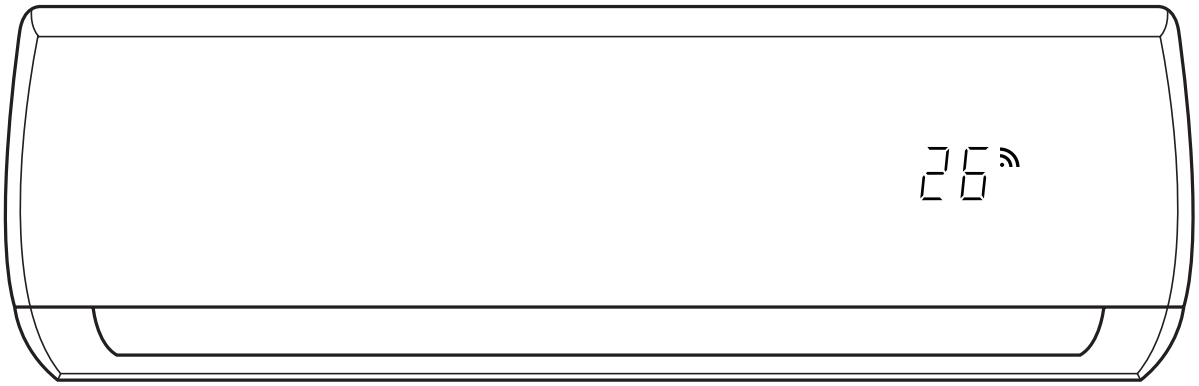
SM_EP(GA)_R454B_3D INV_US_NA_2406

# ALL EASY PRO 3D INVERTER SERIES

SERVICE MANUAL





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 operates in areas water or other liquids.
- Ensure the drain hose is installed correctly to ensure proper water drainage.
- When lifting or transporting the unit, it is recommended that two or more people are used for this task.
- When the unit is not to be used for an extended time, disconnect the power supply or turn off the breaker.

## WARNING For Using Flammable Refrigerant

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

2. Servicing
- Any person who is involved with working on or breaking into a refrigerant circuit should hold a current valid certificate from an industry-accredited assessment authority, which authorises their competence to handle refrigerants safely in accordance with an industry recognised assessment specification.

3. Maintenance and repair requiring the assistance of other skilled personnel shall be carried out under the supervision of the person competent in the use of flammable refrigerants.

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

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

6. Be more careful that foreign matter(oil, water,etc) does not enter the piping. Also, when storing the piping, securely seal the opening by pinching, taping, etc.

7. Do not pierce or burn.

8. Be aware that refrigerants may not contain an odour.

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

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

11. The appliance shall be stored so as to prevent mechanical damage from occurring.

12. Joints shall be tested with detection equipment with a capability of 5 g/year of refrigerant or better, with the equipment in standstill and under operation or under a pressure of at least these standstill or operation conditions after installation. Detachable joints shall NOT be used in the indoor side of the unit (brazed, welded joint could be used).

13. When a FLAMMABLE REFRIGERANT is used, the requirements for installation space of appliance and /or ventilation requirements are determined according to
-- the mass charge amount(M) used in the appliance,
-- the installation location,
-- the type of ventilation of the location or of the appliance.
-- piping material, pipe routing, and installation shall include protection from physical damage in operation and service, and be in compliance with national and local codes and standards, such as ASHRAE 15, IAPMO Uniform Mechanical Code, ICC International Mechanical Code, or CSA B52. All field joints shall be accessible for inspection prior to being covered or enclosed.
-- that protection devices, piping, and fittings shall be protected as far as possible against adverse environmental effects, for 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:

- The minimum test pressure for the low side of the system shall be the low side design pressure and the minimum test pressure for the high side of the system shall be the high side design pressure, unless the high side of the system, cannot be isolated from the low side of the system in which case the entire system shall be pressure tested to the low side design pressure.
- The test pressure after removal of pressure source shall be maintained for at least 1h with no decrease of pressure indicated by the test gauge, with test gauge resolution not exceeding 5% of the test pressure.
- During the evacuation test, after achieving a vacuum level specified in the manual or less, the refrigeration system shall be isolated from the vacuum pump and the pressure shall not rise above 1500 microns within 10 min. The vacuum pressure level shall be specified in the manual, and shall be the lessor of 500 microns or the value required for compliance with national and local codes and standards, which may vary between residential, commercial,and industrial buildings.

-- field-made refrigerant joints indoors shall be tightness tested according to the following requirements: The test method shall have a sensitivity of 5 grams per year of refrigerant or better under a pressure of at least 0,25 times the maximum allowable pressure. No leak shall be detected.
--correct the minimum room area of the space Amin by multiplying by the altitude adjustment factor (AF) factor in the below table based on for building site ground level altitude (Halt) in meters.

Altitude Adjustment Factor

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

-- Warning: keep any required ventilation openings clear of obstruction;
-- Any servicing shall be performed only as recommended by the manufacturer

14. Qualification of workers

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

Examples for such working procedures are:
- breaking into the refrigerating circuit;
- opening of sealed components;
- opening of ventilated enclosures.

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

## 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

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

## 2.11 Intrinsically safe components must be replaced

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

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

## 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 |
|---|---|---|---|
| MSEPB-09HRFN10-B1 | MOX230-09HFN10-B1 | 9k Energy Star Series | 115V~, 60Hz, 1Phase |
| MSEPB-12HRFN10-B1 | MOX230-12HFN10-B1 | 12k Energy Star Series | |
| MSEPBM-12HRFN10-M1 | MOX230-06HFN10-M1X | 6k Hyper Heat Series | 208/230V~, 60Hz, 1Phase |
| MSEPB-06HRFN10-M1 | | | |
| MSEPB-09HRFN10-M1 | MOX230-09HFN10-M1 | 9k Energy Star Series | |
| | MOX330-09HFN10-M1X | 9k Hyper Heat Series | |
| MSEPBM-12HRFN10-M1 | MOX230-09HFN10-M1 | 9k Energy Star Series | |
| | MOX330-09HFN10-M1X | 9k Hyper Heat Series | |
| | MOX230-12HFN10-M1 | 12k Energy Star Series | |
| | MOX330-12HFN10-M1X | 12k Hyper Heat Series | |
| MSEPC-06HRFN1-M1H | MOX430-06HFN1-M1H | 6k High Tier Series | |
| MSEPC-09HRFN1-M1H | MOX430-09HFN1-M1H | 9k High Tier Series | |
| MSEPC-12HRFN10-M1H | MOX430-12HFN10-M1H | 12k High Tier Series | |
| MSEPD-18HRFN10-M1H | MOD30-18HFN10-M1H | 18k High Tier Series | |
| MSEPC-18HRFN10-M1 | MOX430-18HFN10-M1X | 18k Hyper Heat Series | |
| | MOX430-18HFN10-M1 | 18k Energy Star Series | |
| MSEPD-24HRFN10-M1 | MOD30-24HFN10-M1X | 24k Hyper Heat Series | |
| | MOD30-24HFN10-M1 | 24k Energy Star Series | |
| MSEPDM-36HRFN10-M1E | MOD30-30HFN10-M1E | 30k Entry Tier Series | |
| MSEPD-30HRFN10-M1 | | | |
| MSEPD-33HRFN10-M1 | MOD30-33HFN10-M1X | 33k Hyper Heat Series | |
| MSEPDM-36HRFN10-M1E | MOD30-36HFN10-M1E | 36k Entry Tier Series | |

## 2. Pipe Length and Drop Height

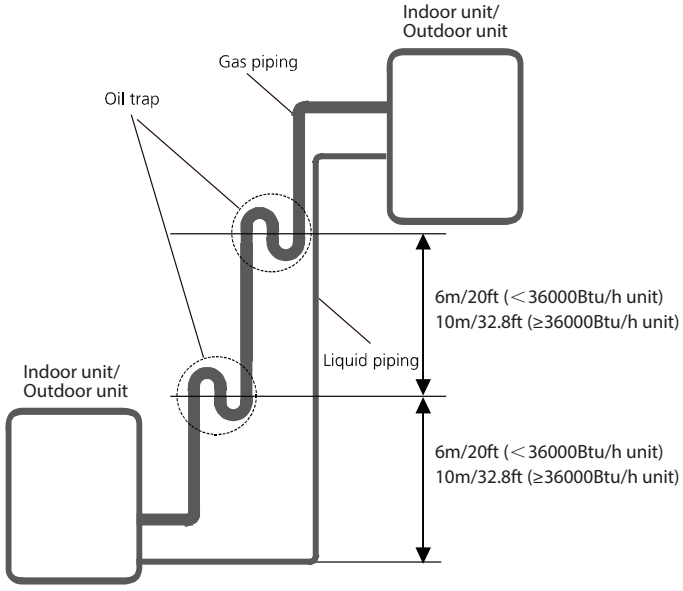
The length and elevation of connection pipe are shown in the table below. if the pipe length exceeds max pipe length, additional refrigerant should be charged to ensure nominal cooling/heating capacity.

| Capacity(Btu/h) | Standard Length | Max Pipe Length | Max Elevation | Additional Refrigerant |
|---|---|---|---|---|
| <15k | 7.5m (24.6ft) | 25m (82.0ft) | 15m (49.2ft) | 15g/m (0.16oz/ft) |
| 18k | | 30m (98.4ft) | 20m (65.6ft) | |
| 18k High Tier Series/ 24k/30k/33k | | 50m (164ft) | 25m (82ft) | 30g/m (0.32oz/ft) |
| 36k | | 65m (213ft) | 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).

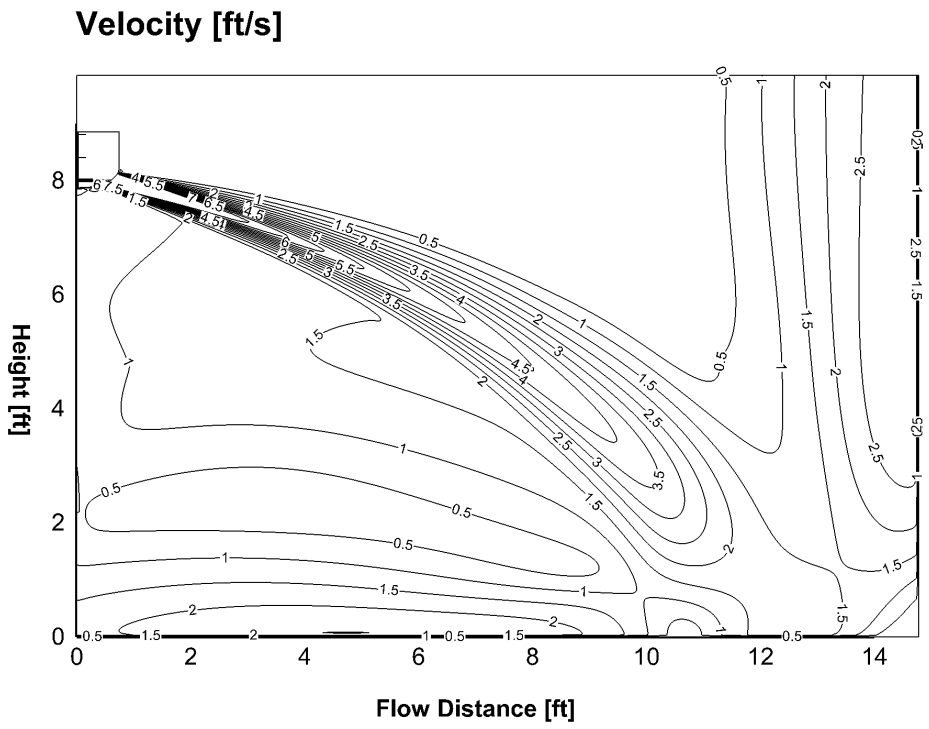


## 3. Air Velocity and Temperature Distributions

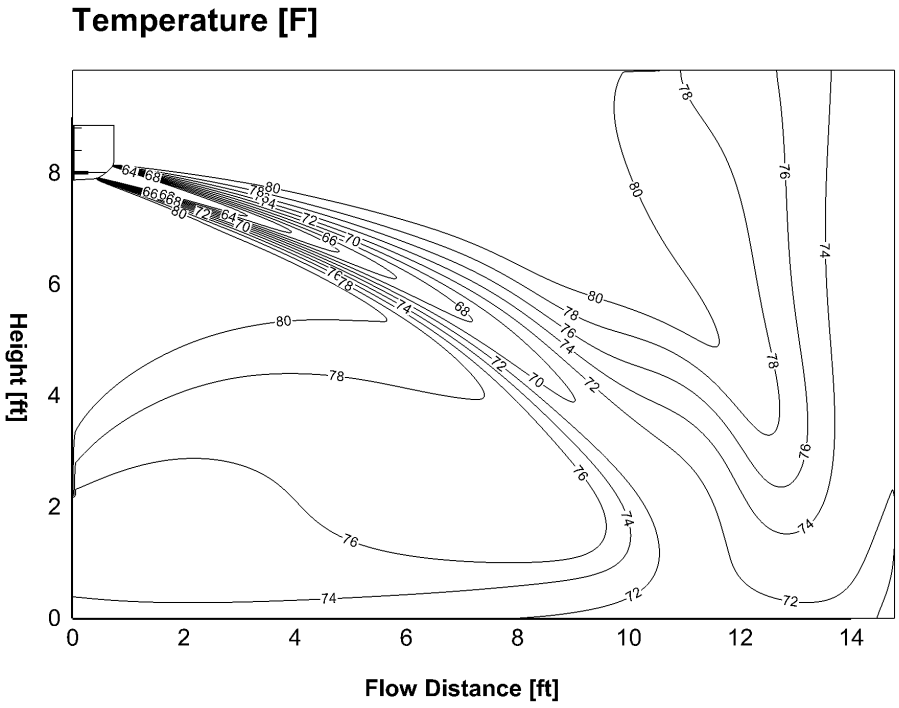
6k-Cooling(ID: 27°C/80.6°F, OD: 35°C/95°F)

Discharge Angle 60°

Airflow velocity distributions



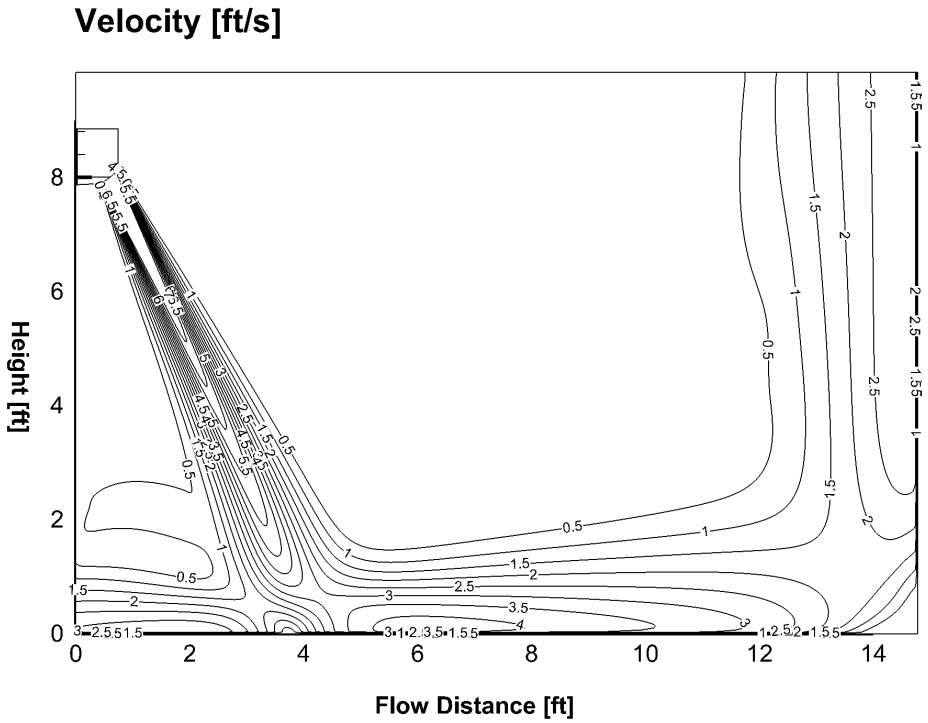

Temperature distributions



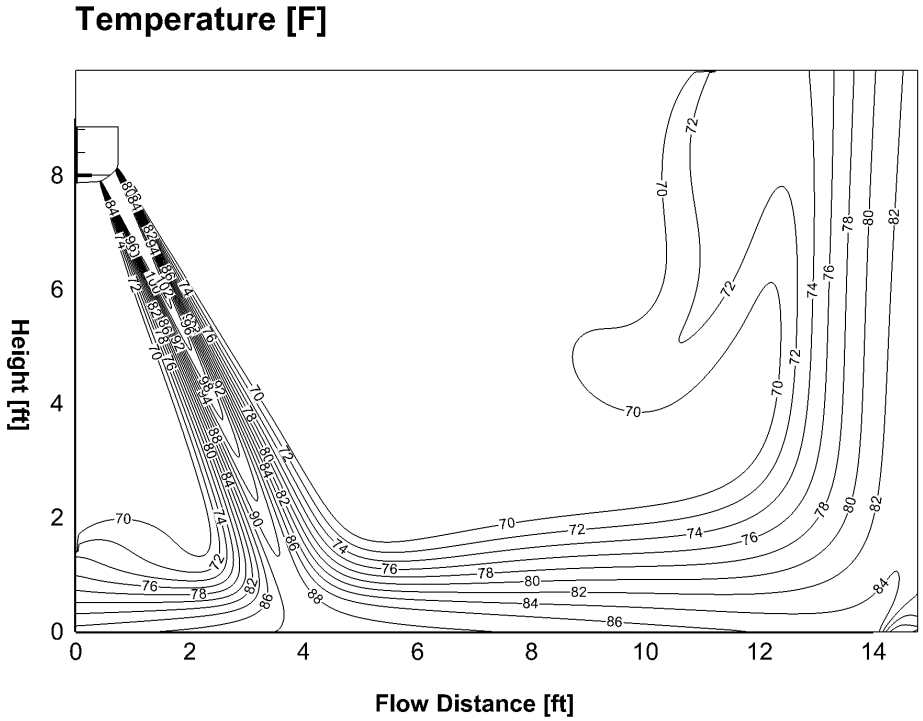
6k-Heating(ID: 20°C/68°F, OD: 7°C/44.6°F)

Discharge Angle 110°

Airflow velocity distributions



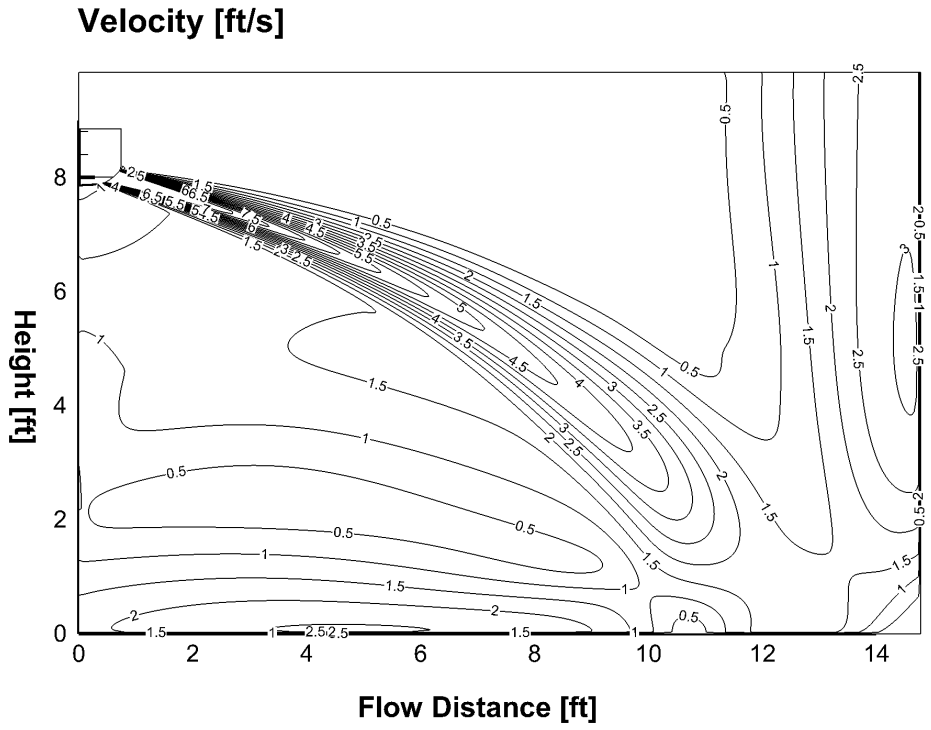

Temperature distributions



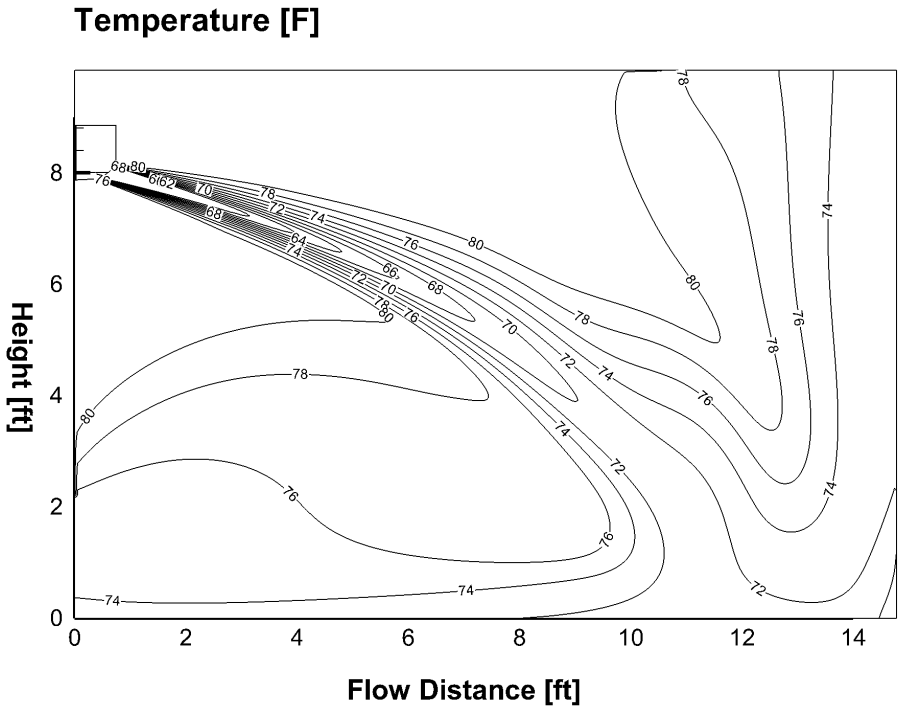
9k-Cooling(ID: 27°C/80.6°F, OD: 35°C/95°F)

Discharge Angle 60°

Airflow velocity distributions



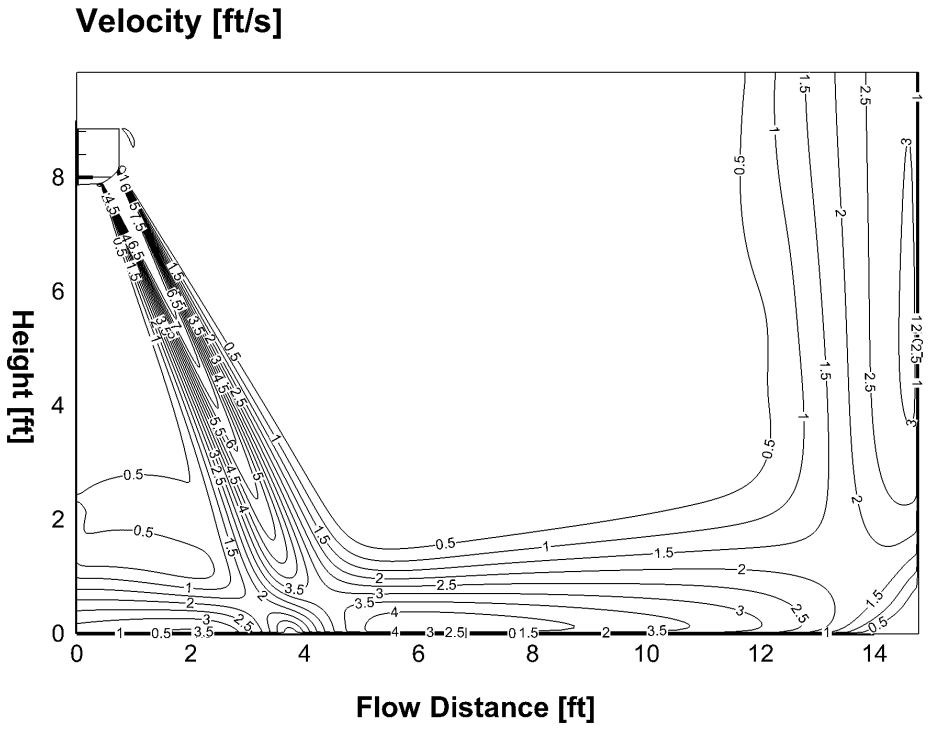

Temperature distributions



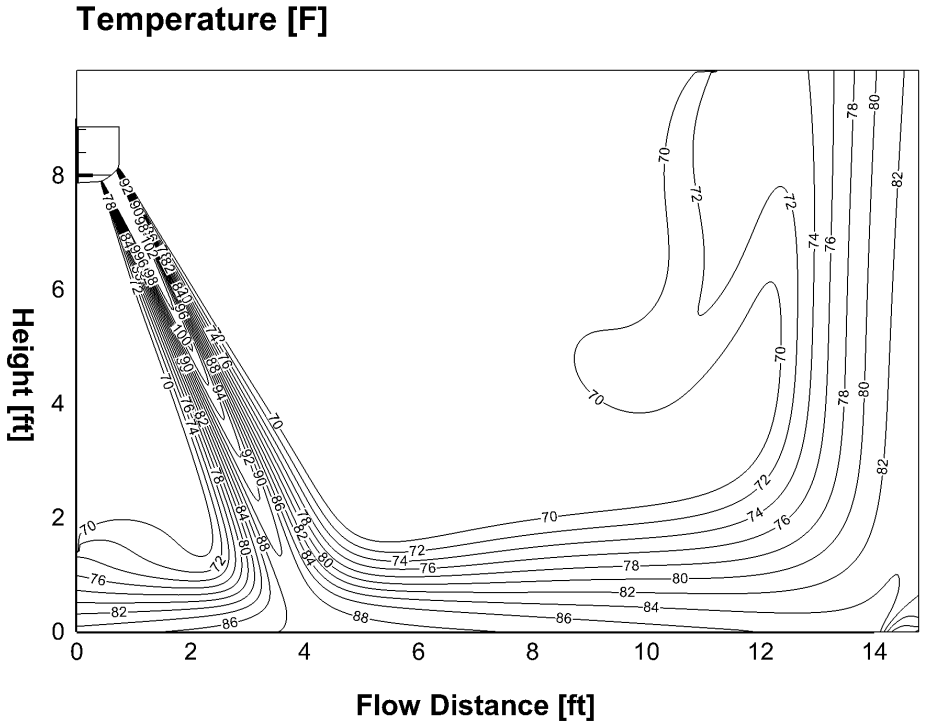
9k-Heating(ID: 20°C/68°F, OD: 7°C/44.6°F)

Discharge Angle 110°

Airflow velocity distributions



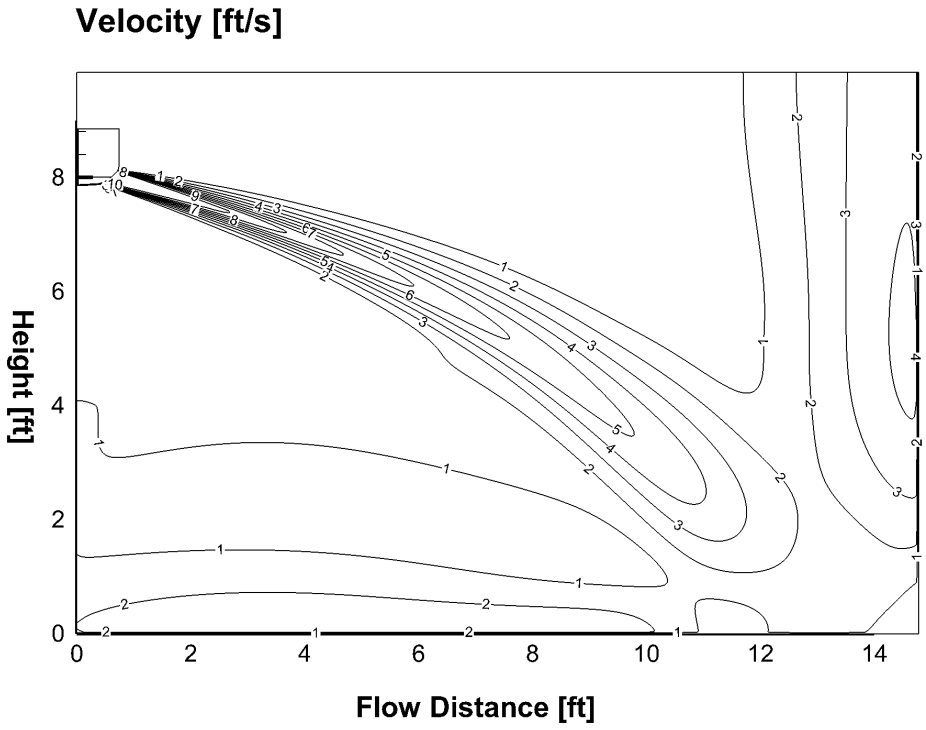

Temperature distributions



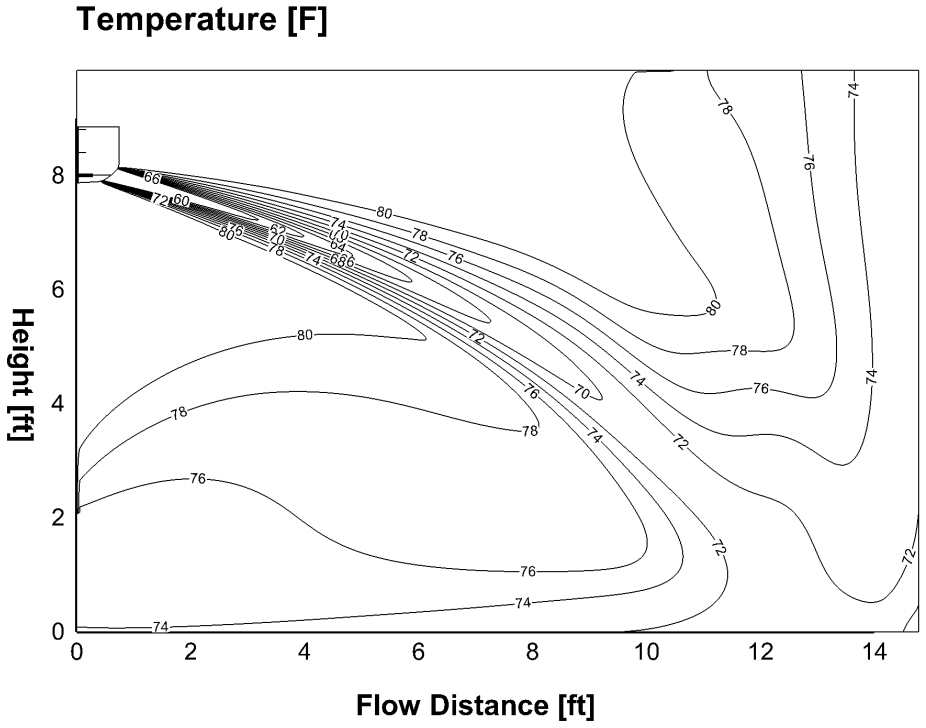
12k-Cooling(ID: 27°C/80.6°F, OD: 35°C/95°F)

Discharge Angle 60°

Airflow velocity distributions



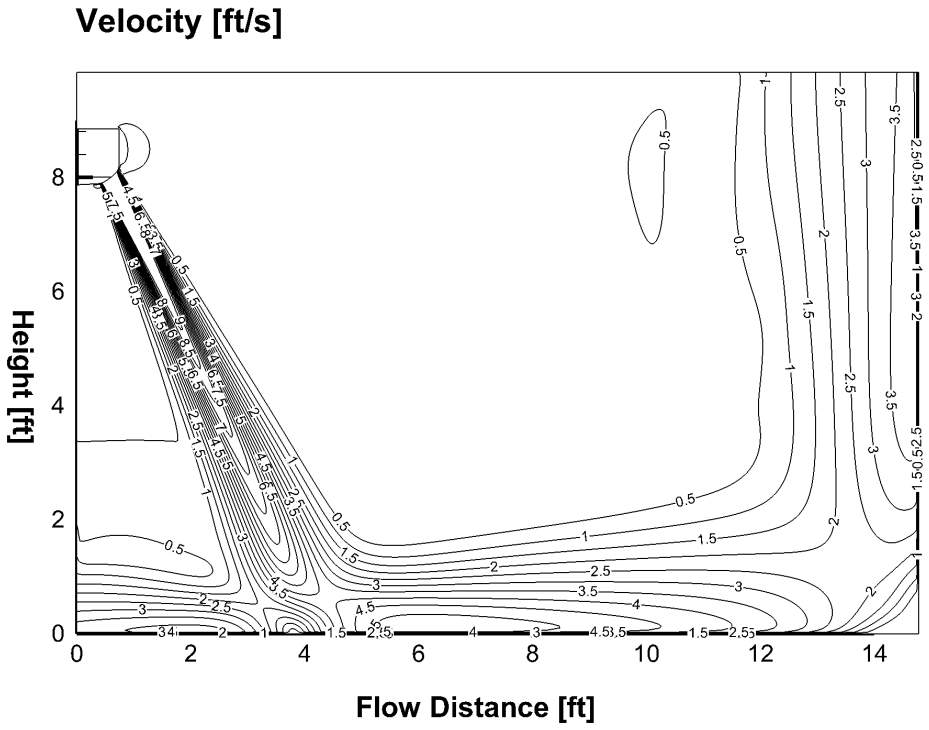

Temperature distributions



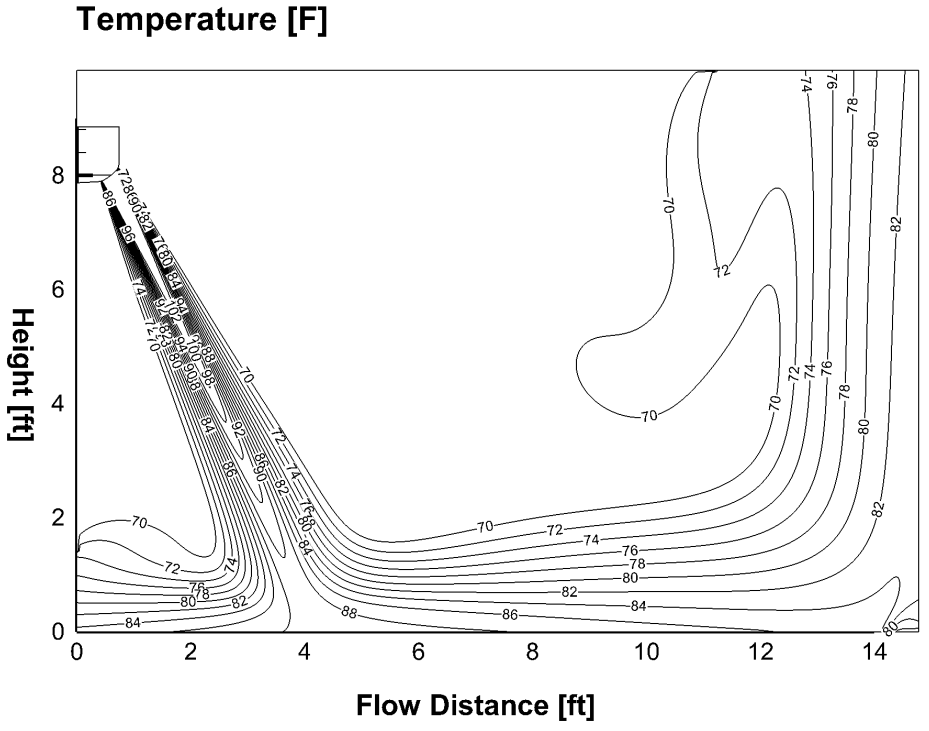
12k-Heating(ID: 20°C/68°F, OD: 7°C/44.6°F)

Discharge Angle 110°

Airflow velocity distributions



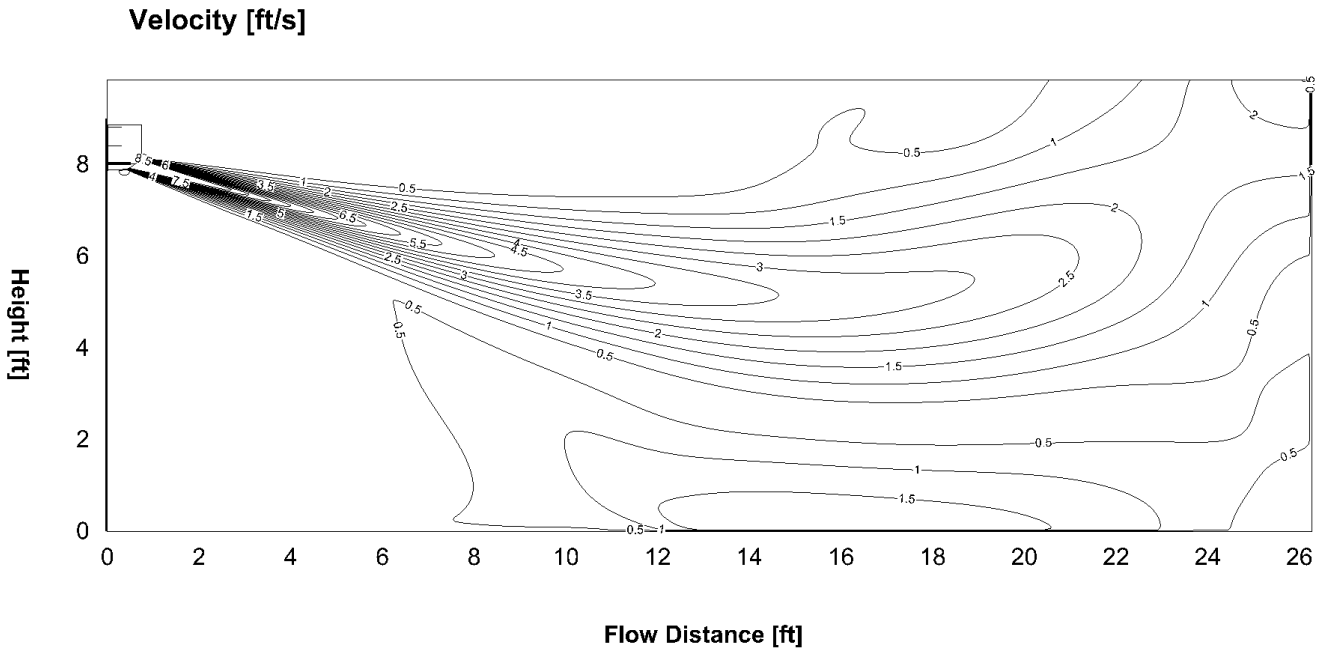

Temperature distributions



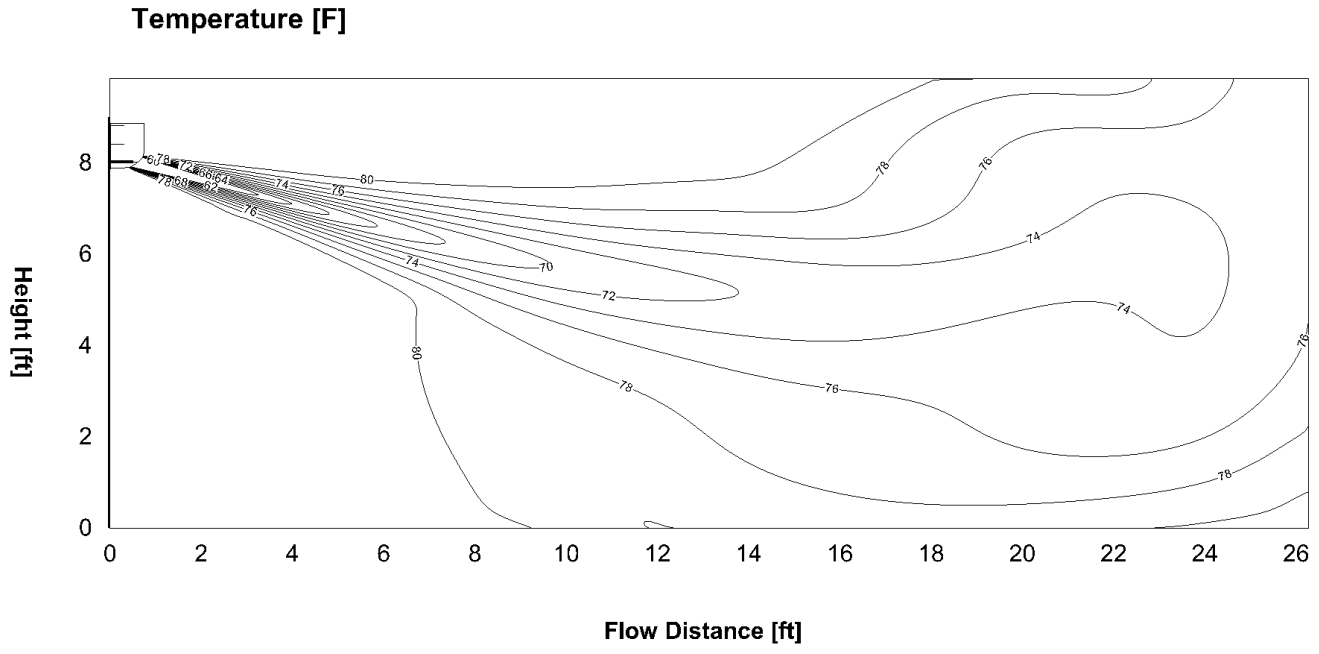
18k-Cooling(ID: 27°C/80.6°F, OD: 35°C/95°F)

