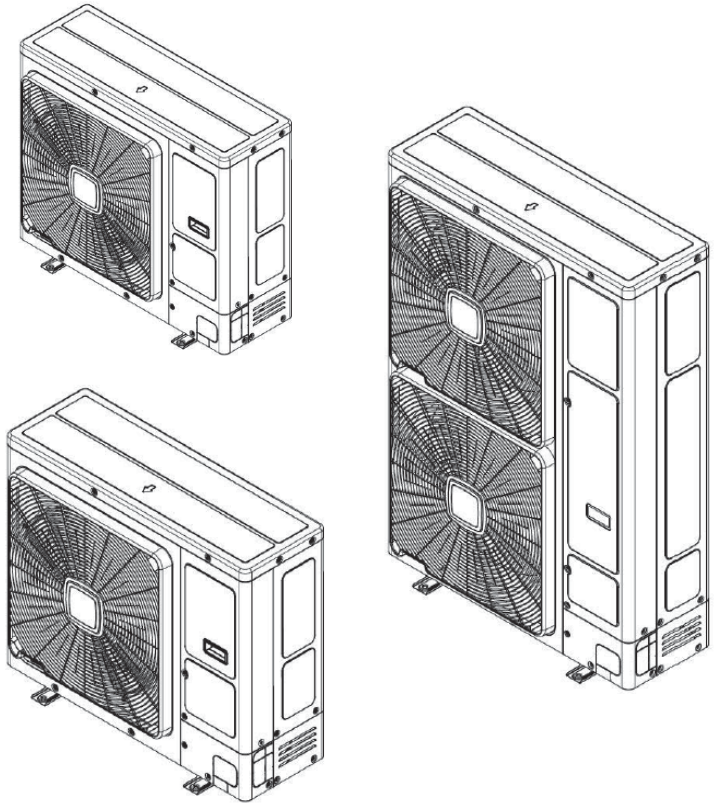
HITACHI

SERVICE MANUAL

HEAT PUMP AIR CONDITIONERS

- SET FREE mini-HNSKQ SERIES VRF CONDITIONERS SYSTEM -



Service Manual

< Outdoor Units >

Power Supply	Model
220~240V/1Ph/50/60Hz	RAS-3.0HNSKQ RAS-3.5HNSKQ RAS-4.0HNSKQ RAS-4.5HNSKQ RAS-5.0HNSKQ RAS-6.0HNSKQ RAS-6.5HNSKQ RAS-7.0HNSKQ

HS2018234A

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IMPORTANT NOTICE

- The company pursues a policy of continuing improvement in design and performance of products.The right is therefore reserved to vary specifications without prior 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 fl .
  * Places where strong salty wind blows such as coast regions.
  * Places with an atmosphere of acidity or alkalinity.
- 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 wate . As a result, drain water splashes outside of the drain pan and splashed water runs inside of 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, remote control cable or remote control 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 catches the animals and plants. It could adversely affect the animals and plants.
- The installation should be in accordance with the local laws and regulations.The following standards may be applicable,if the local regulations are not available.International Organization for Standardization, ISO5149 or European Standard, EN 378 or Japan Standard, KHKS0010.
- 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 spoken people. If this is not the case, the customer should be add safety, caution and operating signs in the native language.
- This heat pump air conditioning unit has been come with a full complement of the appropriate Safety, Danger, and Caution, Warnings.
- This air conditioning cannot work in the cooling and heating operation meanwhile. Otherwise, the indoor unit which its operation is conflicted with the operation of the outdoor unit would not work
- In case of any query, please contact your distributor or dealer.
- This manual provides common descriptions,basic and advanced information to maintain and service this heat pump air conditioningunit which you operate as well for other models.
- This heat pump air conditioning has been designed for the following temperatures range. Operate the heat pump air conditioning within this range according to the table below.

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	Stable -20°C DB

NOTE:

* : The temperature value may vary with different outdoor units.

SAFETY SUMMARY

< 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.

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

NOTICE : NOTICE is used to address practices not related to personal 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 the instructions are not followed, it may result in a water leakage, electric shock or a fire
- Use the specified non-flammable refrigerant (R410A) to the outdoor unit in the refrigerant cycle. Do no charge material other than R410A into the unit such as hydrocarbon refrigerants (propane or etc.), oxygen, flammable gases (acetylene or etc.) or poisonous gases when installing, maintaining and moving. These flammable gases are extremely dangerous and may cause an explosion, a fire, and inju .
- Do not pour water into the indoor or outdoor unit. These products are equipped with electrical parts. If poured, it will cause a serious electric shock.
- Do not open the service cover or access panel for the indoor or outdoor units without turning OFF the main power supply.
- Do not touch or adjust safety devices inside the indoor unit or outdoor units. If these devices are touched or readjusted, it may cause a serious accident.
- Refrigerant leakage can cause difficulty with breathing due to insufficient a . Turn OFF the main switch, extinguish any naked flames and contact your service contracto , if refrigerant leakage occurs.
- Make sure that the refrigerant leakage test should be performed. Refrigerant (Fluorocarbon) for this unit is incombustible, non-toxic and odorless. However, if the refrigerant is leaked and is contacted with fire, toxic gas will generate. Also because the fluorocarbon is heavier than ai , the floor surface will be filled with it which could cause suffocation.
- The installer and system specialist shall secure safety against refrigerant leakage according to local regulations or standards
- Use an ELB (Earth Leakage Breaker). In the event of fault, there is danger of an electric shock or a fire if it is not used.
- Do not install the outdoor unit where there is high level of oil mist, flammable gases, salty air or harmful gases such as sulfur.
- For installation, firmly connect the refrigerant pipe before the compressor starts operating.For maintenance, relocation and disposal, remove the refrigerant pipe after the compressor stops.
- Do not perform a short-circuit of the protection device such as a pressure switch when operating.It may cause a fire and explosion
- The A-weighted emission sound pressure level do not exceeds 70 dB(A)

⚠ WARNING

- Do not use any sprays such as insecticide, lacquer, hair spray or other flammable gases within approximately one meter from the system.
- If circuit breaker or fuse is often activated, stop the system and contact your service contractor.
- Check that the ground wire is securely connected. If the unit is not correctly grounded, it may lead to electric shock. Do not connect the ground wiring to gas piping, water piping, lighting conductor or ground wiring for telephone.
- Before performing any brazing work, check to ensure that there is no flammable material around.When using refrigerant, be sure to wear leather gloves to prevent cold injuries.
- Connect a fuse of specified capacit .
- Protect the wires, electrical parts, etc. from rats or other small animals.If not protected, rats may gnaw at unprotected parts and which may lead to a fire
- Fix the cables securely. External forces on the terminals could lead to a fire
- Provide a sufficiently strong foundation. If not, the unit may fall down and it may lead to injuries
- Do not install the unit in a place where oil, vapor, organic solvent and corrosive gas (ammonia, sulfur compound and acid) may be present in quantities. It may cause refrigerant leakage due to corrosion, electric shock, deteriorated performance and breakage.
- Perform electrical work according to Installation Manual and all the relevant regulation and standards. If the instructions are not followed, an electric shock and fire may occur due to insufficient capacity and inadequate performance.

- Use specified cables between units and choose the cables correctly. If not, an electric shock or fire may occur.
- Ensure that the wiring terminals are tightened securely with the specified torques. If not, generating fire or electric shock at the terminal connection part may occur.

⚠ CAUTION

- Do not step or put any material on the product.
- Do not put any foreign material on the unit or inside the unit.
- 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.

NOTICE

- Do not install the indoor unit, outdoor unit, remote control switch and cable within approximately 3 meters from strong electromagnetic wave radiators such as medical equipment.
- Supply electrical power to the system to energize the oil heater for 12 hours before startup after a long shutdown.
- Make sure that the outdoor unit is not covered with snow or ice before operation.
- In some cases, the packaged air conditioner may not be operated normally under the following cases.
  * In case that electrical power for the packaged air conditioner is supplied from the same power transformer as the device*.
  * In case that the power source wires for the device* and the packaged air conditioner are located close to each other.
  Device*: (Ex) Lift, container crane, rectifier for electric railwa , inverter power device, arc furnace,electric furnace,large-sized induction motor and large-sized switch.It consumes a large quantity of electrical power.
  Regarding the cases mentioned above, surge voltage may be inducted in the power supply cables for the packaged air conditioning due to a rapid change in power consumption of the device and an activation of a switch.
  Check field regulations and standards before performing electrical work in order to protect the power supply for the new air conditioning unit.

NOTES:

- It is recommended that the room will be ventilated every 3 to 4 hours.
- The heating capacity of the heat pump unit is decreased according to the outdoor air temperature. Therefore, it is recommended that auxiliary heating equipment be used in the field when the units is installed in a low temperature region.

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.

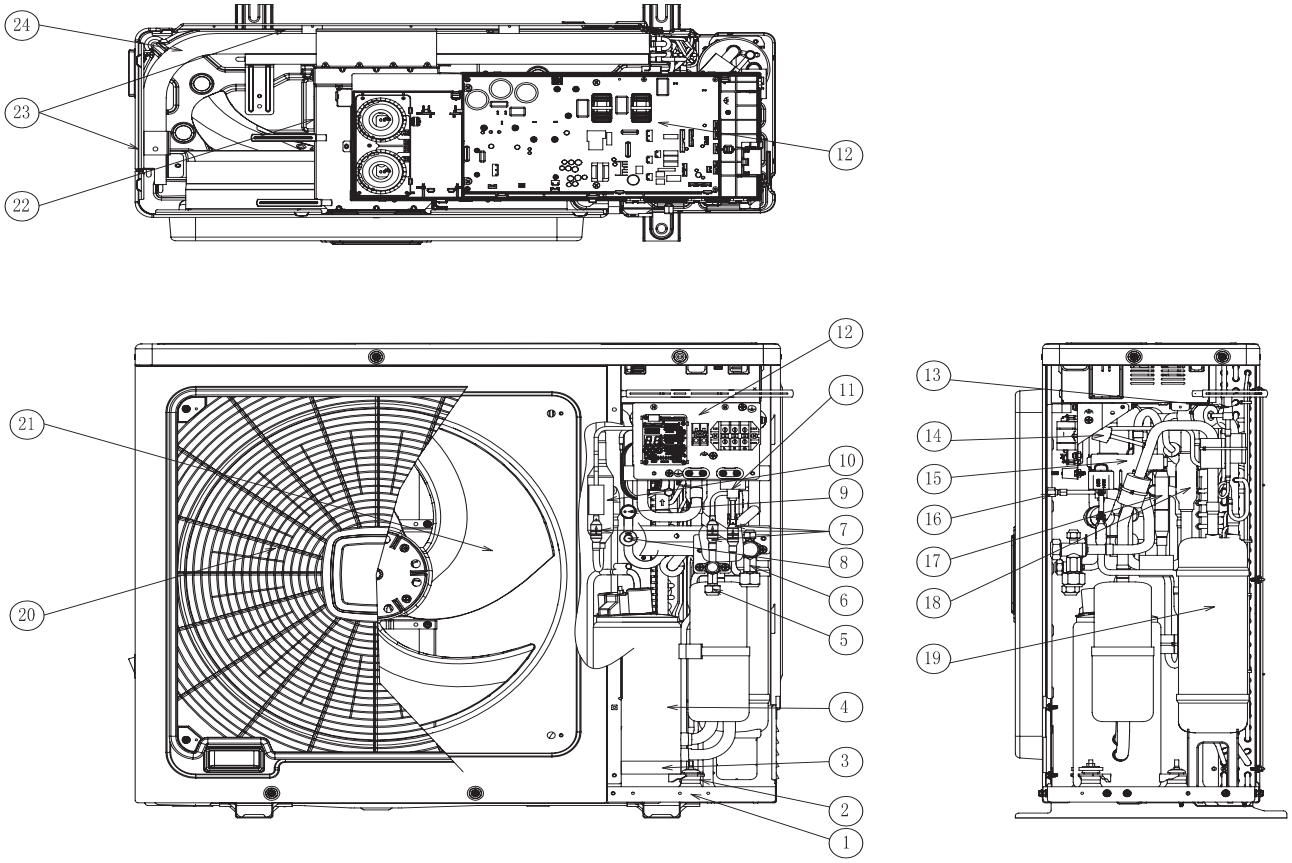
■: Interchangeability is available with current R22 ●: Only for Refrigerant R410A (No Interchangeability with R22)
◎: Prohibited ★: Only for Refrigerant R407C (No Interchangeability with R22)

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 * If using flaring tube, make dimension of tube large for R410A. * 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. * Synthetic oil absorbs moisture quickly.	Applying Oil to the Flared Surface
Vacuum Drying; Refrigerant Charge	Refrigerant Cylinder	●	★	* Check refrigerant cylinder color. ○: 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.) 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.

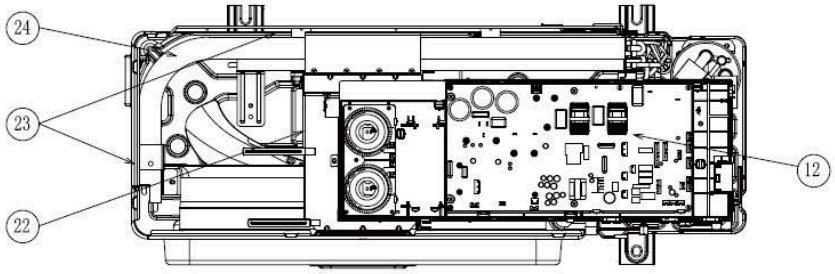
1.2 Structure

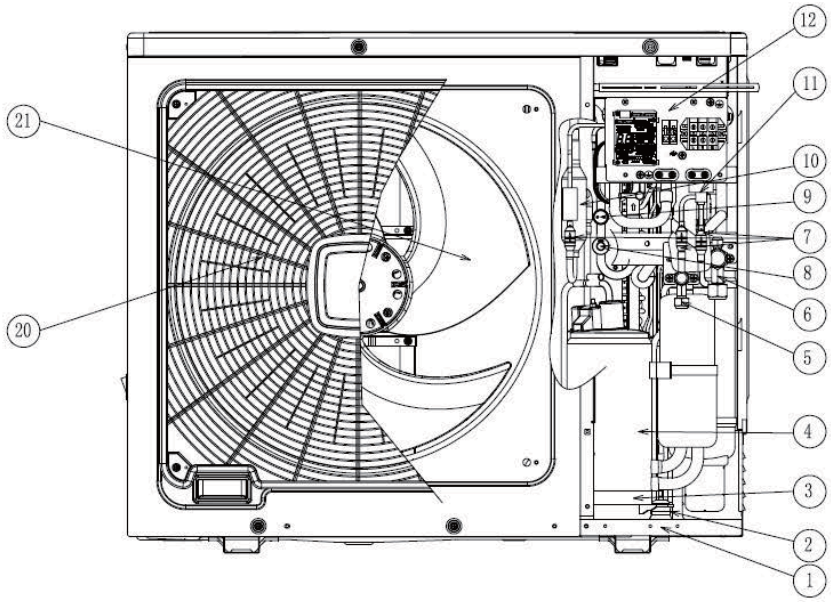
Model: RAS-3.0~4.0HNSKQ

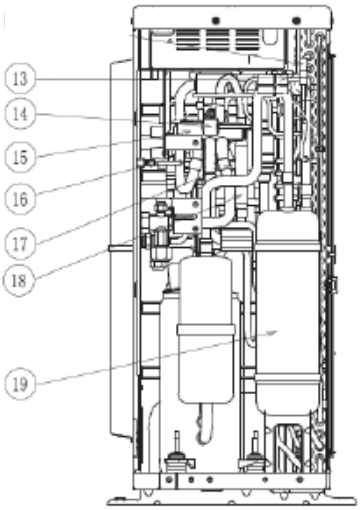


No.	Part Name	No.	Part Name	No.	Part Name	No.	Part name
1	Chassis	7	Filter	13	Solenoid Valve	19	Accumulator
2	Vibration Absorder	8	High Pressure Sensor	14	Low Pressure Switch	20	Air Outlet
3	Crankcase Heater	9	High Pressure Switch	15	4-Way Valve	21	Propeller Fan
4	Compressor	10	Oil Separator	16	Check 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-4.5~6.0HNSKQ

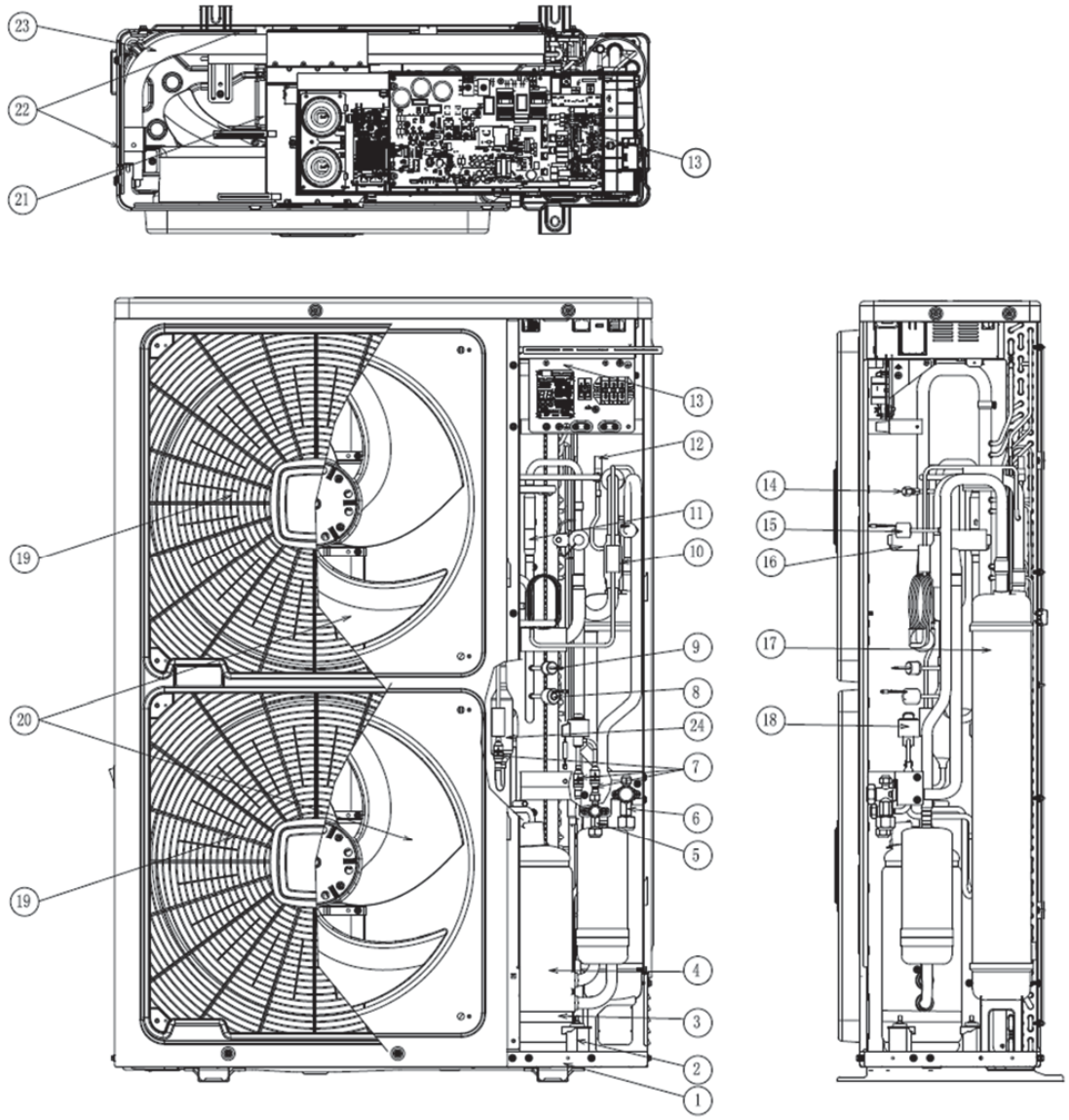






No.	Part Name	No.	Part Name	No.	Part Name	No.	Part Name
1	Chassis	7	Filter	13	Solenoid Valve	19	Accumulator
2	Vibration absorber	8	High Pressure Sensor	14	Low Pressure Switch	20	Air Outlet
3	Crankcase Heater	9	High Pressure Switch	15	4-Way Valve	21	Propeller Fan
4	Compressor	10	Oil Separator	16	Check 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

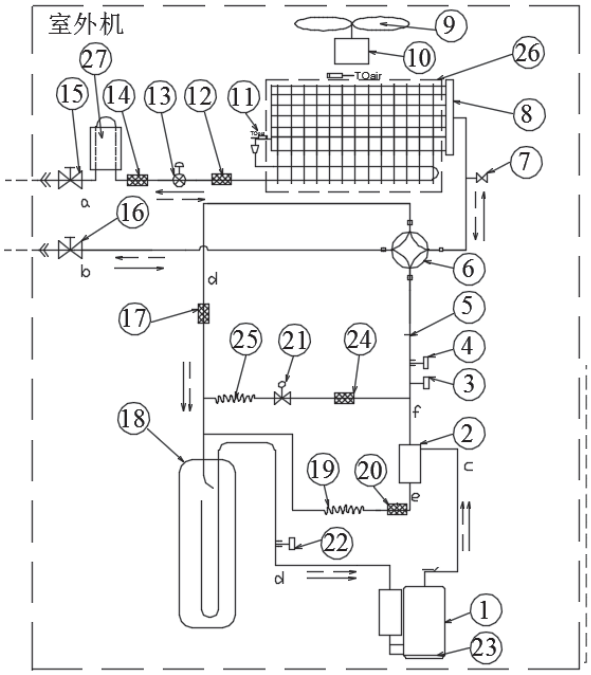
Model: RAS-6.5~7.0HNSKQ



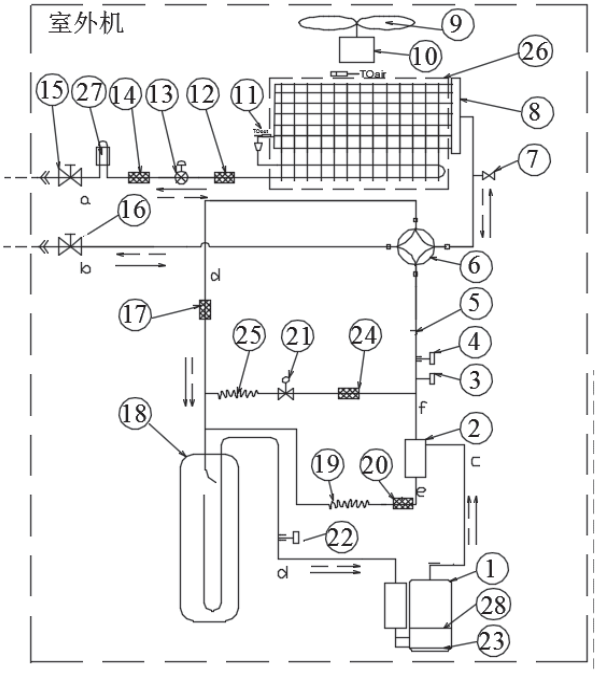
No.	Part Name	No.	Part Name	No.	Part Name	No.	Part Name
1	Chassis	7	Filter	13	Electrical Box	19	Air Outlet
2	Vibration Absorber	8	High Pressure Sensor	14	Check Joint	20	Propeller Fan
3	Crankcase Heater	9	High Pressure Switch	15	Low Pressure Switch	21	Fan Motor
4	Compressor	10	Filter	16	4-Way Valve	22	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

1.3 Refrigerant Cycle Diagram

Model: RAS-3.0~6.0HNSKQ



Model: RAS-6.5~7.0HNSKQ



Cooling
Heating
Refrigerant Piping
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 Switch
5	Check Valve	14	Filter 2	23	Crankcase Heater 1
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	Refrigerant cooling
				28	Crankcase Heater 2

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	Rated Capacity (kW)	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-3.0HNSKQ	8.0	4	10.4	2~4	1.8
RAS-3.5HNSKQ	10.0	5	13	2~5	1.8
RAS-4.0HNSKQ	11.2	5.6	14.56	2~5	1.8
RAS-4.5HNSKQ	12.5	6.25	15.6	2~5	1.8
RAS-5.0HNSKQ	14.0	7	18.2	2~6	1.8
RAS-6.0HNSKQ	16.0	8	20.8	2~6	1.8
RAS-6.5HNSKQ	18.0	9	23.4	2~9	1.8
RAS-7.0HNSKQ	20.0	10	26	2~10	1.8

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 round-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.

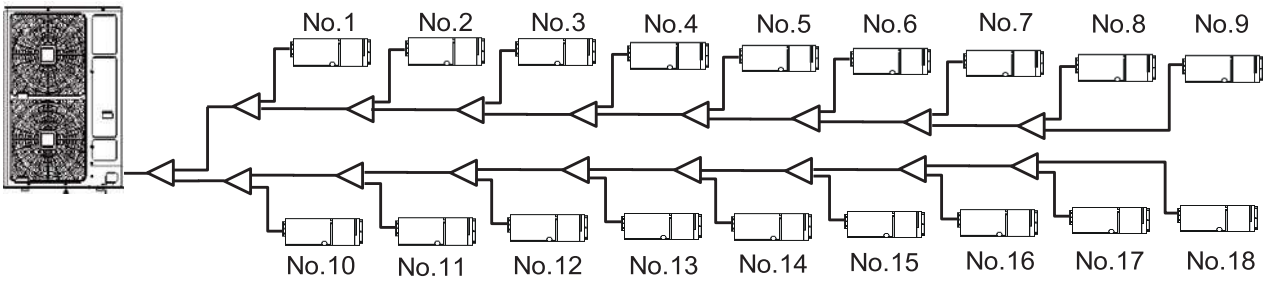
(4) For the same system, if the connectable indoor unit capacity ratio is over than 100%, and which all the indoor units operate simultaneously, capacity of every indoor unit should be less than its rated capacity.

(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 100%.

(d) Only the compact ducted, Medium ESP Ducted, High ESP Ducted indoor units can be selected as indoor unit.



*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.

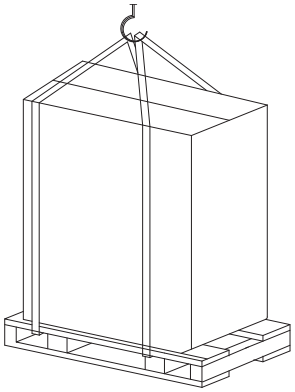
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(1) The Method of Hanging

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

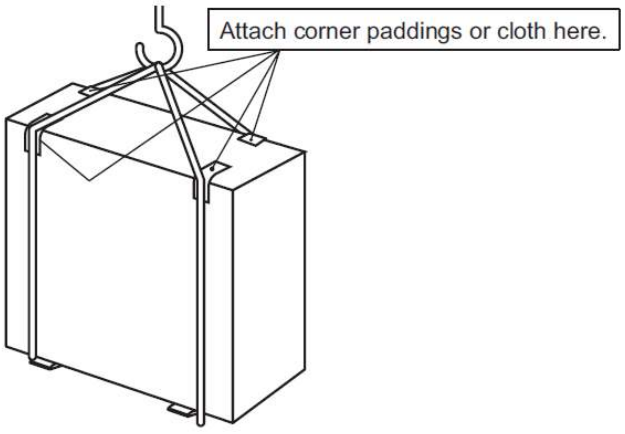
(a) Do not unwrap the package until the hanging work is finished

(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-3.0HNSKQ RAS-3.5HNSKQ RAS-4.0HNSKQ	74	84
RAS-4.5HNSKQ RAS-5.0HNSKQ RAS-6.0HNSKQ	87	100

Model	Net Weight (kg)	Gross Weight (kg)
RAS-6.5HNSKQ RAS-7.0HNSKQ	118	132

⚠ 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	Quantity	Remarks
Wire Clamp (big)	1	RAS-3.0~7.0HNSKQ
Wire Clamp (small)	3	
Washer	4	
Magnetic Ring	3/2/3	RAS-3.0~4.0/4.5~6.0 /6.5~7.0HNSKQ

NOTE:

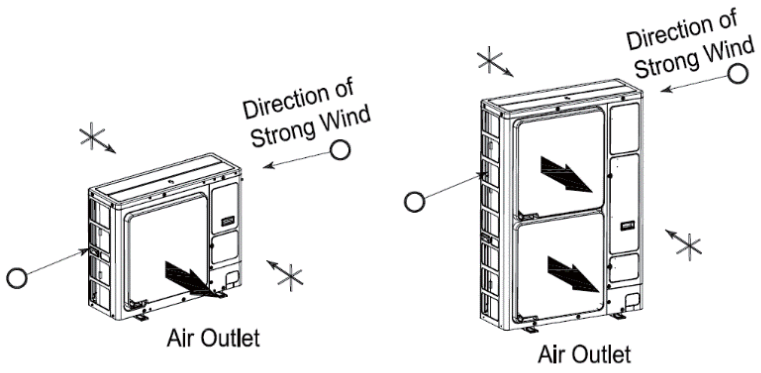
- If any of these accessories are not packed in the unit, please contact your distributor.

2. Outdoor Unit Installation

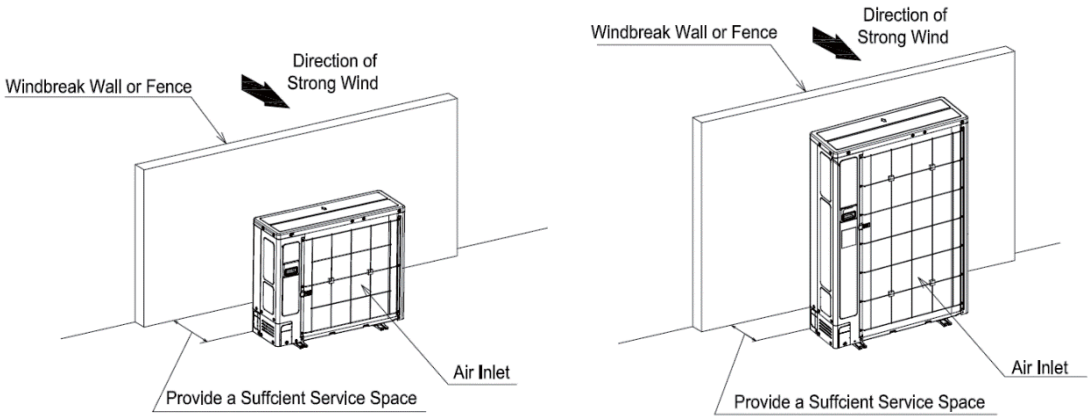
2.1 Installation Location and Precautions

- 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 heav , 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 near .
- 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 lef 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.

- 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 normall .
- 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.

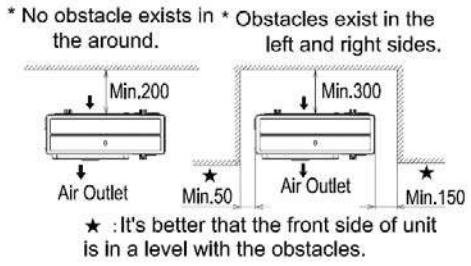
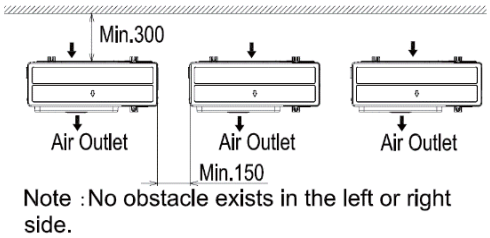
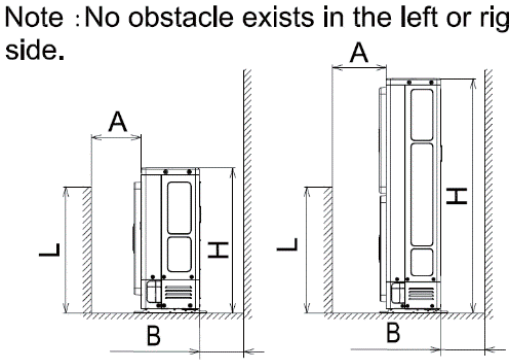
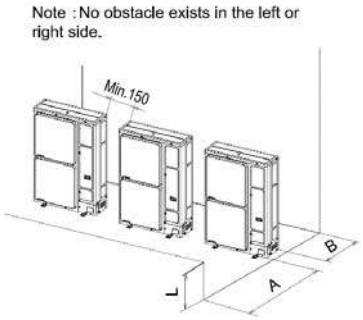
2.2 Service Space

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

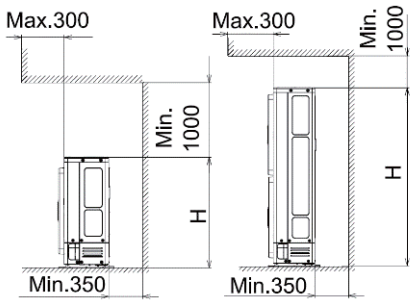
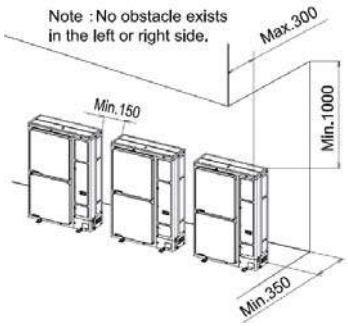
- If there is not enough service space for air inlets and outlets, it may result in a performance drop-off and mechanical issues due to insufficient air intake
- Additionally, adequate srvice space is required for service maintenance access.

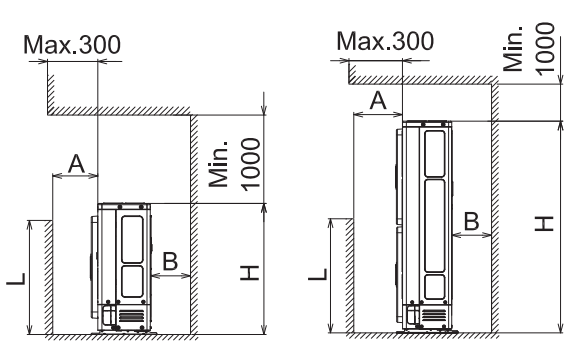
(1) Obstacles on the inlet side

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

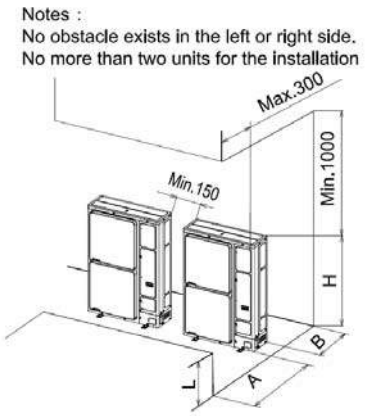
Single Inatallation	Multiple Installation
	
	

(b) There are obstacles upper side Unit: mm

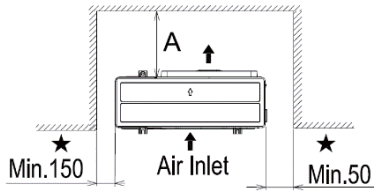
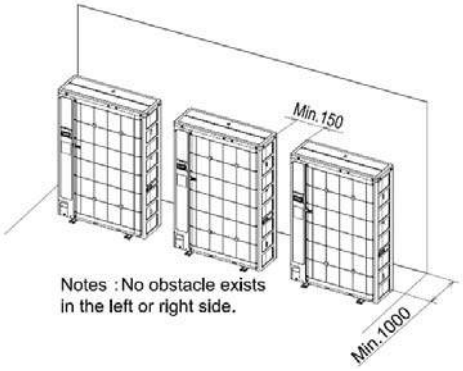
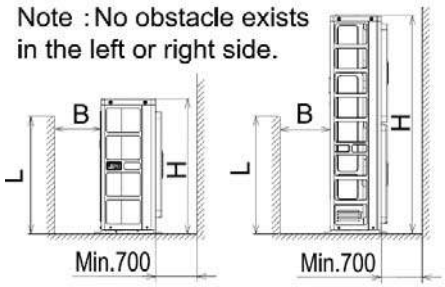
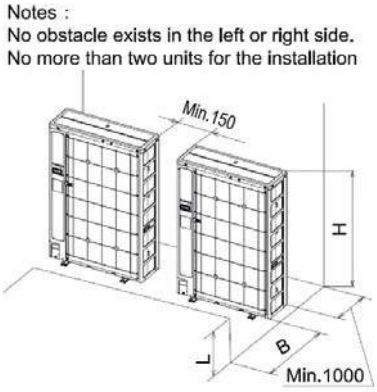
Single Installation	Multiple Installation
	



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



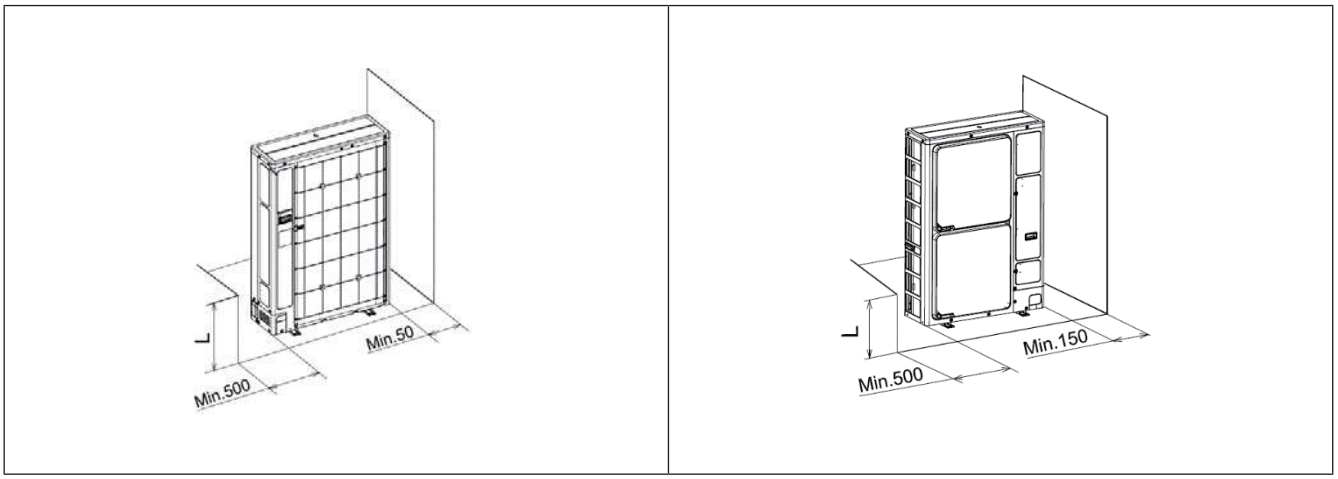
(2) Obstacles on the outlet side and no obstacle in the upper side. Unit: mm

Single Installation	Multiple Installation
	
	

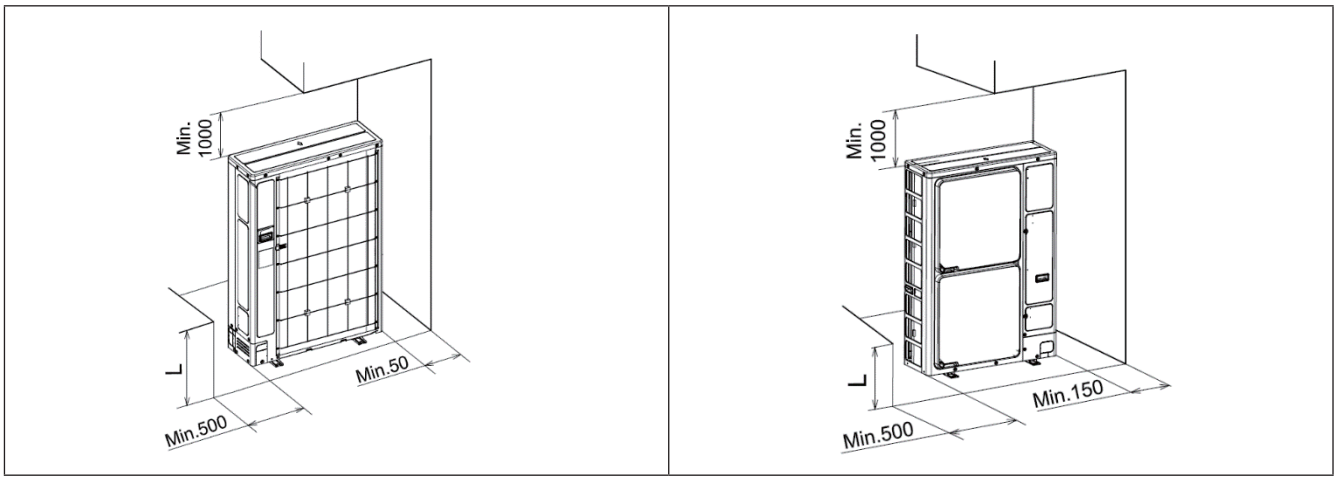
★ : It's better that the back side of unit is in a level with the obstacles.
Note: Obstacles exist in the either left or right side.

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

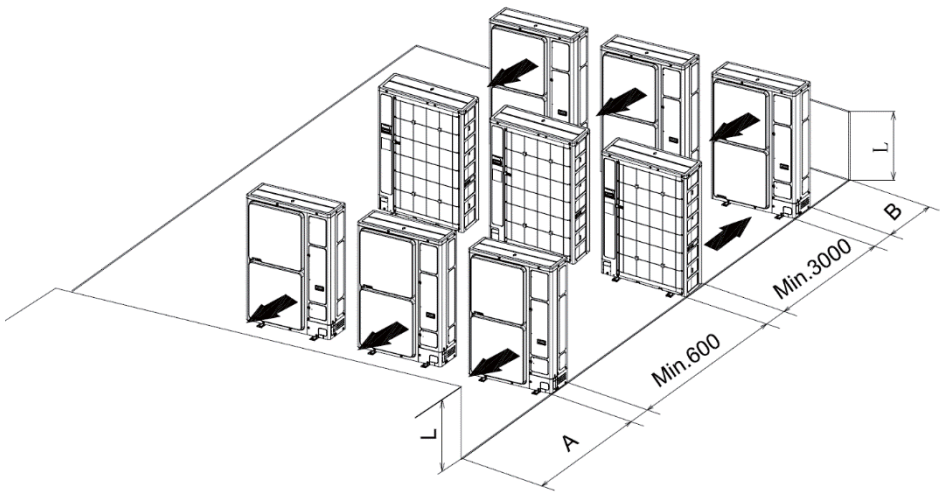
(a) There is no obstacle in the upper side. Unit: mm



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



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



NOTE:

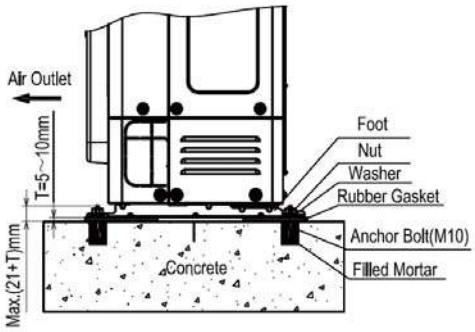
● If L is larger than H, mount the units on a base so that H is greater or equal to L. Be sure to seal up every surface of the base. If the base allows the airflow to go, it may cause a short-circuit

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 coul decrease the vibration into the room.

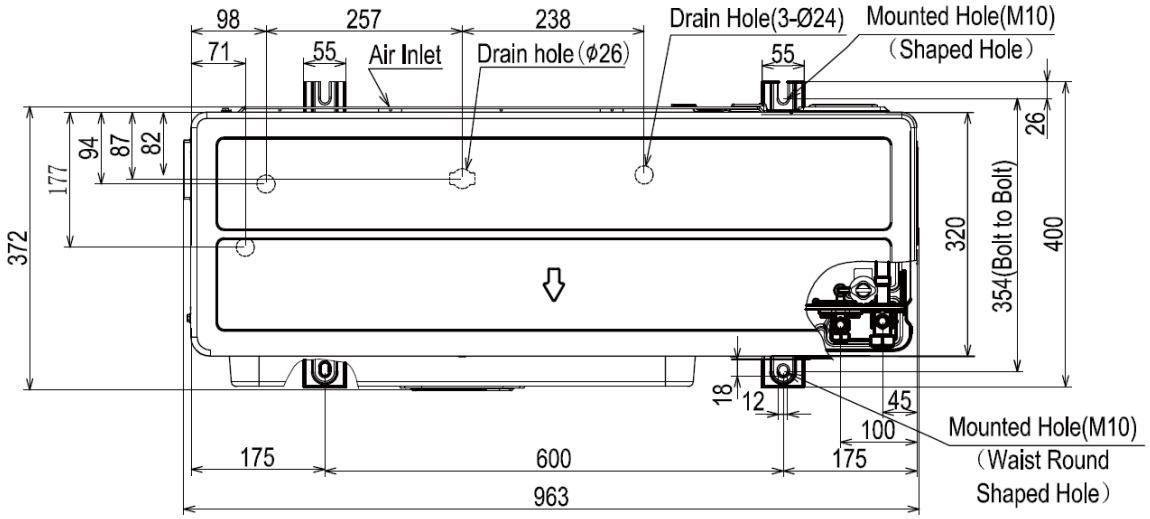


Model:RAS-3.0~7.0HNSKQ

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

Model: RAS-3.0~7.0HNSKQ

Unit: mm



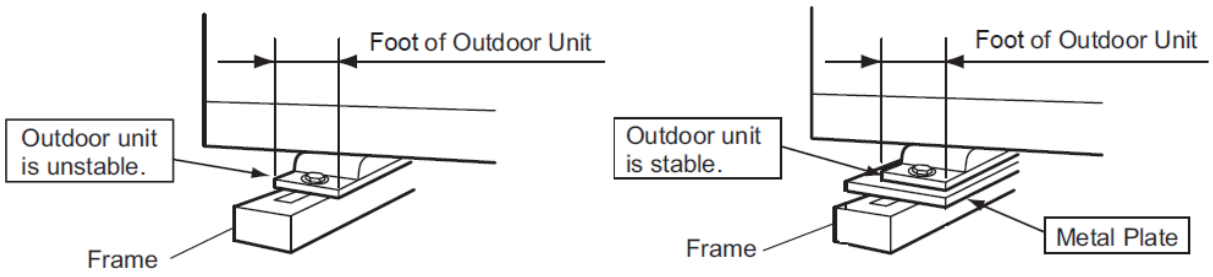
(3) The drain holes are working during the heating and defrosting operation. Choose a place where well drainage is available or provide a groove for draining.

