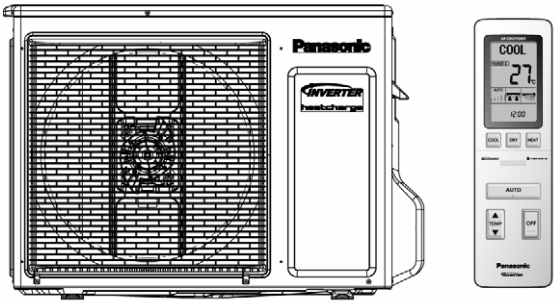
Order No: RAC1207001CE

Service Manual

Air Conditioner



Indoor Unit	Outdoor Unit
CS-VE9NKE	CU-VE9NKE
CS-VE12NKE	CU-VE12NKE

⚠ WARNING

This service information is designed for experienced repair technicians only and is not designed for use by the general public.
It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product.
Products powered by electricity should be serviced or repaired only by experienced professional technicians. Any attempt to service or repair the products dealt with in this service information by anyone else could result in serious injury or death.

⚠ PRECAUTION OF LOW TEMPERATURE

In order to avoid frostbite, be assured of no refrigerant leakage during the installation or repairing of refrigerant circuit.

TABLE OF CONTENTS

Panasonic®

1. Safety Precautions

- Read the following “SAFETY PRECAUTIONS” carefully before perform any servicing.
- Electrical work must be installed or serviced by a licensed electrician. Be sure to use the correct rating of the power plug and main circuit for the model installed.
- The caution items stated here must be followed because these important contents are related to safety. The meaning of each indication used is as below. Incorrect installation or servicing due to ignoring of the instruction will cause harm or damage, and the seriousness is classified by the following indications.

⚠ **WARNING**	This indication shows the possibility of causing death or serious injury.
⚠ **CAUTION**	This indication shows the possibility of causing injury or damage to properties.

- The items to be followed are classified by the symbols:

⃠	This symbol denotes item that is PROHIBITED from doing.

- Carry out test run to confirm that no abnormality occurs after the servicing. Then, explain to user the operation, care and maintenance as stated in instructions. Please remind the customer to keep the operating instructions for future reference.

⚠ **WARNING**	
1. Do not modify the machine, part, material during repairing service.	
2. If wiring unit is supplied as repairing part, do not repair or connect the wire even only partial wire break. Exchange the whole wiring unit.	
3. Do not wrench the fasten terminal. Pull it out or insert it straightly.	
4. Engage authorized dealer or specialist for installation and servicing. If installation or servicing done by the user is defective, it will cause water leakage, electrical shock or fire.	
5. Install according to this installation instructions strictly. If installation is defective, it will cause water leakage, electric shock or fire.	
6. Use the attached accessories parts and specified parts for installation and servicing. Otherwise, it will cause the set to fall, water leakage, fire or electrical shock.	
7. Install at a strong and firm location which is able to withstand the set’s weight. If the strength is not enough or installation is not properly done, the set will drop and cause injury.	
8. For electrical work, follow the local national wiring standard, regulation and the installation instruction. An independent circuit and single outlet must be used. If electrical circuit capacity is not enough or defect found in electrical work, it will cause electrical shock or fire.	
9. This equipment is strongly recommended to install with Earth Leakage Circuit Breaker (ELCB) or Residual Current Device (RCD). Otherwise, it may cause electrical shock and fire in case equipment breakdown or insulation breakdown.	
10. Do not use joint cable for indoor/outdoor connection cable. Use the specified indoor/outdoor connection cable, refer to installation instruction CONNECT THE CABLE TO THE INDOOR UNIT and connect tightly for indoor/outdoor connection. Clamp the cable so that no external force will be acted on the terminal. If connection or fixing is not perfect, it will cause heat up or fire at the connection.	
11. Wire routing must be properly arranged so that control board cover is fixed properly. If control board cover is not fixed perfectly, it will cause heat-up or fire at the connection point of terminal, fire or electrical shock.	
12. When install or relocate air conditioner, do not let any substance other than the specified refrigerant, eg. air etc. mix into refrigeration cycle (piping). (Mixing of air etc. will cause abnormal high pressure in refrigeration cycle and result in explosion, injury etc.).	
13. Do not install outdoor unit near handrail of veranda. When installing air-conditioner unit at veranda of high rise building, child may climb up to outdoor unit and cross over the handrail and causing accident.	
14. This equipment must be properly earthed. Earth line must not be connected to gas pipe, water pipe, earth of lightning rod and telephone. Otherwise, it may cause electric shock in case equipment breakdown or insulation breakdown.	⃠
15. Keep away from small children, the thin film may cling to nose and mouth and prevent breathing.	⃠
16. Do not use unspecified cord, modified cord, joint cord or extension cord for power supply cord. Do not share the single outlet with other electrical appliances. Poor contact, poor insulation or over current will cause electrical shock or fire.	⃠
17. Tighten the flare nut with torque wrench according to specified method. If the flare nut is over-tightened, after a long period, the flare may break and cause refrigerant gas leakage.	⃠
18. For R410A models, when connecting the piping, do not use any existing (R22) pipes and flare nuts. Using such same may cause abnormally high pressure in the refrigeration cycle (piping), and possibly result in explosion and injury. Use only R410A materials. Thickness of copper pipes used with R410A must be more than 0.8mm. Never use copper pipes thinner than 0.8mm. It is desirable that the amount of residual oil is less than 40 mg/10m.	⃠

⚠ WARNING
19. During installation, install the refrigerant piping properly before run the compressor. (Operation of compressor without fixing refrigeration piping and valves at opened condition will caused suck-in of air, abnormal high pressure in refrigeration cycle and result in explosion, injury etc).
20. During pump down operation, stop the compressor before remove the refrigeration piping. (Removal of compressor while compressor is operating and valves are opened will cause suck-in of air, abnormal high pressure in refrigeration cycle and result in explosion, injury etc.)
21. After completion of installation or service, confirm there is no leakage or refrigerant gas. It may generate toxic gas when the refrigerant contacts with fire.
22. Ventilate if there is refrigerant gas leakage during operation. It may cause toxic gas when refrigerant contacts with fire.
23. Do not insert your fingers or other objects into the unit, high speed rotating fan may cause injury.
24. Must not use other parts except original parts described in catalog and manual.
25. Using of refrigerant other than the specified type may cause product damage, burst and injury etc.

⚠ CAUTION
1. Do not install the unit at place where leakage of flammable gas may occur. In case gas leaks and accumulates at surrounding of the unit, it may cause fire.
2. Carry out drainage piping as mentioned in installation instructions. If drainage is not perfect, water may enter the room and damage the furniture.
3. Tighten the flare nut with torque wrench according to specified method. If the flare nut is over-tightened, after a long period, the flare may break and cause refrigerant gas leakage.
4. Do not touch outdoor unit air inlet and aluminium fin. It may cause injury.
5. Select an installation location which is easy for maintenance.
6. Pb free solder has a higher melting point than standard solder; typically the melting point is 50°F – 70°F (30°C – 40°C) higher. Please use a high temperature solder iron. In case of the soldering iron with temperature control, please set it to 700 ± 20°F (370 ± 10°C). Pb free solder will tend to splash when heated too high (about 1100°F / 600°C).
7. Power supply connection to the air conditioner. Connect the power supply cord of the air conditioner to the mains using one of the following methods. Power supply point shall be the place where there is ease for access for the power disconnection in case of emergency. In some countries, permanent connection of this room air conditioner to the power supply is prohibited. i. Power supply connection to the receptacle using a power plug. Use an approved 15/16A (3/4~1.75HP) or 16A (2.0HP) or 20A (2.5HP) or 25A (3.0HP) power plug with earth pin for the connection to the socket. ii. Power supply connection to a circuit breaker for the permanent connection. Use an approved 16A (3/4~2.0HP), 20A (2.5HP) or 25A (3.0HP) circuit breaker for the permanent connection. It must be a double pole switch with a minimum 3.0 mm contact gap.
8. Do not release refrigerant during piping work for installation, servicing, reinstallation and during repairing a refrigerant parts. Take care of the liquid refrigerant, it may cause frostbite.
9. Installation or servicing work: It may need two people to carry out the installation or servicing work.
10. Do not install this appliance in a laundry room or other location where water may drip from the ceiling, etc.
11. Do not sit or step on the unit, you may fall down accidentally.
12. Do not touch the sharp aluminium fins or edges of metal parts. If you are required to handle sharp parts during installation or servicing, please wear hand glove. Sharp parts may cause injury.

2. Specification

Model			Indoor	CS-VE9NKE					
			Outdoor	CU-VE9NKE					
Performance Test Condition				EN 14511					
Power Supply			Phase, Hz	Single, 50					
			V	220			230		
				Min.	Mid.	Max.	Min.	Mid.	Max.
Cooling	Capacity		kW	0.60	2.50	3.00	0.60	2.50	3.00
	Running Current		A	—	2.3	—	—	2.2	—
	Input Power		W	140	485	790	140	485	790
	Annual Consumption		kWh	—	243	—	—	243	—
	EER		W/W	—	5.15	—	—	5.15	—
	Erp	Pdsign	kW	—	—	—	—	2.50	—
		SEER	(W/W)	—	—	—	—	8.60	—
		Annual Consumption	kWh	—	—	—	—	102	—
		Class		—	—	—	—	A+++	—
	Power Factor		%	—	94	—	—	94	—
	Indoor Noise (H / L / QLo)		dB-A	44 / 26 / 23			44 / 26 / 23		
			Power Level dB	59 / -			59 / -		
	Outdoor Noise (H / L)		dB-A	49 / -			49 / -		
			Power Level dB	64 / -			64 / -		
Heating	Capacity		kW	0.60	3.20	7.60	0.60	3.20	7.70
	Running Current		A	—	2.8	—	—	2.7	—
	Input Power		W	140	585	2.65k	140	585	2.72k
	COP		W/W	—	5.47	—	—	5.47	—
	Erp warm/ ave./ cold	Pdsign	kW	—	—	—	5.60 / 3.20 / 4.70		
		Tbivalent	°C	—	—	—	2 / -10 / -19		
		SCOP	(W/W)	—	—	—	6.00 / 5.40 / 4.10		
		Annual Consumption	kWh	—	—	—	1307 / 830 / 2408		
		Class		—	—	—	A+++ / A+++ / A+		
	Power Factor		%	—	94	—	—	94	—
	Indoor Noise (H / L / QLo)		dB-A	44 / 27 / 24			44 / 27 / 24		
			Power Level dB	59 / -			59 / -		
	Outdoor Noise (H / L)		dB-A	49 / -			49 / -		
			Power Level dB	64 / -			64 / -		
Extr Low Temp.: Capacity (kW) / I.Power (W) / COP				—			5.00 / 2.37k / 2.11		
Max Current (A) / Max Input Power (W)				14.0 / 3.22k					
Starting Current (A)				2.8			2.7		
Compressor	Type			Hermetic Motor (Rotary)					
	Motor Type			Brushless (6-poles)					
	Output Power		W	900					

Model				Indoor	CS-VE9NKE	
				Outdoor	CU-VE9NKE	
Indoor Fan	Type				Cross-flow fan	
	Material				AS+GF Resin	
	Motor Type				PWM (8-poles)	
	Input Power			W	23.6	
	Output Power			W	40	
	Speed	QLo	Cool	rpm	600	
			Heat	rpm	640	
		Lo	Cool	rpm	640	
			Heat	rpm	720	
		Me	Cool	rpm	960	
			Heat	rpm	980	
		Hi	Cool	rpm	1110	
			Heat	rpm	1110	
		Shi	Cool	rpm	1190	
			Heat	rpm	1110	
Outdoor Fan	Type				Propeller Fan + Flat piece	
	Material				PP	
	Motor Type				DC Brushless (8-poles)	
	Input Power			kW	51.61	
	Output Power			W	40	
	Speed	Hi	Cool	rpm	910	
			Heat	rpm	—	
Moisture Removal				L/h (Pt/h)	1.5 (3.2)	
Indoor Airflow		QLo	Cool	m^3/min (ft^3/m)	3.5 (124)	
			Heat	m^3/min (ft^3/m)	4.0 (141)	
		Lo	Cool	m^3/min (ft^3/m)	4.0 (141)	
			Heat	m^3/min (ft^3/m)	5.1 (180)	
		Me	Cool	m^3/min (ft^3/m)	8.1 (286)	
			Heat	m^3/min (ft^3/m)	8.4 (297)	
		Hi	Cool	m^3/min (ft^3/m)	10.0 (353)	
			Heat	m^3/min (ft^3/m)	10.0 (353)	
		Shi	Cool	m^3/min (ft^3/m)	11.0 (388)	
			Heat	m^3/min (ft^3/m)	10.0 (353)	
Outdoor Airflow		Hi	Cool	m^3/min (ft^3/m)	33.0 (1165)	33.0 (1165)
			Heat	m^3/min (ft^3/m)	31.5 (1112)	31.5 (1112)
Refrigeration Cycle		Control Device			Expansion Valve	
		Refrigerant Oil		cm^3	FV50S (450)	
		Refrigerant Type		g (oz)	R410A, 1.50k (52.9)	
Dimension		Height(I/D / O/D)		mm (inch)	295 (11-5/8) / 623 (24-1/2)	
		Width (I/D / O/D)		mm (inch)	890 (35) / 799 (31-1/2)	
		Depth (I/D / O/D)		mm (inch)	275 (10-7/8) / 299 (11-3/4)	
Weight		Net (I/D / O/D)		kg (lb)	14.5 (32) / 43 (95)	
Piping	Pipe Diameter (Liquid / Gas)			mm (inch)	6.35 (1/4) / 9.52 (3/8)	
	Standard length			m (ft)	5.0 (16.4)	
	Length range (min – max)			m (ft)	3 (9.8) ~ 15 (49.2)	
	I/D & O/D Height different			m (ft)	5.0 (16.4)	
	Additional Gas Amount			g/m (oz/ft)	20 (0.2)	
	Length for Additional Gas			m (ft)	7.5 (24.6)	

Model			Indoor	CS-VE9NKE	
			Outdoor	CU-VE9NKE	
Drain Hose	Inner Diameter		mm	16.7	
	Length		mm	650	
Indoor Heat Exchanger	Fin Material			Aluminium (Pre Coat)	
	FPI			26.5 + 17	
Outdoor Heat Exchanger	Fin Material			Aluminium (Pre Coat)	
	Fin Type			Corrugated Fin	
	Row x Stage x FPI			2 × 32 × 19.5	
	Size (W x H x D)		mm	871.6 × 586.24 × 37.8 840.4	
Power Supply				Indoor Power Supply	
Power Supply Cord			A	Nil	
Thermostat				Electronic Control	
Protection Device				Electronic Control	
				DRY BULB	WET BULB
Indoor Operation Range		Cooling	Maximum	32	23
			Minimum	16	11
		Heating	Maximum	30	—
			Minimum	16	—
Outdoor Operation Range		Cooling	Maximum	43	26
			Minimum	-10	—
		Heating	Maximum	24	18
			Minimum	-20	—

1. Cooling capacities are based on indoor temperature of 27°C Dry Bulb (80.6°F Dry Bulb), 19.0°C Wet Bulb (66.2°F Wet Bulb) and outdoor air temperature of 35°C Dry Bulb (95°F Dry Bulb), 24°C Wet Bulb (75.2°F Wet Bulb).
2. Heating capacities are based on indoor temperature of 20°C Dry Bulb (68°F Dry Bulb) and outdoor air temperature of 7°C Dry Bulb (44.6°F Dry Bulb), 6°C Wet Bulb (42.8°F Wet Bulb).
3. Heating low temperature capacity, Input Power and COP measured at 230 V, indoor temperature of 20°C, outdoor 2/1°C.
4. Heating extreme low temperature capacity, Input Power and COP measured at 230 V, indoor temperature of 20°C, outdoor -7/-8°C.
5. Specifications are subjected to change without prior notice for further improvement.

Model			Indoor	CS-VE12NKE					
			Outdoor	CU-VE12NKE					
Performance Test Condition				EN 14511					
Power Supply			Phase, Hz	Single, 50					
			V	220			230		
				Min.	Mid.	Max.	Min.	Mid.	Max.
Cooling	Capacity		kW	0.60	3.50	4.00	0.60	3.50	4.00
	Running Current		A	—	4.1	—	—	3.9	—
	Input Power		W	140	880	1.10k	140	880	1.10k
	Annual Consumption		kWh	—	440	—	—	440	—
	EER		W/W	—	3.98	—	—	3.98	—
	Erp	Pdsign	kW	—	—	—	—	3.50	—
		SEER	(W/W)	—	—	—	—	8.50	—
		Annual Consumption	kWh	—	—	—	—	145	—
		Class		—	—	—	—	A+++	—
	Power Factor		%	—	97	—	—	97	—
	Indoor Noise (H / L / QLo)		dB-A	45 / 29 / 26			45 / 29 / 26		
			Power Level dB	60 / -			60 / -		
	Outdoor Noise (H / L)		dB-A	50 / -			50 / -		
			Power Level dB	65 / -			65 / -		
Heating	Capacity		kW	0.60	4.20	8.30	0.60	4.20	8.40
	Running Current		A	—	4.0	—	—	3.8	—
	Input Power		W	140	855	3.08k	140	855	3.16k
	COP		W/W	—	4.91	—	—	4.91	—
	Erp warm/ ave./ cold	Pdsign	kW	—	—	—	6.10 / 4.20 / 6.10		
		Tbivalent	°C	—	—	—	2 / -10 / -17		
		SCOP	(W/W)	—	—	—	5.70 / 5.10 / 4.00		
		Annual Consumption	kWh	—	—	—	1499 / 1153 / 3203		
		Class		—	—	—	A+++ / A+++ / A+		
	Power Factor		%	—	97	—	—	97	—
	Indoor Noise (H / L / QLo)		dB-A	45 / 33 / 30			45 / 33 / 30		
			Power Level dB	60 / -			60 / -		
	Outdoor Noise (H / L)		dB-A	50 / -			50 / -		
			Power Level dB	65 / -			65 / -		
Extr Low Temp.: Capacity (kW) / I.Power (W) / COP				—			5.60 / 2.80k / 2.00		
Max Current (A) / Max Input Power (W)				15.0 / 3.45k					
Starting Current (A)				4.1			3.9		
Compressor	Type			Hermetic Motor (Rotary)					
	Motor Type			Brushless (6-poles)					
	Output Power		W	900					

Model				Indoor	CS-VE12NKE	
				Outdoor	CU-VE12NKE	
Indoor Fan	Type				Cross-flow fan	
	Material				AS+GF Resin	
	Motor Type				PWM (8-poles)	
	Input Power			W	28.5	
	Output Power			W	40	
	Speed	QLo	Cool	rpm	660	
			Heat	rpm	750	
		Lo	Cool	rpm	740	
			Heat	rpm	870	
		Me	Cool	rpm	1040	
			Heat	rpm	1050	
		Hi	Cool	rpm	1190	
			Heat	rpm	1140	
		Shi	Cool	rpm	1270	
			Heat	rpm	1140	
Outdoor Fan	Type				Propeller Fan + Flat piece	
	Material				PP	
	Motor Type				DC Brushless (8-poles)	
	Input Power			kW	57.29	
	Output Power			W	40	
	Speed	Hi	Cool	rpm	960	
			Heat	rpm	—	
Moisture Removal				L/h (Pt/h)	2.0 (4.2)	
Indoor Airflow		QLo	Cool	m^3/min (ft^3/m)	4.3 (152)	
			Heat	m^3/min (ft^3/m)	5.4 (191)	
		Lo	Cool	m^3/min (ft^3/m)	5.3 (187)	
			Heat	m^3/min (ft^3/m)	6.9 (244)	
		Me	Cool	m^3/min (ft^3/m)	9.0 (318)	
			Heat	m^3/min (ft^3/m)	9.1 (321)	
		Hi	Cool	m^3/min (ft^3/m)	10.9 (384)	
			Heat	m^3/min (ft^3/m)	10.3 (362)	
		Shi	Cool	m^3/min (ft^3/m)	11.9 (420)	
			Heat	m^3/min (ft^3/m)	10.3 (364)	
Outdoor Airflow		Hi	Cool	m^3/min (ft^3/m)	34.2 (1208)	34.2 (1208)
			Heat	m^3/min (ft^3/m)	31.5 (1112)	31.5 (1112)
Refrigeration Cycle		Control Device			Expansion Valve	
		Refrigerant Oil		cm^3	FV50S (450)	
		Refrigerant Type		g (oz)	R410A, 1.50k (52.9)	
Dimension		Height(I/D / O/D)		mm (inch)	295 (11-5/8) / 623 (24-1/2)	
		Width (I/D / O/D)		mm (inch)	890 (35) / 799 (31-1/2)	
		Depth (I/D / O/D)		mm (inch)	275 (10-7/8) / 299 (11-3/4)	
Weight		Net (I/D / O/D)		kg (lb)	14.5 (32) / 43 (95)	
Piping	Pipe Diameter (Liquid / Gas)			mm (inch)	6.35 (1/4) / 9.52 (3/8)	
	Standard length			m (ft)	5.0 (16.4)	
	Length range (min – max)			m (ft)	3 (9.8) ~ 15 (49.2)	
	I/D & O/D Height different			m (ft)	5.0 (16.4)	
	Additional Gas Amount			g/m (oz/ft)	20 (0.2)	
	Length for Additional Gas			m (ft)	7.5 (24.6)	

Model			Indoor	CS-VE12NKE	
			Outdoor	CU-VE12NKE	
Drain Hose	Inner Diameter		mm	16.7	
	Length		mm	650	
Indoor Heat Exchanger	Fin Material			Aluminium (Pre Coat)	
	FPI			26.5 + 17	
Outdoor Heat Exchanger	Fin Material			Aluminium (Pre Coat)	
	Fin Type			Corrugated Fin	
	Row x Stage x FPI			2 × 32 × 19.5	
	Size (W x H x D)		mm	871.6 × 586.24 × 37.8 840.4	
Power Supply				Indoor Power Supply	
Power Supply Cord			A	Nil	
Thermostat				Electronic Control	
Protection Device				Electronic Control	
				DRY BULB	WET BULB
Indoor Operation Range		Cooling	Maximum	32	23
			Minimum	16	11
		Heating	Maximum	30	—
			Minimum	16	—
Outdoor Operation Range		Cooling	Maximum	43	26
			Minimum	-10	—
		Heating	Maximum	24	18
			Minimum	-20	—

1. Cooling capacities are based on indoor temperature of 27°C Dry Bulb (80.6°F Dry Bulb), 19.0°C Wet Bulb (66.2°F Wet Bulb) and outdoor air temperature of 35°C Dry Bulb (95°F Dry Bulb), 24°C Wet Bulb (75.2°F Wet Bulb).
2. Heating capacities are based on indoor temperature of 20°C Dry Bulb (68°F Dry Bulb) and outdoor air temperature of 7°C Dry Bulb (44.6°F Dry Bulb), 6°C Wet Bulb (42.8°F Wet Bulb).
3. Heating low temperature capacity, Input Power and COP measured at 230 V, indoor temperature of 20°C, outdoor 2/1°C.
4. Heating extreme low temperature capacity, Input Power and COP measured at 230 V, indoor temperature of 20°C, outdoor -7/-8°C.
5. Specifications are subjected to change without prior notice for further improvement.

3. Features

- **Inverter Technology**
  - Wider output power range
  - Energy saving
  - Quick Cooling
  - Quick Heating
  - More precise temperature control

- **Environment Protection**
  - Non-ozone depletion substances refrigerant (R410A)

- **Long Installation Piping**
  - Long piping up to 15 meters during single split connection only

- **Easy to use remote control**

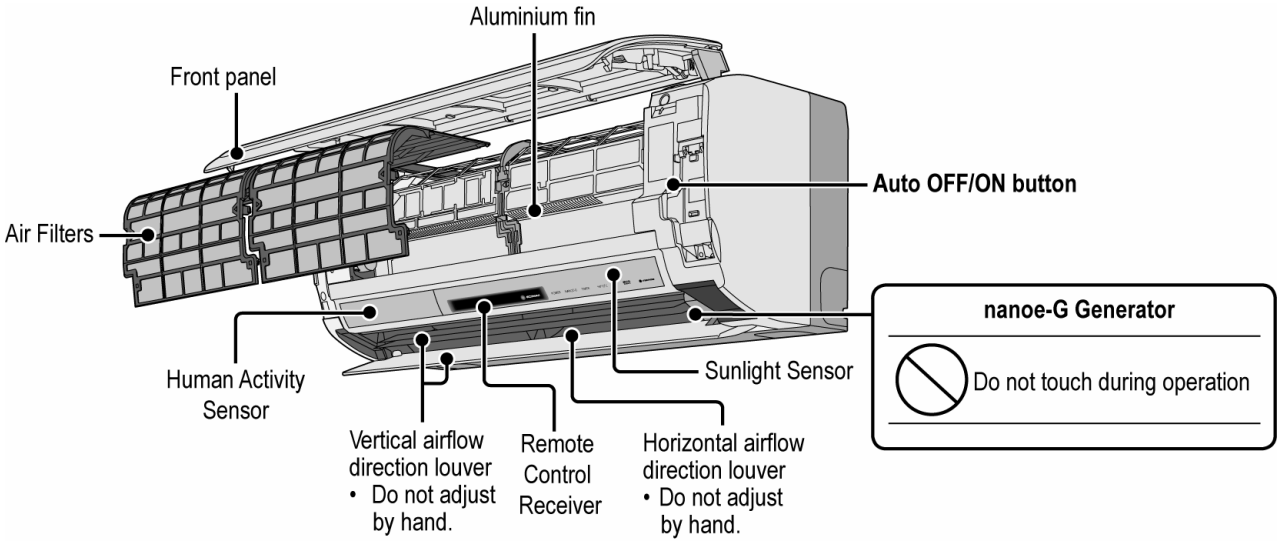
- **Quality Improvement**
  - Random auto restart after power failure for safety restart operation
  - Gas leakage protection
  - Prevent compressor reverse cycle
  - Inner protector to protect compressor
  - Noise prevention during soft dry operation

- **Operation Improvement**
  - Quiet mode to reduce the indoor unit operating sound
  - Powerful mode to reach the desired room temperature quickly
  - 24-hour timer setting

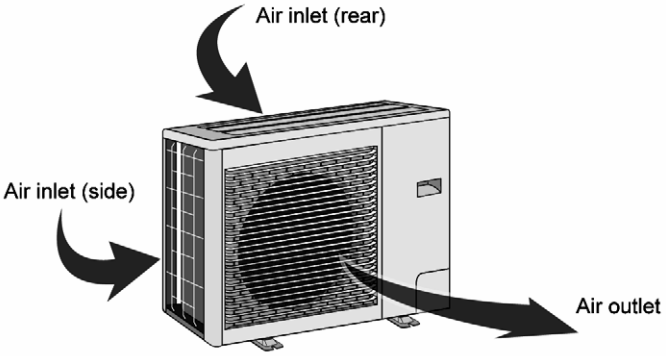
- **Serviceability Improvement**
  - Breakdown Self Diagnosis function