Discharge Angle 60°

Airflow velocity distributions



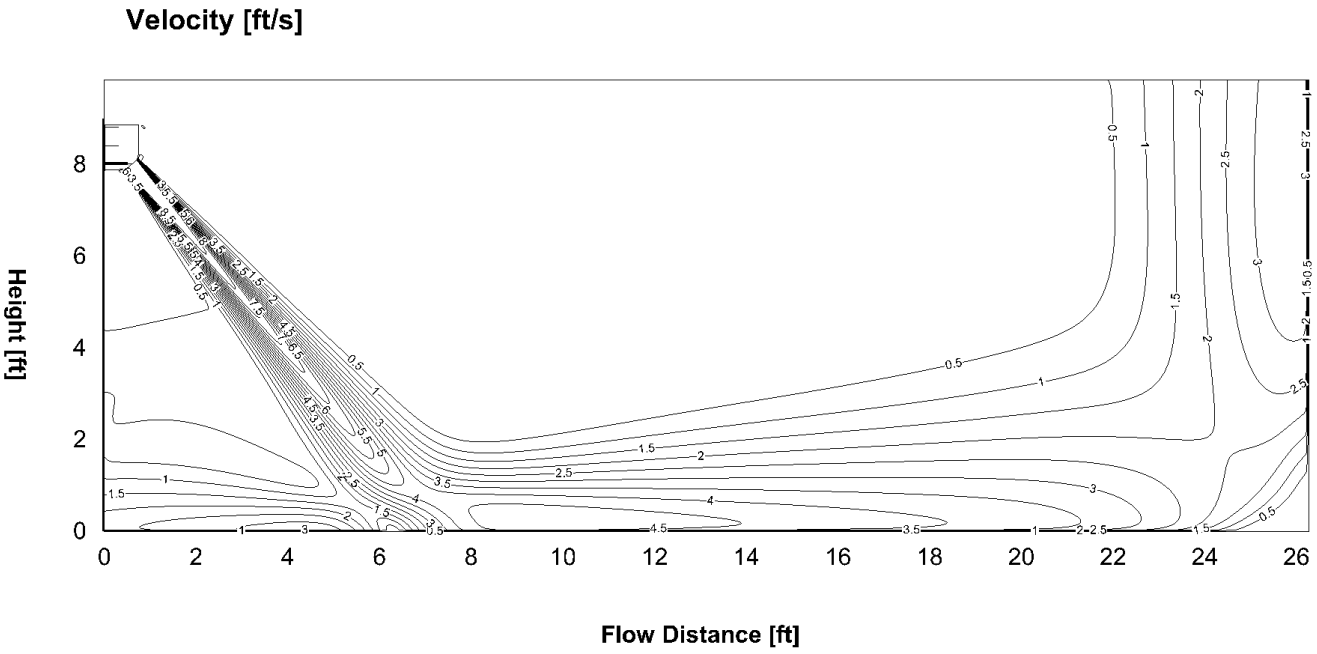

Temperature distributions



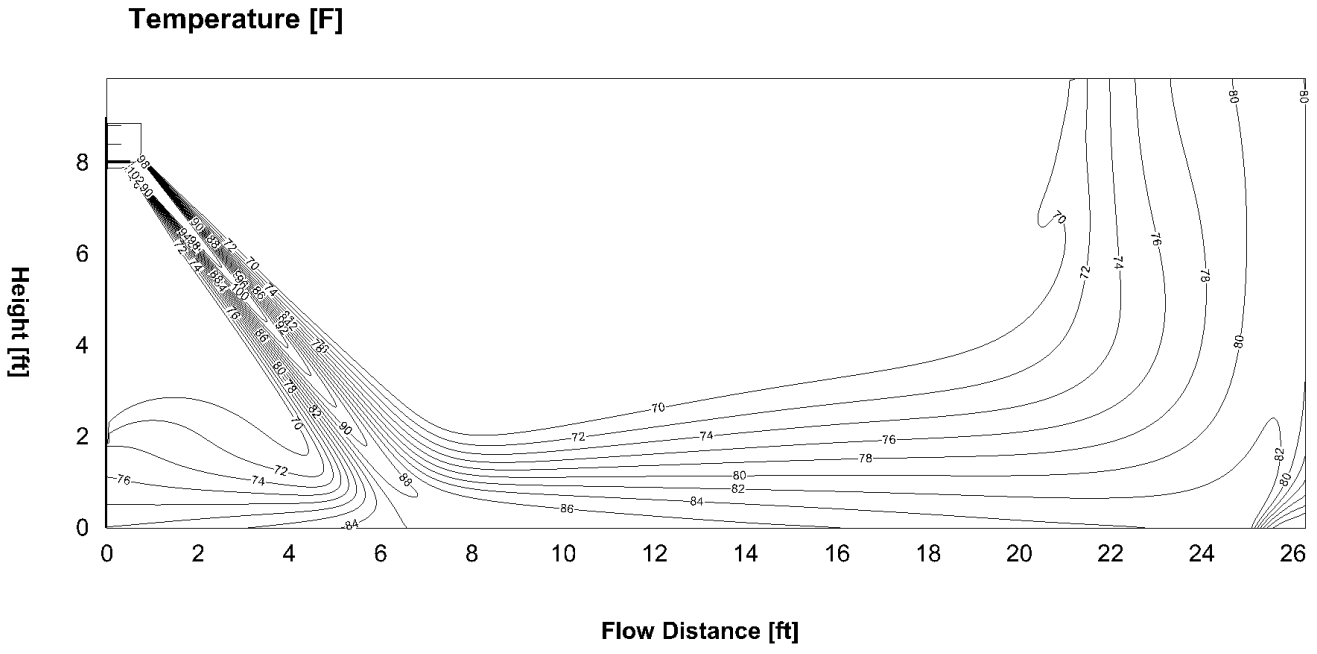
18k-Heating(ID: 20°C/68°F, OD: 7°C/44.6°F)

Discharge Angle 95°

Airflow velocity distributions



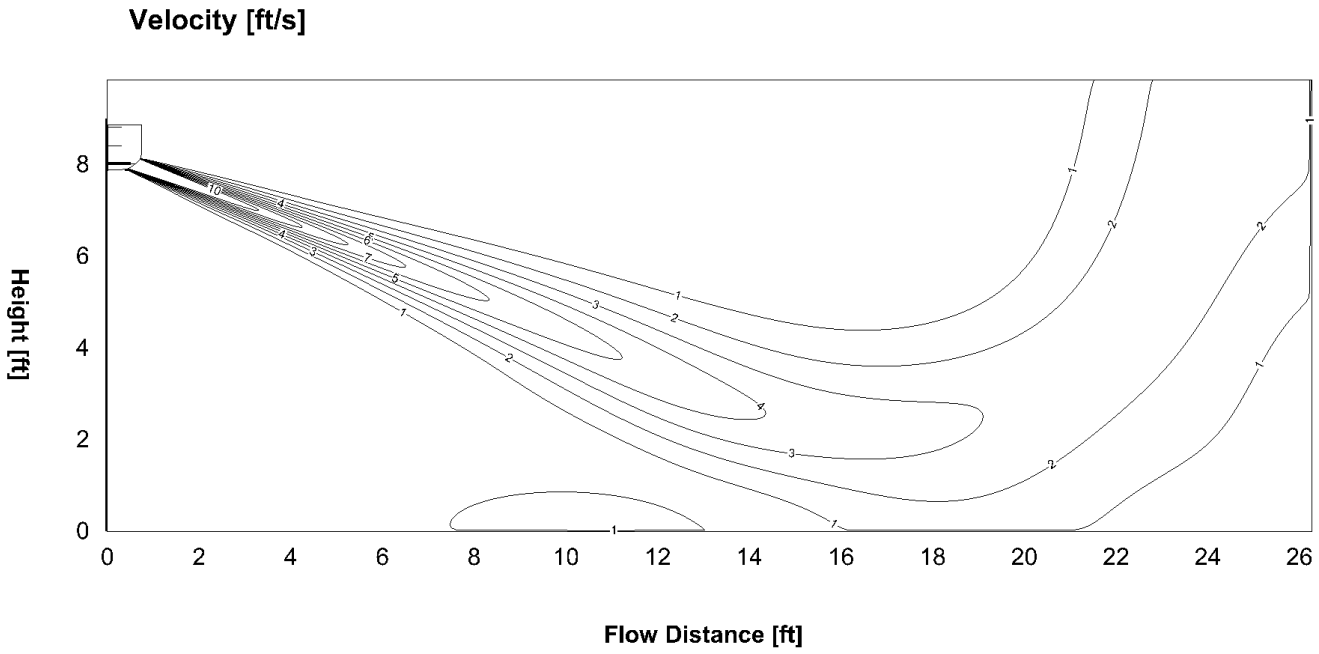

Temperature distributions



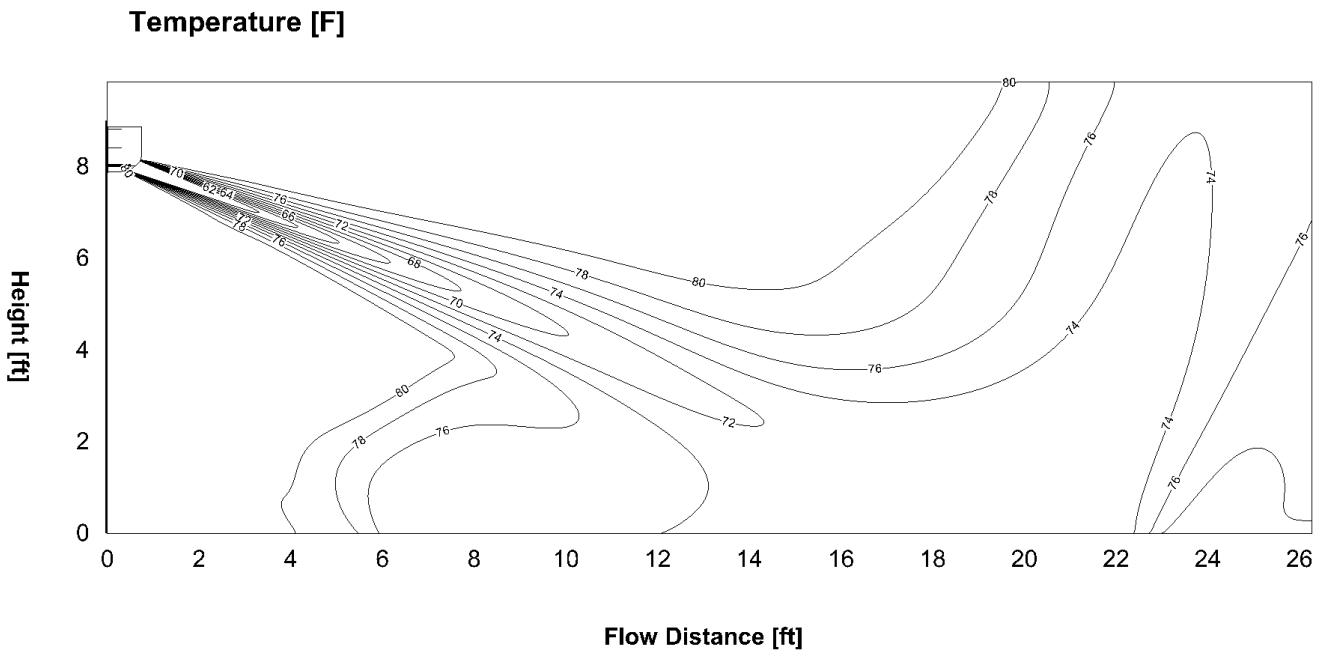
24k-Cooling(ID: 27°C/80.6°F, OD: 35°C/95°F)

Discharge Angle 65°

Airflow velocity distributions



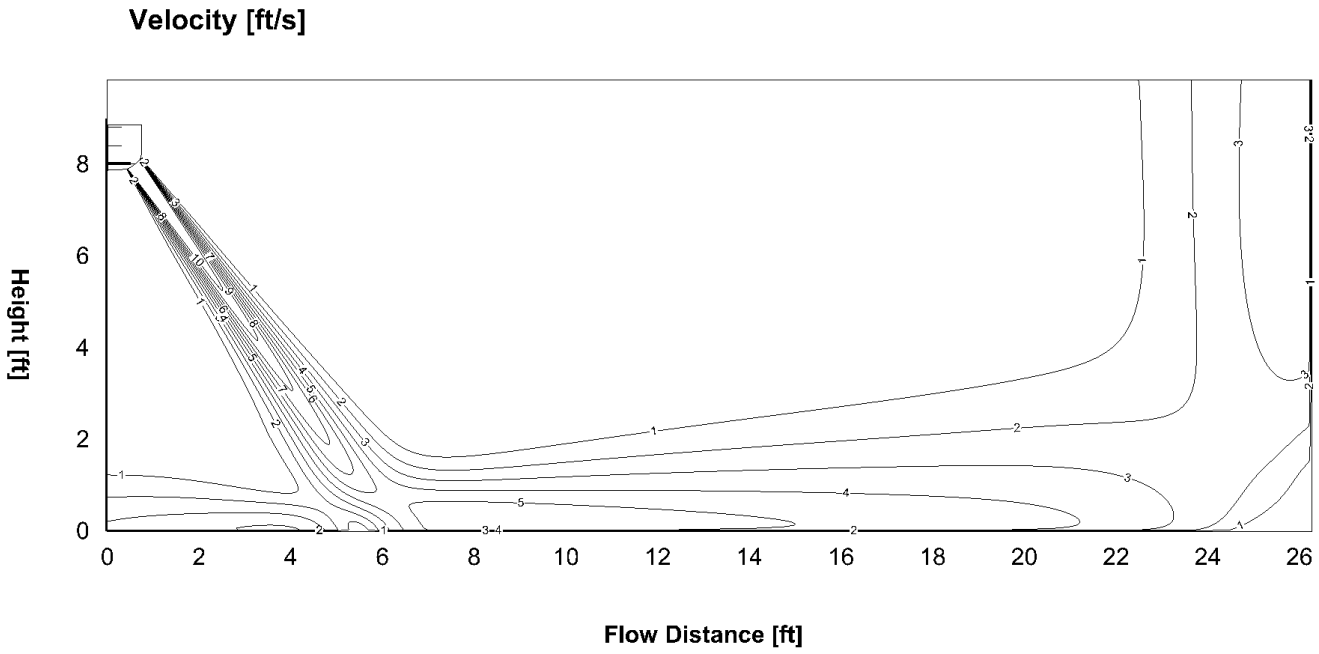

Temperature distributions



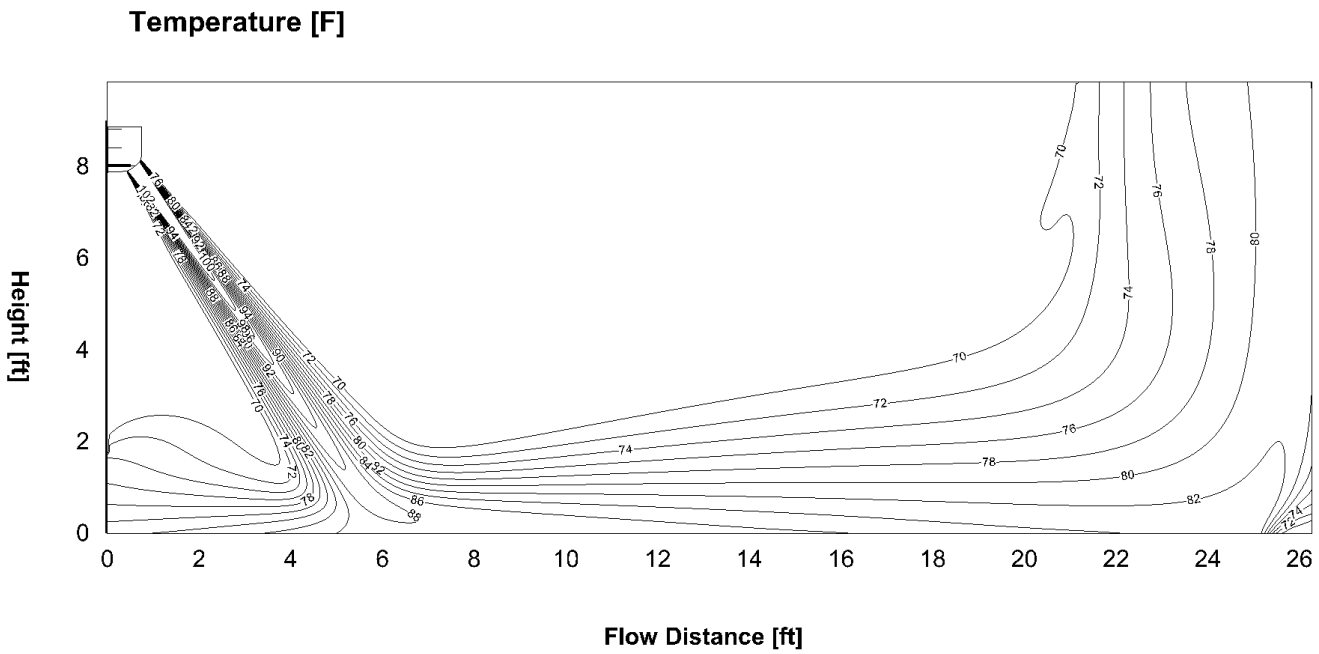
24k-Heating(ID: 20°C/68°F, OD: 7°C/44.6°F)

Discharge Angle 100°

Airflow velocity distributions



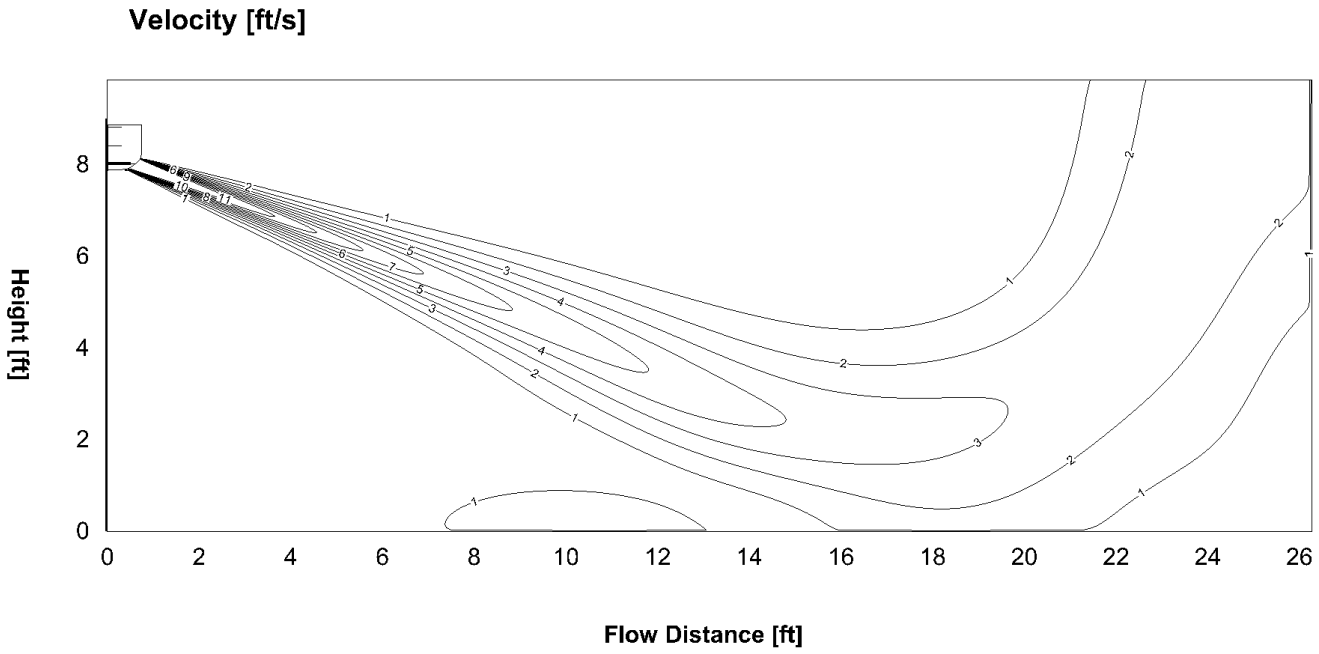

Temperature distributions



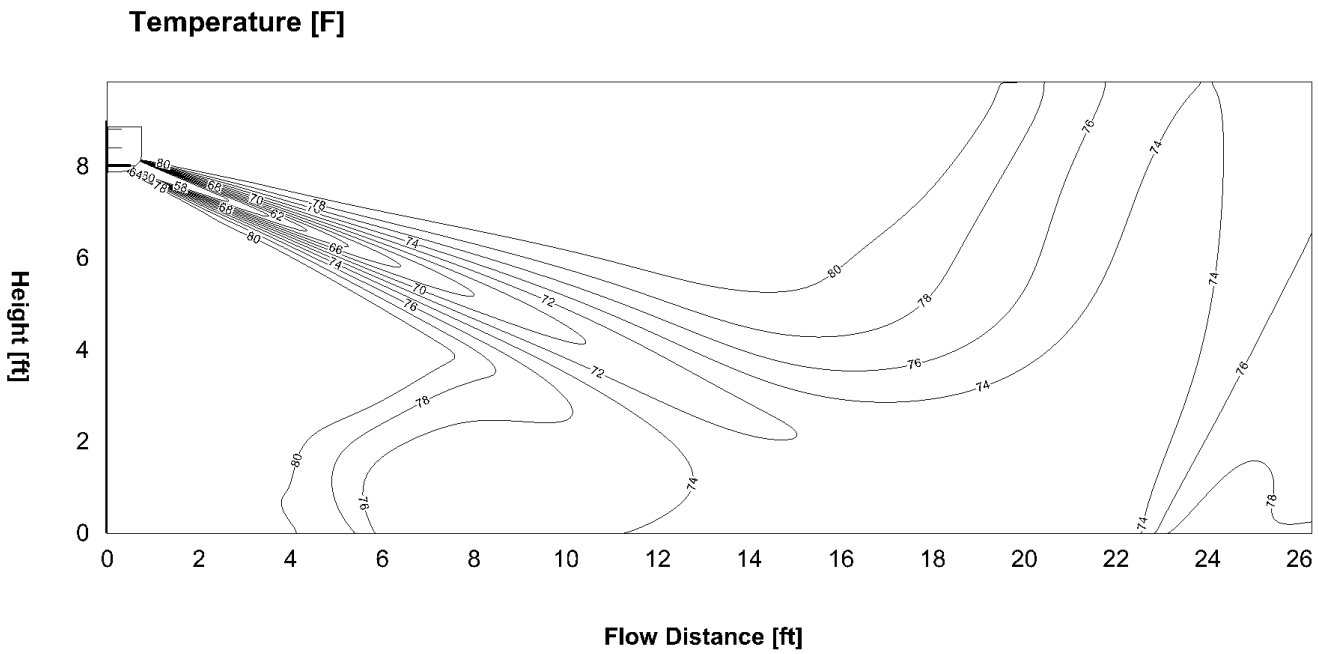
30k-Cooling(ID: 27°C/80.6°F, OD: 35°C/95°F)

Discharge Angle 65°

Airflow velocity distributions



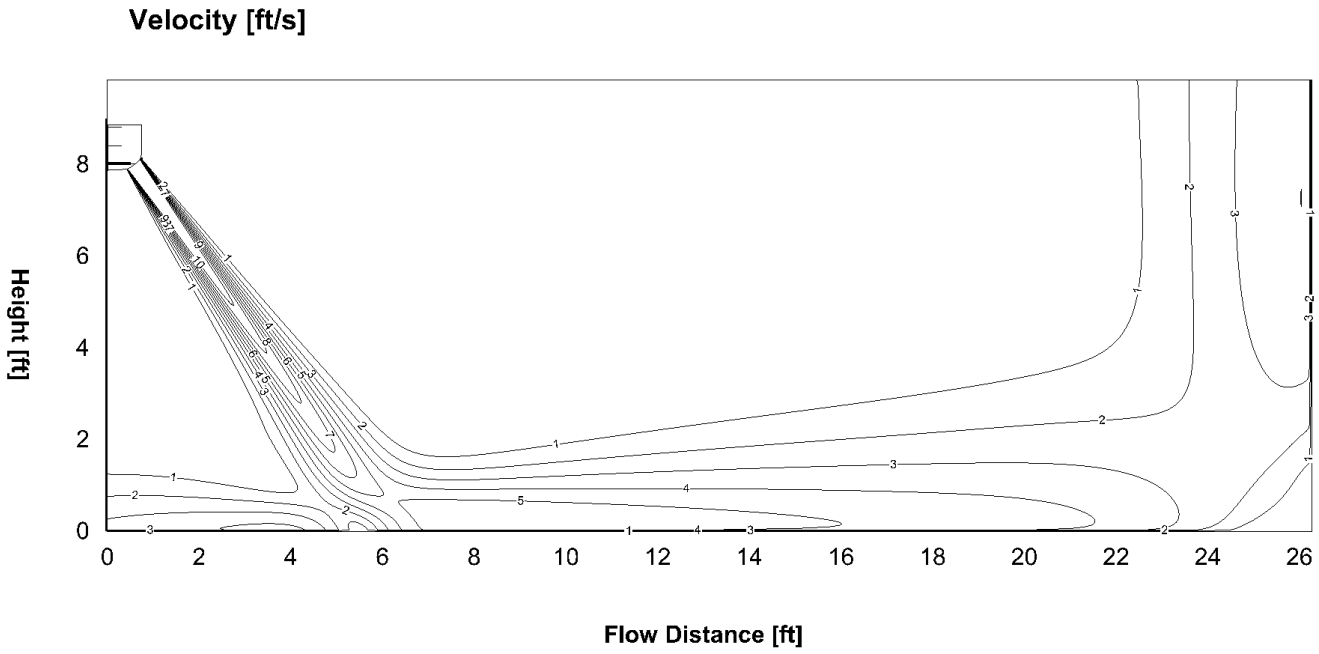

Temperature distributions



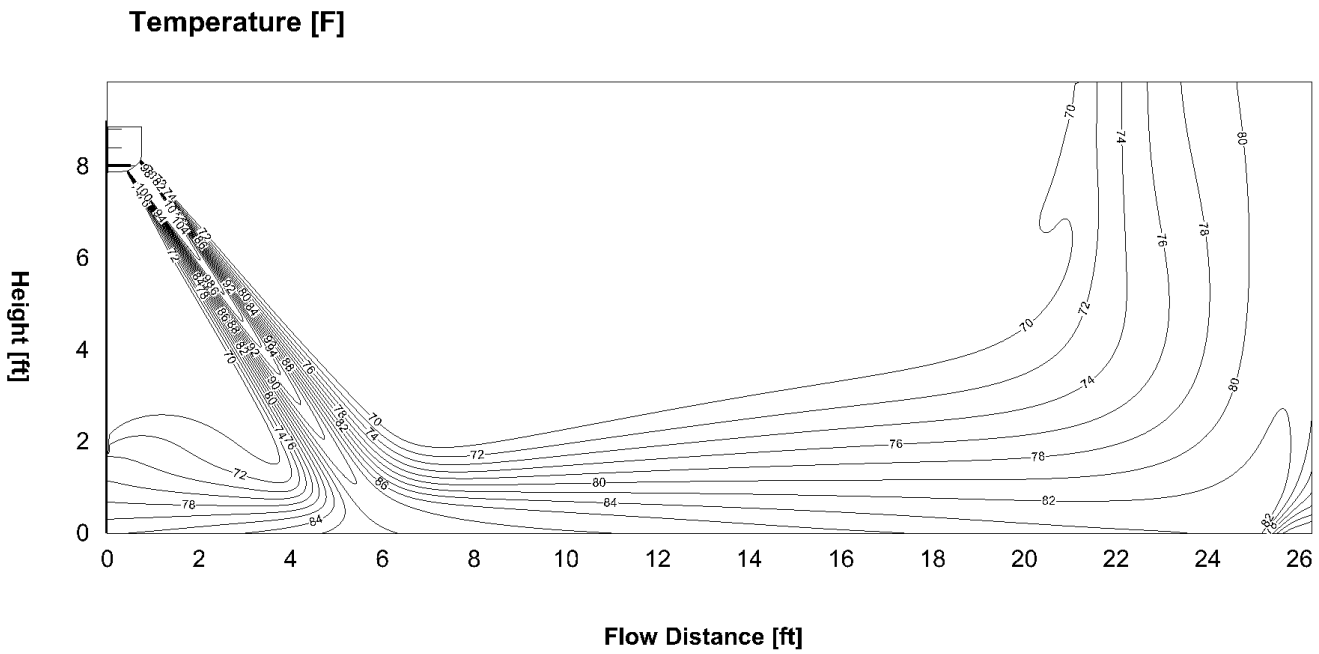
30k-Heating(ID: 20°C/68°F, OD: 7°C/44.6°F)

Discharge Angle 100°

Airflow velocity distributions



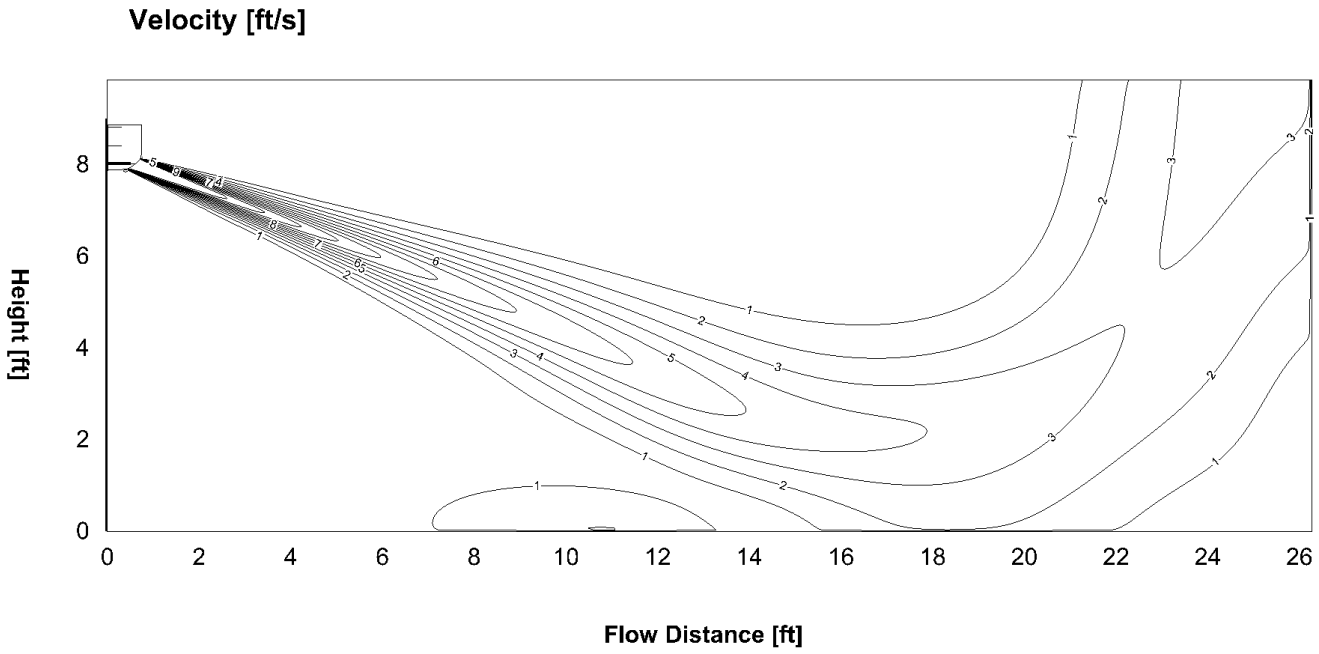

Temperature distributions



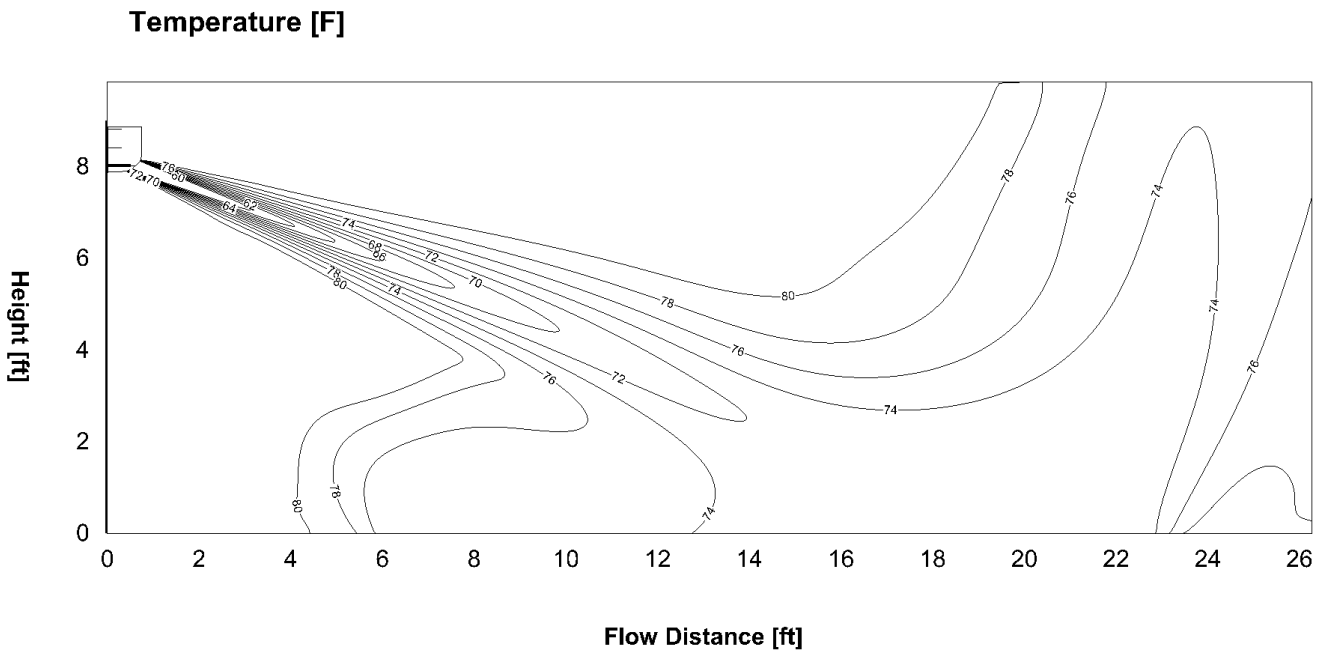
33k-Cooling(ID: 27°C/80.6°F, OD: 35°C/95°F)

