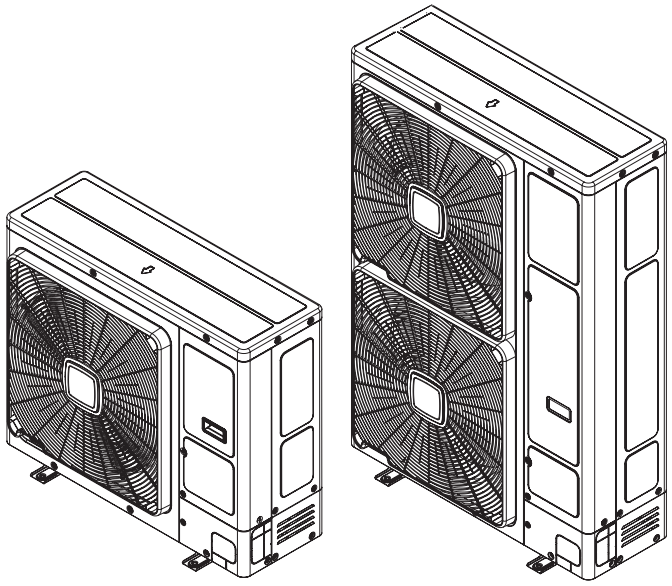
HITACHI

# SERVICE MANUAL

## HEAT PUMP AIR CONDITIONERS

## - SET FREE mini-HNRQ1 SERIES VRF CONDITIONERS SYSTEM -



### Service Manual

**< Outdoor Units >**

| Power Supply | Model |
|---|---|
| 220-240V/1Ph/50Hz | RAS-3.0HNBRKQ1<br>RAS-3.5HNBRKQ1<br>RAS-4.0HNBRKQ1<br>RAS-4.5HNBRKQ1<br>RAS-5.0HNBRKQ1<br>RAS-6.0HNBRKQ1<br>RAS-6.5HNBRKQ1 |
| 380-415V/3Ph/50Hz | RAS-7.0HNBRMQ1<br>RAS-8.0HNBRMQ1<br>RAS-10HNBRMQ1<br>RAS-11HNBRMQ1<br>RAS-12HNBRMQ1 |

HS2019266A

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# IMPORTANT NOTICE

- The company pursues a policy of continuous improvement in design and performance of products. The right is therefore reserved to vary specifications without notice.
- The company cannot anticipate every possible circumstance that might involve a potential hazard.
- This heat pump air conditioner is designed for standard air conditioning only. Do not use this heat pump air conditioner for other purposes such as drying clothes, refrigerating foods or for any other cooling or heating process.
- Do not install the unit in the following places. It may cause a fire, deformation, corrosion or failure:
  * Places where oil (including machinery oil).
  * Places where a lot of sulfide gas drifts such as in hot spring.
  * Places where inflammable gas may generate or flow.
  * Places where strong salty wind blows or with an atmosphere of acidity or alkalinity such as coastal regions.
- Do not install the unit in the place where silicon gas drifts. If the silicon gas attaches to the surface of heat exchanger, the fin surface repels water. As a result, drain water splashes outside the drain pan and splashed water runs into electrical box. In the end, water leakage or electrical devices failure may occur.
- Pay attention to the following points when the unit is installed in a hospital or other facilities where electromagnetic wave generates from medical equipment.
  * Do not install the unit in the place where the electromagnetic wave is directly radiated to the electrical box, wired controller cable or switch.
  * Install the unit at least 3 meters away from electromagnetic wave such as a radio.
- Do not install the unit in the place where the breeze directly blows to the animals and plants. It could adversely affect the animals and plants.
- The installation and service engineering should be in accordance with the local laws and regulations.
- If you have any questions, contact your distributor or dealer.
- The installation of this air conditioner can only be carried out by dealers or specialists. If the user installs the air conditioner by himself, it may cause leakage, electric shock or fire.
- This manual gives a common description and information for this heat pump air conditioner and also for other models.
- To protect the environment, do not discard the product at will, the company can provide recycling services as per the relevant provisions of the country, and provide replaceable components as per national standards.
- No part of this manual may be reproduced without written permission.
- It is assumed that this heat pump air conditioner will be operated and serviced by English speaking people. If this is not the case, the customer should be added safety, caution and operating signs in the native language.
- This heat pump air conditioner has been designed for the following temperatures. Operate the heat pump air conditioner within this range.

Temperature DB: Dry Bulb, WB: Wet Bulb

| | | Maximum | Minimum |
|---|---|---|---|
| Cooling Operation | Indoor | 32°C DB/23°C WB | 21°C DB/15°C WB |
| | Outdoor | Stable 48°C DB Interval 48~52°C DB | -5°C DB * |
| Heating Operation | Indoor | 27°C DB | 15°C DB |
| | Outdoor | 24°C DB/15°C WB | Stable -15°C WB Interval -20~-15°C WB |

**Note:**

*: When RAS-7.0~12HNBRMQ1 outdoor units are connected with the RCIM-0.8FSN4 or RCD-0.8~1.0FSN3 or RCS-0.8~1.0FSN, if only one of these indoor unit is operating in cooling mode, the minimum outdoor temperature is limited to 5°C DB.

<Signal Words>

● Signal words are used to identify levels of hazard seriousness.

Definitions for identifying hazard levels are provided below with their respective signal words.

**⚠ DANGER** : **DANGER** indicates a hazardous situation which, if not avoided, will result in death or serious injury.

**⚠ WARNING** : **WARNING** indicates a hazardous situation which, if not avoided, could result in death or serious injury.

***NOTICE*** : **NOTICE**, used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

**NOTE** : **NOTE** is useful information for operation and/or maintenance.

**⚠ DANGER**

- Do not perform installation work, refrigerant piping work, drain pump, drain piping and electrical wiring connection without referring to our installation manual. If performed without following the instructions, it may result in a system leakage, electric shock or a fire.
- Do not pour water into the indoor or outdoor unit. These products are equipped with electrical parts. If poured, it will cause a serious electrical shock.
- Do not open the service cover and the PCB for the indoor and outdoor unit without turning OFF the main power supply, this may lead to serious safety accidents.
- Do not touch or adjust safety devices inside the indoor or outdoor units. If these devices are touched or readjusted, serious accidents may occur.
- Refrigerant leakage can cause difficulty with breathing due to insufficient air. If a refrigerant leakage is found, immediately turn OFF the main power supply, extinguish any open flame, and then contact the service dealer.
- Make sure to perform air-tight testing.
- The refrigerant R410A used in this product (fluorocarbon) is not flammable, non-toxic, and odourless. If there is refrigerant leakage, exposure to open flame produces toxic gases. Also, the refrigerant gas is heavier than air, if the area is filled with refrigerant gas, it may cause suffocation to the people in the vicinity.When conducting leak detection and air-tight testing, filling with oxygen, acetylene or flammable and toxic gas may cause explosion. Nitrogen is recommended for this test.
- The refrigerant safety leakage standard for construction and operation systems are determined as per local regulations or standards.
- Use a medium induction speed above ELB (Earth Leakage Breaker with action time of 0.1 seconds or less). Otherwise, this may cause electric shock or fire.
- Do not install the product in places where there is high density of oil mist, flammable gas, salt spray, or toxic gases (such as sulphide), and so on.
- During installation, connect the refrigerant pipe firmly before the compressor starts running. For maintenance, stop the compressor before moving, handling and removing the refrigerant pipe.
- Do not short-circuit the protective devices (such as pressure switches and so on) during operation. Otherwise it may cause a fire or explosion.

**⚠ WARNING**

- Please do not use sprays such as pesticide, oil paint, hair spray or other flammable gases within 1 meter of the unit.
- If the circuit breaker acts or fuse acts frequently, please stop the system operation immediately and contact your local dealer or customer service.
- Ensure that the grounding wire is securely connected. If not, it may cause an electrical failure. Do not connect the grounding wire to the gas pipe, tap water pipe, lightning rod or telephone grounding wire.
- Use fuse of specified capacity.
- While you perform brazing, ensure that there are no combustible around it. Please wear leather gloves while using refrigerant to prevent freezing.
- Prevent mice and other small animals damaging the wiring and the electrical components. If unprotected parts are bitten, it may lead to fire.
- Securely connect and fix the wiring, do not apply external force on terminal blocks, this may cause the terminal to loosen and can cause a fire.
- Ensure that the foundation is robust enough to install the unit. If not, the appliance can fall and break.
- Do not install the unit in the presence of large amounts of oil, steam, organic solvents and corrosive gases (ammonia, sulphide and acid, so on). Because corrosion may cause refrigerant leakage, electrical failure, performance degradation and unit damage.
- Please follow the installation manual and all the relevant provisions, standards for electrical construction. Otherwise, electric failure of fire may occur due to insufficient capacity or mismatch of specifications.
- Use specified wiring between the units and select the correct wiring between the appliances. Otherwise,it will cause an electrical malfunction or fire.
- Make sure that the terminals are tightened with the specified torque. Otherwise it will cause a fire or electrical fault at the terminal block.
- If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.
- If there is fire, please cut-off the power supply immediately.
- This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved. Children shall not play with the appliance. Cleaning and user maintenance shall not be made by children without supervision.
- Means for disconnection from the supply mains, which have a contact separation in all poles that provide full disconnection under overvoltage category III conditions, must be incorporated in the fixed wiring in accordance with the wiring rules.
- The appliance shall be installed in accordance with national wiring regulations.
- The maximum working pressure is 4.15MPa. This maximum working pressure shall be considered when connecting the outdoor unit to indoor units.
- The refrigerant used in the outdoor unit is R410A. Please refer to “Additional Refrigerant Charge” of this manual for the refrigerant charging.
- The outdoor unit shall only be connected to indoor units suitable for the same refrigerant (R410A).
- The unit is a partial unit air conditioner, complying with partial unit requirements of the International Standard, and must only be connected to other units that have been confirmed as complying with corresponding partial unit requirements of the International Standard.

## *NOTICE*

- Do not tread on the product or place sundries on the product.
- Do not place or put any material on the product or inside the product.
- Provide a strong and correct foundation so that:

  A. The outdoor unit is not on an incline.

  B. Abnormal sound does not occur.

  C. The outdoor unit will not fall down due to a strong wind or earthquake.

**NOTE:**

- Please do not install indoor unit, outdoor unit, wired controller and wiring within 3m of strong electromagnetic radiation appliance (For example: medical device).
- After a long time shut down, if you want to restart the appliance, please power the crankcase heating band to work 12 hours prior to operation.
- Before switching on the outdoor unit, make sure that it is not covered by snow and ice.
- The heat pump air conditioner may not work properly if:
  * The power of the transformer which supplies power is equal or less than the electric power of the air conditioner.
  * Power supply for high-power equipment is too close to the power wire of the air conditioner.

  Device*: (Ex) Lift, container crane, rectifier for electric railway, inverter power device, arc furnace, electric furnace, large-sized induction motor and large-sized switch. It consumes a large quantity of electrical power.

  In the case mentioned above, the power wire of the air conditioner generates a large induced surge voltage due to the abrupt change in the power consumption of the power equipment and the switch action.
- Therefore, to protect the power supply to the system, before performing electric construction, please carefully check the field installation specifications and standards.
- It is recommended to ventilate the room every 3 to 4 hours.
- Reduction in heat pump air conditioner heating capacity is observed due to the degradation of outdoor environmental temperature. Therefore, in some low temperature areas, it is recommended to use auxiliary heating device while installing heat pump air conditioner.
- Only a professional maintenance personnel can perform maintenance work for this air conditioner.

# Installation

**INSTALLATION**

# 1. Before Installation

## 1.1 Necessary Tools and Instrument List for the Installation

| No. | Tool | No. | Tool |
|---|---|---|---|
| 1 | Handsaw | 12 | Wrench |
| 2 | Phillips Screwdriver, Slotted Screwdriver | 13 | Scale |
| 3 | Vacuum pump | 14 | Charging Cylinder |
| 4 | Refrigerant Gas Hose | 15 | Gauge Manifold |
| 5 | Megohmmeter | 16 | Wire Cutters |
| 6 | Copper Pipe Bender | 17 | Gas Leak Detector |
| 7 | Manual Water Pump (for Indoor Unit) | 18 | Leveller |
| 8 | Pliers | 19 | Crimper for solderless Terminals |
| 9 | Pipe Cutter | 20 | Hoist (for Indoor Unit) |
| 10 | Brazing Kit | 21 | Ammeter |
| 11 | Hexagon Wrench | 22 | Voltage Meter |

It is recommended to use specially designated tools for handling R410A refrigerant.

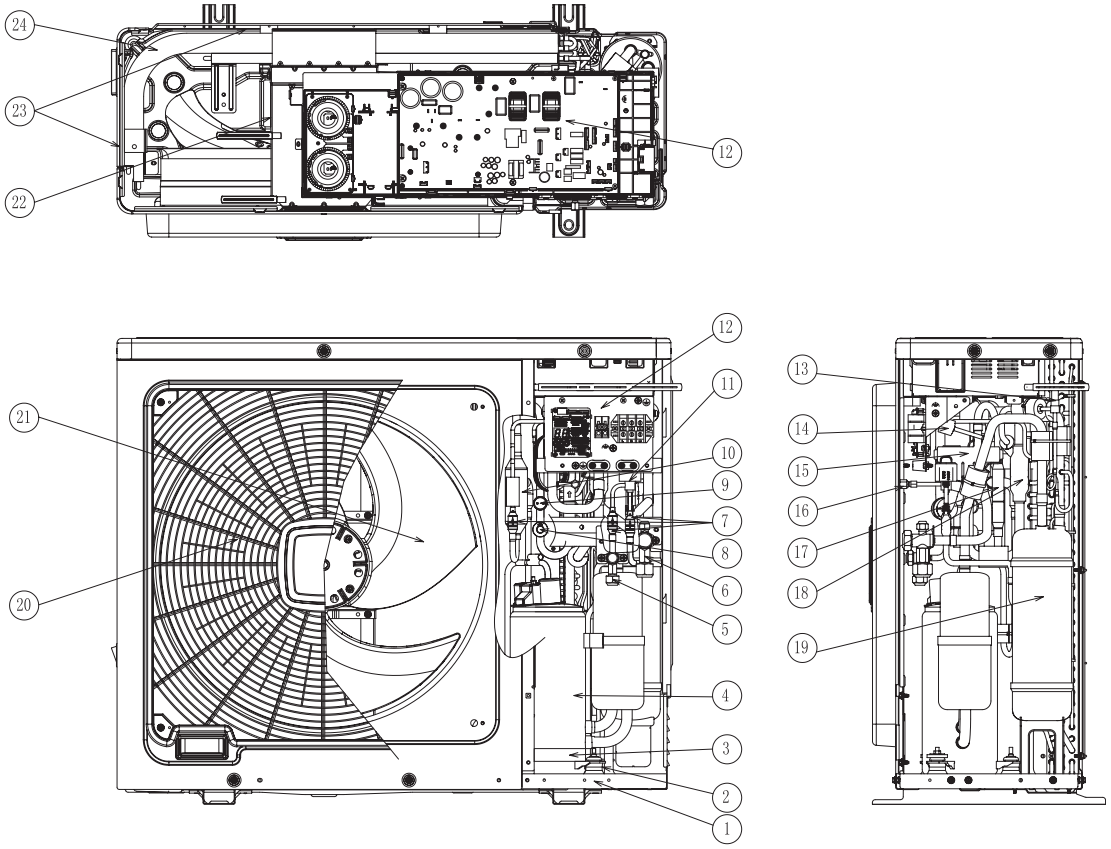
■: Interchangeability is available with current R22 ●: Only for Refrigerant R410A (No Interchangeability with R22)
◎: Prohibited ★: Only for Refrigerant R407C (No Interchangeability with R22)

| Measuring Instrument and Tool | | Interchangeability with R22 | | Reason of Non-Interchangeability and Attention ( ○ : Strictly Required) | Use |
|---|---|---|---|---|---|
| | | R410A | R407C | | |
| Refrigerant Pipe | Pipe Cutter, Chamfering Reamer | ■ | ■ | – | Cutting Pipe Removing Burrs |
| | Flaring Tool | ■ | ■ | * The flaring tools for R407C are applicable to R22.<br>* If using flaring tube, make dimension of tube larger for R410A.<br>* In case of hard temper pipe, flaring is not available. | Flaring for Tubes |
| | Extrusion Adjustment Gauge | ● | – | | Dimensional Control for Extruded Portion of Tube after Flaring |
| | Pipe Bender | ■ | ■ | * In case of hard temper pipe, bending is not available. Use elbow for bend and braze. | Bending |
| | Expanding Tool | ■ | ■ | * In case of hard temper pipe, expanding of tube is not available..Use socket for connecting tube. | Expanding Tubes |
| | Torque Wrench | ● | ■ | * For 12.7mm D., 15.88mm D., wrench size is up 2mm. | Connection of Flare Nut |
| | | ■ | ■ | * For 6.35mm D., 9.52mm D., 19.05mm D., wrench size is the same. | |
| | Brazing Tool | ■ | ■ | * Perform correct brazing work. | Brazing for Tubes |
| | Nitrogen Gas | ■ | ■ | * Strict control against pollution (Blow nitrogen during brazing.) | Prevention from Oxidation during Brazing |
| | Lubrication Oil (for Flare Surface | ● | ★ | * Use a synthetic oil which is equivalent to the the oil used in the refrigeration cycle.<br>* Synthetic oil absorbs moisture quickly. | Applying Oil to the Flared Surface |
| Vacuum Drying; Refrigerant Charge | Refrigerant Cylinder | ● | ★ | * Check refrigerant cylinder color.<br>○ : Liquid refrigerant charging is required regarding zeotropic refrigerant. | Refrigerant Charging |
| | Vacuum Pump | ■ | ■ | ○ : It is required to mount a vacuum pump adapter (check valve) to prevent oil of the vacuum pump from being pulled when the vacuum pump stops. | Vacuum Pumping |
| | Adapter for Vacuum Pump (Check Valve) | ※● | ★ | | |
| | Manifold Valve | ● | ★ | ○ : Use manifold and charging hoses designed for each refrigerant as design pessure is different.Do not share manifold and charging hoses with other refrigerant type to prevent mixing of different types of refrigerant oil. (If use, it may cause cycle choking or compressor failure.)<br>Standard of Connection Screw: R410A: UNF1/2, R407C: UNF7/16. | Vacuum Pumping, Vacuum Holding, Refrigerant Charging and Check of Pressures |
| | Charging Hose | ● | ★ | | |
| | Charging Cylinder | ◎ | ◎ | * Use the weight scale. | – |
| | Weight | ■ | ■ | – | Measuring Instrument for Refrigerant Charging |
| | Refrigerant Gas Leakage Detector | *● | ★ | * Use a detector designed for each refrigerant as detecting method is different. | Gas Leakage Check |

※: Interchangeability with R407C.

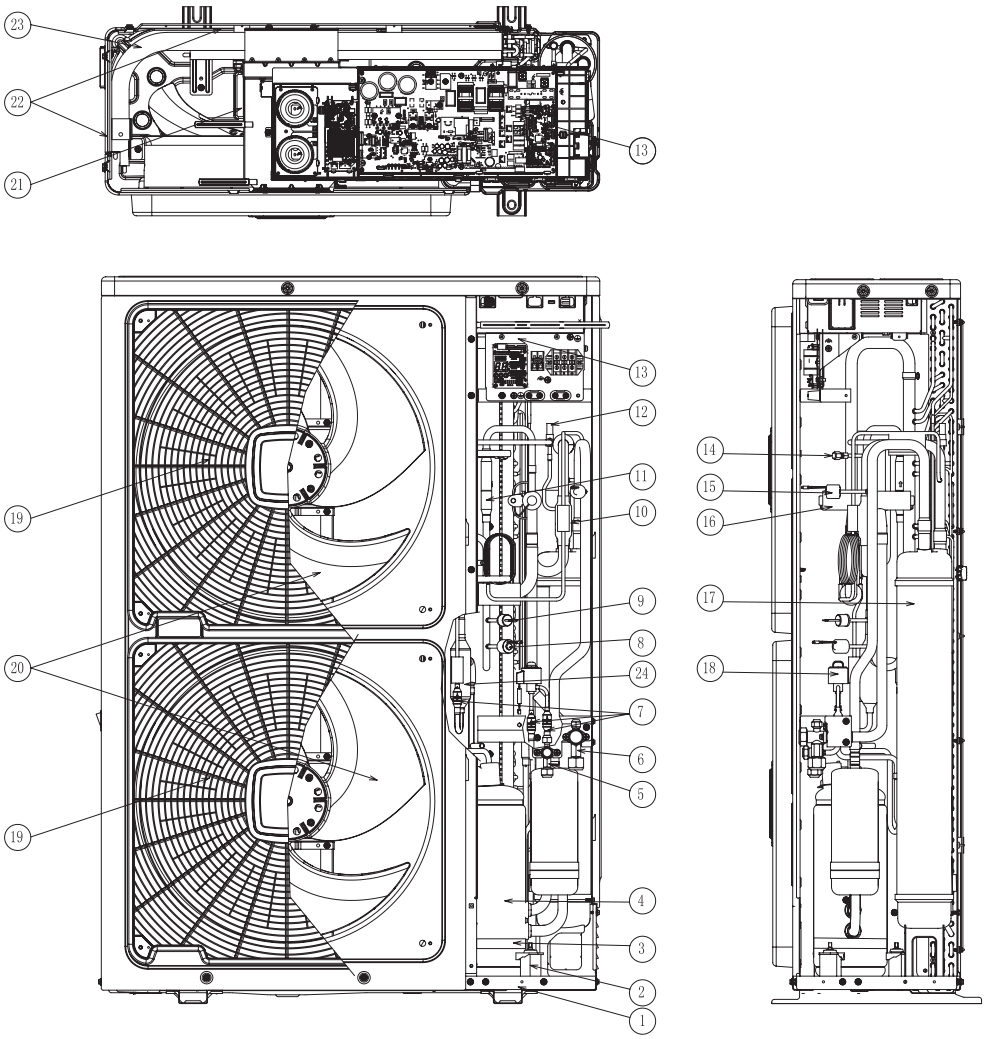
## 1.2 Structure

### Model: RAS-3.0~3.5HNBRKQ1




| No. | Part Name | No. | Part Name | No. | Part Name | No. | Part name |
|---|---|---|---|---|---|---|---|
| 1 | Chassis | 7 | Filter | 13 | Solenoid Valve | 19 | Accumulator |
| 2 | Vibration Absorder | 8 | High Pressure Sensor | 14 | Low Pressure Sensor | 20 | Air Outlet |
| 3 | Crankcase Heater | 9 | High Pressure Switch | 15 | 4-Way Valve | 21 | Propeller Fan |
| 4 | Compressor | 10 | Oil Separator | 16 | Check Joint | 22 | Fan Motor |
| 5 | Liquid Stop Valve | 11 | Electronic Expansion Valve | 17 | Check Valve | 23 | Air Inlet |
| 6 | Gas Stop Valve | 12 | Electrical Box | 18 | Filter | 24 | Heat Exchanger |

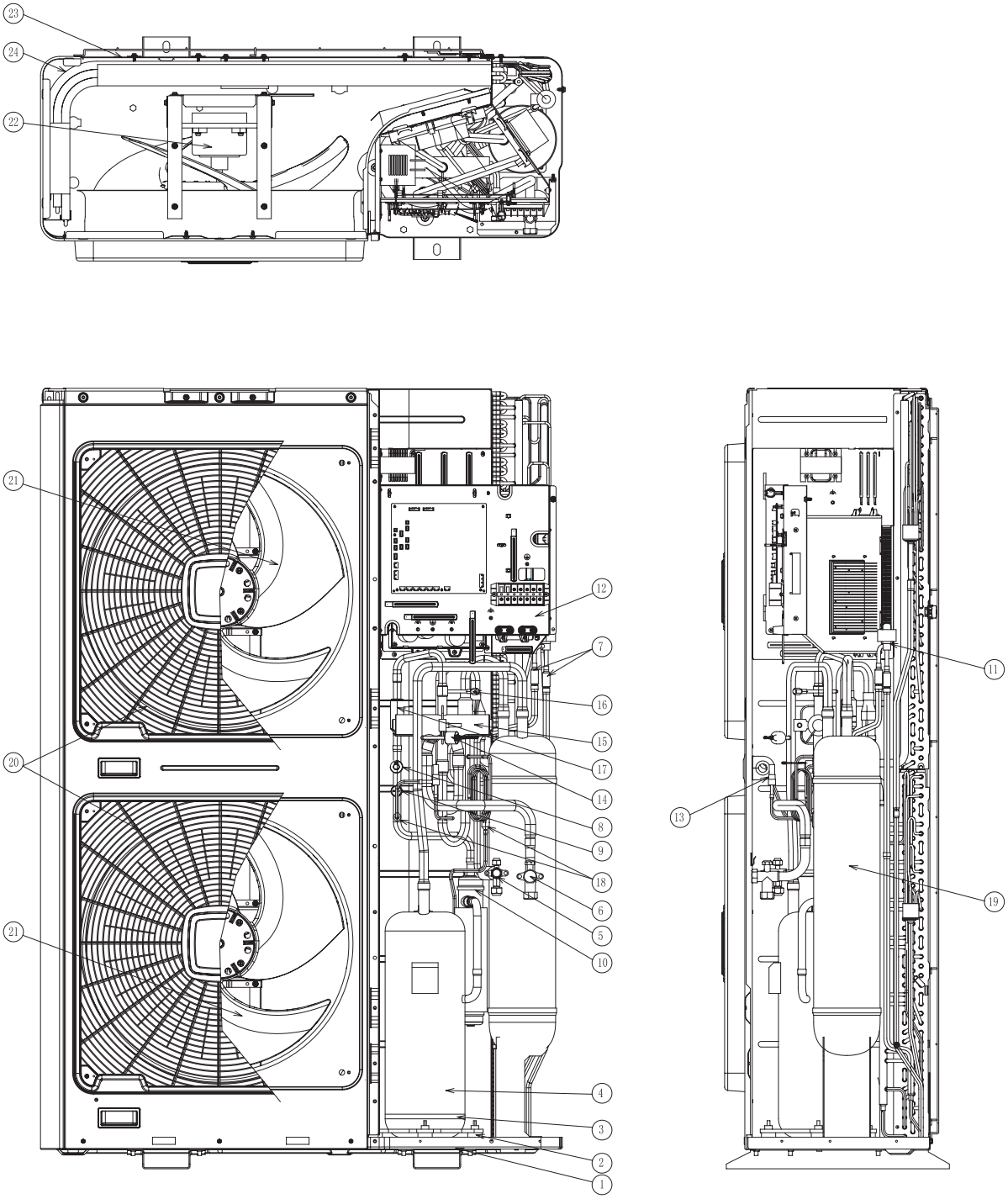
**Model: RAS-4.0~6.5HNBRKQ1**




| No. | Part Name | No. | Part Name | No. | Part Name | No. | Part name |
|---|---|---|---|---|---|---|---|
| 1 | Chassis | 7 | Filter | 13 | Electrical Box | 19 | Air Outlet |
| 2 | Vibration Absorder | 8 | High Pressure Sensor | 14 | Check Joint | 20 | Propeller Fan |
| 3 | Crankcase Heater | 9 | High Pressure Switch | 15 | Low Pressure Sensor | 21 | Fan Motor |
| 4 | Compressor | 10 | Filter | 16 | 4-Way Valve | 22 | Air Inlet |
| 5 | Liquid Stop Valve | 11 | Check Valve | 17 | Accumulator | 23 | Heat Exchanger |
| 6 | Gas Stop Valve | 12 | Solenoid Valve | 18 | Electronic Expansion Valve | 24 | Oil Separator |

## INSTALLATION

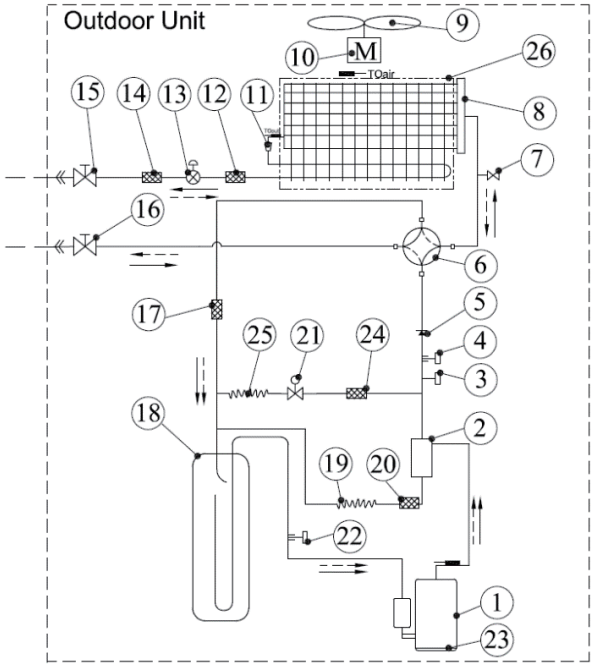
**Model: RAS-7.0~12HNBRMQ1**



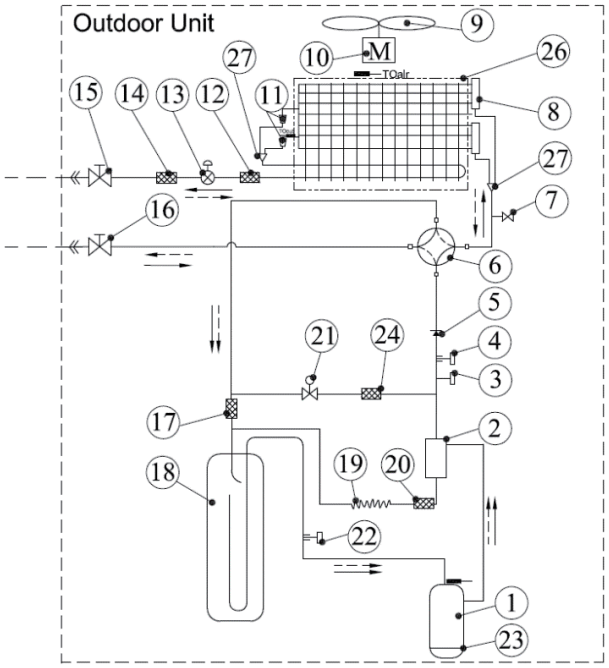

| No. | Part Name | No. | Part Name | No. | Part Name | No. | Part name |
|---|---|---|---|---|---|---|---|
| 1 | Chassis | 7 | Filter | 13 | Solenoid Valve | 19 | Accumulator |
| 2 | Vibration Absorder | 8 | High Pressure Sensor | 14 | Low Pressure Sensor | 20 | Air Outlet |
| 3 | Crankcase Heater | 9 | High Pressure Switch | 15 | 4-Way Valve | 21 | Propeller Fan |
| 4 | Compressor | 10 | Oil Separator | 16 | Check Joint | 22 | Fan Motor |
| 5 | Liquid Stop Valve | 11 | Electronic Expansion Valve | 17 | Check Valve | 23 | Air Inlet |
| 6 | Gas Stop Valve | 12 | Electrical Box | 18 | Filter | 24 | Heat Exchanger |

## 1.3 Refrigerant Cycle Diagram

Model:RAS-3.0~6.5HNBRKQ1




Model:RAS-7.0~12HNBRMQ1




Cooling — — Refrigerant Piping
Heating —«— Flare Connection

| No. | Part Name | No. | Part Name | No. | Part Name |
|---|---|---|---|---|---|
| 1 | Compressor | 10 | Fan Motor | 19 | Oil Capillary Tube |
| 2 | Oil Separator | 11 | Distributor | 20 | Filter 4 |
| 3 | High Pressure Switch | 12 | Filter 1 | 21 | Solenoid Valve |
| 4 | High Pressure Sensor | 13 | Electronic Expansion Valve | 22 | Low Pressure Sensor |
| 5 | Check Valve | 14 | Filter 2 | 23 | Crankcase Heater |
| 6 | 4-Way Valve | 15 | Liquid Stop Valve | 24 | Filter 5 |
| 7 | Check Joint | 16 | Gas Stop Valve | 25 | Bypass Capillary Tube |
| 8 | Gas Collector | 17 | Filter 3 | 26 | Heat Exchanger |
| 9 | Propeller Fan | 18 | Accumulator | 27 | Y-shaped Joint |

## 1.4 Model of Outdoor Unit

The number of indoor units that can be connected to an outdoor unit is defined in the following table :

Table 1.1 System Combination

| Outdoor Unit Type | Min. Total Capacity of the indoor units can be connected (kW) | Max. Total Capacity of the indoor units can be connected (kW) | Numbers of the indoor units can be connected (Q'ty) | Min. Capacity at Individual Operation (kW) |
|---|---|---|---|---|
| RAS-3.0HNBRKQ1 | 4.0 | 10.40 | 2~4 | 2.2 |
| RAS-3.5HNBRKQ1 | 5.0 | 13.00 | 2~5 | 2.2 |
| RAS-4.0HNBRKQ1 | 5.6 | 14.56 | 2~6 | 2.2 |
| RAS-4.5HNBRKQ1 | 6.0 | 15.60 | 2~6 | 2.2 |
| RAS-5.0HNBRKQ1 | 7.0 | 18.20 | 2~7 | 2.2 |
| RAS-6.0HNBRKQ1 | 8.0 | 20.80 | 2~8 | 2.2 |
| RAS-6.5HNBRKQ1 | 9.0 | 23.40 | 2~9 | 2.2 |
| RAS-7.0HNBRMQ1 | 10.0 | 26.00 | 2~10 | 2.2 |
| RAS-8.0HNBRMQ1 | 11.2 | 29.10 | 2~10 | 2.2 |
| RAS-10HNBRMQ1 | 14.1 | 36.50 | 2~10(13)△ | 2.2 |
| RAS-11HNBRMQ1 | 15.5 | 40.30 | 2~10(14)△ | 2.2 |
| RAS-12HNBRMQ1 | 16.8 | 43.60 | 2~10(15)△ | 2.2 |

**Notes:**

(1) The connectable indoor unit capacity ratio can be calculated as follows:
Connectable Indoor Unit Capacity Ratio = Total Indoor Unit Capacity / Total Outdoor Unit Capacity.

(2) It is suggested that the total capacity of indoor units which are operated simultaneously should not exceed the capacity of outdoor units under the following conditions. Otherwise, there is a decrease in operating performance.

- When there are some 4-way cassette indoor units and high wall indoor units in the system;
- When the outdoor air temperature is 43°C or more during the outdoor unit cooling operation;
- When the outdoor air temperature is lower than -10°C during the outdoor unit heating operation.

(3) When operating the outdoor unit under low heating load conditions and the outdoor temperature is 15°C WB or more, only one indoor unit is in the operation, the outdoor unit will be Thermo-OFF* to protect the compressor from failure.

(4) *: When RAS-7.0~12HNBRMQ1 outdoor units are connected with the RCIM-0.8FSN4 or RCD-0.8~1.0FSN3 or RCS-0.8~1.0FSN, if only one of these indoor unit is operating in cooling mode, the minimum outdoor temperature is limited to 5°C DB.

(5) For the same system, if the connectable indoor unit capacity ratio is over than 100%, and which all the indoor units operate simultaneously, capacity of every indoor unit should be less than its rated capacity.

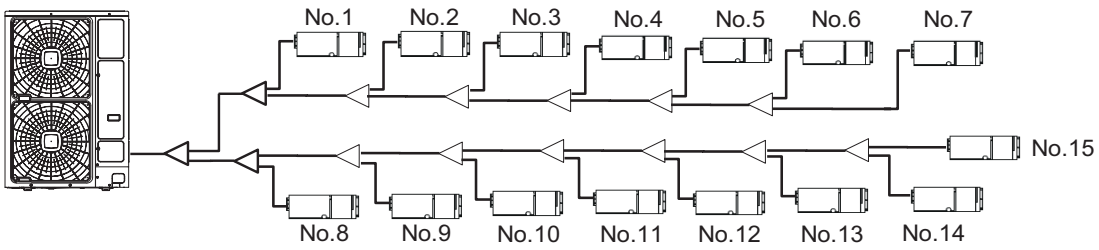
(6) △ : When the number of indoor units which are connected to the model of RAS-10~12HNBRMQ1 outdoor unit is over than 10 units, the following restrictions are also required to meet.

(a) The piping system must be divided into two main pipes, the total capacity and the number of the units connected to each main pipe should be as equal as possible.

(b) The maximum height difference between outdoor and indoor units is 30 meters and the maximum height difference between indoor units is 10 meters, the longest piping length between the branch pipe to the connected indoor unit is 10 meters.

(c) The connectable indoor unit capacity ratio should not be more than 105%.

(d) Only 0.8~4.0HP of ducted indoor units can be selected.




*Thermo-ON: The outdoor unit and some indoor units are running;

Thermo-OFF: The outdoor unit and some indoor units are standby, but don't run.

## 1.5 Transportation

Transport the product as near to the installation location before unwrapping the package.

**⚠ CAUTION**

- Do not put any material or stand on the product.
- Apply two lifting wires onto the outdoor unit, when lifting it by crane.

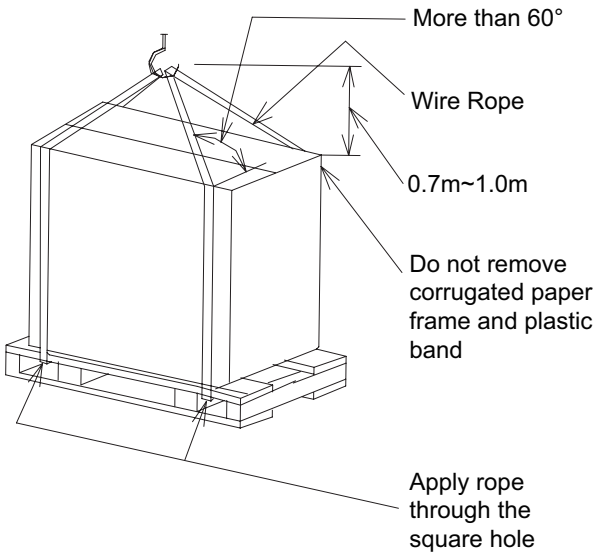
---

(1) The Method of Hanging

When hanging the unit, ensure a balance of the unit, ensure the safety and lift up smoothly.

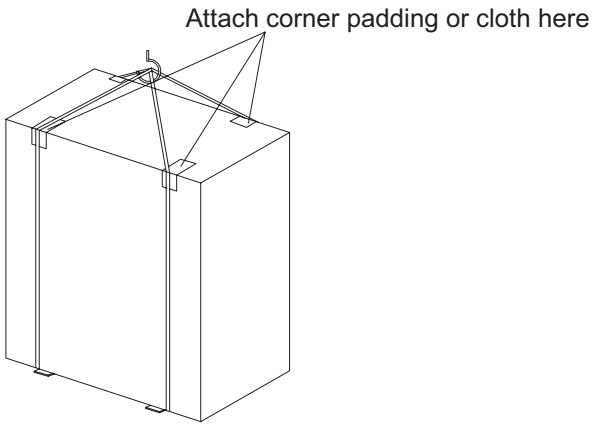
(a) Do not unwrap the package until the hanging work is finished.

(b) The hanging work can be followed the next figure:




**Notes:**

- Make sure the unit is in horizontal while lifting.
- Do not hook with the plastic bands.
- If the unit is lifted after unwrapping the package, protect the unit with the corner paddings or cloth.



(2) The weight of outdoor unit.

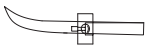
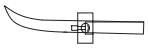
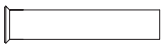
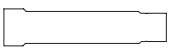
| Model | Net Weight (kg) | Gross Weight (kg) |
|---|---|---|
| RAS-3.0HNBRKQ1<br>RAS-3.5HNBRKQ1 | 75 | 85 |
| RAS-4.0HNBRKQ1<br>RAS-4.5HNBRKQ1<br>RAS-5.0HNBRKQ1 | 114 | 124 |
| RAS-6.0HNBRKQ1<br>RAS-6.5HNBRKQ1 | 118 | 128 |
| RAS-7.0HNBRMQ1<br>RAS-8.0HNBRMQ1 | 154 | 168 |
| RAS-10HNBRMQ1<br>RAS-11HNBRMQ1<br>RAS-12HNBRMQ1 | 172 | 187 |

**⚠ WARNING**

Do not place or leave any other objects (cables, tools) inside the outdoor unit or control board and verify that nothing remains there prior to installation and test run. Ignoring the instructions can lead to damage and fire incidents.

## 1.6 Factory Supplied Accessories

The accessories are packed in the outdoor unit, please check that in the package.

| Accessory | Appearance | Quantity | Remarks |
|---|---|---|---|
| Plastic Bag | | 1 | RAS models |
| IOM | | 1 | |
| Wire Clamp (big) |  | 1 | Only for RAS-3.0~6.5HNBRKQ1 |
| Wire Clamp (small) | | 3 | |
| Magnetic Ring (big) | | 2 | |
| Magnetic Ring (small) | | 1 | |
| Washer | | 4 | |
| Wire Clamp (big) |  | 2 | Only for RAS-7.0~12HNBRMQ1 |
| Pipe Adapter 1 |  | 1 | |
| Pipe Adapter 2 |  | 1 | |

**Note:**

If any of these accessories are not packed in the unit, please contact your distributor.

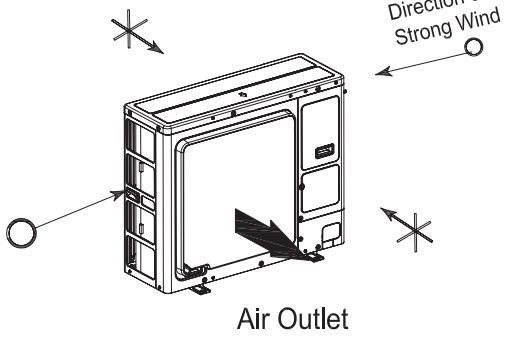
# 2. Outdoor Unit Installation

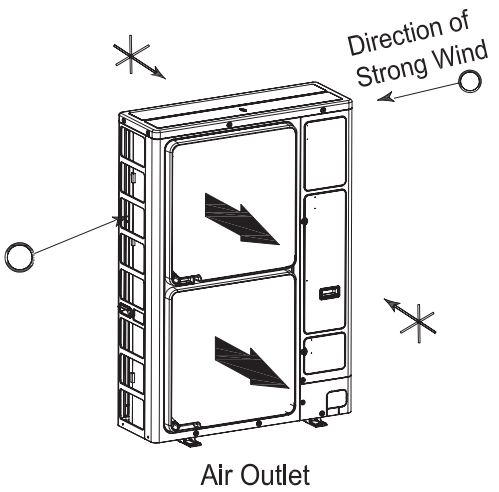
## 2.1 Installation Location and Precautions

- When installing the unit into:
  - A wall: Make sure the wall is strong enough to hold the weight of the unit. It may be necessary to construct a strong wood or metal frame to provide added support.
  - A room: Properly insulate any refrigerant tubing run inside a room to prevent “sweating” that can cause dripping and water damage to wall and floors.
  - Damp or uneven areas: Use a raised concrete pad or concrete blocks to provide a solid and level foundation for the unit to prevent water damage and abnormal vibration.
  - An area with high winds: Securely anchor the outdoor unit down with bolts and a metal frame. Provide a suitable wall for wind prevention (field-supplied).
  - A snowy area: Install the outdoor unit on a raised platform that is higher than drifting snow. Provide snow roof for snow prevention (field-supplied).
- Do not install the unit in the following places. Otherwise, it can result in an explosion, fire, deformation, corrosion, or product failure.
  - Explosive or flammable atmosphere.
  - Where a fire, oil, steam, or powder can directly enter the unit, such as in close proximity or directly above a kitchen stove.
  - Where oil (including machinery oil) may be present.
  - Where corrosive gases such as chlorine, bromine, or sulphide can accumulate, such as near a hot tub or hot spring.
  - Where dense, salt-laden airflow is heavy, such as in coastal regions.
  - Where the air quality is of high acidity.
  - Where harmful gases can be generated from decomposition.
- Do not install the indoor unit where such dripping can cause moisture damage or uneven locations: Use a raised concrete pad or concrete blocks to provide a solid and level foundation for the unit to prevent water damage and abnormal vibration. Do not position the drain pipe for the indoor unit near any sanitary sewers where corrosive gases may be present.
- Before performing any brazing work, be sure that there are no flammable materials or open flames nearby.
- Perform a test run to ensure normal operation. Safety guards, shields, barriers, covers, and protective devices must be in place while the compressor/unit is operating. During the test run, keep fingers and clothing away from any moving parts.
- Clean up the site when finished, remember to check that no metal scraps or bits of wiring have been left behind inside the unit being installed.
- After installation work for the system has been completed, explain the “Safety Precautions”, the proper use and maintenance of the unit to the customer according to the information in all manuals that came with the system. All manuals and warranty information must be given to the user or be left near the Indoor Unit.

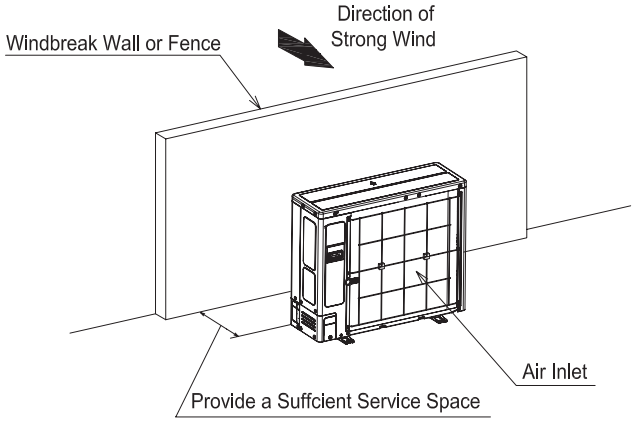
## INSTALLATION

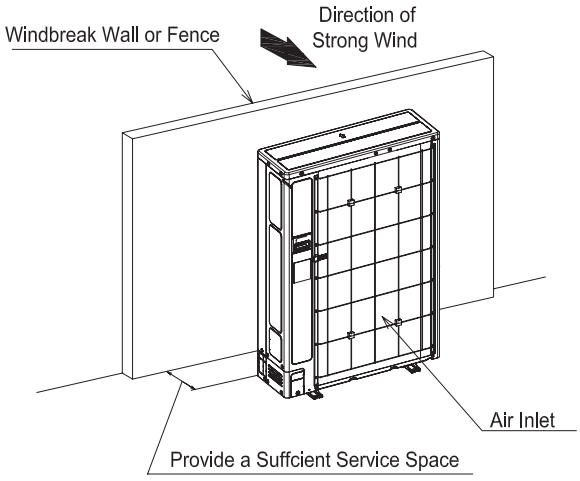
- Select a direction where a strong wind does not blow to the air outlet surface or the air inlet surface.




- If a suitable location cannot be found, the windbreak wall or fence should be installation to prevent a strong wind blows to air inlet or outlet of the outdoor unit. Make sure to provide sufficient space around the outdoor unit for operation and maintenance.




**Notes:**

- If strong wind blows to the air outlet directly, the needed airflow volume cannot be maintained and the outdoor unit may be difficult to operate normally.
- If excessively strong wind blows to the air outlet consecutively, it may cause the propeller fan or the fan motor breakage by high speed rotation or overload.

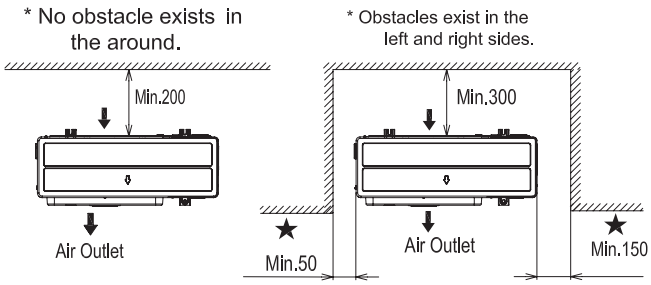
## 2.2 Service Space

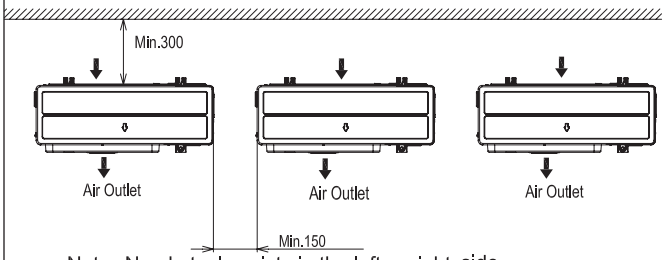
When the outdoor unit is installed, the allowed service space is as follows:

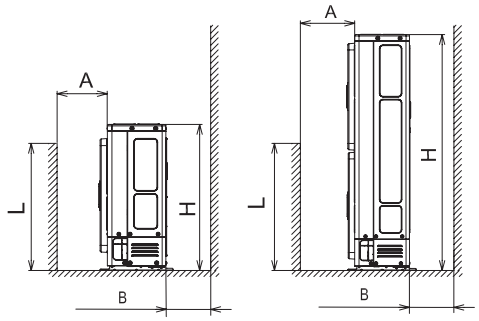
- If there is not enough service space for air inlets and outlets, it may result in a performance drop-off and mechanical issues due to insufficient air intake.
- Additionally, adequate srvice space is required for service maintenance access.

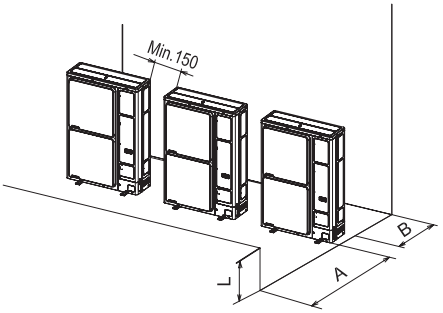
(1) Obstacles on the inlet side

(a) There is no obstacle in the upper side. Unit: mm

<table>
<tr><th>Single Installation</th><th>Multiple Installation</th></tr>
<tr><td>


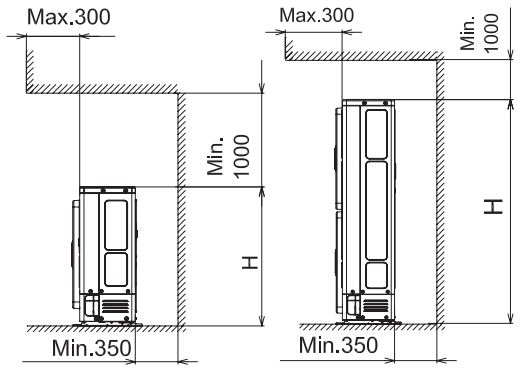
★ : It's better that the front side of unit is in a level with the obstacles.
</td><td>


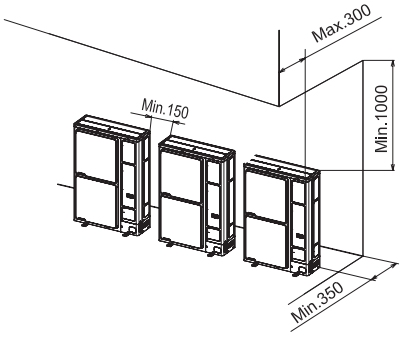
Note : No obstacle exists in the left or right side.
</td></tr>
<tr><td>
Note : No obstacle exists in the left or right side.


</td><td>
Note : No obstacle exists in the left or right side.


</td></tr>
</table>

(b) There are obstacles upper side Unit: mm

<table>
<tr><th>Single Installation</th><th>Multiple Installation</th></tr>
<tr><td>


</td><td>
Note : No obstacle exists in the left or right side.


</td></tr>
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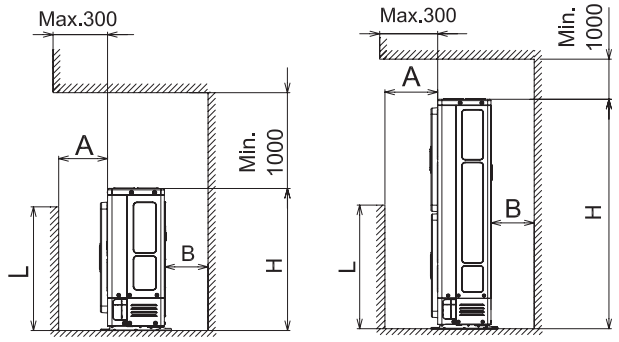
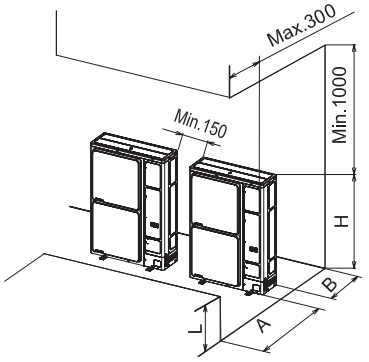
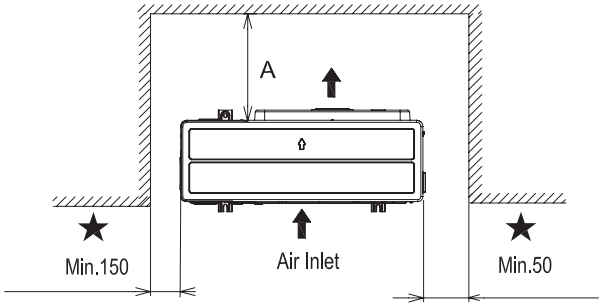
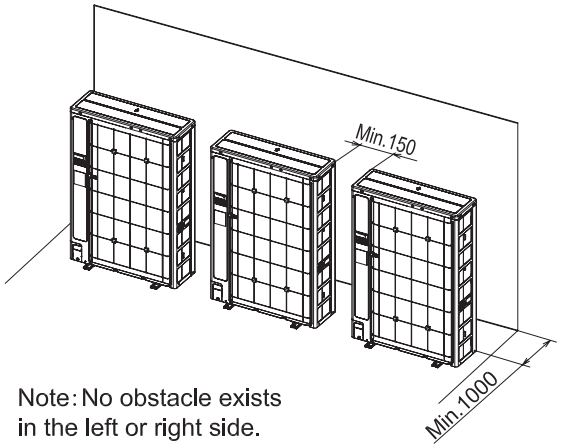
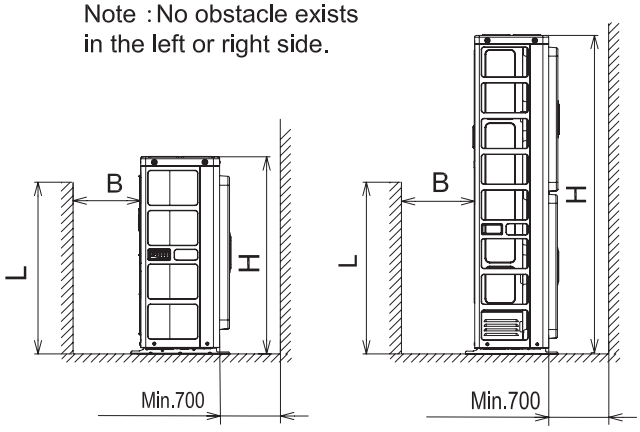
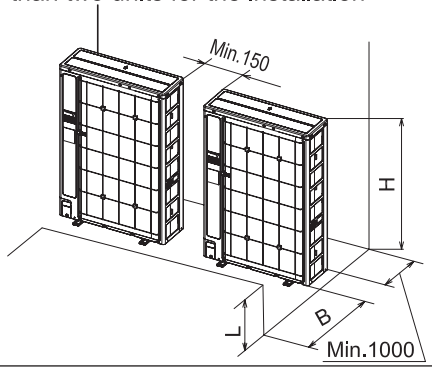



Note : No obstacle exists in the left or right side.

Notes :
No obstacle exists in the left or right side.
No more than two units for the installation

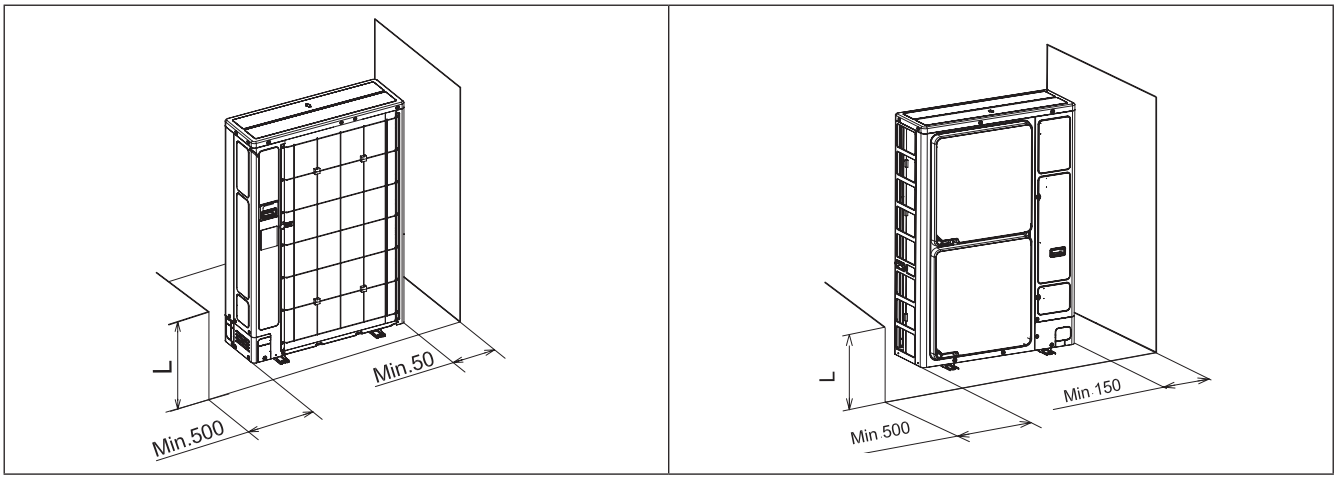



(2) Obstacles on the outlet side and no obstacle in the upper side. Unit: mm

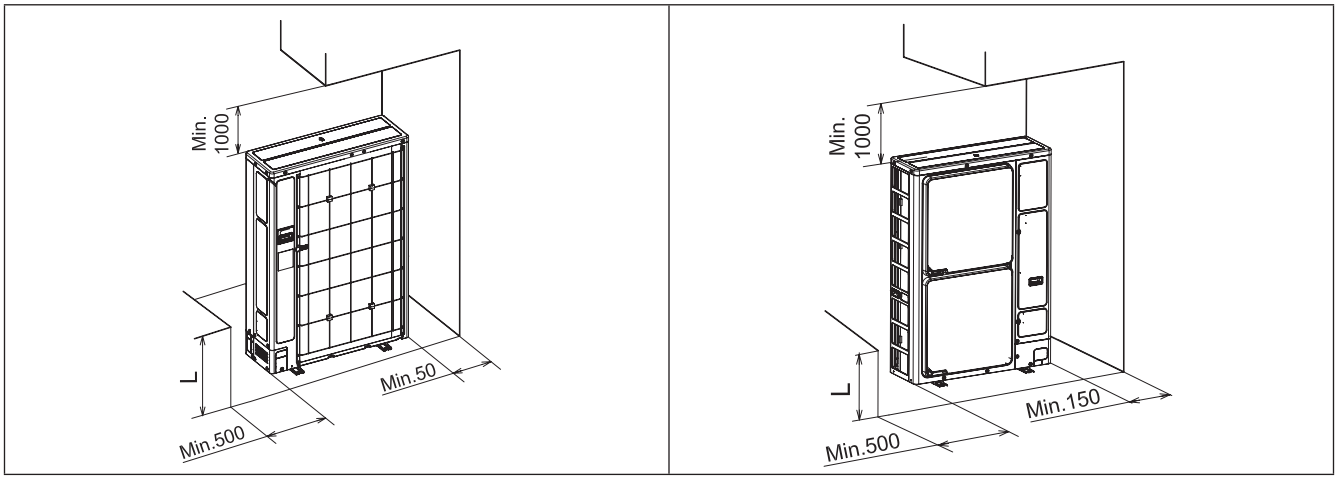
| Single Installation | Multiple Installation |
|---|---|
|  |  |
| ★ : It's better that the back side of unit is in a level with the obstacles.<br>Note: Obstacles exist in the either left or right side. | Note: No obstacle exists in the left or right side. |
| Note : No obstacle exists in the left or right side. | Notes :<br>No obstacle exists in the left or right side.<br>No more than two units for the installation |
|  |  |

(3) Obstacles on right and left side of single installation.

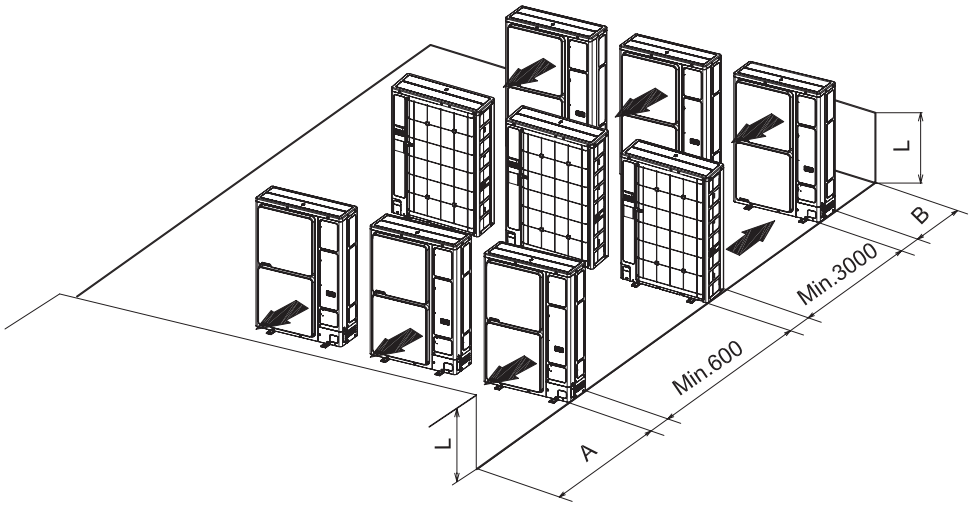
(a) There is no obstacle in the upper side. Unit: mm




(b) There are obstacles in the upper side. Unit: mm




(4) Multi-row and multiple installations. Unit: mm




**Note:**

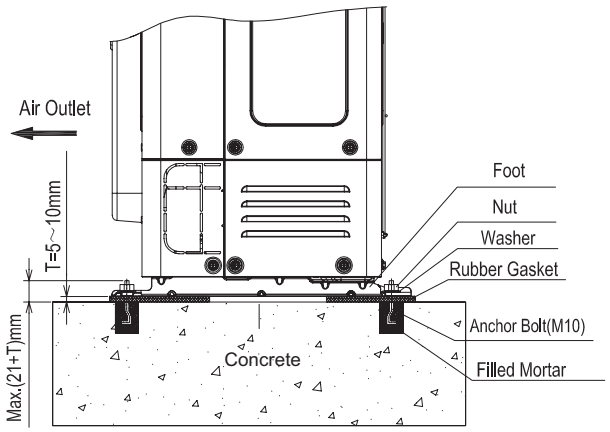
If L is larger than H, mount the units on a base so that H is greater or equal to L. Be sure to seal up every surface of the base. If the base allows the airflow to go, it may cause a short-circuit.

| L | A (mm) | B (mm) |
|---|---|---|
| 0 < L ≤ 1/2H | 600 or more | 300 or more |
| 1/2H < L ≤ H | 1400 or more | 350 or more |

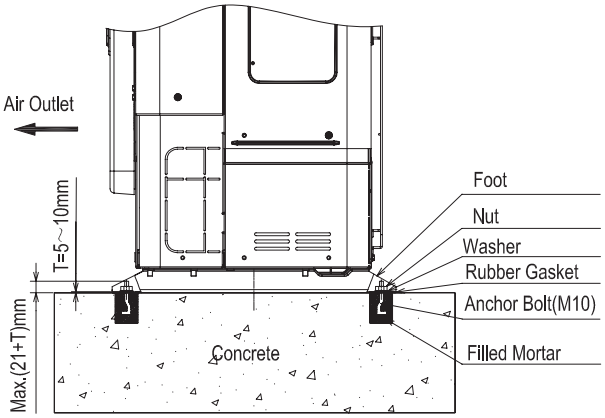
## 2.3 Installation Work

(1) Secure the outdoor unit with the anchor bolts.

In order to avoid the vibration from transmitting to the indoor by the base of the unit, the 5 ~ 10mm thickness of rubber gaskets (field supplied) should be placed under the feet of the outdoor unit, which could decrease the vibration into the room.




a) Model:RAS-3.0~6.5HNBRKQ1

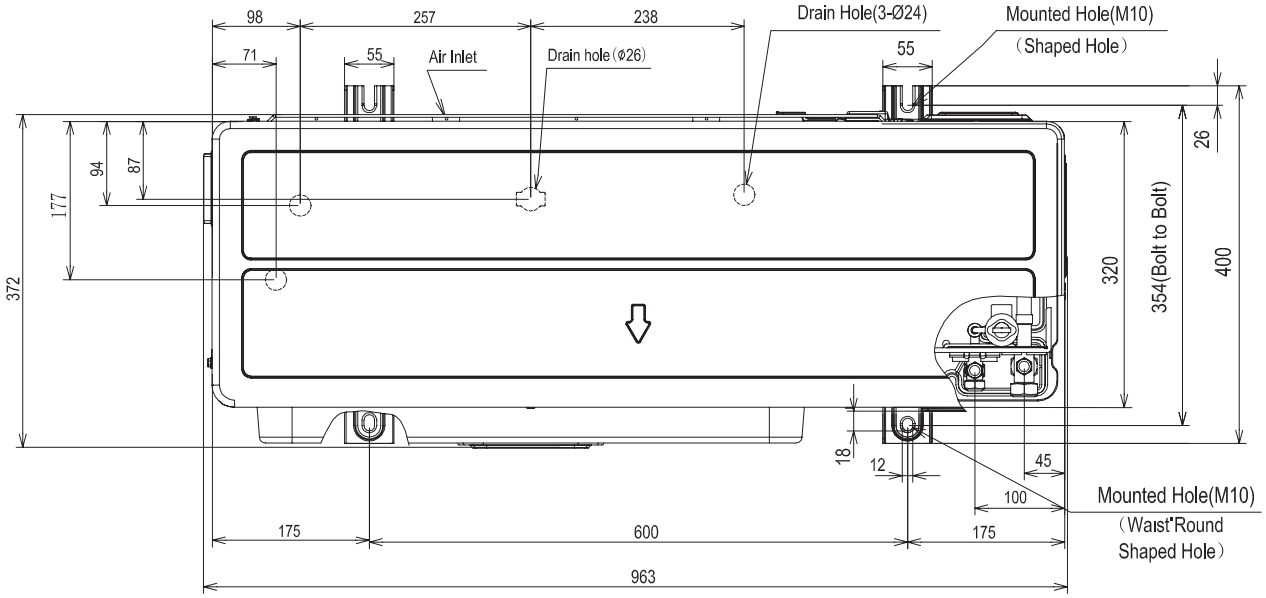



b) Model: RAS-7.0~12HNBRMQ1

(2) Installation positions of feet, air inlet and drain holes are shown in the following figures:

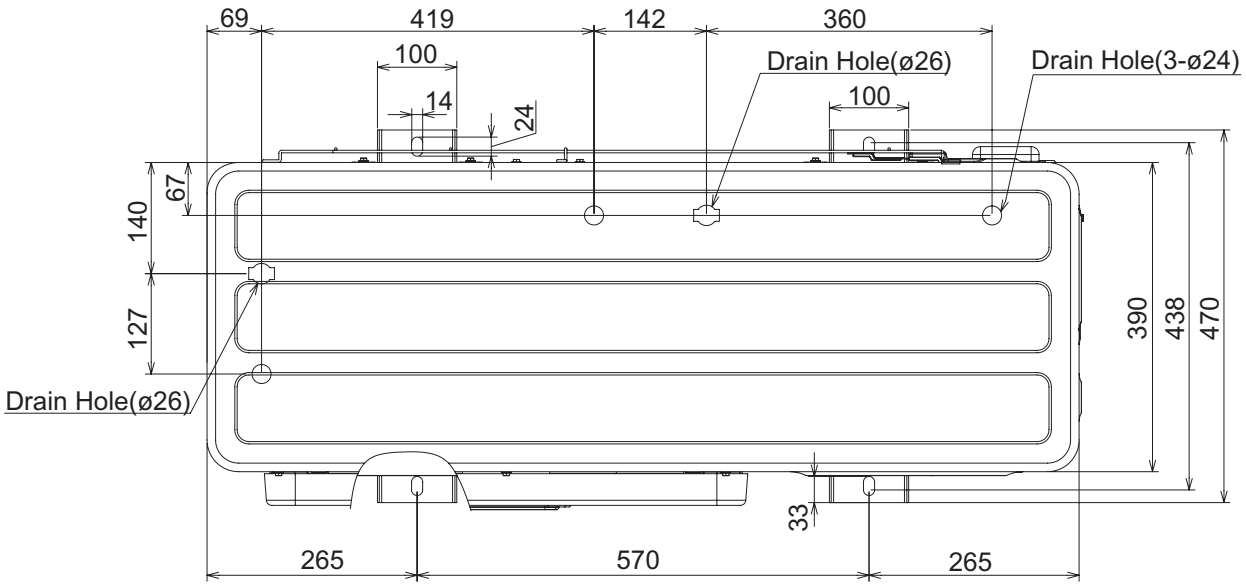
**Model: RAS-3.0~6.5HNBRKQ1**

Unit: mm



**Model: RAS-7.0~12HNBRMQ1**

Unit: mm

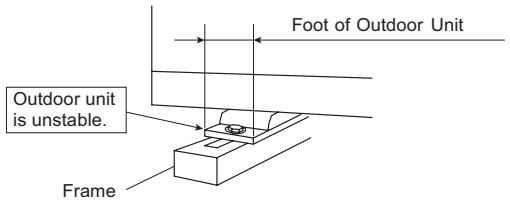


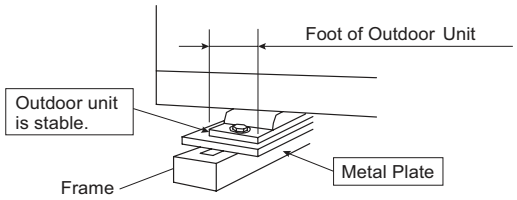

(3) The drain holes are working during the heating and defrosting operation. Choose a place where well drainage is available or provide a groove for draining.

(4) The unit will condensate in heating mode, and the condensate will freeze in colder climates, which may cause the road slippery, if not properly managed.

(5) The base of the outdoor unit should be installed on a foundation, which is made up of concrete or metal frame. When the rubber gaskets have been adopted, they should also be positioned under the feet of the outdoor unit.

(6) When the outdoor unit is installed on a metal frame, the metal plates should be used to adjust the frame width for stable installation.




Recommended Metal PlateSize (Field-Supplied):
Material: Hot-Rolled Mild Steel Plate (SPHC);
Plate Thickness: 4.5mm.

Aluminum fins have very sharp edges, handle them carefully to avoid injuries.

**Note:**

Install the outdoor unit on a roof or in an area where only service engineers come in contact with the outdoor unit.

## 3. Refrigerant Piping Work

**⚠ WARNING**

- The design pressure for this product is 4.15MPa. The pressure required for refrigerant R410A is 1.4 times higher than that of the refrigerant R22. That means that the refrigerant piping for R410A must be thicker than that for R22. Make sure to use specified refrigerant piping. Otherwise, the refrigerant piping may rupture due to an excessive refrigerant pressure. Pay close attention to the piping thickness when using copper refrigerant piping.
- Ensure that the stop valves are closed before removing the flare nut of the stop valves.

**⚠ CAUTION**

- When handling the refrigerant, be sure to wear leather gloves to prevent injuries.

### 3.1 Precaution for Refrigerant Piping

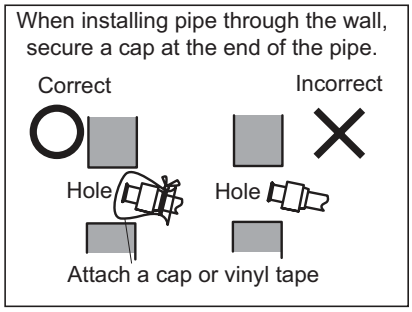
(1) Use the copper pipe for refrigerant piping.