4. Location of Controls and Components

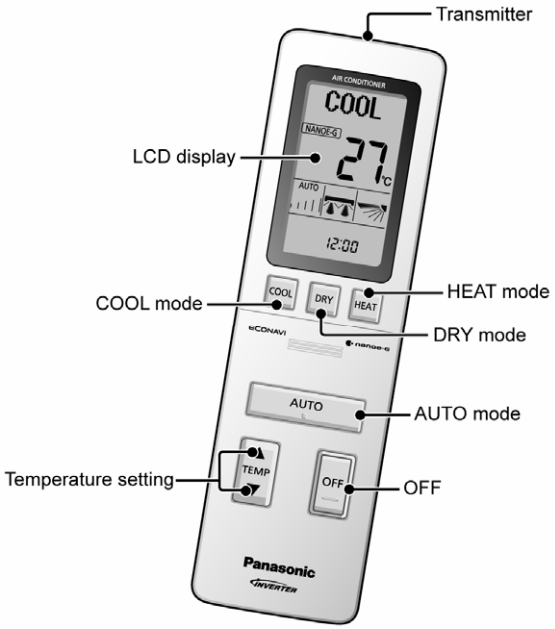
4.1 Indoor Unit



4.2 Outdoor Unit

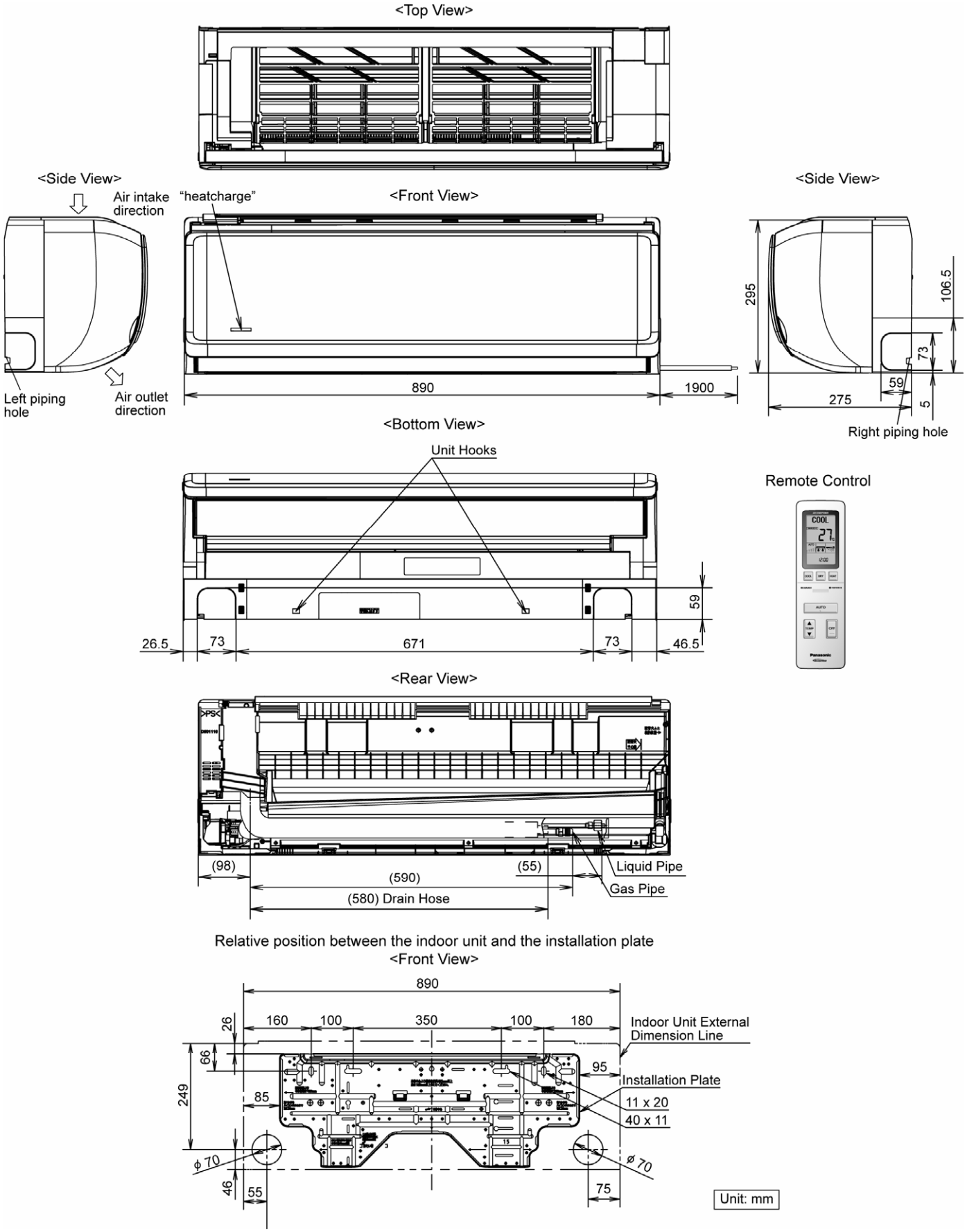


4.3 Remote Control



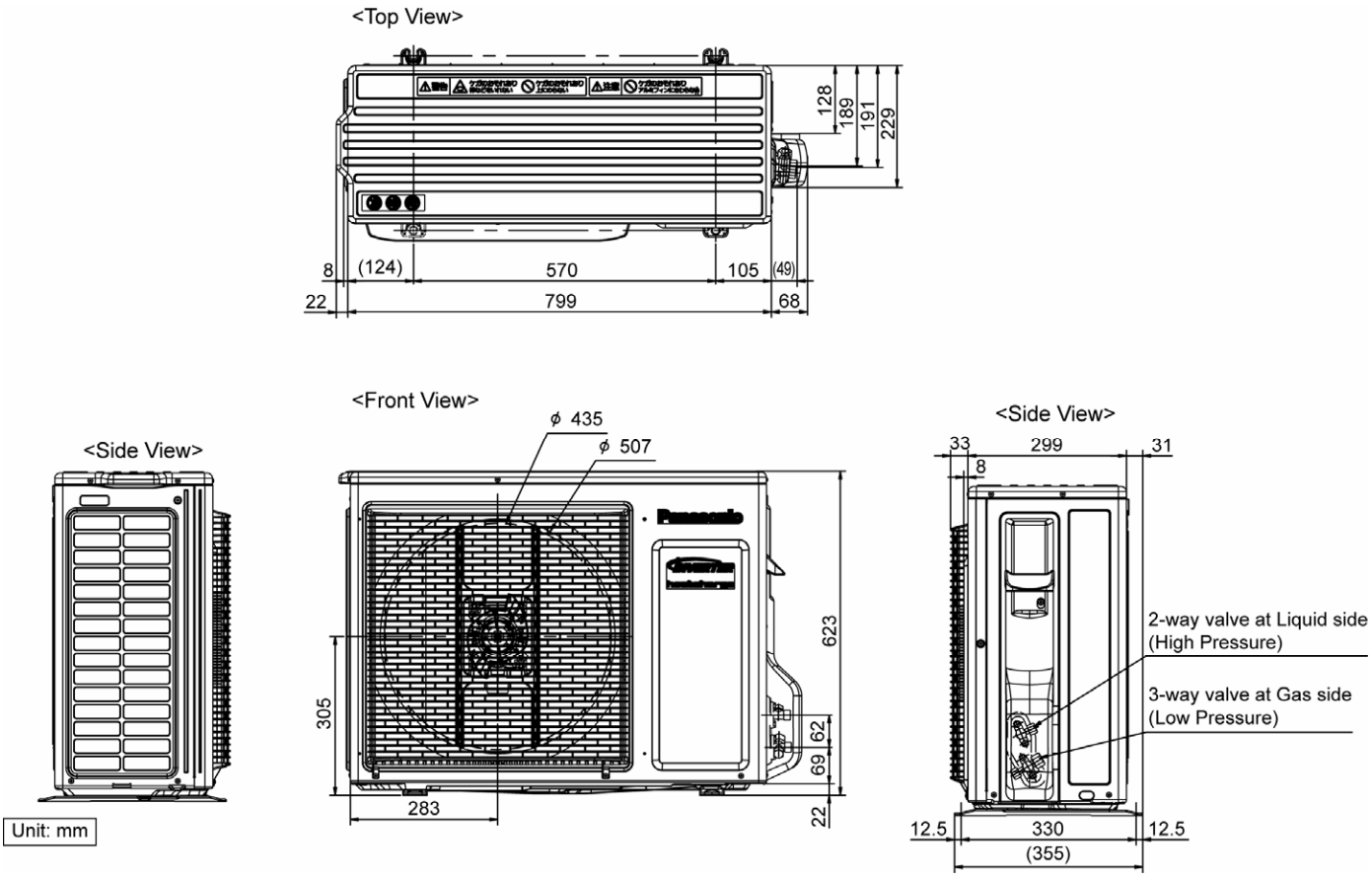
5. Dimensions

5.1 Indoor Unit and Remote Control

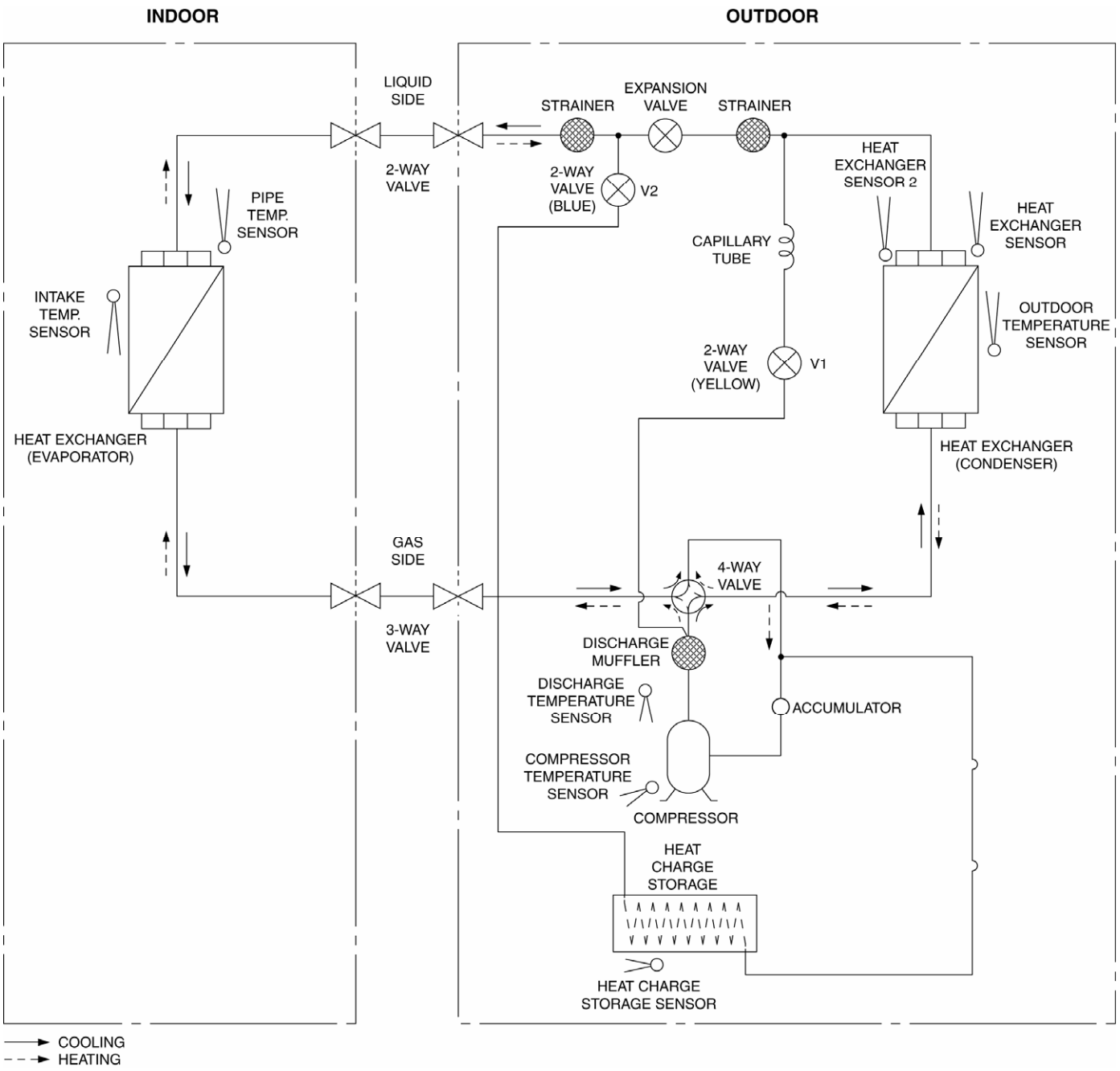


Relative position between the indoor unit and the installation plate

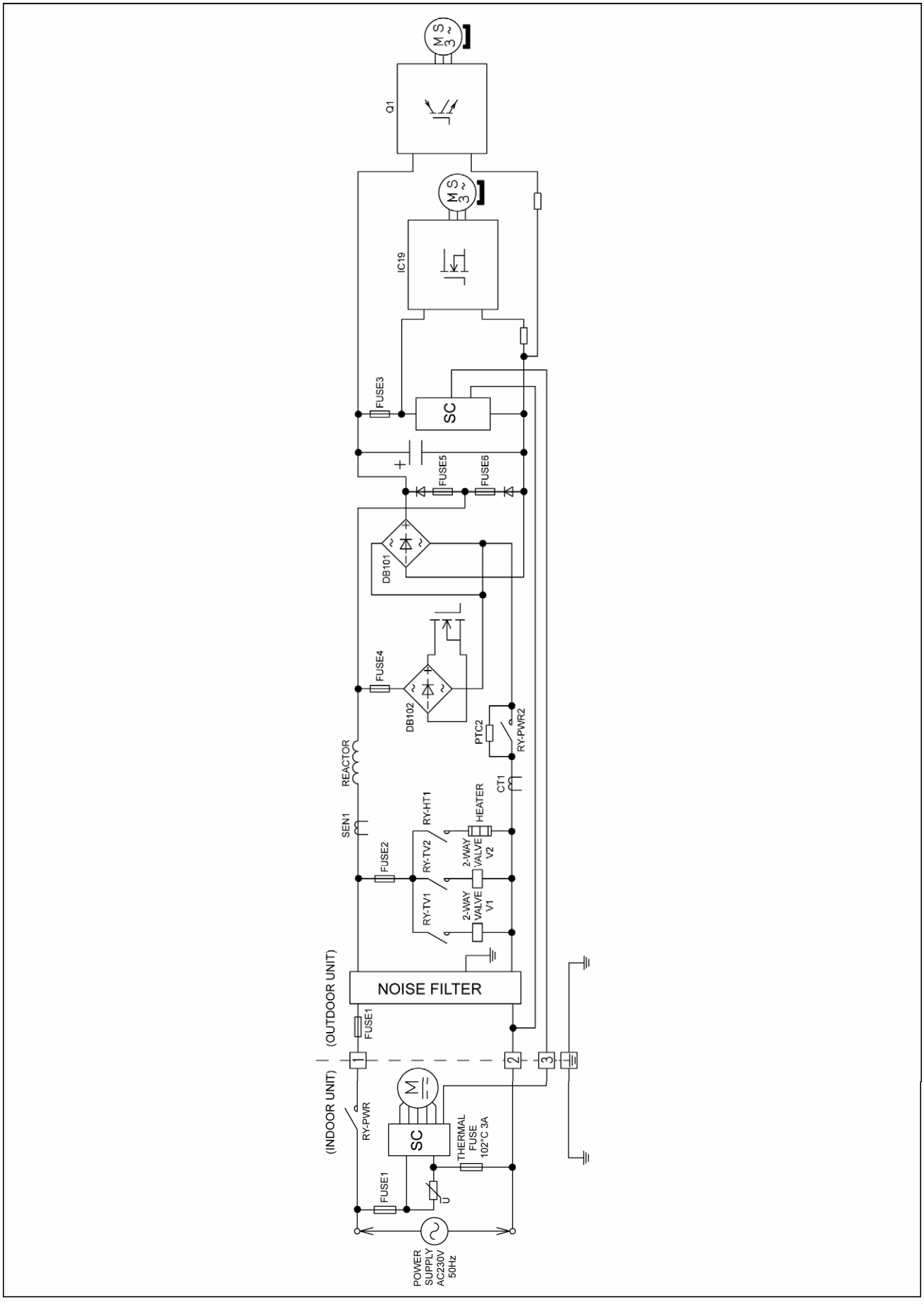
5.2 Outdoor Unit



6. Refrigeration Cycle Diagram

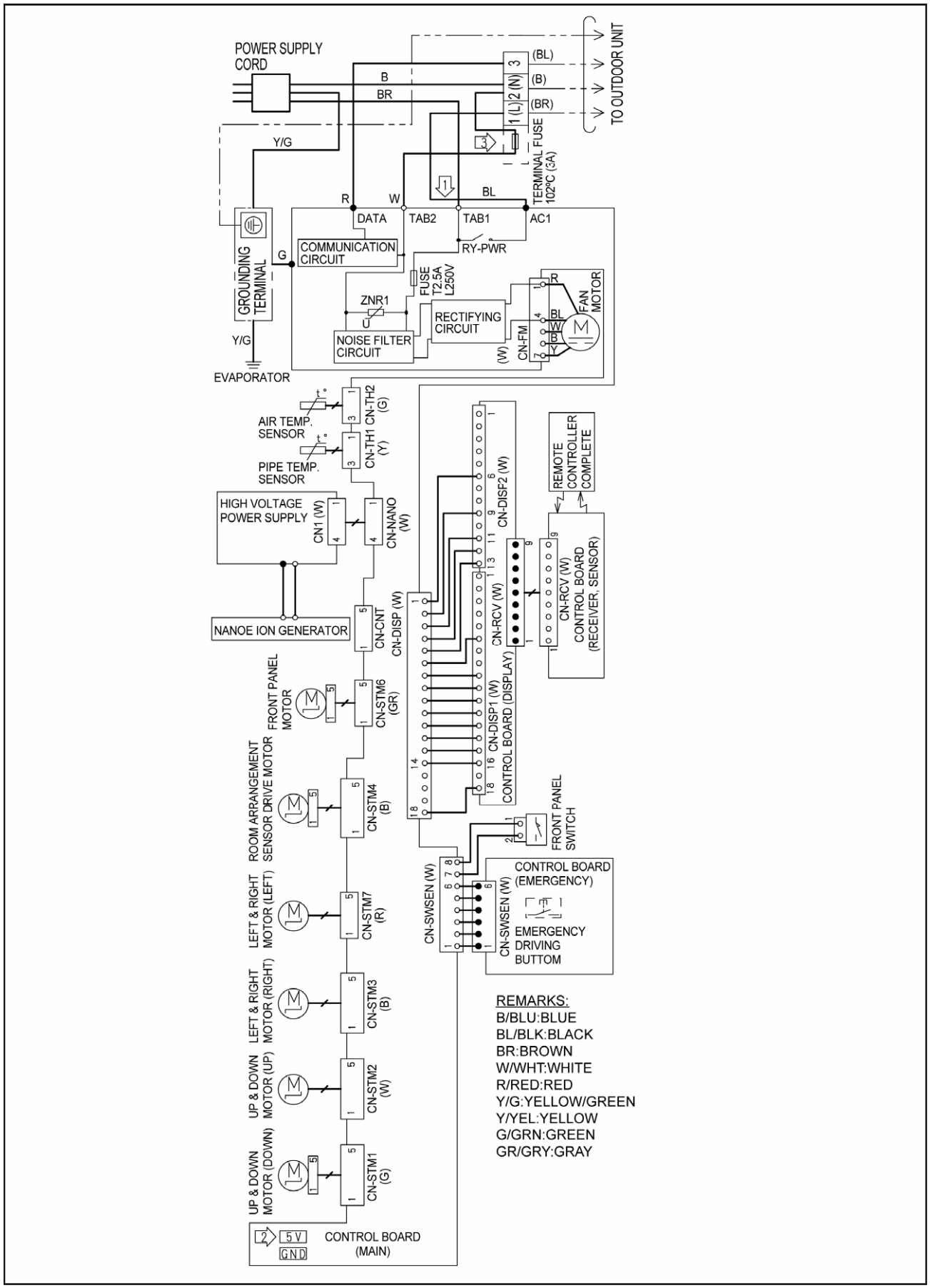


7. Block Diagram

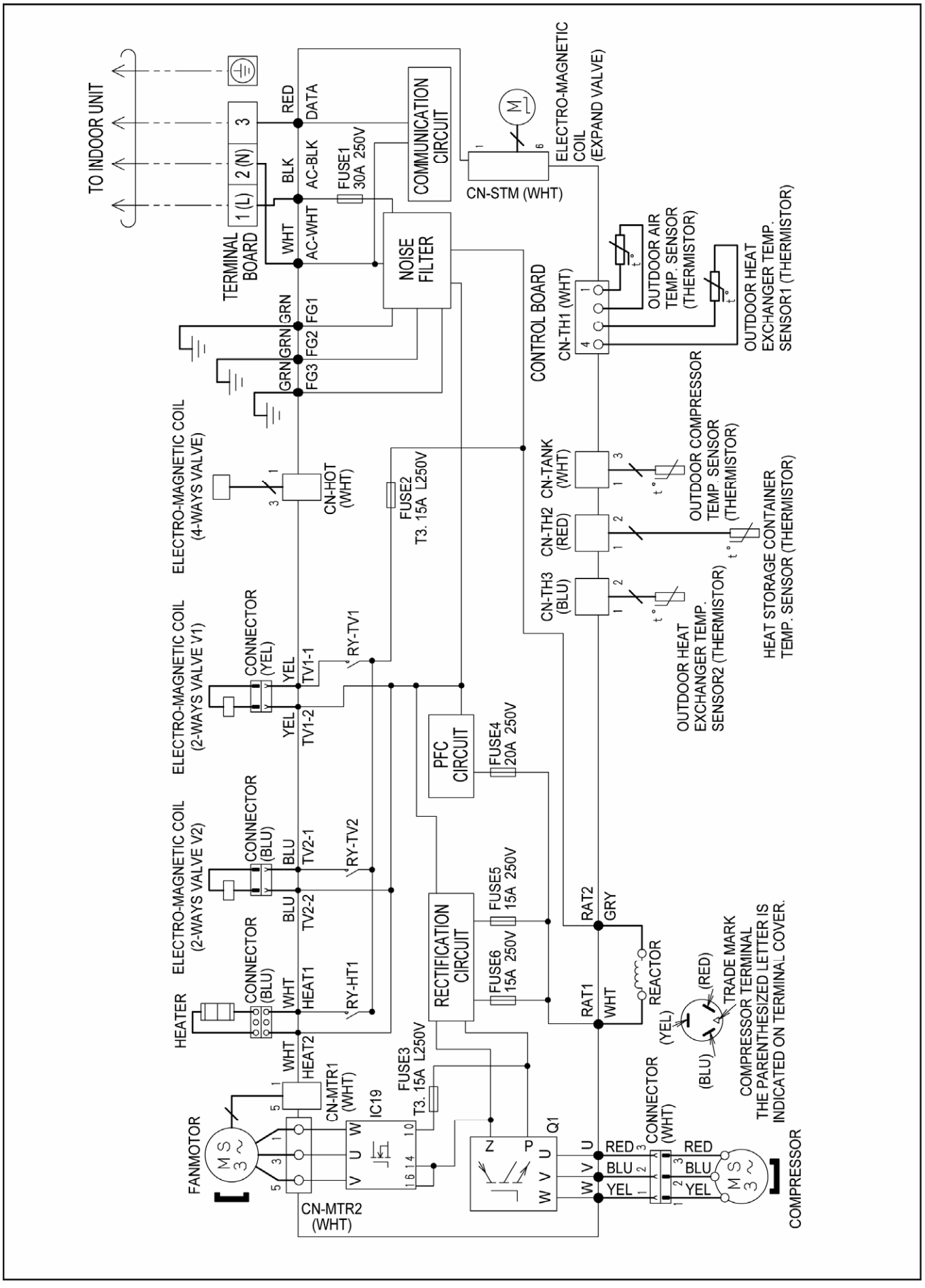


8. Wiring Connection Diagram

8.1 Indoor Unit

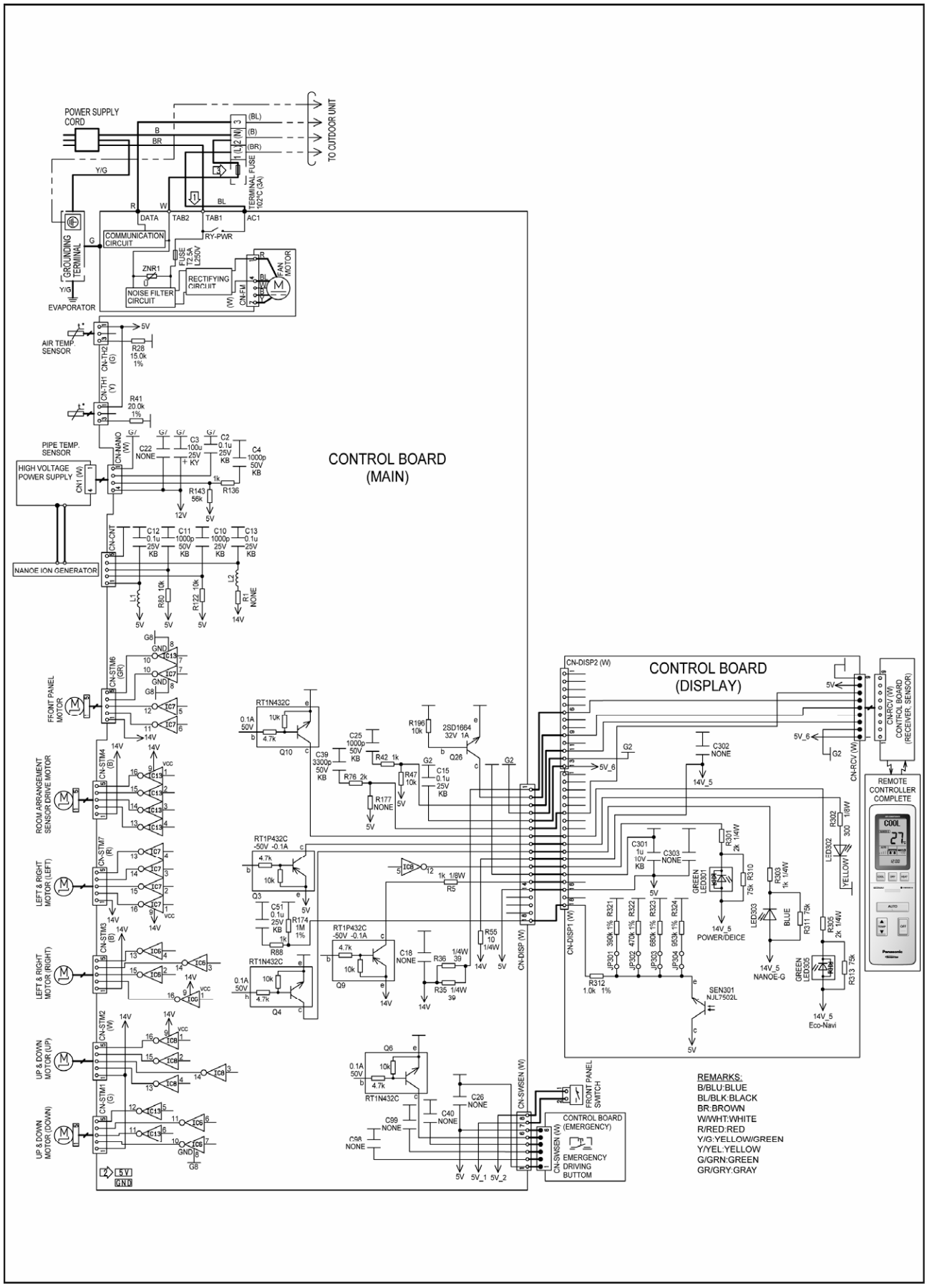


8.2 Outdoor Unit

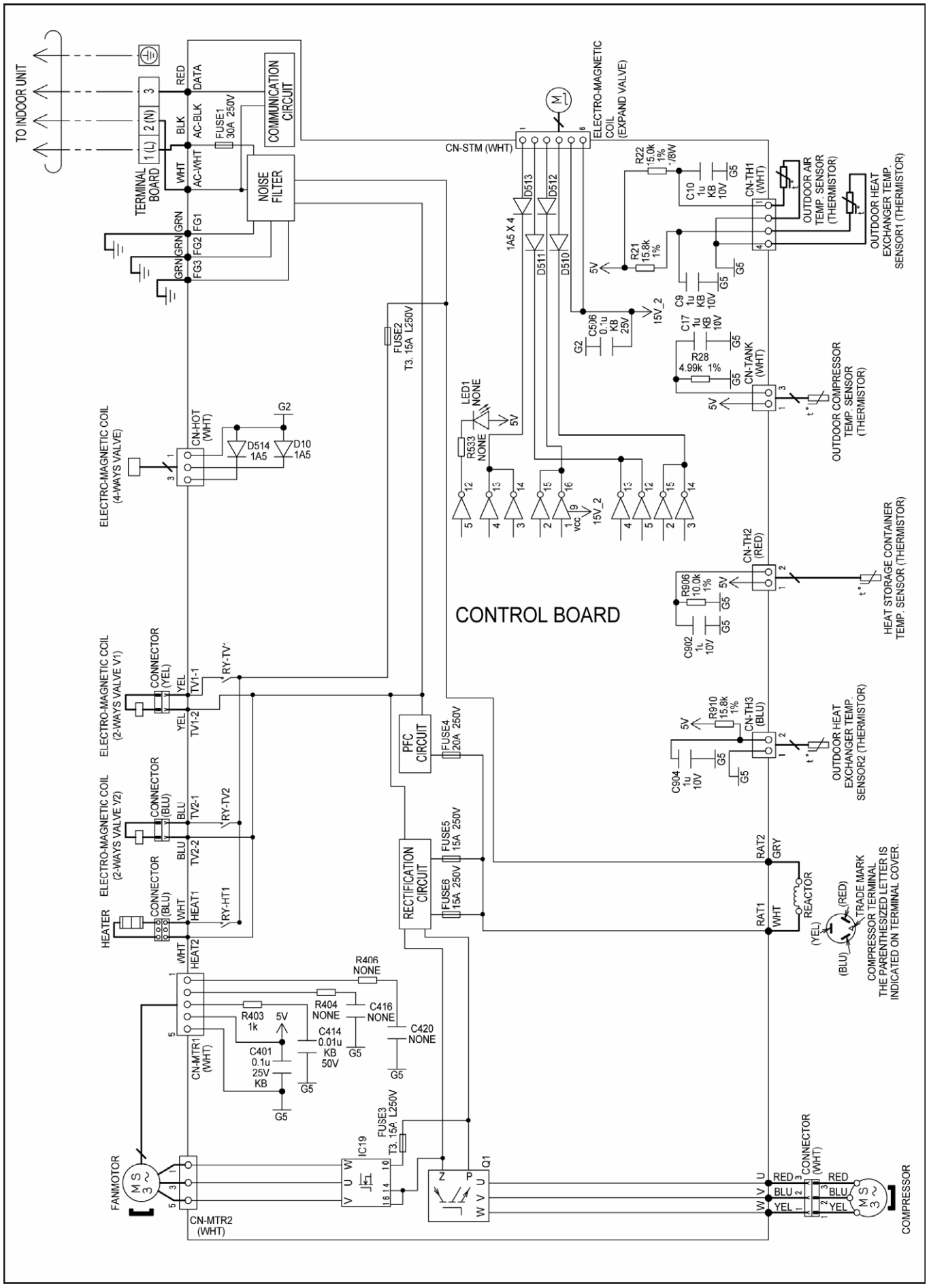


9. Electronic Circuit Diagram

9.1 Indoor Unit



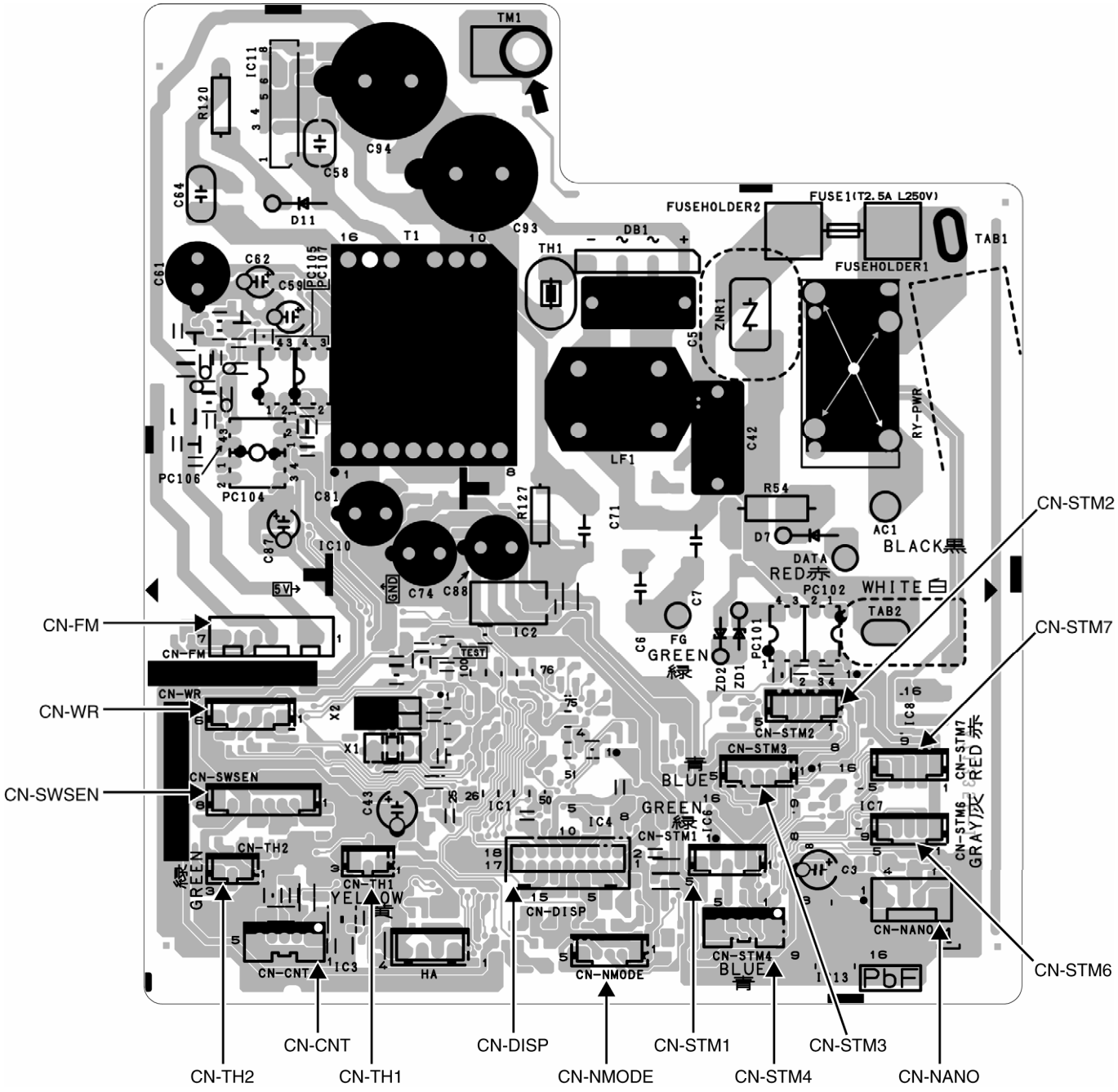
9.2 Outdoor Unit



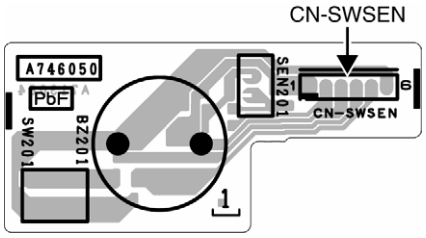
10. Printed Circuit Board

10.1 Indoor Unit

10.1.1 Main Printed Circuit Board

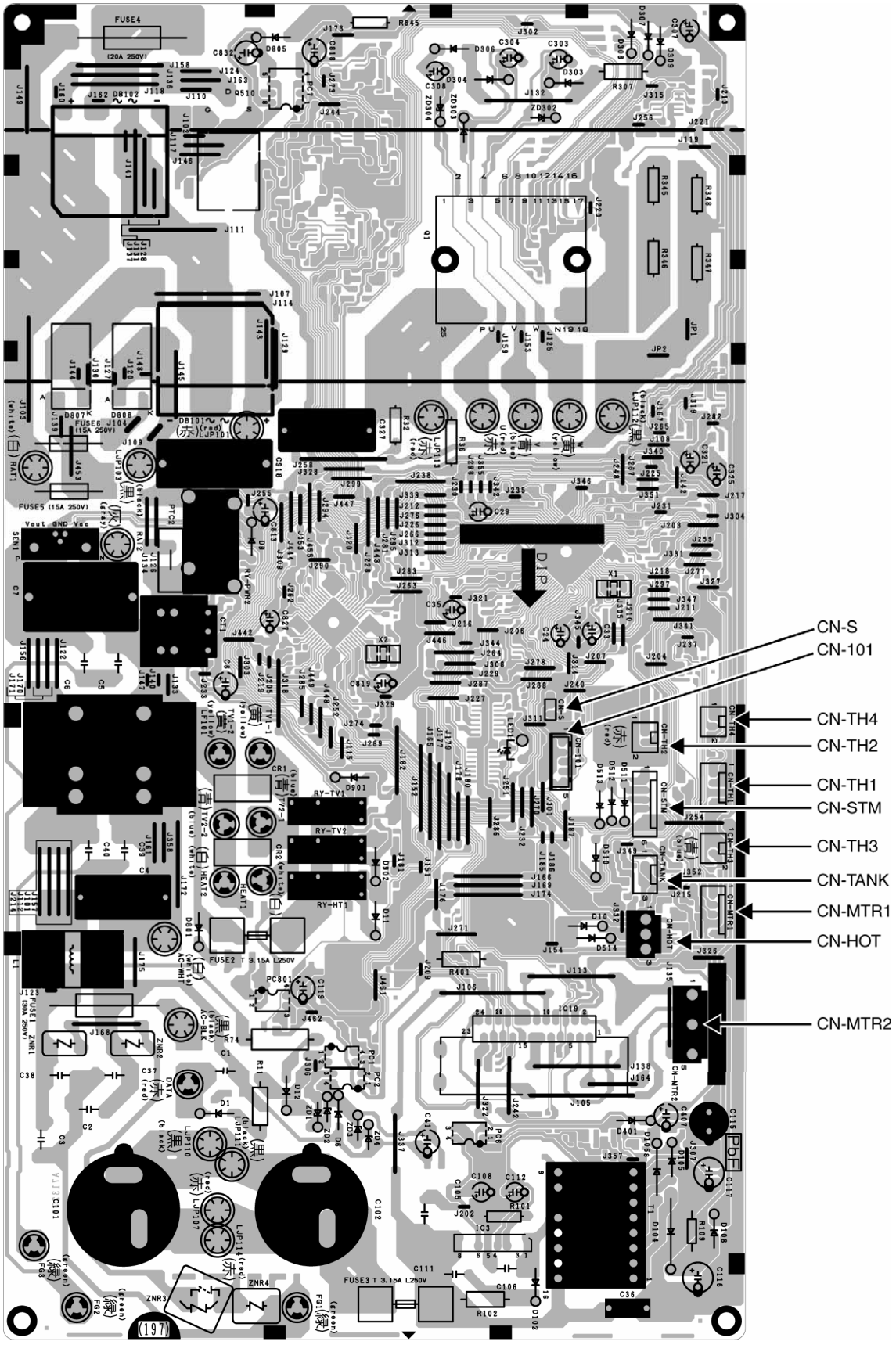


10.1.2 Printed Circuit Board



10.2 Outdoor Unit

10.2.1 Main Printed Circuit Board



11. Installation Instruction

11.1 Select the Best Location

11.1.1 Indoor Unit

- Do not install the unit in excessive oil fume area such as kitchen, workshop and etc.
- There should not be any heat source or steam near the unit.
- There should not be any obstacles blocking the air circulation.
- A place where air circulation in the room is good.
- A place where drainage can be easily done.
- A place where noise prevention is taken into consideration.
- Do not install the unit near the door way.
- Ensure the spaces indicated by arrows from the wall, ceiling, fence or other obstacles.
- Recommended installation height for indoor unit shall be at least 2.5 m.

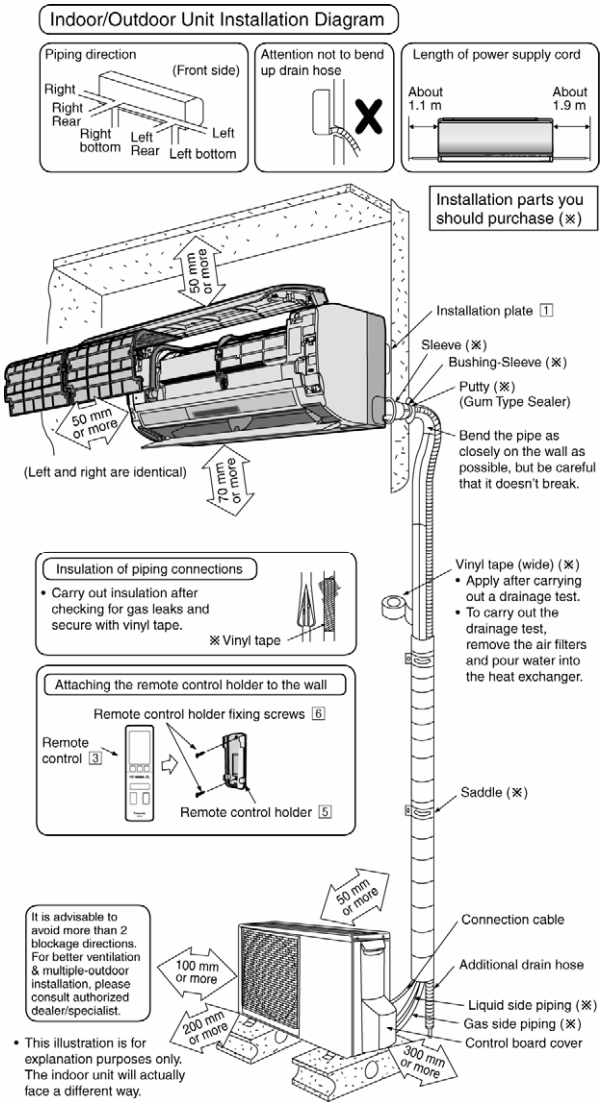
11.1.2 Outdoor Unit

- If an awning is built over the unit to prevent direct sunlight or rain, be careful that heat radiation from the condenser is not obstructed.
- There should not be any animal or plant which could be affected by hot air discharged.
- Keep the spaces indicated by arrows from wall, ceiling, fence or other obstacles.
- Do not place any obstacles which may cause a short circuit of the discharged air.
- If piping length is over the [piping length for additional gas], additional refrigerant should be added as shown in the table.

Model	Horse Power (HP)	Piping size		Std. Length (m)	Max Elevation (m)	Min. Piping Length (m)	Max. Piping Length (m)	Additional Refrigerant (g/m)	Piping Length for add. gas (m)
		Gas	Liquid						
VE9***	1.0HP	9.52 mm (3/8")	6.35 mm (1/4")	5	12	3	15	20	10
VE12***	1.5HP								

Example: For VE9***
If the unit is installed at 12 m distance, the quantity of additional refrigerant should be 40 g .... (12-10) m x 20 g/m = 40 g.

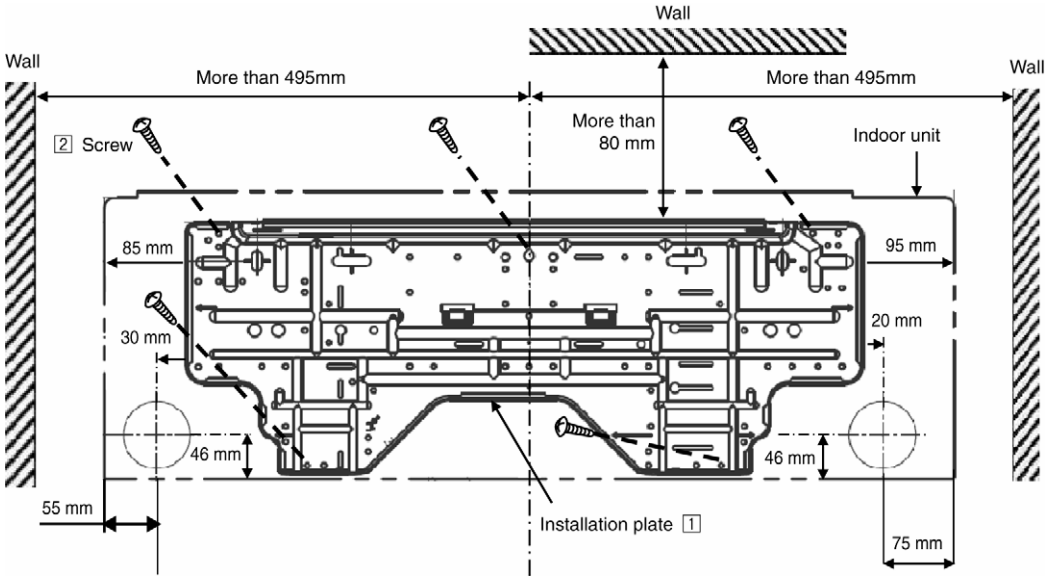
11.1.3 Indoor/Outdoor Unit Installation Diagram



11.2 Indoor Unit

11.2.1 How to Fix Installation Plate

The mounting wall shall be strong and solid enough to prevent it from the vibration.



The center of the installation plate should be at more than 495 mm at right and left of the wall.
The distance from installation plate edge to ceiling should more than 80 mm.

From installation plate left edge to unit's left side is 85 mm.
From installation plate right edge to unit's right is 95 mm.

1 Mount the installation plate on the wall with 5 screws or more (at least 5 screws).
(If mounting the unit on the concrete wall, consider using anchor bolts.)
   - Always mount the installation plate horizontally by aligning the marking-off line with the thread and using a level gauge.

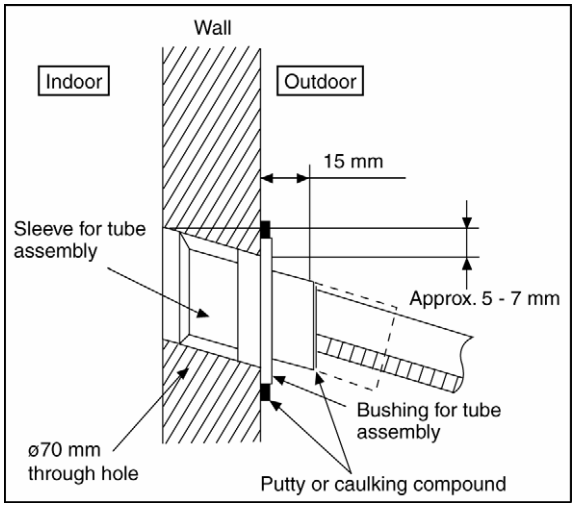
2 Drill the piping plate hole with ø70 mm hole-core drill.
   - The hole center of the right pipe is the meeting point of the following two lines, the 20 mm offset line from the vertical edge of the installation plate and the horizontally extended line of the side arrow on the plate. (see figure above).
   - The hole centre of the left pipe is the meeting point of the following two lines, the 30mm offset line from the vertical edge of the installation plate and the horizontally extended line of the side arrow on the plate. (see figure above).
   - Drill the piping hole at either the right or the left and the hole should be slightly slanted to the outdoor side.

11.2.2 To Drill a Hole in the Wall and Install a Sleeve of Piping

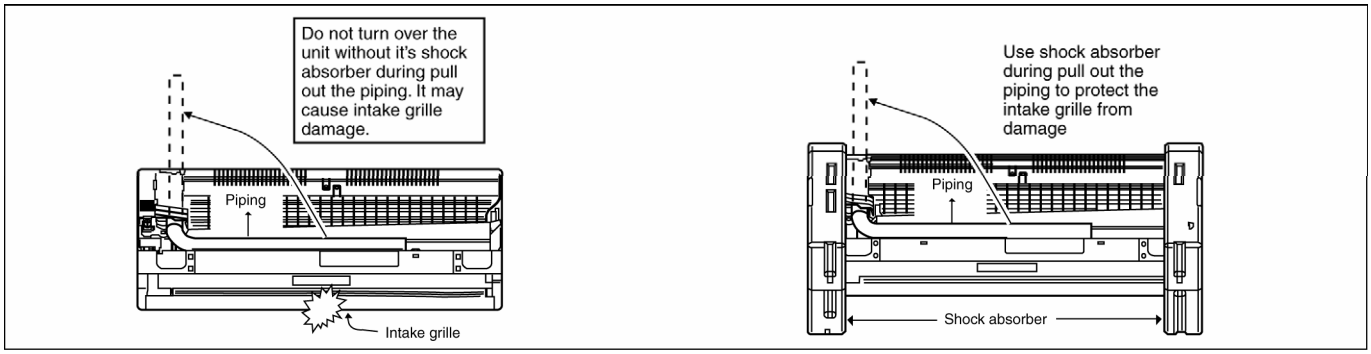
1 Insert the piping sleeve to the hole.
2 Fix the bushing to the sleeve.
3 Cut the sleeve until it extrudes about 15 mm from the wall.

> **⚠ CAUTION**
>
> When the wall is hollow, please be sure to use the sleeve for tube assembly to prevent dangers caused by mice biting the connection cable.

4 Finish by sealing the sleeve with putty or caulking compound at the final stage.



11.2.3 Indoor Unit Installation



11.2.3.1 For the Right Rear Piping

Step-1 Pull out the Indoor piping

Step-2 Install the Indoor Unit

Step-3 Secure the Indoor Unit

Step-4 Insert the connection cable

11.2.3.2 For the Right and Right Bottom Piping

Step-1 Pull out the Indoor piping

Step-2 Install the Indoor Unit

Step-3 Insert the connection cable

Step-4 Secure the Indoor Unit

11.2.3.3 For the Embedded Piping

Step-1 Replace the drain hose

Step-2 Bend the embedded piping

- Use a spring bender or equivalent to bend the piping so that the piping is not crushed.

Step-3 Pull the connection cable into Indoor Unit

- The inside and outside connection cable can be connected without removing the front grille.

Step-4 Cut and flare the embedded piping

- When determining the dimensions of the piping, slide the unit all the way to the left on the installation plate.
- Refer to the section "Cutting and flaring the piping".

Step-5 Install the Indoor Unit

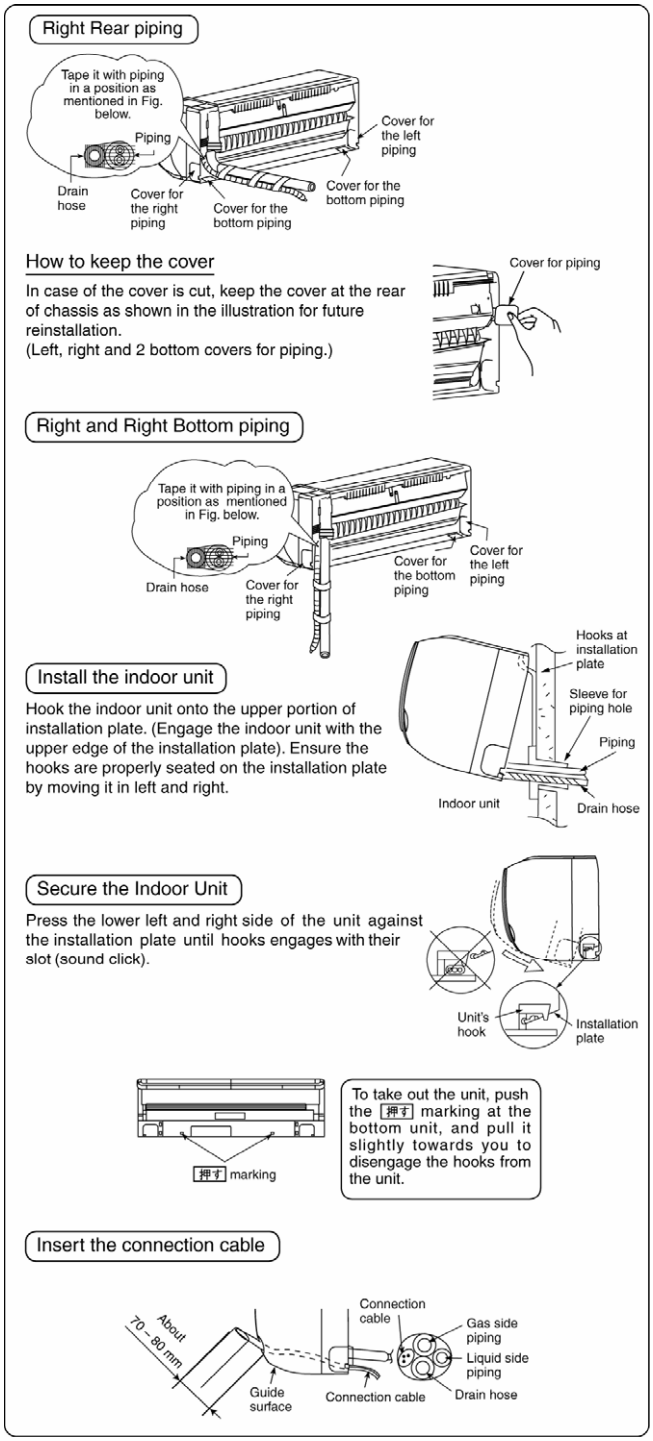
Step-6 Connect the piping

- Please refer to "Connecting the piping" column in outdoor unit section. (Below steps are done after connecting the outdoor piping and gas-leakage confirmation.)

Step-7 Insulate and finish the piping

- Please refer to "Insulation of piping connection" column as mentioned in indoor/outdoor unit installation.

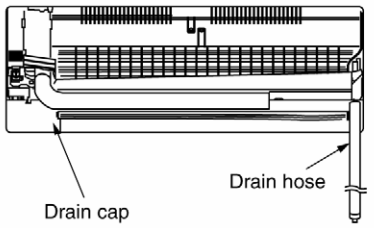
Step-8 Secure the Indoor Unit



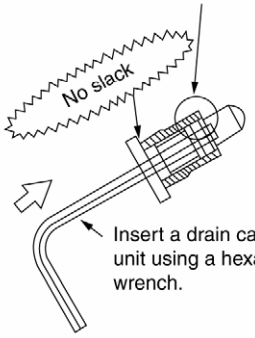
(This can be used for left rear piping and bottom piping also.)

Exchange the drain hose and the cap

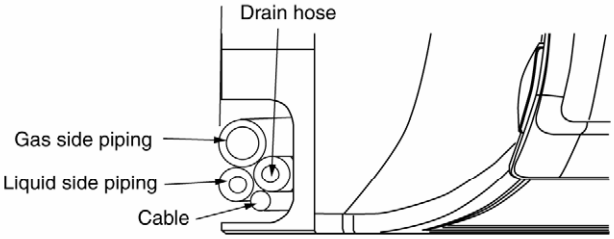
Rear view for left piping installation



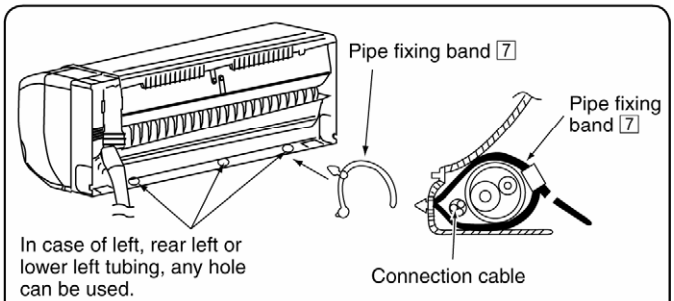
When inserting a drain cap into the unit, do not use a lubricant (such as refrigerating oil). This may cause damage and water leakage.



- In case of left piping how to insert the connection cable and drain hose.

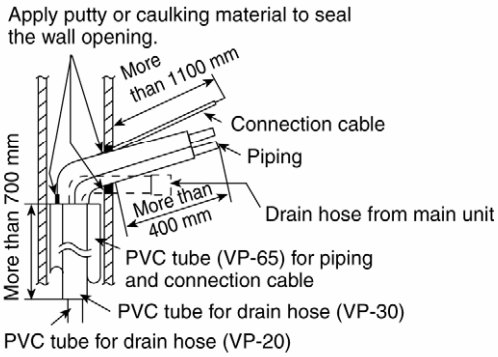


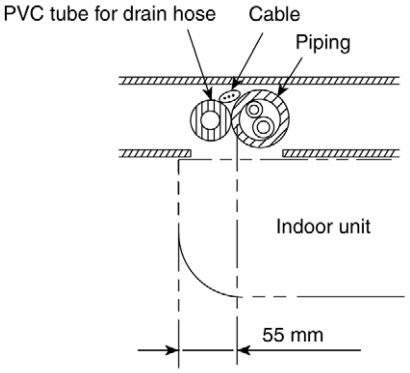
(For the right piping, follow the same procedure)



Cut off the excess hose clamp.
(Otherwise, it may cause abnormal noise or water leakage.)

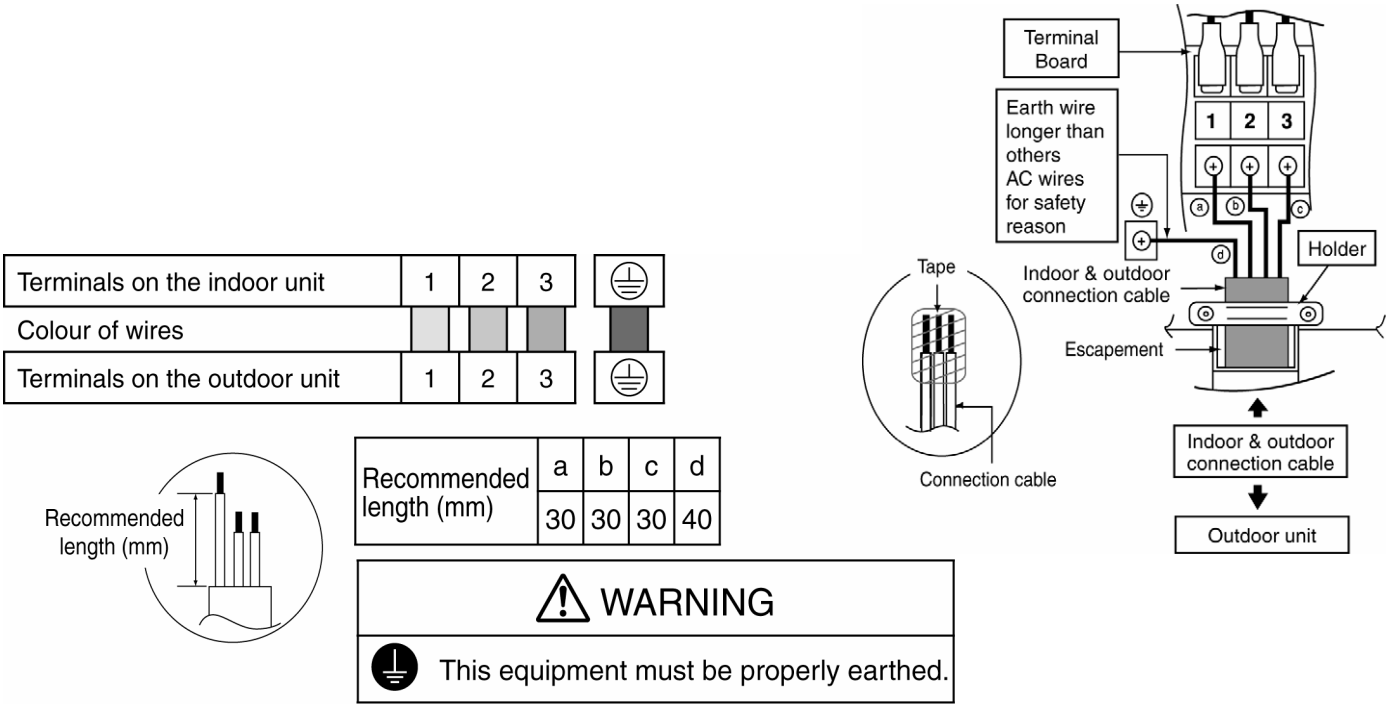
- How to pull the piping and drain hose out, in case of the embedded piping.





11.2.4 Connect the Cable to the Indoor Unit

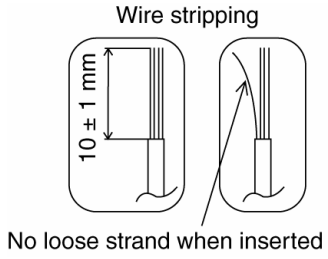
1 The inside and outside connection cable can be connected without removing the front grille.
2 **Connection cable** between indoor unit and outdoor unit shall be approved polychloroprene sheathed 4 x 1.5 mm^2 flexible cord, type designation 245 IEC 57 or heavier cord.
3 Bind all the indoor and outdoor connection cable with tape and route the connection cable via the escapement.
4 Remove the tapes and connect the connection cable between indoor unit and outdoor unit according to the diagram below.

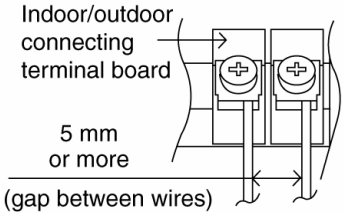


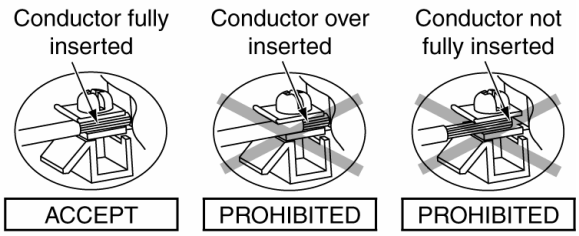
Note:

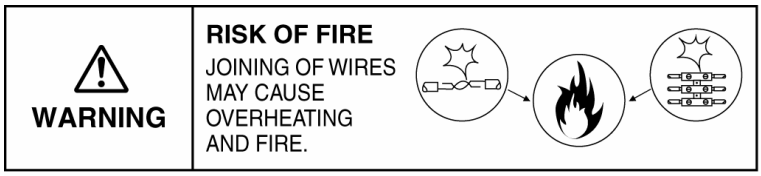
- Secure the connection cable onto the control board with the holder (clamper).
- Ensure the colour of wires of outdoor unit and the terminal Nos. are the same to the indoor's respectively.
- Earth wire shall be Yellow/Green (Y/G) in colour and longer than other AC wires for safety reason.

11.2.5 Wire Stripping and Connecting Requirement

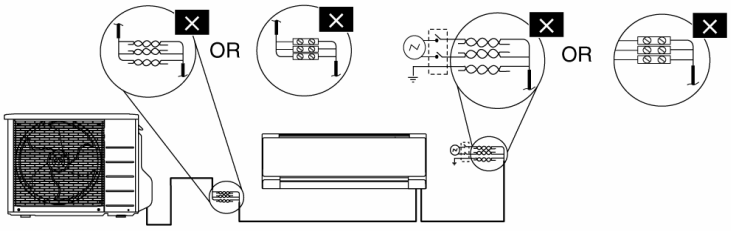


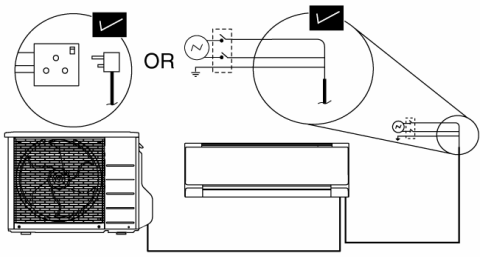






- Do not joint wires

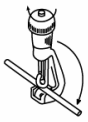




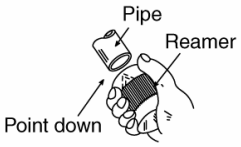
- Use complete wire without joining.
- Use approved socket and plug with earth pin.
- Wire connection in this area must follow to national wiring rules.

11.2.6 Cutting and Flaring the Piping

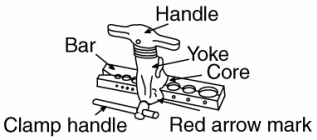
1 Please cut using pipe cutter and then remove the burrs.
2 Remove the burrs by using reamer. If burrs is not removed, gas leakage may be caused. Turn the piping end down to avoid the metal powder entering the pipe.
3 Please make flare after inserting the flare nut onto the copper pipes.



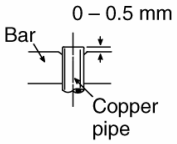
1. To cut

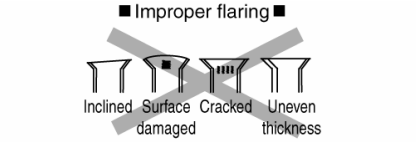


2. To remove burrs



3. To flare



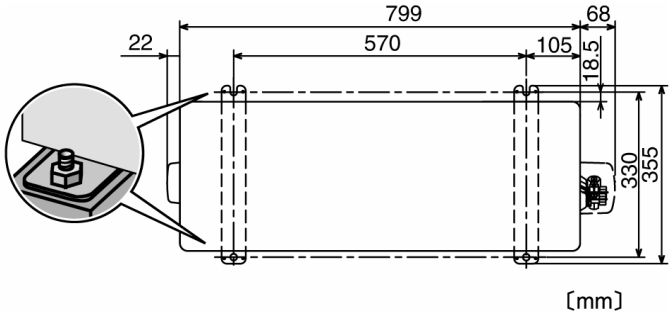


When properly flared, the internal surface of the flare will evenly shine and be of even thickness. Since the flare part comes into contact with the connections, carefully check the flare finish.

11.3 Outdoor Unit

11.3.1 Install the Outdoor Unit

- After selecting the best location, start installation according to Indoor/Outdoor Unit Installation Diagram.
  1 Install at least 3 cm above the ground. Do not install the unit on the floor.
  2 Fix the unit on concrete or rigid frame firmly and horizontally by bolt (ø10 mm). Install the outdoor unit in a level position and do not block the holes. Failure to do so may result in water leakage or accumulation.
  3 When installing at roof, please consider strong wind and earthquake. Please fasten the installation stand firmly with bolt or nails.

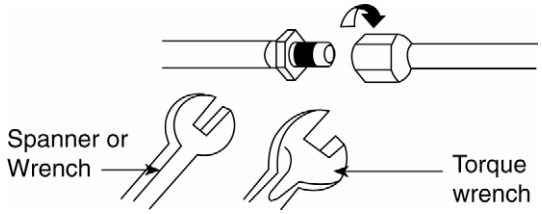


11.3.2 Connect the Piping

Connecting the Piping to Indoor Unit
Please make flare after inserting flare nut (locate at joint portion of tube assembly) onto the copper pipe. (In case of using long piping)

Connect the piping
- Align the center of piping and sufficiently tighten the flare nut with fingers.
- Further tighten the flare nut with torque wrench in specified torque as stated in the table.

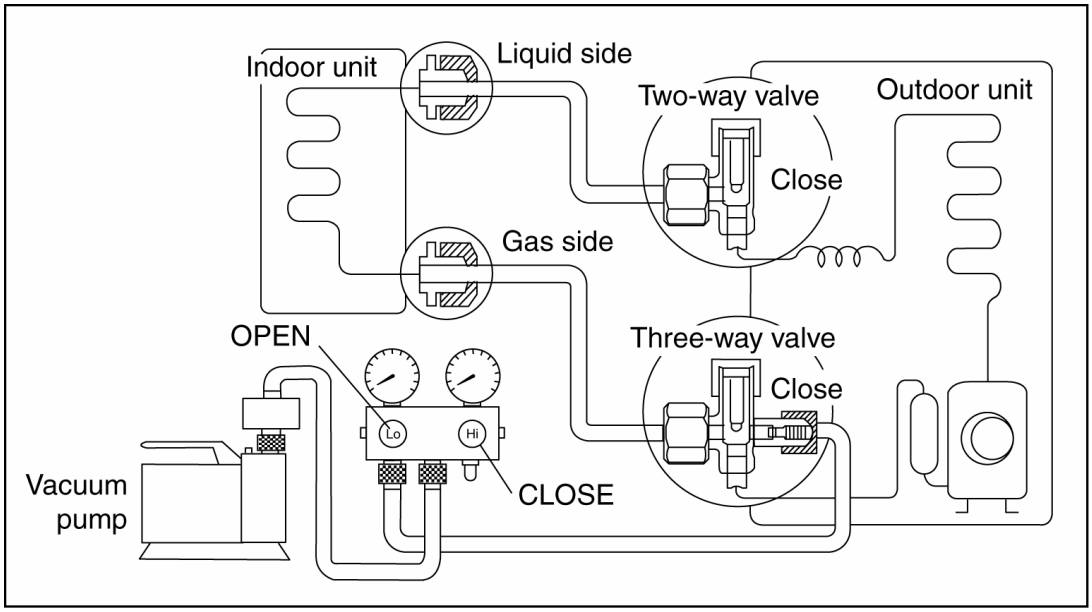
Connecting the Piping to Outdoor Unit
Decide piping length and then cut by using pipe cutter. Remove burrs from cut edge. Make flare after inserting the flare nut (locate at valve) onto the copper pipe. Align center of piping to valves and then tighten with torque wrench to the specified torque as stated in the table.



Do not overtighten, overtightening may cause gas leakage.	
Piping size	Torque
6.35 mm (1/4”)	[18 N•m (1.8 kgf.m)]
9.52 mm (3/8”)	[42 N•m (4.3 kgf.m)]
12.7 mm (1/2”)	[55 N•m (5.6 kgf.m)]
15.88 mm (5/8”)	[65 N•m (6.6 kgf.m)]
19.05 mm (3/4”)	[100 N•m (10.2 kgf.m)]

11.3.3 Evacuation of the Equipment

WHEN INSTALLING AN AIR CONDITIONER, BE SURE TO EVACUATE THE AIR INSIDE THE INDOOR UNIT AND PIPES in the following procedure.



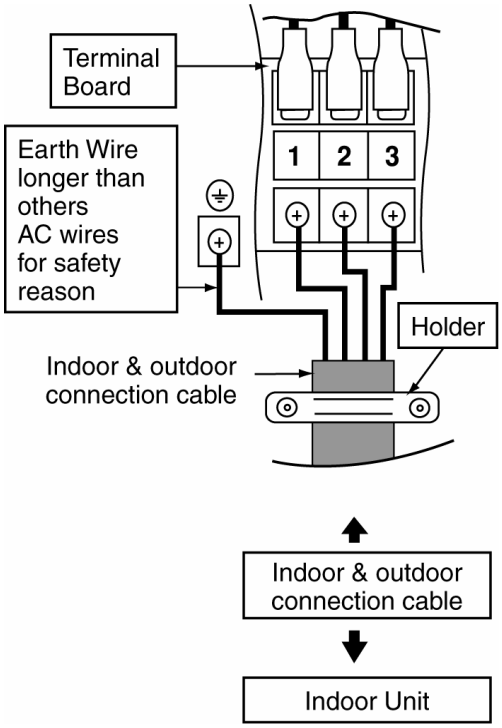
1 Connect a charging hose with a push pin to the Low side of a charging set and the service port of the 3-way valve.
   - Be sure to connect the end of the charging hose with the push pin to the service port.
2 Connect the center hose of the charging set to a vacuum pump.
3 Turn on the power switch of the vacuum pump and make sure that the needle in the gauge moves from 0 cmHg (0 MPa) to –76 cmHg (–0.1 MPa). Then evacuate the air approximately ten minutes.
4 Close the Low side valve of the charging set and turn off the vacuum pump. Make sure that the needle in the gauge does not move after approximately five minutes.
   Note : BE SURE TO TAKE THIS PROCEDURE IN ORDER TO AVOID REFRIGERANT GAS LEAKAGE.
5 Disconnect the charging hose from the vacuum pump and from the service port of the 3-way valve.
6 Tighten the service port caps of the 3-way valve at a torque of 18 N•m with a torque wrench.
7 Remove the valve caps of both of the 2-way valve and 3-way valve. Position both of the valves to “OPEN” using a hexagonal wrench (4 mm).
8 Mount valve caps onto the 2-way valve and the 3-way valve.
   - Be sure to check for gas leakage.

- If gauge needle does not move from 0 cmHg (0 MPa) to –76 cmHg (–0.1 MPa), in step ③ above take the following measure:
- If the leak stops when the piping connections are tightened further, continue working from step ③.
- If the leak does not stop when the connections are retightened, repair location of leak.
- Do not release refrigerant during piping work for installation and reinstallation.
- Take care of the liquid refrigerant, it may cause frostbite.

11.3.4 Connect the Cable to the Outdoor Unit

1 Remove the control board cover from the unit by loosening the screw.
2 **Connection cable** between indoor unit and outdoor unit shall be approved polychloroprene sheathed 4 x 1 .5 mm^2 flexible cord, type designation 245 IEC 57 or heavier cord.
3 Connect the connection cable between indoor unit and outdoor unit according to the diagram below.

Terminals on the indoor unit	1	2	3	⏚
Colour of wires				
Terminals on the outdoor unit	1	2	3	⏚



4 Secure the connection cable onto the control board with the holder.
5 Attach the control board cover back to the original position with screw.
6 For wire stripping and connection requirement, refer to instruction 11.2.5 of indoor unit.

⚠ WARNING
⏚ This equipment must be properly earthed.

Note:
- Isolating Devices (Disconnecting means) should have minimum 3.0 mm contact gap.
- Earth wire shall be Yellow/Green (Y/G) in colour and longer than other AC wires for safety reason.

11.3.5 Piping Insulation

1 Please carry out insulation at pipe connection portion as mentioned in Indoor/Outdoor Unit Installation Diagram. Please wrap the insulated piping end to prevent water from going inside the piping.
2 If drain hose or connecting piping is in the room (where dew may form), please increase the insulation by using POLY-E FOAM with thickness 6 mm or above.

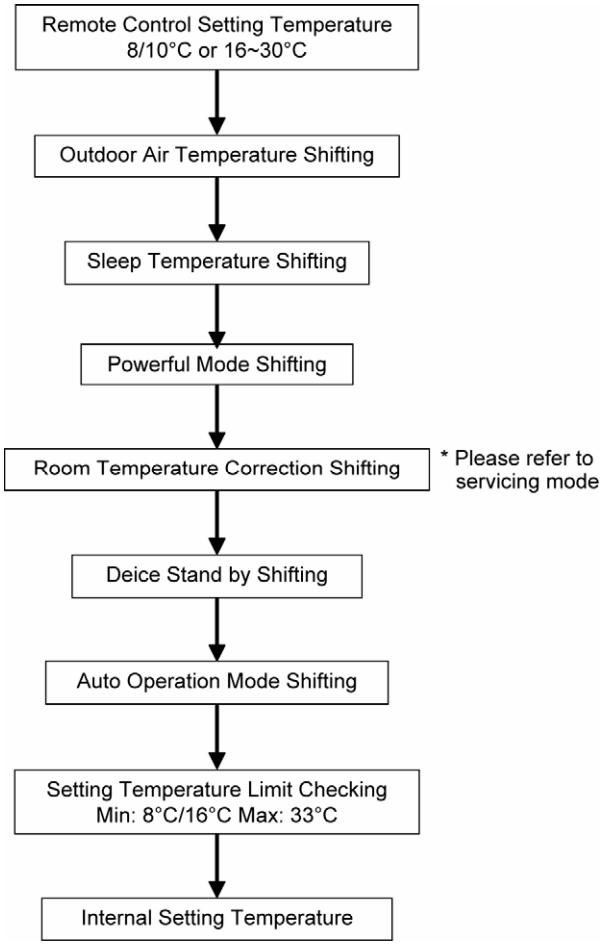
12. Operation Control

12.1 Basic Function

Inverter control, which equipped with a microcomputer in determining the most suitable operating mode as time passes, automatically adjusts output power for maximum comfort always. In order to achieve the suitable operating mode, the microcomputer maintains the set temperature by measuring the temperature of the environment and performing temperature shifting. The compressor at outdoor unit is operating following the frequency instructed by the microcomputer at indoor unit that judging the condition according to internal setting temperature and intake air temperature.

12.1.1 Internal Setting Temperature

Once the operation starts, remote control setting temperature will be taken as base value for temperature shifting processes. These shifting processes are depending on the air conditioner settings and the operation environment. The final shifted value will be used as internal setting temperature and it is updated continuously whenever the electrical power is supplied to the unit.



12.1.2 Cooling Operation

12.1.2.1 Thermostat Control

- Compressor is OFF when Intake Air Temperature - Internal Setting Temperature < -1.5°C continue for 3 minutes.
- Compressor is ON after waiting for 3 minutes, if the Intake Air Temperature - Internal Setting Temperature > Compressor OFF point.

12.1.3 Soft Dry Operation

12.1.3.1 Thermostat Control

- Compressor is OFF when Intake Air Temperature - Internal Setting Temperature < -2.5°C continue for 3 minutes.
- Compressor is ON after waiting for 3 minutes, if the Intake Air Temperature - Internal Setting Temperature > Compressor OFF point.

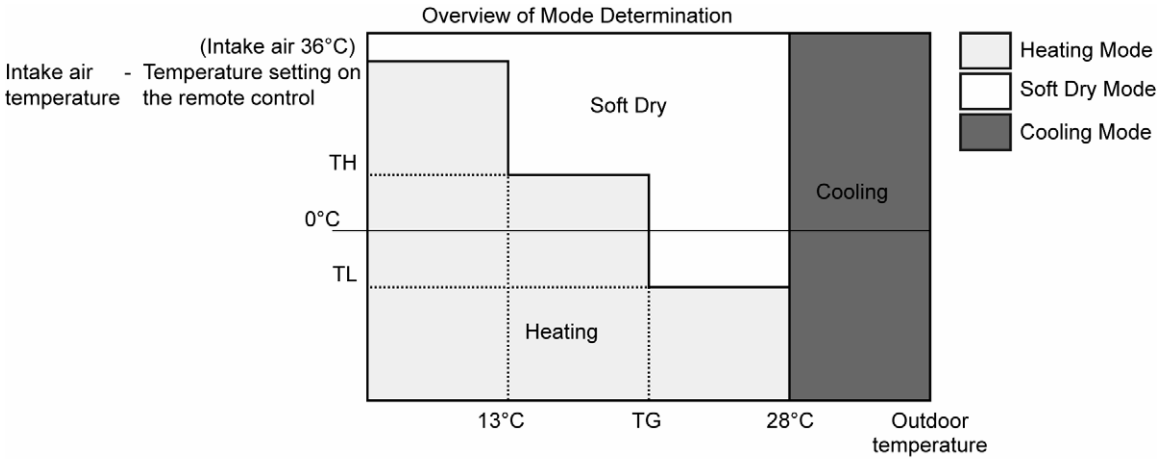
12.1.4 Heating Operation

12.1.4.1 Thermostat Control

- Compressor is OFF when Intake Air Temperature - Internal Setting Temperature > +2.0°C continue for 3 minutes.
- Compressor is ON after waiting for 3 minutes, if the Intake Air Temperature - Internal Setting Temperature < Compressor OFF point.

12.1.5 Automatic Operation

- This mode can be set using remote control and the operation is decided by remote control setting temperature, remote control operation mode, indoor intake air temperature and outdoor air temperature.
- During operation mode judgment, indoor fan motor (with speed of Lo-) and outdoor fan motor are running for 30 seconds to detect the indoor intake and outdoor air temperature. The operation mode is decided based on below chart.



TG	19°C	16°C	22°C
TH	3.5K	0.0K	5.0K
TL	-3.5K	-5.0K	-3.5K

Every 30 minutes, the indoor and outdoor temperature is judged.
The Auto Operation Mode shifting will take place whenever operation mode changed from Cooling/Soft Dry to Heating or vice versa.

