

TOSHIBA

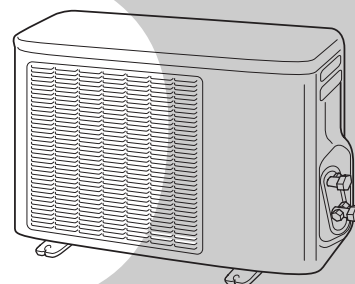
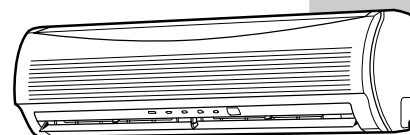
FILE NO. A02-015

SERVICE MANUAL

AIR-CONDITIONER

SPLIT TYPE

RAS-10JKVP-E
RAS-10JAVP-E
RAS-13JKVP-E
RAS-13JAVP-E



PRINTED IN JAPAN, Jun., 2003 ToMo

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1. SPECIFICATIONS

1-1. Specifications

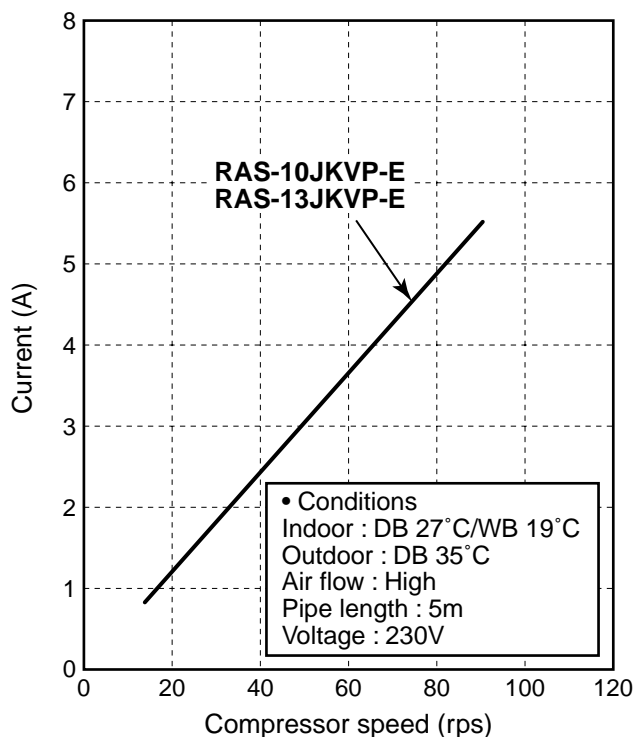
RAS-10JKVP-E/RAS-10JAVP-E, RAS-13JKVP-E/RAS-13JAVP-E

Unit model		Indoor		RAS-10JKVP-E		RAS-13JKVP-E		
		Outdoor		RAS-10JAVP-E		RAS-13JAVP-E		
Cooling capacity				(kW)	2.5		3.5	
Cooling capacity range				(kW)	0.6–3.4		0.6–4.2	
Heating capacity				(kW)	3.2		4.2	
Heating capacity range				(kW)	0.6–6.2		0.6–6.6	
Power supply				1Ph/50Hz/220–240 V, 1Ph/60Hz/220 V				
Electric characteristics	Indoor	Operation mode		Cooling	Heating	Cooling	Heating	
		Running current (A)		0.15	0.15	0.15	0.15	
		Power consumption (W)		30	30	30	30	
		Power factor (%)		87	87	87	87	
	Outdoor	Operation mode		Cooling	Heating	Cooling	Heating	
		Running current (A)		2.58/2.46/2.35	3.44/3.28/3.14	4.40/4.20/4.02	5.07/4.84/4.63	
		Power consumption (W)		540	720	920	1060	
		Power factor (%)		95	95	95	95	
		Starting current (A)		3.59/3.43/3.29		5.22/4.99/4.78		
COP (Cooling/Heating)				4.39/4.27		3.68/3.85		
Operating noise	Indoor	High (Cooling/Heating) (dB•A)		42/43		43/44		
		Medium (Cooling/Heating) (dB•A)		33/34		34/35		
		Low (Cooling/Heating) (dB•A)		25/25		26/26		
	Outdoor (Cooling/Heating) (dB•A)		45/47		48/50			
Indoor unit	Unit model		RAS-10JKVP-E		RAS-13JKVP-E			
	Dimension	Height (mm)	250		250			
		Width (mm)	790		790			
		Depth (mm)	208		208			
	Net weight (kg)		10		10			
	Fan motor output (W)		30		30			
	Air flow rate (Cooling/Heating) (m³/h)		550/610		560/640			
Outdoor unit	Unit model		RAS-10JAVP-E		RAS-13JAVP-E			
	Dimension	Height (mm)	550		550			
		Width (mm)	780		780			
		Depth (mm)	270		270			
	Net weight (kg)		38		38			
	Compressor	Motor output (W)	750		750			
		Type	Twin rotary type with DC-inverter variable speed control					
		Model	DA91A1F-45F		DA91A1F-45F			
	Fan motor output (W)		43		43			
Air flow rate (Cooling/Heating) (m³/h)		2150/2150		2410/2410				
Piping connection	Type		Flare connection		Flare connection			
	Indoor unit	Liquid side	Ø6.35		Ø6.35			
		Gas side	Ø9.52		Ø9.52			
	Outdoor unit	Liquid side	Ø6.35		Ø6.35			
		Gas side	Ø9.52		Ø9.52			
	Maximum length (m)		25		25			
	Maximum chargeless length (m)		15		15			
Maximum height difference (m)		10		10				
Refrigerant	Name of refrigerant		R410A		R410A			
	Weight (kg)		0.9		0.9			
Wiring connection	Power supply		3 Wires : includes earth (Outdoor)		3 Wires : includes earth (Outdoor)			
	Interconnection		4 Wires : includes earth		4 Wires : includes earth			
Usable temperature range		Indoor (Cooling/Heating) (°C)	21–32/0–28		21–32/0–28			
		Outdoor (Cooling/Heating) (°C)	10–43/–15–24		10–43/–15–24			
Accessory	Indoor unit	Installation plate		1		1		
		Wireless remote controller		1		1		
		Batteries		2		2		
		Remote controller holder		1		1		
		Zeolite-plus filter		1		1		
		Zeolite-3G filter		1		1		
		Mounting screw		6 (Ø4 x 25L)		6 (Ø4 x 25L)		
		Flat head wood screw		2 (Ø3.1 x 16L)		2 (Ø3.1 x 16L)		
		Dust collecting unit		1		1		
		Installation manual		1		1		
		Owner's manual		1		1		
		Pattern		1		1		
	Outdoor unit	Drain nipple		1		1		

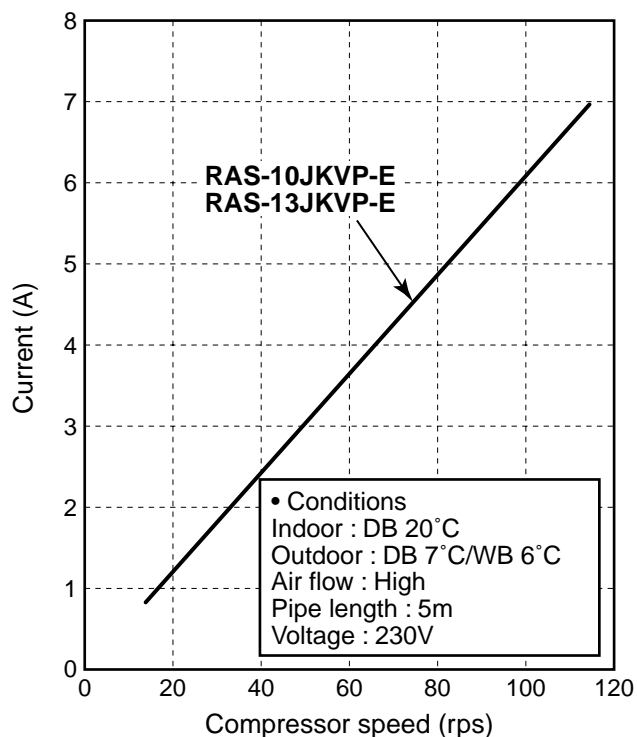
- The specifications may be subject to change without notice for purpose of improvement.

1-2. Operation Characteristic Curve

<Cooling>

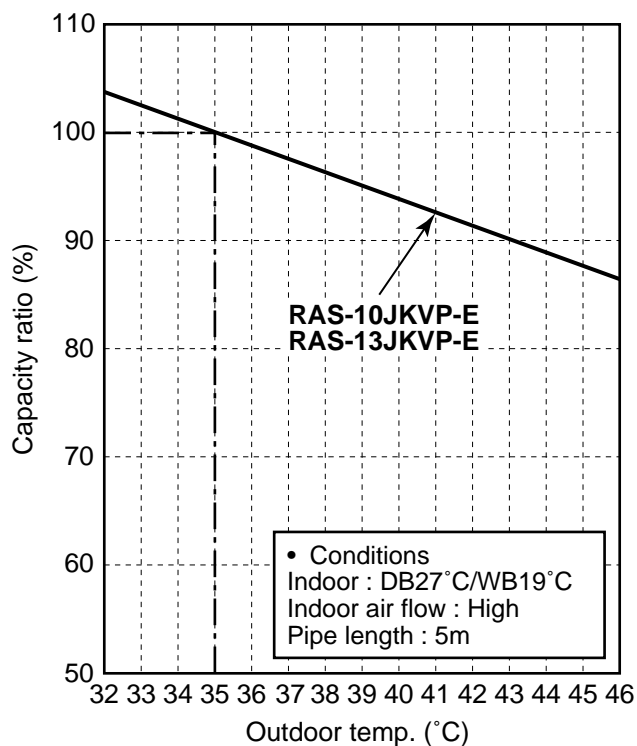


<Heating>

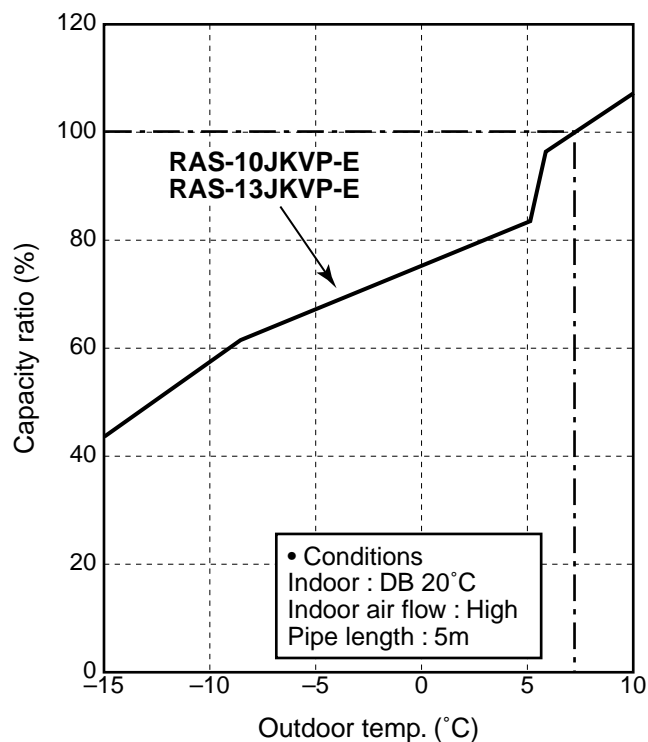


1-3. Capacity Variation Ratio According to Temperature

<Cooling>



<Heating>



* Capacity ratio : 100% = 3.5 kW (RAS-13JKVP-E)
2.5 kW (RAS-10JKVP-E)

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.

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

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

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

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

- (3) If a refrigeration gas leakage occurs during installation/servicing, be sure to ventilate fully.
If the refrigerant gas comes into contact with fire, a poisonous gas may occur.
- (4) When installing or removing an air conditioner, do not allow air or moisture to remain in the refrigeration cycle. Otherwise, pressure in the refrigeration cycle may become abnormally high so that a rupture or personal injury may be caused.
- (5) After completion of installation work, check to make sure that there is no refrigeration gas leakage.
If the refrigerant gas leaks into the room, coming into contact with fire in the fan-driven heater, space heater, etc., a poisonous gas may occur.

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

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

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

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

- (8) Unauthorized modifications to the air conditioner may be dangerous. If a breakdown occurs please call a qualified air conditioner technician or electrician.

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

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.

- (1) Copper Pipes

It is necessary to use seamless copper pipes which are made of either copper or copper alloy and it is desirable that the amount of residual oil is less than 40 mg/10 m. Do not use copper pipes having a collapsed, deformed or discolored portion (especially on the interior surface).

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

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

Thicknesses of copper pipes used with R410A are as shown in Table 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

(2) Joints

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

a) Flare Joints

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

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

b) Socket Joints

Socket joints are such that they are brazed for connections, and used mainly for thick pipings whose diameter is larger than 20 mm. Thicknesses of socket joints are as shown in Table 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 other than lubricating oils used in the installed air conditioner is used, and that refrigerant does not leak. When using lubricating oils in the piping processing, use such lubricating oils whose water content has been removed. When stored, be sure to seal the container with an airtight cap or any other cover.

(1) Flare Processing Procedures and Precautions**a) Cutting the Pipe**

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

b) Removing Burrs and Chips

If the flared section has chips or burrs, refrigerant leakage may occur. Carefully remove all burrs and clean the cut surface before installation.

c) Insertion of Flare Nut

d) Flare Processing

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

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

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

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

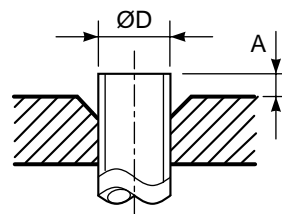


Fig. 2-2-1 Flare processing dimensions

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 R410A 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	19.7	19.0	16.0	23	27
3/4	19.05	1.0	23.3	24.0	19.2	34	36

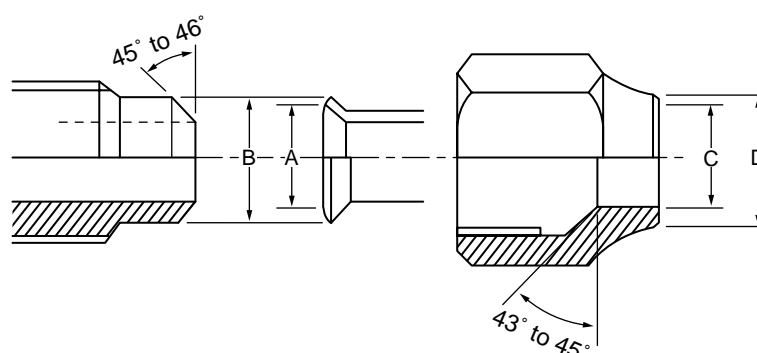


Fig. 2-2-2 Relations between flare nut and flare seal surface

(2) Flare Connecting Procedures and Precautions

- Make sure that the flare and union portions do not have any scar or dust, etc.
- Correctly align the processed flare surface with the union axis.
- Tighten the flare with designated torque by means of a torque wrench. The tightening torque for R410A is the same as that for conventional R22. Incidentally, when the torque is weak, the gas leakage may occur.

When it is strong, the flare nut may crack and may be made non-removable. When choosing the tightening torque, comply with values designated by manufacturers. Table 2-2-7 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 conditioner using R410A is changed to prevent mixing of other refrigerant. To reinforce the pressure-resisting strength, flare processing dimensions and opposite side dimension of flare nut (For Ø12.7 copper pipe) of the refrigerant piping are lengthened.

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

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

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

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

Tools whose specifications are changed for R410A and their interchangeability

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

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

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

General tools (Conventional tools can be used.)

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

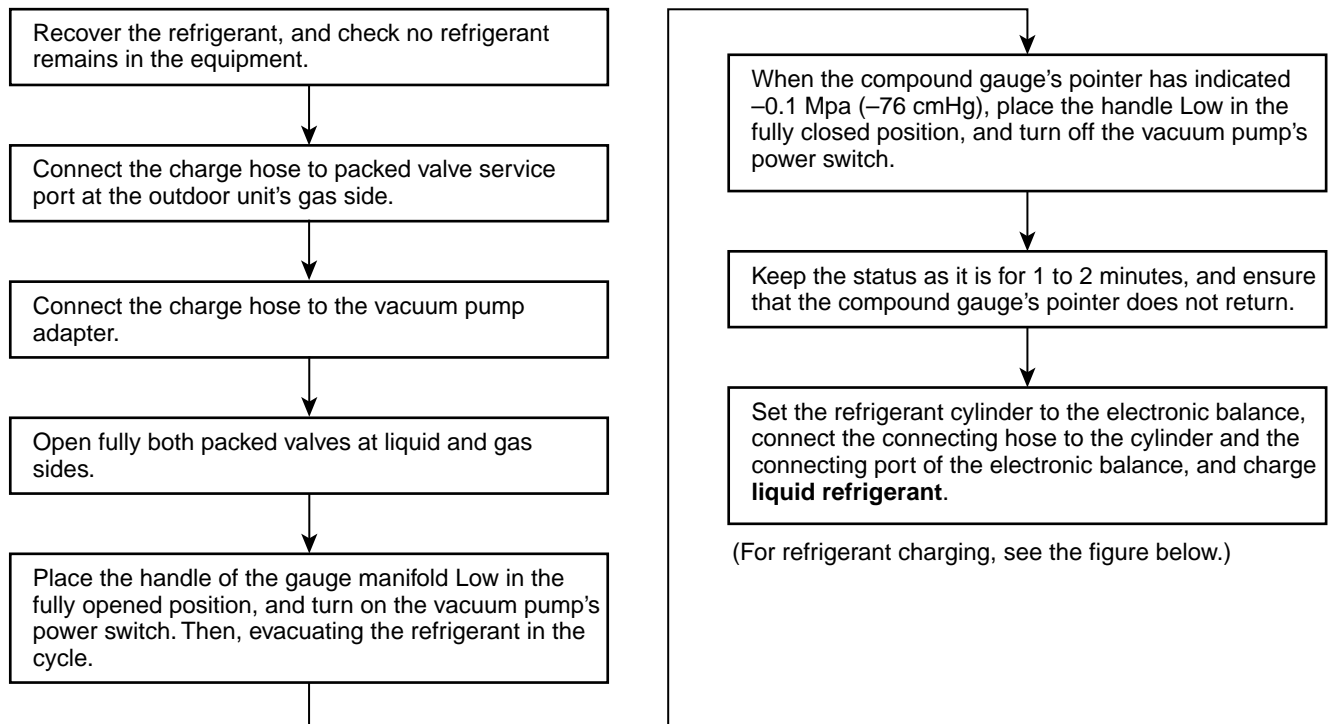
- | | | |
|---|------------------------------|--|
| (1) Vacuum pump
Use vacuum pump by
attaching vacuum pump adapter. | (5) Pipe bender | (10) Hexagon wrench
(Opposite side 4mm) |
| (2) Torque wrench (For Ø6.35, Ø9.52) | (6) Level vial | (11) Tape measure |
| (3) Pipe cutter | (7) Screwdriver (+, -)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

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

- | | |
|-----------------|----------------------------------|
| (1) Clamp meter | (3) Insulation resistance tester |
| (2) Thermometer | (4) Electroscope |

2-4. Recharging of Refrigerant

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



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

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

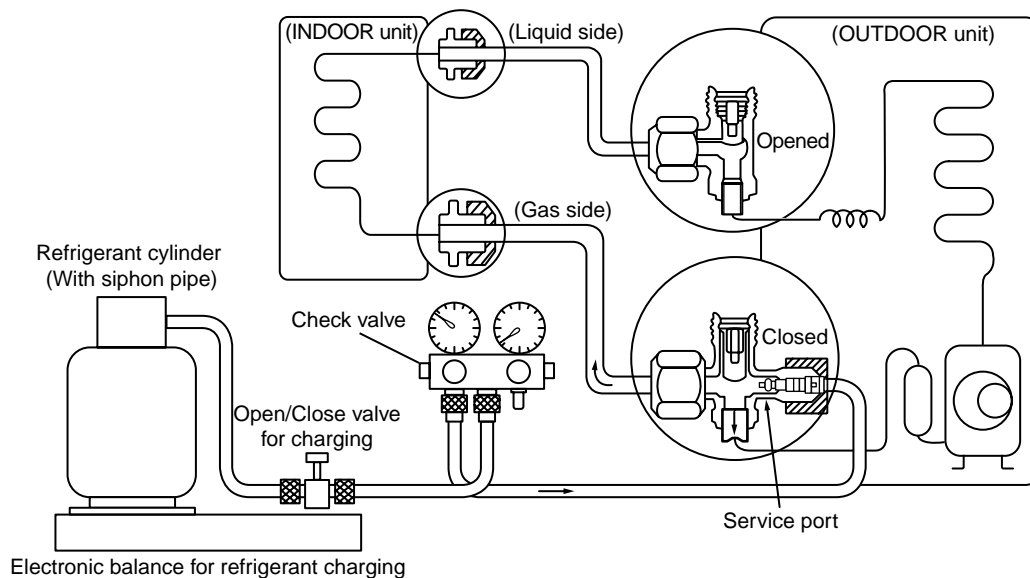
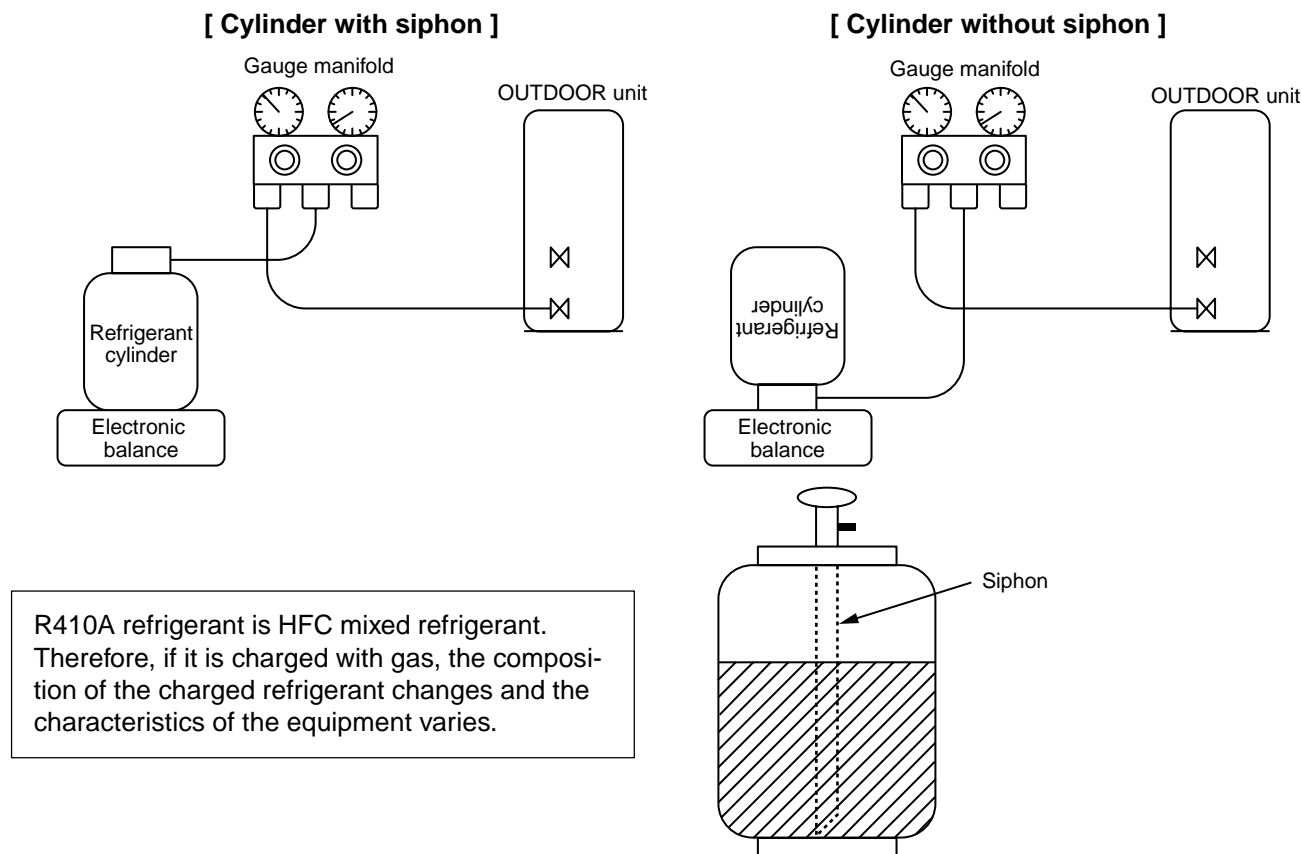


Fig. 2-4-1 Configuration of refrigerant charging

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

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



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.

Fig. 2-4-2

2-5. Brazing of Pipes

2-5-1. Materials for Brazing

(1) Silver brazing filler

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

(2) Phosphor bronze brazing filler

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

(3) Low temperature brazing filler

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

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

2-5-2. Flux

(1) Reason why flux is necessary

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

(2) Characteristics required for flux

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

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

(3) Types of flux

• Noncorrosive flux

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

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

• Activated flux

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

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

(4) Piping materials for brazing and used brazing filler/flux

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

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

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.

Never use gas other than Nitrogen gas.

(1) 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 m³/Hr or 0.02 MPa (0.2kgf/cm²) by means of the reducing valve.
- 6) After performing the steps above, keep the Nitrogen gas flowing until the pipe cools down to a certain extent (temperature at which pipes are touchable with hands).
- 7) Remove the flux completely after brazing.

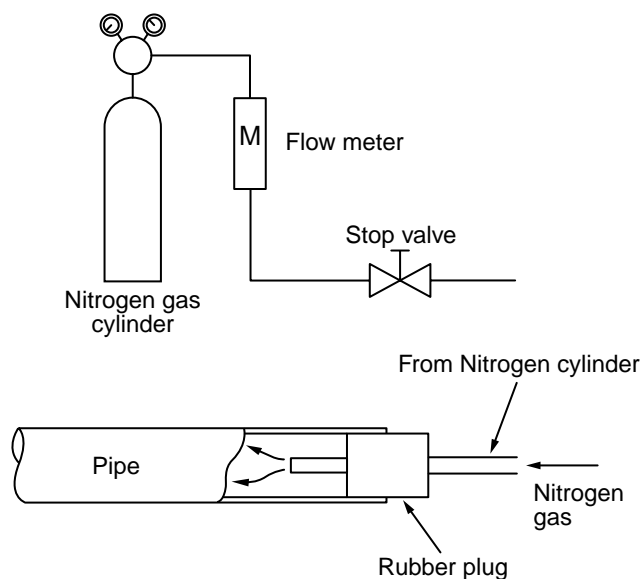
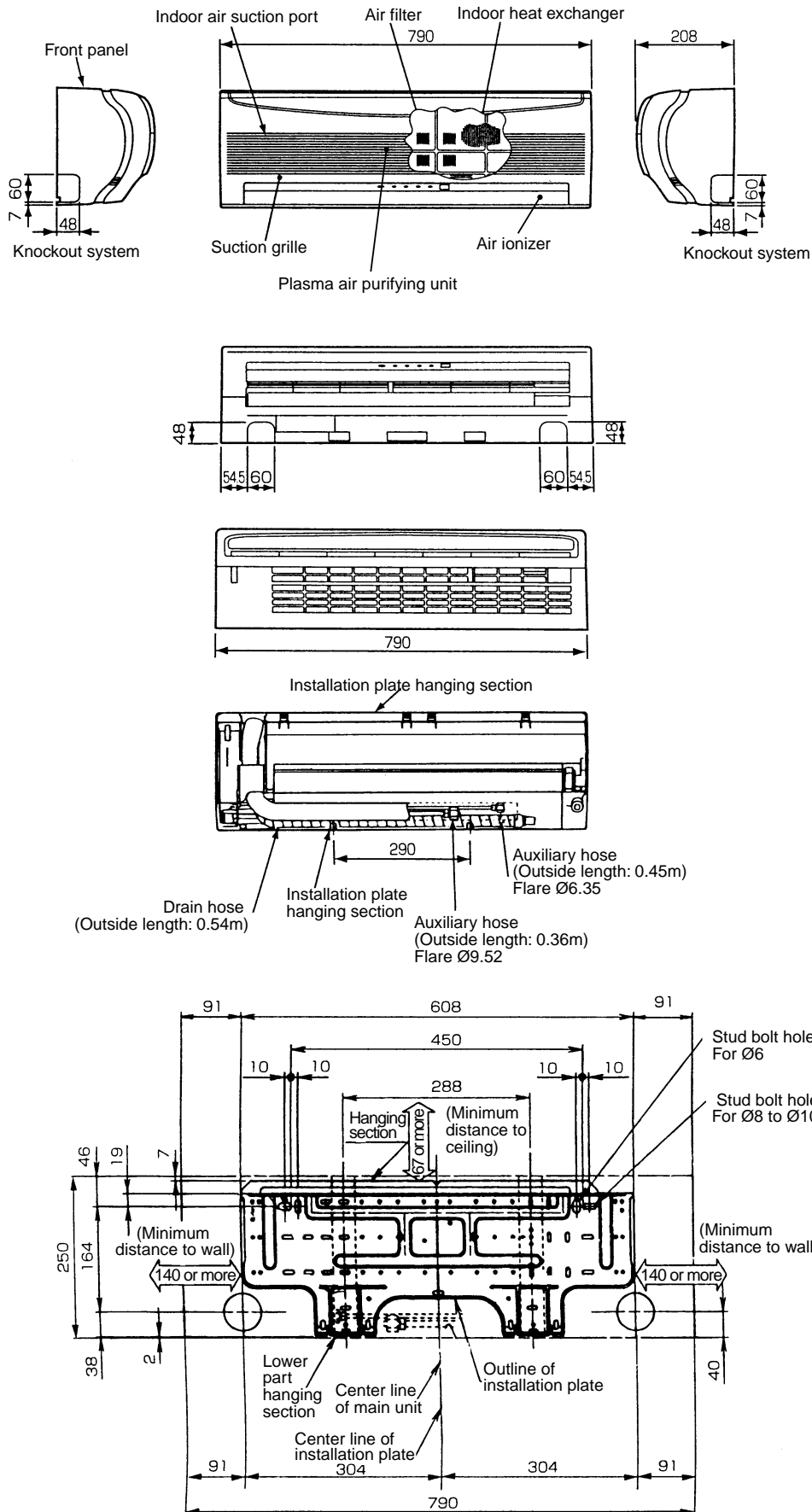


Fig. 2-5-1 Prevention of oxidation during brazing

3. CONSTRUCTION VIEWS

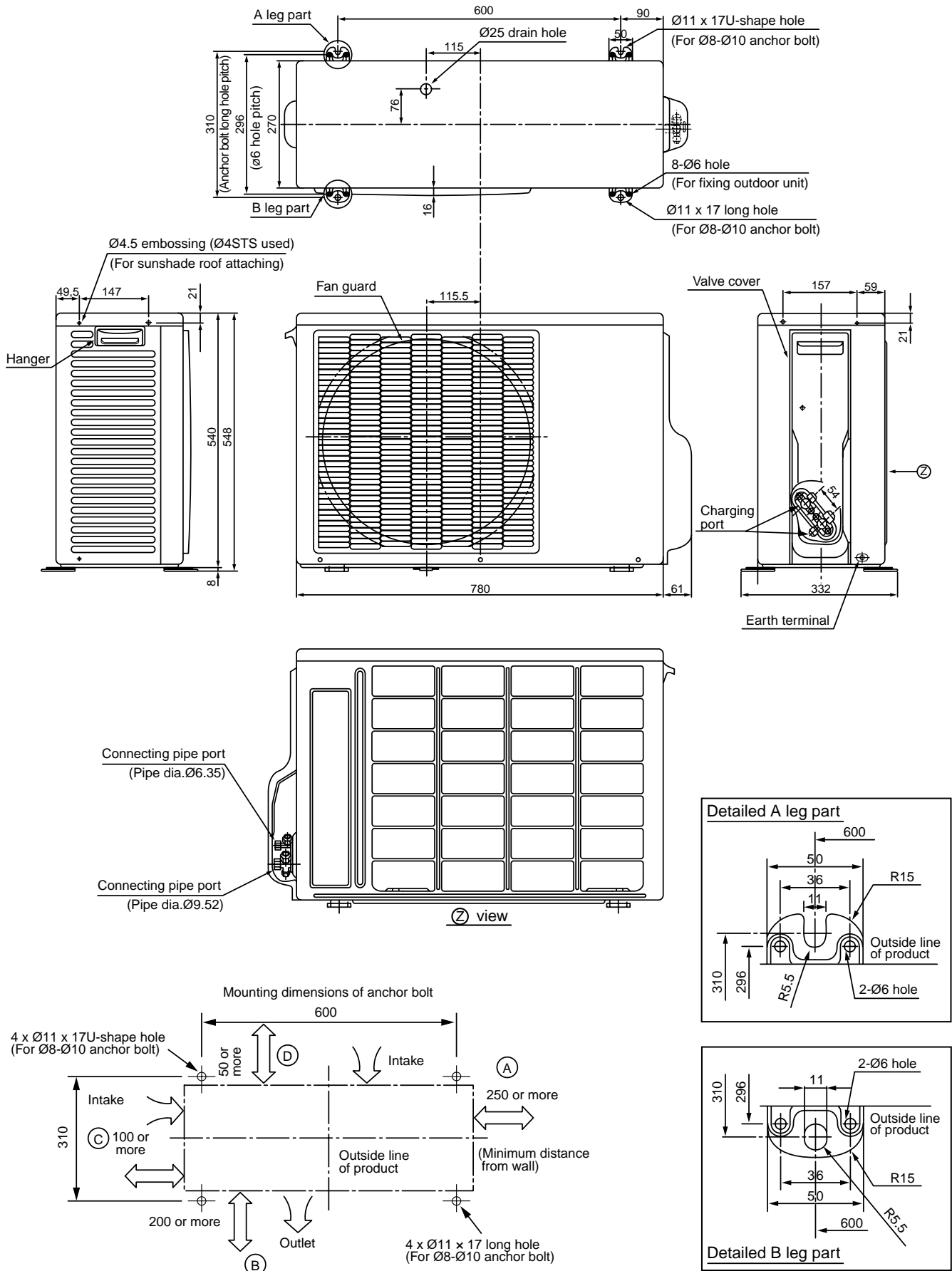
3-1. Indoor Unit

RAS-10JKVP-E, RAS-13JKVP-E



3-2. Outdoor Unit

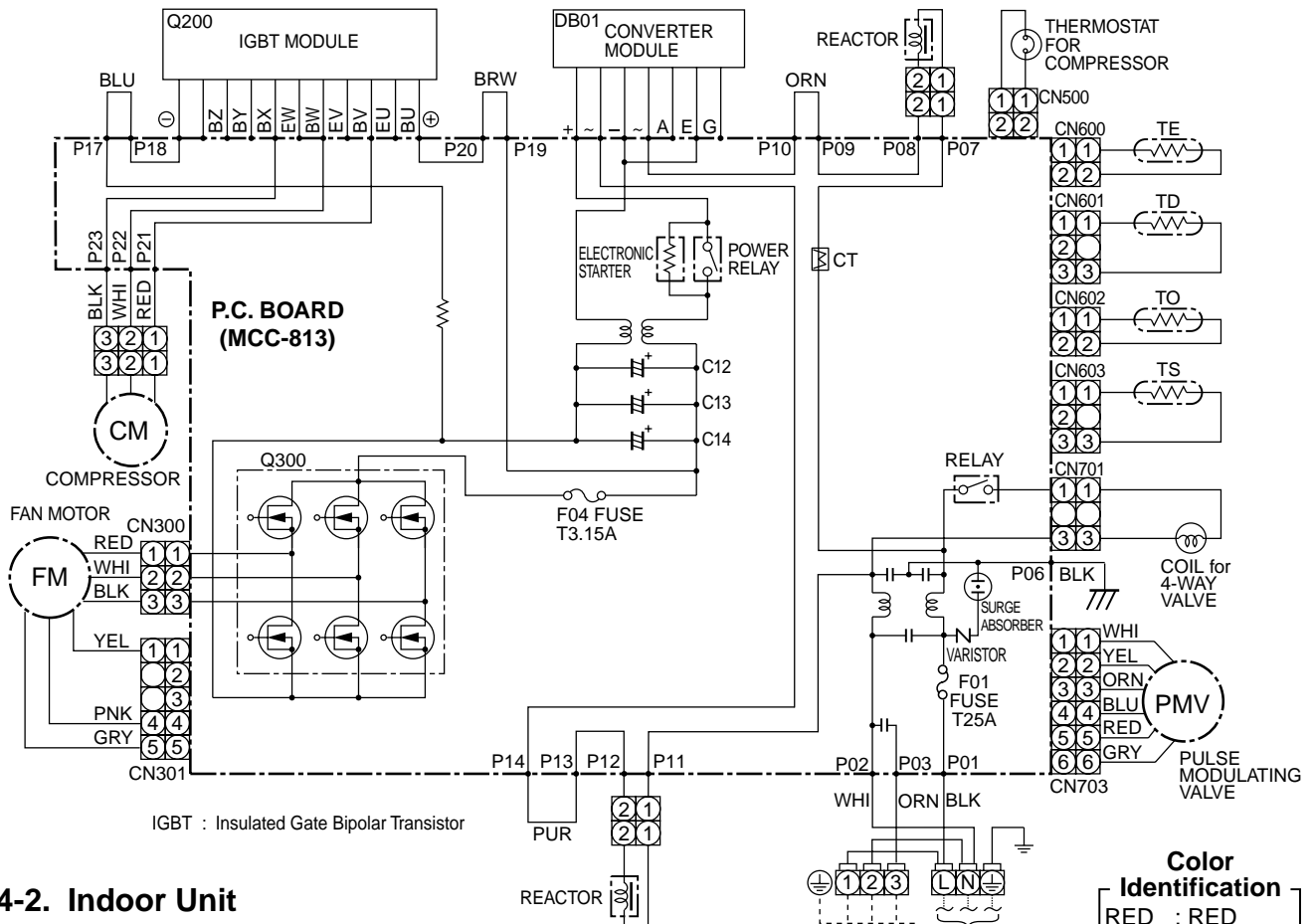
RAS-10JAVP-E, RAS-13JAVP-E



4. WIRING DIAGRAM

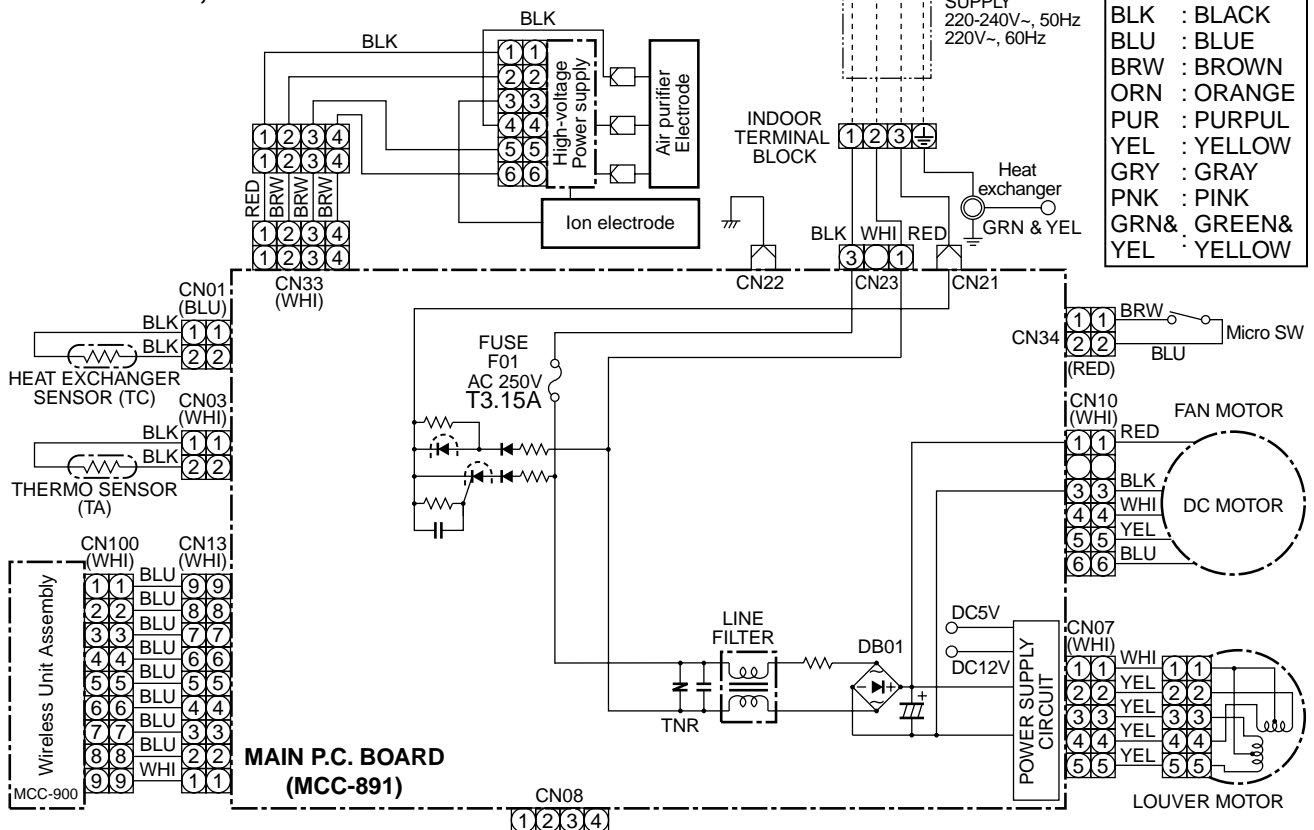
4-2. Outdoor Unit

RAS-10JAVP-E, RAS-13JAVP-E



4-2. Indoor Unit

RAS-10JKVP-E, RAS-13JKVP-E



5. SPECIFICATIONS OF ELECTRICAL PARTS

5-1. Indoor Unit

RAS-10JKVP-E, RAS-13JKVP-E

No.	Parts name	Type	Specifications
1	Fan motor (for indoor)	MF-280-30-1	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	Louver motor	MP24GA	Output (Rated) 1W, 16poles, 1phase DC12V

