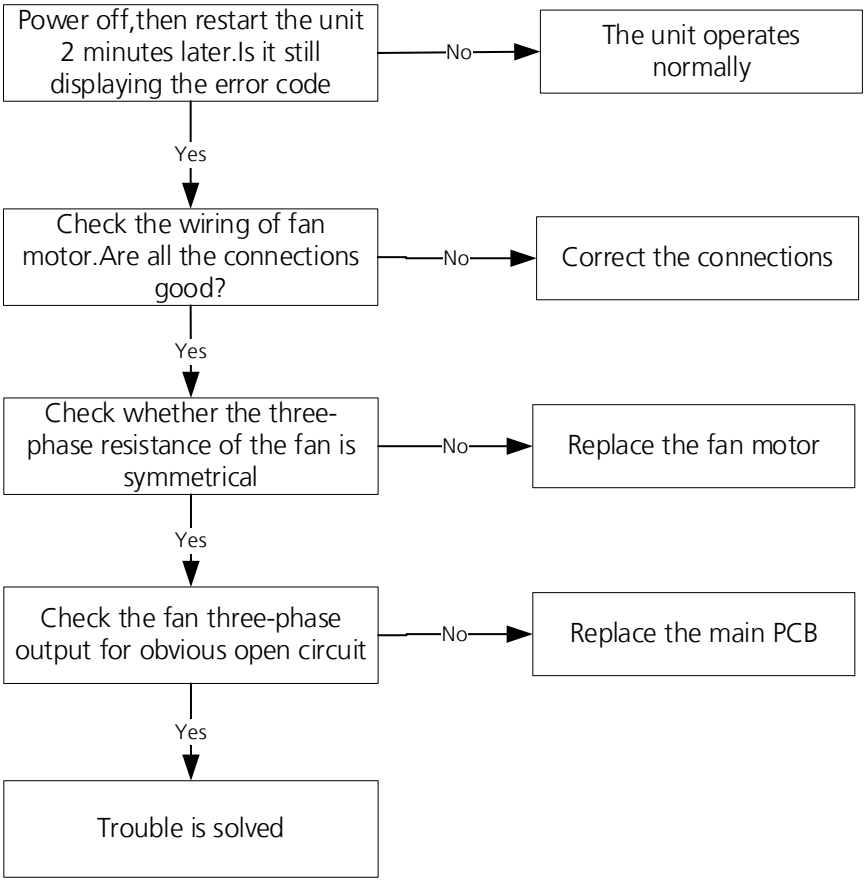
8.26 EC72(Lack phase failure of ODU DC fan motor) diagnosis and solution

Description: When the three-phase sampling current of the DC motor is abnormal, especially when the current of one or more phases is always small and almost 0, the LED displays the failure code.

Recommended parts to prepare:

- Connection wire
- Fan motor
- Outdoor PCB

Troubleshooting and repair:



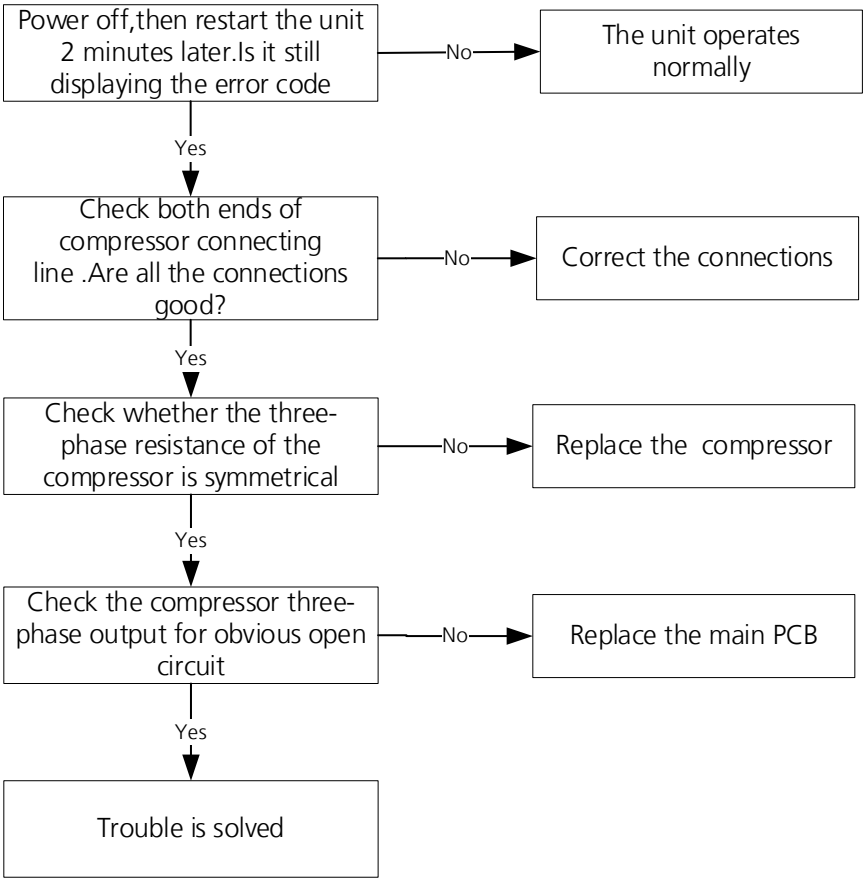
8.27 PC43(ODU compressor lack phase protection) diagnosis and solution