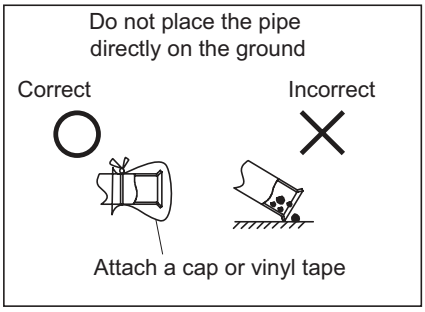
(2) Keep the copper pipes clean. Make sure there is no dust or moisture inside the pipes. Blow nitrogen or dry, compressed air into the pipes to remove any dust or foreign materials before connecting them. Do not use any cutting tools such as a grinder or saw which could produce metal particles.

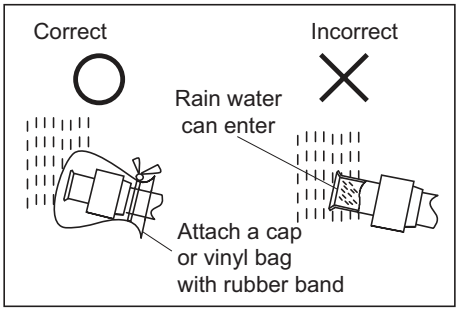
(3) Take special care to prevent pollution or moisture settling from going into the interior pipe during piping work.

(4) Avoid performing the piping connection work for outdoor unit in the rain.

(5) Refrigerant pipe ends.




(6) Piping Thickness and Material

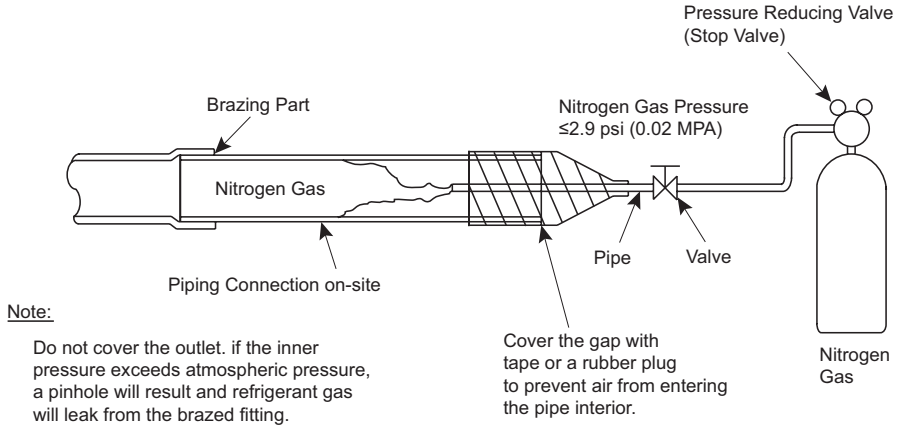
The thickness of refrigerant pipe differs depending on design pressure. For copper tube, pay attention to pipe selection, because the piping thickness differs depending on its material.

| Diameter (Φd) | R410A | |
|---|---|---|
| | Thickness | Temper |
| 6.35 mm | 0.8 mm | O |
| 9.52 mm | 0.8 mm | O |
| 12.7 mm | 0.8 mm | O |
| 15.88 mm | 1.0 mm | O |
| 19.05 mm | 1.0 mm | 1/2H |
| 22.2 mm | 1.2 mm | 1/2H |
| 25.4 mm | 1.2 mm | 1/2H |

**Notes:**

- Do not use the pipe with allowable pressure is less than 4.15MPa.
- The reference value of the refrigerant piping thickness is indicated in the table.
- Do not use the pipe which is considerably different from the reference value.

(7) Cautions for Brazing Work




(A) For piping connections, complete non-oxidation brazing with a nitrogen charge. If brazing the pipes without the nitrogen substitution, a large amount of oxidized scaling will be generated in the piping. This oxidized scaling can cause clogging inside the expansion valve, solenoid valve, accumulator, and compressor, which can damage the unit.

Do not use field-supplied antioxidant which can corrode pipes and degrade the refrigerant oil.

**Notes:**

- Make sure to use nitrogen. Nitrogen gas pressure shall be 0.02 MPa or less.
- Make sure to use the pressure-reducing valve.
- Do not use field-supplied antioxidant.

(B) Use a type of flux with a low chlorine concentration.

(C) Washing the weld joints to remove all flux completely after completing brazing work.

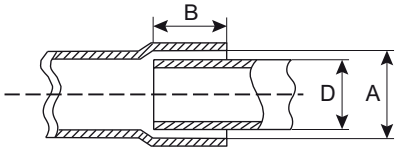
**Note:**

To avoid oxidation and scaling, perform brazing at the appropriate temperature.

(D) To prevent gas leakage at the brazing connection, refer to the table for the insertion depth and the gap for joint pipe.

Unit: mm

| Diameter(ΦD) | Min. Insertion Depth (B) | Gap (A - D) |
|---|---|---|
| 5≤ D <8 | 6 | 0.05 - 0.35 |
| 8≤ D <12 | 7 | |
| 12≤ D <16 | 8 | 0.05 - 0.45 |
| 16≤ D <25 | 10 | |

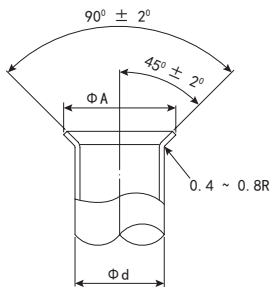



(8) Cautions for Flaring Work

(A) Perform the flaring work as shown below:

Unit: mm

| Diameter (Φd) | $A^{+0}_{-0.4}$ |
|---|---|
| | R410A |
| 6.35 | 9.1 |
| 9.52 | 13.2 |
| 12.7 | 16.6 |
| 15.88 | 19.7 |
| 19.05 | (*) |




(*): It is impossible to perform flaring work with hard temper pipe. Use an accessory pipe with a flare.

(B) Joint Selection

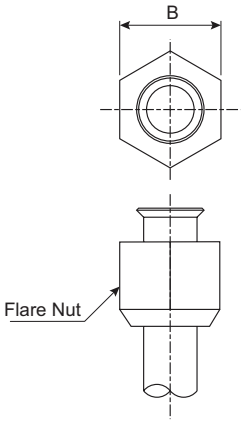
The minimum thickness of joint and flare nut dimension are selected from the table below:

Minimum Thickness of Joint
Unit: mm

| Diameter(Φd) | R410A |
|---|---|
| 6.35 | 0.5 |
| 9.52 | 0.6 |
| 12.7 | 0.7 |
| 15.88 | 0.8 |
| 19.05 | 0.8 |

Flare Nut Dimension B
Unit: mm

| Diameter(Φd) | R410A |
|---|---|
| 6.35 | 17 |
| 9.52 | 22 |
| 12.7 | 26 |
| 15.88 | 29 |
| 19.05 | 36 |

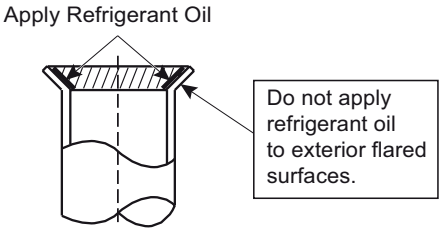



**Note:**

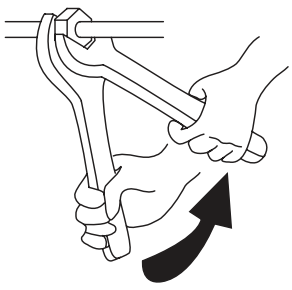
Do not use a thin joint other than the ones shown in the table above.

(C) Verify that there are no scratches, metal particles, gaps, or deformations at the flared end before making connections to the system.

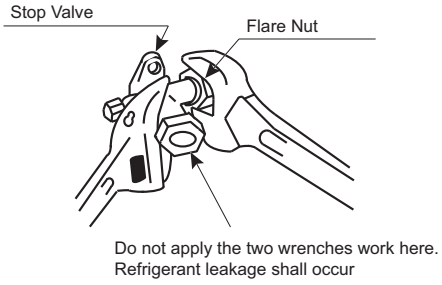
(D) Apply a little of refrigerant oil (field-supplied) on the flare surface of the pipe and flare nut before performing flaring work. Tighten the flare nut to specified torque settings using two wrenches. Perform flaring work to the liquid piping side before treating the gas piping side. Verify that no gas leakage has occurred after completing flaring work.




(E) Be sure to use two wrenches as shown.



Use two wrenches as shown




Tightening Work for Stop Valve

Required Tightening Torque

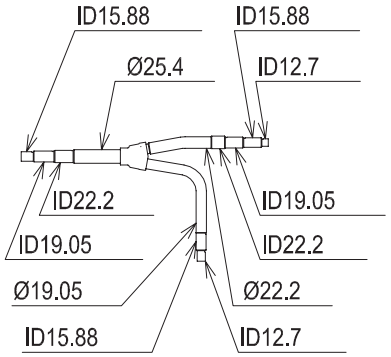
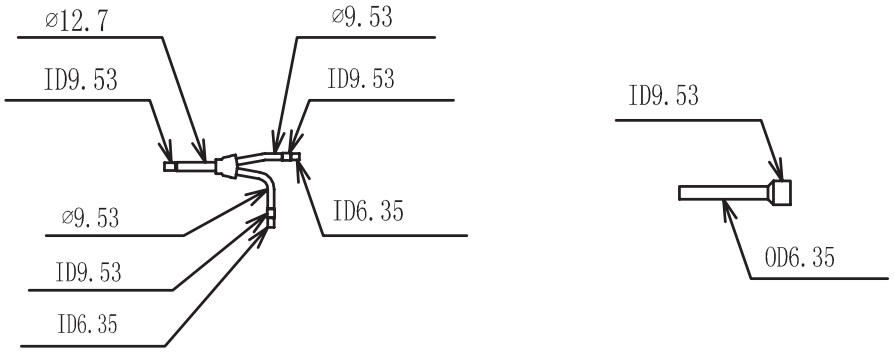
| Pipe Diameter | Tightening Torque |
|---|---|
| Φ6.35mm | 20 N·m |
| Φ9.52mm | 40 N·m |
| Φ12.7mm | 60 N·m |
| Φ15.88mm | 80 N·m |
| Φ19.05mm | 100 N·m |

## 3.2 Model of Branch Pipe

(1) E-102SN

The model of E-102SN branch pipe is used for the model of RAS-3.0~6.5HNBRKQ1 and RAS-7.0~12HNBRMQ1 outdoor unit.

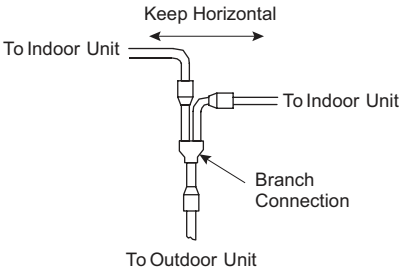
Unit: mm

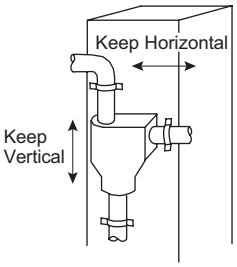
| Model | E-102SN for RAS-3.0~6.5HNBRKQ1 and RAS-7.0~12HNBRMQ1 |
|---|---|
| Gas Pipe |  |
| Liquid Pipe |  |

(2) Precaution for branch pipe connection

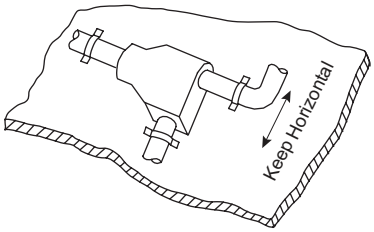
Use the branch pipe to connect the outdoor/indoor units. Mounted the branch pipes to a pillar, a wall, or a ceiling.

Keep the inlet pipe of the branch pipe straight, and the length of the straight pipe is no less than 0.5 meter.

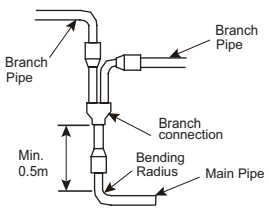
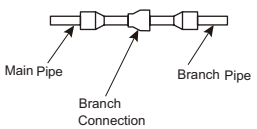
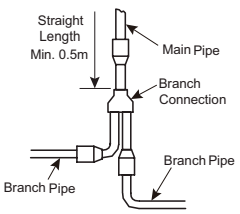
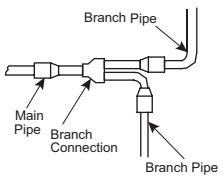



Secure the Branch Pipe to the surface of Pillar or Wall.




Secure the Branch Pipe to Ceiling surface or Beam

| Upper side | Upper side | Upper side | Upper side |
|---|---|---|---|
|  |  |  |  |
| CORRECT | CORRECT | CORRECT | INCORRECT |

### 3.3 Refrigerant Piping Size

Example of connection: connection of 4 indoor units.

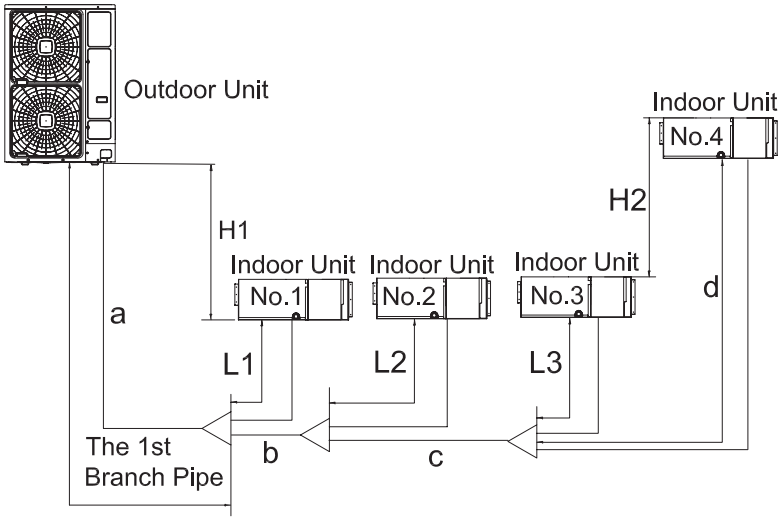



Table 3.1 Piping Size of Main Pipe

| Model | Stop Valve (mm) | | Pipe between the outdoor unit and the 1st branch pipe; The pipes between the branch pipes | | |
|---|---|---|---|---|---|
| | Gas | Liquid | Gas | Liquid | Marks |
| RAS-3.0~6.5HNBRKQ1 | Φ15.88 | Φ9.52 | Φ15.88 | Φ9.52▲ | a; b; c |
| RAS-7.0~8.0HNBRMQ1 | Φ19.05 | Φ9.52 | Φ19.05 | Φ9.52▲ | a; b; c |
| RAS-10HNBRMQ1 | Φ19.05 | Φ12.7 | Φ22.2* | Φ12.7 | a; b; c |
| RAS-11~12HNBRMQ1 | Φ19.05 | Φ12.7 | Φ25.4* | Φ12.7 | a; b; c |

**Notes:**

- Mark "▲" represent that if the liquid pipe which is between the outdoor unit and the 1st branch is over than 70 meters, its diameter should be up size. Thus the Φ9.52 diameter pipe is converted to Φ12.7 diameter pipe.
- Mark " * " represent that there are pipe adapters in the outdoor unit, which is used to adjust the gas pipe between the outdoor unit and the first branch. Thus the Φ19.05 diameter pipe is converted to Φ22.2 diameter pipe in the model of RAS-10HNBRMQ1, and the Φ19.05 diameter pipe is converted to Φ25.4 diameter pipe in the model of RAS-11~12HNBRMQ1.

Table 3.2 Piping Work Conditions

| Item | | Marks | Allowable Piping Length | |
|---|---|---|---|---|
| Maximum Piping Length (Liquid Pipe) | Between the outdoor unit and the farthest indoor unit | a+b+c+d | RAS-3.0~3.5HNBRKQ1 | ≤65 meters |
| | | | RAS-4.0~5.0HNBRKQ1 | ≤70 meters |
| | | | RAS-6.0~6.5HNBRKQ1 | ≤85 meters |
| | | | RAS-7.0~12HNBRMQ1 | ≤100 meters |
| | Total liquid pipe length | a+b+c+d+L1+ L2+L3 | RAS-3.0~3.5HNBRKQ1 | ≤100 meters |
| | | | RAS-4.0~5.0HNBRKQ1 | ≤120 meters |
| | | | RAS-6.0~6.5HNBRKQ1 | ≤150 meters |
| | | | RAS-7.0~12HNBRMQ1 | ≤180 meters |
| | Between the 1st branch pipe and the farthest indoor unit | b+c+d | | ≤40 meters |
| | Between branch pipes and connected indoor units | L1,L2,L3,d | | ≤15 meters |
| Allowable Height Difference | Outdoor unit is higher than indoor unit | H1 | RAS-3.0~6.5HNBRKQ1 | ≤30 meters |
| | | | RAS-7.0~12HNBRMQ1 | ≤50 meters |
| | Outdoor unit is lower than indoor unit | H1 | RAS-3.0~6.5HNBRKQ1 | ≤30 meters |
| | | | RAS-7.0~12HNBRMQ1 | ≤40 meters |
| | Height difference between indoor units | H2 | | ≤15 meters |
| Others | The model of branch pipe▲ | RAS-3.0~6.5HNBRKQ1 RAS-7.0~12HNBRMQ1 | | E-102SN |

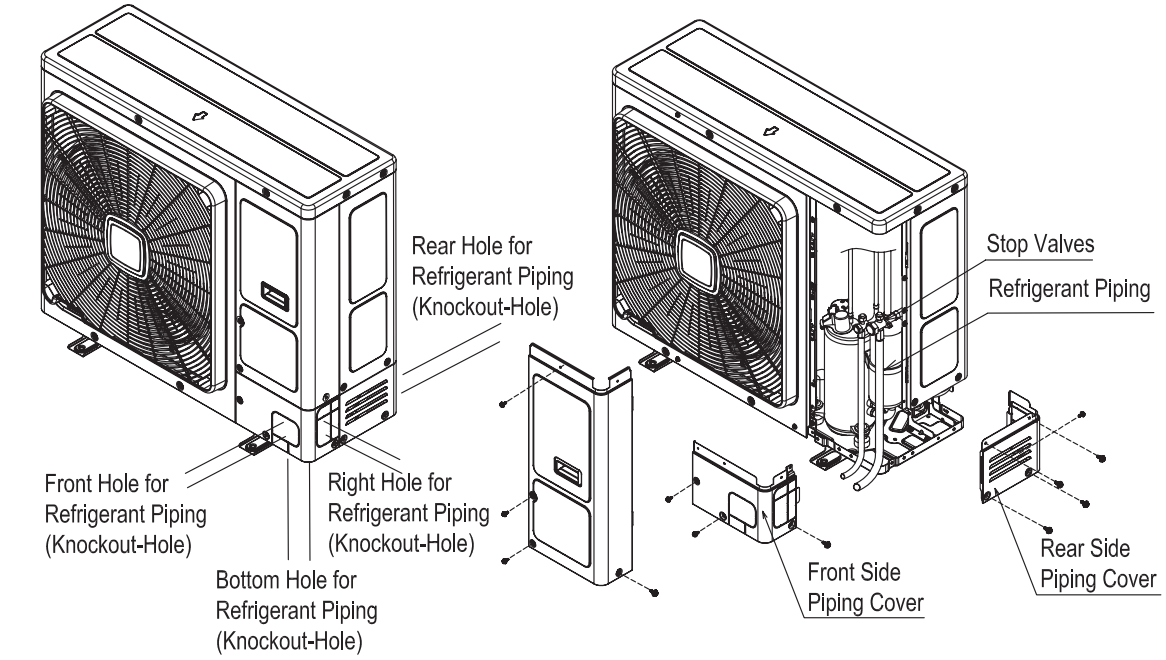
**Note:**

Mark "▲" represent that the model of branch pipe should be same as the requirement of the table above.

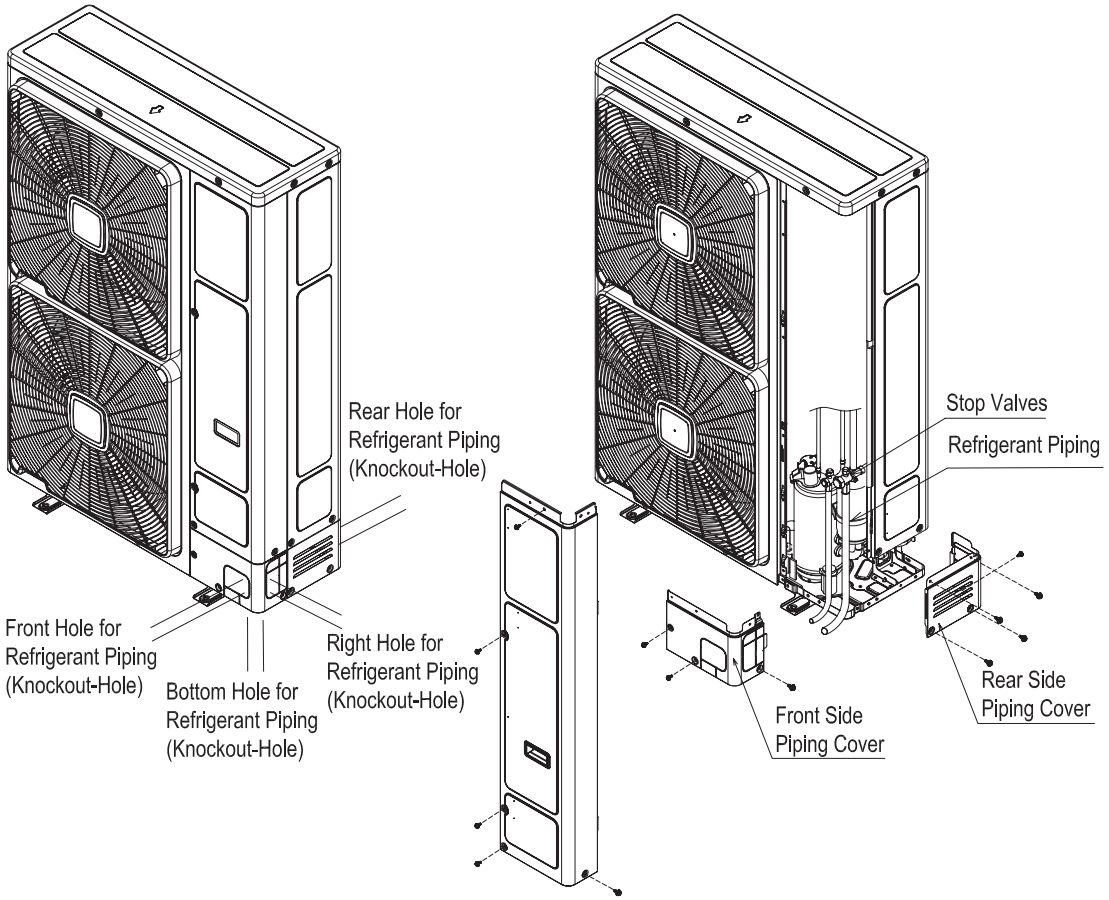
### 3.4 Refrigerant Piping Work for Outdoor Unit

(1) The refrigerant piping can be installed in four directions (front, right, bottom or rear side) as shown in the following figures.

**Model: RAS-3.0~3.5HNBRKQ1**




**Model: RAS-4.0~6.5HNBRKQ1; RAS-7.0~12HNBRMQ1**



Attention for Removing Service Cover

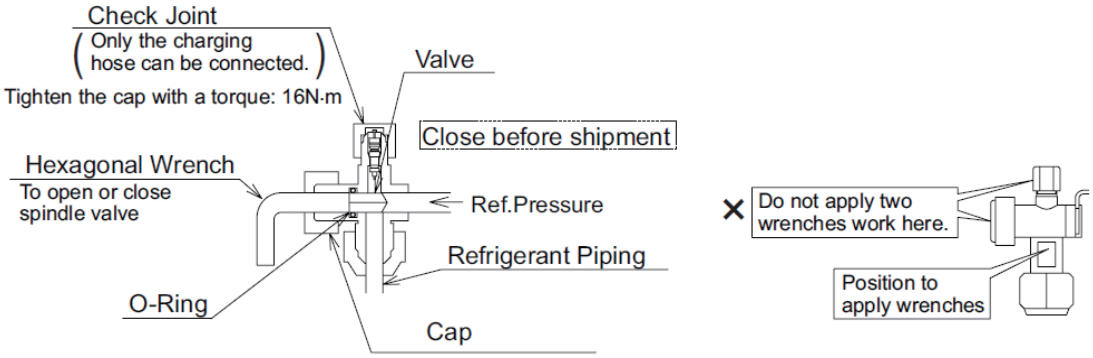
– Procedures of Removing Cover –

- Remove the screws according to the figure above.

**Note:**
Remove the screws and hold the service cover with your hands. If not, the service cover may fall down.

- Slowly push the service cover downward.

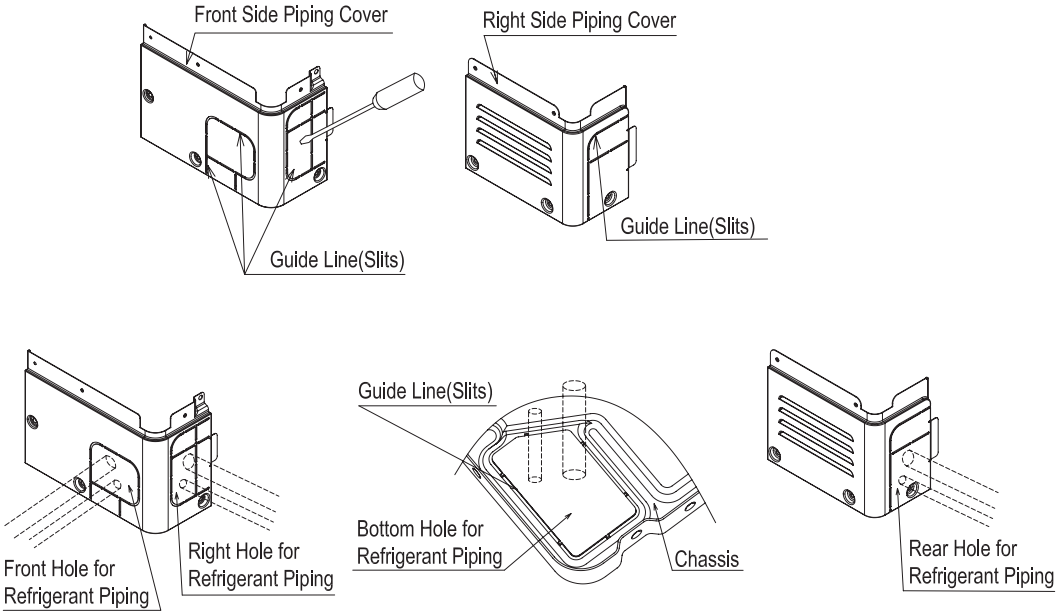
(2) Securely use two wrenches at the following position when removing or installing the pipe. (If not, refrigerant leakage may occur.)




Controlling torque of hexagonal wrench

| Model | Gas side stop valve | Liquid side stop valve |
|---|---|---|
| RAS-3.0~6.5HNBRKQ1 | 11~14 N·m | 7~9 N·m |
| RAS-7.0~8.0HNBRMQ1 | 12~15 N·m | 7~9 N·m |
| RAS-10~12HNBRMQ1 | 12~15 N·m | 8~12 N·m |

(3) If the direction of the refrigerant piping has been chosen, please remove the piping cover from the unit, punch out the holes following the guide line with a screwdriver and a hammer. Then, deburr the holes and attach insulation (field-supplied) for protection of cables and pipes.




(a) Front and Right Side Piping Work (b) Bottom Side Piping Work (c) Rear Side Piping Work

**NOTICE**

- Protect cables and refrigerant pipes from the edges of the holes with insulations and so on. (Field supplied).
- Prevent the cables from contacting the refrigerant piping and the hot components of the unit directly.
- For the right side and rear side piping work, secure enough space for the piping.

(4) Be sure to attach the piping cover to prevent rain water entering the unit. Completely seal the penetration parts of the pipes with field-supplied insulation in order to prevent rain water entering the unit.

(5) Use a pipe bender or an elbow (field-supplied) for bending work while connecting pipes.

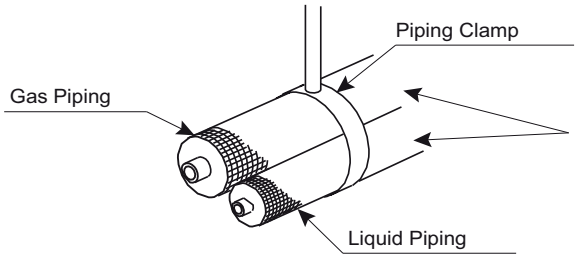
### 3.5 Air Tight Test

(1) The stop valves should be closed completely (factory-setting). Do not open the stop valves until all the refrigerant piping connections, air tight test, and vacuum have been completed.

(2) The refrigerant used for the outdoor unit is R410A. Use the pressure gauge and the charging hose for exclusive use of R410A.

(3) Connect the indoor/outdoor units with refrigerant piping. Mounted the piping to a stable wall or ceiling with the piping clamp at interval of 1.5 meters. Otherwise, the piping may be damaged.

(4) Securely insulate the gas piping side and liquid piping side individually.



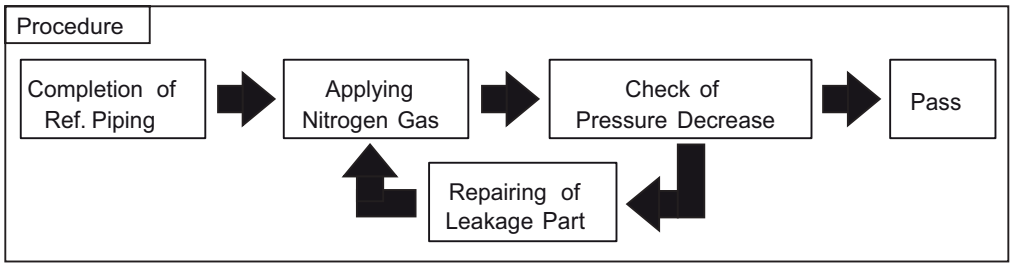

Note:
Due to gas and liquid piping will stretch or contact at different rates due to changing refrigerant temperatures.
Do not fasten gas and liquid piping together.
Distortion and deformation of the piping can occur.

(5) Connect the pressure gauge and the charging hoses to the check joints of the stop valves with a nitrogen tank. Perform the air tight test at 4.15 MPa for the test pressure.

(6) For the air tight test, please use a leak detector or forming agent to detect the joints and stop valves for the piping connection. If there is leakage, please solve it and repeat the air tight test.

(7) If there is no leakage, the nitrogen gas should be discharged from the refrigerant pipes and the air tight test is finished.

(8) Make sure to insulate the joints for the piping connection as well. Seal the gap between the piping cover and pipes with the field-supplied packing after insulation work is completed.




**⚠ CAUTION**

- The air tight test should be performed on the gas stop valve and the liquid stop valve simultaneously. Otherwise, the air tight test is invalid.
- Use the pressure gauge and the charging hose for exclusive use of R410A.

### 3.6 Vacuuming

(1) Connect the pressure gauge and the charging hoses to the check joints of the stop valves with a vacuum pump.

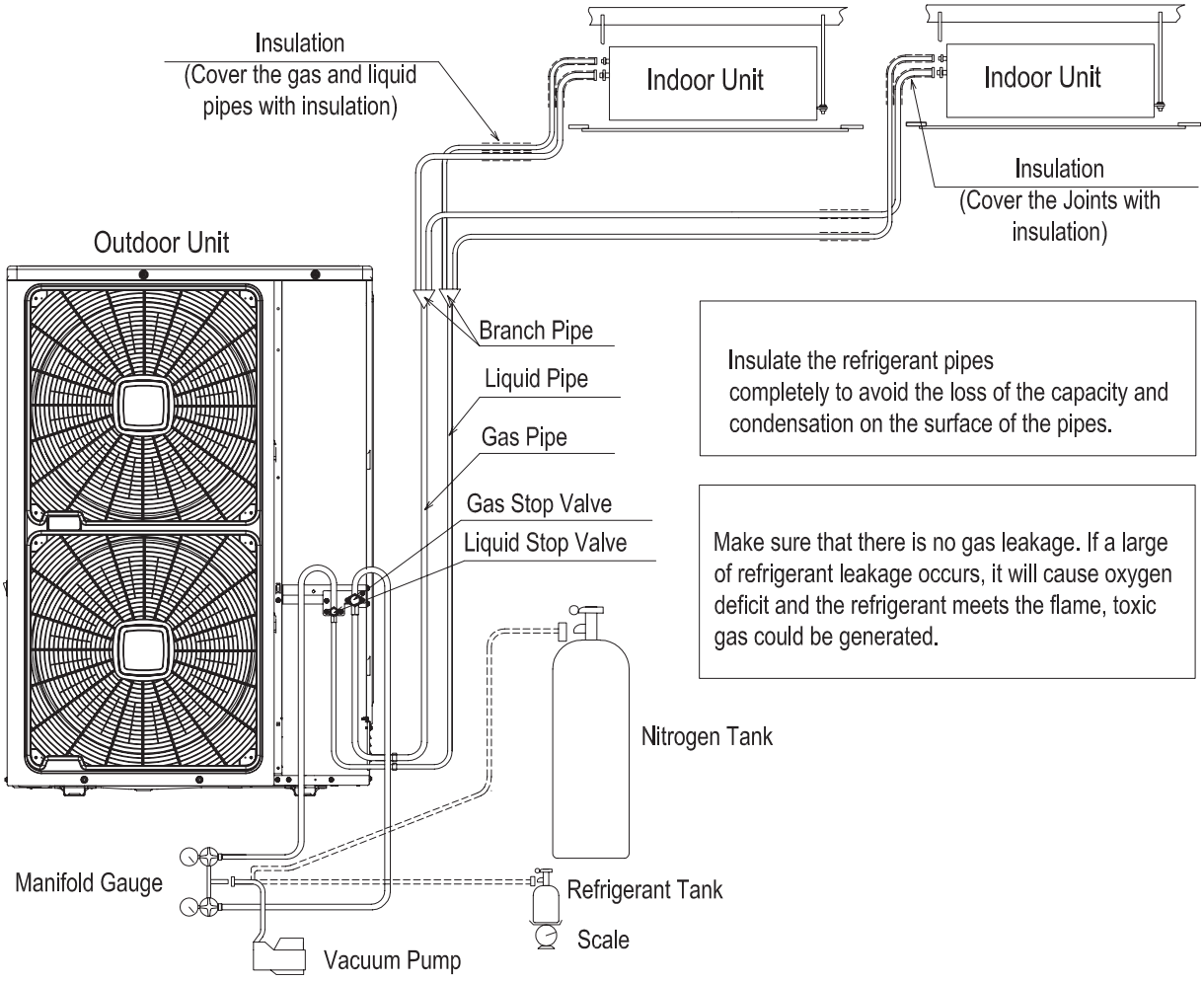
(2) Vacuum the refrigerant piping of the system with the vacuum pump until the pressure reaches -0.1MPa or lower. Then, continue the vacuum pumping work for more than one hour.

(3) After that, turn off the vacuum pump and then observe the pressure for more than two hours.

(4) If the pressure is over than -0.1MPa obviously, a gas leak is suspected. Please check the leak position and eliminate it. Then repeat the vacuuming work again.

**⚠ CAUTION**

- The vacuuming should be performed on the gas stop valve and the liquid stop valve simultaneously. Otherwise, air may be left in the system and lead the system to be damaged.
- The tools are used for exclusive use of R410A.



## 3.7 Additional Refrigerant Charge Calculation

Although this unit has been charged with refrigerant, additional refrigerant charge is required on the site.

Determine additional quantity of refrigerant required according to the following table, and charge it into the system.

(1) Calculating the method of Additional Refrigerant Charge

<table>
<tr><td>Model</td><td>Item</td><td colspan="5">Contents</td><td>Total Additional Charge</td></tr>
<tr><td rowspan="5">RAS-3.0~6.5 HNBRKQ1</td><td rowspan="4">For the refrigerant pipes</td><td>Pipe diameter</td><td>Symbol</td><td>Total length of liquid piping (meter)</td><td>Refrigerant charge per meter</td><td>Additional charge (kg)</td><td rowspan="5">W=W11+W12 +W13</td></tr>
<tr><td>Φ6.35</td><td>W11=</td><td></td><td>×0.020kg/m=</td><td></td></tr>
<tr><td>Φ9.52</td><td>W12=</td><td></td><td>×0.050kg/m=</td><td></td></tr>
<tr><td>Φ12.7</td><td>W13=</td><td></td><td>×0.085kg/m=</td><td></td></tr>
<tr><td>For the Indoor units</td><td colspan="5">0</td></tr>
<tr><td rowspan="9">RAS-7.0~12 HNBRMQ1</td><td rowspan="4">For the refrigerant pipes</td><td>Pipe diameter</td><td>Symbol</td><td>Total length of liquid piping (meter)</td><td>Refrigerant charge per meter</td><td>Additional charge (kg)</td><td rowspan="9">W=W11+W12 +W13+W21 +W22+W23</td></tr>
<tr><td>Φ6.35</td><td>W11=</td><td></td><td>×0.020kg/m=</td><td></td></tr>
<tr><td>Φ9.52</td><td>W12=</td><td></td><td>×0.059kg/m=</td><td></td></tr>
<tr><td>Φ12.7</td><td>W13=</td><td></td><td>×0.120kg/m=</td><td></td></tr>
<tr><td rowspan="4">For the 4-way cassette indoor units</td><td>Model</td><td>Symbol</td><td>Numbers (Q’ty)</td><td>Refrigerant charge per unit</td><td>Additional charge (kg)</td></tr>
<tr><td>RCI-1.0~1.5</td><td>W21=</td><td></td><td>×0.23kg/pcs=</td><td></td></tr>
<tr><td>RCI-2.0~2.5</td><td>W22=</td><td></td><td>×0.29kg/pcs=</td><td></td></tr>
<tr><td>RCI-3.0~6.5</td><td>W23=</td><td></td><td>×0.47kg/pcs=</td><td></td></tr>
<tr><td>For the other indoor units</td><td colspan="5">0</td></tr>
</table>

**Note:**

Ensure the total additional charge should not be exceeded the max. additional refrigerant charge quantity.

(2) Max. Additional Refrigerant Charge Quantity

| Outdoor Unit | RAS-3.0~ 3.5HNBRKQ1 | RAS-4.0~ 5.0HNBRKQ1 | RAS-6.0~ 6.5HNBRKQ1 | RAS-7.0~ 8.0HNBRMQ1 | RAS-10~ 12HNBRMQ1 |
|---|---|---|---|---|---|
| Max. Additional Refrigerant Charge Quantity (kg) | 3.9 | 7.9 | 8.6 | 12.9 | 12.9 |

(3) Refrigerant Charge Amount of Outdoor Unit before Shipment.

| Outdoor Unit | $W_0$(kg) |
|---|---|
| RAS-3.0~3.5HNBRKQ1 | 3.0 |
| RAS-4.0~5.0HNBRKQ1 | 4.1 |
| RAS-6.0~6.5HNBRKQ1 | 4.4 |
| RAS-7.0~8.0HNBRMQ1 | 5.5 |
| RAS-10~12HNBRMQ1 | 6.5 |

**Note:**

$W_0$ is outdoor unit refrigerant charge before shipment.

(4) Record of Additional Charge

The total refrigerant charge of the system should be calculated by the following formula:

| Total of Refrigerant Charge | = | W | + | $W_0$ | | | | Total Additional Charge: W ☐ Kg<br>Total Ref. Charge: ☐ Kg<br>Date of Ref. Charge Work: ☐ / ☐ / ☐ |
|---|---|---|---|---|---|---|---|---|
| The system | = | | + | | = | | kg | |

### 3.8 Additional Refrigerant Charge Work

(1) The additional refrigerant charge is required according to the calculation.

(2) Before charge work, make sure that the stop valves are fully closed.

(3) Charge the additional refrigerant from the check joint of liquid stop valve.

(4) After refrigerant has been charged, fully open the liquid stop valve and gas stop valve.

(5) If it proves impossible to charge the required quantity of refrigerant, follow the procedure below:

(A) Fully open the gas stop valve.

(B) Operate the compressor in the cooling mode and charge the additional refrigerant from the check joint of the liquid stop valve. At this time, keep the liquid stop valve slightly open.

(C) After the refrigerant is charged, fully open the liquid stop valve and the gas stop valve.

(D) Carefully calculate any additional refrigerant quantity for charging. If the quantity of additional refrigerant is not correct, it may cause an abnormal condition in the system. The additional refrigerant must be charged as liquid.

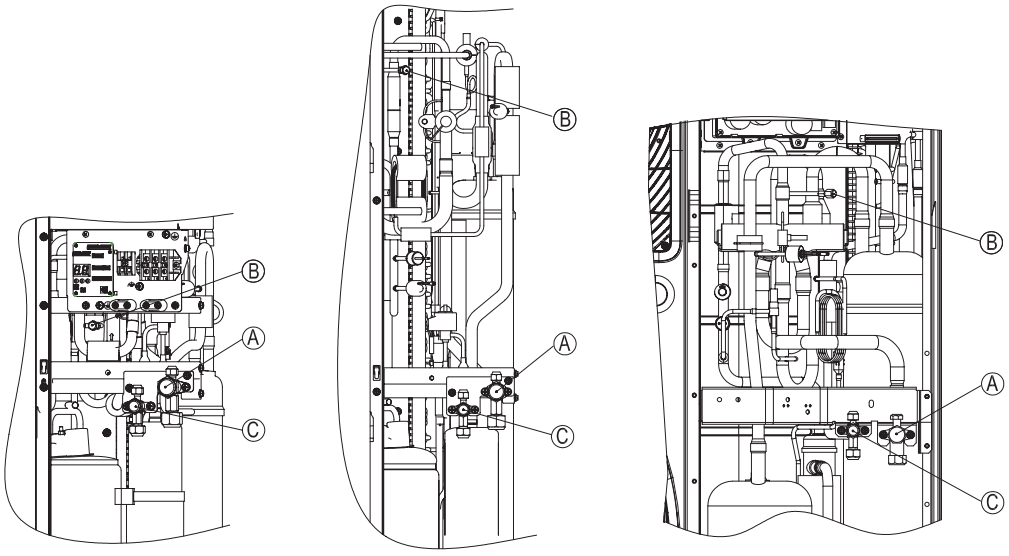
**NOTICE**

- Do not apply excessive force to the stop valves after fully opening the valves.
- At the test run, fully open the gas and liquid stop valves.

### 3.9 Pressure Measurement

When the pressure is measured, it can be applied by the check joints as the following figures. Connect the pressure gauge according to the table below, because of high pressure side and low pressure side change by operation mode.

| Item | Cooling Operation | Heating Operation |
|---|---|---|
| Check joint for gas stop valve “A” | Low Pressure | High Pressure |
| Check joint for piping “B” | High Pressure | Low Pressure |
| Check joint for liquid stop valve “C” | High Pressure | High Pressure |




a) RAS-3.0~3.5HNBRKQ1 b) RAS-4.0~6.5HNBRKQ1 c) RAS-7.0~12HNBRMQ1

## 4. Electrical Wiring

**⚠ WARNING**

- Turn off the main power switch of the indoor unit and the outdoor unit, then wait for more than 10 minutes before electrical wiring work or a periodical check is performed.
- Ensure that the indoor fan and the outdoor fan have been stopped before electrical wiring work or a periodical check is performed.
- Protect the wirings, electrical parts, and so on. from rats or other small animals. If not, rats may gnaw at unprotected parts and which may lead to a fire.
- Avoid the wirings touching the refrigerant pipes, plate edges and electrical parts inside the unit. If not, the wirings will be damaged and a fire may be happened.
- Secure the cables. External forces on the terminals can lead to a fire.

**NOTICE**

- The indoor unit fan may continue to operate for up to five minutes following the heating cycle to dissipate residual heat from the indoor unit.

## 4.1 General Check

(1) Make sure that the field-supplied electrical components (main power switches, circuit breakers, wires, conduit connectors and wire terminals) have been properly selected according to the electrical characteristics indicated in the table 4.1. Make sure that the components comply with the local national standards and rules.

- The power sources for the indoor unit and outdoor unit should be supplied respectively.
- Supply electrical power to each outdoor unit. An ELB (Earth Leakage Breaker), fuse and main switch should be used for each outdoor unit. If not, it will be cause of fire or electrical shock.

(2) Ensure that the power supply voltage is within ±10% of the rated voltage. If the power supply voltage is too low, the system cannot start due to the voltage drop.

(3) Check the size of the electrical wires.

(4) Ensure that the ground wiring for the outdoor unit and indoor unit are connected. If not, it will be cause of fire or electrical shock.

(5) Communication cabling shall be a minimum of 0.75mm$^2$, 2-Conductor, Stranded Copper. Shielded cable must be considered for applications and routing in areas of high EMI and other sources of potentially excessive electrical noise to reduce the potential for communication errors. When shielded cabling is applied, proper bonding and termination of the cable shield is required as per guidelines. Plenum and riser ratings for transmission cables must be considered per application and local code requirements.

- In case of where the power source for the air conditioning is supplied from the same power transformer as the device with high electricity consumption*.
- In case of where the power supply wiring for the device* and for the air conditioning are located close to each other.

* Example: Lift, container crane, rectifier for electric railway, inverter power device, arc furnace, electric furnace, large-sized induction motor, and large-sized switch.

In the instances mentioned above, an induction surge of the power supply wiring for the air conditioning could occur due to a rapid change in electricity consumption of the device and activation of the switch. Therefore, check the field regulations and standards before performing electrical work in order to protect the power supply wiring for the air conditioning.

## 4.2 Electrical Wiring Connection

Connect the electrical wiring according to the following figures:

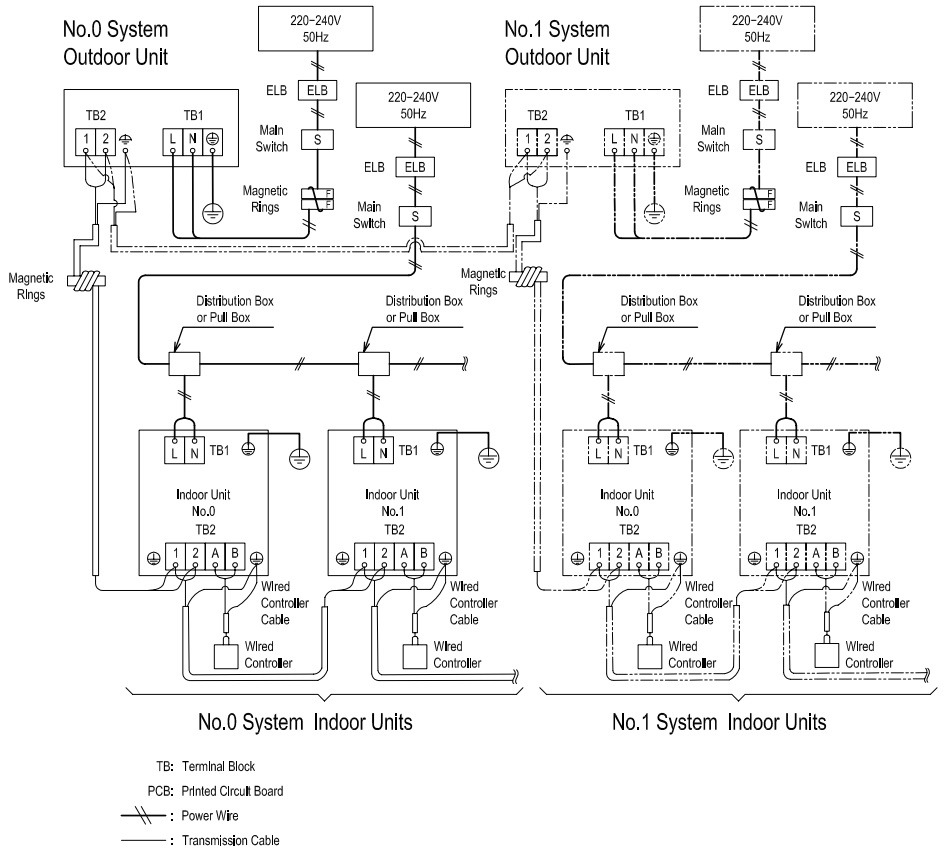



Figure 4.1 Electrical Wiring Connection for RAS-3.0~6.5HNBRKQ1

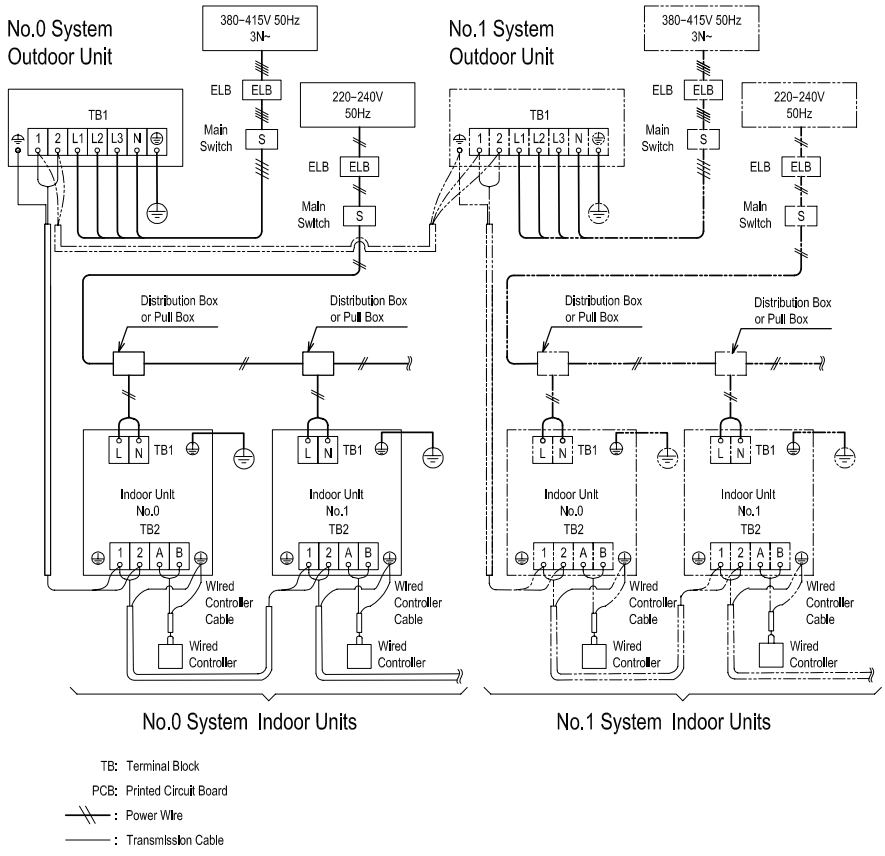



Figure 4.2 Electrical Wiring Connection for RAS-7.0~12HNBRMQ1

Table 4.1 Recommended Electrical Characteristics

| Model | Power Supply | Maximum Running Ampacity (A) | Power Supply Wiring (Cores×mm$^2$) | Transmission cable (Cores×mm$^2$) | ELB | |
|---|---|---|---|---|---|---|
| | | | | | Rated Ampacity (A) | Rated Sensitive Ampacity (mA) |
| RAS-3.0~3.5 HNBRKQ1 | 220-240V/1Ph/50Hz | 21 | 3×4.0 | 2×0.75 | 32 | 30 |
| RAS-4.0~6.5 HNBRKQ1 | 220-240V/1Ph/50Hz | 31 | 3×6.0 | 2×0.75 | 40 | 30 |
| RAS-7.0~8.0 HNBRMQ1 | 380-415V/3Ph/50Hz | 20 | 5×6.0 | 2×0.75 | 25 | 30 |
| RAS-10~12 HNBRMQ1 | 380-415V/3Ph/50Hz | 28 | 5×6.0 | 2×0.75 | 40 | 30 |

(1) Connect the power supply wirings to the terminal block TB1 and ground wiring to the terminal in the electrical control box. The ELB (Earth leakage breaker), FUSE and S (Main switch) must be installed to each power source of outdoor unit.

(2) Connect the transmission cables between the outdoor unit and indoor units to the terminals 1 and 2 on the terminal block. The transmission cables must be made from the shielded twist pair cabling. Proper bonding and termination of the cable shield is required as per guidelines. The installation must be considered per application and local code requirements. Transmission cable shall be a minimum of 0.75mm$^2$, 2-Conductor, Stranded Copper.

(3) For the model of RAS-3.0~6.5HNBRKQ1 outdoor units, the magnetic rings in the package of the outdoor unit should be used on the power supply wire and transmission cable. For the power supply wire, two magnetic rings should be paralleled and the wire should through them by one cycle. For the transmission cable between the outdoor unit and indoor units, the cable should be through the magnetic ring by 3 cycles.

(4) Connect the transmission cables between the indoor unit and wireless controller to the terminals A and B on the terminal block.

(5) The transmission cable is required to be separated from the power supply wiring.
Keep at least 5cm distance between the transmission cable and the power supply wiring, and also min. 1.5m distance between the transmission cable and power supply wiring for other electrical device. If the above is not secured, put the power supply wiring into the metal conduit tube to separate from other wirings.

(6) Do not connect the power supply wiring to the terminals 1 and 2 on the terminal block for transmission wiring. Otherwise, printed circuit board may be damaged.

(7) Connect the ground wire for the outdoor/indoor units. The ground wiring work under the condition of 100Ω (max.) ground resistance should be performed by the qualified person.

(8) Tighten screws for the terminal block according to the following table:

| Size | Tightening Torque |
|---|---|
| M4 | 1.0~1.3 N·m |
| M5 | 2.0~2.5 N·m |
| M6 | 4.0~5.0 N·m |
| M8 | 9.0~11.0 N·m |
| M10 | 18.0~23.0 N·m |

**WARNING**

- The ELB (Earth leakage breaker), FUSE and S (Main switch) must be installed to each power source of outdoor unit and indoor units. If not, it may cause of an electrical shock or fire.
- Perform the electrical work according to the regulations of each region and this installation and maintenance manual. A separate, dedicated electrical circuit must be used. If the electrical wiring work is performed incorrectly or there is a capacity shortage of the power circuit, it will cause an electric shock or fire.
- Check that the ground wire is securely connected. Otherwise, it may lead to an electrical shock. Do not connect the ground wiring to gas piping, water piping, lightning conductor, or telephone ground wirings.
- In the electrical wiring connection for RAS-7.0~12HNBRMQ1, do not connect the live wires (L1/L2/L3) to the terminals N of the terminal block TB1. Otherwise, printed circuit board may be damaged.

### 4.3 Electrical Wiring for Outdoor Unit

Avoid the wirings touching the refrigerant pipes, plate edges and electrical parts inside the unit. If not, the wires will be damaged and at the worst, a fire will occur.

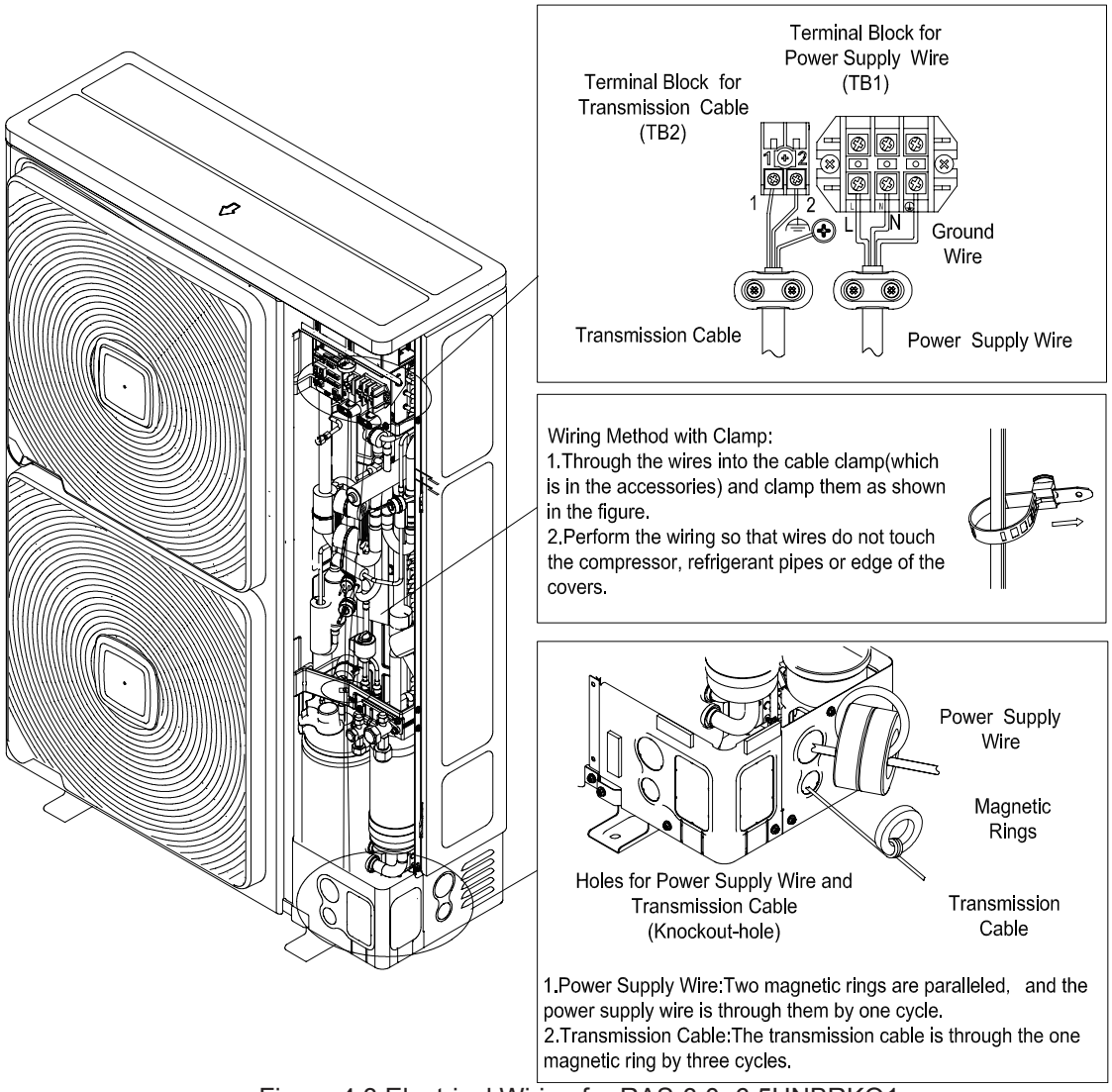



Figure 4.3 Electrical Wiring for RAS-3.0~6.5HNBRKQ1

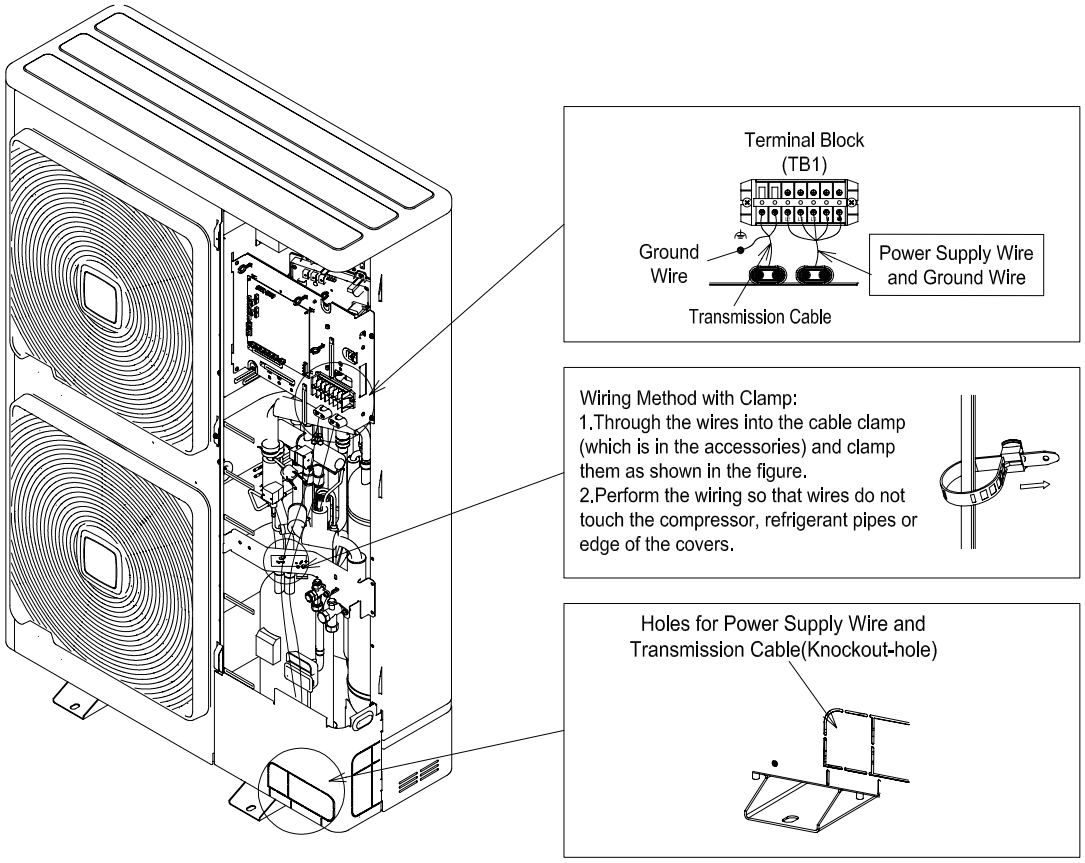



Figure 4.4 Electrical Wiring for RAS-7.0~12HNBRMQ1

**Notes:**

(1) Perform all the electrical work in accordance with this manual and in compliance with the local regulations and safety standards. The electrical wiring should be applied by the qualified person.

(2) The recommended electrical characteristics are calculated by the related safety standards. The environment temperature is less than 40°C, the length of the power supply wire is no more than 15 meters. If the air conditioning is in an extreme environment, please calculate the electrical characteristics again.

(3) If the distribution box or pull box is adopted to the power supply for air conditioning, the size of the power supply wire should be chosen according to the following table.

| Total Ampacity (A) | Power Supply Wiring ($mm^2$) | |
|---|---|---|
| I≤6 | 2.5 | |
| 6<I≤10 | 2.5 | |
| 10<I≤16 | 2.5 | *1: If the total ampacity is over than 63A, the power supply wires must not be connected in series. |
| 16<I≤25 | 4 | |
| 25<I≤32 | 6 | |
| 32<I≤40 | 10 | |
| 40<I≤63 | 16 | |
| 63<I | *1 | |

(4) The power supply wire should be stranded copper with shielding by neoprene.

(5) The transmission cables must be made up of the shielded twist pair cabling, and the shielded should be connected to the ground.

(6) If the power supply wiring or the transmission cable is damaged, please turn off the power supply and contact the service dealer.

## 5. DIP Switch Setting of Outdoor Unit

There are several DIP Switches in the front of the outdoor unit, which are designed for the test and diagnostic convenience. They have the advantages that they can monitor the real-time status of the outdoor unit, display the alarm codes, view the historical alarm codes, and so on.

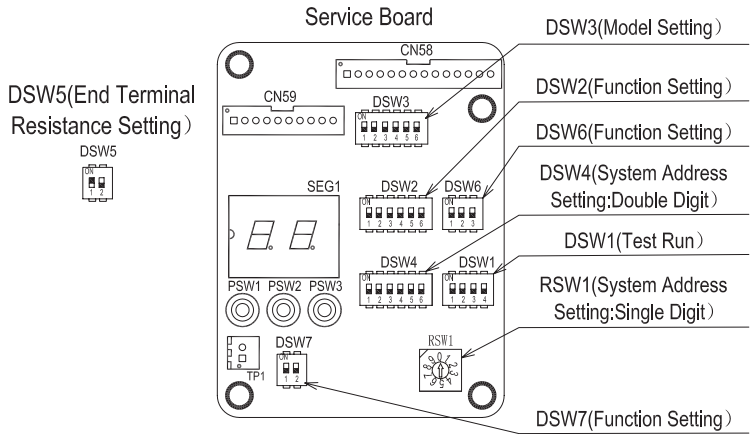



Figure 5.1 DIP Switches of RAS-3.0~6.5HNBRKQ1

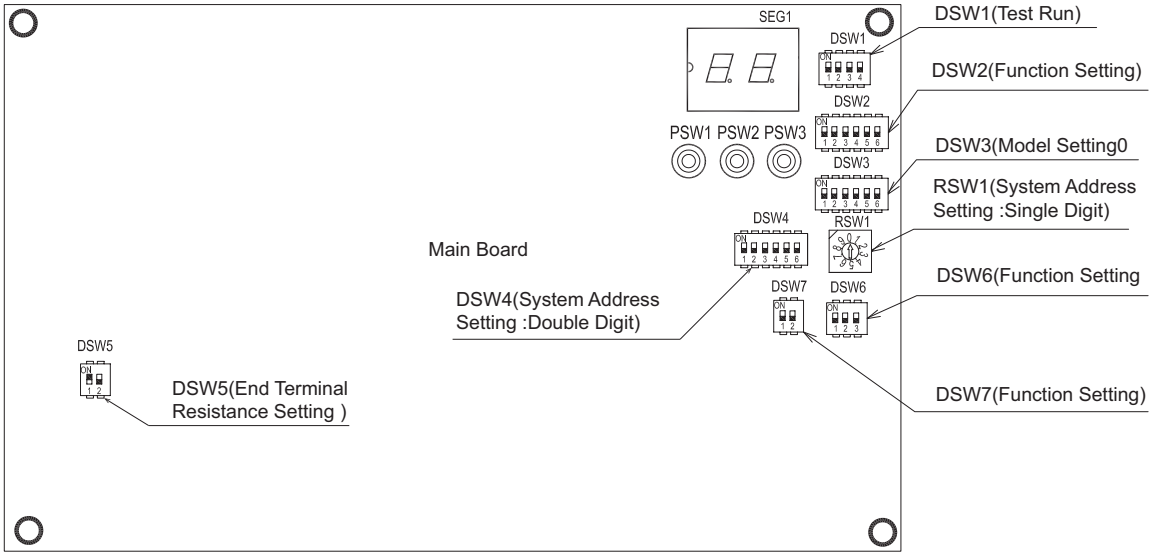



Figure 5.2 DIP Switches of RAS-7.0~12HNBRMQ1

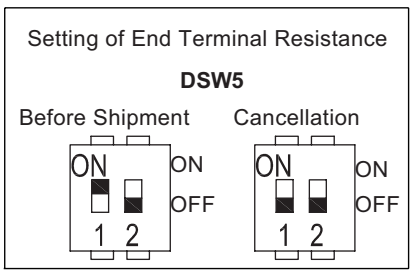
(1) The mark of "■" indicates the position of DIP switches. Set the DIP switches according to the introduction of DIP switches inside the outdoor unit.

(2) Setting for Transmitting

It is required to set the refrigerant cycle No. of outdoor unit.

(3) Setting End Terminal Resistance

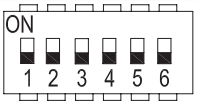
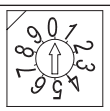
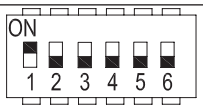
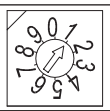
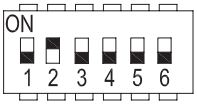
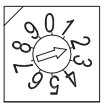
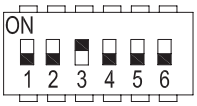
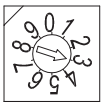
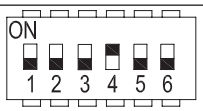
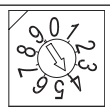
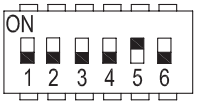
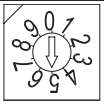
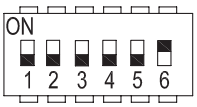
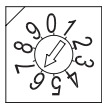
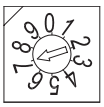
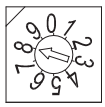
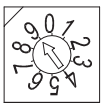
Before shipment, No. 1 pin of DSW5 is set at the "ON" side. If there are 2 or more units in the same communication system, set No. 1 pin of DSW5 at the "OFF" side from the 2nd refrigerant group outdoor unit. If only one outdoor unit is used, no setting is required.



(4) Setting Refrigerant Cycle No.

In the same refrigerant cycle, set the same refrigerant cycle No. for the outdoor unit and the indoor units as shown below. The range of refrigerant cycle No. is between 0 and 63.

Refrigerant Cycle No. = The value of the DSW4 (System Address Setting: Double Digit) + The value of the RSW1 (System Address Setting: Single Digit).

| DSW4 (System Address Setting: Double Digit) | | RSW1 (System Address Setting: Single Digit) | |
|---|---|---|---|
| DIP Switch Setting | Value | DIP Switch Setting | Value |
|  | 0 |  | 0 |
|  | 10 |  | 1 |
|  | 20 |  | 2 |
|  | 30 |  | 3 |
|  | 40 |  | 4 |
|  | 50 |  | 5 |
|  | 60 |  | 6 |
| | |  | 7 |
| | |  | 8 |
| | |  | 9 |

# 6. Test Run

Test run of outdoor units and indoor units should be performed one by one sequentially.

## 6.1 Before Test Run

(1) Do not operate the system until all the points have been examined and cleared.

- Check to ensure that the refrigerant piping and transmission between outdoor unit and indoor units are connected to the same refrigerant cycle. If not, it will cause an abnormal operation and a serious accident.
- Check to ensure that the resistance to ground is more than 1 megohm, by measuring the resistance between ground and the terminal of the electrical parts. If not, do not operate the system until the electrical leakage is found and repaired. Do not impress the power supply wiring on the terminals for transmission.
- Check to ensure that the liquid stop valve and the gas stop valves are fully open.
- Check to ensure that the power supply of air conditioning has been turn on for more than 12 hours, in order to warm the compressor oil by the crankcase heater.

(2) Pay attention to the following items while the system is running.

- Do not touch the compressor and the discharge gas pipes by hand, because their surface is very hot, it may be lead to be scalded.
- Do not touch any electrical components, otherwise, it may cause an electrical shock.

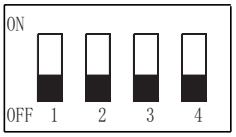
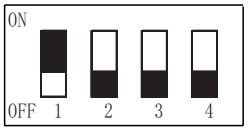
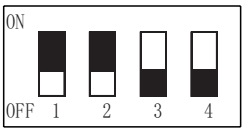
(3) Turn off the main power switch to the indoor unit and the outdoor unit and wait for more than 10 minutes before electrical wiring work or a periodical check is performed.

## 6.2 Test Run by DIP Switch of Outdoor Unit

(1) Turn on the power supply of the outdoor and indoor units for more than 12 hours, the 7-segment display is lighting.

(2) Check the 7-segment display of the outdoor unit. If there is any alarm code blinking, please examine and clear it by referring to the table of alarm codes.

(3) Operate the air conditioning in the cooling or heating operation according to the ambient temperature. The DIP Switch setting is shown as below. The operation will start in 1 minute after the DIP Switch setting is done.

| DIP Switch | Original State | Cooling Operation | Heating Operation |
|---|---|---|---|
| DSW1 |  |  |  |

(4) The indoor unit automatically starts operating when the test run of the outdoor unit is set. The operation continues for 2 hours without thermo-off, switch the DSW1 to the origin state, defrosting or a malfunction has happened.

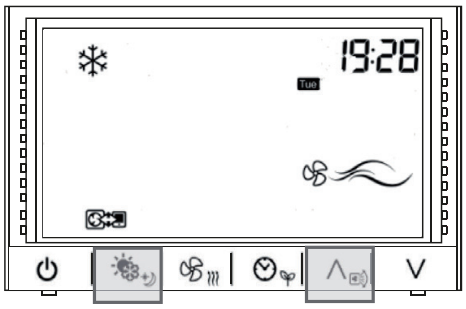
(5) During the test run, if any malfunction happens, please examine and clear it by referring to the table of alarm codes.

(6) If the test run has been finished, please switch the DSW1 to the original state. Otherwise, the air conditioning will not work normally.

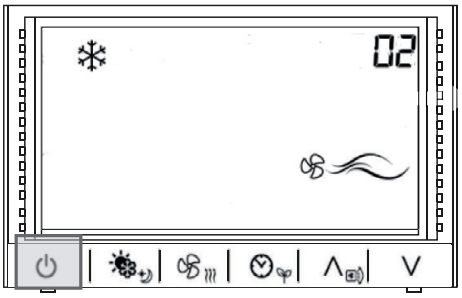
### 6.3 Test Run by Wired Controller

(1) Turn on the power supply of the outdoor and indoor units for more than 12 hours.