(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.

Incorrect **Correct**



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

⚠ CAUTION

◆ 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

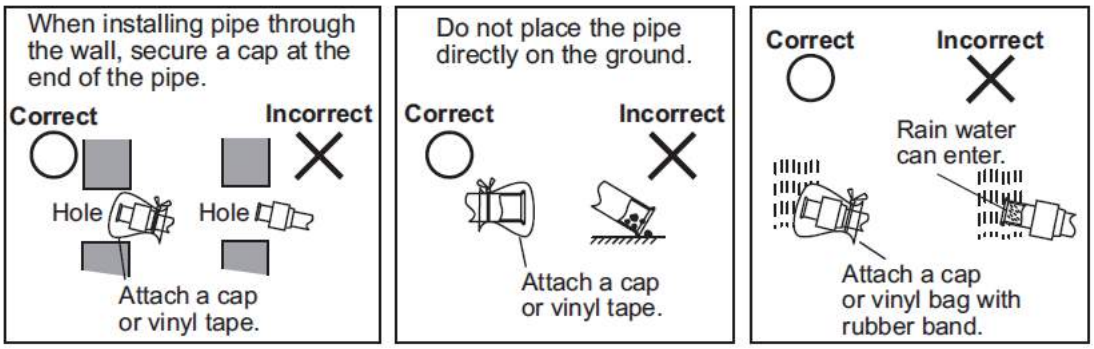
(1) Use the copper pipe for refrigerant piping.

(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

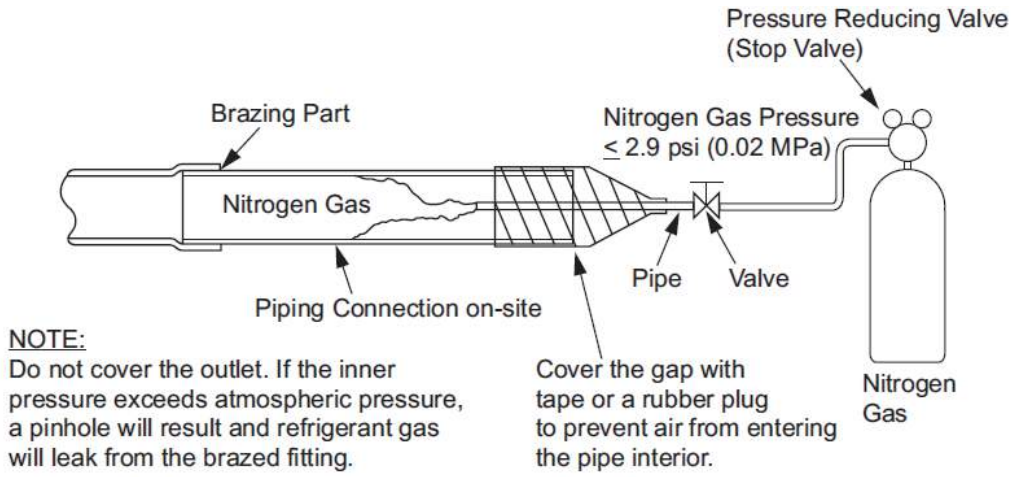
The thickness of refrigerant pipe differs depending on design pressure. For copper tube, pay attention to pipe selection, because the piping thickness differs depending on its material.

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

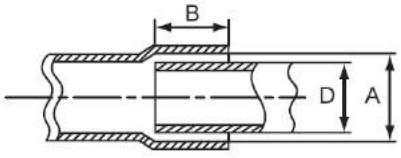
NOTE:

- 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	

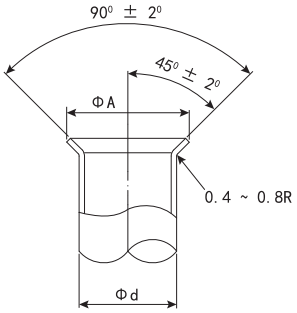


(8) Cautions for Flaring Work

(A) Perform the flaring work as shown bel w:

Unit: mm

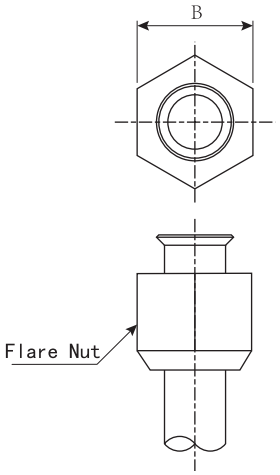
Diameter (Φd)	A $^{+0}_{-0.4}$
	R410A
6.35	9.1
9.52	13.2
12.7	16.6
15.88	19.7
19.05	(*)



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

(B) Joint Selection

The minimum thickness of joint and flare nut dimension are selected fro 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

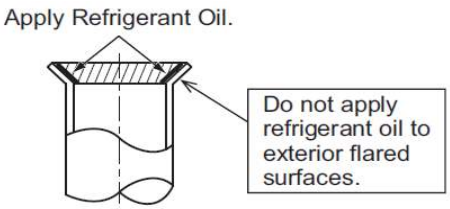
Diameter(Φd)	R410A
6.35	17
9.52	22
12.7	26
15.88	29
19.05	36

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 befor making connections to the system.

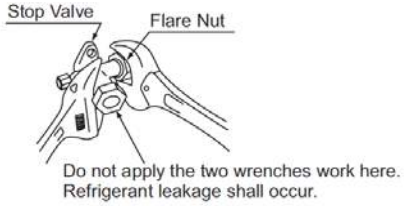
(D) Apply a little of refrigerant oil (field-supplied) on the flare surface of the pipe and flare nut befo performing flaring work. Tighten the flare nut to specified torque settings using two wrenches. Perform flari work to the liquid piping side before treating the gas piping side. Verify that no gas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



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



Use two wrenches as shown



Tightening work for stop valve

Required Tightening Torque

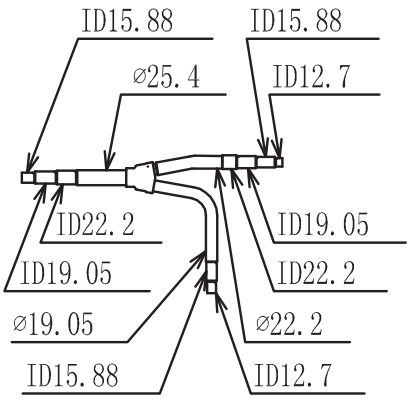
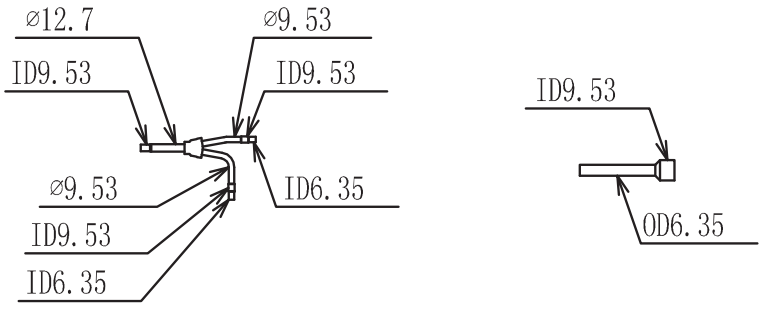
Pipe Diameter	Tightening Torque
Φ6.35mm	20 N·m
Φ9.52mm	40 N·m
Φ12.7mm	60 N·m
Φ15.88mm	80 N·m
Φ19.05mm	100 N·m

3.2 Model of Branch Pipe

(1) JE-102SN

The model of JE-102SN branch pipe is used for the model of RAS-3.0~7.0HNSKQ outdoor unit.

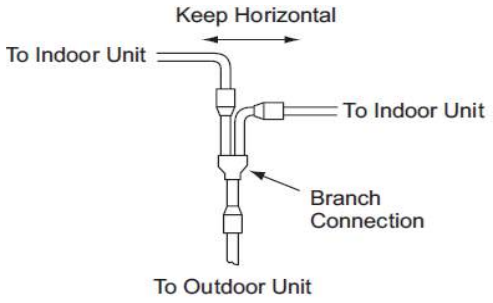
Unit: mm

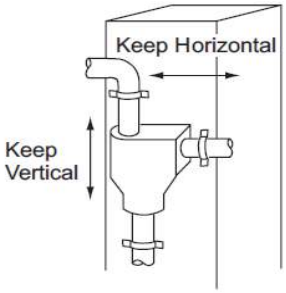
Model	E-102SN for RAS-3.0~7.0HNSKQ
Gas Pipe	
Liquid Pipe	

(2) Precaution for branch pipe connection

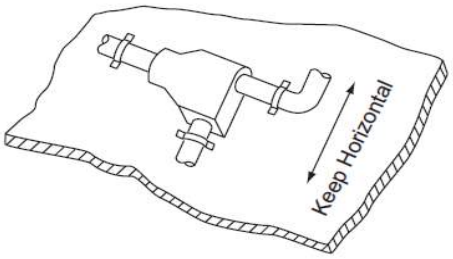
Use the branch pipe to connect the outdoor/indoor units. Mounted the branch pipes to a pillar, a wall, or a ceiling.

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

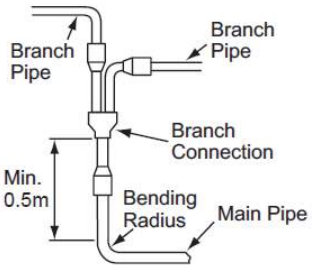
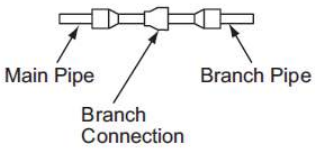
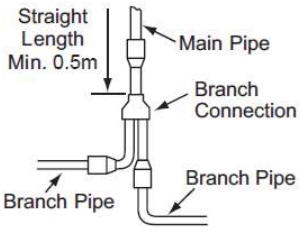
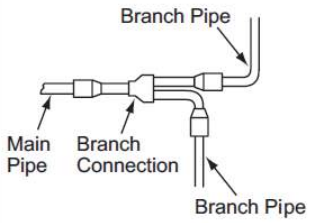




Secure the Branch Pipe to the surface of Pillar or Wall.



Securing 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.

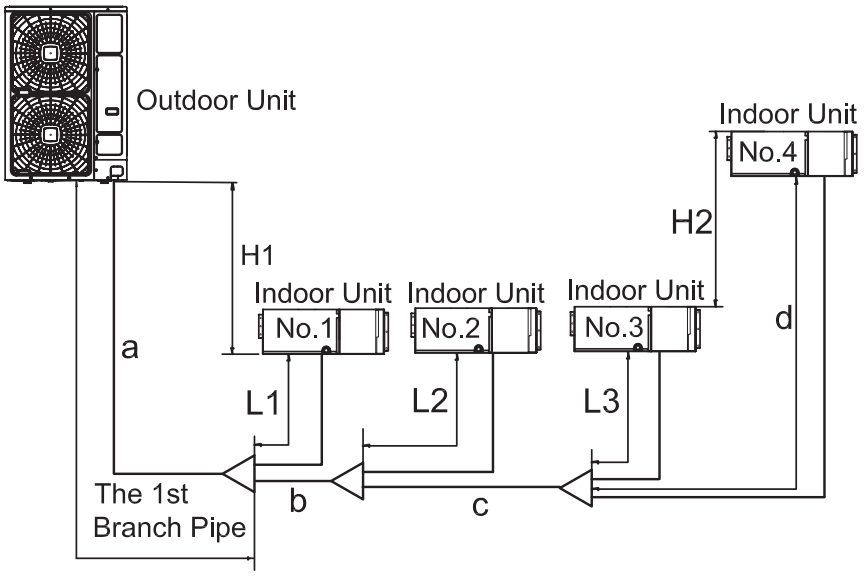


Table 3.1 Piping Size of Main Pipe

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-3.0~7.0HNSKQ	Φ15.88	Φ9.52	Φ15.88	Φ9.52▲	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.

Table 3.2 Piping Size of Indoor Unit

Indoor Unit Type	Model	Gas Pipe(mm)	Liquid Pipe (mm)	Marks
Compact Ducted Medium ESP Ducted High ESP Ducted Floor Concealed	18~45	Φ12.7	Φ6.35	L1; L2; L3; d
	50~56	Φ15.88	Φ6.35	L1; L2; L3; d
	63~160	Φ15.88	Φ9.52	L1; L2; L3; d
Round-way Cassette High Wall 2-way Cassette	22~63	Φ12.7	Φ6.35	L1; L2; L3; d
	71~160	Φ15.88	Φ9.52	L1; L2; L3; d

Table 3.3 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-3.0~4.0HNSKQ	≤25 meters
			RAS-4.5~6.0HNSKQ	≤60 meters
			RAS-6.5~7.0HNSKQ	≤75 meters
	Total liquid pipe length	a+b+c+d+L1+ L2+L3	RAS-3.0HNSKQ	≤30 meters
			RAS-3.5~4.0HNSKQ	≤40 meters
			RAS-4.5~6.0HNSKQ	≤70 meters
			RAS-6.5~7.0HNSKQ	≤120 meters
	Between the 1st branch pipe and the farthest indoor unit	b+c+d	RAS-3.0~4.0HNSKQ	≤20 meters
			RAS-4.5~7.0HNSKQ	≤30 meters
	Between branch pipes and connected indoor units	L1，L2，L3，d		≤10 meters
Allowable Height Difference	Outdoor unit is higher than indoor unit	H1	RAS-3.0~4.0HNSKQ	≤20 meters
			RAS-4.5~7.0HNSKQ	≤30 meters
	Outdoor unit is lower than indoor unit	H1	RAS-3.0~6.0HNSKQ	≤20 meters
			RAS-6.5~7.0HNSKQ	≤30 meters
	Height difference between indoor units	H2	RAS-3.0~4.0HNSKQ	≤3.5 meters
			RAS-4.5~7.0HNSKQ	≤10 meters
Others	The model of branch pipe▲	RAS-3.0~7.0HNSKQ		E-102SN
	Setting requirement for oil trap	When the gas pipe is lifted over than 10meters interval, one oil trap should be set.		

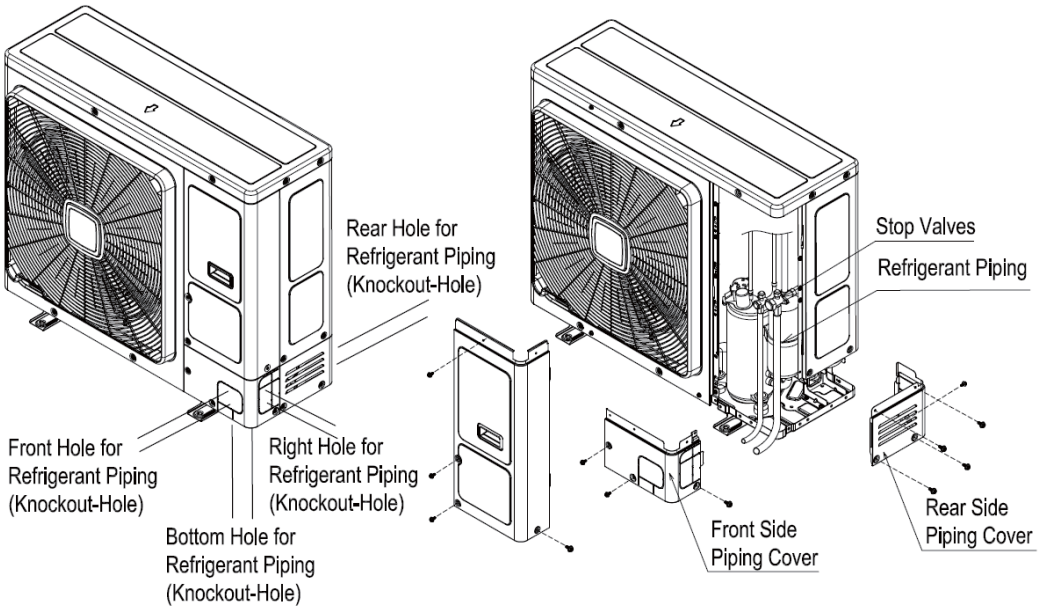
NOTE:

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

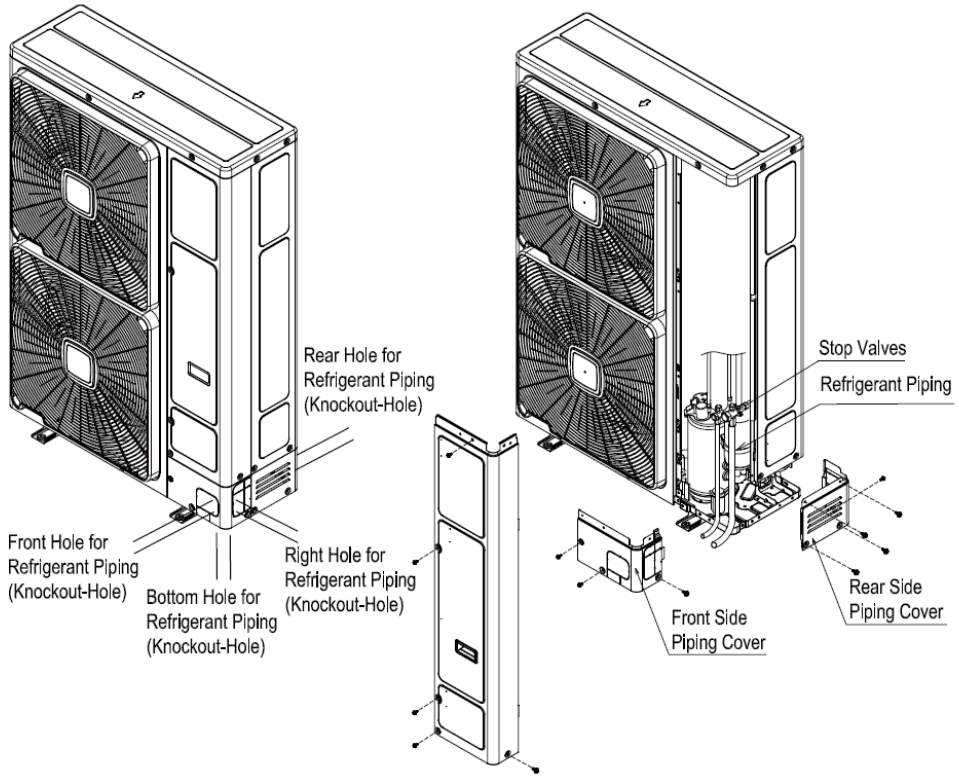
3.4 Refrigerant Piping Work for Outdoor Unit

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

Model: RAS-3.0~6.0HNSKQ

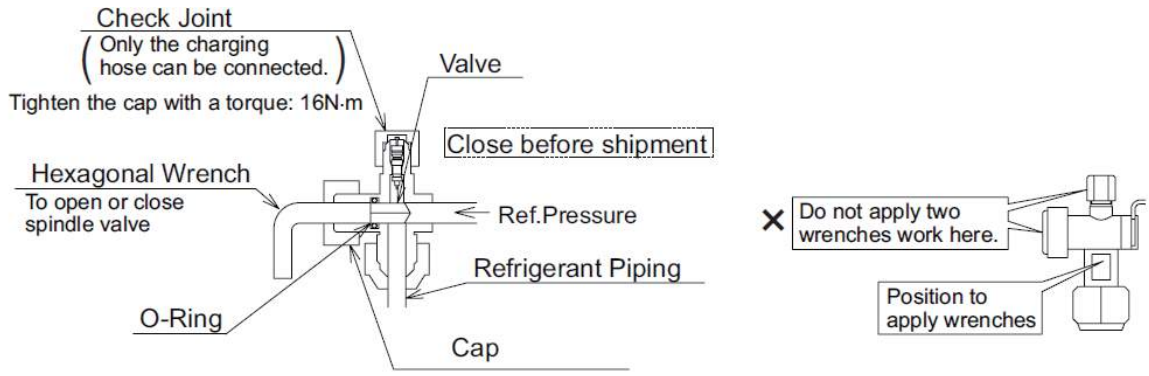


Model: RAS-6.5~7.0HNSKQ



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.

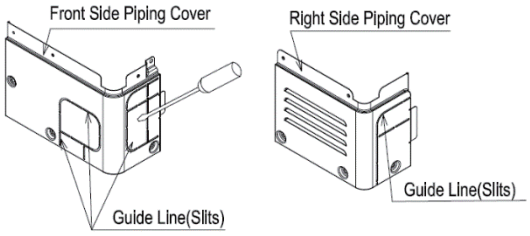
(2) Securely use two wrenches at the following position when removing or installing the pipe. (If not, refrigerant leakage may occur.)

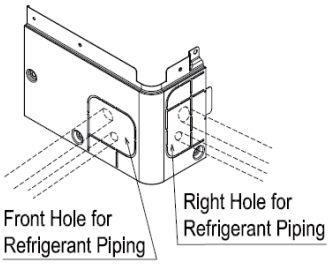


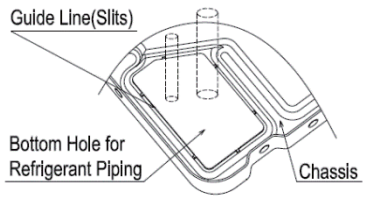
Controlling torque of hexagonal wrench

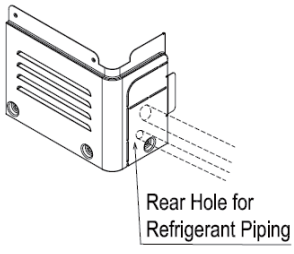
Model	Gas side stop valve	Liquid side stop valve
RAS-3.0~7.0HNSKQ	11~14 N·m	7~9 N·m

(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 pi es.









(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

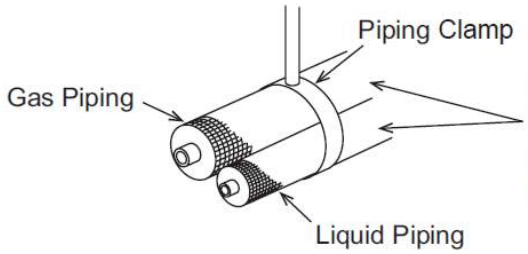
3.5 Air Tight Test

(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.



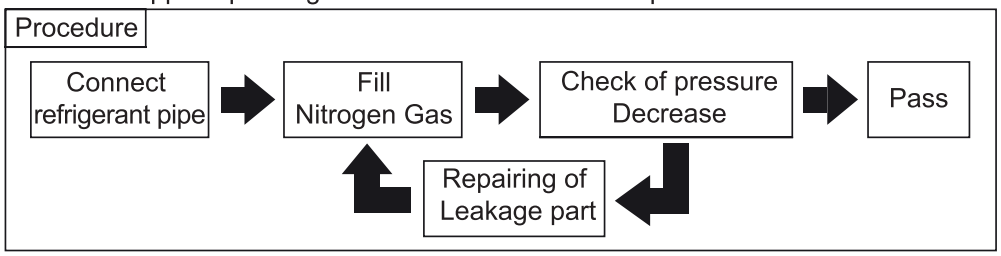
NOTE:
Due to gas and liquid piping will stretch or contract at different rates due to changing refrigerant temperatures.
Do not fasten gas and liquid piping together.
Distortion and deformation of the piping can occur.

(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 complet d.



⚠ 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.

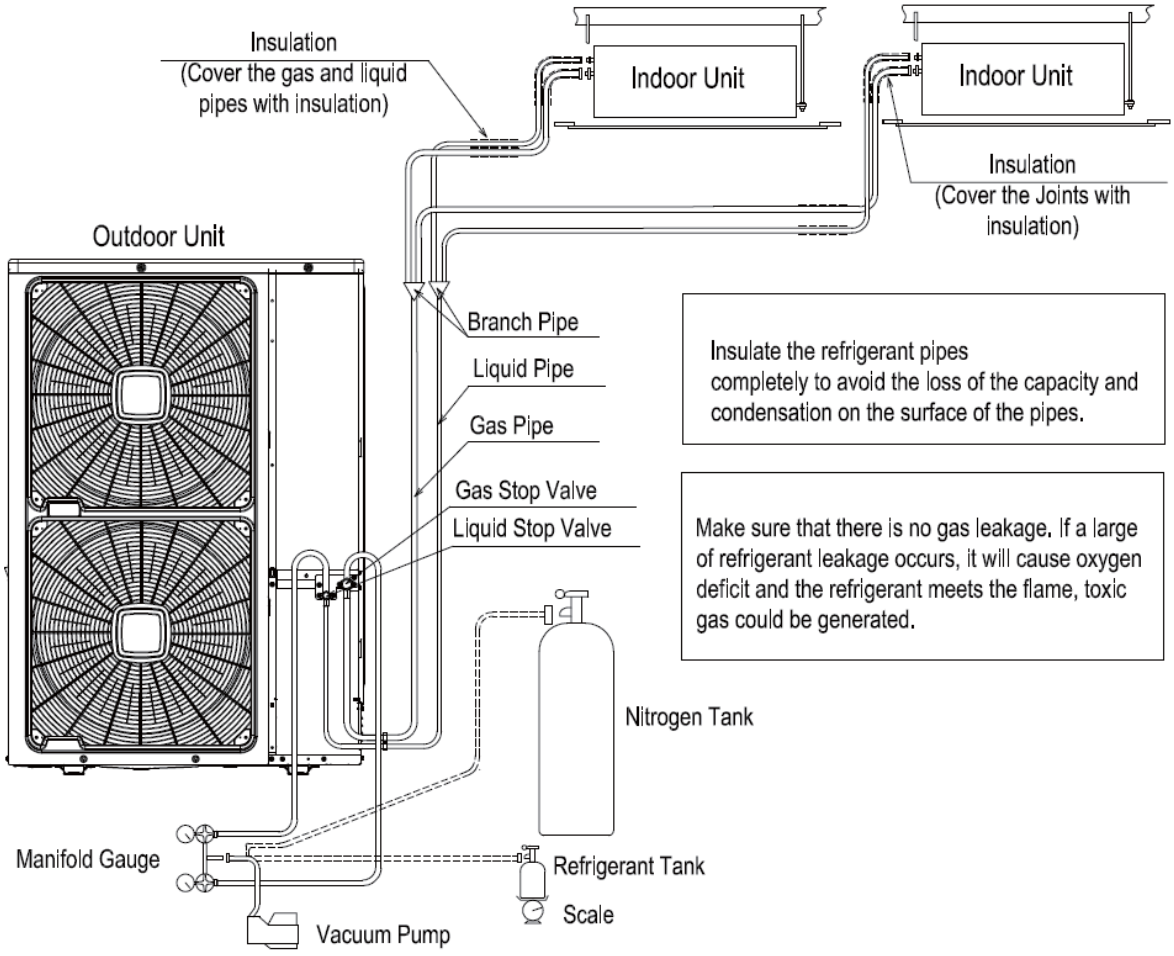
(2) Vacuum the refrigerant piping of the system with the vacuum pump until the pressure reaches -0.1MPa or lower. Then, continue the vacuum pumping work for more than one hour.

(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-3.0~6.0 HNSKQ</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-6.5~7.0 HNSKQ</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 round-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>28~45</td><td>W21=</td><td></td><td>×0.23kg/pcs=</td><td></td></tr>
<tr><td>50~71</td><td>W22=</td><td></td><td>×0.29kg/pcs=</td><td></td></tr>
<tr><td>80~160</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-3.0~4.0HNSKQ	RAS-4.5~6.0HNSKQ	RAS-6.5~7.0HNSKQ
Max. Additional Refrigerant Charge Quantity (kg)	3.1	2.7	7.9

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

Outdoor Unit	W_0(kg)
RAS-3.0HNSKQ	2.5
RAS-3.5~4.0HNSKQ	3.1
RAS-4.5~6.0HNSKQ	4.0
RAS-6.5HNSKQ	5.5
RAS-7.0HNSKQ	5.9

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				
The system	=		+		=		kg	Total Additional Charge: W ☐ kg Total Ref. Charge: ☐ kg Date of Ref. Charge Work: ☐ / ☐ / ☐

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.

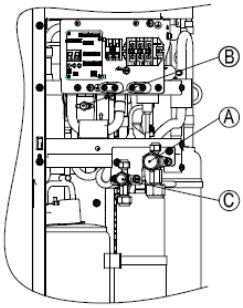
NOTICE

- 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.

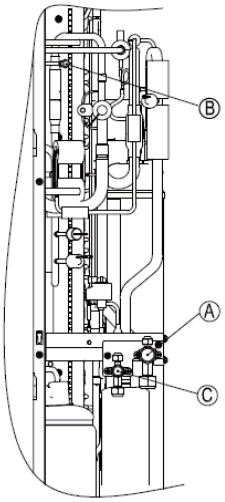
3.9 Pressure Measurement

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

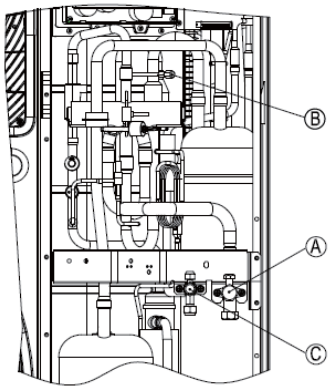
Item	Cooling Operation	Heating Operation
Check joint for gas stop valve “A”	Low Pressure	High Pressure
Check joint for piping “B”	High Pressure	Low Pressure
Check joint for liquid stop valve “C”	High Pressure	High Pressure



a)RAS-3.0~4.0HNSKQ



b) RAS-4.5~6.0HNSKQ



c) RAS-6.5~7.0HNSKQ

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 dissipat 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 railwa , 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 figur s:

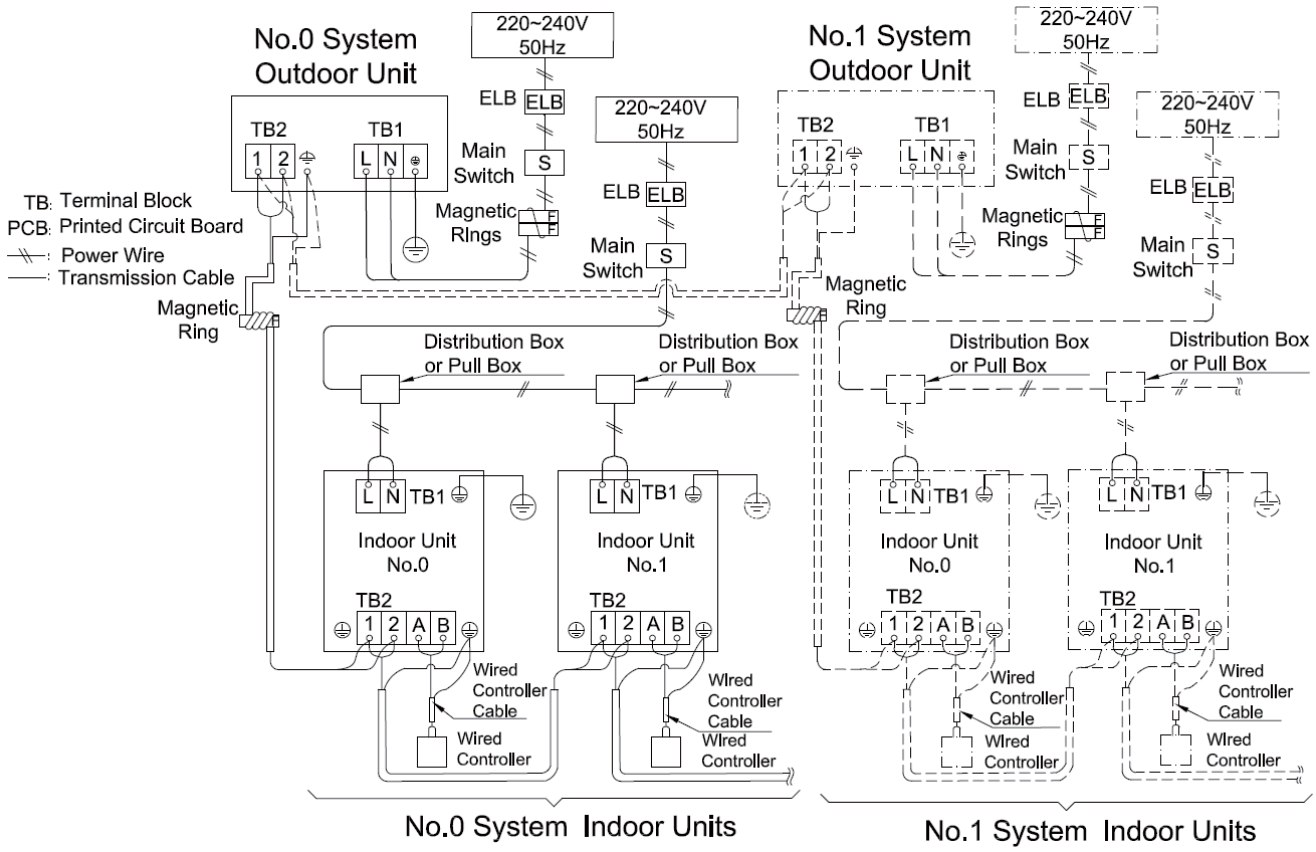


Figure 4.1 Electrical Wiring Connection for RAS-3.0~7.0HNSKQ

Table 4.1 Electrical Data and Recommended Characteristics

Model	Power Supply	Rated Ampacity (A)	Power Supply Wiring (Cores×mm^2)	Transmission cable (Cores×mm^2)	ELB	
					Rated Ampacity (A)	Rated Sensitive Ampacity (mA)
RAS-3.0~4.0HNSKQ	220~240V 1Ph/50Hz	25	3×4.0	2×0.75	32	30
RAS-4.5HNSKQ	220~240V 1Ph/50Hz	30	3×6.0	2×0.75	40	30
RAS-5.0HNSKQ	220~240V 1Ph/50Hz	31	3×6.0	2×0.75	40	30
RAS-6.0HNSKQ	220~240V 1Ph/50Hz	33	3×10.0	2×0.75	40	30
RAS-6.5HNSKQ	220~240V 1Ph/50Hz	32	3×6.0	2×0.75	40	30
RAS-7.0HNSKQ	220~240V 1Ph/50Hz	32	3×6.0	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-3.0~7.0HNSKQ 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

OPERATION

⚠ 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.

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.

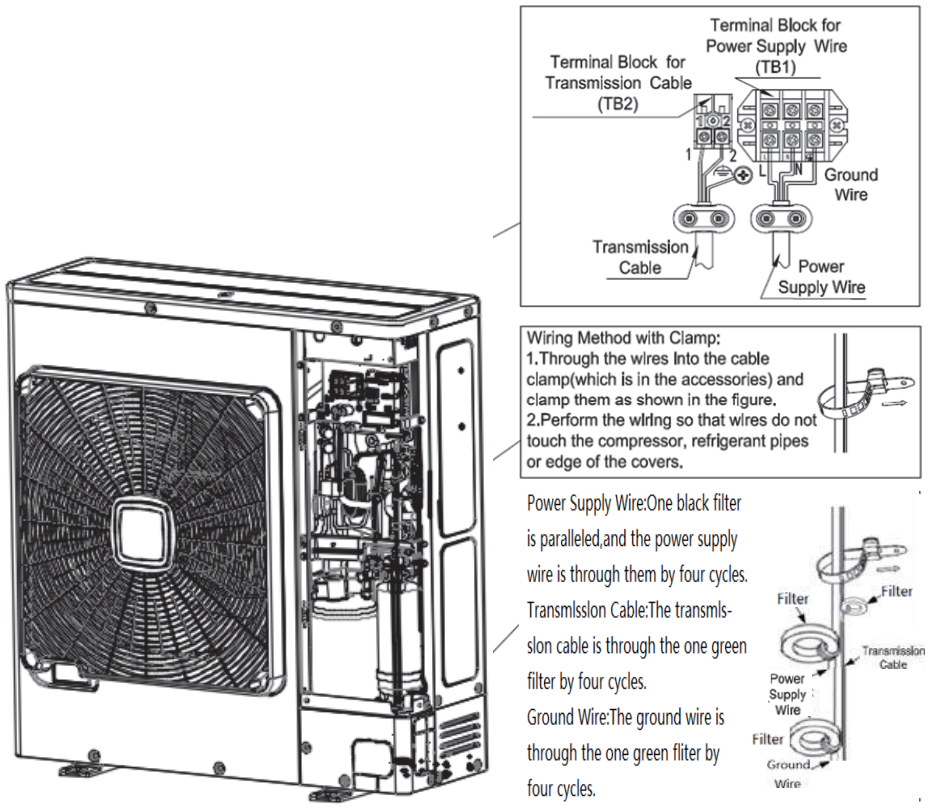


Figure 4.2 Electrical Wiring for RAS-3.0~4.0HNSKQ

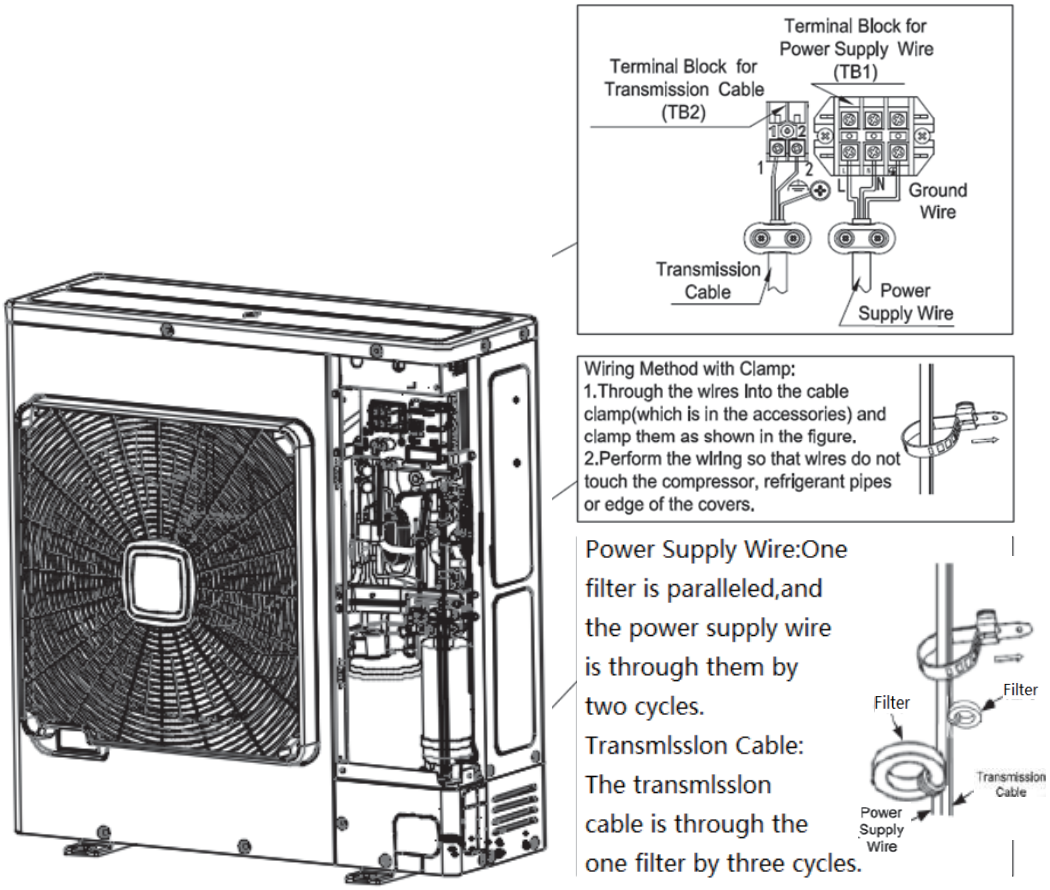


Figure 4.3 Electrical Wiring for RAS-4.5~6.0HNSKQ

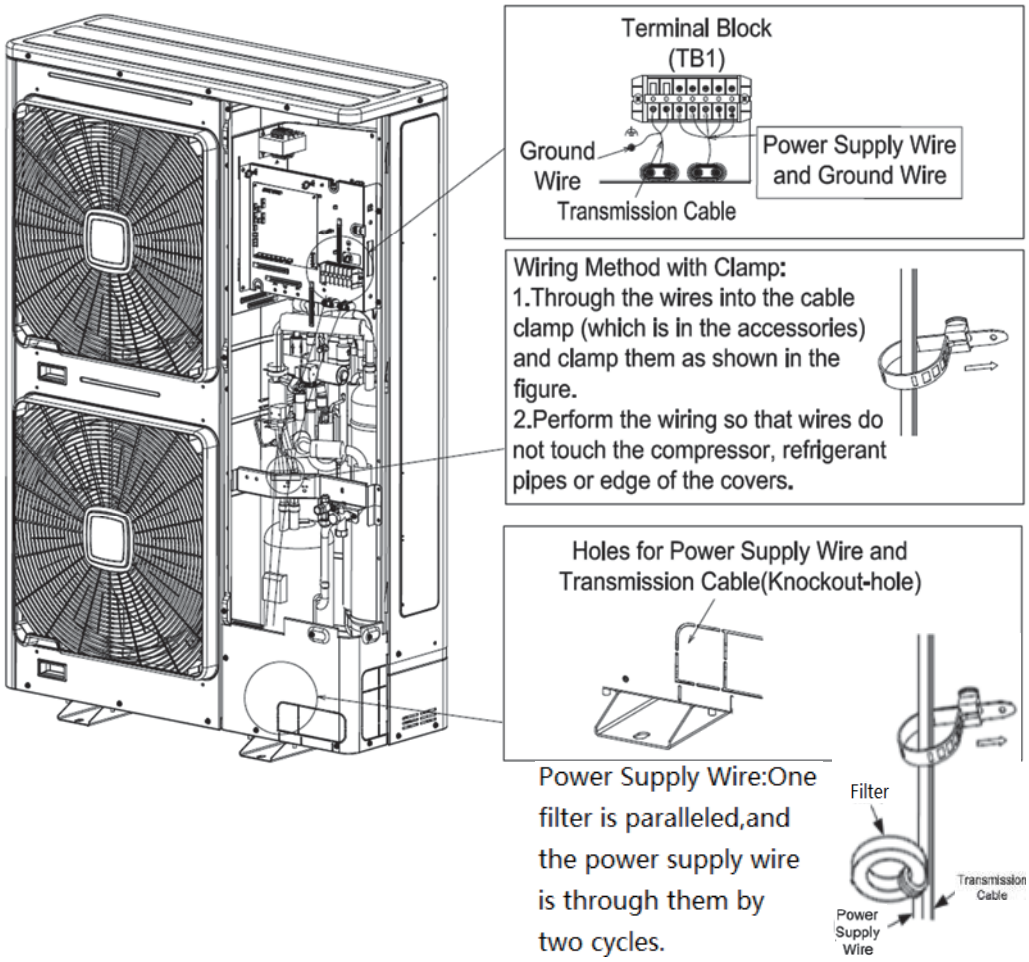


Figure 4.4 Electrical Wiring for RAS-6.5~7.0HNSKQ

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	*1: If the total ampacity is over than 63A, the power supply wires must not be connected in series.
10<I≤16	2.5	
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.

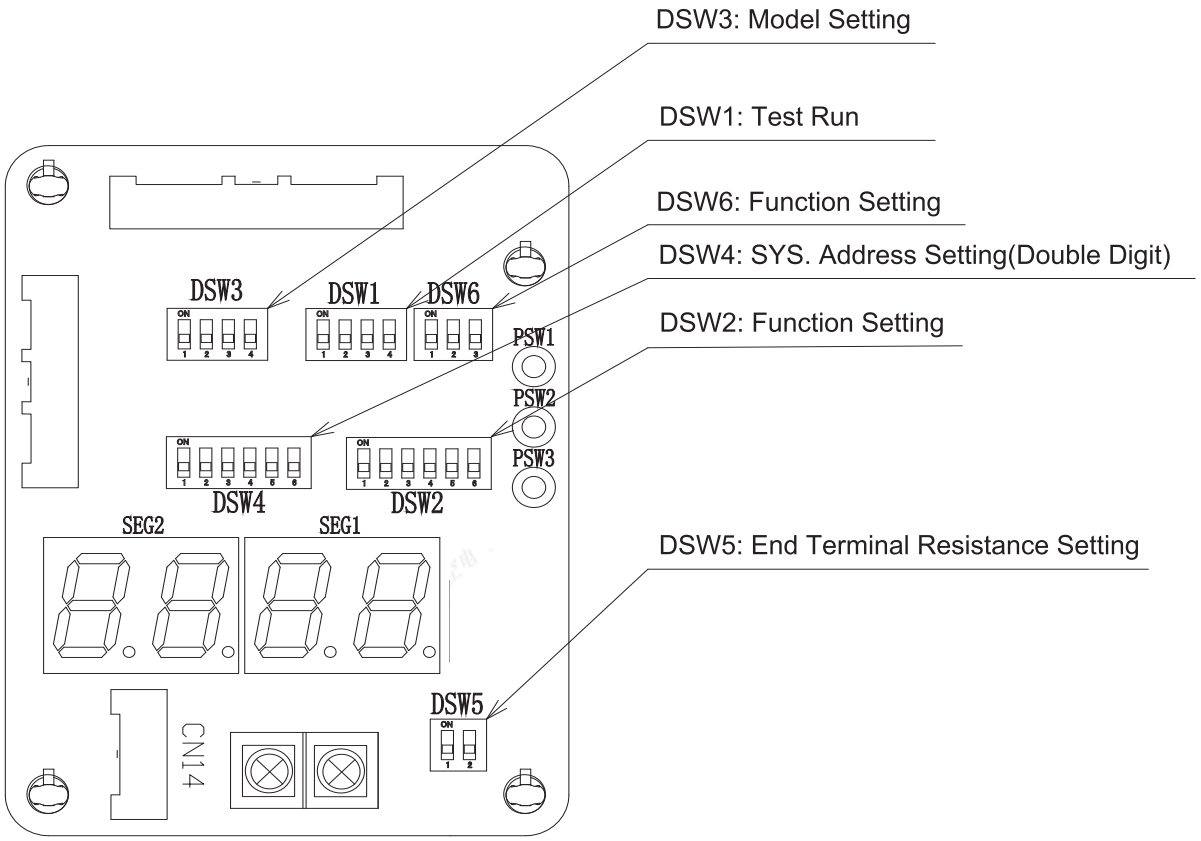


Figure 5.2 DIP Switches of RAS-3.0~7.0HNSKQ

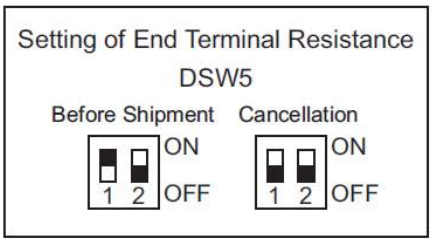
(1) The mark of "■" indicates the position of DIP switches. Set the DIP switches according to the introduction of DIP switches inside the outdoor unit.