Discharge Angle 65°

Airflow velocity distributions



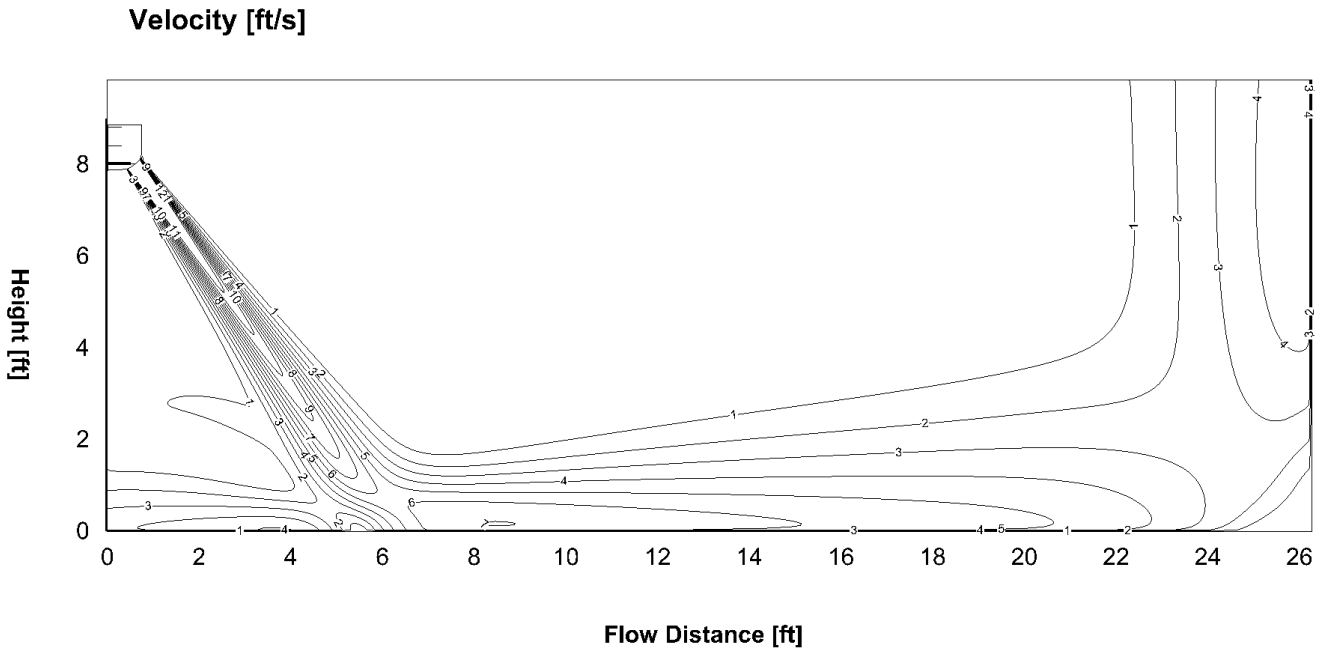

Temperature distributions



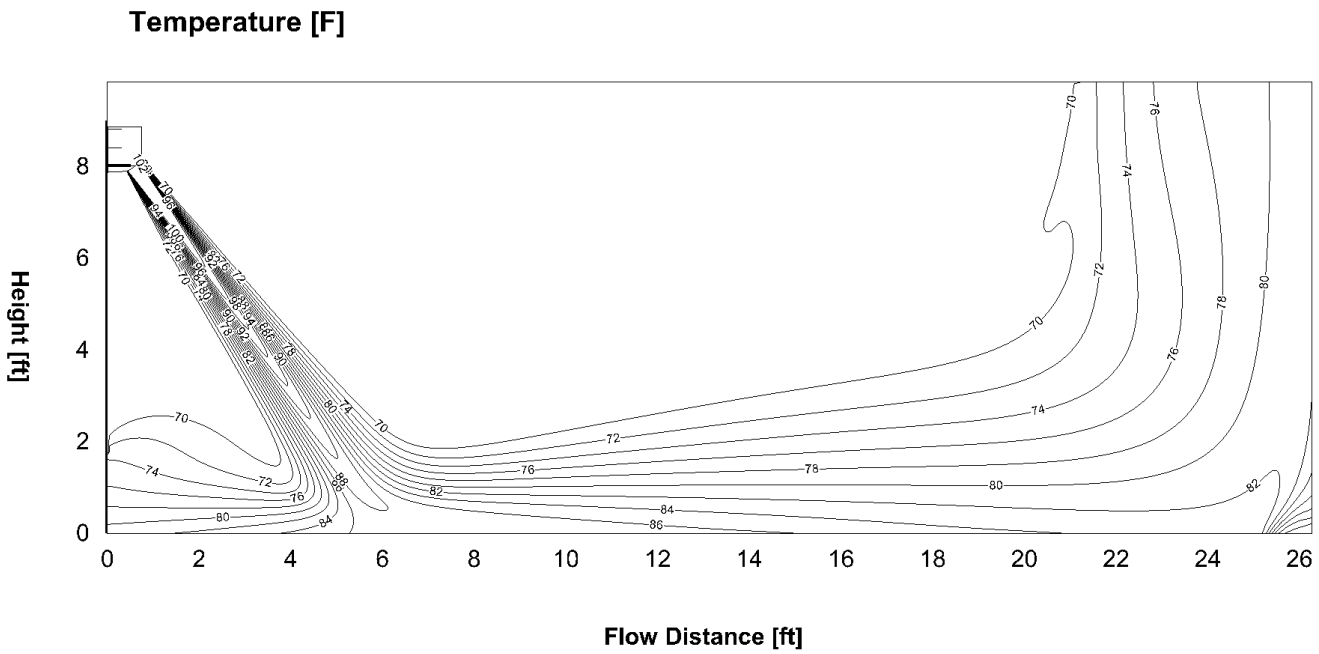
33k-Heating(ID: 20°C/68°F, OD: 7°C/44.6°F)

Discharge Angle 100°

Airflow velocity distributions



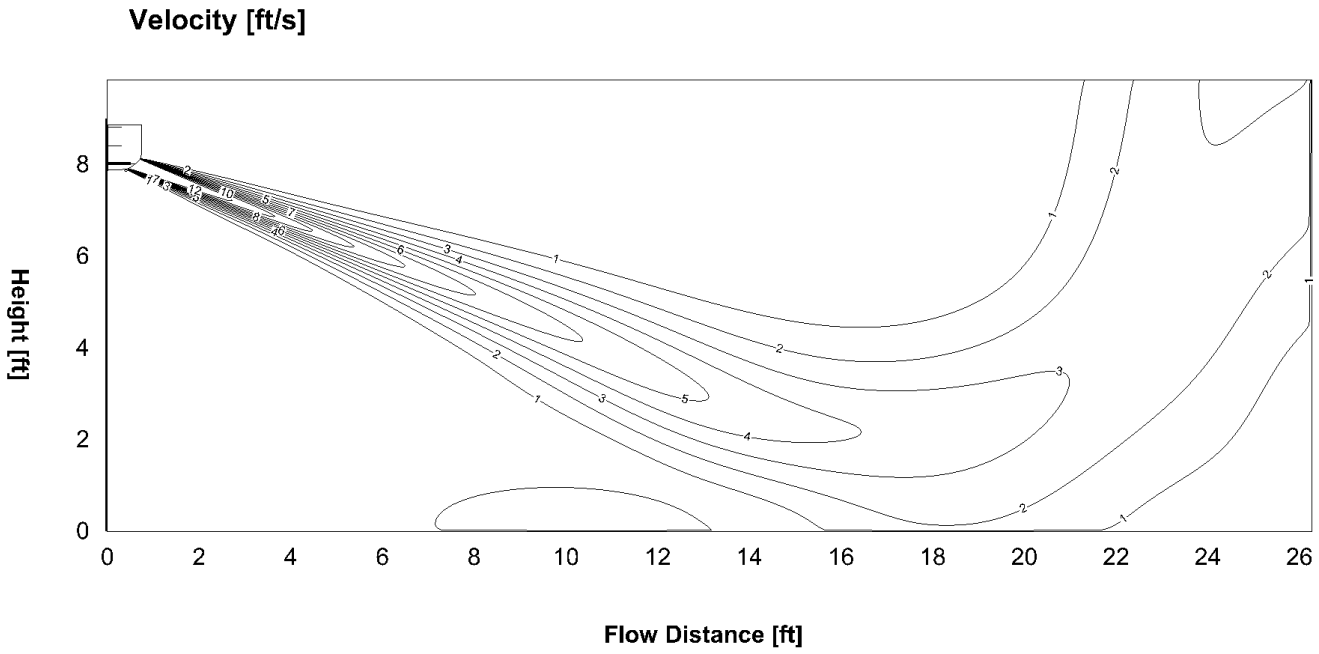

Temperature distributions



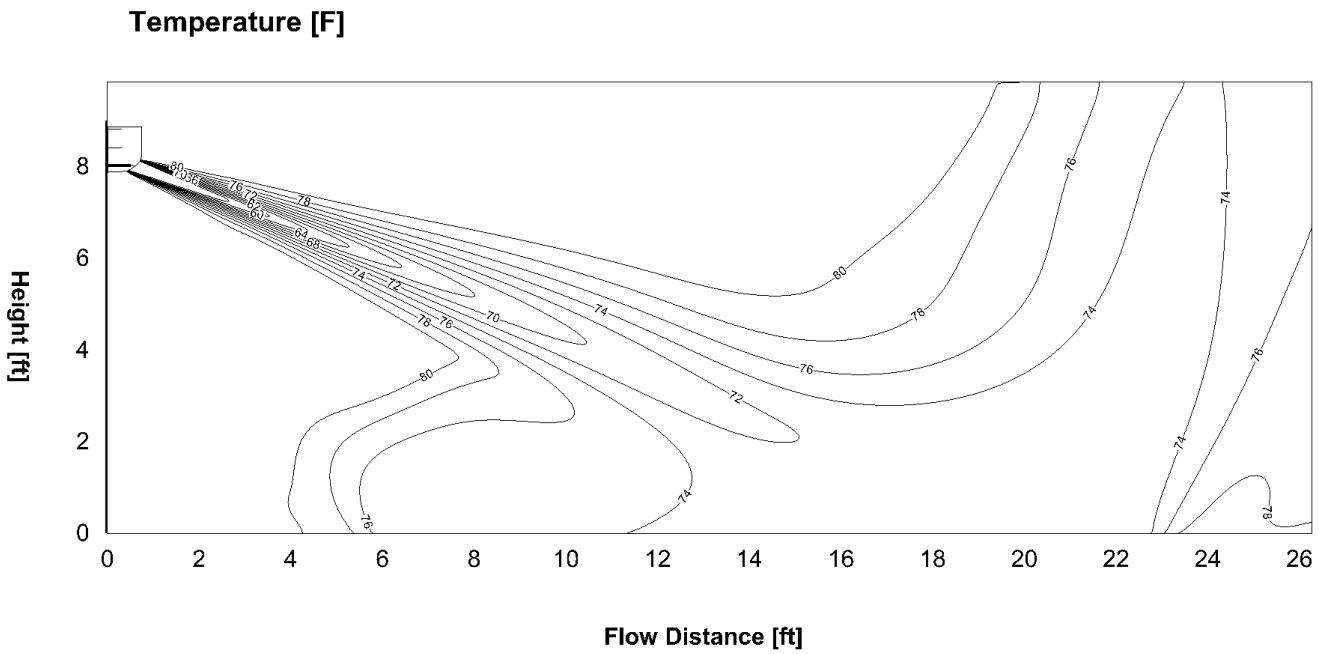
36k-Cooling(ID: 27°C/80.6°F, OD: 35°C/95°F)

Discharge Angle 65°

Airflow velocity distributions



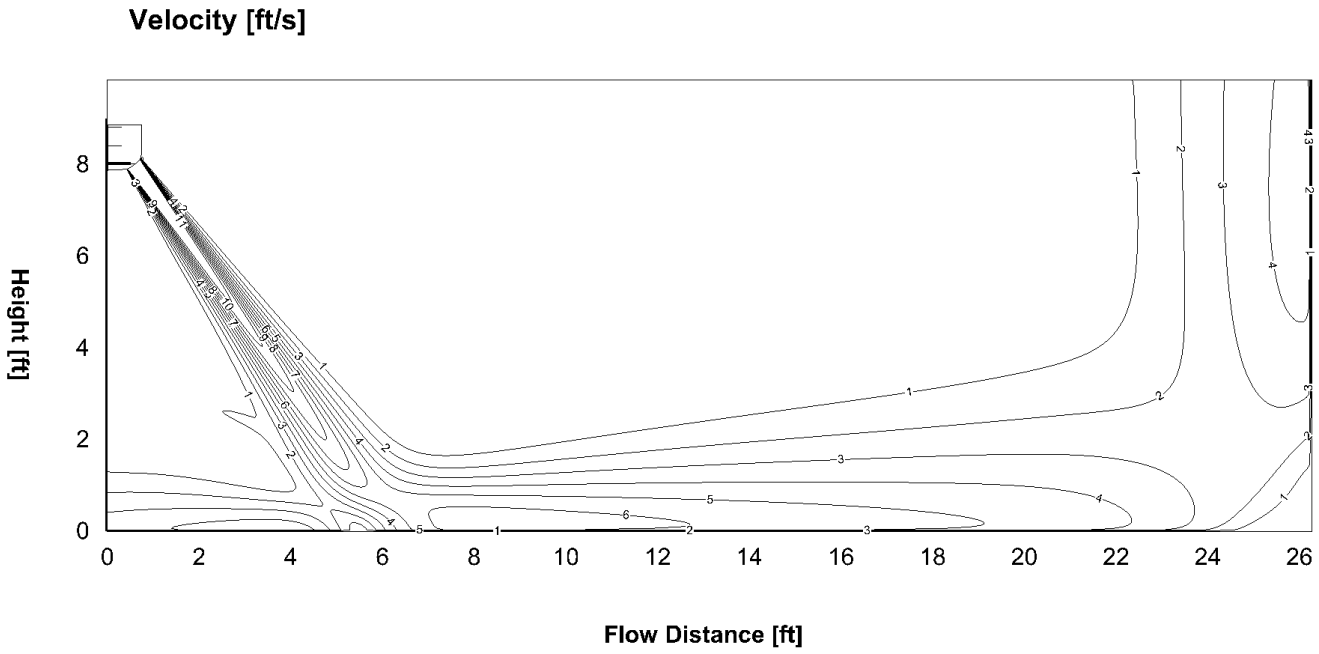

Temperature distributions



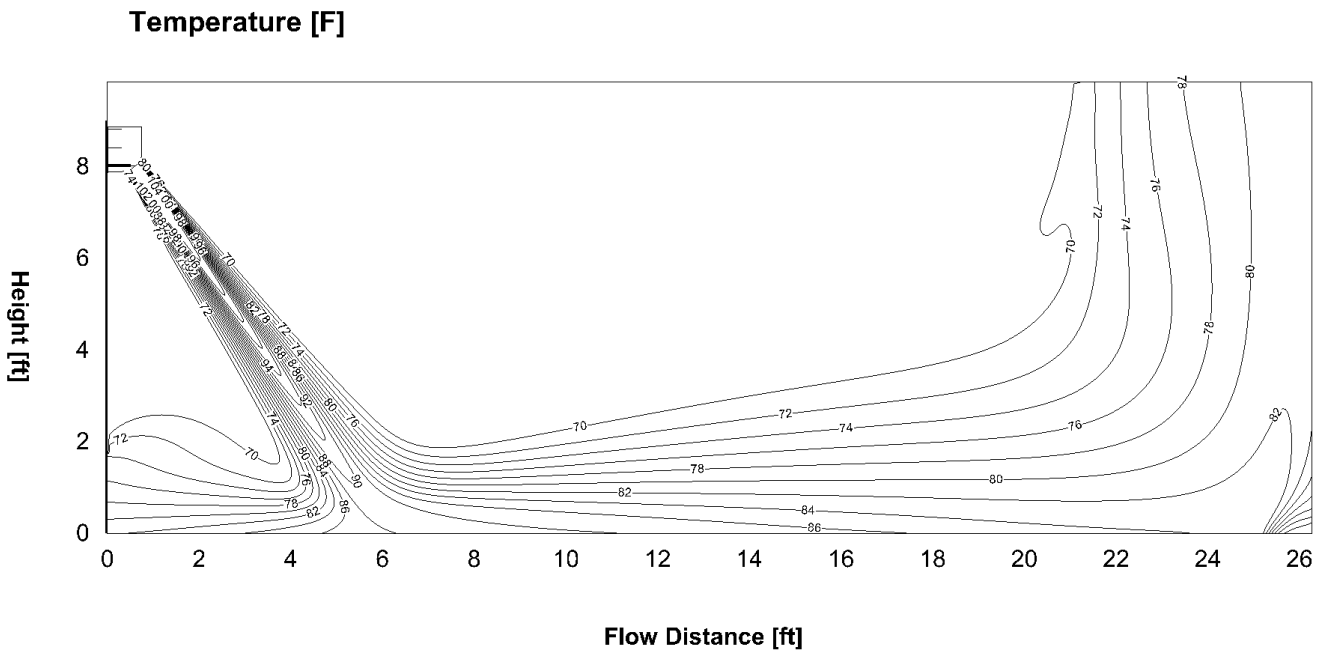
36k-Heating(ID: 20°C/68°F, OD: 7°C/44.6°F)

Discharge Angle 100°

Airflow velocity distributions



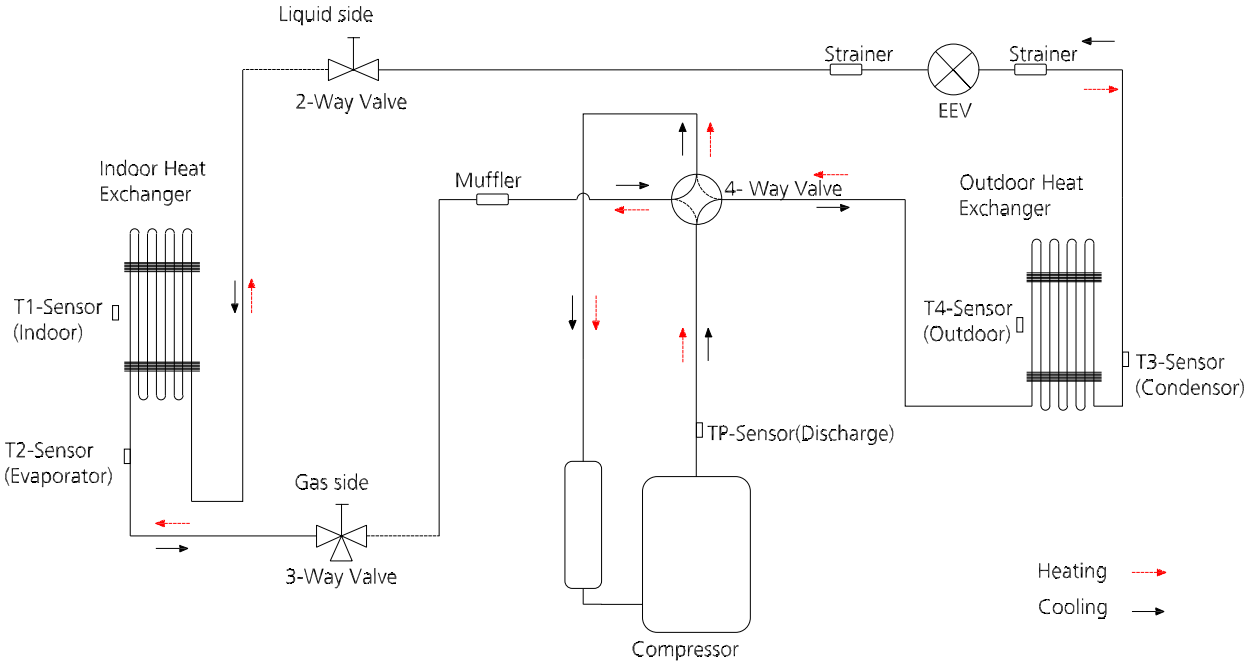

Temperature distributions



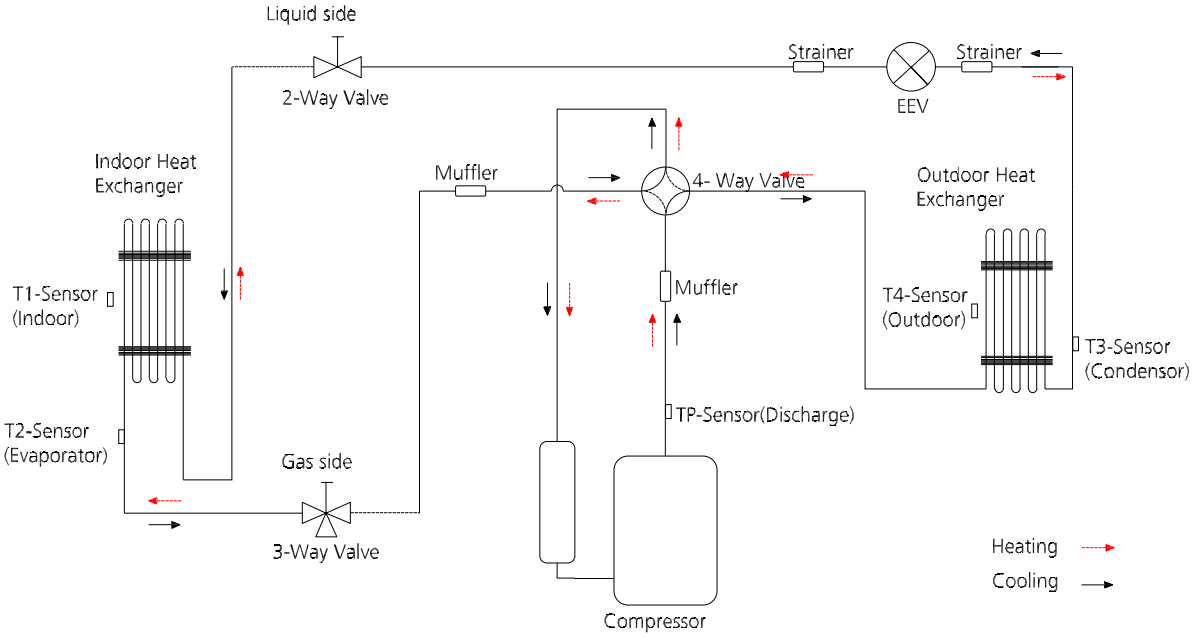
## 4. Refrigerant Cycle Diagrams

MOX230-09HFN10-B1, MOX230-12HFN10-B1, MOX230-06HFN10-M1X, MOX330-09HFN10-M1X,

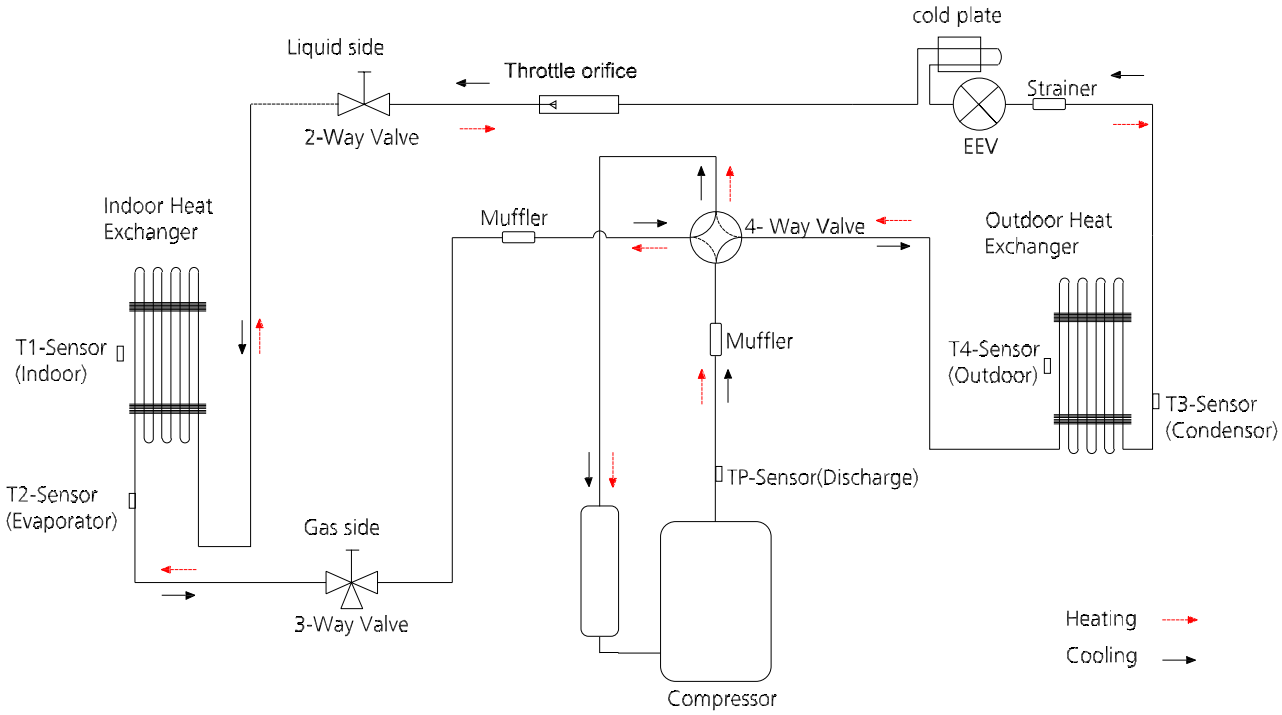
MOX230-09HFN10-M1, MOX230-12HFN10-M1,MOX330-12HFN10-M1X



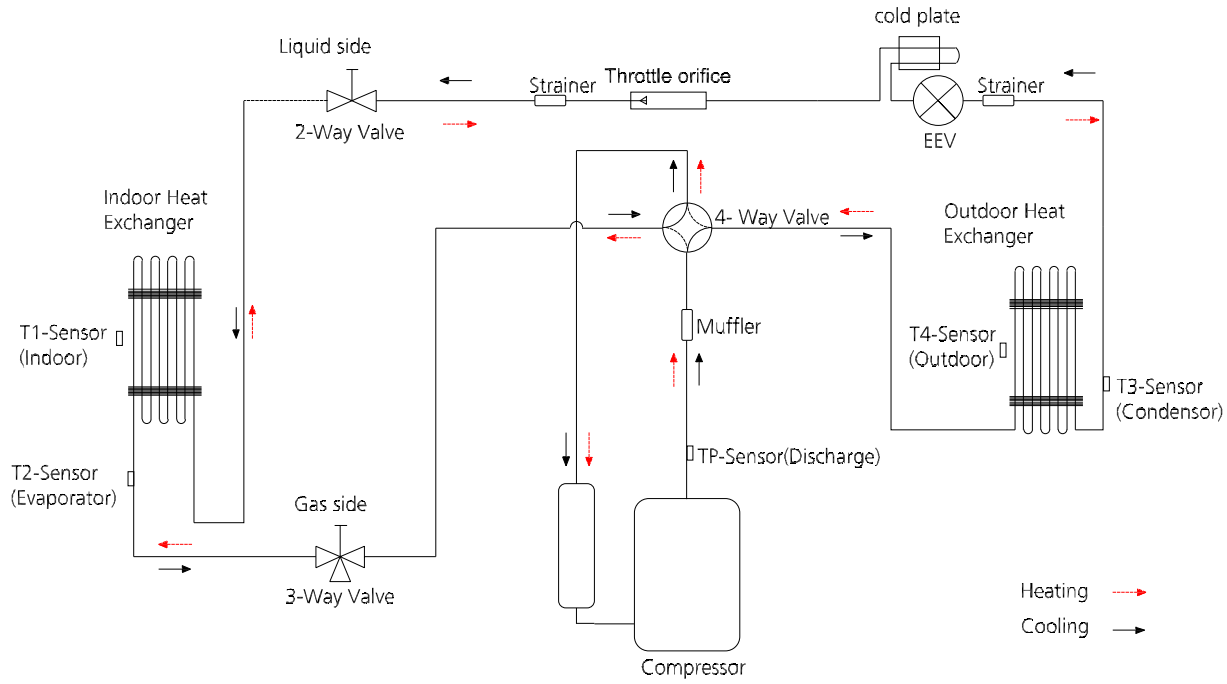

MOX430-06HFN1-M1H, MOX430-09HFN1-M1H, MOX430-12HFN10-M1H



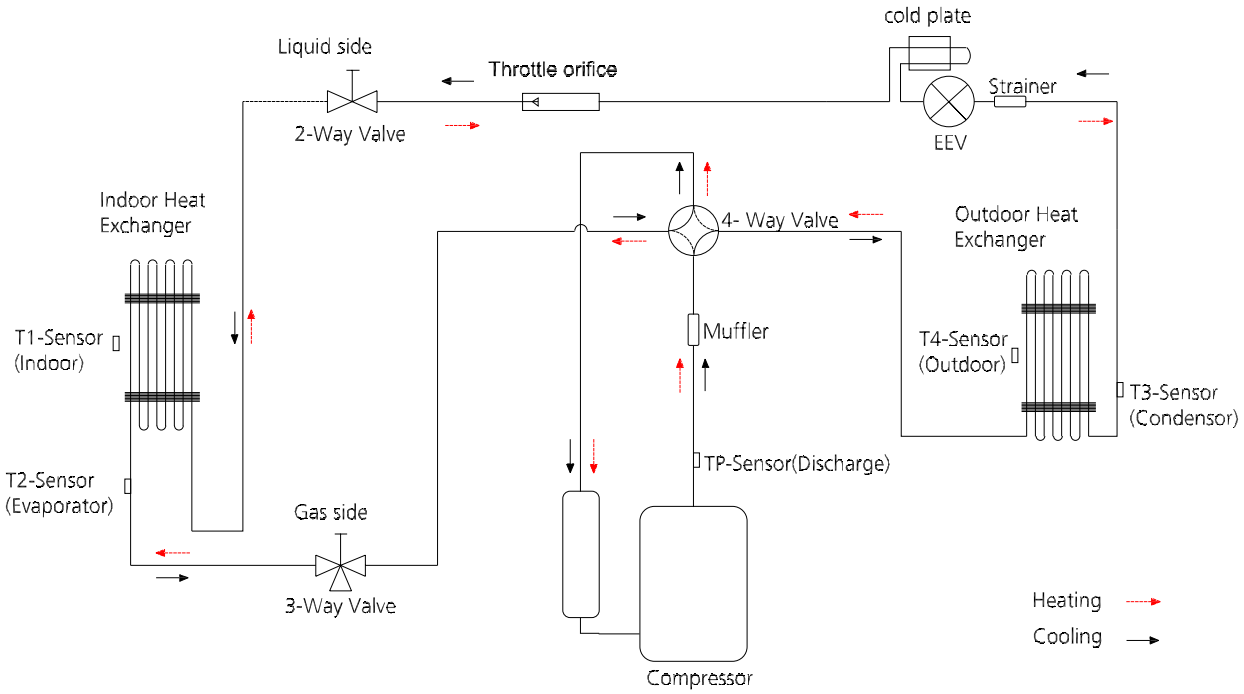
MOX430-18HFN10-M1X, MOX430-18HFN10-M1



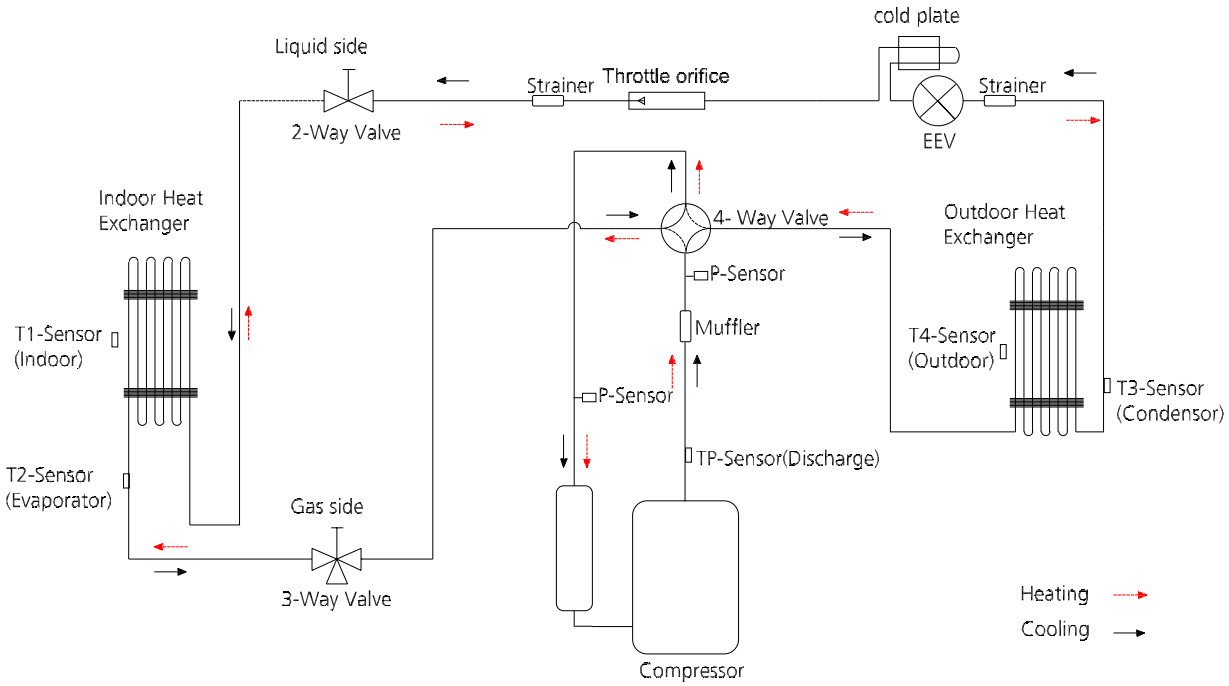

MOD30-18HFN10-M1H, MOD30-24HFN10-M1X, MOD30-30HFN10-M1E



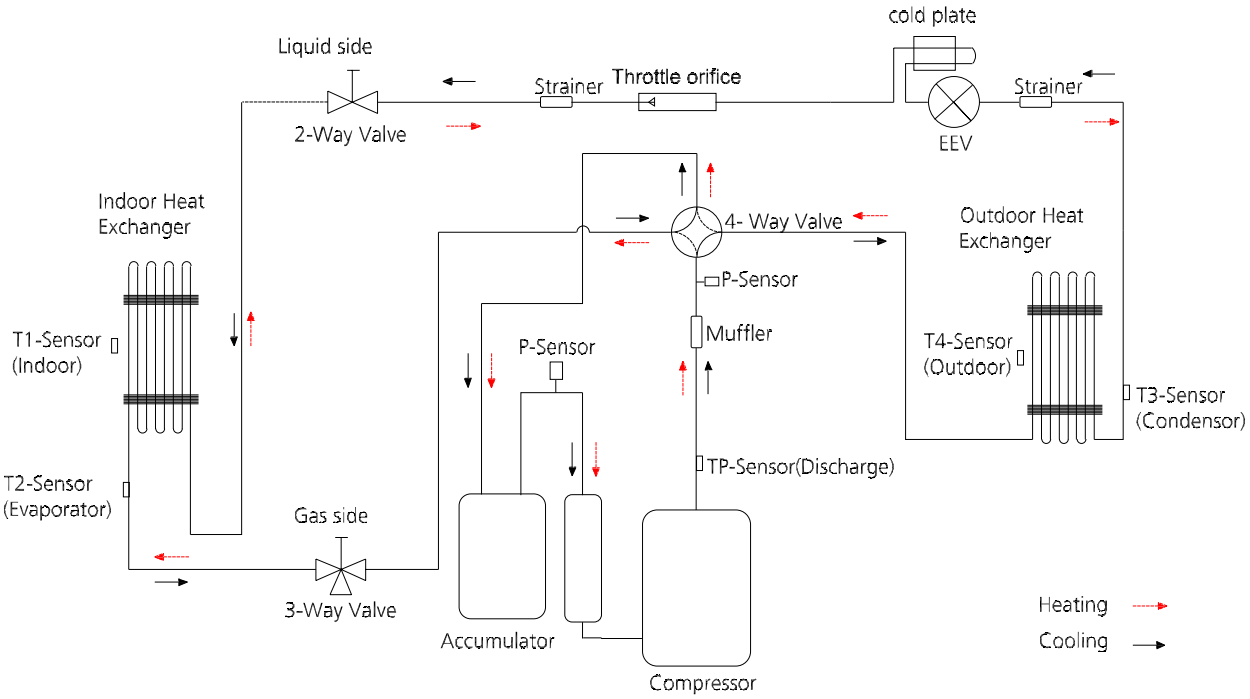
MOD30-24HFN10-M1




MOD30-33HFN10-M1X



MOD30-36HFN10-M1E



## 5. Electrical Wiring Diagrams

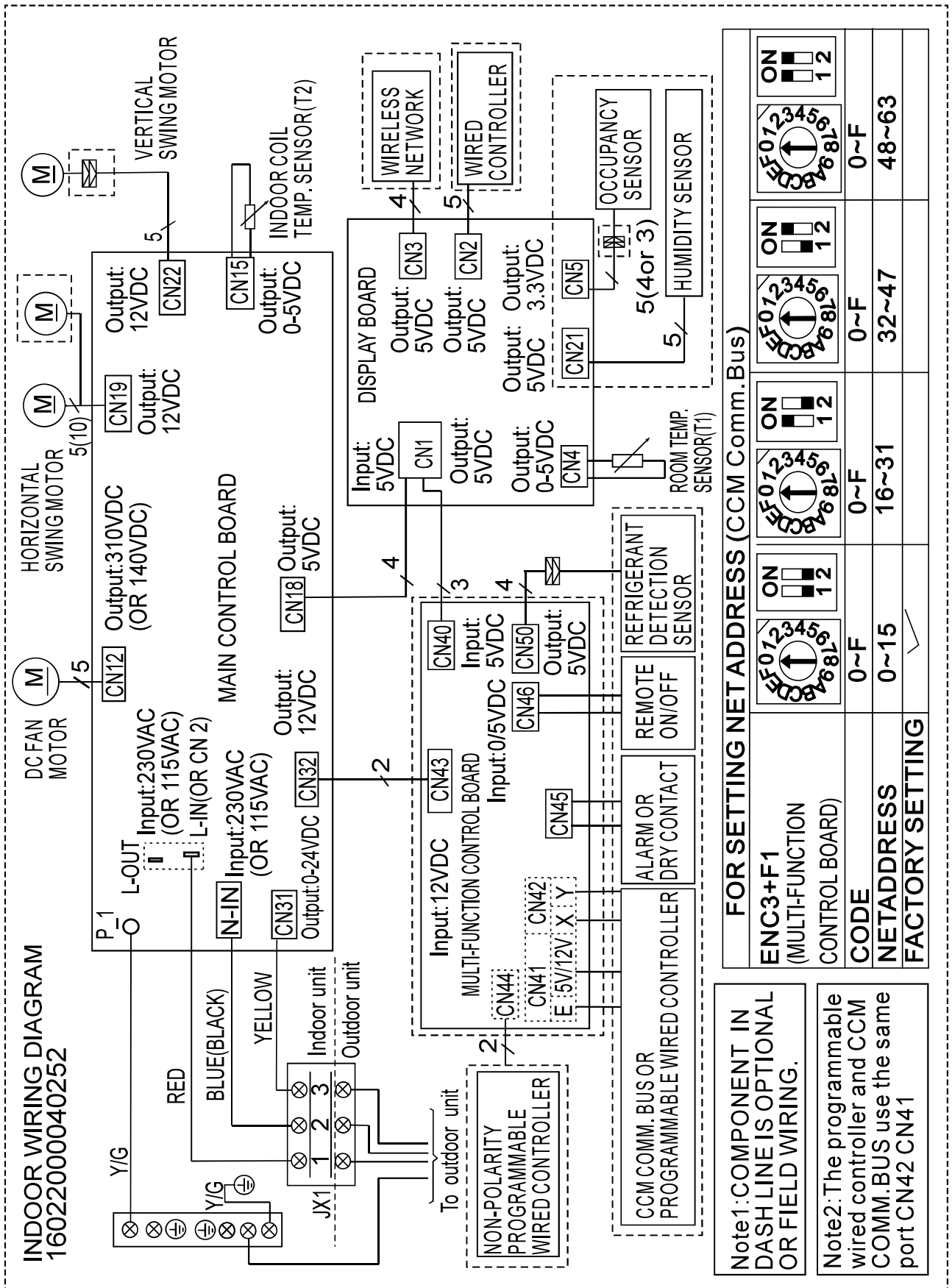
Indoor unit wiring diagram

| Indoor Unit | |
|---|---|
| **IDU Model** | **IDU Wiring Diagram** |
| MSEPB-09HRFN10-B1 | 16022000040252 |
| MSEPB-12HRFN10-B1 | |
| MSEPB-06HRFN10-M1 | |
| MSEPB-09HRFN10-M1 | |
| MSEPBM-12HRFN10-M1 | |
| MSEPC-06HRFN1-M1H | |
| MSEPC-09HRFN1-M1H | |
| MSEPC-12HRFN10-M1H | |
| MSEPD-18HRFN10-M1H | |
| MSEPC-18HRFN10-M1 | |
| MSEPD-24HRFN10-M1 | |
| MSEPD-30HRFN10-M1 | |
| MSEPDM-36HRFN10-M1E | |
| MSEPD-33HRFN10-M1 | |

