

# TOSHIBA

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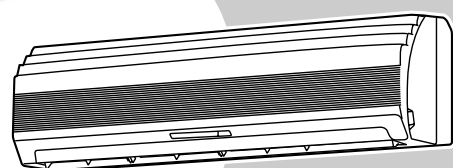
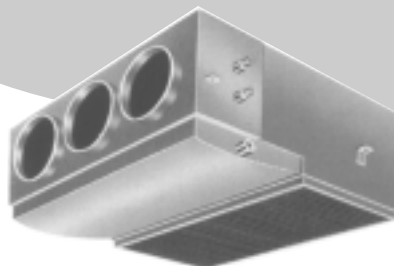
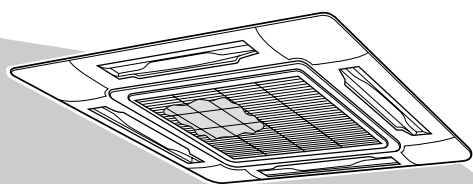
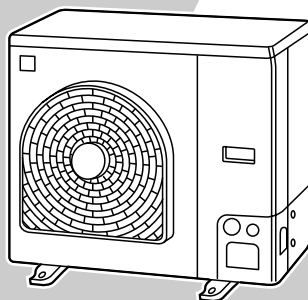
## SERVICE MANUAL

<OWNER'S MANUAL/INSTALLATION MANUAL>

# AIR-CONDITIONER

## SPLIT TYPE

***RAV-SM560AT-E/RAV-SM800AT-E***  
***RAV-SM560UT-E/RAV-SM800UT-E***  
***RAV-SM560BT-E/RAV-SM800BT-E***  
***RAV-SM560KRT-E/RAV-SM800KRT-E***



PRINTED IN JAPAN, Apr.,2003 

## ADOPTION OF NEW REFRIGERANT

This Air Conditioner is a new type which adopts a new refrigerant HFC (R410A) instead of the conventional refrigerant R22 in order to prevent destruction of the ozone layer.

## WARNING

Cleaning of the air filter and other parts of the air filter involves dangerous work in high places, so be sure to have a service person do it. Do not attempt it yourself. The cleaning diagram for the air filter is there for the service person, and not for the customer.

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## 4-Way Air Discharge Cassette Type

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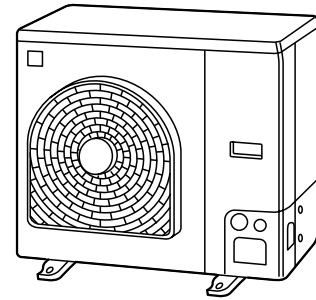
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### OWNER'S MANUAL

# Outdoor Unit ——— RAV-SM800AT-E/RAV-SM800AT-E

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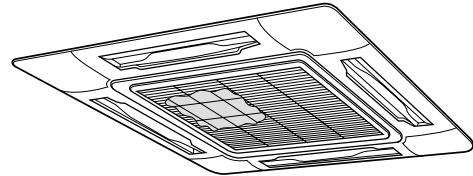


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RAV-SM800AT-E

# RAV-SM560UT-E/RAV-SM800UT-E

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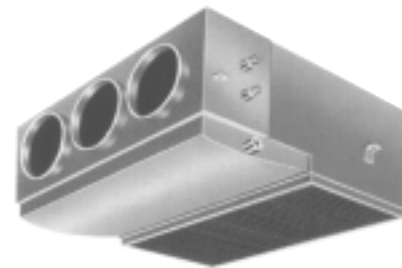


RAV-SM560UT-E  
RAV-SM800UT-E

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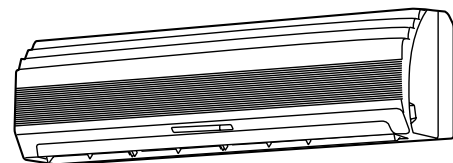


RAV-SM560BT-E  
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RAV-SM560KRT-E  
RAV-SM800KRT-E

# ???

## INSTALLATION MANUAL

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# 1 PRECAUTIONS FOR SAFETY

- Ensure that all Local, National and International regulations are satisfied.
- Read this "PRECAUTIONS FOR SAFETY" carefully before Installation.
- The precautions described below include the important items regarding safety. Observe them without fail.
- After the installation work, perform a trial operation to check for any problem.  
Follow the Owner's Manual to explain how to use and maintain the unit to the customer.
- Turn off the main power supply switch (or breaker) before the unit maintenance.
- Ask the customer to keep the Installation Manual together with the Owner's Manual.

## CAUTION

### New Refrigerant Air Conditioner Installation

- **THIS AIR CONDITIONER ADOPTS THE NEW HFC REFRIGERANT (R410A) WHICH DOES NOT DESTROY OZONE LAYER.**

The characteristics of R410A refrigerant are ; easy to absorb water, oxidizing membrane or oil, and its pressure is approx. 1.6 times higher than that of refrigerant R22. Accompanied with the new refrigerant, refrigerating oil has also been changed. Therefore, during installation work, be sure that water, dust, former refrigerant, or refrigerating oil does not enter the refrigerating cycle.

To prevent charging an incorrect refrigerant and refrigerating oil, the sizes of connecting sections of charging port of the main unit and installation tools are changed from those for the conventional refrigerant.


Accordingly the exclusive tools are required for the new refrigerant (R410A).

For connecting pipes, use new and clean piping designed for R410A, and please care so that water or dust does not enter. Moreover, do not use the existing piping because there are problems with pressure-resistance force and impurity in it.

## CAUTION

### To Disconnect the Appliance from Main Power Supply.

This appliance must be connected to the main power supply by means of a switch with a contact separation of at least 3 mm.

**The installation fuse (25A D type  ) must be used for the power supply line of this conditioner.**

## WARNING

- **Ask an authorized dealer or qualified installation professional to install/maintain the air conditioner.**  
Inappropriate installation may result in water leakage, electric shock or fire.
- **Turn off the main power supply switch or breaker before attempting any electrical work.**  
Make sure all power switches are off. Failure to do so may cause electric shock.
- **Connect the connecting cable correctly.**  
If the connecting cable is connected in a wrong way, electric parts may be damaged.
- **When moving the air conditioner for the installation into another place, be very careful not to enter any gaseous matter other than the specified refrigerant into the refrigeration cycle.**  
If air or any other gas is mixed in the refrigerant, the gas pressure in the refrigeration cycle becomes abnormally high and it may resultingly causes pipe burst and injuries on persons.
- **Do not modify this unit by removing any of the safety guards or by by-passing any of the safety interlock switches.**
- **Exposure of unit to water or other moisture before installation may cause a short-circuit of electrical parts.**  
Do not store it in a wet basement or expose to rain or water.

- **After unpacking the unit, examine it carefully if there are possible damage.**
- **Do not install in a place that might increase the vibration of the unit.**
- **To avoid personal injury (with sharp edges), be careful when handling parts.**
- **Perform installation work properly according to the Installation Manual.**  
Inappropriate installation may result in water leakage, electric shock or fire.
- **When the air conditioner is installed in a small room, provide appropriate measures to ensure that the concentration of refrigerant leakage occur in the room does not exceed the critical level.**
- **Install the air conditioner securely in a location where the base can sustain the weight adequately.**
- **Perform the specified installation work to guard against an earthquake.**  
If the air conditioner is not installed appropriately, accidents may occur due to the falling unit.
- **If refrigerant gas has leaked during the installation work, ventilate the room immediately.**  
If the leaked refrigerant gas comes in contact with fire, noxious gas may generate.
- **After the installation work, confirm that refrigerant gas does not leak.**  
If refrigerant gas leaks into the room and flows near a fire source, such as a cooking range, noxious gas might generate.
- **Electrical work must be performed by a qualified electrician in accordance with the Installation Manual. Make sure the air conditioner uses an exclusive power supply.**  
An insufficient power supply capacity or inappropriate installation may cause fire.
- **Use the specified cables for wiring connect the terminals securely fix. To prevent external forces applied to the terminals from affecting the terminals.**
- **Be sure to provide grounding.**  
Do not connect ground wires to gas pipes, water pipes, lightning rods or ground wires for telephone cables.
- **Conform to the regulations of the local electric company when wiring the power supply.**  
Inappropriate grounding may cause electric shock.
- **Do not install the air conditioner in a location subject to a risk of exposure to a combustible gas.**  
If a combustible gas leaks, and stays around the unit, a fire may occur.

#### Required tools for installation work



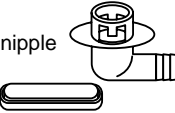

- |                            |                            |
|----------------------------|----------------------------|
| 1) Philips screw driver    | 9) Thermometer             |
| 2) Hole core drill (65 mm) | 10) Mega-tester            |
| 3) Spanner                 | 11) Electro circuit tester |
| 4) Pipe cutter             | 12) Hexagonal wrench       |
| 5) Knife                   | 13) Flare tool             |
| 6) Reamer                  | 14) Pipe bender            |
| 7) Gas leak detector       | 15) Level vial             |
| 8) Tape measure            | 16) Metal saw              |

#### R410A (Special requirement)

- 17) Gauge manifold  
(Charge hose : R410A special requirement)
- 18) Vacuum pump  
(Charge hose : R410A special requirement)
- 19) Torque wrench  
1/4 (17 mm) 16 N•m (1.6 kgf•m)  
3/8 (22 mm) 42 N•m (4.2 kgf•m)  
1/2 (26 mm) 55 N•m (5.5 kgf•m)  
5/8 (15.9 mm) 120 N•m (12.0 kgf•m)
- 20) Copper pipe gauge adjusting projection margin
- 21) Vacuum pump adapter

# 2 ACCESSORY AND REFRIGERANT

## Accessory and Installation Parts

①	 Outdoor unit Installation manual x 1	③	 Protective bush (For SM800AT only)
②	 Drain nipple Waterproof rubber cap	④	 Guard material for passage part (For SM800AT only)

## Refrigerant Piping

- Piping kit used for the conventional refrigerant cannot be used.
- Use copper pipe with 0.8 mm or more thickness for Ø6.4, Ø9.5, Ø12.7.  
Use copper pipe with 1.0 mm or more thickness for Ø15.9.
- Flare nut and flare works are also different from those of the conventional refrigerant. Take out the flare nut attached to the main unit of the air conditioner, and use it.

# 3 SELECTION OF INSTALLATION

## Before installation

Be careful to the following items before installation.

### Length of refrigerant pipe

#### <SM560AT-E>

Length of refrigerant pipe connected to indoor/outdoor unit	Item
20m or shorter	Addition of refrigerant is unnecessary at the local site.
*21m to 30m	<Addition of refrigerant> Add 20g of refrigerant for every 1m of pipe which exceeds 20m.

#### \* Caution at addition of refrigerant

When the total length of refrigerant pipe exceeds 20m, add 20g/m of refrigerant and the maximum total length of pipe is 30m.  
(Max. amount of additional refrigerant is 200g.)  
Charge the refrigerant accurately. Overcharge may cause a serious trouble of compressor.

#### <SM800AT-E>

Length of refrigerant pipe connected to indoor/outdoor unit	Item
20m or shorter	Addition of refrigerant is unnecessary at the local site.
*21m to 50m	<Addition of refrigerant> Add 40g of refrigerant for every 1m of pipe which exceeds 20m.

#### \* Caution at addition of refrigerant

When the total length of refrigerant pipe exceeds 20m, add 40g/m of refrigerant and the maximum total length of pipe is 50m.  
(Max. amount of additional refrigerant is 1200g.)  
Charge the refrigerant accurately. Overcharge may cause a serious trouble of compressor.

### Air purge

- For air purge, use a vacuum pump.
- Do not use refrigerant charged in the outdoor unit for air purge. (The refrigerant for air purge is not contained in the outdoor unit.)

### Electrical cabling

- Be sure to fix the power cables and indoor/outdoor connecting cables with clamps so that they do not contact with the cabinet, etc.

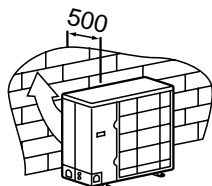
## Installation Place

- A place which provides a specified space around the outdoor unit.
- A place where the operation noise and discharged air are not given to your neighbors.
- A place that is not exposed to a strong wind.
- A place that does not block a passage.
- When the outdoor unit is installed in an elevated position, be sure to secure its feet.
- There must be sufficient space for carrying in the unit.
- A place where the drain water does not make any problem.

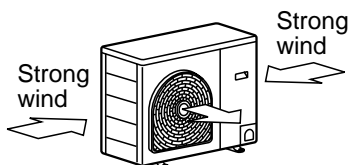
## CAUTION

1. Install the outdoor unit at a place where discharge air is not blocked.
2. When an outdoor unit is installed in a place that is always exposed to a strong wind like a coast or on a high storey of a building, secure a normal fan operation by using a duct or a wind shield.
3. When installing the outdoor unit in a place that is constantly exposed to a strong wind such as the upper stairs or rooftop of a building, apply the windproof measures referring to the following examples.

- 1) Install the unit so that its discharge port faces to the wall of the building. Keep a distance 500 mm or more between the unit and the wall surface.



- 2) Supposing the wind direction during the operation season of the air conditioner, install the unit so that the discharge port is set at right angle to the wind direction.



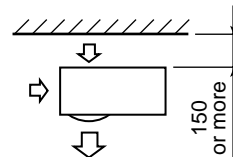
4. Installation in the following places may result in some troubles. Do not install the unit in such places below.
  - A place full of machine oil.
  - A place full of sulphuric gas.
  - A place where high-frequency radio waves are likely to be generated as from audio equipment, welders, and medical equipment.

## Necessary Space for Installation

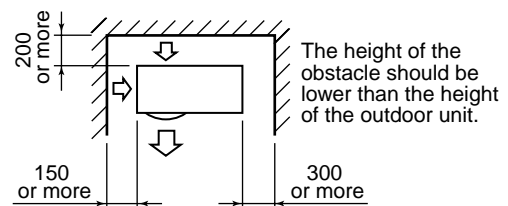
### Obstacle at rear side

#### <Upper side is free>

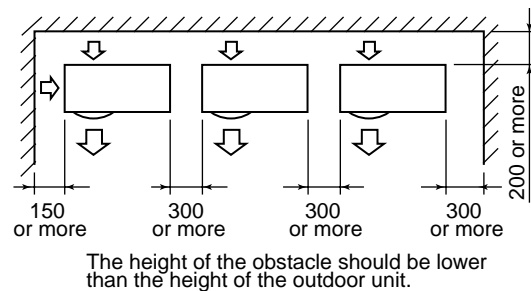
1. Single unit installation



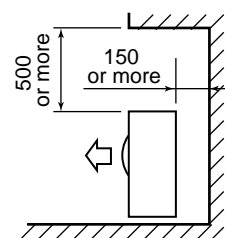
2. Obstacles at both right and left sides.



3. Serial installation of two or more units



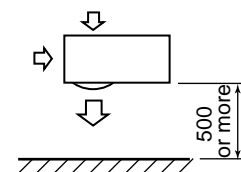
### <Obstacle also at the upper side>



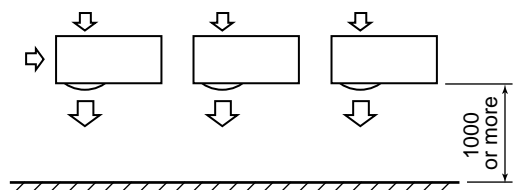
### Obstacle at front side

#### <Upper side is free>

1. Single unit installation

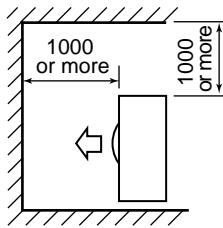


2. Serial installation of two or more units



# 3 SELECTION OF INSTALLATION

## <Obstacle also at the upper side>

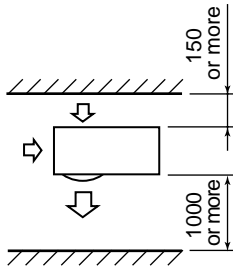


### Obstacles at both front and rear sides

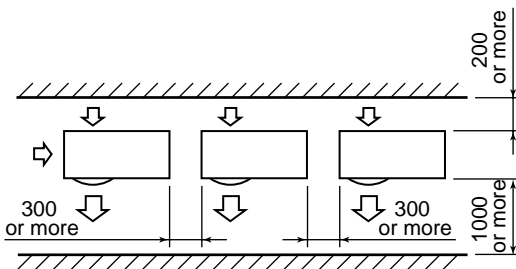
Open the upper side and both right and left sides. The height of obstacle at both front and rear side, should be lower than the height of the outdoor unit.

### <Standard installation>

#### 1. Single unit installation



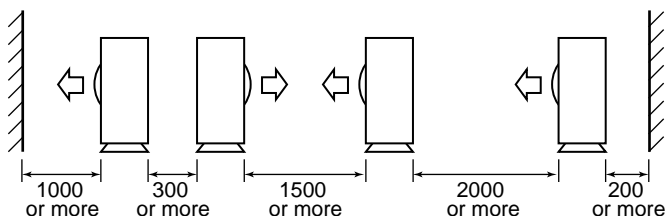
#### 2. Serial installation of two or more units



### Serial installation at front and rear sides

Open the upper side and both right and left sides. The height of obstacle at both front and rear sides should be lower than the height of the outdoor unit.

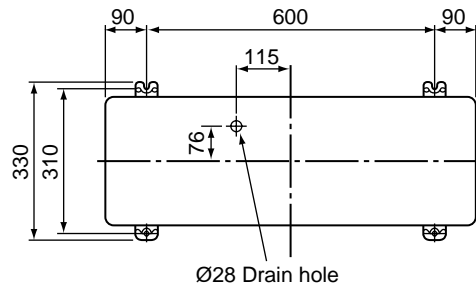
### <Standard installation>



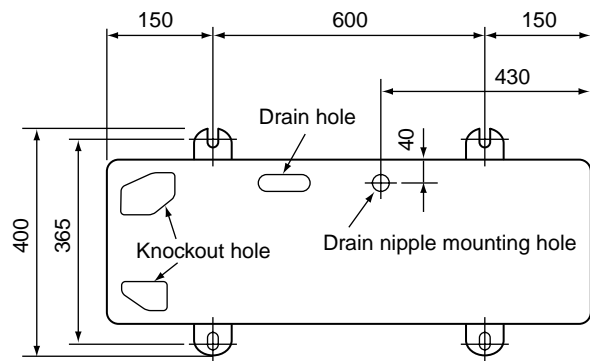
## Installation of Outdoor Unit

- Before installation, check strength and horizontality of the base so that abnormal sound does not generate.
- According to the following base diagram, fix the base firmly with the anchor bolts. (Anchor bolt, nut: M10 x 4 pairs)

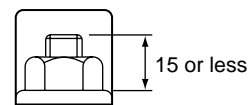
### <SM560AT-E>



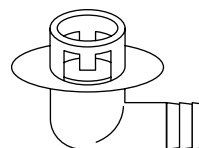
### <SM800AT-E>



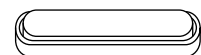
Set the out margin of the anchor bolt to 15mm or less.



- In case of draining through the drain hose, attach the following drain nipple and the waterproof rubber cap, and use the drain hose (Inner diam.: 16mm) sold on the market. And also seal the screws securely with silicone material, etc. so that water does not drop down. Some conditions may cause dewing or dripping of water.



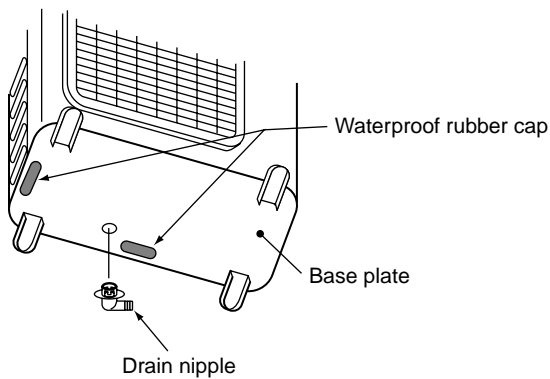
Drain nipple



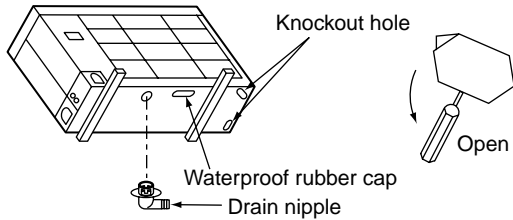
Waterproof rubber cap



<SM560AT-E>



<SM800AT-E>



- When there is a possibility of freezing of drain at the cold district or a snowfall area, be careful for drainage ability of drain. The drainage ability increases when a knockout hole on the base plate is opened. (Open the knockout hole to outside using a screwdriver, etc.)

**Optional Installation Parts  
(Local Procure)**

	Parts name	Q'ty
A	Refrigerant piping Liquid side : Ø6.35 mm or Ø9.52 mm Gas side : Ø12.7 mm or Ø15.9 mm	Each one
B	Pipe insulating material (polyethylene foam, 6 mm thick)	1
C	Putty, PVC tapes	Each one

**Refrigerant Piping Connection**

**CAUTION**

**TAKE NOTICE THESE IMPORTANT 4 POINTS BELOW FOR PIPING WORK**

1. Keep dust and moisture away from inside the connecting pipes.
2. Tightly connect the connection between pipes and the unit.
3. Evacuate the air in the connecting pipes using VACUUM PUMP.
4. Check gas leak at connected points.

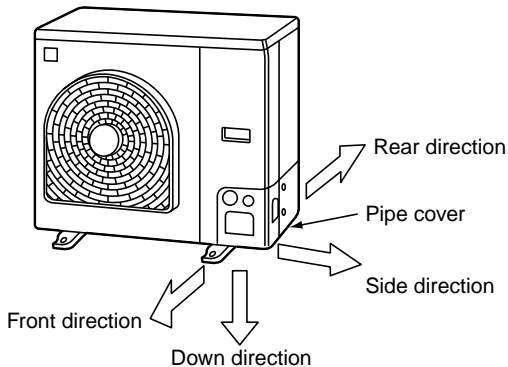
<Piping connection>

Capacity rank	Liquid side		Gas side	
	Outer diameter	Thickness	Outer diameter	Thickness
RAV-				
SM560	Ø6.4	0.8	Ø12.7	0.8
SM800	Ø9.5	0.8	Ø15.9	1.0

# 3 SELECTION OF INSTALLATION

## Knockout of Pipe Cover

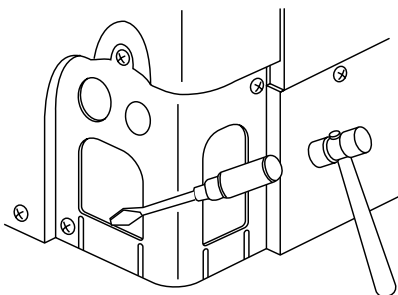
<SM800AT-E>



## Knockout procedure

- The indoor/outdoor connecting pipes can be connected to 4 directions.  
Take off the knockout part of the pipe cover in which pipes or wires pass through the base plate.
- As shown in the figure, do not remove the pipe cover from the cabinet so that the knockout hole can be easily punched. To knock out, it is easily taken off by hands by punching a position at the lower side of 3 connected parts with screwdriver along the guide line.
- After marking the knockout hole, remove the burr and mount the attached protective bush and guard material for pass-through part in order to protect pipes and wires.

After connecting the pipes, be sure to mount the pipe cover. The pipe cover is easily mounted by cutting off the slit at the lower part of the pipe cover.



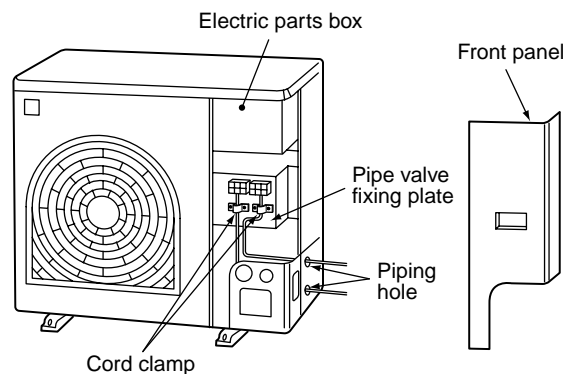
## How to remove the front panel

1. Remove screws of the front panel.
2. Pull the front panel downward.

Removing the front panel, the electric parts appear at the front side.

- The metal pipes are attachable to the piping holes. If the size of the used power pipe does not match with the hole, adjust the hole size to match with pipe size.
- Be sure to fix the power cable and indoor/outdoor connecting cable with bundling band sold on the market so that they do not make contact with the compressor and discharge pipe. (Temperature of the compressor and discharge pipe becomes high.)

In order to avoid the force applied to on the connecting section, be sure to fix the cables to the cord clamps provided on the pipe valve fixing plate and the electric parts box.

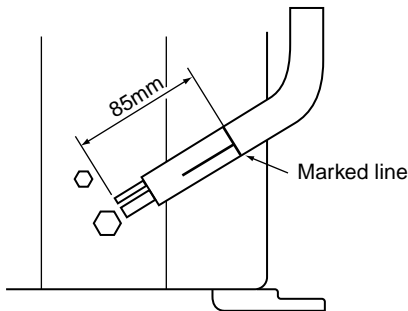


# 4 REFRIGERANT PIPING

## Pipe Forming/End Positioning

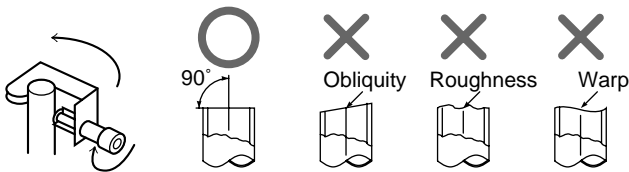
### <SM560AT-E>

- Forming of pipe  
Form the pipe along with a marked line of the cabinet.
- End positioning of pipe  
Match the ends of both pipes at a distance of 85 mm apart from the marked line.

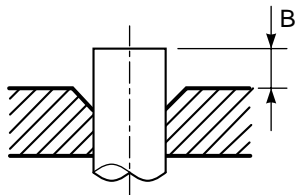


## Flaring

- Cut the pipe with a pipe cutter.



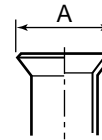
- Insert a flare nut into the pipe, and flare the pipe.  
As the flaring sizes of R410A differ from those of refrigerant R22, the flare tools newly manufactured for R410A are recommended. However, the conventional tools can be used by adjusting projection margin of the copper pipe.



## • Flaring size : A (Unit : mm)

Outer dia. of copper pipe	A $\begin{smallmatrix} +0 \\ -0.4 \end{smallmatrix}$	
	R410A	R22
6.35	9.1	9.0
9.52	13.2	13.0
12.7	16.6	16.2
15.9	19.7	19.4

\* In case of flaring for R410A with the conventional flare tool, pull it out approx. 0.5 mm more than that of R22 to adjust to the specified flare size. The copper pipe gauge is useful for adjusting projection margin size.



## • Projection margin in flaring : B (Unit : mm)

Rigid (Clutch type)

Outer dia. of copper pipe	R410A tool used		Conventional tool used	
	R410A	R22	R410A	R22
6.35	0 to 0.5	(Same as left)	1.0 to 1.5	0.5 to 1.0
9.52	0 to 0.5	(Same as left)	1.0 to 1.5	0.5 to 1.0
12.7	0 to 0.5	(Same as left)	1.0 to 1.5	0.5 to 1.0
15.9	0 to 0.5	(Same as left)	1.0 to 1.5	0.5 to 1.0

Imperial (Wing nut type)

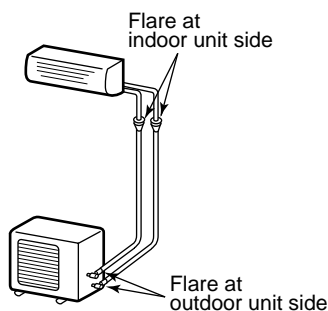
Outer dia. of copper pipe	R410A	R22
6.35	1.5 to 2.0	1.0 to 1.5
9.52	1.5 to 2.0	1.0 to 1.5
12.7	2.0 to 2.5	1.5 to 2.0
15.9	2.0 to 2.5	1.5 to 2.0

# 4 REFRIGERANT PIPING

## Tightening of Connecting Part

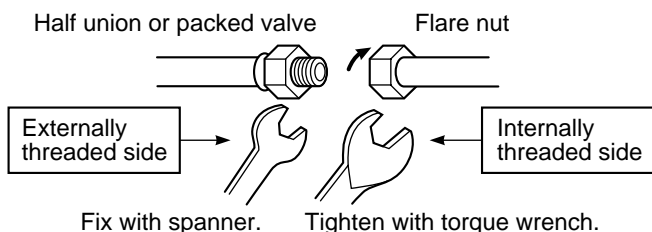
(Unit: N•m)

Outer dia. of copper pipe	Tightening torque
6.35mm (diam.)	14 to 18 (1.4 to 1.8kgf•m)
9.52mm (diam.)	33 to 42 (3.3 to 4.2kgf•m)
12.7mm (diam.)	50 to 62 (5.0 to 6.2kgf•m)
15.9mm (diam.)	63 to 77 (6.3 to 7.7kgf•m)



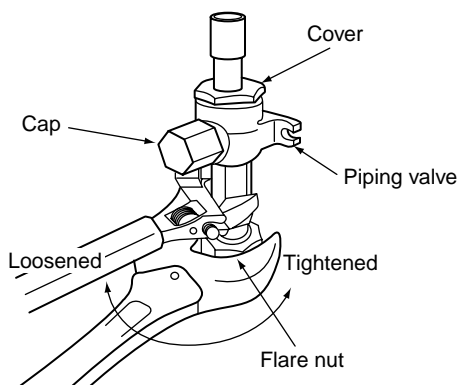
- Align the centers of the connecting pipes and tighten the flare nut strong as far as possible with your fingers.

Then fix the nut with a spanner and tighten it with torque wrench as shown in the figure.



- As shown in the figure, be sure to use a double spanner to loosen or tighten the flare nut of the valve at gas side. If using a single spanner, the nut cannot be tightened with necessary tightening torque.

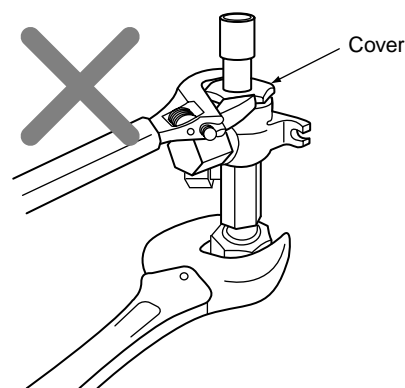
On the contrary, use a single spanner to loosen or tighten the flare nut of the valve at liquid side.



SM800 type valve at gas side

## REQUIREMENT

- Do not put the spanner on the cap. The valve may be broken.
  - If applying excessive torque, the nut may be broken according to some installation conditions.
- After the installation work, be sure to check gas leak of connecting part of the pipes with nitrogen.



- Pressure of R410A is higher than that of R22 (Approx. 1.6 times). Therefore, using a torque wrench, tighten the flare pipe connecting sections which connect the indoor/outdoor units at the specified tightening torque. Incomplete connections may cause not only a gas leak, but also a trouble of the refrigeration cycle.

**Do not apply refrigerating machine oil to the flared surface.**

# 5 EVACUATING

## Air Purge

This air conditioner can be installed up to the connecting pipe length and height difference in the following table.

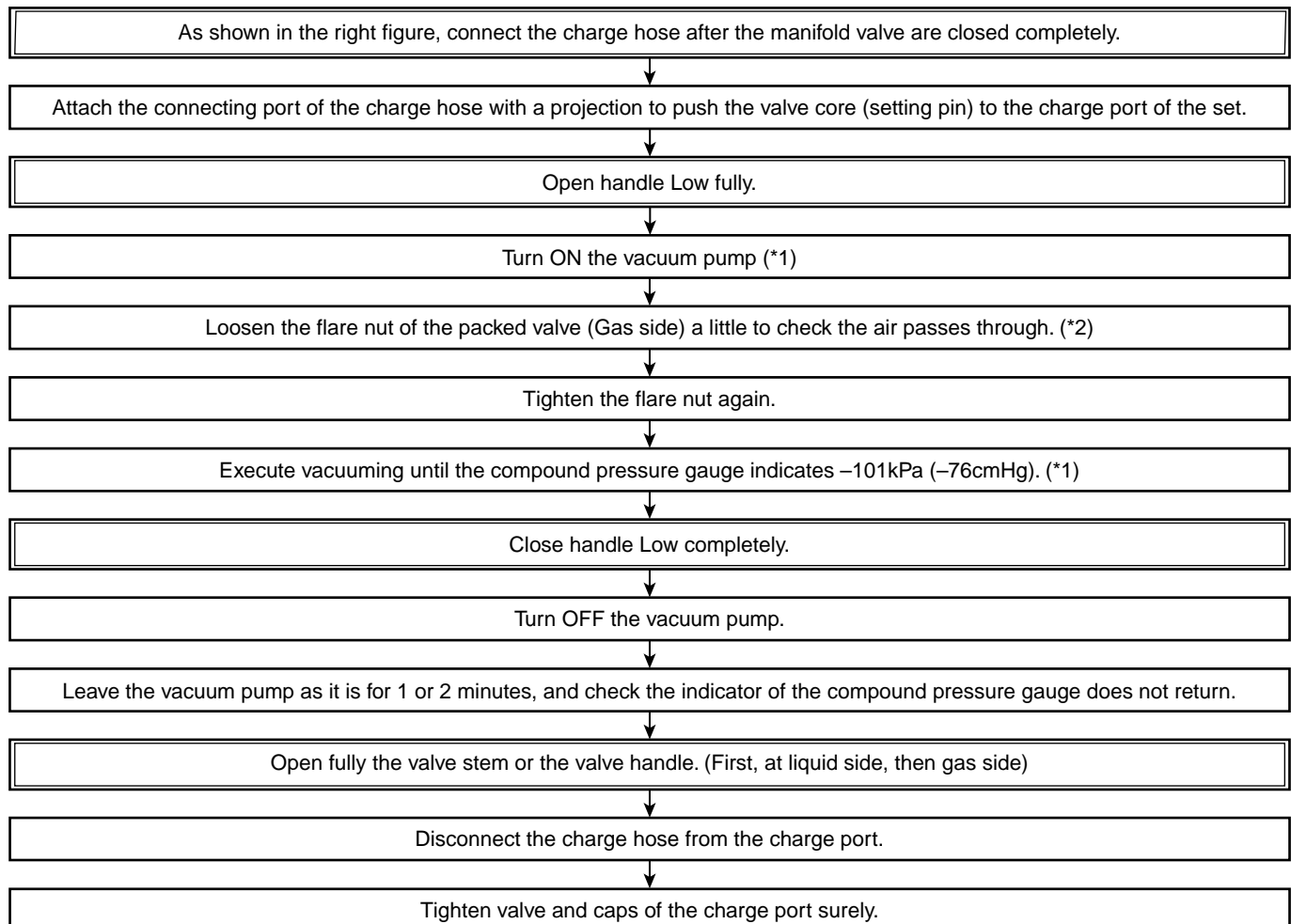
Capacity rank	Max. connecting pipe length (m)	Height difference (m)		Hexagonal wrench size
		Outdoor unit at upper side	Outdoor unit at lower side	
SM560 type	30	30	15	4mm
SM800 type	50	30	15	

With respect to the preservation of terrestrial environment, adopt "Vacuum pump" for air purge (Evacuate air in the connecting pipes) when installing the unit.

- Do not discharge the refrigerant gas to the atmosphere to preserve the terrestrial environment.
- Use a vacuum pump to discharge the air (nitrogen, etc.) remained in the set. If the air remains, the capacity may decrease.

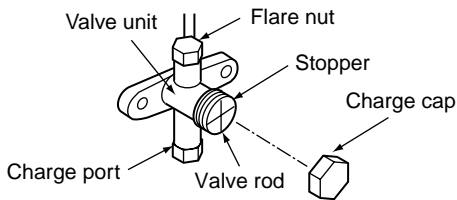
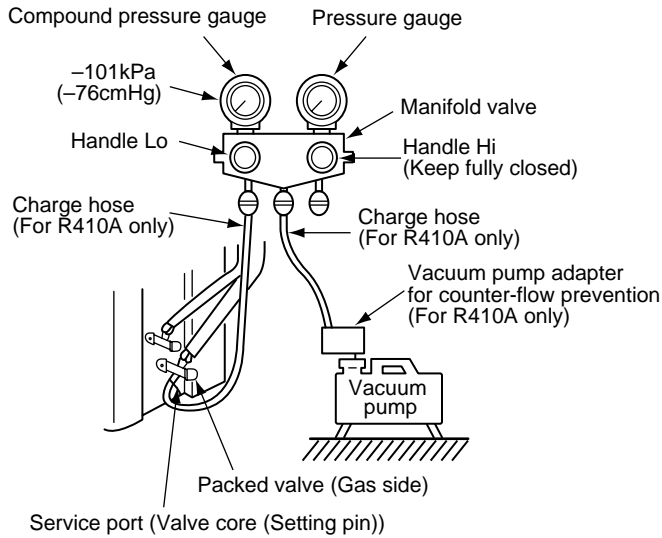
For the vacuum pump, be sure to use one with backflow preventer so that the oil in the pump does not backflow into the pipe of the air conditioner when the pump stops. (If oil in the vacuum pump is put in an air conditioner including R410A, it may cause trouble on the refrigeration cycle.)

## Vacuum pump

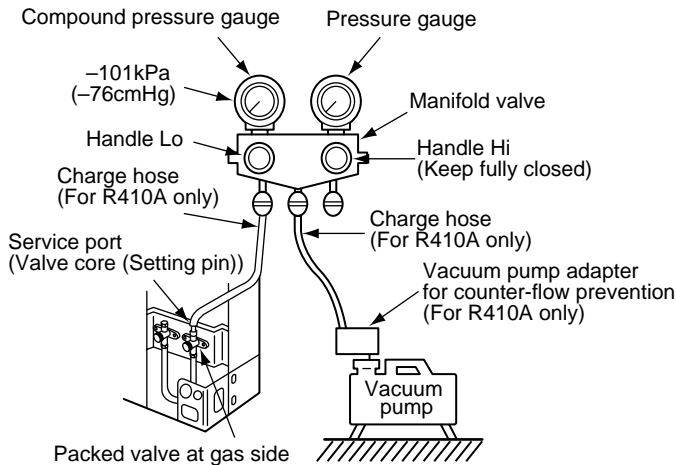


# 5 EVACUATING

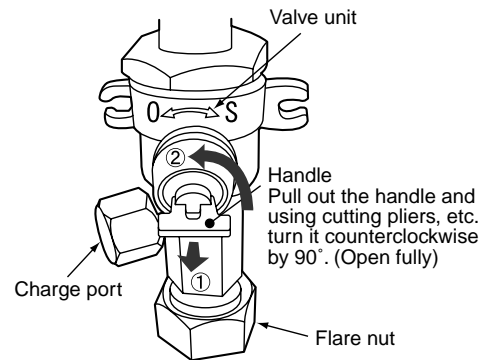
## <SM560AT-E>



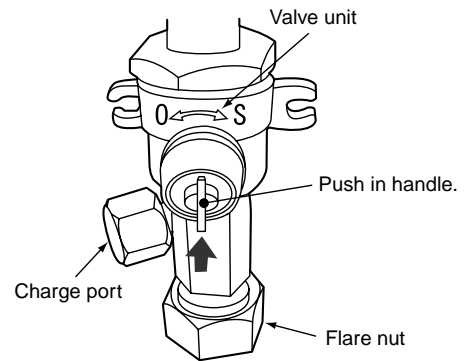
## <SM800AT-E>



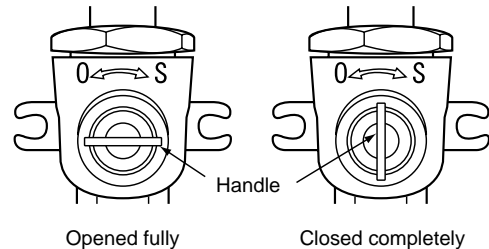
**OPEN**



**CLOSE**



**Handle position**



- \*1. Use the vacuum pump, vacuum pump adapters, and gauge manifold referring to the manuals attached to each tool before using them. For the vacuum pump, check oil is filled up to the specified line of the oil gauge.
- \*2. While the air is purged, check again that the connecting port of charge hose, which has a projection to push the valve core, is firmly connected to the charge port.

### Valve handling precautions

- Open the valve stem or the handle until it strikes the stopper. It is unnecessary to apply further force.
- Securely tighten the cap with a torque wrench.
- Cap tightening torque

Valve size	Ø6.4	14 to 18N•m (1.4 to 1.8kgf•m)
	Ø9.5	33 to 42N•m (3.3 to 4.2kgf•m)
	Ø12.7	33 to 42N•m (3.3 to 4.2kgf•m)
	Ø15.9	20 to 25N•m (2.0 to 2.5kgf•m)
Charge port		14 to 18N•m (1.4 to 1.8kgf•m)

# 6 ELECTRICAL WORK

For the air conditioner that has no power cable, connect a power cable as mentioned below.

Model	RAV-	SM560AT-E	SM800AT-E
Power supply	220 – 240 V Single phase 50 Hz		
Maximum running current	12A	15A	
Installation fuse rating	25 A (D type $\ominus$ $\equiv$ $\rightarrow$ )		
Power cable	H07 RN-F or 245 IEC 66 (2.5 mm <sup>2</sup> or more)		

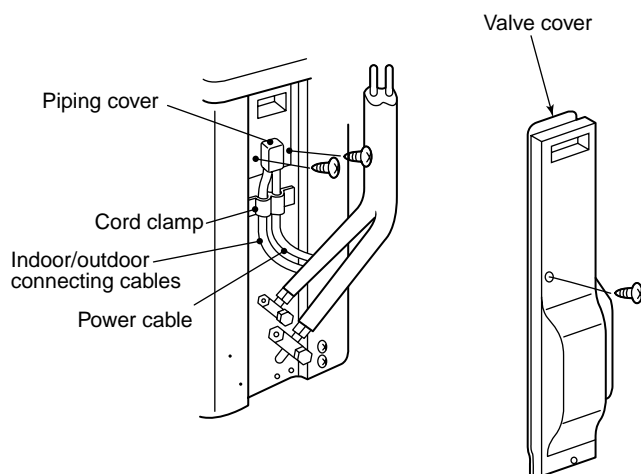
## CAUTION

- Wrong wiring may cause a burn-out to some electrical parts.
- Be sure to use the cord clamps attached to the product.
- Do not damage or scratch the conductive core and inner insulator of power and inter-connecting cables when peeling them.
- Be sure to comply with local regulations of the cable from outdoor unit to indoor unit. (wire size and cabling method etc.)
- Use the power and Inter-connecting cables with specified thickness, specified type and protective devices required.

