

HITACHI INVERTER-DRIVEN SPLIT SYSTEM HEAT PUMP AIR CONDITIONERS

- DC Inverter UTOPIA -

Technical Catalog

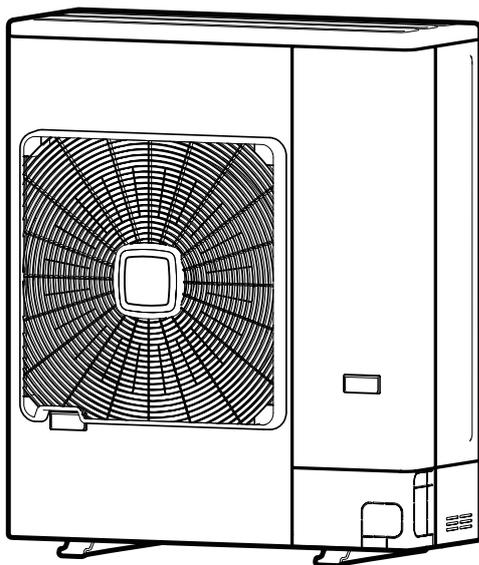
Models

< Outdoor Units >

RAS-4HVNC1

RAS-5HVNC1

RAS-6HVNC1



IMPORTANT NOTICE

- HITACHI pursues a policy of continuing improvement in design and performance of products. The right is therefore reserved to vary specifications without notice.
- HITACHI 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 a fire, oil, steam or powder may enter directly to the unit such as right above a kitchen, etc.
 - * Places where oil (including machinery oil) may be present in quantities.
 - * Places where a lot of sulfide gas drifts such as a hot spring.
 - * Places where flammable gas may be generated or flow.
 - * Places where strong salty wind blows, such as coast regions.
 - * Places with an atmosphere of acidity or alkalinity.
 - * Places where gas from festering trash, etc. may be generated.
- Do not install the unit in the place where silicon gas drifts. If the silicon gas attaches to the surface of the heat exchanger, the fin surface repels water. As a result, drain water splashes outside of the drain pan and splashed water runs inside of the electrical box. In the end, water leakage or electrical devices failure may occur.
- Pay attention to the following points when installing the unit in a hospital or other facilities where electromagnetic waves are generated from medical equipment.
 - * Do not install the unit in the place where electromagnetic waves are directly radiated to the electrical box, remote control cable or remote control switch.
 - * Install the unit at least 3 meters away from devices generating electromagnetic waves, such as a radio.
- Do not install the unit in the place where animals and plants catch the direct outlet air. It could adversely affect animals and plants.
- The installer and system specialist shall secure safety against the refrigerant leakage according to local regulations or standards. The following standards may be applicable, if the local regulations are not available; International Organization for Standardization, ISO5149 or European Standard, EN378 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 speaking people. If this is not the case, the customer should be provided with safety, caution and operating signs in the native language.
- If you have any questions, contact your distributor or dealer of HITACHI.
- This manual gives a common description and information for this heat pump air conditioner which you operate as well for other models.
- This heat pump air conditioner has been designed for the following temperatures. Operate the heat pump air conditioner within this range.

Temperature		(°C)	
		Maximum	Minimum
Cooling Operation	Indoor	32 DB/23 WB	21 DB/15 WB
	Outdoor	46 DB	-5 DB
Heating Operation	Indoor	27 DB	15 DB
	Outdoor	15 WB	-20 WB

DB: Dry Bulb, WB: Wet Bulb

This manual should be considered as a permanent part of the air conditioning equipment and should remain with the air conditioning equipment.

CHECKING PRODUCT RECEIVED

- Upon receiving this product, inspect it for any shipping damage. Claims for damage, either apparent or concealed, should be filed immediately with the shipping company.
- Check the model number, electrical characteristics (power supply, voltage and frequency) and accessories to determine if they are correct.

The standard utilization of the unit shall be explained in these instructions.

Therefore, the utilization of the unit other than those indicated in these instructions is not recommended.

Please contact your local agent, as the occasion arises.

HITACHI's liability shall not cover defects arising from the alteration performed by a customer without HITACHI's consent in a written form.

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



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



: 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.

SAFETY SUMMARY

⚠ DANGER

- Do not perform installation work, refrigerant piping work, drain pumping, drain piping and electrical wiring connecting work without referring to our installation manual. If the instructions are not followed, it may result in a water leakage, an electric shock, a fire and an injury.
- Use the specified non-flammable refrigerant (R410A) to the outdoor unit in the refrigerant cycle. Do not charge the unit with materials other than R410A, such as hydrocarbon refrigerants (propane, etc.), oxygen, flammable gases (acetylene, etc.) or poisonous gases when installing, maintaining and moving the unit. Contamination of these are extremely dangerous and may cause an explosion, a fire, and an injury.
- Do not pour water into the product. This product is equipped with electrical parts. If water is poured, therefore, it will cause a serious electric shock.
- Make sure to turn OFF the main power supply before opening the service cover of the outdoor unit. Otherwise, it may cause an electric shock.
- Do not touch or adjust safety devices inside the indoor unit and outdoor unit. If these devices are touched or readjusted, it may cause a serious accident.
- Prior to installation work, make sure to conduct refrigerant leakage test. The refrigerant (Fluorocarbon) for this unit is non-flammable, non-toxic and odorless. However, if it should leak and contact with fire, toxic gas will be generated. Also because the fluorocarbon is heavier than air, it settles close to the floor, which could cause suffocation.
- Refrigerant leakage may lead to insufficient air and cause difficulty with breathing. Turn OFF the main switch, extinguish all naked flames and contact your service contractor, if refrigerant leakage should occur.
- The installer and system specialist shall secure safety against refrigerant leakage according to the local regulations or standards.
- For installation in a small room, make sure to take strong measures to prevent the refrigerant from exceeding the maximum permissible concentration in case a refrigerant gas leakage should occur. Otherwise, leaked refrigerant gas will cause suffocation in the event of a leakage. Consult with your distributor for countermeasures (ventilation system, etc).
- Use an ELB (Earth Leakage Breaker).
If it is not used, an electric shock or a fire can be caused in the event of a fault.
- Do not install the outdoor unit where there is high level of oil mist, flammable gases, salty air or harmful gases such as sulfur.
- When installing the unit, make sure to connect the refrigerant piping before the compressor starts operating. When maintaining, relocating and disposing the unit, remove the refrigerant piping after the compressor stops. If the refrigerant piping are not connected and the compressor are operated with the stop valve opened, the refrigerant cycle will be subjected to extremely high pressure, which may cause an explosion, a fire and an injury.
- Do not modify protection devices such as a pressure switch. Modification to protection devices (short circuit, etc.) might cause a fire and an explosion.
- Be sure to use Nitrogen Gas for air tight test. If other gases such as oxygen gas, acetylene gas or fluorocarbon gas are accidentally used, it may cause an explosion or gas intoxication.
- When cleaning the existing refrigerant piping, comply with the following points.
 - a. Use non-flammable and non-toxic cleaning agent for cleaning the pipes. Flammable cleaning agent may cause an explosion or a fire.
 - b. Open the window for ventilation during installation. If not, it might cause suffocation.
 - c. Make sure that cleaning agent does not contact fire nor reach a high temperature, in order to prevent toxic gas from being generated.

SAFETY SUMMARY

⚠ WARNING

- Do not use any sprays such as an insecticide, lacquer or hair spray, or other flammable gases within approximately one (1) meter from the system.
- If the 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 will lead to an electric shock. Do not connect the ground wiring to a gas piping, water piping, lighting conductor or ground wiring for telephone.
- Connect a fuse of specified capacity.
- Before any brazing work, check to ensure that there is no flammable material around. Otherwise, it might lead to a fire.
- Select a sufficiently strong installation location. If not, the unit may fall down and it may lead to injuries.
- When handling the refrigerant, be sure to wear leather gloves to prevent cold injuries.
- Do not install the unit where oil, vapor, organic solvent and corrosive gas (ammonia, sulfur compound and acid, etc.) may be present in quantities. Operation under such conditions may lead to refrigerant leakage due to corrosion, an electric shock, performance degradation and a failure.
- Electrical wiring work must be performed by authorized installers. Incorrect installation by a non-authorized installer may cause an electric shock or a fire.
- Perform electrical work according to this Installation Manual and all the relevant regulations and standards. Failing to follow these instructions can cause capacity shortage and performance degradation, resulting in an electric shock and a fire.
- Use specified cables between the outdoor unit and the indoor units. Selecting incorrect cables may cause an electric shock or a fire.
- Ensure that the wiring terminals are tightened securely with the specified torques. Loose terminals may cause heat generation at the terminal connection part, a fire or an electric shock.
- Make sure to tie the wires together with cord clamps after connecting the wiring to the terminal block and pass the wires through the wiring hole. If not, the wires will be pinched, causing a fire.
- Make sure to turn OFF the power supply before handling the service connector.
- Fix the cables securely. External forces from the cables applied on the terminals could lead to heat generation and a fire.
- When controlling the switch on PCB, do not touch other electrical parts. Otherwise, it may cause an electric shock.
- Protect the wires, electrical parts, etc. from rats or other small animals. If not, rats may gnaw at unprotected parts, which may lead to a fire.
- Take care not to pinch electrical wirings when attaching the service cover. It might cause an electric shock or a fire.
- Turn OFF the main power supply of all the units before electrical wiring work or a periodical check of electrical parts and check that there is no residual voltage, to avoid an electric shock being caused by residual voltage.

SAFETY SUMMARY

! CAUTION

- Do not step on the product nor put any material on it.
- Do not put any foreign material on the unit or inside the unit.
- Provide a strong foundation so that;
 - a. the outdoor unit will not incline.
 - b. abnormal sound will not occur.
 - c. the outdoor unit will not fall down due to a strong wind or an earthquake.
- Tighten the flare nuts according to the specified torque. If an excessive force is applied, the flare nuts may crack due to aging degradation, causing refrigerant leakage.

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.
- For operation after a long-term shutdown, supply electrical power to the system to energize the crankcase heater for 12 hours before startup.
- Make sure that the outdoor unit is not covered with snow or ice, before operation.
- 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 with high electricity consumption*.

* In case that the power source wires for the device* and for the packaged air conditioner are located close to each other.

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

Regarding the cases mentioned above, surge voltage may be inducted in the power supply wiring for the packaged air conditioner due to a rapid change in power consumption of the device and an activation of switch.

Therefore, check the field regulations and standards before performing electrical work in order to protect the power supply for the packaged air conditioner.

NOTE

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

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1. Features

1.1 System Features

New DC Inverter UTOPIA Series for Single Power Source

HITACHI proudly introduces the New "DC Inverter UTOPIA" HVNC1 series, the highly-efficient and reliable air conditioning system, for the Oceanian markets. Recently, increased numbers of buildings and shops are requiring "Intelligent" facilities - communication networks, office automation, including a comfortable environment. In addition to that, energy saving operation is needed.

Particularly, comfortable space is required all the day through the year in shops and office buildings.

This split air conditioner, "DC Inverter UTOPIA" can meet these requirements. The proven combination of the scroll compressor and the inverter provides the best air conditioning for shops and small office buildings.

New Line-up of Outdoor Units

Type	Model Name
Outdoor Unit	RAS-4HVNC1
	RAS-5HVNC1
	RAS-6HVNC1

FEATURES

Standard Combination of Outdoor Unit and Indoor Unit

Outdoor Unit	Indoor Unit (Type)	Single Combination	Twin Combination	Triple Combination	Quad Combination
RAS-4HVNC1	In-the-Ceiling (RPI-*FSN2SQ)	RPI-4.0FSN2SQ	-	-	-
	4-Way Cassette (RCI-*FSN3)	RCI-4.0FSN3	RCI-2.0FSN3 x 2	-	RCI-1.0FSN3 x 4
	4-Way Cassette (Compact) (RCIM-*FSN3)	-	RCIM-2.0FSN3 x 2	-	RCIM-1.0FSN3 x 4
	In-the-Ceiling (RPI-*FSN2)	-	RPI-2.0FSN2 x 2	-	RPI-1.0FSN2 x 4
	2-Way Cassette (RCD-*FSN2)	-	RCD-2.0FSN2 x 2	-	RCD-1.0FSN2 x 4
	Ceiling (RPC-*FSN3)	-	RPC-2.0FSN3 x 2	-	-
	Wall (RPK-*FSNSM3)	-	RPK-2.0FSNSM3 x 2	-	RPK-1.0FSNSM3 x 4
RAS-5HVNC1	In-the-Ceiling (RPI-*FSN2SQ)	RPI-5.0FSN2SQ	-	-	-
	4-Way Cassette (RCI-*FSN3)	RCI-5.0FSN3	RCI-2.5FSN3 x 2	RCI-1.5FSN3 x 3	-
	4-Way Cassette (Compact) (RCIM-*FSN3)	-	-	RCIM-1.5FSN3 x 3	-
	In-the-Ceiling (RPI-*FSN2)	-	RPI-2.5FSN2 x 2	RPI-1.5FSN2 x 3	-
	2-Way Cassette (RCD-*FSN2)	-	RCD-2.5FSN2 x 2	RCD-1.5FSN2 x 3	-
	Ceiling (RPC-*FSN3)	-	RPC-2.5FSN3 x 2	RPC-1.5FSN3 x 3	-
	Wall (RPK-*FSNSM3)	-	RPK-2.5FSNSM3 x 2	RPK-1.5FSNSM3 x 3	-
RAS-6HVNC1	In-the-Ceiling (RPI-*FSN2SQ)	RPI-6.0FSN2SQ	-	-	-
	4-Way Cassette (RCI-*FSN3)	RCI-6.0FSN3	RCI-3.0FSN3 x 2	RCI-2.0FSN3 x 3	RCI-1.5FSN3 x 4
	4-Way Cassette (Compact) (RCIM-*FSN3)	-	-	RCIM-2.0FSN3 x 3	RCIM-1.5FSN3 x 4
	In-the-Ceiling (RPI-*FSN2)	-	RPI-3.0FSN2 x 2	RPI-2.0FSN2 x 3	RPI-1.5FSN2 x 4
	2-Way Cassette (RCD-*FSN2)	-	RCD-3.0FSN2 x 2	RCD-2.0FSN2 x 3	RCD-1.5FSN2 x 4
	Ceiling (RPC-*FSN3)	-	RPC-3.0FSN3 x 2	RPC-2.0FSN3 x 3	RPC-1.5FSN3 x 4
	Wall (RPK-*FSNSM3)	-	RPK-3.0FSNSM3 x 2	RPK-2.0FSNSM3 x 3	RPK-1.5FSNSM3 x 4

- The single connection is subject to MEPS. Other connections are NOT acceptable.
- Refer to the Technical Catalog as to the information of indoor units.

Indoor Unit	Technical Catalog No.
RPI-*FSN2SQ	TC-12001
RCI-*FSN3	TCI-12001
RCIM-*FSN3	TCI-13002
RPI-*FSN2 RCD-*FSN2	TCI-08001
RPC-*FSN3	TCI-13001
RPK-*FSNSM3	TCI-12002

Enhanced Combination of Outdoor Unit and Indoor Unit

- (1) The combination of outdoor units is available in the following conditions. For simultaneous operation of all multiple indoor units, it is recommended to connect less indoor units than is recommended, in order to prevent a cold draft during heating operation.

Outdoor Unit Capacity		4HP	5HP	6HP
Recommended Number of Connectable Indoor Unit		≤ 2 Units		
Maximum Number of Connectable Indoor Unit		4 Units		
Minimum Indoor Unit Capacity		0.8HP		
Ratio of Total Indoor Unit Capacity to Outdoor Unit Capacity (The case of exceeding the recommended number of connectable units)		90-115% (90-100%)		
Minimum Indoor Unit Capacity	In-the-Ceiling Type (RPI-*FSN2SQ)	Only 4.0HP	Only 5.0HP	Only 6.0HP
	4-Way Cassette Type (RCI-*FSN3)	1.0HP		
	4-Way Cassette (Compact) Type (RCIM-*FSN3)	0.8HP		
	In-the-Ceiling Type (RPI-*FSN2)	0.8HP		
	2-Way Cassette Type (RCD-*FSN2)	1.0HP		
	Ceiling Type (RPC-*FSN3)	1.5HP		
	Wall Type (RPK-*FSNSM3)	1.0HP		

- (2) (Total Indoor Unit Capacity / Total Outdoor Unit Capacity) should be within the value shown in the “Ratio of Total Indoor Unit Capacity to Outdoor Unit Capacity” in the table above. If the ratio exceeds 100%, adjust it according to the outdoor unit capacity.
- (3) In the following cases, it is recommended to connect less indoor units than is recommended, and it is also recommended that “Ratio of Total Indoor Unit Capacity to Outdoor Unit Capacity” be less than 100%.
- 4-Way Cassette Type or Ceiling Type indoor unit is connected to the outdoor unit
 - The unit is installed in cold areas (areas where outside temperature drops to -5°C)
 - The unit is installed in cold areas under high heating load conditions.
- (4) For operation of multiple indoor units, the minimum indoor unit capacity against the maximum indoor unit capacity in the same refrigerant cycle should be as follows.

Max. Indoor Unit Capacity	0.8 - 1.5HP	2.0HP	2.5 - 4.0HP	5.0 - 6.0HP
Min. Indoor Unit Capacity	≥ 0.8HP	≥ 1.0HP	≥ 1.5HP	≥ 2.0HP

- (5) The air flow volume for indoor unit of 0.8 and 1.0HP is higher than that for indoor units of 1.5HP or more. Do not install the unit where users are subject to cold draft during heating operation.

1.2 Appearance

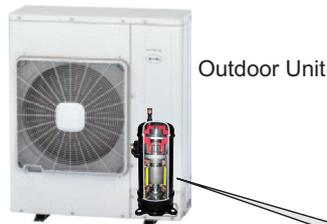
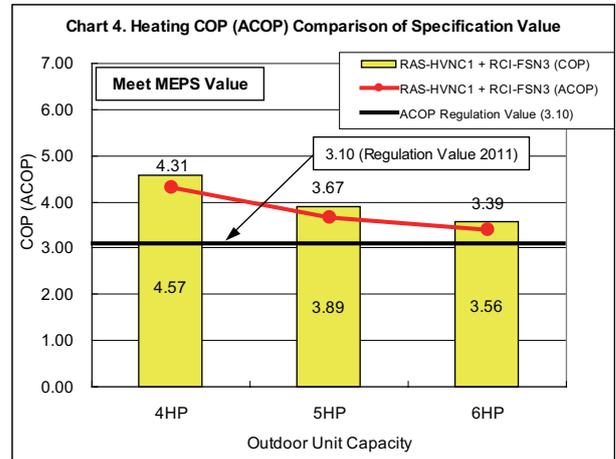
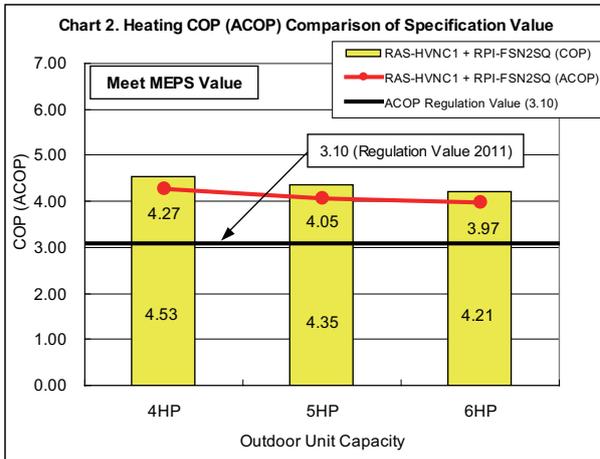
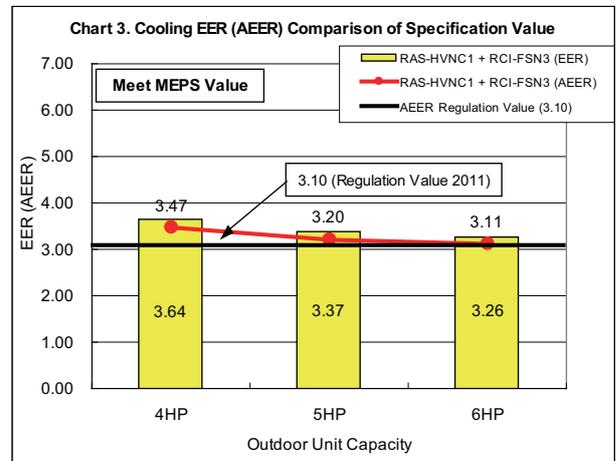
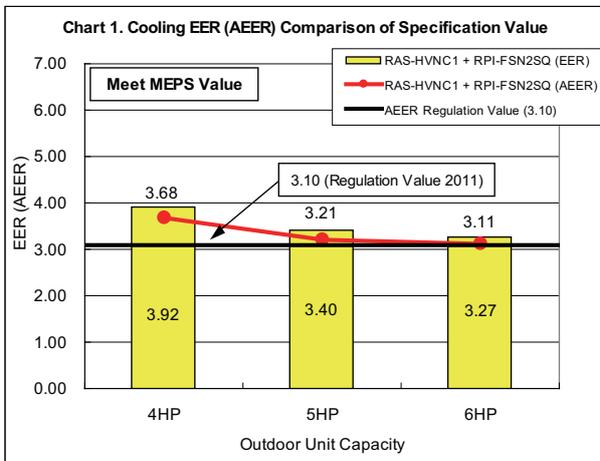


RAS-4 - 6HVNC1

1.3 Features on Outdoor Units

■ Energy-Saving

- a) High energy-saving is realized by the improving of intermediate capacity for the new compressors.
- b) The slitless fin type of the heat exchanger is adopted to improve the heating performance.



Heat Exchanger
The heating performance is increased by the slitless fin.

DC Inverter Compressor NEW
The new shaft mechanism and the improved DC inverter motor are adopted to increase the low speed operation performance.

■ Individual Operation

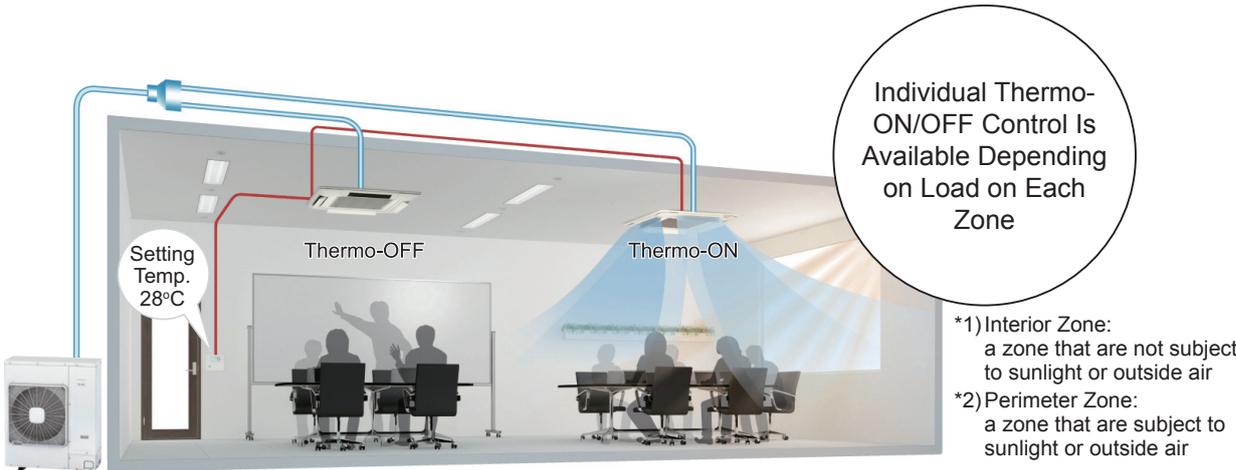
Individual operation makes it possible to keep one room / multiple rooms comfortably and efficiently air-conditioned.

(1) Keeping One Room / Multiple Rooms Comfortably and Efficiently Air-conditioned

< One Room >

Individual Thermo-ON/OFF Control Achieves Uniform Temperature

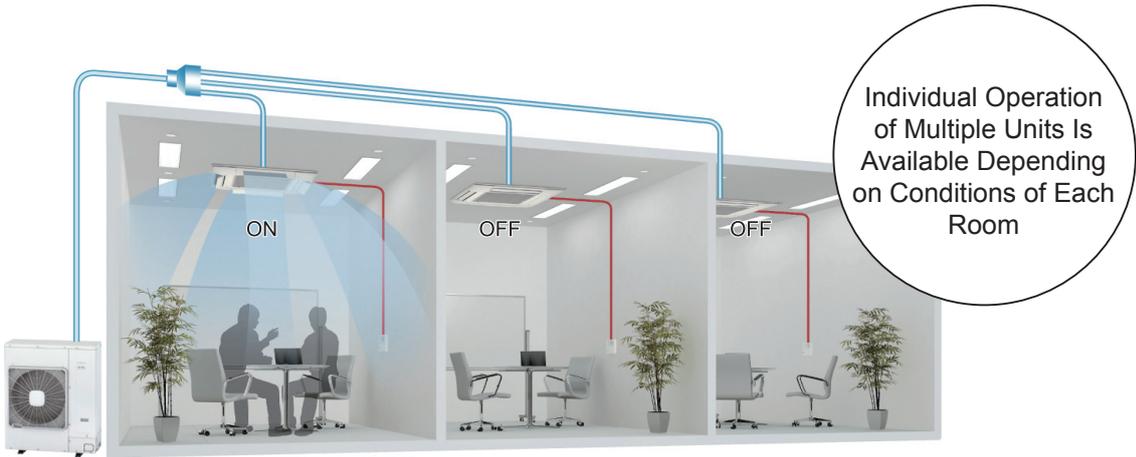
For multiple indoor units installed in one room, Thermo-ON/OFF can individually be controlled with one remote control switch depending on the load on each zone in the room (Interior Zone *1) / Perimeter Zone *2)).



< Multiple Room >

Individual Operation / Temperature Setting for Each Room Save Energy

For multiple indoor units installed in different rooms, operation and temperature setting can individually be controlled depending on conditions of each room, by installing one remote control switch to each room. This will save the units of a lot of energy.

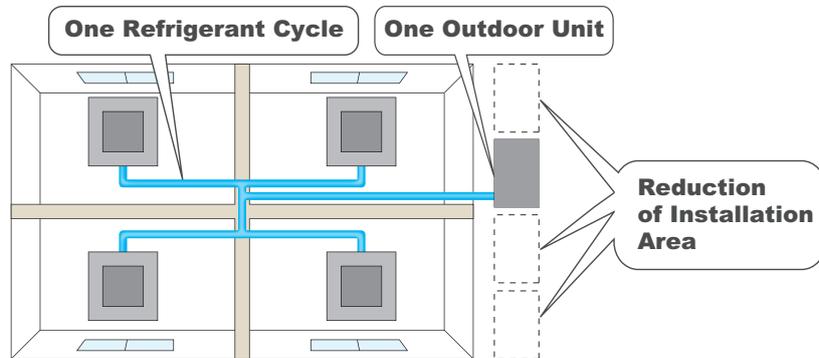


FEATURES

(2) Easier Installation Work

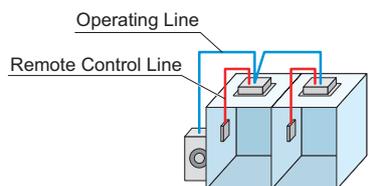
Multiple indoor units can be connected to one outdoor unit, which is why fewer outdoor units are required. This helps to save more installation space and so increases flexibility in installation location. Piping and wiring work for only one refrigerant cycle is required, which makes easier installation possible and makes the work period shortened.

Installation of multiple indoor units to one refrigerant cycle makes installation easier.

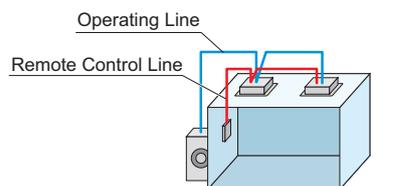


< Wiring Example >

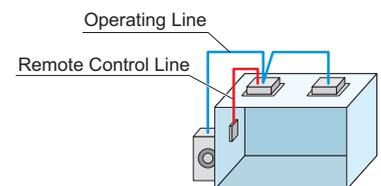
Basic Combinations
(In the case of Twin Combination)



Individual Control
Running ON/OFF Individually
Thermo-ON/OFF Individually

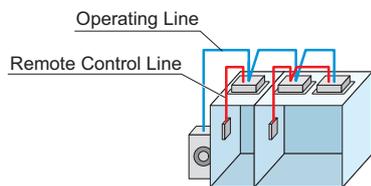


Individual Control
Running ON/OFF Simultaneously
Thermo-ON/OFF Individually

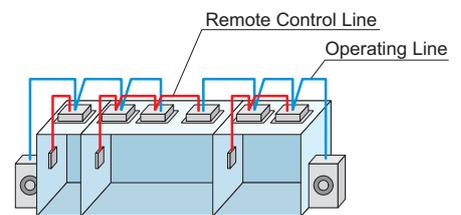
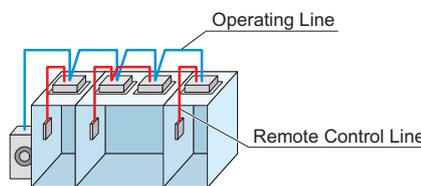


Simultaneous Control
Running ON/OFF Simultaneously
Thermo-ON/OFF Simultaneously

Flexible Combinations for Individual Operation
(Combination example by using Individual Operation Function)



Flexible combinations are realized
by using the remote control switches.



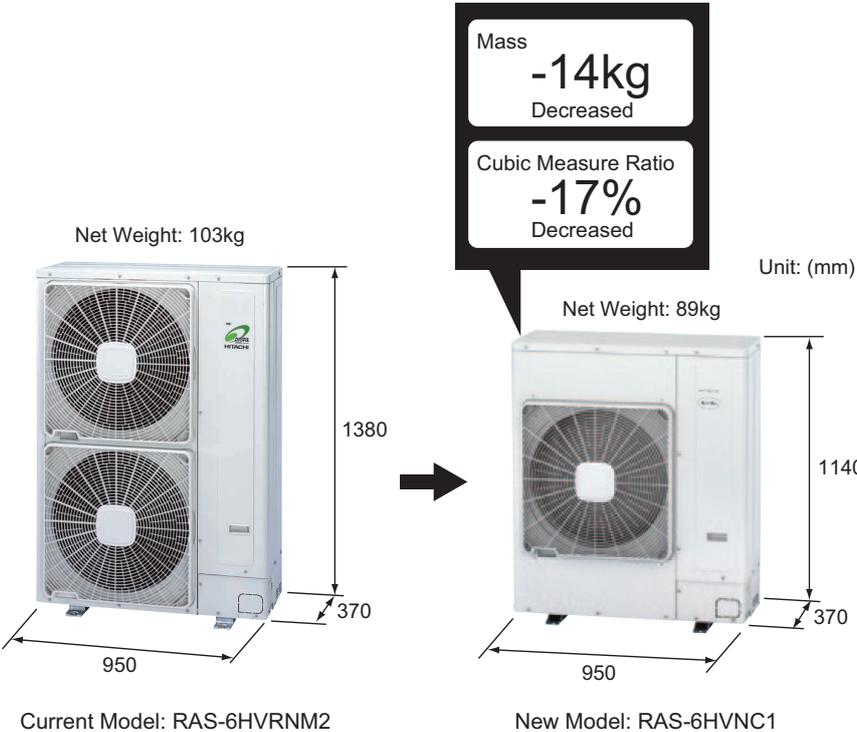
The individual control in the multiple
refrigerant cycle systems (H-LINK II) is available.

■ Compact Size

The new DC Inverter HVNC1 series outdoor units are lighter and more compact. Their lightness and smaller volume allow them to be transported more easily. They also take up less room and can be installed more quickly.

< Lighter and Smaller >

Since it is lighter and smaller less installation space is required, making it easier to access the machine for installation and subsequent maintenance.

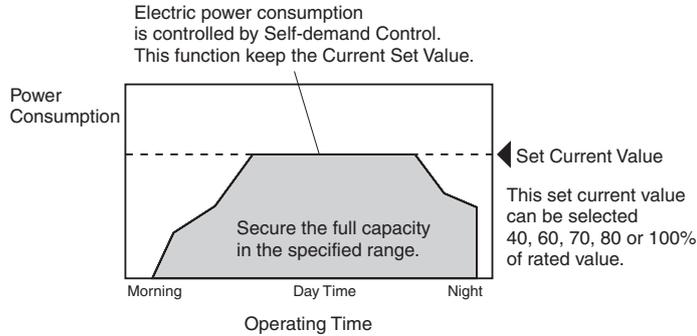


FEATURES

■ Demand Control

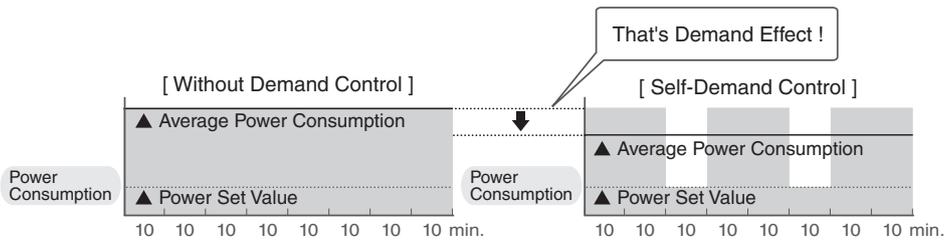
- (1) Self-Demand Control
Standard equipment of power-saving technology.

Other facility/multiple air conditioners are not limited to use during on-peak energy hours thanks to demand control function (2 patterns).



- (2) Wave Mode

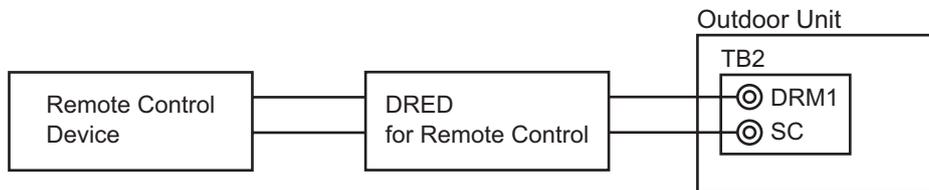
Equipped wave mode function to minimize temperature change and electricity.



- (3) Demand Function for Demand Stoppage and Forced Stoppage is available.

The stoppage signal input terminals "DRM1" and "SC" of TB2 are utilized for compressor stoppage by short-circuited them.

This function is supported Australian Standard "Demand response capabilities and supporting technologies for electrical products" AS 4755.3.1: 2008.



■ H-LINK II System

The total number of the indoor units to be controlled is increased from 128 to 160, and the total number of the refrigerant cycles to be controlled is increased from 16 to 64 by combination with the equipment supporting the transmission system H-LINK II.

● Comparison with H-LINK System

Item	H-LINK	H-LINK II
Number of Max. Ref. Groups / Systems	16	64
Address Setting Range of Indoor Units / Ref. Groups	0 to 15	0 to 63
Number of Max. Indoor Units / Systems	128	160
Total Device Q'ty in Same H-LINK	145	200
Max. Wiring Length	Total 1,000m (5,000m*)	
Recommended Cable	Twist Pair Cable with Shield, Over 0.75mm ² (Equivalent to KPEV-S)	

*: In case 4 (four) H-LINK relays (PSC-5HR, Optional) are used.

● H-LINK II System

The provided H-LINK II wiring system requires only two transmission wires to connect each indoor unit and outdoor unit of up to 64 refrigerant cycles, and to connect wires for all indoor units and outdoor units.

<Specifications>

- * Transmission Wire: 2-Wire
- * Polarity of Transmission Wire: Non-Polar Wire
- * Maximum Outdoor Units to be Connected: 64 Units per System
- * Maximum Indoor Units to be Connected: 160 Units per H-LINK II System
- * Maximum Wiring Length: Total 1,000m (including CS-NET)
- * Recommended Cable: Twist-Pair Cable with Shield, over 0.75mm² (Equivalent to KPEV-S)
- * Voltage: DC5V

NOTE:

H-LINK II system requires the setting of dip switch for outdoor unit.
If the dip switches are not set or the setting is incorrect, the alarm will occur due to transmission failure.

GENERAL DATA

2. General Data

Model		RAS-4HVNC1	RAS-5HVNC1	RAS-6HVNC1
Power Supply		AC 1 ϕ , 220-240V/50Hz, 220V/60Hz		
Nominal Cooling Capacity	kW	10.0	12.5	13.0
	kcal/h	8,600	10,750	11,200
	Btu/h	34,100	42,700	44,400
Nominal Heating Capacity	kW	11.2	14.0	16.0
	kcal/h	9,600	12,000	13,800
	Btu/h	38,200	47,800	54,600
Cabinet		Synthetic Resin Paint Baked on Galvanized Steel Plate		
Sound Pressure Level				
Cool (Night Shift)/Heat	dB (A)	52(50)/54	52(50)/54	55(53)/57
Outer Dimensions				
Height	mm	1,140	1,140	1,140
	(in.)	(44-7/8)	(44-7/8)	(44-7/8)
Width	mm	950	950	950
	(in.)	(37-3/8)	(37-3/8)	(37-3/8)
Depth	mm	370	370	370
	(in.)	(14-9/16)	(14-9/16)	(14-9/16)
Net Weight	kg	79	89	89
	(lbs.)	(174)	(196)	(196)
Refrigerant		R410A		
Flow Control		Micro-Computer Control Expansion Valve		
Compressor		Hermetic (Scroll)		
Model		EU260XC1	HB36PHD-A1S2	HB36PHD-A1S2
Quantity		1	1	1
Motor Output (Pole)	kW	1.90 (4)	3.00 (6)	3.00 (6)
Heat Exchanger		Multi-Pass Cross-Finned Tube		
Condenser Fan		Propeller Fan		
Quantity		1	1	1
Air Flow Rate	m ³ /min.	62	68	80
	(l/s)	(1,033)	(1,133)	(1,333)
Motor Output (Pole)	kW	0.20 (10)	0.20 (10)	0.20 (10)
Refrigerant Piping		Flare-Nut Connection (with Flare Nuts)		
Liquid Line	mm	ϕ 9.52	ϕ 9.52	ϕ 9.52
	(in.)	(3/8)	(3/8)	(3/8)
Gas Line	mm	ϕ 15.88	ϕ 15.88	ϕ 15.88
	(in.)	(5/8)	(5/8)	(5/8)
Refrigerant Charge	kg	3.2	3.2	3.2
Approximate Packing Measurement	m ³	0.61	0.61	0.61

NOTES:

- The above cooling and heating capacities show the maximum capacities when the outdoor and indoor temperature are below condition.

Cooling Operation Conditions

Indoor Air Inlet Temperature: 27°C DB (80°F DB)
19.0°C WB (66.2°F WB)
Outdoor Air Inlet Temperature: 35°C DB (95°F DB)

Heating Operation Conditions

Indoor Air Inlet Temperature: 20°C DB (68°F DB)
Outdoor Air Inlet Temperature: 7°C DB (45°F DB)
6°C WB (43°F WB)

Piping Length: 7.5 Meters Piping Lift: 0 Meter

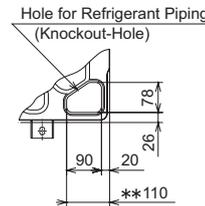
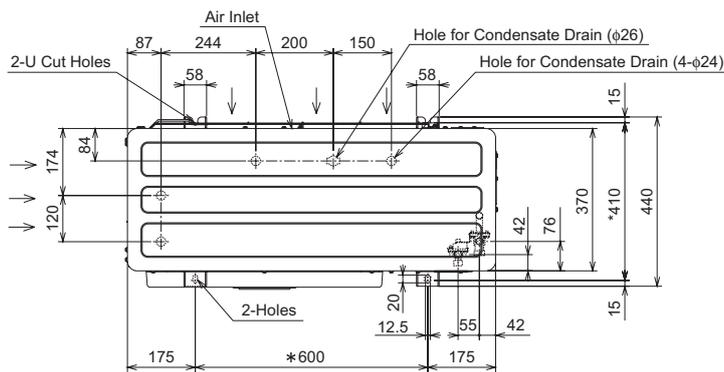
- The sound pressure is based on the following conditions.

1 Meter from the unit service cover surface, and 1.5 Meters from floor level.

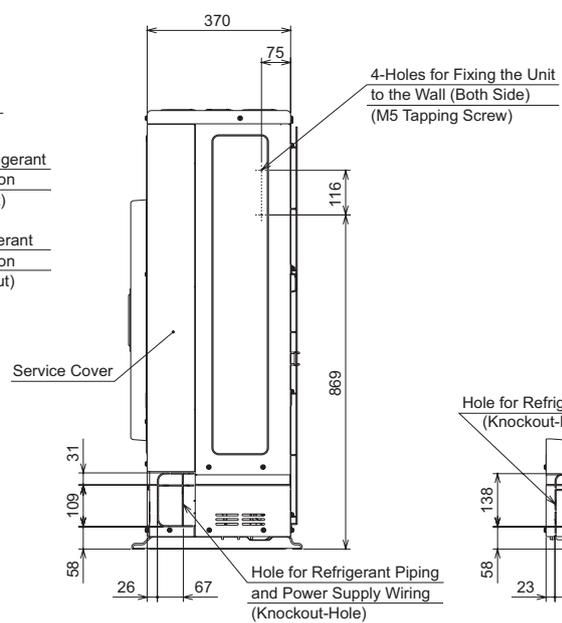
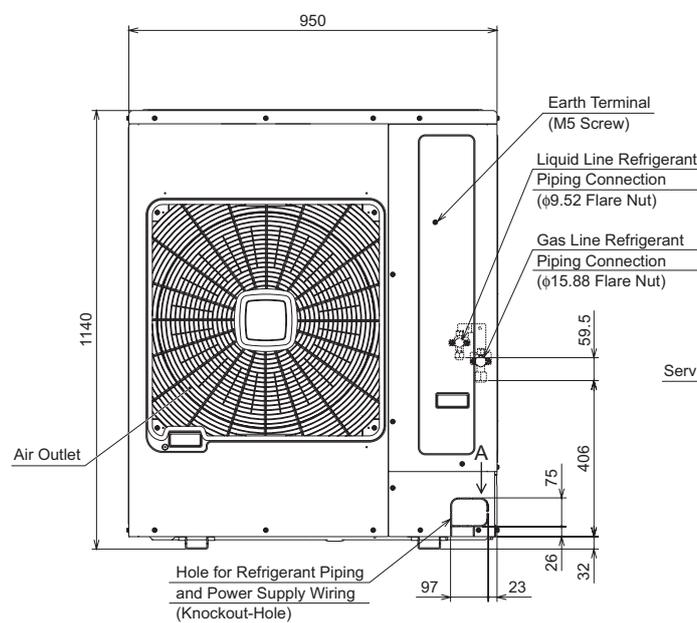
The above data was measured in an anechoic chamber so that reflected sound should be taken into consideration in the field.

3. Dimensional Data

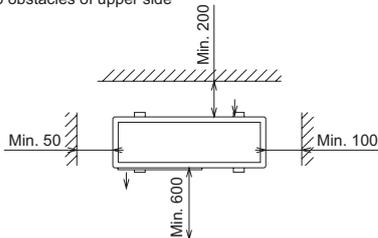
Unit: mm



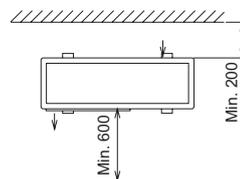
Viewed from A



- In the case of obstacles on both sides, and no obstacles of upper side



- In the case of no obstacles on both sides, and upper side



Service Space

Drain Water

Drain water is caused during a defrosting operation.

1. Choose a place where well drainage is available. Provide a groove for drain.
2. Do not provide an upward slope from the unit to avoid reverse flow of the drain. Provide a second drain pan under the outdoor unit, to collect drain water securely.

NOTES:

1. Refrigerant is factory charged for actual piping length and no additional charge less than 30 meters is required in the field. Additional charge more than 30 meters is required in the field.
2. There are stop valves in the cabinet.
3. In the case that dimension of 110 marked with ** is provides, it is possible to perform piping work from the bottom without interference such as foundation, etc.
4. The dimension marked with * indicates the mounting pitch dimension for anchor bolts.

4. Selection Data

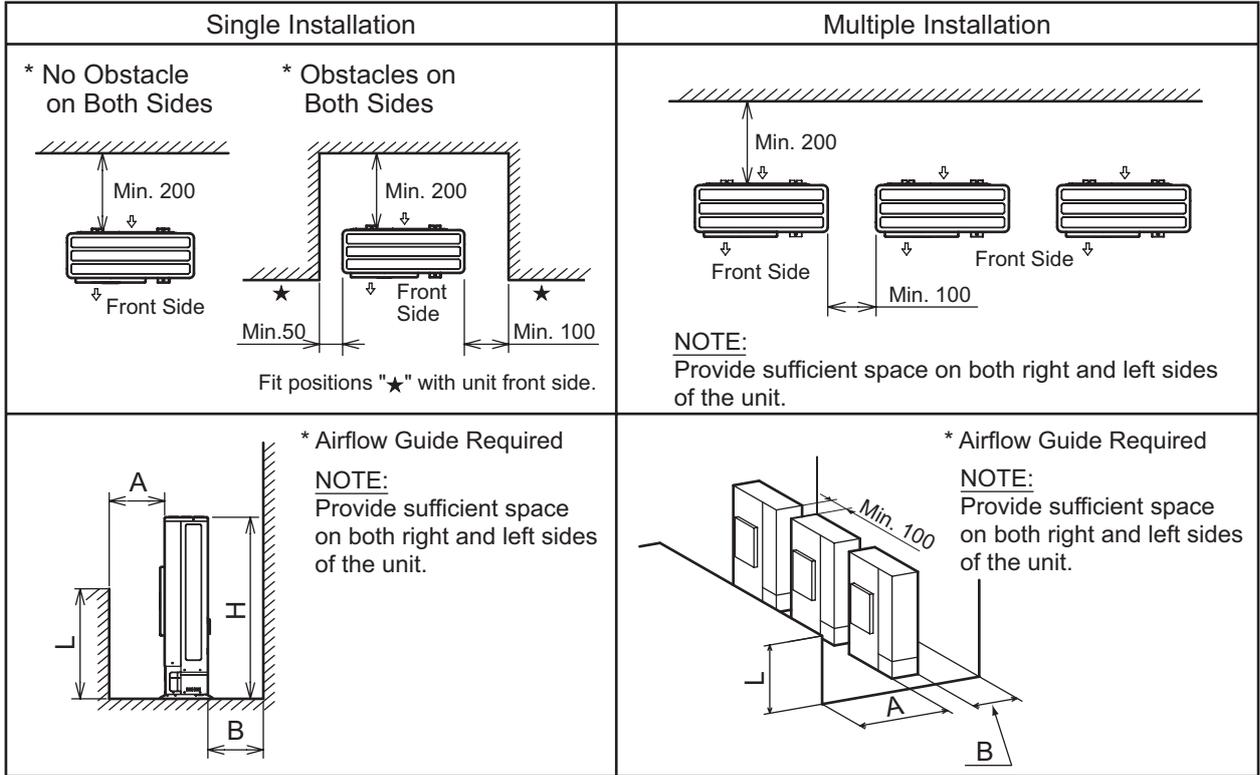
4.1 Service Space

Install the outdoor unit with a sufficient space around the outdoor unit for operation and maintenance as shown below.

(1) Obstacles on Inlet Side

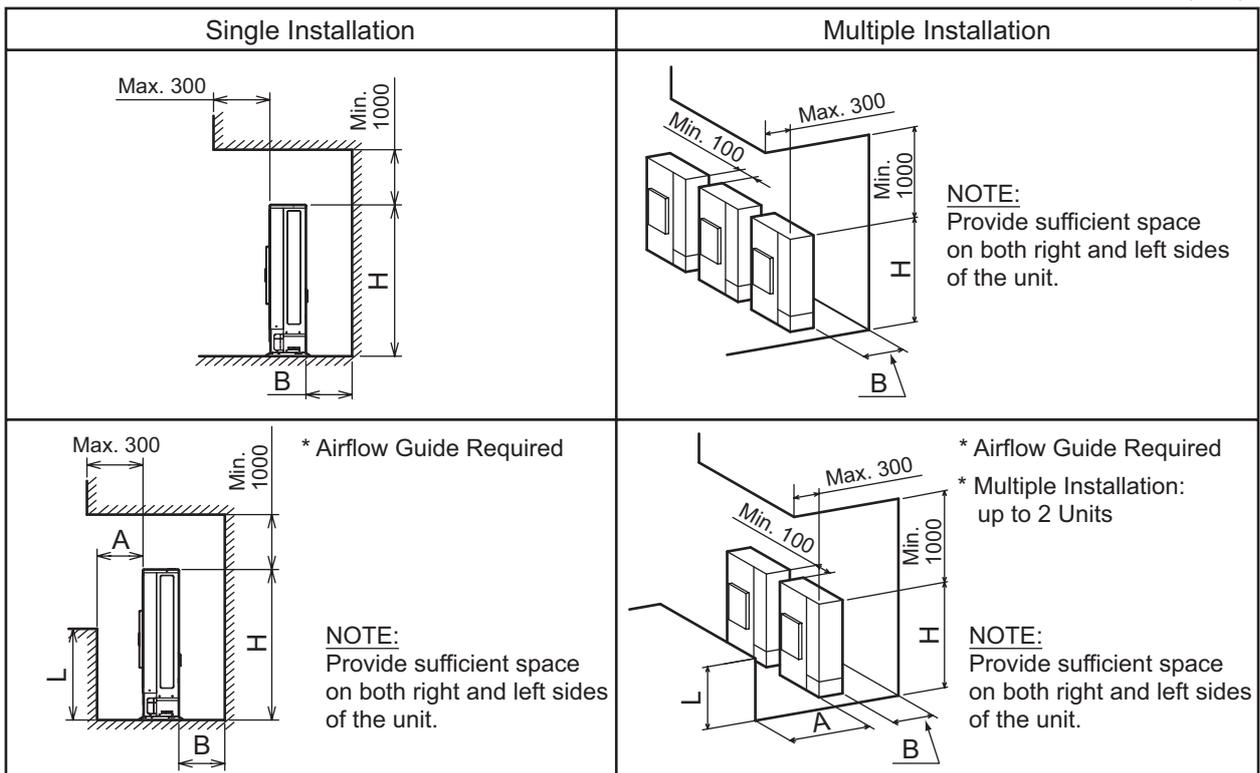
(a) No Obstacle Above

(mm)



(b) Obstacle Above

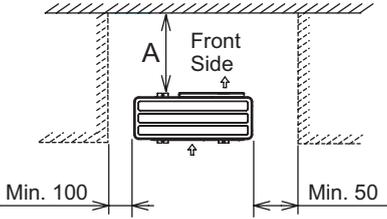
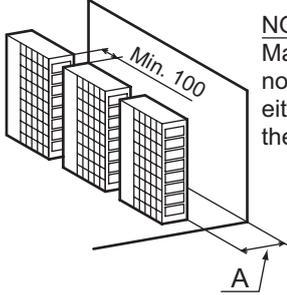
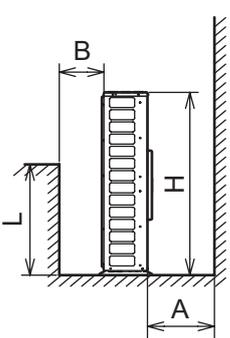
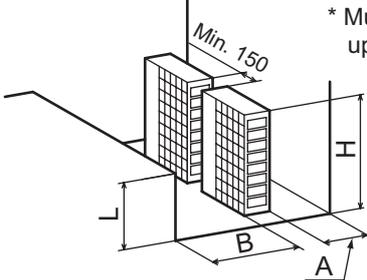
(mm)



(2) Obstacles on Discharge Side

(a) No Obstacle Above

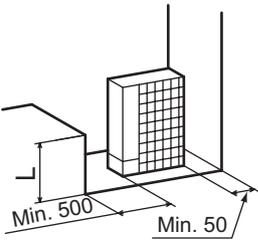
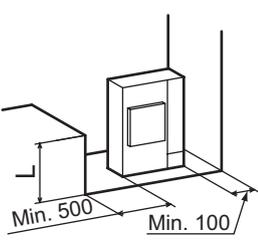
(mm)

Single Installation	Multiple Installation
 <p>NOTE: Make sure that there is no obstacle (wall, etc.) on either right or left side of the unit.</p>	 <p>NOTE: Make sure that there is no obstacle (wall, etc.) on either right or left side of the unit.</p>
 <p>* Airflow Guide Required</p> <p>NOTE: Provide sufficient space on both right and left sides of the unit.</p>	 <p>* Airflow Guide Required * Multiple Installation: up to 2 Units</p> <p>NOTE: Provide sufficient space on both right and left sides of the unit.</p>

(3) Obstacles on Right and Left Side

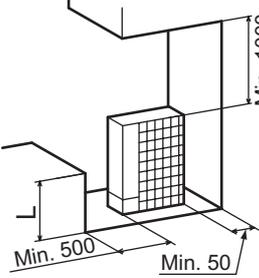
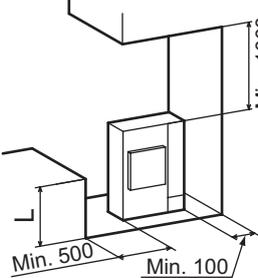
(a) No Obstacle Above

(mm)

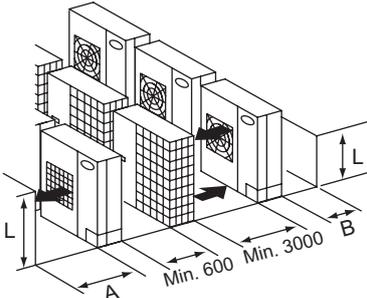
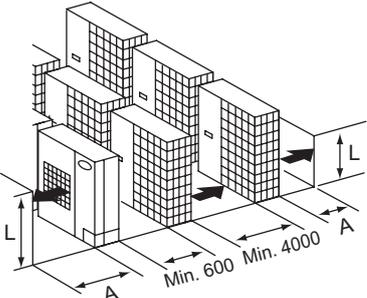
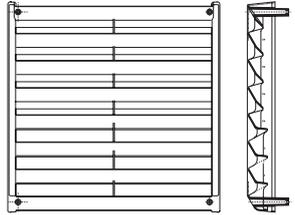
Single Installation	
	

(b) Obstacle Above

(mm)

Single Installation	
	

(4) Multi-Row and Multiple Installations

 <p>NOTE: Mount the airflow guide and provide sufficient space on both right and left sides.</p>	 <p>NOTE: Mount the airflow guide and provide sufficient space on both right and left sides.</p>	<p>NOTE: When using Airflow Guide (AG-335A, Optional), check that the discharged air is not short-circuited to the air inlet side.</p> 
--	---	---

NOTE

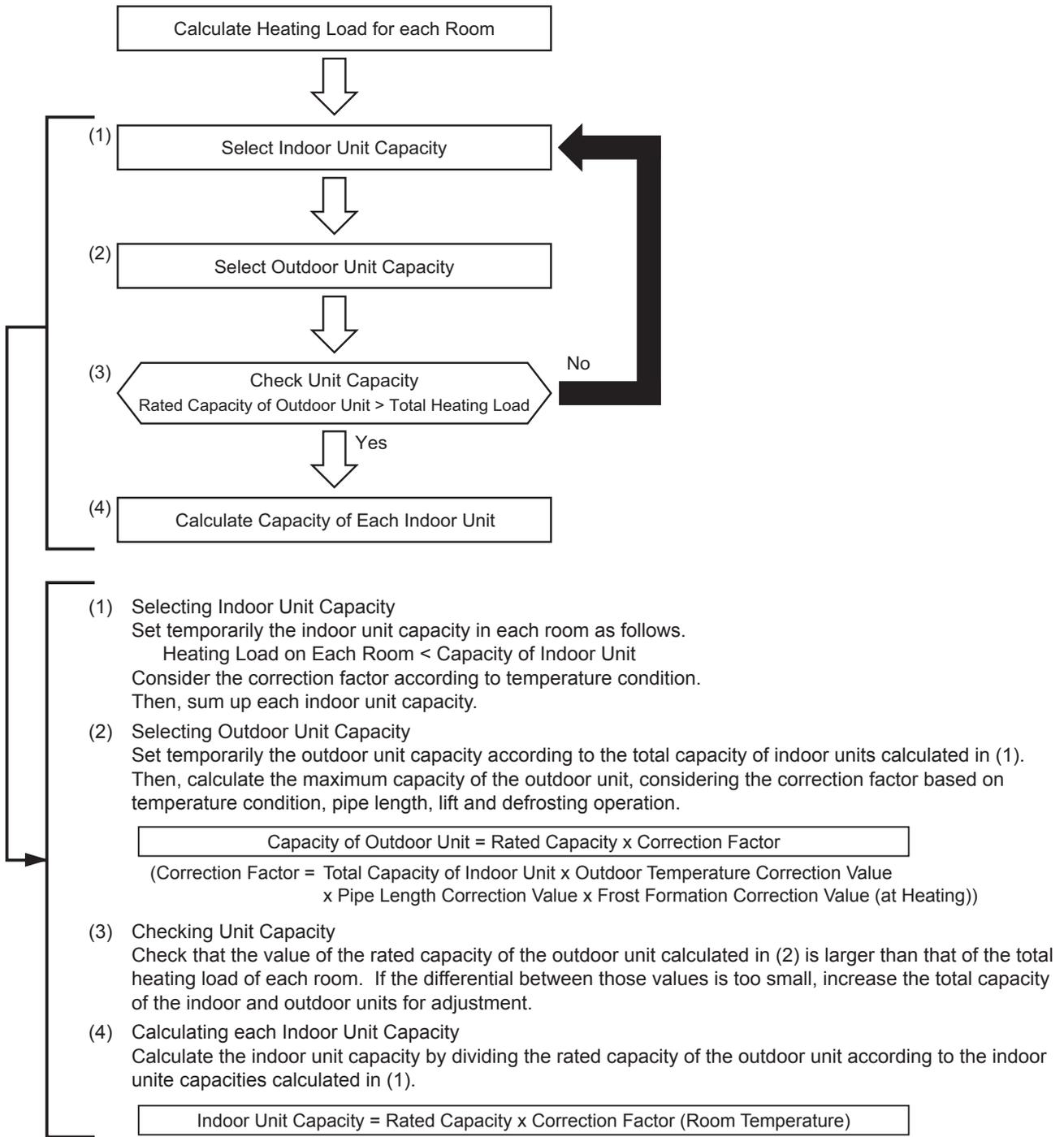
< Dimension of Service Space >

A		B	
$0 < L \leq 1/2H$	$1/2H < L \leq H$	$0 < L \leq 1/2H$	$1/2H < L \leq H$
Min. 600	Min. 1400	Min. 300	Min. 350

- If L is longer than H, mount the unit on a base so that H is longer than L. In such case ensure that the open space between feet of the base is closed to prevent short circuit of airflow.
 - An airflow guide (Optional) is required when there are obstacles on both front and rear side of the outdoor unit.
 - Up to 3 outdoor units can be installed for multi-row and multiple outdoor unit installation on a roof top, etc. When more than 3 outdoor units are installed, an airflow guide (Optional) is required in order to prevent short circuit of discharged air.
 - Make sure to leave at least 250mm of space to the pipe cover side (on right side as viewed from the front) of the unit.
 - When using optional parts, refer to "Installation & Maintenance Manual" of each product in order to provide service space correctly.
-

4.2 Selection Guide

The various indoor units can be combined with the HITACHI DC Inverter UTOPIA Series. Selection of Unit Model Capacity Procedure is shown below.