12.2 Indoor Fan Motor Operation

12.2.1 CS-VE9NKE

——— Indicates the changeable range using the remote control

				Stop	SSLo	SLo	Quiet Lo	Lo-	Lo	Me-	Me	Hi	SHi
COOL / COOL Range	Fan speed: Manual			O	480	540	580	580	660	820	980	1100 ~ 1180	---
	Fan speed: Auto	Normal (with programmed air)		O	Outside temperature is below 35°C or Neuro is stable.					Outside temperature is 35°C or higher and Neuro is unstable.			
					MIN 590 ± 50 ~ 860 ± 50rpm					940 ± 50rpm			
		Initial airflow	Powerful		1230 (SHi) (1180 when the setting is changed from Hi to Powerful on the remote control.)								
			Long Right/Left		1290 (SHi) (1180 when the setting is changed from Hi to Long on the remote control.)								
			Long Other than Right/Left		1250 (SHi) (1180 when the setting is changed from Hi to Long on the remote control.)								
			When the area control is in operation		980								
		Airflow stable / unstable	Powerful		640 ←——→ 1030								
			Long Right/Left		660 ←——→ 1070								
			Long Other than Right/Left		660 ←——→ 1050								
			When the area control is in operation		(※1) 640 ←——→ 1030								
COOL DRY Range		Normal	Cool dry	O	Range ② 540 Range ① 660								
		Initial airflow	Powerful/Long		660								
			When the area control is in operation		980								
		Airflow stable / unstable	Powerful/Long		540 ←——→ 760								
			When the area control is in operation		(※1) 540 ←——→ 760								
Full Dry	Fan speed: Manual			O	---	---	550	---	690	790	890	990	---
	Fan speed: Auto	Normal			710								
		Powerful / Long	At the start of operation		1230								
			Not at the start of operation		1090								
		When the area control is in operation			Min. rotation speed for each of the following fields								
		Clothes drying			1230								
HEAT	Fan speed: Manual			O	380	540	650	650	730	890	1050	1240 ~ 1300	---
	Fan speed: Auto	Normal	Unstable		830 ←——→ 1100								
			Stable		910 ←——→ 1100								
		Initial airflow	Powerful		830 ←——→ 1220 (1300 when the setting is changed from Hi to Powerful on the remote control.)								
			Long Right/Left		830 ←——→ 1400 (1300 when the setting is changed from Hi to Long on the remote control.)								
			Long Other than Right/Left		830 ←——→ 1240 (1300 when the setting is changed from Hi to Long on the remote control.)								
			When the area control is in operation		830 ←——→ 1220								
		Airflow stable / unstable	Powerful		950 ←——→ 1050								
			Long Right/Left		970 ←——→ 1090								
			Long Other than Right/Left		970 ←——→ 1070								
			When the area control is in operation		(※1) 950 ←——→ 1050								
Hot Dry					max 730								
Individual ventilation / NANOE			Fan speed: Manual	O			580		660	820	980	1150	---
			Fan speed: Auto		500								
Odor Cut Shift Only for the COOL and COOL range					Below Lo: No shifting Below Me and fan speed auto: 20 Me and above: 90								

* Lock detection: When the rotation speed of 2550rpm and above or below 50rpm is detected for 10 consecutive seconds during the feedback control, H19 is indicated (the TIMER indicator flashes) if normal rotation speed is not detected even after the retry is performed 7 times.
* Refer to the attached list of “Indoor Unit Fan Operation Status” for the operations of the indoor unit fan while the thermostat is OFF.

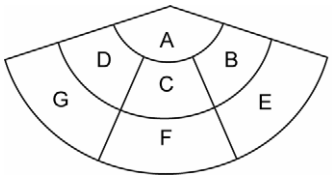
(※1) When the area control is in operation, the minimum rotation speed is limited as outlined below depending on the human position area.

COOL & COOL DRY	Same as the fan speed in the powerful mode. When the airflow is stable, the minimum rotation speed is limited to "①+②+③+④" as in the table below.
HEAT	Same as the fan speed in the powerful mode. In the range where the airflow is stable and the pipe temperature is high, the minimum rotation speed is limited to "①+③+④" as in the table below.
FULL DRY	The rotation speed is fixed at "①+②+③+④" as in the table below.

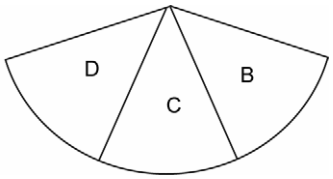
Min. rotation speed for each field

The minimum rotation speed is limited based on the following area information.

Three-sensor models



Two-sensor models



	Corresponding Area
Field 1	A
Field 2	B, D
Field 3	C
Field 4	E, G
Field 5	F

①

	COOL	COOL DRY	REHEAT DRY	HEAT
Field 1	--	--	--	--
Field 2	840	670	680	940
Field 3	800	630	640	920
Field 4	--	--	--	--
Field 5	--	--	--	--

② During the ceiling airflow, a correction is performed for the minimum rotation speed as follows.

In COOL or COOL DRY mode	In REHEAT DRY mode
100	100

③ When making the air blow towards human body/object, a correction is performed for the minimum rotation speed as follows.

In COOL or COOL DRY mode	In REHEAT DRY mode
60	60

④ When making the air blow to avoid human body/object, a correction is performed for the minimum rotation speed as follows.

In COOL or COOL DRY mode	In REHEAT DRY mode	In HEAT mode
0	0	40

12.2.2 CS-VE12NKE

Indicates the changeable range using the remote control

				Stop	SSLo	SLo	Quiet Lo	Lo-	Lo	Me-	Me	Hi	SHi
COOL / COOL Range	Fan speed: Manual			O	480	640	650	650	730	870	1010	1100 ~ 1190	---
	Fan speed: Auto	Normal (with programmed air)		O	Outside temperature is below 35°C or Neuro is stable.					Outside temperature is 35°C or higher and Neuro is unstable.			
					MIN 640 ± 50 ~ 910 ± 50rpm					970 ± 50rpm			
		Initial airflow	Powerful		1240 (SHi) (1190 when the setting is changed from Hi to Powerful on the remote control.)								
			Long Right/Left		1300 (SHi) (1190 when the setting is changed from Hi to Long on the remote control.)								
			Long Other than Right/Left		1260 (SHi) (1190 when the setting is changed from Hi to Long on the remote control.)								
			When the area control is in operation		1010								
		Airflow stable / unstable	Powerful		710 ←——→ 1040								
			Long Right/Left		730 ←——→ 1080								
			Long Other than Right/Left		730 ←——→ 1060								
			When the area control is in operation		(※1) 710 ←——→ 1040								
COOL DRY Range		Normal	Cool dry	O	Range ② 640 Range ① 730								
		Initial airflow	Powerful/Long		730								
			When the area control is in operation		1010								
		Airflow stable / unstable	Powerful/Long		640 ←——→ 830								
			When the area control is in operation		(※1) 640 ←——→ 830								
Full Dry	Fan speed: Manual			O	---	---	550	---	690	790	890	990	---
	Fan speed: Auto	Normal			750								
		Powerful / Long	At the start of operation		1230								
			Not at the start of operation		1090								
		When the area control is in operation			Min. rotation speed for each of the following fields								
		Clothes drying			1230								
HEAT	Fan speed: Manual			O	380	540	720	720	820	960	1100	1240 ~ 1340	---
	Fan speed: Auto	Normal	Unstable		920 ←——→ 1140								
			Stable		940 ←——→ 1140								
		Initial airflow	Powerful		920 ←——→ 1260 (1340 when the setting is changed from Hi to Powerful on the remote control.)								
			Long Right/Left		920 ←——→ 1440 (1340 when the setting is changed from Hi to Long on the remote control.)								
			Long Other than Right/Left		920 ←——→ 1280 (1340 when the setting is changed from Hi to Long on the remote control.)								
			When the area control is in operation		920 ←——→ 1260								
		Airflow stable / unstable	Powerful		980 ←——→ 1100								
			Long Right/Left		1000 ←——→ 1140								
			Long Other than Right/Left		1000 ←——→ 1120								
			When the area control is in operation		(※1) 980 ←——→ 1100								
Hot Dry					max 820								
Individual ventilation / NANOE			Fan speed: Manual	O			650		730	870	1010	1160	---
			Fan speed: Auto		500								
Odor Cut Shift Only for the COOL and COOL range					Below Lo: No shifting Below Me and fan speed auto: 20 Me and above: 90								

* Lock detection: When the rotation speed of 2550rpm and above or below 50rpm is detected for 10 consecutive seconds during the feedback control, H19 is indicated (the TIMER indicator flashes) if normal rotation speed is not detected even after the retry is performed 7 times.
* Refer to the attached list of “Indoor Unit Fan Operation Status” for the operations of the indoor unit fan while the thermostat is OFF.

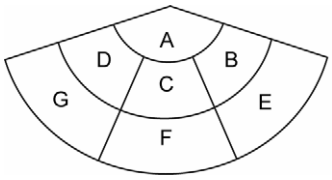
(※1) When the area control is in operation, the minimum rotation speed is limited as outlined below depending on the human position area.

COOL & COOL DRY	Same as the fan speed in the powerful mode. When the airflow is stable, the minimum rotation speed is limited to "①+②+③+④" as in the table below.
HEAT	Same as the fan speed in the powerful mode. In the range where the airflow is stable and the pipe temperature is high, the minimum rotation speed is limited to "①+③+④" as in the table below.
FULL DRY	The rotation speed is fixed at "①+②+③+④" as in the table below.

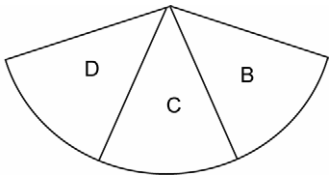
Min. rotation speed for each field

The minimum rotation speed is limited based on the following area information.

Three-sensor models



Two-sensor models



	Corresponding Area
Field 1	A
Field 2	B, D
Field 3	C
Field 4	E, G
Field 5	F

①

	COOL	COOL DRY	REHEAT DRY	HEAT
Field 1	--	--	--	--
Field 2	840	670	680	940
Field 3	800	630	640	920
Field 4	--	--	--	--
Field 5	--	--	--	--

② During the ceiling airflow, a correction is performed for the minimum rotation speed as follows.

In COOL or COOL DRY mode	In REHEAT DRY mode
100	100

③ When making the air blow towards human body/object, a correction is performed for the minimum rotation speed as follows.

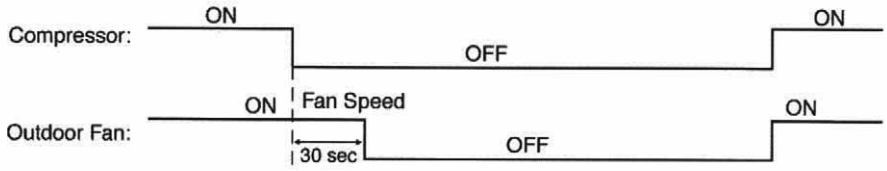
In COOL or COOL DRY mode	In REHEAT DRY mode
60	60

④ When making the air blow to avoid human body/object, a correction is performed for the minimum rotation speed as follows.

In COOL or COOL DRY mode	In REHEAT DRY mode	In HEAT mode
0	0	40

12.3 Outdoor Fan Motor Operation

Outdoor fan motor is operated with one fan speed only. It starts when compressor starts operation and it stops 30 seconds after compressor stops operation.



12.4 Airflow Direction

- There are two types of airflow, vertical airflow (directed by horizontal vane) and horizontal airflow (directed by vertical vanes).
- Control of airflow direction can be automatic (angles of direction is determined by operation mode, heat exchanger temperature and intake air temperature) and manual (angles of direction can be adjusted using remote control).

12.4.1 Vertical Airflow

<table>
<tr><td colspan="2" rowspan="3"></td><td colspan="5">Vertical Airflow Direction Louver</td></tr>
<tr><td rowspan="2">Airflow direction: Manual</td><td colspan="4">Airflow direction: Auto</td></tr>
<tr><td>Normal</td><td>Powerful</td><td>Long</td><td>Sensor
Normal</td></tr>
<tr><td colspan="2">AUTO</td><td colspan="5">According to each mode</td></tr>
<tr><td rowspan="3">HEAT</td><td>Discharge temperature is high.</td><td rowspan="3">1-4: Preset angle (10-50°)
5: Preset angle 60°
(57° when there is no airflow towards feet.)</td><td colspan="4">35°</td></tr>
<tr><td>Discharge temperature is medium.</td><td colspan="2">2.2 ~ 3.6kW : 57°
4.0 ~ 5.6kW : 51°
6.3 ~ 7.1kW : 48°</td><td>Horizontal airflow direction
When “Front, Spot or Wide” is set:
40°

When “Slightly Right or Slightly Left” is set:
40°

When “Right or Left” is set:
68° (upper louver)
60° (lower louver)</td><td>3.6kW or below: 60°
(Slightly upward when there is no airflow towards feet.)
When the furniture position has been set on the remote control, the airflow direction is set upward according to the setting.

4.0kW and above: Human detecting direction
When the furniture position has been set on the remote control, the airflow direction is set upward according to the setting.
When the human detection sensor detects an obstacle automatically, the airflow direction is set upward according to the detection.</td></tr>
<tr><td>Discharge temperature is low.</td><td colspan="4">10°</td></tr>
<tr><td colspan="2" rowspan="2">COOL</td><td rowspan="2">1: Ceiling airflow
2-5: Preset angle (10-50°)</td><td>Unstable: 10-40° (Swing)</td><td>Initial airflow: 30°</td><td rowspan="2">Horizontal airflow direction
When “Front, Spot or Wide” is set:
20°

When “Slightly Right or Slightly Left” is set:
30°

When “Right or Left” is set:
66° (upper louver)
60° (lower louver)</td><td>Airflow unstable: Human detecting direction
3.6kW or below:
When the furniture position has been set on the remote control, the airflow direction is set upward according to the setting.

4.0kW and above:
When the furniture position has been set on the remote control, the airflow direction is set upward according to the setting.
When the human detection sensor detects an obstacle automatically, the airflow direction is set upward according to the detection.</td></tr>
<tr><td>Stable: 10-35° (Swing)</td><td>Other than initial airflow: 10°</td><td>Airflow stable: Ceiling airflow</td></tr>
<tr><td colspan="2">COOL DRY

Mild Dry Cooling
(For the models of 6.3kW and above only)</td><td>1: Ceiling airflow
2-5: Preset angle (10-40°)</td><td colspan="2">Ceiling airflow
(No powerful setting for Mild Dry Cooling)</td><td rowspan="3">No setting is available.

Louver direction can be set when the “Auto Comfort” is set.
At this time, the angle is the same as the Cool Long mode if the mode set is other than the HEAT mode.</td><td>Drying unstable: Human detecting direction
3.6kW or below:
When the furniture position has been set on the remote control, the airflow direction is set upward according to the setting.

4.0kW and above:
When the furniture position has been set on the remote control, the airflow direction is set upward according to the setting.
When the human detection sensor detects an obstacle automatically, the airflow direction is set upward according to the detection.</td></tr>
<tr><td colspan="5">Drying stable: Ceiling airflow</td></tr>
<tr><td colspan="2" rowspan="2">DRY</td><td rowspan="2">Same as the manual setting in COOL mode.</td><td rowspan="2">Ceiling airflow</td><td>Initial airflow: 30°</td><td rowspan="2">Ceiling airflow</td></tr>
<tr><td>Other than initial airflow: Ceiling airflow</td></tr>
</table>

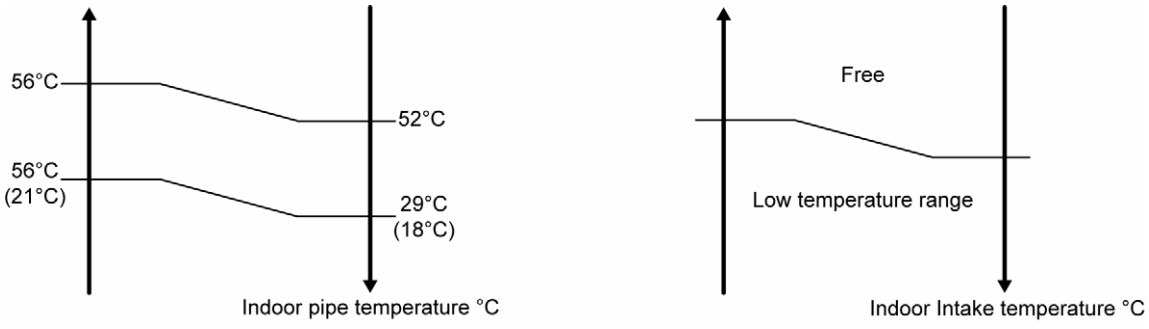
12.4.2 Horizontal Airflow

- Automatic horizontal airflow direction can be set using remote control; the vane swings left and right within the angles as stated below.

Left vane/right vane

During Manual Setting				1	2	3	4	5	6	7	At air-conditioning Area
During Auto Setting Condition				Middle Setting			Right Setting		Left Setting		
Heating Operation	Auto	C Area		0° / 0°							
		B Area	Normal: Neuro Balance	-10° ~ 10° / 10° ~ -10° (~2.8kw) -5° ~ 5° / 5° ~ -5° (4.0kw~)			-35° ~ -15° / 15° ~ 35°		15° ~ 35° / -35° ~ -15°		Human detection direction (It is suitable in the direction which detect people in the following area) (Detect 9 area left and right for 2.8kW below model)
			Normal: Neuro Unbalance	0° / 0°			-25° / 25°		25° / -25°		
			Powerful: Initial	Same with normal neuro unbalance							
			Powerful: Balance / Unbalance	0° / 0°			-30° / 30°		30° / -30°		
		A Area		-40° / -40°			40° / -40°		-40° / 40°		Same with during auto normal neuro balance time
	Manual	Middle Setting		0° / 0°	20° / 20°	-30° / -30°	-40° / 40°	-30° / 0°	0° / -30°	40° / -40°	
		Right Setting					-40° / 50°			40° / -40°	
		Left Setting					-40° / 40°			50° / -40°	
Cooling Operation	Auto	Initial Powerful		0° / 0°			-10° / 10°		10° / -10°		Human detection direction (It is suitable in the direction which detect people in the following area) (Detect 9 area left and right for 2.8kW below model)
		Normal, other than above		-35° ~ 35° / -35° ~ 35°			-35° ~ 0° / 0° ~ 35°		0° ~ 35° / -35° ~ 0°		
	Manual	Normal		0° / 0°	20° / 20°	-35° / -35°	-35° / 35°	-35° / 0°	0° / -35°	35° / -35°	
Soft Dry		Auto		Same as normal cooling auto operation							Human Detection Direction
		Manual		Same as normal cooling manual operation							

* Airflow direction during Auto



() Indoor pipe temperature during Hi and Quiet fan

12.5 Quiet Operation

- Purpose
  - To provide quiet cooling operation compare to normal operation.

- Control condition
  - Quiet operation start condition
    - When “QUIET” button at remote control is pressed.

  - Quiet operation stop condition
    - When one of the following conditions is satisfied, quiet operation stops:
      - QUIET button is pressed again.
      - Stop by OFF/ON switch.
      - Timer “off” activates.
      - AUTO COMFORT button is pressed.
      - ECONAVI button is pressed.
    - When quiet operation is stopped, operation is shifted to normal operation with previous setting.
    - When fan speed is changed, quiet operation is shifted to quiet operation of the new fan speed.
    - When operation mode is changed, quiet operation is shifted to quiet operation of the new mode.
    - During quiet operation, if timer “on” activates, quiet operation maintains.
    - After off, when on back, quiet operation is not memorised.

- Control contents
  - Fan speed is changed from normal setting to quiet setting of respective fan speed.
    This is to reduce sound of Hi, Me, Lo for 3dB (some models more than 3dB).
  - Fan speed for quiet operation is reduced from setting fan speed.

12.6 Powerful Mode Operation

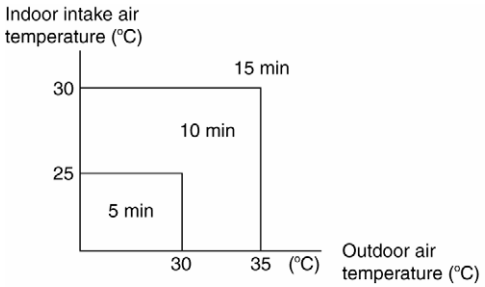
- When the powerful mode is selected, the internal setting temperature will shift lower up to 1°C (for Cooling/Soft Dry) or higher up to 1.66°C (for Heating) than remote control setting temperature for 20 minutes to achieve the setting temperature quickly.

12.7 Timer Control

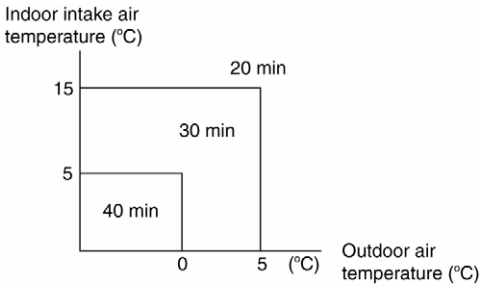
- There are 2 sets of ON and OFF timer available to turn the unit ON or OFF at different preset time.
- If more than one timer had been set, the upcoming timer will be displayed and will activate in sequence.

12.7.1 ON Timer Control

- ON timer 1 and ON timer 2 can be set using remote control, the unit with timer set will start operate earlier than the setting time.
  This is to provide a comfortable environment when reaching the set ON time.
- 60 minutes before the set time, indoor (at fan speed of Lo-) and outdoor fan motor start operate for 30 seconds to determine the indoor intake air temperature and outdoor air temperature in order to judge the operation starting time.
- From the above judgment, the decided operation will start operate earlier than the set time as shown below.



Cooling/Soft Dry



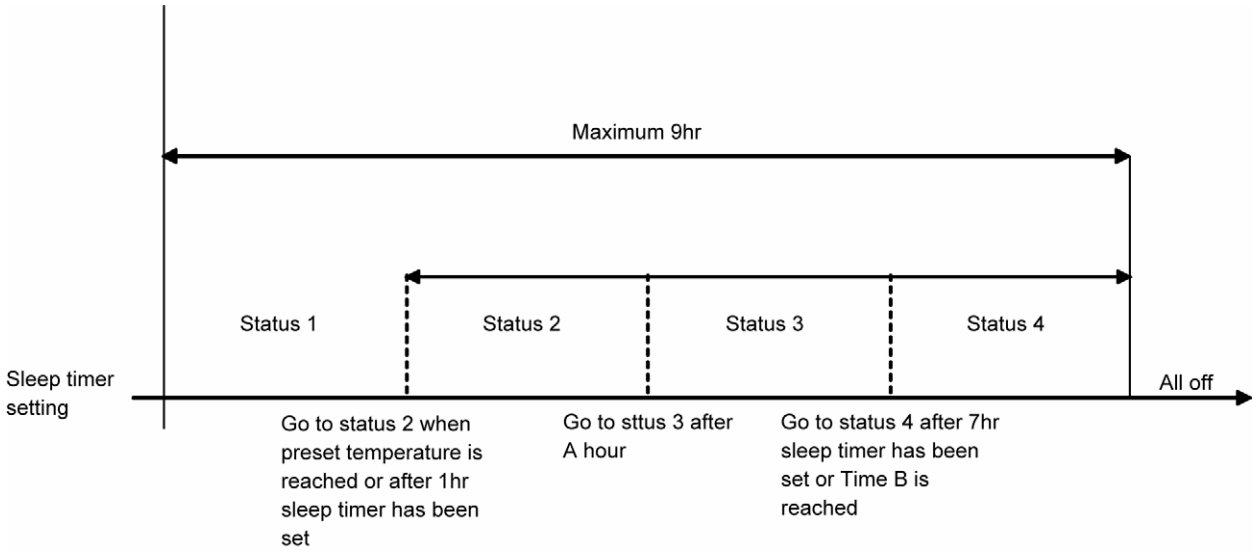
Heating

12.7.2 OFF Timer Control

OFF timer 1 and OFF timer 2 can be set using remote control, the unit with timer set will stop operate at set time.

12.7.3 Sleep Timer

- Sleep operation is performed according to the delay OFF time (0.5, 1, 2, 3, 5, 7 or 9 hr) and provide comfortable environment by shifting set temperature.



	Heating	Cooling, Dry
A	2hr	3hr
B	*5am	*4am

* According to remote control clock

Temperature Shift

		Status 1	Status 2	Status 3	Status 4
Set temperature (°C)	Cooling	0	+1	+2	+3
	Heating	0	-1	-2	-3

Stop condition
- Reached delay time.
- Pressed sleep button to cancel.
- Unit is OFF.

12.8 Auto Restart Control

- When the power supply is cut off during the operation of air conditioner, the compressor will re-operate within three to four minutes (there are 10 patterns between 2 minutes 58 seconds and 3 minutes 52 seconds to be selected randomly) after power supply resumes.
- This type of control is not applicable during ON/OFF Timer setting.
- This control can be omitted by open the circuit of JP1 at indoor unit printed circuit board.

12.9 Indication Panel

LED	POWER	TIMER	+8/10°C HEAT	nanoe-G	ECONAVI
Color	Green	Orange	Green	Blue	Green
Light ON	Operation ON	Timer Setting ON	+8/10°C HEAT Mode ON	nanoe-G ON	ECONAVI ON
Light OFF	Operation OFF	Timer Setting OFF	+8/10°C HEAT Mode OFF	nanoe-G OFF	ECONAVI OFF

Note:
- If POWER LED is blinking, the possible operation of the unit are Hot Start, during Deice operation, operation mode judgment, or ON timer sampling.
- If Timer LED is blinking, there is an abnormality operation occurs.

12.10 nanoe-G Operation

- This operation provides clean air by producing great amount of negative ions and distribute through the discharge airflow to capture or deactivate molds, bacteria or viruses.

- nanoe-G ON/OFF condition

<table>
<tr><th>Priority</th><th colspan="2">Item</th><th>Output</th></tr>
<tr><td rowspan="5">1</td><td colspan="2">“No NANOE-G” is selected during model selection.</td><td rowspan="5">OFF</td></tr>
<tr><td colspan="2">During Demo mode</td></tr>
<tr><td colspan="2">Two-way communications on remote control</td></tr>
<tr><td colspan="2">NANOE-G connector open</td></tr>
<tr><td colspan="2">NANOE-G error (circuit error & abnormal discharge detection)</td></tr>
<tr><td rowspan="2">2</td><td colspan="2">Inspection mode NANOE-G ON command</td><td>ON</td></tr>
<tr><td colspan="2">Inspection mode NANOE-G OFF command</td><td>OFF</td></tr>
<tr><td rowspan="4">3</td><td colspan="2">No “NANOE-G” setting on the remote control</td><td rowspan="4">OFF</td></tr>
<tr><td colspan="2">Operation status: OFF</td></tr>
<tr><td colspan="2">During NANOE-G restart prohibiting time
(Prohibiting time is set in the case of abnormal discharge and room temperature of 40°C and above. Details will be provided later.)</td></tr>
<tr><td colspan="2">During FM OFF; or FM rotation speed is less than 490 rpm</td></tr>
<tr><td rowspan="3">4</td><td rowspan="2">Ordinary vertical louver selected; or Airflow direction is not set to ceiling airflow or DOWN ※</td><td>Less than 60 minutes have elapsed since the start of Powerful individual fan operation.</td><td>ON</td></tr>
<tr><td>Other than above</td><td rowspan="2">ON/OFF intermittent output as mentioned below</td></tr>
<tr><td colspan="2">Twin louver is selected; or airflow direction is ceiling airflow or DOWN ※</td></tr>
</table>

※ ON/OFF intermittent output

- nanoe-G operation pause condition
  - When indoor fan stop (during deice, odor cut control, thermostat off, etc.). nanoe-G operation resume after indoor fan restarts.
  - When indoor intake temperature ≥ 40°C. nanoe-G operation resume after indoor intake temperature ≤ 40°C continuously for 30 minutes.

- Indoor fan control
  - During any operation mode combines with nanoe-G operation, fan speed follows respective operation mode. However, nanoe-G system enabled when fan speed ≥ 490 rpm to ensure proper negative ion distribution, nanoe-G system disabled when fan speed < 490 rpm.

- Airflow direction control
  - During any operation mode combines with nanoe-G operation, airflow direction follows respective operation mode.
  - During nanoe-G individual operation, only Auto Air Swing is allowed. Even if Air Swing button is pressed, no signal is sent to the unit and no change on remote control display.

- Timer control
  - When ON Timer activates when unit stops, previous operation resumes and restored last saved nanoe-G operation status.
  - When ON Timer activates during any operation, no change on current operation.
  - When OFF Timer activates during any operation, all operation stops and the latest nanoe-G operation status is saved.

- Indicator
  - When nanoe-G starts, nanoe-G indicator ON.

- Remote Control Receiving Sound
  - Normal Operation ➔ nanoe-G Operation : Beep
  - Nanoe-G Operation ➔ Normal Operation : Beep
  - Stop ➔ nanoe-G individual Operation : Beep
  - Nanoe-G individual Operation ➔ Stop : Long Beep

- Power failure
  - During nanoe-G individual operation, if power failure occurs, after power resumes, nanoe-G individual operation resumes immediately.
  - During combination operation, if power failure occurs, after power resumes, combination operation resume immediately.
  - nanoe-G operation status is not memorized after OFF the unit. After OFF the unit, when the operation is ON again, air conditioner operates with nanoe-G operation.

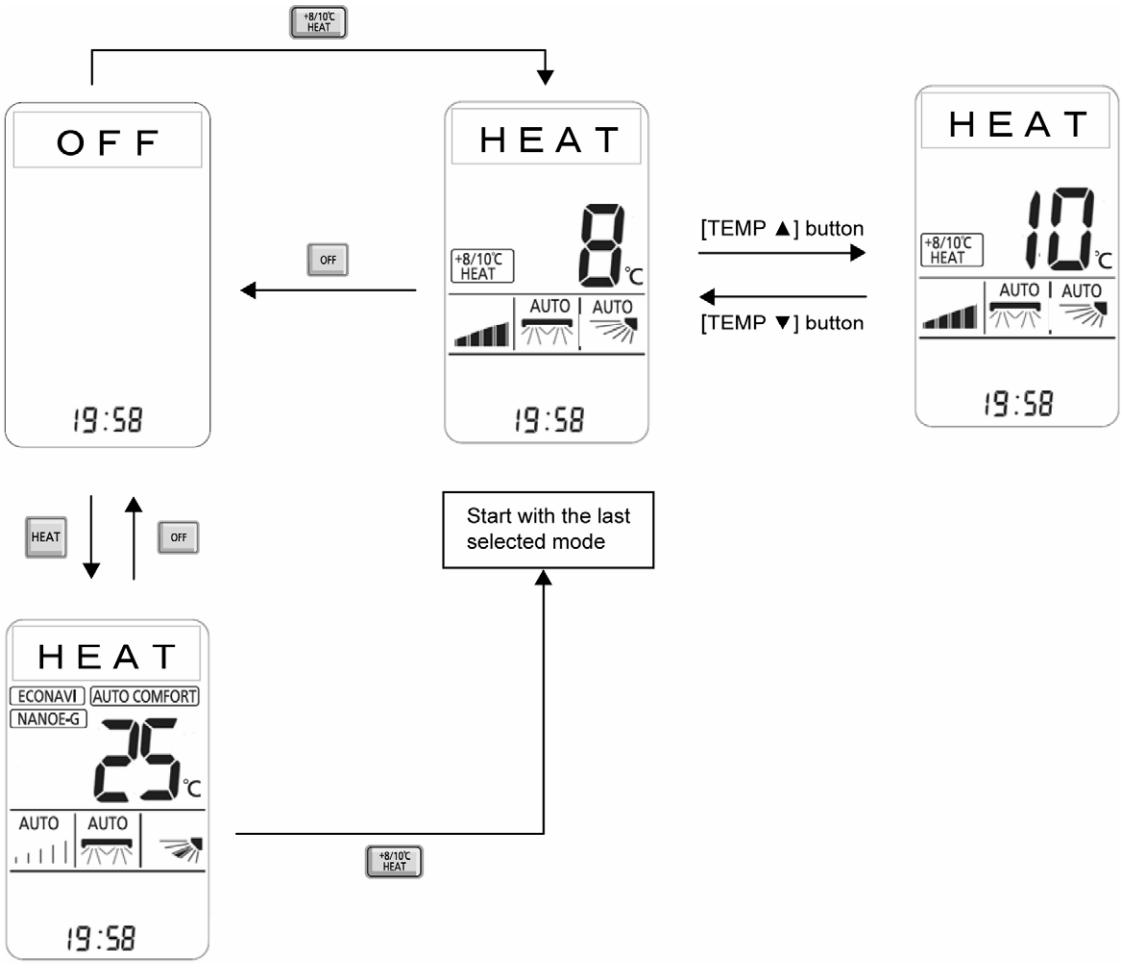
- Error detection control
  When nanoe-G indicator blinks, it indicates error listed below:
  - nanoe-G connector at main PCB open
    - Judgment method
      - During nanoe-G operation, nanoe-G connector at main PCB is opened.
    - Troubleshooting method
      - Connect the connector or stop operation to cancel the blinking.
  - Abnormal discharge error
    - Judgment method
      - During nanoe-G operation, the nanoe-G system has abnormal discharge due to short-circuit caused by water or dust adhesion and so forth, with Lo-feedback voltage (at microcontroller).
      - When abnormal discharge occurred, every 30 minutes the unit supplies power to the nanoe-G system.
      - When abnormal discharge occurs for 24 times continuously, nanoe-G indicator blinks.

  - Troubleshooting method
    - Press nanoe-G button or OFF/ON button to stop the operation and check the nanoe-G connector at PCB.
    - After that, press nanoe-G button again to confirm the nanoe-G indicator do not blinks.
    - The 24 timer counter will be clear after 10 minutes of normal operation or when operation stops.

  - Error reset method
    - Press OFF/ON button to OFF the operation.
    - Press AUTO OFF/ON button at indoor unit to OFF the operation.
    - OFF Timer activates.
    - Power supply reset.

12.11 +8/10°C Heat Operation

- +8/10°C Heat operation provides heating at low setting temperature in unoccupied houses during winter for the purpose of protecting equipments or housing appliances which may be destroyed by the extreme cold weather.
- This operation can be ON by pressing the +8/10°C heat button on the remote control.
- Two temperature settings are available, which are;
  - 8°C (Pressing TEMP down button at the remote control)
  - 10°C (Pressing TEMP up button at the remote control)
- During the operation of this mode;
  - The indoor fan speed will remain at Hi fan tap all the time included deice process.
  - Powerful operation, Quiet operation, Econavi operation and Fan Speed selection are disabled.
  - Cold draft prevention control is disabled.
- Control condition;



NOTE:
Summer house set temperature follows previously fixed set temperature (+8°C or +10°C).
But after battery reset, (default condition) set temperature always start with +8°C.

- **Caution!**

If the indoor temperature constantly is less than 0°C (Door, windows not close properly), the error code F11 may occur. This is because in open area, the indoor sensor will misjudge operation condition and will give error code.

12.12 AUTO COMFORT and ECONAVI Operation

- Area of human availability, activity level and absent is judged based on pulses by using 2 infrared sensors. The internal setting temperature shift, fan speed and horizontal airflow direction are adjusted in order to provide comfort environment while maintain the energy saving level.

- AUTO COMFORT start condition:
  - When AUTO COMFORT button is pressed.

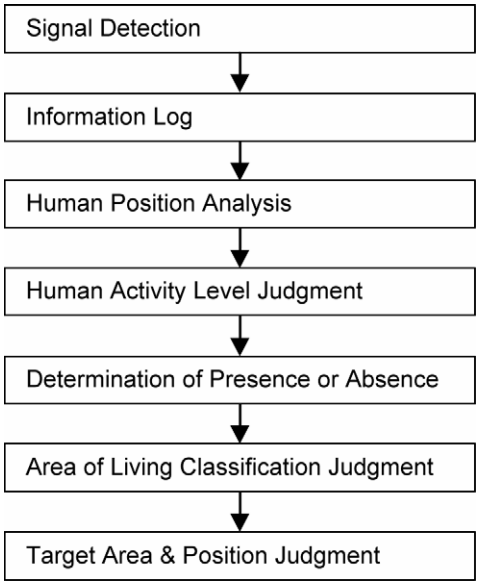
- AUTO COMFORT stop conditions:
  - When AUTO COMFORT button is pressed again.
  - When unit is OFF by OFF/ON button.
  - When unit is OFF when OFF TIMER activates.
  - When unit is OFF by AUTO OFF/ON button at indoor unit.
  - When POWERFUL, QUIET and AUTO COMFORT operation activates.
  - When ◄► button is pressed.

- ECONAVI start condition:
  - When ECONAVI button is pressed.

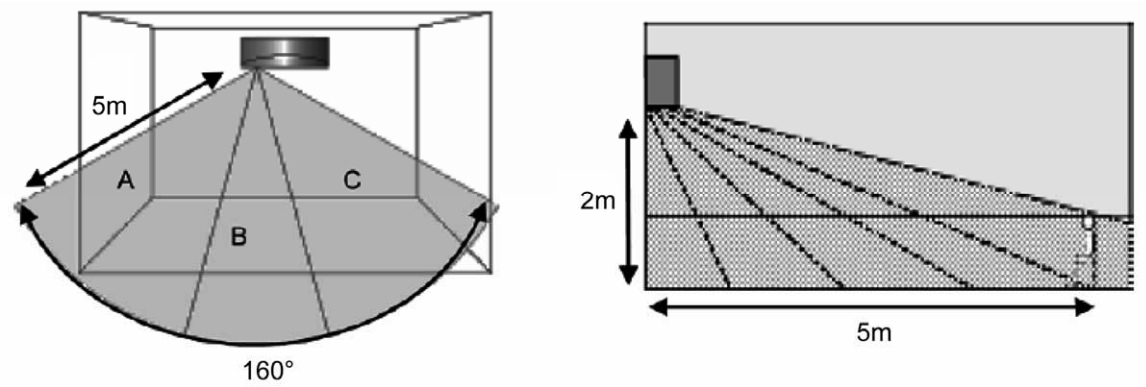
- ECONAVI stop conditions:
  - When ECONAVI button is pressed again.
  - When unit is OFF by OFF/ON button.
  - When unit is OFF when OFF TIMER activates.
  - When unit is OFF by AUTO OFF/ON button at indoor unit.
  - When POWERFUL, QUIET and AUTO COMFORT operation activates.
  - When ◄► button is pressed.

12.12.1 Human Activity Sensor

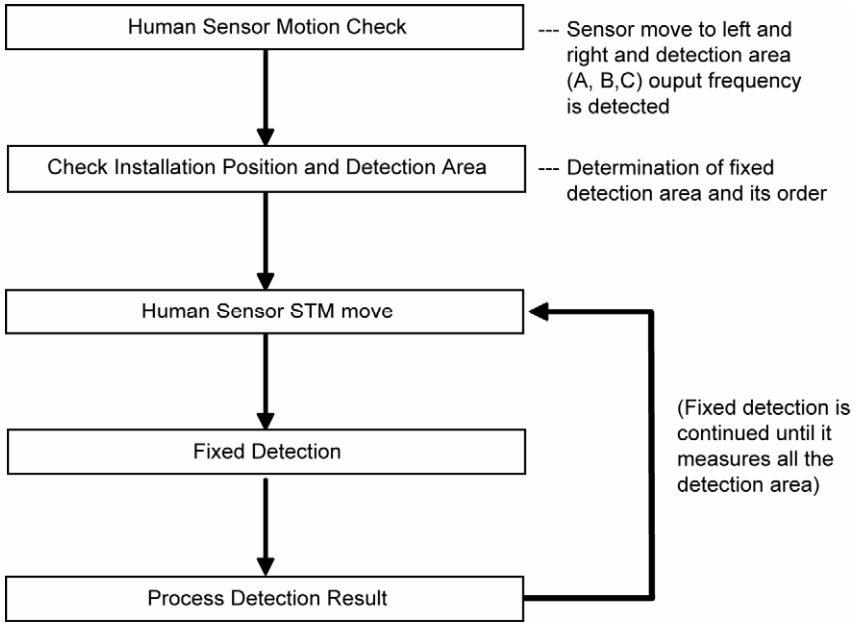
- Area of human availability, activity level and absent is judged based on pulses by using infrared sensor. The internal setting temperature shift, fan speed and horizontal airflow direction are adjusted in order to provide comfort environment while maintain the energy saving level.
- Human activity judgment is as following:



12.12.1.1 Signal Detection



- Presumption flow of human position.
  - Detection outline.



12.12.1.2 Information Log

- The signal from Infrared sensor will be log to human activity database for further analysis.

12.12.1.3 Human Position Analysis

- According to Area of Living, frequency of activity, the system will analyze the human position away from the indoor unit.

12.12.1.4 Human Activity Level Judgment

- Human Activity Level is judged based on the frequency of pulses detected by the infrared sensor within a timeframe. The activity level will be categorized into High, Normal or Low level.
- When a pulse is detected within this timeframe, the status of human presence is judge.
- When there is no signal detection continues for 40 minutes or more or the result of activity amount status is "Low" consecutively for 5 cycles the status of human absence is judged.

12.12.1.5 Determination of Presence or Absence

- Human presence status shall be determined based on the human presence status of each area.
- When all area has been detected absent for more than 120 minutes then it will judge as absence.

12.12.1.6 Area of Living Classification Judgment

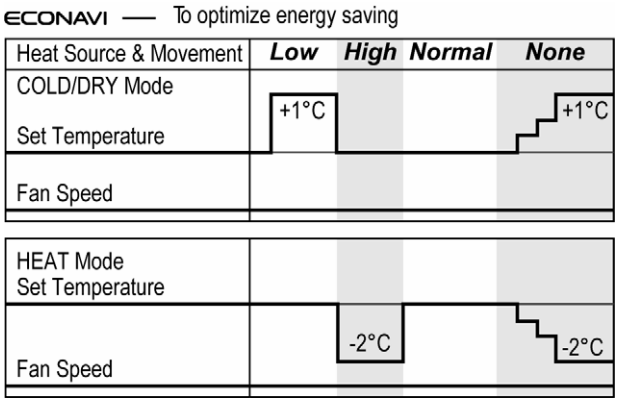
- The system is able to judge area of living according to human activity database, classified as following:
  - (Zone I) Living Area - In front of television, dining table, etc.
  - (Zone II) Walkway - Human detection is relatively less.
  - (Zone III) Non-Living Area - Near windows, wall, etc.

12.12.1.7 Target Area and Position Judgment

- By default, the system will judge the indoor unit installation position according to human activities and will reset the louver center position:
  - Non-Living Area at Position A - Indoor unit is installed at left side of the room, louver center position set to right side.
  - Non-Living Area at Position C - Indoor unit is installed at right side of the room, louver center position set to left side.
  - Other than above - Indoor unit is installed at center of the room, louver position set to center.
- Every 4 hours, the Target Area and Position Judgment will restart.
- If the indoor unit installation position is set by remote control, the above judgement will be ignored.

12.12.2 Setting Temperature and Fan Speed Shift

- Cooling Dual Sensor



12.12.2.1 Demo Mode

The air conditioner starts the operation in the Demo mode as described below when 2 minutes have elapsed after the protection control was started subsequent to the confirmation of communication error.
(At this time, a strong warning sound is emitted for 3 minutes if the test run memory is “incomplete”.)

Condition to stop the mode
The operation is stopped by turning off the air conditioner on the remote control or pressing the EMERGENCY OPERATON switch during the Demo mode.
(“TIMER” LED flashes.)

Zone B	Airflow Unit Operation Mode (Normal Operation)			
Transition time to Demo Mode	180sec from the demo starts	360 sec from the demo starts	540 sec from the demo starts	640 sec from the demo starts
[POWER] LED	ON			OFF
[NANOE-G] LED	Follow the remote control settings			OFF
[+8/10°C HEAT] LED	Follow the remote control settings			OFF
[ECONAVI] LED	Follow the remote control settings			OFF
[TIMER] LED	Auto Demo mode is set during the model selection: Follow the remote control settings. When in Product Demo mode: Always OFF (Timer is cancelled due to H11)			
Front panel STM	Open			Stop position
Vertical louver STM	Ceiling airflow	Heating 5	Swing	Stop position
Horizontal louver STM	Area OFF or Auto Demo is set: Swing from the front side Others: Area control under Heating, Range B, Airflow stable			Reset
Fan motor	Fan speed is set to Auto on the remote control: OFF Fan speed is set to Manual on the remote control: Remote controller setting tap			Stop position
Human activity sensor	Area ON: Repeat the scan detection and fixed detection. Area OFF: Standby position (Default position)			Standby position (Default position)
Sunlight sensor	LED brightness changes (Bright-Dim) when ECONAVI is ON. Confirmed time is for Demo only.			
NANOE output	OFF			

12.12.2.2 Infrared Sensor Abnormality

- Abnormality detection:
  - Connector disconnection / Wire cut abnormality
    - Sensor judge Hi level continuously for 25 seconds
  - Circuit abnormality
    - 65 seconds after power ON, if infrared sensor judge Lo level continuously for 25 seconds
- Error Code judgment
  - When abnormality happened, internal counter increase by 1 time.
  - Infrared sensor power OFF, retry after 5 seconds.
  - When the infrared sensor maintains normal condition for 120 seconds, the counter reset or AC reset.
  - When abnormality counter reached 4 times, H59 occurred – No TIMER indicator blinking.
- When error code happened, the unit is able to operate without ECONAVI / AUTO COMFORT.

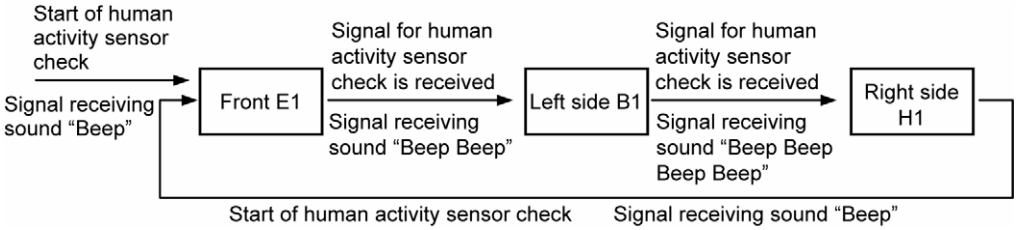
12.12.2.3 Infrared Sensor Check Mode

1 Conditions to start the mode
The infrared sensor check mode starts when all of the following conditions are met:
- The infrared sensor error is not being detected.
- Not in Demo mode.
- Human activity sensor is not selected.
- An error of Error Level 20 or higher is not present.
- The signal for infrared sensor check is received. (Long-press the “AUTO COMFORT” button on the remote control for 10 seconds)

2 Conditions to end the mode
The infrared sensor check mode ends when any of the following conditions is met:
- A signal other than the signal for infrared sensor check is received; or the EMERGENCY button is pressed → The signal received is followed.
- 5 minutes have elapsed since the signal for infrared sensor check was received → The mode is stopped.
- The infrared sensor error is confirmed → The mode is stopped.
- An error of Error Level 20 or higher has occurred → Follow the processing of each error.

3 Descriptions of the mode
Every time the signal for infrared sensor check is received, the fixed detection is performed at a different human activity sensor angle. The result is displayed on LED every 3 seconds.

Operation mode	OFF (Cleaning is also stopped)	
Panel	Ordinary operating position (It opens even if the mode signal received is “OFF”)	
Human activity sensor STM	Every time the signal for infrared sensor check is received, the position is shifted in the sequence of “Front → Left → Right → Front …” It starts operation from the front position when the check mode starts.	
	Front	Direction towards detection sub-area E1
	Left	Direction towards detection sub-area B1
	Right	Direction towards detection sub-area H1
LED	[TIMER] LED	Sensor responded: ON Sensor not responded: OFF
	[ECONAVI] LED	The status in which the detection is not allowed ※: OFF The status in which the detection is allowed: ON
	Other LEDs	OFF
Other parts	Follow the case of OFF mode	

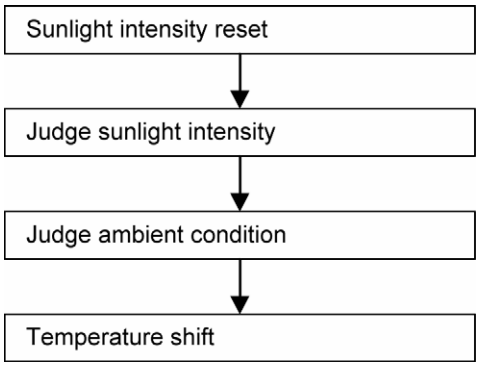


※ Conditions in which detection is not allowed
- For 65 seconds after the infrared sensor is powered ON.
- While the human detection sensor STM is in operation and for 10 seconds after the human activity sensor STM turns off.

※ Operation command by HA and ON timer is not valid during check mode.
(OFF mode continues even after the check mode stops at the expiry time.)

12.12.3 Sunlight Sensor

- During ECONAVI operation, the sunlight sensor detects sunlight intensity coming through windows and differentiates between sunny and cloudy or night to further optimize energy saving by adjusting the temperature.
- Sunlight judgment is as following.

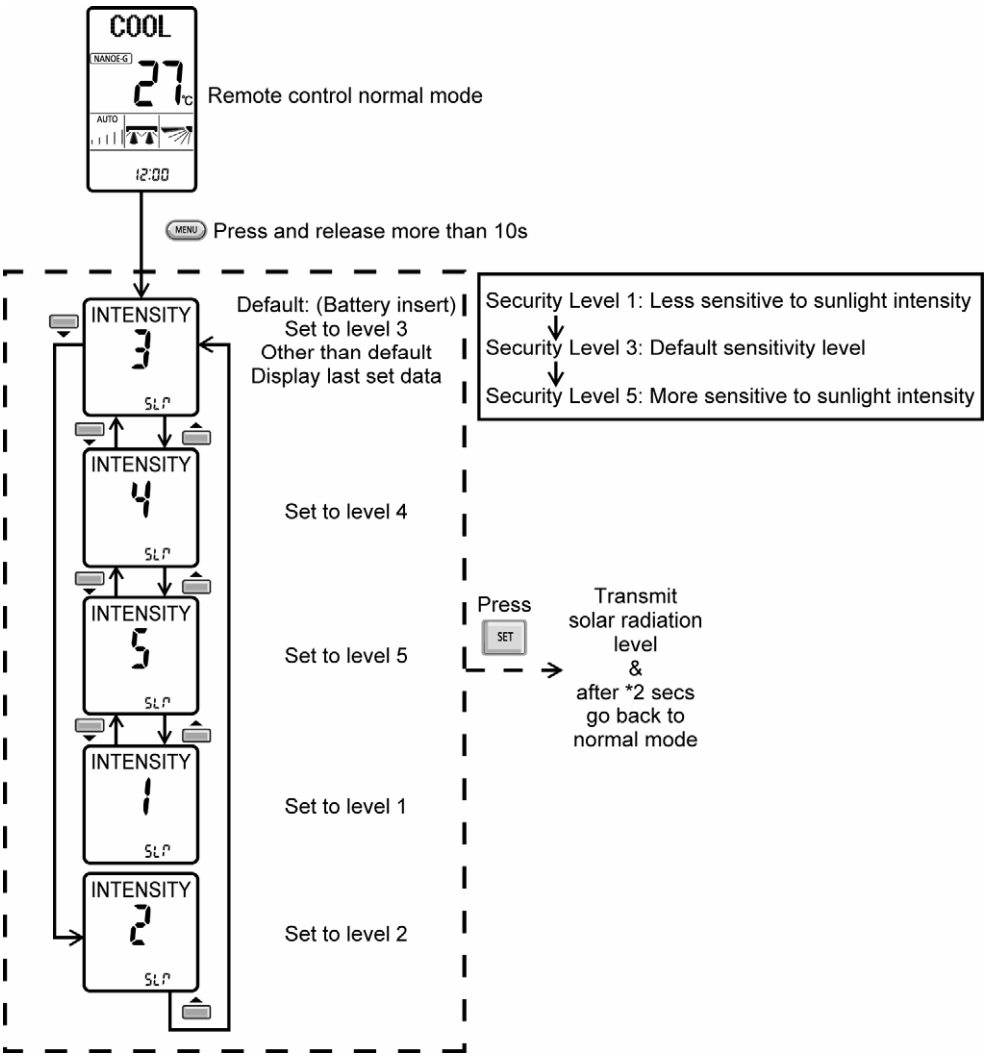


12.12.3.1 Sunlight Intensity Reset

- The sunlight intensity will to reset to zero (no sunlight condition) when
  - Each time ECONAVI is activated.
  - Setting temperature is changed.
  - Operation mode is changed.

12.12.3.2 Judge Sunlight Intensity

- Based on sunlight sensor output voltage, the sunlight intensity value will be computed and logged to sunlight intensity database.
- The sunlight sensor sensitivity could be adjusted:



12.12.3.3 Judge Ambient Condition

- According to sunlight intensity over a period of time, the system will analyze the ambient condition is sunny, cloudy or night.

12.12.3.4 Temperature Shift

Ambient condition	*Cloudy/ Night*	*Sunny*	*Cloudy/ Night*	*Sunny*
COOL/DRY Mode Set Temperature			+1~2°C	
HEAT Mode Set Temperature		-1°C		-1°C

ECONAVI is activated while it is cloudy / night
ECONAVI is activated while it is sunny

12.12.3.5 Sunlight Sensor Check Mode

- Operation details
  - The sunlight sensor check mode will be operated for 5 minutes.
  - During check mode, the ON and OFF timer will be memorized but it operation be ignored.
  - During check mode, if the sunlight sensor check code is retransmitted, the 5 minutes counter will be reset.
  - During check mode, if sunlight sensor detected the sunlight intensity value above minimum level, the ECONAVI indicator turns ON. Else if sunlight sensor detected sunlight intensity value below minimum level, the ECONAVI indicator is OFF.
- To disable sunlight sensor check mode
  - After check mode is ended (5 minutes counter elapsed), press AUTO OFF/ON button at indoor unit.
  - If the sunlight sensor detected sunlight intensity is at abnormal range, the check mode will be ended. Please check for error code.

12.12.3.6 Sunlight Sensor Abnormality

- Abnormality detection:
  - When ECONAVI is ON, if the sunlight intensity value below minimum level continuously for 24 hours, the sunlight sensor disconnection error counter will increase by 1 time. If the ECONAVI is OFF, the 24 hours timer will be reset, but the sunlight sensor disconnection error counter will not be reset.
- Error Code judgment
  - When sunlight sensor disconnection error counter reached 15 times. H70 occurred.
  - No TIMER indicator or ECONAVI indicator blink.
- When error code happened, the unit is able to operate without sunlight sensor.

13. Protection Control

13.1 Protection Control for All Operations

13.1.1 Restart Control (Time Delay Safety Control)

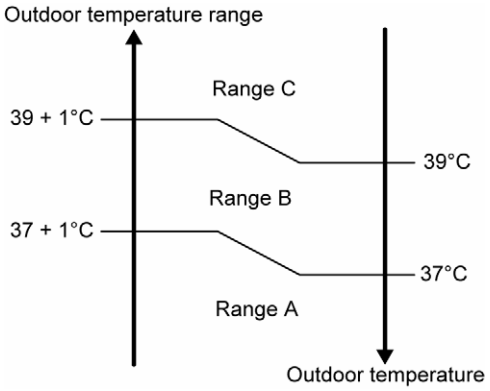
- The Compressor will not turn on within 3 minutes from the moment operation stops, although the unit is turned on again by pressing OFF/ON button at remote control within this period.
- This control is not applicable if the power supply is cut off and on again.
- This phenomenon is to balance the pressure inside the refrigerant cycle.