Description: When the three-phase sampling current of the compressor is abnormal, especially when the current of one or more phases is always small and almost 0, the LED displays the failure code

Recommended parts to prepare:

- Connection wire
- Compressor
- Outdoor PCB

Troubleshooting and repair:



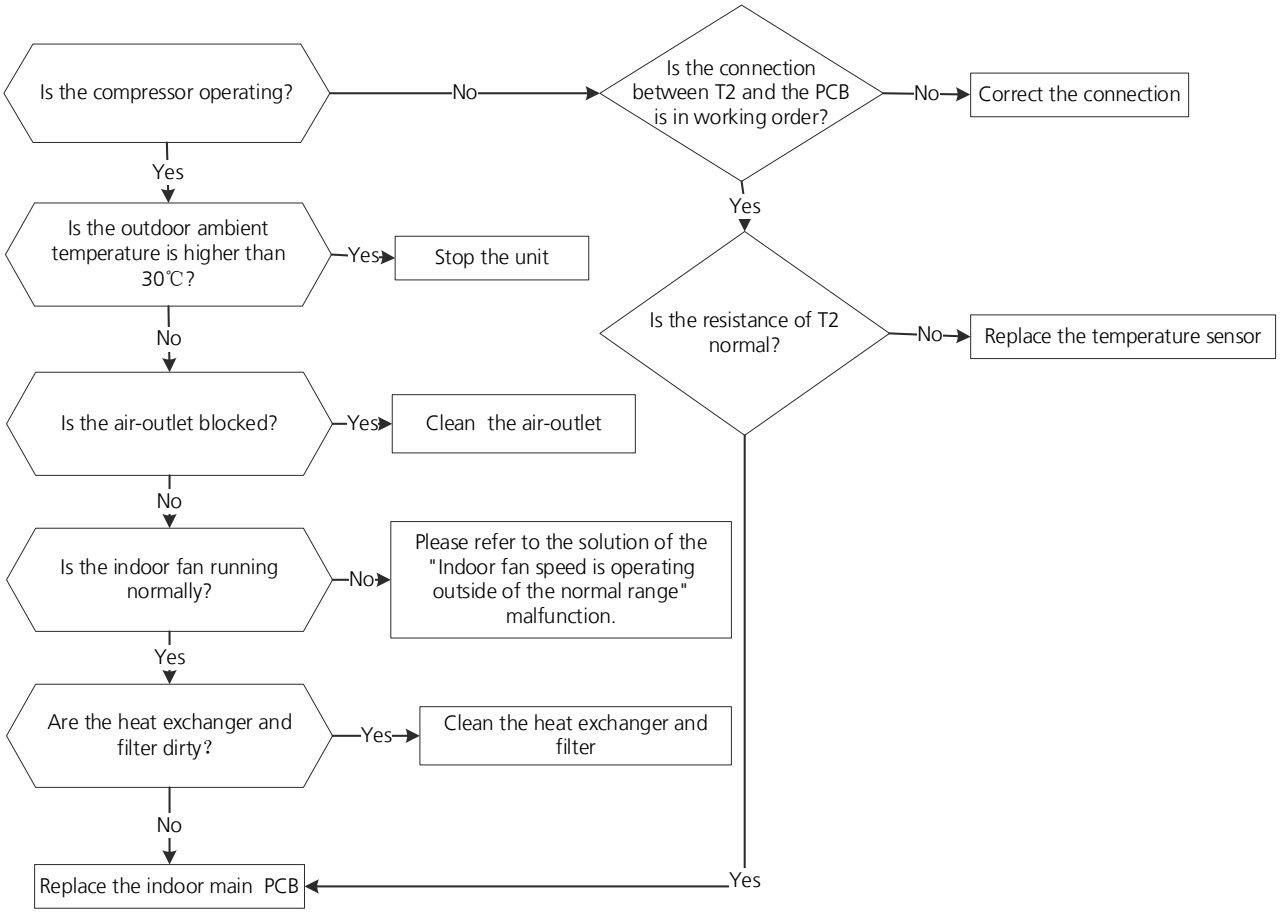
8.28 PH90(High temperature protection of evaporator diagnosis and solution)

