

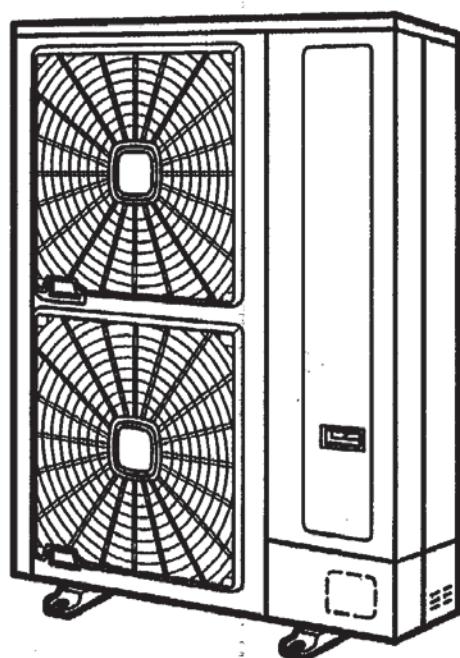


## *Installation & Maintenance Manual*

*INVERTER-DRIVEN  
MULTI-SPLIT SYSTEM  
HEAT PUMP  
AIR CONDITIONERS  
- SET FREE -mini(R410A) -*

### Outdoor Unit

Model
RAS- 4FSVN1Q
RAS- 5FSVN1Q
RAS- 6FSVN1Q
RAS- 5FSYN1Q
RAS- 6FSYN1Q



### **IMPORTANT:**

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

**P00692Q**  
ORIGINAL INSTRUCTIONS

## **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.
- No part of this manual may be reproduced without written permission.
- Signal words (DANGER, WARNING and CAUTION) are used to identify levels of hazard seriousness. Definitions for identifying hazard levels are provided below with their respective signal words.

**DANGER**

: Immediate hazards which WILL result in severe personal injury or death.

**WARNING**

: Hazards or unsafe practices which COULD result in severe personal injury or death.

**CAUTION**

: Hazards or unsafe practices which COULD result in minor personal injury or product or property damage.

**NOTE**

: Useful information for operation and/or maintenance.

- 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 add 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 as for other models.
- Install this air conditioners by local regulations or standards.
- 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	23WB	15WB
	Outdoor	46 DB	-5 DB
Heating Operation	Indoor	30 DB	15 DB
	Outdoor	15.5 WB	-20 WB

DB: Dry Bulb, WB: Wet Bulb

**NOTE:**

This air conditioners only is applicable of cooling or heating mode,do not operate cool and heat mode together, if operate cool and heat mode at the same time,air conditioner system will be fluctuated for large difference in temperature for changing operate mode.

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

## SAFETY SUMMARY

### **! DANGER**

- Use refrigerant R410A in the refrigerant cycle. Do not charge oxygen, acetylene or other flammable and poisonous gases into the refrigerant cycle when performing a leakage test or an air-tight test. These types of gases are extremely dangerous and can cause an explosion. It is recommended that compressed air, nitrogen or refrigerant be used for these types of tests.
- Do not pour water into the indoor or outdoor unit. These products are equipped with electrical parts. If poured, it will cause a serious electrical shock.
- Do not touch or adjust safety devices inside the indoor or outdoor units. If these devices are touched or readjusted, it may cause a serious accident.
- Do not open the service cover or access panel for the indoor or outdoor units without turning OFF the main power supply.
- Refrigerant leakage can cause difficulty with breathing due to insufficient air. Turn OFF the main switch, extinguish any naked flames and contact your service contractor, if refrigerant leakage occurs.
- The installer and system specialist shall secure safety against refrigerant leakage according to local regulations or standards.
- Use an ELB (Electric Leakage Breaker). In the event of a fault, there is danger of an electric shock or a fire if it is not used.
- Do not install the outdoor unit where there is a high level of oil mist, flammable gases, salty air or harmful gases such as sulphur.

### **! WARNING**

- Do not use any sprays such as insecticide, lacquer, hair spray or other flammable gases within approximately one (1) meter from the system.
- If circuit breaker or fuse is often activated, stop the system and contact your service contractor.
- Do not perform installation work, refrigerant piping work, drain piping and electrical wiring connection without referring to our installation manual. If the instructions are not followed, it may result in a water leakage, electric shock or a fire.
- Check that the ground wire is securely connected. If the unit is not correctly grounded, it lead electric shock. Do not connect the ground wiring to gas piping, water piping, lightning conductor or ground wiring for telephone.
- Connect a fuse of specified capacity.
- Do not put any foreign material on the unit or inside the unit.
- Make sure that the outdoor unit is not covered with snow or ice, before operation.
- Before performing any brazing work, check to ensure that there is no flammable material around.  
When using refrigerant be sure to wear leather gloves to prevent cold injuries.
- Protect the wires, electrical parts, etc. from rats or other small animals.  
If not protected, rats may gnaw at unprotected parts and which may lead to a fire.
- Fix the cables securely. External forces on the terminals could lead to a fire.

## **SAFETY SUMMARY**

### **⚠ CAUTION**

- Do not install the indoor unit, outdoor unit, remote control switch and cable within approximately 3 meters from strong electromagnetic wave radiators such as medical equipment.
- Supply electrical power to the system to energize the oil heater for 12 hours before start-up after a long shutdown.
- Do not step or put any material on the product.
- Provide a strong and correct foundation so that;
  - a. The outdoor unit is not on an incline.
  - b. Abnormal sound does not occur.
  - c. The outdoor unit will not fall down due to a strong wind or earthquake.

---

#### **NOTE:**

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

## **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.

#### **⚠ ATTENTION :**



This product shall not be mixed with general household waste at the end of its life and it shall be retired according to the appropriated local or national regulations in an environmentally correct way. Due to refrigerant, oil and other components contained in the Air Conditioner, its dismantling must be done by a professional installer accordingly to the applicable regulations.

Contact the Hitachi Customer Care for more information.

# TABLE OF CONTENTS

1. Safety Summary .....	1
2. Structure .....	1
2.1 Outdoor Unit & Refrigerant Cycle .....	1
2.2 Necessary Tools and Instrument List for Installation .....	3
3. Transportation and Handling .....	4
3.1 Combination of Indoor and Outdoor Unit .....	4
3.2 Transportation .....	4
4. Outdoor Unit Installation .....	5
4.1 Factory-Supplied Accessories .....	5
4.2 Initial Check .....	5
4.3 Service Space .....	6
4.4 Installation Work .....	6
5. Refrigerant Piping Work .....	7
5.1 Piping Materials .....	7
5.2 Refrigerant Piping Work .....	9
5.3 Multi-Kit.....	12
5.4 Piping Connection .....	13
5.5 Air Tight Test.....	14
5.6 Vacuum Pumping and Charging Refrigerant.....	15
5.7 Caution of the Pressure by Check Joint .....	17
5.8 Additional Refrigerant Charge.....	18
5.9 Collecting Refrigerant.....	19
6. Electrical Wiring .....	19
6.1 General Check .....	19
6.2 Electrical Wiring Connection .....	20
7. Outdoor Unit Dip-Switch Setting.....	23
8. Test Run.....	24
9. Safety and Control Device Setting .....	28

## 1. Safety Summary

### ! WARNING

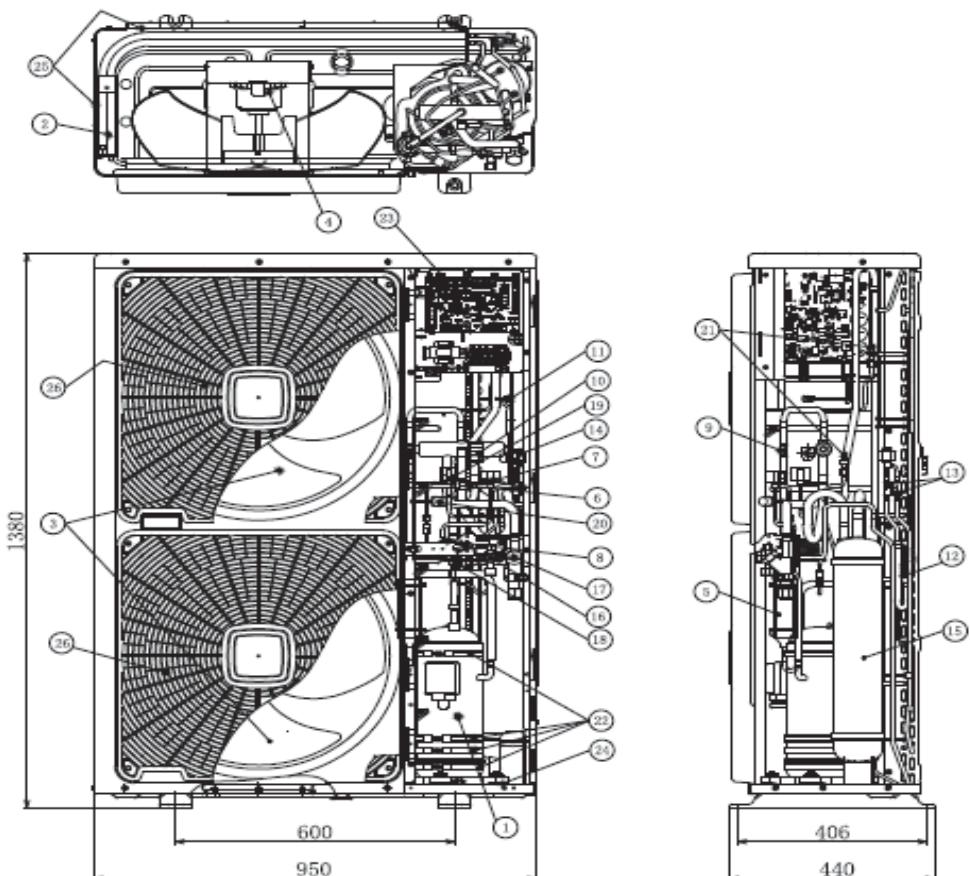
- Do not perform installation work, refrigerant piping work, drain piping and electrical wiring connection without referring to the installation manual.
- Check that the ground wire is securely connected.
- Connect a fuse of specified capacity.

### ! CAUTION

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.

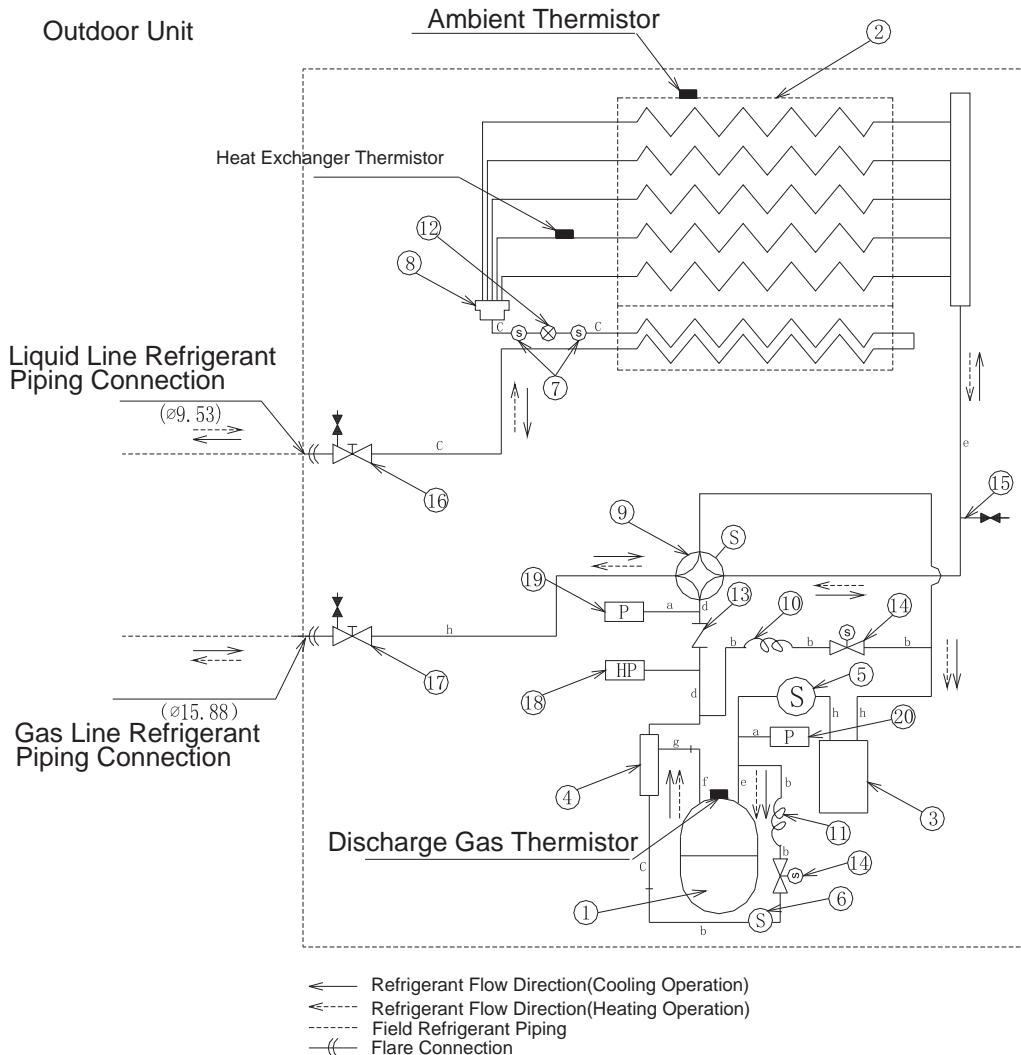
## 2. Structure

### 2.1 Outdoor Unit & Refrigerant Cycle <Outdoor Unit>



No.	Part Name	No.	Part Name
1	Compressor	14	Electrical Expansion Valve
2	Heat Exchanger	15	Accumulator
3	Propeller Fan	16	Stop Valve for Liquid Line
4	Fan Motor	17	Stop Valve for Gas Line
5	Oil Seperator	18	Strainer
6	Strainer	19	Bypass Solenoid Valve
7	Oil Return Solenoid Valve	20	High Pressure Switch
8	Oil Return Cpillary Tube	21	Pressure Sensor
9	Check Valve	22	Crankcase Heater
10	Reversing Valve	23	Electrical Box
11	Check Joint for High/Low Pressure(Cool/Heat)	24	Vibration Absorbing Rubber
12	Distributor	25	Air Inlet
13	Strainer	26	Air Outlet