(2) Setting for Transmitting

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

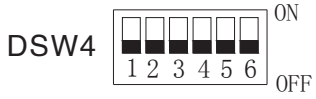
(3) Setting End Terminal Resistance

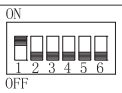
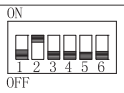
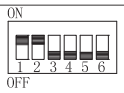
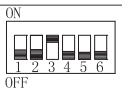
Before shipment, No. 1 pin of DSW5 is set at the "ON" side. If there are 2 or more units in the same communication system, set No. 1 pin of DSW5 at the "OFF" side from the 2nd refrigerant group outdoor unit. If only one outdoor unit is used, no setting is required.



(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.



0	1	2	3	4	~	62	63
					~		

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.

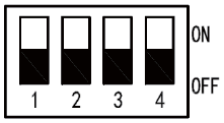
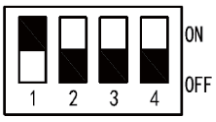
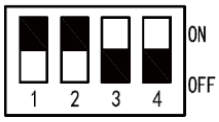
(3) Turn off the main power switch to the indoor unit and the outdoor unit and wait for more than 10 minutes before electrical wiring work or a periodical check is performed.

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.

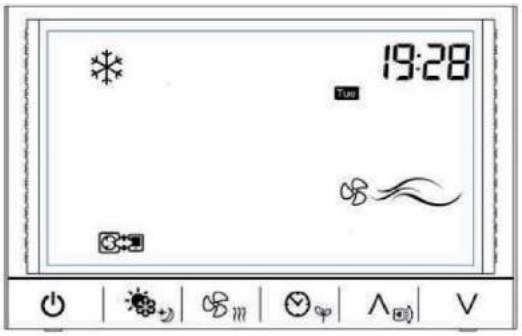
(5) During the test run, if any malfunction happens, please examine and clear it by referring to the table of alarm codes.

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

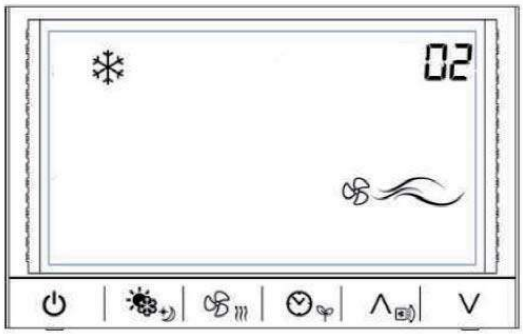
6.3 Test Run by Wired Controller

(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:

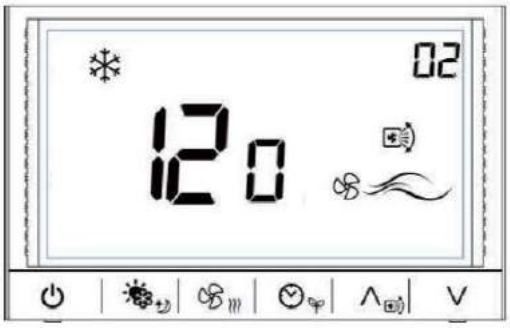


(3) Press and hold the MODE “ ” and INCREASE “ ” simultaneously for at least 5 seconds, the test run menu will be displayed.



- 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/O F " ⏻ ", 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; ● Power supply for outdoor unit is not turned on or incorrect wiring; ● Incorrect wiring of wired controller.	● The terminal block for transmission wiring in the indoor unit; ● The terminal block for transmission wiring in the wired controller; ● The wiring connected to the wrong terminals; ● The screws for the terminal block are loosen.
Less than the actual connected	● Power supply for indoor unit is not turned on; ● 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~ 4.0HNSKQ	RAS-4.5~ 7.0HNSKQ
High Pressure Switch		Automatic Reset, Non-Adjustable	
Cut-Out	MPa	$4.15^{-0.05}_{-0.2}$	$4.15^{-0.05}_{-0.2}$
Cut-In	MPa	$3.2^{+0.15}_{-0.2}$	$3.2^{+0.15}_{-0.2}$
Breaker	A	32	40
Crankcase Heater	W	24	28
CCP Timer Setting Time	Min	Non-Adjustable 3	Non-Adjustable 3

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

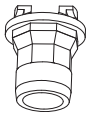
This Drain Adaptor is for the drain pipe connection in order to use the outdoor unit bottom base as a drain pan. Install it as instructed in this manual.

(1) Applicable Unit

Model of Outdoor Unit	3~7.0HP
Required Quantity for Drain Adapter	1

(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

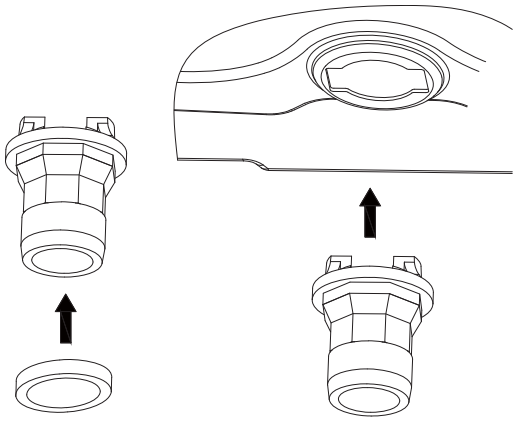
⚠ CAUTION

● 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 th 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 adapto , 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: ● The connection for thermistors ● The connection for the wired controller cable ● The connection for communication cable ● Each connection for power source line 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 overcurrent 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-3.0HNSKQ	220~240	1	50	264	198	1	9.17	10.37	32	20
RAS-3.5HNSKQ	220~240	1	50	264	198	1	11.74	12.25	32	22
RAS-4.0HNSKQ	220~240	1	50	264	198	1	13.85	13.85	32	25
RAS-4.5HNSKQ	220~240	1	50	264	198	1	16.56	17.66	40	26
RAS-5.0HNSKQ	220~240	1	50	264	198	1	19.72	20.23	40	28
RAS-6.0HNSKQ	220~240	1	50	264	198	1	23.62	22.89	40	31
RAS-6.5HNSKQ	220~240	1	50	264	198	1	25.04	23.53	40	32
RAS-7.0HNSKQ	380~415	1	50	456.5	342	1	26.83	25.73	40	32

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.

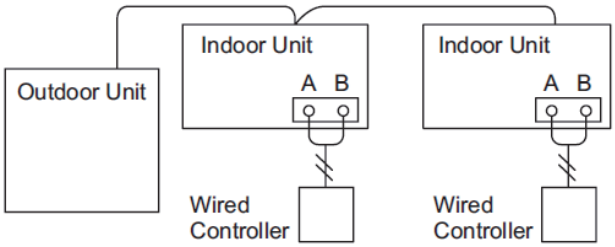
Gas Piping: An explosion and ignition may occur if gas is escaping.

Water Piping: There is no effective electrical ground provided when hard vinyl piping is used.

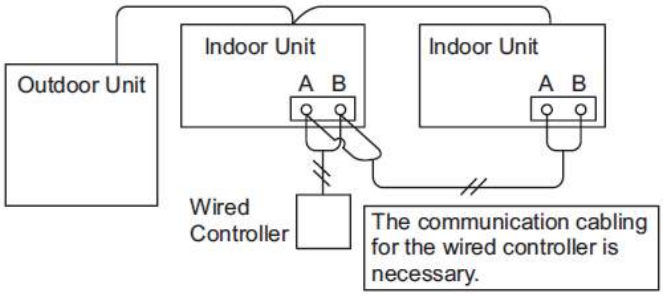
Lightning Conductor: The electrical potential of the earth increases when a lightning conductor is used.

(3) Wired Controller Connecting Diagram

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

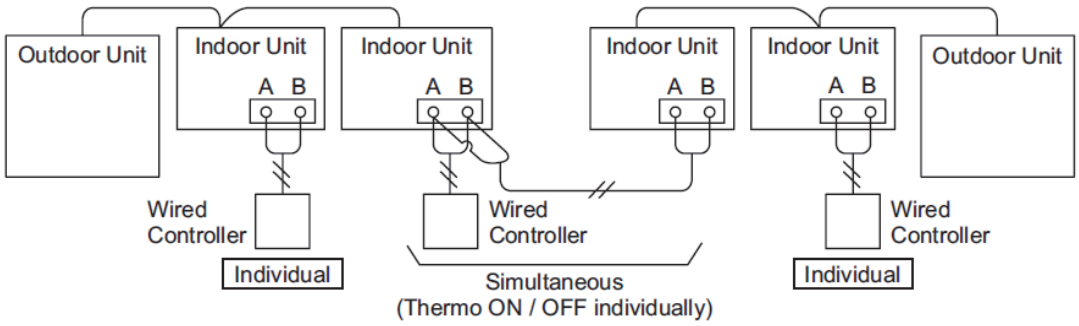


(b) One Wired Controller for Individual Operation Setting.



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.



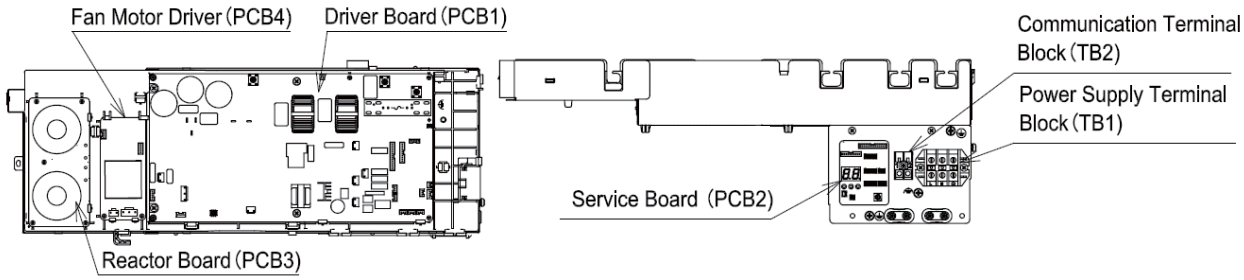
NOTES:

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

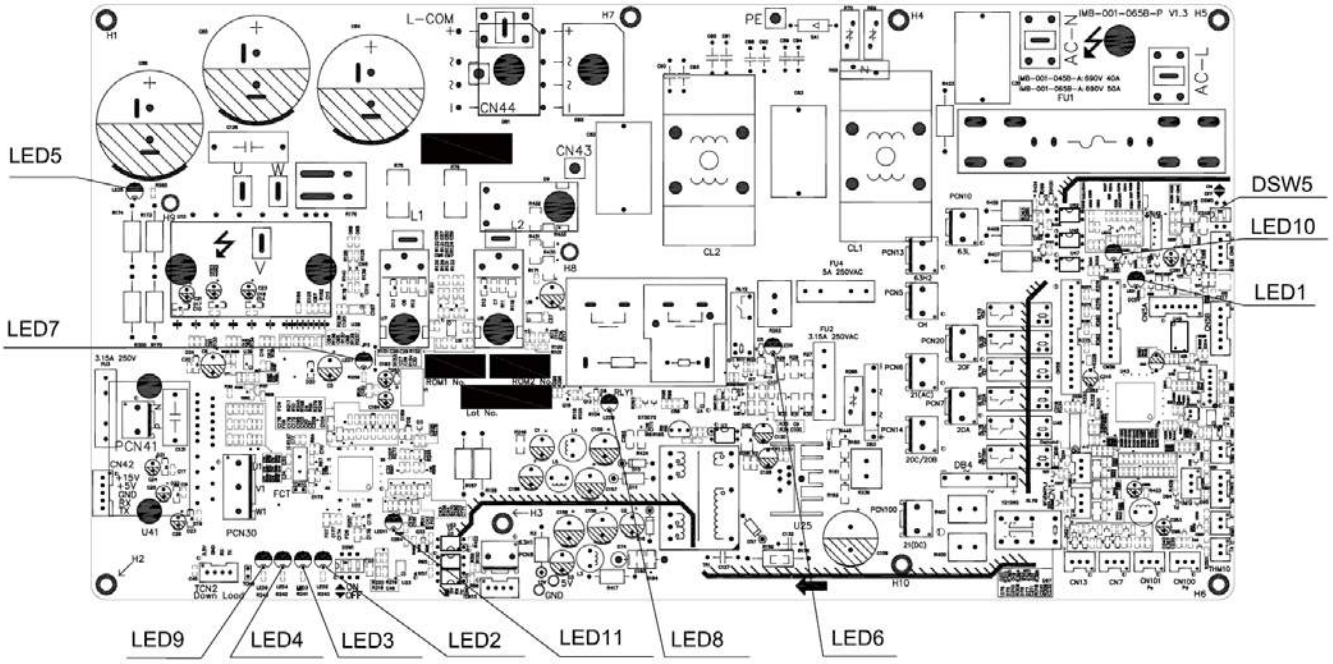
(1) Model: RAS-3.0~7.0HNSKQ



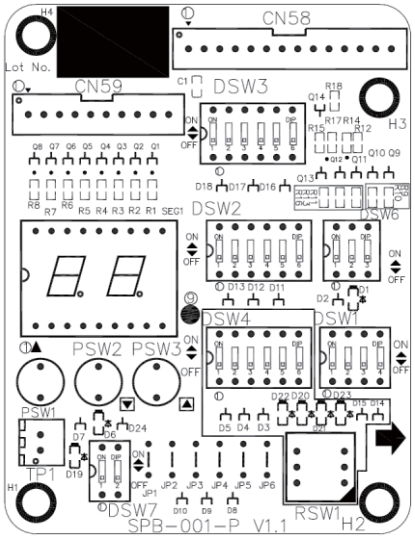
Symbol	PCB	Purpose
PCB1	Outdoor Unit Board (Driver Board)	1. Communicating between Indoor Unit and Outdoor Unit; 2. Processing Sensor Input; 3. Operation Control for Above Items 1 to 2. Compressor Operation Control, Fan2 Control, Electrical Expansion Valve, 4-Way Valve, Solenoid Valve, and Overcurrent Control; 4. Processing of Safety Device Input; 5. Processing of Relay Output.
PCB2	Service Board	1. Processing DIP Switch Input; 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) 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 Normal Condition: Activated /ON; Abnormal Condition: Deactivated /OFF.
LED6 (Red)	Power source indicator for Precharge Relay Normal Condition: Activated /ON; Abnormal Condition: Deactivated /OFF.
LED7 (Green)	Power source indicator for inverter control of the PCB1 (3.3V) Normal Condition: Activated /ON; Abnormal Condition: Deactivated /OFF.
LED8 (Red)	Power source indicator for Main Relay 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. Normal Condition: Activated /Flash; Abnormal Condition: Deactivated /OFF.
LED11 (Green)	It indicates the communication state between the main control and inverter control of PCB1. Normal Condition: Activated /Flash; Abnormal Condition: Deactivated /OFF.



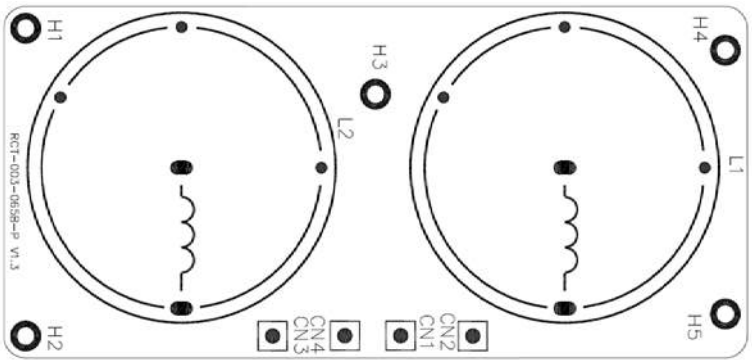
b. Service Board (PCB2)



Definition of DI Switch:

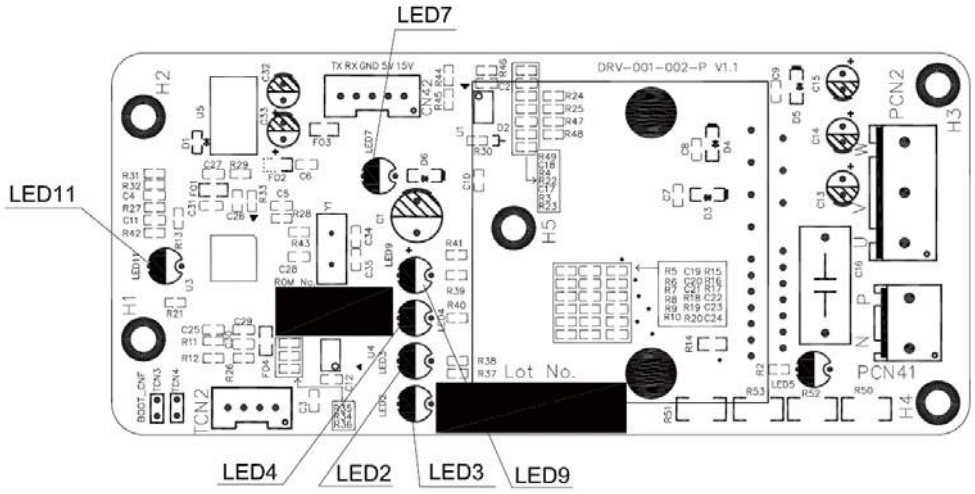
No.	DIP Switch Code	Definitio	No.	DIP Switch Code	Definitio
1	DSW1	Test Run	7	PSW1	Manual Defrosting
2	DSW2	Function Setting	8	PSW2	Decrease ▼
3	DSW3	Model Setting	9	PSW3	Increase ▲
4	DSW4	System Address Setting: Double Digit	10	SEG1	7-segment Display
5	DSW6	Function Setting	11	TP1	Test Port for Factory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

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) 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. Normal Condition: Activated /Flash; Abnormal Condition: Deactivated /OFF.



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 firs 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

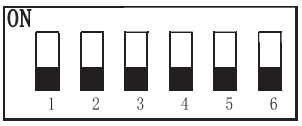


Setting Item	Pin No.
Test Cooling Operation	1
Test Heating Operation	1,2
No setting is required	3
Compressor Forced Stop and Function Setting	4

DSW2 Function Setting

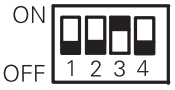
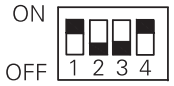
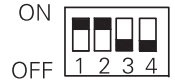
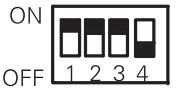
Setting is required.

Setting before Shipment



Stteing 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

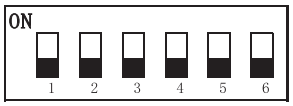
030	035	040	045
			
050	**060**	**065**	**070**
			

DSW4 Ref.Cycle No Setting

Setting is required

Setting Before Shipment

DSW4



Tens Digit

Set the unit number of outdoor unit at each refrigerant cycle.

(Setting before shipment is unit 0.)

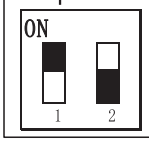
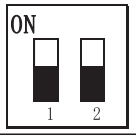
DSW5 Communication Setting

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.

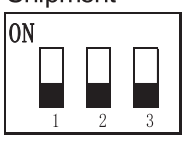
Refer to "Setting of End Terminal Resistance".

Setting Before Shipment	End Resistance Cancellation
	

DSW6 -

No Setting is required.

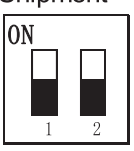
Setting Before Shipment



DSW7 -

No Setting is required.

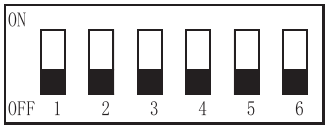
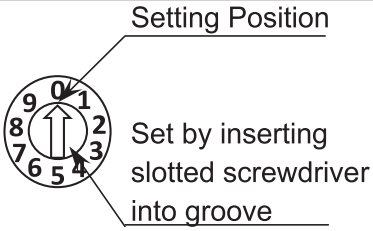
Setting Before Shipment



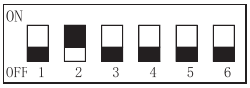
(2) Setting of Refrigerant System No.

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.		
Indoor Unit	DSW5	RSW2

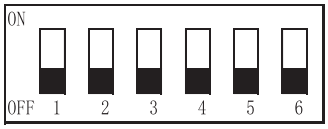
For example: If Setting Refrigerant System No. 25



Turn On No.2 pin



Set Dial No.5

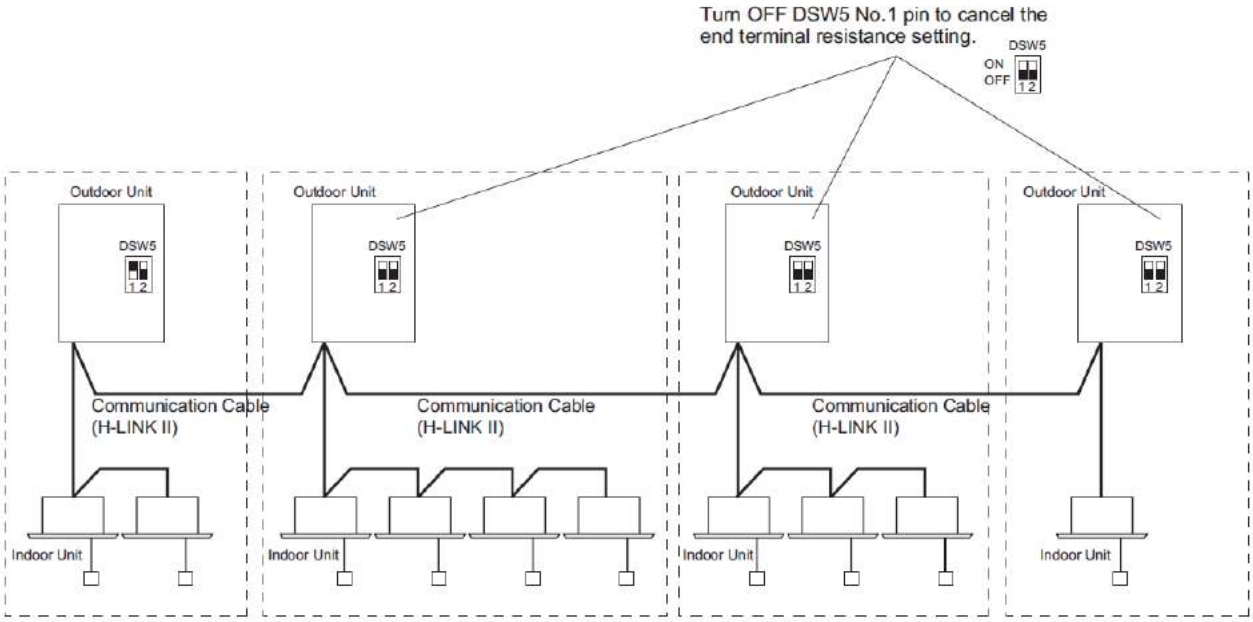
Item	Setting Switch
	2digit
Refrigerant System No.	
outdoor unit	DSW4

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.

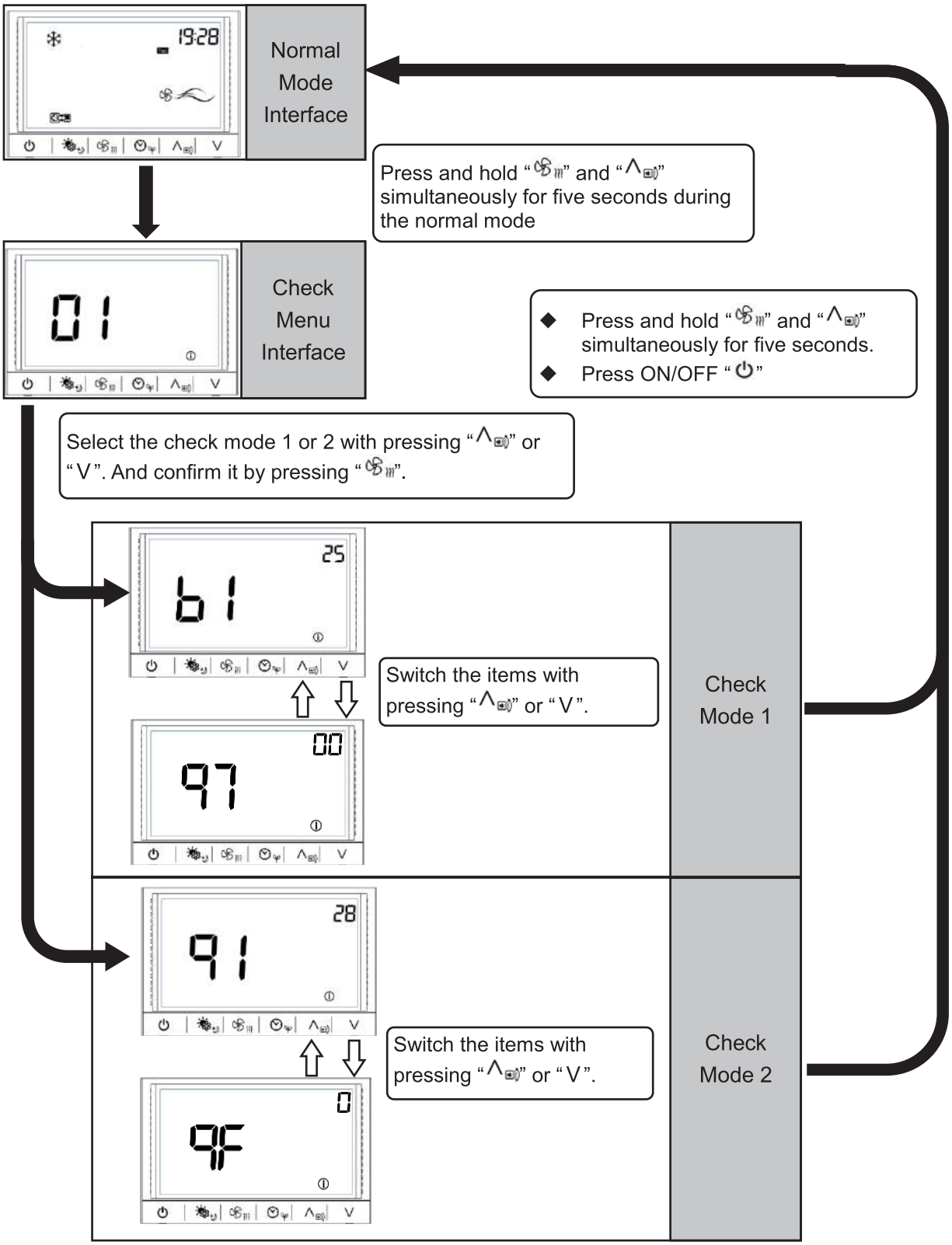
(3) Setting of End Terminal Resistance

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 fig re:



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.

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.			

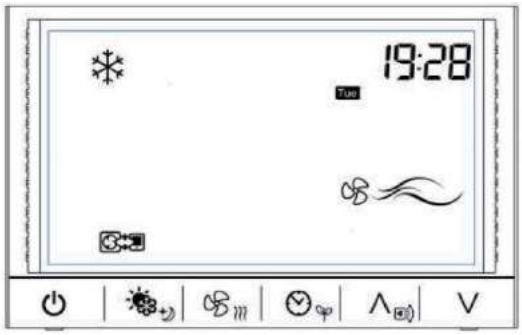
NOTE:

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

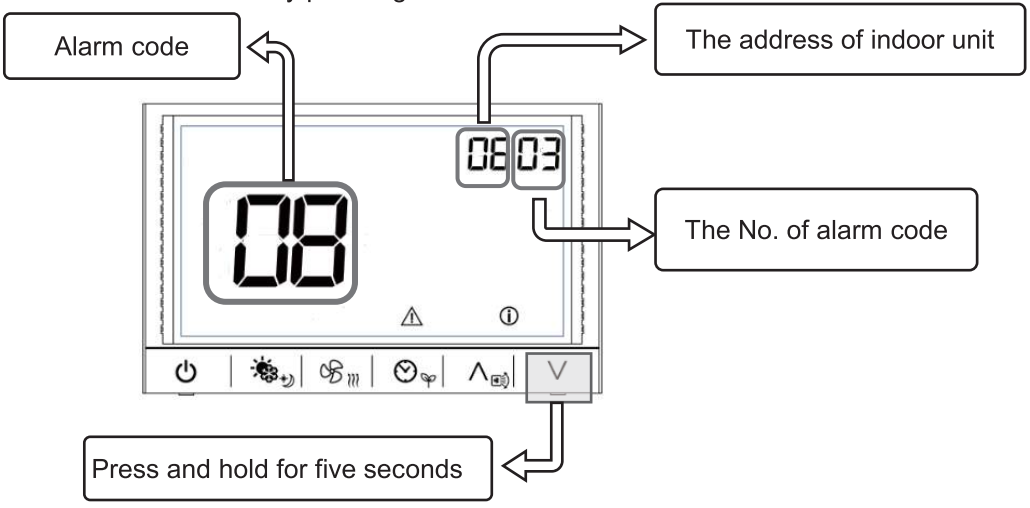
(3) Alarm History Display

The Alarm History Display is accessed from the Check Menu.

(A) The figure shows the normal mode inter ace.



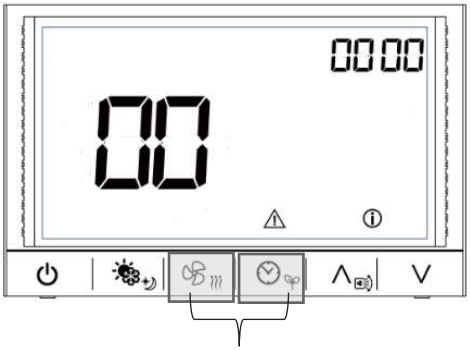
(B) Press and hold “ ∨ ” for five seconds during the normal mode, and the history alarm code woul display. The codes can be checked by pressing “ ∧ ”or “ ∨ ”.



(C) Press the “ ∨ ” for five seconds or press ON/O F “ ⏻ ”, 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 displa ， 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 fi ure.



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

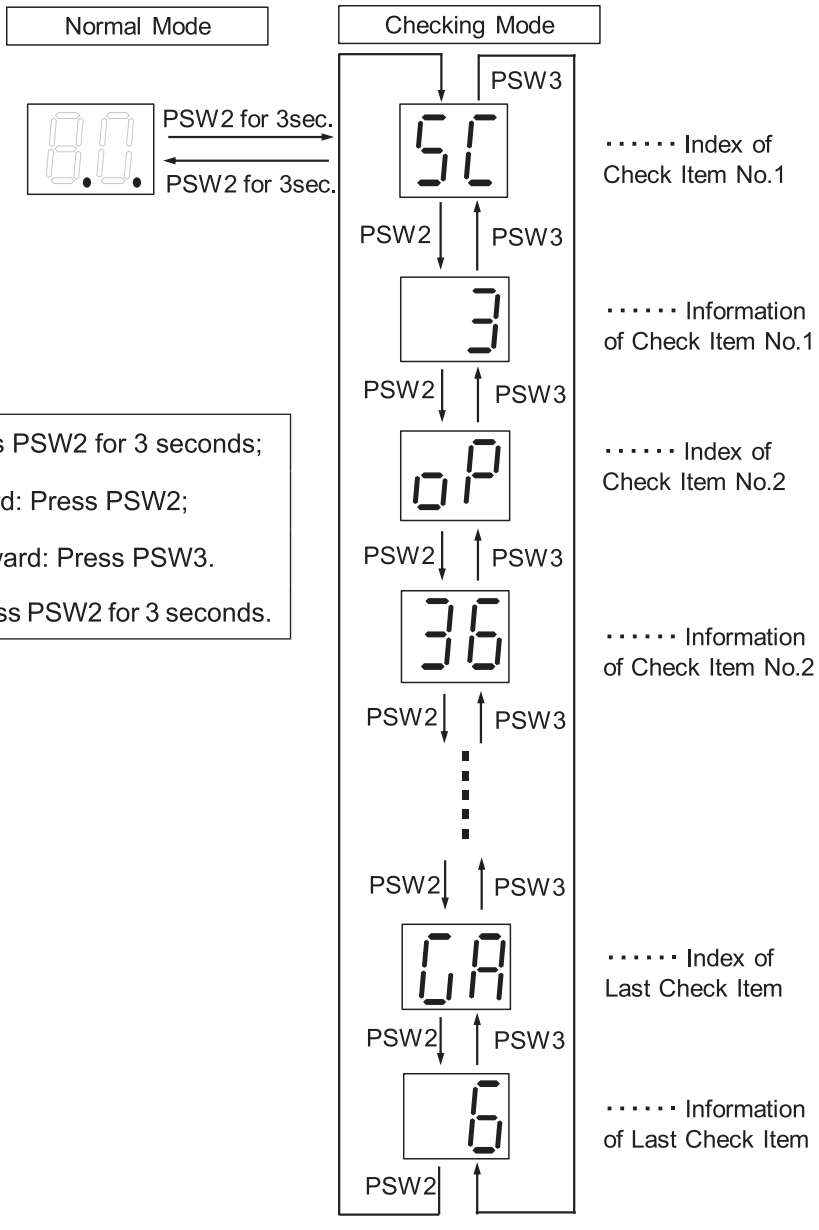
● Only an authorized person can check using this method.

---

(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 (3~7HP) and push switches (PSW).



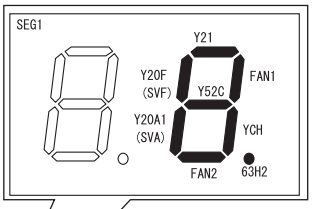
(A) To start the checking mode: Press PSW2 for 3 seconds;

(B) To move the checking item forward: Press PSW2;

(C) To move the checking item backward: Press PSW3.

(D) To cancel the checking mode: Press PSW2 for 3 seconds.

(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 (Indoor Unit No.)
Indoor Electronic Expansion Valve Opening	25	EA	45	0 ～ 100(%)
Liquid Pipe Temp. of Indoor Unit	26	LA	-5 *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	UU	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	UU ⇨ ……..	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

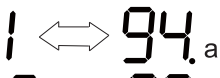
For example：

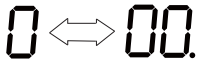
When number is "-19", SEG1 displays -19

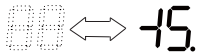
When number is "120", SEG1 flashe 20

- *2: Alternately upper 2 digits and lower 2 digits are indicated every 0.5 sec.

For example：

When number is "194", SEG1 displays  alternately every 0.5 sec.

When number is "0", SEG1 displays  alternately every 0.5 sec.

When number is "-15", SEG1 displays  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 Capacit
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 alve 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 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 (FF /FF.)

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

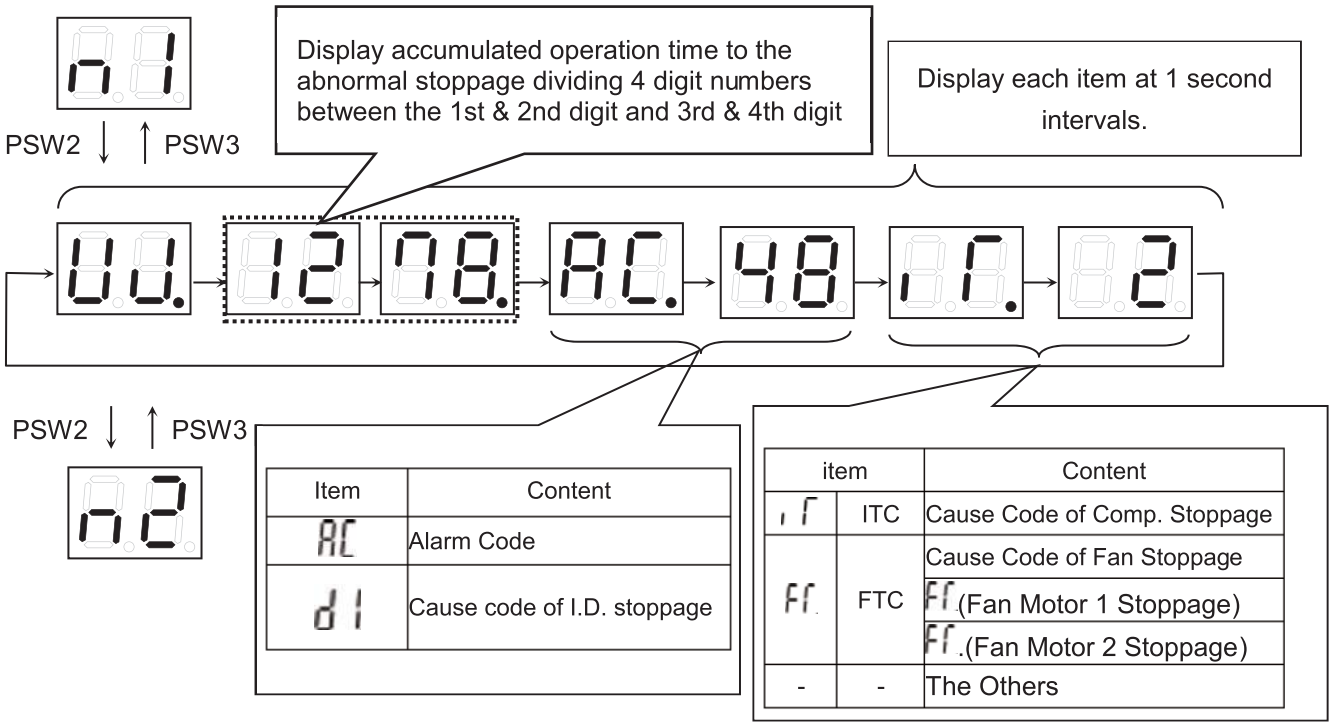
Code	Capacity Name	Code	Capacity Name
5	18	20	71
6	22	22	80
7	25	26	90
8	28	28	100
9	32	32	112
10	36	35	125
11	40	40	140
13	45	48	160
14	50	56	180
16	56	64	224
18	63	80	280

(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



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 Deccrease	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)

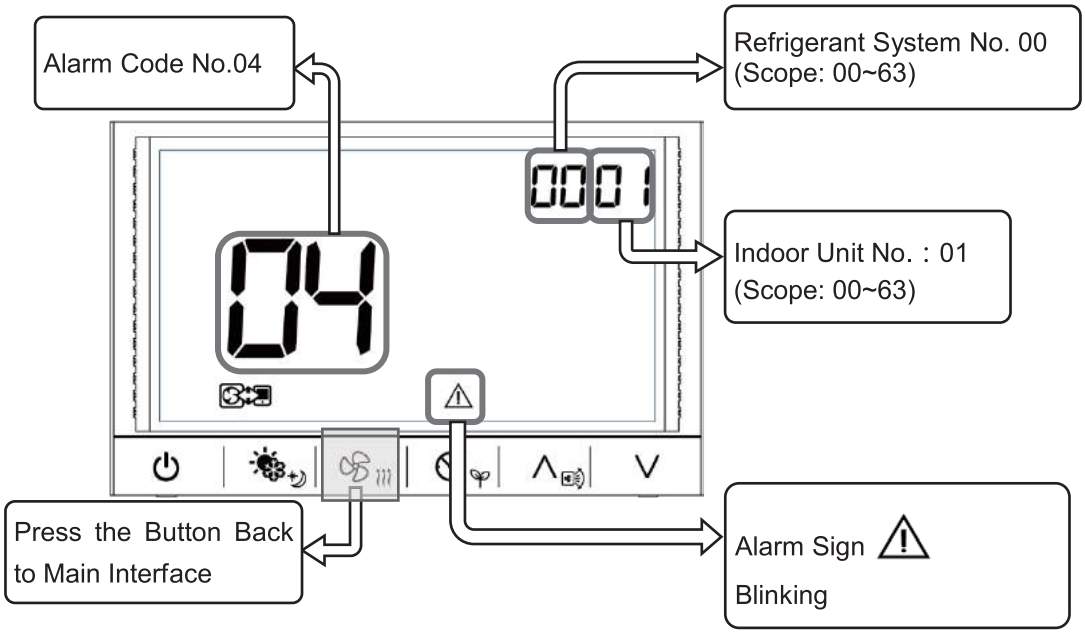
Protection Control Code and Retry Control Code

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 oltage/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

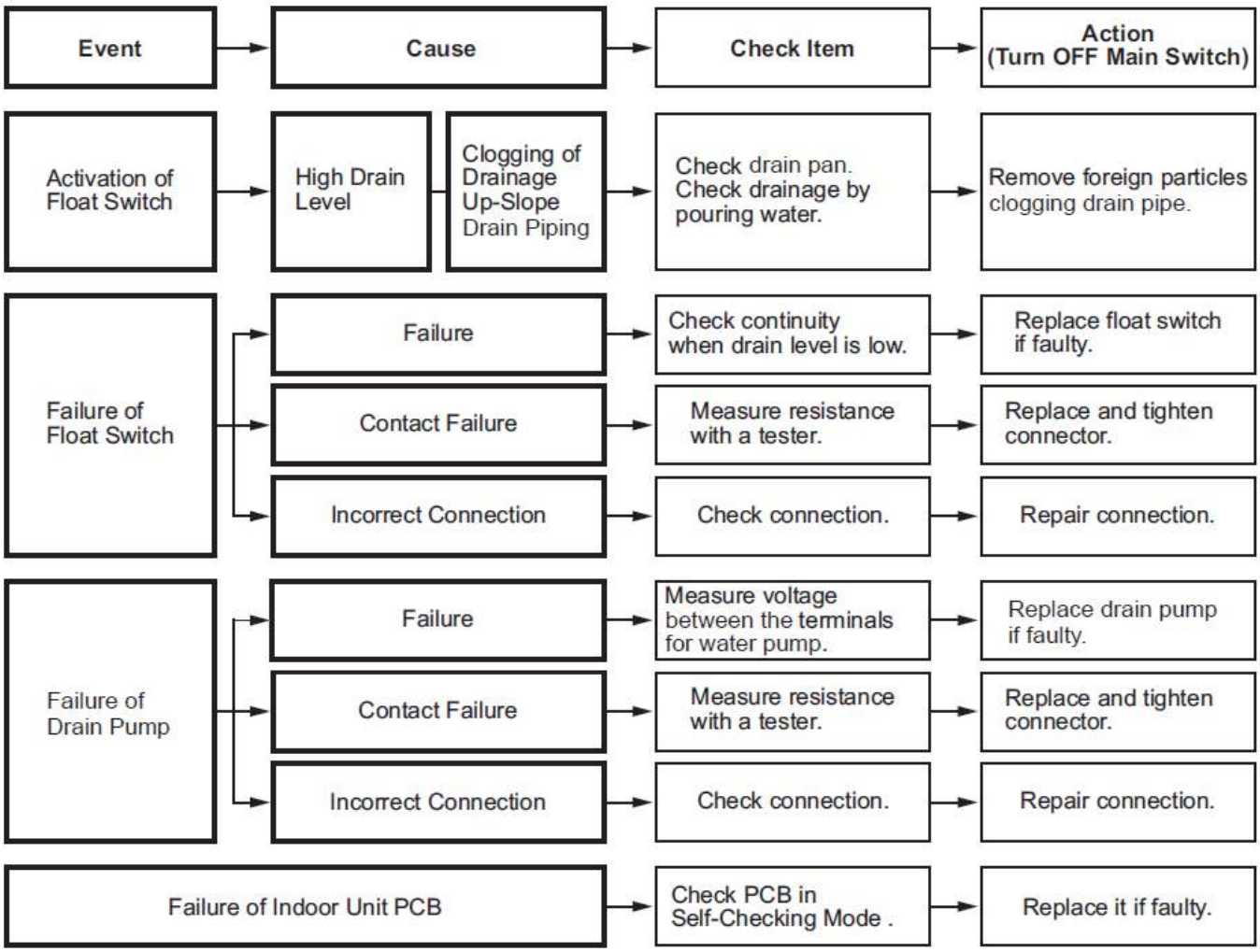
Alarm Code	01	Activation of Protection Device (Float Switch) in Indoor Unit

- 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

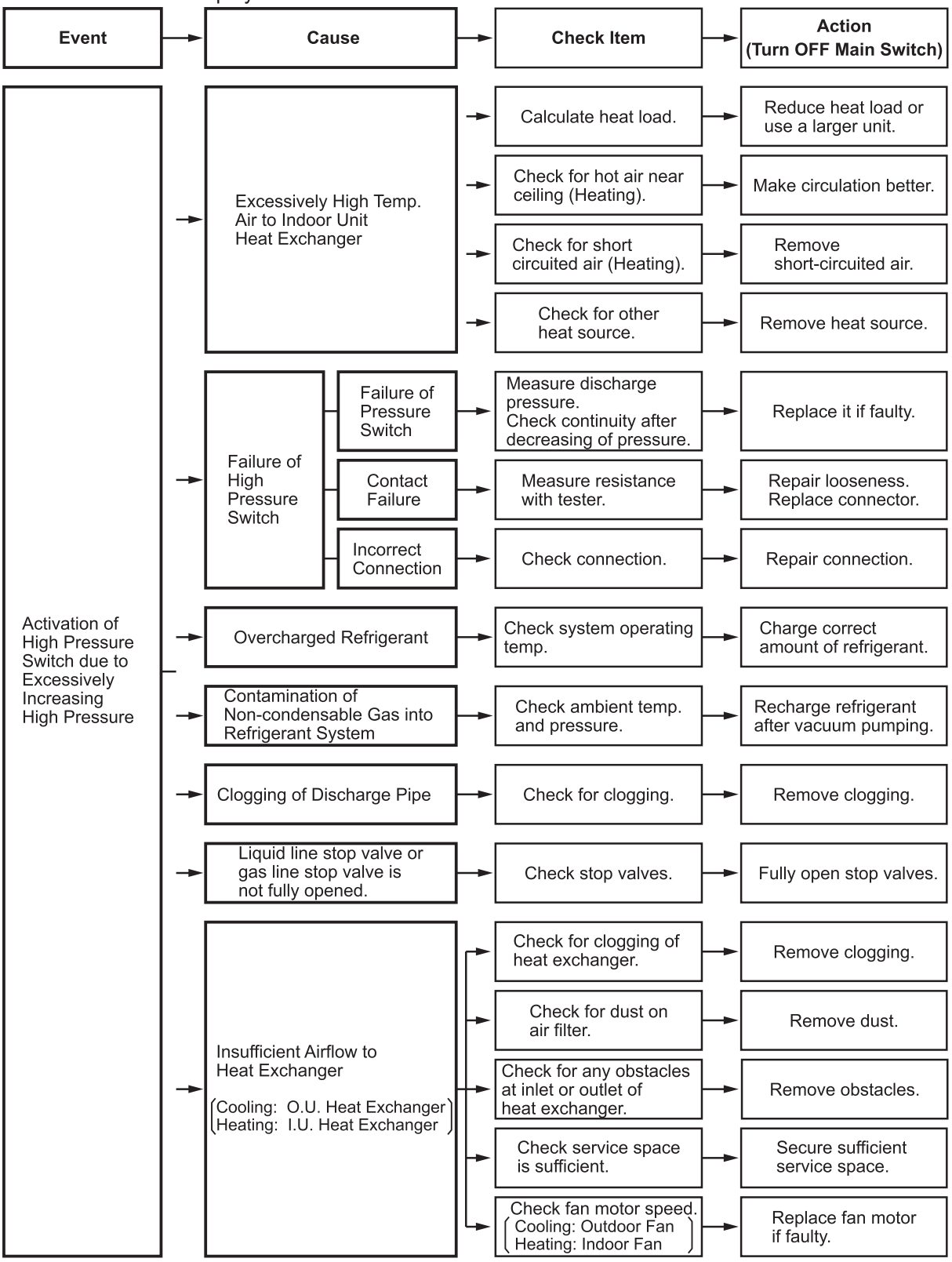
This alarm code is displayed when the contact between #1 and #2 of CN14 on the I.U. PCB is opened for more than 120 seconds during the cooling, dry, fan, or heating operation.