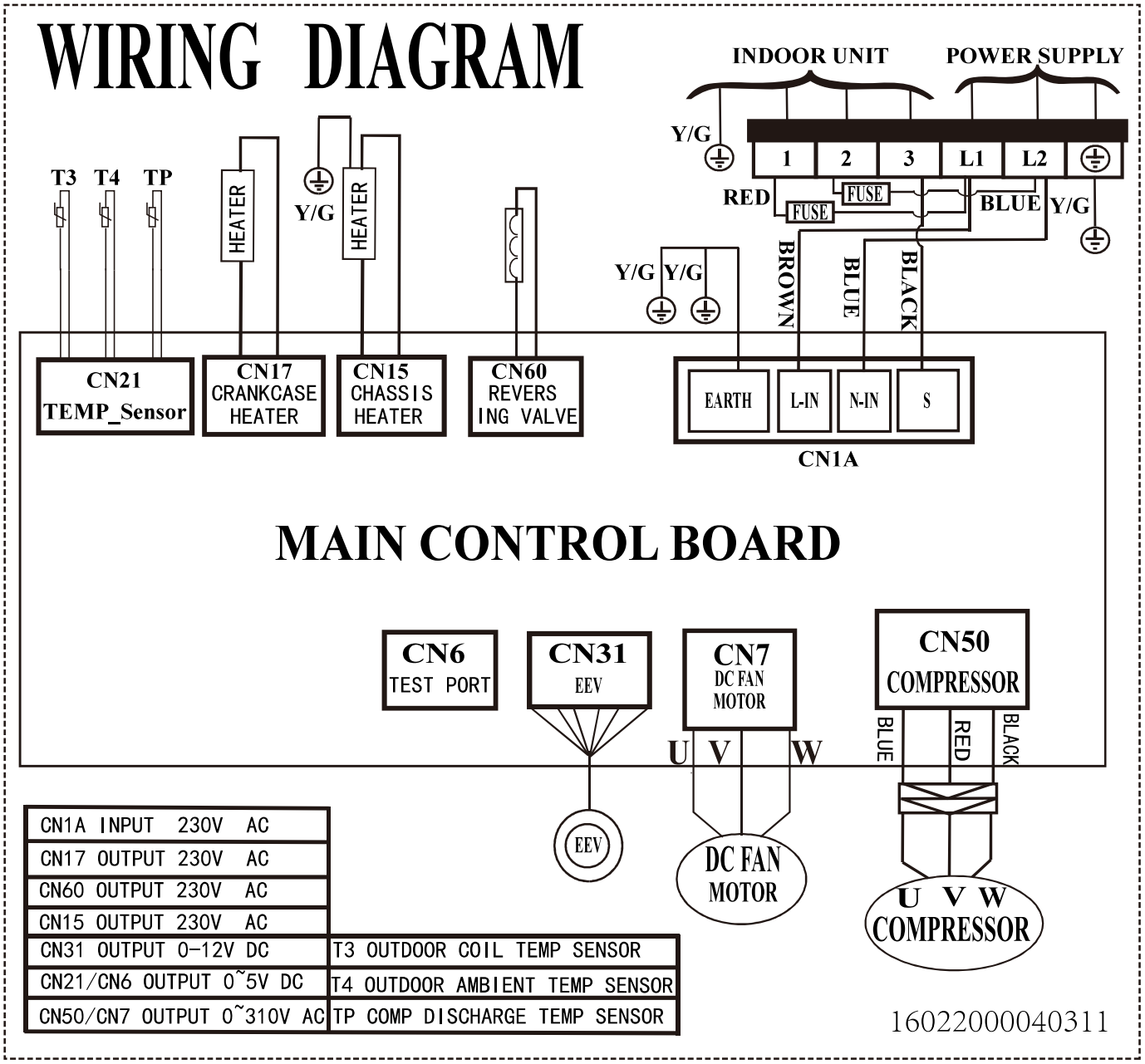
Outdoor unit wiring diagram and printed circuit board diagram

| Outdoor Unit | | |
|---|---|---|
| **ODU Model** | **ODU Wiring Diagram** | **ODU Printed Circuit Board** |
| MOX230-09HFN10-B1 | 16022000040956 | 17122000062141 |
| MOX230-12HFN10-B1 | | |
| MOX230-06HFN10-M1X | 16022000040311 | 17122000057661 |
| MOX230-09HFN10-M1 | | |
| MOX230-12HFN10-M1 | | |
| MOX330-09HFN10-M1X | | |
| MOX330-12HFN10-M1X | | |
| MOX430-06HFN1-M1H | 16022000041381 | 17122000057814 |
| MOX430-09HFN1-M1H | | |
| MOX430-12HFN10-M1H | | |
| MOX430-18HFN10-M1 | 16022000040313 | 17122000048066 |
| MOX430-18HFN10-M1X | | 17122000048064 |
| MOD30-24HFN10-M1 | | |
| MOD30-18HFN10-M1H | 16022000040331 | 17122300007152 |
| MOD30-24HFN10-M1X | | |
| MOD30-30HFN10-M1E | | |
| MOD30-33HFN10-M1X | 16022000040650 | |
| MOD30-36HFN10-M1E | | |

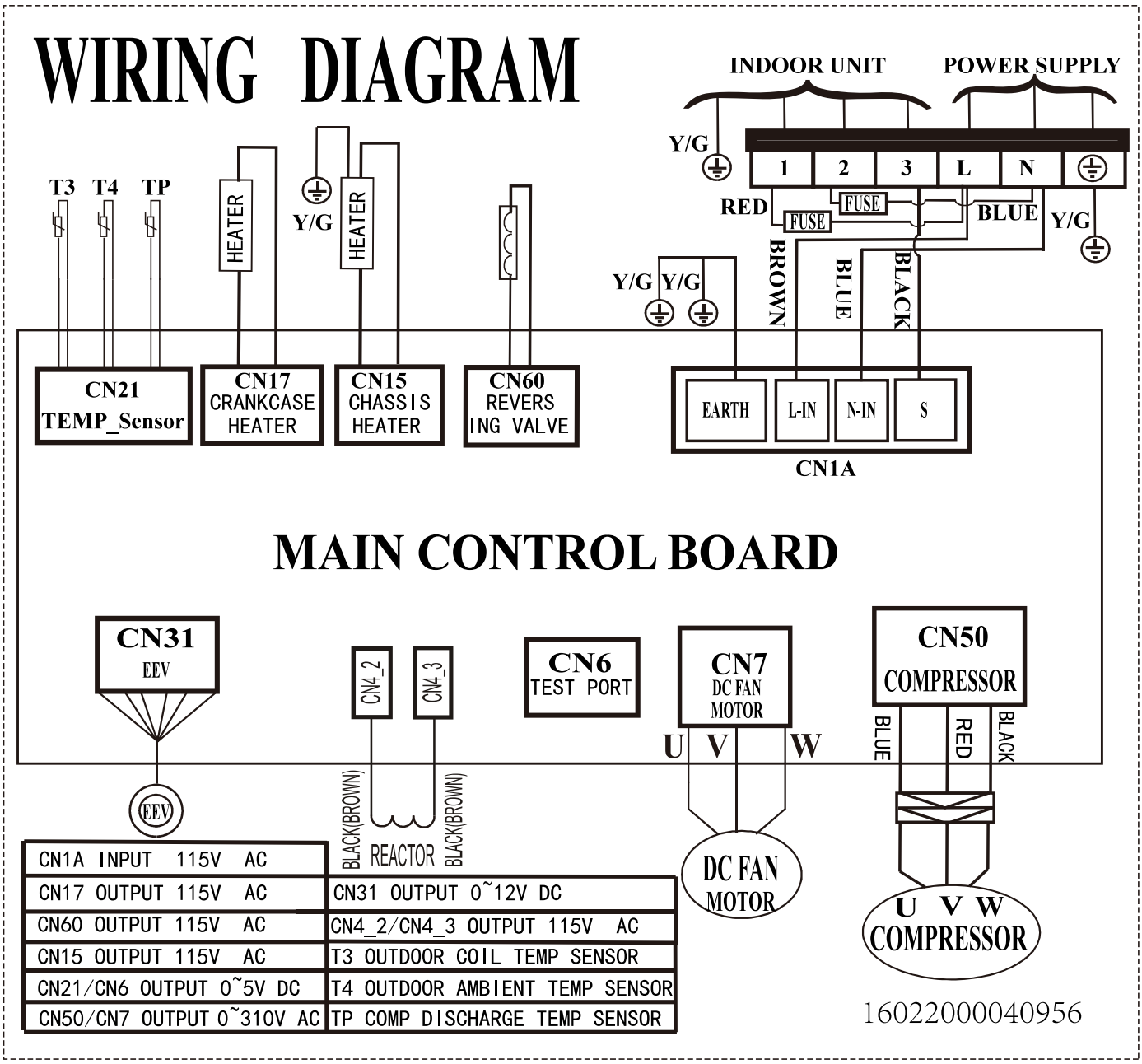
Indoor unit wiring diagram: 16022000040252



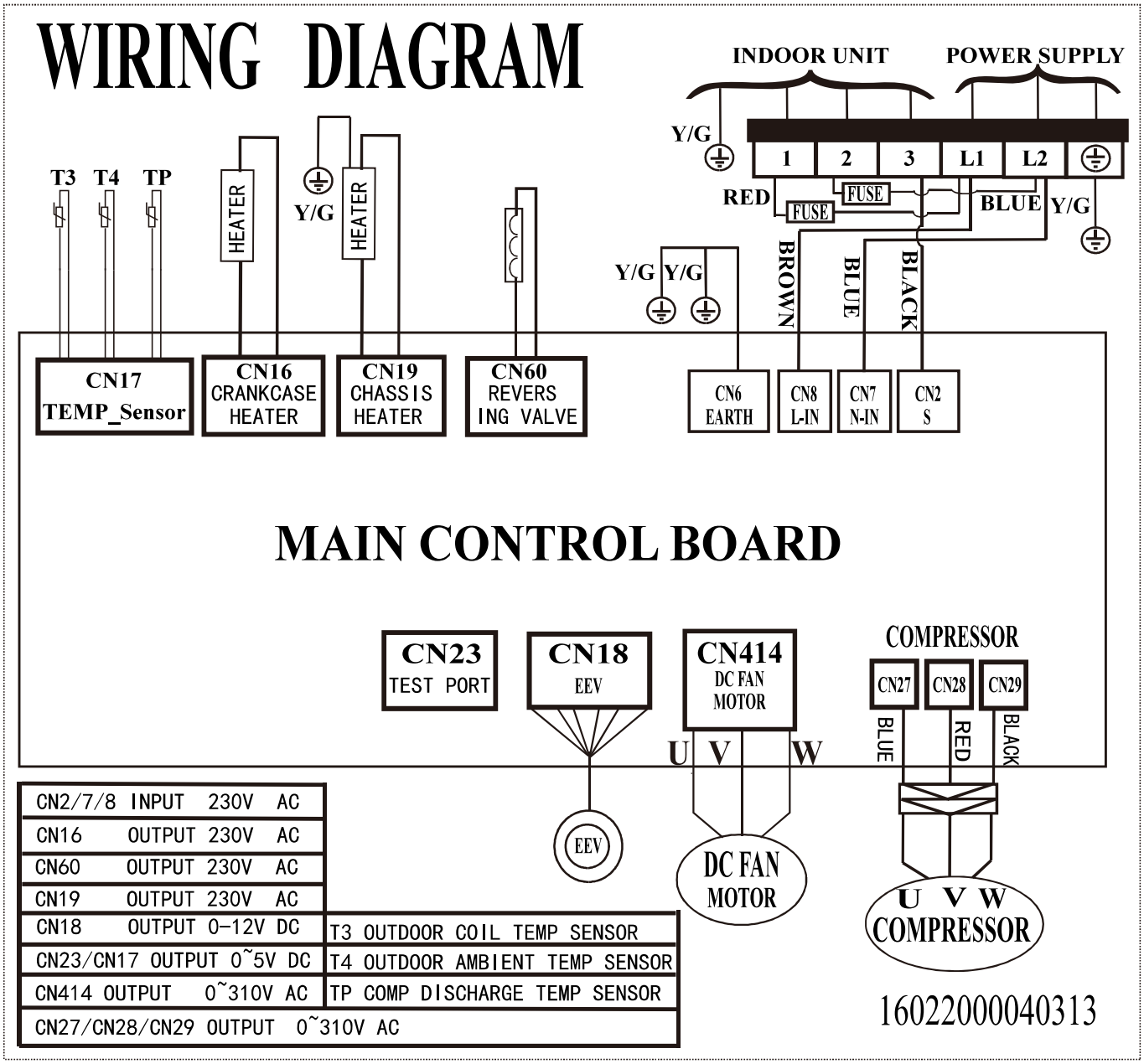
Outdoor unit wiring diagram: 16022000040311

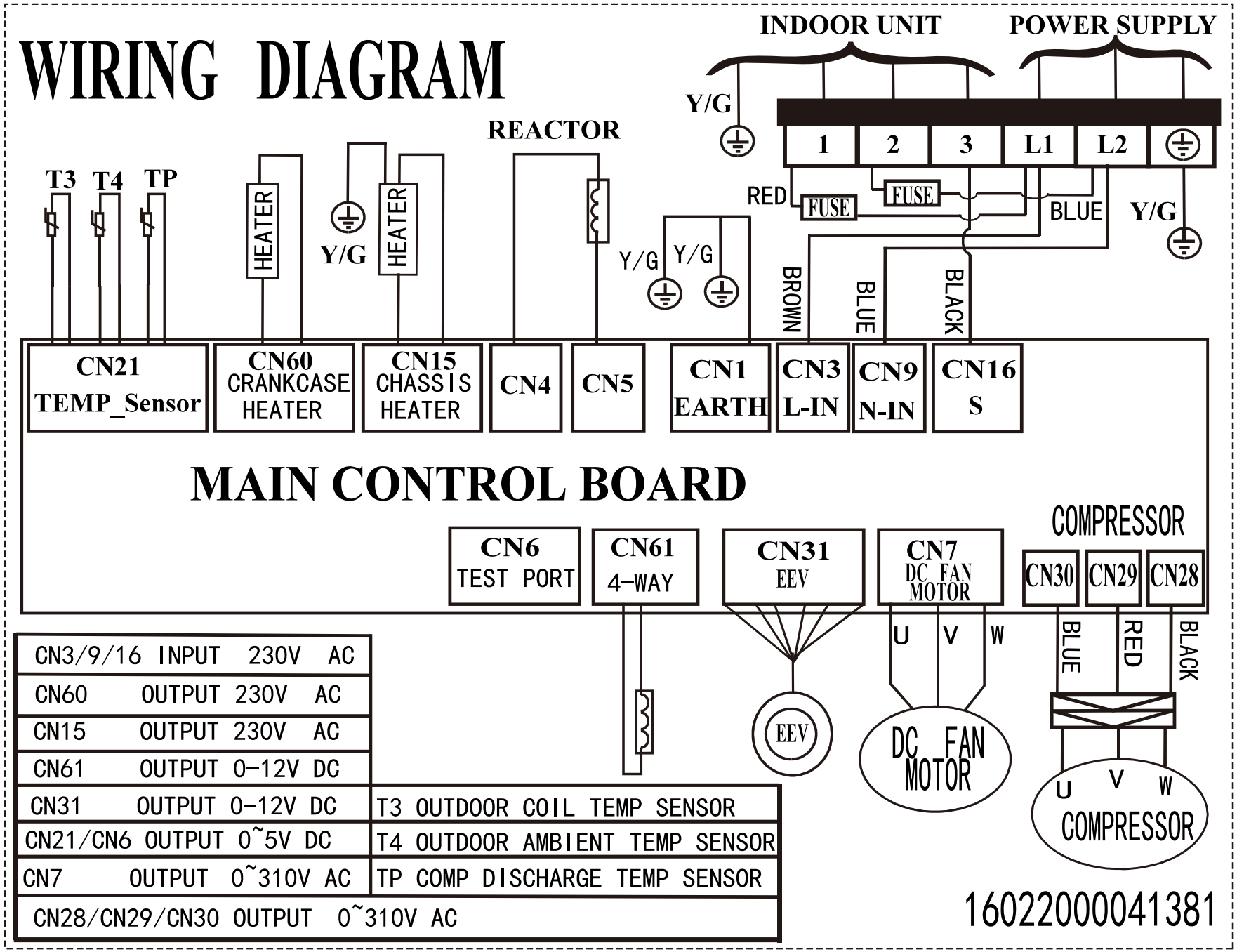


Outdoor unit wiring diagram: 16022000040956

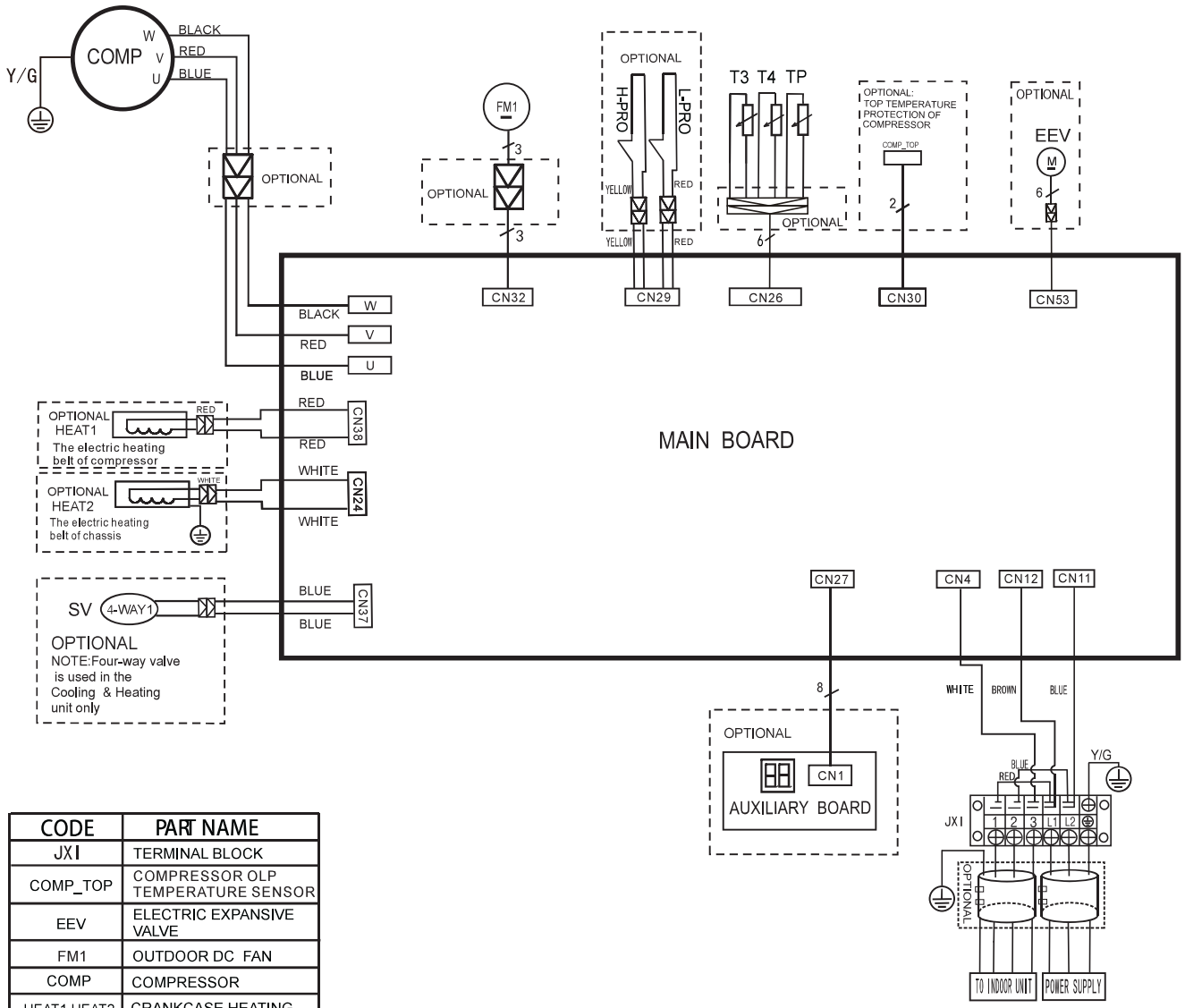


Outdoor unit wiring diagram: 16022000040313




WIRING DIAGRAM
INDOOR UNIT
POWER SUPPLY
Y/G
1
2
3
L1
L2
RED
FUSE
FUSE
BLUE
Y/G
REACTOR
T3
T4
TP
HEATER
Y/G
HEATER
Y/G
Y/G
BROWN
BLUE
BLACK
CN21
TEMP_Sensor
CN60
CRANKCASE
HEATER
CN15
CHASSIS
HEATER
CN4
CN5
CN1
EARTH
CN3
L-IN
CN9
N-IN
CN16
S
MAIN CONTROL BOARD
CN6
TEST PORT
CN61
4-WAY
CN31
EEV
CN7
DC FAN
MOTOR
COMPRESSOR
CN30
CN29
CN28
U
V
W
BLUE
RED
BLACK
EEV
DC FAN
MOTOR
U
V
W
COMPRESSOR
CN3/9/16 INPUT 230V AC
CN60 OUTPUT 230V AC
CN15 OUTPUT 230V AC
CN61 OUTPUT 0-12V DC
CN31 OUTPUT 0-12V DC
CN21/CN6 OUTPUT 0~5V DC
CN7 OUTPUT 0~310V AC
CN28/CN29/CN30 OUTPUT 0~310V AC
T3 OUTDOOR COIL TEMP SENSOR
T4 OUTDOOR AMBIENT TEMP SENSOR
TP COMP DISCHARGE TEMP SENSOR
16022000041381

Outdoor unit wiring diagram: 16022000040331

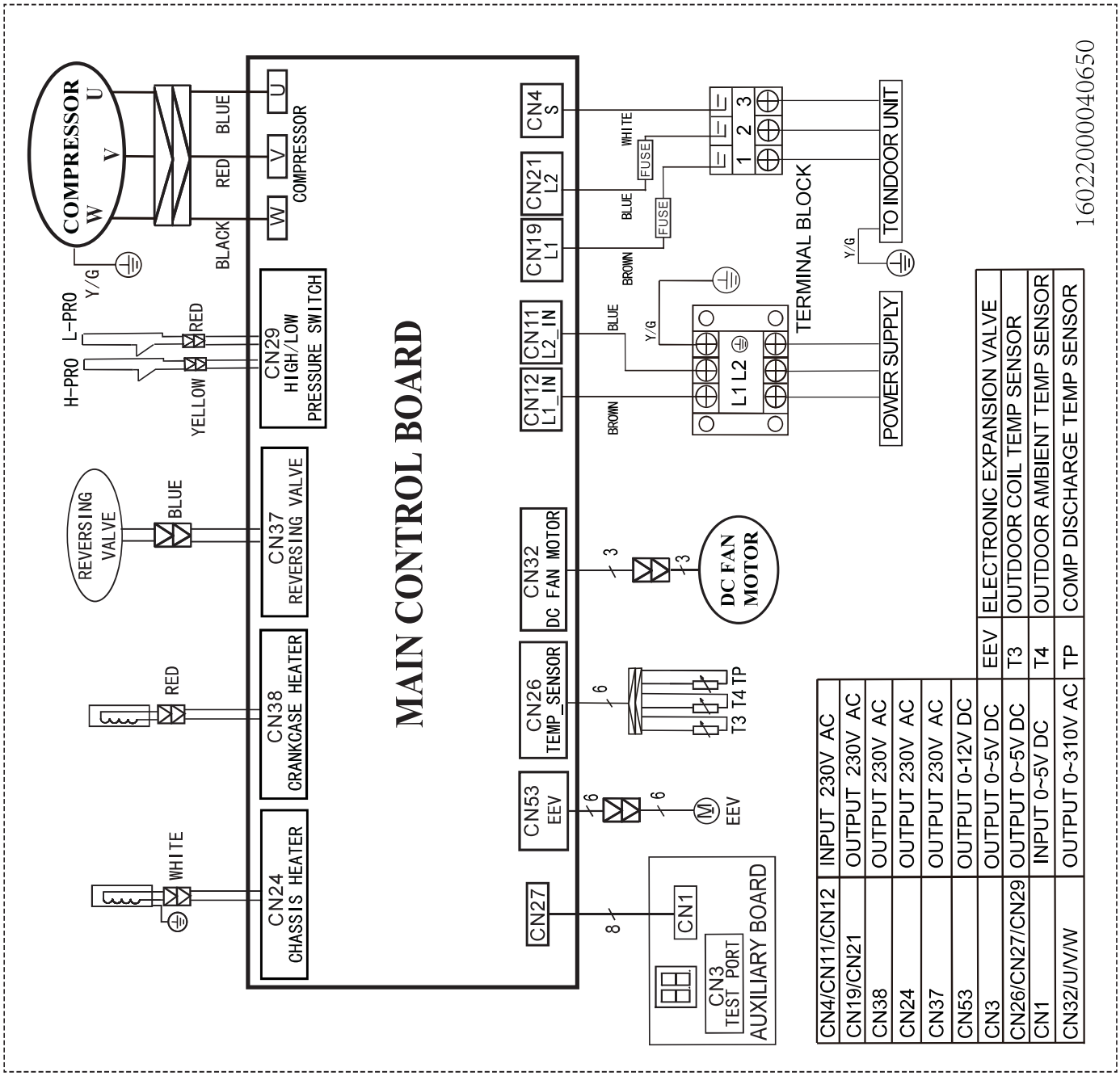



| CODE | PART NAME |
|---|---|
| JXI | TERMINAL BLOCK |
| COMP_TOP | COMPRESSOR OLP TEMPERATURE SENSOR |
| EEV | ELECTRIC EXPANSIVE VALVE |
| FM1 | OUTDOOR DC FAN |
| COMP | COMPRESSOR |
| HEAT1,HEAT2 | CRANKCASE HEATING |
| H-PRO | HIGH PRESSURE SWITCH |
| L-PRO | LOW PRESSURE SWITCH |
| SV | 4-WAY VALVE |
| TP | EXHAUST TEMPERATURE SENSOR |
| T3 | CONDENSER TEMPERATURE SENSOR |
| T4 | OUTDOOR AMBIENT TEMPERATURE SENSOR |

Notes:
This symbol indicates the element is optional, the actual shape shall be prevail.

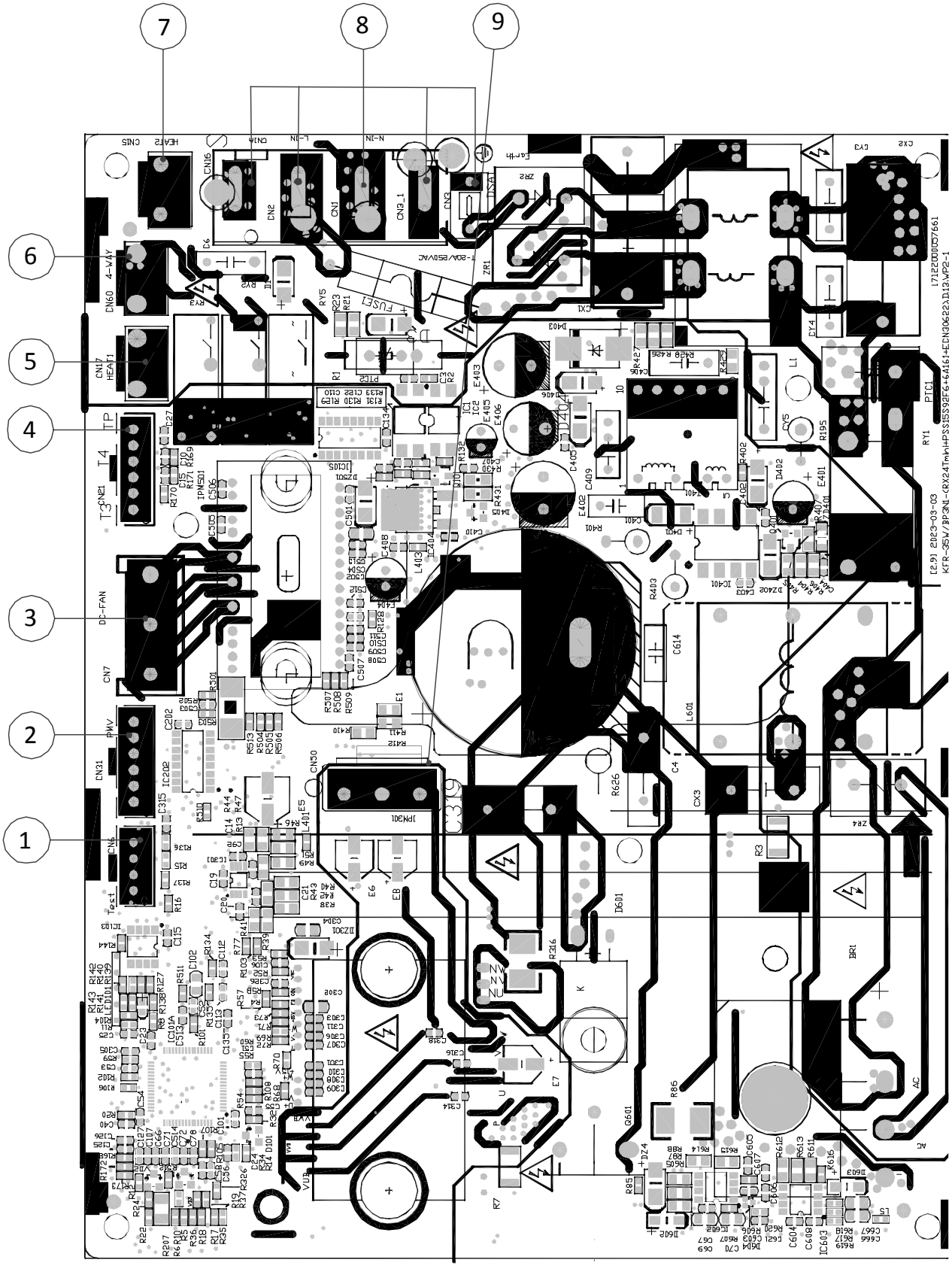
16022000040331

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 |
| CN26/CN27/CN29 | OUTPUT 0~5V DC |
| CN1 | INPUT 0~5V DC |
| CN32/U/V/W | OUTPUT 0~310V AC |
| EEV | ELECTRONIC EXPANSION VALVE |
| T3 | OUTDOOR COIL TEMP SENSOR |
| T4 | OUTDOOR AMBIENT TEMP SENSOR |
| TP | COMP DISCHARGE TEMP SENSOR |

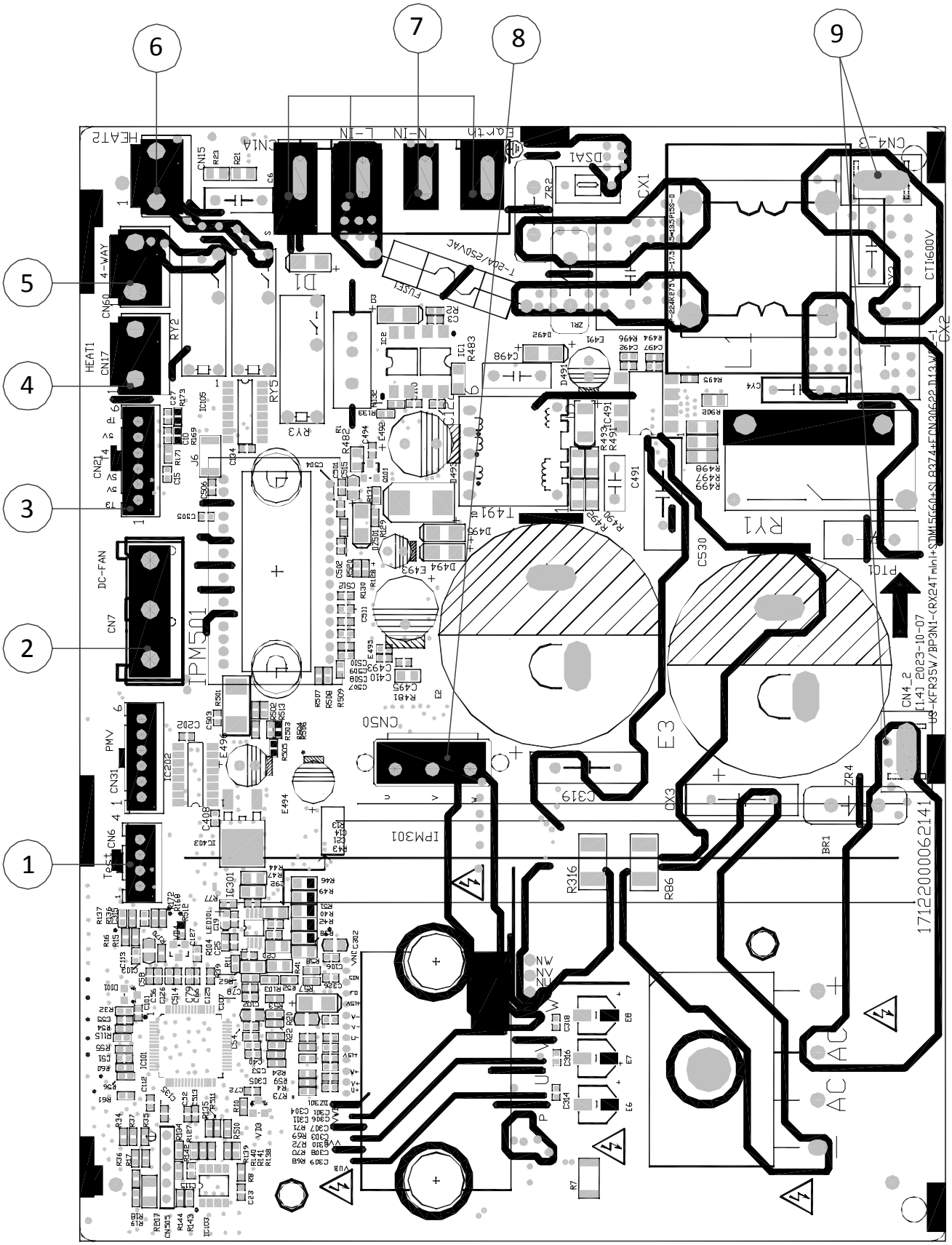
Outdoor unit printed circuit board diagram: 17122000057661



| No. | Name | CN# | Meaning |
|---|---|---|---|
| 1 | TESTPORT | CN6 | used for testing |
| 2 | PMV | CN31 | connect to electric expansion valve (Output:0~2V DC) |
| 3 | DC-FAN | CN7 | connect to DC fan (Output: 0~310V AC). |
| 4 | TP T4 T3 | CN21 | connect to pipe temp. sensor T3, ambient temp. sensor T4, exhaust temp. sensor TP (Output: 0~5V DC) |
| 5 | HEAT1 | CN17 | connect to compressor heater (Output: 230V AC). |
| 6 | 4-WAY | CN60 | connect to 4 way valve (Output: 230V AC) |
| 7 | HEAT2 | CN15 | connect to chassis heater (Output: 230V AC) |
| 8 | CN1A | CN16 | S: connect to indoor unit communication |
| | | CN2 | L_in: connect to L-line (230V AC input) |
| | | CN1 | N_in: connect to N-line (230V AC input) |
| | | CN3 | Earth |
| 9 | CN50 | W | connect to compressor (Output: 0-310V AC) |
| | | V | |
| | | U | |

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

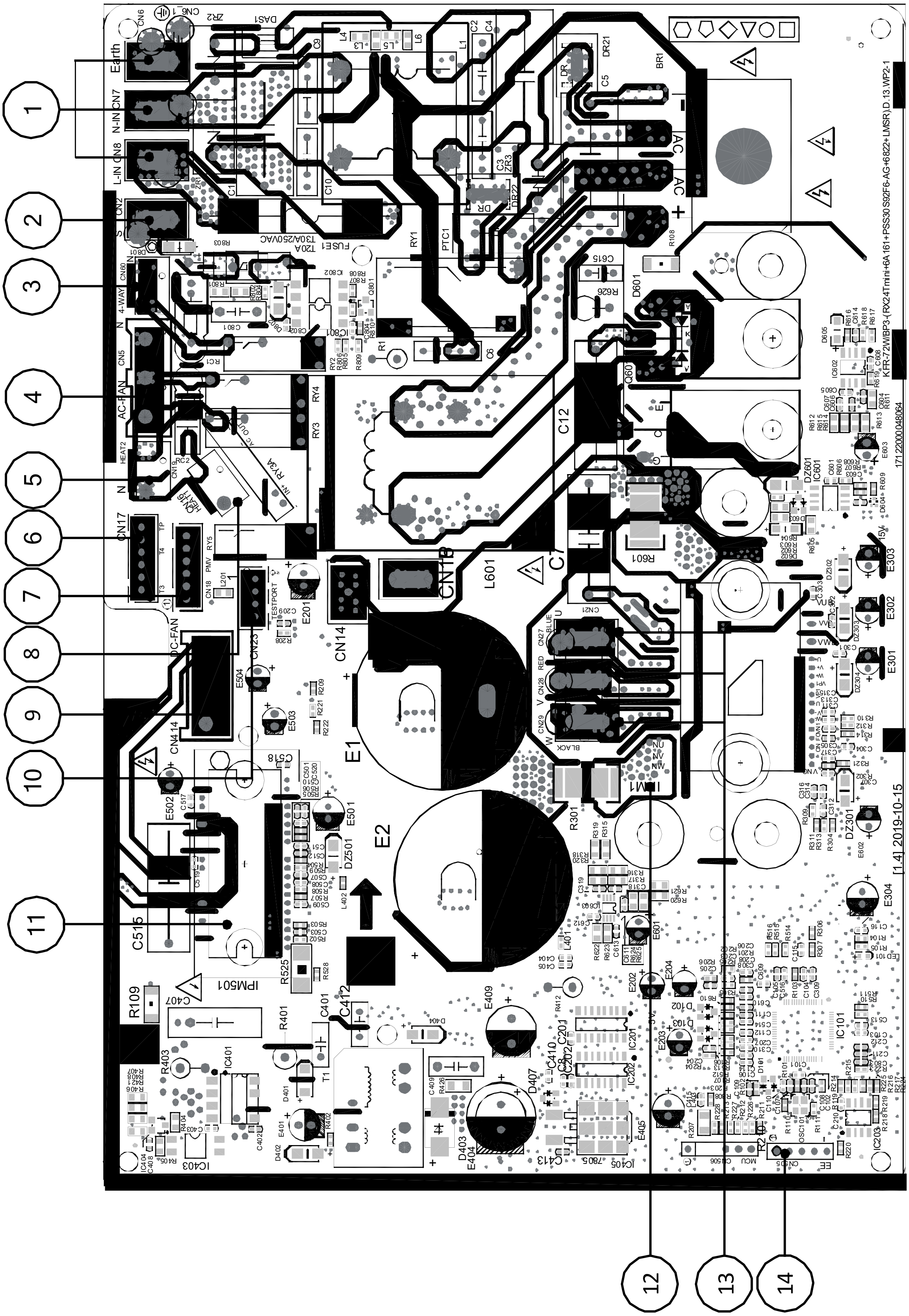
Outdoor unit printed circuit board diagram: 17122000062141



| No. | Name | CN# | Meaning |
|---|---|---|---|
| 1 | TESTPORT | CN6 | used for testing(Output:0~5 V DC) |
| 2 | DC-FAN | CN7 | connect to DC fan(Output:0~310 V AC) |
| 3 | TP T4 T3 | CN21 | connect to pipe temp. sensor T3, ambient temp. sensor T4, exhaust temp. sensor TP(Output:0~5 VDC) |
| 4 | HEAT1 | CN17 | connect to compressor heater, 115V AC when is ON |
| 5 | 4-WAY | CN60 | connect to 4 way valve, 115V AC when is ON. |
| 6 | HEAT2 | CN15 | connect to chassis heater, 115V AC when is ON |
| 7 | CN1A | / | S: connect to indoor unit communication |
| | | / | L_in: connect to L-line (115V AC input) |
| | | / | N_in: connect to N-line (115V AC input) |
| | | / | Earth |
| 8 | CN50 | W | connect to compressor,0V AC (standby),0-310V AC (running) |
| | | V | |
| | | U | |
| 9 | REACTOR | CN4_2 | connect to reactor, 115V AC when is ON |
| | | CN4_3 | |