< Indoor Unit Selection for Installation of Multiple Indoor Units >

- The indoor unit capacity in heating mode is roughly calculated as follows.

$$\text{Indoor Unit Capacity (Heat)} = * \text{Temperature Difference} \times \text{Air Flow Volume}$$

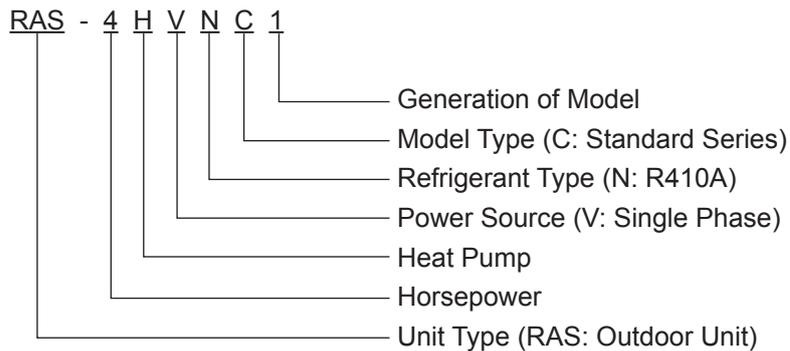
$$*(\text{Indoor Unit Outlet Air Temperature} - \text{Indoor Unit Inlet Air Temperature})$$

In simultaneous operation of all multiple indoor units, the total air flow volume increases and so the temperature difference may be smaller. Installing the units where the outlet air directly blows against users, therefore, could cause a cold draft during heating operation. In order to prevent a cold draft during heating operation, decide the outlet air temperature with care when designing facilities.

- In simultaneous operation of all multiple indoor units, it is recommended to connect less indoor units than is recommended, in order to prevent a cold draft during heating operation.

SELECTION DATA

(1) Meaning of Model Name for Outdoor Unit



(2) Nominal Capacity of Outdoor Unit

Model		RAS-4HVNC1	RAS-5HVNC1	RAS-6HVNC1
Horsepower (HP)		4	5	6
Cooling Capacity	kW	10.0	12.5	13.0
Heating Capacity	kW	11.2	14.0	16.0

Nominal Capacity of Outdoor Unit is under the condition that the total indoor unit horsepower is same as outdoor unit horsepower.

(3) Given Condition (Example)

Total Load for Each Room

Item		Room (1)	Room (2)	Room (3)	(1) + (2) + (3)
Estimated Cooling Load	kW	2.92	3.86	4.88	11.66
Estimated Heating Load	kW	3.29	4.34	5.49	13.12

Temperature Condition

Cooling	Heating
Outdoor Coil Air Inlet Dry Bulb: 30°C	Outdoor Coil Air Inlet Dry Bulb: 1°C
Indoor Coil Air Inlet Dry Bulb: 27°C Wet Bulb: 19°C	Indoor Coil Air Inlet Wet Bulb: 0°C Dry Bulb: 20°C

Equivalent Piping Length between Indoor Units and Outdoor Unit: 50m
Piping Lift: 20m

(4) Selecting Matching Indoor Units and Nominal Capacity

Select 4-Way Cassette Type Indoor Units (Example)

Item		Room (1)	Room (2)	Room (3)	(1) + (2) + (3)
Selected Model		RCI-1.5FSN3	RCI-2.0FSN3	RCI-2.5FSN3	-
Nominal Cooling Capacity	kW	4.0	5.0	7.1	16.1
Nominal Heating Capacity	kW	4.8	5.6	8.0	18.4

(5) Selecting Matching Outdoor Unit

Select Outdoor Unit (Example)

Item		Outdoor Unit
Selected Model		RAS-6HVNC1
Nominal Cooling Capacity	kW	13.0
Nominal Heating Capacity	kW	16.0

(6) Actual Capacity

In the case of the example, the total indoor horsepower is 6HP and outdoor horsepower is 6HP. Therefore, the outdoor unit capacity at the nominal temperature which is selected from the item 4.3 "Capacity Characteristic Curve" is 16.0kW at the cooling operation, 20.0kW at the heating operation under nominal conditions.

a) Actual Capacity of Outdoor Unit

Maximum Actual Capacity of Outdoor Unit

= Outdoor Unit Capacity at Nominal Temperature selected from Total Indoor Unit Capacity

× Correction Factor According to Piping Length and Lift *1)

× Correction Factor According to Temperature Condition *2)

× Correction Factor According to Defrosting Operation *3)

*1): Refer to the diagram in item 4.6 "Correction Factor According to Piping Length".

Correction Factor of Cooling Capacity = 0.85

Correction Factor of Heating Capacity = 0.96

*2): Refer to the table in item 4.4 and 4.5 "Correction Factor According to Temperature Condition".

Correction Factor of Cooling Capacity = 1.04

Correction Factor of Heating Capacity = 0.86

*3): Refer to the table in item 4.7 "Correction Factor According to Defrosting Operation"

Correction Factor = 0.85

Actual capacity of outdoor unit is

Cooling: $16.0\text{kW} \times 0.85 \times 1.04 = 14.14$

Heating: $20.0\text{kW} \times 0.96 \times 0.86 \times 0.85 = 14.04$

b) Actual Capacity of Each Indoor Unit

Actual Capacity of Each Indoor Unit

= Actual Capacity of Outdoor Unit

× (Each Indoor Unit's Horsepower ÷ Summation of Each Indoor Unit Horsepower)

ex.

< RCI-1.5FSN3 >

Cooling Capacity: $14.14 \times (1.5\text{HP}/6.0\text{HP}) = 3.54\text{kW}$

Heating Capacity: $14.04 \times (1.5\text{HP}/6.0\text{HP}) = 3.51\text{kW}$

< RCI-2.0FSN3 >

Cooling Capacity: $14.14 \times (2.0\text{HP}/6.0\text{HP}) = 4.71\text{kW}$

Heating Capacity: $14.04 \times (2.0\text{HP}/6.0\text{HP}) = 4.68\text{kW}$

< RCI-2.5FSN3 >

Cooling Capacity: $14.14 \times (2.5\text{HP}/6.0\text{HP}) = 5.89\text{kW}$

Heating Capacity: $14.04 \times (2.5\text{HP}/6.0\text{HP}) = 5.85\text{kW}$

< Result >

Item		Room (1)	Room (2)	Room (3)	(1)+(2)+(3)	
Selected Model		RCI-1.5FSN3	RCI-2.0FSN3	RCI-2.5FSN3	-	
Actual Capacity	Actual Maximum Cooling Capacity	kW	3.54	4.71	5.89	14.14
	Actual Maximum Heating Capacity	kW	3.51	4.68	5.85	14.04
Design Load	Estimated Cooling Load	kW	2.92	3.86	4.88	11.66
	Estimated Heating Load	kW	3.29	4.34	5.49	13.12

SELECTION DATA

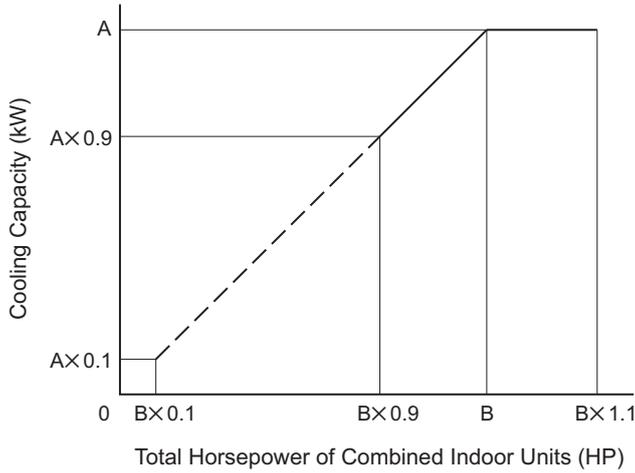
4.3 Capacity Characteristic Curve

The following charts show the characteristics of outdoor unit capacity which corresponds with total horsepower of combined indoor unit, on standard condition with refrigerant piping of horizontal and 7.5m at length.

< Cooling Capacity >

• Condition

Indoor Air Inlet Temperature: 27.0°C DB (80.0°F DB), 19.0°C WB (66.2°F WB)
 Outdoor Air Inlet Temperature: 35.0°C DB (95.0°F DB)

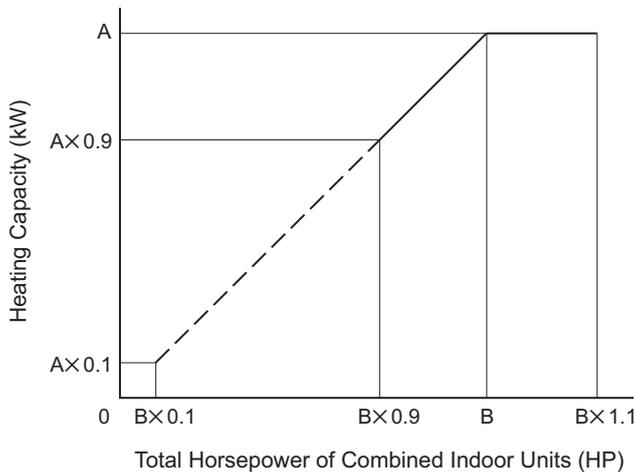


Model	A (kW)	B (HP)
RAS-4HVNC1	11.2	4
RAS-5HVNC1	14.0	5
RAS-6HVNC1	16.0	6

< Heating Capacity >

• Condition

Indoor Air Inlet Temperature: 20.0°C DB (68.0°F DB)
 Outdoor Air Inlet Temperature: 7.0°C DB (45.0°F DB), 6.0°C WB (43.0°F WB)



Model	A (kW)	B (HP)
RAS-4HVNC1	14.0	4
RAS-5HVNC1	18.0	5
RAS-6HVNC1	20.0	6

The following shows the examples of outdoor unit capacity which corresponds with total horsepower of combined indoor unit, according to the "Capacity Characteristic Curve" on the previous page.

Outdoor Unit Capacity with Total Horsepower of Combined Indoor Unit

Indoor Unit Total (HP)	Outdoor Unit Capacity (kW)					
	RAS-4HVNC1		RAS-5HVNC1		RAS-6HVNC1	
	Cooling	Heating	Cooling	Heating	Cooling	Heating
3.6	10.1	12.6				
3.7	10.4	13.0				
3.8	10.6	13.3				
3.9	10.9	13.7				
4.0	11.2	14.0				
4.1	11.2	14.0				
4.2	11.2	14.0				
4.3	11.2	14.0				
4.4	11.2	14.0				
4.5			12.6	16.2		
4.6			12.9	16.6		
4.7			13.2	16.9		
4.8			13.4	17.3		
4.9			13.7	17.6		
5.0			14.0	18.0		
5.1			14.0	18.0		
5.2			14.0	18.0		
5.3			14.0	18.0		
5.4			14.0	18.0	14.4	18.0
5.5			14.0	18.0	14.7	18.3
5.6					14.9	18.7
5.7					15.2	19.0
5.8					15.5	19.3
5.9					15.7	19.7
6.0					16.0	20.0
6.1					16.0	20.0
6.2					16.0	20.0
6.3					16.0	20.0
6.4					16.0	20.0
6.5					16.0	20.0
6.6					16.0	20.0

SELECTION DATA

The following table shows the outdoor unit capacity according to temperature condition.

Cooling Capacity for RAS-4HVNC1 (Connected Indoor Unit: 100%)

(kW)

Outdoor Air Inlet Dry Bulb (°C)	Indoor Air Inlet Dry Bulb / Wet Bulb (°C)											
	23		26		27		28		31		32	
	16		18		19		20		22		23	
	TC	SHC	TC	SHC	TC	SHC	TC	SHC	TC	SHC	TC	SHC
25	10.9	9.3	11.5	9.5	11.8	9.6	12.1	9.6	12.7	9.8	13.1	9.9
30	10.6	9.1	11.2	9.3	11.5	9.4	11.8	9.5	12.5	9.7	12.8	9.8
35	10.3	9.0	10.9	9.2	11.2	9.3	11.5	9.4	12.1	9.6	12.4	9.6
40	10.0	8.8	10.6	9.1	10.9	9.2	11.2	9.3	11.7	9.4	11.9	9.5

Cooling Capacity for RAS-5HVNC1 (Connected Indoor Unit: 100%)

(kW)

Outdoor Air Inlet Dry Bulb (°C)	Indoor Air Inlet Dry Bulb / Wet Bulb (°C)											
	23		26		27		28		31		32	
	16		18		19		20		22		23	
	TC	SHC	TC	SHC	TC	SHC	TC	SHC	TC	SHC	TC	SHC
25	13.6	10.5	14.4	10.7	14.7	10.8	15.0	10.8	15.6	10.9	15.8	10.9
30	13.1	10.3	13.9	10.5	14.3	10.6	14.6	10.7	15.2	10.7	15.4	10.7
35	12.6	10.0	13.6	10.3	14.0	10.5	14.3	10.5	14.7	10.5	14.8	10.5
40	11.9	9.7	12.7	10.0	13.0	10.1	13.3	10.1	13.8	10.2	14.0	10.2

Cooling Capacity for RAS-6HVNC1 (Connected Indoor Unit: 100%)

(kW)

Outdoor Air Inlet Dry Bulb (°C)	Indoor Air Inlet Dry Bulb / Wet Bulb (°C)											
	23		26		27		28		31		32	
	16		18		19		20		22		23	
	TC	SHC	TC	SHC	TC	SHC	TC	SHC	TC	SHC	TC	SHC
25	15.9	11.7	16.7	11.8	17.0	11.8	17.3	11.8	17.9	11.8	18.1	11.7
30	15.5	11.5	16.3	11.6	16.6	11.6	17.0	11.7	17.5	11.6	17.7	11.6
35	14.7	11.0	15.6	11.3	16.0	11.3	16.3	11.4	16.8	11.3	16.9	11.3
40	13.9	10.7	14.7	10.9	15.1	11.0	15.5	11.0	16.0	11.0	16.2	11.0

TC: Total Capacity, SHC: Sensible Heat Capacity

NOTE:

- The table shows the normal value of cooling operation at the maximum compressor frequency. In some cases, the value may change due to the compressor protection control.
- The value on the table shows when the system is operated under the following conditions.
The indoor unit total capacity: 100% of outdoor unit capacity
The total piping length: 7.5m
The height difference: 0m
- SHC values in the table are for the connection with 4-way Cassette Type Indoor Unit (Single Indoor Unit, Air Flow Volume: Hi).
For connection with other indoor units, refer to the item 4.8 "Sensible Heat Factor (SHF)."

Heating Capacity for RAS-4HVNC1 (Connected Indoor Unit: 100%)

(kW)

Outdoor Air Inlet Wet Bulb (°C)	Indoor Air Inlet Dry Bulb (°C)					
	16	18	20	21	22	24
	TC	TC	TC	TC	TC	TC
-20	8.1	7.9	7.7	7.5	7.4	7.2
-15	9.3	9.1	8.9	8.8	8.7	8.5
-10	10.5	10.3	10.1	10.1	9.9	9.7
-5	11.7	11.5	11.4	11.3	11.2	11.0
0	12.9	12.7	12.6	12.5	12.5	12.3
5	14.0	13.9	13.8	13.7	13.6	13.5
6	14.2	14.1	14.0	13.9	13.9	13.7
10	15.5	15.5	15.4	15.3	15.2	15.1
15	17.1	17.1	17.1	17.0	16.9	16.8

Heating Capacity for RAS-5HVNC1 (Connected Indoor Unit: 100%)

(kW)

Outdoor Air Inlet Wet Bulb (°C)	Indoor Air Inlet Dry Bulb (°C)					
	16	18	20	21	22	24
	TC	TC	TC	TC	TC	TC
-20	8.6	8.5	8.4	8.4	8.4	8.4
-15	10.2	10.2	10.1	10.1	10.0	10.0
-10	11.9	11.9	11.8	11.8	11.7	11.7
-5	13.6	13.5	13.5	13.4	13.4	13.3
0	15.8	15.7	15.6	15.5	15.5	15.4
5	18.0	17.9	17.8	17.7	17.7	17.5
6	18.2	18.1	18.0	17.9	17.9	17.7
10	19.0	18.9	18.8	18.7	18.7	18.5
15	19.7	19.6	19.5	19.4	19.4	19.1

Heating Capacity for RAS-6HVNC1 (Connected Indoor Unit: 100%)

(kW)

Outdoor Air Inlet Wet Bulb (°C)	Indoor Air Inlet Dry Bulb (°C)					
	16	18	20	21	22	24
	TC	TC	TC	TC	TC	TC
-20	9.3	9.2	9.1	9.1	9.0	9.0
-15	11.0	11.0	10.9	10.9	10.9	10.8
-10	12.8	12.7	12.6	12.6	12.6	12.6
-5	14.8	14.7	14.6	14.6	14.6	14.5
0	17.4	17.3	17.2	17.1	17.1	17.0
5	20.0	19.9	19.8	19.7	19.6	19.5
6	20.3	20.1	20.0	19.9	19.9	19.7
10	21.1	21.0	20.9	20.8	20.8	20.7
15	22.2	22.0	21.9	21.8	21.8	21.6

TC: Total Capacity

NOTE:

- The table shows the normal value of heating operation at the maximum compressor frequency. In some cases, the value may change due to the compressor protection control.
- The heating capacity on the table indicates the peak value, which does not include the capacity decrease caused by frost.
- The value on the table shows when the system is operated under the following conditions.
The indoor unit total capacity: 100% of outdoor unit capacity
The total piping length: 7.5m
The height difference: 0m

4.4 Correction Factor According to Temperature Condition (Cooling)

Correction Factor for RAS-4HVNC1 (Connected Indoor Unit: 100%)

Outdoor Air Inlet Dry Bulb (°C)	Indoor Air Inlet Wet Bulb (°C)					
	16	18	19	20	22	23
25	0.97	1.03	1.05	1.08	1.14	1.17
30	0.95	1.00	1.03	1.05	1.11	1.14
35	0.92	0.97	1.00	1.03	1.08	1.10
40	0.89	0.95	0.97	1.00	1.04	1.06

Correction Factor for RAS-5HVNC1 (Connected Indoor Unit: 100%)

Outdoor Air Inlet Dry Bulb (°C)	Indoor Air Inlet Wet Bulb (°C)					
	16	18	19	20	22	23
25	0.97	1.03	1.05	1.07	1.11	1.13
30	0.94	1.00	1.02	1.05	1.08	1.10
35	0.90	0.97	1.00	1.02	1.05	1.06
40	0.85	0.91	0.93	0.95	0.98	1.00

Correction Factor for RAS-6HVNC1 (Connected Indoor Unit: 100%)

Outdoor Air Inlet Dry Bulb (°C)	Indoor Air Inlet Wet Bulb (°C)					
	16	18	19	20	22	23
25	0.99	1.04	1.06	1.08	1.12	1.13
30	0.97	1.02	1.04	1.06	1.10	1.11
35	0.92	0.97	1.00	1.02	1.05	1.06
40	0.87	0.92	0.95	0.97	1.00	1.01

NOTE:

1. The table shows the normal value of cooling operation at the maximum compressor frequency. In some cases, the value may change due to the compressor protection control.
2. The value on the table shows when the system is operated under the following conditions.
 The indoor unit total capacity: 100% of outdoor unit capacity
 The total piping length: 7.5m
 The height difference: 0m

4.5 Correction Factor According to Temperature Condition (Heating)

Correction Factor for RAS-4HVNC1 (Connected Indoor Unit: 100%)

Outdoor Air Inlet Wet Bulb (°C)	Indoor Air Inlet Dry Bulb (°C)					
	16	18	20	21	22	24
-20	0.58	0.56	0.55	0.54	0.53	0.51
-15	0.66	0.65	0.64	0.63	0.62	0.60
-10	0.75	0.74	0.72	0.72	0.71	0.70
-5	0.83	0.82	0.81	0.81	0.80	0.79
0	0.92	0.91	0.90	0.90	0.89	0.88
5	1.00	0.99	0.98	0.98	0.97	0.96
6	1.01	1.01	1.00	1.00	0.99	0.98
10	1.11	1.10	1.10	1.09	1.09	1.08
15	1.22	1.22	1.22	1.21	1.21	1.20

Correction Factor for RAS-5HVNC1 (Connected Indoor Unit: 100%)

Outdoor Air Inlet Wet Bulb (°C)	Indoor Air Inlet Dry Bulb (°C)					
	16	18	20	21	22	24
-20	0.48	0.47	0.47	0.47	0.47	0.47
-15	0.57	0.56	0.56	0.56	0.56	0.56
-10	0.66	0.66	0.66	0.65	0.65	0.65
-5	0.76	0.75	0.75	0.74	0.74	0.74
0	0.88	0.87	0.87	0.86	0.86	0.86
5	1.00	1.00	0.99	0.99	0.98	0.97
6	1.01	1.01	1.00	1.00	0.99	0.98
10	1.06	1.05	1.04	1.04	1.04	1.03
15	1.09	1.09	1.08	1.08	1.08	1.06

Correction Factor for RAS-6HVNC1 (Connected Indoor Unit: 100%)

Outdoor Air Inlet Wet Bulb (°C)	Indoor Air Inlet Dry Bulb (°C)					
	16	18	20	21	22	24
-20	0.46	0.46	0.46	0.45	0.45	0.45
-15	0.55	0.55	0.54	0.54	0.54	0.54
-10	0.64	0.63	0.63	0.63	0.63	0.63
-5	0.74	0.74	0.73	0.73	0.73	0.72
0	0.87	0.87	0.86	0.86	0.85	0.85
5	1.00	1.00	0.99	0.98	0.98	0.97
6	1.01	1.01	1.00	1.00	0.99	0.99
10	1.06	1.05	1.04	1.04	1.04	1.03
15	1.11	1.10	1.10	1.09	1.09	1.08

NOTE:

1. The table shows the normal value of heating operation at the maximum compressor frequency. In some cases, the value may change due to the compressor protection control.
2. The heating capacity on the table indicates the peak value, which does not include the capacity decrease caused by frost.
3. The value on the table shows when the system is operated under the following conditions.
The indoor unit total capacity: 100% of outdoor unit capacity
The total piping length: 7.5m
The height difference: 0m

SELECTION DATA

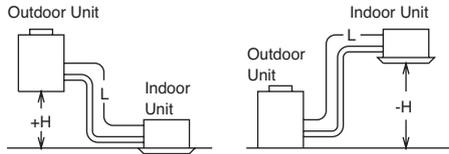
4.6 Correction Factor According to Piping Length

< Cooling Capacity >

Correction Factor for Cooling Capacity According to Piping Length
 The correction factors are shown in the following figure.

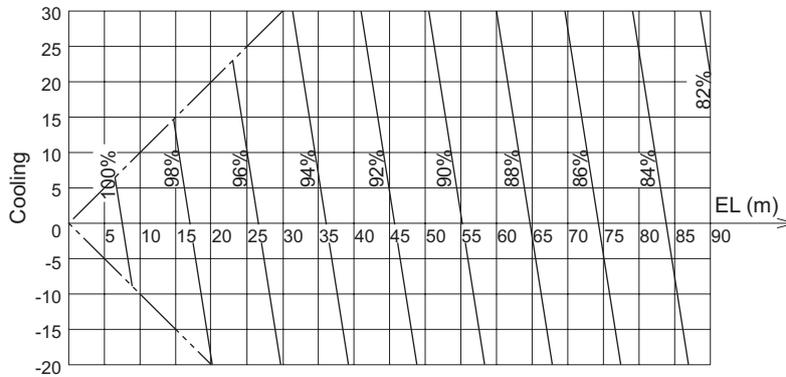
Equivalent Piping Length for

- One 90° Elbow is 0.5m.
- One 180° Bend is 1.5m.
- One Multi-Kit is 0.5m.

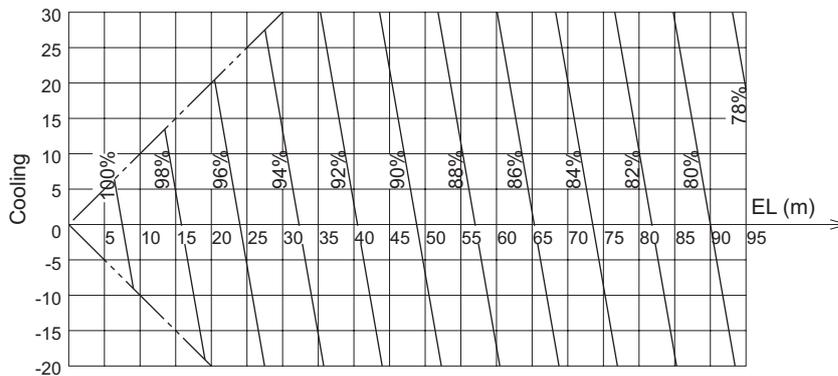


- H: Vertical Distance Between Indoor Unit and Outdoor Unit in Meters
- EL: Equivalent Total Distance Between Indoor Unit and Outdoor Unit in Meters (Equivalent One-Way Piping Length)
- H>0: Position of Outdoor Unit Higher Than Position of Indoor Unit
- L: Actual One-Way Piping Length Between Indoor Unit and Outdoor Unit in Meters

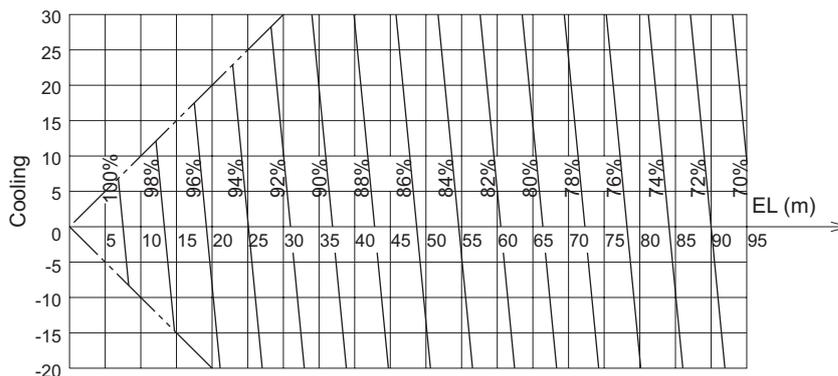
• RAS-4HVNC1



• RAS-5HVNC1



• RAS-6HVNC1

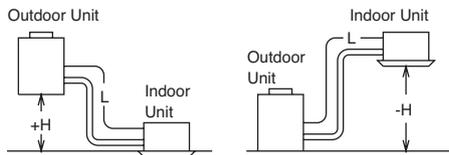


< Heating Capacity >

Correction Factor for Heating Capacity According to Piping Length
 The correction factors are shown in the following figure.

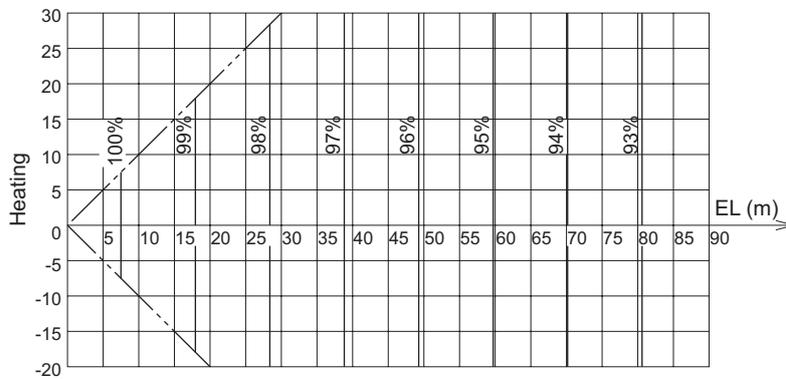
Equivalent Piping Length for

- One 90° Elbow is 0.5m.
- One 180° Bend is 1.5m.
- One Multi-Kit is 0.5m.

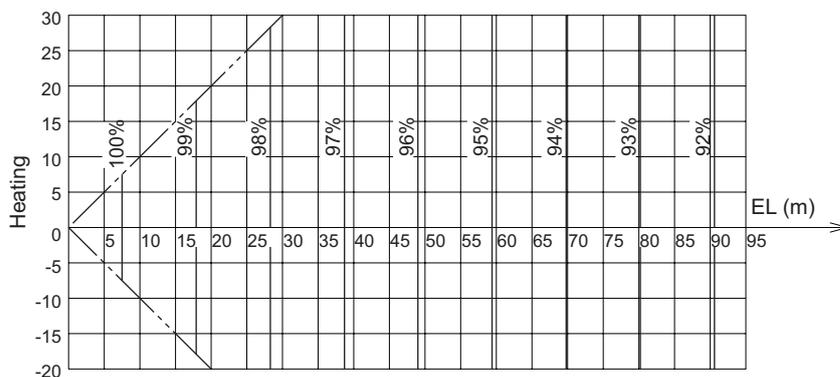


- H: Vertical Distance Between Indoor Unit and Outdoor Unit in Meters
- EL: Equivalent Total Distance Between Indoor Unit and Outdoor Unit in Meters (Equivalent One-Way Piping Length)
- H>0: Position of Outdoor Unit Higher Than Position of Indoor Unit
- L: Actual One-Way Piping Length Between Indoor Unit and Outdoor Unit in Meters

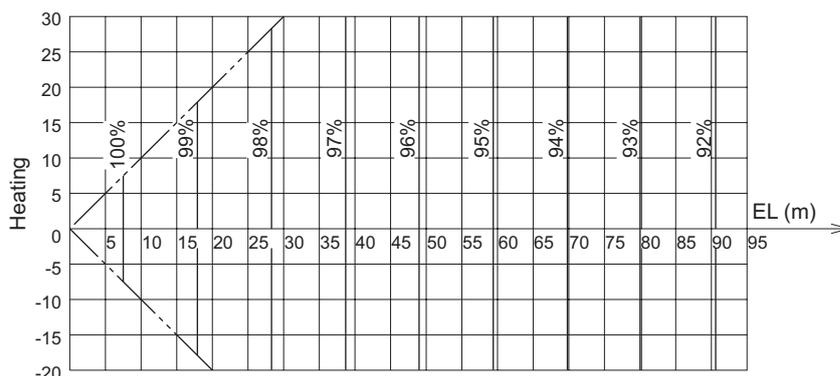
• RAS-4HVNC1



• RAS-5HVNC1



• RAS-6HVNC1



SELECTION DATA

4.7 Correction Factor According to Defrosting Operation

The heating capacity in the preceding paragraph, excludes the condition of the frost or the defrosting operation period.

In consideration of the frost or the defrosting operation, the heating capacity is corrected by the equation below.

$$\text{Corrected Heating Capacity} = \text{Correction Factor} \times \text{Heating Capacity}$$

Outdoor Inlet Air Temp. (°C DB) (Humidity=85% RH)	-7	-5	-3	0	3	5	7
Correction Factor	0.95	0.93	0.88	0.85	0.87	0.90	1.0

NOTE:

The correction factor is not available for the special condition like a snowfall or a operation in a transitional period.

4.8 Sensible Heat Factor (SHF)

The sensible heat factor of indoor units at fan speed (Hi) based on the JIS Standard B8616, which is given in the below.

Outdoor Unit	Type	Indoor Unit	SHF (Hi)						
			RPI- *FSN2SQ	RCI- *FSN3	RCIM- *FSN3	RPI- *FSN2	RCD- *FSN2	RPC- *FSN3	RPK- *FSNSM3
4HP	Single	4.0HP	0.87	0.84	-	-	-	-	-
	Twin	2.0HP x 2	-	0.91	0.74	0.76	0.74	0.78	0.72
	Triple	-	-	-	-	-	-	-	-
	Quad	1.0HP x 4	-	0.86	0.85	0.76	0.85	-	0.82
5HP	Single	5.0HP	0.88	0.77	-	-	-	-	-
	Twin	2.5HP x 2	-	0.91	-	0.72	0.71	0.78	0.74
	Triple	1.5HP x 3	-	0.89	0.77	0.77	0.77	0.79	0.73
	Quad	-	-	-	-	-	-	-	-
6HP	Single	6.0HP	0.90	0.74	-	-	-	-	-
	Twin	3.0HP x 2	-	0.86	-	0.72	0.69	0.78	0.74
	Triple	2.0HP x 3	-	0.91	0.77	0.76	0.75	0.77	0.72
	Quad	1.5HP x 4	-	0.88	0.78	0.77	0.77	0.85	0.73

5. Electrical Data

< Outdoor Unit (220-240V/50Hz, 220V/60Hz) >

Model	Unit Main Power			Applicable Voltage		Compressor Motor						Maximum Current
	VOL	PH	HZ	Maximum	Minimum	PH	STC	Cooling Operation		Heating Operation		
								RNC	IPT	RNC	IPT	
RAS-4HVNC1	220/240	1	50	264	198	3	-	11.9/10.8	2.51	10.5/9.6	2.21	26.3
RAS-5HVNC1								16.3/14.9	3.47	15.8/14.5	3.36	26.4
RAS-6HVNC1	220		60				-	17.4/15.9	3.70	19.8/18.1	4.21	26.4

VOL: Rated Unit Power Supply Voltage (Plated)(V)

HZ: Frequency (Hz)

STC: Starting Current (A)

RNC: Running Current (A)

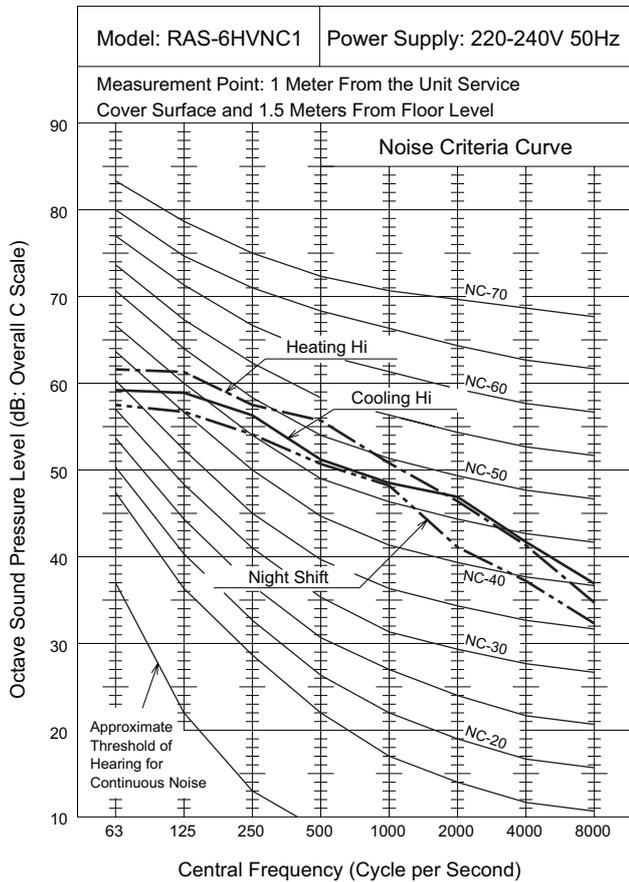
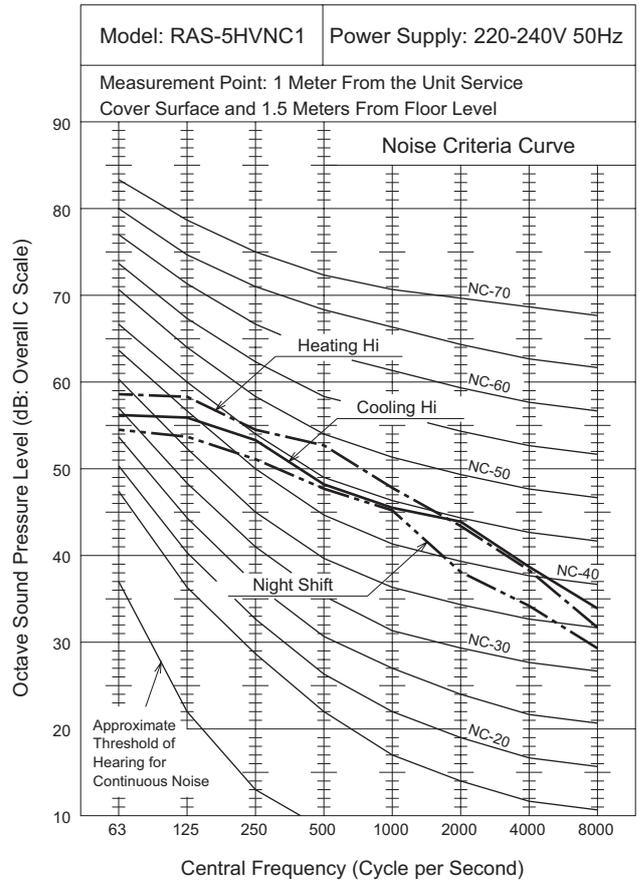
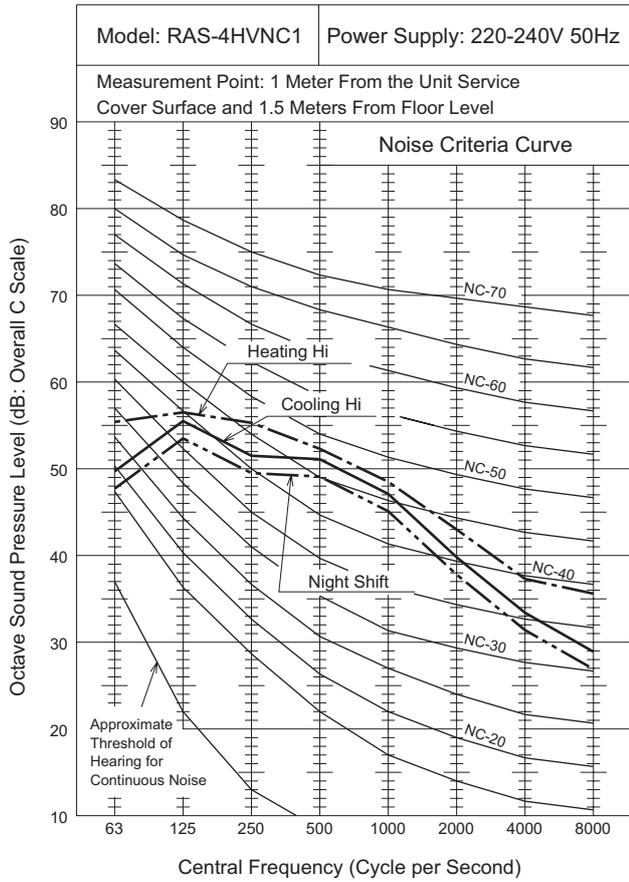
PH: Phase (ϕ)

IPT: Input (kW)

NOTES:

1. The above performance data is based on 7.5m equivalent piping length and 0m piping lift.
2. These data are based on the same conditions as the nominal heating and cooling capacities.
3. The compressor is started by an inverter, resulting in extremely low starting current.

6. Sound Data



7. Working Range

Power Supply

Working Voltage: 90% to 110% of the Rated Voltage
 Voltage Imbalance: Within a 3% Deviation from Each Voltage at the Main Terminal
 Starting Voltage: Higher than 85% of the Rated Voltage

Temperature Range

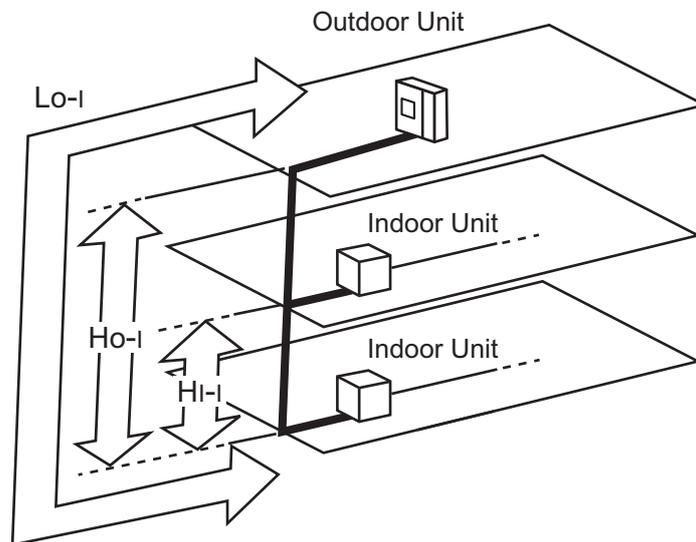
The temperature range are given in the following table.

		Cooling Operation	Heating Operation
Indoor Temperature	Minimum	21°C DB / 15°C WB	15°C DB
	Maximum	32°C DB / 23°C WB	27°C DB
Outdoor Temperature	Minimum	-5°C DB	-20°C WB
	Maximum	46°C DB	15°C WB

DB: Dry Bulb, WB: Wet Bulb

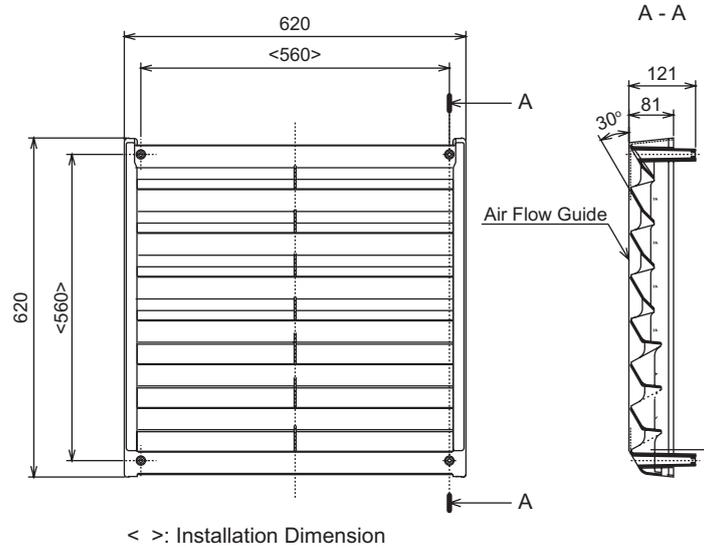
Piping Provision

- Maximum Piping Length (Actual Length) L_{O-I}:
 - 70m (RAS-4HVNC1)
 - 75m (RAS-5HVNC1 and RAS-6HVNC1)
- Maximum Piping Lift between Outdoor Unit and Indoor Unit H_{O-I}:
 - 30m (When Outdoor Unit is Higher than Indoor Unit)
 - 20m (When Indoor Unit is Higher than Outdoor Unit)
- Maximum Piping Lift between Indoor Units H_{I-I}:
 - 3m



8. Optional Accessories

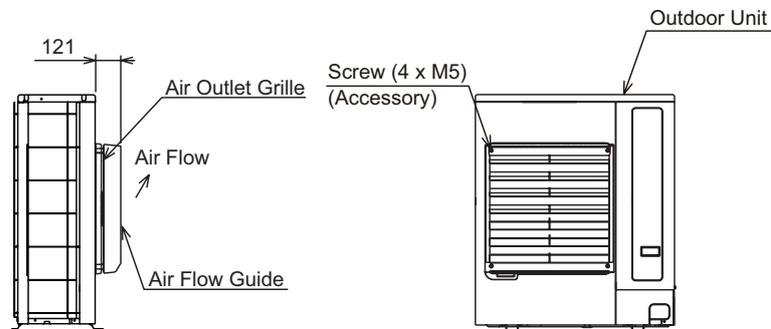
8.1 Air Flow Guide: AG-335A



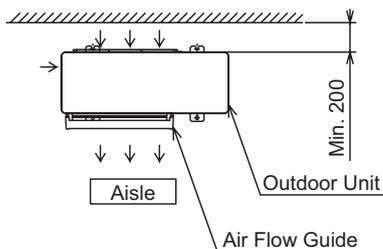
< >: Installation Dimension

< Installation >

- (1) To attach the air flow guide, remove the 4 fixing screws at corner of resin air outlet grille. Then, attach the air flow guide by 4 screws (accessory). (Tightening Torque: 2.4 - 3.1N.m)
- (2) When the air flow guide is attached, do not remove the air outlet grille. (If it is removed, there is danger of touching fan rotating parts.)



< Service Space >



NOTES:

1. For the left and right air outlets, maintain the enough service space for outlet air.
2. For the air outlet downward, install a foundation in order to secure enough service space downward.
3. If multiple outdoor units are installed serially, the upward air outlet shall be utilized.

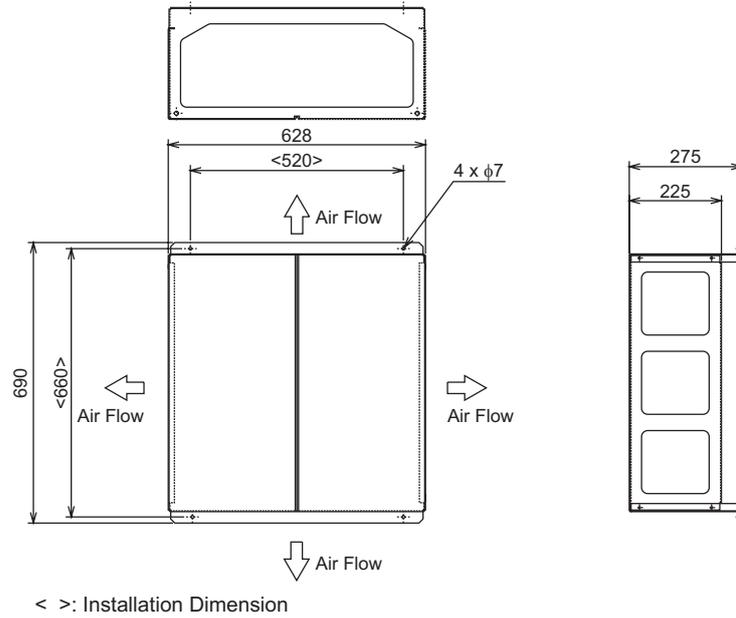
Specifications

	Model	AG-335A
Item		
Applicable Outdoor Unit Model (RAS-**HVNC1)		4 to 6
Quantity (per outdoor unit)		1
Air Flow Direction		Upward (Downward), Left and Right
Material		PP
Color		Natural Gray
Weight	kg	1.9
Accessory		Fixing Screw (M5 (SUS) x 20ℓ x 4), Installation Manual
Installation Restriction		It can not be utilized with the wind guard and the snow-protection hood.

NOTES:

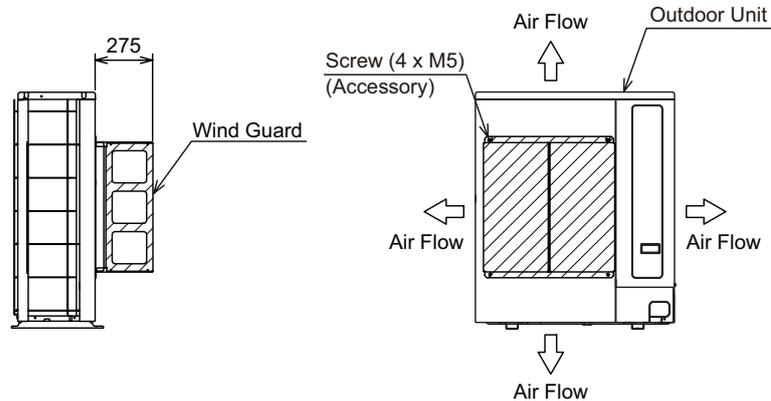
1. This optional air flow guide lets the outlet air to flow upward (downward) or left and right if there are obstacles in front of the outdoor unit.
2. Do not put any obstacles at the air flow direction.
If there are obstacles, the short-circuit will occur or the air flow volume will decrease. Secure the appropriate service space according to the installation and maintenance manual of the outdoor unit.
3. For the left and right air outlets, do not install other outdoor unit next to. Other outdoor unit will suck the air flow from the air flow guide.
4. The operation noise is slightly increased by attaching air flow guide.
5. The snow protection hood shall be utilized in snow covered area.
6. In the case of icing at the air outlet in cold area, melt ice by lukewarm water (approx. 40°C).
If the ice is shaved by hummer etc., the air flow guide may be damaged.

8.2 Wind Guard: WSP-335A

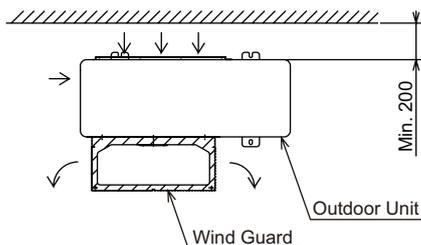


< Installation >

- (1) To attach the air flow guide, remove the 4 fixing screws at corner of resin air outlet grille. Then, attach the air flow guide by 4 screws (accessory). (Tightening Torque: 2.4 - 3.1N.m)
- (2) When the air flow guide is attached, do not remove the air outlet grille.
(If it is removed, there is danger of touching fan rotating parts.)