### <SM560AT-E>

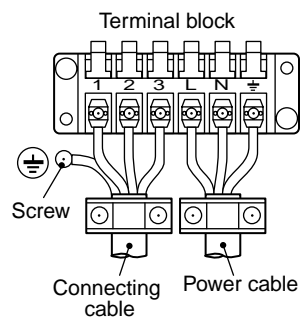
#### How to remove the valve cover

1. Remove screws of the valve cover.
2. Pull the valve cover downward to remove it.

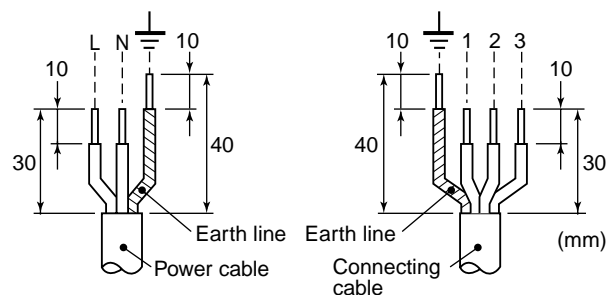


#### How to wire

1. Connect the connecting cable to the terminal as identified with their respective numbers on the terminal block of indoor and outdoor unit. H07 RN-F or 245 IEC 66 (1.0 mm<sup>2</sup> or more)
2. When connecting the connecting cable to the outdoor unit terminal, prevent water coming in the outdoor unit.
3. Insulate the unsheathed cords (conductors) with electrical insulation tape. Process them so that they do not touch any electrical or metal parts.
4. For inter connecting cable, do not use a wire jointed to another on the way.  
Use wires long enough to cover the entire length.



#### Stripping length power cord and connecting cable



## CAUTION

- The installation fuse (25A D type  $\ominus$   $\equiv$   $\rightarrow$ ) must be used for the power supply line of this air conditioner.
- Incorrect/incomplete wiring might cause an electrical fire or smoke.
- Prepare the exclusive power supply for the air conditioner.
- This product can be connected to the mains.  
Connection to the fixed wiring :  
A switch which disconnects all poles and has a contact separation of at least 3 mm must be incorporated in the fixed wiring.

# 7 FINAL INSTALLATION CHECKS

## Check and Test Operation

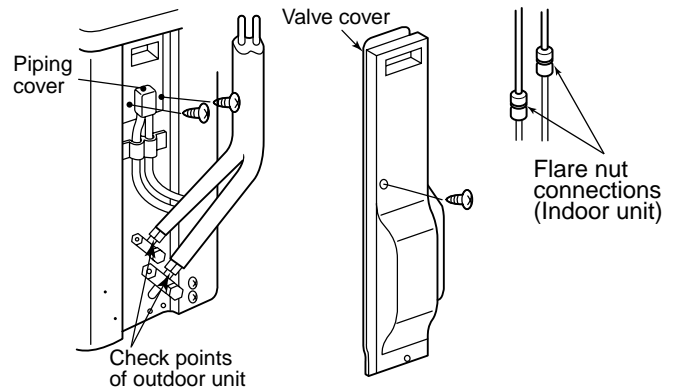
For R410A, use the leak detector exclusively manufactured for HFC refrigerant (R410A, R134a, etc.).

- \* The conventional leak detector for HCFC refrigerant (R22, etc.) cannot be used because its sensitivity for HFC refrigerant lowers to approx. 1/40.
- Pressure of R410A is approx. 1.6 times higher than that of R22.

If installation work is incompletely finished, a gas leakage may occur when pressure rises during operation.

Therefore, be sure to test the piping connections for leakage.

- Check gas leakage at the flare nut connections, valve stem cap connections and service port cap fittings with a leak detector or soap water.



## Useful Functions (SM800AT-E only)

## Self-Diagnosis by LED Indication

In addition to the code checking by remote controller of the indoor unit, troubles of the outdoor unit can be diagnosed by LED indications on the cycle control P.C. board of the outdoor unit. Utilize them for various checks. For the check by remote controller of the indoor unit, refer to the Installation Manual of the indoor unit. Before a check, confirm each bit of the DIP switch is set to OFF position.

### LED indication and code checking

DIP switch SW800	Cycle control P.C. board				Cause
	LED indication				
	D800	D801	D802	D803	
	○	●	●	●	Heat exchanger sensor (TE) error
	●	●	○	●	Suction sensor (TS) error
	○	○	●	●	Discharge sensor (TD) error
	●	○	●	○	High-pressure protection error
	●	○	●	●	Outdoor temperature sensor (TO) error
	○	○	○	●	DC outside fan error
	○	●	●	○	Communication error between IPDU
	●	○	○	●	Discharge temp. error
	○	○	●	○	EEPROM error
	●	●	○	○	Communication error between IPDU
	⊙	●	●	●	G-Tr short-circuit protection
	●	⊙	●	●	Detect circuit error
	⊙	⊙	●	●	Current sensor error
	●	●	⊙	●	Comp. lock error
	⊙	●	⊙	●	Comp. break down
	●	●	●	⊙	Phase missing detection, Detection of coming-off of CT current sensor
●	○	●	○	Serial communication error by thermo. operation of Comp. case	

**LED indication**

D800 : Red  
○ : Red

D801 : Yellow  
○ : Yellow

D802 : Yellow  
○ : Yellow

D803 : Yellow  
○ : Yellow

⊙ : Rapid flash

● : Go off

○ : Go on









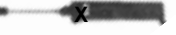
## Installation/Service Tools

## Changes in the product and components

In the case of an air conditioner using R410A, in order to prevent any other refrigerant from being charged accidentally, service port diameter of the outdoor unit control valve (3 way valve) has been changed. (1/2 UNF 20 threads per inch)

- In order to increase the pressure resisting strength of the refrigerant piping flare processing diameter and size of opposite side of flare nuts has been changed. (for copper pipes with nominal dimensions 1/2 and 5/8)

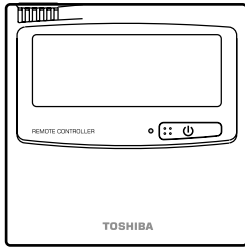
### New tools for R410A

New tools for R410A	Applicable to R22 model		Changes
Gauge manifold	×		As pressure is high, it is impossible to measure by means of conventional gauge. In order to prevent any other refrigerant from being charged, each port diameter is changed.
Charge hose	×		In order to increase pressure resisting strength, hose materials and port size are changed (to 1/2 UNF 20 threads per inch). When purchasing a charge hose, be sure to check the port size.
Electronic balance for refrigerant charging	○		As pressure is high and gasification speed is fast, it is difficult to read the indicated value by means of charging cylinder, as air bubbles occur.
Torque wrench (nominal diam. 1/2, 5/8)	×		The size of opposite sides of flare nuts have been increased. Incidentally, a common wrench is used for nominal diameters 1/4 and 3/8.
Flare tool (clutch type)	○		By increasing the clamp bar's receiving hole, strength of spring in the tool has been improved.
Gauge for projection adjustment	—	—	Used when flare is made with using conventional flare tool.
Vacuum pump adapter	○		Connected to the conventional vacuum pump. It is necessary to use an adapter to prevent vacuum pump oil from flowing back to the charge hose. The charge hose connecting part has two ports-one for conventional refrigerant (7/16 UNF 20 threads per inch) and one for R410A. If the vacuum pump oil (mineral) mixes with R410A a sludge may occur and damage the equipment.
Gas leakage detector	×		Exclusive for HFC refrigerant.

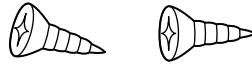
- Incidentally, the "refrigerant cylinder" comes with the refrigerant designation (R410A) and protector coating in the U.S.'s ARI specified rose color (ARI color code: PMS 507).
- Also, the "charge port and packing for refrigerant cylinder" require 1/2 UNF 20 threads per inch corresponding to the charge hose's port size.

## ACCESSORIES

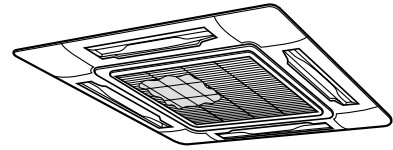
### Remote controller



### Screws (two pcs.)



### Standard 4-way cassette panel optional parts



## PRECAUTIONS FOR SAFETY

### WARNING


#### WARNINGS ABOUT INSTALLATION

- Make sure to ask the qualified installation professional in electric work to install the air conditioner.  
If the air conditioner is inappropriately installed by yourself, it may cause water leak, electric shock, fire, and so on.
- Ground the air conditioner without fail.  
Do not connect the ground wire to gas pipe, water pipe, lightning rod or ground wire of telephone. If the air conditioner is imperfectly grounded, it may cause electric shock.

### CAUTION

#### TO DISCONNECT THE APPLIANCE FROM THE MAINS SUPPLY

This appliance must be connected to the mains by means of a switch with a contact separation of at least 3 mm.

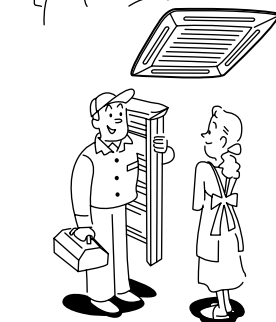
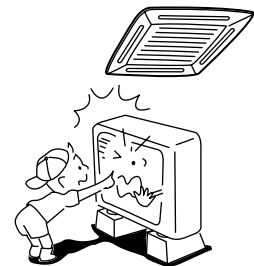
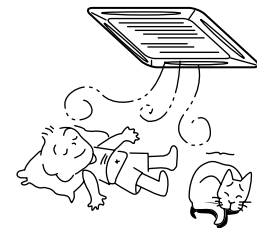
**The installation fuse (25A D type  ) must be used for the power supply line of this conditioner.**

#### WARNINGS ABOUT OPERATION

- Avoid cooling the room too strong or exposing the human body to cool breeze for a long time as it is bad for the health.
- When you notice something abnormal with the air conditioner (smells like something scorching, poor cooling, etc.), immediately turn off the main switch, the circuit breaker, from the mains to stop the air conditioner, and contact the dealer.  
If the air conditioner is continuously operated with something abnormal, it may cause machine failure, electric shock, fire, and so on.

#### WARNINGS ABOUT MOVEMENT AND REPAIR

- Do not move or repair any unit by yourself.  
Since there is high voltage inside the unit, you may get electric shock when removing the cover and main unit.
- Whenever the air conditioner needs repair, make sure to ask the dealer to do it.  
If it is repaired imperfectly, it may cause electric shock or fire.
- When moving the air conditioner for re-installing at another place, ask the dealer to do it. If it is imperfectly installed, it may cause electric shock or fire.



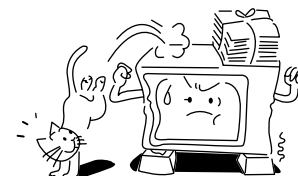
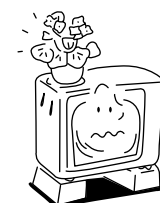
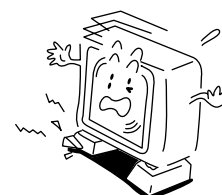
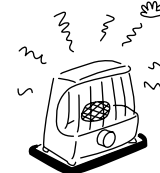
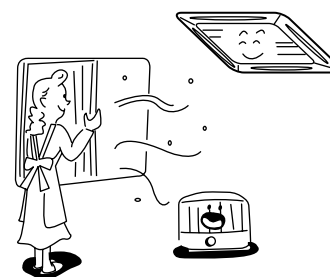
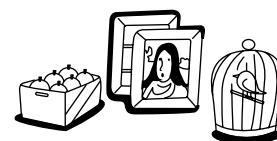
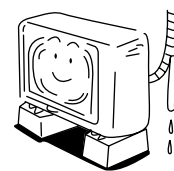
## CAUTION

### CAUTIONS ABOUT INSTALLATION

- Certainly lay the drain hose for perfect draining. Bad drainage may cause flooding in the house and getting furniture wet.
- Make sure to connect the air conditioner to an exclusive AC outlet of the rated voltage, otherwise the unit may break down or cause a fire.
- Do not install the unit in a place where inflammable gas may leak. If inflammable gas accumulates around the unit, it may cause a fire.

### CAUTIONS ABOUT OPERATION

- Carefully read this manual before starting the air conditioner. There are many important things to keep in mind for daily operation.
- Do not use this air conditioner for special purpose such as preserving food, precision instruments, art objects, breeding animals, growing potted plants, etc.
- Avoid exposing potted plants and animals to the wind of the air conditioner, since it badly affects the health and growth of them.
- When the air conditioner is operated with a combustion appliance in the same place, be careful of ventilation to let fresh air enter the room. Poor ventilation causes oxygen shortage.
- When the air conditioner is used in a closed room, be careful of sufficient ventilation of the room. Poor ventilation causes oxygen shortage.
- Do not touch any switches with wet finger, otherwise you may get an electric shock.
- Do not place any combustion appliance in a place where it is directly exposed to the wind of air conditioner, otherwise it may cause imperfect combustion.
- If the air conditioner won't be used for a considerably long time, turn off the main switch or the circuit breaker, for safety. Disconnect from the power supply prevents the unit from lightning and power supply surge.
- Check the concrete blocks, etc. of the base of the outdoor unit occasionally. If the base is left damaged or deteriorated, the unit may topple over and inflict an injury to a person as the worst case.
- When cleaning the unit, make sure to turn off the main switch or the circuit breaker beforehand for preventing you from getting injured by the electric fan running inside. For details of cleaning method, refer to "Maintenance" on page 10.
- Do not put anything on the outdoor unit nor step onto it. If you do so, it may not only topple over the unit but also injure yourself.
- To make the air conditioner operate in its original performance, operate it within the range of the operating temperature specified in the instructions. Otherwise it may cause a malfunction, or water leak from the unit.
- Prevent any liquid from falling into the remote controller. Do not spill juice, water or any kind of liquid.



# PARTS NAME

## Indoor unit

### Button

Button to open/close the suction port

### Earth screw

Provided in the electric parts box

### Air filter

Removes dust or trash.  
(Provided on the suction port.)

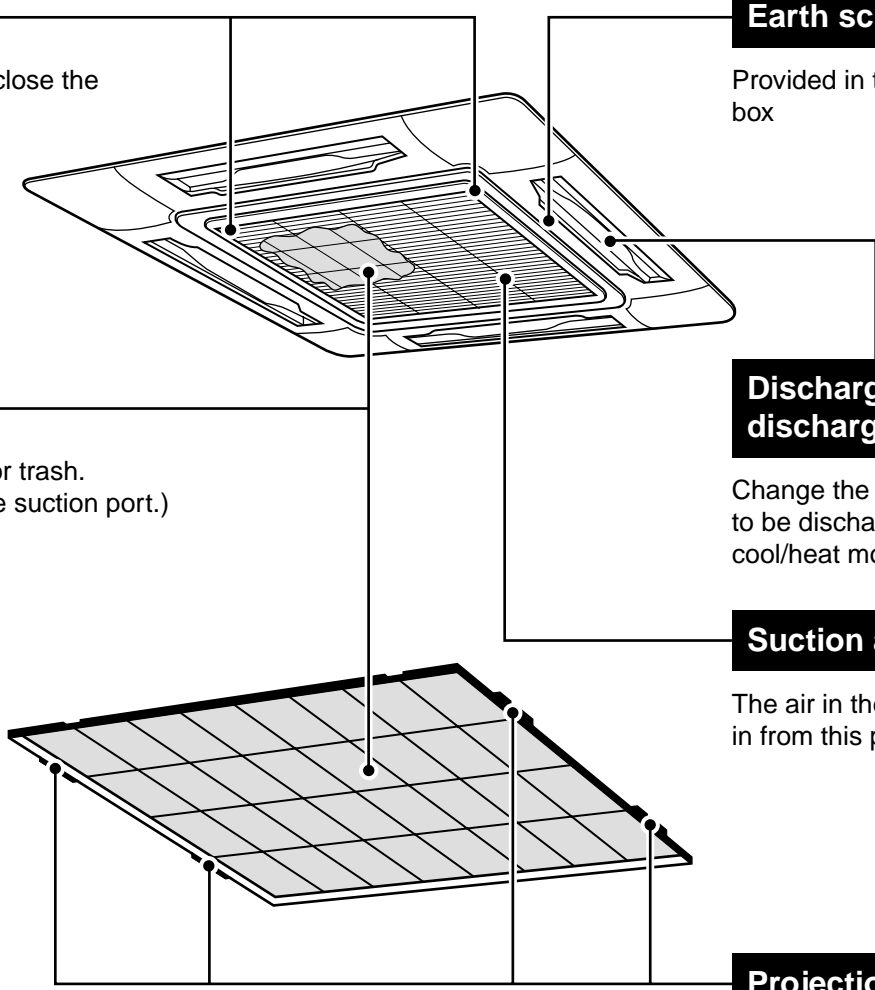
### Discharge flap of discharge port

Change the direction of the air to be discharged according to cool/heat mode.

### Suction air port

The air in the room is sucked in from this port.

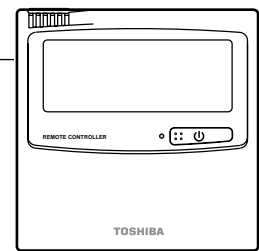
### Projection of air filter



## Outdoor unit

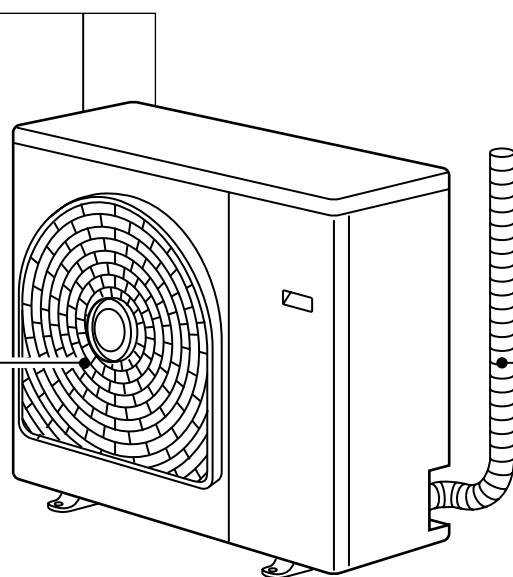
### Air inlet (Side and rear)

### Remote controller



### Air outlet

### Pipes and electric wires



RAV-SM560UT-E  
RAV-SM800UT-E

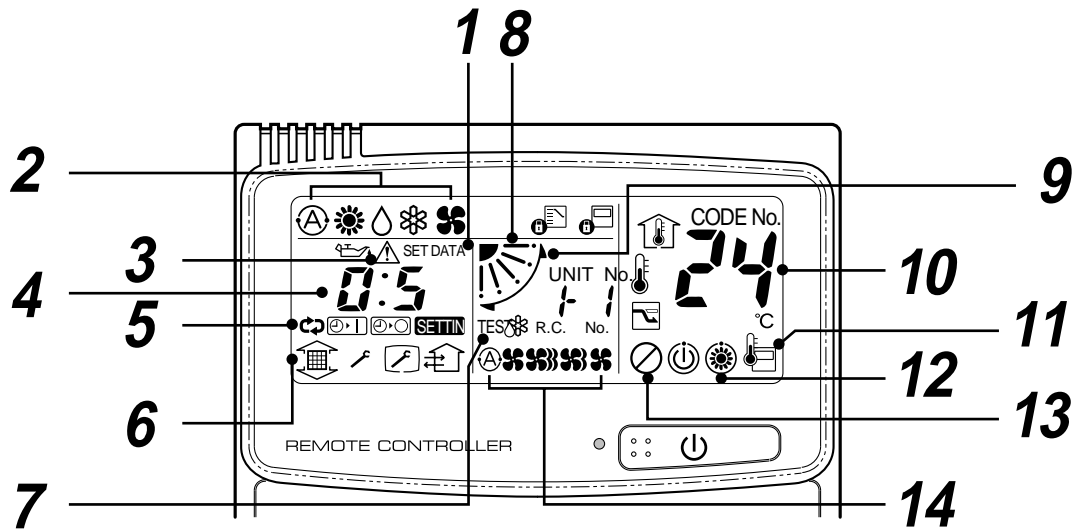
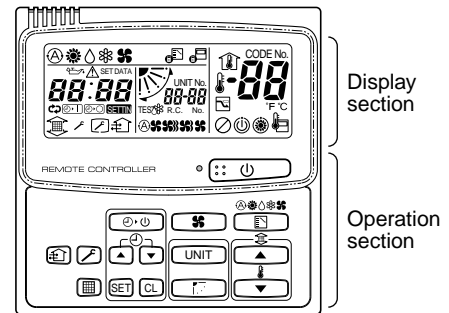
# PARTS NAME OF REMOTE CONTROLLER

## Display section

In the display example, all indicators are displayed for the explanation.

In reality only, the selected contents are indicated.

- When turning on the leak breaker at the first time, [SET DATA] flashes on the display part of the remote controller. While this display is flashing, the model is being automatically confirmed. Accordingly, wait for a while after [SET DATA] display has disappeared, and then use the remote controller.



### 1 SET DATA display

Displayed during setup of the timer.

### 2 Operation mode select display

The selected operation mode is displayed.

### 3 CHECK display

Displayed while the protective device works or a trouble occurs.

### 4 Timer time display

Time of the timer is displayed.  
(When a trouble occurs, the check code is displayed.)

### 5 Timer SETIN setup display

When pushing the Timer SETIN button, the display of the timer is selected in order of [OFF]

☺ → ♻ [OFF] repeat OFF timer → [ON]

☺ → No display.

### 6 Filter display

If "FILTER  is displayed, clean the air filter.

### 7 TEST run display

Displayed during a test run.

### 8 Flap position display

Displays flap position.

### 9 SWING display

Displayed during up/down movement of the flap.

### 10 Set up temperature display

The selected set up temp. is displayed.

### 11 Remote controller sensor display

Displayed while the sensor of the remote controller is used.

### 12 PRE-HEAT display





Displayed when the heating operation starts or defrost operation is carried out. While this indication is displayed, the indoor fan stops or the mode enters in LOW.

### 13 No function display

Displayed if there is no function even if the button is pushed.

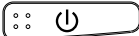
### 14 Air volume select display

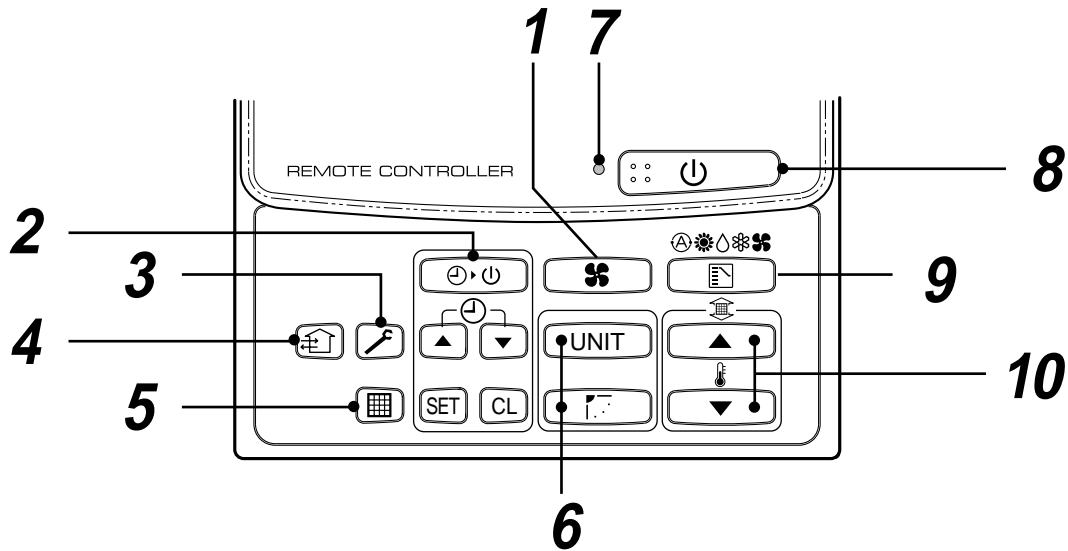
The selected air volume mode is displayed.

- (AUTO) 
- (HIGH) 
- (MED.) 
- (LOW) 

## Operation section

Push each button to select a desired operation.

- The details of the operation needs to be set up once, afterward, the air conditioner can be used by pushing  button only.



### 1 Air volume select button

Selects the desired air volume mode.

### 2 Timer set button

TIMER SET button is used when the timer is set up.

### 3 Check button

The CHECK button is used for the check operation. During normal operation, do not use this button.

### 4 Fan button


FAN button is used when a fan which is sold on the market or etc. is connected.

- If "No function" is displayed on the remote controller when pushing the FAN button, a fan is not connected.

### 5 Filter reset button

Resets (Erases) "FILTER  display.

### 6 UNIT and AUTO flap button

 (No function)



### 7 Operation lamp

Lamp is lit during the operation. Lamp is off when stopped.

Although it flashes when operating the protection device or abnormal time.

### 8 button

When the button is pushed, the operation starts, and it stops by pushing the button again.

When the operation has stopped, the operation lamp and all the displays disappear.

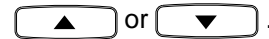
### 9 Operation select button

Selects desired operation mode.

### 10 Set up temperature button

Adjusts the room temperature.

Set the desired set temperature by pushing




### OPTION :

#### Remote controller sensor

Usually the TEMP. sensor of the indoor unit senses the temperature. The temperature on the surrounding of the remote controller can also be sensed.

For details, contact the dealer from which you have purchased the air conditioner.

# CORRECT USAGE


When you use the air conditioner for the first time or when you change the SET DATA value, follow the procedure below. From the next time, the operation displayed on the remote controller will start by pushing the  button only.

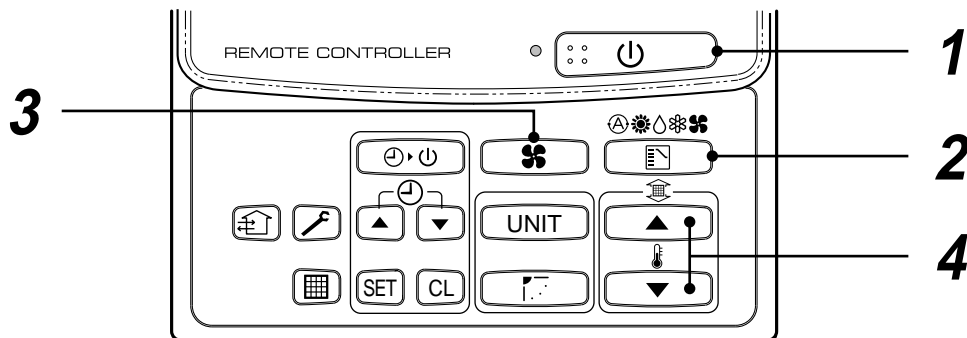
## Preparation

**Turn on the main power switch and/or the leakage breaker.**

- When the power supply is turned on, a partition line is displayed on the display part of the remote controller.
- \* After the power supply is turned on, the remote controller does not accept an operation for approx. 1 minute, but it is not a failure.

### REQUIREMENT

- While using the air conditioner, operate it only with  button without turning off the main power switch and the leak breaker.

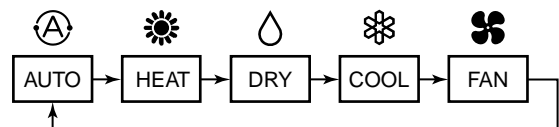




### 1 Push button.

The operation lamp goes on, and the operation starts.

### 2 Select an operation mode with the “MODE” button.

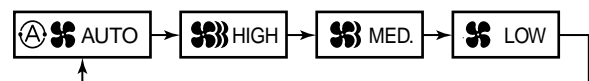
One push of the button, and the display changes in the order shown on the right.









- In HEAT  mode, if the room temperature reaches to the set temperature, the outdoor unit stops and the air flow becomes LOW and the air volume decreases.
- In the defrost mode, the fan stops so that cool air is not discharged and PRE-DEF  is displayed.

### 3 Select air volume with “FAN ” button.


One push of the button, and the display changes in the order shown on the right.



- When air volume is “AUTO ”, air volume differs according to the room temperature.
- In DRY  mode, “AUTO ” is displayed and the air volume is LOW.
- In heating operation, if the room temperature is not heated sufficiently with VOLUME “LOW ” operation, select “MED. ” or “HIGH ” operation.


### 4 Determine the set up temperature by pushing the “TEMP. ” or “TEMP. ” button.

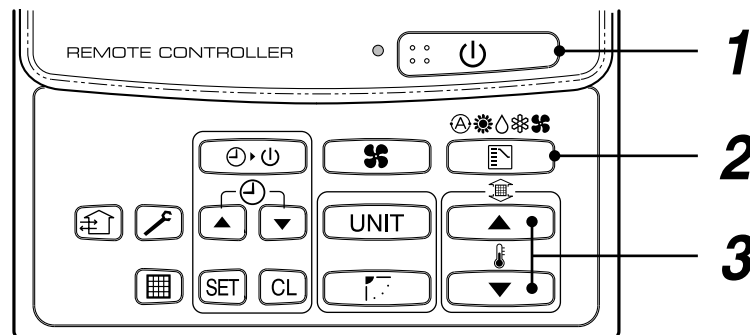
## Stop

Push  button.

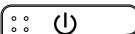
The operation lamp goes off, and the operation stops.

## AUTOMATIC OPERATION (Auto Changeover)

When you set the air conditioner in  mode or switch over from AUTO operation because of some settings change, it will automatically select either cooling, heating, or fan only operation depending on the indoor temperature.



## Start

**1**  button

Push this button to start the air conditioner.

**2** Mode select button (MODE)

Select Auto.

**3** Temperature button

Set the desired temperature.

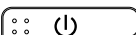
- In case of cooling, start the operation after approx. 1 minute.
- In case of heating, the operation mode is selected in accordance with the room temperature and operation starts after approximately 3 to 5 minutes.
- When you select the Auto mode, it is unnecessary to set the fan speed. The FAN speed display will show AUTO and the fan speed will be automatically controlled.
- After the heating operation has stopped, FAN operation may continue for approx. 30 seconds.
- When the room temperature reaches the set temperature and the outdoor unit stops, the super low wind is discharged and the air volume decreases excessively. During defrost operation, the fan stops so that cool air is not discharged and "HEAT READY" is displayed.
- If the Auto mode is uncomfortable, you can select the desired conditions manually.

### NOTE

#### When restarting the operation after stop

- When restarting the operation immediately after stop, the air conditioner does not operate for approx. 3 minutes to protect the machine.


## Stop

Push  button.

Push this button again to stop the air conditioner.



# ADJUSTMENT OF WIND DIRECTIONd

- When the air conditioner stops, the flap (adjustment plate of up/down wind direction) directs downward automatically.
- When the heating operation is in READY states, the flap (adjustment plate of up/down wind direction) directs upward. The swinging starts after HEAT READY status cleared, SWING  is displayed on the remote controller even if the heating operation is in READY status.

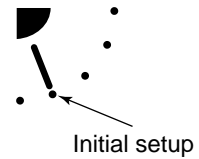
## How to set up the wind direction

**1** Push  during operation.

The wind direction changes for every push of the button.

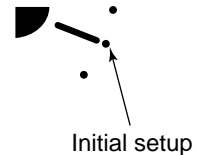
### In HEAT operation

Direct the flap (adjustment plate of up/down wind direction) downward. If directing at upward, hot air may not come to the foot.






### In COOL/DRY operation

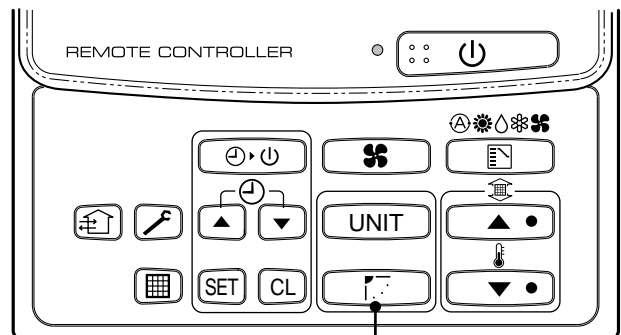
Direct the flap (adjustment plate of up/down wind direction) upward. If directing it downward, the dew may form on the surface of the air discharge port and may drop down.



## How to start swinging


**1** Push , set the flap (adjustment plate of up/down wind direction) direction to the lowest position, and then push  again.

SWING  is displayed and the up/down wind direction is automatically selected.

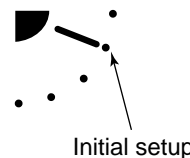


## How to stop swinging

**1** Push SWING/WIND again while the flap is swinging.

- The flap stops at a position when you push. After then, if pushing , the wind direction descends from the highest position.
- In COOL/DRY operation, the flap does not stop as it directs downward. If stopping the flap as it directs downward during swing operation, it stops after moving to the 3<sup>rd</sup> position from the highest position.

### In FAN operation



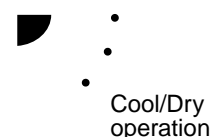
### In all modes



### Display when stopping the swing



Fan/Heat operation



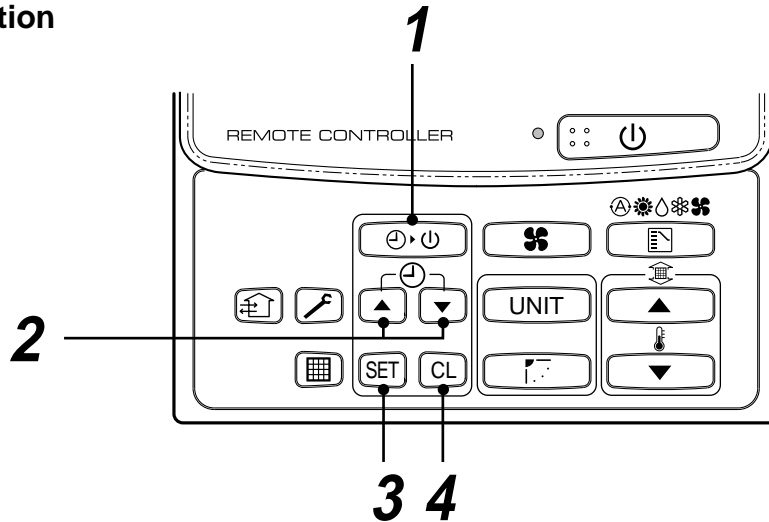
Cool/Dry operation

# TIMER OPERATION


A type of timer operation can be selected from the following three types.

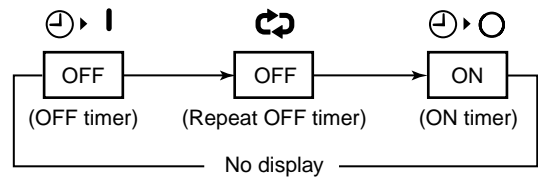
- OFF timer : The operation stops when the time of timer has reached the set time.
- Repeat OFF timer : Every time, the operation stops after the set time has passed.
- ON timer : The operation starts when the time of timer has reached the set time.

## Timer operation




### 1 Push TIMER SET button.


- The timer display (type) changes for every push of the button.
- SET DATA and  display flashes.



### 2 Push to select "SET TIME".


For every push of  button, the set time increases in the unit of 0.5 hr (30 minutes).

The maximum set time is 72.0 hr.

For every push of  button, the set time decreases in the unit of 0.5 hr (30 minutes).

The minimum set time is 0.5 hr.

### 3 Push SET button.

- SET DATA display disappears and  display goes on.


(When ON timer is activated, time is displayed, and after time of the timer has been up, displays other than ON disappear.)

## Cancel of timer operation

### 4 Push CL button.

- TIMER display disappears.

## NOTICE

- When the operation stops after the timer reached the preset time, the Repeat OFF timer resumes the operation by pushing  button and stops the operation after the time of the timer has reached the set time.

## HINTS FOR ECONOMICAL OPERATION

### Maintain room temperature at comfortable level

#### Clean air filters

The clogged air filter impairs the performance of the air conditioner.

Clean them every 2 weeks.

#### Never open doors and windows more often than necessary

To keep cool or warm air in the room, never open doors and windows more often than necessary.

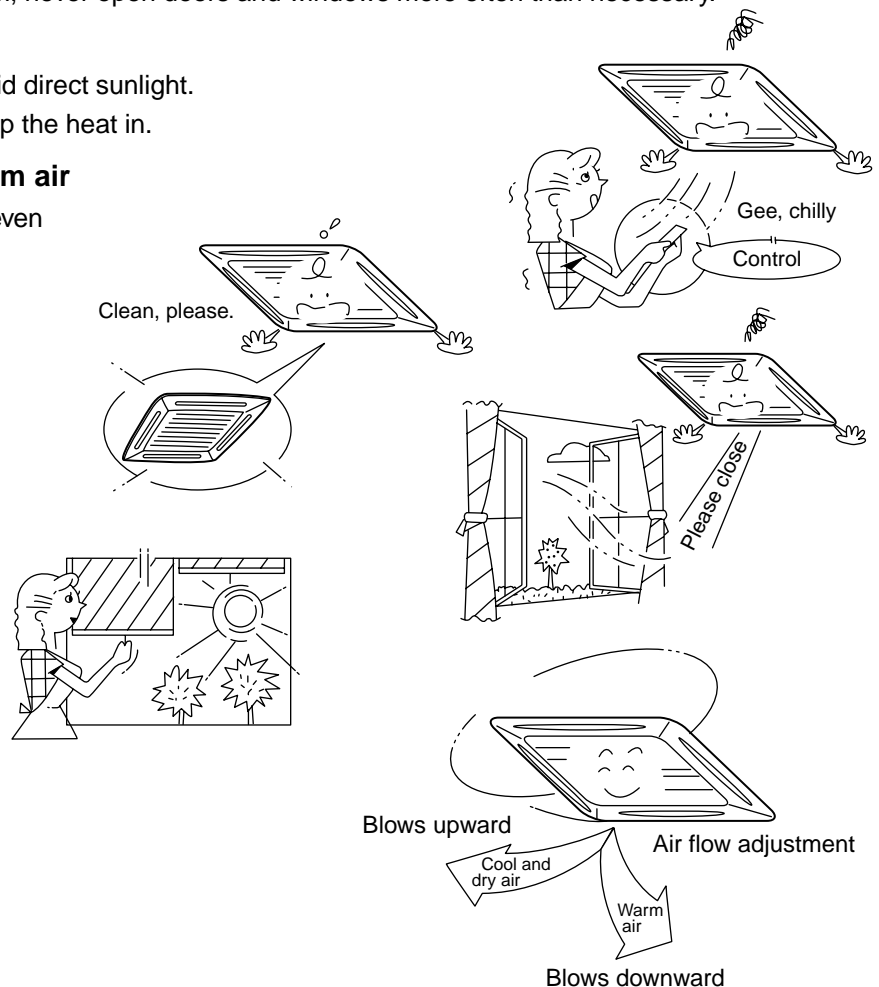
#### Window curtains

In cooling, close the curtains to avoid direct sunlight.

In heating, close the curtains to keep the heat in.

#### Get uniform circulation of room air

Adjust the air flow direction for the even circulation of room air.

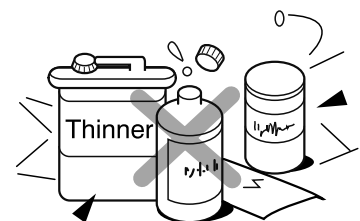


## MAINTENANCE

### Cleaning of remote controller

#### CAUTION

- Use a dry cloth to wipe the remote controller.
- A cloth dampened with cold water may be used on the indoor unit if it is very dirty.
- Never use a damp cloth on the remote controller.
- Do not use a chemically-treated duster for wiping or leave such materials on the unit for long. It may damage or fade the surface of the unit.
- Do not use benzine, thinner, polishing powder, or similar solvents for cleaning. These may cause the plastic surface to crack or deform.



## If you do not plan to use the unit for more than 1 month

- (1) Operate the fan for 3 to 4 hours to dry inside the unit
  - Operate "FAN ONLY" mode with set temperature 30°C.
- (2) Stop the air conditioner and turn off the main power switch or the circuit breaker.



## Checks before operation

- (1) Check that the air filters are installed.
- (2) Check that the air outlet or inlet is not blocked.
- (3) Turn on the main power switch or the circuit breaker for the mains AC outlet to turn on the air conditioner.


**FAN ONLY operation or thermo.-off operation**

## WARNING

Make sure to ask the qualified maintenance professional for cleaning.  
Turn off the main power supply switch or breaker before the unit maintenance.

**Before maintenance, be sure to turn off the leakage breaker.**

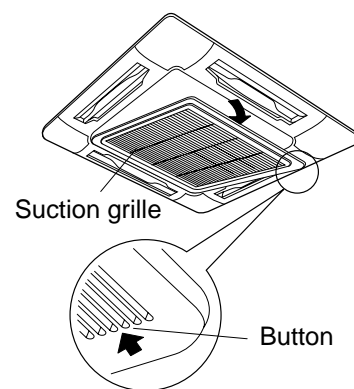
## Cleaning of air filter

- If  is displayed on the remote controller, maintain the air filter.
- Clogging of the air filter reduce cooling/heating performance.

## Cleaning of panel and air filter

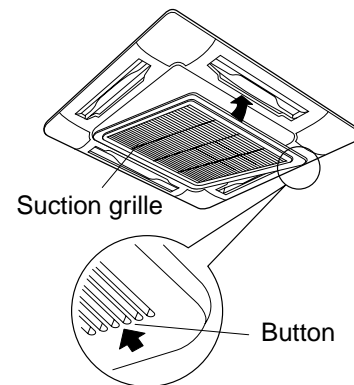
### Preparation :

1. Turn off the air conditioner by the remote controller.
2. Open the suction air port.
  - Slide the button of the suction air port inward, and open the suction port slowly while holding it.




