

TOSHIBA

FILE NO. A06-015

SERVICE MANUAL

AIR-CONDITIONER SPLIT TYPE

INDOOR UNIT

Heat Pump Model

RAS-M10SMUV-E
RAS-M13SMUV-E
RAS-M16SMUV-E

Cooling Only Model

RAS-M10SMUCV-E
RAS-M13SMUCV-E
RAS-M16SMUCV-E



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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1. SAFETY PRECAUTIONS

For general public use

Power supply cord of outdoor unit shall be 1.5 mm² (H07RN-F or 60245IEC66) polychloroprene sheathed flexible cord.

- Read this "SAFETY PRECAUTIONS" carefully before servicing.
- The precautions described below include the important items regarding safety. Observe them without fail.
- After the servicing work, perform a trial operation to check for any problem.
- Turn off the main power supply switch (or breaker) before the unit maintenance.

CAUTION

New Refrigerant Air Conditioner Installation

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

R410A refrigerant is apt to be affected by impurities such as water, oxidizing membrane, and oils because the working pressure of R410A refrigerant is approx. 1.6 times of refrigerant R22. Accompanied with the adoption of the new refrigerant, the refrigeration machine oil has also been changed. Therefore, during installation work, be sure that water, dust, former refrigerant, or refrigeration machine oil does not enter into the new type refrigerant R410A air conditioner circuit.

To prevent mixing of refrigerant or refrigerating machine oil, the sizes of connecting sections of charging port on main unit and installation tools are different from those used for the conventional refrigerant units.

Accordingly, special tools are required for the new refrigerant (R410A) units. For connecting pipes, use new and clean piping materials with high pressure fittings made for R410A only, so that water and/or dust does not enter. Moreover, do not use the existing piping because there are some problems with pressure fittings and possible impurities in existing piping.

CAUTION

TO DISCONNECT THE APPLIANCE FROM THE MAIN POWER SUPPLY

A switch or circuit breaker that can disconnect all poles must be included in the fixed wiring. Be sure to use an approved circuit breaker or switch.

DANGER

- **ASK AN AUTHORIZED DEALER OR QUALIFIED INSTALLATION PROFESSIONAL TO INSTALL/ MAINTAIN THE AIR CONDITIONER.**
INAPPROPRIATE SERVICING MAY RESULT IN WATER LEAKAGE, ELECTRIC SHOCK OR FIRE.
- **TURN OFF MAIN POWER SUPPLY BEFORE ATTEMPTING ANY ELECTRICAL WORK. MAKE SURE ALL POWER SWITCHES ARE OFF. FAILURE TO DO SO MAY CAUSE ELECTRIC SHOCK.**



DANGER: HIGH VOLTAGE

The high voltage circuit is incorporated.

Be careful to do the check service, as the electric shock may be caused in case of touching parts on the P.C. board by hand.

- CORRECTLY CONNECT THE CONNECTING CABLE. IF THE CONNECTING CABLE IS INCORRECTLY CONNECTED, ELECTRIC PARTS MAY BE DAMAGED.
- CHECK THAT THE EARTH WIRE IS NOT BROKEN OR DISCONNECTED BEFORE SERVICE AND INSTALLATION. FAILURE TO DO SO MAY CAUSE ELECTRIC SHOCK.

- DO NOT INSTALL NEAR CONCENTRATIONS OF COMBUSTIBLE GAS OR GAS VAPORS. FAILURE TO FOLLOW THIS INSTRUCTION CAN RESULT IN FIRE OR EXPLOSION.
- TO PREVENT THE INDOOR UNIT FROM OVERHEATING AND CAUSING A FIRE HAZARD, PLACE THE UNIT WELL AWAY (MORE THAN 2 M) FROM HEAT SOURCES SUCH AS RADIATORS, HEAT REGISTORS, FURNACE, STOVES, ETC.
- WHEN MOVING THE AIR-CONDITIONER FOR INSTALLATION IN ANOTHER PLACE, BE VERY CAREFUL NOT TO ALLOW THE SPECIFIED REFRIGERANT (R410A) TO BECOME MIXED WITH ANY OTHER GASEOUS BODY INTO THE REFRIGERATION CIRCUIT. IF AIR OR ANY OTHER GAS IS MIXED IN THE REFRIGERANT, THE GAS PRESSURE IN THE REFRIGERATION CIRCUIT WILL BECOME ABNORMALLY HIGH AND IT MAY RESULT IN THE PIPE BURSTING AND POSSIBLE PERSONNEL INJURIES.
- IN THE EVENT THAT THE REFRIGERANT GAS LEAKS OUT OF THE PIPE DURING THE SERVICE WORK AND THE INSTALLATION WORK, IMMEDIATELY LET FRESH AIR INTO THE ROOM. IF THE REFRIGERANT GAS IS HEATED, SUCH AS BY FIRE, GENERATION OF POISONOUS GAS MAY RESULT.

WARNING

- **Never modify this unit by removing any of the safety guards or bypass any of the safety interlock switches.**
- **Do not install in a place which cannot bear the weight of the unit. Personal injury and property damage can result if the unit falls.**
If refrigerant gas leaks into the room and flows near a fire source, such as a cooking range, noxious gas may generate.
- **The electrical work must be performed by a qualified electrician in accordance with the Installation Manual. Make sure the air conditioner uses an exclusive circuit.**
An insufficient circuit capacity or inappropriate installation may cause fire.
- **When wiring, use the specified cables and connect the terminals securely to prevent external forces applied to the cable 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.

CAUTION

- Exposure of unit to water or other moisture before installation may result in an electrical short.
Do not store in a wet basement or expose to rain or water.
- Do not install in a place that can increase the vibration of the unit. Do not install in a place that can amplify the noise level of the unit or where noise or discharged air might disturb neighbors.
- To avoid personal injury, be careful when handling parts with sharp edges.
- **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.

For Reference:

If a heating operation would be continuously performed for a long time under the condition that the outdoor temperature is 0°C or lower, drainage of defrosted water may be difficult due to freezing of the bottom plate, resulting in a trouble of the cabinet or fan.

It is recommended to procure an antifreeze heater locally for a safe installation of the air conditioner.

For details, contact the dealer.

2. SPECIFICATIONS

2-1. Combined Outdoor Unit

The outdoor units, which can be combined with 4-way Air Discharge Cassette indoor unit are as described below:

2-1-1. Cooling and Heating Type

Outdoor unit type	Combined outdoor unit model name	Capacity rank of 4-way Air Discharge Cassette			Conditions of combination
		16 class	13 class	10 class	
2-room Multi outdoor unit	RAS-M14GAV-E	✗	✗	✗	Combination unavailable
	RAS-M18GAV-E	○	○	○	None
3-room Multi outdoor unit	RAS-3M18SAV-E	○	○	○	None
	RAS-3M26GAV-E	○	○	○	None
4-room Multi outdoor unit	RAS-4M23SAV-E	○	○	○	None
	RAS-4M27GAV-E	○	○	○	Restrict the max. pipe length 70m to 50m

○: Combination available, ✗: Combination unavailable

2-1-2. Cooling only type

Outdoor unit type	Combined outdoor unit model name	Capacity rank of 4-way Air Discharge Cassette			Conditions of combination
		16 class	13 class	10 class	
2-room Multi outdoor unit	RAS-M14GACV-E	✗	✗	✗	Combination unavailable
	RAS-M18GACV-E	○	○	○	None
3-room Multi outdoor unit	RAS-3M18SACV-E	○	○	○	None
	RAS-3M23GACV-E	✗	✗	✗	Combination unavailable
4-room Multi outdoor unit	RAS-4M23SACV-E	○	○	○	None
	RAS-4M27GACV-E	○	○	○	Restrict the max. pipe length 70m to 50m

○: Combination available, ✗: Combination unavailable

This Service Manual describes about 4-way Air Discharge Cassette indoor units, RAS-M10SMUV-E, RAS-M13SMUV-E, RAS-M16SMUV-E, RAS-M10SMUCV-E, RAS-M13SMUCV-E and RAS-M16SMUCV-E only. For the outdoor unit, refer to the Service Manual attached to the combined outdoor unit.

Outdoor unit	File No.
RAS-M18GAV-E	A05-009-1
RAS-3M18SAV-E	A06-013
RAS-4M23SAV-E	A06-014
RAS-3M26GAV-E, RAS-4M27GAV-E	A05-011

2-2. Indoor Unit

2-2-1. Heat Pump Model

Model	Indoor unit		RAS-M10SMUV-E	RAS-M13SMUV-E	RAS-M16SMUV-E
	Panel		RB-B11MC (W) E		
Power supply				1 phase, 50Hz 220 to 240 V, 60Hz 220 V	
Cooling mode	Electrical characteristics	Voltage (V)	220/230/240	220/230/240	220/230/240
		Running current (A)	0.21/0.20/0.19	0.21/0.20/0.19	0.21/0.20/0.19
		Power consumption (W)	23	23	23
		Power factor (%)	50	50	50
	Sound pressure level	High (dB)	37	38	40
		Medium+ (dB)	35	36	38
		Medium (dB)	33	34	37
		Low+ (dB)	32	32	34
		Low (dB)	30	30	31
	Air flow	High (m³/min.)	9.8	10.3	11.0
		Medium+ (m³/min.)	9.1	9.6	10.3
		Medium (m³/min.)	8.4	8.8	9.5
		Low+ (m³/min.)	7.7	8.1	8.4
		Low (m³/min.)	7.2	7.2	7.5
Heating mode	Electrical characteristics	Voltage (V)	220/230/240	220/230/240	220/230/240
		Running current (A)	0.21/0.20/0.19	0.21/0.20/0.19	0.21/0.20/0.19
		Power consumption (W)	23	23	23
		Power factor (%)	50	50	50
	Sound pressure level	High (dB)	37	38	40
		Medium+ (dB)	35	36	38
		Medium (dB)	33	34	37
		Low+ (dB)	32	32	34
		Low (dB)	30	30	31
	Air flow	High (m³/min.)	9.8	10.3	11.0
		Medium+ (m³/min.)	9.1	9.6	10.3
		Medium (m³/min.)	8.4	8.8	9.5
		Low+ (m³/min.)	7.7	8.1	8.4
		Low (m³/min.)	7.2	7.2	7.5
Fan unit	Fan		Turbo fan		
	Motor output (W)		60		
Outer dimension	Indoor unit	Height (mm)	268		
		Width (mm)	575		
		Depth (mm)	575		
	Panel	Height (mm)	27		
		Width (mm)	700		
		Depth (mm)	700		
Appearance	Indoor unit		Zinc hot dipping steel plate		
	Panel		Moon-white (Muncel 2.5GY, 9.0/0.5)		
Total weight	Indoor unit (kg)		15		
	Panel (kg)		3		
Piping connection		Type	Flare connection		
		Liquid side (mm)	Ø6.35		
		Gas side (mm)	Ø9.52	Ø9.52	Ø12.7
		Drain port	VP25		
Installable ceiling height of indoor unit		Minimun (m)	2.5	2.5	2.5
		Maximum (m)	2.7	2.7	3.5
Usable temperature range		Cooling (°C)	21 to 32		
		Heating (°C)	0 to 29		
Accessory	Indoor unit	Wireless remote controller	1 (WH-H3UE)		
		Batteries	2		
		Remote controller holder	1		
		Mounting screw	1		
		Owner's manual	1		
		Installation manual	1		
	Panel	Installation manual	1		
		Mounting screw	4		

2-2-2. Cooling Only Model

Model	Indoor unit		RAS-M10SMUCV-E	RAS-M13SMUCV-E	RAS-M16SMUCV-E			
	Panel		RB-B11MC (W) E					
Power supply		1 phase, 50Hz 220 to 240 V, 60Hz 220 V						
Cooling mode	Electrical characteristics	Voltage (V)	220/230/240	220/230/240	220/230/240			
		Running current (A)	0.21/0.20/0.19	0.21/0.20/0.19	0.21/0.20/0.19			
		Power consumption (W)	23	23	23			
		Power factor (%)	50	50	50			
	Sound pressure level	High (dB)	37	38	40			
		Medium+ (dB)	35	36	38			
		Medium (dB)	33	34	37			
		Low+ (dB)	32	32	34			
		Low (dB)	30	30	31			
	Air flow	High (m³/min.)	9.8	10.3	11.0			
		Medium+ (m³/min.)	9.1	9.6	10.3			
		Medium (m³/min.)	8.4	8.8	9.5			
		Low+ (m³/min.)	7.7	8.1	8.4			
		Low (m³/min.)	7.2	7.2	7.5			
Fan unit	Fan		Turbo fan					
	Motor output (W)		60					
Outer dimension	Indoor unit	Height (mm)	268					
		Width (mm)	575					
		Depth (mm)	575					
	Panel	Height (mm)	27					
		Width (mm)	700					
		Depth (mm)	700					
Appearance	Indoor unit		Zinc hot dipping steel plate					
	Panel		Moon-white (Muncel 2.5GY, 9.0/0.5)					
Total weight	Indoor unit (kg)		15					
	Panel (kg)		3					
Piping connection	Type	Flare connection						
	Liquid side (mm)	Ø6.35						
	Gas side (mm)	Ø9.52	Ø9.52	Ø12.7				
	Drain port	VP25						
Installable ceiling height of indoor unit	Minimun (m)	2.5	2.5	2.5				
	Maximum (m)	2.7	2.7	3.5				
Usable temperature range	Cooling (°C)	21 to 32						
Accessory	Indoor unit	Wireless remote controller	1 (WC-H2UE)					
		Batteries	2					
		Remote controller holder	1					
		Mounting screw	1					
		Owner's manual	1					
		Installation manual	1					
	Panel	Installation manual	1					
		Mounting screw	4					

3. REFRIGERANT R410A

This air conditioner adopts the new refrigerant HFC (R410A) which does not damage the ozone layer.

The working pressure of the new refrigerant R410A is 1.6 times higher than conventional refrigerant (R22). The refrigerating oil is also changed in accordance with change of refrigerant, so be careful that water, dust, and existing refrigerant or refrigerating oil are not entered in the refrigerant cycle of the air conditioner using the new refrigerant during installation work or servicing time.

The next section describes the precautions for air conditioner using the new refrigerant. Conforming to contents of the next section together with the general cautions included in this manual, perform the correct and safe work.

3-1. Safety During Installation/Servicing

As R410A's pressure is about 1.6 times higher than that of R22, improper installation/servicing may cause a serious trouble. By using tools and materials exclusive for R410A, it is necessary to carry out installation/servicing safely while taking the following precautions into consideration.

1. Never use refrigerant other than R410A in an air conditioner which is designed to operate with R410A.

If other refrigerant than R410A is mixed, pressure in the refrigeration cycle becomes abnormally high, and it may cause personal injury, etc. by a rupture.

2. Confirm the used refrigerant name, and use tools and materials exclusive for the refrigerant R410A.

The refrigerant name R410A is indicated on the visible place of the outdoor unit of the air conditioner using R410A as refrigerant. To prevent mischarging, the diameter of the service port differs from that of R22.

3. If a refrigeration gas leakage occurs during installation/servicing, be sure to ventilate fully.

If the refrigerant gas comes into contact with fire, a poisonous gas may occur.

4. When installing or removing an air conditioner, do not allow air or moisture to remain in the refrigeration cycle. Otherwise, pressure in the refrigeration cycle may become abnormally high so that a rupture or personal injury may be caused.

5. After completion of installation work, check to make sure that there is no refrigeration gas leakage.

If the refrigerant gas leaks into the room, coming into contact with fire in the fan-driven heater, space heater, etc., a poisonous gas may occur.

6. When an air conditioning system charged with a large volume of refrigerant is installed in a small room, it is necessary to exercise care so that, even when refrigerant leaks, its concentration does not exceed the marginal level.

If the refrigerant gas leakage occurs and its concentration exceeds the marginal level, an oxygen starvation accident may result.

7. Be sure to carry out installation or removal according to the installation manual.

Improper installation may cause refrigeration trouble, water leakage, electric shock, fire, etc.

8. Unauthorized modifications to the air conditioner may be dangerous.

If a breakdown occurs please call a qualified air conditioner technician or electrician.

Improper repair's may result in water leakage, electric shock and fire, etc.

3-2. Refrigerant Piping Installation

3-2-1. Piping Materials and Joints Used

For the refrigerant piping installation, copper pipes and joints are mainly used.

Copper pipes and joints suitable for the refrigerant must be chosen and installed.

Furthermore, it is necessary to use clean copper pipes and joints whose interior surfaces are less affected by contaminants.

1. Copper Pipes

It is necessary to use seamless copper pipes which are made of either copper or copper alloy and it is desirable that the amount of residual oil is less than 40 mg/10 m.

Do not use copper pipes having a collapsed, deformed or discolored portion (especially on the interior surface).

Otherwise, the expansion valve or capillary tube may become blocked with contaminants.

As an air conditioner using R410A incurs pressure higher than when using R22, it is necessary to choose adequate materials.

Thicknesses of copper pipes used with R410A are as shown in Table 3-2-1.

Never use copper pipes thinner than 0.8 mm even when it is available on the market.

Table 3-2-1 Thicknesses of annealed copper pipes

Nominal diameter	Outer diameter (mm)	Thickness (mm)	
		R410A	R22
1/4	6.35	0.80	0.80
3/8	9.52	0.80	0.80
1/2	12.70	0.80	0.80
5/8	15.88	1.00	1.00

2. Joints

For copper pipes, flare joints or socket joints are used. Prior to use, be sure to remove all contaminants.

a) Flare Joints

Flare joints used to connect the copper pipes cannot be used for pipings whose outer diameter exceeds 20 mm. In such a case, socket joints can be used.

Sizes of flare pipe ends, flare joint ends and flare nuts are as shown in Tables 3-2-3 to 3-2-6 below.

b) Socket Joints

Socket joints are such that they are brazed for connections, and used mainly for thick pipings whose diameter is larger than 20 mm.

Thicknesses of socket joints are as shown in Table 3-2-2.

Table 3-2-2 Minimum thicknesses of socket joints

Nominal diameter	Reference outer diameter of copper pipe jointed (mm)	Minimum joint thickness (mm)
1/4	6.35	0.50
3/8	9.52	0.60
1/2	12.70	0.70
5/8	15.88	0.80

3-2-2. Processing of Piping Materials

When performing the refrigerant piping installation, care should be taken to ensure that water or dust does not enter the pipe interior, that no other oil than lubricating oils used in the installed air-water heat pump is used, and that refrigerant does not leak.

When using lubricating oils in the piping processing, use such lubricating oils whose water content has been removed. When stored, be sure to seal the container with an airtight cap or any other cover.

1. Flare processing procedures and precautions

a) Cutting the Pipe

By means of a pipe cutter, slowly cut the pipe so that it is not deformed.

b) Removing Burrs and Chips

If the flared section has chips or burrs, refrigerant leakage may occur.

Carefully remove all burrs and clean the cut surface before installation.

c) Insertion of Flare Nut

d) Flare Processing

Make certain that a clamp bar and copper pipe have been cleaned.

By means of the clamp bar, perform the flare processing correctly.

Use either a flare tool for R410A or conventional flare tool.

Flare processing dimensions differ according to the type of flare tool. When using a conventional flare tool, be sure to secure "dimension A" by using a gauge for size adjustment.

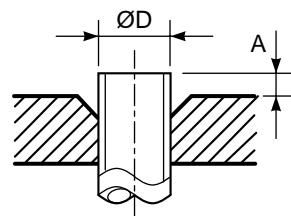


Fig. 3-2-1 Flare processing dimensions

Table 3-2-3 Dimensions related to flare processing for R410A

Nominal diameter	Outer diameter (mm)	Thickness (mm)	A (mm)		
			Flare tool for R410A clutch type	Conventional flare tool	
				Clutch type	Wing nut type
1/4	6.35	0.8	0 to 0.5	1.0 to 1.5	1.5 to 2.0
3/8	9.52	0.8	0 to 0.5	1.0 to 1.5	1.5 to 2.0
1/2	12.70	0.8	0 to 0.5	1.0 to 1.5	2.0 to 2.5
5/8	15.88	1.0	0 to 0.5	1.0 to 1.5	2.0 to 2.5

Table 3-2-4 Dimensions related to flare processing for R22

Nominal diameter	Outer diameter (mm)	Thickness (mm)	A (mm)		
			Flare tool for R22 clutch type	Conventional flare tool	
				Clutch type	Wing nut type
1/4	6.35	0.8	0 to 0.5	0.5 to 1.0	1.0 to 1.5
3/8	9.52	0.8	0 to 0.5	0.5 to 1.0	1.0 to 1.5
1/2	12.70	0.8	0 to 0.5	0.5 to 1.0	1.5 to 2.0
5/8	15.88	1.0	0 to 0.5	0.5 to 1.0	1.5 to 2.0

Table 3-2-5 Flare and flare nut dimensions for R410A

Nominal diameter	Outer diameter (mm)	Thickness (mm)	Dimension (mm)				Flare nut width (mm)
			A	B	C	D	
1/4	6.35	0.8	9.1	9.2	6.5	13	17
3/8	9.52	0.8	13.2	13.5	9.7	20	22
1/2	12.70	0.8	16.6	16.0	12.9	23	26
5/8	15.88	1.0	19.7	19.0	16.0	25	29

Table 3-2-6 Flare and flare nut dimensions for R22

Nominal diameter	Outer diameter (mm)	Thickness (mm)	Dimension (mm)				Flare nut width (mm)
			A	B	C	D	
1/4	6.35	0.8	9.0	9.2	6.5	13	17
3/8	9.52	0.8	13.0	13.5	9.7	20	22
1/2	12.70	0.8	16.2	16.0	12.9	20	24
5/8	15.88	1.0	19.7	19.0	16.0	23	27
3/4	19.05	1.0	23.3	24.0	19.2	34	36

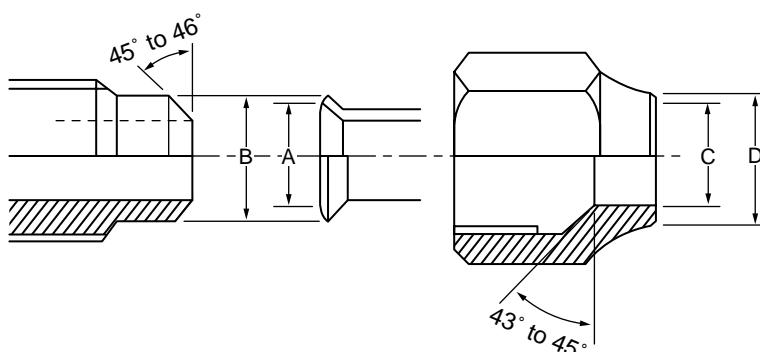


Fig. 3-2-2 Relations between flare nut and flare seal surface

2. Flare Connecting Procedures and Precautions

- Make sure that the flare and union portions do not have any scar or dust, etc.
- Correctly align the processed flare surface with the union axis.
- Tighten the flare with designated torque by means of a torque wrench.

The tightening torque for R410A is the same as that for conventional R22.

Incidentally, when the torque is weak, the gas leakage may occur.

When it is strong, the flare nut may crack and may be made non-removable.

When choosing the tightening torque, comply with values designated by manufacturers.

Table 3-2-7 shows reference values.

NOTE :

When applying oil to the flare surface, be sure to use oil designated by the manufacturer.

If any other oil is used, the lubricating oils may deteriorate and cause the compressor to burn out.

Table 3-2-7 Tightening torque of flare for R410A [Reference values]

Nominal diameter	Outer diameter (mm)	Tightening torque N·m (kgf·cm)	Tightening torque of torque wrenches available on the market N·m (kgf·cm)
1/4	6.35	14 to 18 (140 to 180)	16 (160), 18 (180)
3/8	9.52	33 to 42 (330 to 420)	42 (420)
1/2	12.70	50 to 62 (500 to 620)	55 (550)
5/8	15.88	63 to 77 (630 to 770)	65 (650)

3-3. Tools

3-3-1. Required Tools

The service port diameter of packed valve of the outdoor unit in the air-water heat pump using R410A is changed to prevent mixing of other refrigerant. To reinforce the pressure-resisting strength, flare processing dimensions and opposite side dimension of flare nut (For Ø12.7 copper pipe) of the refrigerant piping are lengthened.

The used refrigerating oil is changed, and mixing of oil may cause a trouble such as generation of sludge, clogging of capillary, etc. Accordingly, the tools to be used are classified into the following three types.

1. Tools exclusive for R410A (Those which cannot be used for conventional refrigerant (R22))
2. Tools exclusive for R410A, but can be also used for conventional refrigerant (R22)
3. Tools commonly used for R410A and for conventional refrigerant (R22)

The table below shows the tools exclusive for R410A and their interchangeability.

Tools exclusive for R410A (The following tools for R410A are required.)

Tools whose specifications are changed for R410A and their interchangeability

No.	Used tool	Usage	R410A air-water heat pump installation		Conventional air-water heat pump installation
			Existence of new equipment for R410A	Whether conven- tional equipment can be used	Whether new equipment can be used with conventional refrigerant
1	Flare tool	Pipe flaring	Yes	*(Note 1)	○
2	Copper pipe gauge for adjusting projection margin	Flaring by conventional flare tool	Yes	*(Note 1)	*(Note 1)
3	Torque wrench (For Ø12.7)	Connection of flare nut	Yes	×	×
4	Gauge manifold	Evacuating, refrigerant charge, run check, etc.	Yes	×	×
5	Charge hose			×	×
6	Vacuum pump adapter	Vacuum evacuating	Yes	×	○
7	Electronic balance for refrigerant charging	Refrigerant charge	Yes	×	○
8	Refrigerant cylinder	Refrigerant charge	Yes	×	×
9	Leakage detector	Gas leakage check	Yes	×	○
10	Charging cylinder	Refrigerant charge	(Note 2)	×	×

(Note 1) When flaring is carried out for R410A using the conventional flare tools, adjustment of projection margin is necessary. For this adjustment, a copper pipe gauge, etc. are necessary.

(Note 2) Charging cylinder for R410A is being currently developed.

General tools (Conventional tools can be used.)

In addition to the above exclusive tools, the following equipments which serve also for R22 are necessary as the general tools.

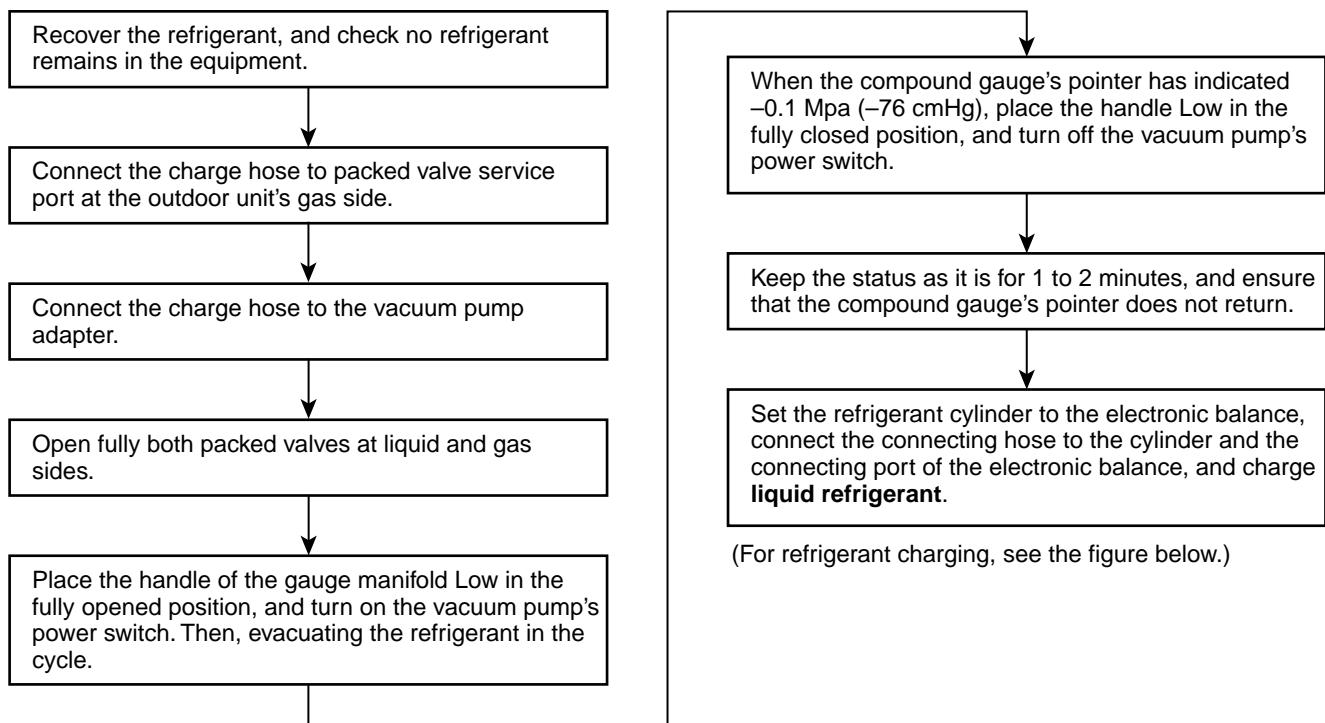
1. Vacuum pump
Use vacuum pump by attaching
vacuum pump adapter.
2. Torque wrench (For Ø6.35, Ø9.52)
3. Pipe cutter
4. Reamer
5. Pipe bender
6. Level vial
7. Screwdriver (+, -)
8. Spanner or Monkey wrench
9. Hole core drill (Ø65)
10. Hexagon wrench
(Opposite side 4mm)
11. Tape measure
12. Metal saw

Also prepare the following equipments for other installation method and run check.

1. Clamp meter
2. Thermometer
3. Insulation resistance tester
4. Electroscope

3-4. Recharging of Refrigerant

When it is necessary to recharge refrigerant, charge the specified amount of new refrigerant according to the following steps.



1. Never charge refrigerant exceeding the specified amount.
2. If the specified amount of refrigerant cannot be charged, charge refrigerant **bit by bit** in COOL mode.
3. Do not carry out additional charging.

When additional charging is carried out if refrigerant leaks, the refrigerant composition changes in the refrigeration cycle, that is characteristics of the air conditioner changes, refrigerant exceeding the specified amount is charged, and working pressure in the refrigeration cycle becomes abnormally high pressure, and may cause a rupture or personal injury.

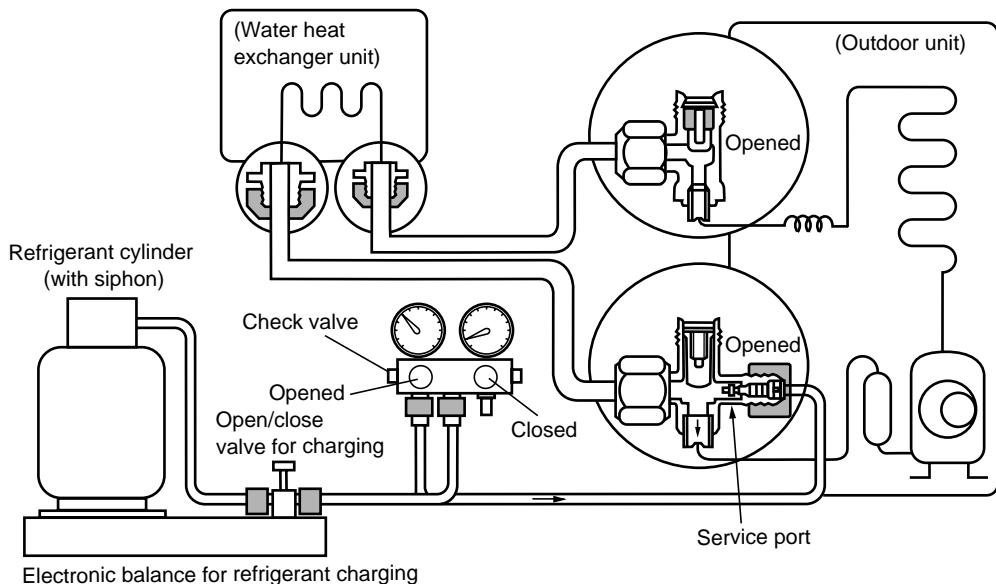


Fig. 3-4-1 Configuration of refrigerant charging

1. Be sure to make setting so that **liquid** can be charged.
2. When using a cylinder equipped with a siphon, liquid can be charged without turning it upside down.

It is necessary for charging refrigerant under condition of liquid because R410A is mixed type of refrigerant. Accordingly, when charging refrigerant from the refrigerant cylinder to the equipment, charge it turning the cylinder upside down if cylinder is not equipped with siphon.