5-2. Outdoor Unit

RAS-10JAVP-E, RAS-13JAVP-E

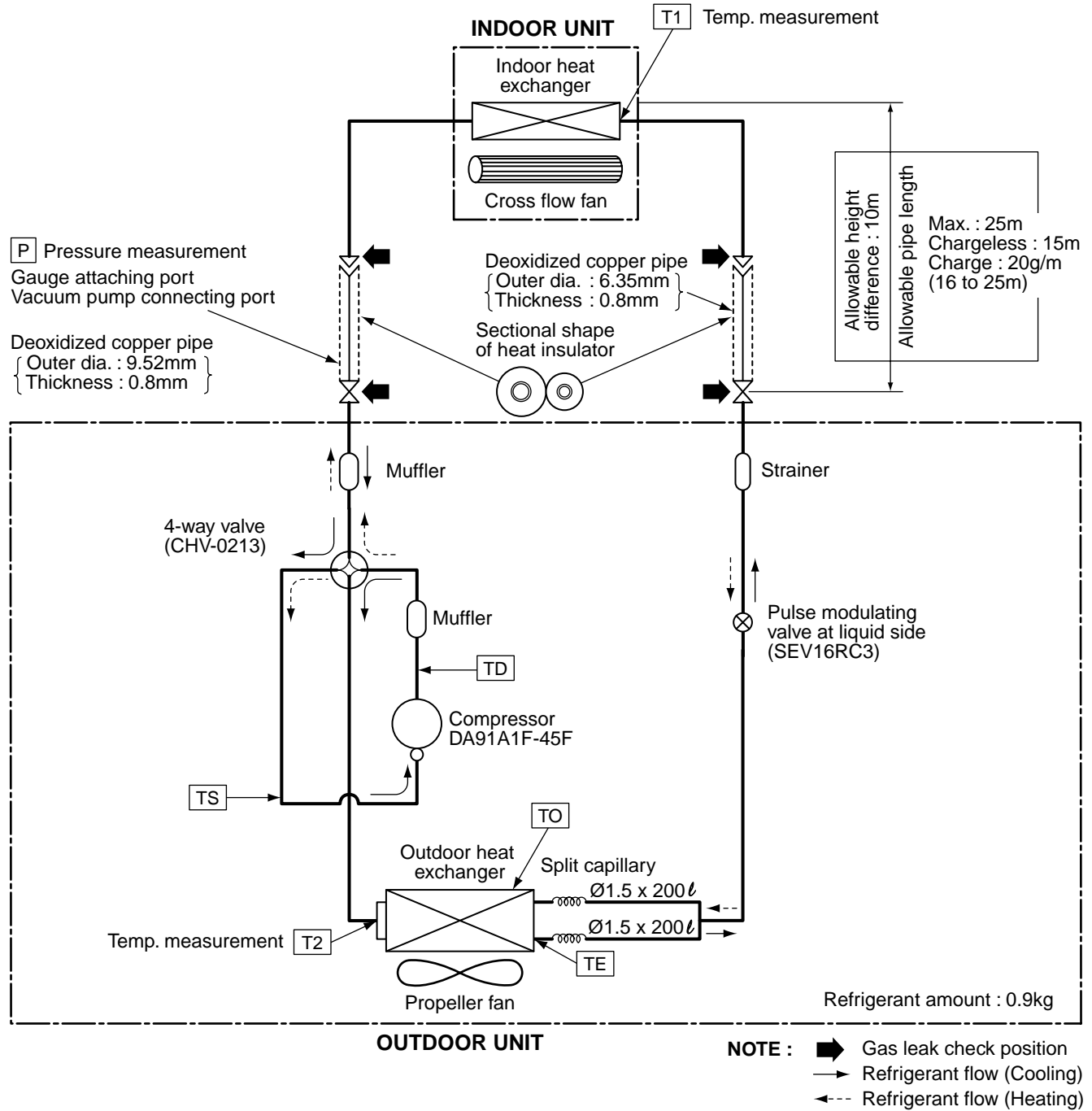
No.	Parts name	Model name	Rating
1	Reactor	CH-57	L=10mH, 16A x 2
2	Outside fan motor	ICF-140-43-1	DC140V, 43W
3	Suction temp. sensor (TS sensor)	(Inverter attached)	10kΩ (25°C)
4	Discharge temp. sensor (TD sensor)	(Inverter attached)	62kΩ (20°C)
5	Outside air temp. sensor (TO sensor)	(Inverter attached)	10kΩ (25°C)
6	Heat exchanger temp. sensor (TE sensor)	(Inverter attached)	10kΩ (25°C)
7	Terminal block (6P)	—	20A, AC250V
8	Compressor	DA91A1F-45F	3-phases 4-poles 750W
9	Compressor thermo.	US-622KXTMQO-SS	OFF: 125 ± 4°C, ON: 90 ± 5° C
10	Coil for PMV	C12A	DC12V
11	Coil for 4-way valve	VHV	AC220-240V

6. REFRIGERANT CYCLE DIAGRAM

6-1. Refrigerant Cycle Diagram

RAS-10JKVP-E/RAS-10JAVP-E

RAS-13JKVP-E/RAS-13JAVP-E



NOTE :

- The maximum pipe length of this air conditioner is 25 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. 200g)

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/–	10JKVP-E	0.9 to 1.1	12 to 14	41 to 43	High	High	47
		13JKVP-E	0.8 to 1.0	10 to 12	43 to 45	High	High	72

<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	10JKVP-E	2.2 to 2.4	37 to 38	2 to 4	High	High	61
		13JKVP-E	2.5 to 2.7	42 to 44	0 to 3	High	High	79

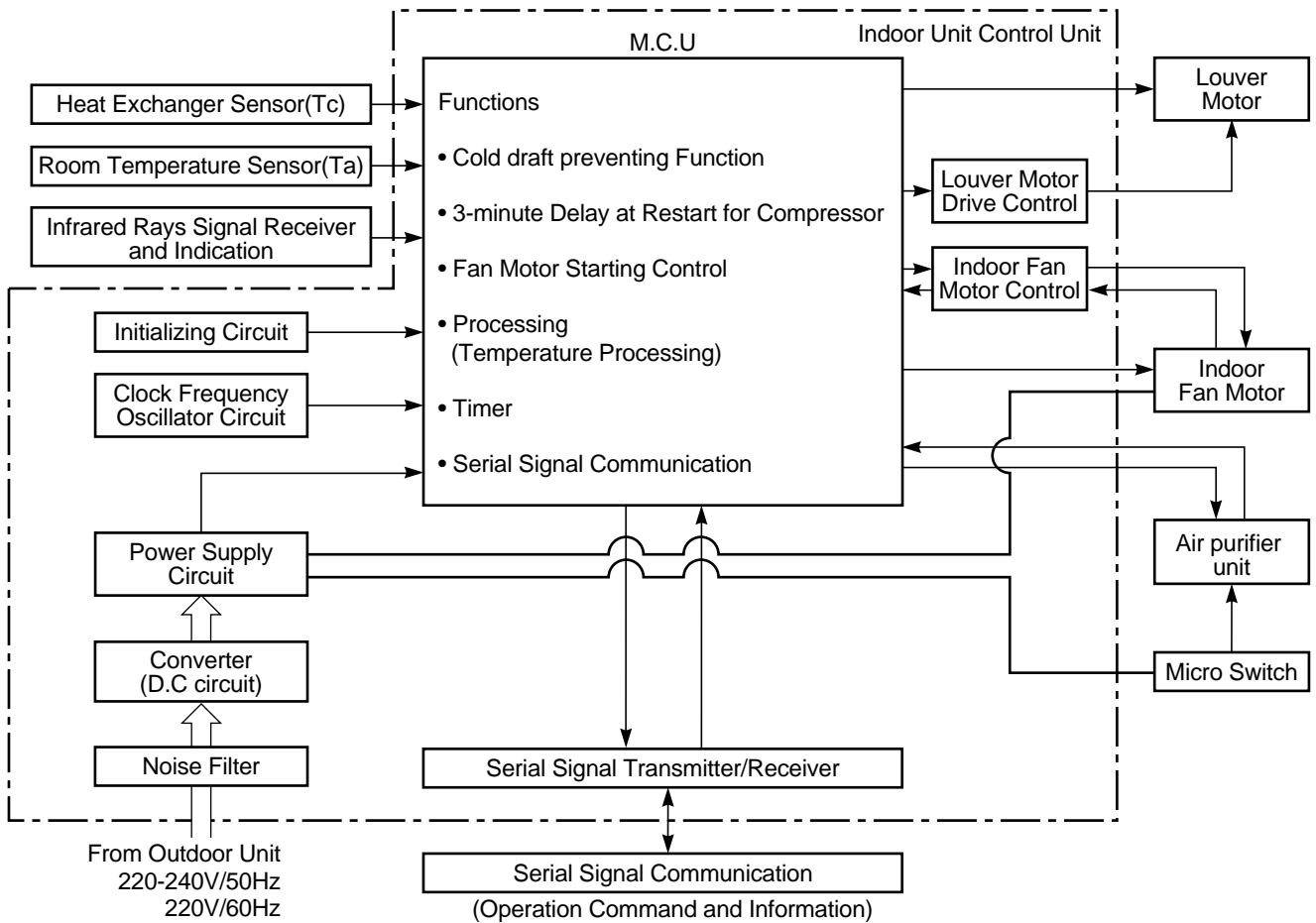
NOTES :

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

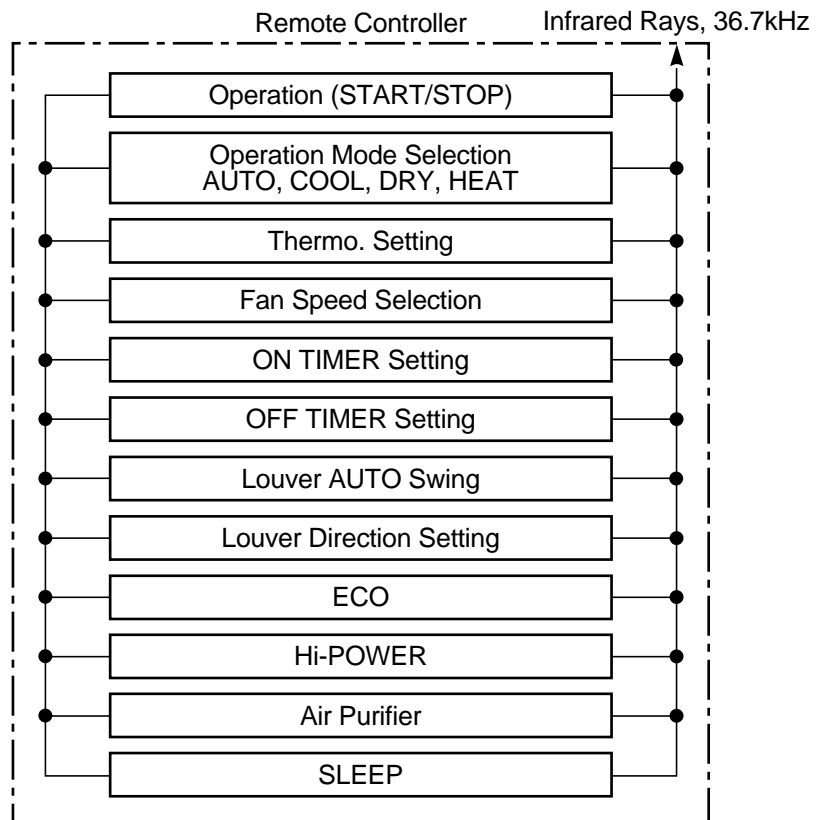
7. CONTROL BLOCK DIAGRAM

7-1. Indoor Unit

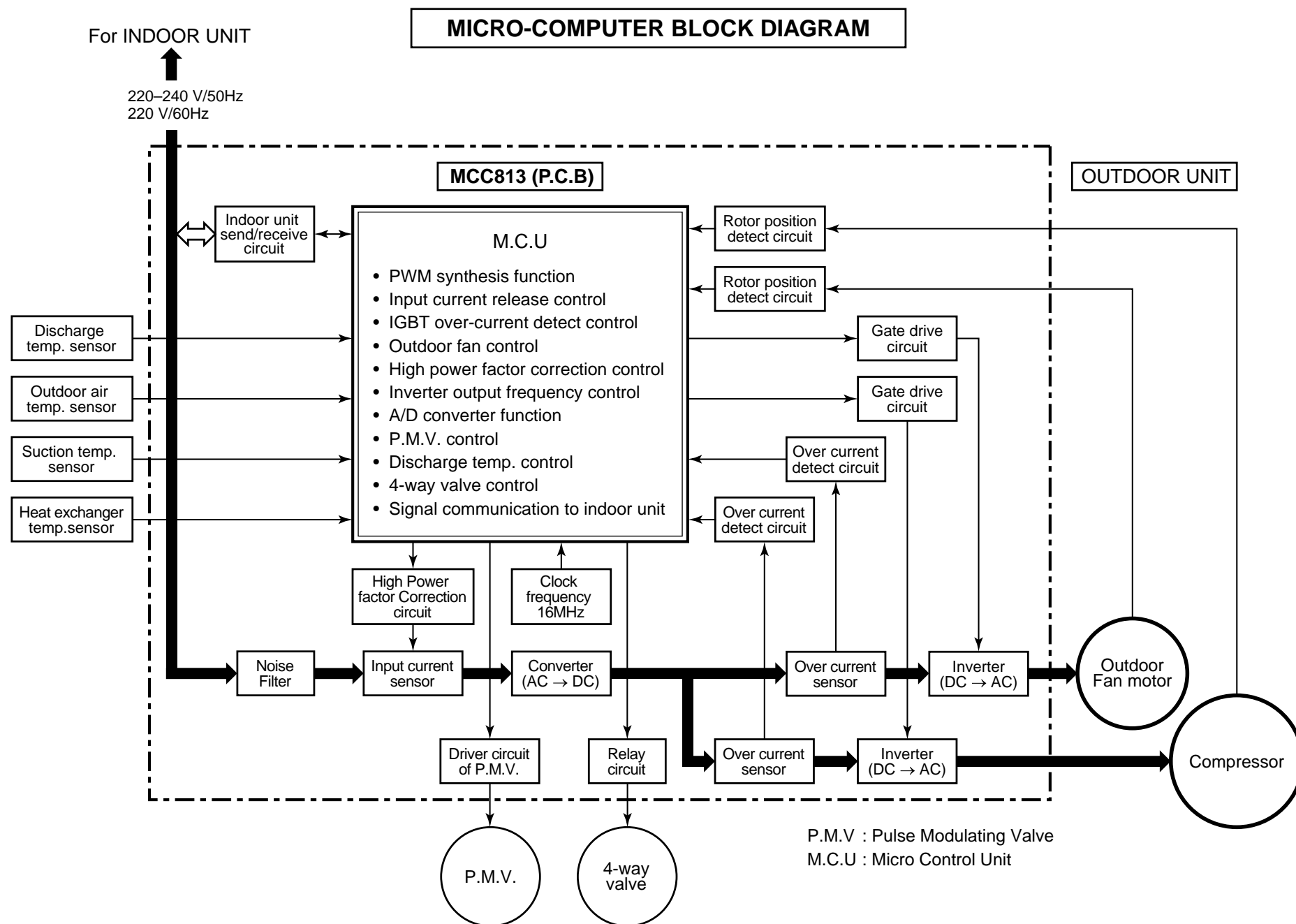
RAS-10JKVP-E, RAS-13JKVP-E



REMOTE CONTROLLER



7-2. Outdoor Unit (Inverter Assembly)
RAS-10JAVP-E, RAS-13JAVP-E



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 capacity-proportional control compressor which can change the motor speed in the range from 13 to 115 rps 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 modulating valve. (P.M.V) Besides, detecting revolution position of the compressor motor, the outdoor unit controller controls speed of the compressor motor by controlling output voltage of the inverter and switching timing of the supply power (current transfer timing) so that motors drive according to the operation command.

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

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

(1) Role of indoor unit controller

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

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

(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 four-way valve and outdoor fan)

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

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

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

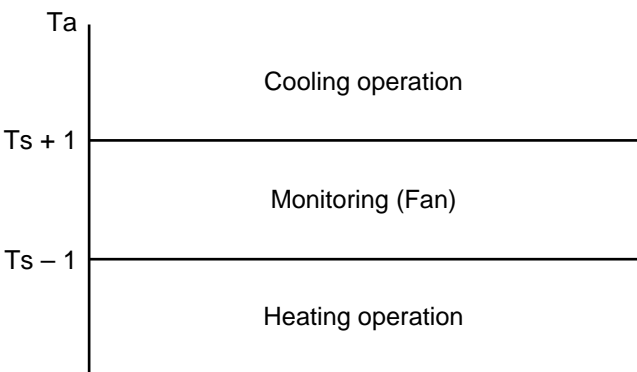
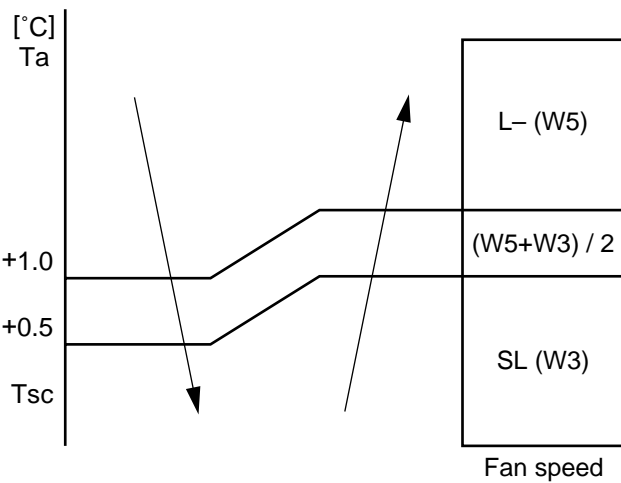
(4) Contents of operation command signal (Serial signal) from outdoor unit controller to indoor unit controller

The following signals are sent from the outdoor unit controller.

- The current operation mode
 - The current compressor revolution
 - Outdoor temperature
 - Existence of protective circuit operation
- For transferring of these signals, the indoor unit controller monitors the contents of signals, and judges existence of trouble occurrence. Contents of judgment are described below.
- Whether distinction of the current operation status meets to the operation command signal
 - Whether protective circuit operates
- When no signal is received from the outdoor unit controller, it is assumed as a trouble.

8-2. Operation Description

Item	Operation flow and applicable data, etc.	Description
1. Basic operation	<p>1) Operation control Receiving the user's operation condition setup, the operation statuses of indoor/outdoor units are controlled.</p> <p style="text-align: center;">Remote controller</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 5px; margin-right: 10px;">Selection of operation conditions</div> <div style="border: 1px solid black; padding: 5px;">ON/OFF</div> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> Control contents of remote controller • ON/OFF (Air conditioner/Air purifier) • Operation select (COOL/HEAT/AUTO/DRY) • Temperature setup • Air direction • Swing • Air volume select (AUTO/LOW/LOW+/MED/MED+/HIGH) • ECO • ON timer setup • OFF timer setup • High power </div> </div> <p style="text-align: center;">Indoor unit</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <div style="display: flex; flex-direction: column; align-items: center;"> <div style="border: 1px solid black; padding: 5px;">Signal receiving</div> <div style="border: 1px solid black; padding: 5px;">Indoor unit control</div> <div style="border: 1px solid black; padding: 5px;">Operation command</div> <div style="border: 1px solid black; padding: 5px;">Serial signal send/receive</div> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> Indoor unit control • Command signal generating function of indoor unit operation • Calculation function (temperature calculation) • Activation compensation function of indoor fan • Cold draft preventive function • Timer function • Indoor heat exchanger release control </div> </div> <p style="text-align: center;">Outdoor unit</p> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 5px; margin-right: 10px;"> <div style="border: 1px solid black; padding: 5px;">Serial signal send/receive</div> <div style="border: 1px solid black; padding: 5px;">Outdoor unit control</div> </div> <div style="border: 1px solid black; padding: 5px; flex-grow: 1;"> Outdoor unit control • Frequency control of inverter output • Waveform composite function • Calculation function (Temperature calculation) • AD conversion function • Quick heating function • Delay function of compressor reactivation • Current release function • GTr over-current preventive function • Defrost operation function </div> <div style="border: 1px solid black; padding: 5px; margin-left: 10px; text-align: center;"> Inverter </div> </div> <div style="margin-top: 10px;"> <div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> • Indoor fan motor • Louver motor </div> <div style="margin-left: 10px;"> • Compressor • Outdoor fan motor • 4-way valve • Pulse modulating valve (PMV) </div> </div> </div>	<p>1) The operation conditions are selected by the remote controller as shown in the left.</p> <p>2) A signal is sent by ON button of the remote controller.</p> <p>3) The signal is received by a sensor of the indoor unit and processed by the indoor controllers as shown in the left.</p> <p>4) The indoor controller controls the indoor fan motor and louver motor.</p> <p>5) The indoor controller sends the operation command to the outdoor controller, and sends/receives the control status with a serial signal.</p> <p>6) The outdoor controller controls the operation as shown in the left, and also controls the compressor, outdoor fan motor, 4-way valve and pulse modulating valve.</p>
	<p>2) Cooling/Heating operation The operations are performed in the following parts by controls according to cooling/heating conditions.</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 5px; margin-right: 10px;">Operation ON</div> <div style="border: 1px solid black; padding: 5px;">Setup of remote controller</div> </div> <div style="display: flex; align-items: center; margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; margin-right: 10px;">Indoor unit control</div> <div style="border: 1px solid black; padding: 5px;">Indoor fan motor control Louver control</div> </div> <div style="display: flex; align-items: center; margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; margin-right: 10px;">Sending of operation command signal</div> <div style="border: 1px solid black; padding: 5px; margin-left: 10px;">Outdoor unit control</div> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> Compressor revolution control Outdoor fan motor control 4-way valve control [In cooling operation: OFF] [In heating operation: ON] Pulse modulating valve control </div> </div>	<p>1) Receiving the operation ON signal of the remote controller, the cooling or heating operation signal starts being transferred from the indoor controller to the outdoor unit.</p> <p>2) At the indoor unit side, the indoor fan is operated according to the contents of "2. Indoor fan motor control" and the louver according to the contents of "9. Louver control", respectively.</p> <p>3) The outdoor unit controls the outdoor fan motor, compressor, pulse modulating valve and 4-way valve according to the operation signal sent from the indoor unit.</p> <p>*1. The power coupler of 4-way valve is usually turned on, and it is turned off during defrost operation. (Only in heating)</p>

Item	Operation flow and applicable data, etc.	Description
1. Basic operation	<p>3) AUTO operation</p> <p>Selection of operation mode</p> <p>As shown in the following figure, the operation starts by selecting automatically the status of room temperature (Ta) when starting AUTO operation.</p>  <p>*1. When reselecting the operation mode, the fan speed is controlled by the previous operation mode.</p>	<p>1) Detects the room temperature (Ta) when the operation started.</p> <p>2) Selects an operation mode from Ta in the left figure.</p> <p>3) Fan operation continues until an operation mode is selected.</p> <p>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.</p> <p>5) If the status of compressor-OFF continues for 15 minutes the room temperature after selecting an operation mode (COOL/HEAT), reselect an operation mode.</p>
	<p>4) DRY operation</p> <p>DRY operation is performed according to the difference between room temperature and the setup temperature as shown below.</p> <p>In DRY operation, fan speed is controlled in order to prevent lowering of the room temperature and to avoid air flow from blowing directly to persons.</p> 	<p>1) Detects the room temperature (Ta) when the DRY operation started.</p> <p>2) Starts operation under conditions in the left figure according to the temperature difference between the room temperature and the setup temperature (Tsc). Setup temperature (Tsc) = Set temperature on remote controller (Ts) + (0.0 to 1.0)</p> <p>3) When the room temperature is lower 1°C or less than the setup temperature, turn off the compressor.</p>

Item	Operation flow and applicable data, etc.	Description
2. Indoor fan motor control	<p><In cooling operation> (This operation controls the fan speed at indoor unit side.)</p> <p>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)</p> <div style="text-align: center;"> <p>(Fig. 1)</p> <p>(Fig. 2)</p> </div>	<p>* Symbols</p> <p>UH : Ultra High H : High M+ : Medium+ M : Medium L+ : Low+ L : Low L- : Low- UL : Ultra Low SUL : Super Ultra Low</p> <p>* The fan speed broadly varies due to position of the louver, etc. The described value indicates one under condition of inclining downward blowing.</p> <p>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.</p> <p>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. 2 and Table 1 according to the setup temperature, room temperature, and heat exchanger temperature.</p>

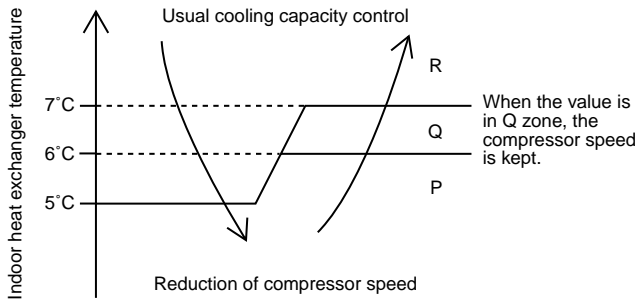
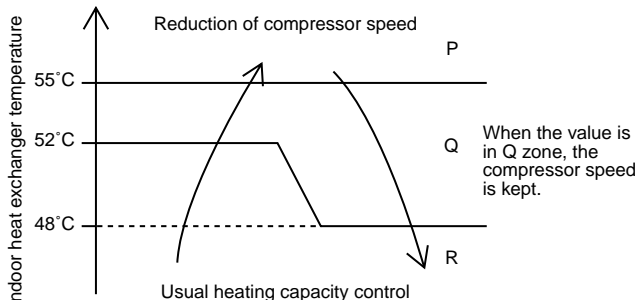
(Table 1) Indoor fan air flow rate

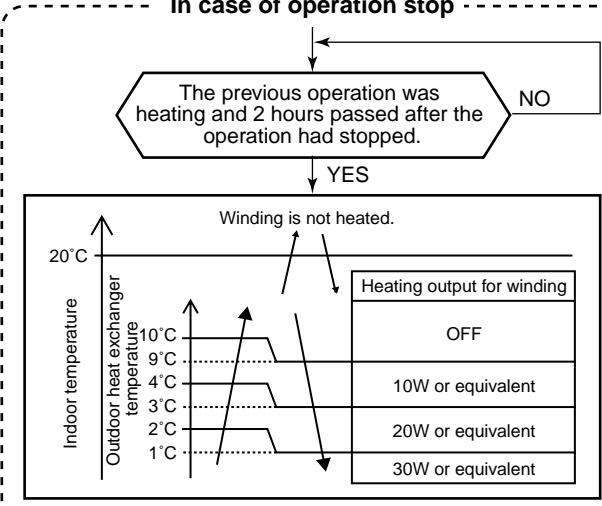
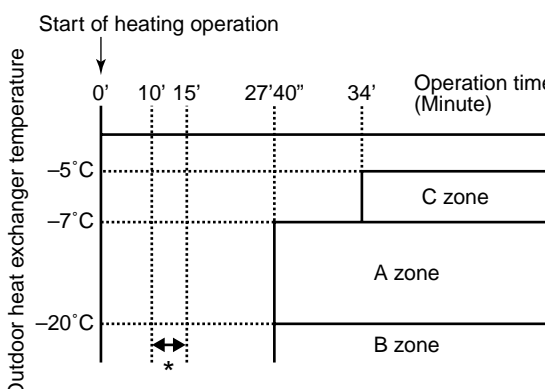
Fan speed level	COOL	HEAT	DRY	RAS-10JKVP-E		RAS-13JKVP-E	
				Fan speed (rpm)	Air flow rate (m³/h)	Fan speed (rpm)	Air flow rate (m³/h)
WF		UH		1630	684	1650	694
WE		H		1480	609	1530	634
WD	UH	M+		1400	569	1440	589
WC	H			1350	544	1390	564
WB	M+			1200	468	1240	488
WA		M		1110	423	1150	443
W9	M	L+		980	358	1010	373
W8		L		830	283	860	298
W7	L+	L-	L+	810	273	810	273
W6	L		L	810	273	810	273
W5	L-	UL	L-	780	257	780	257
W4	UL		UL	700	217	700	217
W3	SUL		SUL	550	142	550	142
W2		SUL		400	67	400	67
W1				400	67	400	67

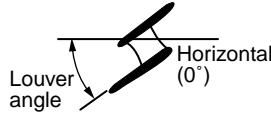


















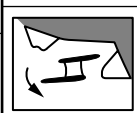

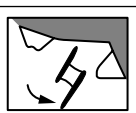

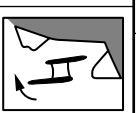
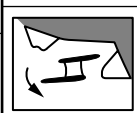

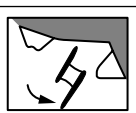

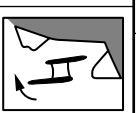
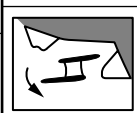

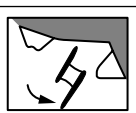

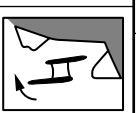
Item	Operation flow and applicable data, etc.	Description																							
2. Indoor fan motor control	<p><In heating operation></p> <div><div><div>HEAT ON</div><div>Fan speed setup</div><div>AUTO</div><div>TC ≥ 42°C</div></div><div><div>MANUAL</div><div><table><tr><th>Indication</th><th>Fan speed</th></tr><tr><td>L </td><td>W8</td></tr><tr><td>L+ </td><td>(L + M) / 2</td></tr><tr><td>M </td><td>WA</td></tr><tr><td>M+ </td><td>(M + H) / 2</td></tr><tr><td>H </td><td>WE</td></tr></table></div><div>Min air flow rate control</div></div></div> <div><p>(Fig. 3)</p><p>(Fig. 4)</p></div> <div><div><p>Basic fan control</p><p>(Fig. 5)</p></div><div><p>Cold draft preventive control</p><p>(Fig. 6)</p></div></div> <tr><td colspan="3"><p>[In starting and in stability]</p><table><tr><th></th><th>In starting</th><th>In stability</th></tr><tr><td>FAN AUTO</td><td><ul style="list-style-type: none">Until 12 minutes passed after operation startWhen 12 to 25 minutes passed after operation start and room temp. is 3°C or lower than set temp.</td><td><ul style="list-style-type: none">When 12 to 25 minutes passed after operation start and room temp. is higher than (set temp. -3°C)When 25 minutes or more passed after operation start</td></tr><tr><td>FAN Manual</td><td>Room temp. < Set temp. -4°C</td><td>Room temp. ≥ Set temp. -3.5°C</td></tr></table></td></tr>	Indication	Fan speed	L	W8	L+	(L + M) / 2	M	WA	M+	(M + H) / 2	H	WE	<p>[In starting and in stability]</p> <table><tr><th></th><th>In starting</th><th>In stability</th></tr><tr><td>FAN AUTO</td><td><ul style="list-style-type: none">Until 12 minutes passed after operation startWhen 12 to 25 minutes passed after operation start and room temp. is 3°C or lower than set temp.</td><td><ul style="list-style-type: none">When 12 to 25 minutes passed after operation start and room temp. is higher than (set temp. -3°C)When 25 minutes or more passed after operation start</td></tr><tr><td>FAN Manual</td><td>Room temp. < Set temp. -4°C</td><td>Room temp. ≥ Set temp. -3.5°C</td></tr></table>				In starting	In stability	FAN AUTO	<ul style="list-style-type: none">Until 12 minutes passed after operation startWhen 12 to 25 minutes passed after operation start and room temp. is 3°C or lower than set temp.	<ul style="list-style-type: none">When 12 to 25 minutes passed after operation start and room temp. is higher than (set temp. -3°C)When 25 minutes or more passed after operation start	FAN Manual	Room temp. < Set temp. -4°C	Room temp. ≥ Set temp. -3.5°C
Indication	Fan speed																								
L	W8																								
L+	(L + M) / 2																								
M	WA																								
M+	(M + H) / 2																								
H	WE																								
<p>[In starting and in stability]</p> <table><tr><th></th><th>In starting</th><th>In stability</th></tr><tr><td>FAN AUTO</td><td><ul style="list-style-type: none">Until 12 minutes passed after operation startWhen 12 to 25 minutes passed after operation start and room temp. is 3°C or lower than set temp.</td><td><ul style="list-style-type: none">When 12 to 25 minutes passed after operation start and room temp. is higher than (set temp. -3°C)When 25 minutes or more passed after operation start</td></tr><tr><td>FAN Manual</td><td>Room temp. < Set temp. -4°C</td><td>Room temp. ≥ Set temp. -3.5°C</td></tr></table>				In starting	In stability	FAN AUTO	<ul style="list-style-type: none">Until 12 minutes passed after operation startWhen 12 to 25 minutes passed after operation start and room temp. is 3°C or lower than set temp.	<ul style="list-style-type: none">When 12 to 25 minutes passed after operation start and room temp. is higher than (set temp. -3°C)When 25 minutes or more passed after operation start	FAN Manual	Room temp. < Set temp. -4°C	Room temp. ≥ Set temp. -3.5°C														
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FAN Manual	Room temp. < Set temp. -4°C	Room temp. ≥ Set temp. -3.5°C																							

