TOSHIBA

Leading Innovation

FILE NO. A08-010

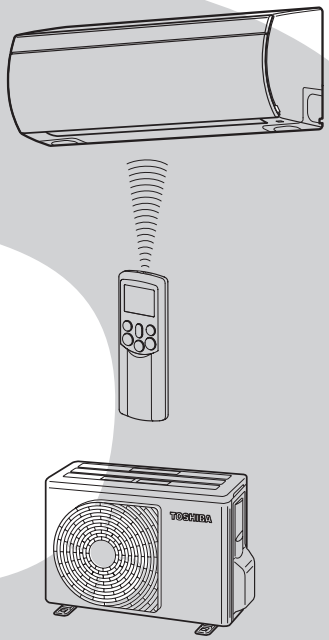
AIR-CONDITIONER (SPLIT TYPE)

SERVICE MANUAL

HFC R410A

Model name:

Indoor Unit	Outdoor Unit
<High Wall, Heat Pump Type>	<Heat Pump Type>
(Standard Type)	(Standard Type)
RAS-07PKVP-E	**RAS-07PAVP-E**
RAS-10PKVP-E	**RAS-10PAVP-E**
RAS-13PKVP-E	**RAS-13PAVP-E**
RAS-16PKVP-E	**RAS-16PAVP-E**
RAS-18PKVP-E	**RAS-18PAVP-E**
(North Europe Type)	(North Europe Type)
RAS-07PKVP-ND	**RAS-07PAVP-ND**
RAS-10PKVP-ND	**RAS-10PAVP-ND**
RAS-13PKVP-ND	**RAS-13PAVP-ND**
RAS-16PKVP-ND	**RAS-16PAVP-ND**
RAS-18PKVP-ND	**RAS-18PAVP-ND**



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SAFETY PRECAUTIONS

The important contents concerned to the safety are described on the product itself and on this Service Manual. Please read this Service Manual after understanding the described items thoroughly in the following contents (Indications/Illustrated marks), and keep them.

[Explanation of indications]

Indication	Explanation
⚠ DANGER	Indicates contents assumed that an imminent danger causing a death or serious injury of the repair engineers and the third parties when an incorrect work has been executed.
⚠ WARNING	Indicates possibilities assumed that a danger causing a death or serious injury of the repair engineers, the third parties, and the users due to troubles of the product after work when an incorrect work has been executed.
⚠ CAUTION	Indicates contents assumed that an injury or property damage (*) may be caused on the repair engineers, the third parties, and the users due to troubles of the product after work when an incorrect work has been executed.

* Property damage : Enlarged damage concerned to property, furniture, and domestic animal/pet

[Explanation of illustrated marks]

Mark	Explanation
	Indicates prohibited items (Forbidden items to do) The sentences near an illustrated mark describe the concrete prohibited contents.
	Indicates mandatory items (Compulsory items to do) The sentences near an illustrated mark describe the concrete mandatory contents.
	Indicates cautions (including danger/warning) The sentences or illustration near or in an illustrated mark describe the concrete cautious contents.

For general public use
Power supply cord of outdoor unit shall be 1.5 mm ² (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.

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.**
- **After the installation work, confirm that refrigerant gas does not leak.**
  If refrigerant gas leaks into the room and flows near a fire source, such as a cooking range, noxious gas 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: RAS- PAVP-E model**

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.
(RAS-** PAVP-ND model has a heater on the bottom plate of the outdoor unit.)

1 SPECIFICATIONS

1-1. Specifications

RAS-07PKVP-E/RAS-10PKVP-E/RAS-13PKVP-E, RAS-07PAVP-E/RAS-10PAVP-E/RAS-13PAVP-E RAS-07PKVP-ND/RAS-10PKVP-ND/RAS-13PKVP-ND, RAS-07PAVP-ND/RAS-10PAVP-ND/ RAS-13PAVP-ND

Unit model	Indoor			RAS-07PKVP-E(-ND)		RAS-10PKVP-E(-ND)		RAS-13PKVP-E(-ND)	
	Outdoor			RAS-07PAVP-E(-ND)		RAS-10PAVP-E(-ND)		RAS-13PAVP-E(-ND)	
Cooling capacity			(kW)	2.0		2.5		3.5	
Cooling capacity range			(kW)	0.3-3.0		0.3-3.5		0.3-4.5	
Heating capacity			(kW)	2.5		3.0		4.0	
Heating capacity range			(kW)	0.3-5.0		0.3-5.8		0.3-6.1	
Power supply				1 Ph/50Hz/220–240 V, 1 Ph/60Hz/220-230 V					
Electric characteristics	Indoor	Operation mode		Cooling	Heating	Cooling	Heating	Cooling	Heating
		Running current (220/230/240V)	(A)	0.21/0.20/0.19				0.24/0.23/0.22	
		Power consumption	(W)	25				30	
		Power factor (220/230/240V)	(%)	54/54/55				57	
	Outdoor	Operation mode		Cooling	Heating	Cooling	Heating	Cooling	Heating
		Running current (220/230/240V)	(A)	1.86/1.78/1.70	2.35/2.25/2.15	2.19/2.10/2.01	2.56/2.45/2.35	3.44/3.29/3.15	3.77/3.61/3.46
		Power consumption (220/230/240V)	(W)	330	415	450	535	740	810
		Power factor	(%)	81	80	93	95	98	
	Starting current(220/230/240V)		(A)	2.56/2.45/2.34		2.77/2.65/2.54		4.01/3.84/3.68	
COP (Cooling/Heating)				5.63/5.68		5.26/5.36		4.55/4.76	
Operating noise	Indoor	High (Cooling/Heating)	(dB-A)	42/42		43/43		45/45	
		Medium (Cooling/Heating)	(dB-A)	34/34		35/35		36/36	
		Low (Cooling/Heating)	(dB-A)	26/26		27/27			
	Outdoor	(Cooling/Heating)	(dB-A)	46/46		48/48		50/50	
Indoor unit	Unit model			RAS-07PKVP-E (-ND)		RAS-10PKVP-E (-ND)		RAS-13PKVP-E (-ND)	
	Dimension	Height	(mm)	295					
		Width	(mm)	790					
		Depth	(mm)	242					
	Net weight		(kg)	12					
	Fan motor output		(W)	30					
	Air flow rate	(Cooling/Heating)	(m³/min.)	10.2/10.8		10.4/11.1		11.6/11.6	
Outdoor unit	Unit model			RAS-07PAVP-E (-ND)		RAS-10PAVP-E (-ND)		RAS-13PAVP-E (-ND)	
	Dimension	Height	(mm)	550					
		Width	(mm)	780					
		Depth	(mm)	290					
	Net weight		(kg)	39				40	
	Compressor	Motor output	(W)	750					
		Type		Twin rotary type (Variable Cylinder Management)					
		Model		DA111A1FD-21F					
	Fan motor output		(W)	43					
	Air flow rate	(Cooling/Heating)	(m³/min.)	27.7/25.5		30.0/27.7		37.2/34.8	
Piping connection	Type			Flare connection					
	Indoor unit	Liquid side		Ø6.35					
		Gas side		Ø9.52					
	Outdoor unit	Liquid side		Ø6.35					
		Gas side		Ø9.52					
	Maximum length		(m)	20					
	Maximum chargeless length		(m)	15					
	Maximum height difference		(m)	10					
Refrigerant	Name of refrigerant			R410A					
	Weight		(kg)	1.12				1.15	
Wiring connection	Power cord			3 Wires : includes earth line (Outdoor)					
	Connecting cable			4 Wires : includes earth line					
Usable temperature range	Indoor	(Cooling/Heating)	(°C)	21–32/0–28					
	Outdoor	(Cooling/Heating)	(°C)	–10–46/–15–24					
Accessory	Indoor unit	Installation plate		1					
		Wireless remote controller		1					
		Batteries		2					
		Remote controller holder		1					
		Mounting screw		7 (Ø4 × 25L)					
		Remote controller holder mounting screw		2 (Ø3.1 × 16L)					
		Installation manual		1					
		Owner's manual		1					
	Outdoor unit	Drain nipple		1					
		Water-proof rubber cap		2					

- The specifications may be subject to change without notice for purpose of improvement.

RAS-16PKVP-E/RAS-18PKVP-E, RAS-16PAVP-E/RAS-18PAVP-E
RAS-16PKVP-ND/RAS-18PKVP-ND, RAS-16PAVP-ND/RAS-18PAVP-ND

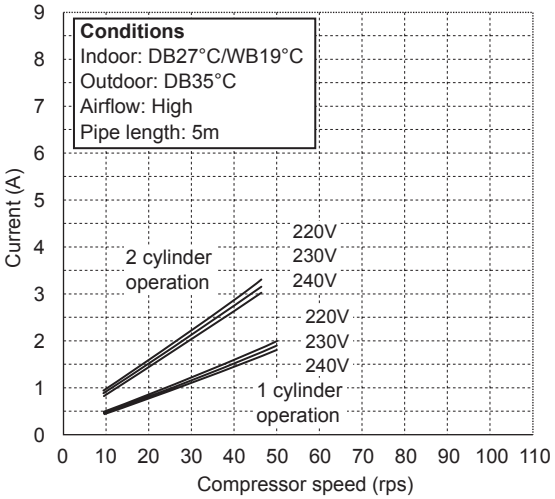
Unit model	Indoor			**RAS-16PKVP-E(-ND)**		**RAS-18PKVP-E(-ND)**	
	Outdoor			**RAS-16PAVP-E(-ND)**		**RAS-18PAVP-E(-ND)**	
Cooling capacity			(kW)	4.5		5.0	
Cooling capacity range			(kW)	0.3-5.0		0.3-5.5	
Heating capacity			(kW)	5.5		6.0	
Heating capacity range			(kW)	0.3-6.5		0.3-6.7	
Power supply				1 Ph/50Hz/220–240 V, 1 Ph/60Hz/220-230 V			
Electric characteristics	Indoor	Operation mode		**Cooling**	**Heating**	**Cooling**	**Heating**
		Running current(220/230/240V)	(A)	0.27/0.26/0.25		0.30/0.29/0.28	
		Power consumption	(W)	35		40	
		Power factor (220/230/240V)	(%)	59/59/58		61/60/60	
	Outdoor	Operation mode		**Cooling**	**Heating**	**Cooling**	**Heating**
		Running current (220/230/240V)	(A)	5.54/5.30/5.08	5.97/5.71/5.47	6.68/6.39/6.12	6.86/6.56/6.29
		Power consumption	(W)	1195	1305	1450	1500
		Power factor	(%)	98	99		
	Starting current(220/230/240V)		(A)	6.24/5.97/5.72		7.16/6.85/6.57	
COP (Cooling/Heating)				3.69/4.10		3.36/3.90	
Operating noise	Indoor	High (Cooling/Heating)	(dB-A)	47/47		49/49	
		Medium (Cooling/Heating)	(dB-A)	38/38		41/41	
		Low (Cooling/Heating)	(dB-A)	30/30		31/31	
	Outdoor	(Cooling/Heating)	(dB-A)	50/50		52/52	
Indoor unit	Unit model			**RAS-16PKVP-E (-ND)**		**RAS-18PKVP-E (-ND)**	
	Dimension	Height	(mm)	295			
		Width	(mm)	790			
		Depth	(mm)	242			
	Net weight		(kg)	12			
	Fan motor output		(W)	30			
	Air flow rate	(Cooling/Heating)	(m³/min.)	12.4/12.4		13.4/13.4	
Outdoor unit	Unit model			**RAS-16PAVP-E (-ND)**		**RAS-18PAVP-E (-ND)**	
	Dimension	Height	(mm)	550			
		Width	(mm)	780			
		Depth	(mm)	290			
	Net weight		(kg)	40			
	Compressor	Motor output	(W)	750			
		Type		Twin rotary type (Variable Cylinder Management)			
		Model		DA111A1FD-21F			
	Fan motor output		(W)	43			
	Air flow rate	(Cooling/Heating)	(m³/min.)	37.2/34.8		39.5/37.2	
Piping connection	Type			Flare connection			
	Indoor unit	Liquid side		Ø6.35			
		Gas side		Ø12.7			
	Outdoor unit	Liquid side		Ø6.35			
		Gas side		Ø12.7			
	Maximum length		(m)	20			
	Maximum chargeless length		(m)	15			
	Maximum height difference		(m)	10			
Refrigerant	Name of refrigerant			R410A			
	Weight		(kg)	1.15			
Wiring connection	Power cord			3 Wires : includes earth line (Outdoor)			
	Connecting cable			4 Wires : includes earth line			
Usable temperature range	Indoor	(Cooling/Heating)	(°C)	21–32/0–28			
	Outdoor	(Cooling/Heating)	(°C)	–10–46/–15–24			
Accessory	Indoor unit	Installation plate		1			
		Wireless remote controller		1			
		Batteries		2			
		Remote controller holder		1			
		Mounting screw		7 (Ø4 × 25L)			
		Remote controller holder mounting screw		2 (Ø3.1 × 16L)			
		Installation manual		1			
		Owner's manual		1			
	Outdoor unit	Drain nipple		1			
		Water-proof rubber cap		2			

• The specifications may be subject to change without notice for purpose of improvement.

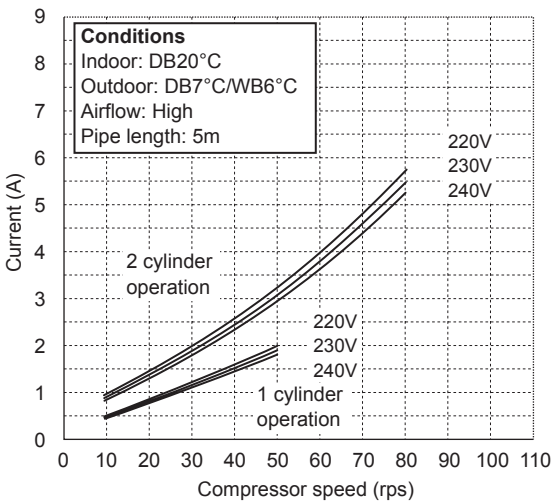
1-2. Operation Characteristic Curve

RAS-07PKVP-E(-ND)

Cooling

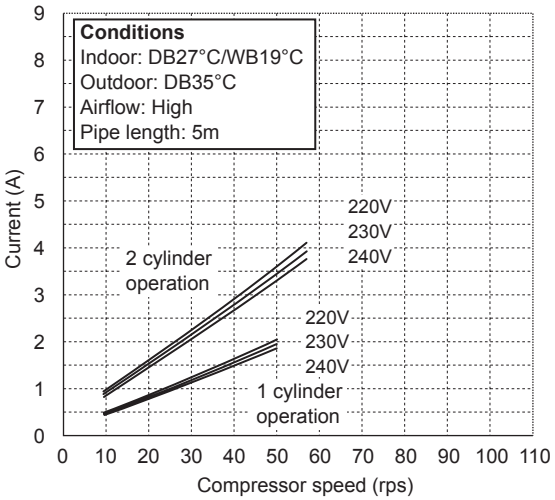


Heating

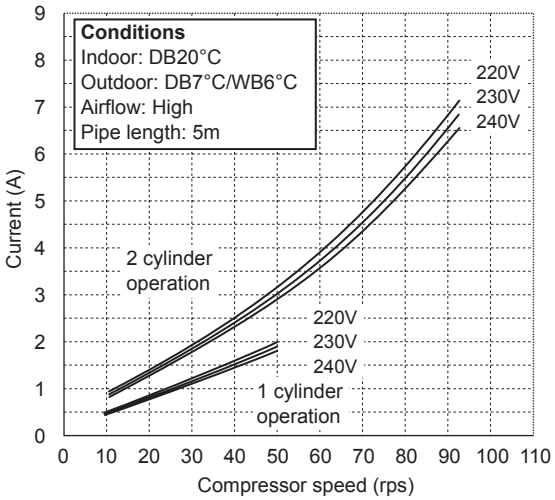


RAS-10PKVP-E(-ND)

Cooling

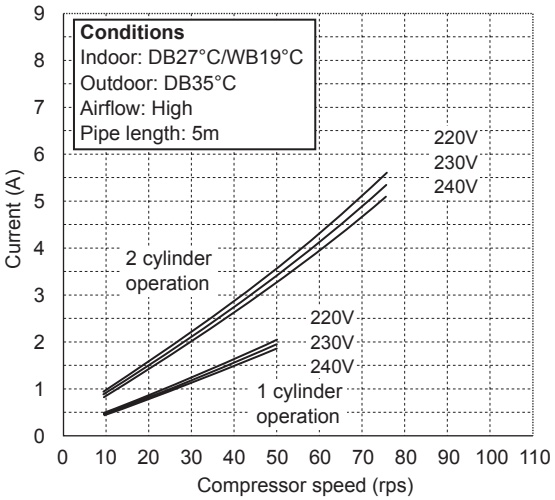


Heating

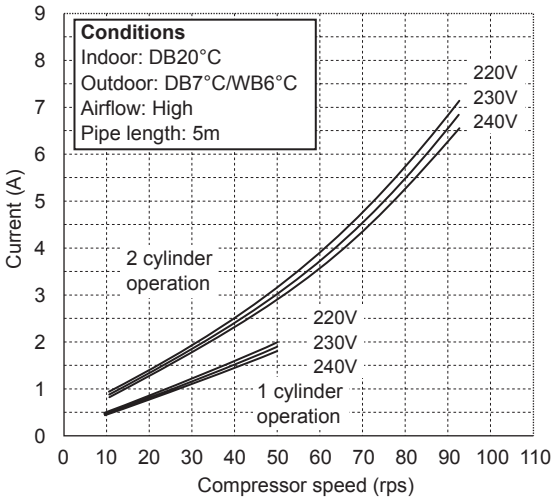


RAS-13PKVP-E(-ND)

Cooling

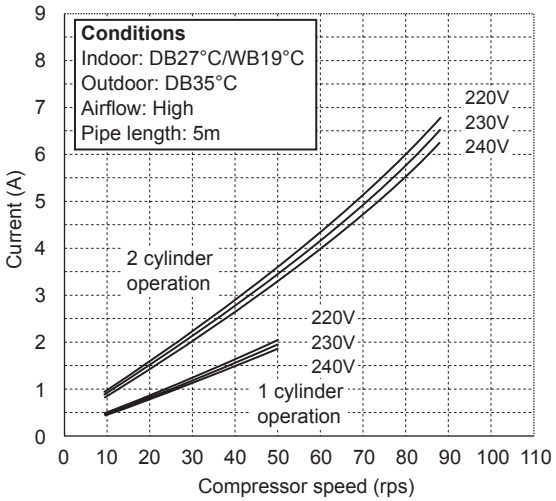


Heating

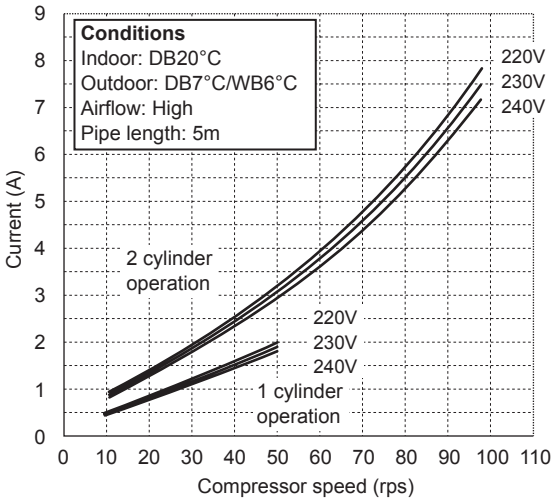


RAS-16PKVP-E(-ND)

Cooling

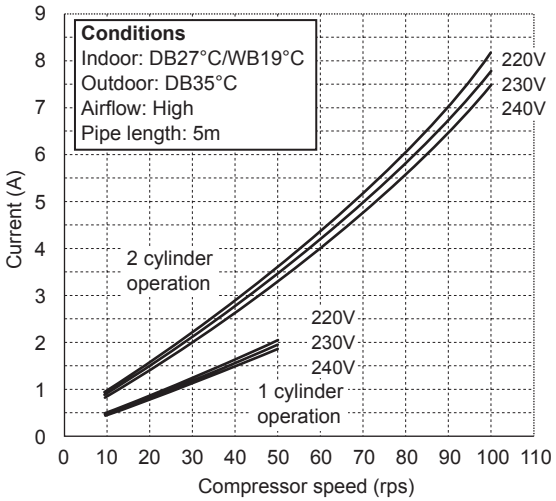


Heating

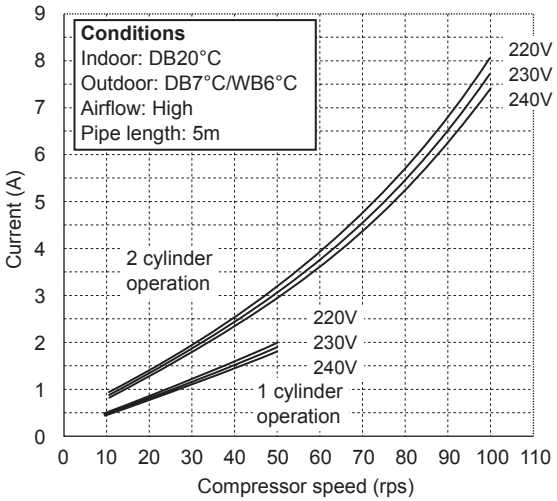


RAS-18PKVP-E(-ND)

Cooling



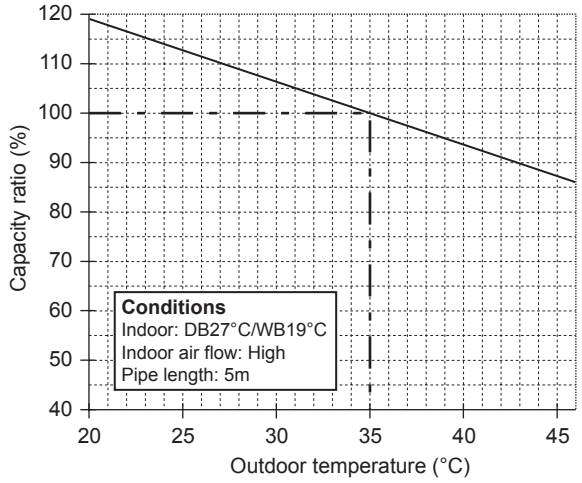
Heating



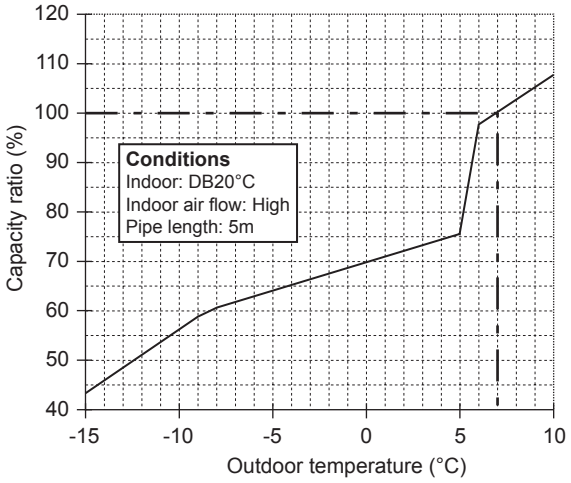
1-3. Capacity Variation Ratio According to Temperature

RAS-07PKVP-E(-ND), RAS-10PKVP-E(-ND), RAS-13PKVP-E(-ND)

Cooling

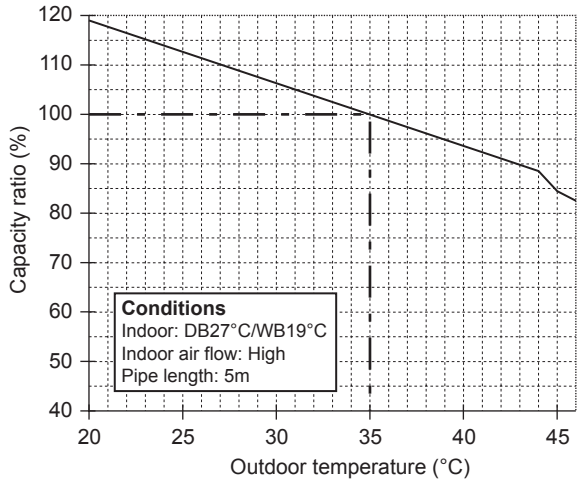


Heating

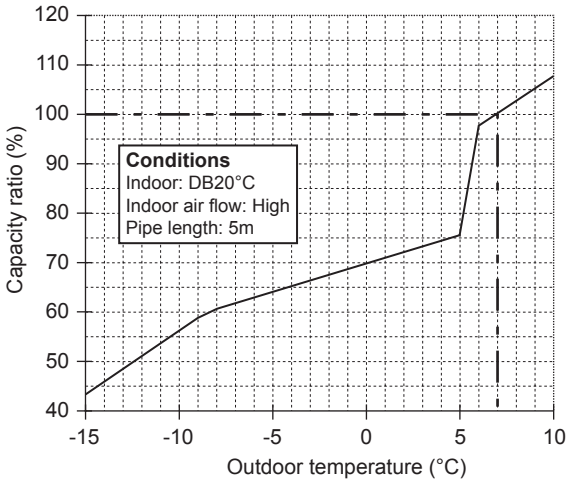


RAS-16PKVP-E(-ND)

Cooling

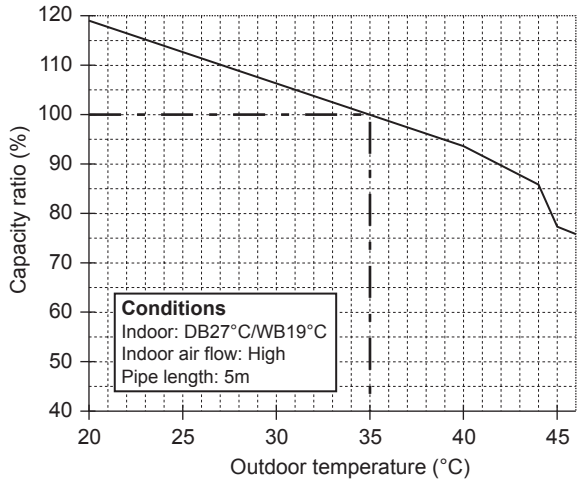


Heating

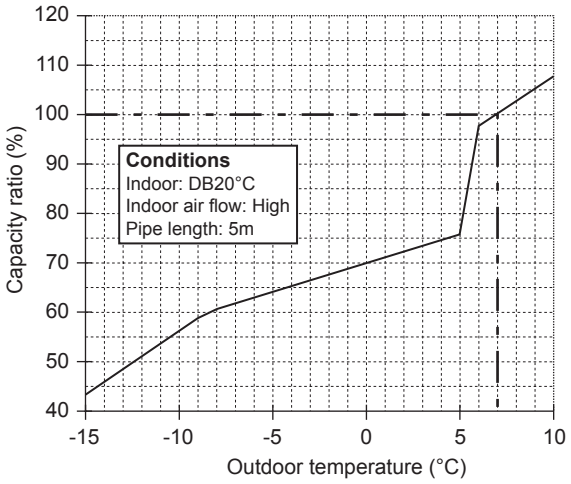


RAS-18PKVP-E(-ND)

Cooling



Heating



2 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.

2-1. 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.

- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.

2-2. Refrigerant Piping Installation

2-2-1. 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.

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 discoloured 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 2-2-1. Never use copper pipes thinner than 0.8 mm even when it is available on the market.

Table 2-2-1 Thicknesses of annealed copper pipes

		Thickness (mm)	
Nominal diameter	Outer diameter (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

Joints

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

- **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 2-2-3 to 2-2-6 below.
- **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 2-2-2.

Table 2-2-2 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

2-2-2. 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.

Flare processing procedures and precautions

1) **Cutting the Pipe**
   By means of a pipe cutter, slowly cut the pipe so that it is not deformed.
2) **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.
3) **Insertion of Flare Nut**
4) **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. 2-2-1
Flare processing dimensions

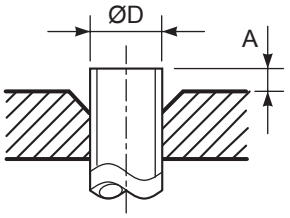


Table 2-2-3 Dimensions related to flare processing for R410A

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 2-2-4 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

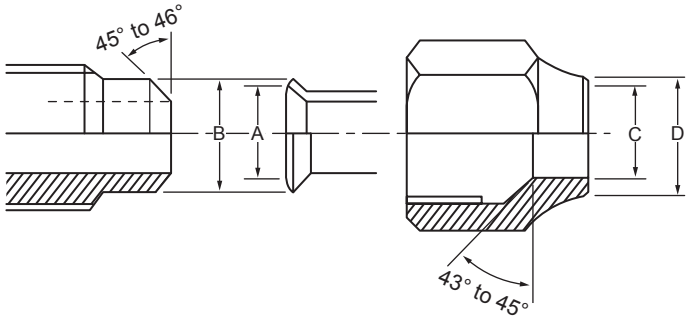
Table 2-2-5 Flare and flare nut dimensions for R410A

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 2-2-6 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	19.4	19.0	16.0	23	27
3/4	19.05	1.0	23.3	24.0	19.2	34	36

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



Flare Connecting Procedures and Precautions

1) Make sure that the flare and union portions do not have any scar or dust, etc.
2) Correctly align the processed flare surface with the union axis.
3) 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 2-2-7 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)

2-3. Tools

2-3-1. 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.

- Tools exclusive for R410A (Those which cannot be used for conventional refrigerant (R22))
- Tools exclusive for R410A, but can be also used for conventional refrigerant (R22)
- 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 conventional equipment can be used	Whether new equipment can be used with conventional refrigerant
1	Flare tool	Pipe flaring	Yes	*(Note 1)	Yes
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	No	No
4	Gauge manifold	Evacuating, refrigerant charge, run check, etc.	Yes	No	No
5	Charge hose				
6	Vacuum pump adapter	Vacuum evacuating	Yes	No	Yes
7	Electronic balance for refrigerant charging	Refrigerant charge	Yes	Yes	Yes
8	Refrigerant cylinder	Refrigerant charge	Yes	No	No
9	Leakage detector	Gas leakage check	Yes	No	Yes
10	Charging cylinder	Refrigerant charge	*(Note 2)	No	No

* **(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 equipment which serve also for R22 are necessary as the general tools.

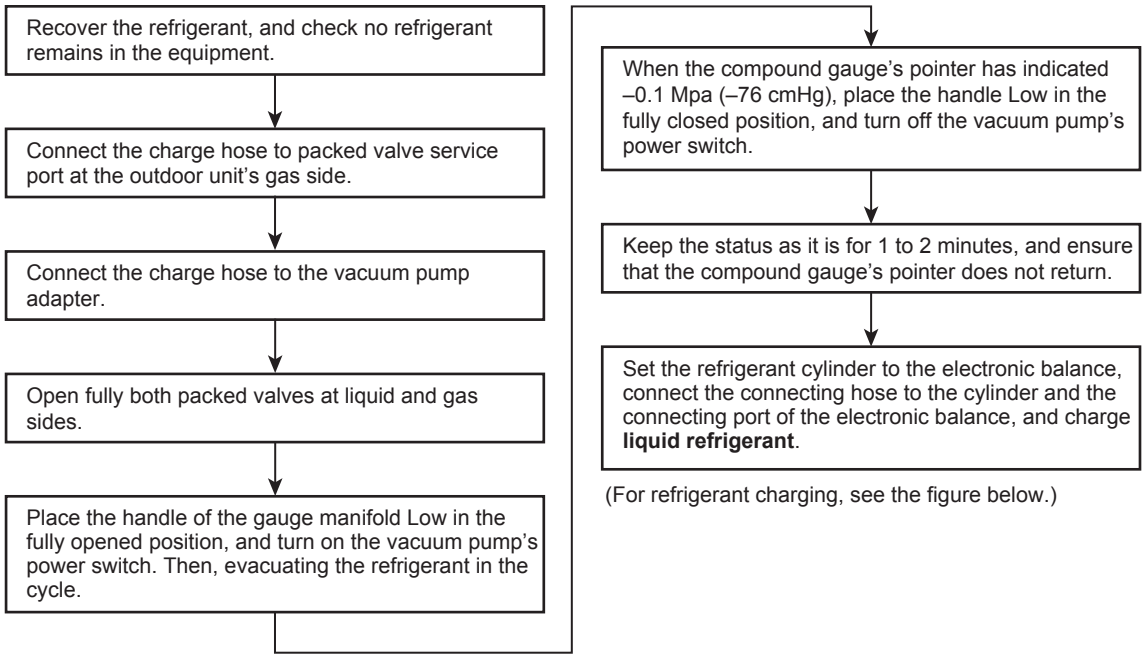
1. Vacuum pump
   Use vacuum pump by attaching vacuum pump adapter.
2. Torque wrench (For Ø6.35, Ø9.52)
3. Pipe cutter
4. Reamer
5. Pipe bender
6. Level vial
7. Screwdriver (+, –)
8. Spanner or Monkey wrench
9. Hole core drill (Ø65)
10. Hexagon wrench
    Opposite side 4mm)
11. Tape measure
12. Metal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

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

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

2-4. Recharging Refrigerant

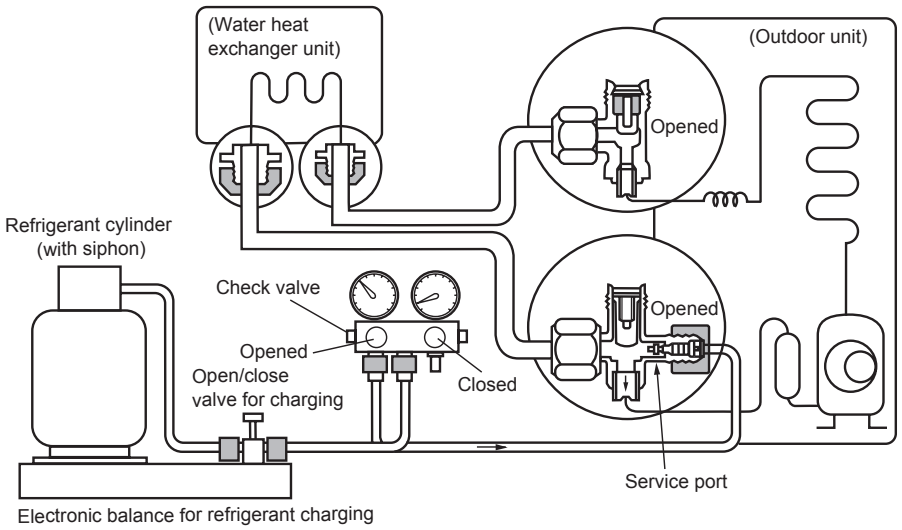
When it is necessary to recharge refrigerant, charge the specified amount of new refrigerant according to the following steps.



⚠ CAUTION

- Never charge refrigerant exceeding the specified amount.
- If the specified amount of refrigerant cannot be charged, charge refrigerant **bit by bit** in COOL mode.
- 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. 2-4-1 Configuration of refrigerant charging



NOTE

- Be sure to make setting so that **liquid** can be charged.
- 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. 2-4-2
Cylinder with siphon

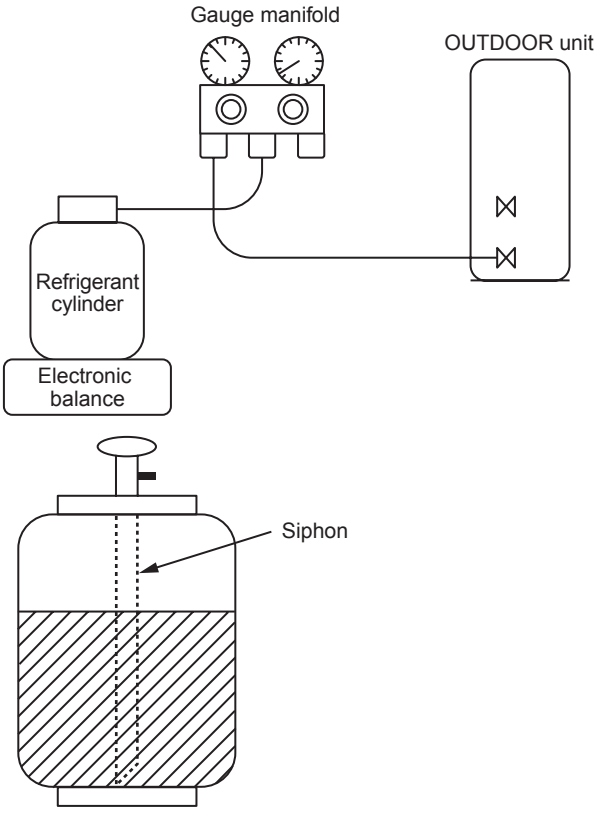
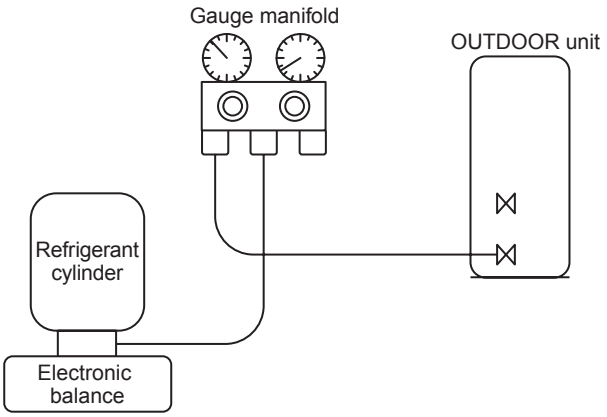


Fig. 2-4-3
Cylinder without siphon



NOTE

R410A refrigerant is HFC mixed refrigerant. Therefore, if it is charged with gas, the composition of the charged refrigerant changes and the characteristics of the equipment varies.

2-5. Brazing of Pipes

2-5-1. Materials for Brazing

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 solder ability.

Phosphor bronze brazing filler

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

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.

REQUIREMENT

- 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.
- When performing brazing again at time of servicing, use the same type of brazing filler.

2-5-2. Flux

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.

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.

Types of flux

- **Non corrosive 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.

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	Vapour flux

NOTE

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

2-5-3. Brazing

As brazing 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 brazing, it is effective to proceed with brazing while letting dry Nitrogen gas (N2) flow.

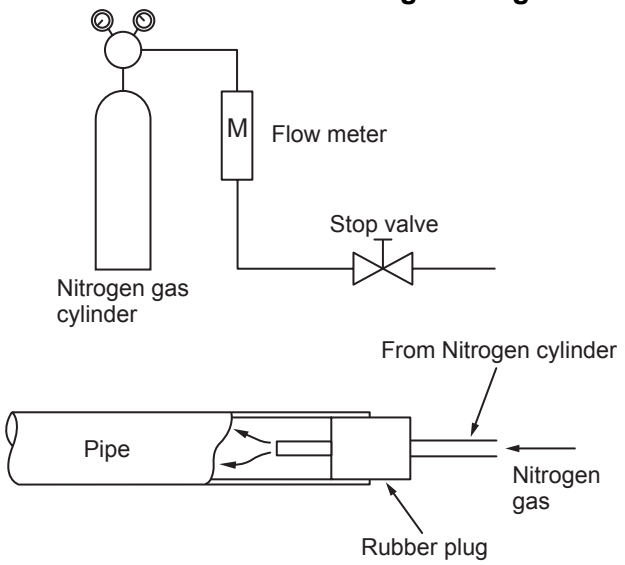
⚠ CAUTION

Never use gas other than Nitrogen gas.

Brazing 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 m^3/Hr or 0.02 MPa (0.2kgf/cm^2) 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 brazing.