13.1.2 Total Running Current

1 When the outdoor unit total running current (AC) exceeds X value, the frequency instructed for compressor operation will be decreased.
2 If the running current does not exceed X value for 10 seconds, the frequency instructed will be increased.
3 However, if total outdoor unit running current exceeds Y value, compressor will be stopped immediately for 3 minutes.

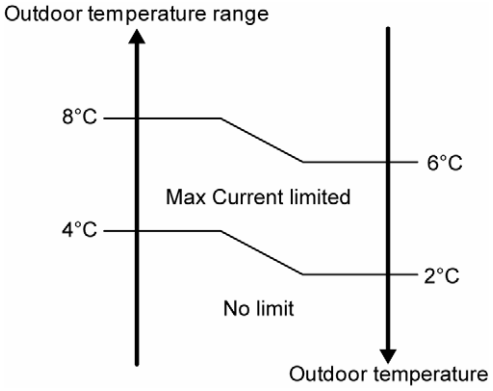
Model	VE9NKE				VE12NKE			
Hz	50		60		50		60	
Operation Mode	X (A)	Y (A)	X (A)	Y (A)	X (A)	Y (A)	X (A)	Y (A)
Cooling / Soft Dry (A)	3.91	16.76	3.90	16.69	7.41	16.76	7.41	16.69
Cooling / Soft Dry (B)	3.91	16.76	3.90	16.69	6.44	16.76	6.44	16.69
Cooling / Soft Dry (C)	3.91	16.76	3.90	16.69	5.14	16.76	5.15	16.69
Heating	11.05	16.76	11.09	16.69	13.02	16.76	13.04	16.69

4 The first 30 minutes of cooling operation, (A) will be applied.

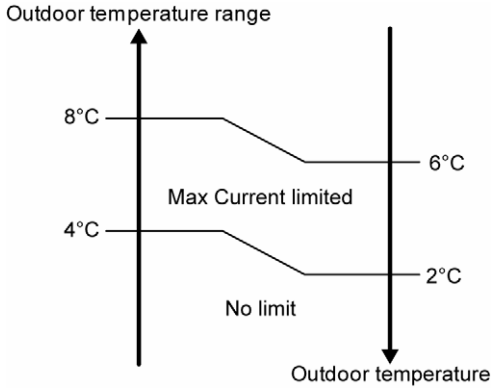


Cooling

Maximum Current Limit



(VE9NKE)



(VE12NKE)

Heating

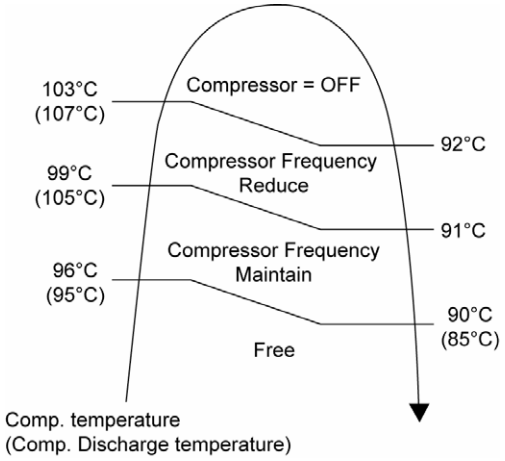
13.1.3 IPM (Power Transistor) Prevention Control

- Overheating Prevention Control
  1 When the IPM temperature rises to 120°C, compressor operation will stop immediately.
  2 Compressor operation restarts after 3 minutes the temperature decreases to 110°C.
  3 If this condition repeats continuously 4 times within 20 minutes, timer LED will be blinking (“F96” is indicated).

- DC Peak Current Control
  1 When electric current to IPM exceeds set value of 20 A, the compressor will stop operate. Then, operation will restart after 3 minutes.
  2 If the set value is exceeded again more than 30 seconds after the compressor starts, the operation will restart after 1 minute.
  3 If the set value exceeded again within 30 seconds after the compressor starts, the operation will restart after 1 minute. If this condition repeats continuously for 7 times, all indoor and outdoor relays will be cut off, timer LED will be blinking (“F99” is indicated).

13.1.4 Compressor Overheating Prevention Control

- Instructed frequency for compressor operation will be regulated by compressor discharge temperature. The changes of frequency are as below.
- If compressor discharge temperature exceeds 107°C, compressor will be stopped, occurs 4 times per 20 minutes, timer LED will be blinking. (“F97” is indicated.)



13.1.5 Low Pressure Prevention Control (Gas Leakage Detection)

- Control start conditions
  - For 5 minutes, the compressor continuously operates and outdoor total current is between 0.75A and 0.95A.
  - During Cooling and Soft Dry operations:
    Indoor suction temperature - indoor piping temperature is below 4°C.
  - During Heating operations :
    Indoor piping temperature - indoor suction is under 5°C.
- Control contents
  - Compressor stops (and restart after 3 minutes).
  - If the conditions above happen 2 times within 20 minutes, the unit will:
    - Stop operation
    - Timer LED blinks and “F91” indicated.

13.1.6 Low Frequency Protection Control 1

- When the compressor operate at frequency lower than 24 Hz continued for 240 minutes, the operation frequency will be changed to 23 Hz for 2 minutes.

13.1.7 Low Frequency Protection Control 2

- When all the below conditions comply, the compressor frequency will change to lower frequency.

Temperature, T, for:	Cooling/Soft Dry	Heating
Indoor intake air (°C)	T < 14 or T ≥ 30	T < 14 or T ≥ 28
Outdoor air (°C)	T < 13 or T ≥ 38	T < 4 or T ≥ 24
Indoor heat exchanger (°C)	T < 30	T ≥ 0

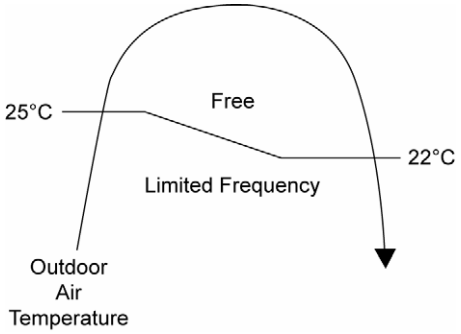
13.1.8 4-Way Valve Operation Detection Control (Switching Abnormality between Cooling and Heating)

- When indoor heat exchanger exceeds 45°C (Cooling operation) or 0°C (Heating and Deice operation) in 4 minutes or 3 minutes (Deice operation) after compressor start, compressor will stopped.
- If above condition occurs 4 times per 30 minutes or 4 times per 40 minutes (non-stop heating deice operation), timer LED blinks "F11" indicated.

13.2 Protection Control for Cooling and Soft Dry Operation

13.2.1 Outdoor Air Temperature Control

- The compressor operating frequency is regulated in accordance to the outdoor air temperature as shown in the diagram below.
- This control will begin 1 minute after the compressor starts.
- Compressor frequency will adjust base on outdoor air temperature.



13.2.2 Cooling Overload Control

- Detects the Outdoor pipe temperature and carry out below restriction/limitation (Limit the compressor Operation frequency).
- The compressor stop if outdoor pipe temperature exceeds 61°C.
- If the compressor stops 4 times in 20 minutes, Timer LED blinking (F95 indicated: outdoor high pressure rise protection).

13.2.3 Freeze Prevention Control 1

- When indoor heat exchanger temperature is lower than 0°C continuously for 6 minutes, compressor will stop operating.
- Compressor will resume its operation 3 minutes after the indoor heat exchanger is higher than 5°C.
- At the same time, indoor fan speed will be higher than during its normal operation.
- If indoor heat exchanger temperature is higher than 5°C for 5 minutes, the fan speed will return to its normal operation.

13.2.4 Freeze Prevention Control 2

- Control start conditions
  - During Cooling operation and soft dry operation
    - During thermo OFF condition, indoor intake temperature is less than 10°C or
    - Compressor stops for freeze prevention control
  - Either one of the conditions above occurs 5 times in 60 minutes.
- Control contents
  - Operation stops.
  - Timer LED blinks and “H99” indicated.

13.2.5 Dew Prevention Control 1

- To prevent dew formation at indoor unit discharge area.
- This control will be activated if:
  - Outdoor air temperature and Indoor pipe temperature judgment by microcontroller is fulfilled.
  - When Cooling or Dry mode is operated more than 20 minutes or more.
- This control stopped if:
  - Compressor stopped.
  - Remote control setting changed (fan speed / temperature).
  - Outdoor air temperature and indoor intake temperature changed.
- Fan speed will be adjusted accordingly in this control.

13.2.6 Odor Cut Control

- To reduce the odor released from the unit.
  - Start Condition
    - AUTO FAN Speed is selected during COOL or DRY operation.
    - During freeze prevention control and timer preliminary operation, this control is not applicable.
  - Control content
    - Depends on compressor conditions:
      1. Compressor OFF → Compressor ON.
         The indoor unit fan stops temporarily and then starts to blow at minimum airflow for 40 seconds.
      2. Compressor ON → Compressor OFF.
         The indoor unit fan stops for 90 seconds and then blows at minimum airflow for 20 seconds.

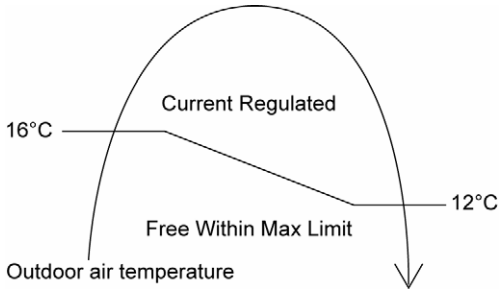
13.3 Protection Control for Heating Operation

13.3.1 Intake Air Temperature Control

Compressor will operate at limited freq., if indoor intake air temperature is 30°C or above.

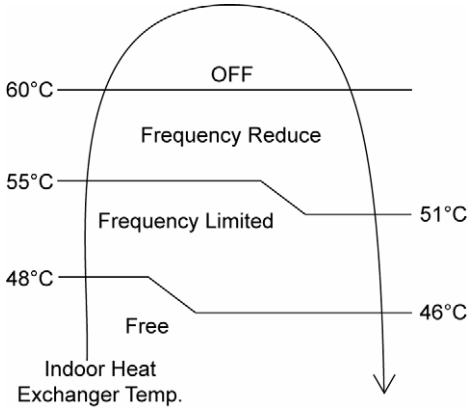
13.3.2 Outdoor Air Temperature Control

- The Max current value is regulated when the outdoor air temperature rise above 16°C in order to avoid compressor overloading.



13.3.3 Overload Protection Control

- The compressor operating frequency is regulated in accordance to indoor heat exchanger temperature as shown below.
- If the heat exchanger temperature exceeds 60°C, compressor will stop.



13.3.4 Low Temperature Compressor Oil Return Control

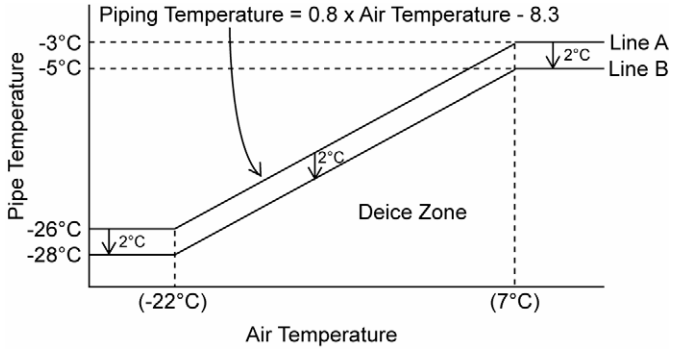
- In heating operation, if the outdoor temperature falls below -10°C when compressor starts, the compressor frequency will be regulated up to 600 seconds.

13.3.5 Cold Draught Prevention Control

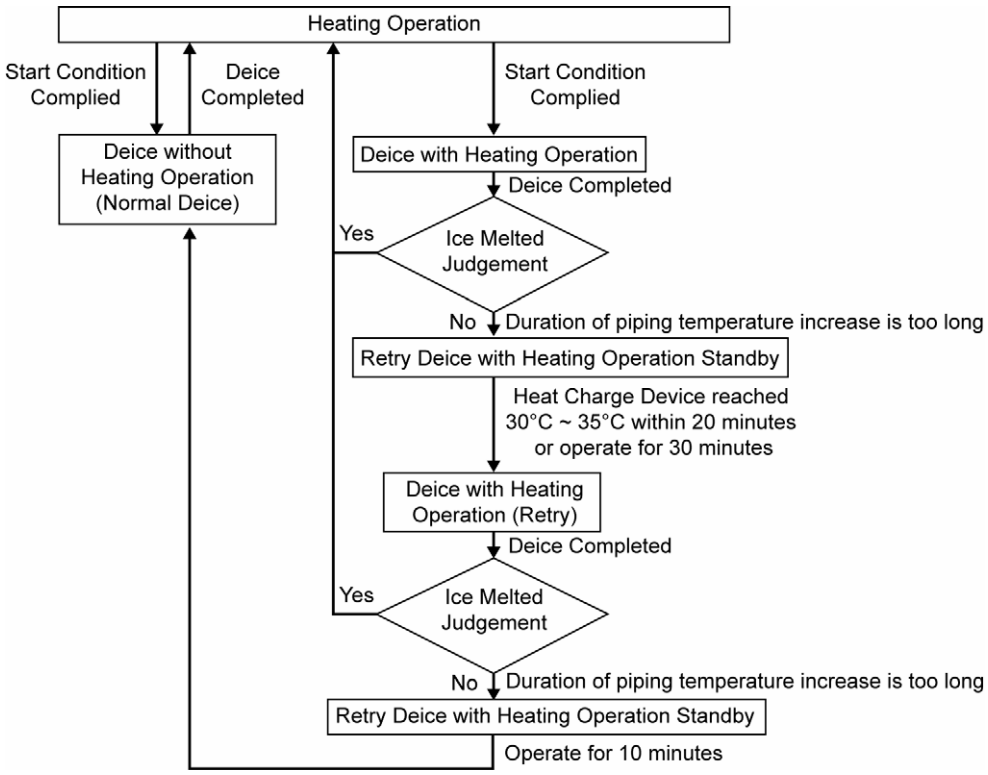
- When indoor pipe temperature is low, cold draught operation starts where indoor fan speed will be reduced.

13.3.6 Deice Operation

- When outdoor pipe temperature and outdoor air temperature is low, deice operation starts.
- Deice Start condition
  - Outdoor air temperature sensor1 detects temperature below 9°C continuously for 40 minutes, for the next 20 minutes if the temperature is below line A for 3 minutes.
  - Outdoor air temperature sensor1 detects temperature below 9°C continuously for 40 minutes, if the temperature is below line A and line B for 3 minutes.
  - Heating operation operates without deicing operation continuously for 24 hour, outdoor temperature is below 3°C.



Non-stop Heating Deice Operation



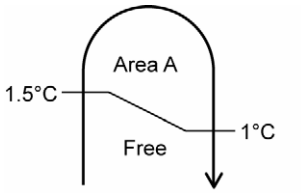
Without Heating Deice Operation

- 4-way valve is switched and deicing is performed by cooling cycle.
- Unit stop heating operation for maximum 12 minutes.
- During this operation the power indicator blinks and the vertical airflow direction louver is left open.

- Non-stop heating deice operation is prohibited when any of the following condition is met
  - Protection control that limit capacity.
  - Heat charge temperature sensor abnormal.
  - Heat charge cycle abnormal.
  - Outdoor pipe temperature sensor 2 abnormal.
  - The outdoor temperature range falls under -30°C.
- Deice stop condition
  - Outdoor air temperature is more than 9°C

13.3.7 Heat Storage 2-Way Valve Control

- Quick Heating
  - Heat storage 2-way valve will open for 30 seconds to speed up heating during Powerful heating start time.
- Thermo OFF comfortable control
  - Heat storage 2-way valve will open before thermo OFF to change the room temperature during thermo OFF and to reduce loss during thermo ON.
- Start condition

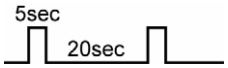


1. Area A continue for 2 minutes.
2. Outdoor piping temperature ≥-3°C.
3. Indoor piping temperature ≥ 40°C.
4. More than 5 hour after deice completed.
5. After more than 20 minutes.
6. Compressor ON.

Intake Temperature - Setting Temperature

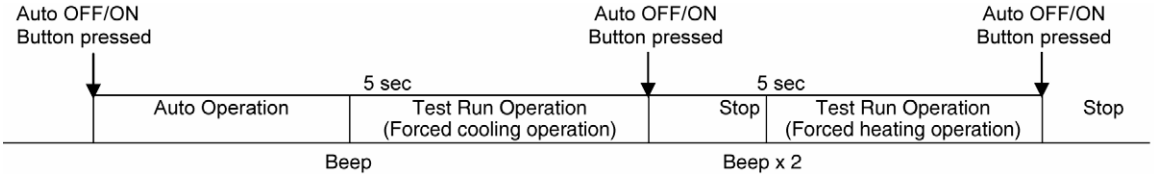
- Control content

Heatstorage 2-way valve ON and OFF maximum 3 times consecutively.



14. Servicing Mode

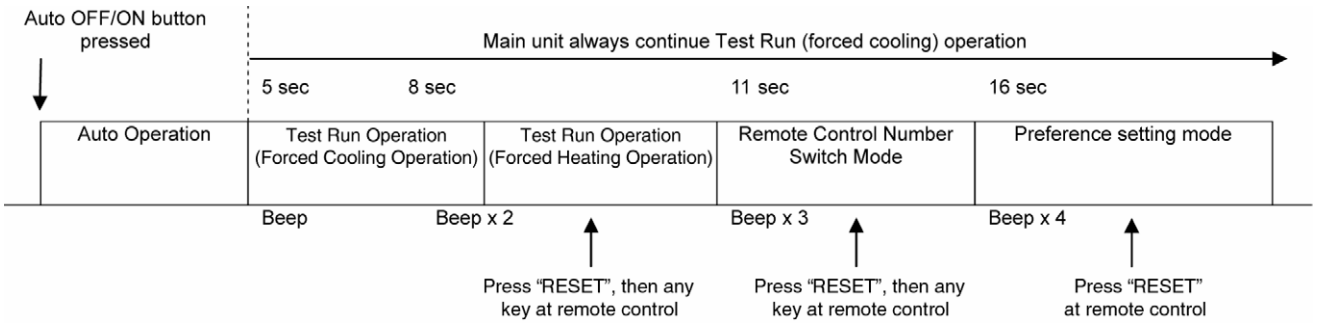
14.1 Auto OFF/ON Button



1 AUTO OPERATION MODE
The Auto operation will be activated immediately once the Auto OFF/ON button is pressed. This operation can be used to operate air conditioner with limited function if remote control is misplaced or malfunction.

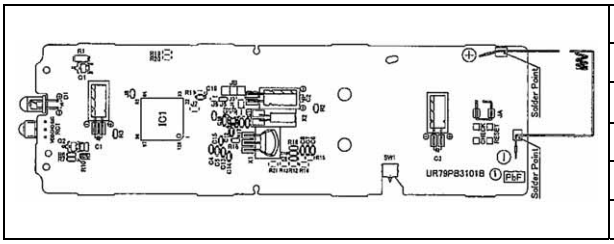
2 TEST RUN OPERATION (FOR PUMP DOWN/SERVICING PURPOSE)
The Test Run operation will be activated if the Auto OFF/ON button is pressed continuously for more than 5 seconds. A “beep” sound will heard at the fifth seconds, in order to identify the starting of Test Run operation (Forced cooling operation). Within 5 minutes after Forced cooling operation start, the Auto OFF/ON button is pressed for more than 5 seconds. A 2 “beep” sounds will heard at the fifth seconds, in order to identify the starting of Forced heating operation.

The Auto OFF/ON button may be used together with remote control to set / change the advance setting of air conditioner operation.



3 REMOTE CONTROL NUMBER SWITCH MODE
The Remote Control Number Switch Mode will be activated if the Auto OFF/ON button is pressed continuously for more than 11 seconds (3 “beep” sounds will occur at 11th seconds to identify the Remote Control Number Switch Mode is in standby condition) and press “RESET” button and then press any button at remote control to transmit and store the desired transmission code to the EEPROM.

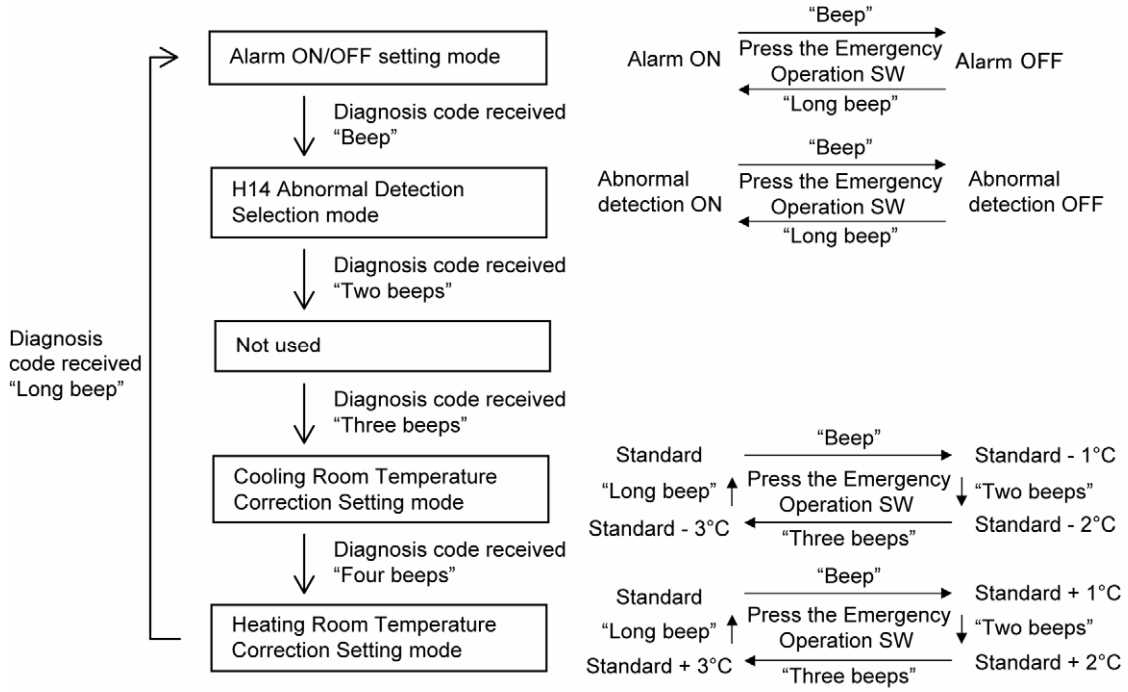
There are 4 types of remote control transmission code could be selected and stored in EEPROM of indoor unit. The indoor unit will only operate when received signal with same transmission code from remote control. This could prevent signal interference when there are 2 or more indoor units installed nearby together.
To change remote control transmission code, short or open jumpers at the remote control printed circuit board.



Remote Control Printed Circuit Board		
Jumper A (J1)	Jumper B (D2)	Remote Control No.
Short	Open	A (Default)
Open	Open	B
Short	Short	C
Open	Short	D

- During Remote Control Number Switch Mode, press any button at remote control to transmit and store the transmission code to the EEPROM.

4 PREFERENCE SETTING MODE
- Individual Mode



※ Each mode is cancelled if no operation is performed for 5 minutes or any code other than the diagnosis code is received from the remote control.

14.2 Remote Control Button

14.2.1 RESET

- To restore the unit's setting to factory default.
  - Press once to restore the unit's setting.

15. Troubleshooting Guide

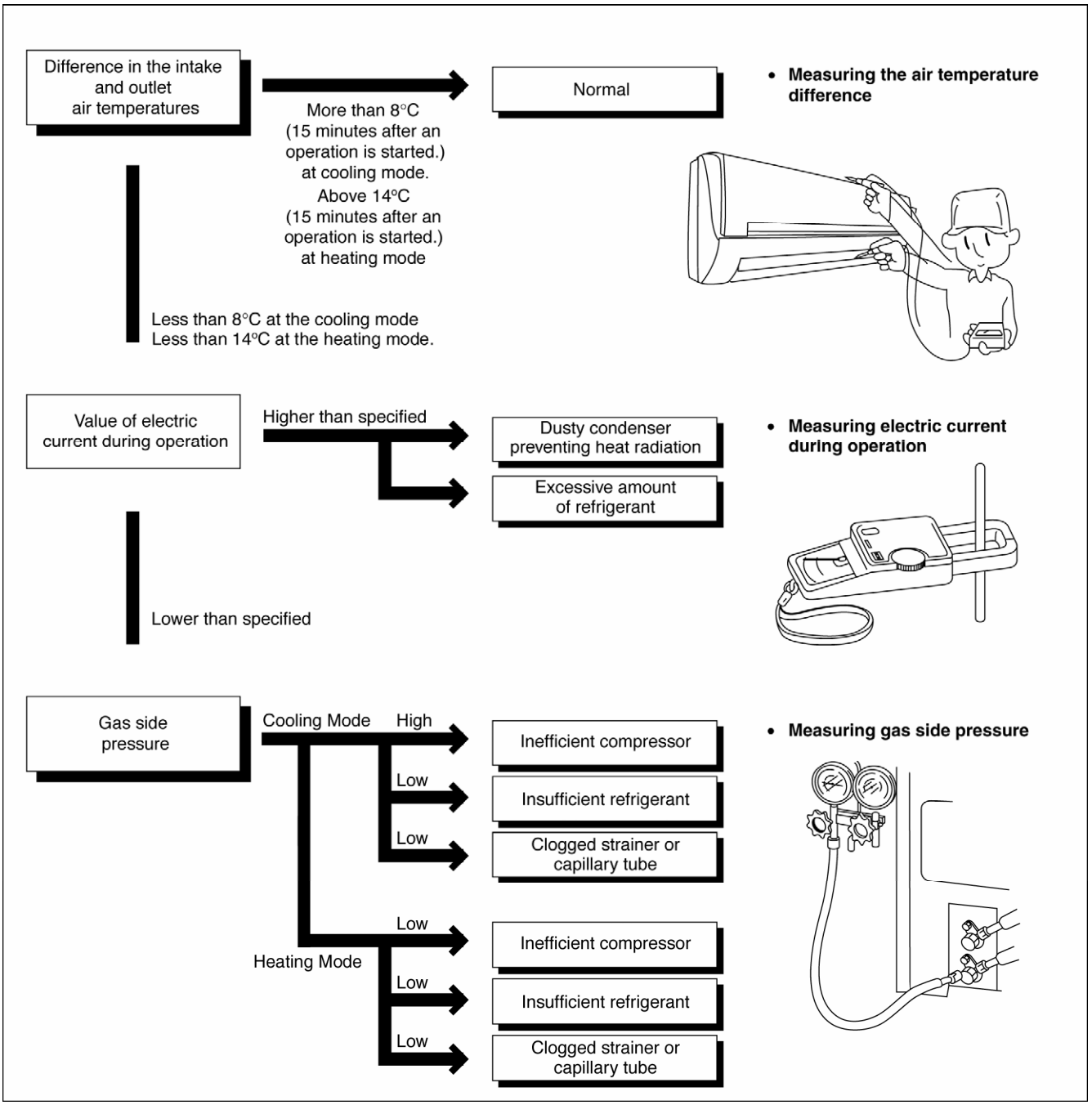
15.1 Refrigeration Cycle System

In order to diagnose malfunctions, make sure that there are no electrical problems before inspecting the refrigeration cycle. Such problems include insufficient insulation, problem with the power source, malfunction of a compressor and a fan.
The normal outlet air temperature and pressure of the refrigeration cycle depends on various conditions, the standard values for them are shown in the table on the right.

Normal Pressure and Outlet Air Temperature (Standard)

	Gas Pressure Mpa (kg/cm^2G)	Outlet air Temperature (°C)
Cooling Mode	0.9 ~ 1.2 (9 ~ 12)	12 ~ 16
Heating Mode	2.3 ~ 2.9 (23 ~ 29)	36 ~ 45

*Condition: • Indoor fan speed = High
• Outdoor temperature 35°C at the cooling mode and 7°C at the heating mode
• Compressor operates at rated frequency



15.1.1 Relationship between the Condition of the Air Conditioner and Pressure and Electric Current

Condition of the air conditioner	Cooling Mode			Heating Mode		
	Low Pressure	High Pressure	Electric current during operation	Low Pressure	High Pressure	Electric current during operation
Insufficient refrigerant (gas leakage)	↘	↘	↘	↘	↘	↘
Clogged capillary tube or Strainer	↘	↘	↘	↗	↗	↗
Short circuit in the indoor unit	↘	↘	↘	↗	↗	↗
Heat radiation deficiency of the outdoor unit	↗	↗	↗	↘	↘	↘
Inefficient compression	↗	↘	↘	↗	↘	↘

• Carry out the measurement of pressure, electric current, and temperature fifteen minutes after an operation is started.

15.2 Breakdown Self Diagnosis Function

15.2.1 Self Diagnosis Function (Three Digits Alphanumeric Code)

- Once abnormality has occurred during operation, the unit will stop its operation and Timer LED blinks. In case of abnormality which does not affect the refrigeration cycle, the operation will not stop but the Timer LED will blinks.
- Although Timer LED goes off when power supply is turned off, if the unit is operated under breakdown condition, the LED will light up again.
- In operation after breakdown repair, the Timer LED will no more blink. The last error code (abnormality will be stored in IC memory).

15.2.2 To Make a Diagnosis

- Timer LED start to blink and the unit automatically stops the operation.
- Press the INFO button on the remote controller.
- Error code will be displayed on the remote controller display for 4 seconds then it will return to the original display.
- If no information can be received from indoor unit, "RETRY" will be display for 4 seconds on the remote controller display.

15.2.3 To Display Memorized Error Code (Protective Operation)

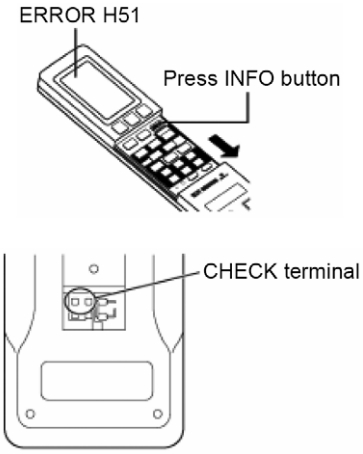
- Turn power on (in standby condition).
- Short the CHECK terminal, the latest error code is displayed on the remote control display.

15.2.4 To Clear Memorized Error Code after Repair (Protective Operation)

- Turn power on (in standby condition).
- Press the Auto button for 5 seconds (A beep receiving sound) on the main unit to operate the unit at Forced Cooling Operation modes.
- Short CHECK terminal to transmit signal to main unit. A beep sound is heard from main unit and the data is cleared.

15.2.5 Temporary Operation (Depending on Breakdown Status)

- Press the AUTO button (A beep receiving sound) on the main unit to operate the unit. (Remote control will become possible.)
- The unit can temporarily be used until repair.



15.3 Self Diagnosis Functions and Points of Diagnosis

[List of Diagnosis Method]

Code	Name of Diagnosis	Descriptions on Diagnosis	Main Areas to be Diagnosed
—	Codes for the commencement of self diagnosis	—	—
H00	No memory of error code	—	—
H11	Indoor/outdoor communication error	When the indoor/outdoor communication failed for 15 seconds or more, the power relay is OFF for 2 minutes. Then, determine the presence of the error again. The error code is displayed when the error is detected two times. (No communication error is determined for 1 minute after the operation is started or the power relay is ON.) <Points of diagnosis> 1. The model and supply voltage of the indoor and outdoor unit are checked. 2. Ensure that the control board of the outdoor unit is working. 3. The voltage of indoor/outdoor communication line, the supply voltage of the outdoor unit and the return voltage from outdoor to indoor unit are checked.	• Check of the model of indoor & outdoor units • Indoor/outdoor unit connection wire • Indoor & outdoor unit control boards • Outdoor unit AC circuit components
H14	Indoor unit intake air temperature sensor error	This error code is displayed when the detected temperature of the intake air temperature sensor is below -50°C for 5 consecutive seconds, or 149°C or higher for 2 consecutive minutes after 20 minutes have elapsed since the air conditioner is turned on. <Points of diagnosis> 1. This is an error code displayed when an improbable temperature is detected. If the sensor is not open (≥ 500kΩ) or short-circuited (≤6.5kΩ), poor contact of the connector has occurred.	• Intake air temperature sensor (Bad connection/ detached connector)
H15	Compressor temperature sensor error	This error code is displayed when the detected temperature of the compressor temperature sensor is 330°C or higher for 5 consecutive seconds, or below -16°C for 5 consecutive seconds after 5 minutes have elapsed since the compressor is started. <Points of diagnosis> 1. This is an error code displayed when an improbable temperature is detected. If the sensor is not open (≥ 500kΩ) or short-circuited (≤0.5kΩ), poor contact of the connector or a failure of control board has occurred.	• Compressor temperature sensor (Bad connection / detached connector)
H16	Outdoor unit CT disconnection error	If the detected total current is below 0.7A for 20 consecutive seconds when the air conditioner operates beyond its rated capacity, the air conditioner stops and this error code is displayed. (This function does not work for 3 minutes after the outdoor unit starts operating.) <Points of diagnosis> 1. Check of refrigerating cycle: Gas leak (Refrigerant level is very low.) 2. Check of control board; Check for disconnection of CT (open) only. (The control board is to be replaced in case of CT open.) ※ For scroll compressor (DC motor): H16 is usually detected only when the compressor is in operation.	• Low refrigerant level (almost empty) • Outdoor unit control board
H19	Indoor unit fan motor lock error	If a rotation error (too high/low speed) is detected for 10 consecutive seconds, only the fan motor is stopped and then restarted. If the rotation error is detected seven consecutive times within 25 seconds, the fan motor lock is determined and this error code is displayed. <Points of diagnosis> 1. Check for indoor unit fan motor lock. 2. Poor contact and detached fan motor connector, fan motor failure and indoor unit control board.	• Indoor unit control board • Indoor unit fan motor (Bad connection / detached connector)
H23	Indoor unit heat exchanger temperature sensor error	This error code is displayed when the detected temperature of the indoor unit heat exchanger temperature sensor is below -50°C or 149°C or higher for 5 consecutive seconds. (The temperature is not detected during De-Icing.) <Points of diagnosis> 1. This is an error code displayed when an improbable temperature is detected. If the sensor is not open (≥ 500kΩ) or short-circuited (≤2.5kΩ), poor contact of the connector or a failure of control board has occurred.	• Indoor unit heat exchanger temperature sensor (Bad connection / detached connector)
H27	Outdoor temperature sensor error	This error code is displayed when the detected temperature of the outdoor temperature sensor is below -40°C or 150°C or higher for 5 consecutive seconds. <Points of diagnosis> 1. This is an error code displayed when an improbable temperature is detected. If the sensor is not open (≥ 500kΩ) or short-circuited (≤0.5kΩ), poor contact of the connector or a failure of control board has occurred.	• Outdoor temperature sensor (Bad connection / detached connector)
H28	Outdoor unit heat exchanger temperature sensor 1 error	This error code is displayed when the outdoor unit heat exchanger temperature sensor 1 is below -58°C or 107°C or higher for 5 consecutive seconds. <Points of diagnosis> 1. This is an error code displayed when an improbable temperature is detected. If the sensor is not open (≥ 500kΩ) or short-circuited (≤0.5kΩ), poor contact of the connector has occurred.	• Outdoor unit heat exchanger temperature sensor 1 (Bad connection / detached connector)

H29	Outdoor unit heat exchanger temperature sensor 2 error	This error code is displayed when the detected temperature of the outdoor temperature sensor 2 is below -58°C or 107°C or higher for 5 consecutive seconds. <Points of diagnosis> 1. This is an error code displayed when an improbable temperature is detected. If the sensor is not open (≥ 500kΩ) or short-circuited (≤0.5kΩ), poor contact of the connector or a failure of control board has occurred.	• Outdoor unit heat exchanger temperature sensor 2 (Bad connection / detached connector)
H33	Connection error of the models with different voltage power supply	This error code is displayed when the models of indoor and outdoor units are different or when 200V or 100V model is connected to 100V and 200V models, respectively. ※ This function does not apply to the case where the supply voltage of the indoor unit is doubled. <Points of diagnosis> 1. Check for the model compatibility between indoor & outdoor units; Check of supply voltage. ① 200V indoor unit: When 100V or 200V is supplied and the outdoor unit is a 100V model: The indoor unit immediately turns off the power relay and H33 is displayed. After the reset is cancelled, the power relay does not turn on if the indoor unit is a 200V model. ② Both indoor and outdoor units are 200V models and 100V power is supplied: If the DC voltage of the outdoor unit is 180V or below after 20 seconds from power relay ON, the signal is transmitted to the indoor unit. If the error occurs one more time, H33 is displayed. ③ 100V indoor unit: When 100V is supplied and the outdoor unit is a 200V model: The indoor unit immediately turns off the power relay and H33 is displayed.	• Model difference between indoor & outdoor units • Check of supply voltage
H38	Brand not corresponding	This error code is displayed when the connection is different between the indoor and outdoor units. <Points of diagnosis> 1. Check of models and capabilities of indoor and outdoor units. 2. Short-circuit of CN-S on outdoor unit control board.	• Models of indoor and outdoor units
H50	Ventilation fan motor error	If a rotation error (too high/low speed) is detected for 55 consecutive seconds, only the ventilation fan motor is stopped and then restarted. If the rotation error is detected seven consecutive times, the ventilation fan motor lock is determined and this error code is displayed. Or, if the speed of the ventilation fan during Auto Clean is below 4000rpm for 250 consecutive seconds, the Auto Clean operation is stopped. If this occurs three consecutive times, this error code is displayed. <Points of diagnosis> 1. Check for ventilation fan motor lock. 2. Poor contact and detached ventilation fan motor connector, ventilation fan motor failure and indoor unit control board.	• Ventilation fan motor (Bad connection / detached connector) • Indoor unit control board
H53	Heat storage tank temperature sensor error	The TIMER indicator flashes when the disconnection or short-circuit of heat storage tank sensor is detected for 5 consecutive seconds. (The air conditioner continues the operation.) <Points of diagnosis> 1. This is an error code displayed when an improbable temperature is detected. If the sensor is not open or short.-circuited, poor contact of the connector or a failure of control board has occurred.	• Heat storage tank temperature sensor (Bad connection / detached connector)
H59	Infrared sensor error	This error code is displayed when the infrared sensor shows no response within 30 seconds after it is ON or continuously responds between 80 and 250 seconds after it is ON. <Points of diagnosis> 1. Check of the detection and location of the infrared sensor. 2. Check for disconnection and detached infrared sensor.	• Infrared sensor (Bad connection / disconnection / detached connector)
H70	Sunlight sensor error	When 24-hour disconnection is detected for 15 consecutive days, the diagnosis code “H70” is displayed on the indoor unit and ECONAVI LED is OFF. (The air conditioner continues the operation.) <Points of diagnosis> 1. Failure of the sunlight sensor. 2. Detached sunlight sensor connector.	• Sunlight sensor (Bad connection of connector)
H96	2- and 3-way valve opening failure check	Failure to open the 2- and 3-way valve is detected based on the changes in indoor unit intake air temperature and indoor unit pipe temperature. The time required for this detection is approximately 10 minutes when in COOL mode and approximately 25 minutes when in HEAT mode. <Points of diagnosis> 1. Check if the 2-way and 3-way valves are closed.	• 2- and 3-way valve opening failure
H97	Outdoor unit fan motor lock error	If a rotation error (too high/low speed) is detected for 10 consecutive seconds, only the fan motor is stopped and then restarted. If the rotation error is detected 2 consecutive times or if an overcurrent (fan motor current 3A and above) is detected, the compressor is stopped, and then restarted after 180 seconds. If the error or overcurrent is detected two times within 20 minutes, this error code is displayed. <Points of diagnosis> 1. Check for outdoor unit fan motor lock. 2. Poor contact and detached fan motor connector, fan motor failure and outdoor unit control board.	• Outdoor unit control board • Outdoor unit fan motor (Bad connection / detached connector)

H98	Indoor unit overpressure protection	When the temperature of the indoor unit heat exchanger temperature sensor exceeds 60°C during the heating operation, this diagnosis code is stored in the memory and the compressor stops operation. It resumes operation after 180 seconds if the temperature is below 60°C. No error code is displayed. <Points of diagnosis> 1. Check of the indoor unit heat exchanger temperature sensor (Check for change in characteristic and resistance value): Symptom – No hot start, no thermo ON and repeating stop and start during the start of the operation. 2. Additional check for short-circuit of the indoor unit and clogging of air filter.	• Dirt on air filter • Short-circuit of indoor unit
H99	Indoor unit heat exchanger freezing protection	When the temperature of the indoor unit heat exchanger temperature sensor is 0°C for 6 consecutive minutes during the cooling or dry operation, this diagnosis code is stored in the memory and the compressor stops. It resumes operation after 180 seconds if the temperature is 10°C and above. No error code is displayed. <Points of diagnosis> 1. The primary cause is cooling or dry operation at low outside temperature. This is not a failure. H99 is also displayed if dry operation is performed under AUTO mode in winter while the outside temperature goes up. 2. Check of refrigerant cycle: Gas leak (refrigerant level is low) and pipe breakage. 3. Additional check for short-circuit of the indoor unit and clogging of air filter.	• Low refrigerant level (relatively low) • Dirt on air filter • Short-circuit of indoor unit
F11	Cooling-Heating switching error	When the temperature of the indoor unit heat exchanger temperature sensor after 4 minutes from the start of compressor is 45°C and above during cooling or dry cool operation or below 0°C during heating operation, this diagnosis code is stored in the memory and the compressor stops. It resumes operation after 180 seconds. The error code is displayed if this error is detected four times within 40 minutes. <Points of diagnosis> 1. Check of the 4-way valve: Check for disconnection or short-circuit of the 4-way valve coil. 2. If the 4-way valve is normal, then switching error of the 4-way valve has occurred.	• 4-way valve • 4-way valve coil
F16	Cooling-Dry switching error	When the temperature of the heat exchanger temperature sensor after 3.5 minutes from the start of compressor is below -7°C consecutively for 1 minute during cooling or dry cool operation, this diagnosis code is stored in the memory and the air conditioner stops operation. It resumes operation after 180 seconds. The error code is displayed if this error is detected eight times within 75 minutes. <Points of diagnosis> 1. Check of the 2-way valve: Make sure that no power is supplied during cool and dry cool operation and the power is supplied during dry operation. Check for disconnection of the coil (coil open). 2. If the coil is normal, then switching error of the 2-way valve has occurred.	• Heat exchanger temperature sensor (Bad connection / detached connector) • 2-way valve • 2-way valve coil
F19	Heat storage cycle error	If all of the following conditions are met three consecutive times, the power relay is OFF for 2 minutes. Subsequently, if all of the following conditions are once again met three consecutive times after the power relay is ON again, the TIMER indicator flashes. (The air conditioner continues the operation.) • The temperature of the heat storage tank is 45°C and above at the start of Non-Stop De-Icing. • The temperature of the heat storage tank drops by not more than 2°C after 4 minutes from the start of Non-Stop De-Icing. • The temperature of the outdoor unit pipe does not reach 6°C at the end of Non-Stop De-Icing. <Points of diagnosis> 1. Liquid leak from the heat storage tank. 2. Check if the 2-way valve of the heat storage tank is working.	• Draining of the antifreeze liquid within the heat storage tank • Error of heat storage tank 2-way valve
F90	PFC protection	The compressor stops if the DC voltage of the outdoor unit control board (PFC output) exceeds the preset value for protection against over-voltage. The error code is displayed if the protection is activated four times within 20 minutes. <Points of diagnosis> 1. Check of the inverter circuit on the control board: The voltage of IPM is checked within 3 minutes after the power is OFF and then ON. Symptom: The compressor stops after 30 seconds from its start and F90 is stored in the memory. The error code is displayed once the compressor is restarted four times.	• Outdoor unit control board
F91	Refrigeration cycle error	While the air conditioner is in operation beyond the ratings, this diagnosis code is stored in the memory and the compressor stops if: • During cooling or dry cool operation: Indoor unit intake air temperature - Indoor unit pipe temperature < 4°C • During heating operation: Indoor unit pipe temperature - Indoor unit intake air temperature < 5°C In the case where the air conditioner operates within the total current range of 0.7 – 1.4A for 5 minutes. The compressor resumes operation after 180 seconds. The error code is displayed if this error is detected two times within 20 minutes. <Points of diagnosis> 1. Check of refrigerating cycle: Gas leak. (Gas level is less than a half.) The diagnosis code to be displayed due to gas leak changes in the order of H99 → F97 → F91 → H16 depending on the amount of gas leaked. The range of this error (F91) is extremely small. (Protection of the compressor at the beginning of a season)	• Draining of refrigerant (3-way valve opening failure, gas leak, etc.)

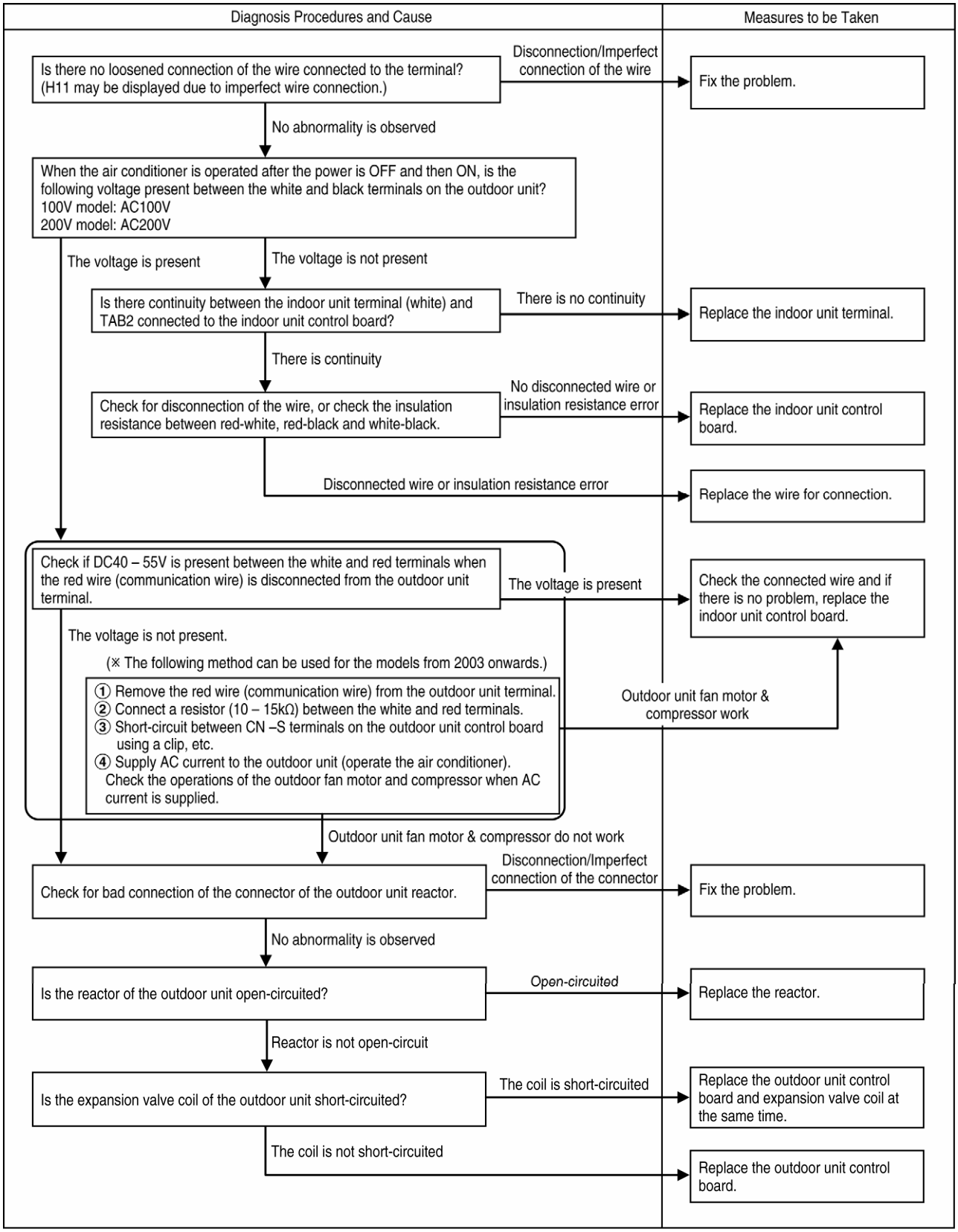
F93	Compressor rotation error	If the rotation of the compressor does not synchronize with the control signal, this diagnosis code is stored in the memory and the compressor stops. It resumes operation after 180 seconds. The error code is displayed if this error is detected four times within 20 minutes. <Points of diagnosis> 1. Symptom caused by the failure to open the 2-way and 3-way valves: The compressor stops after it operates for 1 to 3 minutes from its start and F93 is stored in the memory. 2. Check of the inverter circuit of the control circuit: The IPM base current is checked (6 locations) within 3 minutes after the power is turned off and on. Symptom: The compressor stops after 30 seconds from its start and F93 is stored in the memory. The error code is displayed once the compressor is restarted four times. 3. Check of the disconnection of the compressor coil (open): Approximately 1Ω when each phase is in normal state (The symptom is the same as the above 2.).	• Outdoor unit control board • 3-way valve opening failure • Detached compressor connector • Compressor phase interruption
F95	Overpressure protection in case of cooling error	When the temperature of the outdoor unit heat exchanger temperature sensor 1 exceeds 61°C during the cooling or dry cool operation, this diagnosis code is stored in the memory and the compressor stops operation. No error code is displayed. <Points of diagnosis> 1. Check of the outdoor unit heat exchanger temperature sensor 1. (Check for change in characteristic and resistance value.) 2. Check for interrupted heat radiation on the outdoor unit.	• Outdoor unit heat exchanger temperature sensor 1 • Interrupted heat radiation
F96	Transistor module over-temperature protection	Overheat is detected in the IPM to block the heat. The diagnosis code is stored in the memory and the compressor stops. The error code is displayed if this error is detected four times within 30 minutes. <Points of diagnosis> 1. Interrupted heat radiation on the outdoor unit and the failure of outdoor unit fan. (The outdoor unit fan does not rotate.) 2. Failure of IPM (outdoor unit control board). 3. Check for short-circuit and continuity of IPM sensor.	• Interrupted heat radiation • Outdoor unit fan motor failure • Overload conditions
F97	Compressor over-temperature protection	When the temperature of the compressor exceeds 103°C, the diagnosis code is stored in the memory and the compressor stops. It resumes operation after 180 seconds when the temperature is 92°C or below. The error code is displayed if this error is detected four times within 20 minutes. <Points of diagnosis> 1. Check of refrigerating cycle: Gas leak (Low refrigerant level). Symptom: The outdoor unit sometimes stops. 2. The compressor temperature sensor is checked when the error code is displayed and the compressor stops. (Check for change in characteristic and resistance value.) 3. Interrupted heat radiation on the outdoor unit and the failure of outdoor unit fan. (The unit fan does not rotate due to open state.) (The error is sometimes detected in case of overload. In this case, F97 remains in the memory.)	• Low refrigerant level (relatively low) • Interrupted heat radiation • Overload conditions
F98	Total current protection	If the total current exceeds the preset value, this diagnosis code is stored in the memory and the compressor stops. It resumes operation after 180 seconds. The error code is displayed if this error is detected three times within 20 minutes. [Refer to “Total Current Protection Control” for the preset value] <Points of diagnosis> 1. AC voltage of the outdoor unit terminal board during operation: The voltage should drop by less than 5% from the voltage at the STOP state. (The rated voltage is to be ±110% even during the operation.) If the voltage drops by not less than 5%, or in case of sudden change in voltage, check for the length/thinness of the indoor wiring and indoor/outdoor connection wire. 2. Check for the interrupted heat radiation on the outdoor unit (during cooling operation): The outdoor unit is usually not stopped and only subjected to the capacity restriction by way of current control. No diagnosis code is displayed.	• High refrigerant level • Interrupted heat radiation
F99	DC peak operation error	When overcurrent, overheat or drop in supply voltage is detected in the IPM within 30 seconds from the start of the compressor, the compressor stops and then resume operation in 60 seconds. When the error is detected seven consecutive times, the compressor stops operation and the error code is displayed. <Points of diagnosis> 1. The compressor stops under F99 within 30 seconds from its start: When the lead wires are disconnected from U, V and W on the IPM then operate: • If F93 is displayed and the compressor stops: Check of refrigerating cycle, 3-way valve opening failure, clogged pipe, failure of compressor (disconnection of coil). • If F99 is displayed and the compressor stops: Check for IPM power supply of DC15V (4 locations) and voltage of DC280V. Failure of outdoor unit control board. 2. If the compressor stops after it operates for more than 5 minutes, a failure of the power circuit and refrigerant cycle is also checked.	• Compressor • Outdoor unit control board

[Examples of the How to Identify the Faulty Point]
The following is some flow charts which illustrate on how to identify the faulty point for each code (examples).