< Service Space >



NOTES:

1. Secure the appropriate service space both left and right side of outdoor unit.
2. Do not put any obstacles at the air flow direction.

Specifications

	Model	WSP-335A
Item		
Applicable Outdoor Unit Model (RAS-**HVNC1)		4 to 6
Quantity (per outdoor unit)		1
Material		Galvanized Steel Sheet + Baked with Synthetic Resin Paint
Color		Natural Gray (1.0Y 8.5 / 0.5)
Weight	kg	5.5
Accessory		Fixing Screw (M5 (SUS) x 12ℓ x 4), Installation Manual
Installation Restriction		It can not be utilized with the air flow guide and the snow-protection hood.

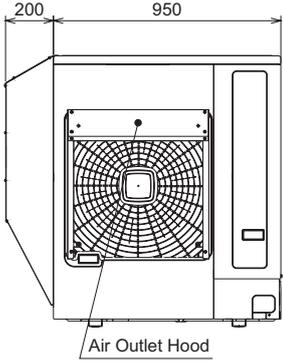
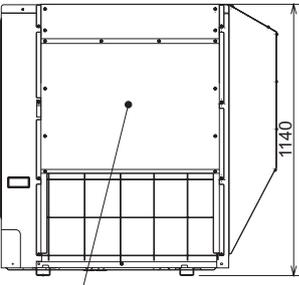
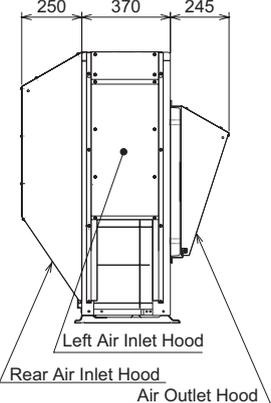
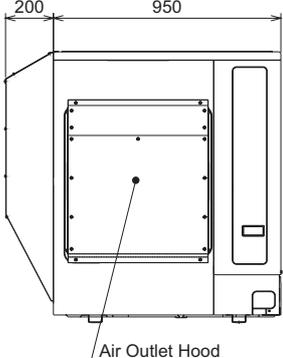
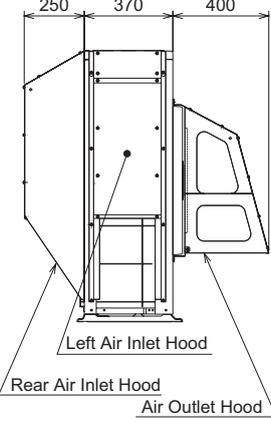
NOTES:

1. This optional wind guard is to protect the air outlet from the strong wind.
2. Do not put any obstacles at the air flow direction.
If there are obstacles, the short-circuit will occur or the air flow volume will decrease.
Secure the appropriate service space according to the installation and maintenance manual of the outdoor unit.
3. Do not install other outdoor unit next to air outlet direction. Other outdoor unit will suck the air flow from the wind guard.
4. The operation noise is slightly increased by attaching wind guard.
5. The snow protection hood shall be utilized in snow covered area.
6. In the case of icing at the air outlet in cold area, melt ice by lukewarm water (approx. 40°C).
If the ice is shaved by hummer etc., the wind guard may be damaged.

OPTIONAL ACCESSORIES

8.3 Snow Protection Hood

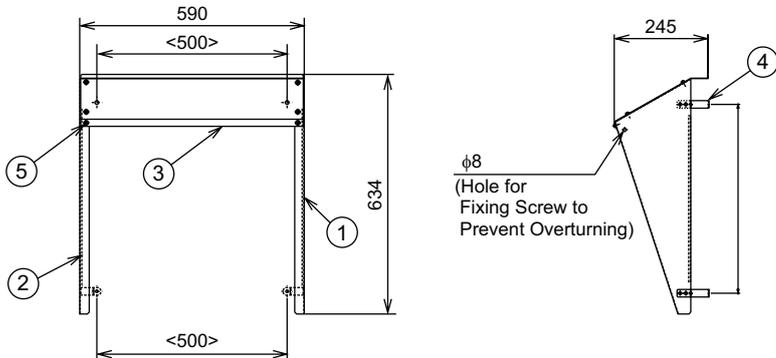
The snow protection hood shall be utilized to protect from mal-defrost in low ambient temperature (below -5°C).

Applicable Outdoor Unit		RAS-4HVNC1 to RAS-6HVNC1					
Half Type	Item	Air Outlet Hood		Rear Air Inlet Hood		Left Air Inlet Hood	
	Model	ASG-NP335F1	ASG-NP335FS4	ASG-SP10BE	ASG-SP10BES2	ASG-SP10LE	ASG-SP10LES2
	Material	Bonderizing Steel Sheet	Stainless Steel	Bonderizing Steel Sheet	Stainless Steel	Bonderizing Steel Sheet	Stainless Steel
	Appearance (mm)					<p>With Air Outlet Hood (Half Type)</p> 	
Full Type	Item	Air Outlet Hood					
	Model	ASG-SP11FB	ASG-SP11FBS2				
	Material	Bonderizing Steel Sheet	Stainless Steel				
	Appearance (mm)					<p>With Air Outlet Hood (Full Type)</p> 	

Half Type: ASG-NP335F1/FS4, ASG-SP10BE/10BES2, ASG-SP10LE/10LES2

< Air Outlet Hood >

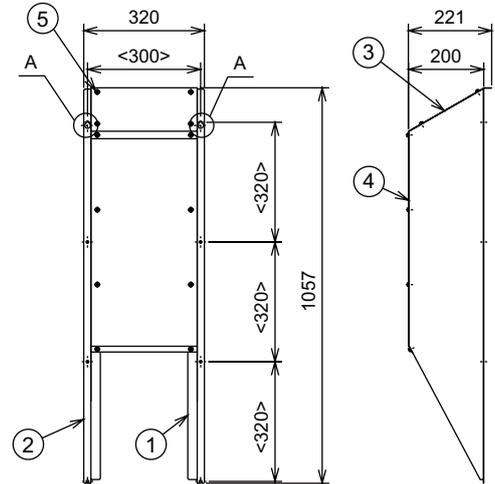
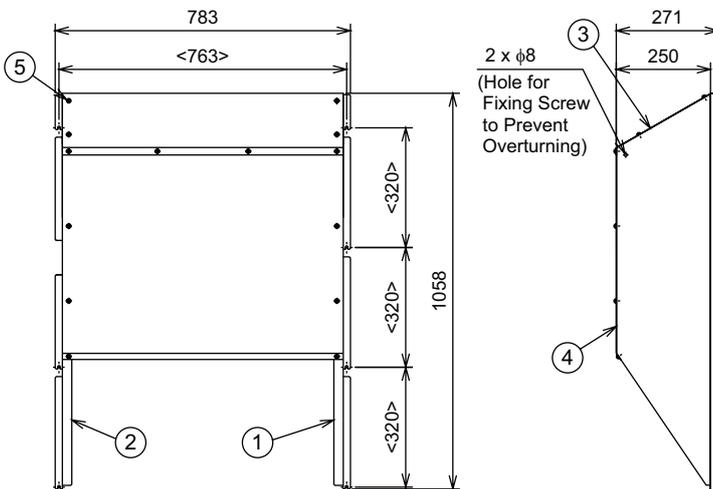
< >: Installation Dimension



No.	Part Name	Q'ty
①	Right Plate	1
②	Left Plate	1
③	Front Plate	1
④	Fixing Stay	4
⑤	Assembling Screw (Accessory)	6

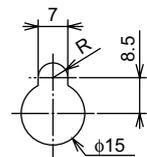
< Rear Air Inlet Hood >

< Left Air Inlet Hood >



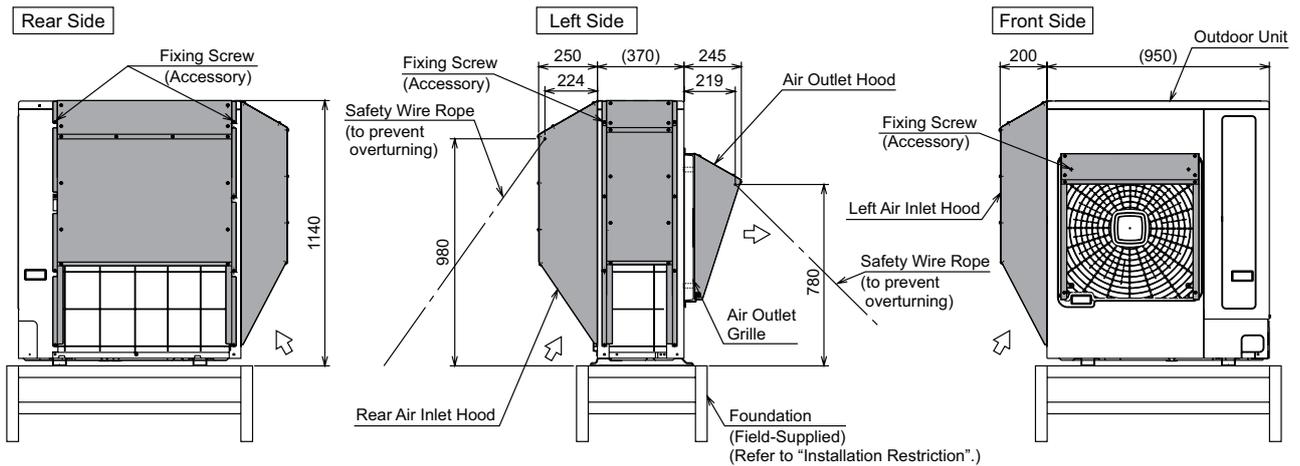
No.	Part Name	Q'ty	
		Rear	Left
①	Right Plate	1	1
②	Left Plate	1	1
③	Front Plate (Upper)	1	1
④	Front Plate (Lower)	1	1
⑤	Assembling Screw (Accessory)	14	12

Enlarged View of A (Fixing Hole)



OPTIONAL ACCESSORIES

< Installation >



NOTE:

The fixing screws (accessory) shall be utilized to attach the snow protection hood to the outdoor unit.

Specifications

Part Name		Air Outlet Hood		Rear Air Inlet Hood		Left Air Inlet Hood	
Item	Model	ASG-NP335F1	ASG-NP335FS4	ASG-SP10BE	ASG-SP10BES2	ASG-SP10LE	ASG-SP10LES2
Applicable Outdoor Unit Model (RAS-**HVNC1)		4 to 6					
Quantity (per outdoor unit)		1					
Material		Bonderized Sheet	Stainless	Bonderized Sheet	Stainless	Bonderized Sheet	Stainless
Color		Natural Gray (1.0Y 8.5/0.5)		Natural Gray (1.0Y 8.5/0.5)		Natural Gray (1.0Y 8.5/0.5)	
Weight	kg	3.0		10.0		6.0	
Configuration		Assembly on site					
Accessory	Hood	1		1		1	
	Fixing Screw [Spare]	M5 (SUS) x 12ℓ x 6 [2]		M5 (SUS) x 12ℓ x 9 [2]		M5 (SUS) x 12ℓ x 10 [2]	
	Assembling Screw [Spare]	M5 (SUS) x 12ℓ x 6	M5 (SUS) x 14ℓ x 8 [2]	M5 (SUS) x 12ℓ x 14	M5 (SUS) x 14ℓ x 16 [2]	M5 (SUS) x 12ℓ x 12	M5 (SUS) x 14ℓ x 14 [2]
		Installation Manual					
Installation Restriction		<ol style="list-style-type: none"> The air outlet hood cannot be used with the wind guard and the air flow guide. Consider snow accumulation when installing the outdoor unit. To avoid being affected by snow, install the unit on a high foundation or on a frame (higher than snow accumulation) and fix the unit securely with anchor bolts. In addition, provide extra service space considering snow accumulation and snow removal. When multiple outdoor units are installed in a row, keep at least 100mm of space between the outdoor units. Do not put any obstacles on the air outlet side. Any obstacle will lead to a short circuit or an air flow volume decrease. 					
Caution		<ol style="list-style-type: none"> Apply a touch-up paint to screw parts or caulk them for corrosion prevention (field-supplied). If the outdoor unit is installed in an area where snow blows upward from the ground, install a partition (field-supplied). The outdoor unit does not have sufficient strength to hold the snow protection hood in strong wind or earthquake. Attach the stay or safety wire rope etc. to the snow protection hood to protect it from falling down. 					

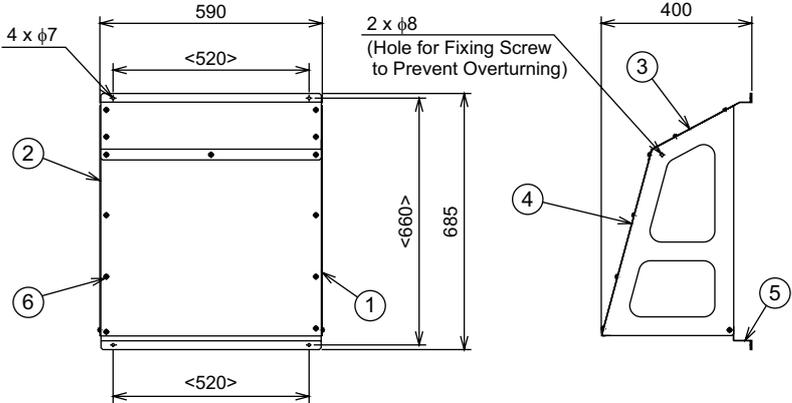
NOTES:

- This snow protection hood is to prevent snow from entering the outdoor unit and to protect the unit from snow damage.
- This snow protection hood is for an on-site assembly. When assembling it, tighten the screws securely. If not, the screws are loosened, which may cause the vibration of the unit.
- The operation noise is slightly increased by attaching snow protection hood.
- Though this snow protection hood is made of the corrosion-resistant materials, it is subject to corrosion in places where strongly-acidic or strongly-alkaline materials, or other corrosive materials continuously present. Contact your distributor or dealer of HITACHI for details of the outdoor unit subjected to anti-corrosive treatment.
- The operating performance of the outdoor unit with the snow protection hood might decrease depending on the service conditions.

Full Type: ASG-SP11FB/11FBS2, ASG-SP10BE/10BES2, ASG-SP10LE/10LES2

< Air Outlet Hood >

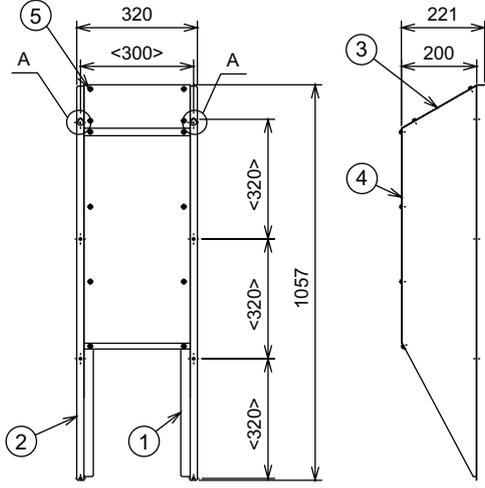
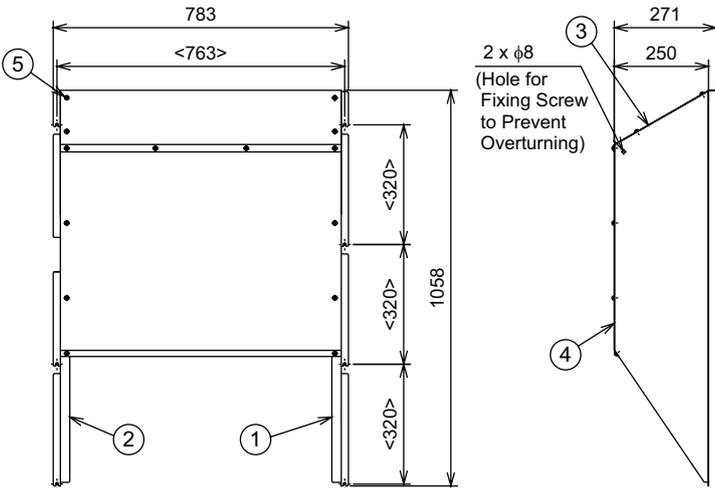
< >: Installation Dimension



No.	Part Name	Q'ty
①	Right Plate	1
②	Left Plate	1
③	Front Plate (Upper)	1
④	Front Plate (Lower)	1
⑤	Fixing Plate	1
⑥	Assembling Screw (Accessory)	15

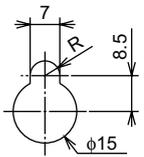
< Rear Air Inlet Hood >

< Left Air Inlet Hood >



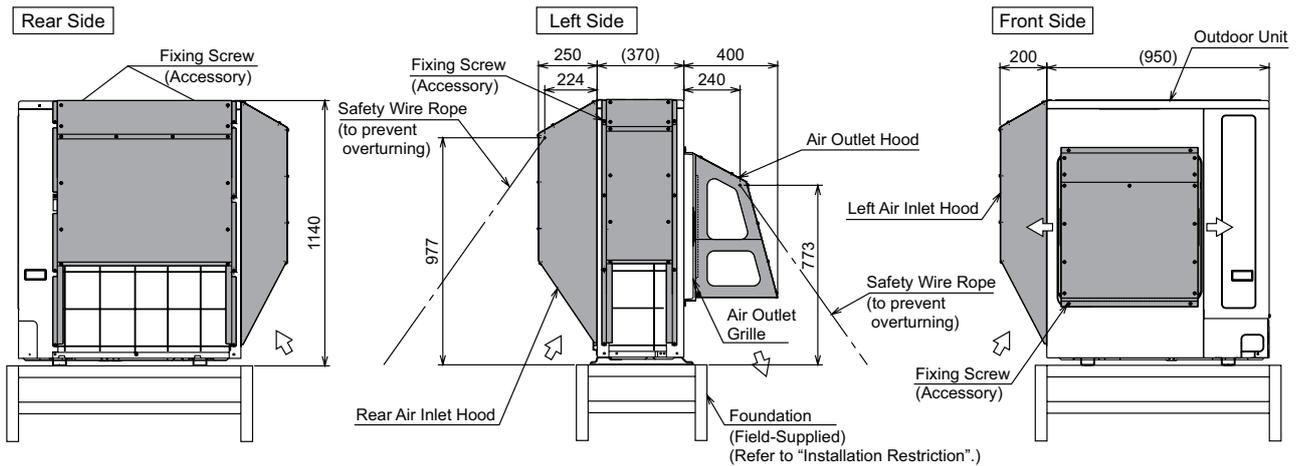
No.	Part Name	Q'ty	
		Rear	Left
①	Right Plate	1	1
②	Left Plate	1	1
③	Front Plate (Upper)	1	1
④	Front Plate (Lower)	1	1
⑤	Assembling Screw (Accessory)	14	12

Enlarged View of A (Fixing Hole)



OPTIONAL ACCESSORIES

< Installation >



NOTE:

The fixing screws (accessory) shall be utilized to attach the snow protection hood to the outdoor unit.

Specifications

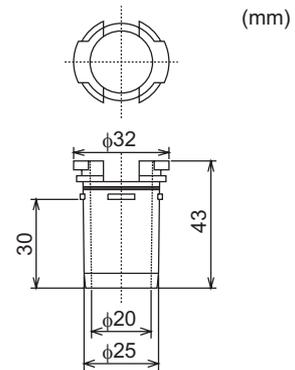
Part Name		Air Outlet Hood		Rear Air Inlet Hood		Left Air Inlet Hood	
Item	Model	ASG-SP11FB	ASG-SP11FBS2	ASG-SP10BE	ASG-SP10BES2	ASG-SP10LE	ASG-SP10LES2
Applicable Outdoor Unit Model (RAS-**HVNC1)		4 to 6					
Quantity (per outdoor unit)		1					
Material		Bonderized Sheet	Stainless	Bonderized Sheet	Stainless	Bonderized Sheet	Stainless
Color		Natural Gray (1.0Y 8.5/0.5)		Natural Gray (1.0Y 8.5/0.5)		Natural Gray (1.0Y 8.5/0.5)	
Weight	kg	7.0		10.0		6.0	
Configuration		Assembly on site					
Accessory	Hood	1		1		1	
	Fixing Screw [Spare]	M5 (SUS) x 12ℓ x 6 [2]		M5 (SUS) x 12ℓ x 9 [2]		M5 (SUS) x 12ℓ x 10 [2]	
	Assembling Screw [Spare]	M5 (SUS) x 12ℓ x 15	M5 (SUS) x 14ℓ x 17 [2]	M5 (SUS) x 12ℓ x 14	M5 (SUS) x 14ℓ x 16 [2]	M5 (SUS) x 12ℓ x 12	M5 (SUS) x 14ℓ x 14 [2]
		Installation Manual					
Installation Restriction		<ol style="list-style-type: none"> The air outlet hood cannot be used with the wind guard and the air flow guide. Consider snow accumulation when installing the outdoor unit. To avoid being affected by snow, install the unit on a high foundation or on a frame (higher than snow accumulation) and fix the unit securely with anchor bolts. In addition, provide extra service space considering snow accumulation and snow removal. When multiple outdoor units are installed in a row, keep at least 100mm of space between the outdoor units. Do not put any obstacles on the air outlet side. Any obstacle will lead to a short circuit or an air flow volume decrease. 					
Caution		<ol style="list-style-type: none"> Apply a touch-up paint to screw parts or caulk them for corrosion prevention (field-supplied). If the outdoor unit is installed in an area where snow blows upward from the ground, install a partition (field-supplied). The outdoor unit does not have sufficient strength to hold the snow protection hood in strong wind or earthquake. Attach the stay or safety wire rope etc. to the snow protection hood to protect it from falling down. 					

NOTES:

- This snow protection hood is to prevent snow from entering the outdoor unit and to protect the unit from snow damage.
- This snow protection hood is for an on-site assembly. When assembling it, tighten the screws securely. If not, the screws are loosened, which may cause the vibration of the unit.
- The operation noise is slightly increased by attaching snow protection hood.
- Though this snow protection hood is made of the corrosion-resistant materials, it is subject to corrosion in places where strongly-acidic or strongly-alkaline materials, or other corrosive materials continuously present. Contact your distributor or dealer of HITACHI for details of the outdoor unit subjected to anti-corrosive treatment.
- The operating performance of the outdoor unit with the snow protection hood might decrease depending on the service conditions.

8.4 Drain Kit: DBS-26

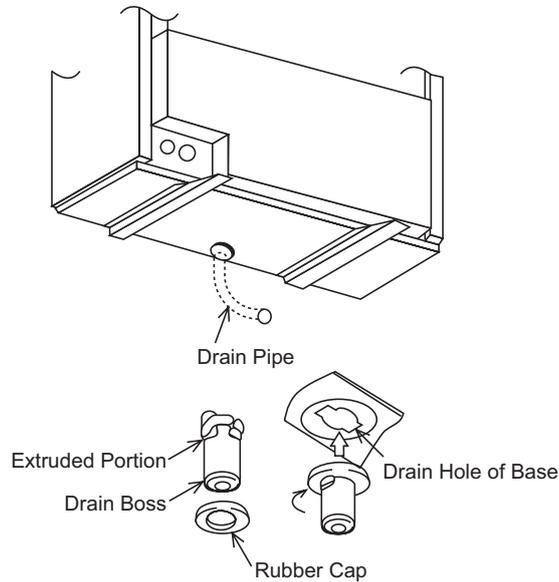
When the base of the outdoor unit is temporarily utilized as a drain receiver and the drain water in it is discharged, this drain boss is utilized to connect the drain piping.



< Connecting Procedure >

Connecting Drain Discharge Boss

- (1) Insert the rubber cap into the drain boss up to the extruded portions. (4 Portions around the Boss)
- (2) Insert the boss into the unit base, and turn approximately 40 degree counterclockwise.
- (3) Size of the drain boss is VP25.
- (4) A drain pipe should be field-supplied.



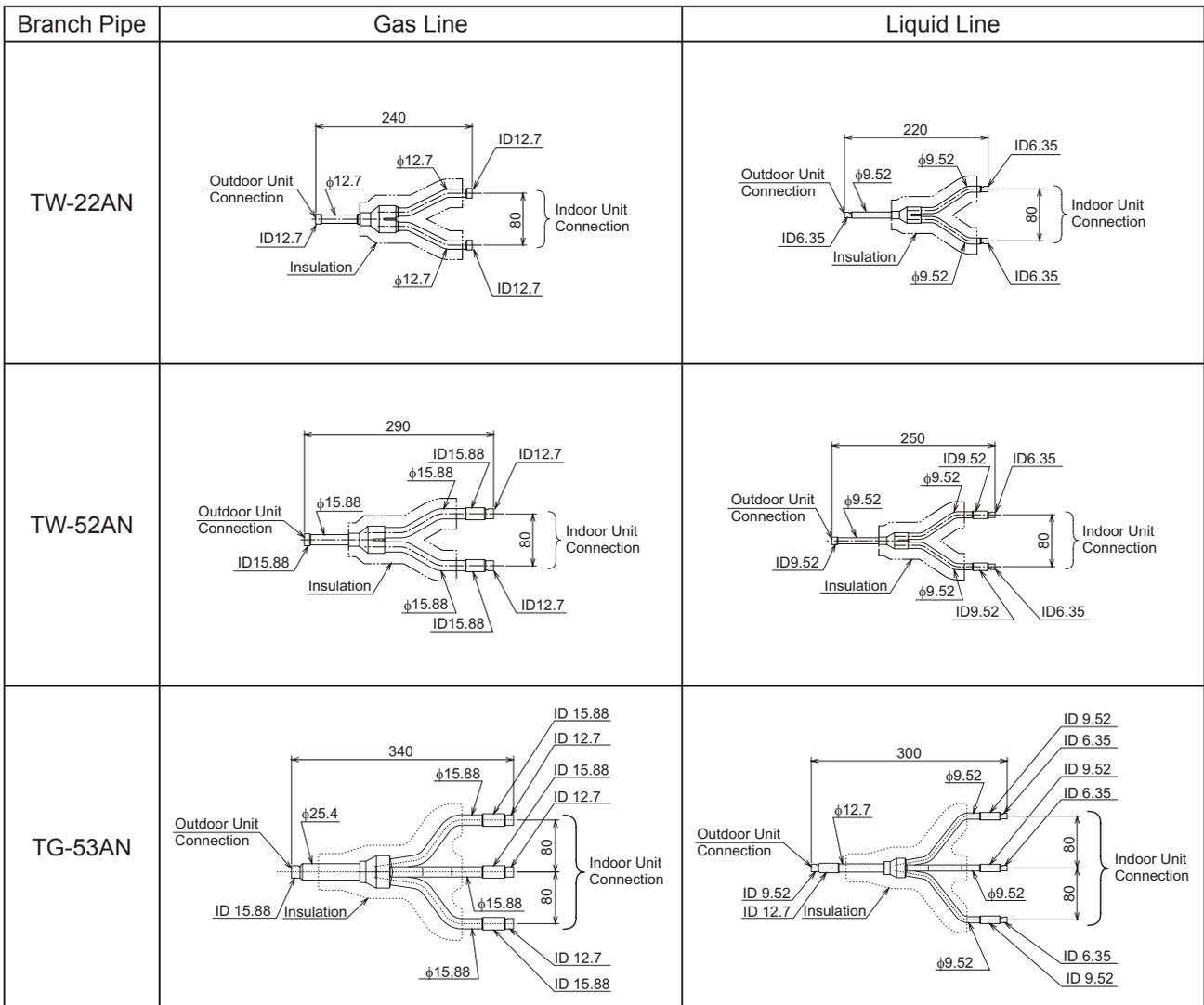
NOTES:

1. Do not use this drain boss set in a cold area, because the drain water may freeze.
2. This drain boss is not sufficient to collect all the drain water.
If collecting drain water is completely required, provide a drain-pan that is bigger than the unit base, and install it under the unit with drainage.

OPTIONAL ACCESSORIES

8.5 Branch Pipe: TW-22AN, TW-52AN, TG-53AN

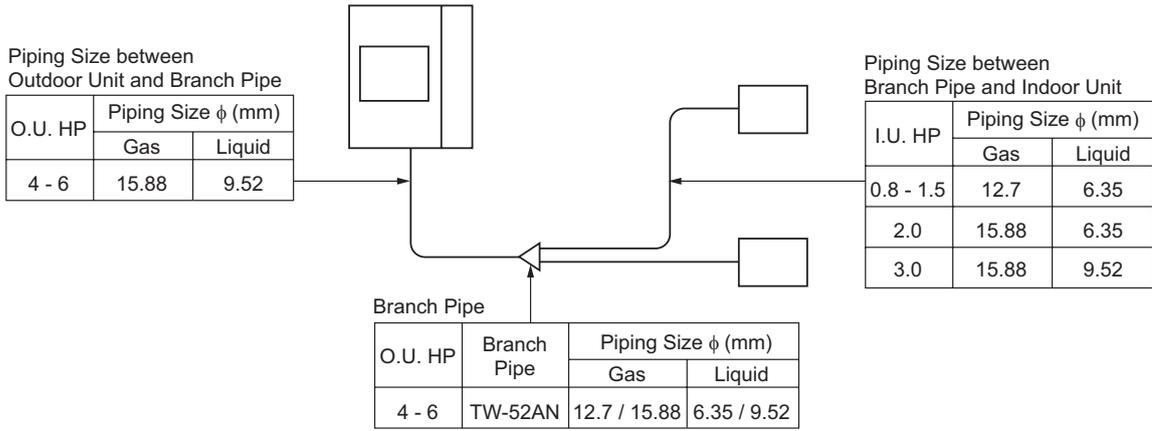
Combination	HP	Branch	Model
Twin	4 - 6	First Branch	TW-52AN
Triple	4 - 6	First Branch	TG-53AN
Quad	4	First Branch	TW-52AN
		Second Branch	TW-22AN x 2
	5, 6	First Branch	TW-52AN
		Second Branch	TW-52AN x 2



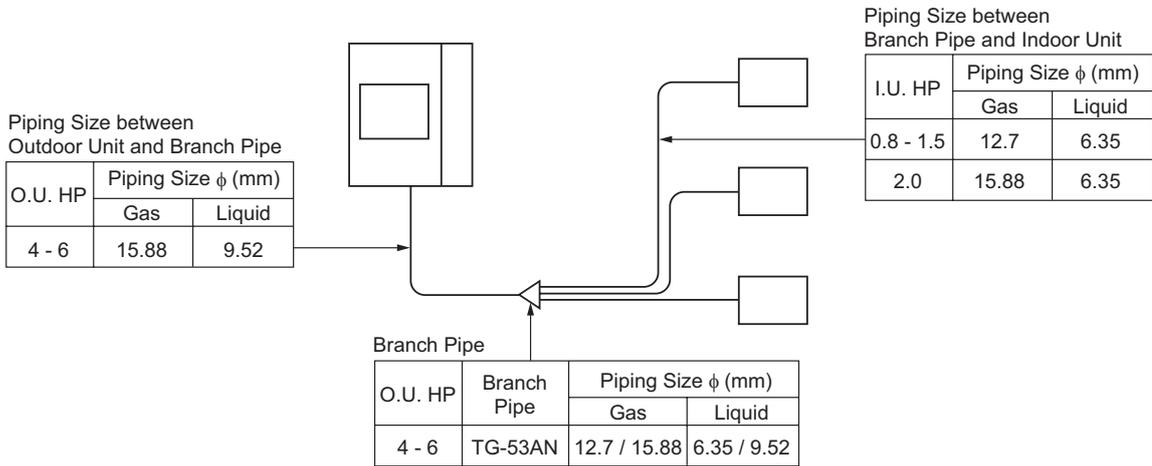
Unit: mm, ID: Inner Diameter, OD: Outer Diameter

< Combinations Example >

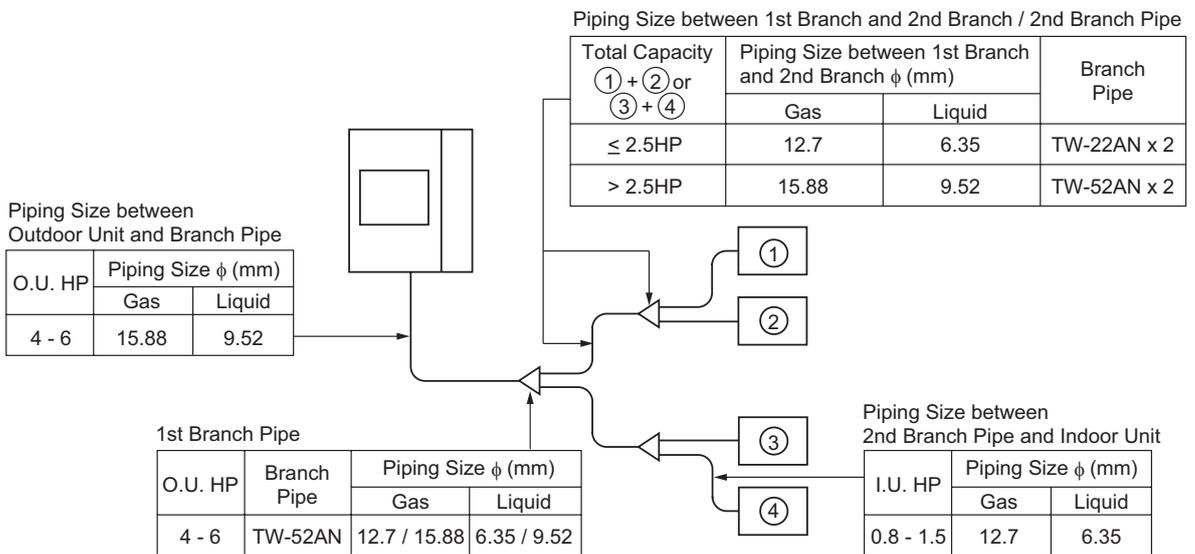
* Twin Combination



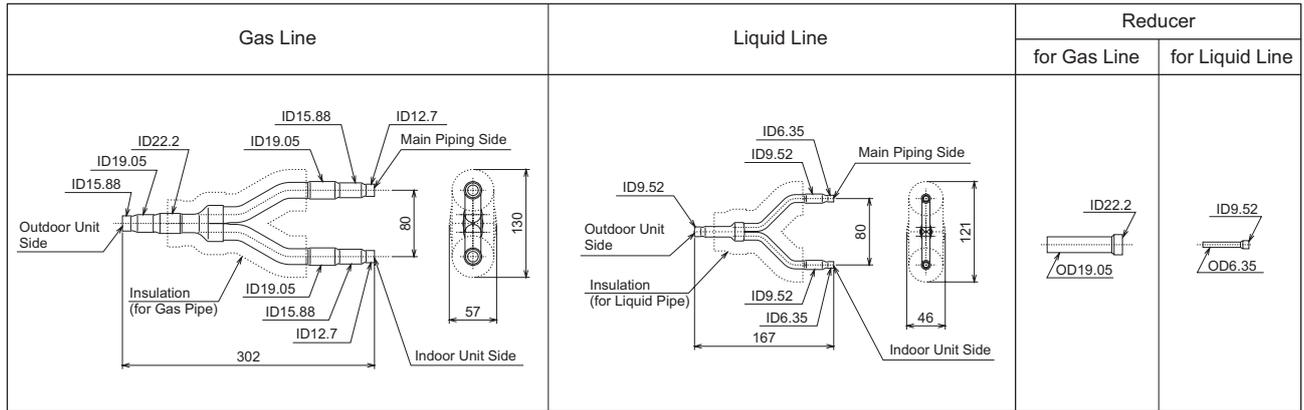
* Triple Combination



* Quad Combination

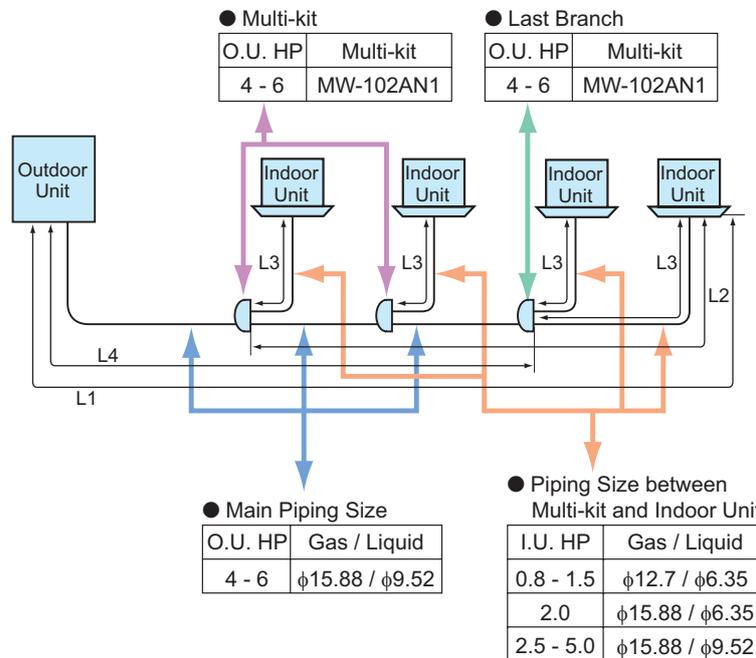


8.6 Multi-Kit for Line Branch: MW-102AN1



Unit: mm, ID: Inner Diameter, OD: Outer Diameter

< Line Branch for Multiple Connection >



		HP		
		4	5	6
Item				
Maximum Number of Connectable I.U.		2 - 4		
Refrigerant Piping Length: L1	Actual Length	≤ 70m	≤ 75m	
	Equivalent Length	≤ 90m	≤ 95m	
Piping Length between 1st Branch and Each I.U.: L2		≤ 20m		
Piping Length between Branch Pipe and Each I.U.: L3		≤ 10m		
Height Difference between O.U. and I.U.	O.U. is Higher	≤ 30m		
	O.U. is Lower	≤ 20m		
Height Difference between I.U. and I.U.		≤ 3m		
Total Piping Length: Sum of L3 + L4		≤ 70m	≤ 75m	

9. Component Data

Outdoor Heat Exchanger and Fan

Model		RAS-4HVNC1	RAS-5HVNC1	RAS-6HVNC1
Heat Exchanger Type		Multi-Pass Cross Finned Tube		
Tube Material		Copper Tube		
Outer Diameter	mm	7	7	7
Rows		2	2	2
Number of Tube/Coil		108	108	108
Fin Material		Aluminum		
Pitch	mm	1.4	1.4	1.4
Maximum Operating Pressure	MPa	4.15	4.15	4.15
Total Face Area	m ²	50.5	50.5	50.5
Number of Coil/Unit		1	1	1
Outdoor Fan		Direct Drive Propeller Fan		
Number/Unit		1	1	1
Outer Diameter	mm	544	544	544
Revolution	rpm	730	730	820
Nominal Air Flow	m ³ /min. (ℓ/s)	62 (1,033)	68 (1,133)	80 (1,333)
Outdoor Fan Motor		Drip-Proof Type Enclosure		
Starting Method				
Nominal Output	W	200	200	200
Quantity		1	1	1
Insulation Class		E	E	E

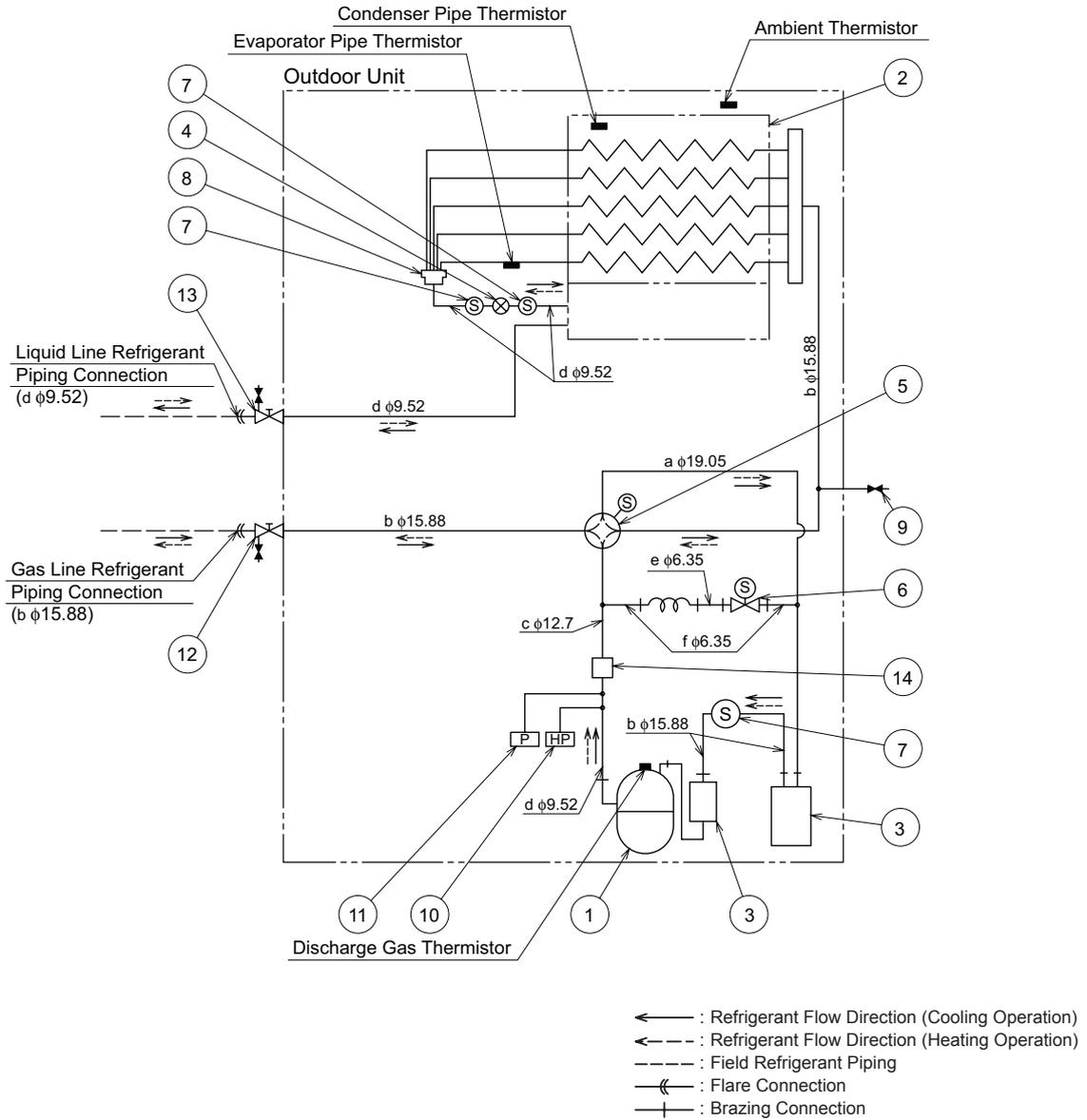
Compressor

Compressor Model		EU260XC1	HB36PHD-A1S2
Applicable Model		RAS-4HVNC1	RAS-5, 6HVNC1
Type		Hermetic Scroll	
Air Tight Pressure			
Discharge	MPa	4.15	4.15
Suction	MPa	2.21	2.21
Motor Type		Inverter-Driven	
Starting Method			
Poles		4	6
Insulation		E	E
Oil Type		HAF63D1 or α68HES-H	FVC68D

10. Control System

10.1 Refrigeration Cycle

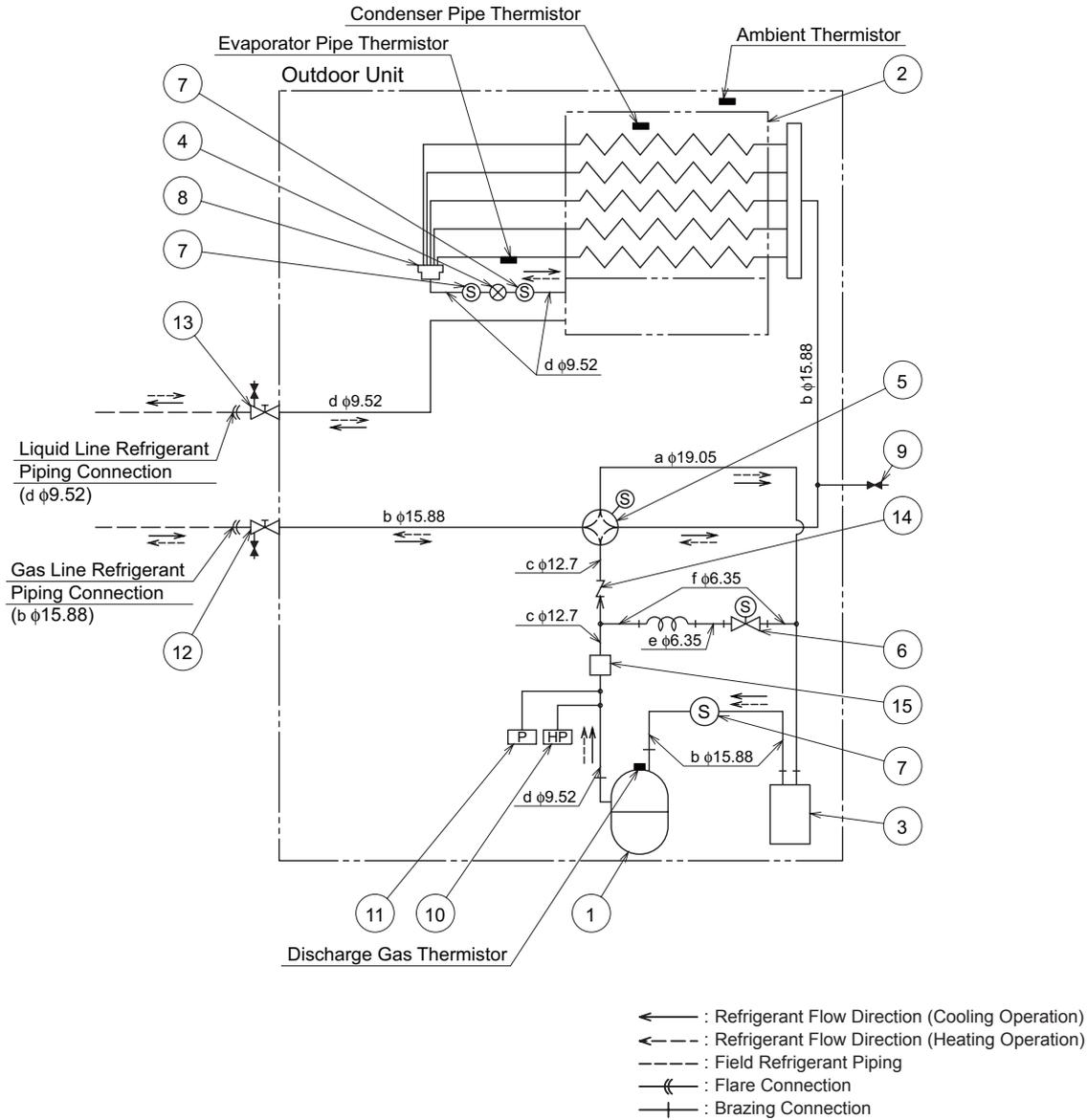
Model: RAS-4HVNC1



Mark	Part Name
1	Compressor
2	Heat Exchanger
3	Accumulator
4	Micro-Computer Control Expansion Valve
5	Reversing Valve
6	Solenoid Valve for Gas Bypass
7	Strainer
8	Distributor
9	Check Joint
10	High Pressure Switch for Protection
11	Pressure Switch for Control
12	Stop Valve for Gas Line
13	Stop Valve for Liquid Line
14	Silencer

Mark	OD x T	Material
a	19.05 x 1.2	C1220T-O
b	15.88 x 1.0	
c	12.7 x 1.0	
d	9.52 x 0.8	
e	6.35 x 1.07	
f	6.35 x 0.7	

Models: RAS-5HVNC1 and RAS-6HVNC1

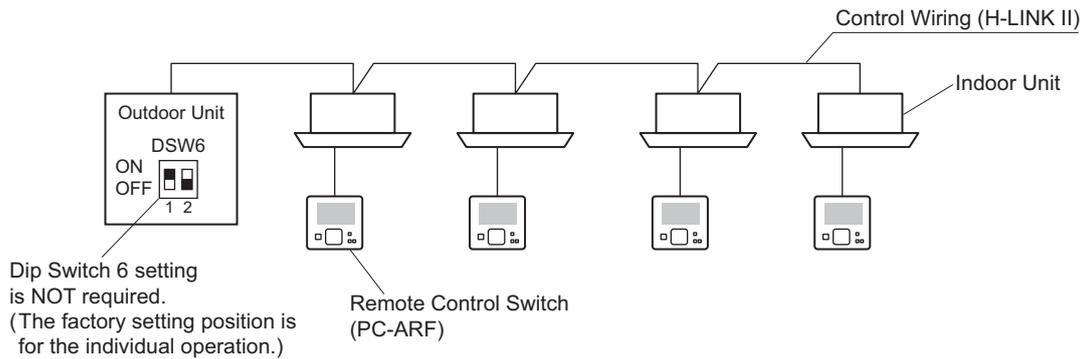


Mark	Part Name
1	Compressor
2	Heat Exchanger
3	Accumulator
4	Micro-Computer Control Expansion Valve
5	Reversing Valve
6	Solenoid Valve for Gas Bypass
7	Strainer
8	Distributor
9	Check Joint
10	High Pressure Switch for Protection
11	Pressure Switch for Control
12	Stop Valve for Gas Line
13	Stop Valve for Liquid Line
14	Check Valve
15	Silencer

Mark	OD x T	Material
a	19.05 x 1.2	C1220T-O
b	15.88 x 1.0	
c	12.7 x 1.0	
d	9.52 x 0.8	
e	6.35 x 1.07	
f	6.35 x 0.7	

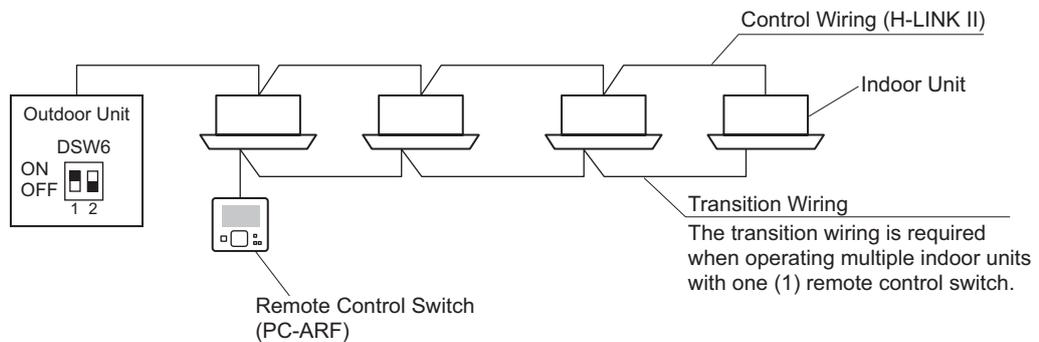
10.2 System Control

10.2.1 Individual Operation



< Individual Thermo ON/OFF Operation >

The individual Thermo ON/OFF is available to be controlled each indoor unit even if multiple indoor units are controlled simultaneously by one remote control switch.



Control Method	by each Optional Remote Control Switch
Operation Method	by One Group
(1) ON/OFF	Yes
(2) Setting of Operation Mode	Yes *1)
(3) Room Temperature Setting	Yes
(4) Fan Speed Setting	Yes
(5) Timer Setting	Yes
(6) ON/OFF by Timer Control	Yes
(7) Operation Indication	Yes
(8) Alarm Indication	Yes
(9) Self-Checking	Yes
(10) Test Mode	Yes
(11) Individual Louver Setting	Yes *2)
(12) Motion Sensor Setting	Yes *3)

Yes : Available

*1) : Cooling and heating can not be operated simultaneously.

*2) : Only for RCI-FSN3 series with PC-ARF

*3) : Only for RCI-FSN3 + P-AP160NAE + PC-ARF

Do not mix other indoor unit, air panel (P-AP160NA1) and remote control switch (PC-AR) if set from one remote control switch.

NOTE:

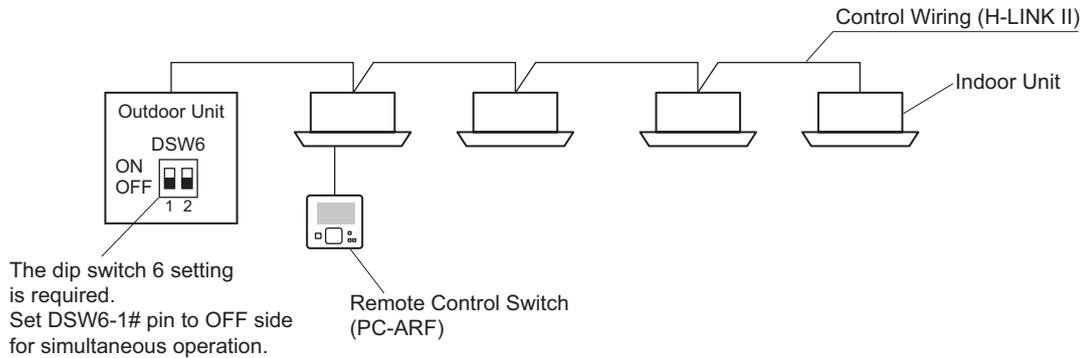
The detail of electrical wiring shall be referred to "Installation and Maintenance Manual" of each.

10.2.2 Simultaneous Operation

This unit can be operated simultaneously with twin, triple and quad combinations.

One remote control switch (PC-ARF) can control without transition wiring up to 4 units of FSN2 series or later model types (H-LINK II supported models) simultaneously.

(Available if it is with the transition wiring.)



Control Method	by One Optional Remote Control Switch
Operation Method	by One Group
(1) ON/OFF	Yes
(2) Setting of Operation Mode	Yes *1)
(3) Room Temperature Setting	Yes
(4) Fan Speed Setting	Yes
(5) Timer Setting	Yes
(6) ON/OFF by Timer Control	Yes
(7) Operation Indication	Yes
(8) Alarm Indication	Yes
(9) Self-Checking	Yes
(10) Test Mode	Yes
(11) Individual Louver Setting	Yes *2)
(12) Motion Sensor Setting	Yes *3)

Yes: Available

*1): Only if all units in one group are connected to the same outdoor unit.