(2) The Liquid Crystal Display (LCD) of the wired controller is shown as below:




(3) Press and hold the MODE "" and INCREASE " " simultaneously for at least 5 seconds, the test run menu will be displayed.




- The total numbers of indoor units connected to the same wired controller is displayed on the LCD. A twin combination (one set with two indoor units) is identified as "02".
- The icon of operate mode " " and the icon of fan "" are blinking.
- Press the FAN "" to set the fan speed of the indoor units.
- Press the ON/OFF " " to turn on the air conditioning.
- The default setting for the test run time is a 120-minutes OFF timer. It can be adjusted by pressing the INCREASE " " and DECREASE " ". The range of the timer is between 30 minutes and 600 minutes, with an interval of 30 minutes.

(4) After setting the test run menu, the LCD will be displayed as follow:

**Notes:**

- Louver angle switch is in auto swing mode.
- If the multiple indoor units are operated simultaneously and controlled by one wired controller, the all setting in the wired controller is applied to every indoor unit which is connected to the same wired controller.

(5) Set the other wired controllers to test the other indoor units.

(6) To finish the test run, wait two hours (as a default setting), press ON/OFF " ", or press the MODE "" and INCREASE " " simultaneously for at least 5 seconds.

(7) During the test run, if any malfunction happens, please examine and clear it by referring to the table of alarm codes.

(8) If the indicated number of the wired controller is different with the actual connected indoor units, the auto-address function is not performed correctly due to incorrect wiring. Turn off the power supply and correct the wiring after checking the following points:

| Indicated Number | Malfunction | Turn off the power supply to check |
|---|---|---|
| None | ● Power supply for indoor unit is not turned on or incorrect wiring;<br>● Power supply for outdoor unit is not turned on or incorrect wiring;<br>● Incorrect wiring of wired controller. | ● The terminal block for transmission wiring in the indoor unit;<br>● The terminal block for transmission wiring in the wired controller;<br>● The wiring connected to the wrong terminals;<br>● The screws for the terminal block are loosen. |
| Less than the actual connected | ● Power supply for indoor unit is not turned on;<br>● Disconnect the transmission cables between outdoor unit and indoor units. | |

## 7. Safety and Control Device Setting

The compressor is protected by the following devices and their combinations:

(1) High Pressure Switch: This switch cuts out the operation of the compressor when the discharge pressure exceeds the setting.

(2) Crankcase Heater: This band type heater protects against oil foaming during cold starting, as it is energized while the compressor is stopped.

| Model | | RAS-3.0~3.5HNBRKQ1 | RAS-4.0~6.5HNBRKQ1 | RAS-7.0~8.0HNBRMQ1 | RAS-10~12HNBRMQ1 |
|---|---|---|---|---|---|
| High Pressure Switch | | Automatic Reset, Non-Adjustable | | Automatic Reset, Non-Adjustable | |
| Cut-Out | MPa | $4.15\ ^{-0.05}_{-0.2}$ | $4.15\ ^{-0.05}_{-0.2}$ | $4.15\ ^{-0.05}_{-0.2}$ | $4.15\ ^{-0.05}_{-0.2}$ |
| Cut-In | MPa | $3.2\ ^{+0.15}_{-0.2}$ | $3.2\ ^{+0.15}_{-0.2}$ | $3.2\ ^{+0.15}_{-0.2}$ | $3.2\ ^{+0.15}_{-0.2}$ |
| Breaker | A | 32 | 40 | 25 | 40 |
| Crankcase Heater | W | 24 | 28 | 80 | 80 |
| CCP Timer Setting Time | Min | Non-Adjustable 3 | Non-Adjustable 3 | Non-Adjustable 3 | Non-Adjustable 3 |

## 8. Drain Adapter: DC-01Q (Optional Parts)

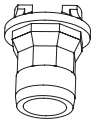
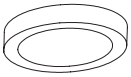
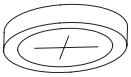
This Drain Adaptor is for the drain pipe connection in order to use the outdoor unit bottom base as a drain pan. Install it as instructed in this manual.

(1) Applicable Unit

| Model of Outdoor Unit | 3~6.5HP | 7~12HP |
|---|---|---|
| Required Quantity for Drain Adapter | 1 | 2 |

(2) Before Installation

Check that all the following accessories are packed with the unit before installation.

| No. | Accessory | Appearance | Q'ty | Remarks |
|---|---|---|---|---|
| 1 | Drain Adaptor (VP20 Equivalent) |  | 1 | Connecting for Drain Piping |
| 2 | Rubber Cap |  | 1 | Securing for the Drain Adaptor |
| 3 | Drain Cap |  | 4 | Plug for Drain Hole |

(3) Installation of Drain Adaptor

**⚠ CAUTION**

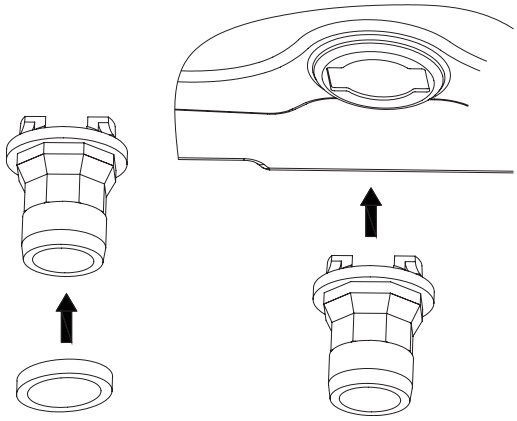
● Place the outdoor unit on a flat foundation or block and secure it at least 100mm higher than the ground. For smooth drainage, install the outdoor unit with a slight incline on the drainage side (rear side).

---

The Drain Adaptor is for the drain pipe connection for use on the outdoor unit bottom base as a drain pan.

(A) Put the rubber cap in the drain adaptor (to the upper part of the drain adaptor projection) in the direction of the arrow.

(B) Put the drain adaptor in the hole for the drain adaptor of the outdoor unit bottom base until it is securely fixed. (approx. 40°). (Fit the Drain Adaptor in the bottom base until it stops.)



(4) Installation of Drain Cap

The drain cap is a component to cover a hole.

Put the drain cap over the drain hole of the outdoor unit bottom base. Then, push the rubber cap to fit with the hole until a "click" sound is heard.

**⚠ CAUTION**

- The drain cap is used exclusively for the drain hole of the outdoor unit bottom base (φ24mm). Do not use it for the hole of the drain adaptor.
- Use a rubber cap when securing the drain adaptor and drain cap. (No rubber cap should allow water leakage.) After securing, ensure that there is no water leakage from the drain cap by pouring water into the bottom base and then draining it from the drain adaptor.
- Securely fix the drain adaptor, rubber cap and drain cap at the bottom base so it does not become loose when connecting the drain pipe.

---

(5) Utilization in Cold Area

**⚠ CAUTION**

- Do not use the Drain Adaptor in an area where drain water may be frozen. (If the drain water in the drain pipe is frozen and then the drain pipe may crack.)

---

(A) In a snow area, water from the heat exchanger may be frozen on the surface of the bottom base. This may lead to poor drainage. Therefore, do not use the drain adaptor in this type of area.

(B) In the drainage method, according to this manual, some of the defrost drain water dripped from the inlet protection grille may flow out over the bottom base of the product.
To prevent this, provide a drain pan larger than the bottom surface of the product. Secure the drain pan and the discharge pipe between the bottom part of the product and the foundation prior to discharge.

# Troubleshooting

# 1. Initial Troubleshooting

## 1.1 Checking Electrical Wiring and Power Source

(1) Check the following items for any abnormality in activation of the system.

| No. | Check Situation | Check Method |
|---|---|---|
| 1 | Is any power source breaker or fuse blown? | Check the voltage (Load side) of the breaker and also check the continuity of the fuse with a tester. |
| 2 | Is voltage at the secondary side of the transformer correct? | Disconnect at the secondary side of the transformer and measure voltage with a tester. |
| 3 | Is wiring firmly secured and correctly connected? | Check that the following wiring connection on O.U./I.U. printed circuit boards (PCBs) is not loose:<br>● The connection for thermistors<br>● The connection for the wired controller cable<br>● The connection for communication cable<br>● Each connection for power source line<br>Check that the wiring connection on O.U./I.U. PCBs is not loose or misconnected on the site according to the “Electrical Wiring Diagram”. |

**Notes:**

- If the fuse(s) on an I.U. PCB blows out, diagnose the cause of over current and recover the fuse(s).
- In addition, check the power source of optional parts because the fuse may blow out because of the power source failure.

(2) Electrical Characteristics

| Model | Power Supply | | | Voltage Range | | Start current | Rated Current Input | | MOP | MCA |
|---|---|---|---|---|---|---|---|---|---|---|
| | Voltage | PH | Hz | Max | Min | | Cooling | Heating | | |
| | (V) | Φ | Hz | (V) | (V) | A | A | A | A | A |
| RAS-3.0HNBRKQ1 | 220~240 | 1 | 50 | 264.0 | 198 | 8.7 | 9.5 | 9.9 | 32 | 21 |
| RAS-3.5HNBRKQ1 | 220~240 | 1 | 50 | 264.0 | 198 | 8.7 | 12.9 | 12.3 | 32 | 21 |
| RAS-4.0HNBRKQ1 | 220~240 | 1 | 50 | 264.0 | 198 | 10.6 | 12.6 | 14.0 | 40 | 31 |
| RAS-4.5HNBRKQ1 | 220~240 | 1 | 50 | 264.0 | 198 | 10.6 | 14.8 | 16.1 | 40 | 31 |
| RAS-5.0HNBRKQ1 | 220~240 | 1 | 50 | 264.0 | 198 | 10.6 | 18.3 | 19.2 | 40 | 31 |
| RAS-6.0HNBRKQ1 | 220~240 | 1 | 50 | 264.0 | 198 | 10.6 | 20.2 | 20.7 | 40 | 31 |
| RAS-6.5HNBRKQ1 | 220~240 | 1 | 50 | 264.0 | 198 | 10.6 | 26.0 | 24.0 | 40 | 31 |
| RAS-7.0HNBRMQ1 | 380~415 | 3 | 50 | 456.5 | 342 | 8.5 | 13.0 | 12.0 | 25 | 20 |
| RAS-8.0HNBRMQ1 | 380~415 | 3 | 50 | 456.5 | 342 | 8.5 | 14.0 | 13.0 | 25 | 20 |
| RAS-10HNBRMQ1 | 380~415 | 3 | 50 | 456.5 | 342 | 20.0 | 19.0 | 18.0 | 40 | 28 |
| RAS-11HNBRMQ1 | 380~415 | 3 | 50 | 456.5 | 342 | 20.0 | 20.0 | 19.0 | 40 | 28 |
| RAS-12HNBRMQ1 | 380~415 | 3 | 50 | 456.5 | 342 | 20.0 | 21.0 | 20.0 | 40 | 28 |

MCA: Minimum Circuit Ampacity (A);

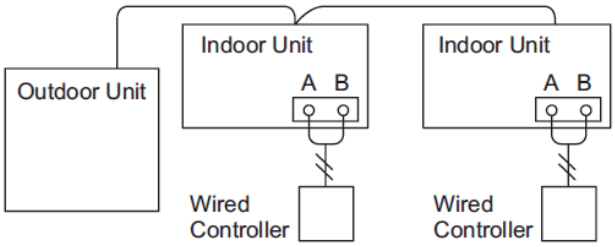
MOP: Maximum Overcurrent Protective Device (A)

**Notes:**

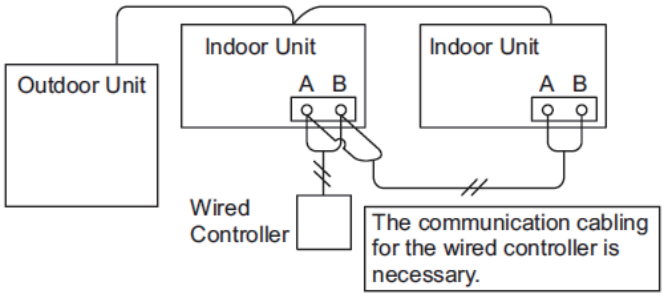
- Power voltage ranges are the following.
  Supply Voltage: Rated Voltage within ±10%; Starting Voltage: Rated Voltage within -15%;
  Operating Voltage: Rated Voltage within ±10%.
- Do not connect the ground wiring to gas piping, water piping, or a lightning conductor.
  Gas Piping: An explosion and ignition may occur if gas is escaping.
  Water Piping: There is no effective electrical ground provided when hard vinyl piping is used.
  Lightning Conductor: The electrical potential of the earth increases when a lightning conductor is used.

(3) Wired Controller Connecting Diagram

(a) Wired Controllers to each Unit for Individual Operation Setting.

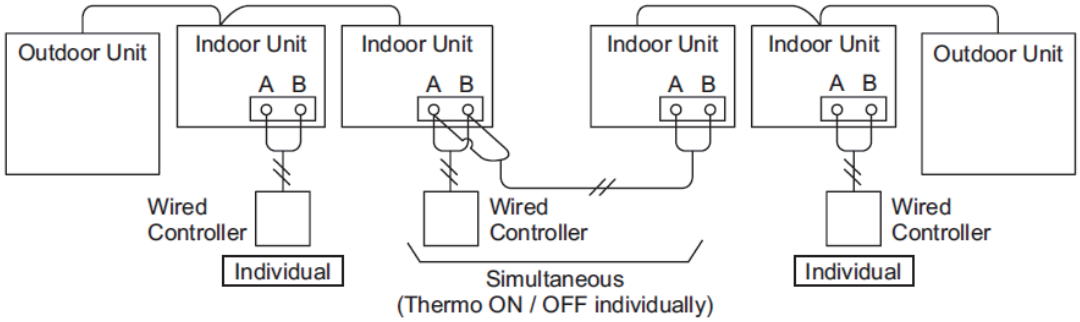



(b) One Wired Controller for Individual Operation Setting.




The maximum quantity of the indoor units can be controlled by one wired controller is 16.

(c) Connecting Wired Controller if Connecting between Individual Systems.

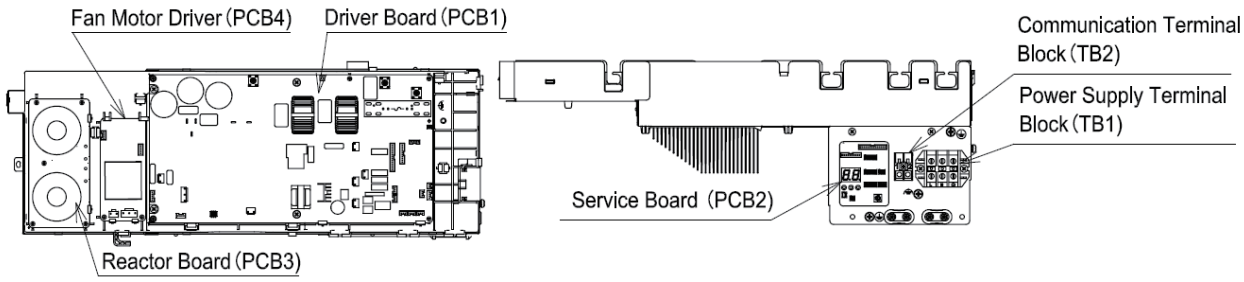



**Notes:**

Thermo-ON: The outdoor unit and some indoor units are running.
Thermo-OFF: The outdoor unit and some indoor units stay on, but don't run.

## 1.2 Location of Printed Circuit Boards

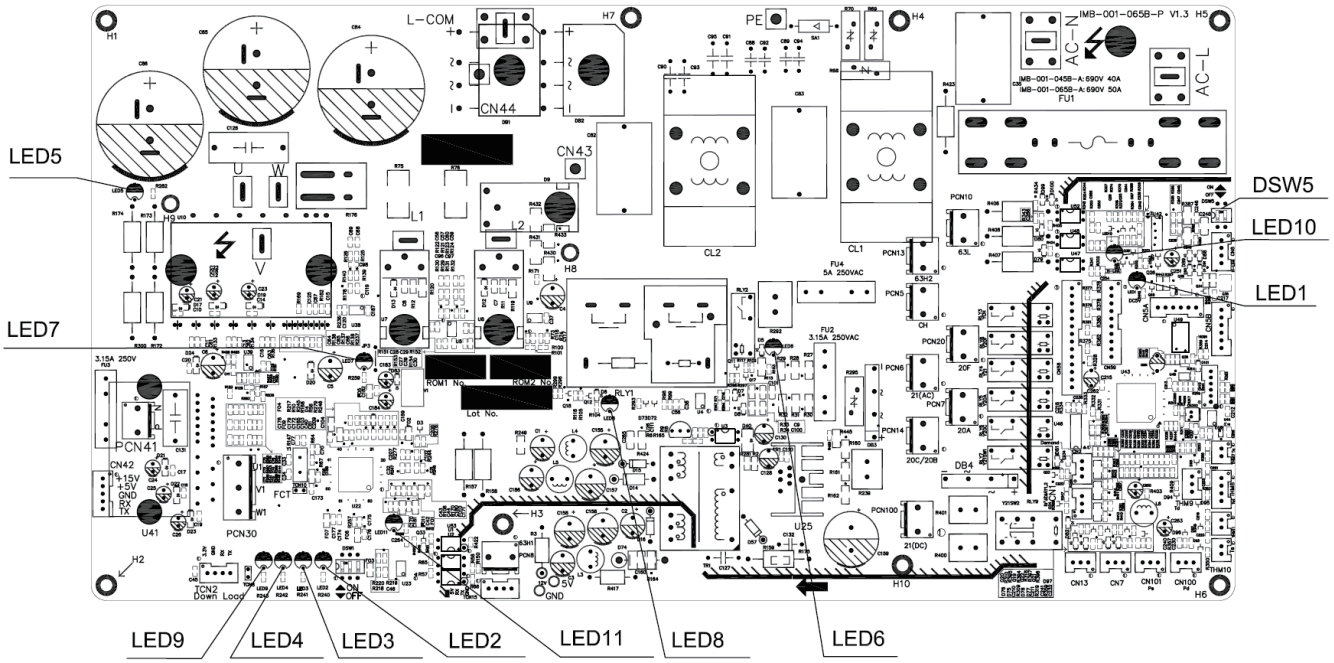
(1) Model: RAS-3.0~6.5HNBRKQ1



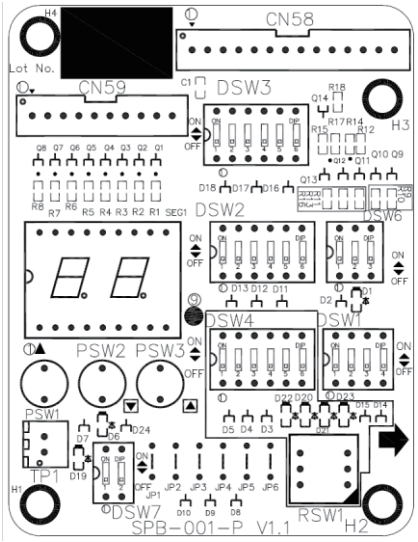

| Symbol | PCB | Purpose |
|---|---|---|
| PCB1 | Outdoor Unit Board (Driver Board) | 1. Communicating between Indoor Unit and Outdoor Unit;<br>2. Processing Sensor Input;<br>3. Operation Control for Above Items 1 to 2. Compressor Operation Control, Fan2 Control, Electrical Expansion Valve, 4-Way Valve, Solenoid Valve, and Overcurrent Control;<br>4. Processing of Safety Device Input;<br>5. Processing of Relay Output. |
| PCB2 | Service Board | 1. Processing DIP Switch Input;<br>2. 7-Segment Indication. |
| PCB3 | Reactor Board | Used for the Power Factor Correction. |
| PCB4 | Fan Motor Driver Board | Drive Fan1 Motor. |

a. Outdoor Unit Board (PCB1)

| Part name | Function Information |
|---|---|
| LED1 (Red) | Power source indicator for main control of the PCB1 (5V)<br>Normal Condition: Activated /ON; Abnormal Condition: Deactivated /OFF. |
| LED2 (Red) | It indicates: “Alarm”. |
| LED3 (Yellow) | It indicates: “Alarm”. |
| LED4 (Green) | It indicates: “Alarm”. |
| LED5 (Red) | Indicator for DC Bus Voltage<br>Normal Condition: Activated /ON; Abnormal Condition: Deactivated /OFF. |
| LED6 (Red) | Power source indicator for Precharge Relay<br>Normal Condition: Activated /ON; Abnormal Condition: Deactivated /OFF. |
| LED7 (Green ) | Power source indicator for inverter control of the PCB1 (3.3V)<br>Normal Condition: Activated /ON; Abnormal Condition: Deactivated /OFF. |
| LED8( Red ) | Power source indicator for Main Relay<br>Normal Condition: Activated /ON; Abnormal Condition: Deactivated /OFF. |
| LED9 (Orange) | It indicates: “Alarm”. |
| LED10 (Yellow) | It indicates the communication state between the indoor unit and outdoor unit.<br>Normal Condition: Activated /Flash; Abnormal Condition: Deactivated /OFF. |
| LED11 (Green) | It indicates the communication state between the main control and inverter control of PCB1.<br>Normal Condition: Activated /Flash; Abnormal Condition: Deactivated /OFF. |



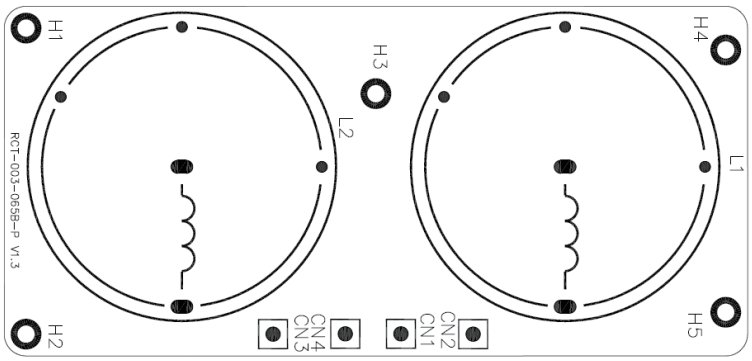

b. Service Board (PCB2)




Definition of DIP Switch:

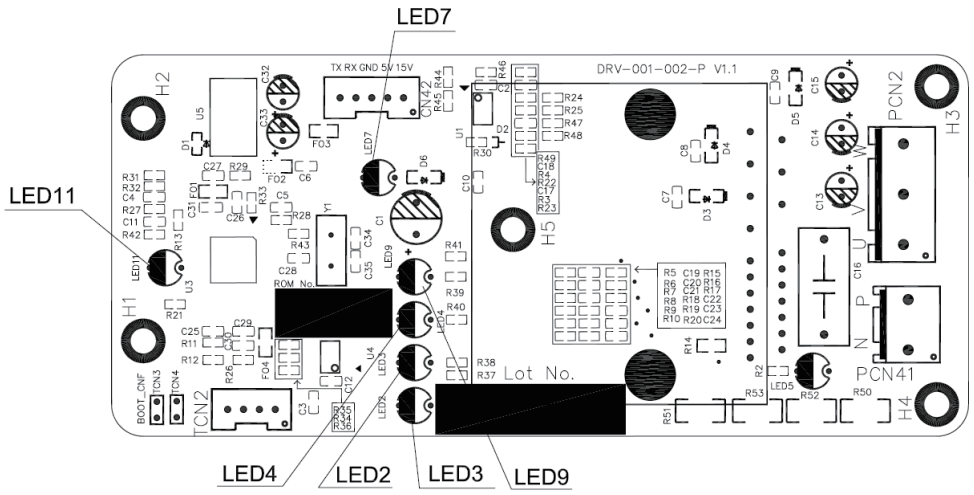
| No. | DIP Switch Code | Definition | No. | DIP Switch Code | Definition |
|---|---|---|---|---|---|
| 1 | DSW1 | Test Run | 7 | PSW1 | Manual Defrosting |
| 2 | DSW2 | Function Setting | 8 | PSW2 | Decrease ▼ |
| 3 | DSW3 | Model Setting | 9 | PSW3 | Increase ▲ |
| 4 | DSW4 | System Address Setting: Double Digit | 10 | RSW1 | System Address Setting: Single Digit |
| 5 | DSW6 | Function Setting | 11 | SEG1 | 7-segment Display |
| 6 | DSW7 | Function Setting | 12 | TP1 | Test Port for Factory |

c. Reactor Board (PCB3)

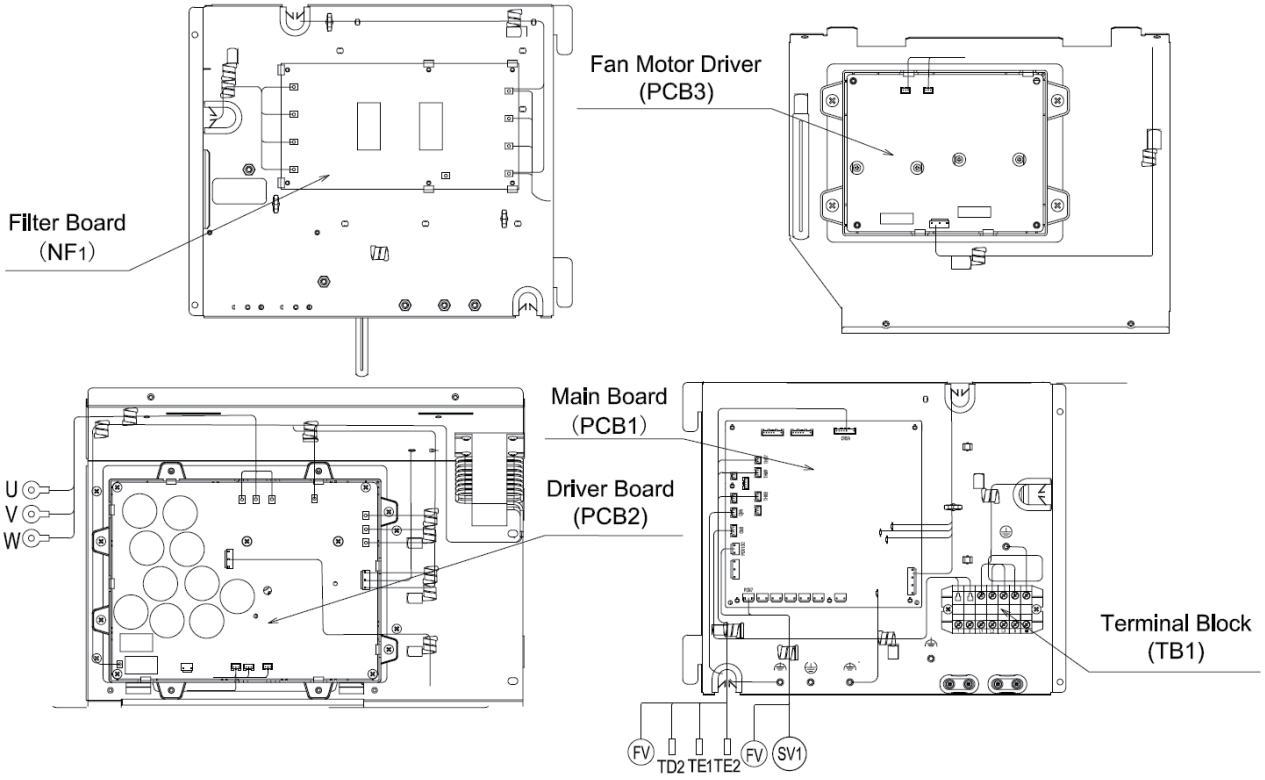



d. Fan Motor Driver Board (PCB4)

| Part name | Function Information |
|---|---|
| LED2 (Red) | It indicates: “Alarm”. |
| LED3 (Yellow) | It indicates: “Alarm”. |
| LED4 (Green) | It indicates: “Alarm”. |
| LED7 (Green) | Power source indicator for inverter control of the PCB1 (3.3V)<br>Normal Condition: Activated /ON; Abnormal Condition: Deactivated /OFF. |
| LED9 (Orange) | It indicates: “Alarm”. |
| LED11 (Green) | This indicates the communication state between the PCB1 and PCB4.<br>Normal Condition: Activated /Flash; Abnormal Condition: Deactivated /OFF. |



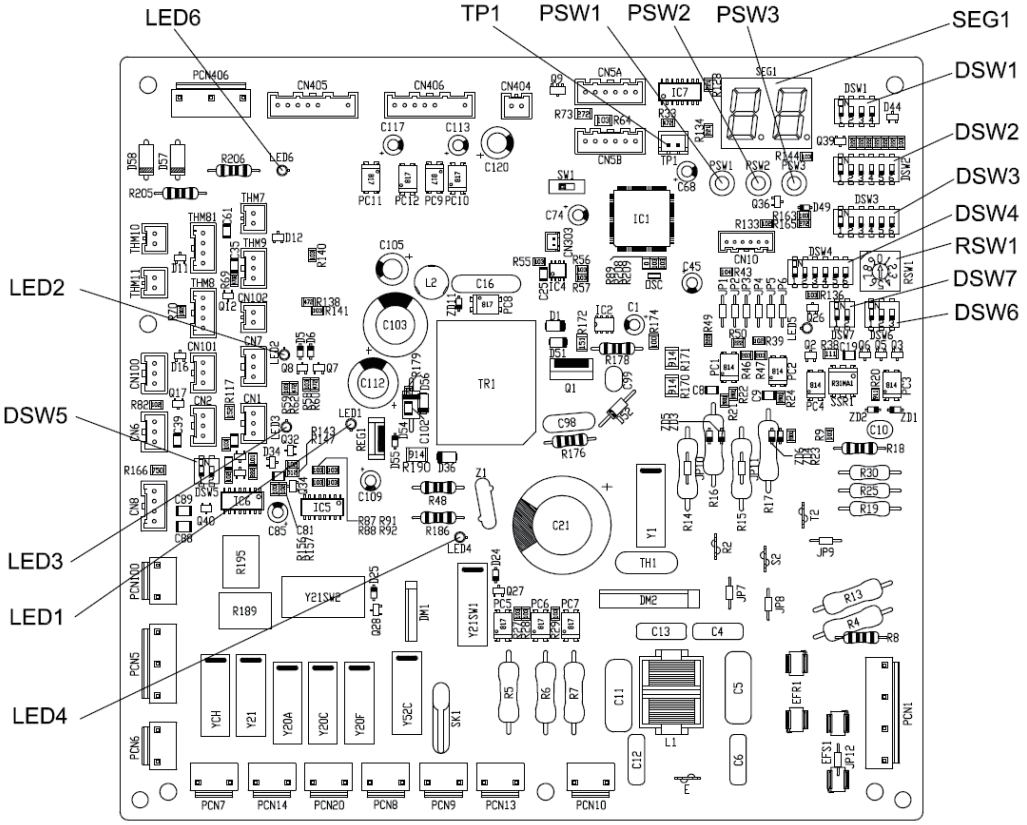
(2) Model: RAS-7.0~12HNBRMQ1




| Symbol | PCB | Purpose |
|---|---|---|
| PCB1 | Outdoor Unit Board<br>(Main Board) | 1. Communicating between Indoor Unit and Outdoor Unit;<br>2. Processing Sensor Input;<br>3. Processing DIP Switch Input;<br>4. Operation Control for Above Items 1 to 3. Compressor Operation Control, Fan Control, Expansion Valve, 4-Way Valve, Solenoid Valve, and Overcurrent Control;<br>5. 7-Segment Indication;<br>6. Processing of Safety Device Input;<br>7. Processing of Relay Output;<br>8. Reverse Phase Detection for Power Source. |
| PCB2 | Driver Board<br>(for Inverter) | 1. Compressor is driven by Driver Board;<br>2. Overcurrent Control;<br>3. Protection Control. |
| PCB3 | Fan Motor Driver Board | 1. Fan motors are driven by Fan Motor Driver Board;<br>2. Overcurrent Control;<br>3. Protection Control. |
| NF1 | Noise Filter Board | 1.Filt the Clutter of the Power Source<br>2.Prevent the harmonic from damaging the Power Source |

## TROUBLESHOOTING

a. Outdoor Unit Board (PCB1)

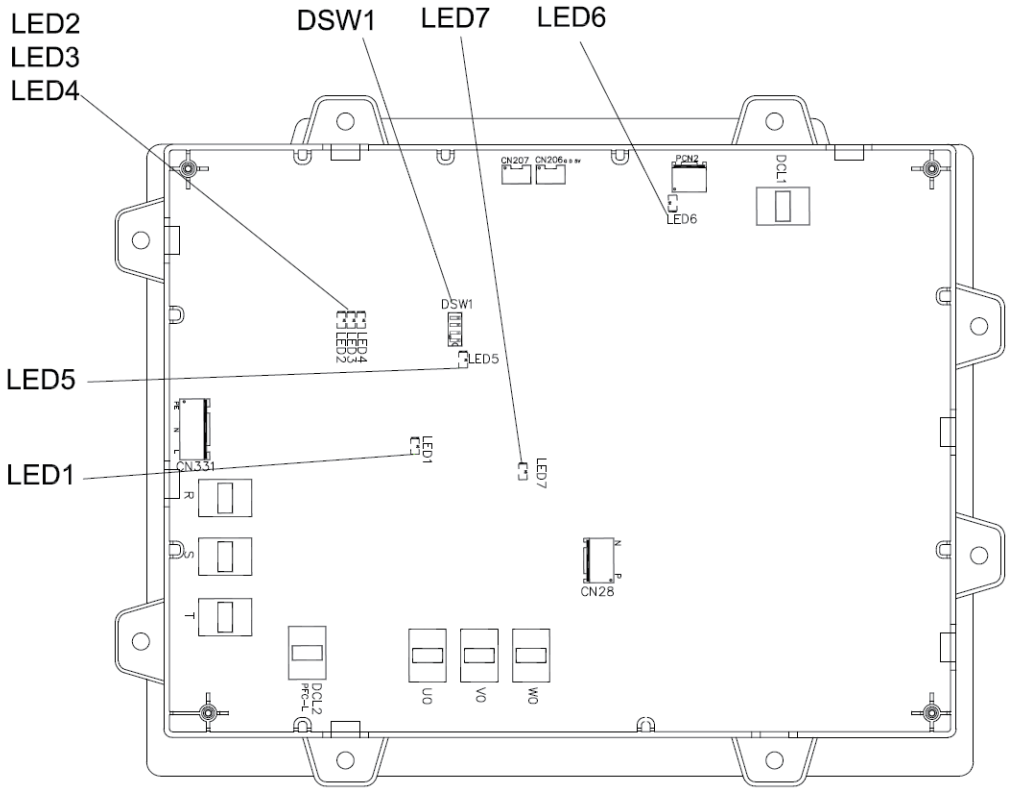


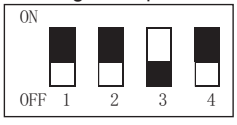

| Part Name | | Function Information |
|---|---|---|
| LEDs | LED1 (Red) | Power Source Indicator for Main Board (Low Voltage)<br>Normal Condition: Activated /ON Abnormal Condition: Deactivated /OFF |
| | LED2 (Green) | It indicates the communication state between the Main Board and Driven Board.<br>Normal Condition: Flashing Abnormal Condition: Deactivated /OFF |
| | LED3 (Yellow) | It indicates the communication state between the indoor unit and outdoor unit.<br>Normal Condition: Flashing Abnormal Condition: Deactivated /OFF |
| | LED4 (Red) | Power Source Indicator for Outdoor Unit PCB (280VDC)<br>Normal Condition: Activated /ON Abnormal Condition: Deactivated /OFF |
| | LED6 (Red) | Power Source Indicator for Outdoor Unit PCB (from PCB2)<br>Normal Condition: Activated /ON Abnormal Condition: Deactivated /OFF |
| SEG | SEG1 | It indicates: “Alarm”, “Protective Safety Device has Tripped” or “Checking Items”. |

Definition of DIP Switch:

| No. | DIP Switch Code | Definition | No. | DIP Switch Code | Definition |
|---|---|---|---|---|---|
| 1 | DSW1 | Test Run | 7 | PSW1 | Manual Defrosting |
| 2 | DSW2 | Function Setting | 8 | PSW2 | Decrease ▼ |
| 3 | DSW3 | Model Setting | 9 | PSW3 | Increase ▲ |
| 4 | DSW4 | System Address Setting: Double Digit | 10 | RSW1 | System Address Setting: Single Digit |
| 5 | DSW6 | Function Setting | 11 | SEG1 | 7-segment Display |
| 6 | DSW7 | Function Setting | 12 | TP1 | Test Port for Factory |

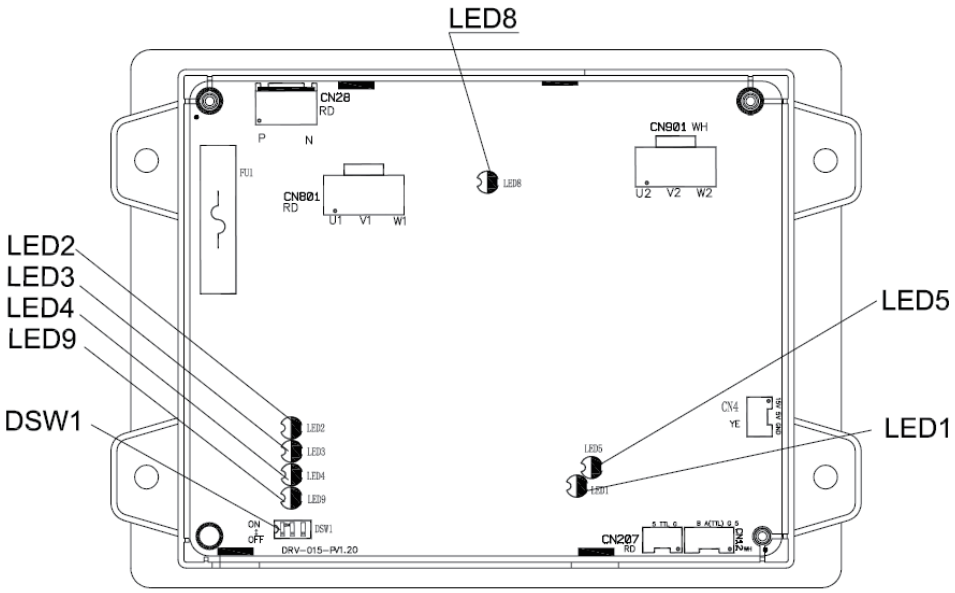
b. Driver Board (PCB2)

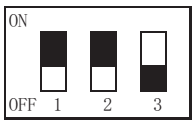



| Part Name | Function Information |
|---|---|
| LED1(Green) | Communication Indicator<br>Normal Condition: Flashing Abnormal Condition: ON /OFF |
| LED7(Red) | Power Source Indicator for Driver Board<br>Normal Condition: Activated /ON Abnormal Condition: Deactivated /OFF |
| LED5(Green) | Power Source Indicator for Control Part<br>Normal Condition: Activated /ON Abnormal Condition: Deactivated /OFF |
| LED6(Red) | Power Source Indicator for Precharge Relay<br>Normal Condition: Activated /ON; Abnormal Condition: Deactivated /OFF. |
| LED4(Green)<br>LED3(Yellow)<br>LED2(Red) | Compressor is Working<br>ON OFF OFF |
| | Frequency Decrease for Overcurrent<br>ON ON OFF |
| | Frequency Limit for Overcurrent<br>ON ON ON |
| | Frequency Limit for Overheat<br>ON Flash OFF |
| | Frequency Decrease for Overheat<br>ON Flash Flash |
| | Compressor is Ready to Operate. (The Main Relay is Activated)<br>Flash OFF OFF |
| DSW1 | NO Setting is Required.<br>  |

- Flash represent that the LED is ON for 0.5 second and then it is OFF for 0.5 second repeatedly.

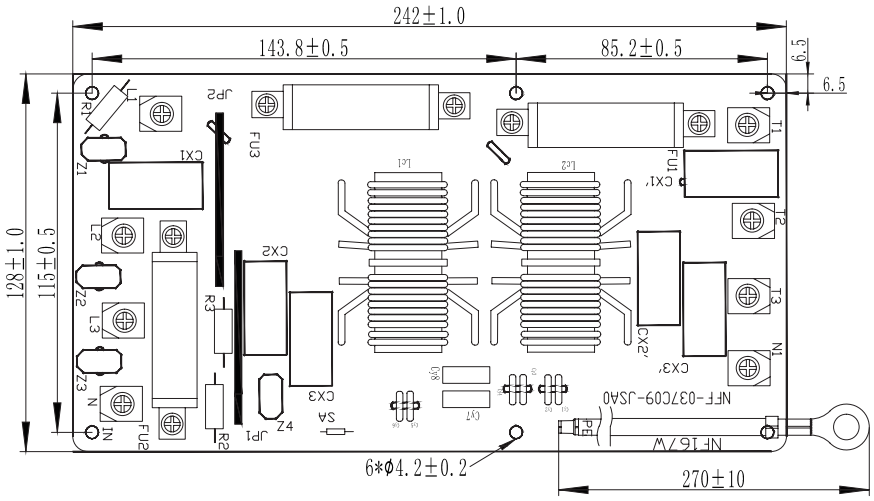
c. Fan Motor Driver Board (PCB3)




| Part Name | Function Information |
|---|---|
| LED1(Green) | Communication Indicator<br>Normal Condition: Activated /ON Abnormal Condition: Deactivated /OFF |
| LED8(Red) | Power Source Indicator for Fan Motor Driver Board<br>Normal Condition: Activated /ON Abnormal Condition: Deactivated /OFF |
| LED5(Green) | Power Source Indicator for Control Part<br>Normal Condition: Activated /ON Abnormal Condition: Deactivated /OFF |
| LED9(Orange) | ON: Fan1 Motor Driver is error<br>Flash: Fan2 Motor Driver is error |
| LED4(Green)<br>LED3(Yellow)<br>LED2(Red) | Fan Motor is Working<br>ON OFF OFF |
| | Frequency Decrease for Overcurrent<br>ON ON OFF |
| | Frequency Limit for Overcurrent<br>ON ON ON |
| | Frequency limit for Overheat<br>ON Flash OFF |
| | Frequency Decrease for Overheat<br>ON Flash Flash |
| | Fan Motor is Ready to Operate. (The Main Relay is Activated)<br>Flash OFF OFF |
| DSW1 | NO Setting is Required.<br>  |

- Flash represent that the LED is ON for 0.5 second and then it is OFF for 0.5 second repeatedly.

d. Noise Filter Board (NF1)



## 1.3 Checking Rotary Switch and DIP Switch Settings

(1) Outdoor Unit (Factory setting)

The following diagram indicates the factory settings of DSWs on PCBs in the outdoor units.

Turn OFF all power sources before performing settings. DIP switch settings cannot be changed without first disconnecting from the power source. (Except the DIP switch setting for test run.)

The darkened square "■" indicates the position of DIP switches.

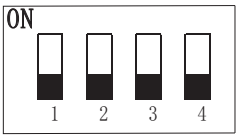
- By using switch DSW1, the unit will start in in 1 minute after the switch adjustment is made.
- To simplify service and maintenance, number this outdoor unit to help distinguish it from the other outdoor units.

Record the unit number in the right of the electrical box.

| DSW1 | Test Run |
|---|---|

Setting is required. For Test Run

Setting before Shipment

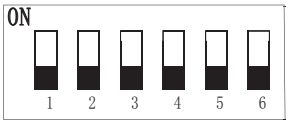



| Setting Item | Pin No. |
|---|---|
| Test Cooling Operation | 1 |
| Test Heating Operation | 1,2 |
| No setting is required | 3 |
| Compressor Forced Stop and Function Setting | 4 |

| DSW2 | Function Setting |
|---|---|

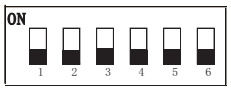
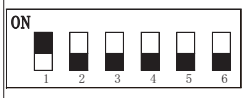
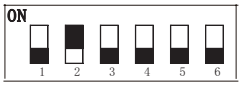
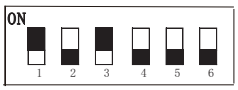
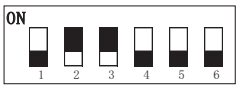
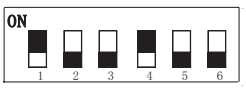
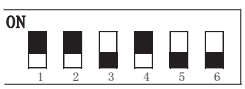
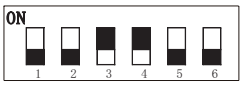
Setting is required.

Setting before Shipment




| Setting item | Pin No. |
|---|---|
| No setting is required | 1 |
| | 2 |
| | 3 |
| | 4 |
| Function Setting | 5 |
| External Input/Output Setting | 6 |

## DSW3 — Capacity and Power Supply Setting

| Power Supply | Capacity(HP) | | | |
|---|---|---|---|---|
| | 3.0 | 3.5 | 4.0 | 4.5 |
| 220-240V 1N~ 50HZ |  |  |  | |
| | 5.0 | 6.0 | 6.5 | |
| | |  |  | |
| 380-415V 3N~ 50HZ | 7.0 | 8.0 | 10.0 | |
| | |  |  | |
| | 11 | 12 | | |
| |  | | | |

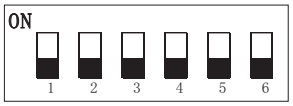
## DSW4 — Ref.Cycle No Setting

Setting is required

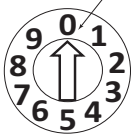
Setting Before Shipment

Setting Position

DSW4



RSW1




## DSW5 — Communication Setting

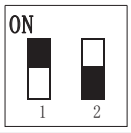
Setting is required

For End Terminal Resistance Cancellation

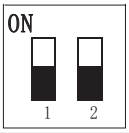
Set No.1 pin of DSW5 correctly in the same H-LINK system otherwise, it may cause abnormal transmission.

Refer to "Setting of End Terminal Resistance".

Setting Before



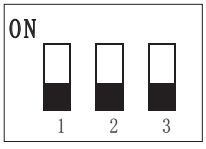
End Resistance



## DSW6 — -

No Setting is required.

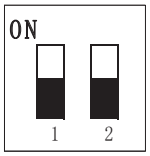
Setting Before Shipment



## DSW7 — -

No Setting is required.

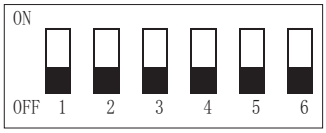
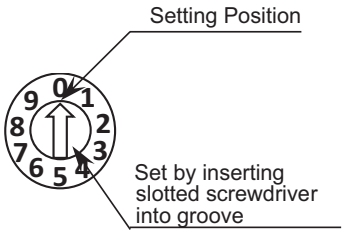
Setting Before Shipment



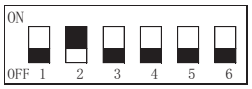
(2) Setting of Refrigerant System No.

Setting outdoor unit refrigerant system No. is required. In the same refrigerant system, set the same refrigerant system No. for the outdoor unit and the indoor units as shown below.

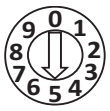
As for setting indoor unit refrigerant system No., set RSW2 and DSW5 on the indoor unit PCB.

| Item | Setting Switch | |
|---|---|---|
| | 10 digit | 1 digit |
| Refrigerant System No. |  |  |
| Outdoor Unit | DSW4 | RSW1 |
| Indoor Unit | DSW5 | RSW2 |

For example: If Setting Refrigerant System No. 25




Turn On No.2 pin



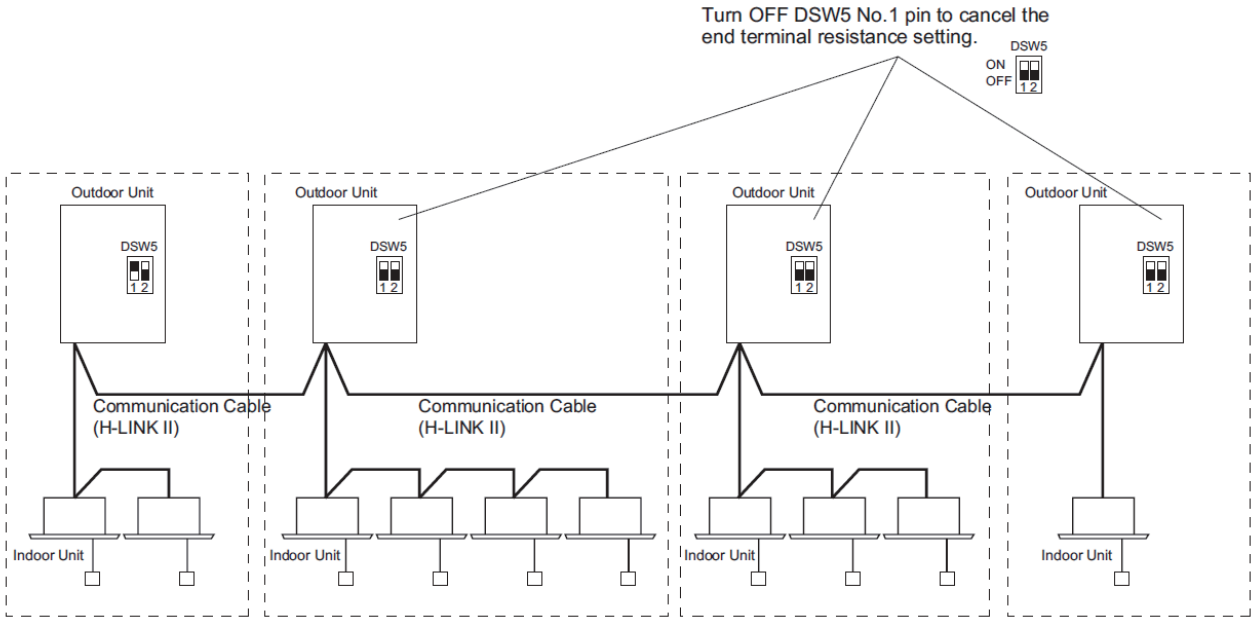

Set Dial No.5

**Notes:**

- DSW and RSW setting before shipment is 0. Maximum in setting refrigerant system No. is 63.
- For installing the outdoor unit and the indoor unit on the same communication cable, maximum number of connectable indoor units is 160.

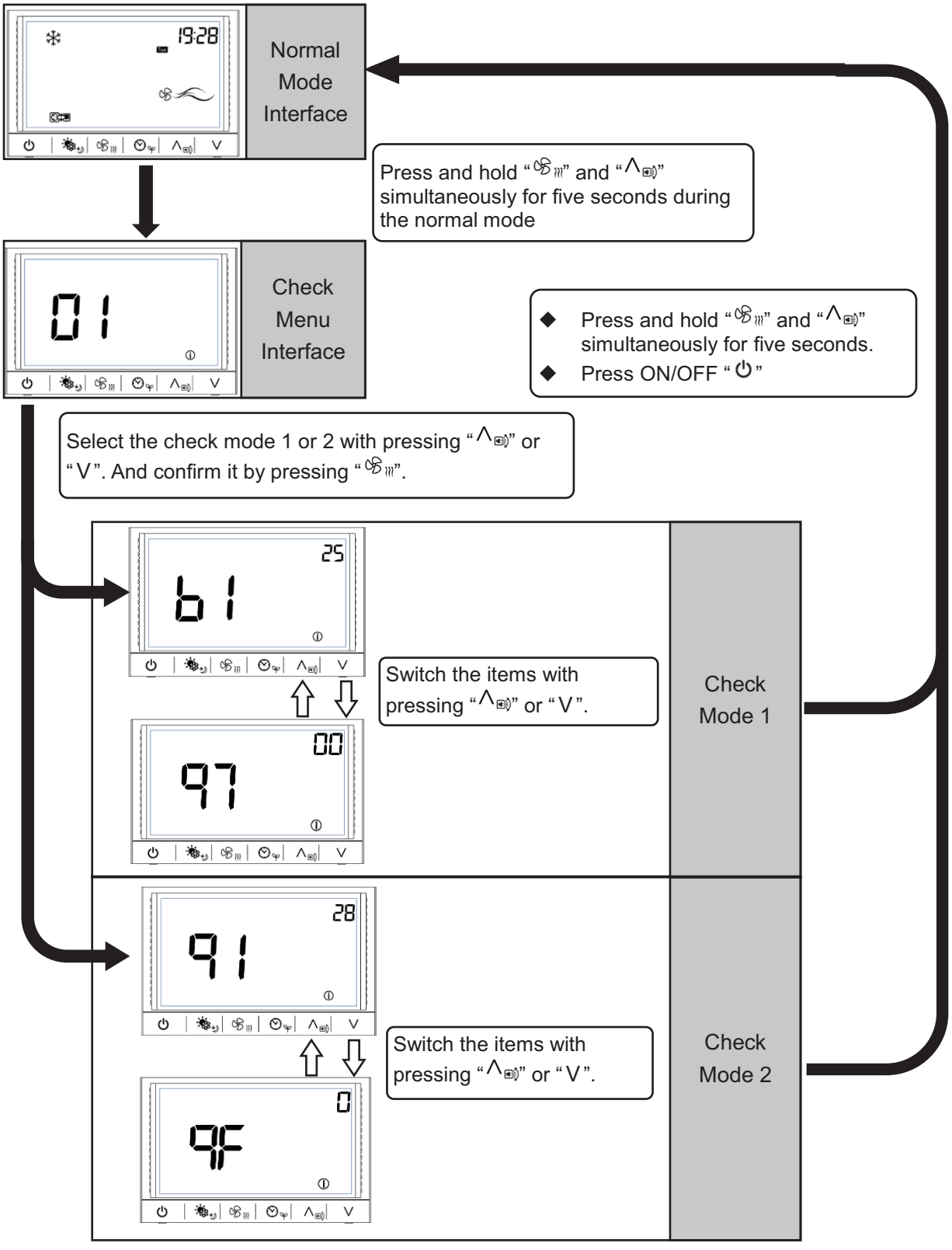
(3) Setting of End Terminal Resistance

Before shipment, No.1 pin of DSW5 is set to “ON”. If the quantity of outdoor units in the same H-LINK II is 2 or more, set No.1 pin of DSW5 to “OFF” from the 2nd refrigerant group outdoor unit. If only one outdoor unit is used, no setting is required.



## 1.4 Checking Wired Controller

Each “Check Menu” item and its function is explained in the following figure:




**Note:**

If one wired controller is connected to more than 2 indoor units, the address of the indoor unit should be selected firstly by entering the check menu interface. If one wired controller is connected to only one indoor unit, the step is skipped.

## TROUBLESHOOTING

| Check Menu Item | Function | Operation |
|---|---|---|
| Check 1 | Sensor condition of air conditioner will be monitored and indicated. | Press and hold " " and " " simultaneously for five seconds during the normal mode, and select "Check 01". |
| Check 2 | Sensor data of air conditioner prior to alarm occurrence will be indicated. | Press and hold " " and " " simultaneously for five seconds during the normal mode, and select "Check 02". |
| Alarm History Display *1 | Previous alarm record (date, time, alarm code) will be indicated. | Press and hold " " for five seconds during the normal mode, and select "Alarm History Display". |

*1 : Please refer to the Service Manual for Indoor Unit.

(1) Features of Check Mode 1

| No. | Item | Data Name | No. | Item | Data Name |
|---|---|---|---|---|---|
| 1 | b1 | Set Temperature for I.U. | 22 | H2 | Suction Pressure |
| 2 | b2 | Inlet Air Temperature for I.U. | 23 | H3 | Control Information |
| 3 | b3 | Outlet Air Temperature for I.U. | 24 | H4 | Operating Frequency |
| 4 | b4 | Liquid Pipe Temp. for I.U. | 25 | J1 | I.U. Capacity |
| 5 | b5 | Wireless Controller Temp. | 26 | J2 | O.U. Code |
| 6 | b6 | Outdoor Air Temp. | 27 | J3 | Refrigerant System No. (1) |
| 7 | b7 | Gas Pipe Temp. for I.U. | 28 | J4 | Refrigerant System No. (2) |
| 8 | b8 | Evaporating Temp. at Heating for O.U. | 29 | L1 | I.U. Expansion Valve |
| 9 | b9 | Condensing Temp. at Cooling for O.U. | 30 | L2 | O.U. Expansion Valve 1 |
| 10 | bA | Comp. Discharge Temp. | 31 | L3 | O.U. Expansion Valve 2 |
| 11 | bb | Wired Controller Temp. | 32 | L4 | O.U. Expansion Valve B |
| 12 | bC | Not Prepared | 33 | P1 | Comp. Current |
| 13 | C1 | I.U. Micro-Computer | 34 | P2 | Accumulated Operation Time of Comp. (×10 hours) |
| 14 | C2 | O.U. Micro-Computer | 35 | q1 | Motion Sensor Reaction Rate |
| 15 | d1 | Cause Code of Indoor Unit Stoppage | 36 | q2 | Radiation Sensor Temp. |
| 16 | E1 | Times of Abnormality | 37 | q3 | Motion Sensor 1 Reaction Rate |
| 17 | E2 | Times of Power Failure | 38 | q4 | Motion Sensor 2 Reaction Rate |
| 18 | E3 | Times of Abnormal Communication | 39 | q5 | Motion Sensor 3 Reaction Rate |
| 19 | E4 | Times of Inverter Tripping | 40 | q6 | Motion Sensor 4 Reaction Rate |
| 20 | F1 | Louver Sensor State | 41 | q7 | Setting Temp. Corrected Value |
| 21 | H1 | Discharge Pressure | | | |

**Note:**

I.U.: Indoor Unit; O.U.: Outdoor Unit.

(2) Features of Check Mode 2

| No. | Item | Data Name | No. | Item | Data Name |
|---|---|---|---|---|---|
| 1 | q1 | Inlet Air Temperature for I.U. | 9 | q9 | Discharge Pressure |
| 2 | q2 | Outlet Air Temperature for I.U. | 10 | qA | Suction Pressure |
| 3 | q3 | Liquid Pipe Temp. for I.U. | 11 | qb | Target Frequency |
| 4 | q4 | Outdoor Air Temp. | 12 | qC | Operating Frequency |
| 5 | q5 | Gas Pipe Temp. for I.U. | 13 | qd | I.U. Expansion Valve (%) |
| 6 | q6 | Evaporating Temp. at Heating for O.U. | 14 | qE | O.U. Expansion Valve 1 (%) |
| 7 | q7 | Condensing Temp. at Cooling for O.U. | 15 | qF | Comp. Current |
| 8 | q8 | Comp. Discharge Temp. | | | |

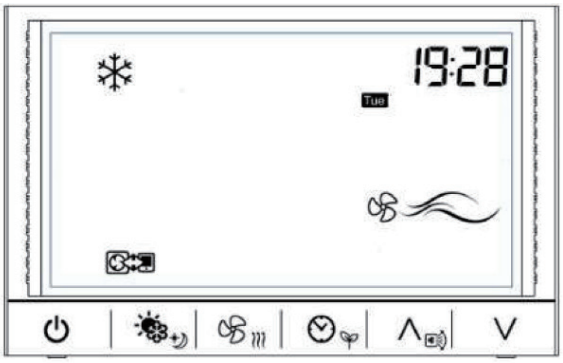
**Note:**

I.U.: Indoor Unit; O.U.: Outdoor Unit.

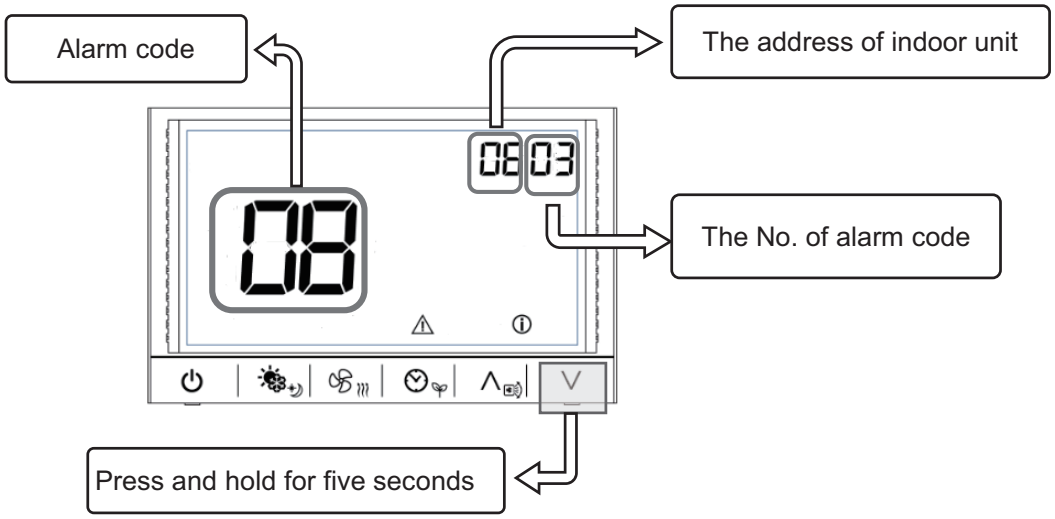
(3) Alarm History Display

The Alarm History Display is accessed from the Check Menu.

(A) The figure shows the normal mode interface.



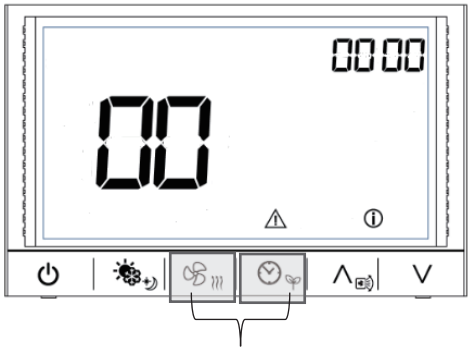

(B) Press and hold " ∨ " for five seconds during the normal mode, and the history alarm code would display. The codes can be checked by pressing "∧"or " ∨ ".




(C) Press the " ∨ " for five seconds or press ON/OFF " ⏻ ", the alarm history display is disappeared and it will show the normal mode interface.

(4) To Reset Alarm History Display

Press and hold “ ” and “ ” simultaneously for five seconds during the alarm code history display, and all the alarm history would be deleted. Then the No. of error, the No. of indoor unit and the error code will display “00” as shown in the following figure.




Press and hold “ ” and “ ” simultaneously for five seconds.

Press the “ ” for five seconds or press ON/OFF “ ”, the alarm history display is disappeared and it will show the normal mode interface.

**Note:**

The maximum history alarm codes can be recorded by the wired controller is 30.

## 1.5 Checking Using 7-Segment Display

**WARNING**

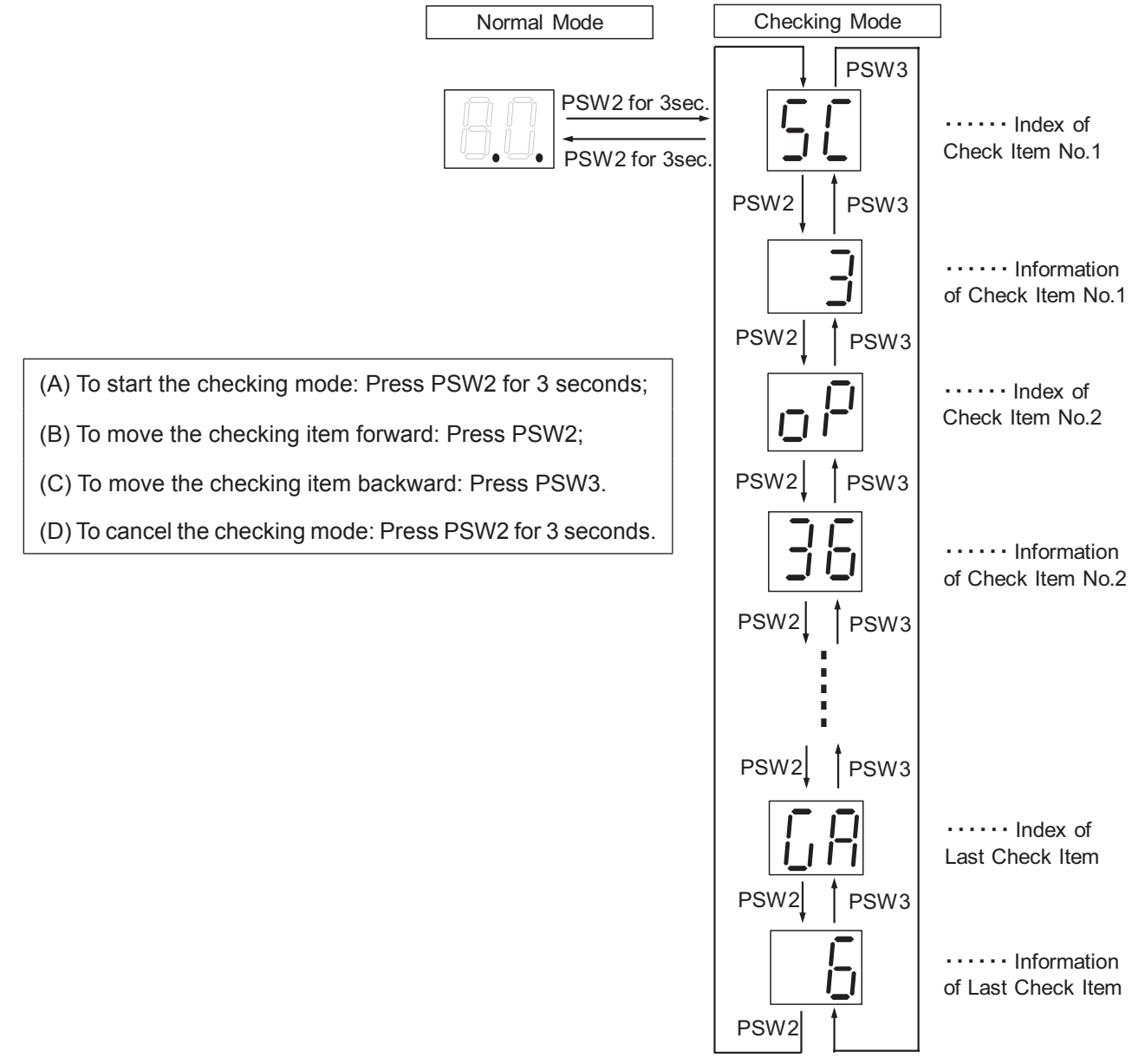
- Only an authorized person can check using this method.

---

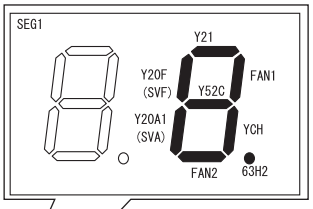
(1) Before Checking

- Turn ON the main power supply. Wait for more than 20 seconds to start checking.
- Checking Items
  * Expansion Valve Opening
  * Temperature Readings from Thermistors
  * Number of Indoor Units Connecting in the Same System
- Check the locations of 7-segment and push switches.
- AC220~240V is applied to the PCB and electrical parts. Never touch electrical parts and wires without appropriate personal protective equipment (PPE) when checking.

Check the operating conditions and each part of the refrigerant system temperature condition by 7-segment display (SEG1) on the service board (3~6.5HP) or outdoor unit PCB (7~12HP) and push switches (PSW).



(2) Details of 7-Segment Display




| Check Item | Item | | Indication Data | |
|---|---|---|---|---|
| | No | Index | Information | Contents |
| Input/Output State of Outdoor Micro-Computer | 01 | SC | 88 | Indicates only for the segments corresponding to the equipment |
| Total Capacity of Operation Indoor Unit | 02 | oP | 20 *1 | 0 ~ 199 |
| No. of Control Software | 03 | SP | 13 ⇔ 50. *2 | Control Software No. in use is indicated. |
| No. of Comp. Inverter Software | 04 | iP | 13 ⇔ 50. *2 | Comp. Inverter Software No. in use is indicated. |
| No. of Fan Motor Inverter Software | 05 | FP | 13 ⇔ 20. *2 | Fan Motor Inverter Software No. in use is indicated. (If there is only one fan motor, it indicates the software No. of fan 2, if there are two fan motors, it indicates the software No. of fan 1). |
| Inverter Order Frequency to Comp. | 06 | H1 | 04 *1 | 0 ~ 140(Hz) |
| Outdoor Fan Step | 07 | Fo | 2 | 0 ~ 18(step) |
| Speed of Outdoor Fan 1 | 08 | F5. | 6 ⇔ 50. *2 | 0~1000(rpm) |
| Speed of Outdoor Fan 2 | 09 | F.5. | 6 ⇔ 50. *2 | 0~1000(rpm) |
| Outdoor Electronic Expansion Valve Opening | 10 | Eo | 13 | 0 ~ 100(%) |
| High Pressure (Discharge Pressure) | 11 | Pd. | 2.1 | 0.1 ~ 4.9(MPa) |
| Low Pressure (Suction Pressure) | 12 | P5. | 0.8 | 0.0 ~ 1.9(MPa) |
| Discharge Temp. | 13 | Td | 50 *1 | 1 ~ 142 (°C) |
| Evaporating Temp. (at Outdoor Unit Heat Exchanger) | 14 | tE | 6 | -19 ~ 80(°C) |
| Ambient Air Temp. | 15 | To | -13 | -19 ~ 80(°C) |
| Condensing Temp. (at Outdoor Unit Heat Exchanger) | 16 | tC | 6 | -19 ~ 80(°C) |
| Comp. Inverter Fin Temp. | 17 | tF | 45 *1 | -19 ~ 127(°C ) |
| Fan 1 Motor Inverter Fin Temp. | 18 | tF. | 50 *1 | -19 ~ 127(°C) |
| Fan 2 Motor Inverter Fin Temp. | 19 | t.F. | 40 *1 | -19 ~ 127(°C) |
| Inverter Primary Current | 20 | A1 | 20 *1 | 0 ~ 199(A) |
| Inverter Secondary Current | 21 | A2 | 13 *1 | 0 ~ 199(A) |

| | | | | |
|---|---|---|---|---|
| Fan 1 Motor Current | 22 | AF. | 2.1 | 0~9.9(A) |
| Fan 2 Motor Current | 23 | A.F. | 0.8 | 0~9.9(A) |
| Indoor Unit Address | 24 | nA | 6 | 0~63<br>(Indoor Unit No.) |
| Indoor Electronic Expansion Valve Opening | 25 | EA | 45 | 0 ~ 100(%) |
| Liquid Pipe Temp. of Indoor Unit | 26 | LA | -45 *1 | -19 ~ 127(°C) |
| Gas Pipe Temp. of Indoor Unit | 27 | uA | 6 *1 | -19 ~ 127(°C) |
| Indoor Unit Inlet Air Temp. | 28 | iA | 15 *1 | -19 ~ 127(°C) |
| Indoor Unit Outlet Air Temp. | 29 | oA | 19 *1 | -19 ~ 127(°C) |
| Cause Code of Indoor Unit Stoppage | 30 | dA | 0 | 0~99 |
| Accumulated Operating Time of Comp. | 150 | UJ | 13 ⇔ 20. *2*3 | 0000 ~ 9999(×10 hours) |
| Accumulated Operating Time of Compressor (Restorable) | 151 | cU | 13 ⇔ 15. *2*3 | 0000 ~ 9999(×10 hours) |
| Outdoor Unit Alarm Code | 152 | AC | 0 | 00 ~ FF |
| Cause Code of Comp. Inverter Stoppage | 153 | iF | 0 | 0 ~ 99 |
| Cause Code of Fan Stoppage (Lower Outdoor Fan) | 154 | Fr. | 0 | 0 ~ 99 |
| Cause Code of Fan Stoppage (Upper Outdoor Fan) | 155 | F.r. | 0 | 0 ~ 99 |
| Abnormal Data Record (No.1) | 156 | n1 | UJ ⇨ …….. | Accumulated Operating Time, Alarm Code or Cause Code of I.U. Stoppage, Cause Code of Inverter/ Fan Stoppage |
| …….. | … | … | | |
| Abnormal Data Record (No.9) | | n9 | | |
| Capacity of Outdoor unit | 157 | oC | 40 | Capacity Code of Outdoor Unit. For example, 40 represent that 40÷8= [5]HP. Besides the 3HP, its capacity code is 22. |
| Total Capacity of Indoor Unit Connected | 158 | CP | 84 *1 | 0 ~ 199 |
| Connected Indoor Unit Number | 159 | AA | 2. | 0. ~ 64. (pcs) |
| System Refrigerant Address | 160 | CA | 0 | 0 ~ 63 (Refrigerant System No.) |

**Notes**:

- *1: When information number is over than 100, the last two digits flash.
  For example：
  When number is "-19", SEG1 displays -19
  When number is "120", SEG1 flashes 20
- *2: Alternately upper 2 digits and lower 2 digits are indicated every 0.5 sec.
  For example：
  When number is "194", SEG1 displays 1 ⇔ 94. alternately every 0.5 sec.
  When number is "0", SEG1 displays 0 ⇔ 00. alternately every 0.5 sec.
  When number is "-15", SEG1 displays 88 ⇔ -15. alternately every 0.5 sec.
- *3: For resetting the Accumulated Operating Time (Restorable), press PSW1 for 5sec. While the Accumulated Operating Time (Restorable) is indicated.