15.4 Self-diagnosis Method

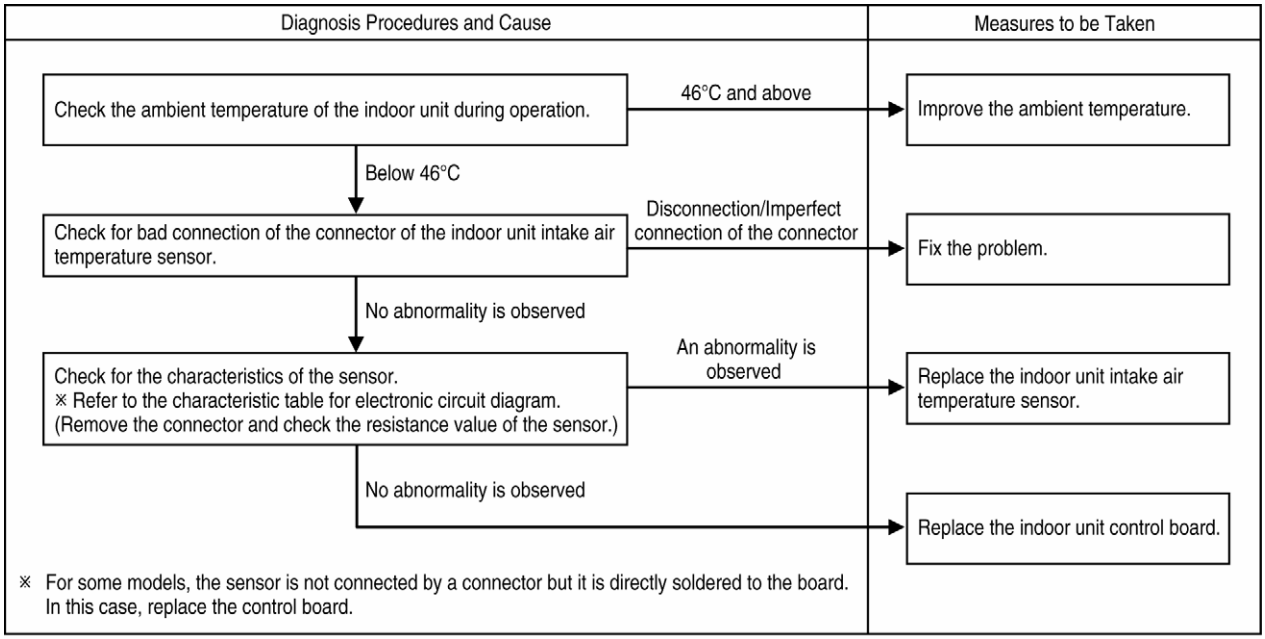
15.4.1 H11 (Indoor/Outdoor Communication Error)

Troubleshooting



15.4.2 H14 (Indoor Unit Intake Air Temperature Sensor Error)

Troubleshooting



15.4.3 H15 (Compressor Temperature Sensor Error)

15.4.4 H23 (Indoor Unit Heat Exchanger Temperature Sensor Error)

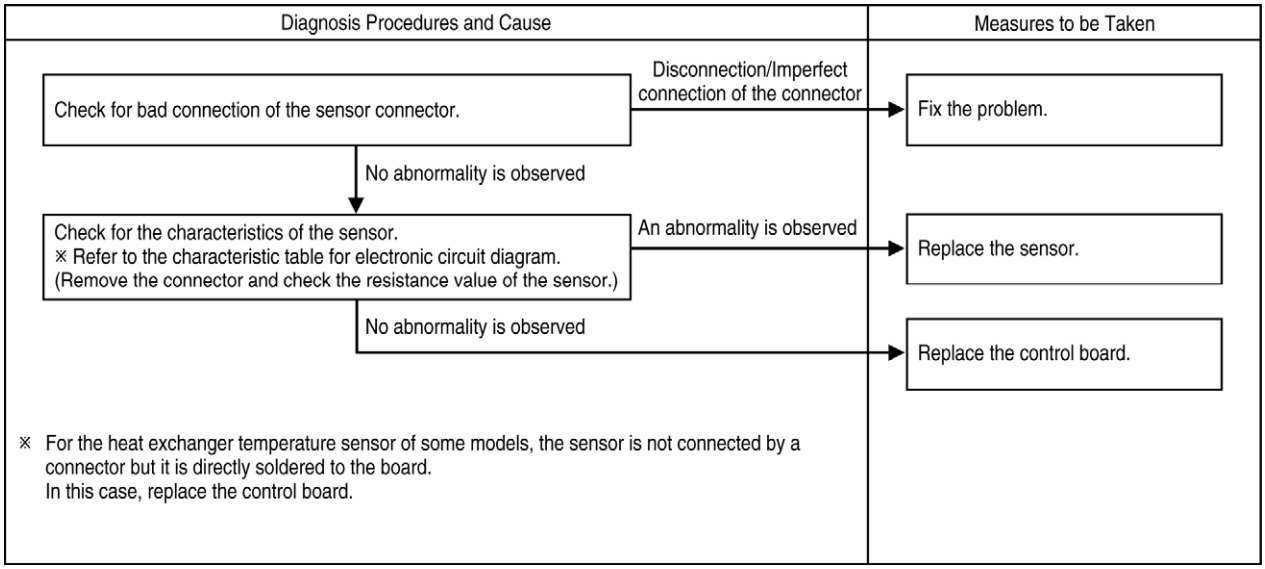
15.4.5 H27 (Outdoor Unit Temperature Sensor)

15.4.6 H28 (Outdoor Unit Heat Exchanger Temperature Sensor 1 Error)

15.4.7 H29 (Outdoor Unit Heat Exchanger Temperature Sensor 2 Error)

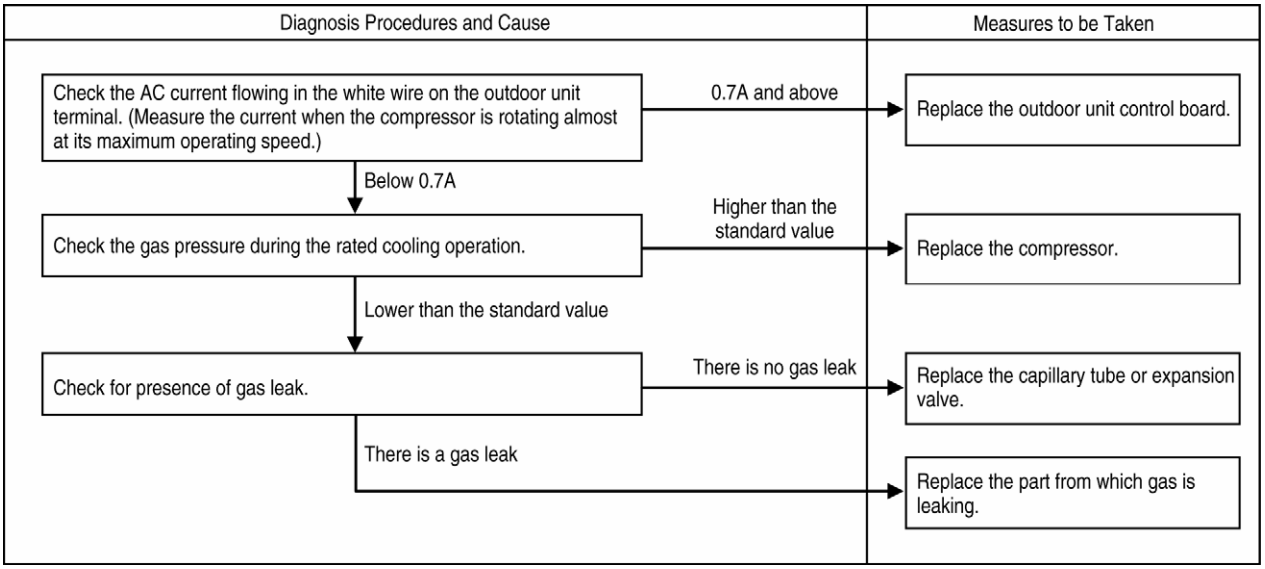
15.4.8 H53 (Heat Storage Tank Temperature Sensor Error)

Troubleshooting



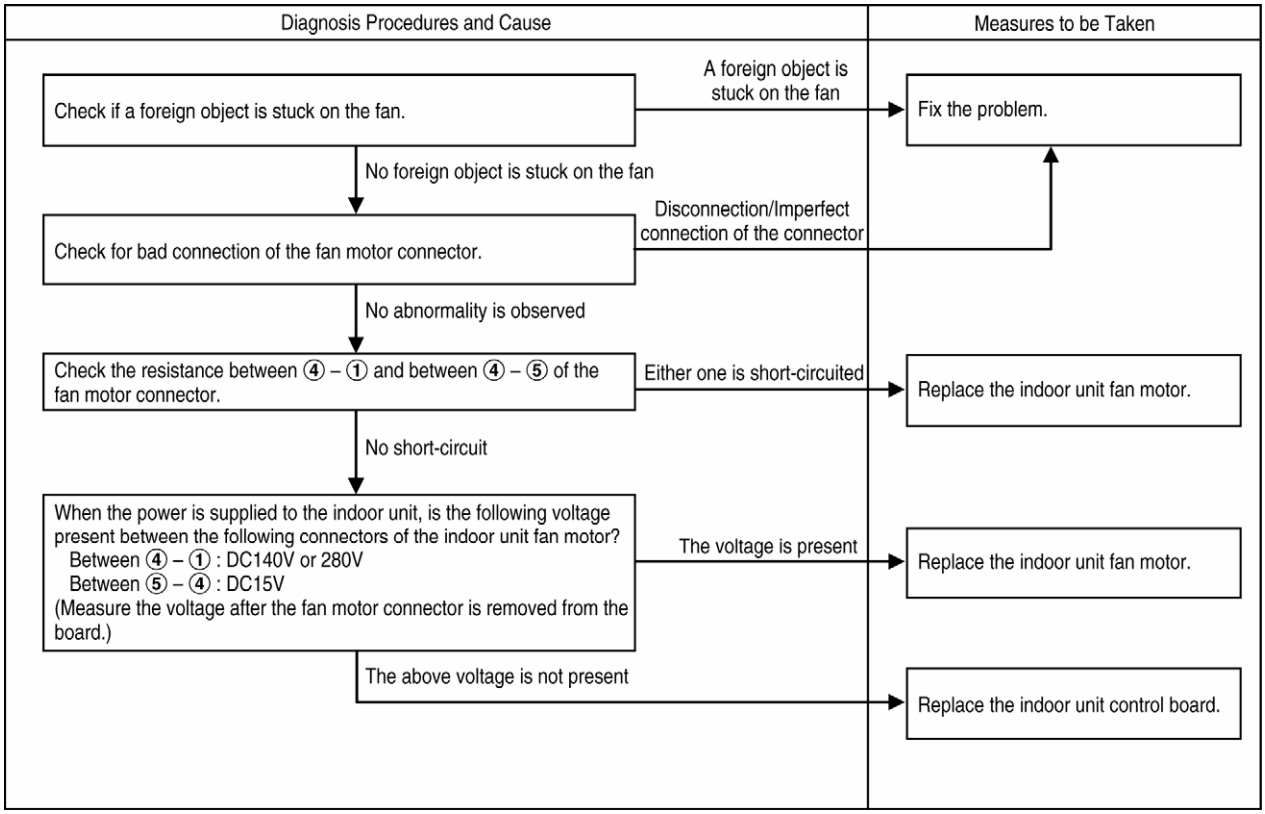
15.4.9 H16 (Outdoor Unit CT Disconnection Error)

Troubleshooting



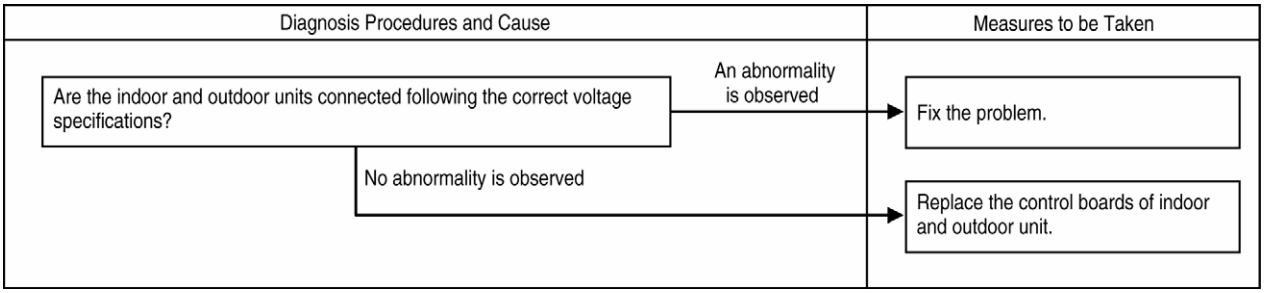
15.4.10 H19 (Indoor Unit Fan Motor Lock Error)

Troubleshooting



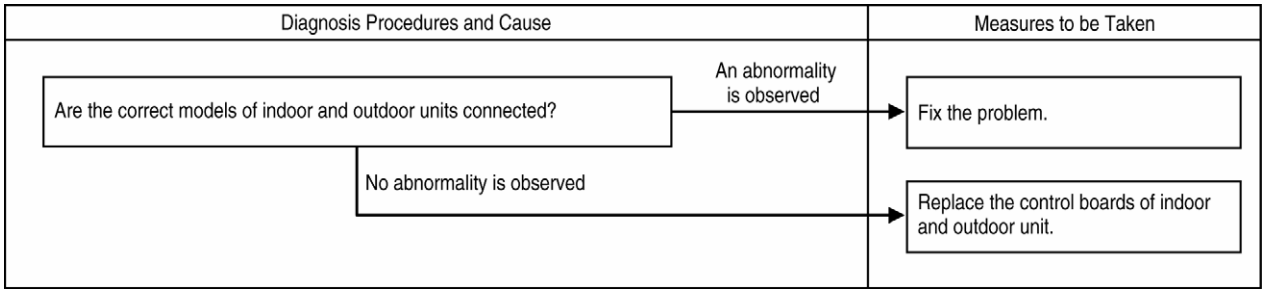
15.4.11 H33 (Connection Error of the Models with Different Voltage Power Supply)

Troubleshooting



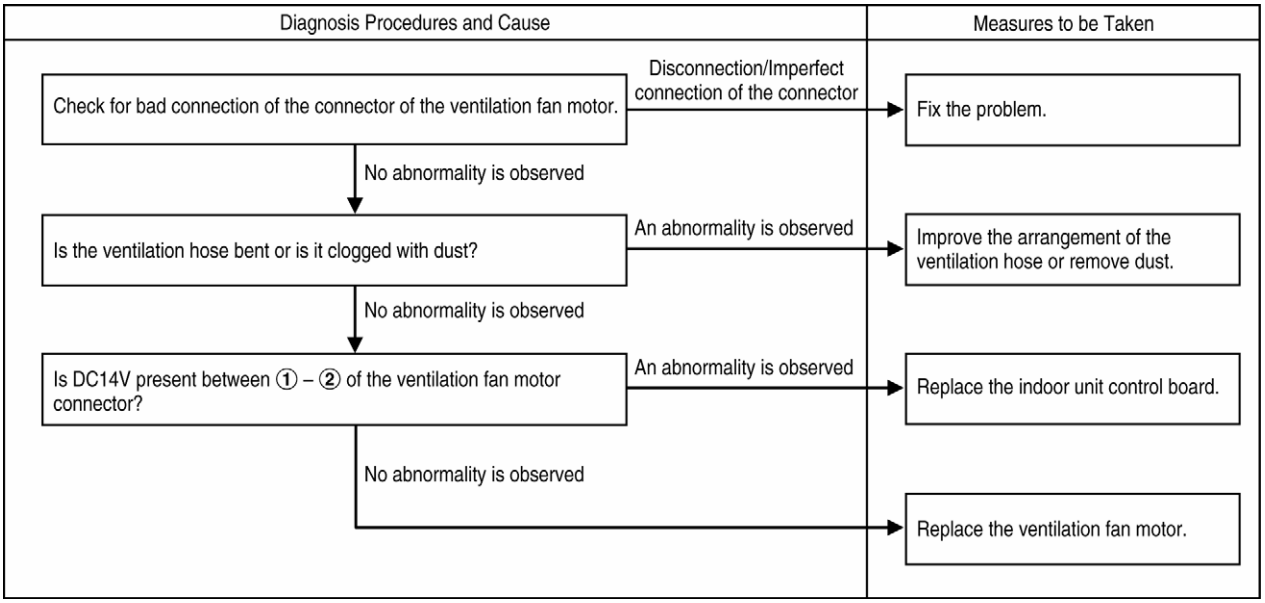
15.4.12 H38 (Brand not Corresponding)

Troubleshooting



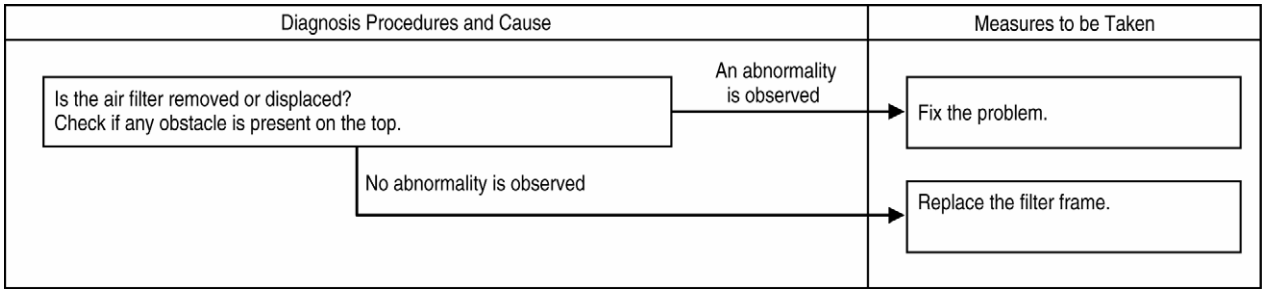
15.4.13 H50 (Ventilation Fan Motor Error)

Troubleshooting



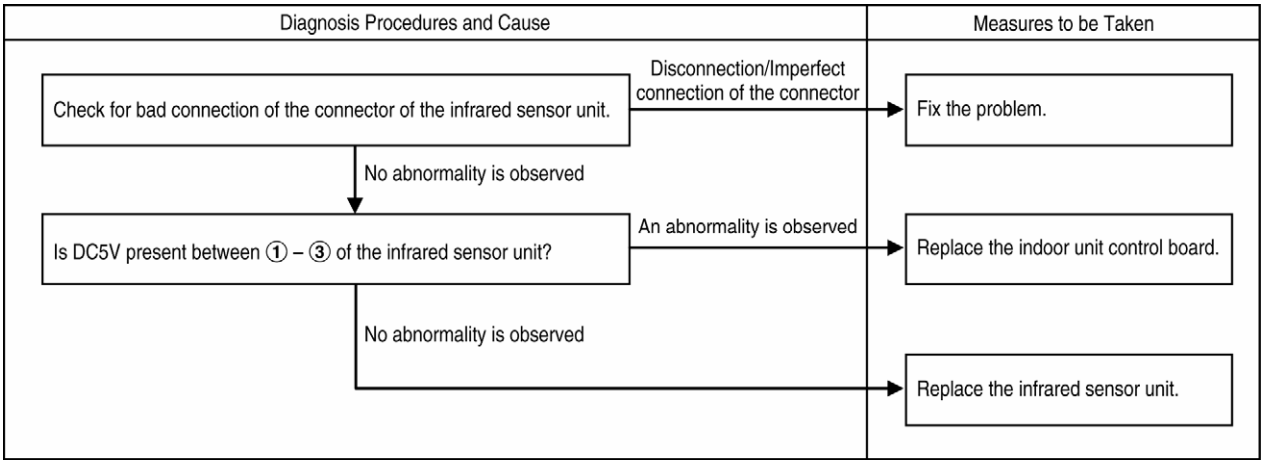
15.4.14 H51 (Filter Cleaning Nozzle Lock Error)

Troubleshooting



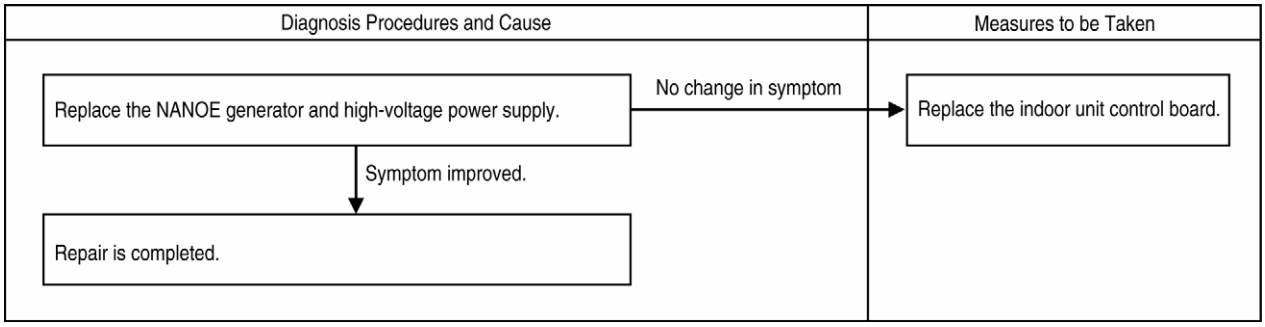
15.4.15 H59 (Infrared Sensor Error)

Troubleshooting



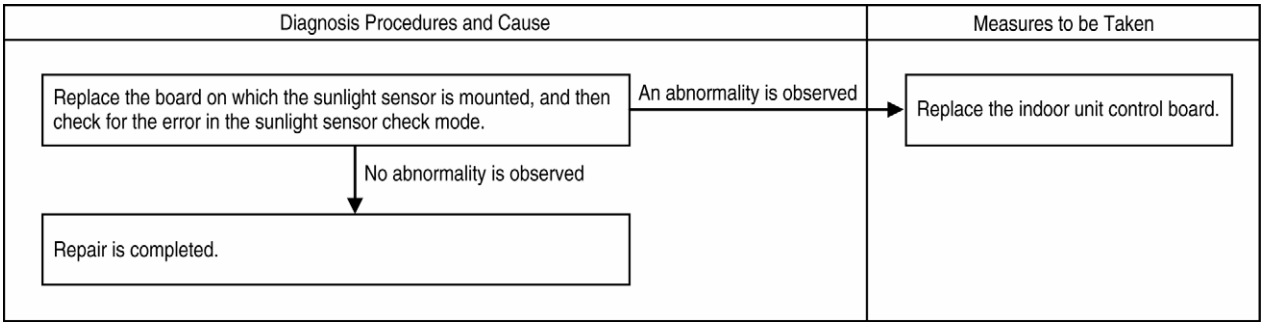
15.4.16 H67 (NANOE Error)

Troubleshooting



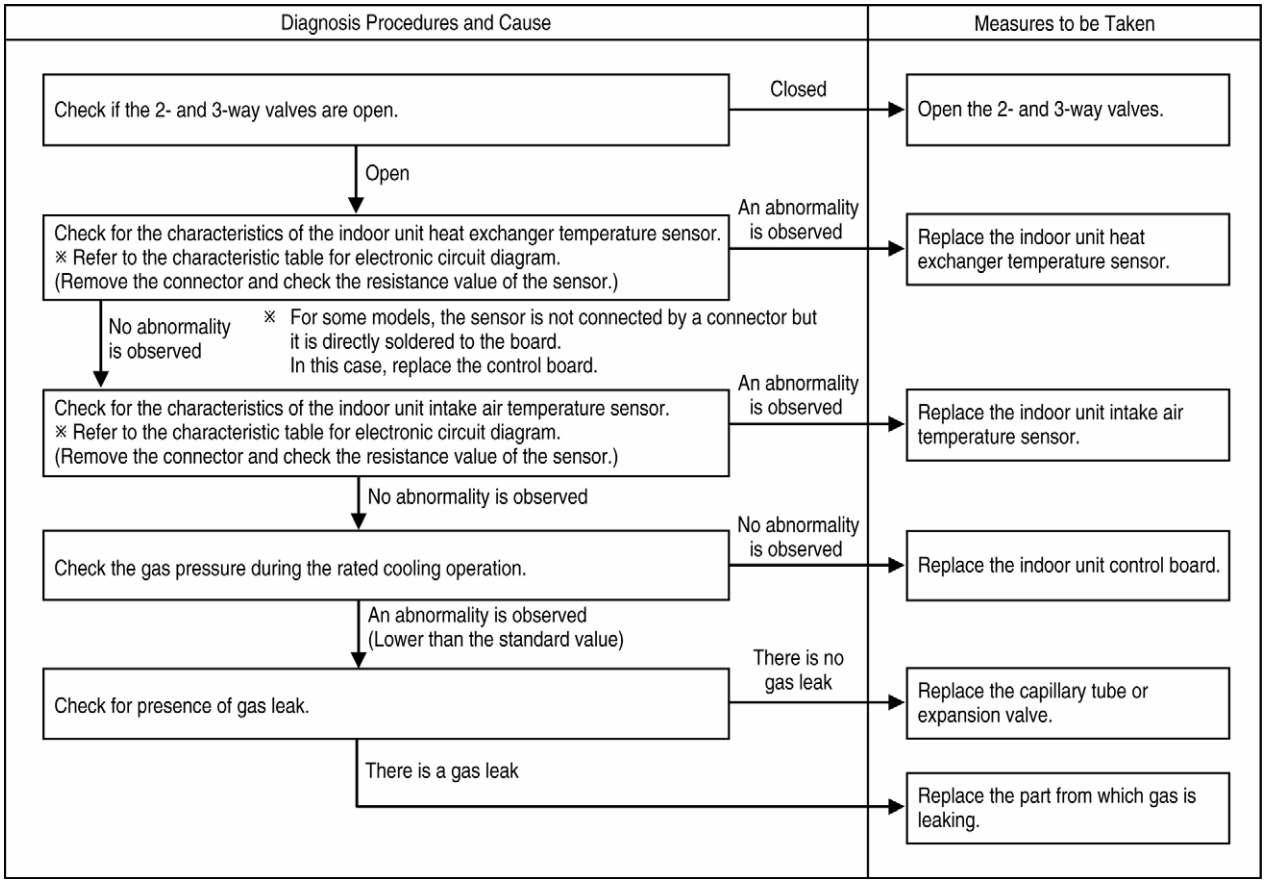
15.4.17 H70 (Sunlight Sensor Error)

Troubleshooting



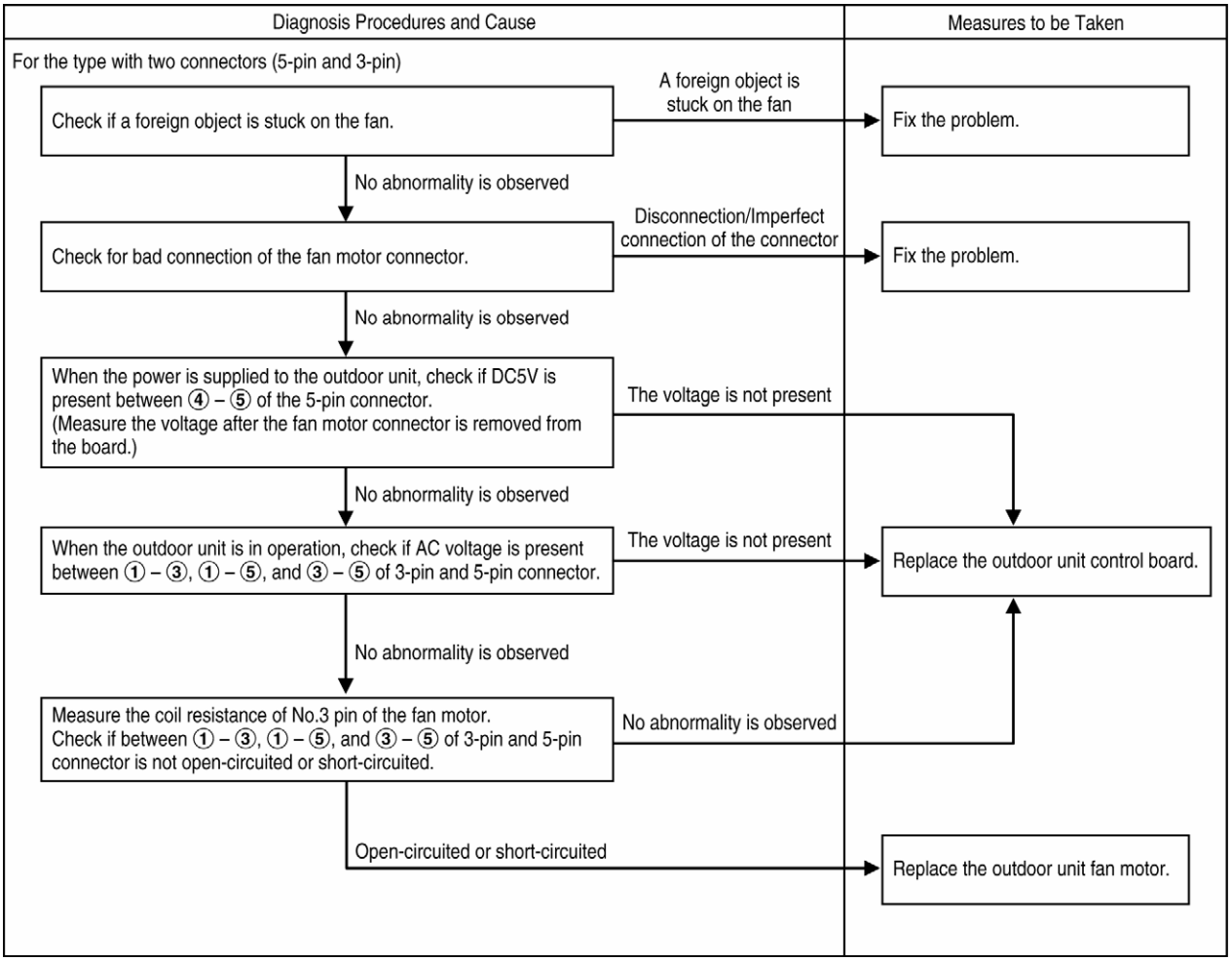
15.4.18 H96 (2- and 3-Way Valve Opening Failure Check)

Troubleshooting



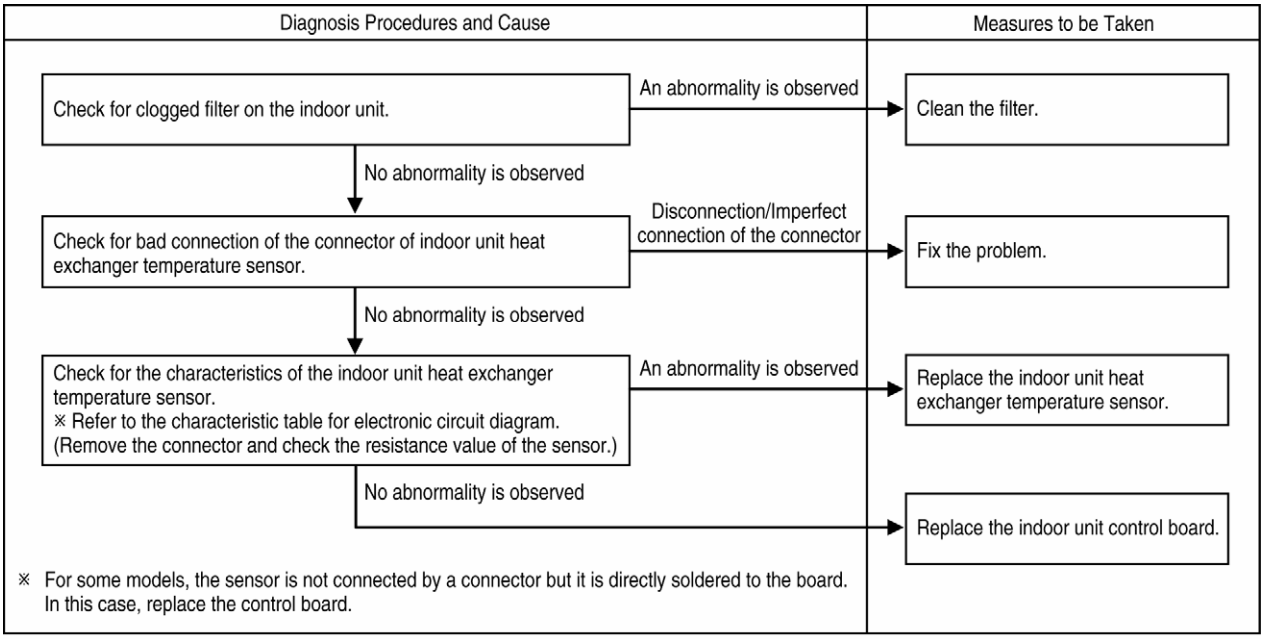
15.4.19 H97 (Outdoor Unit Fan Motor Lock Error)

Troubleshooting



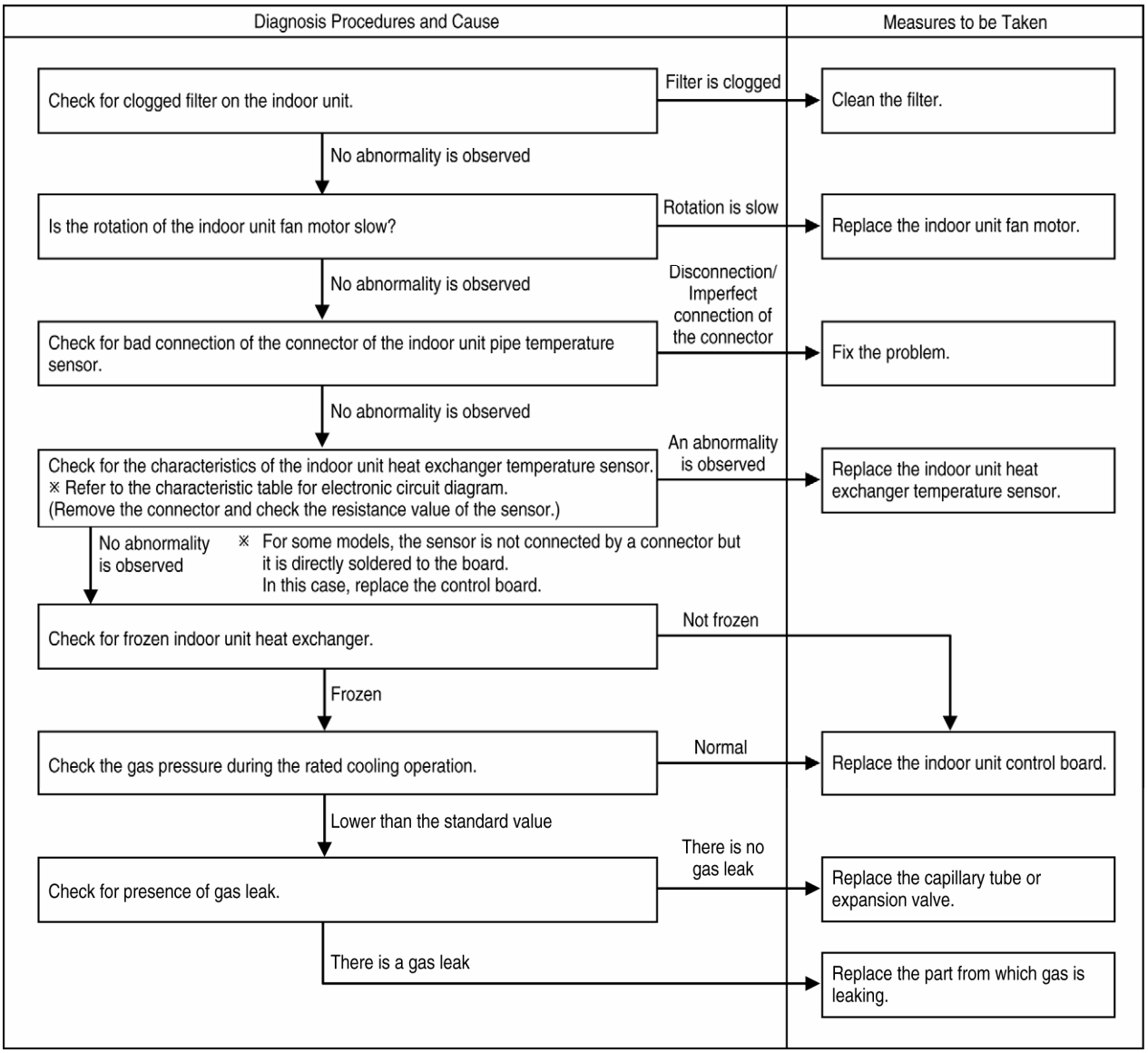
15.4.20 H98 (Indoor Unit Overpressure Protection)

Troubleshooting



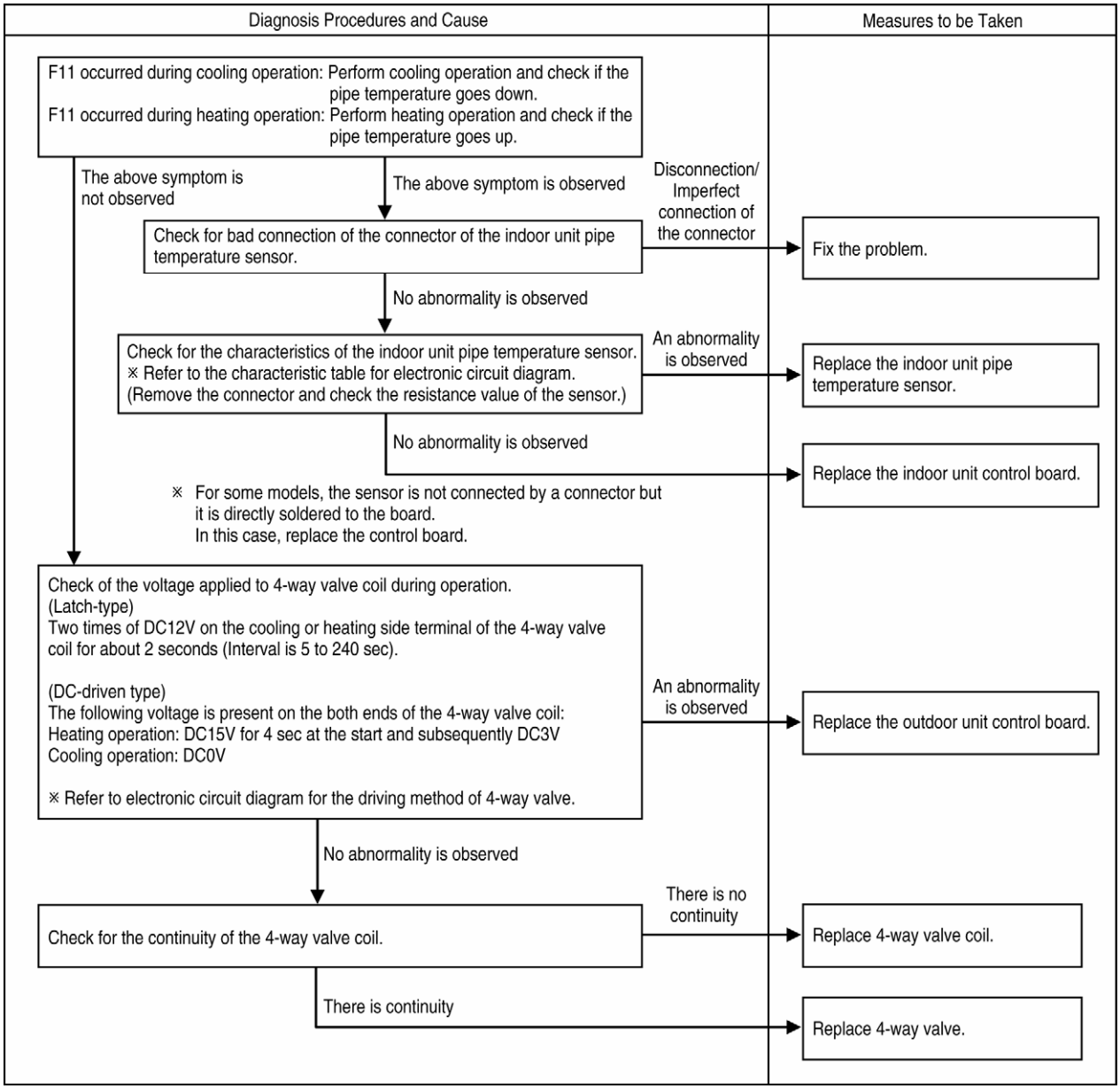
15.4.21 H99 (Indoor Unit Heat Exchanger Freezing Protection (Error Code is to be Stored in the Memory only))

Troubleshooting



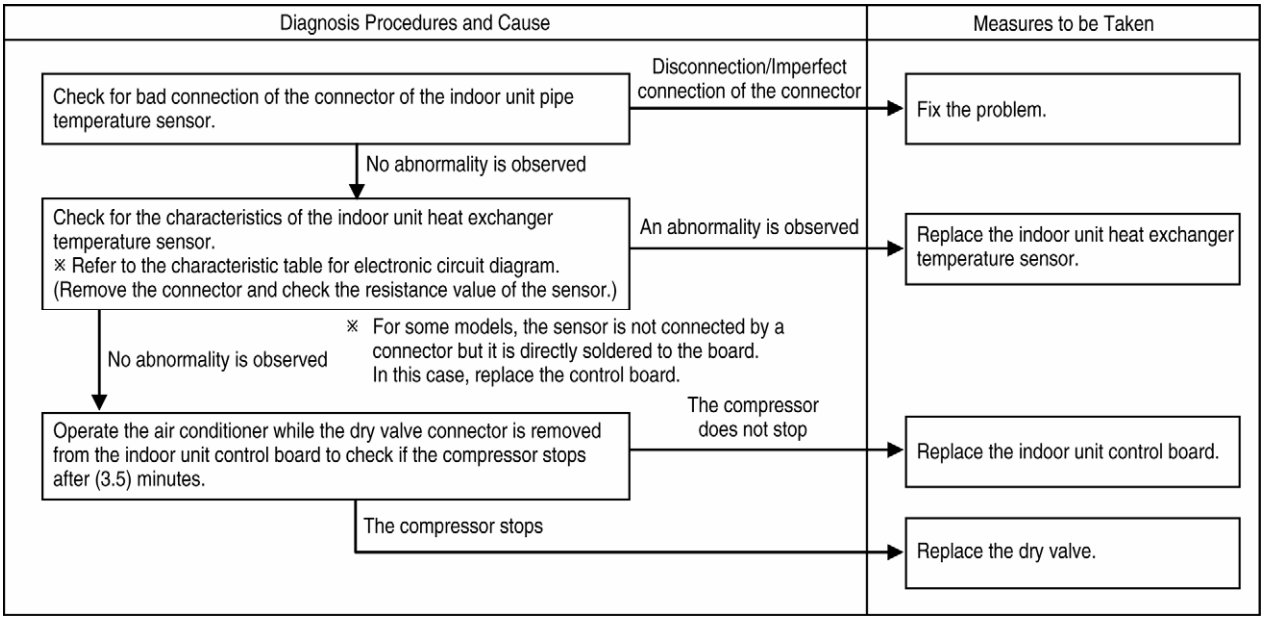
15.4.22 F11 (Cooling-Heating Switching Error)

Troubleshooting



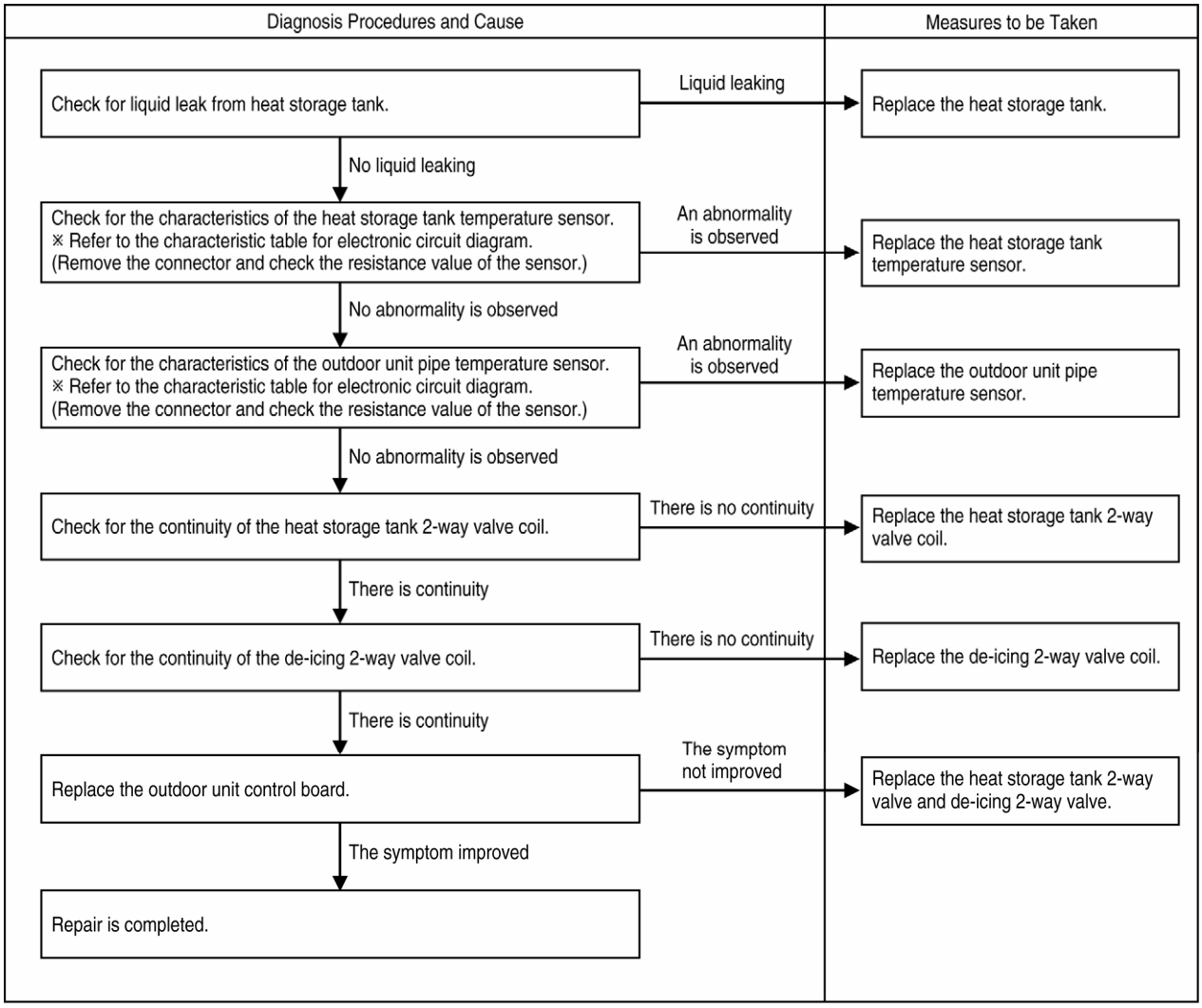
15.4.23 F16 (Cooling-Dry Switching Error)

Troubleshooting



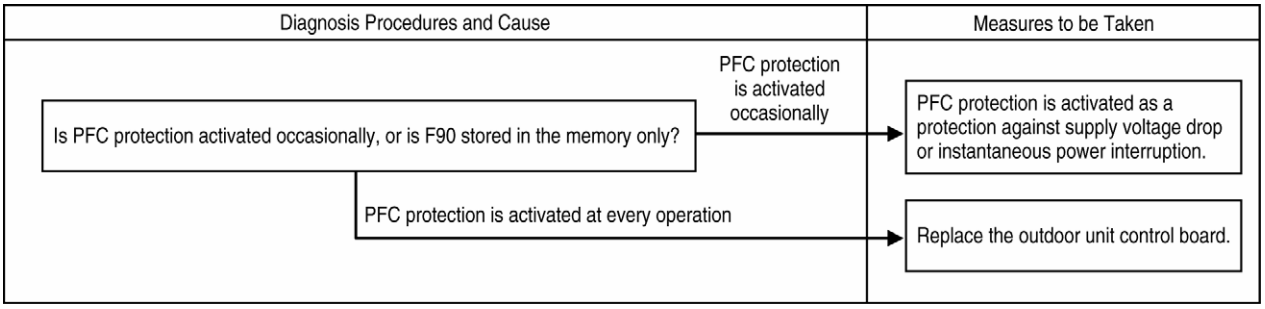
15.4.24 F19 (Heat Storage Cycle Error)

Troubleshooting



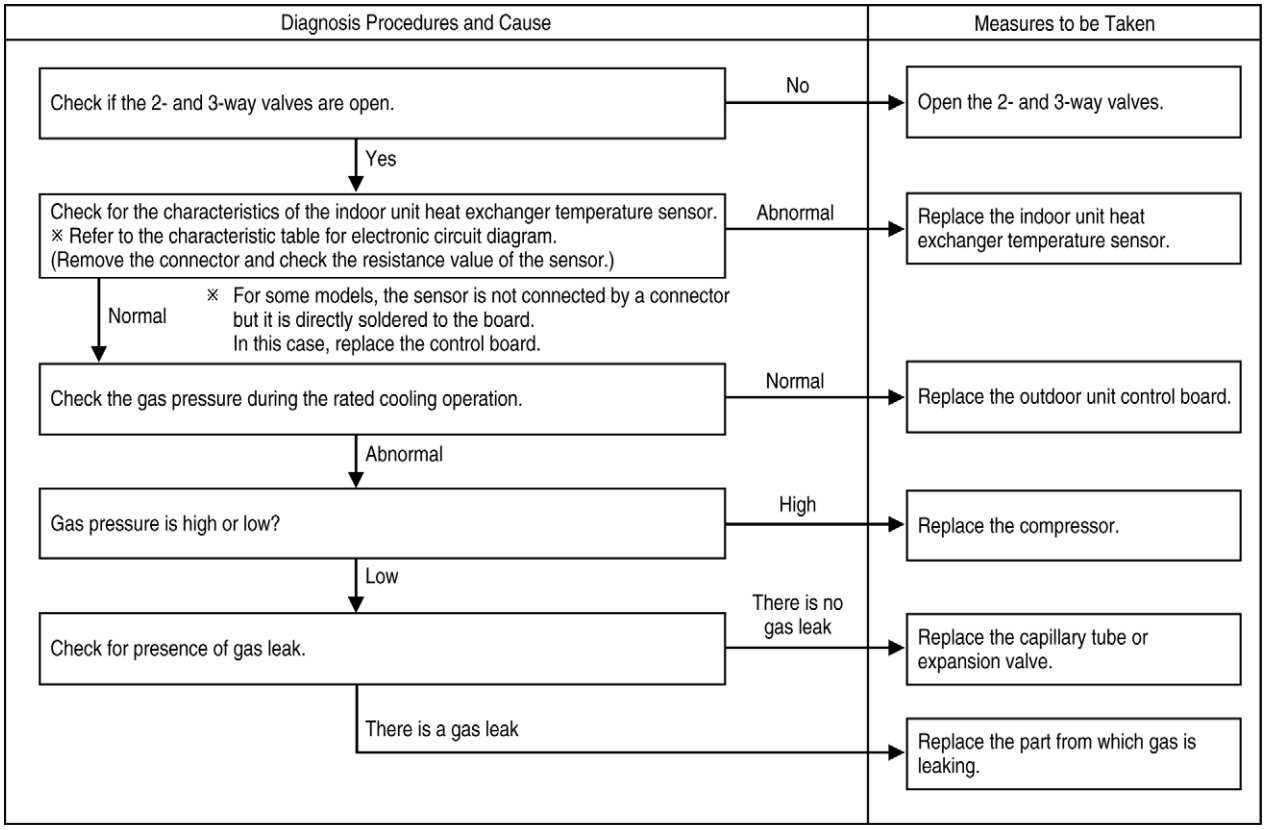
15.4.25 F90 (PFC Protection)

Troubleshooting



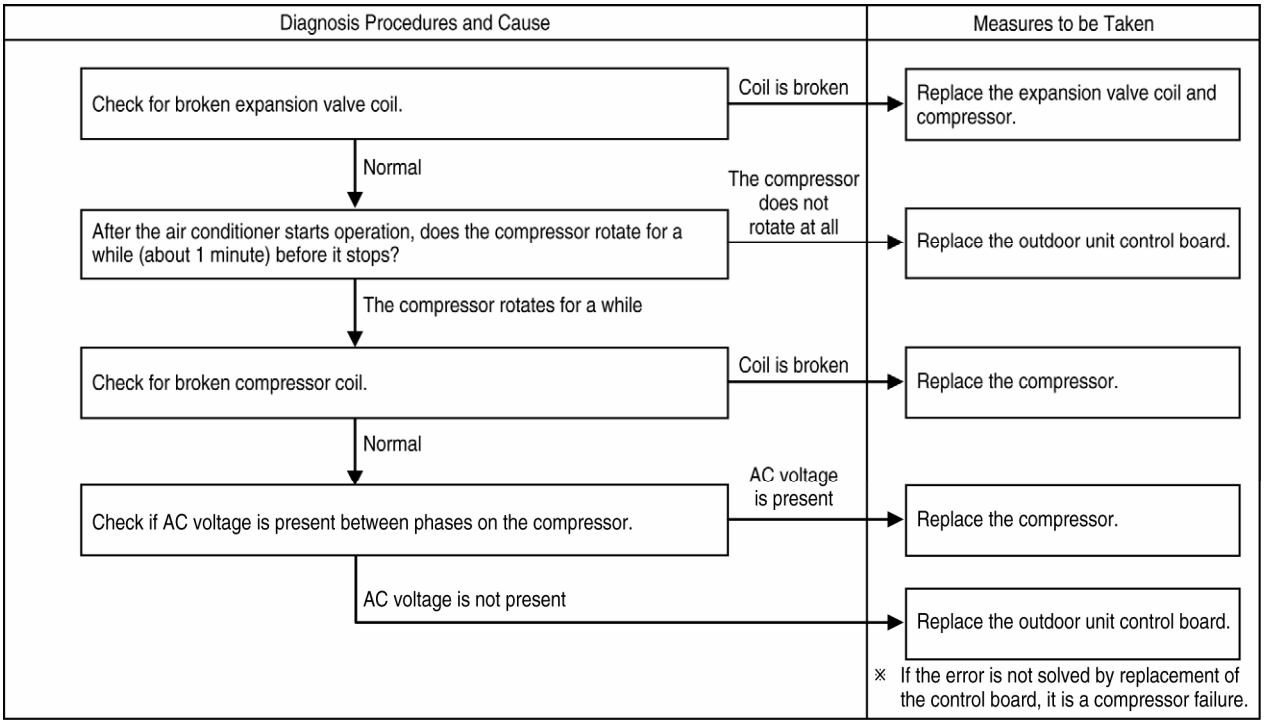
15.4.26 F91 (Refrigeration Cycle Error)