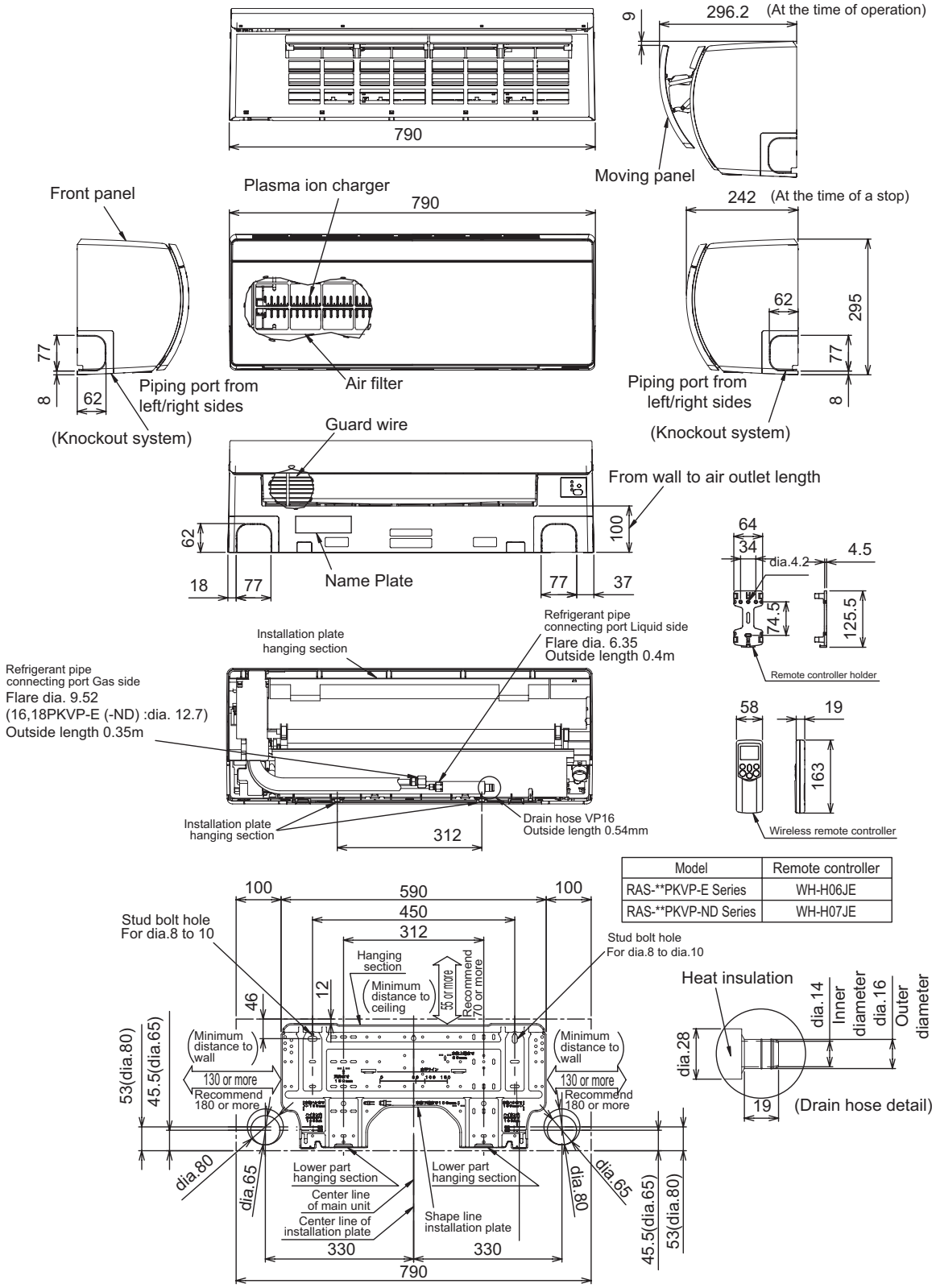
Fig. 2-5-1
Prevention of oxidation during brazing



3 CONSTRUCTION VIEWS

3-1. Indoor Unit

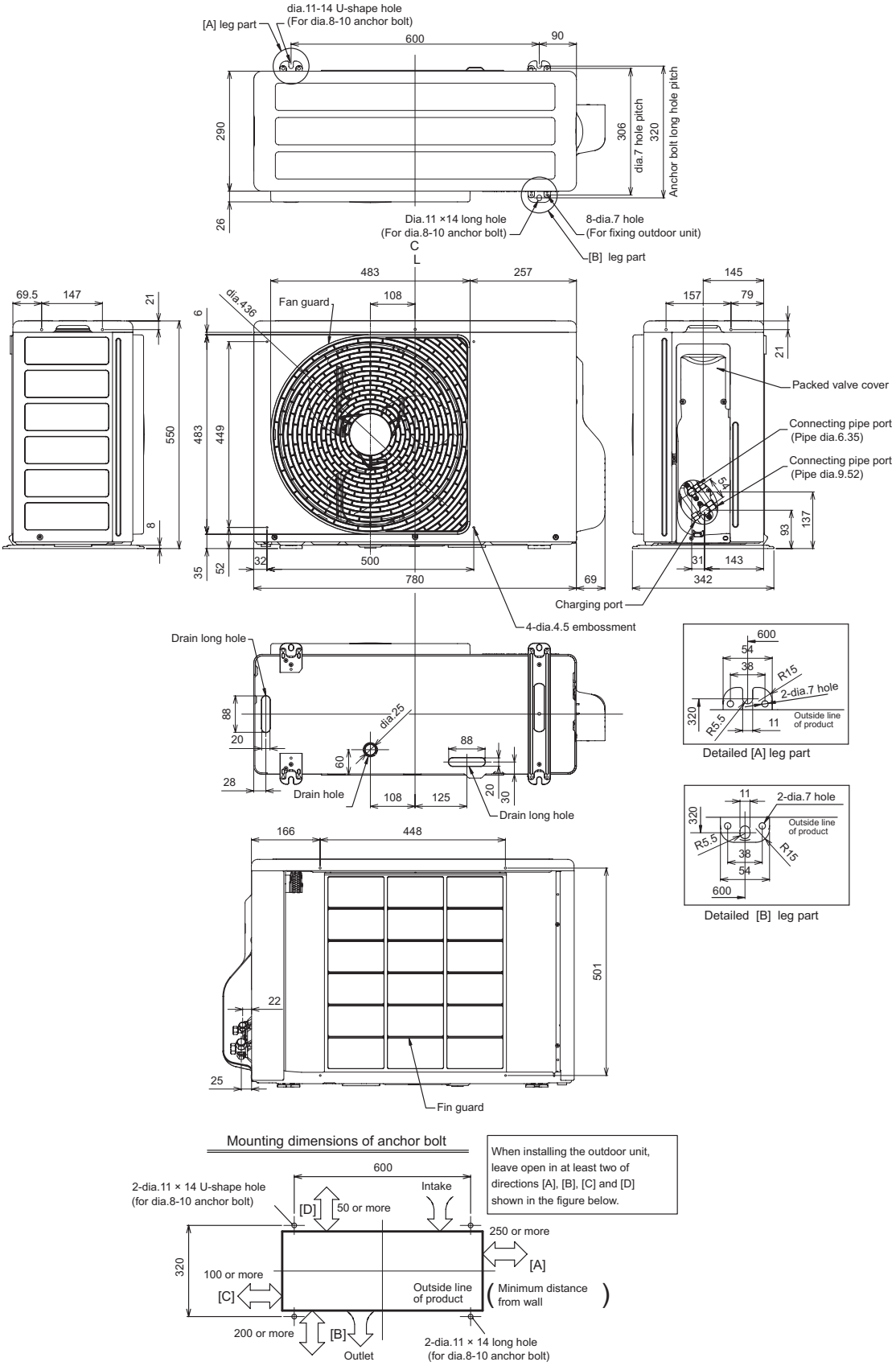
RAS-07PKVP-E, RAS-10PKVP-E, RAS-13PKVP-E, RAS-16PKVP-E, RAS-18PKVP-E
RAS-07PKVP-ND, RAS-10PKVP-ND, RAS-13PKVP-ND, RAS-16PKVP-ND, RAS-18PKVP-ND



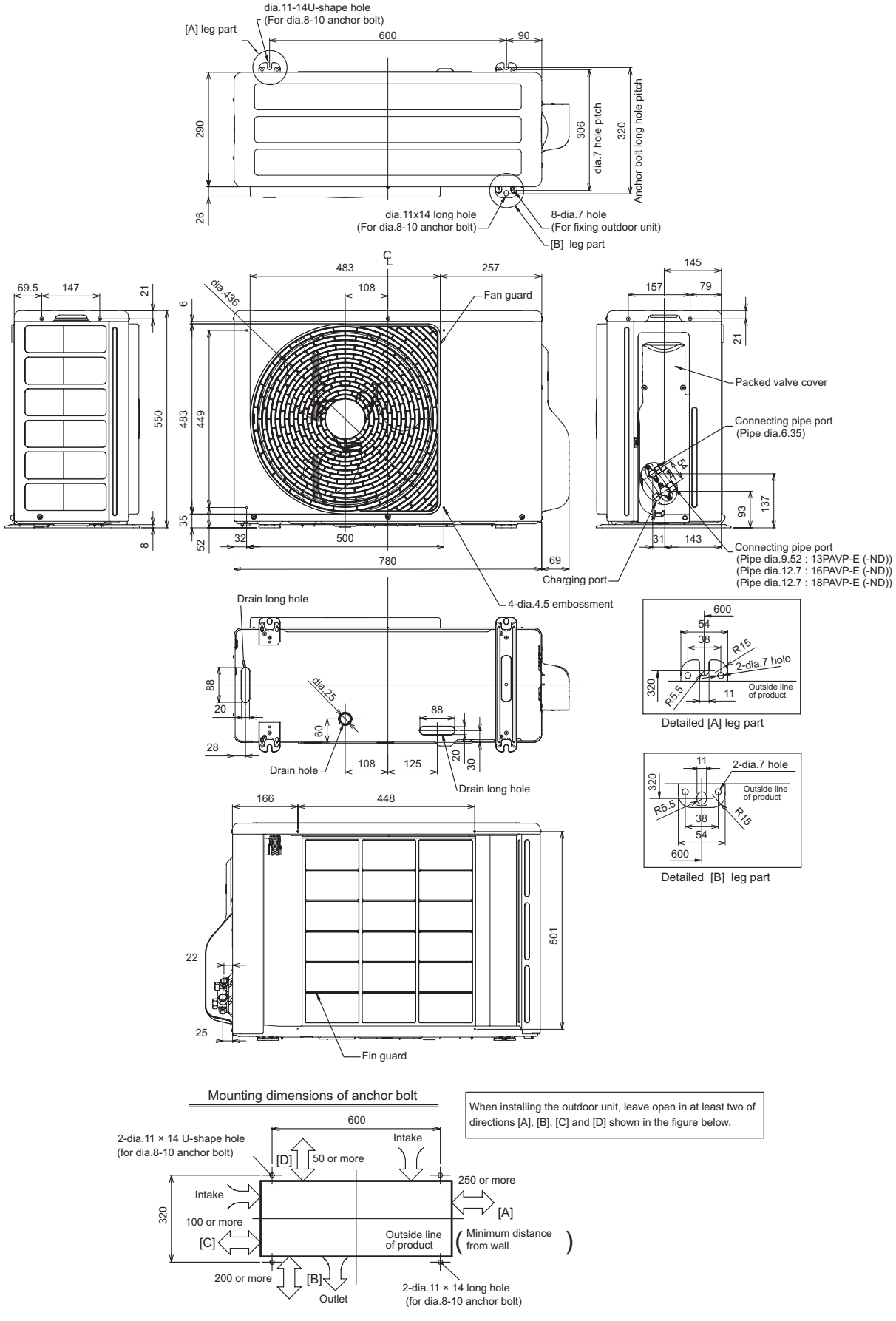
Model	Remote controller
RAS-**PKVP-E Series	WH-H06JE
RAS-**PKVP-ND Series	WH-H07JE

3-2. Outdoor Unit

RAS-07PAVP-E, RAS-10PAVP-E
RAS-07PAVP-ND, RAS-10PAVP-ND



RAS-13PAVP-E, RAS-16PAVP-E, RAS-18PAVP-E
RAS-13PAVP-ND, RAS-16PAVP-ND, RAS-18PAVP-ND

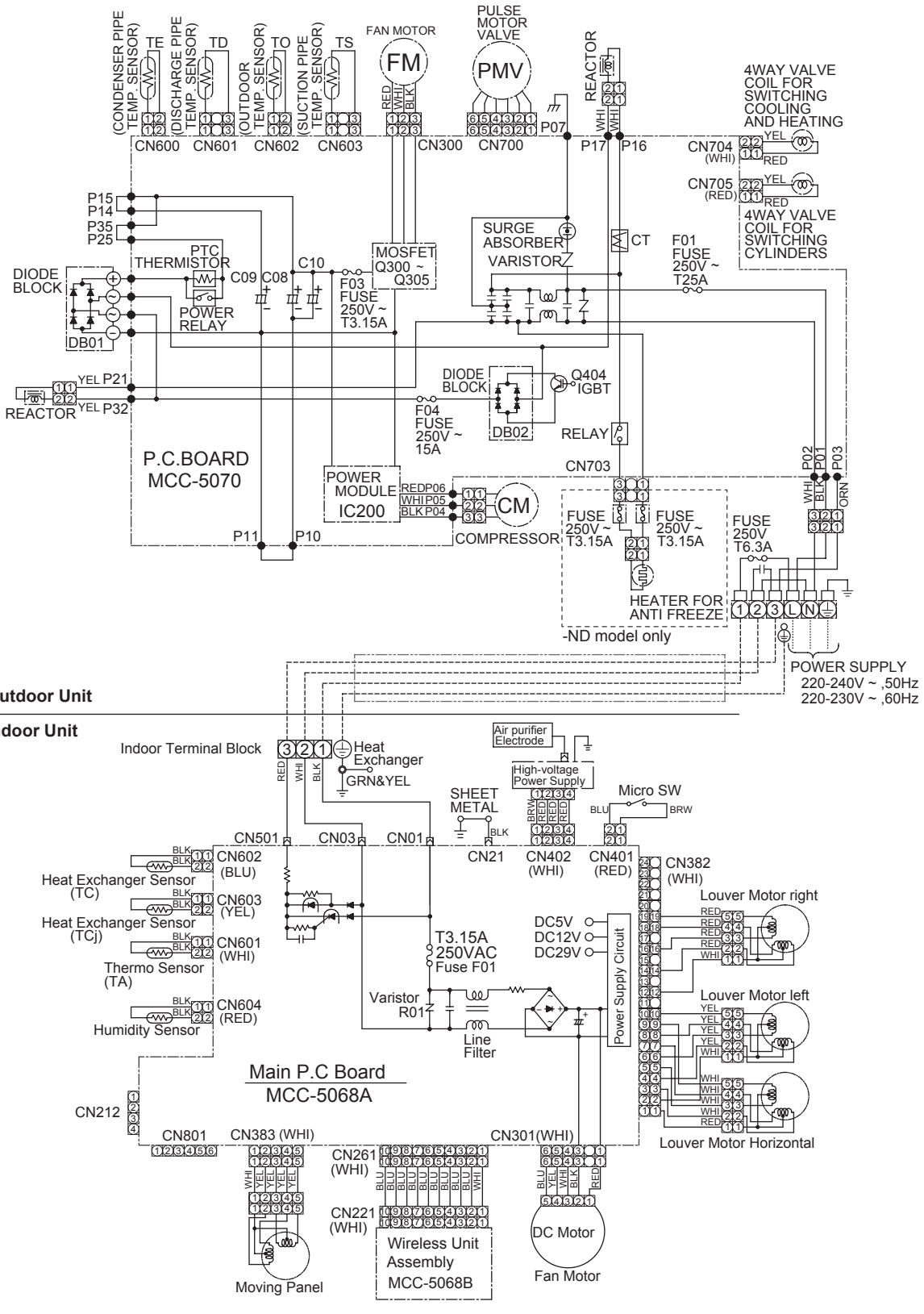


Mounting dimensions of anchor bolt

When installing the outdoor unit, leave open in at least two of directions [A], [B], [C] and [D] shown in the figure below.

4 WIRING DIAGRAM

RAS-07PAVP-E, RAS-10PAVP-E, RAS-13PAVP-E, RAS-16PAVP-E, RAS-18PAVP-E
RAS-07PKVP-E, RAS-10PKVP-E, RAS-13PKVP-E, RAS-16PKVP-E, RAS-18PKVP-E
RAS-07PAVP-ND, RAS-10PAVP-ND, RAS-13PAVP-ND, RAS-16PAVP-ND, RAS-18PAVP-ND
RAS-07PKVP-ND, RAS-10PKVP-ND, RAS-13PKVP-ND, RAS-16PKVP-ND, RAS-18PKVP-ND



5 SPECIFICATIONS OF ELECTRICAL PARTS

5-1. Indoor Unit

RAS-07PKVP-E, RAS-10PKVP-E, RAS-13PKVP-E, RAS-16PKVP-E, RAS-18PKVP-E
RAS-07PKVP-ND, RAS-10PKVP-ND, RAS-13PKVP-ND, RAS-16PKVP-ND, RAS-18PKVP-ND

No.	Parts name	Type	Specifications
1	Fan motor (for Indoor Unit)	E:ICF-340-30-4 ND:ICF-340-30-4A	DC280–340V, 30W
2	Room temp. sensor (TA-sensor)	(–)	10kΩ at 25°C
3	Heat exchanger temp. sensor (TC-sensor)	(–)	10kΩ at 25°C
4	Heat exchanger temp. sensor (TCj-sensor)	(–)	10kΩ at 25°C
5	Humidity sensor	C7-M3R-TC2	31kΩ 60%RH
6	Louver motor (right, left, Horizontal)	MP24Z3N	Output (Rated) 1W, 16 poles, DC12V
7	Louver motor (Moving panel)	MP24Z4N	Output (Rated) 1W, 16 poles, DC12V

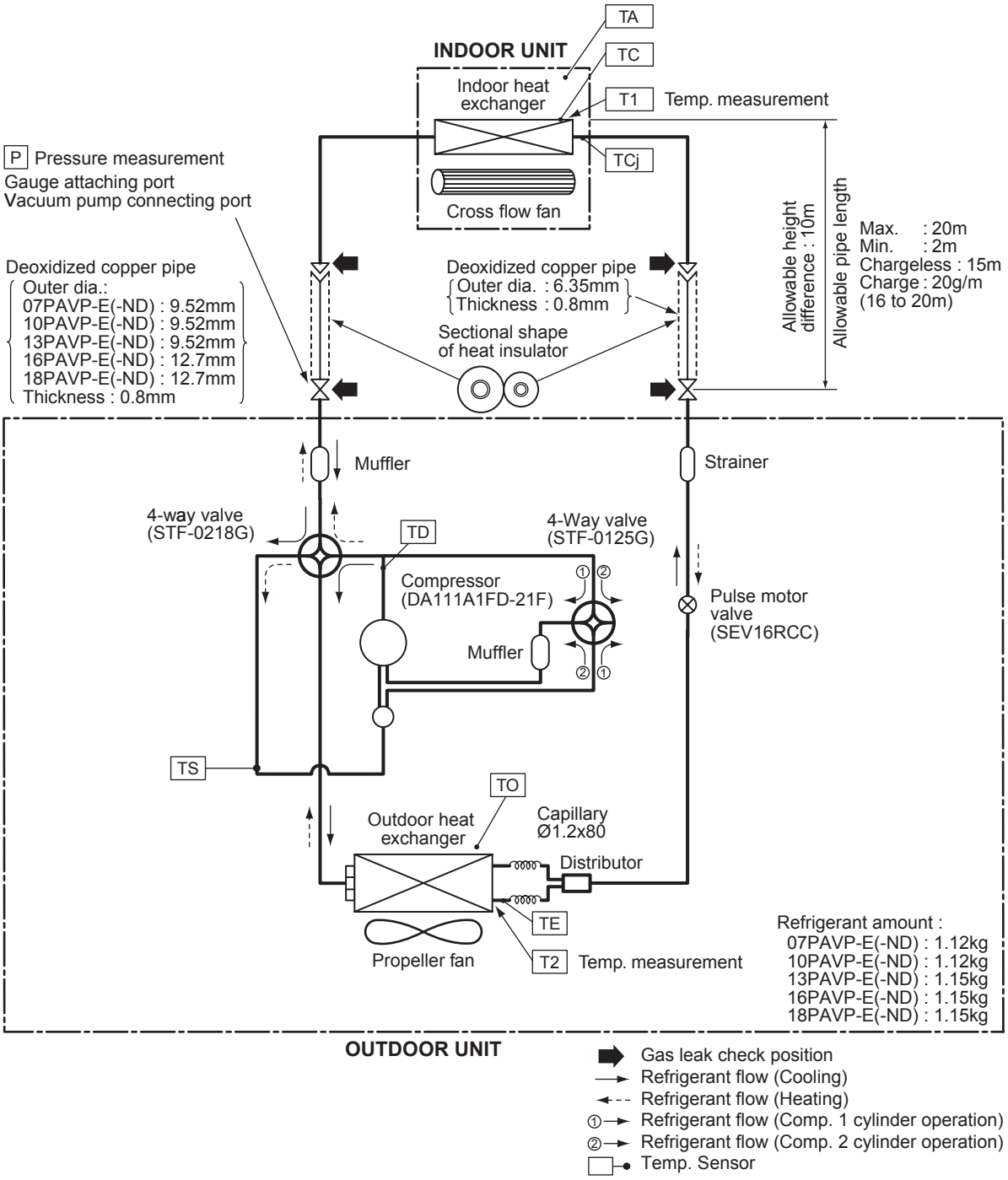
5-2. Outdoor Unit

RAS-07PAVP-E, RAS-10PAVP-E, RAS-13PAVP-E, RAS-16PAVP-E, RAS-18PAVP-E
RAS-07PAVP-ND, RAS-10PAVP-ND, RAS-13PAVP-ND, RAS-16PAVP-ND, RAS-18PAVP-ND

No.	Parts name	Model name	Rating
1	Reactor	CH-57	L = 10mH, 16A
2	Fan motor (for Outdoor Unit)	ICF-140-43-4R	DC140V, 43W
3	Suction temp. sensor (TS sensor)	(Inverter attached)	10kΩ (25°C)
4	Discharge temp. sensor (TD sensor)	(Inverter attached)	1,905kΩ (120°C)
5	Outside air temp. sensor (TO sensor)	(Inverter attached)	10kΩ (25°C)
6	Heat exchanger temp. sensor (TE sensor)	(Inverter attached)	10kΩ (25°C)
7	Terminal block (6P)	JXO-6B	20A, AC250V
8	Compressor	DA111A1FD-21F	3-phases 4 poses 750W
9	Coil for P.M.V.	C12A-80A	DC12V
10	Coil for 4-way valve (Cooling/heating switching)	VHV-01AZ535A1	DC12V
11	Coil for 4-way valve (Comp. cylinder switching)	VHV-01AZ535B1	DC12V
12	Cord heater assembly (-ND model only)	CSC-2	AC230V, 75W
13	Heater fuse assembly (-ND model only)	—	AC250V, 3.15A

6 REFRIGERANT CYCLE DIAGRAM

6-1. Refrigerant Cycle Diagram



NOTE

The maximum pipe length of this air conditioner is 20 m. When the pipe length exceeds 15m, the additional charging of refrigerant, 20g per 1m for the part of pipe exceeded 15m is required. (Max. 100g)

6-2. Operation Data

Cooling

Temperature condition (°C)		Model name RAS-	Standard pressure P (MPa)	Heat exchanger pipe temp.		Indoor fan mode	Outdoor fan mode	Compressor revolution (rps)
Indoor	Outdoor			T1 (°C)	T2 (°C)			
27/19	35/–	07PKVP-E 07PKVP-ND	1.0 to 1.2	14 to 16	39 to 42	High	High	26
		10PKVP-E 10PKVP-ND	1.0 to 1.2	13 to 15	40 to 43	High	High	34
		10PKVP-E 10PKVP-ND	0.9 to 1.1	10 to 13	42 to 45	High	High	54
		16PKVP-E 16PKVP-ND	0.8 to 1.0	8 to 11	44 to 47	High	High	77
		18PKVP-E 18PKVP-ND	0.8 to 1.0	7 to 10	45 to 48	High	High	90

Heating

Temperature condition (°C)		Model name RAS-	Standard pressure P (MPa)	Heat exchanger pipe temp.		Indoor fan mode	Outdoor fan mode	Compressor revolution (rps)
Indoor	Outdoor			T1 (°C)	T2 (°C)			
20/–	7/6	07PKVP-E 07PKVP-ND	1.8 to 2.0	32 to 34	2 to 4	High	High	35
		10PKVP-E 10PKVP-ND	2.0 to 2.2	35 to 37	2 to 4	High	High	45
		13PKVP-E 13PKVP-ND	2.2 to 2.4	38 to 41	2 to 4	High	High	60
		16PKVP-E 16PKVP-ND	2.5 to 2.7	43 to 46	1 to 3	High	High	85
		18PKVP-E 18PKVP-ND	2.6 to 2.8	44 to 47	1 to 3	High	High	93

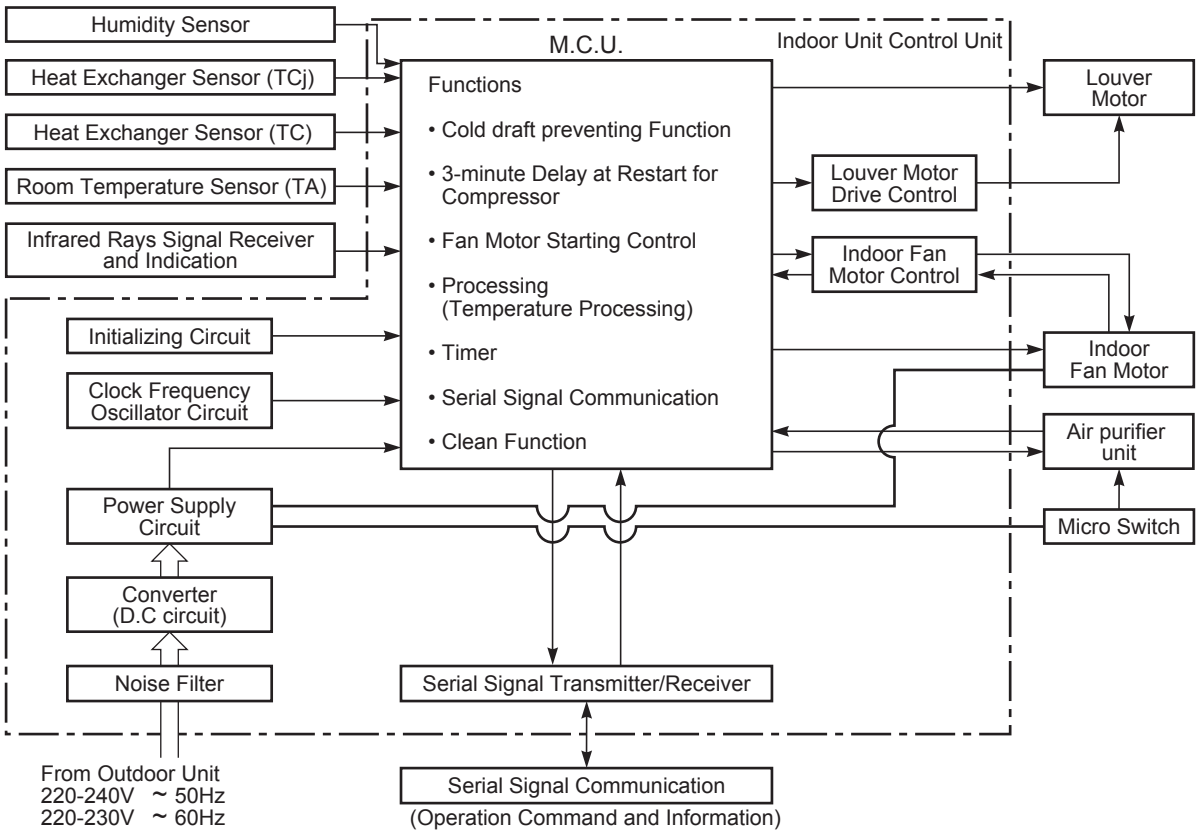
NOTE

- Measure surface temperature of heat exchanger pipe around centre of heat exchanger path U bent. (Thermistor thermometer)
- Connecting piping condition : 5 m

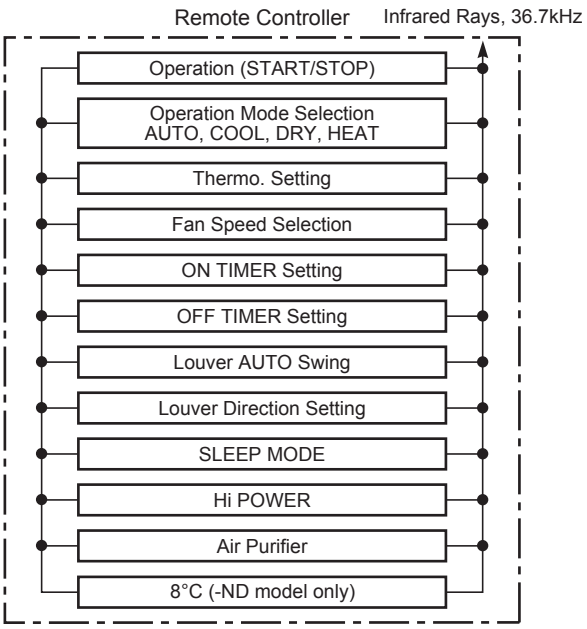
7 CONTROL BLOCK DIAGRAM

7-1. Indoor Unit

RAS-07PKVP-E, RAS-10PKVP-E, RAS-13PKVP-E, RAS-16PKVP-E, RAS-18PKVP-E
RAS-07PKVP-ND, RAS-10PKVP-ND, RAS-13PKVP-ND, RAS-16PKVP-ND, RAS-18PKVP-ND

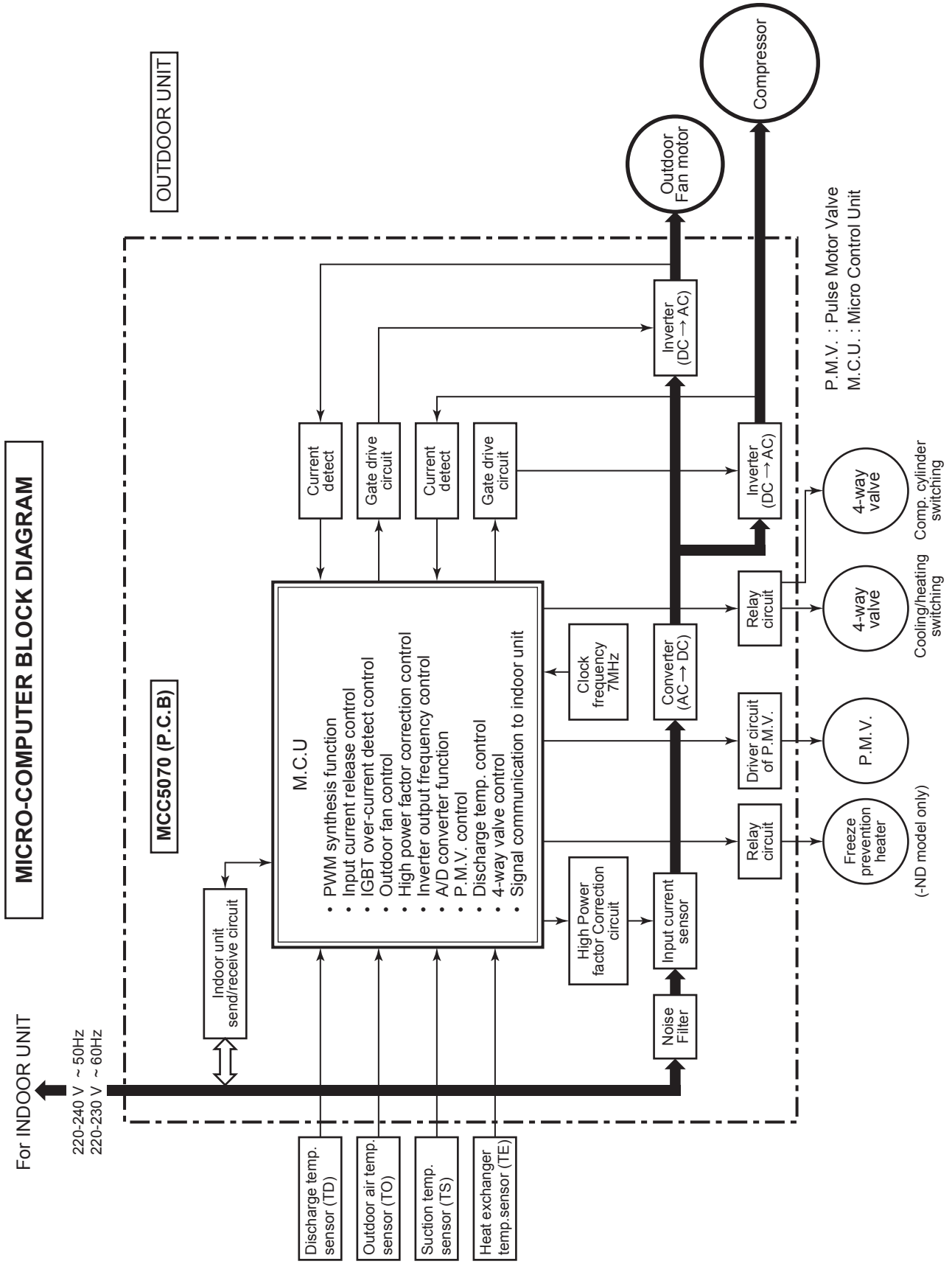


Remote Controller



7-2. Outdoor Unit (Inverter Assembly)

RAS-07PAVP-E, RAS-10PAVP-E, RAS-13PAVP-E, RAS-16PAVP-E, RAS-18PAVP-E
RAS-07PAVP-ND, RAS-10PAVP-ND, RAS-13PAVP-ND, RAS-16PAVP-ND, RAS-18PAVP-ND



8 OPERATION DESCRIPTION

8-1. 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. And the Variable Cylinder Management Compressor (VCM Comp.) which can change the motor speed in the range from 10 to 100 rps at 2 cylinder operation and the range from 10 to 50 rps at 1 cylinder operation is mounted. 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.

NOTE

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.

8-1-1. 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 and super heat control, etc.)
- Judgment of inlet indoor heat exchanger temperature by using heat exchanger sensor (TCj sensor)(Super heat control etc.)
- Judgment of suction air humidity of the indoor heat exchanger by using humidity sensor. (Hu sensor)
- 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
- Air purifier operation control
- Moving panel control

8-1-2. 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)

8-1-3. 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.

From outdoor unit controller to indoor unit controller

The following signals are sent from the outdoor unit controller.

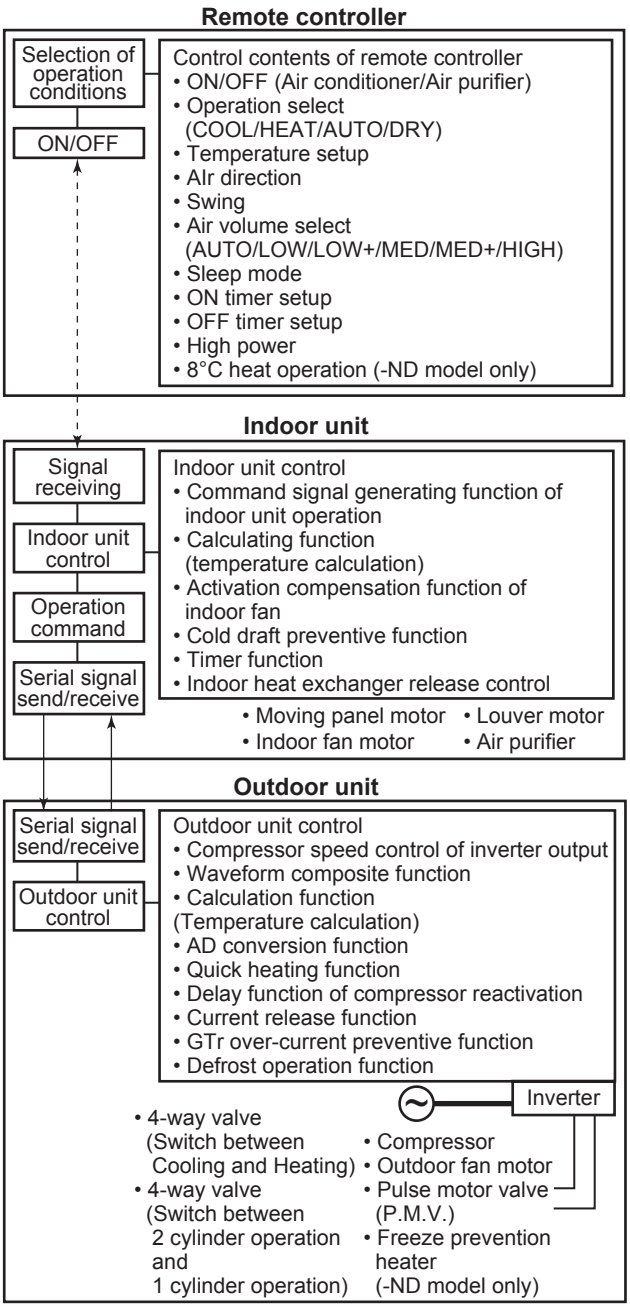
- The current operation mode
- The current compressor revolution
- Outdoor temperature
- Existence of protective circuit operation
  For transferring of these signals, the indoor unit controller monitors the contents of signals, and judges existence of trouble occurrence.
  Contents of judgment are described 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.

8-2. Basic Operation

8-2-1. Operation Control

Receiving the user's operation condition setup, the operation statuses of indoor/outdoor units are controlled.

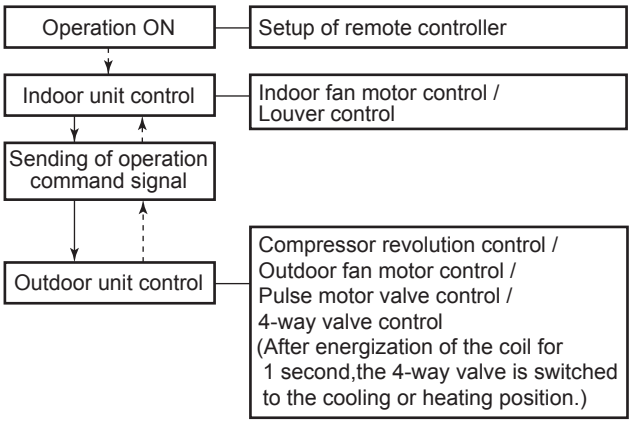
1) The operation conditions are selected by the remote controller as shown in the below.
2) A signal is sent by ON button of the remote controller.
3) The signal is received by a sensor of the indoor unit and processed by the indoor controllers as shown in the below.
4) The indoor controller controls 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 below, and also controls the compressor, outdoor fan motor, 4-way valve and pulse motor valve.



8-2-2. Cooling/Heating Operation

The operations are performed in the following parts by controls according to cooling/heating conditions.

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 “8-3. Indoor fan motor control” and the louver according to the contents of “8-9. 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.

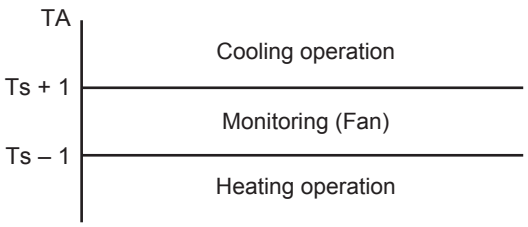


8-2-3. AUTO Operation

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.

* 1. When reselecting the operation mode, the fan speed is controlled by the previous operation mode.

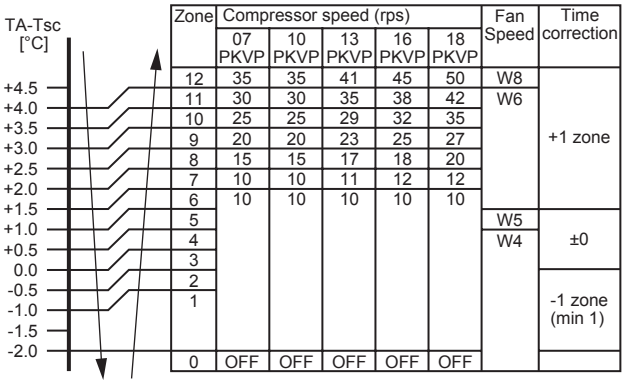


1) Detects the room temperature (TA) when the operation started.
2) Selects an operation mode from TA in the above figure.
3) Fan operation continues until an operation mode is selected.

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.

8-2-4. DRY Operation

DRY operation is performed according to the difference between room temperature and the setup temperature as shown below.
In DRY operation, fan speed is controlled in order to prevent lowering of the room temperature.



Zone	Compressor speed (rps) 07 PKVP	10 PKVP	13 PKVP	16 PKVP	18 PKVP	Fan Speed	Time correction
12	35	35	41	45	50	W8	
11	30	30	35	38	42	W6	
10	25	25	29	32	35		+1 zone
9	20	20	23	25	27		
8	15	15	17	18	20		
7	10	10	11	12	12		
6	10	10	10	10	10		
5						W5	
4						W4	±0
3							
2							
1							-1 zone (min 1)
0	OFF	OFF	OFF	OFF	OFF		

1) Detects the room temperature (TA) when the DRY operation started.
2) Starts operation under conditions in the above figure according to the temperature difference between the room temperature and the setup temperature (Tsc).
Setup temperature (Tsc)
= Set temperature on remote controller (Ts)
+ (-1.5 to 2.0)
3) When the room temperature is lower 2°C or less than the setup temperature, turn off the compressor.
4) The time correction is performed every 8 minutes.

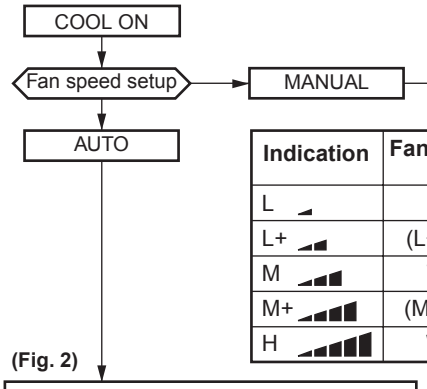
8-3. Indoor Fan Motor Control

8-3-1. In Cooling Operation

(This operation controls the fan speed at indoor unit side.)
The indoor fan (cross flow fan) is operated by the phase control induction motor. The fan rotates in 5 stages in MANUAL mode, and in 5 stages in AUTO mode, respectively.
(Table 1)

*** Symbols**

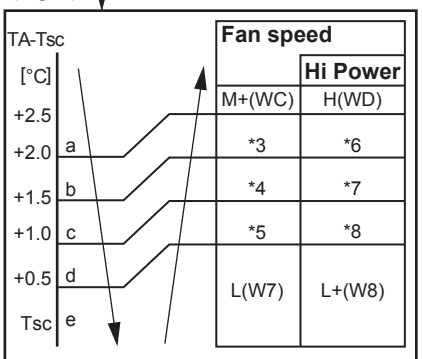
UH	: Ultra High
H	: High
M+	: Medium+
M	: Medium
L+	: Low+
L	: Low
L-	: Low–
UL	: Ultra Low
SUL	: Super Ultra Low



(Fig. 1)

Indication	Fan speed	Hi Power
L	W7	W8
L+	(L+M)/2	(L+M)/2
M	WA	WC
M+	(M+H)/2	(M+H)/2
H	WD	WE

(Fig. 2)



	Fan speed	
	M+(WC)	Hi Power H(WD)
a	*3	*6
b	*4	*7
c	*5	*8
d, e	L(W7)	L+(W8)

*3 : Fan speed = (M+–L)x3/4+L
*4 : Fan speed = (M+–L)x2/4+L
*5 : Fan speed = (M+–L)x1/4+L

*6 : Fan speed = (H–L+)x3/4+L+
*7 : Fan speed = (H–L+)x2/4+L+
*8 : Fan speed = (H–L+)x1/4+L+
(Linear approximation from M+ and L)

Table 8-3-1 Indoor fan air flow rate (Cooling, Dry)

Fan speed level		RAS-07PKVP-E RAS-07PKVP-ND		RAS-10PKVP-E RAS-10PKVP-ND		RAS-13PKVP-E RAS-13PKVP-ND	
		Fan speed (rpm)	Air flow rate (m^3/h)	Fan speed (rpm)	Air flow rate (m^3/h)	Fan speed (rpm)	Air flow rate (m^3/h)
WF		1170	645	1200	665	1300	740
WE	UH	1170	645	1200	665	1300	740
WD	H	1120	610	1140	625	1240	695
WC	M+	1060	570	1080	580	1180	655
WB		1050	560	1080	580	1110	605
WA	M	900	455	930	475	960	495
W9		900	455	930	475	960	495
W8	L+	820	395	840	410	860	425
W7	L	670	290	690	305	710	320
W6	L–	670	290	670	290	670	290
W5	UL	600	240	600	240	600	240
W4		550	205	550	205	550	205
W3	SUL	500	170	500	170	500	170
W2		500	170	500	170	500	170
W1		420	110	420	110	420	110

Fan speed level		RAS-16PKVP-E RAS-16PKVP-ND		RAS-18PKVP-E RAS-18PKVP-ND	
		Fan speed (rpm)	Air flow rate (m^3/h)	Fan speed (rpm)	Air flow rate (m^3/h)
WF		1370	790	1450	845
WE	UH	1370	790	1450	845
WD	H	1310	745	1390	805
WC	M+	1250	705	1330	760
WB		1160	640	1220	680
WA	M	1010	530	1070	575
W9		1010	530	1070	575
W8	L+	930	475	980	510
W7	L	780	370	830	405
W6	L–	670	290	700	310
W5	UL	600	240	600	240
W4		550	205	550	205
W3	SUL	500	170	500	170
W2		500	170	500	170
W1		420	110	420	110

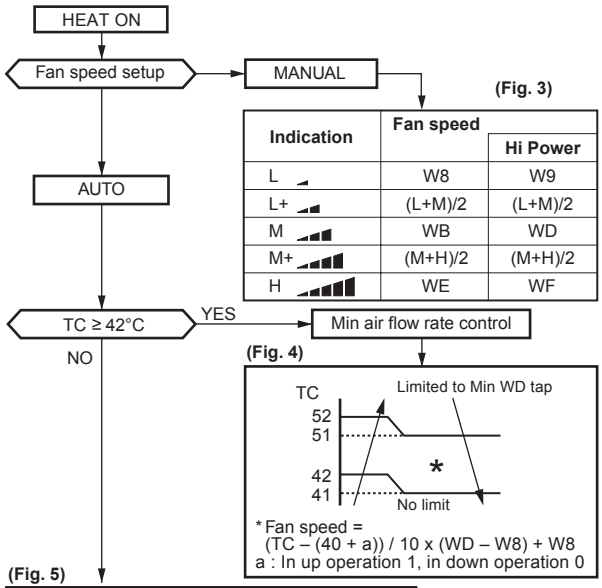
* The fan speed broadly varies due to position of the louver, etc.
The described value indicates one under condition of inclining downward blowing.