(3) Alarm Code

| Alarm Code | Category | Content of Abnormality | Leading Cause |
|---|---|---|---|
| 01 | Indoor Unit | Activation of Protection Device (Float Switch) | Activation of Float Switch (High Water Level in Drain Pan, Problem of Drain Piping, Float Switch, or Drain Pan) |
| 02 | Outdoor Unit | Activation of Protection Device (High Pressure Cut) | Activation of PSH (Pipe Clogging, Excessive Refrigerant, Inert Gas Mixing) |
| 03 | Communication | Abnormal Communication between Indoor and Outdoor | Incorrect Wiring, Loose Terminals, Disconnected Communication Cable, Blowout of Fuse, Outdoor Unit Power OFF |
| 04 | | Abnormal Communication between Inverter PCB and Outdoor PCB | Inverter PCB-Outdoor Unit PCB Communication Failure (Loose Connector, Wire Breaking, Blown of Fuse) |
| 05 | Supply Phase | Abnormality of Power Supply Phases | Incorrect Power Supply, Incorrect Connection (Reversed Phase), Open-Phase |
| 06 | Voltage | Abnormal Inverter Voltage | Outdoor Voltage Drop, Insufficient Power Capacity |
| 07 | Cycle | Decrease in Discharge Gas Superheat | Excessive Refrigerant Charge, Failure of Thermistor, Incorrect Wiring. Incorrect Piping Connection, Expansion Valve Locking at Opened Position (Disconnect Connector) |
| 08 | | Increase in Discharge Gas Temperature | Insufficient Refrigerant Charge, Pipe Clogging, Failure of Thermistor, Incorrect Wiring, Incorrect Piping Connection, Expansion Valve Locking at Closed Position (Disconnect Connector) |
| 11 | Sensor on Indoor Unit | Abnormality of Inlet Air Thermistor | Incorrect Wiring, Disconnected Wiring, Broken Wire, Short Circuit |
| 12 | | Abnormality of Outlet Air Thermistor | |
| 13 | | Abnormality of Freeze Protection | |
| 14 | | Abnormality of Gas Piping Thermistor | |
| 15 | | Abnormality of Outdoor Air Thermistor (ECONO) | |
| 16 | | Abnormality of Remoter Sensor(DOAS) | |
| 17 | | Abnormality of Thermistor Built-in Wired Controller | |
| 18 | Fan Motor on Indoor Unit | Activation of Protection Device for Invertor PCB of Indoor Fan | |
| 19 | | Activation of Protection Device for Indoor | Fan Motor Overheat, Lockup |
| 1A | | Abnormality of Fin Temperature of Indoor Fan Controller | |
| 1b | | Overcurrent of Indoor Fan Controller | |
| 1C | | Abnormality of Current Sensor of Indoor Fan Controller | |
| 1d | | Indoor Fan Controller Protection Action | |
| 1E | | Abnormality of Voltage of Indoor Fan Controller | |

| | | | |
|---|---|---|---|
| 20 | Sensor on Outdoor Unit | Abnormality of Discharge Gas Thermistor | Incorrect Wiring, Disconnected Wiring, Broken Wire Short Circuit |
| 21 | | Abnormality of High Pressure Sensor | |
| 22 | | Abnormality of Outdoor Air Thermistor | |
| 24 | | Abnormality of Heat Exchanger Piping Thermistor | |
| 29 | | Abnormality of Low Pressure Sensor | |
| 31 | | Incorrect Capacity Setting of Outdoor Unit and Indoor Unit | Incorrect Capacity Code Setting of Combination Excessive or Insufficient Indoor Unit Total Capacity Code |
| 35 | | Incorrect Setting of Indoor Unit No. | Duplication of Indoor Unit No. in same Refrigerant Group |
| 36 | | Incorrect of Indoor Unit Combination | Outdoor unit and indoor unit are different Tier, brand exception combination |
| 38 | | Problem with Protective Pick-up Circuit in Outdoor Unit | Failure of Protection Detecting Device (Incorrect Wiring of Outdoor PCB) |
| 3E | | Combination Problem between Inverter PCB and Outdoor PCB | Incorrect Combination between Inverter PCB and Outdoor PCB |
| 43 | Sensor on Outdoor Unit | Activation of Pressure Ratio Decrease Protection | Defective Compression (Failure of Compressor or Inverter, Loose Power Supply Connection) |
| 44 | | Activation of Low Pressure Increase Protection | Overload at Cooling, High Temperature at Heating, Expansion Valve Locking at Open Position (Loose Connector) |
| 45 | | Activation of High Pressure Increase Protection | Overload Operation (Heat Exchanger Clogging, Short Circuit of Airflow), Pipe Clogging, Excessive Refrigerant, Inert Gas Mixing |
| 47 | | Activation of Low Pressure Decrease Protection | Insufficient Refrigerant, Piping Clogging, Expansion Valve Locking at Close Position (Loosen Connector) |
| 48 | | Activation of Inverter Overcurrent | Overload Operation, Compressor Failure |
| 51 | Inverter | Abnormality of Current Sensor for Inverter | Current Sensor Failure |
| 53 | | Inverter Error Signal Detection | Driver IC Error Signal Detection (Protection for Overcurrent, Low Voltage, Short Circuit) |
| 54 | | Abnormality of Inverter Fin Temperature | Abnormal Inverter Fin Thermistor, Heat Exchanger Clogging, Fan Motor Failure |
| 55 | | Inverter Failure | Inverter PCB Failure |
| 57 | Fan Controller | Abnormality of Fan Motor | Fan Motor Failure (Fan Motor Locking, Increase Fan Motor Temperature, Blown Fuse) |
| 5A | | Abnormality ofFan Controller FinTemperature | Fin Thermistor Failure, Heat Exchanger Clogging, Fan Motor Failure |
| 5b | | Activation of Overcurrent Protection | Fan Motor Failure |
| 5C | | Problem with Fan Controller Sensor | Failure of Current Sensor |
| b0 | Outdoor Unit No. Setting | Incorrect Setting of Indoor Models and Capacity | |
| b1 | | Incorrect Setting of Unit and Refrigerant System Number | There are 64 or More Numbers Set for Refrigerant System. |

| | | | |
|---|---|---|---|
| b2 | Indoor Unit No. Setting | Abnormality of EEPROM | |
| b3 | | Incorrect Outdoor Unit Combination | Outdoor unit, indoor machine different Tier, brand exception combination |
| b5 | | Incorrect Indoor Unit Connection No. Setting | There are 19 or More Non-Corresponding to H-LINK II Units are Connected to One System. |
| b6 | | Indoor Fan Controller Communication Error | |
| b7 | | Indoor 2 Fan Controller Communication Error | |
| bF | | Abnormality of No. of Software Control Board Connections | |
| EE | Compressor | Compressor Protection Alarm | This alarm code (02, 07, 08, 39, 43, 44, 45, 47) appears when the following alarms occurs three times within 6 hours. |
| A1 | Outdoor Unit | Abnormality of Noise Filter Board | Noise Filter Board is abnormal |

**Notes:**

1. When SEG1 displays “04.”, “06.”, or “3E.”, the malfunctions are from the fan motor inverter PCB. When SEG1 displays “04”, “06”, or “3E”, the malfunctions are from the compressor inverter PCB (Driver Board).
2. When SEG1 displays “31”, the condition of activation:
   - Incorrect Capacity Code Setting (DSW3) of Combination;
   - Excessive or Insufficient Indoor Unit Total Capacity Code. (The allowable scope is 45%~150%)
3. When SEG1 displays “35”, the condition of activation:
   - This alarm code is displayed in 3 to 5 minutes after powering-on outdoor unit, when the indoor unit No. set by DSW6 and RSW1 on I.U. PCB in the same refrigerant system No. duplicates.
   - When the refrigerant system No. and the address setting value are 64 or more.
4. When SEG1 displays “36”, the condition of activation:
   - Outdoor unit and indoor unit are in different Tier, brand exception combination
5. When SEG1 displays “01”, “11”, “12”, “13”, “14”, “16”, “17”, “18”, “19”, “1A”, “1b”, “1C”, “1d”, “1E”, “b0”, “b1”, “b2”, “b3”, “b6”, “b7”, “bF”, the malfunctions are from the indoor unit. When they are displayed by SEG1, the address of malfunction indoor unit and the alarm code are displayed alternately every 0.5 sec.
6. When the RUN indicator flashes every 4 seconds, the communication failure between the indoor unit and the wired controller (Loosening at connector, Incorrect Wiring, Disconnecting Wiring, Breaking Wire) occurs.
7. If the outdoor unit is designed for single phase, the alarm code “05” is not available. (*)

(4) Cause Code of Indoor Unit Stoppage ( dA )

| Code (SEG1) | Item | Code (SEG1) | Item |
|---|---|---|---|
| 0 | Operation OFF, Power OFF | 17 | Instantaneous Overcurrent of Inverter; Electronic Thermal Activation of Inverter Retry; Abnormal Current Sensor of Inverter Retry. |
| 1 | Thermo-OFF | 18 | Retry due to Inverter Voltage Decrease; Retry due to Inverter Overvoltage |
| 2 | Alarm | 19 | Electronic Valve Opening Difference Protection |
| 3 | Freeze Protection; Overheating Protection | 21 | Forced Thermo-OFF for Oil Return |
| 5 | Instantaneous Power Failure at the Outdoor Unit | 22 | The Outdoor Unit Hot Start |
| 6 | Instantaneous Power Failure at the Indoor Unit | 26 | Retry due to High Pressure Decrease |
| 7 | Stoppage of Cooling Operation due to High/Low Outdoor Air Temperature<br>Stoppage of Heating Operation due to High Outdoor Air Temperature | 28 | Cooling Air Discharge Temperature Decrease |
| 10 | Demand. Forced Stoppage | 33 | Forced Thermo-OFF |
| 11 | Retry due to Pressure Ratio Decrease | 34 | Forced Thermo-OFF |
| 12 | Retry due to Ps Increase | 35 | Retry due to Abnormal Operating Mode (4-Way Valve Switching Failure) |
| 13 | Retry due to Pd Increase | 36 | Retry after Defrosting Operation |
| 15 | Retry due to Discharge Gas Temperature Increase; Retry due to Low Pressure Decrease | 39 | Forced Thermo-OFF for the Indoor Units Rotation |
| 16 | Retry due to Discharge Gas SUPERHEAT Decrease | 41 | Forced Thermo-OFF for the Outdoor Unit Control |

**Notes:**

- The cause code of indoor unit stoppage is not always "02" (Alarm) during stoppage by the abnormality. If the unit is under Thermo-OFF by other cause of stoppage before "02" (Alarm) occurs, the previous cause code of indoor unit stoppage remains.
- When the communication between the driver board and the outdoor unit PCB is disconnected for 30 seconds, the outdoor micro-computer will be reset. Accordingly when the alarm code "04" (Communication Failure between Driver Board and Outdoor Unit PCB) occurs, the cause code of indoor unit stoppage may be indicated "05".
- When the communication between the indoor unit and the outdoor unit is disconnected for 3 minutes, the indoor micro-computer will be reset. Accordingly when the alarm code "03" (Communication Failure between Indoor Unit and Outdoor Unit) occurs, the cause code of indoor unit stoppage may be indicated "06".

(5) Cause Code of Comp. Inverter Stoppage ( 1F )

| Code (SEG1) | Cause | Corresponding of Cause Code of I.D. Stoppage | Remark | |
|---|---|---|---|---|
| | | | Indication during Retry | Alarm Code |
| 1 | IPM Error | 17 | P7 | 53 |
| 2 | Instantaneous Overcurrent | 17 | P7 | 48 |
| 3 | Inverter Fin Thermistor Protection Activation | 17 | P7 | 54 |
| 4 | Electronic Thermal Protection | 17 | P7 | 48 |
| 5 | Inverter Voltage Decrease | 18 | P8 | 06 |
| 6 | Overvoltage | 18 | P8 | 06 |
| 7 | Abnormal Communication | 18 | -- | 04 |
| 8 | Abnormal Current Detection | 17 | P7 | 51 |
| 9 | Instantaneous Power Failure Detection | 18 | -- | -- |
| 11 | Reset of Micro-Computer for Inverter | 18 | -- | -- |
| 12 | Ground Fault Detection from Compressor | 17 | P7 | 53 |
| 13 | Open Phase Detection | 18 | -- | -- |
| 16 | Inverter Malfunction | 18 | P8 | 55 |
| 17 | Communication Error | 18 | P8 | 55 |
| 18 | Protection Device Actuation (PSH) | -- | -- | 02 |
| 19 | Abnormal Protective Device | -- | -- | 38 |
| 20 | Early Return Protective Device | 18 | -- | -- |
| 21 | Step-Out Detection | 18 | -- | -- |
| 22 | Abnormal PCB Setup | -- | -- | 3E |
| 23 | EERPOM Error | -- | -- | 55 |
| 24 | Abnormal Comp. Frequency | 17 | P7 | 53 |
| 25 | Beyond Frequency Scope | 17 | P7 | 53 |
| 26 | DC BUS Pre-charge Malfunction | -- | -- | 55 |
| 30 | Phase Default of Comp. Inverter Output | 17 | P7 | 53 |
| 32 | Overcurrent of L1 Reactor | 17 | P7 | 48 |
| 33 | Overcurrent of L2 Reactor | 17 | P7 | 48 |
| 34 | Overcurrent of Comp. Inverter Input | 17 | P7 | 48 |
| 35 | Overload of Comp. Inverter Input | 17 | P7 | 48 |
| 38 | Error of IPM Temp. Sensor | 17 | P7 | 54 |

| | | | | |
|---|---|---|---|---|
| 40 | Abnormal MCU RAM | -- | -- | 55 |
| 41 | Abnormal MCU Register | -- | -- | 55 |
| 42 | Abnormal MCU Timer | -- | -- | 55 |
| 43 | Abnormal MCU Flash | -- | -- | 55 |
| 44 | Abnormal Reference Voltage | -- | -- | 55 |
| 45 | Abnormal Software Protection Module | -- | -- | 55 |

(6) Cause Code of Fan Controller Stoppage ( Fr / Fr. )

| Code (SEG1) | Cause | Corresponding of Cause Code of I.D. Stoppage | Remark | |
|---|---|---|---|---|
| | | | Indication during Retry | Alarm Code |
| 1 | IPM Error | -- | -- | 57 |
| 2 | Instantaneous Overcurrent | -- | -- | 56 |
| 3 | Inverter Fin Thermistor Protection Activation | -- | -- | 5A |
| 4 | Electronic Thermal Protection | -- | -- | 56 |
| 5 | Inverter Voltage Decrease | 18 | P8 | 06 |
| 6 | Overvoltage | 18 | P8 | 06 |
| 7 | Abnormal Communication | 18 | -- | 04 |
| 8 | Abnormal Current Detection | 17 | P7 | 51 |
| 11 | Reset of Micro-Computer for Inverter | 18 | -- | -- |
| 12 | Ground Fault Detection from Compressor | -- | -- | 57 |
| 16 | Inverter Malfunction | -- | -- | -- |
| 21 | Step-Out Detection | -- | -- | -- |
| 23 | EERPOM Error | -- | -- | 5C |
| 24 | Abnormal Fan Motor Frequency | -- | -- | 57 |
| 25 | Beyond Frequency Scope | -- | -- | 57 |
| 30 | Phase Default of Inverter Output | -- | -- | 57 |
| 38 | Error of IPM Temp. Sensor | -- | -- | 5A |
| 40 | Abnormal of MCU RAM | -- | -- | 5C |
| 41 | Abnormal of MCU Register | -- | -- | 5C |
| 42 | Abnormal of MCU Timer | -- | -- | 5C |
| 43 | Abnormal of MCU Flash | -- | -- | 5C |
| 44 | Abnormal of Reference Voltage | -- | -- | 5C |
| 45 | Abnormal of Software Protection Module | -- | -- | 5C |

(7) Indoor Unit Capacity Table

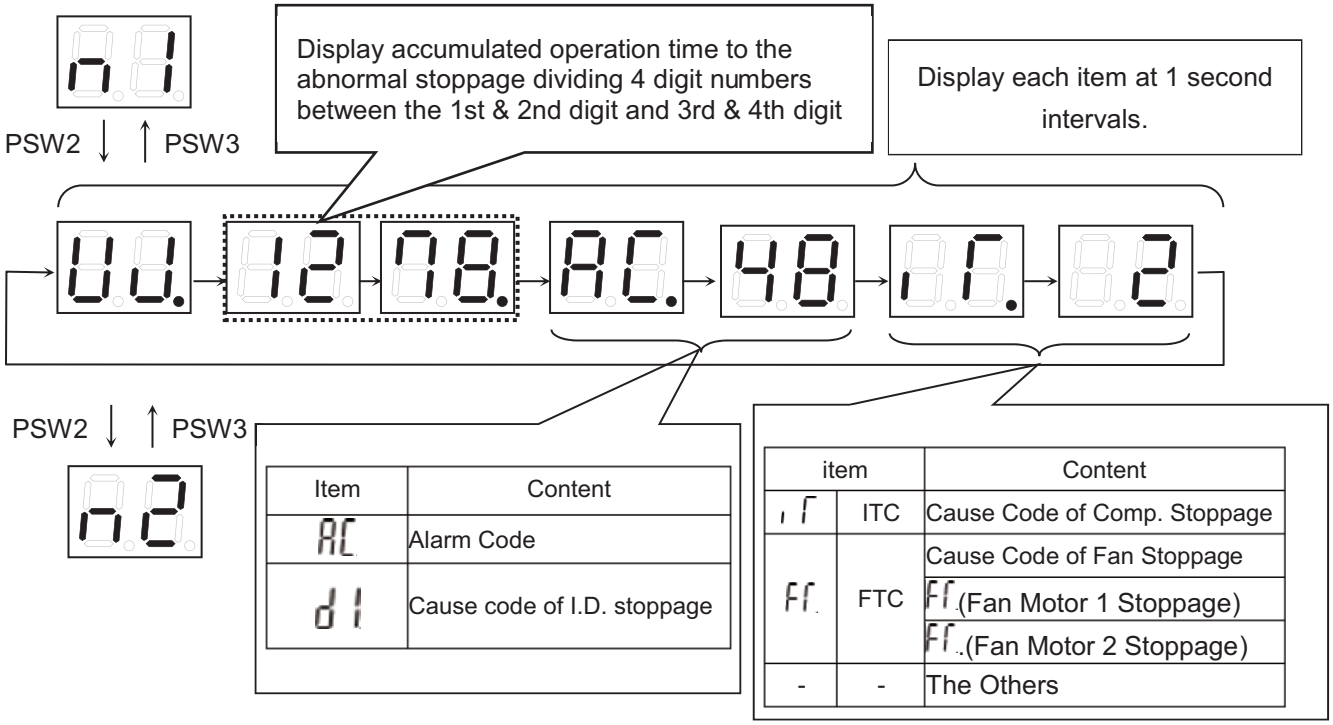
| Code | Capacity Name | Code | Capacity Name |
|---|---|---|---|
| 5 | 18 | 20 | 71 |
| 6 | 22 | 22 | 80 |
| 7 | 25 | 26 | 90 |
| 8 | 28 | 28 | 100 |
| 9 | 32 | 32 | 112 |
| 10 | 36 | 35 | 125 |
| 11 | 40 | 40 | 140 |
| 13 | 45 | 48 | 160 |
| 14 | 50 | 56 | 180 |
| 16 | 56 | 64 | 224 |
| 18 | 63 | 80 | 280 |

(8) Abnormal Data Record

"Abnormal Data Record" (n1 ~ n9) in checking item can record recent abnormal stoppages. (The maximum number of recordable is n9, n1 is the latest one.) In case of abnormal stoppage in following table, accumulated operation time when abnormality happened, alarm code/cause code of I.D. stoppage, and cause code of inverter/fan stoppage are recorded:

For example:

| | |
|---|---|
| No. of Abnormal Data | n1 |
| Accumulated Operation Time | 1278h |
| Alarm Code | 48 |
| Cause Code of Inverter Stoppage | 2 |




| Item | Content |
|---|---|
| AC | Alarm Code |
| d1 | Cause code of I.D. stoppage |

| item | | Content |
|---|---|---|
| iF | ITC | Cause Code of Comp. Stoppage |
| FF | FTC | Cause Code of Fan Stoppage |
| | | FF (Fan Motor 1 Stoppage) |
| | | FF. (Fan Motor 2 Stoppage) |
| - | - | The Others |

| Alarm Code or Cause Code of I.D. Stoppage | Contents | Cause Code of Inverter/Fan Stoppage | |
|---|---|---|---|
| | | ITC | FTC |
| 02 | Activation of protection device (High Pressure Cut) | - - | - - |
| 04 | Abnormality communication between inverter PCB and outdoor unit PCB | - - | - - |
| 05 | Abnormality of power supply phase | - - | - - |
| 06 | Activation of inverter voltage increase/decrease protection | 5,6 | - - |
| d1-18 | | | |
| 07 | Activation of discharge gas superheat decrease protection | - - | - - |
| d1-16 | | | |
| 08 | Activation of discharge gas temperature increase protection | - - | - - |
| d1-15 | | | |
| 20 | Abnormality of thermistor for discharge gas temp. (Td) | - - | - - |
| 21 | Abnormality of high pressure sensor (Pd) | - - | - - |
| 22 | Abnormality of thermistor for outdoor air temperature (Ta) | - - | - - |
| 24 | Abnormality of thermistor for outdoor unit heat exchanger liquid pipe (Te) | - - | - - |
| 31 | Incorrect capacity setting of indoor unit and outdoor unit | - - | - - |
| 38 | Abnormality of picking up circuit for protection in outdoor unit | - - | - - |
| 45 | Activation of high pressure increase protection | - - | - - |
| d1-13 | | | |
| 47 | Activation of low pressure decrease protection | - - | - - |
| d1-15 | | | |
| 48 | Activation of overcurrent protection | 2,4 | - - |
| d1-17 | | | |
| 51 | Abnormality of current sensor for inverter | 8 | - - |
| d1-17 | | | |
| 53 | Activation of inverter PCB protection device | 1,12,21 | - - |
| d1-17 | | | |
| 54 | Activation of inverter fin temperature increase protection | 3 | - - |
| d1-17 | | | |
| 55 | Inverter failure | 9,10,11,13,14, 15,16,23 | - - |
| d1-18 | | | |
| 57 | Abnormality of Outdoor Fan Motor | - - | 1,12,24 |
| 5b | Activation of overcurrent protection for outdoor fan | - - | 2 |
| 5C | Abnormality of outdoor fan controller sensor | - - | 8 |
| EE | Compressor protection alarm | - - | - - |
| d1-05 | Instantaneous power failure at the outdoor unit | - - | - - |
| d1-26 | Retry due to high pressure decrease | - - | - - |
| A1 | Abnormality of Active Filter | - - | - - |
| d1-35 | 4-Way valve switching failure | - - | - - |

**Note:**

All History will be erased by pressing PSW1 for 5 seconds when Abnormal Data Record is displayed.

## 1.6 Checking of Protection Control Information

Protection control code is displayed on 7-segment display when a protection control is activated. It is turned OFF when the protection control is canceled. If several protection controls are activated, the code of the protection control with highest priority will be displayed. Also if several retry control is activated, the code of the latest retry control will be displayed.

| Rank Order. | Indication | Protection Control Contents |
|---|---|---|
| 1 | P1 | Pressure Ratio Protection Control |
| 2 | P2 | High Pressure Increase Protection Control |
| 3 | P3 | Inverter Current Protection Control |
| 4 | P4 | Inverter Fin Temperature Increase Protection Control |
| 5 | P5 | Discharge Temperature Increase Protection Control |
| 6 | P6 | Low Pressure Decrease Protection Control |
| 7 | PA | Demand Current Control |
| 8 | Pd | Low Pressure Increase Protection Control |
| 9 | P9 | High Pressure Decrease Protection Control |

| | | ② Lower Rank Order of Protection Control Function | | | |
|---|---|---|---|---|---|
| | | Forced Decrease | Forced Increase | Prohibition of Increase | Prohibition of Decrease |
| ① Higher Rank Order of Protection Control Function | Forced Decrease | ① | ① | ① | ① |
| | Forced Increase | ① | ① | ① | ① |
| | Prohibited Increase | ② | ① | ② *1 | ① |
| | Prohibited Decrease | ② | ② | ② | ② |

*1: Discharge Temperature Increase Protection Control (P5) is higher than the following protection controls.

a) Low Pressure Decrease Protection Control (P6)

b) Demand Current Control (PA)

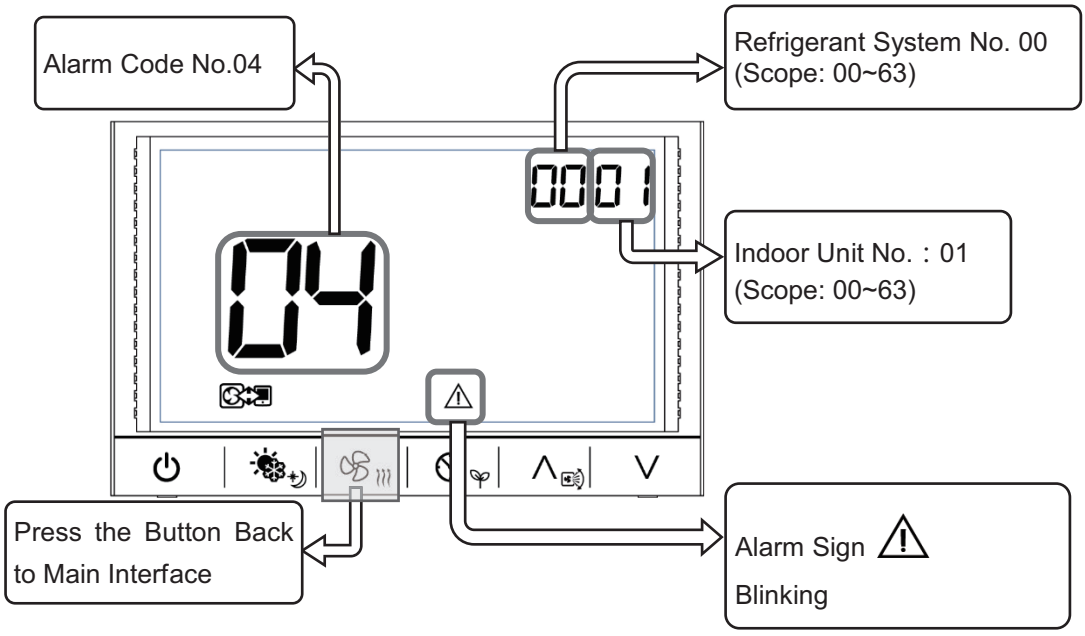
Protection Control Code and Retry Control Code

| Indication (SEG1) | Protection Control | Remark |
|---|---|---|
| P1 | Pressure Ratio Protection Control | To control the compressor frequency for prevention of operation with high/low pressure ratio. |
| P2 | High Pressure Increase Protection Control | To control the compressor frequency for prevention of high pressure increase. |
| P3 | Inverter Current Protection Control | To control the compressor frequency for prevention of inverter current increase in the outdoor unit during operation. |
| P4 | Inverter Fin Temperature Increase Protection Control | To control the compressor frequency for prevention of inverter fin temperature increase. The inverter fin temperature is detected at the inverter PCB. |
| P5 | Discharge Temperature Increase Protection Control | To control the compressor frequency for prevention of discharge gas temperature increase during operation. |
| P6 | Low Pressure Decrease Protection Control | To control the compressor frequency for prevention of low pressure decrease. |
| P9 | High Pressure Decrease Protection Control | To control the compressor frequency for prevention of high pressure decrease, which would interrupt smooth refrigerant distribution to indoor units with different height and oil supply to the compressor. |
| PA | Demand Current Control | To control the compressor frequency for fixing the inverter primary current around the set value (40~100% of rated current for cooling). |
| Pd | Low Pressure Increase Protection Control | To control the compressor frequency for prevention of low pressure increase. |
| P7 | Inverter Trip Retry | To stop the unit operation temporarily for protection of the compressor and inverter. The operation will be restarted or stopped depending on the retry frequency. |
| P8 | Insufficient Voltage/Open Phase Detection Retry | |

## 2. Troubleshooting Procedures

### 2.1 Alarm Code Indication of Wired Controller

Protection control code is displayed on the wired controller when a protection control is activated.



## 2.2 Troubleshooting Using Alarm Codes

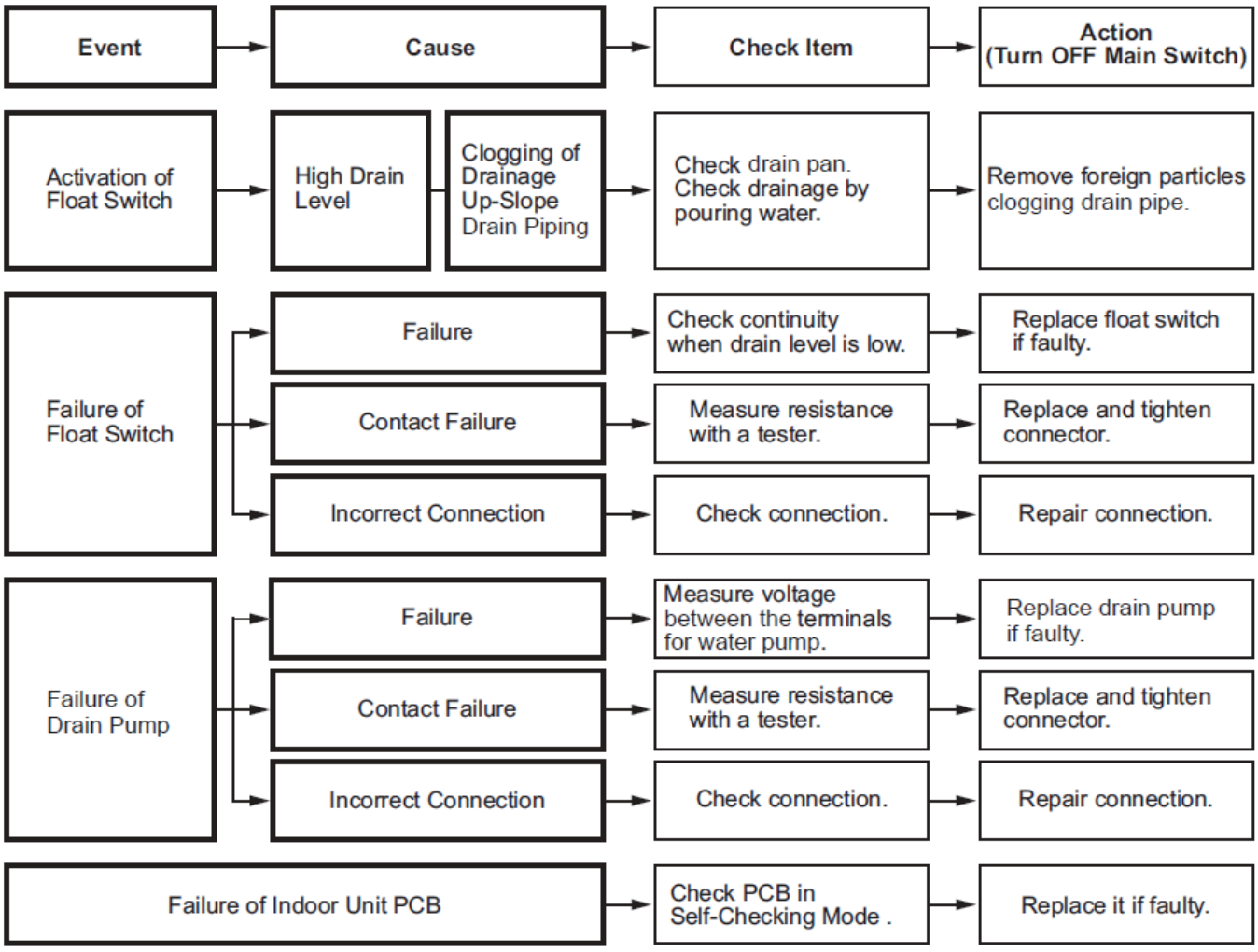
| Alarm Code | | |
|---|---|---|
| | **01** | Activation of Protection Device (Float Switch) in Indoor Unit |

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

★ Example of 4-way Cassette Type

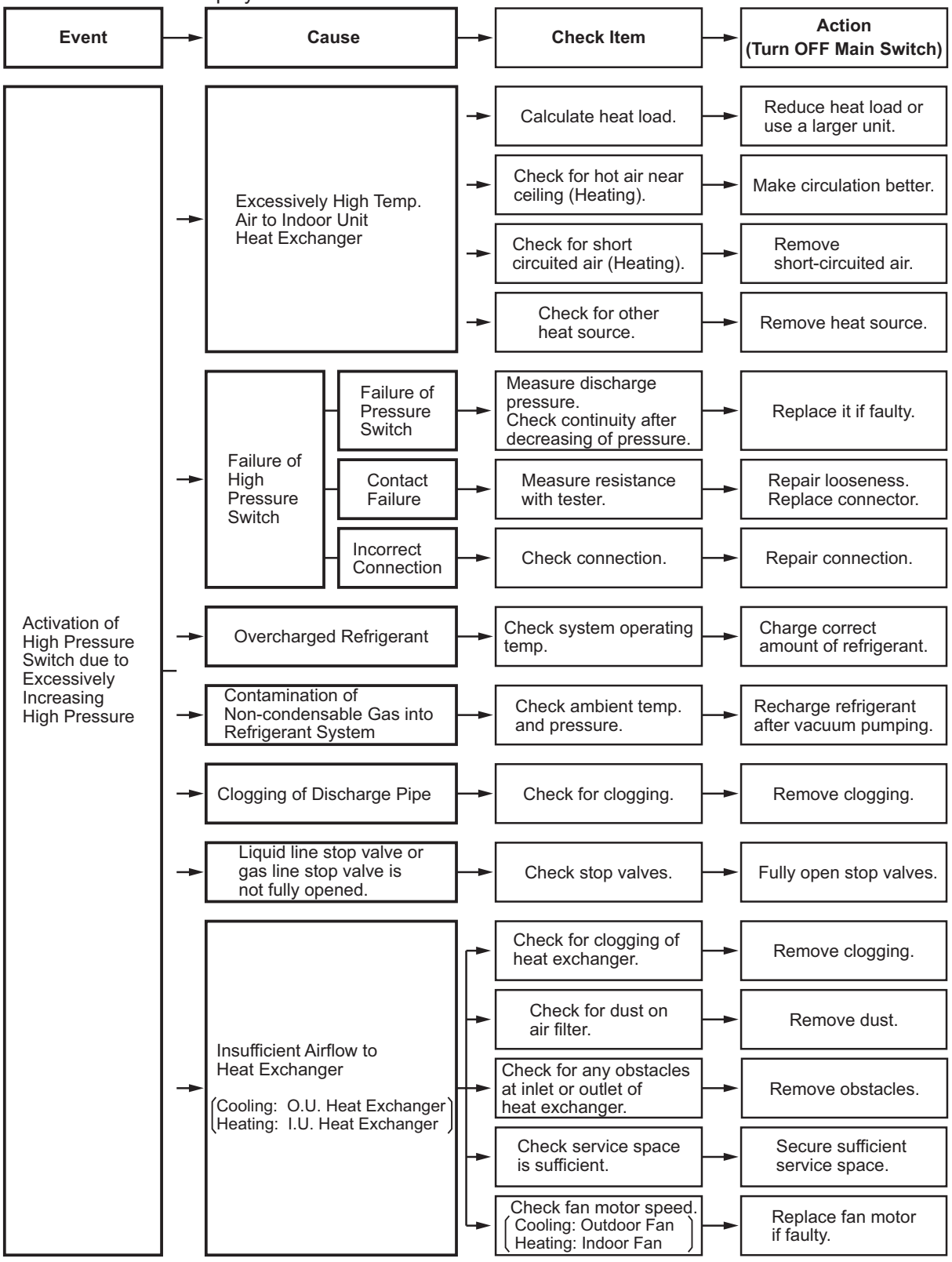
This alarm code is displayed when the contact between #1 and #2 of CN14 on the I.U. PCB is opened for more than 120 seconds during the cooling, dry, fan, or heating operation.

I.U. PCB: Indoor Unit PCB



| Alarm Code | 02 | Activation of Protection Device (High Pressure Switch) in Outdoor Unit |
|---|---|---|

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.



## TROUBLESHOOTING

| Alarm Code | 03 | Abnormal Communication between Indoor Unit and Outdoor Unit |
|---|---|---|

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

★ When fuses are blown, or the circuit breakers are activated, check the cause of overcurrent and take necessary action.

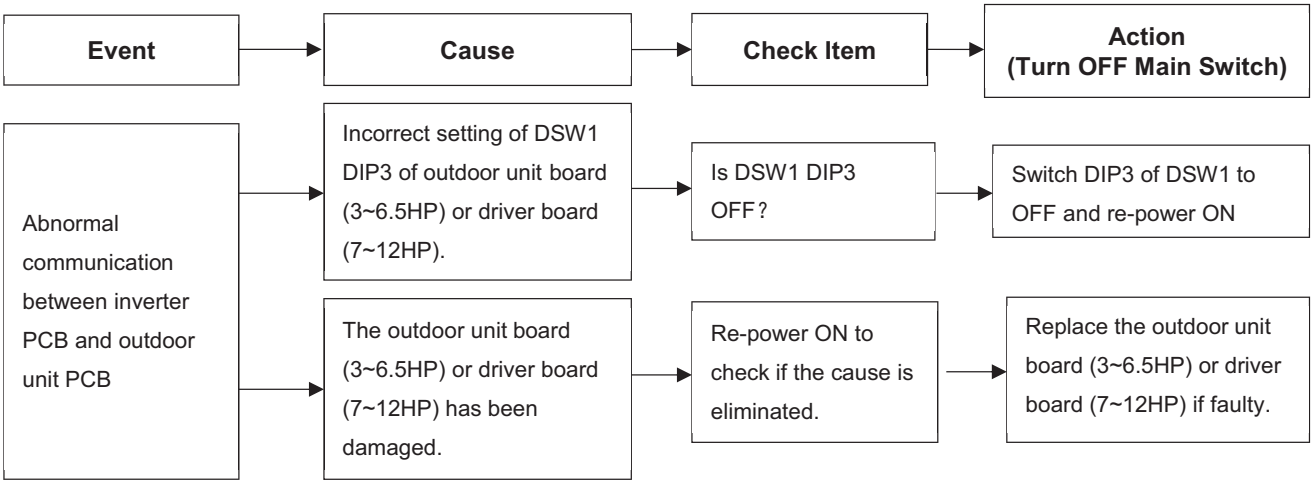
★ This alarm code is displayed when an abnormal condition continues for three minutes after normal communication between indoor units and outdoor units, and also the abnormal condition continues for 30 seconds even after the micro-computer is automatically reset. If communication failure occurs from the beginning, the alarm code is displayed after 30 seconds from start up.

| Event | Cause | Check Item | Action (Turn OFF Main Switch) |
|---|---|---|---|
| Power Failure of No Power Supply | | Measure voltage with tester. | Supply power. |
| Blown Fuse for Power Supply or Activation of Outdoor Unit Breaker | Short Circuit between Wires | Check for breakage of insulation. | Remove cause of short circuit. Replace fuse and/or I.U./O.U. PCB if faulty. |
| | Ground Fault | Measure insulation resistance. | Remove cause of short circuit to ground. Replace fuse and/or I.U./O.U. PCB if faulty. |
| | Failure of Comp. Motor | Measure resistance between wires and insulation resistance. | Replace comp. and fuse. (O.U.) Replace inverter PCB and/or PCB if faulty. (O.U.) |
| | Failure of Outdoor Unit Fan Motor | Measure resistance between wires and insulation resistance. | Replace outdoor unit fan motor and fuse. Replace O.U. PCB if faulty. |
| Blown Fuse on O.U. PCB | Short Circuit between Wires | Check for breakage of insulation. | Remove cause of short circuit and replace fuse. |
| | Incorrect Power Supply Circuit of O.U. PCB | Check O.U. PCB output. | Replace fuse. |
| Incorrect Power Supply Circuit of O.U. PCB | | Measure O.U. PCB output. | Replace O.U. PCB. |
| Disconnected Wires, Contact Failure or Incorrect Connection | Communication Cable Between Outdoor Unit and Indoor Unit | Check continuity of wires. Check for looseness of connection screws. Check terminal Nos. | Replace or repair wires, tighten screws or correct wires. |
| | Power Supply Wiring for Outdoor Unit | | |
| Failure of O.U. and I.U.PCB | Disconnected Wires to I.U./O.U. PCB | Check connection. | Correctly connect wires. |
| | Failure of I.U./O.U.PCB | | Replace it if faulty. |

| Alarm Code | 04 | Abnormal Communication between Inverter PCB and Outdoor Unit PCB |
|---|---|---|

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

★ This alarm code is displayed after the operation is stopped when an abnormal communication occurs between the inverter PCB (Driver Board) and the outdoor unit PCB (Main Board).

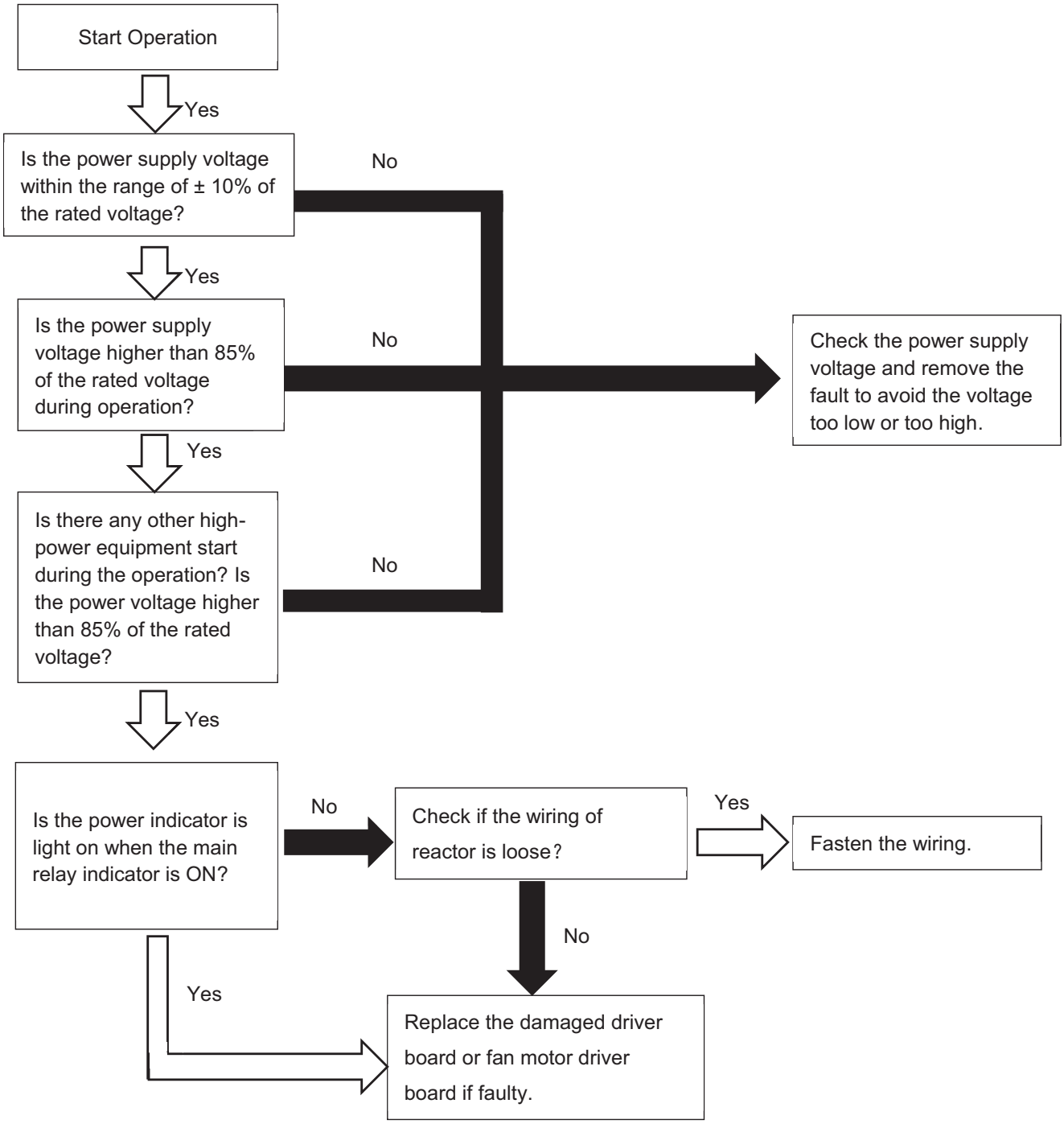


## TROUBLESHOOTING

| Alarm Code | 06 | Abnormal Inverter Voltage (Insufficient Inverter Voltage or Overvoltage) |
|---|---|---|

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

★ If either insufficient voltage or overvoltage is detected between the terminal R-S on the inverter PCB (Driver Board) three times in 30 minutes, the operation stops and this alarm code is displayed. If this occurs less than three times in 30 minutes, the operation is automatically retried.

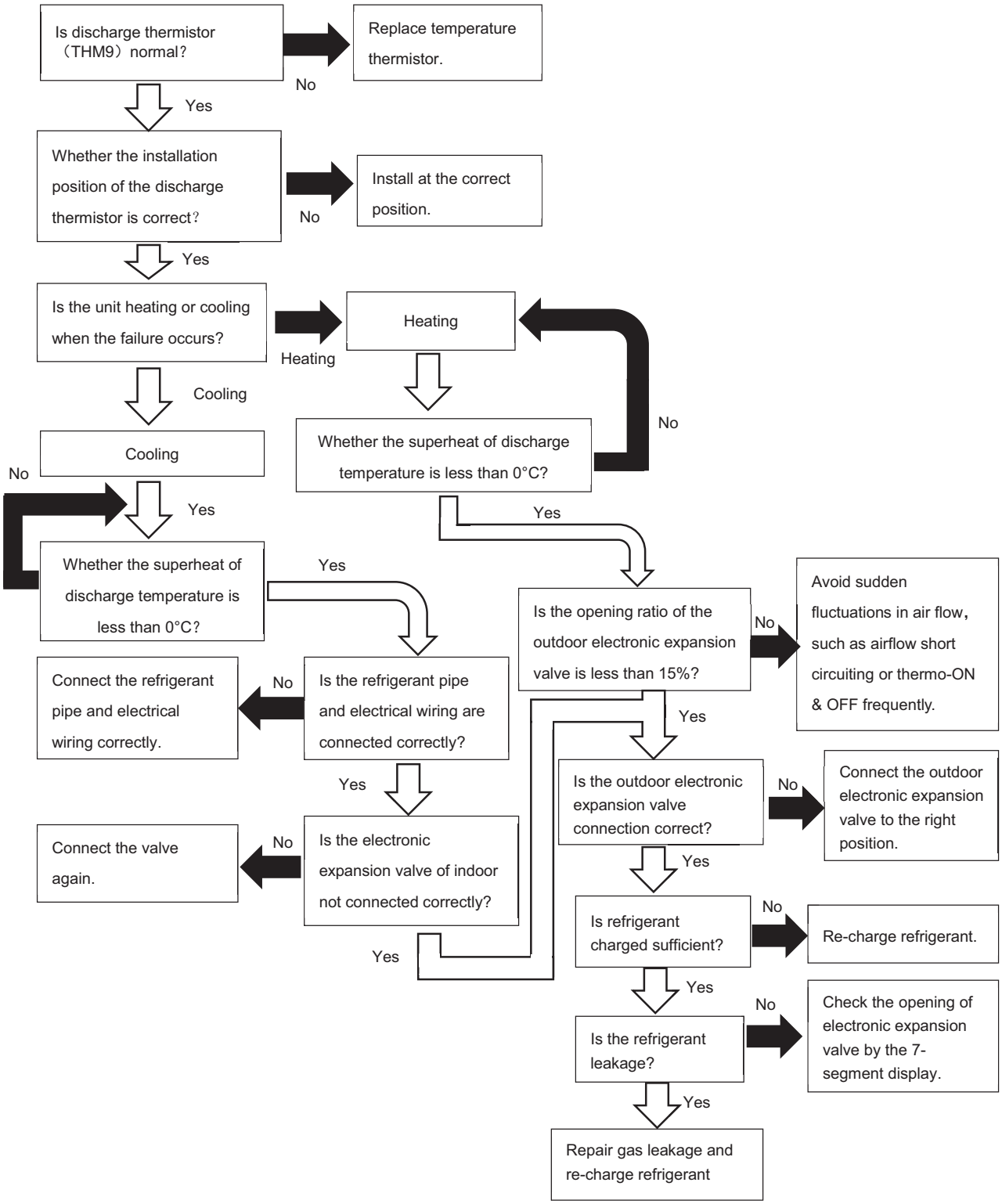


| Alarm Code | 07 | Decrease in Discharge Gas Superheat |
|---|---|---|

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

★ If the discharge temperature of the compressor is below the estimated condensing temperature for 30 minutes during operation, the compressor stops and then the operation is automatically retried after three minutes.If this occurs again twice in the next 120 minutes, this alarm code is displayed.

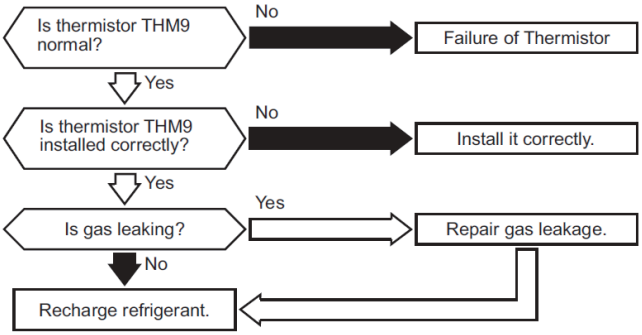
★ This alarm code is displayed when an abnormality cannot be detected by the step-out detection, caused by locking of compressor shaft.

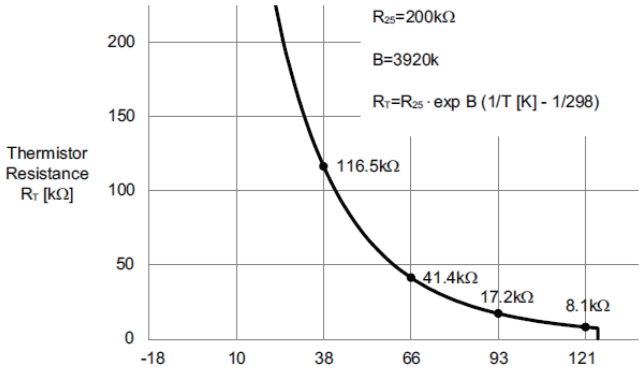


| Alarm Code | 08 | Excessively High Discharge Gas Temperature |
|---|---|---|

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

★ This alarm code is displayed when the discharge temperature is too high during cooling/heating operation.



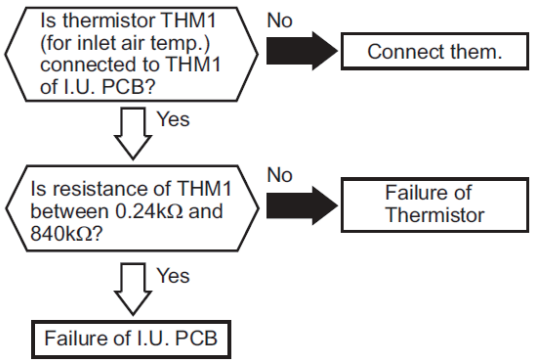




Thermistor Characteristics

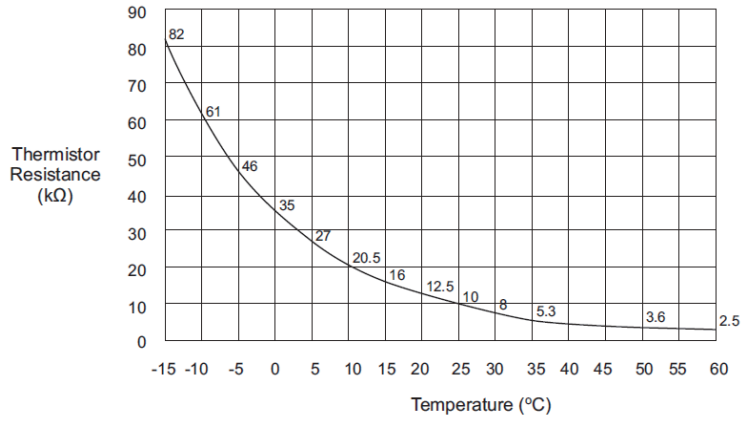
| Alarm Code | 11 | Abnormality of Thermistor for Indoor Unit Inlet Air Temperature (Inlet Air Thermistor) |
|---|---|---|

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

★ This alarm code is displayed when a short circuit (0.24kΩ or less) or disconnection (840kΩ or more) of the thermistor is detected during a heating or cooling operation. The operation automatically restarts when the malfunction is removed.




| Event | Cause | Check Item | Action (Turn OFF Main Switch) |
|---|---|---|---|
| Failure of Inlet Air Thermistor | Failure | Check resistance. | Replace thermistor if faulty. |
| | Incorrect Connection | Check connection. | Correctly connect wires. |
| Failure of I.U. PCB | | Replace I.U. PCB and check operation. | Replace I.U. PCB if faulty. |

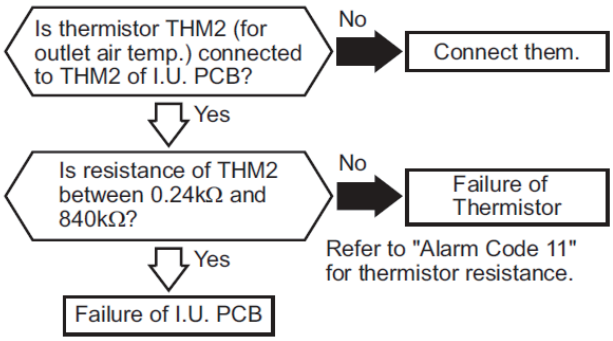



Thermistor Characteristics

| Alarm Code | 12 | Abnormality of Thermistor for Indoor Unit Outlet Air Temperature (Outlet Air Thermistor) |
|---|---|---|

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

★ This alarm code is displayed when a short circuit (0.24kΩ or less) or disconnection (840kΩ or more) of the thermistor is detected during a heating or cooling operation. The operation automatically restarts when the malfunction is removed.

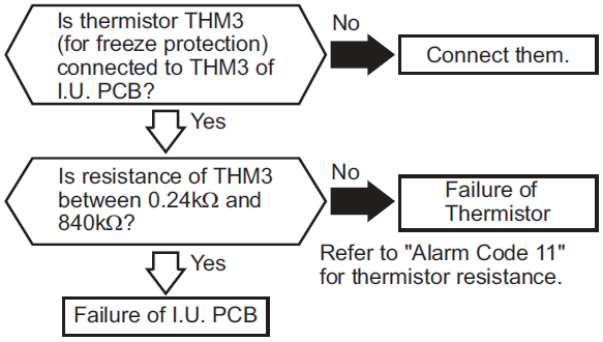



| Event | Cause | Check Item | Action (Turn OFF Main Switch) |
|---|---|---|---|
| Failure of Outlet Air Thermistor | Failure | Check resistance. | Replace thermistor if faulty. |
| | Incorrect Connection | Check wiring to I.U. PCB. | Correctly connect wires. |
| Failure of I.U. PCB | | Replace I.U. PCB and check operation. | Replace I.U. PCB if faulty. |

| Alarm Code | 13 | Abnormality of Thermistor for Liquid Refrigerant Pipe Temperature at Indoor Unit Heat Exchanger (Freeze Protection Thermistor) |
|---|---|---|

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

★ This alarm code is displayed when a short circuit (0.24kΩ or less) or disconnection (840kΩ or more) of the thermistor is detected during a heating or cooling operation. The operation automatically restarts when the malfunction is removed.

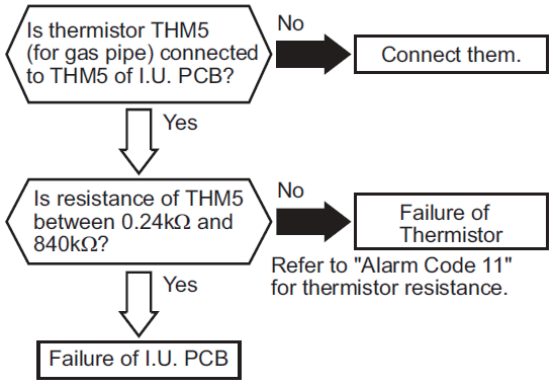



| Event | Cause | Check Item | Action (Turn OFF Main Switch) |
|---|---|---|---|
| Failure of Freeze Protection Thermistor | Failure | Check resistance. | Replace thermistor if faulty. |
| | Incorrect Connection | Check wiring to I.U. PCB. | Correctly connect wires. |
| Failure of I.U. PCB | | Replace I.U. PCB and check operation. | Replace I.U. PCB if faulty. |

| Alarm Code | 14 | Abnormality of Thermistor for Gas Refrigerant Pipe Temperature at Indoor Unit Heat Exchanger (Gas Pipe Thermistor) |
|---|---|---|

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

★ This alarm code is displayed when a short circuit (0.24kΩ or less) or disconnection (840kΩ or more) of the thermistor is detected during a heating or cooling operation. The operation automatically restarts when the malfunction is removed.

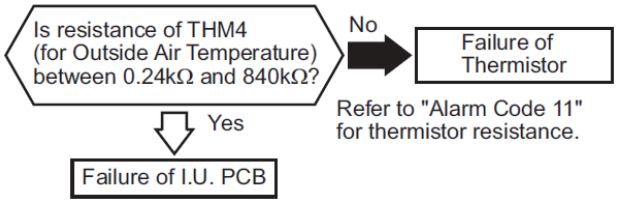



| Event | Cause | Check Item | Action (Turn OFF Main Switch) |
|---|---|---|---|
| Failure of Thermistor for Indoor Unit Heat Exchanger Gas Pipe Temp. | Failure | Check resistance. | Replace thermistor if faulty. |
| | Incorrect Connection | Check wiring to I.U. PCB. | Correctly connect wires. |
| Failure of I.U. PCB | | Replace I.U. PCB and check operation. | Replace I.U. PCB if faulty. |

| Alarm Code | 15 | Abnormality of Thermistor for Outside Air Temperature (for Econo Fresh) |
|---|---|---|

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

★ This alarm code is displayed when a short circuit (0.24kΩ or less) or disconnection (840kΩ or more) of the thermistor is detected during a heating or cooling operation.

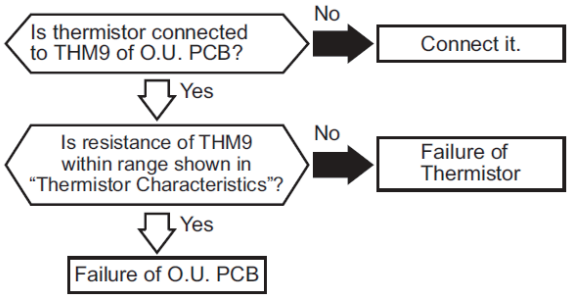


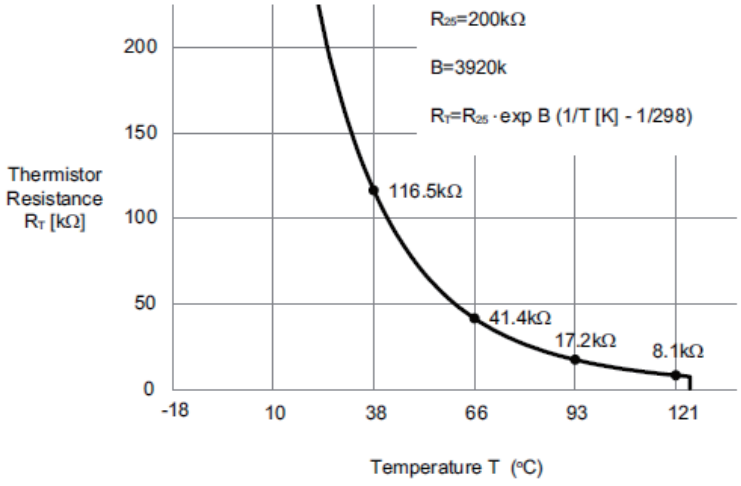

| Event | Cause | Check Item | Action (Turn OFF Main Switch) |
|---|---|---|---|
| Failure of Thermistor for Outside Air Temperature | Failure | Check resistance. | Replace thermistor if faulty. |
| | Incorrect Connection | Check wiring to I.U. PCB. | Correctly connect wires. |
| Failure of I.U. PCB | | Replace I.U. PCB and check operation. | Replace I.U. PCB if faulty. |

| Alarm Code | 20 | Abnormality of Discharge Gas Thermistor |
|---|---|---|

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

★ This alarm code is displayed when a short circuit (0.9kΩ or less) or disconnection (5946kΩ or more) of the thermistor is detected during a heating or cooling operation.



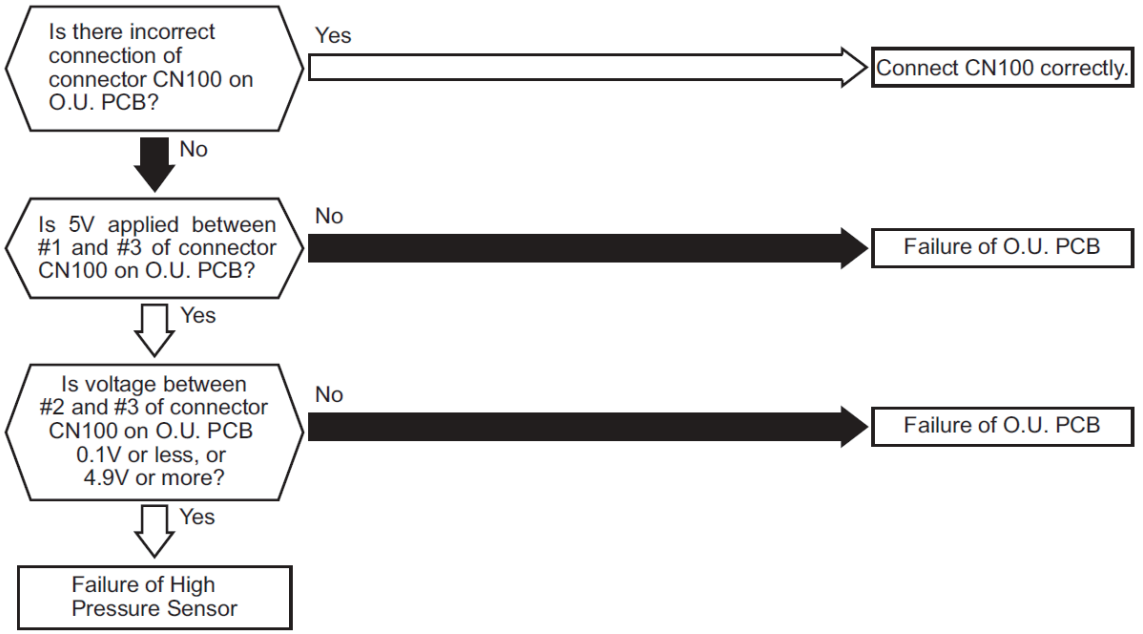

Thermistor Characteristics

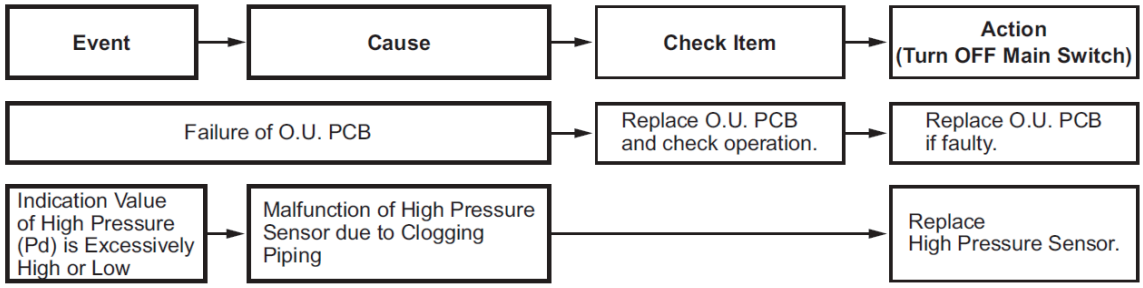
| Event | Cause | Check Item | Action (Turn OFF Main Switch) |
|---|---|---|---|
| Failure of Thermistor for Discharge Gas Temp. on Top of Compressor | Failure | Check resistance. | Replace thermistor if faulty. |
| | Incorrect Connection | Check wiring to O.U. PCB. | Repair wiring and connection. |
| Failure of O.U. PCB | | Replace O.U. PCB and check operation. | Replace O.U. PCB if faulty. |

| Alarm Code | 21 | Abnormality of High Pressure Sensor |
|---|---|---|

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

★ This alarm code is displayed when output voltage of the high pressure sensor decreases to 0.1V or less, or increases to 4.9V or more during operation.

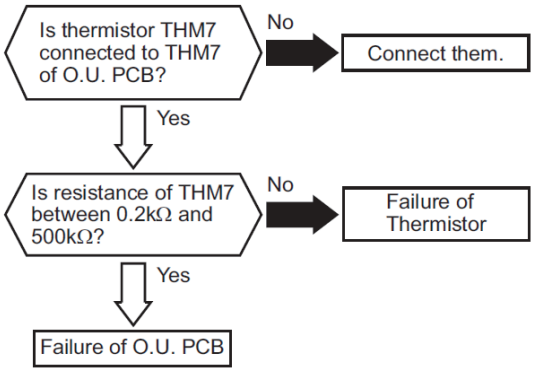


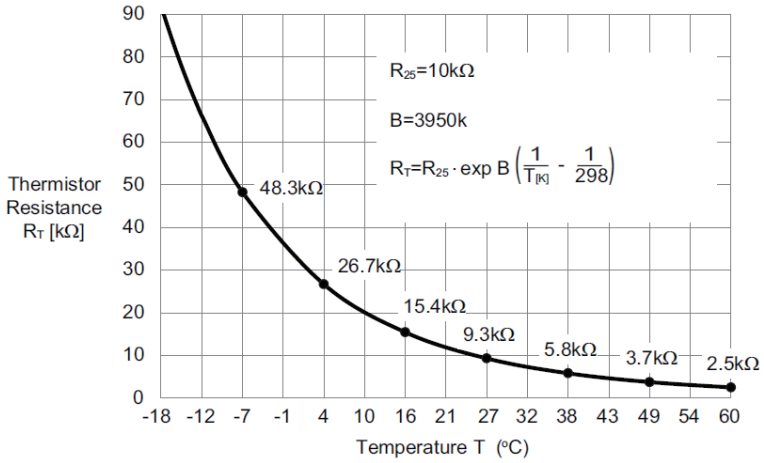
| Alarm Code | 22 | Abnormality of Outdoor Air Thermistor (Outdoor Unit Ambient Thermistor) |
|---|---|---|

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

★ This alarm code is displayed when a short circuit (0.2kΩ or less) or disconnection (500kΩ or more) of the thermistor is detected during heating or cooling operation.




| Event | Cause | Check Item | Action (Turn OFF Main Switch) |
|---|---|---|---|
| Failure of Thermistor for Outdoor Air Temp. | Failure | Check resistance. | Replace thermistor if faulty. |
| | Incorrect Connection | Check wiring to O.U. PCB. | Repair wiring and connection. |
| Failure of O.U. PCB | | Replace O.U. PCB and check operation. | Replace O.U. PCB if faulty. |

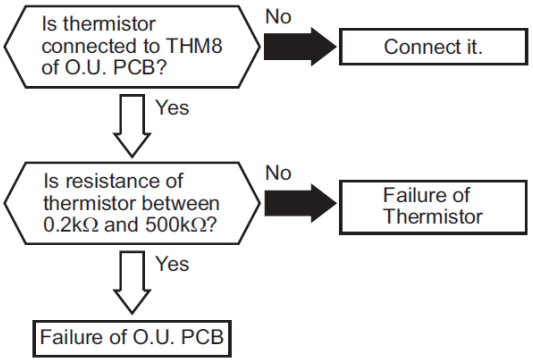



Thermistor Characteristics

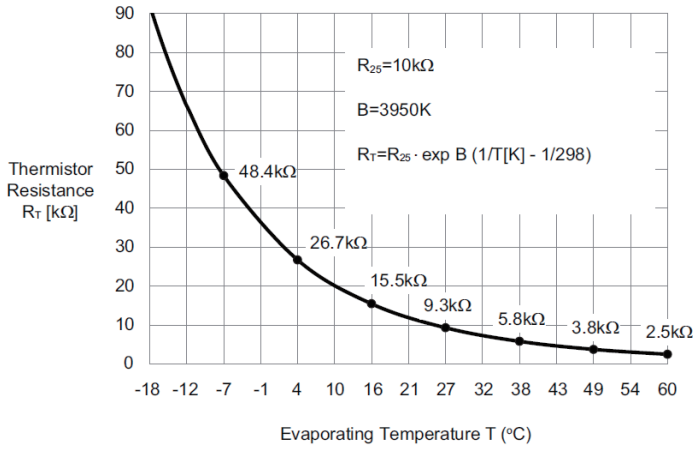
| Alarm Code | 24 | Abnormality of Thermistor for Evaporating Temperature during Heating Operation (Outdoor Unit Evaporating Thermistor) |
|---|---|---|

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

★ This alarm code is displayed when a short circuit (0.2kΩ or less) or disconnection (500kΩ or more) of the thermistor is detected during heating or cooling operation.




| Event | Cause | Check Item | Action (Turn OFF Main Switch) |
|---|---|---|---|
| Failure of Thermistor for Evaporating Temperature during Heating | Failure | Check resistance. | Replace thermistor if faulty. |
| | Incorrect Connection | Check wiring to O.U. PCB. | Repair wiring and connection. |
| Failure of O.U. PCB | | Replace O.U. PCB and check operation. | Replace O.U. PCB if faulty. |

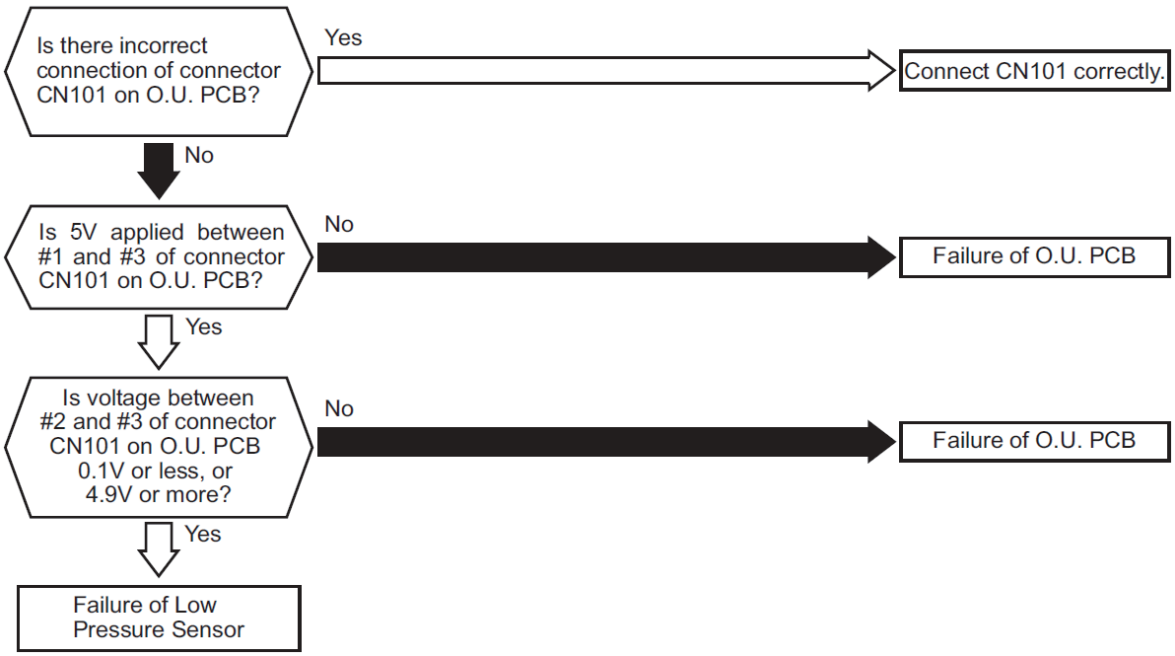



Thermistor Characteristics

| Alarm Code | 29 | Abnormality of Low Pressure Sensor |
|---|---|---|

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

★ This alarm code is displayed when output voltage of the low pressure sensor decreases to 0.1V or less, or increases to 4.9V or more during operation.




| Event | Cause | Check Item | Action (Turn OFF Main Switch) |
|---|---|---|---|
| Failure of O.U. PCB | | Replace O.U. PCB and check operation. | Replace O.U. PCB if faulty. |
| Indication Value of Low Pressure (Ps) is Excessively High or Low | Malfunction of Low Pressure Sensor due to Clogging Piping | | Replace Low Pressure Sensor. |

| Alarm Code | 31 | Incorrect Capacity Setting of Outdoor Unit and Indoor Unit |
|---|---|---|

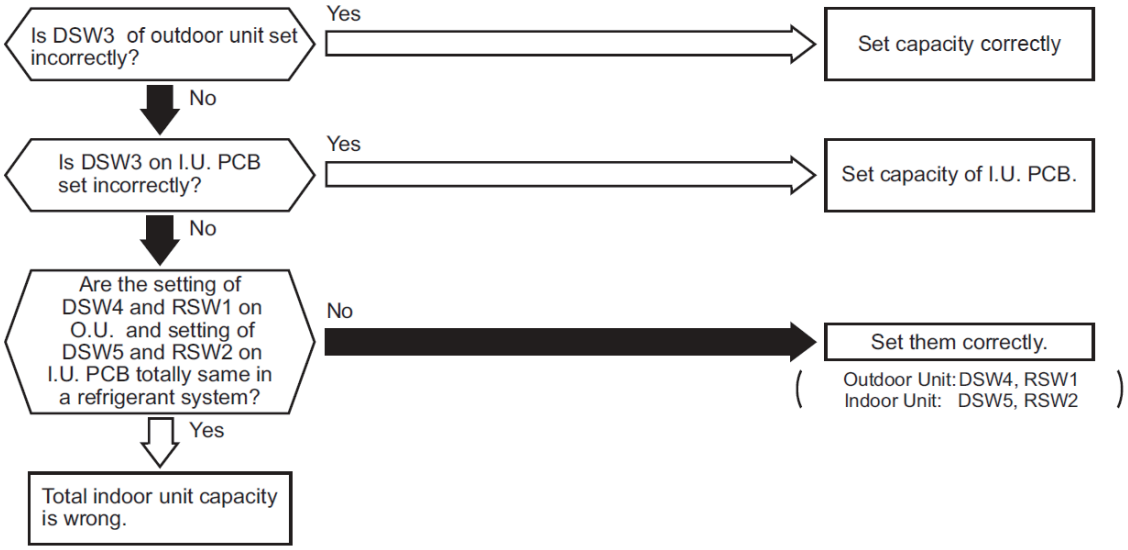
- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

★ This alarm code is displayed when an undefined setting is set to DSW3 (for capacity and power supply setting) on the service board (3~6.5HP) or O.U.PCB. (7~12HP)

★ This alarm code is displayed when the total indoor unit capacity is outside the range of connectable indoor unit capacity ratio.