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.



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.

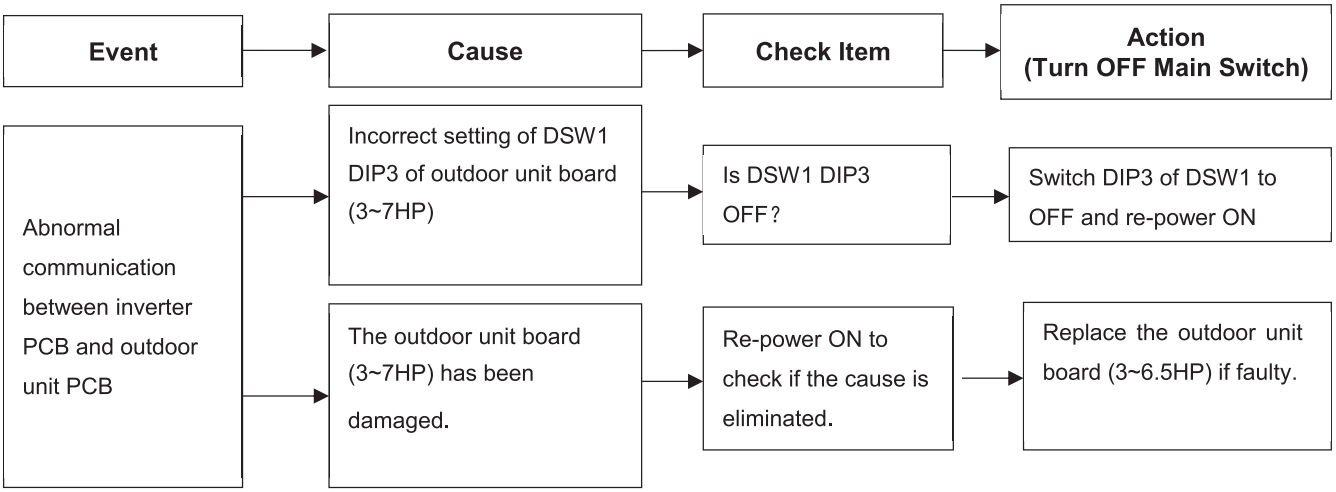
★ This alarm code is displayed when an abnormal condition continues for three minutes after normal communication between indoor units and outdoor units, and also the abnormal condition continues for 30 seconds even after the micro-computer is automatically reset. If communication failure occurs from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

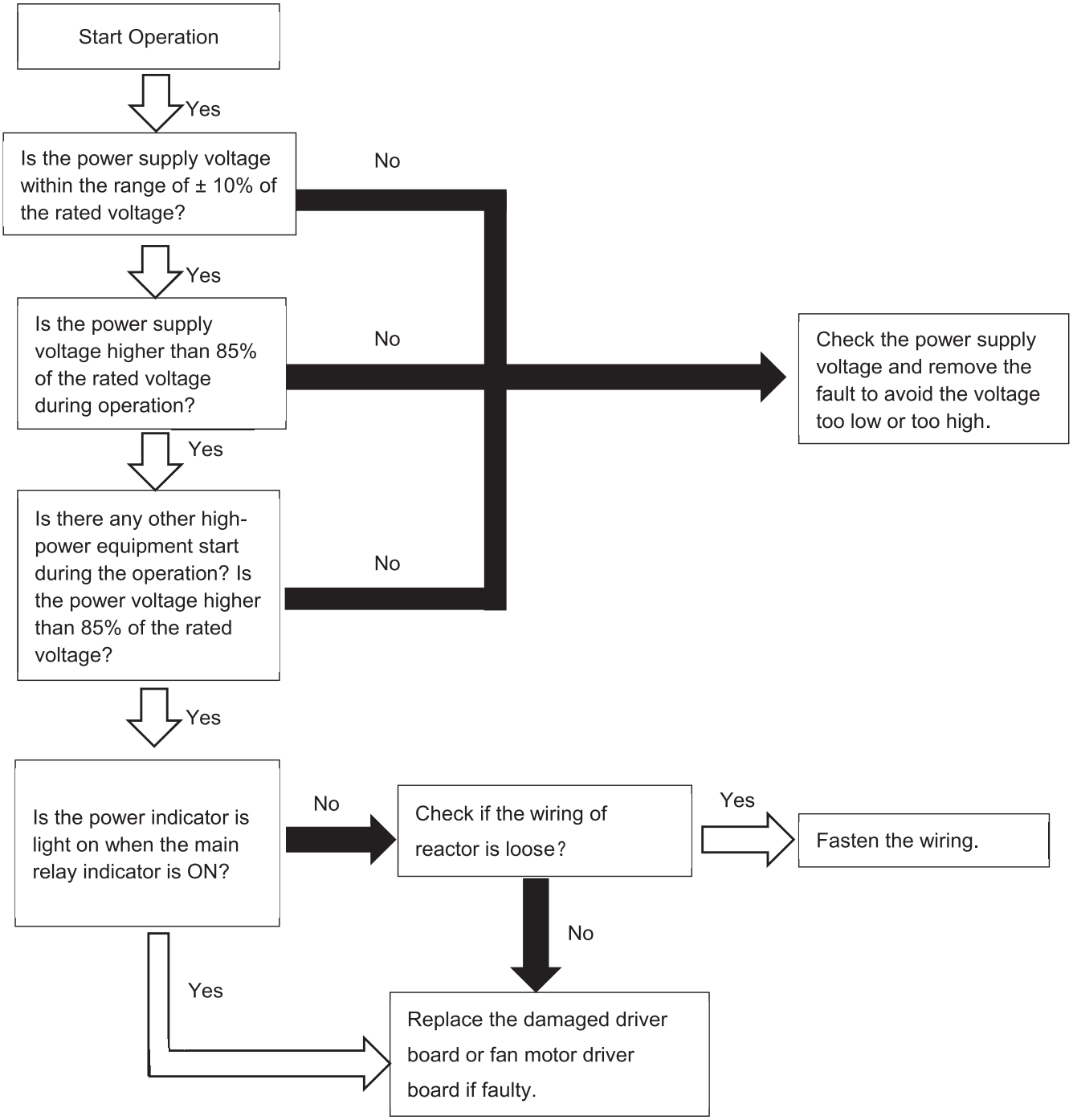
★ This alarm code is displayed after the operation is stopped when an abnormal communication occurs between the inverter PCB (Driver Board) and the outdoor unit PCB (Main Board).



Alarm Code	06	Abnormal Inverter Voltage (Insufficient Inverter oltage 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 (Drive 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.

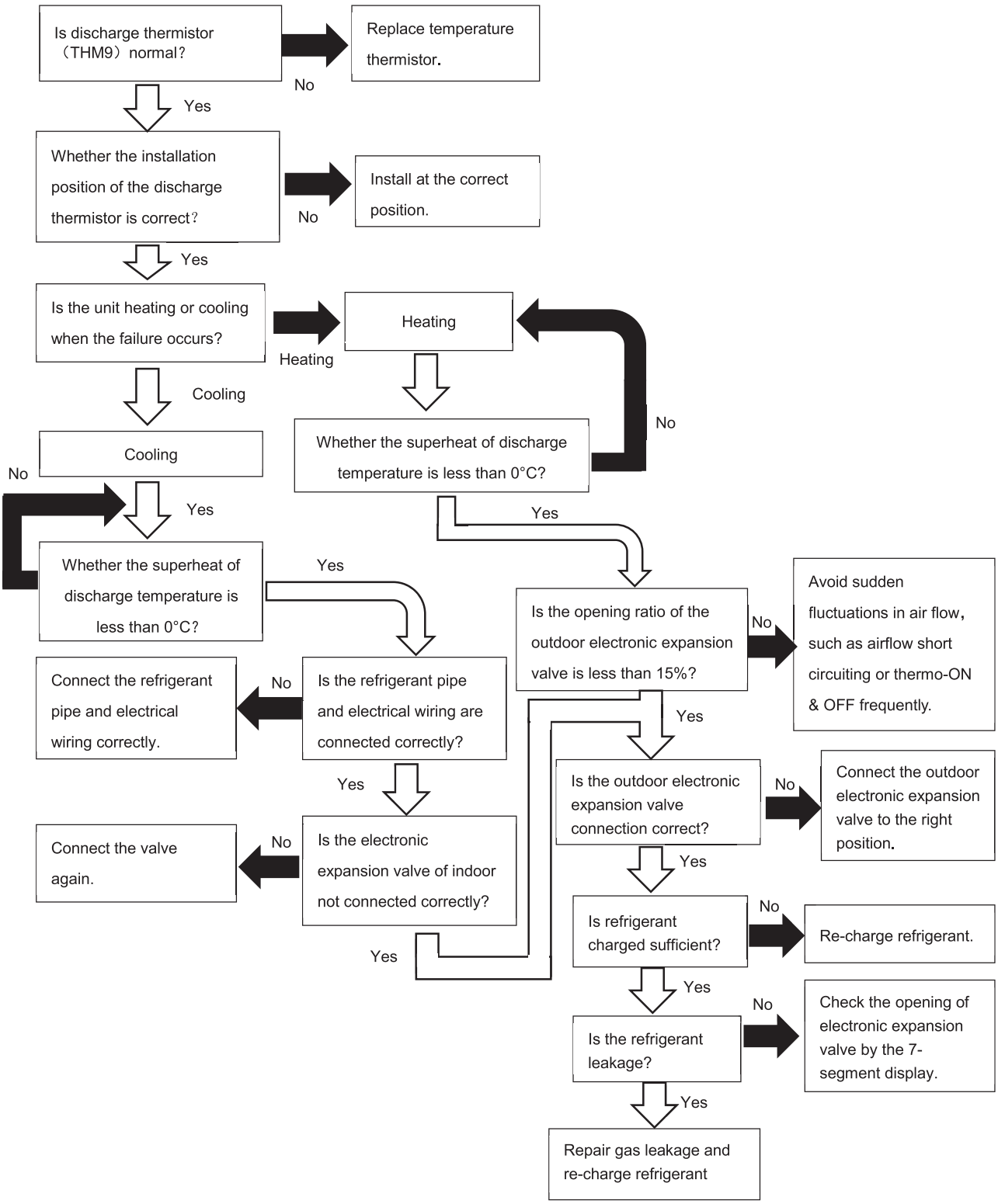


Alarm Code	07	Decrease in Discharge Gas Superheat

- 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.

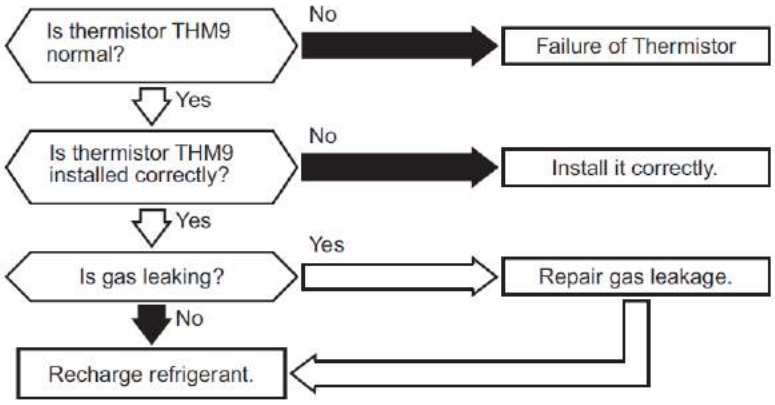
★ This alarm code is displayed when an abnormality cannot be detected by the step-out detection, caused by locking of compressor shaft.

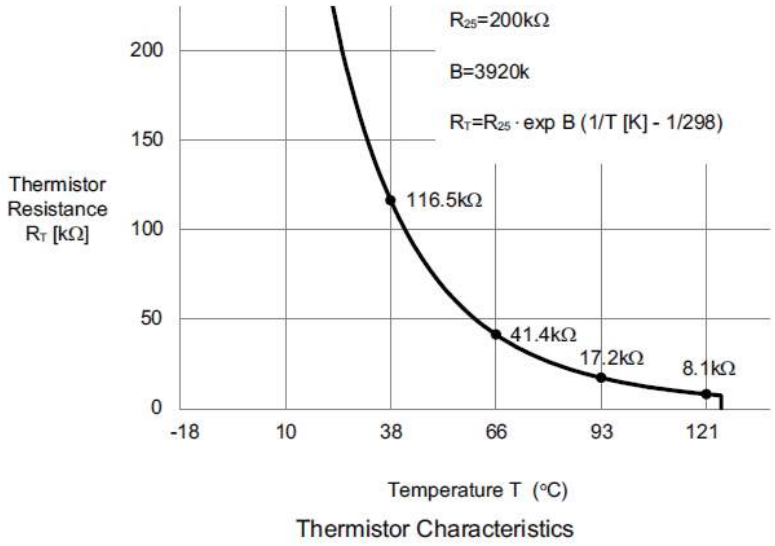

Is discharge thermistor （THM9）normal?
No
Replace temperature thermistor.
Yes
Whether the installation position of the discharge thermistor is correct?
No
Install at the correct position.
Yes
Is the unit heating or cooling when the failure occurs?
Heating
Heating
Cooling
Cooling
No
Yes
Whether the superheat of discharge temperature is less than 0°C?
No
Yes
Whether the superheat of discharge temperature is less than 0°C?
Yes
Is the opening ratio of the outdoor electronic expansion valve is less than 15%?
No
Avoid sudden fluctuations in air flow, such as airflow short circuiting or thermo-ON & OFF frequently.
Yes
Connect the refrigerant pipe and electrical wiring correctly.
No
Is the refrigerant pipe and electrical wiring are connected correctly?
Yes
Is the outdoor electronic expansion valve connection correct?
No
Connect the outdoor electronic expansion valve to the right position.
Yes
Connect the valve again.
No
Is the electronic expansion valve of indoor not connected correctly?
Yes
Is refrigerant charged sufficient?
No
Re-charge refrigerant.
Yes
Is the refrigerant leakage?
No
Check the opening of electronic expansion valve by the 7-segment display.
Yes
Repair gas leakage and re-charge refrigerant

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.



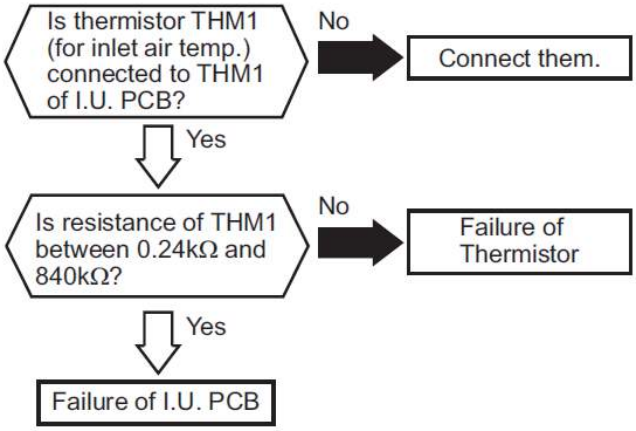


Thermistor Characteristics

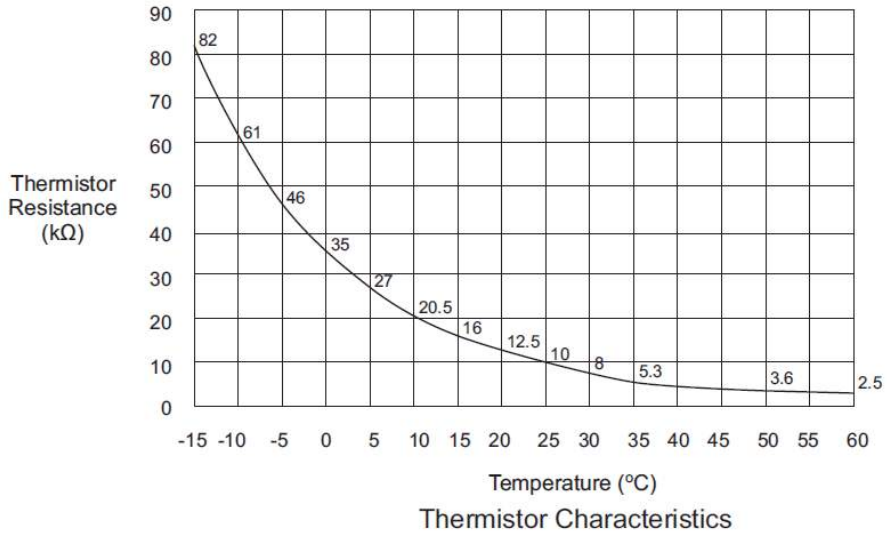
Alarm Code	11	Abnormality of Thermistor for Indoor Unit Inlet Air Temperature (Inlet Air Thermistor)

- 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.

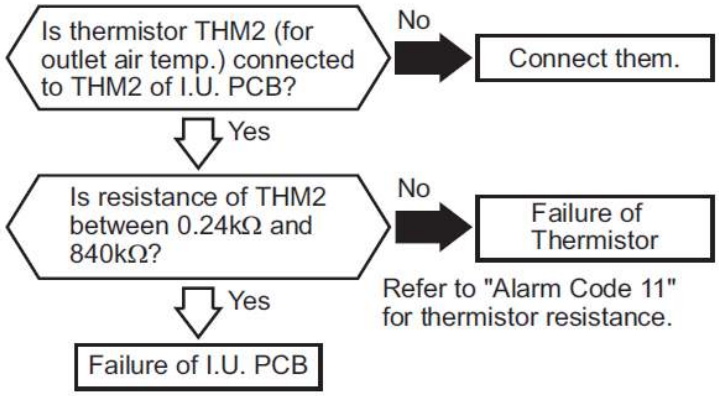


Thermistor Characteristics

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.

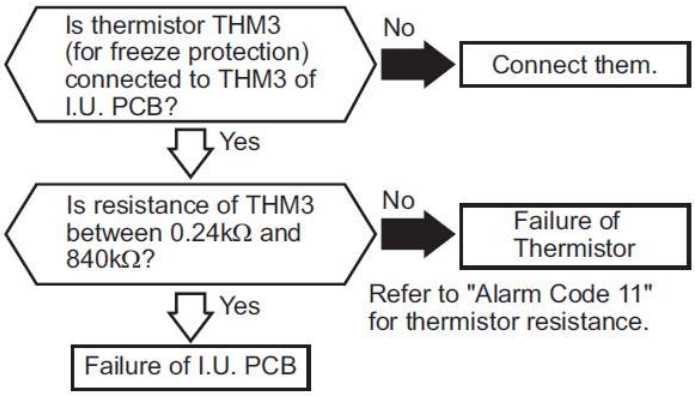


Event	Cause	Check Item	Action (Turn OFF Main Switch)
Failure of Outlet Air Thermistor	Failure	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check wiring to I.U. PCB.	Correctly connect wires.
Failure of I.U. PCB		Replace I.U. PCB and check operation.	Replace I.U. PCB if faulty.

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.

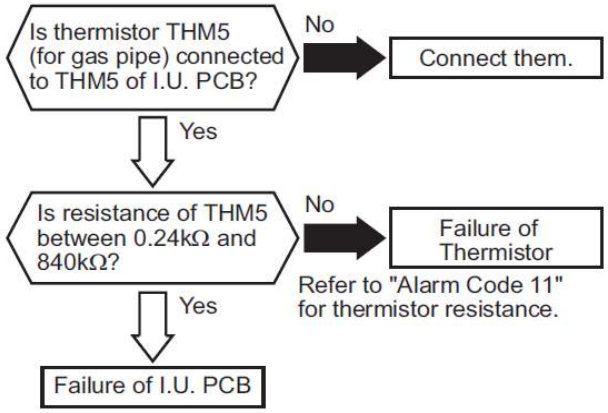


Event	Cause	Check Item	Action (Turn OFF Main Switch)
Failure of Freeze Protection Thermistor	Failure	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check wiring to I.U. PCB.	Correctly connect wires.
Failure of I.U. PCB		Replace I.U. PCB and check operation.	Replace I.U. PCB if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

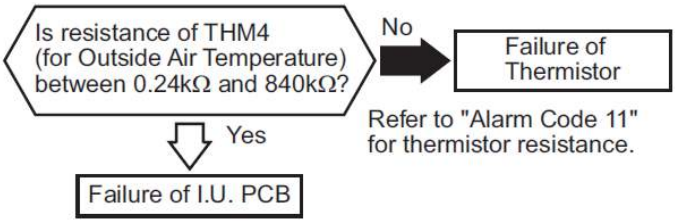


Event	Cause	Check Item	Action (Turn OFF Main Switch)
Failure of Thermistor for Indoor Unit Heat Exchanger Gas Pipe Temp.	Failure	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check wiring to I.U. PCB.	Correctly connect wires.
Failure of I.U. PCB		Replace I.U. PCB and check operation.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

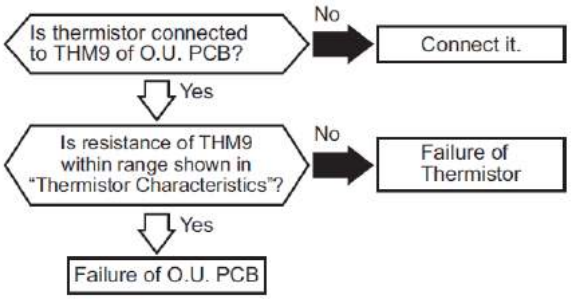


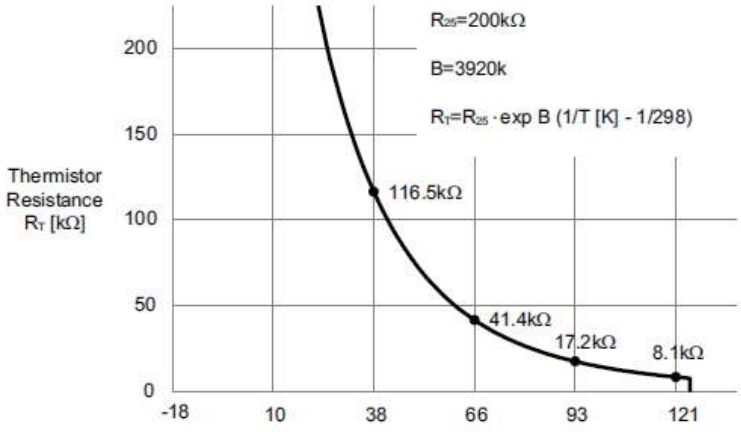
Event	Cause	Check Item	Action (Turn OFF Main Switch)
Failure of Thermistor for Outside Air Temperature	Failure	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check wiring to I.U. PCB.	Correctly connect wires.
Failure of I.U. PCB		Replace I.U. PCB and check operation.	Replace I.U.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





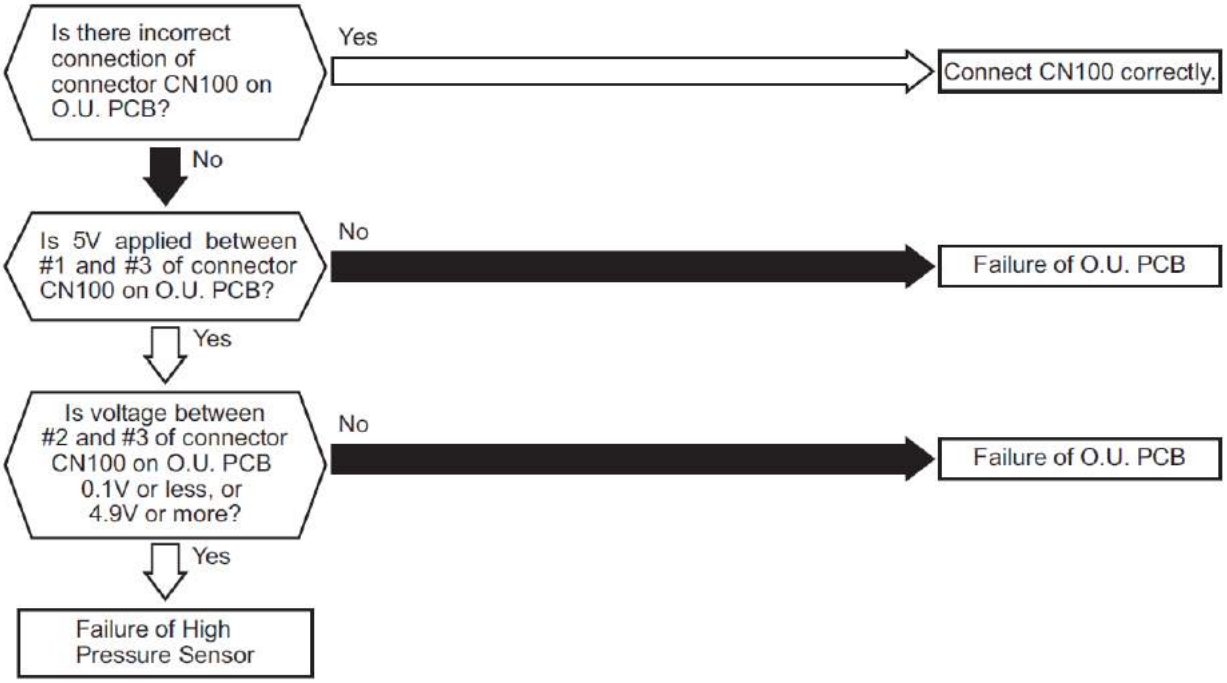
Thermistor Characteristics

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.

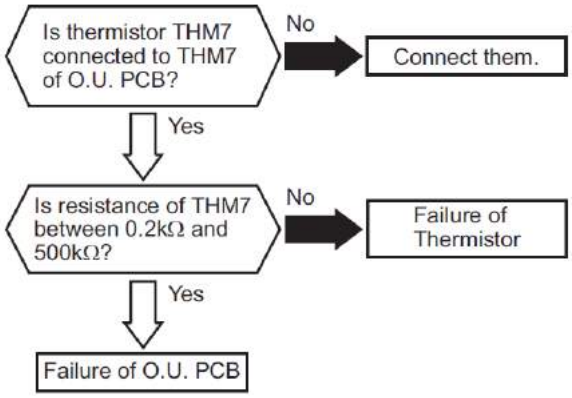


Event	Cause	Check Item	Action (Turn OFF Main Switch)
Failure of O.U. PCB		Replace O.U. PCB and check operation.	Replace O.U. PCB if faulty.
Indication Value of High Pressure (Pd) is Excessively High or Low	Malfunction of High Pressure Sensor due to Clogging Piping		Replace High Pressure Sensor.

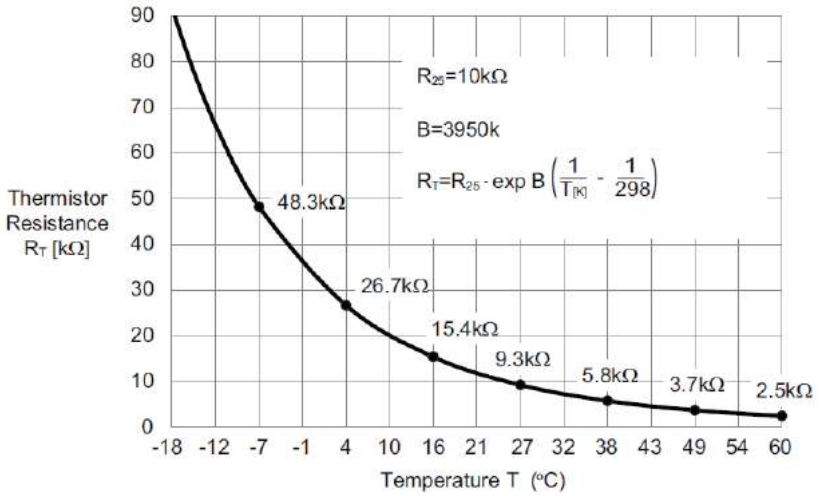
Alarm Code	22	Abnormality of Outdoor Air Thermistor (Outdoor Unit Ambient Thermistor)

- 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.

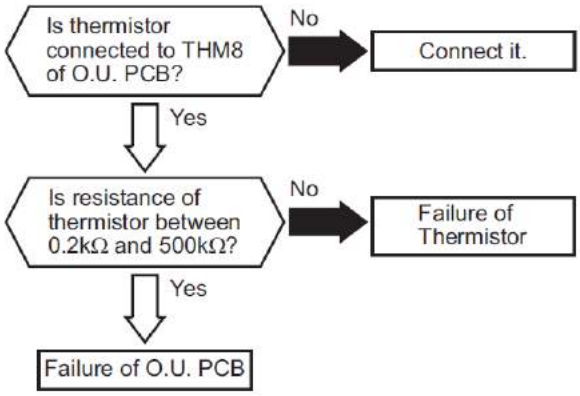


Thermistor Characteristics

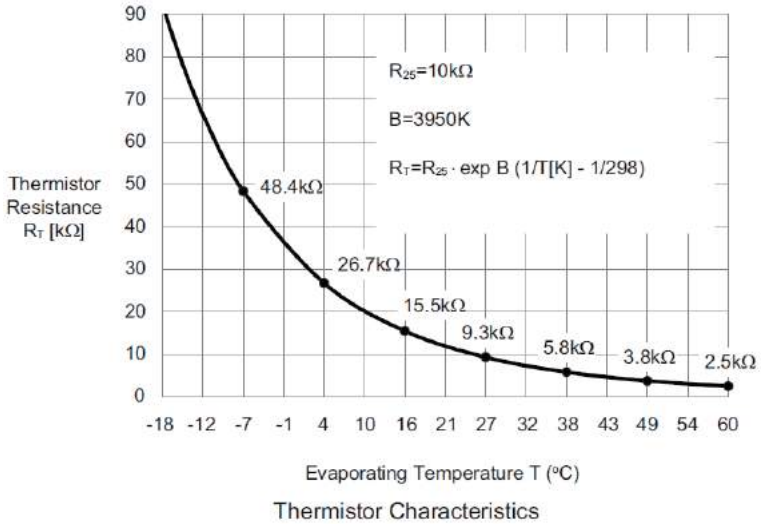
Alarm Code	24	Abnormality of Thermistor for Evaporating Temperature during Heating Operation (Outdoor Unit Evaporating Thermistor)

- 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.

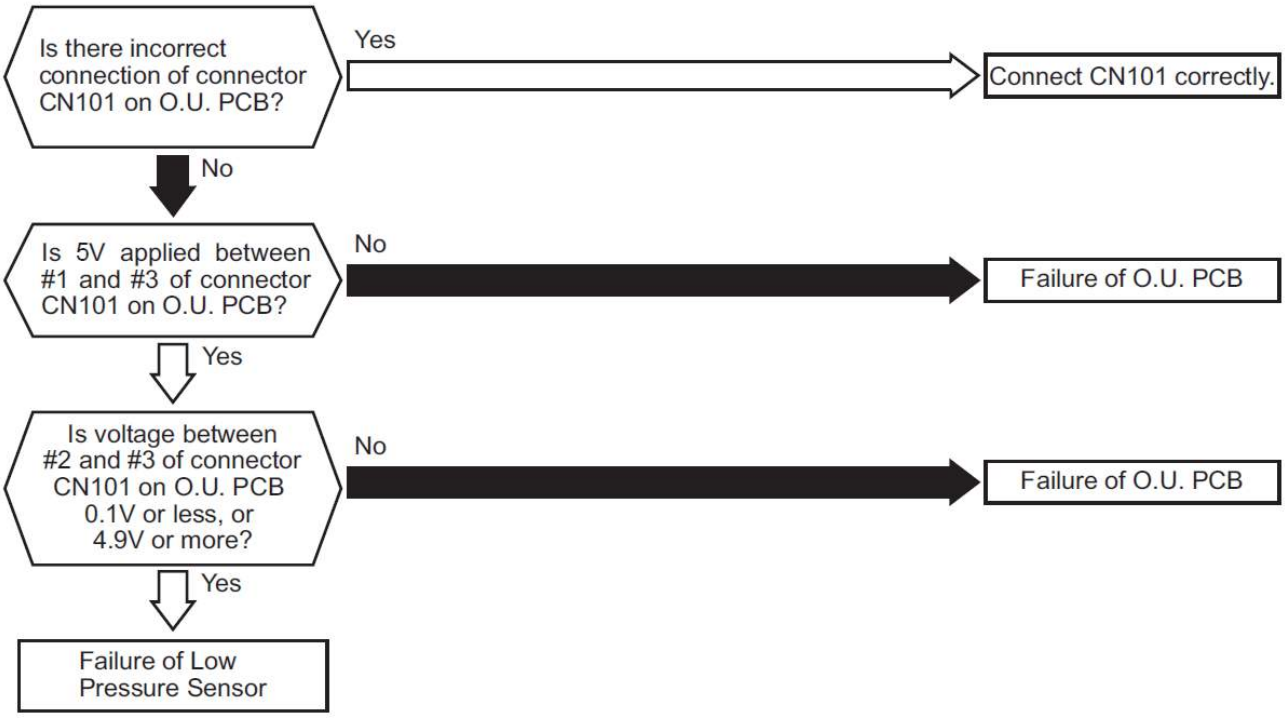


Thermistor Characteristics

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

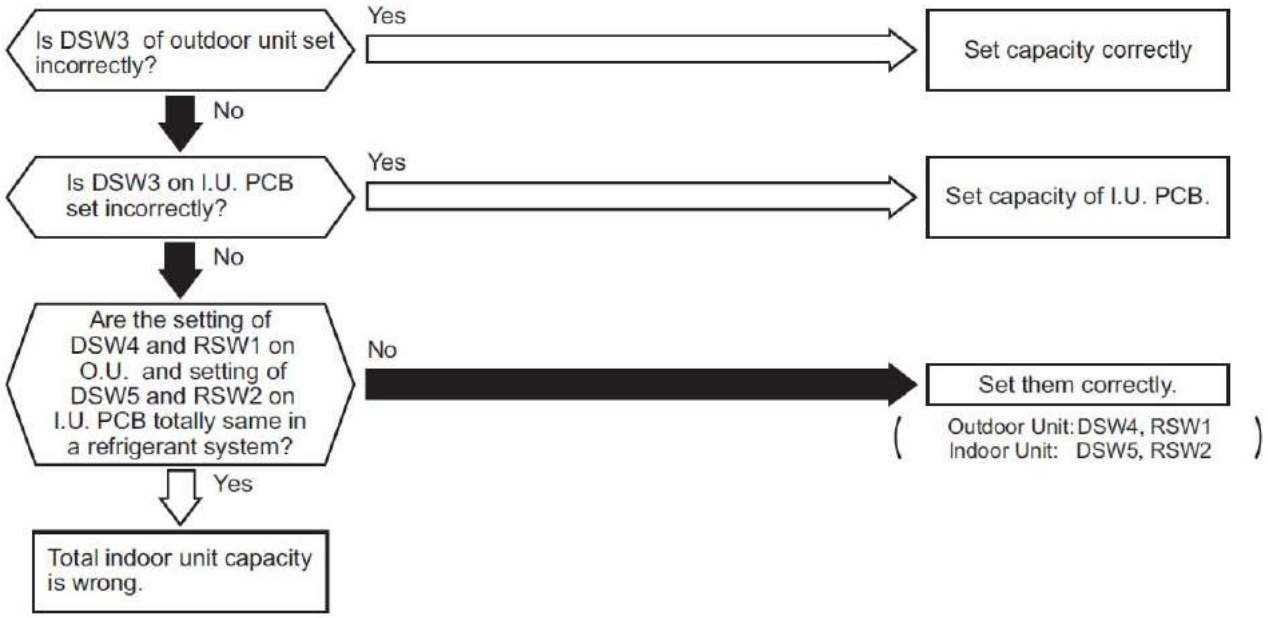
- The alarm code is flashed on the 7-segment display of the outdoor unit
- The alarm code is displayed on the wired controller of the indoor unit.

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

★ 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~7HP	50%	130%



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 (3~7HP) in the same H-LINK Ⅱ system duplicates.

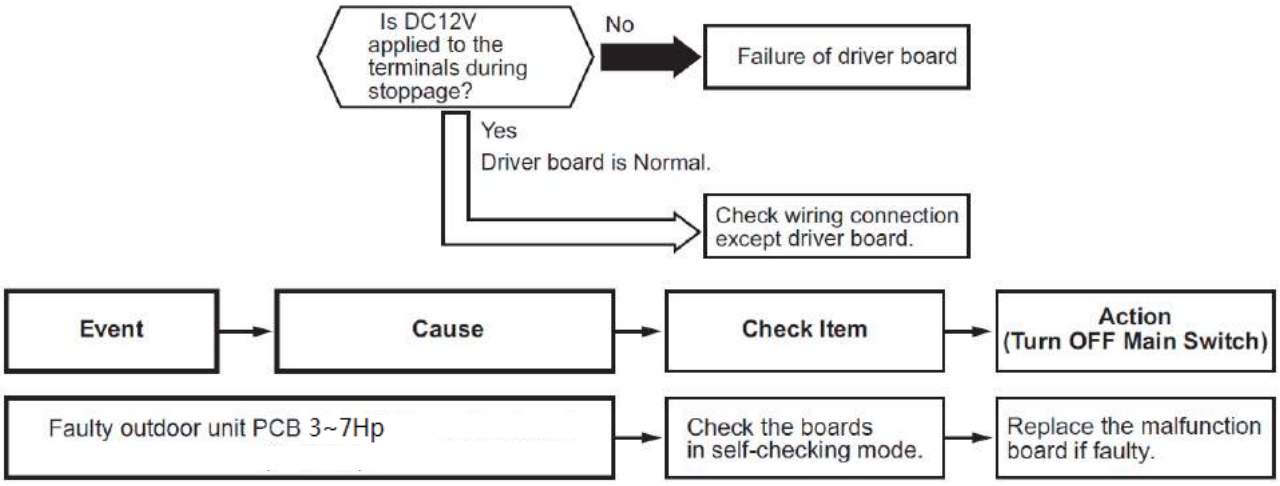
NOTE:

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.

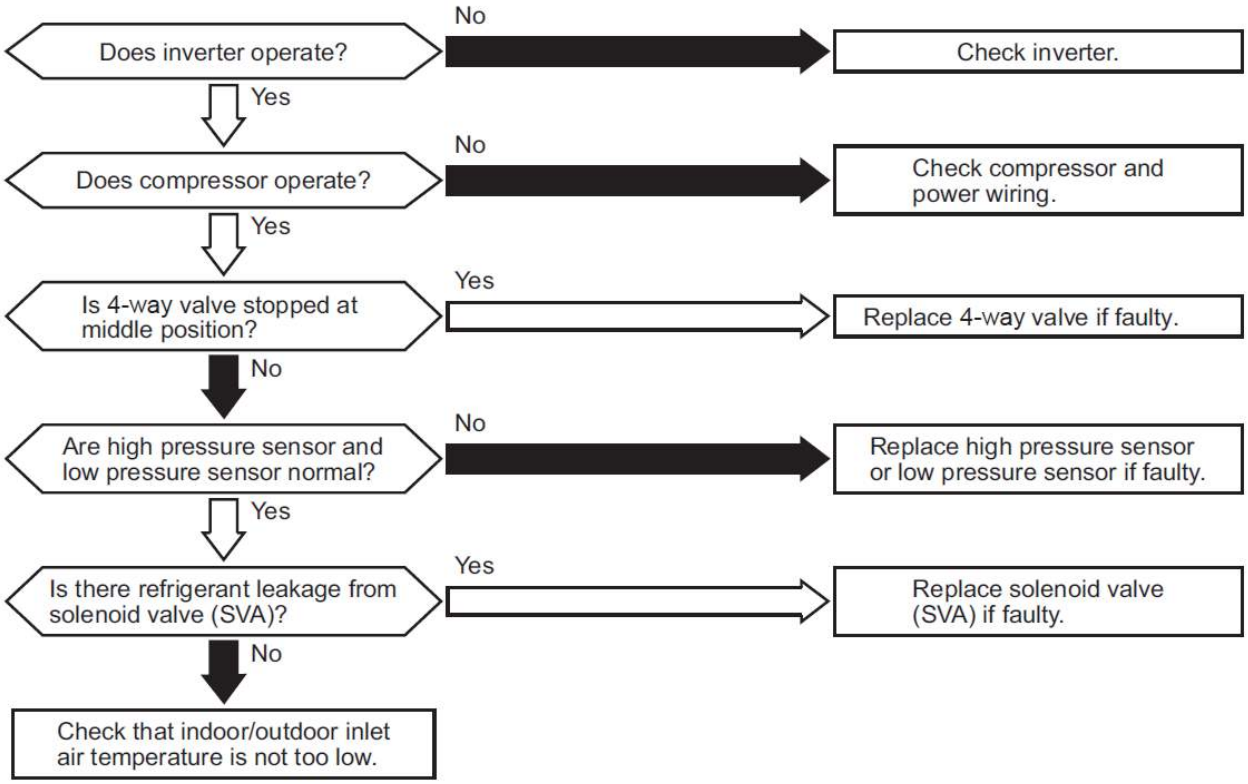
Alarm Code	43	Activation of Pressure Ratio Decrease Protection

- 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)



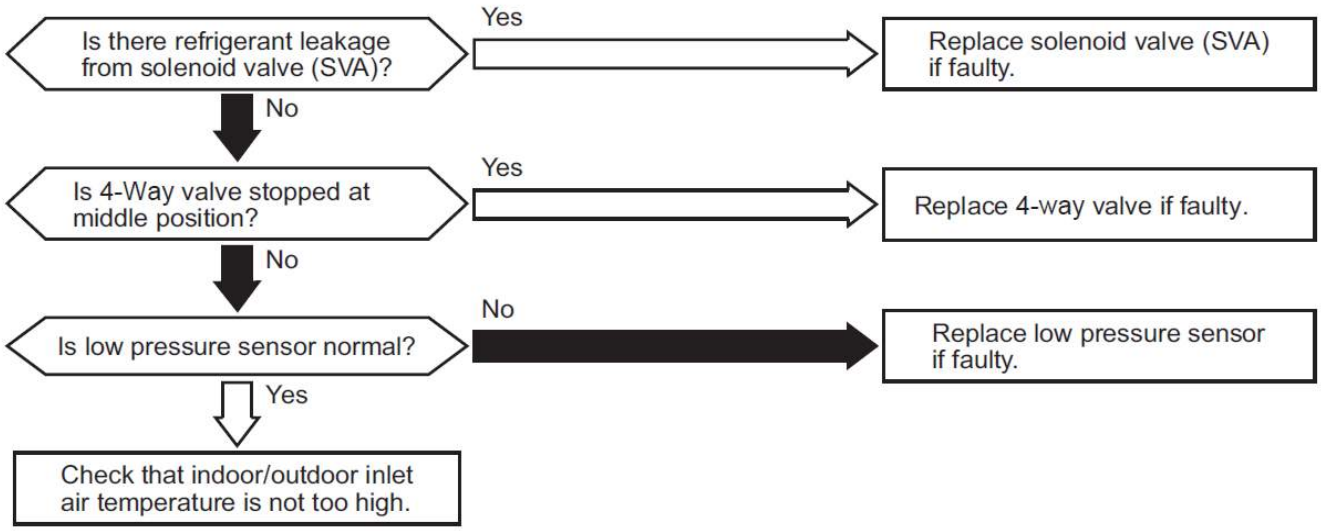
Event	Cause	Check Item	Action (Turn OFF Main Switch)
Excessively Low Pressure Ratio	Inverter is not functioning.	Check inverter.	Repair faulty part.
	Compressor is not operating.	Check compressor.	Replace comp. if faulty.
	Valve Stoppage at Middle Position of 4-Way Valve	Measure suction pipe temp. of 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

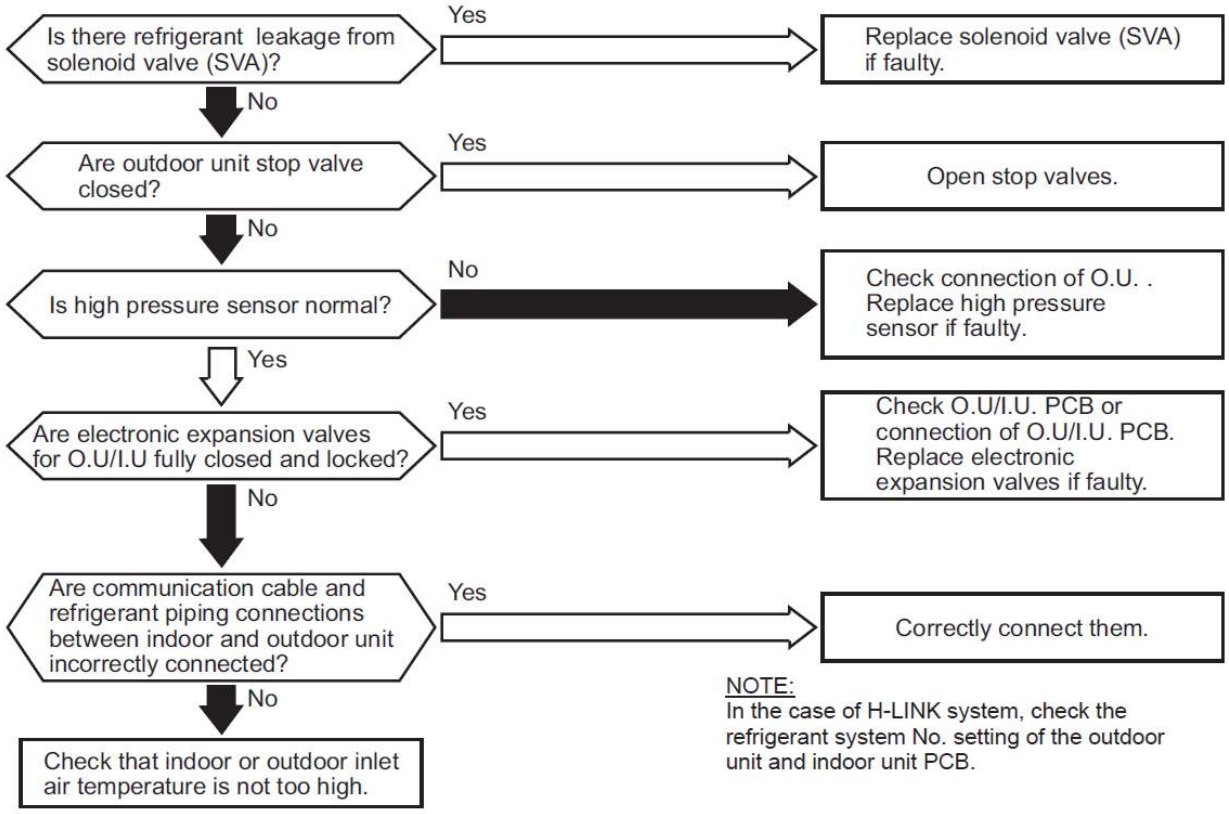


Event	Cause	Check Item	Action (Turn OFF Main Switch)
Excessively Increasing Low Pressure	Leakage from Solenoid Valve (SVA)	Check outlet pipe temp. of solenoid valve (SVA).	Check connecting wires. Replace solenoid valve (SVA) if faulty.
	Valve Stoppage at Middle Position of 4-Way Valve	Measure suction 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.