Item	Operation flow and applicable data, etc.	Description																																																																																																						
3. Outdoor fan motor control	<p>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.</p> <p>* For the fan motor, a DC motor with non-stage variable speed system is used. However, it is limited to 8 stages for reasons of controlling.</p> <div><div>Air conditioner ON (Remote controller)</div><div>Indoor unit controller</div><div>1) Outdoor unit operation command (Outdoor fan control)</div><div>2) Fan speed ≥ 400 when the motor stopped.</div><div>YES</div><div>OFF status of fan motor continues.</div><div>NO</div><div>Fan motor ON</div><div>3) Fan lock</div><div>YES</div><div>Air conditioner OFF</div><div>Alarm display</div><div>NO</div><div>4) Motor operates as shown in the table below.</div><div><table><tr><th colspan="5">In cooling operation</th></tr><tr><th colspan="2">Compressor speed (rps)</th><th>~13.8</th><th>~34.7</th><th>35.4~ MAX</th></tr><tr><td rowspan="3">To</td><td>To ≥ 38°C</td><td>f 7</td><td>f 4</td><td>f 3</td></tr><tr><td>To < 38°C</td><td>f 7</td><td>f 5</td><td>f 4</td></tr><tr><td>To < 15°C</td><td>f 8</td><td>f 8</td><td>f 8</td></tr><tr><td rowspan="3">During ECO mode</td><td>To ≥ 38°C</td><td>f 7</td><td>f 5</td><td>f 4</td></tr><tr><td>To < 38°C</td><td>f 7</td><td>f 7</td><td>f 5</td></tr><tr><td>To < 15°C</td><td>f 8</td><td>f 8</td><td>f 8</td></tr><tr><td colspan="2">When To is abnormal</td><td>f 5</td><td>f 5</td><td>f 4</td></tr></table><table><tr><th colspan="4">In heating operation</th></tr><tr><th colspan="2">Compressor speed (rps)</th><th>~16.8</th><th>~57.4</th><th>58.0~ MAX</th></tr><tr><td rowspan="2">To</td><td>To ≥ 5.5°C</td><td>f 7</td><td>f 6</td><td>f 4</td></tr><tr><td>To < 5.5°C</td><td>f 6</td><td>f 6</td><td>f 3</td></tr><tr><td rowspan="2">During ECO mode</td><td>To ≥ 5.5°C</td><td>f 7</td><td>f 7</td><td>f 6</td></tr><tr><td>To < 5.5°C</td><td>f 7</td><td>f 6</td><td>f 6</td></tr><tr><td colspan="2">When To is abnormal</td><td>f 7</td><td>f 6</td><td>f 4</td></tr></table></div><div><table><tr><th colspan="3">Outdoor fan speed (rpm)</th></tr><tr><th>Tap</th><th>RAS-10JAVP-E</th><th>RAS-13JAVP-E</th></tr><tr><td>f 1</td><td>1050</td><td>1050</td></tr><tr><td>f 2</td><td>840</td><td>840</td></tr><tr><td>f 3</td><td>750</td><td>840</td></tr><tr><td>f 4</td><td>750</td><td>840</td></tr><tr><td>f 5</td><td>700</td><td>700</td></tr><tr><td>f 6</td><td>650</td><td>650</td></tr><tr><td>f 7</td><td>390</td><td>390</td></tr><tr><td>f 8</td><td>390</td><td>390</td></tr></table></div></div> <div><div>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.</div><div>2) When strong wind blows at outdoor side, the operation of air conditioner continues with the fan motor stopped.</div><div>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.</div><div>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.</div></div>	In cooling operation					Compressor speed (rps)		~13.8	~34.7	35.4~ MAX	To	To ≥ 38°C	f 7	f 4	f 3	To < 38°C	f 7	f 5	f 4	To < 15°C	f 8	f 8	f 8	During ECO mode	To ≥ 38°C	f 7	f 5	f 4	To < 38°C	f 7	f 7	f 5	To < 15°C	f 8	f 8	f 8	When To is abnormal		f 5	f 5	f 4	In heating operation				Compressor speed (rps)		~16.8	~57.4	58.0~ MAX	To	To ≥ 5.5°C	f 7	f 6	f 4	To < 5.5°C	f 6	f 6	f 3	During ECO mode	To ≥ 5.5°C	f 7	f 7	f 6	To < 5.5°C	f 7	f 6	f 6	When To is abnormal		f 7	f 6	f 4	Outdoor fan speed (rpm)			Tap	RAS-10JAVP-E	RAS-13JAVP-E	f 1	1050	1050	f 2	840	840	f 3	750	840	f 4	750	840	f 5	700	700	f 6	650	650	f 7	390	390	f 8	390	390
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Item	Operation flow and applicable data, etc.	Description															
4. Capacity control	<p>The cooling or heating capacity depending on the load is adjusted.</p> <p>According to difference between the setup value of temperature and the room temperature, the capacity is adjusted by the compressor revolution.</p> <pre> graph TD subgraph Remote_controller [Remote controller] Ts[Set temp. (Ts)] end subgraph Indoor_unit [Indoor unit] Ta[Room temp. (Ta)] end Ts --> Diff{Ts - Ta} Ta --> Diff Diff --> Hz[Correction of Hz signal] Hz --> Force[Detection of electromotive force of compressor motor winding] Force --> Speed[Detection of motor speed and rotor position] Speed --> Hz2{Correction value of Hz signal ≤ Operating Hz} Hz2 --> Inverter[Inverter output change Commutation timing change] Inverter --> Speed2[Change of compressor speed] </pre>	<ol style="list-style-type: none"> 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. <p>* The contents of control operation are same in cooling operation and heating operation</p>															
5. Current release control	<p>This function prevents troubles on the electronic parts of the compressor driving inverter.</p> <p>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.</p> <pre> graph TD Inverter[Outdoor unit inverter main circuit control current] --> Check{Operating current ≤ Setup value} Temp[Outdoor temp. To] --> Setup[Setup of current release point] Setup --> Check Check -- High --> Reduce[Reduce compressor speed] Reduce --> Decrease{Current decrease} Decrease --> Continue[Capacity control continues.] Check -- Low --> Continue </pre> <table border="1"> <thead> <tr> <th>Outdoor temp.</th><th>Cooling current release value</th><th>Heating current release value</th></tr> </thead> <tbody> <tr> <td>45°C</td><td rowspan="2">5.62A</td><td rowspan="2">9.82A</td></tr> <tr> <td>40°C</td></tr> <tr> <td>16°C</td><td rowspan="3">9.00A</td><td rowspan="3">10.31A</td></tr> <tr> <td>11°C</td></tr> <tr> <td>10.5°C</td></tr> <tr> <td></td><td></td><td>10.80A</td></tr> </tbody> </table>	Outdoor temp.	Cooling current release value	Heating current release value	45°C	5.62A	9.82A	40°C	16°C	9.00A	10.31A	11°C	10.5°C			10.80A	<ol style="list-style-type: none"> 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.
Outdoor temp.	Cooling current release value	Heating current release value															
45°C	5.62A	9.82A															
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Item	Operation flow and applicable data, etc.	Description
<p>6. Release protective control by temperature of indoor heat exchanger</p>	<p><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.</p> 	<ol style="list-style-type: none"> 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)
	<p><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.</p> 	<ol style="list-style-type: none"> 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)

Item	Operation flow and applicable data, etc.	Description						
7. Quick heating control	<p>This function quickens the starting of heating operation when indoor/outdoor temperature is low. (Available only in heating operation)</p> <p>When indoor temperature is low, this function stores the heat by heating winding depended on the outdoor temperature and then it enables the hot air blowing out quickly.</p> <div><p>In case of operation stop</p></div>	<p>When the following conditions are satisfied, winding is heated by output varied by the outdoor heat exchanger temperature.</p> <p>Condition 1 : The previous operation was heating.</p> <p>Condition 2 : 2 hours passed after operation stop.</p> <p>Condition 3 : The room temperature is 20°C or lower.</p> <p>The indoor temperature sensor detects the room temperature. If the detected room temperature is 20°C or lower, the outdoor heat exchanger temperature sensor detects the outdoor heat exchanger temperature. As shown in the left figure, winding of the compressor is heated for each division of the temperature (\approx for each outdoor temperature) and the heat is stored.</p>						
8. Defrost control (Only in heating operation)	<p>(This function removes frost adhered to the outdoor heat exchanger.)</p> <p>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.</p>  <p>* The minimum value of Te sensor 10 to 15 minutes after start of operation is stored in memory as Te0.</p> <p>Table 1</p> <table><tr><td>A zone</td><td>When $Te0 - TE \geq 2.5$ continued for 2 minutes in A zone, defrost operation starts.</td></tr><tr><td>B zone</td><td>When the operation continued for 2 minutes in B zone, defrost operation starts.</td></tr><tr><td>C zone</td><td>When $Te0 - TE \geq 3$ continued for 2 minutes in C zone, defrost operation starts.</td></tr></table>	A zone	When $Te0 - TE \geq 2.5$ 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 $Te0 - TE \geq 3$ continued for 2 minutes in C zone, defrost operation starts.	<p>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, or C zone each. (Table 1)</p> <p><Defrost operation></p> <ul style="list-style-type: none">Defrost operation in A to C zones <ol style="list-style-type: none">1) Stop operation of the compressor for 20 seconds.2) Invert (OFF) 4-way valve 10 seconds after stop of the compressor.3) The outdoor fan stops at the same time when the compressor stops.4) When temperature of the indoor heat exchanger becomes 38°C or lower, stop the indoor fan. <p><Finish of defrost operation></p> <ul style="list-style-type: none">Returning conditions from defrost operation to heating operation <ol style="list-style-type: none">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. <p><Returning from defrost operation></p> <ol style="list-style-type: none">1) Stop operation of the compressor for approx. 50 seconds.2) Invert (ON) 4-way valve approx. 40 seconds after stop of the compressor.3) The outdoor fan starts rotating at the same time when the compressor starts.
A zone	When $Te0 - TE \geq 2.5$ 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 $Te0 - TE \geq 3$ continued for 2 minutes in C zone, defrost operation starts.							

Item	Operation flow and applicable data, etc.	Description																						
9. Louver control 1) Louver position	<p>This function controls the air direction of the indoor unit.</p> <ul style="list-style-type: none">The position is automatically controlled according to the operation mode (COOL/HEAT).The set louver position is stored in memory by the microcomputer, and the louver returns to the stored position when the next operation is performed. (Cooling/heating memory position) <p>The angle of the louver is indicated as the horizontal angle is 0°.</p> <p>When the louver closes fully, it directs approx. 49° upward.</p> <p>1) Louver position in cooling operation</p> <div></div> <table><tr><th rowspan="2">Cooling operation/ AUTO (COOL)/Dry</th><th colspan="2">Powerful</th></tr><tr><th>Room temp. (Ta) < Set temp. (Tsc) + 3.5</th><th>Room temp. (Ta) ≥ Set temp. (Tsc) + 3.5</th></tr><tr><td></td><td></td><td></td></tr><tr><td>Initial setting of "Cooling storage position" Louver : Directs downward (9°)</td><td>Initial setting of "Cooling storage position" Louver : Directs downward (9°)</td><td>"Inclined blowing" Louver : Directs downward (14°)</td></tr></table> <p>2) Louver position in heating operation</p> <table><tr><th rowspan="2">Heating operation/ AUTO (HEAT)</th><th colspan="2">ECO operation</th></tr><tr><th>Room temp. (Ta) < Set temp. (Tsc) – 3 or 25 minutes after start of operation</th><th>Room temp. (Ta) ≥ Set temp. (Tsc) – 3</th></tr><tr><td></td><td></td><td></td></tr><tr><td>Initial setting of "Heating storage position" Louver : Directs downward (76°)</td><td>"Heating storage position" Louver : Directs downward (76°)</td><td>"Cooling storage position" Louver : Directs downward (9°)</td></tr></table>	Cooling operation/ AUTO (COOL)/Dry	Powerful		Room temp. (Ta) < Set temp. (Tsc) + 3.5	Room temp. (Ta) ≥ Set temp. (Tsc) + 3.5				Initial setting of "Cooling storage position" Louver : Directs downward (9°)	Initial setting of "Cooling storage position" Louver : Directs downward (9°)	"Inclined blowing" Louver : Directs downward (14°)	Heating operation/ AUTO (HEAT)	ECO operation		Room temp. (Ta) < Set temp. (Tsc) – 3 or 25 minutes after start of operation	Room temp. (Ta) ≥ Set temp. (Tsc) – 3				Initial setting of "Heating storage position" Louver : Directs downward (76°)	"Heating storage position" Louver : Directs downward (76°)	"Cooling storage position" Louver : Directs downward (9°)	<div><p>Cooling/AUTO (COOL)/DRY operation</p><pre>graph TD Start[Cooling/AUTO (COOL)/DRY operation] --> MemPos[Cooling memory position] MemPos -- NO --> Powerful{{Powerful operation}} Powerful -- YES --> TempCheck1{{Room temp. ≥ Set temp. +3.5}} TempCheck1 -- YES --> InclBlow[Inclined blowing] TempCheck1 -- NO --> MemPos InclBlow -- YES --> TempCheck2{{Room temp. ≥ Set temp. +3.5}} TempCheck2 -- YES --> MemPos TempCheck2 -- NO --> MemPos</pre></div> <div><p>Heating operation</p><pre>graph TD Start[Heating operation] --> MemPos[Heating memory position] MemPos -- NO --> ECO{{ECO operation}} ECO -- YES --> TempCheck1{{Room temp. ≥ Set temp. -3.0}} TempCheck1 -- YES --> MemPos TempCheck1 -- NO --> HorPos[Horizontal position] HorPos --> MemPos MemPos -- YES --> TempCheck2{{Room temp. ≥ Set temp. -3.0}} TempCheck2 -- YES --> MemPos TempCheck2 -- NO --> HorPos</pre></div> <ul style="list-style-type: none">The louver position can be arbitrarily set up by pushing [FIX] button.
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2) Air direction adjustment	<div><p>Air direction</p><table><tr><th>Horizontal blowing</th><th>Inclined blowing</th><th>Blowing downward</th><th>Inclined blowing</th><th>Horizontal blowing</th></tr><tr><td></td><td></td><td></td><td></td><td></td></tr></table></div>	Horizontal blowing	Inclined blowing	Blowing downward	Inclined blowing	Horizontal blowing																		
Horizontal blowing	Inclined blowing	Blowing downward	Inclined blowing	Horizontal blowing																				
																								
3) Swing	<ul style="list-style-type: none">Swing operation is performed in width 35° with the stop position as the center.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.	<ul style="list-style-type: none">Swing When pushing [SWING] button during operation, the louver starts swinging.																						

Item	Operation flow and applicable data, etc.	Description																																																																													
10. ECO operation	<p>When pushing [ECO] button on the remote controller, a quiet and mild operation is performed by reducing the fan speed and the compressor speed.</p> <p><Cooling operation></p> <p>This function operates the air conditioner with the difference between the set and the room temperature as shown in the following figure.</p> <p>The time correction is performed for 8 minutes each. (However, the first correction is performed 150 seconds after start of the operation.)</p> <div><div><table><thead><tr><th>Zone</th><th>Frequency</th><th>Fan</th><th>Time correction</th></tr></thead><tbody><tr><td>12</td><td>DRY max</td><td>L+ (W7)</td><td rowspan="5">+ 1</td></tr><tr><td>11</td><td>*12</td><td rowspan="4">L (W6)</td></tr><tr><td>10</td><td>*11</td></tr><tr><td>9</td><td>*10</td></tr><tr><td>8</td><td>*9</td></tr><tr><td>7</td><td>*8</td><td rowspan="5">L- (W5)</td><td rowspan="5">± 0</td></tr><tr><td>6</td><td>COOL min</td></tr><tr><td>5</td><td></td></tr><tr><td>4</td><td></td></tr><tr><td>3</td><td></td></tr><tr><td>2</td><td></td><td rowspan="2">UL (W4)</td><td rowspan="2">-1 zone: min 1</td></tr><tr><td>1</td><td></td></tr><tr><td>0</td><td>OFF</td><td></td><td></td></tr></tbody></table><div><p>* 12 (DRY max - COOL min) / 6 x 5 + COOL min</p><p>* 11 (DRY max - COOL min) / 6 x 4 + COOL min</p><p>* 10 (DRY max - COOL min) / 6 x 3 + COOL min</p><p>* 9 (DRY max - COOL min) / 6 x 2 + COOL min</p><p>* 8 (DRY max - COOL min) / 6 x 1 + COOL min</p></div></div></div> <p><Heating operation></p> <div><table><thead><tr><th>Zone</th><th>Frequency</th><th>Fan</th><th>Time correction</th></tr></thead><tbody><tr><td>12</td><td>DRY max</td><td>L+ (W7)</td><td rowspan="5">+ 1</td></tr><tr><td>11</td><td>*12</td><td rowspan="4">L (W6)</td></tr><tr><td>10</td><td>*11</td></tr><tr><td>9</td><td>*10</td></tr><tr><td>8</td><td>*9</td></tr><tr><td>7</td><td>*8</td><td rowspan="5">L- (W5)</td><td rowspan="5">± 0</td></tr><tr><td>6</td><td>COOL min</td></tr><tr><td>5</td><td></td></tr><tr><td>4</td><td></td></tr><tr><td>3</td><td></td></tr><tr><td>2</td><td></td><td rowspan="2">UL (W4)</td><td rowspan="2">-1 zone: min 1</td></tr><tr><td>1</td><td></td></tr><tr><td>0</td><td>OFF</td><td></td><td></td></tr></tbody></table><div><p>* 12 (DRY max - COOL min) / 6 x 5 + COOL min</p><p>* 11 (DRY max - COOL min) / 6 x 4 + COOL min</p><p>* 10 (DRY max - COOL min) / 6 x 3 + COOL min</p><p>* 9 (DRY max - COOL min) / 6 x 2 + COOL min</p><p>* 8 (DRY max - COOL min) / 6 x 1 + COOL min</p></div></div> <p><Cooling operation></p> <ol style="list-style-type: none">1) The room temperature (Tao) at the start time of DRY operation is detected.2) According to difference between the room temperature and the set temperature (Tsc), the operation starts with the conditions shown in the left figure. Set temp. (Tsc) = Set temp. on remote controller (Ts) + (0.0 to 1.0)3) If the room temperature is down by 2°C or more, turn off the compressor. <p><Heating operation></p> <ol style="list-style-type: none">1) The indoor fan speed is controlled within W7 as maximum value.2) Setting the compressor speed to Max. 52Hz, the temperature zone in which the operation can be performed with Max. 16Hz is gradually widened after 30 minutes passed when starting ECO 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 ECO operation.	Zone	Frequency	Fan	Time correction	12	DRY max	L+ (W7)	+ 1	11	*12	L (W6)	10	*11	9	*10	8	*9	7	*8	L- (W5)	± 0	6	COOL min	5		4		3		2		UL (W4)	-1 zone: min 1	1		0	OFF			Zone	Frequency	Fan	Time correction	12	DRY max	L+ (W7)	+ 1	11	*12	L (W6)	10	*11	9	*10	8	*9	7	*8	L- (W5)	± 0	6	COOL min	5		4		3		2		UL (W4)	-1 zone: min 1	1		0	OFF		
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7	*8	L- (W5)	± 0																																																																												
6	COOL min																																																																														
5																																																																															
4																																																																															
3																																																																															
2		UL (W4)	-1 zone: min 1																																																																												
1																																																																															
0	OFF																																																																														

Item	Operation flow and applicable data, etc.	Description
11. Temporary operation	<p>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.</p> <pre> graph TD A{{Filter lamp ON}} -- YES --> B[Push RESET button.] A -- NO --> C{{Did you push [RESET] button for 3 seconds or more?}} C -- NO --> D[Temporary [AUTO] operation] C -- YES --> E{{Did you push [RESET] button for 10 seconds or more?}} E -- YES --> F[Temporary [COOL] Operation] E -- NO --> G[Switch to [AUTO RESTART] control.] B --> A </pre>	<ol style="list-style-type: none"> 1) When pushing [RESET] button, the temporary [AUTO] operation starts. 2) When keeping [RESET] button pushed for 3 seconds or more, Pi, Pi, Pi sound is heard and [AUTO RESTART] control is changed. 3) When keeping [RESET] button pushed for 10 seconds or more, "Pi" 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.
12. Air purifying control [Detection of abnormality]	<p>This function notifies a trouble on the purifying operation. The following items are judged as troubles (Filter lamp ON).</p> <ol style="list-style-type: none"> (1) 1000H counts of the timer were up. (2) The panel switch was turned off by an operation such as opening the front panel, etc. (3) An abnormal discharge due to adhesion of dirt, etc was detected while the filter was turned on. <p>* For items (2) and (3), they are judged as troubles when they continued for 1 second or more.</p> <pre> graph TD A[Purifying operation] --> B{{Total operation time 1000H}} B -- YES --> C[Filter lamp ON] B -- NO --> D{{Error input [H]}} C --> E[Purifier power OFF] D -- NO --> A D -- YES --> F{{Purifier power ON 1 minute or less}} E --> F F -- YES --> G[Filter lamp ON] F -- NO --> H[Filter lamp-OFF continues.] G --> I[Filter power OFF] H --> J[Purifier power OFF] I --> K((1)) J --> L{{Error detection Approx. 10 minutes passed.}} L -- YES --> M[Purifier power ON] L -- NO --> A M --> N((3)) N --> A </pre> <p>1) Reset by RESET button.</p> <p>2) Reset by RESET button or by the stop direction from the remote controller.</p> <p>* When the breaker is turned [ON] (In restart time after power failure) or RESET button is pushed while the filter lamp 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 not the air purifier operation time). It is the safety measures considering an incomplete drain when electric dust collector unit has been cleaned with water.</p>	<p>The sequence that filter lamp is turned on are described in the left flowchart.</p> <ol style="list-style-type: none"> 1) When 1000H timer counts up, the filter lamp 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, FILTER button on the remote controller or a power failure. (Filter lamp goes off.) 2) A trouble detected within 1 minute after activation of the air is immediately judged as an error and the filter lamp goes on. 3) In case that 1 minute passed after activation of the purifier, the purifier is turned off while the lamp keeps ON. After 10 minutes passed, restart the purifier and an error is judged again.

Item	Operation flow and applicable data, etc.	Description																										
12. Air purifying control	<p>This function generates negative ion while cleaning the air in the room.</p> <p>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.</p> <p>The air ion generator operates linked with the air purifying operation.</p> <div><div><p>Sending air purifier-ON</p><p>① Air conditioner stops</p><p>①, ② Air conditioner operates</p><p>②</p></div><div><p>Operation lamp ON</p><p>Memory position of louver/COOL</p><p>Fan ON</p><p>Air purifier ON</p><p>Air purifying operation</p></div><div><p>Start of air purifier-ON</p><p>Air conditioner + air purifier operate</p></div></div> <div><div><p>Sending air purifier-OFF</p><p>③ Air purifier operates</p><p>③, ④ Air conditioner + Air purifier operate</p><p>④</p></div><div><p>Operation lamp OFF</p><p>Fan stop</p><p>Air purifier-OFF</p><p>Louver close</p><p>All stop</p></div><div><p>Filter-OFF</p><p>Air conditioner operates</p></div></div>	<table><tr><th rowspan="2">Present status</th><th colspan="2">Operation button</th></tr><tr><th>PAP button</th><th>Air conditioner</th></tr><tr><td>Stop</td><td>Air purifier</td><td>AC operation*</td></tr><tr><td>Air purifier only</td><td>Stop (All)</td><td>AC + Air purifier</td></tr><tr><td>Air conditioner</td><td>AC + Air purifier</td><td>All stop</td></tr><tr><td>Joint use of AC and air purifier</td><td>AC operation</td><td>All stop</td></tr></table> <p>* 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.)</p> <table><tr><th></th><th>Louver*1</th><th>Fan speed *2</th></tr><tr><td>Air purifying operation</td><td>Cooling position</td><td>AUTO, L, L+, M, M+, H</td></tr><tr><td>AC + Air purifying operation</td><td>Follows to AC operation</td><td>Follows to AC operation</td></tr></table> <p>*1 Swing is available</p> <p>*2 Fan speed is Fan Auto mode varies in order, (M + 1) → (L) → (L-) → (SL).</p>	Present status	Operation button		PAP 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*1	Fan speed *2	Air purifying operation	Cooling position	AUTO, L, L+, M, M+, H	AC + Air purifying operation	Follows to AC operation	Follows to AC operation
Present status	Operation button																											
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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*1	Fan speed *2																										
Air purifying operation	Cooling position	AUTO, L, L+, M, M+, H																										
AC + Air purifying operation	Follows to AC operation	Follows to AC operation																										
13. Discharge temperature control	<table><tr><th>Td value</th><th>Control operation</th></tr><tr><td>117℃</td><td>Judges as an error and stops the compressor.</td></tr><tr><td>112℃</td><td>Reduce the compressor speed.</td></tr><tr><td>108℃</td><td>Reduce slowly compressor speed.</td></tr><tr><td>105℃</td><td>Keeps the compressor speed.</td></tr><tr><td></td><td>If the operation is performed with lower speed than one commanded by the serial signal, speed is slowly raised up to the commanded speed.</td></tr><tr><td>98℃</td><td>Operates with speed commanded by the serial signal.</td></tr></table>	Td value	Control operation	117℃	Judges as an error and stops the compressor.	112℃	Reduce the compressor speed.	108℃	Reduce slowly compressor speed.	105℃	Keeps the compressor speed.		If the operation is performed with lower speed than one commanded by the serial signal, speed is slowly raised up to the commanded speed.	98℃	Operates with speed commanded by the serial signal.	<p>1. Purpose</p> <p>This function detects error on the refrigerating cycle or error on the compressor, and performs protective control.</p> <p>2. Operation</p> <ul style="list-style-type: none">Control of the compressor speed <p>The speed control is performed as described in the left table based upon the discharge temperature.</p>												
Td value	Control operation																											
117℃	Judges as an error and stops the compressor.																											
112℃	Reduce the compressor speed.																											
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98℃	Operates with speed commanded by the serial signal.																											

Item	Operation flow and applicable data, etc.	Description
<p>14. Pulse modulating valve (PMV) control</p>	<p>This function controls throttle amount of the refrigerant in the refrigerating cycle.</p> <p>According to operating status of the air conditioner, this function also controls the open degree of valve with an expansion valve with pulse motor.</p> <pre> graph TD Start[Starting up] --> Init[Initialize] Init --> Move[Move to initial position] Move --> Comp[Compressor ON] Comp --> SH[SH control] Comp --> Td[Td release control] SH --> PMV[PMV open degree control] Td --> PMV PMV --> Remote[Stop by remote controller] PMV --> Ta[Room temp. sensor Ta sensor control] Remote --> Power[Power OFF] Ta --> Defrost[Defrost] Defrost --> Move </pre> <p>* SH (Super Heat amount) = Ts (Temperature of suction pipe of the compressor) – Tc or Te (Heat exchanger temperature at evaporation side)</p> <p>* PMV: Pulse Modulating Valve</p>	<ol style="list-style-type: none"> 1) When starting the operation, move the valve once until it fits to the stopper. (Initialize) * 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 valve is adjusted according to each setup conditions during preparation for defrost and during defrost operation (4-way valve is inversed.). 5) To turn off the compressor while the air conditioner stops by control of the thermostat or by remote controller, adjust the open degree of valve to the setup value before stop of the compressor.
<p>15. Select switch on remote controller</p>	<p>A remote controller operates only one indoor unit.</p> <p>When two indoor units are installed in a room or in two adjacent rooms, this function prevents that two indoor units receive concurrently a signal from the remote controller as only one unit is to be operated.</p> <pre> graph TD Push[Push the operation button on the remote controller.] --> Both{Both indoor units start operation.} Both -- YES --> Set[Set Remote controller SELECT switches of one of two indoor units and the remote controller to B. For details, refer to Installation Manual.] Both -- NO --> Unnecessary[Unnecessary set Remote controller select] </pre>	<p>The indoor unit of which SELECT switch on the remote controller is set to B receives the signal sent from the remote controller set to B.</p> <p>(At shipment from the factory, SELECT switch on the remote controller and indoor unit is set to A. There is no display of A setting.)</p>

8-3. 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.

8-3-1. How to Set the Auto Restart Function

To set the auto restart function, proceed as follows:

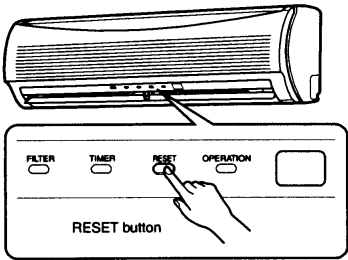
The power supply to the unit must be on ; the function will not set if the power is off.

Push the [RESET] button located in the center of the front panel continuously for three seconds.

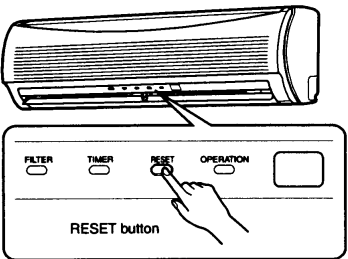
The unit receives the signal and beeps three times.

The unit then restarts operating automatically in the event of power supply being accidentally shut down.

• When the unit is standby (Not operating)

Operation	Motions
<p>Push [RESET] button for more than three seconds.</p> 	<p>The unit is on standby.</p> <p>↓</p> <p>The unit starts to operate. The green lamp is on.</p> <p>↓ After approx. three seconds,</p> <p>The unit beeps three times The lamp changes from green to orange. and continues to operate.</p> <p>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.</p>

• When the unit is in operation

Operation	Motions
<p>Push [RESET] button for more than three seconds.</p> 	<p>The unit is in operation. The green lamp is on.</p> <p>↓</p> <p>The unit stops operating. The green lamp is turned off.</p> <p>↓ After approx. three seconds,</p> <p>The unit beeps three times.</p> <p>If the unit is required to operate at this time, push [RESET] button once more or use the remote controller to turn it on.</p>

- While this function is being set, if the unit is in operation, the orange lamp is on.
- This function can not be set if the timer operation has been selected.

- When the unit is turned on by this function, the louver will not swing even though it was swinging automatically before shutting down.
- While the filter check lamp is on, the RESET button has the function of filter reset button.

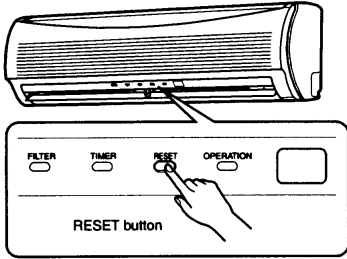
8-3-2. How to Cancel the Auto Restart Function

To cancel auto restart function, proceed as follows :

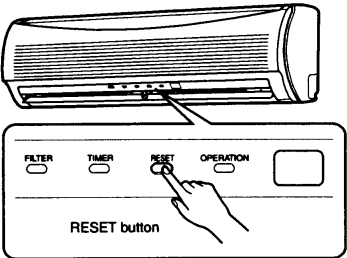
Repeat the setting procedure : the unit receives the signal and beeps three times.

The unit will be required to be turned on with the remote controller after the main power supply is turned off.

- **When the system is on stand-by (not operating)**

Operation	Motions
<p>Push [RESET] button for more than three seconds.</p> 	<p>The unit is on standby.</p> <p>↓</p> <p>The unit starts to operate. The orange lamp is on.</p> <p>↓ After approx. three seconds,</p> <p>The unit beeps three times The lamp changes from orange to green. and continues to operate.</p> <p>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.</p>

- **When the system is operating**

Operation	Motions
<p>Push [RESET] button for more than three seconds.</p> 	<p>The unit is in operation. The orange lamp is on.</p> <p>↓</p> <p>The unit stops operating. The orange lamp is turned off.</p> <p>↓ After approx. three seconds,</p> <p>The unit beeps three times.</p> <p>If the unit is required to operate at this time, push [RESET] button once more or use the remote controller to turn it on.</p>

- While this function is being set, if the unit is in operation, the orange lamp is on.

8-3-3. Power Failure During Timer Operation

When the unit is in timer operation, if it is turned off because of power failure, the timer operation is cancelled. Therefore, 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.

8-4. Filter Check Lamp

When the elapsed time reaches 1000 hours after air purifier operation, the filter lamp indicates.

After cleaning the filters, turn off the filter lamp.

8-41. How to Turn Off Filter Check Lamp

Push [FILTER] button on the remote controller or push [RESET] button on the indoor unit.

Then we have to clarify it.

NOTE :

If [RESET] button is pushed while the filter check lamp is not indicating, the indoor unit will start the automatic operation.

When you want a temporary operation while the filter lamp lights, put out the lamp once, and then push the RESET button.

8-5. Remote Controller and Its Functions

8-5-1. Parts Name of Remote Controller

1 Infrared signal emitter

Transmits signal to the indoor unit.

2 button




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

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

If no receiving sound is heard from the indoor unit,
push the button twice.

3 Mode select button (MODE)

Push this button to select a mode.

Each time you push the button, the modes cycle in
order from A : Auto changeover control,  : Cool,
 : Dry,  : Heat and back to A.
(A receiving beep is heard.)

4 Temperature button ()






▲ The temperature setting is increased to 30°C.

▼ The temperature setting is reduced to 17°C.
(A receiving beep is heard.)

5 Fan speed button (FAN)

Push 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.)

6 Auto louver button (SWING)

Push this button to swing the louver.

(A receiving beep is heard.)


Push this button again to stop the louver from
swinging. (A receiving beep is heard.)


7 Set louver button (FIX)

Push this button again to adjust the air flow direction.
(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, push ▲ of the "ON " button.

To move down the time, push ▼ of the "ON "
button.

9 OFF timer button (OFF)

Use this button to change the OFF timer times.

To move up the time, push ▲ of the "OFF " button.

To move down the time, push ▼ of the "OFF "
button.

10 Reserve button (SET)

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


11 Cancel button (CLR)

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

12 High power button (Hi POWER)

Push this button to start high power operation.

13 Memory button (MEMO)

Push this button to ready for storing the settings.
Hold down the button for more than 3 seconds to
store the setting indicated on the remote controller
and until the  mark is displayed.

14 Automatic operation button (AUTO)

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

15 ECO timer button (ECO)

Push this button to operate the air conditioner
economically.

16 FILTER button

Push this button to turn off the filter cleaning indica-
tor on the indoor unit.

Push this button after cleaning the air filter.

17 PRESET button

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

18 Air purifying button (PAP)

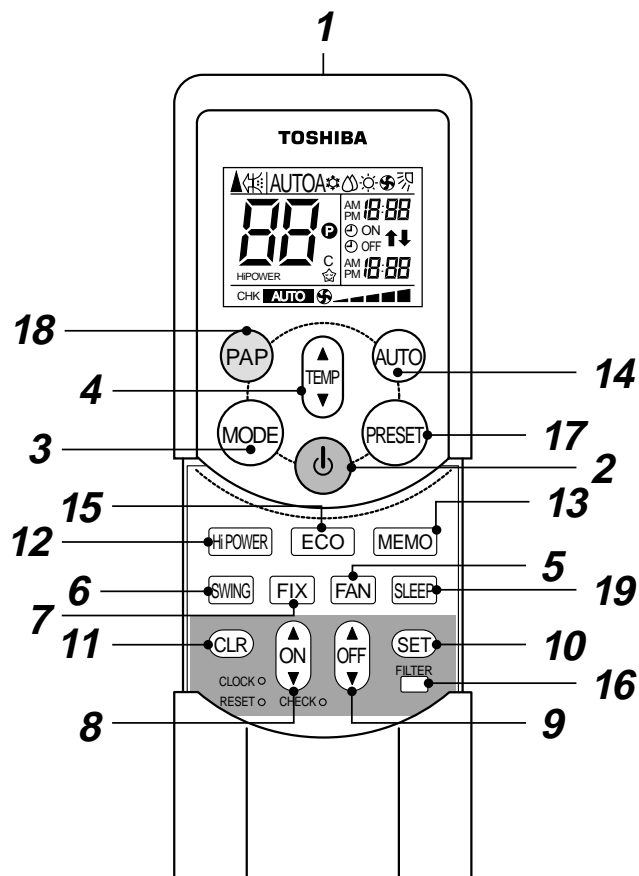
Push this button to start the electrical air purifying
operation.