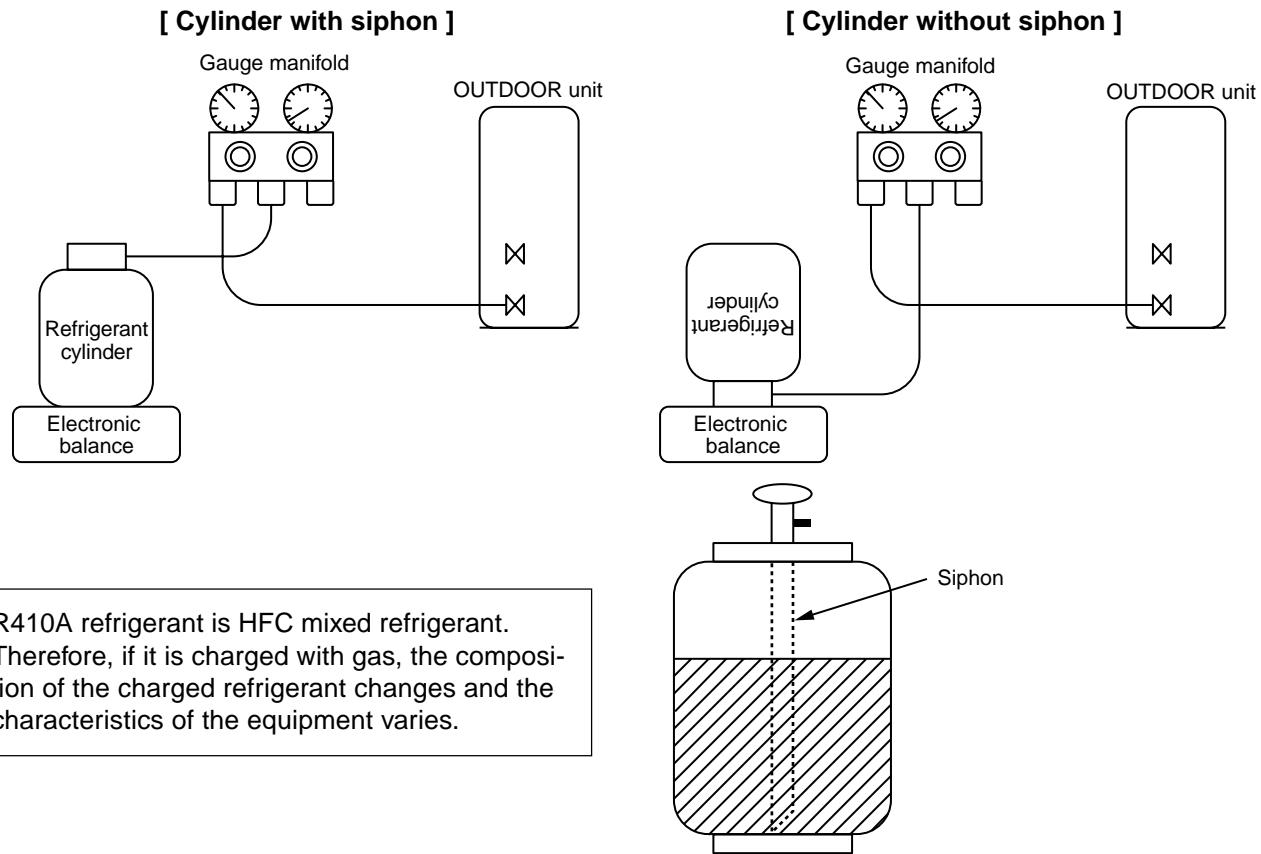


Fig. 3-4-2

3-5. Brazing of Pipes

3-5-1. Materials for Brazing

1. Silver brazing filler

Silver brazing filler is an alloy mainly composed of silver and copper. It is used to join iron, copper or copper alloy, and is relatively expensive though it excels in solderability.

2. Phosphor bronze brazing filler

Phosphor bronze brazing filler is generally used to join copper or copper alloy.

3. Low temperature brazing filler

Low temperature brazing filler is generally called solder, and is an alloy of tin and lead. Since it is weak in adhesive strength, do not use it for refrigerant pipes.

1. Phosphor bronze brazing filler tends to react with sulfur and produce a fragile compound water solution, which may cause a gas leakage. Therefore, use any other type of brazing filler at a hot spring resort, etc., and coat the surface with a paint.
2. When performing brazing again at time of servicing, use the same type of brazing filler.

3-5-2. Flux

1. Reason why flux is necessary

- By removing the oxide film and any foreign matter on the metal surface, it assists the flow of brazing filler.
- In the brazing process, it prevents the metal surface from being oxidized.
- By reducing the brazing filler's surface tension, the brazing filler adheres better to the treated metal.

2. Characteristics required for flux

- Activated temperature of flux coincides with the brazing temperature.
- Due to a wide effective temperature range, flux is hard to carbonize.
- It is easy to remove slag after brazing.
- The corrosive action to the treated metal and brazing filler is minimum.
- It excels in coating performance and is harmless to the human body.

As the flux works in a complicated manner as described above, it is necessary to select an adequate type of flux according to the type and shape of treated metal, type of brazing filler and brazing method, etc.

3. Types of flux

• Noncorrosive flux

Generally, it is a compound of borax and boric acid.

It is effective in case where the brazing temperature is higher than 800°C.

• Activated flux

Most of fluxes generally used for silver brazing are this type.

It features an increased oxide film removing capability due to the addition of compounds such as potassium fluoride, potassium chloride and sodium fluoride to the borax-boric acid compound.

4. Piping materials for brazing and used brazing filler/flux

Piping material	Used brazing filler	Used flux
Copper - Copper	Phosphor copper	Do not use
Copper - Iron	Silver	Paste flux
Iron - Iron	Silver	Vapor flux

1. Do not enter flux into the refrigeration cycle.
2. When chlorine contained in the flux remains within the pipe, the lubricating oil deteriorates. Therefore, use a flux which does not contain chlorine.
3. When adding water to the flux, use water which does not contain chlorine (e.g. distilled water or ion-exchange water).
4. Remove the flux after brazing.

3-5-3. Braze

As braze work requires sophisticated techniques, experiences based upon a theoretical knowledge, it must be performed by a person qualified.

In order to prevent the oxide film from occurring in the pipe interior during braze, it is effective to proceed with braze while letting dry Nitrogen gas (N₂) flow.

Never use gas other than Nitrogen gas.

1. Braze method to prevent oxidation

- 1) Attach a reducing valve and a flow-meter to the Nitrogen gas cylinder.
- 2) Use a copper pipe to direct the piping material, and attach a flow-meter to the cylinder.
- 3) Apply a seal onto the clearance between the piping material and inserted copper pipe for Nitrogen in order to prevent backflow of the Nitrogen gas.
- 4) When the Nitrogen gas is flowing, be sure to keep the piping end open.
- 5) Adjust the flow rate of Nitrogen gas so that it is lower than 0.05 m³/Hr or 0.02 MPa (0.2kgf/cm²) by means of the reducing valve.
- 6) After performing the steps above, keep the Nitrogen gas flowing until the pipe cools down to a certain extent (temperature at which pipes are touchable with hands).
- 7) Remove the flux completely after braze.

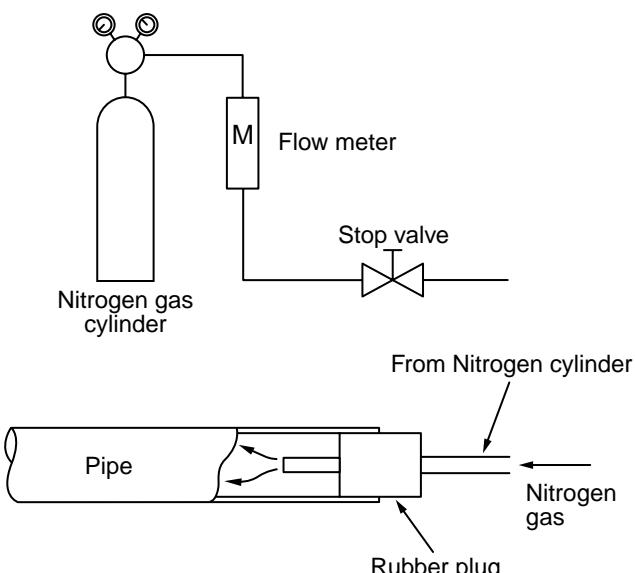
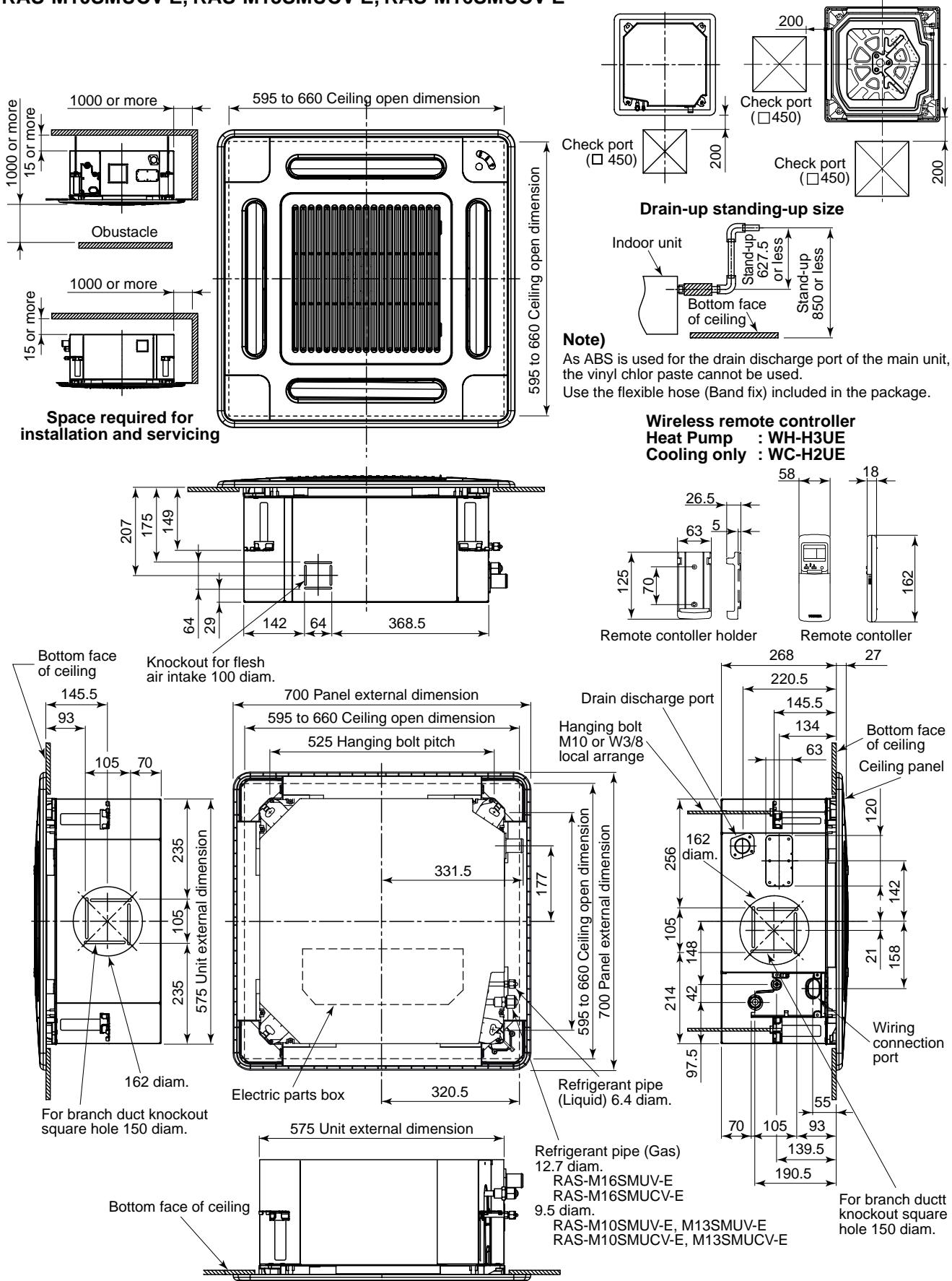


Fig. 3-5-1
Prevention of oxidation during braze

4. CONSTRUCTION VIEWS

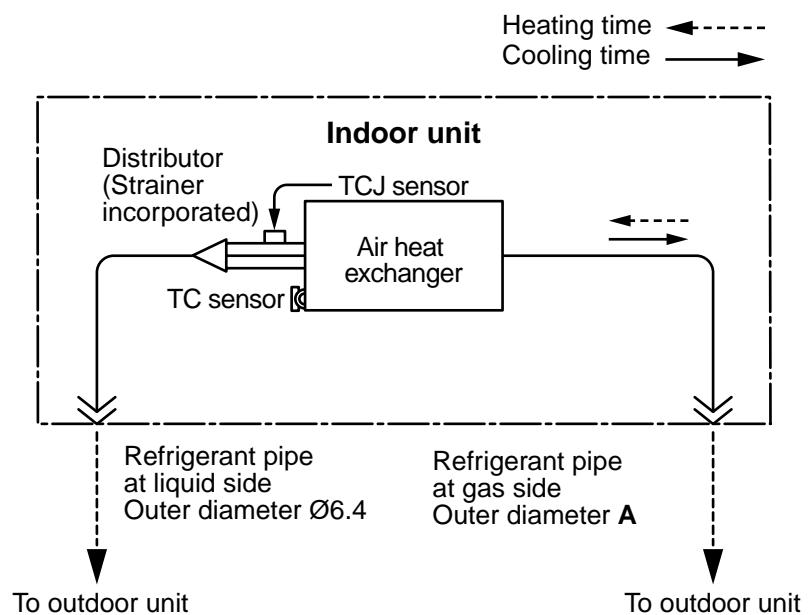
4-1. Indoor Unit

RAS-M10SMUV-E, RAS-M13SMUV-E, RAS-M16SMUV-E
RAS-M10SMUCV-E, RAS-M13SMUCV-E, RAS-M16SMUCV-E



5. REFRIGERATING CYCLE DIAGRAM

5-1. Indoor Unit



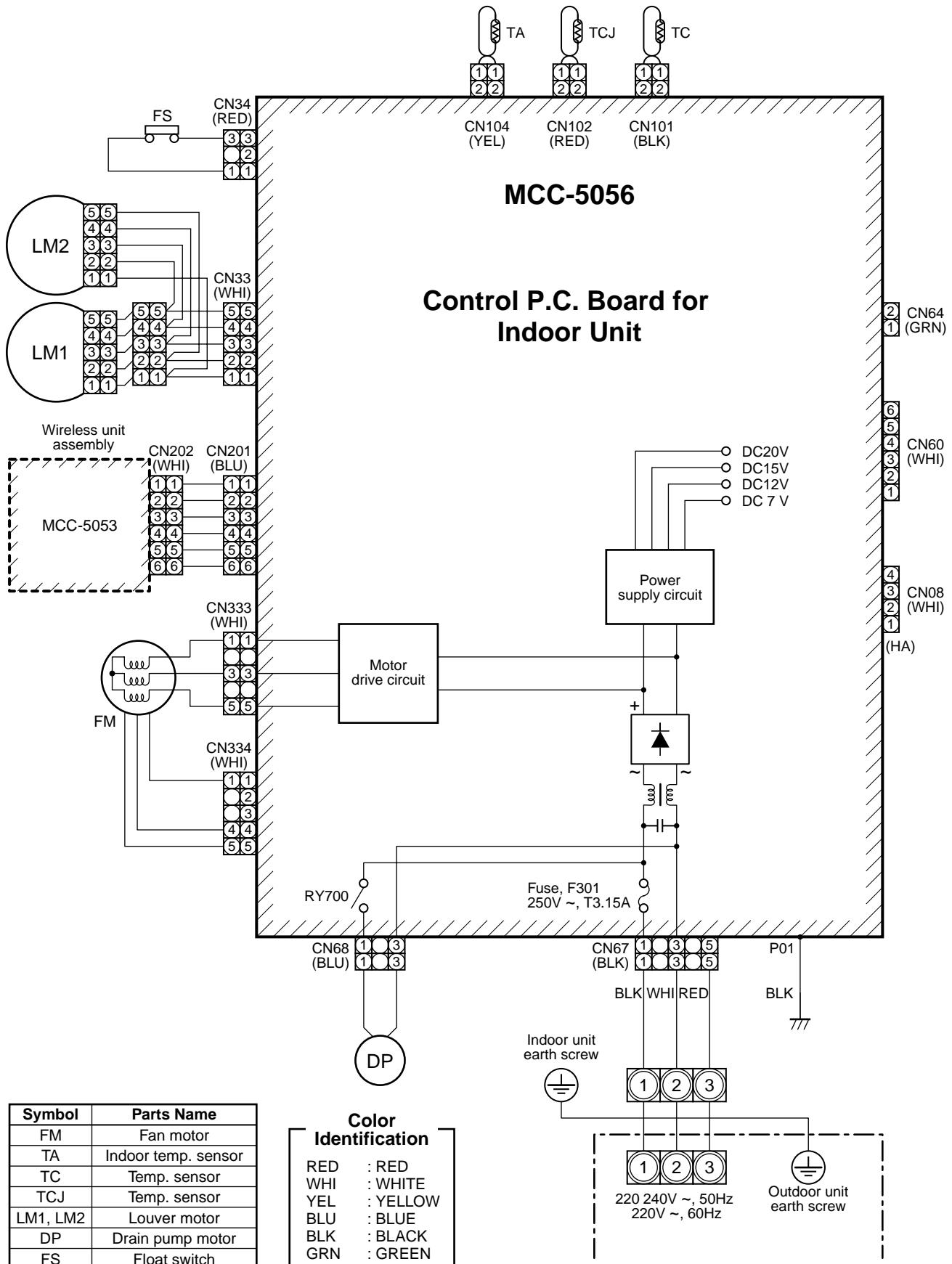
	Outer diameter A
RAS-M10SMUV-E, RAS-M10SMUCV-E	Ø9.52
RAS-M13SMUV-E, RAS-M13SMUCV-E	Ø9.52
RAS-M16SMUV-E, RAS-M16SMUCV-E	Ø12.7

For the outdoor unit, refer to the Service Manual of the combined outdoor unit.

6. WIRING DIAGRAM

6-1. Indoor Unit

6-1-1. 4-way Air Discharge Cassette Type



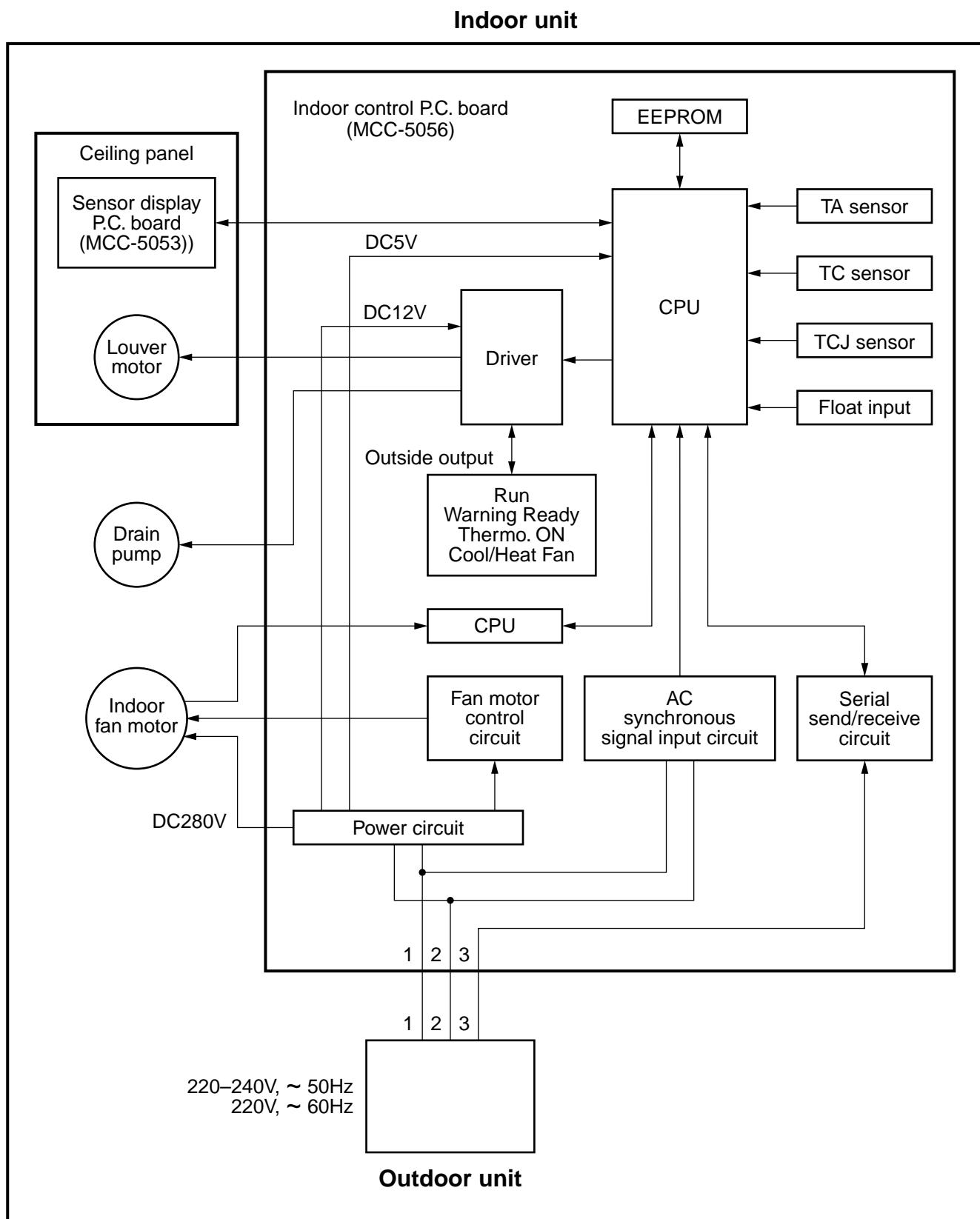
7. SPECIFICATIONS OF ELECTRICAL PARTS

7-1. Indoor Unit

No.	Parts name	Type	Specifications
1	Fan motor (for indoor)	SWF-230-60-1R	Output (Rated) 60 W, 220–240 V
2	Thermo. sensor (TA-sensor)	155 mm	10 kΩ at 25°C
3	Heat exchanger sensor (TCJ-sensor)	Ø6 mm, 1500 mm	10 kΩ at 25°C
4	Heat exchanger sensor (TC-sensor)	Ø6 mm, 1400 mm	10 kΩ at 25°C
5	Float switch	FS-0218-103	
6	Drain pump	ADP-1409	

8. CONTROL BLOCK DIAGRAM

8-1. Indoor Control Circuit



9. OPERATION DESCRIPTION

9-1. Outline of Air Conditioner Control

This air conditioner is a capacity-variable type air conditioner, which uses DC motor for the indoor fan motor and the outdoor fan motor.

The DC motor drive circuit is mounted to the indoor unit. The compressor and the inverter to control fan motor are mounted to the outdoor unit.

The entire air conditioner is mainly controlled by the indoor unit controller.

The indoor unit controller drives the indoor fan motor based upon command sent from the remote controller, and transfers the operation command to the outdoor unit controller.

The outdoor unit controller receives operation command from the indoor unit side, and controls the outdoor fan and the pulse motor valve. (P.M.V)

Besides, detecting revolution position of the compressor motor, the outdoor unit controller controls speed of the compressor motor by controlling output voltage of the inverter and switching timing of the supply power (current transfer timing) so that motors drive according to the operation command.

And then, the outdoor unit controller transfers reversely the operating status information of the outdoor unit to control the indoor unit controller.

As the compressor adopts four-pole brushless DC motor, the frequency of the supply power from inverter to compressor is two-times cycles of the actual number of revolution.

1. Role of indoor unit controller

The indoor unit controller judges the operation commands from the remote controller and assumes the following functions.

- Judgment of suction air temperature of the indoor heat exchanger by using the indoor temp. sensor. (TA sensor)
- Judgment of the indoor heat exchanger temperature by using heat exchanger sensor (TC sensor) (Prevent-freezing control, etc.)
- Louver motor control
- Indoor fan motor operation control
- LED (Light Emitting Diode) display control
- Transferring of operation command signal (Serial signal) to the outdoor unit
- Reception of information of operation status (Serial signal including outside temp. data) to the outdoor unit and judgment/display of error

2. Role of outdoor unit controller

Receiving the operation command signal (Serial signal) from the indoor unit controller, the outdoor unit performs its role.

- Compressor operation control
- Operation control of outdoor fan motor
- P.M.V. control
- 4-way valve control

Operations followed to judgment of serial signal from indoor side.

- Detection of inverter input current and current release operation
- Over-current detection and prevention operation to IGBT module (Compressor stop function)
- Compressor and outdoor fan stop function when serial signal is off (when the serial signal does not reach the board assembly of outdoor control by trouble of the signal system)
- Transferring of operation information (Serial signal) from outdoor unit controller to indoor unit controller
- Detection of outdoor temperature and operation revolution control
- Defrost control in heating operation (Temp. measurement by outdoor heat exchanger and control for 4-way valve and outdoor fan)

3. Contents of operation command signal (Serial signal) from indoor unit controller to outdoor unit controller

The following three types of signals are sent from the indoor unit controller.

- Operation mode set on the remote controller
- Compressor revolution command signal defined by indoor temperature and set temperature (Correction along with variation of room temperature and correction of indoor heat exchanger temperature are added.)
- Temperature of indoor heat exchanger
- For these signals ([Operation mode] and [Compressor revolution] indoor heat exchanger temperature), the outdoor unit controller monitors the input current to the inverter, and performs the followed operation within the range that current does not exceed the allowable value.

4. Contents of operation command signal (Serial signal) from outdoor unit controller to indoor unit controller

The following signals are sent from the outdoor unit controller.

- The current operation mode
- The current compressor revolution
- Outdoor temperature
- Existence of protective circuit operation

For transferring of these signals, the indoor unit controller monitors the contents of signals, and judges existence of trouble occurrence.

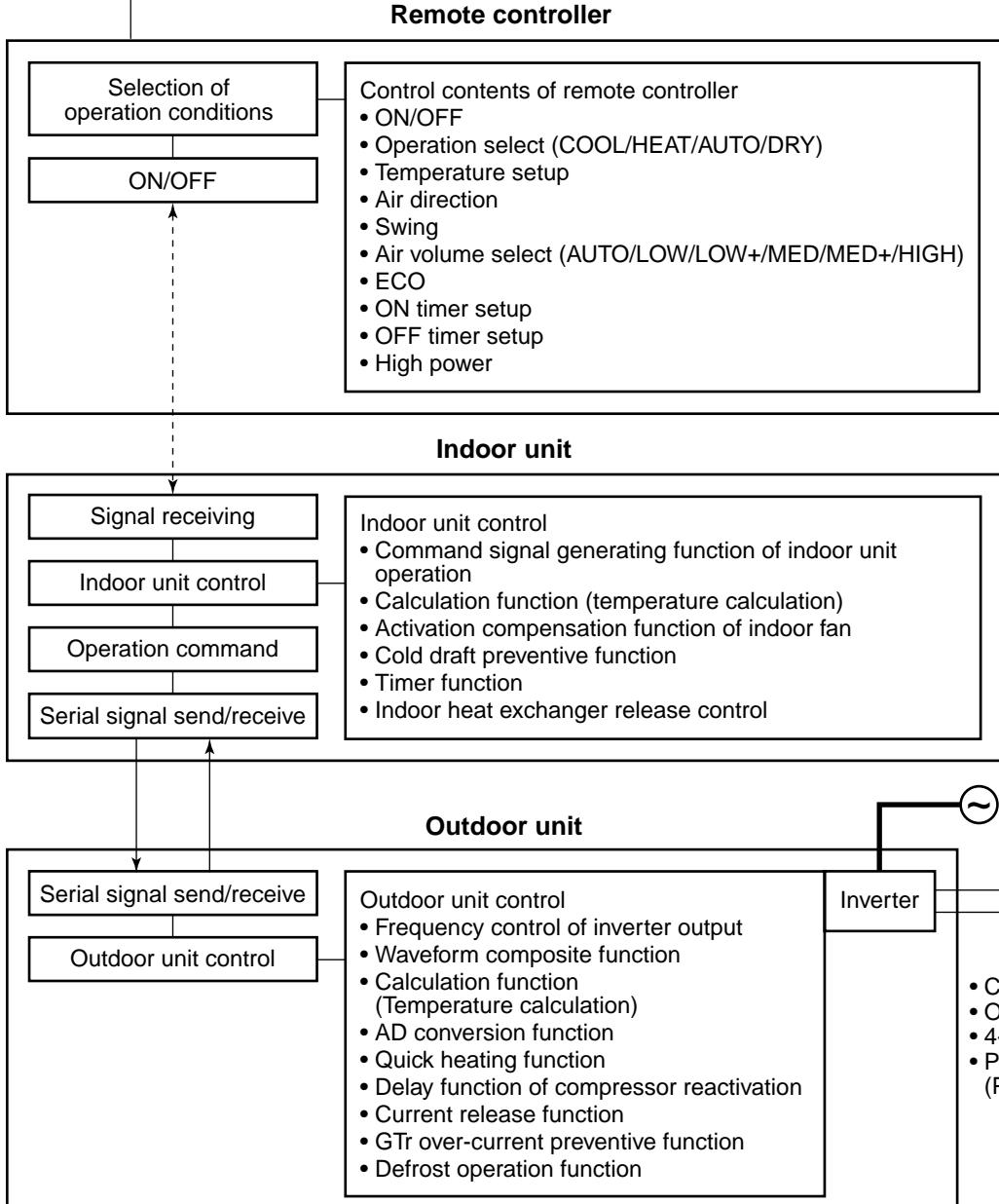
Contents of judgment are described below.

- Whether distinction of the current operation status meets to the operation command signal
- Whether protective circuit operates

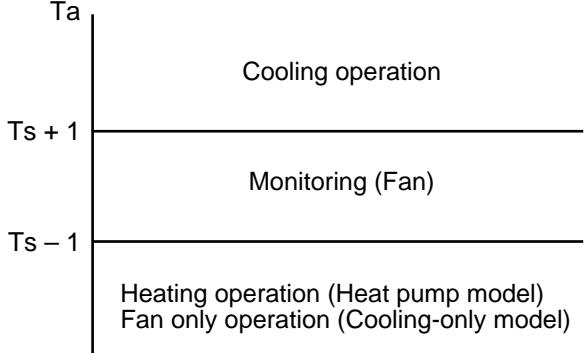
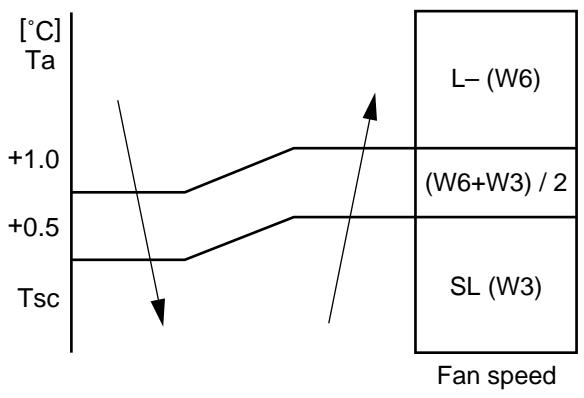
When no signal is received from the outdoor unit controller, it is assumed as a trouble.