1) 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.
2) When the fan speed mode is manual and TA<22°C and the compressor stops, the fan speed is controlled from W2 (20 seconds) to 0rpm (40 seconds).
3) 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 8-3-1 according to the setup temperature, room temperature, and heat exchanger temperature.
4) When the fan speed mode is AUTO and the compressor stops, the fan speed is controlled from W2 (20 seconds) to 0 rpm (40 seconds).

8-3-2. In Heating Operation

(This operation controls the fan speed at the indoor unit side.)

The indoor fan (cross flow fan) is operated by the phase control induction motor. The fan rotates in 5 stages in MANUAL mode, and in 5 stages in AUTO mode, respectively.
(Table 1)

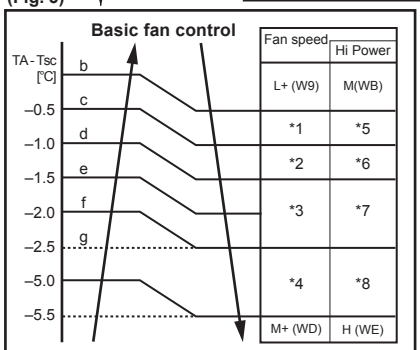


(Fig. 3)

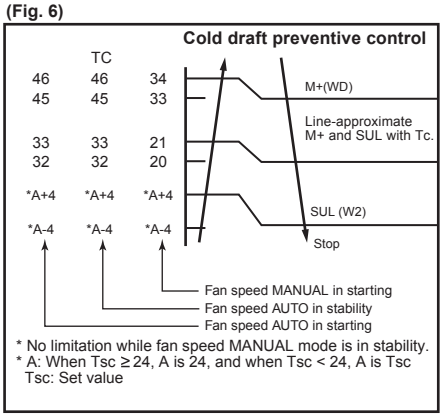
Indication	Fan speed	
		Hi Power
L	W8	W9
L+	(L+M)/2	(L+M)/2
M	WB	WD
M+	(M+H)/2	(M+H)/2
H	WE	WF

(Fig. 4)

(Fig. 5)



(Fig. 6)



1) 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 8-3-2.
2) 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.
3) Min. air flow rate is controlled by temperature of the indoor heat exchanger (TC) as shown in Fig. 4.
4) Cold draft prevention, the fan speed is controlled by temperature of the indoor heat exchanger (TC) as shown in Fig. 6.

In starting and in stability

	In starting	In stability
FAN AUTO	• Until 12 minutes passed after operation start. • When 12 to 25 minutes passed after operation start and the room temperature is 3°C or more lower than the set temperature.	• When 12 to 25 minutes passed after operation start and the room temperature is higher than the set temperature –3°C • When 25 minutes or more passed after operation start
FAN Manual	• Room temperature < Set temperature –4°C	• Room temperature ≥ Set temperature –3.5°C

Table 8-3-2 Indoor fan air flow rate (Heating)

Fan speed level		RAS-07PKVP-E RAS-07PKVP-ND		RAS-10PKVP-E RAS-10PKVP-ND		RAS-13PKVP-E RAS-13PKVP-ND	
		Fan speed (rpm)	Air flow rate (m^3/h)	Fan speed (rpm)	Air flow rate (m^3/h)	Fan speed (rpm)	Air flow rate (m^3/h)
WF		1170	645	1200	665	1240	695
WE	UH	1170	645	1200	665	1240	695
WD	H	1070	575	1100	595	1140	625
WC	M+	980	510	1010	530	1050	560
WB		900	455	930	475	960	495
WA	M	880	440	880	440	880	440
W9		850	420	850	420	850	420
W8	L+	750	345	750	345	750	345
W7	L	750	345	750	345	750	345
W6	L–	650	275	650	275	650	275
W5	UL	650	275	650	275	650	275
W4		650	275	650	275	650	275
W3	SUL	650	275	650	275	650	275
W2		560	210	560	210	560	210
W1		420	110	420	110	420	110

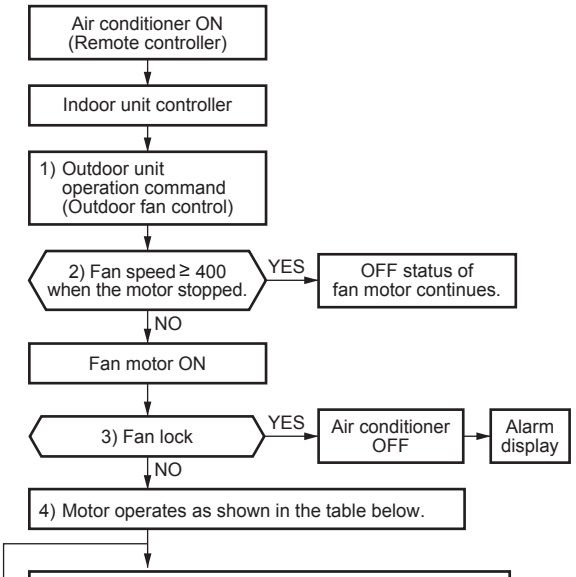
Fan speed level		RAS-16PKVP-E RAS-16PKVP-ND		RAS-18PKVP-E RAS-18PKVP-ND	
		Fan speed (rpm)	Air flow rate (m^3/h)	Fan speed (rpm)	Air flow rate (m^3/h)
WF		1310	745	1390	805
WE	UH	1310	745	1390	805
WD	H	1210	675	1290	730
WC	M+	1120	610	1180	655
WB		1010	530	1070	575
WA	M	930	475	980	510
W9		900	455	950	490
W8	L+	800	385	850	420
W7	L	800	385	850	420
W6	L–	700	310	700	310
W5	UL	650	275	650	275
W4		650	275	650	275
W3	SUL	650	275	650	275
W2		560	210	560	210
W1		420	110	420	110

8-4. Outdoor Fan Motor Control

The blowing air volume at the outdoor unit side is controlled.

Receiving the operation command from the controller of indoor unit, the controller of outdoor unit controls fan speed.

* For the fan motor, a DC motor with non-stage variable speed system is used. However, it is limited to 16 stages for reasons of controlling



In Cooling Operation							
Compressor speed (rps)		<22		<*CF		*CF≤	
		MIN	MAX	MIN	MAX	MIN	MAX
TO	TO ≥ 38°C	f5	f9	f7	fC	f9	fF
	TO ≥ 28°C	f5	f9	f7	fC	f9	fF
	TO ≥ 15°C	f3	f7	f3	f9	f5	fC
	TO ≥ 5°C	f1	f3	f1	f7	f3	f9
	TO ≥ 0°C	f1	f3	f1	f5	f3	f7
	TO < 0°C	f0	f1	f0	f3	f1	f4
During SLEEP MODE	TO ≥ 38°C	f5	f9	f7	fC	f9	fC
	TO ≥ 28°C	f5	f9	f7	fC	f9	fC
	TO ≥ 15°C	f3	f7	f3	f9	f5	fA
	TO ≥ 5°C	f1	f3	f1	f7	f3	f9
	TO ≥ 0°C	f1	f3	f1	f5	f3	f7
	TO < 0°C	f0	f1	f0	f3	f1	f4
When TO is abnormal		f1	f9	f1	fC	f1	fF

*CF: 32rps (07PAVP-E(-ND), 10PAVP-E(-ND)
50rps (13PAVP-E(-ND), 16PAVP-E(-ND), 18PAVP-E(-ND))

In Heating Operation				
Compressor speed (rps)		<31	<*HF	*HF≤
		MAX	MAX	MAX
TO	TO ≥ 10°C	f6	f8	fA
	TO ≥ 5°C	f8	fB	fD
	TO ≥ –5°C	f8	fB	fE
	TO < –5°C	f8	fB	fE
During SLEEP MODE	TO ≥ 10°C	f5	f7	f9
	TO ≥ 5°C	f7	fA	fB
	TO ≥ –5°C	f7	fA	fB
	TO < –5°C	f7	fA	fB
When TO is abnormal		f8	fB	fE

*HF: 40rps (07PAVP-E(-ND), 10PAVP-E(-ND)
50rps (13PAVP-E(-ND), 16PAVP-E(-ND), 18PAVP-E(-ND))

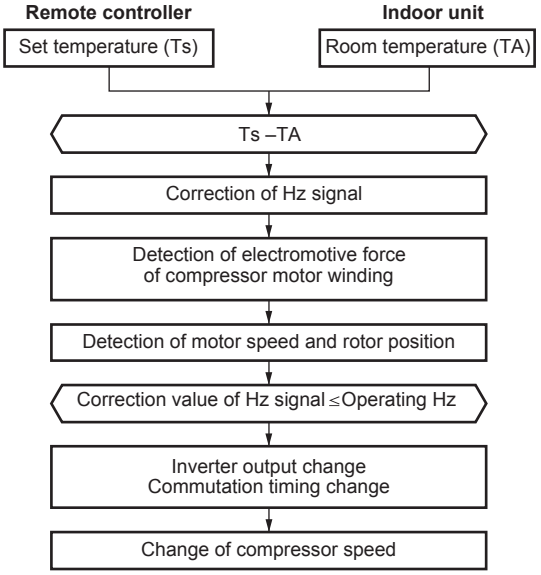
Outdoor fan speed (rpm)

Tap	07PAVP-E 07PAVP-ND	10PAVP-E 10PAVP-ND	13PAVP-E 13PAVP-ND	16PAVP-E 16PAVP-ND	18PAVP-E 18PAVP-ND
f0	0	0	0	0	0
f1	230	230	230	230	230
f2	300	300	300	300	300
f3	350	350	350	350	350
f4	400	400	400	400	400
f5	450	450	450	450	450
f6	500	500	500	500	500
f7	550	550	550	550	550
f8	600	600	600	600	600
f9	650	650	650	650	650
fA	700	700	700	700	700
fB	750	750	800	800	800
fC	750	750	800	800	800
fD	750	800	850	850	900
fE	800	850	900	900	950
fF	800	850	900	900	950

1) The operation command sent from the remote controller is processed by the indoor unit controller and transferred to the controller of the outdoor unit.
2) When strong wind blows at outdoor side, the operation of air conditioner continues with the fan motor stopped.
3) Whether the fan is locked or not is detected, and the operation of air conditioner stops and an alarm is displayed if the fan is locked.
4) According to each operation mode, by the conditions of outdoor temperature (TO) and compressor revolution, the speed of the outdoor fan shown in the table is selected.

8-5. Capacity Control

The cooling or heating capacity depending on the load is adjusted.
According to difference between the setup value of temperature and the room temperature, the capacity is adjusted by the compressor revolution.

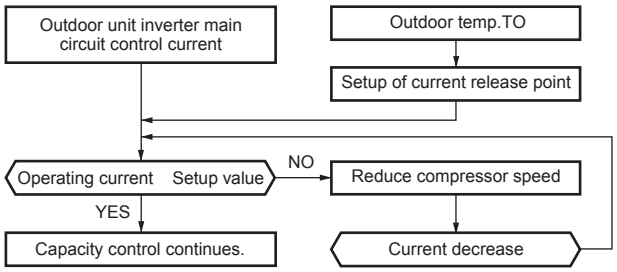


1) The difference between set temperature on remote controller (Ts) and room temperature (TA) is calculated.
2) According to the temperature difference, the correction value of Hz signal which determines the compressor speed is set up.
3) The rotating position and speed of the motor are detected by the electromotive force occurred on the motor winding with operation of the compressor.
4) According to the difference resulted from comparison of the correction value of Hz signal with the present operation Hz, the inverter output and the commutation timing are varied.
5) Change the compressor motor speed by outputting power to the compressor.

*The contents of control operation are same in cooling operation and heating operation

8-6. Current Release Control

This function prevents troubles on the electronic parts of the compressor driving inverter.
This function also controls drive circuit of the compressor speed so that electric power of the compressor drive circuit does not exceed the specified value.



Outdoor temp.	Cooling current release value		Heating current release value	
	07PAVP-E 07PAVP-ND	13PAVP-E 13PAVP-ND	07PAVP-E 07PAVP-ND	13PAVP-E 13PAVP-ND
	10PAVP-E 10PAVP-ND	16PAVP-E 16PAVP-ND	10PAVP-E 10PAVP-ND	16PAVP-E 16PAVP-ND
		18PAVP-E 18PAVP-ND		18PAVP-E 18PAVP-ND
50°C ≤ TO	5.40A	6.00A	7.72A	7.72A
45°C ≤ TO<50°C				
40°C ≤ TO<45°C	6.00A	7.20A		
16°C ≤ TO<40°C	6.53A	8.77A		
11°C ≤ TO<16°C			8.25A	8.25A
–5°C ≤ TO<11°C			8.77A	8.77A
TO<–5°C	6.90A	6.90A		

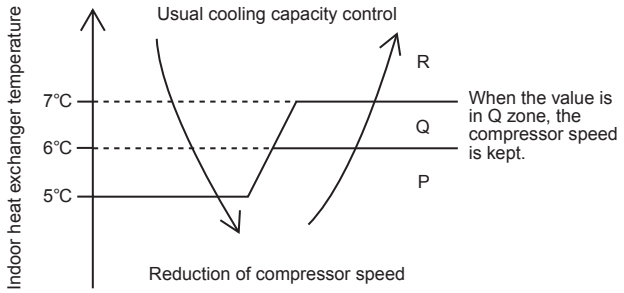
1) The input current of the outdoor unit is detected in the inverter section of the outdoor unit.
2) According to the detected outdoor temperature, the specified value of the current is selected.
3) Whether the current value exceeds the specified value or not is judged.
4) If the current value exceeds the specified value, this function reduces the compressor speed and controls speed up to the closest one commanded from the indoor unit within the range which does not exceed the specified value.

8-7. Release Protective control by Temperature of Indoor Heat Exchanger

8-7-1. In Cooling/Dry Operation

Prevent-freezing control for indoor heat exchanger

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.

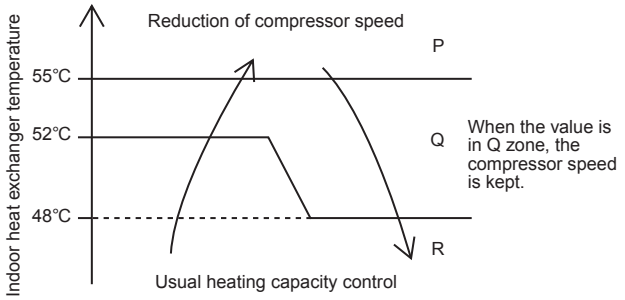


1) When temperature of the indoor heat exchanger drops below 5°C, the compressor speed is reduced. (P zone)
2) When temperature of the indoor heat exchanger rises in the range from 6°C to under 7°C, the compressor speed is kept. (Q zone)
3) When temperature of the indoor heat exchanger rises to 7°C or higher, the capacity control operation returns to the usual control in cooling operation.
(R zone)

8-7-2. In heating operation

Prevent-overpressure control for refrigerating cycle

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.

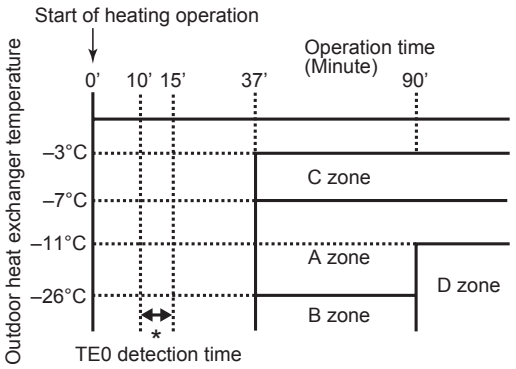


1) When temperature of the indoor heat exchanger rises in the range from 52°C to 55°C, the compressor speed is kept. (Q zone)
   When temperature of the indoor heat exchanger drops in the range from 48°C to under 55°C, the compressor speed is kept. (Q zone)
2) When temperature of the indoor heat exchanger rises to 55°C or higher, the compressor speed is reduced. (P zone)
3) When temperature of the indoor heat exchanger does not rise to 52°C, or when it drops below to 48°C, the capacity control operation returns to the usual control in heating operation. (R zone)

8-8. Defrost Control (Only in Heating Operation)

This function removes frost adhered to the outdoor heat exchanger.

The temperature sensor of the outdoor heat exchanger (TE sensor) judges the frosting status of the outdoor heat exchanger and the defrost operation is performed with 4-way valve reverse defrost system.



* The minimum value of TE sensor 10 to 15 minutes after start of operation is stored in memory as TE0.

Table 8-8-1

A zone	When TE0 - TE ≥ 2.5 continued for 2 minutes in A zone, defrost operation starts.
B zone	When the operation continued for 2 minutes in B zone, defrost operation starts.
C zone	When TE0 - TE ≥ 3 continued for 2 minutes in C zone, defrost operation starts.
D zone	When the operation get into D zone, defrost operation starts.

The necessity of defrost operation is detected by the outdoor heat exchanger temperature. The conditions to detect the necessity of defrost operation differ in A, B, C or D zone each. (Table 8-8-1)

8-8-1. Defrost Operation

Defrost operation in A to D zones

1) The compressor stops for 40 seconds.
2) The 4-way valve is switched to the cooling position 30 seconds after the compressor stops.
3) The outdoor fan stops at the same time when the compressor stops.
4) The indoor fan stops after temperature of the indoor heat exchanger becomes 38°C or lower.

8-8-2. Finish of Defrost Operation

Returning conditions from defrost operation to heating operation

1) Temperature of outdoor heat exchanger rises to +8°C or higher.
2) Temperature of outdoor heat exchanger is kept at +5°C or higher for 80 seconds.
3) Defrost operation continues for 15 minutes.

8-8-3. Returning from defrost operation

1) The compressor stops for 40 seconds.
2) The 4-way valve is switched 30 seconds after the compressor stops.
3) The outdoor fan starts rotating 30 seconds after the compressor stops.

8-9. Louver Control

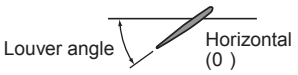
8-9-1. Louver Position

This function controls the air direction of the indoor unit.

- 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)

The angle of the louver is indicated as the horizontal angle is 0°.

When the louver closes fully, it directs approx. 10° upward.



Louver position in cooling operation

Cooling operation/AUTO (COOL)	Powerful
Initial setting of "Cooling storage position" Louver : Directs downward (23°)*1	"Cooling storage position" Louver : Directs downward (34°)

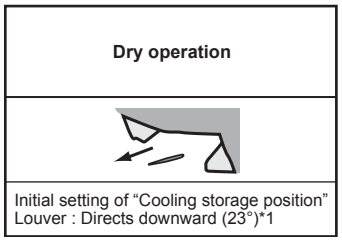
*1 When the indoor humidity is high (Hu sensor valve) ≥ 70%), the compressor speed is 23 rps or more and the position of the louver is less than 29°, the louver moves to 29° to prevent the air outlet from dew drop.
And the louver can't be move to less than 29°. When the indoor humidity become low or the compressor speed become less than 23 rps, the louver returns to the storage position.

Louver position in heating operation

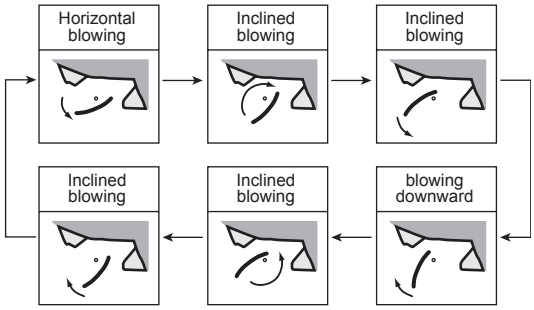
Heating operation / AUTO (HEAT)	Powerful
Initial setting of "Heating storage position" Louver : Directs downward (72°)	"Heating storage position" Louver : Directs downward (58°)

SLEEP MODE operation	
In case that the following temperature is obtained during 12 minutes or 12 to 25 minutes from start of heating operation: Room temperature (TA) < Set temperature (Tsc) –3.0	In case that the following temperature is obtained during 12 to 25 minutes from start of heating operation: Room temperature (TA) ≥ Set temperature (Tsc) –3.0 or when 25 minutes or more passed from start of heating operation.
"Heating storage position" Louver : Directs downward (72°)	"Cooling storage position" Louver : Directs downward (23°)

Louver position in dry operation



8-9-2. Air Direction Adjustment



- The louver position can be arbitrarily set up by pushing [FIX] button.

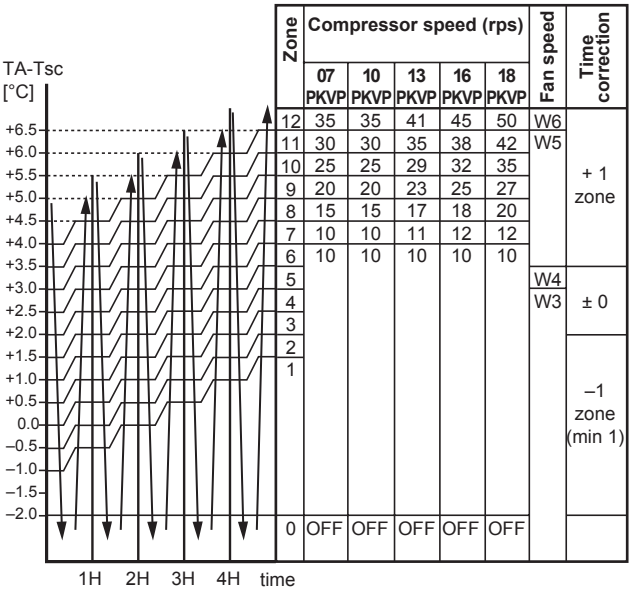
8-9-3. Swing

1) When pushing [SWING] button during operation, the louver starts swinging.
2) Each time you press the SWING button, you can change the swing mode.
   (Vertical swing → Horizontal swing → Vertical and Horizontal swing → Stop swinging)

- Swing operation is performed in width 35° with the stop position as the centre.
- If the stop position exceeds either upper or lower limit position, swing operation is performed in width 35° from the limit which the stop position exceeded.

8-10. SLEEP MODE Operation

8-10-1. Cooling Operation



Zone	Compressor speed (rps) 07 PKVP	10 PKVP	13 PKVP	16 PKVP	18 PKVP	Fan speed	Time correction
12	35	35	41	45	50	W6	+ 1 zone
11	30	30	35	38	42	W5	
10	25	25	29	32	35		
9	20	20	23	25	27		
8	15	15	17	18	20		
7	10	10	11	12	12		
6	10	10	10	10	10		
5						W4	± 0
4						W3	
3							
2							
1							–1 zone (min 1)
0	OFF	OFF	OFF	OFF	OFF		

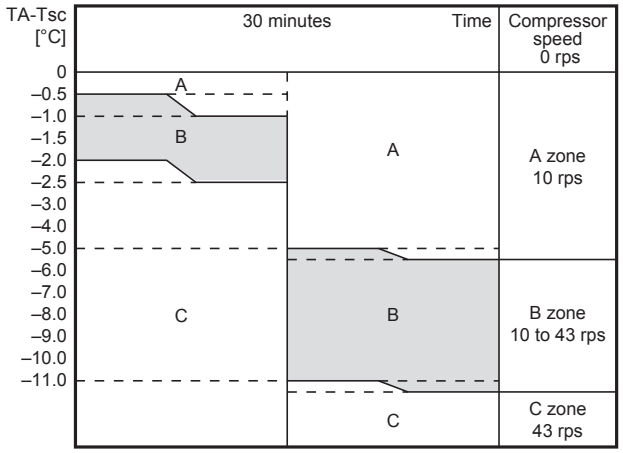
When pushing [SLEEP MODE] button on the remote controller, a quiet and mild operation is performed by reducing the fan speed and the compressor speed.

This function operates the air conditioner with the difference between the set and the room temperature as shown in the above figure.
The time correction is performed for 8 minutes each.

1) The indoor fan speed is controlled between W6 and W3.
   The compressor speed in control as shown in the above figure.
2) The set temperature increased 0.5°C per hour up to 2°C starting from the set temperature when SLEEP MODE has been received.

8-10-2. Heating Operation

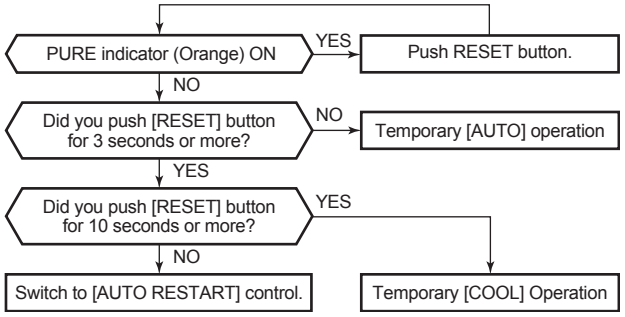
When pushing [SLEEP MODE] button on the remote controller, a quiet and mild operation is performed by reducing the fan speed and the compressor speed.



1) The indoor fan speed is controlled within (W7) as maximum value.
2) Setting the compressor speed to Max. 43 rps, the temperature zone in which the operation can be performed with Max. 10 rps is gradually widened after 30 minutes passed when starting SLEEP MODE operation.
3) The louver position is set horizontally (Standard cooling position) when the room temperature comes close to the set temperature or when 25 minutes passed after starting SLEEP MODE operation.

8-11. Temporary Operation

Pushing [RESET] button starts the temporary operation of [AUTO] operation. When keeping [RESET] button pushed for 10 seconds or more, the temporary [COOL] operation is performed.



1) When pushing [RESET] button, the temporary [AUTO] operation starts.
2) When keeping [RESET] button pushed for 3 seconds or more, beep, beep, beep sound is heard and [AUTO RESTART] control is switched.
3) When keeping [RESET] button pushed for 10 seconds or more, “beep” sound is heard and the temporary [COOL] operation starts.
4) If the filter lamp goes on, push [RESET] button to go off the filter lamp, and then push [RESET] button again.
5) To stop the temporary operation, push the button again.

8-12. Air Purifying Control

8-12-1. Purpose

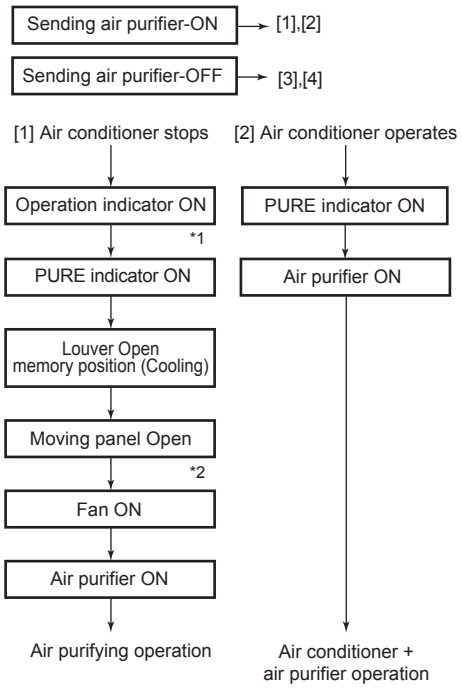
This function generates negative ion while cleaning the air in the room.
The air purifying control function is to alert the user that something is wrong in the ionizing or air purifying operation.
If air purifier-ON signal is received while the air conditioner stops, the air purifier starts operation, and if it is received while the air conditioner operates, the air conditioner and the air purifier start operation.
The air ion generator operates linked with the air purifying operation.

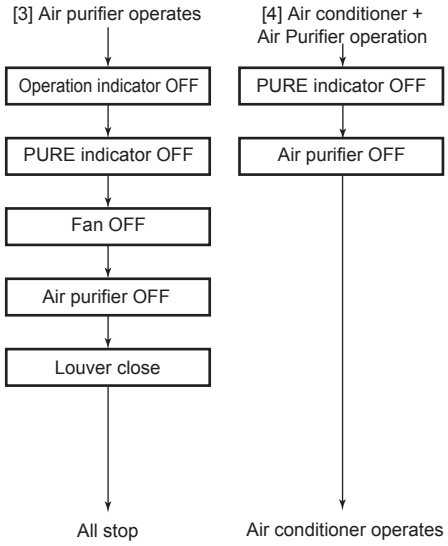
Present status	Operation button	
	PURE button	Air conditioner
Stop	Air purifier	AC operation*
Air purifier only	Stop (All)	AC + Air purifier
Air conditioner	AC + Air purifier	All stop
Joint use of AC and air purifier	AC operation	All stop

	Louver Swing is available	Fan speed *1
Air purifying operation	Cooling position	AUTO, L, L+, M, M+, H
AC + Air purifying operation	Follows to AC operation	Follows to AC operation

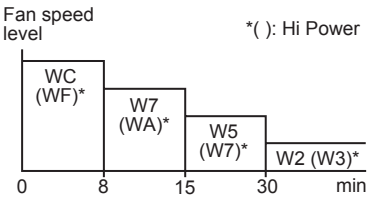
NOTE

When the previous operation was the operation of air conditioner + air purifier, an operation of air conditioner + air purifier starts by pushing AC button on the remote controller.
(Operation of air conditioner + air purifier is stored in memory.)





*1 Fan speed at Fan Auto mode.



8-12-2. Description

Error is determined to have occurred (indicated by the PURE indicator (Orange))in the following two cases.

1) When the panel switch has been set to OFF by the opening of the air inlet grill, etc.
2) When an abnormal discharge caused by a symptom such as the build-up of dirt has been detected while the air purifier is ON.

NOTE

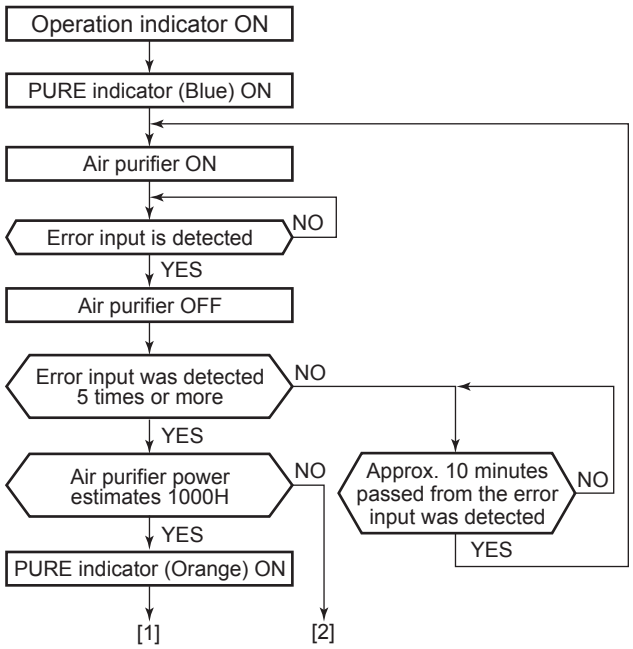
The above case 1) or 2) is deemed to have occurred when the action concerned continues for more than one second

8-12-3. Operation

The sequence that PURE indicator (Orange) is turned on are described in the following flowchart.

1) If the air purifying error input was detected by 5 times or under, turn on the purifier again approx. 10 minutes after and judge it again.
2) If the air purifying error input was detected by 5 times or more and 1000 H timer counts up, determine the error and turn on the PURE indicator (Orange).
3) The FILTER indicator keeps lighting even if the operation is stopped by the remote controller.
   The timer is stored in memory of the microcomputer, and the operation time is cleared by filter RESET button on the indoor unit.
   (FILTER indicator goes off.)

Air purifying operation



[1] Reset by RESET button.
[2] Reset by RESET button or by the stop direction from the remote controller.

NOTE

When the breaker is turned [ON] or RESET button is pushed while the FILTER indicator is turned on, the air purifier is not turned on until the integrated operation time of the indoor fan exceeds 1 hour after operation start.
It is the safety measures considering an incomplete drain when electric dust collector has been cleaned with water.

8-13. Discharge Temperature Control

8-13-1. Purpose

This function detects error on the refrigerating cycle or error on the compressor, and performs protective control.

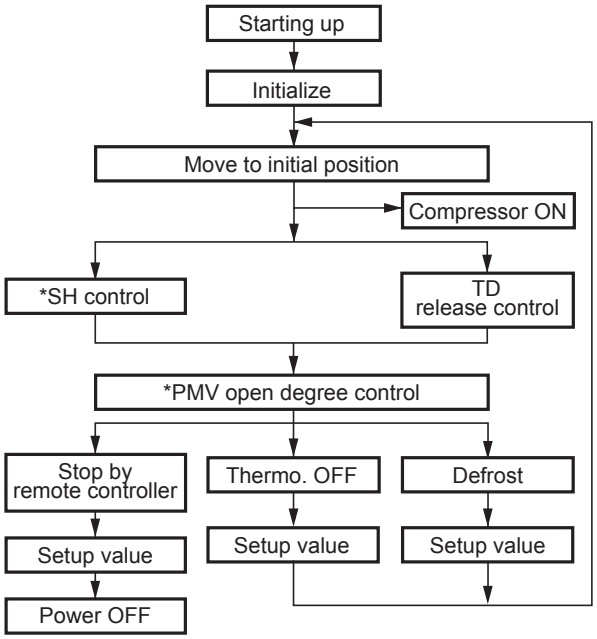
8-13-2. Operation

Control of the compressor speed
The speed control is performed as described in the table below based upon the discharge temperature.

TD value	Control operation
117°C	Judges as an error and stops the compressor.
112°C	Reduce the compressor speed.
108°C	Reduce slowly compressor speed.
105°C	Keeps the compressor speed.
98°C	If the operation is performed with lower speed than one commanded by the serial signal, speed is slowly raised up to the commanded speed.
	Operates with speed commanded by the serial signal.

8-14. Pulse Motor Valve (PMV) Control

This function controls throttle amount of the refrigerant in the refrigerating cycle.
According to operating status of the air conditioner, this function controls the open degree of valve with an expansion valve with pulse motor.



* SH (Super Heat amount) =
TS (Temperature of suction pipe of the compressor) –
TC or TE (Heat exchanger temperature at evaporation side)
* PMV: Pulse Motor Valve

1) When starting the operation, move the valve until it fits to the stopper. (Initialize)

NOTE

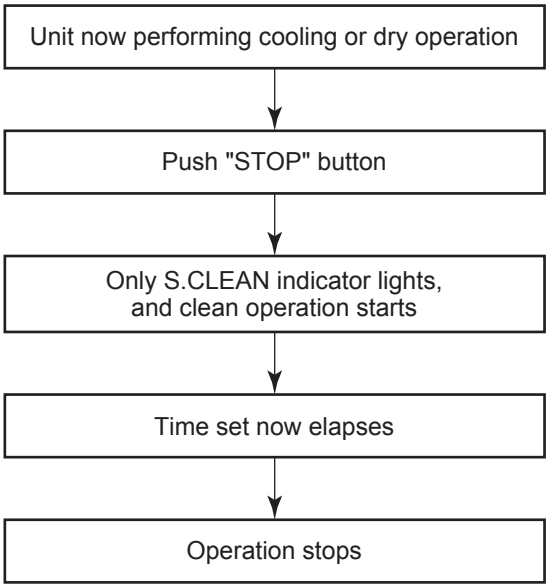
In this time, “Click” sound may be heard.

2) Adjust the open degree of valve by super heat amount. (SH control)
3) If the discharge temperature was excessively up, adjust the open degree of valve so that it is in the range of set temperature. (Discharge temp. control)
4) When defrost operation is performed, the open degree of PMV is adjusted according to each setup conditions; during preparation for defrost or during defrost operation (4-way valve is inversed.).
5) When turn off the compressor by thermo. OFF or STOP by remote controller, the open degree of the PMV is adjusted to the setup value.

8-15. Clean Operation

8-15-1. Purpose

The clean operation is to minimize the growth of mold, bacteria etc. by running the fan and drying so as to keep the inside of the air conditioner clean.
When the cooling or dry operation shuts down, the unit automatically starts the clean operation which is then performed for the specified period based on duration of the operation which was performed prior to the shutdown, after which the clean operation stops.
(The clean operation is not performed after a heating operation.)



- During clean operations: The louver opens slightly. The indoor fan operates continuously at a speed of 450 rpm.

8-15-2. Operation

1) When the stop signal from the remote controller is received, the S.CLEAN indicator (Orange) on the main body lights, and the clean operation starts.
(Neither the OPERATION indicator nor the PURE indicator light.)
2) The period of the clean operation is determined by the duration of the operation performed prior to the reception of the stop code.
3) After the clean operation has been performed for the specified period, the unit stops operating.

Clean operation times

Operation mode	Operation time	Clean operation time
Cooling: AUTO (Cooling) Dry	Up to 10 minutes	No clean operation performed (0 minutes)
	10 minutes or longer	4 hours
Heating: AUTO (Heating)	No clean operation performed	
AUTO (Fan only)		
Shutdown		

- To stop an ongoing clean operation at any time, push the start/stop button on the remote controller twice during the clean operation.
  (After pushing the button for the first time, push it for the second time without delay
  (within 10 minutes).)

8-15-3. Setting the Clean Operation Cancel

Add J231 of the Wireless Unit P.C. board assembly.
* This cancels the auto restart function.

↓

Hold down the [RESET] button on the indoor unit for at least 3 seconds but not more than 10 seconds.

↓

The indoor unit's buzzer emits three beeps.

↓

This completes the clean operation cancel setting.

NOTE

Once J231 is added, the [RESET] button on the unit is designated for CLEAN OPERATION (Set/Cancel), therefore the [RESET] button can not be used for the selection (Set/ Cancel) of AUTO RESTART function (Refer to **8-21.Auto Restart Function**).

⚠ CAUTION

J231 will be near the MCU so take steps to ensure that it will not be exposed to excessive of heat.
Also take care to avoid solder bridging with the surrounding components.

8-15-4. Setting the Clean Operation

Hold down the [RESET] button on the indoor unit for at least 3 seconds but not more than 10 seconds.

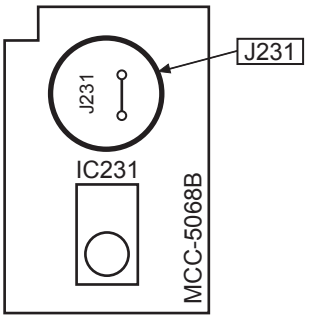
↓

The indoor unit's buzzer emits three beeps, and the OPERATION indicator flashes at 5 Hz intervals.

↓

This completes the clean operation setting.

Indoor P.C. Board



8-16. Select Switch on Remote Controller

8-16-1. Purpose

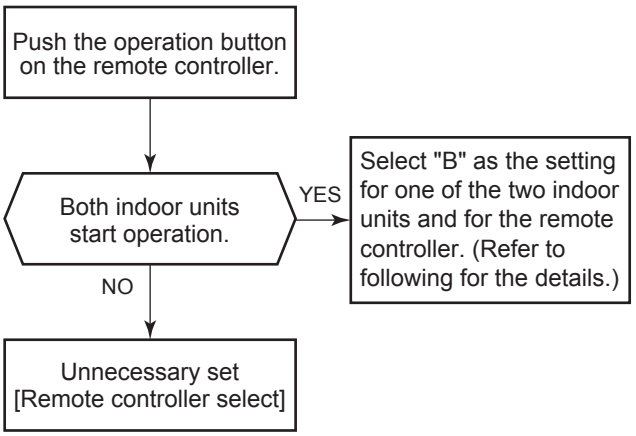
This operation is to operate only one indoor unit using one remote controller.

8-16-2. Description

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.

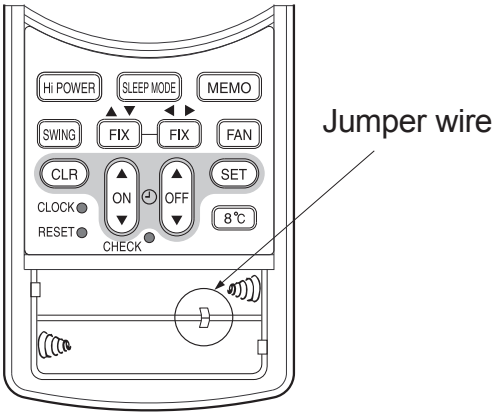
8-16-3. Operation

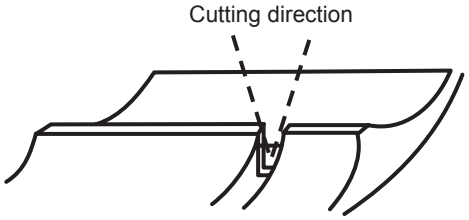
The indoor unit on which the remote controller selection has been set to B receives the signal of the remote controller also set to B.
(At the factory the remote controller selection is set to A on all the indoor units. There is no A setting display.)



8-16-4. Setting the Remote Controller

1) Slide and open the remote controller cover and remove the batteries.
2) Cut the jumper wire inside the battery compartment using nippers.





⚠ CAUTION

The jumper wire should not remain in contact after being cut. Also be careful not to let plastic scraps, jumper wire cuttings or other debris enter the inside of the remote controller.

3) Insert the batteries. “B” appears in the remote controller display.

NOTE

- Even after the jumper wire has been cut, switching between A and B is still possible by pushing the CHECK button and FIX button together.
  The A or B setting, which was switched by pushing the CHECK button and FIX (▲ ▼) button together, is restored to the setting established prior to the switching when the battery is replaced or the RESET button is pushed.
- When switching between settings “A” and “B”, always switch the indoor unit board and the remote controller as a pair.
  (Otherwise, the indoor unit will not accept the remote controller’s signals.)

4) Push the RESET button (Indoor unit) to start automatic operation.