Troubleshooting



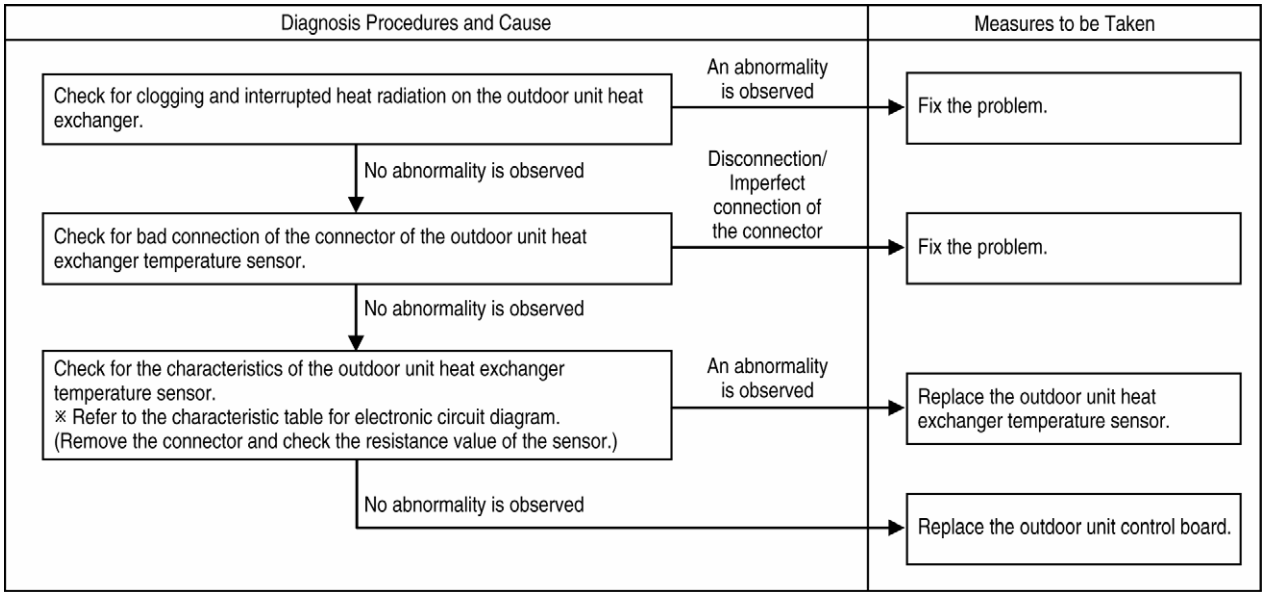
15.4.27 F93 (Compressor Rotation Error)

Troubleshooting



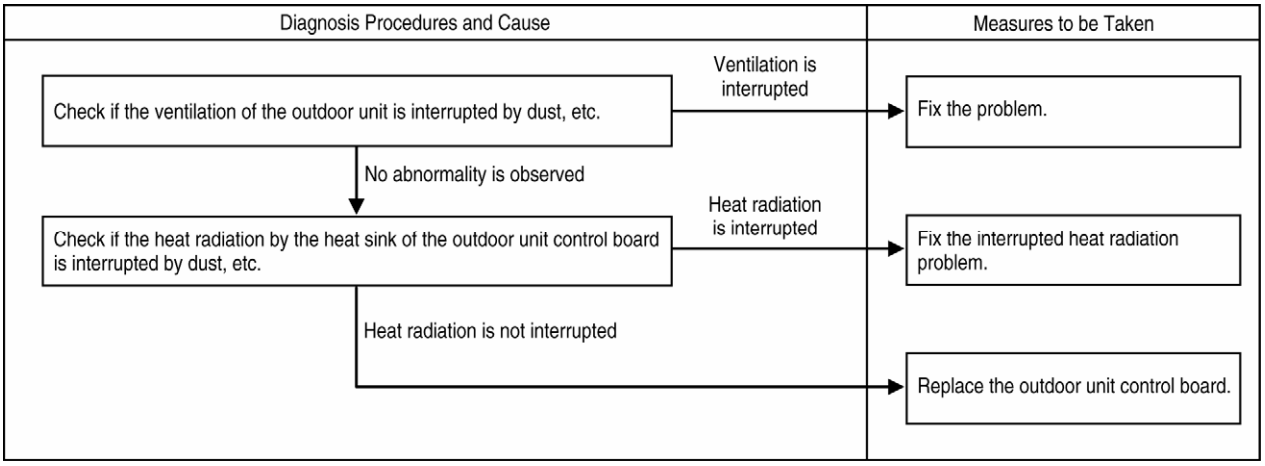
15.4.28 F95 (Overpressure Protection in Case of Cooling Error)

Troubleshooting



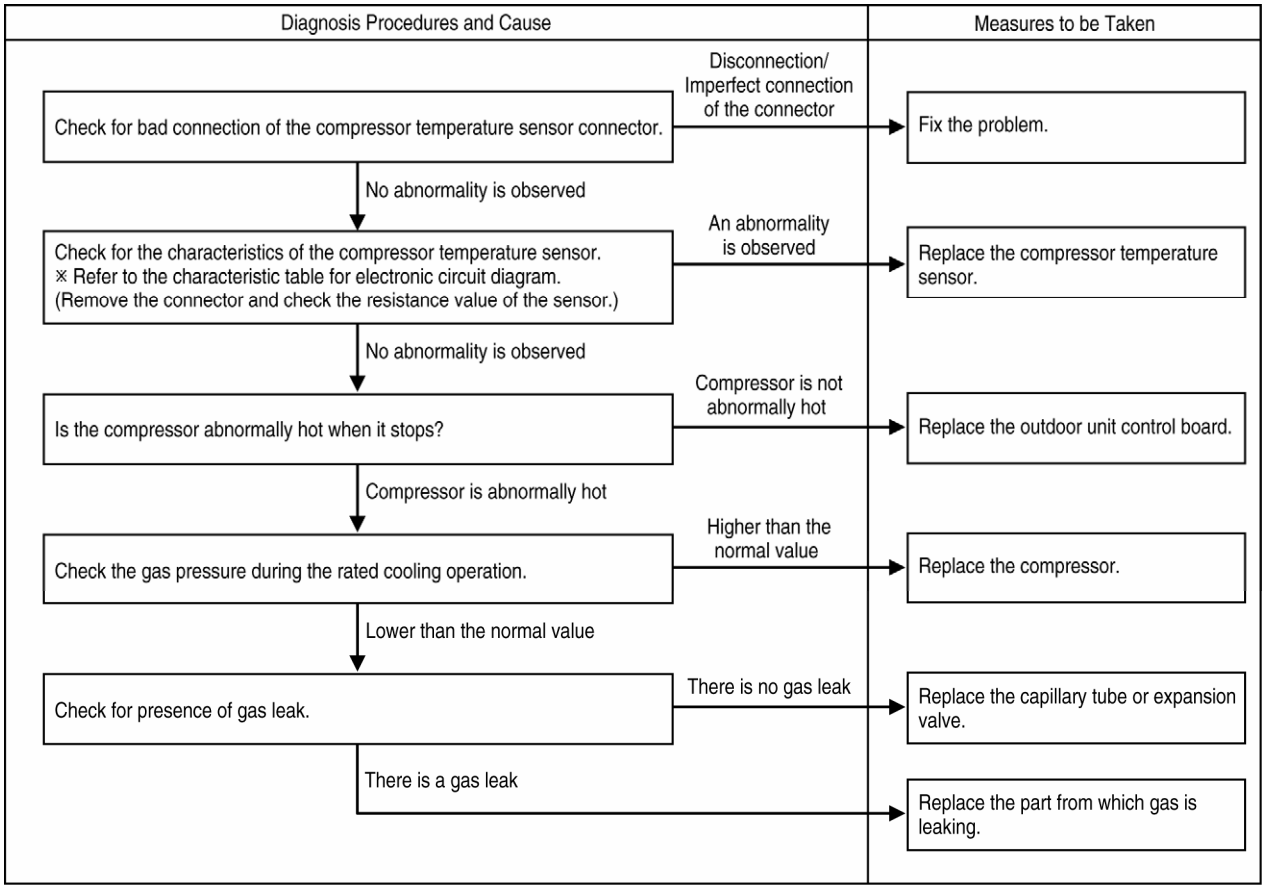
15.4.29 F96 (Transistor Module Over-temperature Protection)

Troubleshooting



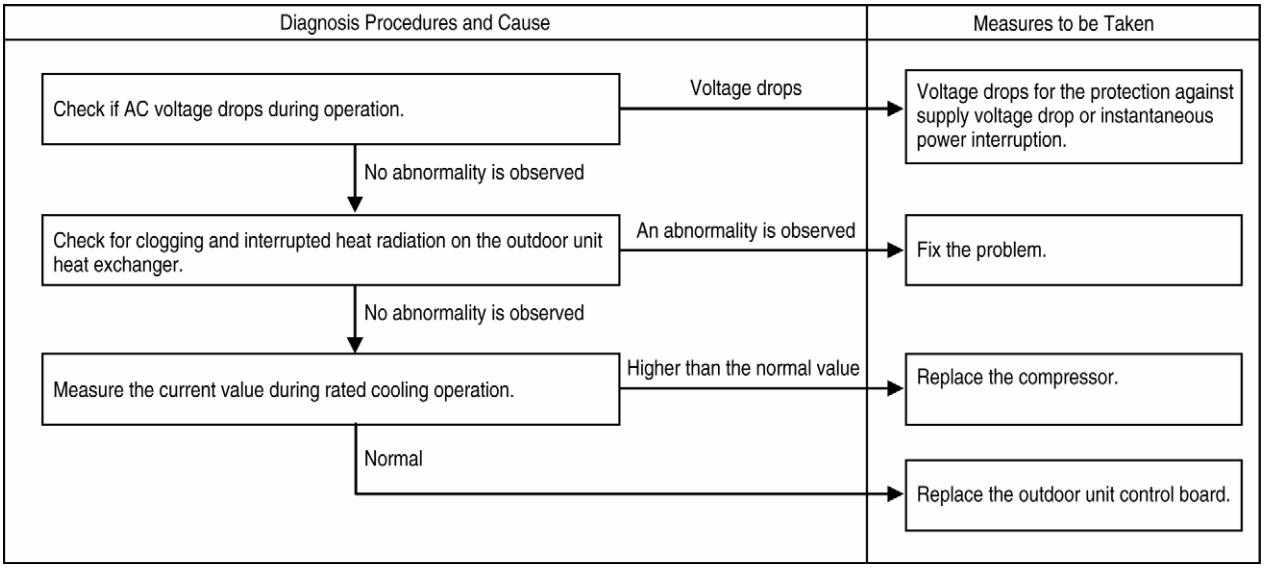
15.4.30 F97 (Compressor Over-temperature Protection)

Troubleshooting



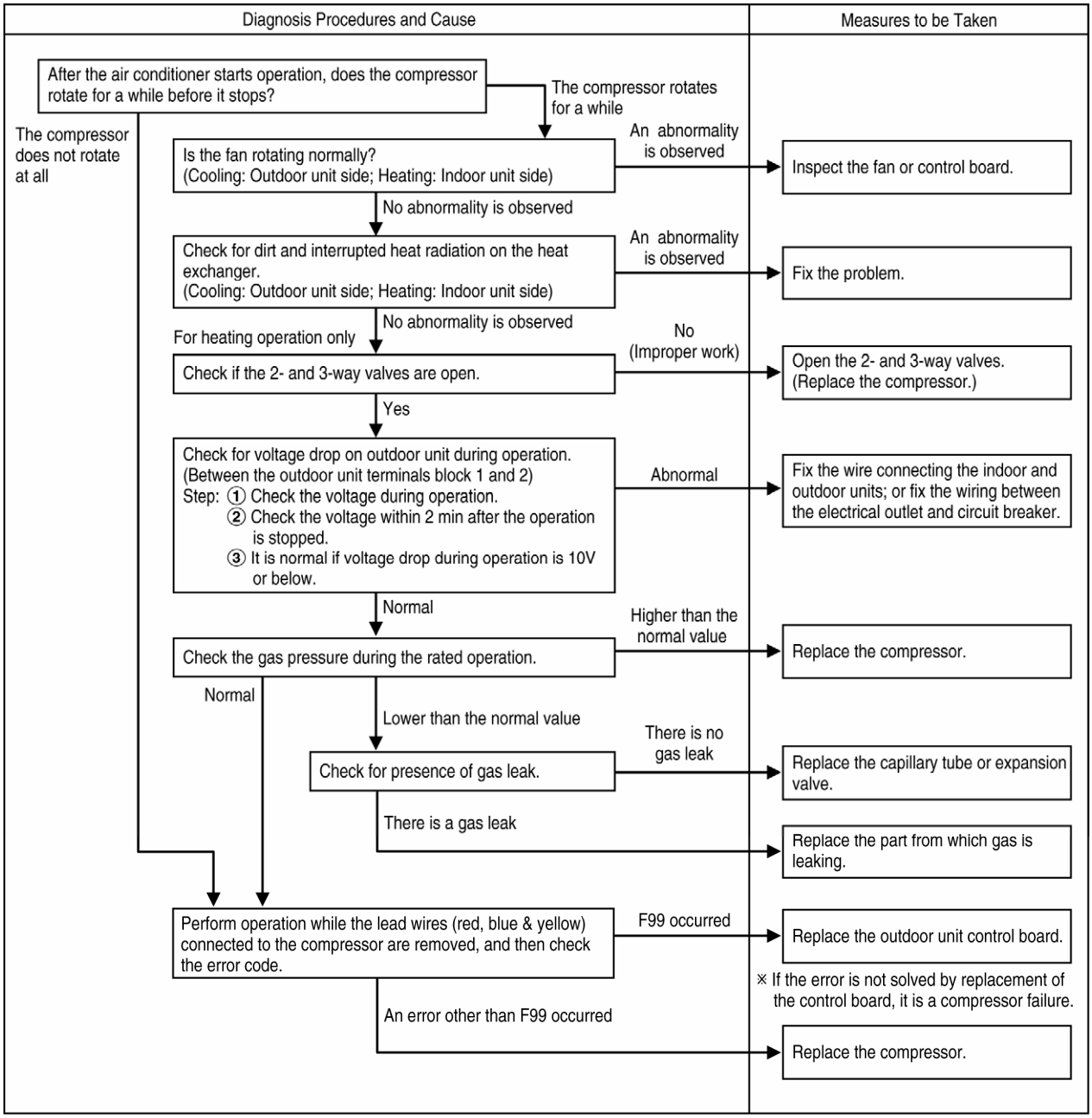
15.4.31 F98 (Total Current Protection Control)

Troubleshooting



15.4.32 F99 (DC Peak Operation Error)

Troubleshooting



16. Disassembly and Assembly Instructions

16.1 Points of Disassembly (Indoor Unit)

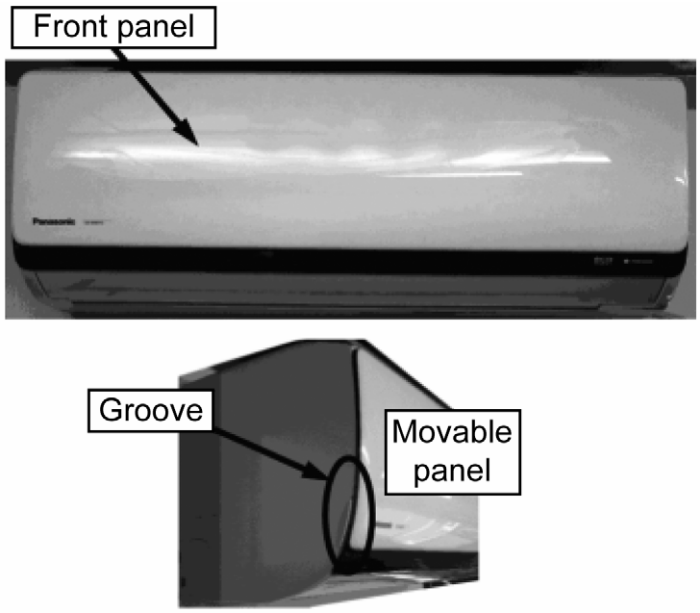
⚠ WARNING

Disconnect the power plug	Be sure to disconnect the power plug from the outlet before disassembly or repair of the unit. Failure to observe this warning could result in electric shock. Be very careful not to touch the live parts when performing a repair work which requires power supply or inspecting the circuit. Also, be very careful of the fan as it can start rotating anytime.

Read this manual carefully when replacing the air filter frame (auto cleaner) block or other parts.

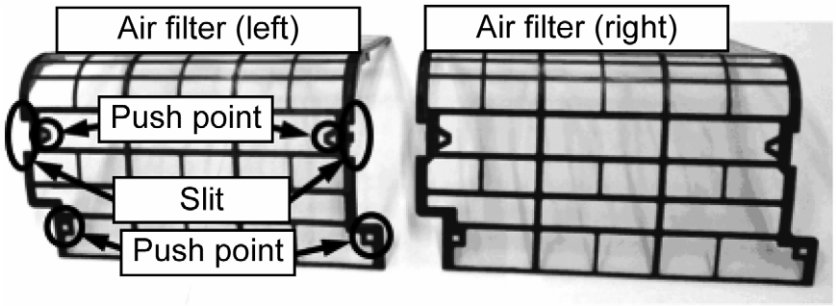
16.1.1 Removing the Front Panel

1 Push the panel up with both hands until it stops. Push the panel further up and then pull it towards you to remove it.
※ Note on disassembly: Hold the grooves on the front panel to open it. (The panel moves if you hold the movable part.)



16.1.2 Removing the Air Filters

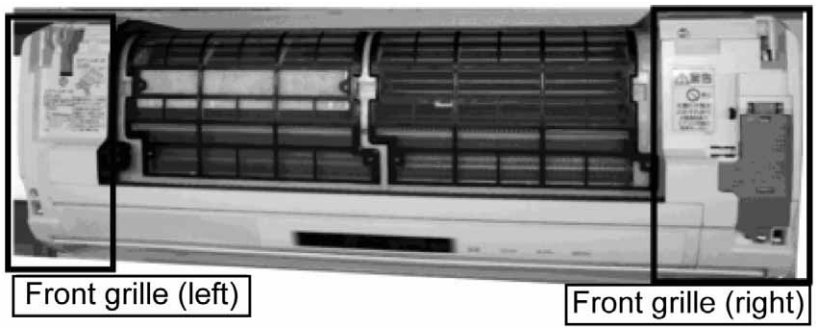
※ Note that the HX series 2011 does not have the “top grille”.
1 Raise the front panel up with both hands until it stops.
※ Note on disassembly: Hold the grooves on the front panel to open it. (The panel moves if you hold the movable part.)
2 Put your fingers at the slits on both sides of the air filter and pull the filter towards you to remove it. (Left and right filters are common.)
※ Note on disassembly: The air filters are in L shape which cover up to the inner end of the top side. Pull the filters slowly towards you to avoid them from getting stuck.



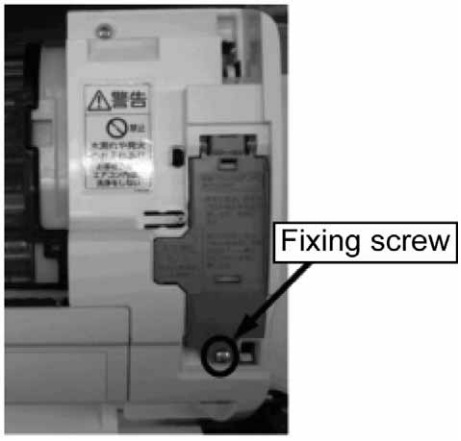
※ Note on assembly: When attaching the air filters, push the push point on the air filters securely and make sure that there is no misalignment of the filters such as lifted filter.

16.1.3 Removing the Front Grille (Right) and Front Grille (Left)

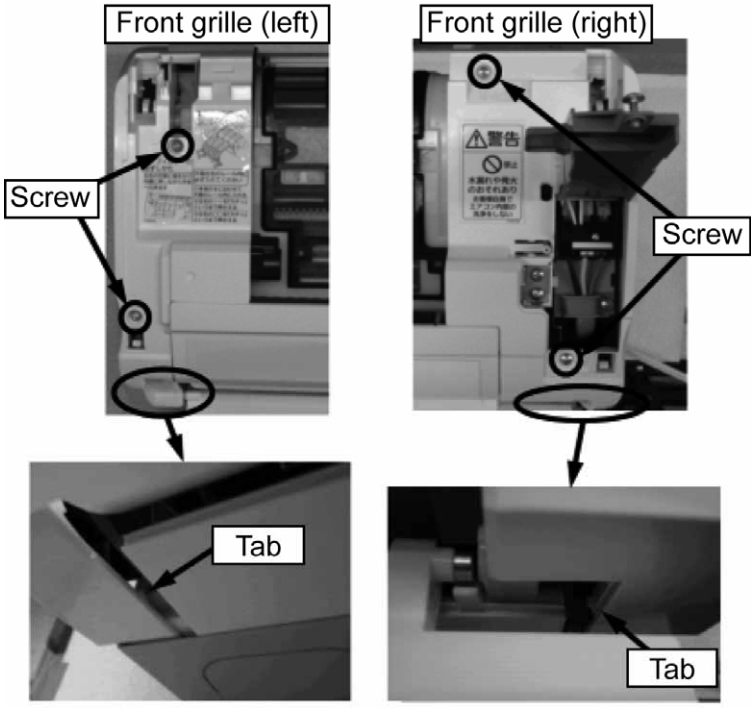
1 Perform “16.1.1 Removing the Front Panel”.



2 Open the vertical airflow direction louver slowly.
3 Remove the fixing screw (1 piece) of the indoor/outdoor unit transmission wire cover and leave the cover open.
※ Note on disassembly: Note that the front grille cannot be removed if the cover is closed because of the reinforced safety structure of electric wiring.

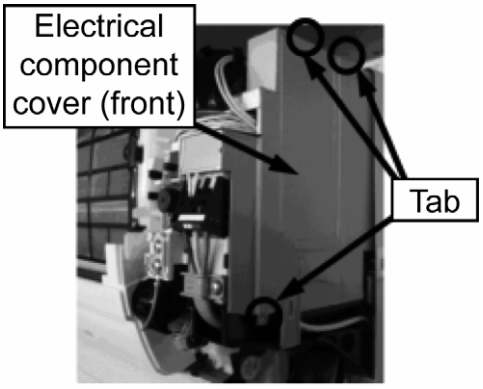


4 Remove the screws of the front grille (right) and (left) (2 screws each).
5 Disengage the tab on the bottom part of the front grille (right) and (left) (one tab each). Slightly lift the bottom part and then raise the front grilles to remove them.

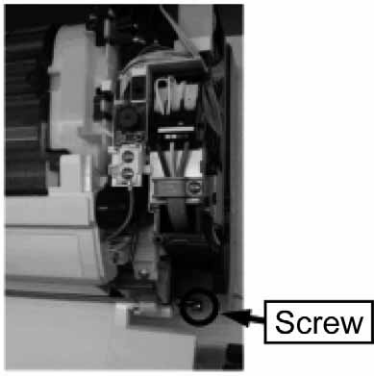


16.1.4 Removing the Control Board Box

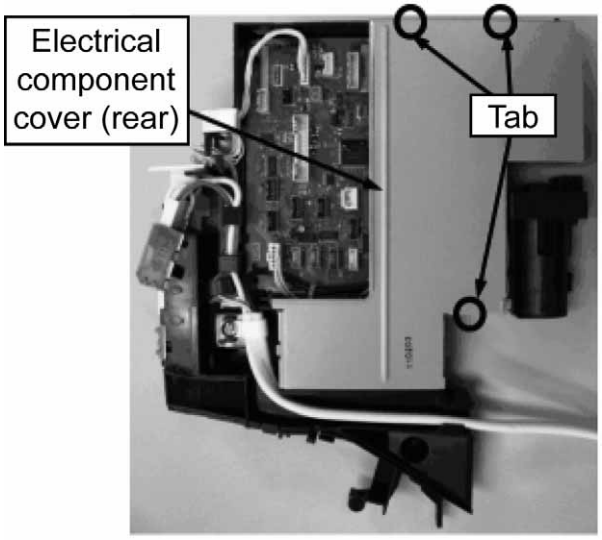
1 Perform “16.1.1 Removing the Front Panel”.
2 Perform “16.1.3 Removing the Front Grille (Right) and Front Grille (Left)”.
※ Note on disassembly: When removing only the control board box, remove the front grille (right) only.
3 Remove the electrical component cover (front) on the right side of the control board box. (There are 2 tabs on top and 1 tab at the bottom.)



4 Remove the screw (1 piece) at the bottom of the control board and then pull the power-supply box towards you.



5 Disengage the tabs (3 locations) which fix the electrical component cover (rear) to the power-supply box. Then, remove the electrical component cover (rear) on the right side of the power-supply box.



6 Disconnect the connectors and terminals.

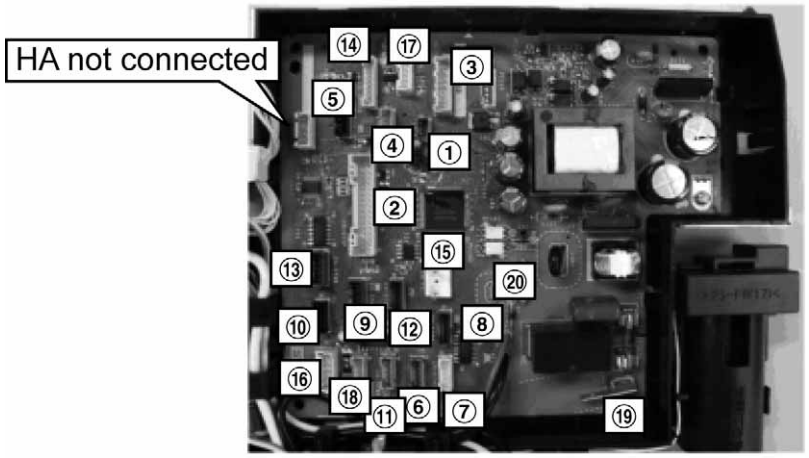
■ Connectors

- CN-TH2 (green) ····· Indoor intake air temperature sensor No. ①
- CN-DISP (white) ····· Control board (human sensor unit, signal receptor and indicator) No. ②
- CN-FM (white) ····· Fan motor No. ③
- CN-TH1 (yellow) ····· Indoor heat exchanger temperature sensor No. ④
- CN-STM1 (green) ····· Vertical louver motor (lower) No. ⑥
- CN-STM2 (white) ····· Vertical louver motor (upper) No. ⑦
- CN-STM3 (blue) ····· Horizontal louver motor (right) No. ⑧
- CN-STM4 (blue) ····· Human sensor drive motor No. ⑨
- CN-STM5 (black) ····· Ventilation/Exhaust switching motor No. ⑩
- CN-STM6 (gray) ····· Front panel motor No. ⑪
- CN-STM7 (red) ····· Horizontal louver motor (left) No. ⑫
- CN-SWSEN (white) ····· Control board (emergency operation button, front panel switch) No. ⑭ ※
- CN-NANO (white) ····· Highvoltage power supply (nanoe) No. ⑯

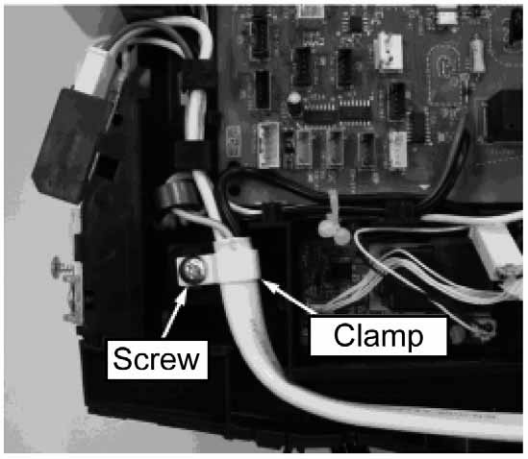
※ Note on disassembly: There is no need to disconnect the connector marked with ※ to remove the control board box. (However, when removing the control board, the connector marked with ※ should be disconnected.)

■ Tab terminals

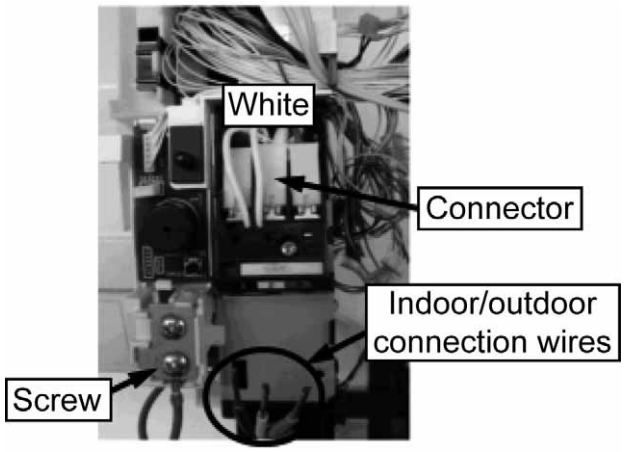
- CN-TAB1 (white) ····· Power supply No. ⑲
- CN-TAB2 (white) ····· Power supply No. ⑳



7 Remove the screw (1 piece) of the clamp for the power cord and then remove the clamp.

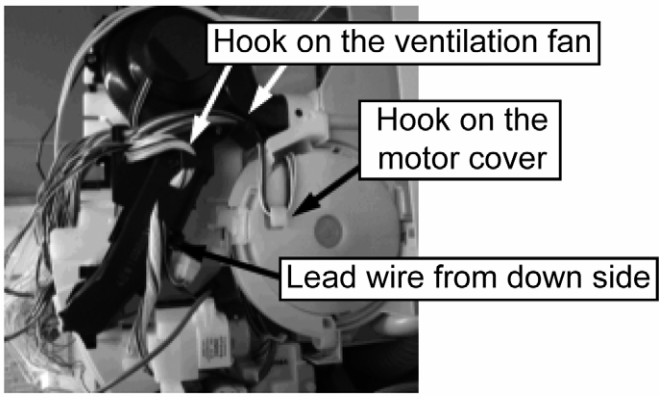


8 Remove the earth wire screw (1 piece) and disconnect the indoor/outdoor connection wires as well as the connector for the white wire connected to the terminal block. Then, remove the control board box.



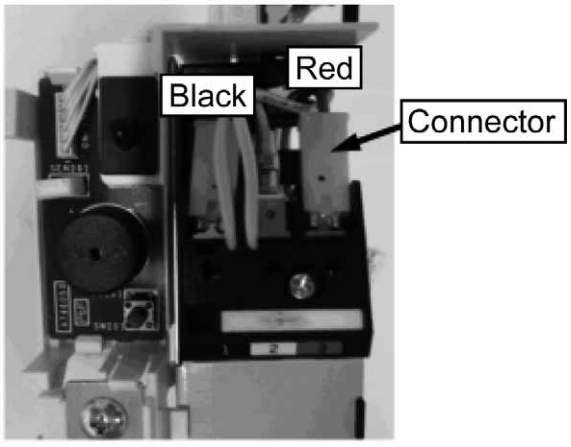
※ Note on assembly: About lead wire arrangement during assembly

- The lead wire of the indoor motor should be hung on the hook on the motor cover, then hung on the hook on the ventilation fan, and then brought to the left. Connect the connector to the control board.
- The lead wire from down side should be positioned along the ventilation fan, then hung on the hook on the ventilation fan, and then brought to the left. Connect the connector to the control board.



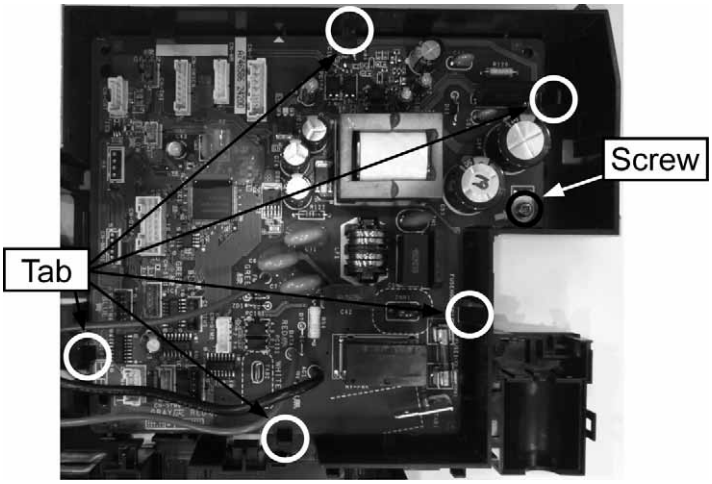
16.1.5 Removing the Control Board

1 Perform “16.1.1 Removing the Front Panel”.
2 Perform “16.1.3 Removing the Front Grille (Right) and Front Grille (Left)”.
※ Note on disassembly: When removing only the control board, remove the front grille (right) only.
3 Perform “16.1.4 Removing the Control Board Box”.
4 Disconnect the connectors for the black and red wires connected to the terminal block.



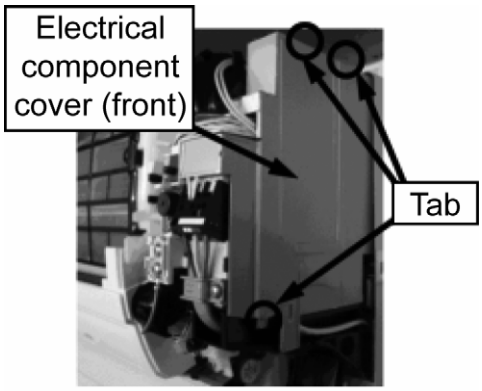
5 Remove the screw (1 piece) which fixes the control board.

6 Disengage the tabs (5 locations) which fix the control board and then remove the control board.

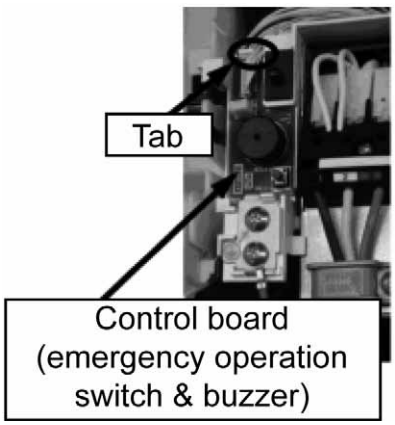


16.1.6 Removing the Control Board (Emergency Operation Switch and Buzzer)

1 Perform “16.1.1 Removing the Front Panel”.
2 Perform “16.1.3 Removing the Front Grille (Right) and Front Grille (Left)”.
※ Note on disassembly: When removing only the control board (emergency operation switch and buzzer), remove the front grille (right) only.
3 Remove the electrical component cover (front) on the right side of the control board box. (There are two tabs on top and one tab at the bottom.)

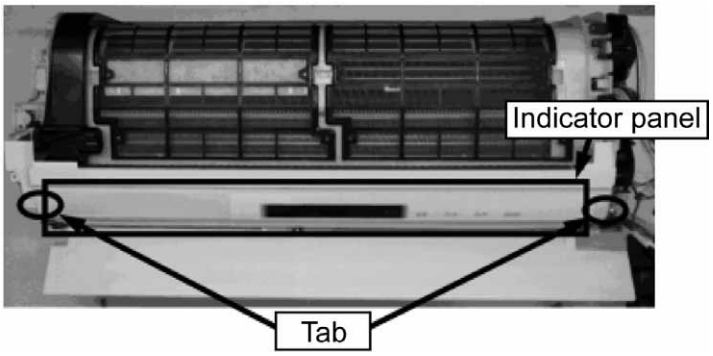


4 Disconnect the connector CN-SWSEN (white) connected to the control board.
5 Press the tab (1 location) on top of the control board (emergency operation switch & buzzer) and remove the control board (emergency operation switch and buzzer).

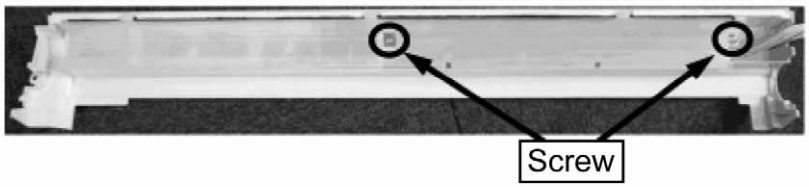


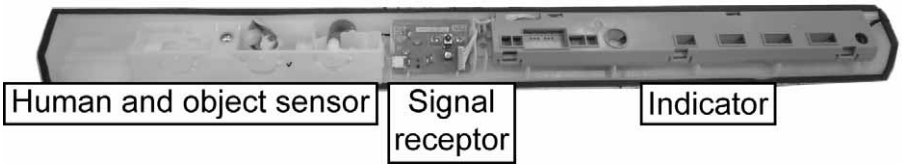
16.1.7 Removing the Human and Object Sensor of the Control Board (Indicator and Signal Receptor)

1 Perform “16.1.1 Removing the Front Panel”.
2 Perform “16.1.3 Removing the Front Grille (Right) and Front Grille (Left)”.
3 Disengage the tabs (2 locations) on both sides of the indicator panel. Then, remove the indicator panel.



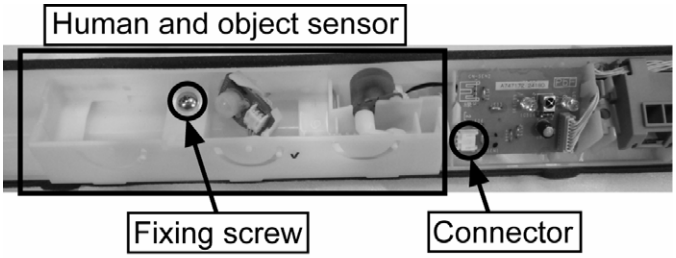
4 Flip the indicator panel and remove the screws (2 pieces).



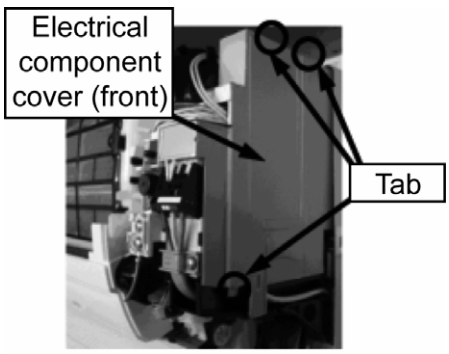


■ How to remove the human and object sensor

1 Disconnect the connectors (2 locations) for the control board (signal receptor).
2 Remove the fixing screw (1 piece) of the human and object sensor. Then, remove the human and object sensor.



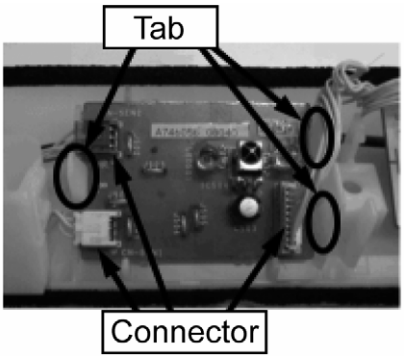
3 Remove the electrical component cover (front) on the right side of the control board box. (There are two tabs on top and one tab at the bottom.)



4 Disconnect the connector CNSTM4 (blue) connected to the control board.

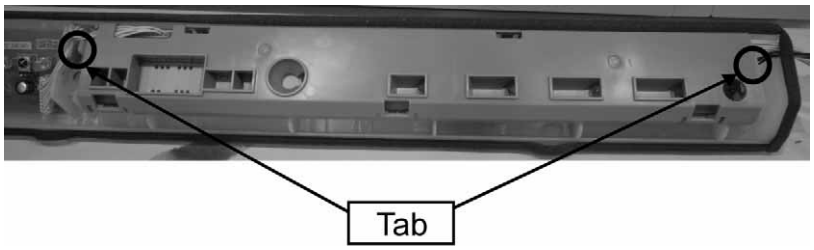
■ How to remove the control board (signal receptor)

1 Disconnect the connectors (3 locations) and disengage the tabs (3 locations) on the control board (signal receptor). Then, remove the control board (signal receptor).

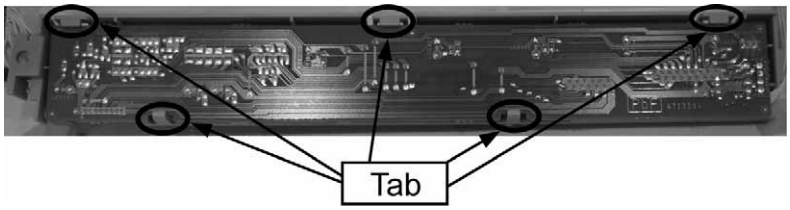


■ How to remove the control board (indicator)

1 Disengage the tabs (2 locations) on the plastic indicator cover.

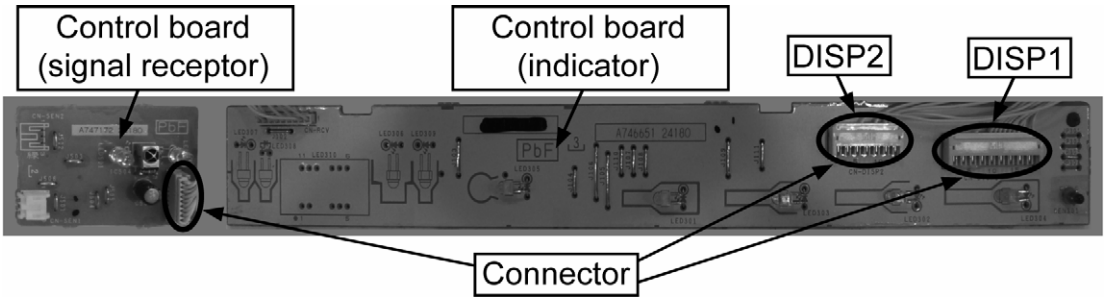


2 Flip the plastic indicator cover and disengage the tabs (5 locations).



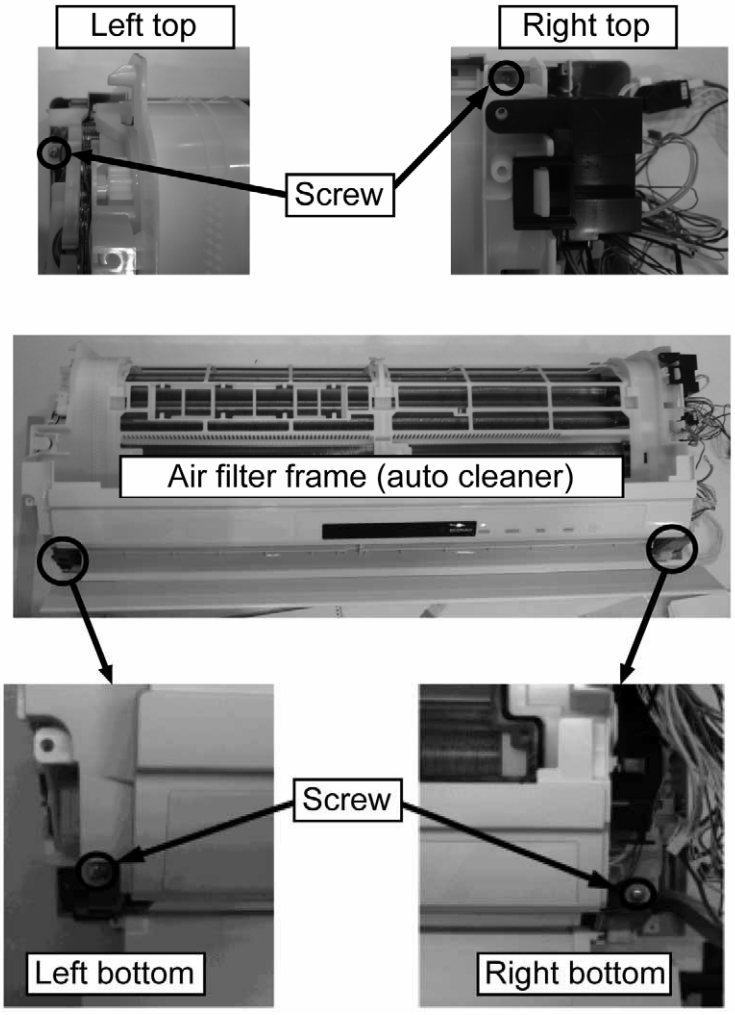
3 Disconnect the connector (1 location) on the control board (signal receptor).

4 Disconnect the connectors (2 locations) on the control board (indicator) and remove the control board (indicator).



16.1.8 Removing the Air Filter Frame (Auto Cleaner)

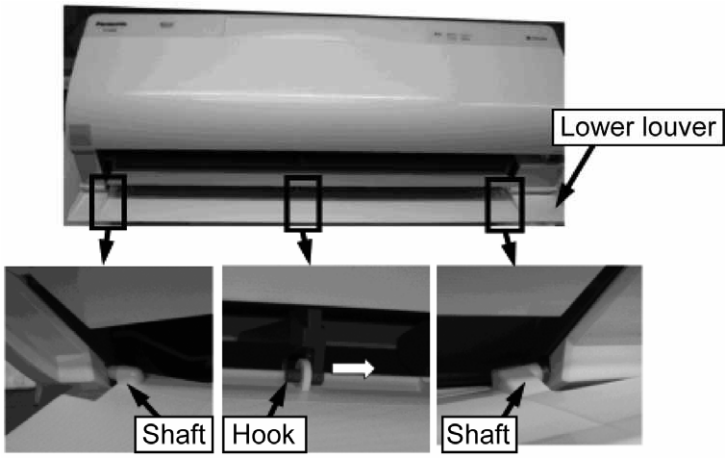
1 Perform “16.1.1 Removing the Front Panel”.
2 Perform “16.1.2 Removing the Air Filters”.
※ Note on disassembly: The air filter frame can be removed without removing the air filters. Nevertheless, be sure to remove the air filters because the top portion of the air filters may get stuck while reattaching the air filter frame.
3 Perform “16.1.3 Removing the Front Grille (Right) and Front Grille (Left)”.
4 Perform “16.1.4 Removing the Control Board Box”.
※ Note on disassembly: There is no need to remove the control board box. However, the air filter frame cannot be removed unless all the engaged connectors are disconnected and the terminal plate is moved a little bit.
5 Remove 4 screws (2 screws each on the right and left sides) which fix the air filter frame (auto cleaner).



16.1.9 Removing the Vertical Airflow Direction Louver

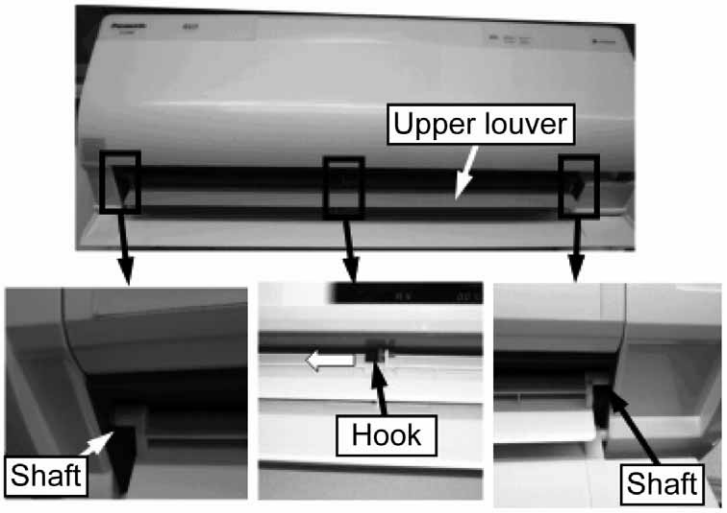
■ How to remove the lower louver of the vertical airflow direction louver

1 Open the lower louver.
2 The back side of the lower louver is designed as follows: left – inserting type; center – hook engaging type; and right – inserting into the motor type. Push the center hook to the right to disengage it.
3 Warp the center part of the lower louver towards you and pull out the left shaft and then the right shaft. Then, remove the lower louver.



■ How to remove the upper louver of the vertical airflow direction louver

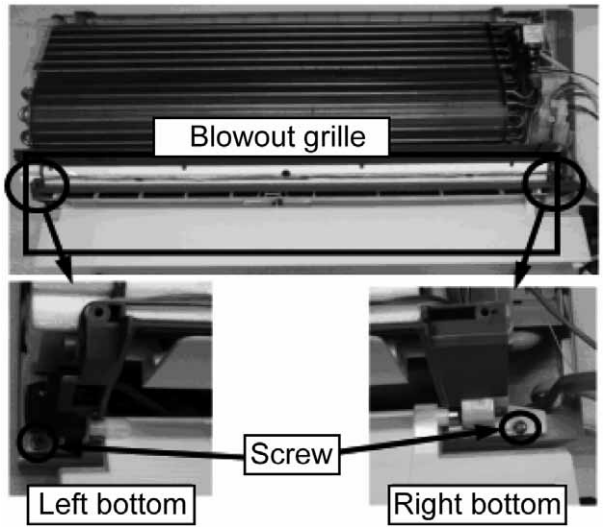
1 Open the lower louver and then open the upper louver.



2 The back side of the upper louver is designed as follows: left – inserting type; center – hook engaging type; and right – inserting into the motor type. Push the center hook to the left to disengage it.
3 Warp the center part of the upper louver towards you and pull out the left shaft and then right shaft. Then, remove the upper louver.

16.1.10 Removing the Blowout Grille

1 Perform “16.1.1 Removing the Front Panel”.
2 Perform “16.1.2 Removing the Air Filters”.
3 Perform “16.1.3 Removing the Front Grille (Right) and Front Grille (Left)”.
4 Perform “16.1.4 Removing the Control Board Box”.
5 Perform “16.1.8 Removing the Air Filter Frame (Auto Cleaner)”.
6 Remove the screws (1 piece each on right and left) located at the bottom side of the blowout grille.

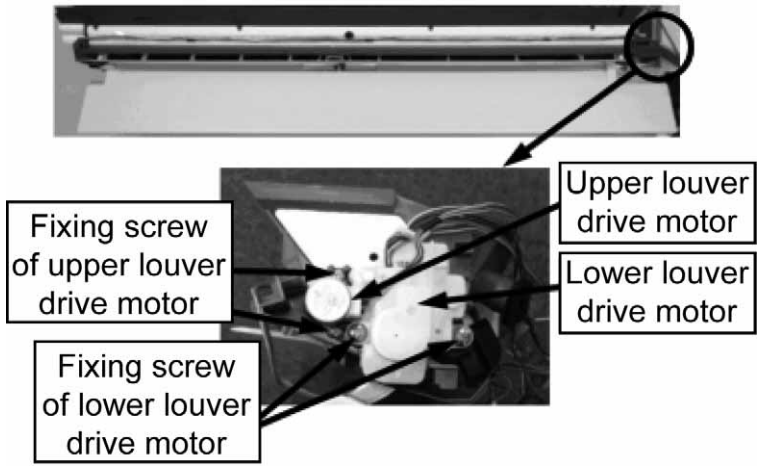


7 Remove the accessory panel below the framework.

8 Disconnect the drain hose and pull the blowout grille to remove it.
※ Note on disassembly: Be careful of the water in the drain hose and drain pan.

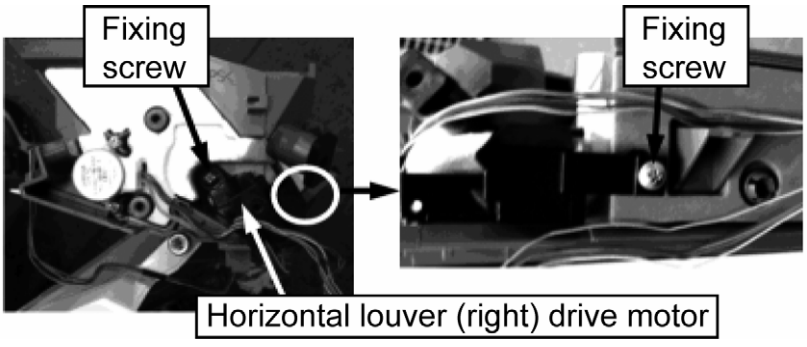
16.1.11 Removing the Drive Motor of the Vertical Airflow Direction Louver (Upper and Lower Louvers)

1 Perform “16.1.1 Removing the Front Panel”.
2 Perform “16.1.2 Removing the Air Filters”.
3 Perform “16.1.3 Removing the Front Grille (Right) and Front Grille (Left)”.
4 Perform “16.1.4 Removing the Control Board Box”.
5 Perform “16.1.8 Removing the Air Filter Frame (Auto Cleaner)”.
6 Perform “16.1.11 Removing the Blowout Grille”.
7 Remove the drive motor fixing screws (2 pieces each) on the right side of the blowout grille. Then, remove the lower louver driving motor and upper louver driving motor.

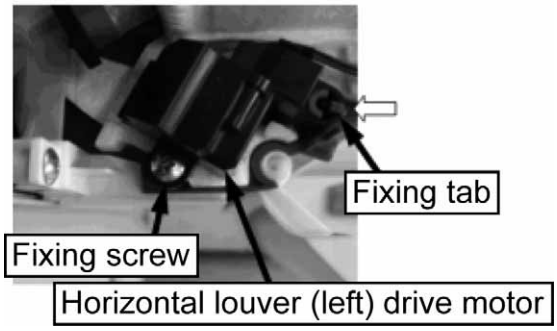


16.1.12 Removing the Drive Motor of the Horizontal Airflow Direction Louver (Right and Left Louvers)

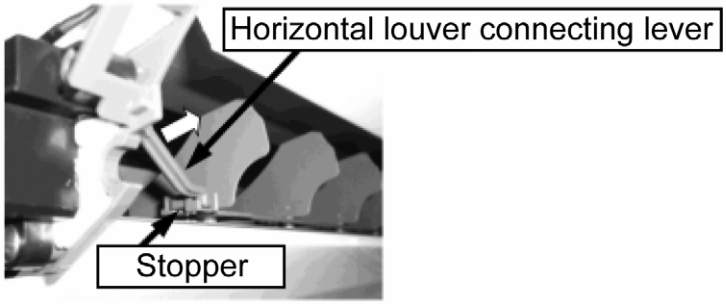
1 Perform “16.1.1 Removing the Front Panel”.
2 Perform “16.1.2 Removing the Air Filters”.
3 Perform “16.1.3 Removing the Front Grille (Right) and Front Grille (Left)”.
4 Perform “16.1.4 Removing the Control Board Box”.
5 Perform “16.1.8 Removing the Air Filter Frame (Auto Cleaner)”.
6 Perform “16.1.11 Removing the Blowout Grille”.
7 Remove the lower louver drive motor according to “16.1.12 Removing the Drive Motor of the Vertical Airflow Direction Louver (Upper and Lower Louvers)”.
8 Remove the horizontal louver (right) drive motor.
   - Remove the drive motor fixing screws (2 pieces) on the right side of the blowout grille and then remove the horizontal louver (right) drive motor.