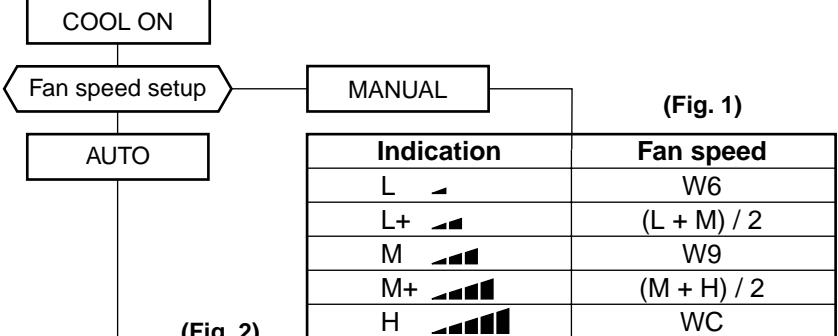
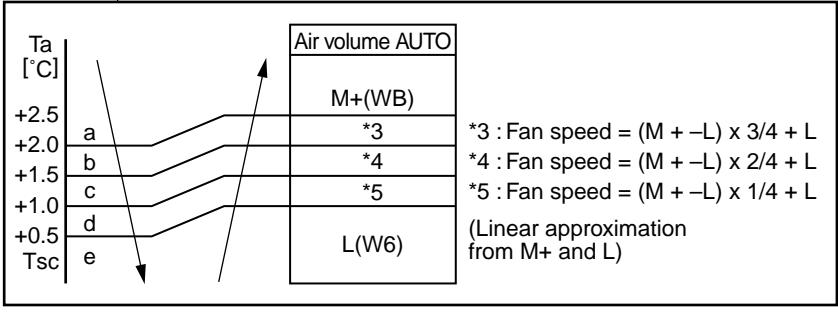
9-2. Operation Description

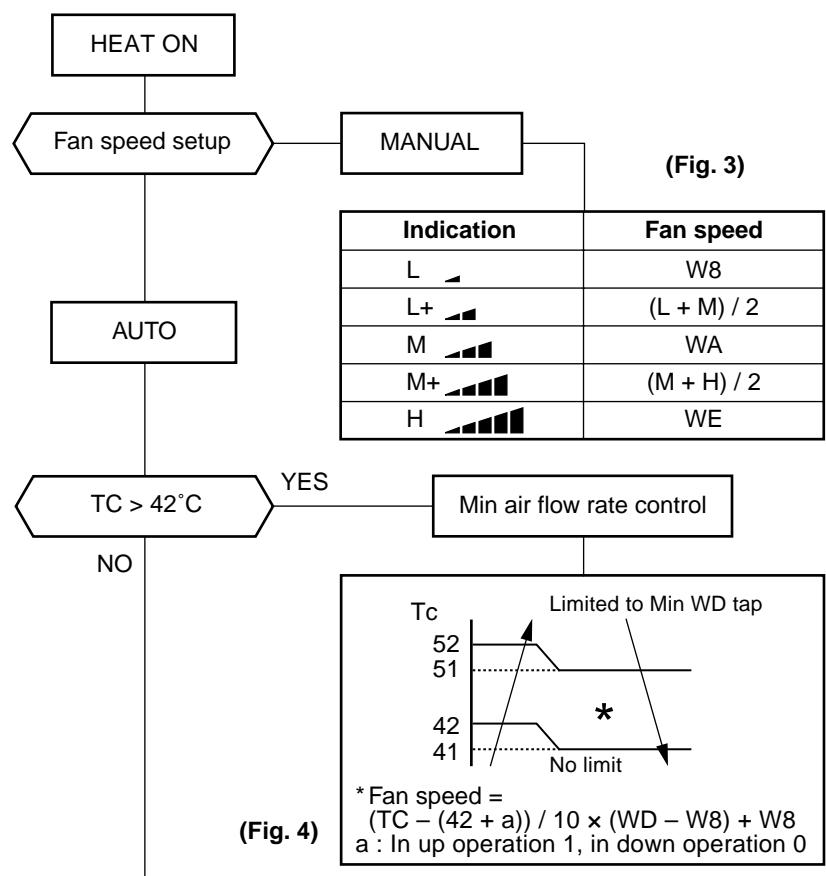
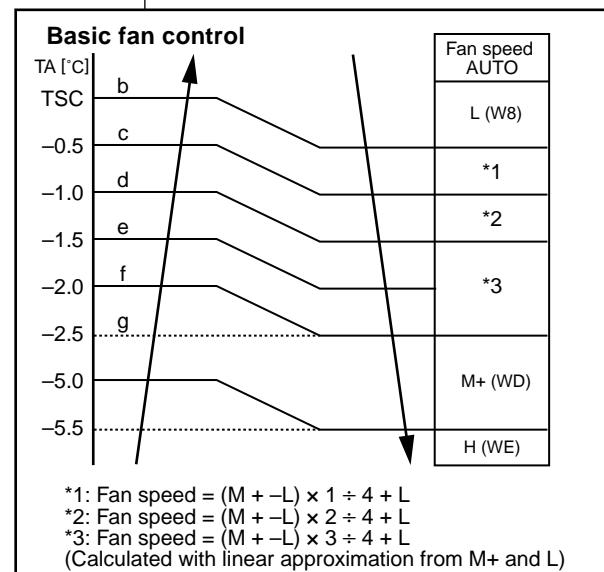
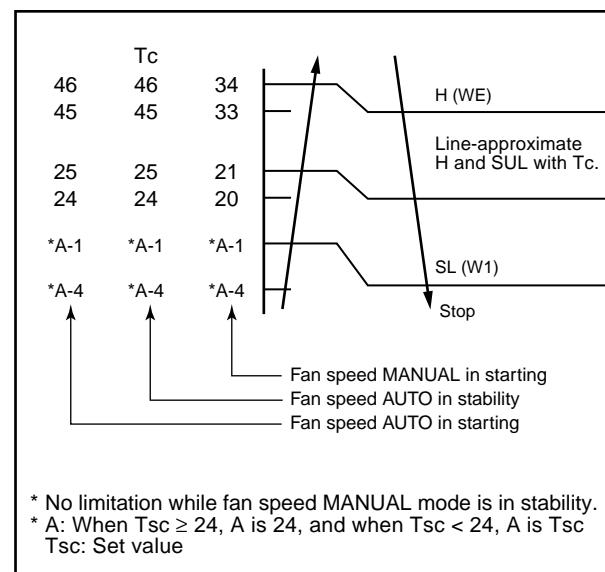
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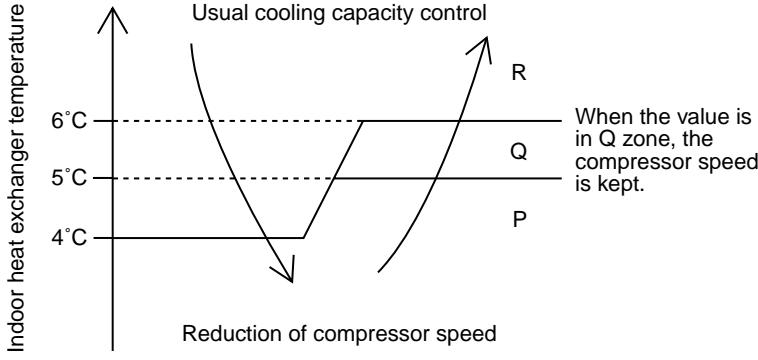
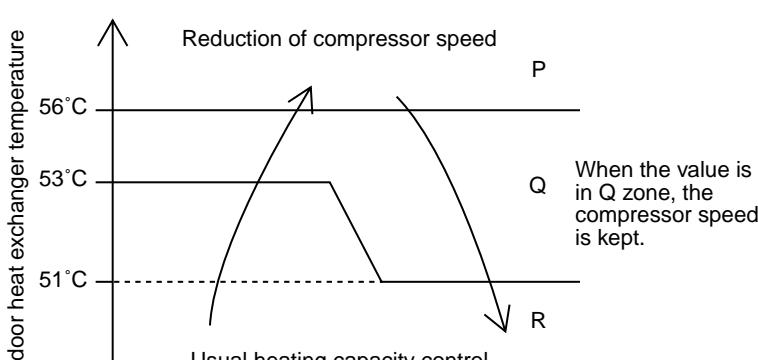
Item	Operation flow and applicable data, etc.	Description
1. Basic operation	<p>1. Operation control</p> <p>Receiving the user's operation condition setup, the operation statuses of indoor/outdoor units are controlled.</p> <ol style="list-style-type: none"> 1) The operation conditions are selected by the remote controller as shown in the below. 2) A signal is sent by ON button of the remote controller. 3) The signal is received by a sensor of the indoor unit and processed by the indoor controllers as shown in the below. 4) The indoor controller controls the indoor fan motor and louver motor. 5) The indoor controller sends the operation command to the outdoor controller, and sends/receives the control status with a serial signal. 6) The outdoor controller controls the operation as shown in the left, and also controls the compressor, outdoor fan motor, 4-way valve and pulse motor valve.  <pre> graph TD subgraph Remote_controller [Remote controller] Selection[Selection of operation conditions] ONOFF[ON/OFF] Selection --- ONOFF end subgraph Indoor_unit [Indoor unit] Signal[Signal receiving] Control[Indoor unit control] Command[Operation command] Serial[Serial signal send/receive] Signal --- Control Control --- Command Command --- Serial end subgraph Outdoor_unit [Outdoor unit] Serial[Serial signal send/receive] Control[Outdoor unit control] Inverter[Inverter] Inverter --- Compressor[Compressor] Inverter --- Fan[Outdoor fan motor] Inverter --- Valve[4-way valve] Inverter --- Pulse[Pulse motor valve] Serial --- Control Control --- Inverter end Selection --> ONOFF ONOFF --> Indoor_unit Indoor_unit --> Serial Serial --> Outdoor_unit </pre>	

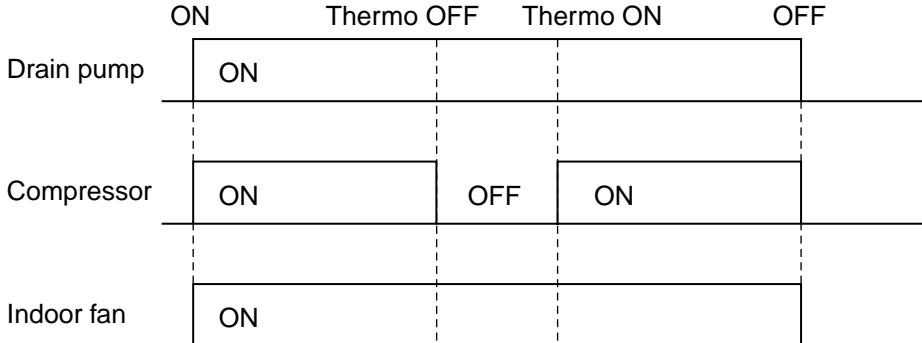
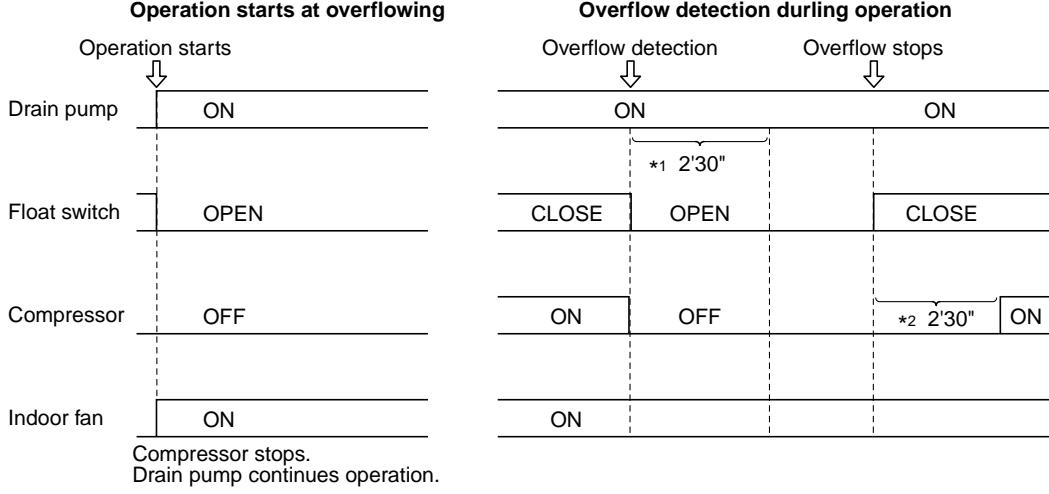
Item	Operation flow and applicable data, etc.	Description																																					
1. Basic operation	<p>2. Operating mode selection when performing 2-room operation</p> <p>1) The outdoor unit operating mode conforms to the instructions of the indoor unit that was pressed first. 2) When combined operation consisting of cooling (dry) and heating, fan and heating, or cleaning operation and heating is performed, operation conforms to the instructions of the indoor unit that was pressed first as shown in the following table. 3) The indoor fan stops for the indoor unit that was pressed last and which instructions are ignored. 4) When three or four indoor units are operated concurrently, the priority is also given to operating mode of the indoor unit which was pressed first as same as the case when two indoor units are operated concurrently.</p> <table border="1"> <thead> <tr> <th>No.</th><th>Indoor unit</th><th>Set operating mode</th><th>Actual indoor unit operation</th><th>Actual outdoor unit operation</th></tr> </thead> <tbody> <tr> <td rowspan="2">1</td><td>Pressed first</td><td>Cooling (dry)</td><td>Cooling (dry)</td><td rowspan="2">Cooling</td></tr> <tr> <td>Pressed last</td><td>Cooling (dry)</td><td>Cooling (dry)</td></tr> <tr> <td rowspan="2">2</td><td>Pressed first</td><td>Heating</td><td>Heating</td><td rowspan="2">Heating</td></tr> <tr> <td>Pressed last</td><td>Heating</td><td>Heating</td></tr> <tr> <td rowspan="2">3</td><td>Pressed first</td><td>Cooling (dry)</td><td>Cooling (dry)</td><td rowspan="2">Cooling</td></tr> <tr> <td>Pressed last</td><td>Heating</td><td>Fan stopped</td></tr> <tr> <td rowspan="2">4</td><td>Pressed first</td><td>Heating</td><td>Heating</td><td rowspan="2">Heating</td></tr> <tr> <td>Pressed last</td><td>Cooling (dry)</td><td>Fan stopped</td></tr> </tbody> </table> <p>3. Cooling/Heating operation</p> <p>The operations are performed in the following parts by controls according to cooling/heating conditions.</p> <p>1) Receiving the operation ON signal of the remote controller, the cooling or heating operation signal starts being transferred from the indoor controller to the outdoor unit. 2) At the indoor unit side, the indoor fan is operated according to the contents of “2. Indoor fan motor control” and the louver according to the contents of “9. Louver control”, respectively. 3) The outdoor unit controls the outdoor fan motor, compressor, pulse motor valve and 4-way valve according to the operation signal sent from the indoor unit. *1. The power coupler of 4-way valve is usually turned off, and it is turned on during defrost operation. (Only in heating)</p>	No.	Indoor unit	Set operating mode	Actual indoor unit operation	Actual outdoor unit operation	1	Pressed first	Cooling (dry)	Cooling (dry)	Cooling	Pressed last	Cooling (dry)	Cooling (dry)	2	Pressed first	Heating	Heating	Heating	Pressed last	Heating	Heating	3	Pressed first	Cooling (dry)	Cooling (dry)	Cooling	Pressed last	Heating	Fan stopped	4	Pressed first	Heating	Heating	Heating	Pressed last	Cooling (dry)	Fan stopped	
No.	Indoor unit	Set operating mode	Actual indoor unit operation	Actual outdoor unit operation																																			
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3	Pressed first	Cooling (dry)	Cooling (dry)	Cooling																																			
	Pressed last	Heating	Fan stopped																																				
4	Pressed first	Heating	Heating	Heating																																			
	Pressed last	Cooling (dry)	Fan stopped																																				
	<pre> graph TD A[Operation ON] --> B[Setup of remote controller] B --> C[Indoor unit control] C --> D[Indoor fan motor control / Louver control] D --> E[Send of operation command signal] E --> F[Outdoor unit control] F --> G[Compressor revolution control / Outdoor fan motor control / 4-way valve control [In cooling operation: OFF, In heating operation: ON] Pulse motor valve control] </pre>																																						

Item	Operation flow and applicable data, etc.	Description
1. Basic operation	<p>4. AUTO operation</p> <p>Selection of operation mode As shown in the following figure, the operation starts by selecting automatically the status of room temperature (Ta) when starting AUTO operation.</p>  <p>*1. When reselecting the operation mode, the fan speed is controlled by the previous operation mode.</p>	<ol style="list-style-type: none"> 1) Detects the room temperature (Ta) when the operation started. 2) Selects an operation mode from Ta in the left figure. 3) Fan operation continues until an operation mode is selected. 4) When AUTO operation has started within 2 hours after heating operation stopped and if the room temperature is 20°C or more, the fan operation is performed with "Super Ultra LOW" mode for 3 minutes. Then, select an operation mode. 5) If the status of compressor-OFF continues for 15 minutes the room temperature after selecting an operation mode (COOL/HEAT), reselect an operation mode.
	<p>5. DRY operation</p> <p>DRY operation is performed according to the difference between room temperature and the setup temperature as shown below.</p> <p>In DRY operation, fan speed is controlled in order to prevent lowering of the room temperature and to avoid air flow from blowing directly to persons.</p> 	<ol style="list-style-type: none"> 1) Detects the room temperature (Ta) when the DRY operation started. 2) Starts operation under conditions in the left figure according to the temperature difference between the room temperature and the setup temperature (Tsc). Setup temperature (Tsc) = Set temperature on remote controller (Ts) + (0.0 to 1.0) 3) When the room temperature is lower 1°C or less than the setup temperature, turn off the compressor.

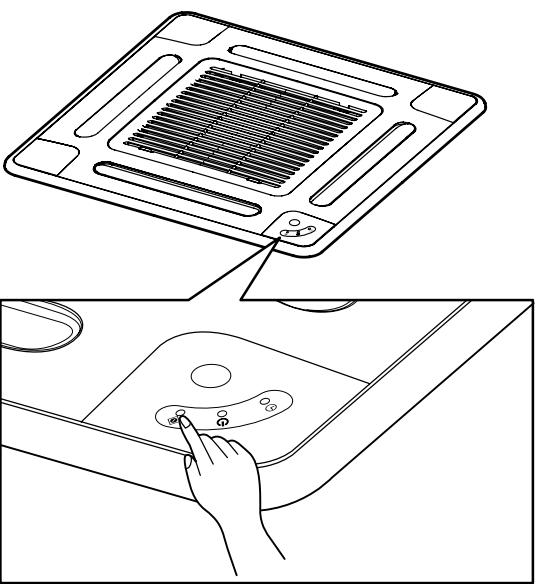
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2. Indoor fan motor control	<p><In cooling operation> (This operation controls the fan speed at indoor unit side.) The indoor fan (Turbo fan) is operated by DC motor. The fan rotates in 5 stages in MANUAL mode, and in 5 stages in AUTO mode, respectively. (Table 1)</p>  <p>(Fig. 1)</p> <p>(Fig. 2)</p>			<p>* Symbols</p> <table> <tr><td>UH</td><td>: Ultra High</td></tr> <tr><td>H</td><td>: High</td></tr> <tr><td>M+</td><td>: Medium+</td></tr> <tr><td>M</td><td>: Medium</td></tr> <tr><td>L+</td><td>: Low+</td></tr> <tr><td>L</td><td>: Low</td></tr> <tr><td>L-</td><td>: Low-</td></tr> <tr><td>UL</td><td>: Ultra Low</td></tr> <tr><td>SUL</td><td>: Super Ultra Low</td></tr> </table> <p>* The fan speed broadly varies due to position of the louver, etc. The described value indicates one under condition of inclining downward blowing.</p> <ol style="list-style-type: none"> When setting the fan speed to L, L+, M, M+ or H on the remote controller, the operation is performed with the constant speed shown in Fig. 1. When setting the fan speed to AUTO on the remote controller, revolution of the fan motor is controlled to the fan speed level shown in Fig. 2 and Table 1 according to the setup temperature, room temperature, and heat exchanger temperature. 	UH	: Ultra High	H	: High	M+	: Medium+	M	: Medium	L+	: Low+	L	: Low	L-	: Low-	UL	: Ultra Low	SUL	: Super Ultra Low																																																																																																																																				
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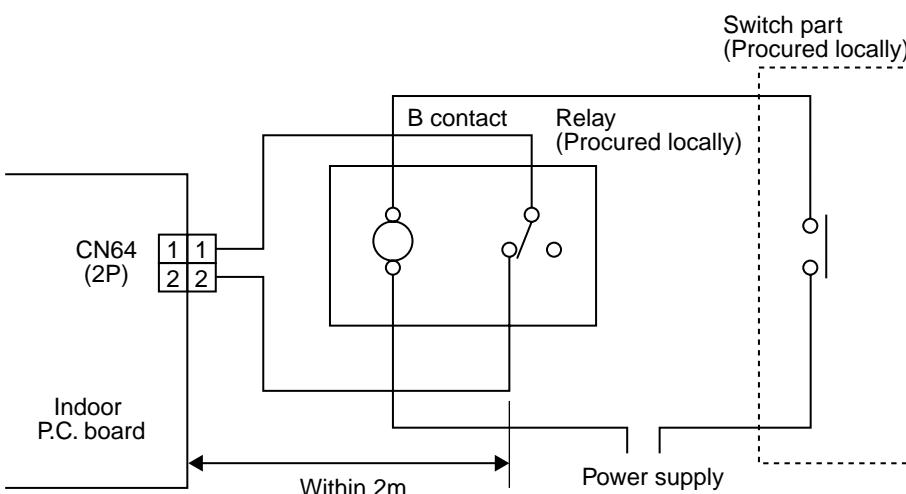
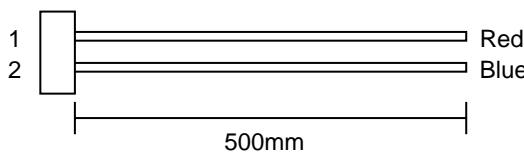
Item	Operation flow and applicable data, etc.	Description									
2. Indoor fan motor control	<p><In heating operation> (Heat pump model)</p>  <p>(Fig. 3)</p> <p>(Fig. 4)</p> <p>Cold draft preventive control</p>	<ol style="list-style-type: none"> When setting the fan speed to L, L+, M, M+ or H on the remote controller, the operation is performed with the constant speed shown in Fig. 3 and Table 1. When setting the fan speed to AUTO on the remote controller, revolution of the fan motor is controlled to the fan speed level shown in Fig. 5 according to the set temperature and room temperature. Min air flow rate is controlled by temperature of the indoor heat exchanger (Tc) as shown in Fig. 4. Cold draft prevention, the fan speed is controlled by temperature of the indoor heat exchanger (Tc) as shown in Fig. 6. 									
	<p>Basic fan control</p>  <p>(Fig. 5)</p> <p>*1: Fan speed = $(M + -L) \times 1 \div 4 + L$ *2: Fan speed = $(M + -L) \times 2 \div 4 + L$ *3: Fan speed = $(M + -L) \times 3 \div 4 + L$ (Calculated with linear approximation from M+ and L)</p>	 <p>(Fig. 6)</p> <p>* No limitation while fan speed MANUAL mode is in stability. * A: When $Tsc \geq 24$, A is 24, and when $Tsc < 24$, A is Tsc Tsc: Set value</p>									
	<p>[In starting and in stability]</p> <table border="1"> <thead> <tr> <th></th> <th>In starting</th> <th>In stability</th> </tr> </thead> <tbody> <tr> <td>FAN AUTO</td> <td> <ul style="list-style-type: none"> Until 12 minutes passed after operation start When 12 to 25 minutes passed after operation start and room temp. is 3°C or lower than set temp. </td> <td> <ul style="list-style-type: none"> When 12 to 25 minutes passed after operation start and room temp. is higher than (set temp. -3°C) When 25 minutes or more passed after operation start </td> </tr> <tr> <td>FAN Manual</td> <td> <ul style="list-style-type: none"> Room temp. < Set temp. -4°C </td> <td> <ul style="list-style-type: none"> Room temp. \geq Set temp. -3.5°C </td> </tr> </tbody> </table>			In starting	In stability	FAN AUTO	<ul style="list-style-type: none"> Until 12 minutes passed after operation start When 12 to 25 minutes passed after operation start and room temp. is 3°C or lower than set temp. 	<ul style="list-style-type: none"> When 12 to 25 minutes passed after operation start and room temp. is higher than (set temp. -3°C) When 25 minutes or more passed after operation start 	FAN Manual	<ul style="list-style-type: none"> Room temp. < Set temp. -4°C 	<ul style="list-style-type: none"> Room temp. \geq Set temp. -3.5°C
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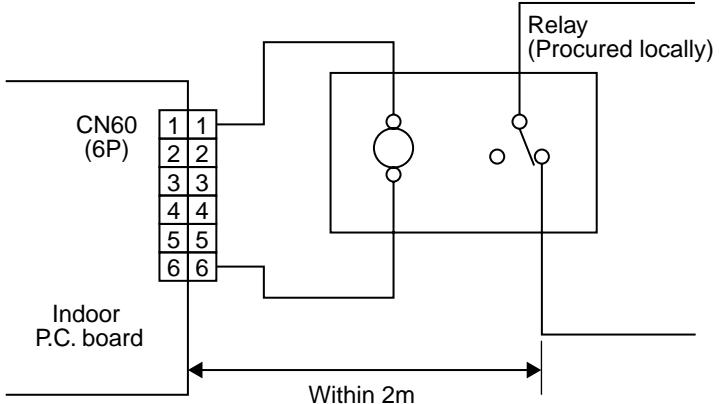
Item	Operation flow and applicable data, etc.	Description
3. Release protective control by temperature of indoor heat exchanger	<p><In cooling/dry operation> (Prevent-freezing control for indoor heat exchanger)</p> <p>In cooling/dry operation, the sensor of indoor heat exchanger detects evaporation temperature and controls the compressor speed so that temperature of the heat exchanger does not exceed the specified value.</p> 	<ol style="list-style-type: none"> When temperature of the indoor heat exchanger drops below 4°C, the compressor speed is reduced. (P zone) When temperature of the indoor heat exchanger rises in the range from 5°C to under 6°C, the compressor speed is kept. (Q zone) When temperature of the indoor heat exchanger rises to 6°C or higher, the capacity control operation returns to the usual control in cooling operation. (R zone)
	<p><In heating operation> (Prevent-overpressure control for refrigerating cycle)</p> <p>In heating operation, the sensor of indoor heat exchanger detects condensation temperature and controls the compressor speed so that temperature of the heat exchanger does not exceed the specified value.</p> 	<ol style="list-style-type: none"> When temperature of the indoor heat exchanger rises in the range from 53°C to 56°C, the compressor speed is kept. (Q zone) When temperature of the indoor heat exchanger drops in the range from 51°C to under 56°C, the compressor speed is kept. (Q zone) When temperature of the indoor heat exchanger rises to 56°C or higher, the compressor speed is reduced. (P zone) When temperature of the indoor heat exchanger does not rise to 53°C, or when it drops below to 51°C, the capacity control operation returns to the usual control in heating operation. (R zone)

Item	Operation flow and applicable data, etc.	Description
4. Drain pump control	<p>In cooling, and dry operation, drain pump is actuated to drain up.</p> <p><Operation control></p>  <p>The chart shows the timing of drain pump, compressor, and indoor fan operations relative to the Thermo cycle. The drain pump is ON during Thermo OFF and Thermo ON phases. The compressor is ON during Thermo OFF and OFF during Thermo ON. The indoor fan is ON during Thermo OFF and OFF during Thermo ON.</p>	<p>1) During cooling, or drying operation: Drain pump ON. (Includes period during thermo-OFF)</p> <p>2) When stopping cooling or dry operation, the drain pump also stops.</p>
5. Over flow check control	<p>Drain level is checked by float switch. If the float switch is actuated (OPEN), stop operation of the outdoor unit and operate the drain pump exert to drain out.</p> <p>In fan only (Cooling only model), heating operation (Heat pump model only), and even in stoppage but while float switch is actuated, drain pump is ON (Operation).</p> <p><Over flow check and control></p>  <p>The chart shows the sequence of events when an overflow occurs. It starts with 'Operation starts' for the drain pump. The float switch goes OPEN. The compressor stops and the drain pump continues to operate. Overflow detection occurs, causing the float switch to CLOSE. The compressor then starts again, and the drain pump continues to operate.</p>	<p>1) If the float switch is not reset (closed) within 2 minutes 30 seconds, the operation lamp flashes. (5Hz)</p> <p>2) When the float switch is reset, the following phenomena appear.</p> <ul style="list-style-type: none"> The operation lamp stops flashing and keeps lighting. The outdoor unit is reactivated 2 minutes and 30 seconds after.
6. After-heat elimination	<p>When heating operation stops, the indoor fan operates with LOW mode for approx. 30 seconds.</p>	

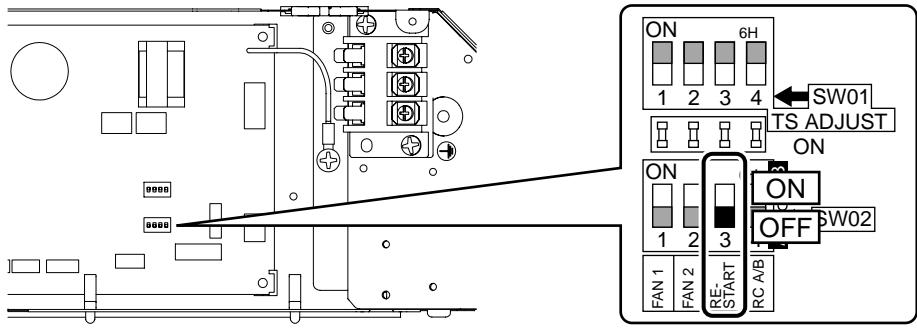
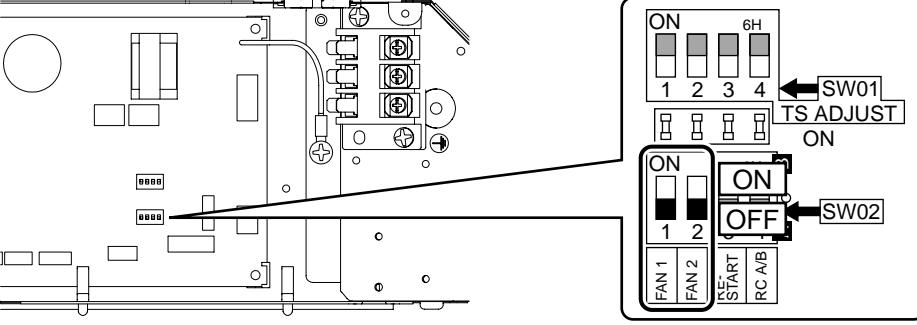
Item	Operation flow and applicable data, etc.	Description
7. Louver control 1) Louver position	<p>This function controls the air direction of the indoor unit.</p> <ul style="list-style-type: none"> The position is automatically controlled according to the operation mode (COOL/HEAT). The set louver position is stored in memory by the microcomputer, and the louver returns to the stored position when the next operation is performed. (Cooling/heating memory position) When the power supply turned on and operation of the air conditioner stopped, the louver is fully opened once and then becomes full close status. <p>1) Louver position during cooling or drying operation (Except swinging time)</p> <p>2) Louver position during heating and fan operation</p> <p>3) During swing operation (All operation modes)</p> <p>• To prevent the cold draft during heating operation, fix lower limit angle of the louver to 36° if temperature of the indoor heat exchanger is low. This control is not operated during cooling, drying or fan operation.</p> <p>1) At increase of Tc sensor temp. The lower limit angle of the louver is fixed to 36° until Tc sensor temp exceeds Z°C. In this case, the louver does not operate even if [FIX] or [SWING] button is pushed. When Tc sensor temp exceeded Z°C, the louver moves to the HEAT memory position.</p> <p>2) At decrease of Tc sensor temp. The louver is at the HEAT memory position until Tc sensor temp exceeds Z-2°C. Tc sensor temp exceeded Z-2°C, the louver moves to the lower limit angle (36°).</p>	<p>Pushing [FIX] button of the remote controller during cooling or drying operation moves the louver. The louver operates in the range between lower limit angle (36°) and cooling upper limit angle (52°). (Except swinging time)</p> <p>Pushing [FIX] button of the remote controller during heating or fan operation moves the louver. The louver operates in the range between lower limit angle (36°) and upper limit angle (92°).</p> <p>Pushing [SWING] button of the remote controller during operation of the air conditioner swings the louver. The louver swings in the range between lower limit angle (36°) and upper limit angle (92°). (Even during cooling or drying operation) When pushing [SWING] button during swinging operation, swinging operation stops.</p>
2) Cold draft preventive control		

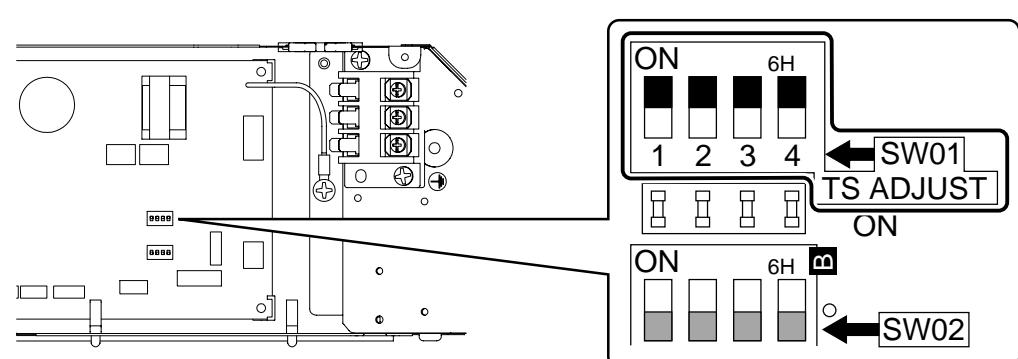
Item	Operation flow and applicable data, etc.	Description
8. ECO operation	<p>Pushing [ECO] button of the remote controller controls the following items.</p> <p>1) During cooling or drying operation Set temperature: Controls with temperature 1.0°C higher than usual. No. of fan revolutions: For No. of fan revolutions, the automatic operation that M tap is at upper limit is performed. (During dry operation, automatic operation with maximum L+ is performed.)</p> <p>2) During heating operation Set temperature: Controls with temperature 1.0°C lower than usual. No. of fan revolutions: For No. of fan revolutions, the automatic operation that M tap is at upper limit is performed.</p>	
9. Hi power operation	<p>Pushing [HiPOWER] button of the remote controller controls the following items.</p> <p>1) During cooling operation Set temperature: Controls with temperature 1.0°C lower than usual. No. of fan revolutions: Controls with No. of revolutions 1 tap higher than usual. (Upper limit is H tap)</p> <p>2) During heating operation Set temperature: Controls with temperature 2.0°C higher than usual. No. of fan revolutions: Controls with No. of revolutions 1 tap higher than usual. (Upper limit is H tap)</p>	
10. Temporary operation	<p>Pushing [RESET] button on the panel starts the temporary operation of [AUTO] operation. When keeping [RESET] button pushed for 10 seconds or more, the temporary [COOL] operation is performed. To stop the temporary operation, push the [RESET] button again.</p> <pre> graph TD A[Push RESET button] --> B{Did you push [RESET] button for 10 seconds or more?} B -- NO --> C[Temporary [AUTO] operation] B -- YES --> D[Temporary [COOL] operation] </pre> 	

Item	Operation flow and applicable data, etc.	Description
11. Forced operation stop switch	<p>This function controls the indoor units individually. It is connected with cable to the control P.C. board of the indoor unit.</p> <p>1. Control items</p> <ol style="list-style-type: none"> 1) Window has closed (Outside contact on) The start/stop operation from the remote controller is allowed. 2) Window open (Outside contact off) If the indoor unit is operating, it is stopped forcedly. (Start/Stop is prohibited to remote controller.) <p>2. Wiring</p>  <ul style="list-style-type: none"> The lead wire, which connects the indoor P.C. board and the relay, should be long within 2m. If using a longer wire or if not using a relay, a malfunction may occur. The lead wire (length: 500mm) attached with connector, which connects it with CN64 is prepared as article sold separately. <p><Model: TCB-KBCN32VEE></p>  <p>3. Operation</p> <ul style="list-style-type: none"> • While the window closes (CN64 is opened), the indoor unit performs the usual operation. • While the window opens (CN64 is short-circuited) and the indoor unit is operating, the indoor unit stops the operation. • If a signal is sent from the remote controller while the window opens (CN64 is short-circuited), the indoor unit ignores the signal and does not operate. In this case, the receiving sound "pip" goes off for five times. • While the window opens, all the operation modes are not used. • If closing the window again when the window opened and the indoor unit stopped the operation, the indoor unit continues the operation stop status and cannot be reset automatically. 	<p>The operation of the indoor unit can be forcedly stopped when opening the window by mounting an outside switch (Procured locally) to the window and connecting it to the indoor P.C. board via a relay.</p>

Item	Operation flow and applicable data, etc.	Description
12. Indoor fan ON output	<p>ON signal is output when the indoor fan is operating.</p> <p>1. Control items</p> <ul style="list-style-type: none"> While the indoor fan is operating, DC12V is output between 1 and 6 of CN60. <p>2. Wiring</p>  <p>3. Operation</p> <ul style="list-style-type: none"> While the indoor fan operating, the output is ON. When thermo-off occurs during heating operation, the indoor fan may perform ON/OFF operation. In this case, the output keeps ON status. 	<p>A fan or etc can be used by synchronized with the indoor unit.</p>