Push the button again to stop operation.

19 Sleep time button (SLEEP)

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

You can select the OFF timer time from among four
settings (1, 3, 5 or 9 hours).




8-5-2. Name and Functions of Indications on Remote Controller




[Display]

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

1 Transmission mark

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

2 Mode display

Indicates the current operation mode.
(AUTO : Automatic control, A : Auto changeover control,  : Cool,  : Dry,  : Heat)






3 Temperature display


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

4 Air purifying indicator

Shows that the electrical air purifying operation is in progress.

5 FAN speed display

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  : Dry.

6 TIMER and clock time display

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 display

Indicates when the Hi-POWER operation starts.

Push the Hi POWER button to start and push it again to stop the operation.

8 P (MEMORY) display

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

The  mark is shown when holding down the button for more than 3 seconds while the mark is flashing.

Push another button to turn off the mark.

9 ECO indicator

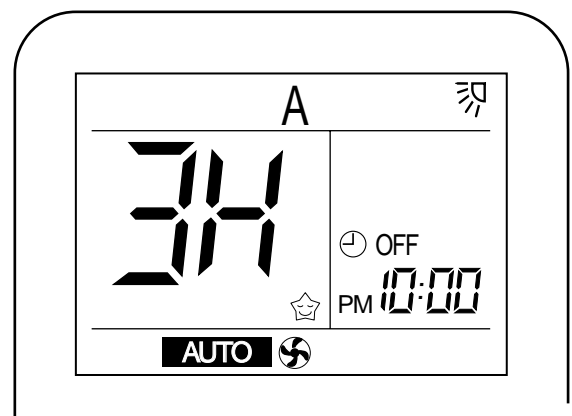
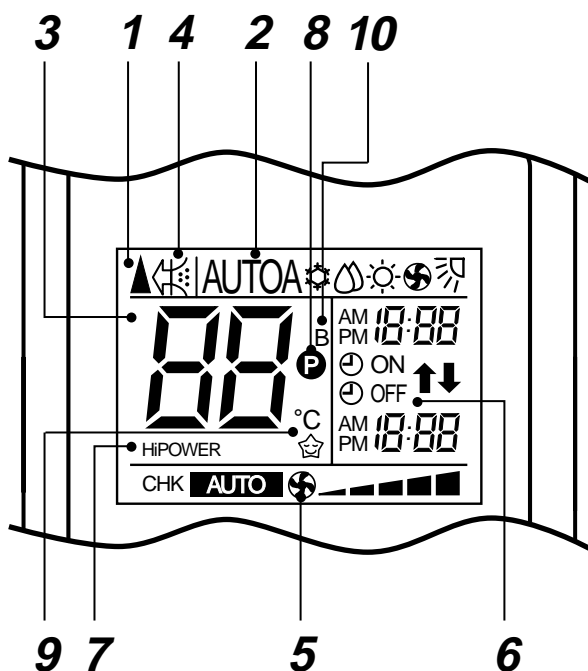
Indicates when the ECO is in activated.

Push the ECO button to start and push it again to stop operation.

10 A, B change indicator remote controller

Push the CHECK point and Fix button at the same time to change the remote controller setting from "A" to "B". (Priority is given to the "A" setting.)

The electric controller of the indoor unit is also changed to the "B" setting.



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

8-6. Hi-POWER Mode **([Hi-POWER] button on the remote** **controller is pushed.)**

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 as follows.

(1) Automatic operation

- The indoor unit operates in according to the current operation.

(2) Cooling operation

- The preset temperature drops 1°C.
(The value of the preset temperature on the remote controller does not change.)
- If the difference between the preset temperature and the room temperature is big, the horizontal louver moves to the Hi-POWER position automatically. Then when the difference between them gets smaller, the horizontal louver returns automatically.

(3) Heating operation

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

(4) The Hi-POWER mode can not be set in Dry operation

9. INSTALLATION PROCEDURE

9-1. Safety Cautions

For general public use

Power supply cord of outdoor unit shall be more than 1.5mm² (H07RN-F or 245IEC66) polychloroprene sheathed flexible cord.

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. The working pressure of R410A refrigerant is approx. 1.6 times of refrigerant R22. Accompanied with 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 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 the existing piping.

CAUTION

TO DISCONNECT THE APPLIANCE FROM THE MAIN POWER SUPPLY

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

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

DANGER

- FOR USE BY QUALIFIED PERSONS ONLY.
- 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.
- 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 INSTALLATION.
- 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 2M) 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 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 by-pass 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.
- Before doing any electrical work, attach an approved plug to the power supply cord and make sure the equipment is grounded.
- Appliance shall be installed in accordance with national wiring regulations.
If you detect any damage, do not install the unit. Contact your Toshiba dealer immediately.

WARNING

- 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.
- After unpacking the unit, examine it carefully for any damage.
- 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.
- Please read the installation manual carefully before installing the unit. It contains further important instructions necessary for proper installation.

For Reference:

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

It is recommended to procure an anti freeze heater locally for a safety installation of the air conditioner.
For details, contact the dealer.

9-1-1. Installation Diagram of Indoor and Outdoor Units

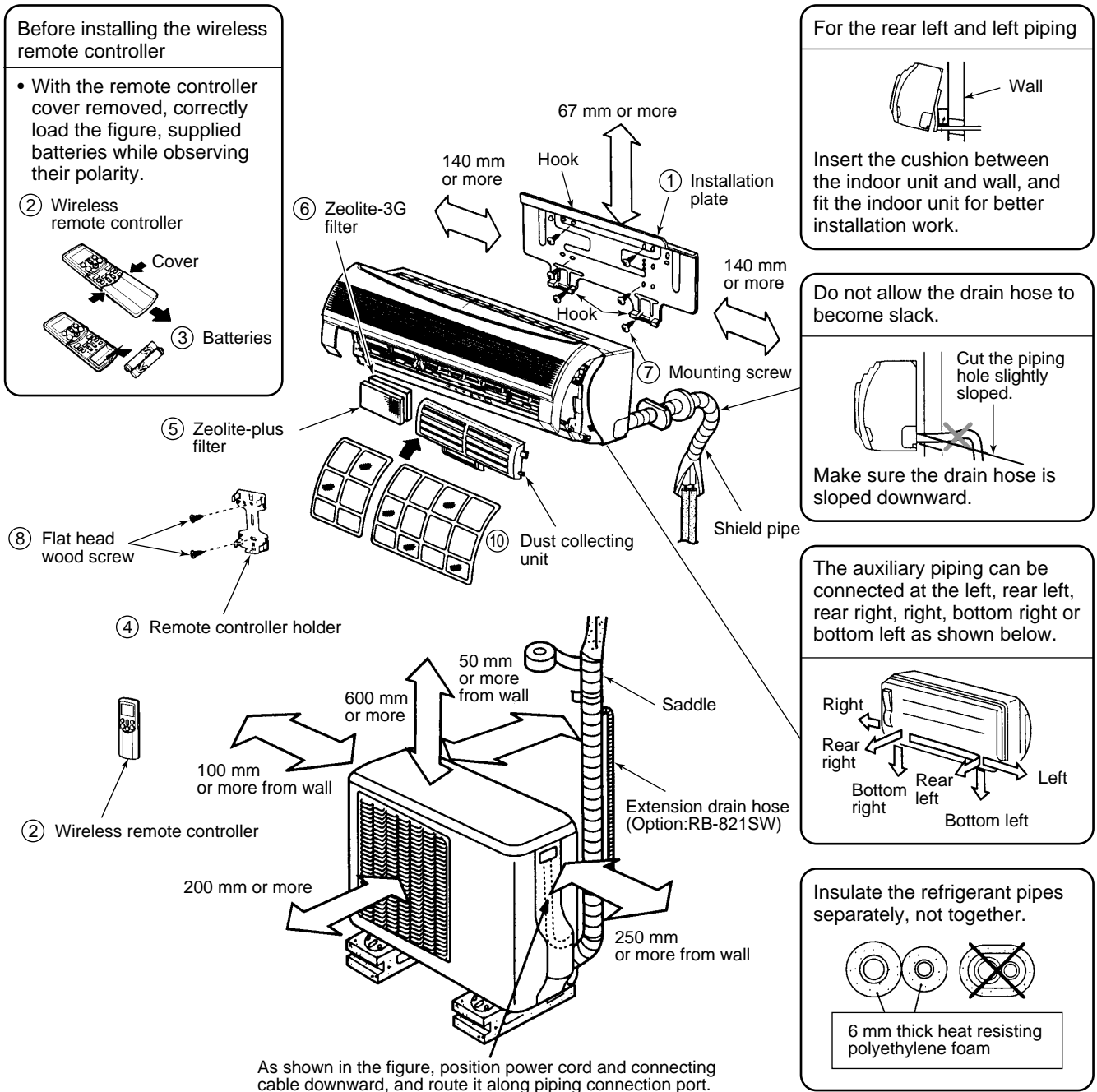


Fig. 9-1-1

9-1-2. Optional Installation Parts

Part code	Parts name	Q'ty
A	Refrigerant piping Liquid side : Ø6.35 Gas side : Ø9.52	Each one
B	Pipe insulating material (Polyethylene foam, 6mm thick)	1
C	Putty, PVC tapes	Each one

Fixing 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 Ø8 mm or Ø10 mm anchor bolts and nuts.
- If it is necessary to drain the defrost water, attach drain nipple to the bottom plate of the outdoor unit before installing it.

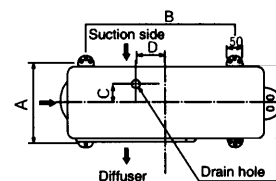



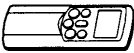
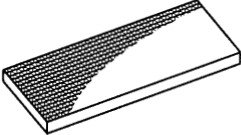




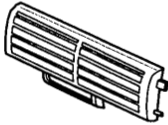


Fig. 9-1-2

A	B	C	D
310	600	76	115

9-1-3. 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 x 1	④	 Remote controller holder x 1	⑦	 Mounting screw Ø4 x 25L x 6
②	 Wireless remote controller x 1	⑤	 Zeolite-plus filter x 1	⑧	 Flat head wood screw Ø3.1 x 16L x 2
③	 Battery x 2	⑥	 Zeolite-3G filter x 1	⑨	 Drain nipple* x 1 (RAS-10JAVP-E) (RAS-13JAVP-E)
Others	Name	This model is not equipped with an extension drain hose. Option : For the extension drain hose, use the optionally available RB-821SW or a commercially available one.			⑩
	Owner's manual				
	Installation manual				Dust collecting unit

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








9-1-4. Installation/Service Tools

Changes in the product and components

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

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

New tools for R410A

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

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

9-2. Indoor Unit

9-2-1. Installation Place

- A place which provides the spaces around the indoor unit as shown in the above diagram.
 - A place where there is no obstacle near the air inlet and outlet.
 - A place which allows an 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 as top of the indoor unit comes to at least 2m height.

Also it must be avoided to put anything on the top of the indoor unit.

CAUTION

- Direct sunlight to the indoor unit wireless receiver should be avoided.
- The microprocessor in the indoor unit should not be too close to r-f noise sources.
(For details, see the owner's manual.)

Remote controller

- A place where there are no obstacles such as a curtain that may block the signal from the indoor unit.
- 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 apart from the nearest TV set or stereo equipment.
(This is necessary to prevent image disturbances or noise interference.)
- The location of the remote controller should be determined as shown below.

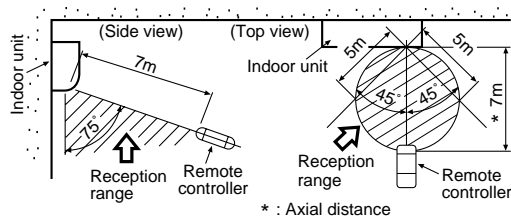


Fig. 9-2-1

9-2-2. Cutting a Hole and Mounting Installation Plate

Cutting a Hole

When install the refrigerant pipes from the rear.

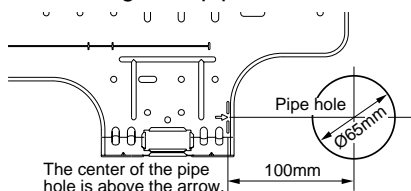


Fig. 9-2-2

1. After determining the pipe hole position on the mounting plate (➡), drill the pipe hole (Ø65 mm) at a slight downward slant to the outdoor side.

NOTE :

- When drilling the wall that contains a metal lath, wire lath or metal plate, be sure to use a pipe hole brim ring sold separately.

Mounting the Installation Plate

For installation of the indoor unit, use the paper pattern on the back.

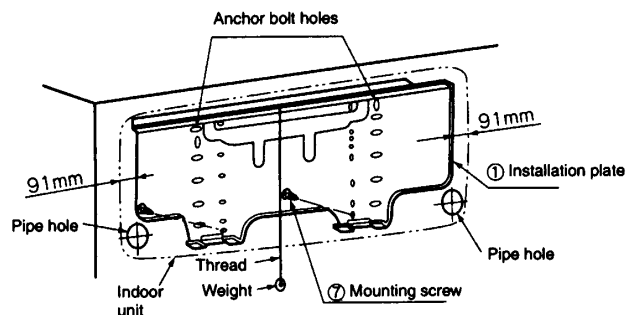


Fig. 9-2-3

When the installation plate is directly mounted on the wall

1. Securely fit the installation plate onto the wall by screwing it in the upper and lower parts to hook up the indoor unit.
2. To mount the installation plate on a concrete wall with anchor bolts, utilize the anchor bolt holes as illustrated in the above figure.
3. Install the installation plate horizontally in the wall.

CAUTION

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

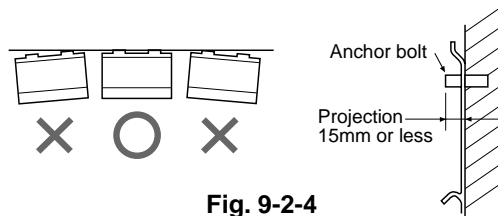


Fig. 9-2-4

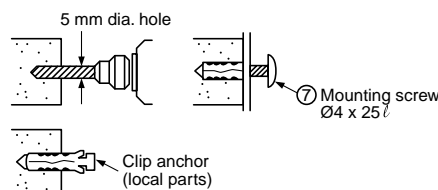


Fig. 9-2-5

CAUTION

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

- In case of block, brick, concrete or similar type walls, make 5 mm dia. holes in the wall.
- Insert clip anchors for appropriate ⑦ mounting screws.

NOTE :

- Install the installation plate using 4 to 6 pieces of mounting screw securing four corners with screws.

9-2-3. Electrical Work

1. The supply voltage must be the same as the rated voltage of the air conditioner.
2. Prepare the power source for exclusive use with the air conditioner.

NOTE :

- Wire type : More than H07RN-F or 245IEC66 (1.0mm² or more)

CAUTION

- This appliance can be connected to the mains in either of the following two ways.
 - (1) Connection to fixed wiring :
A switch or circuit breaker which disconnects all poles and has a contact separation of at least 3 mm must be incorporate in the fixed wiring.
An approved circuit breaker or switches must be used.
 - (2) Connection with power supply plug :
Attach power supply plug with power cord and plug it into wall outlet. An approved power supply cord and plug must be used.

NOTE :

- Perform wiring works so as to allow a generous wiring capacity.

9-2-4. Wiring Connection

How to connect the connecting cable

Wiring of the connecting cable can be carried out without removing the front panel.

1. Remove the air inlet grille.
Open the air inlet grille upward and pull it toward you.
2. Remove the terminal cover and cord clamp.
3. Insert the connecting cable (according to the local cords) into the pipe hole on the wall.
4. Take out the connecting cable through the cable slot on the rear panel so that it protrudes about 15cm from the front.
5. Insert the connecting cable fully into the terminal block and secure it tightly with screws.
6. Tightening torque : 1.2 N•m (0.12 kgf•cm)
7. Secure the connecting cable with the cord clamp.
8. Fix the terminal cover, rear plate bushing and air inlet grille on the indoor unit.

CAUTION

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

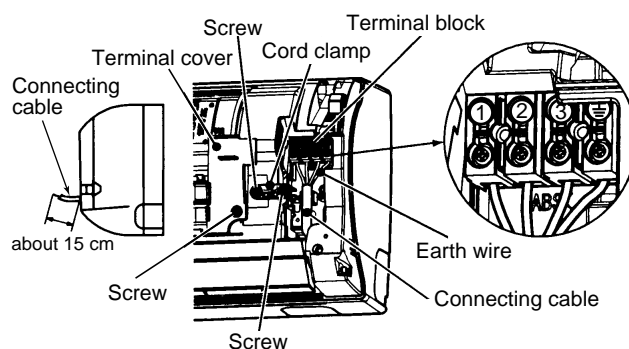
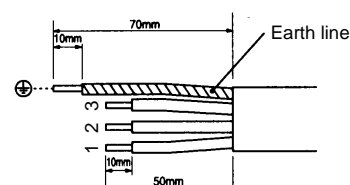


Fig. 9-2-6



NOTE : WIRE TYPE : more than H07 RN-F or 245 IEC 66. (1.0mm² or more)

Fig. 9-2-7 Stripping length of connecting cable

9-2-5. Piping and Drain Hose Installation

Piping and drain hose forming

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

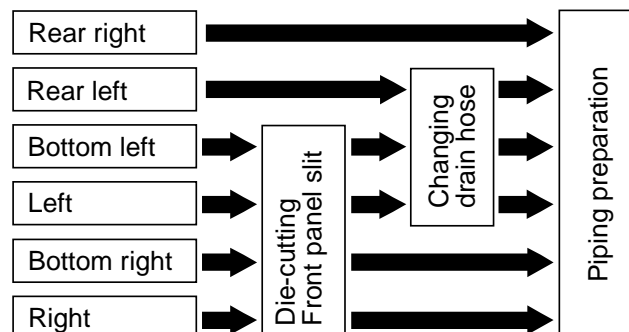


Fig. 9-2-8

1. Die-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. Changing drain hose

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

How to remove the Drain Cap

Clip drain cap by needle-nose plier, and pull out.

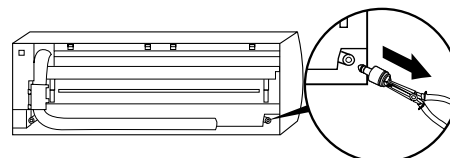


Fig. 9-2-9

How to install the Drain Cap

Firmly insert drain hose connecting part unit hitting on a heat insulator.

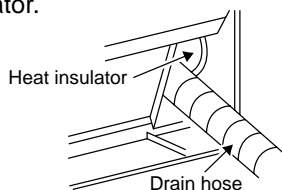


Fig. 9-2-10

How to fix the Drain Cap

1) Insert hexagonal wrench (Ø4mm) in a center head.

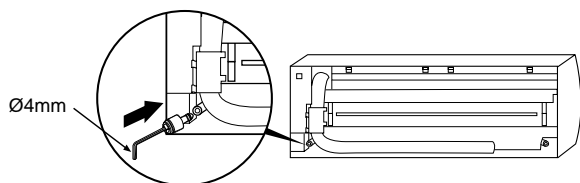


Fig. 9-2-11

2) Firmly insert drain cap.

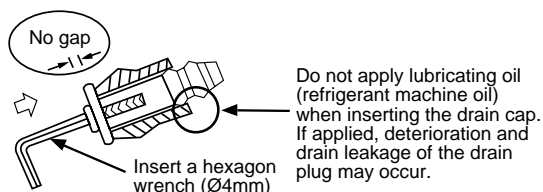


Fig. 9-2-12

CAUTION

Firmly insert the drain hose and drain cap : otherwise, water may leak.

In case of right or left piping

- After scribing slits of the front panel with a knife or a marking-off pin, cut them with a pair of nippers or an equivalent tool.

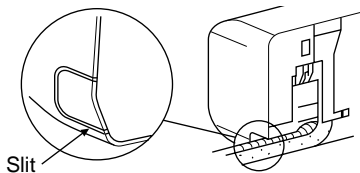


Fig. 9-2-13

In case of bottom right or bottom left piping

- After scribing slits of the front panel with a knife or a marking-off pin, cut them with a pair of nippers or an equivalent tool.

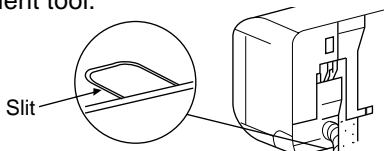


Fig. 9-2-14

Left-hand connection with piping

Bend the connecting pipe so that it is laid within 43mm above the wall surface. If the connecting pipe is laid exceeding 43mm above the wall surface, the indoor unit may unstably be set on the wall. When bending the connecting pipe, make sure to use a spring bender so as not to crush the pipe.

Bend the connection pipe within a radius of 30mm (Ø6.35), 40mm (Ø9.52).

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

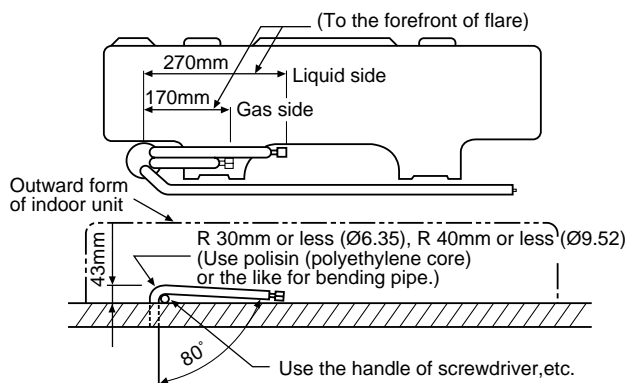


Fig. 9-2-15

NOTE :

If the pipe is bent incorrectly, the indoor unit may unstably be set 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.

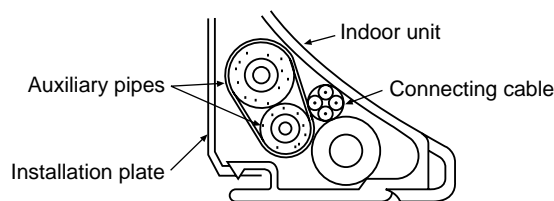


Fig. 9-2-16

- Carefully arrange pipes so that any pipe does not stick out of the rear plate of the indoor unit.
- Carefully connect the auxiliary pipes and connecting pipes to each other and cut off the insulating tape wound on the connecting pipe to avoid double-taping at the joint, 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, carefully do it not to crush it.

9-2-6. 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 up 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 up on the installation plate.

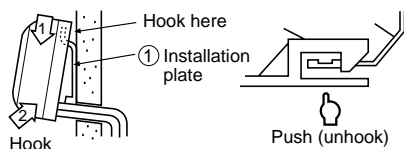


Fig. 9-2-17

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

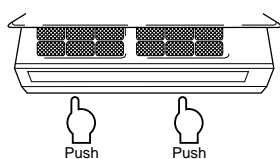


Fig. 9-2-18

8-2-7. Drainage

1. Run the drain hose sloped downwards.

NOTE :

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

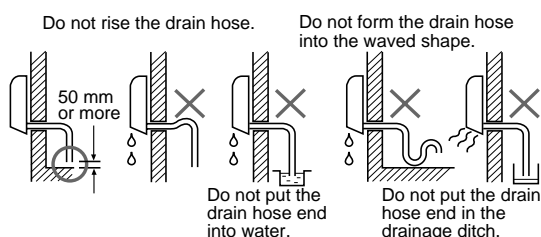


Fig. 9-2-19

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 connecting part of extension drain hose with shield pipe.

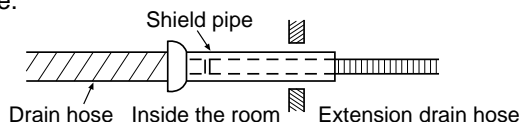


Fig. 9-2-20

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.

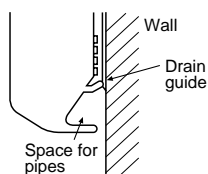


Fig. 9-2-21

9-3. Outdoor Unit

9-3-1. Installation Place

- A place which provides the spaces around the outdoor unit as shown in the left 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 users neighbors.
- A place which is not exposed to a strong wind.
- A place free of a leakage of combustible gases.
- A place which does not block a passage.
- When the outdoor unit is to be installed in an elevated position, be sure to secure its feet.
- This air conditioner accepts a connection piping length of up to 25 m.
- 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 20g of refrigerant per meter of added connection piping for installations requiring connection piping to be between 16 m to 25 m.
- An allowable height level is up to 10 m.
- A place where the drain water does not raise any problem.

Precautions for adding refrigerant

- Use a scale having a precision with at least 10 g per index line 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.

CAUTION

1. Install the outdoor unit without anything blocking the air discharging.
2. When the outdoor unit is installed in a place exposed always to a strong wind like a coast or on a high storey of a building, secure the normal fan operation using a duct or a wind shield.
3. Specially in windy areas, install the unit prevent the admission of wind.
4. 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 as from audio equipment, welders, and medical equipment.

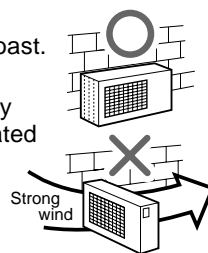


Fig. 9-3-1

9-3-2. Refrigerant Piping Connection

Flaring

1. Cut the pipe with a pipe cutter.

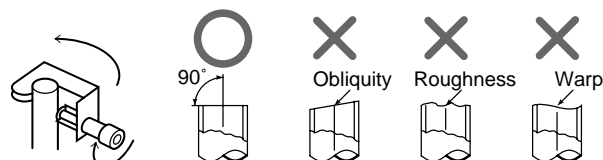


Fig. 9-3-2

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

• **Projection margin in flaring : A (Unit : mm)**

Rigid (Clutch type)

Outer dia. 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

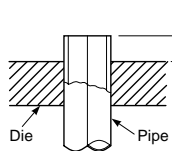


Fig. 9-3-3

Imperial (Wing nut type)

Outer dia. of copper pipe	R410A
6.35	1.5 to 2.0
9.52	1.5 to 2.0

Tightening Connection

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

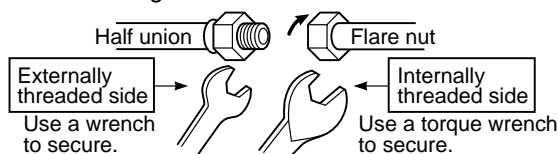


Fig. 9-3-4

CAUTION

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

(Unit : N·m)

Outer dia. of copper pipe	Tightening torque
Ø6.35 mm	14 to 18 (1.4 to 1.8 kgf·m)
Ø9.52 mm	33 to 42 (3.3 to 4.2 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 each flare pipe connects incorrectly, it may cause not only a gas leakage but also a trouble of the refrigeration cycle.

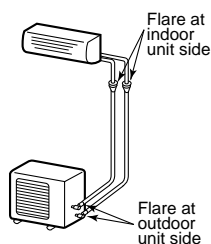


Fig. 9-3-5

Shaping pipes

1. How to shape the pipes

Shape the pipes along the incused line on the outdoor unit.

2. How to fit position of the pipes

Put the edges of the pipes to the place with a distance of 85mm from the incused line.

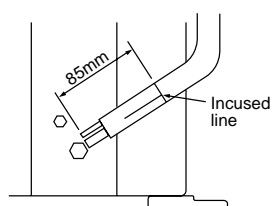


Fig. 9-3-6

9-3-3. Evacuating

After the piping has been connected to the indoor unit, you can perform the air purge together at once.

AIR PURGE

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

Use a vacuum pump

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

1. Connect the charge hose from the manifold valve to the service port of the gas side packed valve.
2. Connect the charge hose to the port of vacuum pump.
3. Open fully the low pressure side handle of the gauge manifold valve.
4. Operate the vacuum pump to start for evacuating. Perform evacuating for about 15 minutes if the piping length is 20 meters. (15 minutes for 20 meters) (assuming a pump capacity of 27 liters per minute.) Then confirm that the compound pressure gauge reading is -101 kPa (-76 cmHg).
5. Close the low pressure side valve handle of gauge manifold.
6. Open fully the valve stem of the packed valves (both side of Gas and Liquid).
7. Remove the charging hose from the service port.
8. Securely tighten the caps on the packed valves.

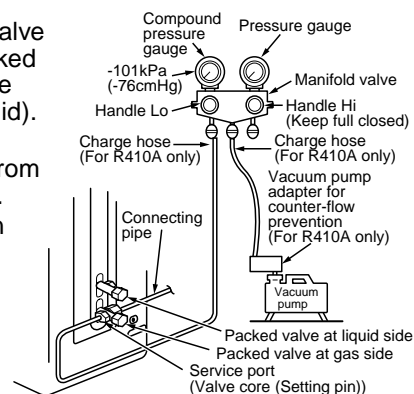


Fig. 9-3-7

CAUTION

• **IMPORTANT POINTS FOR PIPING WORK**

1. Keep dust and moisture away from entering the pipes.
2. Tight connection (between pipes and unit)
3. Evacuate the air in the connecting pipes using VACUUM PUMP.
4. Check gas leak (connected points)

Packed Valve Handling Precautions

- Open the valve stem all the way out : but do not try to open it beyond the stopper.
- Securely tighten the valve stem cap with torque in the following table :

Gas side (Ø9.52 mm)	33 to 42 N·m (3.3 to 4.2 kgf·m)
Liquid side (Ø6.35 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)

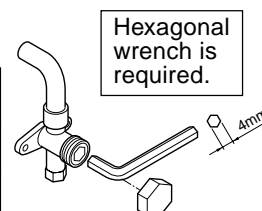


Fig. 9-3-8

9-3-4. Wiring Connection

1. Remove the electric parts cover from the outdoor unit.
2. Connect the connecting cable to the terminal as identified with their respective matched numbers on the terminal block of indoor and outdoor unit.
3. When connecting the connecting cable to the outdoor unit terminal, make a loop as shown in installation diagram of indoor and outdoor unit, to prevent water coming in the outdoor unit.
4. Insulate the unused cords (conductors) with water coming in the outdoor unit. Process them so that they do not touch any electrical or metal parts.

Stripping length of connecting cable

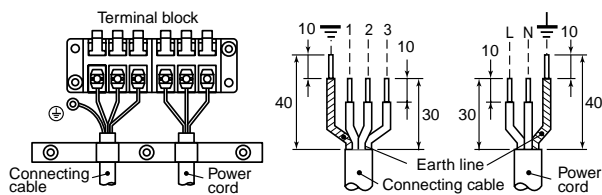




Fig. 9-3-9

Model	RAS-10JKVP-E	RAS-13JKVP-E
Power source	220 – 240 V~, 50 Hz 220 V~, 60 Hz	
Maximum running current	10A	11A
Installation fuse rating	25A (D type )	
Power cord	H07RN-F or 245IEC66 (1.5 mm ² or more)	
Connection cable	Wire type: More than H07RN-F or 245IEC66 (1.0 mm ² or more)	

CAUTION

- Wrong wiring connection may cause some electrical parts 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 connected firmly.
- This installation fuse (25A D type ) must be used for the power supply line of this air conditioner.
- If incorrect or incomplete wiring is carried out, it will cause an ignition or smoke.
- Prepare the power supply for exclusive use with the air conditioner.
- This product can be connected to the main breaker.

Connection to fixed wiring : A switch which disconnects all poles and has a contact separation of at least 3 mm must be incorporated in the fixed wiring when connecting to a main breaker circuit.

NOTE : Connecting cable

- Wire type : More than H07RN-F or 245IEC66 (1.0mm² or more)

9-3-5. Gas Leak Test

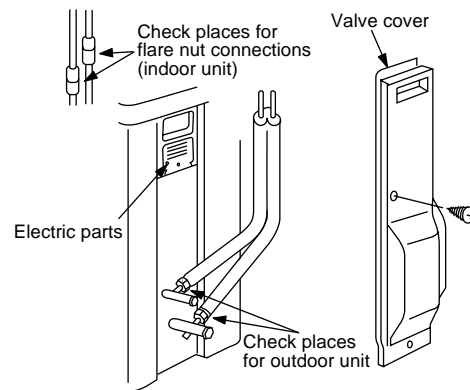


Fig. 9-3-10

- Check the flare nut connections for the gas leak with a gas leak detector or soap water.

9-3-6. Test Operation

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

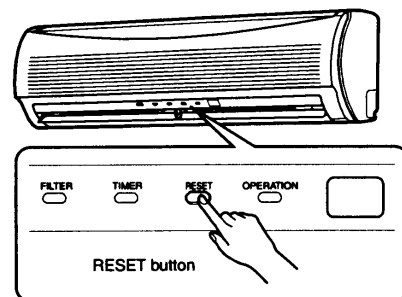


Fig. 9-3-11

9-3-7. Auto Restart Setting

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

Information

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

How to Set the Auto Restart

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

Setting of Remote Controller Selector Switch

Remote controller selector switch

- If two indoor units are installed in the same room or adjoining rooms, the second unit can inadvertently receive a remote controller signal and start operation when operating the first unit. This can be prevented by setting one of the indoor units and the corresponding remote controller to the B setting (the A setting is the default setting).
1. Setting the remote controller switch on the main unit
 - Remove the front panel, and then set the selector switch to "B".
 - After setting of the switch, remount the front panel.
 2. Setting the remote controller switch on the remote controller
 - Insert dry-cell batteries, and push the RESET button.
 - While holding down the CHECK button with a pointed object, push the FIX button so that "B" is displayed at the right of the temperature indicator.
 3. Check that the indoor unit can be operated by the modified remote controller.

Position of remote controller selector switch

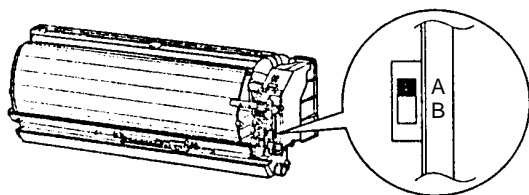


Fig. 9-3-12

10. HOW TO DIAGNOSE THE TROUBLE

The pulse modulating 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	First Confirmation	52
2	Primary Judgment	53
3	Judgment by Flashing LED of Indoor Unit	54
4	Self-Diagnosis by Remote Controller	55
5	Judgment of Trouble by Every Symptom	58
6	How to Check Simply the Main Parts	67

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.

< 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 C14 ("CAUTION HIGH VOLTAGE" is indicated.) electrolytic capacitor (500μF/400V) on P.C. board, and then perform discharging.

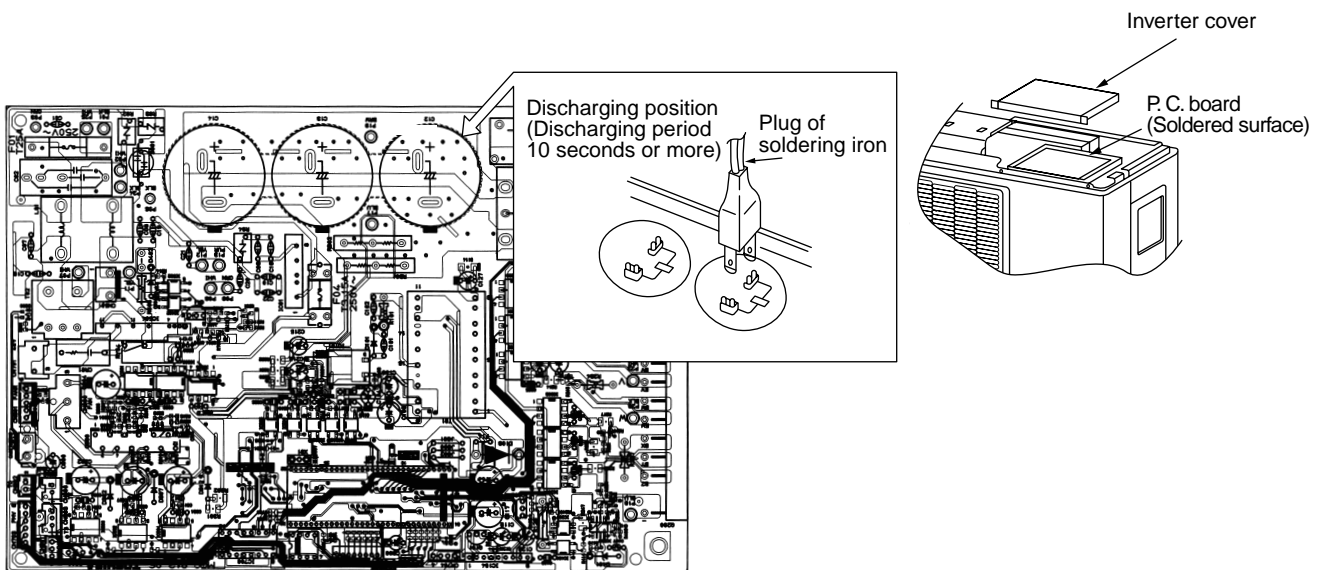


Fig. 10-1

10-1. First Confirmation

10-1-1. Confirmation of Power Supply

Confirm that the power breaker operates (ON) normally.

10-1-2. 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.

10-1-3. Operation Which is not a Trouble (Program Operation)

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

Table 10-1-1

No.	Operation of air conditioner	Description
1	When power breaker is turned "ON", the operation lamp (Green) of the indoor unit flashes.	The OPERATION lamp of the indoor unit flashes when power source is turned on. If [START/STOP] button is operated once, flashing stops. (Flashes also in power failure)
2	Compressor may not operate even if the room temperature is within range of compressor-ON.	The compressor does not operate while compressor restart delay timer (3-minutes timer) operates. The same phenomenon is found after power source has been turned on because 3-minutes timer operates.
3	In Dry and ECO 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.