*2): Only for RCI-FSN3 series with PC-ARF

*3): Only for RCI-FSN3 + P-AP160NAE + PC-ARF

Do not mix other indoor unit, air panel (P-AP160NA1) and remote control switch (PC-AR) if set from one remote control switch.

NOTE:

The detail of electrical wiring shall be referred to "Installation and Maintenance Manual" of each.

10.3 General Description of Refrigerant Cycle Control

No.	Item		Detail
1	Cooling Operation	Comp. Frequency Control	To determine the compressor frequency depending on (a) and (b).
		for Individual Operation	To determine the compressor frequency from (a), (b) and (c).
		Indoor Exp. Valve Control	Quasi PI Control: To determine the indoor expansion valve opening so as to keep (d) at an optimum value.
		for Individual Operation	To change the indoor expansion valve opening when the number of operating indoor units is changed.
		Outdoor Exp. Valve Control	EVO: 480pls (Fully Opened)
		Outdoor Fan Control	To control the fan steps so that the heat exchanger temperature is within a stable temperature range.
		Reversing Valve Control	Reversing Valve: OFF
		Control of Solenoid Valve for High/Low Pressure Bypass (SVA)	at Start-up and when High Pressure Increase Protection activated: ON
	High/Low Pressure Control	SVA: ON (during Operation Stop)	
2	Heating Operation	Comp. Frequency Control	To determine the compressor frequency depending on (a) and (b).
		for Individual Operation	To determine the compressor frequency from (a), (b) and (c).
		Indoor Exp. Valve Control	To determine the indoor expansion valve opening so that the indoor liquid pipe temperature (trl) is at an optimum level.
		for Individual Operation	To change the indoor expansion valve opening when the number of operating indoor units is changed.
		Outdoor Exp. Valve Control	Quasi PI Control: To determine the outdoor expansion valve opening so as to keep the temperature at the top of the compressor at an optimum level.
		for Individual Operation	When Operating Indoor Unit Number Changed: To determine the outdoor expansion valve opening from the compressor frequency ratio before/after the change and Quasi PI Control.
		Outdoor Fan Control	To control the fan steps depending on the outdoor liquid pipe temperature and temperature at the top of the compressor.
		Reversing Valve Control	Reversing Valve: ON
	Control of Solenoid Valve for High/Low Pressure Bypass (SVA)	at Start-up and when High Pressure Increase Protection activated: ON	
	High/Low Pressure Control	SVA: ON (during operation stop)	
3	Defrosting Operation	Comp. Frequency Control	Fixed Compressor Frequency
		Indoor Exp. Valve Control	To determine the indoor expansion valve opening depending on the temperature at the top of the compressor (Td).
		Outdoor Exp. Valve Control	EVO: 480pls (Fully Opened)
		Outdoor Fan Control	To stop the outdoor fan.
		Reversing Valve Control	Reversing Valve: OFF
		Control of Solenoid Valve for High/Low Pressure Bypass (SVA)	at Start-up: ON
4	Comp. Preheating Control	Crankcase Heater Control	

- (a): Difference between Indoor Inlet Air Temperature and Setting Temperature
- (b): Amount of Temperature Difference Change
- (c): Capacity Ratio between Operating Indoor Unit and Outdoor Unit
- (d): Temperature Difference between Indoor Gas Pipe and Indoor Liquid Pipe
(= Indoor Gas Pipe Temperature - Indoor Liquid Pipe Temperature)

■ Compressor Capacity Control

Compressor frequency is determined by multiplying the compressor frequency depending on the capacity of operating indoor units by the factor in the table below. In a normal operating state (except in a transient control state of startup control, defrosting control, etc.), compressor frequency is controlled depending on difference between indoor inlet air temperature and setting temperature and amount of temperature difference change.

< Cooling Operation >

	$Q_c \leq -4$	$-4 < Q_c \leq -2$	$-2 < Q_c \leq -1$	$-1 < Q_c \leq 0$	$0 < Q_c \leq 1$	$1 < Q_c \leq 3$	$3 < Q_c$
$\Delta T_c \leq 0$	0.25	0.30	0.35	0.40	0.45	0.50	0.55
$\Delta T_c = 1$	0.35	0.40	0.45	0.50	0.55	0.60	0.65
$\Delta T_c = 2$	0.50	0.55	0.60	0.65	0.70	0.75	0.80
$\Delta T_c = 3$	0.65	0.70	0.75	0.80	0.85	0.90	0.95
$\Delta T_c = 4$	0.75	0.80	0.85	0.90	0.95	1.00	1.05
$\Delta T_c = 5$	0.85	0.90	0.95	1.00	1.05	1.10	1.15
$\Delta T_c = 6$	0.85	0.90	0.95	1.00	1.05	1.10	1.15
$\Delta T_c = 7$	0.90	0.95	1.00	1.05	1.10	1.15	1.20
$\Delta T_c = 8$	0.95	1.00	1.05	1.10	1.15	1.20	1.20
$\Delta T_c = 9$	1.00	1.05	1.10	1.15	1.20	1.20	1.20
$\Delta T_c \geq 10$	1.05	1.10	1.15	1.20	1.20	1.20	1.20

NOTES:

1. $\Delta T_c (n)$: Indoor Inlet Air Temp. - Setting Temp.
2. $\Delta T_c (n-1)$: Last Time $\Delta T_c (n)$
3. Q_c : $\Delta T_c (n) - \Delta T_c (n-1)$

< Heating Operation >

	$Q_h \leq -4$	$-4 < Q_h \leq -2$	$-2 < Q_h \leq -1$	$-1 < Q_h \leq 0$	$0 < Q_h \leq 1$	$1 < Q_h \leq 3$	$3 < Q_h$
$\Delta T_h \leq 0$	0.25	0.30	0.35	0.40	0.45	0.50	0.55
$\Delta T_h = 1$	0.35	0.40	0.45	0.50	0.55	0.60	0.65
$\Delta T_h = 2$	0.50	0.55	0.60	0.65	0.70	0.75	0.80
$\Delta T_h = 3$	0.65	0.70	0.75	0.80	0.85	0.90	0.95
$\Delta T_h = 4$	0.75	0.80	0.85	0.90	0.95	1.00	1.05
$\Delta T_h = 5$	0.85	0.90	0.95	1.00	1.05	1.10	1.15
$\Delta T_h = 6$	0.85	0.90	0.95	1.00	1.05	1.10	1.15
$\Delta T_h = 7$	0.90	0.95	1.00	1.05	1.10	1.15	1.20
$\Delta T_h = 8$	0.95	1.00	1.05	1.10	1.15	1.20	1.20
$\Delta T_h = 9$	1.00	1.05	1.10	1.15	1.20	1.20	1.20
$\Delta T_h \geq 10$	1.05	1.10	1.15	1.20	1.20	1.20	1.20

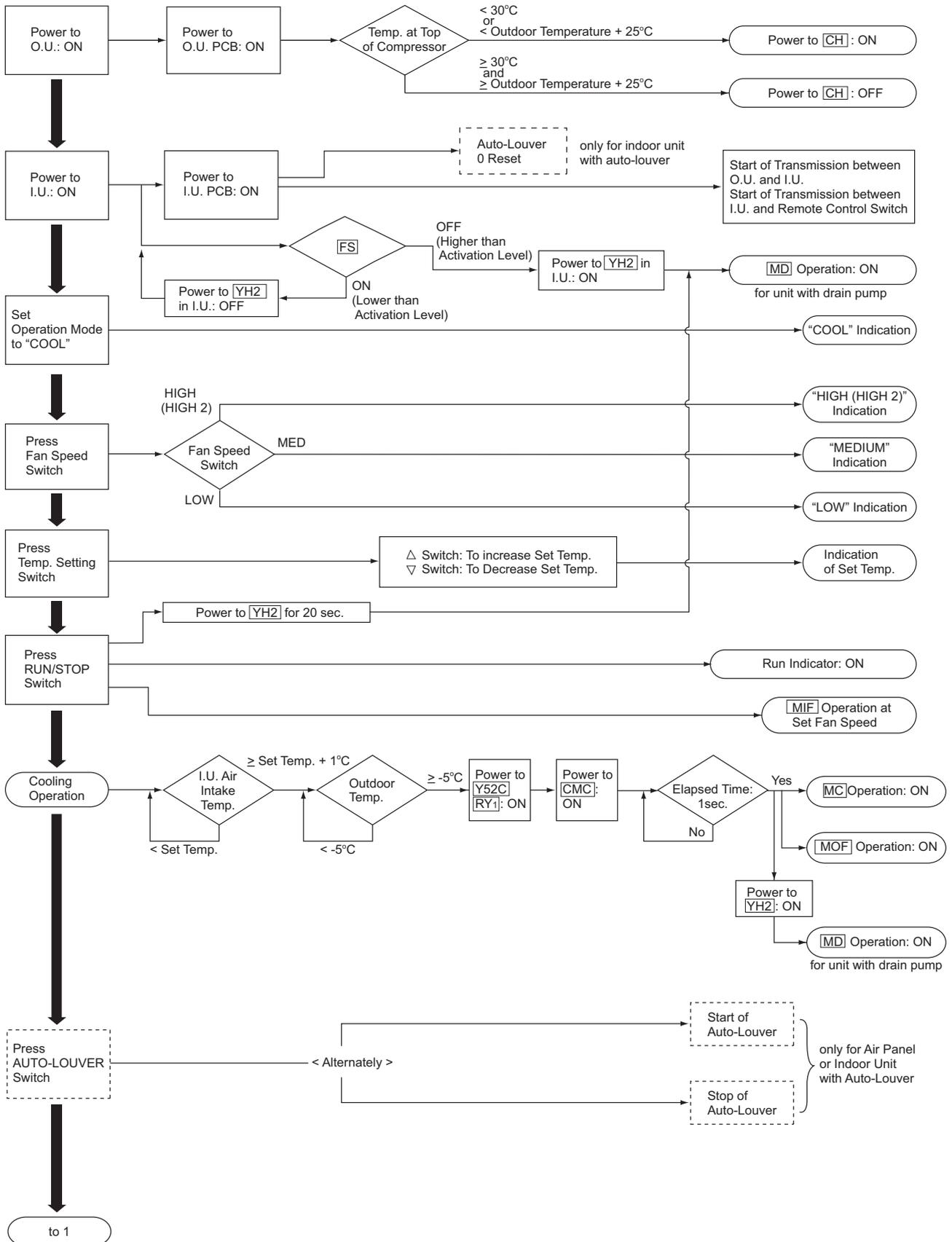
NOTES:

1. $\Delta T_h (n)$: Setting Temp. - Indoor Inlet Air Temp.
2. $\Delta T_h (n-1)$: Last Time $\Delta T_h (n)$
3. Q_h : $\Delta T_h (n) - \Delta T_h (n-1)$

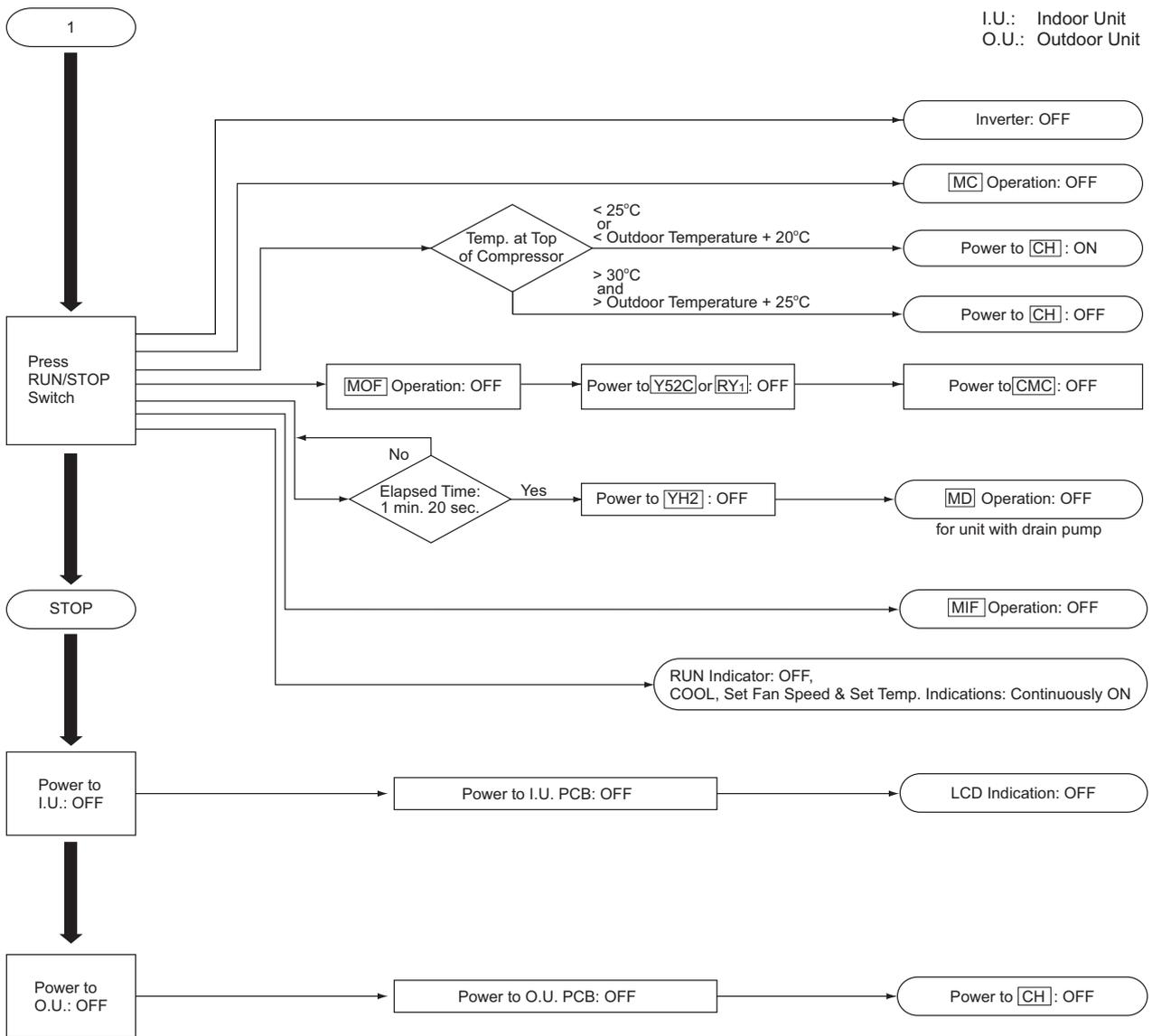
10.4 Standard Operation Sequence

■ Cooling Operation

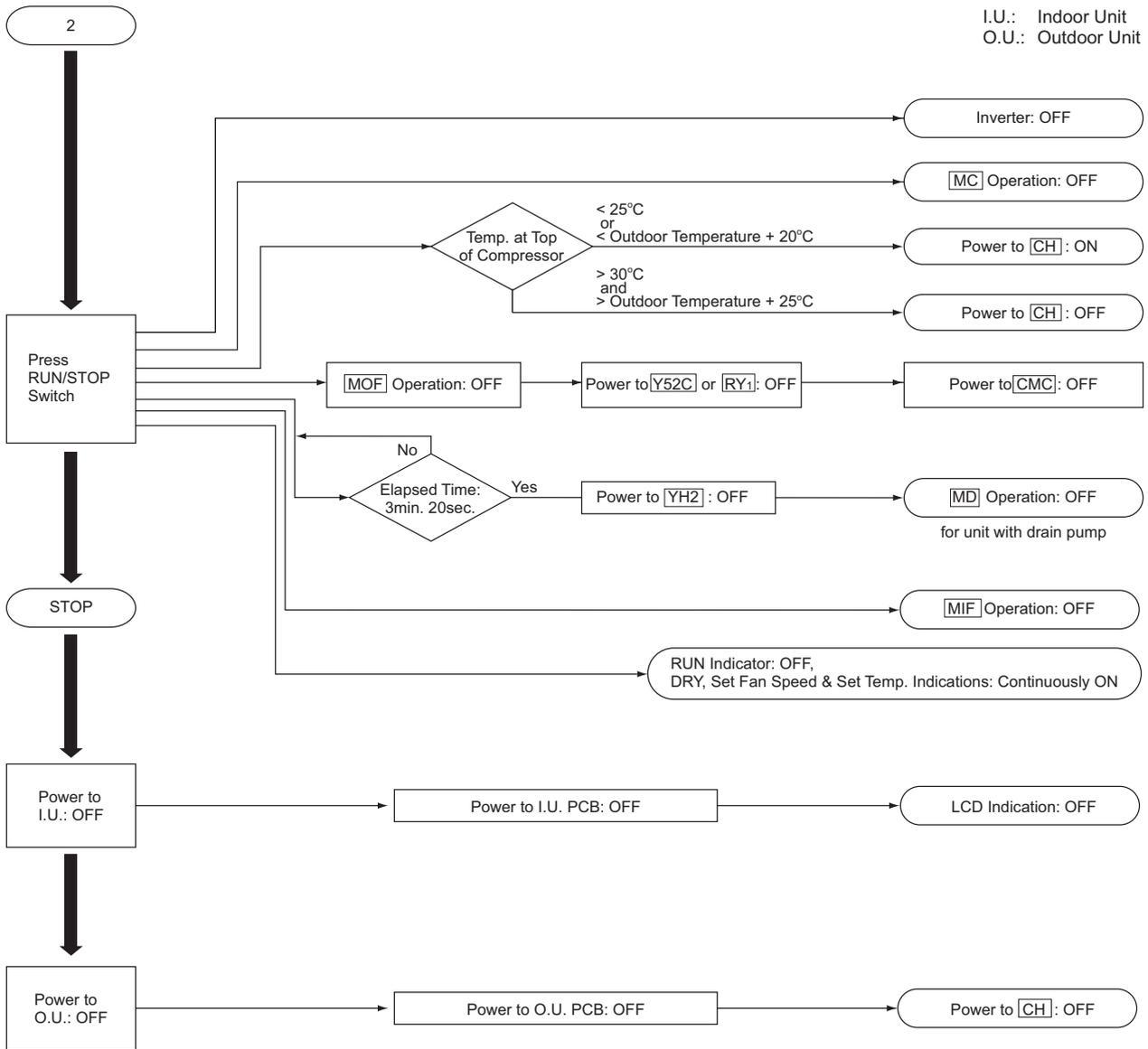
I.U.: Indoor Unit
O.U.: Outdoor Unit



■ Cooling Operation



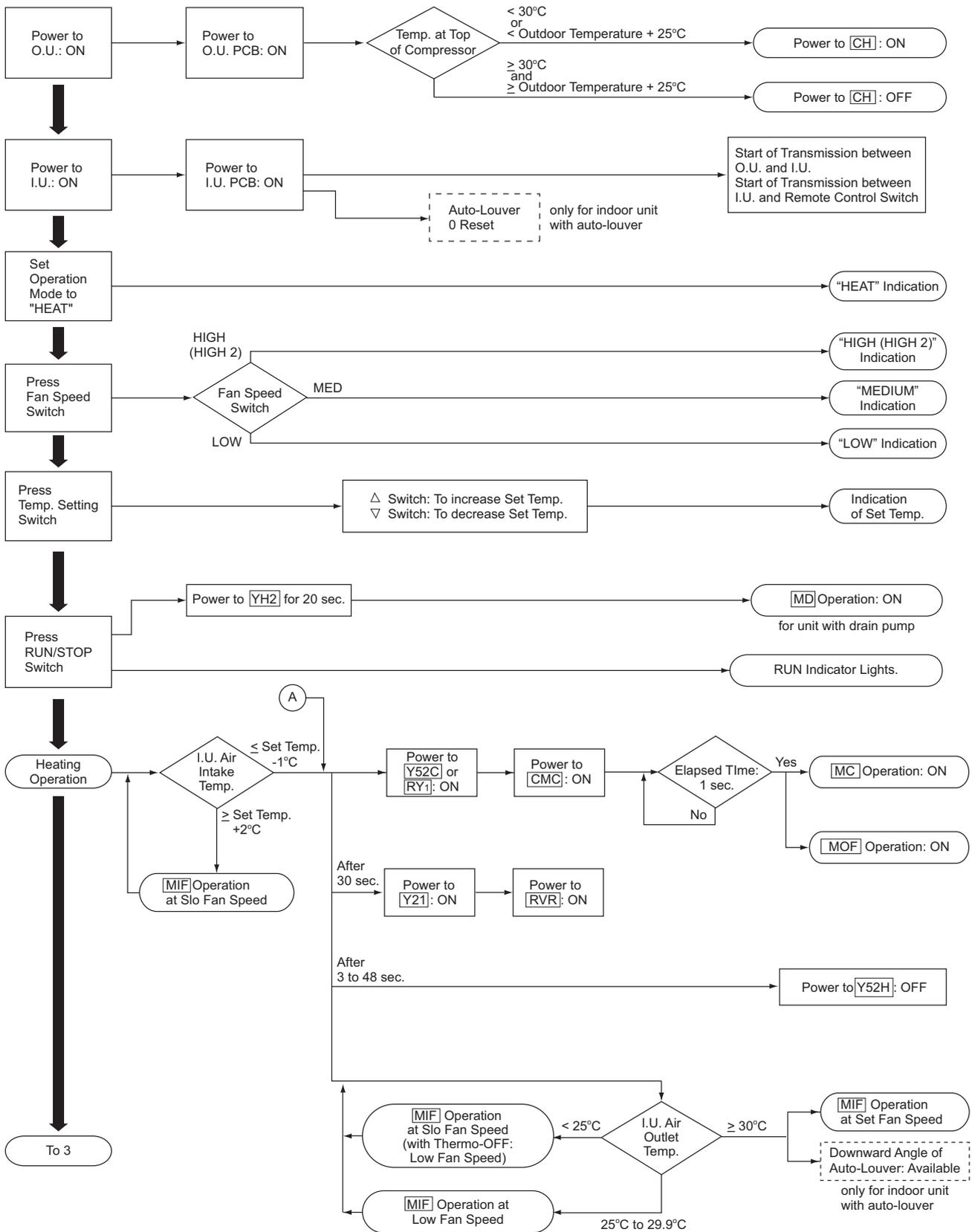
■ Dry Operation



CONTROL SYSTEM

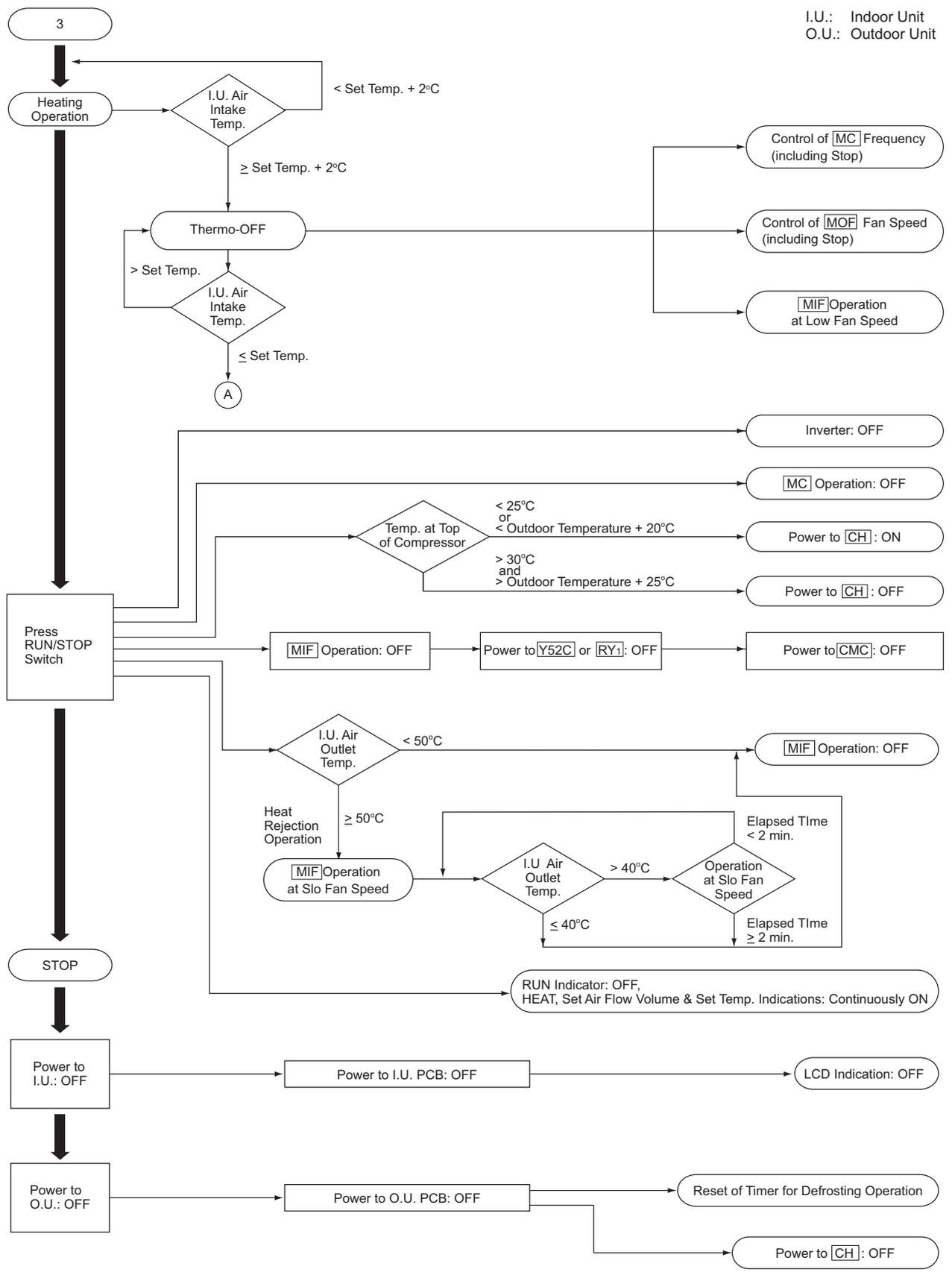
■ Heating Operation

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



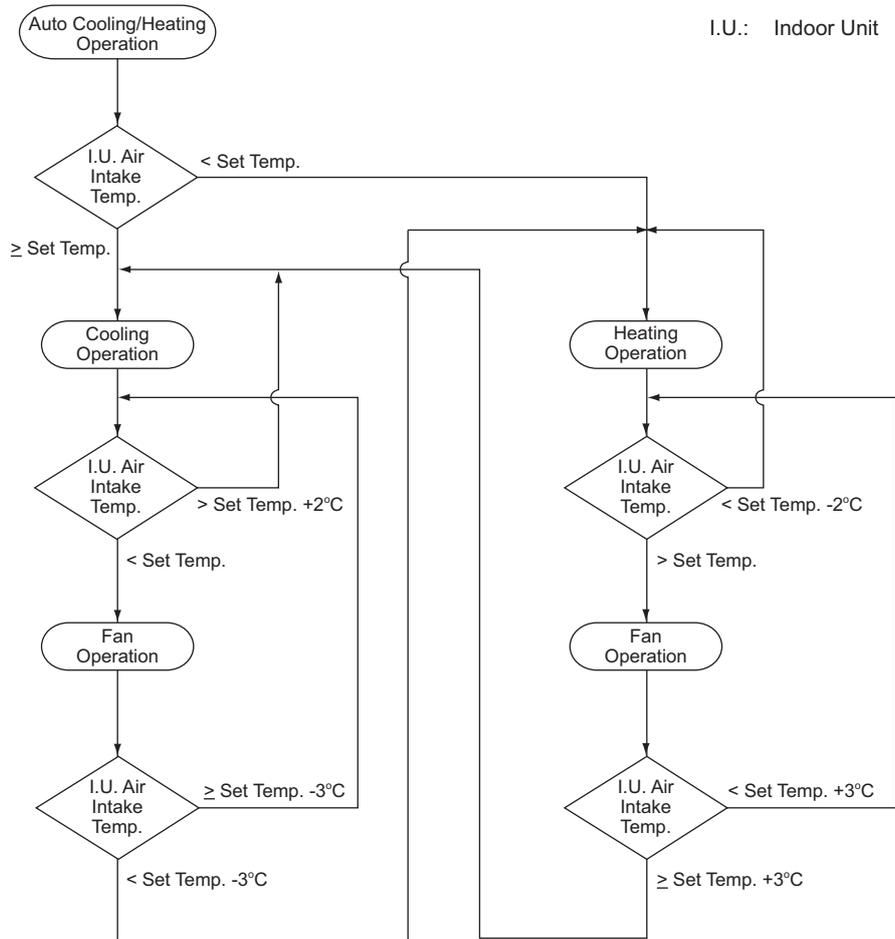
■ Heating Operation

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



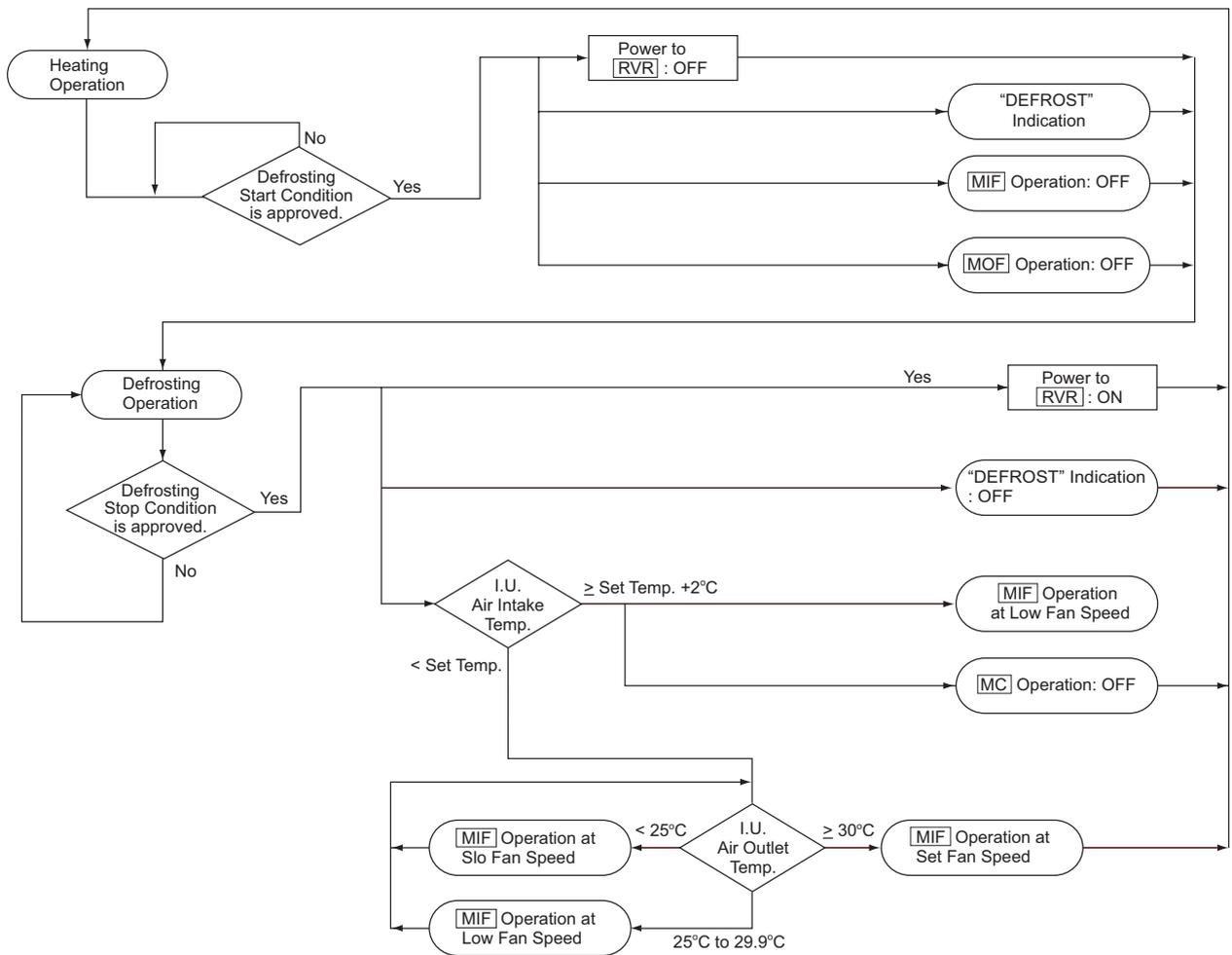
■ Automatic Cooling and Heating Operation

It is applicable only for single.



■ Defrosting Operation

I.U.: Indoor Unit



< Defrosting Operation >

The following defrosting operations, “Standard Defrost”, “Forced Defrost” and “Manual Defrost” are available.

- (1) Standard Defrost
This operation starts according to the outdoor temperature, the outdoor evaporating temperature and the operating time.
- (2) Forced Defrost
This operation starts when the indoor unit repeats Thermo-ON/OFF operation and therefore cannot start the “Standard Defrost.”
- (3) Manual Defrost
This operation starts when the push switch “PSW1” on the outdoor unit PCB is pressed for more than 3 seconds during maintenance, etc. (This function cannot be used when the pressure and the outdoor evaporating temperature is high or at the beginning of the operation.)

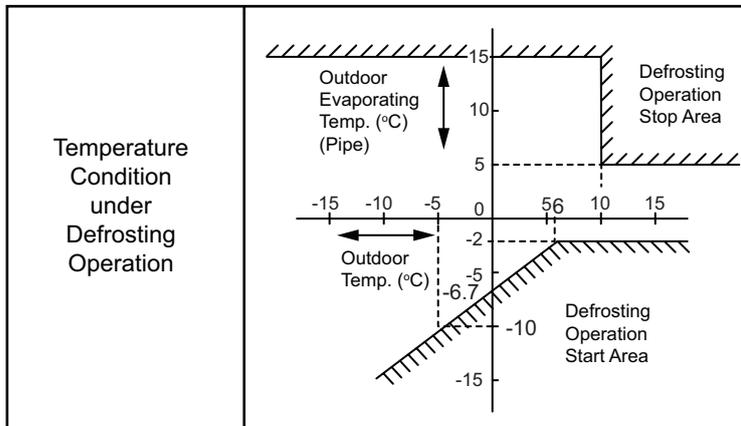
NOTE:

Do not repeat “Manual Defrost” frequently.

< Condition for Starting Defrosting Operation >

(1) Standard Defrost

(a) Temperature Condition



(b) Condition of Operating Time for Defrosting Operation Start

The defrosting operation starts when the temperature condition shown in “(a) Temperature Condition” is met after the heating operation of 40 to 120 minutes. The heating operation time is determined by estimating the amount of frost on the heat exchanger.

(2) Forced Defrost

The “Forced Defrost” starts when all the following conditions are met.

- (a) The reversing valve is “ON” for more than 120 minutes.
- (b) The outdoor temperature is 10°C or lower.
- (c) The accumulated heating operation time is more than 60 minutes.
(The accumulated time is reset when the operation is stopped or the defrosting operation is performed.)
- (d) The compressor is operated continuously for more than 1 and a half minutes.
- (e) The outdoor evaporating temperature is lower than 5°C right before the operation starts.
- (f) The pressure switch for control is “OFF”.

< Condition for Completing Defrosting Operation >

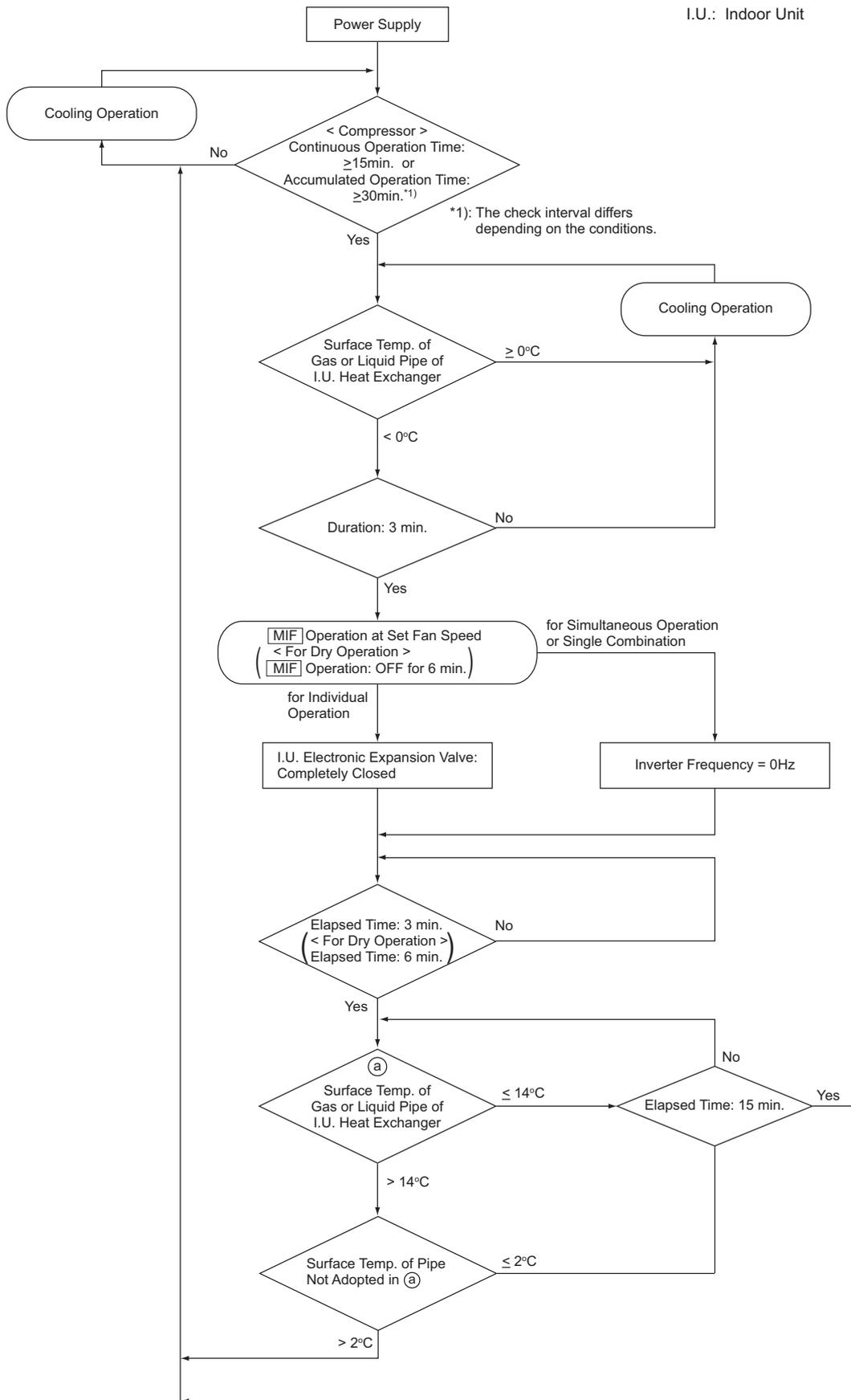
The defrosting operation stops when any of the following conditions is met.

- (1) The outdoor evaporating temperature reaches 25°C within 2 minutes after the defrosting operation starts.
- (2) The outdoor evaporating temperature reaches 15°C (the outdoor temperature < 10°C) and high pressure reaches 1.5MPa after a lapse of 2 minutes or more from the defrosting operation start.
- (3) The outdoor evaporating temperature reaches 5°C (the outdoor temperature ≥ 10°C) after a lapse of 2 minutes or more from the defrosting operation start.
- (4) The temperature at the top of the compressor reaches 132°C.
- (5) The pressure switch for control is “ON”.
- (6) The high pressure reaches 3.3MPa within 20 seconds after the defrosting operation starts.
- (7) The high pressure reaches 3.1MPa after a lapse of 2 minutes or more from the defrosting operation start.
- (8) More than 9 minutes have passed from the defrosting operation start.

NOTE:

The defrosting operation does not start immediately even if the above conditions are met, because these conditions may be met temporarily depending on the refrigerant cycle variability. The defrosting operations start when these conditions are met continuously for a certain period of time.

■ Freezing Protection Control during Cooling or Dry Operation



■ Prevention Control for High Pressure Increase during Cooling Operation

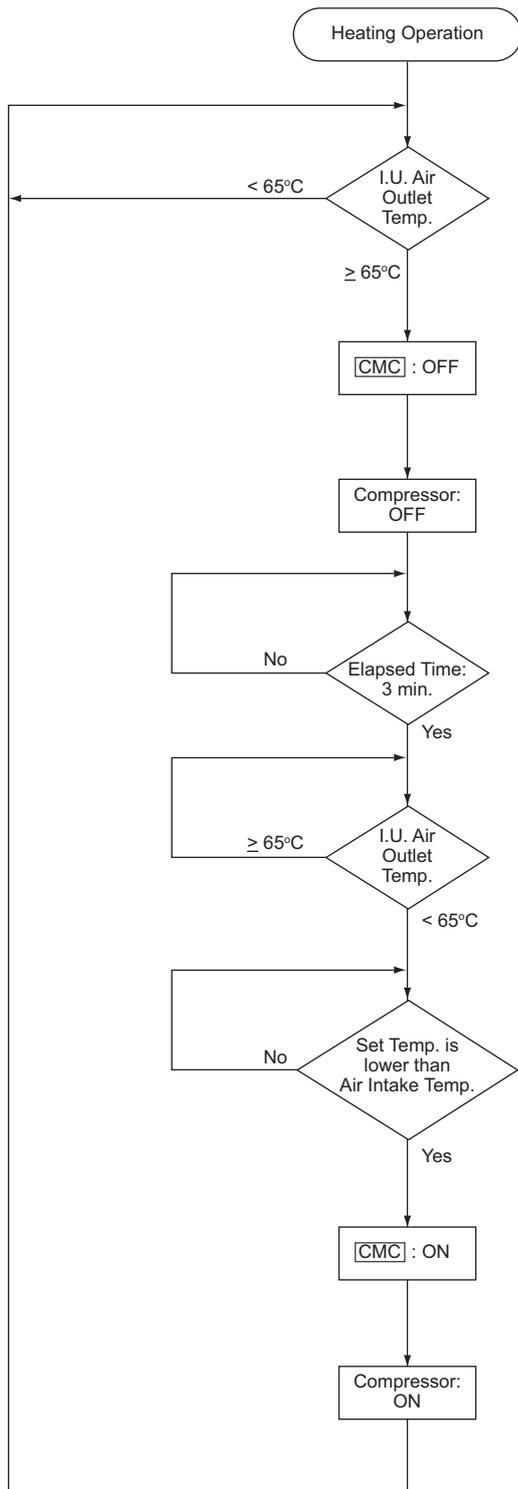
This function is utilized to prevent the abnormal condition (Alarm Code: 02) that the air flow volume is decreased by a seasonal wind against the air outlet of the outdoor unit. When the following conditions are met, the forced Thermo-OFF operation will be performed.

The cause of stoppage is "13" during Thermo-OFF.

- (1) **Y52C** is turned "ON" during cooling operation, or **RY1** is turned "ON" (during the compressor operation).
- (2) Pressure Switch for Control is turned ON (ON: 3.6MPa / OFF: 2.85MPa)
- (3) Condensation temperature $\geq 62^{\circ}\text{C}$

■ Prevention Control for Excessively High Discharge Gas Temperature

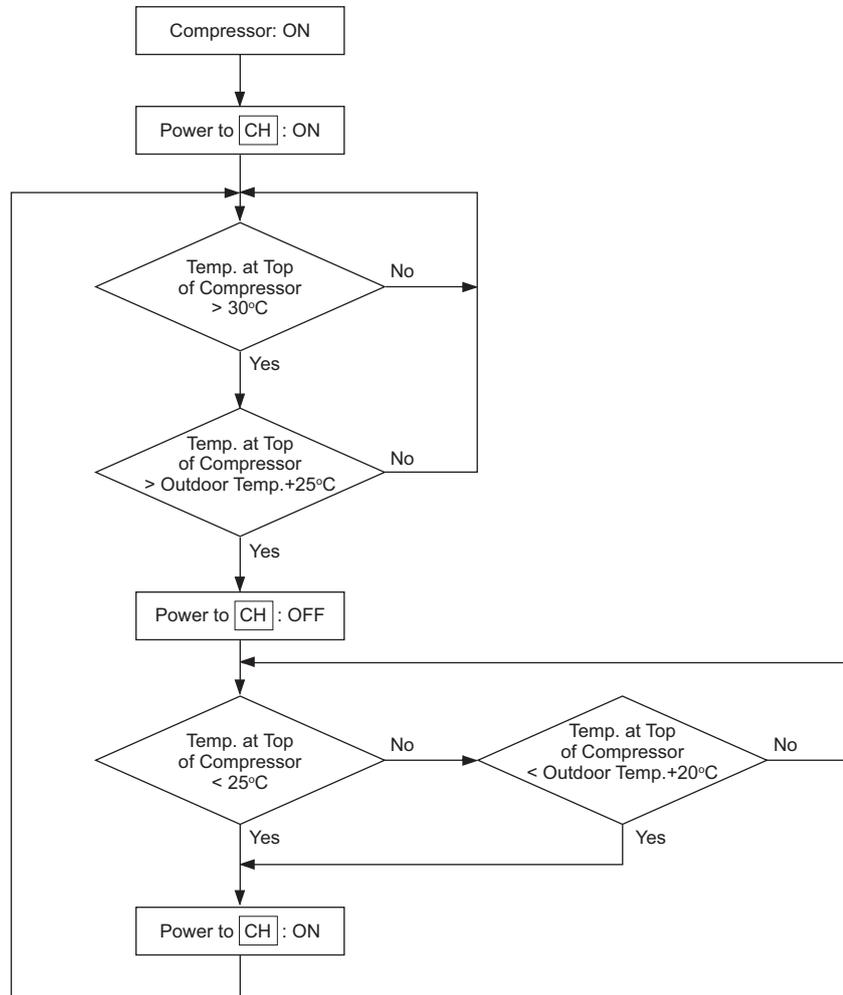
I.U.: Indoor Unit



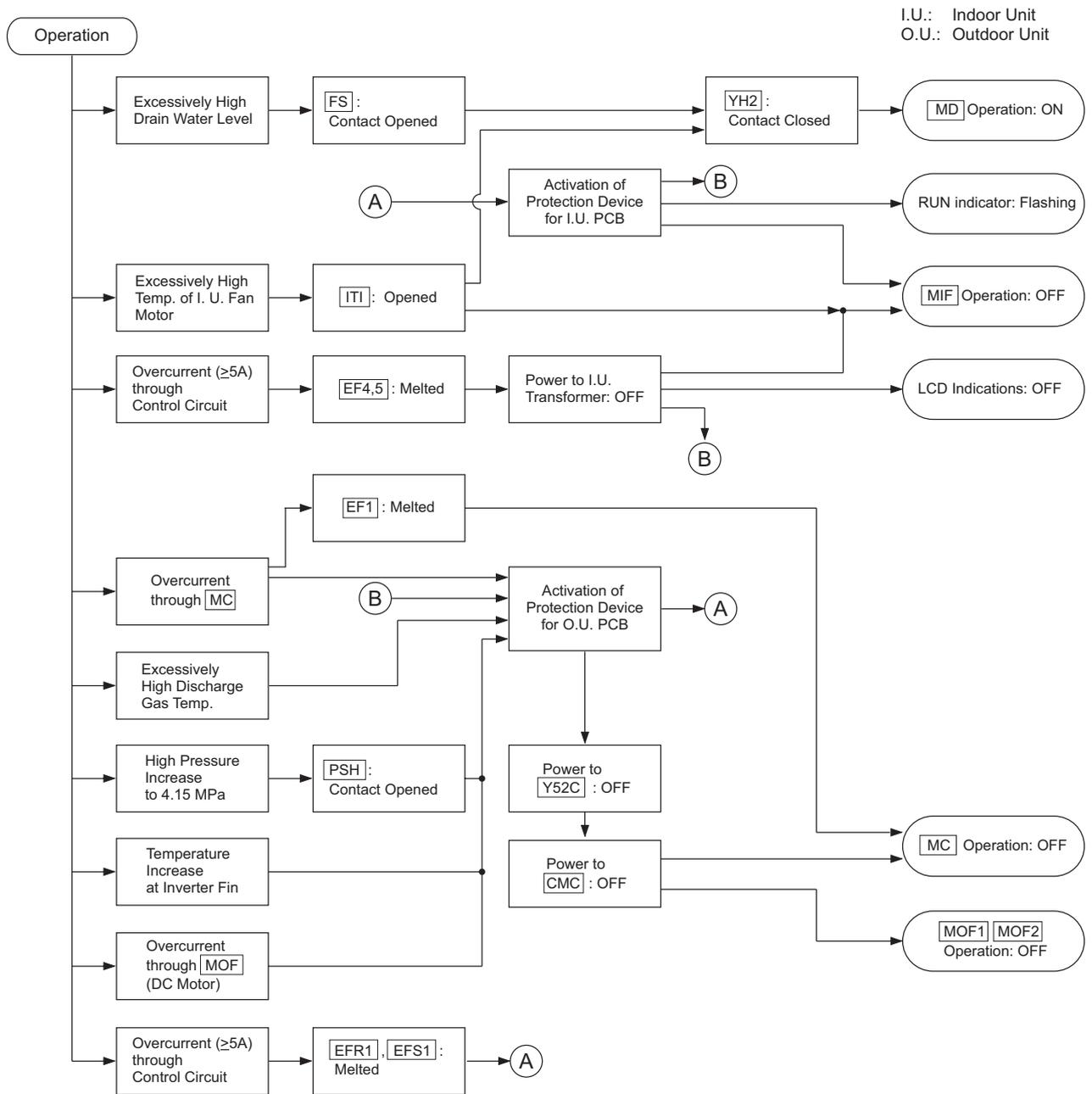
Thermo-ON/OFF Control for Indoor Unit

■ Control for Crankcase Heater

< During Compressor Shutdown / During Compressor Operation >



■ Activation of Protection Instrument



10.5 Protection and Safety Control

Compressor Protection

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

High Pressure Switch - This switch cuts out the operation of the compressor when the discharge pressure exceeds the setting.

Crankcase Heater - This band type heater protects against oil Carry-over during cold starting, as it is energized while the compressor is stopped.

Fan Motor Protection

Internal Protection Device in the fan motor, this device cuts out the operation of the fan motor when the fan motor current exceeds the setting.

Chip Ceramic

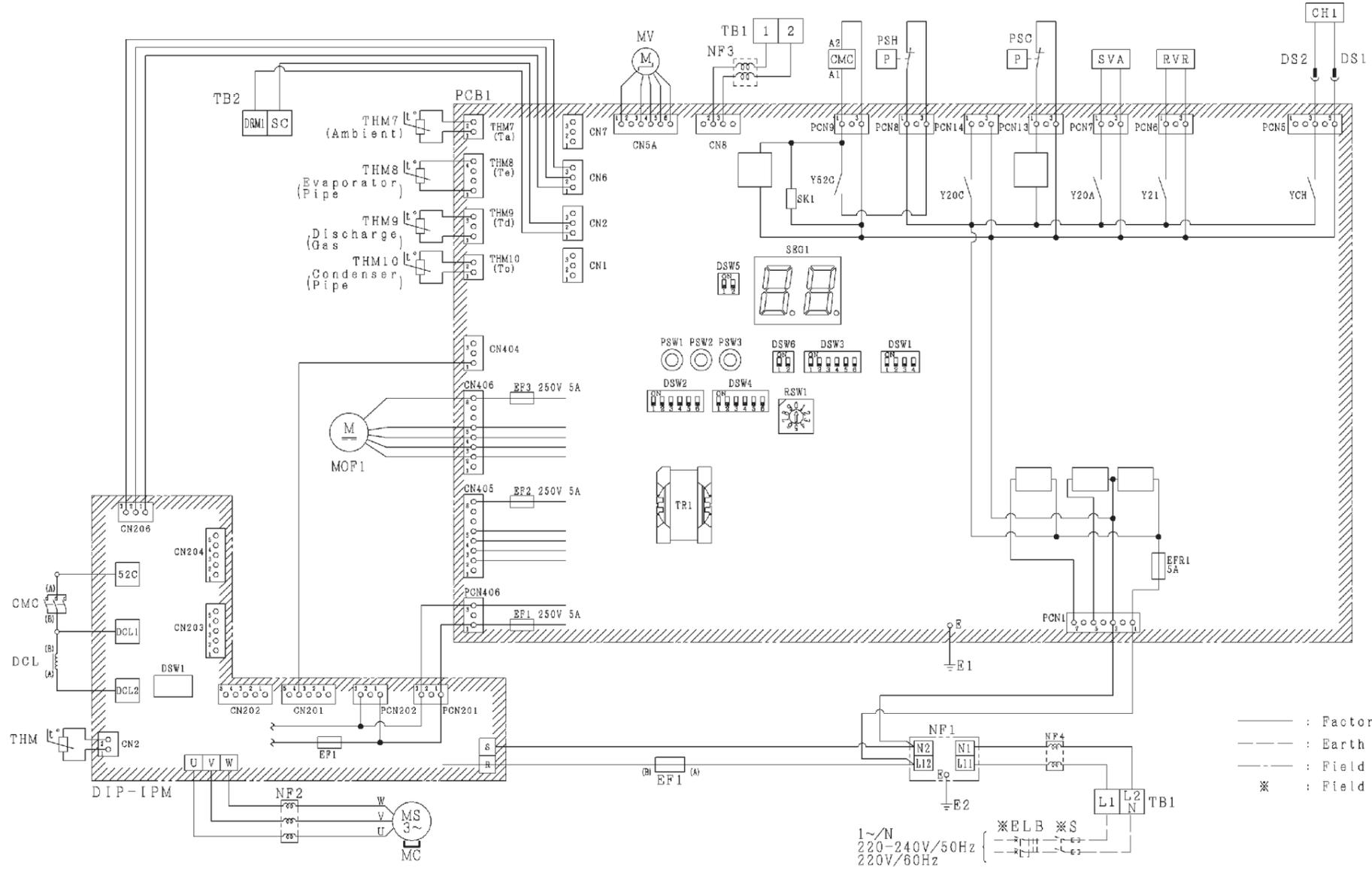
PTC Thermistor (POSISTOR ®) in the DC fan motor, this device control the fan motor revolution when the fan motor internal temperature exceeds the setting.