Connectable Indoor Unit Capacity

| Outdoor Unit Model | Connectable Indoor Unit Capacity Ratio | |
|---|---|---|
| | Minimum | Maximum |
| 3HP~12HP | 45% | 150% |




| Event | Cause | Check Item | Action (Turn OFF Main Switch) |
|---|---|---|---|
| Incorrect Capacity Setting of Indoor Unit | | Check combination of indoor units and capacity setting of I.U. PCB. | Correctly set DIP switch, DSW3. |
| Incorrect Capacity Setting of Outdoor Unit | | Check capacity setting of O.U. | Correctly set DIP switch, DSW3. |
| Total Indoor Unit Capacity Connected to Outdoor Unit is Beyond Permissible Range | | Check outdoor unit model by calculating total indoor units capacity. | Ensure that total indoor unit capacity. |
| Refrigerant System Setting of Outdoor Unit and Indoor Unit is Different | | Check refrigerant system setting of O.U. and I.U. PCB. | Set them correctly. |

| Alarm Code | 35 | Incorrect Setting of Indoor Unit Number |
|---|---|---|

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

★ This alarm code is displayed in 3 to 5 minutes after power-on of outdoor unit, when the indoor unit No. set by DSW6 and RSW1 on I.U. PCB in the same refrigerant system No. duplicates.

★ This alarm code is displayed when the refrigerant system No. and the address setting value are 64 or more. (The alarm code “b1” is displayed on the wired controller.)

★ This alarm code is displayed when refrigerant system No. set by DSW4 and RSW1 on service board (3~6.5HP) or outdoor unit PCB (7~12HP) in in the same H-LINK Ⅱ system duplicates.

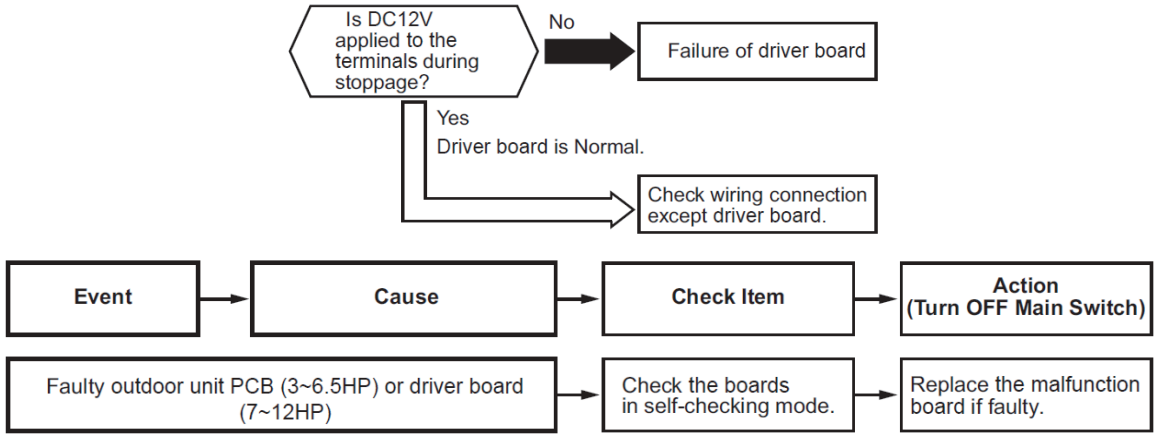
**Note:**

In the case of H-LINK Ⅱ system, this alarm code may be displayed when DSW4 and RSW1 (for refrigerant system No. setting) on the outdoor unit and DSW5 and RSW2 (for refrigerant system No. setting) on the indoor unit PCB are not set correctly. In this case, turn OFF the power supply and set them correctly, and turn ON the power supply again. (The rotary switch RSW2 is not available depending on the indoor unit model.)

| Alarm Code | 38 | Problem with Picking up Circuit for Protection in Outdoor Unit |
|---|---|---|

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

★ This alarm code is displayed when the outdoor unit PCB detects that the protection device (PSH) is activated.




**Note:**

This alarm code may be displayed at starting the operation when the high pressure switch (PSH) is connected incorrectly or fails (open fault). The item for alarm code 02 should be checked as well.

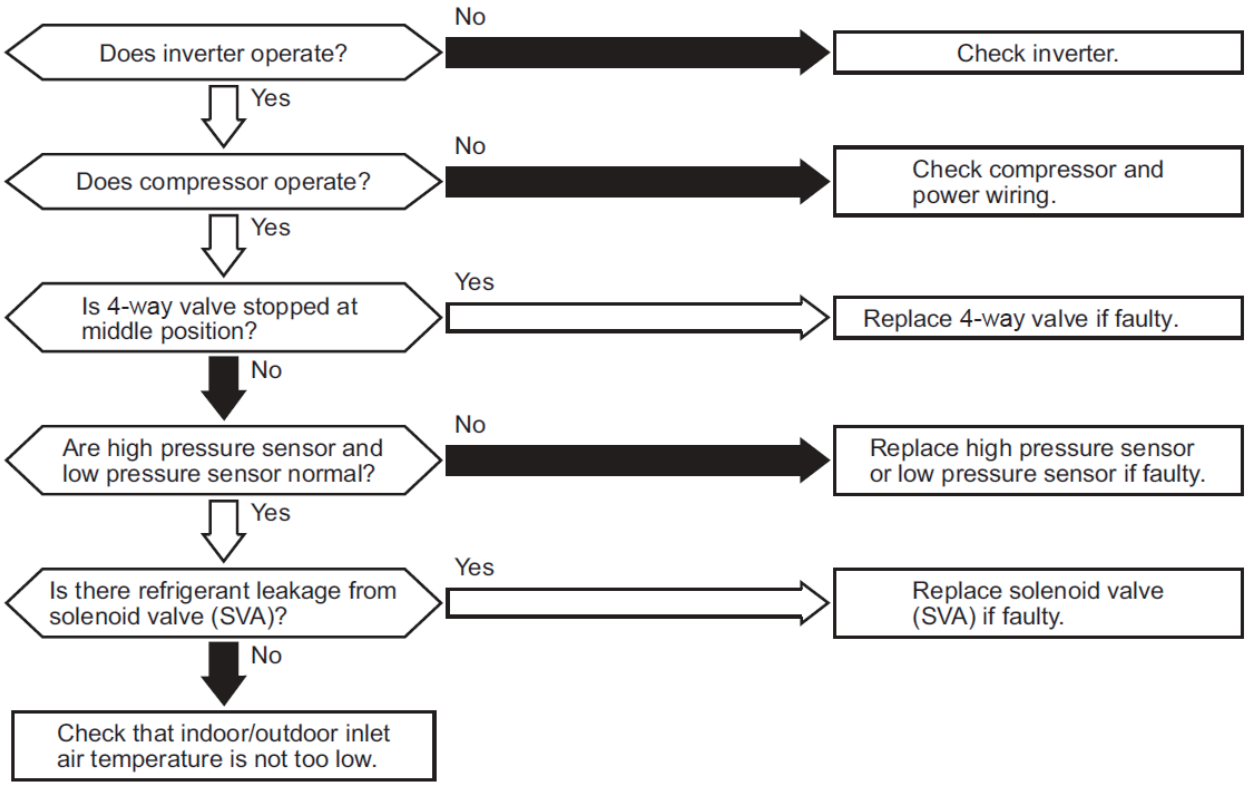
| Alarm Code | 43 | Activation of Pressure Ratio Decrease Protection |
|---|---|---|

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

★ If the pressure ratio ε*1) is less than 1.5 for a minute, the compressor stops. The operation automatically restarts after three minutes. If this occurs again twice in the next 30 minutes, this alarm code is displayed.

*1) Pressure Ratioε= (Pd[MPa] + 0.1)/(Ps[MPa] + 0.1)

Pd: high pressure (discharge pressure)  Ps: low pressure (suction pressure)



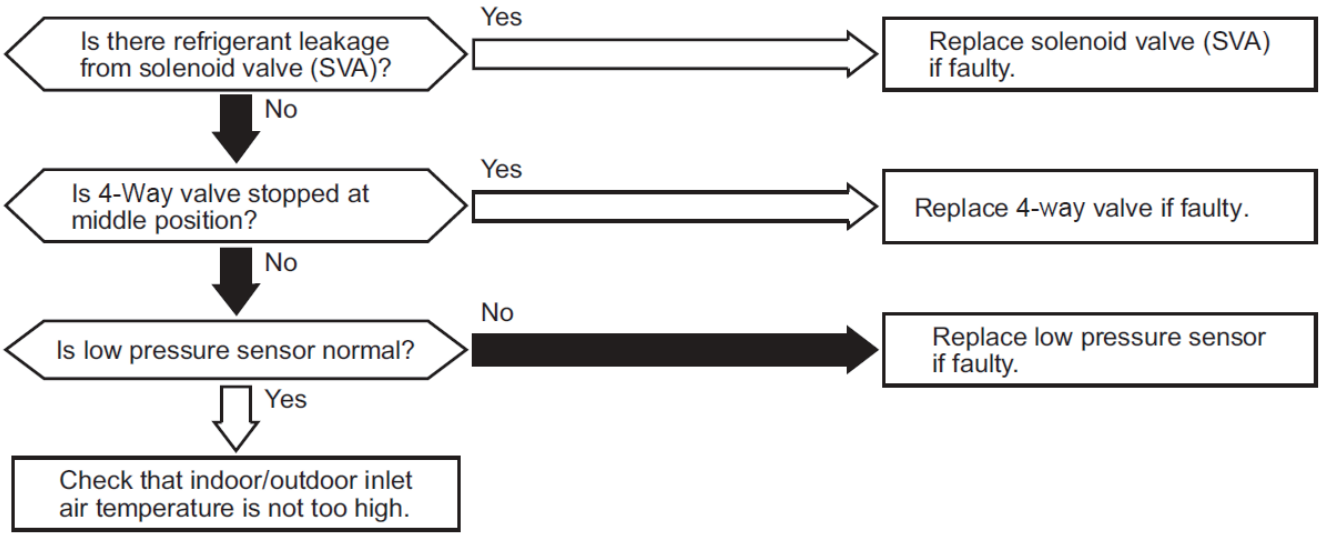

| Event | Cause | Check Item | Action (Turn OFF Main Switch) |
|---|---|---|---|
| Excessively Low Pressure Ratio | Inverter is not functioning. | Check inverter. | Repair faulty part. |
| | Compressor is not operating. | Check compressor. | Replace comp. if faulty. |
| | Valve Stoppage at Middle Position of 4-Way Valve | Measure suction pipe temp. of 4-way valve. | Replace 4-way valve if faulty. |
| | Abnormality of High or Low Pressure Sensor | Check connector for O.U. , power supply and pressure indication. | Replace sensor if faulty. |
| | Excessively Low Indoor Inlet Air Temperature | Check indoor unit and outdoor unit air temp. thermistor. | Replace thermistor if faulty. |
| | Leakage from Solenoid Valve (SVA) | Check Solenoid Valve. | Replace SVA if there is leakage. |

| Alarm Code | 44 | Activation of Low Pressure Increase Protection |
|---|---|---|

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

★ If the suction pressure (Ps) of the compressor is more than 1.4 MPa for a minute, the compressor stops. The operation automatically restarts after three minutes. If this occurs again twice in the next 30 minutes, this alarm code is displayed.

O.U. PCB: Outdoor Unit PCB

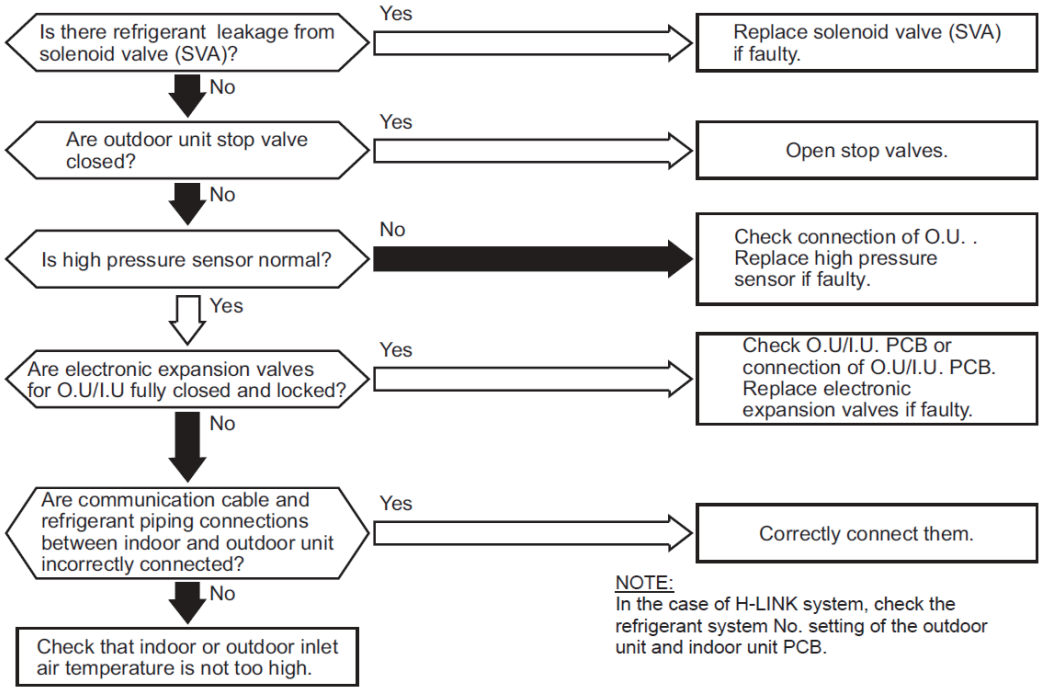



| Event | Cause | Check Item | Action (Turn OFF Main Switch) |
|---|---|---|---|
| Excessively Increasing Low Pressure | Leakage from Solenoid Valve (SVA) | Check outlet pipe temp. of solenoid valve (SVA). | Check connecting wires. Replace solenoid valve (SVA) if faulty. |
| | Valve Stoppage at Middle Position of 4-Way Valve | Measure suction gas pipe temp. of 4-Way valve. | Replace 4-Way valve if faulty. |
| | Abnormal Suction Pressure Sensor | Check connectors of O.U. and power supply. | Replace sensor if faulty. |
| | Excessively High Indoor Unit and Outdoor Unit Inlet Air Temperature | Check indoor unit and outdoor unit inlet air temp. thermistor. | Replace thermistor if faulty. |

| Alarm Code | 45 | Activation of High Pressure Increase Protection |
|---|---|---|

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

★ If the high pressure (Pd) of the compressor is more than 3.8 MPa for a minute, the compressor stops. The operation automatically restarts after three minutes. If this occurs again twice in the next 30 minutes, this alarm code is displayed.



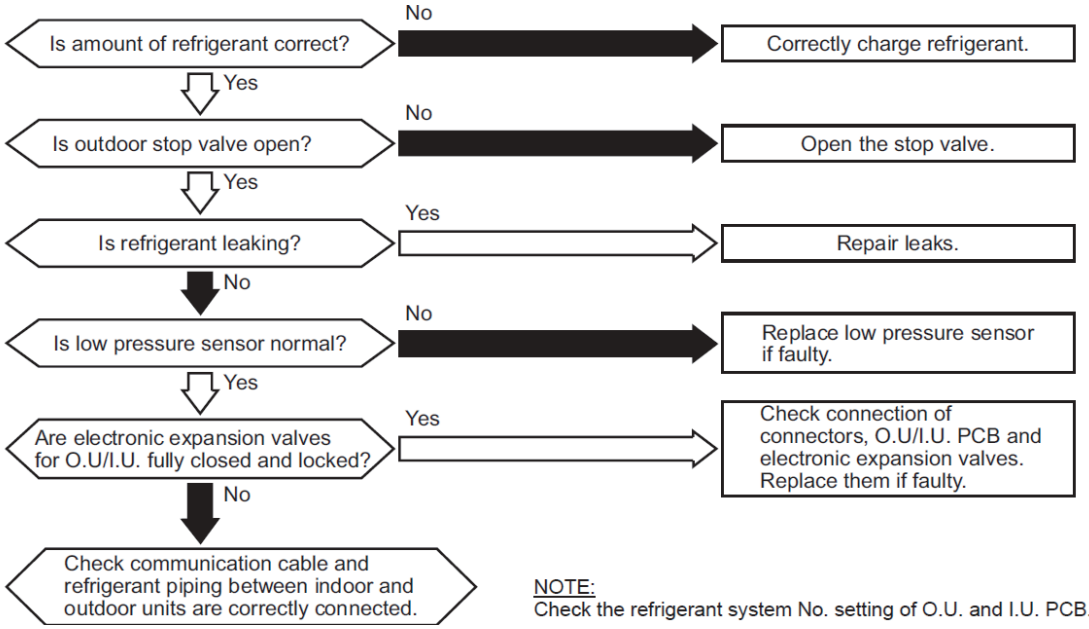

| Event | Cause | Check Item | Action (Turn OFF Main Switch) |
|---|---|---|---|
| Excessively Increasing High Pressure | Leakage from Solenoid Valve (SVA) | Check outlet temp. of solenoid valve (SVA). | Check connection. Replace solenoid valve (SVA) if faulty. |
| | Closed Stop Valve | Check stop valves. | Open stop valves. |
| | Abnormal High Pressure Sensor | Check connecting condition and output voltage of connector CN100 (on O.U. ) for high pressure sensor. | Replace high pressure sensor if faulty. |
| | Excessively High Temperature of Inlet Air for Outdoor Unit or Indoor Unit | Check thermistor for indoor unit and outdoor unit inlet air temp. | Replace inlet air thermistor if faulty. |
| | Incorrect Connection between Indoor Unit and Outdoor Unit | Check electrical system and ref. system. | Correctly connect them. |
| | Locked Expansion Valve (Fully Closed) | Check condition of connector CN100 on O.U. . | Repair connector for O.U. or expansion valve. Replace it if faulty. |

| Alarm Code | 47 | Activation of Low Pressure Decrease Protection |
|---|---|---|

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

★ If the low pressure (Ps) of the compressor is less than 0.09 MPa for 12 minutes, the compressor stops. The operation automatically restarts after three minutes. If this occurs again twice in the next 60 minutes, this alarm code is displayed.

O.U: outdoor unit; I.U. PCB: indoor unit PCB




| Event | Cause | | Check Item | Action (Turn OFF Main Switch) |
|---|---|---|---|---|
| Excessively Decreasing Low Pressure | Shortage of Refrigerant | | Check charged ref. volume or check for leakage. | Repair leakage and correctly charge ref.. |
| | Closed Stop Valve | | Check stop valve. | Open stop valve. |
| | Abnormal High Pressure Sensor | | Check connector for O.U. PCB. | Replace pressure sensor if faulty. |
| | Incorrect Connection between Indoor Unit and Outdoor Unit | | Check electrical system and ref. system. | Correctly connect indoor unit and outdoor unit. |
| | Locked Electronic Expansion Valve for O.U/I.U. (Fully Closed) | | Check connector for O.U./I.U. PCB. | Repair connector for O.U. /I.U. PCB or expansion valve. Replace it if faulty. |
| | Electronic Expansion Valve Closed by Disconnecting Td Thermistor | | Check Td thermistors for compressors and measure Td thermistor resistance. | Repair or replace Td thermistor. |
| Internal Thermostat for Outdoor Fan is Activated in Heating Operation | Faulty Outdoor Fan Motor | | Measure coil resistance and insulation resistance. | Replace outdoor fan motor if faulty. |
| | Faulty Internal Thermostat | Failure | Check for continuity after temperature of outdoor fan motor decreases. | Replace outdoor fan motor. |
| | | Contact Failure | Measure resistance with a tester. | Tighten or replace connector. |
| | | Incorrect Connection | Check connection. | Connect it correctly. |

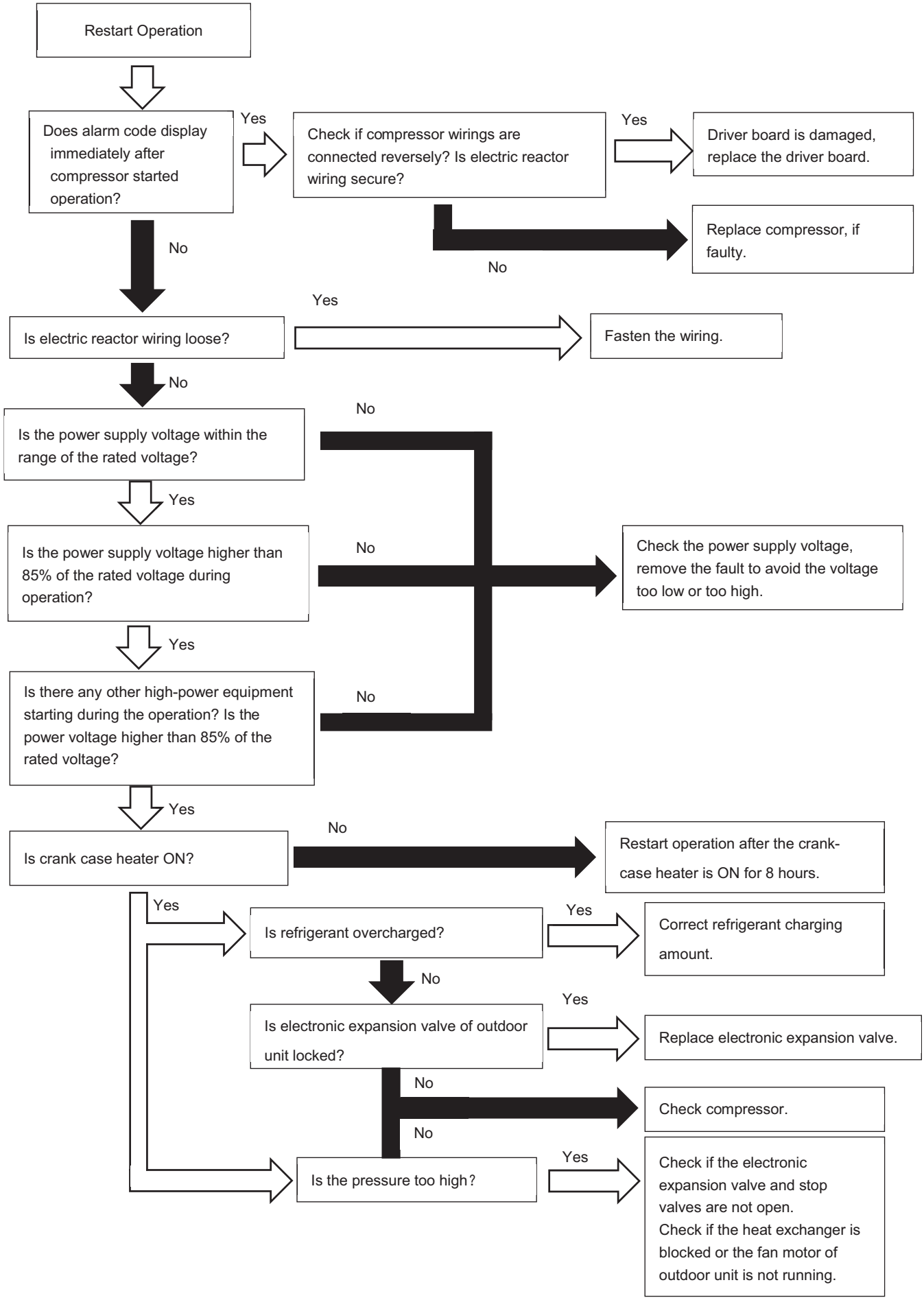
| Alarm Code | 48 | Activation of Inverter Overcurrent Protection |
|---|---|---|

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

★ If instantaneous overcurrent or electronic thermal protection occurs on inverter as follows, the compressor stops.The operation automatically restarts after three minutes. If this occurs again five times in the next 30 minutes, this alarm code is displayed.

Condition of Activation:

1) Instantaneous overcurrent
   Main causes: Compressor damage, output U, V, W are connected in reverse.
2) Electronic thermal
   Main causes: Heavy compressor load, and so on.
3) PFC_A hardware overcurrent
   Main causes: Short circuited PFC electric reactor L1, driver hardware is abnormal.
4) PFC_B hardware overcurrent
   Main causes: Short circuited PFC electric reactor L2, driver hardware is abnormal.
5) AC input overcurrent
   Main causes: AC input voltage under voltage, higher compressor load, and so on.
6) AC input overload
   Main causes: AC input voltage overload, higher compressor load, and so on.


Restart Operation
Does alarm code display immediately after compressor started operation?
Yes
Check if compressor wirings are connected reversely? Is electric reactor wiring secure?
Yes
Driver board is damaged, replace the driver board.
No
Replace compressor, if faulty.
No
Is electric reactor wiring loose?
Yes
Fasten the wiring.
No
Is the power supply voltage within the range of the rated voltage?
No
Yes
Is the power supply voltage higher than 85% of the rated voltage during operation?
No
Yes
Is there any other high-power equipment starting during the operation? Is the power voltage higher than 85% of the rated voltage?
No
Check the power supply voltage, remove the fault to avoid the voltage too low or too high.
Yes
Is crank case heater ON?
No
Restart operation after the crank-case heater is ON for 8 hours.
Yes
Is refrigerant overcharged?
Yes
Correct refrigerant charging amount.
No
Is electronic expansion valve of outdoor unit locked?
Yes
Replace electronic expansion valve.
No
Check compressor.
No
Is the pressure too high?
Yes
Check if the electronic expansion valve and stop valves are not open.
Check if the heat exchanger is blocked or the fan motor of outdoor unit is not running.

| Alarm Code | 51 | Abnormality of Current Sensor for Inverter |
|---|---|---|

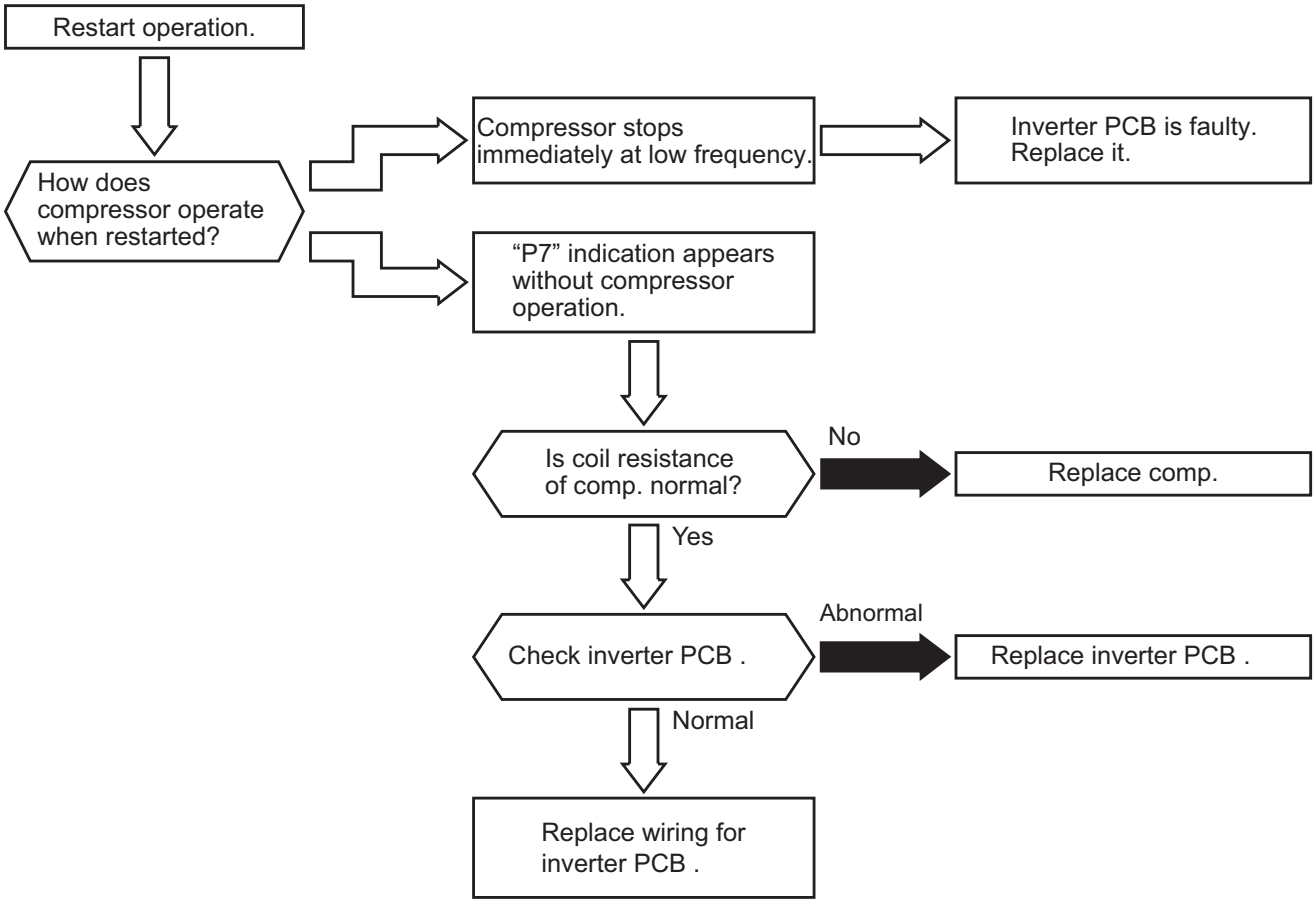
- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

★ If abnormal current detection occurs, the compressor stops. The operation automatically restarts after three minutes. If this occurs again twice in the next 30 minutes, this alarm code is displayed.

Condition of Activation:

(1) Picking up circuit for inverter current is not central value before the compressor starts operation;

(2) Inverter secondary current is excessively low when the compressor starts operation.



| Alarm Code | 53 | Inverter Error Signal Detection |
|---|---|---|

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

★ If IPM (transistor module) error, ground fault detection or step-out detection occurs, the compressor stops. The operation automatically restarts after three minutes. If this occurs again six times in the next 30 minutes, this alarm code is displayed.

Condition of Activation:

1) IPM (Fault) signal error

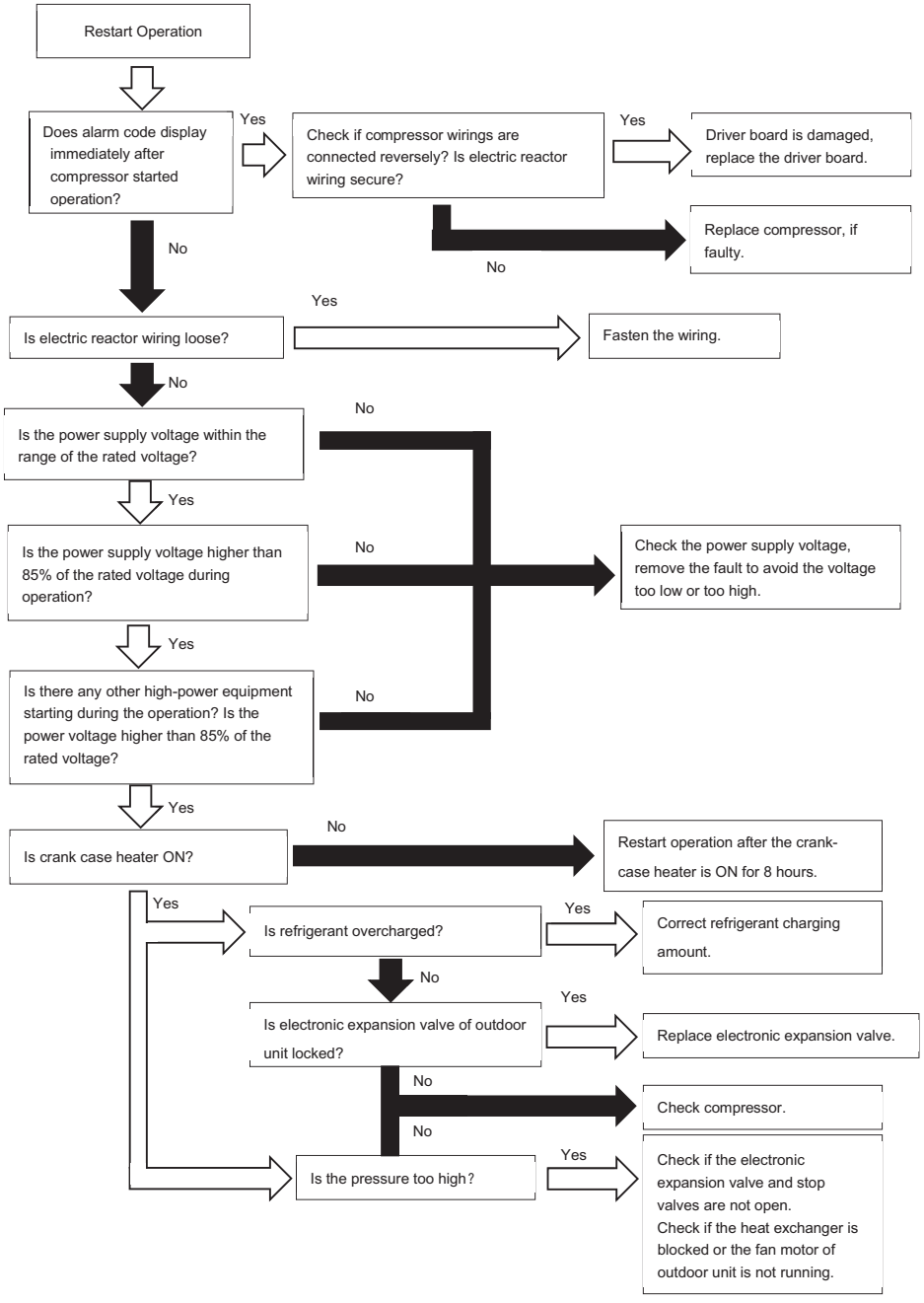
Main causes: Abnormal compressor current, abnormal IPM control voltage, short circuited IPM, and so on.

2) Speed abnormality

Main causes: Compressor phase loss, output U, V, W are open.

3) FOC output phase loss

Main causes: Compressor phase loss and so on.



| Alarm Code | 54 | Abnormality of Inverter Fin Temperature |
|---|---|---|

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

★ When the following condition occurs three times in 30 minutes, the operation stops and this alarm code is displayed. If this occurs less than three times in 30 minutes, the operation automatically restarts.

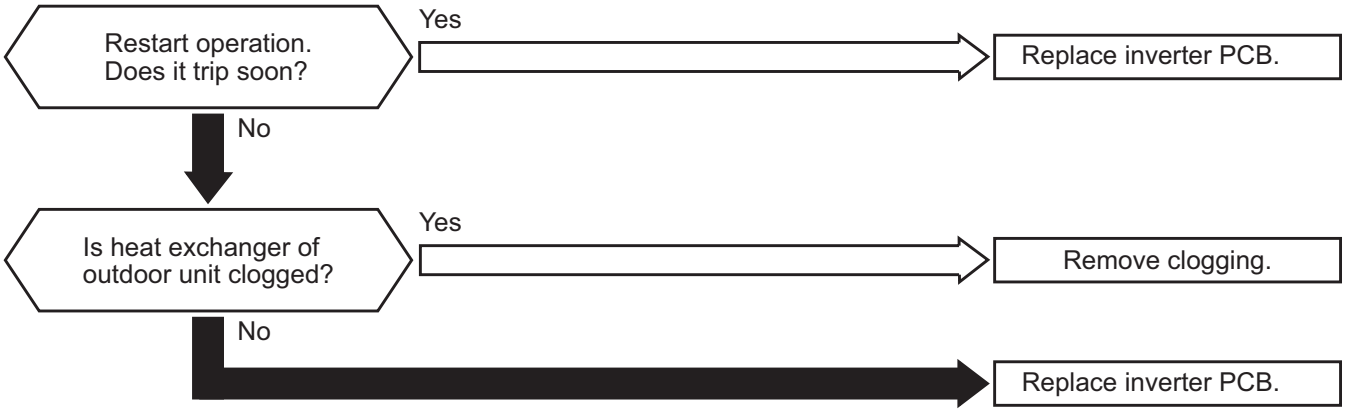
Condition of Activation:

(1) Fin temperature increases

Main causes: Increased temperature of the fins of the heat dissipation module

(2) Thermistor failure

Main causes: Abnormality of driver temperature sampling circuit, and so on.



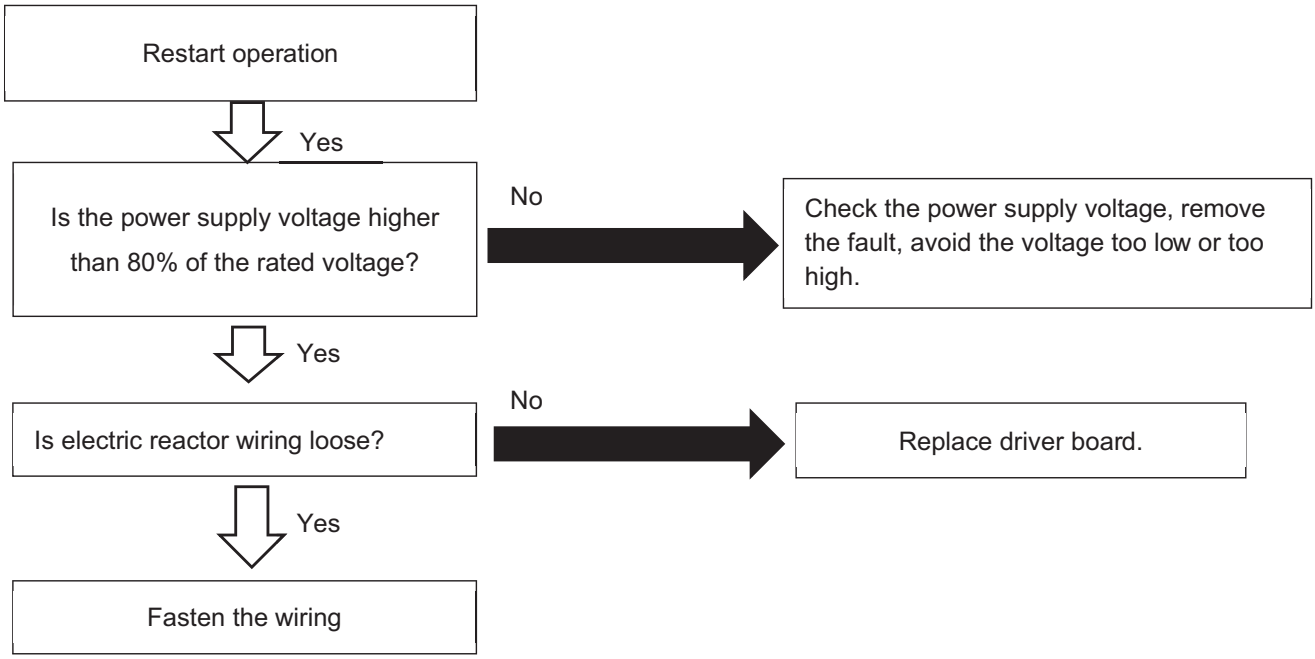
| Alarm Code | 55 | Inverter Failure |
|---|---|---|

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

★ When the following condition occurs three times in 30 minutes, the operation stops and this alarm code is displayed. If this occurs less than three times in 30 minutes, the operation automatically restarts.

Condition of Activation:

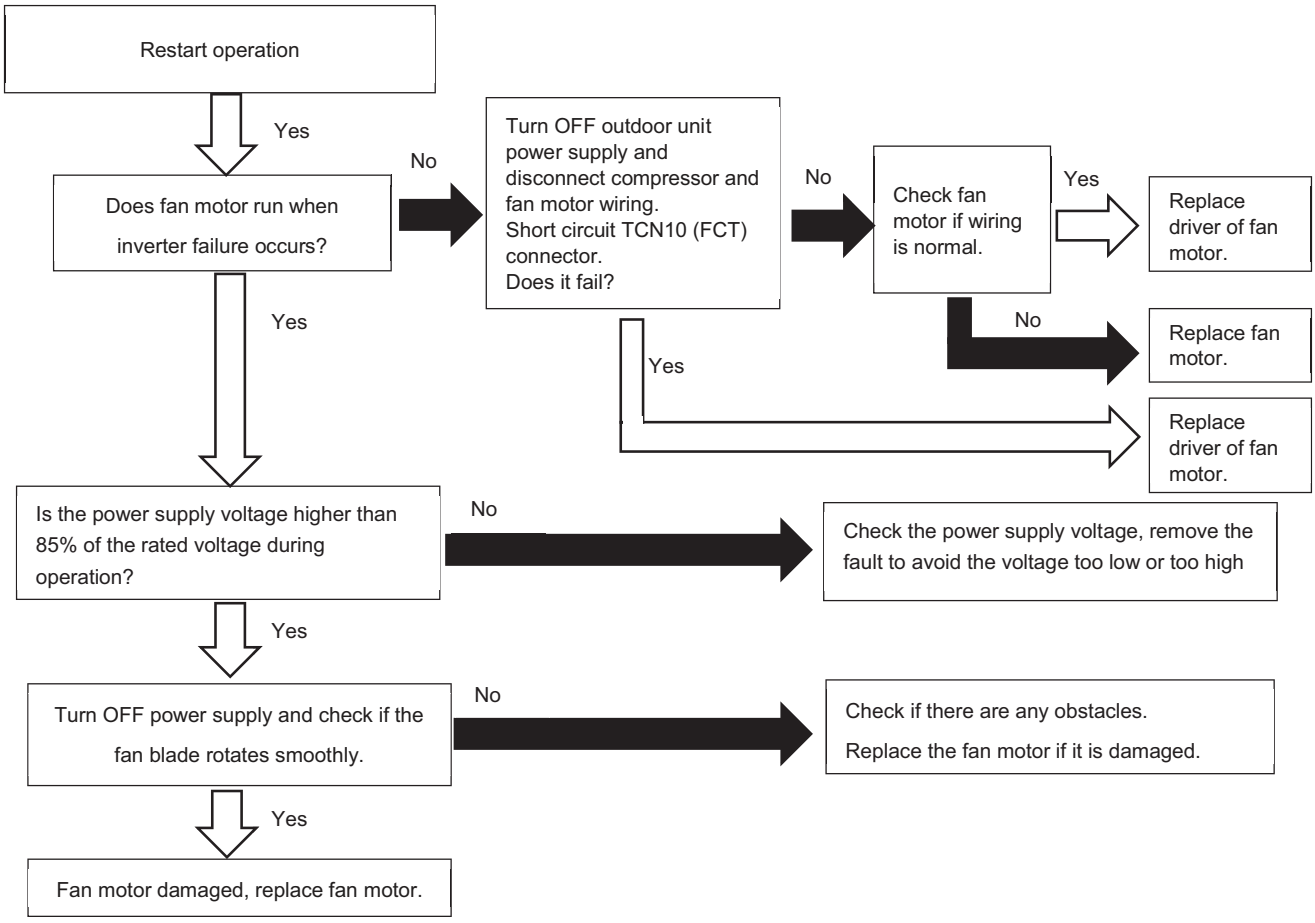
1) Pre-charge failure
   Main causes: AC input is under voltage, driver hardware abnormality, and so on.
2) MCU RAM abnormality
   Main causes: MCU RAM abnormality, driver MCU abnormality.
3) MCU Register abnormality
   Main causes: Driver MCU abnormality.
4) MCU clock abnormality
   Main causes: Driver MCU abnormality, driver crystal oscillator circuit abnormality.
5) MCU FLASH abnormality
   Main causes: Driver MCU abnormality.
6) Reference voltage abnormality
   Main causes: Driver MCU abnormality, driver reference voltage circuit abnormality.
7) Software protection module abnormality
   Main causes: Driver MCU abnormality.



| Alarm Code | 57 | Abnormality of Fan Motor |
|---|---|---|

- The alarm code is flashed on the 7-segment display of the outdoor unit.
- The alarm code is displayed on the wired controller of the indoor unit.

★ If the revolution of the fan motor is less than 10rpm in 10 seconds after the fan motor starts operation, the fan motor stops. The fan motor restarts operation automatically after 10 seconds (During this, the compressor continues to operate). If this occurs again nine times in the next five minutes, this alarm code is displayed. This alarm is caused by locking or electrical abnormality of the fan motor.



# 3. Procedures for Checking

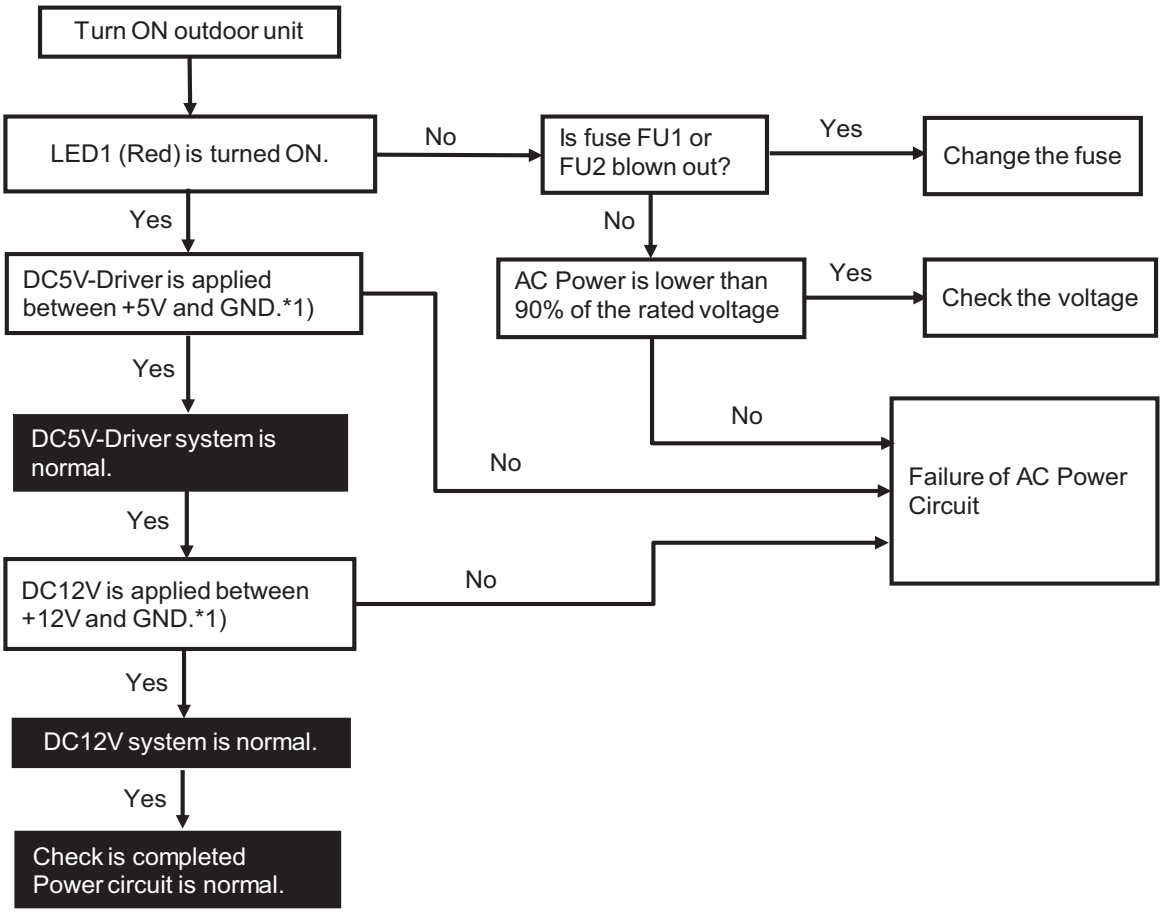
## 3.1 Checking Method for Outdoor Unit PCB of 3~6.5HP

(1) Checking Power Circuit of Outdoor Unit PCB

Check the power circuit on O.U.PCB in following procedures. Refer to the figure on next page about the positions of LEDs, fuses, and check points. Refer check points by a circuit tester and judgment value as well.

**⚠ CAUTION**

- Pay attention to an electric shock when the voltage is measured by a circuit tester.
- Do not contact the test lead to unspecified check points when measuring by circuit tester. It may cause failure of terminal and circuit tester.
- When the voltage is measured by a circuit tester, the range should be set within the DC voltage measurement. If the setting is not correct, it may cause failure of O.U.PCB and circuit tester.



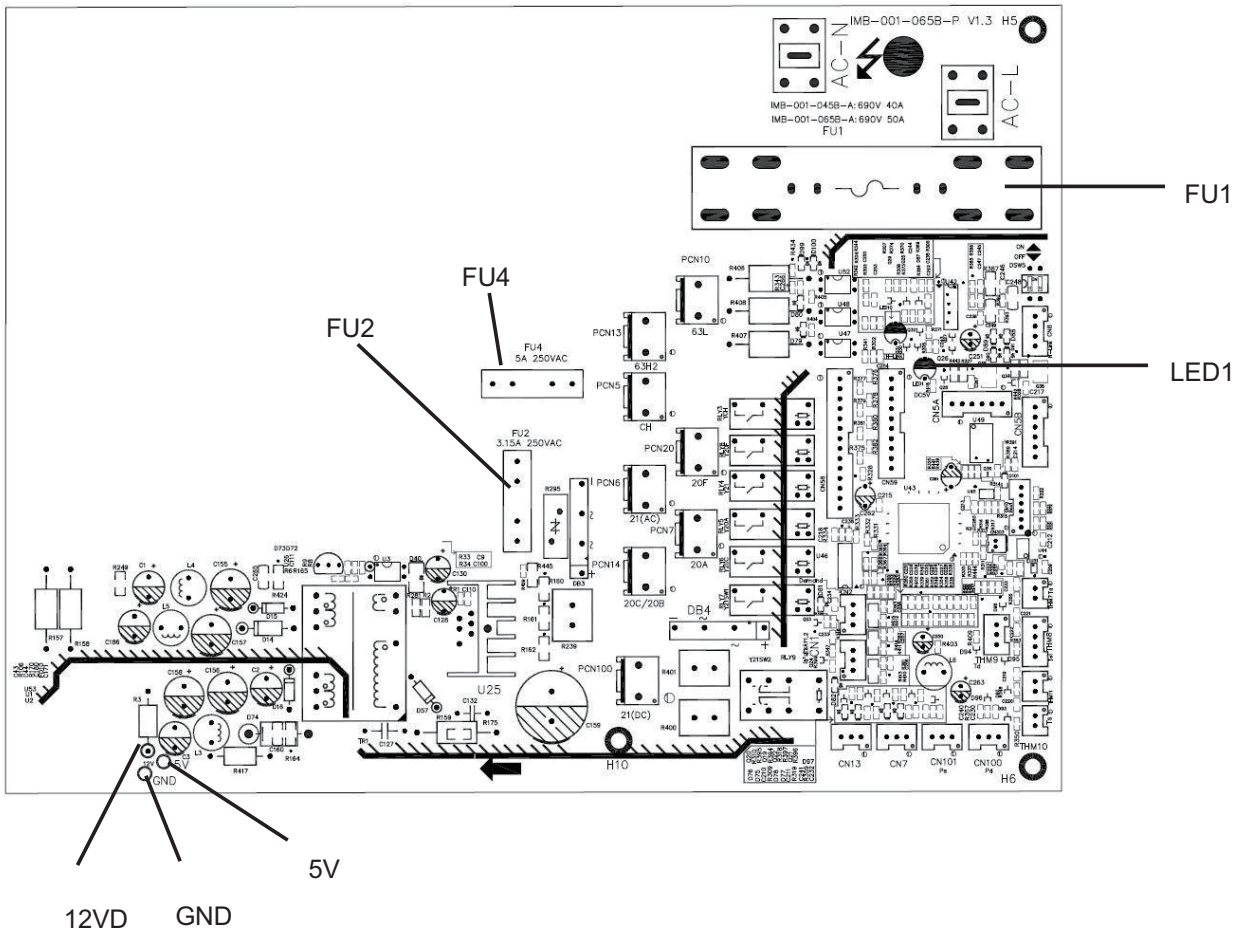

*1) The following table shows the check points and the normal range of voltage in case that the voltage on O.U.PCB is measured by a circuit tester. The setting of circuit tester shall be set within the DC voltage measurement range when the following voltages are measured.

| Check Point | | Normal Range (V) |
|---|---|---|
| (+) Side of Tester | (-) Side of Tester | |
| 5V | GND | 4.8VDC ~ 5.1VDC |
| 12V | | 10.5VDC ~ 13.5VDC |

(2) Control Part of Outdoor Unit PCB

The position of LEDs, connectors on O.U.PCB are as follow

| Item | Part Name |
|---|---|
| LED | LED1, LED2, LED*** |
| Connector | PCN***, CN*** |
| Fuse | FU1, FU2 |
| Check Point | 5V, 12V, GND |



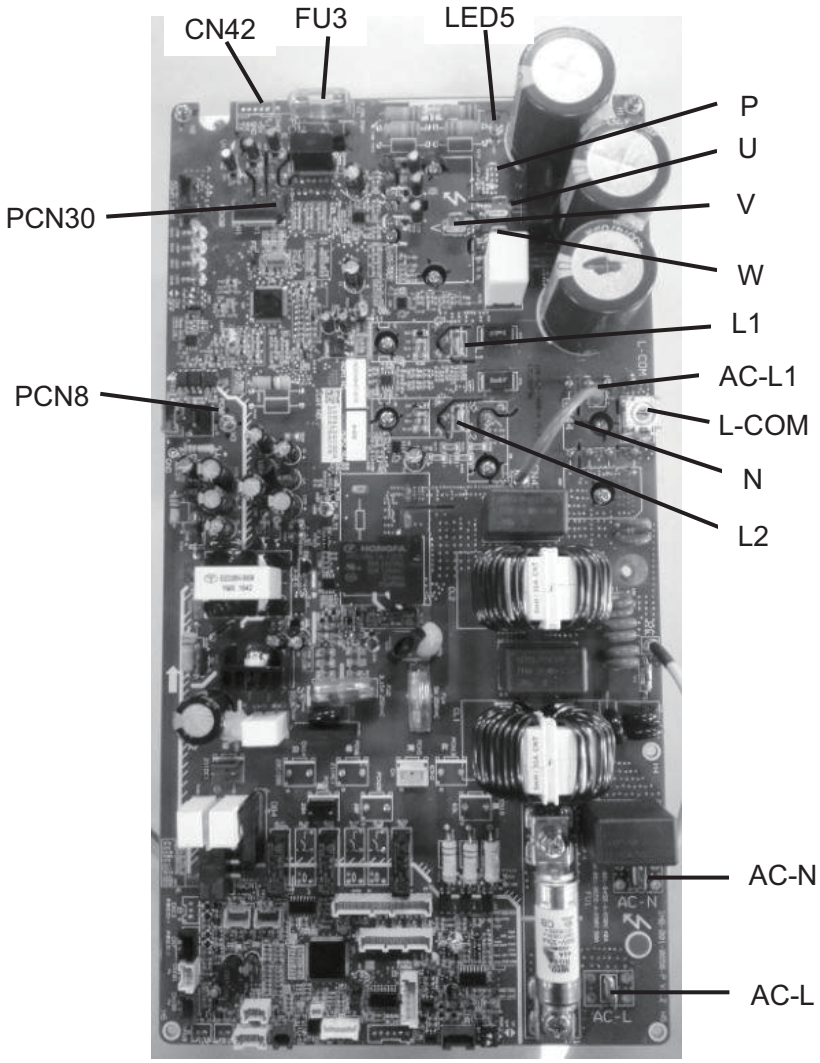

- Checking Item for Fuse

The purpose, capacity, and causes of fuse melted are shown as below.

| Fuse | Capacity | Purpose |
|---|---|---|
| FU1 | 40A (3~3.5HP) | Protection for short circuiting of control circuit(220/230/240V) |
| | 50A (4~6.5HP) | |
| FU2 | 3.15A | |
| FU4 | 5A | |

(3) Inverter Part of Outdoor Unit PCB

- Detail of Check Points




**⚠ CAUTION**

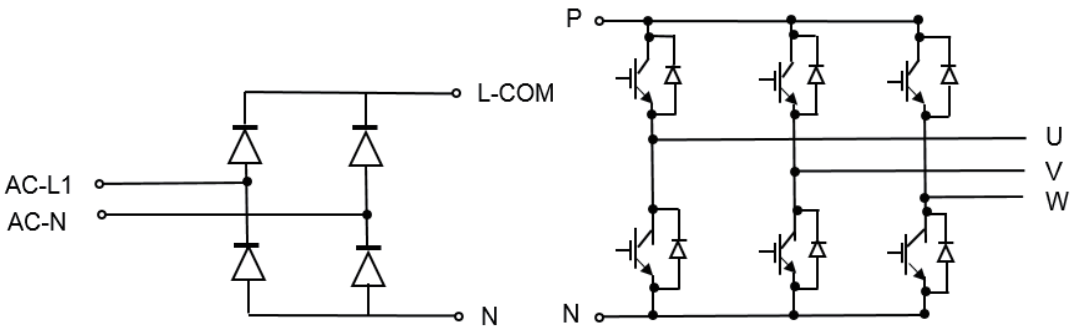
- Check whether the high voltage still exists in the inverter PCB after power is disconnected. When the unit is operated, LED5 is turned ON. At the time of powering off the unit, LED5 is turned OFF. In this case, the residual voltage is less than DC50V.
- If LED5 is turned ON while powering off the unit, please wait for about five minutes, LED5 will turn OFF.

## TROUBLESHOOTING

- Checking Method for Inverter Module

Rectifier and Inverter Circuit of Inverter Module. Remove all the terminals of the inverter module before check

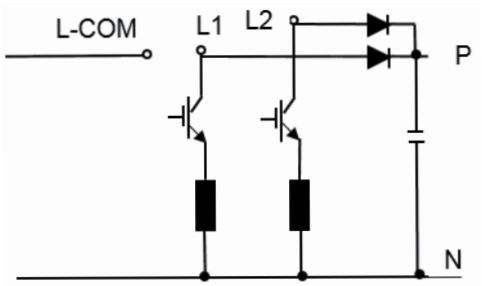
If all the items (below table) are performed and all items are satisfied, the inverter module is non-defective.




| Test Point | | Analog Tester Result | Digital Tester Result |
|---|---|---|---|
| + side of tester | -Side of tester | | |
| AC-L1/AC-N | L-COM | More than 1k Ohm | 0.5V or smaller |
| AC-L1/AC-N | N | More than 100k Ohm | Overload |
| L-COM | AC-L1/AC-N | More than 100k Ohm | Overload |
| N | AC-L1/AC-N | More than 1k Ohm | 0.5V or smaller |
| U/V/W | P | More than 1k Ohm | 0.5V or smaller |
| U/V/W | N | More than 100k Ohm | Overload |
| P | U/V/W | More than 100k Ohm | Overload |
| N | U/V/W | More than 1k Ohm | 0.5V or smaller |

- APFC Circuit of Inverter Module

If all the items (below table) are performed and all items are satisfied, the inverter module is non-defective.




| Test Point | | Analog Tester Result | Digital Tester Result |
|---|---|---|---|
| + side of tester | -Side of tester | | |
| L1/L2 | P | More than 1k Ohm | 0.5V or smaller |
| P | L1/L2 | More than 100k Ohm | Over Load |
| L1/L2 | N | More than 5M Ohm | Over Load |
| N | L1/L2 | More than 0.5M Ohm | Over Load |

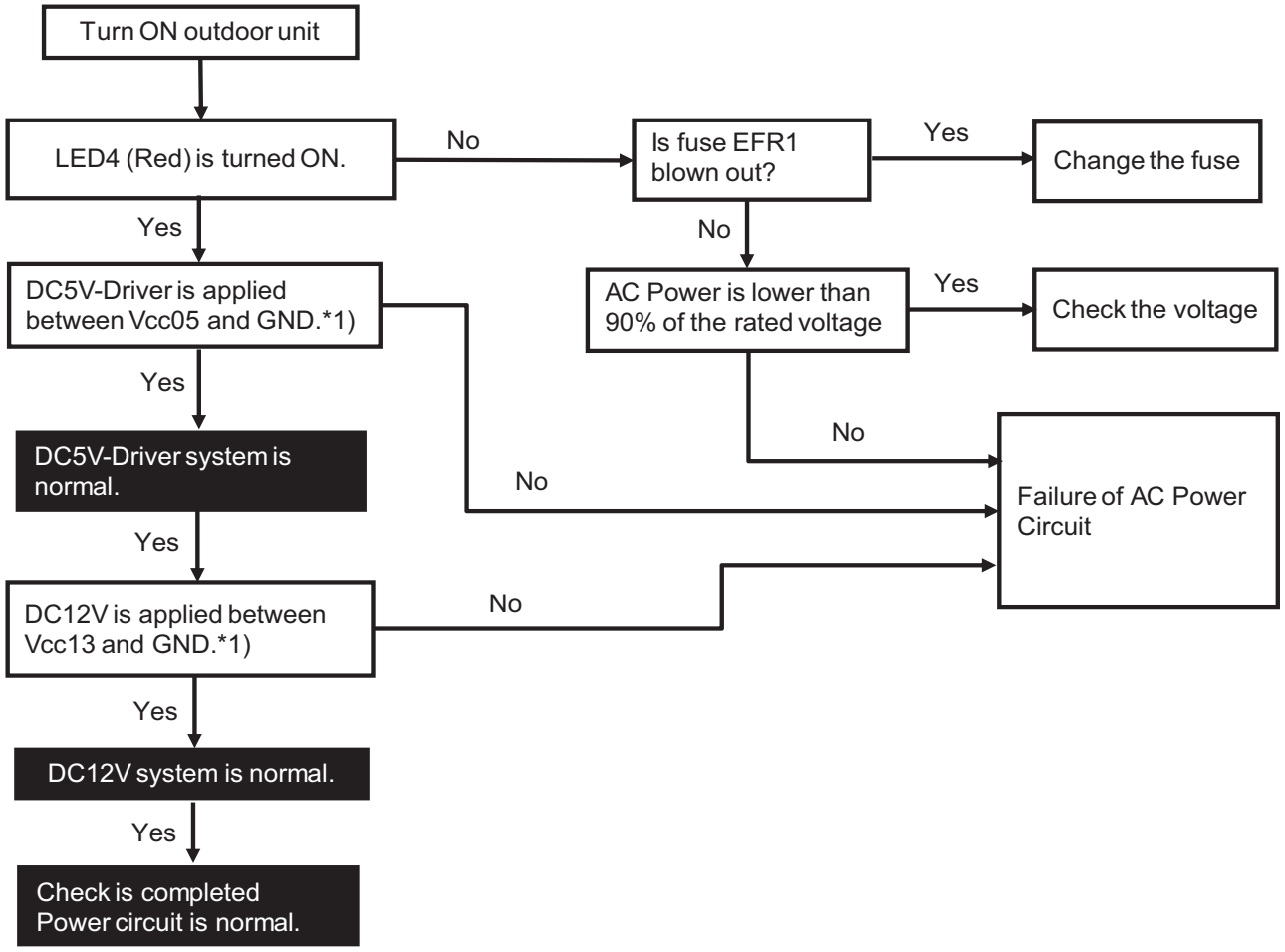
### 3.2 Checking Method for PCBA of 7~12HP

(1) Checking Method of Outdoor Unit PCB

Check the power circuit on O.U.PCB in following procedures. Refer to the figure on next page about the positions of LEDs, fuses, and check points. Refer check points by a circuit tester and judgment value as well.

**⚠ CAUTION**

- Pay attention to an electric shock when the voltage is measured by a circuit tester.
- Do not contact the test lead to unspecified check points when measuring by circuit tester. It may cause failure of terminal and circuit tester.
- When the voltage is measured by a circuit tester, the range should be set within the DC voltage measurement. If the setting is not correct, it may cause failure of O.U.PCB and circuit tester.




*1) The following table shows the check points and the normal range of voltage in case that the voltage on O.U.PCB is measured by a circuit tester. The setting of circuit tester shall be set within the DC voltage measurement range when the following voltages are measured.

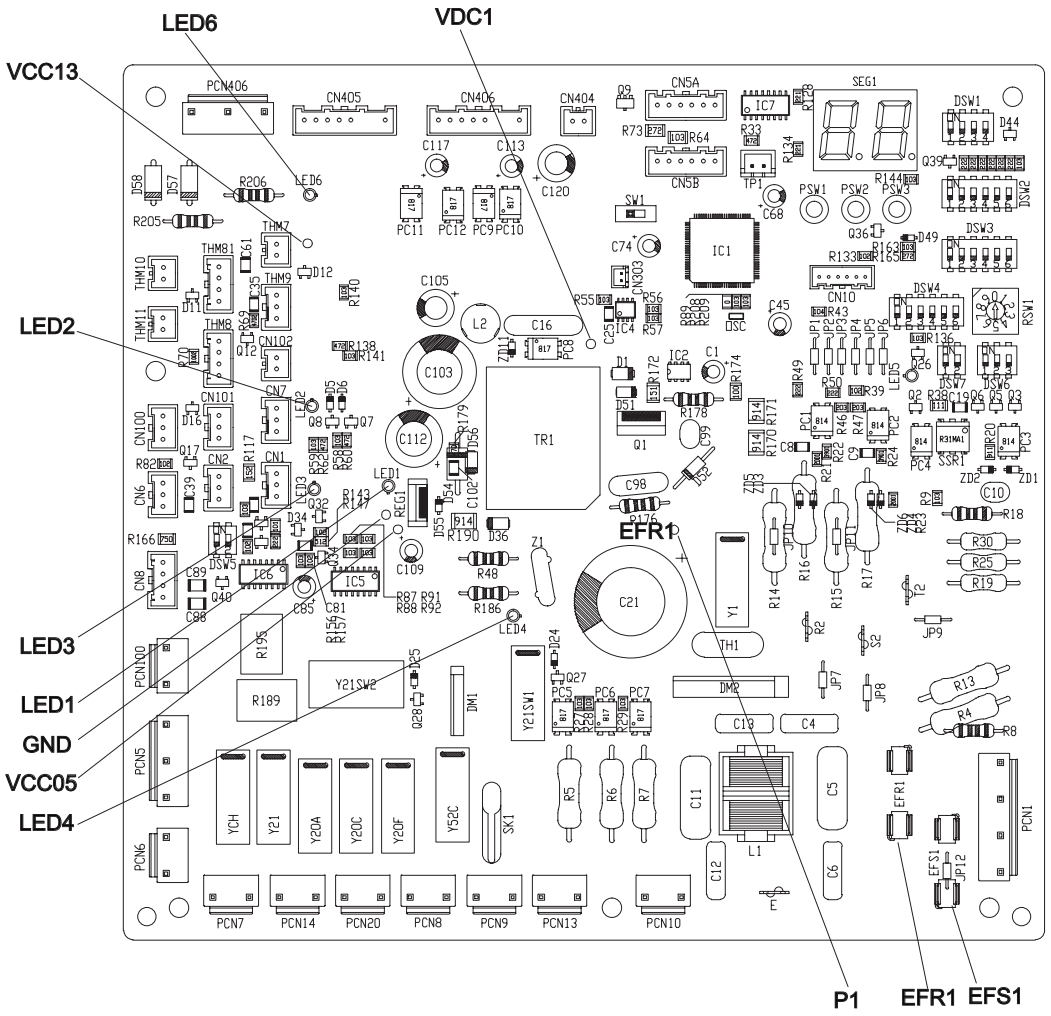
| Check Point | | Normal Range (V) |
|---|---|---|
| (+) Side of Tester | (-) Side of Tester | |
| 5V | GND | 4.8VDC ~ 5.1VDC |
| 12V | | 10.5VDC ~ 13.5VDC |

## TROUBLESHOOTING

- Detail of Check Points

The position of LEDs, connectors on O.U.PCB are as follow

| Item | Part Name |
|---|---|
| LED | LED1, LED2, LED3, LED4, LED6 |
| Connector | PCN***, CN*** |
| Fuse | EFR1, EFS1 |
| Check Point | P1, GND, VCC05, VCC13, VDC-1 |



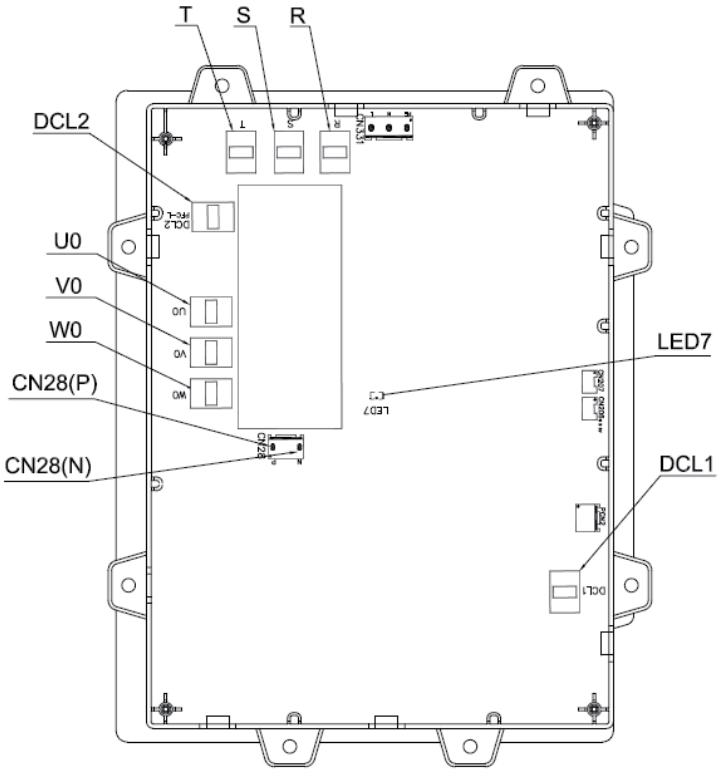

- Checking Item for Fuse

The purpose, capacity, and causes of fuse melted are shown as below.

| Fuse | Capacity | Purpose |
|---|---|---|
| EFR1<br>EFS1 | 5A | Protection for short circuiting of control circuit (220/230/240V) |

(2) Checking Method for Inverter PCB (Driver Board)

- Detail of Check Points



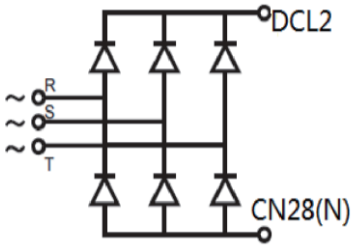

**CAUTION**

- Check whether the high voltage still exists in the inverter PCB after power is disconnected. When the unit is operated, LED7 is turned ON. At the time of powering off the unit, LED7 is turned OFF. In this case, the residual voltage is less than DC50V.
- If LED7 is turned ON while powering off the unit, please wait for about ten minutes, LED7 will turn OFF.