Description: When evaporator coil temperature is more than 60°C in heating mode, the unit stops. It starts again only when the evaporator coil temperature is less than 52°C.

Recommended parts to prepare:

- Connection wires
- Evaporator coil temperature sensor (T2)
- Indoor fan
- Indoor main PCB

Troubleshooting and repair:

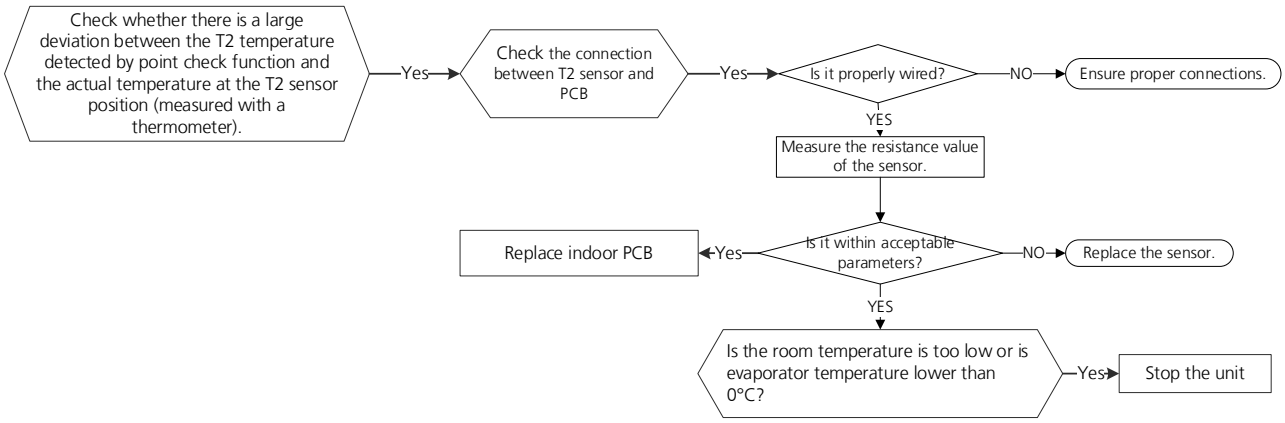


8.29 PH91(Low temperature protection of evaporator diagnosis and solution)

Description: When evaporator coil temperature is lower than 0°C in cooling mode or drying mode, the unit stops. It starts again only when the evaporator coil temperature is more than 5°C.

Recommended parts to prepare:

- Connection wires
- Evaporator coil temperature sensor (T2)
- Indoor main PCB



8. Check Procedures

8.1 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.

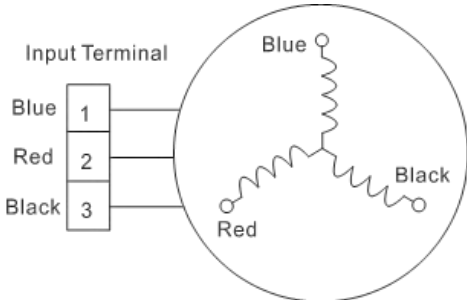
1. Disconnect the temperature sensor from PCB (Refer to Chapter Indoor&Outdoor Unit Disassembly).
2. Measure the resistance value of the sensor using a multi-meter.
3. Check corresponding temperature sensor resistance value table (Refer to Chapter 8. Appendix).



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

8.2 Compressor Check

1. Disconnect the compressor power cord from outdoor PCB (Refer to Chapter 6. Outdoor Unit Disassembly)).
2. Measure the resistance value of each winding using a multi-meter.
3. Check the resistance value of each winding in the following table.