5) Push the ⏻ button of the remote controller that was set in step 1 to stop the air conditioner. (This operation will change the setting to “B”.)
6) Check that the remote controller operates the indoor unit.

8-17. Set Temperature Correction

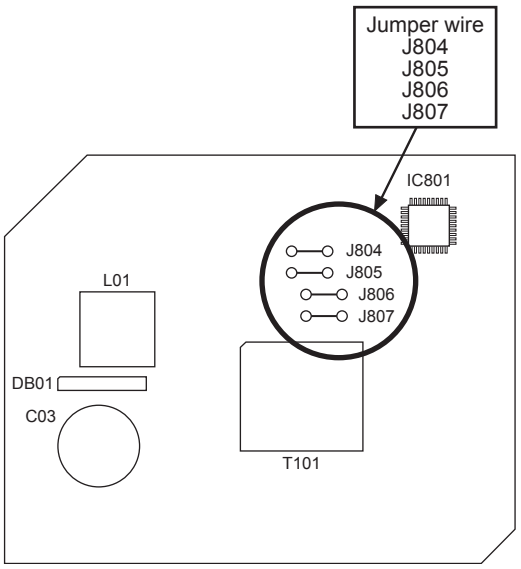
8-17-1. Purpose

When the difference between the set temp. of the remote controller and the room temp. is wide due to the installation condition, etc, the set temp. is corrected. (HEAT operation only)

8-17-2. Description

The set temp. received from the remote controller is corrected. The correct value from –2°C to +4°C is changed by the jumper wire on P.C. board of the indoor microcomputer.

Indoor Control P.C. Board (Factory Default)



In HEAT Operation

Jumper wire setup		HEAT shift value	
J804	J805		
×	×	–2	
×	○	+4	
○	×	+2	
○	○	0	← At shipment

○: With Jumper wire
×: Cut Jumper wire

In 8°C HEAT Operation (-ND model only)

Jumper wire setup		HEAT shift value	
J806	J807		
×	×	–2	
×	○	+4	
○	×	+2	
○	○	0	← At shipment

8-18. Outdoor Quiet Control

8-18-1. Purpose

For the users who concern about noise of the outdoor unit, this control controls the maximum revolutions of the compressor to reduce the noise.

8-18-2. Description

To reduce noise, [RESET] button of the indoor unit is kept pushed for 20 seconds.
The number of revolution for the indoor fan motor and the setup temp value are kept as they are.

With Quiet control/Non-select method

Select “Control” or “No control” by keeping [RESET] button pushed for 20 seconds.
(“No control” as the factory default)

↓

- Exchanging from “No control” to “Control”:
  Beep sound is heard and the operation LED 5Hz flashes for 5 seconds.
- Exchanging from “Control” to “No control”:
  Beep sound is heard.
  (Operation LED does not flash.)

8-18-3. Operation

As shown in the table, the maximum revolution number of compressor can be reduced.
As the maximum number of revolution of the compressor is restricted, the rise-up performance at the start time is weakened.

Maximum number of revolution of compressor at normal time and Quiet control time

	RAS-07PKVP-E RAS-07PKVP-ND		RAS-10PKVP-E RAS-10PKVP-ND		RAS-13PKVP-E RAS-13PKVP-ND	
	Normal time (rps)	Quite controlled (rps)	Normal time (rps)	Quite controlled (rps)	Normal time (rps)	Quite controlled (rps)
Cooling	46	40	57	49	75	59
Heating	80	70	93	72	92	72

	RAS-16PKVP-E RAS-16PKVP-ND		RAS-18PKVP-E RAS-18PKVP-ND	
	Normal time (rps)	Quite controlled (rps)	Normal time (rps)	Quite controlled (rps)
Cooling	88	69	100	80
Heating	98	77	100	80

8-19. 8°C HEAT Operation (-ND Model Only)

8-19-1. Start 8°C HEAT Operation When the Air Conditioner is Stopped

1) Pushing [8°C] button turns on the Operation lamp (Green) of the main unit is turned on and the HEAT operation of set temperature 8°C starts.

8-19-2. Start 8°C HEAT Operation When the Air Conditioner is Operating

1) Pushing [8°C] button shifts the operation to HEAT operation with set temperature 8°C.

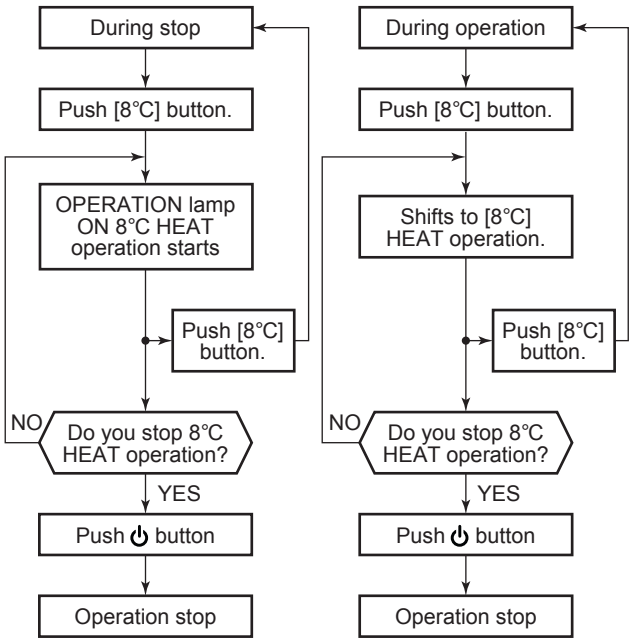
NOTE

- In case of COOL (including automatic cooling) or DRY operation, 8°C HEAT operation starts approx. 3 minutes after operation stop.
  In case of HEAT operation, the operation shifts to 8°C HEAT operation as it is.
- If the timer operation has been set up before 8°C HEAT operation, the setup is released when 8°C HEAT operation starts.
- When [8°C] button is pushed again during 8°C HEAT operation, the status returns to that before 8°C HEAT operation.
- When the operation shifts from 8°C HEAT operation to the normal HEAT operation, the cold draft preventive control works.
  Therefore the hot air may blow out after approx. 5 minutes.

8-19-3. Stop

1) Pushing ⏻ button stops the operation.

The air conditioner is controlled according to the room temperature 8°C as a standard.
The room temperature may be a little off the room temperature 8°C due to the room size or installation condition of the unit.

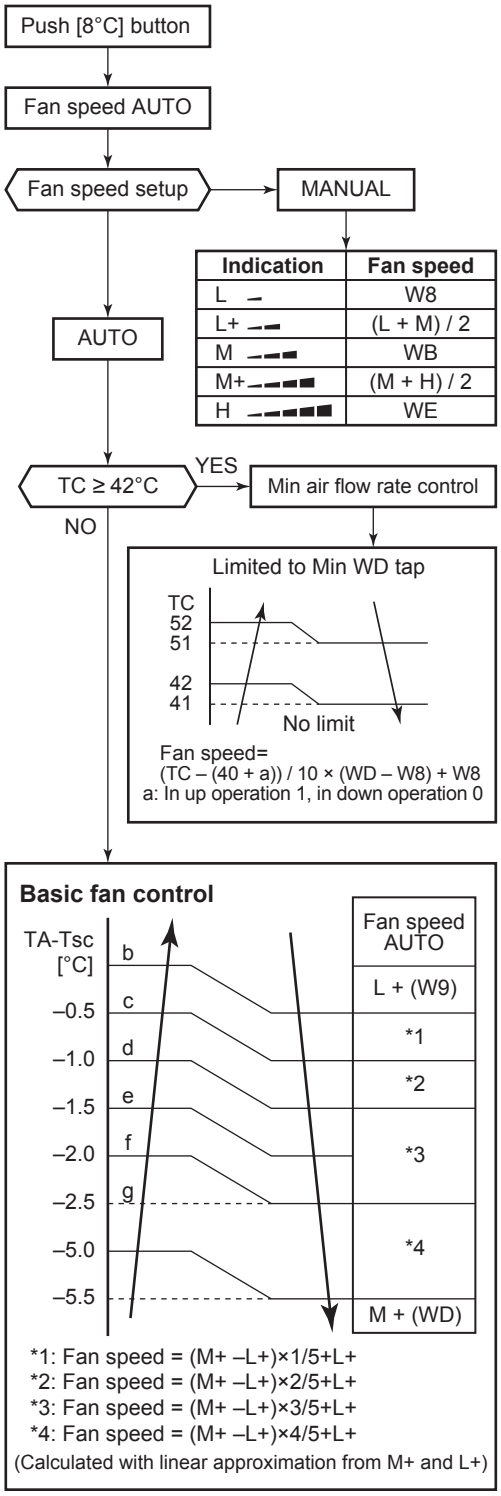


Contents of which setting can be changed during 8°C HEAT operation

- SWING (louver swing)
- FIX (louver position)
- FAN (fan speed)
- PURE (pure operation)
- TEMP. (temperature setting) : 5 to 13°C

8-19-4. Indoor Fan Control

When 8°C HEAT operation, the indoor fan control rises up automatically.
When the indoor fan is operated manually, it is matched with the fan tap. However the cold draft preventive control becomes invalid.



8-19-5. Compressor Speed Control

The compressor speed control is carried out according to **8-5.Capacity Control**.
Refer to **8-5.Capacity Control**.

8-20. Cord Heater Control (-ND Model Only)

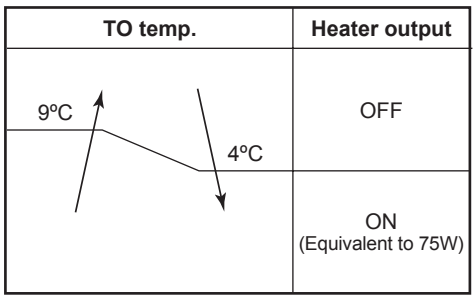
8-20-1. Purpose

Base plate freeze prevention of the outdoor unit.

8-20-2. Operation

As shown in the figure below, the base plate freeze preventive heater is controlled by temperature of the outside temperature sensor (TO).

Base plate cord heater control



When TO sensor is defective or the air conditioner is in cooling operation, heater output is turned off.

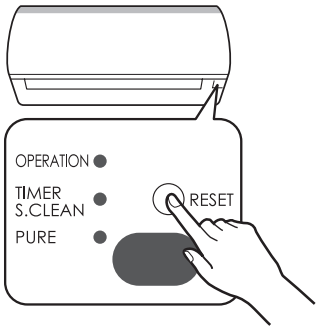
8-21. Auto Restart Function

This indoor unit is equipped with an automatic restarting function which allows the unit to restart operating with the set operating conditions in the event of a power supply being accidentally shut down.
The operation will resume without warning three minutes after power is restored.
This function is not set to work when shipped from the factory. Therefore it is necessary to set it to work.

8-21-1. Setting the Auto Restart Function

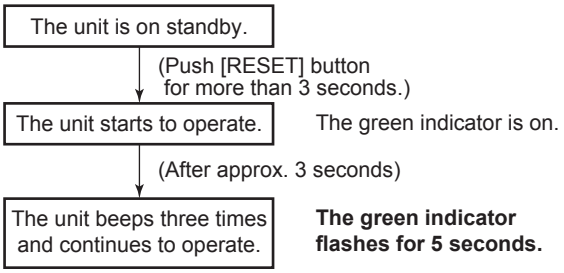
To set the auto restart function, proceed as follows:

1) The power supply to the unit must be on; the function will not set if the power is off.
2) Push the [RESET] button located in the centre of the front panel continuously for three seconds.
3) The unit receives the signal and beeps three times.
4) The unit then restarts operating automatically in the event of power supply being accidentally shut down.



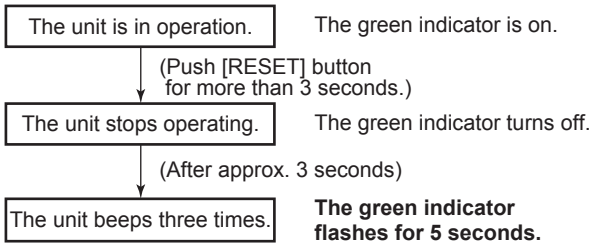
Push [RESET] button for more than three seconds. (Less than 10 seconds)

When the unit is stand-by (Not operating)



If the unit is not required to operate at this time, push [RESET] button once more or use the remote controller to turn it off.

When the unit is operating



If the unit is required to operate at this time, push [RESET] button once more or use the remote controller to turn it on.

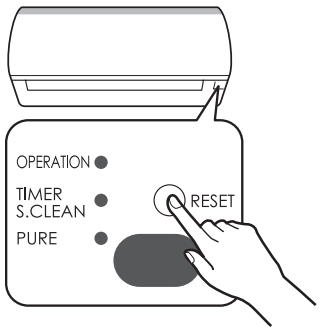
NOTE

- After restarting the air conditioner by the AUTO RESTART OPERATION, the louver swing (AUTO) operation doesn't resume.
- While the PURE indicator (Orange) is on, the RESET button has the function of air purifier reset button.

8-21-2. Cancelling the Auto Restart Function

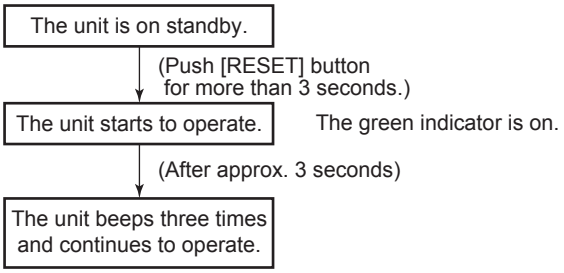
To cancel auto restart function, proceed as follows:

1) Repeat the setting procedure: the unit receives the signal and beeps three times.
2) The unit will be required to be turned on with the remote controller after the main power supply is turned off.



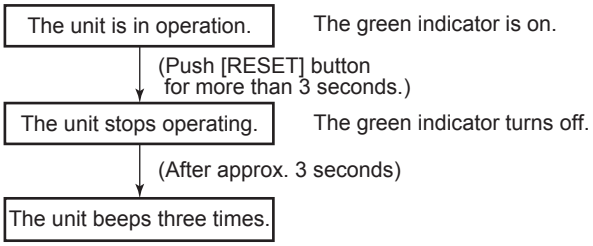
Push [RESET] button for more than three seconds. (Less than 10 seconds)

When the unit is stand-by (Not operating)



If the unit is not required to operate at this time, push [RESET] button once more or use the remote controller to turn it off.

When the unit is operating



If the unit is required to operate at this time, push [RESET] button once more or use the remote controller to turn it on.

8-21-3. Power Failure During Timer Operation

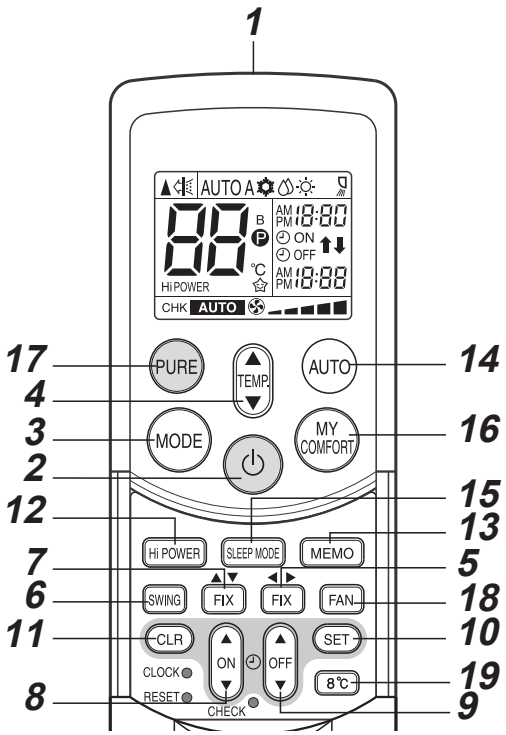
When the unit is turned off because of power failure during timer operation, the timer operation is cancelled. In that case, set the timer operation again.

NOTE

The Everyday Timer is reset while a command signal can be received from the remote controller even if it stopped due to a power failure.

8-22. Remote Controller and Its Functions

8-22-1. Parts Name of Remote Controller



1 Infrared signal transmitter

Transmits signals to the indoor unit.

2 ⏻ button

Press the button to start operation. (A receiving beep is heard.) Press the button again to stop operation. (A receiving beep is heard.)
If the receiving beep isn't heard from the indoor unit, press the button again.

3 Mode select button (MODE)

Press this button to select a mode. Each time you press the button, the modes cycle in order from A: Auto change over control, ☼: COOL, 💧: DRY, ☀: HEAT and back to A.
(A receiving beep is heard.)

4 Temperature button (TEMP)

▲ ... The temperature setting is raised to 30°C.
▼ ... The temperature setting is lowered to 17°C.
(A receiving beep is heard.)

5 Set horizontal air flow button (FIX)

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

6 Set vertical air flow button (FIX)

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

7 Auto louver button (SWING)

Each time you press the SWING button, you can change the swing mode. (A receiving beep is heard.)
(Vertical swing → Horizontal swing → Vertical and Horizontal swing → Stop swinging)
Press the button again to stop the swinging mode. (A receiving beep is heard.)

8 ON timer button (ON)

Use this button to change the clock and ON timer times.

To move up the time, press ▲ of the ON button.

To move down the time, press ▼ of the ON button.

9 OFF timer button (OFF)

Use this button to change the OFF timer times.

To move up the time, press ▲ of the OFF button.

To move down the time, press ▼ of the OFF button.

10 Reserve button (SET)

Press this button to store the time settings. (A receiving beep is heard.)

11 Cancel button (CLR)

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

12 High power button (Hi POWER)

Press this button to start high power operation.

13 Memory button (MEMO)

Press this button to ready for storing the settings.
Hold down the button for 3 seconds or more to store the Ⓟ mark is displayed.

14 Automatic operation button (AUTO)

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

15 SLEEP MODE button

Press this button to start sleep mode.

16 MY COMFORT button

Press this button to operate the air conditioner according to the settings stored using the MEMO button.

17 PURE button (PURE)

Press this button to start the electrical air purifying operation.
Press the button again to stop operation.

18 Fan speed button (FAN)

Press this button to select the 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 from five available settings.
(LOW ▁ , LOW+ ▁▂ , MED ▁▂▃ , MED+ ▁▂▃▄ , HIGH ▁▂▃▄▅)(A receiving beep is heard.)

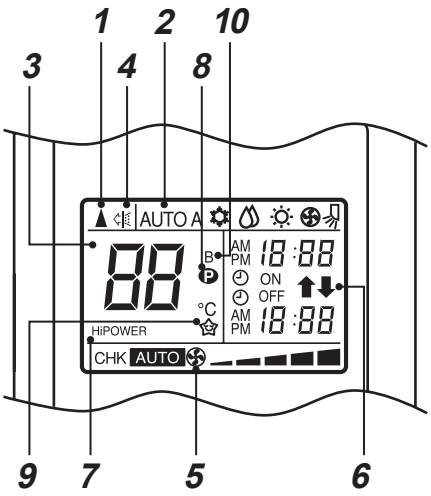
19 8°C operation button (8°C)

Press this button to start the 8°C set temperature heating operation. (RAS-***-ND model only)

8-22-2. Name and Functions of Indications on Remote Controller

Display

All indications, except for the clock time indicator, are displayed by pushing the ⏻ button.



- In the illustration, all indications are shown for purposes of explanation.
  During operation, only the relevant indicators are shown on the remote controller.

1 Transmission mark

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

2 Mode indicator

Indicates the current operation mode.

- Heat pump models
  (AUTO : Automatic control, A : Auto change over control, ☼ : Cool, 💧: Dry, ☼ : Heat)

3 Temperature indicator

Indicates the temperature setting. (17°C to 30°C)

4 PURE indicator

Shows that the electrical air purifying operation is in progress.

5 FAN speed indicator

Indicates the selected fan speed. AUTO or five fan speed levels (LOW ▁ , LOW+ ▁▂ , MED ▁▂▃ , MED+ ▁▂▃▄ , HIGH ▁▂▃▄▅) can be shown.
Indicates AUTO when the operating mode is either AUTO or : Dry.

6 TIMER and clock time indicator

The time setting for timer operation or the clock time is indicated.
The current time is always indicated except during TIMER operation.

7 Hi POWER indicator

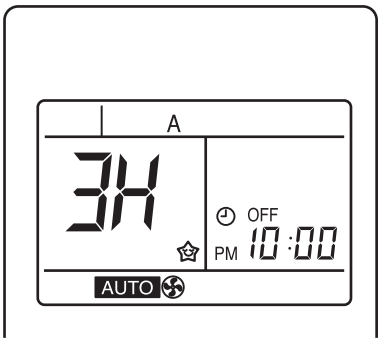
Indicates when Hi POWER operation starts.
Press the Hi POWER button to start and press it again to stop operation.

8 Ⓟ (MEMORY) indicator

Flashes for 3 seconds when the MEMO button is pressed during operation.
The Ⓟ mark is shown when holding down the button for 3 seconds or more while the mark is flashing.
Press another button to turn off the mark.

9 SLEEP MODE indicator

Indicates when the SLEEP MODE is activated.
Press the SLEEP MODE button to start and press it again to stop operation.



10 A, B change indicator remote controller

- When the remote controller switching function is set, “B” appears in the remote controller display. (When the remote controller setting is “A”, there is no indication at this position.)

NOTE

Remote controller switching function

- If two indoor units are installed in the same room or adjoining rooms, both units may start and stop at the same time when the remote controller is operated. This can be prevented by setting the switching function so that each indoor unit is operated only by the corresponding remote controller.
- To use the remote controller switching function, refer to 8-16.

8-23. Hi POWER Mode

When [Hi POWER] button is pushed while the indoor unit is in Auto, Cooling or Heating operation, Hi POWER mark is indicated on the display of the remote controller and the unit operates according to the present operation mode as described below.

8-23-1. In Automatic Operation

The preset temperature changes according to the operation mode selected.
In the Cooling operation, the preset temperature drops by 1°C.
In the Heating operation, the preset temperature increases by 2°C.

8-23-2. In Cooling Operation (Manual)

The preset temperature drops by 1°C.
(The value of the preset temperature on the remote controller does not change.)

8-23-3. In Heating operation (Manual)

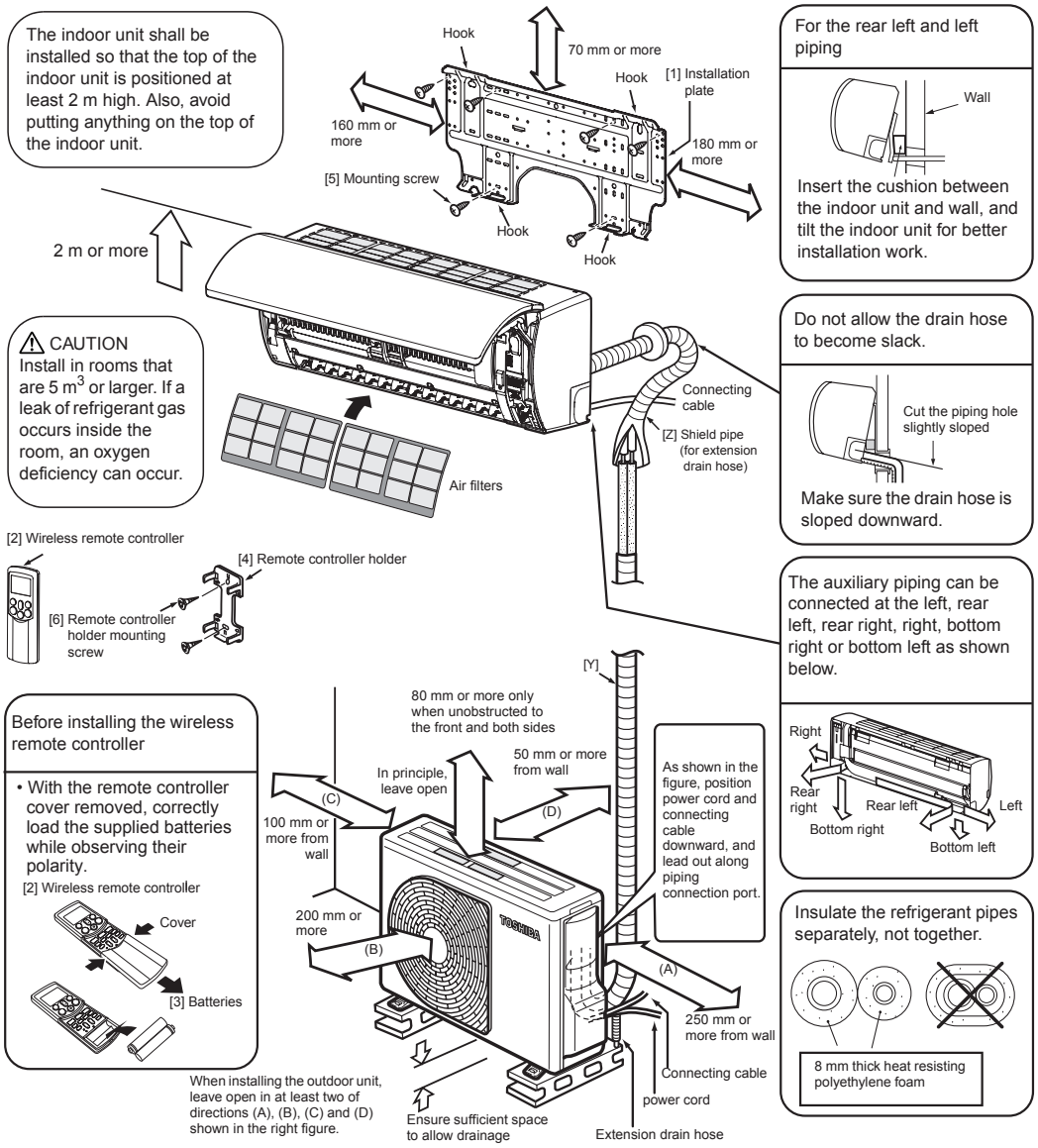
The preset temperature increases by 2°C.
(The value of the preset temperature on the remote controller does not change.)

NOTE

- **The Hi POWER mode can not be set in Dry operation**
- **Release of Hi POWER mode:**
  Push [Hi POWER] button on the remote controller again.

9 INSTALLATION PROCEDURE

9-1. Installation Diagram of Indoor and Outdoor Uunits



- If the system will be used in cooling mode when the outdoor temperature is below zero, take measures to ensure that the drain water does not freeze.
- When the outdoor unit is installed in a place that is always exposed to strong winds like on the coast or on a high story of a building, secure the normal fan operation using a duct or a wind shield.

NOTE

(RAS-***-ND model only)

- Use care to avoid burns. A heater is installed on the base plate of the outdoor unit. When the outside air temperature is low, the heater runs to warm the base plate even if the unit is not operating so that snow does not accumulate inside the outdoor unit.
- Do not use the supplied drain nipple for draining water. Drain the water from all the drain holes directly. Provide a space of at least 50 cm under the outdoor unit so that the draining water does not freeze and block the drain holes.

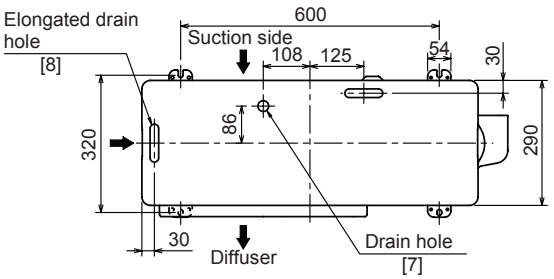
9-2. Optional Parts, Accessories and Tools

9-2-1. Optional Installation Parts

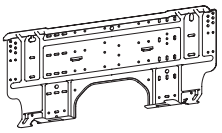
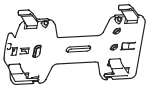
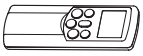
Part Code	Parts name			Q'ty
[Y]	Refrigerant piping			1 ea.
	Indoor unit name	Liquid side (Outer diameter)	Gas side (Outer diameter)	
	RAS-07PKVP-E, RAS-07PKVP-ND RAS-10PKVP-E, RAS-10PKVP-ND RAS-13PKVP-E, RAS-13PKVP-ND	6.35 mm	9.52 mm	
	RAS-16PKVP-E, RAS-16PKVP-ND RAS-18PKVP-E, RAS-18PKVP-ND	6.35 mm	12.7 mm	
[Z]	Shield pipe (for extension drain hose) (polyethylene foam, 8 mm thick)			1

Attachment bolt arrangement of outdoor unit

- Secure the outdoor unit with the attachment bolts and nuts if the unit is likely to be exposed to a strong wind.
- Use dia. 8 mm or dia. 10 mm anchor bolts and nuts.
- If it is necessary to drain the defrost water, attach drain nipple to the base plate of the outdoor unit before installing it.



9-2-2. Accessory and Installation Parts

Part No.	Part name (Q'ty)	Part No.	Part name (Q'ty)	Part No.	Part name (Q'ty)
[1]	 Installation plate × 1	[4]	 Remote controller holder × 1	[7]	 Drain nipple* × 1
[2]	 Wireless remote controller × 1	[5]	 Mounting screw Ø4 × 25L × 7	[8]	 Water-proof rubber cap* × 2
[3]	 Battery × 2	[6]	 Remote controller holder mounting screw Ø3.1 × 16L × 2		

Parts marked with asterisk (*) are packaged with the outdoor unit.

Others

Name
Owner's manual
Installation manual
Important information and warning*
B/W strips (Energy efficiency labels)

This model is not equipped with an extension drain hose.

- For the extension drain hose, use a commercially available one.

9-2-3. Installation/Service Tools

Changes in the product and components

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

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

New tools for R410A

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

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

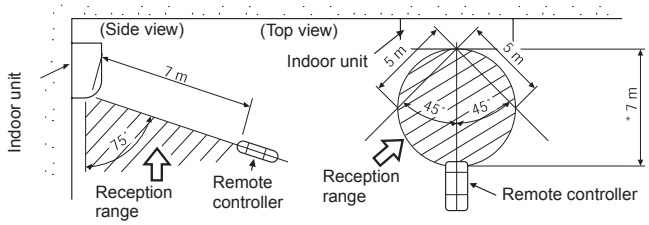
9-3. Installation of Indoor Unit

9-3-1. Installation Location

- A place which provides enough space around the indoor unit as shown in the diagram.
- A place where there are no obstacles near the air inlet and outlet.
- A place which allows easy installation of the piping to the outdoor unit.
- A place which allows the front panel to be opened.
- The indoor unit shall be installed so that the top of the indoor unit is positioned at least two m high.
  Also, avoid putting anything on the top of the indoor unit.

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 1 m away from the nearest TV set or stereo equipment. (This is necessary to prevent image disturbance or noise interference.)
- Do not install near high-frequency devices or wireless devices.
- The location of the remote controller should be determined as shown below.

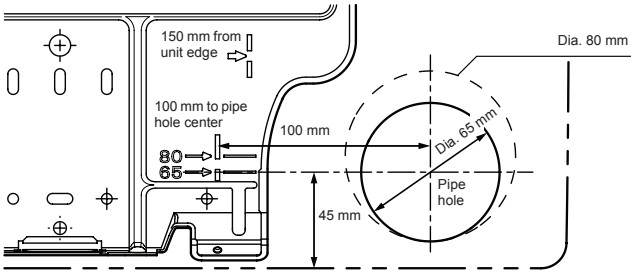


*: Axial distance

9-3-2. Drilling and Mounting Installation Plate

Drilling

When installing the refrigerant pipes from the rear.



1) Decide the installation plate mounting position on the wall.
2) Mark the corresponding pipe hole wall positions according to the positioning marks (⇨) on the installation plate.
3) Drill the pipe holes (Dia. 65 mm or Dia. 80 mm) slightly slanted downward to the outside.

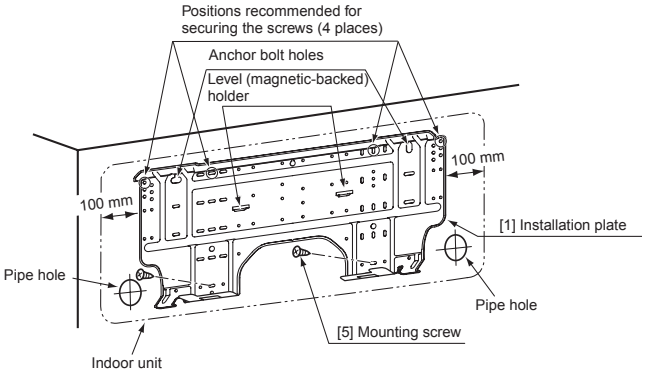
NOTE

- When drilling into a wall that contains a metal lath, wire lath or metal plate, be sure to use a pipe hole brim ring sold separately.
- The unit is designed to enable installation using holes of 65 mm in diameter. However, if installation is difficult, make holes that are 80 mm in diameter.

⚠ CAUTION

Completely fill in the gaps in the pipe holes with noncombustible material (such as putty) to prevent condensation and fire in the casing.

Mounting the installation plate

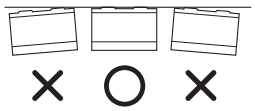


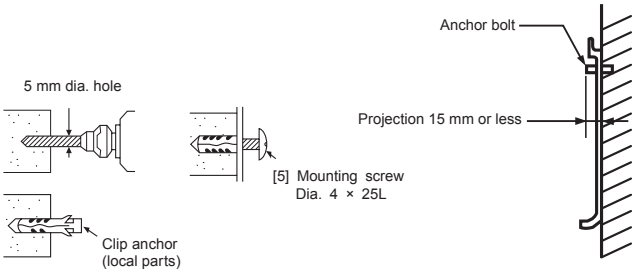
Mounting the installation plate directly on a wall

1) Securely fit the installation plate onto the wall by screws with the upper and lower catches.
2) To mount the installation plate on a concrete wall use anchor bolts. Drill the anchor bolt holes as illustrated in the above figure.
3) Place the level at the top end of the installation plate, and check that the plate is horizontal.

⚠ CAUTION

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





⚠ CAUTION

Failure to securely install the unit may result in personal injury and/or property damage if the unit falls.

- In case of block, brick, concrete or similar type walls, drill 5 mm dia. holes in the wall.
- Insert clip anchors for the [5] mounting screws.

NOTE

Install the installation plate using between 4 to 6 mounting screws, making sure all four corners are secure.

9-3-3. Electrical Work

- The supply voltage must be the same as the rated voltage of the air conditioner.
- Prepare a power source for the exclusive use of the air conditioner.

NOTE

- Wire type: H07RN-F or 60245IEC66 (1.0 mm^2)
- Make sure the wire length is sufficient before performing wiring work.

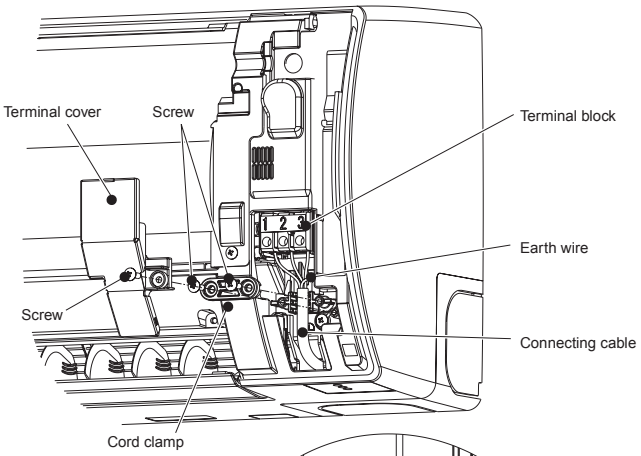
9-3-4. Wiring Connection

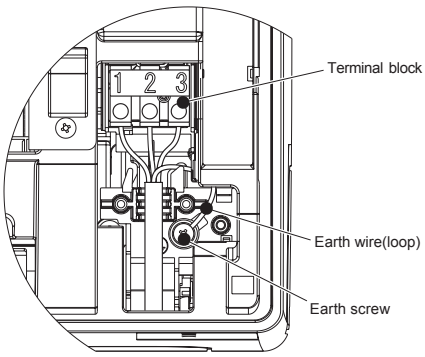
Connecting cable (Wiring the connecting cable can be carried out without removing the front panel.)

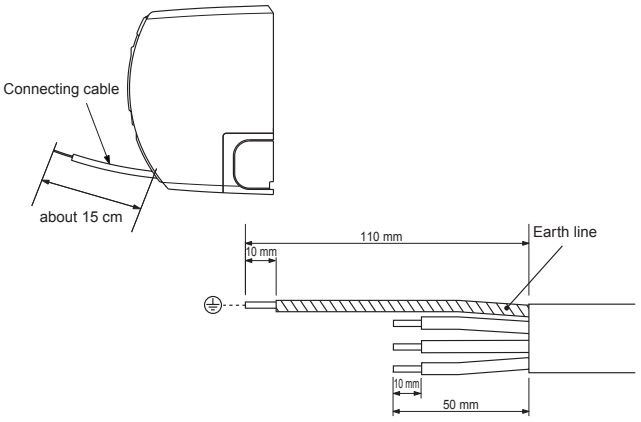
1) Pull the handles on the bottom of the right and left sides, and open the moving panel until it is horizontal.
2) Remove the terminal cover and cord clamp.
3) Insert the connecting cable (or as according to local regulations/codes) into the pipe hole on the wall.
4) Pull the connecting cable through the cable slot on the rear panel so that it protrudes about 15 cm out of the front.
5) Insert the connecting cable fully into the terminal block and secure it tightly with screws. Make a loop with the earth wire under the terminal block and secure it with the earth screw.
6) Tightening torque: 1.2 N·m (0.12 kgf·m)
7) Secure the connecting cable with the cord clamp.
8) Attach the terminal cover and moving panel on the indoor unit.

⚠ CAUTION

- Be sure to refer to the wiring system diagram labelled inside the front panel.
- Check local electrical regulations for any specific wiring instructions or limitations.







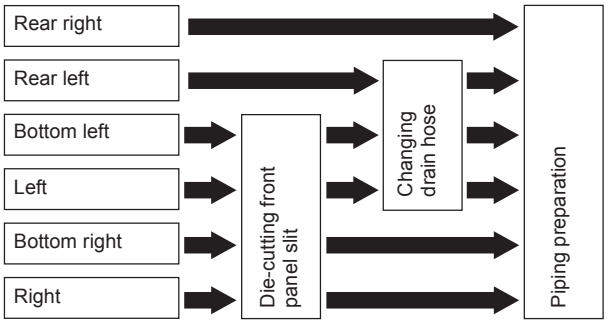
NOTE

- Connecting cable (Indoor unit/outdoor unit)
- Wire type: H07RN-F or 60245IEC66 (1.0 mm^2)

9-3-5. Piping and Drain Hose Installation

Piping and drain hose forming

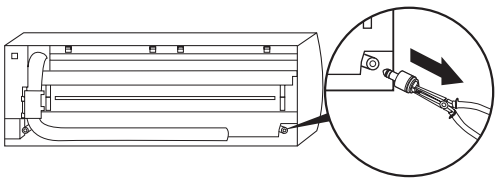
Since condensation results in machine trouble, make sure to insulate both the connecting pipes separately. (Use polyethylene foam as insulating material.)



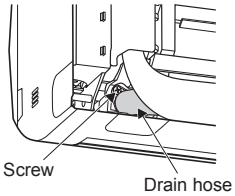
Relocating drain hose

For left connection, left-bottom connection and rear-left connection's piping, it is necessary to relocate the drain hose and drain cap.

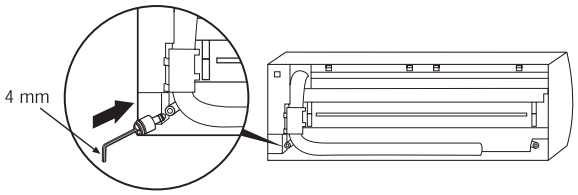
1) Cutting front panel slit.
   Cut out the slit on the left or right side of the front panel for the left or right connection and the slit on the bottom left or right side of the front panel for the bottom left or right connection with a pair of nippers.
2) Remove the drain cap
   Clamp drain cap with needle-nose pliers, and pull out.



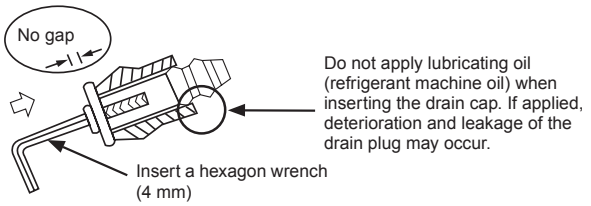
3) Remove the drain horse
   The drain hose is secured in place by a screw. Remove the screw securing the drain hose, then pull out the drain hose.



4) Attach the drain cap
   Insert hexagonal wrench (4 mm).



5) Firmly insert drain cap.



6) Attach the drain hose
   Insert the drain hose firmly until the connector contacts the insulation, then secure it in place using the original screw.

NOTE

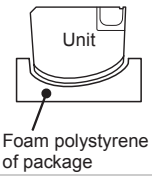
Always use the original screw that secured the drain hose to the unit. Using a different screw may cause water to leak.

⚠ CAUTION

Securely insert the drain hose and drain cap; otherwise, water may leak.

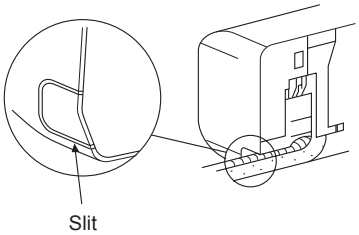
NOTE

The packaged foam polystyrene can be used to make replacement of the drain cap and drain hose easier.



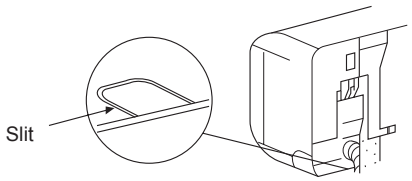
Piping on the right side or the left side

1) After making slits on the front panel with a knife or similar tool, cut them out with a pair of nippers or an equivalent tool.



Piping on the bottom right or the bottom left

1) After making slits on the front panel with a knife or similar tool, cut them out with a pair of nippers or an equivalent tool.



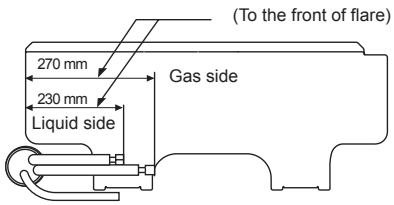
Left-hand connection with piping

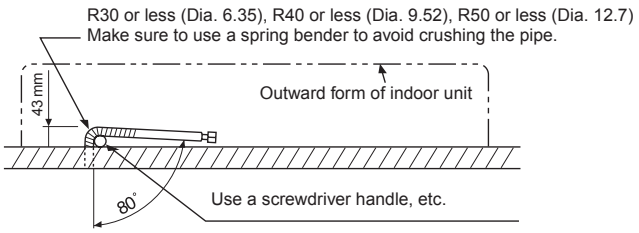
1) Bend the connecting pipes so that they are positioned within 43 mm above the wall surface. If the connecting pipes are positioned more than 43 mm above the wall surface, the indoor unit may be unstable. When bending the connecting pipe, make sure to use a spring bender to avoid crushing the pipe.