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

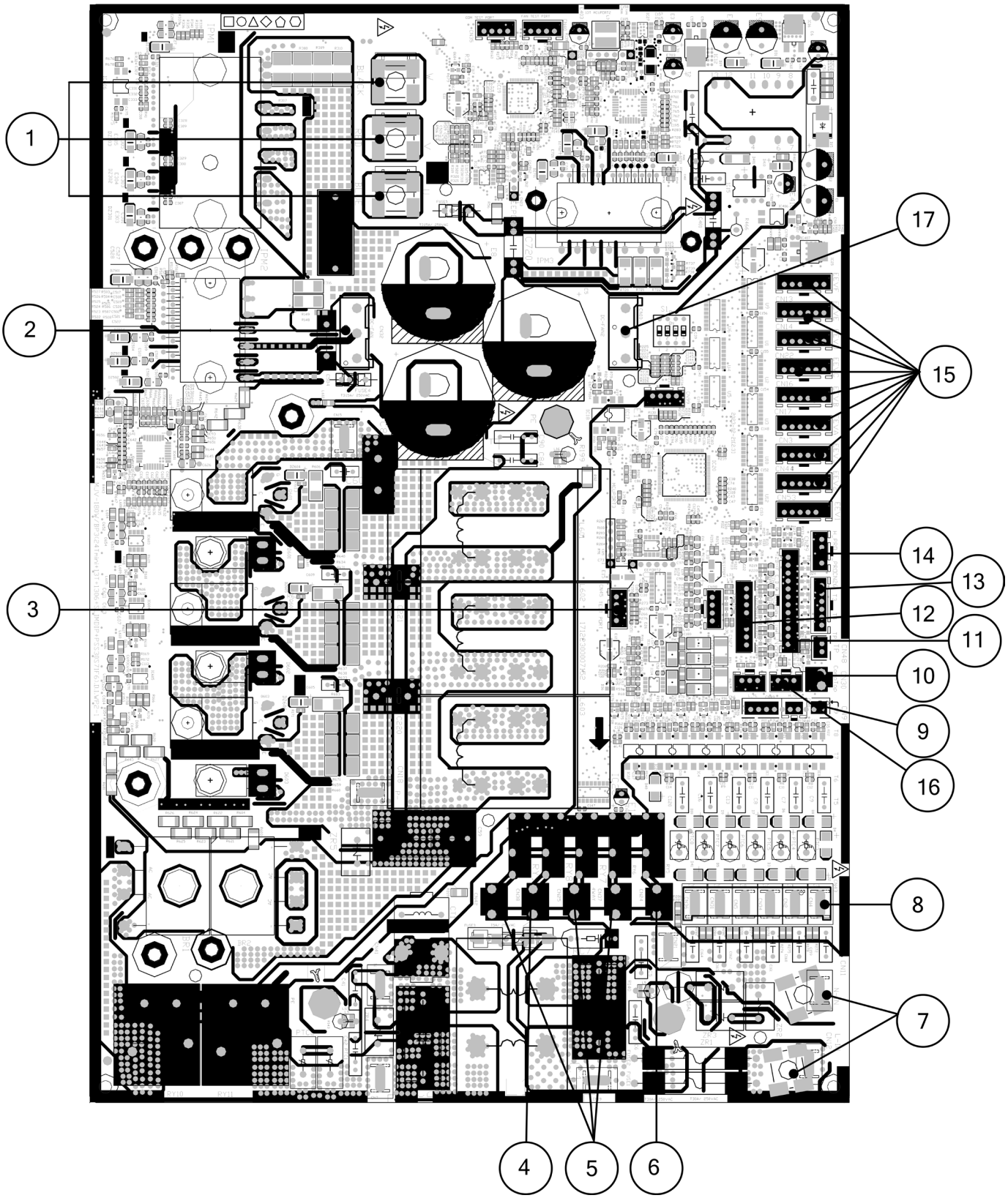
Outdoor unit printed circuit board diagram: 17122000048064& 17122000048066



| No. | Name | CN# | Meaning |
|---|---|---|---|
| 1 | Power Supply | CN6 | Earth: connect to Ground |
| | | CN7 | N_in: connect to N-line (230V AC input) |
| | | CN8 | L_in: connect to L-line (230V AC input) |
| 2 | S | CN2 | S: connect to indoor unit communication(230V AC input) |
| 3 | 4-WAY | CN60 | connect to 4 way valve(Output: 230V AC) |
| 4 | AC-FAN | CN5 | connect to AC fan |
| 5 | HEAT2 | CN19 | connect to chassis heater(Output: 230V AC) |
| 6 | TP T4 T3 | CN17 | connect to pipe temp. sensor T3, ambient temp. sensor T4, exhaust temp. sensor TP(Output: 0~5V DC) |
| 7 | PMV | CN18 | connect to Electric Expansion Valve |
| 8 | HEAT1 | CN16 | connect to compressor heater(Output: 230V AC) |
| 9 | DC-FAN | CN414 | connect to DC fan(Output: 0~310V AC) |
| 10 | TESTPORT | CN23 | used for testing |
| 11 | FAN_IPM | IPM501 | IPM for DC fan |
| 12 | COMP_IPM | IPM1 | IPM for compressor |
| 13 | U | CN27 | connect to compressor(Output: 0~310V AC) |
| | V | CN28 | |
| | W | CN29 | |
| 14 | EE_PORT | CN505 | EEPROM programer port |

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

Outdoor unit printed circuit board diagram: 17122300007152



| No. | Name | CN# | Meaning |
|---|---|---|---|
| 1 | COMPRESSOR | W | connect to compressor(Output: 0~310V AC) |
| | | V | |
| | | U | |
| 2 | DC-FAN1 | CN32 | connect to DC fan(Output: 0~310V AC) |
| 3 | TESTPORT | CN45 | used for testing |
| 4 | HEAT_Y | CN38 | connect to compressor heater(Output: 230V AC) |
| 5 | 4-WAY | CN37 | connect to 4 way valve 1(Output: 230V AC) |
| | | CN25 | connect to 4 way valve 2(Output: 230V AC) |
| | | CN42 | connect to 4 way valve 3(Output: 230V AC) |
| 6 | HEAT_D | CN24 | connect to chassis heater(Output: 230V AC) |
| 7 | Power Supply | CN11 | N_in: connect to N-line (230V AC input) |
| | | CN12 | L_in: connect to L-line (230V AC input) |
| 8 | S-A | CN43 | S: connect to indoor unit communication(230V AC input) |
| | S-B | | |
| | S-C | | |
| | S-D | | |
| | S-E | | |
| | S-F | | |
| 9 | TBH-IN TBH-OUT T3B TF | CN9 | connect to cold plate inlet temp. sensor TBH-IN, cold plate outlet temp. sensor TBH-OUT, condenser coil middle temp. sensor T3B, refrigerant tube inlet temp. sensor TF |
| 10 | OLP TEMP. SENSOR | CN30 | connect to compressor top temp. sensor (Output: 0~5V DC) |
| 11 | T2B | CN28 | connect to evaporator coil outlet temperature sensor T2B |
| 12 | / | CN27 | connect to key board CN1 |
| 13 | T3 T4 TP | CN26 | connect to condenser coil temp. sensor T3, ambient temp. sensor T4, exhaust temp. sensor TP(Output: 0~5V DC) |
| 14 | H-PRO,L-RPO | CN29 | connect to high and low pressure switch(pin1-pin2&pin3-pin4:5VDC pulse wave) |

| No. | Name | CN# | Meaning |
|---|---|---|---|
| 15 | EEVA | CN17 | connect to electric expansion valve(Output: 0~12V DC) |
| | EEVB | CN16 | |
| | EEVC | CN22 | |
| | EEVD | CN14 | |
| | EEVE | CN13 | |
| | EEVF | CN1 | |
| | EEV1 | CN53 | |
| | EEV2 | CN44 | |
| | EEV3 | CN3 | |
| 16 | H_YL | CN49 | connect to high pressure sensor |
| 17 | DC-FAN2 | CN10 | connect to DC fan(Output: 0~310V AC) |

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

# Product Features

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# 1. Display Function

Unit display functions




(A) (B) (C)

| Display | | Function |
|---|---|---|
| ECO | | ECO function (available on select units only) |
| | | when Wireless Control feature is activated(some units) |
| 88.8<br>88 | Temperature value | Temperature |
| | ON (3s) | Timer ON is set.<br>Activation of , Fresh, Swing, Turbo, ECO, Breeze away, ECO intelligent or Silence |
| | OF (3s) | Timer OFF is set.<br>Cancellation of Fresh, Swing, Turbo, ECO, Breeze away, ECO intelligent or Silent |
| | dF | Defrost |
| | CL | Active Clean (For Inverter split type) or self-cleaning(For Fixed-speed type) |
| | FP | Heating in room temperature under 8°C |

**Note: Please select the display function according to your purchase product.**

## 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.

**Compressor preheating**

Preheating is automatically activated when T4 sensor is lower than setting temperature.

**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(32.9°F))

Note: CDIFTEMP is EEPROM setting parameter. It is 2°C(35.6°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(35.6°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.

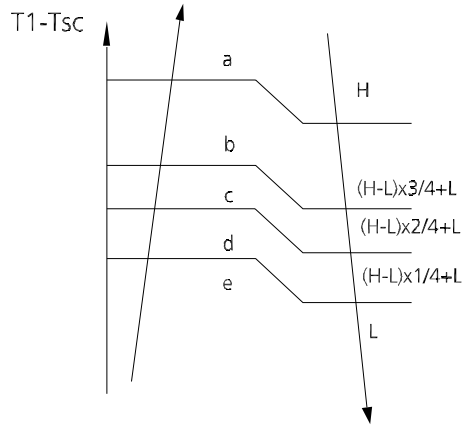
2) Auto fan

For DC fan motor units:

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

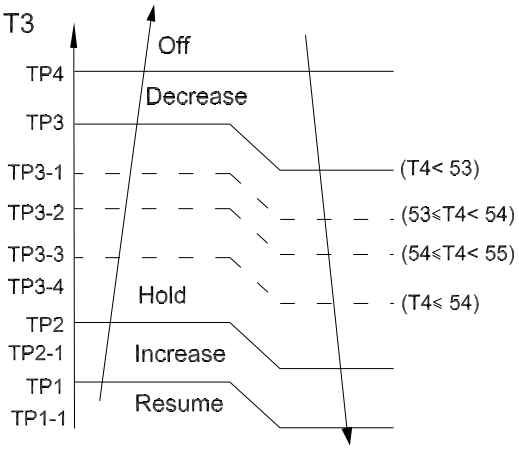
For AC fan motor units:




### 3.3.3 Outdoor Fan Control

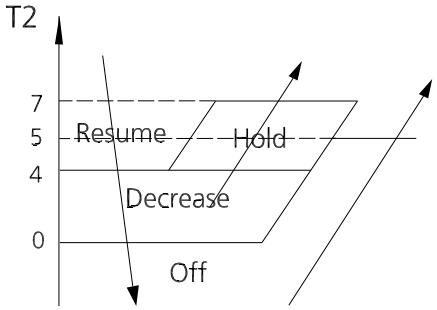
- The outdoor unit will be run at different fan speed according to T4 and compressor running frequency..
- For different outdoor units, the fan speeds are different.

### 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(35.6°F) usually.

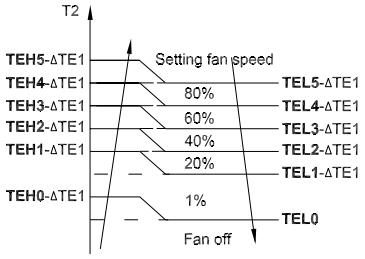
- If one of the following conditions is satisfied, not judge protective time.
  - Compressor running frequency(fr) is more than test frequency(TestFre).
  - When compressor running frequency is equal to test frequency, T4 is more than 15°C(59°F) or T4 fault.
  - Change setting temperature.
  - Turn on/off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



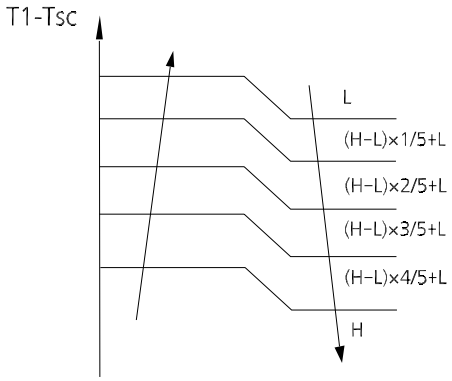

| | |
|---|---|
| T1 ≥ 19°C(66°F) | ΔTE1=0 |
| 15°C(59°F)≤T1<19°C(66°F) | ΔTE1=19°C−T1 (66°F-T1) |
| T1<15°C(59°F) | ΔTE1=4°C(7.2°F) |

2) Auto fan

For DC fan motor units:

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

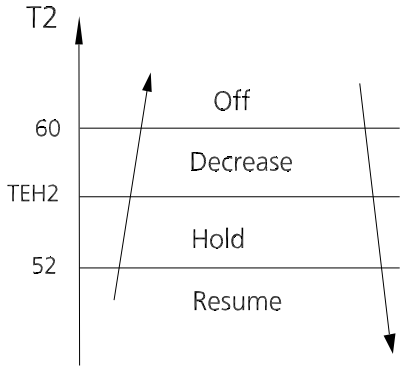
Condition 8: When T3 or T4 lower that -3°C (last for 30 seconds) cumulate running for (EE_TIME_DEFROST7_ADD+30) minutes (not need based on T30 keep running with minimum 10th minutes)

- 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/7.2°F.
  - T3 maintained above TCDE2+4°C/7.2°F for 80 seconds.
  - Unit runs for 15 minutes consecutively in defrosting mode.

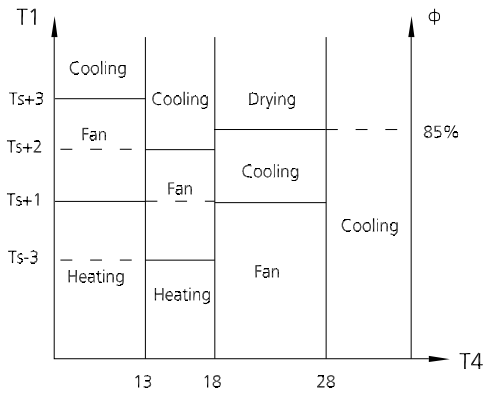
### 3.4.5 Evaporator Temperature Protection




- 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.

## 3.6 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(53.6°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/1.8°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/ 1.8°F(to not lower than 16°C/60.8°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

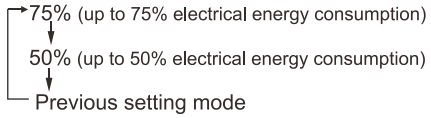
noise to the lowest possible level.

## 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/75.2°F, fan speed of Auto to save energy (but only if the set temperature is less than 24°C/75.2°F). If the set temperature is more than 24°C/75.2°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**

**3 Re-Installation ..... 5**

3.1 Indoor Unit ..... 5

3.2 Outdoor Unit ..... 7

# 1. First Time Installation Check

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

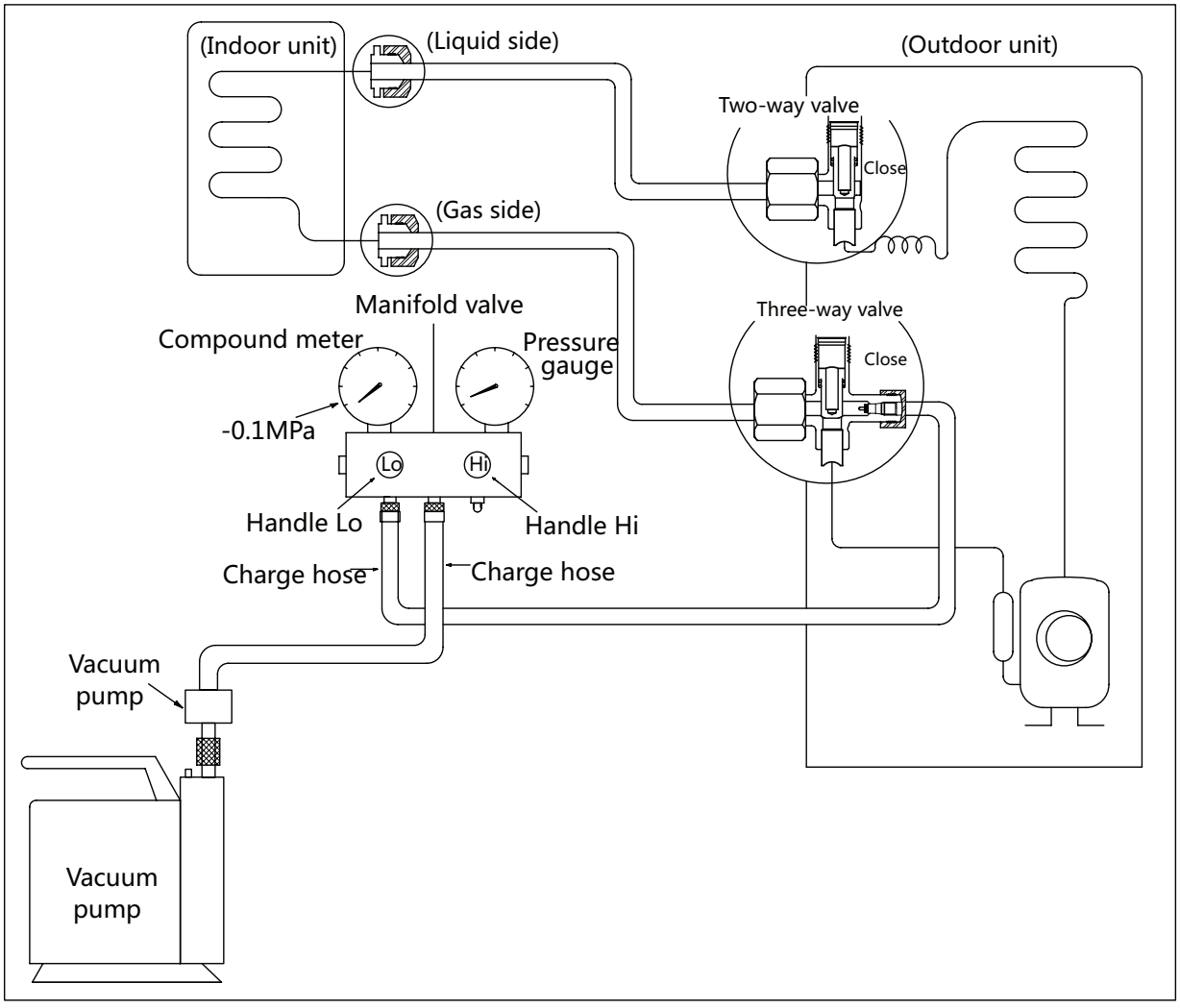
- Increasing pressure in the system.
- Increasing the operating current.
- Decreasing the cooling or heating efficiency.
- Congesting the capillary tubing due to ice build-up in the refrigerant circuit.
- Corroding the refrigerant system.

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.

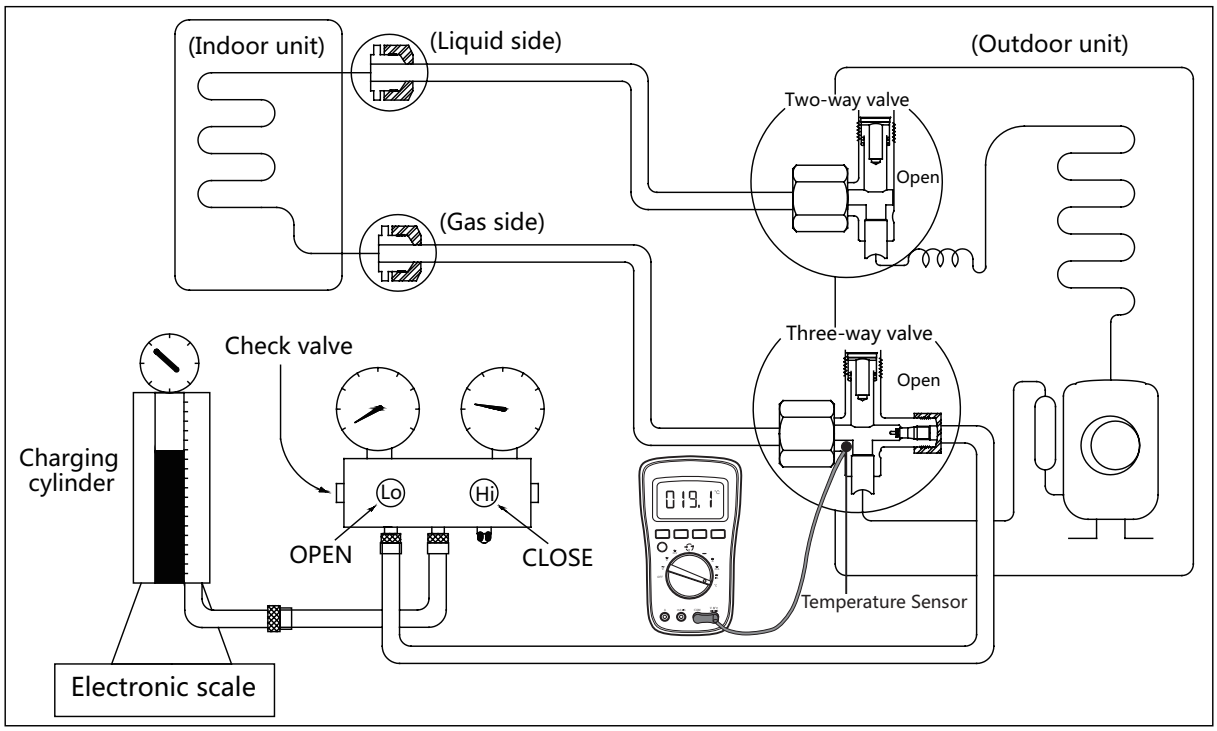
**Air purging with vacuum pump**



**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



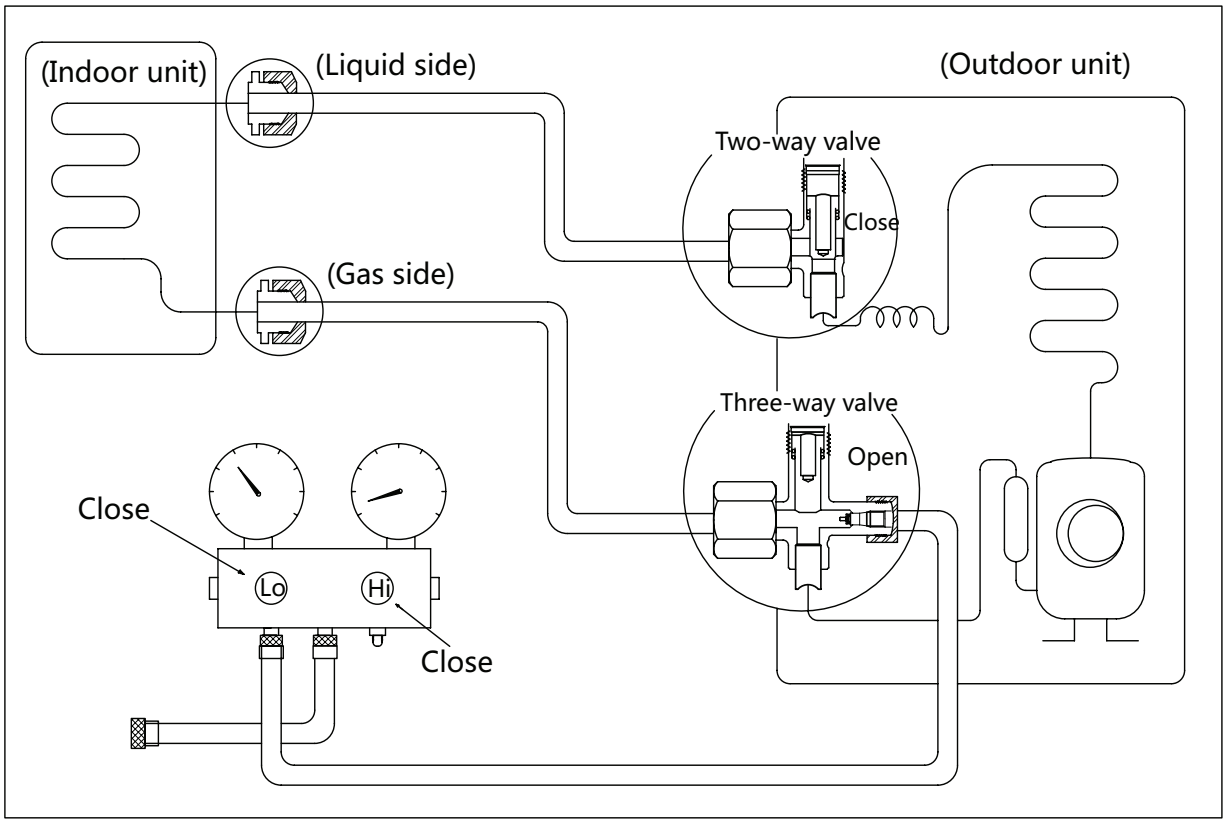

**Procedure:**

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

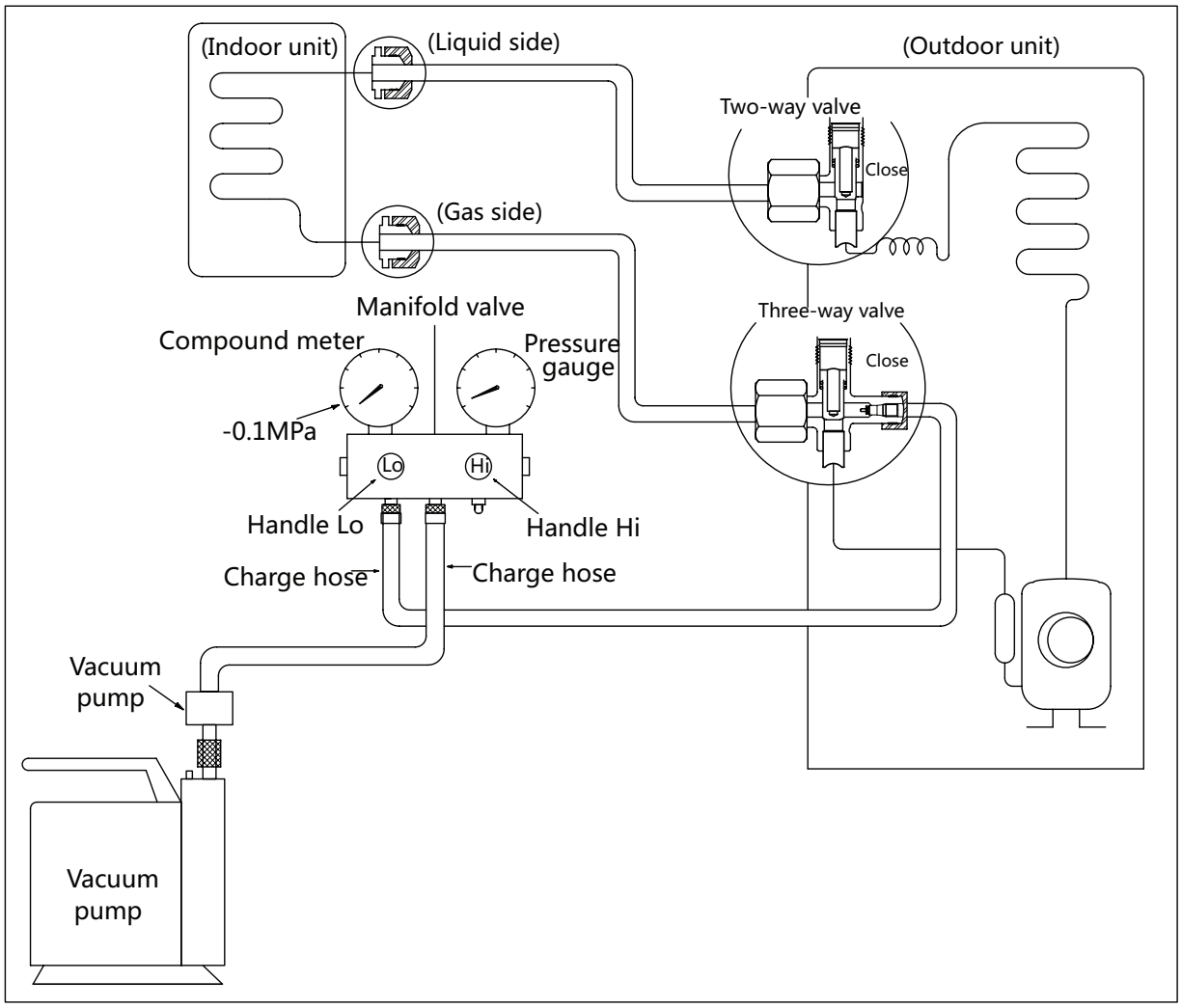
**Collecting the refrigerant into the outdoor unit**




**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

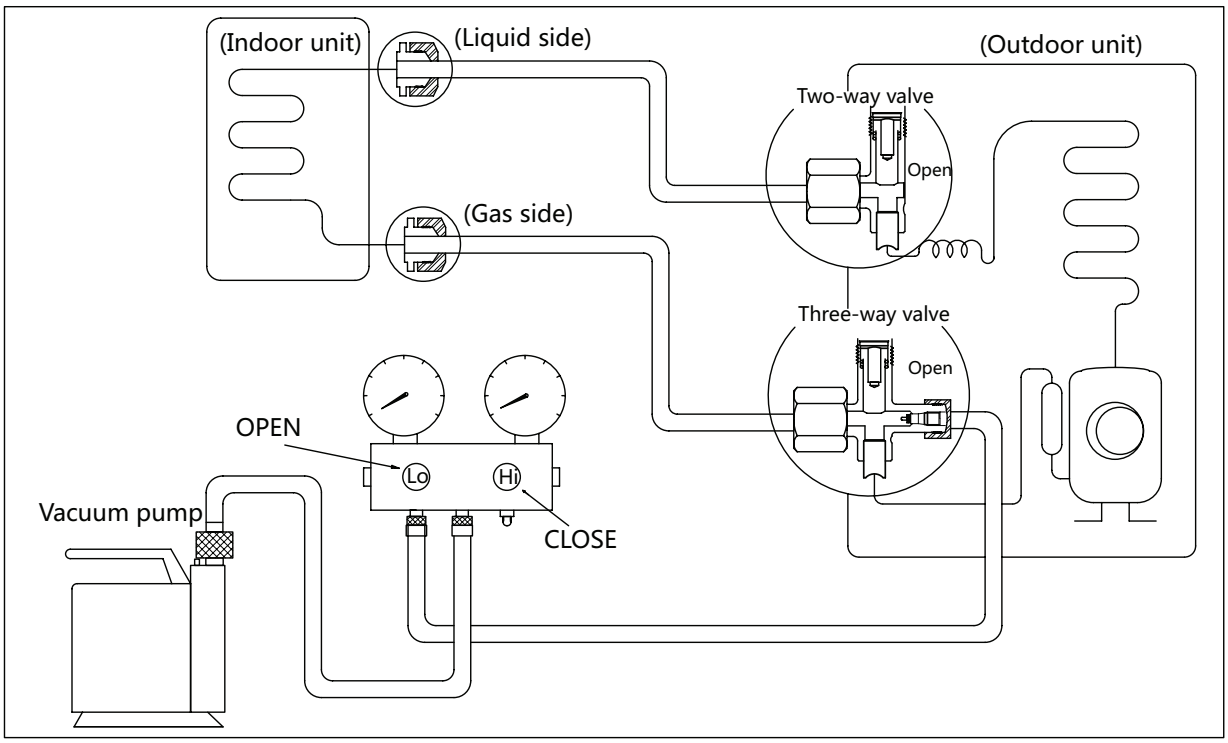



**Procedure:**

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

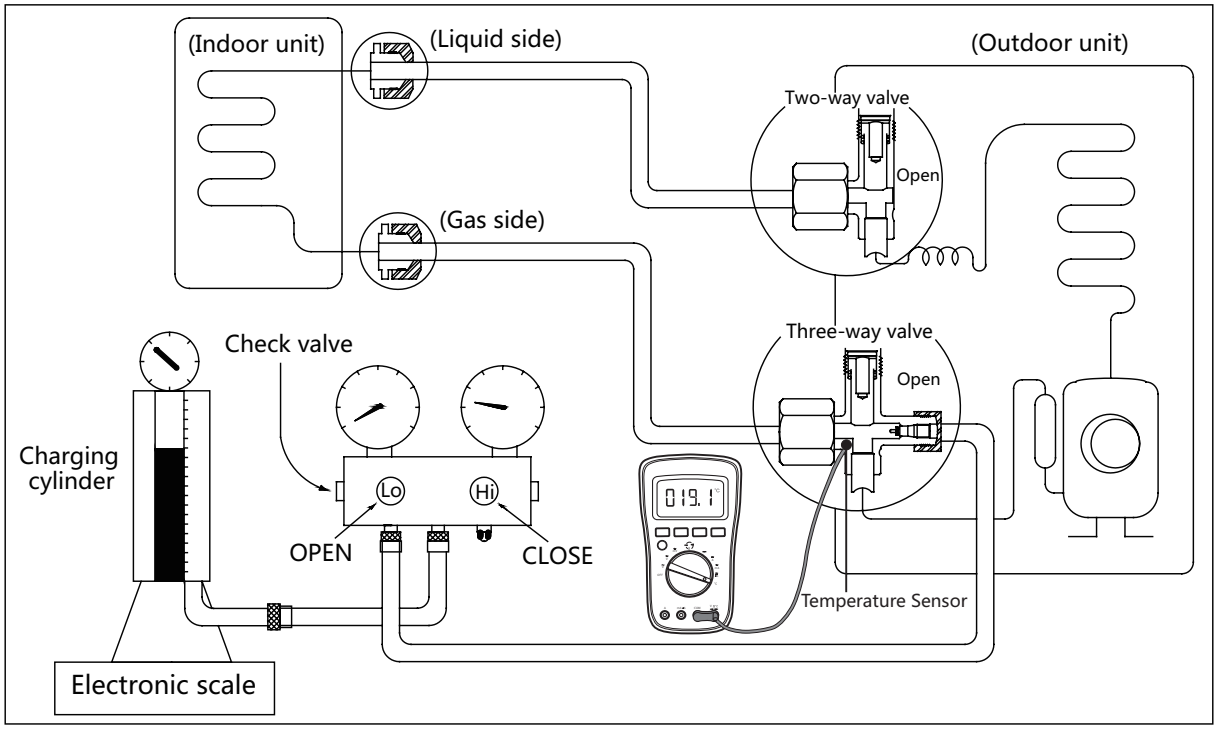
**Evacuation for the whole system**




**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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**2. General Troubleshooting .....4**

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**6. Error Diagnosis and Troubleshooting Without Error Code.....15**

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**7. Quick Maintenance by Error Code.....21**

**8. Troubleshooting by Error Code.....23**

TS01-IDU Indoor EEPROM malfunction or indoor EEPROM parameter error diagnosis and solution

TS01-ODU ODU EEPROM parameter error diagnosis and solution

TS02-S-INV IDU & ODU communication error diagnosis and solution

TS03 Zero-crossing signal detection error diagnosis and solution

TS04-S-IDU IDU fan speed out of control diagnosis and solution

TS04-ODU ODU fan speed out of control diagnosis and solution

TS05-IDU Open circuit or short circuit of temperature sensor(T1, T2) diagnosis and solution

TS05-ODU Open circuit or short circuit of temperature sensor(T3, T4, TP, T2B,TH) diagnosis and solution

TS06-INV System lacks refrigerant diagnosis and solution

TS07 IDU main control board and display board communication error diagnosis and solution

# Troubleshooting

## Contents

TS08-S: Current overload protection diagnosis and solution

TS05-N10: Refrigerant sensor error or Refrigerant sensor is out of range diagnosis and solution

TS06-N10: Refrigerant sensor detects leakage or Refrigerant sensor is out of range and leakage is detected diagnosis and solution

TS09-S ODU IPM module protection diagnosis and solution

TS10-S ODU voltage protection diagnosis and solution

TS11-S-INV Compressor top (or IPM) temp. protection diagnosis and solution

TS12-S Inverter compressor drive error diagnosis and solution

TS26-INV System Pressure protection(low or high pressure) diagnosis and solution

TS14 IDUs mode conflict Diagnosis and Solution

LP Low temperature protection of outdoor uni diagnosis and solution

TS27-INV: High temperature protection of condenser diagnosis and solution

TS30: PFC module protection diagnosis and solution

TS31: Communication error between outdoor main chip and compressor driven chip diagnosis and solution