10.6 Safety and Control Device Setting

Model			RAS-4HVNC1	RAS-5HVNC1	RAS-6HVNC1
For Compressor Pressure Switch			Automatic Reset, Non-adjustable (each one for each compressor)		
High	Cut-Out	MPa	4.15 ^{-0.05} _{-0.15}	4.15 ^{-0.05} _{-0.15}	4.15 ^{-0.05} _{-0.15}
	Cut-In	MPa	3.20±0.15	3.20±0.15	3.20±0.15
Low	Cut-Out	MPa	0.30±0.05	0.30±0.05	0.30±0.05
	Cut-In	MPa	0.20±0.03	0.20±0.03	0.20±0.03
Fuse					
1φ, 220/240V, 50Hz					
1φ, 220V, 60Hz		A	40	40	40
CCP Timer			Non-Adjustable		
Setting Time		min.	3	3	3
For Condenser Fan Motor Internal Thermostat			Automatic Reset, Non-Adjustable (each one for each motor)		
For Control Circuit					
Fuse Capacity on PCB		A	5	5	5

10.7 Electrical Wiring Diagram

ELECTRICAL WIRING DIAGRAM (FOR MODELS: RAS-4HVNC1, RAS-5HVNC1 AND RAS-6HVNC1)

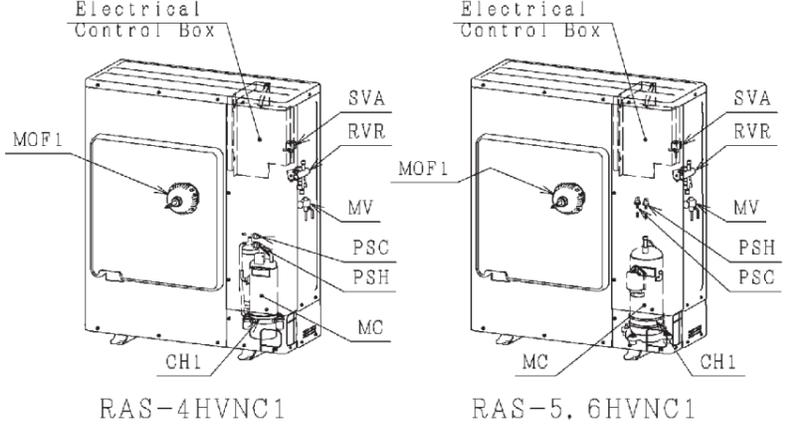


Mark	Name
CH1	Crankcase Heater
CMC	Contactor for Compressor Motor
DCL	Reactor
DIP-IPM	Inverter Module
DS1, 2	I. F Connector
DSW1~6	Dip Switch on PCB1
E1, 2	Earth
EF1	Fuse
MC	Motor for Compressor
MOP1	Motor for Outdoor Fan
MV	Micro-Computer Control Expansion Valve
NF1~4	Noise Filter
PCB1	Printed Circuit Board
PSC	Pressure Switch for Control
PSH	High Pressure Switch for Protection
PSW1~3	Push Switch on PCB1
RSW1	Switch on PCB1
RVR	Reversing Valve Relay
SVA	Solenoid Valve
TB1, 2	Terminal Block
THM7~10	Thermistor
THM	Thermistor for Pin Temperature

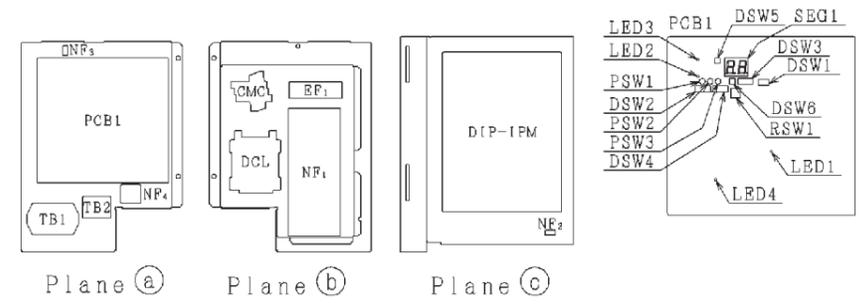
— : Factory Wiring
 - - - : Earth Wiring
 - · - · : Field Wiring
 * : Field Supplied

1~N
 220-240V/50Hz
 220V/60Hz

LOCATION OF MAIN PARTS



Electrical Control Box



Note:

1. All the field wiring and equipment must comply with local codes.

11. Miscellaneous Notes

Special Notes

1. Provide a service access door near the unit piping connection part on the false ceiling for the cassette type units.
2. Consider the air distribution from the unit to the space of the room, and select a suitable location so that uniform air temperature in the room can be obtained.
Cassette Type - Avoid unit installation in a room where the ceiling height (distance between the floor to the false ceiling) exceeds three meters. If the indoor unit is installed in a room with a ceiling of higher than 3 meters, it is recommended that an air circulation fan be installed separately to obtain uniform air temperature in the room, especially during the heating operation.
3. Check to ensure that the ceiling slab is strong enough and that the false ceiling is flat and level.
4. Avoid obstacles which may restrict the air intake or the discharge flow.
5. Do not install the unit in a machinery shop or kitchen where vapor from oil or its mist can enter to the unit.
The oil will deposit on the heat exchanger, thereby reducing the unit performance, and may deform, in the worst case, break the plastic parts of the unit.
6. Pay attention to the following points when the unit is installed in a hospital or other facilities where electromagnetic wave is radiated from medical equipment.
 - (A) Do not install the unit where the electromagnetic wave is directly radiated to the electrical box, remote control cable or remote control switch.
 - (B) Install the unit and component as far as practical (at least three meters) from the electromagnetic wave radiator.
 - (C) Prepare a steel box and install the remote control switch in it. Prepare a steel conduit pipe and wire the remote control cable in it. And then, connect earth wire with the box and the pipe.
 - (D) Install a noise filter when the power supply emits harmful noise.
7. Do not install the units in an acid or alkaline environment due to the corrosive action on the heat exchanger. In the case that outdoor units are installed near the sea, it is recommended that optional corrosion-resistant type outdoor unit be used.
8. Do not install the units in a flammable environment due to the danger of an explosion.
9. Regarding cassette type indoor units, consider the direct and reflected sound level, when selecting the unit for spaces where extremely low sound is required.
10. During heating operation, the outdoor heat exchanger produces condensate dew or melting water from frost.
Install the outdoor unit where drainage of such water is convenient, or provide a drain passage.
11. Heating Performance: The heating capacity normally decreases when outdoor temperatures decrease. Therefore, provide an auxiliary heating unit if outdoor temperatures are very low.
12. In the case that an outdoor temperature is low and humidity is high, the outdoor heat exchanger will be covered with frost, resulting in lower heating capacity. In order to remove the frost, the unit is automatically changed to the defrosting mode. During this defrosting operation, the unit is stopped for approximately 3 to 10 minutes.
13. As this unit is of heat pump type by circulating hot air in the whole room space, it takes time to heat up the room temperature.
14. The operating sound data is based on an anechoic chamber. Therefore, the actual operating sound will be higher due to reflected sound from the floor and wall.
15. In the case that the unit is operated for a long time higher than the indoor temperature of 27°C DB or the humidity of 80%, dewing may occur on the cabinets resulting in dew drops. If dewing, it is required to add thermal insulator on the cabinets.
16. Provide snow-protection hoods to prevent the outdoor heat exchanger from snow clogging. If the unit is operated in an area where it snows heavily, provide a base under the outdoor unit which should be 50cm higher than the presumable maximum snow height.
17. It is recommended that periodical service and maintenance be performed by authorized service engineers before air conditioning seasons, in order to avoid performance decrease due to dust or dirt.
18. This heat pump air conditioner has been designed for normal air conditioning for men. Do not apply to other purposes such as for food, animals, plants, high precision machines or work of art. Also do not apply to vehicles or vessels. It will result in water leakage or electrical leakage.
19. It is recommended that the system be installed by authorized engineers. If not, it may cause water leakage, electric shock or fire.
20. In a place where fibers or dusts are floating, the air filter or heat exchangers or the drain pipe may be clogged, resulting in water leakage from the drain pan.

12. Standard Specifications

UNIT - The unit shall be a multi-split system inverter-driven heat pump air conditioner for application with R410A refrigerants, and shall be composed of 4-way cassette type indoor units, or in-the-ceiling type indoor units and an outdoor unit, with a distributed refrigeration cycle, electrical components and enclosing cabinets. Optional accessories shall also be provided upon customer request. The indoor unit shall be constructed for installation, and the outdoor unit shall be completely weather-proofed for outdoor installation. Both indoor unit and the outdoor unit shall be properly assembled, internally piped and wired, thoroughly tested, and charged with R410A refrigerant at the factory and shall comply with Japanese Industrial Standards and other Japanese standardization statuses.

CAPACITY - The total capacity of the multi-split system inverter-driven heat pump air conditioner shall be ____kW or greater with ____°C air inlet dry bulb, ____°C air inlet wet bulb, ____°C outdoor air inlet temperature and ____m³/min. indoor air flow. The total compressor power inputs shall not exceed ____kW. The total heating capacity of the split-type air conditioners shall be ____kW or greater, with ____°C indoor heat exchanger air inlet dry bulb, ____°C outdoor heat exchanger air inlet dry bulb, ____°C outdoor heat exchanger air inlet wet bulb, and ____m³/min. indoor air flow. The total compressor power input shall not exceed ____kW.

INDOOR UNIT

CABINET - The cabinet shall be constructed of galvanized steel sheet or finished steel sheet, baked with synthetic resin-paint, with a plastic air panel assembly for cassette type unit, and be constructed of galvanized steel sheet for the in-the-ceiling duct type unit.

REFRIGERATION CYCLE - The refrigeration cycle shall be equipped with a heat exchanger, an electronic expansion valve, solenoid valves and flare connections.

INDOOR FAN AND FAN MOTOR - The indoor fan shall be the multi-blade centrifugal type, statically and dynamically balanced, and directly driven by a ____W motor for model ____ and a ____W motor for model _____. The fan motor bearing shall be permanently lubricated. The fan shall deliver ____m³/min. air flow for model ____ and ____m³/min. for model ____ at the nominal air flow. Three operating positions Hi, Me and Lo can be selected according to the required conditions.

INDOOR HEAT EXCHANGER - The heat exchanger shall be the multi-pass, cross-finned tube type, equipped with highly-efficient aluminum fins, mechanically bonded to seamless, oxygen-free copper tubes. The fins shall be spaced at no more than 12 fins per 25.4mm. The face area shall not be less than ____m² for model ____ and ____m² for model _____. The coil shall be cleaned, dehydrated and tested for leakage at the factory.

OUTDOOR UNIT

CABINET - The cabinet shall be constructed of galvanized steel sheet, baked with synthetic resin paint. The service panel shall be easily removable for service access to the electrical components and the compressor section.

REFRIGERATION CYCLE - Each refrigeration cycle shall be equipped with a scroll compressor, a solenoid valve, a heat exchanger, a 4-Way valve and flare connection parts.

COMPRESSOR PROTECTION - The compressor shall be protected against breakdown by a quick response overcurrent relay, a high pressure switch, a wrap-around type crankcase heater and a discharge gas thermistor.

OUTDOOR FAN AND FAN MOTOR - The outdoor fan(s) shall be the plastic propeller type, dynamically balanced, and the fan shall be directly driven by a ____W motor for horizontal-flow air discharge. The fan motor shall be permanently lubricated and be protected from ingress of water.

OUTDOOR HEAT EXCHANGER - The heat exchanger shall be the multi-pass, cross-finned tube type, equipped with highly-efficient aluminum fins, mechanically bonded to oxygen-free copper tubes. The coil shall be cleaned, dehydrated and tested for leakage at the factory.

CONTROL - All electrical control devices, shall be enclosed in the indoor and outdoor units.

In addition to the compressor protection devices, the indoor fan motor shall be equipped with an internal thermostat. The outdoor fan motor shall be protected by an internal thermostat. The indoor fan motor shall be directly supplied with the power source from the control circuit. The functions of these control devices shall compose an electrical sequence of manual starting and stopping, automatic continuous operation whenever the room thermostat requires, and the protection devices allow the operation.

CABINET - The cabinet shall be constructed of galvanized steel sheet.

REFRIGERATION CYCLE - The refrigeration cycle shall be equipped with solenoid valves and flare connections to changeover the cycle in mediating between outdoor unit and indoor unit.

13. Caution on Refrigerant Leakage

13.1 Maximum Permissible Concentration of HFC (or HCFC) Gas

The refrigerant R410A, charged in the DC Inverter HVRNM2 system, is an incombustible and non-toxic gas. However, if leakage occurs and gas fills a room, it may cause suffocation.

The maximum permissible concentration of R410A in air is *0.3 kg/m³, according to the refrigeration and air conditioning facility standard (KHK S 0010) by the KHK (High Pressure Gas Protection Association) Japan. Therefore, some effective measure must be taken to lower the R410A concentration in air below *0.3 kg/m³, in case of leakage.

13.2 Calculation of Refrigerant Concentration

- (1) Calculate the total quantity of refrigerant R (kg) charged in the system connecting all the indoor units of rooms to be air-conditioned.
- (2) Calculate the room Volume V (m³) of each room.
- (3) Calculate the refrigerant concentration C (kg/m³) of the room according to the following equation.

$$\frac{R: \text{Total Quantity of Charged Refrigerant (kg)}}{V: \text{Room Volume (m}^3\text{)}} = C: \text{Refrigerant Concentration} \leq 0.3 \text{ (kg/m}^3\text{)}$$

13.3 Countermeasure for Refrigerant Leakage According to KHK Standard

The facility shall be arranged as follows referring to the KHK standards, so that the refrigerant concentration will be below *0.3 kg/m³.

- (1) Provide a shutterless opening which will allow fresh air to circulate into the room.
- (2) Provide a doorless opening of 0.15% or more size to the floor area.
- (3) Provide a ventilator, linked with a gas leak detector, of 0.4 m³/min. or more ventilating capacity per Japanese Refrigeration Ton (= compressor displacement m³/h / 8.5) of the air conditioning system utilizing refrigerant R410A.

RAS-4HVNC1	1.91 ton
RAS-5HVNC1	2.30 ton
RAS-6HVNC1	2.30 ton

- (4) Pay a special attention to the place, such as a basement, etc., where refrigerant can stay, since refrigerant is heavier than air.

*: Use this value for a reference only, since this value is not fixed yet. Follow upon local regulations.

If local codes or regulations are specified, follow them.

<Example>

British Standard BS4434 1989
R410A Commercial Office Building Class D Occupancy
MR = C x V
MR: Maximum Charge or Leakage of Refrigerant (kg)
C: Maximum Allowable Concentration = 0.17 (kg/m³)
V: Volume of Space (m³)

Installation and Maintenance

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HITACHI

Inspire the Next

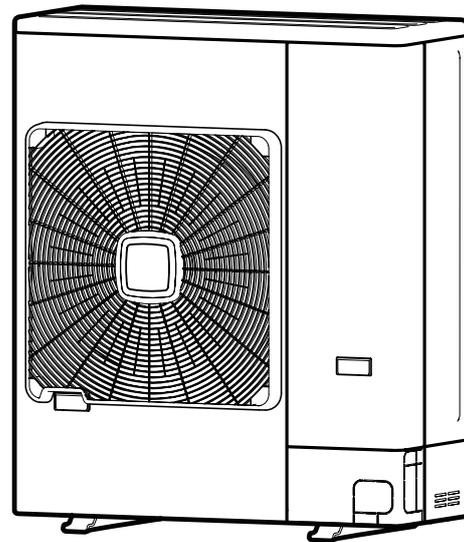
Installation & Maintenance Manual

*INVERTER-DRIVEN
SPLIT SYSTEM
HEAT PUMP
AIR CONDITIONERS
- DC INVERTER UTOPIA -*

Models:

Outdoor Units;

**RAS-4HVNC1
RAS-5HVNC1
RAS-6HVNC1**



IMPORTANT:

*READ AND UNDERSTAND
THIS MANUAL BEFORE
USING THIS HEAT-PUMP
AIR CONDITIONERS.
KEEP THIS MANUAL FOR
FUTURE REFERENCE.*

P5415267

IMPORTANT NOTICE

- HITACHI pursues a policy of continuing improvement in design and performance of products. The right is therefore reserved to vary specifications without notice.
- HITACHI 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 a fire, oil, steam or powder may enter directly to the unit such as right above a kitchen, etc.
 - * Places where oil (including machinery oil) may be present in quantities.
 - * Places where a lot of sulfide gas drifts such as a hot spring.
 - * Places where flammable gas may be generated or flow.
 - * Places where strong salty wind blows, such as coast regions.
 - * Places with an atmosphere of acidity or alkalinity.
 - * Places where gas from festering trash, etc. may be generated.
- Do not install the unit in the place where silicon gas drifts. If the silicon gas attaches to the surface of the heat exchanger, the fin surface repels water. As a result, drain water splashes outside of the drain pan and splashed water runs inside of the electrical box. In the end, water leakage or electrical devices failure may occur.
- Pay attention to the following points when installing the unit in a hospital or other facilities where electromagnetic waves are generated from medical equipment.
 - * Do not install the unit in the place where electromagnetic waves are directly radiated to the electrical box, remote control cable or remote control switch.
 - * Install the unit at least 3 meters away from devices generating electromagnetic waves, such as a radio.
- Do not install the unit in the place where animals and plants catch the direct outlet air. It could adversely affect animals and plants.
- The installer and system specialist shall secure safety against the refrigerant leakage according to local regulations or standards. The following standards may be applicable, if the local regulations are not available; International Organization for Standardization, ISO5149 or European Standard, EN378 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 speaking people. If this is not the case, the customer should be provided with safety, caution and operating signs in the native language.
- If you have any questions, contact your distributor or dealer of HITACHI.
- This manual gives a common description and information for this heat pump air conditioner which you operate as well for other models.
- This heat pump air conditioner has been designed for the following temperatures. Operate the heat pump air conditioner within this range.

Temperature		(°C)	
		Maximum	Minimum
Cooling Operation	Indoor	32 DB/23 WB	21 DB/15 WB
	Outdoor	46 DB	-5 DB
Heating Operation	Indoor	27 DB	15 DB
	Outdoor	15 WB	-20 WB

DB: Dry Bulb, WB: Wet Bulb

This manual should be considered as a permanent part of the air conditioning equipment and should remain with the air conditioning equipment.

CHECKING PRODUCT RECEIVED

- **Upon receiving this product, inspect it for any shipping damage. Claims for damage, either apparent or concealed, should be filed immediately with the shipping company.**
- **Check the model number, electrical characteristics (power supply, voltage and frequency) and accessories to determine if they are correct.**

The standard utilization of the unit shall be explained in these instructions.

Therefore, the utilization of the unit other than those indicated in these instructions is not recommended.

Please contact your local agent, as the occasion arises.

HITACHI's liability shall not cover defects arising from the alteration performed by a customer without HITACHI's consent in a written form.

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1. 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 indicates a hazardous situation which, if not avoided, will result in death or serious injury.

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

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

 : 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 pumping, drain piping and electrical wiring connecting work without referring to our installation manual. If the instructions are not followed, it may result in a water leakage, an electric shock, a fire and an injury.
- Use the specified non-flammable refrigerant (R410A) to the outdoor unit in the refrigerant cycle. Do not charge the unit with materials other than R410A, such as hydrocarbon refrigerants (propane, etc.), oxygen, flammable gases (acetylene, etc.) or poisonous gases when installing, maintaining and moving the unit. Contamination of these are extremely dangerous and may cause an explosion, a fire, and an injury.
- Do not pour water into the product. This product is equipped with electrical parts. If water is poured, therefore, it will cause a serious electric shock.
- Make sure to turn OFF the main power supply before opening the service cover of the outdoor unit. Otherwise, it may cause an electric shock.
- Do not touch or adjust safety devices inside the indoor unit and outdoor unit. If these devices are touched or readjusted, it may cause a serious accident.
- Prior to installation work, make sure to conduct refrigerant leakage test. The refrigerant (Fluorocarbon) for this unit is non-flammable, non-toxic and odorless. However, if it should leak and contact with fire, toxic gas will be generated. Also because the fluorocarbon is heavier than air, it settles close to the floor, which could cause suffocation.
- Refrigerant leakage may lead to insufficient air and cause difficulty with breathing. Turn OFF the main switch, extinguish all naked flames and contact your service contractor, if refrigerant leakage should occur.
- The installer and system specialist shall secure safety against refrigerant leakage according to the local regulations or standards.
- For installation in a small room, make sure to take strong measures to prevent the refrigerant from exceeding the maximum permissible concentration in case a refrigerant gas leakage should occur. Otherwise, leaked refrigerant gas will cause suffocation in the event of a leakage. Consult with your distributor for countermeasures (ventilation system, etc).
- Use an ELB (Earth Leakage Breaker).
If it is not used, an electric shock or a fire can be caused in the event of a fault.
- Do not install the outdoor unit where there is high level of oil mist, flammable gases, salty air or harmful gases such as sulfur.
- When installing the unit, make sure to connect the refrigerant piping before the compressor starts operating. When maintaining, relocating and disposing the unit, remove the refrigerant piping after the compressor stops. If the refrigerant piping are not connected and the compressor are operated with the stop valve opened, the refrigerant cycle will be subjected to extremely high pressure, which may cause an explosion, a fire and an injury.
- Do not modify protection devices such as a pressure switch. Modification to protection devices (short circuit, etc.) might cause a fire and an explosion.
- Be sure to use Nitrogen Gas for air tight test. If other gases such as oxygen gas, acetylene gas or fluorocarbon gas are accidentally used, it may cause an explosion or gas intoxication.
- When cleaning the existing refrigerant piping, comply with the following points.
 - a. Use non-flammable and non-toxic cleaning agent for cleaning the pipes. Flammable cleaning agent may cause an explosion or a fire.
 - b. Open the window for ventilation during installation. If not, it might cause suffocation.
 - c. Make sure that cleaning agent does not contact fire nor reach a high temperature, in order to prevent toxic gas from being generated.

⚠ WARNING

- Do not use any sprays such as an insecticide, lacquer or hair spray, or other flammable gases within approximately one (1) meter from the system.
- If the 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 will lead to an electric shock. Do not connect the ground wiring to a gas piping, water piping, lighting conductor or ground wiring for telephone.
- Connect a fuse of specified capacity.
- Before any brazing work, check to ensure that there is no flammable material around. Otherwise, it might lead to a fire.
- Select a sufficiently strong installation location. If not, the unit may fall down and it may lead to injuries.
- When handling the refrigerant, be sure to wear leather gloves to prevent cold injuries.
- Do not install the unit where oil, vapor, organic solvent and corrosive gas (ammonia, sulfur compound and acid, etc.) may be present in quantities. Operation under such conditions may lead to refrigerant leakage due to corrosion, an electric shock, performance degradation and a failure.
- Electrical wiring work must be performed by authorized installers. Incorrect installation by a non-authorized installer may cause an electric shock or a fire.
- Perform electrical work according to this Installation Manual and all the relevant regulations and standards. Failing to follow these instructions can cause capacity shortage and performance degradation, resulting in an electric shock and a fire.
- Use specified cables between the outdoor unit and the indoor units. Selecting incorrect cables may cause an electric shock or a fire.
- Ensure that the wiring terminals are tightened securely with the specified torques. Loose terminals may cause heat generation at the terminal connection part, a fire or an electric shock.
- Make sure to tie the wires together with cord clamps after connecting the wiring to the terminal block and pass the wires through the wiring hole. If not, the wires will be pinched, causing a fire.
- Make sure to turn OFF the power supply before handling the service connector.
- Fix the cables securely. External forces from the cables applied on the terminals could lead to heat generation and a fire.
- When controlling the switch on PCB, do not touch other electrical parts. Otherwise, it may cause an electric shock.
- Protect the wires, electrical parts, etc. from rats or other small animals. If not, rats may gnaw at unprotected parts, which may lead to a fire.
- Take care not to pinch electrical wirings when attaching the service cover. It might cause an electric shock or a fire.
- Turn OFF the main power supply of all the units before electrical wiring work or a periodical check of electrical parts and check that there is no residual voltage, to avoid an electric shock being caused by residual voltage.

⚠ CAUTION

- Do not step on the product nor put any material on it.
- Do not put any foreign material on the unit or inside the unit.
- Provide a strong foundation so that;
 - a. the outdoor unit will not incline.
 - b. abnormal sound will not occur.
 - c. the outdoor unit will not fall down due to a strong wind or an earthquake.
- Tighten the flare nuts according to the specified torque. If an excessive force is applied, the flare nuts may crack due to aging degradation, causing refrigerant leakage.

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.
- For operation after a long-term shutdown, supply electrical power to the system to energize the crankcase heater for 12 hours before startup.
- Make sure that the outdoor unit is not covered with snow or ice, before operation.
- 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 with high electricity consumption*.

* In case that the power source wires for the device* and for the packaged air conditioner are located close to each other.

{ Device*: (Ex) Lift, container crane, rectifier for electric railway, inverter power device, arc furnace, electric furnace, large-sized induction motor and large-sized switch. }

Regarding the cases mentioned above, surge voltage may be inducted in the power supply wiring for the packaged air conditioner due to a rapid change in power consumption of the device and an activation of switch.

Therefore, check the field regulations and standards before performing electrical work in order to protect the power supply for the packaged air conditioner.

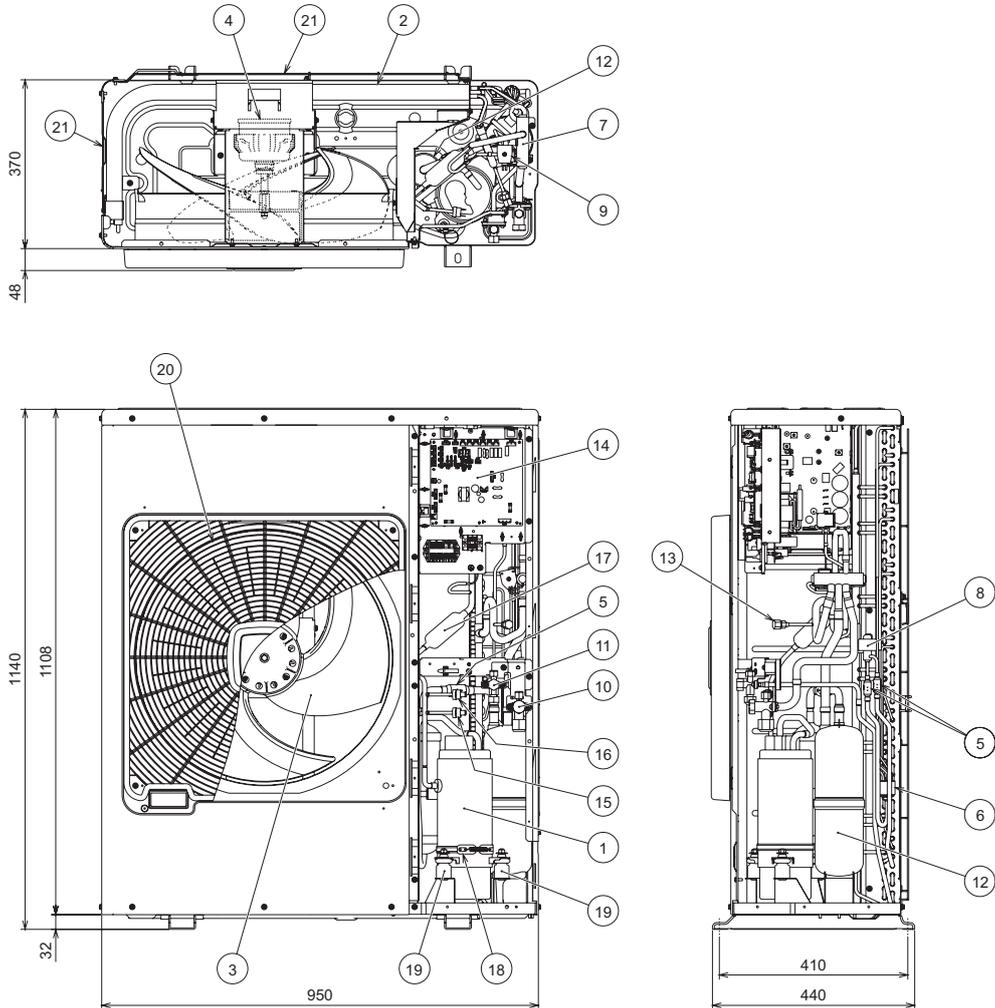
NOTE

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

2. Structure

2.1 Name of Parts

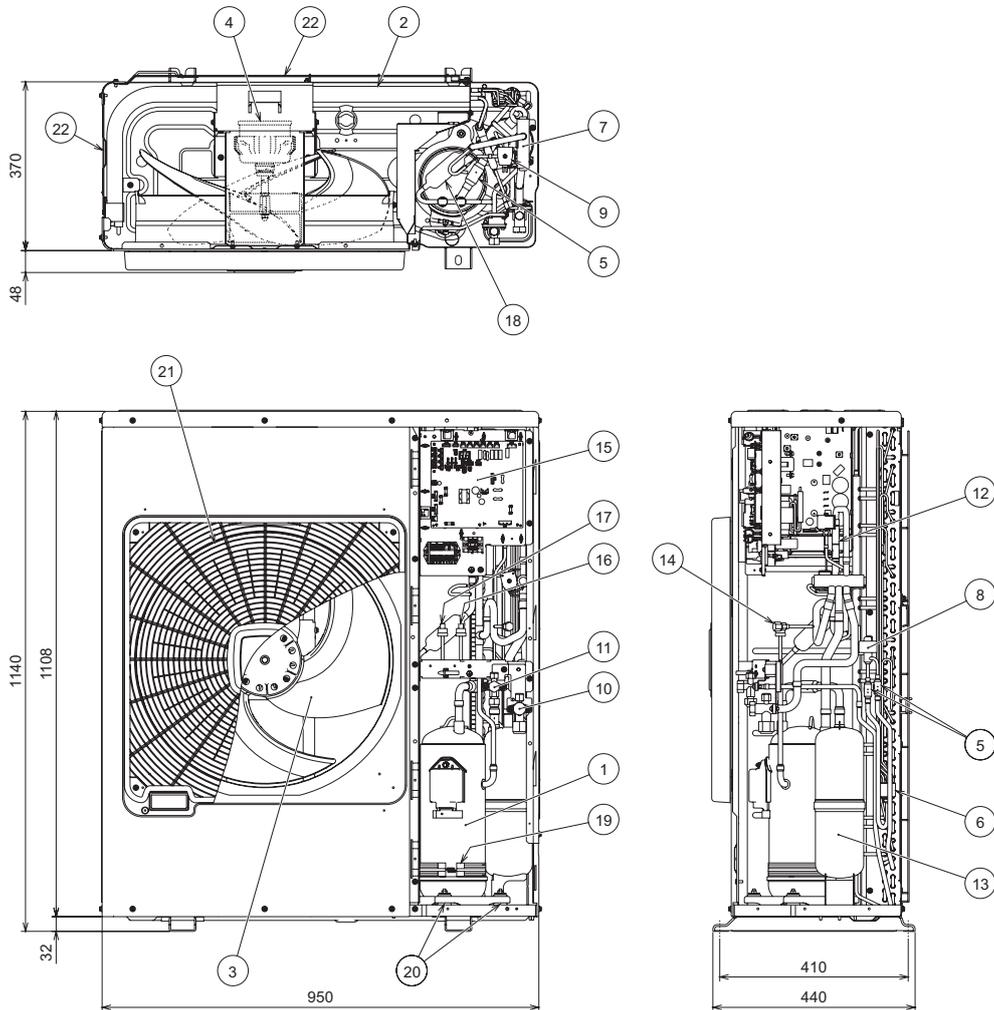
< RAS-4HVNC1 >



No.	Part Name	No.	Part Name
1	Compressor	12	Accumulator
2	Heat Exchanger	13	Check Joint
3	Propeller Fan	14	Electrical Box
4	Fan Motor	15	High Pressure Switch for Protection
5	Strainer	16	Pressure Switch for Control
6	Distributor	17	Silencer
7	Reversing Valve	18	Crankcase Heater
8	Micro-Computer Control Expansion Valve	19	Vibration Absorbing Rubber (4pcs.)
9	Solenoid Valve	20	Air Outlet
10	Stop Valve for Gas Line	21	Air Inlet
11	Stop Valve for Liquid Line		

OUTDOOR UNIT

< RAS-5HVNC1 and RAS-6HVNC1 >



No.	Part Name	No.	Part Name
1	Compressor	12	Check Valve
2	Heat Exchanger	13	Accumulator
3	Propeller Fan	14	Check Joint
4	Fan Motor	15	Electrical Box
5	Strainer	16	High Pressure Switch for Protection
6	Distributor	17	Pressure Switch for Control
7	Reversing Valve	18	Silencer
8	Micro-Computer Control Expansion Valve	19	Crankcase Heater
9	Solenoid Valve	20	Vibration Absorbing Rubber (4pcs.)
10	Stop Valve for Gas Line	21	Air Outlet
11	Stop Valve for Liquid Line	22	Air Inlet

2.2 Necessary Tools and Instrument List for Installation

No.	Tool	No.	Tool	No.	Tool
1	Handsaw	8	Plier	16	Cutter for Wires
2	Phillips Screwdriver	9	Pipe Cutter	17	Gas Leak Detector
3	Vacuum Pump	10	Brazing Kit	18	Leveller
4	Refrigerant Gas Hose	11	Hexagon Wrench	19	Clamper for Solderless Terminals
5	Megohmmeter	12	Spanner	20	Hoist (for Indoor Unit)
6	Copper Pipe Bender	13	Weigher	21	Ammeter
7	Manual Water Pump (for Indoor Unit)	14	Charging Cylinder	22	Voltage Meter
		15	Manifold Gauge	23	Wrench

When handling the new refrigerant R410A, use tools and measuring instruments exclusively for it.

NOTICE

- The refrigerant used for this product is HFC refrigerant R410A, which does not damage the ozone layer.
- The design pressure for this product is 4.15MPa. The pressure of the refrigerant R410A is 1.4 times higher than that of the refrigerant R22. Therefore, the refrigerant piping for the refrigerant R410A shall be thicker than that for the refrigerant R22. Make sure to use the specified refrigerant piping. If not, the refrigerant piping may be damaged due to an excessive refrigerant pressure. Take care when using copper refrigerant piping because thickness of copper refrigerant piping differs depending on its material.
- Due to the change of the refrigerant oil, the refrigerant cycle is more subject to foreign matters such as moisture, oxide film, and fat. Be careful that moisture, dust or different refrigerant does not enter the refrigerant cycle during installation work. Otherwise such parts as an expansion valve might bite into foreign matters and so operation will be unavailable.
- To prevent the refrigerant or refrigerant oil from entering the cycle, use the specified refrigerant piping and joints exclusively for the refrigerant R410A.

OUTDOOR UNIT

To avoid accidental mixing of different refrigerant or different refrigerant oil, the size of the charging connections has been changed. Therefore, prepare the following tools before installation work.

◇: Interchangeable with Tool for Current R22

●: Exclusively for Refrigerant R410A (Not Interchangeable with Tool for R22)

×: Prohibited

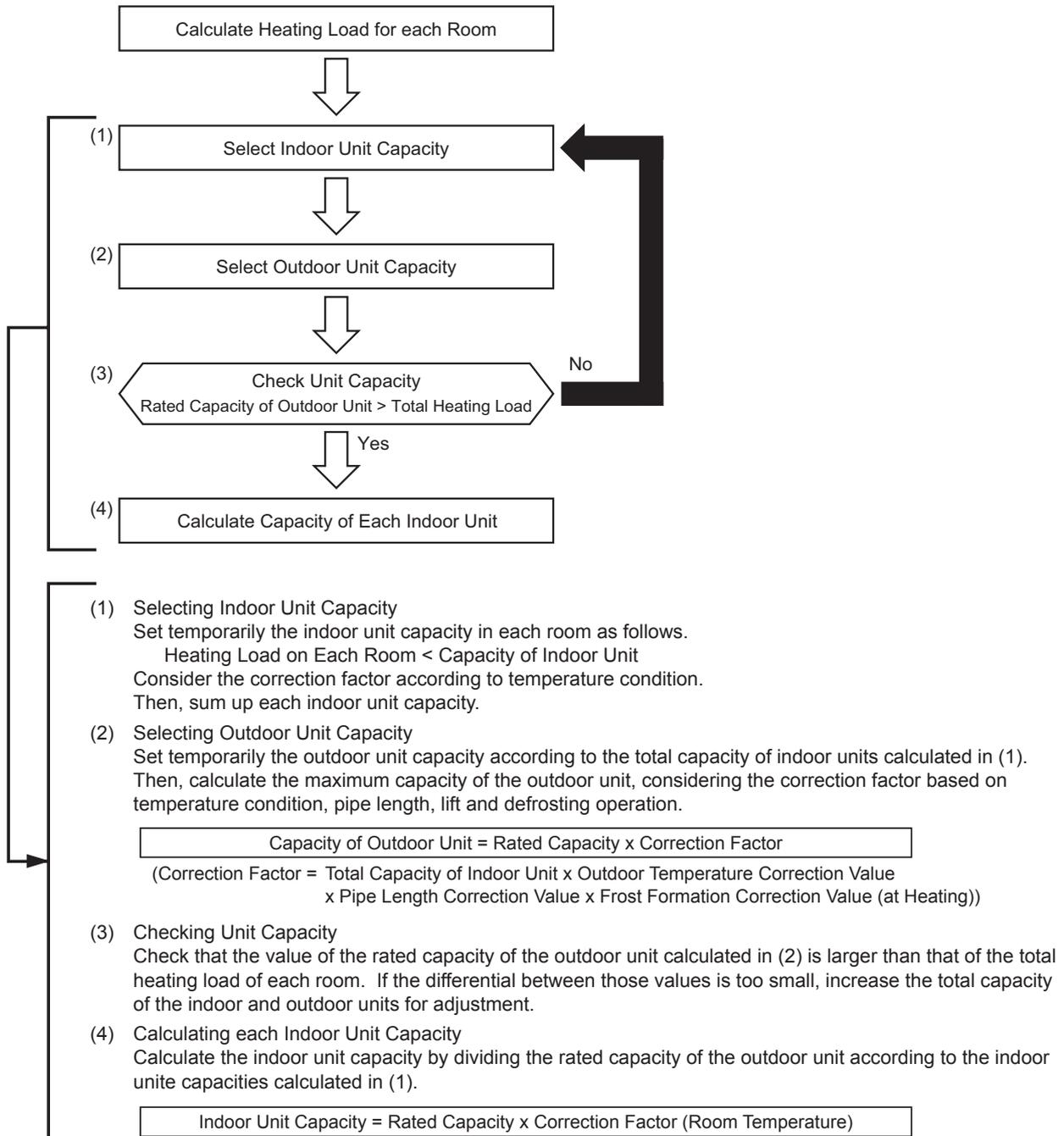
◆: Exclusively for Refrigerant R407C (Not Interchangeable with Tool for R22)

Measuring Instrument and Tool		Interchangeability with R22		Reason for Non-interchangeability and Attention (★: Strictly Required)	Use
		R410A	R407C		
Refrigerant Pipe	Pipe Cutter Chamfering Reamer	◇	◇	-	Pipe Cutting, Burring
	Flaring Tool	◇●	◇	* Because the pressure of R410A is higher than R22, flared openings shall be bigger. * If using flaring tools for R22, adjust the dimension of extruded part by 1mm with an extrusion adjustment gauge. * Flaring tools for R410A can also be used for R407C without adjustment (an extrusion adjustment gauge is not required).	Flaring for Pipe
	Extrusion Adjustment Gauge	●	-		Dimensional Adjustment for Extruded Portion of Pipe after Flaring
	Pipe Bender	◇	◇		-
	Expanding Tool	◇	◇	-	Pipe Expanding
	Torque Wrench	●	◇	* φ12.7, φ15.88: The spanner for R410A is 2mm longer than that for R22.	Connection of Flare Nut
		◇	◇	* φ6.35, φ9.52, φ19.05: The spanners for R410A and R407C are interchangeable with that for R22.	
	Brazing Tool	◇	◇	* Perform brazing work correctly.	Brazing for Tubes
	Nitrogen Gas	◇	◇	* Strengthen control of nitrogen gas to prevent contaminants. (at nitrogen gas blow during brazing)	Prevention of Oxidation during Brazing Work, Air Tight Test
	Lubrication Oil (for Flared Surface)	●	◆	* Ethereal Oil: FVC68D (Idemitsu Kosan Co., Ltd.)	Oil Coating for Flared Surface
Vacuum Drying • Refrigerant Charge	Refrigerant Cylinder	●	◆	* Identification Label R410A: Pale Pink / R407C: Blown * Prepare a charging connections for each refrigerant cylinder. ★ Make sure to charge liquid refrigerant for zeotropic refrigerant mixture.	Refrigerant Charge
	Vacuum Pump	◇	◇	★ The vacuum pump for R22 can be used for R410A and R407C, but only with a vacuum pump adapter to prevent a backflow of oil when vacuum pumping stops.	Vacuum Pumping
	Adapter for Vacuum Pump	●	*◆		
	Manifold Valve	●	◆	* Because the pressure of R410A and R407C is higher than R22, the manifold valve and charging hose for R410A and R407C are not interchangeable with those for R22. * Connection diameter for screws differ depending on the refrigerant. R410A: UNF1/2 R407C: UNF7/16	Vacuum Pump, Vacuum Holding, Refrigerant Charge Pressure Check
	Charging Hose	●	◆	★ Do not use a manifold valve and charging hose for R22. Otherwise, mineral oil will flow into the refrigerant cycle and cause sludges, resulting in clogging or compressor failure.	
	Charging Cylinder	×	×	-	Refrigerant Charge
	Weight Scale	◇	◇	-	Measuring Instrument for Refrigerant Charge
Refrigerant Gas Leakage Detector	●	*◆	* The gas leakage detectors for R410A and R407C are not interchangeable with that for R22 due to differences in detecting method.	Gas Leakage Check	

*: Interchangeable with Tool for R407C.

3. Before Installation

3.1 Selection of Unit Model



3.2 Indoor Unit Selection for Installation of Multiple Indoor Units

- (1) The indoor unit capacity in heating mode is roughly calculated as follows.

$$\text{Indoor Unit Capacity (Heat)} = * \text{Temperature Difference} \times \text{Air Flow Volume}$$

*(Indoor Unit Outlet Air Temperature - Indoor Unit Inlet Air Temperature)

In simultaneous operation of all multiple indoor units, the total air flow volume increases and so the temperature difference may be smaller. Installing the units where the outlet air directly blows against users, therefore, could cause a cold draft during heating operation. In order to prevent a cold draft during heating operation, decide the outlet air temperature with care when designing facilities.

- (2) In simultaneous operation of all multiple indoor units, it is recommended to connect less indoor units than is recommended, in order to prevent a cold draft during heating operation.

3.3 Standard Combination of Outdoor Unit and Indoor Unit

Outdoor Unit	Indoor Unit (Type)	Single Combination	Twin Combination	Triple Combination	Quad Combination
RAS-4HVNC1	In-the-Ceiling (RPI-*FSN2SQ)	RPI-4.0FSN2SQ	-	-	-
	4-Way Cassette (RCI-*FSN3)	RCI-4.0FSN3	RCI-2.0FSN3 x 2	-	RCI-1.0FSN3 x 4
	4-Way Cassette (Compact) (RCIM-*FSN3)	-	RCIM-2.0FSN3 x 2	-	RCIM-1.0FSN3 x 4
	In-the-Ceiling (RPI-*FSN2)	-	RPI-2.0FSN2 x 2	-	RPI-1.0FSN2 x 4
	2-Way Cassette (RCD-*FSN2)	-	RCD-2.0FSN2 x 2	-	RCD-1.0FSN2 x 4
	Ceiling (RPC-*FSN3)	-	RPC-2.0FSN3 x 2	-	-
	Wall (RPK-*FSNSM3)	-	RPK-2.0FSNSM3 x 2	-	RPK-1.0FSNSM3 x 4
RAS-5HVNC1	In-the-Ceiling (RPI-*FSN2SQ)	RPI-5.0FSN2SQ	-	-	-
	4-Way Cassette (RCI-*FSN3)	RCI-5.0FSN3	RCI-2.5FSN3 x 2	RCI-1.5FSN3 x 3	-
	4-Way Cassette (Compact) (RCIM-*FSN3)	-	-	RCIM-1.5FSN3 x 3	-
	In-the-Ceiling (RPI-*FSN2)	-	RPI-2.5FSN2 x 2	RPI-1.5FSN2 x 3	-
	2-Way Cassette (RCD-*FSN2)	-	RCD-2.5FSN2 x 2	RCD-1.5FSN2 x 3	-
	Ceiling (RPC-*FSN3)	-	RPC-2.5FSN3 x 2	RPC-1.5FSN3 x 3	-
	Wall (RPK-*FSNSM3)	-	RPK-2.5FSNSM3 x 2	RPK-1.5FSNSM3 x 3	-
RAS-6HVNC1	In-the-Ceiling (RPI-*FSN2SQ)	RPI-6.0FSN2SQ	-	-	-
	4-Way Cassette (RCI-*FSN3)	RCI-6.0FSN3	RCI-3.0FSN3 x 2	RCI-2.0FSN3 x 3	RCI-1.5FSN3 x 4
	4-Way Cassette (Compact) (RCIM-*FSN3)	-	-	RCIM-2.0FSN3 x 3	RCIM-1.5FSN3 x 4
	In-the-Ceiling (RPI-*FSN2)	-	RPI-3.0FSN2 x 2	RPI-2.0FSN2 x 3	RPI-1.5FSN2 x 4
	2-Way Cassette (RCD-*FSN2)	-	RCD-3.0FSN2 x 2	RCD-2.0FSN2 x 3	RCD-1.5FSN2 x 4
	Ceiling (RPC-*FSN3)	-	RPC-3.0FSN3 x 2	RPC-2.0FSN3 x 3	RPC-1.5FSN3 x 4
	Wall (RPK-*FSNSM3)	-	RPK-3.0FSNSM3 x 2	RPK-2.0FSNSM3 x 3	RPK-1.5FSNSM3 x 4

*The single connection is subject to MEPS. Other connections are NOT acceptable.

3.4 Enhanced Combination of Outdoor Unit and Indoor Unit

The combination of outdoor units and indoor units are available in the following conditions. For simultaneous operation of all multiple indoor units, it is recommended to connect less indoor units than is recommended, in order to prevent a cold draft during heating operation.

Outdoor Unit Capacity		4HP	5HP	6HP
Recommended Number of Connectable Indoor Unit		≤ 2 Units		
Maximum Number of Connectable Indoor Unit		4 Units		
Minimum Indoor Unit Capacity		0.8HP		
Ratio of Total Indoor Unit Capacity to Outdoor Unit Capacity (The case of exceeding the recommended number of connectable units)		90-115% (90-100%)		
Minimum Indoor Unit Capacity	In-the-Ceiling Type (RPI-*FSN2SQ)	Only 4.0HP	Only 5.0HP	Only 6.0HP
	4-Way Cassette Type (RCI-*FSN3)	1.0HP		
	4-Way Cassette (Compact) Type (RCIM-*FSN3)	0.8HP		
	In-the-Ceiling Type (RPI-*FSN2)	0.8HP		
	2-Way Cassette Type (RCD-*FSN2)	1.0HP		
	Ceiling Type (RPC-*FSN3)	1.5HP		
	Wall Type (RPK-*FSNSM3)	1.0HP		

- (1) (Total Indoor Unit Capacity / Total Outdoor Unit Capacity) should be within the value shown in the “Ratio of Total Indoor Unit Capacity to Outdoor Unit Capacity” in the table above. If the ratio exceeds 100%, adjust it according to the outdoor unit capacity.
- (2) In the following cases, it is recommended to connect less indoor units than is recommended, and it is also recommended that “Ratio of Total Indoor Unit Capacity to Outdoor Unit Capacity” be less than 100%.
 - 4-Way Cassette Type or Ceiling Type indoor unit is connected to the outdoor unit
 - The unit is installed in cold areas (areas where outside temperature drops to -5°C)
 - The unit is installed in cold areas under high heating load conditions.
- (3) For operation of multiple indoor units, the minimum indoor unit capacity against the maximum indoor unit capacity in the same refrigerant cycle should be as follows.

Max. Indoor Unit Capacity	0.8-1.5HP	2.0HP	2.5-4.0HP	5.0 - 6.0HP
Min. Indoor Unit Capacity	≥ 0.8HP	≥ 1.0HP	≥ 1.5HP	≥ 2.0HP

- (4) The air flow volume for indoor unit of 0.8 and 1.0HP is higher than that for indoor units of 1.5HP or more. Do not install the unit where users are subject to cold draft during heating operation.

4. Transportation and Handling

! WARNING

- Select a sufficiently strong installation location. If not, the unit may fall down and it may lead to injuries.

! CAUTION

- Do not step on the product nor put any material on it.
- Do not handle the product alone during transportation.
- Some products are packed with plastic bands. Do not hang the product with them.
- Do not touch the heat exchanger by bare hands. Touching the heat exchanger fins may lead to an injury.

• Hanging Unit

- (1) Transport the product as close to the installation location as possible before unpacking.
- (2) When hanging the unit with crane, refer to the caution label attached to it.
- (3) Hang the unit with two (2) ropes, without unpacking it, as shown in Fig. 4.1. If hanging the unit after unpacking, protect it with corrugated cardboards or clothes.

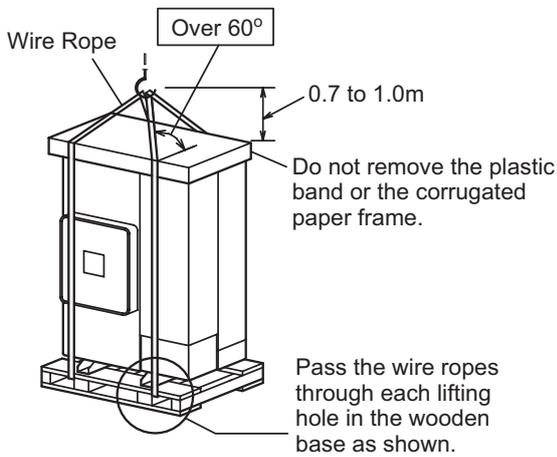


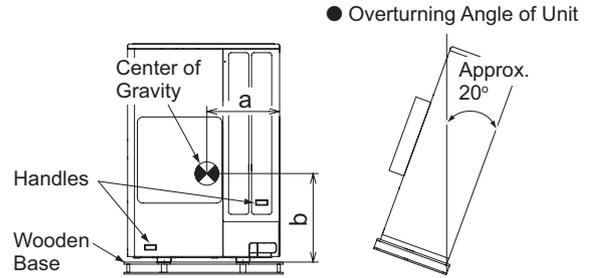
Fig. 4.1 Hanging Work for Transportation

NOTES

- Check safety, make sure that the unit is kept level, and then lift it up slowly.
- Do not hook the cap of the corrugated paper frame or the plastic bands.
- To avoid damage to the resin cover, protect it with clothes before lifting or moving the unit.

• Lifting Unit Using Handles

- (1) Do not remove the wooden base from outdoor unit while moving the unit.
- (2) To prevent the unit from toppling over, check the center of gravity shown in the figure.
- (3) Check the center of gravity shown in the figure.



Outdoor Unit Capacity	Gross Weight (kg)	a (mm)	b (mm)
4HP	85	360	510
5-6HP	95	340	490

5. Outdoor Unit Installation

5.1 Factory-Supplied Accessories

Check to ensure that the following accessories are packed with the outdoor unit.

Table 5.1 Factory-Supplied Accessories

Accessory	Q'ty	Remarks
Special Washer	4	For Fixing Anchor Bolt

NOTE

If any of these accessories is not packed with the unit, please contact your contractor.

DANGER

- Do not install the outdoor unit where flammable gases could be present. Installation in such place may cause fire.
- For installation in a small room, make sure to take strong measures to prevent the refrigerant from exceeding the maximum permissible concentration in case a refrigerant gas leakage should occur. Otherwise, leaked refrigerant gas will cause suffocation in the event of a leakage. Consult with your distributor for countermeasures (ventilation system, etc).

WARNING

- Select a sufficiently strong installation location. If not, the unit may fall down and it may lead to injuries.
- Do not put any foreign material into the outdoor unit and check to ensure that no foreign material exists in the outdoor unit before installation and test run. Otherwise, fire or failure, etc. may occur.

5.2 Initial Check

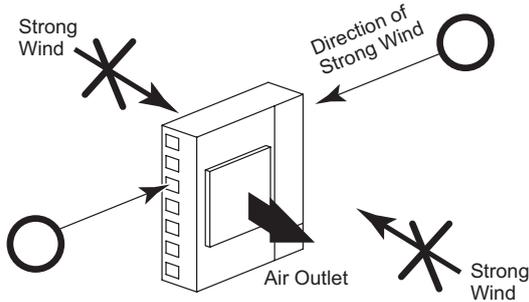
- Install the outdoor unit in dry and well ventilated places.
- Do not install the outdoor unit in places subject to direct radiant heat from the sunlight or heat sources. If installing the unit in such places for an unavoidable reason, protect the unit with sunshade, etc.
- Do not install the outdoor unit where the sound from the outdoor unit is obtrusive to others in the vicinity. Note that the sound level of the operation sound is 3 to 6dB higher at the rear side (air-discharging side) than that indicated in the brochure.
- Do not install the outdoor unit where discharged air blows directly against foliage plants or windows.
- Check to ensure that the foundation is level and sufficiently strong. Provide a strong foundation so that;
 - the outdoor unit will not incline.
 - abnormal sound will not occur.
 - the outdoor unit will not fall down due to a strong wind or an earthquake.
- Do not install the outdoor unit where dust or other contaminants could be sucked in the heat exchanger.
- For installation in cold and snowy areas, mount field-supplied hoods at the discharge side of the outdoor unit and the inlet side of the heat exchanger. Also provide a base to the unit in case it snows.
- During heating and defrosting operation, drain water is discharged. Install the unit in a place with good drainage or provide a drainage ditch. To prevent dew from falling on people, do not install the unit high. If installing the unit in such places for an unavoidable reason, provide a 2nd drain pan for better drainage. Otherwise, drain water freezes in winter, causing falls.
- Do not install the outdoor unit in the following places. It may cause a fire, deformation, corrosion or failure.
 - Places where oil (including machinery oil) can be present.
 - Places where a lot of sulfide gas can be present (a hot spring, etc.)
 - Places where strong salty wind blows (coast regions, etc.).
 - Places with an atmosphere of acidity or alkalinity.
- Do not install the outdoor unit where the electromagnetic waves are directly radiated to the electrical box.
- Install the outdoor unit at least 3 meters away from the electromagnetic wave radiator.