<Refrigerant Cycle>



NO.	Part Name	Remark
1	Compressor	
2	Heat Exchanger	
3	Accumulator	
4	Oil Seperator	
5	Strainer	
6	Strainer	
7	Strainer	
8	Distributor	
9	Reversing Valve	
10	Capillary Tube	Bypass
11	Capillary Tube	Return Oil
12	Electrical Expansion Valve	
13	Check Valve	
14	Solenoid Valve	Bypass&Return Oil
15	Check Joint	
16	Stop Valve for Liquid Line	
17	Stop Valve for Gas Line	
18	Pressure Switch	High Pressure Protect
19	Pressure Sensor	High Pressure
20	Pressure Sensor	Low Pressure

NO.	O.D. x T	Material
a	Φ6.35 × 0.7 t	
b	Φ6.35 × 1.07 t	
c	Φ9.53 × 0.8 t	
d	Φ12.7 × 1.0 t	
e	Φ15.88 × 1.0 t	
f	Φ15.88 × 1.2 t	
g	Φ15.88 × 1.65 t	
h	Φ19.05 × 1.2 t	

## 2.2 Necessary Tools and Instrument List for Installation

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

Use tools and measuring instruments only for the new refrigerant which is directly touch to refrigerant.

◊: Interchangeability is available with current R22  
X: Prohibited

●: only for Refrigerant R410A (No Interchangeability with R22)  
◆: only for Refrigerant R407C (No Interchangeability with R22)

Measuring Instrument and Tool		Interchangeability with R22		Reason of Non-Interchangeability and Attention (★: Strictly Required)	Use
		R410A	R407C		
Refrigerant Pipe	Pipe Cutter Chamfering Reamer	◊	◊	-	Cutting Pipe Removing Burrs
	Flaring Tool	◊ ●	◊	* The flaring tools for R407C are applicable to R22. * If using flaring tube, make dimension of tube larger for R410A.	Flaring for Tubes
	Extrusion Adjustment Gauge	●	-	* In case of material 1/2H, flaring is not available.	Dimensional Control for Extruded Portion of Tube after Flaring
	Pipe Bender	◊	◊	* In case of material 1/2H, bending is not available. Use elbow for bend and braze.	Bending
	Expanding Tool	◊	◊	* In case of material 1/2H, expanding of tube is not available. Use socket for connecting tube.	Expanding Tubes
	Torque Wrench	●	◊	* For φ12.7, φ15.88, spanner size is up 2mm.	Connection of Flare Nut
		◊	◊	* For φ6.35, φ9.53, φ19.05, spanner size is the same.	
	Brazing Tool	◊	◊	* Perform correct brazing work.	Brazing for Tubes
	Nitrogen Gas	◊	◊	* Strict Control against Contamin (Blow nitrogen during brazing.)	Prevention from Oxidation during Brazing
Vacuum Drying Refrigerant Charge	Lubrication Oil (for Flare Surface)	●	◆	* Use a synthetic oil which is equivalent to the oil used in the refrigeration cycle. * Synthetic oil absorbs moisture quickly.	Applying Oil to the Flared Surface
	Refrigerant Cylinder	●	◆	* Check refrigerant cylinder color. ★ Liquid refrigerant charging is required regarding zeotropic refrigerant.	Refrigerant Charging
	Vacuum Pump	◊	◊	★ The current ones are applicable. However, it is required to mount a vacuum pump adapter which can prevent from reverse flow when a vacuum pump stops, resulting in no reverse oil flow.	Vacuum Pumping
	Adapter for Vacuum Pump	* ●	◆		
	Manifold Valve	●	◆	* No interchangeability is available due to higher pressures when compared with R22.	Vacuum Pumping, Vacuum Holding, Refrigerant Charging and Check of Pressures
	Charging Hose	●	◆	★ Do not use current ones to the different refrigerant. If used, mineral oil will flow into the cycle and cause sludges, resulting in clogging or compressor failure. Connection diameter is different; R410A: UNF1/2, R407C: UNF7/16.	
	Charging Cylinder	X	X	* Use the weight scale.	-
	Weight Scale	◊	◊	-	Measuring Instrument for Refrigerant Charging
	Refrigerant Gas Leakage Detector	* ●	◆	* The current gas leakage detector (R22) is not applicable due to different detecting method.	Gas Leakage Check

\*: Interchangeability with R407C.

### 3. Transportation and Handling

#### 3.1 Combination of Indoor Unit and Outdoor Unit

- Below is indoor Unit combined with SET-FREE mini FSVN1(Q)&FSYN1(Q)

Table 3.1 Indoor Unit Model

Indoor Unit Type	Nominal Capacity (HP)										
	1.0	1.3	1.5	1.8	2.0	2.3	2.5	3.0	4.0	5.0	6.0
In-the-Ceiling Type	○	○	○	○	○	○	○	○	○	○	○
In-the-Ceiling Low-height Type	○	○	○	○	○	○	○				
4-Way Cassette	○	○	○	○	○	○	○	○	○	○	○
2-Way Cassette	○	○	○	○	○	○	○	○	○	○	○
Wall	○		○	○							
Floor	○	○									
Floor Concealed	○	○									
Ceiling			○		○	○	○	○			

○ : Available

- Indoor Unit total Capacity must be 50% to 130% for Outdoor Unit Nominal Capacity

Table 3.2 System Matching

Outdoor Unit Model	Indoor unit			
	Min. Matching Capacity ( HP )	Max. Matching Capacity ( HP )	Matching Quantity	Min. Single Operate Capacity ( HP )
RAS- 4FSVN1Q	2.0	5.2	2 to 6	1.0
RAS- 5FSVN1Q	2.5	6.5	2 to 8	1.0
RAS- 6FSVN1Q	3.0	7.2	2 to 9	1.0
RAS- 5FSYN1Q	2.5	6.5	2 to 8	1.0
RAS- 6FSYN1Q	3.0	7.2	2 to 9	1.0

#### 3.2 Transportation

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

#### CAUTION

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

##### Lifting Method

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

- Do not remove any packing materials.
- Lift the unit under packing condition with two (2) ropes, as shown in Fig. 3.1.

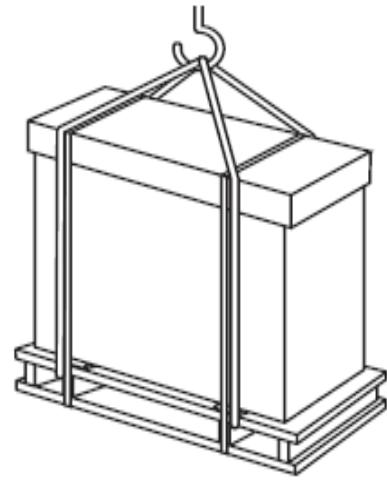


Fig. 3.1 Lifting Work for Transportation

#### CAUTION

If have no package to move,please protect with cloth or paper

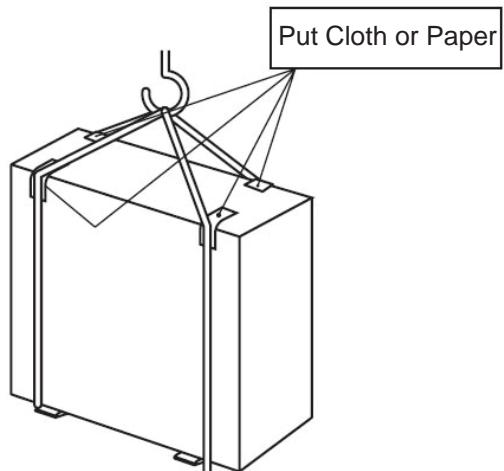


Fig.3.2 Transportation for no wooden base

( kg )

Outdoor Unit Model	Net Weight
RAS- 4FSVN1Q	
RAS- 5FSVN1Q	
RAS- 6FSVN1Q	
RAS- 5FSYN1Q	97
RAS- 6FSYN1Q	

#### WARNING

**Do not put any foreign material into the outdoor unit and check to ensure that none exists in the outdoor unit before the installation and test run. Otherwise, a fire or failure, etc. may occur.**

## 4. Outdoor Unit Installation

### 4.1 Factory-Supplied Accessories

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

Table 4.1 Factory-Supplied Accessories

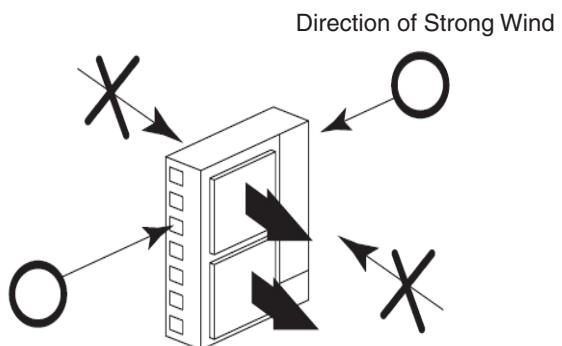
Accessory	Q'ty	Recommend
Washer	4	for Anchor Bolts

#### NOTE

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

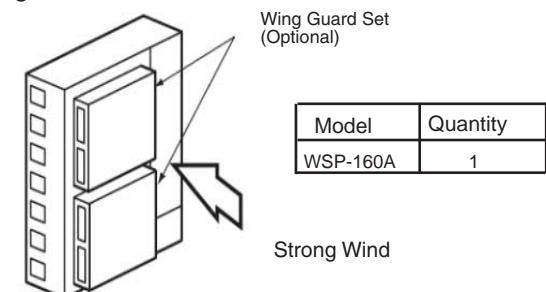
### 4.2 Initial Check

- Install the outdoor unit where good ventilation is available, and where it is dry.
- Install the outdoor unit where the sound or the discharge air from the outdoor unit does not affect neighbors or surrounding vegetation. The operating sound at the rear or right/left sides is higher than the value in the catalog at the front side.
- Check to ensure that the foundation is flat, level and sufficiently strong.
- Do not install the outdoor unit where there is a high level of oil mist, salty air or harmful gases such as sulphur.
- Do not install the outdoor unit where the electromagnetic wave is directly radiated to the electrical box.
- Install the outdoor unit as far as practical, being at least 3 meters from the electromagnetic wave radiator.
- When installing the outdoor unit in snow-covered areas, mount the field-supplied hoods at the discharge side of the outdoor unit and the inlet side of the heat exchanger.
- Install the outdoor unit where it is in the shade or it will not be exposed to direct sunshine or direct radiation from high temperature heat source.
- Do not install the outdoor unit where dust or other contamination could block the outdoor heat exchanger.
- Install the outdoor unit in a space with limited access to general public.
- Do not install the outdoor unit in a space where a seasonal wind directly blows to the outdoor heat exchanger or a wind from a building space directly blows to the outdoor fan.

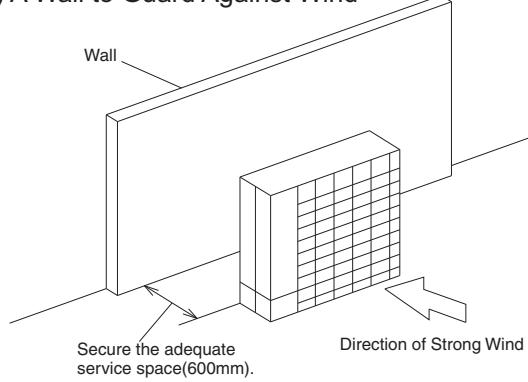


- In case of installation in the open spaces unavoidably where there is no buildings or surrounding structures, adopt the wind guard set or install near the wall to avoid facing the wind directly. Ensure that the service space should be secured.

#### (1) Using Wind Guard



#### (2) A Wall to Guard Against Wind



#### NOTE:

If the extreme strong wind blows directly against the air discharge portion, the fan may rotate reversely and be damaged.

## 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 an area where people except service engineers can not touch the outdoor unit.

### 4.3 Service Space

Install the outdoor unit with a sufficient space around the outdoor unit for operation and maintenance as shown below Fig4.1.