### Clean the panel and air filter with water:

- Wipe down the panel and air filter with a sponge or towel moistened with a kitchen detergent. (Do not use any metallic brush for cleaning.)
- **Carefully rinse the panel and air filter to wash out the detergent.**
- **After rinsing the panel and air filter with water, dry it in the shade.**



3. Close the suction air port.
  - Close the suction air port, slide the button outward, and fix the suction port securely.

## CAUTION

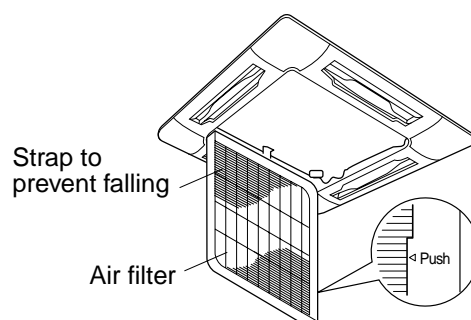
- Do not start the air conditioner while leaving the panel and air filter removed.
- Push the filter reset button.  indication will be turn off.)

## Cleaning of Air Filters

- Recommended cleaning intervals: Every two weeks.
- If the air filters are not cleaned, it not only reduce the cooling a performance of air conditioner but causes a failure in the air conditioner such as water falling in drops.

### Preparation :

1. Stop the operation by remote controller.
2. Dismount the air filter.



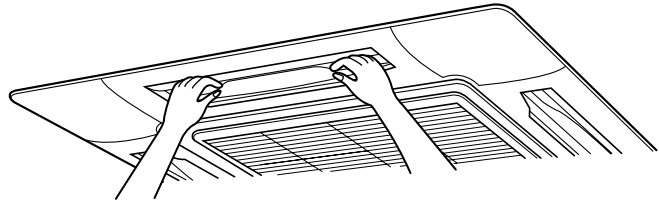
**Use a vacuum cleaner to remove dust from the filters or wash them with water.**

- After rinsing the air filters with water, dry them in the shade.
- Set the air filter into the air conditioner.

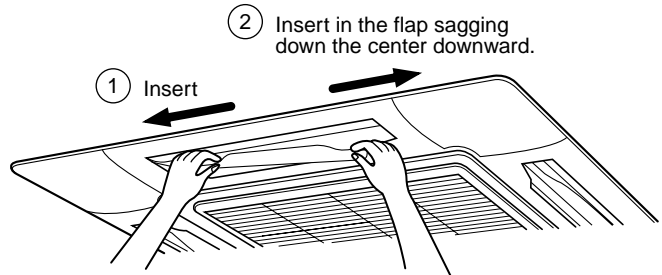
**Cleaning of discharge flap**

The discharge flap can be removed to clean.

1. Remove the discharge flap.
  - Holding the both ends of the discharge flap, remove the flap sagging the center downward.



2. Cleaning with water
  - If the dirt is terrible, clean the flap by tepid water with neutral detergent or water.



3. Mount the discharge flap.
  - First push in one side of the flap, and then insert the other side sagging the center downward.

**Be careful to the direction of the flap when mounting.**

Mount the flap so that the side with the mark faces upward and the arrow direction of the mark directs.

**NOTE**

For Air conditioning system which is operated regularly, cleaning and maintenance of the indoor/outdoor units are strongly recommended. As a general rule, if an indoor unit is operated for about 8 hours daily, the indoor/outdoor units will need to be cleaned at least once every 3-MONTH. This cleaning and maintenance shall be carried out by a qualified person. Failure to clean the indoor/outdoor units regularly will result in poor performance, icing, water leaking and even compressor failure.

# AIR CONDITIONER OPERATIONS AND PERFORMANCE

## 3 minutes protection function

3-minutes protection function prevents the air conditioner from starting for initial 3 minutes after the main power switch/circuit breaker is turned on for re-starting the air conditioner.

## Power failure

Power failure during operation will stop the unit completely.

- To restart the operation, push the START/STOP button on the remote controller.
- Lightning or a wireless car telephone operating nearby may cause the unit to malfunction. Turn off the main power switch or circuit breaker and then turn them on again. Push the START/STOP button on the remote controller to restart.

## Heating characteristics

### Preheating operation

The air conditioner will not deliver warm air immediately after it is turned on. Warm air will start to flow out after approximately 5 minutes when the indoor heat exchanger warmed up.

### Warm air control (In heating operation)

When the room temperature reaches the set temperature, the fan speed is automatically reduced to prevent to blow cold draft. At this time, the outdoor unit will stop.

## Defrosting operation

If the outdoor unit is frosted during the heating operation, defrosting starts automatically (for approximately 2 to 10 minutes) to maintain the heating capacity.

- The fans in both indoor and outdoor units will stop during the defrosting operation.
- During the defrosting operation, the defrosted water will be drained from the bottom plate of the outdoor unit.

## Heating capacity

In the heating operation, the heat is absorbed from the outside and brought into the room. This way of heating is called heat pump system. When the outside temperature is too low, it is recommended to use another heating apparatus in combination with the air conditioner.

## Attention to snowfall and freeze on the outdoor unit

- In snowy areas, the air inlet and air outlet of the outdoor unit are often covered with snow or frozen up. If snow or freeze on the outdoor unit is left as it is, it may cause machine failure or poor warming.
- In cold areas, pay attention to the drain hose so that it perfectly drains water without water remaining inside for freeze prevention. If water freezes in the drain hose or inside the outdoor unit, it may cause machine failure or poor warming.

## Air conditioner operating conditions

For proper performance, operate the air conditioner under the following temperature conditions:

Cooling operation	Outdoor temperature : -5°C to 43°C
	Room temperature : 21°C to 32°C (Dry valve temp.), 15°C to 24°C (Wet valve temp.)
	<b>CAUTION</b> Room relative humidity – less than 80 %. If the air conditioner operates in excess of this figure, the surface of the air conditioner may cause dewing.
Dry operation	Outdoor temperature : 15°C to 43°C (Maximum suction air temp. 46°C)
	Room temperature : 17°C to 32°C
Heating operation	Outdoor temperature : -15°C to 15°C (Wet valve temp.)
	Room temperature : 15°C to 28°C (Dry valve temp.)

If air conditioner is used outside of the above conditions, safety protection may work.

## RE-INSTALLATION

### DANGER

Ask the dealer or an installation professional to re-install the air conditioner to a new place or move it to another place and to observe the following items.

If the air conditioner is inappropriately installed by yourself, it may cause electric shock or fire.

### Do not install the air conditioner in the following places

- Do not install the air conditioner in any place within 1 m from a TV, stereo, or radio set. If the unit is installed in such place, noise transmitted from the air conditioner affects the operation of these appliances.
- Do not install the air conditioner near a high frequency appliance (sewing machine or massager for business use, etc.), otherwise the air conditioner may malfunction.
- Do not install the air conditioner in a humid or oily place, or in a place where steam, soot, or corrosive gas is generated.
- Do not install the air conditioner in a salty place such as seaside area.
- Do not install the air conditioner in a place where a great deal of machine oil is used.
- Do not install the air conditioner in a place where it is usually exposed to strong wind such as in seaside area or on the roof or upper floor of a building.
- Do not install the air conditioner in a place where sulfurous gas generated such as in a spa.
- Do not install the air conditioner in a vessel or mobile crane.

### Be careful with noise or vibrations

- Do not install the air conditioner in a place where noise by outdoor unit or hot air from its air outlet annoys your neighbors.
- Install the air conditioner on a solid and stable foundation so that it prevents transmission of resonating, operation noise and vibration.
- If one indoor unit is operating, some sound may be audible from other indoor units that are not operating.



## TROUBLES AND CAUSES

### CAUTION

If any of the following conditions occur, turn off the main power supply switch and immediately contact the dealer :

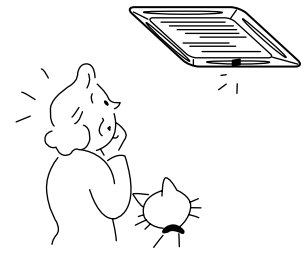
- The operation lamps flash at short intervals (5 Hz) even though you have tried turning off the power supply and turning on again after 2 or 3 minutes.
- Switch operation does not work properly.
- The main power fuse often blows out, or the circuit breaker is often activated.
- A foreign matter or water fall inside the air conditioner.
- Any other unusual conditions are observed.

**Before you ask for servicing or repairs, check the following points.**

**Recheck**

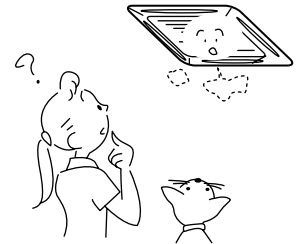
**Inoperative**

- The main power switch is turned off.
- The circuit breaker is activated to cut off power supply.
- The main power fuse has blown out.
- Stoppage of electric current.



**Does not cool well or heat well**

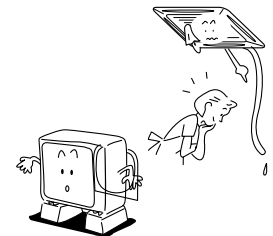
- The air inlet and/or outlet of the outdoor unit is blocked.
- Doors or windows are opened.
- The fan speed is set to low.
- The air conditioner is set in the DRY mode.
- The set temperature is too high. (In cooling operation)
- The set temperature is too low. (In heating operation)



**These are not failures.**

**Indoor unit or outdoor unit makes a strange noise.**

- When the temperature suddenly changes, the indoor or outdoor unit occasionally makes a strange noise because of expansion/contraction of parts or change of refrigerant flow.



**The room air is smelly or a bad odor comes from the air conditioner.**

- Smells impregnated in the walls, carpets, furniture, clothing, or furs, come out.



**Outdoor unit is frosted in heating operation.**

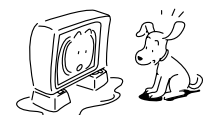
**Water drains from outdoor unit.**

- The outdoor unit is sometimes frosted in heating operation.  
In that case, the unit automatically performs defrosting (for 2 to 10 minutes) for increasing the heating efficiency.
- In defrosting operation, both the indoor and outdoor units stop air flow.
- Hiss sound is heard when flow of the refrigerant is changed for defrosting.
- Resultant water of automatic defrosting in heating operation drains from outdoor unit.



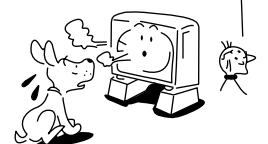
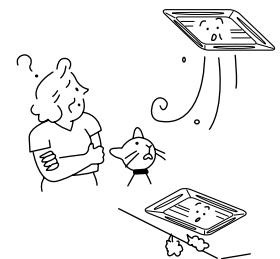
**Air flow changes though the FAN button is not set to the AUTO mode.**

- When the temperature of blown air drops in heating operation, the air conditioner automatically changes or stops air flow from the indoor unit not to make persons in the room feel chilly.
- Air flow from the indoor unit is occasionally changed in the cooling operation.



**A white mist of chilled air or water is generated from the outdoor unit.**

- The indoor unit in cooling operation or the outdoor unit in defrosting operation occasionally steams.
















# Accessory parts and Parts to be procured locally


## □ Accessory parts

Part name	Q'ty	Shape	Usage
Installation Manual	1	This manual	(Be sure to hand over to customers)
Heat insulating pipe	2		For heat insulation of pipe connecting section
Installation pattern	1		For confirmation of ceiling opening and main unit position
Installation gauge	2		For positioning of ceiling position (united with installation pattern)
Pattern fixing screw	4	M5 x 16L	For attach the installation pattern
Heat insulator	1		For heat insulation of drain connecting section

Part name	Q'ty	Shape	Usage
Washer	8		For hanging-down unit
Hose band	1		For connecting drain pipe
Flexible hose	1		For adjusting core-out of drain pipe
Heat insulator	1		For sealing of wire connecting port
Owner's Manual	1		(Be sure to hand over to customers)

RAV-SM560UT-E  
RAV-SM800UT-E

## <Separate sold parts>

Part name	Q'ty	Shape	Usage
Standard wired remote controller	1		

## □ Parts to be procured locally

<p>Connecting pipe (Liquid side)                      (6.35mm (diam.), Nominal (diam.) 1/4" thick 0.8mm)                      RAV-SM560UT-E, RAV-SM560AT-E                      (9.52mm (diam.), Nominal (diam.) 3/8" thick 0.8mm)                      RAV-SM800UT-E, RAV-SM800AT-E</p>
<p>Connecting pipe (Gas side)                      (12.7mm (diam.), Nominal (diam.) 1/2" thick 0.8mm)                      RAV-SM560UT-E, RAV-SM560AT-E                      (15.9mm (diam.), Nominal (diam.) 5/8" thick 1.0mm)                      RAV-SM800UT-E, RAV-SM800AT-E</p>
<p>Power supply cord                      2.5mm<sup>2</sup> (H07RN-F or 245IEC66) or 3.5mm<sup>2</sup> (AWG-12)</p>

<p>Connecting cable                      H07RN-F or 245IEC66 (1.5mm<sup>2</sup> or more)</p>
<p>Thermal insulation for refrigerant pipe                      (10mm or more, thermal insulating foam polyethylene)</p>
<p>Thermal insulation for drain pipe                      (10mm or more, foam polyethylene)</p>
<p>Drain pipe (Outer 26mm (diam.))</p>
<p>Tapes</p>
<p>Grounding cable (2.0mm (diam.) or more)</p>

# 1 PRECAUTIONS FOR SAFETY

- Ensure that all Local, National and International regulations are satisfied.
- Read this "PRECAUTIONS FOR SAFETY" carefully before Installation.
- The precautions described below include the important items regarding safety. Observe them without fail.
- After the installation work, perform a trial operation to check for any problem.  
Follow the Owner's Manual to explain how to use and maintain the unit to the customer.
- Turn off the main power supply switch (or breaker) before the unit maintenance.
- Ask the customer to keep the Installation Manual together with the Owner's Manual.

## CAUTION

### New Refrigerant Air Conditioner Installation

- **THIS AIR CONDITIONER ADOPTS THE NEW HFC REFRIGERANT (R410A) WHICH DOES NOT DESTROY OZONE LAYER.**

The characteristics of R410A refrigerant are ; easy to absorb water, oxidizing membrane or oil, and its pressure is approx. 1.6 times higher than that of refrigerant R22. Accompanied with the new refrigerant, refrigerating oil has also been changed. Therefore, during installation work, be sure that water, dust, former refrigerant, or refrigerating oil does not enter the refrigerating cycle.

To prevent charging an incorrect refrigerant and refrigerating oil, the sizes of connecting sections of charging port of the main unit and installation tools are charged from those for the conventional refrigerant.


Accordingly the exclusive tools are required for the new refrigerant (R410A).

For connecting pipes, use new and clean piping designed for R410A, and please care so that water or dust does not enter. Moreover, do not use the existing piping because there are problems with pressure-resistance force and impurity in it.

## CAUTION

### To Disconnect the Appliance from Main Power Supply.

This appliance must be connected to the main power supply by means of a switch with a contact separation of at least 3 mm.

**The installation fuse (25A D type  ) must be used for the power supply line of this conditioner.**

## ⚠ WARNINGS

- **Ask an authorized dealer or qualified installation professional to install/maintain the air conditioner.**  
Inappropriate installation may result in water leakage, electric shock or fire.
- **Turn off the main power supply switch or breaker before attempting any electrical work.**  
Make sure all power switches are off. Failure to do so may cause electric shock.
- **Connect the connecting cable correctly.**  
If the connecting cable is connected in a wrong way, electric parts may be damaged.
- **When moving the air conditioner for the installation into another place, be very careful not to enter any gaseous maller other than the specified refrigerant into the refrigeration cycle.**  
If air or any other gas is mixed in the refrigerant, the gas pressure in the refrigeration cycle becomes abnormally high and it resultingly causes pipe burst and injuries on persons.
- **Do not modify this unit by removing any of the safety guards or by by-passing any of the safety interlock switches.**
- **Exposure of unit to water or other moisture before installation may cause a short-circuit of electrical parts.**  
Do not store it in a wet basement or expose to rain or water.

# 1 PRECAUTIONS FOR SAFETY

- **After unpacking the unit, examine it carefully if there are possible damage.**
- **Do not install in a place that might increase the vibration of the unit.**
- **To avoid personal injury (with sharp edges), be careful when handling parts.**
- **Perform installation work properly according to the Installation Manual.**  
Inappropriate installation may result in water leakage, electric shock or fire.
- **When the air conditioner is installed in a small room, provide appropriate measures to ensure that the concentration of refrigerant leakage occur in the room does not exceed the critical level.**
- **Install the air conditioner securely in a location where the base can sustain the weight adequately.**
- **Perform the specified installation work to guard against an earthquake.**  
If the air conditioner is not installed appropriately, accidents may occur due to the falling unit.
- **If refrigerant gas has leaked during the installation work, ventilate the room immediately.**  
If the leaked refrigerant gas comes in contact with fire, noxious gas may generate.
- **After the installation work, confirm that refrigerant gas does not leak.**  
If refrigerant gas leaks into the room and flows near a fire source, such as a cooking range, noxious gas might generate.
- **Electrical work must be performed by a qualified electrician in accordance with the Installation Manual. Make sure the air conditioner uses an exclusive power supply.**  
An insufficient power supply capacity or inappropriate installation may cause fire.
- **Use the specified cables for wiring connect the terminals securely fix. To prevent external forces applied to the terminals from affecting the terminals.**
- **Be sure to provide grounding.**  
Do not connect ground wires to gas pipes, water pipes, lightning rods or ground wires for telephone cables.
- **Conform to the regulations of the local electric company when wiring the power supply.**  
Inappropriate grounding may cause electric shock.
- **Do not install the air conditioner in a location subject to a risk of exposure to a combustible gas.**  
If a combustible gas leaks, and stays around the unit, a fire may occur.

# 2 SELECTION OF INSTALLATION PLACE

## ⚠ WARNING

- **Install the air conditioner at enough strong place to withstand the weight of the unit.**  
If the strength is not enough, the unit may fall down resulting in injury.
- **Install the air conditioner at a height 2.5m or more from the floor.**  
If you insert your hands or others directly into the unit while the air conditioner operates, it is dangerous because you may contact with revolving fan or active electricity.

## ⚠ CAUTION

- **Do not install the air conditioner in a location subject to a risk of exposure to a combustible gas.**  
If a combustible gas leaks and stays around the unit, a fire may occur.

**Upon approval of the customer, install the air conditioner in a place that satisfies the following conditions.**

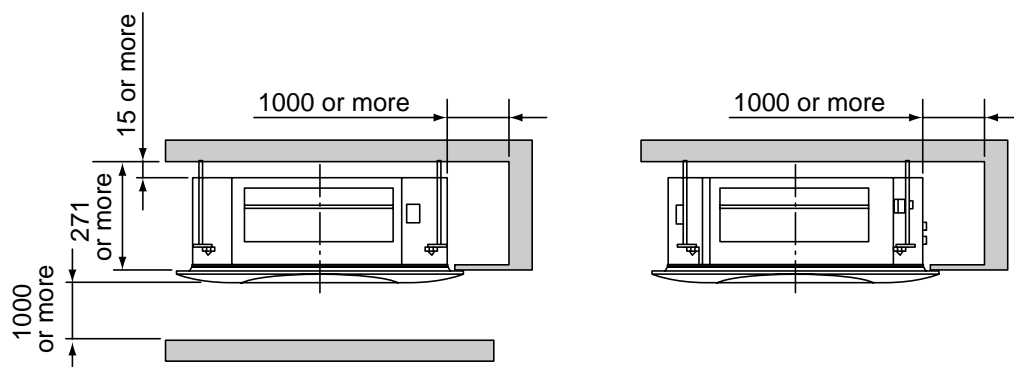
- Place where the unit can be installed horizontally.
- Place where a sufficient servicing space can be ensured for safety maintenance and check.
- Place where drained water will not cause any problem.

**Avoid installing in the following places.**

- Place exposed to air with high salt content (seaside area), or place exposed to large quantities of sulfide gas (hot spring). (Should the unit be used in these places, special protective measures are needed.)
- Place exposed to oil, vapor, oil smoke or corrosive gas.
- Place where organic solvent is used nearby.
- Place close to a machine generating high frequency.
- Place where the discharged air blows directly into the window of the neighboring house. (For outdoor unit)
- Place where noise of the outdoor unit is easily transmitted.  
(When installing the air conditioner on the boundary with the neighbor, pay due attention to the level of noise.)
- Place with poor ventilation. (Before air ducting work, check whether value of air volume, static pressure and duct resistance are correct.)

## Installation space

Secure the specified space in the figure for installation and servicing.



# 2 SELECTION OF INSTALLATION PLACE

## Selection of installation place

In case of continued operation of the indoor unit under high-humidity conditions as described below, dew may condense and water may drop.

Especially, high-humidity atmosphere (dew point temperature : 23°C or more) may generate dew inside the ceiling.

1. Unit is installed inside the ceiling with slated roof.
2. Unit is installed at a location using inside of the ceiling as fresh air take-in path.
3. Kitchen

If installing a unit at such place, put insulating material (glass wool, etc.) additionally on all the positions of the indoor unit which come to contact with high-humidity atmosphere.

## Advice

Set a check service opening panel at right side of the unit (size: 450 x 450mm or more) for piping, maintenance, and servicing.

## Ceiling height

Model RAV-	Possible install ceiling height
SM560UT-E, SM800UT-E	Up to 3.8m

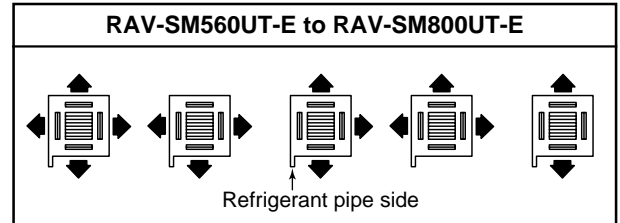
When the height of the ceiling exceeds the distance of the item Standard/4-way in Table below, the hot air is difficult to reach the floor. Therefore, it is necessary to change the setup value of the high ceiling switch or discharge direction.

## REQUIREMENT

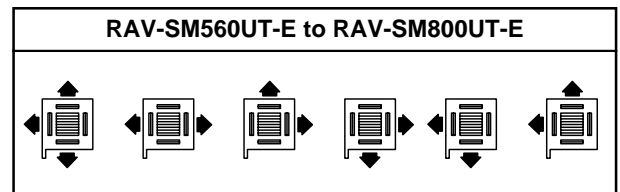
- When using the air conditioner with 2-way discharge system with the standard setting (at a shipment), it may stop abnormally in heating. Therefore, change the setting switch according to the number of discharge direction and the ceiling height.
- When using the air conditioner with 2-way/3-way discharge system, a strong wind blows directly if the ceiling height is lower than the standard. Therefore, change the setting switch according to height of the ceiling.
- When using the high ceiling (1) or (2) with 4-way discharge system, the draft is apt to be felt due to drop of the discharge temperature.

## Discharge direction

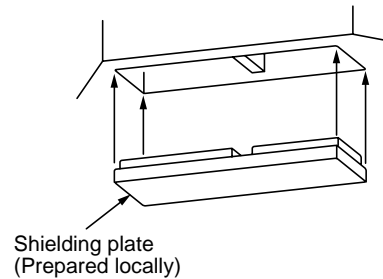
As shown in the following figure, No. of discharge directions can be selected according to the shape of rooms and installation position.



As shown in the following figure direction are not acceptable.



- To change discharge direction, use a shielding plate.
- When attaching a shielding plate, remove the ceiling panel and insert the shielding plate into the discharge port as shown in the figure below.



## WARNING

Install the air conditioner certainly to sufficiently withstand the weight.  
If the strength is insufficient, the unit may fall down resulting in human injury.  
Perform a specified installation work to guard against an earthquake.  
An incomplete installation can cause accidents by the units falling and dropping.

## Height list of ceiling possible to be installed

(Unit : m)

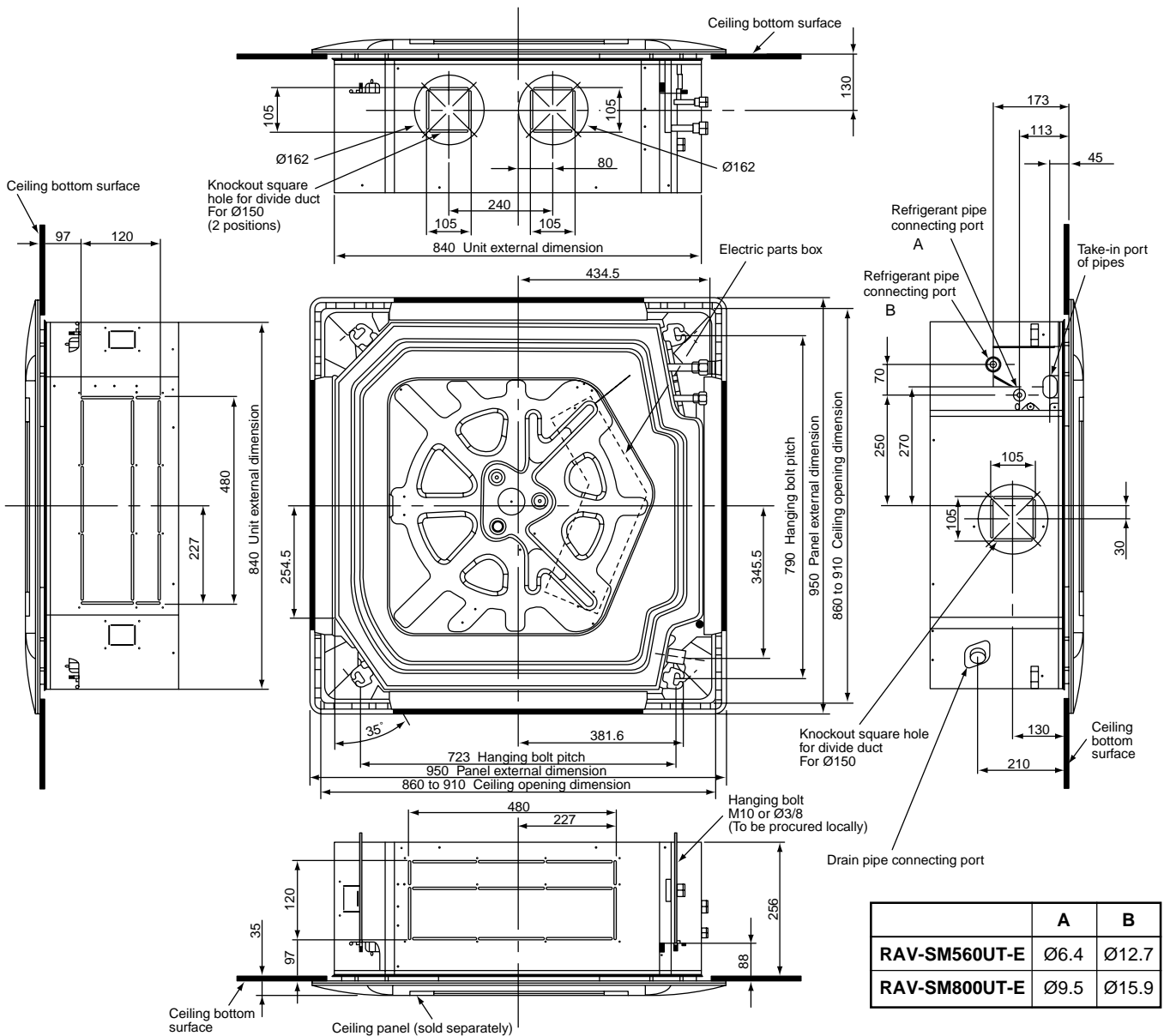
Model	RAV-SM560UT-E			RAV-SM800UT-E			High ceiling setup
	No. of discharge direction	4-way	3-way	2-way	4-way	3-way	
Standard (at shipment)	2.8	3.2	3.5	3.0	3.3	3.6	Set data
High ceiling (1)	3.2	3.5	3.8	3.3	3.5	3.8	0000
High ceiling (2)	3.5	3.8	—	3.6	3.8	—	0001
							0003

## External view

### REQUIREMENT

Strictly comply with the following rules to prevent damage of the indoor units and human injury.

- Do not put a heavy article on the indoor unit. (Even units are packaged)
- Carry in the indoor unit as it is packaged if possible. If carrying in the indoor unit unpacked by necessity, be sure to use buffering cloth, etc. to not damage the unit.
- To move the indoor unit, hold the hooking metals (4 positions) only. Do not apply force to the other parts (refrigerant pipe, drain pan, foamed parts, or resin parts, etc.).
- Carry the package by two or more persons, and do not bundle it with PP band at positions other than specified.



Considering pipe/wire connecting work inside the ceiling after the indoor unit has been hanged, select an installation place and determine piping direction.

- If the ceiling has already been set before hanging the main unit, prepare refrigerant pipe, drain pipe, indoor connecting wire, remote controller cord, etc. up to the place where pipe and wire can be connected.
- Check the size of the indoor unit, and match the indoor unit size, with ceiling opening size and that position using the attached installation pattern.  
(Attach the pattern to the lower side of indoor unit with attached four screws M5 x 16L.)

## 2 SELECTION OF INSTALLATION PLACE

### Opening a ceiling and installation of hanging bolts

#### <Treatment of ceiling>

The ceiling differs according to structure of building. For details, consult your constructor or interior finish contractor. In the process after the ceiling board has been removed, it is important to reinforce ceiling foundation (frame) and to keep horizontal level of installed ceiling correctly in order to prevent vibration of ceiling board.

- (1) Cut and remove the ceiling foundation.
- (2) Reinforce the cut surface of ceiling foundation, and add ceiling foundation for fixing the end of ceiling board.

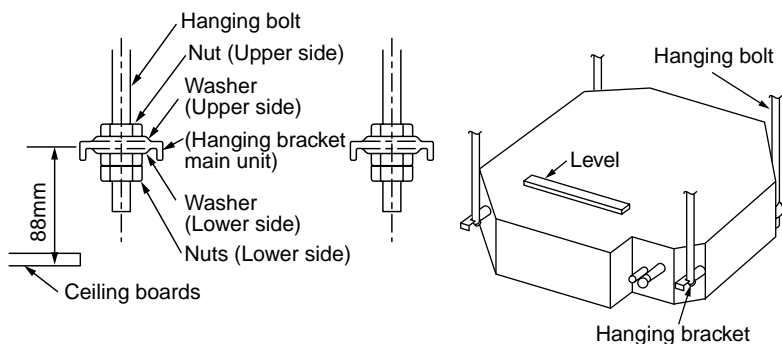
#### <Installation of hanging bolt>

Use M10 hanging bolts (4 pcs, to be local procure). Matching to the existing structure, set pitch according to size in the unit external view as shown below.

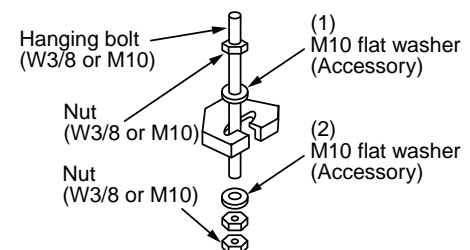
New concrete slab	Steel frame structure	Existing concrete slab
Install the bolts with insert brackets or anchor bolts.	Use existing angles or install new support angles.	Use a hole-in anchors, hole-in plugs, or a hole-in bolts.
<p>(Blade type bracket) (Slide type bracket) (Pipe hanging anchor bolt)</p>	<p>Hanging bolt Support angle</p>	

### Installation of ceiling opening and hanging bolt

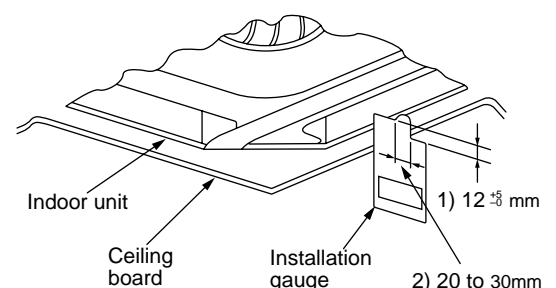
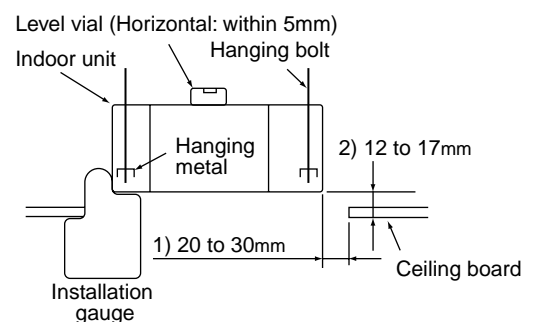
Adjust nut position (lower side) so that clearance between the attached washer (lower side) and ceiling board is 88mm.



- Hang up the main unit by hanging the nut of hanging bolt to T groove of hanging bracket of the main unit.
- Using the level vial, etc., set the horizontal level of the main unit within 5mm.
- Using the installation gauge, check and adjust the positional relation between the main unit and ceiling opening hole, and hanging-up height of the main unit. (Direction to be used is indicated on the installation gauge.)
  - 1) Check lower side of the indoor unit locates at position (12 to 17) mm higher than the lower surface of the ceiling board. (4 corners)
  - 2) Check clearance between side of the indoor unit and the ceiling board is 20 to 30mm. (Common to 4 corners)



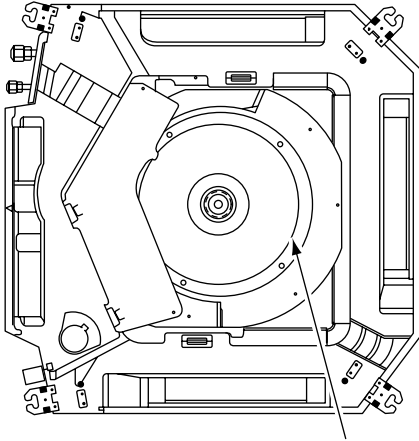
- (1) Required those other than M10 flat washer at site.
- (2) To prevent falling-off of bolt (safety), be sure to set it just under the hanging bracket as shown in the figure.





### REQUIREMENT

Before installation of the indoor unit, be sure to remove the cushion for transportation between the fan and the bell mouth. Running the unit without removing the cushion may damage the fan motor.



Be sure to remove the cushion for transportation between the fan and the bell mouth.

### Installation of ceiling panel (Sold separately)

Install the ceiling panel according to Installation Manual attached with it after piping/wiring work has completed.

Check that installation of indoor unit and ceiling opening part is correct, and then install it.

### REQUIREMENT

Joint the connecting sections of ceiling panel, ceiling surface, ceiling panel and indoor unit closely.

Any gap between them will cause air leakage and this generate condensation or water leakage.

### Installation of ceiling opening and hanging bolt

For installation of the wired remote controller, follow the Installation Manual attached with the remote controller.

- Pull out the remote controller cord together with the refrigerant pipe or drain pipe.  
Be sure to pass the remote controller cord through upper side of the refrigerant pipe and drain pipe.

# 3 DRAIN PIPING WORK

## CAUTION

- Following the Installation Manual, perform the drain piping work so that water is properly drained, and apply a heat insulation so as not to cause a dew. Inappropriate piping work may result in water leakage in the room and wet of furniture.

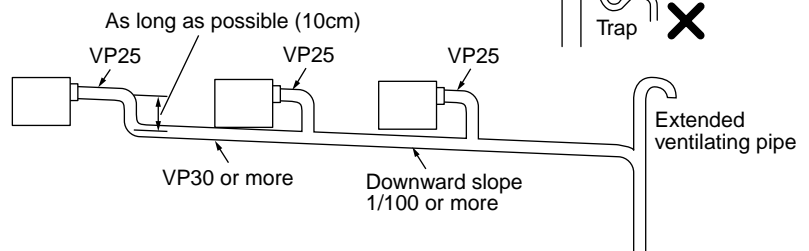
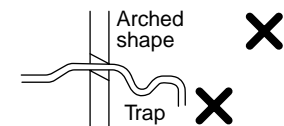
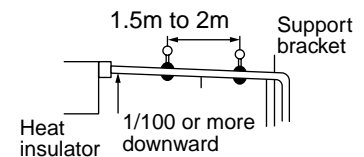
## Piping/Heat insulating material

Require the following materials for piping and heat insulating at site.

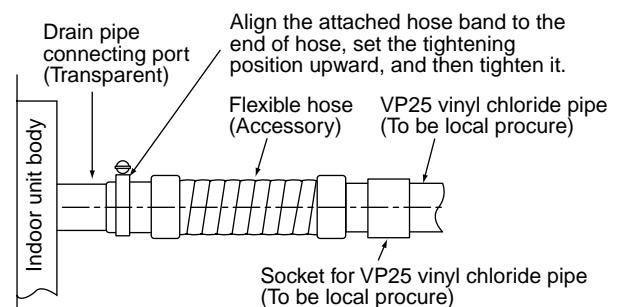
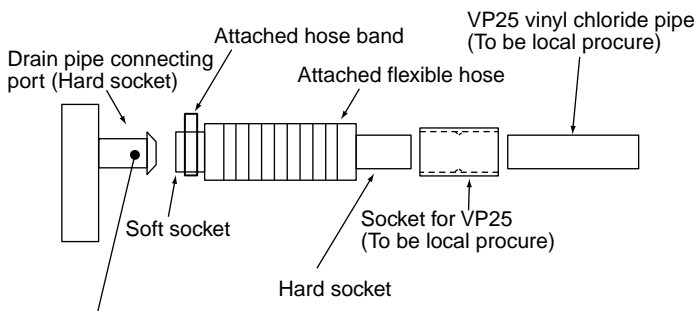
<b>Piping</b>	Hard vinyl chloride pipe VP25 (Outer dia. : Ø32mm)
<b>Heat insulator</b>	Foam polyethylene : Thickness 10mm or more

## REQUIREMENT

- Be sure to perform heat insulation of the drain pipes of the indoor unit.
- Never forget to perform heat insulation of the connecting part with the indoor unit. An incomplete heat insulation causes dewing.
- Set the drain pipe with downward slope (1/100 or more), and do not make swelling or trap on the piping. It may cause an abnormal sound.
- For length of the traversing drain pipe, restrict to 20m or less. In case of a long pipe, provide support brackets with interval of 1.5 to 2m in order to prevent waving.



- Set the collective piping as shown in the right figure.
- Be sure not to apply force to the connecting part of the drain pipe.
- The hard vinyl-chloride pipe cannot be directly connected to the drain pipe connecting port of the indoor unit. For connection with the drain pipe connecting port, be sure to use/fix the attached flexible hose with the hose band, otherwise a damage or water leak is caused on the drain pipe connecting port.



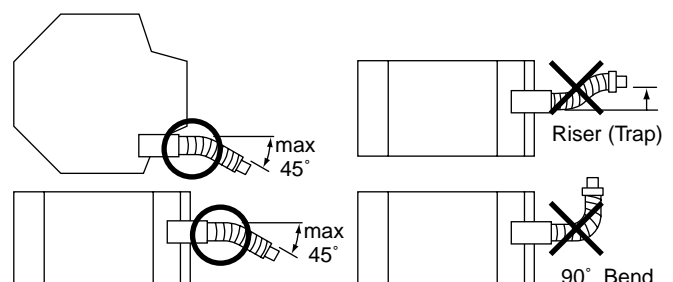
### Adhesive inhibited :

Use the attached flexible hose and hose band for connecting the drain hose to the clear drain socket. If applying the adhesive, socket will be damaged and cause water leakage.

## Flexible hose

Use the attached flexible hose to adjust core discrepancy of the hard vinyl chloride pipe or to adjust the angle.

- Do not use the flexible hose as stretched, or do not deform it more extent than that in the following figure.
- Be sure to fix the soft end of the flexible hose with the attached hose band.
- Use the flexible hose on a horizontal level.



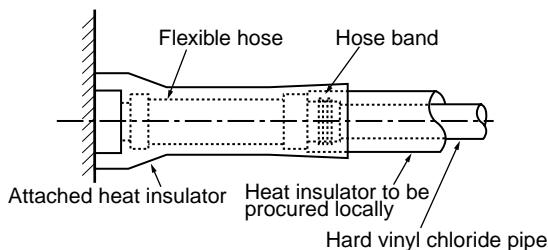
## Connection procedure

### Connect a socket and a hard vinyl chloride pipe.

- Using adhesive agent for vinyl chloride pipe, connect the drain pipes certainly so that water does not leak.
- It takes approx. 10 hours to dry and harden the adhesive agent. During this period, do not apply force to the connecting part with the drain pipe.

### Perform heat insulating.

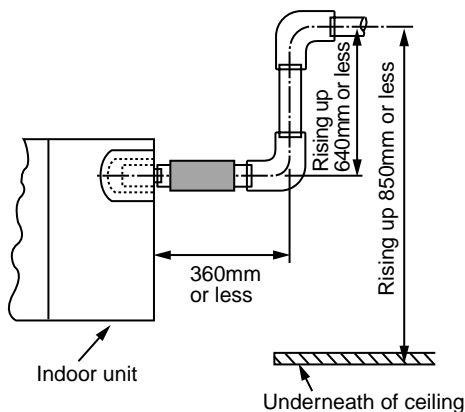
- As shown in the figure, cover the flexible hose and hose band with the attached heat insulator up to the bottom of the indoor unit without gap.



## Drain up

When a downward grading cannot be secured on the drain pipe, drain-up up to 640mm is possible.

Set downward grading immediately after raising up vertically.



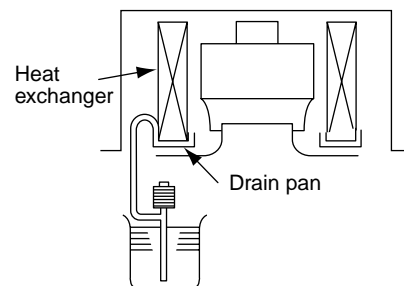
## Check the draining

In the test run, check that water drain is properly performed and water does not leak from the connecting part of the pipes.

Be sure to check draining also when installed in heating period.