---

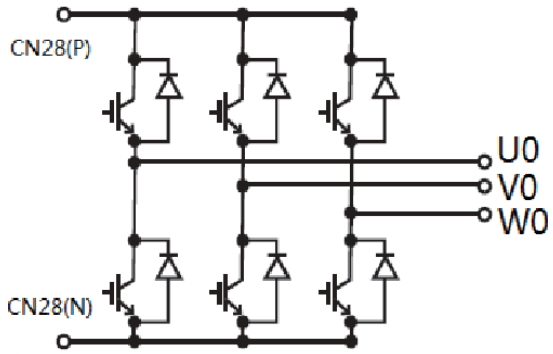
- APFC Circuit of Driver Board (In case of using Digital Tester)

Rectifier and Inverter Circuit of Driver Board. Remove all the terminals of the driver board before check. If all the items (below table) are performed and all items are satisfied, the driver board is non-defective.




| Test Point | | Digital Tester Result |
|---|---|---|
| + side of tester | -Side of tester | |
| DCL2 | R/S/T | Over Load (OL) |
| R/S/T | DCL2 | 0.5V or smaller |
| R/S/T | CN28(N) | Over Load (OL) |
| CN28(N) | R/S/T | 0.5V or smaller |

- IPM Circuit of Driver Board (In case of using Digital Tester)




| Test Point | Analog Tester Result | Digital Tester Result |
|---|---|---|
| (+)DCL2, (-)R | More than 100k Ohm | Over Load (OL) |
| (-)DCL2, (+)R | More than 1k Ohm | 0.5V or smaller |
| (-)CN28(N), (+)R | More than 100k Ohm | Over Load (OL) |
| (+)CN28(N), (-)R | More than 1k Ohm | 0.5V or smaller |
| (+)DCL2, (-)S | More than 100k Ohm | Over Load (OL) |
| (-)DCL2, (+)S | More than 1k Ohm | 0.5V or smaller |
| (-)CN28(N), (+)S | More than 100k Ohm | Over Load (OL) |
| (+)CN28(N), (-)S | More than 1k Ohm | 0.5V or smaller |
| (+)DCL2, (-)T | More than 100k Ohm | Over Load (OL) |
| (-)DCL2, (+)T | More than 1k Ohm | 0.5V or smaller |
| (-)CN28(N), (+)T | More than 100k Ohm | Over Load (OL) |
| (+)CN28(N), (-)T | More than 1k Ohm | 0.5V or smaller |
| (+)CN28(P), (-)U0 | More than 100k Ohm | Over Load (OL) |
| (-)CN28(P), (+)U0 | More than 1k Ohm | 0.5V or smaller |
| (-)CN28(N), (+)U0 | More than 100k Ohm | Over Load (OL) |
| (+)CN28(N), (-)U0 | More than 1k Ohm | 0.5V or smaller |
| (+)CN28(P), (-)V0 | More than 100k Ohm | Over Load (OL) |
| (-)CN28(P), (+)V0 | More than 1k Ohm | 0.5V or smaller |
| (-)CN28(N), (+)V0 | More than 100k Ohm | Over Load (OL) |
| (+)CN28(N), (-)V0 | More than 1k Ohm | 0.5V or smaller |
| (+)CN28(P), (-)W0 | More than 100k Ohm | Over Load (OL) |
| (-)CN28(P), (+)W0 | More than 1k Ohm | 0.5V or smaller |
| (-)CN28(N), (+)W0 | More than 100k Ohm | Over Load (OL) |
| (+)CN28(N), (-)W0 | More than 1k Ohm | 0.5V or smaller |

**Notes:**

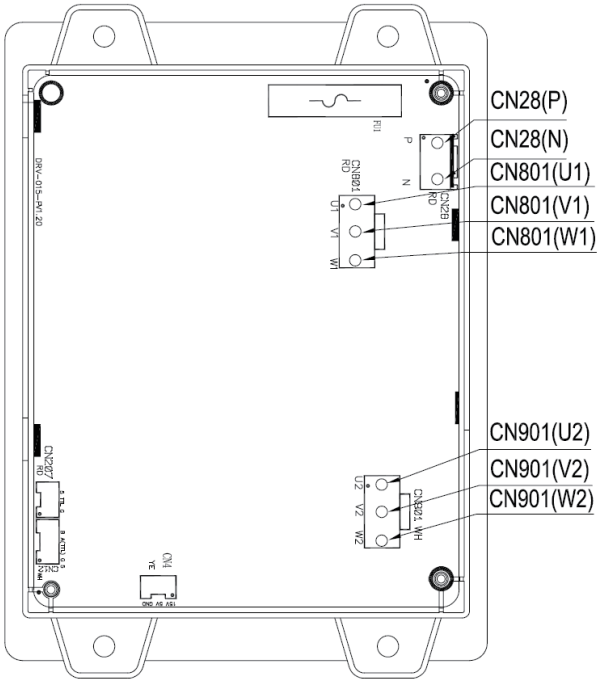
- The positive side (+) of tester: Red; The negative side (-) of tester: Black.
- Pre-charge circuit of the Inverter PCBA

  If the positive side (+) of tester is connected to DCL1, and the negative side (-) of tester is connected to CN28(P)

  1) If the resistance is about 1k Ohm, it is OK.  2) If the resistance is about 0 Ohm or infinity, it is damaged.

(3) Checking Method for Fan Motor Driver Board

- Detail of Check Points



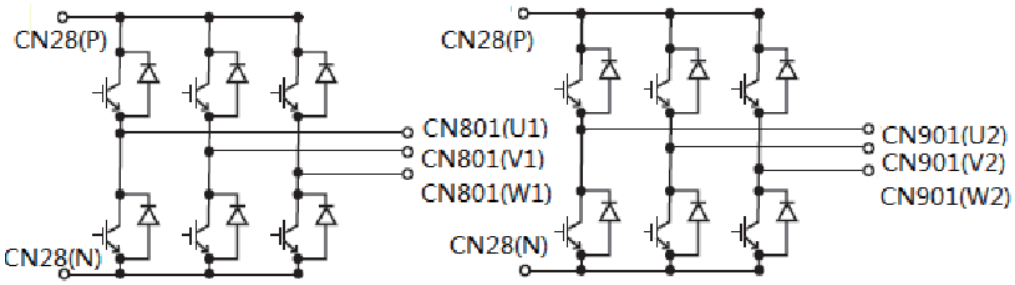

**⚠ CAUTION**

- Check whether the high voltage still exists in the fan motor driver board after power is disconnected. When the unit is operated, LED7 is turned ON. At the time of powering off the unit, LED7 is turned OFF. In this case, the residual voltage is less than DC50V.
- If LED7 is turned ON while powering off the unit, please wait for about ten minutes, LED7 will turn OFF.

---

- IPM Circuit of Fan Motor Driver Board (In case of using Digital Tester)

Rectifier and Inverter Circuit of Fan Motor Driver Board. Remove all the terminals of the fan motor driver board before check. If all the items (below table) are performed and all items are satisfied, the fan motor driver board is non-defective.



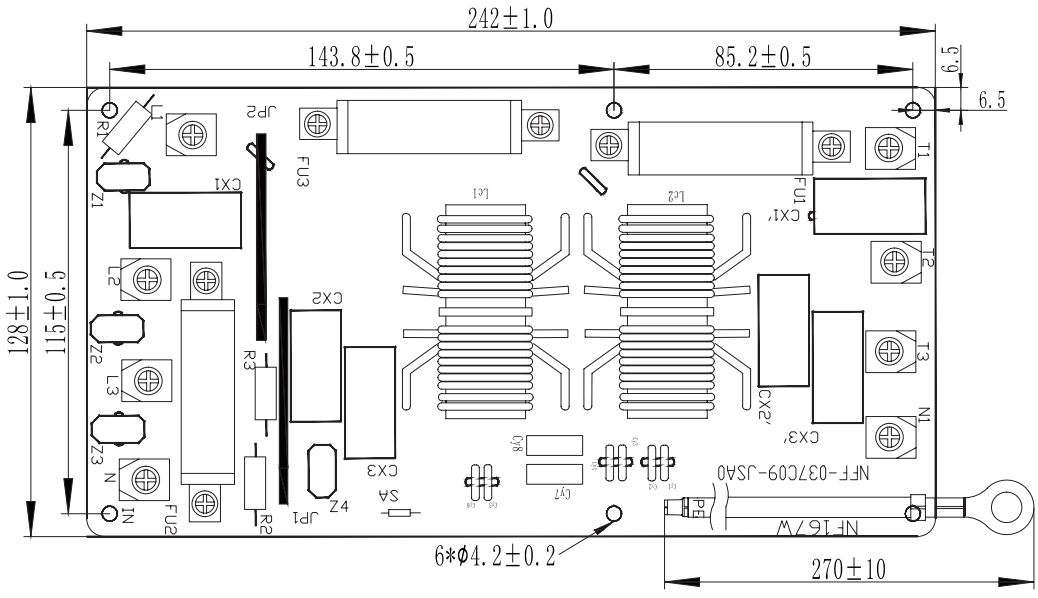
| Test Point | Analog Tester Result | Digital Tester Result |
|---|---|---|
| (+)CN28(P), (-)CN801(U1) | More than 100k Ohm | Over Load (OL) |
| (-)CN28(P), (+)CN801(U1) | More than 1k Ohm | 0.5V or smaller |
| (-)CN28(N), (+)CN801(U1) | More than 100k Ohm | Over Load (OL) |
| (+)CN28(N), (-)CN801(U1) | More than 1k Ohm | 0.5V or smaller |
| (+)CN28(P), (-)CN801(V1) | More than 100k Ohm | Over Load (OL) |
| (-)CN28(P), (+)CN801(V1) | More than 1k Ohm | 0.5V or smaller |
| (-)CN28(N), (+)CN801(V1) | More than 100k Ohm | Over Load (OL) |
| (+)CN28(N), (-)CN801(V1) | More than 1k Ohm | 0.5V or smaller |
| (+)CN28(P), (-)CN801(W1) | More than 100k Ohm | Over Load (OL) |
| (-)CN28(P), (+)CN801(W1) | More than 1k Ohm | 0.5V or smaller |
| (-)CN28(N), (+)CN801(W1) | More than 100k Ohm | Over Load (OL) |
| (+)CN28(N), (-)CN801(W1) | More than 1k Ohm | 0.5V or smaller |
| (+)CN28(P), (-)CN901(U2) | More than 100k Ohm | Over Load (OL) |
| (-)CN28(P), (+)CN901(U2) | More than 1k Ohm | 0.5V or smaller |
| (-)CN28(N), (+)CN901(U2) | More than 100k Ohm | Over Load (OL) |
| (+)CN28(N), (-)CN901(U2) | More than 1k Ohm | 0.5V or smaller |
| (+)CN28(P), (-)CN901(V2) | More than 100k Ohm | Over Load (OL) |
| (-)CN28(P), (+)CN901(V2) | More than 1k Ohm | 0.5V or smaller |
| (-)CN28(N), (+)CN901(V2) | More than 100k Ohm | Over Load (OL) |
| (+)CN28(N), (-)CN901(V2) | More than 1k Ohm | 0.5V or smaller |
| (+)CN28(P), (-)CN901(W2) | More than 100k Ohm | Over Load (OL) |
| (-)CN28(P), (+)CN901(W2) | More than 1k Ohm | 0.5V or smaller |
| (-)CN28(N), (+)CN901(W2) | More than 100k Ohm | Over Load (OL) |
| (+)CN28(N), (-)CN901(W2) | More than 1k Ohm | 0.5V or smaller |

**Note:**

The positive side (+) of tester: Red; The negative side (-) of tester: Black.

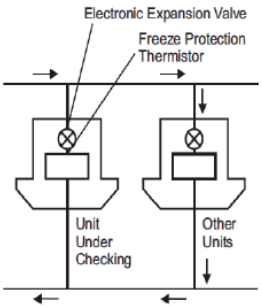
(4) Checking Method for Noise Filter PCB

- Detail of Check Points




Test the resistance of FU1，FU2，FU3. If it is 0 Ohm, the fuse is OK, otherwise it is damaged.

## 3.3 Checking Method of Electronic Expansion Valve

<table>
<tr><th></th><th>For Indoor Unit</th><th>For Outdoor Unit</th></tr>
<tr><td>Locked with Fully Closed</td><td>Check for the liquid pipe temperature during the heating operation.<br>It is abnormal if the temperature does not increase.</td><td>It is abnormal if the liquid pipe pressure does not increase during the cooling operation.</td></tr>
<tr><td>Locked with slightly opened</td><td rowspan="2">It is abnormal under under the following conditions;The temperature of freeze protection thermistor becomes lower than the inlet air temperature when the unit under checking is stopped and other units are under the cooling operation<br> 
</td><td>It is abnormal if the liquid pipe pressure does not increase and the outlet temperature of the expansion valve decreases after the cooling operation is started.</td></tr>
<tr><td>Locked with Fully Opened</td><td>It is abnormal under under the following conditions;After heating operation for more than 30 min.,the discharge gas temperature of compressor is not +10°C higher than the condensing temperature and there is no other faults such as excessive charge of refrigerant,etc.</td></tr>
</table>

# Maintenance

# 1. Outdoor Unit

**⚠ WARNING**

- TURN OFF all power supply switches.

**NOTICE**

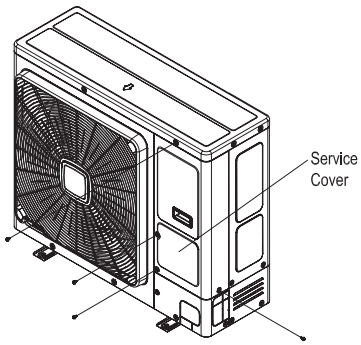
- Removal of main parts should be performed according to the following procedures.
- To attach new parts after replacement, reverse the removal procedure.
- To prevent contamination of the refrigerant by water or foreign materials, do not expose the refrigerant parts open to atmosphere for long periods. If necessary, seal pipe ends using caps or tape.

## 1.1 Removing Service Cover

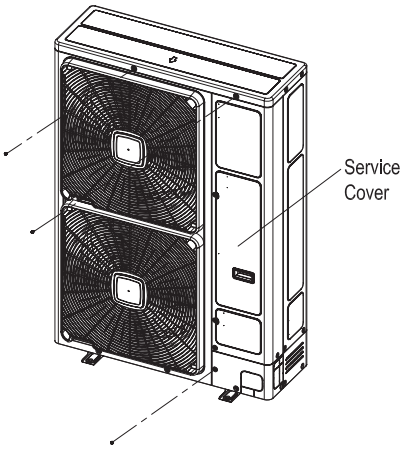
Remove the service cover by drawing it downward after removing the securing screws for the service cover. When removing the service cover, take special care not to drop it.

| Tool | Gloves, Phillips Screwdriver |
|---|---|

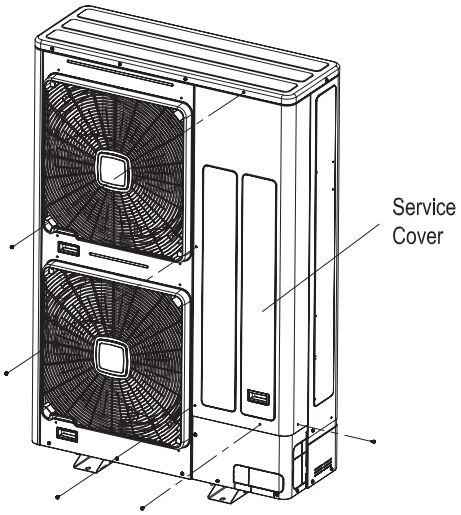
Model:3~3.5HP




Model:4~6.5HP




Model:7~12HP

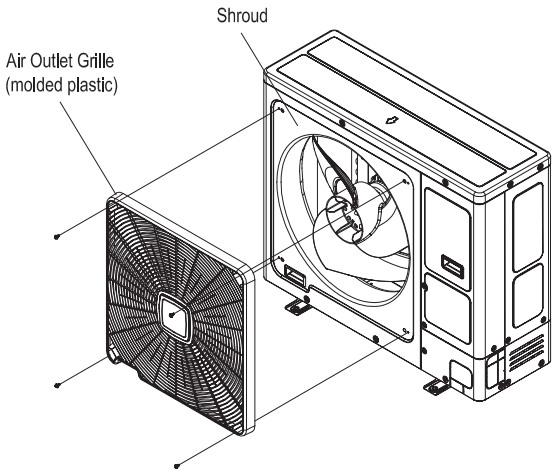


## 1.2 Removing Air Outlet Grille

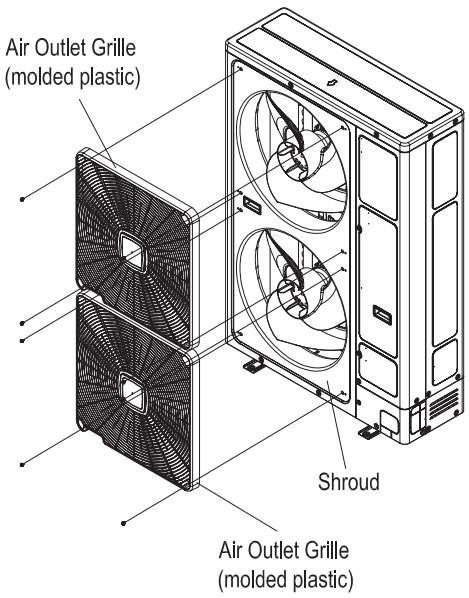
Remove the securing screws for each air outlet grille (molded plastic).

| Tool | Gloves, Phillips Screwdriver |
|---|---|

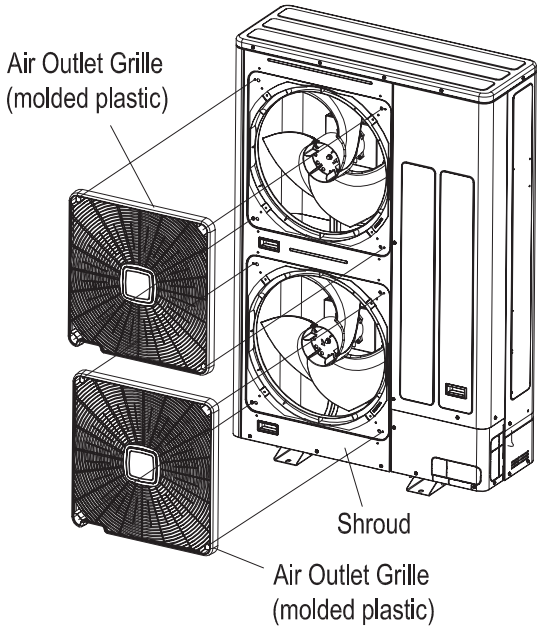
Model:3~3.5HP




Model:4~6.5HP




Model:7~12HP

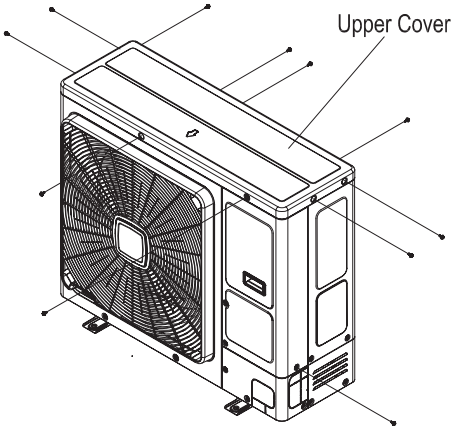


### 1.3 Removing Upper Cover

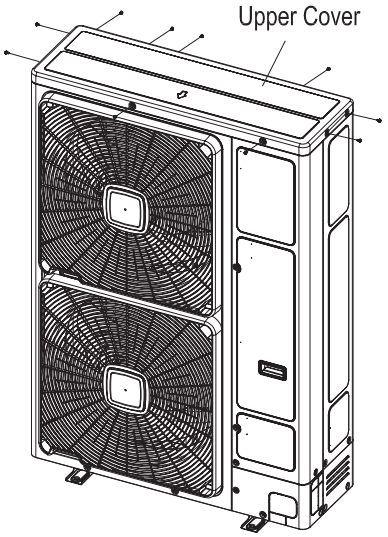
After removing the securing screws for the upper cover, lift the upper cover up.

| Tool | Gloves, Phillips Screwdriver |
|---|---|

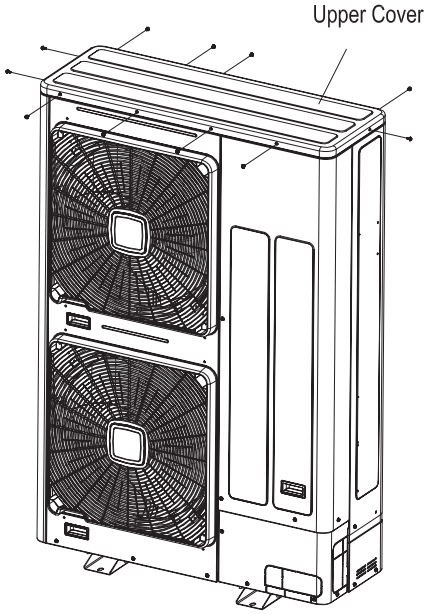
Model: 3~3.5HP




Model: 4~6.5HP




Model: 7~12HP



## 1.4 Removing Lower Service Cover and Rear Cover

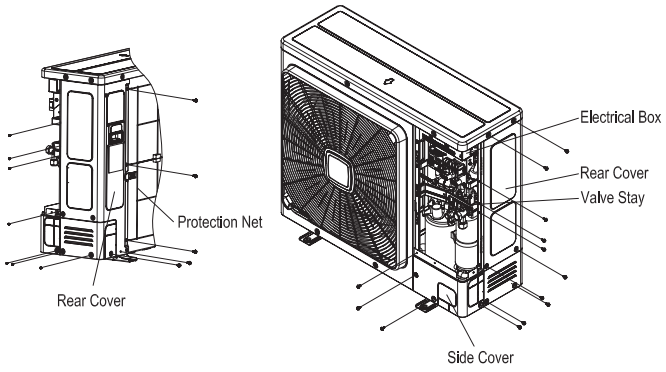
(1) Remove the service cover.

(2) Remove the securing screws for the side cover and remove the side cover pulling it downward.

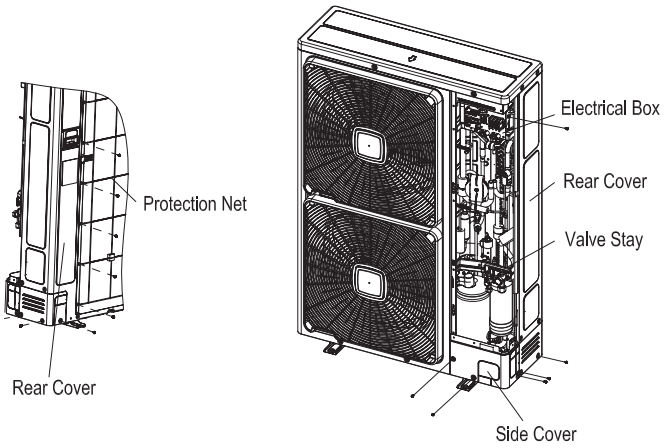
(3) Remove the securing screws for rear cover and remove the rear cover by pulling it downward.

| Tool | Gloves, Phillips Screwdriver |
|---|---|

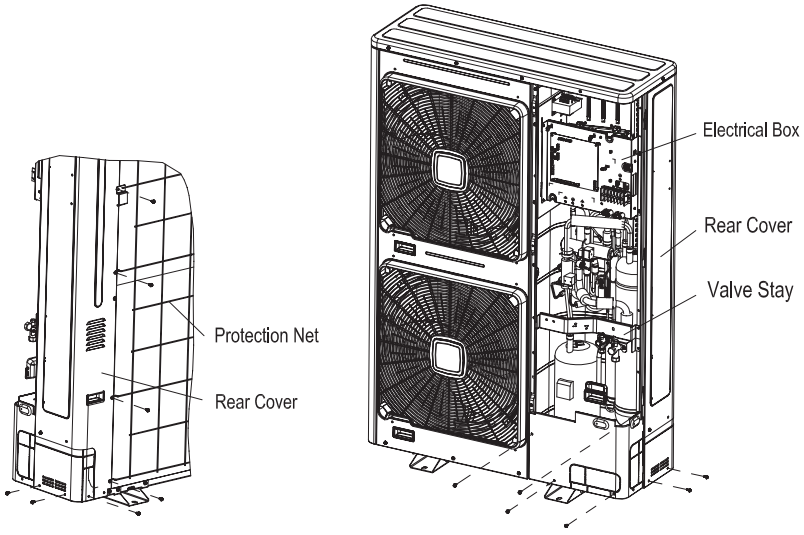
Model: 3~3.5HP




Model: 4~6.5HP




Model: 7~12HP



### 1.5 Removing Outdoor Fan Motor

(1) Remove the air outlet grille.

(2) Remove the upper cover.

(3) Remove the closing nut and the washer securing the propeller fan to the motor shaft with a socket wrench. Then remove the propeller fan from the motor shaft. (If it is difficult to remove, a corrosion or puller may be needed.)

(4) Removing Fan Motor.

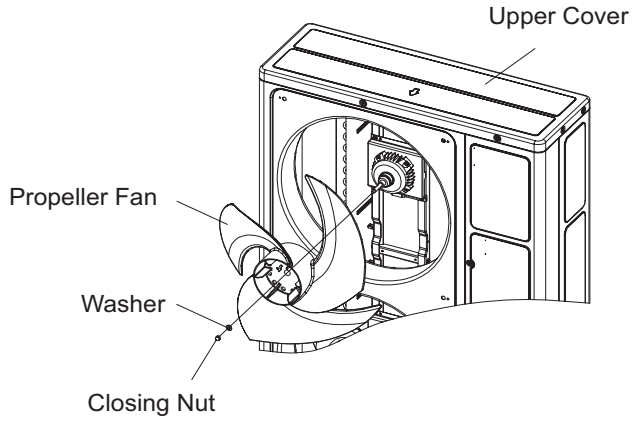
(a) Remove the service cover.

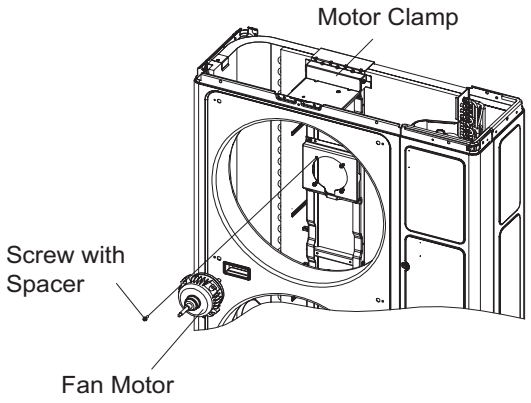
(b) Disconnect the connectors for the fan motors from the outdoor unit PCB in the electrical box.

(c) Remove the spacer screws securing the fan motor.

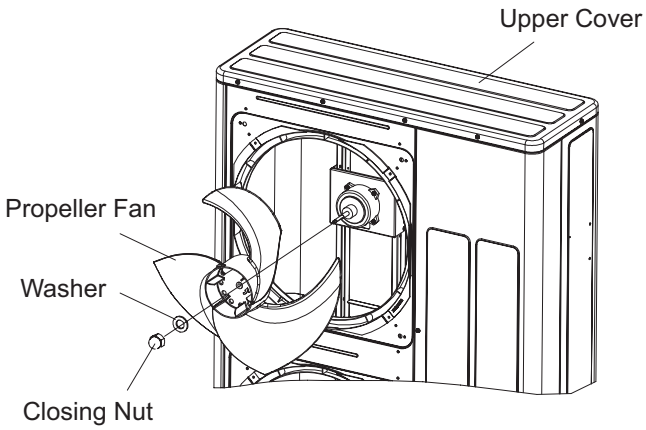
| Tool | Gloves, Phillips Screwdriver<br>Adjustable Wrench, Puller, Nipper |
|---|---|

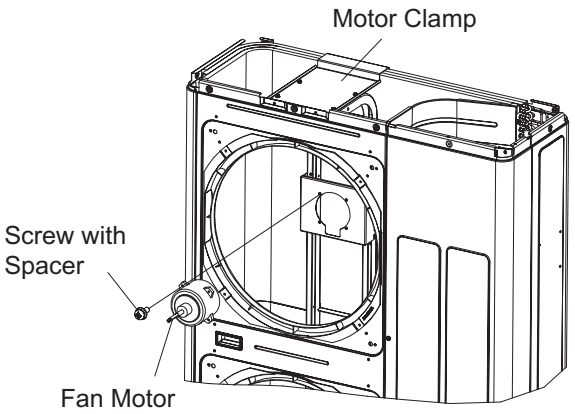
Model: 3~6.5HP

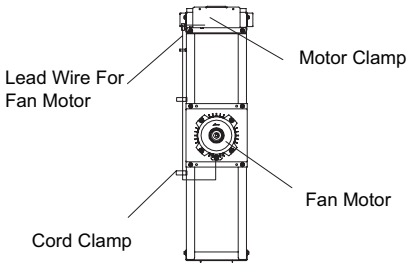
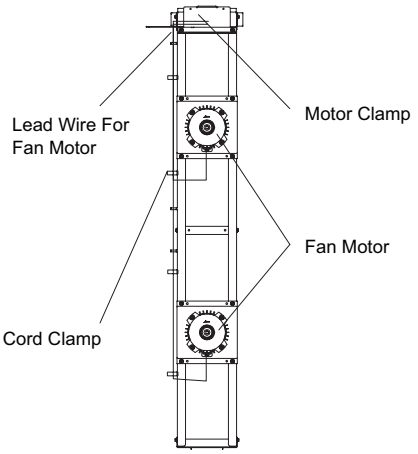
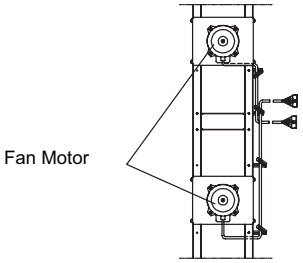



Model: 7~12HP



| Model | Fan Motor Q'ty | Connector | | Securing Screw for Fan Motor | | Securing Positions of Motor Clamp and Wires |
|---|---|---|---|---|---|---|
| | | Upper Fan Motor | Lower Fan Motor | Upper Fan Motor | Lower Fan Motor | |
| 3~3.5HP | 1 | O.U. PCB PCN30 (Red) | / | M5 x 20 (Screw with Spacer) x 4 | / |  |
| 4~6.5HP | 2 | O.U. PCB PCN30 (Red) | O.U. PCB PCN2 (Black) | M5 x 20 (Screw with Spacer) x 4 | M5 x 20 (Screw with Spacer) x 4 |  |
| 7~12HP | 2 | O.U. PCB CN801 (Red) | O.U. PCB CN801 (White) | M5 x 20 (Screw with Spacer) x 4 | M5 x 20 (Screw with Spacer) x 4 |  |

**Notes:**

(1) Mount the fan motor so that the wiring harness is at the bottom. (Adjust the position not to touch the propeller fan to shroud.)

(2) Secure the wiring for the motor with the provided clamp taking care to route and secure the wiring away from the propeller fan.

(3) Mount the fan motor so that the gap of wiring harness is at lowest position.

(4) Reinstalling Propeller Fan

Carefully align the D cut hole of propeller fan to match the shaft and slide on slowly. Once the propeller fan hits the stop on motor shaft, using figures start closing nut and tighten to approximately 20 N·m.

(5) After carefully routing and securing the wiring harness, reconnect motor connectors at the main PCB.

Ensure motor connectors are color matched at the PCB connections.

(6) Once motor(s) have been installed, reinstall metal, and plastic air outlet grilles. Be careful do not over tighten.

## 1.6 Removing Electrical Box

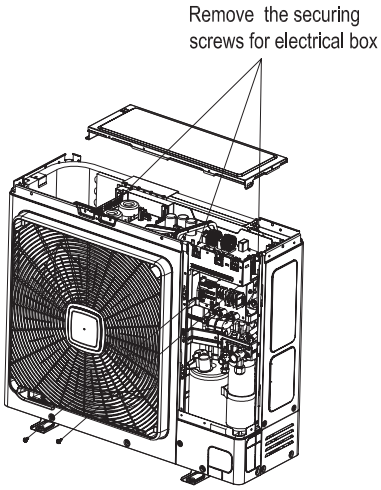
(1) Remove the service cover.

(2) Remove the upper cover.

(3) Remove the securing screws for electrical box.

| Tool | Phillips Screwdriver |
|---|---|

Model: 3~3.5HP




**Note:**

Remove the electrical box after disconnecting wires.

(1) Remove the 4-Way valve coil, the expansion valve coil, and the solenoid valve coil.

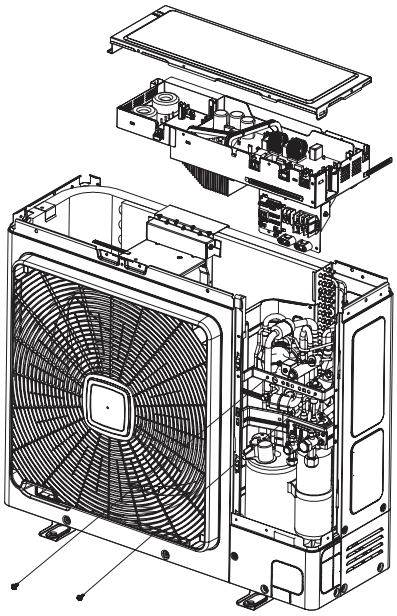
(2) Disconnect the fasten terminals from high pressure switch and pressure sensor.

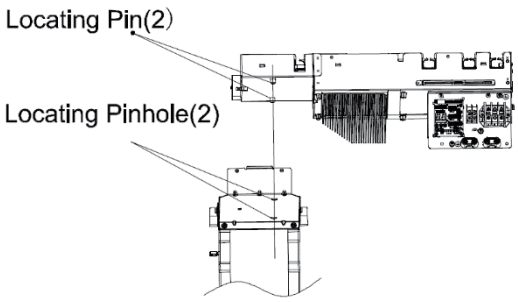
(3) Disconnect the fan motor connectors and thermistors from the outdoor unit PCB.

(4) Disconnect the compressor wires and loosen all cord clamps.

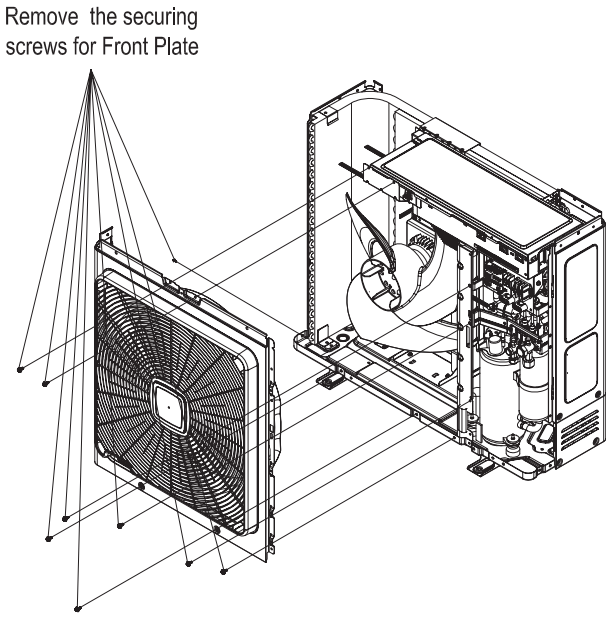
(5) When mounting the electrical box, join and fit the electrical box and the partition plate into the outdoor unit.

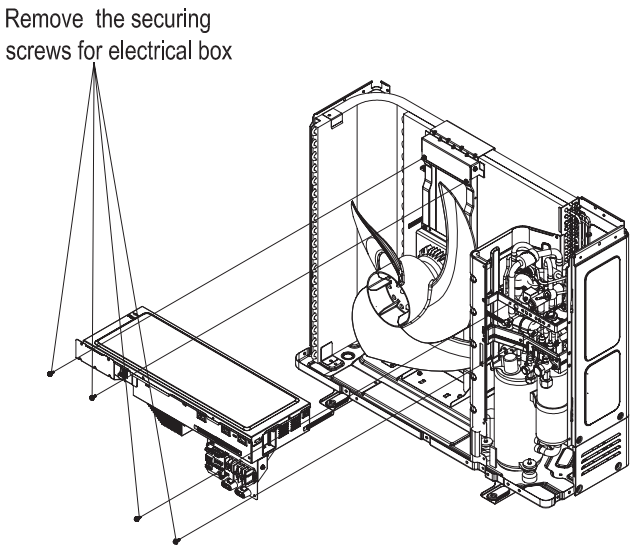
- Remove the electrical box from the top of outdoor unit.



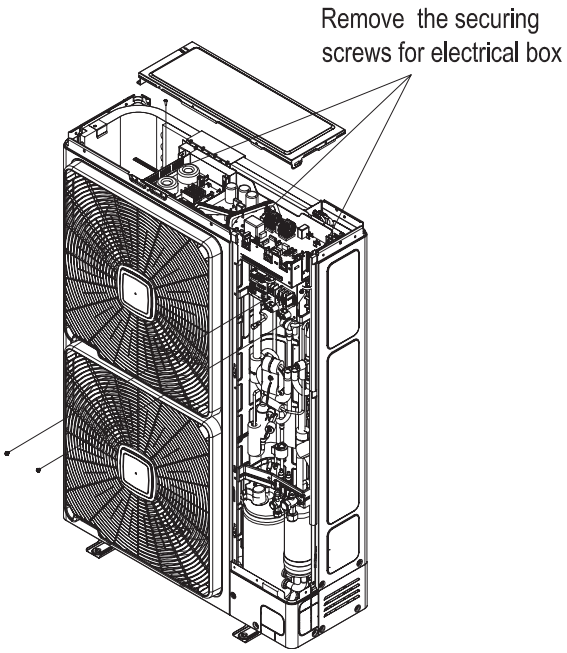


- Remove the electrical box from the front of outdoor unit.




Model: 4~6.5HP




**Note:**

Remove the electrical box after disconnecting wires.

(1) Remove the 4-Way valve coil, the expansion valve coil and the solenoid valve coil.

(2) Disconnect the fasten terminals from high pressure switch and pressure sensor.

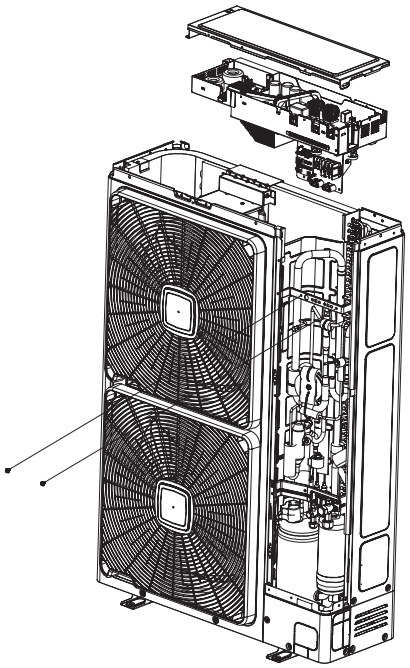
(3) Disconnect the fan motor connectors and thermistors from the outdoor unit PCB.

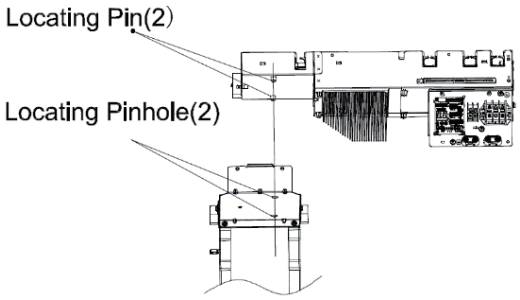
(4) Disconnect the compressor wires and loosen all cord clamps.

(5) When mounting the electrical box, join and fit the electrical box and the partition plate into the outdoor unit.

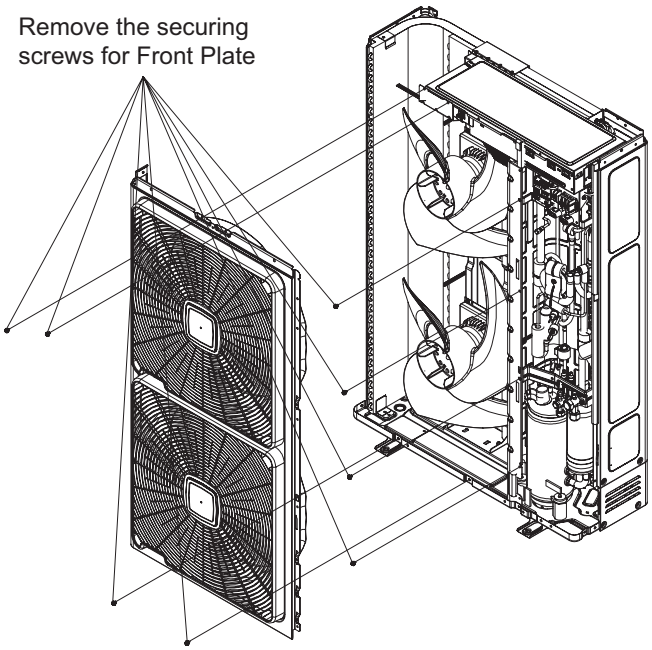
## MAINTENANCE

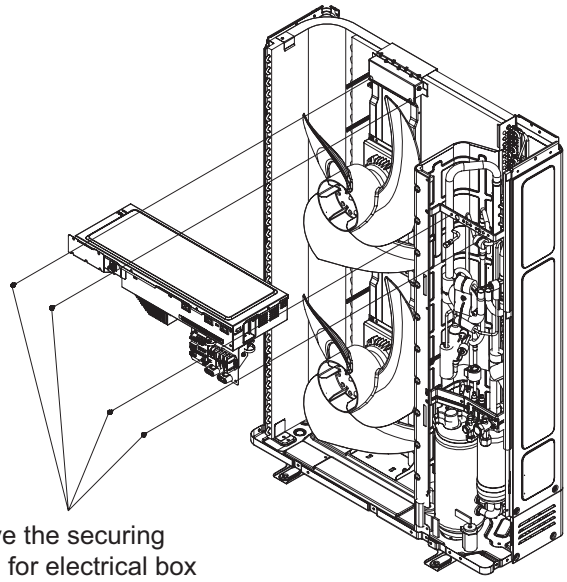
- Remove the electrical box from the top of outdoor unit.






- Remove the electrical box from the front of outdoor unit.



Model: 7~12HP

**Note:**

Remove the electrical box after disconnecting wires.

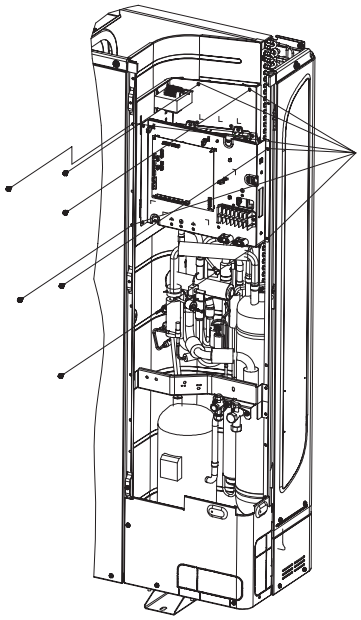
(1) Remove the 4-Way valve coil, the expansion valve coil, and the solenoid valve coil.

(2) Disconnect the fasten terminals from high pressure switch and pressure sensor.

(3) Disconnect the fan motor connectors and thermistors from the outdoor unit PCB.

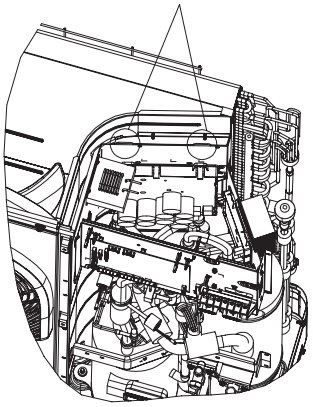
(4) Disconnect the compressor wires and loosen all cord clamps.

(5) When mounting the electrical box, join and fit the electrical box and the partition plate into the outdoor unit.



Remove the securing screws for electrical box

Remove the hook



## 1.7 Removing Compressor

(1) Remove the service cover, the side cover, and the rear cover.

In case that the outdoor unit is located near the wall, remove refrigerant piping and move the outdoor unit away from the wall.

(2) Recover the refrigerant from check joints.

(3) Remove the valve stay.

(4) Open the sound proof cover wrapped around the compressor. Remove the terminal box cover for the compressor and disconnect the lead wiring.

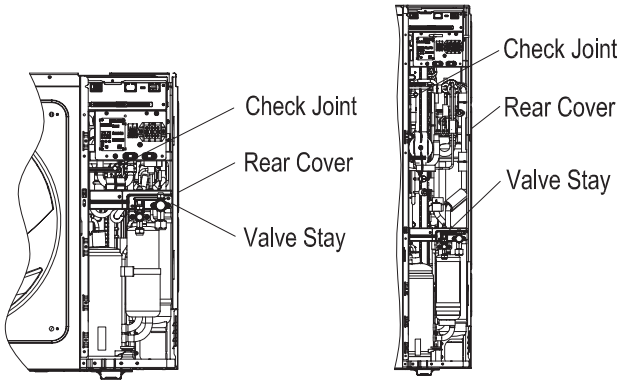
**Notes:**

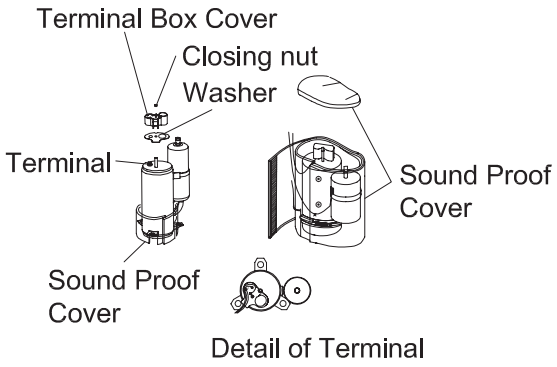
- Write down or photograph wiring and terminal designations to prevent mis-wiring of replacement compressor as shown below.
- If the read wiring is connected incorrectly to the terminal, the compressor may be damaged due to reverse rotation.

(5) Remove the rubber cap and the crankcase heater.

| | |
|---|---|
| Tool | Phillips Screwdriver, Charging Hose, Refrigerant Cylinder |

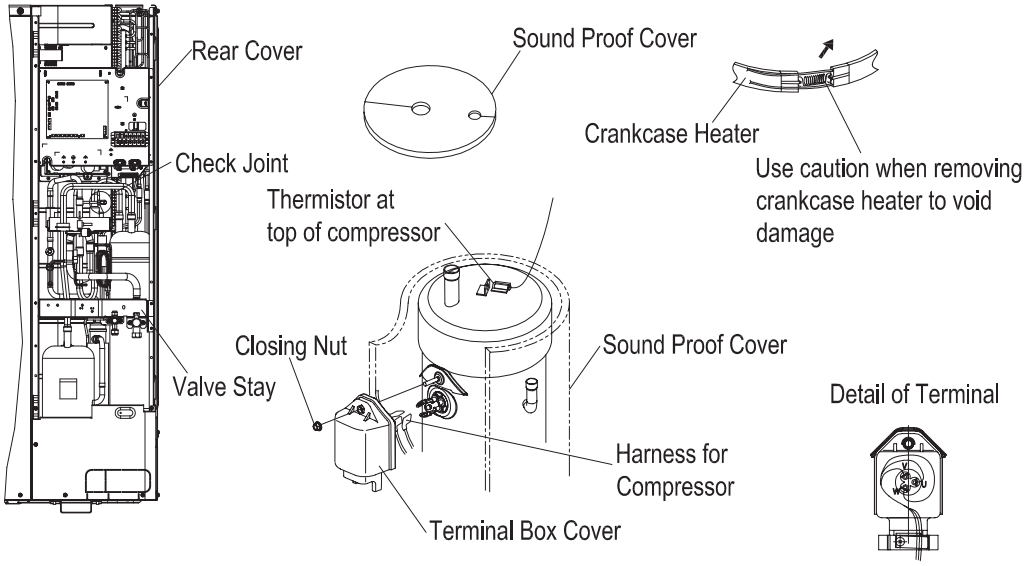
Model: 3~6.5HP

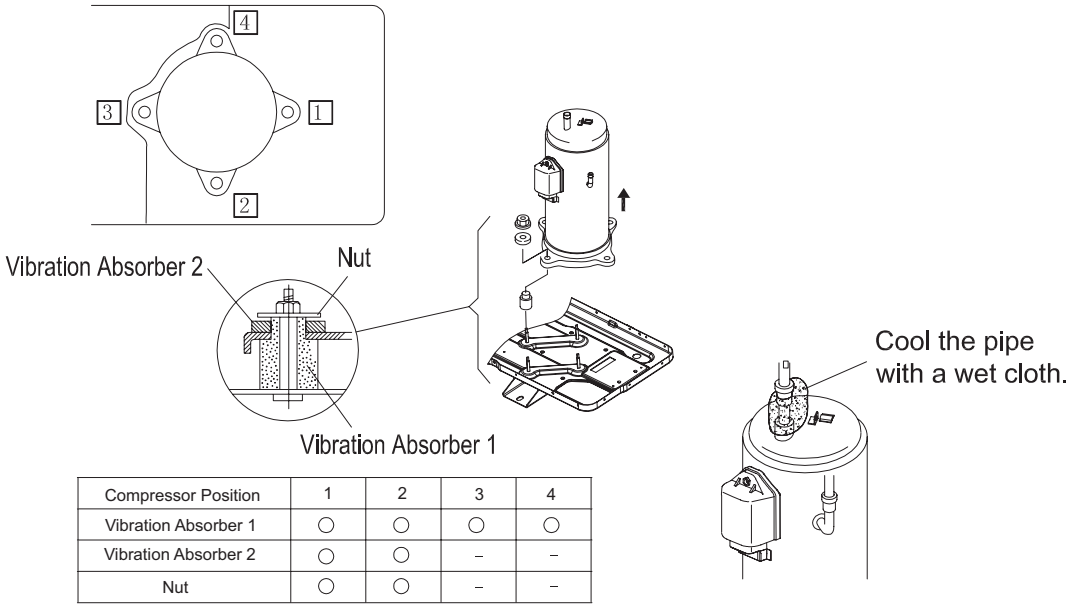



Detail of Terminal

Model: 7~12HP




| Compressor Position | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Vibration Absorber 1 | ○ | ○ | ○ | ○ |
| Vibration Absorber 2 | ○ | ○ | – | – |
| Nut | ○ | ○ | – | – |

○ : Attached
– : Not Attached

**Notes:**

- The compressor and piping are connected by brazing. Before brazing work, ensure that there is no flammable material nearby, as remaining oil inside the piping may ignite.
- To prevent contamination of the refrigerant by water or foreign materials, do not expose the refrigerant parts to atmosphere for long periods. If necessary, seal the pipe ends using caps or tape.
- Remove the caps for piping of the new compressor right before replacement. When replacing the compressor, seal the suction and discharge pipes with tape to prevent water and foreign particles entering the compressor, and remove it right before brazing work.

(6) Disconnect the suction pipe and discharge pipe from the compressor with a torch.
Ensure that wiring and electrical parts are kept away from the brazing area. If not, they may catch fire at brazing work.

(7) Remove all securing to the compressor. Tilt the compressor forward, lift it up and remove it.

(8) When performing the brazing work for the replaced compressor, work quickly and do not overheat piping and fittings. Cool area with a wet cloth to prevent oxidation. Be careful not let the solder or dust flows into the compressor.

## 1.8 Removing High Pressure Switch and Pressure Sensor

(1) Remove the service cover.

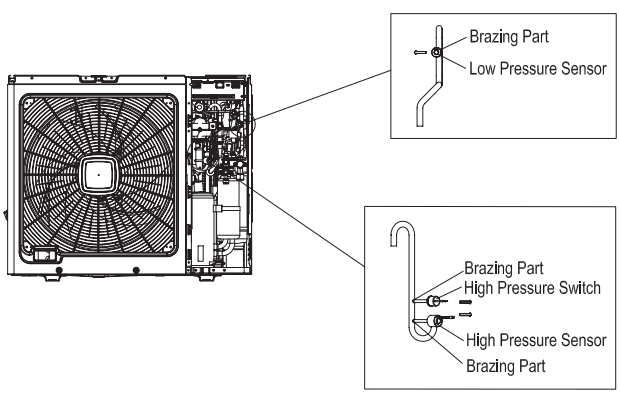
(2) Recover the refrigerant from check joints.

(3) Disconnect the fasten terminals of the high pressure switch and pressure sensor.

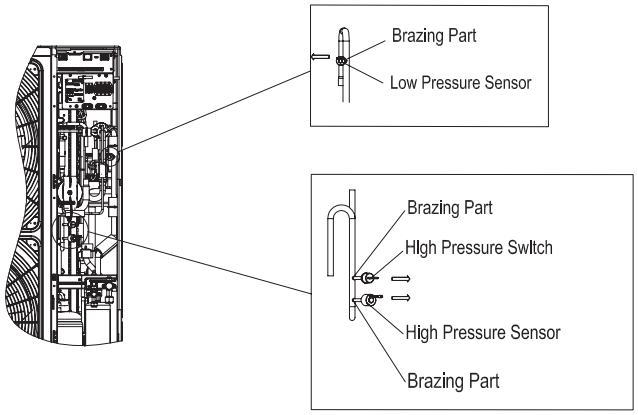
(4) Carefully unsolder the high pressure switch and the pressure sensors.

| Tool | Phillips Screwdriver, Charging Hose, Torch |
|---|---|

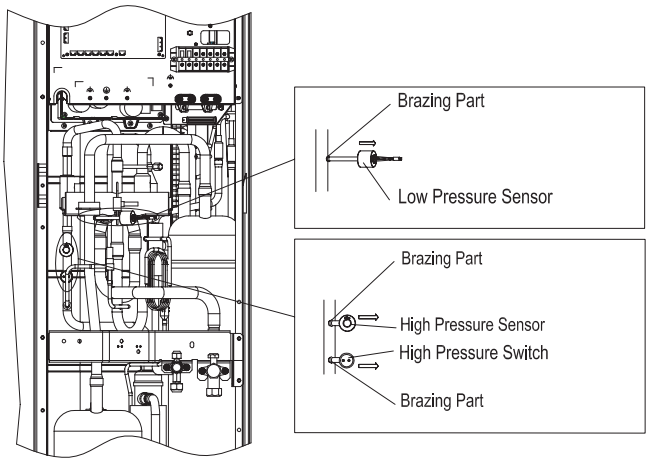
Model: 3~3.5HP




Model: 4~6.5HP




Model: 7~12HP



## 1.9 Removing 4-Way Valve Coil

(1) Remove the service cover.

(2) Disconnect the connector on the outdoor unit PCB in the electrical box.

(3) Remove the 4-Way valve coil by removing one securing screw for 4-Way valve.

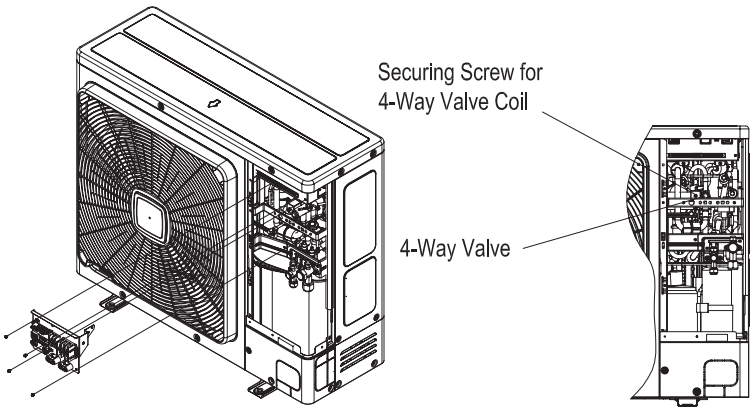
**Note:**

For model of 3~3.5HP, remove the front plate of the electrical box before removing the 4-Way valve coil.

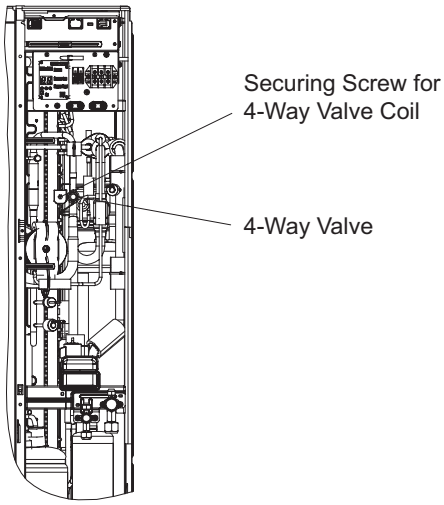
(4) To replace the 4-Way valve coil, reverse the removal procedure.

| Tool | Phillips Screwdriver,<br>Stubby Phillips Screwdriver |
|---|---|

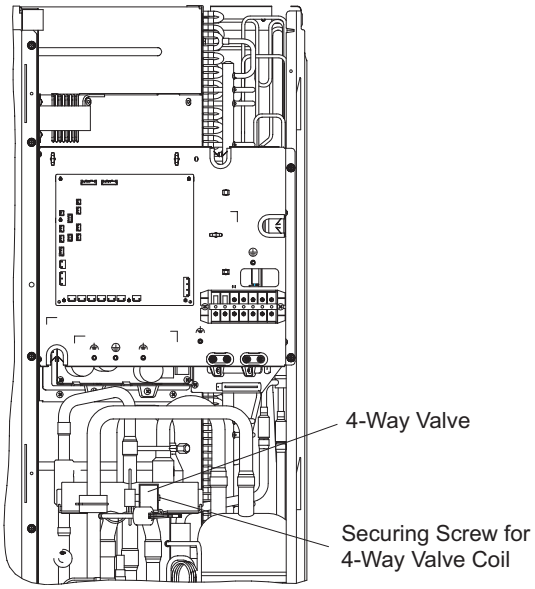
Model: 3~3.5HP




Model: 4~6.5HP




Model:7~12HP



## 1.10 Removing Electronic Expansion Valve Coil

(1) Remove the service cover, the side cover, and the rear cover.

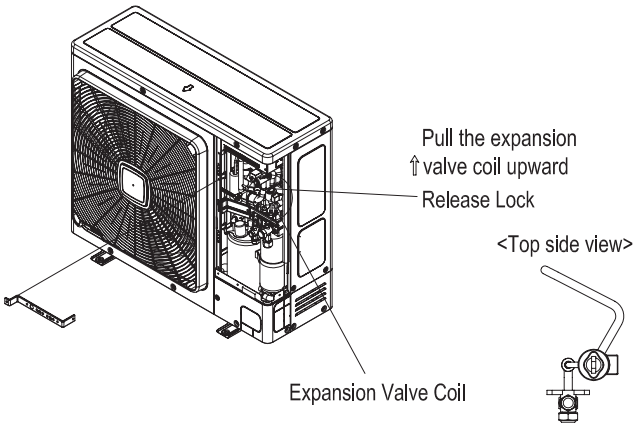
(2) Disconnect the connector on the outdoor unit PCB.

(3) Pull the expansion valve coil upward until it slides off from valve body.

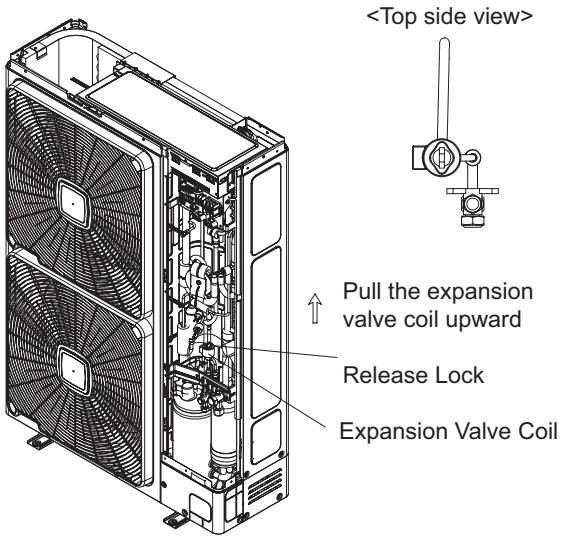
(4) To attach the new expansion valve coil, reverse the removal procedure.

| Tool | Phillips Screwdriver, Nipper, Band |
|---|---|

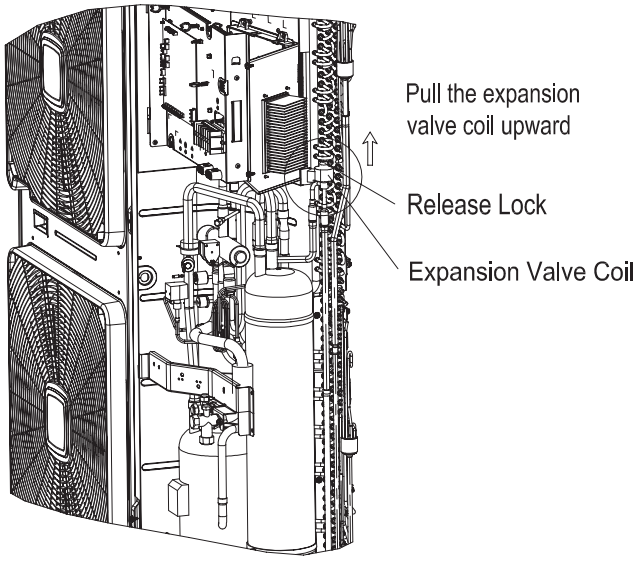
Model: 3~3.5HP




Model: 4~6.5HP




Model: 7~12HP



## 1.11 Removing Solenoid Valve Coil (SVA)

(1) Remove the service cover.

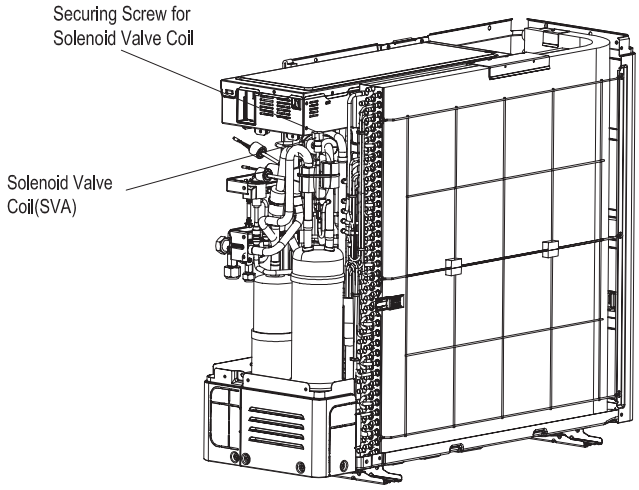
(2) Disconnect the connector on the outdoor unit PCB.

(3) Remove one securing screw for solenoid valve coil (SVA) and slide the solenoid valve coil (SVA) upward.

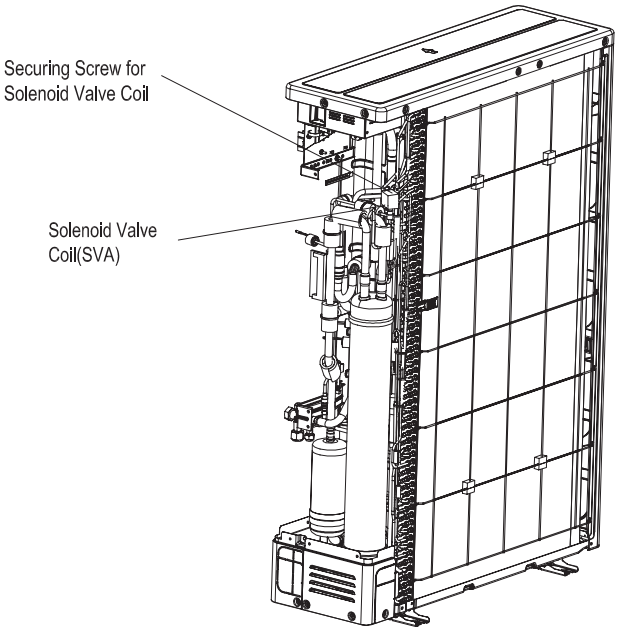
(4) To install a new solenoid valve coil, reverse the removal procedure.

| Tool | Phillips Screwdriver |
|---|---|

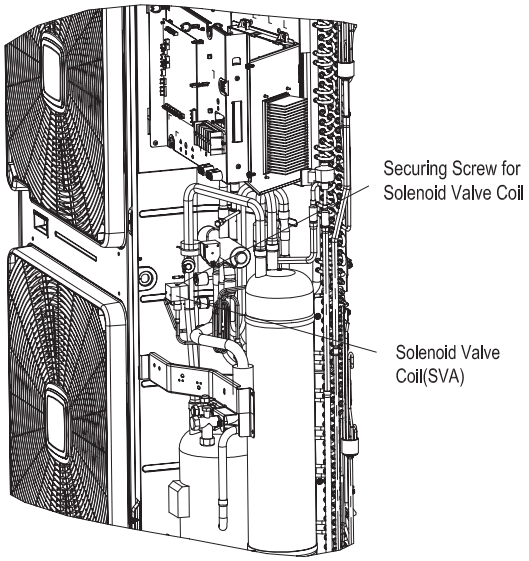
Model: 3~3.5HP




Model: 4~6.5HP




Model: 7~12HP



### 1.12 Removing 4-Way Valve

(1) Remove the service cover, the upper cover, the side cover, and the rear cover.

(2) Recover the refrigerant from check joints.

(3) Remove the 4-Way valve coil.

(4) Remove the 4-Way valve assemblies from the secured positions (four brazed parts).

(a) Remove the 4-Way valve and the gas stop valve while cooling the valve bodies with a wet cloth.

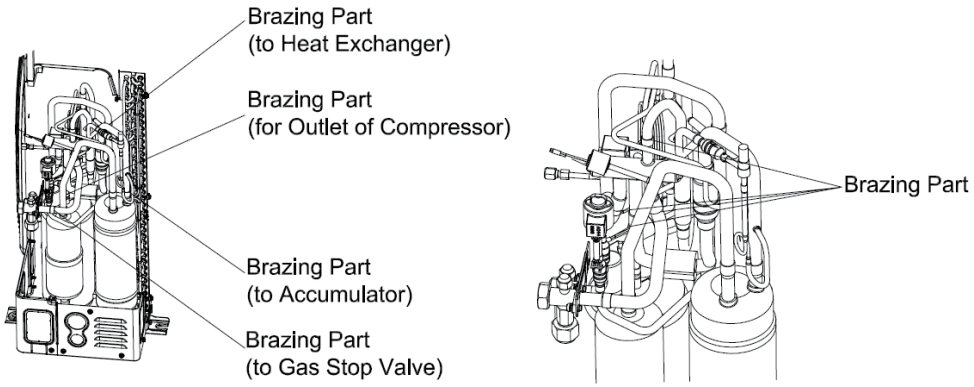
(b) Perform the brazing work while keeping the flame away from electrical wiring and piping insulation.

(5) Remove the 4-Way valve from the assemblies (four parts). Remove/Attach the 4-Way valve while cooling the valve bodies with a wet cloth.

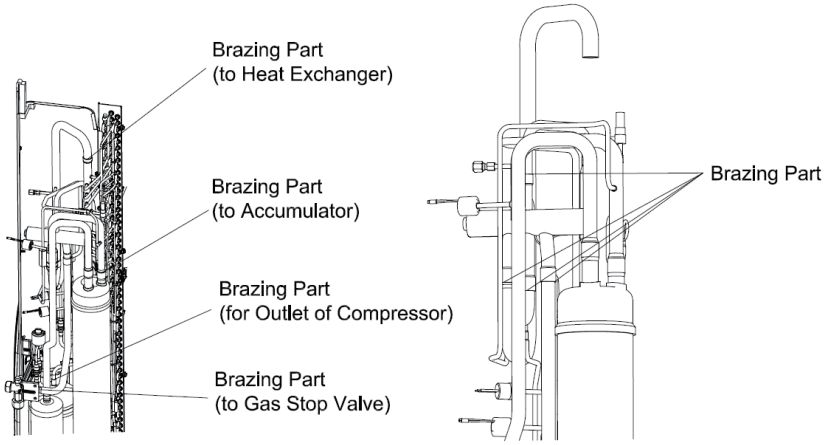
(6) To attach the new 4-Way valve after replacement, reverse the removal procedure.

| | |
|---|---|
| Tool | Phillips Screwdriver, Charging Hose, Torch, Wet Cloth, Adjustable Wrench |

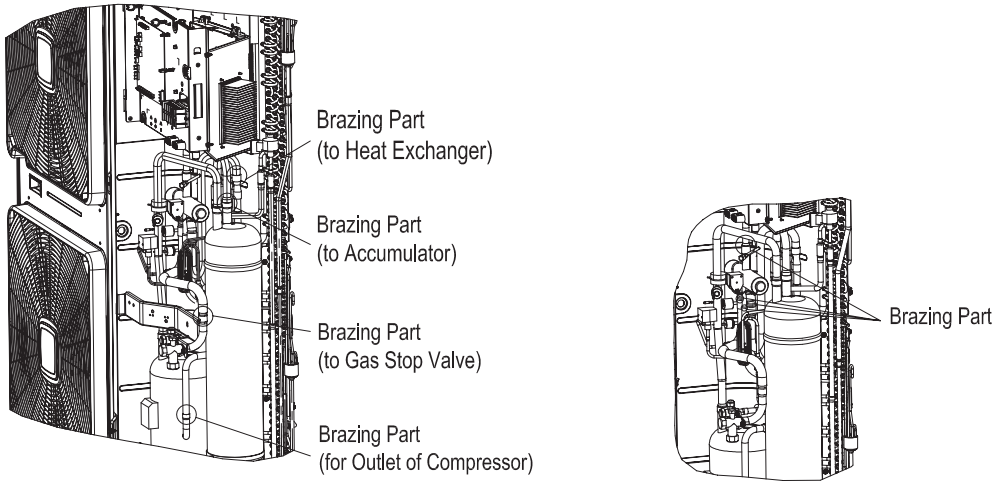
Model：3~3.5HP




Model：4~6.5HP




Model：7~12HP



## 1.13 Removing Electronic Expansion Valve and Solenoid Valve

(1) Remove the service cover, Remove the front piping cover, and the rear cover.

(2) Recover the refrigerant from check joints.

(3) Remove the coils.

(4) Remove the brazed parts as shown in the figures.

Electronic Expansion Valve (EVO) Brazed Parts: 2

Solenoid Valve (SVA) Brazed Parts: 2

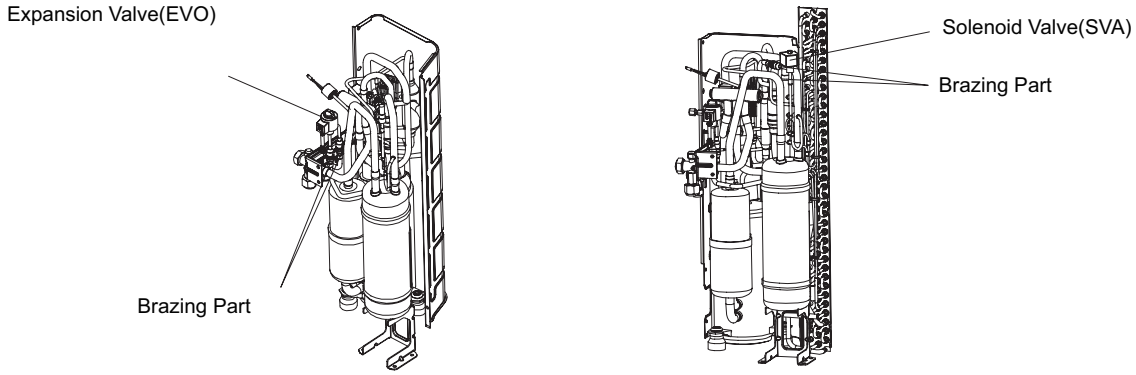
(a) Remove the electronic expansion valve and the solenoid valve after cooling the valve bodies with a wet cloth.