Resistance Value	KSK89D53UEZ	KSK89D29UEZD	KSN98D22UFZ	KSK103D33UEZ3 KSK103D33UEZ3(MD) KBK103D33UEZ3	KSK103D32UEZ31 KSK75D32UEZD31	KTN150D30UFZA KTN150D30SFZA
Blue-Red	2.35±5%Ω (at 20°C/68°F)	1.99±5%Ω (at 20°C/68°F)	1.57±5%Ω (at 20°C/68°F)	2.13±5%Ω (at 20°C/68°F)	4.06±5%Ω (at 20°C/68°F)	1.02±5%Ω (at 20°C/68°F)
Blue-Black						
Red-Black						

Resistance Value	KSM135D23UFZ	KTN110D42UFZ	KSN140D21UFZ	KTM140D78UFZ3	KTF235D22UMT ATF235D22TMT KTF250D22UMT	KTM240D46UKT2
Blue-Red	1.72±5%Ω (at 20°C/68°F)	1.82±5%Ω (at 20°C/68°F)	1.28±5%Ω (at 20°C/68°F)	1.5±5%Ω (at 20°C/68°F)	0.75±5%Ω (at 20°C/68°F)	1.04±5%Ω (at 20°C/68°F)
Blue-Black						
Red-Black						

Resistance Value	KSN140D58UFZ	KTM240D43UKT	KSN98D64UFZ3	ASN140D35TFZ	KTF420D62UNT	ASN108D22TEZ
Blue-Red	1.86±5%Ω (at 20°C/68°F)	1.03±5%Ω (at 20°C/68°F)	2.7±5%Ω (at 20°C/68°F)	0.83±5%Ω (at 20°C/68°F)	0.86±5%Ω (at 20°C/68°F)	1.76±5%Ω (at 20°C/68°F)
Blue-Black						
Red-Black						

Resistance Value	KTM240D63SKT2	KTM240D57UMT	DTN210D32UFZ	KSN140D33UFZB3	KTM110D79UFZA3	GSD098XKUF7JV6B
Blue-Red	1.19±5%Ω (at 20°C/68°F)	0.62±5%Ω (at 20°C/68°F)	1.7±5%Ω (at 20°C/68°F)	1.68±5%Ω (at 20°C/68°F)	1.88±5%Ω (at 20°C/68°F)	2.83±5%Ω (at 20°C/68°F)
Blue-Black						
Red-Black						

Resistance Value	KSK75D33UEZD3	DTN210D54UEZ3	DTN250D53UFZ3	KSN103D42UEZ31	GTD141RKRF8JV8B	ATD186RKSF8JV8
Blue-Red	2.14±5%Ω (at 20°C/68°F)	2.53±5%Ω (at 20°C/68°F)	1.97±5%Ω (at 20°C/68°F)	2.35±5%Ω (at 20°C/68°F)	1.765±5%Ω (at 20°C/68°F)	1.64±5%Ω (at 20°C/68°F)
Blue-Black						
Red-Black						

Resistance Value	KTM29000D27UKT3	KSN98D13UEZ32	KSN140D43SFZ31	KTM180D68UMT		
Blue-Red	0.9±5%Ω (at 20°C/68°F)	3.15±5%Ω (at 20°C/68°F)	1.81±5%Ω (at 20°C/68°F)	1.91±5%Ω (at 20°C/68°F)		
Blue-Black						
Red-Black						



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

8.3 IPM Continuity Check

WARNING

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

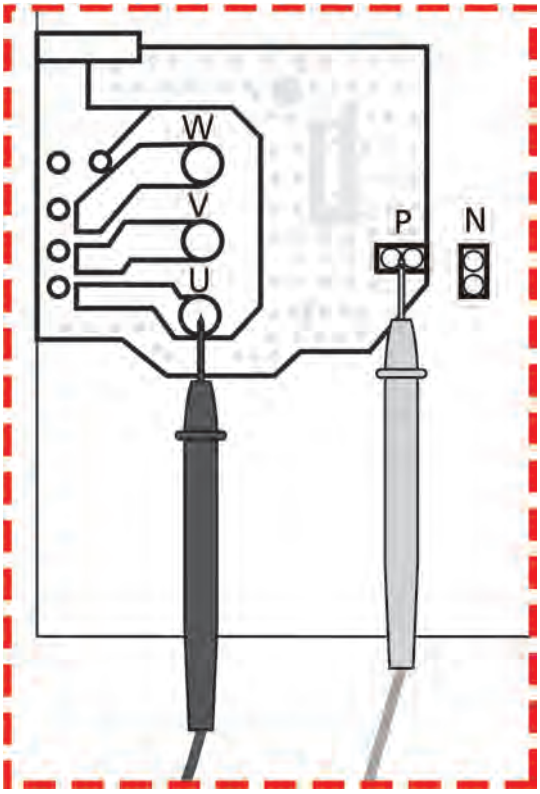
1. Turn off outdoor unit and disconnect power supply.
2. Discharge electrolytic capacitors and ensure all energy-storage unit has been discharged.
3. Disassemble outdoor PCB or disassemble IPM board.
4. Measure the resistance value between P and U(V, W, N); U(V, W) and N.