TS32: Discharge temperature protection of compressor diagnosis and solution

TS38: Lack phase failure of ODU DC fan motor diagnosis and solution

TS39: ODU compressor lack phase protection diagnosis and solution

TS40: ODU IR chip drive failure diagnosis and solution

**8. Check Procedures**

## 1. Safety Caution

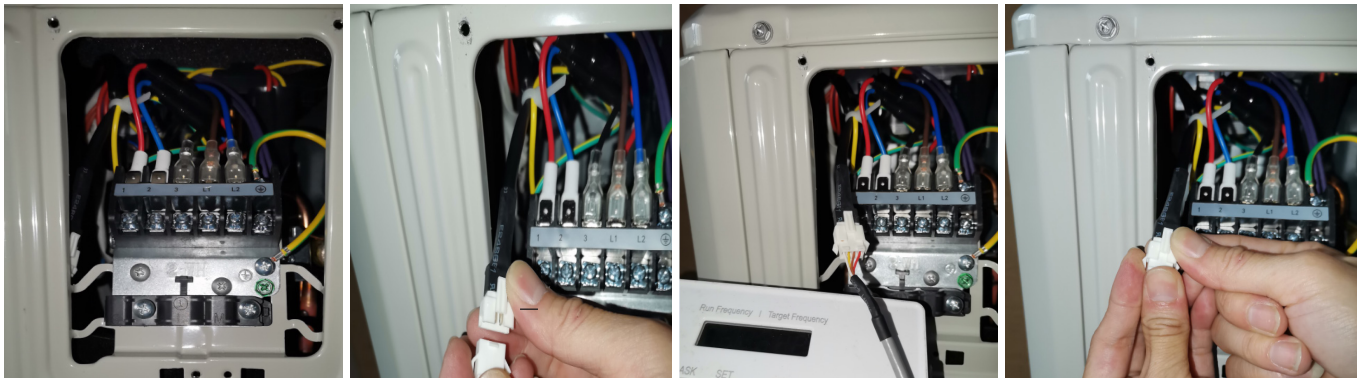
**WARNING**

**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 | Filter cleaning reminder(power on display for 15 seconds) | |
| CL | Active clean | |
| nF | Filter replacement reminder(power on display for 15 seconds)(for some models) | |
| 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 | TS01-IDU |
| EH0A | Indoor EEPROM parameter error | TS01-IDU |
| EL01 | IDU & ODU communication error | TS02-S-INV |
| EH02 | Zero-crossing signal detection error | TS03 |
| EH03 | IDU fan speed out of control | TS04-S-IDU |
| EC51 | ODU EEPROM parameter error | TS01-ODU |
| EC52 | ODU coil temp. sensor (T3) error | TS05-ODU |
| EC53 | ODU ambient temp. sensor (T4) error | TS05-ODU |
| EC54 | COMP. discharge temp. sensor (TP) error | TS05-ODU |
| EC56 | IDU coil outlet temp. sensor (T2B) error(Multi-zone) | TS05-ODU |
| EH60 | IDU room temp. sensor (T1) error | TS05-IDU |
| EH61 | IDU pipe temp. (T2) sensor error | TS05-IDU |
| EC07 | ODU fan speed out of control | TS04-ODU |
| EH0b | IDU main control board and display board communication error | TS07 |
| FHCC | Refrigerant sensor error | TS05-N10 |
| EHC1 | Refrigerant sensor detects leakage | TS06-N10 |
| EHC2 | Refrigerant sensor is out of range and leakage is detected | TS06-N10 |
| EHC3 | Refrigerant sensor is out of range | TS05-N10 |
| EC01 | Other IDU refrigerant sensor detects leakage (Multi-zone) | TS06-N10 |

| | | |
|---|---|---|
| EL0C | System lacks refrigerant | TS06-INV |
| PC00 | ODU IPM module protection | TS09-S |
| PC01 | ODU voltage protection | TS10-S |
| PC02 | Compressor top (or IPM) temp. protection | TS11-S-INV |
| PC04 | Inverter compressor drive error | TS12-S |
| PC03 | Pressure protection(low or high pressure)(for some models) | TS26-INV |
| PC0L | Low ambient temperature protection(for some models) | LP |
| ---- | IDUs mode conflict(Multi-zone) | TS14 |

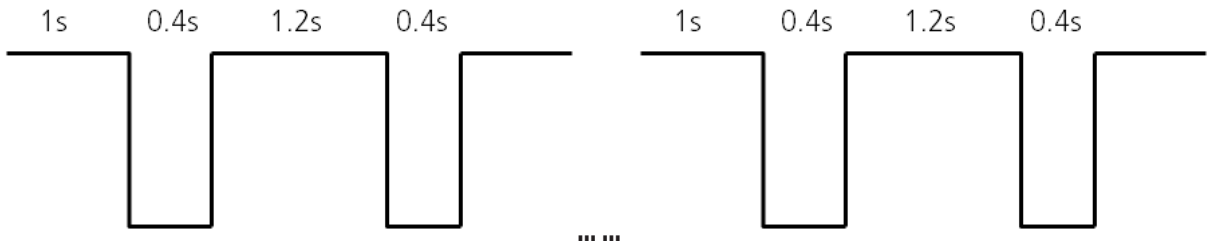
**For other errors:**

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 | |
| EC 51 | ODU EEPROM parameter error | TS01-ODU |
| Eb 01 | IDU & ODU communication error | TS02-S-INV |
| PC 40 | Communication error between outdoor main chip and compressor driven chip | TS31 |
| PC 08 | ODU overcurrent protection | TS08-S |
| PC 10 | ODU low AC voltage protection | TS10-S |
| PC 11 | ODU main control board DC bus high voltage protection | TS10-S |
| PC 12 | ODU main control board DC bus low voltage protection/341 MCE error | TS10-S |
| PC 00 | ODU IPM module protection | TS09-S |
| PC 0F | PFC module protection | TS30 |
| EC 71 | Over current failure of ODU DC fan motor | TS04-ODU |
| EC 72 | Lack phase failure of ODU DC fan motor | TS38 |
| EC 07 | ODU fan speed out of control | TS04-ODU |
| PC 43 | ODU compressor lack phase protection | TS39 |
| PC 44 | ODU zero speed protection | TS08-S |
| PC 45 | ODU IR chip drive failure | TS40 |
| PC 46 | Compressor speed has been out of control | TS08-S |
| PC 49 | Compressor overcurrent failure | TS08-S |
| PC 30 | System high pressure protection | TS26-INV |
| PC 31 | System low pressure protection | TS26-INV |
| PC 0A | High temperature protection of condenser | TS27-INV |
| PC 06 | Discharge temperature protection of compressor | TS32 |
| LC 06 | High temperature protection of Inverter module (IPM) | TS11-S-INV |
| PC 02 | Compressor top (or IPM) temp. protection | TS11-S-INV |
| PH 90 | High temperature protection of evaporator | -- |
| PH 91 | Low temperature protection of evaporator | -- |
| EC 52 | ODU coil temp. sensor (T3) error | TS05-ODU |
| EC 53 | ODU ambient temp. sensor (T4) error | TS05-ODU |
| EC 54 | COMP. discharge temp. sensor (TP) error | TS05-ODU |
| EC 50 | Open or short circuit of outdoor unit temperature sensor(T3,T4.TP) | TS05-ODU |
| PC 0L | Low ambient temperature protection(for some models) | LP |

## 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.<br><br>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.<br><br>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<br>Bit6 Frequency limit caused by PFC<br>Bit5 Frequency limit caused by high temperature of T2.<br>Bit4 Frequency limit caused by low temperature of T2.<br>Bit3 Frequency limit caused by T3.<br>Bit2 Frequency limit caused by TP.<br>Bit1 Frequency limit caused by current<br>Bit0 Frequency limit caused by voltage<br><br>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<br><br>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. Information Inquiry&Setting

- To enter engineer mode, in power-on or standby mode, and in non-locked state, press the key combination “ON/OFF + Air Speed” for 7s:
- After entering the engineer mode, the remote control will display icons of “Auto, Cool, Dry, Heat”, and the Battery icon; at the same time, it will also display the numeric code of the current engineer mode (for the initial engineer mode, the numeric code displayed is 0), and all other icons are inactive.
- In engineer mode, the value of the current numeric code can be adjusted circularly through the Up/Down key, with the setting range of 0 to 30. Each time the current numeric code is adjusted, the special code of the engineer mode will be transmitted with a delay of 0.6s. The code can also be transmitted by pressing “OK”, and the special code of the engineer mode sent contains information of the currently displayed numeric code (if the numeric code is 0, the code to enter the engineer mode will be transmitted).
- In engineer mode, other keys or operations are invalid except for the On/Off key, the Up/Down key, the OK key or executing the operation to exit the engineer mode.

| Code | Query Content | Advanced Function Setting |
|---|---|---|
| 0 | Error code | press “On/Off” for 2s to enter the Capactity, the code displayed is “Ch”, press “OK” to send the Query Capactity code; press the Up/Down key to select 1 to 100K |
| 1 | T1 temperature | press "On/Off" for 2s to enter the Power Down Memory Selector, the code displayed is “Ch”, press "OK" to send the Query Power Down Memory Selector code; press the Up/Down key to select 1 or 0 and press “OK” to confirm, 1 indicates that the power down memory exists, and 0 indicates that no power down memory exists; and press "On/Off" for 2s to exit. (Set within 1 minute after power on) |
| 2 | T2 temperature | press "On/Off" for 2s to enter the Internal Fan Control Selector after the pre-set temperature is reaches, the code displayed is “Ch”, press "OK" to send the Query Internal Fan Control Selector code; press the Up/Down key to select 1 to 13: 1 - Stop the fan, 2 - Min. fan speed, 3 - Set the air speed, 4 - Termal stop for 4min running for 1min, 5 - Termal stop for 8min running for 1min, 6 - Termal stop for 16min running for 1min, 7 - Termal stop for 24min running for 1min, 8 - Termal stop for 48min running for 1min, 9 - Termal stop for 15min running for 2.5min, 10 - Termal stop for 30min running for 2.5min, 11 - Termal stop for 60min running for 2.5min, 12- Set fan speed(but stop the fan when the set fan speed is auto fan) and 13- Breeze fan(but stop the fan when the set fan speed is auto fan) press "OK" to confirm, and press "On/Off" for 2s to exit.(Item 5~13 are valid for some models)(Set within 1 minute after power on) |
| 3 | T3 temperature | press "On/Off" for 2s to enter the Mode Selector, press the Up/Down key to select CH (cool and heat, Auto + Cool + Dry + Heat + Fan), HH (Heat only, Heat only + Fan), CC(Cool only, Auto + Cool + Dry + Fa) or nU (Cool and Heat without Auto, Cool + Dry + Heat + Fan), press "OK" to confirm, and the mode selected can be memorized when the remote control is powered down and powered on; and press "On/Off" for 2s to exit. When the remote control does not burn any parameters, the mode setting will not be memorized.(CC or nU is valid for some models)(Set within 1 minute after power on) |
| 4 | T4 temperature | press the "On/Off" for 2s to enter the Min. Set Temperature Selector, press the Up/Down key to select "16°C~24°C", press "OK" to confirm, and the Min. Set Temperature can be memorized when the remote control is powered on and power lost; and press "On/Off" for 2s to exit. When the remote control does not burn any parameters, the min. set temperature will not be memorized.(Set within 1 minute after power on) |

| | | |
|---|---|---|
| 5 | TP temperature | press "On/Off" for 2s to enter the Max. Set Temperature Selector, press the Up/Down key to select "25°C~30°C", press "OK" to confirm, and the Max. Set Temperature can be memorized when the remote control is powered on and power lost; and press "On/Off" for 2s to exit. When the remote control does not burn any parameters, the max. set temperature will not be memorized.(Set within 1 minute after power on) |
| 6 | Compressor Target Frequency FT | press "On/Off" for 2s to enter the Multi-split Cooling and Heating Preference Selector, the code displayed is "Ch", press "OK" to send the Query Multi-split Cooling and Heating Preference Selector code; press the Up/Down key to select H (heating preferred), C (cooling preferred) or A (master settings), press "OK" to confirm; and press "On/Off" for 2s to exit.(Set within 1 minute after power on)(Only multi models are effective) |
| 7 | Compressor Running Frequency Fr | / |
| 8 | | / |
| 9 | Current AC Voltage Uo | / |
| 10 | | / |
| 11 | | press "On/Off" for 2S to enter the Min. Desired Cooling Frequency Selector, the code displayed is Ch, press "OK" to send the Query Min. Desired Cooling Frequency Selector code; press the Up/Down key to select the minimum cooling frequency desired and press "OK" to confirm; press "On/Off" for 2s to exit.(Range:10-50Hz,--;"--" cancels the Settings)(for some models) (Set within 1 minute after power on) |
| 12 | Set Speed Pr of the outdoor fan | press "On/Off" for 2s to enter the Min. Desired Heating Frequency Selector, the code displayed is "Ch", press "OK" to send the Query Min. Desired Heating Frequency Selector code; press the Up/Down key to select the min. desired heating frequency value, press "OK" to confirm; and press the "On/Off" for 2s to exit.(Range:10-50Hz,--;"--" cancels the Settings) (for some models)(Set within 1 minute after power on) |
| 13 | Opening Lr of EEV | press "On/Off" for 2s to enter the Max. Running Frequency Selector of the restricted area 6 in the cooling mode T4, the code displayed is "Ch", press "OK" to send the Query Max. Running Frequency Selector code of the restricted area 6 in the cooling mode T4; press the Up/Down key to select the limit, then press "OK" to confirm; and press "On/Off" for 2s to exit. (Range:20-150Hz,--;"--" cancels the Settings)(for some models) |
| 14 | Actual Running Speed ir of the indoor fan | press "On/Off" for 2s to enter the Resonance Point Frequency Selector, the code displayed is "Ch", press "OK" to send the Resonance Point Frequency Selector code; press the Up/Down key to select the outdoor forced running frequency("10-250Hz"), then press "OK" to confirm; and press "On/Off" for 2s to exit.(Range:10-250Hz,--;"--" cancels the Settings)(for some models) |
| 15 | Indoor Humidity Hu | press "On/Off" for 2s to enter the Outdoor Forced Running Frequency Selector, the code displayed is "Ch", press "OK" to send the Query Outdoor Forced Running Frequency Selector code; press the Up/Down key to select the outdoor forced running frequency("10-250Hz"), then press "OK" to confirm; and press "On/Off" for 2s to exit.(Range:10-250Hz,--;"--" cancels the Settings)(for some models) |
| 16 | Set Temperature TT after compensation | press "On/Off" for 2s to enter One-Key Recovery, the code displayed is "rS", then press "OK" to send the One-Key Recovery code, the mode selector of the remote control will recover to "Cooling and heating", the min. temperature recovers to 16°C, and the max. temperature recovers to 30°C; and press "On/Off" for 2s to exit.(for some models) |

| | | |
|---|---|---|
| 17 | / | / |
| 18 | WIFI signal strength | press “On/Off” for 2s to enter Model Selection the code displayed is “Ch”, then press “OK” to send the Model Selection code, press the Up/Down key to select,such as 23,26,32,35,51,72,120 etc; and press “On/Off” for 2s to exit. |
| 19 | Dc bus voltage AD value | press "On/Off" for 2s to enter the Cooling Frequency Threshold Settings; press the Up/Down key to select the cooling frequency threshold, press "OK" to confirm; and press the "On/Off" for 2s to exit. (Range:40,41……83,84,--;”--” cancels the Settings)(Set within 1 minute after power on) |
| 20 | Indoor Target Frequency oT | press "ON/OFF" for 2s to enter the Heating Frequency Threshold Settings; press the Up/Down key to select the heating frequency threshold, press "OK" to confirm; and press "On/Off" for 2s to exit.(Range:40,41……83,84,--;”--” cancels the Settings) (Set within 1 minute after power on) |
| 21 | Reserve | press "On/Off" for 2s to enter the Cooling Temperature Compensation Value Settings, the code displayed is “Ch”, then press "OK" to send the Query Cooling Temperature Compensation Value code; press the Up/Down key to select the cooling temperature compensation value, then press "OK"; and press "On/Off" for 2s to exit.(Range:-3.0,-2.5,-2.0…2.0,2.5,3.0,3.5,--;”--” cancels the Settings) |
| 22 | | press "On/Off" for 2s to enter the Heating Temperature Compensation Value Settings, the code displayed is “Ch”, press "OK" to send the Query Heating Temperature Compensation Value code; press the Up/Down key to select the heating temperature compensation value, then press "OK"; and press "On/Off" for 2s to exit.(Range:-6.5,-6,…1.0,1.5,2.0…6.0,6.5,7.0,7.5,--;”--” cancels the Settings) |
| 23 | | press "On/Off" for 2s to enter the Max. Cooling Air Speed Settings, the code displayed is “Ch”, press "OK" to send the Query Max. Cooling Air Speed code; press the Up/Down key to select the max. cooling air speed, then press "OK"; and press "On/Off" for 2s to exit.(Range: -41,-40,-39…17,18,19,20,--;”--” cancels the Settings) |
| 24 | | press "On/Off" for 2S to enter the Min. Cooling Air Speed Settings, the code displayed is "Ch", press "OK" to send the Query Min. Cooling Air Speed code; press the Up/Down key to select the minimum cooling air speed and press "OK" to confirm; press "On/Off" for 2s to exit.(Range: -41,-40,-39… 17,18,19,20,--;”--” cancels the Settings) |
| 25 | | press "On/Off" for 2s to enter the Max. Heating Air Speed Settings, the code displayed is "Ch", press "OK" to send the Query Max. Heating Air Speed code; press the Up/Down key to select the maximum heating air speed and press "OK" to confirm; press "On/Off" for 2s to exit.(Range: -41,-40,-39… 17,18,19,20,--;”--” cancels the Settings) |
| 26 | | press "On/Off" for 2s to enter the Min. Heating Air Speed Settings, the code displayed is "Ch", press "OK" to send the Query Min. Heating Air Speed code; press the Up/Down key to select the minimum heating air speed and press "OK" to confirm; press "On/Off" for 2s to exit.(Range: -41,-40,-39… 17,18,19,20,--;”--” cancels the Settings) |
| 27 | | / |
| 28 | | press “On/Off” for 2s to enter the The Temperature of Stop Fan, the code displayed is “Ch”, press “OK” to send the The Temperature of Stop Fan code; press the Up/Down key to select 16,17,18...28 and press “OK” to confirm; press “On/Off” for 2s to exit. |
| 29 | | |
| 30 | | |

- In Channel 1~30 settings of the engineer mode, long press the On/off key to return the previous engineer mode.
- When the setting is successful, "CS" will be displayed;When the setting fails, "CF "will be displayed.

Exit of engineer mode:

1)In engineer mode, press the key combination of "On/Off + Air speed" for 2s;

2)The engineer mode will be exited if there are no valid key operations for continuous 60s.

Error code of engineer mode

| Display | Error Information |
|---|---|
| nR | No fault or protection |
| EH00 | IDU EEPROM malfunction |
| EH0R | Indoor EEPROM parameter error |
| EL01 | IDU & ODU communication error |
| EHbR | Communication error between indoor unit and indoor external fan module |
| EH30 | Parameters error of indoor external fan |
| EH35 | Phase failure of indoor external fan |
| EH36 | Indoor external fan current sampling bias fault |
| EH37 | Indoor external fan zero speed failure |
| EH38 | Indoor external fan stall failure |
| EH39 | Out of step failure of indoor external fan |
| EH3R | Low voltage protection of indoor external fan DC bus |
| EH3b | Indoor external fan DC bus voltage is too high fault |
| EH3E | Indoor external fan overcurrent fault |
| EH3F | Indoor external fan module protection/hardware overcurrent protection |
| EH03 | IDU fan speed out of control |
| EC51 | ODU EEPROM parameter error |
| EC52 | ODU coil temp. sensor (T3) error |
| EC53 | ODU ambient temp. sensor (T4) error |
| EC54 | COMP. discharge temp. sensor (TP) error |
| EC55 | ODU IPM module temp.sensor(TH) error |
| EC0d | Outdoor unit malfunction |
| EH60 | IDU room temp. sensor (T1) error |
| EH61 | Evaporator coil temperature sensor T2 is in open circuit or short circuit |
| EC71 | Outdoor external fan overcurrent fault |
| EC75 | Outdoor external fan module protection/hardware overcurrent protection |
| EC72 | Outdoor external fan phase failure |
| EC74 | Outdoor external fan current sampling bias fault |
| EC73 | Zero speed failure of outdoor unit DC fan |
| EC07 | ODU fan speed out of control( |
| EL0C | System lacks refrigerant |

| | |
|---|---|
| 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 |
| PC0R | High temperature protection of condenser |
| PH0C | Indoor unit humidity sensor malfunction |
| LH00 | Evaporator temp. freq.limited(L0) |
| LH30 | Indoor external fan current freq. limited |
| LH31 | Indoor external fan voltage freq. limited |
| 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 |
| LC30 | High pressure freq. limited |
| LC31 | Low pressure freq. limited |
| LH07 | Remote control frequency limitation in effect |
| -- | IDUs mode conflict(Multi-zone) |

# 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.

| No. | Problem | Solution |
|---|---|---|
| 1 | Unit will not start | TS17 - TS18 |
| 2 | The power switch is on but fans will not start | TS17 - TS18 |
| 3 | The temperature on the display board cannot be set | TS17 - TS18 |
| 4 | Unit is on but the wind is not cold(hot) | TS17 - TS18 |
| 5 | Unit runs, but shortly stops | TS17 - TS18 |
| 6 | The unit starts up and stops frequently | TS17 - TS18 |
| 7 | Unit runs continuously but insufficient cooling(heating) | TS17 - TS18 |
| 8 | Cool can not change to heat | TS17 - TS18 |
| 9 | Unit is noisy | TS17 - TS18 |

## 6.2 Field maintenance

| | Problem | Solution |
|---|---|---|
| 1 | Unit will not start | TS19 - TS20 |
| 2 | Compressor will not start but fans run | TS19 - TS20 |
| 3 | Compressor and condenser (outdoor) fan will not start | TS19 - TS20 |
| 4 | Evaporator (indoor) fan will not start | TS19 - TS20 |
| 5 | Condenser (Outdoor) fan will not start | TS19 - TS20 |
| 6 | Unit runs, but shortly stops | TS19 - TS20 |
| 7 | Compressor short-cycles due to overload | TS19 - TS20 |
| 8 | High discharge pressure | TS19 - TS20 |
| 9 | Low discharge pressure | TS19 - TS20 |
| 10 | High suction pressure | TS19 - TS20 |
| 11 | Low suction pressure | TS19 - TS20 |
| 12 | Unit runs continuously but insufficient cooling | TS19 - TS20 |
| 13 | Too cool | TS19 - TS20 |
| 14 | Compressor is noisy | TS19 - TS20 |
| 15 | Horizontal louver can not revolve | TS19 - TS20 |

| 1.Remote Maintenance | Electrical Circuit | | | | | | | Refrigerant Circuit | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Possible causes of trouble** | Power failure | The main power tripped | Loose connections | Faulty transformer | The voltage too high or too low | The remote control is powered off | Broken the remote control | Dirty air filter | Dirty condenser fins | The setting temperature is higher/lower than the room's(cooling/heating) | The ambient temperature is too high/low when the mode is cooling/heating | Fan mode | SILENCE function is activated(Optional function) | Frosting and defrosting frequently | |
| Unit will not start | ☆ | ☆ | ☆ | ☆ | | | | | | | | | | | |
| The power switch is on but fans will not start | | | ☆ | ☆ | ☆ | | | | | | | | | | |
| The 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 | Change the transformer | Test voltage | Replace the battery of the remote control | Replace the remote control | Clean or replace | Clean | Adjust the setting temperature | Turn on the AC later | Adjust to cool mode | Turn off the SILENCE funciton | Turn on the AC later | |

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

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

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

## 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

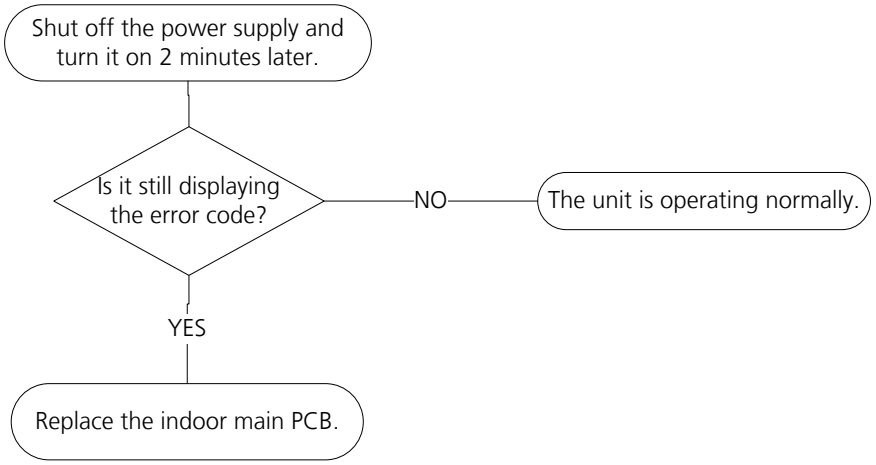
## TS01-IDU: IDU EEPROM malfunction or indoor EEPROM parameter error diagnosis and solution

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

**Recommended parts to prepare:**

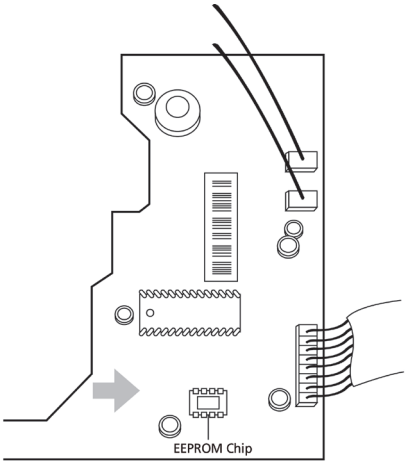
- Indoor PCB

**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.**

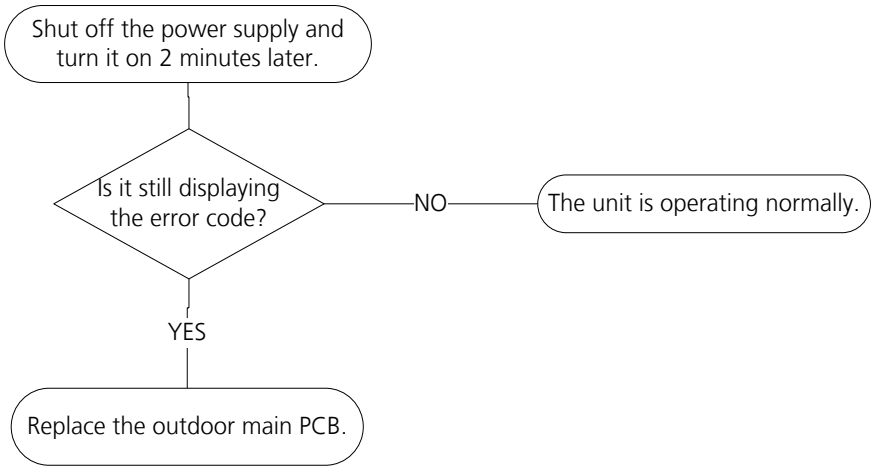
## TS01-ODU: ODU EEPROM parameter error diagnosis and solution

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

**Recommended parts to prepare:**

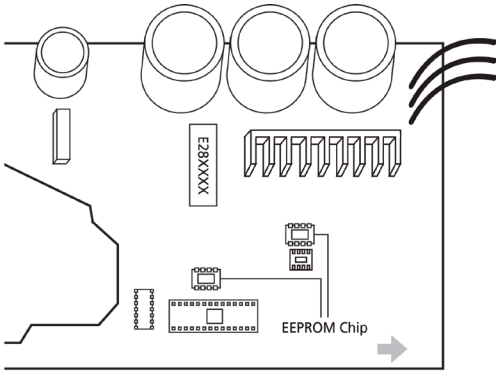
- Outdoor PCB

**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.**

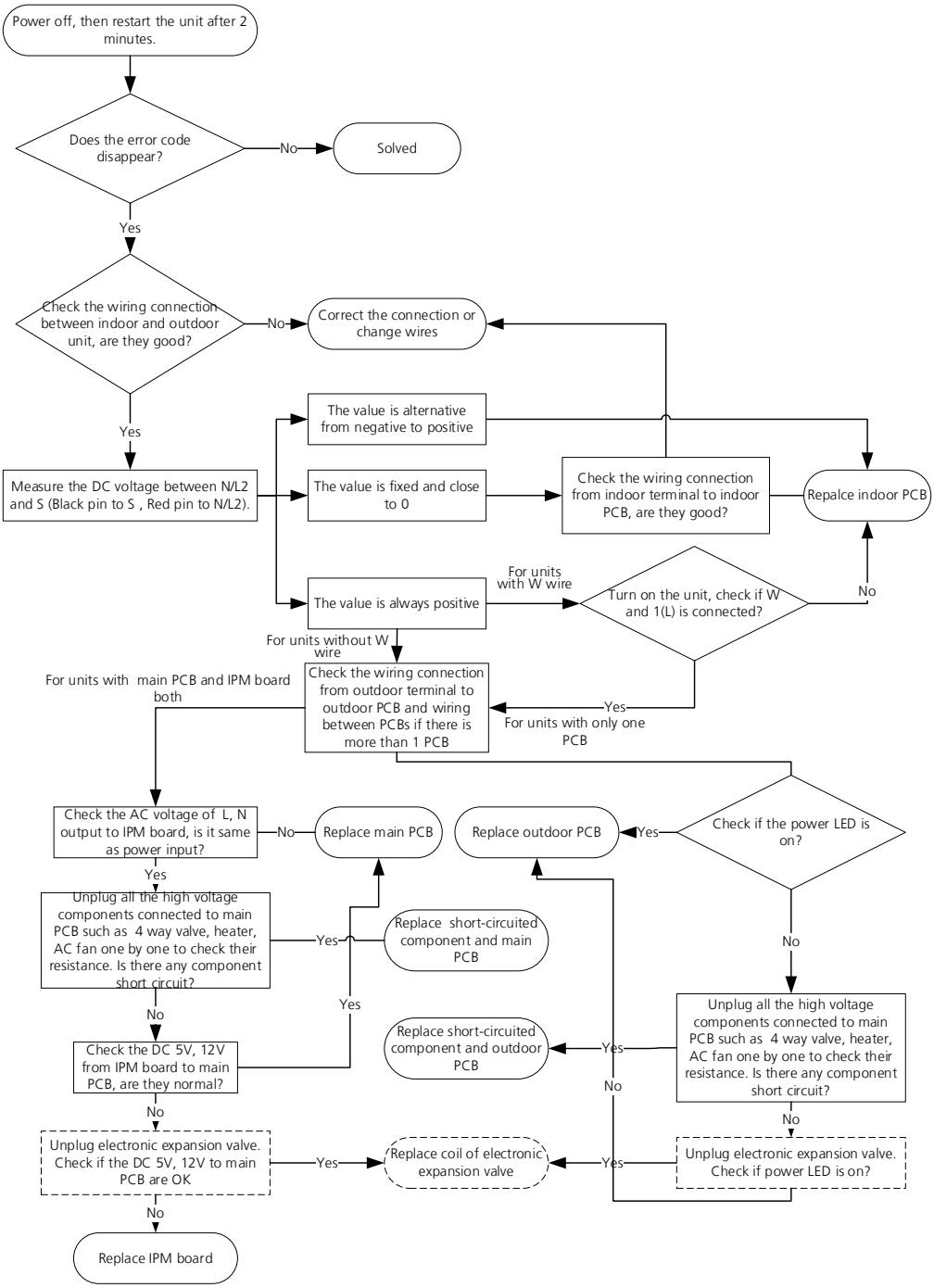
## TS02-S-INV: IDU & ODU communication error diagnosis and solution

**Description**: Indoor unit can not communicate with outdoor unit

**Recommended parts to prepare:**

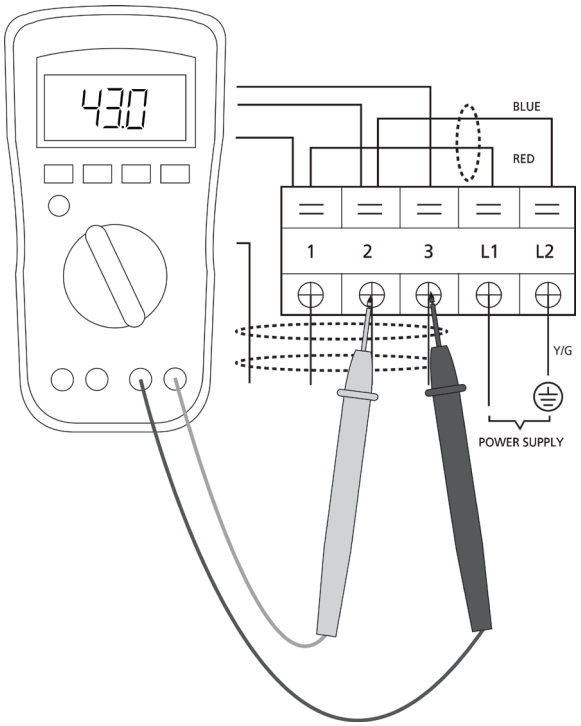
- Indoor PCB
- Outdoor PCB
- Short-circuited component

**Troubleshooting and repair:**



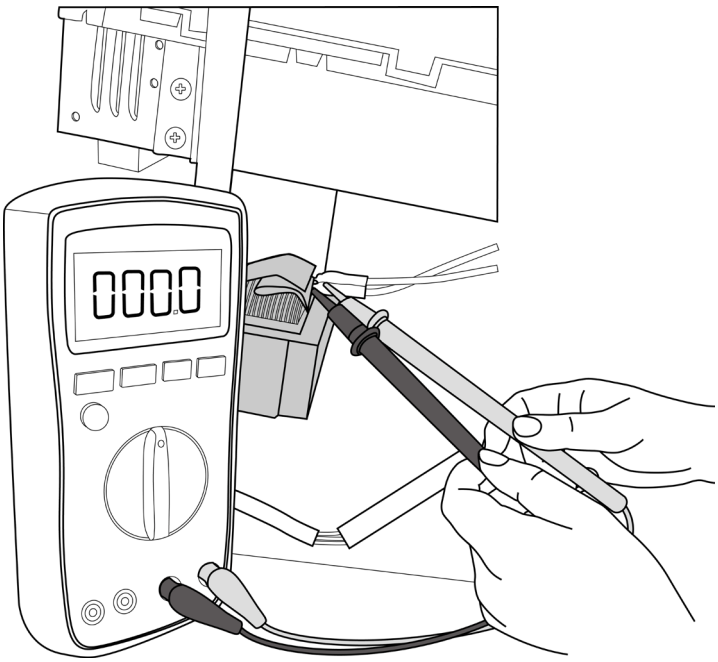
**Remarks:**

- 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.**

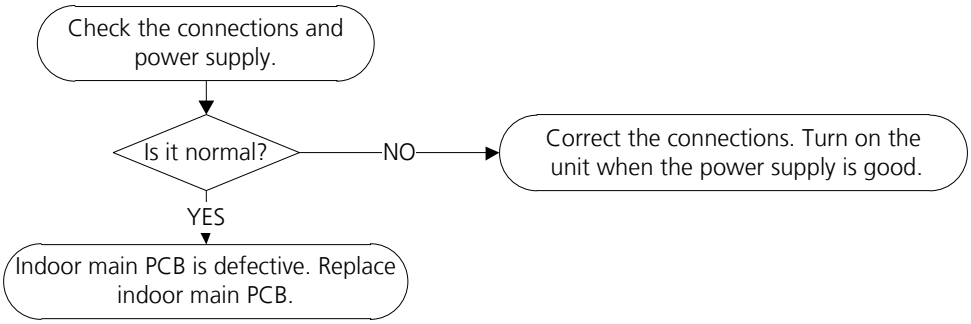
## TS03: Zero crossing detection error diagnosis and solution

**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.**

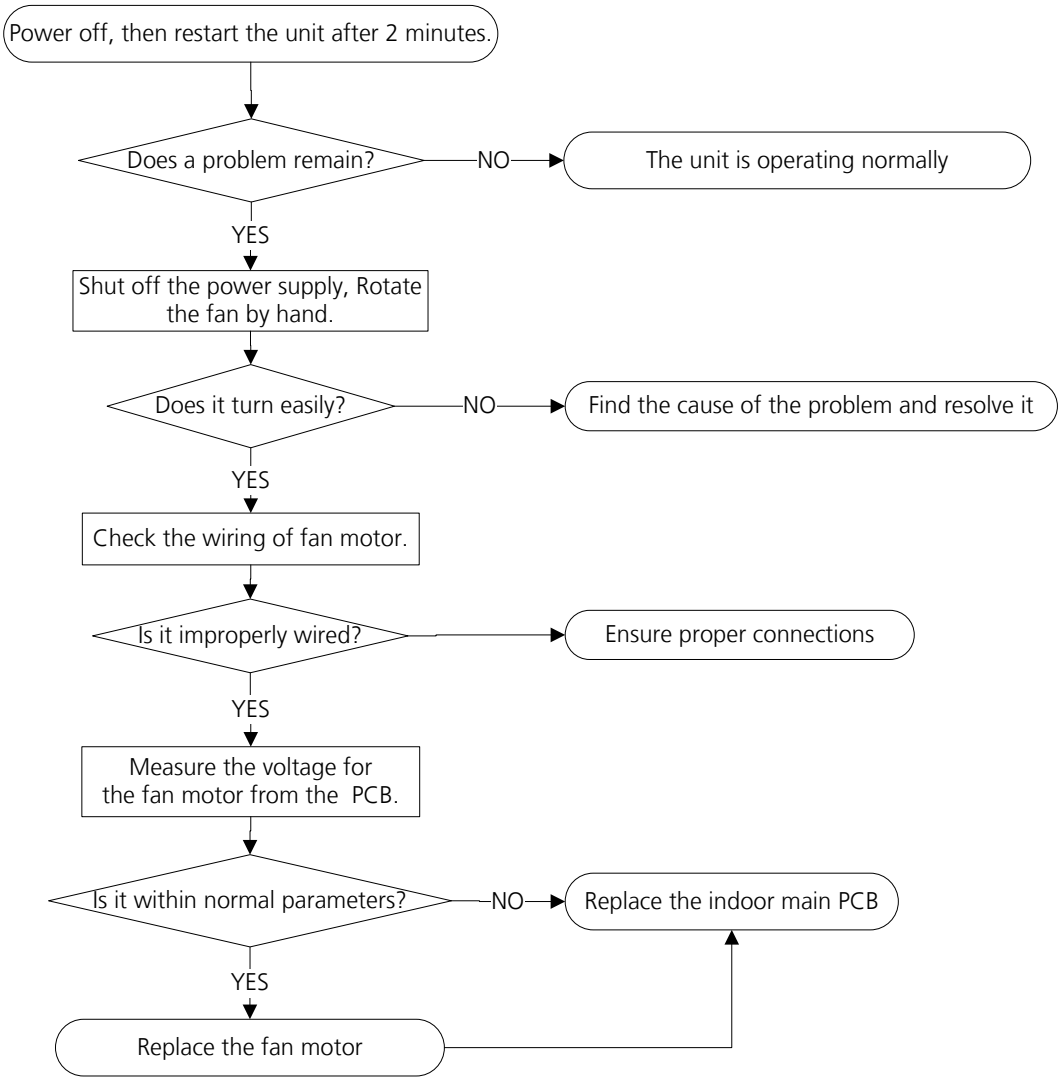
## TS04-S-IDU: The Indoor fan speed is operating outside of normal range diagnosis and solution)

**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 or Outdoor DC Fan Motor(control chip is in fan motor)

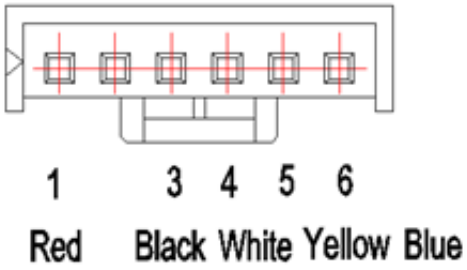
Power on and when the unit is in standby, measure the voltage of pin1-pin3, pin4-pin3 in fan motor connector. If the value of the voltage is not in the range showing in below table, the PCB must has problems and need to be replaced.

- 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 |

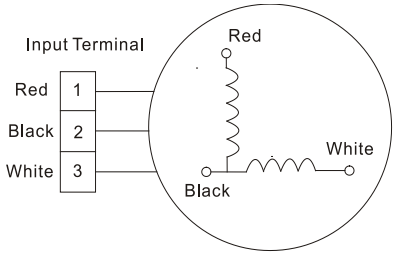
- DC motor voltage input and output (voltage: 115V~):

| 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.