(b) Perform the brazing work while keeping the flame away from electrical wiring and piping insulation.

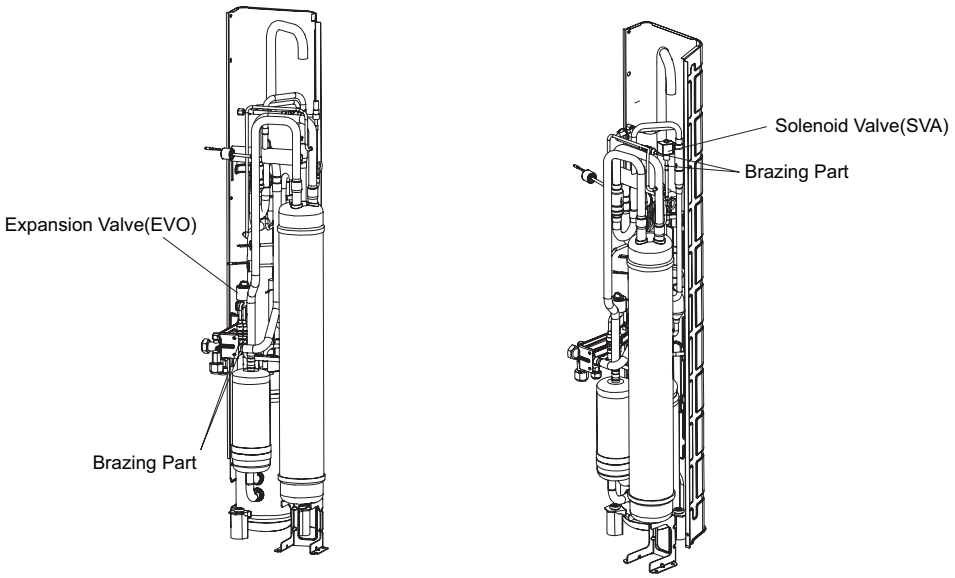
(5) To attach the new valves after replacement, reverse the removal procedure.

| | |
|---|---|
| Tool | Phillips Screwdriver, Charging Hose, Torch, Wet Cloth, Adjustable Wrench |

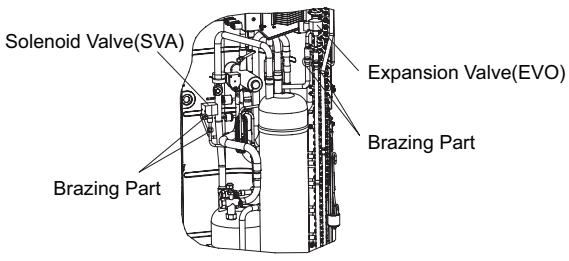
Model: 3~3.5HP




Model: 4~6.5HP




Model: 7~12HP

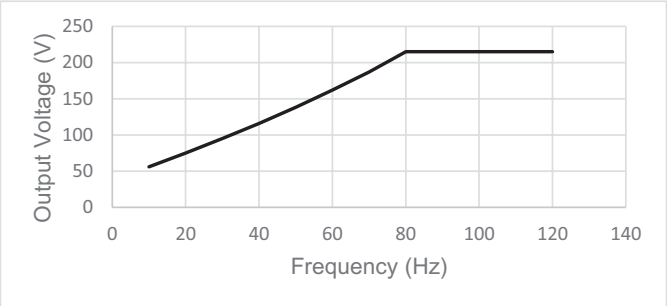
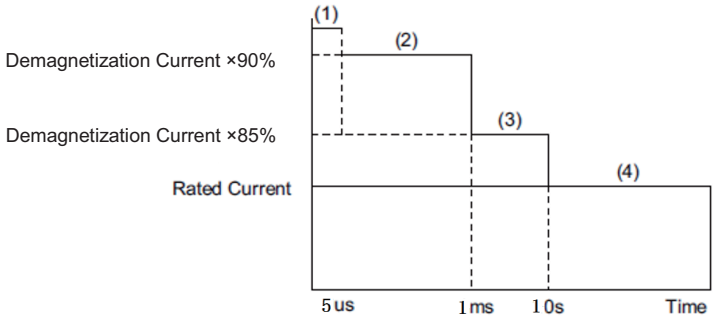


# 2. Main Parts

## 2.1 Inverter

(1) 3~6.5HP

- Specification

<table>
<tr><td colspan="2">Applicable Model</td><td>3HP~4.5HP</td><td>5HP~6.5HP</td></tr>
<tr><td colspan="2">Applicable Power Source</td><td colspan="2">220-240V/1Ph/50Hz</td></tr>
<tr><td colspan="2">Output Voltage (Maximum)</td><td colspan="2">220V</td></tr>
<tr><td rowspan="2">Output Current (Maximum)</td><td>Inverter PCB</td><td>16A</td><td>20A</td></tr>
<tr><td>Fan Controller</td><td colspan="2">1.2A</td></tr>
<tr><td colspan="2">Control Method</td><td colspan="2">Vector PWM Control</td></tr>
<tr><td rowspan="2">Range Output Frequency</td><td>Inverter</td><td colspan="2">10Hz~120Hz ±1Hz</td></tr>
<tr><td>Fan</td><td colspan="2">90rpm~850rpm ±10rpm</td></tr>
<tr><td colspan="2">Output Characteristics</td><td colspan="2"> 
</td></tr>
<tr><td colspan="2">Speed Rate</td><td colspan="2">0.125Hz/s, 0.25Hz/s, 0.5Hz/s, 1Hz/s, 3Hz/s (5 Steps)</td></tr>
<tr><td colspan="2">Protection Function (Excessive High or Low Voltage for Inverter)</td><td colspan="2">Voltage output is stopped, when voltage is lower than 190V DC or higher than 450V DC.<br>Cause of Abnormality: Failure of Inverter PCB, Incorrect Wiring</td></tr>
<tr><td colspan="2">Overcurrent Protection for Inverter (Electronic Thermal/ Instantaneous Overcurrent)</td><td colspan="2"> 
<br>(1) Short-Circuit Trip of Arm. (Protect by internal IPM)<br>(2) Instantaneous Overcurrent Trip. It is detected when current value is Over Demagnetization current × 90%.<br>(3) Instantaneous Overcurrent Trip: It is detected when current value is Over Demagnetization current × 85%.<br>(4) Electronic Thermal Trip: It is detected when current value is over rate current. Condition is maintained longer than 10 seconds.</td></tr>
<tr><td colspan="2">Protection of IPM of Inverter PCB</td><td colspan="2">The transistor module has three protection functions for self-protection.<br>(1) Some of the output terminals "U", "V", or "W" are short-circuited.<br>(2) Running current of IPM of Inverter PCB reaches the maximum rated current.<br>(3) Control voltage of IPM of Inverter PCB abnormally decreases.</td></tr>
<tr><td colspan="2">Overload Control</td><td colspan="2">Overload control is cancelled when Current Value ≤ Rated Current x 98%</td></tr>
<tr><td colspan="2">Fin Temperature Increase</td><td colspan="2">The unit is stopped when the fin temperature is higher than 95°C.</td></tr>
</table>

- Protective Function

(i). Excessive High or Low Voltage for Inverter

(a) Level of Detection

When the voltage of direct current is greater than 450V, an abnormality is detected.

When the voltage of direct current is smaller than 190V, an abnormality is detected.

(b) Function

When an abnormality is detected, the inverter compressor is stopped and the cause code of inverter stoppage is communicated to outdoor unit PCB.

(c) Cancellation of Protection Function

When the wired controller is off or main power supply is cut off.

(ii). Overcurrent Protection for Inverter

(a) Level of Detection

When the current detected reaches 85% of the demagnetization current, overcurrent is detected. (Instantaneous Overcurrent)

When the current detected exceeds the rated current continuously for 10 seconds, overcurrent is detected.

(b) Function

When an abnormality is detected, the inverter compressor is stopped and the cause code of inverter stoppage is communicated to main control.

(c) Cancellation of Protection Function

When the wired controller is off or main power supply is cut off.

(iii). Protection of IPM of Inverter

(a) Level of Detection

When some of the output terminals between “U” and “V”, “V” and “W”, “W” and “U” of DIPIPM of inverter PCB are short-circuited, an abnormality is detected.

When the running current of DIPIPM of inverter PCB reaches the maximum rated current, an abnormality is detected.

When the control voltage of DIPIPM of inverter PCB abnormally decreases, an abnormality is detected.

(b) Function

When an abnormality is detected, the inverter compressor is stopped and the cause code of inverter stoppage is communicated to outdoor unit PCB.

(c) Cancellation of Protection Function

When the wired controller is off or main power supply is cut off.

(iv). Fin Temperature Increase

(a) Level of Detection

When the temperature of internal thermistor exceeds more than 95°C, an abnormality is detected.

(b) Function

When an abnormality is detected, the inverter compressor is stopped and the cause code of inverter stoppage is communicated to main control.

(c) Cancellation of Protection Function

When the wired controller is off or main power supply is cut off.

(v). Overload Protection Control

(a) Level of Detection

When the output current exceeds the rated current continuously for 10 seconds, an abnormality is detected.

(b) Function

When output current exceeds the rated current, and the frequency decreases. An overload signal is issued when output current exceeds the rated current continuously for 10 seconds. When the output current decreases lower than 98% of the rated current, the frequency decrescence is canceled.

(c) Cancellation of Protection Function

After the operation described in the above item (b) is performed, this control is canceled.

(2) 7~12HP

- Specification

| Applicable Model | 7-8HP | 10-12HP |
|---|---|---|
| Model of Inverter PCB | DRV-180A-A | DRV-180B-A |
| Applicable Power Source | 380-415V ±10% /3Ph/50Hz | |
| Output Current (Maximum) (A) (RMS) | 24 | 30 |
| Range Output Frequency (rps) | 15~140 | 10~130 |

- Protective Function

(i) Excessive High or Low Voltage for Inverter

(a) Level of Detection

When the voltage of direct current is greater than 752V, an abnormality is detected.

When the voltage of direct current is smaller than 396V, an abnormality is detected.

(b) Function

When an abnormality is detected, the inverter compressor is stopped and the cause code of inverter stoppage is communicated to outdoor unit PCB.

(c) Cancellation of Protection Function

When the wired controller is off or main power supply is cut off.

(ii) Overcurrent Protection for Inverter

(a) Level of Detection

When the current detected is more than 49.5A (DRV-180A-A);

When the current detected is more than 69.3A (DRV-180B-A)

(b) Function

When an abnormality is detected, the inverter compressor is stopped and the cause code of inverter stoppage is communicated to main control.

(c) Cancellation of Protection Function

When the wired controller is off or main power supply is cut off.

(iii) Protection of IPM of Inverter

(a) Level of Detection

When some of the output terminals between “U” and “V”, “V” and “W”, “W” and “U” of IPM of inverter PCB are short-circuited, an abnormality is detected.

When the control voltage of IPM of inverter PCB abnormally decreases, an abnormality is detected.

(b) Function

When an abnormality is detected, the inverter compressor is stopped and the cause code of inverter stoppage is communicated to outdoor unit PCB.

(c) Cancellation of Protection Function

When the wired controller is off or main power supply is cut off.

(iv) Fin Temperature Increase

(a) Level of Detection

When the temperature of internal thermistor exceeds more than 100°C, an abnormality is detected.

(b) Function

When an abnormality is detected, the inverter compressor is stopped and the cause code of inverter stoppage is communicated to main control.

(c) Cancellation of Protection Function

When the wired controller is off or main power supply is cut off.

(v) Pre-charge Protection

(a) Level of Detection

When the pre-charge time of the relay is over than 5 seconds, the relay is not activated, then an abnormality is detected.

(b) Function

When an abnormality is detected, the inverter compressor is stopped and the cause code of inverter stoppage is communicated to main control.

(c) Cancellation of Protection Function

When the wired controller is off or main power supply is cut off.

## 2.2 Rotary Compressor

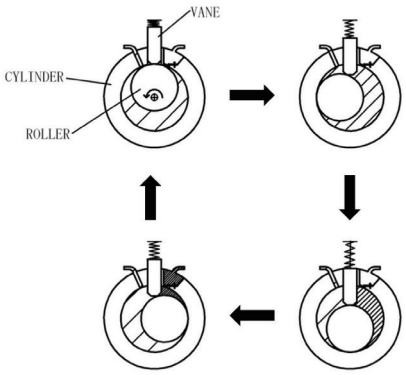
The rotary compressor is adopted in the model of 3~6.5HP. It has the following advantages:

(1) Low vibration and low noise design

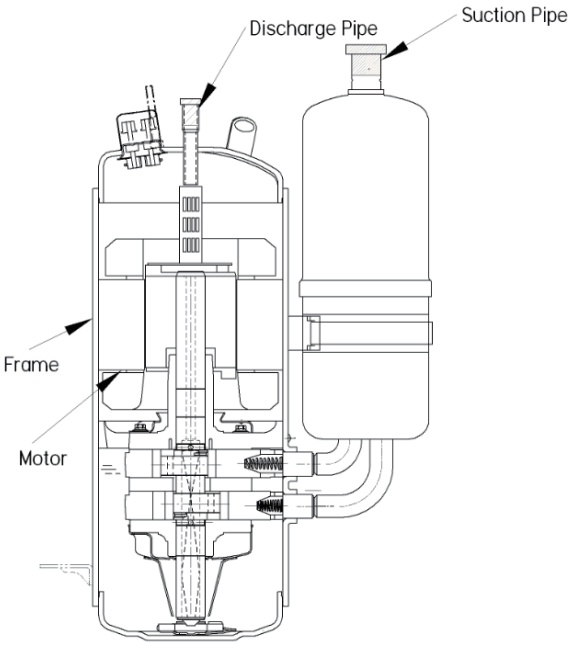
(i) The twin rotor crankshaft is arranged in a symmetrical type, which counteracts the centrifugal force produced by the rotation, and the vibration is smaller.

(ii) Unique low noise structure design, and high efficiency DC motor is adopted. The operation can be smooth and low noise at the full frequency.

(2) Principle of Compression




(3) Structure



## 2.3 Scroll Compressor

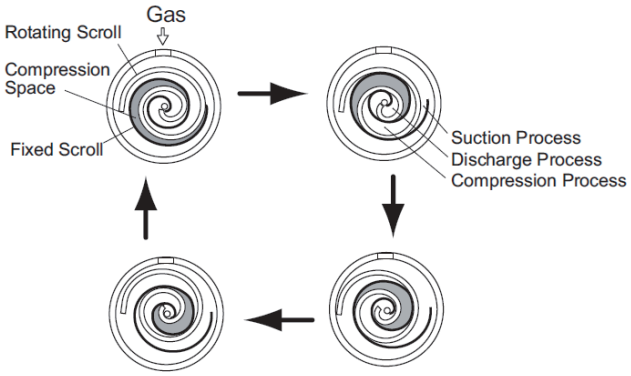
A sort of scroll compressor is adopted in the model of 7~12HP. It has the following advantages:

(1) Reliable Mechanism for Low Vibration and Low Sound

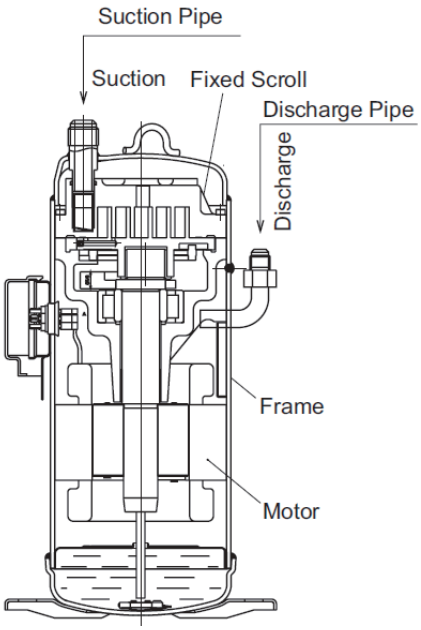
(i) The rotating direction is definite.

(ii) The pressure inside of the chamber is high pressure, and the surface temperature of the chamber is 60°C to 110°C.

(2) Principle of Compression



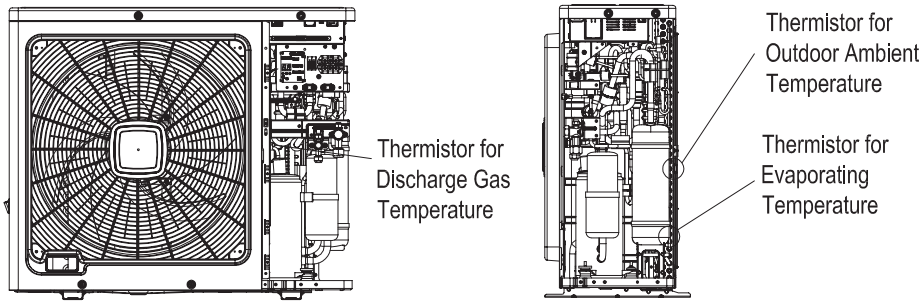

(3) Structure



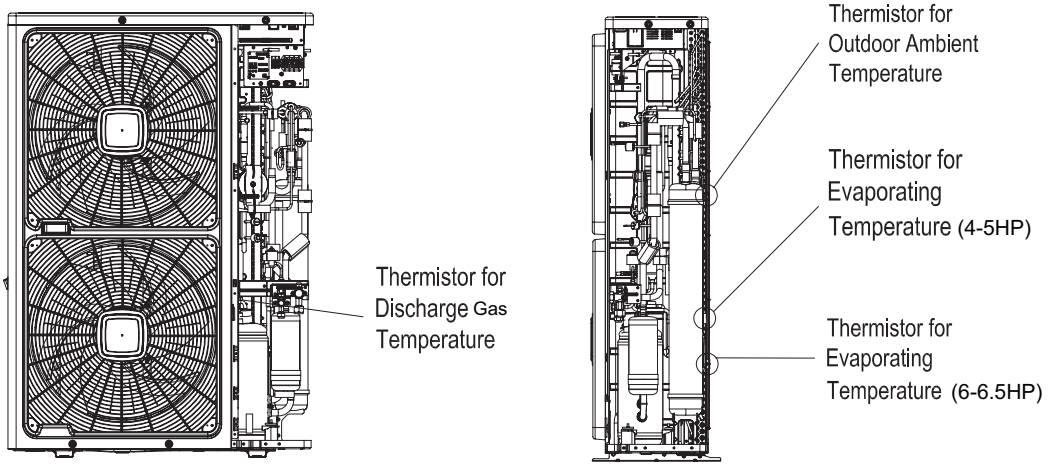
## 2.4 Thermistor

(1) Position of Thermistor

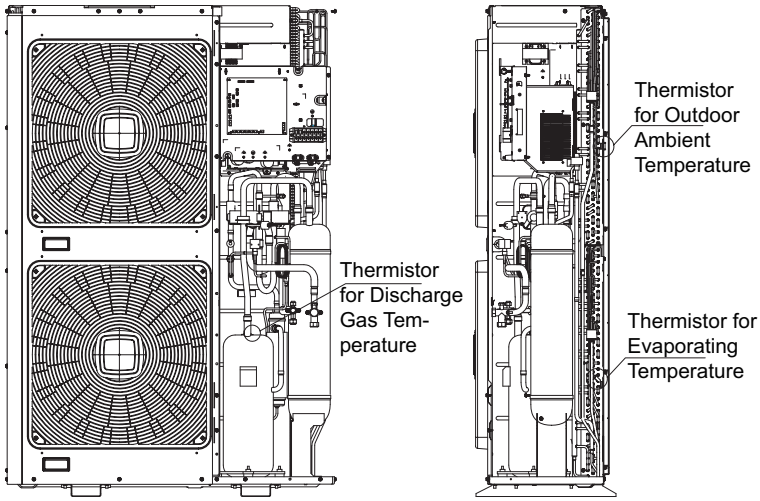
Model: 3~3.5HP




Model: 4~6.5HP




Model: 7~12HP



(2) Thermistor for Discharge Gas Temperature of Compressor (for Prevention of Discharge Gas Overheating)

(a) A thermistor for discharge gas temperature of the compressor is installed to prevent discharge gas from overheating. If discharge gas temperature increases excessively, lubricating oil deterioration occurs and lubricating properties deteriorate, resulting in short compressor life.

(b) If discharge gas temperature increases excessively, compressor temperature increases. At the worst, compressor motor winding will be burnt out.

(c) When discharge gas temperature of compressor increases during operation, the unit is controlled according to the following method.

- An electronic expansion valve and high pressure refrigerant is returned to the compressor through the accumulator, decreasing compressor temperature.
- If the discharge gas temperature of compressor increases exceeding 132°C even if an electronic expansion valve opens, the compressor is stopped, in order to protect the compressor.

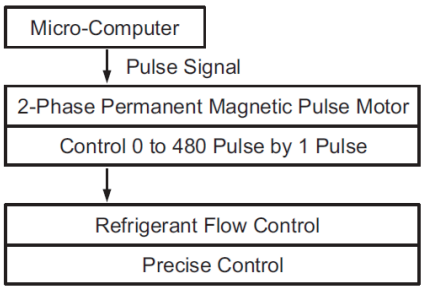
(3) Thermistor for Outdoor Ambient Temperature

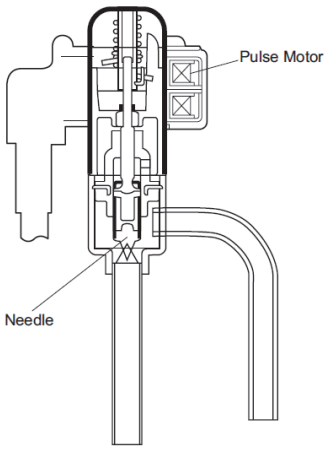
The thermistor resistance characteristics are shown in the figure below.

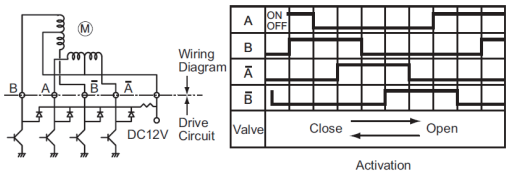
(4) Thermistor for Evaporating Temperature of Outdoor Unit

The characteristics for the thermistor is the same with the value of thermistor for outdoor ambient temperature as shown in the figure below.

## 2.5 Electronic Expansion Valve for Outdoor Units



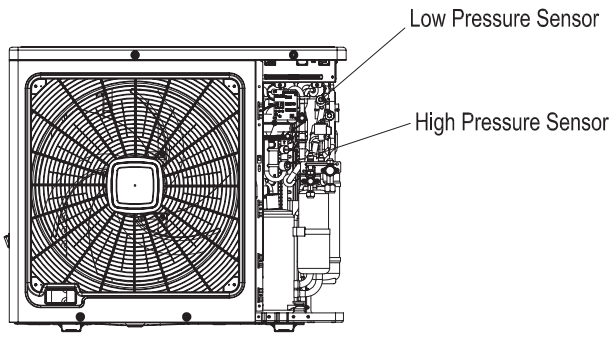




| Items | Specifications |
|---|---|
| Type | UKV Series |
| Refrigerant Used | R410A |
| Working Temperature Range | -30°C to 70°C |
| Mounting Direction | Drive Shaft in Vertical Direction within an Angle of 45° as Maximum |
| Flow Direction | Reversible |
| Drive Method | 4-Phase Pulse Motor Method |
| Rated Voltage | DC12V+10% |
| Drive Condition | 63PPS 1, 2 Phase Excitation |
| Coil Resistance (Each Phase) | 46Ω+3Ω (at 20°C) |
| Wiring Diagram, Drive Circuit, and Activation Mode |  |

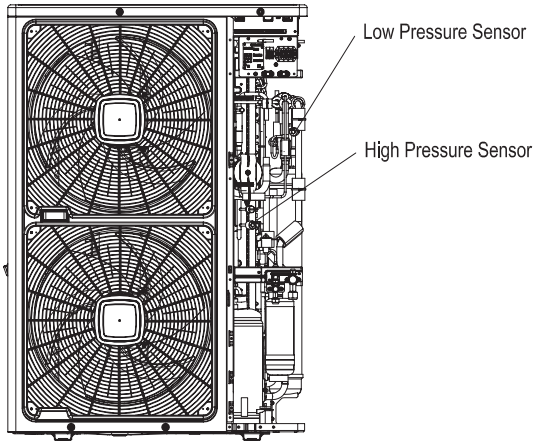
## 2.6 Pressure Sensor

(1) Position of Pressure Sensor

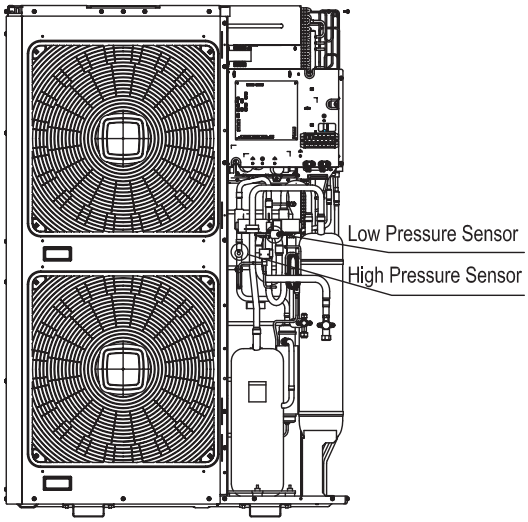
Model: 3HP~3.5HP




Model: 4HP~6.5HP

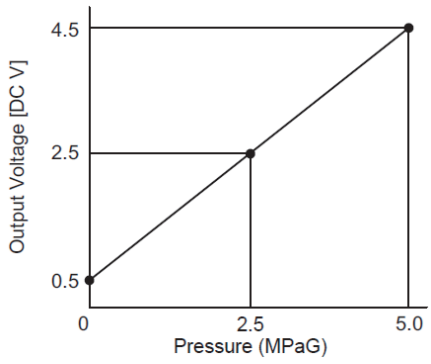



Model: 7HP~12HP

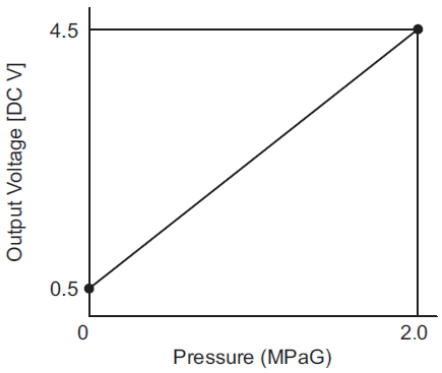



(2) High Pressure Sensor

The high pressure during operation is detected by a high pressure sensor, and compressor frequencies are controlled by the proportional controlling method with operating capacity of indoor units (or PID Control for Compressor Frequency) so that the high pressure is controlled in an appropriate range. The output characteristics of the high pressure sensor are as follows.




Output Characteristics of High Pressure Sensor




Output Characteristics of Low Pressure Sensor

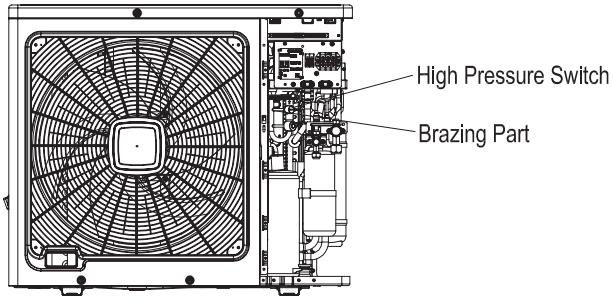
(3) Low Pressure Sensor

The low pressure during operation is detected by a low pressure sensor for protecting excessive increase/ decrease. The output characteristics of the low pressure sensor are as below.

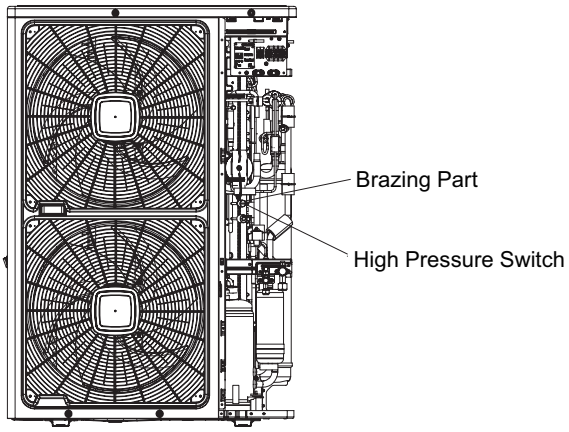
## 2.7 High Pressure Switch

When the high pressure reaches 601 psi (4.15MPa), compressor is stopped to protect the refrigerant cycle components.

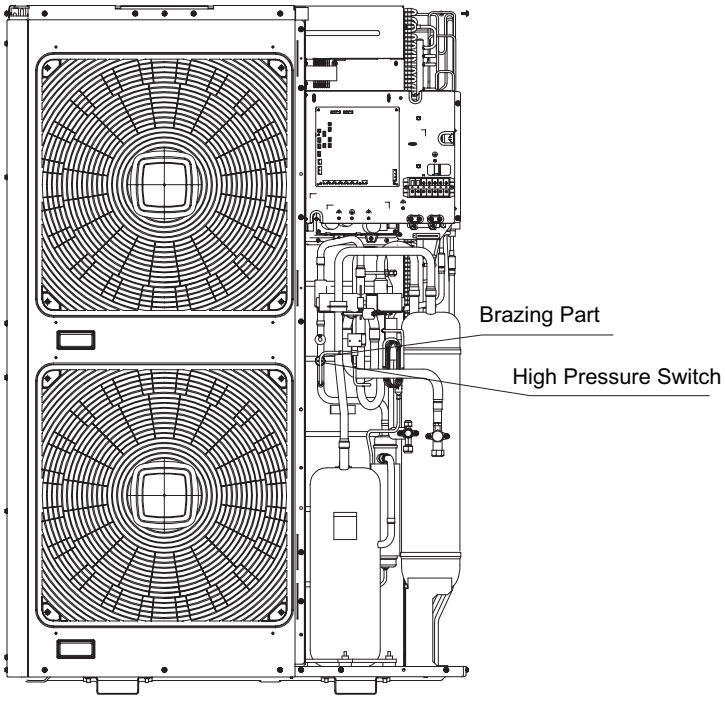
Model: 3HP~3.5HP




Model: 4HP~6.5HP




Model: 7HP~12HP




## 2.8 Noise Filter (NF1)

The noise filter decreases the leakage of noise made by the outdoor unit to the power supply. The individual noise filter is adopted in the model of 7HP~12HP.

| Item | Specifications |
|---|---|
| Model | NF167W |
| Rated Voltage | AC 3Ph 380V/415V |
| Rated Current | 30A |
| Fuse FU1,FU2,FU3 | 690V/40A |

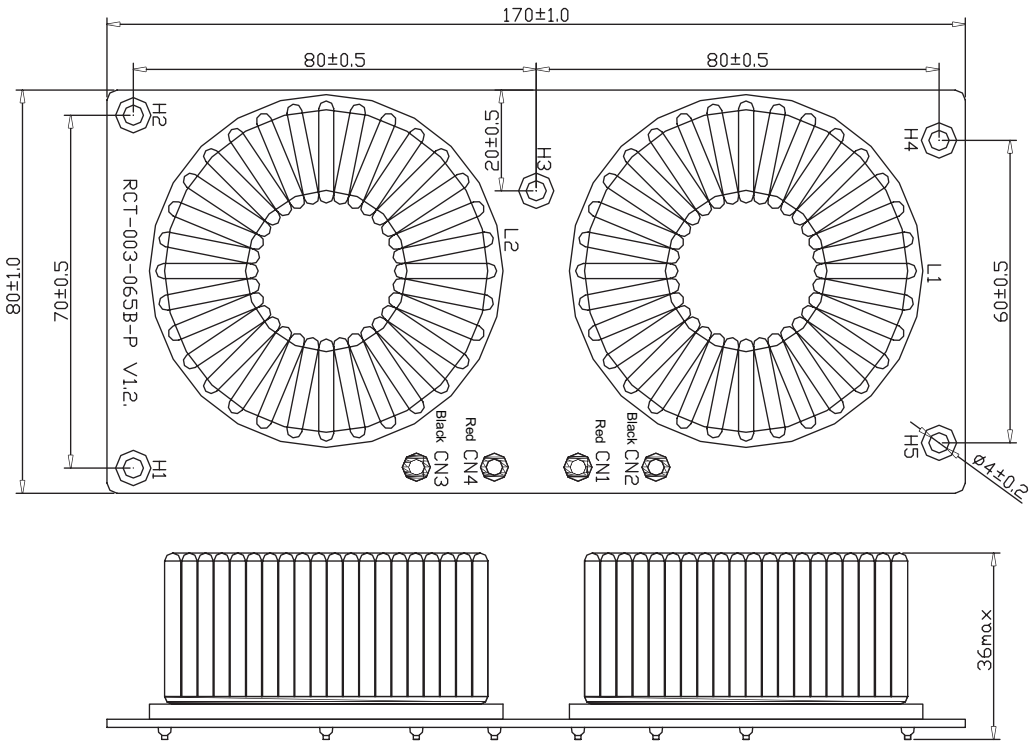
## 2.9 Reader (DCL)

This part is used for changing the alternative current to the direct current for the inverter.

Model: 3HP~6.5HP

Reactor <400V/50Hz, 380-415V/50Hz, 380V/60Hz>

| Items | Specifications |
|---|---|
| Character | 0.41mH (40KHz) (DC 16A) |
| Rated Current | 16A |
| Direct Current Resistance | 50.0mΩ (Max) (25°C) |



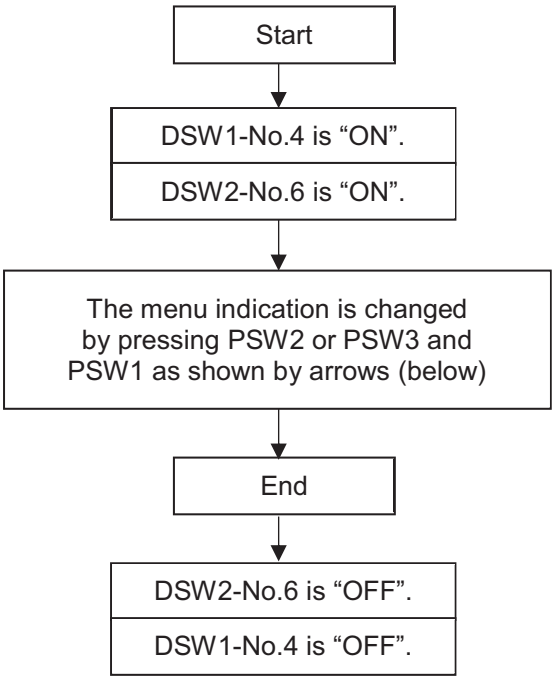

Model: 7HP~12HP

| Items | Specifications |
|---|---|
| Character | 1mH |
| Rated Voltage | AC 380V/415V |
| Rated Current | 30A |

# External Input/Output and Function Setting

## 1. External Input/Output Setting Method

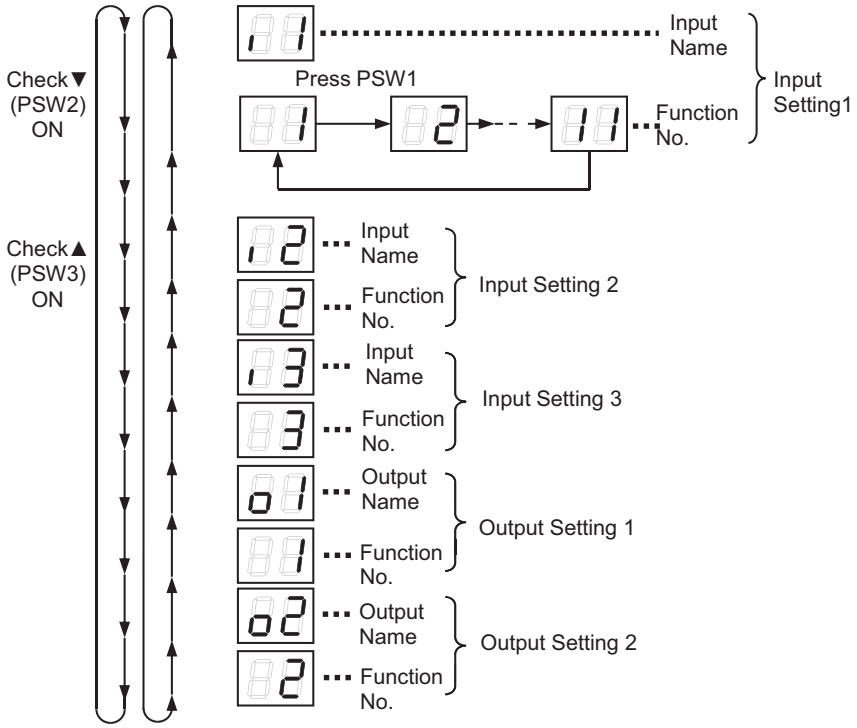
The setting should be performed during the outdoor unit stoppage. This setting is not available during the operation, the check mode, and the function setting.



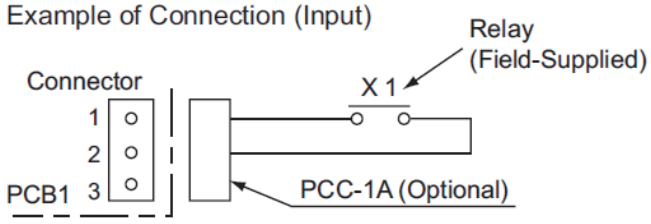

**NOTES:**

1. Record the function No. of each setting when setting the optional function. The example is for setting 1.

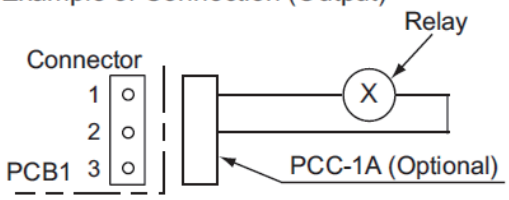
2. The same function cannot be set to a different input terminal. If it is set, the setting of the larger input No. is not available. Record the setting No. on the nameplate “External Input/Output and Function Setting” attached to the reverse surface of the service cover as well.



● Example of Connection (Input)




● Example of Connection (Output)




● Specifications of Relay

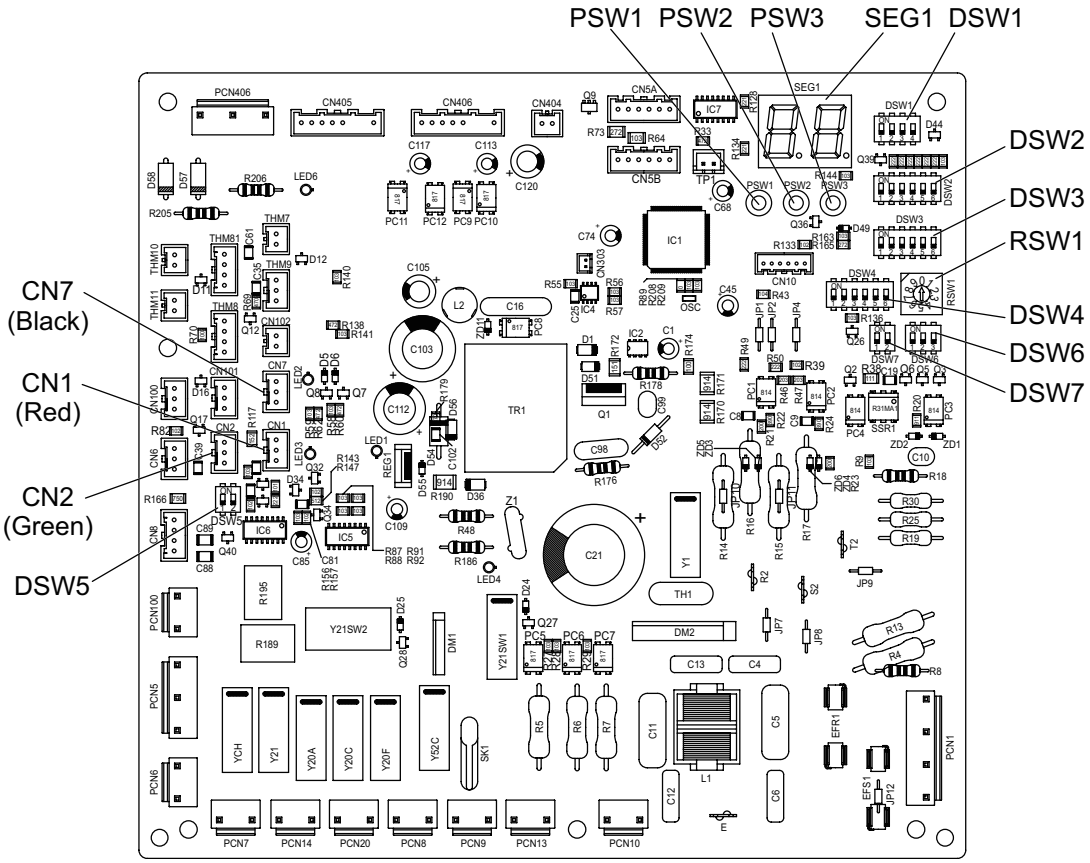
| Specifications | Remarks |
|---|---|
| Mini-Power Relay MY1F (or 2F) made by OMRON Co. | 220V |

● Specifications of Relay

| Specifications |
|---|
| Mini-Power Relay LY1F DC12V made by OMRON Co. |

● Arrangement of Push Switches on PCB1

For example: 7~12HP



## 2. Exteral Input and Output Settings

On the outdoor unit Printed Circuit Board (PCB1), there are three input terminals (CN1, CN2 as shown below) to receive external signals and two output terminals (CN7 as shown below) to send signals out. Control functions shown in these tables are available when setting input and output terminals.

### 2.1 Definition of External Input and Output Settings

- Input:

| Control Function No. | Setting Function for Input |
|---|---|
| 1 | Fixing Heating Operation Mode |
| 2 | Fixing Cooling Operation Mode |
| 3 | Demand Stoppage |
| 4 | Outdoor Fan Motor Start/Stop |
| 5 | Forced Stoppage |
| 6 | Demand Current Control 40% |
| 7 | Demand Current Control 60% |
| 8 | Demand Current Control 70% |
| 9 | Demand Current Control 80% |
| 10 | Demand Current Control 100% |
| 11 (*1) | No Setting |

(*1): Control Function No.11 is valid only when applied to Input Setting 3.

- Output:

| Control Function No. | Setting Function for Output |
|---|---|
| 1 | Operation Signal |
| 2 | Alarm Signal |
| 3 | Compressor ON Signal |
| 4 | Defrosting Signal |

- Input/Output Terminal:

| Input Terminal Name | Connector (Pin No.) | Factory Setting | |
|---|---|---|---|
| | | Control Function No. | Setting Function |
| Input Setting 1 | CN1 (1-2) | 1 | Fixing Heating Operation Mode |
| Input Setting 2 | CN1 (2-3) | 2 | Fixing Cooling Operation Mode |
| Input Setting 3 | CN2 (1-2) | 3 | Demand Stoppage |
| Output Setting 1 | CN7 (1-2) | 1 | Operation Signal |
| Output Setting 2 | CN7 (1-3) | 2 | Alarm Signal |

The following functions have been already set at the factory.

## 2.2 External Input Function Setting

The following signals can be received by the outdoor unit PCB.

(1) Input Fixing Heating Operation Mode (Control Function No.1),

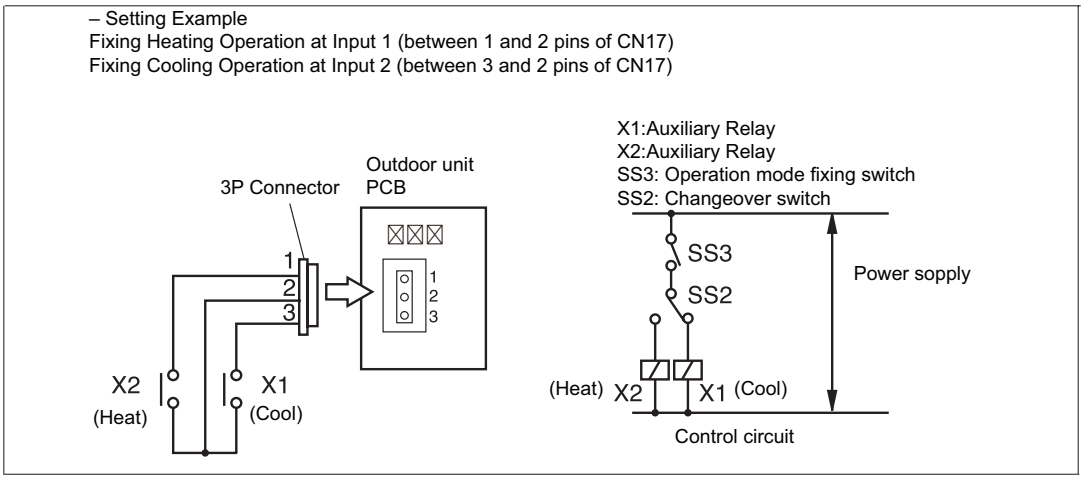
Input Fixing Cooling Operation Mode (Control Function No.2)

When the input terminals for the setting operation mode on the outdoor unit PCB are short-circuited, the operation mode can be set at the cooling or heating mode.

Short Circuit between Terminals 1 and 2 of CN1: Fixed Heating Operation Mode

Short Circuit between Terminals 2 and 3 of CN1: Fixed Cooling Operation Mode

During this set heating (or cooling) mode, no cooling (or heating) operation is possible. The indoor units under the cooling or dry operation (or heating operation) will be changed to the Thermo-OFF condition during this mode, and stoppage code No. “20” is given.




(2) Input Demand Stoppage (Control Function No.3)

When the input terminals for Demand Stoppage on the outdoor unit PCB are short-circuited while running, the compressor is stopped. (In this case, the indoor unit(s) is put under Thermo-OFF condition. Cooling operation: Air-flow setting, Heating operation: Lo setting)

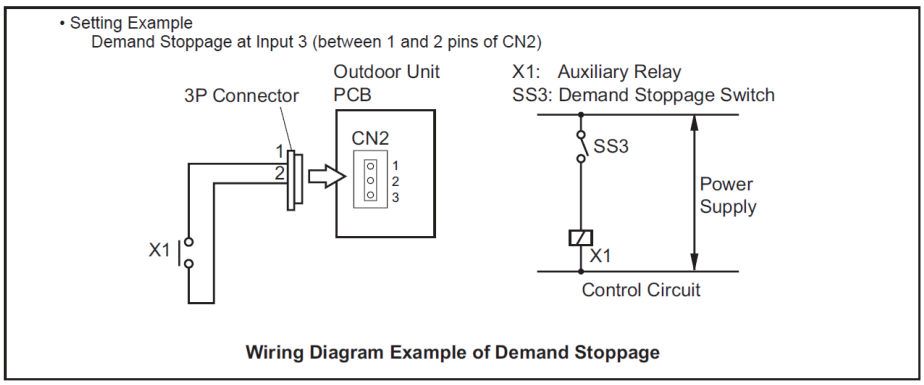
The stoppage code No. “10” is given. If the input terminals are opened, operation is resumed.

**Note:**

When demand control (ON/OFF) is performed, it is recommended that the control (ON/OFF) time is set appropriately according to the heat load. Also, set the demand control time approximately once in 15 minutes at the minimum in consideration for saving energy.

*Thermo-ON: The outdoor unit and some indoor units are running.

Thermo-OFF: The outdoor unit and some indoor units stay on, but don’t run.



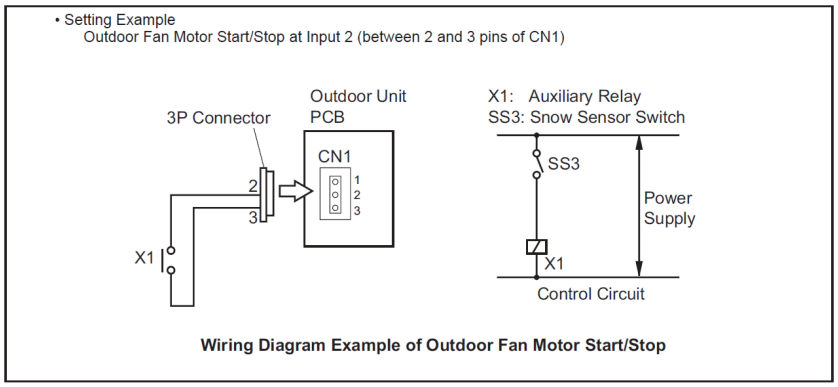

**Wiring Diagram Example of Demand Stoppage**

(3) Input Outdoor Fan Motor Start/Stop (Control Function No.4)

This is an auxiliary function to protect the outdoor unit from snow. When the input terminals for Outdoor Fan Motor Start/Stop on the outdoor unit PCB are short-circuited during the compressor stoppage. If outdoor ambient temperature is 10 °C or less, all the outdoor fan motors start operating. If the compressor restarts operating, the outdoor fan motors will be restored to normal operation. If the input terminals of Outdoor Fan Motor Start/Stop are opened during the outdoor fan motor operation following the short circuit of these terminals, the outdoor fan motor will stop.

This function is possible only during the compressor stoppage (during Switch-OFF or Thermo-OFF of the Switch-ON). Therefore, this function will not be possible even if the input signal is sent during the normal cooling or heating operation.

An example of basic wiring when the Outdoor Fan Motor Start/Stop (Input 2) is set to 2 and 3 pins of CN1 by an external signal is shown below.




**Wiring Diagram Example of Outdoor Fan Motor Start/Stop**

**Notes:**

- This is an auxiliary function to protect the unit from snow. In snowy regions, make sure to protect the unit with a snow-prevention roof, fence (field-supplied), or snow protection hood (optional). Otherwise, abnormal vibrations because of an imbalanced propeller fan will be caused.
- This function can not operate the outdoor fan when outdoor ambient temperature is higher than 10 °C.
- If the fan motor fails during this function, stop all the outdoor fans to suspend this function. Check the alarm code and deal properly with the failure, before next time the compressor is operated.
- When setting the snow sensor switch for Outdoor Fan Motor Start/Stop, make sure that the continuous operating time is 30 seconds or more. Also Outdoor Fan Motor Start/Stop intervals shall be at least 10 minutes. Otherwise, malfunction of the outdoor fan motors will be caused by frequent starts and stops.
- The operation pattern of the outdoor fan can be changed by Function Setting “Fo”.

  * Switch-ON: Some indoor units are running or staying.
    Switch-OFF: All indoor units are stopped.

(4) Input Forced Stoppage (Control Function No.5)

When the input terminals for Forced Stoppage on the outdoor unit PCB are short-circuited while running, the compressors and the indoor fan motors are stopped. The stoppage code No. “10” is given.

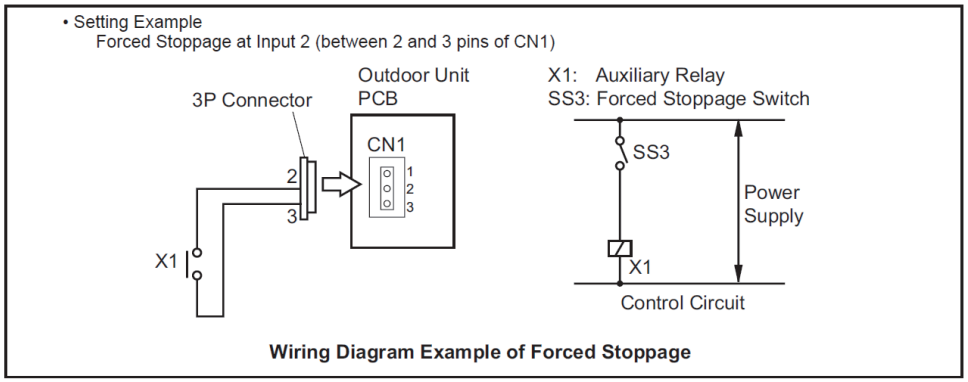
In this case, if the input terminals are opened, operation is resumed.

**Notes:**

When demand control (ON/OFF) is performed, it is recommended that the control (ON/OFF) time is set appropriately according to the heat load. Also, set the demand control time approximately once in 15 minutes at the minimum in consideration for saving energy.

*Thermo-ON: The outdoor unit and some indoor units are running.

Thermo-OFF: The outdoor unit and some indoor units stay on, but don’t run.




**Wiring Diagram Example of Forced Stoppage**

(5) Input Demand Current Control 40, 60, 70, 80, 100% (Control Function No.6 to 10)

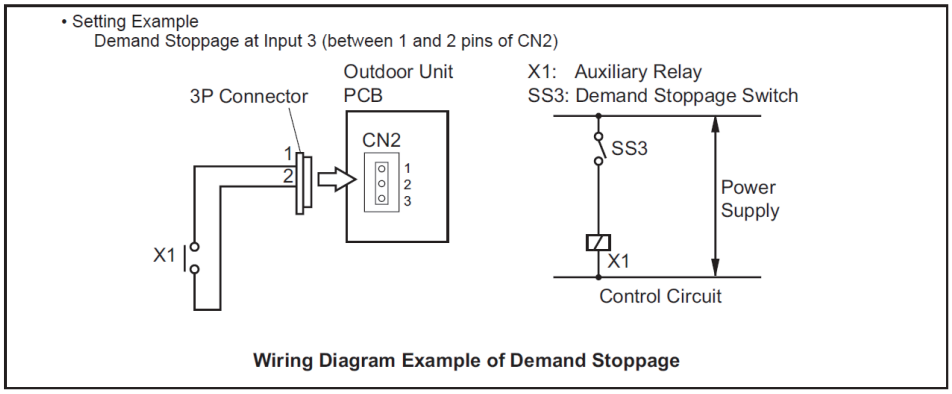
When the input terminals for Demand Current Control on the outdoor unit PCB are short-circuited, the compressor frequency is controlled so that the maximum limit of the outdoor running current is set to 100%, 80%, 70%, 60%, or 40% of the reference power consumption.

If the outdoor unit running current exceeds the maximum limit for twenty minutes, the indoor unit is put under Thermo-OFF condition. In this case, the stoppage code No. “10” is given. When the input terminal is opened during the demand current control, its control is released.

**Notes:**

Thermo-ON: The outdoor unit and some indoor units are running.

Thermo-OFF: The outdoor unit and some indoor units stay on, but don’t run.




**Wiring Diagram Example of Demand Stoppage**

**Notes:**

- The Demand Current Control (%) is value criterion. The value used for this control is calculated from the current, and therefore it is different from the value indicated by a wattmeter. If it is required that the maximum power consumption is managed precisely, a field-supplied demand controller should be used.
- The actual value may temporarily be higher than the indicated value (by 40% to100%) depending on the operating control conditions such as protection control.

| Parts | | Specifications | Remarks |
|---|---|---|---|
| Auxiliary Relay (X1, X2) | | Mini-Power Relay, (Model: MY1F or MY2F) made by OMRON | 220V |
| Change-Over Switch (SS2, SS3) | | Manual Switch | 220V |
| 3 Pin Connector Cord | | Model: PCC-1A (Connected to JST Connector, XARP-3) | Five Cords with Connectors as One Set |
| Electric Wiring (Inside of Unit) | Low Volt. | AWG22 | Lower than 24V |
| | 220V | AWG18-20 | / |
| Electric Wiring (Outside of Unit) | Low Volt. | AWG18-20 | Lower than 24V |
| | 220V | AWG14 | / |

**Notes:**

- Make the wiring to the terminals as short as possible.
- Do not run the wirings too closely to the high voltage cable. Keep at least 30cm distance between the wiring and the high voltage cable. (Crossing cables is okay.) If it is necessary to run the wirings closer than 30cm to the high voltage cable, insert the low voltage cable(s) in a metal tube and ground it at one end. If sealed wirings are used at the low voltage wiring side, ground it at one end of the shielded wirings.
- The maximum length should be within 70m.

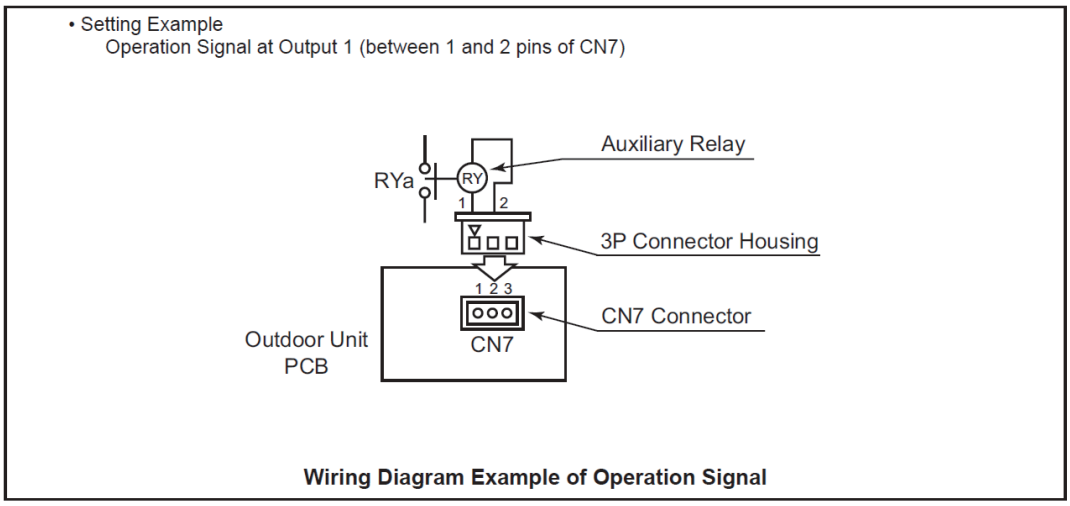
## 2.3 External Output Function Setting

The following signals can be picked from the outdoor unit PCB.

(1) Output Operation Signal (Control Function No.1)

This function is utilized to receive the operation signal.

Auxiliary relay contacting (RYa) is closed during the operation. The operation signal will be sent to output terminals when the indoor units are operating. (Even when one indoor unit is operating, the signal will be sent.) This function can be used for circulator or humidifier operation.

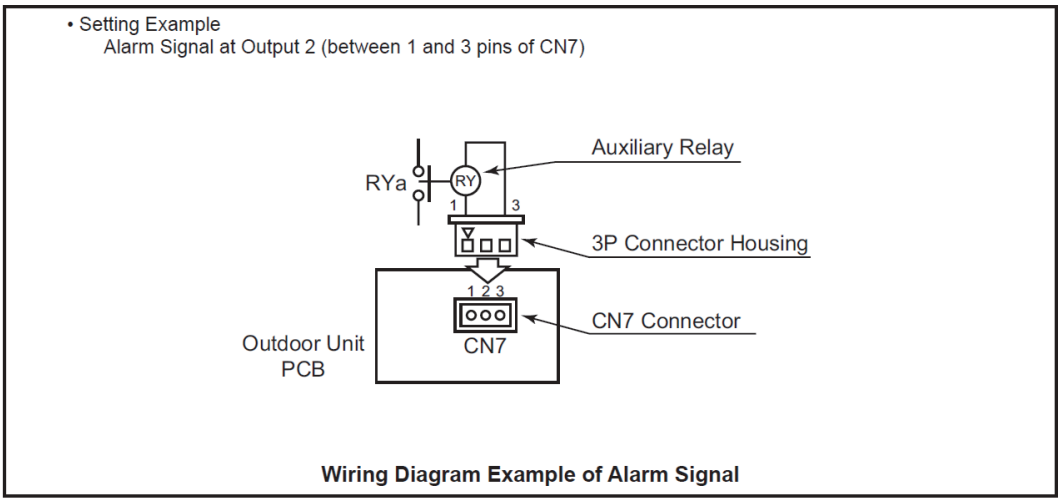



**Wiring Diagram Example of Operation Signal**

(2) Output Alarm Signal (Control Function No.2)

This function is utilized to receive the alarm signal.

Auxiliary relay contacting (RYa) is closed when the alarm occurs. The alarm signal will be sent to output terminals when the alarm occurs from the indoor units. (The signal will be sent even when the alarm occurs from one indoor unit.)



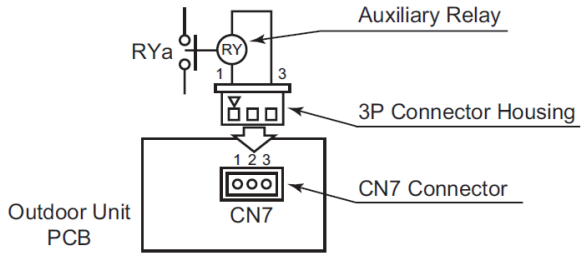

**Wiring Diagram Example of Alarm Signal**

(3) Output Compressor ON Signal (Control Function No.3)

This function is utilized to receive the compressor operation signal.

Auxiliary relay contacting (RYa) is closed during the compressor operation.

• Setting Example
Compressor ON Signal at Output 2 (between 1 and 3 pins of CN7)



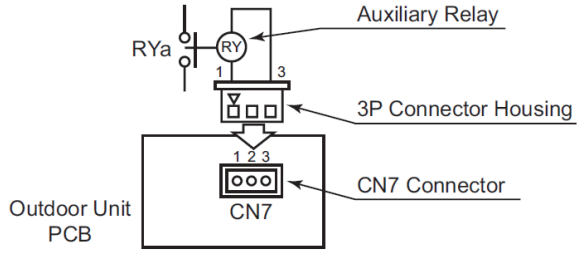

**Wiring Diagram Example of Compressor ON Signal**

(4) Output Defrosting Signal (Control Function No.4)

This function is utilized to receive the defrosting signal.

Auxiliary relay contacting (RYa) is closed during the defrosting.

• Setting Example
Defrosting Stoppage at Output 2 (between 1 and 3 pins of CN7)




**Wiring Diagram Example of Defrosting Signal**

Specifications of Required Auxiliary Relay

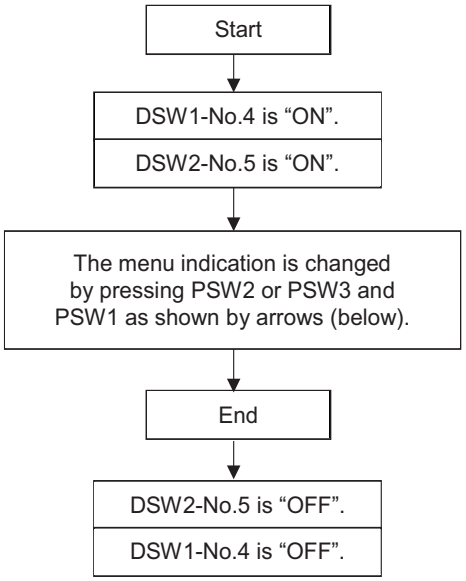
| Parts | Specifications |
|---|---|
| Auxiliary Relay * | High-Power Relay, LY2F DC12V made by OMRON |

* Do not use the relay with diode built-in.

## 3. Function Setting

The function setting should be performed during the outdoor unit stoppage.

This setting is not available during External Input/Output Setting.




**NOTES:**
1. Record the function No. of each setting when setting the optional function. The example is for setting 1.

2. Record the setting No. on the nameplate “External Input/ Output and Function Setting” attached to the reverse surface of the service cover as well.

| No. | 7-Segment Display | | Setting Item | Contents |
|---|---|---|---|---|
| 1 | FA | 0 | Circulator Function at Heating Thermo-OFF | No setting (continuously operation) |
| | | 1 | | Indoor fan forced ON and OFF (2min. ON/6min. OFF) |
| 2 | n1 | 0 | Night Shift (Low Noise) | No setting |
| | | 1 | | Setting night shift for cooling |
| 3 | CS | 0 | Cancellation of Outdoor Ambient Temperature Limit | No setting (valid) |
| | | 1 | | Cancellation for heating |
| | | 2 | | Cancellation for cooling |
| | | 3 | | Cancellation for cooling and heating |
| 4 | Jo | 0 | Change of Defrost Condition | No setting |
| | | 1 | | Defrost for cold area |
| | | 2 | | Defrost for warm area |
| 5 | bJ | 0 | SLo (IU Fan Speed) Defrost Setting | No setting (Indoor fan stoppage during defrost operation) |
| | | 1 | | Indoor fan SLo operation when heating operation is activated/during defrost operation |
| 6 | Hr | 0 | Cancellation of Hot Start | No setting |
| | | 1 | | Cancellation of hot start |
| 7 | nU | 0 | Priority Capacity Mode | No setting |
| | | 1 | | Change of correction factor for compressor frequency (pattern1) |
| | | 2 | | Change of correction factor for compressor frequency (pattern2) |
| | | 3 | | Change of correction factor for compressor frequency (pattern3) |
| 8 | Hc | 0 | Compressor Frequency Control Target Value for Cooling | No setting |
| | | 1 | | Change of upper limit for compressor frequency of cooling operation |
| 9 | Hh | 0 | Compressor Frequency Control Target Value for Heating | No setting |
| | | 1 | | Change of upper limit for compressor frequency of heating operation |
| 10 | SC | 0 | Compressor Frequency Fixed Mode | No setting |
| | | 1 | | Fixed frequency mode |

## EXTERNAL INPUT/OUTPUT AND FUNCTION SETTING

| No. | 7-Segment Display | | Setting Item | Contents |
|---|---|---|---|---|
| 11 | | 0 | IU Electronic Expansion Valve Opening during Heating Operation Stoppage | No setting |
| | | 1 | | Expansion valve opening: pattern1 |
| | | 2 | | Expansion valve opening: pattern2 |
| 12 | | 0 | IU Electronic Expansion Valve Opening during Heating Thermo-OFF | No setting |
| | | 1 | | Expansion valve opening: pattern1 |
| | | 2 | | Expansion valve opening: pattern2 |
| 13 | | 0 | IU Electronic Expansion Valve Opening during Heating Thermo-ON | No setting |
| | | 1 | | Expansion valve opening: pattern1 |
| | | 2 | | Expansion valve opening: pattern2 |
| 14 | | 0 | Sound Reduced Function | No setting |
| | | 1 | | Low Noise Setting 1 |
| | | 2 | | Low Noise Setting 2 |
| | | 3 | | Low Noise Setting 3 |
| | | 4 | | Low Noise Setting 1 |
| | | 5 | | Low Noise Setting 2 |
| | | 6 | | Low Noise Setting 3 |
| | | 7 | | Low Noise Setting 1 |
| | | 8 | | Low Noise Setting 2 |
| | | 9 | | Low Noise Setting 3 |
| 15 | | 0 | Demand Function Setting | No setting |
| | | 1 | | Valid demand function all time |
| 16 | | 0 | Demand Function Setting | No setting |
| | | 1 | | Valid wave function (20min. 100% demand/10min. minimum setting) |
| 17 | | 0 | Protection of Decrease in Outlet Temperature of Cooling | No setting |
| | | 1 | | Cooling outlet temperature decrease protection1 |
| | | 2 | | Cooling outlet temperature decrease protection1 |
| 18 | | 0 | Outlet Temperature Control (DOAS) | No setting |
| | | 1 | | Restrain capacity control |
| | | 2 | | Outlet air temperature control |
| 19 | | 0 | Not Prepared | |
| | | 1 | | |
| 20 | | 0 | Thermo-OFF Setting for Outdoor Unit After Defrosting Operation | No setting (continuously operation) |
| | | 1 | | Valid forced stoppage after defrost operation |
| 21 | | 0 | Intermittent Operation of Outdoor Fan Motor (Snow Prevention) (Prepared 1) | No setting (continuously outdoor fan operation when "input function No.4"=ON) |
| | | 1 | | Intermittent outdoor fan operation (30sec. ON/570sec. OFF) |
| | | 2 | | Intermittent outdoor fan operation (60sec. ON/540sec. OFF) |
| | | 3 | | Intermittent outdoor fan operation (120sec. ON/480sec. OFF) |
| | | 4 | | Intermittent outdoor fan operation (300sec. ON/300sec. OFF) |
| 22 | | 0 | Prepared 2 | |
| | | 1 | | |
| 23 | | 0 | Prepared 3 | |
| | | 1 | | |

| No. | 7-Segment Display | | Setting Item | Contents |
|---|---|---|---|---|
| 24 | F4 | 0 | Invalid Electronic Expansion Valve Opening Difference Protection (Prepared 4) | No Setting (valid) |
| | | 1 | | Invalid electronic expansion valve opening deference protection |
| 25 | F5 | 0 | Prepared 5 | |
| | | 1 | | Interaction defrosting (For store) |
| 26 | F6 | 0 | Prepared 6 | |
| | | 1 | | Voltage balance control for power supply |
| 27 | F7 | 0 | Prepared 7 | |
| | | 1 | | ESP for outdoor unit |
| 28 | F8 | 0 | Crankcase Heater Control during Stoppage (Prepared 8) | No setting (Preheating during outdoor unit stoppage) |
| | | 1 | | Power saving during outdoor unit stoppage (without preheating by crankcase heater) |
| 29 | F9 | 0 | Invalid Motion Sensor during Prepare Defrost (Prepared 9) | No Setting |
| | | 1 | | Invalid starting defrosting by motion sensor detecting "no human activity (absent)" |
| 30 | FC | 0 | Convert Unit in Checking Mode (Valid for North America) | No setting (indication unit: [°F] or [psi]) |
| | | 1 | | Convert indication unit: [°C] or [MPa] |
| 31 | Fd | 0 | Prepared 11 | |
| | | 1 | | |
| 32 | FE | 0 | Permit Indoor Fan Operation during Forced Stoppage | No setting (Indoor fan stoppage during forced stoppage by DSW1-4 or input function No.5) |
| | | 1 | | Permit indoor fan operation during forced stoppage |
| 33 | FF | 0 | Prepared 13 | |
| | | 1 | | |
| 34 | FG | 0 | Prepared 14 | |
| | | 1 | | |

# 4. Service and Maintenance Record by 7-Segment Display

Customer's Name _____ DATE ____-____-____

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Outdoor Unit Model (Serial No. ) | | | (Serial No. ) | | | | | | (Serial No. ) | | | | | |
| (1)Operation Mode | | | | | | | | | | | | | | |
| (2)Test Run Start Time | | | | | | | | | | | | | | |
| (3)Data Collect Start Time | | | | | | | | | | | | | | |
| (4)Read Out Data from 7-Segment in Outdoor Unit | | | | | | | | | | | | | | |
| Protection Control Code | | | | | | | | | | | | | | |
| Checking Mode | Input/Output State of Outdoor Micro-Computer | SC | Y20A | Y21 | Y52C | Fan2 | Fan1 | YCH | Y20A | Y21 | Y52C | Fan2 | Fan1 | YCH |
| | | | | | | | | | | | | | | |
| | Total Capacity of Operating Indoor Unit | oP | | | | | | | | | | | | |
| | Control Software No. | SP | | | | | | | | | | | | |
| | Inverter Software No. | iP | | | | | | | | | | | | |
| | Fan controller Software No. | FP | | | | | | | | | | | | |
| | Inverter Order Frequency to Compressor | H1 | | | | | | | | | | | | |
| | Outdoor Fan Step | Fo | | | | | | | | | | | | |
| | Outdoor Expansion Valve Opening | Eo | | | | | | | | | | | | |
| | High Pressure (Discharge Pressure) | Pd. | | | | | | | | | | | | |
| | Low Pressure (Suction Pressure) | Ps. | | | | | | | | | | | | |
| | Discharge Temperature | Td | | | | | | | | | | | | |
| | Evaporating Temperature | TE | | | | | | | | | | | | |
| | Ambient Air Temperature | To | | | | | | | | | | | | |
| | Inverter Fin Temperature | TF | | | | | | | | | | | | |
| | Inverter Primary Current | A1 | | | | | | | | | | | | |
| | Inverter Secondary Current | A2 | | | | | | | | | | | | |
| | Checking for Indoor Unit: Indoor Unit Address | n- | | | | | | | | | | | | |
| | Checking for Indoor Unit: Indoor Expansion Valve Opening | E- | | | | | | | | | | | | |
| | Checking for Indoor Unit: Liquid Pipe Temperature of Indoor Unit | L- | | | | | | | | | | | | |
| | Checking for Indoor Unit: Gas Pipe Temperature of Indoor Unit | u- | | | | | | | | | | | | |
| | Checking for Indoor Unit: Indoor Unit Inlet Air Temperature | i- | | | | | | | | | | | | |
| | Checking for Indoor Unit: Indoor Unit Outlet Air Temperature | o- | | | | | | | | | | | | |
| | Checking for Indoor Unit: Cause Code of Indoor Unit Stoppage | d- | | | | | | | | | | | | |
| | Accumulated Operating Time of Compressor | UJ | | | | | | | | | | | | |
| | | cU | | | | | | | | | | | | |
| | Outdoor Unit Alarm Code | AC | | | | | | | | | | | | |
| | Cause Code of Inverter Stoppage | iT | | | | | | | | | | | | |
| | Cause Code of Fan Stoppage (Lower) | FT. | | | | | | | | | | | | |
| | Cause Code of Fan Stoppage (Upper) | F.T. | | | | | | | | | | | | |
| | Capacity of Indoor Unit(capacity DIP) | oC | | | | | | | | | | | | |
| | Total Capacity of Indoor Unit Connected | CP | | | | | | | | | | | | |
| | Connected Indoor Unit Number | AA | | | | | | | | | | | | |
| | Refrigerant Address | GA | | | | | | | | | | | | |

# Field Work Instructions

## 1. Caution for Refrigerant Leakage

Make sure that the entire VRF system meets the local codes, regarding Safety.