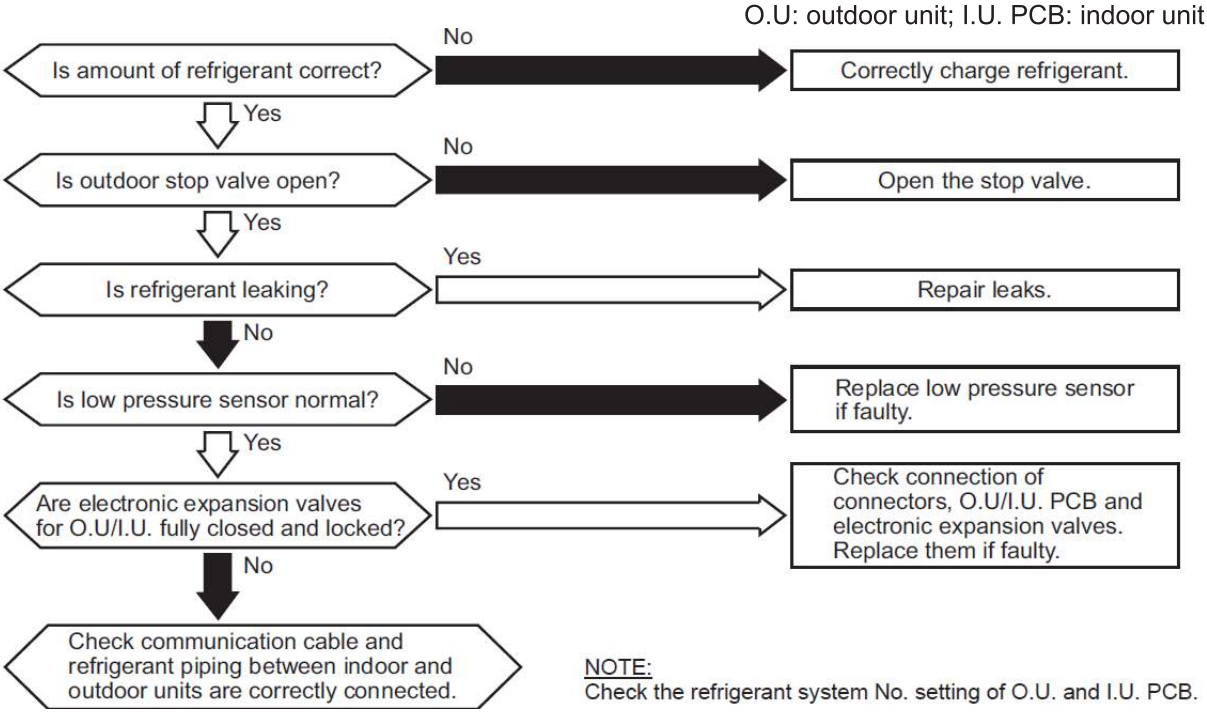
Event	Cause	Check Item	Action (Turn OFF Main Switch)
Excessively Increasing High Pressure	Leakage from Solenoid Valve (SVA)	Check outlet temp. of solenoid valve (SVA).	Check connection. Replace solenoid valve (SVA) if faulty.
	Closed Stop Valve	Check stop valves.	Open stop valves.
	Abnormal High Pressure 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



NOTE:
Check the refrigerant system No. setting of O.U. and I.U. 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.
	Faulty Internal Thermostat – Contact Failure	Measure resistance with a tester.	Tighten or replace connector.
	Faulty Internal Thermostat – 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

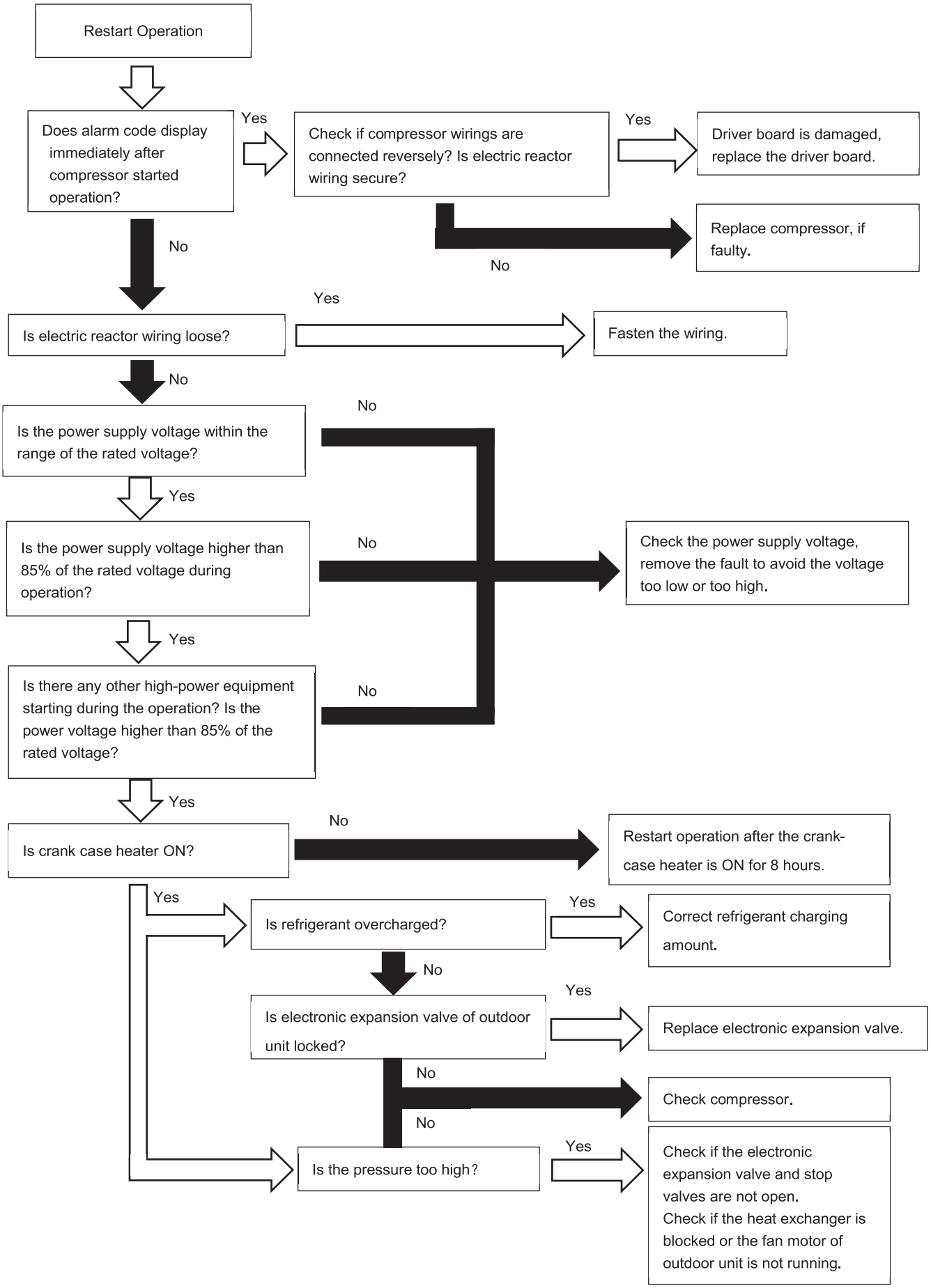
Main causes: Short circuited PFC electric reactor L2, driver hardware is abnormal.

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

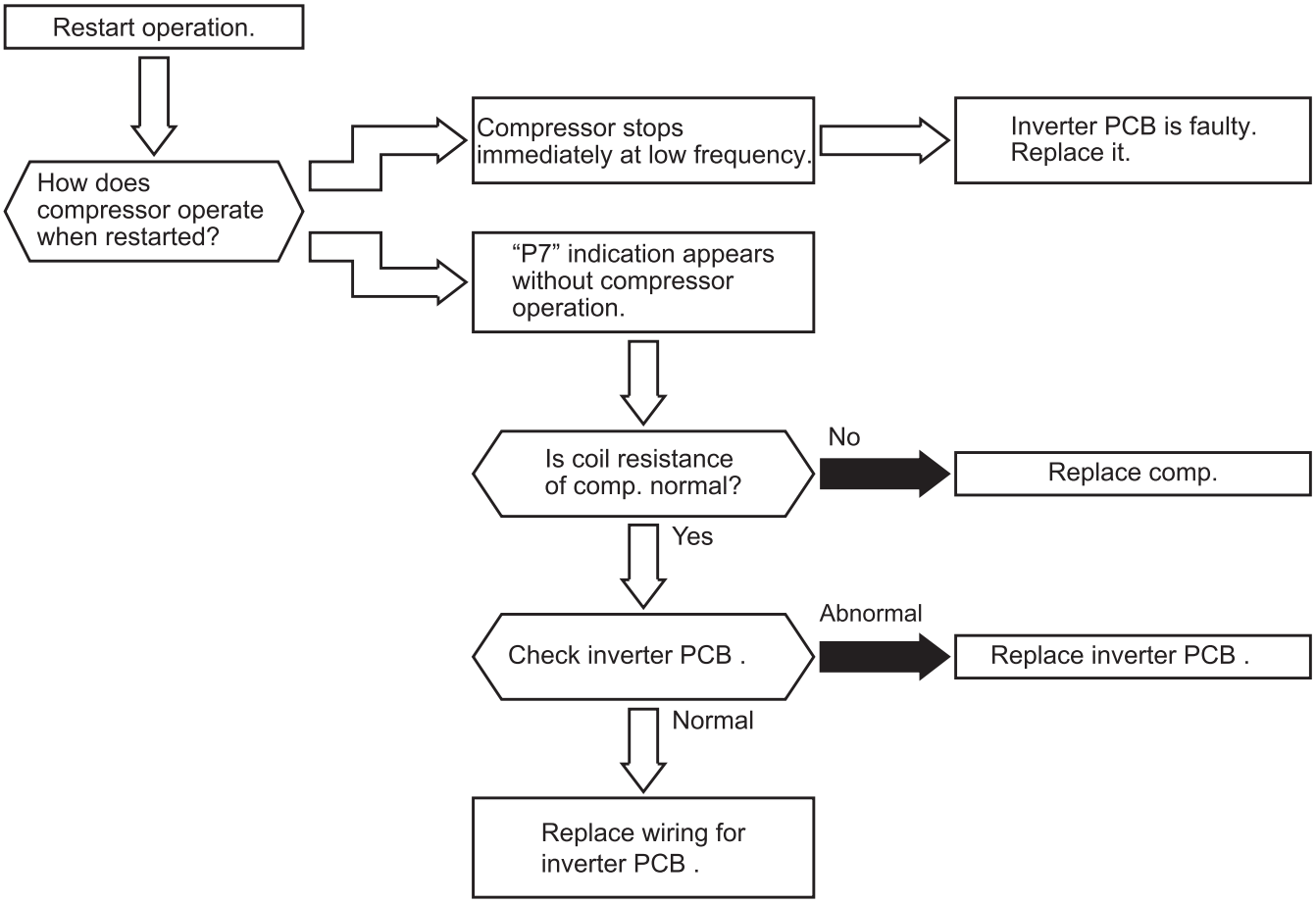
- The alarm code is flashed on the 7-segment display of the outdoor unit
- The alarm code is displayed on the wired controller of the indoor unit.

★ 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

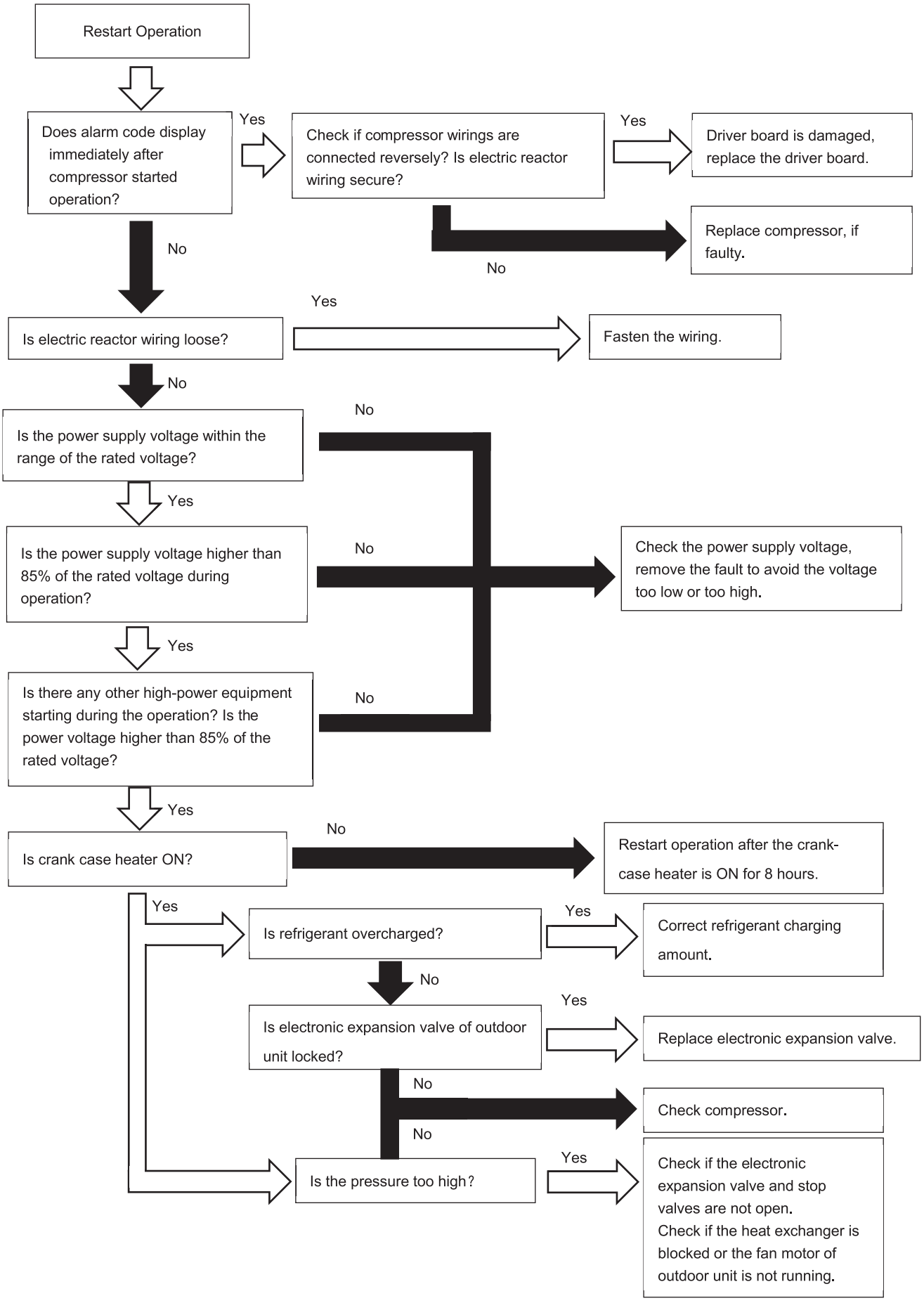
Main causes: Abnormal compressor current, abnormal IPM control voltage, short circuited IPM, and so on.

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.


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	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.

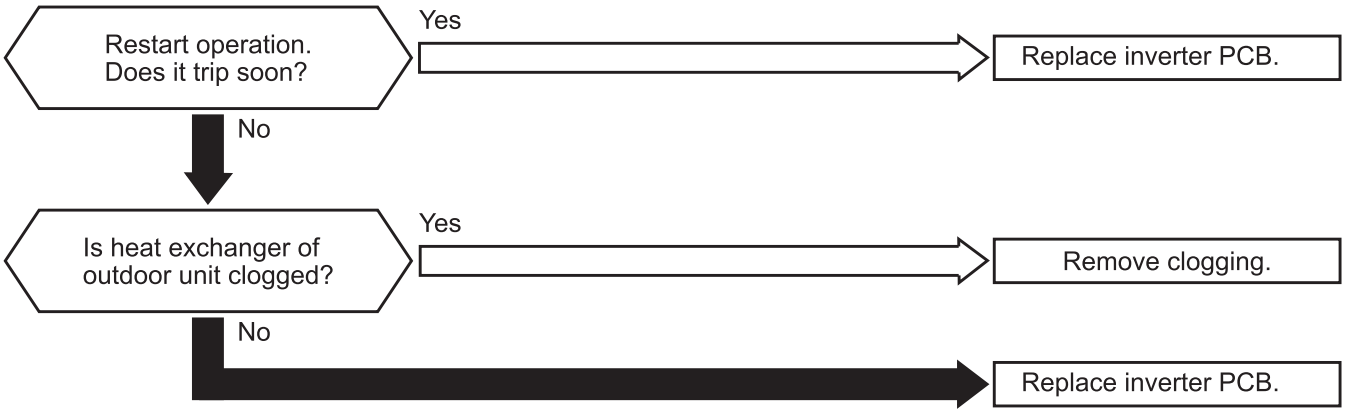
Condition of Activation:

(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

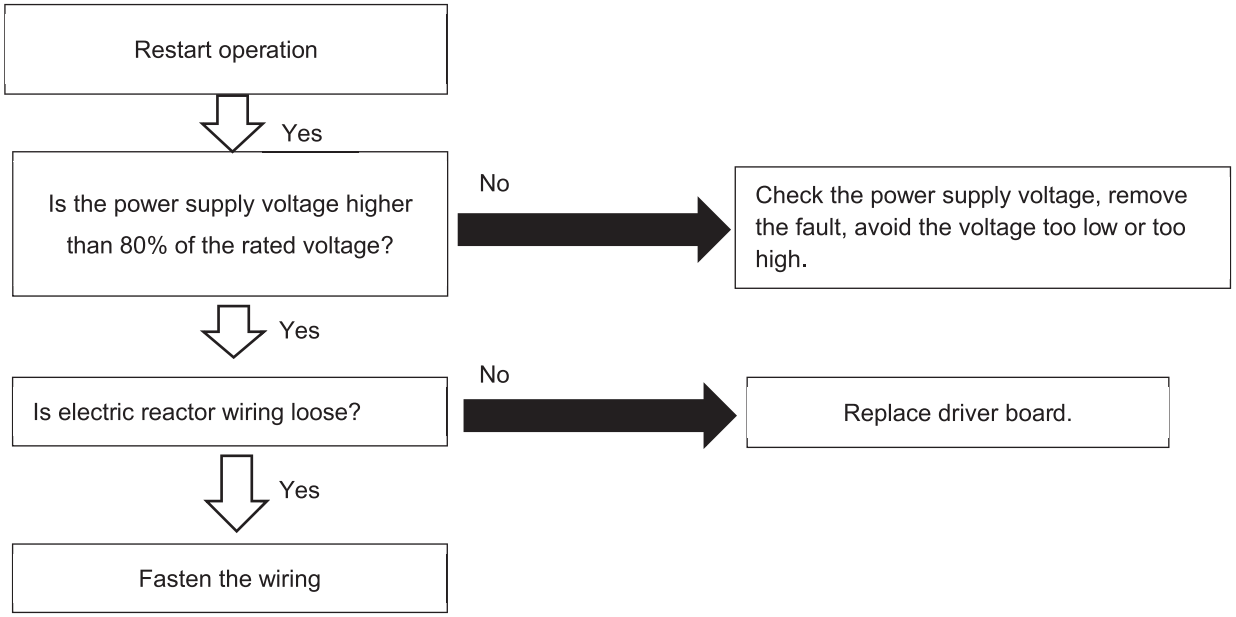
Main causes: Driver MCU abnormality

6) Reference voltage abnormality

Main causes: Driver MCU abnormality, driver reference voltage circuit abnormality.

7) Software protection module abnormality

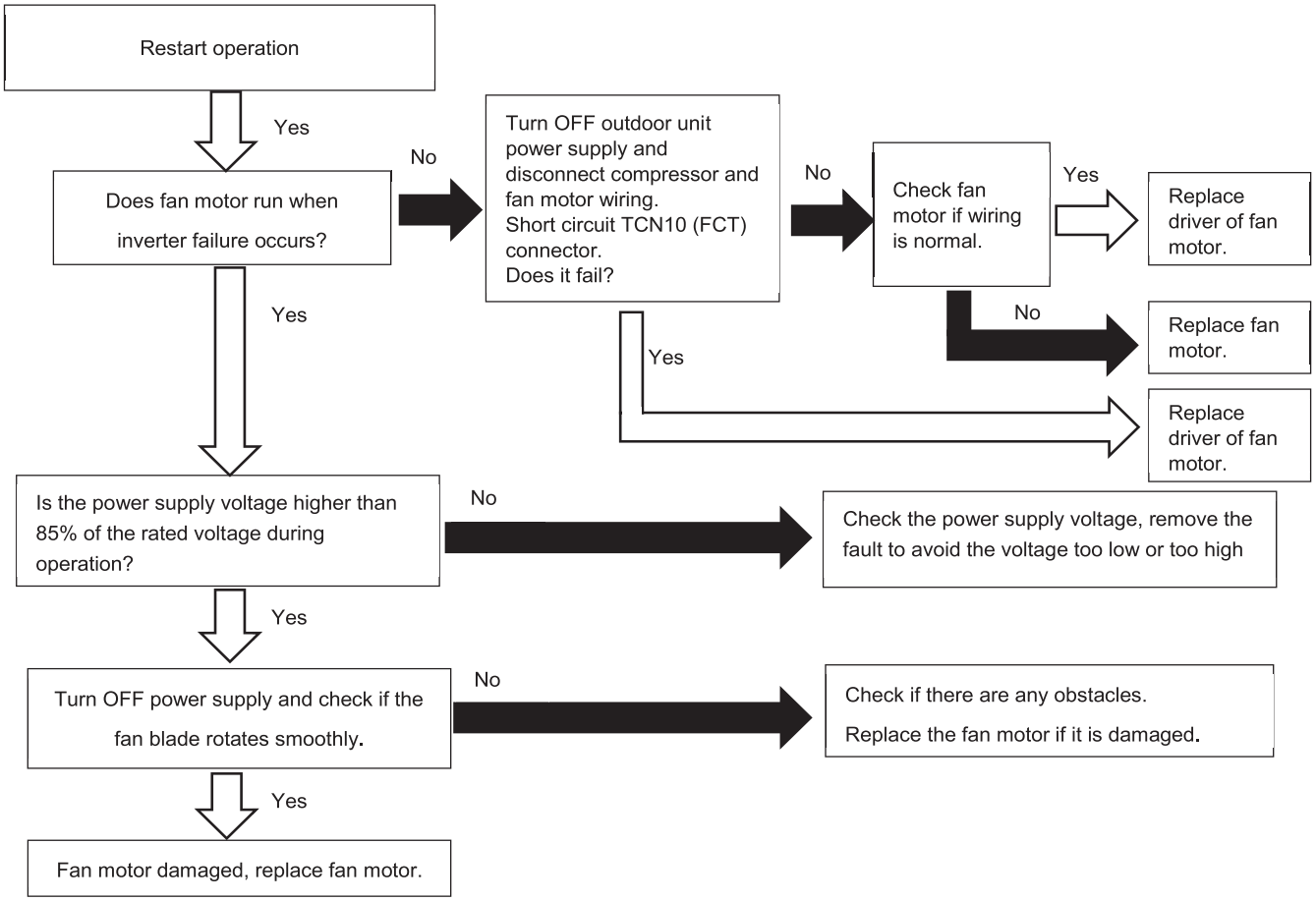
Main causes: Driver MCU abnormality



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

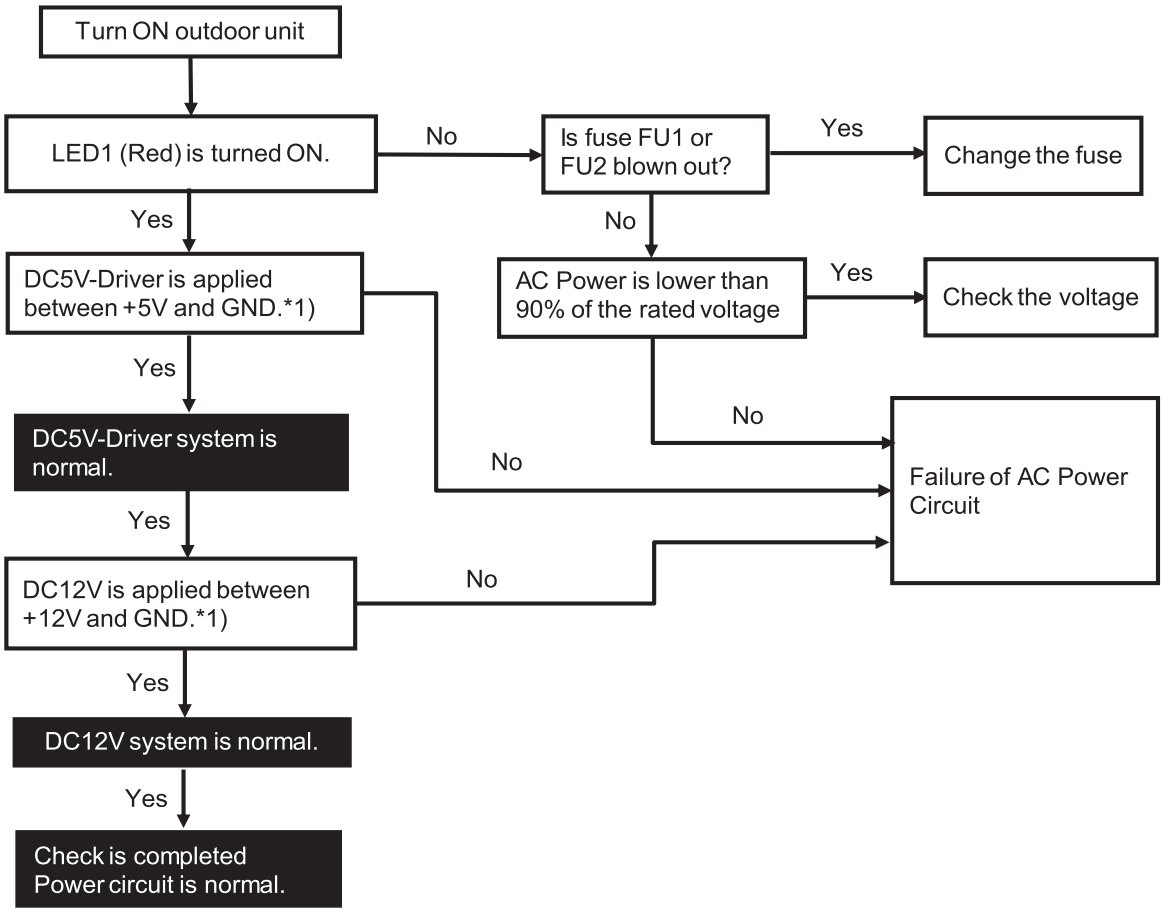
3.1 Checking Method for Outdoor Unit PCB of 3~7HP

(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 teste . 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.



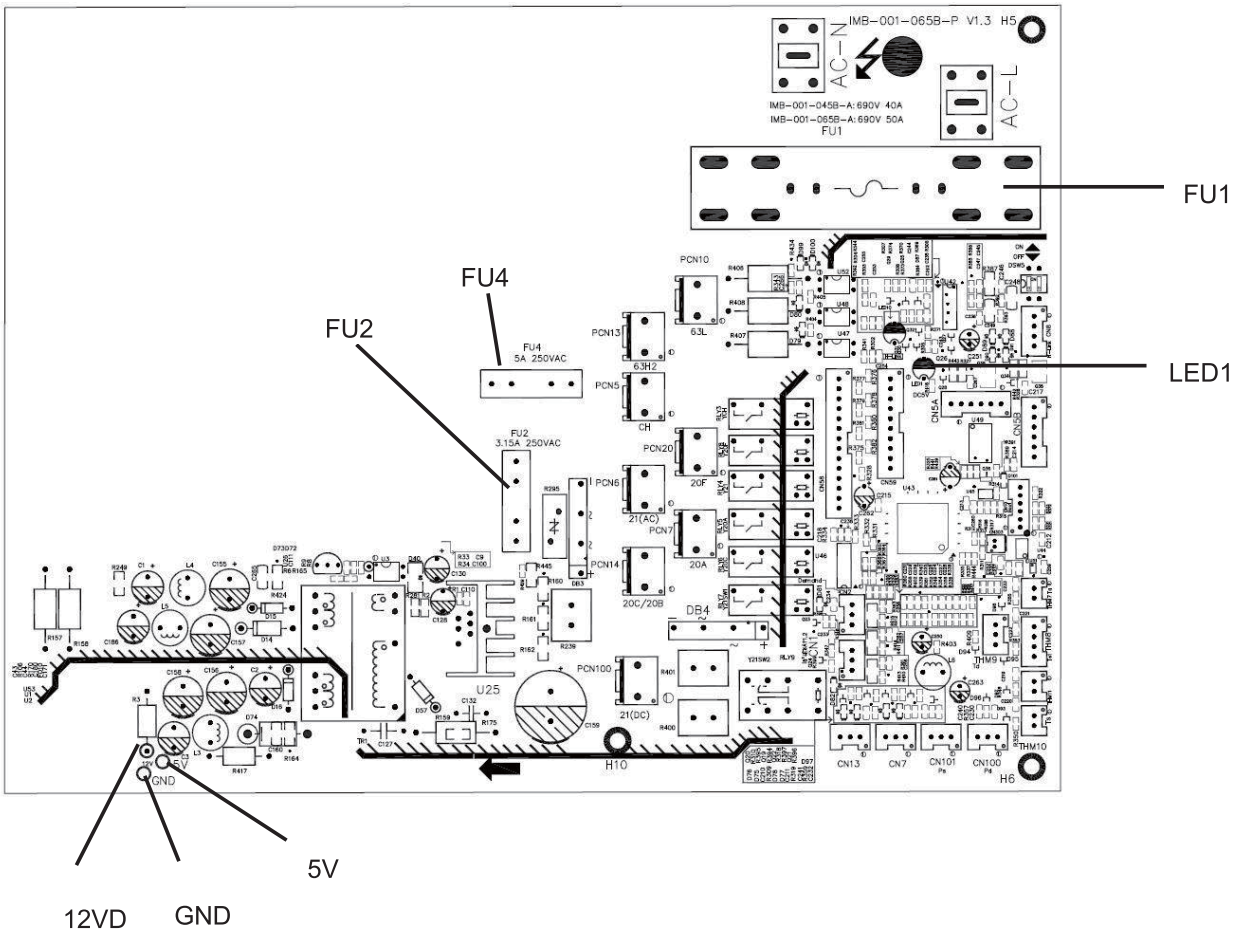
*1) The following table shows the check points and the normal range of voltage in case that the voltage on O.U.PCB is measured by a circuit tester. The setting of circuit tester shall be set within the DC voltage measurement range when the following voltages are measured.

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



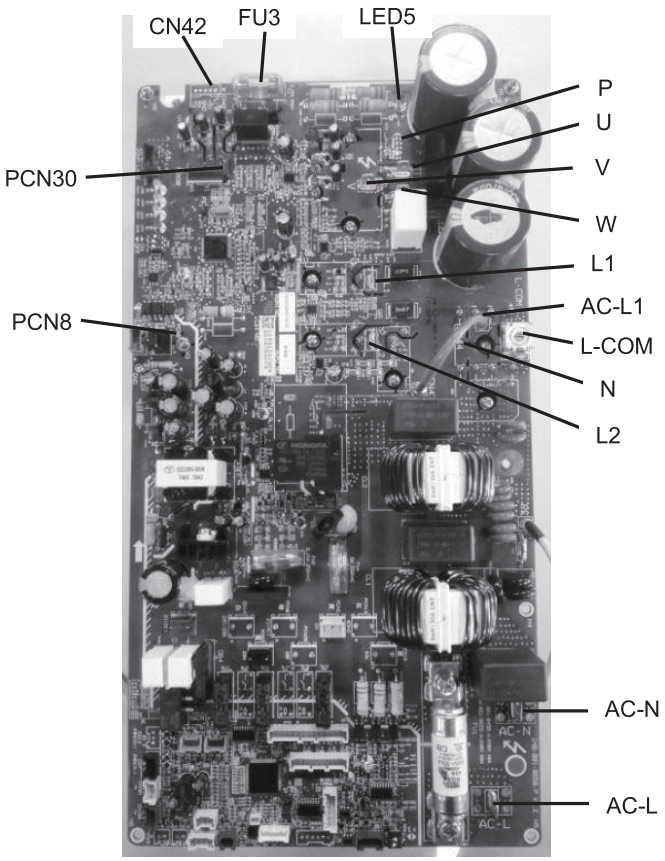
● Checking Item for Fuse

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

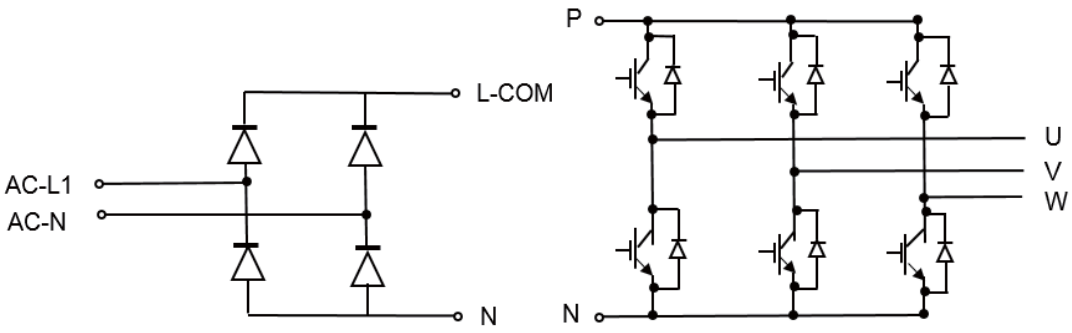


CAUTION

- 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 OF .

● Checking Method for Inverter Module

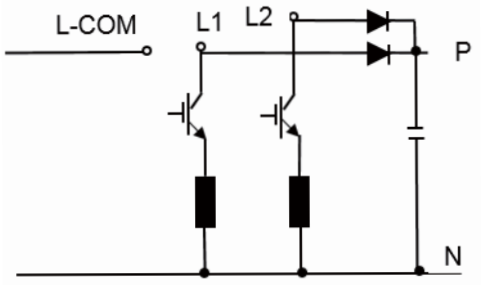
Rectifier and Inverter Circuit of Inverter Module. Remove all the terminals of the inverter module before check If all the items (below table) are performed and all items are satisfied, the inverter mod le is non-defective.



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

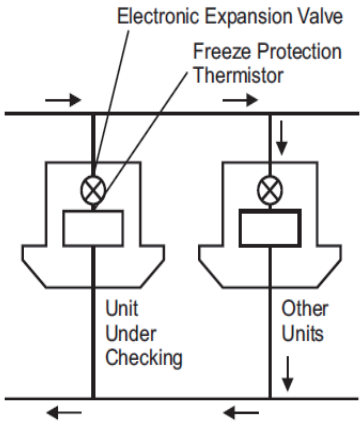
● APFC Circuit of Inverter Module

If all the items (below table) are performed and all items are satisfied, the inverter odule 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

3.3 Checking Method of Electronic Expansion Valve

	for Indoor Unit	for Outdoor Unit
Locked with Fully Closed	Check for the liquid pipe temperature during the heating operation. It is abnormal if the temperature does not increase.	It is abnormal if the liquid pipe pressure does not increase during the cooling operation.
Locked with Slightly Opened	It is abnormal 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.	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.
Locked with Fully Opened		It is abnormal 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.

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.

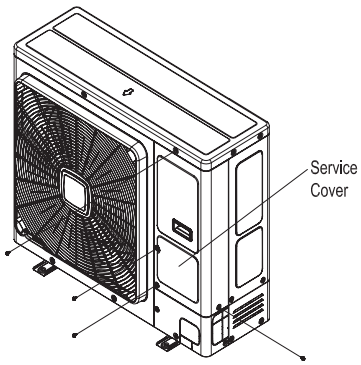
● To prevent contamination of the refrigerant by water or foreign materials, do not expose the refrigerant parts open to atmosphere for long periods. If necessary, seal pipe ends using caps or tape.

1.1 Removing Service Cover

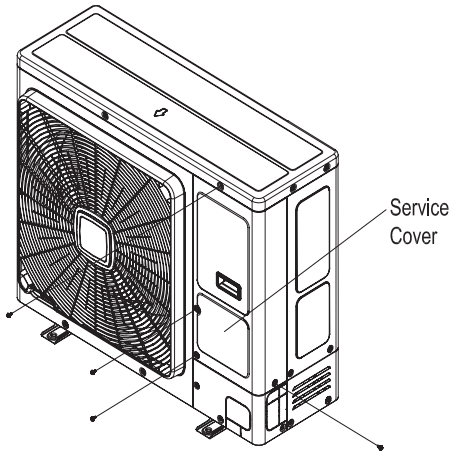
Remove the service cover by drawing it downward after removing the securing screws for the service cover. When removing the service cover, take special care not to drop it.

Tool	Gloves, Phillips Screwdriver

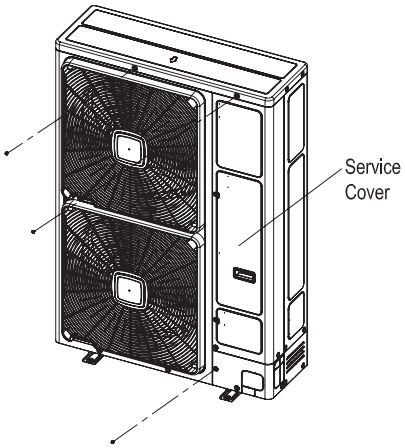
Model:3~4.0HP



Model:4.5~6HP



Model:6.5~7.0HP

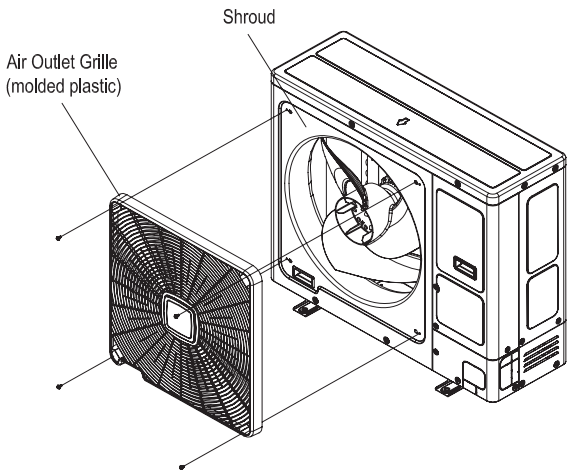


1.2 Removing Air Outlet Grille

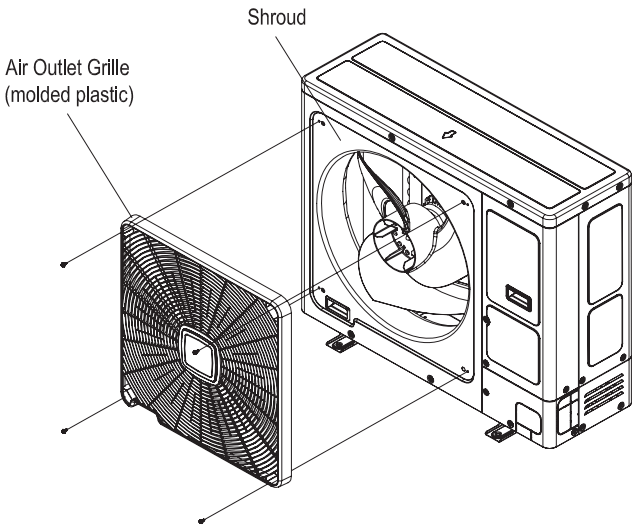
Remove the securing screws for each air outlet grille (molded plastic).

Tool	Gloves, Phillips Screwdriver

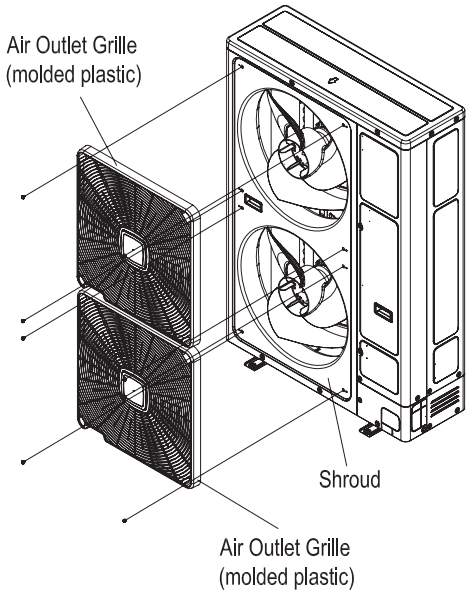
Model:3~4.0HP



Model:4.5~6.0HP



Model:6.5~7HP

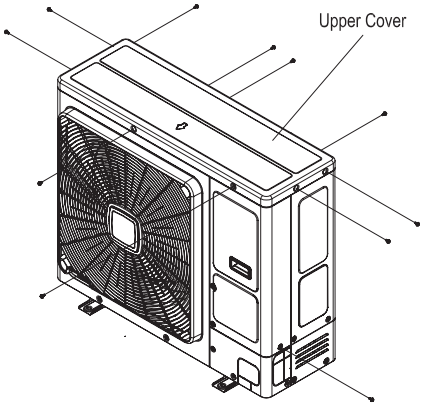


1.3 Removing Upper Cover

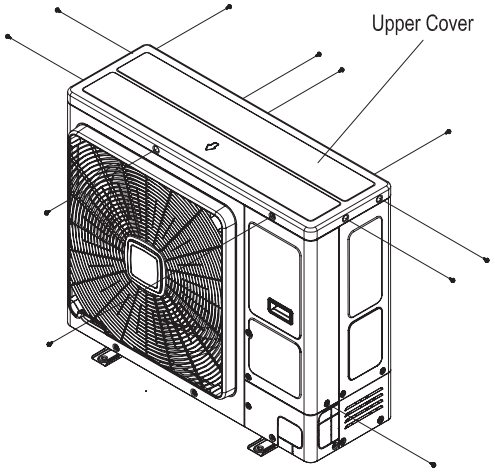
After removing the securing screws for the upper cover, lift the upper cover up.