Item	Operation flow and applicable data, etc.	Description
13. Select switch on remote controller	<p>1. Setting remote controller</p> <ul style="list-style-type: none"> • Remove the cover, and insert the batteries. • Push the “CHECK” point and “MODE” button at once for changing remote controller setting from “A” to “B”. (Priority is given to “A” setting.) <p>2. Setting the unit</p> <ul style="list-style-type: none"> • 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.) • There are the selector switches (SW02) on the P.C. board of the electric parts box. No.4 of the selector switches (SW02) is provided to select the switch of the remote controller. Select ON of No.4 of the selector switches (SW02). (OFF: A setting, ON: B setting) <ul style="list-style-type: none"> • Check whether the changed remote controller can operate the indoor unit or not. 	<p>1. Purpose</p> <p>This operation is to operate only one indoor unit using one remote controller.</p> <p>2. Description</p> <p>When operating one indoor unit in a situation where two indoor units have been installed in the same room or nearby rooms, this operation prevents the remote controller signal from being received simultaneously by both units, thus preventing both units from operating.</p> <p>3. Operation</p> <p>The indoor unit on which the remote controller selection has been set to B receives the signal of the remote controller also set to B. (At the factory the remote controller selection is set to A on all the indoor units. There is no A setting display.)</p>

Item	Operation flow and applicable data, etc.	Description																																		
14. Auto restart function	<p>This product is designed so that, after a power failure, it can restart automatically in the same operating mode as before the power failure.</p> <p>INFORMATION</p> <p>The product was shipped with Auto Restart function in the OFF position. Turn it ON as required.</p>	<p>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.)</p> <p>There are the selector switches (SW02) on the P.C. board of the electric parts box. No.3 of the selector switches (SW02) is provided for the selector switch. Select ON of No.3 of the selector switches (SW02). (OFF: setting without Auto Restart, ON: setting with Auto Restart)</p> 																																		
15. High ceiling select switch	<p><How to set the High ceiling switch></p> <p>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.)</p> <p>There are the selector switches (SW02) on the P.C. board of the electric parts box. No.1 and No.2 of the selector switches (SW02) are provided to select the height of the ceiling. According to the ceiling height in the following table, select No.1 or No.2 of the selector switches (SW02).</p> <table border="1" data-bbox="362 1275 907 1432"> <thead> <tr> <th>Model RAS-</th> <th>Possible installed ceiling height</th> </tr> </thead> <tbody> <tr> <td>M10SMUV-E, M10SMUCV-E, M13SMUV-E, M13SMUCV-E</td> <td>Up to 2.7 m</td> </tr> <tr> <td>M16SMUV-E, M16SMUCV-E</td> <td>Up to 3.5 m</td> </tr> </tbody> </table> <p>REMARKS</p> <p>When using the high ceiling (1) or (2), cold air may be felt due to the temperature drop of discharge air.</p> <p><Height list of ceiling possible to be installed></p> <table border="1" data-bbox="362 1500 1416 1691"> <thead> <tr> <th rowspan="2">Model RAS-</th> <th>M10SMUV-E</th> <th>M13SMUV-E</th> <th>M16SMUV-E</th> <th colspan="2">SW02</th> </tr> <tr> <th>M10SMUCV-E</th> <th>M13SMUCV-E</th> <th>M16SMUCV-E</th> <th>No.1</th> <th>No.2</th> </tr> </thead> <tbody> <tr> <td>Standard (Factory setting)</td> <td>2.5 to 2.7 m</td> <td>2.5 to 2.7 m</td> <td>2.5 to 2.9 m</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <td>High ceiling (1)</td> <td>—</td> <td>—</td> <td>2.9 to 3.2 m</td> <td>ON</td> <td>OFF</td> </tr> <tr> <td>High ceiling (2)</td> <td>—</td> <td>—</td> <td>3.2 to 3.5 m</td> <td>ON</td> <td>ON</td> </tr> </tbody> </table> 	Model RAS-	Possible installed ceiling height	M10SMUV-E, M10SMUCV-E, M13SMUV-E, M13SMUCV-E	Up to 2.7 m	M16SMUV-E, M16SMUCV-E	Up to 3.5 m	Model RAS-	M10SMUV-E	M13SMUV-E	M16SMUV-E	SW02		M10SMUCV-E	M13SMUCV-E	M16SMUCV-E	No.1	No.2	Standard (Factory setting)	2.5 to 2.7 m	2.5 to 2.7 m	2.5 to 2.9 m	OFF	OFF	High ceiling (1)	—	—	2.9 to 3.2 m	ON	OFF	High ceiling (2)	—	—	3.2 to 3.5 m	ON	ON
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Item	Operation flow and applicable data, etc.	Description																																																																																																						
16. Setting temperature correction switch	<p>1. To improve Cooling/Heating effect</p> <p>When only poor cooling/heating effect is obtained due to installation place of the indoor unit or construction of the room, the detection temperature of cooling/heating can be changed.</p> <ul style="list-style-type: none"> 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.) There are the selector switches (SW01) on the P.C. board of the electric parts box. <p>The setting of the detection temperature can be changed by combining No.1 to No.4 switches of the selector switches (SW01). Adjust the setting of the detection temperature according to the following table.</p> <table border="1"> <thead> <tr> <th>No.1</th> <th>No.2</th> <th>No.3</th> <th>No.4</th> <th>COOL/DRY (°C)</th> <th>HEAT (°C)</th> </tr> </thead> <tbody> <tr><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>-2</td><td>-2</td></tr> <tr><td>ON</td><td>OFF</td><td>OFF</td><td>OFF</td><td>-2</td><td>+4</td></tr> <tr><td>OFF</td><td>ON</td><td>OFF</td><td>OFF</td><td>-2</td><td>+2</td></tr> <tr><td>ON</td><td>ON</td><td>OFF</td><td>OFF</td><td>-2</td><td>0</td></tr> <tr><td>OFF</td><td>OFF</td><td>ON</td><td>OFF</td><td>+4</td><td>-2</td></tr> <tr><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>+4</td><td>+4</td></tr> <tr><td>OFF</td><td>ON</td><td>ON</td><td>OFF</td><td>+4</td><td>+2</td></tr> <tr><td>ON</td><td>ON</td><td>ON</td><td>OFF</td><td>+4</td><td>0</td></tr> <tr><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td>+2</td><td>-2</td></tr> <tr><td>ON</td><td>OFF</td><td>OFF</td><td>ON</td><td>+2</td><td>+4</td></tr> <tr><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>+2</td><td>+2</td></tr> <tr><td>ON</td><td>ON</td><td>OFF</td><td>ON</td><td>+2</td><td>0</td></tr> <tr><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td><td>0</td><td>-2</td></tr> <tr><td>ON</td><td>OFF</td><td>ON</td><td>ON</td><td>0</td><td>+4</td></tr> <tr><td>OFF</td><td>ON</td><td>ON</td><td>ON</td><td>0</td><td>+2</td></tr> <tr><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td>0</td><td>0</td></tr> </tbody> </table> <p>← Factory setting</p> <p><Setting at shipment></p> 	No.1	No.2	No.3	No.4	COOL/DRY (°C)	HEAT (°C)	OFF	OFF	OFF	OFF	-2	-2	ON	OFF	OFF	OFF	-2	+4	OFF	ON	OFF	OFF	-2	+2	ON	ON	OFF	OFF	-2	0	OFF	OFF	ON	OFF	+4	-2	ON	OFF	ON	OFF	+4	+4	OFF	ON	ON	OFF	+4	+2	ON	ON	ON	OFF	+4	0	OFF	OFF	OFF	ON	+2	-2	ON	OFF	OFF	ON	+2	+4	OFF	ON	OFF	ON	+2	+2	ON	ON	OFF	ON	+2	0	OFF	OFF	ON	ON	0	-2	ON	OFF	ON	ON	0	+4	OFF	ON	ON	ON	0	+2	ON	ON	ON	ON	0	0	
No.1	No.2	No.3	No.4	COOL/DRY (°C)	HEAT (°C)																																																																																																			
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9-3. Intermittent Operation Control for Indoor Fans of the Indoor Unit at Thermo-off Side in Heating Operation

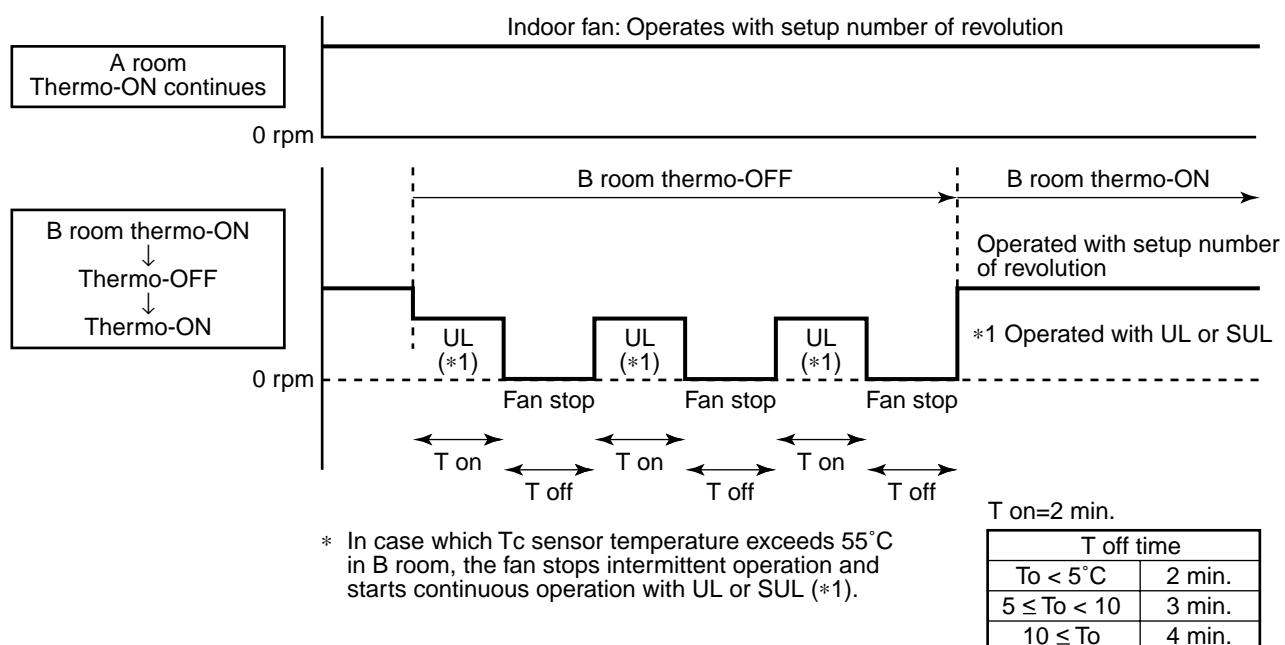
While heating operation is executed in two rooms, if room temperature reached the setup temperature in one room and thermo-off occurred, the following operations start. (Refer to the figure below.)

1. The indoor unit of the room (A room) in which thermo-off did not occur starts a continuous operation with the setup number of revolution.
2. The indoor unit of the room (B room) in which thermo-off occurred starts intermittent operation of the indoor fan.

The indoor fan operates with number of revolution of UL or SUL. Fan-ON time is 2 minutes and Fan-OFF time is 2 to 4 minutes.

However if temperature of the indoor heat exchanger becomes over 55°C or more in B room, the indoor fan stops the intermittent operation and starts continuous operation.

While heating operation is executed in two rooms, if room temperature reached the setup temperature in both rooms and thermo-off occurred, both indoor units start intermittent operation of the indoor fan.



9-4. Remote Controller

9-4-1. Parts Name of Remote Controller

1 START/STOP button

Push the button to start operation.
(A receiving beep is heard.)

Push the button again to stop operation.
(A receiving beep is heard.)

If no sound is heard from the receiver, push the button again.

2 Mode select button (MODE)

Push this button to select a mode.

Each time you push the button, a mode is selected in a sequence.

A : Auto changeover control, : Cool,
 : Dry, : Heat (For Heat pump model only),
 : Fan only (For Cooling only model), and back to A. (A receiving beep is heard.)

3 Temperature button (TEMP)

- ▲ The set temperature can be raised to 30°C.
- ▼ The set temperature can be lowered to 17°C.
(A receiving beep is heard.)

4 Fan speed button (FAN)

Push this button to select fan speed. When you select AUTO, the fan speed is automatically adjusted according to the room temperature.

You can also manually select the desired fan speed. There are five settings.

(LOW , LOW+ , MED , MED+ , HIGH) (A receiving beep is heard.)

5 Auto louver button (SWING)

Push this button to swing the louver.
(A receiving beep is heard.)

Push the SWING button to stop the louver swinging. (A receiving beep is heard.)

6 Set louver button (FIX)

Push this button to adjust the air flow direction.
(A receiving beep is heard.)

7 Off timer button (OFF)

Push this button to set the OFF timer.

8 On timer button (ON)

Push this button to set the ON timer.

9 Reserve button (SET)

Push this button to reserve time settings.
(A receiving beep is heard.)

10 Cancel button (CLR)

Push this button to cancel ON timer and OFF timer. (A receiving beep is heard.)

CAUTION

- When pushing the "FILTER" button.
The indoor unit does not operate and the receiver does not sound a beep.

11 High power button (Hi POWER)

Push this button to start the high power operation.

12 Memory button (MEMO)

Push this button to store the settings.

Push the button again for 3 seconds or more to store the setting indicated on the remote controller and is indicated.

(Refer to "MEMORY/PRESET OPERATION")

13 ECO timer button (ECO)

Push this button to start the ECO timer (OFF timer) operation.

You can select the OFF timer duration.

There are four settings (1, 3, 5 or 9 hours).

14 PRESET button

Push this button to operate the air conditioner according to the settings memorized by the MEMO button.

15 TIMER button

Use this button to change the clock, to set the On and Off durations.

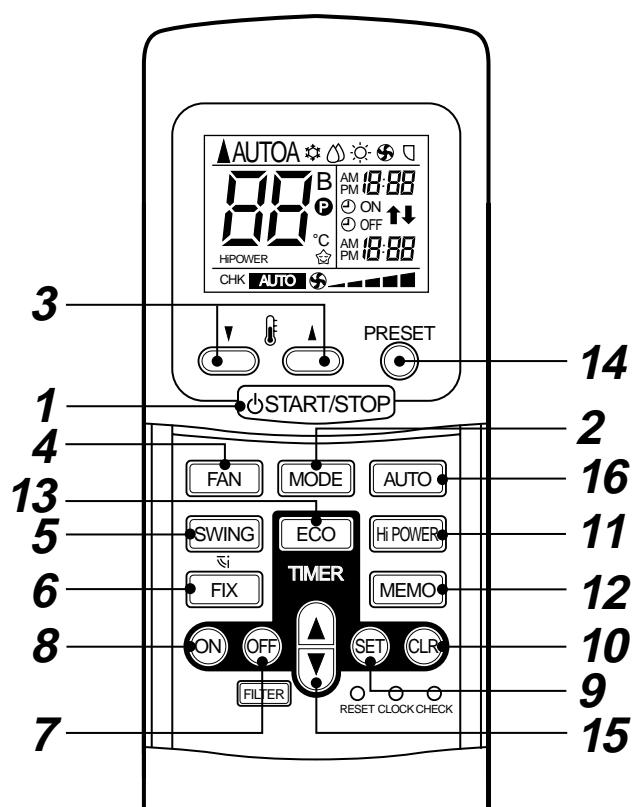
To forward the time, push the "TIMER " button.

To set back the time, push the "TIMER " button.

16 Automatic operation button (AUTO)

Push this button to operate the air conditioner automatically. (A receiving beep is heard.)

(Refer to "AUTOMATIC OPERATION")



9-4-2. Names and Functions of Indications on Remote Controller

Display

All indications, except for clock time indication, are indicated by pushing the START/STOP button.

1 Transmission mark

This transmission mark ▲ indicates when the remote controller transmits signals to the indoor unit.

2 Mode display

Indicates the current operation mode.
(AUTO : Automatic control, A : Auto changeover control, ☀ : Cool, ☁ : Dry, ☀ : Heat, ⚡ : Fan only)

3 Temperature display

Indicates the temperature setting (17°C to 30°C). When you set the operating mode to ⚡ : Fan only, no temperature setting is indicated.

4 FAN speed display

Indicates the selected fan speed. AUTO or one of five fan speed levels (LOW ▲, LOW+ ▲▲, MED ▲▲▲, MED+ ▲▲▲▲, HIGH ▲▲▲▲▲) can be indicated.

Indicates AUTO when the operating mode is either AUTO or ☁ : Dry or ☀ : ECO.

5 TIMER and clock time display

The time set for timer operation or clock time is indicated.

The present time is always indicated except for TIMER operation.

6 High power display

Indicates when the High power operation starts. Push the Hi-POWER button to start and push it again to stop the operation.

7 P (MEMORY) display

Flashes for 3 seconds when the MEMO button is pushed during operation.

P mark is indicated when the button is pushed for more than 3 seconds while the mark is flashing.

Push another button to turn off the mark.

8 ECO TIMER display

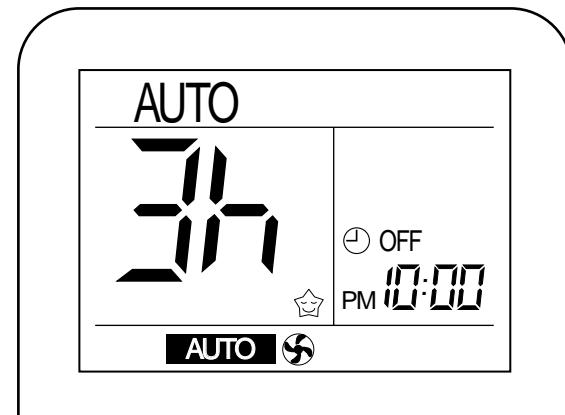
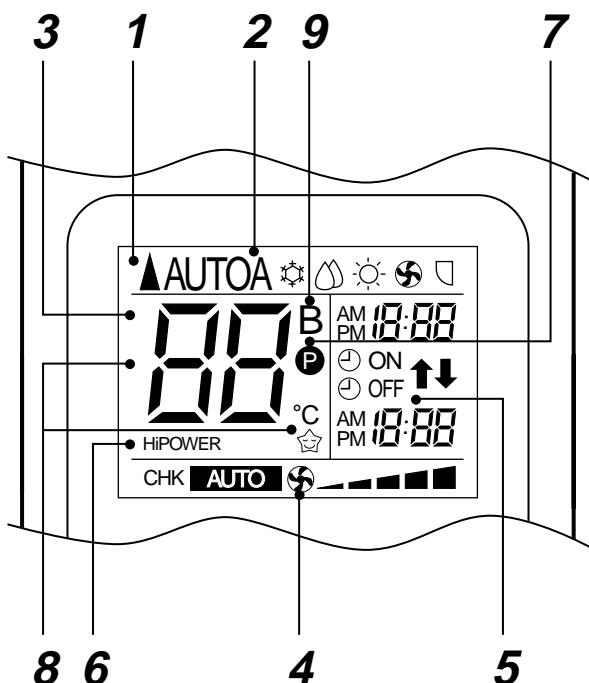
Indicates when the ECO TIMER is in operation. Each time you push the ECO button, the display changes in the sequence of 1, 3, 5, or 9h.

9 A, B change indication remote controller

Push the "CHK" point and "MODE" button at once, for changing remote controller setting from "A" to "B". (Priority is given to "A" setting.)

The switch panel of the indoor unit is also changed to "B" setting.

- In the illustration, all indications are indicated for explanation.
During operation, only the relevant indications will be indicated on the remote controller.



10. INSTALLATION MANUAL

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)
Wireless remote controller	1		—
Remote controller holder	1		—
Mounting screws for remote controller holder 3.1 mm (diam.) x 16 mm	1		—
Batteries (Manganese)	2		—
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
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 A	1		For sealing of wire connecting port
Heat insulator B	1		For sealing of wire connecting port
Owner's Manual	1		(Be sure to hand over to customers)

<Separate sold parts>

Part name	Q'ty	Shape	Usage
Ceiling panel	1		Model : RB-B11MC(W)E

□ Parts to be procured locally

Connecting pipe (Liquid side) (6.4 mm (diam.), Nominal (diam.) 1/4" thick 0.8 mm)	Connecting wire H07RN-F or 60245IEC66 (1.0 mm ²)
Connecting pipe (Gas side) (9.5 mm (diam.), Nominal (diam.) 3/8" thick 0.8 mm) RAS-M10SMUV-E, RAS-M10SMUCV-E, RAS-M13SMUV-E, RAS-M13SMUCV-E (12.7 mm (diam.), Nominal (diam.) 1/2" thick 0.8 mm) RAS-M16SMUV-E, RAS-M16SMUCV-E	Thermal insulation for refrigerant pipe (10 mm or more, thermal insulating foam polyethylene)
Power supply cord 2.5 mm ² (H07RN-F or 60245IEC66)	Thermal insulation for drain pipe (10 mm or more, foam polyethylene)
	Drain pipe (Outer 26 mm (diam.))
	Tapes
	Grounding wire (1.6 mm (diam.) or more)

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 FEATURES A NEW HFC REFRIGERANT (R410A) WHICH DOES NOT DEPLETE OZONE LAYER.**

The pressure of R410A is 1.6 times higher than that of former refrigerant R22.

The refrigerating oil has also been changed. Therefore be sure that any former refrigerant, refrigerant oil or any other contaminants do not enter the refrigerating cycle of the air conditioner, during either installation or service work. If incorrect tools or operating procedures are used, there is a possibility of a serious accident.

Use only tools and materials that have been designed to operate with R410A.

To prevent the risk of charging with an incorrect refrigerant, the dimensions of the charging port connections are different to those used for conventional refrigerant.

Therefore only tools designed to operate with R410A can be used.

For connecting pipes, use piping specifically designed for R410A.

During installation, ensure pipes are clean and ensure contaminants do not enter the pipes as the system is affected by impurities such as water, oxide scales, dirt, oil, etc. Do not use existing pipe work from previous installation as this will cause problems due to pressure resistances and impurities within the pipe.

CAUTION

To Disconnect the Appliance from Main Power Supply.

A switch or circuit breaker that can disconnect all poles must be included in the fixed wiring.

Be sure to use an approved circuit breaker or switch.

The installation fuse 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 an electric shock.
- **Connect all of the installation wiring correctly.**
If the installation wiring is incorrect electrical parts may be damaged.
- **During the transportation and installation of the air conditioning unit, ensure that gaseous matter other than the specified refrigerant does not enter into the refrigeration cycle.**
If a refrigerant becomes contaminated with foreign gases, the gas pressure within the refrigerant cycle will become abnormally high and may result in the fracture of pipework and possible human injury.
- **Do not modify this unit by removing any of the safety guards or by overriding any of the safety interlock switches.**
- **Exposure of the unit to water or other forms of moisture before installation may cause a short-circuit of the electrical parts.**
Do not store it in a wet basement or expose to rain or water.

- **After unpacking the unit, examine for 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.**
Incorrect installation may result in water leakage, electric shock or a fire.
- **When the air conditioner is installed in a small room, provide appropriate measures to ensure that in the event of a refrigerant leak the room does not exceed the critical level.**
- **Install the air conditioner securely in a location where the base can sustain the weight of the unit 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 unit falling.
- **If refrigerant gas has leaked during the installation work, ventilate the room immediately.**
If the leaked refrigerant gas comes in contact with fire, noxious gases may be generated.
- **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 gases may be generated.
- **Electrical work must be performed by a qualified electrician in accordance with the Installation Manual. Ensure the power supply to the air conditioner is exclusive to that unit only.**
An insufficient power supply capacity or inappropriate installation may cause fire.
- **Use only the specified wiring during the unit installation. Ensure that all terminals are securely fixed, so preventing any external forces having a negative effect on 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 authority when wiring the power supply.**
Inappropriate grounding may cause an electric shock.
- **Do not install the air conditioner in a location that maybe subjected to a risk of exposure to a combustible gas.**
If a combustible gas leaks and becomes concentrated around the unit, a fire may occur.

2 SELECTION OF INSTALLATION PLACE

WARNING

- The air conditioner must be installed in a location that can support the weight of the unit effectively.**
If the unit is not installed on a foundation that can support its weight effectively, the unit may fall down, resulting in possible human injury.
- Where required ensure that the units installation is sufficient enough to withstand against an earthquake.**
An insufficient installation could result in the unit falling, causing possible human injury.
- Install the air conditioner at a minimum height of 2.5 m from the floor.**
Do not insert your hands or others into the unit while the air conditioner is operating.

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.)

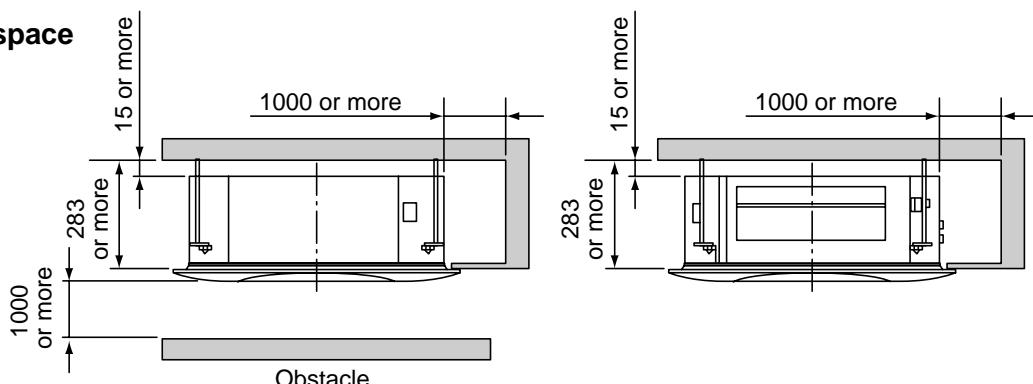
Installation space

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

Ensure there is sufficient space to install the unit and to perform maintenance work as and when required.

Keep 15 mm or more for clearance between top plate of the indoor unit and the ceiling surface.

Installation space



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 intake path.
3. Kitchen

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

Advice

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

Ceiling height

Model RAS-	Possible installed ceiling height
M10SMUV-E, M10SMUCV-E, M13SMUV-E, M13SMUCV-E	Up to 2.7 m
M16SMUV-E, M16SMUCV-E	Up to 3.5 m

Height list of ceiling possible to be installed

Model RAS-	M10SMUV-E M10SMUCV-E	M13SMUV-E M13SMUCV-E	M16SMUV-E M16SMUCV-E	SW02	
				No.1	No.2
Standard (Factory setting)	2.5 to 2.7 m	2.5 to 2.7 m	2.5 to 2.9 m	OFF	OFF
High ceiling (1)	—	—	2.9 to 3.2 m	ON	OFF
High ceiling (2)	—	—	3.2 to 3.5 m	ON	ON

When the height of the ceiling exceeds the distance of the item Standard 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.

(RAS-M16SMUV-E and M16SMUCV-E only)

When changing the setting of the ceiling height in the models, RAS-M10SMUV-E, M10SMUCV-E, M13SMUV-E and M13SMUCV-E, if it is set over 2.7 m, the hot air is difficult to reach the floor.

How to set the High ceiling switch

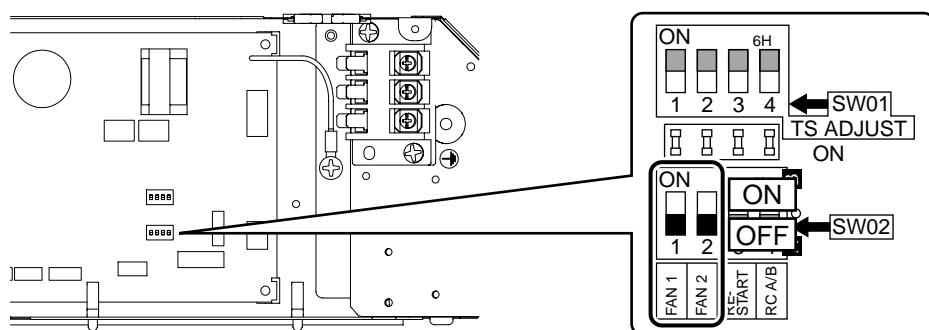
- Remove the cover of the electric parts box by taking off the mounting screws (3 positions) and pushing the hooking section. (The cover of the electric parts box remains hanged to the hinge.)
- There are the selector switches (SW02) on the P.C. board of the electric parts box.

No.1 and No.2 of the selector switches (SW02) are provided to select the height of the ceiling.

According to the ceiling height in the following table, select No.1 or No.2 of the selector switches (SW02).

REMARKS

- When using the high ceiling (1) or (2), cold air may be felt due to the temperature drop of discharge air.



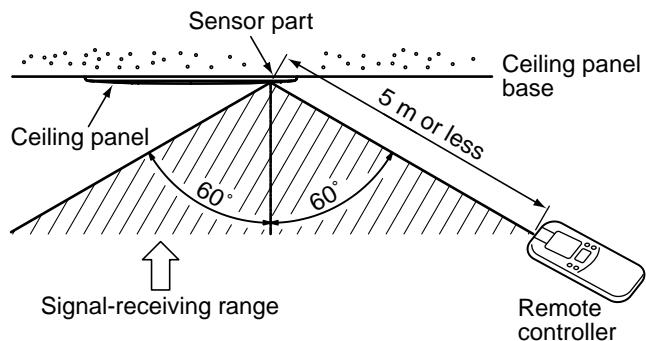
2 SELECTION OF INSTALLATION PLACE

⚠ 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.

Remote controller

- Should be placed where there are no obstacles, such as curtains, that may block the signal
- Do not install the remote controller in a place exposed to direct sunlight or close to a heating source such as a stove.
- Keep the remote controller at least 1m away from the nearest TV set or stereo equipment.
(This is necessary to prevent image disturbance or noise interference.)
- The location of the remote controller should be determined as shown below.

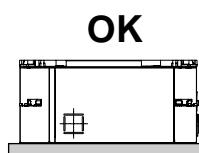


3 INSTALLATION OF INDOOR UNIT

⚠ WARNING

The installation of the air conditioning unit must be positioned in a location that can sufficiently support its weight and give protection against adverse environmental conditions.
Failure to do so may result in unit damage and possible human injury.
Any incomplete installation may also cause possible risk of human injury.

- Unpack the package, take out the product and then place it on the floor so that the same surface directs underneath as it is placed in the package.
- Never put the products in a pile or put weight on them, which are taken out from the packing box; otherwise there is a possibility to damage electric parts, fan parts, draining mechanism, and etc.
If the both sides are turned over, a deformation of mounting metal of the ceiling panel which is sold separately, etc. may be caused.
Accordingly the product may be damaged and the installation becomes impossible in some cases.

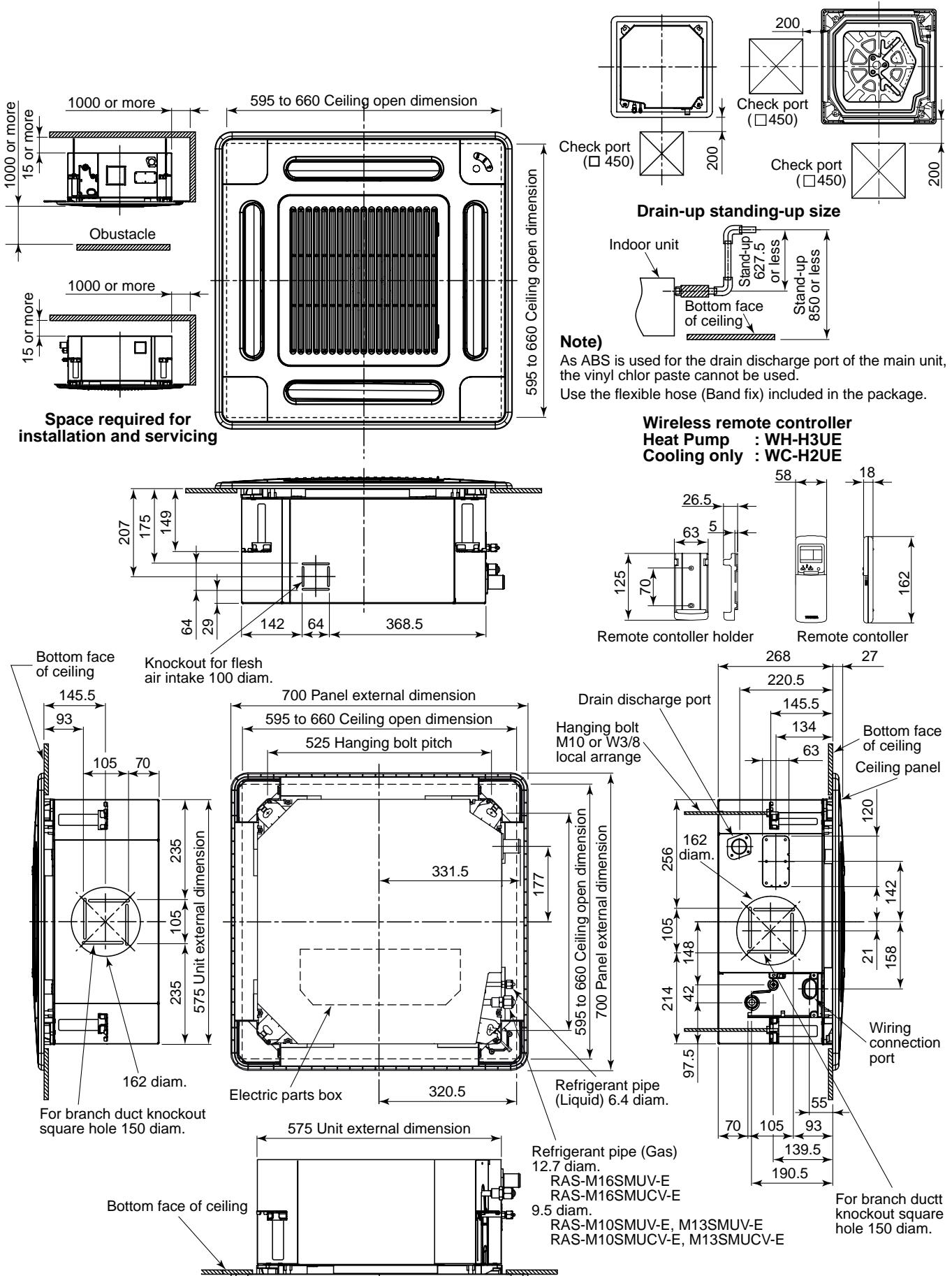


REQUIREMENT

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

- Do not place heavy objects on the indoor unit. (Even when units are still packaged)
- Always carry the unit as packaged from the factory wherever possible.
If carrying in the indoor unit unpacked by necessity, be sure to use buffering cloth, etc. to prevent damaging the unit.
- To move the indoor unit, hold the hanging brackets (4 positions) only.
Do not apply force to other parts (refrigerant pipe, drain pan, foamed parts, or resin parts etc.).
- To be carried by two or more people. Do not strap the unit in positions other than stated.