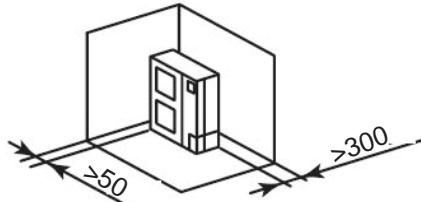
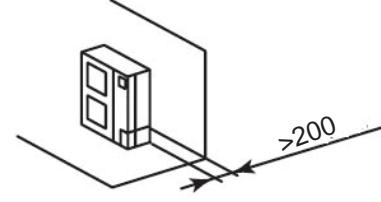
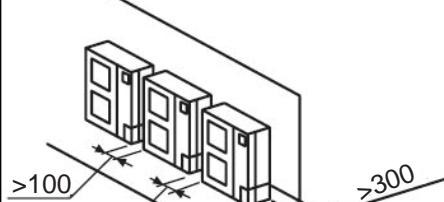
(unit:mm)		
Single Installation	Single Installation	Multiple Installation
<p>Upper Side is Open</p>  <p>Keep a distance of 100mm between right side at least</p>	<p>Left, Right &amp; Upper Side is Open</p> 	 <p>Keep a distance of 100mm between right side at least</p>

Fig. 4.1 Installation Space

### 4.4 Installation Work

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

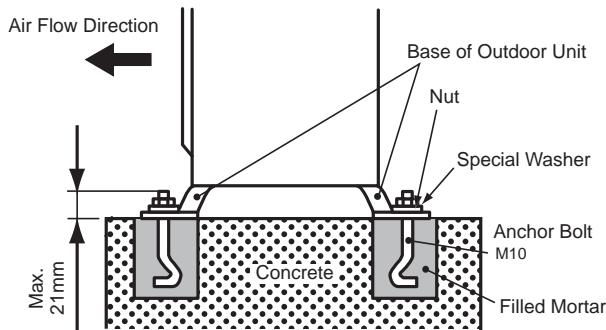


Fig. 4.2 Installation of Anchor Bolts

Fix the outdoor unit to the anchor bolts by special washer of factory-supplied accessory.

(2) When installing the outdoor unit, fix the unit by anchor bolts. Refer to Fig. 4.3

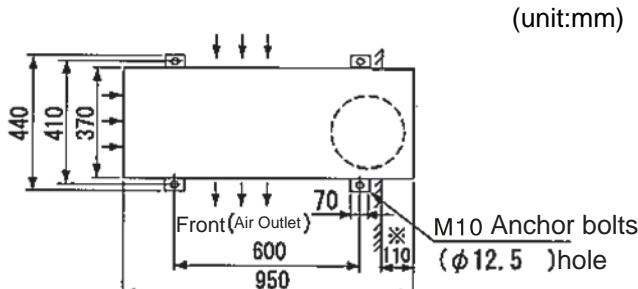


Fig. 4.3 Position of Anchor Bolts

**NOTE:**

When the mark \* dimension is secured, piping work from bottom side is easy without interference of foundation.

(3) Example of fixing outdoor unit by anchor bolts.

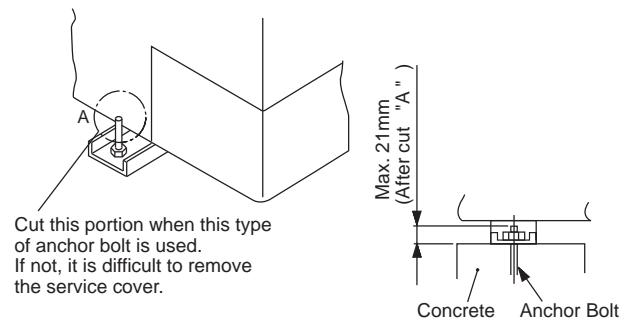


Fig. 4.4 Fixing Example

(4) Fix the outdoor unit firmly so that declining, making noise, and falling down by strong wind or earthquake is avoided.

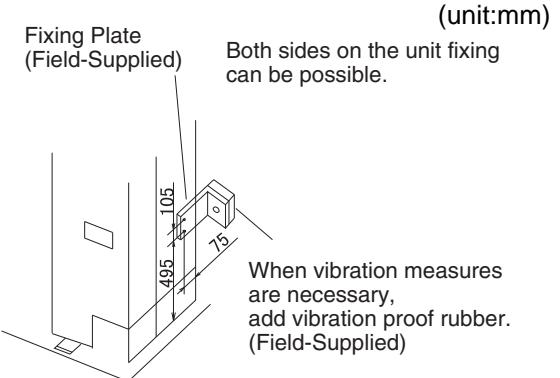
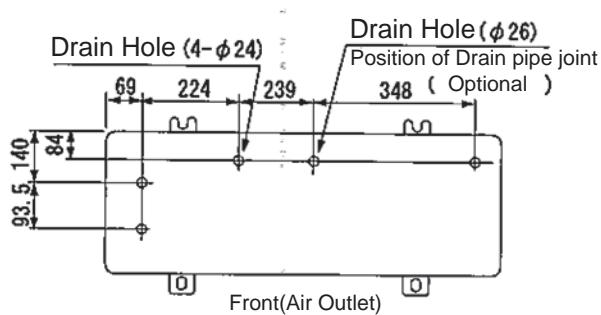


Fig. 4.5 Additional Fixing Arrangement

(5) When installing the unit on a roof or a veranda, drain water sometimes turns to ice in a cold morning. Therefore, avoid draining in an area where people often use because it is slippery.

(6) In case of the drain piping is necessary for the outdoor unit, use the drain-kit (DBS-26 or DBS-26L:Optional Parts) .

(unit:mm)



Recommended Metal Plate Size (Field-Supplied)

Material: Hot-Rolled Mild Steel Plate (SPHC)

Plate Thickness: 4.5T

(unit:mm)

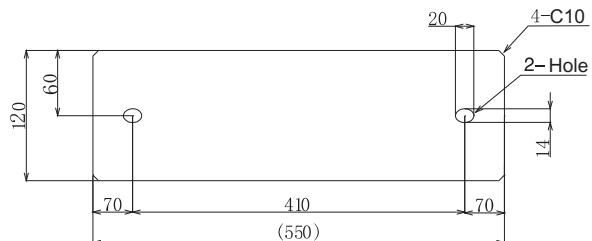
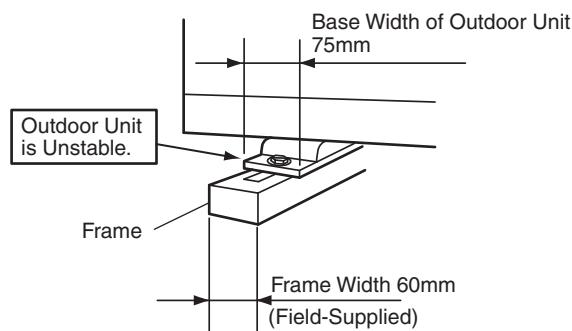


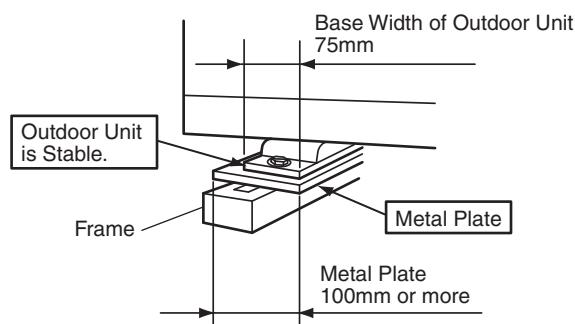
Fig. 4.6 Frame and Base Installation

(7) The whole of the base of the outdoor unit should be installed on a foundation. When using vibration-proof mat, it should also be positioned the same way. When installing the outdoor unit on a field-supplied frame, use metal plates to adjust the frame width for stable installation as shown in Fig. 4.6.

### Incorrect



### Correct



## 5. Refrigerant Piping Work

### ! DANGER

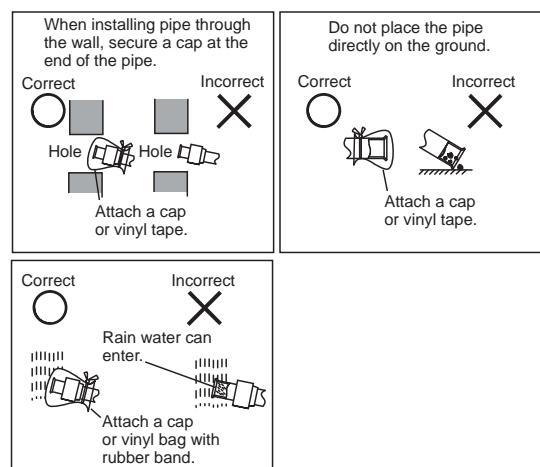
Use refrigerant R410A in the refrigerant cycle. Do not charge oxygen, acetylene or other flammable and poisonous gases into the refrigerant cycle when performing a leakage test or an air-tight test. These types of gases are extremely dangerous and can cause an explosion. It is recommended that compressed air, nitrogen or refrigerant be used for these types of tests.

### 5.1 Piping Materials

- (1) Prepare locally-supplied copper pipes.
- (2) Select the piping size from the Table 5.1.
- (3) Select clean copper pipes. Make sure there is no dust and moisture inside of the pipes. Blow the inside of the pipes with nitrogen or dry air, to remove any dust or foreign materials before connecting pipes.

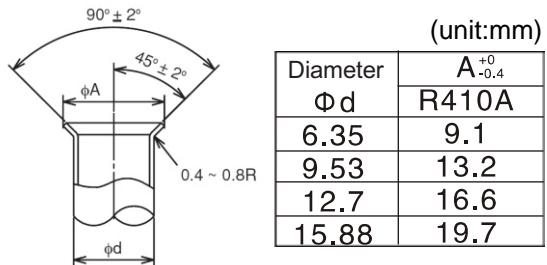
### NOTE

#### ● Cautions for Refrigerant Pipe Ends



## CAUTION

- Cap the end of the pipe when the pipe is to be inserted through a hole.
- Do not put pipes on the ground directly without a cap or vinyl tape at the end of the pipe.
- Flaring Dimension  
Perform the flaring work as shown below.



- Piping Thickness and Material  
Use the pipe as below. (unit:mm)

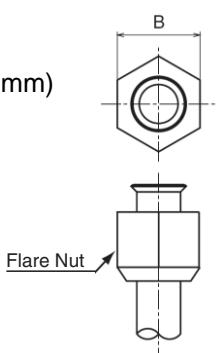
Diameter	R410A	
	Thickness	Material
$\phi 6.35$	0.8	0
$\phi 9.53$	0.8	0
$\phi 12.7$	0.8	0
$\phi 15.88$	1.0	0

Material is based on a JIS standard (JIS B8607).

- Flare Nut Dimension  
Use the flare nut as below.

<Flare Nut Dimension B (unit:mm)

Diameter	R410A
$\phi 6.35$	17
$\phi 9.53$	22
$\phi 12.7$	26
$\phi 15.88$	29



Dimension is based on a JIS standard (JIS B8607).

## 5.2 Refrigerant Piping Work

(1) Ensure that the directions for refrigerant piping work according to the tables.

Table 5.1 Limitation of Outdoor Unit

Diameter Model	Outer Diameter of Pipe ( mm )		
	Gas	Liquid	Multi-Kit
RAS-4~6 FSVN1Q	φ 15.88	φ 9.53	E-102SN
RAS-5~6 FSYN1Q			

Table 5.2 Indoor Unit Pipe Model

Indoor Unit Pipe Model	Gas Pipe	Liquid Pipe
RPI-1.0~1.5FSNQL(H) RPIZ-1.0~1.5FSN1Q RCI-1.0~1.5FSN1Q RCD-1.0~1.5FSN2Q RPK-1.0~1.5FSNQ RPF(I)-1.0~1.5FSNE	φ 12.7 (1/2)	φ 6.35 (1/4)
RPI-1.8~2.0FSNQL(H) RPIZ-1.8~2.0FSN1Q RCI-1.8~2.0FSN1Q RCD-2.0FSN2Q,RPC-2.0FSN RPK-2.0FSNQ~2.3FSNQ	φ 15.88 (5/8)	φ 6.35 (1/4)
RPI-2.3~3.0FSNQL(H) RPIZ-2.3~2.5FSN1Q RCI-2.3~3.0FSN1Q RCD-2.5~3.0FSN2Q RPC-2.5~3.0FSN	φ 15.88 (5/8)	φ 9.53 (3/8)
RPI-4.0~6.0FSNQL(H) RCI-4.0~6.0FSN1Q RCD-4.0~5.0FSN2Q RPC-4.0~5.0FSN	φ 15.88 (5/8)	φ 9.53 (3/8)

(2) Additional Refrigerant Charge R410A

Although refrigerant has been charged into this unit, it is required that additional refrigerant be charged according to piping length.

Table 5.3  $W_0$  is Outdoor Unit Ref. charge before shipment

Outdoor Unit	$W_0$ ( kg )
RAS-4FSVN1Q RAS-5FSVN1Q RAS-6FSVN1Q RAS-5FSYN1Q RAS-6FSYN1Q	3.6

- Calculate charge refrigerant quantity by liquid pipe length, charge it to refrigerant cycle.

$$W11(\text{kg}): (\phi 9.53 \text{ liquid length , m}) \times 0.05$$

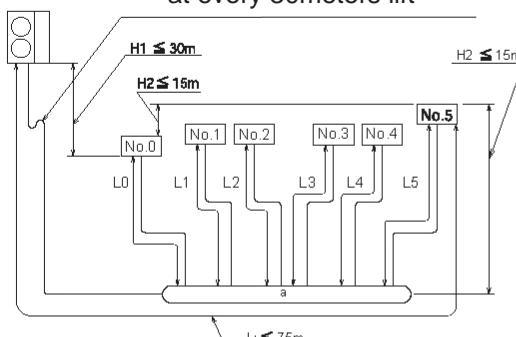
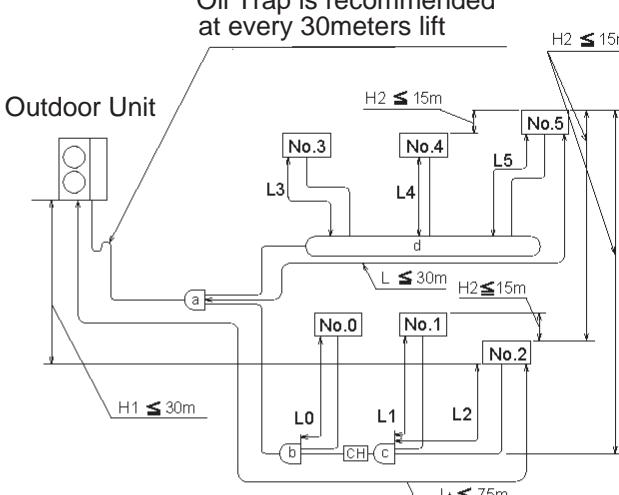
$$W12(\text{kg}): (\phi 6.35 \text{ liquid length , m}) \times 0.02$$

$$W=W11+W12$$

- Inform local service the quantity of charging refrigerant after finish charging.