Tool	Gloves, Phillips Screwdriver

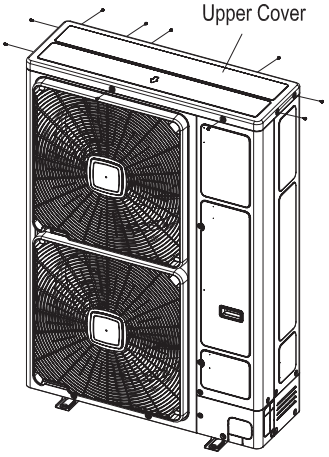
Model: 3~4HP



Model: 4.5~6HP



Model: 6.5~7HP



1.4 Removing Lower Service Cover and Rear Cover

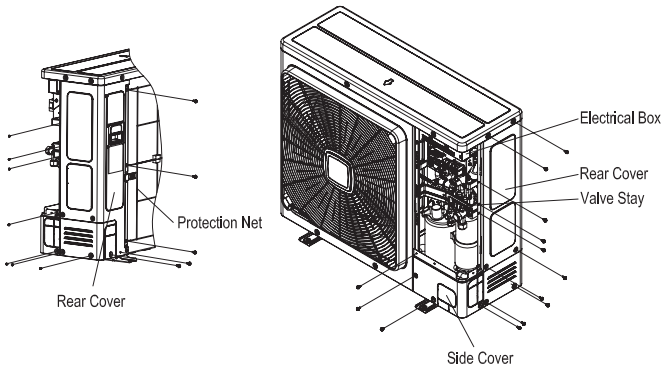
(1) Remove the service cover.

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

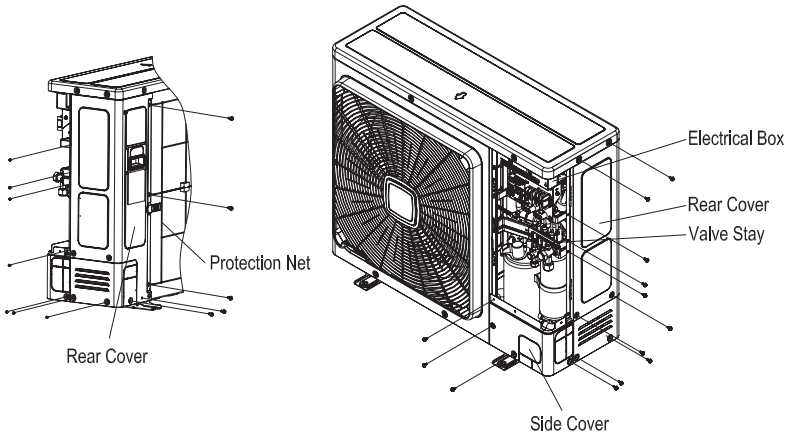
(3) Remove the securing screws for rear cover and remove the rear cover by pulling it downward.

Tool	Gloves, Phillips Screwdriver

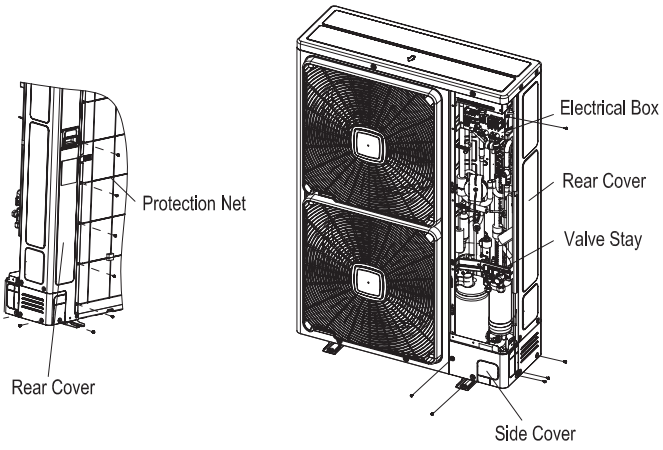
Model: 3~4HP



Model: 4.5~6HP



Model: 6.5~7HP



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.

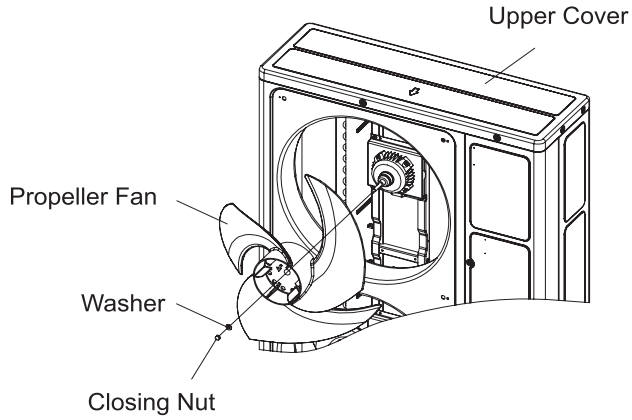
(a) Remove the service cover.

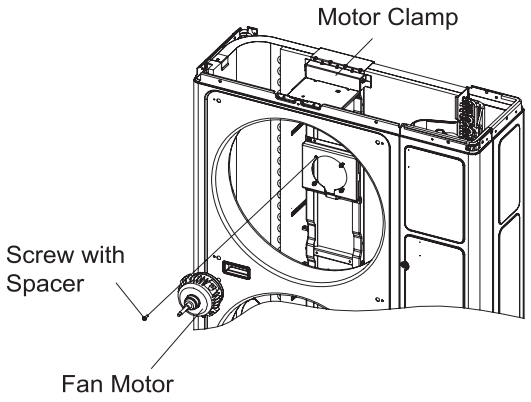
(b) Disconnect the connectors for the fan motors from the outdoor unit PCB in the electrical box.

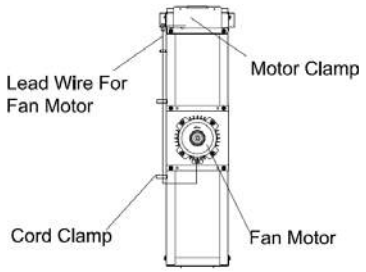
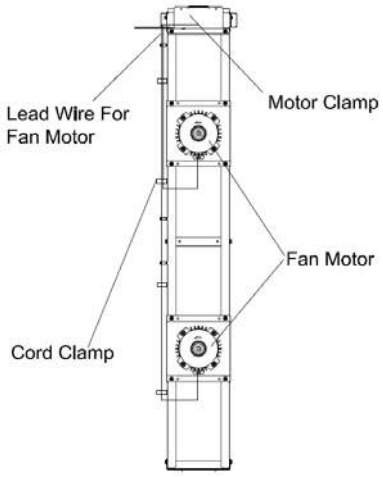
(c) Remove the spacer screws securing the fan motor.

Tool	Gloves, Phillips Screwdriver Adjustable Wrench, Puller, Nipper

Model: 3~7HP





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	
3~6HP	1	O.U. PCB PCN30 (Red)	/	M5 x 20 (Screw with Spacer) x 4	/	
6.5~7HP	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	

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

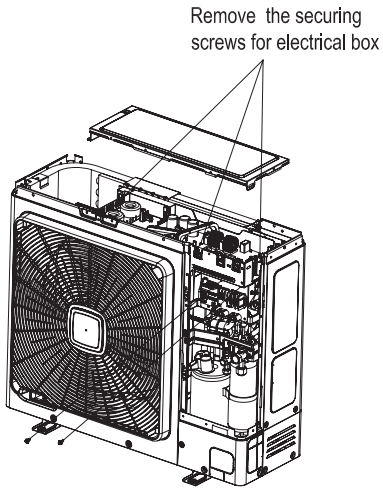
(1) Remove the service cover.

(2) Remove the upper cover.

(3) Remove the securing screws for electrical box.

Tool	Phillips Screwdriver

Model: 3~6HP



NOTE:

Remove the electrical box after disconnecting wires.

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

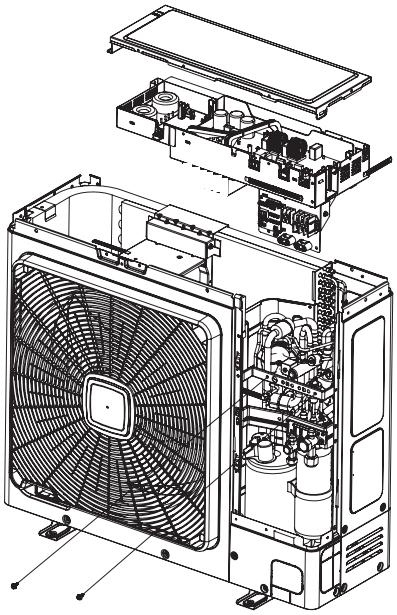
(2) Disconnect the fasten terminals from high pressure switch and pressure sensor.

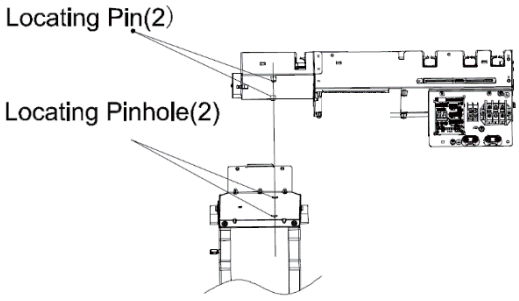
(3) Disconnect the fan motor connectors and thermistors from the outdoor unit PCB.

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

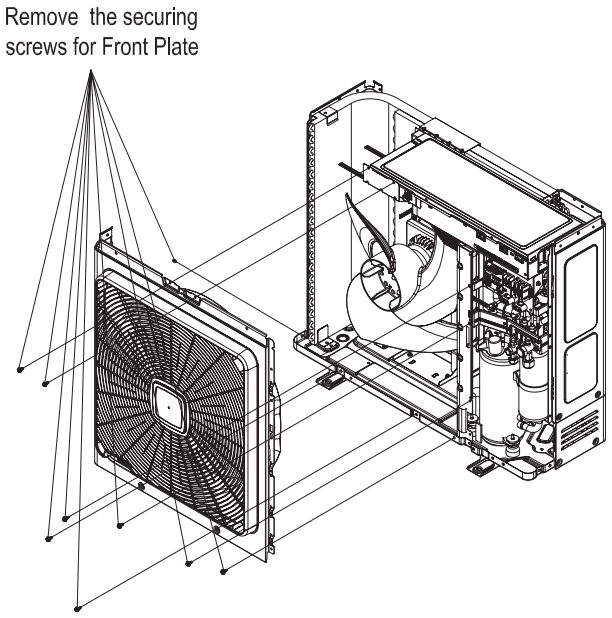
(5) When mounting the electrical box, join and fit the electric l box and the partition plate into the outdoor unit.

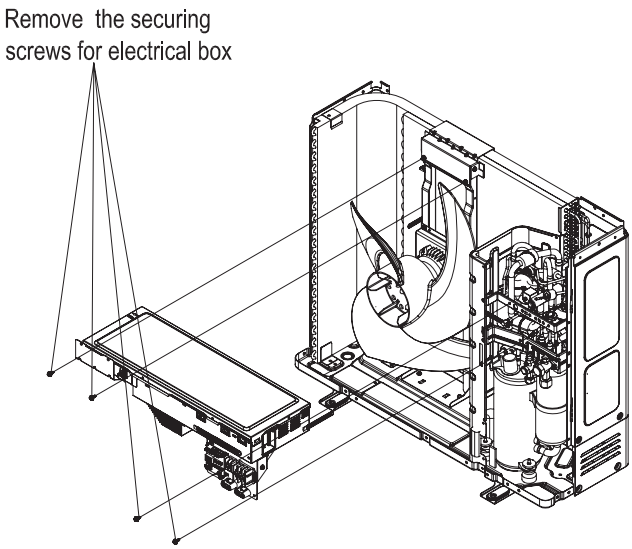
● Remove the electrical box from the top of outdoor unit.



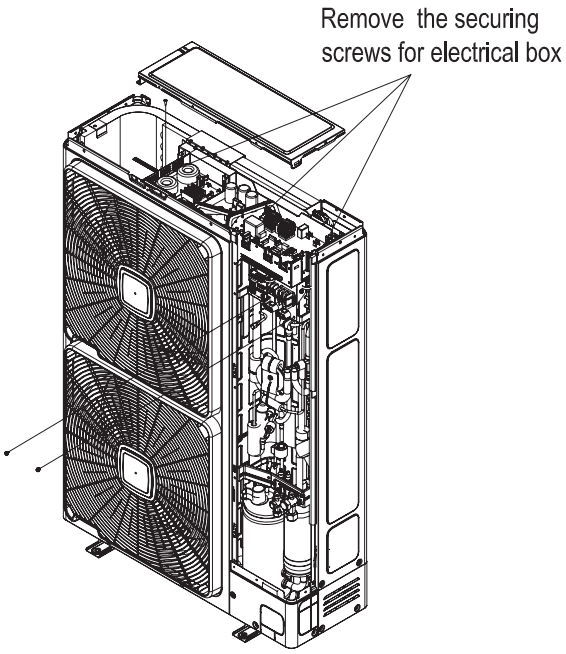


● Remove the electrical box from the front of outdoor unit.





Model: 6.5~7HP



NOTE:

Remove the electrical box after disconnecting wires.

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

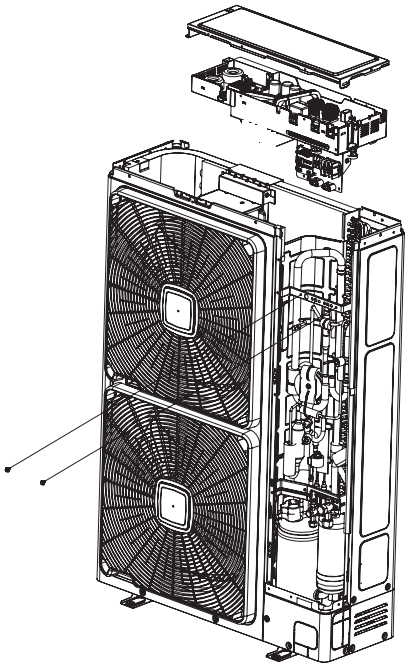
(2) Disconnect the fasten terminals from high pressure switch and pressure sensor.

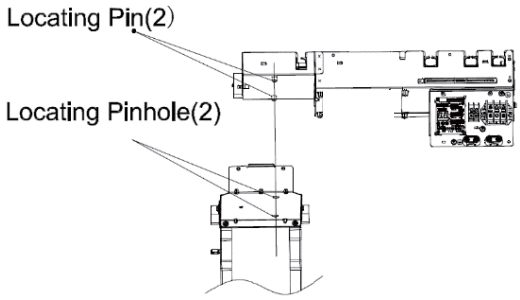
(3) Disconnect the fan motor connectors and thermistors from the outdoor unit PCB.

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

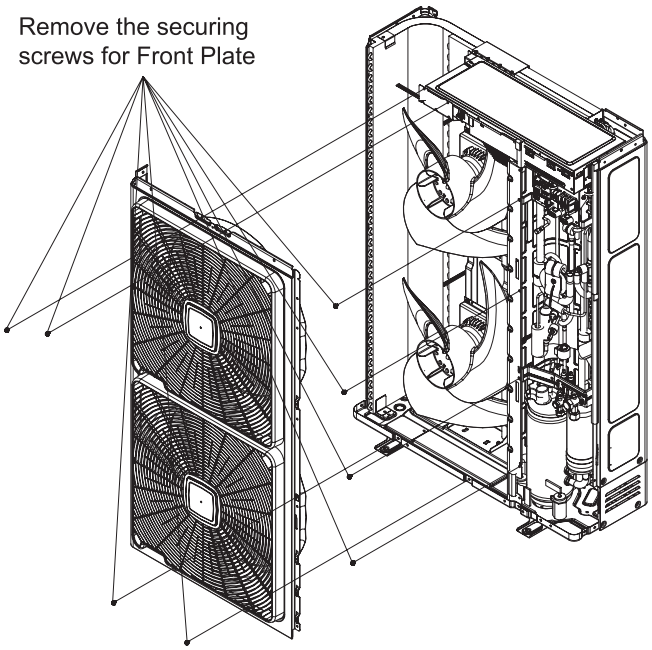
(5) When mounting the electrical box, join and fit the electric I box and the partition plate into the outdoor unit.

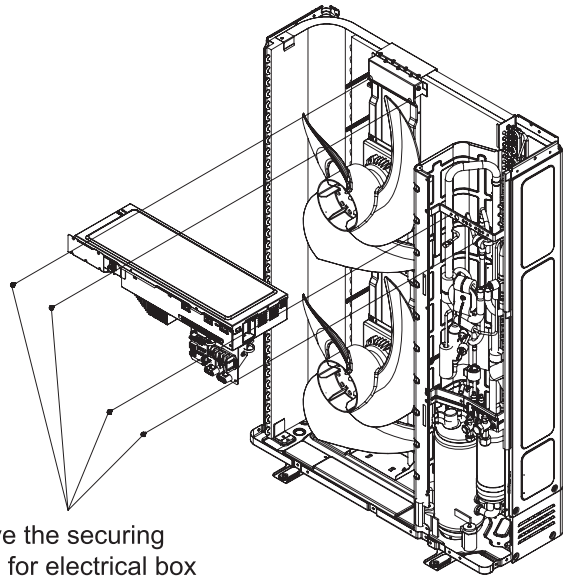
- Remove the electrical box from the top of outdoor unit.





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





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.

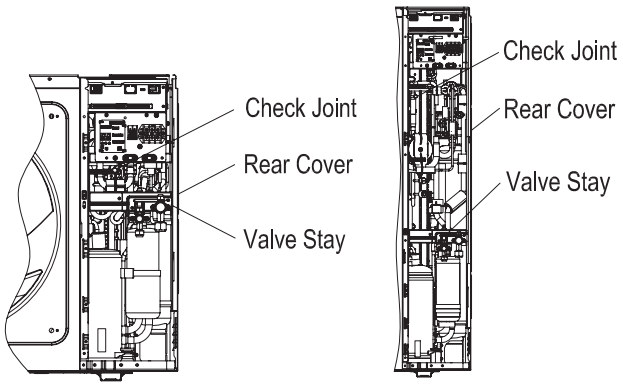
NOTES:

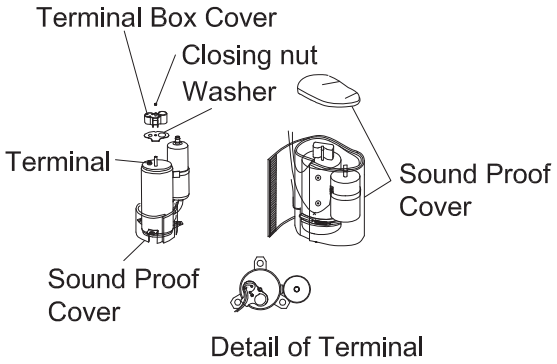
- Write down or photograph wiring and terminal designations to prevent mis-wiring of replacement compressor as shown below.
- If the read wiring is connected incorrectly to the terminal, the compressor may be damaged due to reverse rotation.

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

Tool	Phillips Screwdriver, Charging Hose, Refrigerant Cylinder

Model: 3~7HP





Detail of Terminal

NOTES:

- The compressor and piping are connected by brazing. Before brazing work, ensure that there is no flammable material nearb , 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 in the compressor.

1.8 Removing High Pressure Switch and Pressure Sensor

(1) Remove the service cover.

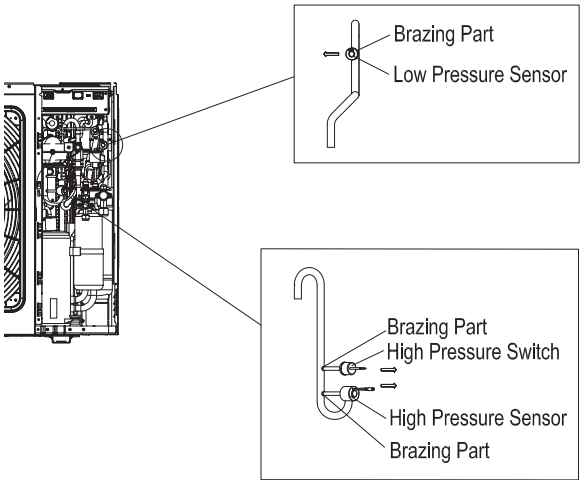
(2) Recover the refrigerant from check joints.

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

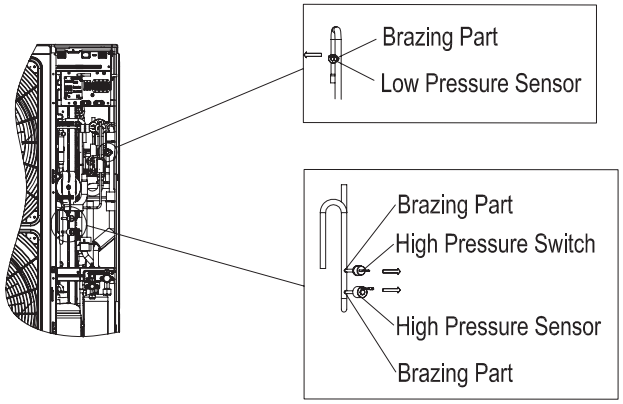
(4) Carefully unsolder the high pressure switch and the pressure sensors.

Tool	Phillips Screwdriver, Charging Hose, Torch

Model: 3~6HP



Model: 6.5~7HP



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.

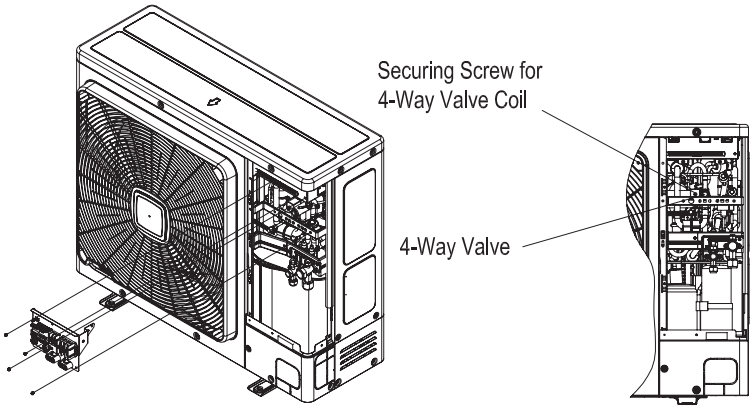
NOTE:

For model of 3~6HP, remove the front plate of the electrical box before removing the 4-Way valve coil.

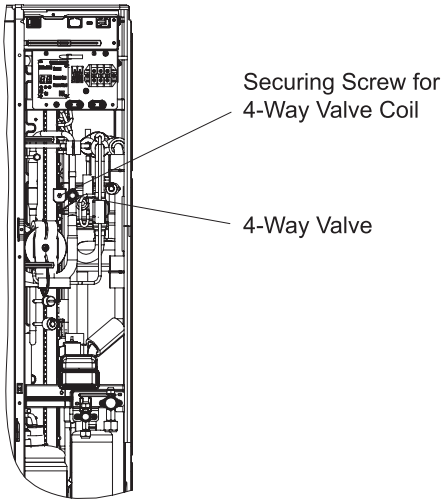
(4) To replace the 4-Way valve coil, reverse the removal procedure.

Tool	Phillips Screwdriver, Stubby Phillips Screwdriver

Model: 3~6HP



Model: 6.5~7HP



1.10 Removing Electronic Expansion Valve Coil

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

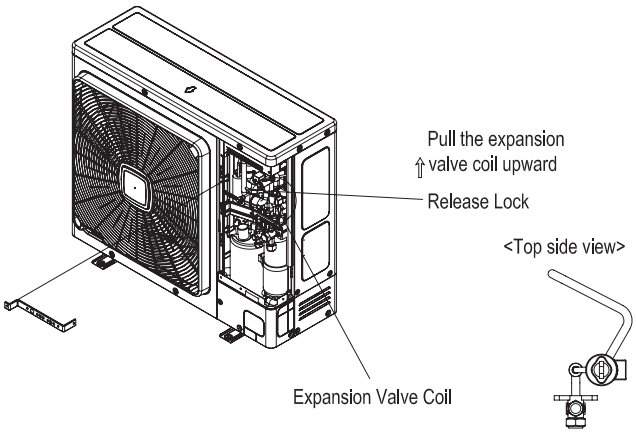
(2) Disconnect the connector on the outdoor unit PCB.

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

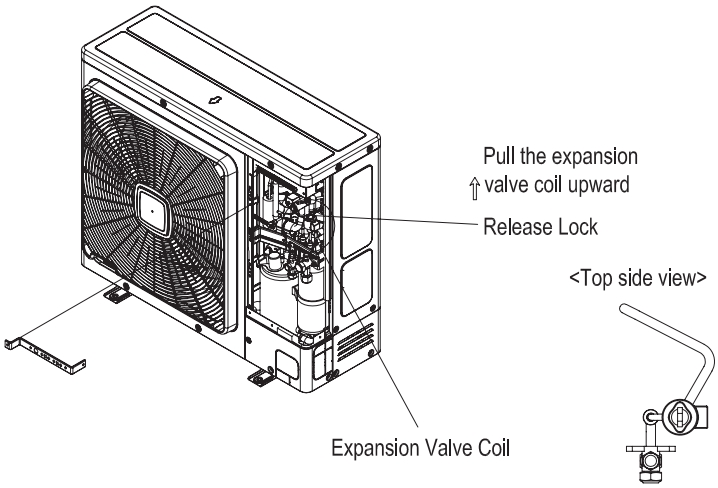
(4) To attach the new expansion valve coil, reverse the removal procedure.

Tool	Phillips Screwdriver, Nipper, Band

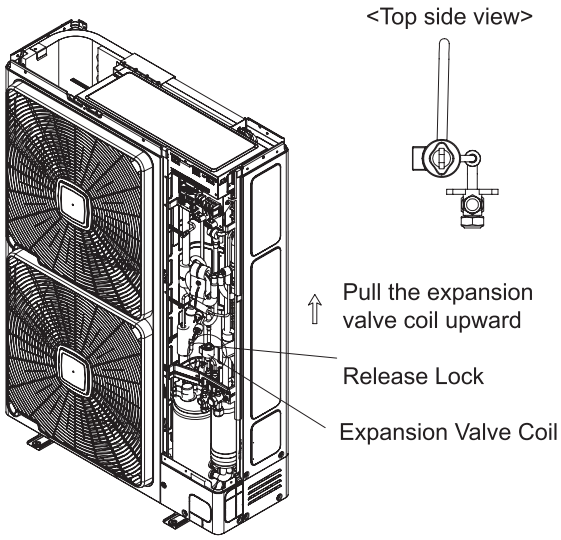
Model: 3~4HP



Model: 4.5~6HP



Model: 6.5~7HP



1.11 Removing Solenoid Valve Coil (SVA)

(1) Remove the service cover.

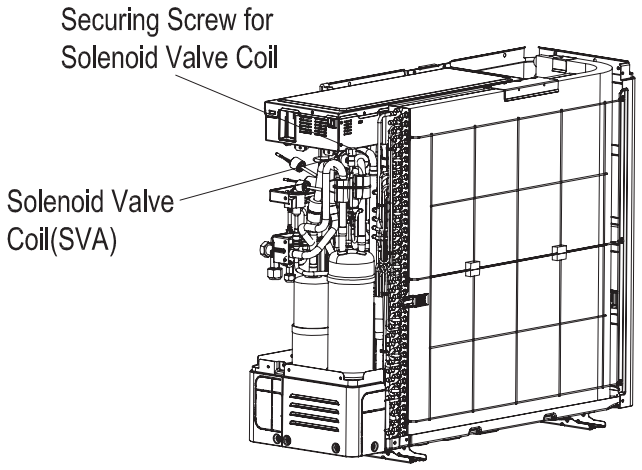
(2) Disconnect the connector on the outdoor unit PCB.

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

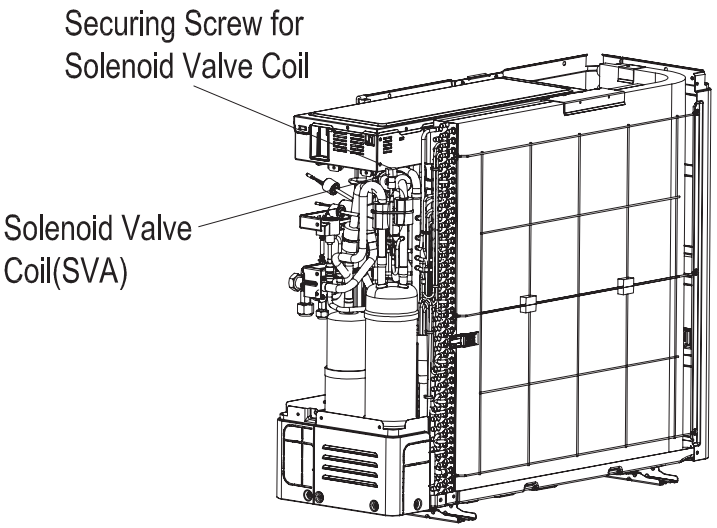
(4) To install a new solenoid valve coil, reverse the removal procedure.

Tool	Phillips Screwdriver

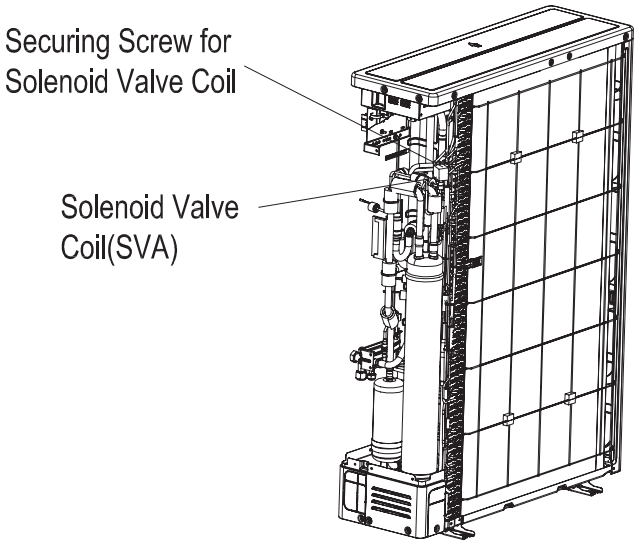
Model: 3~4HP



Model: 4.5~6HP



Model: 6.5~7HP



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.

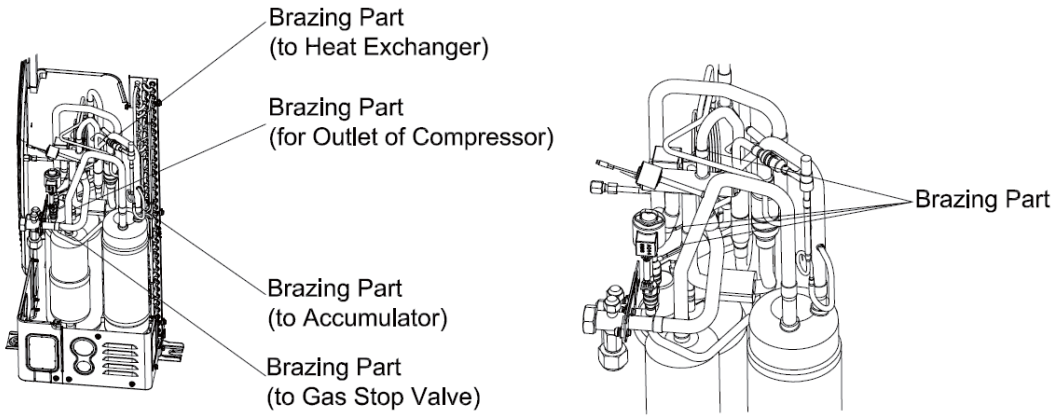
(b) Perform the brazing work while keeping the flame away from electrical wiring and piping insulation

(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.

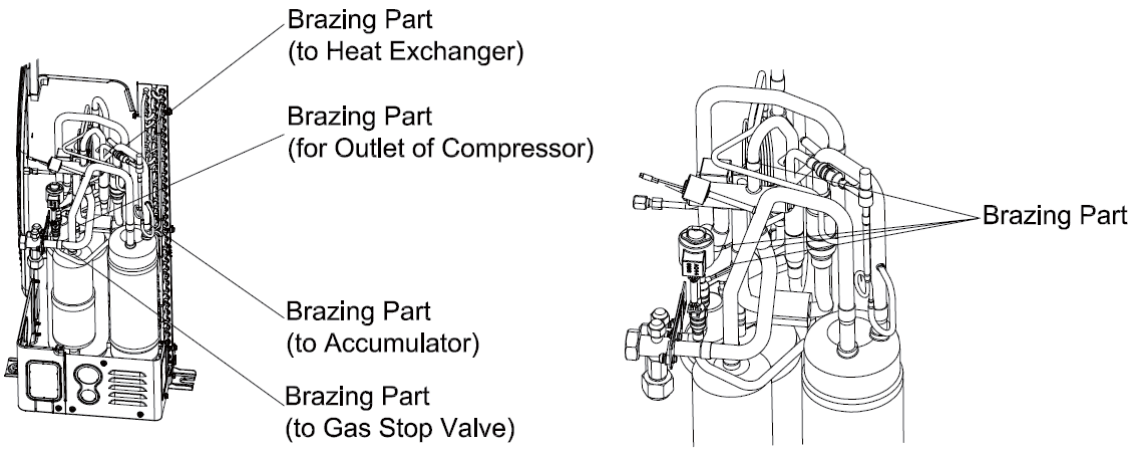
(6) To attach the new 4-Way valve after replacement, reverse the removal procedure.

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

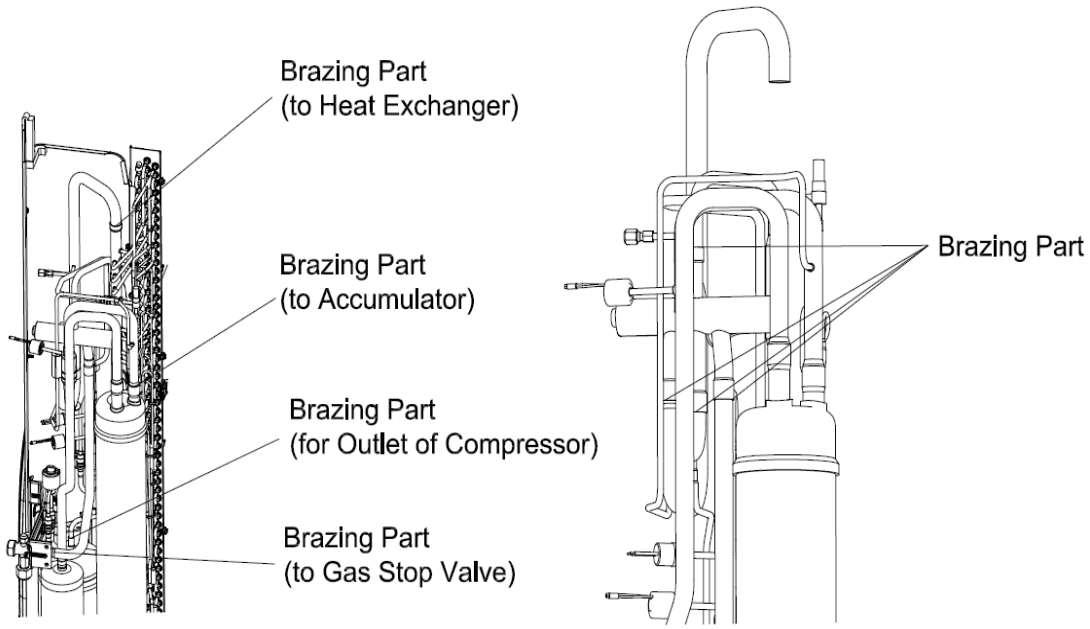
Model：3~4HP



Model：4.5~6HP



Model：6.5~7HP


Brazing Part
(to Heat Exchanger)
Brazing Part
(to Accumulator)
Brazing Part
(for Outlet of Compressor)
Brazing Part
(to Gas Stop Valve)
Brazing Part

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

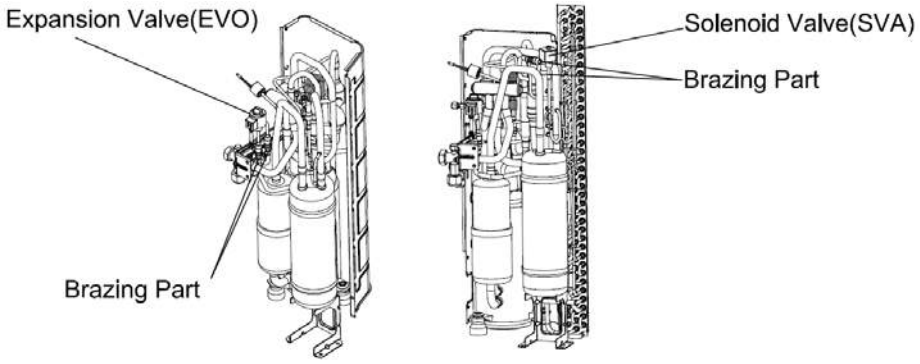
(a) Remove the electronic expansion valve and the solenoid valve after cooling the valve bodies with a wet cloth.

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

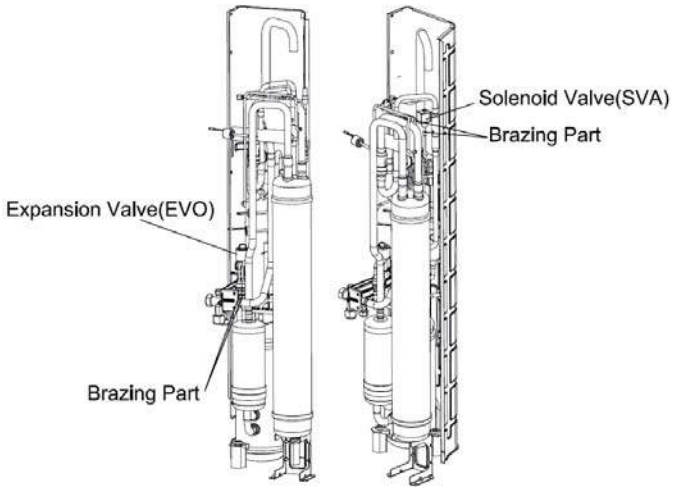
(5) To attach the new valves after replacement, reverse the removal procedure.

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

Model: 3~6HP



Model: 6.5~7HP

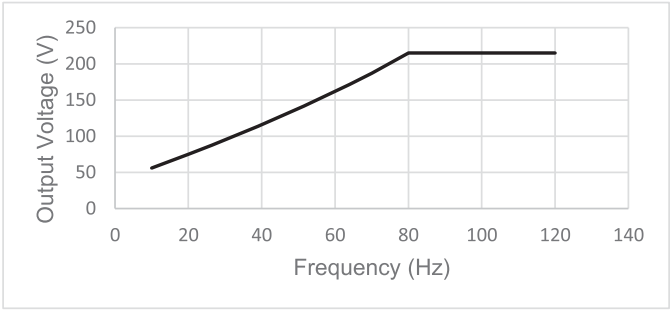
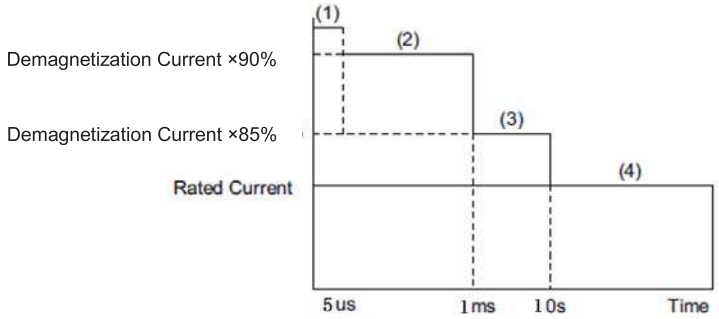


2. Main Parts

2.1 Inverter

(1) 3~7HP ●

Specificatio

Applicable Model		3HP~6HP	6.5HP~7HP
Applicable Power Source		220~240VAC/1Ph/50Hz	
Output Voltage (Maximum)		220V	
Output Current (Maximum)	Inverter PCB	16A	20A
	Fan Controller	1.2A	
Control Method		Vector PWM Control	
Range Output Frequency	Inverter	10Hz~120Hz ±1Hz	
	Fan	90rpm~850rpm ±10rpm	
Output Characteristics			
Speed Rate		0.125Hz/s, 0.25Hz/s, 0.5Hz/s, 1Hz/s, 3Hz/s (5 Steps)	
Protection Function (Excessive High or Low Voltage for Inverter)		Voltage output is stopped, when voltage is lower than 190V DC or higher than 450V DC. Cause of Abnormality: Failure of Inverter PCB, Incorrect Wiring	
Overcurrent Protection for Inverter (Electronic Thermal/ Instantaneous Overcurrent)		 (1) Short-Circuit Trip of Arm. (Protect by internal IPM) (2) Instantaneous Overcurrent Trip. It is detected when current value is Over Demagnetization current × 90%. (3) Instantaneous Overcurrent Trip: It is detected when current value is Over Demagnetization current × 85%. (4) Electronic Thermal Trip: It is detected when current value is over rate current. Condition is maintained longer than 10 seconds.	
Protection of IPM of Inverter PCB		The transistor module has three protection functions for self-protection. (1) Some of the output terminals "U", "V", or "W" are short-circuited. (2) Running current of IPM of Inverter PCB reaches the maximum rated current. (3) Control voltage of IPM of Inverter PCB abnormally decreases.	
Overload Control		Overload control is cancelled when Current Value ≤ Rated Current x 98%	
Fin Temperature Increase		The unit is stopped when the fin temperature is higher than 95°C	

● 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.

2.2 Rotary Compressor

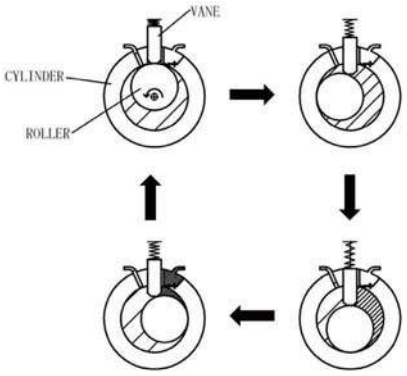
The rotary compressor is adopted in the model of 3~7HP. It has the following advantages:

(1) Low vibration and low noise design

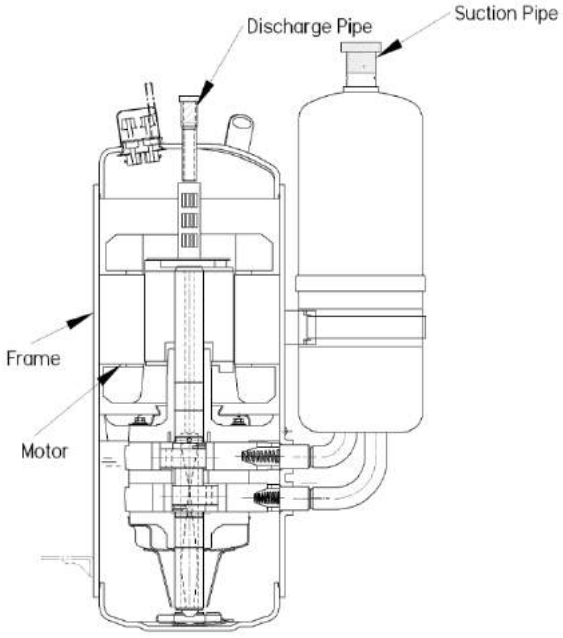
(i) The twin rotor crankshaft is arranged in a symmetrical type, which counteracts the centrifugal force produced by the rotation, and the vibration is smaller.