10-2. Primary Judgment

To diagnose the troubles, use the following methods.

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

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

10-3. 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 10-3-1

	Item	Check code	Block display	Description for self-diagnosis
<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">Indoor indication lamp flashes.</div> <div style="margin-left: 40px;">↓</div> <div style="border: 1px solid black; padding: 5px; margin-left: 40px;">Which lamp does flash?</div> <div style="margin-left: 40px;">↓</div> <div style="margin-left: 40px;">→</div>	A	—	OPERATION (Green) Flashing display (1 Hz)	Power failure (when power is ON)
	B	00	OPERATION (Green) Flashing display (5 Hz)	Protective circuit operation for indoor P.C. board
	C	01	OPERATION (Green) TIMER (Yellow) Flashing display (5 Hz)	Protective circuit operation for connecting cable and serial signal system
	D	02	OPERATION (Green) FILTER (Orange) Flashing display (5 Hz)	Protective circuit operation for outdoor P.C. board
	E	03	OPERATION (Green) TIMER (Yellow) FILTER (Orange) Flashing display (5 Hz)	Protective circuit operation for others (including compressor)

NOTES :

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

10-4. Self-Diagnosis by Remote Controller (Check Code)

- (1) If the lamps are indicated as shown B to E in Table 10-3-1, excute the self-diagnosis by the remote controller.
- (2) When the remote controller is set to the service mode, the indoor controller diagnoses the operation condition and indicate 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 (Pi, Pi, Pi ...). The timer lamp usually flashes (5Hz) during self-diagnosis.

10-4-1. How to Use Remote Controller in Service Mode

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.
- The timer lamp of the indoor unit flashes continuously. (5 times per 1 sec.)

2 Push [ON ▲] or [OFF ▼] button

If there is no fault with a code, the indoor unit will beep once (Pi) and the display of the remote controller will change as follows :

00 → 01 → 02 ... 1d → 1E → 33

- Check the unit with all 52 check codes (00 to 33) as shown in Table-10-4-1.
- Push [ON ▲] or [OFF ▼] button to change the check code backward.

If there is a fault, the indoor unit will beep for 10 seconds (Pi, Pi, Pi...).

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

- 2-digits alphanumeric will be indicated on the display.
- All lamps 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.

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.

Fig. 10-4-1

10-4-2. Caution at Servicing

- (1) After servicing, push the START/STOP button to return to the normal mode.
- (2) After servicing by the check code, turn off breaker of the power supply, and turn on breaker of the power supply again so that memory in the microcomputer returns the initial status. However, the check codes are not deleted even if the power supply is turned off because they are stored in the fixed memory.
- (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 10-4-1

Block distinction		Operation of diagnosis function				Judgment and action
Check code	Block	Check code	Cause of operation	Air conditioner status	Remarks	
	Indoor P.C. board etc.		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.
			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.
			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		Trouble on other indoor P.C. boards	Operation continues.	Displayed when error is detected.	Replace P.C. board.
	Connecting cable and serial signal		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: (1) Check connecting cable, and correct if defective wiring. (2) Check 25A fuse of inverter P.C. board. (3) Check 3.15A of inverter P.C. board. 2. To display [Other] block during operation, check compressor thermo. operation and supply gas (check gas leak also). 3. Unit operates normally during check. If Return serial signal does not stop between indoor terminal board 2 and 3, replace inverter P.C. board. If signal stops between indoor terminal board 2 and 3, replace indoor P.C. board.

Block distinction		Operation of diagnosis function				Judgment and action
Check code	Block	Check code	Cause of operation	Air conditioner status	Remarks	
02	Outdoor P.C. board	14	Inverter over-current protective circuit operates. (Short time)	All off	Displayed when error is detected.	Even if trying operation again, all operations stop immediately. : Replace P.C. board.
		15	Position-detect circuit error or short-circuit between windings of compressor	All off	Displayed when error is detected.	1. Even if connecting lead wire of compressor is removed, position-detect circuit error occurred. : Replace P.C. board. 2. Measure resistance between wires of compressor, and perform short-circuit. : Replace compressor.
		17	Current-detect circuit error	All off	Displayed when error is detected.	Even if trying operation again, all operations stop immediately. : Replace P.C. board.
		18	Being out of place, disconnection or short-circuit of the outdoor 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	Outdoor heat exchanger temp. sensor error	Operation continues	—	1. Check outdoor temp. sensor (TO). 2. Check P.C. board.
03	Outdoor P.C. board	1c	Compressor drive output error, Compressor error (lock, missing, etc.), Break down	All off	Displayed when error is detected.	When 20 seconds passed after start-up, position-detect circuit error occurred. : Replace compressor.
	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	Four-way valve inverse error (TC sensor value lowered during heating operation.)	Operation continues	—	1. Check four-valve operation.

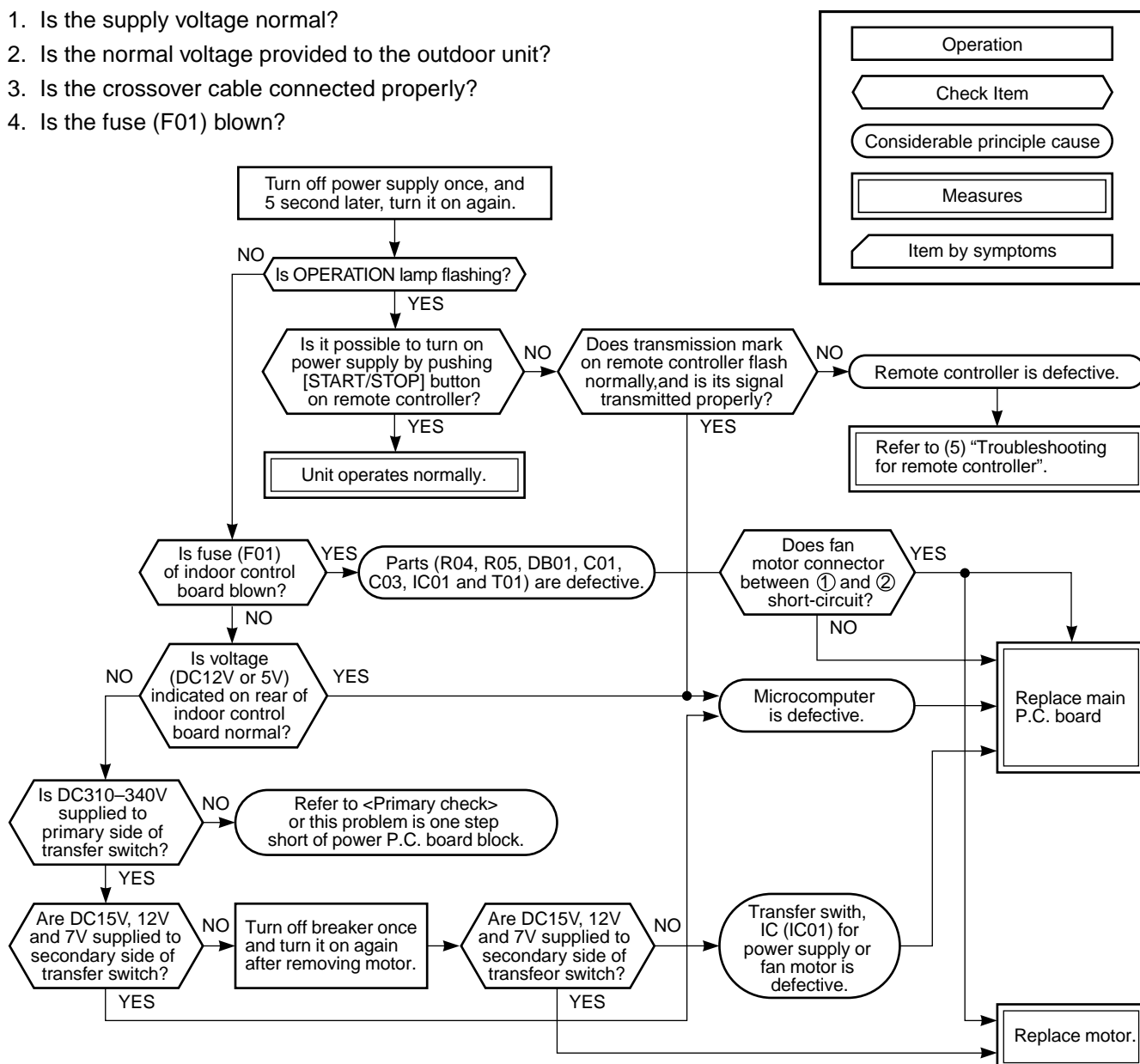
10-5. Judgment of Trouble by Every Symptom

10-5-1. Indoor Unit (Including Remote Controller)

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

<Primary check>

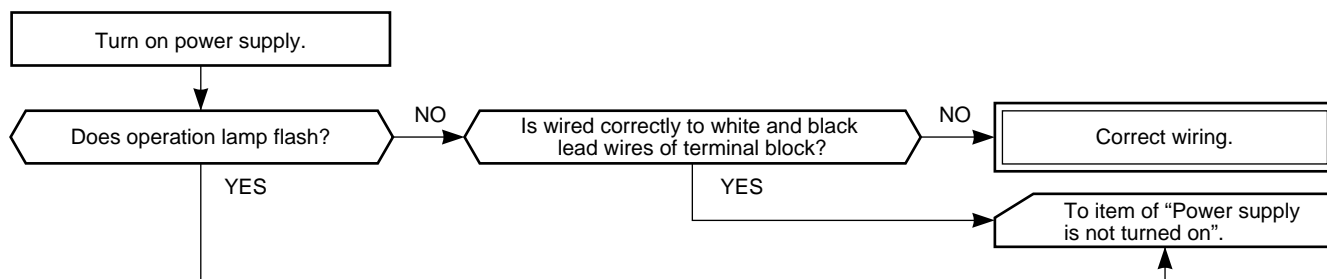
1. Is the supply voltage normal?
2. Is the normal voltage provided to the outdoor unit?
3. Is the crossover cable connected properly?
4. Is the fuse (F01) blown?



- Be sure to disconnect the motor connector CN10 after shut off the power supply, or it will be a cause of damage of the motor.

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

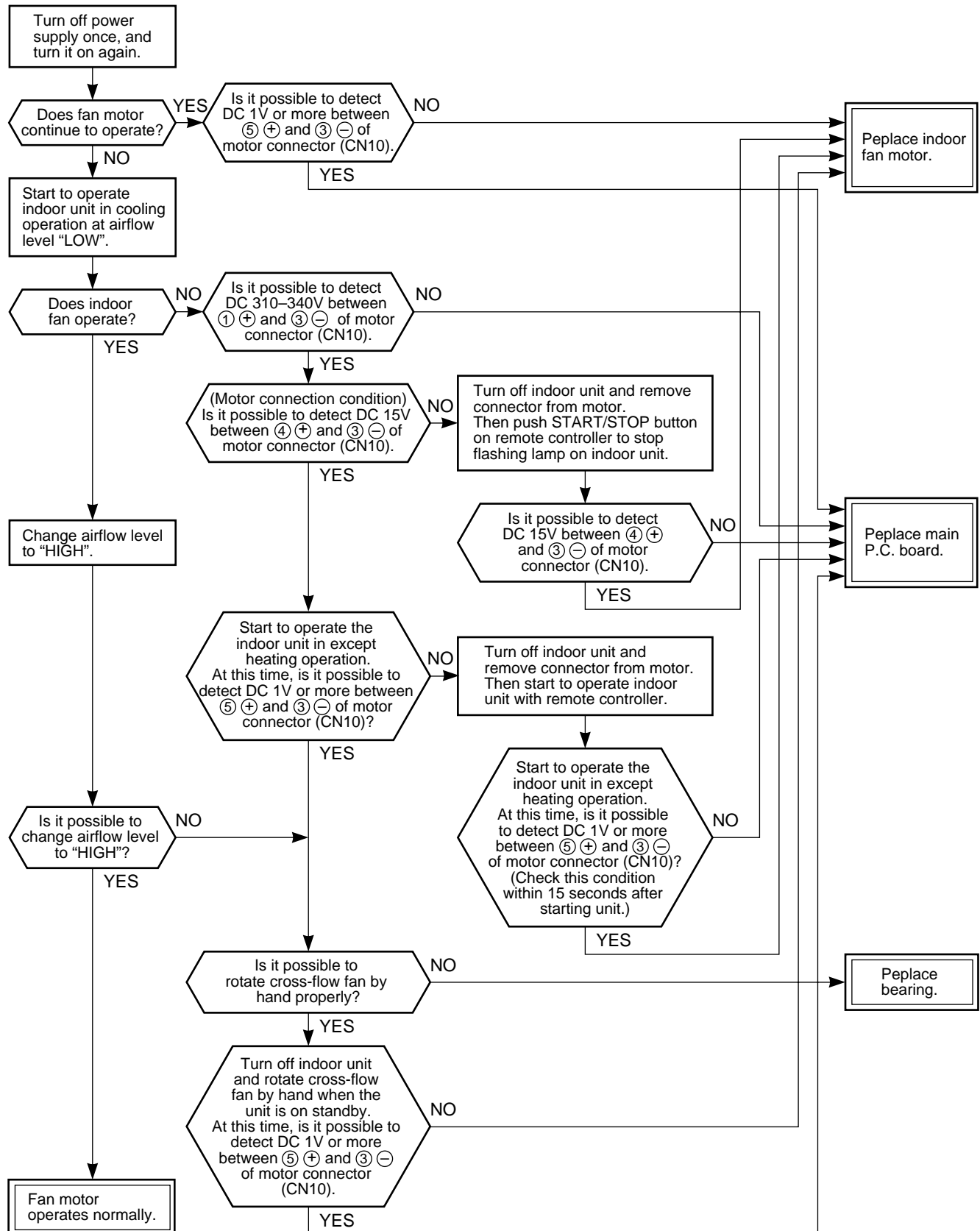
<Confirmation procedure>



(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.)



(4) Indoor fan motor automatically starts to rotate 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.

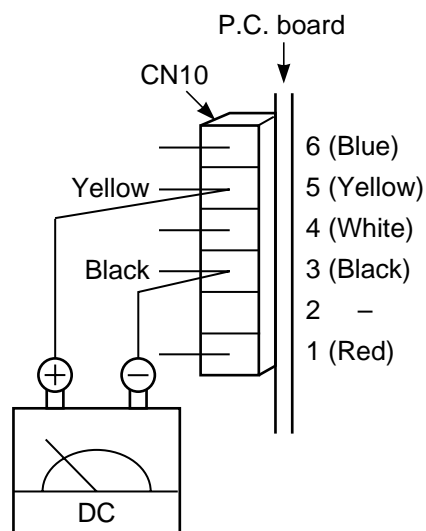
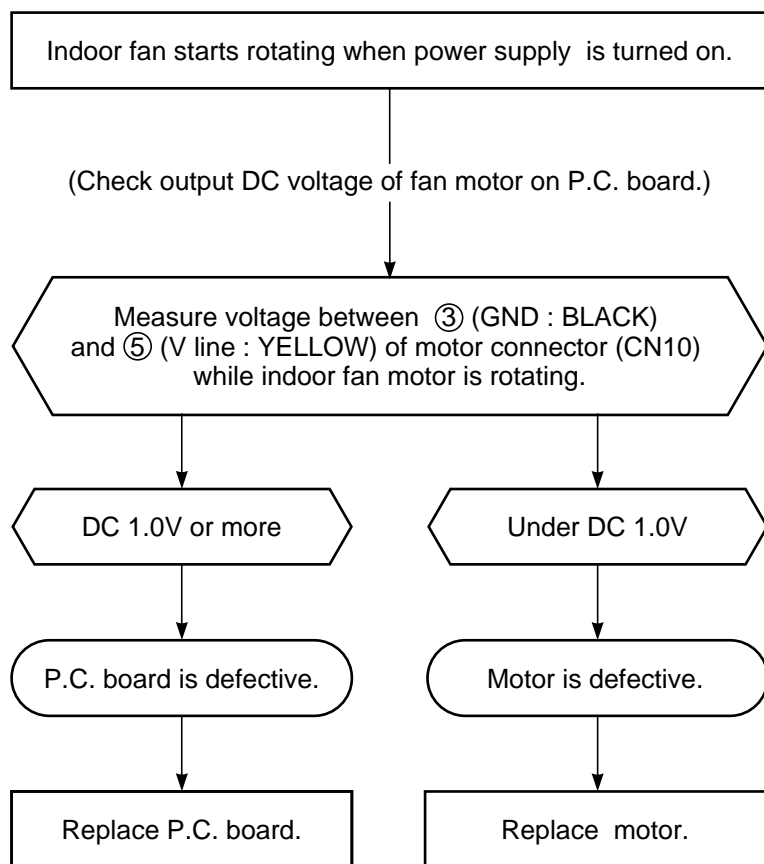
If the P.C. board is soldered imperfectly or the IC is defective, the fan motor may automatically rotate by turning on power supply.

<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 CN10 connector while the fan motor is rotating.

NOTE :

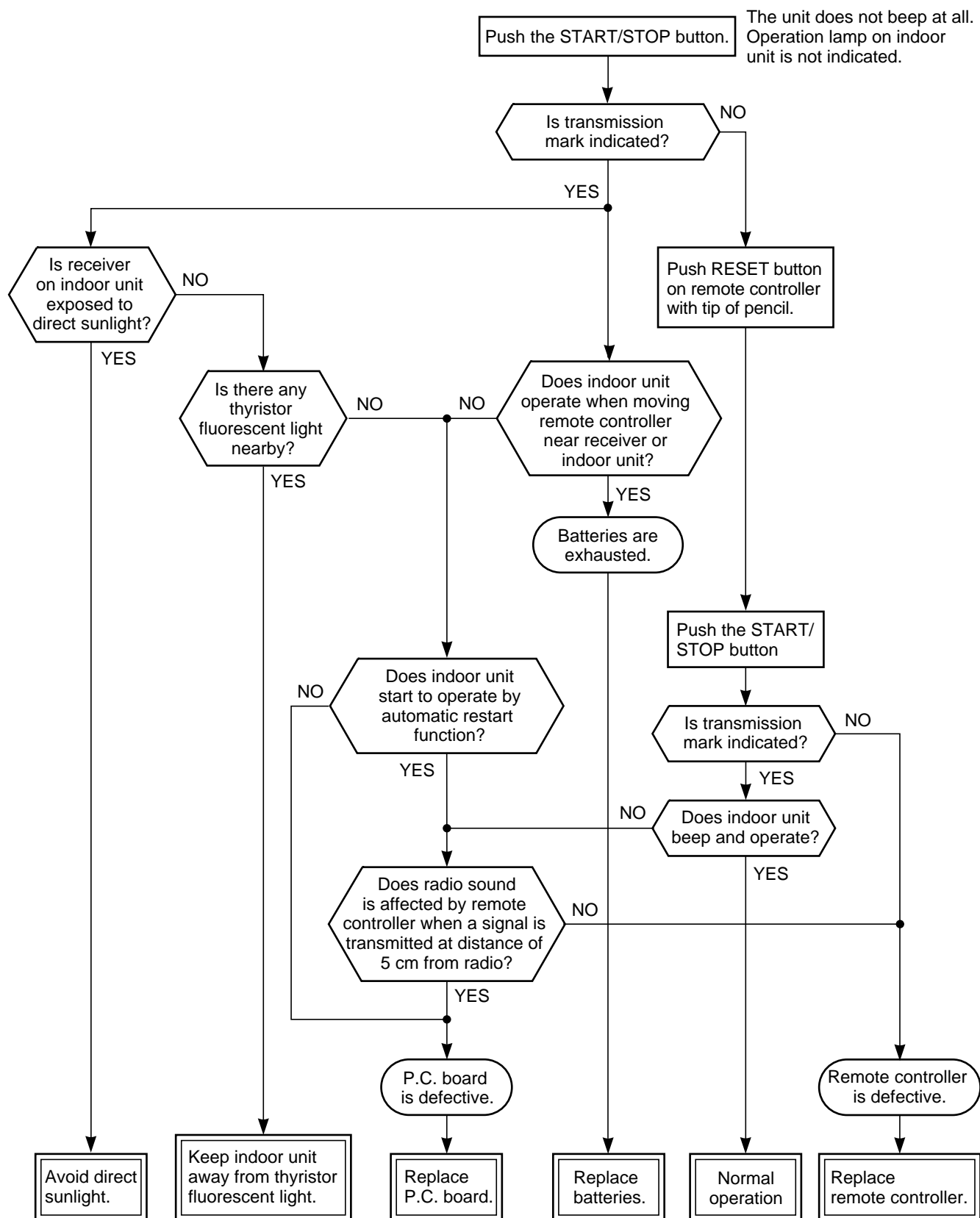
- Do not disconnect the connector while the fan motor is rotating.
- Use a thin test rod.



(5) Troubleshooting for remote controller

<Primary check>

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



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

10-5-2. Wiring Failure (Interconnecting and Serial Signal Wire)

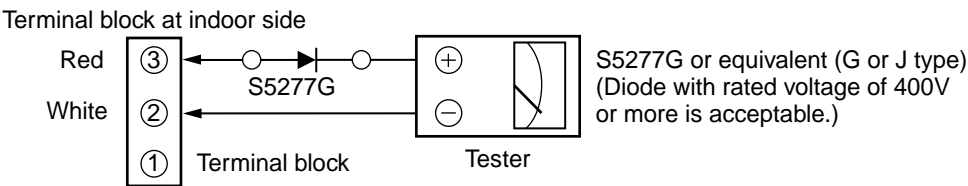
(1) Outdoor unit does not operate

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

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

NOTE:

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

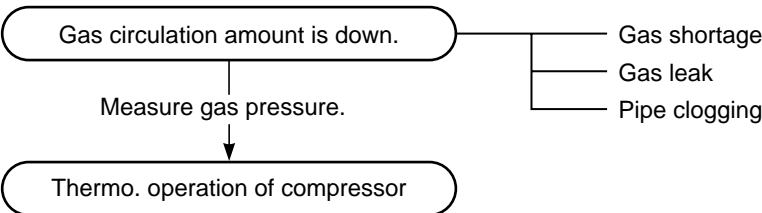


Normal time : Voltage swings between DC15 and 60V.Inverter Assembly check (10-8-1)
Abnormal time : Voltage does not vary.

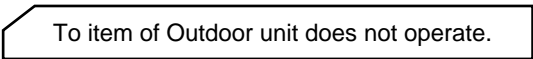
(2) Outdoor unit stops in a little while after operation started

<Check procedure> Select phenomena described below.

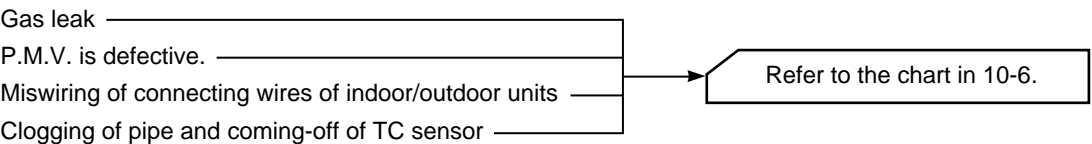
(1) The outdoor unit stops 10 to 20 minutes after operation started, and 10 minutes or more are required to restart the unit.



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

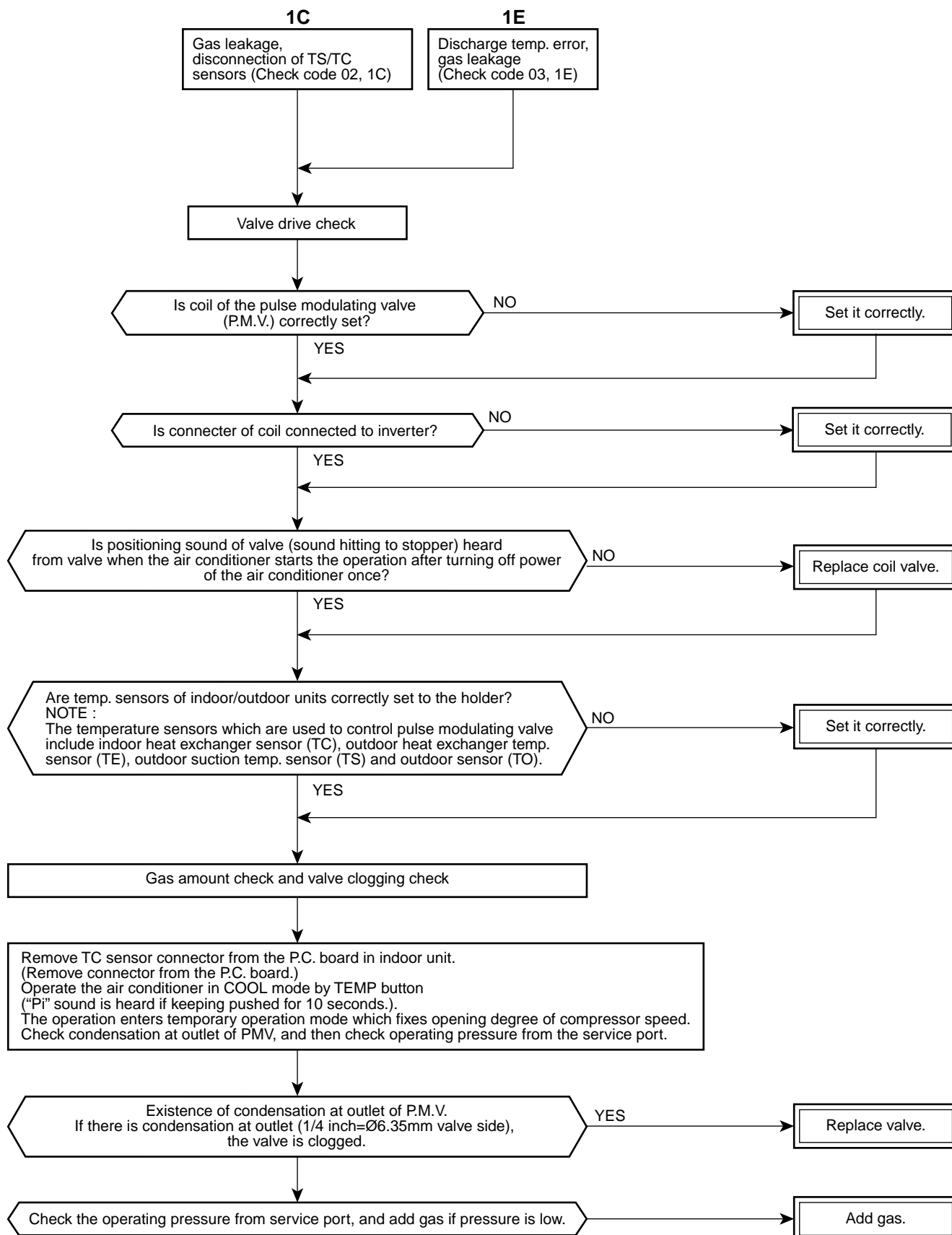


(3) The outdoor unit stops 10 minutes to 1 hour after operation started, and an alarm is displayed.
(Discharge temp. error check code 03, 1E Sensor temp. error check code 02, 1C)



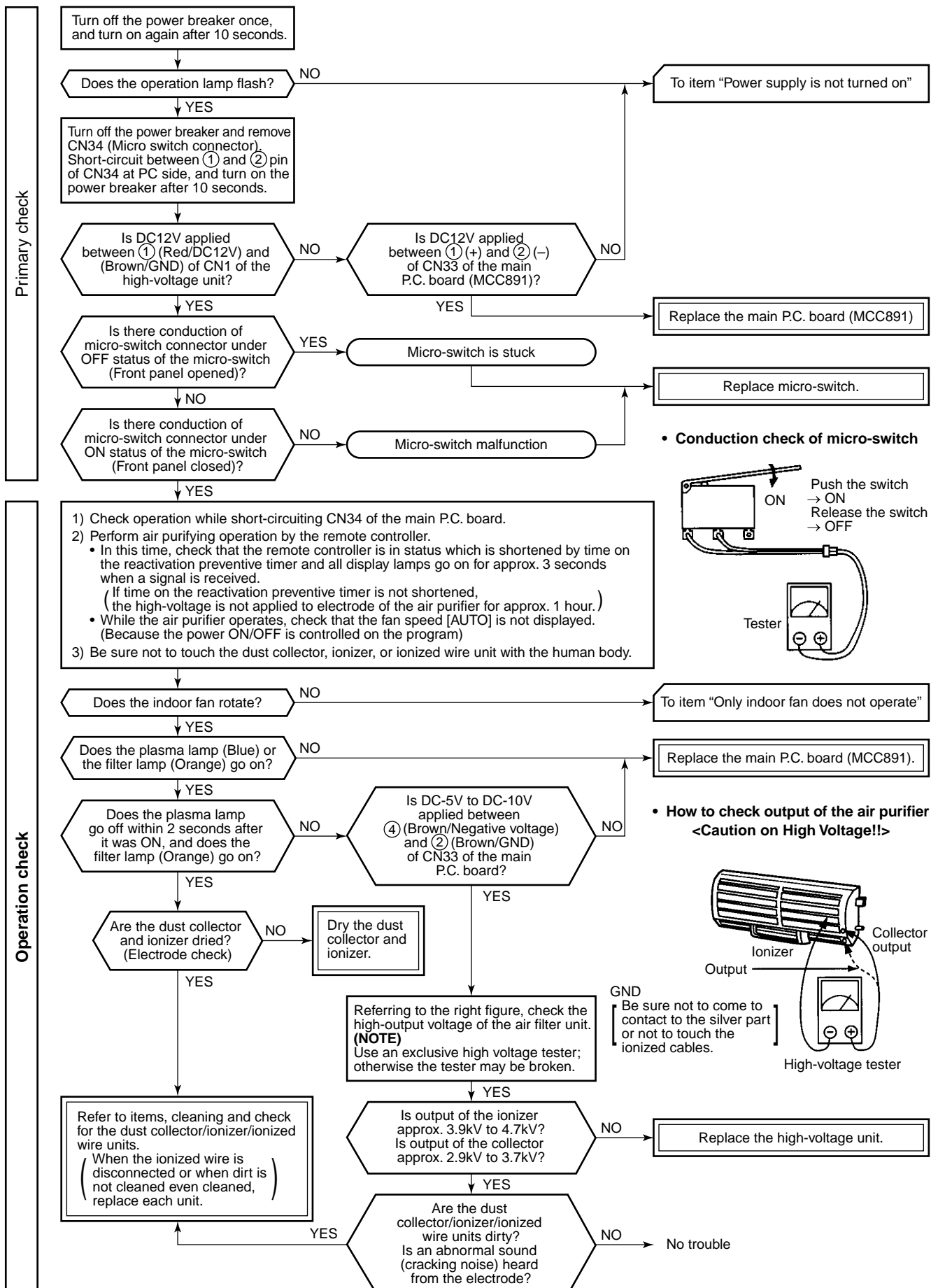
10-6. Check Code 1C (Miswiring in indoor/outdoor units) and 1E

<Check procedure>

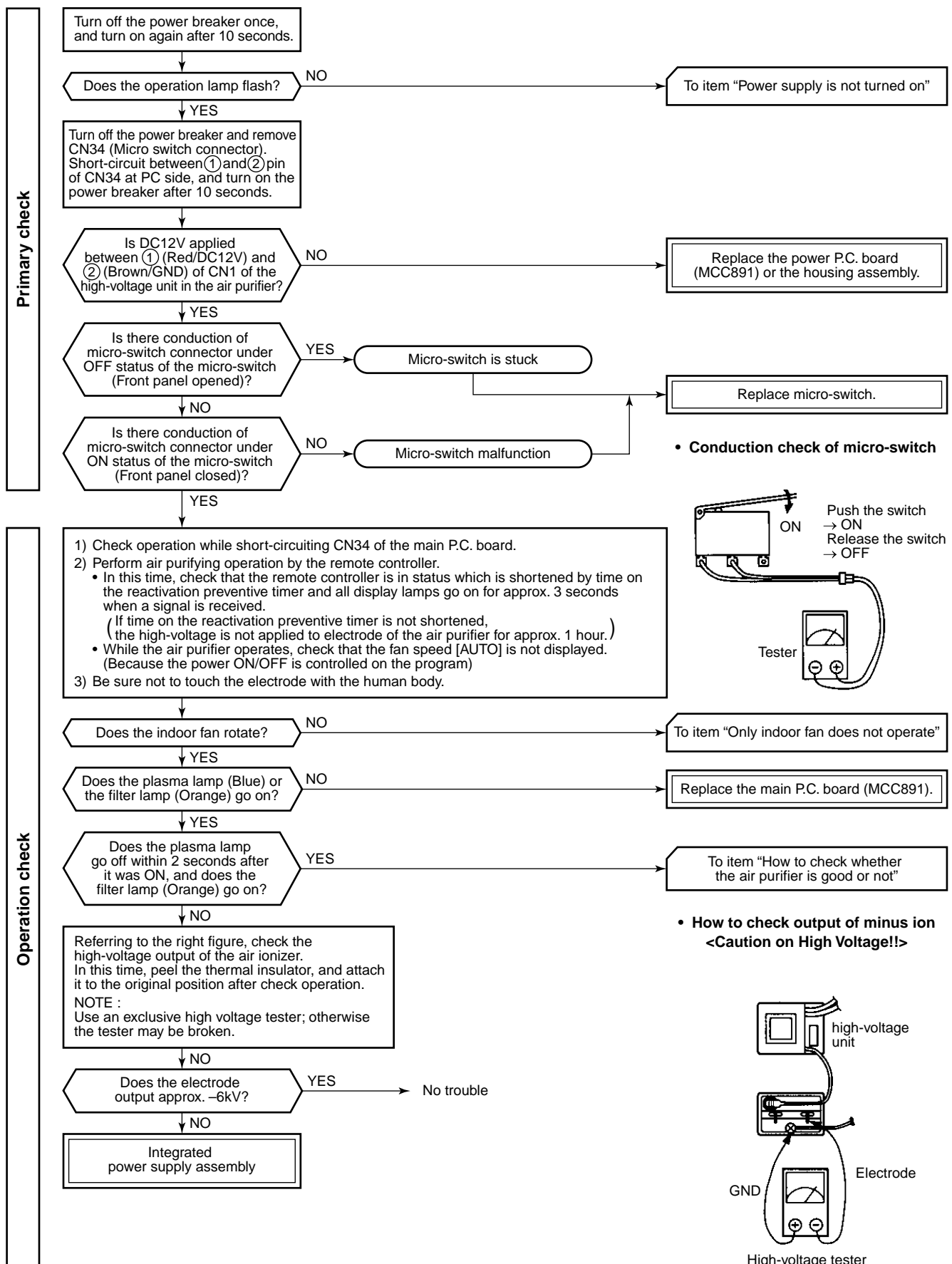


10-7. Troubleshooting

10-7-1. How to Check Whether the Air Purifier is Good or Not



10-7-2. How to Check Whether the Minus Ion Generator is Good or Not



10-8. How to Diagnose Trouble in Outdoor Unit

10-8-1. Summarized Inner Diagnosis of Inverter Assembly

Table 10-8-1

Diagnosis/Process flowchart	Item	Contents	Summary
<pre> graph TD A[Remove connector of compressor.] --> B{Check 25A fuse (Part No.F01).} B -- NG --> C[Replace fuse.] C --> D{{Check electrolytic capacitor, diode block (DB01), etc.}} B -- OK --> E{{Check terminal voltage of electrolytic capacitor.}} D -.-> E E -- NG --> F{{Check electrolytic capacitor, diode (DB01), etc.}} F -.-> E E -- OK --> G{Does outdoor fan rotate?} G -- YES --> A1((A)) G -- NO --> H{Does LED on control board flash or go on?} H -- YES --> C1((C)) H -- NO --> I{{Remove connector CN300 of outdoor fan motor, and using a tester, check resistance value between every phases at motor side.}} I -- NG --> J[Replace outdoor fan motor.] I -- OK --> B1((B)) </pre>	Preparation	Turn "OFF" the power supply breaker, and remove 3P connector which connects inverter and compressor.	<p>If fuse was blown, be sure to check the electrolytic capacitor and diode block. (DB01)</p> <ul style="list-style-type: none"> Connect discharge resistance (approx. 100Ω40W) or soldering iron (plug) between +, - terminals of the electrolytic capacitor (500μF) of C14 (with printed CAUTION HIGH VOLTAGE) on P.C. board. <p>Discharging position (Discharging period 10 seconds or more)</p> <p>OK if 500μF → DC280 to 380V</p> <p>Remove CN300 while pushing the part indicated by an arrow because CN01 is a connector with lock.</p> <p>→ Resistance between phases should be approx. 55 to 77Ω</p> <p>→ Should be 10MΩ or more.</p>
	Check	<ul style="list-style-type: none"> Check whether 25A fuse on the control board assembly is blown or not. (F01) 	
	Check		
	Operation	Turn on the power breaker, and operate the air conditioner in COOL mode by time shortening.	
	Measurement	Measure terminal voltage of the electrolytic capacity.	<p>500μF:400WV x 3</p> <p>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.</p> <ul style="list-style-type: none"> Is not winding between ①-②, ②-③, or ①-③ opened or short-circuited? Is not frame grounded with ①, ②, or ③?
	Check		
	Stop		
	Check Measurement		

Diagnosis/Process flowchart	Item	Contents	Summary
<pre> graph TD A((A)) --> R1[Replace control board assembly.] B((B)) --> C1{{Check fan motor position detect signal.}} C1 -- NG --> R2[Replace outdoor fan motor.] C1 -- OK --> R1 C((C)) --> C2{{Check winding of compressor.}} C2 -- NG --> R3[Replace compressor.] C2 -- OK --> R1 R1 --> C3{{Check compressor winding resistance.}} C3 -- OK --> R4[Replace control board.] C3 -- NG --> R5[Replace compressor.] </pre>	<p>Check</p> <p>Operation</p> <p>Check</p>	<p>Check winding resistance between phases of compressor, and resistance between outdoor frames by using a tester.</p> <ul style="list-style-type: none"> Is not grounded. Is not short-circuited between windings. Winding is not opened. <p>Remove connector CN300 of the outdoor fan motor, turn on the power supply breaker, and perform the operation. (Stops though activation is prompted.)</p> <p>Check operation within 2 minutes 20 seconds after activation stopped.</p> <p><Output check of fan motor position detect signal></p> <p>While connecting connector 5P (CN301) for position detection, using a tester, measure voltage between ① - ⑤. Between ⑤ - ④ : 5V</p>	<p>→ OK if 10MΩ or more</p> <p>→ OK if 0.51Ω → 0.57Ω (Check by a digital tester.)</p> <p>a) One or two of three voltages should be 5V, and others should be 0V. (When all are 0V or 5V, it is not accepted.)</p> <p>b) When rotating the fan slowly with hands, the voltage between pins should move from 0V to 5V. (Check it with an analog tester.)</p>

10-9. How to Check Simply the Main Parts

10-9-1. How to Check the P.C. Board (Indoor Unit)

(1) Operating precautions

- 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.