Refer to the table below for the bending radius of each connection pipe.

Outer diameter	Bending radius
6.35 mm	30 mm
9.52 mm	40 mm
12.7 mm	50 mm

Connecting the pipe after installation of the unit (figure)



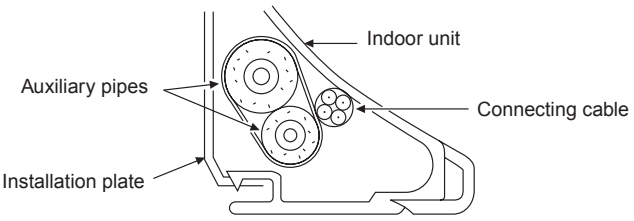


NOTE

If the pipe is incorrectly bent, the indoor unit may be unstable on the wall.
After passing the connecting pipe through the pipe hole, connect the connecting pipe to the auxiliary pipes and wrap the facing tape around them.

⚠ CAUTION

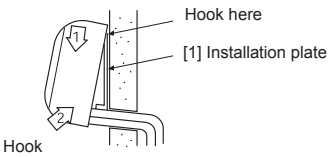
- Bind the auxiliary pipes (two) and connecting cable with facing tape tightly. In case of leftward piping and rear-leftward piping, bind the auxiliary pipes (two) only with facing tape.



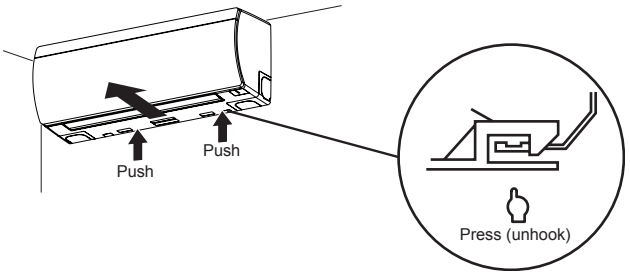
- Carefully arrange the pipes so that none of the pipes stick out of the rear plate of the indoor unit.
- Carefully connect the auxiliary pipes and connecting pipes to each other and cut off the insulating tape wound on the connecting pipe to avoid double-taping at the joint, moreover, seal the joint with the vinyl tape, etc.
- Since condensation can result in machine performance trouble, be sure to insulate both connecting pipes. (Use polyethylene foam as insulating material.)
- When bending a pipe, be careful not to crush it.

9-3-6. Indoor Unit Installation

1) Pass the pipe through the hole in the wall, and hook the indoor unit on the installation plate at the upper hooks.
2) Swing the indoor unit to right and left to confirm that it is firmly hooked on the installation plate.
3) While pressing the indoor unit onto the wall, hook it at the lower part on the installation plate. Pull the indoor unit toward you to confirm that it is firmly hooked on the installation plate.4. Pull the connecting cable through the cable slot on the rear panel so that it protrudes about 15 cm out of the front.



- For detaching the indoor unit from the installation plate pull the indoor unit toward you while pushing the bottom up at the specified places.

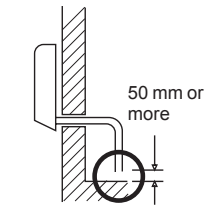


9-3-7. Drainage

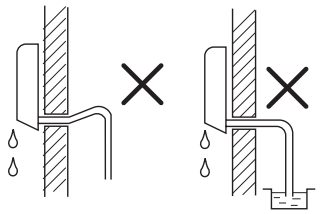
1) Run the drain hose at a downward sloped angle.

NOTE

Hole should be made at a slight downward slant on the outdoor side.

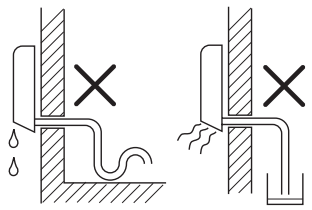


Do not route the drain hose upwards.



Do not put the drain hose end into water.

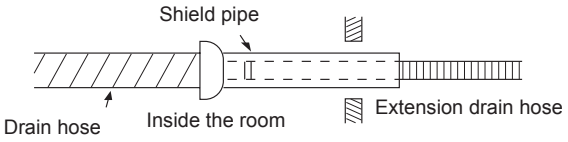
Do not form the drain hose into a waved shape.



Do not put the drain hose end in a drainage ditch.

2) Put water in the drain pan and make sure that the water is being drained outside.

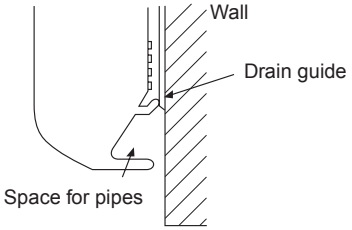
3) When connecting extension drain hose, insulate the connection part of extension drain hose with shield pipe.



⚠ CAUTION

Install the drain pipe for proper drainage. Improper drainage can result in water dripping inside the room.

This air conditioner has been designed to drain water collected from condensation which forms on the back of the indoor unit, to the drain pan.
Therefore, do not locate the power cord and other parts at a height above the drain guide.



9-4. Installation of Outdoor Unit

9-4-1. Installation Location

- A place which provides enough space around the outdoor unit as shown in the diagram.
- A place which can bear the weight of the outdoor unit and does not allow an increase in noise level and vibration.
- A place where the operation noise and discharged air do not disturb neighbours.
- A place which is not exposed to a strong wind.
- A place free of combustible gases.
- A place which does not block a passageway.
- When the outdoor unit is to be installed in an elevated position, be sure to secure its feet.
- An allowable height level is up to 10 m.
- A place where the drain water does not cause any problems.
- This air conditioner accepts a connection piping length from 2 m to 20 m.

NOTE

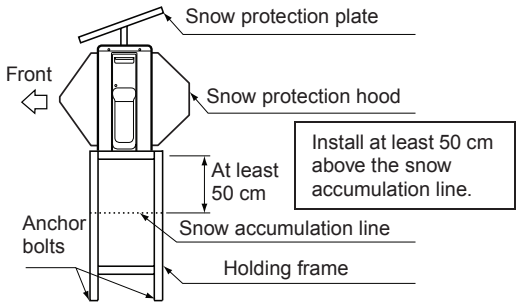
- There is no need to add refrigerant as long as the length of the connection piping is 15 m or less.
- You will need to add 20 g of refrigerant per meter of added connection piping for installations requiring connection piping to be between 15 m to 20 m.

Precautions for Adding Refrigerant

- Use a scale having at least 10 g per index line precision when adding the refrigerant. Do not use a bathroom scale or similar instrument.
- Use liquid refrigerant when refilling the refrigerant. Since the refrigerant is in liquid form, it can fill quickly. Therefore, perform the filling operation carefully and insert the refrigerant gradually.

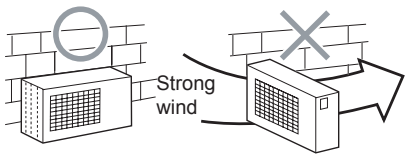
9-4-2. Precautions about Installation in Regions with Snowfall and Cold Temperatures

- Do not use the supplied drain nipple for draining water. Drain the water from all the drain holes directly.
- To protect the outdoor unit from snow accumulation, install a holding frame, and attach a snow protection hood and plate.
- Do not use a double-stacked design.



⚠ CAUTION

- Install the outdoor unit in a location where there are no obstructions near its air intake or air outlet.
- When the outdoor unit is installed in a place that is always exposed to strong winds like on the coast or on a high story of a building, secure the normal fan operation using a duct or a wind shield.
- Especially in windy areas, install the unit to prevent the admission of wind.
- Installation in the following places may result in trouble. Do not install the unit in such places.
  - A place full of machine oil.
  - A saline-place such as the coast.
  - A place full of sulfide gas.
  - A place where high-frequency waves are likely to be generated, such as from audio equipment, welders, and medical equipment.

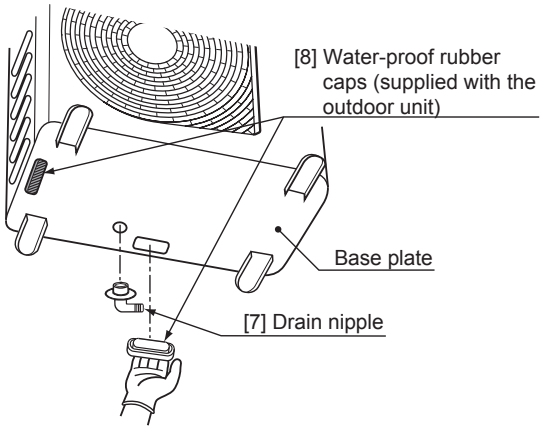


9-4-3. Draining the water

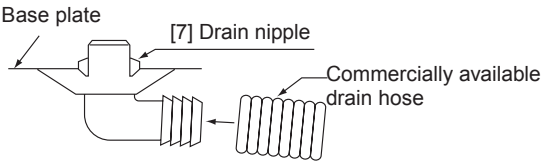
Holes are provided on the base plate of the outdoor unit to ensure that the defrost water produced during heating operations is drained off efficiently. If a centralized drain is required when installing the unit on a balcony or wall, follow the steps below to drain off the water.

1) Proceed with water-proofing by installing the water-proof rubber caps [8] in the 2 elongated holes on the base plate of the outdoor unit.
2) Install the water-proof rubber caps
   Place four fingers into each cap, and insert the caps into the water drain holes by pushing them into place from the underside of the base plate.
3) Press down on the outer circumferences of the caps to ensure that they have been inserted tightly.
   (Water leaks may result if the caps have not been inserted properly, if their outer circumferences lift up or the caps catch on or wedge against something.)

4) When water still leaks even after performing steps 1) and 2), add caulking material, putty or other sealants.



5) Install the drain nipple [7] and a commercially available drain hose (with 16 mm inside diameter), and drain off the water.
(For the position where the drain nipple g is installed, refer to the installation diagram of the indoor and outdoor units.)
6) Check that the outdoor unit is horizontal, and route the drain hose at a downward sloped angle with very little slack to the hose.



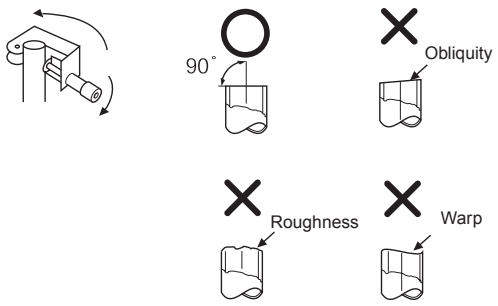
⚠ CAUTION

Do not use ordinary garden hose, which can flatten and prevent drainage.

9-4-4. Refrigerant Piping Connection

Flaring

1) Cut the pipe with a pipe cutter.



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

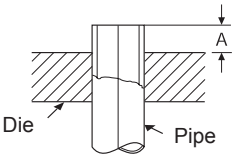
Projection margin in flaring: A (Unit: mm)

Rigid (Clutch type)

Outer diameter of copper pipe	R410A tool used	Conventional tool used
6.35	0 to 0.5	1.0 to 1.5
9.52	0 to 0.5	1.0 to 1.5
12.7	0 to 0.5	1.0 to 1.5

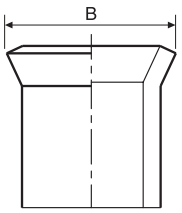
Imperial (Wing nut type)

R410A tool used	Conventional tool used
0 to 0.5	1.0 to 1.5
0 to 0.5	1.0 to 1.5
0 to 0.5	1.0 to 1.5



Flaring size : B (Unit : mm)

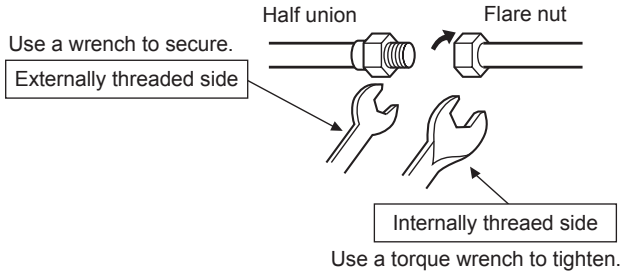
Outer diameter of copper pipe	B $^{+0}_{-0.4}$	
	R410A	R22
6.35	9.1	9.0
9.52	13.2	13.0
12.7	16.6	16.2



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

Tighten the connection

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

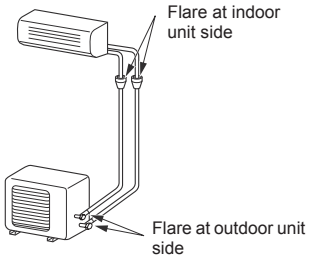


⚠ CAUTION

Do not apply excessive force. Otherwise, the nut may break.

(Unit: N·m)

Outer diameter of copper pipe	Tightening torque
Dia. 6.35 mm	14 to 18 (1.4 to 1.8 kgf·m)
Dia. 9.52 mm	33 to 42 (3.3 to 4.2 kgf·m
Dia. 12.7 mm	50 to 62 (5.0 to 6.2 kgf·m)



Tightening torque for connection of flare pipe

The pressure of R410A is higher than R22. (Approx. 1.6 times.) Therefore securely tighten the flare pipes which connect the outdoor unit and the indoor unit with the specified tightening torque using a torque wrench. If any flare pipe is incorrectly connected, it may cause not only a gas leakage but also trouble in the refrigeration cycle.

9-4-5. Evacuating

After the piping has been connected to the indoor unit, perform vacuuming.

NOTE

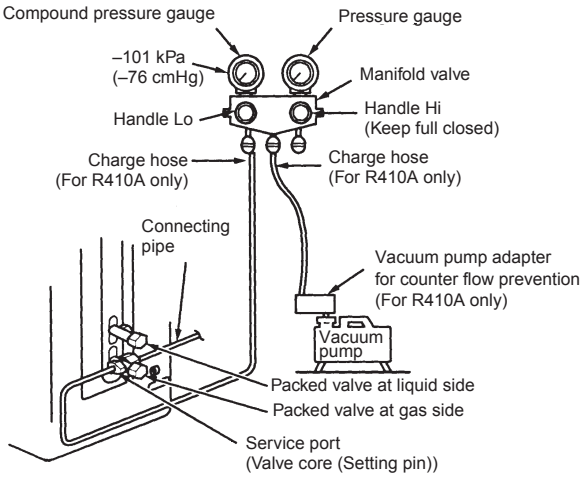
AIR PURGE

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

Using a vacuum pump

Be sure to use a vacuum pump with counter-flow prevention function so that oil inside the pump does not flow back into the air conditioner pipes when the pump stops. (If oil inside the vacuum pump enters the air conditioner circuit which uses R410A, trouble with the refrigeration system may develop.)

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 the vacuum pump.
3) Open fully the low pressure side handle of the gauge manifold valve.
4) Operate the vacuum pump to begin evacuating. Perform evacuating for about 15 minutes if the piping length is 20 meters (15 minutes for 20 meters) (assuming a pump capacity of 27 litres per minute). Confirm that the compound pressure gauge reading is –101 kPa (–76 cmHg).
5) Close the low pressure 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.



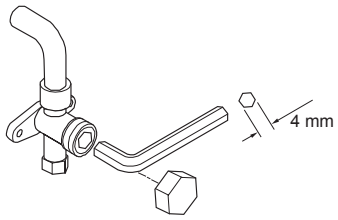
⚠ CAUTION

IMPORTANT POINTS FOR PIPING WORK
- Prevent dust and moisture from entering the pipes.
- Tighten connections carefully (between pipes and unit).
- Evacuate the air in the connecting pipes using a VACUUM PUMP.
- Check for gas leaks at all connections.

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 with torque in the following table:

Gas side (Dia. 12.7 mm)	33 to 42 N·m (3.3 to 4.2 kgf·m)
Gas side (Dia. 9.52 mm)	33 to 42 N·m (3.3 to 4.2 kgf·m)
Liquid side (Dia. 6.35 mm)	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)



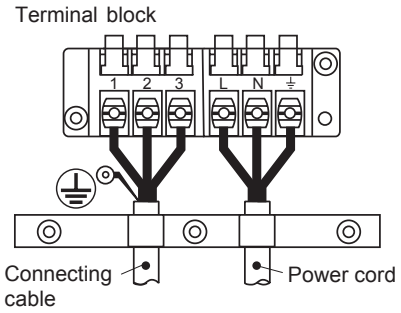
NOTE

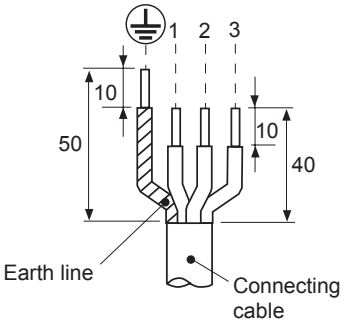
Hexagon wrench is required.

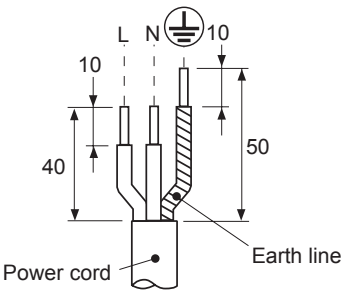
9-4-6. Wiring Connection

1) Remove the valve cover, the electric parts cover and the cord clamp from the outdoor unit.
2) Connect the connecting cable to the terminal as identified by the matching numbers on the terminal block of indoor and outdoor unit.
3) Insert the power cord and the connecting cable fully into the terminal block and secure it tightly with screws.
4) Use vinyl tape, etc. to insulate the cords which are not going to be used. Locate them so that they do not touch any electrical or metal parts.
5) Secure the power cord and the connecting cable with the cord clamp.
6) Attach the electric parts cover and the valve cover on the outdoor unit.

Stripping length of connecting cable







Model	RAS-07PKVP-E RAS-07PKVP-ND	RAS-10PKVP-E RAS-10PKVP-ND	RAS-13PKVP-E RAS-13PKVP-ND
Power source	220–240 V ~50 Hz 220–230 V ~60 Hz		
Maximum running current	9.5 A		
Installation fuse rating	16 A breaker or fuse (all types can be used)		
Power cord	H07RN-F or 60245IEC66 (1.5 mm^2)		
Connecting cable	Wire type: H07RN-F or 60245IEC66 (1.0 mm^2)		

Model	RAS-16PKVP-E RAS-16PKVP-ND	RAS-18PKVP-E RAS-18PKVP-ND
Power source	220–240 V ~50 Hz 220–230 V ~60 Hz	
Maximum running current	9.5 A	
Installation fuse rating	16 A breaker or fuse (all types can be used)	
Power cord	H07RN-F or 60245IEC66 (1.5 mm^2)	
Connecting cable	Wire type: H07RN-F or 60245IEC66 (1.0 mm^2)	

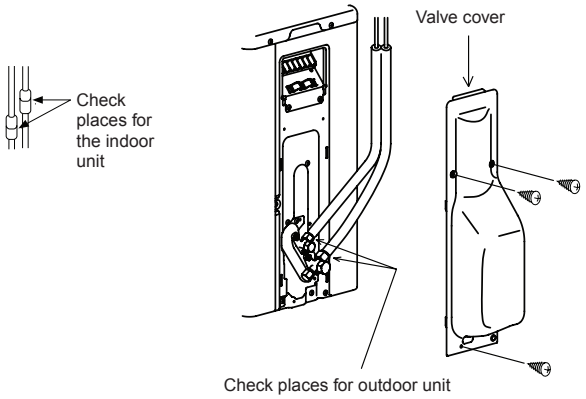
⚠ CAUTION

- Incorrect wiring connection may cause electrical parts to burn out.
- Be sure to comply with local regulations/codes when running the wire from outdoor unit to indoor unit. (Size of wire and wiring method etc.)
- Every wire must be securely connected.
- If incorrect or incomplete wiring is carried out, fire or smoke may result.
- Prepare the power supply for the exclusive use of the air conditioner.

9-5. Test Operation

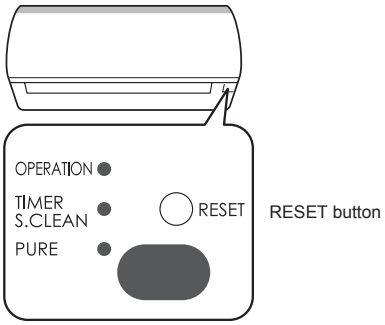
9-5-1. Gas Leak Test

Check the flare nut connections for gas leaks with a gas leak detector and/or soapy water.



9-5-2. Test Operation

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



9-5-3. Setting the Auto Restart

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

NOTE

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

1) Press and hold the RESET button for about 3 seconds. After 3 seconds, three short electric beeps will be heard to inform you that the Auto Restart has been selected.
2) To cancel the Auto Restart, follow the steps described in the section Auto Restart Function of the Owner's Manual.

9-5-4. Select Switch on Remote Controller

- 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 is not accepted.

Setting the remote controller

1) Slide open the remote controller cover and remove the batteries.
2) Cut the jumper wire inside the battery compartment using nippers.

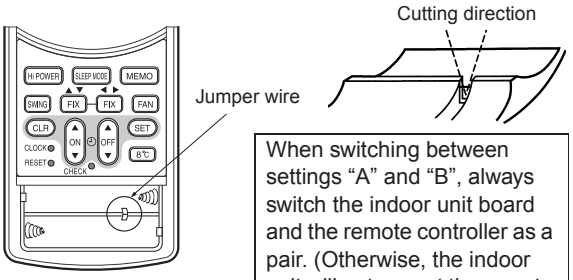
NOTE

The jumper wire should not remain in contact after being cut. Also, be careful not to let plastic scraps, jumper wire cuttings or other debris enter the inside of the remote controller.

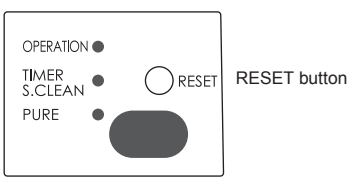
3) Insert the batteries. “B” appears in the remote controller display.

Setting the unit

1) Press the RESET button to start automatic operation.
2) Press the ⏻ button of the remote controller that was set in step 1 to stop the air conditioner. (This operation will change the setting to “B”.)
3) Check that the remote controller operates the indoor unit.



When switching between settings “A” and “B”, always switch the indoor unit board and the remote controller as a pair. (Otherwise, the indoor unit will not accept the remote controller’s signals.)



9-6. Removing the Main Parts

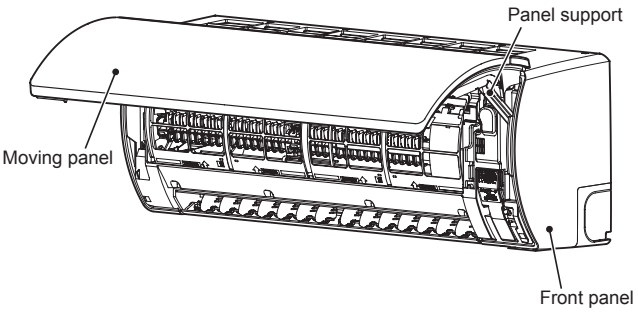
Normally, the front panel, moving panel, and air flow louvres do not need to be removed. However, use the procedure below if removal of these parts is necessary.

⚠ CAUTION

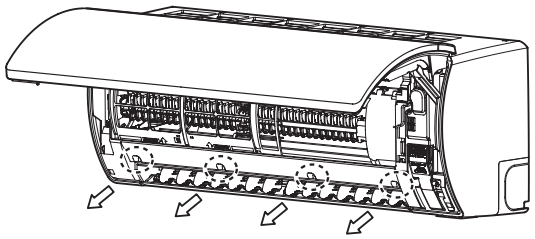
Before removing the front panel, moving panel, or air flow louvres, be sure to stop operation of the air conditioner and unplug the power supply.

9-6-1. Removing the Front Panel and Moving Panel

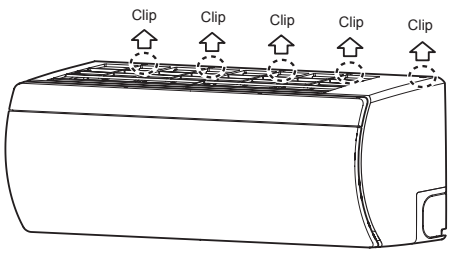
1) Open the moving panel, and support the moving panel by the panel support on the right side.



2) Remove the four set screws on the front panel.

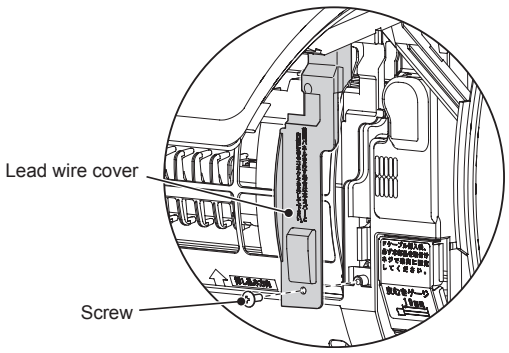


3) Insert your thumb into the air outlet bottom section, and lift up the front panel bottom.
4) Close the moving panel to remove the clips on the top side as shown below.
Press your finger down on the clip on the front panel top, and lift up the panel back edge so that the clip is released (5 locations).

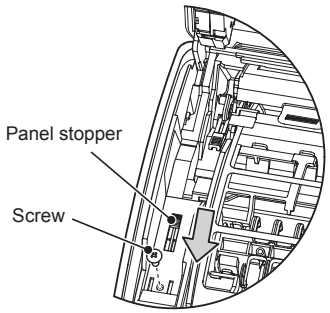


9-6-2. Removing the Moving Panel

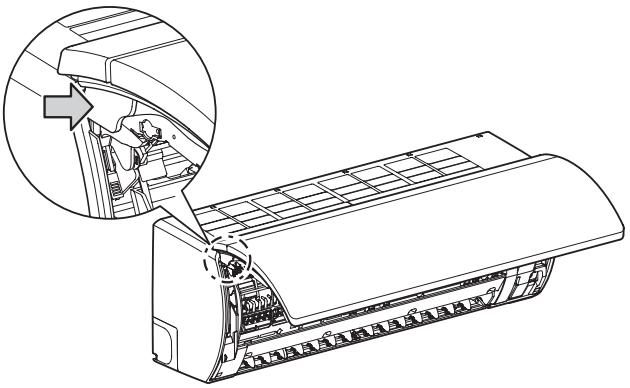
1) 1. Open the moving panel, and support the moving panel by the panel support on the right side.
2) Remove the lead wire cover on the right side. (1 screw)



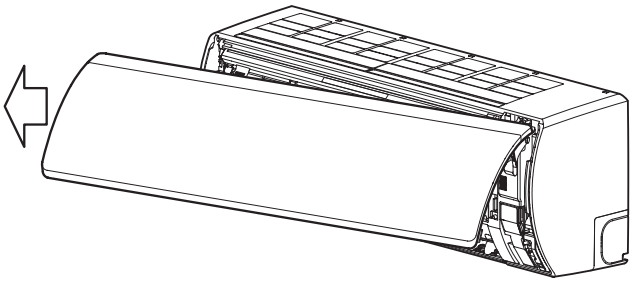
3) After removing a screw of the left-side panel stopper, slide the panel stopper downwards.



4) Grasp both sides of the moving panel, return the panel support to its original position, and press the left-side arm inwards with your finger.

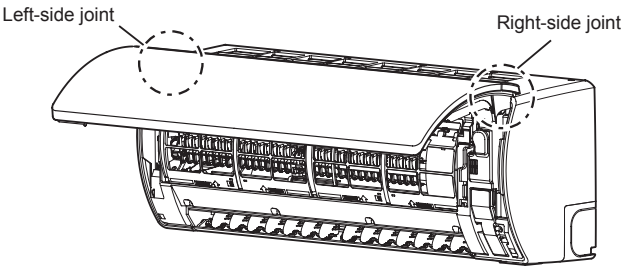


5) Pull out the moving panel towards the left side to remove.

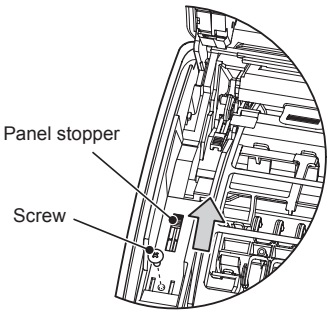


9-6-3. Attaching the Moving Panel

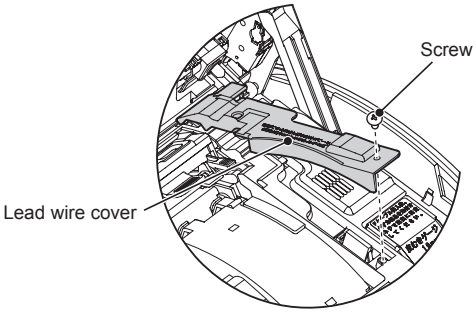
1) Grasp both sides of the moving panel, and insert the right-side joint first.



2) Insert the left-side joint, raise the panel stopper upwards, and secure with the screw.



3) Insert the top edge of the lead wire cover into the front panel, and secure with a screw.

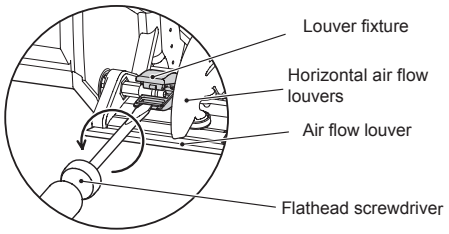


9-6-4. Removing the Vertical Air Flow Louver

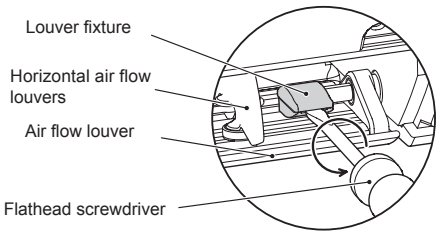
⚠ CAUTION

The horizontal air flow louvres cannot be released from the vertical air flow louver.

1) Open the moving panel, and support it with the panel support.
2) Open the vertical air flow louver.
3) Insert a flathead screwdriver into the gap of the louver fixture on the right and left ends of the vertical air flow louver, and turn in the counter-clockwise direction to remove.



Removing the louver fixture (Left side)

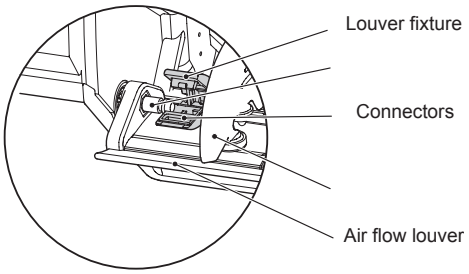


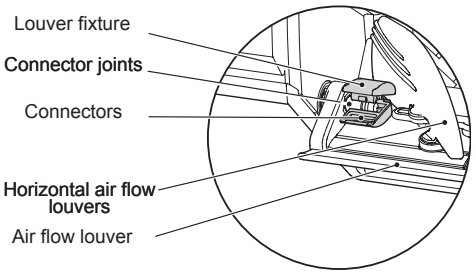
Removing the louver fixture (Right side)

4) After pressing in the right and left connector joints, remove the vertical air flow louvres. Press in the right-side joint first before pressing in the left-side joint.

9-6-5. Attaching the Vertical Air Flow Louvres

1) Attach the vertical air flow louvres by inserting the connector joints in the order of left, right, and centre.
2) Secure the horizontal air flow louvres to the connector joints.





3) After pressing in the connector joints, align the positions of the connector joints and connectors.
4) Press the louver fixture downwards to lock it into place.
5) After attaching, move the louver fixture from side to side to check that the connector joint does not come off.

10 TROUBLESHOOTING

The pulse motor circuits are mounted to both indoor and outdoor units.
Therefore, diagnose troubles according to the trouble diagnosis procedure as described below.
(Refer to the check points in servicing written on the wiring diagrams attached to the indoor/outdoor units.)

Table 10-1

No.	Troubleshooting Procedure	Page
1	Precautions When Handling the New Inverter	73
2	Precautions When Inspecting the Control Section of the Outdoor Unit	74
3	First Confirmation	75
4	Primary Judgment	75
5	Judgment by Flashing LED of Indoor Unit	76
6	Self-Diagnosis by Remote Controller (Check Code)	77

No.	Troubleshooting Procedure	Page
7	Judgment of Trouble by Symptom	80
8	Check Code 1C (Miswiring in Indoor/Outdoor Units) and 1E	85
9	Inspection of the Air Purifier	86
10	Diagnose Trouble in Outdoor Unit	87
11	Inspection of the Main Parts	89
12	Inspection of the Outdoor Fan Motor	93

10-1. Precautions When Handling the New Inverter

⚠ CAUTION

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.

The control circuitry has an uninsulated construction.

Fig.10-1-1 JAVP-E series (insulated type)

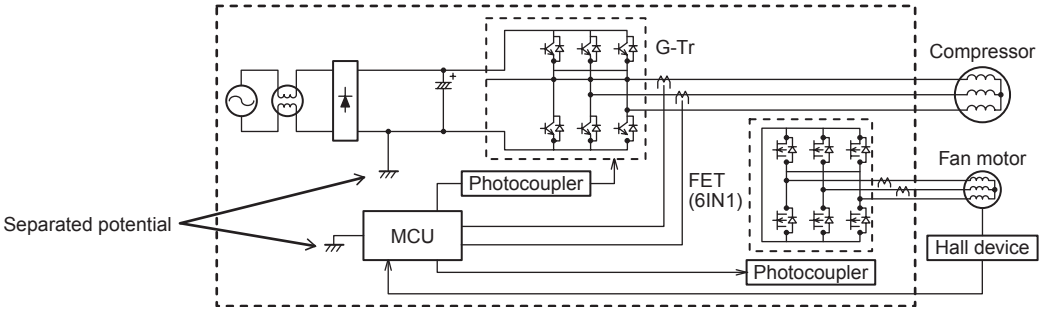
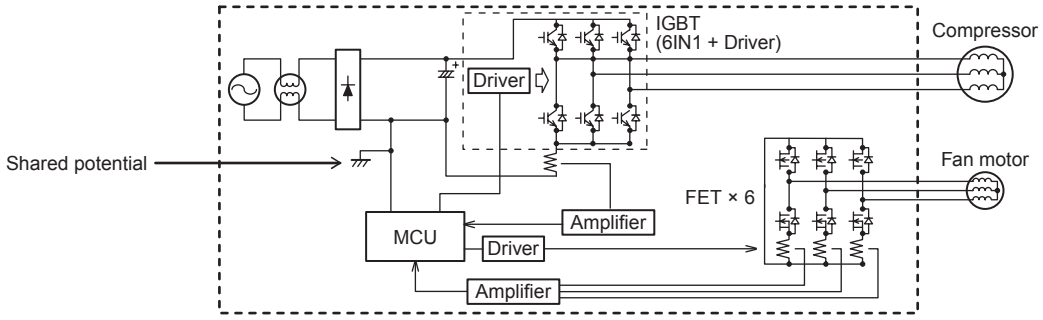


Fig.10-1-2 PAVP-E, PAVP-ND series (uninsulated type)

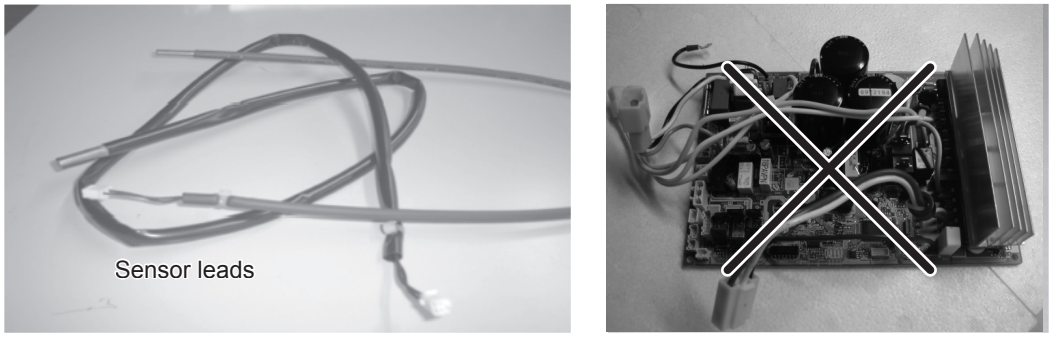


SAVP-E, SAVP-ND, GAVP-E, EAVP-E series (uninsulated type)

⚠ CAUTION

A high voltage (equivalent to the supply voltage) is also energized to ground through the sensors, PMV and other low-voltage circuits. The sensor leads and other wires are covered with insulated tubes for protection. Nevertheless, care must be taken to ensure that these wires are not pinched.
Take sufficient care to avoid directly touching any of the circuit parts without first turning off the power.
At times such as when the circuit board is to be replaced, place the circuit board assembly in a vertical position. Laying the board flat on an electrically conductive object (such as the top panel of the air conditioner's outdoor unit) while a charge is still retained by the electrolytic capacitors of the inverter's main circuit may cause short-circuiting between the electrolytic capacitors and secondary circuit components and result in damage to the components.

Fig.10-1-3



Do NOT lay the circuit board assembly flat.

10-2. Precautions When Inspecting the Control Section of the Outdoor Unit

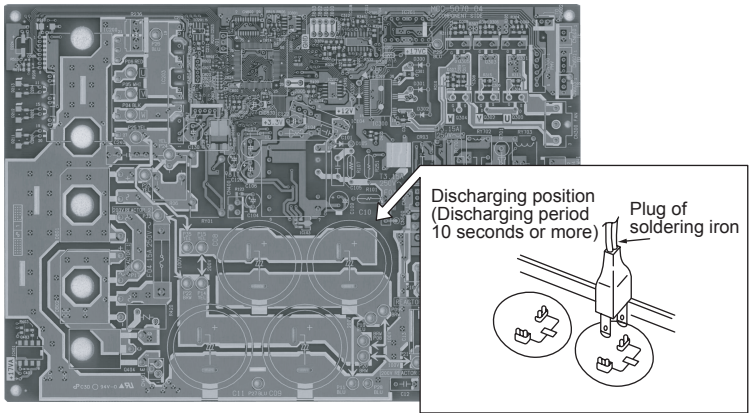
NOTE

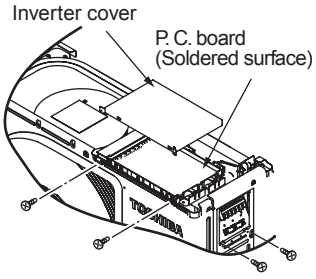
A large-capacity electrolytic capacitor is used in the outdoor unit controller (inverter). Therefore, if the power supply is turned off, charge (charging voltage DC280 to 380V) remains and discharging takes a lot of time. After turning off the power source, if touching the charging section before discharging, an electrical shock may be caused. Discharge the electrolytic capacitor completely by using soldering iron, etc.

10-2-1. Discharging Method

1) Remove the inverter cover (plating) by opening four mounting claws.
2) As shown below, connect the discharge resistance (approx. 100Ω40W) or plug of the soldering iron to voltage between + – terminals of the C08 (“CAUTION HIGH VOLTAGE” is indicated.) electrolytic capacitor (500μF/400V) on P.C. board, and then perform discharging.

Fig.10-2-1





10-3. First Confirmation

10-3-1. Confirmation of Power Supply

Confirm that the power breaker operates (ON) normally.

10-3-2. Confirmation of Power Voltage

Confirm that power voltage is AC 220–230–240 ± 10%.
If power voltage is not in this range, the unit may not operate normally.

10-3-3. 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 10-1-1

No.	Operation of air conditioner	Description
1	When power breaker is turned “ON”, the operation indicator (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 SLEEP 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. 41 rps for 2 minutes, and Max.91 rps for 2 minutes to 3 minutes, respectively after the operation has started.
5	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.
6	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.

10-4. Primary Judgment

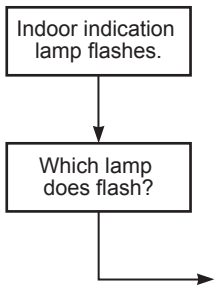
To diagnose the troubles, use the following methods.
- Judgment by flashing LED of indoor unit
- Self-diagnosis by service check remote controller
- Judgment of trouble by every symptom

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

10-5. Judgment by Flashing LED of Indoor Unit

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 10-5-1



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 (Orange) 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 (Orange) Flashing display (5 Hz)	Protective circuit operation for others (including compressor)

NOTE

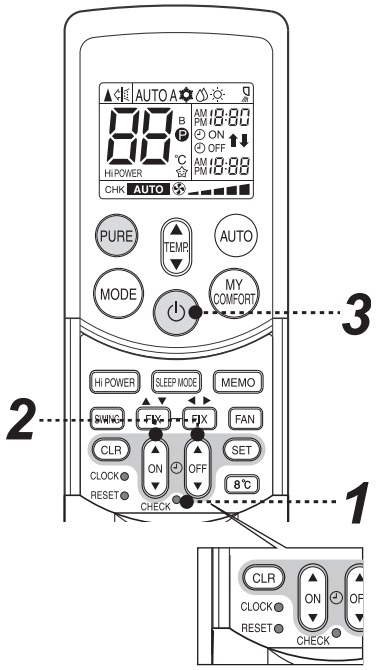
- The contents of items B and C and a part of item E are displayed when air conditioner operates.
- When item B and C, and item B and a part of item E occur concurrently, priority is given to the block of item B.
- The check codes can be confirmed on the remote controller for servicing.

10-6. Self-Diagnosis by Remote Controller (Check Code)

- If the lamps are indicating B to E as shown on Table 10-5-1, execute the self-diagnosis by the remote controller.
- When the remote controller is set to the service mode, the indoor controller diagnoses the operation condition and indicates the information of the self-diagnosis on the display of the remote controller with the check codes. If a fault is detected, all lamps on the indoor unit will flash at 5Hz and it will beep for 10 seconds (Beep, Beep, Beep ...). The timer lamp usually flashes (5Hz) during self-diagnosis.

10-6-1. Using Remote Controller in Service Mode

Fig. 10-6-1



Alphanumeric characters are used for the check codes.

5 is 5.	6 is 6.
A is A.	b is B.
C is C.	d is D.

1 **Push [CHECK] button with a tip of pencil to set the remote controller to the service mode.**

- " 00 " is indicated on the display of the remote controller.

2 **Push [ON ▲] or [OFF ▼] button**
If there is no fault with a code, the indoor unit will beep once (Beep) and the display of the remote controller will change as follows :

→ 00 → 01 → 02 ··· 1d → 1E → 33 →

- The TIMER indicator of the indoor unit flashes continuously. (5 times per 1 sec.)
- Check the unit with all 52 check codes (00 to 33) as shown in Table-10-6-1.
- Push [ON ▲] or [OFF ▼] button to change the check code backward.
  If there is a fault, the indoor unit will beep for 10 seconds (Beep, Beep, Beep...).