(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



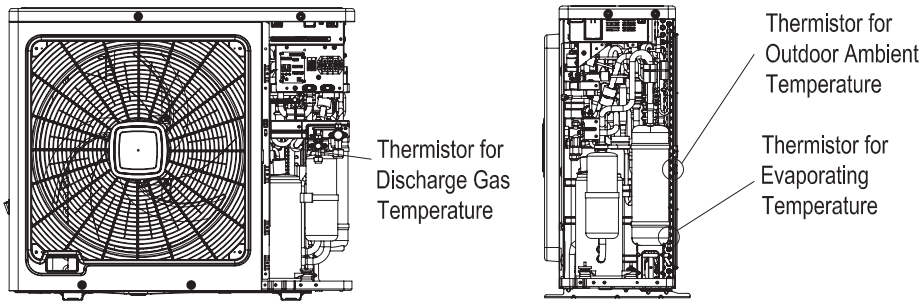
(3) Structure



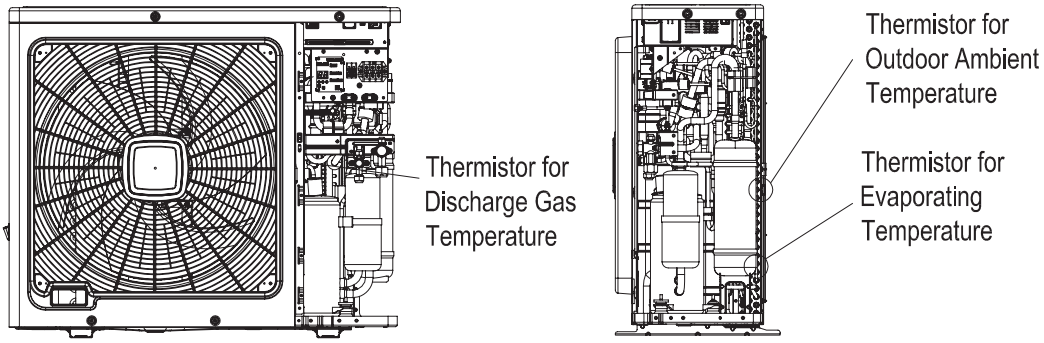
2.4 Thermistor

(1) Position of Thermistor

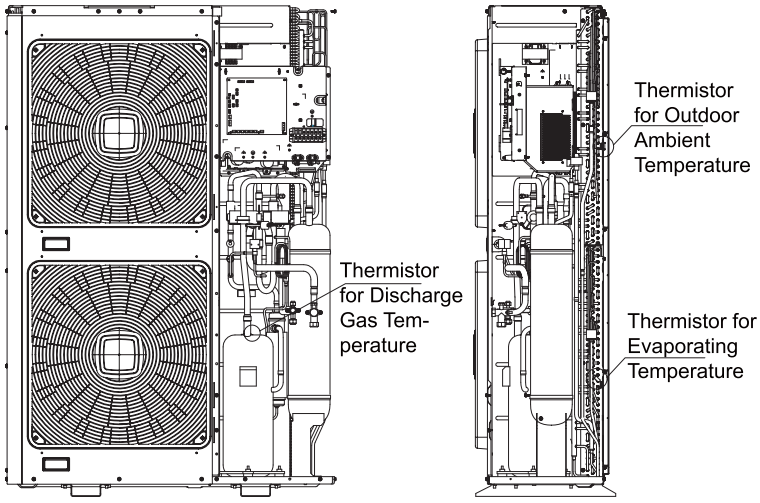
Model: 3~4HP



Model: 4.5~6HP



Model: 6.5~7HP



(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.

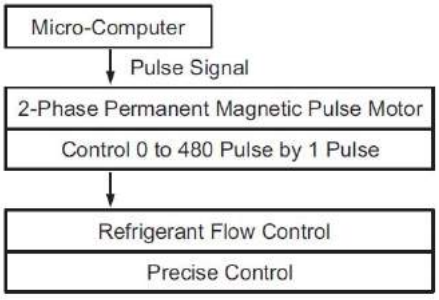
(3) Thermistor for Outdoor Ambient Temperature

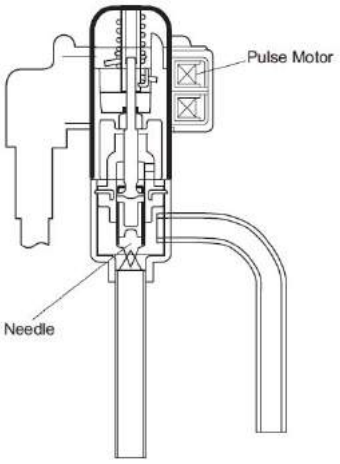
The thermistor resistance characteristics are shown in the figure belo .

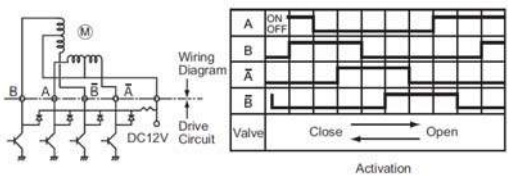
(4) Thermistor for Evaporating Temperature of Outdoor Unit

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

2.5 Electronic Expansion Valve for Outdoor Units



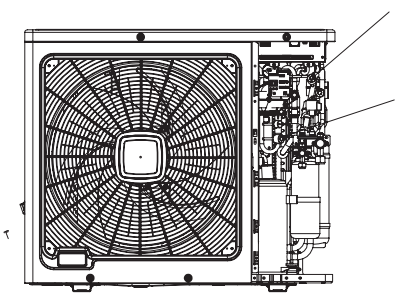


Items	Specification
Type	UKV Series
Refrigerant Used	R410A
Working Temperature Range	-30°C to 70°C
Mounting Direction	Drive Shaft in Vertical Direction within an Angle of 45° as Maximum
Flow Direction	Reversible
Drive Method	4-Phase Pulse Motor Method
Rated Voltage	DC12V+10%
Drive Condition	63PPS 1,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

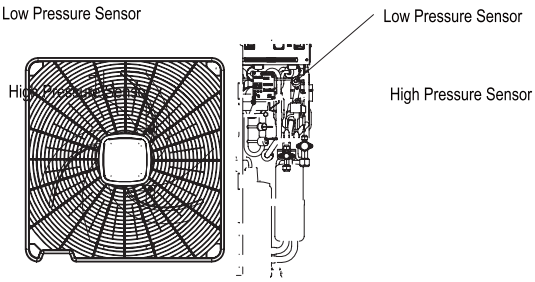
2.6 Pressure Sensor

(1) Position of Pressure Sensor

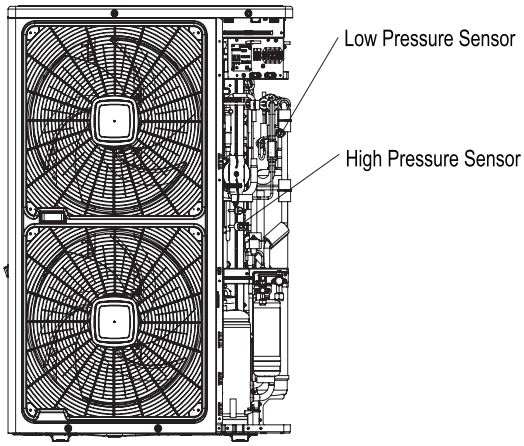
Model: 3HP~4HP



Model: 4.5HP~6HP

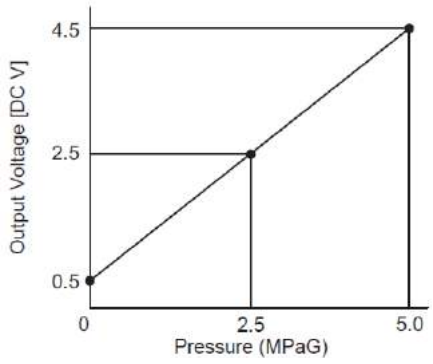


Model: 6.5HP~7HP

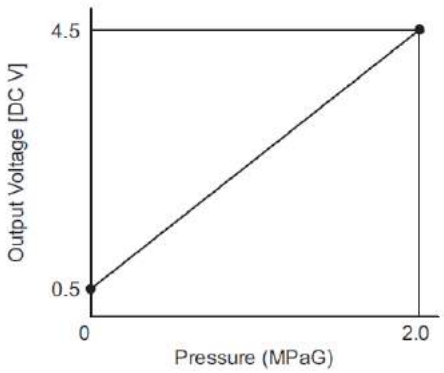


(2) High Pressure Sensor

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

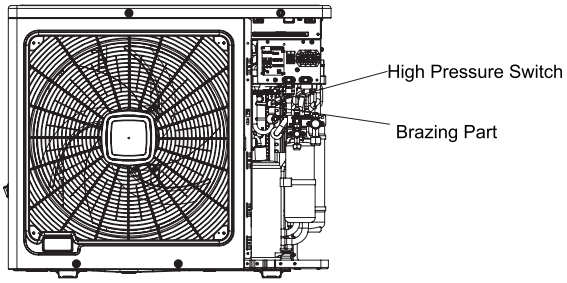
(3) Low Pressure Sensor

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.

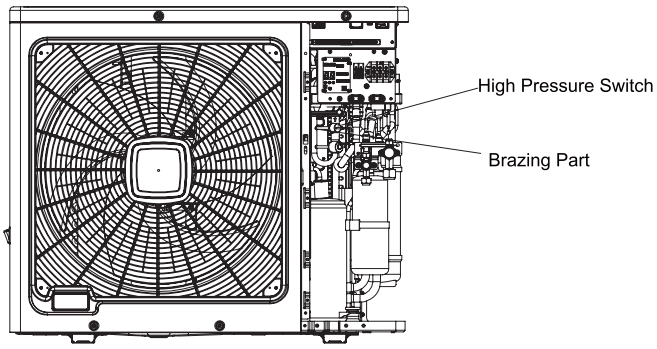
2.7 High Pressure Switch

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

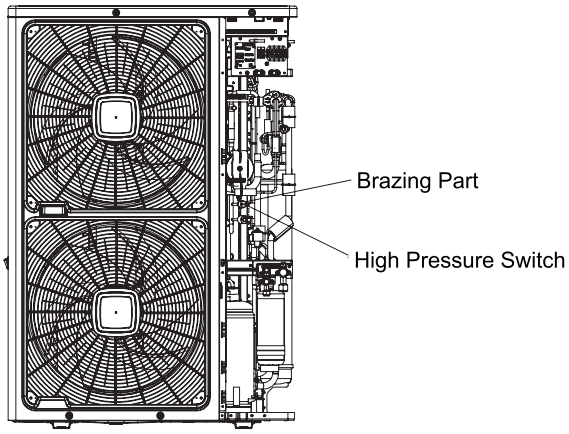
Model: 3HP~4HP



Model: 4.5HP~6HP



Model: 6.5HP~7HP



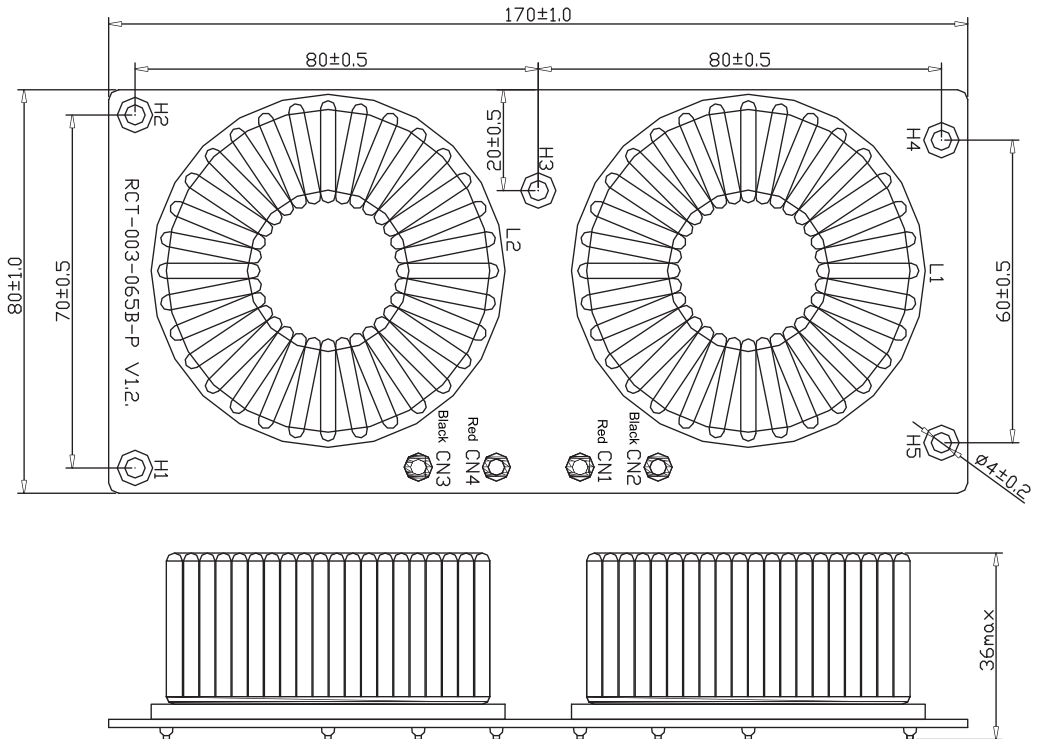
2.8 Reader (DCL)

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

Model: 3HP~7HP

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

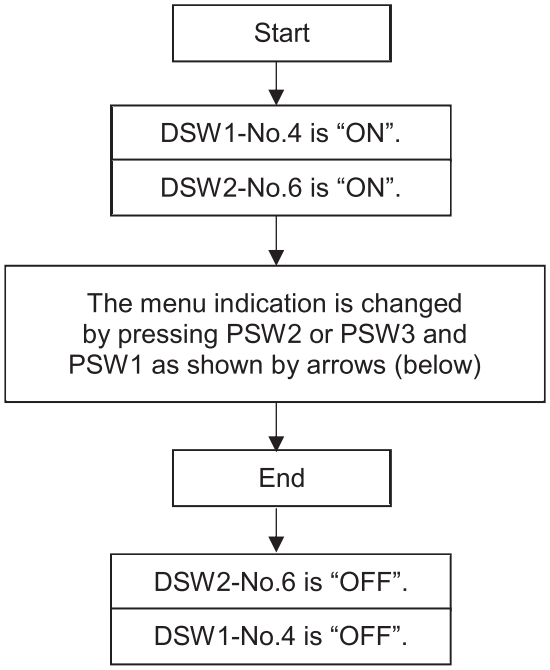
Items	Specification
Character	0.41mH (40KHz) (DC 16A)
Rated Current	16A
Direct Current Resistance	50.0mΩ (Max) (25°C)



External Input/Output and Function Setting

1. External Input/Output Setting Method

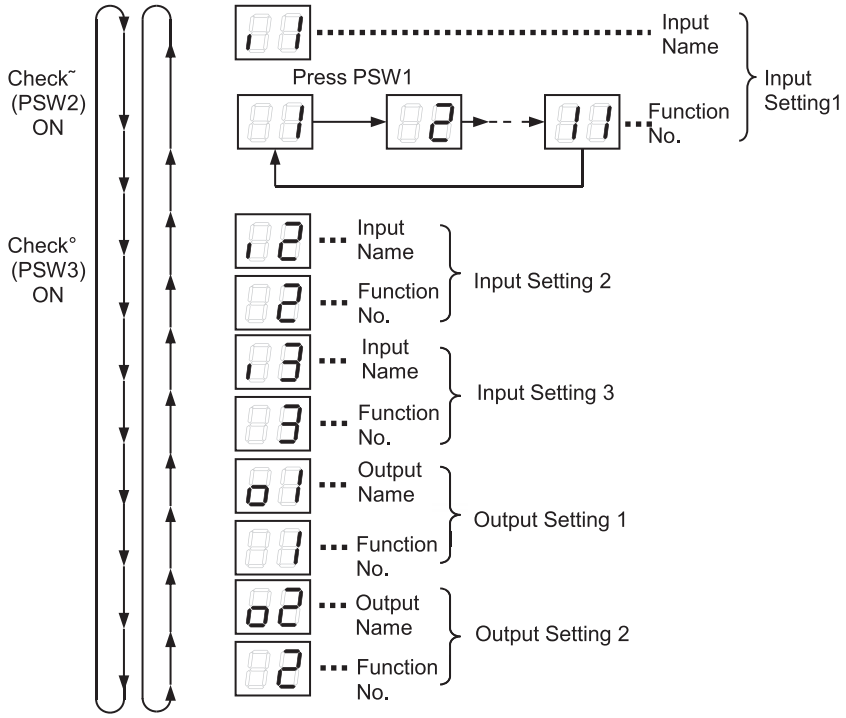
The setting should be performed during the outdoor unit stoppage. This setting is not available during the operation, the check mode, and the function setting.



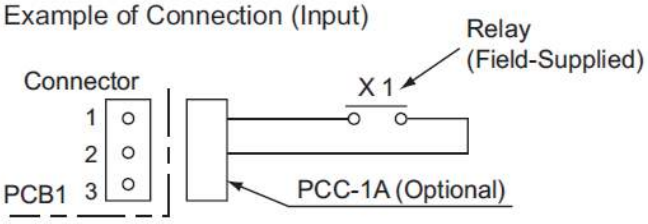
NOTES:

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

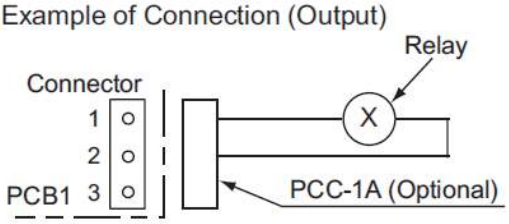
2. The same function cannot be set to a different input terminal. If it is set, the setting of the larger input No. is not available. Record the setting No. on the nameplate “External Input/Output and Function Setting” attached to the reverse surface of the service cover as well.



● Example of Connection (Input)



● Example of Connection (Output)



● Specifications of Rela

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

● Specifications of Rela

Specification
Mini-Power Relay LY1F DC12V made by OMRON Co.

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 Setting

- 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),

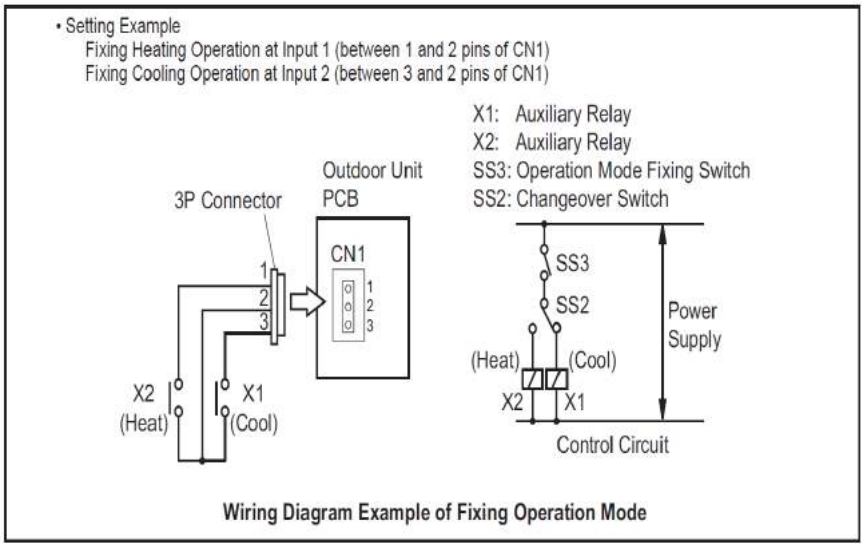
Input Fixing Cooling Operation Mode (Control Function No.2)

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.



Wiring Diagram Example of Fixing Operation Mode

(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)

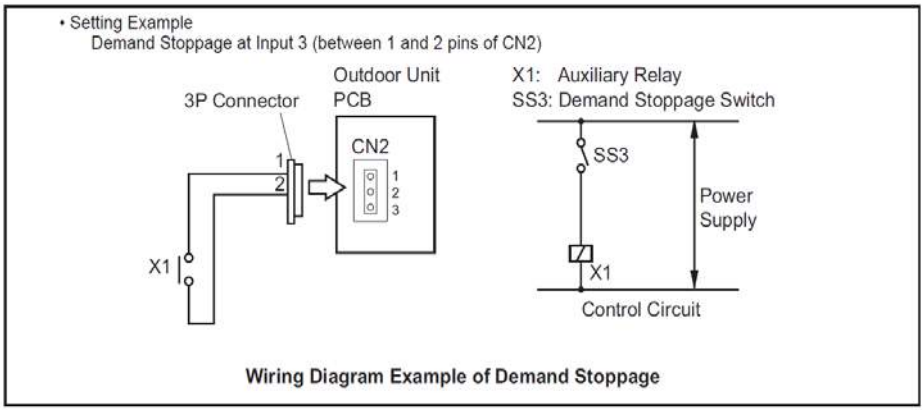
The stoppage code No. “10” is given. If the input terminals are opened, operation is resumed.

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.



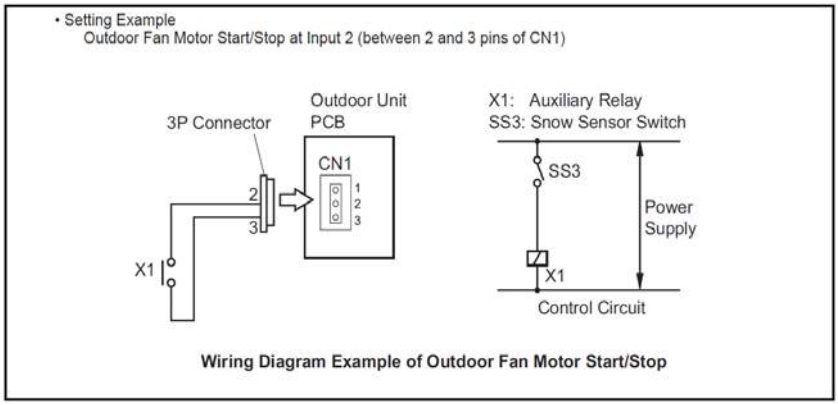
Wiring Diagram Example of Demand Stoppage

(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.

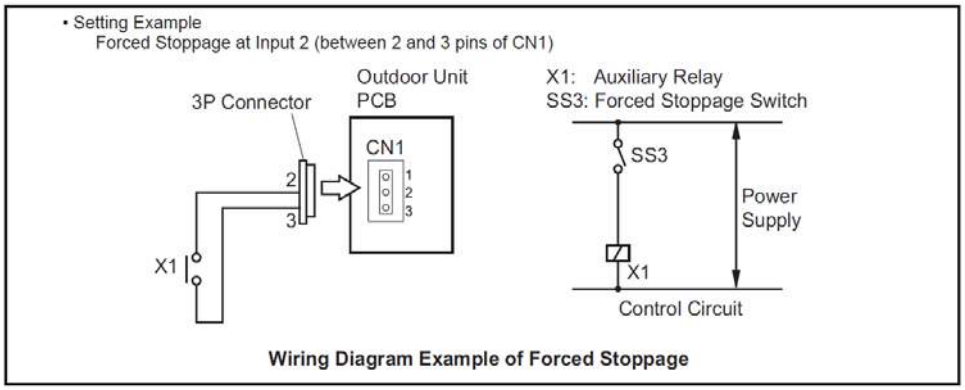
In this case, if the input terminals are opened, operation is resumed.

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 Forced Stoppage

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

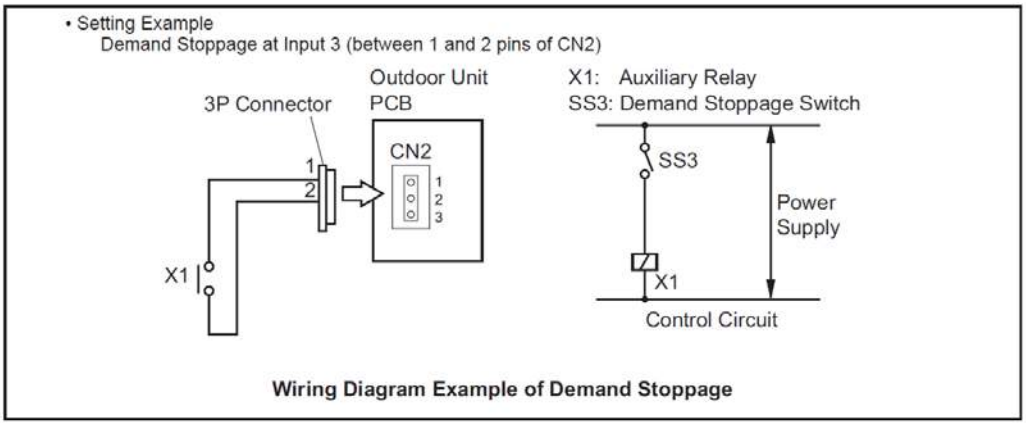
When the input terminals for Demand Current Control on the outdoor unit PCB are short-circuited, the compressor frequency is controlled so that the maximum limit of the outdoor running current is set to 100%, 80%, 70%, 60%, or 40% of the reference power consumption.

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		Specification	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.

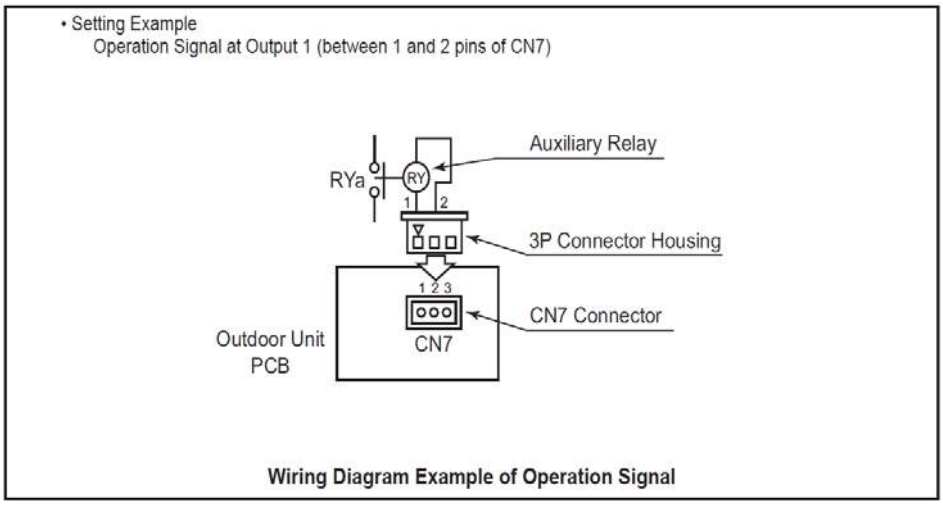
2.3 External Output Function Setting

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

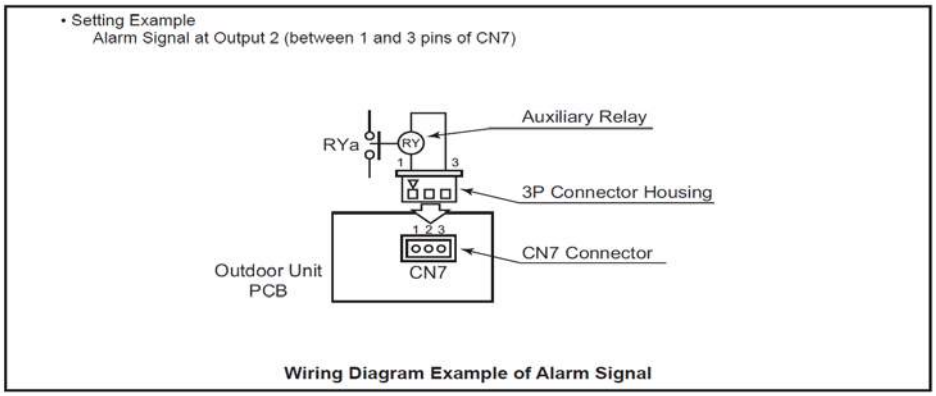


Wiring Diagram Example of Operation Signal

(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.)

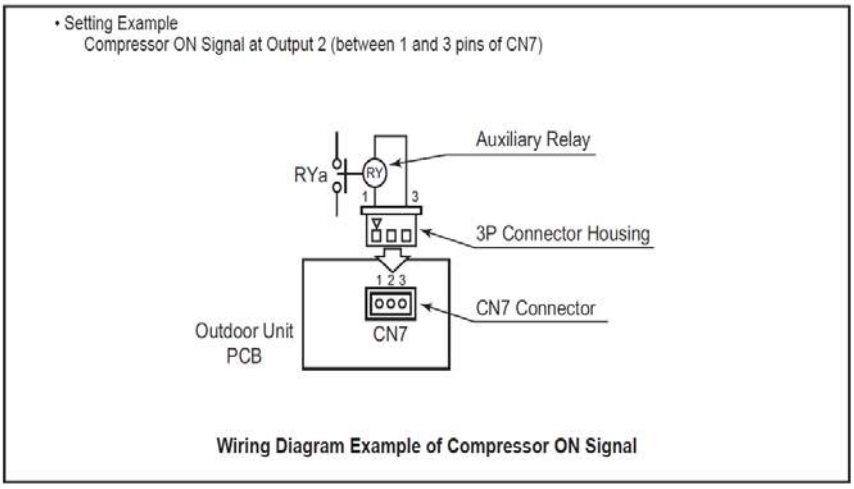


Wiring Diagram Example of Alarm Signal

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

This function is utilized to receive the compressor operation signal.

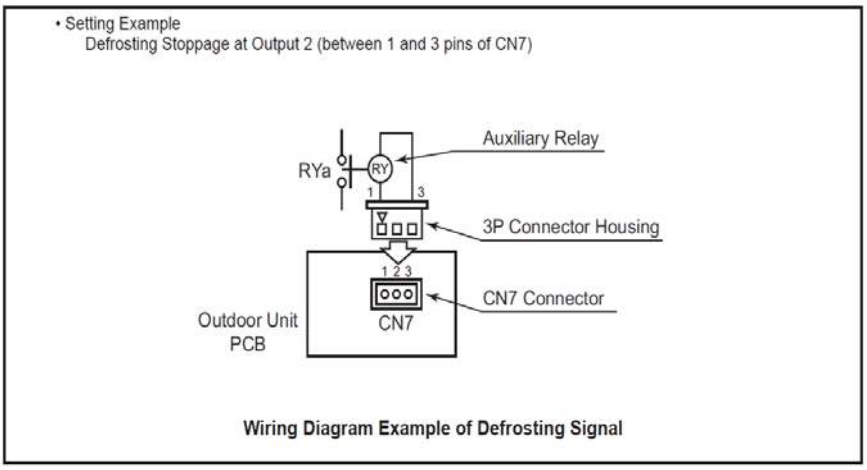
Auxiliary relay contacting (RYa) is closed during the compressor operation.



(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.



Specifications of Required Auxiliary Relay

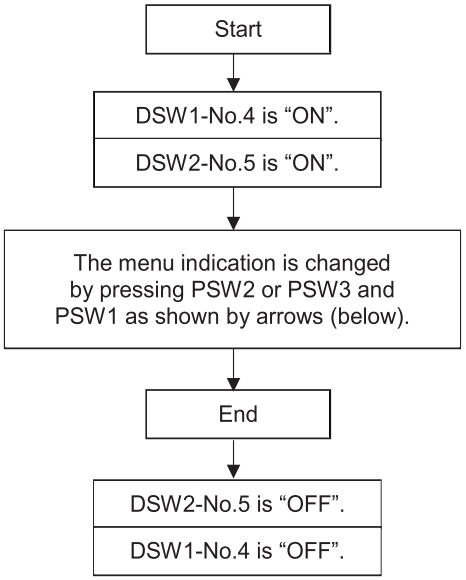
Parts	Specification
Auxiliary Relay *	High-Power Relay, LY2F DC12V made by OMRON

* 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

No.	7-Segment Display		Setting Item	Contents
10	SC	0	Compressor Frequency Fixed Mode	No setting
		1		Fixed frequency mode
11	S1	0	IU Electronic Expansion Valve Opening during Heating Operation Stoppage	No setting
		1		Expansion valve opening: pattern1
		2		Expansion valve opening: pattern2
12	So	0	IU Electronic Expansion Valve Opening during Heating Thermo-OFF	No setting
		1		Expansion valve opening: pattern1
		2		Expansion valve opening: pattern2
13	c1	0	IU Electronic Expansion Valve Opening during Heating Thermo-ON	No setting
		1		Expansion valve opening: pattern1
		2		Expansion valve opening: pattern2
14	db	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	dE	0	Demand Function Setting	No setting
		1		Valid demand function all time
16	UE	0	Demand Function Setting	No setting
		1		Valid wave function (20min. 100% demand/10min. minimum setting)
17	Fb	0	Protection of Decrease in Outlet Temperature of Cooling	No setting
		1		Cooling outlet temperature decrease protection1
		2		Cooling outlet temperature decrease protection1
18	Fr	0	Outlet Temperature Control (DOAS)	No setting
		1		Restrain capacity control
		2		Outlet air temperature control
19	E1	0	Not Prepared	
		1		
20	d5	0	Thermo-OFF Setting for Outdoor Unit After Defrosting Operation	No setting (continuously operation)
		1		Valid forced stoppage after defrost operation
21	F1	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)

EXTERNAL INPUT/OUTPUT AND FUNCTION SETTING

No.	7-Segment Display		Setting Item	Contents
22	F2	0	Prepared 2	
		1		
23	F3	0	Prepared 3	
		1		
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 Refrigerant

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 for an outdoor unit, other obstacles such as growing grass and pieces of paper, which might intercept air flo , 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	°C
Discharge Temperature:	°C	°C

8. Check Pressure:

Discharge Pressure:	MPa
Suction Pressure:	MPa

9. Check Voltage:

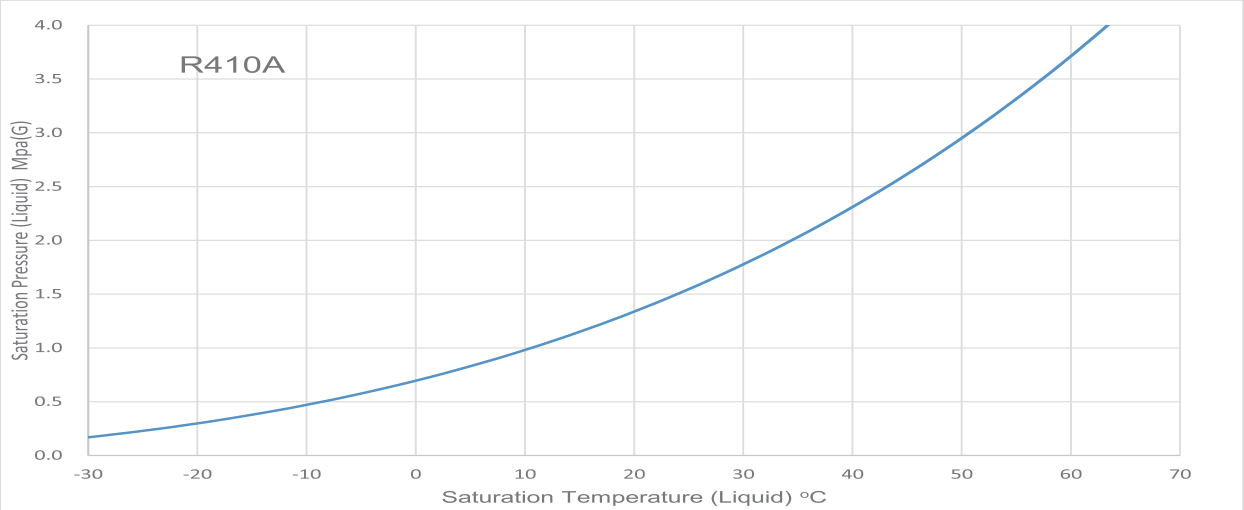
Rated Voltage:	V
Operating Voltage:	L-N V
Starting Voltage:	V

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

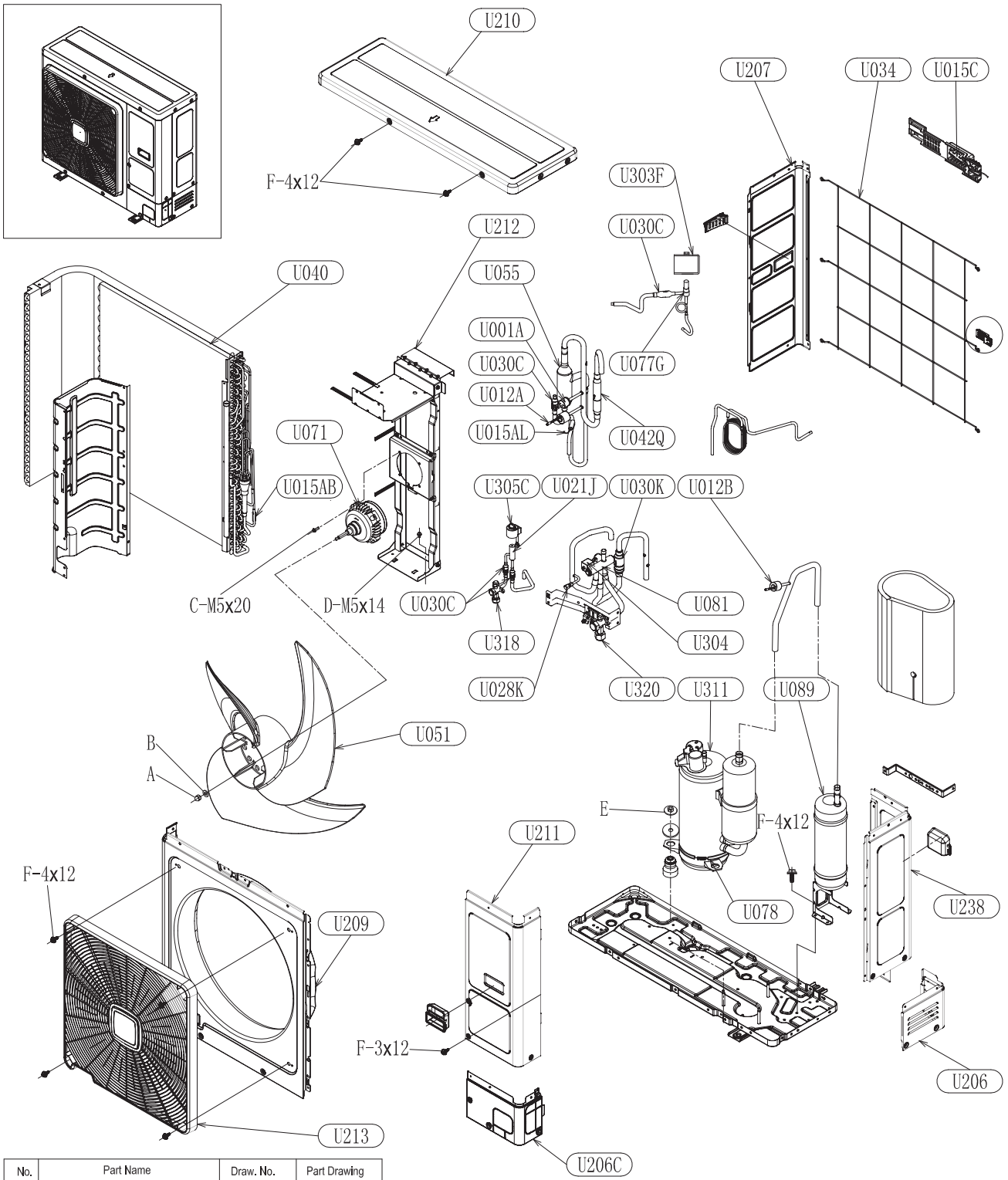
SERVICE PARTS LIST

No.	Part Name	Replacement Parts		Remarks	Voltage: 1φ 220V 50Hz — Quantity Per Unit						
		Draw. No.	Part No. (Order No.)		RAS-3.0HNSKQ	RAS-3.5HNSKQ	RAS-4.0HNSKQ	RAS-4.5HNSKQ	RAS-5.0HNSKQ	RAS-6.0HNSKQ	RAS-6.5~7.0HNSKQ
U001A	PRESSURE SWITCH	H7C00447B	QU001004		1	1	1	1	1	1	1
U012A	PRESSURE SENSOR	H17B46257B	QU012009	0-5.0Mpa/DC0.5-4.5V	1	1					
U012A	PRESSURE SENSOR	H17B46257C	QU012017	0-5.0Mpa/DC0.5-4.5V			1	1	1	1	1
U012B	PRESSURE SENSOR	H17B47112A	QU012016	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	QU013039		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	H7B00029A	QU015009	Td,THM9,R25=200kΩ±5% B25/50=3920K±2%	1	1	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	P26007		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	QU051007		1	1	2	2	2	2	2
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	QU078020		1	1					
U078	OIL HEATER	H7C05802C	QU078021				1	1	1	1	1
U081	4-WAY VALVE	H7C04171A	QU081021		1	1					
U081	4-WAY VALVE	H7C03985A	QU081002				1	1	1	1	1

U089	ACCUMULATOR	H7C05805A	QU089023		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	H7C05555A			1	1	1	1	1	1	1
U206C	SIDE COVER	H7C05556A			1	1	1	1	1	1	1
U207	SIDE COVER ASSY- LEFT	H7D10758A			1	1					
U207	SIDE COVER ASSY- LEFT	H7D10759A					1	1	1	1	1
U209	FRONT COVER ASSY	H7D10774A			1	1					
U209	FRONT COVER ASSY	H7C05978A					1	1	1	1	1
U210	UPPER COVER ASSY	H7D10779A			1	1	1	1	1	1	1
U211	SERVICE COVER ASSY	H7D10790A			1	1					
U211	SERVICE COVER ASSY	H7D10791A					1	1	1	1	1
U212	MOTOR BRACKET	H7D10766A			1	1					
U212	MOTOR BRACKET	H7D10767A					1	1	1	1	1
U213	FAN GUARD	H7C05544A			1	1	2	2	2	2	2
U238	SIDE COVER ASSY- RIGHT	H7C06535A			1	1					
U238	BACK COVER ASSY	H7C06536A					1	1	1	1	1
U303F	SOLENOID VALVE COIL	H7C01911A	QU303007		1	1	1	1	1	1	1
U304	4-WAY VALVE COIL	H7D09826A	QU304003		1	1	1	1	1	1	1
U305C	EXPANSION VALVE COIL	17C78180A	P26009		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	QU407001	IMB-001-045B-AC AC690V 40A	1	1					
U405	MAIN PCBA	H7C05653D	QU407002	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

Location Map of Repair Parts in Outdoor Unit

Model:
RAS-3.0HNSKQ
RAS-3.5HNSKQ
RAS-4.0HNSKQ



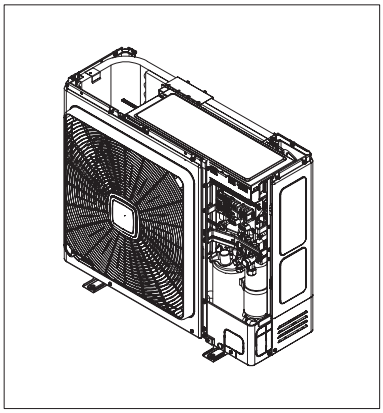
No.	Part Name	Draw. No.	Part Drawing
A	Cap Nut	17D50034B	
B	Washer	01VF0800	
C	Cross Recess Pan Head Screw	453H0520	
D	Cross Recess Pan Head Screw	453H0514	
E	Hexagon Flange Nut	17D49475A	
F	Cross Recess Hexagon Screw(Other)	17G24763A	

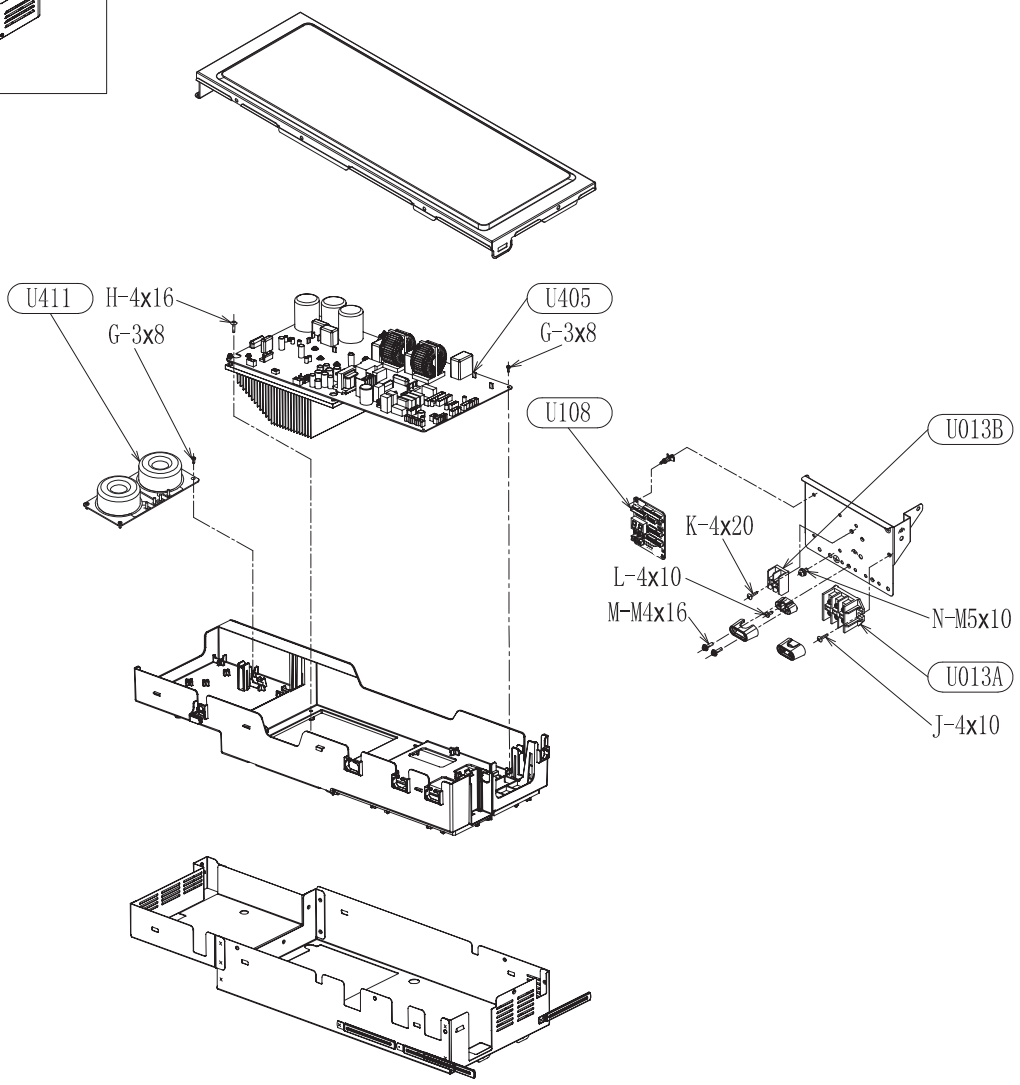
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Model:
RAS-3.0HNSKQ
RAS-3.5HNSKQ
RAS-4.0HNSKQ