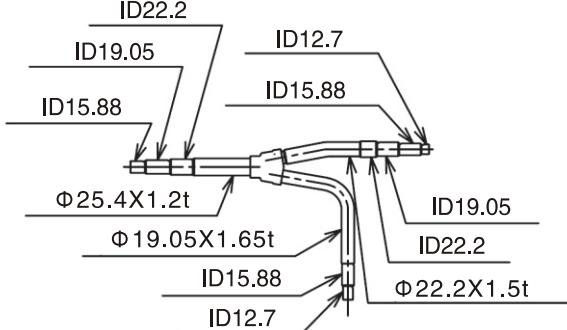
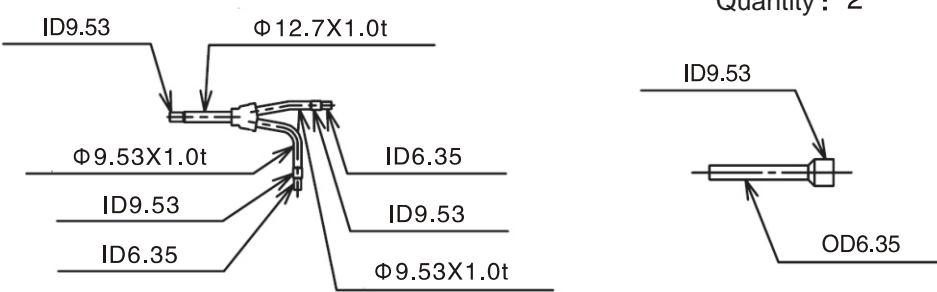
Table 5.4 Refrigerant Pipe System&Additional Refrigerant Quantity

Item	System	Line Branch System																								
Example of system Base on the connection of the one outdoor unit and six indoor units as example. The pipes should be provided at site.		<p>Outdoor Unit</p> <p>Oil Trap is recommended at every 30meters lift</p> <p><math>H1 \leq 30m</math></p> <p><math>H2 \leq 15m</math></p> <p><math>L \leq 30m</math></p> <p><math>L_t \leq 75m</math></p>																								
Max.Pipe Length	Max. Length of econcmic pipe $L_t$	$L_t \leq 75m$																								
	Total Length of pipe $L_{to} = L_t + L_0 + L_1 + L_2 + L_3 + L_4$	$L_{to} \leq 120m$																								
Max.height difference between Outdoor and Indoor Unit	Situation that position of outdoor unit is higher than that of indoor unit	$H1 \leq 30m$																								
	Situation that position of indoor unit is higher than that of outdoor unit	$H1 \leq 30m$																								
Max.height difference between all indoor units or the indoor unit and multi-Kit		$H2 \leq 15m$																								
Max.Pipe Length between Branch Pipe and Indoor	From "a" Branch Pipe to Indoor of Max. Distance	$L \leq 30m$																								
	From every Branch Pipe to Indoor of connecting	$L_0, L_1, L_2, L_3, L_4, L_5 \leq 15m$																								
Choose Branch Pipe	RAS-4~6FSVN1Q RAS-5~6FSYN1Q	"a, b, c, d, e" with E-102SN																								
Total refrigerant charge of this system is calculted in the following formula.	Liquid Pipe	<p>&lt;Example&gt; ( RAS-5FSVN1Q )</p> <table border="1"> <thead> <tr> <th>Symbol</th><th><math>L_t - L_5</math></th><th><math>L_0</math></th><th><math>L_1</math></th><th><math>L_2</math></th><th><math>L_3</math></th><th><math>L_4</math></th><th><math>L_5</math></th></tr> </thead> <tbody> <tr> <td>Mark</td><td><math>\phi 9.53</math></td><td><math>\phi 6.35</math></td><td><math>\phi 6.35</math></td><td><math>\phi 6.35</math></td><td><math>\phi 6.35</math></td><td><math>\phi 6.35</math></td><td><math>\phi 6.35</math></td></tr> <tr> <td>Size</td><td>21</td><td>5</td><td>3</td><td>5</td><td>3</td><td>5</td><td>3</td></tr> </tbody> </table> <p><math>W_{11} = 21 \times 0.05 = 1.05kg</math>  <math>W_{12} = (5+3+5+3+5+3) \times 0.02 = 0.48kg</math></p>	Symbol	$L_t - L_5$	$L_0$	$L_1$	$L_2$	$L_3$	$L_4$	$L_5$	Mark	$\phi 9.53$	$\phi 6.35$	Size	21	5	3	5	3	5	3					
Symbol	$L_t - L_5$	$L_0$	$L_1$	$L_2$	$L_3$	$L_4$	$L_5$																			
Mark	$\phi 9.53$	$\phi 6.35$	$\phi 6.35$	$\phi 6.35$	$\phi 6.35$	$\phi 6.35$	$\phi 6.35$																			
Size	21	5	3	5	3	5	3																			
	Total	$W = W_{11} + W_{12}(kg) = 1.53kg$																								

Branch System of Centralize Pipe		Branch System of Embranchment & Centralize Pipe																									
<p>Outdoor Unit      Oil Trap is recommended at every 30meters lift</p> 		<p>Oil Trap is recommended at every 30meters lift</p> 																									
Lt ≤ 75m		Lt ≤ 75m																									
L <sub>to</sub> =L <sub>t</sub> +L <sub>1</sub> +L <sub>2</sub> +L <sub>3</sub> +L <sub>4</sub> ≤120m		L <sub>to</sub> =L <sub>t</sub> +L <sub>1</sub> +L <sub>2</sub> +L <sub>3</sub> +L <sub>4</sub> ≤120m																									
H <sub>1</sub> ≤30m		H <sub>1</sub> ≤30m																									
H <sub>1</sub> ≤30m		H <sub>1</sub> ≤30m																									
H <sub>2</sub> ≤15m		H <sub>2</sub> ≤15m																									
L≤15m		L≤30m																									
L <sub>0</sub> ,L <sub>1</sub> ,L <sub>2</sub> ,L <sub>3</sub> ,L <sub>4</sub> ,L <sub>5</sub> ≤15m		L <sub>0</sub> ,L <sub>1</sub> ,L <sub>2</sub> ,L <sub>3</sub> ,L <sub>4</sub> ,L <sub>5</sub> ≤15m																									
“a” with -108HSN		“a, b, c” with E-102SN, “d” with E-108HSN																									
<p>( RAS-5FSVN1Q )</p> <table border="1"> <thead> <tr> <th></th><th>L<sub>t</sub>-L<sub>5</sub></th><th>L<sub>0</sub></th><th>L<sub>1</sub></th><th>L<sub>2</sub></th><th>L<sub>3</sub></th><th>L<sub>4</sub></th><th>L<sub>5</sub></th></tr> </thead> <tbody> <tr> <td></td><td>φ 9.53</td><td>φ 6.35</td><td>φ 6.35</td><td>φ 6.35</td><td>φ 6.35</td><td>φ 6.35</td><td>φ 6.35</td></tr> <tr> <td></td><td>51</td><td>5</td><td>3</td><td>5</td><td>3</td><td>5</td><td>3</td></tr> </tbody> </table>					L <sub>t</sub> -L <sub>5</sub>	L <sub>0</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	L <sub>5</sub>		φ 9.53	φ 6.35		51	5	3	5	3	5	3					
	L <sub>t</sub> -L <sub>5</sub>	L <sub>0</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	L <sub>5</sub>																				
	φ 9.53	φ 6.35	φ 6.35	φ 6.35	φ 6.35	φ 6.35	φ 6.35																				
	51	5	3	5	3	5	3																				
<p>W<sub>11</sub>=51×0.05=2.55kg W<sub>12</sub>=(5+3+5+3+5+3)×0.02=0.48kg</p>																											
<p>W=W<sub>11</sub>+W<sub>12</sub>=2.55+0.48=3.03kg</p>																											
<p>&lt;EXAMPLE&gt; ( RAS-5FSVN1Q )</p> <table border="1"> <thead> <tr> <th></th><th>L<sub>t</sub>+L-(L<sub>2</sub>+L<sub>5</sub>)</th><th>L<sub>0</sub></th><th>L<sub>1</sub></th><th>L<sub>2</sub></th><th>L<sub>3</sub></th><th>L<sub>4</sub></th><th>L<sub>5</sub></th></tr> </thead> <tbody> <tr> <td></td><td>φ 9.53</td><td>φ 6.35</td><td>φ 6.35</td><td>φ 6.35</td><td>φ 6.35</td><td>φ 6.35</td><td>φ 6.35</td></tr> <tr> <td></td><td>31</td><td>5</td><td>3</td><td>5</td><td>3</td><td>5</td><td>3</td></tr> </tbody> </table>					L <sub>t</sub> +L-(L <sub>2</sub> +L <sub>5</sub> )	L <sub>0</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	L <sub>5</sub>		φ 9.53	φ 6.35		31	5	3	5	3	5	3					
	L <sub>t</sub> +L-(L <sub>2</sub> +L <sub>5</sub> )	L <sub>0</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	L <sub>5</sub>																				
	φ 9.53	φ 6.35	φ 6.35	φ 6.35	φ 6.35	φ 6.35	φ 6.35																				
	31	5	3	5	3	5	3																				
<p>W<sub>11</sub>=31×0.05=1.55kg W<sub>12</sub>=(5+3+5+3+5+3)×0.02=0.48kg</p>																											
<p>W=W<sub>11</sub>+W<sub>12</sub>=1.55+0.48=2.03kg</p>																											

### 5.3 Multi-Kit for Line Branch

Table 5.5 Y Multi-Kit

Multi-Kit	E-102SN	
Gas Line		
Liquid Line		<p>Quantity : 2</p>

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

## 5.4 Piping Connection

Pipes can be connected from 4 directions.

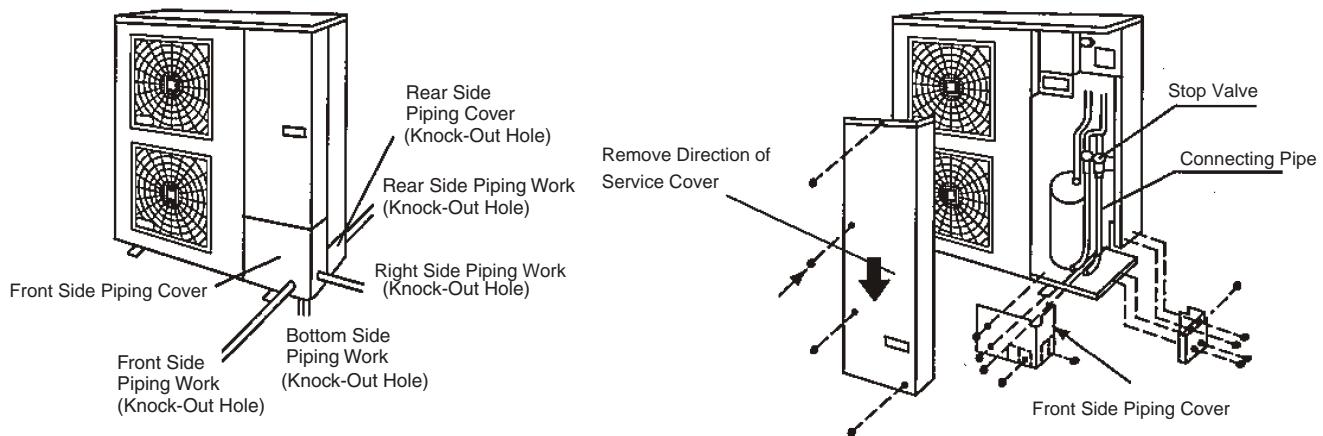


Fig. 5.1 Piping Direction

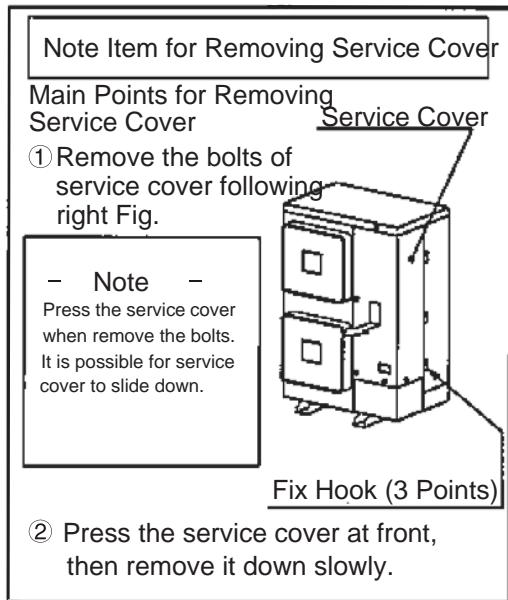
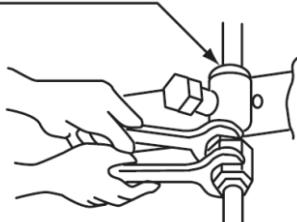
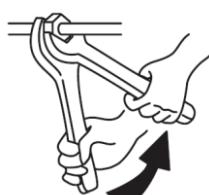


Fig. 5.2 Remove Service Cover

- (1) Confirm that the valve is closed.
- (2) Prepare a field-supplied bend pipe for liquid line. Connect it to the liquid valve by flare nut through the square hole of bottom base.
- (3) For Gas Piping Connection  
Prepare a field-supplied bend pipe for gas line. Braze it and the factory-supplied pipe flange at the outside of the unit.