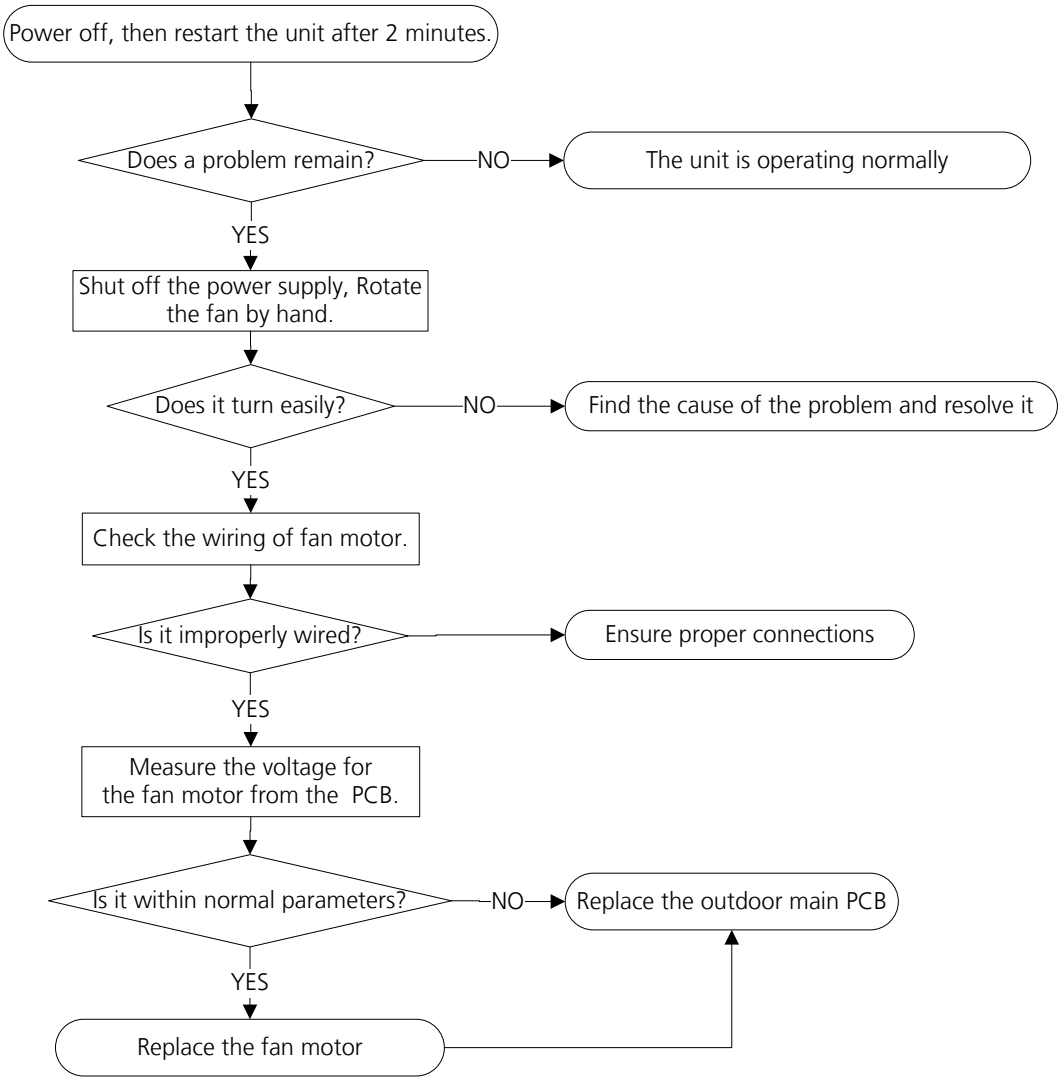
## TS04-ODU: The outdoor fan speed is operating outside of normal range diagnosis and solution)

**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

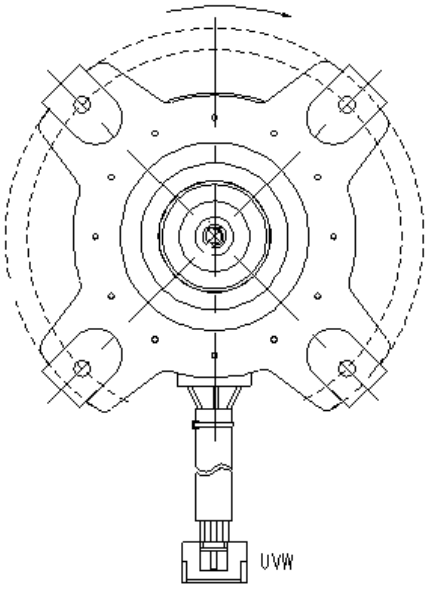
**Troubleshooting and repair:**



**Index:**

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

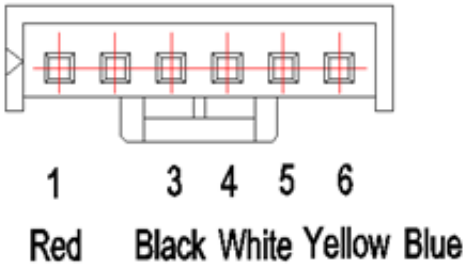
Release the UVW connector. Measure the resistance of U-V, U-W, V-W. If the resistance is not equal to each other, the fan motor must has problems and need to be replaced. otherwise the PCB must has problems and need to be replaced.




### 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 |



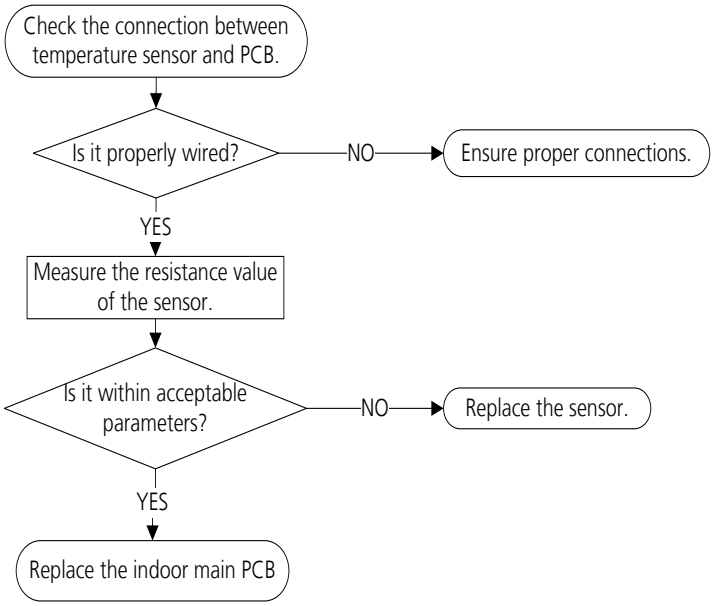
## TS05-IDU: Open circuit or short circuit of indoor temperature sensor(T1, T2) diagnosis and solution

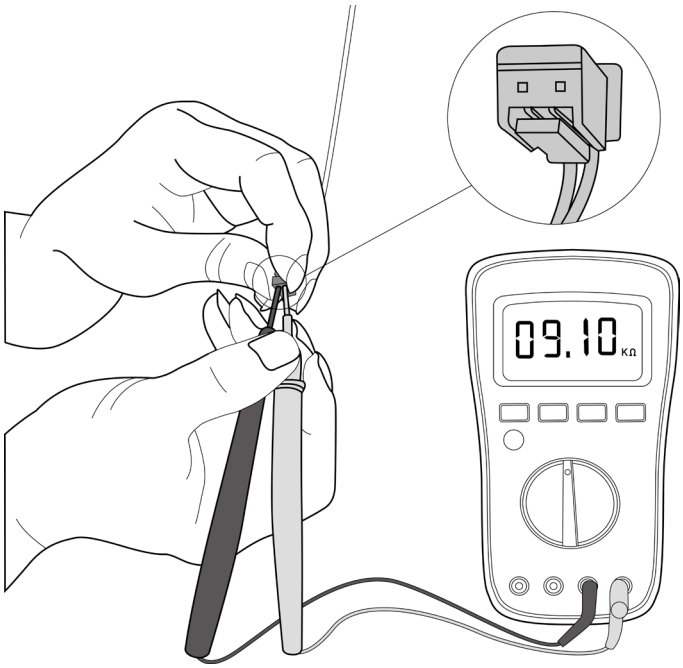
**Description**: If the sampling voltage is lower than 0.06V or higher than 4.94V, the LED displays the failure code.

**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.**

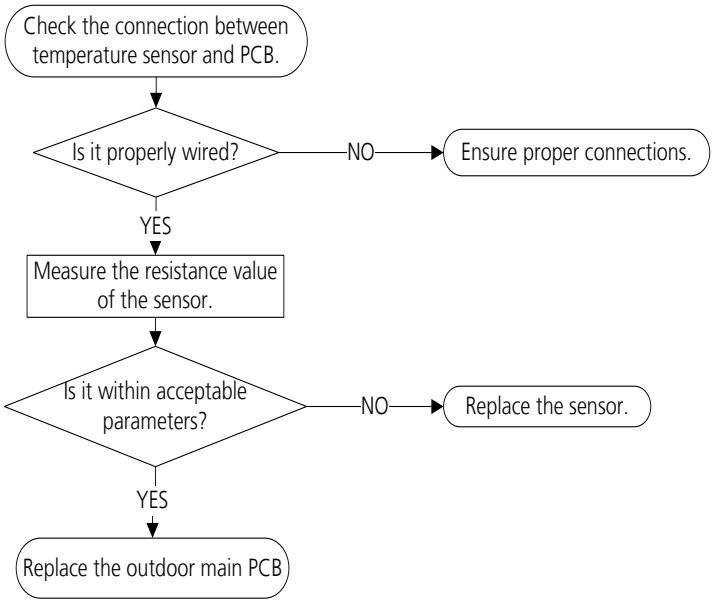
## TS05-ODU: Open circuit or short circuit of outdoor temperature sensor(T3, T4, TP, T2B,TH) diagnosis and solution

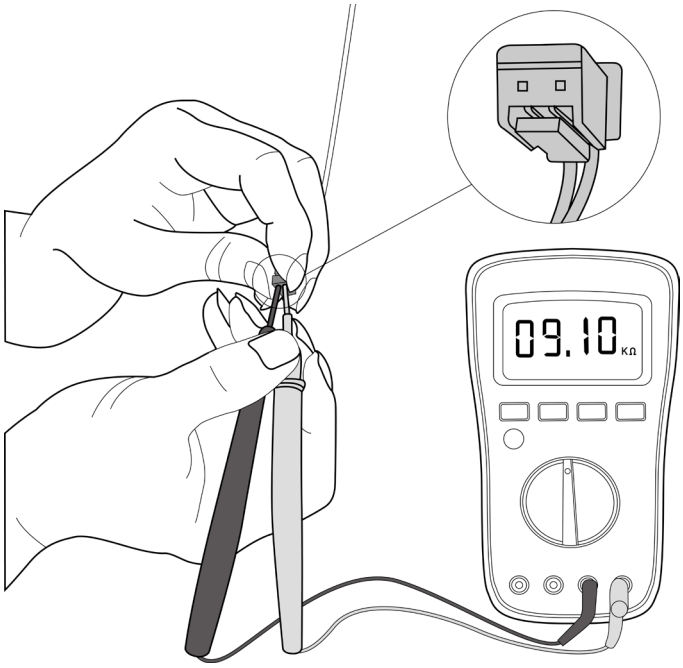
**Description**: If the sampling voltage is lower than 0.06V or higher than 4.94V, the LED displays the failure code.

**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.**

## TS06-INV: System lacks refrigerant diagnosis and solution

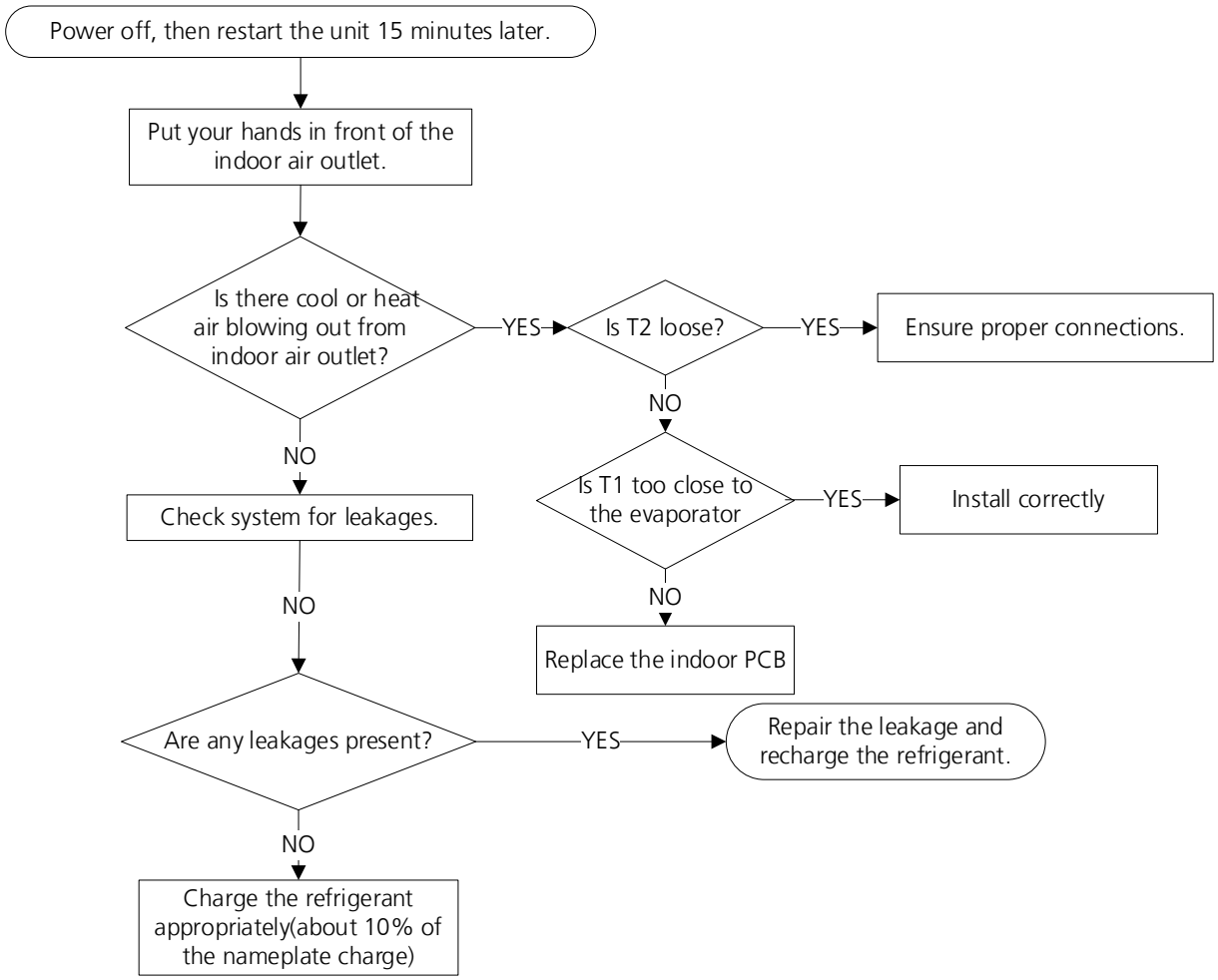
**Description**:

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:**



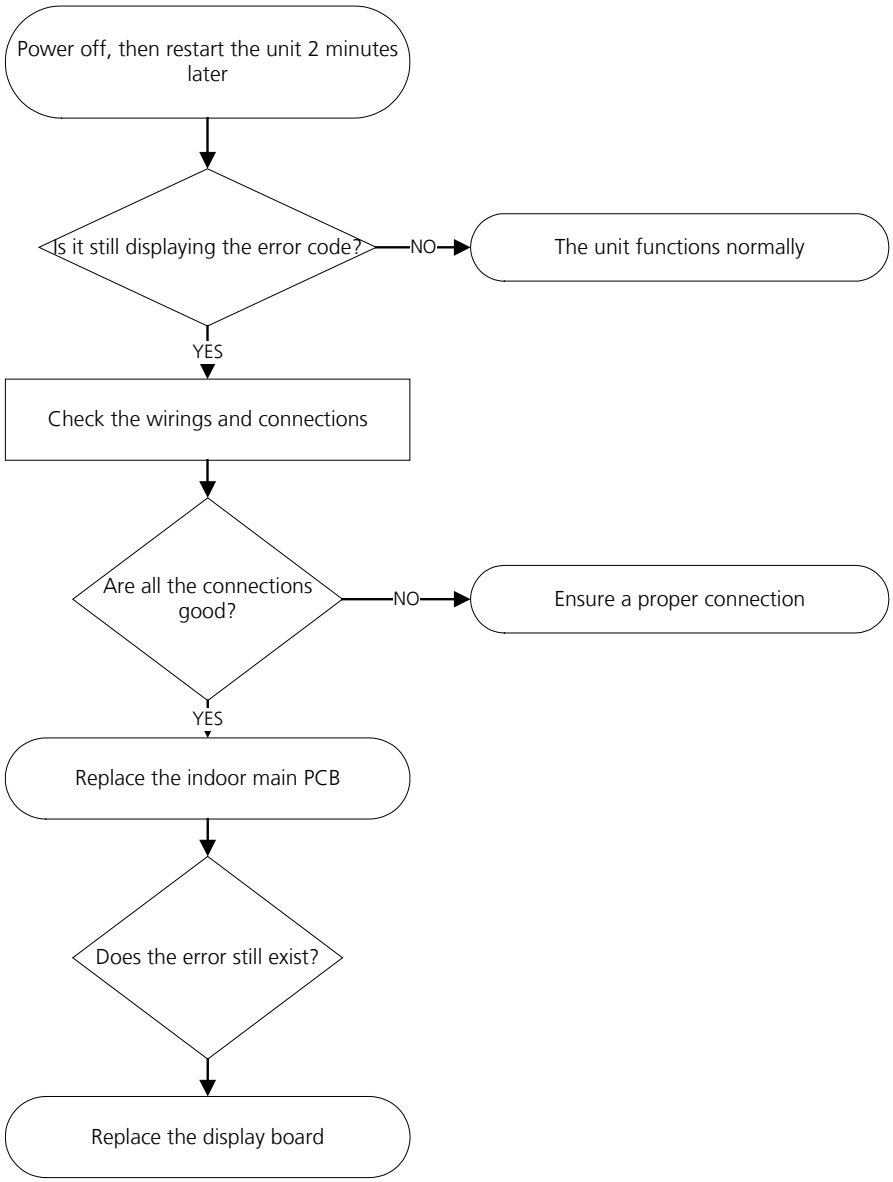
## TS07: Indoor PCB / Display board communication error diagnosis and solution

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

**Recommended parts to prepare:**

- Communication wire
- Indoor PCB
- Display board

**Troubleshooting and repair:**



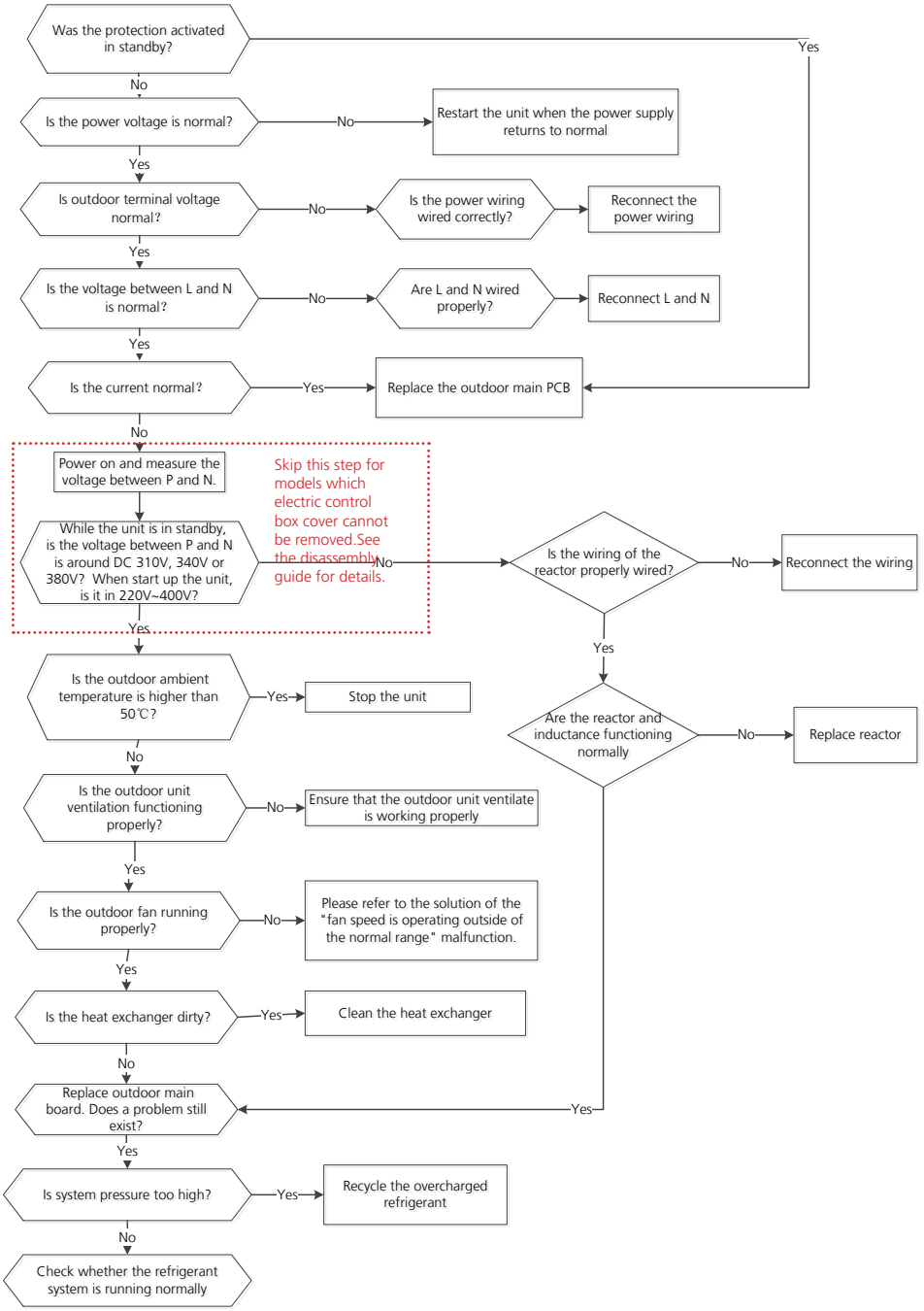
## TS08-S: Current overload protection diagnosis and solution

**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:**



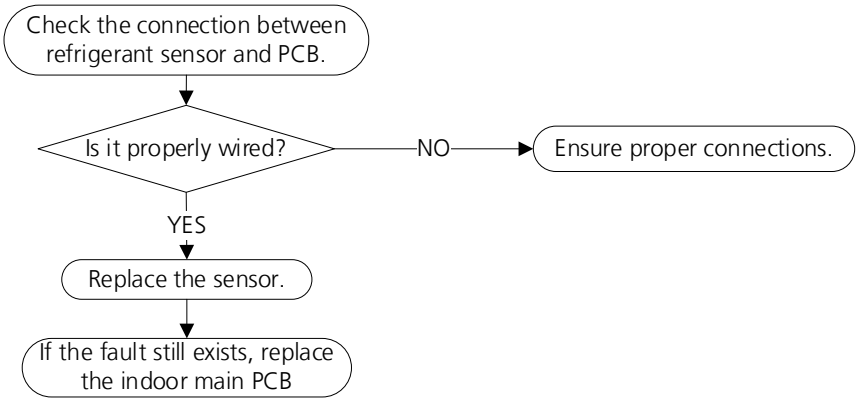
## TS05-N10: Refrigerant sensor error or Refrigerant sensor is out of range diagnosis and solution

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

**Recommended parts to prepare:**

- Connection wires
- Sensors
- Indoor main PCB

**Troubleshooting and repair:**



## TS06-N10: Refrigerant sensor detects leakage or Refrigerant sensor is out of range and leakage is detected diagnosis and solution

**Description:**

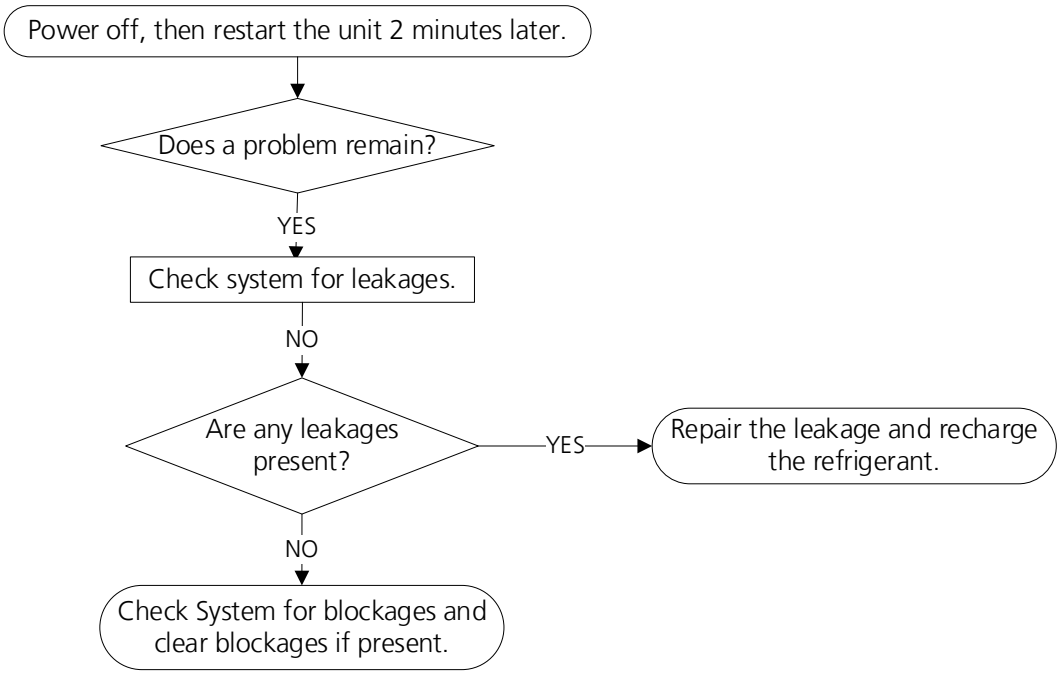
The refrigerant sensor detects a concentration higher than or equal to 10%*LFL for 10 seconds or the refrigerant sensor detects a concentration higher than or equal to 20%*LFL or the multi model receives the refrigerant leakage protection fault sent by the outdoor unit.

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

**Recommended parts to prepare:**

• Additional refrigerant

**Troubleshooting and repair:**



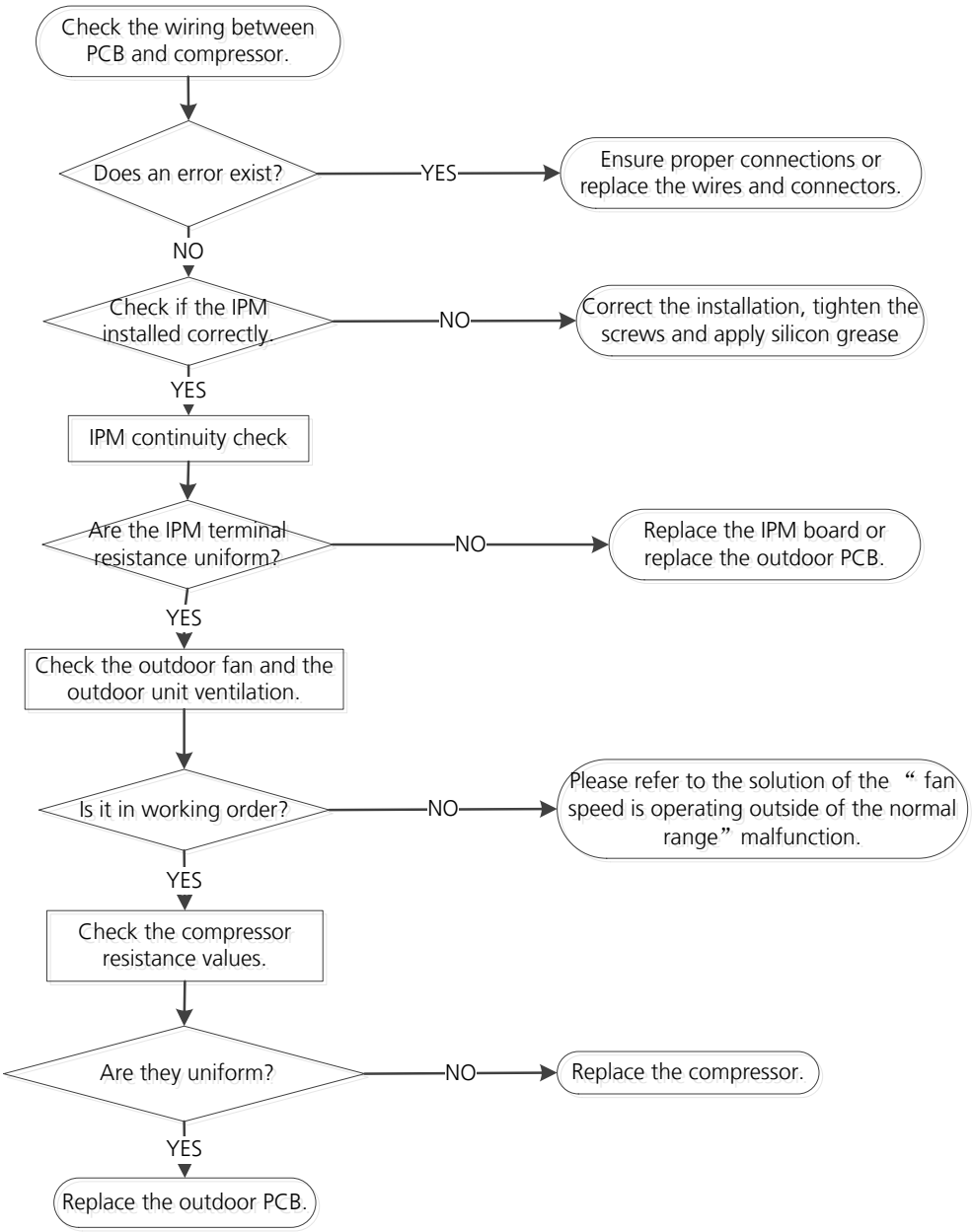
## TS09-S: ODU IPM module protection diagnosis and solution

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

**Recommended parts to prepare:**

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

**Troubleshooting and repair:**



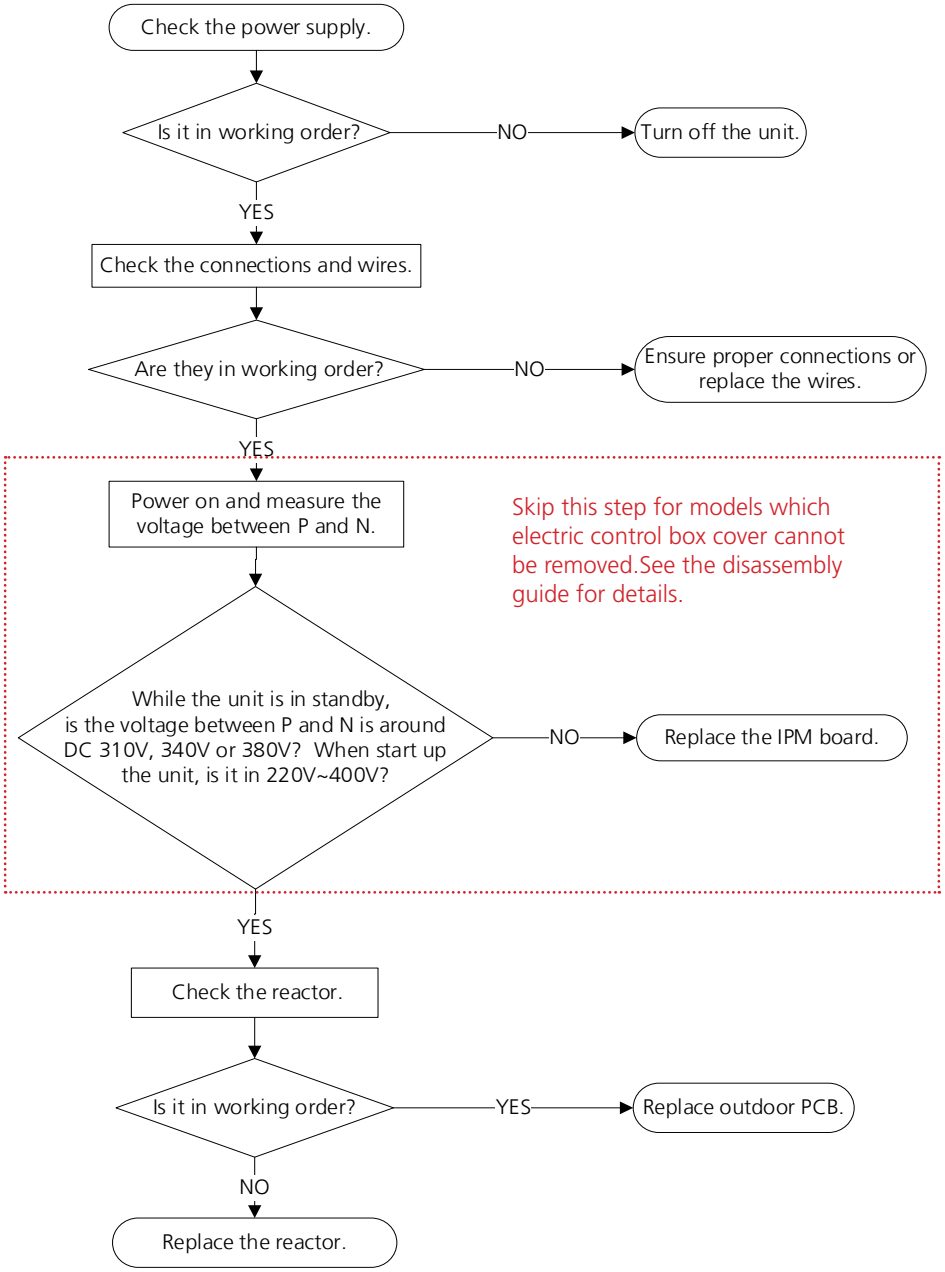
## TS10-S: ODU voltage protection diagnosis and solution

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

**Recommended parts to prepare:**

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

**Troubleshooting and repair:**



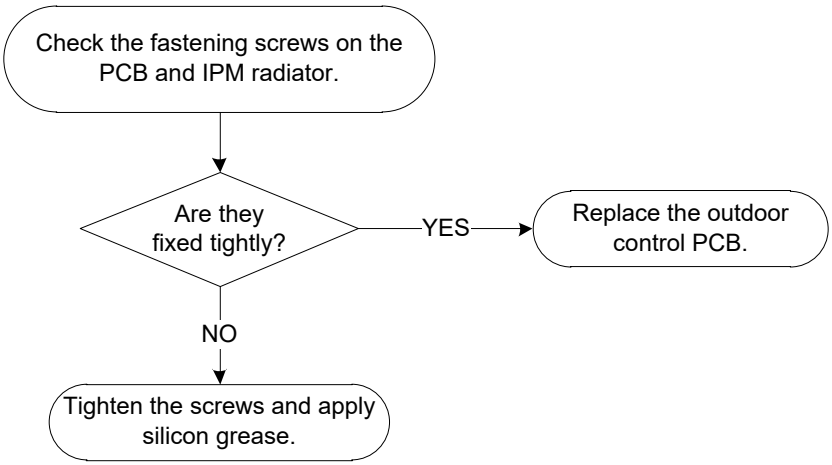
## TS11-S-INV: Compressor top (or IPM) temp. protection diagnosis and solution

**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
- IPM module board
- High pressure protector
- System blockages

**Troubleshooting and repair:**



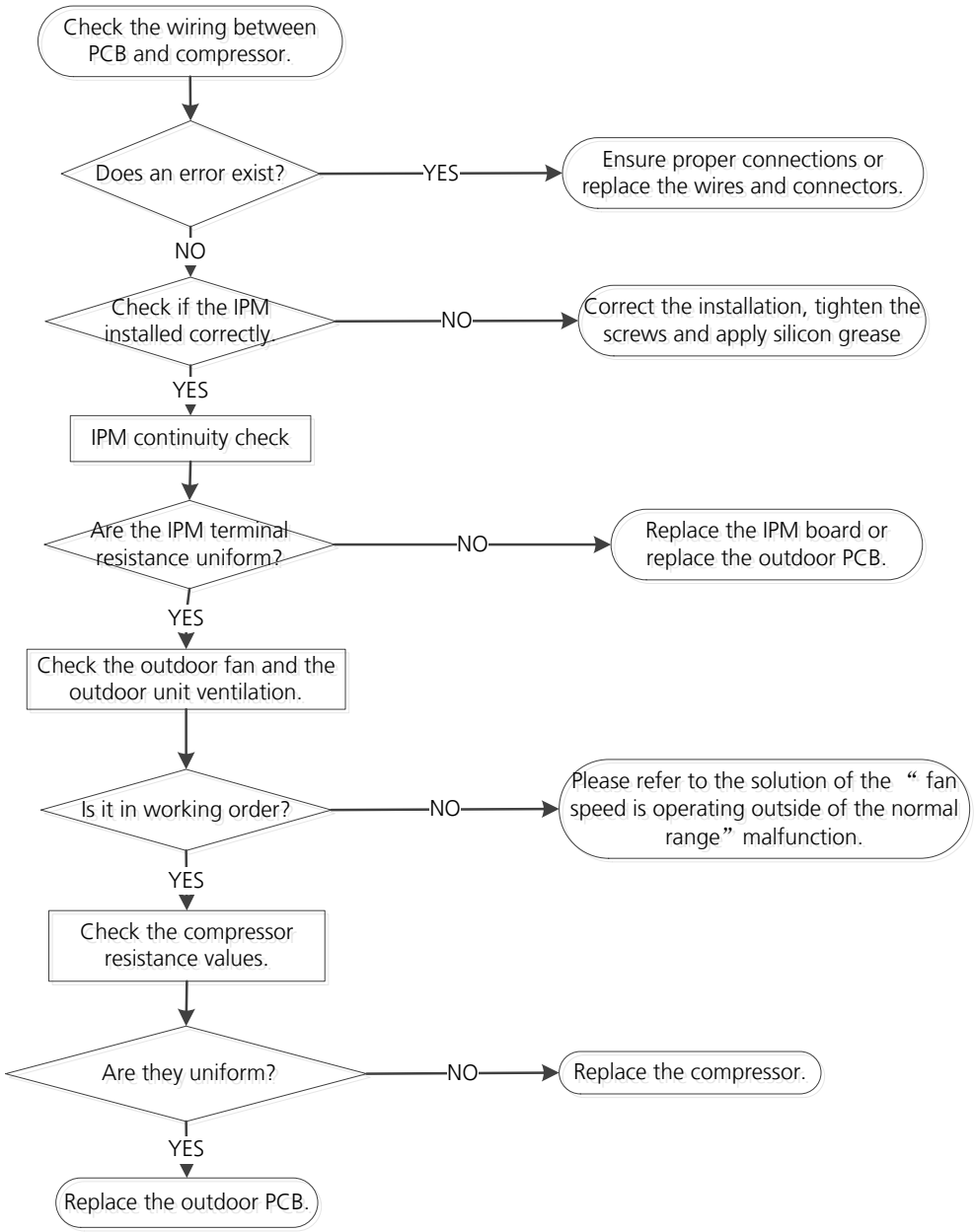
## TS12-S: Inverter compressor drive error diagnosis and solution