Note the check code on the display of the remote controller.

- 2-digits alphanumeric will be indicated on the display.
- All indicators on the indoor unit will flash. (5 times per 1 sec.)

3 **Push [START/STOP] button to release the service mode.**

- The display of the remote controller returns to as it was before service mode was engaged.

4 **Time shortening method.**

1) Push SET button while pushing CHECK button.
2) Push [START/STOP] button.

10-6-2. Check Code

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.
3) After servicing, push [CLR] button under check mode status and then send the check code “7F” to the indoor unit. The error code stored in memory is cleared.

Table 10-6-1

Block distinction		Operation of diagnosis function				Judgment and action
Check code	Block	Check code	Cause of operation	Air conditioner status	Remarks	
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 the motor. 2) When the motor is normal, check P.C. board.
	Not displayed	12	Trouble on other indoor P.C. boards	Operation continues.	Displayed when error is detected.	1) 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 operate: • Check connecting cable, and correct if defective wiring. • Check 25A fuse of inverter P.C. board. • Check 6.3A fuse of connecting cable of inverter unit and outdoor unit. 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.
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.
		16	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.

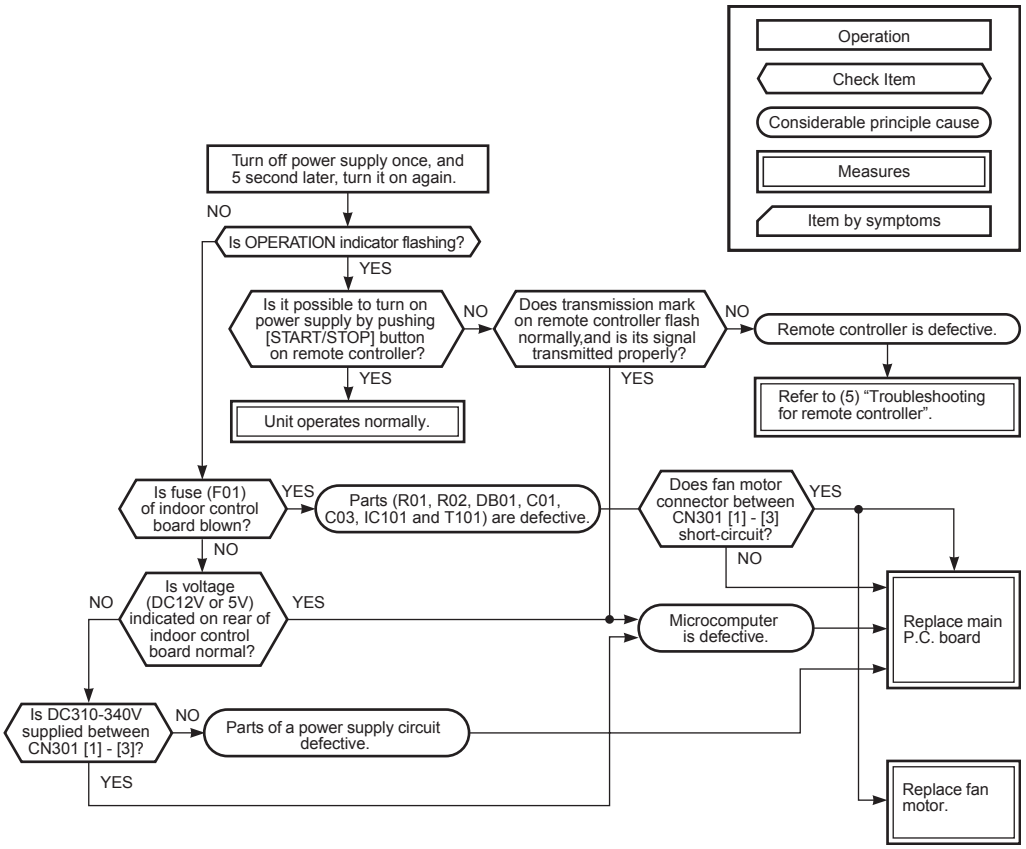
Block distinction		Operation of diagnosis function				Judgment and action
Check code	Block	Check code	Cause of operation	Air conditioner status	Remarks	
02	Outdoor P.C. board	18	Being out of place, disconnection or short-circuit of the outdoor heat exchanger sensor (TE) or suction temp. sensor (TS)	All off	Displayed when error is detected.	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	Being out of place, disconnection or short-circuit of the outdoor temp. sensor (TO)	Operation continues	——	1. Check outdoor temp. sensor (TO). 2. Check P.C. board.
	Outdoor P.C. board	1C	Compressor drive output error, Compressor error (lock, missing, etc.), Break down	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). 3) When 20 seconds passed after start-up, position-detect circuit error occurred. : Replace compressor. Trouble on P.M.V.
03	Others (including compressor)	07	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).
		08	4-way valve inverse error (TC sensor value lowered during heating operation.)	Operation continues	——	1) Check 4-way valve operation.

10-7. Judgment of Trouble by Symptom

10-7-1. Power of Indoor Unit Does 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?

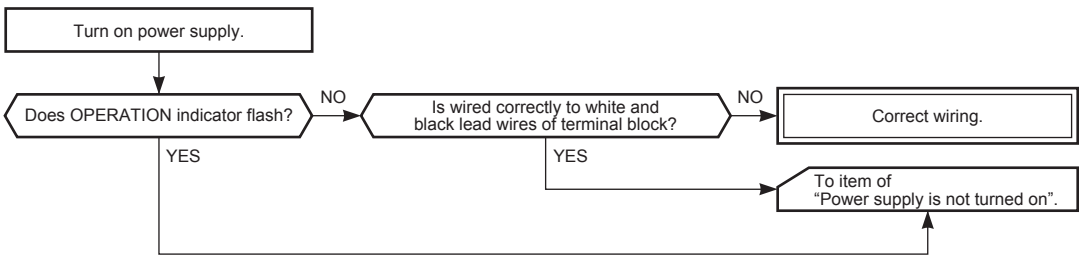


NOTE

Be sure to disconnect the motor connector CN301 after shut off the power supply, or it will be a cause of damage of the motor.

10-7-2. Power of Indoor Unit Does not Turned on Though Indoor P.C. Board is Replaced

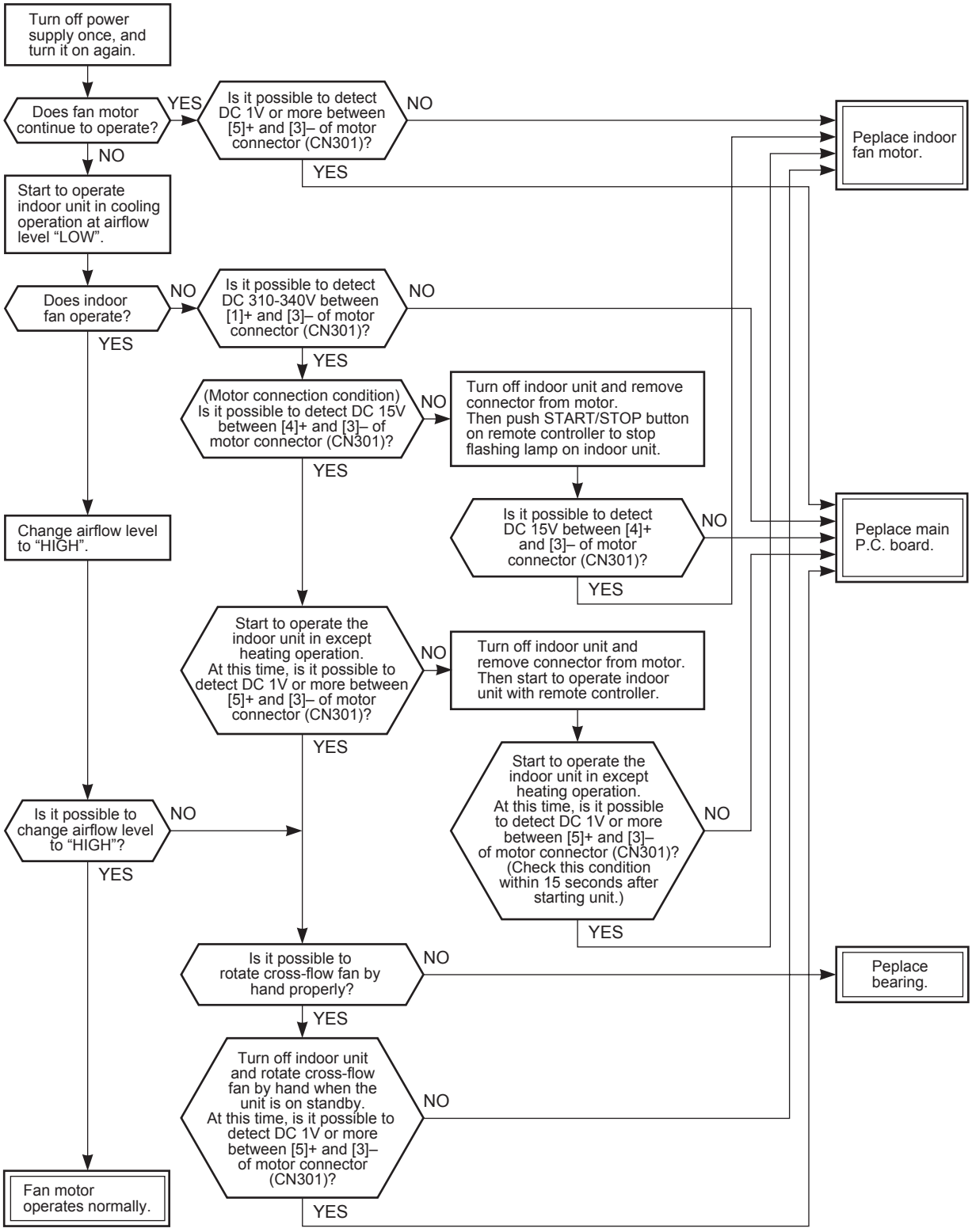
Confirmation procedure



10-7-3. Only the Indoor Motor Fan Does not Operate

Primary check

1) Is it possible to detect the power supply voltage (AC220–240V) between [1] and [2] on the terminal block?
2) Does the indoor fan motor operate in cooling operation?
   (In heating operation, the indoor fan motor does not operate for approximately 10 minutes after it is turned on, to prevent a cold air from blowing in.)



10-7-4. Indoor Fan Motor Automatically Starts to Spin by Turning on Power Supply

Cause

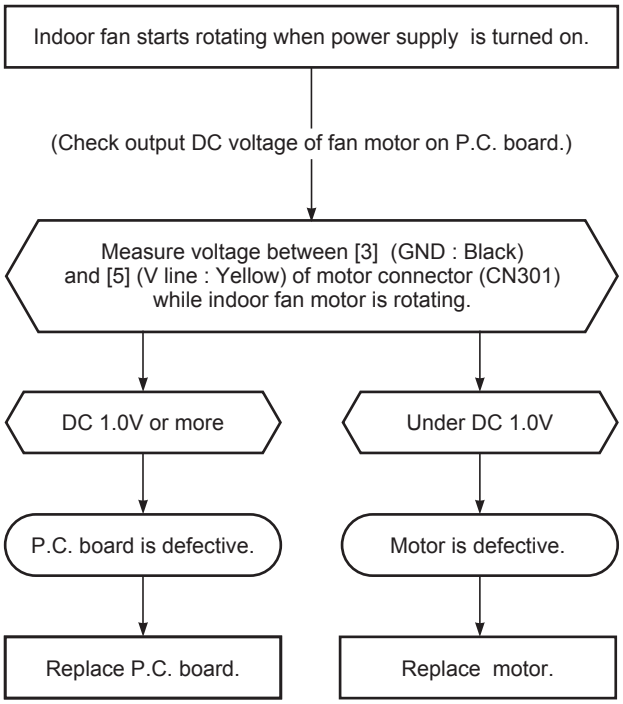
The IC is built in the indoor fan motor. Therefore the P.C. board is also mounted to inside of the motor.
If the P.C. board is soldered imperfectly or the IC is defective, the fan motor may automatically rotate by turning on power supply.

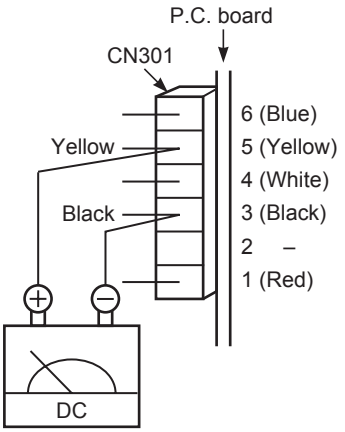
Inspection procedure

1) Remove the front panel. (Remove 2 screws.)
2) Remove the cover of the fan motor lead wires.
3) Check DC voltage with CN301 connector while the fan motor is rotating.

NOTE

- Do not disconnect the connector while the fan motor is rotating.
- Use a thin test rod.

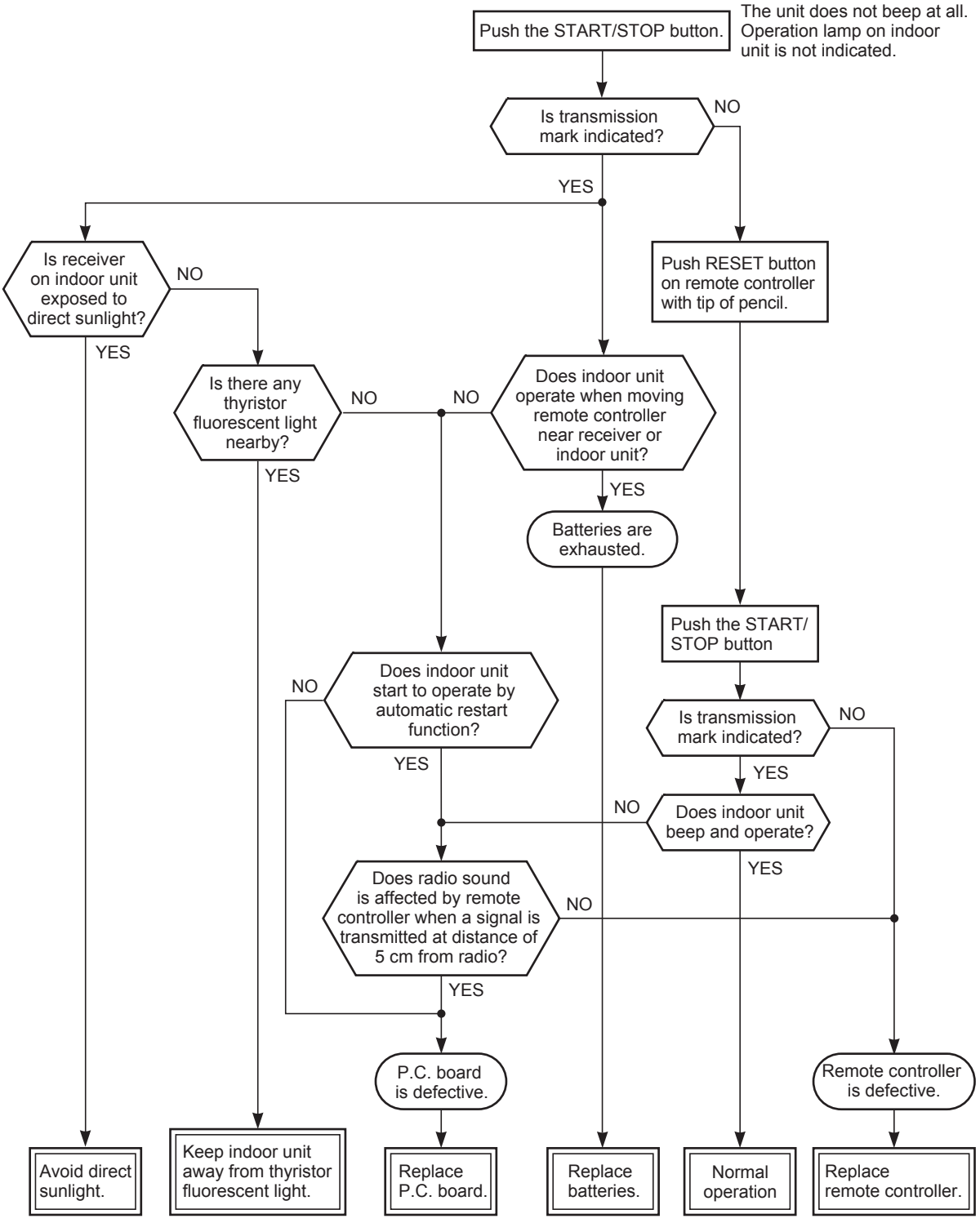




10-7-5. Troubleshooting for Remote Controller

Primary check

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



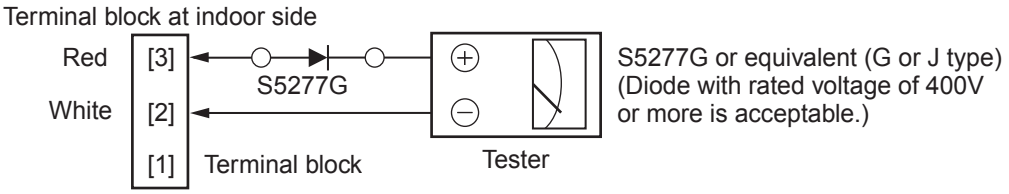
NOTE : After replacing batteries, push the RESET button with a tip of a pencil.

10-7-6. Outdoor Unit Does not Operate

1) Is the voltage between [2] and [3] of the indoor terminal block varied?
2) 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.



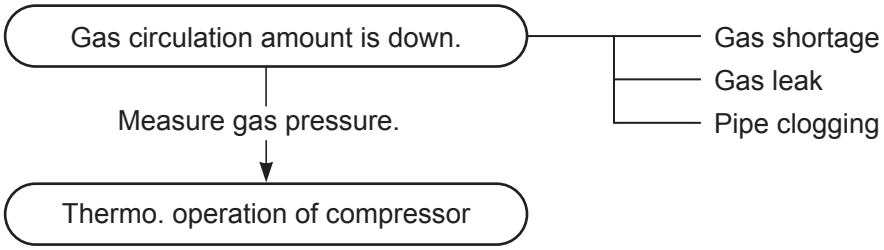
Normal time : Voltage swings between DC15 and 60V. .....Inverter Assembly check (10-8-1.)
Abnormal time :Voltage does not vary.

10-7-7. Outdoor Unit Stops in a Little While After Operation Started

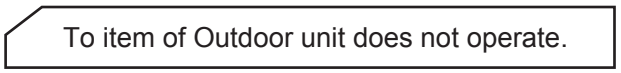
Check procedure

Select phenomena described below.

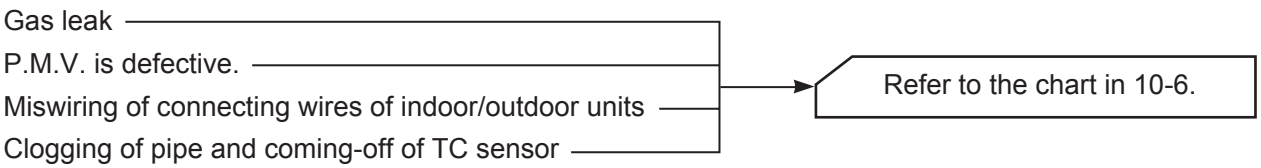
1) The outdoor unit stops 10 to 20 minutes after operation started, and 10 minutes or more are required to restart the unit.



2) If the unit stops once, it does not operate until the power will be turned on again.

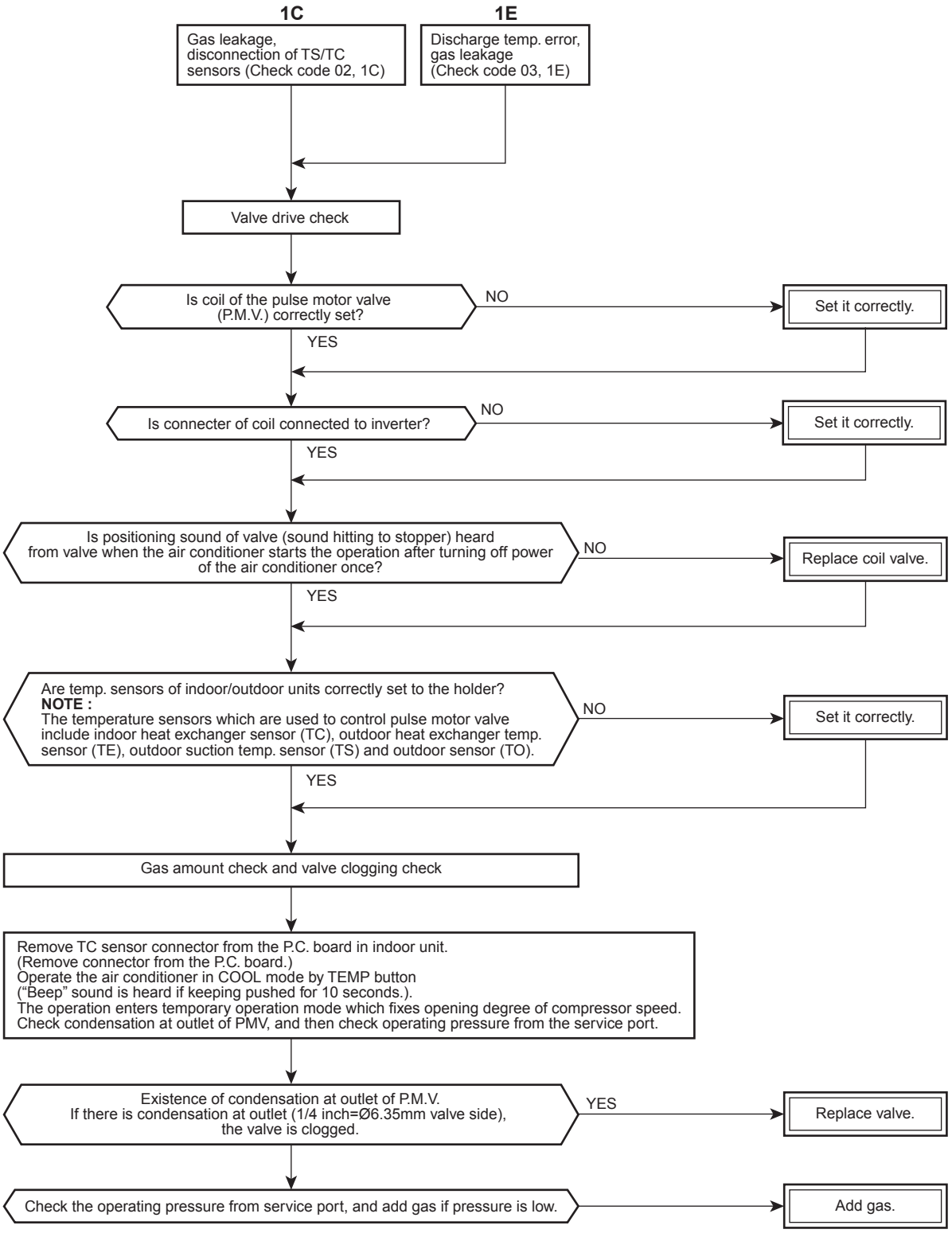


3) The outdoor unit stops 10 minutes to 1 hour after operation started, and an alarm is displayed.
(Discharge temp. error check code 03, 1E Sensor temp. error check code 02, 1C)

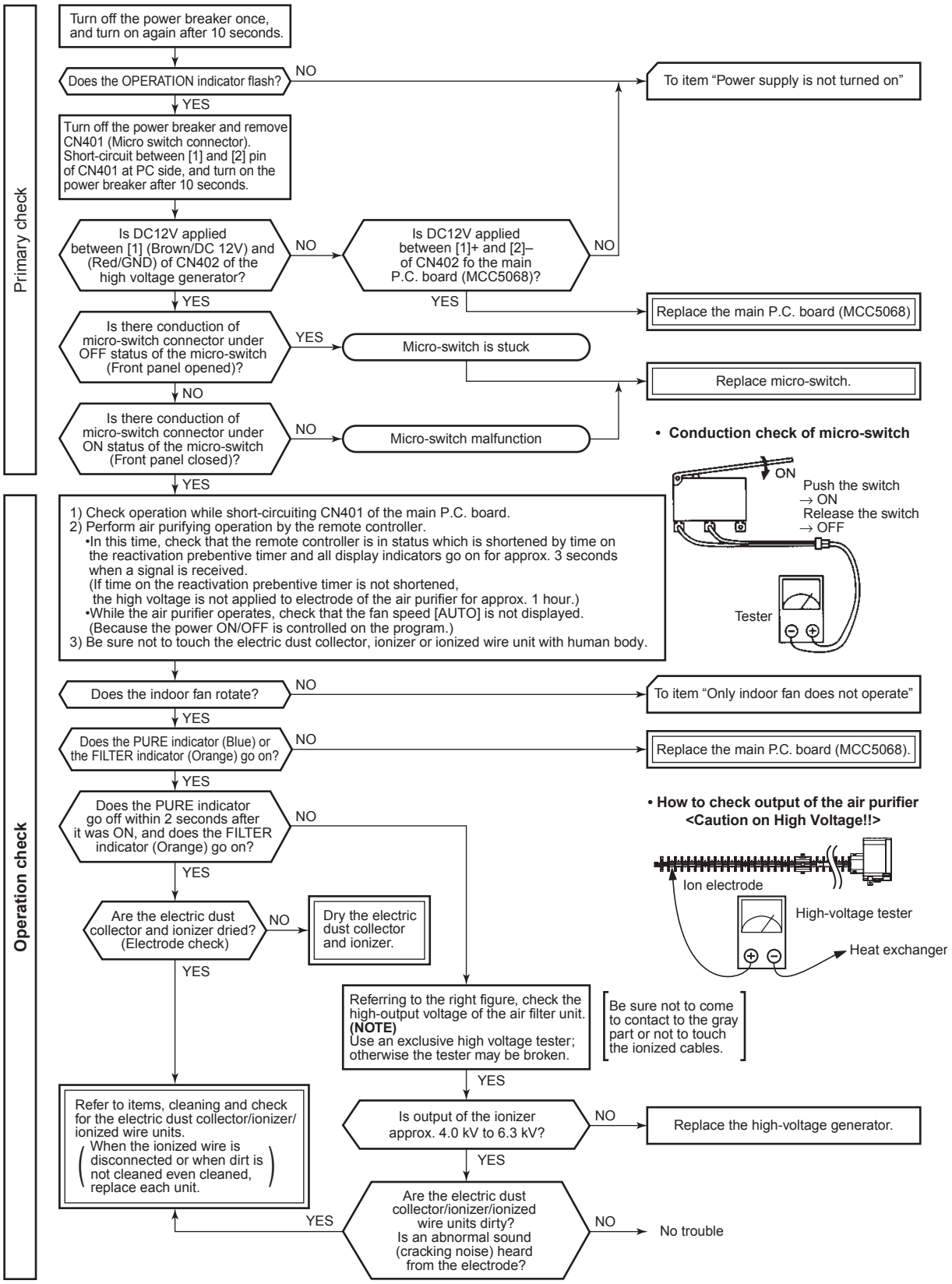


10-8. Check Code 1C (Miswiring in Indoor/Outdoor Units) and 1E

Check procedure

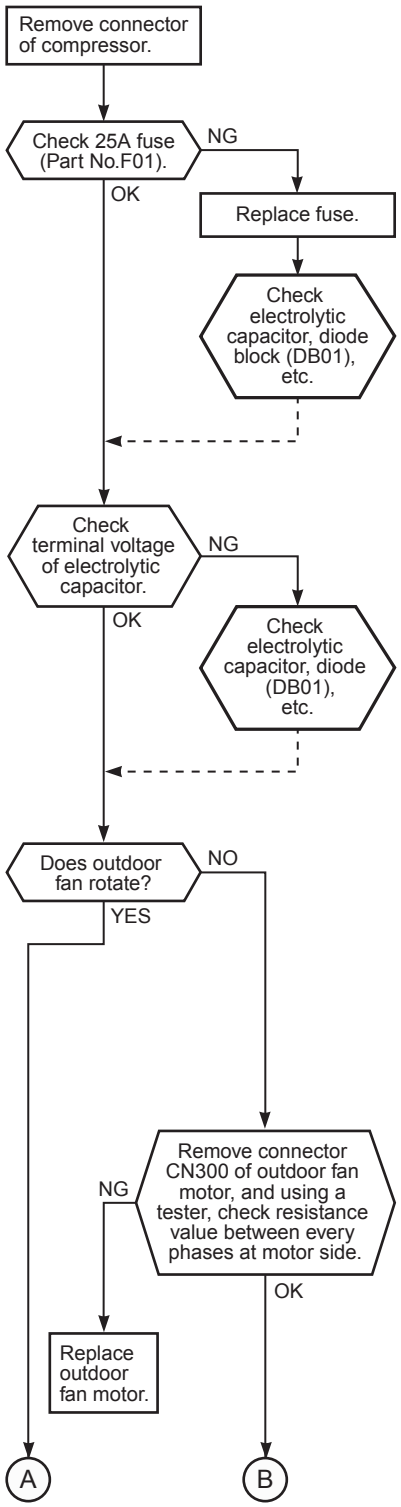
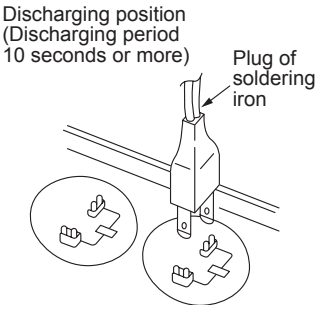
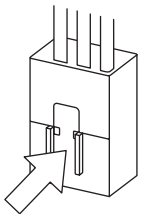


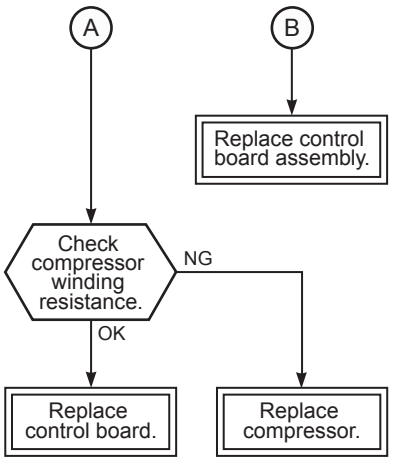
10-9. Inspection of the Air Purifier



10-10.Diagnose Trouble in Outdoor Unit

Table 10-10-1

Diagnosis/Process flowchart	Item	Contents	Summary
	Preparation	Turn “OFF” the power supply breaker, and remove 3P connector which connects inverter and compressor.	
	Check	• Check whether 25A fuse on the control board assembly is blown or not. (F01)	If fuse was blown, be sure to check the electrolytic capacitor and diode block. (DB01)
	Check		• Connect discharge resistance (approx. 100Ω, 40W) or soldering iron (plug) between +, – terminals of the electrolytic capacitor (500μF) of C08 (with printed CAUTION HIGH VOLTAGE) on P.C. board. 
	Operation	Turn on the power breaker, and operate the air conditioner in COOL mode by time shortening.	OK if 500μF → DC280 to 380V
	Measurement	Measure terminal voltage of the electrolytic capacity. 500μF:400WV × 3	Remove CN300 while pushing the part indicated by an arrow because CN300 is a connector with lock.
	Check Stop	After operation, turn off the power breaker after 2 minutes 20 seconds passed, and discharge the electrolytic capacitor by soldering iron. Check voltage between motor phases.	
	Check Measurement	• Is not winding between [1]-[2], [2]-[3], or [1]-[3] opened or short-circuited?	→ Resistance between phases should be approx. 55 to 77Ω
		• Is not frame grounded with [1], [2], or [3]?	→ Should be 10MΩ or more.

Diagnosis/Process flowchart	Item	Contents	Summary
	Check Operation	Check winding resistance between phases of compressor, and resistance between outdoor frames by using a tester. • Is not grounded. • Is not short-circuited between windings. • Winding is not opened. Remove connector CN300 of the outdoor fan motor, turn on the power supply breaker, and perform the operation. (Stops though activation is prompted.) Check operation within 2 minutes 20 seconds after activation stopped.	 → OK if 10MΩ or more → OK if 1.24Ω 1.37Ω (Check by a digital tester.)

10-11.Inspection of the Main Parts

10-11-1.Inspection of the P.C. Board (Indoor Unit)

⚠ CAUTION

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

Inspection procedures

1) When a P.C. board is judged to be defective, check for disconnection, burning, or discoloration of the copper foil pattern or this P.C. board.

NOTE

The P.C. board consists of the following 2 parts

- Main P.C. board part :
  DC power supply circuit (5V, 12V, 15V), Indoor fan motor control circuit, CPU and peripheral circuits, buzzer, and Driving circuit of louver.
- Indication unit of infrared ray receiving infrared ray receiving circuit, LED :

2) To check defect of the P.C. board, follow the procedure described below.

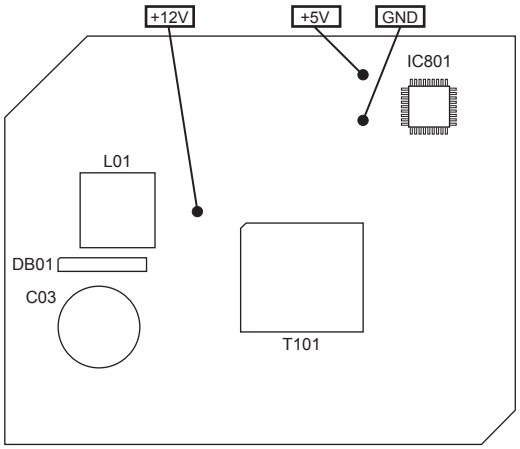
Check procedures

Table 10-11-1

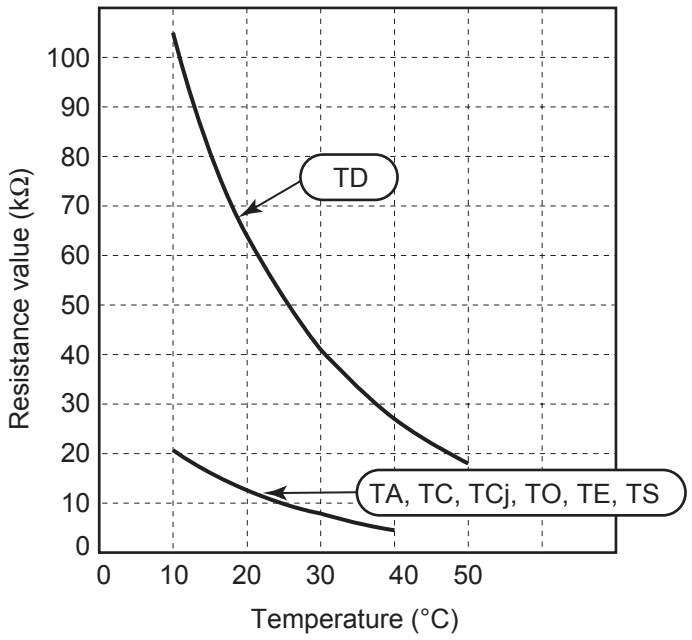
No.	Procedure	Check points	Causes
1	Turn off the power supply breaker and remove the P.C. board assembly from electronic parts base. Remove the connecting cables from the terminal block.	Check whether or not the fuse (F01) is blown.	Impulse voltage was applied or the indoor fan motor short-circuited.
2	Remove the connector of the motor and turn on the power supply breaker. If OPERATION indicator flashes (once per second), it is not necessary to check steps (1 to 3) in the right next column.	Check power supply voltage : 1. Between No. 1 and No. 3 of CN301 (AC 220–240V) 2. Between ⊕ and ⊖ of C03 (DC 310–340V) 3. Between ⊖ of IC122 and output side of IC122 (DC 15V) 4. Between 12V and GND 5. Between 5V and GND	1. The terminal block or the crossover cable is connected wrongly. 2. The capacitor (C01), line filter (L01), resistor (R02), or the diode (DB01) is defective. 3. IC101, IC122 and T101 are defective. 4. IC101, IC122 and T101 are defective. 5. IC101, IC122, IC121 and T101 are defective.
3	Push [START/STOP] button once to start the unit. (Do not set the mode to On-Timer operation.)	Check power supply voltage : 1. Between CN03 and CN501 (DC 15–60V)	IC501 and IC502 are defective.
4	Shorten the restart delay timer and start unit.	Check whether or not all indicators (OPERATION, TIMER, PURE) are lit for 3 seconds and they return to normal 3 seconds later.	The indicators are defective or the housing assembly (CN261) is defective.
5	Push [START/STOP] button once to start the unit, • Shorten the restart delay timer. • Set the operation mode to COOL. • Set the fan speed level to AUTO. • Set the preset temperature much lower than the room temperature. (The unit (compressor) operates continuously in the above condition.)	1. Check whether or not the compressor operates. 2. Check whether or not the OPERATION indicator flashes.	1. The temperature of the indoor heat exchanger is extremely low. 2. The connection of the heat exchanger sensor is loose. (The connector is disconnected.) (CN602) 3. The heat exchanger sensor and the P.C. board are defective. (Refer to Table 10-6-1.) 4. The main P.C. board is defective.

No.	Procedure	Check points	Causes
6	If the above condition (No. 5) still continues, start the unit in the following condition. • Set the operation mode to HEAT. • Set the preset temperature much higher than room temperature.	1. Check whether or not the compressor operates. 2. Check whether or not the OPERATION indicator flashes.	1. The temperature of the indoor heat exchanger is extremely high. 2. The connection of the heat exchanger sensor short-circuited. (CN602) 3. The heat exchanger sensor and the P.C. board are defective. (Refer to Table 10-6-1.) 4. The main P.C. board is defective
7	Connect the motor connector to the motor and turn on the power supply. Start the unit the following condition. • Set the fan speed level to HIGH. (The unit (compressor) operates continuously in the above condition in No. 5.)	1. Check it is impossible to detect the voltage (DC 15V) between 3 and 4 of the motor terminals. 2. The motor does not operate or the fan motor does not rotate with high speed. (But it is possible to receive the signal from the remote controller.) 3. The motor rotates but vibrates strongly.	1. The indoor fan motor is defective. (Protected operation of P.C. board.) 2. The P.C. board is defective. 3. The connection of the motor connector is loose.

P.C. Board Layout

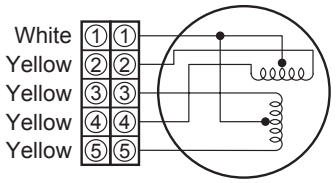


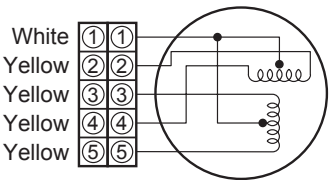
Sensor characteristic table



TD : Discharge temp. sensor
TA : Room temp. sensor
TC, TCj : Heat exchanger temp. sensor
TO : Outdoor temp. sensor
TE : Outdoor heat exchanger temp. sensor
TS : Suction temp. sensor

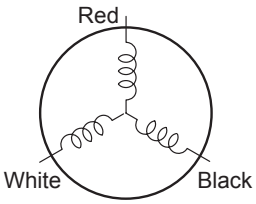
10-11-2.Indoor Unit (Other Parts)

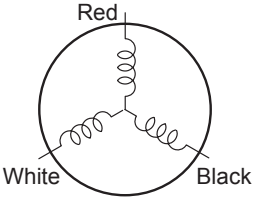
<table>
<tr><th>No.</th><th>Part name</th><th>Checking procedure</th></tr>
<tr><td>1</td><td>Room temp. (TA) sensor
Heat exchanger (TC) sensor
Heat exchanger (TCj) sensor</td><td>Disconnect the connector and measure the resistance value with tester.
(Normal temp.)
<table>
<tr><th>Temperature / Sensor</th><th>10°C</th><th>20°C</th><th>25°C</th><th>30°C</th><th>40°C</th></tr>
<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>
</table></td></tr>
<tr><td>2</td><td>Remote controller</td><td>Refer to 10-7-5.Troubleshooting for Remote Controller</td></tr>
<tr><td>3</td><td>Louver motor (right, left, Horizontal)
MP24Z3N</td><td>Measure the resistance value of each winding coil by using the tester.
(Under normal temperature 25°C)
 

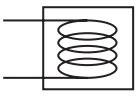
<table>
<tr><th>Position</th><th>Resistance value</th></tr>
<tr><td>1 to 2
1 to 3
1 to 4
1 to 5</td><td>250 ± 20 Ω</td></tr>
</table></td></tr>
<tr><td>4</td><td>Louver motor (Moving panel)
MP24Z4N</td><td>Measure the resistance value of each winding coil by using the tester.
(Under normal temp. 25°C)
 

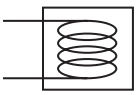
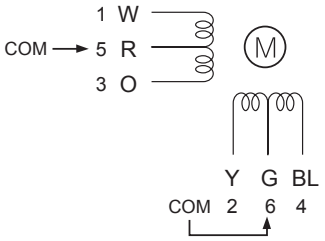
<table>
<tr><th>Position</th><th>Resistance value</th></tr>
<tr><td>1 to 2
1 to 3
1 to 4
1 to 5</td><td>200 ± 20 Ω</td></tr>
</table></td></tr>
<tr><td>5</td><td>Indoor fan motor</td><td>Refer to 10-7-3.Only the Indoor Motor Fan Does not Operate and 10-7-4.Indoor Fan Motor Automatically Starts to Spin by Turning on Power Supply in 10-7.</td></tr>
</table>

10-11-3.Outdoor Unit

<table>
<tr><th>No.</th><th>Part name</th><th>Checking procedure</th></tr>
<tr><td>1</td><td>Compressor
(Model : DA111A1FD-21F)</td><td>Measure the resistance value of each winding by using the tester.
 

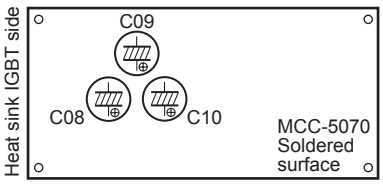
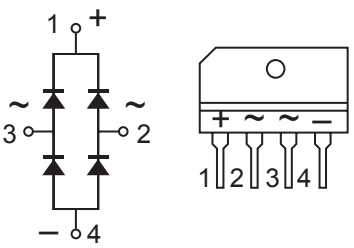
<table>
<tr><th>Position</th><th>Resistance value</th></tr>
<tr><td>Red - White</td><td rowspan="3">1.24 to 1.38 Ω</td></tr>
<tr><td>White - Black</td></tr>
<tr><td>Black - Red</td></tr>
</table>
Under 20°C</td></tr>
<tr><td>2</td><td>Outdoor fan motor
(Model : ICF-140-43-4R)</td><td>Measure the resistance value of winding by using the tester.
 