(2) Inspection procedures

- 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.

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

a. 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.

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

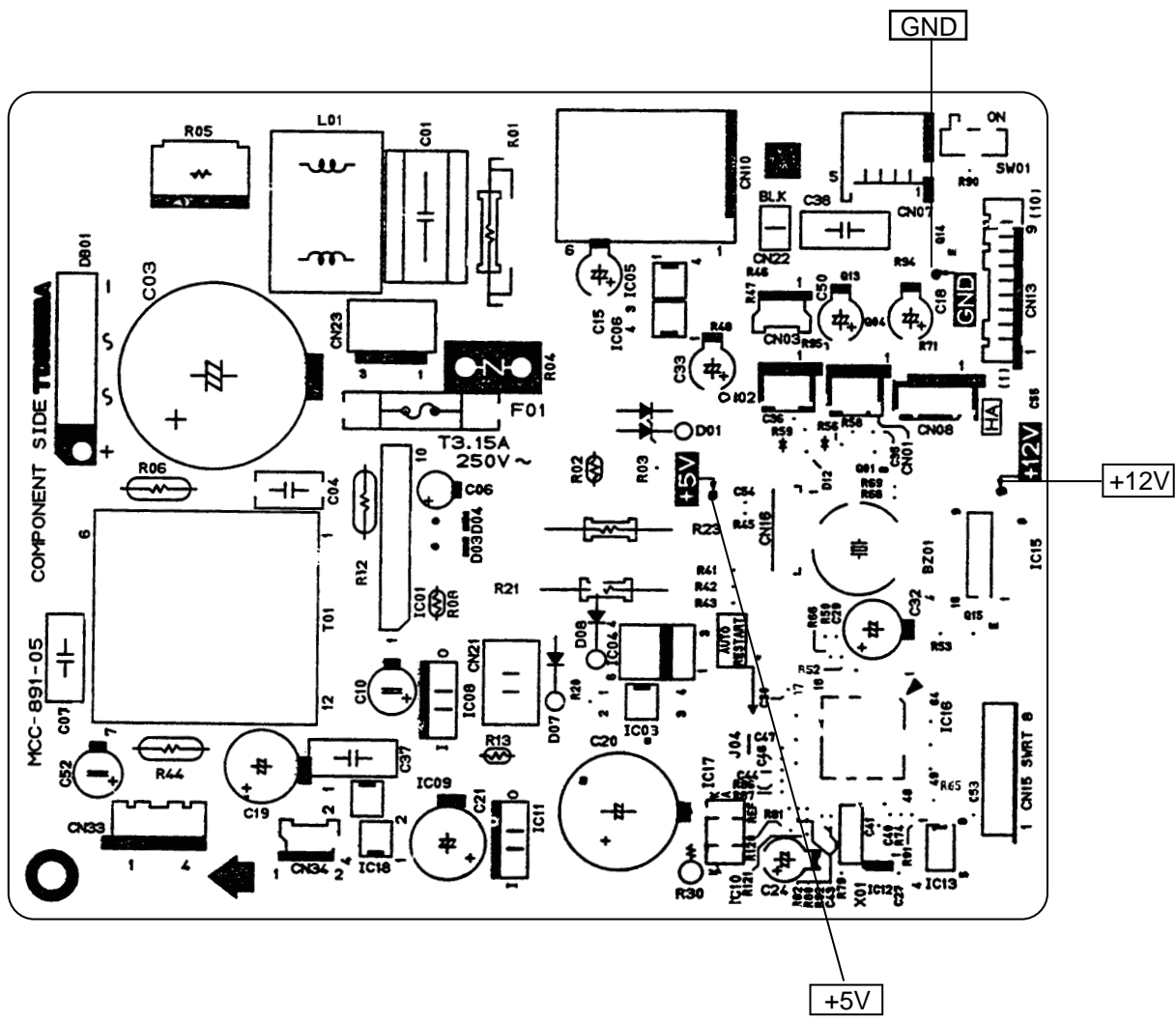
To check defect of the P.C. board, follow the procedure described below.

(3) Check procedures

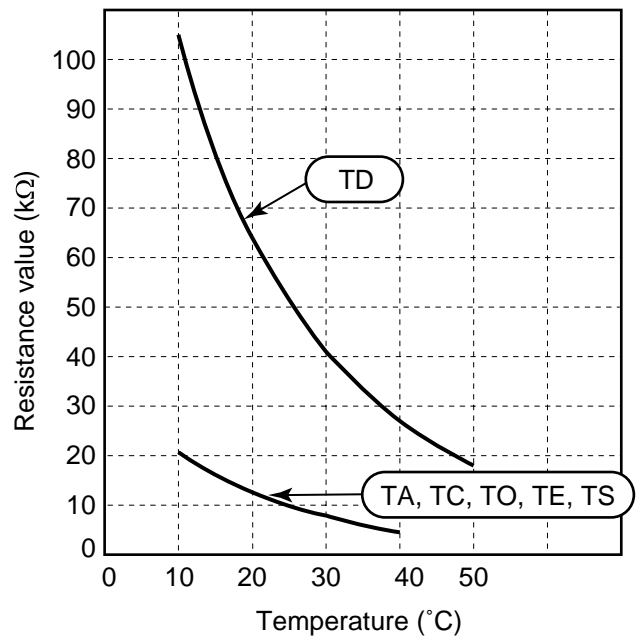
Table 10-9-1

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 lamp 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 CN23 (AC 220–240V) 2. Between ⊕ and ⊖ of C03 (DC 310–340V) 3. Between ⊖ of C10 and output side of IC08 (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 (R05), or the diode (DB01) is defective. 3. IC01, IC08 and T01 are defective. 4. IC01, IC08 and T01 are defective. 5. IC01, IC08, IC07 and T01 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 CN21 and No. 1 of CN23 (DC 15–60V)	IC03 and IC04 are defective.
4	Shorten the restart delay timer and start unit.	Check whether or not all lamps (OPERATION, TIMER, FILTER, Plasma) are indicated for 3 seconds and they return to normal 3 seconds later.	The lamps are defective or the housing assembly (CN13) 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 lamp 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.) (CN01) 3. The heat exchanger sensor and the P.C. board are defective. (Refer to Table 10-4-1.) 4. The main P.C. board is defective.
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 lamp flashes.	1. The temperature of the indoor heat exchanger is extremely high. 2. The connection of the heat exchanger sensor short-circuited. (CN01) 3. The heat exchanger sensor and the P.C. board are defective. (Refer to Table 10-4-1.) 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.

10-9-2. P.C. Board Layout

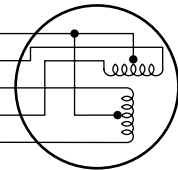


[1] Sensor characteristic table

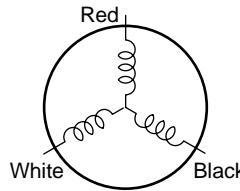
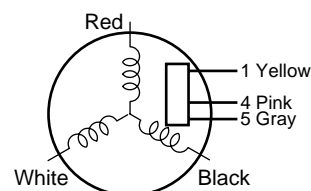


- TD : Discharge temp. sensor
- TA : Room temp. sensor
- TC : Heat exchanger temp. sensor
- TO : Outdoor temp. sensor
- TE : Outdoor heat exchanger temp. sensor
- TS : Suction temp. sensor

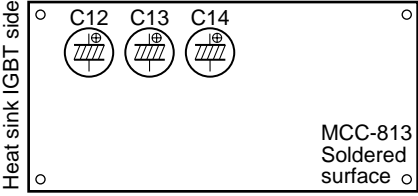
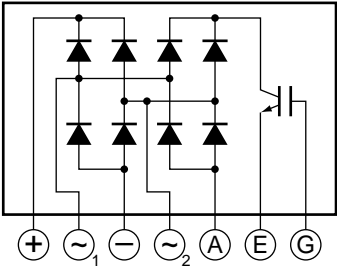
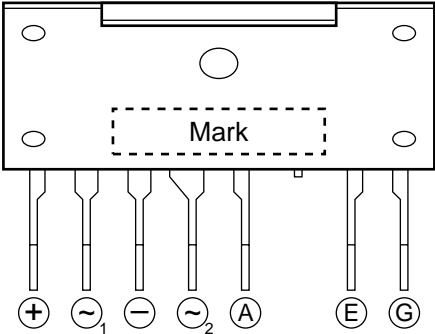
10-9-3. Indoor Unit (Other Parts)

No.	Part name	Checking procedure												
1	Room temp. (TA) sensor Heat exchanger (TC) sensor	<div>Disconnect the connector and measure the resistance value with tester. (Normal temp.)</div> <table><tr><th><div>Temperature</div><div>Sensor</div></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 (kΩ)</td><td>20.7</td><td>12.6</td><td>10.0</td><td>7.9</td><td>4.5</td></tr></table>	<div>Temperature</div> <div>Sensor</div>	10°C	20°C	25°C	30°C	40°C	TA, TC (kΩ)	20.7	12.6	10.0	7.9	4.5
<div>Temperature</div> <div>Sensor</div>	10°C	20°C	25°C	30°C	40°C									
TA, TC (kΩ)	20.7	12.6	10.0	7.9	4.5									
2	Remote controller	Refer to 10-5-1. (5).												
3	Louver motor MP24GA	<div>Measure the resistance value of each winding coil by using the tester. (Under normal temp. 25°C)</div> <div><div><div>White</div><div>Yellow</div><div>Yellow</div><div>Yellow</div><div>Yellow</div></div><div><div>①</div><div>②</div><div>③</div><div>④</div><div>⑤</div></div><div><div>①</div><div>②</div><div>③</div><div>④</div><div>⑤</div></div><div></div></div> <table><tr><th>Position</th><th>Resistance value</th></tr><tr><td>1 to 2</td><td rowspan="4">380 ± 40 Ω</td></tr><tr><td>1 to 3</td></tr><tr><td>1 to 4</td></tr><tr><td>1 to 5</td></tr></table>	Position	Resistance value	1 to 2	380 ± 40 Ω	1 to 3	1 to 4	1 to 5					
Position	Resistance value													
1 to 2	380 ± 40 Ω													
1 to 3														
1 to 4														
1 to 5														
4	Indoor fan motor	Refer to 10-5-1. (3) and (4).												

10-9-4. Outdoor Unit

No.	Part name	Checking procedure												
1	Compressor (Model : DA91A1F-45F)	<div>Measure the resistance value of each winding by using the tester.</div> <div></div> <div><table><tr><th>Position</th><th>Resistance value</th></tr><tr><td>Red - White</td><td rowspan="3">0.51 to 0.57 Ω</td></tr><tr><td>White - Black</td></tr><tr><td>Black - Red</td></tr></table><div>Under 20°C</div></div>	Position	Resistance value	Red - White	0.51 to 0.57 Ω	White - Black	Black - Red						
Position	Resistance value													
Red - White	0.51 to 0.57 Ω													
White - Black														
Black - Red														
2	Outdoor fan motor (Model : ICF-140-43-1)	<div>Measure the resistance value of winding by using the tester.</div> <div></div> <div><table><tr><th>Position</th><th>Resistance value</th></tr><tr><td>Yellow- Pink</td><td>5 to 20 kΩ</td></tr></table><div>For details, refer to Section 10-9.</div></div>	Position	Resistance value	Yellow- Pink	5 to 20 kΩ								
Position	Resistance value													
Yellow- Pink	5 to 20 kΩ													
3	Compressor thermo. Bimetal type (Model : US-622KXTMQO-SS)	Check conduction by using the tester.												
4	Outdoor temperature sensor (TO), discharge temperature sensor (TD), suction temperature sensor (TS), outdoor heat exchanger temperature sensor (TE)	<div>Disconnect the connector, and measure resistance value with the tester. (Normal temperature)</div> <table><tr><th><div>Temperature</div><div>Sensor</div></th><th>10°C</th><th>20°C</th><th>30°C</th><th>40°C</th><th>50°C</th></tr><tr><td>TD (kΩ)</td><td>105</td><td>64</td><td>41</td><td>27</td><td>18</td></tr></table> <div>TO, TS, TE : Refer to the TA, TC characteristic table in Indoor. (Refer to 10-8-3, No. 1)</div>	<div>Temperature</div> <div>Sensor</div>	10°C	20°C	30°C	40°C	50°C	TD (kΩ)	105	64	41	27	18
<div>Temperature</div> <div>Sensor</div>	10°C	20°C	30°C	40°C	50°C									
TD (kΩ)	105	64	41	27	18									

10-9-5. Checking Method for Each Part

No.	Part name	Checking procedure																																
1	Electrolytic capacitor (For boost, smoothing)	<div>1. Turn OFF the power supply breaker.</div> <div>2. Discharge all three capacitors completely.</div> <div>3. Check that safety valve at the bottom of capacitor is not broken.</div> <div>4. Check that vessel is not swollen or exploded.</div> <div>5. Check that electrolytic liquid does not blow off.</div> <div>6. Check that the normal charging characteristics are shown in continuity test by the tester.</div> <div><div><div>Heat sink IGBT side</div><div></div></div><div><div>Case that product is good</div><div>Pointer swings once, and returns slowly. When performing test once again under another polarity, the pointer should return.</div></div><div>C12, C13, C14 → 500μF/400V</div></div>																																
2	Converter module	<div>1. Turn OFF the power supply breaker.</div> <div>2. Discharge all three capacitors completely.</div> <div>3. Check that the normal rectification characteristics are shown in continuity test by the tester.</div> <div><div></div><div></div><div><div>Diode check</div><table><tr><th colspan="2">Tester rod</th><th rowspan="2">Resistance value in good product</th></tr><tr><th>+</th><th>-</th></tr><tr><td>~1</td><td>-</td><td rowspan="6">50kΩ or more (0Ω in trouble)</td></tr><tr><td>~2</td><td>-</td></tr><tr><td>+</td><td>~1</td></tr><tr><td>+</td><td>~2</td></tr><tr><td>E</td><td>~1</td></tr><tr><td>E</td><td>~2</td></tr></table></div><div><div>IGBT check</div><table><tr><th colspan="2">Tester rod</th><th rowspan="2">Resistance value in good product</th></tr><tr><th>+</th><th>-</th></tr><tr><td>~2</td><td>E</td><td rowspan="4">50kΩ or more (0Ω in trouble)</td></tr><tr><td>G</td><td>E</td></tr><tr><td>~1</td><td>A</td></tr><tr><td>~2</td><td>A</td></tr></table></div></div>	Tester rod		Resistance value in good product	+	-	~1	-	50kΩ or more (0Ω in trouble)	~2	-	+	~1	+	~2	E	~1	E	~2	Tester rod		Resistance value in good product	+	-	~2	E	50kΩ or more (0Ω in trouble)	G	E	~1	A	~2	A
Tester rod		Resistance value in good product																																
+	-																																	
~1	-	50kΩ or more (0Ω in trouble)																																
~2	-																																	
+	~1																																	
+	~2																																	
E	~1																																	
E	~2																																	
Tester rod		Resistance value in good product																																
+	-																																	
~2	E	50kΩ or more (0Ω in trouble)																																
G	E																																	
~1	A																																	
~2	A																																	

10-10. How to Simply Judge Whether Outdoor Fan Motor is Good or Bad

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.

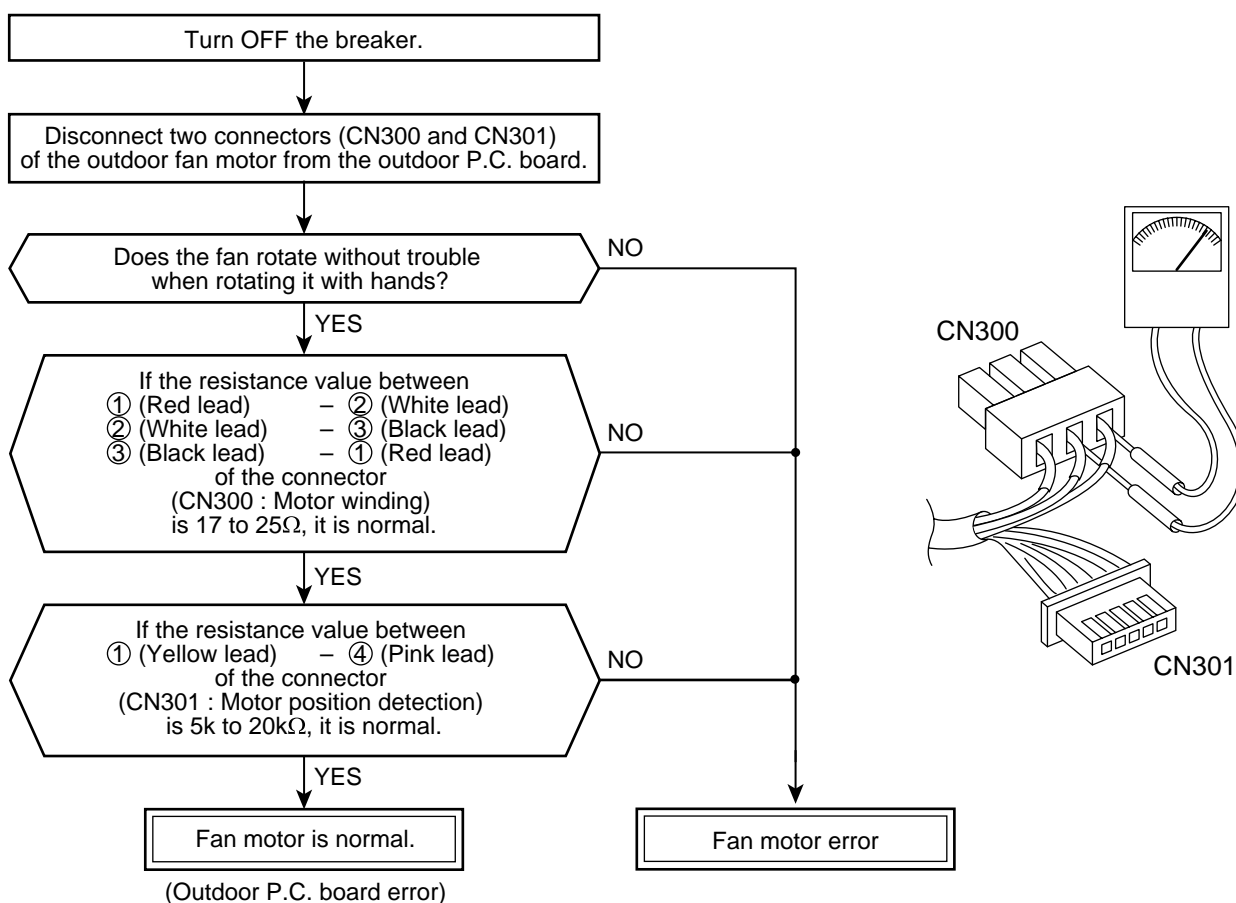
Remote controller check code "02 : Outdoor block, 1A : Outdoor fan drive system error"

2. Cause

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

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

3. How to simply judge whether outdoor fan motor is good or bad



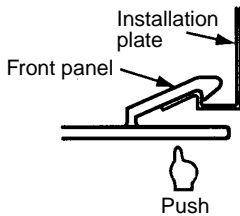
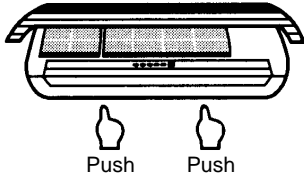
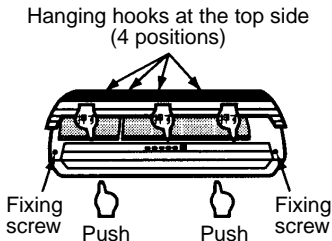
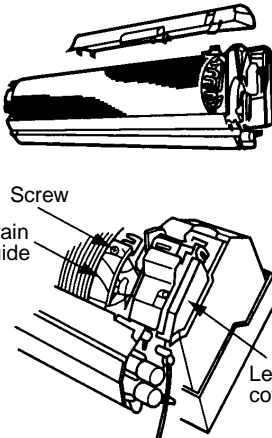
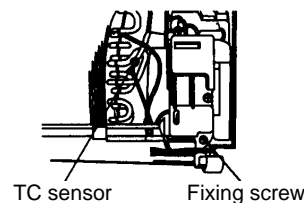

NOTE :

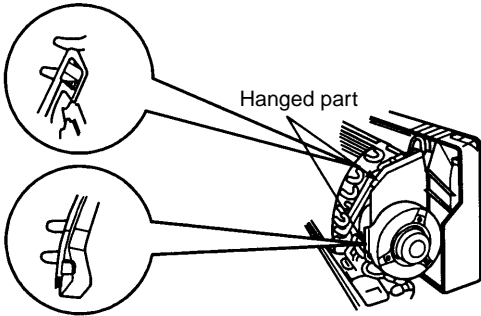
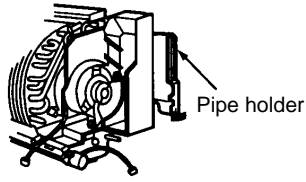
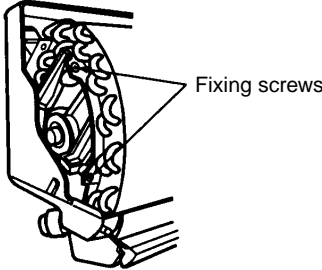
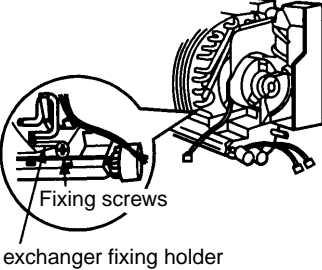
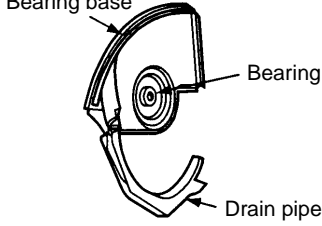
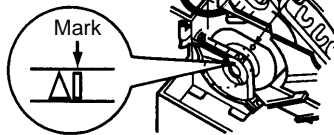
However, GND circuit error inside of the motor may be accepted in some cases when the above check is performed.

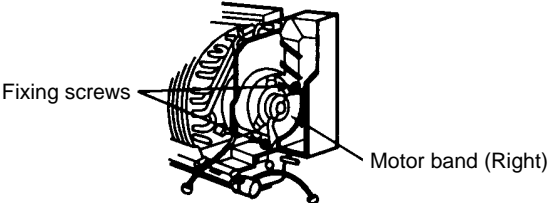
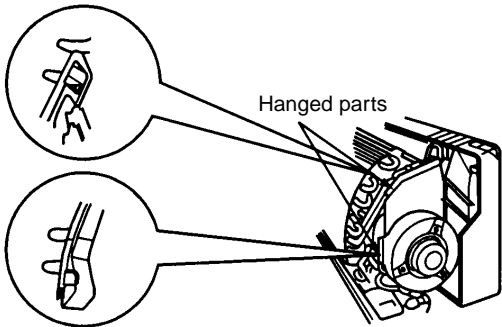
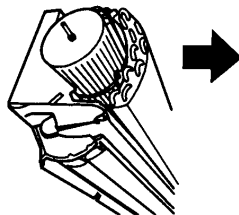
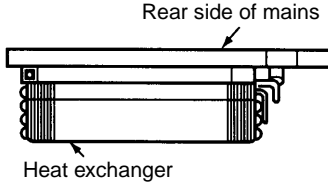
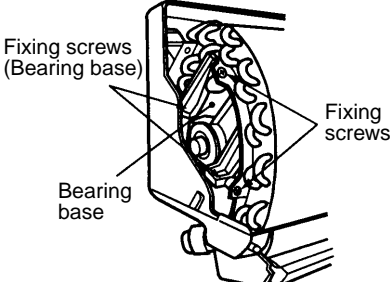
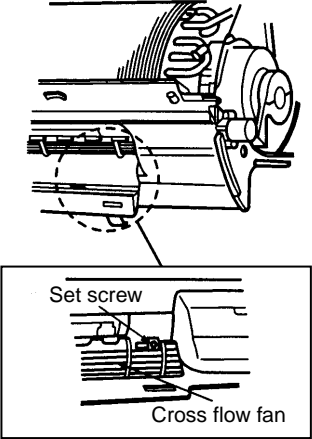
When the fan motor does not become normal even if P.C. board is replaced, replace the outdoor fan motor.

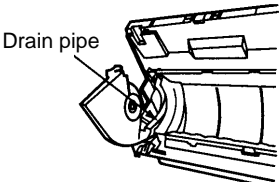
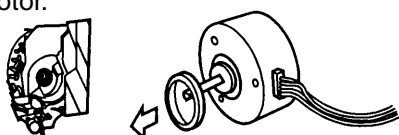
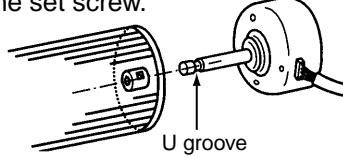
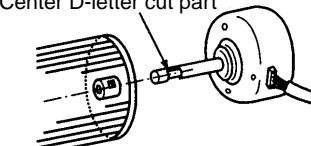


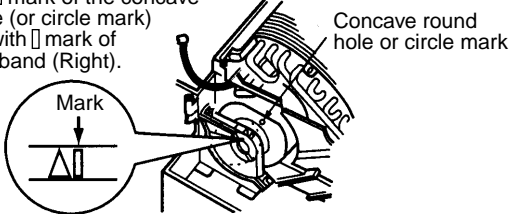
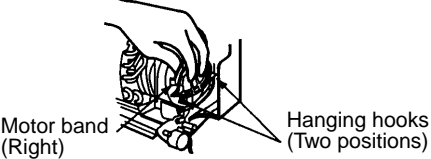
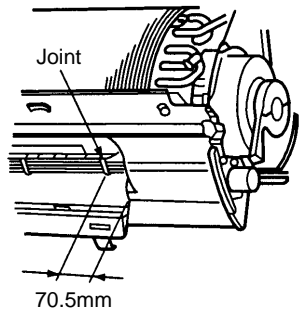
11. HOW TO REPLACE THE MAIN PARTS

11-1. Indoor Unit

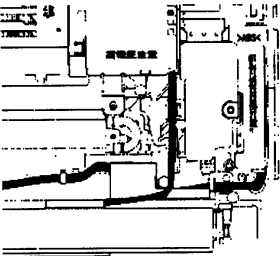
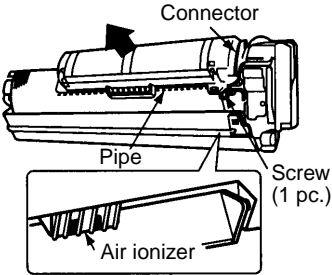
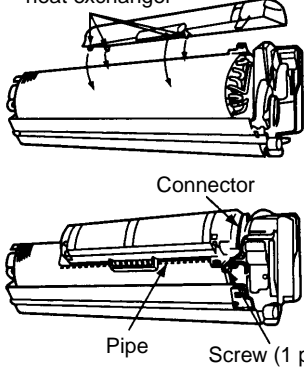
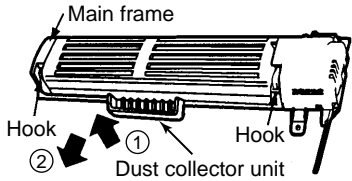
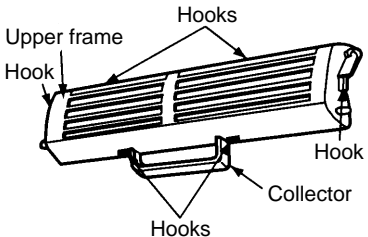
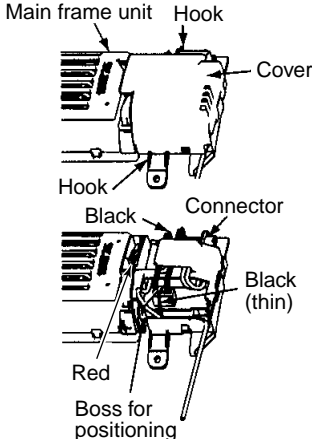
No.	Part name	Procedures	Remarks
①	Front panel	<ol style="list-style-type: none"> 1) Stop operation of the air conditioner and turn off its main power supply. 2) Push "PUSH" part under the front panel and remove hooks of the front panel from the installation plate. 3) Remove the front panel fixing screws (2 pcs.) while opening the air inlet grille. 4) Push the electric parts box with the right thumb while pulling the both sides of the front panel toward you. <p><How to assemble the front panel></p> <ol style="list-style-type: none"> 1) Push three center positions and two lower center positions of the air outlet, and then hang the hanging hooks (4 pcs.) at the top side of the front panel to the rear plate. 2) Tighten two screws. <ul style="list-style-type: none"> • Incomplete hanging or incomplete pushing may cause a dewdrops or generation of a fluttering sound. 	  
②	Electric parts box assembly	<ol style="list-style-type: none"> 1) Follow to the procedure in the item ①. 2) Remove the drain guide. 3) Remove the electric dust collector. (*) 4) Remove screw of earth lead attached to the end plate of the heat exchanger. 5) Remove the lead wire cover, and remove connector (5P) for the fan motor and connector (5P) for the louver motor from the microcomputer assembly. 6) Remove a fixing screw of the electric parts base and draw out it toward you. 7) Pull out TC sensor from sensor holder of the heat exchanger. 8) As shown in the right figure, treat the lead wire surely after replacement of the parts. (Otherwise, water leak is caused.) <p>* For removal/mounting of the electric dust collector, follow to the item ①, How to replace the electric dust collector.</p>	 
③	Horizontal louver	<ol style="list-style-type: none"> 1) Remove shaft of the horizontal louver from the rear plate. (First remove the left shaft, and then remove other shafts while sliding the horizontal louver leftward.) 	

No.	Part name	Procedures	Remarks
④	Heat exchanger	<ol style="list-style-type: none"> 1) Follow to the procedure in the item ②. 2) Remove the pipe holder from the rear side of the main unit. 3) Remove two fixing screws at the left side of the end plate of the heat exchanger. 4) Remove the fixing screw at the lower right side of the heat exchanger. 5) Remove right side of the end plate from two fixing ribs while sliding slightly the heat exchanger rightward. 	  
⑤	Bearing	<ol style="list-style-type: none"> 1) Follow to the procedure in the items ① and ⑦-4), and remove the bearing from the bearing base. <p><Caution at assembling> If the bearing is out from the housing, push it into the specified position and then incorporate it in the main body.</p>	
⑥	Fan motor	<ol style="list-style-type: none"> 1) Follow to the procedure in the item ②. 2) Loosen the set screw of the cross flow fan. 3) Remove two fixing screws of the motor band (Right), and then remove the motor band (Right). 4) Pull the fan motor outward. 	<p>In assembling work, install the fan motor as follows.</p> <p>Arrange □ mark of the concave round hole (or circle mark) correctly with □ mark of the motor band (Right).</p> 

No.	Part name	Procedures	Remarks
⑦	Cross flow fan	<ol style="list-style-type: none"> 1) Stop operation of the air conditioner and turn off its main power supply. 2) Follow to the procedure in the item ②. 3) Remove two fixing screws at the left side of the end plate of the heat exchanger, and remove two fixing screws of the bearing base. 4) Lift up slightly the left side of the heat exchanger to remove the bearing base. 5) Loosen the set screw of the cross flow fan. 6) Remove two fixing screws of the motor band (Right) to remove the motor band (Right).  <ol style="list-style-type: none"> 7) Slide the fan motor outward to remove it. 8) Remove the fixing screws at the lower right side of the heat exchanger. 9) Remove the heat exchanger from two hanged parts of the motor band (Left) while sliding it rightward.  <ol style="list-style-type: none"> 10) Lift up the left side of the heat exchanger toward you to remove the cross flow fan. 	 <p>Top view of the set (Without panel)</p>  

No.	Part name	Procedures	Remarks
⑦	Cross flow fan	<p>• Caution at reassembly</p> <p>a) At assembling work of the bearing base, check that the drain pipe is surely incorporated in the rear plate. (Otherwise, water leak is caused.)</p>  <p>b) To incorporate the fan motor, remove the fan motor rubber (at shaft core side), incorporate the motor into the position in the following figure, and then install the fan motor.</p>  <ul style="list-style-type: none"> • Install the cross flow fan so that the right end of the 1st joint from the right of the cross flow fan is set keeping 70.5mm from wall of rear plate of the main unit. • Holding the set screw, install the cross flow fan so that U-groove of the fan motor comes to the mounting hole of the set screw.  <ul style="list-style-type: none"> • Install the fan motor for service work so that the center D-letter cut part comes to the set screw mounting hole position.  <p>• Perform positioning of the fan motor as follows:</p> <p>Arrange  mark of the concave round hole (or circle mark) correctly with  mark of the motor band (Right).</p>  <p>c) For incorporation of the motor band (Right), follow to the above procedure b), incorporate two hanging hooks of the motor band (Right) into the main unit, and then follow to the reverse procedure in 7).</p> 	

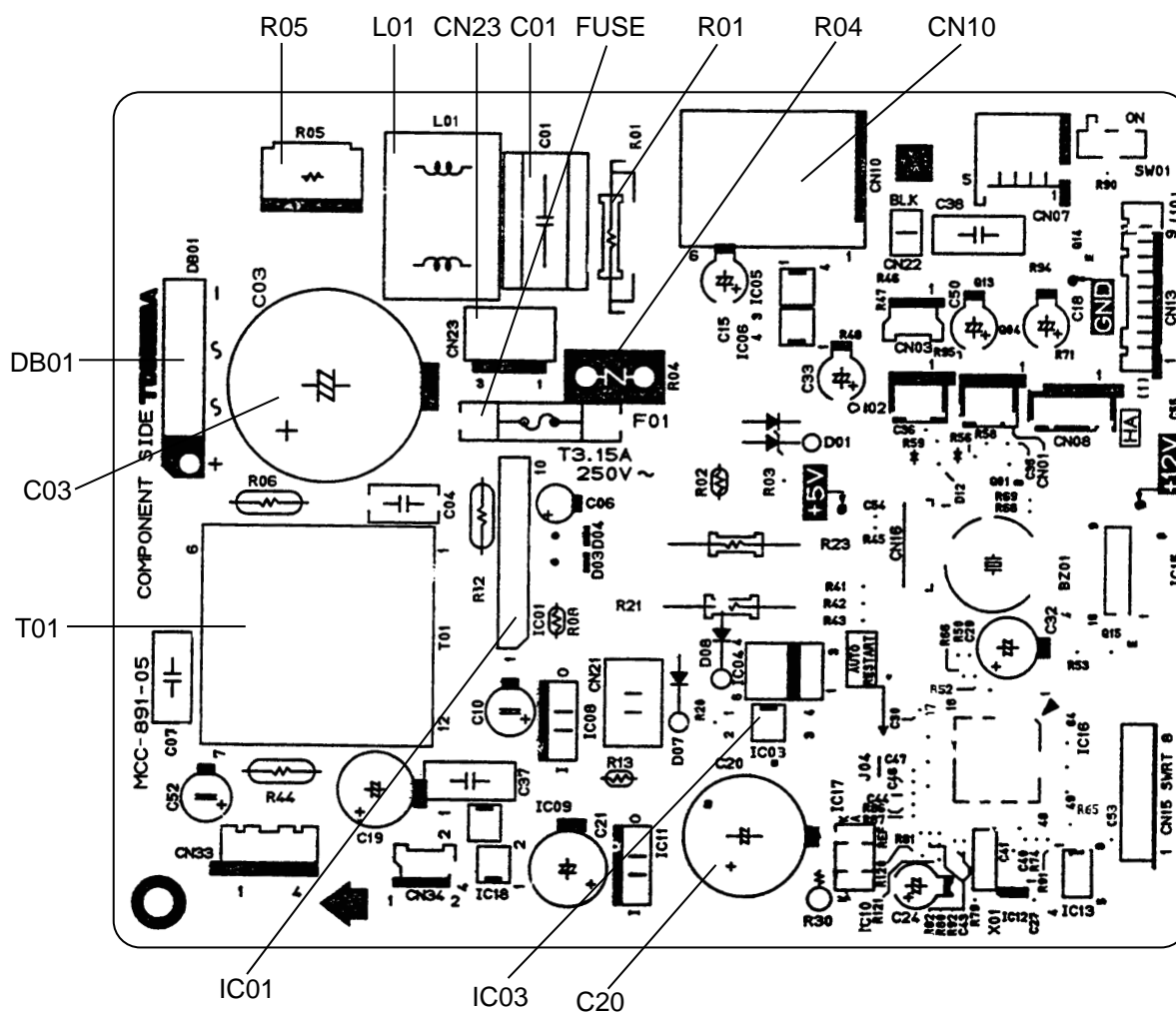
11-2. How to Replace the Parts of Electric Dust Collector (Be sure to pull off the power plug before work.)