Dimensional view



3 INSTALLATION OF INDOOR UNIT

Ceiling opening and installation of hanging bolts

- Evaluate and determine the piping and wiring requirements inside the ceiling prior to the hanging of the unit.
- After installation place of the indoor unit has been determined, create opening in ceiling and install the hanging bolts.
- For the ceiling opening size and pitch for hanging bolts refer to the dimensional drawing and the supplied installation pattern.
- Once the ceiling void has been created, ensure that the drain pipe, refrigerant pipes, inter-connecting wires and all control wires are in place prior to installing the actual indoor unit.

Please procure the hanging bolts and nuts for installation of the indoor unit at local site.

Hanging bolt	M10 or W3/8	4 pieces
Nut	M10 or W3/8	12 pieces

How to use the supplied installation pattern

The installation pattern is enclosed within the packaging of the air conditioner.

Existing ceiling void

Use the pattern to determine the position and size of the opening and location of the hanging bolts.

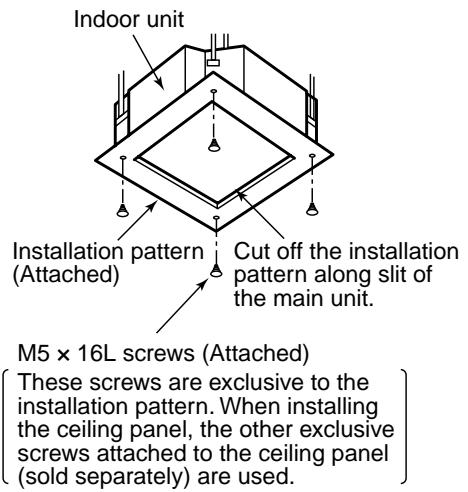
New ceiling void

Use the pattern to determine the position of the new ceiling opening.

Cut off slit section of the main unit of the installation pattern.

Cut off the outside of the pattern according to size of the ceiling opening. (There is a slit on the standard opening size section.)

- Install the indoor unit after installation of the hanging bolts.
- Using the supplied pattern attach it to the indoor unit using the supplied fixing screws (M5 x 16L 4 off). (Screw pattern to the ceiling panel hanging brackets of the indoor unit)
- When creating the opening ensure it is as per the outer dimensions of the supplied pattern.



Opening a ceiling and installation of hanging bolts

Treatment of ceiling

The ceiling differs according to the structure of the building. For details, consult your architect.

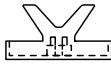
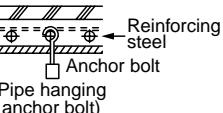
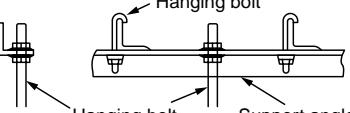
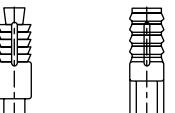
In the process after the ceiling panels have been removed, it is important to reinforce the ceiling construction and ensure the ceiling remains in a horizontal position. This is to prevent possible vibration of the ceiling panels.

- Cut and remove the ceiling material.
- Reinforce the cut surface of the ceiling construction and add support for fixing the end of ceiling panel.

Installation of hanging bolt

Use M10 hanging bolts (4 off, locally procured).

When mounting the unit, set the pitch of the hanging bolts according to the size of the unit as detailed on the dimensional drawing.

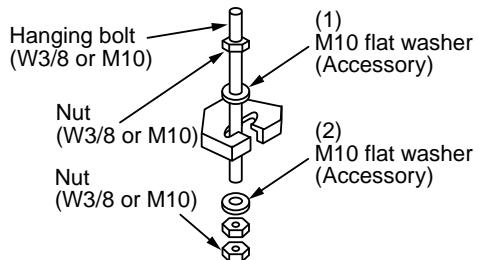
New concrete slab	Steel flame structure	Existing concrete slab
Install the bolts with insert brackets or anchor bolts.   	Use existing angles or install new support angles. 	Use a hole-in anchors, hole-in plugs, or a hole-in bolts. 

Installation of indoor unit

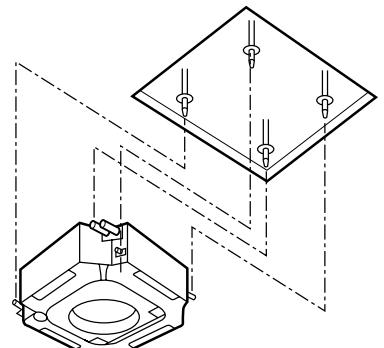
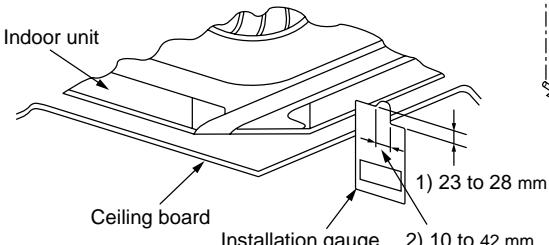
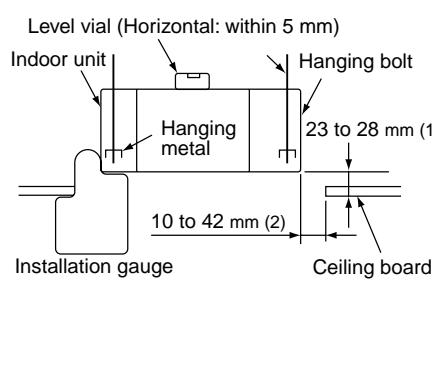
- Attach the nut (M10 or W3/8: Procured locally) and washer (34 mm (diam.)) to the hanging bolt.
- Put washers at either side of the T-groove on the hanging bracket of the indoor unit in order to hang the unit.
- Using a spirit level, check that all four sides are horizontal. (Horizontal positioned within 5 mm)
- Cut off the installation gauge from the installation pattern.
- Using the installation gauge check and adjust clearance between the indoor unit and the ceiling opening (1) (10 to 42 mm on each side).
Ensure that the unit is level to the ceiling and within a distance of (2) 23 mm to 28 mm below.

The installation gauge has details of how to use printed on it.

Note) Install the indoor unit so that the end part of opening does not come into contact with the drain socket piping.

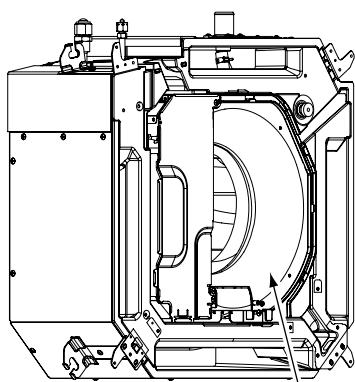


(1) M10 washer supplied, all other material must be procured locally.
(2) To ensure that the unit is mounted safely, the hanging bolt must be positioned just below the hanging bracket as shown in the diagram.



REQUIREMENT

Before installation of the indoor unit be sure to remove the transportation cushion found 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 after completion of the installation of the indoor unit, including all piping and wiring.

Install the ceiling panel as per the supplied Installation Manual.

Check the installation dimensions of the indoor unit and the ceiling opening are correct and then install.

REQUIREMENT

Ensure the ceiling panel is mated to the ceiling surface or the indoor unit.

If the panel and unit are not mated together this may result in the formation of dew condensation causing a possible water leak.

First remove the 4 corner caps from the ceiling panel and fit to the indoor unit.

4 DRAIN PIPING WORK

CAUTION

- Install the drain piping so that the water drains effectively.
- Apply heat insulation to prevent dew condensation from forming.
- Incorrectly installed pipework may result in a water leak.

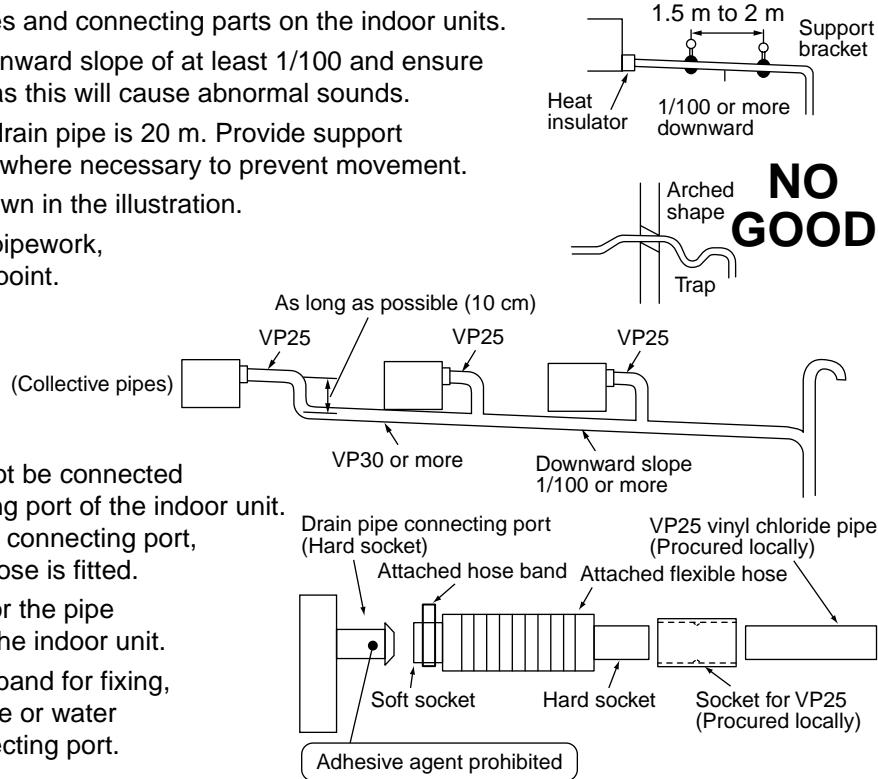
Pipe material / Insulator and size

The following materials for piping work and insulation are to be procured locally.

Pipe material	Hard vinyl chloride pipe socket for VP25
	Hard vinyl chloride pipe VP25 (Outer diameter 32 mm (diam.))
Insulator	Foamed polyethylene foam, thickness: 10 mm or more

REQUIREMENT

- Ensure insulating of the drain pipes and connecting parts on the indoor units.
- The drain pipe should have a downward slope of at least 1/100 and ensure there are no swells or blockages as this will cause abnormal sounds.
- The maximum traverse length of drain pipe is 20 m. Provide support brackets at intervals of 1.5 to 2 m where necessary to prevent movement.
- Install the combined piping as shown in the illustration.
- Do not create an air purge in the pipework, as the water would leak from this point.



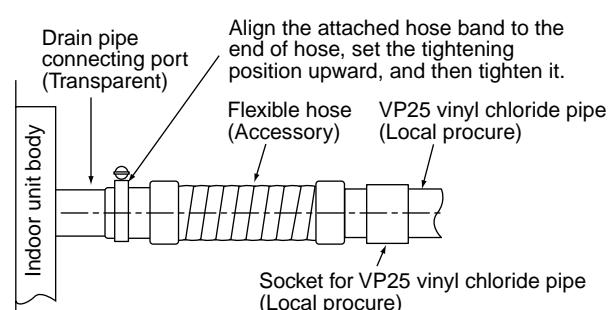
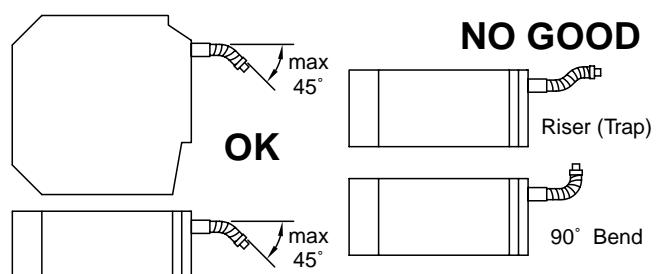
- The hard vinyl-chloride pipe cannot be connected directly to the drain pipe connecting port of the indoor unit. For connection with the drain pipe connecting port, ensure that the supplied flexible hose is fitted.
- Adhesive agent cannot be used for the pipe connecting port (hard socket) on the indoor unit. Be sure to use the supplied hose band for fixing, otherwise there is a risk of damage or water leakage from the drain pipe connecting port.

Connection of flexible hose

- Insert the soft socket of the supplied flexible hose into the connecting port of the drain pipe.
- Align the supplied hose band to the pipe connecting port end, and tighten.

REQUIREMENT

- Fix the soft socket with the supplied hose band, tighten at the upper position of the unit.
- The supplied flexible hose can bend up to a maximum of 45°



Connection of drain pipe

- Connect the hard socket (Procured locally) to the hard socket side of the supplied flexible hose which has been installed.
- Connect the drain pipes (Procured locally) in turn to the connected hard sockets.

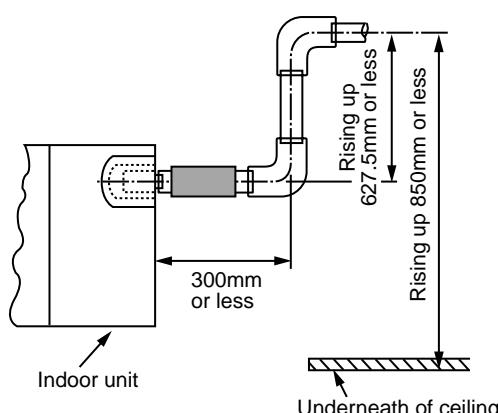
REQUIREMENT

- Using a adhesive agent for vinyl chloride, connect the hard vinyl chloride pipes so that water does not leak.
- Allow sufficient time for the adhesive to set and harden.
(Refer to the instructions of the adhesive.)

Drain up

When it is not possible to achieve a natural downward slope on the drain pipe, you can create a vertical lift (Drain up) on the pipe.

- Set the height of the drain pipe within 850 mm from the bottom surface of the ceiling.
- The drain pipe should be piped from the drain pipe connecting port horizontally for a maximum of 300 mm and then piped vertically.
- After piping the vertical lift, ensure the pipework is set to a downward gradient.



Check the draining

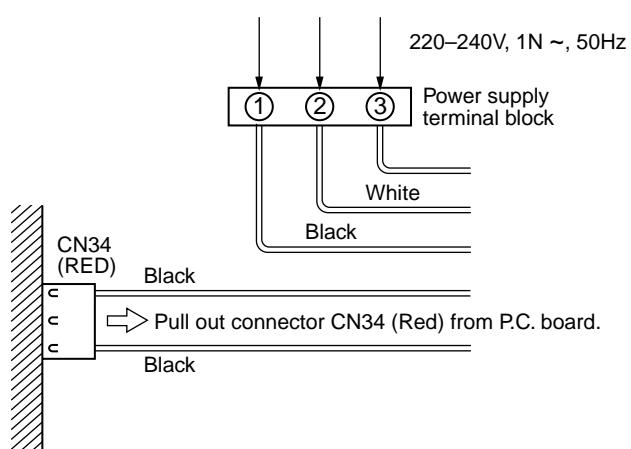
After completion of drain piping, Check water drains away and that no water leaks from any of the connecting parts. At the same time check for any abnormal sounds from the drain pump. Ensure drainage is checked during cooling mode.

When the electric work has finished:

- Before installing the ceiling panel, pour water as shown in the following figure, check water drains from the drain pipe connecting port (Transparent) in COOL mode and then check there are no water leaks from the drain pipes.

When the electric work has not finished:

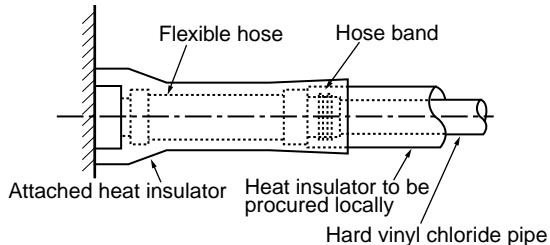
- Pull out the float switch connector (3P: Red) from P.C. board connector (CN34: Red) of the electric parts box. (Ensure the power is turned off.)
- Connect the single-phase 220-240V, 1N, 50 Hz power to the terminal blocks (1) and (2).
- Pour water referring to the figure. (Amount: 1500 cc to 2000 cc)
- When the power is turned on, the drain pump motor drives automatically. Check water is drained from the drain pipe connecting port (Transparent), and then check there is no water leak from the drain pipes.
- After checking for water leaks on the drain, turn off the power supply, and re-attach the float switch connector to the original position (CN34) on the P.C. board and refit the electric parts box.



4 DRAIN PIPING WORK

Thermal insulating process

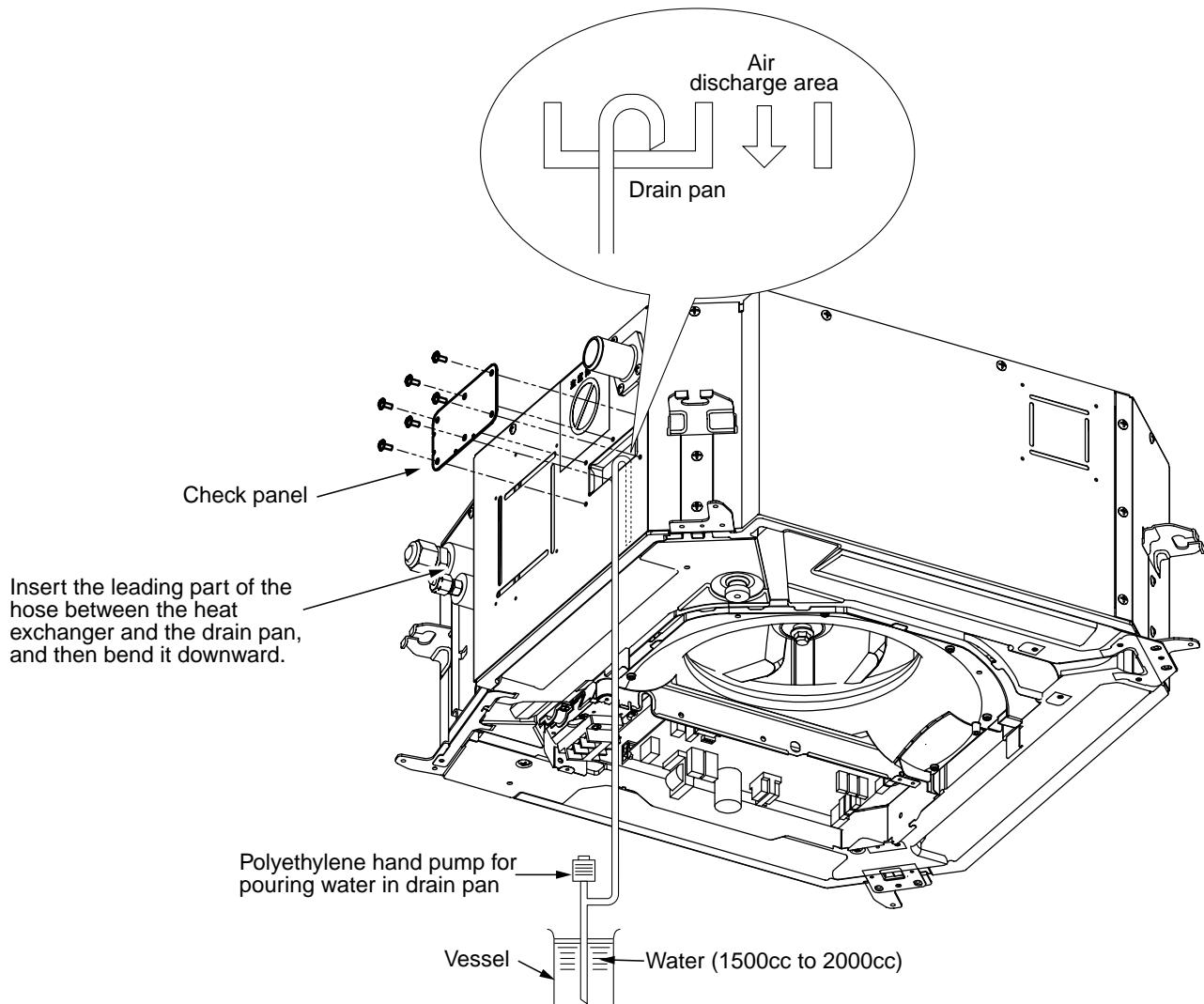
- After checking the draining, wrap the supplied thermal insulation material for the drain connecting part around the flexible hose leaving no clearance from the root of the drain pipe connecting port of the indoor unit.
- Wrap the thermal insulation material (procured locally) around the drain pipe so that it piles up on the supplied thermal insulation material for the drain connecting part, leaving no clearance.



CAUTION

Ensure water is poured slowly.

If water is poured vigorously, it is scattered inside of the indoor unit resulting in a cause of unit trouble.



5 REFRIGERANT PIPING AND EVACUATING

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 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

They vary according to the outdoor unit. For details, refer to the Installation Manual attached to the outdoor unit.

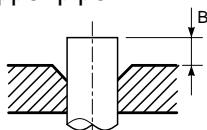
Flaring

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)

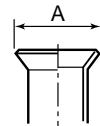


Outer diam. of copper pipe	R410A tool used		Conventional tool used	
	R410A	R22	R410A	R22
6.4	0 to 0.5 (Same as left)		1.0 to 1.5	0.5 to 1.0
9.5	0 to 0.5 (Same as left)		1.0 to 1.5	0.5 to 1.0
12.7	0 to 0.5 (Same as left)		1.0 to 1.5	0.5 to 1.0

Imperial (Wing nut type)

Outer diam. of copper pipe	R410A	R22
6.4	1.5 to 2.0	1.0 to 1.5
9.5	1.5 to 2.0	1.0 to 1.5
12.7	2.0 to 2.5	1.5 to 2.0

- Flaring diam. meter size :**
A (Unit : mm)



Outer diam. of copper pipe	A +0 -0.4	
	R410A	R22
6.4	9.1	9.0
9.5	13.2	13.0
12.7	16.6	16.2

* 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.

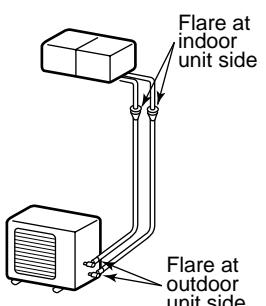
(Unit : N·m)

Outer diam. of copper pipe	Tightening torque
6.4 mm (diam.)	14 to 18 (1.4 to 1.8 kgf·m)
9.5 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)

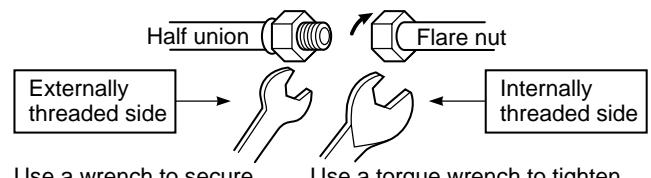
- Tightening torque of flare pipe connections

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.

6 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 70 meters.

(25 minutes for total 50 meters)

(assuming a pump capacity of 27 liters per minute.)

Then confirm that the compound pressure gauge reading is -101 kPa (-76 cmHg).

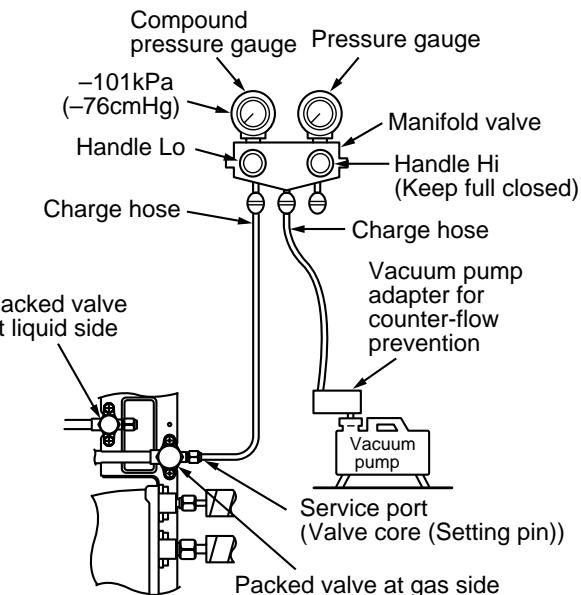
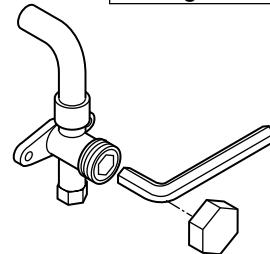
5. Close the low pressure side valve handle of gauge manifold.
6. Open fully the valve stem of the packed valves (both sides of Gas and Liquid).
7. Remove the charging hose from the service port.
8. Securely tighten the caps on the packed valves.

Packed valve handling precautions

- Open the valve stem until it touches the stopper. Once it is in contact with the stopper, refrain from applying any more force than is necessary.
- 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 (9.5 mm (diam.))	33 to 42 N·m (3.3 to 4.2 kgf·m)
Liquid side (6.4 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)

Hexagonal wrench is required.



7 ELECTRICAL WORK

⚠ WARNING

1. **Using the specified wires, ensure to connect the wires, and fix wires securely so that the external tension to the wires 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 wires 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

- Appliance shall be installed in accordance with national wiring regulations.
- For wiring of power supply of the outdoor units, follow the Installation Manual of each outdoor unit.
- 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 wires to the terminal blocks, provide a trap and fix wires with the cord 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.

How to wire

1. Connect the connecting wire to the terminal as identified with their respective numbers on the terminal block of indoor and outdoor unit. H07 RN-F or 60245 IEC 66 (1.0 mm²)
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.

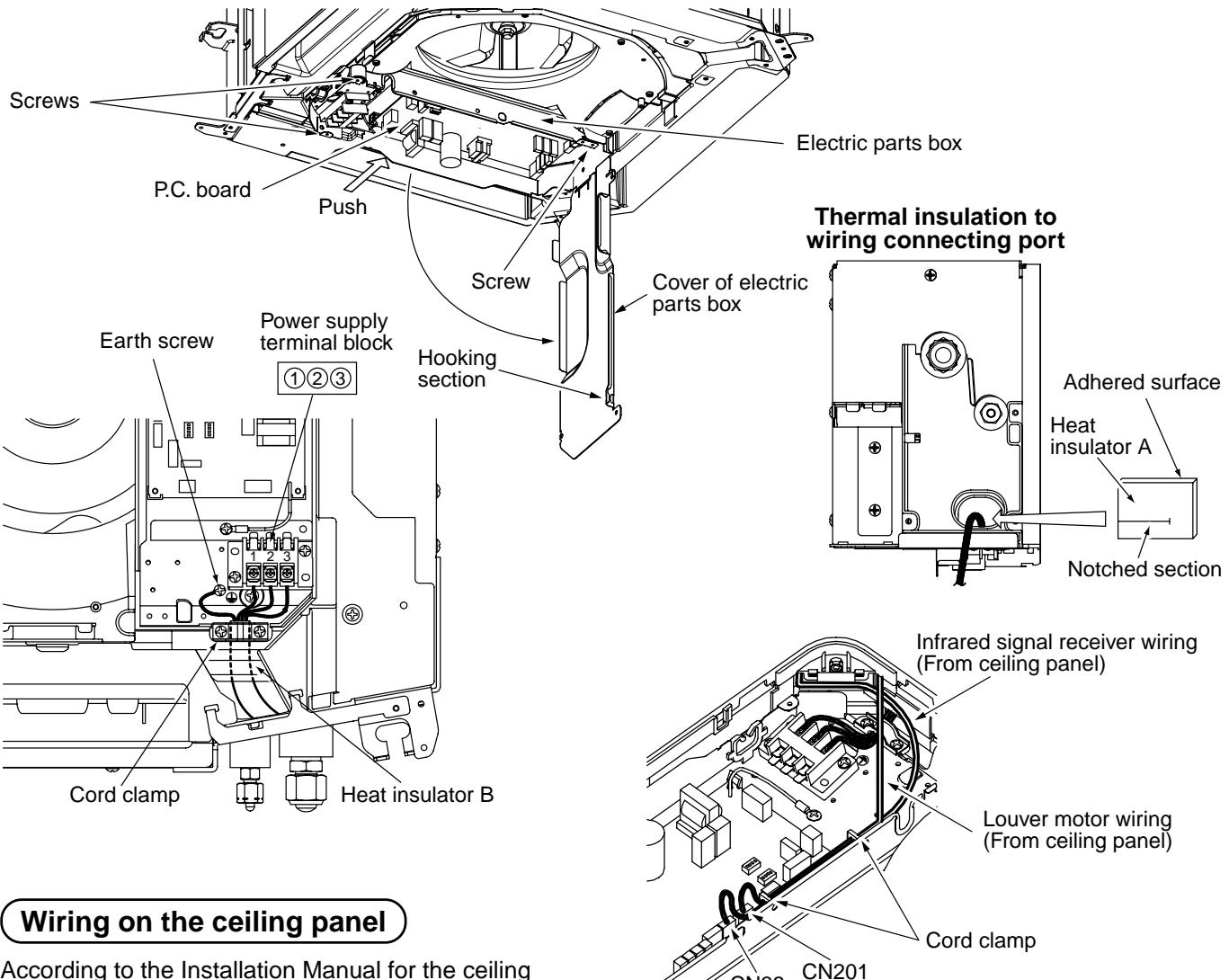
7 ELECTRICAL WORK

Wire connection

REQUIREMENT

- Be sure to connect the wires matching the terminal numbers. Incorrect connection causes a trouble.
- Be sure to pass the cables through the bushing of wiring connection port of the indoor unit.
- Keep a margin (Approx. 100mm) on a wire to hang down the electric parts box at servicing, etc.

- 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 wires 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 wires 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 wires. (Mount the cover after cabling on the ceiling panel.)



Wiring on the ceiling panel

According to the Installation Manual for the ceiling panel, connect the connectors to the P.C. board in the electric parts box.

Connect the sensor connector to CN201 (Blue), and the louver motor wiring connector to CN33 (White) on the P.C. board, respectively.

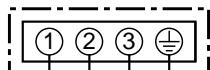
Draw and pass the sensor lead wire upper the louver motor wiring, and then close cover of the electric parts box. Perform the wiring work so that the electric parts box does not pinch the sensor lead wire.

Wiring

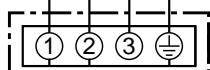
1. Remove a screw and then remove cover of the electric parts box.
2. Strip wire ends (10 mm).
3. Match wire colors with terminal numbers on indoor and outdoor units' terminal blocks and firmly screw wires to the corresponding terminals.
4. Connect the ground wires to the corresponding terminals.
5.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

Wiring diagram

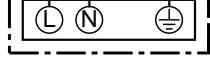
Indoor side



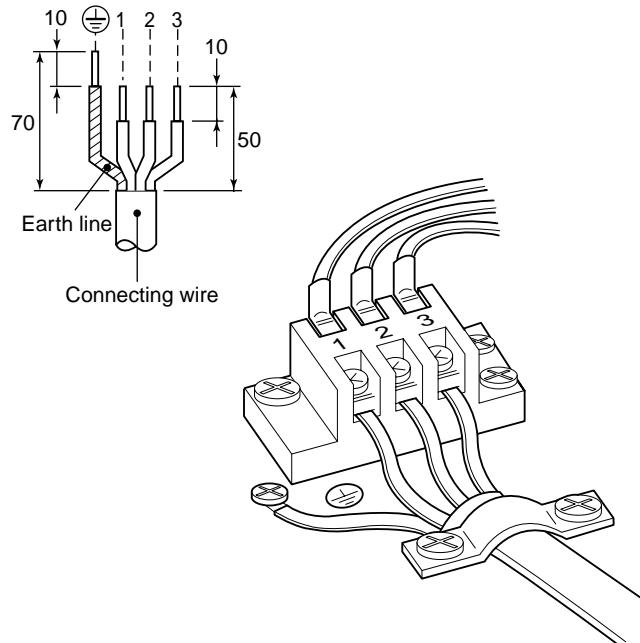
Indoor/Outdoor connecting wires



Outdoor side



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



NOTE

Wire type: H07RN-F or 60245IEC66 (1.0 mm²)

8 APPLICABLE CONTROLS

Remote controller selector switch setting

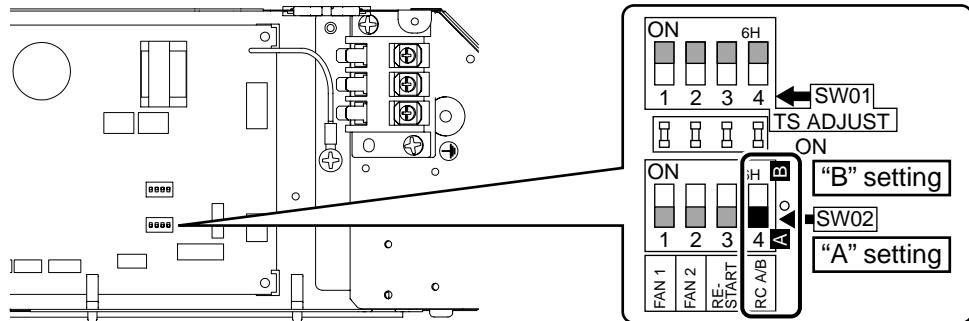
- If two indoor units are installed in the same room or adjoining rooms, when the user tries to operate only one unit, both units may receive the same remote controller signal and operate. This can be prevented by changing one of the indoor units and remote controllers to setting "B" (The default setting for both units is "A").
- If the indoor unit and remote controller settings are different, the remote controller signal will not be accepted.

1. Setting the remote controller

- Remove the cover, and insert the batteries.
- Push the "CHECK" point and "MODE" button at once, for changing remote controller setting from "A" to "B". (Priority is given to "A" setting.)

2. Setting the unit

- 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.)
- There are the selector switches (SW02) on the P.C. board of the electric parts box. No.4 of the selector switches (SW02) is provided to select the switch of the remote controller. Select ON of No.4 of the selector switches (SW02). (OFF: A setting, ON: B setting)



- Check whether the changed remote controller can operate the indoor unit or not.