< Precautions against Strong Wind >

Install the outdoor unit in places less susceptible to a seasonal wind, building wind or storm. If installing the unit in places susceptible to these strong wind for an unavoidable reason, take the following measures to prevent strong wind against the air outlet and inlet.

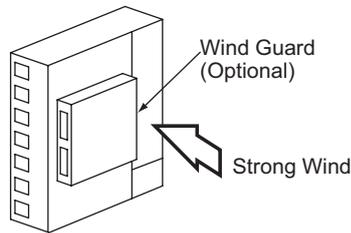
● Changing Installation Direction

If strong wind blows against the air outlet, change the installation direction so that the wind blows against the sides of the unit.



● Wind Guard (Optional)

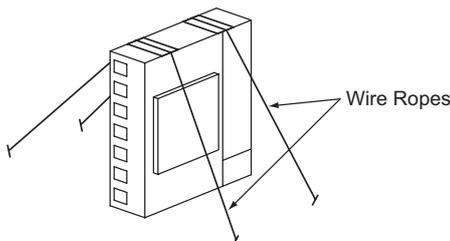
If strong wind blows against the air outlet, use the specified wind guard (optional).



Wind Guard Model

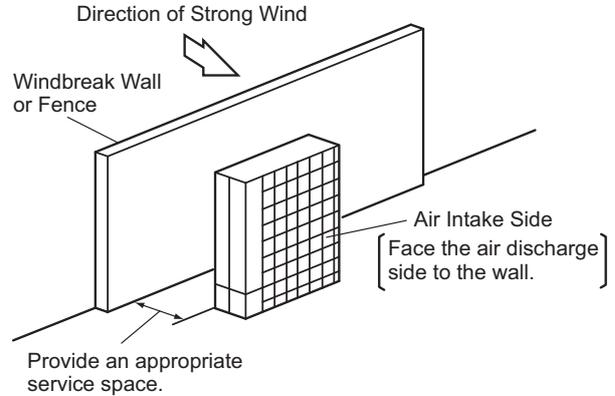
Model	Number of Set Required
WSP-335A	1

● Fix the unit with wire ropes to prevent overturning in case a seasonal strong wind (storm, etc.) blows against the unit.



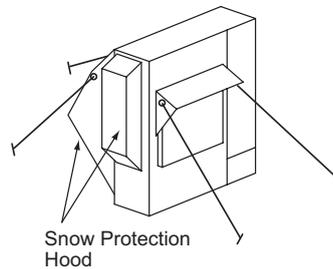
● Installing Windbreak Wall / Fence

If installing windbreak wall or fence, make sure to provide sufficient space around the outdoor unit for operation and maintenance. Refer to the next page for service space.



● In case of Installing Snow Protection Hood (Optional)

The snow protection hood can be utilized to protect the unit from damage or abnormal vibration of propeller fan in low ambient temperature down to -5°C.



Snow Protection Hood Model

Model	Number of Set Required	Type	Material	Attaching Portion
ASG-NP335FS4	1	Half	Stainless Steel Plate	Front Side
ASG-SP10BES2	1			Rear Side
ASG-SP10LES2	1			Left Side
ASG-NP335F1	1		Steel Plate	Front Side
ASG-SP10BE	1			Rear Side
ASG-SP10LE	1			Left Side
ASG-SP11FBS2	1	Full	Stainless Steel Plate	Front Side
ASG-SP10BES2	1			Rear Side
ASG-SP10LES2	1			Left Side
ASG-SP11FB	1		Steel Plate	Front Side
ASG-SP10BE	1			Rear Side
ASG-SP10LE	1			Left Side

NOTICE

- If the air inlet and outlet of the outdoor unit are continuously exposed to excessively strong wind when the unit is not operating, the propeller fan will rotate at high speed, causing failure of the fan and fan motor.
 - If the air inlet and outlet of the outdoor unit are continuously exposed to excessively strong wind during operation, insufficient air flow volume will cause some operational trouble.
-

5.3 Service Space

Install the outdoor unit with sufficient space around it for operation and maintenance as shown below.

(1) Obstacles on Inlet Side

(a) No Obstacle Above

(mm)

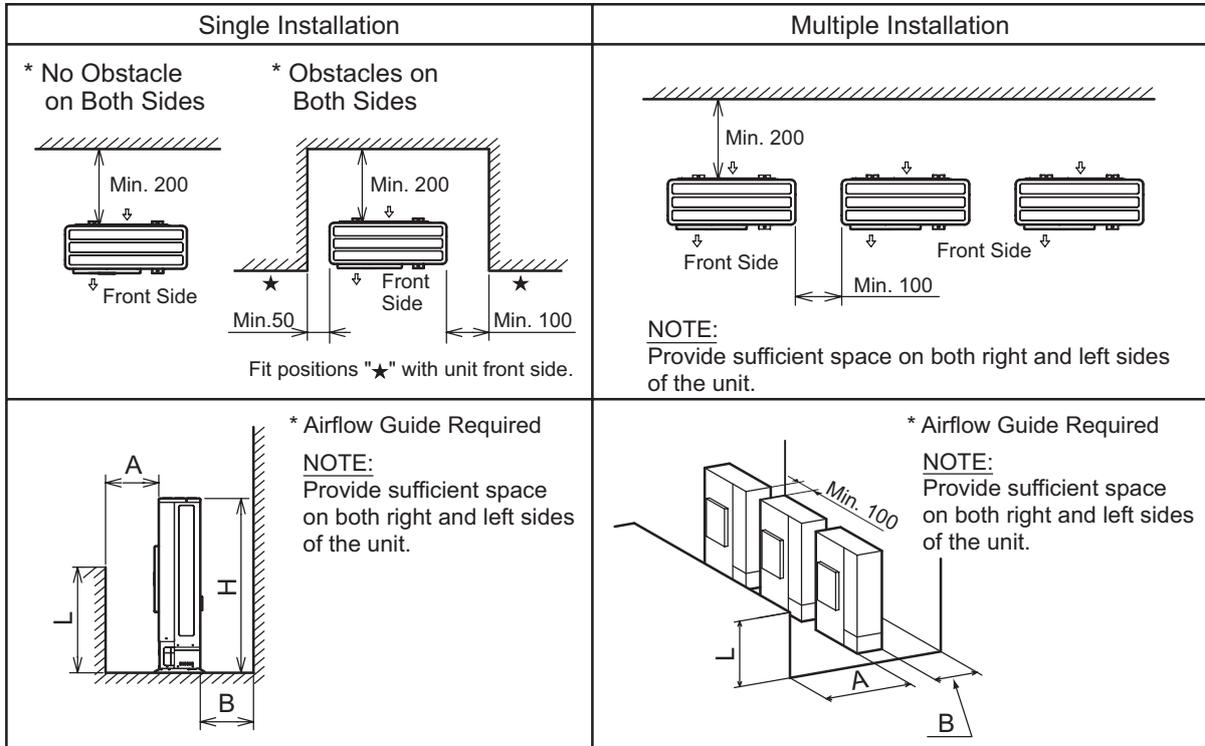


Fig. 5.1 Installation Space (1)

(b) Obstacle Above

(mm)

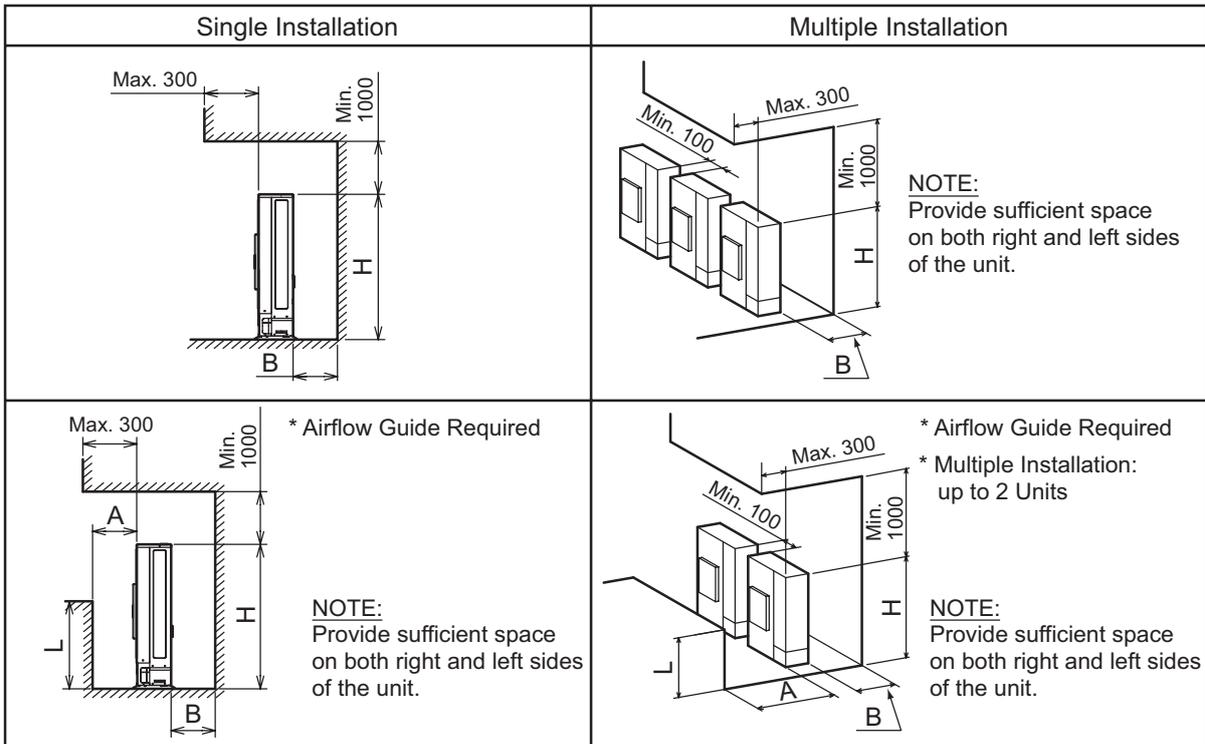


Fig. 5.2 Installation Space (2)

(2) Obstacles on Discharge Side

(a) No Obstacle Above

(mm)

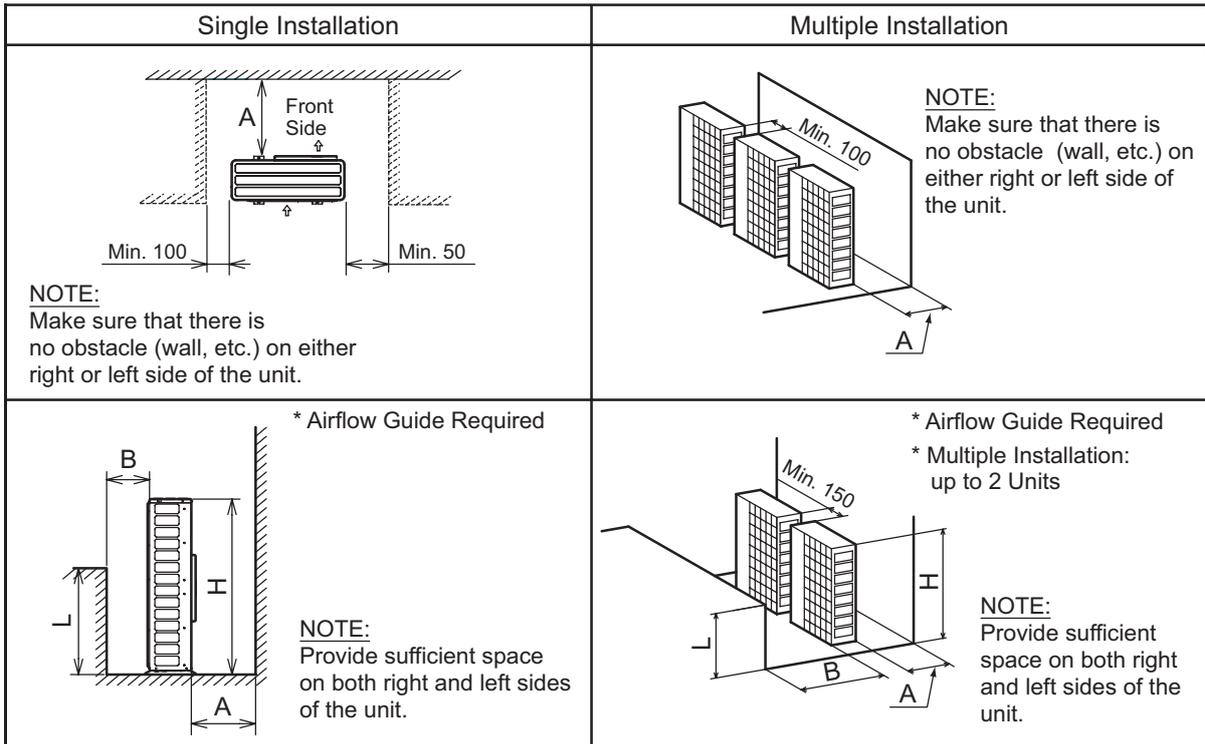
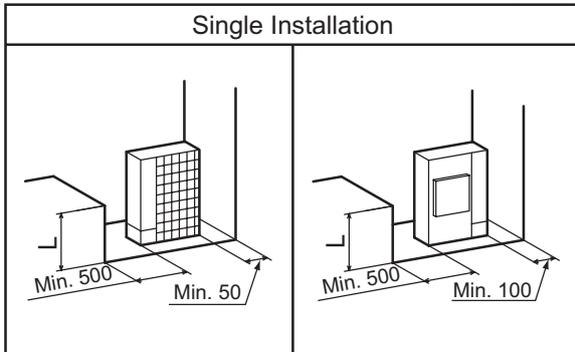


Fig. 5.3 Installation Space (3)

(3) Obstacles on Right and Left Side

(a) No Obstacle Above

(mm)



(b) Obstacle Above

(mm)

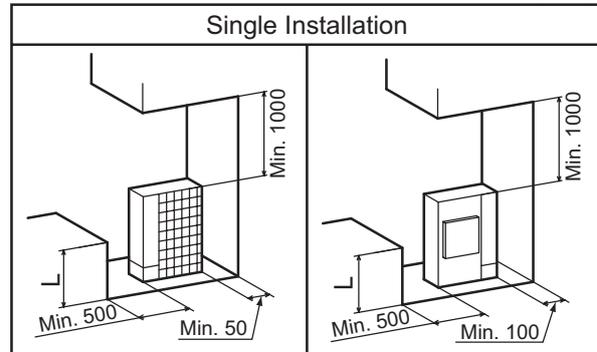


Fig. 5.4 Installation Space (4)

(4) Multi-Row and Multiple Installations

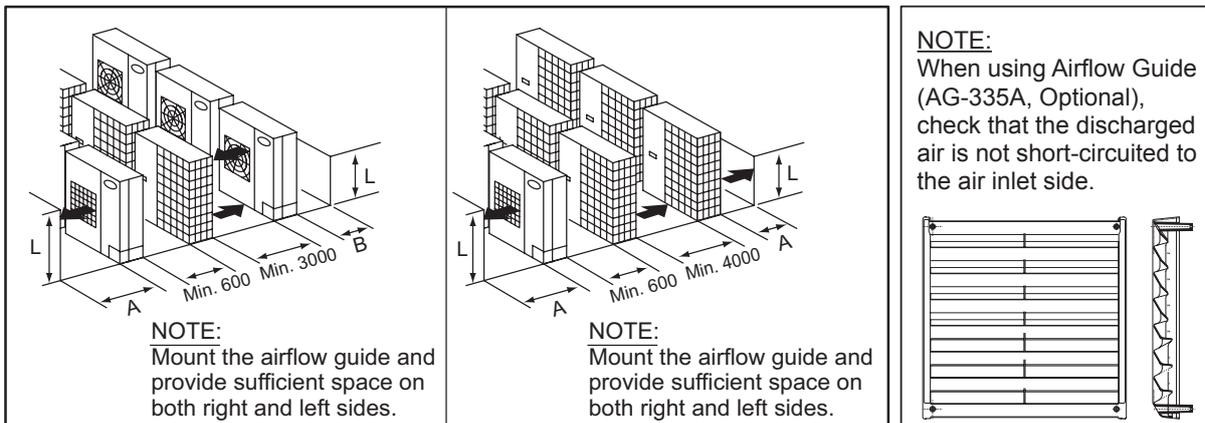


Fig. 5.5 Installation Space (5)

Table 5.2 Dimension of Service Space

A		B	
$0 < L \leq 1/2H$	$1/2H < L \leq H$	$0 < L \leq 1/2H$	$1/2H < L \leq H$
Min. 600	Min. 1400	Min. 300	Min. 350

NOTE

- If L is longer than H, mount the unit on a base so that H is longer than L. In such case ensure that the open space between feet of the base is closed to prevent short circuit of airflow.
- An airflow guide (Optional) is required when there are obstacles on both front and rear side of the outdoor unit.
- Up to 3 outdoor units can be installed for multi-row and multiple outdoor unit installation on a roof top, etc. When more than 3 outdoor units are installed, an airflow guide (Optional) is required in order to prevent short circuit of discharged air.
- Make sure to leave at least 250mm of space to the pipe cover side (on right side as viewed from the front) of the unit.
- When using optional parts, refer to "Installation & Maintenance Manual" of each product in order to provide service space correctly.

5.4 Installation Work

(1) Securing Outdoor Unit with Anchor Bolts

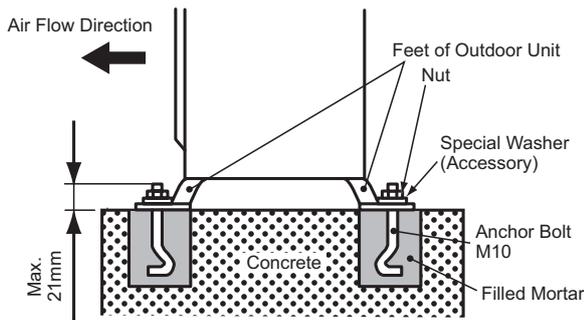


Fig. 5.6 Installation of Anchor Bolts

Secure the outdoor unit to anchor bolts with special washers (factory-supplied accessory).

(3) Example for Fixing Outdoor Unit by Anchor Bolts

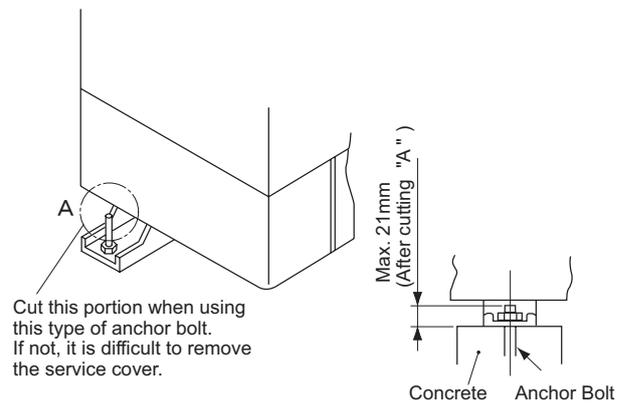


Fig. 5.8 Fixing Example

(2) Mounting Dimension of Anchor Bolts
Refer to Fig. 5.7 for the location of fixing holes.

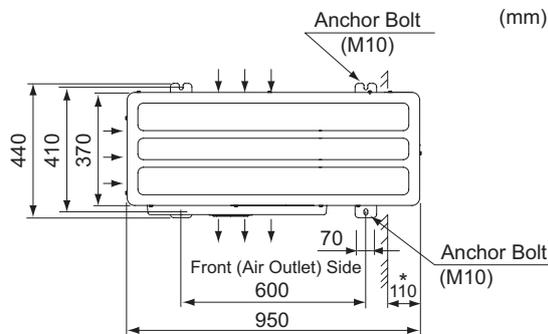


Fig. 5.7 Position of Anchor Bolts

NOTE:
When the dimension marked with * is secured, the piping work from the bottom side can easily be done without interference of the foundation.

(4) Further Foundation Work
Fix the outdoor unit firmly to prevent the unit from declining, making noise, and falling down due to strong wind or an earthquake.

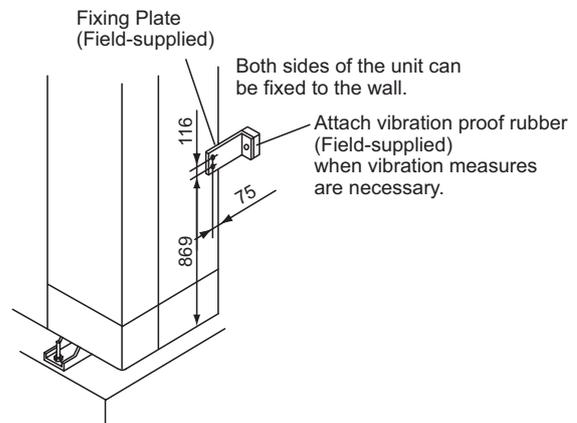
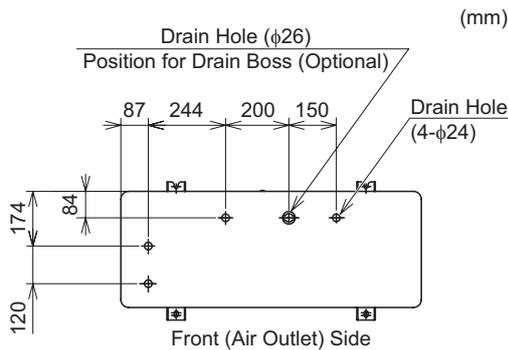


Fig. 5.9 Additional Fixing Arrangement

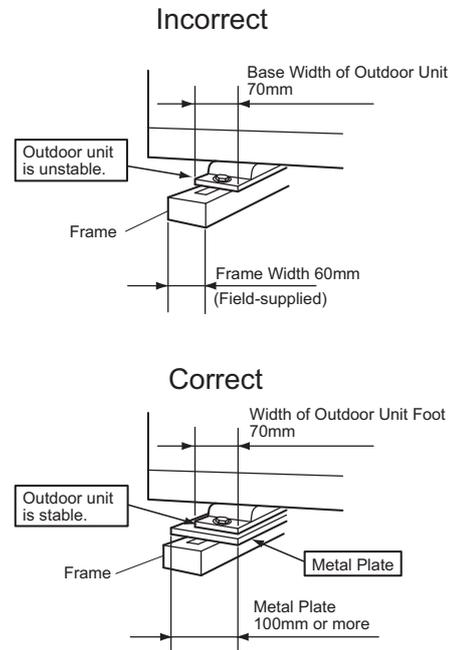
- (5) The drain water is discharged during heating and defrosting operation. Choose a place with good drainage, or provide a drain ditch.
- (6) The drain water might turn into ice in a cold morning. Therefore, when installing the unit on a roof or a balcony, avoid discharging water into places which people often use, because the frozen drain water makes a floor slippery. If installing the unit in such places, provide a second drain pan and the additional drainage.
- (7) Use a drain boss set (Optional) when drain piping work is required to the outdoor unit. Note that the drain boss set cannot be used in cold and snowy areas.



Drain Boss Set

Model	Q'ty
DBS-26	1

- (8) The whole of the base of the outdoor unit should be installed on a foundation. When using a vibration-proof mat, it should also be installed in the same way. When installing the outdoor unit on a field-supplied flame, use metal plates to adjust the frame width for stable installation as shown in Fig. 5.10.



Recommended Metal Plate (Field-supplied)

Material: Hot-Rolled Mild Steel Plate (SPHC)
Plate Thickness: 4.5T

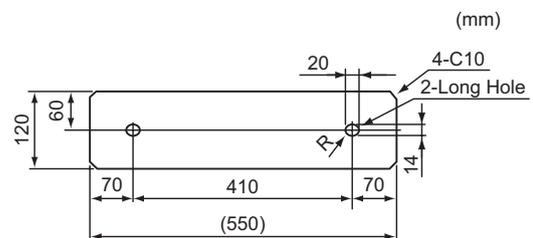


Fig. 5.10 Frame and Base Installation

CAUTION

Aluminum fins have very sharp edges. Pay attention to the fins to avoid any injury.

NOTE

Install the outdoor unit on a roof or in a place where people except service engineers cannot touch the outdoor unit.

6. Refrigerant Piping Work

! DANGER

- Use the specified non-flammable refrigerant (R410A) to the outdoor unit in the refrigerant cycle. Do not charge the unit with materials other than R410A, such as hydrocarbon refrigerants (propane, etc.), oxygen, flammable gases (acetylene, etc.) or poisonous gases when installing, maintaining and moving the unit. These flammables are extremely dangerous and may cause an explosion, a fire, and an injury.
- Prior to installation work, make sure to conduct refrigerant leakage test. The refrigerant (Fluorocarbon) for this unit is non-flammable, non-toxic and odorless. However, if it should leak and contact with fire, toxic gas will be generated. Also because the fluorocarbon is heavier than air, it settles close to the floor, which could cause suffocation.
- For installation in a small room, make sure to take strong measures to prevent the refrigerant from exceeding the maximum permissible concentration in case a refrigerant gas leakage should occur. Otherwise, leaked refrigerant gas will cause suffocation in the event of a leakage. Consult with your distributor for countermeasures (ventilation system, etc).
- When installing the unit, make sure to connect the refrigerant piping before the compressor starts operating. When maintaining, relocating and disposing the unit, remove the refrigerant piping after the compressor stops. If the refrigerant piping are not connected and the compressor are operated with the stop valve opened, the refrigerant cycle will be subjected to extremely high pressure, which may cause an explosion, a fire and an injury.

! WARNING

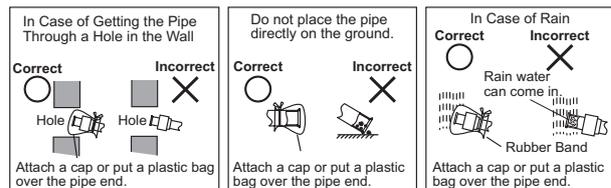
- When handling the refrigerant, be sure to wear leather gloves to prevent cold injuries.
- Before any brazing work, check to ensure that there is no flammable material around. Otherwise, it might lead to a fire.
- Check to ensure that no pressure exists inside the stop valve before removing the flare nut.

! CAUTION

- Tighten the flare nuts according to the specified torque. If an excessive force is applied, the flare nuts may crack due to aging degradation, causing refrigerant leakage.

NOTICE

- Be sure to connect the piping among the units to the same refrigerant cycle.
- Refrigerant Piping End



- (1) Attach a cap or put a plastic bag over the pipe end in case of getting the pipe through a hole in the wall.
- (2) Do not place pipes directly on the ground without a cap or vinyl tape attached at the end of the pipe.

6.1 Piping Materials

● Piping Size

- (1) Prepare locally-supplied copper pipes.
- (2) Select the pipe size from the Table 6.1 and Table 6.2.
- (3) Select clean copper pipes. Make sure there is no dust and moisture inside the pipes. Blow nitrogen or dry air into the pipes, to remove any dust or foreign materials before connecting pipes. Do not use any tools which produce a lot of swarf such as a saw or a grinder.

Table 6.1 Piping Size of Outdoor Unit

Outdoor Unit Capacity	mm (in.)	
	Gas Piping	Liquid Piping
4 - 6HP	φ15.88 (5/8)	φ9.52 (3/8)

Table 6.2 Piping Size of Indoor Unit

Indoor Unit Capacity	mm (in.)	
	Gas Piping	Liquid Piping
0.8 - 1.5HP	φ12.7 (1/2)	φ6.35 (1/4)
2.0HP	φ15.88 (5/8)	φ6.35 (1/4)
2.5 - 6.0HP	φ15.88 (5/8)	φ9.52 (3/8)

NOTE

If the pipe length is 70m or more, the piping size for the liquid piping shall be φ12.7.

● Piping Thickness and Material

Due to the change of the design pressure, the piping thickness has been changed. The thickness of copper pipe differs depending on its material.

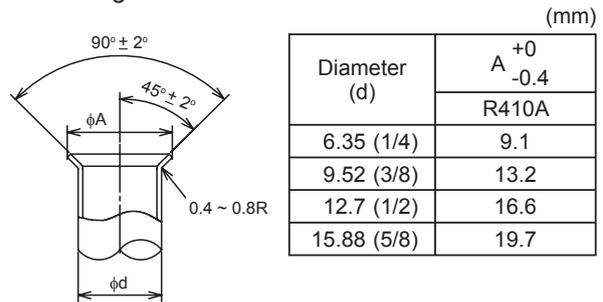
Diameter	R410A	
	Thickness	Material
φ 6.35	0.8	O Material
φ 9.52	0.8	O Material
φ 12.7	0.8	O Material
φ 15.88	1.0	O Material

NOTE

Material is based on JIS B8607. Make sure to use an appropriate pipe shown in the table above.

6.2 Flaring and Joint

● Flaring Dimension



● Joint Selection

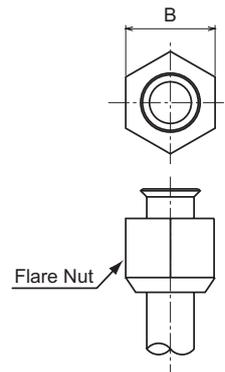
Do not perform flaring work to the joint made of 1/2H Material. In this case, use a joint with the minimum thickness shown in the table below.

< Minimum Thickness of Joint >
(mm)

Diameter	R410A
φ 6.35	0.5
φ 9.52	0.6
φ 12.7	0.7
φ 15.88	0.8
φ 19.05	0.8

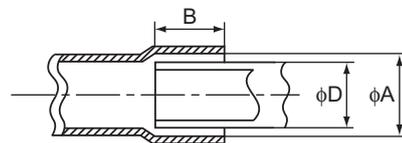
< Flare Nut Dimension B >

Diameter	R410A
φ 6.35 (1/4)	17
φ 9.52 (3/8)	22
φ 12.7 (1/2)	26
φ 15.88 (5/8)	29
φ 19.05 (3/4)	36



● Processing at Brazed Connection

To prevent gas leakage at the brazed connection, comply with the dimension shown in the table regarding the insertion depth and the gap of the joint pipe.



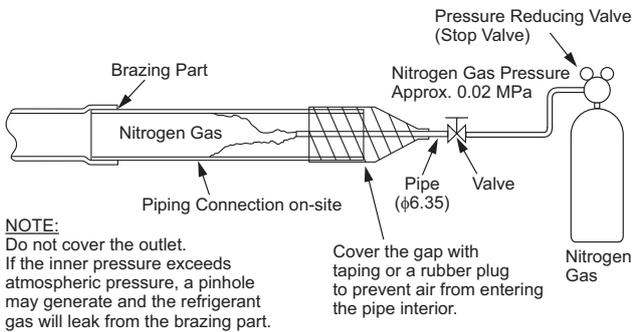
Diameter (D)	Min. Insertion Depth (B)	Gap (A - D)
5 ≤ D < 8	6	0.05 - 0.35
8 ≤ D < 12	7	
12 ≤ D < 16	8	0.05 - 0.45
16 ≤ D < 25	10	

6.3 Piping Connection Work

● **Brazing Work**

- (1) The brazing work must be performed by an authorized installer in order to prevent any trouble.
- (2) For piping connection, perform securely non-oxidation brazing with nitrogen substitution. If brazing the pipes without the nitrogen substitution, a large amount of oxidized scale will be generated in the pipes. This oxidized scale may cause clogging in the expansion valve, solenoid valve, accumulator and compressor, which can prevent the unit from operating properly.

Do not use field-supplied antioxidant, etc., which may corrode pipes and deteriorate the refrigerant oil.



NOTE:
Do not cover the outlet. If the inner pressure exceeds atmospheric pressure, a pinhole may generate and the refrigerant gas will leak from the brazing part.

NOTE

- Make sure to use nitrogen. Nitrogen gas pressure shall be approximately 0.02 MPa. **DO NOT** use the following gases.

Oxygen	Oxygen is flammable and causes oxidation degradation of the refrigerant oil.
Carbon Dioxide	Carbon Dioxide may cause decrease in drier performance.
Freon Gas	Freon Gas emits harmful gases if exposed to fire.

- Make sure to use the pressure reducing valve.
- Do not use field-supplied antioxidant.

- (3) Use a quality brazing filler metal. Select flux low in chlorine concentration.
- (4) Remove the flux completely after brazing work.

NOTE

To minimize oxidized scale generation, braze the minimum portion at appropriate temperature.

● **Flaring Work**

- (1) Check that there are no scratches and dents on the surface of the existing refrigerant piping nor smudges inside the pipe.
- (2) Before flaring work, apply refrigerant oil (field-supplied) in thin layer over the flaring surface of the pipe and the flare nut. And then tighten the flare nut for the liquid pipe according to the specified tightening torque using two spanners. Then, tighten the flare nut for the gas pipe in the same way. Check for the gas leakage after flaring work.

NOTE:
Refrigerant oil is field-supplied.
[Ethereal Oil FVC68D
(Idemitsu Kousan Co. Ltd.)]



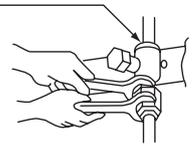
Required Tightening Torque (JIS B8607)

Pipe Size	Tightening Torque
φ6.35 (1/4)	14 to 18 (N-m)
φ9.52 (3/8)	34 to 42 (N-m)
φ12.7 (1/2)	49 to 61 (N-m)
φ15.88 (5/8)	68 to 82 (N-m)
φ19.05 (3/4)	100 to 120 (N-m)

Do not put two spanners here. Refrigerant leakage may occur.



Two Spanners Work

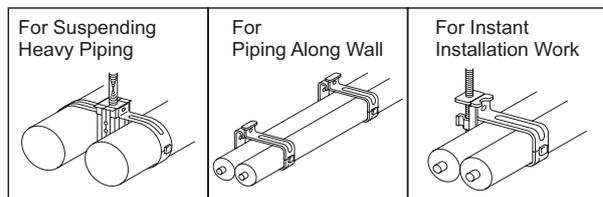


Tightening Work for Stop Valve (Liquid)

- (3) Insulate the flare connection for both liquid and gas pipe with thermal insulation and then wrap protective tape around the outside of them in order to avoid dew formation.

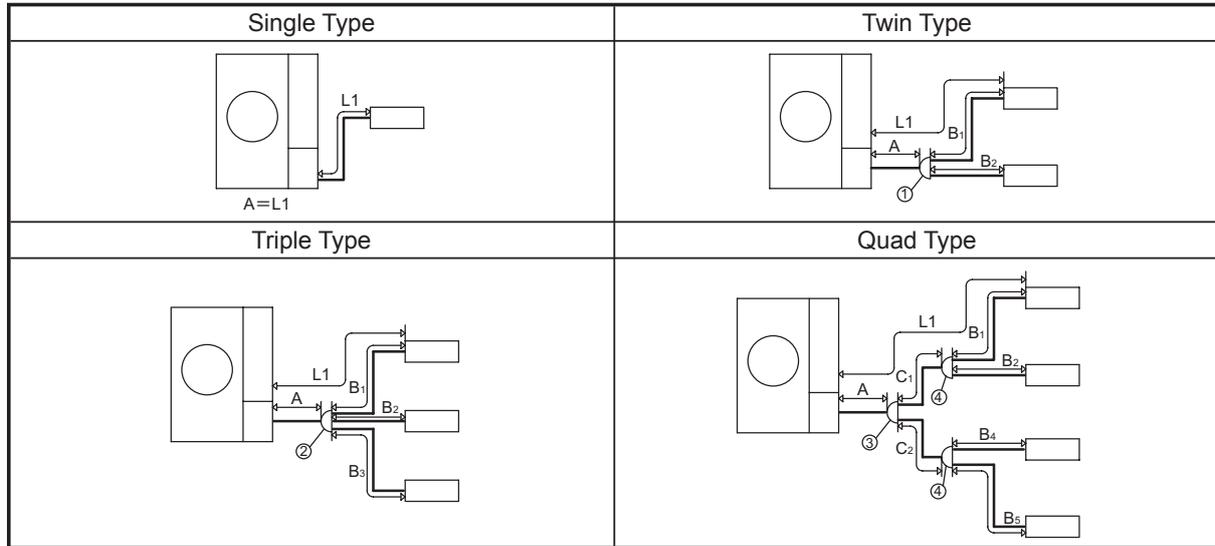
NOTE

- When connecting indoor/outdoor units with refrigerant piping, suspend it from certain points and prevent it from touching the weak parts of the building such as the wall, ceiling, etc. Otherwise, an abnormal sound may occur due to the vibration of the piping.
- Some examples of fixing methods for the refrigerant piping are shown below.



6.4 Pipe Selection

- Select an appropriate pipe according to the combination of the outdoor unit and the indoor unit(s). In the case that more than 5 indoor units are connected to the outdoor unit, select the line branch. (Refer to "Piping Work for Line Branch" in the next page.)



● Pipe Size Selection

Outdoor Unit	Pipe Size											
	A		B1-B5						C1-C2			
	Gas	Liquid	Indoor Unit Capacity									
			0.8-1.5HP		2.0HP		2.5-6.0HP		Total Indoor Unit Capacity after ④ Branch Pipe			
			≤ 2.0HP		≥ 2.5HP							
Gas	Liquid	Gas	Liquid	Gas	Liquid	Gas	Liquid	Gas	Liquid	Gas	Liquid	
4-6HP	φ15.88	φ9.52	φ12.7	φ6.35	φ15.88	φ6.35	φ15.88	φ9.52	φ12.7	φ6.35	φ15.88	φ9.52

NOTE:

If the pipe length is 70m or more, the pipe size for the liquid piping shall be φ12.7.

● Pipe Length and Branch Pipe Selection

Outdoor Unit	Pipe Length							Height Difference between O.U. and I.U.		Branch Pipe				
	Max. Pipe Length	Total Pipe Length			Pipe Length after 1st Branch	Main Pipe Length A (Twin, Triple, Quad)	O.U. is Higher.	O.U. is Lower.	①	②	③	④		
		Total Actual Length of All Liquid Piping		Actual Length of B or B+C								≤ 2.0HP	≥ 2.5HP	
	L1		Twin		Triple	Quad								
	Actual Length	Equivalent Length												
4HP	70	90	70	70	70	10	Main pipe length A shall be much longer than B-C	30	20	TW-52AN	TG-53AN	TW-52AN	TW-22AN	TW-52AN
5, 6HP	75	95	75	75	75	10		30	20	TW-52AN	TG-53AN	TW-52AN	TW-22AN	TW-52AN

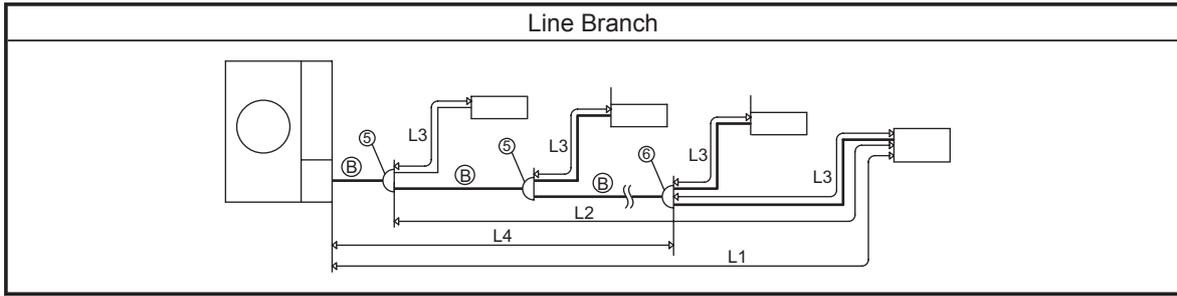
I.U.: Indoor Unit, O.U.: Outdoor Unit

NOTES:

- The length and the route of the liquid piping shall be the same as those of the gas piping.
- Install the branch pipe near the indoor unit.
- When installing the branch pipe, the pipe length between the branch and each indoor unit shall be equal (B1=B2=B3, B4=B5, C1=C2). If the pipe length is not equal because of building structure, the difference of the pipe length shall be within 8m.
 (B1-B2), (B2-B3), (B3-B1), (B4-B5) = within 8m
 (B1+C1) - (B4+C2), (B1+C1) - (B5+C2), (B2+C1) - (B4+C2), (B2+C1) - (B5+C2) = within 8m
- When installing the piping, make sure that there is no height difference in the pipe length between the indoor units. If there is a height difference because of building structure, the difference of the pipe length should be within 3m.

OUTDOOR UNIT

● Piping Work for Line Branch



● Pipe Length and Branch Pipe Selection

Outdoor Unit		4HP	5HP	6HP
Refrigerant Piping Length: L1	Actual Length	70	75	
	Equivalent Length	90	95	
Pipe Length from 1st Branch to Each Indoor Unit: L2		20	20	
Pipe Length from Each Branch to Each Indoor Unit: L3		10	10	
Height Difference between Outdoor / Indoor Units (Outdoor Unit is Higher / Lower.)		30 / 20	30 / 20	
Height Difference between Indoor / Indoor Units		3	3	
Total Pipe Length: Total of L3+L4		70	75	
Multi-kit Model	⑤	MW-102AN1		
	⑥	MW-102AN1		

● Pipe Selection

Main Pipe Diameter (⑤)

Outdoor Unit Capacity	Gas / Liquid
4-6HP	$\phi 15.88 / \phi 9.52$

Piping between Multi-kit and Indoor Unit (L3)

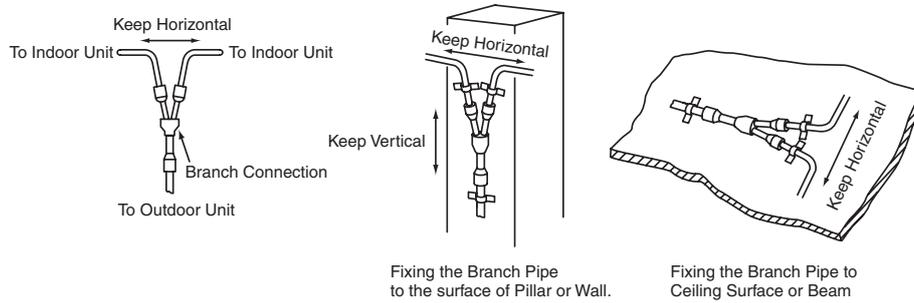
Indoor Unit Capacity	Gas / Liquid
0.8-1.5HP	$\phi 12.7 / \phi 6.35$
2.0HP	$\phi 15.88 / \phi 6.35$
2.5-6.0HP	$\phi 15.88 / \phi 9.52$

* If the pipe length is 70m or more, the pipe size for liquid piping shall be $\phi 12.7$.

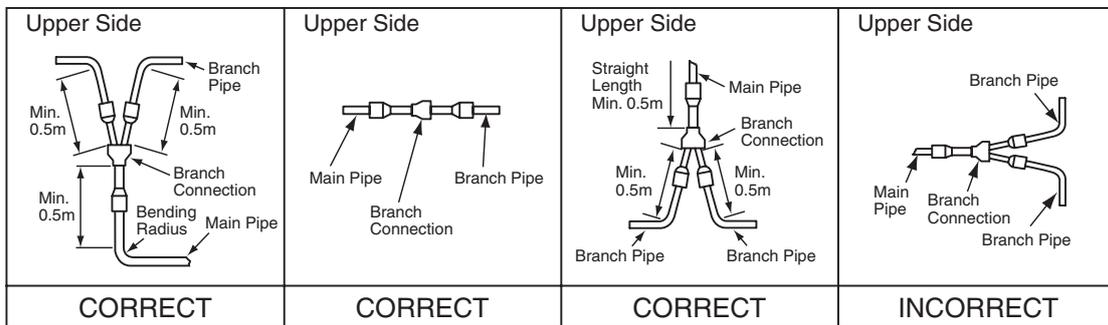
- (2) Make sure to use the branch pipe kit for the distributing pipe.
Do not use a T-Joint. Fix the branch pipes horizontally to the pillar, wall or ceiling.

NOTE:

When fixing the piping by fixing plates, wrap the branch pipe with an insulation or slip a cushioning between the pipe and the plate. Then fix it on the wall, etc..

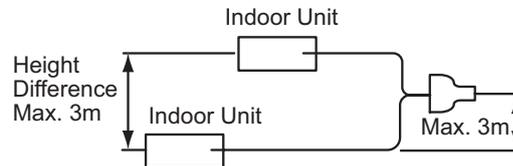


● **Installation Posture of Branch Pipe**



- (3) Ensure the positions of branch pipes and height difference between indoor units according to the right figure.

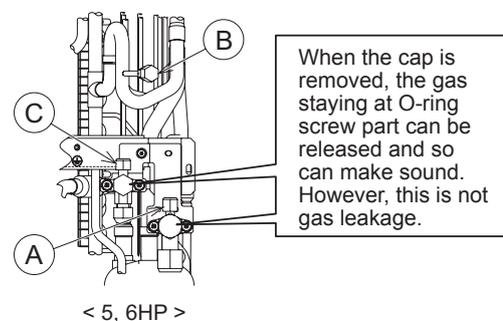
(In Case of Twin Type)



- (4) Pressure Measurement with Check Joint

Use the check joints (“A”) for the gas stop valve and “B”) for the pipe side) to measure the pressure. The pressures switch from high to low depending on the operation mode (cooling operation or heating operation) . Connect a manifold gauge according to the table below.

	Cooling	Heating
Check Joint (A) (for Gas Stop Valve)	Low Pressure	High Pressure
Check Joint (B) (for Piping)	High Pressure	Low Pressure
Check Joint (C) (for Liquid Stop Valve)	Exclusive for Vacuum Pump and Refrigerant Charge	

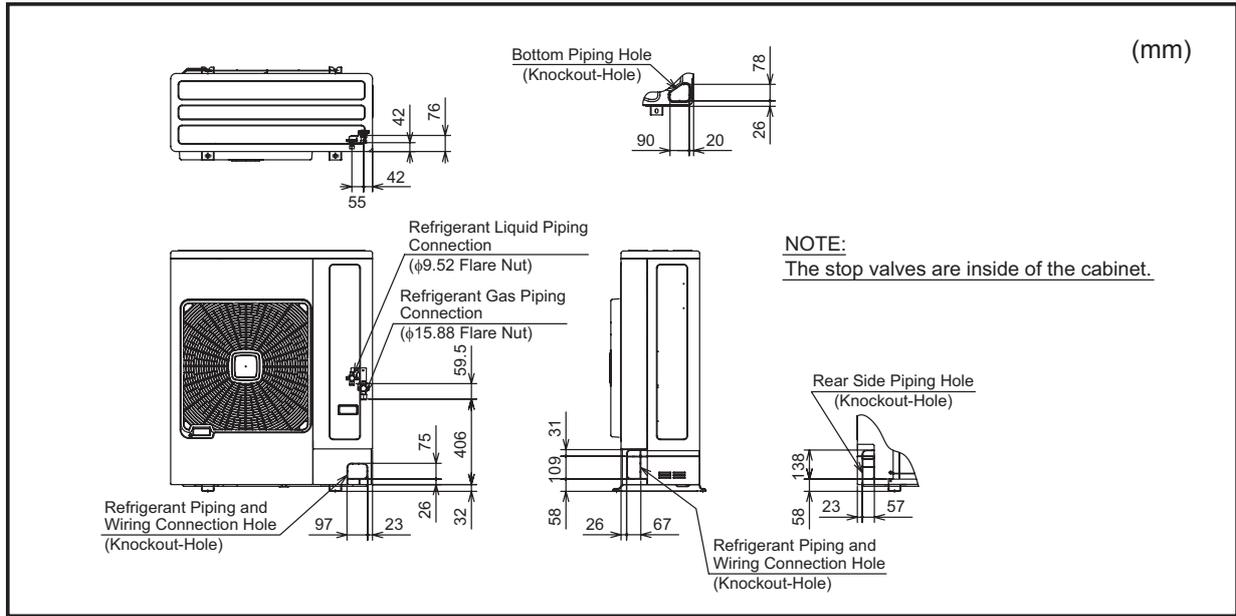


NOTE:

Be careful that the refrigerant and the refrigerant oil does not splash on the electrical box or the electrical parts when removing the charging hose.

6.5 Piping Connection

● **Position of Stop Valve**



● **Pipes can be connected from 4 directions.**

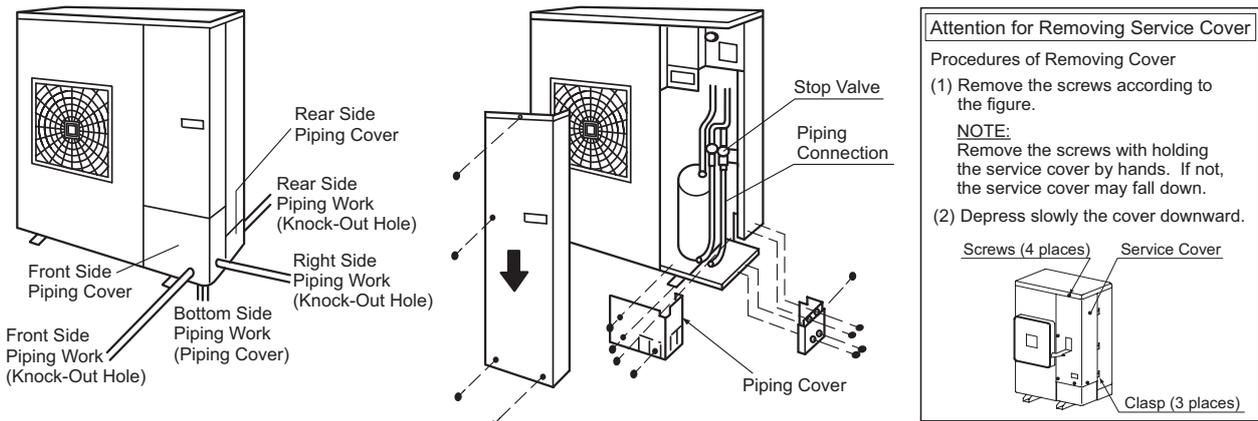
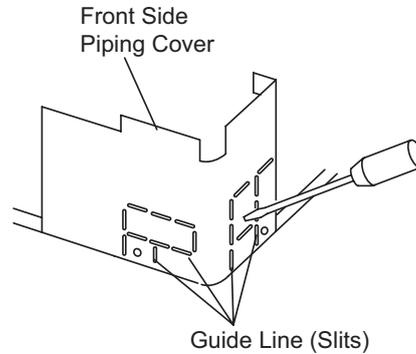
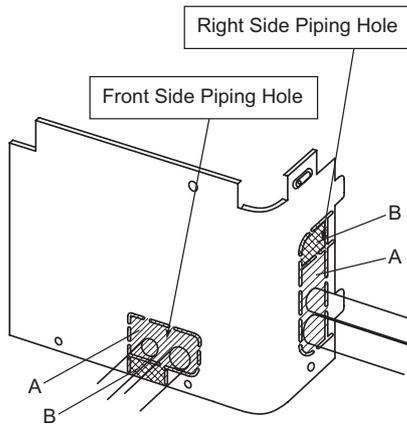


Fig. 6.1 Piping Direction

- (1) The refrigerant piping can be connected from any of the 4 directions as shown in Fig. 6.1. Make a knock-out hole in the front side pipe cover or bottom base to pass the pipe through the hole. After removing the pipe cover from the unit, punch out the holes following the guide line with a screwdriver and a hammer. Then, deburr the holes and attach insulation (Field-supplied) for protection of cables and pipes.



- (a) Front and Right Side Piping Work
Select the correct knock-out size depending on the size of liquid and gas piping, power wiring, or transition wiring.

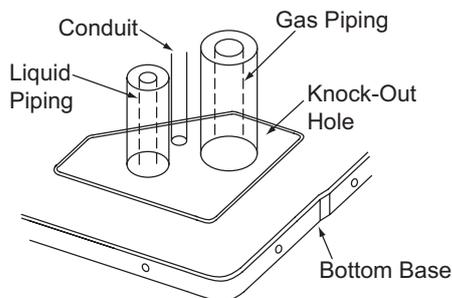


The liquid or gas piping, power source cable of less than 14mm², and control cable can be connected from "A" part. When using a lagging cover or conduit, remove "A" and "B" parts. Check the tube size before removing "A" and "B" parts.

NOTE:

Protect cables and pipes from the edges of the cover with insulations, etc. (Field-supplied).

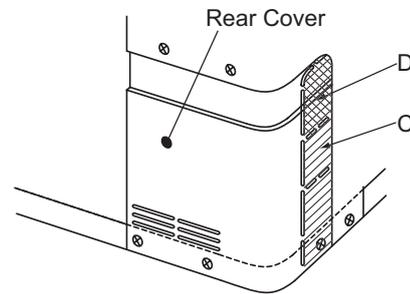
- (b) Bottom Side Piping Work
After removing the piping cover for the bottom base, perform piping and wiring work.



NOTE:

Prevent the cables from coming into direct contact with the piping.

- (c) Rear Side Piping Work
After removing the rear side piping cover, punch out "C" hole along the guide line. When using a lagging cover or conduit, remove "D" part. Check the tube size before removing "D" part.



NOTE:

Protect cables and pipes from the edges of the cover with insulations, etc. (Field-supplied).

NOTICE

For the right side and rear side piping work, secure enough space for the piping.