Do not apply the double spanner work here.  
Refrigerant leakage shall occur.



Double Spanner Work

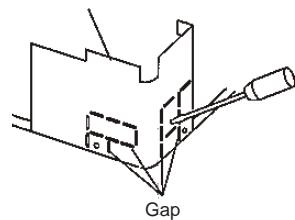
Tightening Work for Stop Valve

Table 5.6 Tightening Torque for Flare Nut

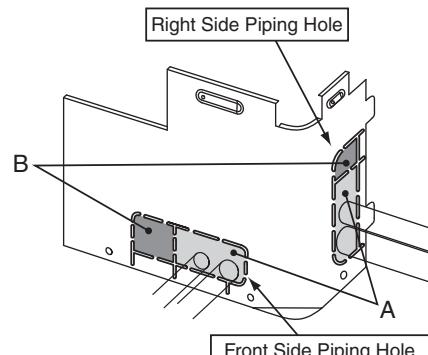
Pipe Size	Torque
Φ 6.35(1/4)	20N · m (2kgf · m)
Φ 9.53(3/8)	40N · m (4kgf · m)
Φ 12.7(1/2)	60N · m (6kgf · m)
5.88(5/8)	80N · m (8kgf · m)

- (4) Pipes can be connected from 4 directions as shown Fig. 5.1. Make a knock-out hole in the front pipe cover or bottom base to pass through the hole. After removing the pipe cover from the unit, punch out the holes following the guide line with screwdriver and a hammer. Then, cut the edge of the holes and attach insulation (Field-Supplied) for cables and pipes protection.

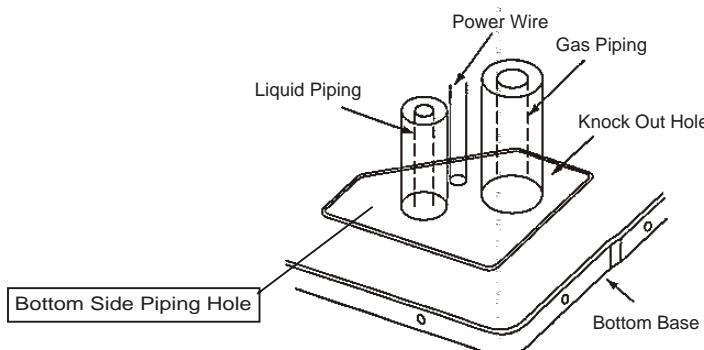
Front Side Piping Cover



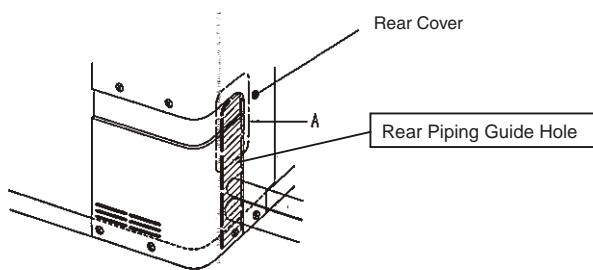
(a) Connect Front and Right Side Pipe



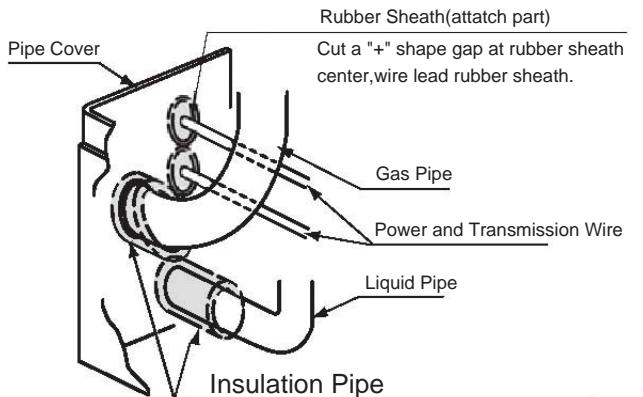
( b ) Bottom Side Piping Work



( c ) Rear Piping Work



( 5 ) To avoid damage protect cables and pipes with rubber sheath (Field- Supplied).



To prevent gaps use a rubber bush and insulation (Factory-Supplied) adequately when installing the piping cover. Cut the lower side guide line of the piping cover when attaching work is difficult.

## 5.5 Air Tight Test

- (1) The stop valve has been closed before shipment, however, make sure that the stop valves are closed completely.
- (2) Connect the indoor unit and the outdoor unit with field-supplied refrigerant piping. Suspend the refrigerant piping at certain points and prevent the refrigerant piping from touching the weak part of the building such as wall, ceiling, etc. (If touched, abnormal sound may occur due to the vibration of the piping. Pay special attention in case of short piping length.)

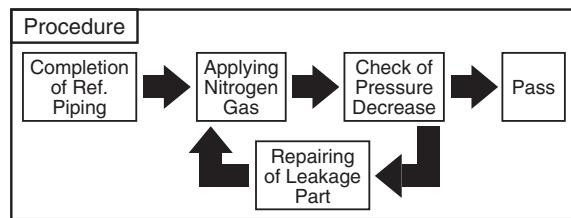
(3) Apply the oil thinly at the seat surface of the flare nut and pipe before tightening.

And when tightening the flare nut, use two spanners.

Lubrication Oil is field-supply.

Model: FVC68D (Ether Oil)

Manufacturer: IDEMITSU KOSAN Co., Ltd.



(4) Stop Valve

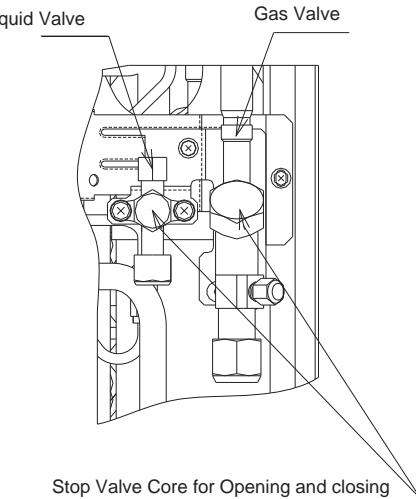
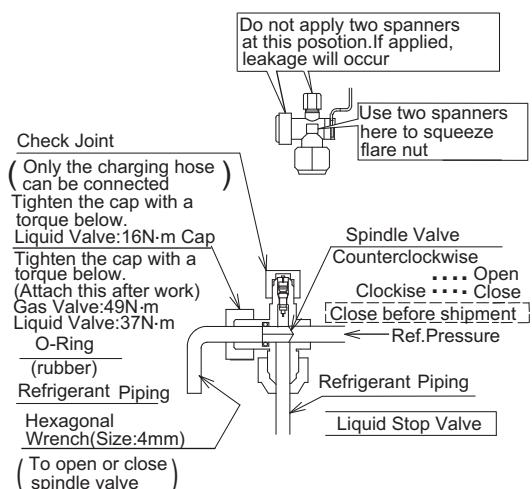


Fig.5.3 Stop Valve Position

Operation of the stop valve should be performed according to the below.

<Liquid Valve>

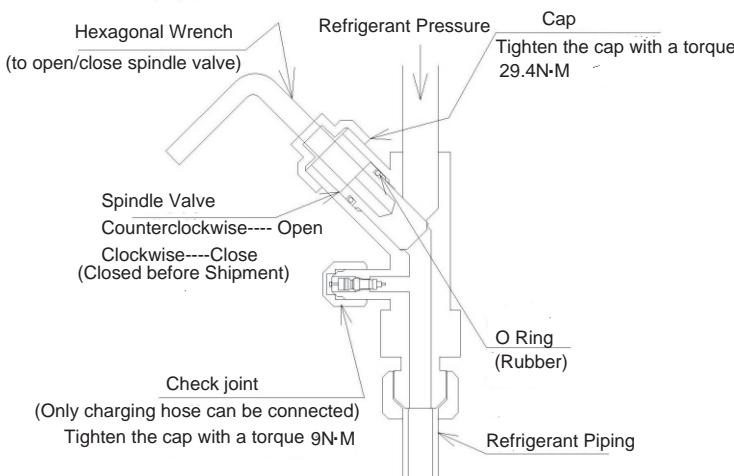


Spindle Valve Torque (N·m)

Gas	Liquid
11~14	7~9

## CAUTION

<Gas Valve>



Hexagonal Wrench Size (mm)

Gas	Liquid
8	4

## CAUTION

- Do not apply an abnormal big force to the spindle valve at the end of opening (5.0N·m or smaller). The back seat construction is not provided.
- Do not loosen the stop ring. If the stop ring is loosened, it is dangerous, since the spindle will hop out.

- (5) Connect the gauge mani-fold using charging hoses with a nitrogen cylinder to the check joints of the liquid line and the gas line stop valves.  
Perform the air-tight test.  
Do not open the stop valves. Apply nitrogen gas pressure of 4.15MPa.
- (6) Check for any gas leakage at the flare nut connections, or brazed parts by gas leak detector or foaming agent.
- (7) After the air tight test, release nitrogen gas.

After pipe and nut cap are connected, when test the air-tight, open the stop valve spindle cap to make sure valve is closed already(clock wise).

- Tighten nut cap below torque, great torque will bring on refrigerant leakage of valve spindle.

Pipe Diameter	Tighten Torque
Φ6.35(1/4)	14~18N·m
Φ9.53(3/8)	34~42N·m
Φ12.7(1/2)	49~61N·m
Φ15.88(5/8)	68~82N·m

- Make air-tight test after valve spindle turn off closely.

Note:

Do not connect nut cap on test joint, supply for connecting refrigerant charging hose. It has no effect for system capacity when connect joint cap and valve cap opened together "pu chi" light sound.

## 5.6 Vacuum Pumping and charge refrigerant

- (1) Connect a mani-fold gauge to the check joints at the both sides.

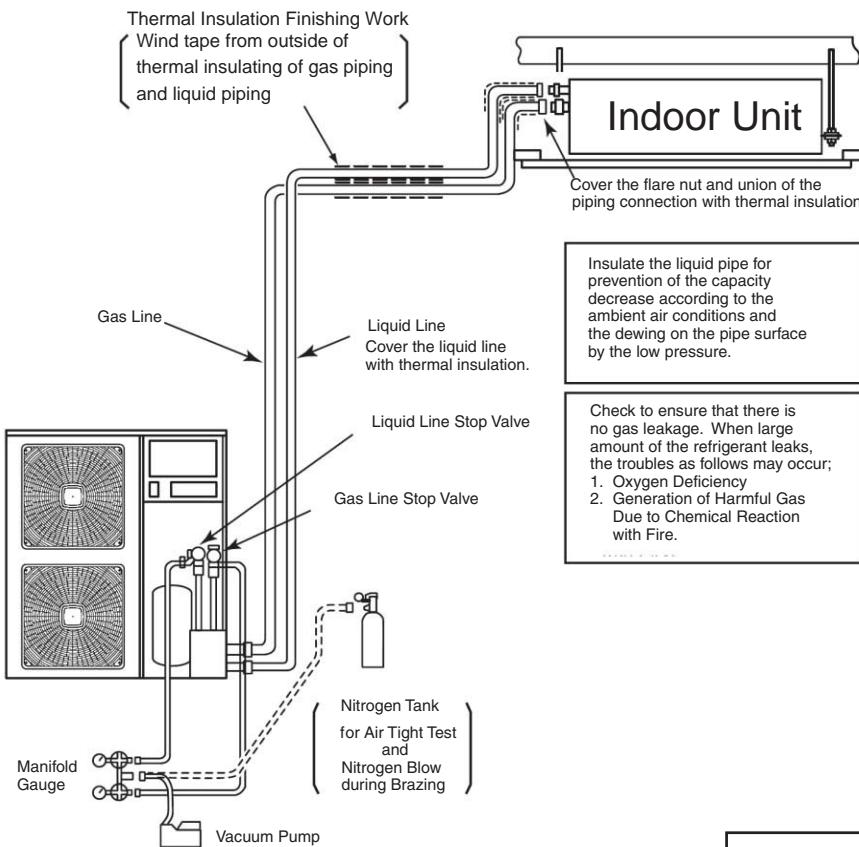
Continue vacuum pumping work until the pressure reaches 756mmHg or lower for one to two hours.

After vacuum pumping work, stop the mani-fold valve's valve, stop the vacuum pump and leave it for one hour. Check to ensure that the pressure in the mani-fold gauge does not increase.

Note:

1. This unit is only for the refrigerant R410A. The manifold gauge and the charging hose should be exclusive use for R410A.
2. If vacuum degree of -0.1MPa (756mmHg) is not available, it is considered of gas leakage or entering moisture. Check for any gas leakage once again. If no leakage exists, operate the vacuum pump for more than one to two hours.
- (2) Connect adjusting valve and charge kettle to check joint of liquid valve.
- (3) Fully open the gas valve and liquid valve slowly.
- (4) Open adjusting valve to add refrigerant (must be refrigerant is liquid).
- (5) Operate cool mode, charge stated refrigerant.
- (6) Confirm the capacity of charging refrigerant with Weighing meter. An excess or a shortage of refrigerant is cause of trouble to the units.
- (7) Fully open the liquid valve.