Auto restart setting

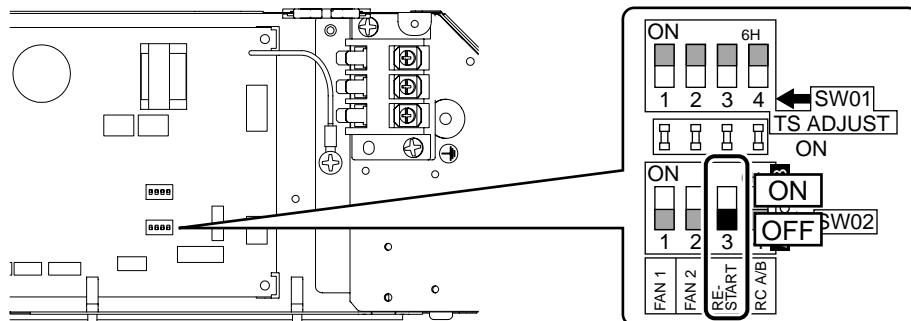
This product is designed so that, after a power failure, it can restart automatically in the same operating mode as before the power failure.

INFORMATION

The product was shipped with Auto Restart function in the OFF position. Turn it ON as required.

How to set the Auto Restart

- 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.)
- There are the selector switches (SW02) on the P.C. board of the electric parts box. No.3 of the selector switches (SW02) is provided for the selector switch. Select ON of No.3 of the selector switches (SW02). (OFF: setting without Auto Restart, ON: setting with Auto Restart)



To improve Cooling/Heating effect

When only poor cooling/heating effect is obtained due to installation place of the indoor unit or construction of the room, the detection temperature of cooling/heating can be changed.

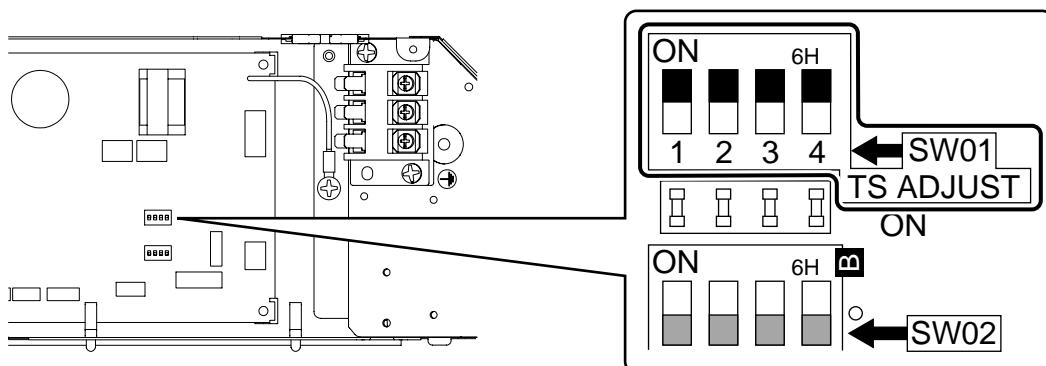
- Remove the cover of the electric parts box by taking off the mounting screws (3 positions) and pushing the hooking section. (The cover of the electric parts box remains hanged to the hinge.)
- There are the selector switches (SW01) on the P.C. board of the electric parts box.

The setting of the detection temperature can be changed by combining No.1 to No.4 switches of the selector switches (SW01). Adjust the setting of the detection temperature according to the right table.

No.1	No.2	No.3	No.4	COOL/DRY (°C)	HEAT (°C)
OFF	OFF	OFF	OFF	-2	-2
ON	OFF	OFF	OFF	-2	+4
OFF	ON	OFF	OFF	-2	+2
ON	ON	OFF	OFF	-2	0
OFF	OFF	ON	OFF	+4	-2
ON	OFF	ON	OFF	+4	+4
OFF	ON	ON	OFF	+4	+2
ON	ON	ON	OFF	+4	0
OFF	OFF	OFF	ON	+2	-2
ON	OFF	OFF	ON	+2	+4
OFF	ON	OFF	ON	+2	+2
ON	ON	OFF	ON	+2	0
OFF	OFF	ON	ON	0	-2
ON	OFF	ON	ON	0	+4
OFF	ON	ON	ON	0	+2
ON	ON	ON	ON	0	0

← Factory setting

Setting at shipment

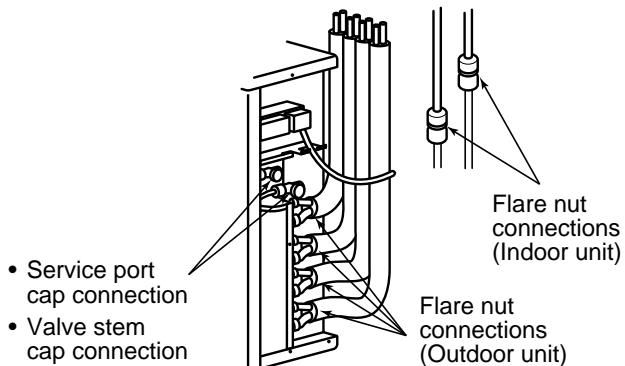


9 TEST OPERATION

Check and Test operation

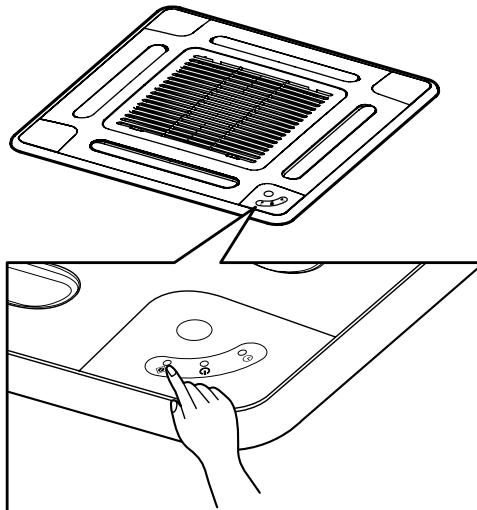
Be sure to test the piping connections for gas leak.

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



Test operation

- To test the system, push and hold RESET button for 10 sec. (There will be one short beep.)



10 INSTALLATION / SERVICING TOOLS

Tools

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

: Newly prepared (They are special requirements for R410A, separated from those for R22.)

: Existing tools are available.

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

11 MAINTENANCE

Prior to maintenance, ensure the power supply is turned off.

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 qualified service person do it. Do not attempt it yourself.

CAUTION

Do not handle the buttons with wet hands as this will cause the risk of electric shock.

Cleaning of air filter

Clean the air filters every 3 months.

The performance of the air conditioner will degrade if the air filters are covered with dust.

Clean the air filters as often as possible.

1 Open the air inlet grille.

- Slide the air inlet grille buttons to detach the air inlet grille from the main ceiling panel. Lower the grille slowly whilst holding.

2 Take out the air filter.

- Push the extrusion of the air filter away from the grille and remove.

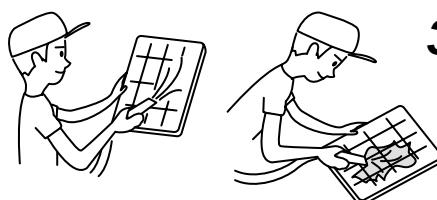
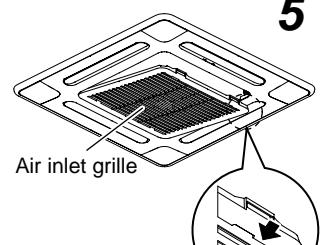
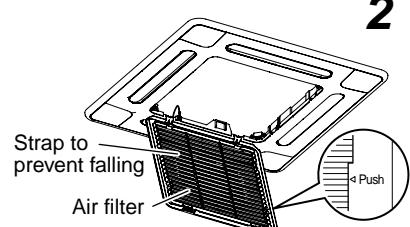
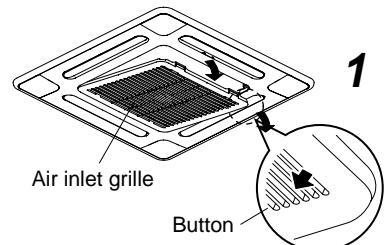
3 Cleaning with water or vacuum cleaner

- If dirt is heavy, clean the air filter using tepid water with a neutral detergent or just water.
- After cleaning with water, dry the air filter sufficiently in a shaded place.

4 Mount the air filter.

5 Close the air inlet grille.

- Close the air inlet grille, slide the button to locate into the ceiling panel fixing securely.

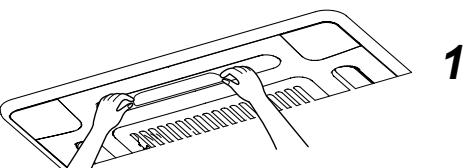


Cleaning of air outlet louver

The air outlet louver can be removed to clean if necessary.

1 Remove the air outlet louver.

- Holding both ends of the air outlet louver, remove it by sagging the center downwards.



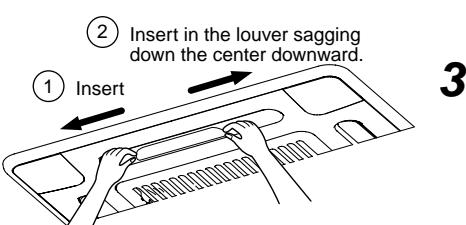
2 Clean the air outlet louver with water.

- If dirt is heavy, clean the air outlet louver using tepid water with neutral detergent or just water.



3 Mount the air outlet louver.

- First push in the one side, and insert the opposite side by sagging the center downwards.



Be careful to insert the louver in the correct direction.

Insert the louver with the printed mark facing upwards, and the arrow on the louver pointing in the outward direction.

11. HOW TO DIAGNOSE THE TROUBLE

Table 11-1

No.	Troubleshooting Procedure	Page
1	First Confirmation	61
2	Primary Judgment	62
3	Judgment by Flashing LED of Indoor Unit (Switch Panel)	62
4	Self-Diagnosis by Remote Controller (Check Code)	63
5	Judgment of Trouble by Every Symptom	66
6	How to Check Simply the Main Parts	70
7	P.C. Board Layout	71
8	Service P.C. Board Selection Information	72

11-1. First Confirmation

11-1-1. Confirmation of Power Supply

Confirm that the power breaker operates (ON) normally.

11-1-2. Confirmation of Power Voltage

Confirm that power voltage is AC 220–240 ±10%. If power voltage is not in this range, the unit may not operate normally.

11-1-3. Operation Which is not a Trouble (Program Operation)

For controlling the air conditioner, the program operations are built in the microcomputer as described in the following table. If a claim is made for running operation, check whether or not it meets to the contents in the following table. When it does, we inform you that it is not trouble of equipment, but it is indispensable for controlling and maintaining of air conditioner.

Table 11-1-1

No.	Operation of air conditioner	Description
1	When power breaker is turned "ON", the operation lamp (Green) of the indoor unit flashes.	The OPERATION lamp of the indoor unit flashes when power source is turned on. If "START/STOP" button is operated once, flashing stops. (Flashes also in power failure)
2	Compressor may not operate even if the room temperature is within range of compressor-ON.	The compressor does not operate while compressor restart delay timer (3-minutes timer) operates. The same phenomenon is found after power source has been turned on because 3-minutes timer operates.
3	In DRY and ECONO. mode, FAN (air flow) display does not change even though FAN (air flow select) button is operated.	The air flow indication is fixed to [AUTO].
4	Increasing of compressor motor speed stops approx. 30 seconds after operation started, and then compressor motor speed increases again approx. 30 seconds after.	For smooth operation of the compressor, the compressor motor speed is restricted to Max. 33 rps for 2 minutes and Max. 57 rps for 2 minutes to 4 minutes, respectively after the operation has started.
5	The set value of the remote control should be below the room temperature.	If the set value is above the room temperature, Cooling operation is not performed. And check whether battery of the remote control is consumed or not.
6	In AUTO mode, the operation mode is changed.	After selecting Cool or Heat mode, select an operation mode again if the compressor keeps stop status for 15 minutes.
7	In HEAT mode, the compressor motor speed does not increase up to the maximum speed or decreases before the temperature arrives at the set temperature.	The compressor motor speed may decrease by high-temp. release control (Release protective operation by temp.-up of the indoor heat exchanger) or current release control.
8	Cool, Dry, or Heat operation cannot be performed.	When the unit in other room operates previously in different mode, Fan Only operation is performed because of first-push priority control. (Cool operation and Dry operation can be concurrently performed.)

11-2. Primary Judgment

To diagnose the troubles, use the following methods.

- (1) Judgment by flashing LED of indoor unit
- (2) Self-diagnosis by service check remote controller
- (3) Judgment of trouble by every symptom

Firstly use the method (1) for diagnosis. Then, use the method (2) or (3) to diagnose the details of troubles.

For any trouble occurred at the outdoor unit side, detailed diagnosis is possible by 5-serial LED on the inverter P.C. board.

11-3. Judgment by Flashing LED of Indoor Unit (Switch Panel)

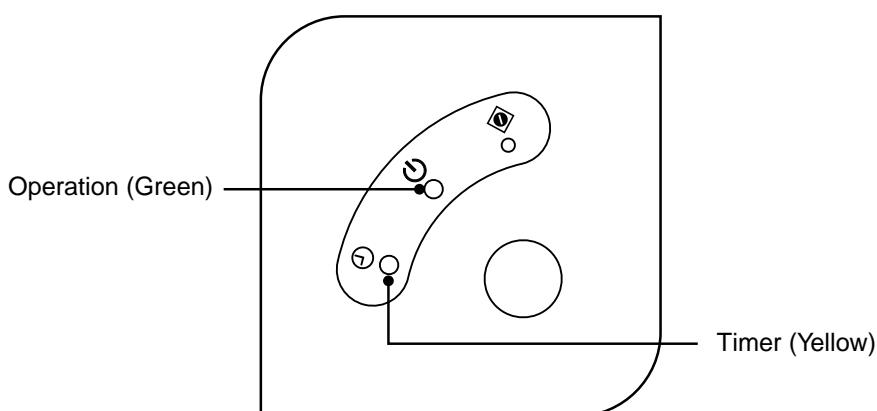
While the indoor unit monitors the operation status of the air conditioner, if the protective circuit operates, the contents of self-diagnosis are displayed with block on the indoor unit indication section.

Table 11-3-1

Indoor indication lamp flashes.	Item	Check code	Block display	Description for self-diagnosis
	A	—	OPERATION (Green) Flashing display (1 Hz)	Power failure (when power is ON)
	B	00	OPERATION (Green) Flashing display (5 Hz)	Protective circuit operation for indoor P.C. board
	C	01	OPERATION (Green) TIMER (Yellow) Flashing display (5 Hz)	Protective circuit operation for connecting cable and serial signal system
	D	02	OPERATION (Green) Flashing display (5 Hz)	Protective circuit operation for outdoor P.C. board
	E	03	OPERATION (Green) TIMER (Yellow) Flashing display (5 Hz)	Protective circuit operation for others (including compressor)

NOTES :

1. The contents of items B and C and a part of item E are displayed when air conditioner operates.
2. When item B and C, and item B and a part of item E occur concurrently, priority is given to the block of item B.
3. The check codes can be confirmed on the remote controller for servicing.
4. For judgment and measures of the outdoor units, refer to the service manual of the outdoor unit to be combined.

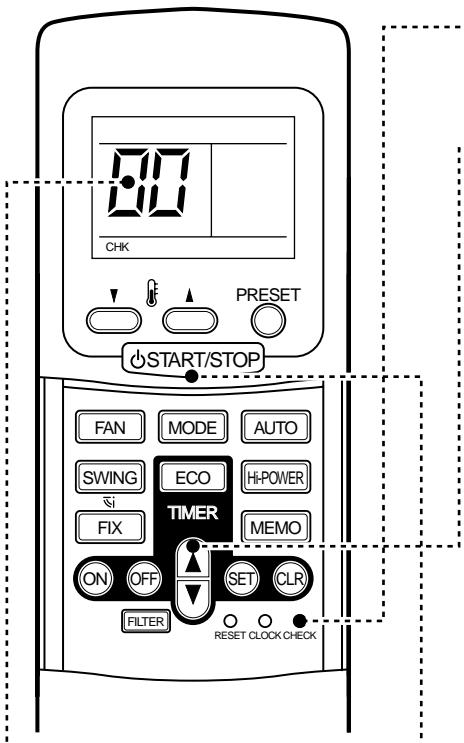


11-4. Self-Diagnosis by Remote Controller (Check Code)

1. The self-diagnosis by the check code is performed while items B to E blocks are displayed.
2. When turning the operation mode on the remote controller to the service mode, and operating the remote controller, the controller of the indoor unit can self-diagnose operation of the protection circuit by displayed contents (check code) on the remote controller, by whether all the lamps flash (5Hz) and the receiving sound (Beep, Beep, Beep ... for 10 seconds) is heard. The timer lamp usually flashes (5Hz) during self-diagnosis.

11-4-1. Self-Diagnosis

1. Wireless remote controller



Alphanumeric characters are used for the check codes.

S is 5. **s** is 6.
A is A. **a** is B.
C is C. **c** is D.

1 Push the **CHK** button by something with thin edge.

- Check **00** is displayed in the indication part of the remote controller.



2 Push **▲** toward the indoor unit one by one.

If it is normal, the receiving sound "Beep" is heard every pushing it and check code in the indication part of the remote controller changes.

→00→01→02→03→04→05→06→07→08→09→0A→0B→0C→0D→0E→0F→0G→0H→0I→0J→0K→0L→0M→0N→0P→0Q→0R→0S→0T→0U→0V→0W→0X→0Y→0Z→22

The timer lamp of the air conditioner flashes.
(5 times for 1 second)

- Check all of 35 check codes (**00** to **22**).
- Push **▼** to return to the objective code if passed.

If a trouble occurs, the receiving sound "Beep" changes to Beep, Beep, Beep (continues for approx. 10 seconds). Check the check code in the indication part of the remote controller.



- 2-digits alphanumeric characters are displayed in the indication part of the remote controller.
- All the lamps of the air conditioner flash (5 times for 1 second).

3 To release the self-diagnosis function, push **START/STOP** button.

Pushing the button once displays the operation stop, and pushing the button twice returns the display before check.

11-4-2. Caution at Servicing

1. After servicing, push the START/STOP button to return to the normal mode.
2. After servicing by the check code, turn off breaker of the power supply, and turn on breaker of the power supply again so that memory in the microcomputer returns the initial status. However, the check codes are not deleted even if the power supply is turned off because they are stored in the fixed memory.

Table 11-4-1

Block distinction		Operation of diagnosis function				Judgment and action
Check code	Block	Check code	Cause of operation	Air conditioner status	Condition	
00	Indoor P.C. board etc.	0C	Short-circuit or disconnection of the room temperature sensor (TA sensor).	Operation continues.	Displayed when error is detected.	1. Check the room temp. sensor. 2. When the room temp. sensor is normal, check P.C. board.
		0d	Being out of place, disconnection, short-circuit, or migration of heat exchanger sensor (TC sensor).	Operation continues.	Displayed when error is detected.	1. Check heat exchanger sensor. 2. When heat exchanger sensor is normal, check P.C. board.
		0F	Being out of place, disconnection, short-circuit, or migration of heat exchanger sensor (TCJ sensor).	Operation continues.	Displayed when error is detected.	1. Check heat exchanger sensor. 2. When heat exchanger sensor is normal, check P.C. board.
		11	Lock of indoor fan or trouble on the indoor fan circuit.	All off	Displayed when error is detected.	1. Check P.C. board. 2. When P.C. board is normal, check the motor.
		0b	Float SW operation	Operation continues. (Outdoor units stop.)	Displayed when error is detected.	1. Check the drainage. 1) Amount of residual drain. 2) Drain water piping installation situation. 2. Float SW operation check 3. Check disconnection of connector.
		12	Trouble on other indoor P.C. boards	Operation continues.	Displayed when error is detected.	Replace P.C. board.
01	Connecting cable and serial signal	04	Return serial signal is not sent to indoor side from operation started. 1) Defective wiring of connecting cable 2) Operation of compressor thermo. Gas shortage Gas leak	Operation continues.	Flashes when trouble is detected on return serial signal, and normal status when signal is reset.	1. When the outdoor unit never operates: 1) Check connecting cable, and correct if defective wiring. 2) Inverter check 2. To display [Other] block during operation, check compressor thermo. operation and supply gas (check gas leak also). 3. Unit operates normally during check. If return serial signal does not stop between indoor terminal board 2 and 3, replace inverter P.C. board. If signal stops between indoor terminal board 2 and 3, replace indoor P.C. board.

Block distinction		Operation of diagnosis function				Judgment and action
Check code	Block	Check code	Cause of operation	Air conditioner status	Remarks	
02	Outdoor P.C. board	14	Inverter over-current protective circuit operates. (Short time)	All off	Displayed when error is detected.	Even if trying operation again, all operations stop immediately. : Replace P.C. board.
		15	Position-detect circuit error or short-circuit between windings of compressor	All off	Displayed when error is detected.	1. Even if connecting lead wire of compressor is removed, position-detect circuit error occurred. : Replace P.C. board. 2. Measure resistance between wires of compressor, and perform short-circuit. : Replace compressor.
		17	Current-detect circuit error	All off	Displayed when error is detected.	Even if trying operation again, all operations stop immediately. : Replace P.C. board.
		18	Being out of place, disconnection or short-circuit of the outdoor temp. sensor (Ts)	All off	Displayed when error is detected.	Check 5-serial LED. 1. Check sensors (TE, TS). 2. Check P.C. board.
		19	Disconnection or short-circuit of discharge temp. sensor	All off	Displayed when error is detected.	1. Check discharge temp. sensor (TD). 2. Check P.C. board
		1A	Outdoor fan drive system error	All off	Displayed when error is detected.	Position-detect error, over-current protective operation of outdoor fan drive system, fan lock, etc. : Replace P.C. board or fan motor.
	Not displayed	1B	Outdoor temp. sensor error	Operation continues	—	1. Check outdoor temp. sensor (TO). 2. Check P.C. board.
03	Outdoor P.C. board	1C	Compressor drive output error, Compressor error (lock, missing, etc.), Break down	All off	Displayed when error is detected.	Check 5-serial LED. When 20 seconds passed after start-up, position-detect circuit error occurred. : Replace compressor. Trouble on P.M.V.
	Others (including compressor)	17	Return serial signal has been sent when operation started, but it is not sent from halfway. 1) Compressor thermo. operation Gas shortage Gas leak 2) Instantaneous power failure	Operation continues	Flashes when trouble is detected on return serial signal, and normal status when signal is reset.	1. Repeat Start and Stop with interval of approx. 10 to 40 minutes. (Code is not displayed during operation.) Supply gas. (Check also gas leak). 2. Unit operates normally during check. If return serial signal does not stop between indoor terminal block 2 and 3, replace inverter P.C. board. If signal stops between indoor terminal block 2 and 3, replace indoor P.C. board.
		1D	Compressor does not rotate. (Current protective circuit does not operate when a specified time passed after compressor had been activated.)	All off	Displayed when error is detected.	1. Trouble on compressor 2. Trouble on wiring of compressor (Missed phase)
		1E	Discharge temp. exceeded 117°C	All off	Displayed when error is detected.	1. Check discharge temp. sensor (TD). 2. Gas leakage 3. Trouble on P.M.V.
		1F	Break down of compressor	All off	Displayed when error is detected.	1. Check power voltage. (220–230–240 V +10%) 2. Overload operation of refrigeration cycle Check installation condition (Short-circuit of outdoor diffuser).

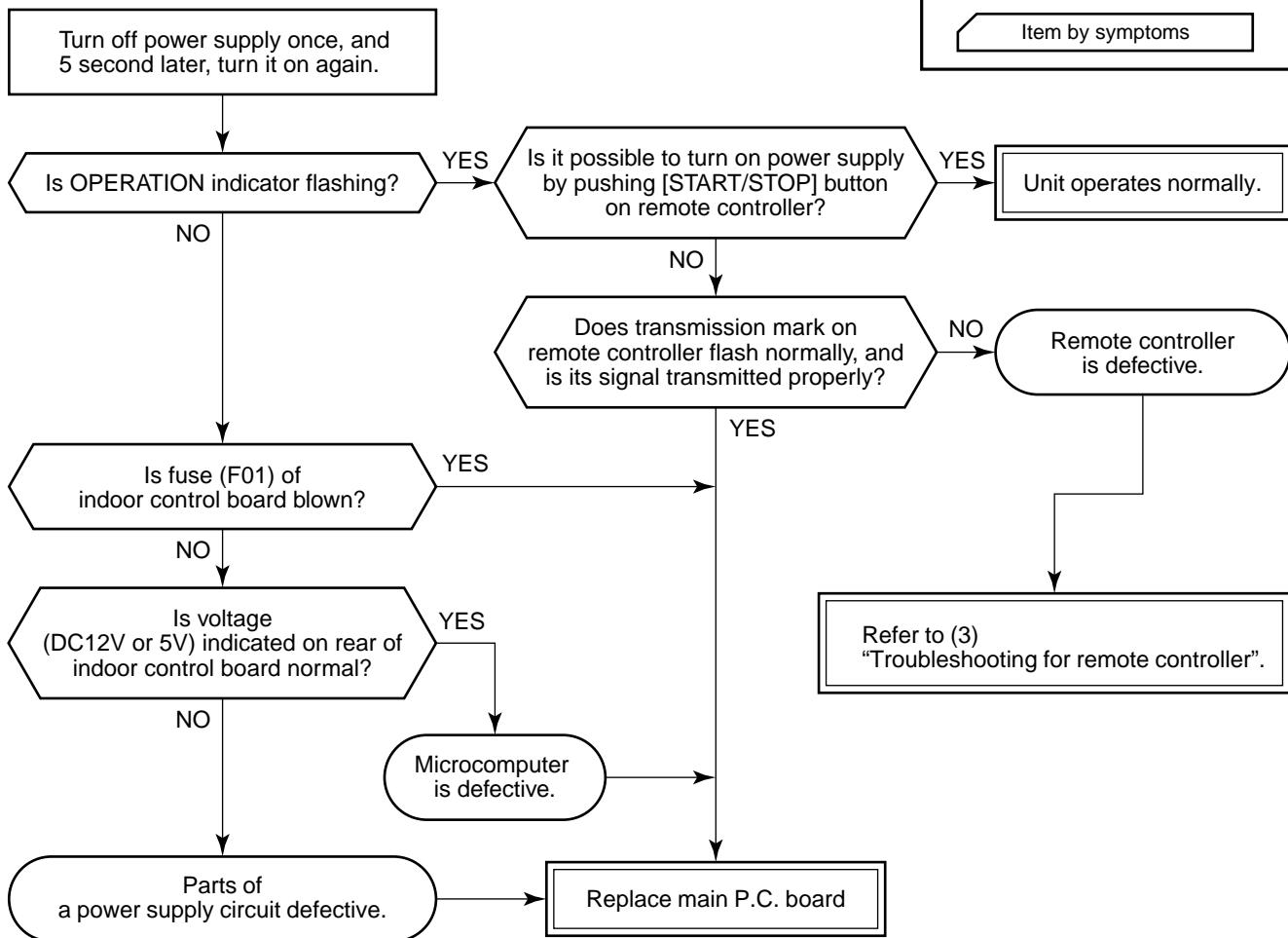
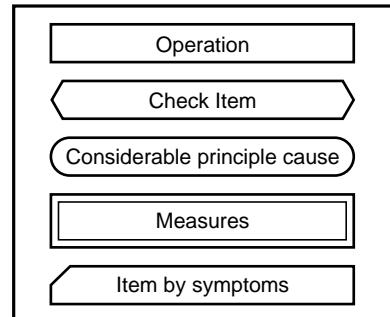
11-5. Judgment of Trouble by Every Symptom

11-5-1. Indoor Unit (Including Remote Controller)

(1) Power is not turned on (Does not operate entirely)

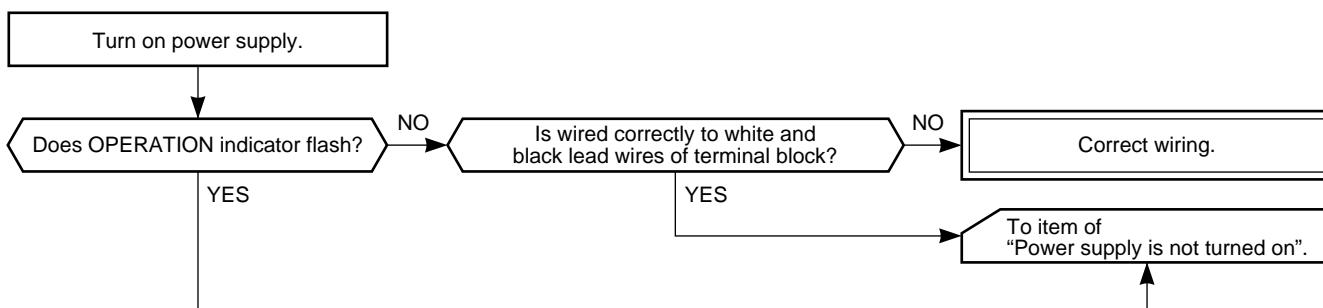
<Primary check>

1. Is the supply voltage normal?
2. Is the normal voltage provided to the outdoor unit?
3. Is the crossover cable connected properly?
4. Is the fuse (F01) blown?

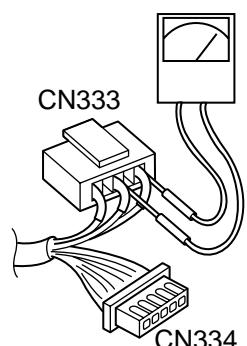
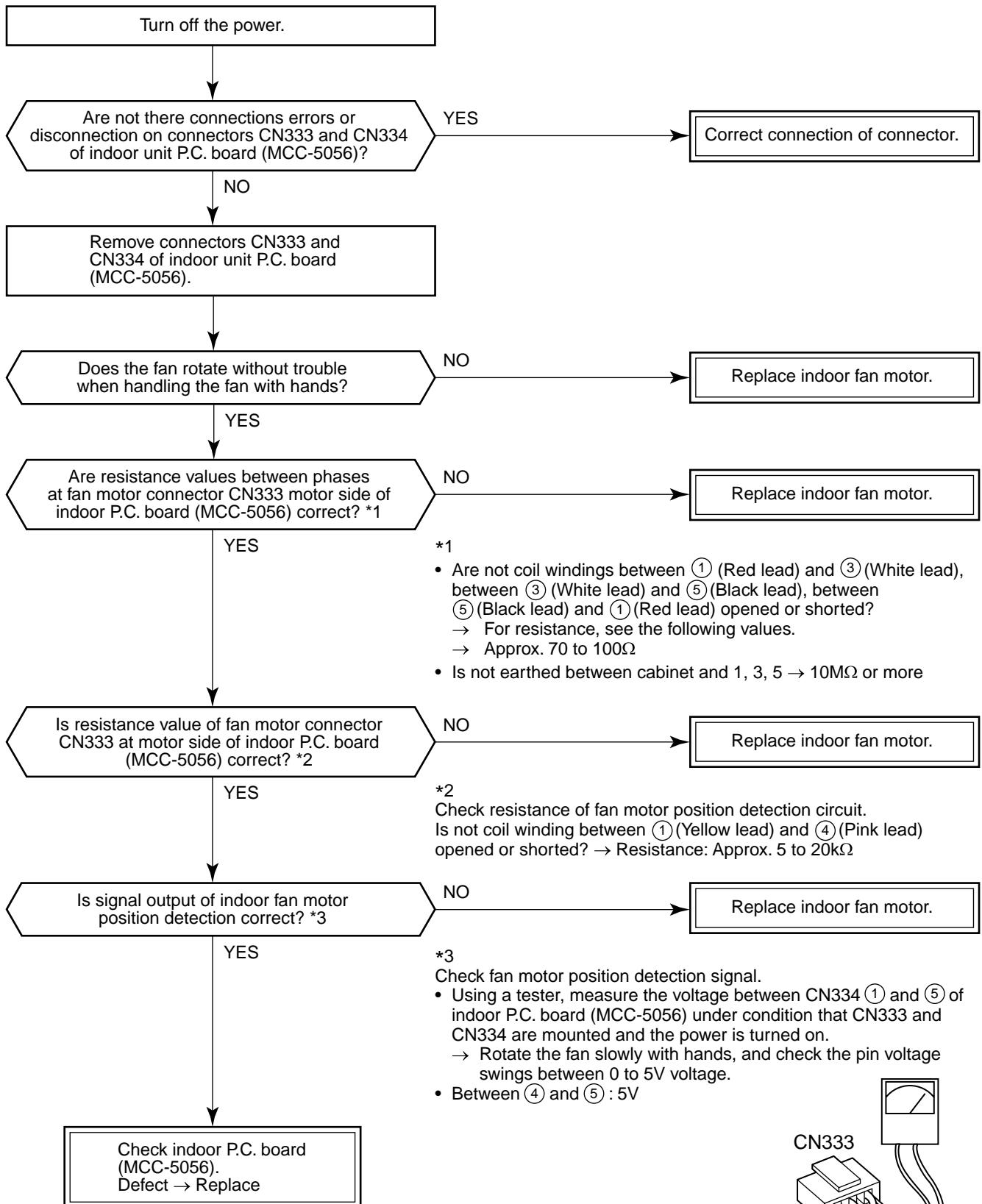


(2) Power is not turned on though Indoor P.C. board is replaced

<Confirmation procedure>



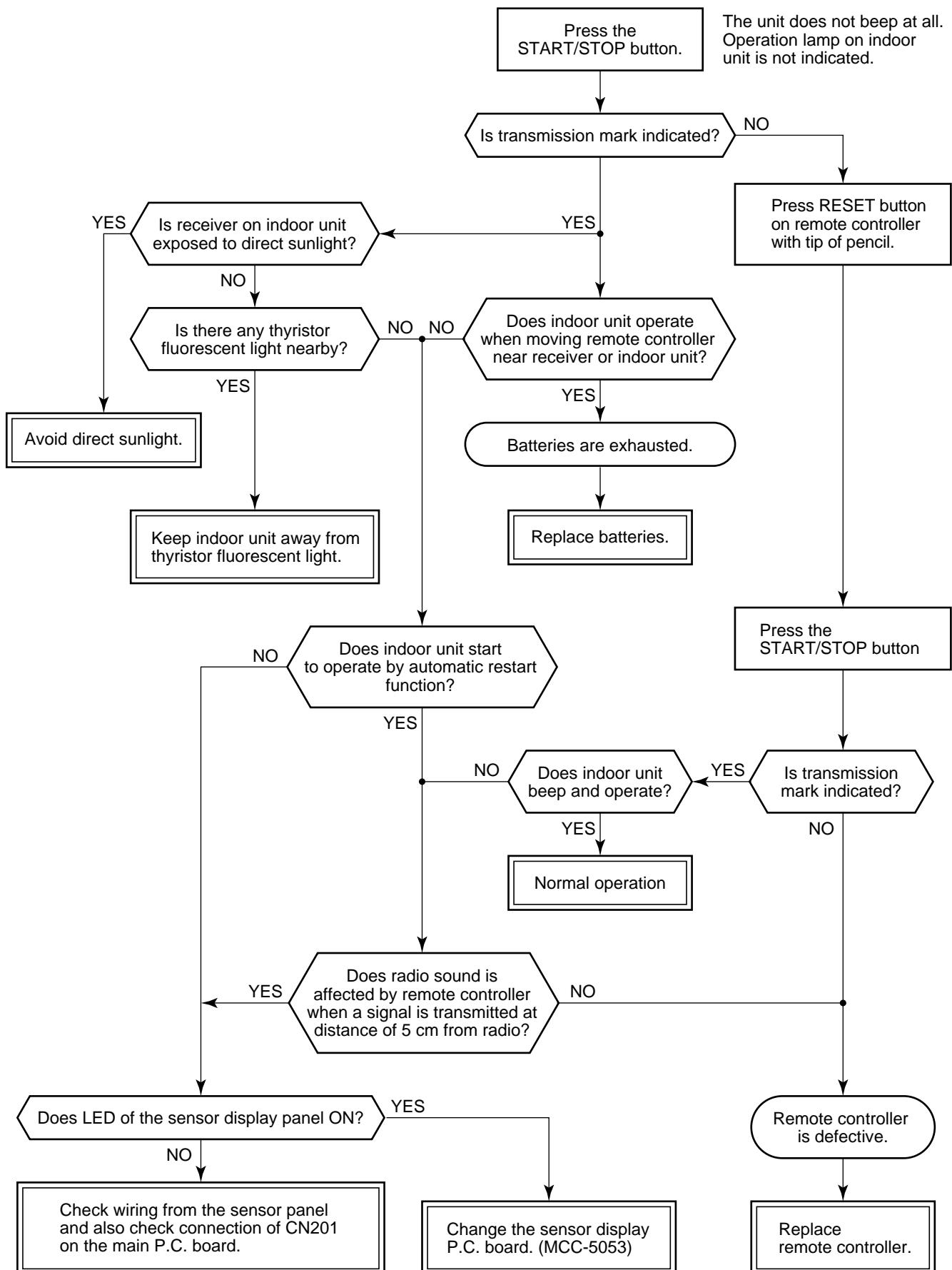
(3) The indoor fan motor does not operate.