No.	Part name	Procedures	Remarks
①	Electric dust collector	<ol style="list-style-type: none"> 1) Remove the front panel. (① Front panel) 2) Remove a fixing screw and a connector. 3) Remove the air ionizer. 4) Remove the electric dust collector vertically to the heat exchanger. <p><Caution at installation></p> <ol style="list-style-type: none"> 1) Arrange screw hole on the end plate correctly to screw hole on the electric dust collector, insert the fixing hooks at the rear side of the dust collector into the heat exchanger, and then fix it with a screw. 2) Install the air ionizer. 3) Perform wiring of the lead wire as follows: 	 <p>Connector Pipe Screw (1 pc.) Air ionizer</p> <p>Fixing hooks for heat exchanger</p>  <p>Connector Pipe Screw (1 pc.)</p>
②	Main frame unit	<ol style="list-style-type: none"> 1) Follow to the procedure in item ①. 2) Remove the dust collecting unit. (Lift up it once, and then draw out it.) 	 <p>Main frame Hook ② ① Dust collector unit Hook</p>
③	Upper frame collector	<ol style="list-style-type: none"> 1) Remove the dust collecting unit. 2) Remove the fixing hooks at 6 positions, and separate the unit into upper frame and collector. 	 <p>Upper frame Hook Hooks Collector Hooks</p>
④	High-voltage unit	<ol style="list-style-type: none"> 1) Follow to the procedure in item ①. 2) Remove two fixing hooks at upper and lower sides of the cover to remove the cover. 3) Remove thick red and black Faston lead wires and the connector attached to the main frame. 4) Remove the earth cover at the rear side of the electric dust collector, and then remove the thin black Faston wire. 5) As shown in the right figure, widen outward the rib at the right side of the main frame and remove the hooks of the high-voltage unit to remove the high-voltage unit. <p><Caution at installation></p> <ol style="list-style-type: none"> 1) Perform cabling as shown in the right figure. 	 <p>Main frame unit Hook Cover Hook Black Connector Black (thin) Red Boss for positioning</p>

11-3. Microcomputer

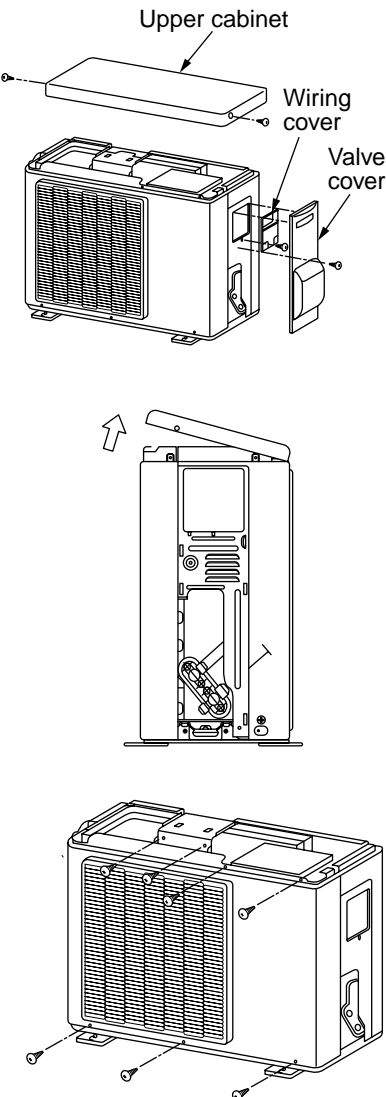
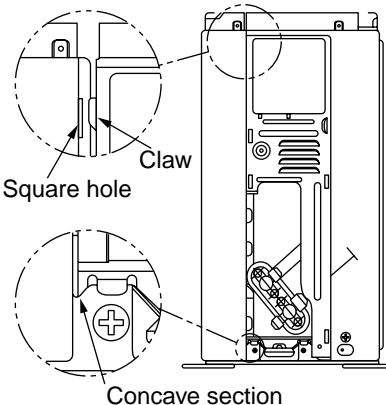
No.	Part name	Procedure	Remarks
①	Common procedure	1) Turn the power supply off to stop the operation of air-conditioner. 2) Remove the front panel. • Remove the 2 fixing screws. 3) Remove the electrical part base.	Replace terminal block, microcomputer ass'y and the P.C. board ass'y.

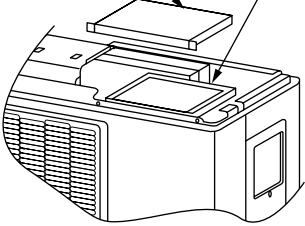
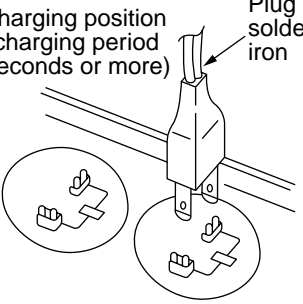
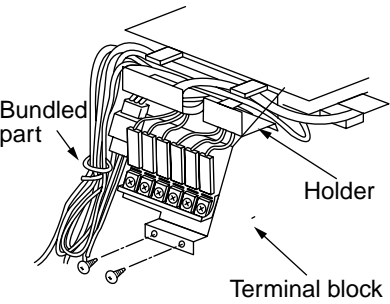
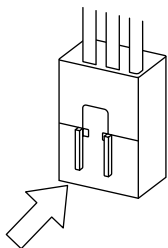
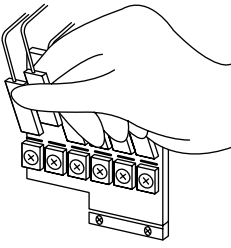
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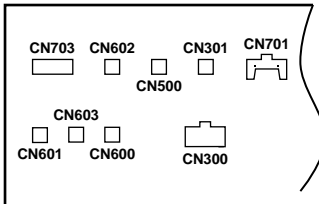
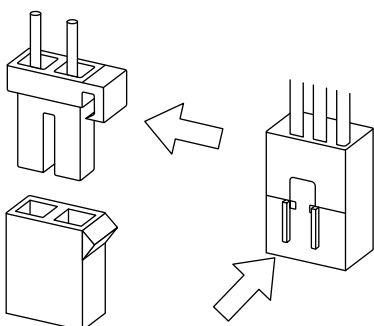
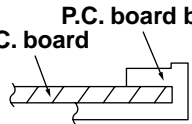
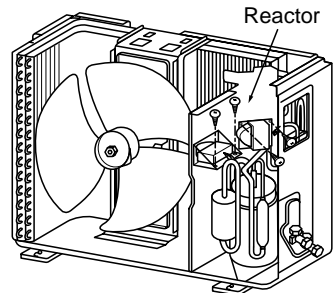


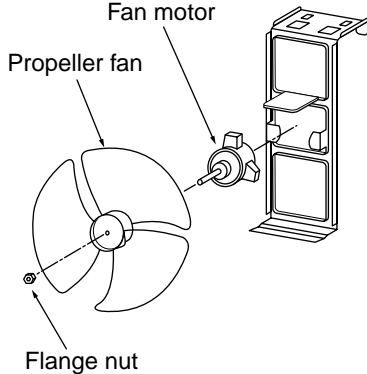
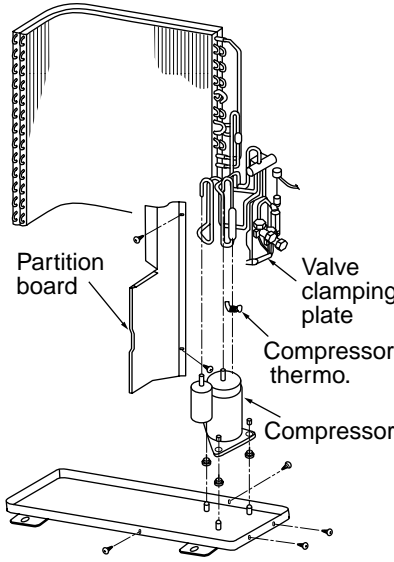
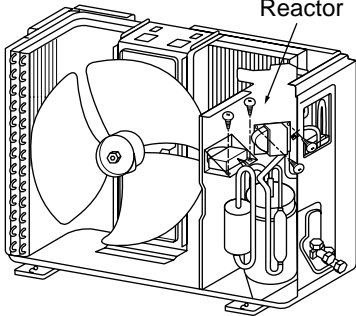
11-4. Outdoor Unit

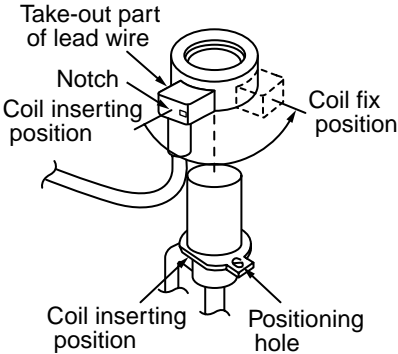
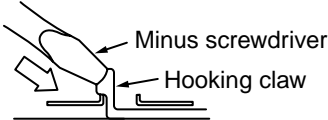
Table-11-4-1

No.	Part name	Procedure	Remarks
①	Common procedure	<p>1. Detachment</p> <ol style="list-style-type: none"> 1) Stop operation of the air conditioner, and turn off the main switch of the breaker for air conditioner. 2) Remove the valve cover. (ST1TØ4 x 10ℓ 1 pc.) <ul style="list-style-type: none"> • After removing screw, remove the valve cover pulling it downward. 3) Remove wiring cover (ST1TØ4 x 10ℓ 2 pcs.), and then remove connecting cable. 4) Remove the upper cabinet. (ST1TØ4 x 10ℓ 2 pcs.) <ul style="list-style-type: none"> • After removing screws, remove the upper cabinet pulling it upward. <p>2. Attachment</p> <ol style="list-style-type: none"> 1) Attach the upper cabinet. (ST1TØ4 x 10ℓ 2 pcs.) <ul style="list-style-type: none"> • Hook the rear side of the upper cabinet to claw of the rear cabinet, and then put it on the front cabinet. 2) Perform cabling of connecting cable, and attach the wiring cover. <ul style="list-style-type: none"> • Insert the upper part into the upper cabinet, insert claw which has been hooked to the lower part into the square hole, and then fix it with screw. (ST1TØ4 x 10ℓ 1 pc.) 3) Attach the valve cover. (ST1TØ4 x 10ℓ 1 pc.) <ul style="list-style-type: none"> • Insert the upper part to the upper cabinet, set hook claw of the valve cover to square holes (at three positions) of the main unit, and attach it pushing upward. 	 <p>The diagrams illustrate the common procedure for the outdoor unit. The top diagram shows the detachment of the upper cabinet and valve cover. The middle diagram shows the attachment of the upper cabinet. The bottom diagram shows the attachment of the valve cover.</p>
②	Front cabinet	<p>1. Detachment</p> <ol style="list-style-type: none"> 1) Perform work of item 1 of ①. 2) Remove screws (ST1TØ4 x 10ℓ 2 pcs.) of the front cabinet and inverter cover and screws (ST1TØ4 x 10ℓ 5 pcs.) of the front cabinet. <ul style="list-style-type: none"> • The left side of the front is made to insert to the rear cabinet, so remove it pulling upward. <p>2. Attachment</p> <ol style="list-style-type: none"> 1) Insert claw at the left side of the front into the rear cabinet. 2) Hook the lower part at the right side of the front to concave part of the bottom plate. Insert claw of the rear cabinet into square hole of the front cabinet. 3) Attach the removed screws to the original positions. 	 <p>The diagrams illustrate the front cabinet procedure. The top diagram shows the detachment of the front cabinet. The bottom diagram shows the attachment of the front cabinet, highlighting the claw and square hole.</p>

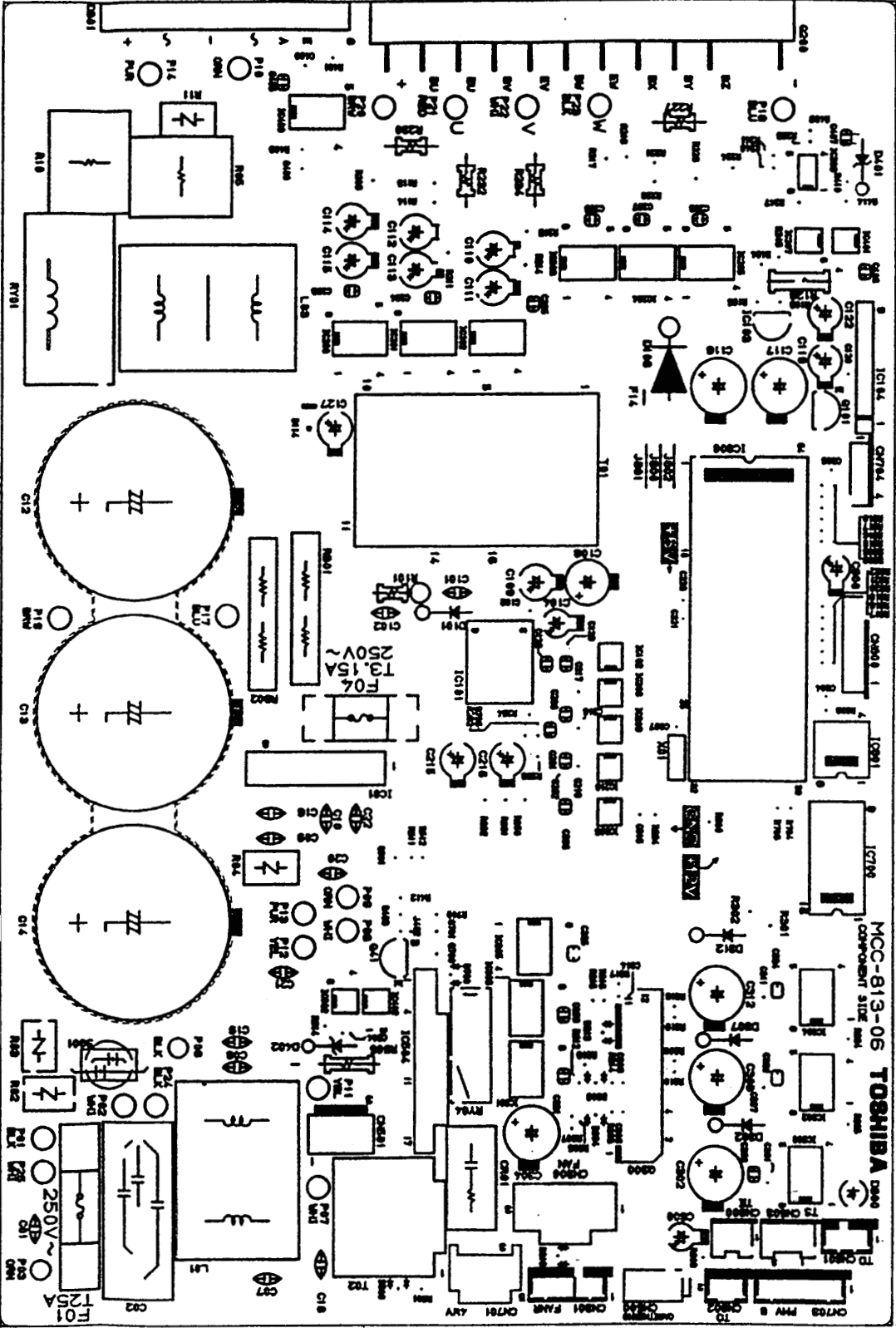
No.	Part name	Procedure	Remarks
③	Inverter assembly	<p>1. Detachment</p> <ol style="list-style-type: none"> 1) Perform work of item 1 of ①. 2) Remove screw (ST1TØ4 x 10ℓ 2 pcs.) of the upper part of the front cabinet. <ul style="list-style-type: none"> • If removing the inverter cover in this condition, P.C. board can be checked. • If there is no space in the upper part of the upper cabinet, perform work of ②. <div data-bbox="411 539 1003 622" style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>Be careful to check the inverter because high-voltage circuit is incorporated in it.</p> </div> <ol style="list-style-type: none"> 3) Perform discharging by connecting ⊕, ⊖ polarity by discharging resistance (approx. 100Ω40W) or plug of soldering iron to ⊕, ⊖ terminals of the C14 (printed "CAUTION HIGH VOLTAGE" is attached.) electrolytic capacitor (500μF) on P.C. board. <div data-bbox="411 835 1003 985" style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>Be careful to discharge the capacitor because the electrolytic capacitor cannot naturally discharge and voltage remains according to trouble type in some cases.</p> </div> <div data-bbox="411 1025 1003 1211" style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>NOTE : This capacitor is one with mass capacity. Therefore, it is dangerous that a large spark generates if short-circuiting between ⊕, ⊖ polarity with screwdriver, etc. for discharging.</p> </div> 4) Remove screw (ST1TØ4 x 10ℓ 2 pcs.) fixing the main body and the inverter box. 5) Remove various lead wires from the holder at upper part of the inverter box and wiring holder at right side of the terminal block. 6) Remove the lead wire from the bundled part at left side of the terminal block. 7) Pull the inverter box upward. 8) Disconnect connectors of various lead wires. <div data-bbox="411 1579 1003 1729" style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>Requirement : As each connector has a lock mechanism, avoid to remove the connector by holding the lead wire, but by holding the connector.</p> </div>	<p>Inverter cover P.C. board (Soldered surface)</p>  <p>Discharging position (Discharging period 10 seconds or more) Plug of soldering iron</p>  <p>Bundled part Holder Terminal block</p>  <p>The connector is one with lock, so remove it while pushing the part indicated by an arrow.</p>   <p>Be sure to remove the connector by holding the connector, not by pulling the lead wire.</p>

No.	Part name	Procedure	Remarks
④	Control board assembly	<p>1) Disconnect lead wires and connectors connected from the control board assembly to other parts.</p> <p>1. Lead wires Lead wires Lead wires Lead wires</p> <ul style="list-style-type: none"> • Connection with terminal block : 3 wires (Black, White, Orange) • Connection with compressor : Remove the connector (3P). • Connection with reactor : Remove the relay connectors from P07, 08 (2P, White) and P12, 13 (2P, Yellow). <p>2. Connectors</p> <p>CN300 : Outdoor fan (3P, White) CN301 : Outdoor fan position detection (5P, White) CN701 : 4-way valve (3P, Yellow) CN600 : TE sensor (2P, White) CN601 : TD sensor (3P, White) CN603 : TS sensor (3P, White) CN602 : TO sensor (2P, White) CN500 : Case thermo. (2P, White) CN703 : Pulse modulating valve (6P, White)</p> <p>2) Remove the control board assembly from P.C. board base.</p> <p>1. Main control board assembly side</p> <ul style="list-style-type: none"> • Remove two claws of P.C. board base, and remove upward the heat sink with hands. • Remove three screws fixing the heat sink and main control board assembly side, and replace the board with a new one. 	 <p>CN300, CN301 and CN701, etc. at the control board assembly side are connectors with locks. Therefore, remove the connector while pushing the part indicated by an arrow.</p>  <p>P.C. board base P.C. board</p>  <p>When mounting a new board, check that the board is correctly set in the groove of base holder of P.C. board base.</p>
⑤	Rear cabinet	<p>1) Perform work of item 1 of ①, and ②, ③.</p> <p>2) Remove fixed screws fixing to the bottom plate. (ST1TØ4 x 10ℓ 3 pcs.)</p> <p>3) Remove fixed screws fixing to the heat exchanger. (ST1TØ4 x 10ℓ 1 pc.)</p> <p>4) Remove fixed screw fixing to the valve mounting plate. (ST1TØ4 x 10ℓ 1 pc.)</p>	 <p>Reactor</p>

No.	Part name	Procedure	Remarks
⑥	Fan motor	<ol style="list-style-type: none"> 1) Perform work of item 1 of ① and ②. 2) Remove the flange nut fixing the fan motor and the propeller. <ul style="list-style-type: none"> • Flange nut is loosened by turning clockwise. (To tighten the flange nut, turn counterclockwise.) 3) Remove the propeller fan. 4) Disconnect the connector for fan motor from the inverter. 5) Remove the fixing screws (3 pcs.) holding by hands so that the fan motor does not fall. 	
⑦	Compressor	<ol style="list-style-type: none"> 1) Perform work of item 1 of ① and ②, ③, ④, ⑤. 2) Extract refrigerant gas. 3) Remove the partition board. (ST1TØ4 x 10ℓ 3 pcs.) 4) Remove the sound-insulation material. 5) Remove terminal cover of the compressor, and disconnect lead wire of the compressor thermo. and the compressor from the terminal. 6) Remove pipe connected to the compressor with a burner. 7) Remove the fixing screw of the bottom plate and heat exchanger. (ST1TØ4 x 10ℓ 1 pc.) 8) Remove the fixing screw of the bottom plate and valve clamping plate. (ST1TØ4 x 10ℓ 2 pcs.) 9) Pull upward the refrigeration cycle. 10) Remove nut fixing the compressor to the bottom plate. 	
⑧	Reactor	<ol style="list-style-type: none"> 1) Perform work of item 1 of ①, and ③. 2) Remove lead wires clung in holder on the partition board. 3) Remove screws fixing the reactor. (ST1TØ4 x 10ℓ 4 pcs.) 	

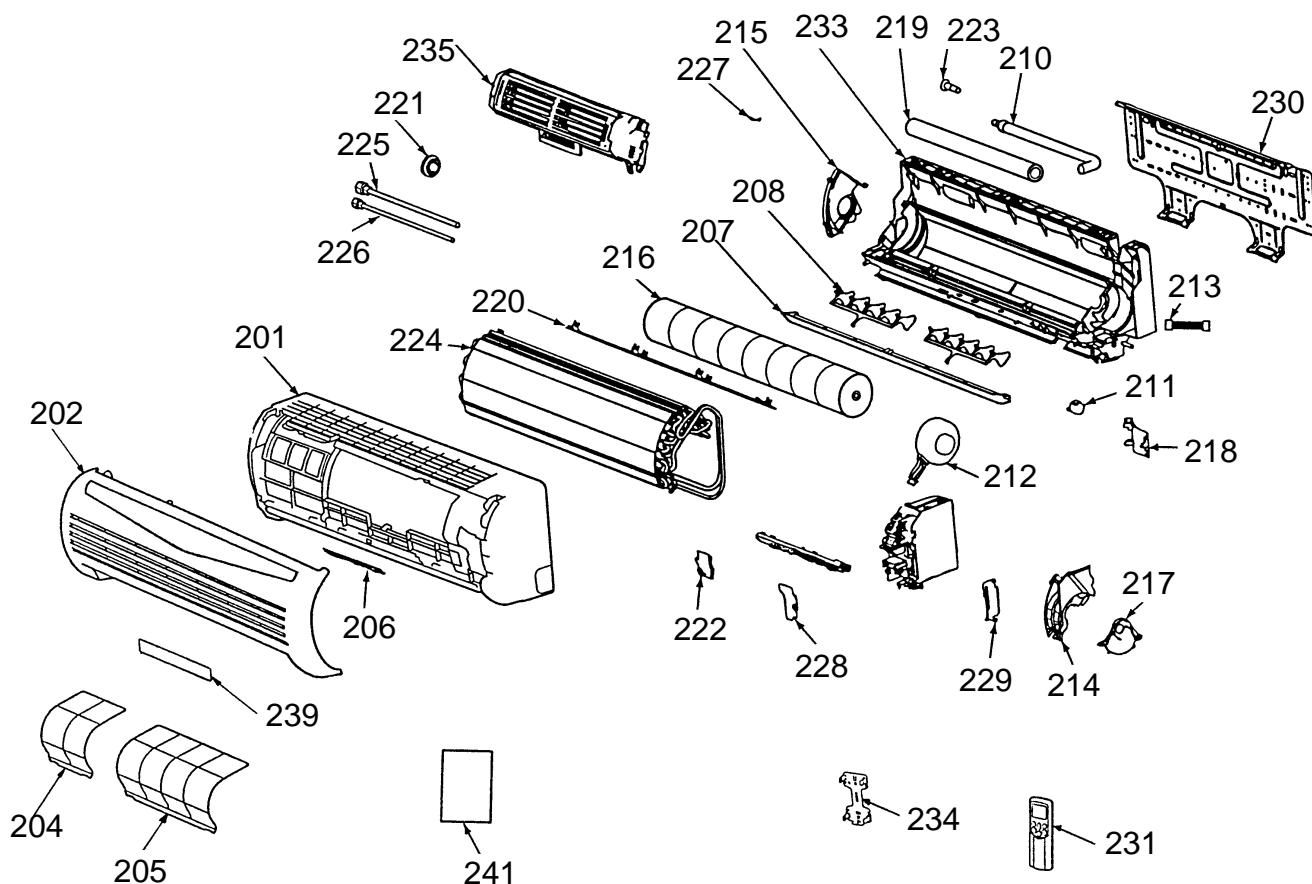
No.	Part name	Procedure	Remarks
⑨	Pulse modulating valve coil	<p>1. Detachment</p> <ol style="list-style-type: none"> 1) Perform work of item 1 of ①, and ②, ③, ⑤. 2) Turn the coil clockwise (counterclockwise) by 90 degrees, and remove coil from the pulse modulating valve. <p>2. Attachment</p> <ol style="list-style-type: none"> 1) Set take-out part of the lead wire of coil to the coil inserting position of the pulse modulating valve, and attach the coil. 2) Turn the coil by 90 degrees, set surely the concave part at lower part of the coil to the positioning hole of the pulse modulating valve, and then fix the coil. 	
⑩	Fan guard	<p>1. Detachment</p> <ol style="list-style-type: none"> 1) Perform work of item 1 of ①, and ②. 2) Remove the front cabinet, and put it down so that fan guard side directs downward. <div data-bbox="413 1184 997 1270" style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>Perform work on a corrugated cardboard, cloth, etc. to prevent flaw to the product.</p> </div> <ol style="list-style-type: none"> 3) Remove the hooking claws by pushing minus screwdriver according to the arrow mark in the right figure, and remove the fan guard. <p>2. Attachment</p> <ol style="list-style-type: none"> 1) Insert claw of the fan guard in the hole of the front cabinet. Push the hooking claws (10 positions) by hands and fix the claws. <div data-bbox="413 1576 997 1697" style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>All the attaching works have completed. Check that all the hooking claws are fixed to the specified positions.</p> </div>	

No.	Part name	Procedure	Remarks																												
⑪	<p>Replacement of temperature sensor for servicing only</p> <p>Common service parts of sensor TO, TS, TE, TD</p>	<ol style="list-style-type: none"> 1) Cut the sensor 100 mm longer than old one. 2) Cut the protective tube after pulling out it (200 mm). 3) Move the protective tube toward the thermal sensor side and tear the tip of lead wire in two then strip the covering part. 4) Pass the stripped part through the thermal constringent tube. 5) Cut the old sensor 100 mm length on the connector side, and recycle that connector. 6) Tear the lead wire in two on the connector side and strip the covering part. 7) Twist the leads on the connector and sensor sides, and solder them. 8) Move the thermal constringent tubes toward the soldered parts and heat them with the dryer and constring them. 9) Wind the attached color tape round the both terminals of the protective tube when colored protective tube is used. 10) Fix the sensor again. <p>NOTES :</p> <ol style="list-style-type: none"> 1) Store the joint part of the sensor and the connector in the electric parts box. 2) Never joint them near the thermal sensor part. Otherwise it would cause insulation inferiority because of dew drops. 3) When replacing the sensor using the colored protective tube, wind the color tape matching the color of that tube. 	<p>The diagram illustrates the replacement procedure for a temperature sensor. It shows the thermal sensor part, connector, and protective tube. Key steps include cutting the sensor 100mm longer, cutting the protective tube 200mm, moving the tube to the sensor side, tearing the lead wire, passing it through the thermal constringent tube, cutting the old sensor, tearing the lead wire on the connector side, twisting and soldering the leads, moving the thermal constringent tubes toward the soldered parts and heating them with a dryer, and finally winding color tape around the terminals of the protective tube.</p>																												
	<p>These are parts for servicing sensors.</p> <p>Please check that the accessories shown in the right table are packed.</p>	<table border="1"> <thead> <tr> <th></th><th>Parts name</th><th>Q'ty</th><th>Remarks</th></tr> </thead> <tbody> <tr> <td>1</td><td>Sensor</td><td>1</td><td>Length : 3m</td></tr> <tr> <td>2</td><td>Sensor Spring (A)</td><td>1</td><td>For spare</td></tr> <tr> <td>3</td><td>Sensor Spring (B)</td><td>1</td><td>For spare</td></tr> <tr> <td>4</td><td>Thermal constringent tube</td><td>3</td><td>Including one spare</td></tr> <tr> <td>5</td><td>Color tape</td><td>1</td><td>9 colors</td></tr> <tr> <td>6</td><td>Terminal</td><td>3</td><td></td></tr> </tbody> </table>		Parts name	Q'ty	Remarks	1	Sensor	1	Length : 3m	2	Sensor Spring (A)	1	For spare	3	Sensor Spring (B)	1	For spare	4	Thermal constringent tube	3	Including one spare	5	Color tape	1	9 colors	6	Terminal	3		
	Parts name	Q'ty	Remarks																												
1	Sensor	1	Length : 3m																												
2	Sensor Spring (A)	1	For spare																												
3	Sensor Spring (B)	1	For spare																												
4	Thermal constringent tube	3	Including one spare																												
5	Color tape	1	9 colors																												
6	Terminal	3																													



12. EXPLODED VIEWS AND PARTS LIST

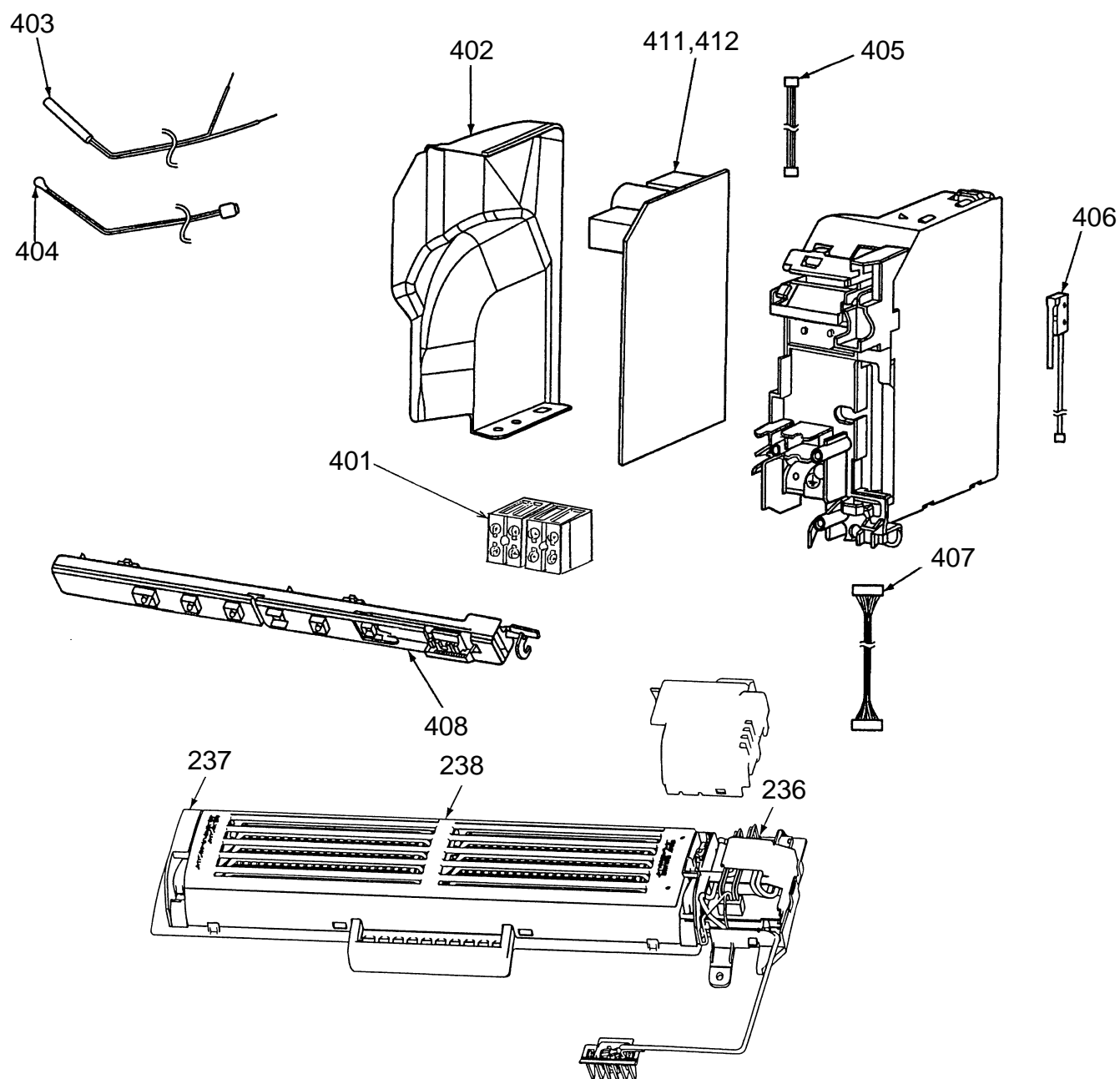
12-1. Indoor Unit (1)



Location No.	Part	Description
201	43005516	Panel Ass'y, Front
202	43005547	Grille, Air Inlet
204	43080447	Filter, Air
205	43080446	Filter, Air
206	43063333	Panel, LED
207	43009630	Louver, Horizontal
208	43009649	Louver, Vertical
210	43070140	Hose, Drain, Plastic
211	4302C029	Motor, Louver
212	4302C038	Motor, Fan
213	4306A024	Cord, Motor, Louver
214	43039363	Band, Motor, Left
215	43039321	Base, Bearing
216	43020315	Fan, Cross Flow
217	43039314	Band, Motor
218	4301V028	Holder, Pipe
219	43049698	Pipe, Shield
220	43039324	Guide, Drain
221	43020253	Bearing, Rubber

Location No.	Part	Description
222	43049728	Guide, Drain, Left
223	43079268	Cap, drain
224	43044741	Evaporator
225	43047332	Pipe, Suction, 9.5DIA
226	43047331	Pipe, Delivery, 6.4DIA
227	43019904	Holder, Sensor, SUS
228	43067108	Cover, Terminal
229	43062247	Cover, Read
230	43082275	Plate, Installation
231	4306S402	Remote Controller (10,13JKVP-E)
233	43003280	Body, Ass'y Back
234	43083071	Holder, Remote, Controller
235	43080486	Electrical Air Purifying Filter
236	4306S404	Generator, HV
237	43080473	Unit, Frame, Main
238	43080461	Unit, Ass'y, EP
239	43001609	Plate, Display (10,13JKVP-E)
241	4308N505	Owner's Manual