9 Remove the horizontal louver (left) drive motor.
   - Remove the drive motor fixing screw (1 piece) on the right side of the blowout grille.
   - Push the drive motor fixing tab (1 location) towards the direction indicated by the arrow to disengage it.

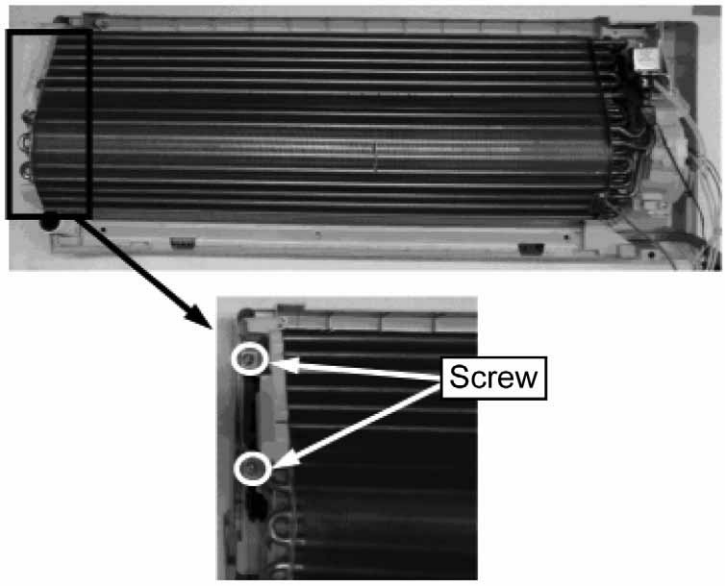


10 Release the lever from the horizontal louver and remove the drive motor. (A lever is connected to the horizontal louver drive motor (both right and left).
   - Press the stopper of the lever and pull the horizontal louver connecting lever towards you to release the lever from the horizontal louver.

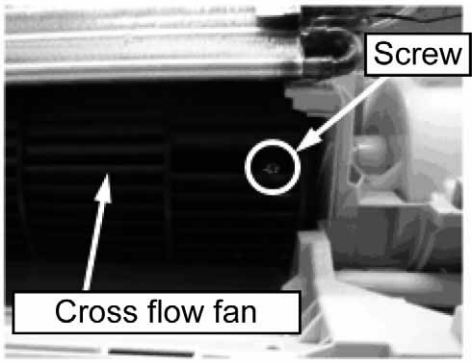


16.1.13 Removing the Indoor Motor and Cross Flow Fan

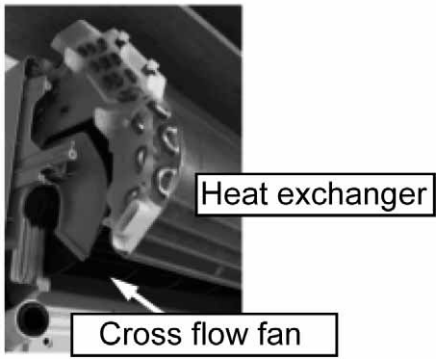
1 Perform “16.1.1 Removing the Front Panel”.
2 Perform “16.1.2 Removing the Air Filters”.
3 Perform “16.1.3 Removing the Front Grille (Right) and Front Grille (Left)”.
4 Perform “16.1.4 Removing the Control Board Box”.
5 Perform “16.1.8 Removing the Air Filter Frame (Auto Cleaner)”.
6 Perform “16.1.11 Removing the Blowout Grille”.
7 Remove the screws (2 pieces) on the left side of the heat exchanger.



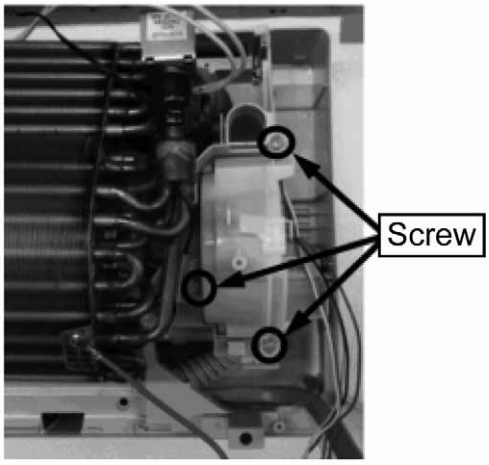
8 Loosen the fixing screw (1 screw) which fixes the cross flow fan to the indoor motor.



9 Pull out the cross flow fan while lifting up the left side of the heat exchanger.



10 Remove the screws (3 pieces) of the indoor motor cover and pull out the indoor motor together with the cover to the right side to remove it.



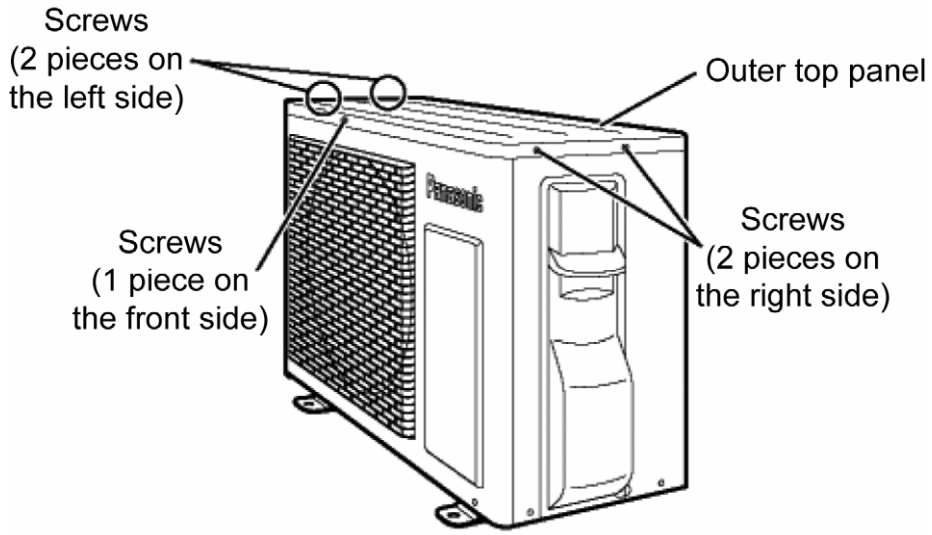
16.2 Points of Disassembly (Outdoor Unit)

⚠ WARNING

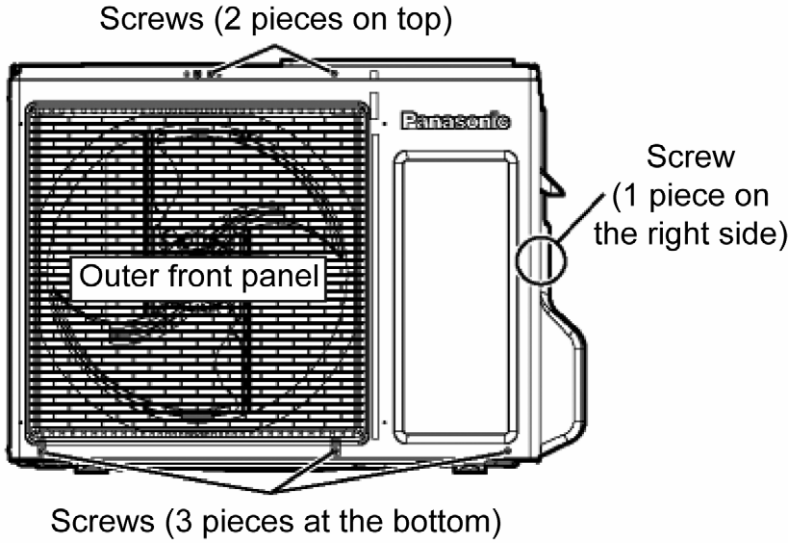
CAUTION: HIGH VOLTAGE	The electrical components of the outdoor unit are under high voltage by the operation of the booster capacitor. Fully discharge the capacitor before commencing a repair work. Failure to observe this warning could result in electric shock.

16.2.1 Removing the Outer Top Panel and Outer Front Panel

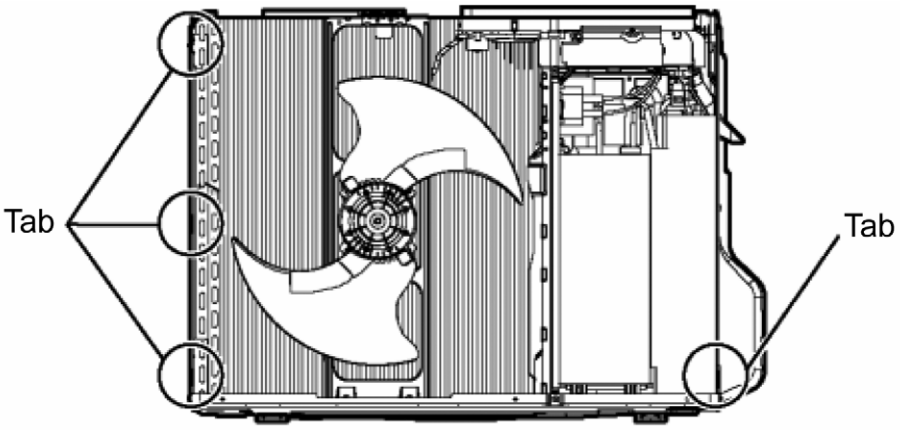
1 Remove the screws of the outer top panel.
- Remove 2 screws on the right, 2 screws on the left and 1 screw on the front side, all from the front view. Then, remove the outer top panel.



2 Remove the screws of the outer front panel.
- Remove 2 screws on top, 3 screws at the bottom and 1 screw on the right side, all from the front view.

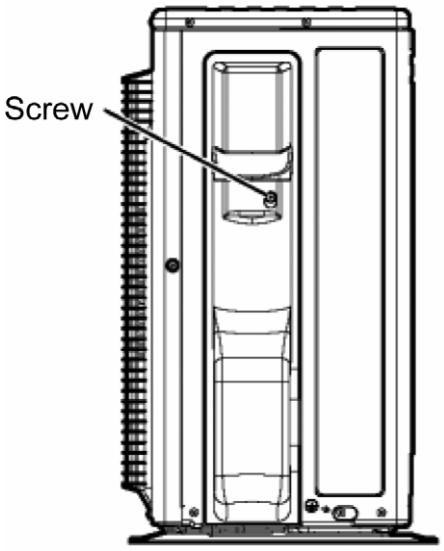


3 Disengage the tabs on the outer front panel (3 locations on the left side and 1 location on the right side). Remove the outer front panel while pulling it slightly up.

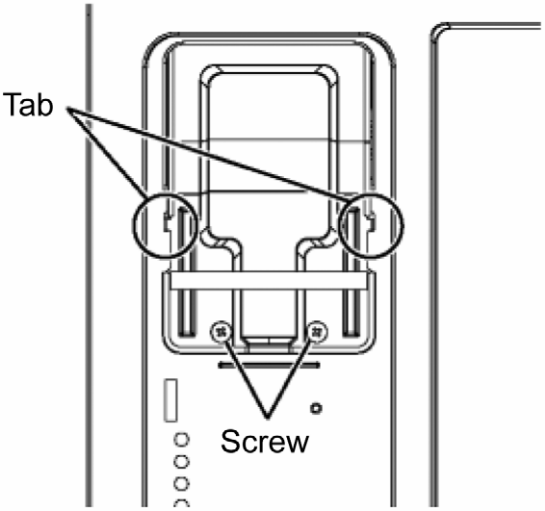


16.2.2 Removing the Electrical Component Covers (2 & 3-way valve Cover and Terminal Plate Cover)

1 Remove the screw (1 piece) of the electrical component cover (2 & 3-way valve cover). Slide the electrical component cover (2 & 3-way valve cover) downward to remove it.

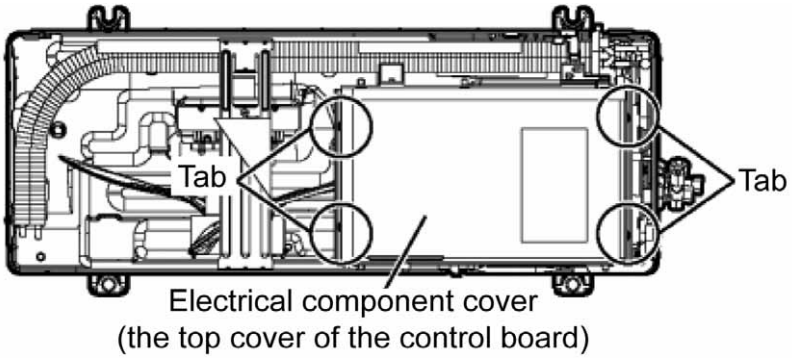


2 Remove the screws (2 pieces) and disengage the tabs (2 locations) of the electrical component cover (terminal plate cover). Then, remove the electrical component cover (terminal plate cover).

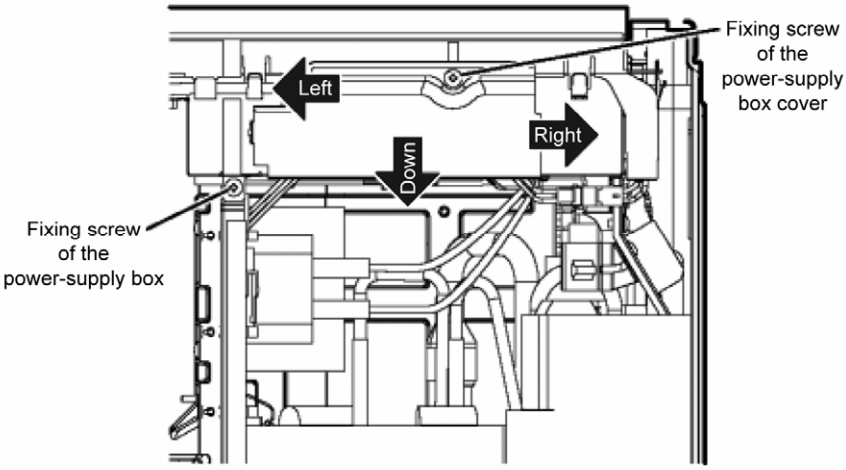


16.2.3 Removing the Power-Supply Box

1 Perform “16.2.1 Removing the Outer Top Panel and Outer Front Panel”.
2 Perform “16.2.2 Removing the Electrical Component Covers (2 & 3-way valve Cover and Terminal Plate Cover)”.
3 Disengage 4 tabs of the electrical component cover (the top cover of the control board) (2 locations each on the right and left sides). Remove the electrical component cover (the top cover of the control board).



4 Remove the fixing screw (1 piece) of the power-supply box and the fixing screw (1 piece) of the powersupply box cover.



5 Disconnect the connectors and terminals.

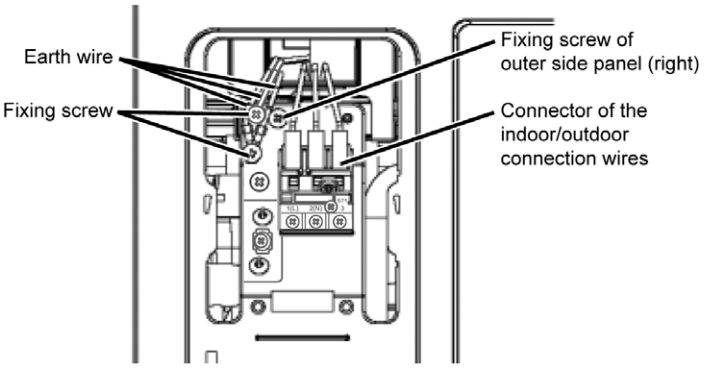
■ Wiring from down side
- Lead wires of the compressor (red, blue and yellow) ····· Disconnect the intermediate connector (white) of the compressor lead wires.
- CN-HOT (white) ····· Electromagnetic coil (4-way valve) Wire color: Yellow
- 2 wires of the reactor connecting terminal Wire color: Gray and white
- CN-TANK (white) ····· Compressor temperature sensor
- CN-TH2 (red) ·····Outdoor heat storage tank temperature sensor

■ Wiring from left side
- CN-MTR1 (white) ·····Outdoor motor
- CN-MTR2 (white) ·····Outdoor motor

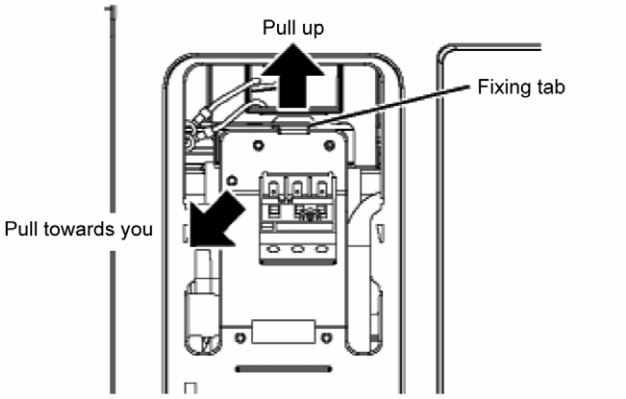
※ Notes on assembly: When performing the wiring for the outdoor motor during replacement of the control board, close the top cover of the control board before connecting the connectors of CN-MTR1 & 2 for wiring. If the wiring is performed without closing the top cover of the control board, the wire may get pinched while closing the cover.

■ Wiring from right side
- CN-STM (white) ····· Electromagnetic coil (expansion valve)
- CN-TH1 (white) ····· Outside air temperature and pipe temperature sensor
- Lead wire of the electromagnetic coil (2-way valve V1) ····· Intermediate connector for the defrosting 2-way valve coil (yellow)
- Lead wire of the electromagnetic coil (2-way valve V2) ····· Intermediate connector for the heat storage tank 2-way valve coil (blue)
- CN-TH3 (blue) ····· Outdoor heat exchanger temperature sensor 2

6 Disconnect the connector of the indoor/outdoor connection wires (red, white and black) and remove the fixing screw of the earth wire (green).
7 Remove the screw (1 piece) which fixes the power-supply box to the outer side panel (right).



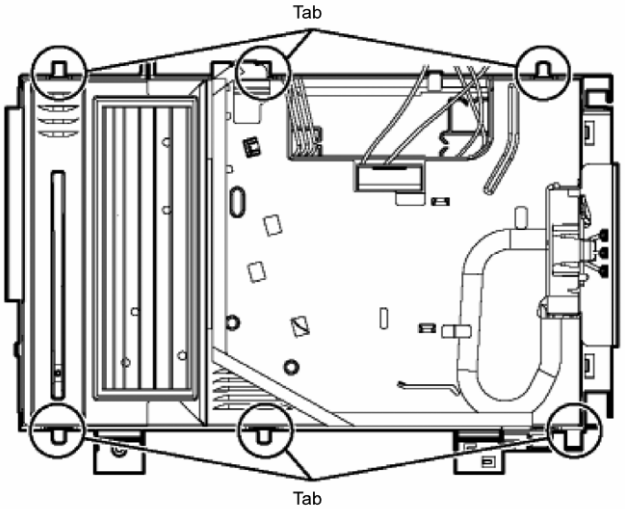
8 Pull the outer side panel (right) towards you while pulling up the fixing tab (1 location) of the powersupply box to disengage the tab.



9 Lift up the power-supply box to remove it.

16.2.4 Removing the Control Board

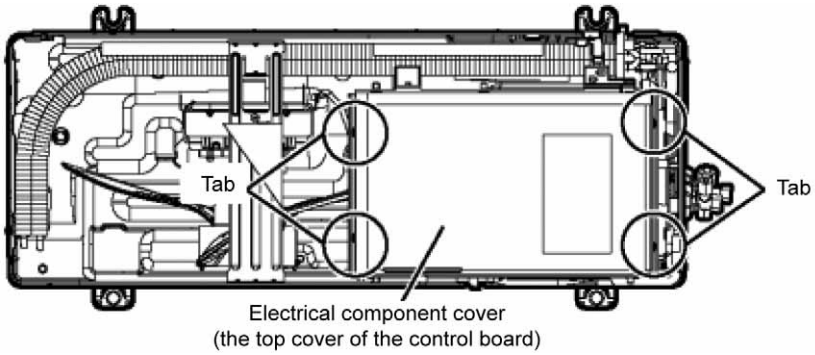
1 Perform “16.2.1 Removing the Outer Top Panel and Outer Front Panel”.
2 Perform “16.2.2 Removing the Electrical Component Covers (2 & 3-way valve Cover and Terminal Plate Cover)”.
3 Perform “16.2.3 Removing the Power-Supply Box”.
4 Disengage the tabs (6 locations) and remove the metal cover.



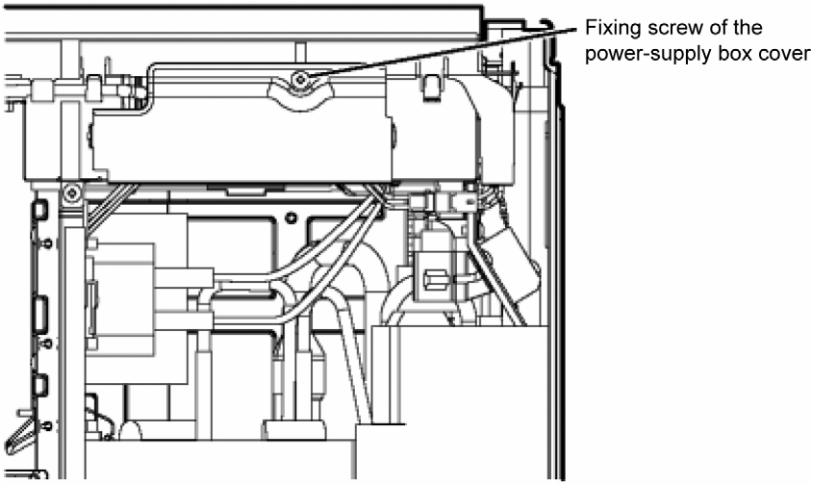
※ Notes on disassembly: During the replacement of outdoor control board, the control board and plastic power-supply box are separated by removing the screws (2 pieces) on the soldered surface. These two parts can be replaced as an integrated piece by applying silicon to them.

16.2.5 Removing the Propeller Fan and Outdoor Motor

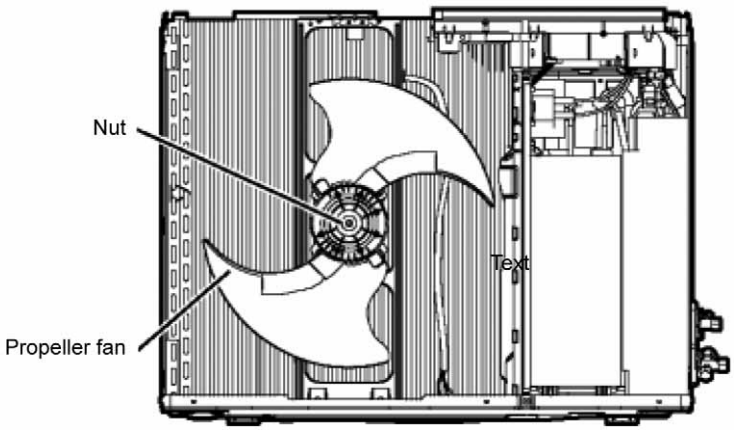
1 Perform “16.2.1 Removing the Outer Top Panel and Outer Front Panel”.
2 Disengage 4 tabs of the electrical component cover (the top cover of the control board) (2 locations each on the right and left sides). Remove the electrical component cover (the top cover of the control board).



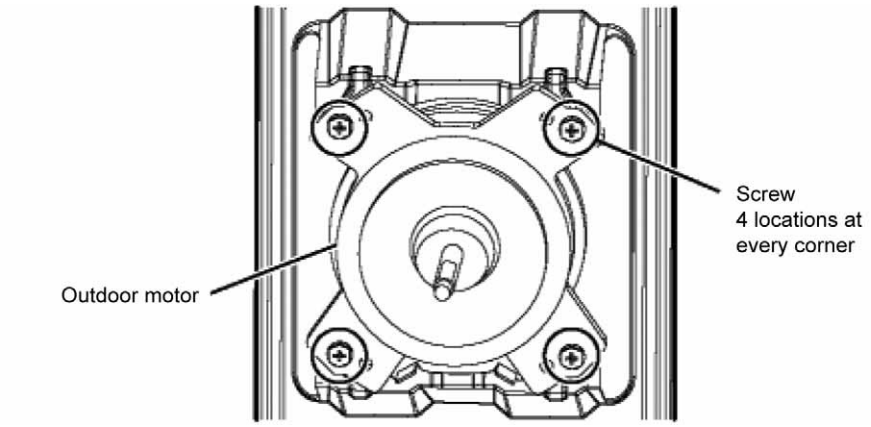
3 Remove the fixing screw (1 piece) of the power-supply box.



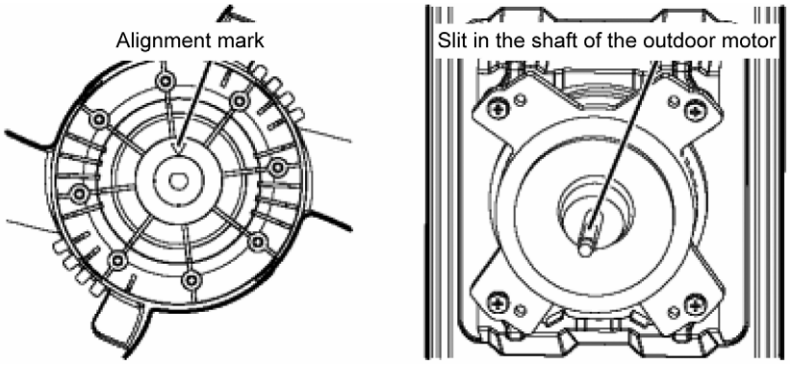
4 Disconnect the connectors of CN-MTR1 (white) and CN-MTR2 (white) only.
※ Notes on assembly: When performing the wiring after the replacement of the outdoor motor, close the top cover of the control board before connecting the connectors of CN-MTR1 & 2 for wiring. If the wiring is performed without closing the top cover of the control board, the wire may get pinched while closing the cover.
5 Rotate the nut located in the center of the propeller fan clockwise. Then, remove the propeller fan.



6 Loosen the fixing screws (4 pieces) of the outdoor motor and remove the outdoor motor.

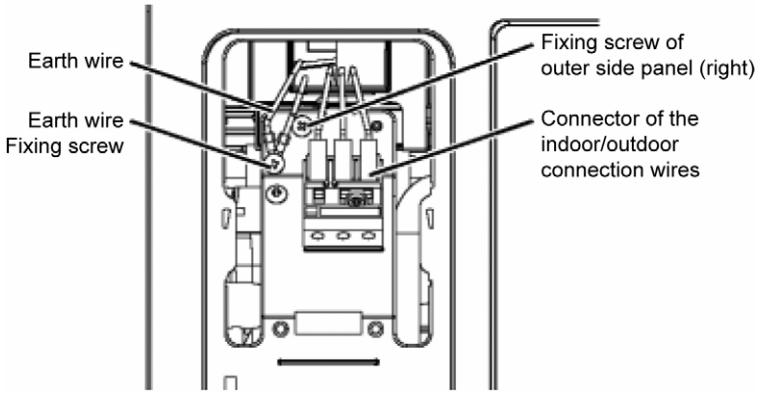


※ Notes on assembly: When assembling the propeller fan and outdoor motor, the alignment mark located in the center part of the propeller fan should be aligned with the slit in the shaft of the outdoor motor.

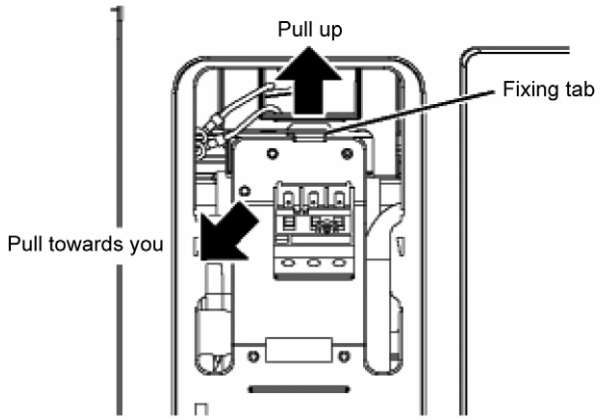


16.2.6 Removing the Outer Side Panel (Right)

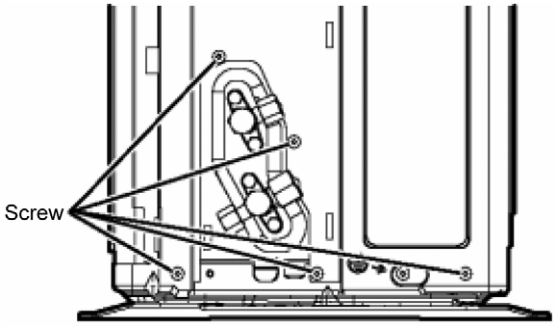
1 Perform “16.2.1 Removing the Outer Top Panel and Outer Front Panel”.
2 Perform “16.2.2 Removing the Electrical Component Covers (2 & 3-way valve Cover and Terminal Plate Cover)”.
3 Disconnect the connector of the indoor/outdoor connection wires (red, white and black) and remove the fixing screw of the earth wire (green).
4 Remove the screw (1 piece) which fixes the power-supply box to the outer side panel (right).



5 Pull the outer side panel (right) towards you while pulling up the fixing tab (1 location) of the power-supply box to disengage the tab.

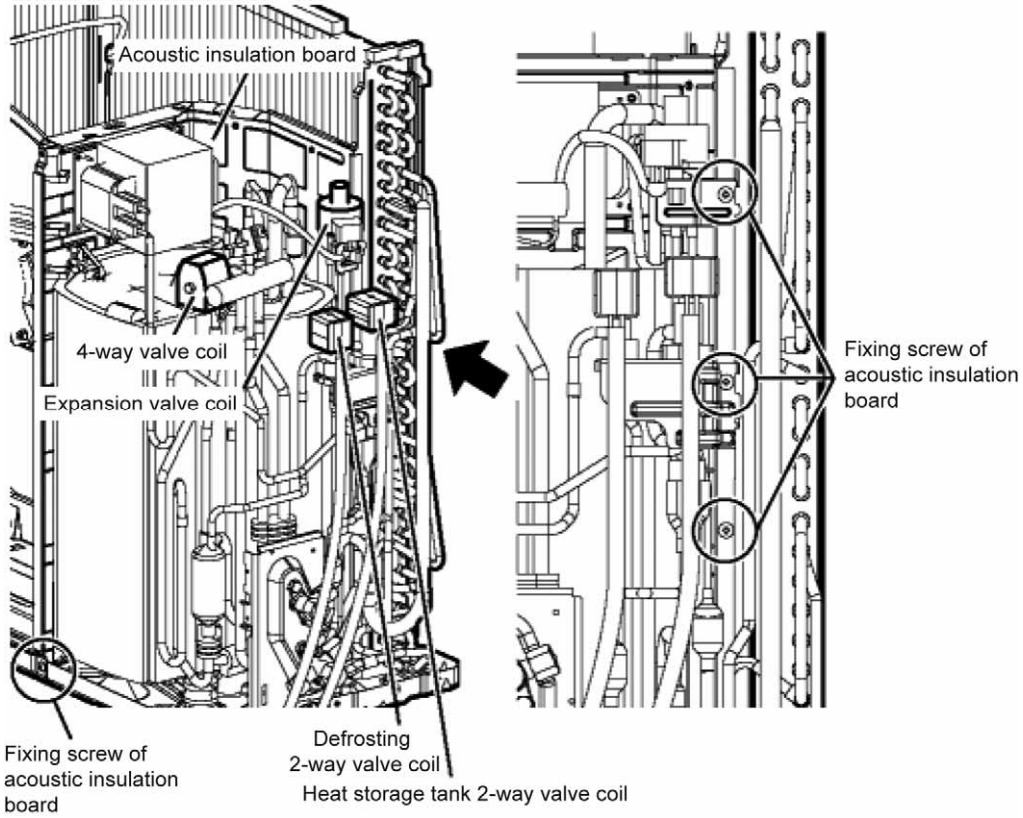


6 Remove the fixing screws (5 pieces) of the outer side panel (right) and remove the outer side panel (right).
※ Note on disassembly: When removing the outer side panel (right) by pulling it upward, be careful not to allow the side of the outer side panel to come into contact with the pipe insulation material/tape to avoid damage and tear of these materials.



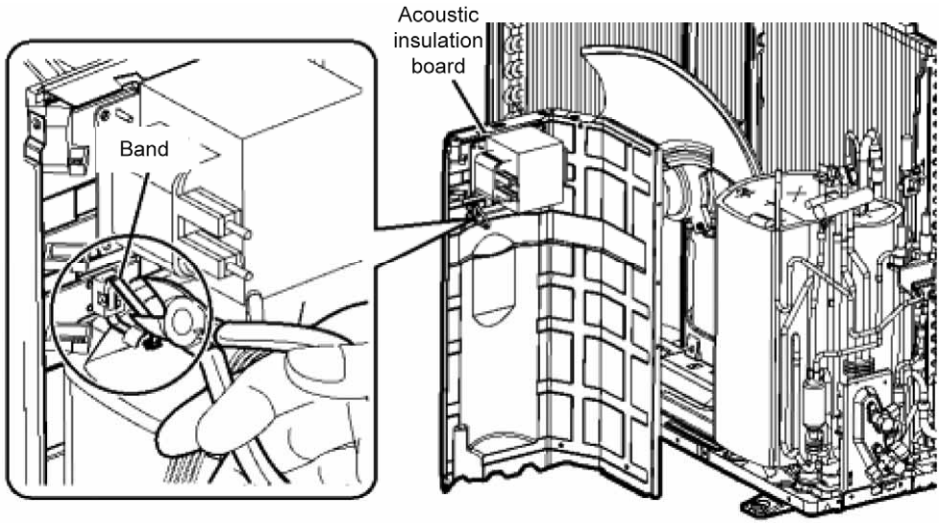
16.2.7 Removing the Compressor and Heat Storage Tank

1 Perform “16.2.1 Removing the Outer Top Panel and Outer Front Panel”.
2 Perform “16.2.2 Removing the Electrical Component Covers (2 & 3-way valve Cover and Terminal Plate Cover)”.
3 Perform “16.2.3 Removing the Power-Supply Box”.
4 Perform “16.2.6 Removing the Outer Side Panel (Right)”.
5 Remove the 4-way valve coil, expansion valve coil, defrosting 2-way valve coil and heat storage tank 2-way valve coil. Then, remove the fixing screws of the acoustic insulation board (3 pieces on the right side and 1 piece at the front bottom).

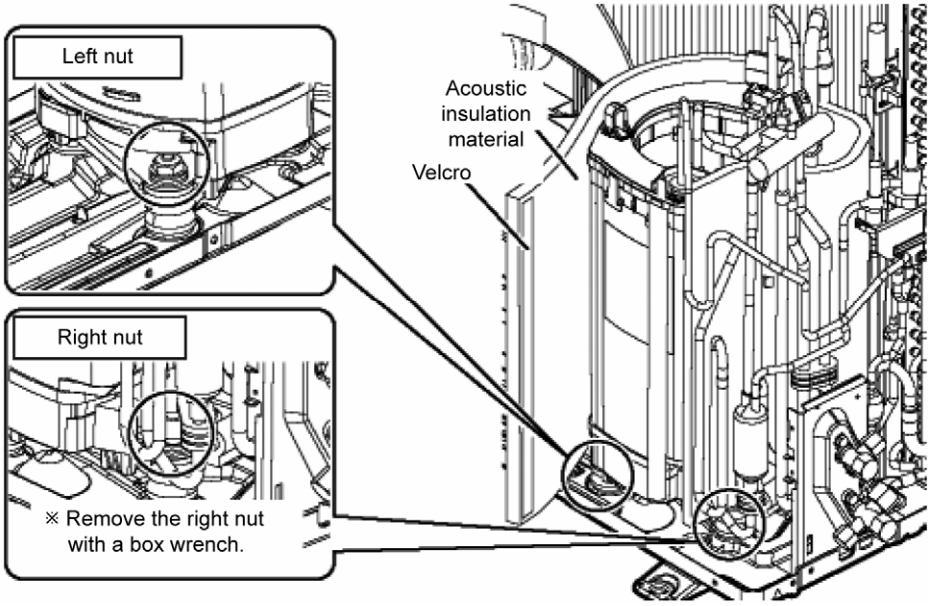


※ Note on assembly: When attaching the defrosting 2-way valve coil and heat storage tank 2-way valve coil, attach the coils according to the colors indicated on the metal sheet located below the coils to the main unit.

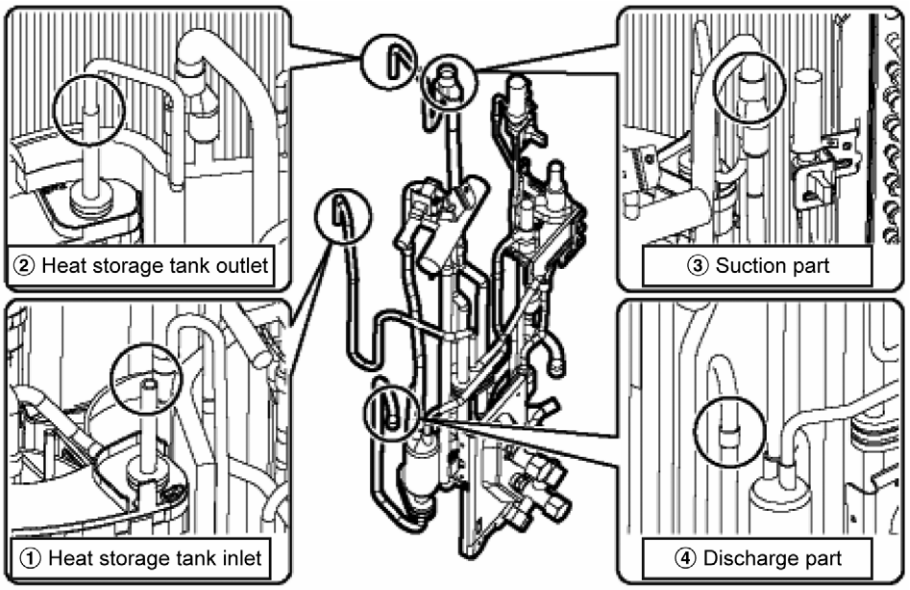
6 Cut the band which fixes the heat storage tank to the acoustic insulation board. Remove the acoustic insulation board.



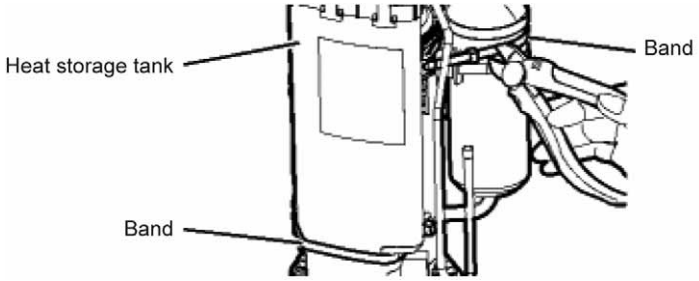
7 Remove the acoustic insulation material and then remove the nuts which fix the compressor (2 locations). (The heat storage tank is attached to the compressor.)
※ Note on disassembly: Use a box wrench to remove the nut located on the right side from the front view.



8 Remove the welded parts (4 locations).
○ Remove ① heat storage tank inlet, ② heat storage tank outlet, ③ suction part and ④ discharge part.

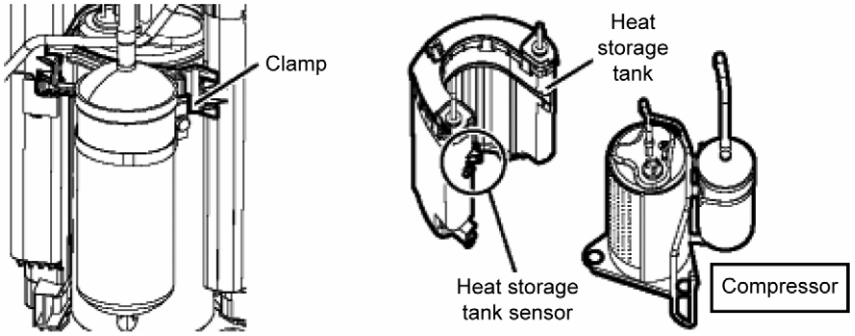


9 Remove the compressor and heat storage tank.
   - Cut the bands (2 locations) which fix the compressor to the heat storage tank.



   - Remove the clamp and separate the compressor and heat storage tank.

※ Note on disassembly: Remove the heat storage tank sensor when replacing the heat storage tank.



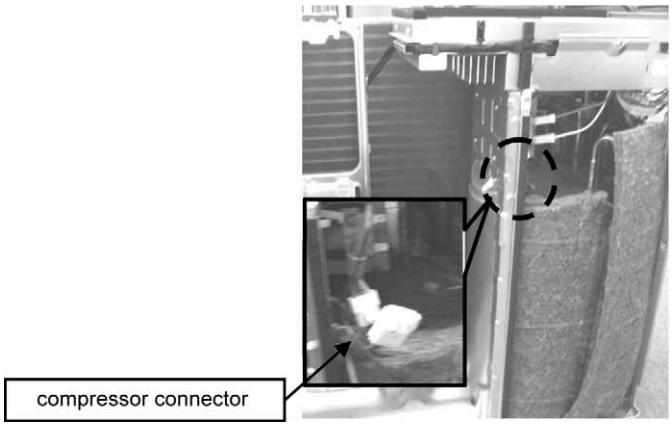
16.2.8 Heat Charger (※) Replacement Procedure

16.2.8.1 Preparation

1 Power-off the unit (remove plug and/or etc.,).
2 Collect all refrigerant into the cylinder by reclaiming machine.
3 As brazing work is involved, make sure the workshop and surrounding area is sufficient and safe.

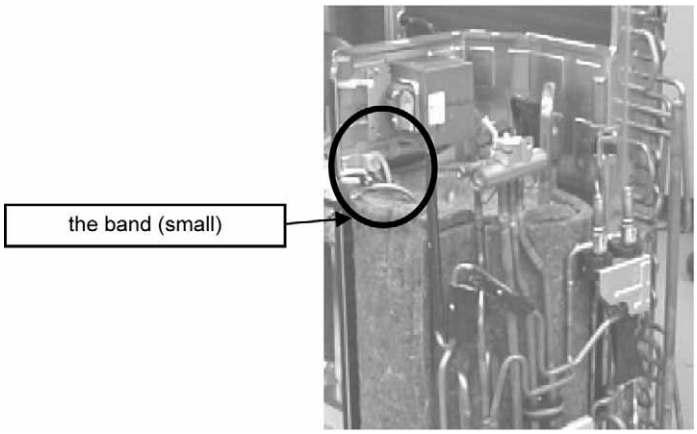
16.2.8.2 Process 1 (Dismantling of the Parts)

1 Remove control-board cover, top plate and front panel, pull out connecting wire, then remove side panel (right).
2 Disconnect all connectors connected to control board.
3 Remove solenoid coils of 2-way, 4-way and expansion valves.
4 Disconnect of compressor connector, and remove control board.

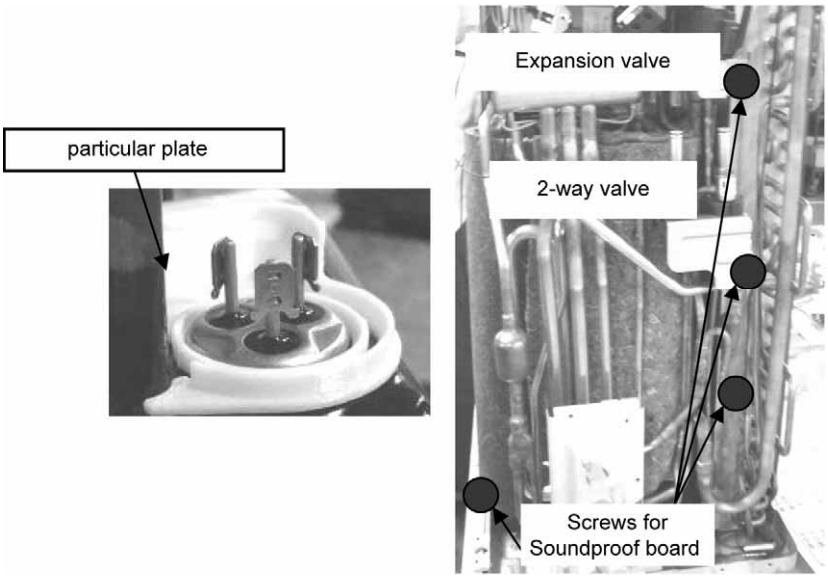


※ Heat charger: Part description is heat charge.

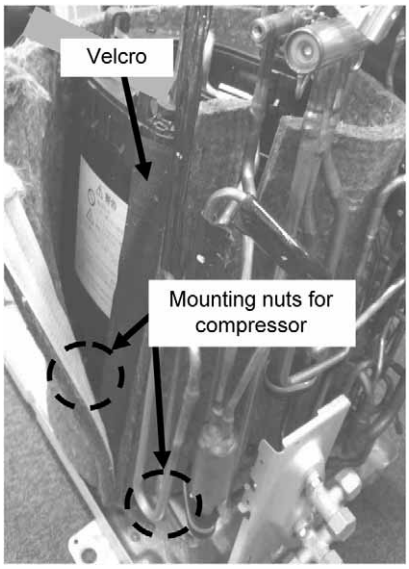
5 Cut off the band (small) for holding soundproof board and heat charger.



6 Remove 4 screws (see figure) and slide soundproof board towards to propeller fan side to remove.
7 Remove soundproof material at upper compressor.
8 Remove discharge pipe sensor.
9 Remove terminal cover from the compressor.
10 Remove 3 lead wires from compressor terminal.
11 Make sure remaining particular plate at the lower compressor terminal are removed.



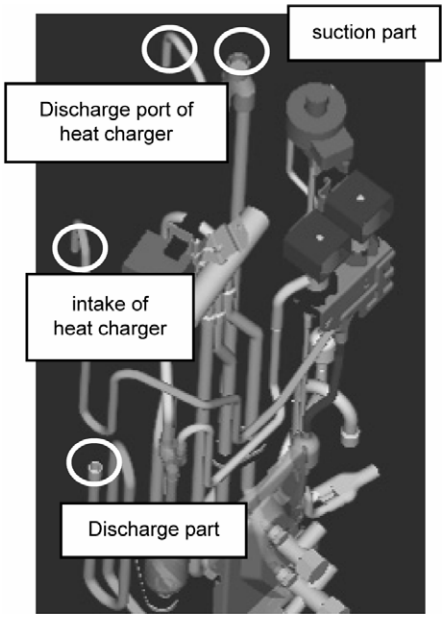
12 Release Velcro on front of soundproof material and remove mounting nuts (left & right) for compressor by the wrench.



16.2.8.3 Process 2 (Removing Brazing Point)

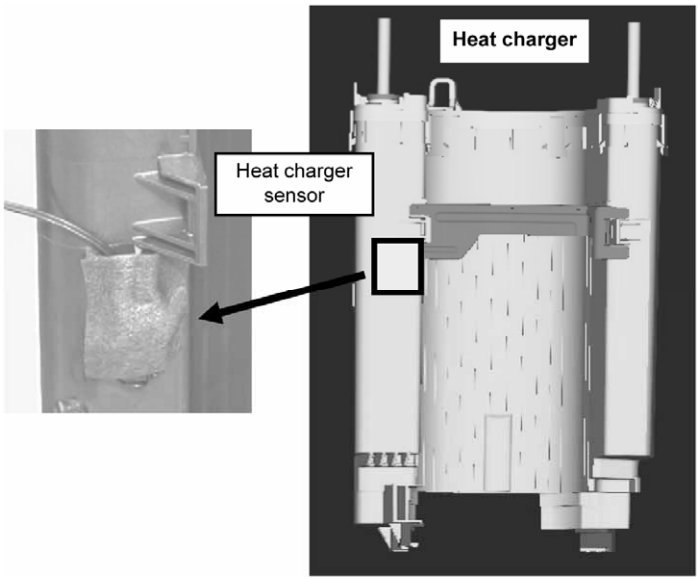
1 Removing butyl tape from piping prior to removing the brazing point.

Caution
Protection from the brazing flame should be considered during replacing the parts.
Firstly disconnect the pipe which entering to heat charger, discharging from heat charger, compressor suction and the discharging pipes.



16.2.8.4 Separate Compressor from Heat Charger.

1 Take out blocks of compressor and heat charger from the base pan.
2 Cut off 2 bands (top and bottom) which holding compressor and heat charger, and lift the bracket to remove.
3 Remove the heat transferring sheet from the compressor once separate the heat charger from compressor.
4 Remove the sensor on heat charger by peeling off polyethylene sheet. Keep the sensor for re-use after the brazing work.



16.2.8.5 Replacement of Heat Charger

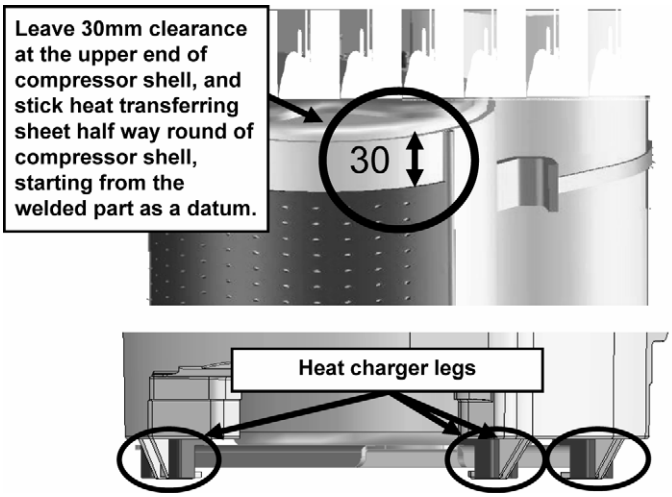
Exchange with the new heat charger.

16.2.8.6 Stick Heat Transferring Sheet and Fix the Heat Charger on the Compressor by Band

1 Peel-off the yellow film from new heat transferring sheet, and stick it on compressor body. Then peel off transparent film for attaching heat charger. For sticking/adhering the heat transferring sheet, the datum shown in figure on right. (in a vertical direction, longer side up)

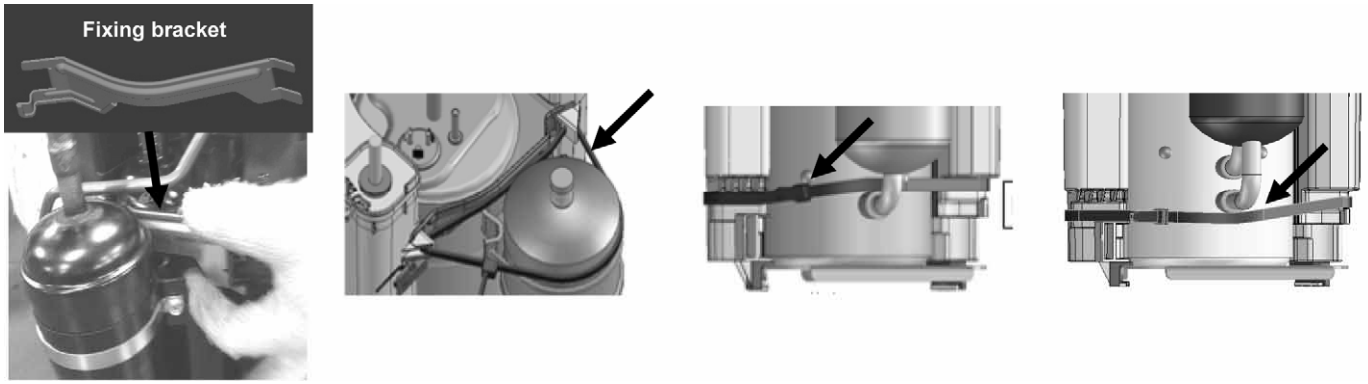
2 When installing heat charger on compressor, make sure the three parts of compressor legs and heat charger legs are engaged.

3 Install heat charge storage fixing bracket to the original position and firmly fix compressor and heat charger with 2 resin bands (large).



Caution

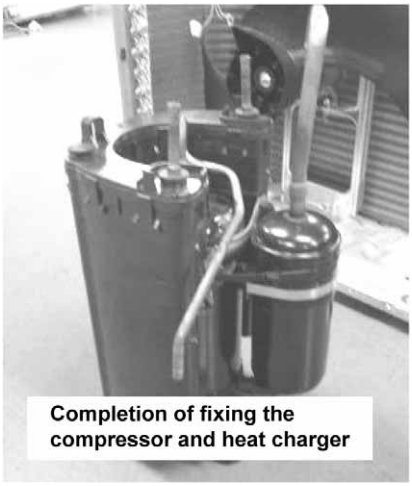
1. Carefully read the instructions before proceeding to the replacement of heat transferring sheet.
2. When tightening resin bands, use pliers to fully pull in bands and make sure there is no cracking or loosening. Cut off the end of band using nippers.



16.2.8.7 Fix-back Compressor and Connect the Tubes

1 Set compressor and heat charger block to the original position.
2 Tighten 2 mounting nuts of compressor by using wrench.
3 Braze-back the tubes you dismantled.

Caution
Protection from the brazing flame should be considered during brazing-back the parts, too.


Completion of fixing the compressor and heat charger

4 After brazing tubes, use cooling rag (wet towel) to cool it down and put the materials such as butyl tape and etc., as original conditions.
5 Reinstall the heat charger sensor to its original position and affix polyethylene sheet.

16.2.8.8 Assemble Electrical Parts

1 Put back electrical parts to their original position.
2 Install soundproof material around compressor and secure soundproof board.
3 Secure heat charger and soundproof board using resin band. This is to prevent compressor and heat charger from falling. There is no need to fasten tightly.
4 Put back each coil and sensor to their original position.