<table>
<tr><th>Position</th><th>Resistance value</th></tr>
<tr><td>Red - White</td><td>20 to 22Ω</td></tr>
<tr><td>White - Black</td><td>20 to 22Ω</td></tr>
<tr><td>Black- Red</td><td>20 to 22Ω</td></tr>
</table>
Under 20°C</td></tr>
<tr><td>3</td><td>4-way valve coil (Cooling/ heating switching)
(Model : VHV-01AZ535A1)</td><td>Measure the resistance value of winding by using the tester.
 
Connector : White
<table>
<tr><th>Resistance value</th></tr>
<tr><td>7.2 ± 0.36 Ω</td></tr>
</table>
Under 20°C</td></tr>
</table>

No.	Part name	Checking procedure
4	4-way valve coil (Comp. cylinder switching) (Model : VHV-01AZ535B1)	Measure the resistance value of winding by using the tester.  Connector : Red Resistance value: 7.2 ± 0.36Ω (Under 20°C)
5	Pulse motor valve coil (Model : C12A-80A)	Measure the resistance value of winding by using the tester.  Position / Resistance value: Red - White: 46 ± 3Ω Red - Orange: 46 ± 3Ω Gray - Yellow: 46 ± 3Ω Gray - Blue: 46 ± 3Ω Under 20°C
6	Outdoor temperature sensor (TO), discharge temperature sensor (TD), suction temperature sensor (TS), outdoor heat exchanger temperature sensor (TE)	Disconnect the connector, and measure resistance value with the tester. (Normal temperature)

Sensor \ Temperature	10°C	20°C	25°C	30°C	40°C	50°C
TD (kΩ)	99	62	50	41	27	18
TO,TS,TE (kΩ)	20.4	12.6	10.0	8.0	5.2	3.5

10-11-4.Checking Method for Each Part

No.	Part name	Checking procedure
1	Electrolytic capacitor (For boost, smoothing)	1) Turn OFF the power supply breaker. 2) Discharge all three capacitors completely. 3) Check that safety valve at the bottom of capacitor is not broken. 4) Check that vessel is not swollen or exploded. 5) Check that electrolytic liquid does not blow off. 6) Check that the normal charging characteristics are shown in continuity test by the tester.  C08, C09, C10 500μF/400V Case that product is good: Pointer swings once, and returns slowly. When performing test once again under another polarity, the pointer should return.
2	Diode block (DB01, DB02)	1) Turn OFF the power supply breaker. 2) Completely discharge the four electrolytic capacitors. 3) Remove the diode block from the PCB (which is soldered in place). 4) Use a multimeter with a pointer to test the continuity, and check that the diode block has the proper rectification characteristics. 

Tester rod ⊕	Tester rod ⊖	Resistance value in good product
~ 2	+ 1	∞
~ 3		
– 4	~ 2	
	~ 3	

10-12.Inspection of the Outdoor Fan Motor

10-12-1.Symptom

- Outdoor fan motor does not rotate.
- Outdoor fan motor stops within several tens seconds though it started rotating.
- Outdoor fan motor rotates or does not rotate according to the position where the fan stopped, etc.

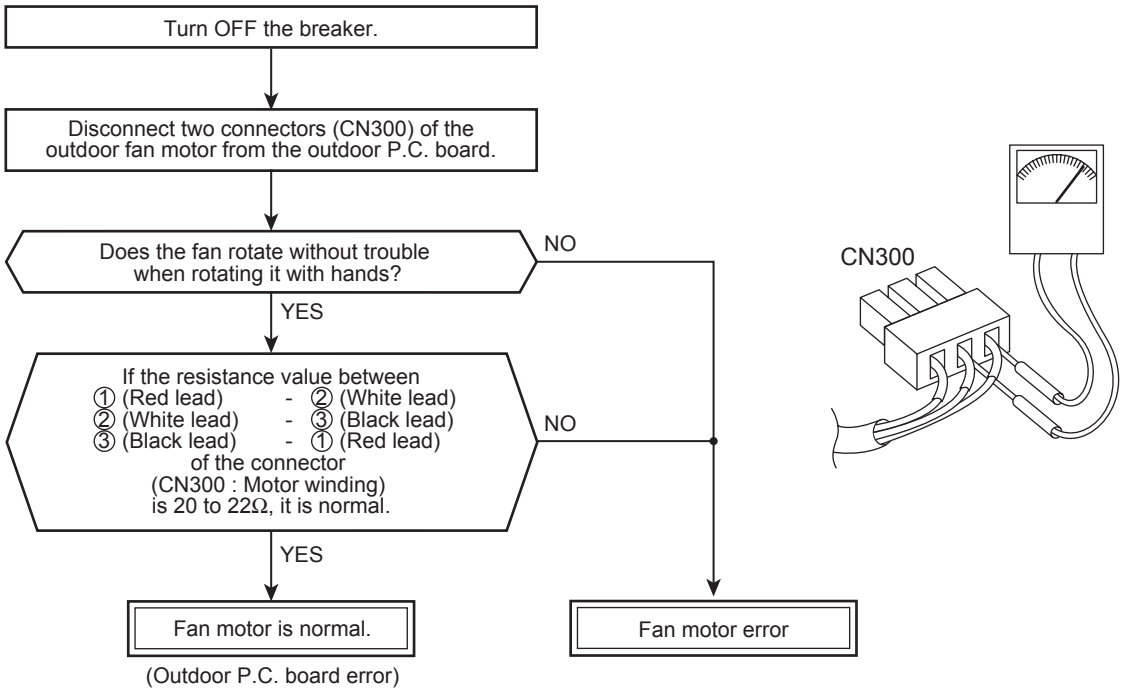
Remote controller check code “02 : Outdoor block, 1A : Outdoor fan drive system error”

10-12-2.Cause

The following causes are considered when the outdoor fan motor does not normally rotate.

- Mechanical lock of the outdoor fan motor
- Winding failure of the outdoor fan motor
- Position-detect circuit failure inside of the outdoor fan motor
- Motor drive circuit failure of the outdoor P.C. board

Diagnosis flow chart



NOTE

- However, GND circuit error inside of the motor may be accepted in some cases when the above check is performed.
- When the fan motor does not become normal even if P.C. board is replaced, replace the outdoor fan motor.

11 REPLACING THE MAIN PARTS

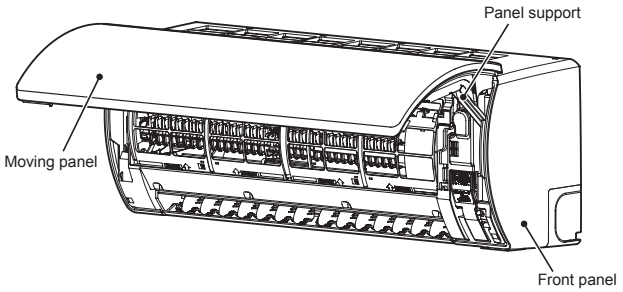
11-1. Indoor Unit

⚠ WARNING	
	Since high voltages is applied to electrical parts, turn off the power without fail before starting replacement work.
CHECK	**After repairs have been completed and the front panel and cabinet have been attached, perform test run and check for smoke, unusual sound, and other abnormalities.** Failure to do so may cause fire or electric shock. Make sure that the cabinet is attached before starting test run.
WATCH OUT FOR FIRE	**Perform the following when repairing the refrigeration cycle.** • Watch out for fire in the surrounding area. If a gas stove or other appliance is being used, extinguish the flames before starting work. If the flames are not extinguished, they may ignite oil mixed with the refrigerant gas and may cause fire or burn injury. • Do not use welding equipment in an airtight room. Carbon monoxide poisoning may be caused if the room is not well ventilated. • Do not use welding equipment near flammable materials. Flames from the equipment may cause the flammable materials to catch fire and may result in fire or burn injury.

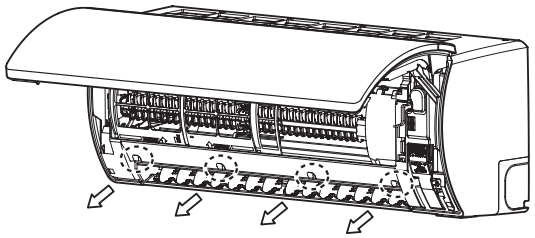
⚠ CAUTION	
WEAR GLOVES	**Wear thick gloves such as cotton work gloves during repair work. Failure to do so may cause injury by parts.**

11-1-1. Removing the Front Panel and Moving Panel

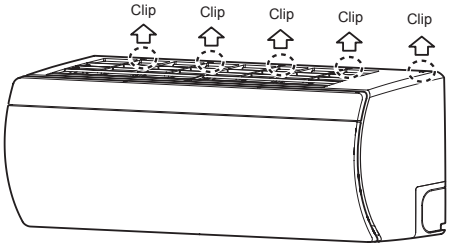
1) Open the moving panel, and support the moving panel by the panel support on the right side.



2) Remove the four set screws on the front panel.

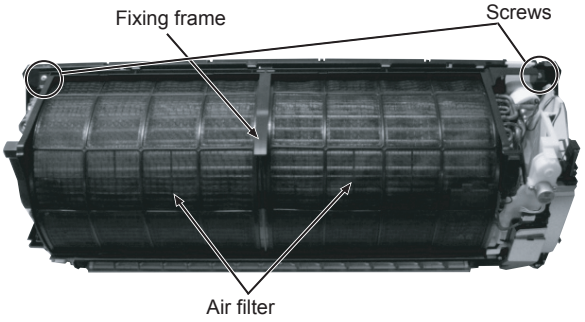


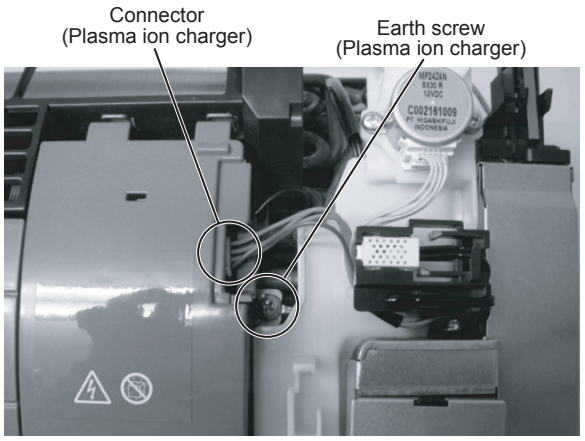
3) Insert your thumb into the air outlet bottom section, and lift up the front panel bottom.
4) Close the moving panel to remove the clips on the top side as shown below.
Press your finger down on the clip on the front panel top, and lift up the panel back edge so that the clip is released (5 locations).



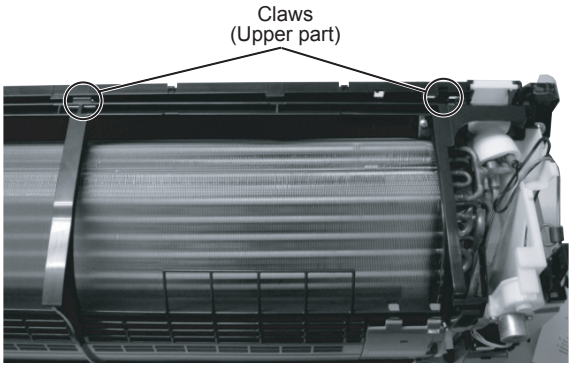
11-1-2. Fixing Frame Assembly

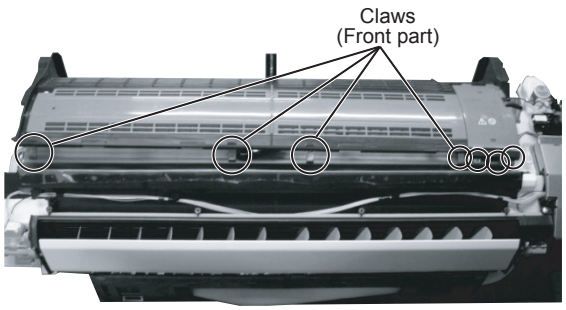
1) Detach the two air filters.
2) Disconnect the plasma ion charger connector and the earth lead (black). (The earth lead is connected to the heat exchanger with a screw.)
3) Remove the two screws securing the fixing frame to the rear of the indoor unit.





4) While turning the upper part of the fixing frame to the front, release the front claw of the fixing frame from the rear of the indoor unit.





11-1-3. Electric Parts Cover Detached

1) Perform all the steps in **11-1-1.Removing the Front Panel and Moving Panel**.
2) Remove the screw beside the screw that secures the electric parts box assembly.
3) Remove the connector cover screws and detach the connector cover.
4) While pressing the claw of the lead wire cover in the direction shown in the figure, lift the bottom of the lead wire cover to detach it.
5) Disconnect the connectors below.
   - Louver motor connector (24P) for louver
   - Fan motor connector (5P)
   - Louver motor connector (5P) for movable panel
   - Minus ion charger connector (4P)
6) Remove the motor base assembly by releasing the claw.
7) Remove the earth screw, TC sensor, and TCj sensor.

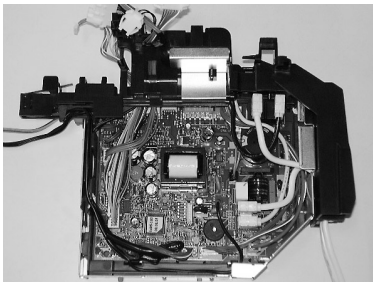
⚠ CAUTION

When attaching the electric parts assembly
- Insert the projection at the rear of the indoor unit into the upper hole in the electric parts assembly.
- Check that the fan motor lead wires are connected as shown in the figure.

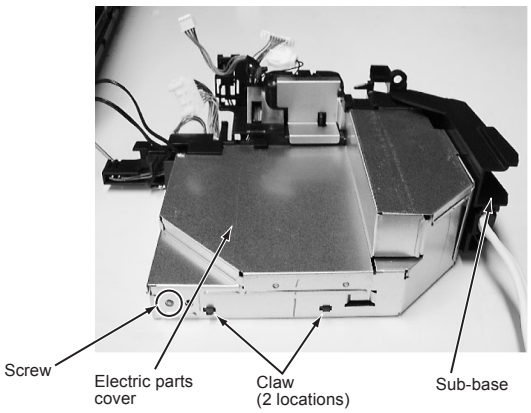
When attaching the motor base assembly
- Before attaching the motor base assembly, connect the earth wire and install the TC and TCj sensors.
- Insert the bottom of the motor base assembly into the portion shown in the figure.
- Insert the motor cover projection into the hole in the right side panel of the motor base assembly.

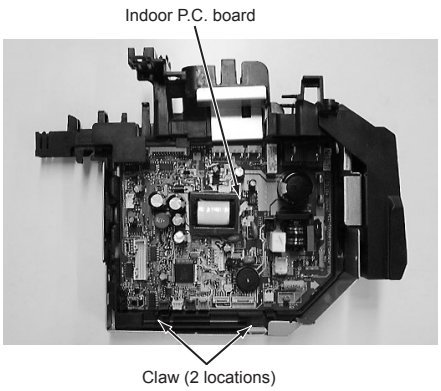
11-1-4. Microcomputer P.C. Board

1) Remove the electric parts cover screw.
2) Detach the metal electric parts cover.
3) Disconnect the connectors from the P.C. board.
4) Disconnect the solderless terminals from the P.C. board.
5) Remove the P.C. board.



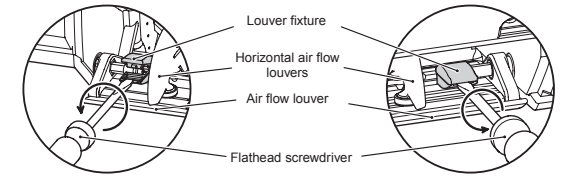
Electric parts cover detached



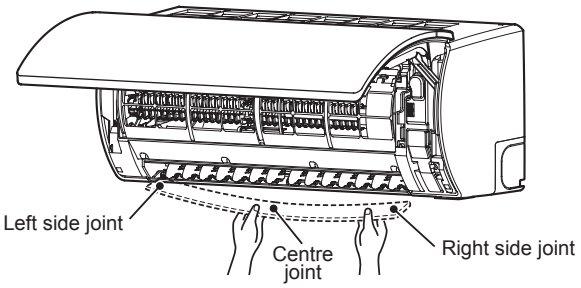


11-1-5. Louver

1) Open the moving panel, and support it with the panel support.
2) Open the vertical air flow louver.
3) Insert a flathead screwdriver into the gap of the louver fixture on the right and left ends of the vertical air flow louver, and turn in the counter-clockwise direction to remove.

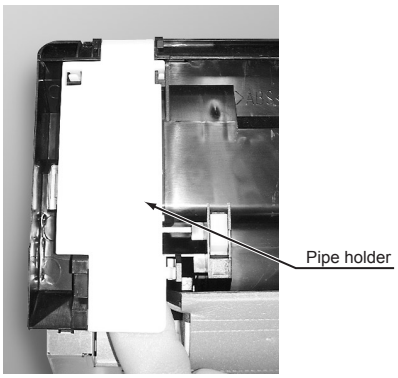


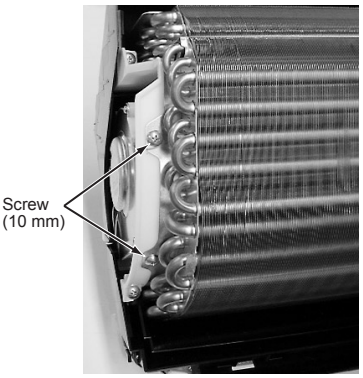
4) After pressing in the right and left connector joints, remove the vertical air flow louvres. Remove the centre joint and bend the louver downward. Remove the right side joint first, and then, remove the left side joint

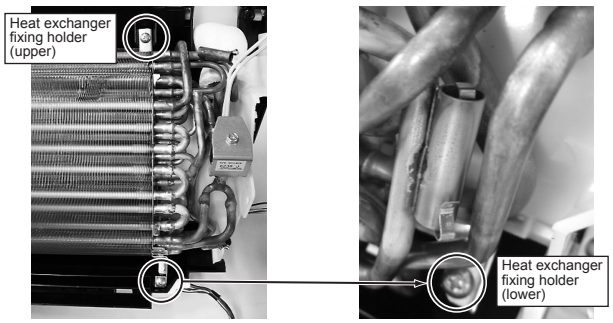


11-1-6. Heat Exchanger

1) Perform all the steps in **11-1-1.Removing the Front Panel and Moving Panel** and **11-1-2. Fixing Frame Assembly**.
2) Remove the pipe holder at the rear of the unit.
3) Remove the two fixing screws (10 mm) at the left of the heat exchanger.
4) Remove the fixing screw of the heat exchanger fixing holder (upper).
5) Remove the fixing screw of the heat exchanger fixing holder (lower).
6) Release the end plate hook and the claw at the right of the heat exchanger, pull up the heat exchanger, and then remove the fixing holder (lower) from the guide of the indoor unit.





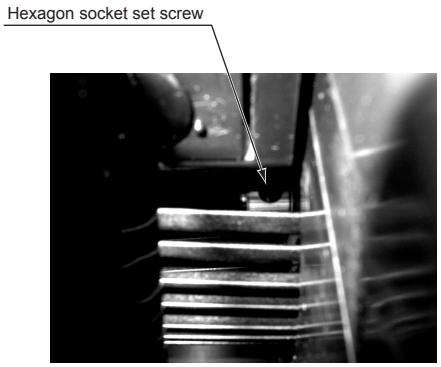


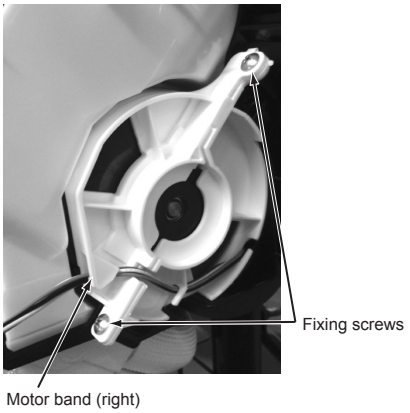
⚠ CAUTION

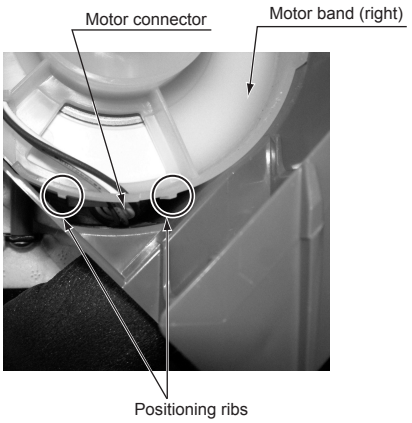
Check that the claw is engaged with the end plate hook, and then secure the heat exchanger with screws.

11-1-7. Fan Motor

1) Perform all the steps in **11-1-1.Removing the Front Panel and Moving Panel** and **11-1-3. Electric Parts Cover Detached**.
2) Loosen the hexagon socket set screw of the cross flow fan from the air outlet.
3) Remove the two fixing screws of the motor band (right).
4) Pull the motor band (right) and the fan motor out of the unit.





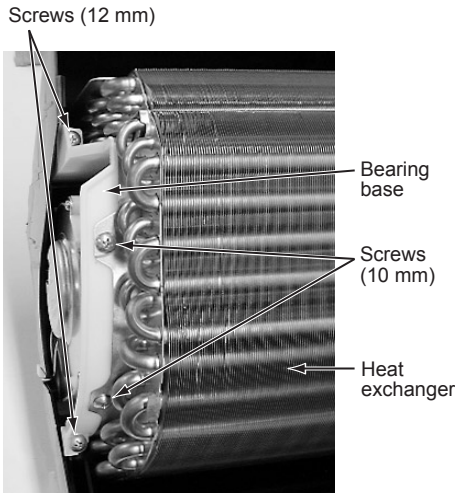


⚠ CAUTION

Install the fan motor while positioning it so that the fan motor connector comes between the positioning ribs on the motor band (right).
Be sure to tighten the hexagon socket set screw so that it touches the D-cut surface of the fan motor shaft.

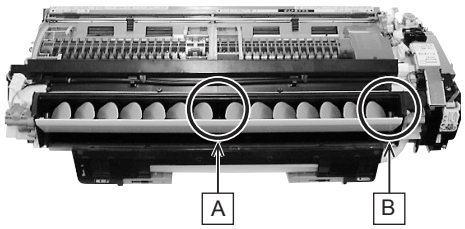
11-1-8. Cross Flow Fan

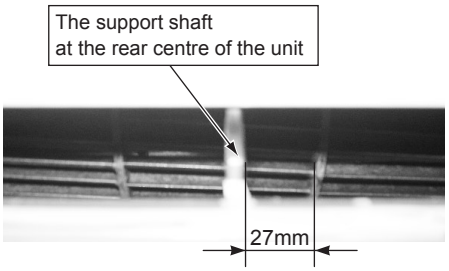
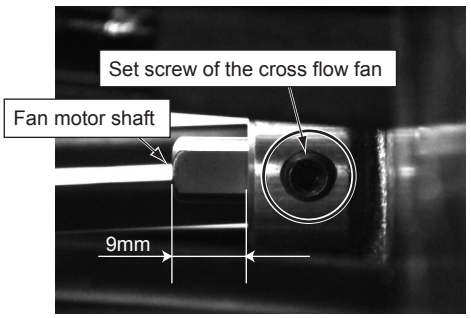
1) Perform all the steps in **11-1-1.Removing the Front Panel and Moving Panel** and **11-1-2. Fixing Frame Assembly**.
2) Remove the two fixing screws (10 mm) at the left of the heat exchanger end plate, and then remove the two fixing screws (12 mm) of the bearing base assembly.
3) Remove the bearing base while lifting the heat exchanger.
4) Remove the cross flow fan while lifting the heat exchanger.



⚠ CAUTION

Check and perform items 1 and 2 in the following table.



1	Keep 27mm distance between the support shaft at the rear centre of the unit and the immediate right joint-section of the cross flow fan. Detail A 
2	Check that the fan motor shaft end **projects by 9 mm above** the screw boss of the cross flow fan. If the motor shaft end is below the screw boss, the cross flow fan may have been assembled improperly. Check again whether the cross flow fan have been assembled properly. Detail B 
3	Be sure to tighten the hexagon socket set screw so that it touches the D-cut surface of the fan motor shaft.

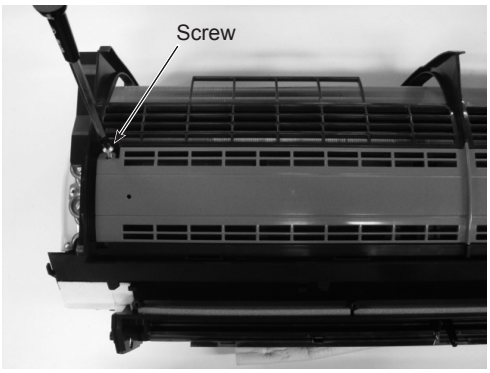
11-2. Plasma Ion Charger

11-2-1. Common Procedure

1) Perform all the steps in **11-1-1.Removing the Front Panel and Moving Panel** for the indoor unit.
2) Detach the two air filters.

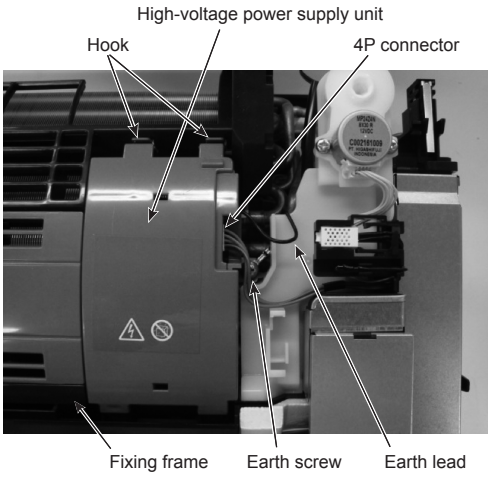
11-2-2. Protective Board

1) Remove the screw shown in the figure.
2) Shift the protective board to the left.
3) Pull the protective board toward you to remove it.



11-2-3. High-voltage Power Supply Unit and Discharger Unit

1) Perform all the steps in **11-1-1.Removing the Front Panel and Moving Panel**.
2) Disconnect the 4P connector on the high-voltage power supply unit.
3) Remove the screw securing the earth lead (black).
4) While pressing down the hook at the upper part of the high-voltage power supply unit, detach the upper part of the power supply unit.
5) Lift the high-voltage power supply unit, and pull the projection at the bottom of the high-voltage power supply unit out of the fixing frame.



⚠ CAUTION

Carry out this work taking care of the end of the sheet metal on the back of the discharger unit.

6) Gently warp the centre of the discharger unit downward, and disengage the upper projection from the fixing frame.
7) Gently warp the centre of the discharger unit upward, and disengage the lower projection from the fixing frame.
8) Hold the hook at the left of the discharger unit, and lift the discharger unit to remove it.

11-3. Outdoor Unit

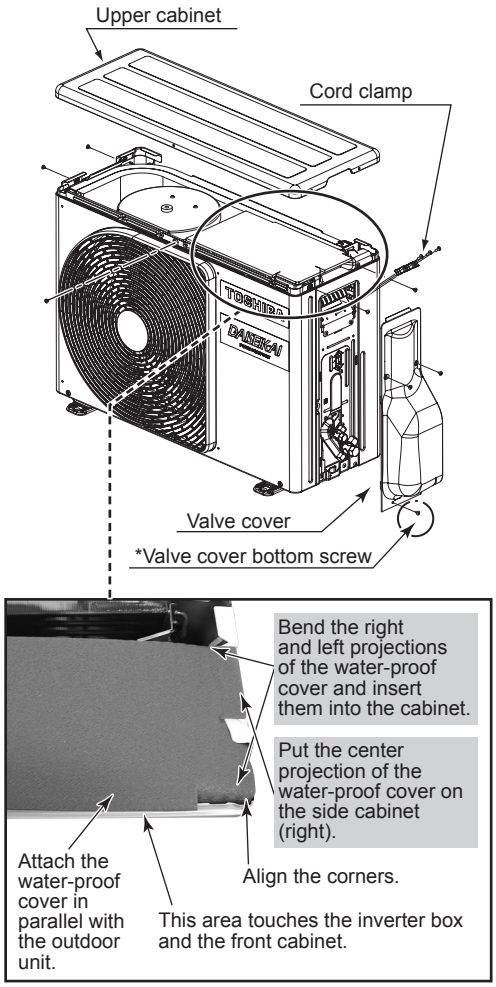
11-3-1. Common Procedure

REQUIREMENT

Wear gloves for this job.
Otherwise, you may injure your hands on the parts, etc.

Detachment

1) Stop operation of the air conditioner, and turn off the power breaker.
2) Remove the valve cover.
   (ST1TØ4 × 8L 3 pcs.)
   After removing the screws, pull down the valve cover to detach it.
3) Remove the cord clamp.
   (ST2TØ4 × 14L 3 pcs.)
4) Disconnect the connecting cable and power cord.
5) Remove the upper cabinet.
   (ST1TØ4 × 8L 5 pcs.)
   After removing the screws, pull up the upper cabinet to detach it.
6) Pull up the fin guard to detach it.
7) Remove the water-proof cover.



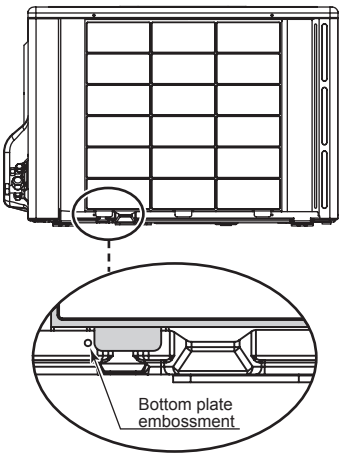
Attachment

1) Attach the water-proof cover.
   Bend the right and left projections to the inside of the side cabinet and the front cabinet.
2) Attach the centre projection so that it comes on the hand-held of the side cabinet (right).
3) After the water-proof cover has been attached, check that its longitudinal lines are in parallel with the outdoor unit.

REQUIREMENT

The water-proof cover must be attached without fail to prevent rain water or other foreign matters from entering inside the outdoor unit.

4) Attach the fin guard by inserting its bottom while nipping the bottom plate edge.
   • When attaching the fin guard, match it with the embossment on the bottom plate.



5) Attach the upper cabinet.
   (ST1TØ4 × 8L 5 pcs.)
   Attach the upper cabinet while pressing the fin guard against the heat exchanger.
6) Connect the connecting cable and the power cord, and then attach the cord clamps.
   (ST1TØ4 × 14L 3 pcs.)
7) Attach the valve cover. (ST1TØ4 × 8L 3 pcs.)
8) Insert the upper part of the valve cover into the wiring hole, fit the claws of the cover with the two rectangular holes in the outdoor unit, and then push up the cover.

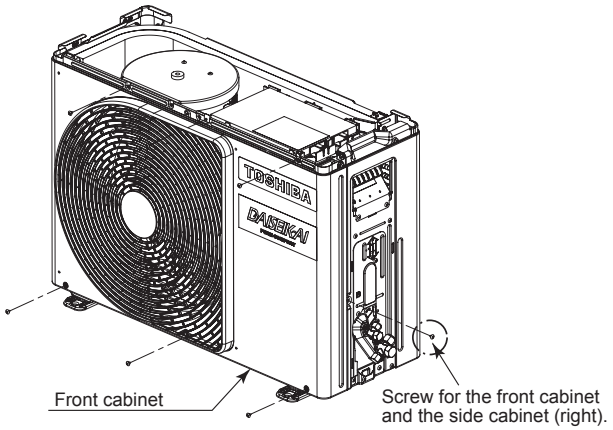
11-3-2. Front Cabinet

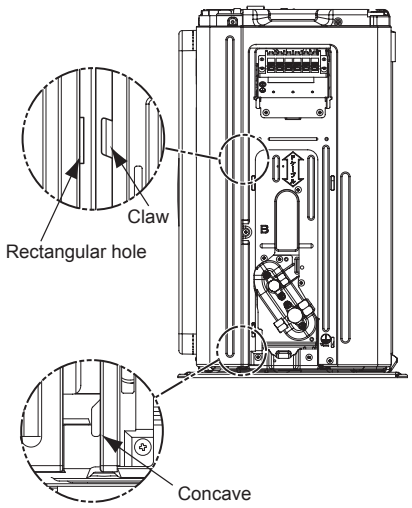
Detachment

1) Perform all steps of detachment in **11-3-1. Common Procedure**.
2) Remove the following screws:
   Screws (ST1TØ4 × 8L 2 pcs.) fixing the front cabinet and the inverter cover
   Front cabinet bottom screws (ST1TØ4 × 8L 3 pcs.)
   Screws (ST1TØ4 × 8L 2 pcs.) fixing the front cabinet and the motor base
   Screw (ST1TØ4 × 8L 1PC.) fixing the front cabinet and the side cabinet (right)
   - The front left aside of the front cabinet is fitted with the side cabinet (left), so pull up the front cabinet to remove it.

Attachment

1) Insert the front left claw into the side cabinet (left).
2) Hook the bottom part on the front right side to the concave of the bottom plate. Insert the claw of the side cabinet (right) into the rectangular hole in the front cabinet.
3) Install the removed screws to their original positions.

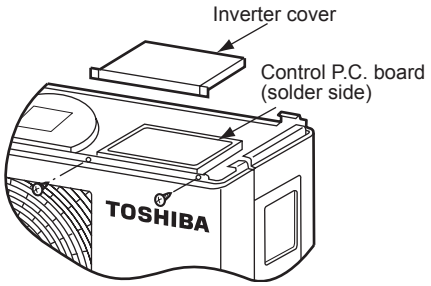




11-3-3. Control Board Assembly

Detachment

1) Perform all steps of detachment in **11-3-1. Common Procedure**.
2) Remove the screws (ST1TØ4 × 8L 2 pcs.) fixing the front cabinet and the inverter cover.



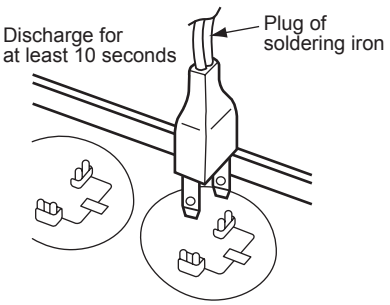
NOTE

- Detach the inverter cover in this state, which enables you to check the control P.C. board.
- If there is not enough space above the upper cabinet, perform step **11-3-2.Front Cabinet**.

⚠ CAUTION

Be very careful when checking the control P.C. board because high-voltage circuit is mounted on it.

3) Discharge the control P.C. board.
   Connect a discharging resistor (approx. 100Ω 40W) between the ⊕ and ⊖ terminals of electrolytic capacitors C08, C09, and C10 on the board or by contacting the plug of a soldering iron with the pins.



NOTE

Be sure to discharge these electrolytic capacitors because they cannot naturally discharge depending on the fault state, and a voltage may remain.

⚠ CAUTION

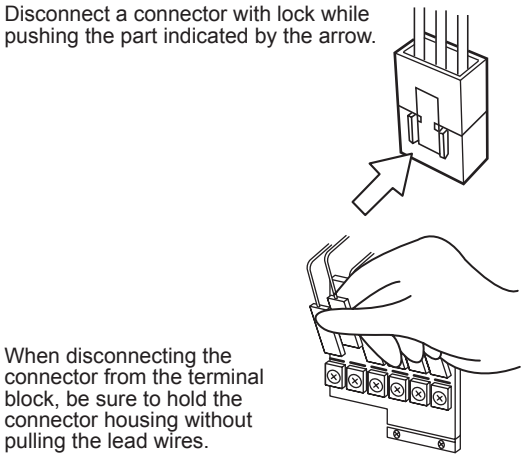
- Be sure to discharge these electrolytic capacitors because they cannot naturally discharge depending on the fault state, and a voltage may remain.

- These capacitors have large capacity. Therefore, it is dangerous if you short-circuit the ⊕, ⊖ terminals for discharging with a screwdriver or the like, which generates a big spark.

4) Perform step 2) of detachment in **11-3-2.Front Cabinet** to detach the front cabinet.
5) Remove the screws (ST1TØ4 × 8L 2 pcs.) fixing the side cabinet (right) and the terminal fixing plate.
6) Disconnect the lead wires from the holder at the upper part of the inverter box.
7) Remove the screw (ST1TØ4 × 8L 1 pc.) fixing the inverter box and the partition board.
8) Pull up the inverter box and disconnect the connectors of the lead wires. (Refer to "**Disconnecting inverter lead wires**")

NOTE

Since each connector has a lock mechanism, be sure to disconnect the connector by holding the connector housing without pulling lead wires.

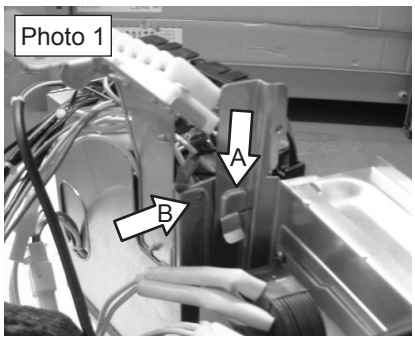


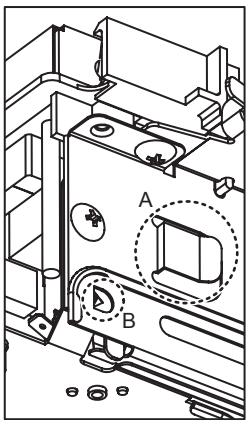
NOTE

Bind the lead wires again with cable ties after the P.C. board is replaced.

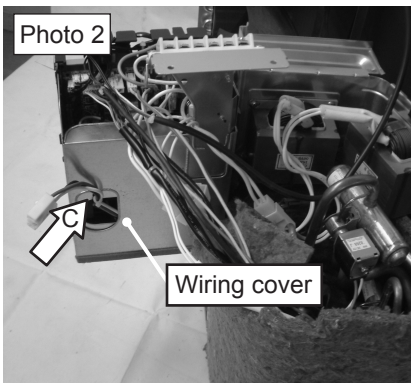
Disconnecting inverter lead wires

1) Hook the claw on the side of the inverter box to the hole in the partition board as shown in Photo 1 (arrow A).





2) Release the lock of the triangle hook (arrow B) with a flat-blade screwdriver or the like, and slide down the wiring cover as shown in Photo 2.



NOTE

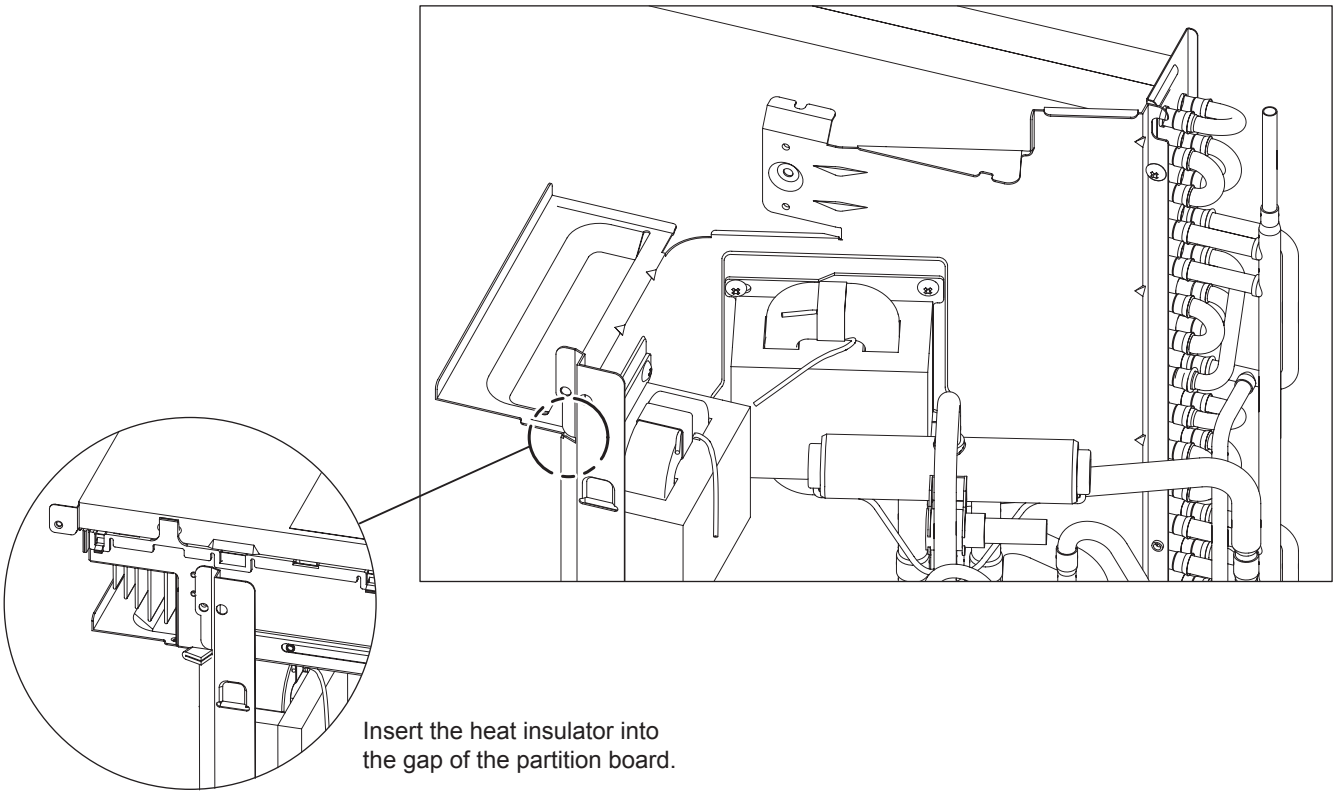
The wiring cover is fixed to the side of the inverter box with rivets, and it can slide along the long side of the inverter box.

3) Cut the cable tie (arrow C) clamping the compressor leads to the inverter box.
4) Remove the earth screw from the inverter box.
5) Cut the cable tie clamping the reactor leads and cord heater leads (-ND model only) to the inverter box.
6) Disconnect the connector on the clamp filter section.