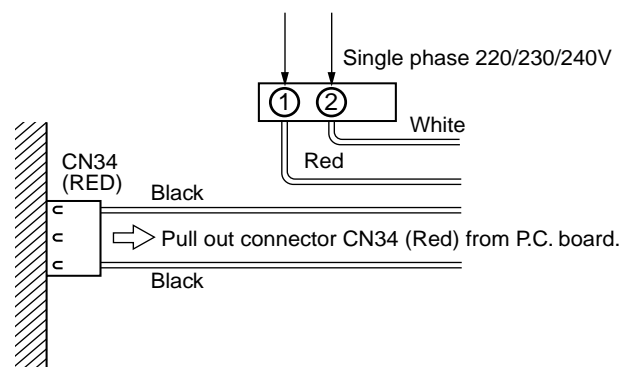
Using a pitcher or hose, pour water (1500 to 2000cc) into the discharge port before installation of the ceiling panel.

Pour water gradually so that water does not spread on the motor of the drain pump.



- After the electric work has finished, pour water during COOL mode operation.
- If the electric work has not yet finished, pull out the float switch connector (CN34 : Red) from the electric parts box, and check draining by plugging the single phase 220/230/240V power to the terminal blocks 1 and 2. If doing so, the drain pump motor operates.
- Test water drain while checking the operation sound of the drain pump motor. (If the operation sound changes from continuous sound to intermittent sound, water is normally drained.)

After the check, the drain pump motor runs, connecting the float switch connector. (In case of check by pulling out the float switch connector, be sure to return the connector to the original position.)



# 4 REFRIGERANT PIPING

## Refrigerant Piping

- If the outdoor units are to be mounted on a wall, make sure that the supporting platform is sufficiently strong. The platform should be designed and manufactured to maintain its strength over a long period of time, and sufficient consideration should be given to ensuring that the outdoor unit will not fall.
- Use copper pipe with 0.8 mm or more thickness.
- Flare nut and flare works are also different from those of the conventional refrigerant. Take out the flare nut attached to the main unit of the air conditioner, and use it.

### CAUTION

#### IMPORTANT 4 POINTS FOR PIPING WORK

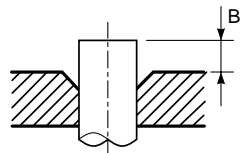
- Remove dust and moisture from the inside of the connecting pipes.
- Tight connection (between pipes and unit)
- Evacuate the air in the connecting pipes using VACUUM PUMP.
- Check the gas leakage. (Connected points)

## Permissible Piping Length and Heat

The maximum piping length from the outdoor to indoor unit	
30 m (Chargeless 20m) (RAV-SM560AT-E)	50 m (Chargeless 20m) (RAV-SM800AT-E)
The maximum height difference outdoor/indoor unit	
Outdoor unit is above	Outdoor unit is below
30m	15m

## Flaring

Insert a flare nut into the pipe, and flare the pipe. As the flaring sizes of R410A differ from those of refrigerant R22, the flare tools newly manufactured for R410A are recommended. However, the conventional tools can be used by adjusting projection margin of the copper pipe.



### • Projection margin in flaring : B (Unit : mm)

Rigid (Clutch type)

Outer diam. of copper pipe	R410A tool used		Conventional tool used	
	R410A	R22	R410A	R22
6.35 to 9.52	0 to 0.5	(Same as left)	1.0 to 1.5	0.5 to 1.0

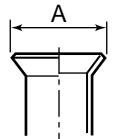
Imperial (Wing nut type)

Outer diam. of copper pipe	R410A	R22
6.35 or 9.52	1.5 to 2.0	1.0 to 1.5
12.7 or 15.9	2.0 to 2.5	1.5 to 2.0

### • Flaring dia meter size : A (Unit : mm)

Outer diam. of copper pipe	A <sup>+0</sup> / <sub>-0.4</sub>	
	R410A	R22
6.35	9.1	9.0
9.52	13.2	13.0
12.7	16.6	16.2
15.9	19.7	19.2

- \* In case of flaring for R410A with the conventional flare tool, pull it out approx. 0.5 mm more than that for R22 to adjust to the specified flare size. The copper pipe gauge is useful for adjusting projection margin size.



## Tightening connection

### CAUTION

- Do not apply excessive torque. Otherwise, the nut may crack depending on the conditions.

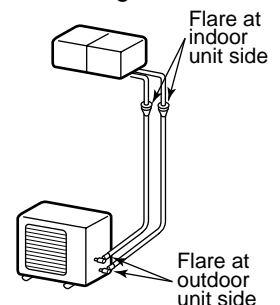
(Unit : N•m)

Outer diam. of copper pipe	Tightening torque
6.35 mm (diam.)	14 to 18 (1.4 to 1.8 kgf•m)
9.52 mm (diam.)	33 to 42 (3.3 to 4.2 kgf•m)
12.7 mm (diam.)	50 to 62 (5.0 to 6.2 kgf•m)
15.9 mm (diam.)	63 to 77 (6.3 to 7.7 kgf•m)

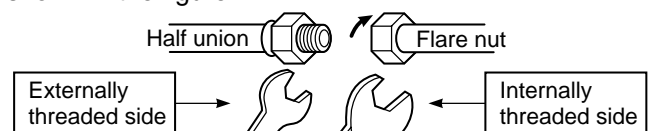
### • Tightening torque of flare pipe connections

Pressure of R410A is higher than that of R22.

(Approx. 1.6 times) Therefore, using a torque wrench, tighten the flare pipe connecting sections which connect the indoor and outdoor units of the specified tightening torque. Incorrect connections may cause not only a gas leak, but also a trouble of the refrigeration cycle.



Align the centers of the connecting pipes and tighten the flare nut as far as possible with your fingers. Then tighten the nut with a spanner and torque wrench as shown in the figure.



Use a wrench to secure. Use a torque wrench to tighten.

# 5 EVACUATING

## AIR PURGE

Evacuate the air in the connecting pipes and in the indoor unit using vacuum pump.  
Do not use the refrigerant in the outdoor unit.  
For details, see the manual of vacuum pump.

## Use a vacuum pump

Be sure to use a vacuum pump with counter-flow prevention function so that inside oil of the pump does not flow backward into pipes of the air conditioner when the pump stops.

1. Connect the charge hose from the manifold valve to the service port of the gas side packed valve.
2. Connect the charge hose to the port of vacuum pump.
3. Open fully the low pressure side handle of the gauge manifold valve.
4. Operate the vacuum pump to start evacuating.

Perform evacuating for about 35 minutes if the piping length is 30 meters total for model SM560 and 50 meters for model SM800 (assuming a pump capacity of 27 liters per minute.) Then confirm that the compound pressure gauge reading is  $-101$  kPa ( $-76$  cmHg).

5. Close the low pressure side valve handle of gauge manifold.
6. Open fully the valve stem of the packed valves (both sides of Gas and Liquid).
7. Remove the charging hose from the service port.
8. Securely tighten the caps on the packed valves.

## REQUIREMENT

For the tools such as charge hose, etc., use those manufactured exclusively for R410A.

## Refrigerant amount to be added

For addition of the refrigerant, add refrigerant "R410A" referring to the attached Installation Manual.

Be sure to use a scale to charge the refrigerant of specified amount.

## REQUIREMENT

- Charging an excessive or too little amount of refrigerant causes a trouble of the compressor. Be sure to charge the refrigerant of specified amount.
- A personnel who charged the refrigerant should write down the pipe length and the added refrigerant amount in the nameplate attached to the service panel of the outdoor unit. It is necessary to troubleshoot the compressor and refrigeration cycle malfunction.

## Open the valve fully

Open the valve of the outdoor unit fully. A 4mm-hexagonal wrench is required for opening the valve.

## Gas leak check

Check with a leak detector or soap water whether gas leaks or not, from the pipe connecting section or cap of the valve.

## REQUIREMENT

Use a leak detector manufactured exclusively for HFC refrigerant (R410A, R134a, etc.).

## Thermal insulation process

Apply thermal insulation for the pipes separately at liquid side and gas side.

For the thermal insulation to the pipes at gas side, be sure to use the material with heat-resisting temperature  $120^{\circ}\text{C}$  or higher.

Using the attached thermal insulation material, apply the thermal insulation to the pipe connecting section of the indoor unit securely without gap.

## REQUIREMENT

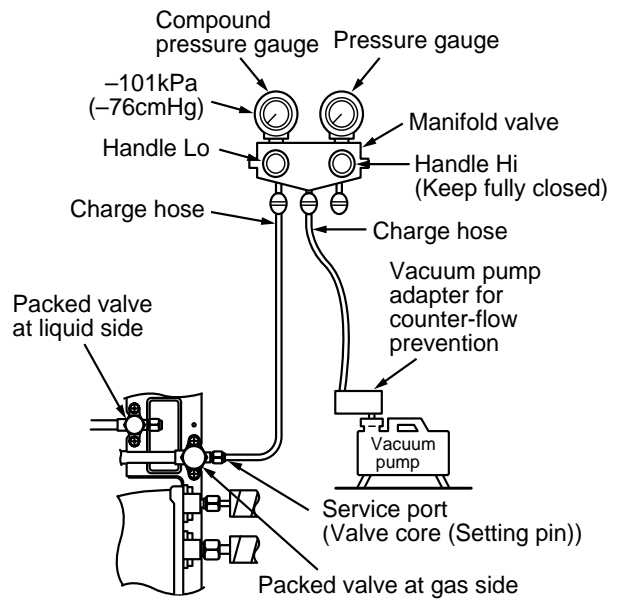
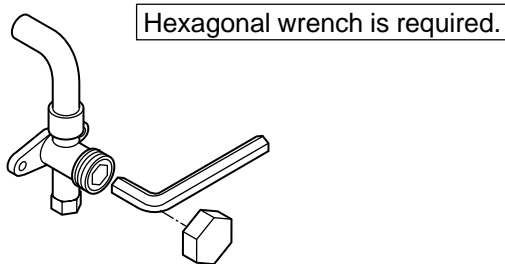
Apply the thermal insulation to the pipe connecting section of the indoor unit securely up to the root without exposure of the pipe. (The pipe exposed to the outside causes water leak.)

# 5 EVACUATING

## Packed valve handling precautions

- Open the valve stem all the way out ; do not try to open it beyond the stopper.
- Securely tighten the valve stem cap at the torque as follows:

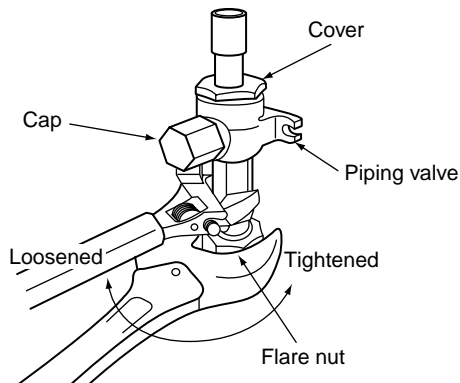
Gas side (15.9 mm (diam.))	63 to 77 N•m (6.3 to 7.7 kgf•m)
Gas side (12.7 mm (diam.))	50 to 62 N•m (5.0 to 6.2 kgf•m)
Gas side (9.52 mm (diam.))	33 to 42 N•m (3.3 to 4.2 kgf•m)
Liquid side (6.35 mm (diam.))	14 to 18 N•m (1.4 to 1.8 kgf•m)
Service port	14 to 18 N•m (1.4 to 1.8 kgf•m)



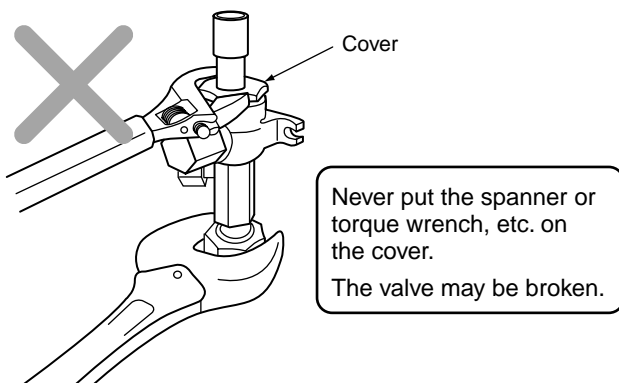
### <For RAV-SM800AT-E model>

- As shown in the figure, be sure to use a double spanner to loosen or tighten the flare nut of the valve at gas side. If using a single spanner, the nut cannot be tightened with necessary tightening torque.

On the contrary, use a single spanner to loosen or tighten the flare nut of the valve at liquid side.



SM800 type valve at gas side



# 6 ELECTRICAL WORK

## ⚠ WARNING

1. **Using the specified cables, ensure to connect the wires, and fix wires securely so that the external tension to the cables do not affect the connecting part of the terminals.**

Incomplete connection or fixation may cause a fire, etc.

2. **Be sure to connect earth wire. (Grounding work)**

Do not connect the earth wire to gas pipe, city water pipe, lightning rod, or the earth wire of telephone. Incomplete grounding causes an electric shock.

3. **For electric work, strictly follow the Local Regulation in each country and the Installation Manual, and use an exclusive circuit.**

Capacity shortage of power circuit or incomplete installation may cause an electric shock or a fire.

## CAUTIONS

- This indoor unit has no power cord.
- If incorrect/incomplete wiring is carried out, it will cause an electrical fire or smoke.
- Be sure to install an earth leakage breaker that is not tripped by shock waves.  
If an earth leakage breaker is not installed, an electric shock may be caused.
- Be sure to use the cord clamps attached to the product.
- Do not damage or scratch the conductive core and inner insulator of power and inter-connecting cables when peeling them.
- Be sure to comply with local regulations on running the wire from outdoor unit to indoor unit (size of wire and wiring method etc.)
- Use the power cord and Inter-connecting cable of specified thickness, type, and protective devices required.

## REQUIREMENT

- For power supply wiring, strictly conform to the Local Regulation in each country.
- For wiring of power supply of the outdoor units, follow the Installation Manual of each outdoor unit.
- Never connect 220/230/240V power to the terminal blocks (A, B, etc.) for control wiring.  
(Otherwise, the system will fail.)
- Perform the electric wiring so that it does not come to contact with the high-temperature part of the pipe.  
The coating may melt resulting in an accident.
- After connecting cables to the terminal blocks, provide a trap and fix cables with the cable clamp.
- Run the refrigerant piping line and control wiring line in the same line.
- Do not turn on the power of the indoor unit until vacuuming of the refrigerant pipes completes.

### Remote controller wiring

2-core non polarity cable is used for the remote controller wiring.

### How to wire

1. Connect the connecting cable to the terminal as identified with their respective numbers on the terminal block of indoor and outdoor unit. H07 RN-F or 245 IEC 66 (1.5 mm<sup>2</sup> or more)
2. Insulate the unsheathed redundant cords (conductors) with electrical insulation tape.  
Process them so that they do not touch any electrical or metal parts.
3. For inter-unit wiring, do not use a wire jointed to another on the way.

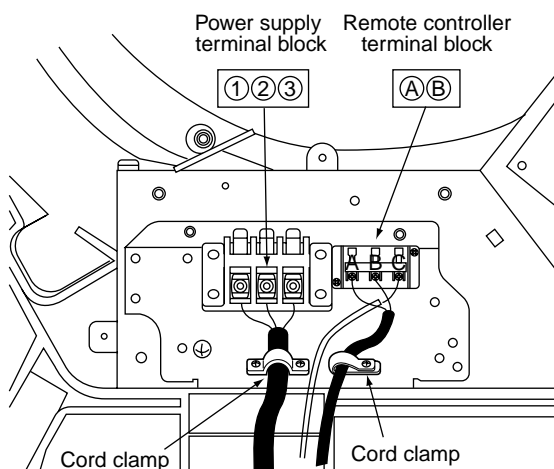
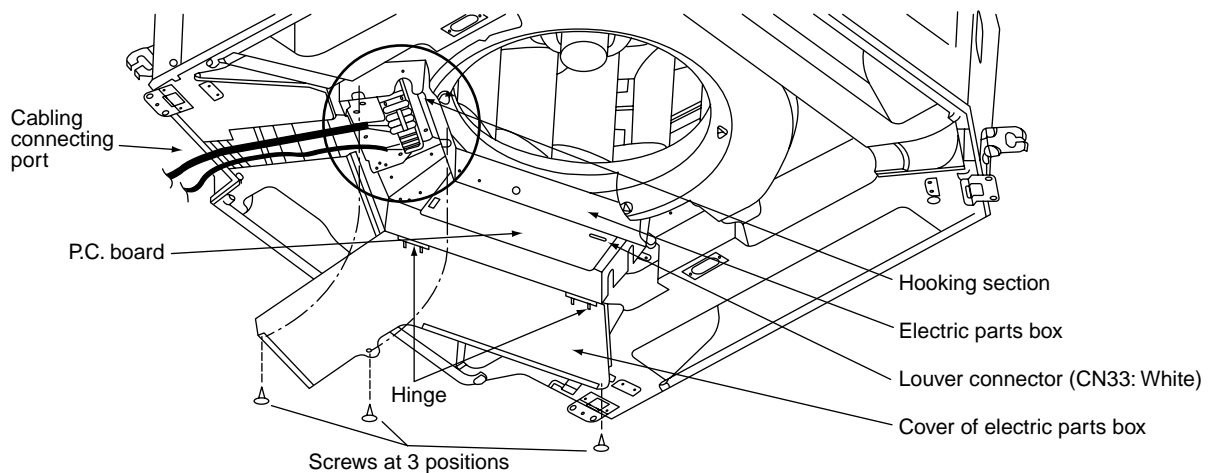
# 6 ELECTRICAL WORK

## Cable connection

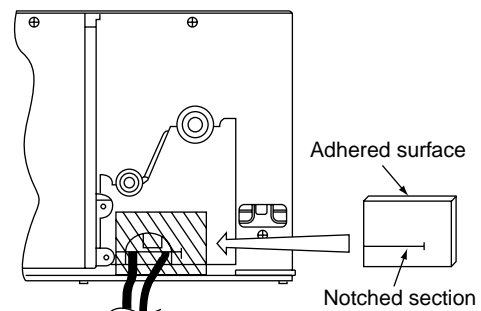
### REQUIREMENT

- Be sure to connect the cables matching the terminal numbers. Incorrect connection causes a trouble.
- Be sure to pass the cables through the bushing of cabling connection port of the indoor unit.
- Keep a margin (Approx. 100mm) on a cable to hang down the electric parts box at servicing, etc.
- The low-voltage circuit is provided for the remote controller. (Do not connect the high-voltage circuit)

- Remove the cover of the electric parts box by taking off the mounting screws (3 positions) and pushing the hooking section. (The cover of the electric parts box remains hanged to the hinge.)
- Connect the indoor/outdoor connection cables and REMOCON cable to the terminal block of the electric parts box. (Do not apply tension to the connecting section of the terminal block.)
- Tighten the screws of the terminal block, and fix the cables with cord clamp attached to the electric parts box. (Do not apply tension to the connecting section of the terminal block.)
- Using the attached thermal insulation material, seal the pipe connecting port. Otherwise, dewing may be caused.
- Mount the cover of the electric parts box without pinching cables. (Mount the cover after cabling on the ceiling panel.)



### <Thermal insulation to cabling connecting port>



## Cabling on the ceiling panel

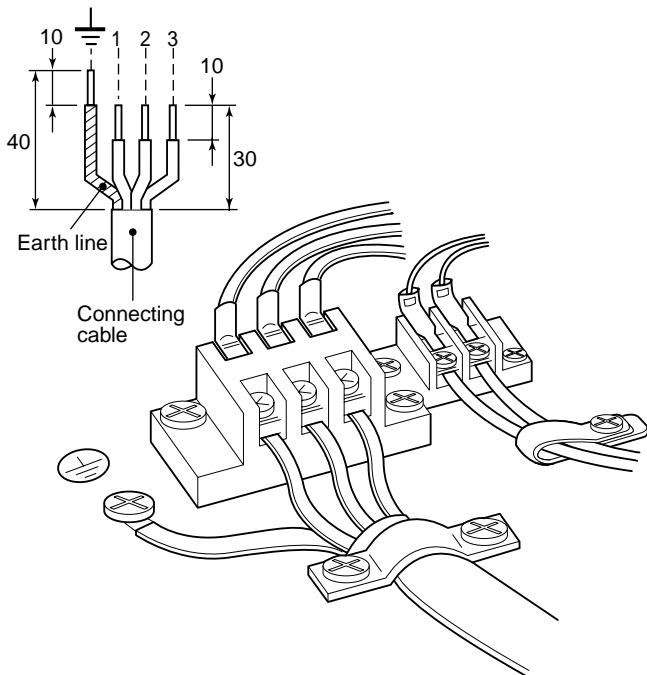
According to the Installation Manual of the ceiling panel, connect the connector (5P: White) of the ceiling panel to the connector (CN33: White) on P.C. board of the electric parts box.



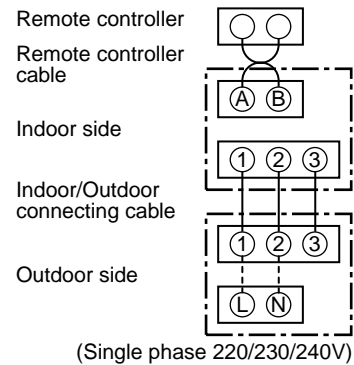
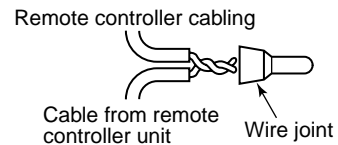
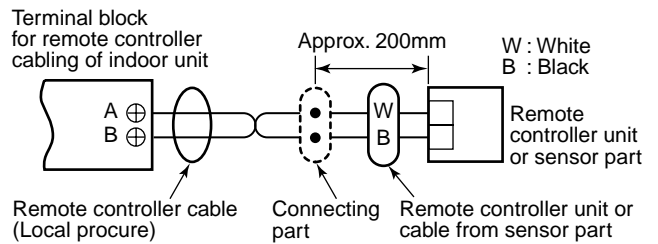
## Cabling

1. Remove a screw and then remove cover of the electric parts box.
2. Strip wire ends (10 mm).
3. Match wire colors with terminal numbers on indoor and outdoor units' terminal blocks and firmly screw wires to the corresponding terminals.
4. Connect the ground wires to the corresponding terminals.
5. Fix the cable with cord clamp.
6. Fix cover of the parts box and the terminal block surely with the fixing screws.

Make a loop on the cable for margin of the length so that the electric parts box can be taken out during servicing.



## Cabling diagram



- For details of cabling/installation of the remote controller, refer to the Installation Manual attached to in the remote controller.

## Remote Controller Cabling

- Strip off approx. 14mm the cable to be connected.
- Non polarity, 2 core cable is used for cabling of the remote controller.
- Twist cable of the remote controller to be connected with cable of the remote controller unit (or sensor), and press-fit them with a wire joint.  
Wire joints (White: 2 pieces) are included in the attachments to the remote controller (sold separately) or the wireless remote controller kit (sold separately).

# 7 TEST RUN

## Before test run

- Before turning on the power supply, carry out the following procedure.
  - 1) Using 500V-megger, check 1MΩ or more exists between the terminal block 1 to 3 and the earth. If 1MΩ or less is detected, do not run the unit. Do not apply to the remote controller circuit.
  - 2) Check the valve of the outdoor unit being opened fully.
- To protect the compressor at activation time, leave power-ON for 12 hours or more before operating.

## How to execute a test run

Using the remote controller, operate the unit as usual.

For the procedure of the operation, refer to the attached Owner's Manual.

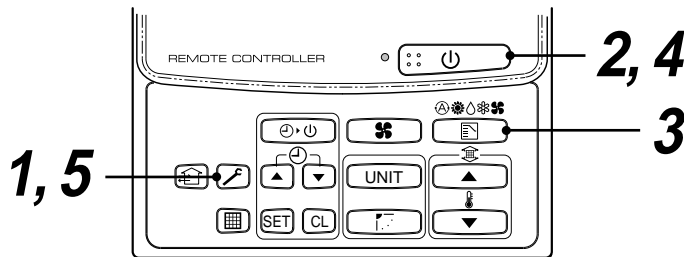
A forced test run can be executed in the following procedure if the operation stops by thermo.-OFF.

In order to prevent a serial operation, the forced test run is released after 60 minutes have passed and returns to the usual operation.

### NOTE

Do not use the forced test run for cases other than the test run because it applies an excessive load to the devices.

## In case of wired remote controller



Procedure	Description	
<b>1</b>	Keep  button pushed for 4 seconds or more. [TEST] is displayed on the display part and the selection of mode in the test mode is permitted.	
<b>2</b>	Push  button.	
<b>3</b>	Using  button, select the operation mode, [COOL] or [HEAT]. <ul style="list-style-type: none"> <li>• Do not run the air conditioner in a mode other than [COOL] or [HEAT].</li> <li>• The temperature controlling function does not work during test run.</li> <li>• The detection of error is performed as usual.</li> </ul>	
<b>4</b>	After the test run, push  button to stop a test run. (Display part is same as procedure <b>1</b> .)	
<b>5</b>	Push  check button to cancel (release from) the test run mode. ([TEST] disappears on the display and the status returns to a normal.)	

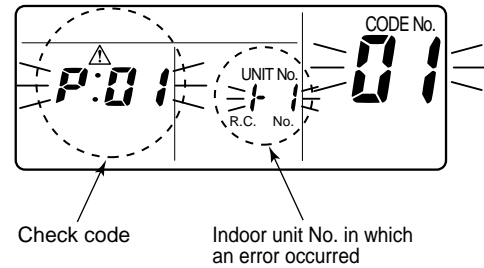
# 8 TROUBLESHOOTING

## Confirmation and check

When a trouble occurred in the air conditioner, the check code and the indoor unit No. appear on the display part of the remote controller.

The check code is only displayed during the operation.

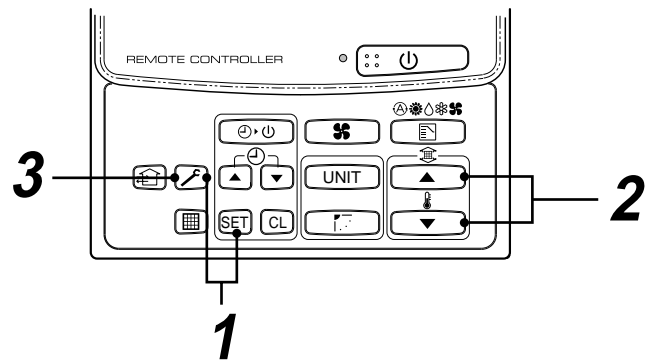
If the display disappears, operate the air conditioner according to the following "Confirmation of error history" for confirmation.








## Confirmation of error history

When a trouble occurred on the air conditioner, the trouble history can be confirmed with the following procedure. (The trouble history is stored in memory up to 4 troubles.)

The history can be confirmed from both operating status and stop status.

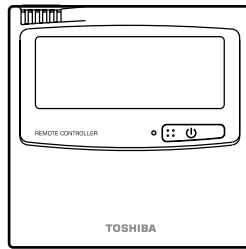


Procedure	Description
1	<p>When pushing [SET] and  buttons at the same time for 4 seconds or more, the following display appears.</p> <p>If [Service check] is displayed, the mode enters in the trouble history mode.</p> <ul style="list-style-type: none"> <li>• [01 : Order of trouble history] is displayed in CODE No. window.</li> <li>• [Check code] is displayed in CHECK window.</li> <li>• [Indoor unit address in which an error occurred] is displayed in UNIT No.</li> </ul>
2	<p>Every pushing of [  ,  ] button used to set temperature, the trouble history stored in memory is displayed in order.</p> <p>The numbers in CODE No. indicate CODE No. [01] (latest) → [04] (oldest).</p> <p><b>REQUIREMENT</b></p> <p>Do not push  button because all the trouble history of the indoor unit will be deleted.</p>
3	<p>After confirmation, push  button to return to the usual display.</p>

1. Check the troubles according to the above procedure.
2. Ask an authorized dealer or qualified service (maintenance) professional to repair or maintain the air conditioner.
3. More details of the service code are explained in Service Manual.

## ACCESSORIES

### Remote controller



### Screws (two pcs.)



## PRECAUTIONS FOR SAFETY

### WARNING


#### WARNINGS ABOUT INSTALLATION

- Make sure to ask the qualified installation professional in electric work to install the air conditioner.  
If the air conditioner is inappropriately installed by yourself, it may cause water leak, electric shock, fire, and so on.
- Ground the air conditioner without fail.  
Do not connect the ground wire to gas pipe, water pipe, lightning rod or ground wire of telephone. If the air conditioner is imperfectly grounded, it may cause electric shock.

### CAUTION

#### TO DISCONNECT THE APPLIANCE FROM THE MAINS SUPPLY

This appliance must be connected to the mains by means of a switch with a contact separation of at least 3 mm.

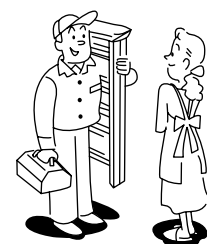
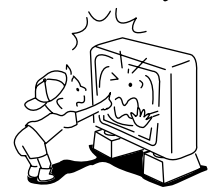
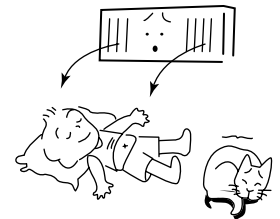
**The installation fuse (25A D type  ) must be used for the power supply line of this conditioner.**

#### WARNINGS ABOUT OPERATION

- Avoid cooling the room too strong or exposing the human body to cool breeze for a long time as it is bad for the health.
- When you notice something abnormal with the air conditioner (smells like something scorching, poor cooling, etc.), immediately turn off the main switch, the circuit breaker, from the mains to stop the air conditioner, and contact the dealer.  
If the air conditioner is continuously operated with something abnormal, it may cause machine failure, electric shock, fire, and so on.

#### WARNINGS ABOUT MOVEMENT AND REPAIR

- Do not move or repair any unit by yourself.  
Since there is high voltage inside the unit, you may get electric shock when removing the cover and main unit.
- Whenever the air conditioner needs repair, make sure to ask the dealer to do it.  
If it is repaired imperfectly, it may cause electric shock or fire.
- When moving the air conditioner for re-installing at another place, ask the dealer to do it. If it is imperfectly installed, it may cause electric shock or fire.



RAV-SM560BT-E  
RAV-SM800BT-E

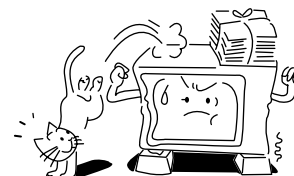
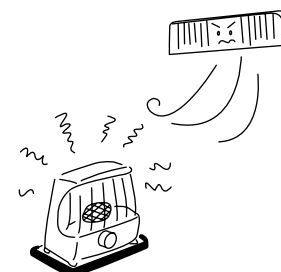
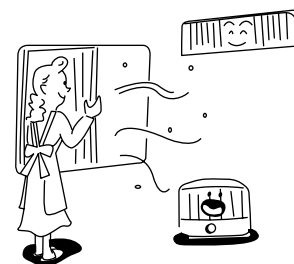
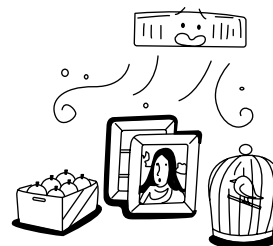
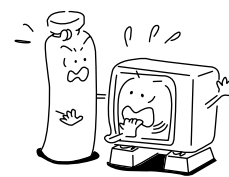
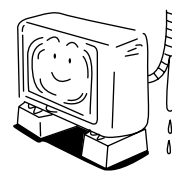
## CAUTION

### CAUTIONS ABOUT INSTALLATION

- Certainly lay the drain hose for perfect draining. Bad drainage may cause flooding in the house and getting furniture wet.
- Make sure to connect the air conditioner to an exclusive AC outlet of the rated voltage, otherwise the unit may break down or cause a fire.
- Do not install the unit in a place where inflammable gas may leak. If inflammable gas accumulates around the unit, it may cause a fire.

### CAUTIONS ABOUT OPERATION

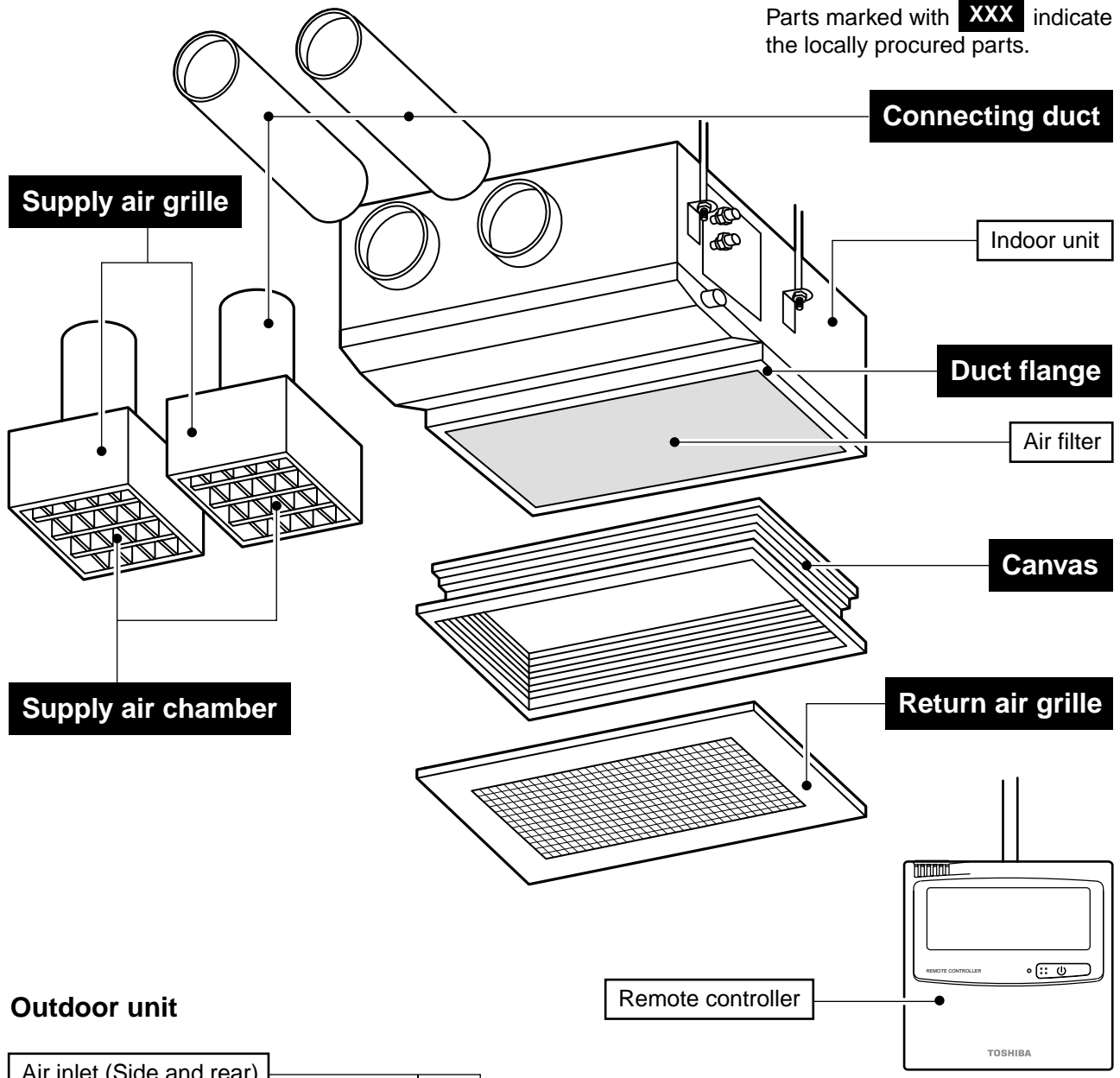
- Carefully read this manual before starting the air conditioner. There are many important things to keep in mind for daily operation.
- Do not use this air conditioner for special purposes such as preserving food, precision instruments, art objects, breeding animals, growing potted plants, etc.
- Avoid exposing potted plants and animals to the wind of the air conditioner, since it badly affects the health and growth of them.
- When the air conditioner is operated with a combustion appliance in the same place, be careful of ventilation to let fresh air enter the room. Poor ventilation causes oxygen shortage.
- When the air conditioner is used in a closed room, be careful of sufficient ventilation of the room. Poor ventilation causes oxygen shortage.
- Do not touch any switches with wet finger, otherwise you may get an electric shock.
- Do not place any combustion appliance in a place where it is directly exposed to the wind of air conditioner, otherwise it may cause imperfect combustion.
- If the air conditioner won't be used for a considerably long time, turn off the main switch or the circuit breaker, for safety. Disconnect from the power supply prevents the unit from lightning and power supply surge.
- Check the concrete blocks, etc. of the base of the outdoor unit occasionally. If the base is left damaged or deteriorated, the unit may topple over and inflict an injury to a person as the worst case.
- When cleaning the unit, make sure to turn off the main switch or the circuit breaker beforehand for preventing you from getting injured by the electric fan running inside. For details of cleaning method, refer to "Maintenance" on page 9.
- Do not put anything on the outdoor unit nor step onto it. If you do so, it may not only topple over the unit but also injure yourself.
- To make the air conditioner operate in its original performance, operate it within the range of the operating temperature specified in the instructions. Otherwise it may cause a malfunction, or water leak from the unit.
- Prevent any liquid from falling into the remote controller. Do not spill juice, water or any kind of liquid.



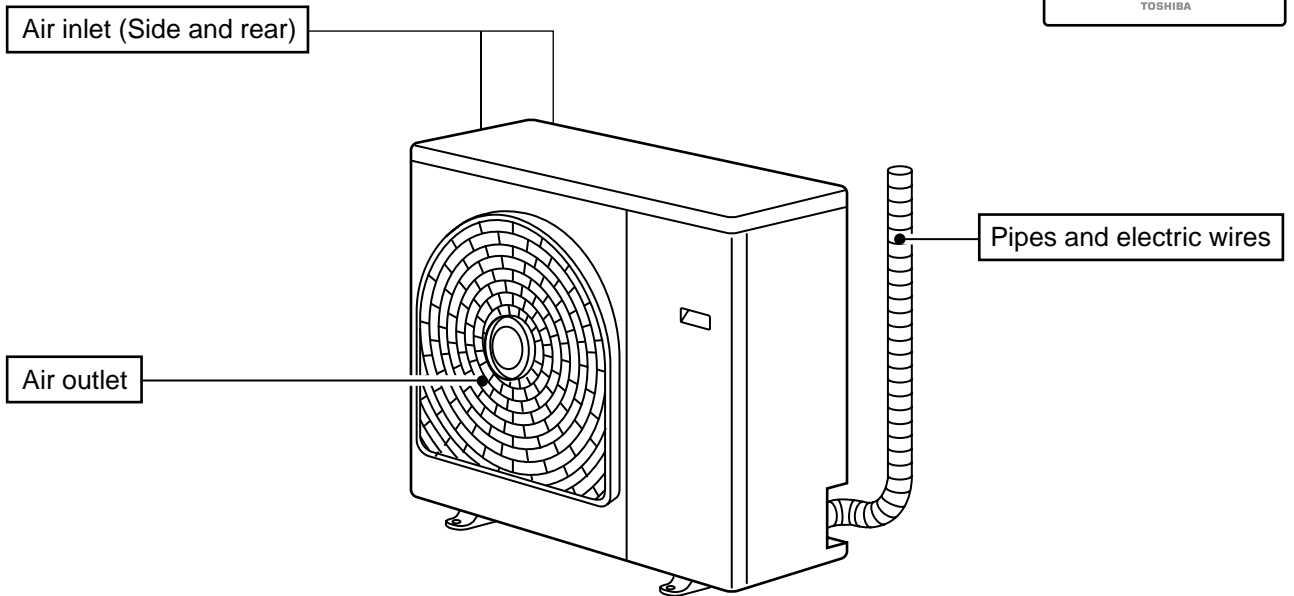
# PARTS NAME

## Indoor unit

**NOTE :**  
Parts marked with **XXX** indicate the locally procured parts.



## Outdoor unit



RAV-SM560BT-E  
RAV-SM800BT-E

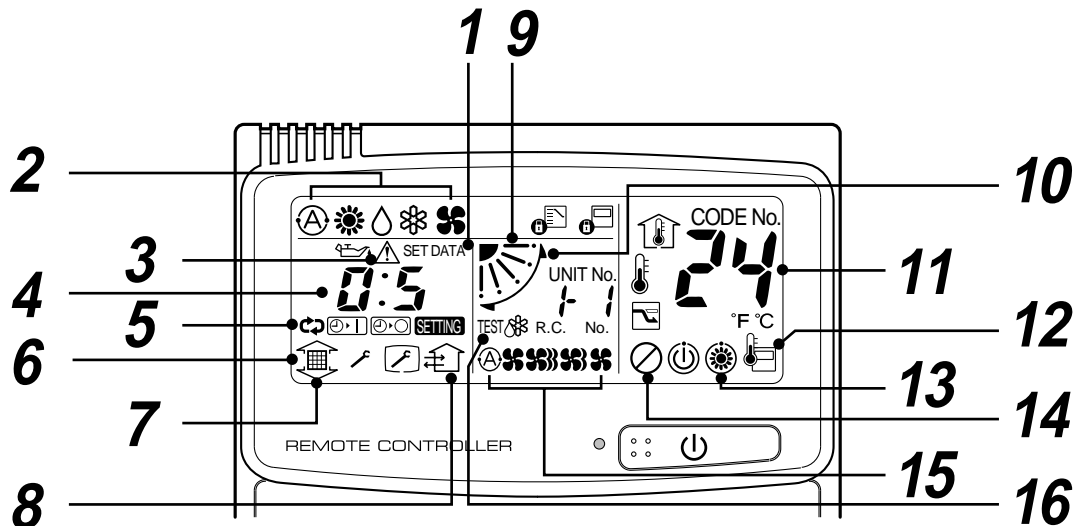
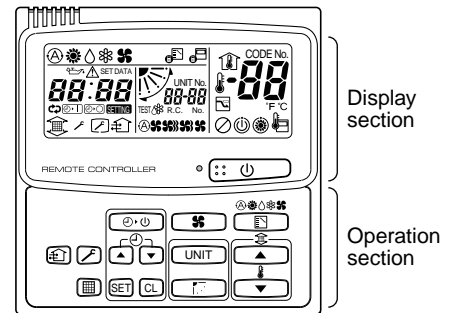
# PARTS NAME OF REMOTE CONTROLLER

## Display section

All display items are shown in right figure for the explanation.