(4) Troubleshooting for remote controller

<Primary check>

Check that A or B selected on the main unit is matched with A or B selected on the remote controller.



11-5-2. Wiring Failure (Interconnecting and Serial Signal Wire)

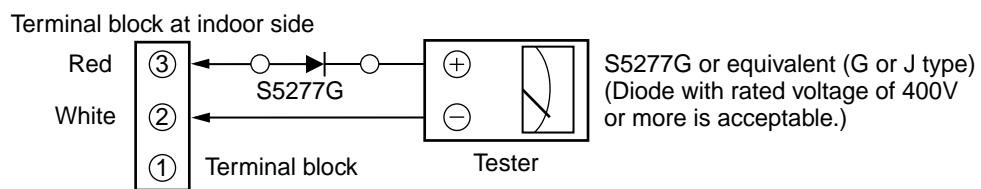
(1) Outdoor unit does not operate

- 1) Is the voltage between ② and ③ of the indoor terminal block varied?

Confirm that transmission from indoor unit to outdoor unit is correctly performed based upon the following diagram.

NOTE:

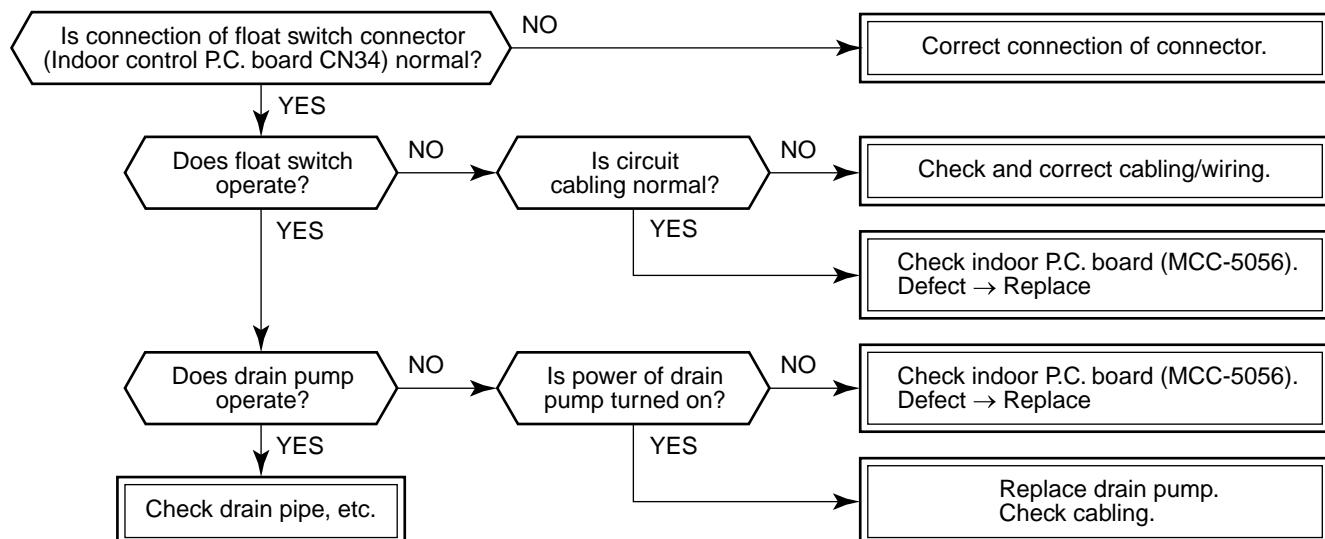
- Measurement should be performed 2 minutes and 30 seconds after starting of the operation.
- Be sure to prepare a diode for judgment.



Normal time : Voltage swings between DC15 and 60V. Inverter Assembly check

Abnormal time : Voltage does not vary.

(2) Overflow detection error [Ob error]



11-6. How to Check Simply the Main Parts

11-6-1. How to Check the P.C. Board (Indoor Unit)

(1) Operating precautions

- 1) When removing the electric parts box or the P.C. board, be sure to shut off the power supply breaker.
- 2) When removing the P.C. board, hold the edge of the P.C. board and do not apply force to the parts.
- 3) When connecting or disconnecting the connectors on the P.C. board, hold the whole housing.
Do not pull at the lead wire.

(2) Inspection procedures

- 1) When the P.C. board is judged to be defective, check for disconnection, burning, or discoloration of the copper foil pattern or this P.C. board.
- 2) The P.C. board consists of the following 2 parts

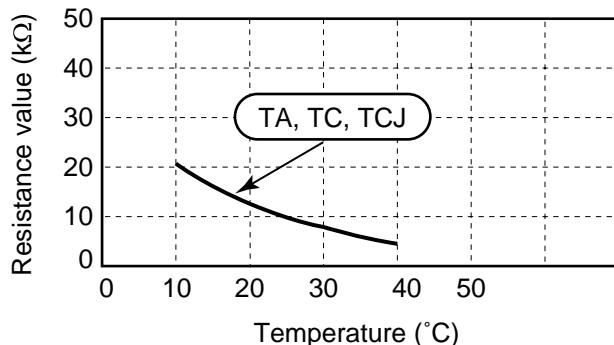
a. Main P.C. board part :

DC power supply circuit (5V, 12V), Indoor fan motor control circuit, CPU and peripheral circuits, buzzer, and Driving circuit of top/ bottom louver.

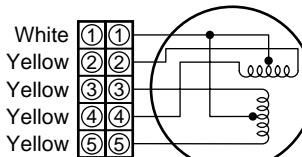
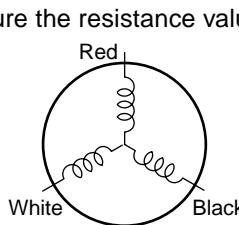
b. Indication unit of infrared ray receiving infrared ray receiving circuit, LED :

11-6-2. Sensor characteristic table

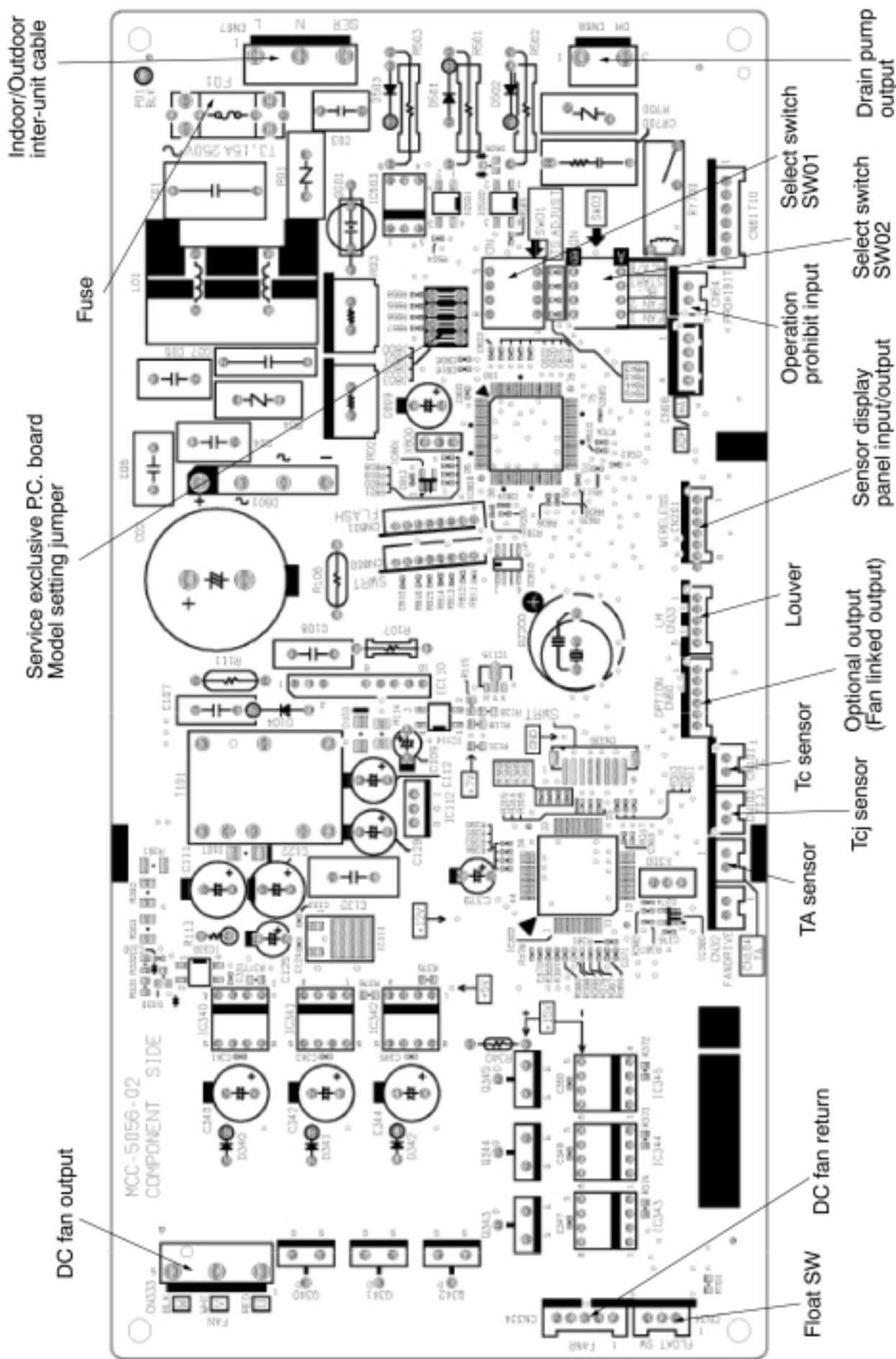
TA : Room temp. sensor
TC : Heat exchanger temp. sensor
TCJ : Heat exchanger temp. sensor



11-6-3. Indoor Unit (Other Parts)

No.	Part name	Checking procedure													
1	Room temp. (TA) sensor Heat exchanger (TC, TCJ) sensor	Disconnect the connector and measure the resistance value with tester. (Normal temp.) <table border="1"> <thead> <tr> <th rowspan="2">Sensor</th> <th>Temperature</th> <th>10°C</th> <th>20°C</th> <th>25°C</th> <th>30°C</th> <th>40°C</th> </tr> </thead> <tbody> <tr> <td>TA, TC, TCJ (kΩ)</td> <td>20.7</td> <td>12.6</td> <td>10.0</td> <td>7.9</td> <td>4.5</td> </tr> </tbody> </table>	Sensor	Temperature	10°C	20°C	25°C	30°C	40°C	TA, TC, TCJ (kΩ)	20.7	12.6	10.0	7.9	4.5
Sensor	Temperature	10°C		20°C	25°C	30°C	40°C								
	TA, TC, TCJ (kΩ)	20.7	12.6	10.0	7.9	4.5									
2	Remote controller	Refer to 11-4-1.													
3	Louver motor MP24Z	Measure the resistance value of each winding coil by using the tester. (Under normal temp. 25°C)  <table border="1"> <thead> <tr> <th>Position</th> <th>Resistance value</th> </tr> </thead> <tbody> <tr> <td>1 to 2</td> <td>380 ± 40Ω</td> </tr> <tr> <td>1 to 3</td> <td></td> </tr> <tr> <td>1 to 4</td> <td></td> </tr> <tr> <td>1 to 5</td> <td></td> </tr> </tbody> </table>	Position	Resistance value	1 to 2	380 ± 40Ω	1 to 3		1 to 4		1 to 5				
Position	Resistance value														
1 to 2	380 ± 40Ω														
1 to 3															
1 to 4															
1 to 5															
4	Indoor fan motor (Model : SWF-230-60-1R)	Measure the resistance value of each winding by using the tester.  <table border="1"> <thead> <tr> <th>Position</th> <th>Resistance value</th> </tr> </thead> <tbody> <tr> <td>Red - White</td> <td rowspan="2">70 to 100Ω</td> </tr> <tr> <td>White - Black</td> </tr> <tr> <td>Black - Red</td> <td></td> </tr> </tbody> </table>	Position	Resistance value	Red - White	70 to 100Ω	White - Black	Black - Red							
Position	Resistance value														
Red - White	70 to 100Ω														
White - Black															
Black - Red															

11-7. P.C. Board Layout



11-8. Service P.C. Board Selection Information

[4-way air discharge cassette type]

Service P.C. board selection corresponded table (Main P.C. board MCC-5056)

The indoor control P.C. board (MCC-5056) can correspond to multiple models. When replacing P.C. board assembly, set the DIP switch and jumper according to the following description.

Switch set up

Function details

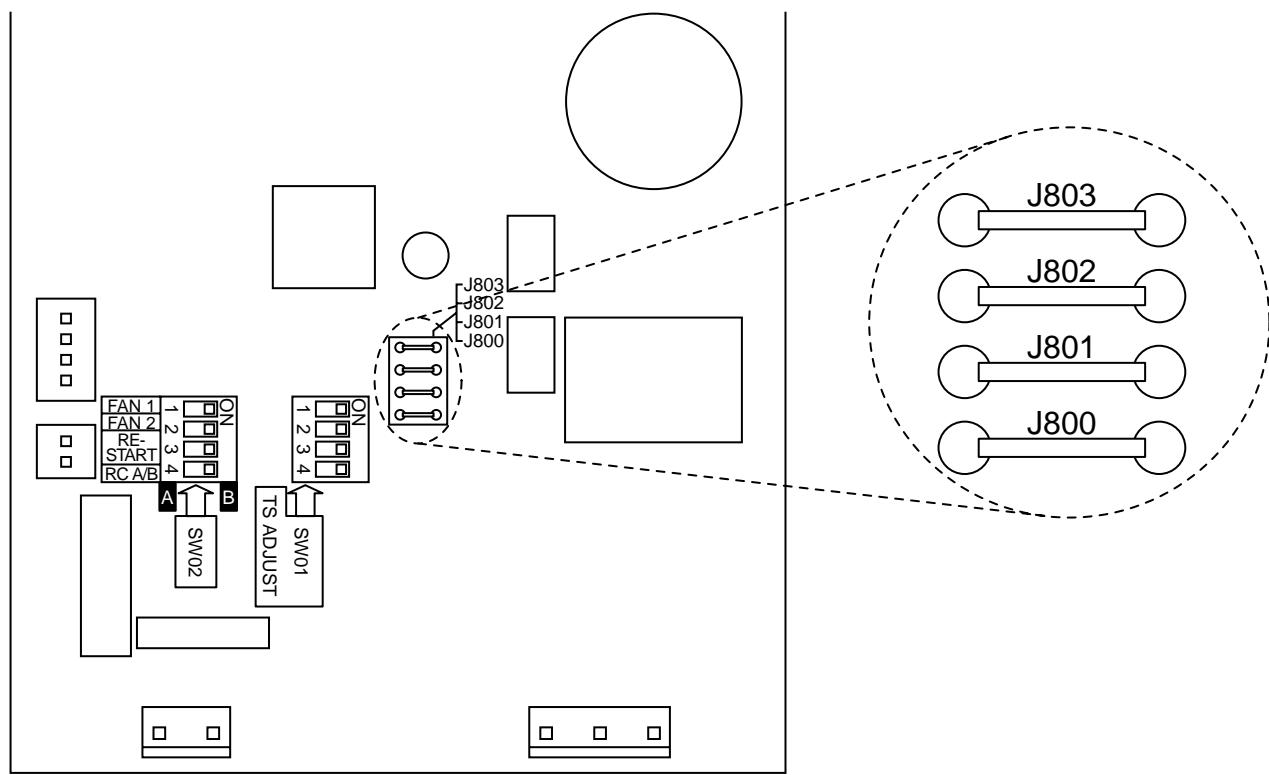
SW	Bit	Function	Description	Remarks	Status at shipment from factory
SW01	Bit1-4	TS ADJUST	Match to set up contents of P.C. board before replacement.	OFF: Auto restart is invalid. ON: Auto restart is valid. OFF: Remote controller A setting ON: Remote controller B setting	All ON
SW02	Bit1, 2	FAN setting			All OFF
	Bit 3	Auto restart			OFF
	Bit 4	Remote controller A/B setting			OFF

Jumper setup

- J800, J801, J802, J803 : For the following models, set up jumpers according to the table.

○ : Provided (Original) **X** : None (Cut)

Model name Part No.	RAS-M10SMUV-E RAS-M10SMUCV-E	RAS-M13SMUV-E RAS-M13SMUCV-E	RAS-M16SMUV-E RAS-M16SMUCV-E	Status at shipment from factory
J803	○	○	○	○
J802	○	○	○	○
J801	○	○	X	○
J800	○	X	○	○



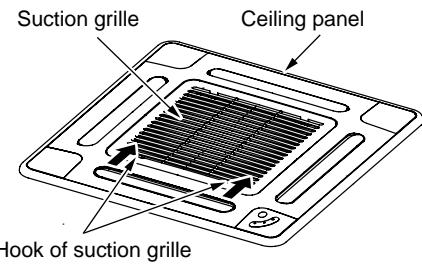
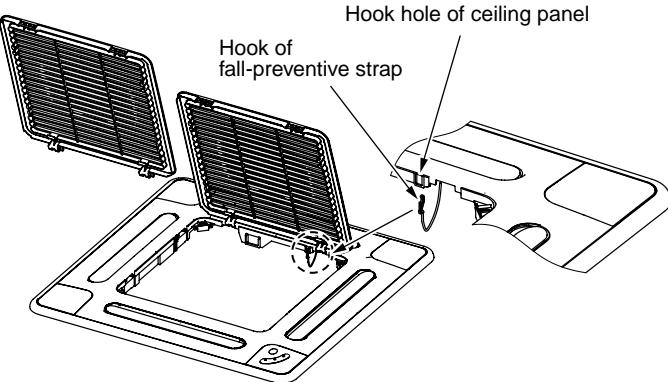
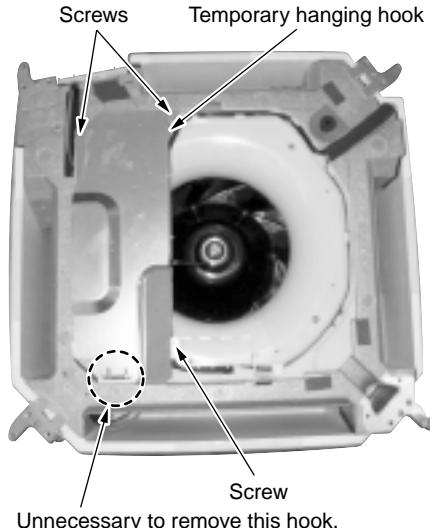
12. DETACHMENTS

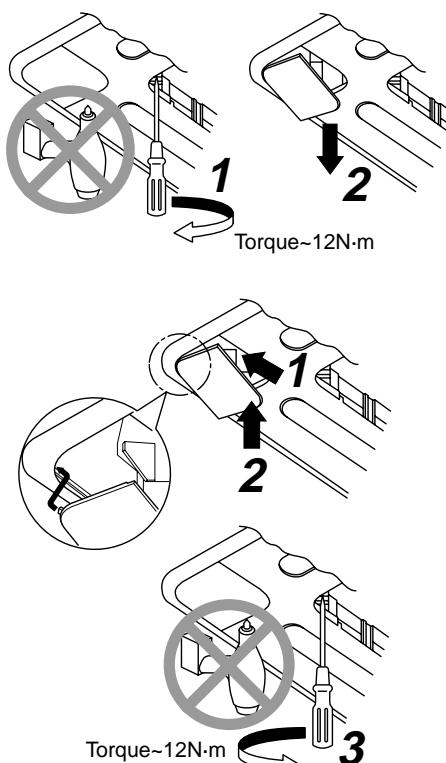
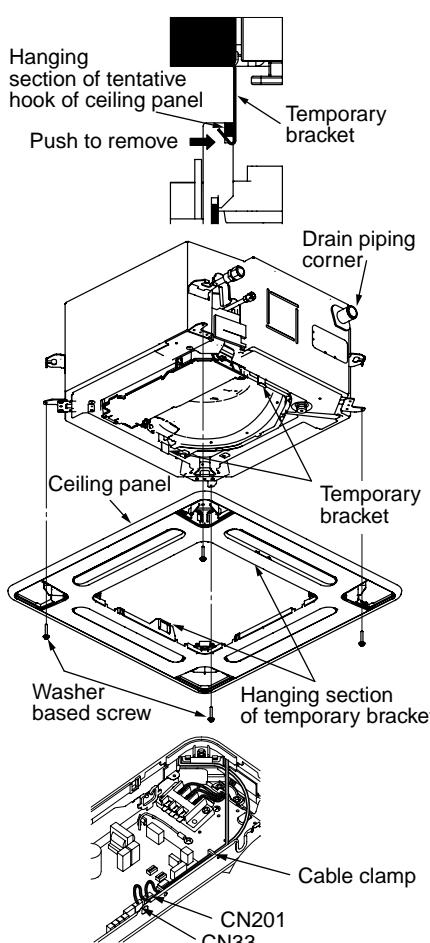
12-1. Indoor Unit

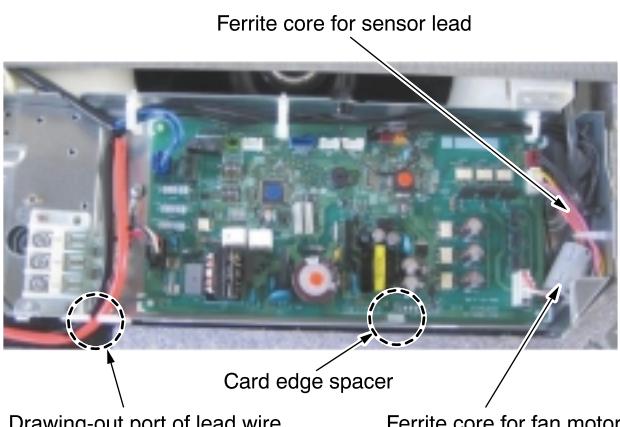
Ceiling panel: RBC-UM11PG(W)E

Preparing work:

1. Before work, be sure to stop the power supply of the air conditioner and turn off switch of the power supply breaker. (Otherwise an electric shock may be caused.)
2. Be sure to put on the gloves when working; otherwise an injury may be caused with parts sharp edges etc.

No.	Part name	Procedure	Remarks
①	Suction grille	<p>1. Detachment</p> <ol style="list-style-type: none"> 1) Slide hooks (2 positions) of the suction grille to inner side, and then hang down the suction grille. 2) Take off the strap that connects the panel and the suction grille, and then lift up shaft of the suction grille to remove the suction grille. 	 
②	Electric parts cover	<p>1. Detachment</p> <ol style="list-style-type: none"> 1) Perform work of procedure ① -1. 2) Take off screws ($\varnothing 4 \times 10$, 3 pcs.) fixing the electric parts cover. 3) Remove the electric parts cover from the temporary hanging hook of the electric parts cover, and then open the cover. <p>2. Attachment</p> <ol style="list-style-type: none"> 1) Close the electric parts cover and hook the cover hole to the temporary hanging hook. 2) Tighten the fixing screws. ($\varnothing 4 \times 10$, 3 pcs.) 	

No.	Part name	Procedure	Remarks
③	Adjust corner cover	<p>1. Detachment</p> <ol style="list-style-type: none"> 1) Perform work of procedure of ① -1. 2) Turn clockwise screws (4 positions) at the suction port corner until adjust corner cover rises up. <p>NOTE) When you work, keep the torque at below 12N·m. Do not use an electric screwdriver; otherwise the mechanism of adjust corner cover may be damaged and not be removed.</p> <ol style="list-style-type: none"> 3) Pull downward the risen-up part of adjust corner cover and remove it. 4) Remove the strap of adjust corner cover. <p>2. Attachment</p> <ol style="list-style-type: none"> 1) Attach the strap of adjust corner cover to the panel, hook claws of adjust corner cover to the panel corner, and then push the opposite side into the panel. 2) Turn screws (4 positions) of the suction port corner counterclockwise until bump between adjust corner cover and panel disappears. <p>NOTE) When you work, keep the torque at below 12N·m. Do not use an electric screwdriver; otherwise the mechanism of adjust corner cover may be damaged and not be removed.</p>	
④	Ceiling panel	<p>1. Detachment</p> <ol style="list-style-type: none"> 1) Perform works of procedure ① -1-, ② -1-, and ③ -1-. 2) Remove the flap connector (CN33, White, 5P) connected to the control P.C. board and then take off the lead wire from the clamp. <p>NOTE) Remove the connectors after unlocking the lock of the housing.</p> <ol style="list-style-type: none"> 3) Take off screws (M5, 4 pcs.) fixing the ceiling panel. 4) Push the temporary bracket to inner side to remove the ceiling panel. <p>2. Attachment</p> <ol style="list-style-type: none"> 1) Hook the panel to the temporary bracket of the drain pan of the main body. <p>NOTE) The panel has directionality. Therefore mount the panel according to the temporary bracket and the bracket mounting position.</p> <ol style="list-style-type: none"> 2) Tighten the fixing screws. (M5, 4 pcs.) 3) Connect flap connector of the ceiling panel to the connector (CN33, White, 5P) of the control P.C. board. 4) Connect sensor connector to the connector (CN201, Blue, 6P) of the P.C. board. 	

No.	Part name	Procedure	Remarks
⑤	Control P.C. board	<p>1. Detachment</p> <ol style="list-style-type: none"> 1) Perform works of procedure ① -1- and ② -1. 2) Remove the connectors connected from the control P.C. board to other parts. <p>CN33 : Flap motor (5P, White) CN34 : Float switch (3P, Red) CN68 : Drain pump (3P, Blue) CN67 : Terminal block of power supply (5P, Black) CN101: TC sensor (2P, Black) CN102: TCJ sensor (2P, Red) CN104: Room temp sensor (2P, Yellow) CN201: Ceiling panel sensor (6P, Blue) CN333: Fan motor power supply (5P, White) CN334: Fan motor position detection (5P, White)</p> <p>NOTE) Remove the connectors after unlocking the lock of the housing.</p> <ol style="list-style-type: none"> 3) Unlock the lock of the card edge spacer (6 positions) and then remove the control P.C. board. 	

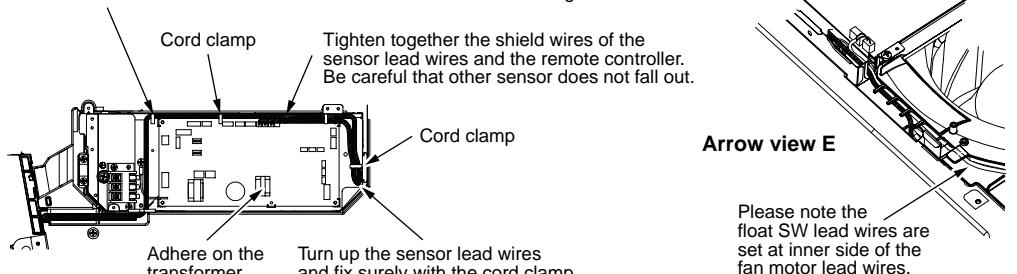
2. Attachment

- 1) Fix the control P.C. board to the card edge spacer. (6 positions)
- 2) Connect the connectors as original before being removed in item 1.

NOTE)

For drawing of each wire and position of ferrite core, perform wiring same as those before removing. If there is incomplete drawing of wire, short or water leakage of the parts may be caused.

Fix the sensor lead wires with cord clamps (2 positions) so that it does not slacken at P.C. board side and draw wires as shown in the figure.



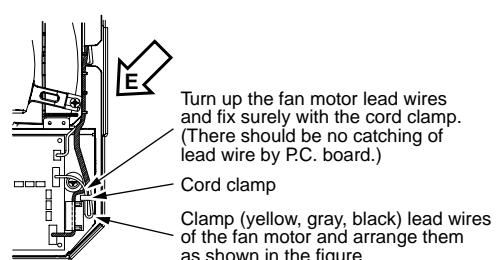
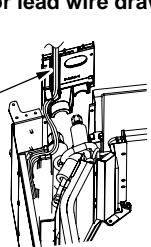
Please note the float SW lead wires are set at inner side of the fan motor lead wires.

<Details of sensor lead wire drawing>

As shown in the figure, hook the sensor lead wires to claw of the piping cover and then pass them so that they are stored in the groove.

After mounting the piping cover, check each lead wire does not hit the liquid pipe.

<Details of piping cover assembly and mounting>



<Details of fan motor lead wire drawing>

No.	Part name	Procedure	Remarks
⑥	Electric parts box	<p>1. Detachment</p> <ol style="list-style-type: none"> 1) Perform works of procedure ① -1-and ② -1. 2) Remove connectors of the lead wire connected to the following connectors of the control P.C. board. <p>CN33 : Flap motor (5P, White) CN34 : Float switch (3P, Red) CN68 : Drain pump (3P, Blue) CN101: TC2 sensor (2P, Black) CN102: TCJ sensor (2P, Red) CN201: Ceiling panel sensor (6P, Blue) CN333: Fan motor power supply (5P, White) CN334: Fan motor position detection (5P, White)</p> <p>NOTE) Remove the connectors after unlocking the lock of the housing.</p> <ol style="list-style-type: none"> 3) Remove each lead wire from cord clamps in the electric parts box. 4) Remove the power supply wiring, remote controller wiring, and crossover wiring. 5) Take off screws ($\varnothing 4 \times 10$, 2 pcs.) 	

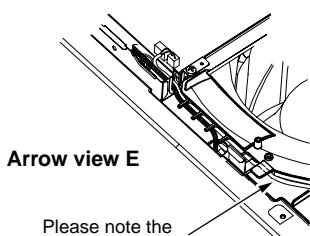
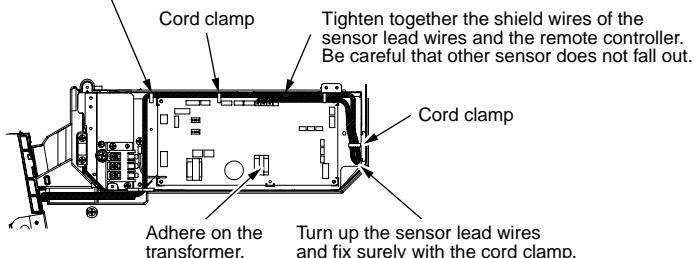
2. Attachment

- 1) Tighten screws ($\varnothing 4 \times 10$, 2 pcs.) fixing the electric parts box.
- 2) Connect the connectors as original before being removed in item 1.
- 3) Perform power supply wiring, remote controller wiring, and crossover wiring between inside and outside.

NOTE)

For drawing of each wire and position of ferrite core, perform wiring same as those before removing. If there is incomplete drawing of wire, short or water leakage of the parts may be caused.

Fix the sensor lead wires with cord clamps (2 positions) so that it does not slacken at P.C. board side and draw wires as shown in the figure.