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

**Recommended parts to prepare:**

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

**Troubleshooting and repair:**



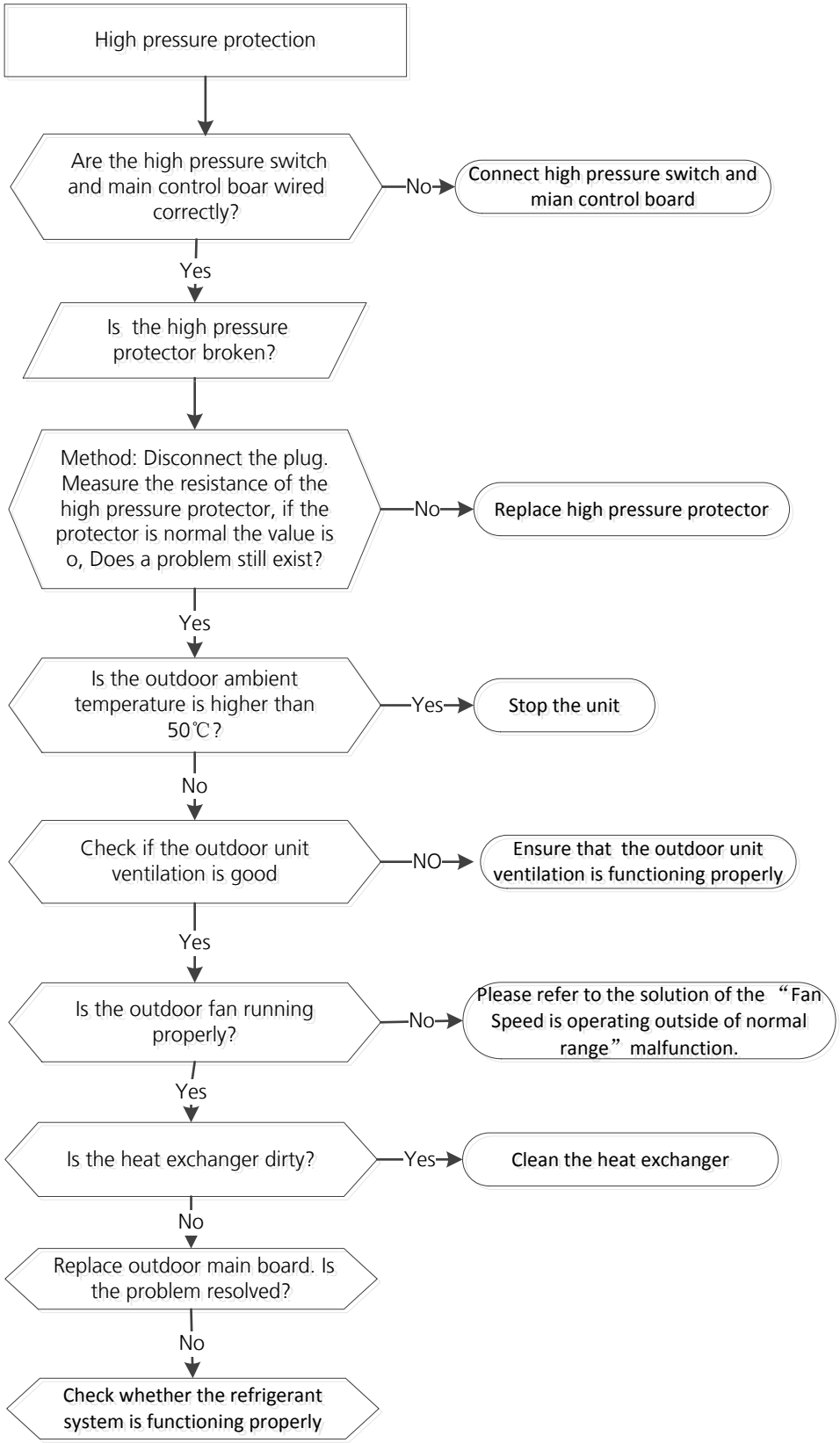
## TS26-INV:  System Pressure protection(low or high pressure) diagnosis and solution

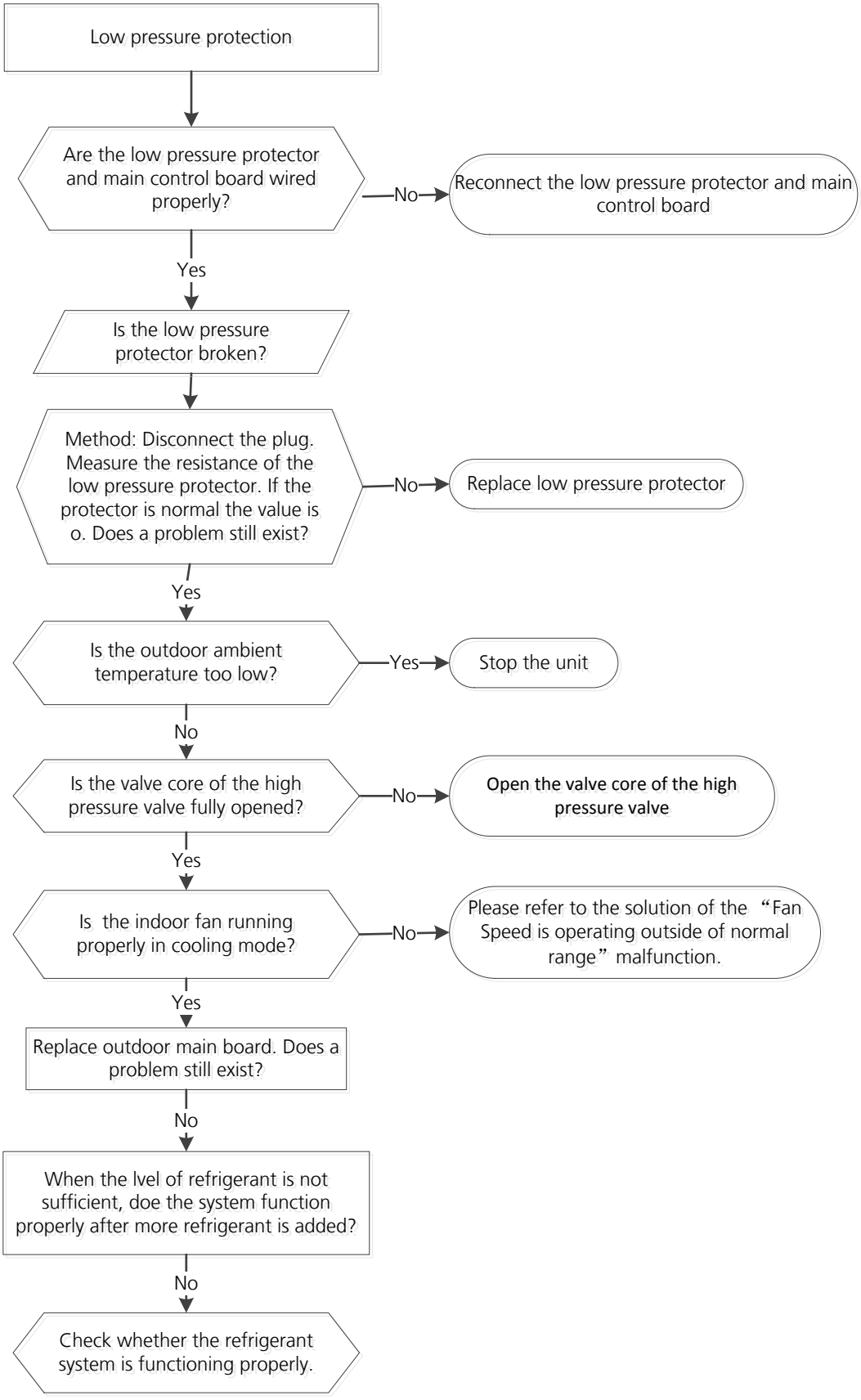
**Description:** Outdoor pressure switch cut off the system because high pressure is higher than 4.4 MPa or outdoor pressure switch cut off the system because low pressure is lower than 0.13 MPa, the LED displays the failure code.

**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.

### TS14: 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

## LP (Low temperature protection of outdoor uni)

**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.

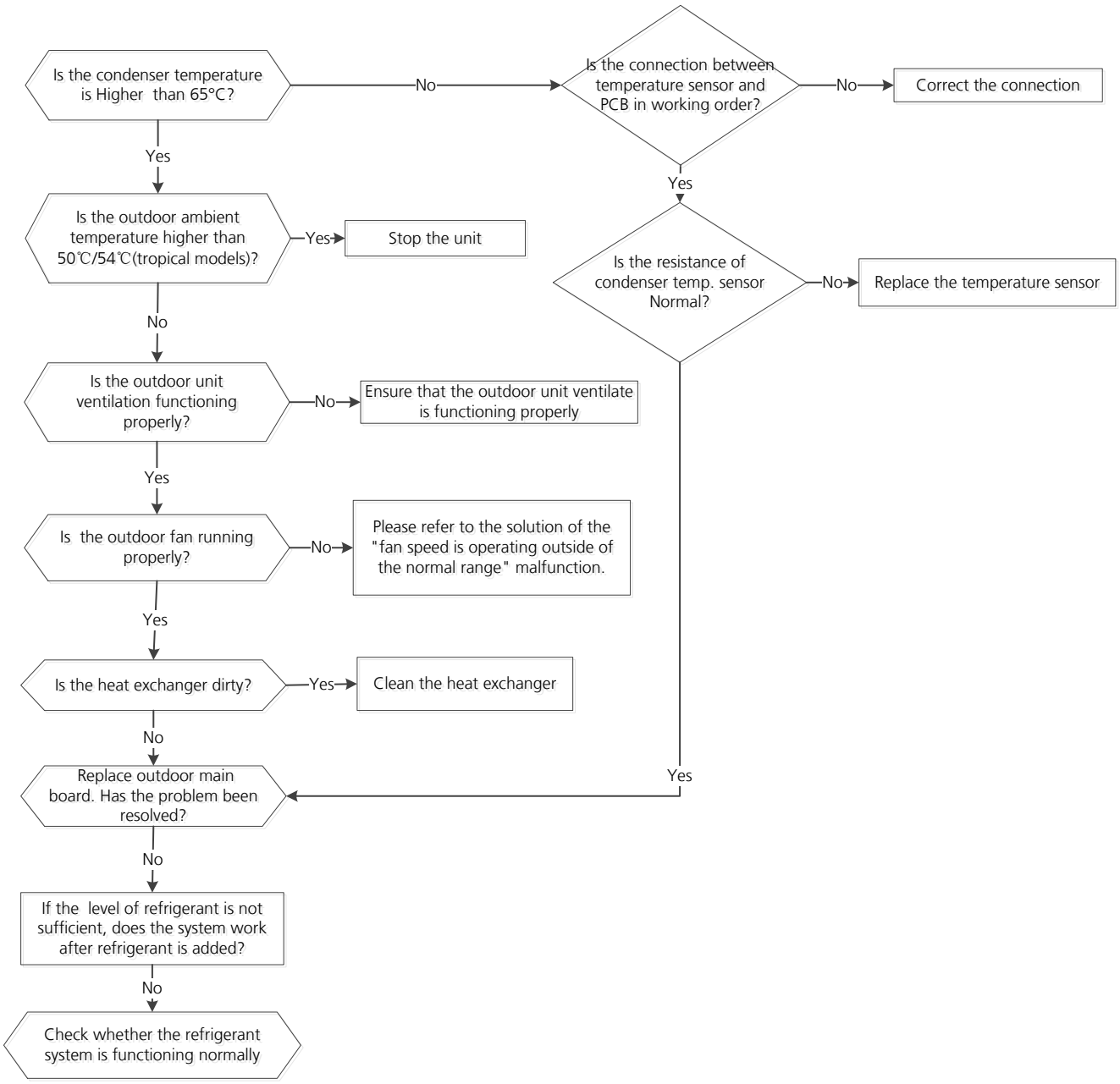
## TS27-INV: High temperature protection of condenser diagnosis and solution

**Description**: When the outdoor pipe temperature is more than 65°C, the unit stops. It starts again only when the outdoor pipe temperature is less than 52°C.

**Recommended parts to prepare:**

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

**Troubleshooting and repair:**



## TS30: PFC module protection diagnosis and solution

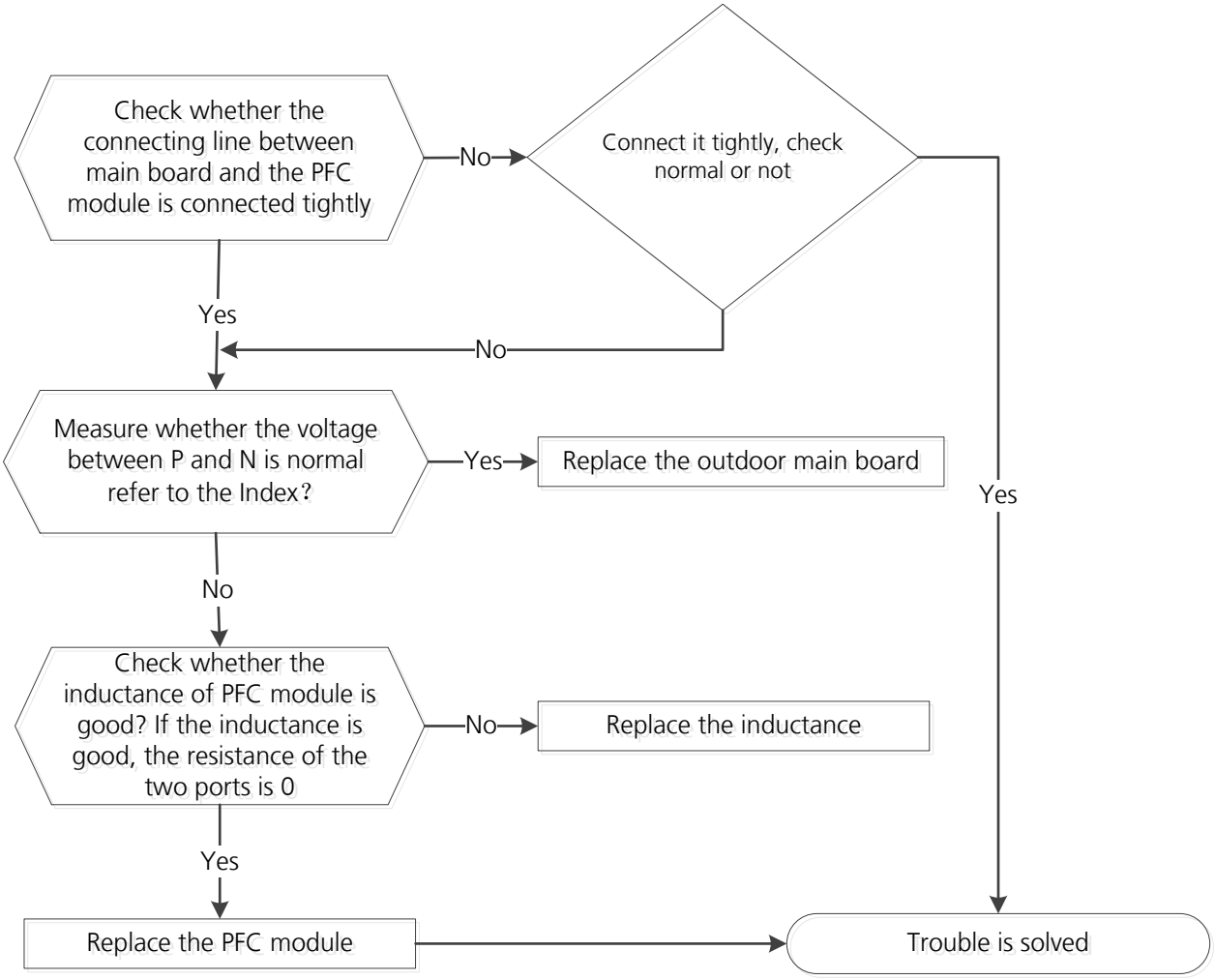
**Description**: When the voltage signal that IPM send to compressor drive chip is abnormal, the LED displays the failure code and the AC turns off.

**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:



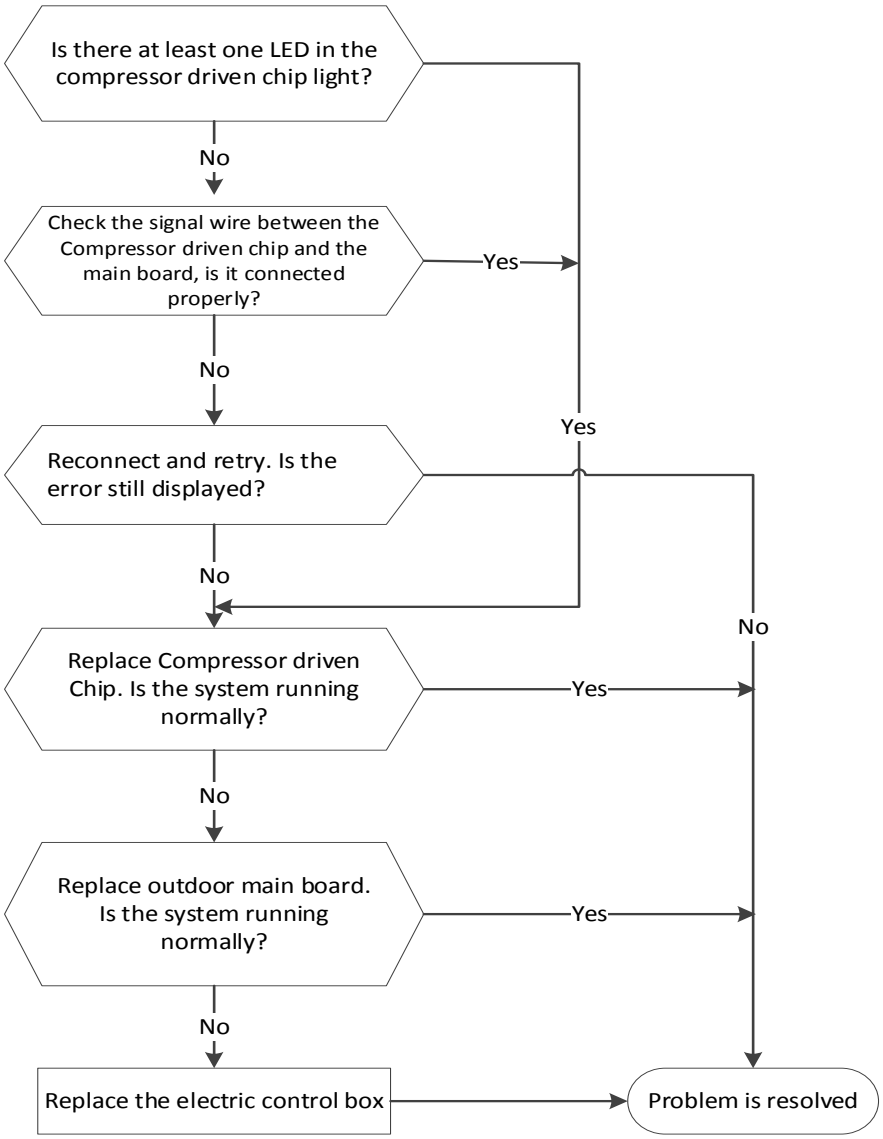
## TS31: Communication error between outdoor main chip and compressor driven chip diagnosis and solution

**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:**



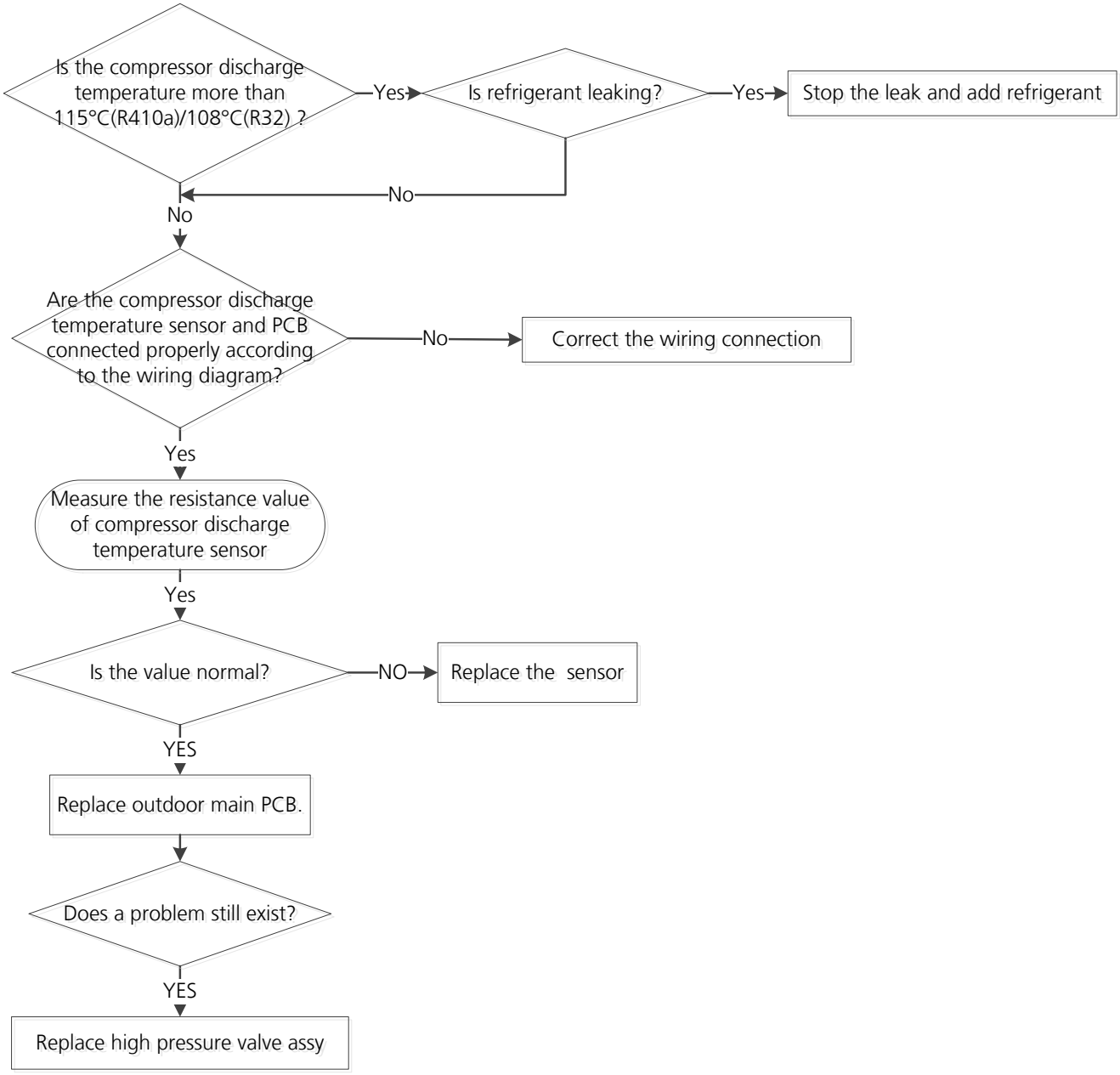
## TS32: Discharge temperature protection of compressor diagnosis and solution

**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.**

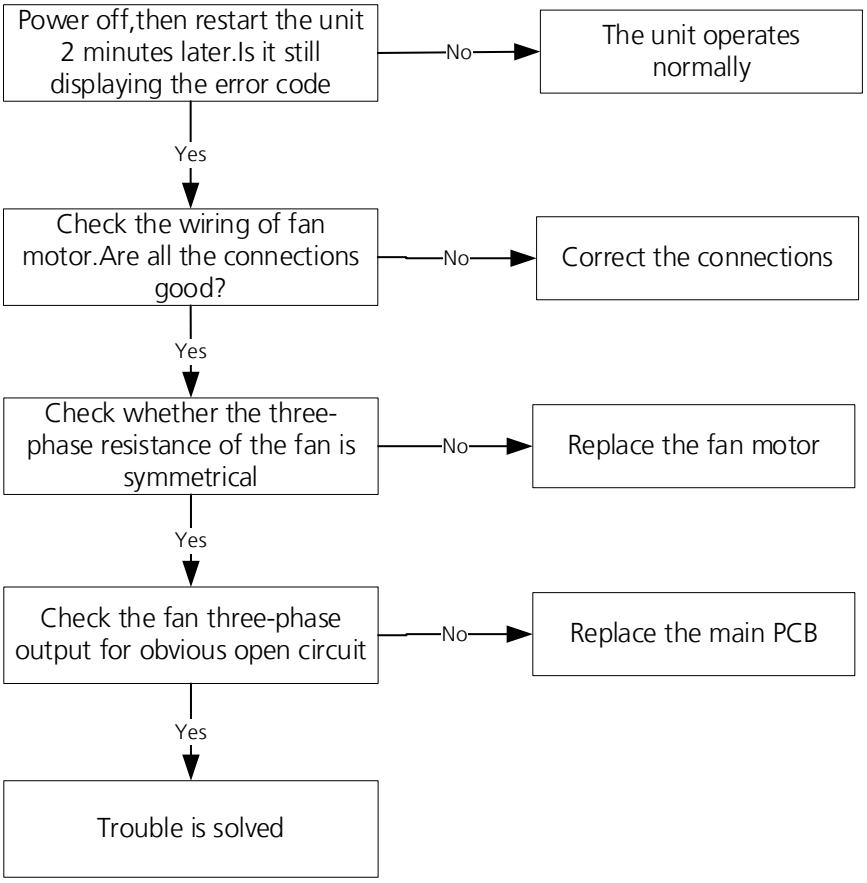
## TS38: Lack phase failure of ODU DC fan motor diagnosis and solution

**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:**



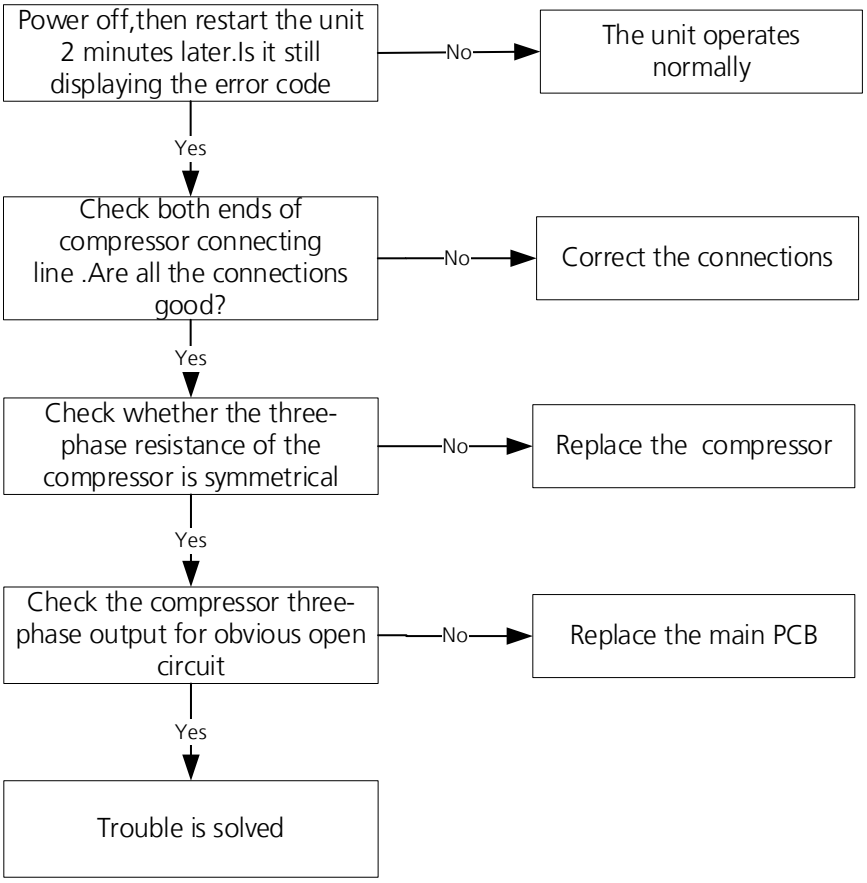
## TS39: ODU compressor lack phase protection diagnosis and solution

**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:**



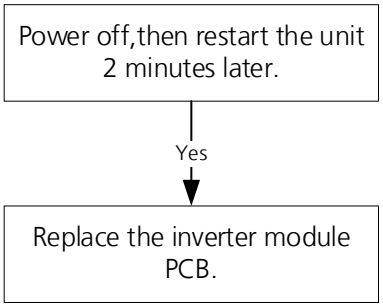
## TS40: ODU IR chip drive failure diagnosis and solution

**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:**



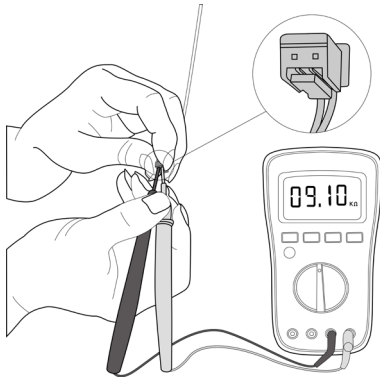
# 8. Check Procedures

## 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.**

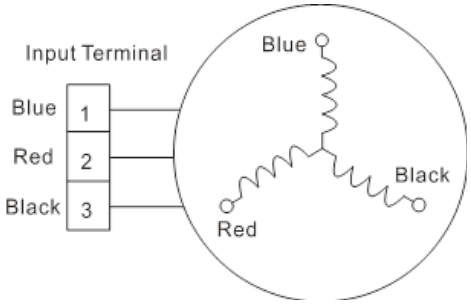
1. Disconnect the temperature sensor from PCB (Refer to Chapter 5&6. Indoor&Outdoor Unit Disassembly).
2. Measure the resistance value of the sensor using a multi-meter.
3. Check corresponding temperature sensor resistance value table (Refer to Chapter 8. Appendix).




**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.

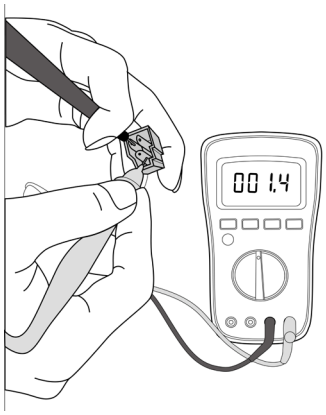



| Resistance Value | KSK89D53UEZ | KSK89D29UEZD | KSN98D22UFZ | KSK103D33UEZ3<br>KSK103D33UEZ3(MD)<br>KBK103D33UEZ3 | KSK103D32UEZ31 | KTN150D30UFZA<br>KTN150D30SFZA |
|---|---|---|---|---|---|---|
| Blue-Red | 2.35Ω | 1.99Ω | 1.57Ω | 2.13Ω | 4.06Ω | 1.02Ω |
| Blue-Black | | | | | | |
| Red-Black | | | | | | |

| Resistance Value | KSM135D23UFZ | KTN110D42UFZ | KSN140D21UFZ | KTM140D78UFZ3 | KTF235D22UMT<br>ATF235D22TMT<br>KTF250D22UMT | KTM240D46UKT2 |
|---|---|---|---|---|---|---|
| Blue-Red | 1.72Ω | 1.82Ω | 1.28Ω | 1.5Ω | 0.75Ω | 1.04Ω |
| Blue-Black | | | | | | |
| Red-Black | | | | | | |

| Resistance Value | KSN140D58UFZ | KTM240D43UKT | KSN98D64UFZ3 | ASN140D35TFZ | KTF420D62UNT | ASN108D22TEZ |
|---|---|---|---|---|---|---|
| Blue-Red | 1.86Ω | 1.03Ω | 2.7Ω | 0.83Ω | 0.86Ω | 1.76Ω |
| Blue-Black | | | | | | |
| Red-Black | | | | | | |

| Resistance Value | KTM240D63SKT2 | KTM240D57UMT | DTN210D32UFZ | KSN140D33UFZB3 | KTM110D79UFZA3 | GSD098XKUF7JV6B |
|---|---|---|---|---|---|---|
| Blue-Red | 1.19Ω | 0.62Ω | 1.7Ω | 1.68Ω | 1.88Ω | 2.83Ω |
| 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.**

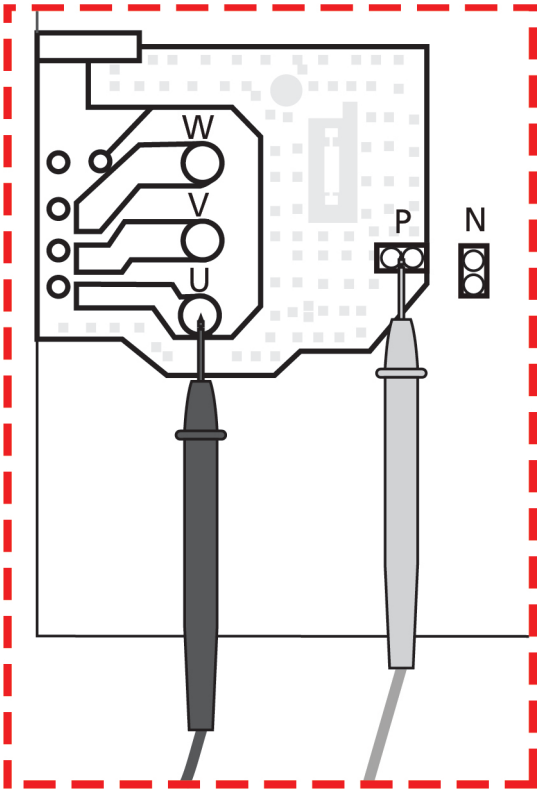
1. Turn off outdoor unit and disconnect power supply.
2. Discharge electrolytic capacitors and ensure all energy-storage unit has been discharged.
3. Disassemble outdoor PCB or disassemble IPM board.
4. Measure the resistance value between P and U(V, W, N); U(V, W) and N.

| Digital tester | | Resistance value | Digital tester | | Resistance value |
|---|---|---|---|---|---|
| (+)Red | (-)Black | | (+)Red | (-)Black | |
| P | N | ∞<br>(Several MΩ) | U | N | ∞<br>(Several MΩ) |
| | 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 | |



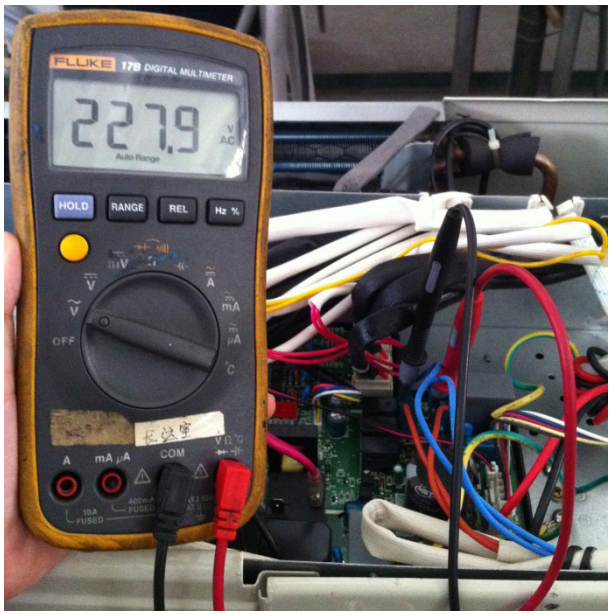

**Note: The picture and the value are only for reference, actual condition and specific value may vary.**

## 8.4 4-way Valve Check

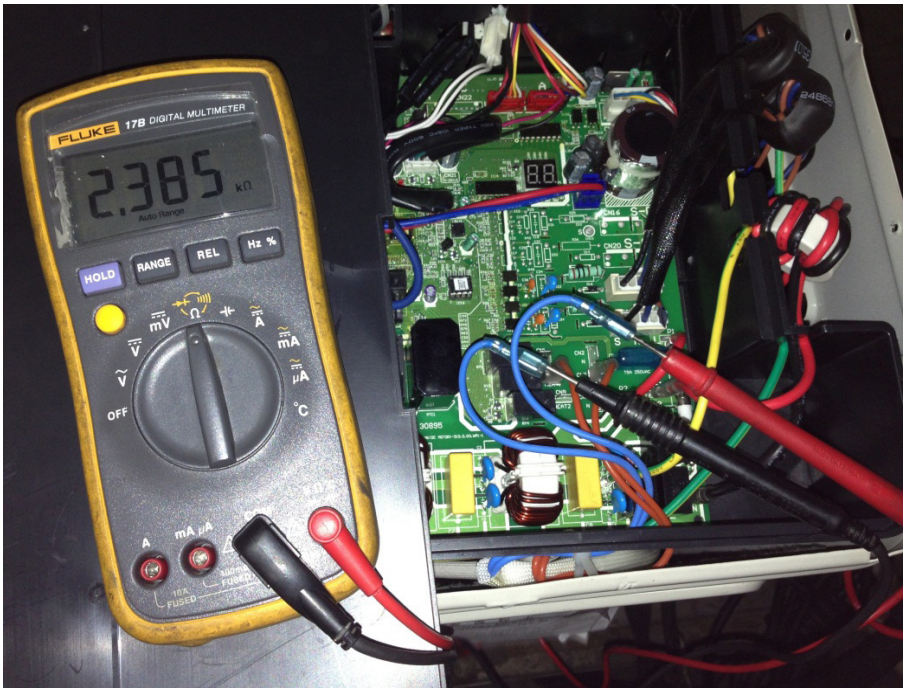
1. Power on, use a digital tester to measure the voltage, when the unit operates in cooling, it is 0V. When the unit operates in heating, it is about 230VAC.

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 KΩ.

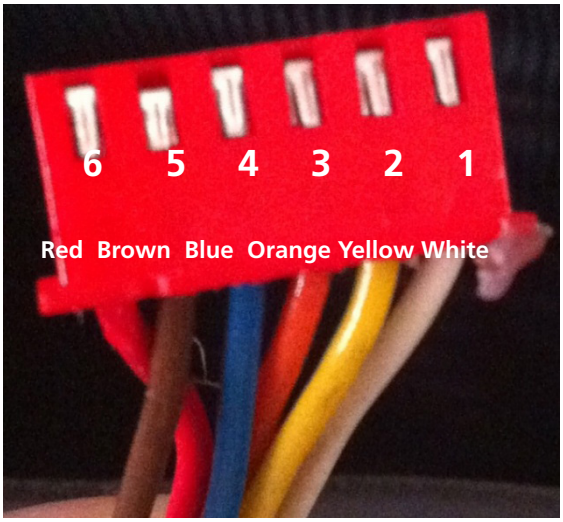


## 8.5 EXV Check

**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


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

iii) System Pressure Table ..... 4

## 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) 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 |