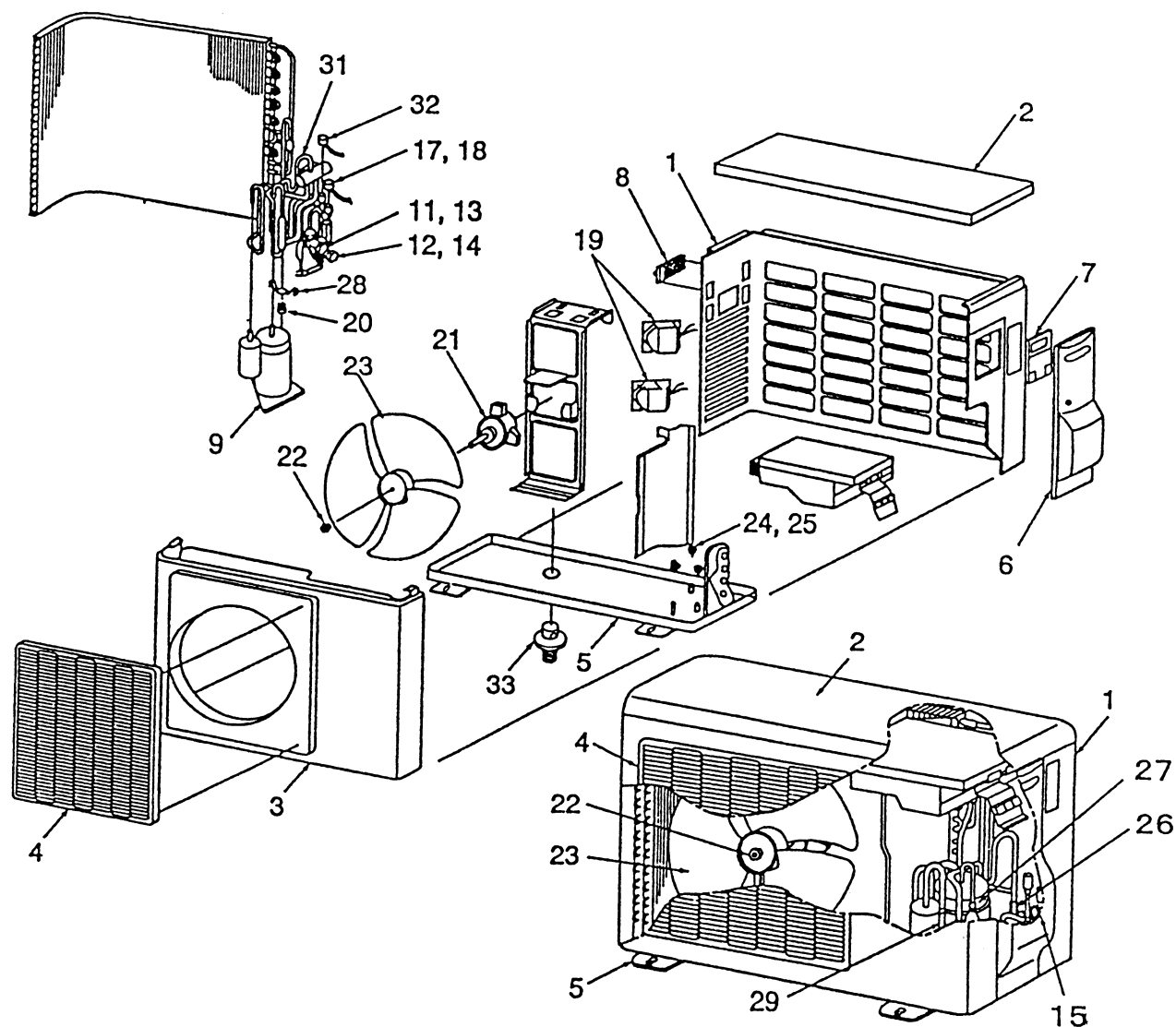
Indoor Unit (2)



Location No.	Part	Description
401	4306A080	Terminal Block, 2P, AC300V, 20A
402	43062189	Cover, E-Parts
403	43050382	Sensor, TC (F6)
404	43050400	Sensor, TA
405	4306A091	Housing, PU1, 4P
406	43051343	SW-Micro Ass'y

Location No.	Part	Description
407	4306A092	Housing, LED, 9P
408	4306S405	P.C. board Ass'y, WRS-LED, MCC-900
411	4306S382	P.C. board Ass'y, MCC-891 (10JKVP-E)
412	4306S383	P.C. board Ass'y, MCC-891 (13JKVP-E)

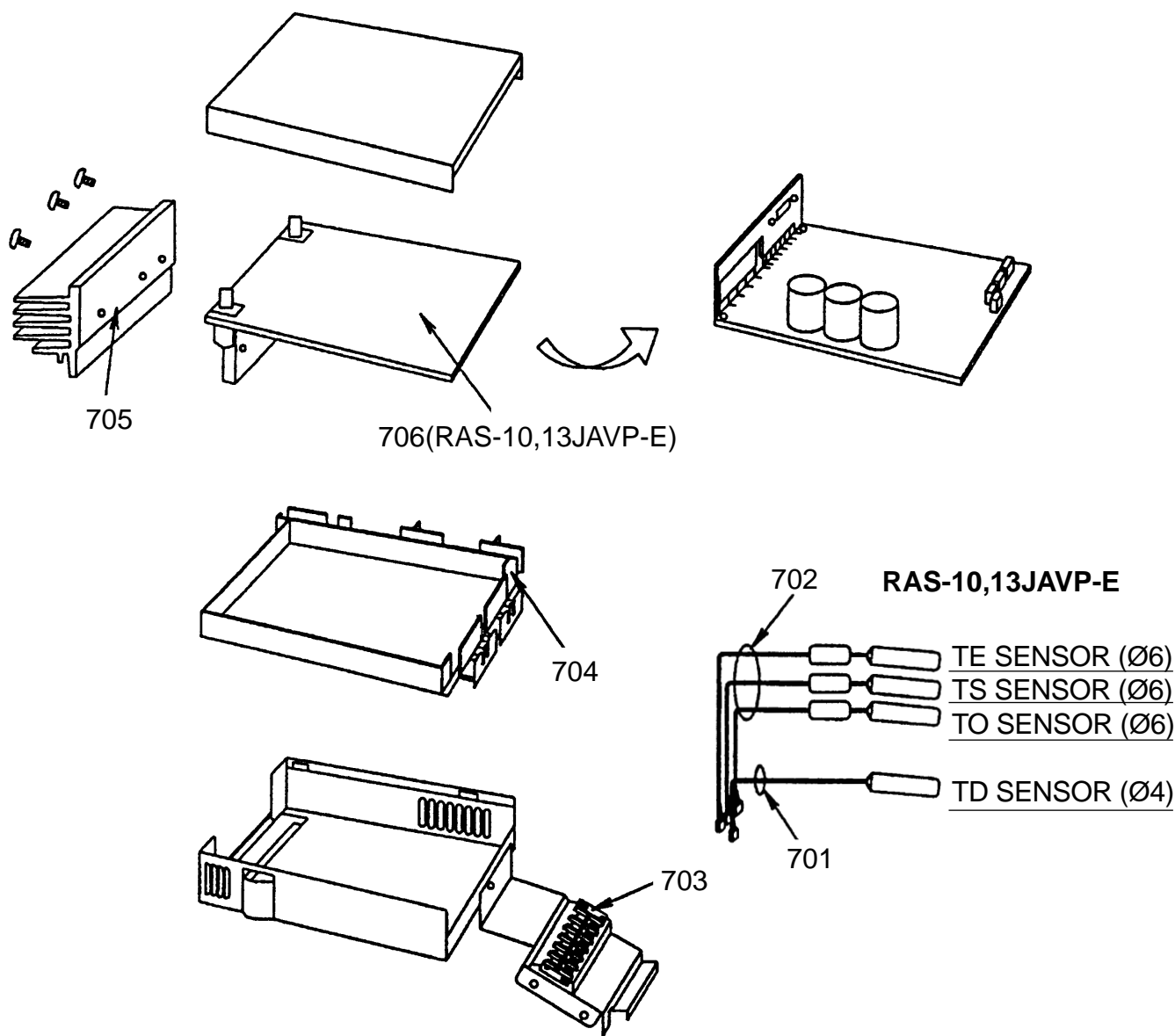
12-2. Outdoor Unit



Location No.	Part	Description
1	43005368	Cabinet, Back, Ass'y
2	43005369	Cabinet, Upper, Ass'y
3	43005370	Cabinet, Front, Ass'y
4	4301V030	Guard, Fan (10,13JAVP-E)
5	43042461	Base, Ass'y
6	4301V012	Cover, Valve, Packed
7	43062230	Cover, Wiring, Ass'y
8	43019903	Hanger
9	43041612	Compressor, DA91A1F-45F
11	43046392	Valve, Packed, 6.35
12	43046391	Valve, Packed, 9.52
13	43147196	Bonnet, 1/4 IN, 6.4CU
14	43047401	Bonnet, 3/8 IN, 9.52CU
15	43047491	Tube, Capillary, I.D 1.5
17	43046422	Valve, Pulse, Modulating
18	36746552	Coil, PMV

Location No.	Part	Description
19	43055521	Reactor, CH-57
20	43050298	Thermostat, Bimetal, CS-7 125
21	4302C033	Motor, Fan, ICF-140-43-1
22	43047667	Nut, Flange
23	43020322	Fan, Propeller
24	43097204	Nut
25	43049643	Cushion, Rubber
26	43063320	Holder, Sensor, 6-8, 9.52
27	43063321	Holder, Sensor, 4-8, 9.52
28	43063195	Holder, Thermostat, Bimetal
29	43063322	Holder, Sensor
31	43046344	Valve, 4 Way, CHV-0213 (10,13JAVP-E)
32	43046348	Coil, Solenoid, VHV-01AI501A1 (10,13JAVP-E)
33	43032441	Nipple, Drain (10,13JAVP-E)

12-3. P.C. Board Layout



Location No.	Part	Description
701	43050334	Sensor, TD (F4)
702	43050382	Sensor, TC (F6)
703	43160469	Terminal Block, 6P, AC250V, 20A

Location No.	Part	Description
704	43062228	Base, P.C. board, ABS
705	43063324	Heatsink, Aluminum
706	4306S380	P.C. board Ass'y, MCC813, (10,13JAVP-E)

Cord Heater Installation Work

Applicable Models: RAS-10JAVP-E, RAS-13JAVP-E

1. Required parts for installation work (Recommendation)

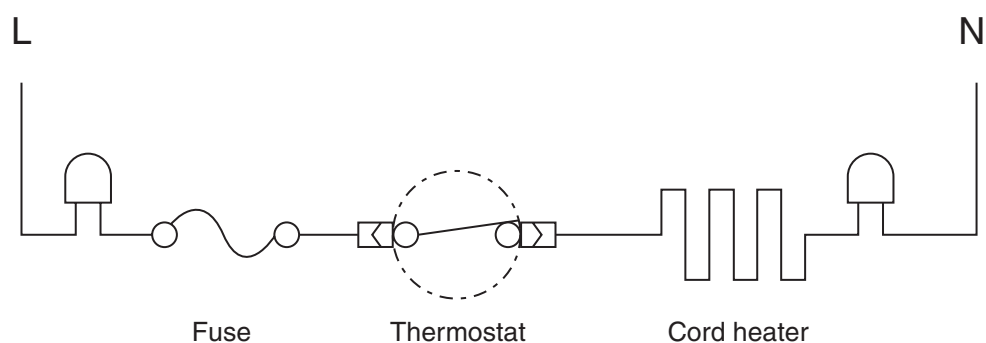
No.	Part name	Q'ty	Specifications/Vendor	Remarks
1	Cord heater	1	Drain line heaters CSC2 (1.5m, 40W/m) by Flexelec com. (Please go to the following URL.) http://www.flexelec.com	Procured locally
2	Thermostat	1	US-622AXRLQE by ASAHI KEIKI Operating temperature: on $4 \pm 4^{\circ}\text{C}$, off $15 \pm 3^{\circ}\text{C}$ A thermostat holder is incorporated with a thermostat in the package. (Please go to the following URL.) http://www.asahiikeiki.co.jp/product/product.html On self-responsibility, you can use a product manufactured by other company (For example, Texas Instruments) if its characteristics are equivalent to those of ASAHI KEIKI. However, when the shape of the thermostat holder is different from that of ASAHI KEIKI, apply some treatment to No.13 thermostat fixing plate and then fix the holder.	Procured locally
3	Fuse	1	ES3-5000, 250V / 5A by NAGASAWA Electric Co. (Please go to the following URL.) http://www.nagasawa-el.co.jp/ On self-responsibility, you can use a product manufactured by other company if its characteristics are equivalent to those of NAGASAWA Electric Co.	Procured locally
4	Fuse holder	1	GM1H-02 by NAGASAWA Electric Co. (Please go to the following URL.) http://www.nagasawa-el.co.jp/ On self-responsibility, you can use a product manufactured by other company if its characteristics are equivalent to those of NAGASAWA Electric Co.	Procured locally
5	P-shape clamp	16	Use heat-resistance, weatherproof and non-hydrolytic type. Material: 4-fluorinated ethylene copolymer Harness diameter: $\varnothing 7.5$ Use equivalence with the above specifications. 15 pieces are used to fix the cord heater to the outdoor unit base. One piece is used to fix the power cords to the thermostat fixing plate.	Procured locally
6	Screw	15	Self-tapping screw type-B $\varnothing 4 \times 6\text{mm}$, truss head, stainless These screws are used to fix the cord heater to the outdoor unit base with P-shape clamp.	Procured locally
7	Screw	3	Self-tapping screw type-B $\varnothing 4 \times 8\text{mm}$, truss head, stainless Two screws are used to fix the thermostat fixing plate to the back cabinet. One screw is used to fix the power cord to the thermostat fixing plate.	Procured locally
8	Screw	2	Self-tapping screw type-B $\varnothing 3.5 \times 8\text{mm}$, pan head These screws are used to fix the thermostat to the thermostat fixing plate with the thermostat holder.	Procured locally
9	Faston	2	#250 They are used for the connecting part to the thermostat.	Procured locally
10	Sleeve for Faston	2	UL sleeve for #250	Procured locally
11	Close-end connector	2	Use the most appropriate connector with the power cord diameter.	Procured locally
12	Power cord	1	2-cores x 0.75mm^2 or more, H05RN-F	Procured locally
13	Thermostat fixing plate	1	Material: SGCC-Z08, Board thickness: 0.8t	Procured locally (Drawing attached)

NOTE: The parts on the above table are recommended parts.

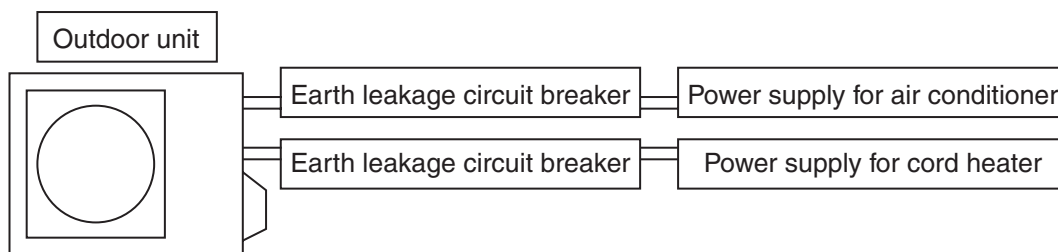
2. Required tools for installation work

No.	Part name	Specifications	Usage
1	Plus screwdriver		It is used for disassembling and assembling of each cabinet.
2	Wrench		It is used for disassembling and assembling of compressor fixing nuts.
3	Motor drill	Drill diameter: Ø3.2 and Ø5.0	It is used to make the additional holes on the base or the back cabinet.
4	Faston crimping tool	Fixing jig for #250	
5	Close-end connector crimping tool		
6	Cutting plier		
7	Stripper		
8	Cutter knife		
9	Insulation tape		

3. Cord heater installation wiring diagram



* Be sure to connect the fuse and the thermostat to LIVE side of the cord heater.



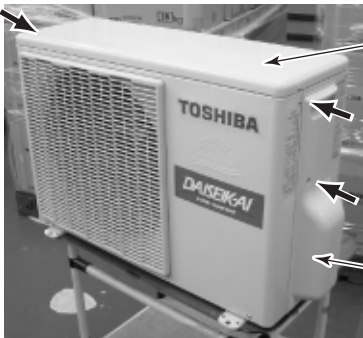
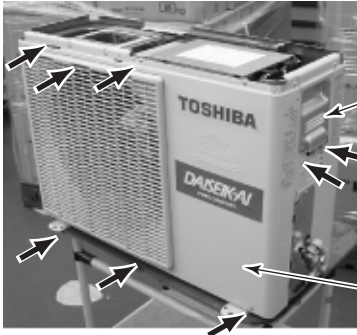
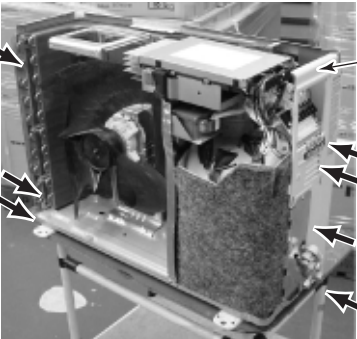
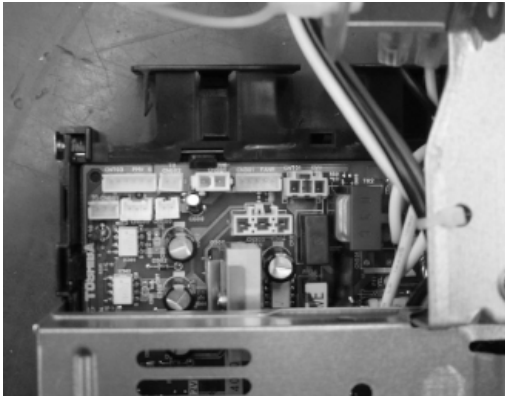
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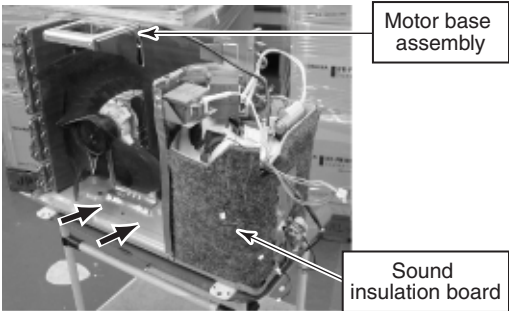
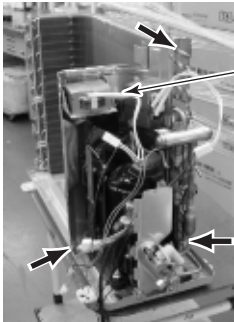
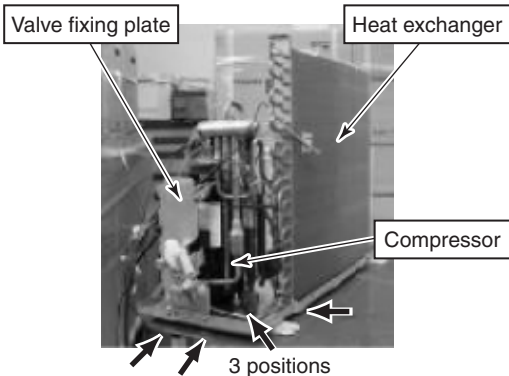
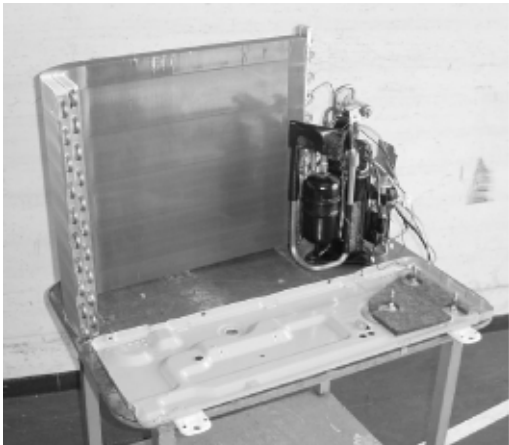
Separate the cord heater power from the air conditioner power, and connect it to its exclusive breaker.

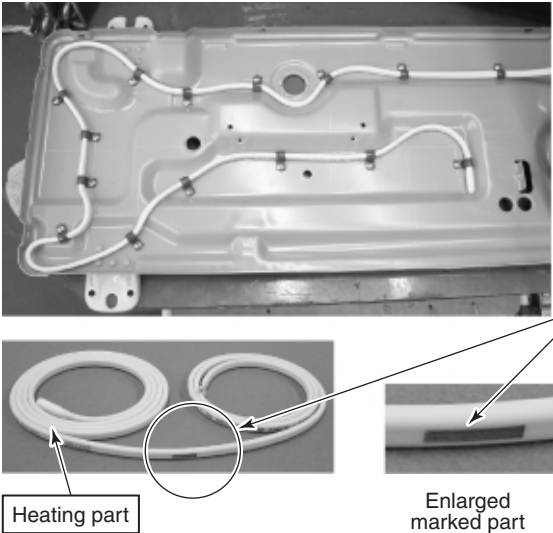
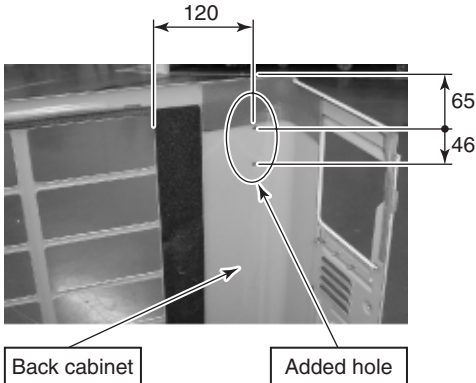
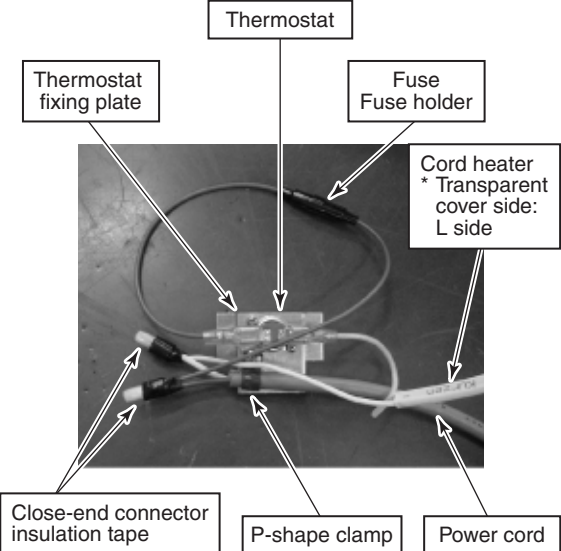
By doing so, the power consumption can be decreased because the breaker can be turned off if there is no possibility of freezing of the base in cooling operation, etc.

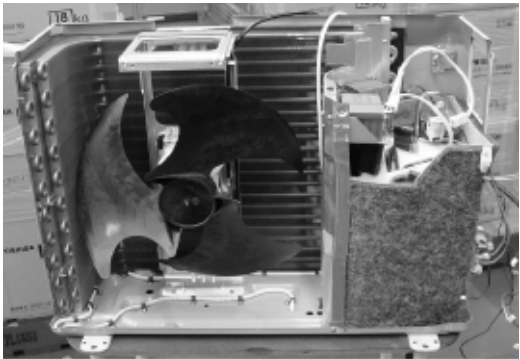
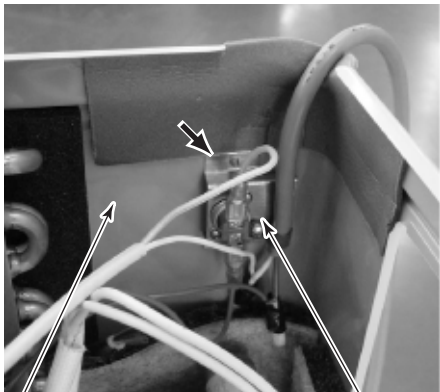

When the cord heater power is connected to the inverter P.C. board assembly or others without connected to the exclusive breaker, the control P.C. board of the inverter assembly may cause a failure.

4. Cord heater installation work procedure

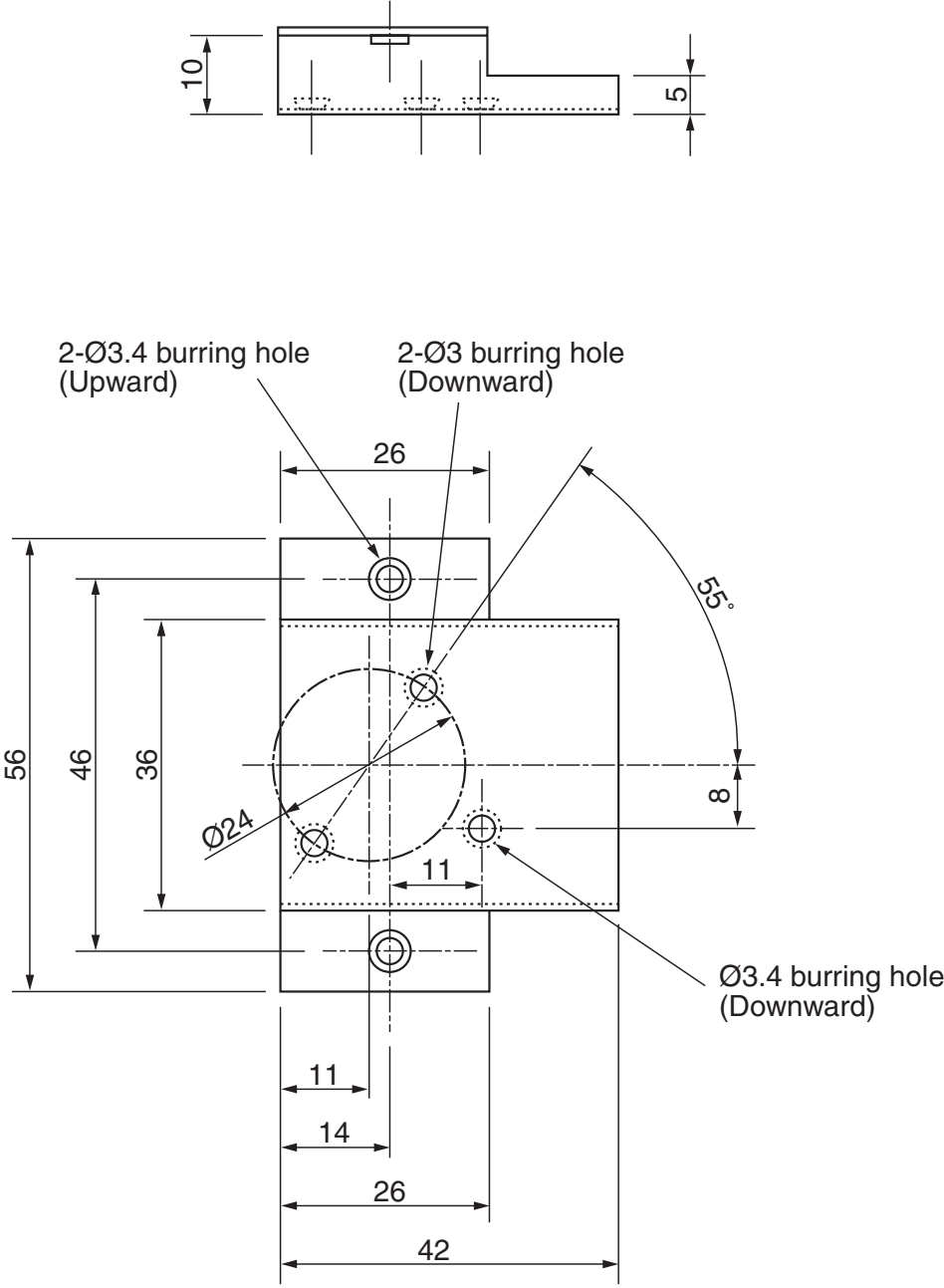
No.	Photo / Explanatory diagram	Procedure																																																
1	Remove each cabinet, inverter assembly, motor base assembly, and partition board assembly. * Do not damage the electric parts such as cables, connectors, etc. while this work.																																																	
1-1	 <p>Upper cabinet</p> <p>Valve cover</p>	Remove the upper cabinet and the valve cover. Related parts / Screws list <table border="1"><thead><tr><th rowspan="2">Part name</th><th colspan="2">Used screw</th></tr><tr><th>Screw type</th><th>Quantity</th></tr></thead><tbody><tr><td>Upper cabinet</td><td>Ø4 × 10</td><td>2</td></tr><tr><td>Valve cover</td><td>Ø4 × 10</td><td>1</td></tr></tbody></table>	Part name	Used screw		Screw type	Quantity	Upper cabinet	Ø4 × 10	2	Valve cover	Ø4 × 10	1																																					
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1-2	 <p>Wiring cover</p> <p>Front cabinet</p>	Remove the front cabinet and the wiring cover. Related parts / Screws list <table border="1"><thead><tr><th rowspan="2">Part name</th><th colspan="2">Used screw</th></tr><tr><th>Screw type</th><th>Quantity</th></tr></thead><tbody><tr><td>Front cabinet</td><td>Ø4 × 10</td><td>7</td></tr><tr><td>Wiring cover</td><td>Ø4 × 10</td><td>2</td></tr></tbody></table>	Part name	Used screw		Screw type	Quantity	Front cabinet	Ø4 × 10	7	Wiring cover	Ø4 × 10	2																																					
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Wiring cover	Ø4 × 10	2																																																
1-3	 <p>Back cabinet</p>	Remove the back cabinet. Related parts / Screws list <table border="1"><thead><tr><th rowspan="2">Part name</th><th colspan="2">Used screw</th></tr><tr><th>Screw type</th><th>Quantity</th></tr></thead><tbody><tr><td>Back cabinet</td><td>Ø4 × 10</td><td>7</td></tr></tbody></table>	Part name	Used screw		Screw type	Quantity	Back cabinet	Ø4 × 10	7																																								
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1-4		Remove the inverter assembly. <table border="1"><thead><tr><th>No.</th><th>Part name</th><th>Connector No.</th><th>Connector color</th></tr></thead><tbody><tr><td>1</td><td>TE sensor</td><td>CN600</td><td>White</td></tr><tr><td>2</td><td>TD sensor</td><td>CN601</td><td>White</td></tr><tr><td>3</td><td>TO sensor</td><td>CN602</td><td>White</td></tr><tr><td>4</td><td>TS sensor</td><td>CN603</td><td>White</td></tr><tr><td>5</td><td>4-way valve coil</td><td>CN701</td><td>Yellow</td></tr><tr><td>6</td><td>PMV coil</td><td>CN703</td><td>White</td></tr><tr><td>7</td><td>Fan motor</td><td>CN300</td><td>White</td></tr><tr><td></td><td></td><td>CN301</td><td>White</td></tr><tr><td>8</td><td>Compressor lead</td><td>(Intermediate connector)</td><td>White</td></tr><tr><td>9</td><td>Case thermo</td><td>CN500</td><td>White</td></tr><tr><td>10</td><td>Reactor (2 pieces.)</td><td>(Intermediate connector)</td><td>White</td></tr></tbody></table>	No.	Part name	Connector No.	Connector color	1	TE sensor	CN600	White	2	TD sensor	CN601	White	3	TO sensor	CN602	White	4	TS sensor	CN603	White	5	4-way valve coil	CN701	Yellow	6	PMV coil	CN703	White	7	Fan motor	CN300	White			CN301	White	8	Compressor lead	(Intermediate connector)	White	9	Case thermo	CN500	White	10	Reactor (2 pieces.)	(Intermediate connector)	White
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No.	Photo / Explanatory diagram	Procedure														
1-5	 <p>Motor base assembly</p> <p>Sound insulation board</p>	<p>Remove the motor base and the sound insulation board.</p> <p>Related parts / Screws list</p> <table border="1"> <thead> <tr> <th rowspan="2">Part name</th><th colspan="2">Used screw</th></tr> <tr> <th>Screw type</th><th>Quantity</th></tr> </thead> <tbody> <tr> <td>Motor base assembly (Including motor and fan)</td><td>Ø4 × 10</td><td>2</td></tr> </tbody> </table>	Part name	Used screw		Screw type	Quantity	Motor base assembly (Including motor and fan)	Ø4 × 10	2						
Part name	Used screw															
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Motor base assembly (Including motor and fan)	Ø4 × 10	2														
1-6	 <p>Partition plate assembly</p>	<p>Remove the partition plate assembly.</p> <p>Related parts / Screws list</p> <table border="1"> <thead> <tr> <th rowspan="2">Part name</th><th colspan="2">Used screw</th></tr> <tr> <th>Screw type</th><th>Quantity</th></tr> </thead> <tbody> <tr> <td>Partition plate assembly (Including reactor)</td><td>Ø4 × 10</td><td>3</td></tr> </tbody> </table>	Part name	Used screw		Screw type	Quantity	Partition plate assembly (Including reactor)	Ø4 × 10	3						
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	Screw type	Quantity														
Partition plate assembly (Including reactor)	Ø4 × 10	3														
1-7	 <p>Valve fixing plate</p> <p>Heat exchanger</p> <p>Compressor</p> <p>3 positions</p>	<p>Remove the fixing screws of the heat exchanger and the valve fixing plate. Remove the compressor fixing nut.</p> <p>Related parts / Screws list</p> <table border="1"> <thead> <tr> <th rowspan="2">Part name</th><th colspan="2">Used screw</th></tr> <tr> <th>Screw type</th><th>Quantity</th></tr> </thead> <tbody> <tr> <td>Heat exchanger</td><td>Ø4 × 10</td><td>1</td></tr> <tr> <td>Valve fixing plate</td><td>Ø4 × 10</td><td>2</td></tr> <tr> <td>Compressor</td><td>Ø8 nut</td><td>3</td></tr> </tbody> </table>	Part name	Used screw		Screw type	Quantity	Heat exchanger	Ø4 × 10	1	Valve fixing plate	Ø4 × 10	2	Compressor	Ø8 nut	3
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1-8		<p>As shown in the left figure, remove the set of refrigeration cycle assembly from the outdoor unit base.</p> <p>* In this time, work attentively so that the cycle pipes are not damaged by dent or deformation. Apply protective measures to pipes if necessary.</p>														

No.	Photo / Explanatory diagram	Procedure
2	Cord heater installation work Drill a hole on the outdoor unit base, and fix the cord heater to the outdoor unit base using P-shape clamp. Connect the cord heater cables.	
2-1	Using a motor drill, etc., drill Ø3.2 holes to the existing emboss on the outdoor unit base. (15 positions) These holes are used to fix the cord heater to the outdoor unit base with P-shape clamp.	
2-2		<p>As shown in the left figure, install the cord heater (1.5m) to the outdoor unit base by using P-shape clamp and screws (Self-tapping screw type-B Ø4 × 6mm, stainless).</p> <p>Pay attention to the direction of P-shape clamp so that it is set to the same direction in the left figure.</p> <ul style="list-style-type: none"> * If the drain port is frozen due to installation status, etc., draw around the cord heater so that the end part of the heater is inserted into the drain port. In this case, add some fixing positions to fix the cord heater surely. * The end part from the marked part of the cord heater heats up. When there is the heating part near the electric parts box, a fire may generate. Be sure to set the heating part on the outdoor unit base at the fan room side or near it. (within 20cm from the outdoor unit base) * Be careful that the cord heater does not hit the fan. Fix the cord heater without any loosening or sag.
2-3		<p>Drill a hole on the back cabinet for fixing the thermostat fixing plate.</p> <p>Ø5 hole at two positions</p> <p>When drilling a hole on the back cabinet, be sure not to damage the cabinet.</p>
2-4		<p>Perform end process and bundling of each cable.</p> <p>Using fixing screws (Self-tapping screw type-B Ø3.5 × 8mm), fix the thermostat to the thermostat fixing plate.</p> <p>Perform end process for various lead cables and connect them according to the wiring diagram.</p> <p>Attach #250 Faston and UL-approved sleeves each to the end of lead cables which are connected to the thermostat.</p> <p>Using insulation tape, apply protective measures to the connected parts by the close-end connectors.</p> <p>Using P-shape clamp and the screws (Self-tapping screw type-B Ø4 × 8mm), fix the power cord to the thermostat fixing plate.</p> <p>When the power cord size does not match with P-shape clamp, procure the most appropriate one at the local site.</p>

No.	Photo / Explanatory diagram	Procedure
3	Assembly Return a set of the refrigeration cycle assembly into the outdoor unit base and reassemble sound insulation board, partition plate assembly, fan motor assembly, and back cabinet as original. Fix the thermostat fixing plate to the back cabinet, built in the inverter assembly, and then connect various cables. After then, incorporate front cabinet, upper cabinet, wiring cover, and valve cover as before.	
3-1		Return a set of the refrigeration cycle assembly into the outdoor unit base, and assemble sound insulation board, partition plate assembly, fan motor assembly, and back cabinet as original.
3-2	 <div data-bbox="233 1227 368 1261">Back cabinet</div> <div data-bbox="552 1227 791 1261">Thermostat fixing plate</div>	Using screws (Self-tapping screw type-B Ø4 × 8mm, stainless), fix the thermostat fixing plate to the back cabinet.
3-3	<div data-bbox="256 1317 791 1373">Do not make cord heater loose. Do not put the heating part near the electric parts box.</div> <div data-bbox="233 1395 616 1451">Perform cable process for collected cord heater and fan motor lead cables.</div>  <div data-bbox="233 1879 389 1935">Power cord for cord heater</div> <div data-bbox="536 1879 791 1935">Put the remained parts of the cord heater together.</div>	After incorporating the inverter assembly as before, furthermore perform cable process for cord heater and power cord. For the cord heater, perform cable process so that there is no looseness or sag at the fan side. Perform cable process for the cord heater together with the fan motor lead cable, and collect the remained part of cables at cable process part of the inverter. Draw the power cord for the cord heater out of cables of the back cabinet. * Check that there is the marked part of the cord heater on the outdoor unit base or near it. When there is the heating part near the electric parts box, a fire may generate.
3-4	Incorporate front cabinet, upper cabinet, wiring cover, and valve cover as before.	
4	In installation work, connect power cord for the cord heater to another breaker separated from one for power cord of the air conditioner.	

5. Drawing of thermostat fixing plate



Material: SGCC-Z08, Thickness: 0.8t

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