< Example >

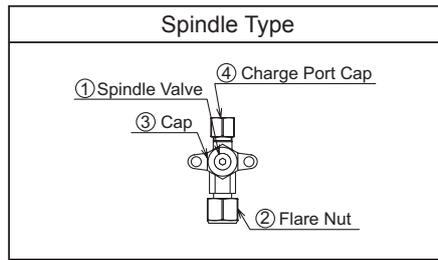
Punch out "D" holes (top of the guide line of the piping cover) during the right side cable and the rear side piping work. It is available to install cables and pipes inside the unit without interfering.

- (2) Be sure to attach the piping cover to prevent rain water from entering the unit. Completely seal the penetration parts of the pipes with field-supplied insulation in order to prevent rain water from entering the conduit. To make it easier to attach the piping cover, cut the lower side guide line of the piping cover.
- (3) In cold and snowy areas, fill the gaps of the piping outlet with field-supplied insulations, etc., for snow prevention.
- (4) Use a pipe bender or an elbow (Field-supplied) for bending work while connecting pipes.

● Operation of Stop Valves

NOTICE

- Remove the stop valve cap before performing the air tight test after connecting the flare nut. Tighten the spindle valve in clockwise direction according to the following table “Tightening Torque of Stop Valves.”
- Tighten the flare nut according the specified torque. If the tightening torque is excessive, it may cause refrigerant leakage from the spindle part.
- Perform the air tight test after tightening work. It is more effective to perform this work after fix the flare nuts for the piping connection to the stop valves.
- Use the charging hose for the check joint connection. When removing the charging hose from the check joint, a sound may be heard by a small quantity of refrigerant leak. However it is not abnormality. Do not apply excessive force to the end of opening the spindle. (Tightening Torque: $\leq 5.0\text{N}\cdot\text{m}$)



< Tightening Torque of Stop Valves >

(N·m)

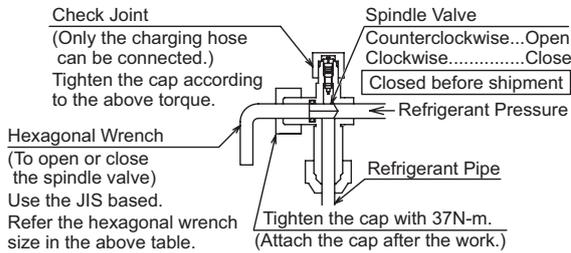
Outdoor Unit	① Spindle Valve		② Flare Nut		③ Cap		④ Check Joint for Service Port	
	Gas	Liquid	Gas	Liquid	Gas	Liquid	Gas	Liquid
4-6HP	9-11	7-9	68-82	34-42	33-42	33-42	14-18	14-18

< Hexagonal Wrench Size for Spindle Valve >

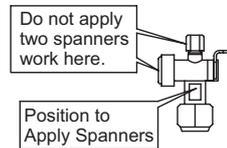
(mm)

Outdoor Unit	Gas	Liquid
4-6HP	5	4

Perform the work after warming the spindle part by a dryer etc. when controlling the stop valve in an cold area. (O-ring of the spindle part will harden at the low temperature and the refrigerant leakage may occur.)



Use securely two spanners at the following position when removing or installing the pipe. If not, refrigerant leakage will occur.



7. Electrical Wiring

WARNING

- **Electrical wiring work must be performed by authorized installers. Incorrect installation by a non-authorized installer may cause an electric shock or a fire.**
- **Perform electrical work according to this Installation Manual and all the relevant regulations and standards. Failing to follow these instructions can cause capacity shortage and performance degradation, resulting in an electric shock and a fire.**
- **Use specified cables between the outdoor unit and the indoor units. Selecting incorrect cables may cause an electric shock or a fire.**
- **Ensure that the wiring terminals are tightened securely with the specified torques. Loose terminals may cause heat generation at the terminal connection part, a fire or an electric shock.**
- **Make sure to tie the wires together with cord clamps after connecting the wiring to the terminal block and pass the wires through the wiring hole. If not, the wires will be pinched, causing a fire.**
- **Make sure to turn OFF the power supply before handling the service connector.**
- **Fix the cables securely. External forces from the cables applied on the terminals could lead to heat generation and a fire.**
- **Make sure to turn OFF the main power supply before opening the service cover of the outdoor unit. Otherwise, it may cause an electric shock.**
- **When controlling the switch on PCB, do not touch other electrical parts. Otherwise, it may cause an electric shock.**
- **Protect the wires, electrical parts, etc. from rats or other small animals. If not, rats may gnaw at unprotected parts, which may lead to a fire.**

7.1 General Check

- (1) Make sure that the field-selected electrical components (main power switches, circuit breakers, wires, conduit connectors and wire terminals) have been properly selected according to the electrical data indicated in Table 7.2 Wiring Capacity and Size. Make sure that the components comply with National Electrical Code (NEC).
 - Supply the electrical power to each outdoor unit. An ELB, fuse and main switch should be provided for each outdoor unit. If not, it will cause fire or an electrical shock.
 - The power source for the indoor unit and outdoor unit should be provided separately. Connect a power source wiring to each indoor unit group connected to the same outdoor unit.
(Max. capacity of one indoor unit group is 6HP.)
- (2) Check to ensure that the power supply voltage is within $\pm 10\%$ of the rated voltage. If the power supply voltage is too low, the system cannot be started due to the voltage drop.
- (3) Check the size of the electrical wires.
- (4) 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 with high electricity consumption*
 - In case that the power source wires for the device* and for the packaged air conditioner are located close to each other
 - * (ex): Lift, container crane, rectifier for electric railway, inverter power device, arc furnace, electric furnace, large-sized induction motor and large-sized switch

Regarding the cases mentioned above, surge voltage may be inducted in the power supply wiring for the packaged air conditioner due to a rapid change in power consumption of the device and an activation of switch. Therefore, check the field regulations and standards before performing electrical work in order to protect the power supply for the packaged air conditioner.
- (5) Check to ensure that the earth wires of the outdoor unit and the indoor units are connected.
- (6) Check to ensure that the electrical resistance is more than 1 megohm, by measuring the resistance between ground and the terminal of the electrical parts. If the electrical resistance is less than 1 megohm, do not operate the system until the electrical leakage is found and repaired.

7.2 Wiring Connection

Perform wiring connecting work for the outdoor unit according to the Fig. 7.1. For the details of the wiring connecting work for each indoor unit, refer to “Installation & Maintenance Manual” of each.

NOTICE

- Do not use a solderless terminal when a single wire is used. Instead, connect the wire directly as shown in the figure. Otherwise, it will cause abnormal heating at the caulking portion of the terminal.
- When using a conduit tube, do NOT lead it into the outdoor unit. If the conduit tube touches the compressor and refrigerant cycle in the outdoor unit, it may damage them.

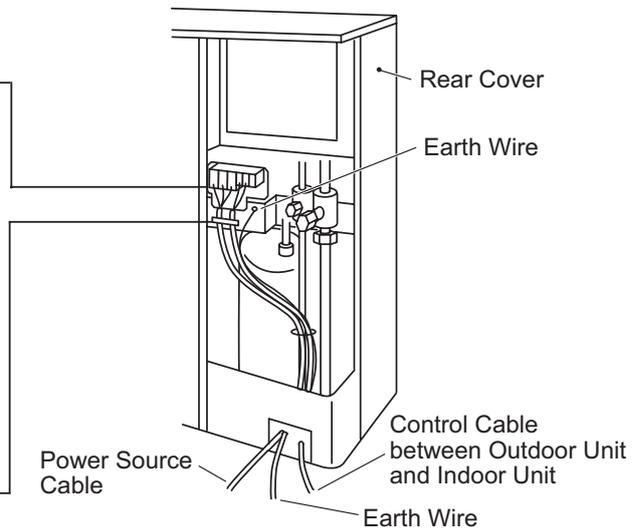
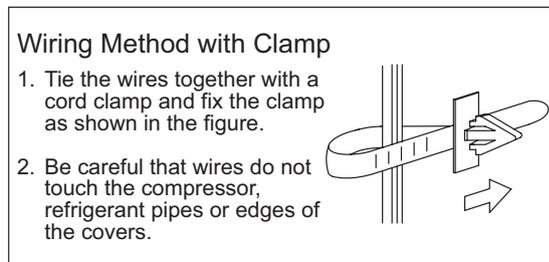
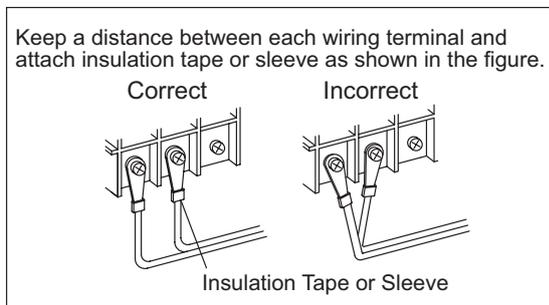
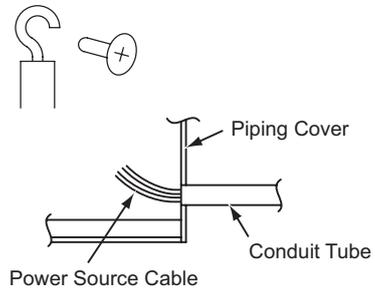
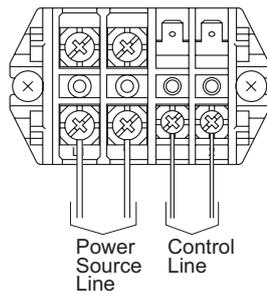
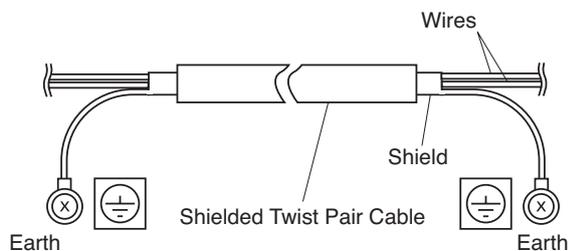


Fig. 7.1 Wiring Connection of Outdoor Unit

- (1) Connect the power source cables (L1 and L2 (N) phases) to the terminal block correctly.



- (2) Do not connect the power source cables to the control line. It will cause a burnout of the printed circuit board.
- (3) Connect the control cables between the indoor unit and the outdoor unit, as shown in Fig. 7.2 to 7.4.
Check to ensure that the terminal for the power source cable (Terminals "L1" to "L1" and "N" to "N" of each terminal block: AC220-240V) between the indoor unit and the outdoor unit coincide correctly. If not, some component will be damaged.
- (4) Use the shielded twist pair cable for control between the outdoor unit and the indoor units. They are connected to the terminals 1 and 2 of the terminal block. The remote control switch cable is connected to the terminals A and B of each indoor unit terminal block.
- (5) When installing the unit in Australia, connect the both ends of the shielded twist pair cable (remote control switch cable and control cable) to the earth as shown below.



NOTES:

1. When the total wiring length for control cable between the outdoor unit and the indoor unit and between indoor units is less than 100m, the normal wiring (more than 0.75mm²) except the twist pair cable is available. (Except for Australia)
2. The total wiring length for the remote control switch can be extended up to 500m. If the total wiring length is less than 30m, the normal wiring (0.3mm²) except the twist pair cable is available. (Except for Australia)

NOTICE

- Connect correctly the power source line phases.
3-Phase 4 Wires: L1, N
3-Phase 3 Wires: L1, L2
- In the case of 3-Phase 4 Wires type
The power source must be applied from L1 line and N line. If applied from L1-L2, the electrical parts will be damaged.
- The control cable between the indoor unit and the outdoor unit does not have any polarity.
Do not apply an excessively high voltage to the cable (Rated Voltage 5V). It may cause failure.
- The remote control switch cable (Field-supplied) does not have any polarity. Do not apply an excessively high voltage to the cable (Rated Voltage 5V). It may cause failure.

⚠ DANGER

- Use an ELB (Earth Leakage Breaker).
If it is not used, an electric shock or a fire can be caused in the event of a fault.

⚠ WARNING

- The tightening torque of each screw shall be as follows. Keep the tightening torque below during wiring work.

M4:	1.0 to 1.3 N-m
M5:	2.0 to 2.5 N-m
M6:	4.0 to 5.0 N-m
M8:	9.0 to 11.0 N-m
M10:	18.0 to 23.0 N-m
- Connect earth wires for the outdoor / indoor unit to prevent an electric shock or an unexpected accident. The earth resistance must be less than 1 megohm. The work must be performed by authorized installers.
- Make sure to turn OFF the main power supply before opening the service cover or of the outdoor unit. Otherwise, it may cause an electric shock.
- Take care not to pinch electrical wirings when attaching the service cover. It might cause an electric shock or a fire.

NOTICE

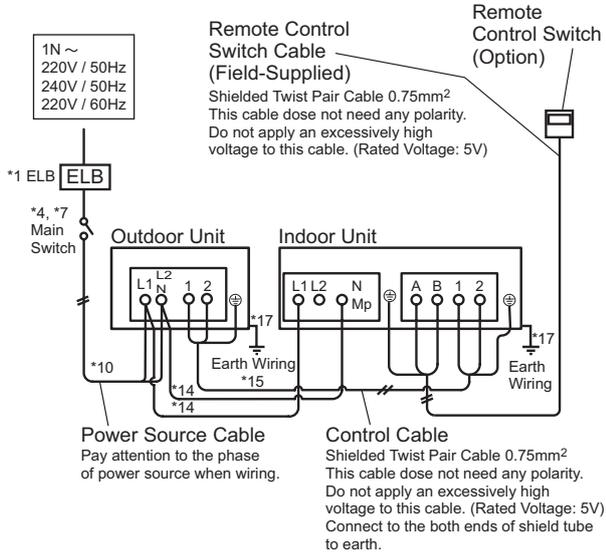
- Maintain the rated voltage for the power source. It may be harmful to the unit if the voltage is either too high or too low.
- Check the the capacity of the power source is enough. If it is not enough, the operation cannot be started due to wide voltage reduction.

Use CASE B method wiring for Australia.

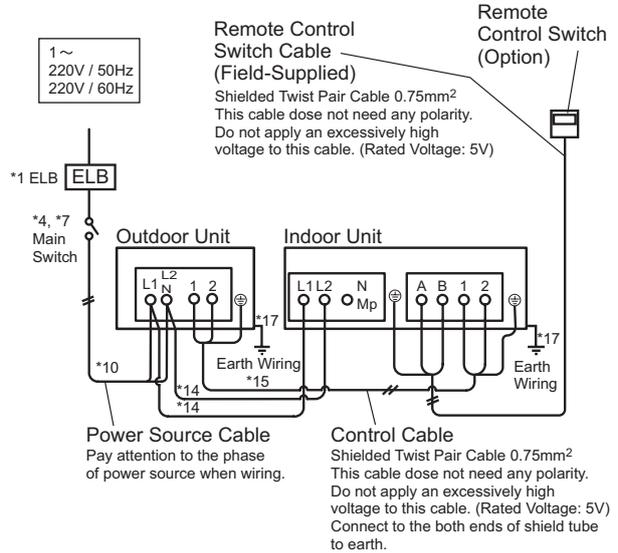
The control cable length between the outdoor unit and the indoor unit shall be less than 75m.

< CASE A >

Power Source Type: 3 Phase 4 Wires

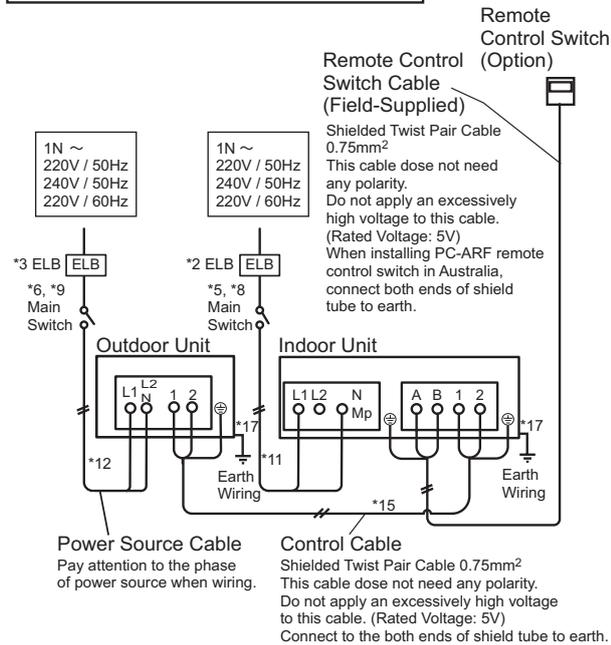


Power Source Type: 3 Phase 3 Wires



< CASE B >

Power Source Type: 3 Phase 4 Wires



Power Source Type: 3 Phase 3 Wires

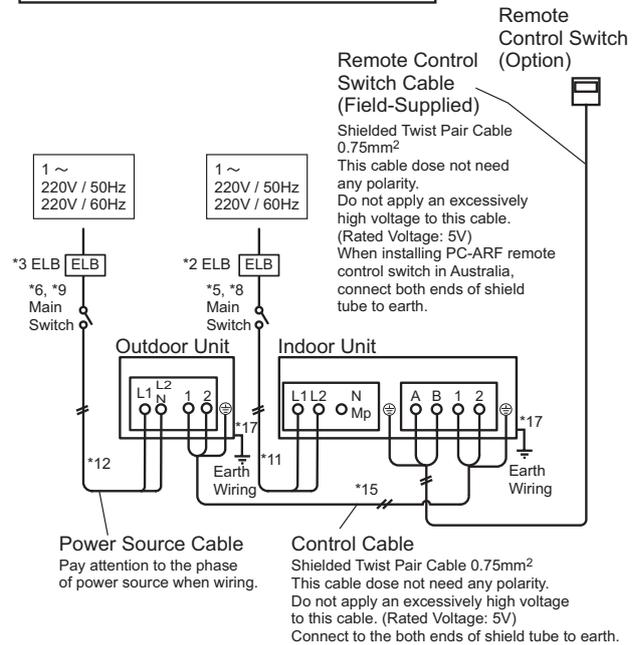
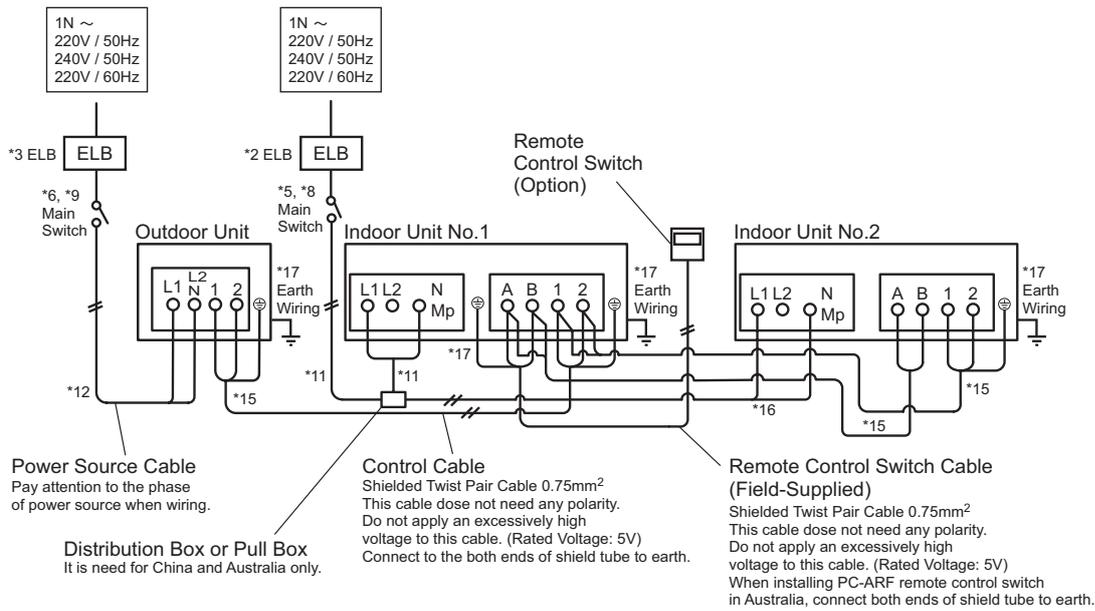


Fig. 7.2 Wiring Connection for Single Type between Indoor Unit and Outdoor Unit

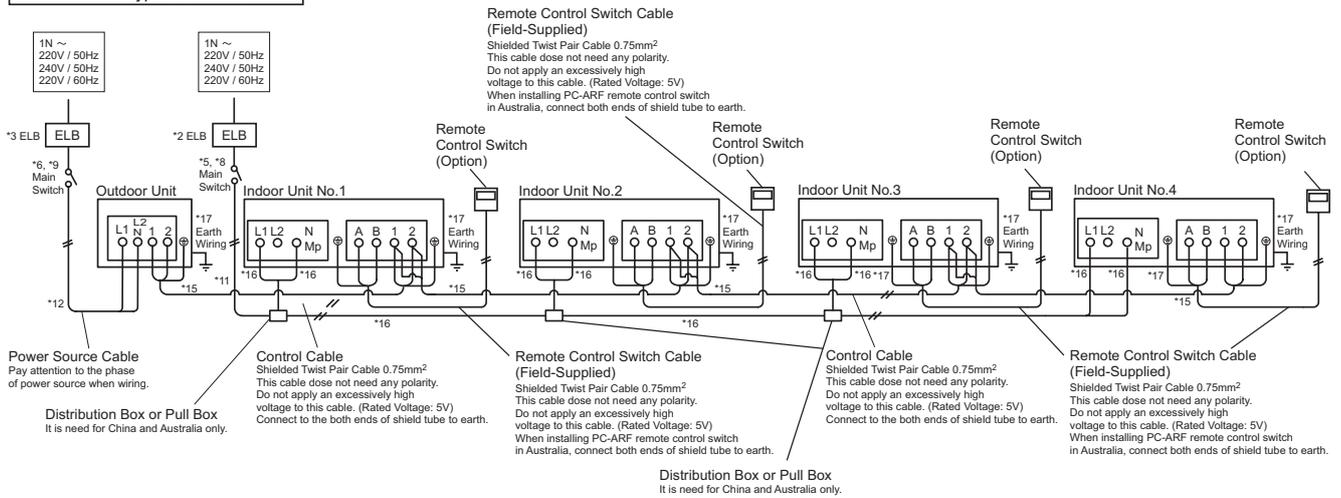
Power Source Type: 3 Phase 4 Wires



NOTE: Other wiring methods are same as the single type.

Fig. 7.3 Multiple Combinations for Simultaneous Operation (CASE B)

Power Source Type: 3 Phase 4 Wires



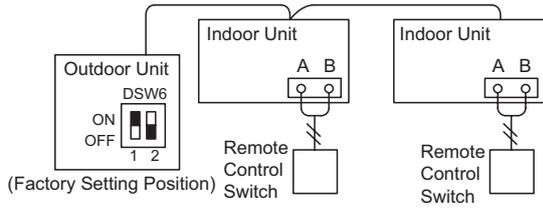
NOTE: Other wiring methods are same as the single type.

Fig. 7.4 Multiple Combinations for Individual Operation (CASE B)

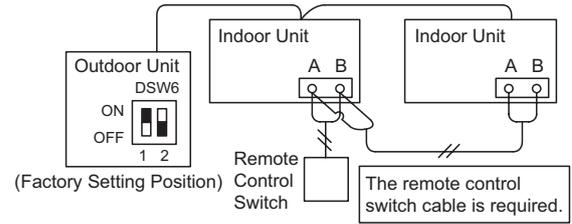
OUTDOOR UNIT

- Remote Control Switch Connecting Diagram

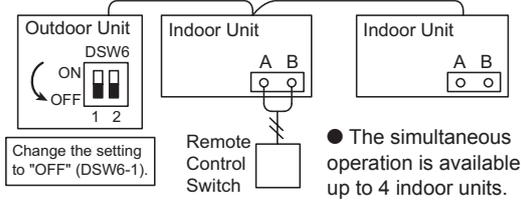
(a) Individual Operation: Installing Wired Remote Control Switch to Each Indoor Unit



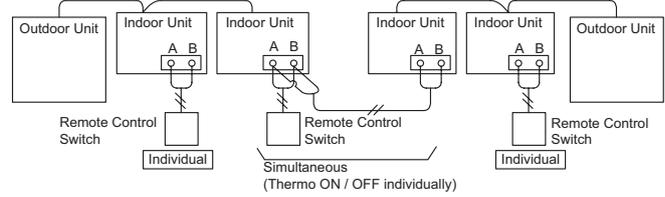
(b) Individual Operation: Installing One Remote Control Switch to Multiple Indoor Units



(c) Simultaneous Operation



(d) Installing Remote Control Switch to Units in Different Refrigerant Cycle Groups

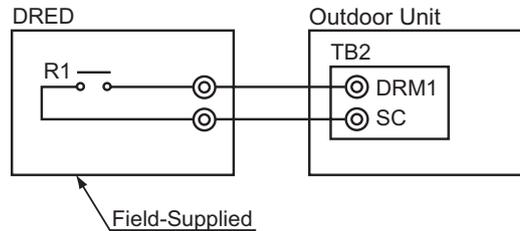


- Connection between Demand Response Enabling Device (DRED) and Outdoor Unit

This function is supported Australian Standard "Demand response capabilities and supporting technologies for electrical products" AS 4755.3.1:2008.

AS 4755	Mode 1 <input checked="" type="checkbox"/>	Mode 2 <input type="checkbox"/>	Mode 3 <input type="checkbox"/>
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When the input terminals DRM1 and SC are short-circuited, the compressor is forcibly stopped and the indoor unit(s) is put under Thermo-OFF condition. The remote control switch display remains the running mode with the stoppage code No. 10.



Wiring Diagram between DRED and Outdoor Unit

NOTE:

If the demand control (ON/OFF) with only time conditions is set, it is recommended to set the time according to the load, not the constant setting time all through the year. The minimum set interval for demand or forcible stoppage should be 30 minutes or more in consideration of the compressor's start-stop frequency and energy-saving.

CAUTION

Do not connect the power source cable or control cable to DRM1 and SC terminals. It will cause a burnout of the printed circuit board.

(6) The recommended breaker sizes etc. are shown in Table 7.1.

Table 7.1 Recommended Electrical Parts

Wiring Connection		ELB	Main Switch		Power Supply Wiring Capacity	Intermediate Wiring between I.U. and O.U.		Intermediate Wiring between I.U. and I.U.	Earth Wiring
			Normal Current	Fuse Capacity		Power Source	Control Cable	Power Source	
Connecting Power Source to O.U. only		*1	*4	*7	*10	*14	*15	*16	*17
Connecting Power Source to O.U. and I.U. separately	Indoor Unit	*2	*5	*8	*11	-	*15	*16	*17
	Outdoor Unit	*3	*6	*9	*12	-	*15	*16	*17

ELB: Earth Leakage Breaker

I.U.: Indoor Unit

O.U.: Outdoor Unit

NOTES:

1. Install a main switch and an ELB for each system separately. Select an ELB that acts within 0.1 second. Select a high-sensitive high speed ELB when the rated sensitive current is less than 30mA.
2. Separate the control wiring (*15) between the outdoor unit and the indoor unit more than approximately 5 ~ 6cm from power supply wiring (*11 and *14). Do not use a coaxial cable.

(7) In the case that a conduit tube for field-wiring is not used, fix rubber bushes with adhesive on the panel.

Table 7.2 Recommended Wiring Capacity and Size

Single Type

Term (measure)	ELB				Normal Current of Main Switch (A)	Fuse Capacity of Main Switch (A)			Wiring Capacity (mm ²)							
	Nominal Current (A)			Normal Sensitive Current (mA)		Power Supply			Between O.U. and I.U.			Earth Wiring				
	CASE A	CASE B Indoor	CASE B Outdoor			CASE A	CASE B Indoor	CASE B Outdoor	CASE A	CASE B Indoor	CASE B Outdoor		Power Source Cable	Control Cable		
Model	*1	*2	*3		*4	*5	*6	*7	*8	*9	*10	*11	*12	*14	*15	*17
RAS-4HVNC1	50	5	40	30	60	5	50	50	5	40	10	0.75	6	0.75	0.75	3.5
RAS-5HVNC1	50	5	40	30	60	5	50	50	5	40	10	0.75	6	0.75	0.75	3.5
RAS-6HVNC1	50	5	40	30	60	5	50	50	5	40	10	0.75	6	0.75	0.75	3.5

Twin Type

Term (measure)	ELB				Normal Current of Main Switch (A)	Fuse Capacity of Main Switch (A)			Wiring Capacity (mm ²)								
	Nominal Current (A)			Normal Sensitive Current (mA)		Power Supply			Between O.U. and I.U. Between I.U. and I.U.			Earth Wiring					
	CASE A	CASE B Indoor	CASE B Outdoor			CASE A	CASE B Indoor	CASE B Outdoor	CASE A	CASE B Indoor	CASE B Outdoor		Power Source Cable	Control Cable	Power Source Cable		
Model	*1	*2	*3		*4	*5	*6	*7	*8	*9	*10	*11	*12	*14	*15	*16	*17
RAS-4HVNC1	50	5	40	30	60	5	50	50	5	40	10	0.75	6	0.75	0.75	0.75	3.5
RAS-5HVNC1	50	5	40	30	60	5	50	50	5	40	10	0.75	6	0.75	0.75	0.75	3.5
RAS-6HVNC1	50	5	40	30	60	5	50	50	5	40	10	0.75	6	0.75	0.75	0.75	3.5

Triple Type

Term (measure)	ELB				Normal Current of Main Switch (A)	Fuse Capacity of Main Switch (A)			Wiring Capacity (mm ²)								
	Nominal Current (A)			Normal Sensitive Current (mA)		Power Supply			Between O.U. and I.U. Between I.U. and I.U.			Earth Wiring					
	CASE A	CASE B Indoor	CASE B Outdoor			CASE A	CASE B Indoor	CASE B Outdoor	CASE A	CASE B Indoor	CASE B Outdoor		Power Source Cable	Control Cable	Power Source Cable		
Model	*1	*2	*3		*4	*5	*6	*7	*8	*9	*10	*11	*12	*14	*15	*16	*17
RAS-4HVNC1	50	5	40	30	60	5	50	50	5	40	10	0.75	6	0.75	0.75	0.75	3.5
RAS-5HVNC1	50	5	40	30	60	5	50	50	5	40	10	0.75	6	0.75	0.75	0.75	3.5
RAS-6HVNC1	50	5	40	30	60	5	50	50	5	40	10	0.75	6	0.75	0.75	0.75	3.5

Quad Type

Term (measure)	ELB				Normal Current of Main Switch (A)	Fuse Capacity of Main Switch (A)			Wiring Capacity (mm ²)								
	Nominal Current (A)			Normal Sensitive Current (mA)		Power Supply			Between O.U. and I.U. Between I.U. and I.U.			Earth Wiring					
	CASE A	CASE B Indoor	CASE B Outdoor			CASE A	CASE B Indoor	CASE B Outdoor	CASE A	CASE B Indoor	CASE B Outdoor		Power Source Cable	Control Cable	Power Source Cable		
Model	*1	*2	*3		*4	*5	*6	*7	*8	*9	*10	*11	*12	*14	*15	*16	*17
RAS-4HVNC1	50	5	40	30	60	5	50	50	5	40	10	0.75	6	0.75	0.75	0.75	3.5
RAS-5HVNC1	50	5	40	30	60	5	50	50	5	40	10	0.75	6	0.75	0.75	0.75	3.5
RAS-6HVNC1	50	5	40	30	60	5	50	50	5	40	10	0.75	6	0.75	0.75	0.75	3.5

ELB: Earth Leakage Breaker
 I.U.: Indoor Unit
 O.U.: Outdoor Unit

■ Field Minimum Wire Sizes for Power Source

Model	Power Source	Maximum Current	Power Source Cable Size		Transmitting Cable Size	
			IEC 60335-1 *1	MLFC *2	IEC 60335-1 *1	MLFC *2
RPI-4.0FSN2SQ RPI-5.0FSN2SQ RPI-6.0FSN2SQ	240V/1φ/50Hz	5A	0.75mm ²	0.5mm ²	0.75mm ²	0.5mm ²
RCI-1.0FSN3 RCI-1.5FSN3 RCI-2.0FSN3 RCI-2.5FSN3 RCI-3.0FSN3 RCI-4.0FSN3 RCI-5.0FSN3 RCI-6.0FSN3	220-240V/1φ/50Hz 220V/1φ/60Hz	5A	0.75mm ²			
RAS-4HVNC1 RAS-5HVNC1 RAS-6HVNC1	220-240V/1φ/50Hz 220V/1φ/60Hz	26A	6.0mm ²	3.5mm ²		

* Refer to the NOTES for selection of the power source cable size.

NOTES:

- 1) Follow the local codes and regulations when selecting field wires.
- 2) The wire sizes marked with *1 in the table above are selected at the maximum current of the unit according to the European Standard, IEC 60335-1. Use the wires which are not lighter than the ordinary tough rubber sheathed flexible cord (code designation H05RN-F) or ordinary polychloroprene sheathed flexible cord (code designation H05RN-F).
- 3) The wire sizes marked with *2 in the table are selected at the maximum current of the unit according to the wire, MLFC (Flame Retardant Polyflex Wire) manufactured by Hitachi Cable Ltd., Japan.
- 4) Use a shielded cable for the transmitting circuit and connect it to ground.
- 5) In the case that power cables are connected in series, add maximum current to each unit and select wires below.

Selection According to IEC 60335-1

Current i (A)	Wire Size (mm ²)
$i \leq 6$	0.75
$6 < i \leq 10$	1
$10 < i \leq 16$	1.5
$16 < i \leq 25$	2.5
$25 < i \leq 32$	4
$32 < i \leq 40$	6
$40 < i \leq 63$	10
$63 < i$	*3

Selection According to MLFC (at Cable Temperature of 60°C)

Current i (A)	Wire Size (mm ²)
$i \leq 15$	0.5
$15 < i \leq 18$	0.75
$18 < i \leq 24$	1.25
$24 < i \leq 34$	2
$34 < i \leq 47$	3.5
$47 < i \leq 62$	5.5
$62 < i \leq 78$	8
$78 < i \leq 112$	14
$112 < i \leq 147$	22

*3: In the case that current exceeds 63A, do not connect cables in series.

⚠ CAUTION

Install a multi-pole main switch with a space of 3.5mm or more between each phase.

8. Setting of Dip Switch

Turn OFF all the power supply of the indoor unit and the outdoor unit before dip switch setting. If not, the setting can be invalid. The “■” mark indicates positions of dip switches. Set the dip switches according to the figure below.

DSW1	DSW2	DSW3
Test Operation	Ref. Piping Length / Optional Function Setting	Capacity Setting
 ON 1 2 3 4 OFF Factory Setting	 ON 1 2 3 4 5 6 OFF Factory Setting	 ON 1 2 3 4 5 6 OFF RAS-4HVNC1
 ON 1 2 3 4 OFF Cooling	 ON 1 2 3 4 5 6 OFF Piping Length ≤ 5m	 ON 1 2 3 4 5 6 OFF RAS-5HVNC1
 ON 1 2 3 4 OFF Heating	 ON 1 2 3 4 5 6 OFF Piping Length ≥ 30m	 ON 1 2 3 4 5 6 OFF RAS-6HVNC1
 ON 1 2 3 4 OFF Cooling for Intermediate Season	 ON 1 2 3 4 5 6 OFF Optional Function Setting	
 ON 1 2 3 4 OFF Heating for Intermediate Season	 ON 1 2 3 4 5 6 OFF External Input / Output Setting Mode	
 ON 1 2 3 4 OFF Forced Stop of Compressor		

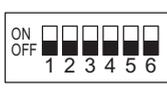
● **Setting for Transmitting**

For H-LINK or H-LINK II system, set the outdoor unit Nos., refrigerant cycle Nos. and the end terminal resistance.

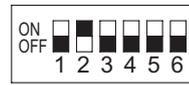
● **Setting of Refrigerant Cycle No.**

In the same refrigerant cycle, set the same refrigerant cycle No. for the outdoor unit and the indoor units as shown below.

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

	Ref. Cycle No. Setting	
	10 digit	1 digit
		 <p>Setting Position</p> <p>Set by inserting slotted screwdriver into the groove.</p>
Outdoor Unit	DSW4	RSW1
Indoor Unit (H-LINK II)	DSW5	RSW2

Ex.: In the Case of Setting Refrigerant Cycle No. 25



Turn ON No. 2 pin.

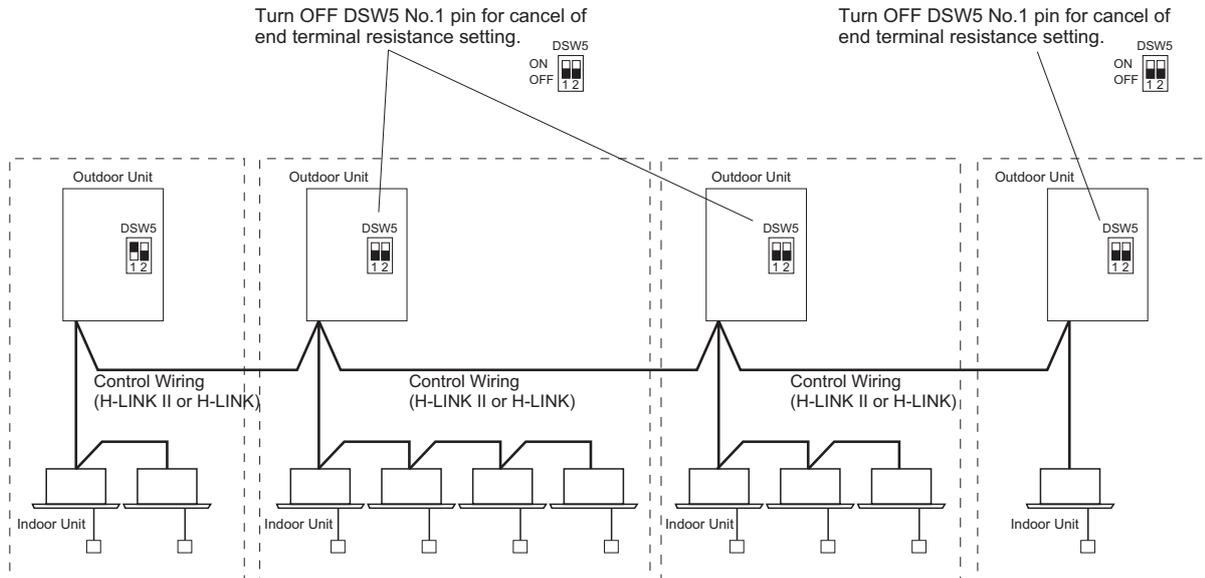
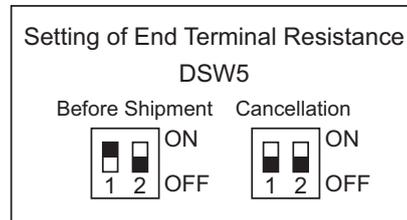


Set Dial No.5.

DSW and RSW setting before shipment is OFF. Maximum in setting refrigerant cycle No. is 63.

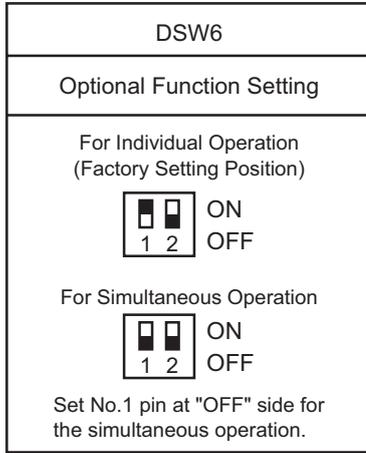
● **Setting of End Terminal Resistance**

Before shipment, No. 1 pin of DSW5 is set to "ON" side. In the case that more than 1 outdoor units are connected in the same H-LINK or H-LINK II, set No. 1 pin of DSW5 for the 2nd and subsequent outdoor units to "OFF" side. If only one outdoor unit is used, no setting is required.



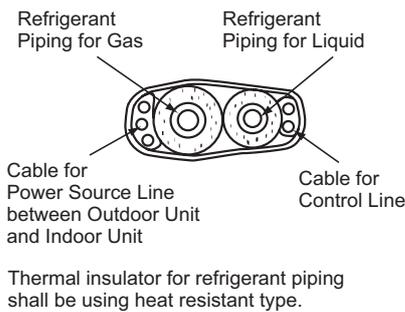
< Setting of Multiple Indoor Units Simultaneous Operation >

Before the outdoor unit is shipped, No. 1 pin of DSW6 is set to "ON" side for the individual operation. If the simultaneous operation is required when installing the multiple indoor units, No. 1 pin of DSW6 is set to "OFF" side.



NOTICE

- The electrical wiring connection may differ depending on the indoor unit type, so refer to "Installation & Maintenance Manual" of the indoor unit.
- For twin, triple or quad combination, select the wiring method "Case B" if the total transition wiring length is more than 75m. Regarding Australia, the wiring method shall be performed "Case B" even if the total transition wiring length is less than 75m.



- Use 2 core cable (equivalent to following cables: VCTF, VCT, CVV, MVVS, VVR or VVF, size: 0.75mm² to 1.25mm² (manufactured by HITACHI Cable Co. Ltd.)) or 2 core twist pair cable (equivalent to following cables: KPEV or KPEV-S (manufactured by HITACHI Cable Co. Ltd.)) for the control cable between the outdoor unit and the indoor unit. The total cable length should be less than 1000m.

- Use 2 core twist pair cable (equivalent to following cables: KPEV or KPEV-S) for the remote control switch cable and the control cable between indoor units. The total cable length should be less than 500m. If the total length of the cable is less than 30m, other cables can be used (the cable size is 0.3mm²).
- Ground securely one side of the shielded twist pair cable (equivalent to following cables: MVVS, KPEV-S) when using it for the control cable between the outdoor unit and the indoor unit, and for the control cable between indoor units. (When installing the unit in Australia, earth the both ends of shielded twist pair cable.)
- Notice for Control Wiring Work between Outdoor Unit and Indoor Unit (for Case A and Case B)
Keep more than 5 to 6cm distance between the control cable and power source cables. Do not use the coaxial cable. In addition, in the case that the other machinery power source cables and the control cable are installed in parallel, keep more than 1.5m distance between them. If impossible, install the power source cable in the metal conduit and be sure ground one side of it.

9. Additional Refrigerant Charge

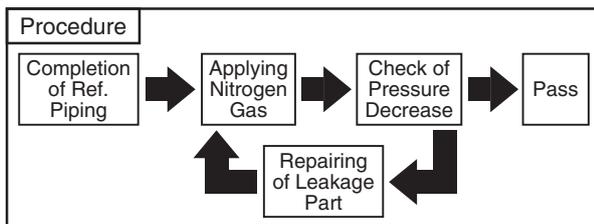
9.1 Air Tight Test

- (1) Check to ensure that the stop valves are closed completely before air tight test.
< Tightening Check of Stop Valves >
After connecting the pipes, remove the caps of stop valves for the gas line and the liquid line. Tighten the open-close spindle in the closing direction according to the following tightening torque.

● Tightening Torque of Stop Valves (N-m)

Outdoor Unit	Spindle Valve	
	Gas	Liquid
4-6HP	9-11	7-9

- (2) Connect the manifold gauge to the check joints of the liquid line and the gas line stop valves, using charging hoses with a vacuum pump or a nitrogen cylinder. Then perform the air tight test. Do not open the stop valves. Apply a nitrogen gas pressure of 4.15MPa. For checking gas leakage, use a leak detector or forming agent. If there is any leakage, fix the leaking parts.



- (3) Check for any gas leakage at the flare nut connections or brazed parts by using a forming agent or a gas leakage detector.

NOTICE

- For checking gas leakage, do not use a forming agent which generates ammonia (NH₃).
- Do not use a household detergent as forming agent, as its components are not clear.

Recommended Forming Agent	Manufacturer
Guproflex	Yokogawa & CO.,Ltd

- Nitrogen Gas shall be charged from both check joints (gas line side and liquid line side). If not, the expansion valve of indoor or outdoor unit can be fully open and so air tight test cannot be performed.

- (4) Insulate the gas piping side and the liquid piping side.
- (5) Wrap the insulation at each flare nut connection and wind a tape for insulation.

⚠ DANGER

Be sure to use Nitrogen Gas for air tight test. If other gases such as oxygen gas, acetylene gas or fluorocarbon gas are accidentally used, it may cause an explosion or gas intoxication.

9.2 Vacuum Pump and Refrigerant Charge

- (1) Vacuum Pumping Work
Connect a manifold gauge and vacuum pump to the check joints. Continue vacuum pumping work for at least 1 to 2 hours until the pressure reaches -0.1MPa (-756mmHg) or lower. After vacuum pumping work, stop the vacuum pumping and leave the gauge for 1 hour. Then check that the pressure in the manifold gauge does not increase. Tighten securely the caps for the check joints according to the following tightening torque.
Gas Stop Valve: 9.0 to 14.0 N-m
Liquid Stop Valve: 14.0 to 18.0 N-m

NOTES:

1. Use tools or measuring instruments exclusively for the refrigerant R410A.
 2. If the pressure does not reach -0.1MPa (-756mmHg), there may be leakage or water collects inside the pipe. Check for any gas leakage and if there is no leakage, operate the vacuum pump for 1 to 2 hours. Then check for any gas leakage once again. If water remains inside the pipe, it may cause a compressor malfunction.
- (2) Charging Work
Additional refrigerant charge is not required if the total pipe length is less than 30m. If the total pipe length is more than 30m, on-site additional refrigerant charge is required. Refer to the item 9.3 "Refrigerant Charge Quantity" for details. Additional refrigerant shall be R410A.

- (a) Fully open the stop valves for the gas line and the liquid line.

NOTE:

For spindle valve, do not apply an excessive force after fully opening it. (Tightening Torque: ≤ 5.0N-m)

- (b) Use a charging hose for the check joint connections of the stop valves.

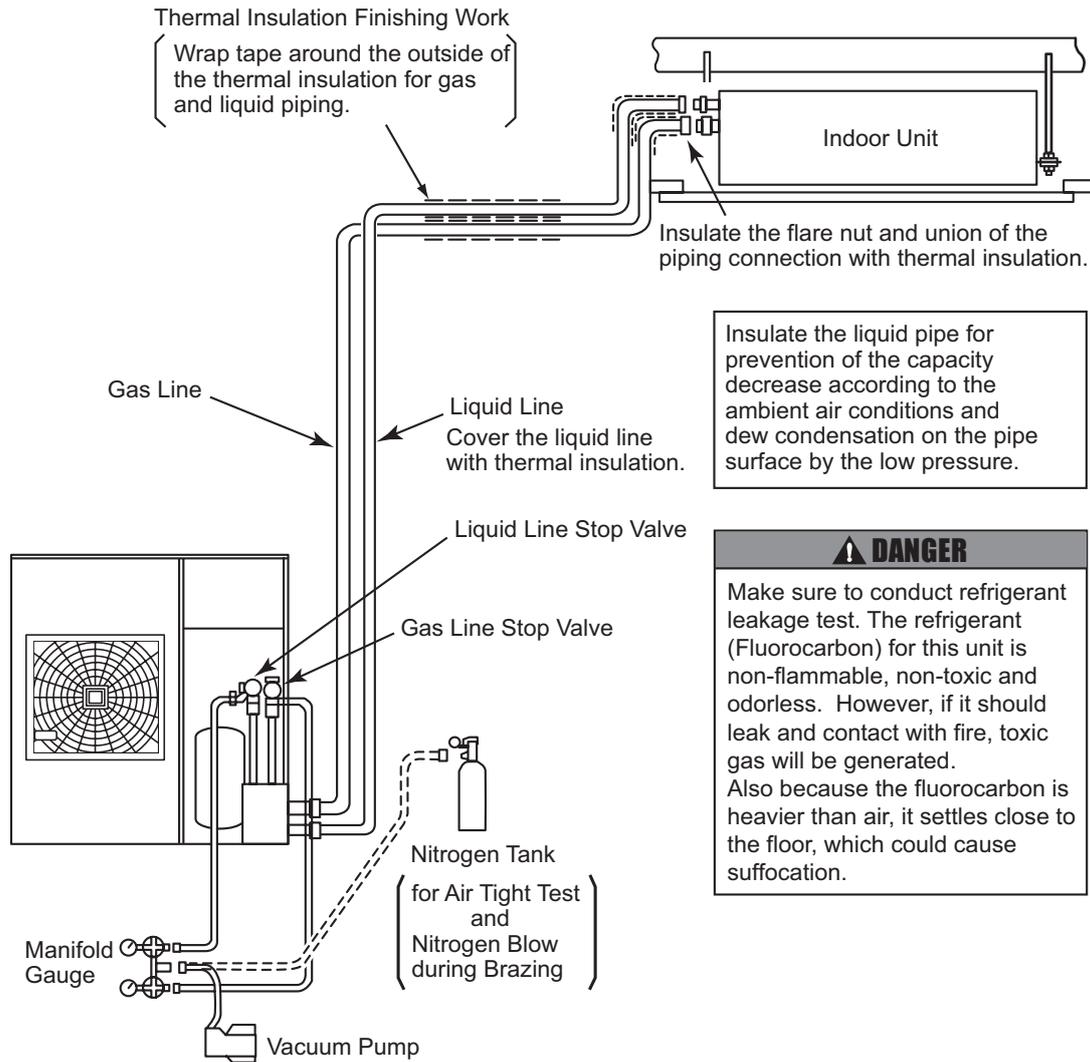
NOTE:

The gas staying at O-ring or screw parts is released and so may make sound when removing the cap of the spindle. This is not gas leakage.

⚠ DANGER

Use the specified non-flammable refrigerant (R410A) to the outdoor unit in the refrigerant cycle. Do not charge the unit with materials other than R410A.

OUTDOOR UNIT



NOTICE

- Do NOT use spent refrigerant for air purge. It may cause malfunction due to refrigerant shortage.

9.3 Refrigerant Charge Quantity

⚠ DANGER

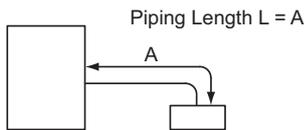
- It is strictly prohibited to release Fluorocarbons into the atmosphere without any reason.
- Make sure to collect Fluorocarbons when depositing and maintaining the product.

Although the unit has been charged with the refrigerant, the additional charge is required according to the pipe length. In the case of the actual pipe length is more than 30m, determine the additional refrigerant quantity according to the following procedure, and charge the unit with it. Record the additional refrigerant quantity to facilitate maintenance and servicing activities thereafter.

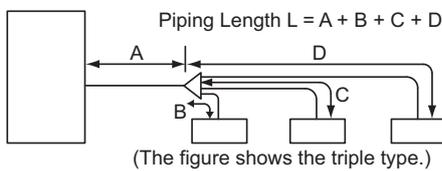
(1) Calculating Method of Additional Refrigerant Charge

(a) Calculate the pipe length L (m).

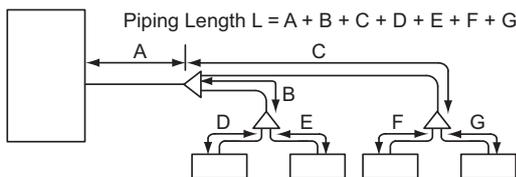
< For Single Type >



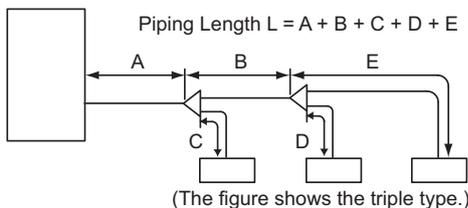
< For Twin and Triple Type >



< For Quad Type >



< For Line Branch >



(b) Calculate the additional refrigerant charge quantity according to the table below.

Outdoor Unit Capacity	Ref. Charge Quantity Before Shipment W_0 (kg)	Chargeless Length (m) : ℓ	Correction Value of Additional Ref. Quantity: P	Max. Additional Ref. Charge Quantity (kg)
4HP	3.2	30	0.04	1.6
5HP	3.2		0.06	2.7
6HP	3.2		0.06	2.7

NOTE:

For Wall Type with the expansion valve kit, some refrigerant charge calculations differ. Refer to "Installation & Maintenance Manual" of the indoor unit for details.

The additional refrigerant charge is NOT required in the case that the piping length is within 30m ($L \leq 30m$).

The additional refrigerant charge is required in the case that the piping length is more than 30m ($L > 30m$).

Calculate the additional refrigerant charge quantity as follows.

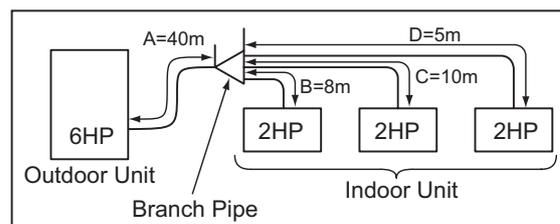
$$W \text{ (Additional Ref. Charge Quantity)} = (L - \ell) \times P$$

L: Pipe Length

ℓ : Chargeless Length (Refer to the table above.)

P: Correction Value of Additional Ref. Amount (Refer to the table above.)

< Example for 6HP and Triple >



$$\begin{aligned} \text{Pipe Length } L &= A + B + C + D \\ &= 40 + 8 + 10 + 5 = 63 \end{aligned}$$

Chargeless Length ℓ : 30

Correction Value of Additional Ref. Quantity P: 0.06

Additional Charge Quantity W:

$$\begin{aligned} W &= (L - \ell) \times P \\ &= (63 - 30) \times 0.06 \\ &= 1.98 \text{ (kg)} \end{aligned}$$

NOTE:

Ensure that the additional charge quantity should not exceed the maximum additional refrigerant charge quantity.

- (2) Refrigerant Charging Work
Charge the additional refrigerant R410A according to the piping length.
- (3) Record of Additional Charge Quantity
Record the additional refrigerant charge quantity. Total refrigerant quantity of this system is calculated in the following formula.

$$\text{Total Ref. Quantity} = W + W_o$$

$$= \square + \square = \square \text{ kg}$$

Additional Charge Qty : W kg
 Total Ref. Qty : kg
 Date of Ref. Charge Work : / /

NOTE:

Regarding the Fluorocarbons used for this product, follow the specification label or caution label for the refrigerant attached to the product.