**Never use the refrigerant charged in the outdoor unit for air purging.  
Insufficient refrigerant will lead to failure.**



## **CAUTION**

- 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 service cover.
- Check for refrigerant leakage in detail. If a large refrigerant leakage occurs, it will cause difficulty with breathing or harmful gases would occur if a fire was being used in the room.

1. Maximum Permissible Concentration of HFC GAS R410A. 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 HCFC gas, R410A in air is 0.3kg/m<sup>3</sup>, 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 0.3kg/m<sup>3</sup>, in case of leakage.

2. Calculation of Refrigerant Concentration

- (1) Calculate the total quantity of refrigerant R (kg) charged in the system connecting all the indoor units of objective rooms.
- (2) Calculate the room volume V (m<sup>3</sup>) of each objective room.
- (3) Calculate the refrigerant concentration C (kg/m<sup>3</sup>) of the room according to the following equation.

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

If local codes or regulations are specified, follow them.

## 5.7 Caution of the Pressure by Check Joint

When the pressure is measured, use the check joint of gas stop valve ((A) in the figure below) and use the check joint of liquid piping ((B) in the figure below).

At that time, connect the pressure gauge according to the following table because of high pressure side and low pressure side changes by operation mode.

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

NOTE:

Be careful that refrigerant and oil do not splash to the electrical parts when removing the charge hoses.

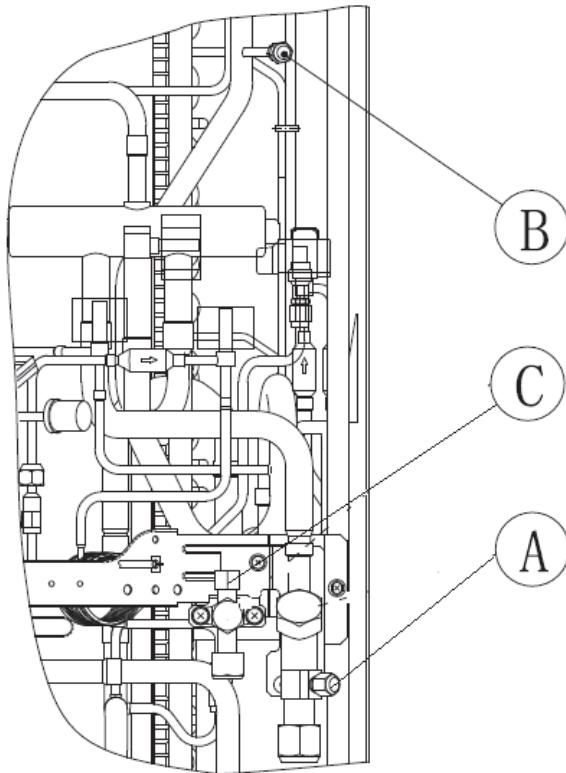


Fig 5.4 Check Joint Position

## 5.8 Additional Refrigerant Charge

It is necessary additional refrigerant charge as follows.

### Additional Refrigerant Charge Calculation

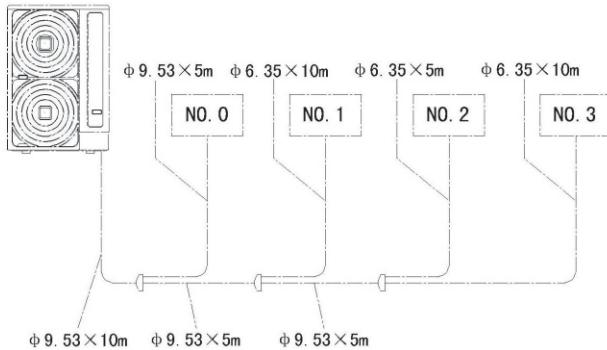
Although refrigerant has been charged into this unit, it is required that additional refrigerant be charged according to piping length.

- Determine an additional refrigerant quantity according to the following procedure, and charge it into the system.
- Record the additional refrigerant quantity to facilitate service activities thereafter.

#### 1. Calculating Method of Additional Refrigerant Charge (W kg)

##### <EXAMPLE>

RAS-5FSVN1Q



<Table 1>

( kg )

Outdoor Unit	W0: Outdoor Unit Ref.Charge
RAS-4FSVN1Q	
RAS-5FSVN1Q	
RAS-6FSVN1Q	
RAS-5FSYN1Q	3.6
RAS-6FSYN1Q	

NOTE:

W0 is outdoor unit ref. charge before shipment.

See Example for Model RAS-5FSVN1Q, and fill in the following table.

Pipe Diameter (mm) Total Piping Length (m) Additional Charge (kg)

$$W11 = \Phi 9.53 \dots (10+5+5+5) \times 0.05 = 1.25$$

$$W12 = \Phi 6.35 \dots (10+10+5) \times 0.02 = 0.50$$

$$\text{Total Piping Length } 50 \text{ m} \quad \text{Additional Charge } W = W11 + W12 = 1.75 \text{ ( kg )}$$

Pipe Diameter (mm) Total Piping Length (m) Additional Charge (kg)

$$W11 = \Phi 9.53 \dots \boxed{\quad} \times 0.05 = \boxed{\quad}$$

$$W12 = \Phi 6.35 \dots \boxed{\quad} \times 0.02 = \boxed{\quad}$$

Total Piping Length  m

Total Ref.Charge W =  +  =  ( kg )

#### 2. Charging Work

Charge refrigerant (R410A) into the system as follows.

(1) For charging refrigerant, connect the gauge mani-fold using charging hoses with a refrigerant cylinder to the check joint of the liquid line stop valve.

(2) Fully open the gas line stop valve and slightly open the liquid line stop valve.

Charge refrigerant by opening the gauge mani-fold valve.

(3) Charge the required refrigerant by operating the system in cooling.

Ensure to charge correct volume by utilizing a weight scale. An excess or shortage of refrigerant is the main cause of trouble to the units.

Fully open the liquid line stop valve after completing refrigerant charge.

#### 3. Record of Additional Charge

Record the refrigerant charging quantity in order to facilitate maintenance and servicing activities.

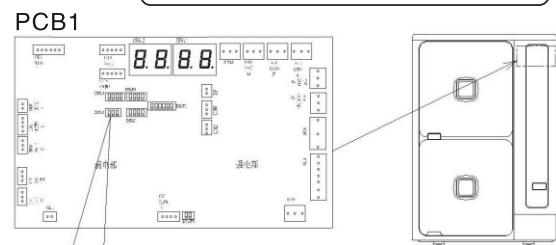
Total refrigerant charge of this system is calculated in the following formula.

$$\begin{aligned} \text{Total Ref. Charge of This System} &= W + W_0 \\ \text{This System} &= \boxed{\quad} + \boxed{\quad} = \boxed{\quad} \text{ kg} \end{aligned}$$

#### 4. Dip-Switch Setting for Piping Length

Follow below ,setting the Dip-Switch for piping length.

Total Additional Charge W	<input type="text"/> kg				
Total Ref. Charge of This System	<input type="text"/> kg				
Date of Ref. Charge Work					
Day	<input type="text"/>	Month	<input type="text"/>	Year	<input type="text"/>

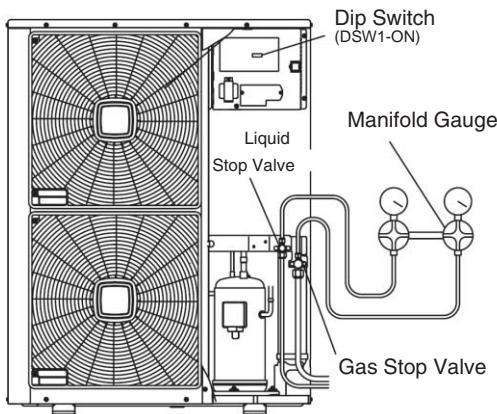


Shipment	I.U.is located higher than O.U.20m	O.U.is located higher than I.U. 25m
ON  OFF	ON  OFF	ON  OFF
ON  OFF	ON  OFF	ON  OFF

## 5.9 Collecting Refrigerant

When the refrigerant should be collected into the outdoor unit due to indoor/outdoor unit relocation, collect the refrigerant as follows.

- (1) Attach the manifold gauge to the gas stop valve and the liquid stop valve.
- (2) Turn ON the power source.
- (3) Set the DSW1-1 pin of the outdoor unit PCB at the "ON" side for cooling operation. Close the liquid stop valve and collect the refrigerant.
- (4) When the pressure at lower pressure side (gas stop valve) indicates -0.01MPa (684mmHg), perform the following procedures immediately.
  - \* Close the gas stop valve.
  - \* Set the DSW1-1 pin at the "OFF" side. (To stop the unit operation.)
- (5) Turn OFF the power source.



### CAUTION

Measure the low pressure by the pressure gauge and keep it not to decrease than -0.01MPa. If the pressure is lower than -0.01MPa, the compressor may be faulty.

## 6. Electrical Wiring

### WARNING

- Turn OFF the main power switch to the indoor unit and the outdoor unit and wait for more than 1 minute before electrical wiring work or a periodical check is performed.
- Check to ensure that the indoor fan and the outdoor fan have stopped before electrical wiring work or a periodical check is performed.
- Protect the wires, electrical parts, etc. from rats or other small animals. If not protected, rats may gnaw at unprotected parts and at the worst, a fire will occur.
- Avoid the wirings from touching the refrigerant pipes, plate edges and electrical parts inside the unit. If not do, the wires will be damaged and at the worst, a fire will occur.

### CAUTION

- Tightly secure the power source wiring using the cord clamp inside the unit.

### NOTE

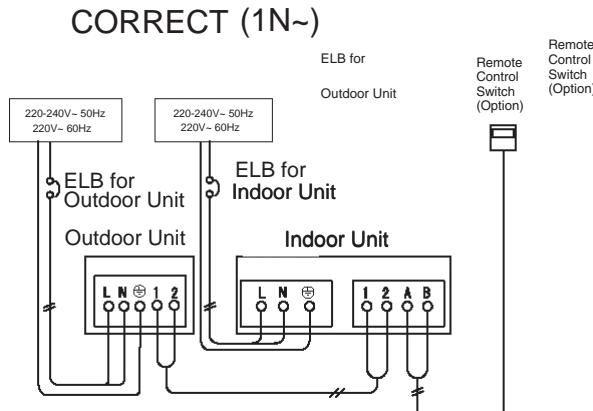
Fix the rubber bushes with adhesive when conduit tubes to the outdoor unit are not used.

## 6.1 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. Make sure that the components comply with National Electrical Code (NEC).
- (2) Check to ensure that the voltage of power supply is within  $\pm 6\%$  of nominal voltage and earth phase is contained in the power supply wires. If not, electrical parts will be damaged.
- (3) Check to ensure that the capacity of power supply is enough. If not, the compressor will be not able to operate because of abnormal voltage drop at starting.
- (4) Check to ensure that the earth wire is connected.
- (5) 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 not, do not operate the system until the electrical leakage is found and repaired.

## 6.2 Electrical Wiring Connection

(1) Connect the power supply wires to the terminal board in the electrical control box of both outdoor unit and indoor unit. And connect the earth wire to the electrical control box of outdoor unit.  
In addition, connect the earth wire to earth screw in the electrical control box of indoor unit. Refer to Fig. 6.3-Fig.6.4



**CORRECT (1N~)**

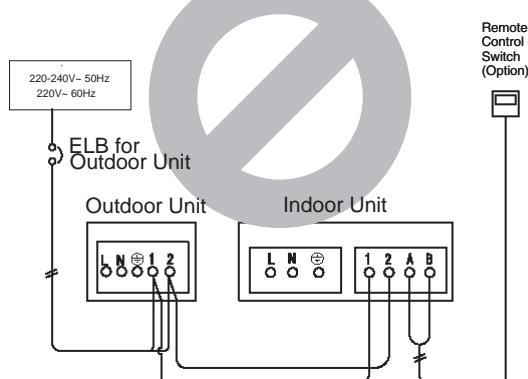
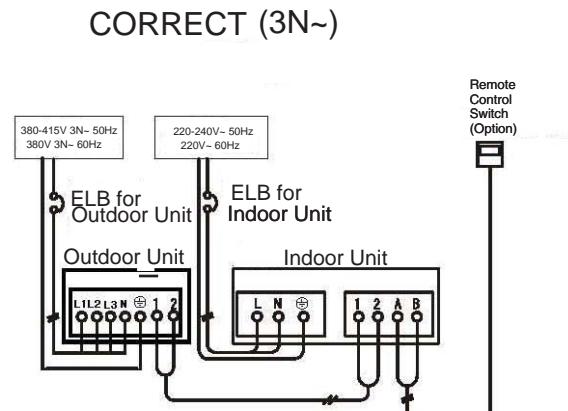


Fig. 6.1 Single phase indoor unit and outdoor unit transmission wire connection

(2) Connect the wires between the outdoor and indoor units to terminals 1 and 2 on the terminal board.  
If power supply wiring is connected to 1 and 2 of terminal board (TB1), printed circuit board will be damaged.  
Refer to Fig. 6.1-Fig.6.2



**CORRECT (3N~)**

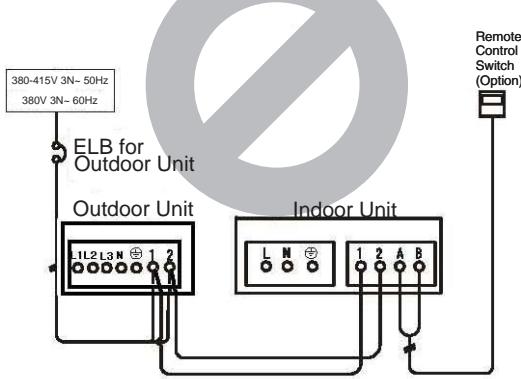


Fig. 6.2 Three phase indoor unit and outdoor unit transmission wire connection

Do not connect the Power Source Line to the terminal 1 and 2.  
These terminals are for the Control Line.  
If connected, the printed circuit board will be damaged.