Digital tester		Resistance value	Digital tester		Resistance value
(+)Red	(-)Black		(+)Red	(-)Black	
P	N	∞ (Several M±5%Ω)	U	N	∞ (Several M±5%Ω)
	U		V		
	V		W		
	W		-		

Or test the conductivity of IPM with diode mode.

Needle-type Tester		Normal Value	Needle-type Tester		Normal Value
Red	Black		Red	Black	
P	U	Open-circuit	N	U	0.3-0.5V
	V			V	
	W			W	

Needle-type Tester		Normal Value	Needle-type Tester		Normal Value
Black	Red		Black	Red	
P	U	0.3-0.5V	N	U	Open-circuit
	V			V	
	W			W	



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

8.4 4-way Valve Check

1. Power on, use a digital tester to measure the voltage, when the unit operates in cooling, it is 0V. When the unit operates in heating, it is about 230VAC.

If the value of the voltage is not in the range, the PCB must have problems and need to be replaced.





2 Turn off the power, use a digital tester to measure the resistance. The value should be 1.8~2.5 K±5%Ω.

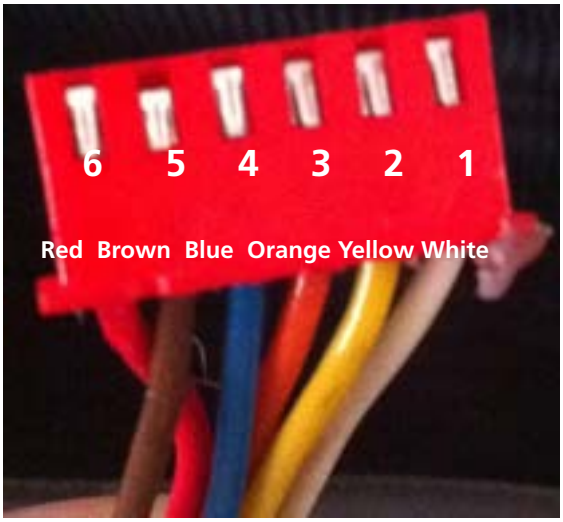


8.5 EXV Check

WARNING

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

1. Disconnect the connector from outdoor PCB.
2. Measure the resistance value of each winding using a multi-meter.
3. Check the resistance value of each winding in the following table.



Color of lead winding	Normal Value
Red- Blue	About 50Ω
Red - Yellow	
Brown-Orange	
Brown-White	

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			

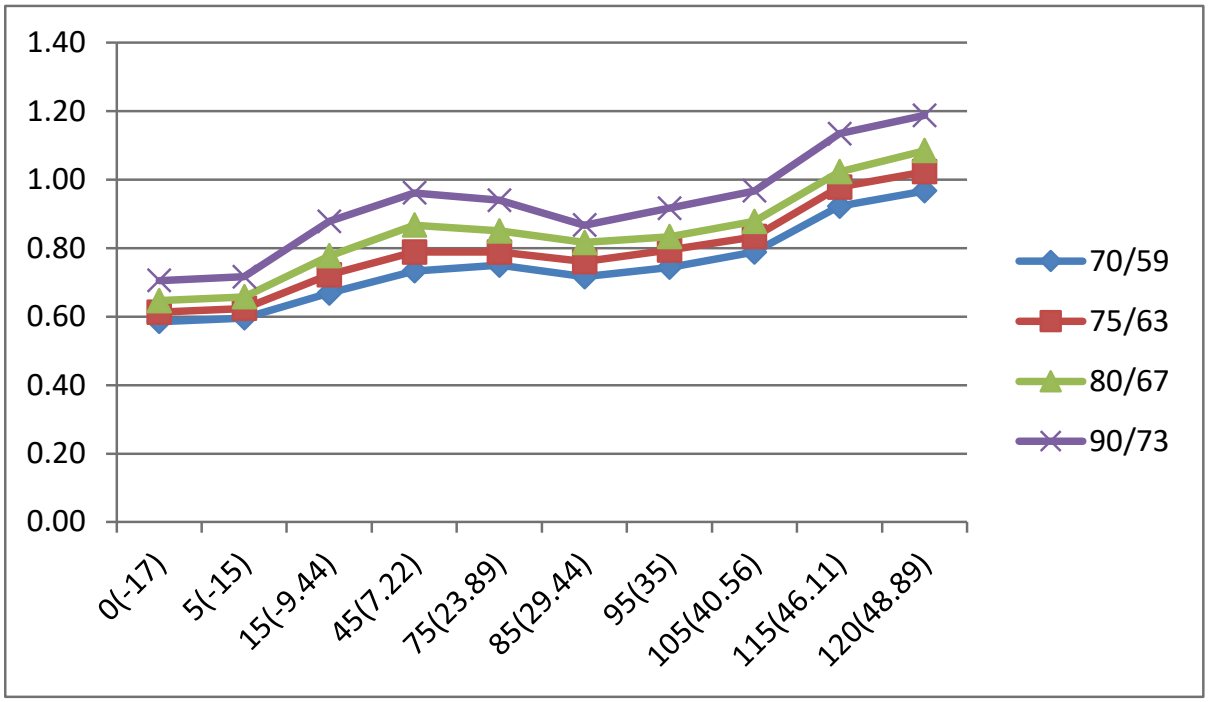
ii) Other Temperature Sensors Resistance Value Table (°C – K)