Only selected contents are displayed in actual operation.

- When turning on the leakage breaker at the first time, [SET DATA] flashes on the display part of the remote controller. While this display is flashing, the model is being automatically confirmed. Accordingly, wait for a while after [SET DATA] display has disappeared, and then use the remote controller.



### 1 SET DATA display

Displayed during setup a timer.

### 2 Operation mode display

The selected operation mode is displayed.

### 3 CHECK display

Displayed while the protective device works or a trouble occurs.

### 4 Timer time display

Set time by the timer is displayed.  
(When a trouble occurs, the check code is displayed.)

### 5 Timer SETIN setup display

When pushing the Timer SET button, the display of the timer is selected in order of [OFF] [ON] → [OFF] repeat OFF timer → [ON]  
[ON] → No display.

### 6 Filter display

If "FILTER" is displayed, clean the air filter.

### 7 UP/DOWN grille display

### 8 Ventilator operation display

### 9 Flap position display

### 10 SWING display

Displayed during up/down movement of the flap.

### 11 Set up temperature display

The selected set up temp. is displayed.

### 12 Remote controller sensor display

Displayed while the sensor of the remote controller is working.

### 13 PRE-HEAT display

Displayed when the heating operation starts or defrost operation is carried out.





While this indication is displayed, the indoor fan stops or the mode changes in LOW.

### 14 No function display

Displayed if there is no function even if the button is pushed.

### 15 Fan mode display

The selected fan mode is displayed.

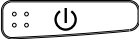
(AUTO)   
(HIGH)   
(MED.)   
(LOW) 

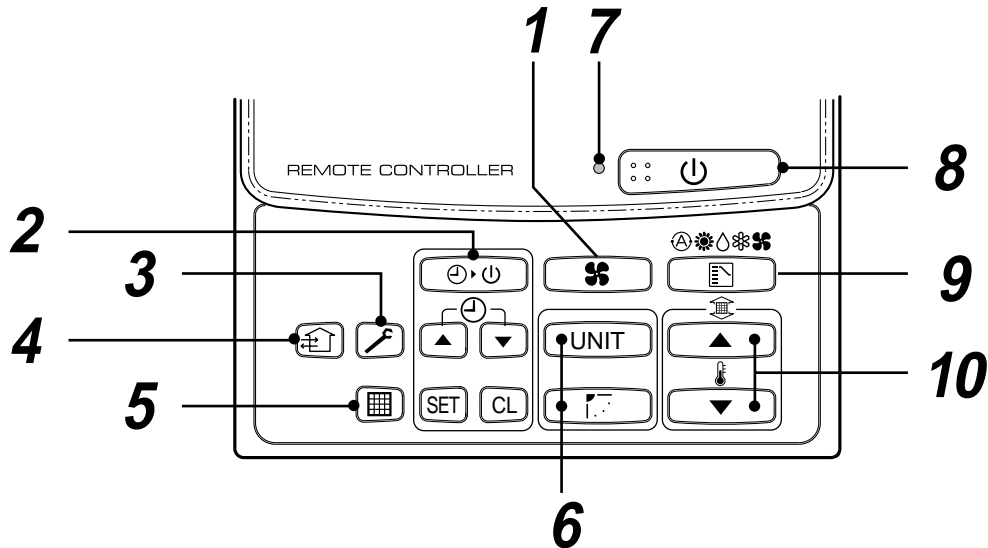
### 16 TEST run display

Displayed during a test run.

## Operation section

Push each button to select a desired operation.

- The details of the operation needs to be set up once, the same states are used by pushing  button.



### 1 Fan mode button

Selects a fan mode.

### 2 Timer set button

TIMER SET button is used when the timer is set up.

### 3 Check button

CHECK button is used for check operation. During normal operation, do not use this button.

### 4 Fan button

FAN button is used when a fan which is sold on the market or etc. is connected.

- If "No function" is displayed on the remote controller when pushing the FAN button, a fan is not connected.

### 5 Filter reset button

Resets (Erases) "FILTER 

### 6 UNIT and AUTO flap button

No function

### 7 Operation lamp

Lamp is lit during the operation. Lamp is off when stopped.

It flashes when operating a protection device or abnormal occurred.

### 8 button

When the button is pushed, operation starts, and it stops by pushing the button again.

When the operation stops, the operation lamp and all displays disappear.

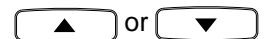
### 9 Operation select button

Selects operation mode.

### 10 Set up temperature button

Adjusts required room temperature.

Set required set temperature by pushing



### FILTER UP/DOWN button

(No function display)

### OPTION :

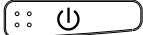
#### Remote controller sensor

Usually the TEMP. sensor of the indoor unit measures a temperature. A temperature around the remote controller can also be measured.

For details, contact the dealer from which you have purchased the air conditioner.



# CORRECT USAGE


When you use the air conditioner for the first time or when you change SET DATA value, follow the procedure below. From the next time, the operation will start as set state by pushing the  button.

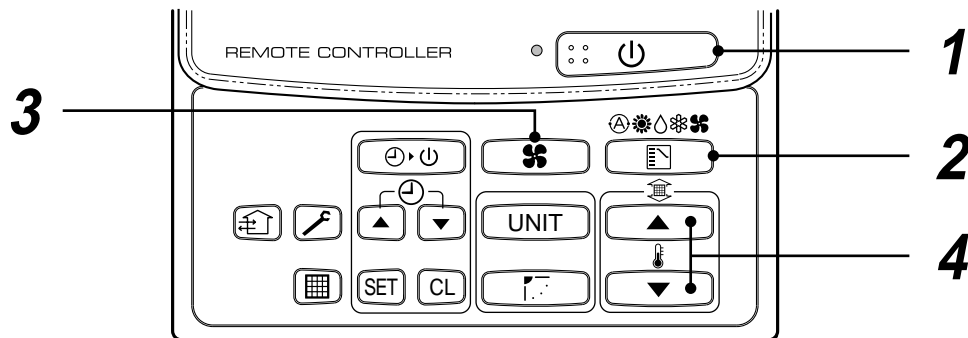
## Preparation

**Turn on the main power switch and/or the leakage breaker.**

- When the power supply is turned on, display section is displayed on the remote controller.
- \* After the power supply is turned on, the remote controller does not accept an operation for approx. 1 minute, but it is not a failure.

### REQUIREMENT

- While using the air conditioner, operate it only with  button without turning off the main power switch and the leakage breaker.
- When starting the operation after stop for a long time, turn on the main power switch for 12 hours or more before start. (This is required to turn on the compressor case heater for warming in order to prevent overload on the compressor when activating the outdoor unit.)

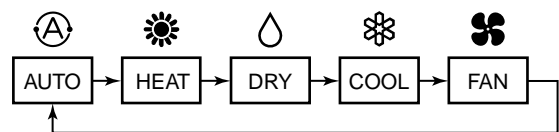




### 1 Push button.

The operation lamp goes on, and the operation starts.

### 2 Select an operation mode with the “MODE” button.

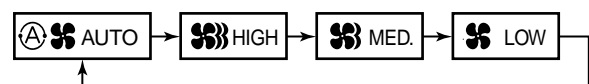
One push of the button, in each time the display changes in the order shown on the right.









- In HEAT  mode, if the room temperature reaches to the set temperature, the outdoor unit stops and the air flow becomes LOW and the air volume decreases.
- In the defrost mode, the fan stops so that cool air is not discharged and PRE-DEF  is displayed.

### 3 Select air volume with “FAN ” button.


One push of the button, in each time the display changes in the order shown on the right.



- When air volume is “AUTO ”, air volume differs according to the room temperature.
- In DRY  mode, “AUTO ” is displayed and the air volume is LOW.
- In heating operation, if the room temperature is not heated sufficiently with fan mode “LOW ” operation, select “MED. ” or “HIGH ” operation.


### 4 Determine the set up temperature by pushing the “TEMP. ” or “TEMP. ” button.

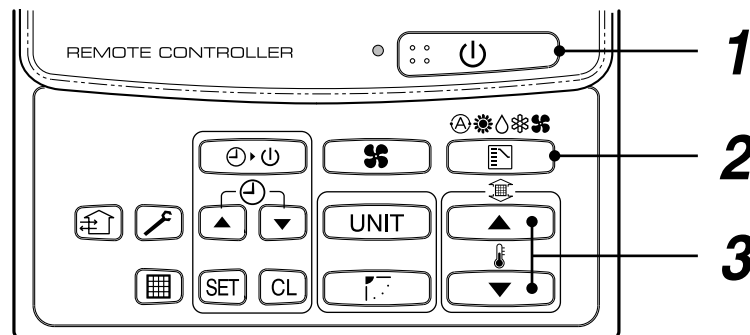
## Stop

Push  button.


The operation lamp goes off, and the operation stops.

## AUTOMATIC OPERATION (Auto Changeover)

When you set the air conditioner in  mode or switch over from AUTO operation, it will automatically select either cooling, heating, or fan only operation depending on the indoor room temperature.



## Start

**1**  button



Push this button to start the air conditioner.

**2** Mode select button (MODE)

Select Auto.

**3** Temperature button

Set the desired temperature.

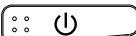
- In case of cooling, start the operation after approx. 1 minute.
- In case of heating, starts the operation after approximately 3 to 5 minutes.
- When you select the Auto mode, it is unnecessary to set the fan speed. The fan speed display will show  and fan speed will be automatically controlled.
- After heating operation stops, FAN operation may continue for approx. 30 seconds.
- When the room temperature reaches the set temperature and the outdoor unit stops, the LOW wind is discharged and the air volume decreases excessively. During defrost operation, the fan stops so that cool air is not discharged and  is displayed.
- If the Auto mode is uncomfortable, you can select the desired conditions manually.

### NOTE

#### When restarting the operation after stop

- When restarting the operation immediately after stop, the air conditioner does not operate for approx. 3 minutes to protect a compressor.

## Stop

Push  button.

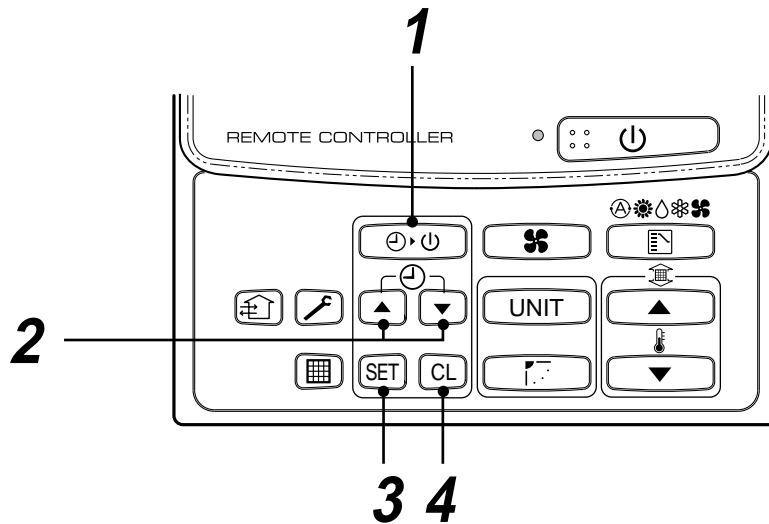
Push this button again to stop the air conditioner.

# TIMER OPERATION

A type of timer operation can be selected from the following three types.

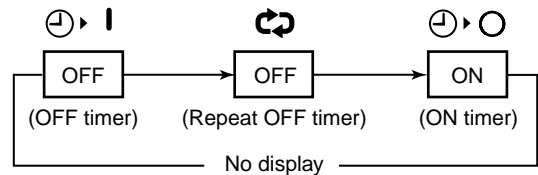
- OFF timer : The operation stops after the set time has passed.
- Repeat OFF timer : Every time, the operation stops after the set time has passed.
- ON timer : The operation starts after the set time has passed.

## Timer operation



### 1 Push TIMER SET button.

- The timer display (type) changes every push of the button.
- SET TIME and , , display flashes.



### 2 Push to select "SET TIME".

- For every push of button, the set time increases in the unit of 0.5 hr (30 minutes). The maximum set time is 72.0 hr.
- For every push of button, the set time decreases in the unit of 0.5 hr (30 minutes). The minimum set time is 0.5 hr.

### 3 Push SET button.

- SET TIME display disappears and timer time display goes on.
- (When ON timer is activated, timer time are displayed, ON timer and SETTING other displays are disappear.)

## Clear of timer operation

### 4 Push CL button.

- TIMER display disappears.

### NOTICE

- Once set "Repeat OFF timer" resumes. So start again, stop by same timer.
- For cancel timer, push button..

## HINTS FOR ECONOMICAL OPERATION

### Maintain room temperature at comfortable level

#### Clean air filters

Airflow and performance are reduced if the air filters become blocked.

Clean them every 2 weeks.

#### Do not open doors and windows more often than necessary

To keep cool or warm air in the room, do not open doors and windows more often than necessary.

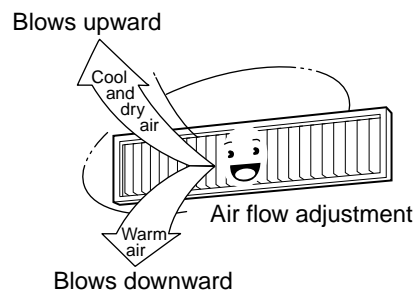
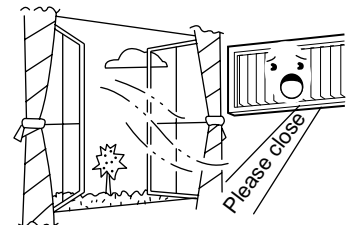
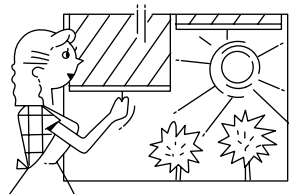
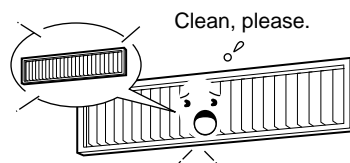
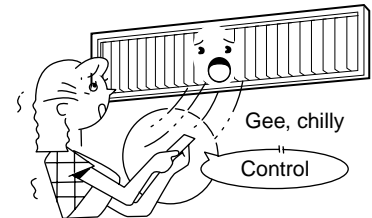
#### Window curtains

In cooling, close the curtains to avoid direct sunlight.

In heating, close the curtains to keep the heat in.

#### Get uniform circulation of room air

Adjust the air flow direction for the even circulation of room air.

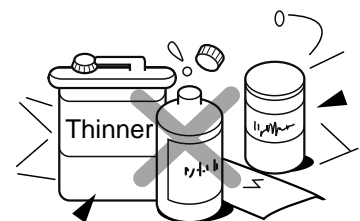


## MAINTENANCE

### Cleaning of remote controller

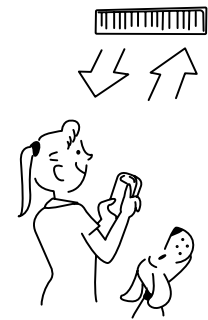
#### CAUTION

- Use a dry cloth to wipe the remote controller.
- A cloth dampened with cold water may be used on the indoor unit if it is very dirty.
- Never use a damp cloth on the remote controller.
- Do not use a chemically-treated duster for wiping or leave such materials on the unit for long. It may damage or fade the surface of the unit.
- Do not use benzine, thinner, polishing powder, or similar solvents for cleaning. These may cause the plastic surface to crack or deform.



### If you do not plan to use the unit for more than 1 month

- (1) Operate the fan for 3 to 4 hours to dry inside the unit  
Operate "FAN ONLY" mode with set temperature 30°C.
- (2) Stop the air conditioner and turn off the main power switch or the circuit breaker.



FAN ONLY operation

### Checks before operation

- (1) Check that the air filters are installed.
- (2) Check that the air outlet or inlet is not blocked.
- (3) Turn on the main power switch or the circuit breaker for the mains AC outlet to turn on the air conditioner.

### WARNING

Make sure to ask the qualified maintenance professional for cleaning.  
Turn off the main power supply switch or breaker before the unit maintenance.

### Cleaning of Return grille

#### Preparation :

1. Turn off the air conditioner by the remote controller.
2. Dismount the Return grille.

#### Clean the Return grilles with water:

- Wipe down the Return grille with a sponge or towel moistened with a kitchen detergent.  
(Do not use any metallic brush for cleaning.)
- **Carefully rinse the Return grille to wash out the detergent.**
- **After rinsing the Return grille with water, dry it in the shade.**

### CAUTION

- Do not start the air conditioner while leaving the return grille removed.

### Cleaning of Air Filters

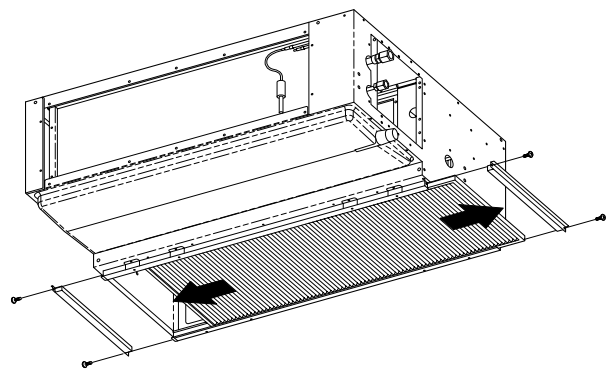
- Recommended cleaning intervals : Every two weeks.
- If the air filters are not cleared, it not only impairs the cooling performance of air conditioner but causes a failure in the air conditioner such as water drops.

#### Preparation :

1. Turn off the air conditioner by the remote controller.
2. Dismount the Return grille.

#### Use a vacuum cleaner to remove dust from the filters or wash them with water.

- After rinsing the air filters with water, dry them in the shade.
- Set the air filter into the air conditioner.



### NOTE

For Air conditioning system which is operated regularly, cleaning and maintenance of the indoor/outdoor units are strongly recommended.  
As a general rule, if an indoor unit is operated for about 8 hours daily, the indoor/outdoor units will need to be cleaned at least once every 3-MONTH. This cleaning and maintenance shall be carried out by a qualified person.  
Failure to clean the indoor/outdoor units regularly will result in poor performance, icing, water leaking and even compressor failure.

# AIR CONDITIONER OPERATIONS AND PERFORMANCE

## 3 minutes protection function

3-minutes protection function prevents the air conditioner from starting for initial 3 minutes after the main power switch/circuit breaker is turned on for re-starting the air conditioner.

## Power failure

Power failure during operation will stop the unit completely.

- To restart the operation, push the START/STOP button on the remote controller.
- Lightning or a wireless car telephone operating nearby may cause the unit to malfunction. Turn off the main power switch or circuit breaker and then turn them on again. Push the START/STOP button on the remote controller to restart.

## Heating characteristics

### Preheating operation

The air conditioner will not deliver warm air immediately after it is turned on. Warm air will start to flow out after approximately 5 minutes when the indoor heat exchanger warmed up.

### Warm air control (In heating operation)

When the room temperature reaches the set temperature, the fan speed is automatically reduced to prevent to blow cold draft. At this time, the outdoor unit will stop.

## Defrosting operation

If the outdoor unit is frosted during the heating operation, defrosting starts automatically (for approximately 2 to 10 minutes) to maintain the heating capacity.

- The fans in both indoor and outdoor units will stop during the defrosting operation.
- During the defrosting operation, the defrosted water will be drained from the bottom plate of the outdoor unit.

## Heating capacity

In the heating operation, the heat is absorbed from the outside and brought into the room. This way of heating is called heat pump system. When the outside temperature is too low, it is recommended to use another heating apparatus in combination with the air conditioner.

## Attention to snowfall and freeze on the outdoor unit

- In snowy areas, the air inlet and air outlet of the outdoor unit are often covered with snow or frozen up. If snow or freeze on the outdoor unit is left as it is, it may cause machine failure or poor warming.
- In cold areas, pay attention to the drain hose so that it perfectly drains water without water remaining inside for freeze prevention. If water freezes in the drain hose or inside the outdoor unit, it may cause machine failure or poor warming.

## Air conditioner operating conditions

For proper performance, operate the air conditioner under the following temperature conditions:

Cooling operation	Outdoor temperature : -5°C to 43°C
	Room temperature : 21°C to 32°C (Dry valve temp.), 15°C to 24°C (Wet valve temp.)
	<b>CAUTION</b> Room relative humidity – less than 80 %. If the air conditioner operates in excess of this figure, the surface of the air conditioner may cause dewing.
Dry operation	Outdoor temperature : 15°C to 43°C (Maximum suction air temp. 46°C)
	Room temperature : 17°C to 32°C
Heating operation	Outdoor temperature : -15°C to 15°C (Wet valve temp.)
	Room temperature : 15°C to 28°C (Dry valve temp.)

If air conditioner is used outside of the above conditions, safety protection may work.

## RE-INSTALLATION

### DANGER

Ask the dealer or an installation professional to re-install the air conditioner to a new place or move it to another place and to observe the following items.

If the air conditioner is inappropriately installed by yourself, it may cause electric shock or fire.

### Do not install the air conditioner in the following places

- Do not install the air conditioner in any place within 1 m from a TV, stereo, or radio set. If the unit is installed in such place, noise transmitted from the air conditioner affects the operation of these appliances.
- Do not install the air conditioner near a high frequency appliance (sewing machine or massager for business use, etc.), otherwise the air conditioner may malfunction.
- Do not install the air conditioner in a humid or oily place, or in a place where steam, soot, or corrosive gas is generated.
- Do not install the air conditioner in a salty place such as seaside area.
- Do not install the air conditioner in a place where a great deal of machine oil is used.
- Do not install the air conditioner in a place where it is usually exposed to strong wind such as in seaside area or on the roof or upper floor of a building.
- Do not install the air conditioner in a place where sulfurous gas generated such as in a spa.
- Do not install the air conditioner in a vessel or mobile crane.

### Be careful with noise or vibrations

- Do not install the air conditioner in a place where noise by outdoor unit or hot air from its air outlet annoys your neighbors.
- Install the air conditioner on a solid and stable foundation so that it prevents transmission of resonating, operation noise and vibration.
- If one indoor unit is operating, some sound may be audible from other indoor units that are not operating.



## TROUBLES AND CAUSES

### CAUTION

If any of the following conditions occur, turn off the main power supply switch and immediately contact the dealer :

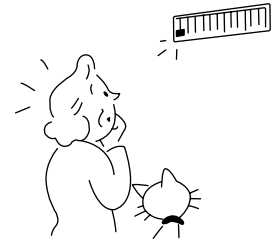
- The operation lamps flash at short intervals (5 Hz) even though you have tried turning off the power supply and turning on again after 2 or 3 minutes.
- Switch operation does not work properly.
- The main power fuse often blows out, or the circuit breaker is often activated.
- A foreign matter or water fall inside the air conditioner.
- Any other unusual conditions are observed.

**Before you ask for servicing or repairs, check the following points.**

Recheck

**Inoperative**

- The main power switch is turned off.
- The circuit breaker is activated to cut off power supply.
- The main power fuse has blown out.
- Stoppage of electric current.



**Does not cool well or heat well**

- The air inlet and/or outlet of the outdoor unit is blocked.
- Doors or windows are opened.
- The fan speed is set to low.
- The air conditioner is set in the DRY mode.
- The set temperature is too high. (In cooling operation)
- The set temperature is too low. (In heating operation)



These are not failures.

**Indoor unit or outdoor unit makes a strange noise.**

- When the temperature suddenly changes, the indoor or outdoor unit occasionally makes a strange noise because of changing of refrigerant flow or expansion work.

**The room air is smelly or a bad odor comes from the air conditioner.**

- Smells impregnated in the walls, carpets, furniture, clothing, or furs, come out from the air conditioner.

**Outdoor unit is frosted in heating operation.**

**Water drains from outdoor unit.**

- The outdoor unit is sometimes frosted in heating operation.  
In that case, the unit automatically performs defrosting (for 2 to 10 minutes) for increasing the heating efficiency.
- In defrosting operation, both the indoor and outdoor units stop air flow.
- Hiss sound is heard when flow of the refrigerant is changed for defrosting.
- Resultant water of automatic defrosting in heating operation drains from outdoor unit.

**Air flow changes without FAN button set to AUTO mode.**

- When the temperature of blown air drops in heating operation, the air conditioner automatically changes or stops air flow from the indoor unit not to make persons in the room feel chilly.
- Air flow of the indoor unit is occasionally changed in the cooling operation.

**A white mist of chilled air or water is generated from the outdoor unit.**



- The indoor unit in cooling operation or the outdoor unit in defrosting operation occasionally cause steams.





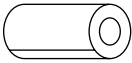
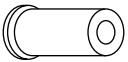
## TROUBLES AND CAUSES (Concerning Remote Controller)

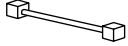
Before you ask for servicing or repairs, check the following points:

Setting Change is Impossible		
Symptoms	Causes	Reason and Disposal
The fan speed can not be changed.	<ul style="list-style-type: none"> <li>Check whether the MODE indicated on the display is "AUTO".</li> </ul> <p style="text-align: center;"><b>AUTO</b> </p>	When the automatic mode is selected, the air conditioner automatically selects the fan speed.
	<ul style="list-style-type: none"> <li>Check whether the MODE indicated on the display is "DRY".</li> </ul> <p style="text-align: center;"><b>(DRY)</b> </p>	When dry operation is selected, the air conditioner automatically selects the fan speed.


# Accessory parts and Parts to be procured locally

## ☐ Accessory parts

Part name	Q'ty	Shape
Pipe insulator	2	
Drain hose socket for drain pipe connection	1	

Part name	Q'ty	Shape
Connecting cable for High static pressure tap	1	
Installation Manual	1	
Owner's Manual	1	

## <Separate sold parts>

Part name	Q'ty	Shape
Standard wired remote controller	1	

## ☐ Parts to be procured locally

<p>Connecting pipe (Liquid side)                      (6.35mm (diam.), Nominal (diam.) 1/4" thick 0.8mm)                      RAV-SM800BT-E, RAV-SM560AT-E</p> <p>(9.52mm (diam.), Nominal (diam.) 3/8" thick 0.8mm)                      RAV-SM560BT-E, RAV-SM800AT-E</p>
<p>Connecting pipe (Gas side)                      (12.7mm (diam.), Nominal (diam.) 1/2" thick 0.8mm)                      RAV-SM560BT-E, RAV-SM560AT-E</p> <p>(15.9mm (diam.), Nominal (diam.) 5/8" thick 1.0mm)                      RAV-SM800BT-E, RAV-SM800AT-E</p>
<p>Power supply cord                      2.5mm<sup>2</sup> (H07RN-F or 245IEC66) or 3.5mm<sup>2</sup> (AWG-12)</p>

<p>Connecting cable                      H07RN-F or 245IEC66 (1.5mm<sup>2</sup> or more)</p>
<p>Thermal insulation for refrigerant pipe                      (10mm or more, thermal insulating foam polyethylene)</p>
<p>Thermal insulation for drain pipe                      (10mm or more, foam polyethylene)</p>
<p>Drain pipe (Outer 26mm (diam.))</p>
<p>Tapes</p>
<p>Grounding cable (2.0mm (diam.) or more)</p>

RAV-SM560BT-E  
 RAV-SM800BT-E

# 1 PRECAUTIONS FOR SAFETY

- Ensure that all Local, National and International regulations are satisfied.
- Read this "PRECAUTIONS FOR SAFETY" carefully before Installation.
- The precautions described below include the important items regarding safety. Observe them without fail.
- After the installation work, perform a trial operation to check for any problem.  
Follow the Owner's Manual to explain how to use and maintain the unit to the customer.
- Turn off the main power supply switch (or breaker) before the unit maintenance.
- Ask the customer to keep the Installation Manual together with the Owner's Manual.

## CAUTION

### New Refrigerant Air Conditioner Installation

- **THIS AIR CONDITIONER ADOPTS THE NEW HFC REFRIGERANT (R410A) WHICH DOES NOT DESTROY OZONE LAYER.**

The characteristics of R410A refrigerant are ; easy to absorb water, oxidizing membrane or oil, and its pressure is approx. 1.6 times higher than that of refrigerant R22. Accompanied with the new refrigerant, refrigerating oil has also been changed. Therefore, during installation work, be sure that water, dust, former refrigerant, or refrigerating oil does not enter the refrigerating cycle.

To prevent charging an incorrect refrigerant and refrigerating oil, the sizes of connecting sections of charging port of the main unit and installation tools are changed from those for the conventional refrigerant.


Accordingly the exclusive tools are required for the new refrigerant (R410A).

For connecting pipes, use new and clean piping designed for R410A, and please care so that water or dust does not enter. Moreover, do not use the existing piping because there are problems with pressure-resistance force and impurity in it.

## CAUTION

### To Disconnect the Appliance from Main Power Supply.

This appliance must be connected to the main power supply by means of a switch with a contact separation of at least 3 mm.

**The installation fuse (25A D type  ) must be used for the power supply line of this conditioner.**

## ⚠ WARNINGS

- **Ask an authorized dealer or qualified installation professional to install/maintain the air conditioner.**  
Inappropriate installation may result in water leakage, electric shock or fire.
- **Turn off the main power supply switch or breaker before attempting any electrical work.**  
Make sure all power switches are off. Failure to do so may cause electric shock.
- **Connect the connecting cable correctly.**  
If the connecting cable is connected in a wrong way, electric parts may be damaged.
- **When moving the air conditioner for the installation into another place, be very careful not to enter any gaseous matter other than the specified refrigerant into the refrigeration cycle.**  
If air or any other gas is mixed in the refrigerant, the gas pressure in the refrigeration cycle becomes abnormally high and it may resultingly causes pipe burst and injuries on persons.
- **Do not modify this unit by removing any of the safety guards or by by-passing any of the safety interlock switches.**
- **Exposure of unit to water or other moisture before installation may cause a short-circuit of electrical parts.**  
Do not store it in a wet basement or expose to rain or water.

# 1 PRECAUTIONS FOR SAFETY

- **After unpacking the unit, examine it carefully if there are possible damage.**
- **Do not install in a place that might increase the vibration of the unit.**
- **To avoid personal injury (with sharp edges), be careful when handling parts.**
- **Perform installation work properly according to the Installation Manual.**  
Inappropriate installation may result in water leakage, electric shock or fire.
- **When the air conditioner is installed in a small room, provide appropriate measures to ensure that the concentration of refrigerant leakage occur in the room does not exceed the critical level.**
- **Install the air conditioner securely in a location where the base can sustain the weight adequately.**
- **Perform the specified installation work to guard against an earthquake.**  
If the air conditioner is not installed appropriately, accidents may occur due to the falling unit.
- **If refrigerant gas has leaked during the installation work, ventilate the room immediately.**  
If the leaked refrigerant gas comes in contact with fire, noxious gas may generate.
- **After the installation work, confirm that refrigerant gas does not leak.**  
If refrigerant gas leaks into the room and flows near a fire source, such as a cooking range, noxious gas might generate.
- **Electrical work must be performed by a qualified electrician in accordance with the Installation Manual. Make sure the air conditioner uses an exclusive power supply.**  
An insufficient power supply capacity or inappropriate installation may cause fire.
- **Use the specified cables for wiring connect the terminals securely fix. To prevent external forces applied to the terminals from affecting the terminals.**
- **Be sure to provide grounding.**  
Do not connect ground wires to gas pipes, water pipes, lightning rods or ground wires for telephone cables.
- **Conform to the regulations of the local electric company when wiring the power supply.**  
Inappropriate grounding may cause electric shock.
- **Do not install the air conditioner in a location subject to a risk of exposure to a combustible gas.**  
If a combustible gas leaks, and stays around the unit, a fire may occur.

# 2 SELECTION OF INSTALLATION PLACE

## ⚠ WARNING

- **Install the air conditioner at enough strong place to withstand the weight of the unit.**  
If the strength is not enough, the unit may fall down resulting in injury.
- **Install the air conditioner at a height 2.5m or more from the floor.**  
If you insert your hands or others directly into the unit while the air conditioner operates, it is dangerous because you may contact with revolving fan or active electricity.

## ⚠ CAUTION

- **Do not install the air conditioner in a location subject to a risk of exposure to a combustible gas.**  
If a combustible gas leaks and stays around the unit, a fire may occur.

**Upon approval of the customer, install the air conditioner in a place that satisfies the following conditions.**

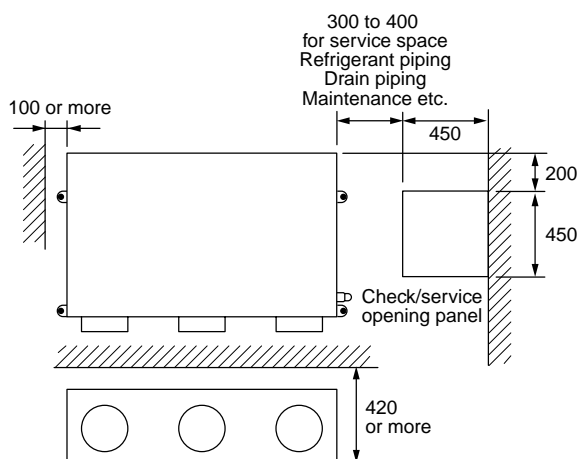
- Place where the unit can be installed horizontally.
- Place where a sufficient servicing space can be ensured for safety maintenance and check.
- Place where drained water will not cause any problem.

**Avoid installing in the following places.**

- Place exposed to air with high salt content (seaside area), or place exposed to large quantities of sulfide gas (hot spring). (Should the unit be used in these places, special protective measures are needed.)
- Place exposed to oil, vapor, oil smoke or corrosive gas.
- Place where organic solvent is used nearby.
- Place close to a machine generating high frequency.
- Place where the discharged air blows directly into the window of the neighboring house. (For outdoor unit)
- Place where noise of the outdoor unit is easily transmitted.  
(When installing the air conditioner on the boundary with the neighbor, pay due attention to the level of noise.)
- Place with poor ventilation. (Before air ducting work, check whether value of air volume, static pressure and duct resistance are correct.)

## Installation space

**Secure the space required to installation and servicing.**



## Selection of installation place

In case of continued operation of the indoor unit under high-humidity conditions as described below, dew may condense and water may drop.

Especially, high-humidity atmosphere (dew point temperature : 23°C or more) may generate dew inside the ceiling.

1. Unit is installed inside the ceiling with slated roof.
2. Unit is installed at a location using inside of the ceiling as fresh air take-in path.
3. Kitchen

If installing a unit at such place, adhere insulating material (glass wool, etc.) additionally over all the positions of the indoor unit which come to contact with high-humidity atmosphere.

## Advice

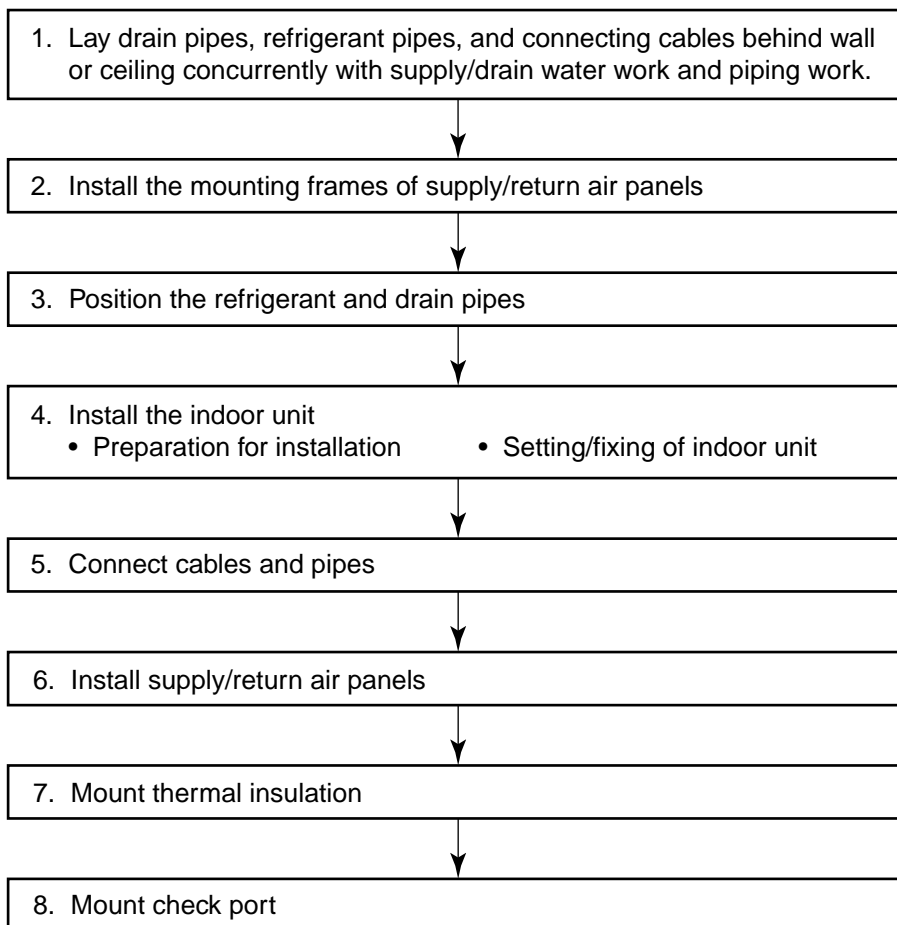
Set a check service opening panel at right side of the unit (size: 450 x 450mm) for piping, maintenance, and servicing.

# 3 INSTALLATION OF INDOOR UNIT

## WARNING

Install the air conditioner certainly at a place to sufficiently withstand the weight.  
If the strength is insufficient, the unit may fall down resulting in human injury.  
Perform a specified installation work to guard against an earthquake.  
An incomplete installation can cause accidents by the units falling and dropping.

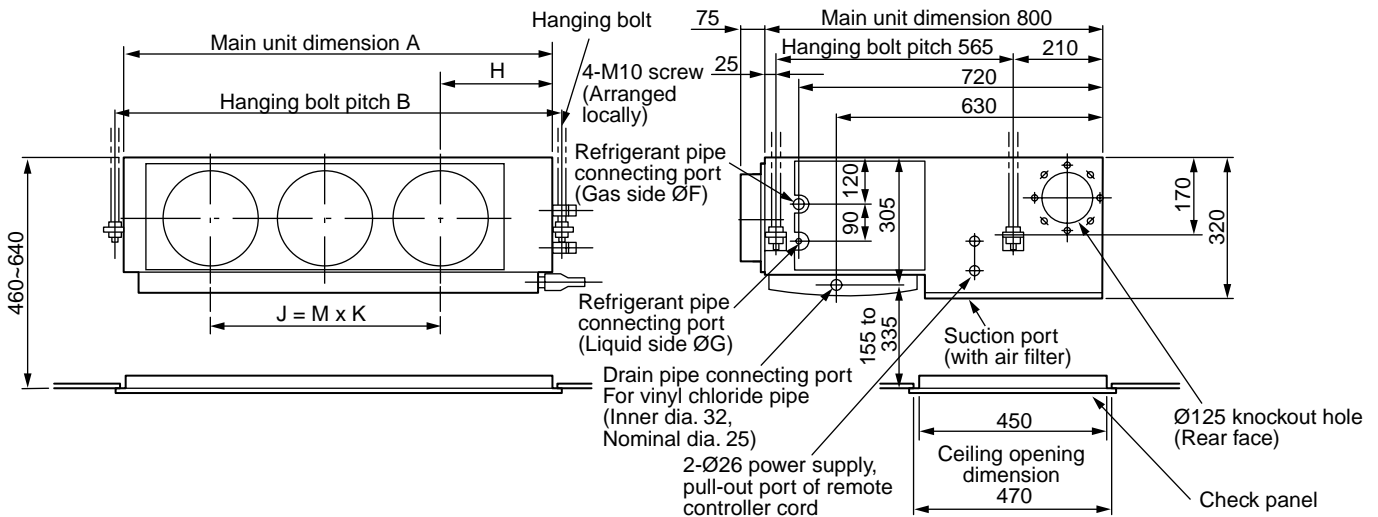
### Installation procedure



## External view

### REQUIREMENT

The hanging bolt pitch on horizontal direction (B) is not halved at center with the ceiling opening size. Therefore, check the relational position in the following figure.



### • Dimension

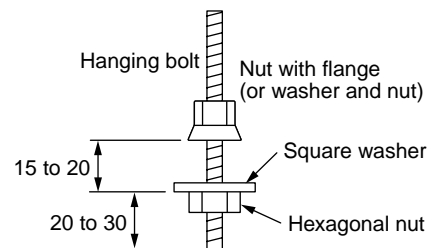
	A	B	F	G	H	J	K	M	N
RAV-SM560BT-E	700	750	12.7	6.4	252	280	280	1	2
RAV-SM800BT-E	1000	1050	15.9	9.5	252	580	290	2	3

### 1. Hanging down of indoor unit

Refer to installation figures of hanging material and hanging bolt.

- Adjustment of hanging bolt length and nut position

Adjust hanging bolt length and nut position as shown in the figure before hanging down the indoor unit.