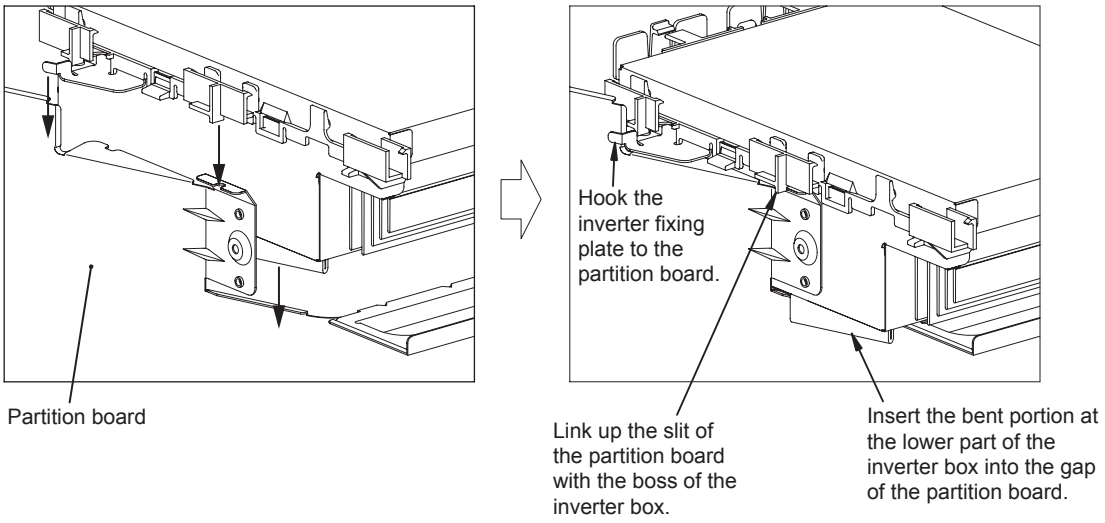
NOTE

- When reassembling the control P.C. board after replacement, clamp the compressor leads again with a cable tie.
- When reassembling the control P.C. board, slide the wiring cover until the hook (arrow B) is locked to return it to the initial position. If the wiring cover remains in the state shown in Photo 2, it cannot be accommodated in the outdoor unit.

Precautions when attaching the inverter box



View from behind



11-3-4. Outdoor Unit Control P.C. Board

1) Disconnect the leads and connectors connected between the control P.C. board assembly and other parts.

NOTE

When leads are clamped with cable ties, cut the cable ties.

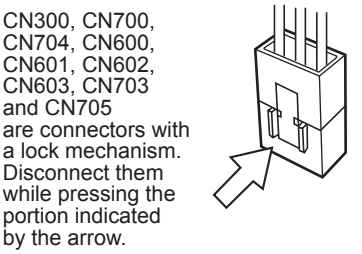
Leads connected to terminal: Disconnect the 3P connector (black/white/orange).

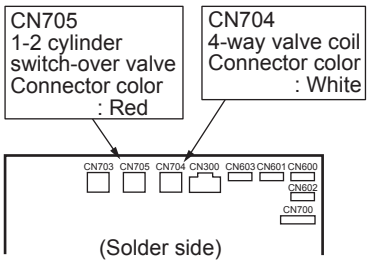
Leads connected to compressor: Disconnect the 3P connector.

Leads connected to reactor: Disconnect the two 2P connectors.

Earth lead (black): Remove the screw.

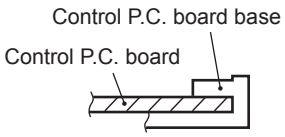
CN300: Outdoor fan motor (3P: white)
CN704: 4-way valve coil (2P: white)
CN600: TE sensor (2P: white)
CN700: Pulse motor valve coil (6P: white)
CN603: TS sensor (3P: white)
CN602: TO sensor (2P: white)
CN601: TD sensor (3P: white)
CN703: Heater for antifreeze (2P: red) (-ND only)
CN705: (1-2 cylinder switching valve)(2P: red)





REQUIREMENT

Connect wires to the correct connectors. Failure to do so may result in a malfunction.



2) Remove the control board assembly from the control P.C. board base with the heat sink assembled with the control board assembly with screws.

NOTE

Release the four claws on the control P.C. board base, hold the heat sink, and then remove the assembly upward.

3) Remove the five screws securing the heat sink and the control board assembly.
4) Attach a new control board assembly.

NOTE

- When attaching the new control board assembly, **insert the board properly into the board holder groove**.
- After the board is replaced and accommodated in the inverter box, **securely clamp the portions that were clamped before replacement with cable ties** to prevent wires from touching hot areas or metal edges.

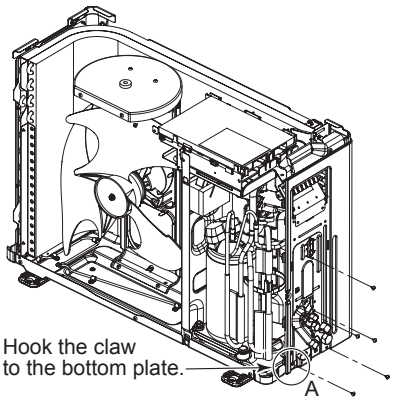
11-3-5. Side Cabinet

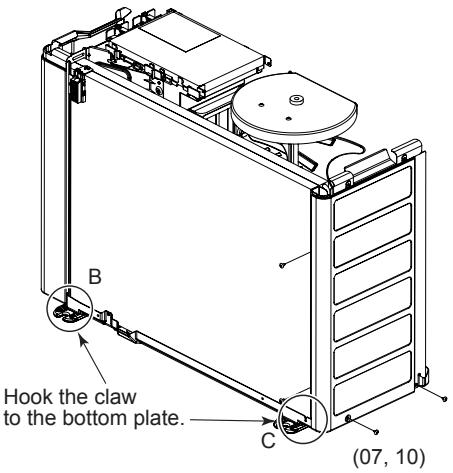
Side cabinet (right)

1) Perform the step of detachment in **11-3-2. Front Cabinet** and all the steps in **11-3-3. Control Board Assembly**.
2) Remove the screws (ST1TØ4 × 8L 5 pcs.) fixing the bottom plate and the packed valve fixing plate.

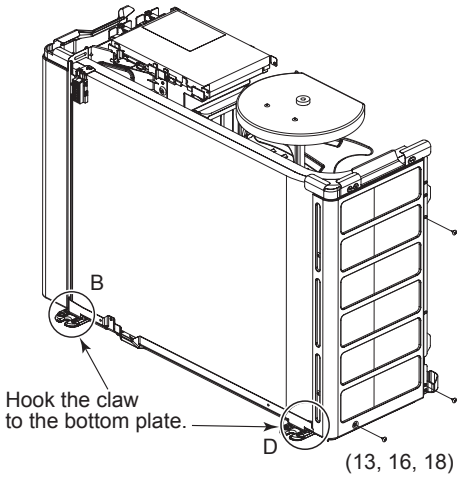
Side cabinet (left)

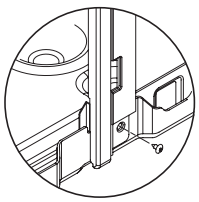
1) Perform the step of detachment in **11-3-2. Front Cabinet**.
2) Remove the screw (ST1TØ4 × 8L) fixing the side cabinet (left) and the heat exchanger.
3) Remove the screws (ST1TØ4 × 8L) fixing the side cabinet (left) and the bottom plate.

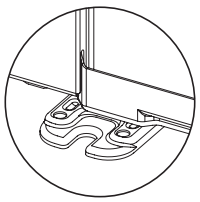


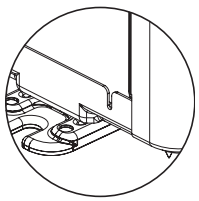


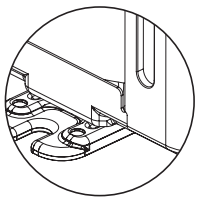
(07, 10)




Detail A


Detail B


Detail C (07, 10)

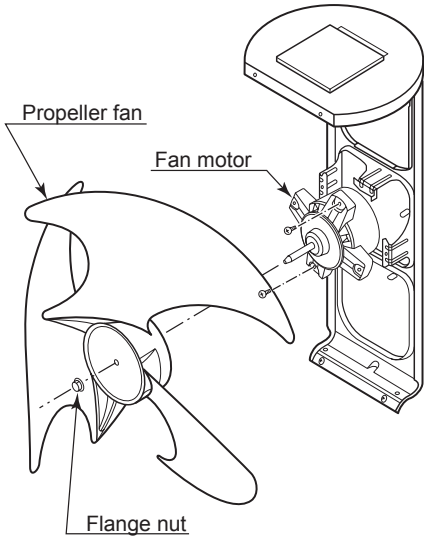

Detail D (13, 16, 18)

11-3-6. Fan Motor

1) Perform the step of detachment in **11-3-2. Front Cabinet**.
2) Remove the flange nut securing the fan motor and the propeller fan.
   The flange nut is loosened by turning it clockwise. (To tighten the flange nut, turn it counter clockwise.)
3) Remove the propeller fan.
4) Disconnect the fan motor connector from the inverter.
5) Remove the screws (ST1TØ4 × 20L 2 pcs.) while holding the fan motor by hand to prevent it from falling.

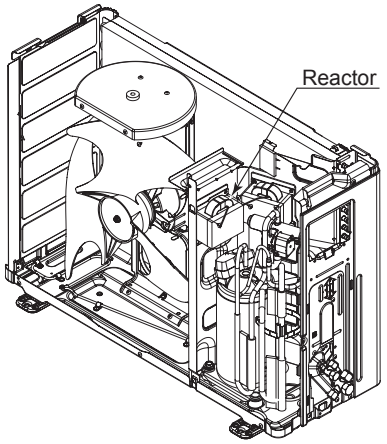
NOTE

When attaching the fan motor, tighten the flange nut to a tightening torque of 4.9N·m (50kgf·cm).



11-3-7. Reactor

1) Perform the step of detachment in **11-3-2. Front Cabinet** and all the steps in **11-3-3. Control Board Assembly**.
2) Remove the screw (ST1TØ4 × 8L 4 pcs.) fixing the reactor.



REQUIREMENT

After replacement, connect the lead wire connector and check whether the connector is coupled incompletely.

11-3-8. Compressor Assembly

1) Perform the step of detachment in **11-3-2. Front Cabinet** and all the steps in **11-3-3. Control Board Assembly**, **11-3-4.Outdoor Unit Control P.C. Board** and **11-3-5.Side Cabinet**.

2) Extract refrigerant gas.
3) Remove the partition board. (ST1TØ4 × 8L 3 pcs.)
4) Remove the sound-insulation material and the sensor.
5) Remove the screw (ST1TØ4 × 8L 1 pc.) fixing the bottom plate and the heat exchanger.
6) Remove the screw (ST1TØ4 × 8L 1 pc.) fixing the bottom plate and the valve fixing plate.
7) Remove the weldment connected to the compressor with a burner.

REQUIREMENT

Be careful not to bring the flame of the burner close to electric components, sensors, or the compressor. (This may result in a malfunction.)

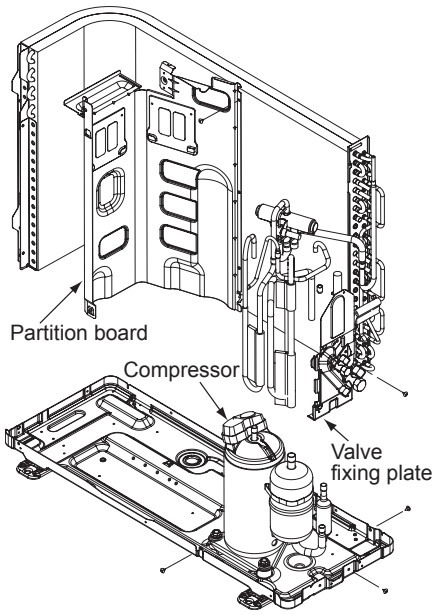
8) Pull up the refrigeration cycle.
9) Remove the compressor bolt fixing the compressor to the bottom plate.
10) Detach the compressor from the bottom plate.
11) Remove the 4-way valve assembly (Fig. A) from the refrigeration cycle.

NOTE

When assemblies the compressor:
- Tighten the compressor bolt to a tightening torque of 4.9N·m (50kgf·cm).
- Be careful not to get the coil lead wire burned.
- Be careful not to forget to install any sensor.

When replacing the compressor assembly, replace it together with the 4-way valve assembly shown in Fig. A.

* Failure to do so may result in a failure.



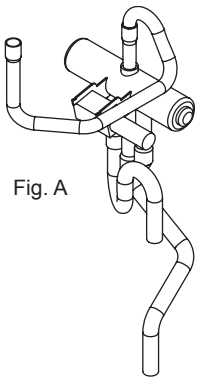
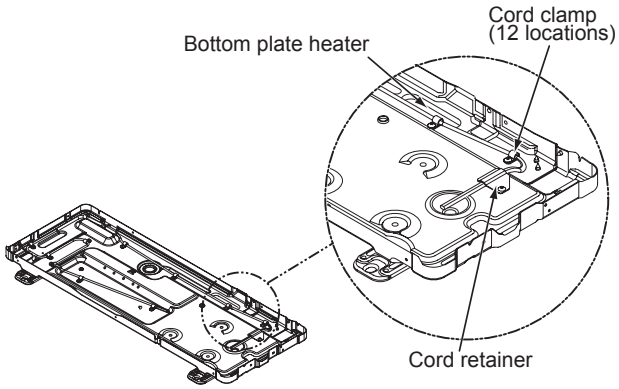


Fig. A

11-3-9. Heater for Antifreeze

Detachment

1) Perform steps in **11-3-8.Compressor Assembly** (except for step 6).
2) Remove the cord retainer. (ST1TØ4 × 10L 1pc.)
3) Remove the 12 cord clamps fixing the heater to the bottom plate, and detach the heater.
4) Attach a new heater to the bottom plate using the cord retainer and cord clamps supplied with the heater assembly (for service). (Part number: 375-57-729)



11-3-10.Fan Guard

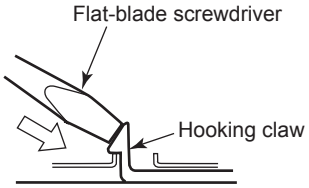
Detachment

1) Perform the step of detachment in **11-3-2. Front Cabinet**.

REQUIREMENT

Perform this work on a corrugated cardboard, cloth, etc. to protect the product from damage.

2) Remove the front cabinet, and put it with the fan guard facing down.
3) Release the hooking claws with a flat-blade screwdriver as shown in the fight figure, and remove the fan guard.



Attachment

1) Insert the claws of the fan guard into the holes in the front cabinet. Press the hooking claws (9 locations) by hand to fix them.

REQUIREMENT

The entire attaching work has been completed. Check that all the hooking claws are fixed at their original positions.

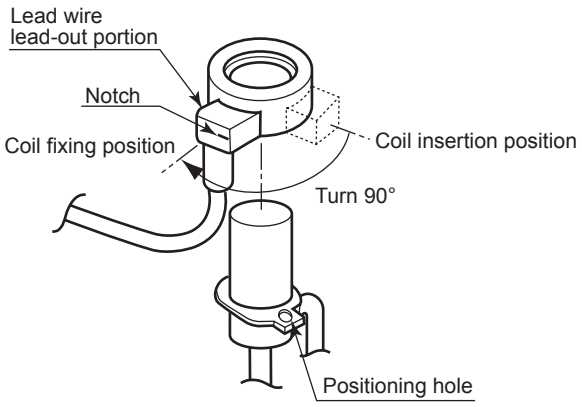
11-3-11.Pulse Motor Valve Coil <C12A>

Detachment

1) Perform the step of detachment in **11-3-2. Front Cabinet** and all the steps in **11-3-3. Control Board Assembly** and **11-3-5.Side Cabinet**.
2) Turn the coil clockwise (or counter clockwise) 90 degrees, and remove the coil from the pulse motor valve body.

Attachment

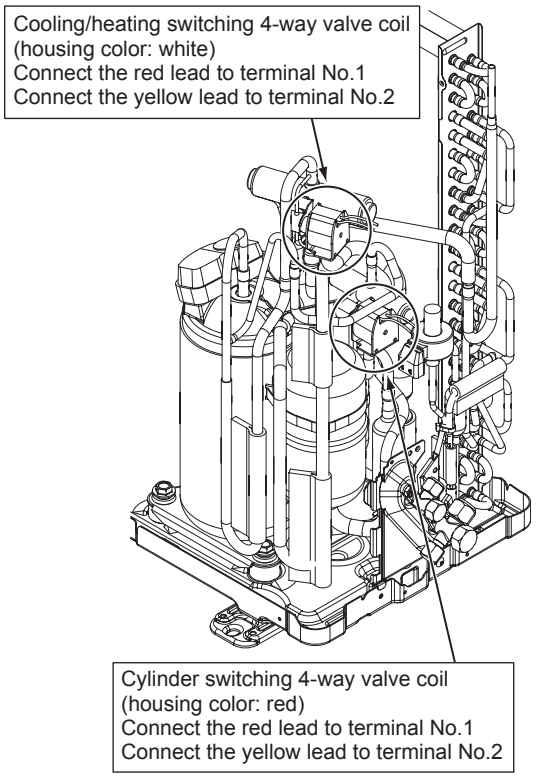
1) Match the coil lead wire lead-out portion with the coin insertion position of the pulse motor valve body, and attach the valve coil.
2) Turn the coil 90 degrees and fix it while matching the projection at the bottom of the coil with the positioning hole in the pulse motor valve body.



11-3-12.4-way Valve Coil

Attachment

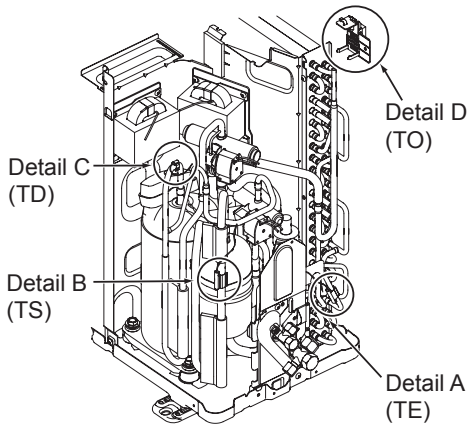
1) When connecting wires to the 4-way valve coils, be careful of lead colours for correct connection.

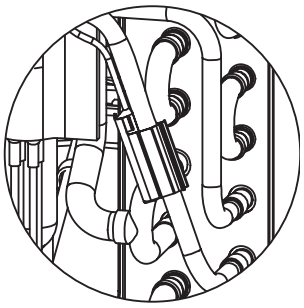


11-3-13.TE Sensor (Outdoor Heat Exchanger Temperature Sensor)

Attachment

1) Install the TE sensor onto the straight part of the condenser output pipe with the lead wires pointing upward and the sensor facing the rear of the cabinet.



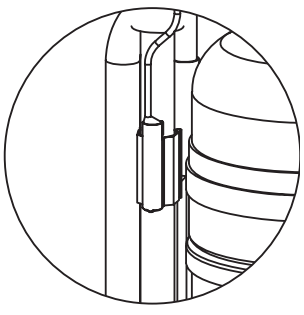


Detail A

11-3-14.TS Sensor (Suction Temperature Sensor)

Attachment

1) Install the TS sensor onto the straight part of the suction pipe with the lead wires pointing upward and the sensor facing the packed valve.

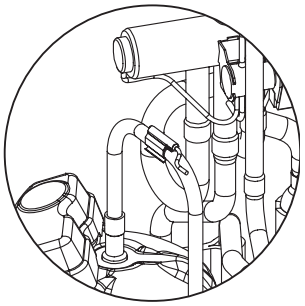


Detail B

11-3-15.TD Sensor (Discharge Temperature Sensor)

Attachment

1) Install the TD sensor onto the straight part of the discharge pipe with the lead wires pointing upward and the sensor facing the front of the cabinet.

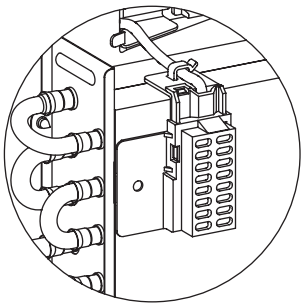


Detail C

11-3-16.TO Sensor (Outside Air Temperature Sensor)

Attachment

1) Install the TO sensor at the upper part of the heat exchanger with the left edge aligned with the heat exchanger edge panel.



Detail D

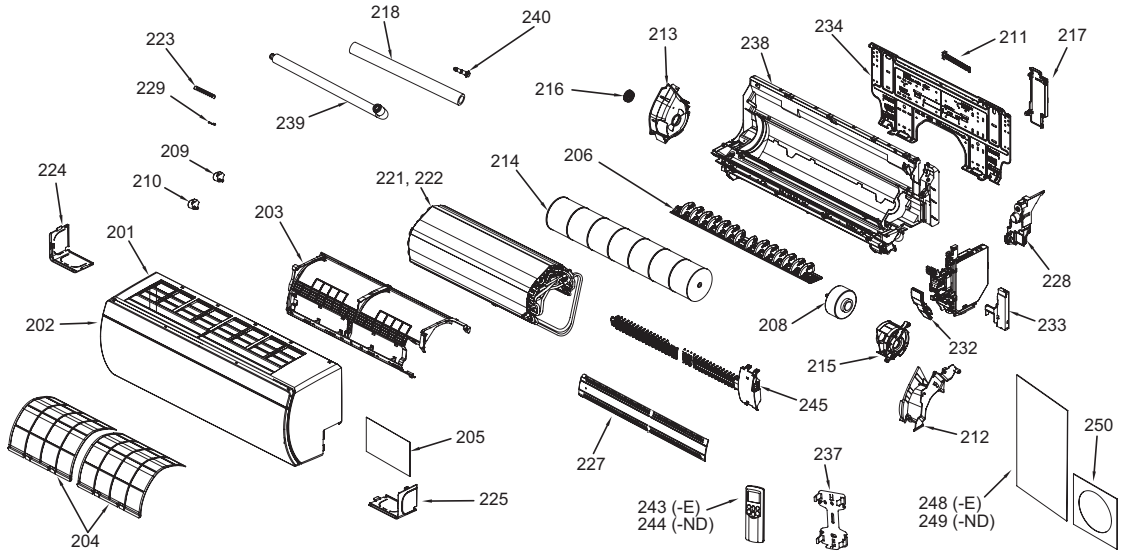
⚠ CAUTION

- During (and at the end of) the installation work, take care not to damage the coverings of the sensor leads on the edges of the metal plates or other parts. Damaged lead coverings may cause electric shock or fire.
- After sensors have been replaced, check whether each sensor is installed properly at the specified position. Incorrect or improper installation will not ensure correct control of the product, which may result in a failure.

12 EXPLODED VIEWS AND PARTS LIST

12-1. Indoor Unit

RAS-07PKVP-E, RAS-10PKVP-E, RAS-13PKVP-E, RAS-16PKVP-E, RAS-18PKVP-E
RAS-07PKVP-ND, RAS-10PKVP-ND, RAS-13PKVP-ND, RAS-16PKVP-ND, RAS-18PKVP-ND



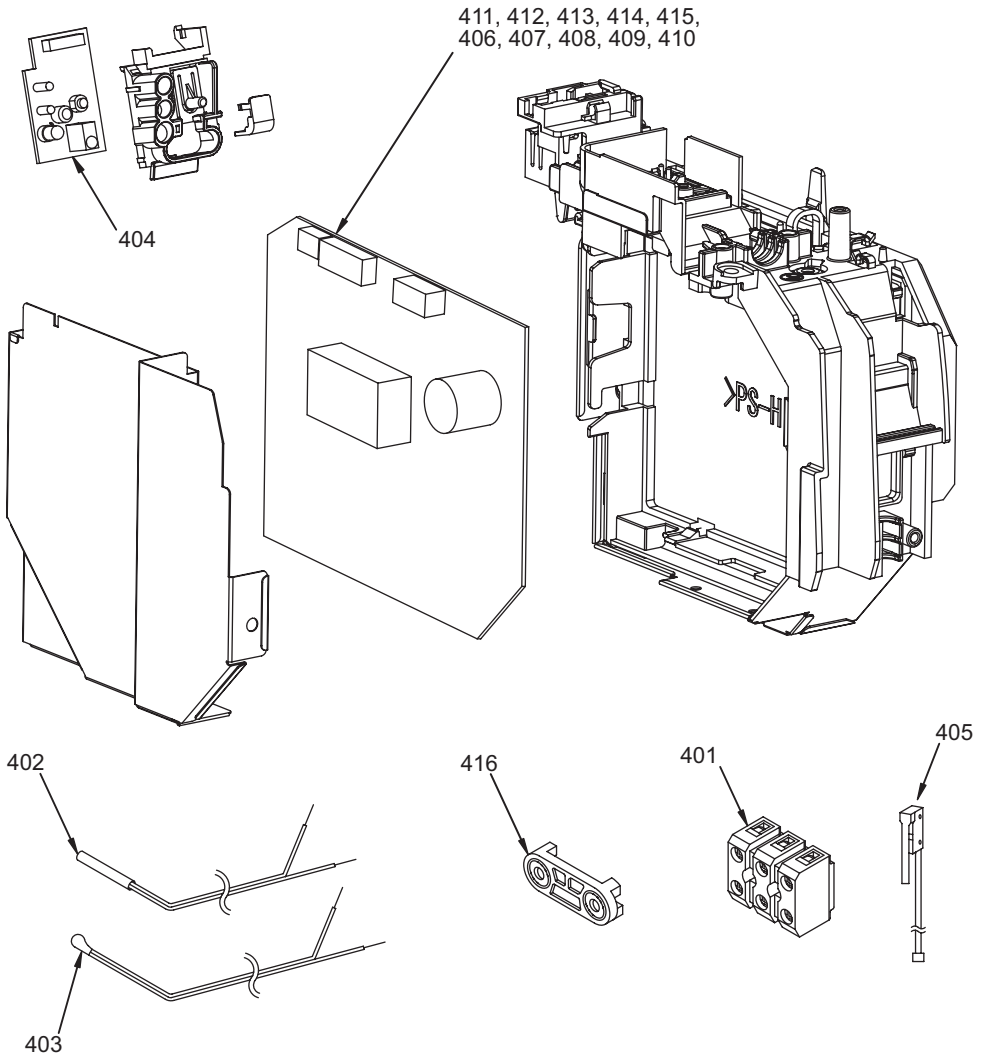
* The parts in the following parts list are conformed to RoHS.
Therefore be sure to use the following parts for repairing and replacing.

Location No.	Part No.	Description
201	43005779	PANEL ASSY
202	43005778	FRAME, AINL ASSY
203	4301V098	FIX, FRAME ASSY
204	43080609	FILTER, AIR
205	4308S207	WIRING DIAGRAM
206	43022455	LOUVER ASSY
208	4302C095	FAN MOTOR ASSEMBLY
209	4302C076	MOTOR, LOUVER (FOR PANEL)
210	4302D003	MOTOR, LOUVER (FOR LOUVER)
211	4306A172	CORD, MOTOR, L0UVER
212	4301V103	COVER ASSY, MOTOR
213	43022458	BASE, BEARING, ASSY
214	43020372	FAN, ASSY, CROSS FL0W
215	43039376	BAND, MOTOR, RIGHT
216	43125171	BEARING ASSY, MOLD
217	4301V083	HOLDER, PIPE
218	43049787	PIPE, SHIELD
221	43044872	REFRIGERATION CYCLE ASSY
		(07,10,13PKVP-E, -ND)
222	43044873	REFRIGERATION CYCLE ASSY
		(16, 18PKVP-E, -ND)
223	43049784	SPRING

Location No.	Part No.	Description
224	43096255	PANEL, BUSH(L)
225	43096257	PANEL, BUSH(R)
227	4301V097	GUARD, PLASMAPURE FILTER
228	4301V089	BASE ASSY, MOTOR
229	43019904	HOLDER, SENSOR
232	43062276	CONNECTOR, COVER ASSY
233	43062275	LEAD, COVER, ASSY
234	43082296	PLATE, INSTALLATION
237	43083071	HOLDER, REMOTE, CONTROLLER
238	43003323	BODY, ASSY, BACK
239	43070199	HOSE, DRAIN
240	43079239	CAP, DRAIN
243	43066024	REMOTE CONTROLLER, WIRELESS
		(07, 10, 13, 16, 18PKVP-E)
244	43066025	REMOTE CONTROLLER, WIRELESS
		(07, 10, 13, 16, 18PKVP-ND)
245	43080608	PLASMA PURE FILTER, ASSY
248	4308S208	OWNER'S MANUAL
		(07, 10, 13, 16, 18PKVP-E)
249	4308S224	OWNER'S MANUAL
		(07, 10, 13, 16, 18PKVP-ND)
250	4308S210	OWNER'S MANUAL
		(CD-ROM)

12-2. Microcomputer P.C. Board

RAS-07PKVP-E, RAS-10PKVP-E, RAS-13PKVP-E, RAS-16PKVP-E, RAS-18PKVP-E
RAS-07PKVP-ND, RAS-10PKVP-ND, RAS-13PKVP-ND, RAS-16PKVP-ND, RAS-18PKVP-ND



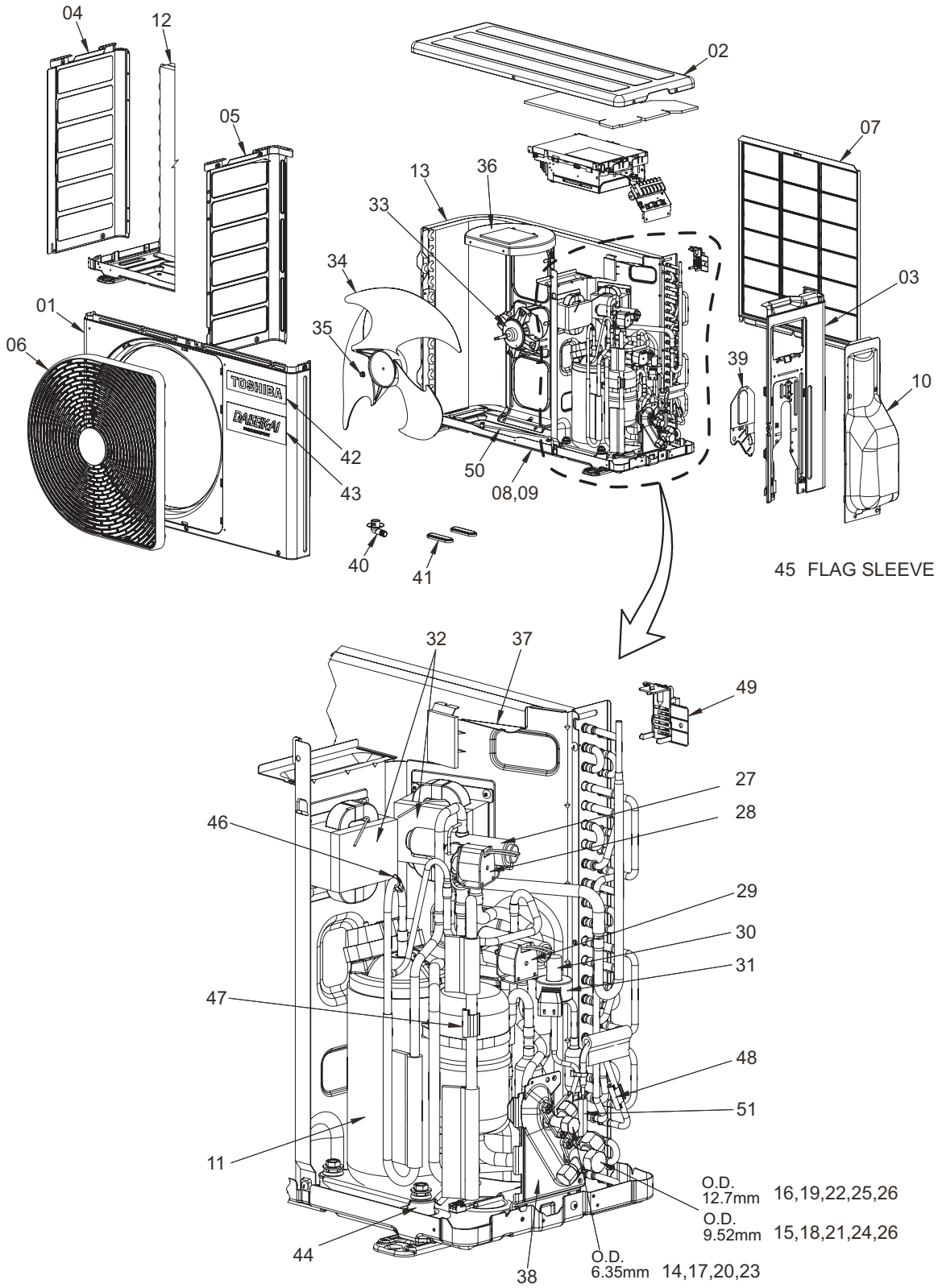
* The parts in the following parts list are conformed to RoHS.
Therefore be sure to use the following parts for repairing and replacing.

Location No.	Part No.	Description
401	4306A132	TERMINAL BLOCK, 3P
402	43050425	SENSOR ASSY, SERVICE
403	43050426	SENSOR, SERVICE
404	4306V137	PC BOARD ASSY, WRS-LED
405	43051349	SWITCH ASSY, MICRO
406	4306V127	PC BOARD ASSY, 07PKVP-E
407	4306V128	PC BOARD ASSY, 10PKVP-E
408	4306V129	PC BOARD ASSY, 13PKVP-E

Location No.	Part No.	Description
409	4306V130	PC BOARD ASSY, 16PKVP-E
410	4306V131	PC BOARD ASSY, 18PKVP-E
411	4306V132	PC BOARD ASSY, 07PKVP-ND
412	4306V133	PC BOARD ASSY, 10PKVP-ND
413	4306V134	PC BOARD ASSY, 13PKVP-ND
414	4306V135	PC BOARD ASSY, 16PKVP-ND
415	4306V136	PC BOARD ASSY, 18PKVP-ND
416	43067115	CLAMP, CORD

12-3. Outdoor Unit

RAS-07PAVP-E, RAS-10PAVP-E, RAS-13PAVP-E, RAS-16PAVP-E, RAS-18PAVP-E
RAS-07PAVP-ND, RAS-10PAVP-ND, RAS-13PAVP-ND, RAS-16PAVP-ND, RAS-18PAVP-ND



RAS-07PAVP-E, RAS-10PAVP-E, RAS-13PAVP-E, RAS-16PAVP-E, RAS-18PAVP-E
RAS-07PAVP-ND, RAS-10PAVP-ND, RAS-13PAVP-ND, RAS-16PAVP-ND, RAS-18PAVP-ND

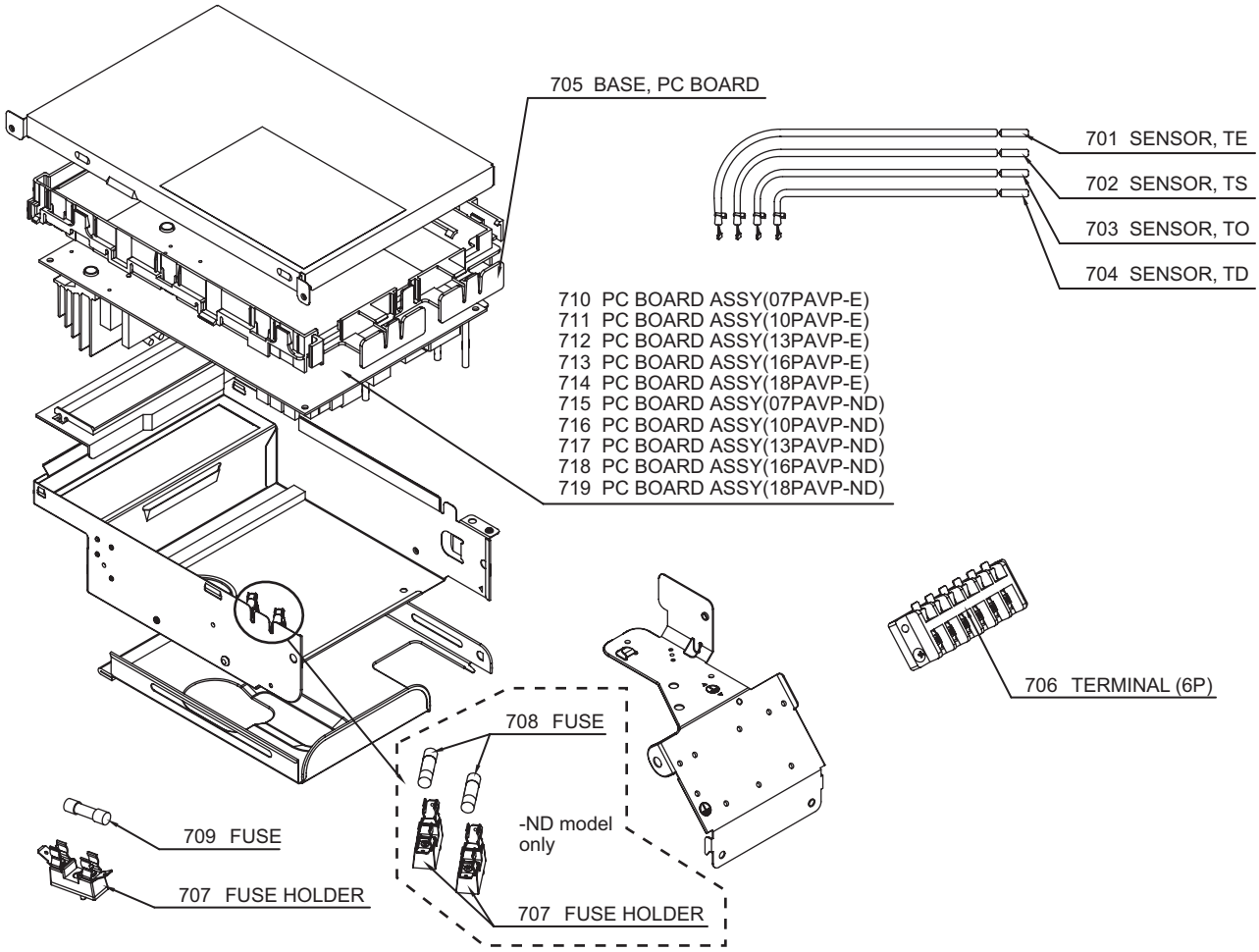
* The parts in the following parts list are conformed to RoHS.
Therefore be sure to use the following parts for repairing and replacing.

Location No.	Part No.	Description
01	43005657	CABI, FRONT
02	43005642	CABINET, UPPER
03	43005774	CABINET, SIDE, RIGHT
04	43005679	CABINET, SIDE, LEFT (07, 10PAVP-E, -ND)
05	43005634	CABINET, SIDE, LEFT
		(13, 16, 18PAVP-E, -ND)
06	4301V088	GUARD, FAN
07	4301V053	GUARD, FIN
08	43100346	BASE ASSY, ROHS (-E)
09	43005716	BASE ASSY (-ND)
10	4301V096	COVER, VALVE, PACKD, ASSY
11	43041643	COMPRESSOR, DA111A1FD-21F
12	43043803	CONDENSER ASSY (07, 10PAVP-E, -ND)
13	43043796	CONDENSER ASSY
		(13, 16, 18PAVP-E, -ND)
14	37546845	VALVE, PACKED, 6.35
15	43046442	VALVE, PACKED, 9.52DIA
		(07, 10, 13PAVP-E, -ND)
16	43146680	VALVE, PACKED, 12.7
		(16, 18PAVP-E, -ND)
17	43147196	BONNET, 1/4 IN
18	43047401	BONNET, 3/8 IN (07, 10, 13PAVP-E, -ND)
19	43147195	BONNET, 1/2 IN (16, 18PAVP-E, -ND)
20	43047676	NUT, FLARE, 6.35
21	43047677	NUT, FLARE, 9.52
		(07, 10, 13PAVP-E, -ND)
22	43047655	NUT, FLARE, 12.7
		(16, 18PAVP-E, -ND)
23	43047679	CAP, VALVE, PACKED, 6.35

Location No.	Part No.	Description
24	43047680	CAP, VALVE, PACKED, 9.52
		(07, 10, 13PAVP-E, -ND)
25	43047659	CAP, VALVE, PACKED, 12.7
		(16, 18PAVP-E, -ND)
26	43047674	CAP, CHARGE, PORT
27	43046451	VALVE, 4-WAY, STF-0218G
28	43046482	COIL, SOLENOID, VHV-01AZ535A1
29	43046483	COIL, SOLENOID, VHV-01AZ535B1
30	43046476	VALVE, PMV, SEV16RCC
31	43046467	COIL, PMV
32	43058270	REACTOR
33	4302C068	MOTOR, FAN, ICF-140-43-4R
34	43020329	FAN, PROPELLER, PJ421
35	43047669	NUT, FLANGE
36	43039394	BASE, MOTOR
37	43004242	PLATE, PARTITION
38	4301V067	PLATE, FIX, VALVE, PACKED
39	4301V095	PLATE, CONNECT, VALVE, PACKED
40	43032441	NIPPLE, DRAIN
41	43089160	CAP, WATERPROOF
42	4301P703	MARK, TOSHIBA
43	4301P702	MARK, DAISEIKAI
44	43042485	RUBBER, CUSHION
45	43062176	SLEEVE, FLAG
46	43063321	HOLDER, SENSOR (TD)
47	43063322	HOLDER, SENSOR (TS)
48	43063325	HOLDER, SENSOR (TE)
49	43063339	HOLDER, SENSOR (TO)
50	37557729	CORD, HEATER, ASSY (-ND)
51	44246239	TUBE, CAPILLARY, ID 1.2

12-4. P.C. Board

RAS-07PAVP-E, RAS-10PAVP-E, RAS-13PAVP-E, RAS-16PAVP-E, RAS-18PAVP-E
RAS-07PAVP-ND, RAS-10PAVP-ND, RAS-13PAVP-ND, RAS-16PAVP-ND, RAS-18PAVP-ND



* The parts in the following parts list are conformed to RoHS.
Therefore be sure to use the following parts for repairing and replacing.

Location No.	Part No.	Description
701	43050441	SENSOR, TE
702	43050442	SENSOR, TS
703	43050451	SENSOR, TO
704	43050443	SENSOR, TD
705	43062228	BASE, PC BOARD
706	43160566	TERMINAL BLOCK, 6P, 20A
707	43160571	FUSE, HOLDER, 15A, 250V
708	4306A156	FUSE(ET), 3.15A, AC250V (-ND)
709	43160590	FUSE, 6.3A, AC250V
710	4306V144	PC BOARD ASSY, MCC5070 (07PAVP-E)
711	4306V145	PC BOARD ASSY, MCC5070 (10PAVP-E)
712	4306V146	PC BOARD ASSY, MCC5070 (13PAVP-E)

Location No.	Part No.	Description
713	4306V147	PC BOARD ASSY, MCC5070 (16PAVP-E)
714	4306V148	PC BOARD ASSY, MCC5070 (18PAVP-E)
715	4306V149	PC BOARD ASSY, MCC5070 (07PAVP-ND)
716	4306V150	PC BOARD ASSY, MCC5070 (10PAVP-ND)
717	4306V151	PC BOARD ASSY, MCC5070 (13PAVP-ND)
718	4306V152	PC BOARD ASSY, MCC5070 (16PAVP-ND)
719	4306V153	PC BOARD ASSY, MCC5070 (18PAVP-ND)

TOSHIBA CARRIER CORPORATION
23-17, TAKANAWA 3-CHOME, MINATOKU, TOKYO 108-0074, JAPAN
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