°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

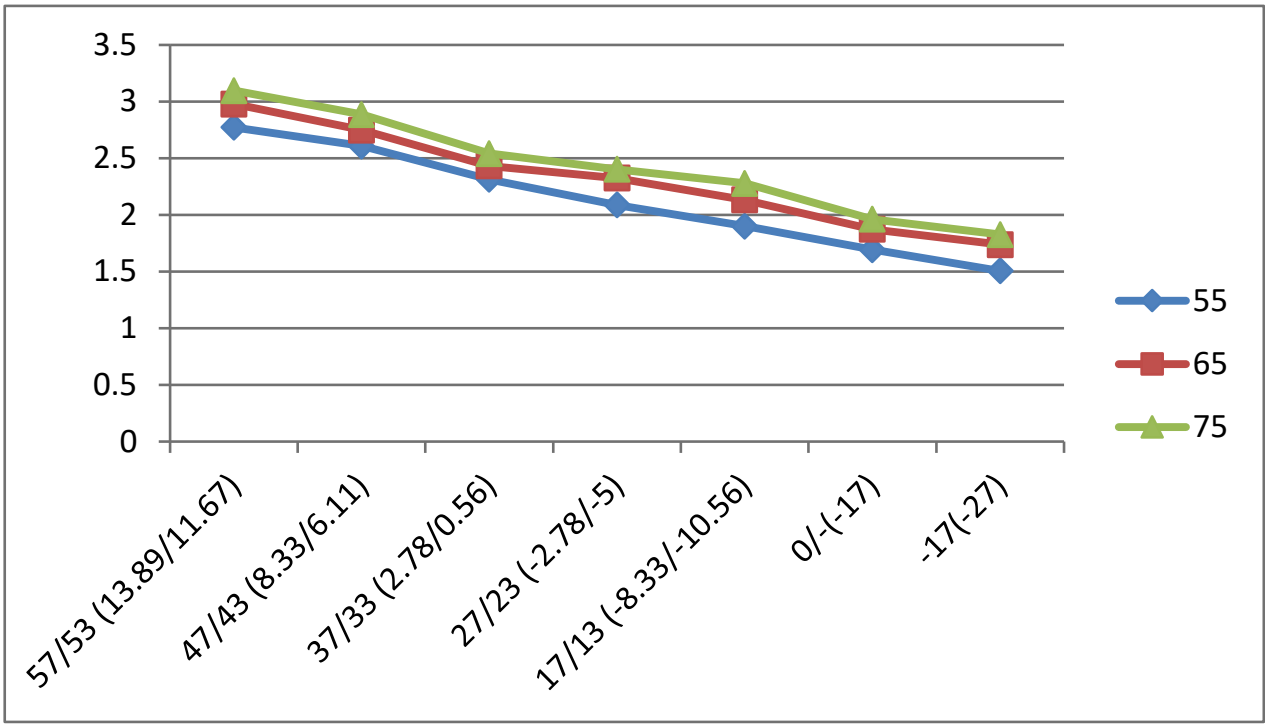
Cooling chart(R454B):

°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