#### NOTE :

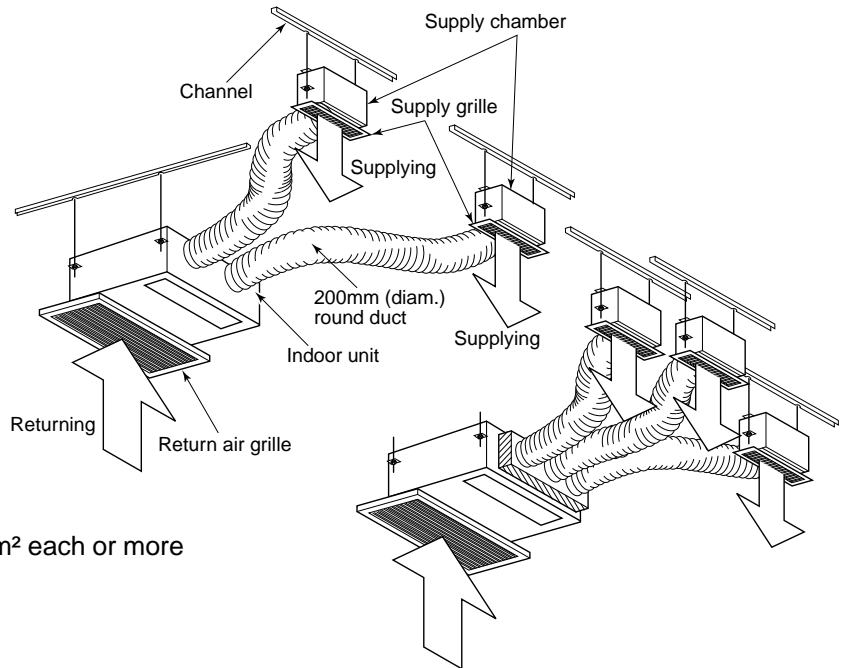
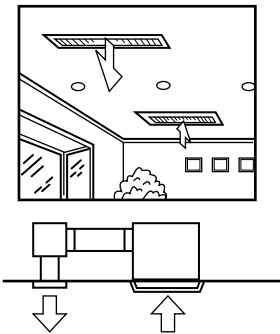
Be sure to set the indoor unit horizontally so as not to cause malfunction of the float switch or leakage of water.

Considering pipe/wire connecting work inside the ceiling after the indoor unit has been hanged, select an installation place and determine piping direction.

- If the ceiling has been already set, prepare refrigerant pipe, drain pipe, connecting wire, switch panel cord, etc. at the place where pipe and wire are connected before hanging the main unit.

# 3 INSTALLATION OF INDOOR UNIT

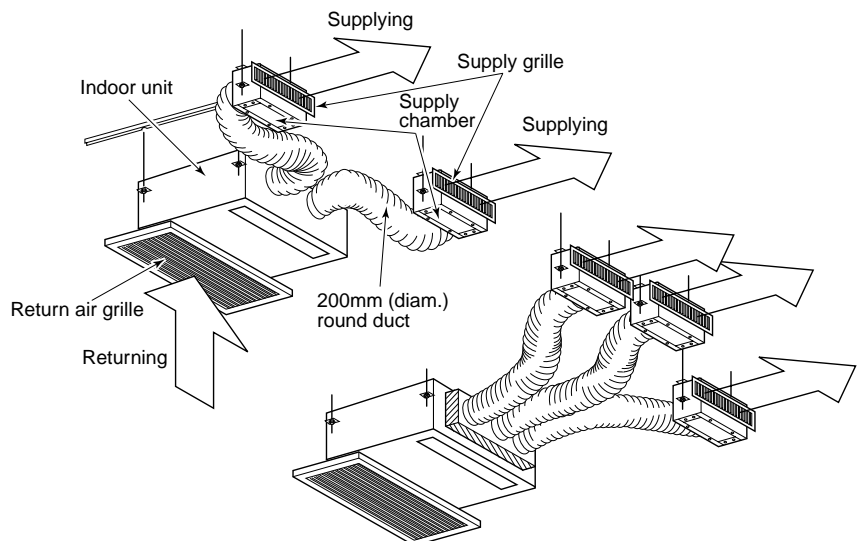
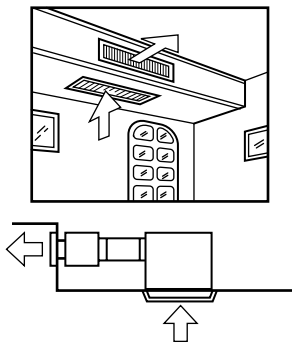
## Concealed duct type



**NOTE:**

- Recommended supplying grille size 400 cm<sup>2</sup> each or more

## Ledge ceiling concealed duct type



### Quality of supplying grilles

SM560BT-E	2
SM800BT-E	3

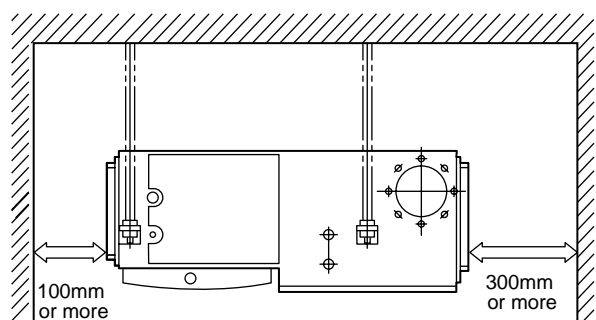
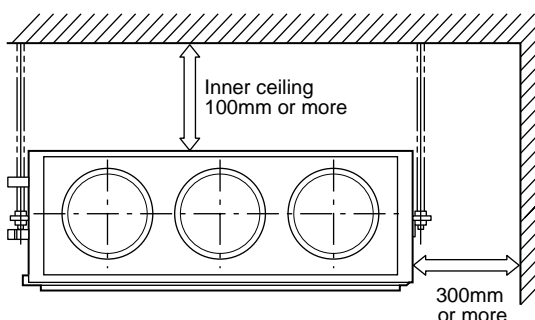
**NOTE:**

- Opening area of the return grille should be larger than the one for suction port (Air filter) of the indoor unit.

### Restriction to installation

#### 1. Installation clearance

- As shown in the figure, keep clearance around the indoor unit.





# 4 AIR DUCTING WORK

## Static pressure characteristics of each model

Fig. 1 RAV-SM560BT-E

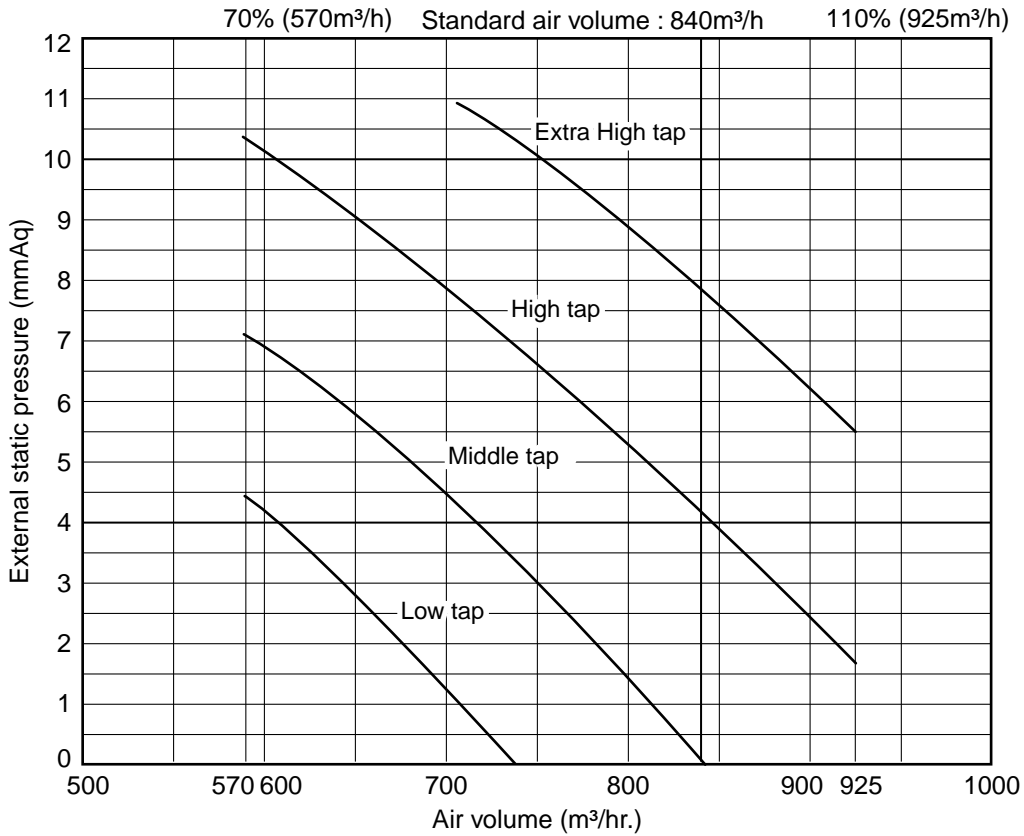
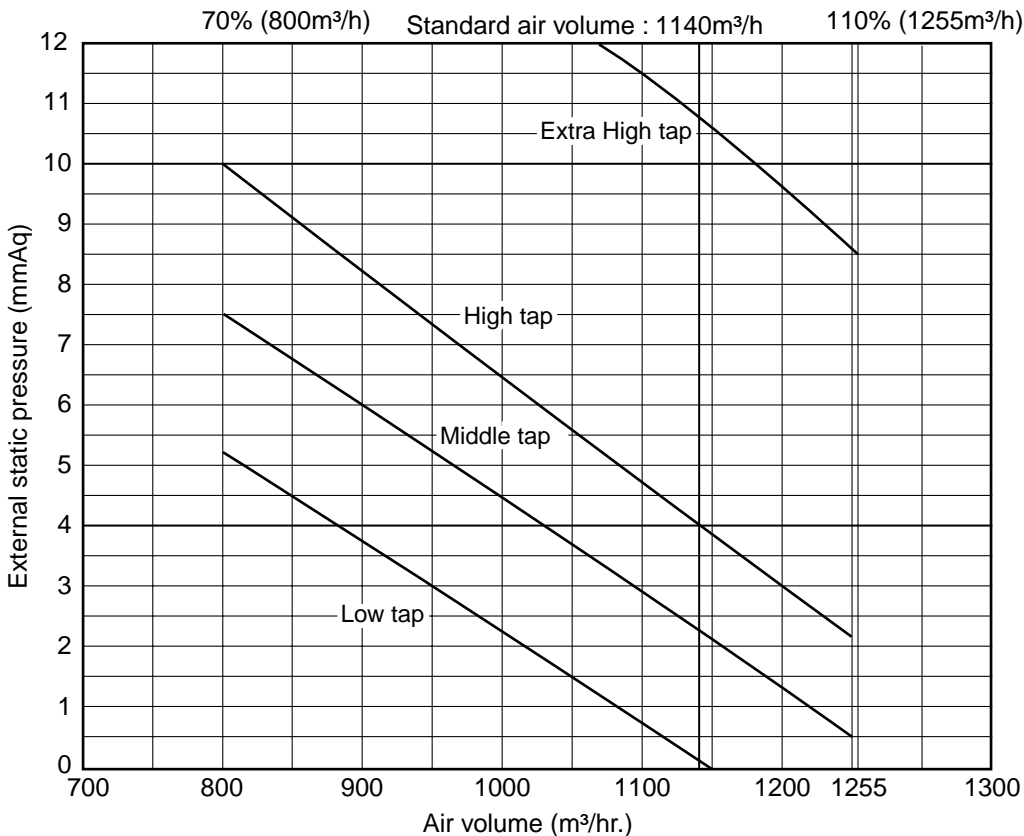


Fig. 2 RAV-SM800BT-E



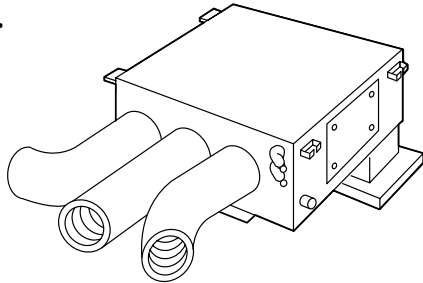
# 4 AIR DUCTING WORK

## Installation Reference

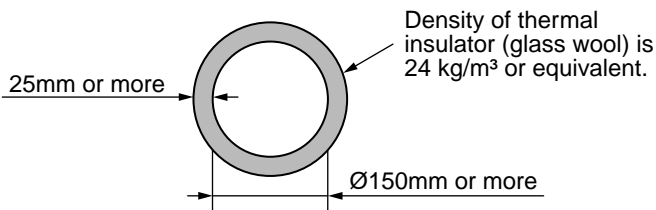
(exp. for RAV-SM800BT-E model)

The air supply ducting work is classified in two ways, one is branched by the round ducts, and the other is branched by the square ducts. (Be sure to divide the air supply duct into three or more branches.)

### <Round duct>

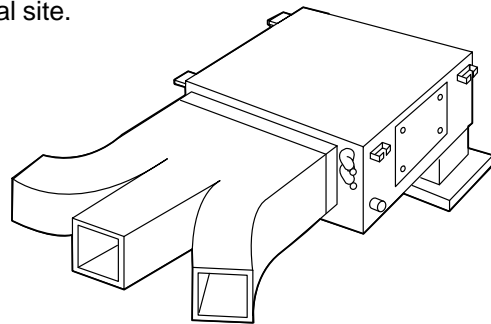


In case of the round duct, use the thermal insulator of thickness 25mm or more and inner diameter 150mm or more to the duct board. (If the inner diameter is not enough, resistance increase, as the result, air does not flow smoothly and loss of the static pressure increases.) For the thermal insulator, use high-density glass wool of 24kg/m<sup>3</sup> or equivalent.

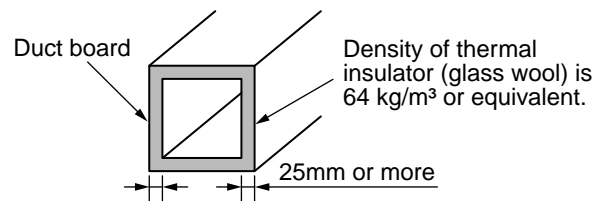


### <Square duct> (Reference for square duct)

When using the square duct, change the type of the air supply flange from round type to square flange at the local site.



In case of the square duct, apply the thermal insulator of thickness 25mm or more to the duct board. For the thermal insulator, use high-density glass wool of weight 64kg/m<sup>3</sup>.



## Connecting method of the duct

### 1. Supply air side

#### <Round duct>

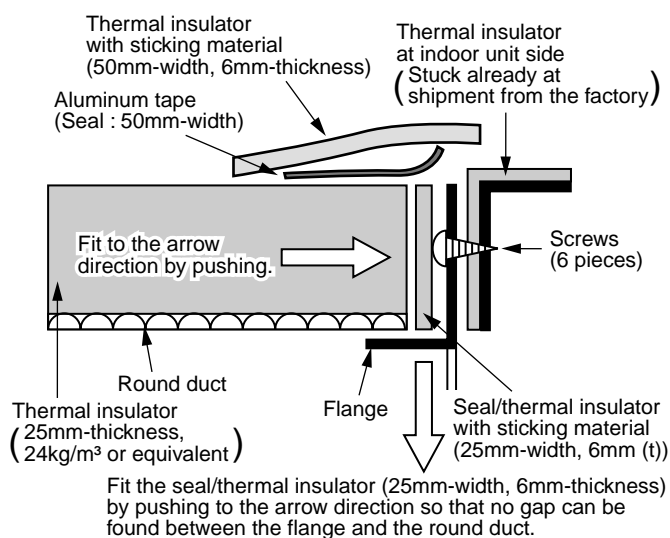


Fig. 2 (a)

#### <Square duct>

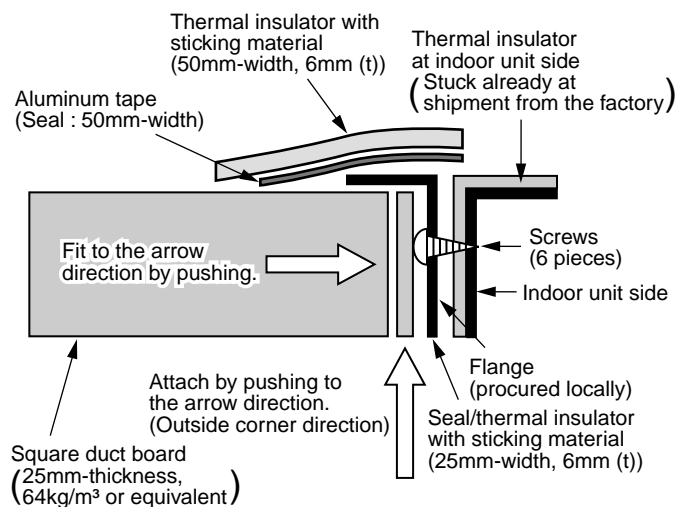


Fig. 2 (b)

## CAUTION

Incomplete thermal insulation of the supply air flange and sealing may cause dew drops.

## Connecting method of the duct

### 1. Supply air side

#### <Round duct>

1. Make the round duct according to inner dimension of the flange  
Use a glass wool board with inside/outside finishing 25mm-thickness and 24kg/m<sup>3</sup>-density.
2. Connect the flange and each type of duct. (Fig. 1)

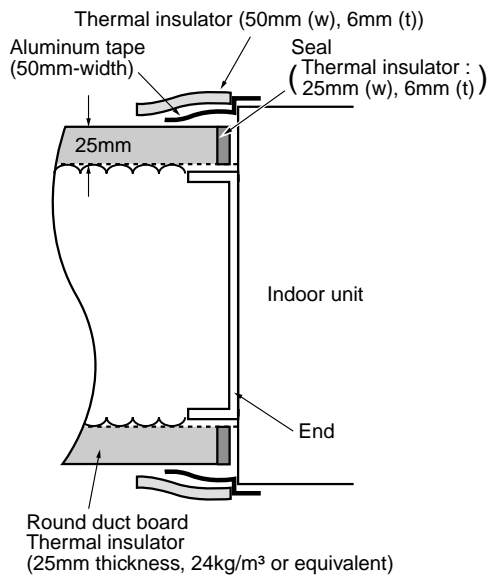


Fig. 1

#### <Square duct>

1. Using 6 screws, mount the flange to the supply air port of the indoor unit. (Fig. 2)
2. Make the square duct according to inner dimension of the flange  $A \times B$ .  
Use a glass wool board with inside/outside finishing 25mm-thickness and 24kg/m<sup>3</sup>-density.
3. Connect the flange and each type of duct. (Fig. 3)

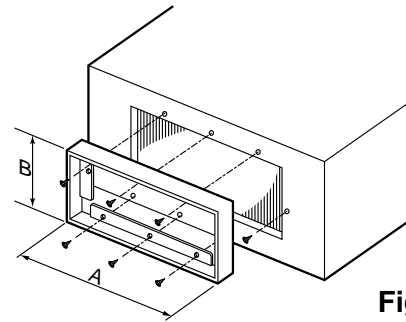


Fig. 2

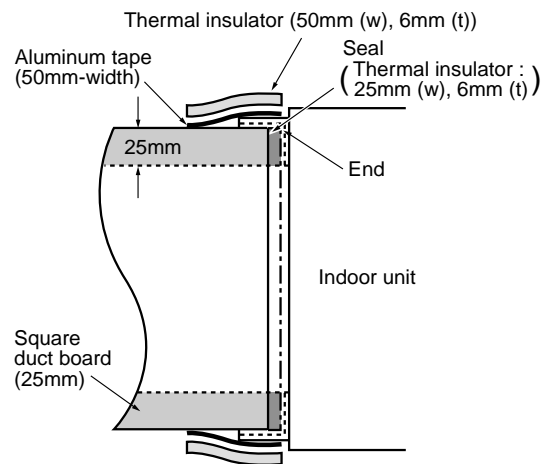


Fig. 3

## Points at installation work

### ■ General cautions

1. Considering installation places of indoor unit supply chamber, structure of the building and determine the duct path.
2. In order to utilize the static pressure characteristics of the air supply in the indoor unit, design the duct branching having the large size of the air supply chamber or setting distance to the first branch as long as possible (Min. : 200mm or longer) so that an even air volume can be obtained.

Especially, when branching just after air supply of the indoor unit, air concentrates at the center part and is difficult to flow to the ducts at both sides.

3. Connect each connecting section surely, and apply sufficient thermal insulation.

In this model of which the duct is branched in the ceiling, compared with the model for ordinary houses, the high temperature generates on the periphery in the cooling time (Especially, at attic and etc.), temperature difference increases between the supply air and outside of the duct, and dewing may occur.

Dewing on the surface of the thermal insulator covering the metal connecting section or leaking portion of the cooled air may cause a trouble such as water drops.

4. Thermal insulation of screwing sections is necessary.

Prevent dewing by applying thermal insulation to 6 screws those fix the duct flange of the air supply chamber.

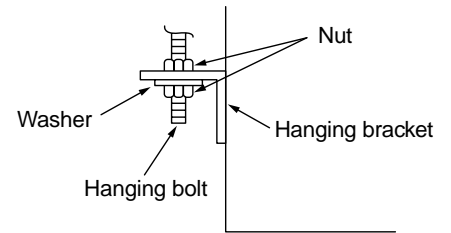
- For duct parts, the flexible branch duct (thermal insulation, 25mm or more thickness) is recommended.
- Adjust the duct length to 6m or less even for straight pipe, and avoid sharp bending (Air flow resistance is large.) if bending.

# 4 AIR DUCTING WORK

## Hanging of indoor unit

Lift up the unit with a lifter, etc., and set the hanging metal in the hanging bolt.

- Hook nut of the hanging bolt to the groove of the hanging metal on the main unit.
- Using the level, etc., install the main unit horizontally.  
Failure to do this will cause water leakage



## Mounting of filter and canvas for suction port

1. Mount a long-life filter or a high-performance filter according to each Installation Manual.
2. Mount the canvases for suction port to the lower side of the above filter.

## Mounting of remote controller

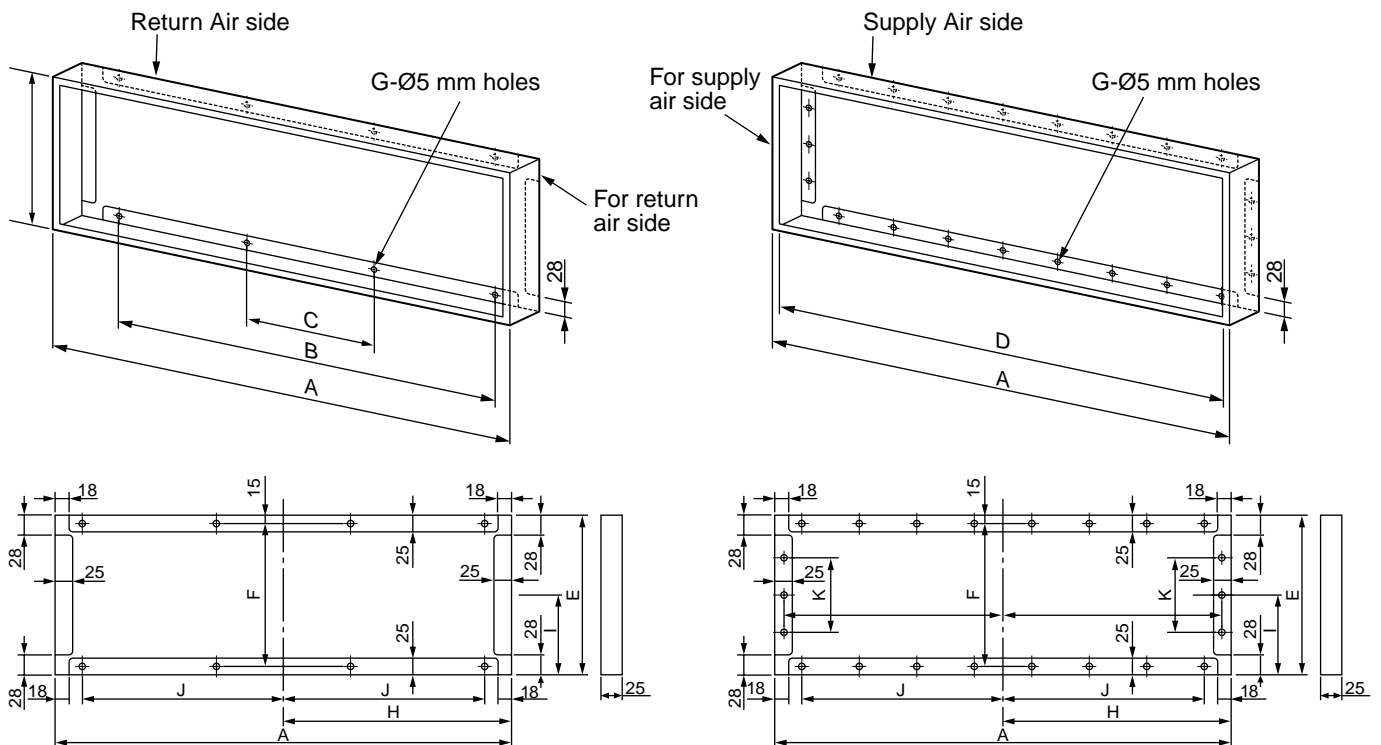
For the mounting of the wired remote controller, refer to the Installation Manual attached to the remote controller.

- Take out the remote controller cord together with the refrigerant pipe or drain pipe. Be sure to set the remote controller cord so that it passes through the upper side of the refrigerant pipe and drain pipe.

## For reference

### <Square duct>

(Procured locally)



	Model	A	B	C	D	E	F	G	H	I	J	K
Return Air side (Return filter side)	RAV-SM560BT-E	700	—	400	—	439	409	4	350	226	—	—
	RAV-SM800BT-E	1000	700	430	—	439	409	8	500	226	350	—
Supply Air side	RAV-SM560BT-E	550	455 (65 x 7)	65	530	265	245	22	275	132.5	227.5	130
	RAV-SM800BT-E	850	715 (65 x 11)	65	830	265	245	30	425	132.5	307.5	130

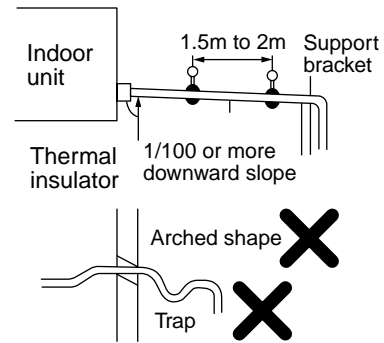
# 5 DRAIN PIPING WORK

## Piping material

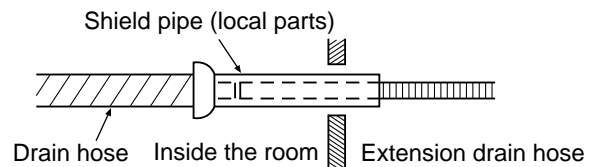
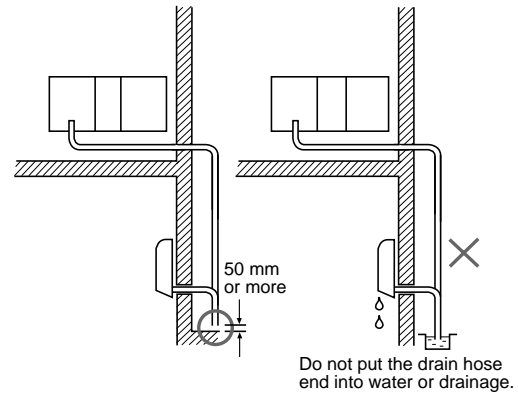
- For laying pipes underground, use hard vinyl chloride pipe. (Inner diam. 20 or 25mm)

## Piping and cautions

- Set drain side of pipe at downward slope. (1/100 or more)
- Be sure to apply thermal insulation (foaming polyethylene, 10mm-thickness or more) for pipes passing through the room.
- Adhere the connecting sections with vinyl chloride agent surely so that no water leakage is caused.
- Support the piping with hanging bracket so that the force is not applied to connection sections of pipe and pipe is not waved.



- As shown in the figure, set the collective piping such as the ceiling duct so that waste water does not back up from the main pipe.

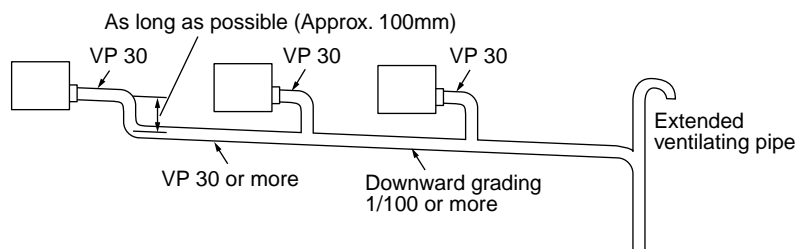


## NOTES :

- Do not make slack or trap at halfway across piping.
- Set pipes so that the end of drain pipe is not dipped in water, and also keep space 50mm or more to the ground.
- After piping work, check if water drains smoothly.
- Hole should be made at a slight downward slant to the outdoor side.
- When connecting extension drain hose, insulate the connecting part of extension drain hose with shield pipe.

## Connection of the drain hose

- Insert the drain hose completely into the connecting port of the drain pan.
- Apply thermal insulation surely to the drain hose with socket thermal insulation seal.



# 6 REFRIGERANT PIPING

## Refrigerant Piping

- If the outdoor units are to be mounted on a wall, make sure that the supporting platform is sufficiently strong. The platform should be designed and manufactured to maintain its strength over a long period of time, and sufficient consideration should be given to ensuring that the outdoor unit will not fall.
- Use copper pipe with 0.8 mm or more thickness.
- Flare nut and flare works are also different from those of the conventional refrigerant. Take out the flare nut attached to the main unit of the air conditioner, and use it.

### CAUTION

#### IMPORTANT 4 POINTS FOR PIPING WORK

- Remove dust and moisture from the inside of the connecting pipes.
- Tight connection (between pipes and unit)
- Evacuate the air in the connecting pipes using VACUUM PUMP.
- Check the gas leakage. (connected points)

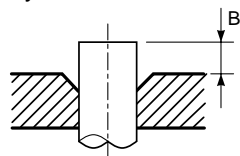
## Permissible Piping Length and Heat

The maximum piping length from the outdoor to indoor unit	
30 m (Chargeless 20m) (RAV-SM560AT-E)	50 m (Chargeless 20m) (RAV-SM800AT-E)
The maximum height difference outdoor/indoor unit	
Outdoor unit is above	Outdoor unit is below
30m	15m

## Flaring

Insert a flare nut into the pipe, and flare the pipe. As the flaring sizes of R410A differ from those of refrigerant R22, the flare tools newly manufactured for R410A are recommended.

However, the conventional tools can be used by adjusting projection margin of the copper pipe.



### • Projection margin in flaring : B (Unit : mm)

Rigid (Clutch type)

Outer diam. of copper pipe	R410A tool used		Conventional tool used	
	R410A	R22	R410A	R22
6.35 to 9.52	0 to 0.5	(Same as left)	1.0 to 1.5	0.5 to 1.0

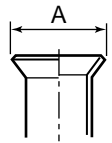
Imperial (Wing nut type)

Outer diam. of copper pipe	R410A	R22
6.35 or 9.52	1.5 to 2.0	1.0 to 1.5
12.7 or 15.9	2.0 to 2.5	1.5 to 2.0

### • Flaring dia meter size : A (Unit : mm)

Outer diam. of copper pipe	A <sup>+0</sup> / <sub>-0.4</sub>	
	R410A	R22
6.35	9.1	9.0
9.52	13.2	13.0
12.7	16.6	16.2
15.9	19.7	19.4

- \* In the case of flaring for R410A with the conventional flare tool, pull out it approx. 0.5 mm more than that for R22 to adjust to the specified flare size. The copper pipe gauge is useful for adjusting projection margin size.



## Tightening connection

### CAUTION

- Do not apply excessive torque. Otherwise, the nut may crack depending on the conditions.

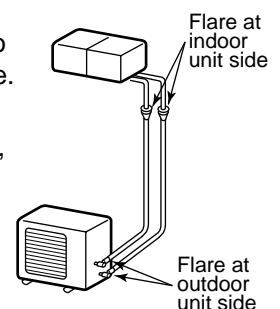
(Unit : N•m)

Outer diam. of copper pipe	Tightening torque
6.35 mm (diam.)	14 to 18 (1.4 to 1.8 kgf•m)
9.52 mm (diam.)	33 to 42 (3.3 to 4.2 kgf•m)
12.7 mm (diam.)	50 to 62 (5.0 to 6.2 kgf•m)
15.9 mm (diam.)	63 to 77 (6.3 to 7.7 kgf•m)

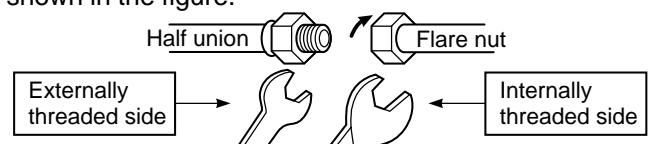
### • Tightening torque of flare pipe connections

Pressure of R410A becomes higher than that of R22. (Approx. 1.6 times) Therefore, using a torque wrench, tighten firmly the flare pipe connecting sections which connect the indoor and outdoor units up to the specified tightening torque.

Incorrect connections may cause not only a gas leakage, but also a trouble of the refrigeration cycle or compressor damage.



Align the centers of the connecting pipes and tighten the flare nut as far as possible with your fingers. Then tighten the nut with a spanner and torque wrench as shown in the figure.



Use a wrench to secure. Use a torque wrench to tighten.

# 7 EVACUATING

## AIR PURGE

Evacuate the air in the connecting pipes and in the indoor unit using vacuum pump.  
Do not use the refrigerant in the outdoor unit.  
For details, see the manual of vacuum pump.

## Use a vacuum pump

Be sure to use a vacuum pump with counter-flow prevention function so that inside oil of the pump does not flow backward into pipes of the air conditioner when the pump stops.

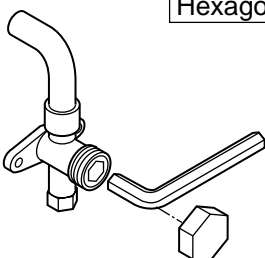
1. Connect the charge hose from the manifold valve to the service port of the gas side packed valve.
2. Connect the charge hose to the port of vacuum pump.
3. Open fully the low pressure side handle of the gauge manifold valve.
4. Operate the vacuum pump to start evacuating.  
Perform evacuating for about 35 minutes if the piping length is 30 meters total for model SM560 and 50 meters for model SM800 (assuming a pump capacity of 27 liters per minute.)  
Then confirm that the compound pressure gauge reading is  $-101 \text{ kPa}$  ( $-76 \text{ cmHg}$ ).
5. Close the low pressure side valve handle of gauge manifold.
6. Open fully the valve stem of the packed valves (both sides of Gas and Liquid).
7. Remove the charging hose from the service port.
8. Securely tighten the caps on the packed valves.

## Packed valve handling precautions

- Open the valve stem all the way out ; do not try to open it beyond the stopper.
- Securely tighten the valve stem cap at the torque as follows:

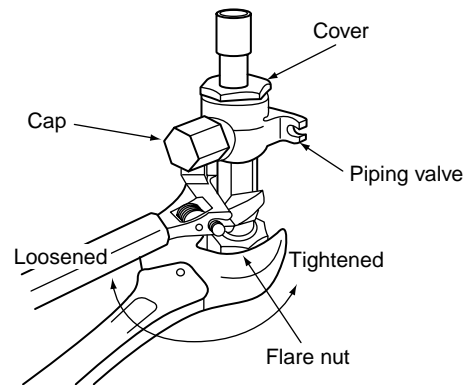
15.9 mm (diam.)	63 to 77 N•m (6.3 to 7.7 kgf•m)
12.7 mm (diam.)	50 to 62 N•m (5.0 to 6.2 kgf•m)
9.52 mm (diam.)	33 to 42 N•m (3.3 to 4.2 kgf•m)
6.35 mm (diam.)	14 to 18 N•m (1.4 to 1.8 kgf•m)

Hexagonal wrench is required.

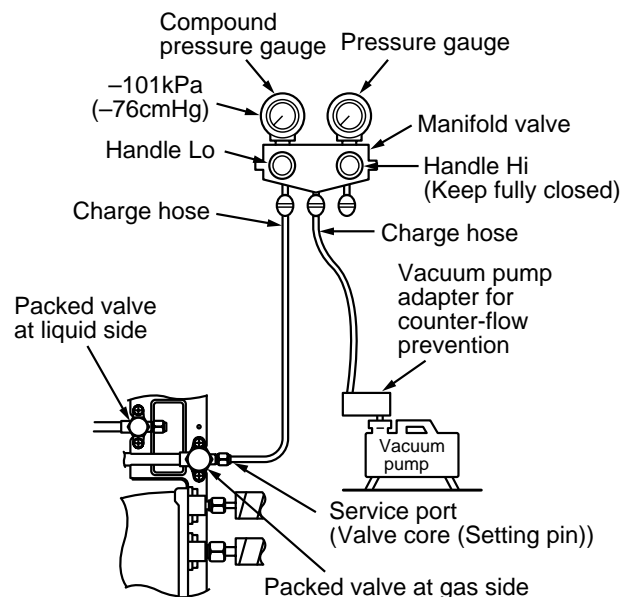
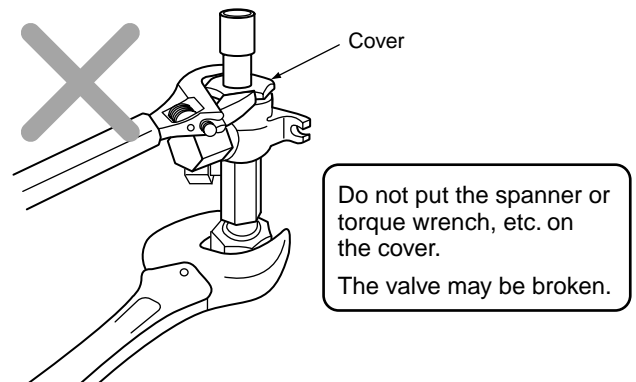


## <For RAV-SM800AT-E model>

- As shown in the figure, be sure to use a double spanner to loosen or tighten the flare nut of the valve at gas side. If using a single spanner, the nut cannot be tightened with necessary tightening torque.  
On the contrary, use a single spanner to loosen or tighten the flare nut of the valve at liquid side.



SM800 type valve at gas side



# 8 ELECTRICAL WORK

For the air conditioner that has no power cord.

## NOTE:

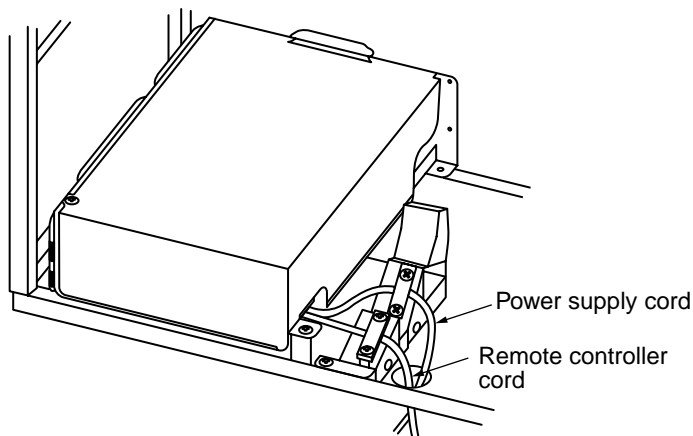
For selection and connection method of the power supply cords, refer to the details in the Installation Manual of the outdoor unit.

## CAUTIONS

- If incorrect/incomplete wiring is carried out, it may cause an electrical fire or smoke.
- Prepare the power supply for exclusive use with the air conditioner.
- Be sure to use the cord clamps with attached to the product.
- Do not damage or scratch the conductive core and inner insulator of power and inter-connecting cables when peeling them.
- Be sure to comply with local regulations on running the wire from outdoor unit to indoor unit (wire size of wire and wiring method etc.)
- Use the power cord and Inter-connecting cable of specified thickness, specified type, and protective devices required.

## How to wire

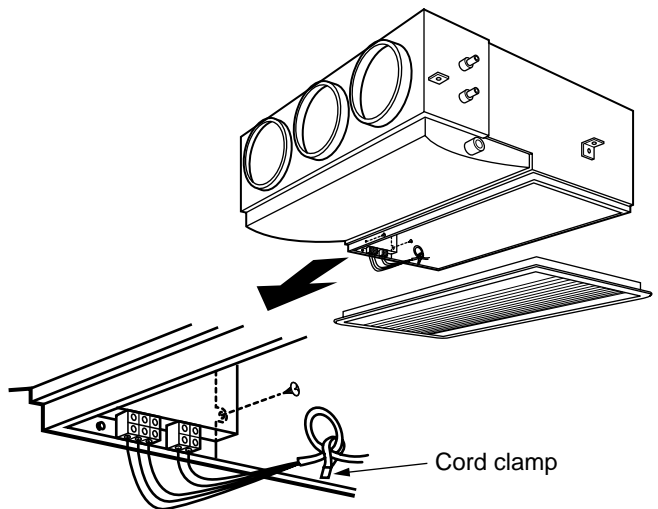
1. Connect the connecting cable to the terminal as identified with their respective numbers on the terminal block of indoor and outdoor unit.  
H07 RN-F or 245 IEC 66 (1.5 mm<sup>2</sup> or more)
2. Insulate the unsheathed redundant cords (conductors) with tape.
3. For inter-unit wiring, do not use a wire jointed to another on the way.



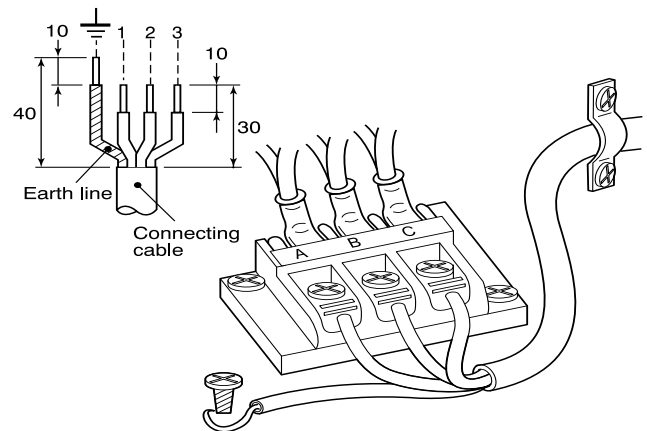
4. Fix the cable with cord clamp.

## Cabling

1. As shown in the figure, remove a screw ① and then remove cover of the electric part.
2. Strip wire ends (10 mm).
3. Match wire colors with terminal numbers on indoor and outdoor units' terminal blocks and firmly screw wires to the corresponding terminals.
4. Connect the ground wires to the corresponding terminals.
5. Fix the cable with cord clamp.
6. Fix cover of the parts box and the terminal block surely with the fixing screws.