(3) Do not wire in front of the fixing screw of the service panel. Otherwise, the screw can not be removed.  
(4) Use shielded twist pair for control between outdoor unit and indoor unit, control wiring between indoor units, Connect the wires between the outdoor and indoor units to terminals 1 and 2 on the terminal board.

### NOTES:

1. In case of total wiring length at intermediate wiring between outdoor unit and indoor unit and between indoor units is less than 100m, it is possible to use the normal wiring (more than 0.75mm<sup>2</sup>) except shielded twist pair .
2. Total wiring length for remote control switch can be extended up to 500m.  
If total wiring length less than 30m, it is possible to use the normal wiring (0.3mm<sup>2</sup>) except shielded twist pair.

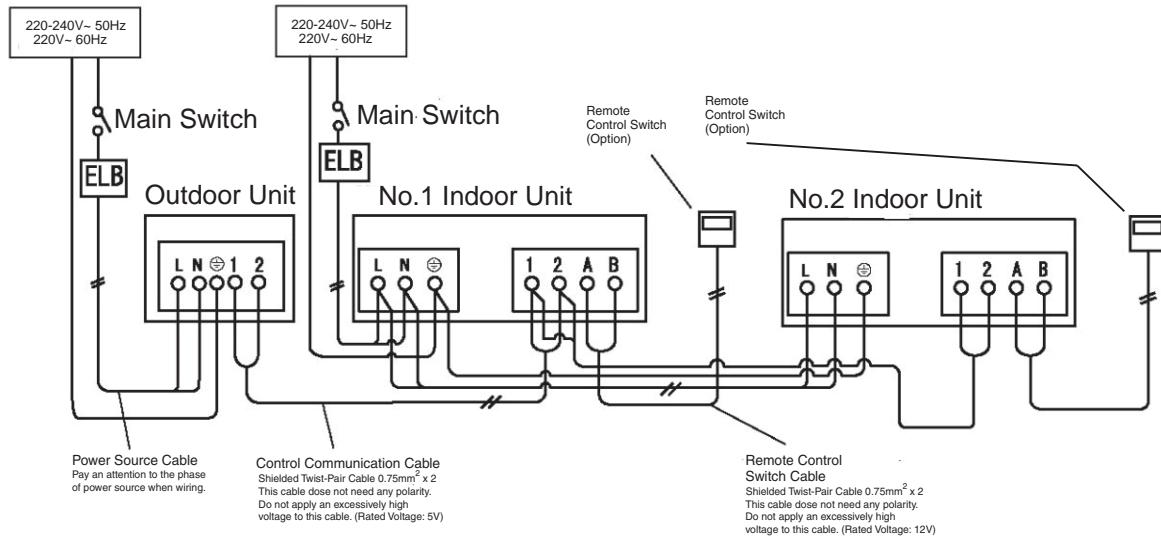


Fig. 6.3 Wiring Connection for Indoor & Outdoor ( 1N~ )

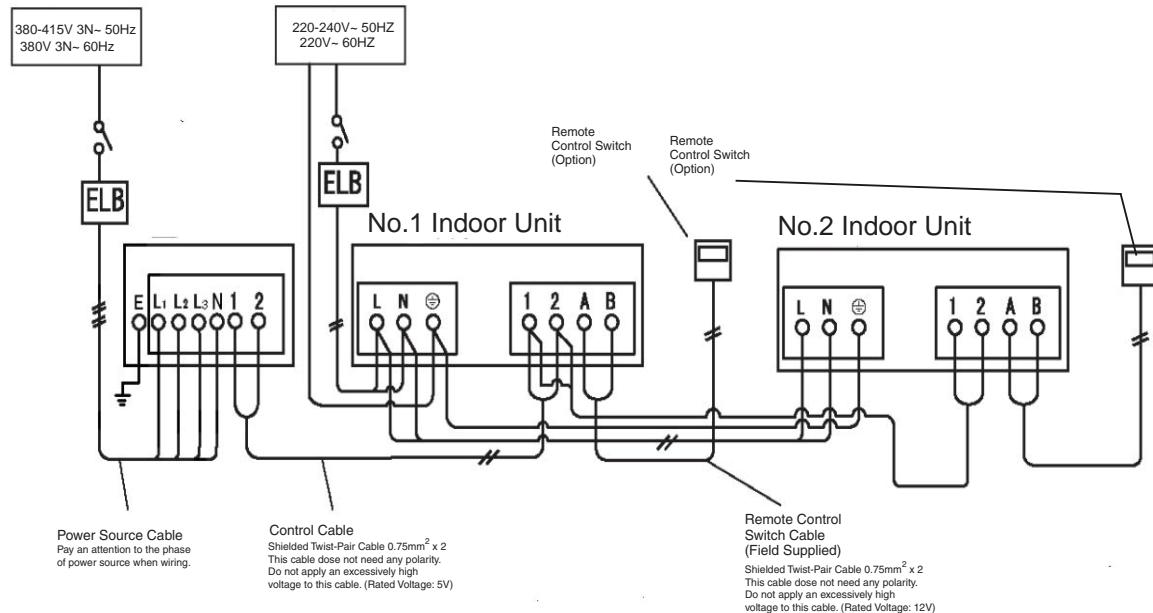


Fig. 6.4 Wiring Connection for Indoor & Outdoor ( 3N~ )

## ⚠ WARNING

- Install an ELB in the power source.  
If ELB is not used, it will cause electric shock or fire at the worst.
- The tightening torque of each screw shall be as follows.
 

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

Keep the above tightening torque when wiring work.

(5) The recommended breaker sizes etc. are shown in Table 6.1.

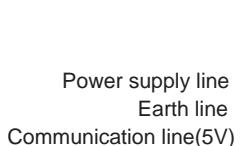
(6) In the case that a conduit tube for field-wiring not used, fix rubber bushes with adhesive on the panel (attachment).

## ! WARNING

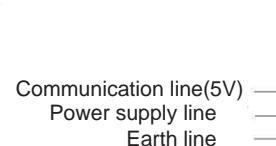
- Install main switch and ELB for each system separately. Select the high response type ELB that is acted within 0.1 second.
- Separate the control wiring between outdoor unit and indoor unit more than approximately 5 to 6cm from power supply wiring. Do not use a coaxial cable.

Table 6.1 Electrical Data and Recommended Wiring, Breaker Size/1 Outdoor Unit

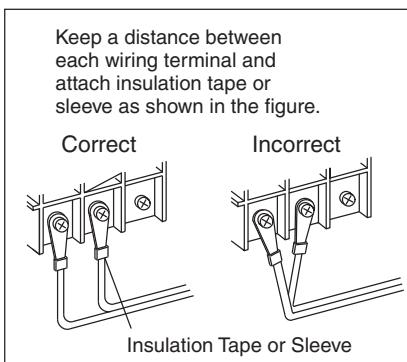
Model	Power Supply	Maximum Running Current (A)		Communication Line (mm <sup>2</sup> )	ELB		Fuse (A)
					Normal Current (A)	Sensitive Current (mA)	
RAS-4FSVN1Q							
RAS-5FSVN1Q	220-240V~ 50Hz 220V~ 60Hz	27.3		0.75	40	30	50
RAS-6FSVN1Q							
RAS-5FSYN1Q	380-415V 3N~ 50Hz 380V 3N~ 60Hz	16.2		0.75	25	30	25
RAS-6FSYN1Q							



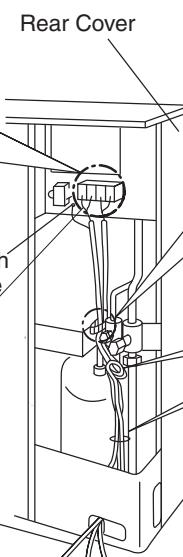
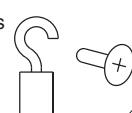
1N~ Outdoor Unit Connect Wire



3N~ Outdoor Unit Connect Wire

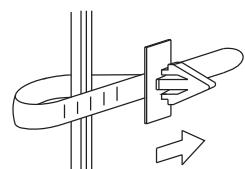


Do not use a solderless terminal when a single wire is used. If used it causes abnormal heating at the caulking portion of the terminal. If a single wire is used connect the wire direct as shown in the figure.



### Wiring Method with Clamp

1. Insert the wires into the cord clamp and clamp them as shown in the figure.
2. Perform wiring so that wires do not touch the compressor, refrigerant pipes or edge of the covers.



Make a loop of the wires so that disconnecting the wirings for replacing parts is not required.

### CAUTION:

When using conduit, do NOT lead it in the outdoor unit. If the conduit wiring touches the compressor and refrigerant cycle in the outdoor unit, it may cause to damage them.

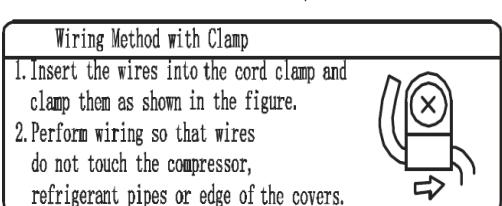
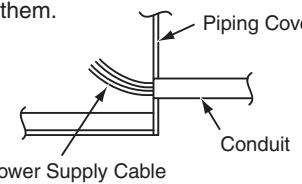


Fig. 6.3 Wiring Connection of Outdoor Unit

NOTES:

- 1) Follow local codes and regulations when selecting field wires.
- 2) Use a shielded cable for the communication line and connect it to ground.
- 3) In the case that power cables are connected in series, add each unit maximum current and select wires.

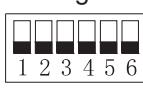
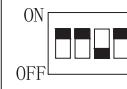
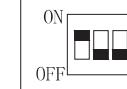
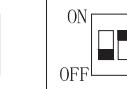
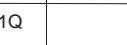
**CAUTION**

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

## 7. Outdoor Unit Dip-Swtich Setting

Turn off all power switch before setting Dip-Switch, else Dip-Switch is of no effect.

Follow this table setting Dip-Switch, “ **■** ” symbol denote the position of Dip-Switch contact joint.

DSW1	DSW2	DSW4	DSW5
 1 ON: Test Run(Cool) 1, 2 ON: Test Run(Heat) 4 ON: Compressor Forced Stop	ALL OFF: Shipment Set 5 ON: Optional Function Setting  6 ON: External Input and Output Setting	Ref. Cycle No. Setting  ON OFF	Communication Setting  ON OFF
DSW3			DSW6
Capacity Setting			Pipe length Setting Shipment  ON OFF
RAS-4FSVN1Q ON  OFF   RAS-5FSVN1Q ON  OFF   RAS-6FSVN1Q ON  OFF   RAS-5FSYN1Q ON  OFF   RAS-6FSYN1Q ON  OFF 	I.U.is located higher than O.U.(>20m) ON  OFF   O.U.is located higher than I.U.(>25m) ON  OFF 		

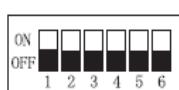
● Communication Setting

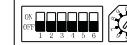
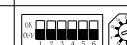
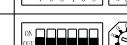
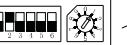
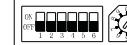
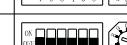
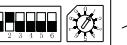
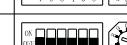
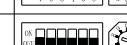
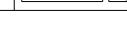
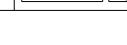
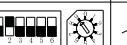
It is necessary to set Ref. cycle system No. and terminal resistor connect to H-LINK system.

● Setting Ref.cycle system No.  
Setting Ref.cycle (DSW4&RSW1)

DSW4

Tens Digit Setting



Digital Unit \	0	1	2	~	5	6
0	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6
1	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6
2	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6
3	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6
4	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6
5	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6
{	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6
9	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6	 0N 0F 1 2 3 4 5 6

Forbid Setting

● Setting Ref.cycle system No.

Setting Ref.cycle (DSW4&RSW1)

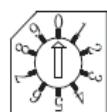
DSW4

Tens Digit Setting



RSW1

Single Digit Setting



- Terminal Resistor Setting

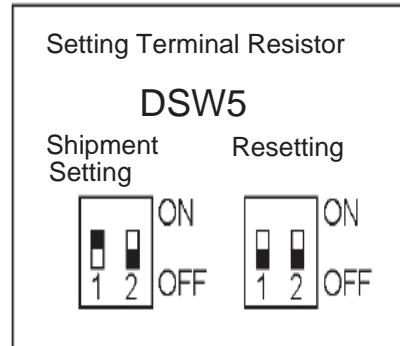
The first key of DSW5 is "ON" position shipment.

It is not necessary to set when H-LINK is connected with one outdoor unit.

It is necessary to set the first key of DSW5 to "OFF" position from the second outdoor unit when a H-LINK system is connected with more than one outdoor unit

## 8. Test Run

Test run should be performed according to the Table 8.1 on page 25. And use the Table 8.2 on page 26 for recording test run.



### WARNING

- Do not operate the system until all the check points have been cleared.