Location Map of Repair Parts in Electrical Box





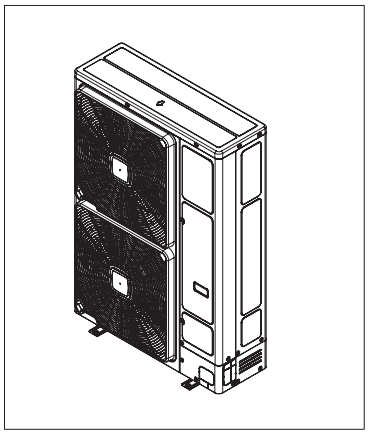
No.	Part Name	Drawing No.	Part Drawing
G	Cross Recess Pan Head Screw	53CB0308	
H	Cross Recess Pan Head Screw	51CB0416	
J	Cross Recess Pan Head Screw	51CB0410	
K	Cross Recess Pan Head Screw	53CB0420	
L	Cross Recess Pan Head Screw	53CB0410	
M	Cross Recess Pan Head Screw	453H0416	
N	Cross Recess Pan Head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

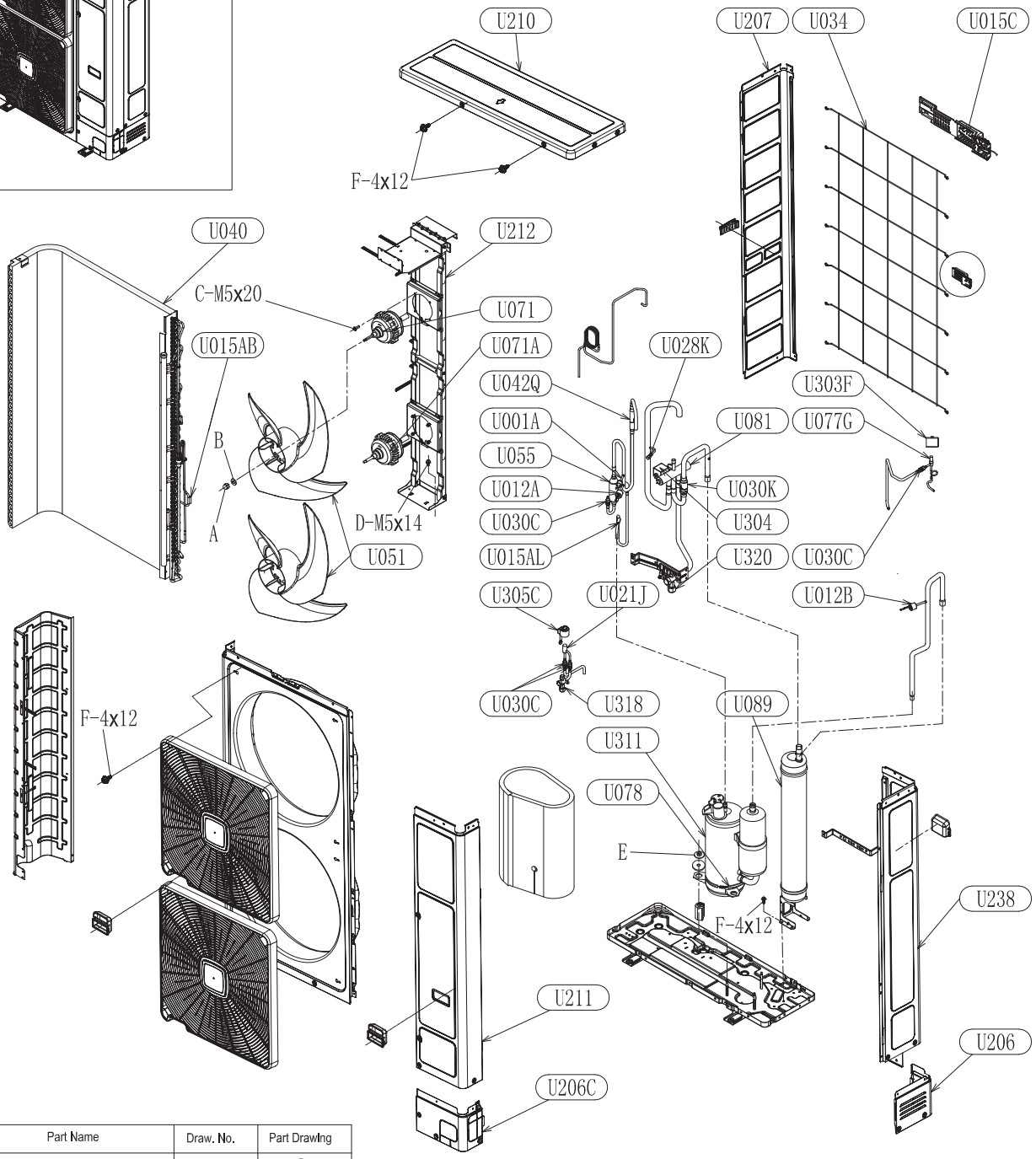
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Location Map of Repair Parts in Outdoor Unit

Model:
RAS-4.5HNSKQ
RAS-5.0HNSKQ
RAS-6.0HNSKQ





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	

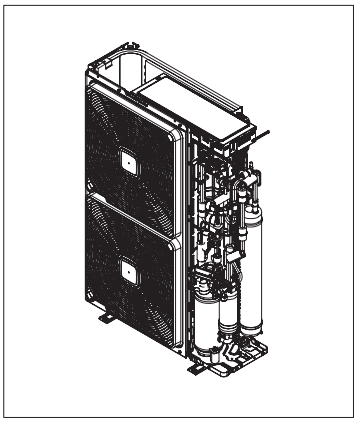
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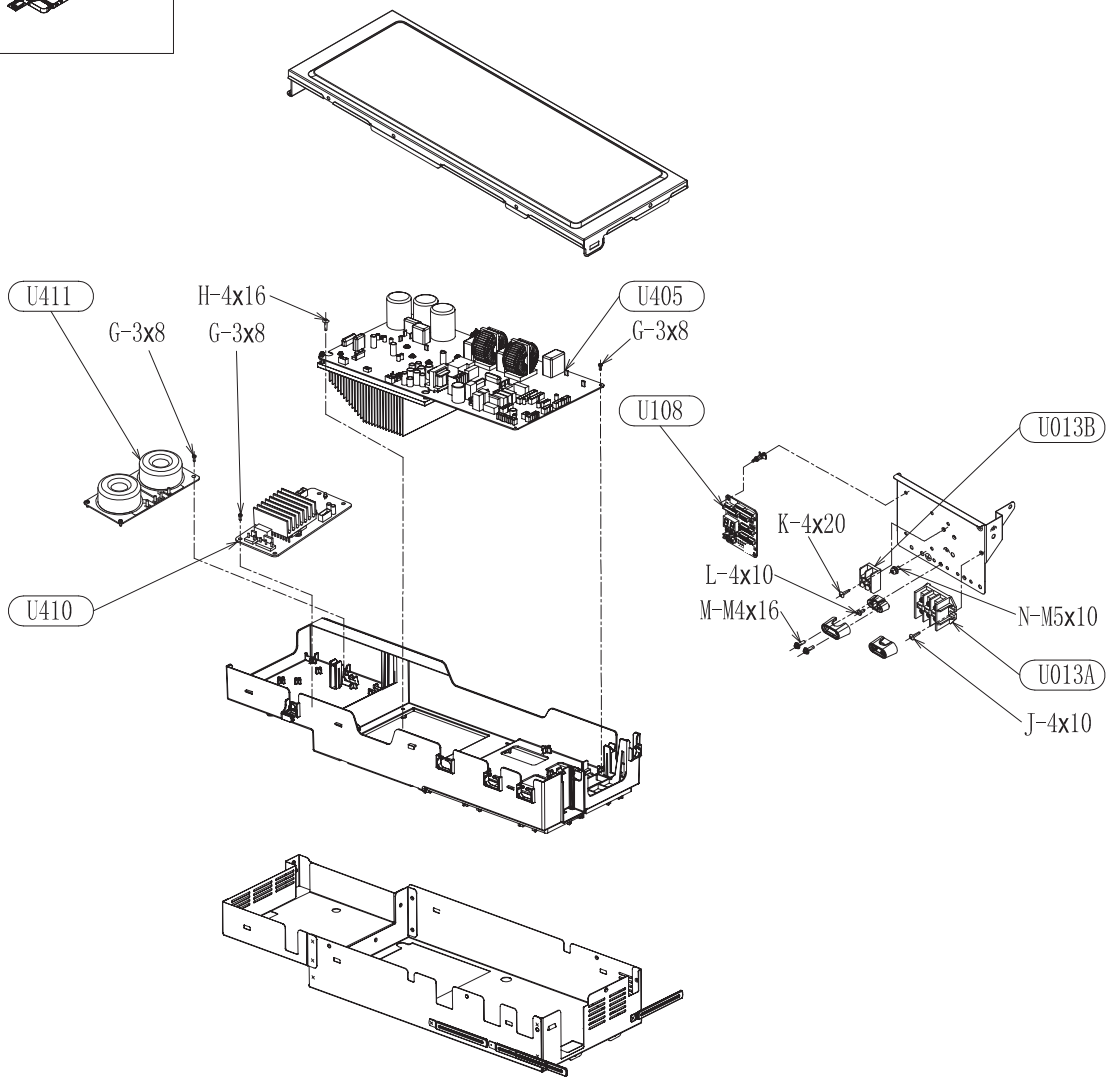
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Location Map of Repair Parts in Electrical Box

Model:

RAS-4.5HNSKQ
RAS-5.0HNSKQ
RAS-6.0HNSKQ





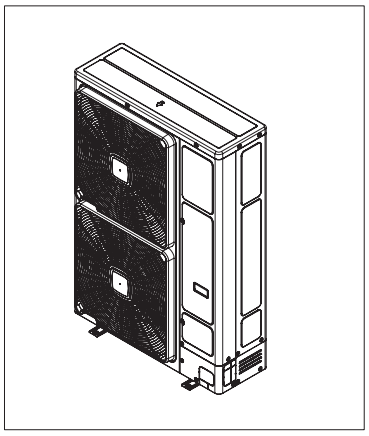
No.	Part Name	Drawing No.	Part Drawing
G	Cross Recess Pan Head Screw	53CB0308	
H	Cross Recess Pan Head Screw	51CB0416	
J	Cross Recess Pan Head Screw	51CB0410	
K	Cross Recess Pan Head Screw	53CB0420	
L	Cross Recess Pan Head Screw	53CB0410	
M	Cross Recess Pan Head Screw	453H0416	
N	Cross Recess Pan Head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

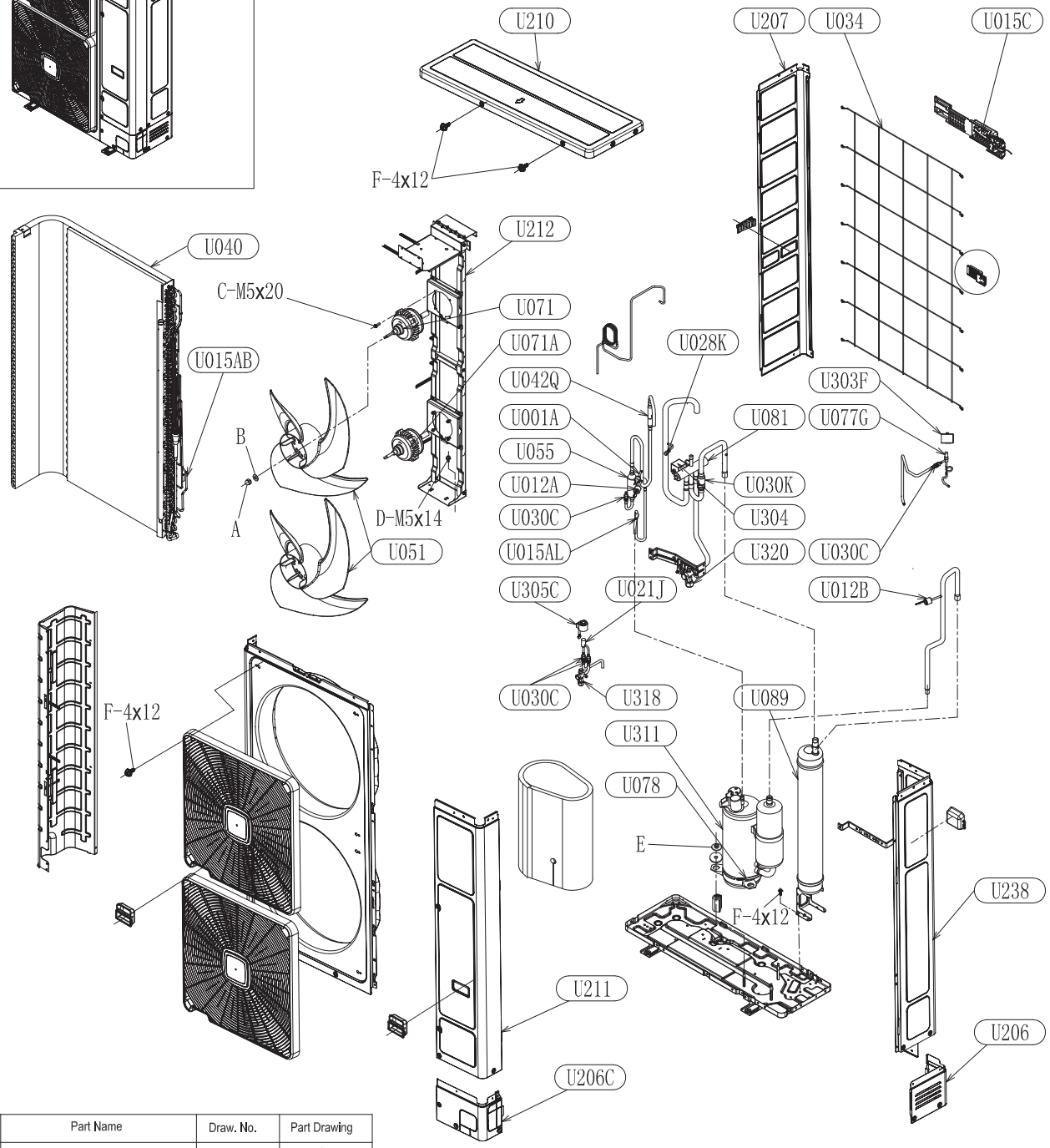
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Location Map of Repair Parts in Outdoor Unit

Model:
RAS- 7.0HNSKQ
RAS-6.5HNSKQ





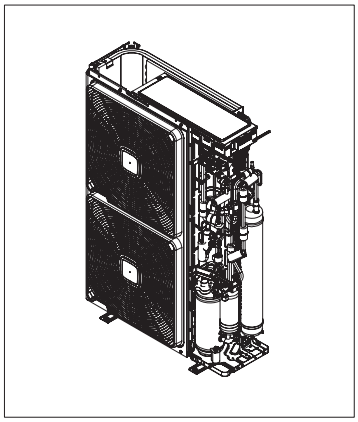
No.	Part Name	Draw. No.	Part Drawing
A	Cap Nut	17D50034B	
B	Washer	01VF0800	
C	Cross Recess Pan Head Screw	453H0520	
D	Cross Recess Pan Head Screw	453H0514	
E	Hexagon Flange Nut	17D49475A	
F	Cross Recess Hexagon Screw(Other)	17G24763A	

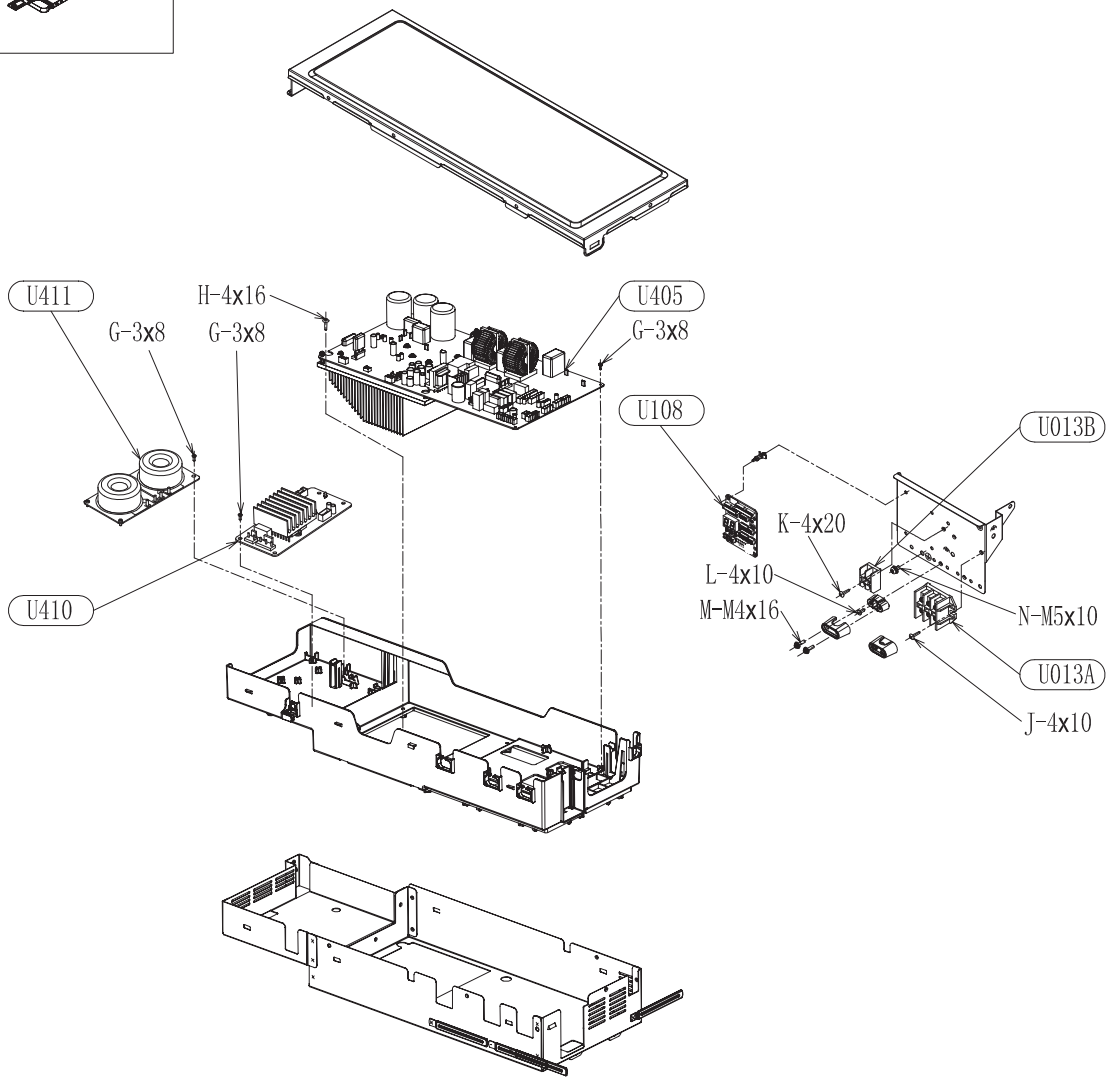
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Model:
RAS- 7.0HNSKQ
RAS-6.5HNSKQ

Location Map of Repair Parts in Electrical Box





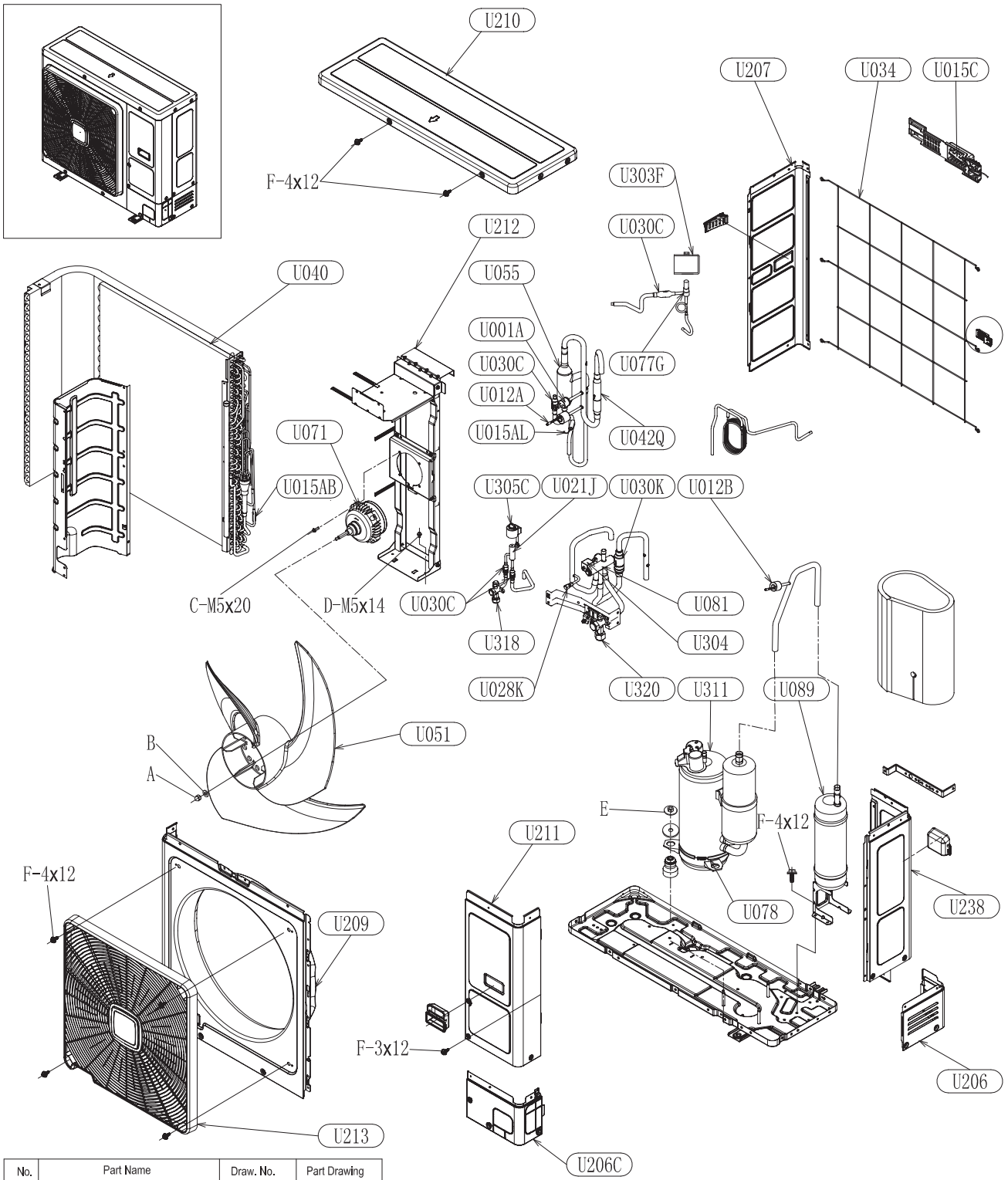
No.	Part Name	Draw. No.	Part Drawing
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H	Cross Recess Pan Head Screw	51CB0416	
J	Cross Recess Pan Head Screw	51CB0410	
K	Cross Recess Pan Head Screw	53CB0420	
L	Cross Recess Pan Head Screw	53CB0410	
M	Cross Recess Pan Head Screw	453H0416	
N	Cross Recess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

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Location Map of Repair Parts in Outdoor Unit

Model:
RAS-3.0HNSKQ
RAS-3.5HNSKQ
RAS-4.0HNSKQ



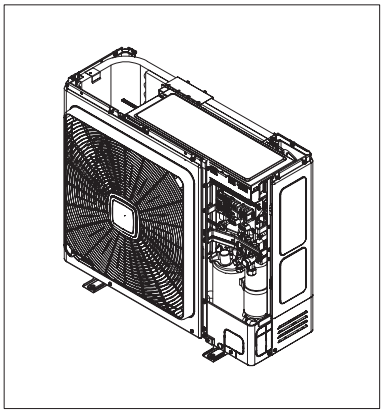
No.	Part Name	Draw. No.	Part Drawing
A	Cap Nut	17D50034B	
B	Washer	01VF0800	
C	Cross Recess Pan Head Screw	453H0520	
D	Cross Recess Pan Head Screw	453H0514	
E	Hexagon Flange Nut	17D49475A	
F	Cross Recess Hexagon Screw(Other)	17G24763A	

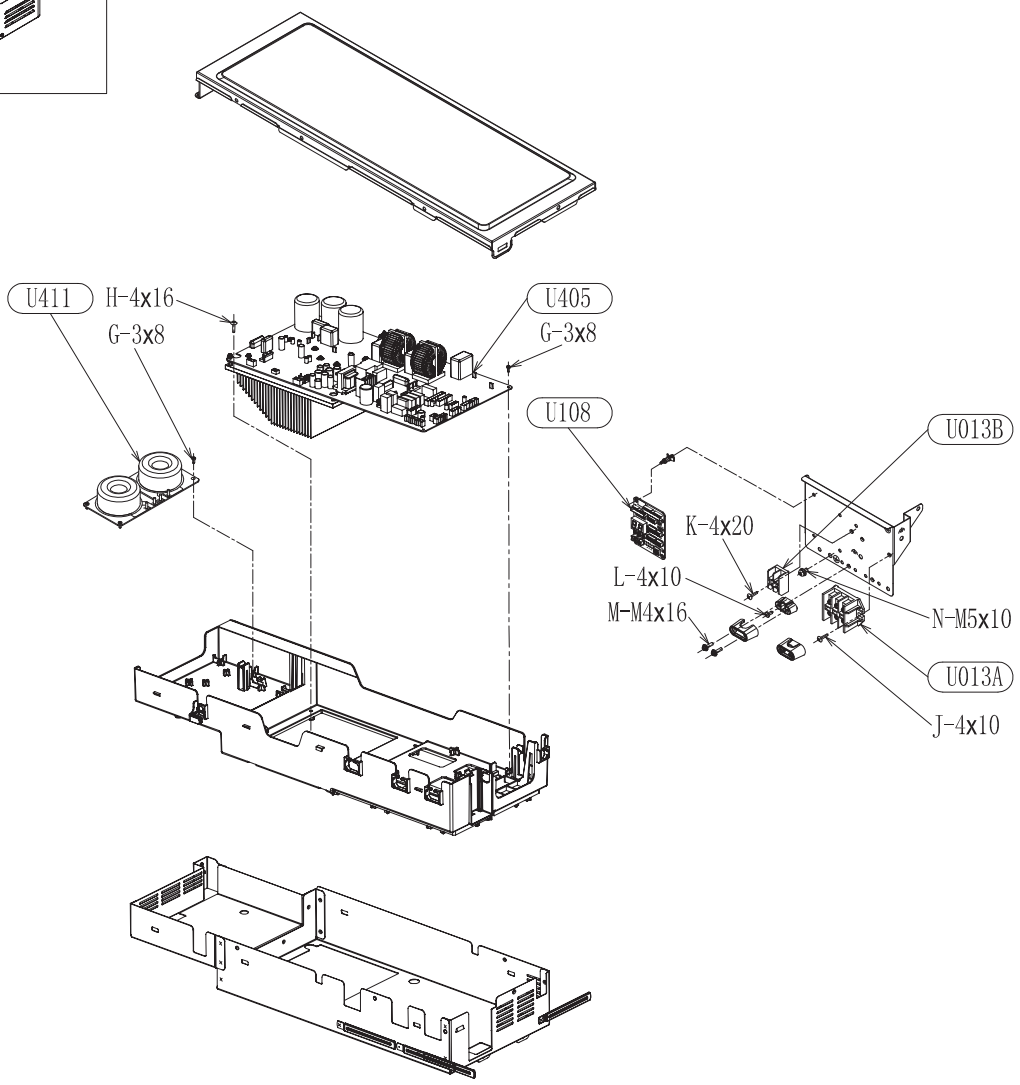
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Location Map of Repair Parts in Electrical Box

Model:
RAS-3.0HNSKQ
RAS-3.5HNSKQ
RAS-4.0HNSKQ





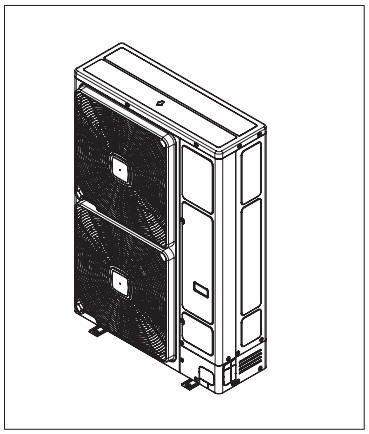
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L	Cross Recess Pan Head Screw	53CB0410	
M	Cross Recess Pan Head Screw	453H0416	
N	Cross Recess Pan Head Screw	453H0510	

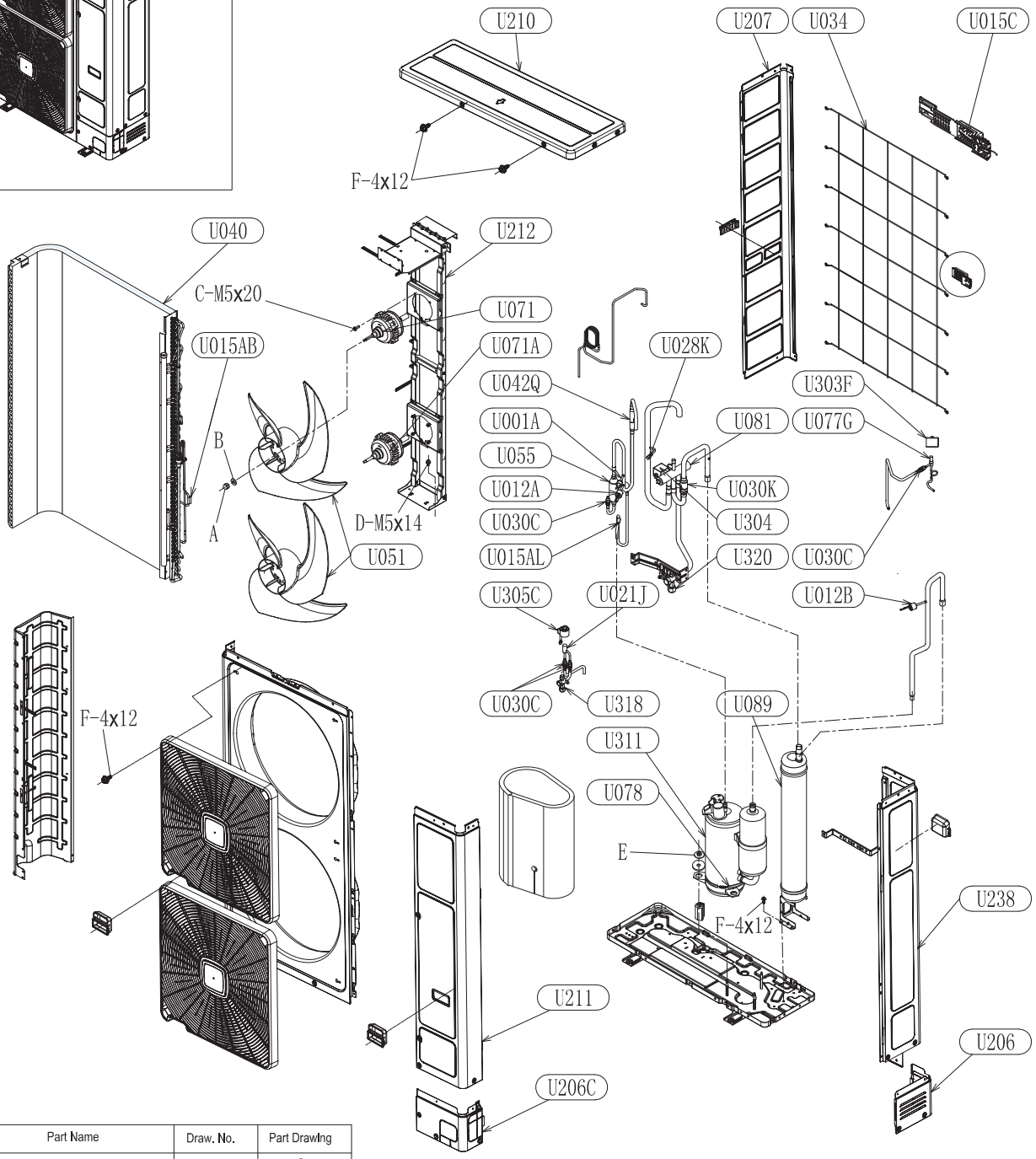
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Location Map of Repair Parts in Outdoor Unit

Model:
RAS-4.5HNSKQ
RAS-5.0HNSKQ
RAS-6.0HNSKQ





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	

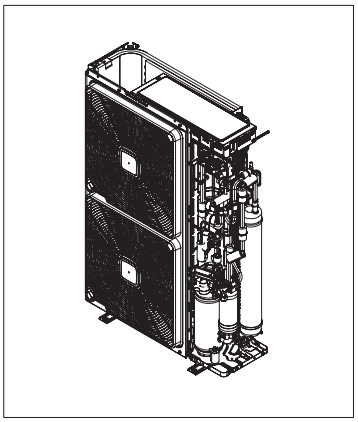
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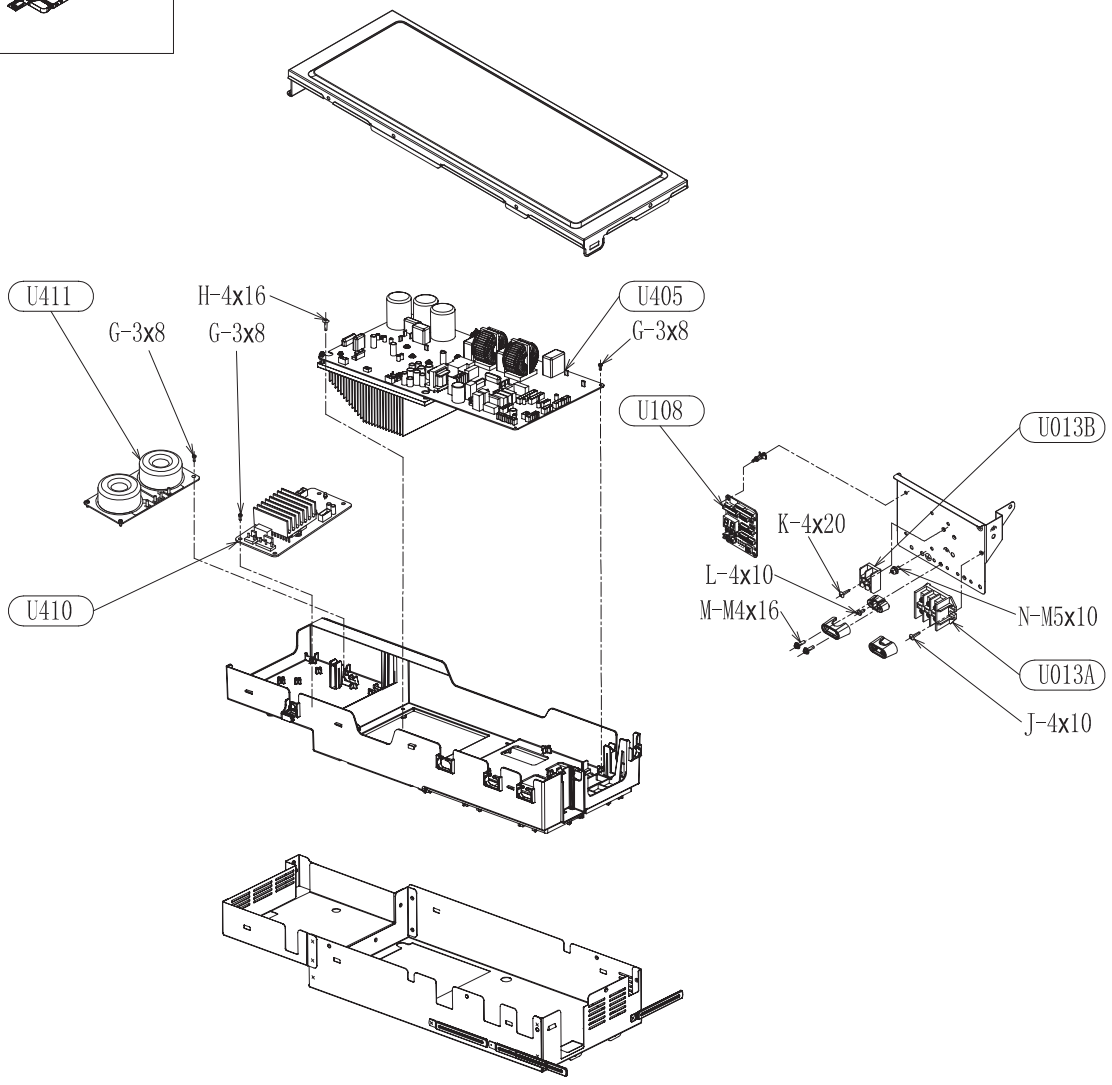
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Location Map of Repair Parts in Electrical Box

Model:

RAS-4.5HNSKQ
RAS-5.0HNSKQ
RAS-6.0HNSKQ





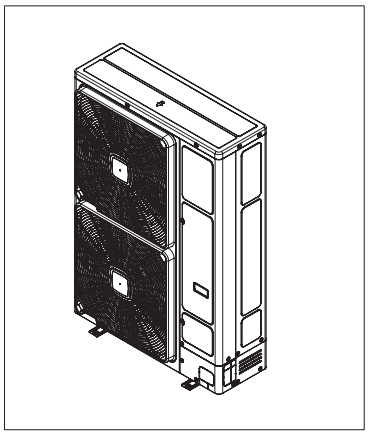
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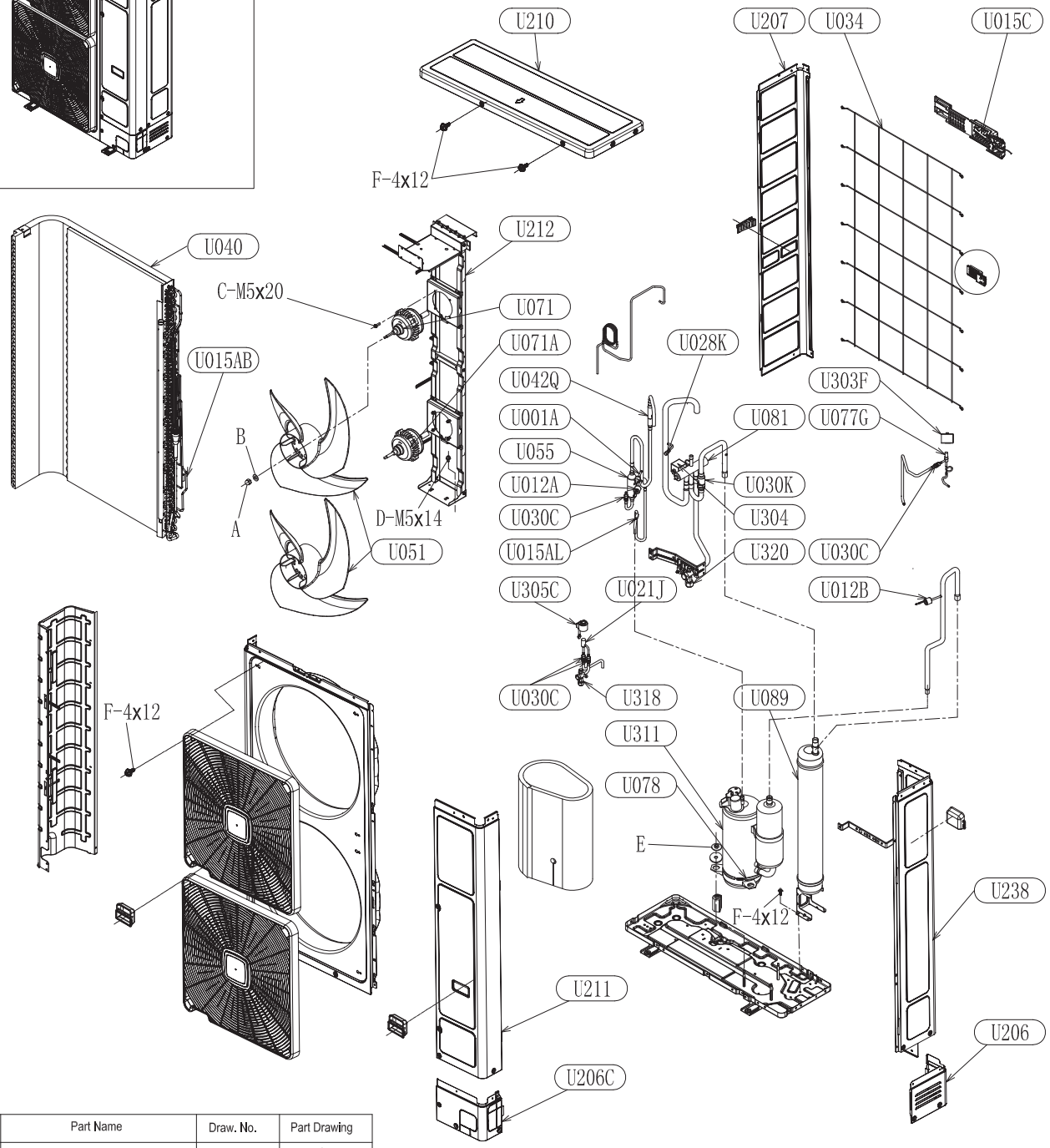
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Location Map of Repair Parts in Outdoor Unit

Model:
RAS- 7.0HNSKQ
RAS-6.5HNSKQ





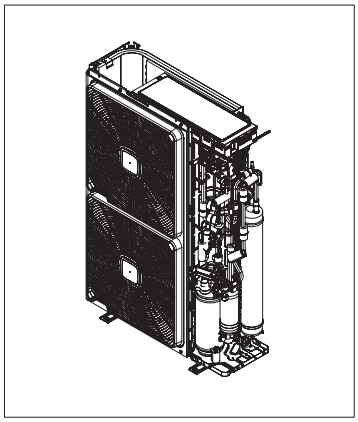
No.	Part Name	Draw. No.	Part Drawing
A	Cap Nut	17D50034B	
B	Washer	01VF0800	
C	Cross Recess Pan Head Screw	453H0520	
D	Cross Recess Pan Head Screw	453H0514	
E	Hexagon Flange Nut	17D49475A	
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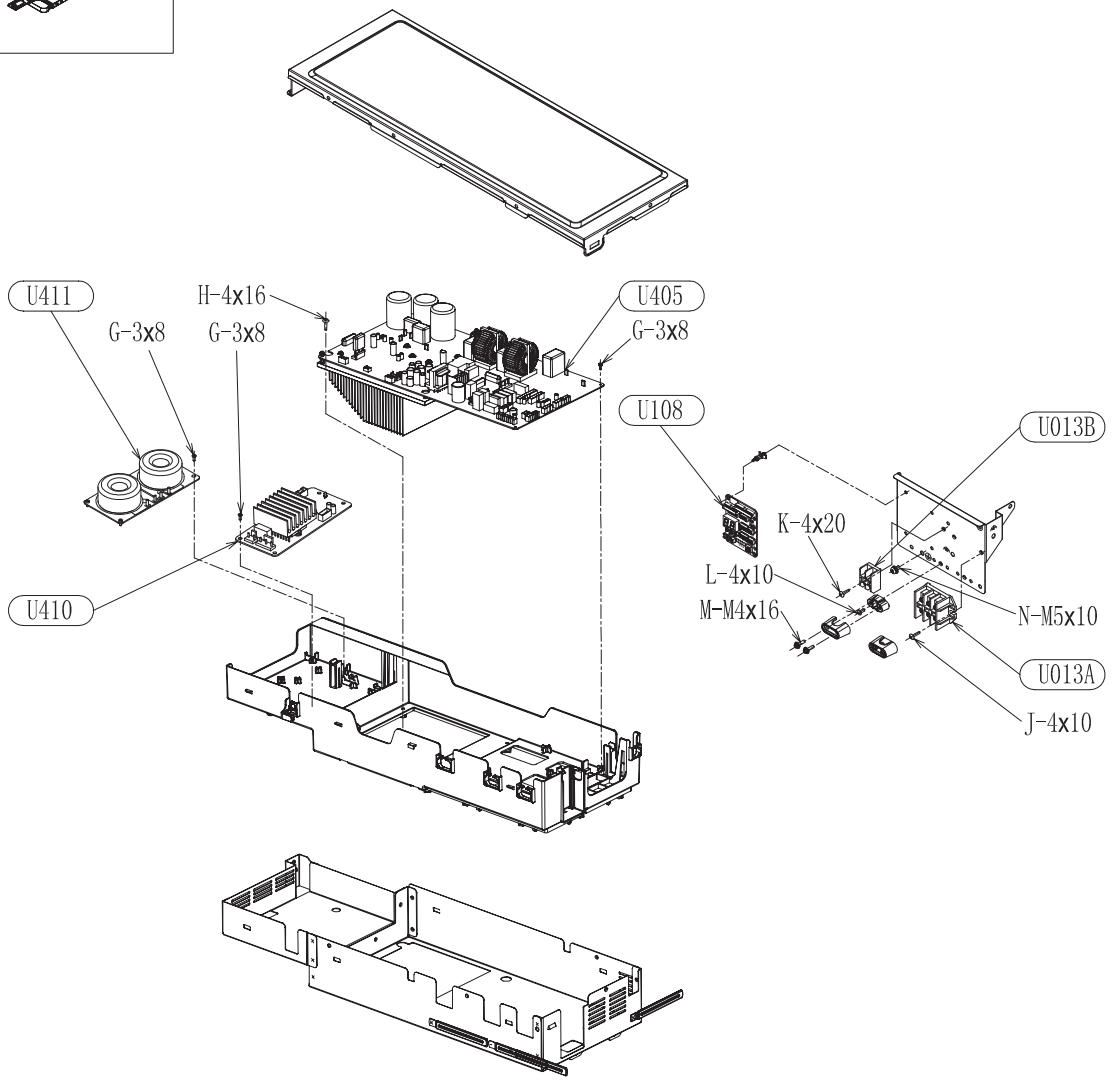
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Model:
RAS- 7.0HNSKQ
RAS-6.5HNSKQ

Location Map of Repair Parts in Electrical Box





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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