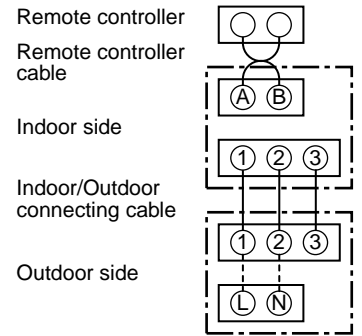
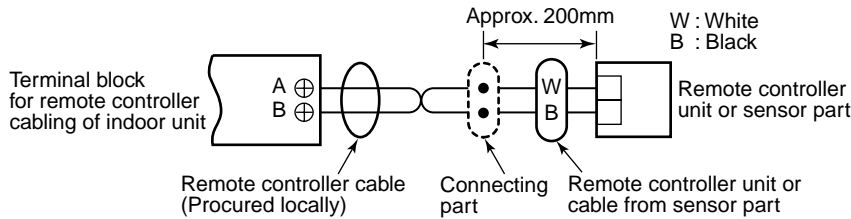
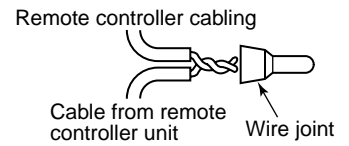
Make a loop for the margin of the cable length so that the electric parts box can be taken out during servicing.





## Remote Controller Cabling

- Strip approx. 14mm the cable to be connected.
- Non polarity, 2 core cable is used for cabling of the remote controller.
- Twist cable of the remote controller to be connected with cable of the remote controller unit (or sensor), and press-fit them with a wire joint.  
(Wire joints (White: 2 pieces) are included in the attachments to the remote controller (sold separately) or the wireless remote controller kit (sold separately).



(Single phase 220/230/240V)

## Cabling diagram

- For details of cabling/installation of the remote controller, refer to the Installation Manual attached to the remote controller.

## Check and Test Operation

Be sure to test the pipe connections for gas leak.

- Check the flare nut connections, valve stem cap connections and service port cap connections for gas leak with a leak detector or some soap water.

# 9 INSTALLATION/SERVICING TOOLS

## Tools

Tools	Applicable to R22 model	Tools	Applicable to R22 model
Gauge manifold	<input type="checkbox"/>	Flare tool (clutch type)	<input type="checkbox"/>
Charge hose	<input type="checkbox"/>	Gauge for projection adjustment	—
Electronic balance for refrigerant charging	<input type="checkbox"/>	Vacuum pump adapter	<input type="checkbox"/>
Torque wrench (nominal diam. 1/4, 3/8, 1/2, 5/8)	<input type="checkbox"/>	Gas leak detector	<input type="checkbox"/>

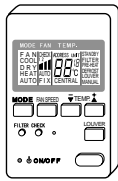
○ : Newly prepared (They are special requirements for R407C, separate from those for R22.)

□ : Existing tools are available.

For the details of the tools, refer to the Installation manual of the outdoor unit.

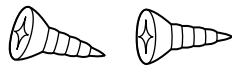
# ACCESSORIES

## Remote controller

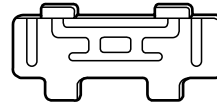


(sold separately)

## Screws (two pcs.) for Remote controller



## Installation plate



## Screws for installation plate Ø4mm x 25mm



# PRECAUTIONS FOR SAFETY

## WARNING


### WARNINGS ABOUT INSTALLATION

- Make sure to ask the qualified installation professional in electric work to install the air conditioner.  
If the air conditioner is inappropriate installed by yourself, it may cause water leak, electric shock, fire, and so on.
- Ground the air conditioner without fail.  
Do not connect the ground wire to gas pipe, water pipe, lightning rod or ground wire of telephone. If the air conditioner is imperfectly grounded, it may cause electric shock.

## CAUTION

### TO DISCONNECT THE APPLIANCE FROM THE MAINS SUPPLY

This appliance must be connected to the mains by means of a switch with a contact separation of at least 3 mm.

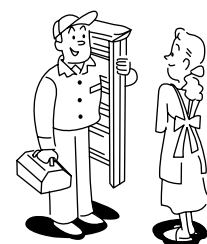
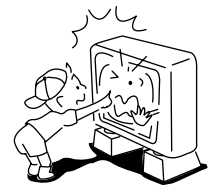
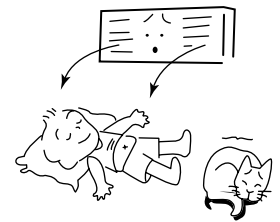
**The installation fuse (25A D type  ) must be used for the power supply line of this conditioner.**

### WARNINGS ABOUT OPERATION

- Avoid cooling the room too strong or exposing the human body to cool breeze for a long time as it is bad for the health.
- When you notice something abnormal with the air conditioner (smells like something scorching, poor cooling, etc.), immediately turn off the main switch, the circuit breaker, from the mains to stop the air conditioner, and contact the dealer.  
If the air conditioner is continuously operated with something abnormal, it may cause machine failure, electric shock, fire, and so on.

### WARNINGS ABOUT MOVEMENT AND REPAIR

- Do not move or repair any unit by yourself.  
Since there is high voltage inside the unit, you may get electric shock when removing the cover and main unit.
- Whenever the air conditioner needs repair, make sure to ask the dealer to do it.  
If it is repaired imperfectly, it may cause electric shock or fire.
- When moving the air conditioner for re-installing at another place, ask the dealer to do it. If it is imperfectly installed, it may cause electric shock or fire.



RAV-SM560KRT-E  
RAV-SM800KRT-E

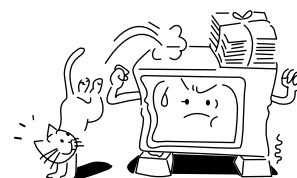
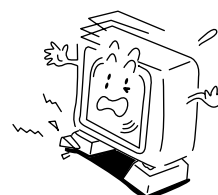
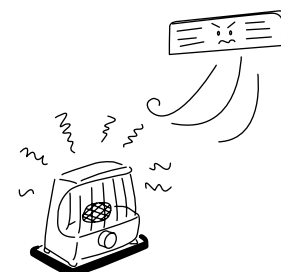
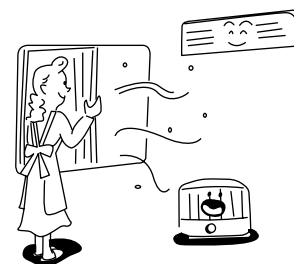
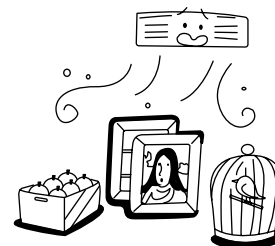
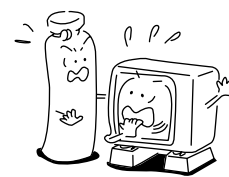
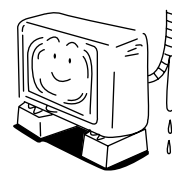
## CAUTION

### CAUTIONS ABOUT INSTALLATION

- Certainly lay the drain hose for perfect draining. Bad drainage may cause flooding in the house and getting furniture wet.
- Make sure to connect the air conditioner to an exclusive AC outlet of the rated voltage, otherwise the unit may break down or cause a fire.
- Do not install the unit in a place where inflammable gas may leak. If inflammable gas accumulates around the unit, it may cause a fire.

### CAUTIONS ABOUT OPERATION

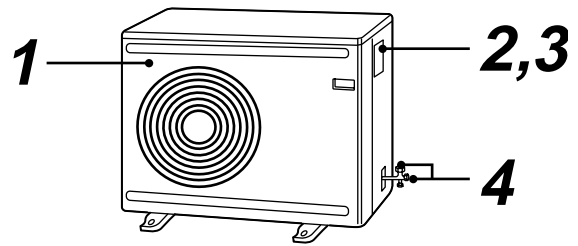
- Carefully read this manual before starting the air conditioner. There are many important things to keep in mind for daily operation.
- Do not use this air conditioner for special purpose such as preserving food, precision instruments, art objects, breeding animals, growing potted plants, etc.
- Avoid exposing potted plants and animals to the wind of the air conditioner, since it badly affects the health and growth of them.
- When the air conditioner is operated with a combustion appliance in the same place, be careful of ventilation to let fresh air enter the room. Poor ventilation causes oxygen shortage.
- When the air conditioner is used in a closed room, be careful of sufficient ventilation of the room. Poor ventilation causes oxygen shortage.
- Do not touch any switches with wet finger, otherwise you may get an electric shock.
- Do not place any combustion appliance in a place where it is directly exposed to the wind of air conditioner, otherwise it may cause imperfect combustion.
- If the air conditioner won't be used for a considerably long time, turn off the main switch or the circuit breaker, for safety. Disconnect from the power supply prevents the unit from lightning and power supply surge.
- Check the concrete blocks, etc. of the base of the outdoor unit occasionally. If the base is left damaged or deteriorated, the unit may topple over and inflict an injury to a person as the worst case.
- When cleaning the unit, make sure to turn off the main switch or the circuit breaker beforehand for preventing you from getting injured by the electric fan running inside. For details of cleaning method, refer to "Maintenance" on page 9.
- Do not put anything on the outdoor unit nor step onto it. If you do so, it may not only topple over the unit but also injure yourself.
- To make the air conditioner operate in its original performance, operate it within the range of the operating temperature specified in the instructions. Otherwise it may cause a malfunction, or water leak from the unit.
- Prevent any liquid from falling into the remote controller. Do not spill juice, water or any kind of liquid.



## PARTS NAME

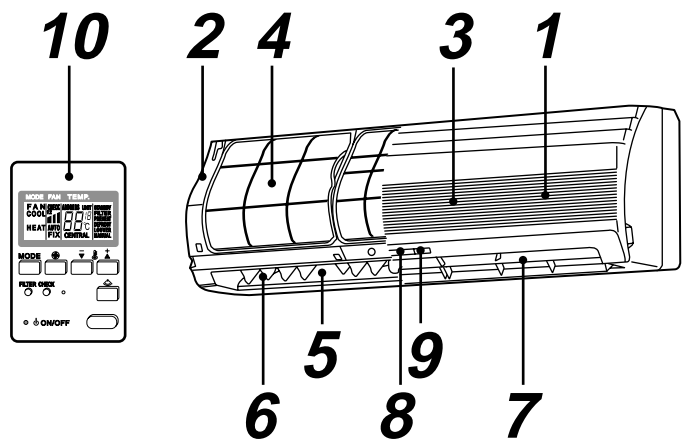
### Outdoor unit

- 1** Air outlet - blows off hot air during cooling or cool air during heating
- 2** Power supply box - contains electrical parts
- 3** Earth screw - in the electrical parts box
- 4** Refrigerant line connections



### Indoor unit

- 1** Room temperature sensor
- 2** Front panel
- 3** Air inlet grille
- 4** Air filter
- 5** Air outlet
- 6** Horizontal air flow louver
- 7** Vertical air flow louver
- 8** Display panel
- 9** Infrared signal receiver
- 10** Remote controller



## NAME AND FUNCTIONS OF INDICATORS AND CONTROLS

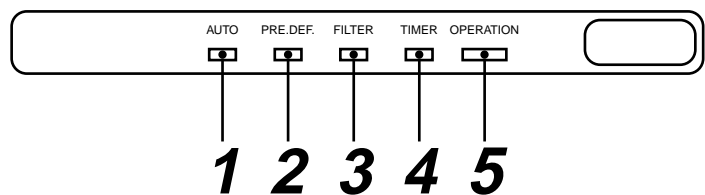
### Display panel

The operating conditions are indicated below.

- 1** AUTO (green)
- 2** PRE. DEF. lamp (orange)
- 3** FILTER lamp (orange)
- 4** TIMER lamp (yellow)
- 5** OPERATION lamp (green/\*orange)

The operation lamp flash rapidly (five times per second), when safety protection feature come into operation.

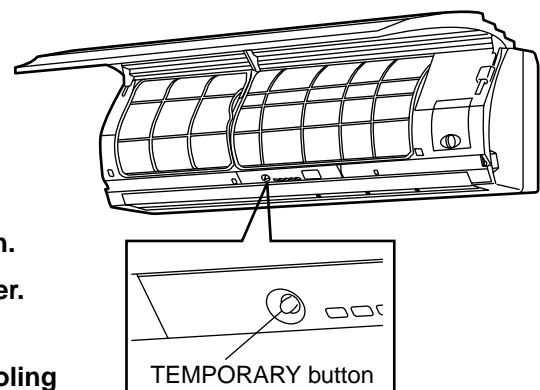
\* When the auto restart function is in operation, the OPERATION lamp is orange.



### TEMPORARY button

If you misplace or lose the remote controller or its batteries are exhausted, push the TEMPORARY button.

- 1** Open the air inlet grille to push the TEMPORARY button.
- 2** Push the TEMPORARY button to start the air conditioner. Push this button once again to stop it.
- 3** Continue to push the button for 10 seconds to start cooling operation.



RAV-SM560KRT-E  
RAV-SM800KRT-E

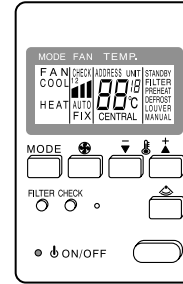
# NAME AND OPERATIONS OF INDICATORS AND CONTROLS

## Display section

All display items are shown in the figure below for purpose of explanation.

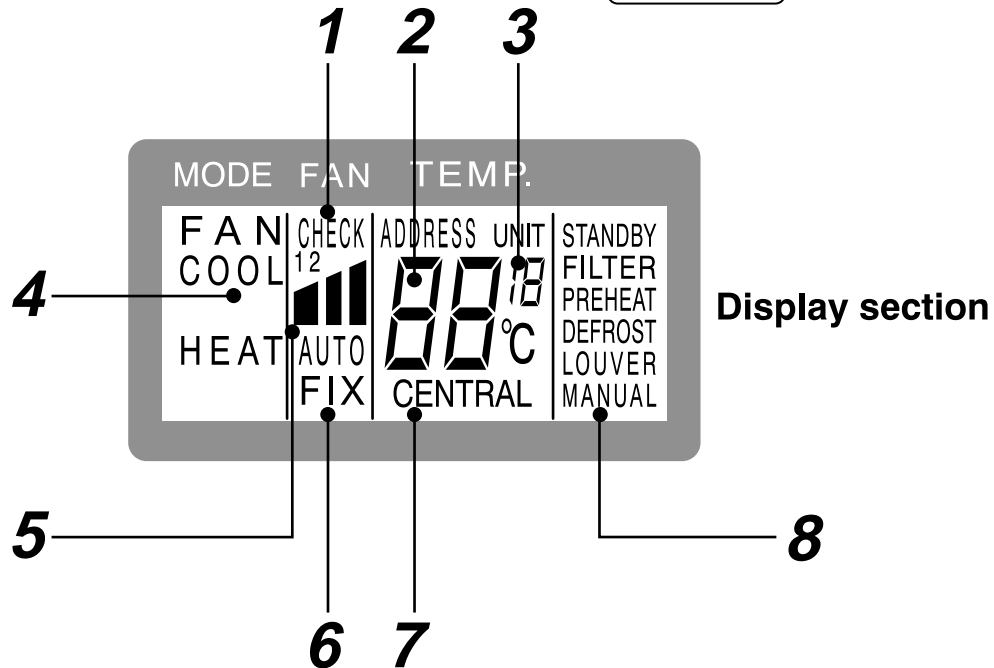
Only selected items are displayed in actual operation.  
(All indicators are displayed for the explanation.)

The displayed contents differ according to shape or type.



Display section

Operation section



### 1 CHECK

Displayed during check mode.

### 2 Set up temperature display

The selected set up temp. is displayed.

### 3 Unit display

Unit No. in which error/fault is displayed in the set up temp. display section.

### 4 Operation mode display

The selected operation mode is displayed.

### 5 Fan mode display

The selected fan mode is displayed.



### 6 Air volume fix display

This is not displayed on this model.

### 7 CENTRAL control display

Displayed when used with the central remote controller, etc.

### 8 STANDBY display

It is displayed when the operation cannot be performed though it is not an error.

#### FILTER display

If "FILTER" is displayed, clean the air filter.

#### PREHEAT/DEFROST display

Displayed when heating operation or defrost operation starts.

#### LOUVER display

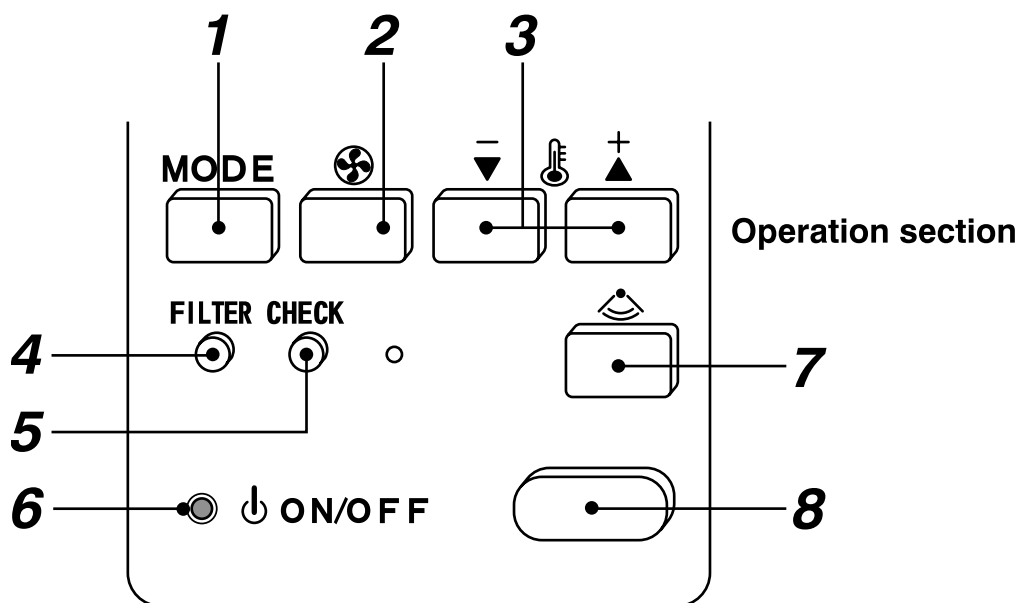
It is displayed while the discharge louver operates in AUTO mode.

#### LOUVER/MANUAL display

It is not displayed on this model.

## Operation section

Push each button to select a desired operation.



### 1 Operation select button

Selects desired operation mode.

### 2 Air volume select button

Selects the desired air volume mode

### 3 Set up temp. button

Adjusts the required room temperature.

Match to the desired set temperature by pushing ▼ ▲.

### 4 Filter reset button

Resets (Erases) "FILTER" display.

### 5 CHECK button

When an error/fault occurs on the air conditioner, this button is used to check the check code indicating fault status.

### 6 Operation lamp

Lamp is lit during the operation.

Lamp is off when stopped.

Although it flashes when power switch is turned on or when turned on again after power failure, it goes on if the operation has started.

### 7 Louver operation button

With auto louver function, the discharge louver operates or stops during operation of air conditioner.

### 8 ON/OFF button

When the button is pushed, the operation starts, and it stops by pushing the button again.

When the operation has stopped, the operation lamp and louver display disappear though other displays remain as they are.

## "Central indication"

When using a remote controller connected to a central remote controller, etc., contents which can be operated by the standard remote controller and "CENTRAL" display change by setting at the central remote controller.

Setup on central remote controller	"CENTRAL" display on standard remote controller	Contents operated by standard remote controller
Last-push priority (No display)	Goes off	Operated from both standard remote controller and central remote controller, and operated with contents specified later.
Center	Goes on	ON / OFF only can be operated.
Operation inhibit	Flashes	Cannot be operated.

For application control using other "Weekly timer" or "Central remote controller" other than this standard remote controller, refer to the Manual attached to each remote controller.

# CORRECT USAGE

When you use the air conditioner at the first time or when you change the setup value, follow the procedure below. From the next time, the operation displayed on the remote controller will start only by pushing ON / OFF button.

## Preparation

### Turn on the power switch.

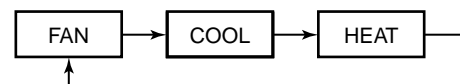
- The operation lamp (Red) flashes.

### REQUIREMENT

- While using the air conditioner, operate it only with ON/OFF button without turning off the power switch.
- When starting the operation after stop for a long time, turn on the power switch for 12 hours or more before start. (This is required because it is necessary to turn on the compressor case heater for heating in order to prevent overload on the compressor when activating the outdoor unit.)

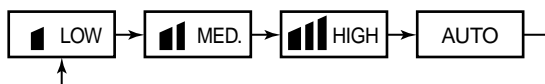
### 1 Select an operation mode with "MODE" button.

For every push of the button, the display changes as right figure :



### 2 Select air volume with the "FAN" button.

The display changes as follows :



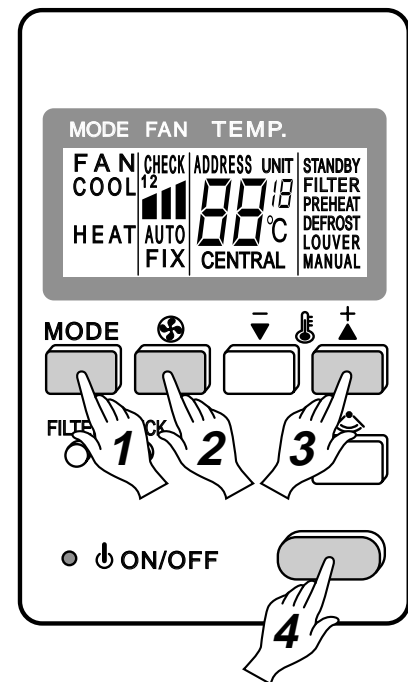
- When air volume is "AUTO", air volume changes according to the room temperature.

### 3 Determine the set up temperature by pushing the "TEMP" button.

▼ ▲ button.

### 4 Push "ON/OFF" button.

The operation lamp goes on, and the operation starts .



## STOP

### Push "ON/OFF" button.

The operation lamp goes off, and the operation stops.

### NOTE

#### In cooling

- When the operation button is pushed, the operation starts approx. 1minute after.

#### In heating

- When pushing "ON/OFF" button, the indoor fan starts pre-heating operation for 3 to 5 minutes before it starts blowing out hot air.
- When the room temperature reaches the set up temperature and the outdoor unit stops, the mode becomes LOW and air volume decreases accordingly. During defrost operation, the fan stops so that cool air is not out, and "PREHEAT" and "DEFROST" are displayed.

#### When restarting the operation after stop

- In heating operation, the fan operation may continue for approx. 30 second.
- When restarting the operation immediately after stop, the air conditioner does not operate for approx. 3 minutes to protect the machine.

## DRY OPERATION

### Start

#### 1 START/STOP button

Push this button to start the air conditioner.

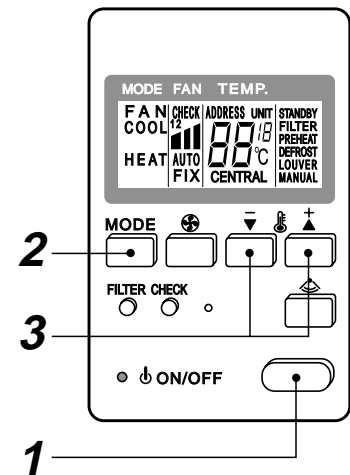
#### 2 Mode select button (MODE)

Select DRY.

#### 3 Temperature button

Set the desired temperature.

- The FAN speed display indicates AUTO
- The OPERATION lamp (green) on the switch panel of the remote controller lights, and operation starts after approximately 3 minutes.



### Stop

#### START/STOP button

Push this button again to stop the air conditioner.

## AUTOMATIC OPERATION (Auto Changeover)

When you set the air conditioner in A mode or switch over from AUTO operation because of some settings change, it will automatically select either cooling, heating, or fan only operation depending on the outdoor temperature.

### Start

#### 1 START/STOP button

Push this button to start the air conditioner.

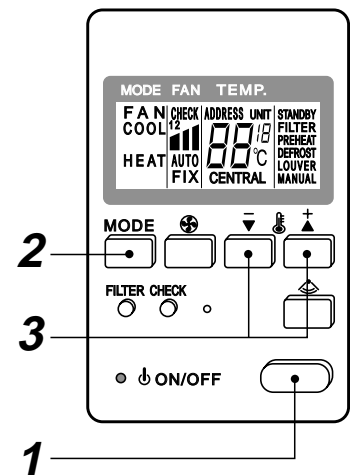
#### 2 Mode select button (MODE)

Select Auto.

#### 3 Temperature button

Set the desired temperature.

- In case of cooling, it starts the operation after approx. 1 minute.
- In case of heating, the operation mode is selected in accordance with the room temperature and operation starts after approximately 3 to 5 minutes.
- When you select the Auto mode, it is unnecessary to set the fan speed. The FAN speed display will show AUTO and the fan speed will be automatically controlled.
- If the Auto mode is uncomfortable, you can select the desired conditions manually.



### Stop

#### START/STOP button

Push this button again to stop the air conditioner.



## ADJUSTING AIR FLOW DIRECTION

- Adjust the air flow direction properly. Otherwise, it might cause discomfort and make the room temperature uneven.
- Adjust the vertical air flow using the remote controller.
- Adjust the horizontal air flow manually.

### Adjust the vertical air flow

The air conditioner automatically adjusts the vertical air flow direction in accordance with the operating conditions.

### To set the air flow direction by yourself

Perform this adjustment when the air conditioner is in operation.

Push the LOUVER button once on the remote controller.

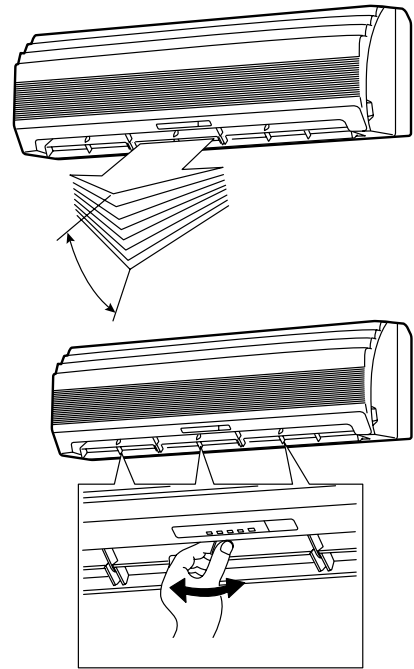
The louver starts to swing. When the desired louver position is reached in the swing, push the LOUVER button again and louver will stop at desired position.

### To automatically swing the air flow direction

Perform this function when the air conditioner is in operation.

Push the LOUVER button on the remote controller.

- To stop the function, push the LOUVER button again.



### CAUTION

- Do not operate the air conditioner for prolonged periods of time with the air flow direction set downward during cooling operation.
- Do not move the vertical air flow louver manually. Always use the LOUVER button.  
If you move the louver manually, it may malfunction during operation.  
If the louver malfunctions, stop the air conditioner once, and restart.

### Adjust the horizontal air flow

#### Preparation :

- Take hold of the lever on the horizontal air flow louver and move them to adjust the air flow direction as you desire.
- You can adjust the air flow at the left, center, and right locations of the grilles.

## HOW THE AIR CONDITIONER WORKS

### Automatic operation

- The air conditioner selects and operates a mode from the cooling, the heating, or the fan only operations, depending on the outdoor temperature.
- If the AUTO mode is uncomfortable, you can select the desired conditions manually.

Outdoor temperature in operation	Operating condition	
Outdoor temperature 22°C or more (in case the outdoor is hot)	Cooling operation	Performs the cooling operation at a temperature 1°C higher than the setting.
Outdoor temperature 20°C to 22°C	Fan only operation	Performs the fan only operation (low speed) while monitoring the outdoor temperature. When the room temperature changes, the air conditioner will select the cooling or heating mode.
The set temperature less than 20°C (in case the outdoor is cold)	Heating operation	Performs the heating operation at a temperature 1°C lower than the setting.

## HINTS FOR ECONOMICAL OPERATION

### 1. Clean air filters

Air flow and performance are reduced if the air filters become blocked.

Clean them every 2 weeks..

### 2. Never open doors and windows more often than necessary

To keep cool or warm air in the room, never open doors and windows more often than necessary.

### 3. Use the timer effectively

Set the timer for the desired operating time.

### 4. Allow uniform circulation of room air

Adjust the air flow direction for the even circulation of room air.

## TEMPORARY OPERATION

### TEMPORARY operation

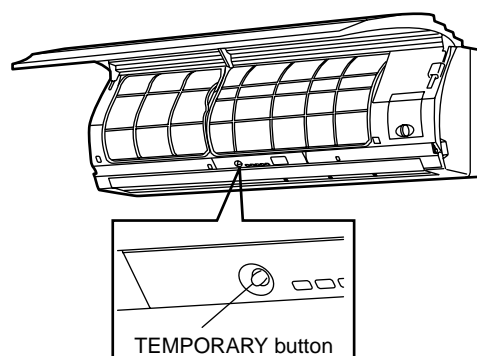
This function is used to operate the unit temporarily in case you misplace the remote controller or its batteries are exhausted.

- Push the TEMPORARY button to start the air conditioner.
- While the substitute operation is set, the remote controller operation is disabled.
- Continue to push the button for 10 seconds to start cooling operation.

### Air filter reset

When the FILTER lamp on the air conditioner is indicated, it is time for cleaning. (The lamp will start to indicate, after every 1000 hours of operation.)

- The FILTER lamp will be out when the TEMPORARY button is pushed.
- The FILTER lamp will also be out when the FILTER button on the remote controller is pushed.



## MAINTENANCE

### WARNING

Before you clean the air conditioner be sure to turn off the circuit breaker or main power switch.

### Cleaning of indoor unit and remote controller

### CAUTION

- Use a dry cloth to wipe the indoor unit and remote controller.
- A cloth dampened with cold water may be used on the indoor unit if it is very dirty.
- Never use a damp cloth on the remote controller.
- Do not use a chemically-treated duster for wiping or leave such materials on the unit for long. It may damage or fade the surface of the unit.
- Do not use benzine, thinner, polishing powder, or similar solvents for cleaning. These may cause the plastic surface to crack or deform.

### If the air conditioner is not to be used for more than one month

1. Operate the air conditioner in FAN ONLY mode for approximately 6 hours to dry inside the unit
2. Stop the air conditioner and turn off the circuit breaker.
3. Remove the batteries from the remote controller.

## Check before operation

### CAUTION

- Check that the air filters are installed.
- Check that the air outlet or inlet of the outdoor unit is not blocked.

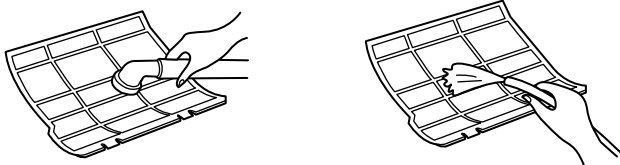
## Cleaning the air filter

Clean the air filters every 2 weeks.

If the air filters are covered with dust, the performance of the air conditioner will deteriorate.

### Clean the air filters as often as possible.

- 1 Open the air inlet grille.**  
Lift the air inlet grille up to the horizontal position.
- 2 Take hold of the left and right handles of the air filter and lift it up slightly, then pull it downward to take it out from the filter holder.**
- 3 Remove the filters.**
- 4 Use a vacuum cleaner to remove the dust from the filters or wash them with water. If you wash the air filters, dry them in the shade.**

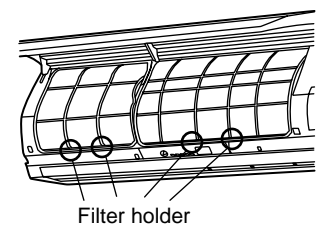
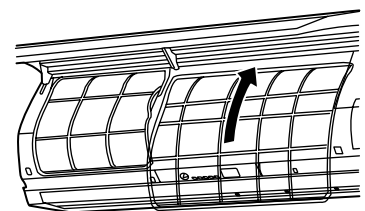
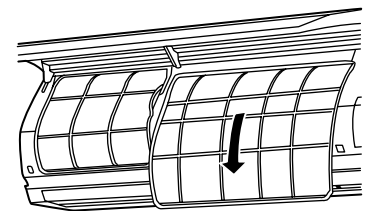
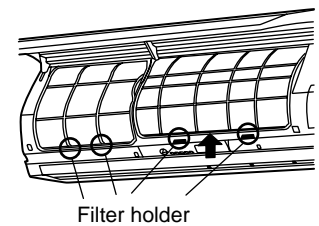
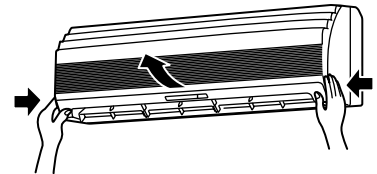
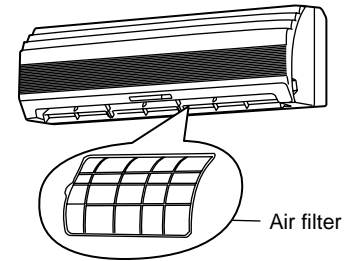


- 5 Insert the upper portion of the air filter aligning right and left edges on the indoor unit until correctly positioned.**

- 6 Close the air inlet grille.**

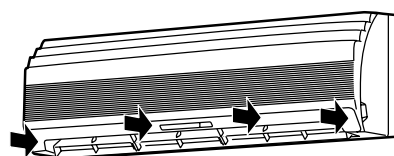
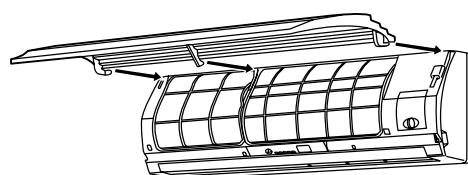
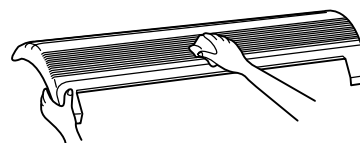
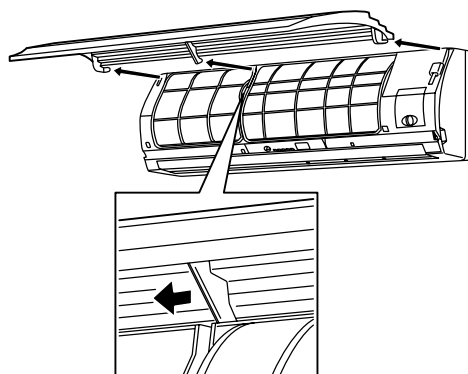
\* If the filter lamp on the indoor unit is indicated, push the FILTER button on the remote controller or the TEMPORARY button on the indoor unit to turn off the lamp.

## FAN ONLY Operation



## Cleaning the air inlet grille

1. Remove the air inlet grille.  
Hold the both sides of the air inlet grille and open upward.  
Move the center arm to the left and remove the grille.
2. Wash it with water using a soft sponge or towel.  
(Do not use metallic scrubbing brush or other hard brushes.)
  - Use of such hard objects will cause scratches on the surface of the air inlet grille, and the coating to peel off.
  - If very dirty, clean the air inlet grille with a neutral detergent, and rinse it off with water after removing it from the unit.
3. Wipe out water from the air inlet grille and dry.
4. Fit the left and right arms of the air inlet grille to the shafts on the two sides of the air conditioner and push in completely, and then push in the center arm.
5. Check that the center arm has been completely inserted and close the air inlet grille.
  - Push the arrow locations (four) at the bottom of the air inlet grille to check whether the grille is completely closed.



## AIR CONDITIONER OPERATIONS AND PERFORMANCE

### 3 minute protection function

A protection feature prevents the air conditioner from being activated for approximately 3 minutes when it is restarted immediately after operation or when the power supply switch is turned on. This will protect the machine.

### Heating operation characteristics

#### Preheating operation

The air conditioner will not deliver warm air immediately after it is started.

Warm air flows out after approximately 5-minutes when the indoor heat exchanger warms up. (The PRE.-DEF. lamp is on during the preheating operation.)

#### Warm air control

When the room temperature reaches the set temperature, the indoor fan speed is automatically reduced to prevent cold draft.

The outdoor unit will stop.

#### Defrosting

If the outdoor unit is frosted during heating operation, defrosting is started automatically (for approximately 5 to 10 minutes). To maintain the heating effect, the PRE.-DEF. lamp is on.

- The fans on the indoor and outdoor units stop during the defrost operation.
- During defrost operation, defrosted water drains from the bottom plate of the outdoor unit.

## Heating capacity

If the outdoor temperature is too low, it is recommended that additional heating appliances be used in conjunction with the air conditioner.

## Power failure

Power failure during operation will stop the unit completely.

- The OPERATION lamp (green) on the indoor unit will start flashing when power is restored.
- To restart operation, push the START/STOP button on the remote controller.

## Air conditioner operating conditions

For proper performance, operate the air conditioner in the following temperature conditions:

Cooling operation	Outdoor temperature : -5°C to 43°C
	Room temperature : 18°C to 32°C
	<b>CAUTION</b> Room relative humidity – less than 80 %. If the air conditioner operates in excess of this figure, the surface of the air conditioner may cause dewing.
Heating operation	Outdoor temperature : -15°C to 21°C
	Room temperature : Less than 30°C

If air conditioner is used outside of the above conditions, safety protection may work.

## PROBLEMS AND CAUSES

### CAUTION

If any of the following conditions occur, turn off the main power supply switch and immediately contact the dealer :

- The indicator lamps flash at short intervals (5 Hz) even though you have tried turning off the power supply and turning on again after 2 to 3 minutes.
- Switch operation is erratic.
- The main power fuse often blows out, or the circuit breaker is often activated.
- A foreign matter or water has fallen into the inside of the air conditioner.
- Any other unusual condition is observed.

**Before you ask for servicing or repairs, check the following points.**

## Recheck

### Inoperative

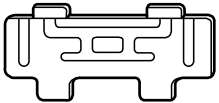
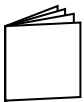

- The main power switch is turned off.
- The circuit breaker is activated to cut off power supply.
- The main power fuse is blown.
- ON timer is set.


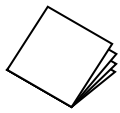
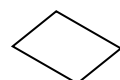
### Does not cool well or heat well

- The air inlet or outlet of the outdoor unit is blocked.
- Doors or windows are opened.
- The air filter is blocked with dust.
- The louver is not at the correct position.
- The fan speed is set too low.
- The set temperature is too high. (In cooling operation)
- The set temperature is too low. (In heating operation)

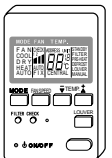
# Accessory parts and Parts to be procured locally

## ☐ Accessory parts

Part name	Q'ty	Shape
Installation plate	1	
Installation Manual	1	
Owner's Manual	1	

Part name	Q'ty	Shape
Mounting screw Ø4mm x 25mm	8	
Pattern paper	1	
Service contact address label	1	

## <Separate sold parts>

Part name	Q'ty	Shape
Wired remote controller	1	

## ☐ Parts to be procured locally

<p>Connecting pipe (Liquid side) (6.35mm (diam.), Nominal (diam.) 1/4" thick 0.8mm) RAV-SM560KRT-E, RAV-SM560AT-E</p> <p>(9.52mm (diam.), Nominal (diam.) 3/8" thick 0.8mm) RAV-SM800KRT-E, RAV-SM800AT-E</p>
<p>Connecting pipe (Gas side) (12.7mm (diam.), Nominal (diam.) 1/2" thick 0.8mm) RAV-SM560KRT-E, RAV-SM560AT-E</p> <p>(15.9mm (diam.), Nominal (diam.) 5/8" thick 1.0mm) RAV-SM800KRT-E, RAV-SM800AT-E</p>
<p>Power supply cord 2.5mm<sup>2</sup> (H07RN-F or 245IEC66) or 3.5mm<sup>2</sup> (AWG-12)</p>

<p>Connecting cable H07RN-F or 245IEC66 (1.0mm<sup>2</sup> or more)</p>
<p>Thermal insulation for refrigerant pipe (10mm or more, thermal insulating foam polyethylene)</p>
<p>Thermal insulation for drain pipe (10mm or more, foam polyethylene)</p>
<p>Drain pipe (Outer 26mm (diam.))</p>
<p>Tapes</p>
<p>Grounding cable (2.0mm (diam.) or more)</p>

**RAV-SM560KRT-E**  
**RAV-SM800KRT-E**

# 1 PRECAUTIONS FOR SAFETY

- Ensure that all Local, National and International regulations are satisfied.
- Read this "PRECAUTIONS FOR SAFETY" carefully before Installation.
- The precautions described below include the important items regarding safety. Observe them without fail.
- After the installation work, perform a trial operation to check for any problem.  
Follow the Owner's Manual to explain how to use and maintain the unit to the customer.
- Turn off the main power supply switch (or breaker) before the unit maintenance.
- Ask the customer to keep the Installation Manual together with the Owner's Manual.

## CAUTION

### New Refrigerant Air Conditioner Installation

- **THIS AIR CONDITIONER ADOPTS THE NEW HFC REFRIGERANT (R410A) WHICH DOES NOT DESTROY OZONE LAYER.**

The characteristics of R410A refrigerant are ; easy to absorb water, oxidizing membrane or oil, and its pressure is approx. 1.6 times higher than that of refrigerant R22. Accompanied with the new refrigerant, refrigerating oil has also been changed. Therefore, during installation work, be sure that water, dust, former refrigerant, or refrigerating oil does not enter the refrigerating cycle.

To prevent charging an incorrect refrigerant and refrigerating oil, the sizes of connecting sections of charging port of the main unit and installation tools are changed from those for the conventional refrigerant.


Accordingly the exclusive tools are required for the new refrigerant (R410A).

For connecting pipes, use new and clean piping designed for R410A, and please care so that water or dust does not enter. Moreover, do not use the existing piping because there are problems with pressure-resistance force and impurity in it.

## CAUTION

### To Disconnect the Appliance from Main Power Supply.

This appliance must be connected to the main power supply by means of a switch with a contact separation of at least 3 mm.