(A) Check and confirm Ref. pipe system and communication wire link to same Ref. cycle system.

(B) 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 not, do not operate the system until the electrical leakage is found and repaired.

(C) Check to ensure that the stop valves of the outdoor unit are fully opened, and then start the system.

(D) Check to ensure that the switch on the main power source has been ON for more than 12 hours, to warm the compressor oil by the oil heater.

- Pay attention to 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 side are heated higher than 90°C.

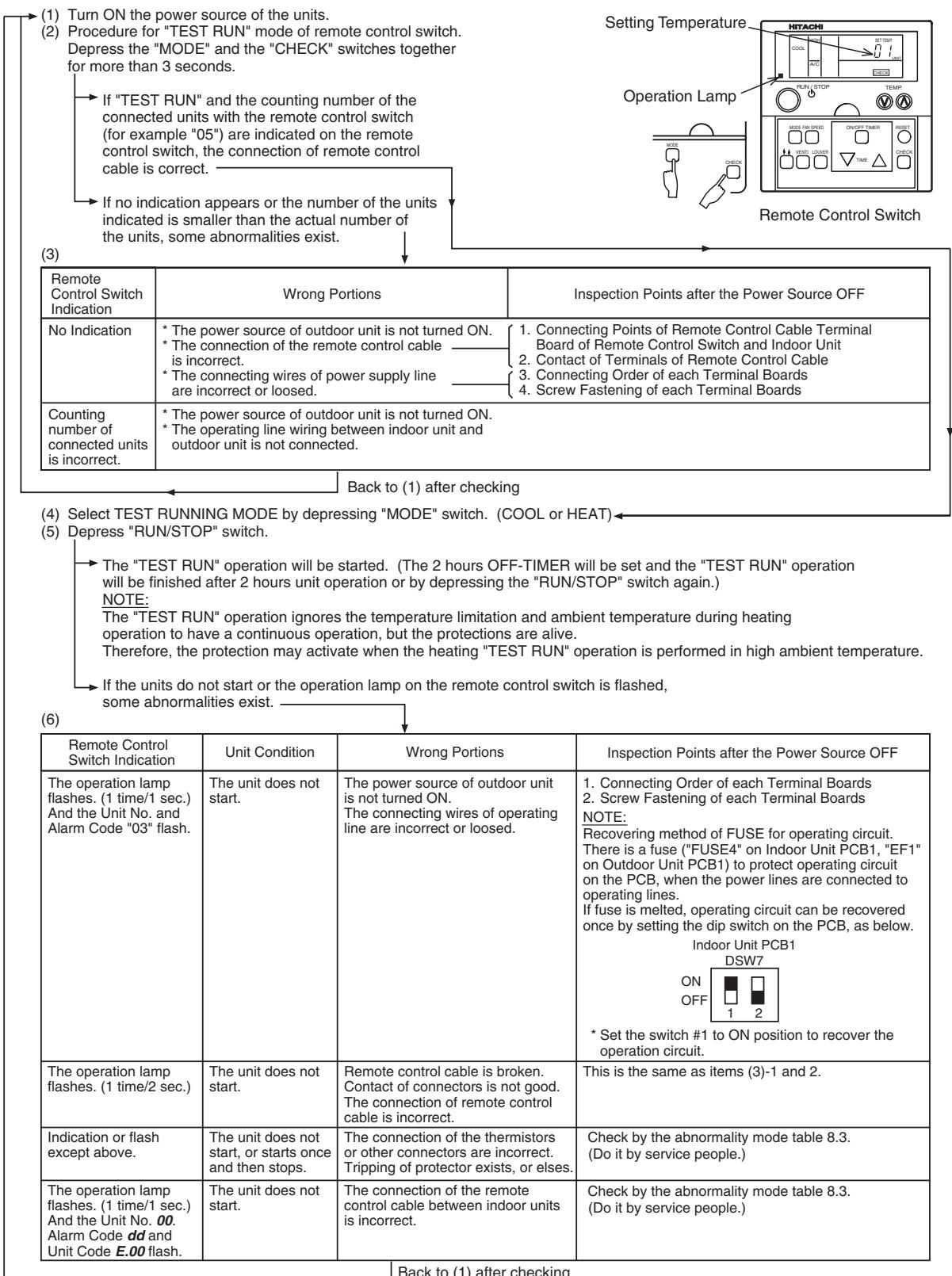
(B) DO NOT PUSH THE BUTTON OF THE MAGNETIC SWITCH(ES). It will cause a serious accident.

- Do not touch any electrical components for more than three minutes after turning OFF the main switch.

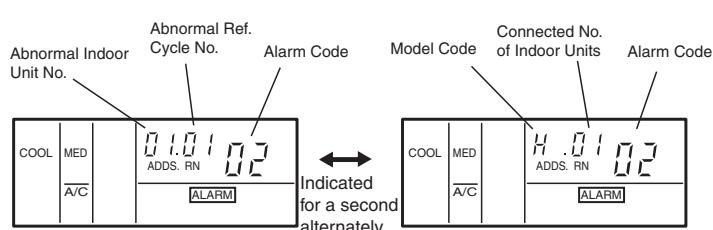
- Operate every indoor unit one by one, check and confirm their Ref. cycle and connect wire joint to same Ref. cycle system.

Table 8.1 Checking of Wire Connection by Test Run

NOTE: "TEST RUN" shall be performed with each refrigerant cycle (each outdoor unit).



● Alarm Code Indication of Remote Control Switch



Model Code

Indication	Model
<b>H</b>	Heat-pump
<b>P</b>	Inverter
<b>F</b>	Multi
<b>C</b>	Cooling Only
<b>E</b>	Others

Table 8.2 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? <input type="checkbox"/> 2. Is the rotation direction of the outdoor coil fan correct? <input type="checkbox"/> 3. Are there any abnormal compressor sounds? <input type="checkbox"/> 4. Has the unit been operated at least twenty (20) minutes? <input type="checkbox"/> 5. Check Room Temperature <table border="0"> <tr> <td>Inlet:</td> <td>No. 1 DB</td> <td>/WB</td> <td>°C,</td> <td>No. 2 DB</td> <td>/WB</td> <td>°C,</td> <td>No.3 DB</td> <td>/WB</td> <td>°C,</td> <td>No.4 DB</td> <td>/WB</td> <td>°C</td> </tr> <tr> <td>Outlet:</td> <td>DB</td> <td>/WB</td> <td>°C,</td> <td>DB</td> <td>/WB</td> <td>°C,</td> <td>DB</td> <td>/WB</td> <td>°C,</td> <td>DB</td> <td>/WB</td> <td>°C</td> </tr> </table>			Inlet:	No. 1 DB	/WB	°C,	No. 2 DB	/WB	°C,	No.3 DB	/WB	°C,	No.4 DB	/WB	°C	Outlet:	DB	/WB	°C,	DB	/WB	°C,	DB	/WB	°C,	DB	/WB	°C
Inlet:	No. 1 DB	/WB	°C,	No. 2 DB	/WB	°C,	No.3 DB	/WB	°C,	No.4 DB	/WB	°C																
Outlet:	DB	/WB	°C,	DB	/WB	°C,	DB	/WB	°C,	DB	/WB	°C																
6. Check Outdoor Ambient Temperature <table border="0"> <tr> <td>Inlet:</td> <td>DB</td> <td>°C,</td> <td>WB</td> <td>°C</td> </tr> <tr> <td>Outlet:</td> <td>DB</td> <td>°C,</td> <td>WB</td> <td>°C</td> </tr> </table>			Inlet:	DB	°C,	WB	°C	Outlet:	DB	°C,	WB	°C																
Inlet:	DB	°C,	WB	°C																								
Outlet:	DB	°C,	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: _____ V, Starting Voltage: _____ V																												
10. Check Compressor Input Running Current Input: _____ kW Running Current: _____ A																												
11. Is the refrigerant charge adequate? <input type="checkbox"/> 12. Do the operation control devices operate correctly? <input type="checkbox"/> 13. Do the safety devices operate correctly? <input type="checkbox"/> 14. Has the unit been checked for refrigerant leakage? <input type="checkbox"/> 15. Is the unit clean inside and outside? <input type="checkbox"/> 16. Are all cabinet panels fixed? <input type="checkbox"/> 17. Are all cabinet panels free from rattles? <input type="checkbox"/> 18. Is the filter clean? <input type="checkbox"/> 19. Is the heat exchanger clean? <input type="checkbox"/> 20. Are the stop valves open? <input type="checkbox"/> 21. Does the drain water flow smoothly from the drain pipe? <input type="checkbox"/>																												

Table 8.3 Alarm Code

Code No.	Category	Content of Abnormality	Leading Cause
01	Indoor Unit	Activating of Protection Device	High Water Level in Drain Pan, Activated Float Switch.
02	Outdoor Unit	Activating of Protection Device (Except Alarm Code 41 and 42)	Activated High Pressure Switch, Locked Motor in Cooling Operation, Abnormality of Power Supply Phase
03	Transmission	Abnormality between Indoor and Outdoor	Incorrect Wiring, Loose Terminals, Disconnected wire, Tripping of Fuse.
04		Abnormality between Inverter and Control PCB	Failure in Transmission of PCB for Inverter.
05	Supply Phases	Abnormality of Power Supply Phases (for 220V/60Hz Unit Only)	Abnormal Waveform of one or more the Supply Phases (Ex. Distortion of the Voltage Signal).
06	Voltage Drop	Voltage Drop by Excessively Low or High Voltage to Outdoor Unit	Voltage Drop of Power Supply, Insufficient Capacity of Power Supply Wiring.
07	Cycle	Decrease of Discharge Gas Superheat	Discharge Gas SUPERHEAT less than 10 deg. is maintained for one hour.
08		Increase of Discharge Gas Temperature	Temperature of the top of Compressor: $T_d \geq 127^{\circ}\text{C}$ (Cooling), $T_d \geq 120^{\circ}\text{C}$ (Heating) over 10 minutes, or $T_d \geq 140^{\circ}\text{C}$ over 5 seconds.
11	Sensor on Indoor Unit	Inlet Air Thermistor	Failure of Thermistor, Loose Terminal, Disconnected Wire.
12		Outlet Air Thermistor	
13		Freeze Protection Thermistor	
14		Gas Piping Thermistor	
19		Tripping of Protection Device	Activated Internal Thermo of Fan Motor.
20	Sensor on Outdoor Unit	Compressor Thermistor	Failure of Thermistor, Loose Terminal, Disconnected Wire, Locked Motor in Heating Operation.
22		Outdoor Air Thermistor	
24		Evaporating Thermistor	
31	System	Incorrect Capacity of Outdoor and Indoor Unit	Incorrect Setting of Capacity Combination or Incorrect O.U. Capacity Setting.
35		Incorrect Indoor Unit No. Setting	Duplication of Indoor Unit No.
38		Abnormality of Protective Circuit in outdoor Unit	Failure of Protection detecting Circuit
41	Pressure	Overload cooling (Possibility of high pressure device activation.)	O.U. Pipe Thermistor Temp. is Higher than 55°C and the Comp. Top Temp. is Higher than 95°C when O.U. Protection Device is activated.
42		Overload heating (Possibility of high pressure device activation.)	I.U. Freeze Protection Thermistor Temp. is Higher than 55°C and the Comp. Top Temp. is Higher than 95°C when O.U. Protection Device is activated.
47		Activation of Low Pressure Decrease Protection Device	Stoppage by Excessively Decrease of evaporating Temperature ( $T_e \leq -35^{\circ}\text{C}$ ) is activated 3 times in one hour, Locked Motor in Heating Operation.
51	Inverter	Abnormality of Current Sensor for Inverter	Failure of Control PCB1, IPM or PCB2
52		Overcurrent Protection Activation	Failure of IPM or PCB2, Clogging of Heat Exchanger.
53		Protection Activation of IPM or PCB2	IPM or PCB2 Abnormality, Failure of Compressor, clogging of Heat Exchanger.
54		Inverter Fin Temperature Increase	Abnormal Inverter Fin Thermistor, Clogging of Heat Exchanger, Abnormal Outdoor Fan
55		IPM or PCB2 Abnormality	Failure of IPM or PCB2
57	Outdoor Fan	Fan Motor Abnormality	Disconnected wire or Incorrect wiring between Control PCB and Inverter PCB, Incorrect Wiring or Fan Motor Abnormality
59	Inverter	Thermistor of Inverter Fin Abnormality (for Inverter Fin Temp.)	Loose Connector, Disconnected Wire, Short Circuit
b1	Indoor Unit No. Setting	Incorrect Unit No. Setting	Over 64 I.U. Setting by Ref. No. or I.U. Address.
EE	Compressor	Compressor Protection Alarm	Failure of Compressor.

## 9. 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.

Outdoor Unit Model		RAS-4~6FSVN1Q	RAS-5~6FSYN1Q
For Compressor Pressure Switch High Pressure		Automatic Reset,Non-Adjustable	Automatic Reset,Non-Adjustable
Cut-Out	MPa	4.15 <sup>-0.05</sup> <sub>-0.20</sub>	4.15 <sup>-0.05</sup> <sub>-0.20</sub>
Cut-In	Mpa	3.2 <sup>+0.15</sup> <sub>-0.20</sub>	3.2 <sup>+0.15</sup> <sub>-0.20</sub>
Fuse on Main Circuit	A	50	25
Compressor Crank Heater Power	W	28 × 4	28 × 4
CCP Timer Set Time	Min	Non-Adjustable 3	Non-Adjustable 3
Control Circuit Fuse	A	5	5