After the additional refrigerant charge, record the total refrigerant quantity (= quantity before shipment + additional refrigerant quantity in the field) on the refrigerant label. In case of the combination of base units, record the total refrigerant quantity on the main unit label.

When the refrigerant is recovered or charged for repairing, operating or adjusting the unit, record the refrigerant quantity again.

- (4) Dip Switch Setting
The dip switch of DSW2 is required according to the pipe length as shown below.

DSW2		
Before Shipment	Piping Length ≤ 5m	Piping Length ≥ 30m
ON <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 1 2 3 4 5 6	ON <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 1 2 3 4 5 6	ON <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 1 2 3 4 5 6

* Mark of "■" indicates the position of dip switches.
 * No.3 to 6 pins are for other functions.

CAUTION

Turn OFF all the power supply of outdoor and indoor unit before the setting. If not, the setting can be invalid.

NOTICE

- At the test run, fully open the spindle. If not fully opened, the devices will be damaged.
- An excess or a shortage of refrigerant is the main cause of trouble to the units. Charge the correct refrigerant quantity according to the description of label at the inside of the service cover.

WARNING

- Check for refrigerant leakage in detail. If a large refrigerant leakage occurs, it will cause difficulty with breathing or harmful gases would occur if fire was being used in the room.
- Maximum Permissible Concentration of HFC GAS R410A
 - (1) The refrigerant R410A is an incombustible and non-toxic gas. However, if leakage occurs and gas fills a room, it may cause suffocation. The maximum permissible concentration of HFC gas, R410A in air is 0.3 kg/m³, according to the refrigeration and air conditioning facility standard (KHK S 0010) by the KHK (High Pressure Gas Protection Association) Japan. Therefore, some effective measure must be taken to lower the R410A concentration in air below 0.3 kg/m³ in case of leakage. As for R410A, this consideration is applied similarly.
 - (2) Calculation of Refrigerant Concentration
 - (A) Calculate the total quantity of refrigerant R (kg) charged in the system connecting all the indoor units of objective rooms.
 - (B) Calculate the room space where this unit is to be installed V (m³) of each objective room.
 - (C) Calculate the refrigerant concentration C (kg/m³) of the room according to the following equation.

$$\frac{\text{R: Total Quantity of Charged Refrigerant (kg)}}{\text{V: Room Space Where This Unit Is to Be Installed (m}^3\text{)}} = \text{C: Refrigerant Concentration} \leq 0.3 \text{ (kg/m}^3\text{)}$$

If local codes or regulations are specified, follow them.

<Example>
 British Standard BS4434 1989
 Commercial Office
 Building Class D Occupancy
 C = 0.17 (kg/m³)

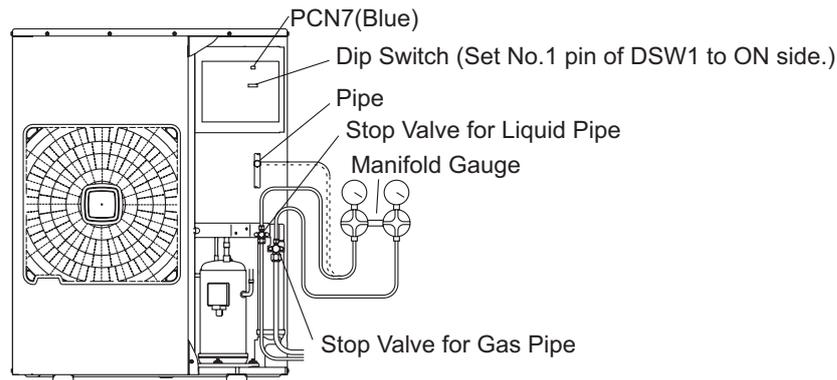
9.4 Refrigerant Recovery

Recover the refrigerant according to the following procedure.

- (1) Turn OFF the power supply before recovery work.
- (2) Install a manifold gauge to each stop valve (for gas and liquid pipe).
- (3) Disconnect the connector PCN7 (Blue) from the outdoor unit PCB so that the valve bypassing high pressure side and low pressure side will not open.
- (4) Turn ON the power supply.
- (5) Set the No.1 pin of DSW1 to ON side to start cooling operation. Then close the stop valve for the liquid pipe and recover the refrigerant.
- (6) Immediately after checking that the pressure of the gas stop valve (low pressure) is -0.01MPa (-100mmHg), close the gas stop valve and set the No.1 pin of DSW1 to OFF side to stop the unit.

NOTE:

1. Make sure to measure the pressure at the low pressure side with a pressure gauge. Keep the low pressure at -0.01MPa or more.
2. Check the temperature on the top of the compressor indicated on 7-segment display (Td). The temperature must be less than 120°C .
- (7) Turn OFF the power supply.
- (8) Connect the connector PCN7 to the outdoor unit PCB.
- (9) Close all the stop valves. If there is residual pressure in the gas and liquid pipes, recover the pressure with a pressure recovery device.



NOTICE

- Turn OFF the power source before recovery work.
- The refrigerant must be collected from 3 check joints (2 for the stop valves of gas and liquid pipe, and 1 for the pipe).

10. Test Run

10.1 Before Test Run

! WARNING

An electrical shock will occur by residual voltage.

- **Disconnect the power source completely before starting the maintenance for electrical parts.**
- **Check to ensure that no residual voltage exists after disconnecting the power source.**

NOTICE

- Check to ensure that each wire for main power supply is connected in correct phase. If it is connected in the reversed phase, the unit will not operate. Connect each electrical wire correctly.
- Do not operate the system until all the check points have been cleared.

- (1) Check to ensure that the electrical resistance is more than 1 megohm, by measuring the resistance between ground and the terminals of the electrical parts. If the electrical resistance is less than 1 megohm, do not operate the system until the electrical leakage is found and repaired according to the "Insulation Resistance".
- (2) Check to ensure that the stop valves of the outdoor unit are fully open, and then start the system.
- (3) When the power source line is disconnected, the unit does not operate. Check to ensure that the power source and the power-supply facility.
- (4) Check to ensure that the power source has been turned ON for more than 12 hours before the test run, to warm the compressor oil by the crankcase heater. If not, the unit will not operate for maximum 4 hours.
- (5) Check the following working range.

	Cooling Operation	Heating Operation
I.U. Suction Air Temperature	≥ 15 °C WB	≤ 27 °C DB
O.U. Suction Air Temperature	≥ -5 °C DB	≤ 15 °C WB

*DB: Dry Bulb, WB: Wet Bulb

- (6) Connect a manifold gauge in order to measure the pressure from the check joint according to item 6.4 "(4) Pressure Measurement by Check Joint".

< Insulation Resistance >

Check to ensure that the insulation resistance is more than 1 megohm by measuring the resistance between ground and the terminal of the electrical parts with a 500V-megohmmeter.

- (1) If the total unit insulation resistance is lower than 1 megohm, there may be refrigerant collecting in the compressor. This may occur if the unit has not been used for long periods. If the insulation resistance of the unit is lower than 1 megohm or the earth leakage breaker is activated, check the following items.

Checking Detail:

- (a) Disconnect the cables for the compressor and measure the insulation resistance of the compressor itself. If the resistance value is 1 megohm or more, the insulation failure at other electrical parts is suspected.
- (b) If the insulation resistance is lower than 1 megohm, disconnect the compressor cable from the inverter PCB. Then, turn ON the main power to apply current to the crankcase heater. After applying current for more than 3 hours, measure the insulation resistance again. If the insulation resistance is more than 1 megohm, there is no problem to the compressor. Reconnect the cables for compressor. If the insulation resistance is less than 1 megohm, the compressor failure is suspected. (Depending on the air conditions, pipe length or refrigerant conditions, it may be necessary to apply the current for a longer period of time.)

NOTE:

When reconnecting the cables to the compressor, pinch the crimp terminal with long-nose pliers to ensure that it is securely fastened.

- (2) Check the recommended size of the ELB shown in Table 7.1 and 7.2. Select high-sensitive high speed ELB when the rated sensitive current is less than 30 mA. (The motion time should be within 0.1 second.)

Table 10.1 Test Run and Maintenance Record

MODEL:	SERIAL. No.	COMPRESSOR MFG. No.
CUSTOMER'S NAME AND ADDRESS:		DATE:

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

Inlet:	No. 1 DB	/WB	°C _i	No. 2 DB	/WB	°C _i
Outlet:	DB	/WB	°C _i	DB	/WB	°C _i
6. Check Outdoor Ambient Temperature

Inlet:	DB	°C _i	WB	°C
Outlet:	DB	°C _i	WB	°C
7. Check Refrigerant Temperature

Liquid Temperature:	_____ °C
Discharge Gas Temperature:	_____ °C
8. Check Pressure

Discharge Pressure:	_____ MPa
Suction Pressure:	_____ MPa
9. Check Voltage

Rated Voltage:	_____ V
Operating Voltage:	_____ L ₁ -N or L ₁ -L ₂ V,
Starting Voltage:	_____ V
10. Check Compressor Input Running Current

Input:	_____ kW
Running Current:	_____ A
11. Is the refrigerant charge adequate?
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 fixed?
17. Are all cabinet panels free from rattles?
18. Is the filter clean?
19. Is the heat exchanger clean?
20. Are the stop valves open?
21. Does the drain water flow smoothly from the drain pipe?

10.2 Test Run

! WARNING

- Do NOT operate the air conditioners to check the electrical wiring, etc until the preparation of the test run is completed.
- Comply with the following items while the system is running.
 - (A) Do not touch any of the parts by hand at the discharge gas side, since the compressor chamber and the pipes at the discharge gas side are higher than 90°C.
 - (B) DO NOT PUSH THE BUTTON OF THE MAGNETIC SWITCH(ES). It will cause a serious accident.

This test run method is for the operation with the wired remote control switch (Model: PC-ARF.) Refer to "Installation & Maintenance Manual" attached to PC-ARF for details on its operation.

- (1) Check to ensure that stop valves (for gas and liquid line) of the outdoor unit are fully opened. (For operation of multiple outdoor units, check to ensure that stop valves of all the outdoor units are fully opened.)
- (2) Perform the test run of indoor units one by one sequentially, and then check the accordance of the refrigerant piping system and the electrical wiring system. (If the multiple indoor units are operated simultaneously, the system accordance cannot be inspected.)
- (3) Perform the test run according to the following procedure. Ensure that the unit is operated without any problem.

NOTE:

In the case that 2 remote control switches (main and sub) are installed to the system, perform test run with the main remote control switch.

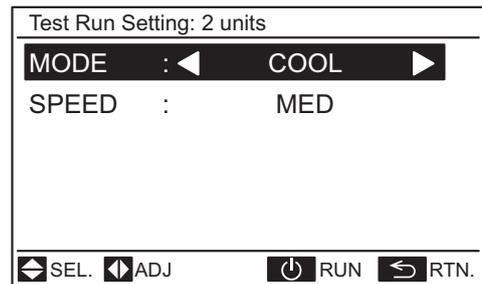
- (a) Press and hold "☰" (menu) and "↵" (return) simultaneously for at least 3 seconds. The test run menu will be displayed.

NOTE:

When using other remote control switches (PC-AR, PC-LH3A or PC-ARH, etc.), perform the test run according to the "Installation & Maintenance Manual" attached to each.

- (b) Select "Test Run" by pressing "△▽" and press "OK". The test run screen will be displayed.

Test Run Screen



- The total number of connected indoor units is indicated on the LCD (Liquid crystal display). In the case of the twin combination (a set of two (2) indoor units), the total number of connected indoor units is indicated as "2 units", and in the case of the triple combination (a set of three (3) indoor units), the total number of connected indoor units is indicated as "3 units".

NOTE:

If "00 unit" is indicated, the auto-address function might have been enabled. Cancel "Test Run" mode and set it again.

- If the number of connected indoor units displayed on LCD is incorrect, the auto-address function is not performed correctly due to incorrect wiring, the electric noise, etc. Turn OFF the power supply, and correct the wiring after checking the following points (do not repeat turning ON and OFF within 10 seconds.)
 - * Failure To Turn ON Power Supply For Indoor Unit
 - * Incorrect Wiring
 - * Loose Connection between Indoor Units or of Remote Control Switch
 - * Incorrect Setting of Indoor Unit Address (The indoor unit address is overlapped.)

(c) Start Test Run.

- Press "⏻" (run/stop). The test run operation starts. The operation mode, the air flow volume, the air flow direction and the test run time can be set on the test run screen. Select the item by pressing "△▽" and set the detail by pressing "◀▶". The default setting of the test run time is 2-hour OFF timer.
- Check the temperature conditions. The unit operation cannot be performed if the conditions are out of range. Refer to item 10.1 (5) for the working range.

< Example >

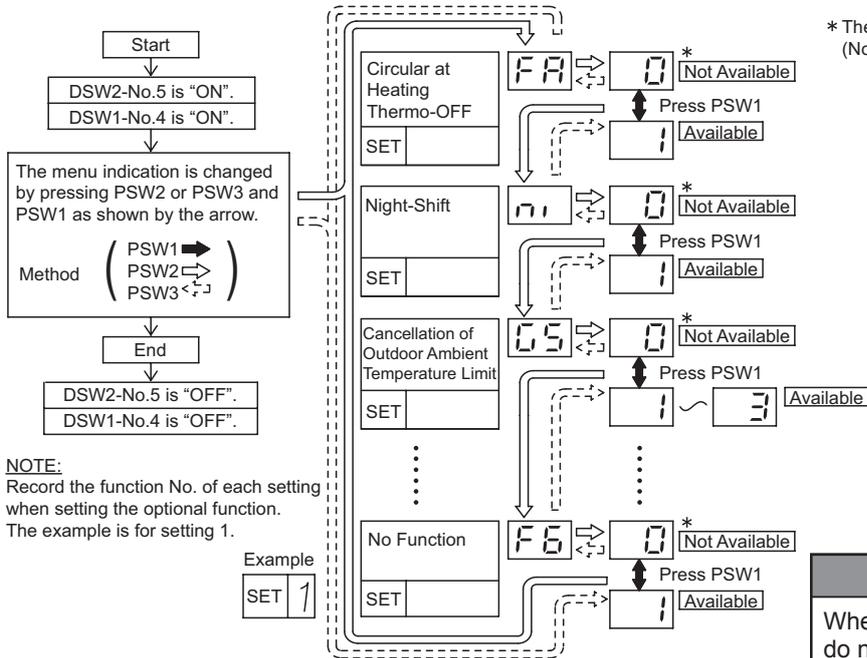
The cooling operation is unavailable if the outdoor temperature drops to -5 °C DB.

- (d) Press “△” or “▽”, select “LOUV.” and select “” (auto swing) by pressing “◁” or “▷”. Then the auto swing operation starts. Check the operating sound of the louvers. If an abnormal sound is generated from louvers, it may be caused by a deformation of the air panel due to incorrect installation. In this case, install the air panel again without a deformation. If an abnormal sound is not generated, press “◁” or “▷” again to stop the auto swing operation.
- (e) Though the temperature detections by the thermistors are invalid, the protection devices are valid during the test run. If an alarm occurs, refer to Table 10.2 “Alarm Code” and perform troubleshooting. Then perform the test run again.
- (f) According to the label “Checking Method by 7-Segment Display” attached to the back side of the service cover of the outdoor unit, check the temperature, the pressure and the operation frequency of specified portions, and check the connected indoor unit numbers on 7-segment display.
- (g) To finish the test run, wait for the set test run time (default setting: 2 hours) to pass, or press “” (run / stop) switch again.
- If the RUN indicator on PC-ARF flashes (2 seconds ON/ 2 seconds OFF), there may be a failure in the transmission between the indoor unit and the remote control switch (loosening of connector, disconnected wire or broken wire, etc.).
 - After turning ON the power source, small sound may be heard from the outdoor unit. This is the operating sound made when the electrical expansion valve adjusts the opening. Therefore, there is no abnormality of the unit.
 - After starting or stopping the compressor, or after starting or finishing the defrosting operation, etc., sound may be heard from the outdoor unit for seconds. This is caused by the pressure difference inside the piping. Therefore, there is no abnormality of the unit.
- (4) For twin, triple and quad combination of indoor units, check the outlet air temperature of each indoor unit. If there is a large difference in the outlet air temperature between the main unit and sub unit(s) (during cooling operation: more than approx. 10deg., during heating operation: more than approx. 20deg.), there may be a failure in the refrigerant piping work. Thus, recheck the refrigerant piping.

10.3 Optional Function Setting

< Function Setting Method >

The function setting should be performed during the outdoor unit stoppage.
This setting is not available during External Input / Output Setting.



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

Example
SET 1

* The setting before shipment is "0"
(Not Available).

WARNING
When controlling the switch on PCB, do not touch other electrical parts. Otherwise, it will cause an electrical shock.

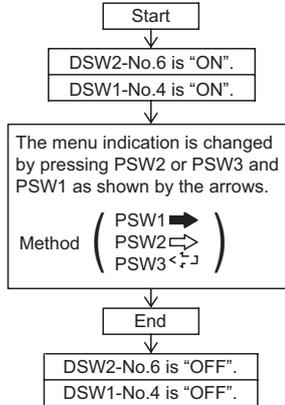
No.	7-Segment Display		Setting Item	
	SEG2	SEG1		
1	FA	1	Circular Function during Heating Thermo-OFF	
2	n1	1	Night Shift	
3	OS	1	Cancellation of Outdoor Ambient Temperature Limit	
		2		For heating
		3		For cooling / heating
4	do	1	Change of Defrost Condition	
5	bu	1	SLo (Fan Speed) Defrost Setting	
6	Hf	1	No Function	
7	nu	1	No Function	
8	Hc	1	Compressor Frequency Control Target Value for Cooling	
9	Hh	1	Compressor Frequency Control Target Value for Heating	
10	Sc	1	No Function	
11	S1	1	Indoor Expansion Valve Opening 1 during Heating Operation Stoppage	
		2	Indoor Expansion Valve Opening 2 during Heating Operation Stoppage	
12	So	1	Indoor Expansion Valve Opening 1 during Heating Thermo-OFF	
		2	Indoor Expansion Valve Opening 2 during Heating Thermo-OFF	

No.	7-Segment Display		Setting Item
	SEG2	SEG1	
13	c1	1	Indoor Expansion Valve Initial Opening 1 at Start of Heating Operation
		2	Indoor Expansion Valve Initial Opening 2 at Start of Heating Operation
14	db	1	Low Noise Setting 1
		2	Low Noise Setting 2
		3	Low Noise Setting 3
15	de	1	Demand Function Setting
16	ue	1	Wave Function Setting
17	Fb	1	Cold Draft Protection 1
		2	Cold Draft Protection 2
18	E1	1	No Function
19	ds	1	Forced Stoppage after Defrost Operation
20	F1	1	Intermittent Operation of Outdoor Fan Motor 1
		2	Intermittent Operation of Outdoor Fan Motor 2
		3	Intermittent Operation of Outdoor Fan Motor 3
		4	Intermittent Operation of Outdoor Fan Motor 4
21	F2	1	No Function
22	F3	1	No Function
23	F4	1	No Function
24	F5	1	No Function
25	F6	1	No Function

NOTE:
When setting the compressor frequency control target (No.8 or 9), the operation noise may be increased 3 to 5dB.

< External Input / Output Setting Method >

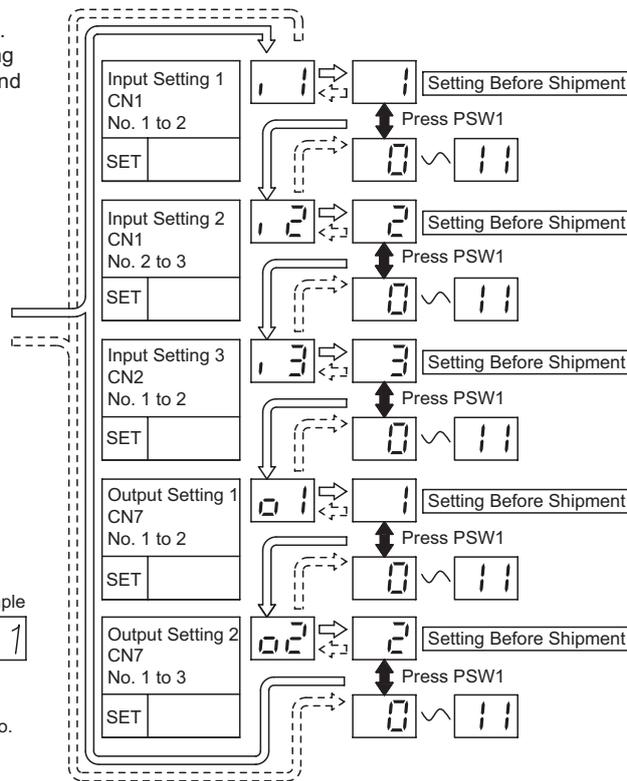
The setting should be performed during the outdoor unit stoppage. This setting is not available during the operation, the check mode and the function setting.



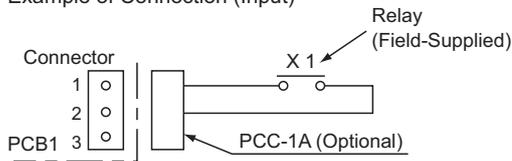
NOTES:

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

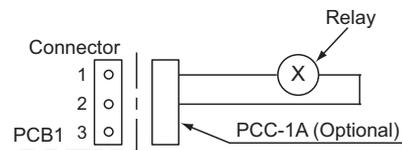
SET	1
-----	---
- The same function cannot be set to a different input terminal. If it is set, the setting of the larger input No. is not available.



● Example of Connection (Input)



● Example of Connection (Output)



● Specifications of Relay

Specifications	Remarks
Mini-Power Relay MY1F (or 2F) made by OMRON Co.	220V / 240V

● Specifications of Relay

Specifications
Mini-Power Relay LY2F DC12V made by OMRON Co.

SEG1	Input	Output
0	No Setting	No Setting
1	Fixed Heating Mode	Operation Signal
2	Fixed Cooling Mode	Alarm Signal
3	Demand Stoppage *1)	Compressor ON Signal
4	Intermittent Operation of Outdoor Fan Motor	Defrost Signal
5	Forced Stoppage *1)	-
6	Demand Current Control 40%	-
7	Demand Current Control 60%	-
8	Demand Current Stoppage 70%	-
9	Demand Current Stoppage 80%	-
10	Demand Current Stoppage 100%	-
11	No Setting	-

*1): For "Demand Stoppage" or "Forced Stoppage", set the function setting "F 1" to "1".

⚠ WARNING

When controlling the switch on PCB, do not touch other electrical parts. Otherwise, it will cause an electrical shock.

NOTE:

In the case of applying the DRED function, a connector CN2 is not available for input setting.

Table 10.2 Alarm Code

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, Abnormality of Drain Pipe, Float Switch or Drain Pan)
02	Outdoor Unit	Activation of Protection Device (High Pressure Cut)	Activation of PSH (Pipe Clogging, Excessive Refrigerant, Insert Gas Mixing, Fan Motor Locking at Cooling Operation)
03	Transmission	Abnormality between Indoor Unit and Outdoor Unit	Incorrect Wiring, Loose Terminals, Disconnected Wire, Blowout of Fuse, Outdoor Unit Power OFF
04		Abnormality between Inverter PCB and Outdoor PCB	Inverter PCB - Outdoor PCB Transmission Failure (Loose Connector, Wire Breaking, Blowout of Fuse)
05	Supply Phase	Abnormality of Power Source Phases	Reverse Phase due to Incorrect Wiring
06	Voltage	Abnormal Inverter Voltage	Outdoor Voltage Drop, Insufficient Power Capacity
07	Cycle	Decrease in Discharge Gas Superheat	Excessive Refrigerant Charge, Failure of Thermistor, Incorrect Wiring, Incorrect Piping Connection, Expansion Valve Locking at Opened Position (Disconnected Connector)
08		Excessively High Discharge Gas Temperature at Top of Compressor Chamber	Shortage of Refrigerant, Leaking, Pipe Clogging
11	Sensor on Indoor Unit	Inlet Air Thermistor	Incorrect Wiring, Disconnected Wiring, Wire Breaking, Short Circuit
12		Outlet Air Thermistor	
13		Freeze Protection Thermistor	
14		Gas Piping Thermistor	
19	Fan Motor	Activation of Protection Device for Indoor Fan Motor	Fan Motor Overheat, Locking (49FE) (130°C OFF)
20	Sensor on Outdoor Unit	Compressor Thermistor	Incorrect Wiring, Disconnected Wiring, Wire Breaking, Short Circuit
21		High Pressure Sensor	
22		Outdoor Air Thermistor	
24		Piping Thermistor	Incorrect Wiring, Disconnected Wiring, Wire Breaking, Short Circuit, Fan Motor Locking at Heating Operation
31	System	Incorrect Capacity Setting of Outdoor Unit and Indoor Unit	Incorrect Capacity Code Setting, Excessive or Insufficient Indoor Unit Total Capacity Code
35		Incorrect Setting of Indoor Unit No.	Duplication of Indoor Unit No. in Same Ref. Group, Excess Indoor Units
38		Abnormality of Picking up Circuit for Protection in Outdoor Unit	Failure of Protection Detecting Device (Incorrect Wiring of Outdoor PCB)
47	Protection Device	Activation of Low Pressure Decrease Protection Device (Vacuum Operation Protection)	Insufficient Refrigerant, Refrigerant Piping, Clogging, Expansion Valve Locking at Open Position (Loose Connector), O.U. Fan Motor Locking at Heating Operation
48		Activation of Overcurrent Protection	Excessive Refrigerant, Heat Exchanger Clogging, Increasing Pressure by Abnormality of Cycle Portions, Abnormality of Compressor (Overload, Locking, Overcurrent)
51	Inverter	Abnormality of Current Sensor for Inverter	Overload Operation (Heat Exchanger Clogging)
53		Activation of Transistor Module Protection Device	Abnormality of Inverter (Overload, Overcurrent, Abnormality of Rotation, Activation Failure), Compressor Failure
54		Abnormality of Inverter Fin Temperature	Abnormal Fin Thermistor Failure, Heat Exchanger Clogging. Fan Motor Failure
55		Inverter Failure	Inverter PCB Failure
57	Outdoor Fan	Abnormality of Fan Motor	Disconnecting Transition Wiring for Fan Motor, Abnormality of Fan Motor or Terminal for Inverter, Incorrect Wiring
b1	Outdoor Unit No. Setting	Incorrect Setting of Unit and Refrigerant Cycle No.	Over 64 Set for Address or Refrigerant Cycle No.
EE	Compressor	Compressor Protection Alarm	This alarm code appears when the following alarms* occur three times within 6 hours. *02, 07, 08, 45, 47

11. Safety and Control Device Setting

● Compressor Protection

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

● Fan Motor Protection

When the thermistor temperature reaches the setting, motor output is decreased. The other way, when the temperature becomes lower, limitation is cancelled.

Model			RAS-4HVNC1	RAS-5HVNC1	RAS-6HVNC1
For Compressor Pressure Switch			Automatic Reset, Non-adjustable (each one for each compressor)		
High	Cut-Out	MPa	4.15 ^{-0.05} _{-0.15}	4.15 ^{-0.05} _{-0.15}	4.15 ^{-0.05} _{-0.15}
	Cut-In	MPa	3.20±0.15	3.20±0.15	3.20±0.15
Low	Cut-Out	MPa	0.30±0.05	0.30±0.05	0.30±0.05
	Cut-In	MPa	0.20±0.03	0.20±0.03	0.20±0.03
Fuse					
1φ, 220/240V, 50Hz					
1φ, 220V, 60Hz		A	40	40	40
CCP Timer			Non-Adjustable		
Setting Time		min.	3	3	3
For Condenser Fan Motor Internal Thermostat			Automatic Reset, Non-Adjustable (each one for each motor)		
For Control Circuit					
Fuse Capacity on PCB		A	5	5	5

All the installation work of the air conditioning is completed.
 Deliver and describe to keep this "Installation & Maintenance Manual" to a user.

HITACHI

Inspire the Next

HITACHI Installation Manual for Multi-Kits

Models: TW-22AN, TW-52AN, TW-102AN

NOTE

Hand over this installation manual to the next installation work personnel.

CAUTION

Do not put any material on the product.

1. Applicable Outdoor Units

These multiple pipe connecting kits can be applied to the R410A DC INVERTER UTOPIA series.

2. Transportation

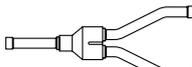
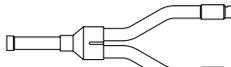
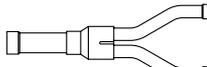
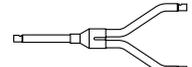
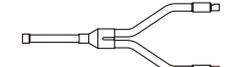
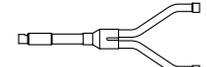
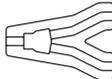
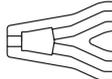
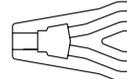
Transport the product as close to the installation location as practical before unpacking.

3. Before Installation

Confirm the number of the following parts by referring to the model printed on the package before unpacking.

Do NOT put any foreign material into the parts.

Check to confirm that no foreign materials are inside the parts before installation.

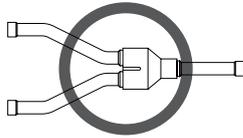
Name of Parts		TW-22AN		TW-52AN		TW-102AN	
		Q'ty		Q'ty		Q'ty	
Branch Pipe for Gas Line			1		1		1
Branch Pipe for Liquid Line			1		1		1
Accessory	Insulation for Gas Line		1 set		1 set		1 set
	Insulation for Liquid Line		1 set		1 set		1 set
	Tape		2		2		2

NOTE : If any of these parts is not contained, please contact your distributor.

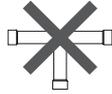
4. Installation Work

NOTE

Use the Multi-Kit surely to the distributing pipe.
Do NOT use the T-Joint.



CORRECT



INCORRECT

4.1 Piping Connection Size

The ends of the multi-kits are finished as shown in the following figures. Cut the end of the pipe to meet with the pipe size.

CAUTION

Piping shall be supported with adequate space. Bent pipes and bypass piping (horizontal loop) shall also be installed in order to absorb piping elasticity caused by temperature changes.

Model	Gas Line	Liquid Line
TW-22AN		
TW-52AN		
TW-102AN		

Unit: mm, ID: Inner Diameter

4.2 Installation Position

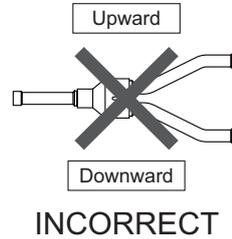
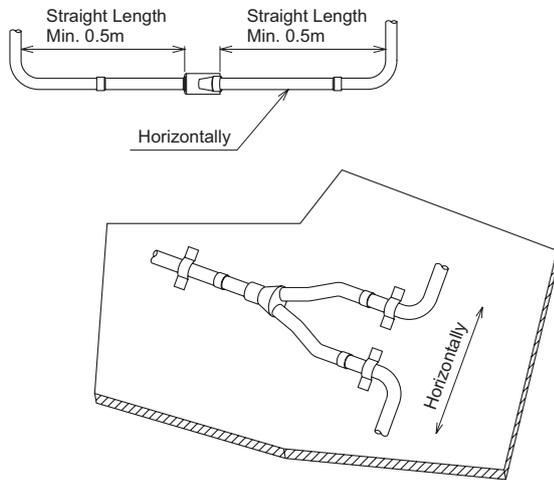
(1) Horizontal Installation

- Fix the branch pipes horizontally to the pillar, wall or ceiling.

NOTE:

Wrap the branch pipes with an insulation or a pad and then fix them on the wall with the fixing plates.

- Make the straight length a minimum of 0.5m after the vertical bend.



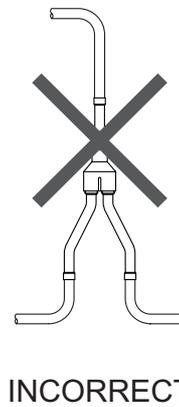
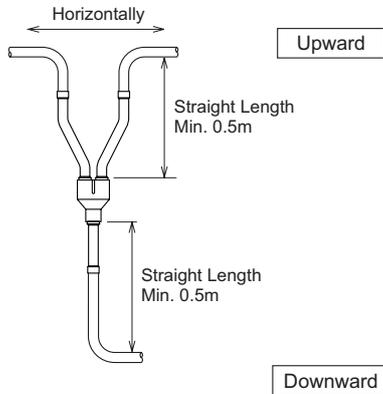
(2) Vertical Installation

- Fix the branch pipes horizontally to the pillar, wall or ceiling.

NOTE:

Wrap the branch pipes with an insulation or a pad and then fix them on the wall with the fixing plates.

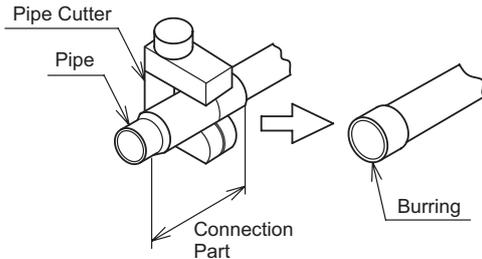
- Make the straight length a minimum of 0.5m after the vertical bend.



4.3 Piping Connection

- (1) Use clean copper pipes without any moisture or foreign materials on inner surface of pipes. When connecting refrigerant pipe, cut the copper pipes with a pipe cutter as shown below.

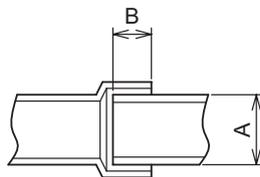
Also blow the pipes with nitrogen or air to remain no dust inside the pipe.
Do NOT use a saw, a grindstone or others which causes a large amount of cutting powder.



- (2) When cutting the pipe, secure the adequate depth for brazing as shown in the following table.

(mm)

A: Outer Diameter	B: Minimum Depth
Over 5, Below 8	6
Over 8, Below 12	7
Over 12, Below 16	8
Over 16, Below 25	10
Over 25, Below 35	12



• Caution for Refrigerant Piping

When installing pipe through the wall, secure a cap at the end of the pipe.

INCORRECT

Hole

Attach a cap or vinyl tape.

CORRECT

Do NOT place the pipe directly on the ground.

CORRECT

INCORRECT

Attach a cap or vinyl tape.

CORRECT

Attach a cap or vinyl tape with rubber band.

INCORRECT

Rain water can enter.

- (3) Make sure that all stop valves of the outdoor unit are closed completely.
- (4) Blow the inside of the pipes with nitrogen gas when brazing.

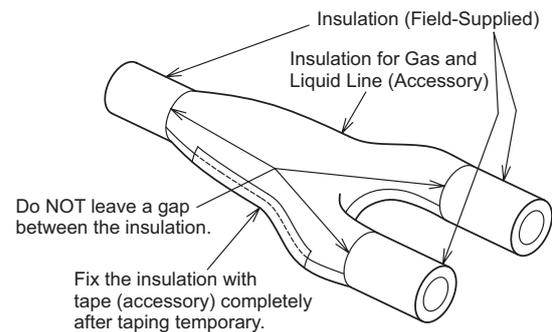
! DANGER

Check for the refrigerant leakage carefully. If large amount of refrigerant leakage occurs, it will cause to breathe with difficulty or to generate harmful gas due to the fire.

- (5) The air tight test pressure of this product is 4.15MPa.
- (6) Apply the insulation supplied with this multi-kits to each branch (liquid side and gas side) with a tape. Also apply the field-supplied insulation to the field-supplied pipes.

NOTE

When polyethylene foam is applied, a thickness of 10mm for liquid piping and 15mm to 20mm for gas piping is recommended. (Use the insulation with heat resistance of 100°C for gas piping.)



! CAUTION

- Perform the insulation work when the pipe surface temperature decreases to the room temperature. If insulation work is performed immediately after brazing, insulation may melt.
- If the ends of pipe are open to the atmosphere for a while after performing piping work, securely put caps or plastic bags over the pipe ends for avoiding moisture or dust.

After installation, it is recommended to keep this manual by a customer.

HITACHI

Inspire the Next

HITACHI Installation Manual for Multi-Kits

Model: TG-53AN, TG-103AN

NOTE

Hand over this installation manual to the next installation work personnel.

CAUTION

Do not put any material on the product.

1. Applicable Outdoor Units

These multiple pipe connecting kits can be applied to the R410A DC INVERTER UTOPIA series.

2. Transportation

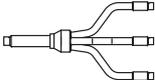
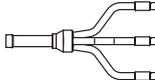
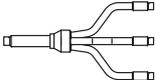
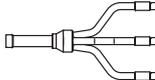
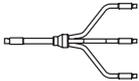
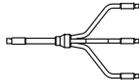
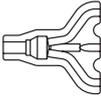
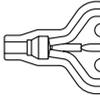
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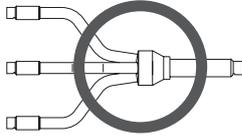
Name of Parts		TG-53AN		TG-103AN	
			Q'ty		Q'ty
Branch Pipe for Gas Line			1		1
Branch Pipe for Liquid Line			1		1
Accessory	Insulation for Gas Line		1 set		1 set
	Insulation for Liquid Line		1 set		1 set
	Tape		2		2

NOTE : If any of these parts is not contained, please contact your distributor.

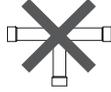
4. Installation Work

NOTE

Use the Multi-Kit surely to the distributing pipe.
Do NOT use the T-Joint.



CORRECT



INCORRECT

4.1 Piping Connection Size

The ends of the multi-kits are finished as shown in the following figures. Cut the end of the pipe to meet with the pipe size.

CAUTION

Piping shall be supported with adequate space. Bent pipes and bypass piping (horizontal loop) shall also be installed in order to absorb piping elasticity caused by temperature changes.

Model	Gas Line	Liquid Line
TG-53AN		
TG-103AN		

Unit: mm, ID: Inner Diameter

4.2 Installation Position

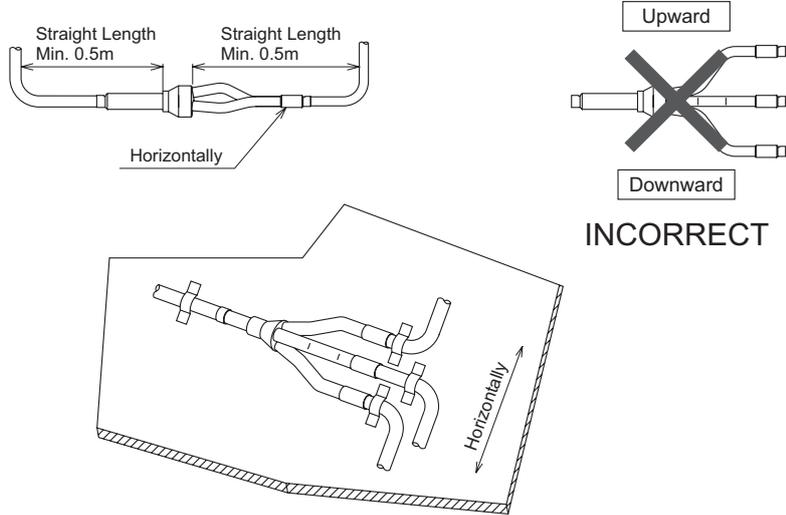
(1) Horizontal Installation

- Fix the branch pipes horizontally to the pillar, wall or ceiling.

NOTE:

Wrap the branch pipes with an insulation or a pad and then fix them on the wall with the fixing plates.

- Make the straight length a minimum of 0.5m after the vertical bend.



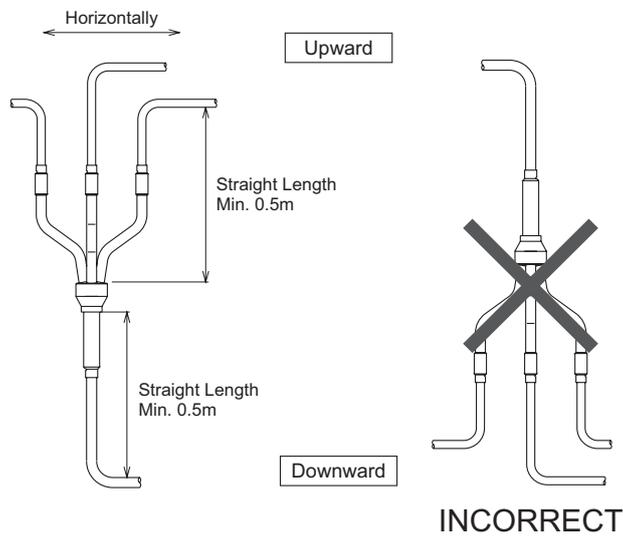
(2) Vertical Installation

- Fix the branch pipes horizontally to the pillar, wall or ceiling.

NOTE:

Wrap the branch pipes with an insulation or a pad and then fix them on the wall with the fixing plates.

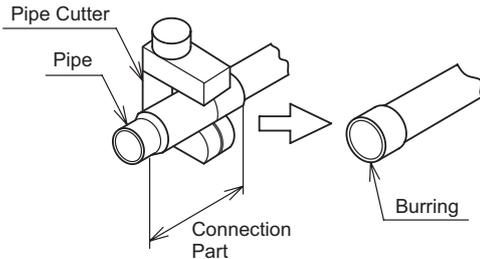
- Make the straight length a minimum of 0.5m after the vertical bend.



4.3 Piping Connection

- (1) Use clean copper pipes without any moisture or foreign materials on inner surface of pipes. When connecting refrigerant pipe, cut the copper pipes with a pipe cutter as shown below.

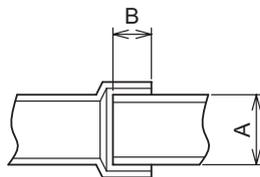
Also blow the pipes with nitrogen or air to remain no dust inside the pipe.
Do NOT use a saw, a grindstone or others which causes a large amount of cutting powder.



- (2) When cutting the pipe, secure the adequate depth for brazing as shown in the following table.

(mm)

A: Outer Diameter	B: Minimum Depth
Over 5, Below 8	6
Over 8, Below 12	7
Over 12, Below 16	8
Over 16, Below 25	10
Over 25, Below 35	12



• Caution for Refrigerant Piping

When installing pipe through the wall, secure a cap at the end of the pipe.

INCORRECT

CORRECT

Attach a cap or vinyl tape.

Do NOT place the pipe directly on the ground.

CORRECT

INCORRECT

Attach a cap or vinyl tape.

CORRECT

Attach a cap or vinyl tape with rubber band.

INCORRECT

Rain water can enter.

- (3) Make sure that all stop valves of the outdoor unit are closed completely.
- (4) Blow the inside of the pipes with nitrogen gas when brazing.

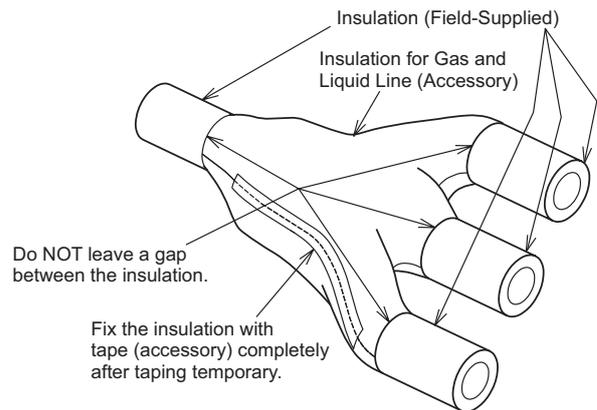
⚠ DANGER

Check for the refrigerant leakage carefully. If large amount of refrigerant leakage occurs, it will cause to breathe with difficulty or to generate harmful gas due to the fire.

- (5) The air tight test pressure of this product is 4.15MPa.
- (6) Apply the insulation supplied with this multi-kits to each branch (liquid side and gas side) with a tape. Also apply the field-supplied insulation to the field-supplied pipes.

NOTE

When polyethylene foam is applied, a thickness of 10mm for liquid piping and 15mm to 20mm for gas piping is recommended. (Use the insulation with heat resistance of 100°C for gas piping.)



⚠ CAUTION

- Perform the insulation work when the pipe surface temperature decreases to the room temperature. If insulation work is performed immediately after brazing, insulation may melt.
- If the ends of pipe are open to the atmosphere for a while after performing piping work, securely put caps or plastic bags over the pipe ends for avoiding moisture or dust.

After installation, it is recommended to keep this manual by a customer.

HITACHI

Inspire the Next

HITACHI Installation Manual for Multi-Kits

Line Branch Models: MW-102AN1, MW-162AN1, MW-242AN1, MW-302AN1

NOTE

Hand over this installation manual to the next installation work personal.

CAUTION

Do not put any material on the product.

1. Applicable Outdoor Units

These multiple line branches can be applied to the R410A SET-FREE series.

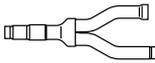
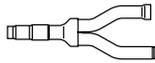
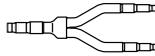
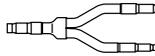
2. Transportation

Transport the product as close to the installation location as practical before unpacking.

3. Before Installation

Confirm the number of the following parts by referring to the model printed on the package before unpacking.

Do NOT put any foreign material into the parts. Check to confirm that no foreign materials are inside the parts before installation.

Name of Parts	MW-102AN1	MW-162AN1	MW-242AN1	MW-302AN1	
	Q'ty	Q'ty	Q'ty	Q'ty	
Branch Pipe for High/Low Pressure Gas Line	 1	 1	 1	 1	
Branch Pipe for Liquid Line	 1	 1	 1	 1	
Accessory	Insulation for High/Low Pressure Gas Line	 1	 1	 1	 1
	Insulation for Liquid Line	 1	 1	 1	 1
	Reducer for High/Low Pressure Gas Line Connection (For End of Multi-Kit Connection)	 1	 1	 1	 1
		— None	— None	— None	 1
		— None	— None	— None	 2
	Reducer for Liquid Line Connection (For Unit Piping Connection)	 2	 1	 1	 1
Tape	 2	 2	 2	 2	

NOTE : If any of these parts is not contained, please contact your distributor.

4. Installation Work

4.1 Piping Connection Size

The ends of the multi-kits are finished as shown in the following figures. Cut the end of the pipe to meet with the pipe size.



Piping shall be supported with adequate space. Bent pipes and bypass piping (horizontal loop) shall also be installed in order to absorb piping elasticity caused by temperature changes.

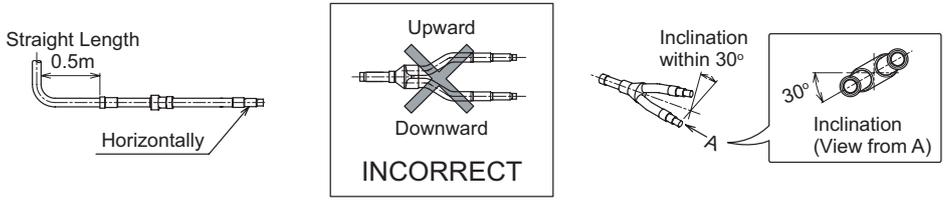
Model	High/Low Pressure Gas Line	Liquid Line	Reducer for High/Low Pressure Gas Line	Reducer for Liquid Line
MW-102AN1				
MW-162AN1				
MW-242AN1				
MW-302AN1				

Unit: mm, ID: Inner Diameter, OD: Outer Diameter

4.2 Installation Position

(1) Horizontal Installation

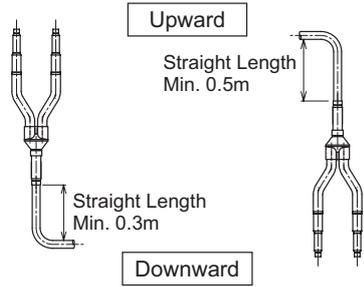
Locate the branch pipes on the same horizontal plane. (Inclination within 30°)
 Make the straight length a minimum of 0.5m after the vertical bend.



(2) Vertical Installation

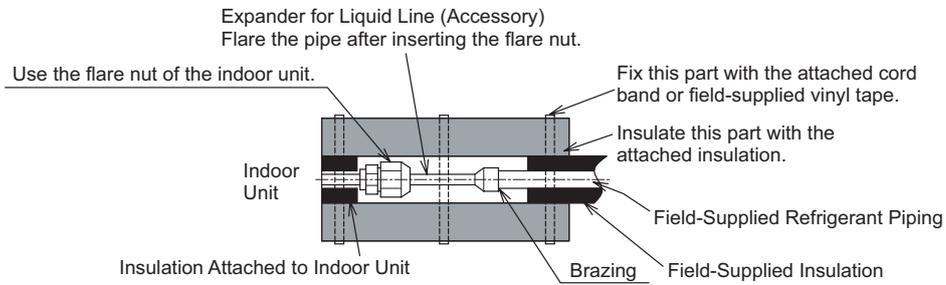
Straight length of the pipe connection on the outdoor unit side is made as follows:

- a) The collective pipe connection part is installed upward, the straight length must be min. 0.5m.
- b) The collective pipe connection part is installed downward, the straight length must be min.0.3m.



4.3 Connection Procedure for Piping Joint

When connecting liquid piping for the unit with a capacity 2.0HP or smaller, and with the length of piping is 15 meters or longer, apply the piping size of $\phi 9.52\text{mm}$. Fix the connecting pipe as shown in the below figure. Use the insulation attached to the indoor unit.

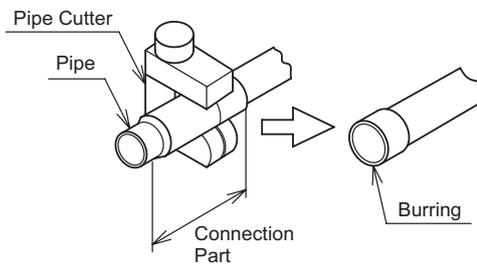


4.4 Piping Connection

- (1) When the branched pipe size is smaller than 22.2mm of inner diameter, a mini pipe cutter (field-supplied) as follow is required.

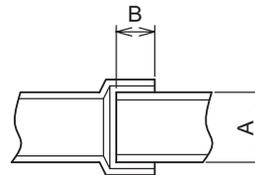
		(mm)	
Recommended Mini Pipe Cutter	Cleavable Size	Rotating Radius	
	φ5 - 28	(50)	

- (2) Use clean copper pipes without any moisture or foreign materials on inner surface of pipes. When connecting refrigerant pipe, cut the copper pipes with a pipe cutter as shown below. Also blow the pipes with nitrogen or air to remain no dust inside the pipe. Do NOT use a saw, a grindstone or others which causes a large amount of cutting powder.



- (3) When cutting the pipe, secure the adequate depth for brazing as shown in the following table.

(mm)	
A: Outer Diameter	B: Minimum Depth
Over 5, Below 8	6
Over 8, Below 12	7
Over 12, Below 16	8
Over 16, Below 25	10
Over 25, Below 35	12
Over 35, Below 45	14



• Caution for Refrigerant Piping

<p>When installing pipe through the wall, secure a cap at the end of the pipe.</p> <p>INCORRECT</p> <p>Hole</p> <p>Attach a cap or vinyl tape.</p> <p>CORRECT</p>	<p>Do NOT place the pipe directly on the ground.</p> <p>CORRECT</p> <p>INCORRECT</p> <p>Attach a cap or vinyl tape.</p>	<table border="0"> <tr> <td style="text-align: center;"> <p>CORRECT</p> <p>Attach a cap or vinyl tape with rubber band.</p> </td> <td style="text-align: center;"> <p>INCORRECT</p> <p>Rain water can enter.</p> </td> </tr> </table>	<p>CORRECT</p> <p>Attach a cap or vinyl tape with rubber band.</p>	<p>INCORRECT</p> <p>Rain water can enter.</p>
<p>CORRECT</p> <p>Attach a cap or vinyl tape with rubber band.</p>	<p>INCORRECT</p> <p>Rain water can enter.</p>			

- (4) Make sure that all stop valves of the outdoor unit are closed completely.
- (5) Blow the inside of the pipes with nitrogen gas when brazing.

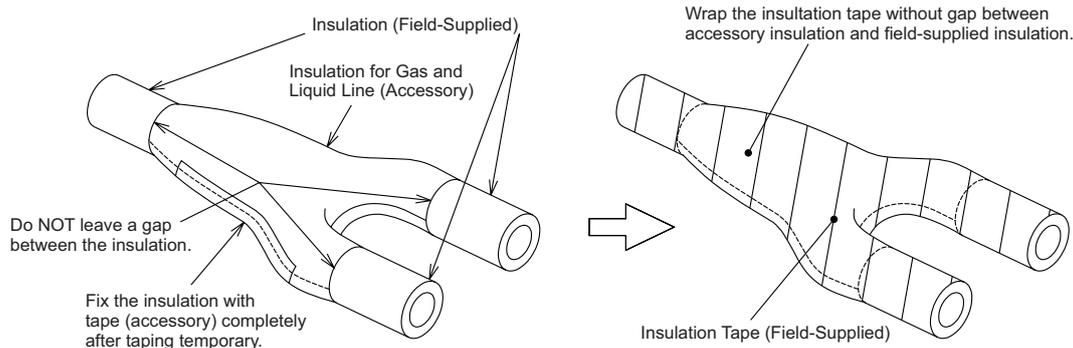
! DANGER

Make sure that the refrigerant leakage test should be performed. Refrigerant (Fluorocarbon) for the indoor unit is non-flammable, 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 air, the floor surface will be filled with it, which could cause suffocation.

- (6) The air tight test pressure of this product is 4.15MPa.
- (7) Apply the insulation supplied with this multi-kits to each branch (liquid side and gas side) with a tape. Also apply the field-supplied insulation to the field-supplied pipes.

NOTE

When polyethylene foam is applied, a thickness of 10mm for liquid piping and 15mm to 20mm for gas piping is recommended. (Use the insulation with heat resistance of 100°C for gas piping.)



! CAUTION

- Perform the insulation work when the pipe surface temperature decreases to the room temperature. If the insulation work is performed immediately after brazing, it may cause to melt the insulation.
- If the pipe ends are open to the atmosphere for a while after piping work, securely put caps or plastic bags over the pipe ends for avoiding moisture or dust.

After installation, it is recommended to keep this manual by a customer.

Specifications in this catalog are subject to change without notice, in order that HITACHI may bring the latest innovations to their customers.

 **Hitachi Appliances, Inc.**

URL: <http://www.hitachi-ap.com>