**The installation fuse (25A D type  ) must be used for the power supply line of this conditioner.**

## ! WARNING

- **Ask an authorized dealer or qualified installation professional to install/maintain the air conditioner.**  
Inappropriate installation may result in water leakage, electric shock or fire.
- **Turn off the main power supply switch or breaker before attempting any electrical work.**  
Make sure all power switches are off. Failure to do so may cause electric shock.
- **Connect the connecting cable correctly.**  
If the connecting cable is connected in a wrong way, electric parts may be damaged.
- **When moving the air conditioner for the installation into another place, be very careful not to enter any gaseous matter other than the specified refrigerant into the refrigeration cycle.**  
If air or any other gas is mixed in the refrigerant, the gas pressure in the refrigeration cycle becomes abnormally high and it may resultingly causes pipe burst and injuries on persons.
- **Do not modify this unit by removing any of the safety guards or by by-passing any of the safety interlock switches.**
- **Exposure of unit to water or other moisture before installation may cause a short-circuit of electrical parts.**  
Do not store it in a wet basement or expose to rain or water.

# 1 PRECAUTIONS FOR SAFETY

- **After unpacking the unit, examine it carefully if there are possible damage.**
- **Do not install in a place that might increase the vibration of the unit.**
- **To avoid personal injury (with sharp edges), be careful when handling parts.**
- **Perform installation work properly according to the Installation Manual.**  
Inappropriate installation may result in water leakage, electric shock or fire.
- **When the air conditioner is installed in a small room, provide appropriate measures to ensure that the concentration of refrigerant leakage occur in the room does not exceed the critical level.**
- **Install the air conditioner securely in a location where the base can sustain the weight adequately.**
- **Perform the specified installation work to guard against an earthquake.**  
If the air conditioner is not installed appropriately, accidents may occur due to the falling unit.
- **If refrigerant gas has leaked during the installation work, ventilate the room immediately.**  
If the leaked refrigerant gas comes in contact with fire, noxious gas may generate.
- **After the installation work, confirm that refrigerant gas does not leak.**  
If refrigerant gas leaks into the room and flows near a fire source, such as a cooking range, noxious gas might generate.
- **Electrical work must be performed by a qualified electrician in accordance with the Installation Manual. Make sure the air conditioner uses an exclusive power supply.**  
An insufficient power supply capacity or inappropriate installation may cause fire.
- **Use the specified cables for wiring connect the terminals securely fix. To prevent external forces applied to the terminals from affecting the terminals.**
- **Be sure to provide grounding.**  
Do not connect ground wires to gas pipes, water pipes, lightning rods or ground wires for telephone cables.
- **Conform to the regulations of the local electric company when wiring the power supply.**  
Inappropriate grounding may cause electric shock.
- **Do not install the air conditioner in a location subject to a risk of exposure to a combustible gas.**  
If a combustible gas leaks, and stays around the unit, a fire may occur.



# 2 INSTALLATION PROCEDURE

## Installation Diagram of Indoor Unit

For rear left and side pipe exit

Insert the cushion between the indoor unit and wall, and lift indoor unit to make work easier.

Do not allow the drain hose to sag.

Cut the piping hole sloped slightly

Make sure to run the drain hose sloped downward.

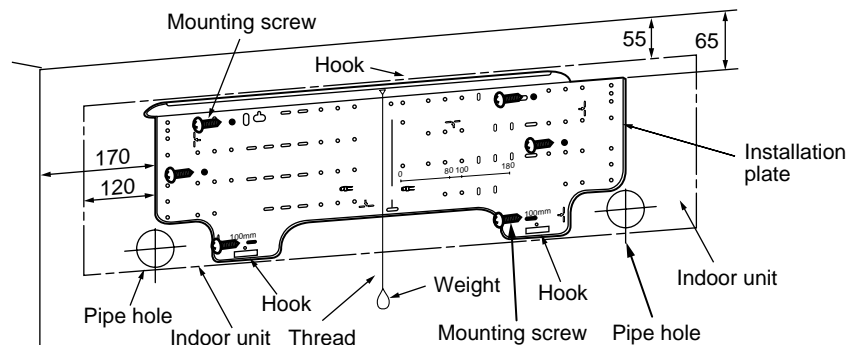
Insulate the refrigerant pipes separately with insulation, not together.

Min. 6 mm thick heat resisting polyethylene foam

The auxiliary piping can be connected the left, rear left, rear, right or bottom.

## Mounting the Installation Plate

For installation of the indoor unit, use the paper template included.

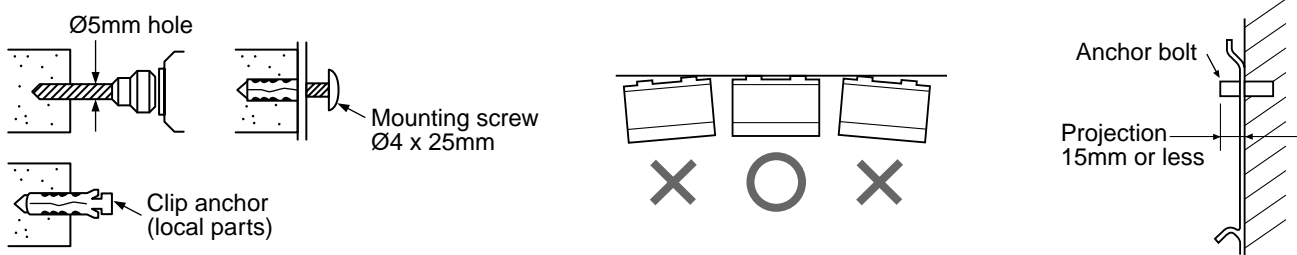


### When the installation plate is directly mounted on the wall

1. Securely fix the installation plate to the wall by screwing it through the upper and lower fixing holes.
2. To mount the installation plate on a concrete wall with anchor bolts, utilize the anchor bolt holes as illustrated in the above figure.
3. Attach the installation plate horizontally to the wall.

## CAUTION

When installing the installation plate with mounting screw, do not use the anchor bolt hole. Otherwise the unit may fall down and result in personal injury and property damage.



# 3 SELECTION OF INSTALLATION PLACE

## ! WARNING

- **Install the air conditioner where there is sufficient strength to withstand the weight of the unit.**  
If the strength is not sufficient, the unit may fall down resulting in injury.

## ! CAUTION

**Upon approval of the customer, install the air conditioner in a place that satisfies the following conditions.**

- Place where the unit can be installed horizontally.
- Place where a sufficient servicing space can be ensured for safe maintenance and check.
- Place where drained water will not cause any problem.

**Avoid installing in the following places.**

- Place exposed to air with high salt content (seaside area), or place exposed to large quantities of sulfide gas (hot spring). (Should the unit be used in these places, special protective measures are needed.)
- Place exposed to oil, vapor, oil smoke or corrosive gas.
- Place where organic solvent is used nearby.
- Place close to a machine generating high frequency.
- Place where the discharged air blows directly into the window of the neighboring house. (For outdoor unit)
- Place where noise of the outdoor unit is easy to transmit.  
(When installing the air conditioner on the boundary with the neighbor, pay due attention to the level of noise.)
- Place with poor ventilation.
- Where the ceiling height is more than 3m.
- Where the floor/wall/ceiling structure is unable to support the weight of the unit.

# 4 INSTALLATION OF INDOOR UNIT

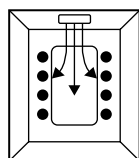
## ! WARNING

- **Install the air conditioner certainly at a place to sufficiently withstand the weight.**  
If the strength is insufficient, the unit may fall down resulting in human injury.
- **Perform a specified installation work to guard against an earthquake.**  
An incomplete installation can cause accidents by the units falling and dropping.

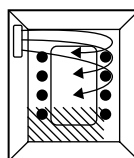
Locate the unit so as to provide uniform circulation of chilled air.

Avoid locating the unit as shown in the bad-marked figures below :

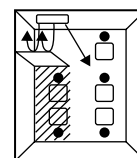
Good location  
Evenly hot or cooled



Bad location  
Shaded area well hot or cooled



Bad location  
Shaded area well hot or cooled



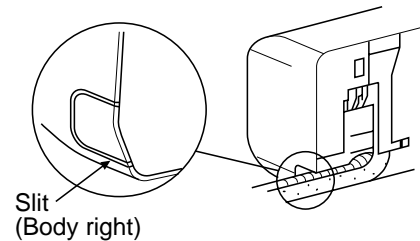
If a good location is not possible, use a fan to circulate the air evenly throughout the room.

# 5 DRAIN PIPING WORK

## Piping and Drain Hose Installation

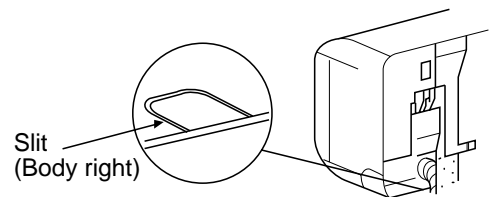
### In case of right-side exit

- Cut out the knockout portion by the slits with a knife or pair of wire cutters as necessary.



### In case of downward pipe exit

- Cut out the knockout portion by the slits with a knife or pair of wire cutters as necessary.

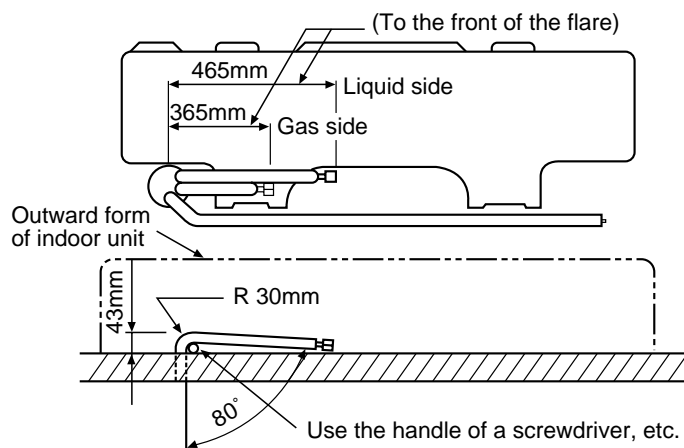


### Piping via left-hand connection

Bend the connecting pipe so that it is laid within 43mm above the wall surface. If the connecting pipe is laid exceeding 43mm above the wall surface, the indoor unit could be unstable when set on the wall. When bending the connecting pipes, always use a suitable bending tool to avoid damaging the pipes.

**Bend the connection pipe within a radius of 30mm.**

**To connect the pipe after installation of unit (figure)**



### NOTE :

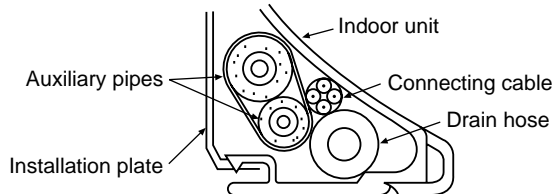
If the pipe is bent incorrectly, the indoor unit could be unstable on the wall.

After passing the connecting pipe through the pipe hole, connect the connecting pipe to the auxiliary pipes and insulate as necessary.

# 5 DRAIN PIPING WORK

## CAUTION

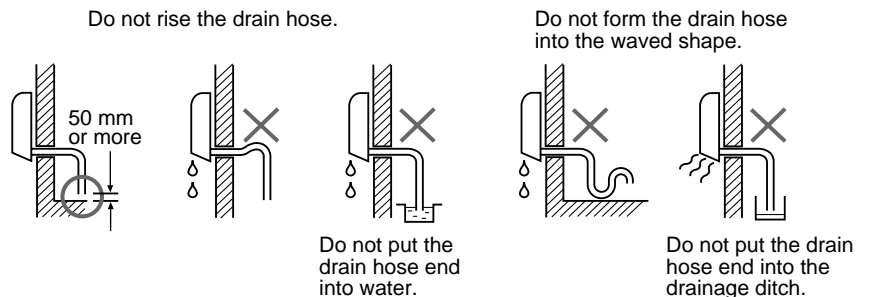
- Bind the auxiliary pipes (two) and connecting cable with tape tightly. In case of left-side pipe exit and rear-left exit, bind the auxiliary pipes (two) only with facing tape.



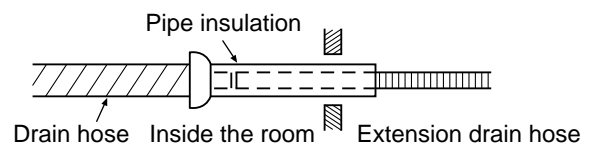
- Carefully arrange pipes so that any pipe does not stick out of the rear plate of the indoor unit.
- Carefully connect the auxiliary pipes and connecting pipes to each other and cut off the insulating tape wound on the connecting pipe to avoid double-taping at the joint, then seal the joint with vinyl tape, etc.
- In order to reduce the possibility of condensed water being produced within the indoor unit, make sure to insulate both the connecting pipes. (Use a suitable form of insulation material specifically design designed for refrigeration pipe work.)
- When bending a pipe, ensure care is taken to prevent pipe damage.

## Drainage

1. Run the drain hose sloped downwards.



2. It is not possible to add water to the drain pan to confirm correct drainage. To do this, the unit must be operated in the COOL mode.
3. When connecting extension drain hose, insulate the connecting part of extension drain hose with pipe insulation.

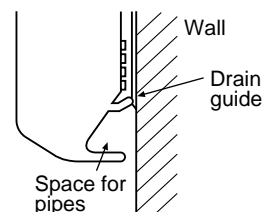


## CAUTION

Arrange the drain pipe to allow proper drainage from the unit. Incorrect drainage can result in condensation problems.

This structure of this air conditioner is designed condensed water, which may form on the back of the indoor unit, into the drain pan.

Therefore, do not store the power cables and other parts within the drain guide.



# 6 REFRIGERANT PIPING

## Refrigerant Piping

1. If the outdoor units are to be mounted on a wall, make sure that the platform supporting is sufficiently strong. The platform should be designed and manufactured to maintain its strength over a long period of time, and sufficient consideration should be given to ensuring that the outdoor unit will not fall.
2. Use copper pipe with 0.8 mm or more thickness.
3. Flare nut and flare works are also different from those of the conventional refrigerant. Take out the flare nut attached to the main unit of the air conditioner, and use it.

## CAUTION

### IMPORTANT 4 POINTS FOR PIPING WORK

1. Take away dust and moisture from the inside of the connecting pipes.
2. Tight connection (between pipes and unit)
3. Evacuate the air in the connecting pipes using VACUUM PUMP.
4. Check the gas leakage. (Connected points)

## Permissible Piping Length and Head

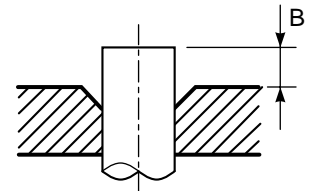
The maximum piping length from the outdoor to indoor unit		The maximum height difference outdoor/indoor unit	
		Outdoor unit is above	Outdoor unit is below
30 m (Without charge 20m) (RAV-SM560AT-E)	50 m (Without charge 20m) (RAV-SM800AT-E)	30m	15m

## Flaring

Insert a flare nut into the pipe, and flare the pipe.

As the flaring sizes of R410A differ from those of refrigerant R22, the flare tools newly manufactured for R410A are recommended.

However, the conventional tools can be used by adjusting projection margin of the copper pipe.



### • Projection margin in flaring : B (Unit : mm)

Rigid (Clutch type)

Outer diam. of copper pipe	R410A tool used		Conventional tool used	
	R410A	R22	R410A	R22
6.35	0 to 0.5	(Same as left)	1.0 to 1.5	0.5 to 1.0
9.52	0 to 0.5	(Same as left)	1.0 to 1.5	0.5 to 1.0
12.7	0 to 0.5	(Same as left)	1.0 to 1.5	0.5 to 1.0

Imperial (Wing nut type)

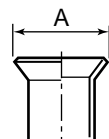
Outer diam. of copper pipe	R410A	R22
6.35	1.5 to 2.0	1.0 to 1.5
9.52	1.5 to 2.0	1.0 to 1.5
12.7	2.0 to 2.5	1.5 to 2.0

### • Flaring dia meter size : A (Unit : mm)

Outer diam. of copper pipe	A $\begin{smallmatrix} +0 \\ -0.4 \end{smallmatrix}$	
	R410A	R22
6.35	9.1	9.0
9.52	13.2	13.0
12.7	16.6	16.2

\* In the case of flaring for R410A with the conventional flare tool, pull out it approx. 0.5 mm more than that for R22 to adjust to the specified flare size.

The copper pipe gauge is useful for adjusting projection margin size.



# 6 REFRIGERANT PIPING

## Tightening connection

Align the centers of the connecting pipes and tighten the flare nut as far as possible with your fingers. Then tighten the nut with a spanner and torque wrench as shown in the figure.

### CAUTION

- Do not apply excess torque. Otherwise, the nut may crack depending on the conditions.

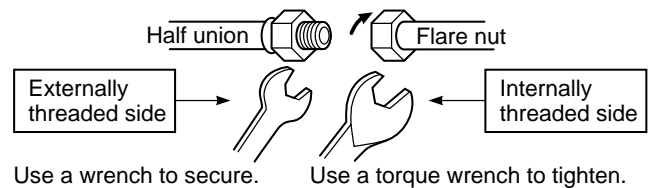
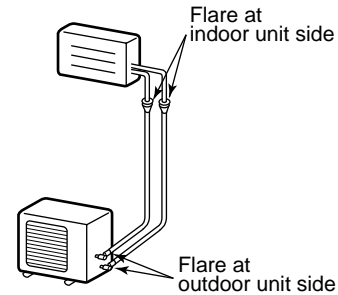
(Unit : N•m)

Outer diam. of copper pipe	Tightening torque
6.35 mm (diam.)	14 to 18 (1.4 to 1.8 kgf•m)
9.52 mm (diam.)	33 to 42 (3.3 to 4.2 kgf•m)
12.7 mm (diam.)	50 to 62 (5.0 to 6.2 kgf•m)
15.9 mm (diam.)	63 to 77 (6.3 to 7.7 kgf•m)

## Tightening torque of flare pipe connections

Pressure of R410A becomes higher than that of R22. (Approx. 1.6 times) Therefore, using a torque wrench, tighten firmly the flare pipe connecting sections which connect the indoor and outdoor units up to the specified tightening torque.

Incorrect connections may cause not only a gas leakage, but also a trouble of the refrigeration cycle or compressor damage.



# 7 EVACUATING

## AIR PURGE

Evacuate the air in the connecting pipes and in the indoor unit using vacuum pump. Do not use the refrigerant in the outdoor unit. For details, see the manual of vacuum pump.

## Use a vacuum pump

Be sure to use a vacuum pump with counter-flow prevention function so that inside oil of the pump does not flow backward into pipes of the air conditioner when the pump stops.

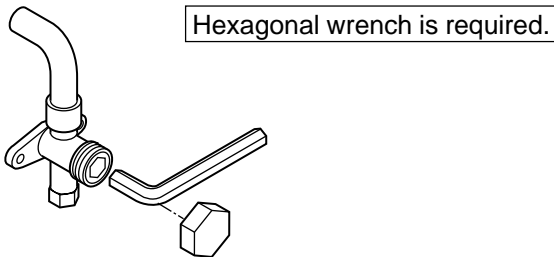
1. Connect the charge hose from the manifold valve to the service port of the gas side packed valve.
2. Connect the charge hose to the port of vacuum pump.

3. Open fully the low pressure side handle of the gauge manifold valve.
4. Operate the vacuum pump to start for evacuating. Perform evacuating for about 35 minutes if the piping length is total 30 meters for model SM560 and 50 meters for model SM800. (assuming a pump capacity of 27 liters per minute.) Then confirm that the compound pressure gauge reading is  $-101$  kPa ( $-76$  cmHg).
5. Close the low pressure side valve handle of gauge manifold.
6. Open fully the valve stem of the packed valves (both sides of Gas and Liquid).
7. Remove the charging hose from the service port.
8. Securely tighten the caps on the packed valves.

### Packed valve handling precautions

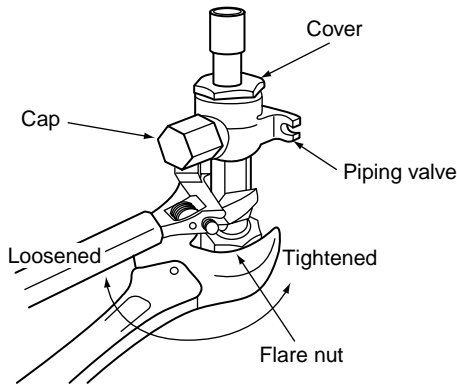
- Open the valve stem all the way out ; do not try to open it beyond the stopper.
- Securely tighten the valve stem cap in torque as follows:

Gas side (12.7 mm (diam.))	50 to 62 N•m (5.0 to 6.2 kgf•m)
Gas side (9.52 mm (diam.))	33 to 42 N•m (3.3 to 4.2 kgf•m)
Liquid side (6.35 mm (diam.))	14 to 18 N•m (1.4 to 1.8 kgf•m)
Service port	14 to 18 N•m (1.4 to 1.8 kgf•m)

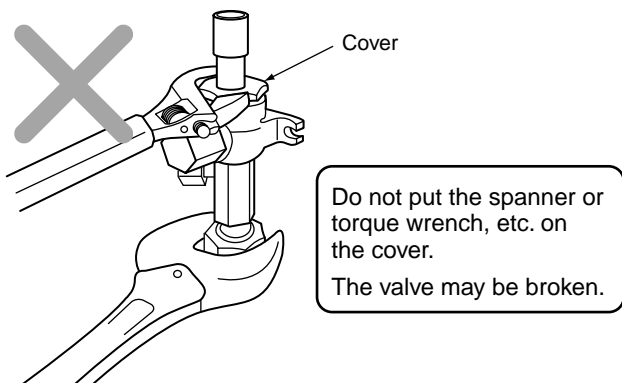


### <For RAV-SM800AT-E model>

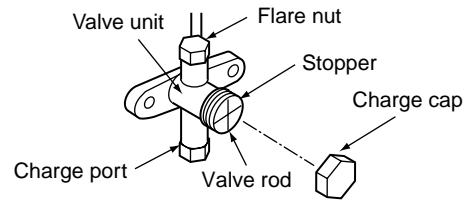
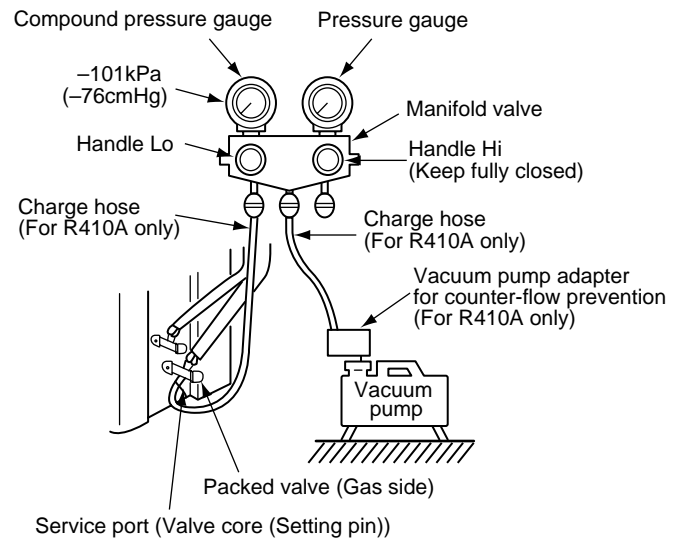
- As shown in the figure, be sure to use a double spanner to loosen or tighten the flare nut of the valve at gas side. If using a single spanner, the nut cannot be tightened with necessary tightening torque. On the contrary, use a single spanner to loosen or tighten the flare nut of the valve at liquid side.



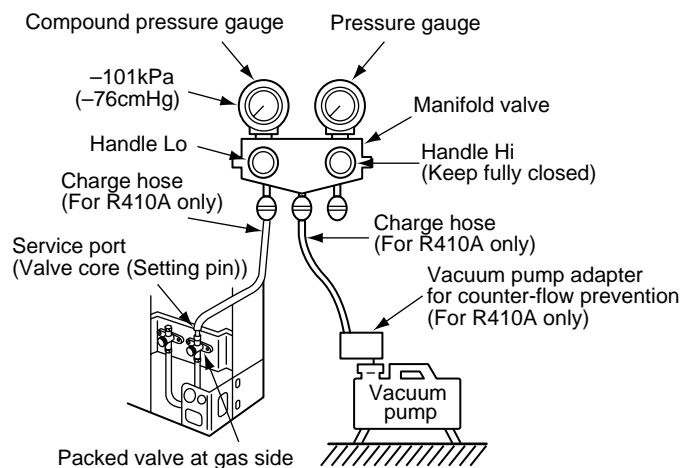
SM800 type valve at gas side



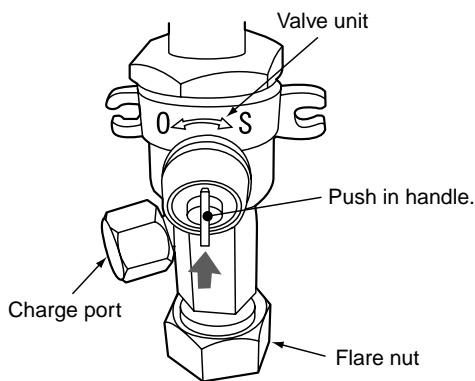
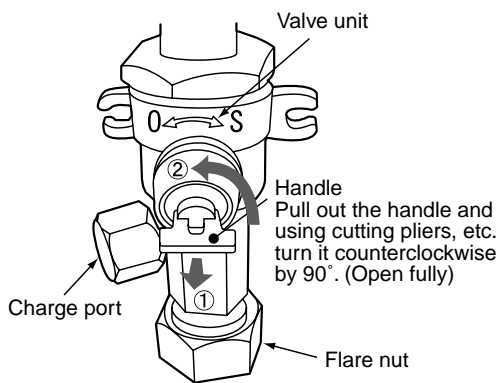
### <For RAV-SM560AT-E model>



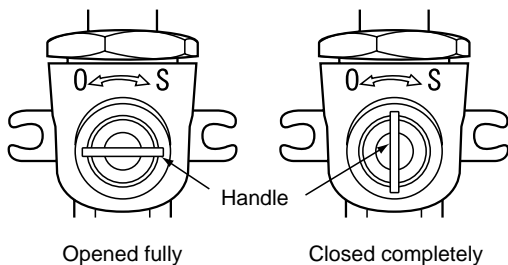
### <For RAV-SM800AT-E model>



# 7 EVACUATING



## Handle position



- \*1. Use the vacuum pump, vacuum pump adapters, and gauge manifold referring to the manuals attached to each tool before using them. For the vacuum pump, check oil is filled up to the specified line of the oil gauge.
- \*2. While the air is purged, check again that the connecting port of charge hose, which has a projection to push the valve core, is firmly connected to the charge port.

## Valve handling precautions

- Open the valve stem or the handle until it strikes the stopper. It is unnecessary to apply further force.
- Securely tighten the cap with a torque wrench.
- Cap tightening torque

Valve size	Ø6.4	14 to 18N•m (1.4 to 1.8kgf•m)
	Ø9.5	33 to 42N•m (3.3 to 4.2kgf•m)
	Ø12.7	33 to 42N•m (3.3 to 4.2kgf•m)
	Ø15.9	20 to 25N•m (2.0 to 2.5kgf•m)
Charge port		14 to 18N•m (1.4 to 1.8kgf•m)

## Additional refrigerant

1. The amount of refrigerant put into the outdoor unit at the factory is sufficient to fill up to 20m of refrigerant piping work.
2. If the length of the refrigerant piping work is 20m or less, addition of refrigerant at the installation site is unnecessary.
3. If the length of the piping work exceeds 20m, extra refrigerant must be added. Refer to the outdoor installation manual for details of the extra amounts.
4. Overcharge or undercharge of refrigerant in the outdoor unit may cause malfunction of the compressor.

## Add Only R410A Refrigerant to These Units

## Heat insulation

1. Provide heat insulation on the refrigerant piping on both the liquid side and gas side separately, and ensure that all joints in the insulation are completely sealed (without gap).
2. Since the temperature of the piping on the gas side increases during heating operations, the heat insulating material used must be able to withstand temperatures of more than 120°C.
3. Use the pipe insulation supplied in the accessory pack to insulate the piping connecting section on the indoor unit side.



# 8 ELECTRICAL WORK

For the air conditioner that has no power cord.

## NOTE:

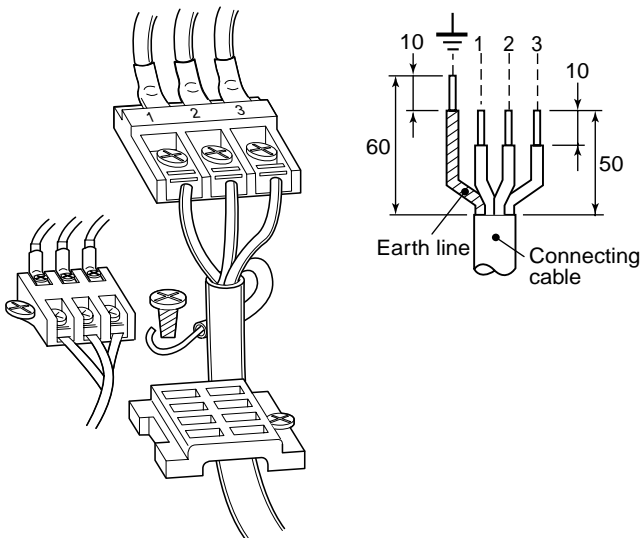
For selection and connection method of the power supply cords, refer to the details in the Installation Manual of the outdoor unit.

## CAUTIONS

- If incorrect/incomplete wiring is carried out, it may cause an electrical fire or smoke.
- Prepare the power supply for exclusive use with the air conditioner.
- Be sure to use the cord clamps specified positions with attached to the product.
- Do not damage or scratch the conductive core and inner insulator of power and inter-connecting cables when peeling them.
- Be sure to comply with local cords on running the wire from outdoor unit to indoor unit (size of wire and wiring method etc.)
- Use the power cord and Inter-connecting cable with specified thickness, specified type, and protective devices specified.

## How to wire

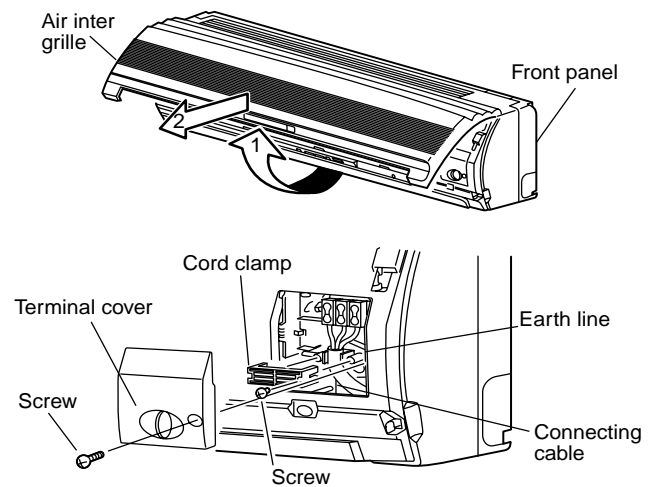
1. Connect the connecting cable to the terminal as identified with their respective matched numbers on the terminal block of indoor and outdoor unit.  
H07 RN-F or 245 IEC 66 (1.0 mm<sup>2</sup> or more)
2. Insulate the unsheathed redundant cords (conductors) with electrical insulation tape. Process them so that they do not touch any electrical or metal parts.
3. For inter-unit wiring, do not use a cut wire jointed to another on the way.



## Wiring between units

1. Connect the wires between the units correctly. Errors made in the connections can result in the unit malfunctioning.
2. Connect the control wires between the outdoor unit and indoor unit as shown in the figure below :

## Wiring connections



# 8 ELECTRICAL WORK

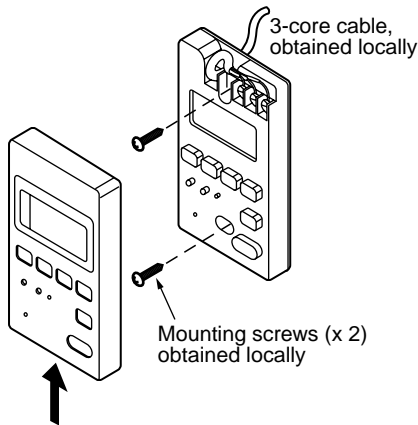
## Installation of Remote Controllers

### Precautions

1. Low-voltage circuit provision is used for remote controller communication, and as such, the remote controller cable is subject to the low-power circuit provision of internal wiring regulations and therefore it cannot be brought into direct contact with a high-voltage AC power line, or housed in the same conduit tube as a power line.

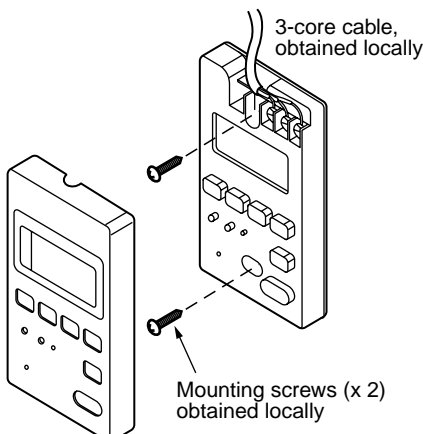
### Flush wall mounting

- Feed the 3-core cable (obtained locally) through the back of the remote controller and then connect to the ABC terminals.
- Attach the remote controller to the wall using two suitable mounting screws (obtained locally).



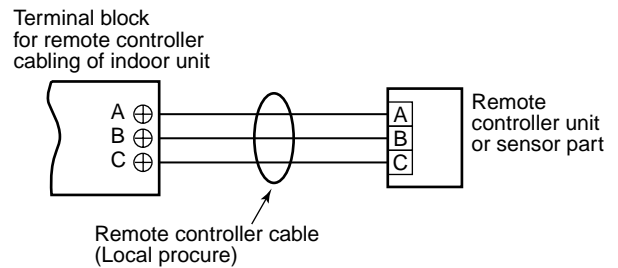
### Wall surface mounting

- Attach the remote controller to the wall using two suitable mounting screws (obtained locally).
- Connect the 3-core cable (obtained locally) to the ABC terminals.
- Make a U-shaped cut-out in the center of the top edge of the decorative cover and pass the 3-core cable through the cut-out.



## Remote Controller Cabling

### Cabling diagram



- For details of cabling/installation of the remote controller, refer to the Installation Manual packaged in the remote controller.

# 9 IMPROVING SYSTEM EFFICIENCY

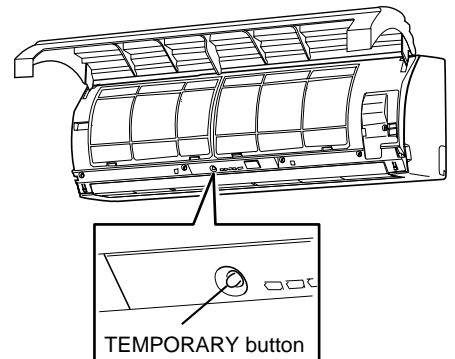
## Air flow direction adjustment

- To improve the effects of cooling and heating, use the outlet louver appropriately for cooling and heating operations. When in cooling operation the most efficient louver position will be horizontal and when in heating operation the optimum louver position is downwards.

## Increasing heating effect

- One method increase the warming effect is to fit an additional means of re-circulating the warmed air from the upper part of the room :
- However if the warming effect of the air conditioner is not good owing to the installation position or the structure of the room, then reset the room temperature regulator as follows to raise the temperature of the room. Adjust position 1 and 2 on DIP switch SW03 located on the indoor P.C. board, according to the table below :

<b>Dip switch SW03 position 1 &amp; 2</b>	Position 1 : ON	Position 1 : OFF	Position 1 : OFF
	Position 2 : OFF	Position 2 : ON	Position 2 : OFF
<b>Temperature increased</b>	Factory pre-set	+2°C	+4°C



## Options

### Test operation

To switch the TEST RUN (COOL) mode, push TEMPORARY button for 10 seconds. (The beeper will make a short beep.)

# 10 FINAL INSTALLATION CHECKS

## Precautions

- Ensure that the electrical cable used for power supply and control of the system is unable to come into contact with either service valves or piping work which are not insulated.

## Electrical wiring

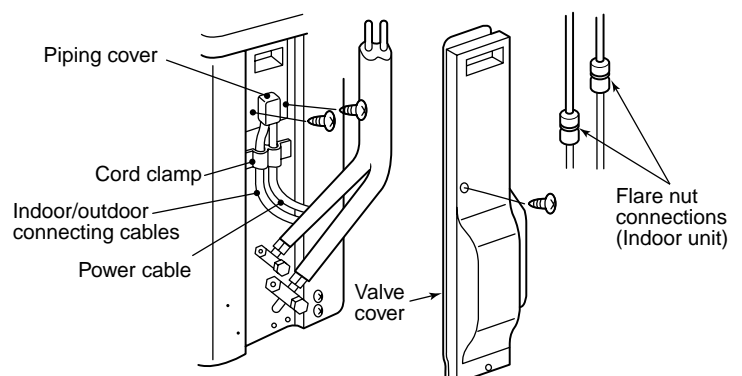
- When installation is complete, check that all power supply and interconnecting wiring has been appropriately protected.

## Refrigerant piping

- When refrigerant and drain piping have been completed. Ensure that all pipework is fully insulated and apply finishing tape to seal the insulation.

## Check and Test Operation

- Pressure of R410A is approx. 1.6 times of that of R22. If installation work is incompletely finished, a gas leakage may occur at the cases such as pressure rise during operation. Therefore, be sure to test the piping connections for leakage.
- Check the flare nut connections, valve stem cap connections and service port cap fittings for gas leak with a leak detector or soap water.



# 10 FINAL INSTALLATION CHECKS

## Useful Functions (SM800AT-E only)

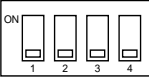
## Self-Diagnosis by LED Indication

In addition to the code checking by remote controller of the indoor unit, troubles of the outdoor unit can be diagnosed by LED indications on the cycle control P.C. board of the outdoor unit. Utilize them for various checks.

For the check by remote controller of the indoor unit, refer to the Installation Manual of the indoor unit.

Before a check, confirm each bit of the DIP switch is set to OFF position.

### LED indication and code checking

DIP switch SW800	Cycle control P.C. board				Cause
	LED indication				
	D800	D801	D802	D803	
	○	●	●	●	Heat exchanger sensor (TE) error
	●	●	○	●	Suction sensor (TS) error
	○	○	●	●	Discharge sensor (TD) error
	●	○	●	○	High-pressure protection error
	●	○	●	●	Outdoor temperature sensor (TO) error
	○	○	○	●	DC outside fan error
	○	●	●	○	Communication error between IPDU
	●	○	○	●	Discharge temp. error
	○	○	●	○	EEPROM error
	●	●	○	○	Communication error between IPDU
	⊙	●	●	●	G-Tr short-circuit protection
	●	⊙	●	●	Detect circuit error
	⊙	⊙	●	●	Current sensor error
	●	●	⊙	●	Comp. lock error
	⊙	●	⊙	●	Comp. break down
	●	●	●	⊙	Phase missing detection, Detection of coming-off of CT current sensor
●	○	●	○	Serial communication error by thermo. operation of Comp. case	

### LED indication

D800 : Red

○ : Red

D801 : Yellow

○ : Yellow

D802 : Yellow

○ : Yellow

D803 : Yellow

○ : Yellow

⊙ : Rapid flash

● : Go off

○ : Go on








## Installation/Serviceing Tools

## Changes in the product and components

In the case of an air conditioner using R410A, in order to prevent any other refrigerant from being charged accidentally, service port diameter of the outdoor unit control valve (3 way valve) has been changed. (1/2 UNF 20 threads per inch)

- In order to increase the pressure resisting strength of the refrigerant piping flare processing diameter and size of opposite side of flare nuts has been changed. (for copper pipes with nominal dimensions 1/2 and 5/8)

### New tools for R410A

New tools for R410A	Applicable to R22 model	Changes
Gauge manifold	×	 As pressure is high, it is impossible to measure by means of conventional gauge. In order to prevent any other refrigerant from being charged, each port diameter is changed.
Charge hose	×	 In order to increase pressure resisting strength, hose materials and port size are changed (to 1/2 UNF 20 threads per inch). When purchasing a charge hose, be sure to check the port size.
Electronic balance for refrigerant charging	○	 As pressure is high and gasification speed is fast, it is difficult to read the indicated value by means of charging cylinder, as air bubbles occur.
Torque wrench (nominal diam. 1/2, 5/8)	×	 The size of opposite sides of flare nuts have been increased. Incidentally, a common wrench is used for nominal diameters 1/4 and 3/8.
Flare tool (clutch type)	○	 By increasing the clamp bar's receiving hole, strength of spring in the tool has been improved.
Gauge for projection adjustment	—	— Used when flare is made with using conventional flare tool.
Vacuum pump adapter	○	 Connected to the conventional vacuum pump. It is necessary to use an adapter to prevent vacuum pump oil from flowing back to the charge hose. The charge hose connecting part has two ports-one for conventional refrigerant (7/16 UNF 20 threads per inch) and one for R410A. If the vacuum pump oil (mineral) mixes with R410A a sludge may occur and damage the equipment.
Gas leakage detector	×	 Exclusive for HFC refrigerant.

Incidentally, the "refrigerant cylinder" comes with the refrigerant designation (R410A) and protector coating in the U.S.'s ARI specified rose color (ARI color code: PMS 507).

- Also, the "charge port and packing for refrigerant cylinder" require 1/2 UNF 20 threads per inch corresponding to the charge hose's port size.

# 11 ENVIRONMENT

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## Environmental Issues

### Product maintenance

1. To minimize the chances of environmental damage and to ensure the efficient operation of the unit, it is recommended to have the air conditioner periodically checked and serviced by a qualified engineer.

### Product disposal

1. Please dispose of the air conditioner unit in an environmentally responsible manner.  
Recycling is the preferred disposal method.
2. When disposing of an air conditioner system, contact either the manufacturer, your local environmental control authority or a local waste disposal company for advice.
3. Ensure all packing material is either recycled or disposed of in accordance with local regulations.
4. The refrigerant gas within the unit should only be removed by an authorized company.

## WARNING

**Discharge of refrigerant to atmosphere is illegal and may lead to prosecution.**

# **TOSHIBA CARRIER CORPORATION**

336 TADEHARA FUJI-SHI, SHIZUOKA-KEN, 416-8521, JAPAN

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