## 2. Modifications of Charging Refrigerants

The company' air conditioners are designed and manufactured based on using specified refrigerants. The applicable refrigerants are specified for each unit's models.

Using any refrigerants besides the specified refrigerants may cause mechanical problems, malfunction, and failure, and in the worst case, it endangers safety seriously and may cause a fire or an explosion. Therefore, do not charge non-specified refrigerants or any of the following in the refrigerant system of a unit.

- Hydrocarbon Refrigerants such as Propane
- Oxygen, or Flammable Gases such as Acetylene
- Poisonous Gases

The types of refrigerants are indicated in the Installation and Maintenance Manuals, Engineering Manuals, Service Manuals, and the specification label for each unit. Be aware that the company does not take any responsibility for unit failure, malfunction, or any accidents caused by charging non-specified refrigerants or others as noted above.

## 3. Maintenance Work

(1) For Outdoor Unit and Indoor Unit

(a) Fan and Fan Motor

- Lubrication - All fan motors are pre-lubricated and sealed at the factory. Therefore, no lubricating maintenance is required.
- Sound and Vibration - Inspect for abnormal sounds or vibration.
- Rotation - Check that the fan rotates counterclockwise and inspect the rotating speed.
- Insulation - Inspect for electrical insulation resistance.

(b) Heat Exchanger

- Clogging - Inspect for any accumulated dirt and dust and remove any at regular intervals. As foran outdoor unit, other obstacles such as growing grass and pieces of paper, which might intercept air flow, should also be removed.

(c) Piping Connection

- Leakage - Inspect for refrigerant leakage at piping connections.

(d) Cabinet

- Stain and Lubricant - Inspect for any stain or lubricant and remove it, if any.
- Securing Screw - Inspect for loose or missing screws and secure or replace as required.
- Insulation - Inspect for peeling thermal insulation material on the cabinet and repair it, if any.

(e) Electrical Equipment

- Activation - Inspect for abnormal activation of the magnetic contactor, auxiliary relay, or printed circuit board (PCB).

- Line Condition - Pay attention to working voltage, amperage and phase balance. Inspect for faulty contact caused by loosened terminal connections, oxidized contacts, foreign matter, and other items. Inspect for electrical insulation resistance.

(f) Control and Protective Devices

- Setting - Do not readjust the setting in the field.

(2) For Outdoor Unit Only

(a) Compressor

- Sound and Vibration - Inspect for abnormal sounds or vibration.
- Activation - Check that the voltage drop of the power supply line is within 16% at start and within 2% during operation.

(b) 4-Way valve

- Activation - Inspect for any abnormal activating sound.

(c) Strainer

- Clogging - Check that there is no temperature difference between the ends.

(d) Ground Wiring

- Ground Line - Inspect for continuity to the earth ground.

(e) Crankcase Heater

- Activation - Apply power to the outdoor unit(s) at least 12 hours prior to operation of the system for preheating of the compressor oil.

(3) For Indoor Unit Only

(a) Air Filter

- Cleaning - Inspect for, and remove, any accumulated dirt and dust and remove.

(b) Drain Pan, Condensate Mechanism and Condensate Pipe

- Drain Line - Inspect and clean the condensate line at least twice a year.
- Drain-Up Mechanism - Inspect for activation of drain-up mechanism.

(c) Float Switch

- Activation - Inspect for activation of float switch.

## 4. Service and Maintenance Record

| Model: | Serial No. | Compressor MFG No. |
|---|---|---|
| User name and address: | | Date: |

1. Is the rotation direction of the indoor unit fan correct?
2. Is the rotation direction of the outdoor unit fans correct?
3. Are there any abnormal compressor sounds?
4. Has the unit been in operation at least twenty (20) minutes?
5. Check Room Temperature

| | | | | |
|---|---|---|---|---|
| Inlet: | No.1 DB /WB °C, | No.2 DB /WB °C, | No.3 DB /WB °C, | No. 4 DB /WB °C |
| Outlet: | DB /WB °C, | DB /WB °C, | DB /WB °C, | DB /WB °C |
| Inlet: | No.5 DB /WB °C, | No.6 DB /WB °C, | No.7 DB /WB °C, | No.8 DB /WB °C |
| Outlet: | DB /WB °C, | DB /WB °C, | DB /WB °C, | DB /WB °C |

6. Check Outdoor Ambient Temperature:

Inlet: DB _____ °C, WB _____ °C

Outlet: DB _____ °C, WB _____ °C

7. Check Refrigerant Temperature:

Liquid Temperature: _____ °C

Discharge Temperature: _____ °C

8. Check Pressure:

Discharge Pressure: _____ MPa

Suction Pressure: _____ MPa

9. Check Voltage:

Rated Voltage: _____ V

Operating Voltage: L-N _____ V

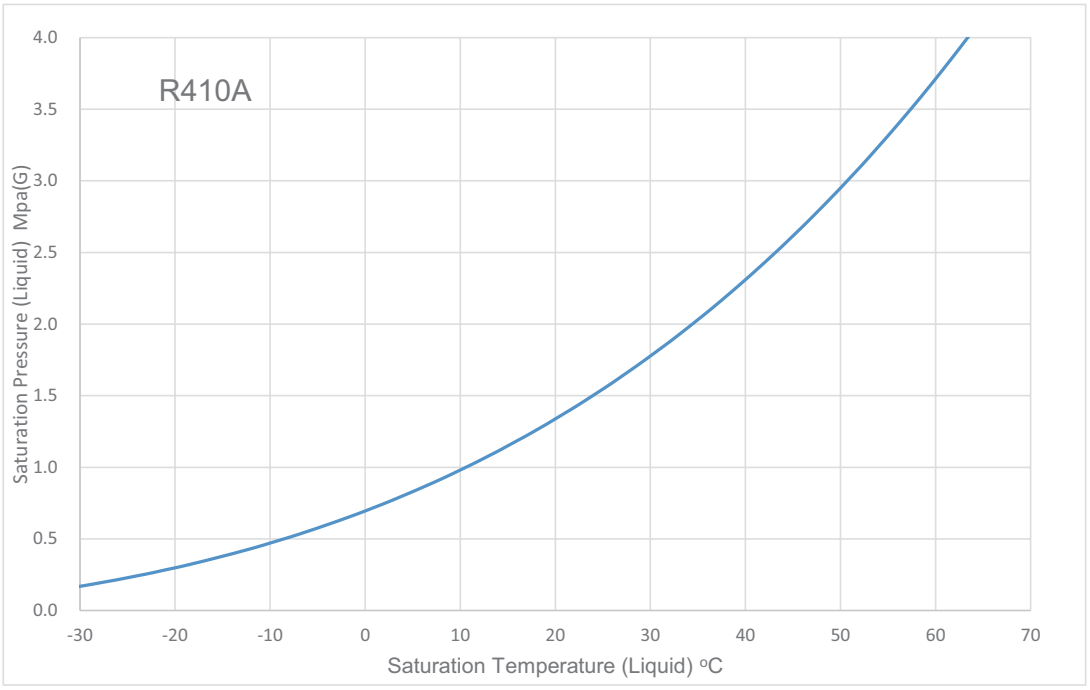
Starting Voltage: _____ V

10. Check the Input Running Current of the Compressor:

Running Current: _____ A

| | |
|---|---|
| 11. Is the refrigerant charge correct? | ☐ |
| 12. Do the operation control devices operate correctly? | ☐ |
| 13. Do the safety devices operate correctly? | ☐ |
| 14. Has the unit been checked for refrigerant leakage? | ☐ |
| 15. Is the unit clean inside and outside? | ☐ |
| 16. Are all cabinet panels mounted? | ☐ |
| 17. Are all cabinet panels free from rattles? | ☐ |
| 18. Is the indoor unit filter clean? | ☐ |
| 19. Are the indoor unit heat exchanger and outdoor unit heat exchanger clean? | ☐ |
| 20. Are the stop valves open? | ☐ |
| 21. Does the drain water flow smoothly from the drain pipe? | ☐ |

## 5. Saturation Curve for Refrigerant



# Service Parts List

## SERVICE PARTS LIST

| No. | Part Name | Replacement Part | | Remarks | Voltage 3φ 380~415V 50Hz Q'ty Per Unit | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Draw. No. | Part No. (Order No.) | | RAS-3.0HNBRMQ1 | RAS-3.5HNBRMQ1 | RAS-4.0HNBRMQ1 | RAS-4.5HNBRMQ1 | RAS-5.0HNBRMQ1 | RAS-6.0HNBRMQ1 | RAS-6.5HNBRMQ1 |
| U001A | PRESSURE SWITCH | H7C00447B | QU001004 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| U012A | PRESSURE SENSOR | H17B46257B | QU012009 | PD,CN100,0-5.0Mpa/DC0.5-4.5V | 1 | 1 | | | | | |
| U012A | PRESSURE SENSOR | H17B46257C | QU012017 | PD,CN100,0-5.0Mpa/DC0.5-4.5V | | | 1 | 1 | 1 | 1 | 1 |
| U012B | PRESSURE SENSOR | H17B47112A | QU012016 | PS,CN101,0-2.0Mpa/DC0.5-4.5V | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| U013A | TERMINAL BOARD | H7C00002A | QU013022 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| U013B | TERMINAL BOARD | H7D09829A | QU013045 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| U015AB | THERMISTOR | H7B00030C | QU015011 | Tel,THM8, R50=3.597kΩ±3% B25/50=3950K±2% | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| U015AL | THERMISTOR | H7B00029E | QU015026 | THM9, DISCHARGE | 1 | 1 | | | | | |
| U015AL | THERMISTOR | H7B00029A | QU015009 | Td,THM9, R25=200kΩ±5% B25/50=3920K±2% | | | 1 | 1 | 1 | 1 | 1 |
| U015C | THERMISTOR | H7B00032B | QU015025 | Ta,THM7, R25=10kΩ±3% B25/50=3950K±3% | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| U021J | EXPANSION VALVE | 17C78465A | QU021007 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| U028K | CHECK JOINT | H7C01396B | QU096001 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| U030C | STRAINER | H17G62701B | QU030010 | | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| U030K | STRAINER | H17G55723A | QU030007 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| U034 | PROTECTION NET | H7D10106A | | | 1 | 1 | | | | | |
| U034 | PROTECTION NET | H7D10108A | | | | | 1 | 1 | 1 | 1 | 1 |
| U040 | HEAT EXCHANGER | H7D10015A | | | 1 | 1 | | | | | |
| U040 | HEAT EXCHANGER | H7D10017A | | | | | 1 | 1 | 1 | | |
| U040 | HEAT EXCHANGER | H7D10018A | | | | | | | | 1 | 1 |
| U042Q | CHECK VALVE | H7D00022A | QU042003 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| U051 | PROPELLER FAN | H7A03833C | QU051009 | | 1 | 1 | 2 | 2 | 2 | 2 | 2 |
| U055 | OIL SEPARATOR | H7C05804A | QU055016 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| U071 | FAN MOTOR | H7D09824B | QU071139 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| U071A | FAN MOTOR | H7D09824A | QU071140 | | | | 1 | 1 | 1 | 1 | 1 |
| U077G | SOLENOID VALVE | H7C01910A | QU077007 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| U078 | OIL HEATER | H7C05802A | QU078036 | | 1 | 1 | | | | | |
| U078 | OIL HEATER | H7C05802C | QU078037 | | | | 1 | 1 | 1 | 1 | 1 |
| U081 | REVERSING VALVE | H7C04171A | QU081021 | | 1 | 1 | | | | | |
| U081 | REVERSING VALVE | H7C03985A | QU081002 | | | | 1 | 1 | 1 | 1 | 1 |
| U089 | ACCUMULATOR | H7C05805A | QU089036 | | 1 | 1 | | | | | |
| U089 | ACCUMULATOR | H7C05807A | QU089024 | | | | 1 | 1 | 1 | 1 | 1 |
| U108 | EXTENSION PCBA | H7C05657A | QU108004 | SPB-001-A | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| U206 | SIDE COVER | H7C05988A | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| U206C | SIDE COVER | H7C05990A | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| U207 | SIDE COVER ASSY- LEFT | H7D11701A | | | 1 | 1 | | | | | |
| U207 | SIDE COVER ASSY- LEFT | H7D11702A | | | | | 1 | 1 | 1 | 1 | 1 |
| U209 | FRONT COVER ASSY | H7D13348A | | | 1 | 1 | | | | | |
| U209 | FRONT COVER ASSY | H7C06792A | | | | | 1 | 1 | 1 | 1 | 1 |
| U210 | UPPER COVER ASSY | H7D11700A | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| U211 | SERVICE COVER ASSY | H7C06320A | | | 1 | 1 | | | | | |
| U211 | SERVICE COVER ASSY | H7C06321A | | | | | 1 | 1 | 1 | 1 | 1 |

## SERVICE PARTS LIST

| No. | Part Name | Replacement Part | | Remarks | Voltage: 3φ 380~415V 50Hz — Q'ty Per Unit | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Draw. No. | Part No. (Order No.) | | RAS-3.0HNBRMQ1 | RAS-3.5HNBRMQ1 | RAS-4.0HNBRMQ1 | RAS-4.5HNBRMQ1 | RAS-5.0HNBRMQ1 | RAS-6.0HNBRMQ1 | RAS-6.5HNBRMQ1 |
| U212 | MOTOR BRACKET | H7D10766A | | | 1 | 1 | | | | | |
| U212 | MOTOR BRACKET | H7D10767A | | | | | 1 | 1 | 1 | | |
| U212 | MOTOR BRACKET | H7D10767B | | | | | | | | 1 | 1 |
| U213 | FAN GUARD | H7A04627A | | | 1 | 1 | 2 | 2 | 2 | 2 | 2 |
| U238 | SIDE COVER ASSY- RIGHT | H7C06318A | | | 1 | 1 | | | | | |
| U238 | BACK COVER ASSY | H7C06319A | | | | | 1 | 1 | 1 | 1 | 1 |
| U303F | SOLENOID VALVE COIL | H7C01911A | QU303007 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| U304 | REVERSING VALVE COIL | H7D09826A | QU304003 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| U305C | EXPANSION VALVE COIL | 17C78180A | QU021019 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| U311 | COMPRESSOR | H7B04846A | QU311018 | ATL232SDNC9AUY | 1 | 1 | | | | | |
| U311 | COMPRESSOR | H7B02183B | QU311019 | ATH356SDPC9FQ-HITACHI | | | 1 | 1 | 1 | | |
| U311 | COMPRESSOR | H7B04848A | QU311022 | ATH420SDPC9EQ | | | | | | 1 | 1 |
| U318 | STOP VALVE | H7C00434B | QU027009 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| U320 | STOP VALVE | H7C00436A | QU027010 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| U405 | MAIN PCBA | H7C05653C | QU407010 | IMB-001-045B-AC AC690V 40A | 1 | 1 | | | | | |
| U405 | MAIN PCBA | H7C05653D | QU407011 | IMB-001-065B-AD AC690V 50A | | | 1 | 1 | 1 | 1 | 1 |
| U410 | PRINTED CIRCUIT BOARD | H7C05659A | QU410001 | DRV-001-002-A | | | 1 | 1 | 1 | 1 | 1 |
| U411 | REACTOR | H7C06205A | QU411001 | RCT-003-065B-A | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

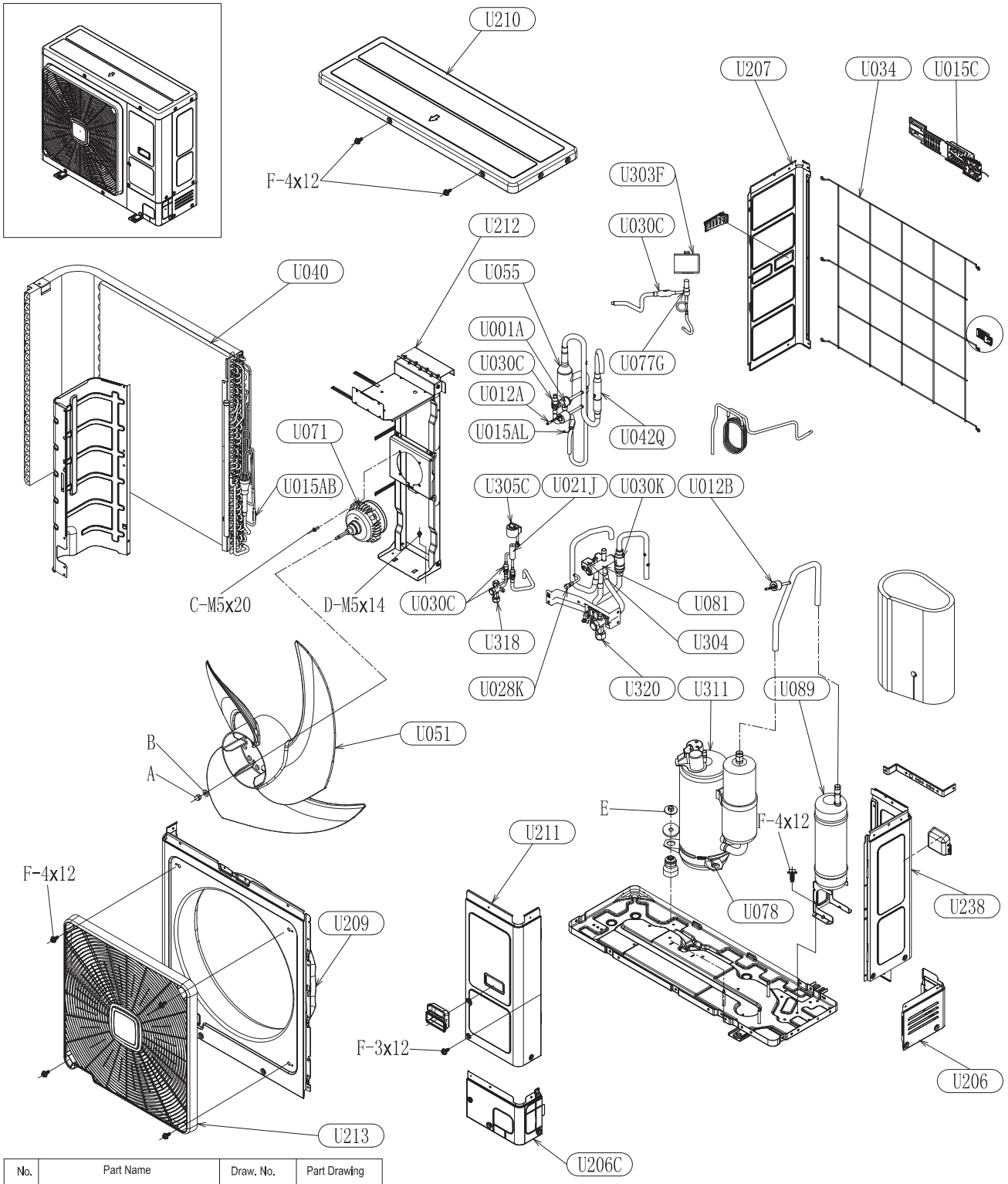
NOTE:

The parts without the order numbers are the custom-ordered, and these are not included in the price list provided by us. When ordering them, the part name and the drawing number are required.

Some parts may take longer time to deliver. Contact your distributor for details such as delivery date or price etc.

Location Map of Repair Parts in Outdoor Unit

Model:
RAS-3.0HNBRKQ1
RAS-3.5HNBRKQ1




| No. | Part Name | Draw. No. | Part Drawing |
|---|---|---|---|
| A | Cap Nut | 17D50034B | |
| B | Washer | 01VF0800 | |
| C | Cross Recess Pan Head Screw | 453H0520 | |
| D | Cross Recess Pan Head Screw | 453H0514 | |
| E | Hexagon Flange Nut | 17D49475A | |
| F | Cross Recess Hexagon Screw(Other) | 17G24763A | |

NOTE
A protective coating like zinc is applied to iron and steel for unspecified materials like a bolt or screw.

NOTE
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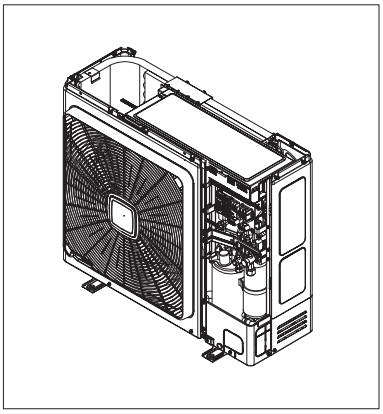
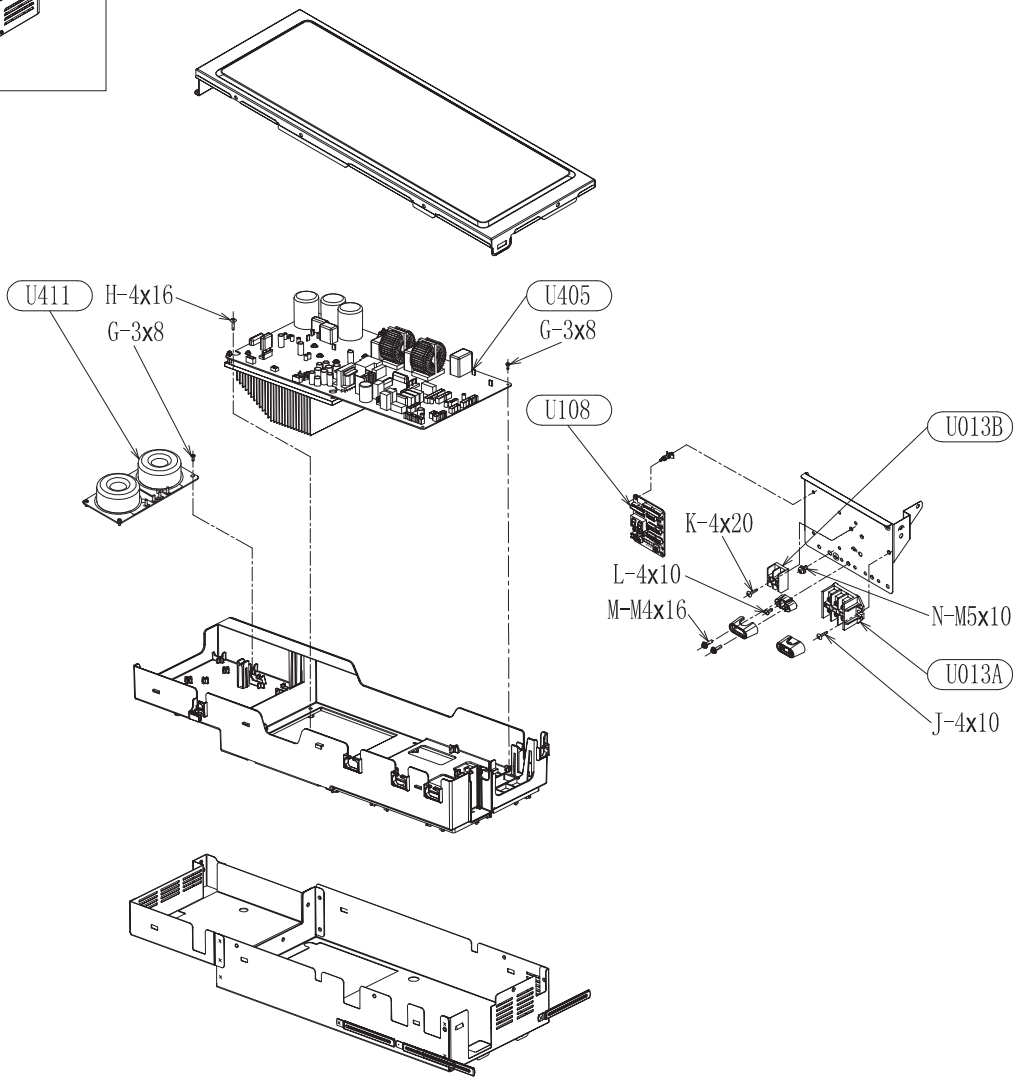
Location Map of Repair Parts in Electrical Box

Model:
RAS-3.0HNBRKQ1
RAS-3.5HNBRKQ1






| No. | Part Name | Drawing No. | Part Drawing |
|---|---|---|---|
| G | Cross Recess Pan Head Screw | 53CB0308 | |
| H | Cross Recess Pan Head Screw | 51CB0416 | |
| J | Cross Recess Pan Head Screw | 51CB0410 | |
| K | Cross Recess Pan Head Screw | 53CB0420 | |
| L | Cross Recess Pan Head Screw | 53CB0410 | |
| M | Cross Recess Pan Head Screw | 453H0416 | |
| N | Cross Recess Pan Head Screw | 453H0510 | |

NOTE
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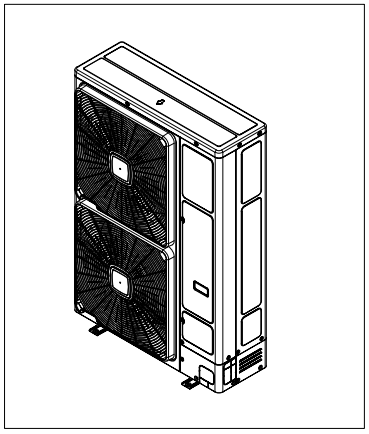
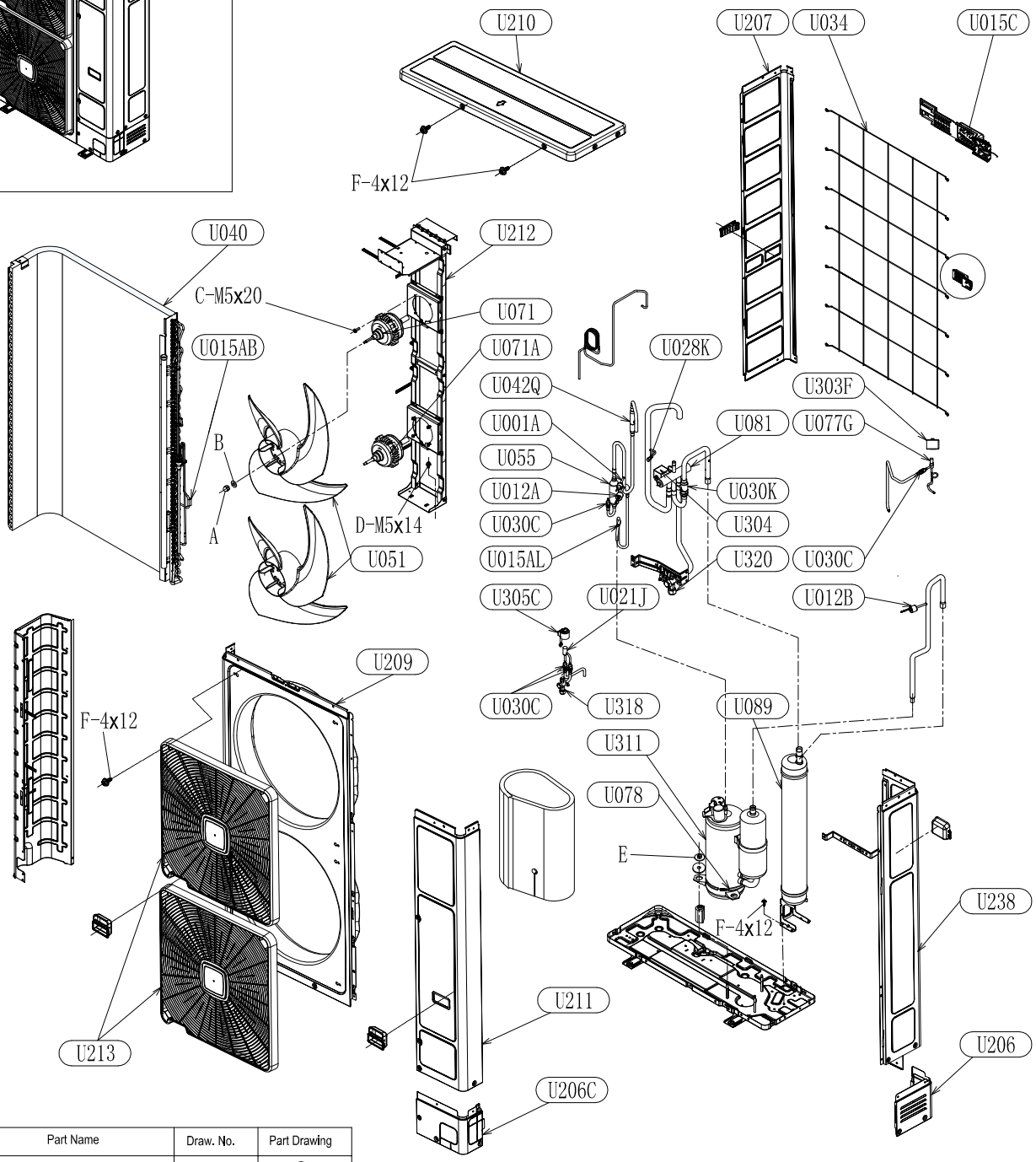
Location Map of Repair Parts in Outdoor Unit

Model:

RAS-4.0HNBRKQ1
RAS-4.5HNBRKQ1
RAS-5.0HNBRKQ1






| No. | Part Name | Draw. No. | Part Drawing |
|---|---|---|---|
| A | Cap Nut | 17D50034B | |
| B | Washer | 01VF0800 | |
| C | Cross Recess Pan Head Screw | 453H0520 | |
| D | Cross Recess Pan Head Screw | 453H0514 | |
| E | Hexagon Flange Nut | 17D49475A | |
| F | Cross Recess Hexagon Screw(Other) | 17G24763A | |

NOTE
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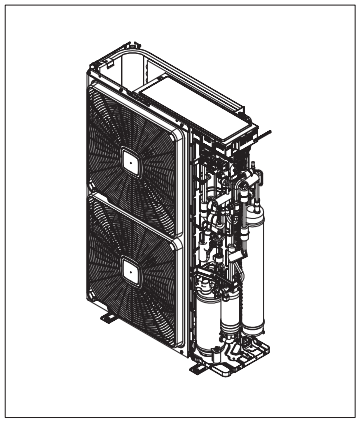
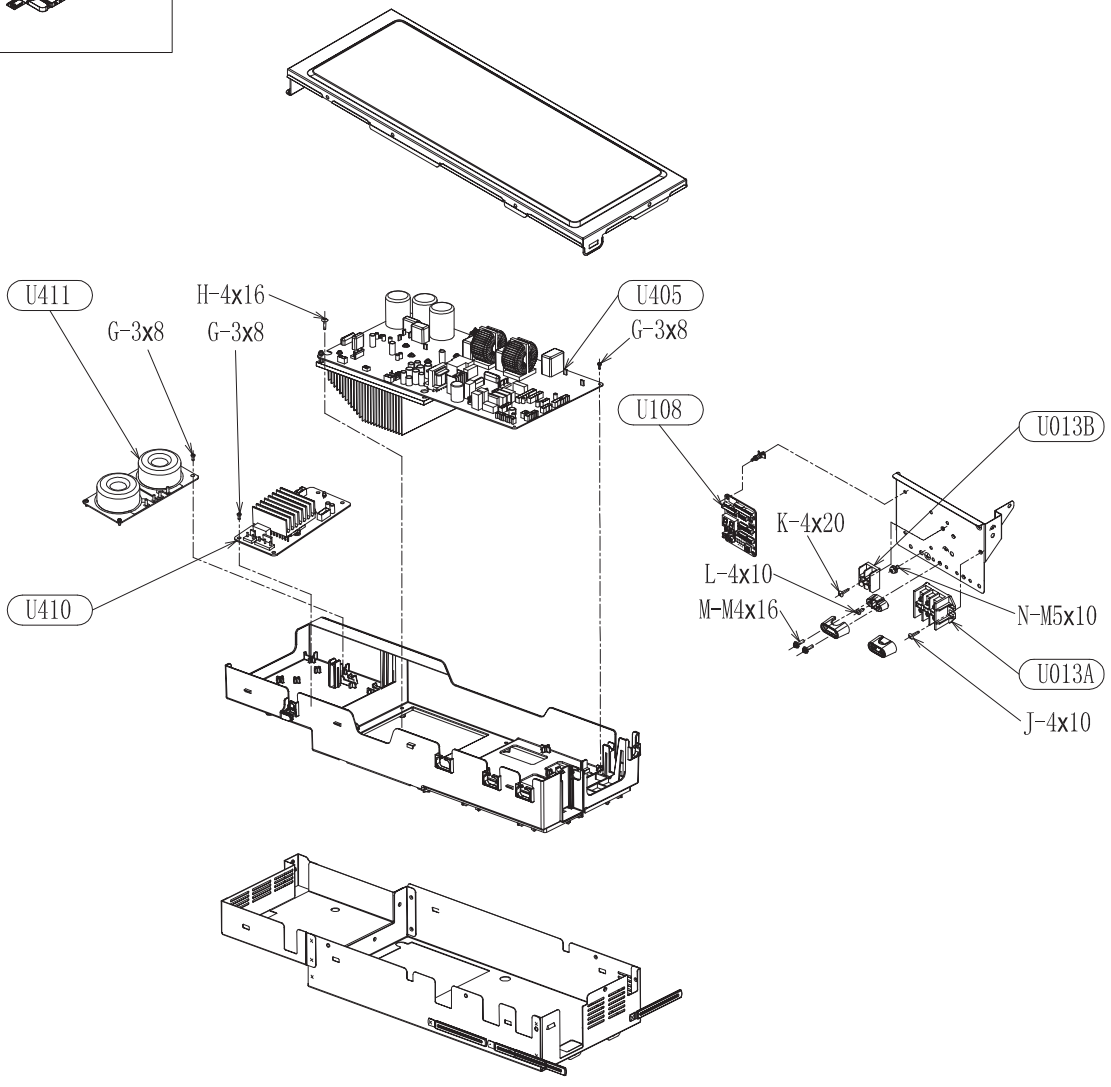
Location Map of Repair Parts in Electrical Box

Model:

RAS-4.0HNBRKQ1
RAS-4.5HNBRKQ1
RAS-5.0HNBRKQ1






| No. | Part Name | Draw. No. | Part Drawing |
|---|---|---|---|
| G | Cross Recess Pan Head Screw | 53CB0308 | |
| H | Cross Recess Pan Head Screw | 51CB0416 | |
| J | Cross Recess Pan Head Screw | 51CB0410 | |
| K | Cross Recess Pan Head Screw | 53CB0420 | |
| L | Cross Recess Pan Head Screw | 53CB0410 | |
| M | Cross Recess Pan Head Screw | 453H0416 | |
| N | Cross Recess Pan Head Screw | 453H0510 | |

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NOTE
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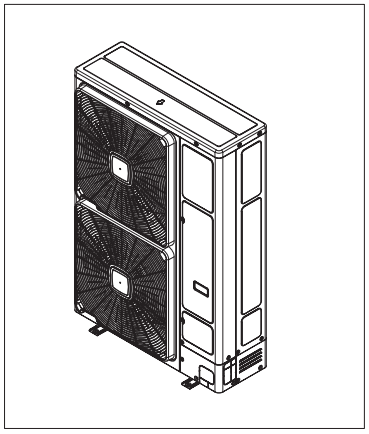
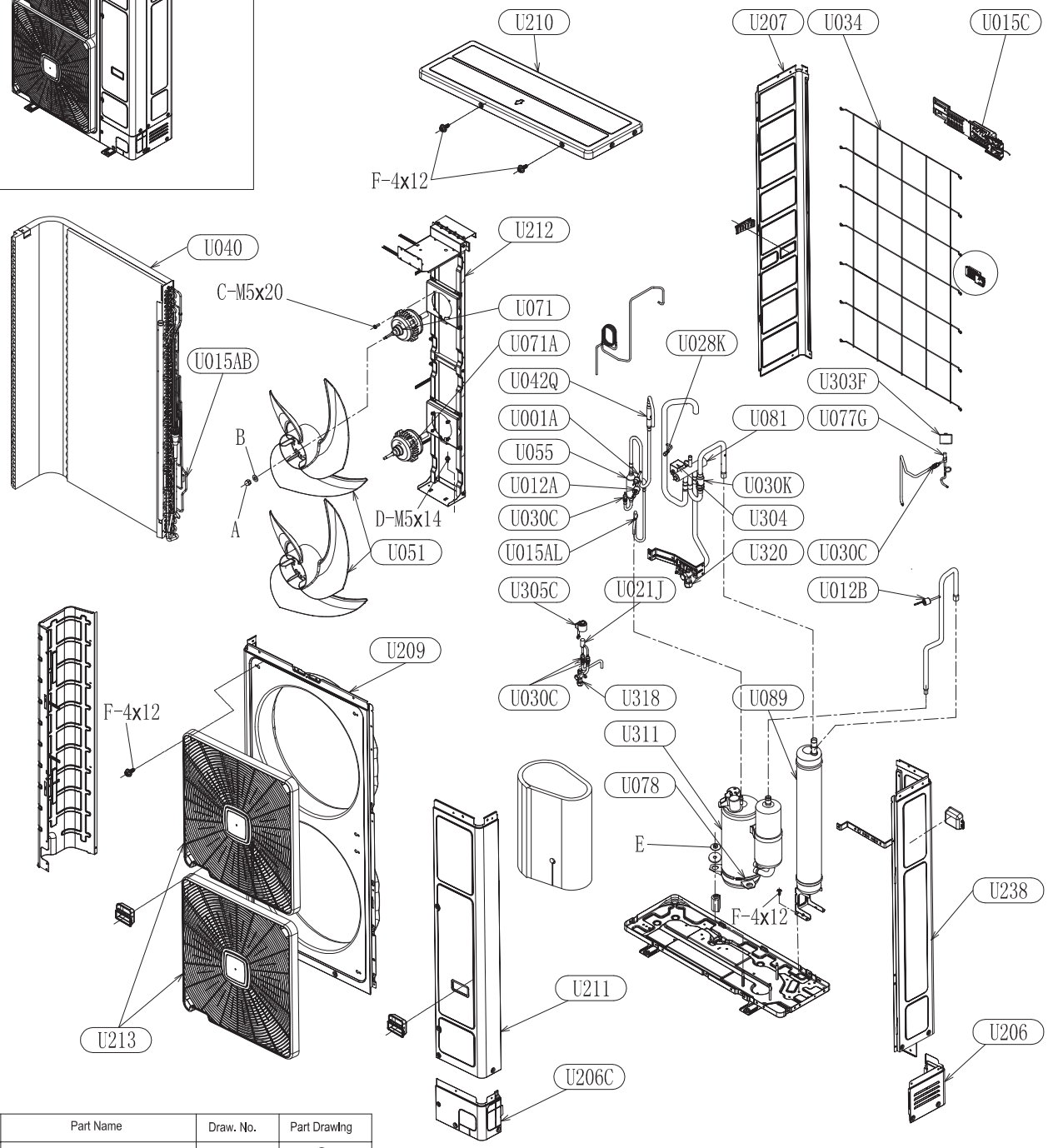
Location Map of Repair Parts in Outdoor Unit

Model:

RAS-6.0HNBRKQ1
RAS-6.5HNBRKQ1






| No. | Part Name | Draw. No. | Part Drawing |
|---|---|---|---|
| A | Cap Nut | 17D50034B | |
| B | Washer | 01VF0800 | |
| C | Cross Recess Pan Head Screw | 453H0520 | |
| D | Cross Recess Pan Head Screw | 453H0514 | |
| E | Hexagon Flange Nut | 17D49475A | |
| F | Cross Recess Hexagon Screw(Other) | 17G24763A | |

NOTE
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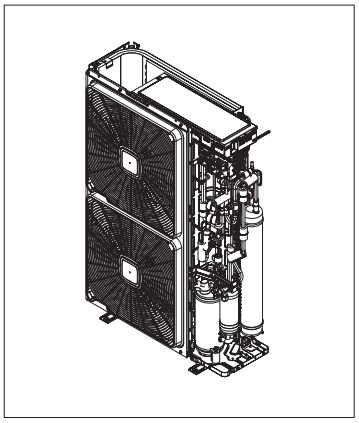
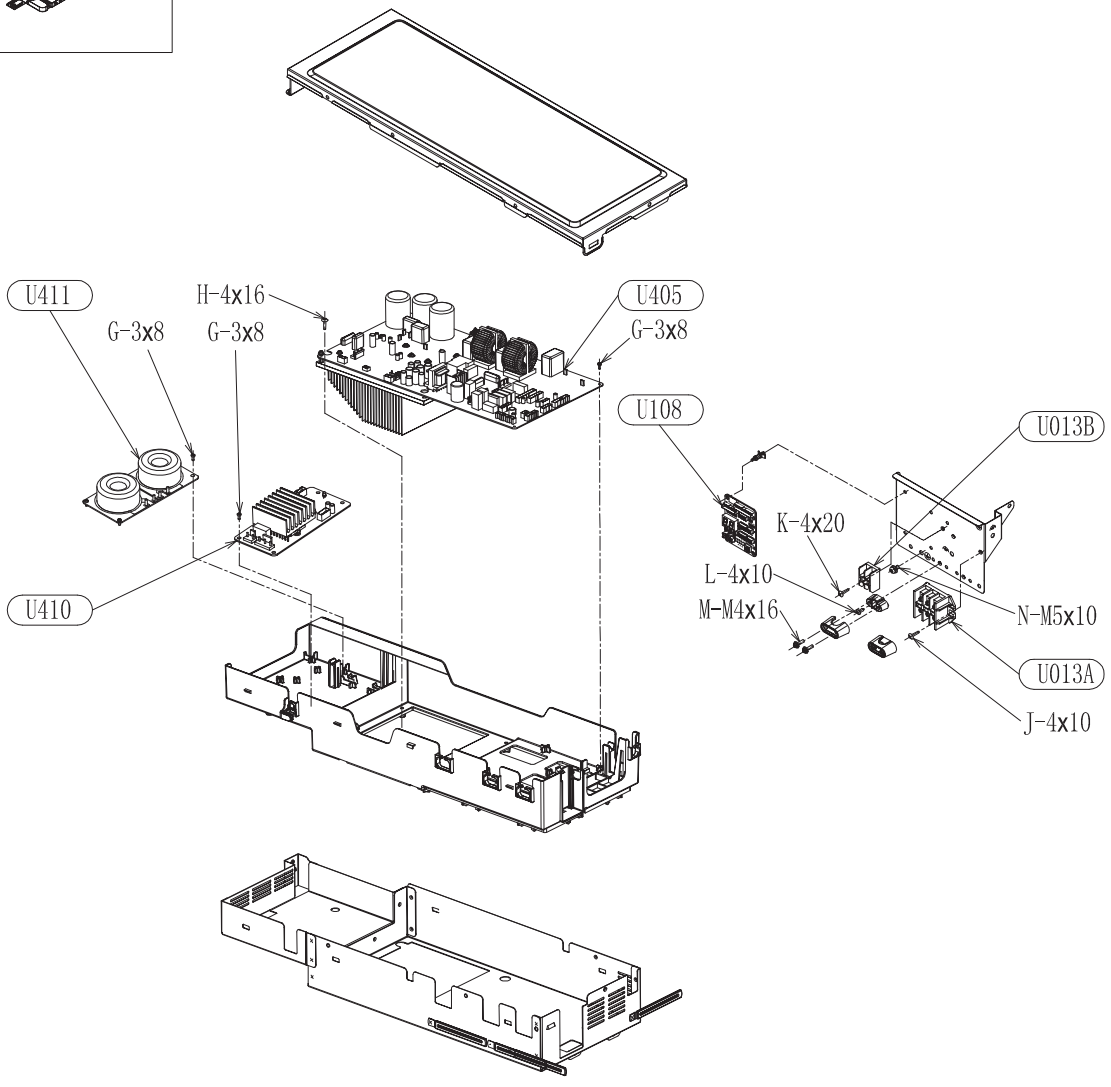
Location Map of Repair Parts in Electrical Box

Model:
RAS-6.0HNBRKQ1
RAS-6.5HNBRKQ1






| No. | Part Name | Draw. No. | Part Drawing |
|---|---|---|---|
| G | Cross Recess Pan Head Screw | 53CB0308 | |
| H | Cross Recess Pan Head Screw | 51CB0416 | |
| J | Cross Recess Pan Head Screw | 51CB0410 | |
| K | Cross Recess Pan Head Screw | 53CB0420 | |
| L | Cross Recess Pan Head Screw | 53CB0410 | |
| M | Cross Recess Pan Head Screw | 453H0416 | |
| N | Cross Recess Pan Head Screw | 453H0510 | |

NOTE
A protective coating like zinc is applied to iron and steel for unspecified materials like a bolt or screw.

NOTE
The parts without the order numbers are the custom-ordered, and these are not included in the price list provided by us. When ordering them, the part name and the drawing number are required.
Some parts may take longer time to deliver. Contact your distributor for details such as delivery date or price etc.

| No. | Part Name | Replacement Part | | Remarks | Voltage: 3φ 380~415V 50Hz — Q'ty Per Unit | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Draw. No. | Part No. (Order No.) | | RAS-7.0HNBRMQ1 | RAS-8.0HNBRMQ1 | RAS-10HNBRMQ1 | RAS-11HNBRMQ1 | RAS-12HNBRMQ1 |
| U001A | PRESSURE SWITCH | H7C00447B | QU001004 | | 1 | 1 | 1 | 1 | 1 |
| U012A | HIGH PRESSURE SENSOR | H17B46257B | QU012009 | PD,CN100,0-5.0Mpa/DC0.5-4.5V | 1 | 1 | 1 | 1 | 1 |
| U012B | LOW PRESSURE SENSOR | 17B47112B | QU012010 | | 1 | 1 | 1 | 1 | 1 |
| U013A | TERMINAL BOARD | H7C00614A | QU013012 | | 1 | 1 | 1 | 1 | 1 |
| U015C | THERMISTOR | H7B00032B | QU015025 | Ta,THM7,<br>R25=10kΩ±3%<br>B25/50=3950K±3% | 1 | 1 | 1 | 1 | 1 |
| U015AB | THERMISTOR | H7B00030C | QU015011 | Tel,THM8,<br>R50=3.597kΩ±3%<br>B25/50=3950K±2% | 1 | 1 | 1 | 1 | 1 |
| U015AK | THERMISTOR | H7B00029E | QU015026 | THM9, DISCHARGE | 1 | 1 | 1 | 1 | 1 |
| U021K | EXPANSION VALVE | 17C78181A | QU021010 | | 1 | 1 | 1 | 1 | 1 |
| U028F | CHECK JOINT | H7C00441B | QU028004 | | 1 | 1 | 1 | 1 | 1 |
| U030B | STRAINER | H17G62701A | QU030005 | | 2 | 2 | 2 | 2 | 2 |
| U030G | STRAINER | H17G56584B | QU030009 | | 2 | 2 | 2 | 2 | 2 |
| U030K | STRAINER | H17G55723A | QU030007 | | 1 | 1 | 1 | 1 | 1 |
| U034 | PROTECTION NET | H7C00561B | | | 1 | 1 | 1 | 1 | 1 |
| U040A | HEAT EXCHANGER | H7C05724A | | | 1 | 1 | | | |
| U040A | HEAT EXCHANGER | H7C05726A | | | | | 1 | 1 | 1 |
| U040B | HEAT EXCHANGER | H7C05719A | | | 1 | 1 | | | |
| U040B | HEAT EXCHANGER | H7C05721A | | | | | 1 | 1 | 1 |
| U042U | CHECK VALVE | H7C01709A | QU042001 | | 1 | 1 | 1 | 1 | 1 |
| U051 | PROPELLER FAN | H7A03833C | QU051009 | | 2 | 2 | 2 | 2 | 2 |
| U055 | OIL SEPARATOR | H7C04486A | QU055007 | | 1 | 1 | 1 | 1 | 1 |
| U071 | FAN MOTOR | H7D09834B | QU071143 | | 1 | 1 | 1 | 1 | 1 |
| U071A | FAN MOTOR | H7D09834A | QU071144 | | 1 | 1 | 1 | 1 | 1 |
| U077H | SOLENOID VALVE | 17C77098A | QU077003 | | 1 | 1 | 1 | 1 | 1 |
| U078 | OIL HEATER | H7D11127B | QU076011 | | 1 | 1 | | | |
| U078 | OIL HEATER | H7D11127A | QU076010 | | | | 1 | 1 | 1 |
| U081 | REVERSING VALVE | H7C03986A | QU081003 | | 1 | 1 | 1 | 1 | 1 |
| U089 | ACCUMULATOR | H7C06211A | QU089037 | | 1 | 1 | 1 | 1 | 1 |
| U101 | PRINTED CIRCUIT BOARD | H7D09835A | QU410002 | | 1 | 1 | 1 | 1 | 1 |
| U103 | NOISE FILTER | H7D10628A | QU103023 | | 1 | 1 | 1 | 1 | 1 |
| U108 | REACTANCE | H7D10629A | QU412005 | | 1 | 1 | 1 | 1 | 1 |
| U206 | SIDE COVER | H7B05738A | | | 1 | 1 | 1 | 1 | 1 |
| U206C | SIDE COVER | H7B05737A | | | 1 | 1 | 1 | 1 | 1 |
| U207 | SIDE COVER - LEFT | H7A04623A | | | 1 | 1 | 1 | 1 | 1 |
| U208 | SIDE COVER - RIGHT | H7A04626A | | | 1 | 1 | 1 | 1 | 1 |
| U209 | FRONT COVER | H7A04624A | | | 1 | 1 | 1 | 1 | 1 |
| U210 | UPPER COVER | H7A04622A | | | 1 | 1 | 1 | 1 | 1 |
| U211 | SERVICE COVER | H7A01014B | | | 1 | 1 | 1 | 1 | 1 |
| U212 | MOTOR BRACKET | H7D10376A | | | 2 | 2 | 2 | 2 | 2 |
| U213 | FAN GUARD | H7A04627A | | | 2 | 2 | 2 | 2 | 2 |
| U214 | FAN GUARD | H7A04647A | | | 2 | 2 | 2 | 2 | 2 |
| U303K | SOLENOID VALVE COIL | 17C64850B | QU077005 | | 1 | 1 | 1 | 1 | 1 |

## SERVICE PARTS LIST

| No. | Part Name | Replacement Part | | Remarks | Voltage: 3φ 380~415V 50Hz — Q'ty Per Unit | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Draw. No. | Part No. (Order No.) | | RAS-7.0HNBRMQ1 | RAS-8.0HNBRMQ1 | RAS-10HNBRMQ1 | RAS-11HNBRMQ1 | RAS-12HNBRMQ1 |
| U304 | REVERSING VALVE COIL | H7D09826A | QU304003 | | 1 | 1 | 1 | 1 | 1 |
| U305C | EXPANSION VALVE COIL | 17C78180A | QU021019 | | 1 | 1 | 1 | 1 | 1 |
| U311 | COMPRESSOR | H7C06209A | QU311027 | AA50PHDG-D1S2 | 1 | 1 | | | |
| U311 | COMPRESSOR | H7C06208A | QU311028 | DC65PHDG-D1S2 | | | 1 | 1 | 1 |
| U318 | STOP VALVE 3/8 | H7C00434A | QU027003 | | 1 | 1 | | | |
| U319 | STOP VALVE 1/2 | H7C00435A | QU027004 | | | | 1 | 1 | 1 |
| U321 | STOP VALVE 3/4 | H7C03201A | QU027012 | | 1 | 1 | 1 | 1 | 1 |
| U405 | MAIN PCBA | H7B04866B | QU409040 | PO141W | 1 | 1 | 1 | 1 | 1 |
| U406 | PRINTED CIRCUIT BOARD | H7C05661A | QU407006 | DRV-180A-A | 1 | 1 | | | |
| U406 | PRINTED CIRCUIT BOARD | H7C05661B | QU407007 | DRV-180B-A | | | 1 | 1 | 1 |

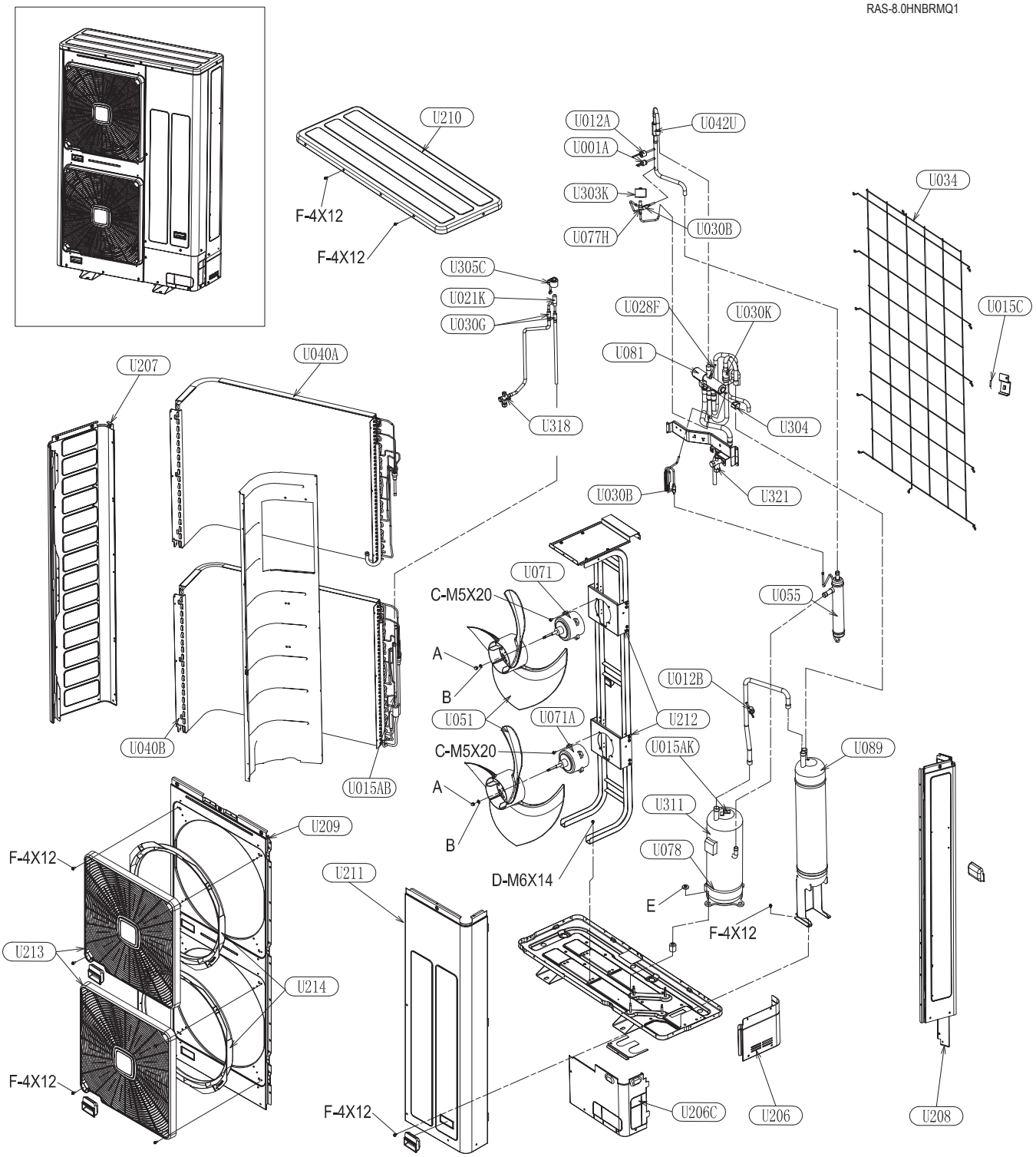
NOTE:

The parts without the order numbers are the custom-ordered, and these are not included in the price list provided by us. When ordering them, the part name and the drawing number are required.

Some parts may take longer time to deliver. Contact your distributor for details such as delivery date or price etc.

Location Map of Repair Parts in Outdoor Unit

Model:
RAS-7.0HNBRMQ1
RAS-8.0HNBRMQ1




| No. | Part Name | Draw. No. | Part Drawing |
|---|---|---|---|
| A | Cap Nut | 17D50034B | |
| B | Washer | 01VF0800 | |
| C | Cross Recess Pan Head Screw | 453H0520 | |
| D | Cross Recess Pan Head Screw | 453H0614 | |
| E | Hexagon Flange Nut | 17D49475A | |
| F | Cross Recess Hexagon Screw(Other) | 17G24763A | |

NOTE
A protective coating like zinc is applied to iron and steel for unspecified materials like a bolt or screw.

NOTE
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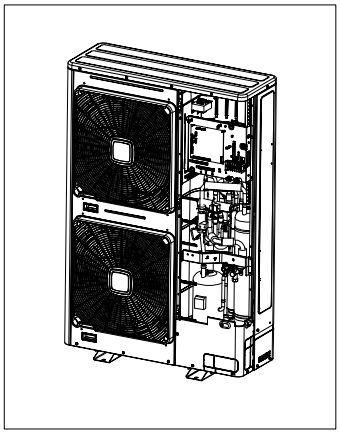
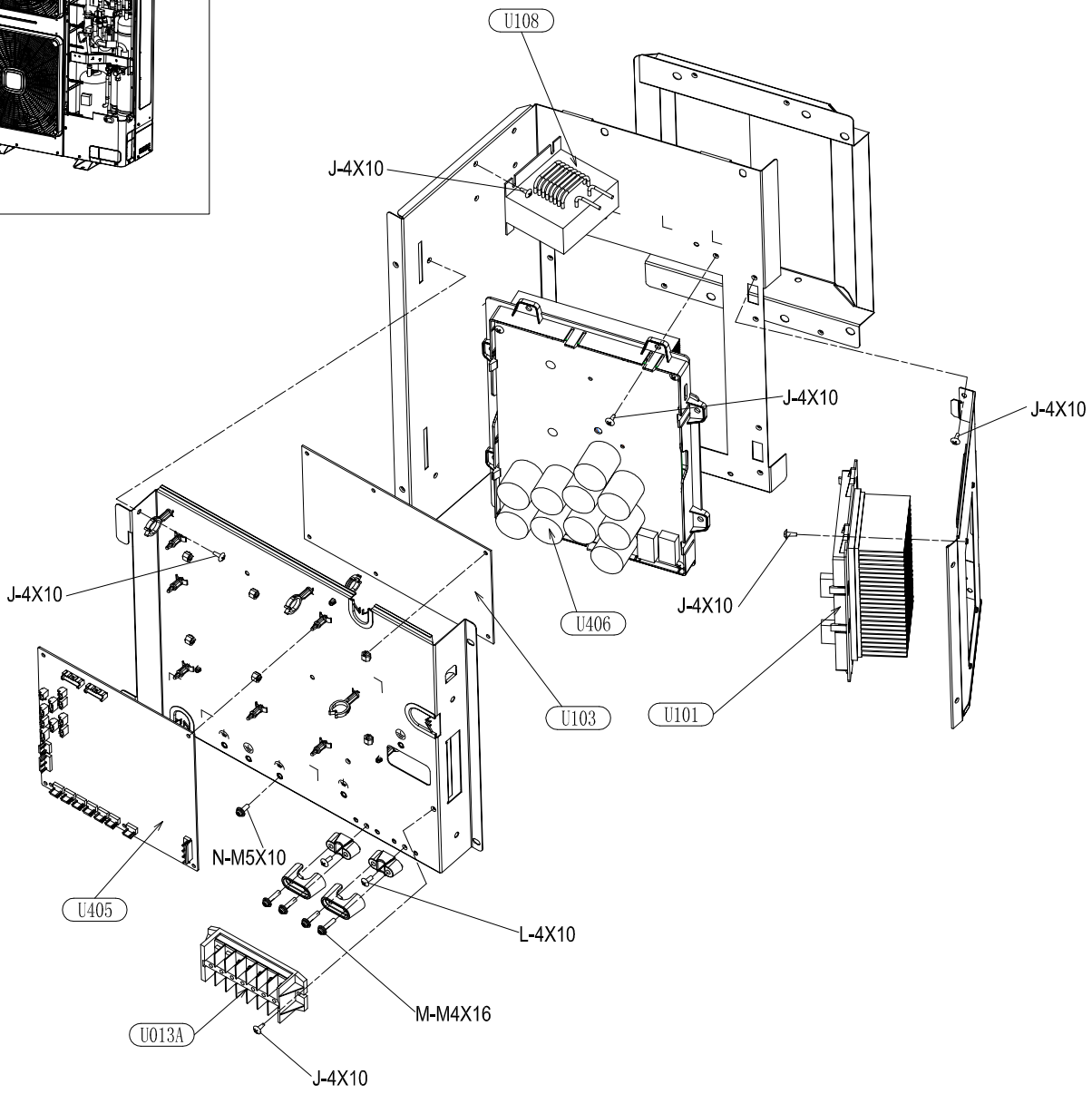
Location Map of Repair Parts in Electrical Box

Model:
RAS-7.0HNBRMQ1
RAS-8.0HNBRMQ1






| No. | Part Name | Draw. No. | Part Drawing |
|---|---|---|---|
| G | Cross Recess Pan Head Screw | 53CB0308 | |
| H | Cross Recess Pan Head Screw | 51CB0416 | |
| J | Cross Recess Pan Head Screw | 51CB0410 | |
| K | Cross Recess Pan Head Screw | 53CB0420 | |
| L | Cross Recess Pan Head Screw | 53CB0410 | |
| M | Cross Recess Pan Head Screw | 453H0416 | |
| N | Cross Recess Pan Head Screw | 453H0510 | |

NOTE
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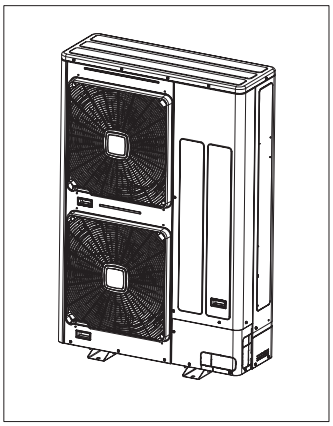
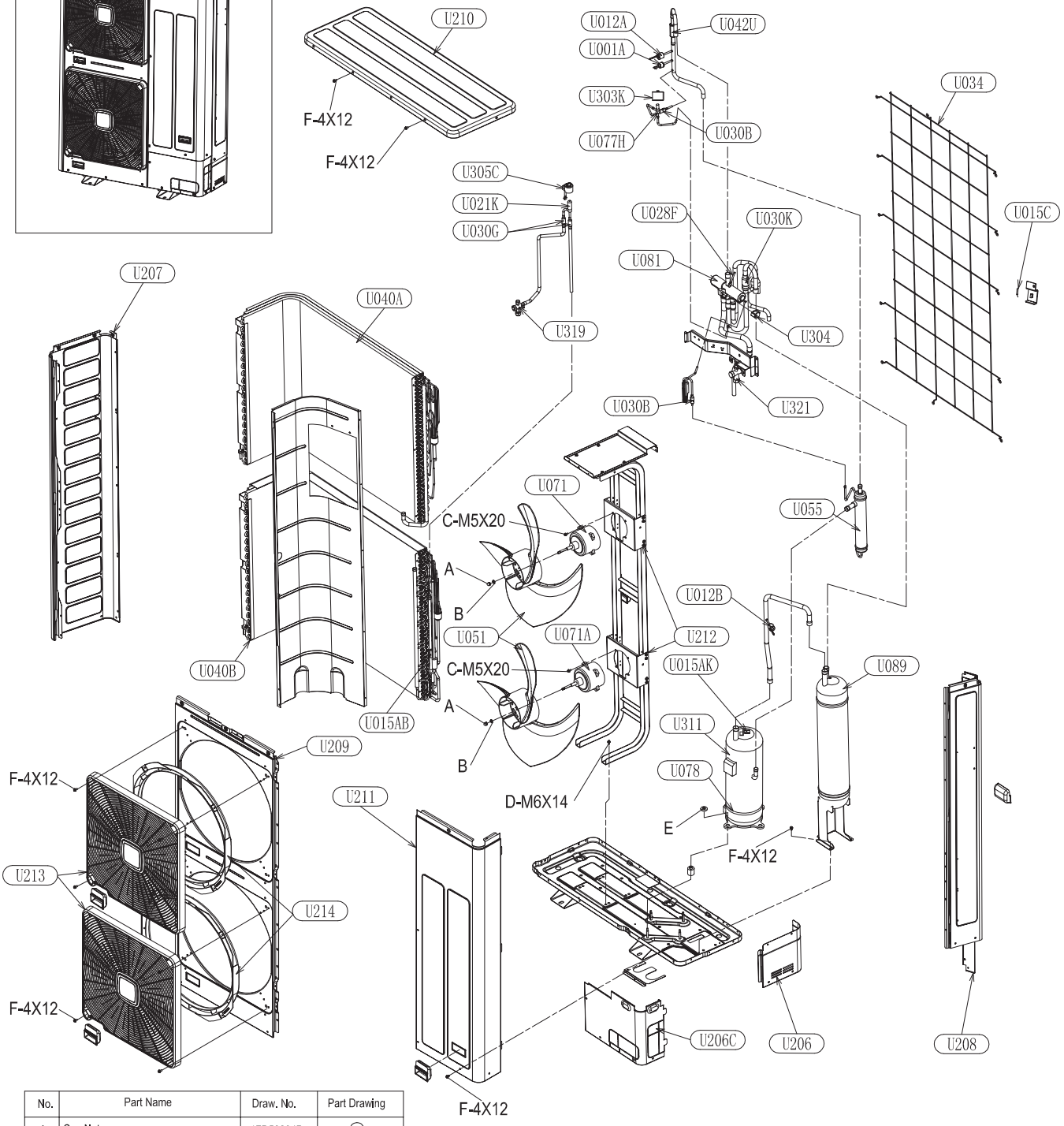
Location Map of Repair Parts in Outdoor Unit

Model:
RAS-10HNBRMQ1
RAS-11HNBRMQ1
RAS-12HNBRMQ1






| No. | Part Name | Draw. No. | Part Drawing |
|---|---|---|---|
| A | Cap Nut | 17D50034B | |
| B | Washer | 01VF0800 | |
| C | Cross Recess Pan Head Screw | 453H0520 | |
| D | Cross Recess Pan Head Screw | 453H0614 | |
| E | Hexagon Flange Nut | 17D49475A | |
| F | Cross Recess Hexagon Screw(Other) | 17G24763A | |

NOTE
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NOTE
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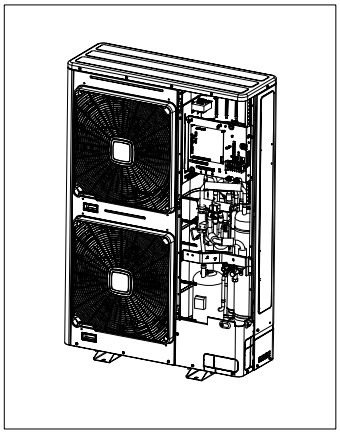
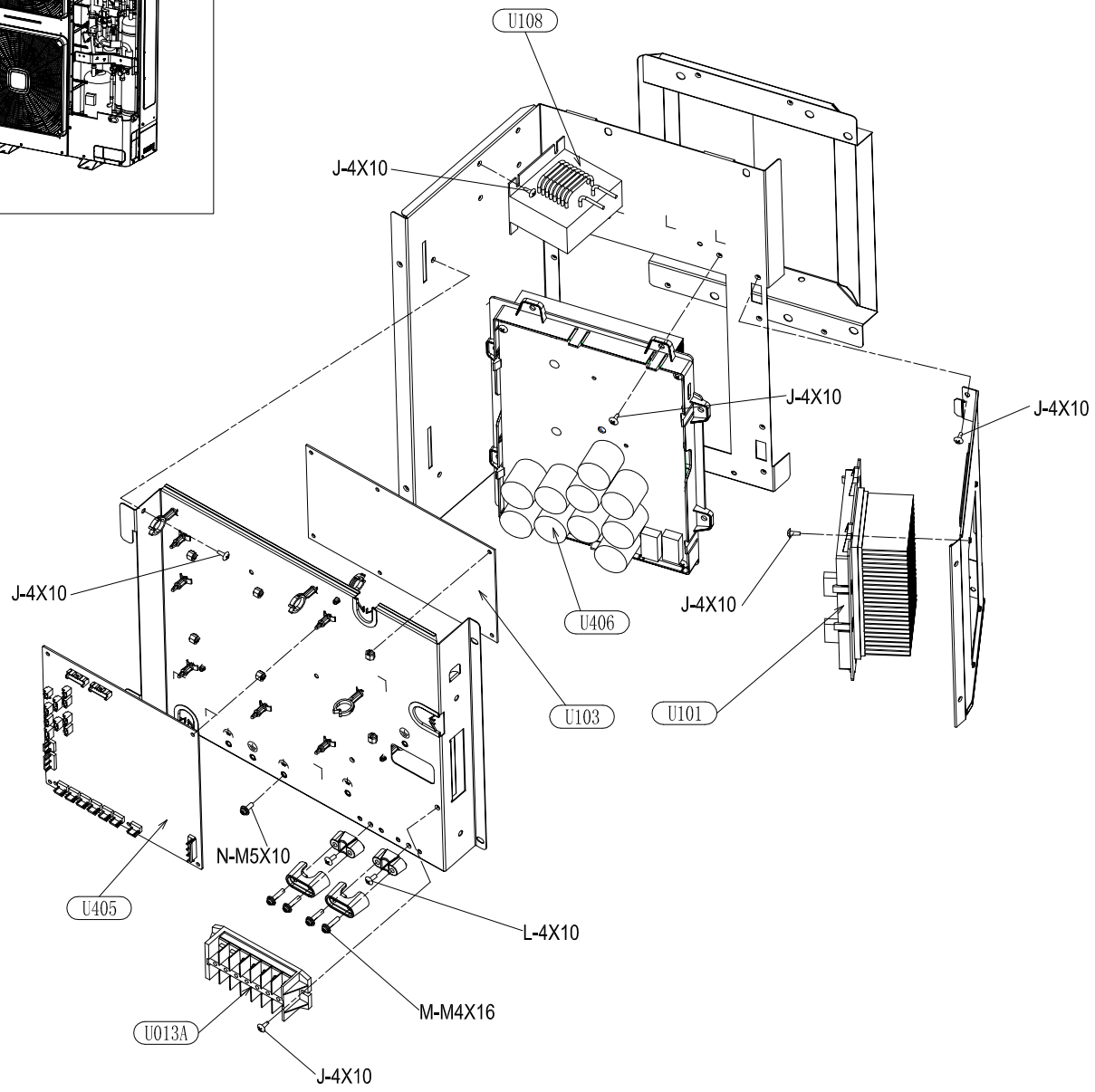
Location Map of Repair Parts in Electrical Box

Model:
RAS-10HNBRMQ1
RAS-11HNBRMQ1
RAS-12HNBRMQ1






| No. | Part Name | Draw. No. | Part Drawing |
|---|---|---|---|
| G | Cross Recess Pan Head Screw | 53CB0308 | |
| H | Cross Recess Pan Head Screw | 51CB0416 | |
| J | Cross Recess Pan Head Screw | 51CB0410 | |
| K | Cross Recess Pan Head Screw | 53CB0420 | |
| L | Cross Recess Pan Head Screw | 53CB0410 | |
| M | Cross Recess Pan Head Screw | 453H0416 | |
| N | Cross Recess Pan Head Screw | 453H0510 | |

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