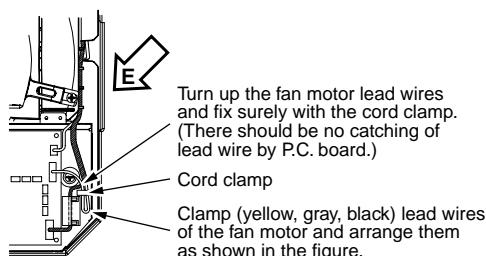
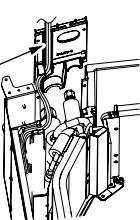
Please note the float SW lead wires are set at inner side of the fan motor lead wires.

<Details of sensor lead wire drawing>

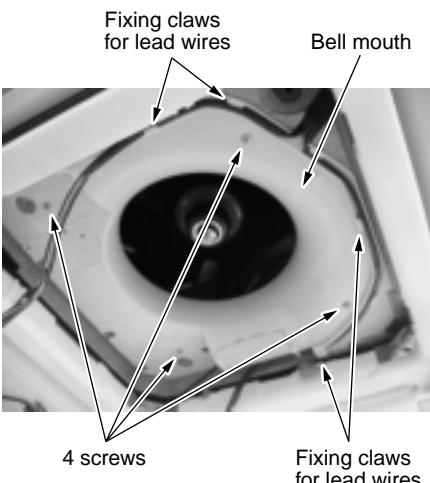
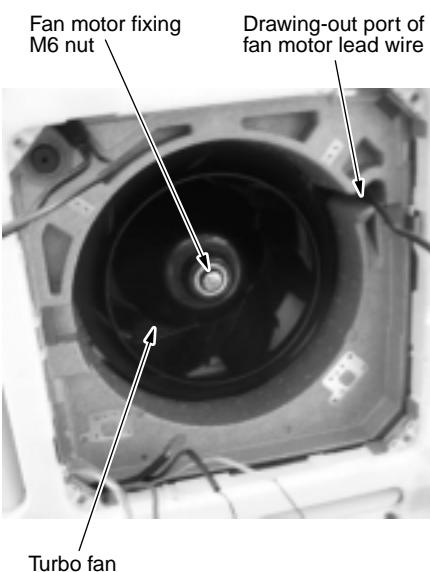
As shown in the figure, hook the sensor lead wires to claw of the piping cover and then pass them so that they are stored in the groove.

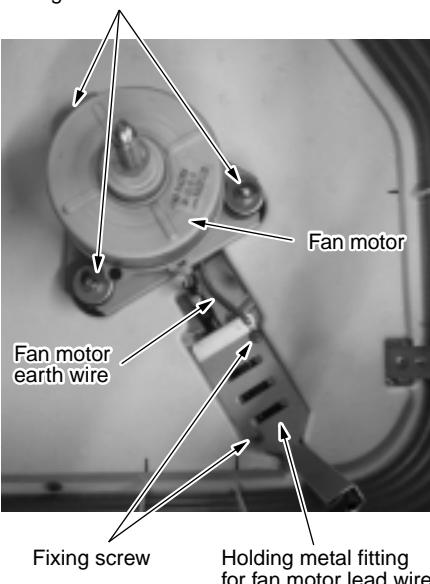
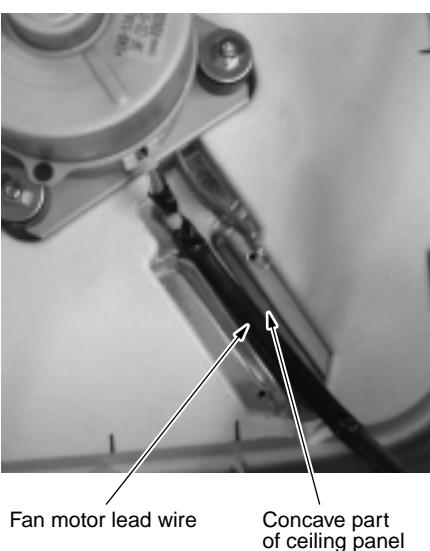
After mounting the piping cover, check each lead wire does not hit the liquid pipe.

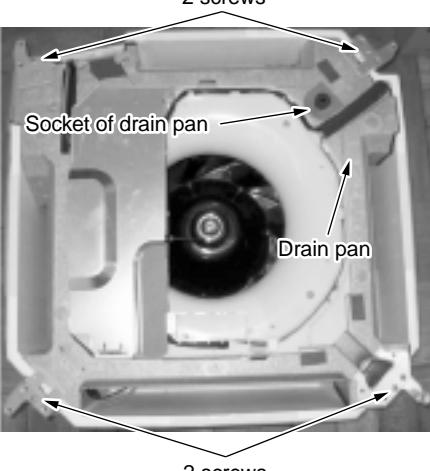
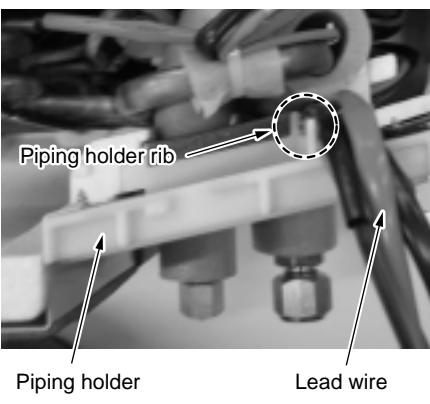
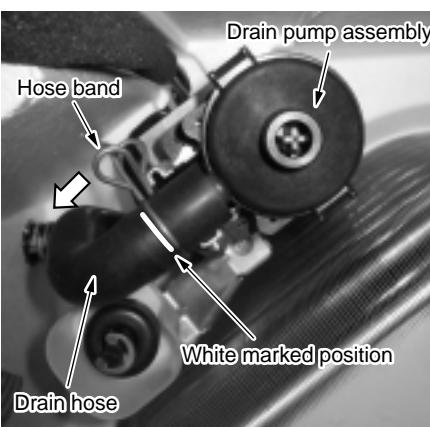
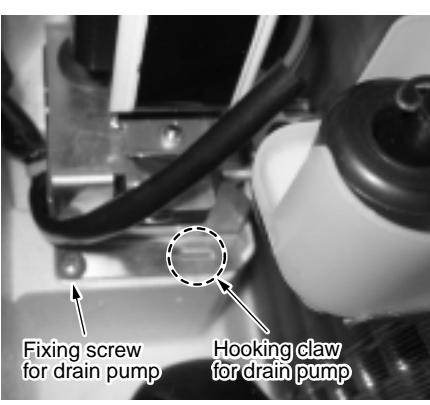
<Details of piping cover assembly and mounting>

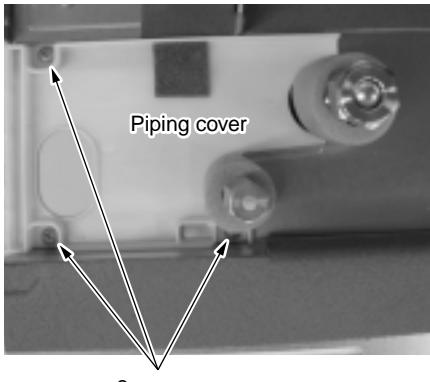
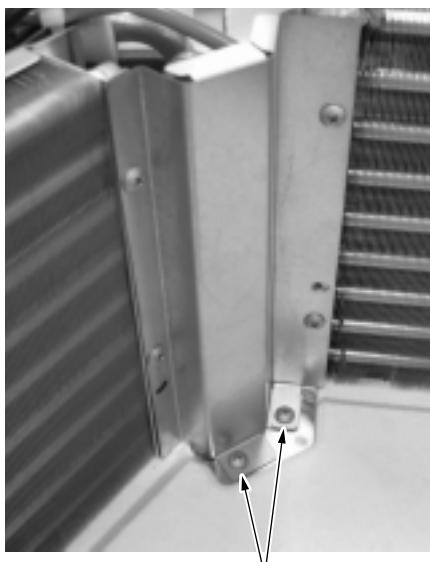
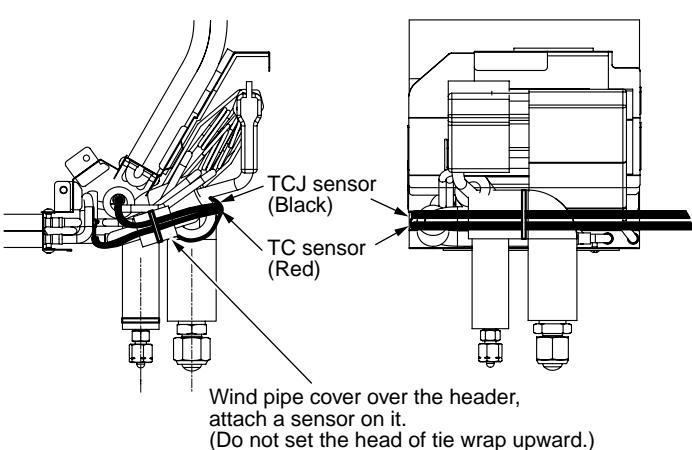


<Details of fan motor lead wire drawing>

No.	Part name	Procedure	Remarks
⑦	Bell mouth	<p>1. Detachment</p> <ol style="list-style-type: none"> 1) Perform work of procedure ① -1. 2) Take off the lead wires of the drain pump, float switch, and fan motor from the bell mouth. 3) Take off fixing screws of the bell mouth. ($\varnothing 4 \times 10$, 4 pcs.) <p>2. Attachment</p> <ol style="list-style-type: none"> 1) Mount the bell mouth with screws. ($\varnothing 4 \times 10$, 4 pcs.) 2) Perform wiring as original before being removed. <p>NOTE) Pinch lead wire of the drain pump and float switch with lead wire fixing claws of the bell mouth and perform wiring along the guide.</p>	
⑧	Turbo fan	<p>1. Detachment</p> <ol style="list-style-type: none"> 1) Perform work of procedure ⑦ -1. 2) Take off the nut (M6 nut 1 pc.) of the turbo fan. <p>NOTE) Use a box wrench for attachment and detachment of the turbo fan. If using a monkey wrench etc, the other parts may be damaged in work.</p> <p>2. Attachment</p> <ol style="list-style-type: none"> 1) Insert the turbo fan into the fan motor so that boss of the turbo fan matches with cut surface of the fan motor, and then tighten it with nut. <p>NOTE) Tightening torque of turbo fan: $5.9 \pm 0.6\text{N}\cdot\text{m}$ Apply looseness-preventing agent to the nut after tightening.</p>	

No.	Part name	Procedure	Remarks
⑨	Fan motor	<p>1. Detachment</p> <ol style="list-style-type: none"> 1) Perform work of procedure ⑧. 2) Take off screws fixed with lead holding bracket of the fan motor. ($\varnothing 4 \times 10$, 2 pcs.) 3) Open wiring holding part of the fan motor lead holding bracket and then take off the fan motor lead wire from the bracket. 4) Take off fixing nuts for the fan motor to remove the fan motor.(M 3 pcs.) <p>NOTE) Use a box wrench for attachment and detachment of the fan motor fixing nuts; otherwise contact or damage for other parts may be caused.</p> <p>2. Attachment</p> <ol style="list-style-type: none"> 1) Mount the fan motor with the fixing nuts. <p>NOTE) Tightening torque of turbo fan: $5.9 \pm 0.6\text{N}\cdot\text{m}$ Apply looseness-preventing agent (as paints) to the nut after tightening.</p> <ol style="list-style-type: none"> 2) Attach the fan motor lead wire holder. <p>NOTE)</p> <ul style="list-style-type: none"> • For the fan motor lead wire, fix the lead wire holding bracket along concave part of the ceiling panel. (There is no catch-in of lead wire and ceiling panel.) • When fixing the lead wire bracket, tighten fan motor earth together with the lead wire. • For this work, do not use an electric screwdriver. • Take note the damage of earth terminal. <ol style="list-style-type: none"> 3) Bend the lead wire holding part and fix the fan motor lead wire. 4) Attach the removed ferrite cores to the red, white and black lead wires. <p>NOTE) Be sure that the lead wire does not come to contact with the heat exchanger.</p>	  

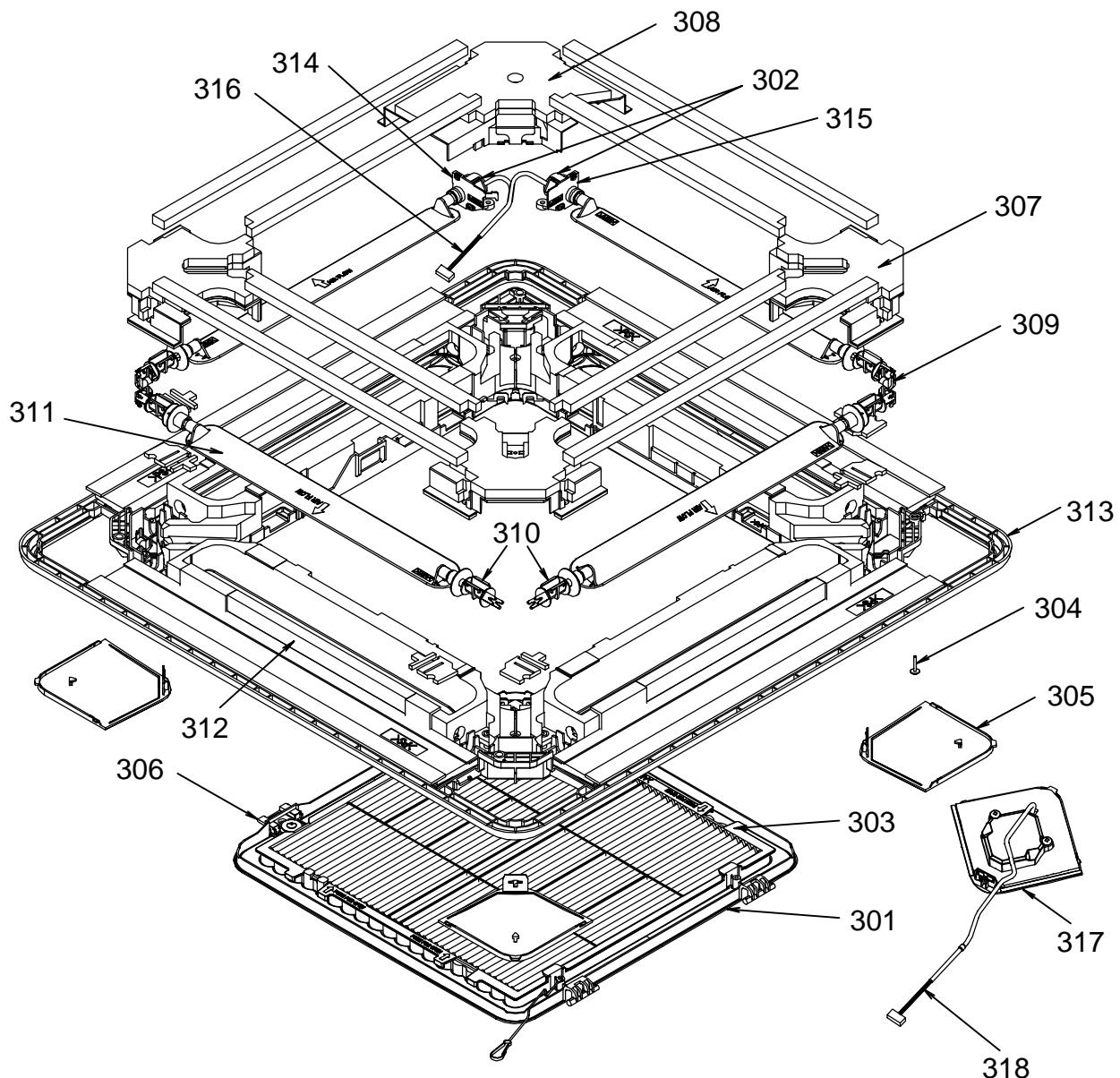
No.	Part name	Procedure	Remarks
⑩	Drain pan	<p>1. Detachment</p> <ol style="list-style-type: none"> 1) Perform works of procedure ④ -1 and ⑦ -1. 2) Remove the drain cap and extract drain water accumulated in the drain pan. <p>NOTE) When removing the drain cap, be sure to receive drain water with a bucket, etc.</p> <ol style="list-style-type: none"> 3) Take off screws fixing the drain pan to remove the drain pan. ($\varnothing 4 \times 10$, 4 pcs.) <p>2. Attachment</p> <ol style="list-style-type: none"> 1) Insert the drain cap into the drain pan. <p>NOTE) Put a stick or others into hole at center of the drain cap, and then insert the drain cap until it strikes on the socket of the drain pan.</p> <ol style="list-style-type: none"> 2) Draw each lead wire to the correct positions, and then insert the drain pan into the main unit. <p>NOTE) Draw lead wires of the drain pump and the float switch along the guide of the cabinet. Insert the drain pan along the guides of sensors (TC1, TC2, TCJ) and PMV lead wire. The drain pan and each lead wire are not caught in; otherwise water leakage may be caused.</p> <ol style="list-style-type: none"> 3) Fix the drain pan with screws. ($\varnothing 4 \times 10$, 4 pcs.) 	 
⑪	Drain pump assembly	<p>1. Detachment</p> <ol style="list-style-type: none"> 1) Perform work of procedure ⑩ -1. 2) Pick up the hose band and slide it from the pump connecting part to remove the drain hose. 3) Take off screws ($\varnothing 4 \times 10$, 3 pcs.) fixing the drain pump assembly, and then move hooking claw (1 position) of the main body from the drain pump assembly to remove the drain pump assembly. <p>2. Attachment</p> <ol style="list-style-type: none"> 1) Fix the drain pump assembly as original. <p>NOTE) For fixing, use a hooking claw (1 position) and screws (3 positions). When screwing, be sure not to run on the hooking claw at main body side.</p> <ol style="list-style-type: none"> 2) Mount the drain hose and the hose band as original. <p>NOTE) Insert the drain hose up to the end of pump connecting part, and then put the band at white marked position of the hose.</p>	 

No.	Part name	Procedure	Remarks
⑫	Heat exchanger	<p>1. Detachment</p> <ol style="list-style-type: none"> 1) Recover refrigerant gas. 2) Remove the refrigerant pipe at indoor unit side. 3) Perform work of procedure ⑩ -1. 4) Take off screws ($\varnothing 4 \times 10$, 3 pcs.) fixing the piping cover to remove the piping cover. 5) While holding the heat exchanger, remove fixing band and fixing screws ($\varnothing 4 \times 10$, 3 pcs.) and then remove the heat exchanger. <p>2. Attachment</p> <ol style="list-style-type: none"> 1) Mount parts in order, heat exchanger → fixing band → piping cover → drain pan → bell mouth → electric parts box as original. <p>NOTE) Arrange wires as original.</p> <ol style="list-style-type: none"> 2) Attach the removed connectors and wires as original. 3) Connect the refrigerant pipe as original, and then perform vacuuming. 	 <p>Piping cover 3 screws</p>  <p>Fixing band Fixing band for heat exchanger</p>  <p>2 fixing screws for heat exchanger</p> <p><Details of sensor lead wire drawing></p>  <p>TCJ sensor (Black) TC sensor (Red)</p> <p>Wind pipe cover over the header, attach a sensor on it. (Do not set the head of tie wrap upward.)</p>

13. EXPLODED VIEWS AND PARTS LIST

13-1. Ceiling Panel

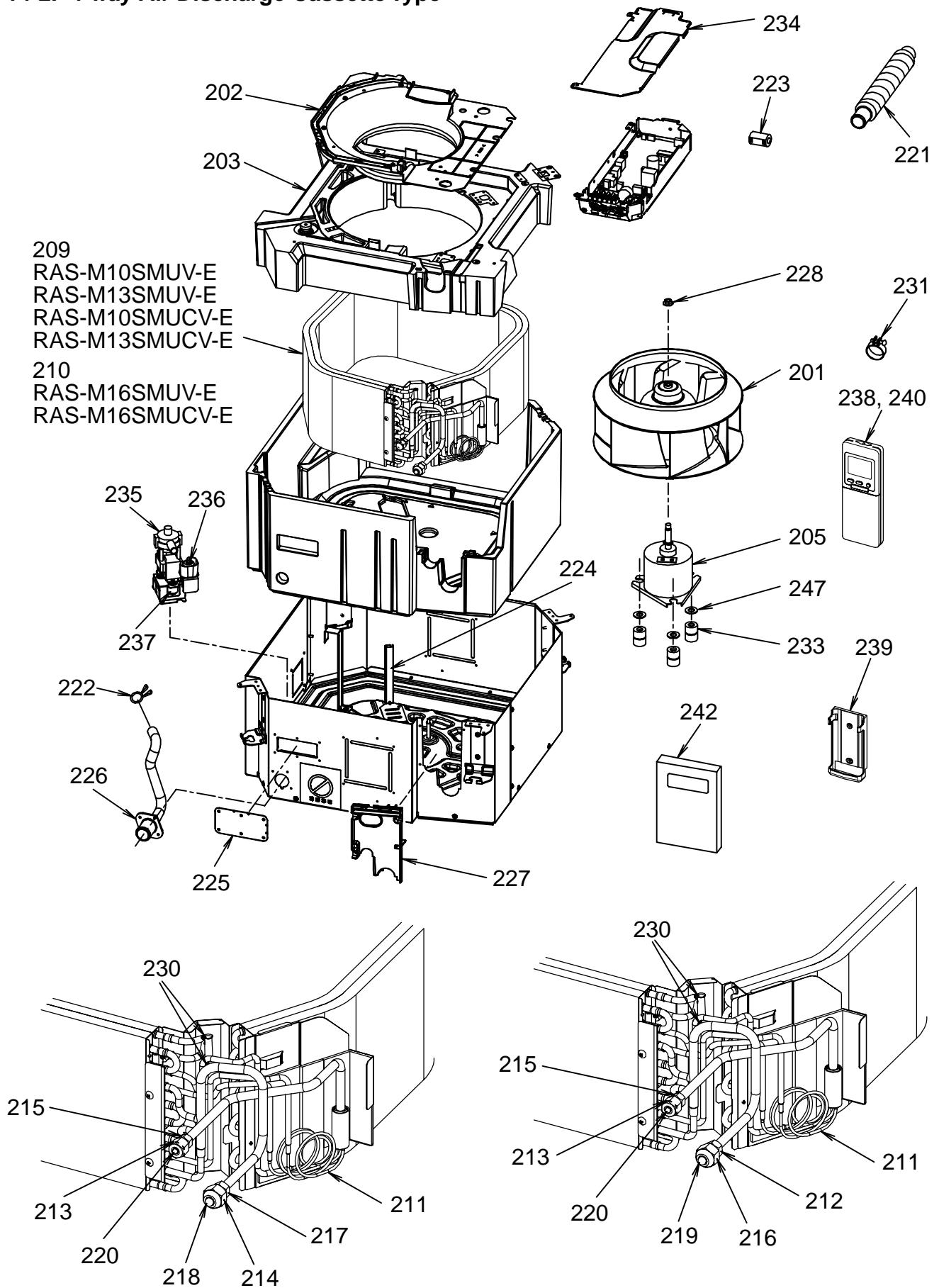
RB-B11MC(W)E



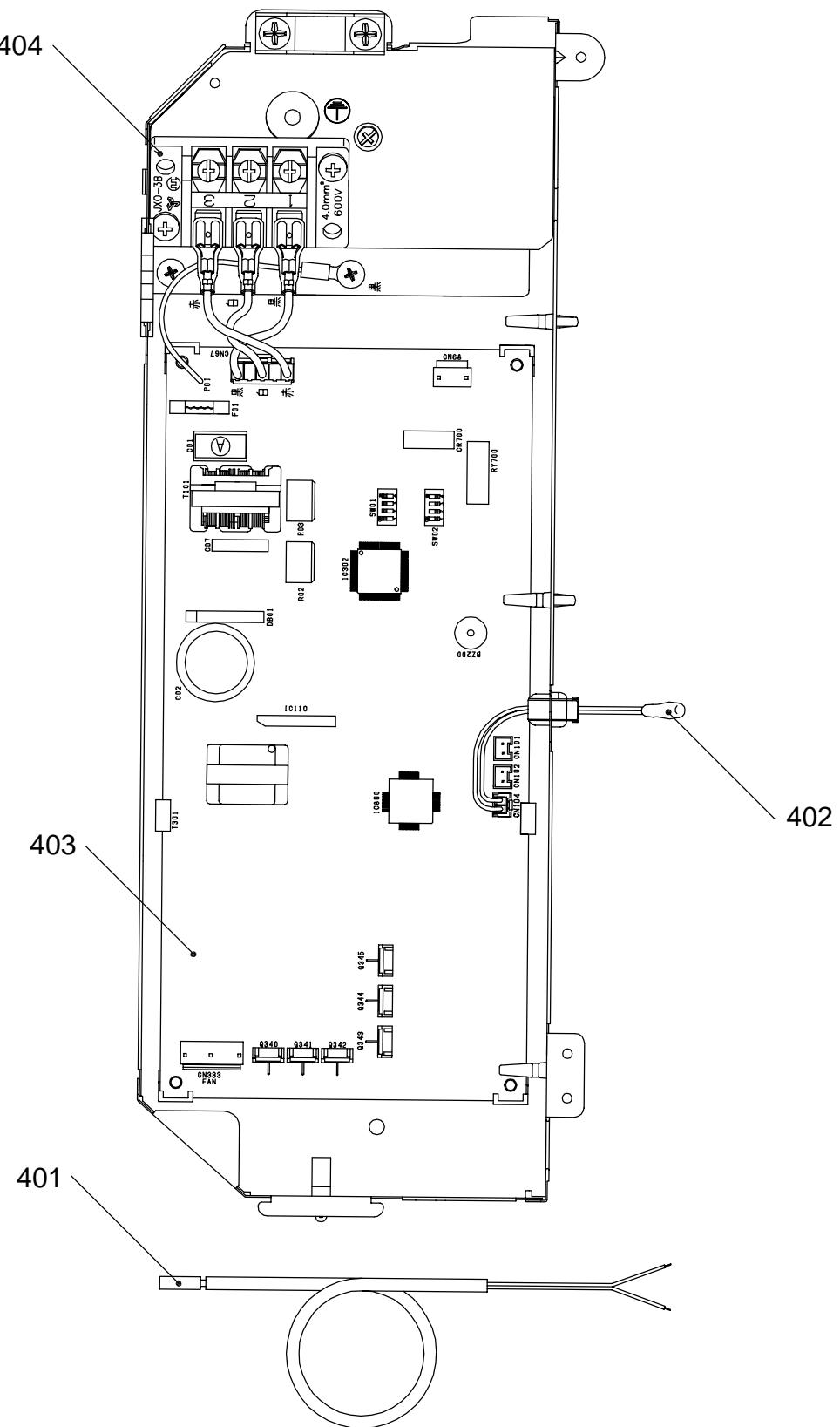
Location No.	Part No.	Description
301	43109414	Grille, Air Inlet
302	4302D003	Motor, Louver
303	43180332	Air Filter
304	43497012	Screw
305	43100322	Cover, Panel Ass'y
306	43107259	Grille, Catch
307	43122089	Cover, Joint (For Joint)
308	43022451	Cover, Joint (For Motor)
309	43122091	Joint, Kit (A)

Location No.	Part No.	Description
310	43122092	Joint, Kit (B)
311	43122093	Louver
312	43107261	Outlet, Air Form
313	43100412	Panel
314	43107262	Fix, Motor
315	43107263	Fix, Motor
316	43160580	Lead, Motor
317	4306S940	PC. Board Ass'y, indicator
318	4306A155	Lead Ass'y, indicator

14-2. 4-way Air Discharge Cassette Type



Location No.	Part No.	Description
201	43120225	Fan Ass'y, Turbo
202	43122094	Bell Mouth
203	43172185	Pan Ass'y, Drain
205	43121738	Motor, Fan, SWF-230-60-1R
209	43044835	Refrigeration, Cycle Ass'y (M10SMUV-E, M13SMUV-E, M10SMUCV-E, M13SMUCV-E)
210	43044836	Refrigeration, Cycle Ass'y (M16SMUV-E, M16SMUCV-E)
211	43047691	Distributor Ass'y
212	43049782	Socket
213	43047685	Nut, Flare, 1/4 IN
214	43149355	Nut, Flare, 3/8 IN
215	43149351	Socket, 1/4 IN
216	43047688	Nut, Flare, 1/2 IN
217	43049776	Socket, 1/2 IN
218	43047609	Bonnet, 3/8 IN
219	43147195	Bonnet, 1/2 IN
220	43049697	Bonnet, 1/4 IN
221	43170244	Hose, Drain
222	43079249	Band, Hose
223	43060029	Filter, Noise
224	43163052	Holder, Lead, Fan Motor
225	43119482	Cover Ass'y Body
226	43170248	Hose, Drain
227	43119483	Cover, Pipe
228	43097212	Nut
230	43019904	Holder, Sensor
231	43179135	Band, Hose
233	43139137	Rubber, Cushion
234	43162056	Cover, E-Box
235	43177001	Pump, Drain
236	43151289	Switch, Float
237	43179126	Rubber, Pump Drain
238	4306S695	Remote Controller, WH-H3UE (Heat Pump)
239	43063329	Holder, Remote Controller
240	4306S694	Remote Controller (Cooling Only)
242	4308S095	Owner's Manual
247	43197155	Washer



Location No.	Part No.	Description
401	43050425	Sensor Ass'y, Service TC, TCJ (F6)
402	43050426	Sensor, Service, TA

Location No.	Part No.	Description
403	4316S935	P.C. Board Ass'y, MMC-5056 (220V – 240V)
404	43160565	Terminal Block, 3P, AC250V, 20A

WARNINGS ON REFRIGERANT LEAKAGE

Check of Concentration Limit

The room in which the air conditioner is to be installed requires a design that in the event of refrigerant gas leaking out, its concentration will not exceed a set limit.

The refrigerant R410A which is used in the air conditioner is safe, without the toxicity or combustibility of ammonia, and is not restricted by laws to be imposed which protect the ozone layer. However, since it contains more than air, it poses the risk of suffocation if its concentration should rise excessively. Suffocation from leakage of R410A is almost non-existent. With the recent increase in the number of high concentration buildings, however, the installation of multi air conditioner systems is on the increase because of the need for effective use of floor space, individual control, energy conservation by curtailing heat and carrying power etc.

Most importantly, the multi air conditioner system is able to replenish a large amount of refrigerant compared with conventional individual air conditioners. If a single unit of the multi conditioner system is to be installed in a small room, select a suitable model and installation procedure so that if the refrigerant accidentally leaks out, its concentration does not reach the limit (and in the event of an emergency, measures can be made before injury can occur).

In a room where the concentration may exceed the limit, create an opening with adjacent rooms, or install mechanical ventilation combined with a gas leak detection device.

The concentration is as given below.

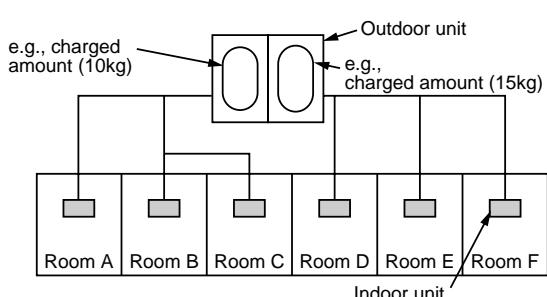
Total amount of refrigerant (kg)

$$\text{Min. volume of the indoor unit installed room (m}^3\text{)} \leq \text{Concentration limit (kg/m}^3\text{)}$$

The concentration limit of R410A which is used in multi air conditioners is 0.3kg/m³.

NOTE 1 :

If there are 2 or more refrigerating systems in a single refrigerating device, the amounts of refrigerant should be as charged in each independent device.



For the amount of charge in this example:

The possible amount of leaked refrigerant gas in rooms A, B and C is 10kg.

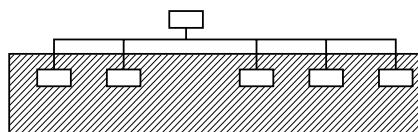
The possible amount of leaked refrigerant gas in rooms D, E and F is 15kg.

Important

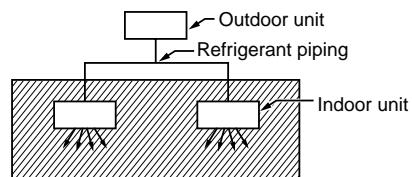
NOTE 2 :

The standards for minimum room volume are as follows.

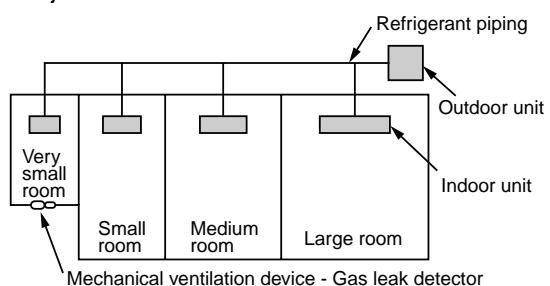
(1) No partition (shaded portion)



(2) When there is an effective opening with the adjacent room for ventilation of leaking refrigerant gas (opening without a door, or an opening 0.15% or larger than the respective floor spaces at the top or bottom of the door).

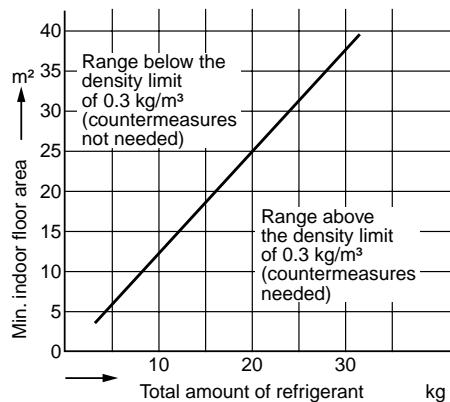


(3) If an indoor unit is installed in each partitioned room and the refrigerant piping is interconnected, the smallest room of course becomes the object. But when a mechanical ventilation is installed interlocked with a gas leakage detector in the smallest room where the density limit is exceeded, the volume of the next smallest room becomes the object.



NOTE 3 :

The minimum indoor floor area compared with the amount of refrigerant is roughly as follows:
(When the ceiling is 2.7m high)



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