16.2.8.9 Setting Exterior Parts

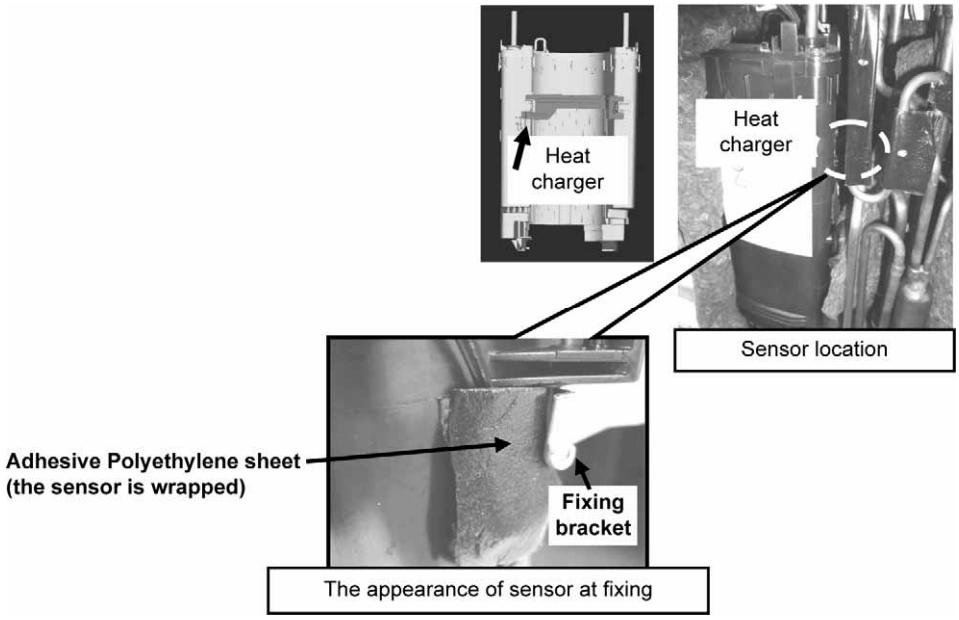
1 Set and attach side panel (right) by using screws.
2 Set control board and insert each connector.

16.2.8.10 Vacuuming, Filling Refrigerant and Checking for Gas Leaks

1 Return outdoor equipment to where it was. Vacuum, fill coolant and check for gas leaks then test.

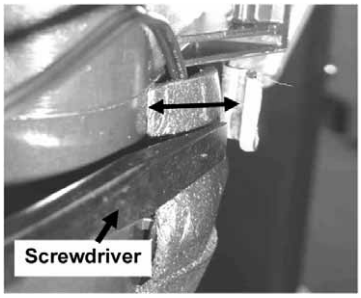
16.2.9 Heat Charger Sensor Replacement Procedure

1 Disconnect the sensor connectors from control board. (CN-TH2: red)
2 Open Velcro on soundproof material to expose the sensor.

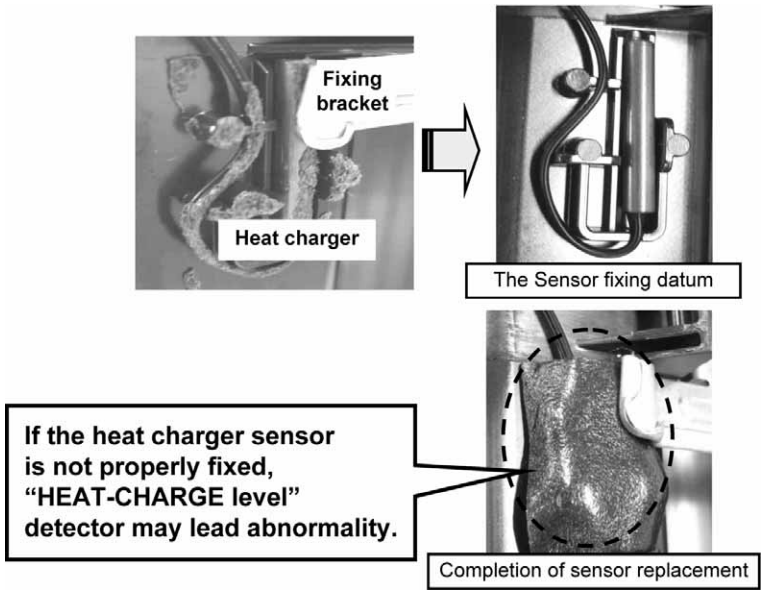


3 Insert flat screwdriver into heat charger fixing bracket to open it wide enough to remove the sensor. (approximately 7mm)

Do not open the bracket too wide.



4 Remove polyethylene sheet to expose the heat charger sensor.
5 Replace with a new heat charger sensor, and fix it tightly with adhesive polyethylene sheet at its original position.



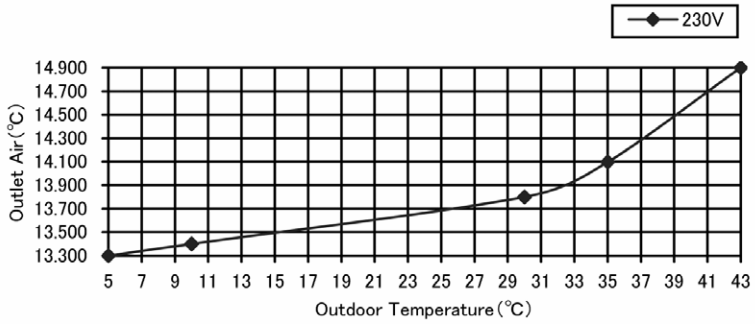
17. Technical Data

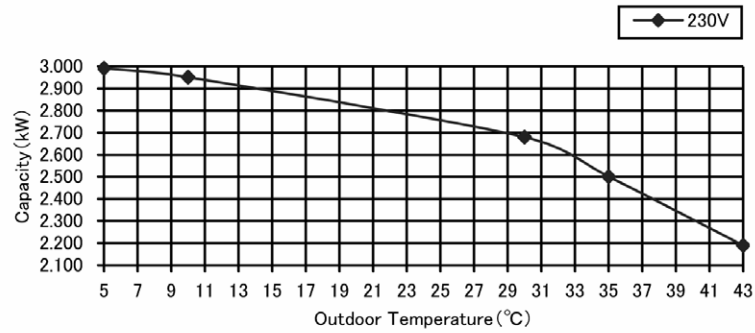
17.1 Operation Characteristics

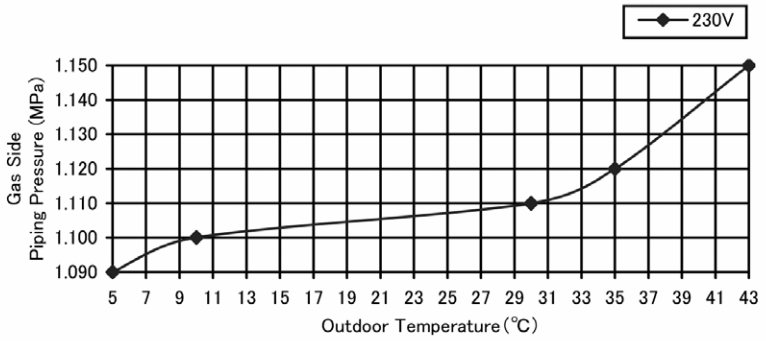
17.1.1 CS-VE9NKE CU-VE9NKE

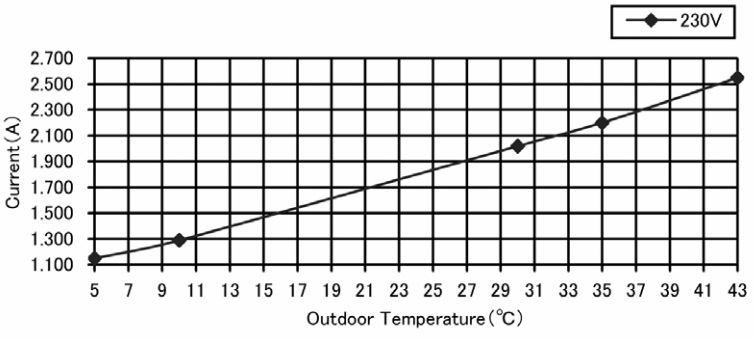
Cooling Characteristic

Condition
Room temperature: 27°C (DBT), 19°C (WBT)
Piping length: 5m
Fc : 29Hz



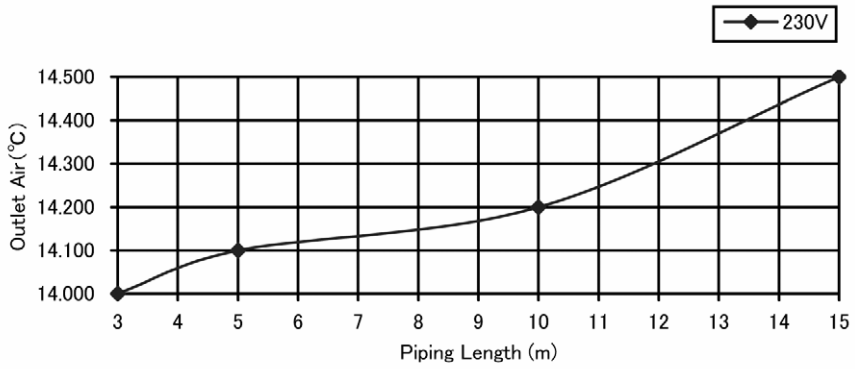


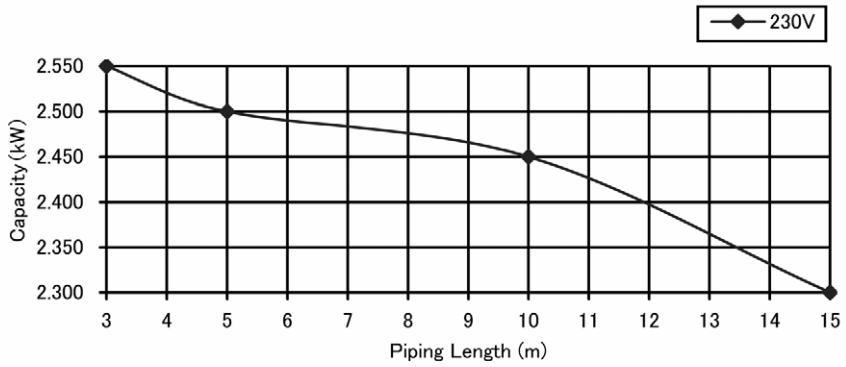


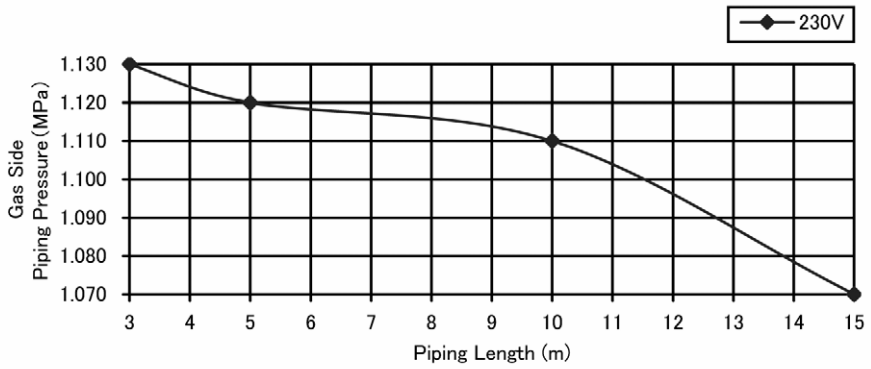


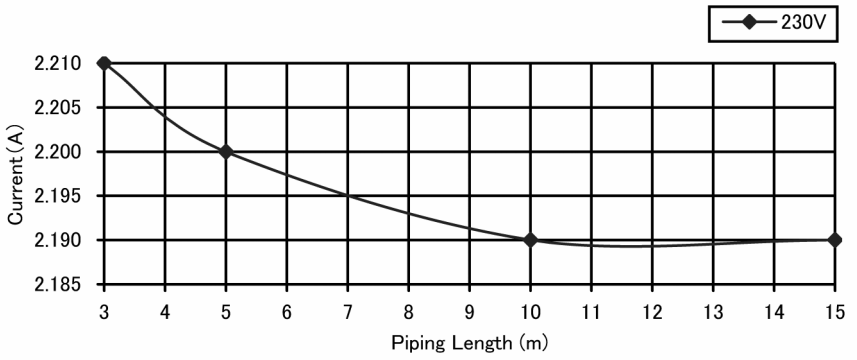
Piping Length Characteristic Cooling

Condition
Room temperature: 27°C (DBT), 19°C (WBT)
Outdoor temperature: 35°C (DBT)
Fc : 29Hz





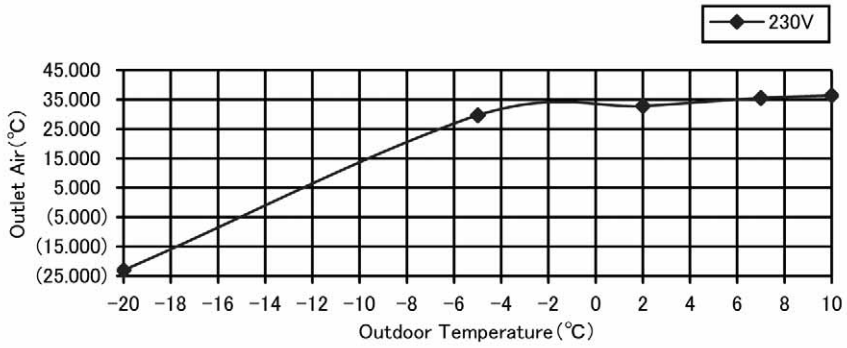


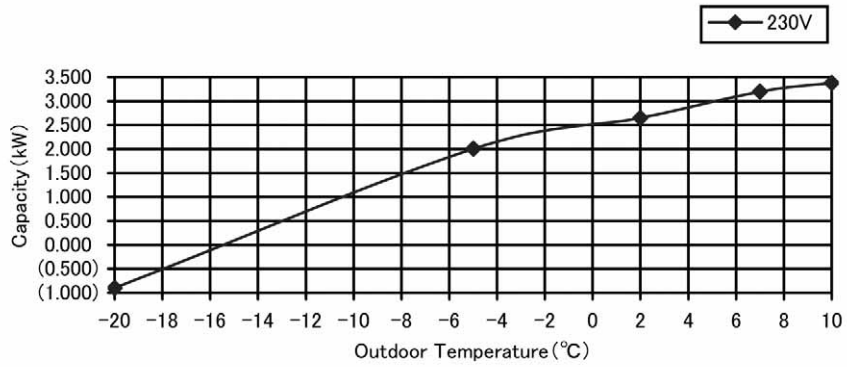


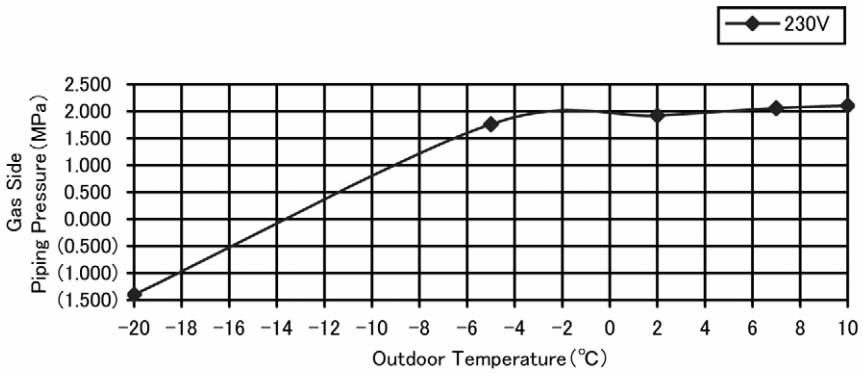
Heating Characteristic

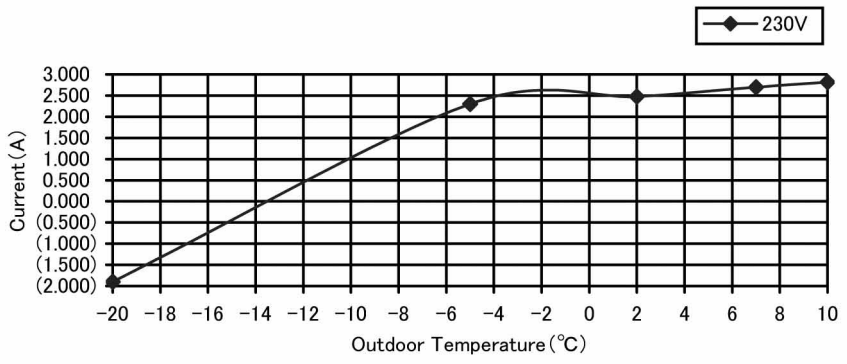
Condition

Room temperature: 20°C (DBT)
Piping length: 5m
Fh : 37Hz



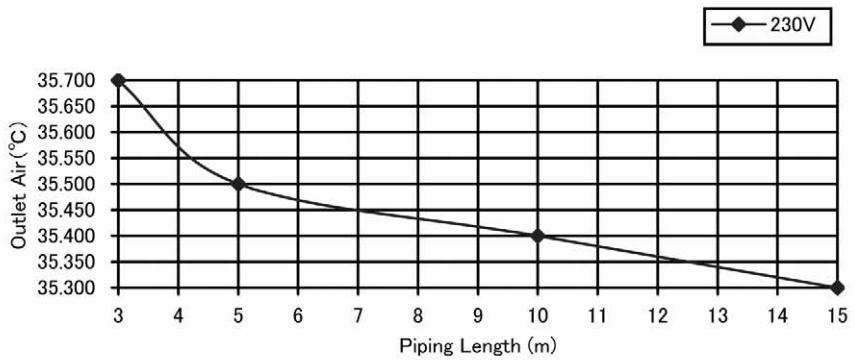


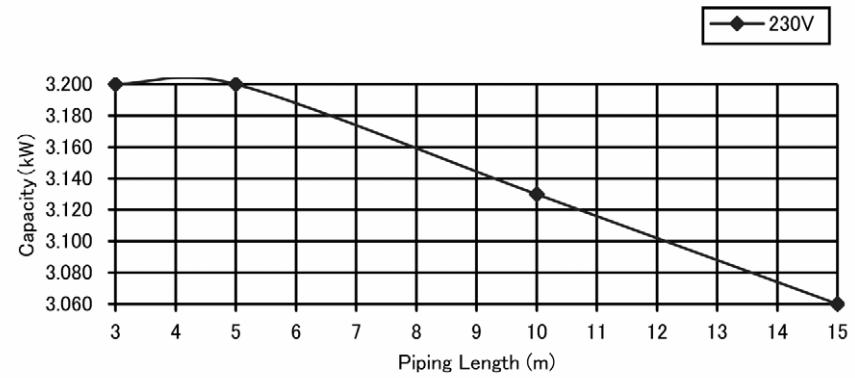


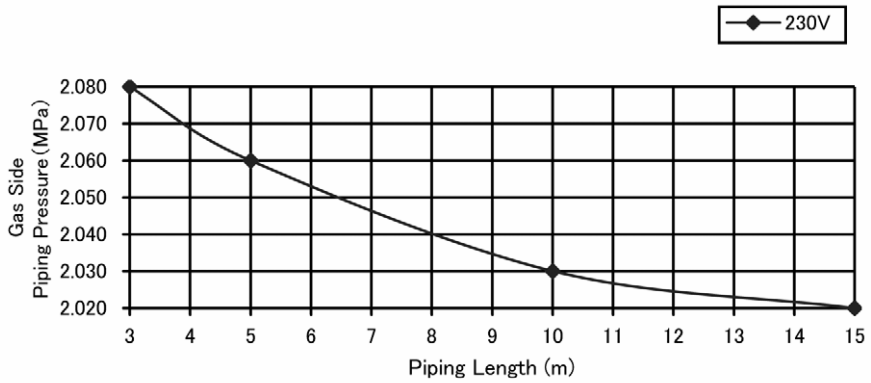


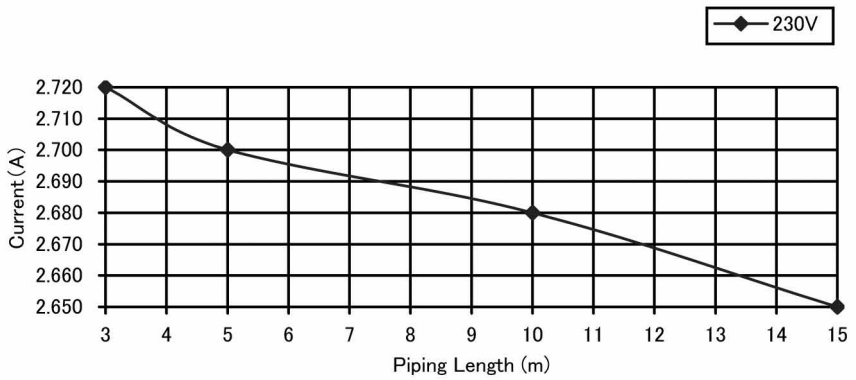
Piping Length Characteristic Heating

Condition
Room temperature: 20°C (DBT)
Outdoor temperature: 7.0°C (DBT), 6.0°C (WBT)
Fh : 37Hz





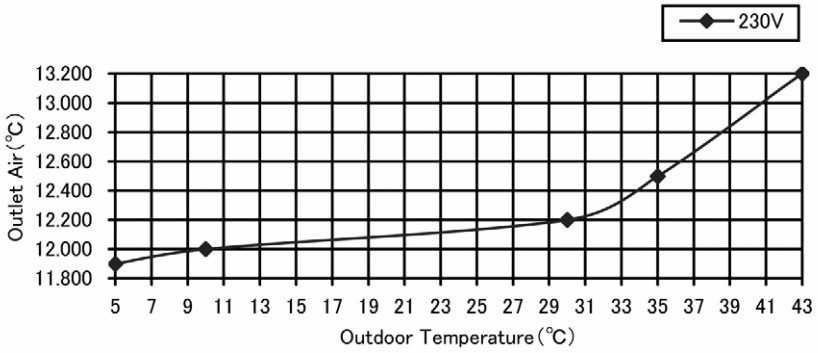


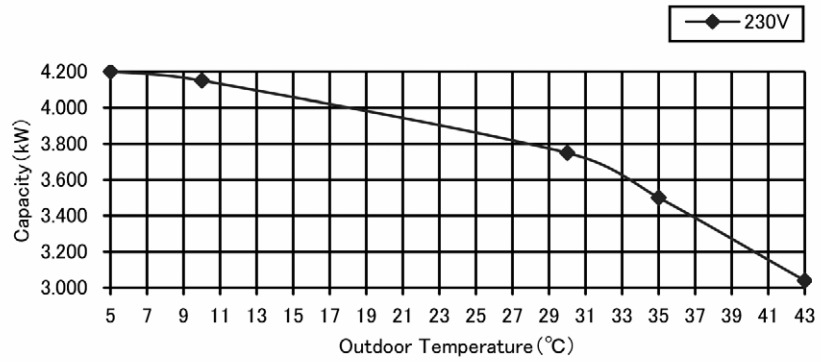


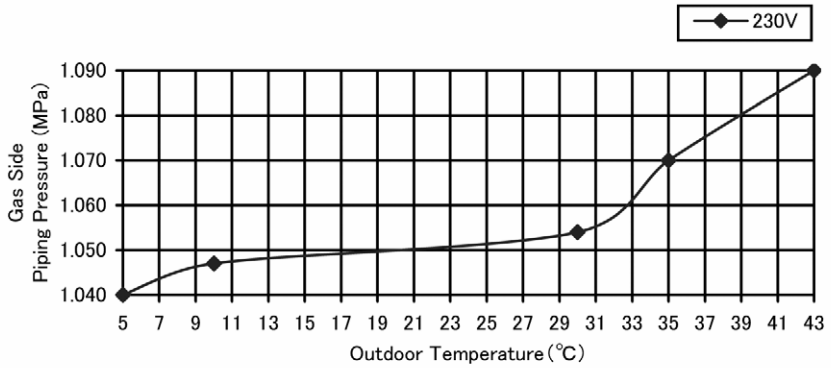
17.1.2 CS-VE12NKE CU-VE12NKE

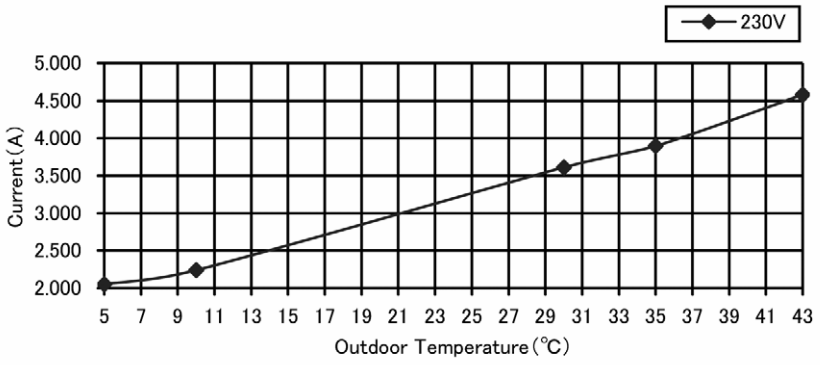
Cooling Characteristic

Condition
Room temperature: 27°C (DBT), 19°C (WBT)
Piping length: 5m
Fc : 48Hz



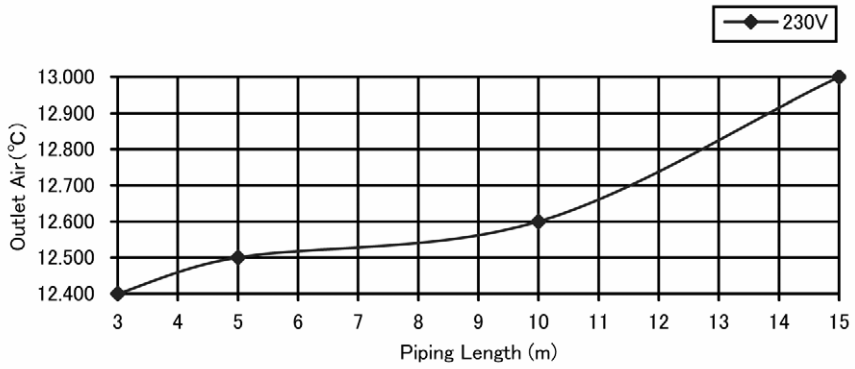


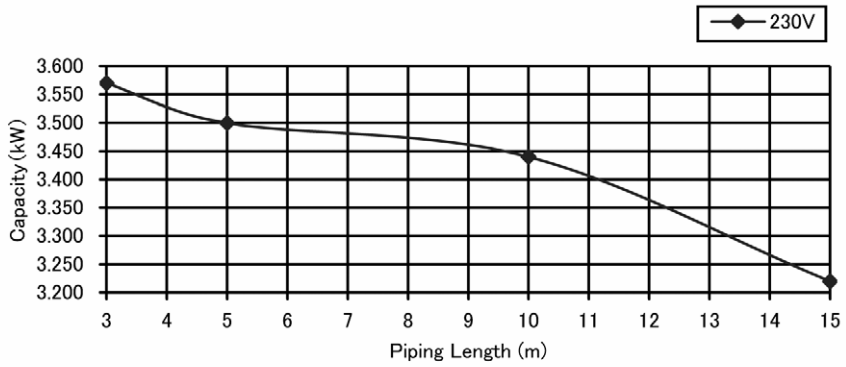


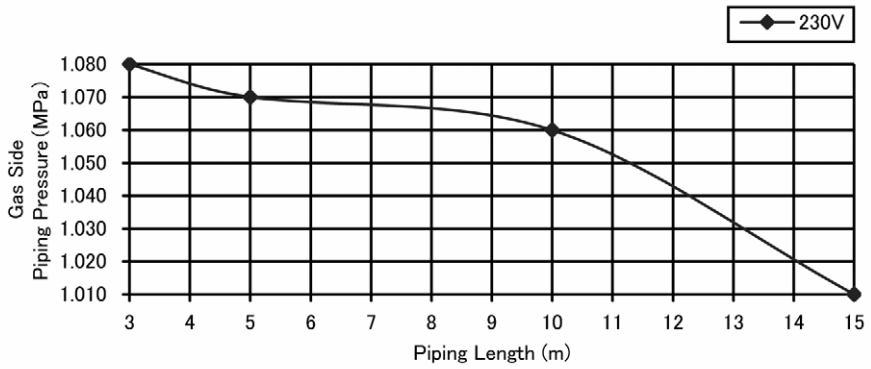


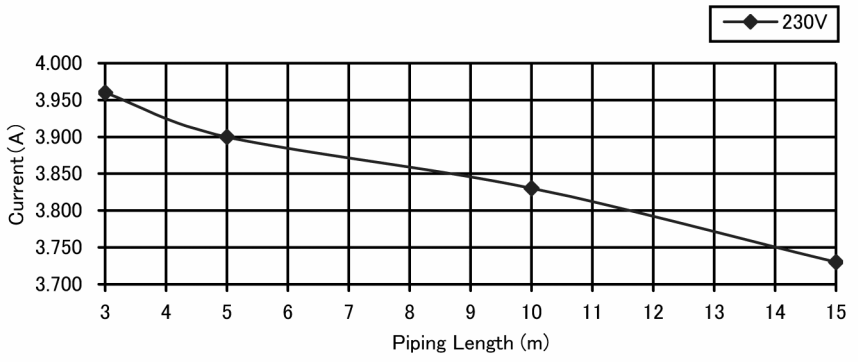
Piping Length Characteristic Cooling

Condition
Room temperature: 27°C (DBT), 19°C (WBT)
Outdoor temperature: 35°C (DBT)
Fc : 48Hz





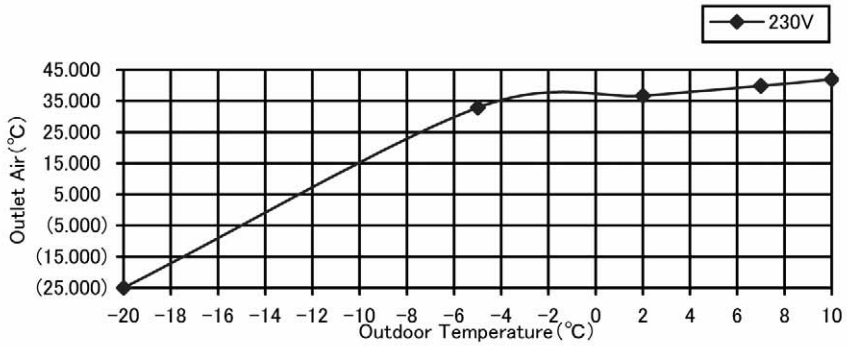


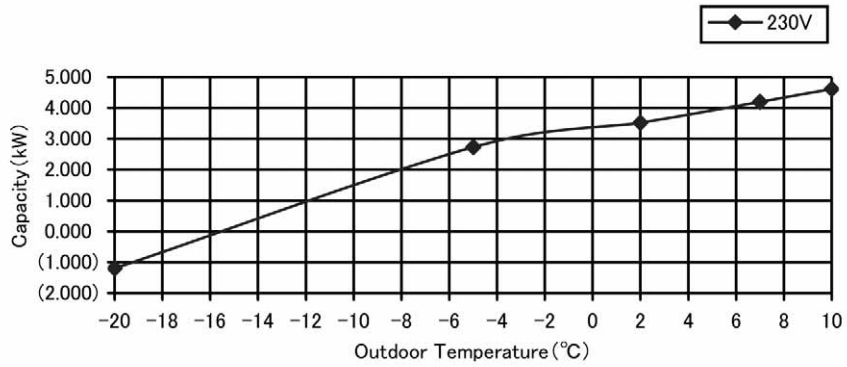


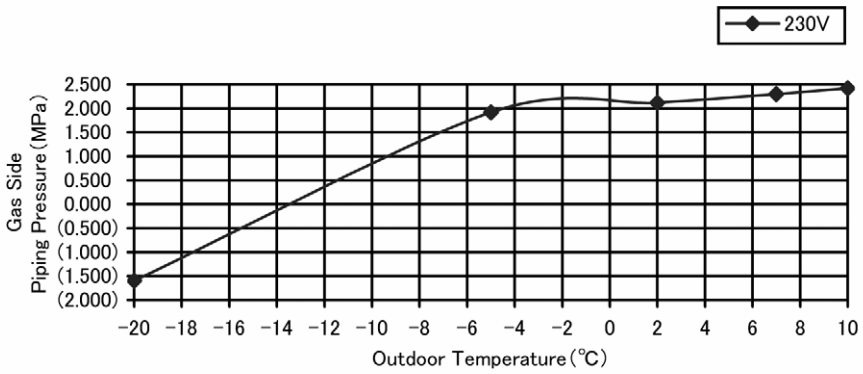
Heating Characteristic

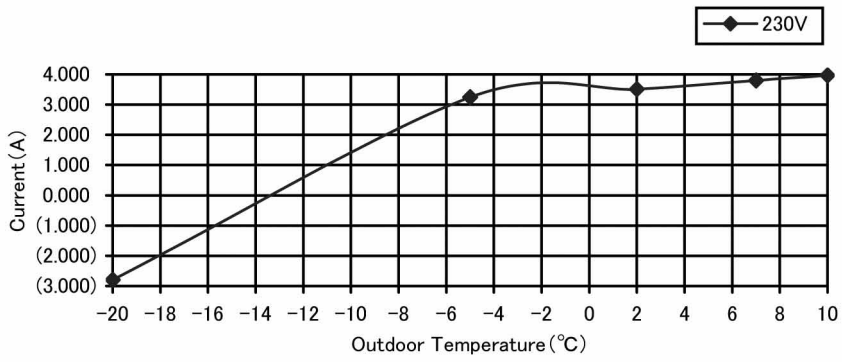
Condition

Room temperature: 20°C (DBT)
Piping length: 5m
Fh : 49Hz



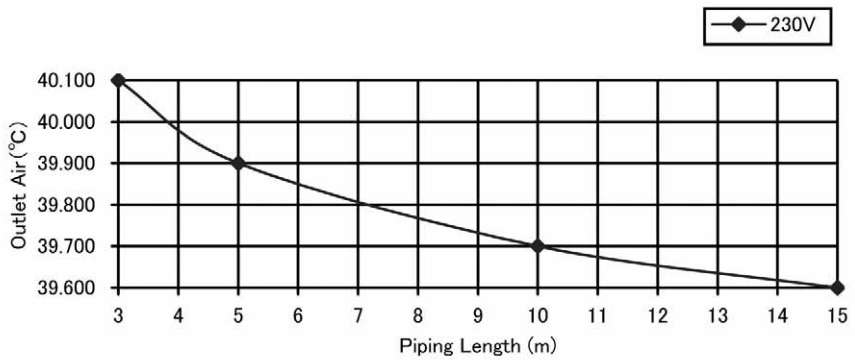


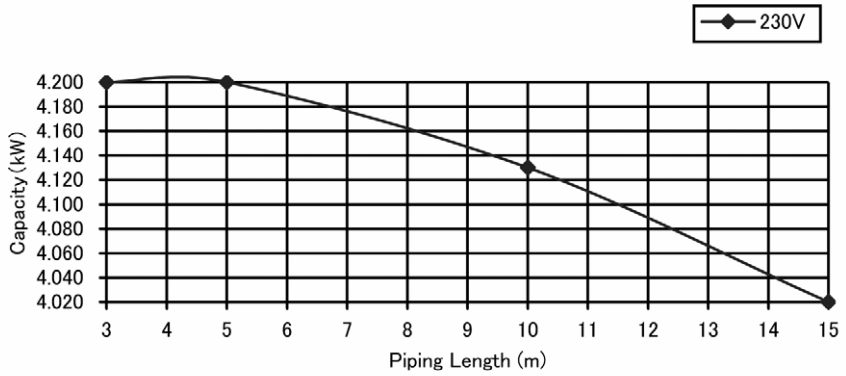


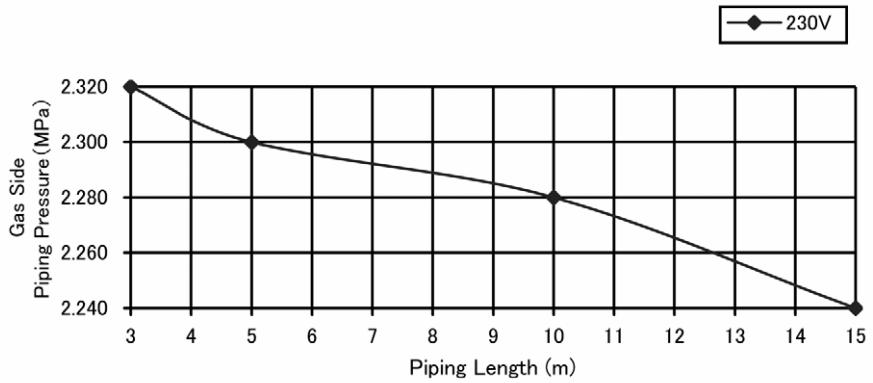


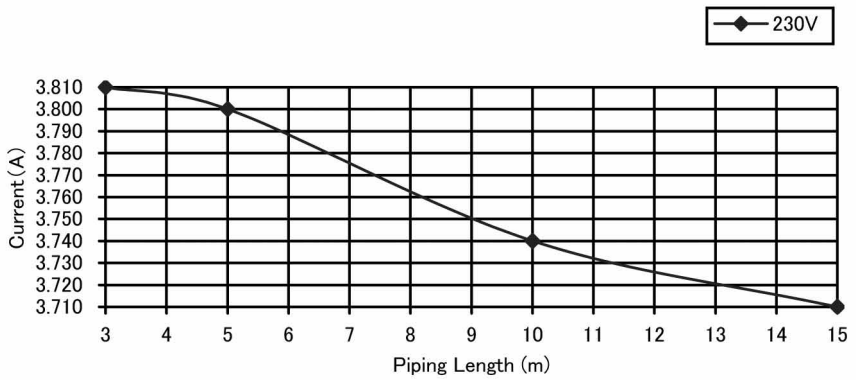
Piping Length Characteristic Heating

Condition
Room temperature: 20°C (DBT)
Outdoor temperature: 7.0°C (DBT), 6.0°C (WBT)
Fh : 49Hz









17.2 Sensible Capacity Chart

- **CS-VE9NKE CU-VE9NKE**

230V	Outdoor Temp. (ºC)								
Indoor wet bulb temp.	30			35			40		
	TC	**SHC**	**IP**	**TC**	**SHC**	**IP**	**TC**	**SHC**	**IP**
17.0ºC	2.47	1.51	0.44	2.31	1.44	0.48	2.15	1.39	0.51
19.0ºC				2.5		0.49			
19.5ºC	2.73	1.58	0.45	2.56	1.51	0.49	2.38	1.46	0.52
22.0ºC	2.98	1.63	0.46	2.78	1.57	0.49	2.59	1.51	0.53

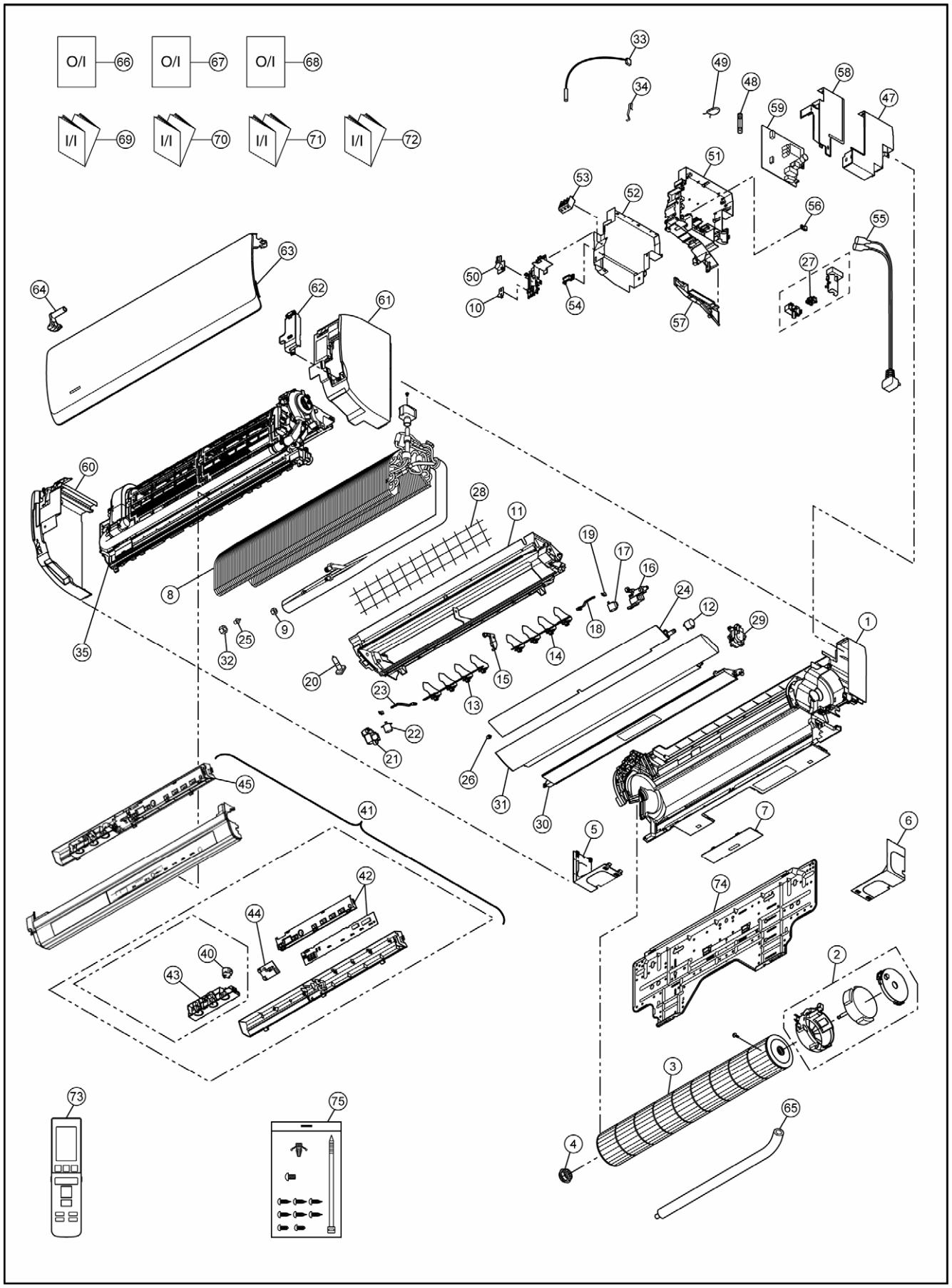
- **CS-VE12NKE CU-VE12NKE**

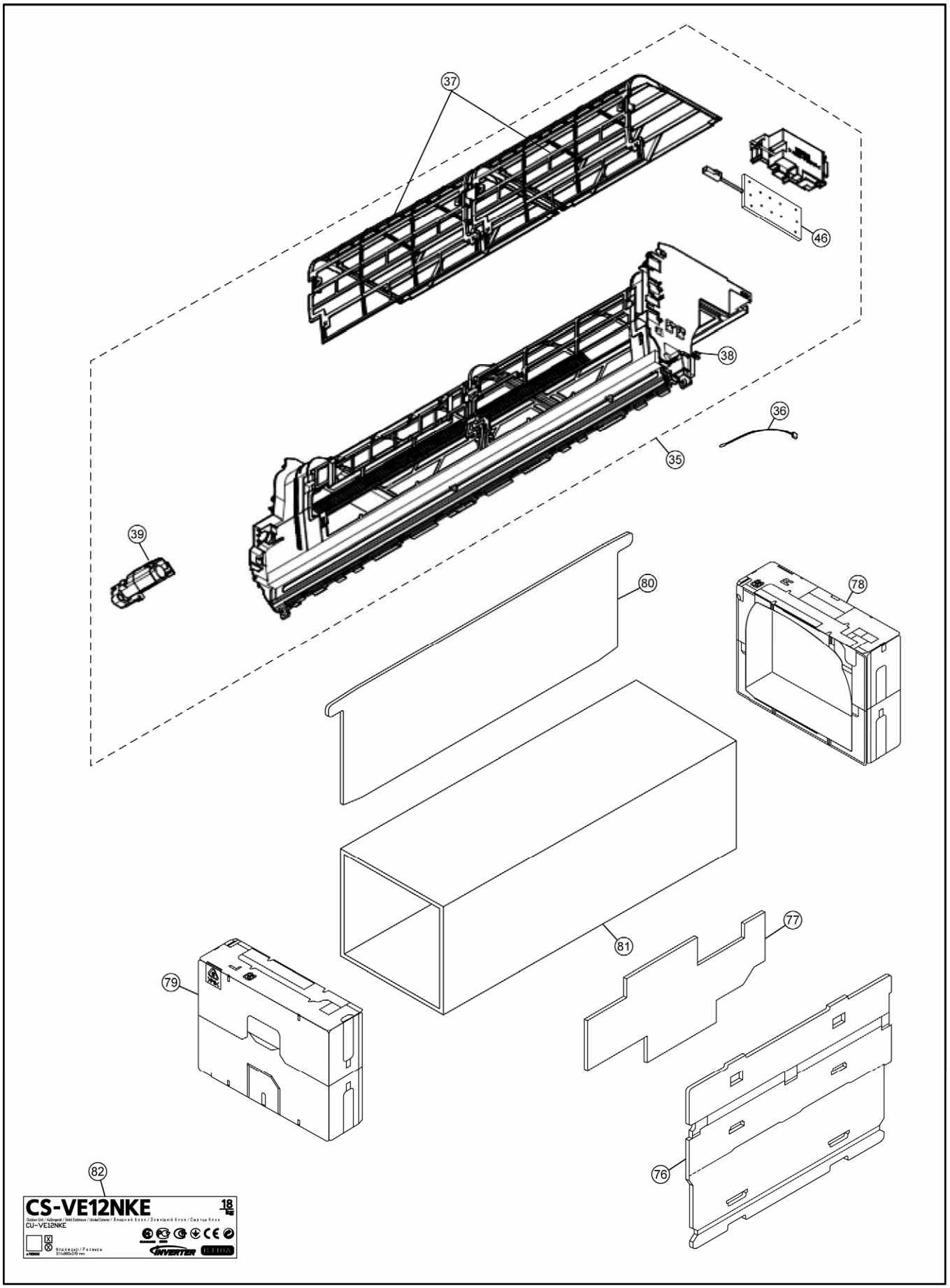
230V	Outdoor Temp. (ºC)								
Indoor wet bulb temp.	30			35			40		
	TC	**SHC**	**IP**	**TC**	**SHC**	**IP**	**TC**	**SHC**	**IP**
17.0ºC	3.47	2.01	0.80	3.25	1.92	0.86	3.02	1.85	0.93
19.0ºC				3.5	2.0	0.88			
19.5ºC	3.81	2.10	0.81	3.57	2.02	0.88	3.32	1.94	0.95
22.0ºC	4.16	2.18	0.83	3.88	2.09	0.90	3.61	2.02	0.96

TC - Total Cooling Capacity (kW)
SHC - Sensible Heat Capacity (kW)
IP - Input Power
Indoor 27°C /19°C
Outdoor 35°C /24°C

18. Exploded View and Replacement Parts List

18.1 Indoor Unit





Note
The above exploded view is for the purpose of parts disassembly and replacement.
The non-numbered parts are not kept as standard service parts.

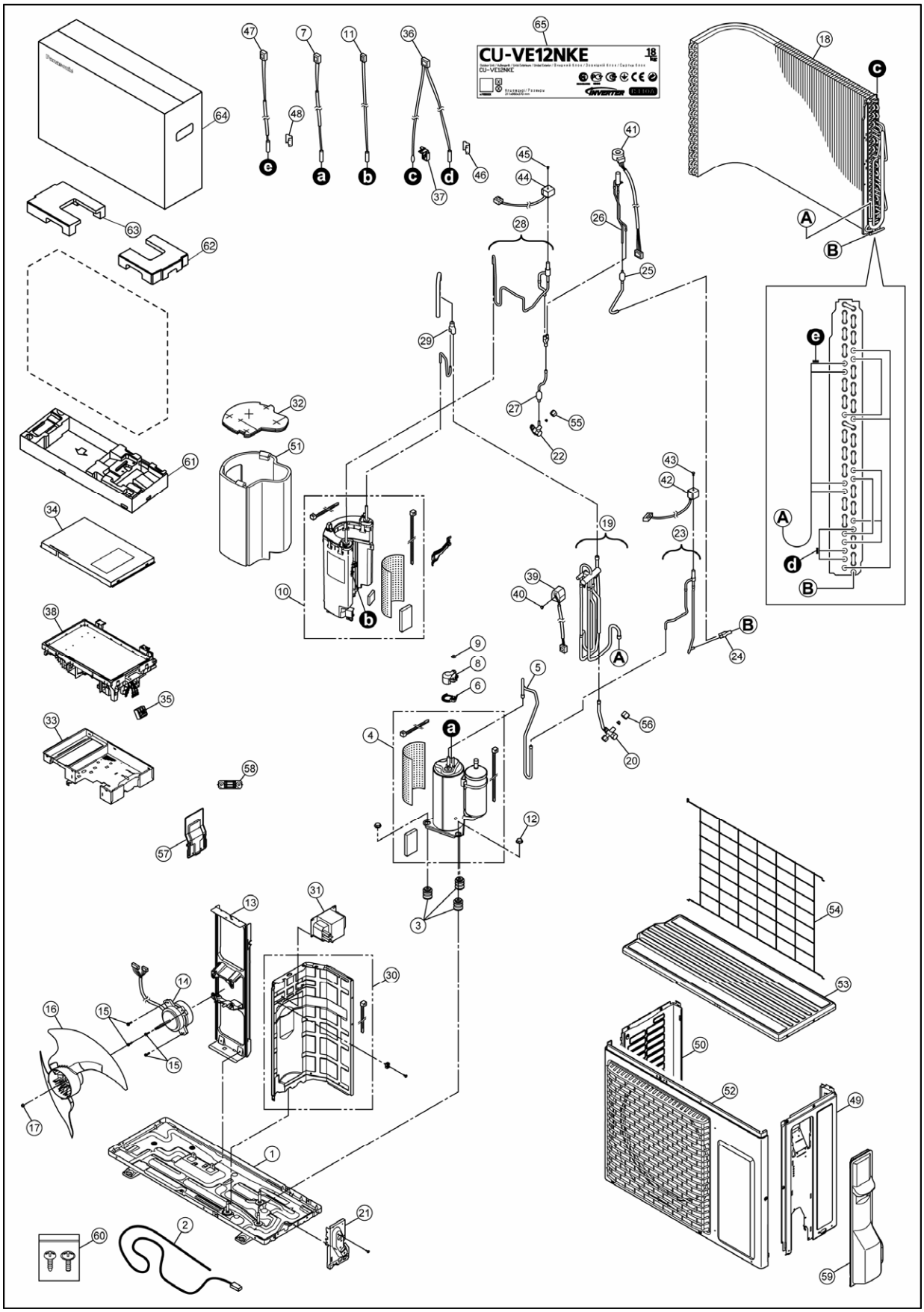
SAFETY	REF NO.	PART NAME & DESCRIPTION	QTY.	CS-VE9NKE	CS-VE12NKE	REMARK
	1	CHASSIS	1	CWD50C1740	←	
⚠	2	MOTOR (SMALL DC)	1	ARW7714AC	←	O
	3	CROSS-FLOW FAN ASS'Y	1	CWH02K1068	←	
	4	BEARING ASS'Y	1	CWH64K1005	←	
	5	L-SHAPED PLATE	1	CWD601212	←	
	6	L-SHAPED PLATE	1	CWD601213	←	
	7	PARTICULAR PLATE	1	CWD911992B	←	
	8	HEAT EXCHANGER	1	CWB30C3987	←	
	9	UNION NUT	1	CWT251026	←	
	10	PARTICULAR PIECE	1	CWD933627	←	
	11	DISCHARGE GRILLE	1	CWE20C3311	←	
	12	GEARED STEPPING MOTORS	1	L6JAYYYH0030	←	
	13	VANE-COMPLETE (L)	1	CWE24C1336	←	
	14	VANE-COMPLETE (R)	1	CWE24C1423	←	
	15	FULCRUM	1	CWH621122	←	
	16	RAIN COVER	1	CWH811142	←	
⚠	17	GEARED STEPPING MOTORS	1	L6JAYYYH0031	←	O
	18	LEVER ARM	1	CWH651067	←	
	19	ROD	1	CWH661019	←	
	20	CAP	1	CWH521096	←	
	21	RAIN COVER	1	CWH811143	←	
⚠	22	GEARED STEPPING MOTORS	1	L6JAYYYH0034	←	O
	23	LEVER ARM	1	CWH651068	←	
	24	VANE	1	CWE241362	←	
	25	CAP	1	CWH521121	←	
	26	SHAFT	1	CWMH630001	←	
	27	GENERATOR COMPLETE	1	CWH94C0049	←	
	28	WIRE NET.RESIN NET	1	CWD041191	←	
	29	GEAR-COMPLETE	1	CWH68C1073	←	
	30	PARTICULAR PLATE	1	CWD91C0194	←	
	31	VANE-COMPLETE	1	CWE24C1348	←	
	32	UNION NUT	1	CWT251027	←	
	33	SENSOR-COMPLETE	1	CWA50C2645	←	O
	34	HOLDER-SENSOR	1	CWH32137	←	
	35	FRAME FOR AIR FILTER	1	CWD01C1166	←	
	36	SENSOR-COMPLETE	1	CWA50C2997	←	O
	37	AIR FILTER	2	CWD001315	←	
	38	PARTICULAR PLATE	1	CWD912160	←	
	39	GEAR-COMPLETE	1	CWH68C1048	←	
	40	GEARED STEPPING MOTORS	1	L6JAYYYH0017	←	O
	41	SENSOR CASE	1	CWE18C1066	←	
⚠	42	ELECTRONIC CONTROL-INDICATE	1	CWA74C1093	←	O
	43	SENSOR CASE	1	CWE18C1070	←	
⚠	44	ELECTRONIC CONTROL-RECEIVE	1	CWA747172	←	O
	45	CONTROL PANEL	1	CWE312919	←	
⚠	46	HI-VOLT PW SUPPLY(600V MORE)	1	N0GE1F000002	←	
	47	CONTROL BOARD COVER	1	CWH13C1245	←	
	48	FUSE(250V,2.5A)	1	K5D252YYA053	←	
	49	VARISTOR	1	ERZVEAV511	←	
⚠	50	ELECTRONIC CONTROL-AUTO	1	CWA746050	←	O
	51	CONTROL BOARD	1	CWH121025	←	
	52	CONTROL BOARD COVER	1	CWH131552	←	
⚠	53	TERMINAL BOARD	1	CWA28C2570	←	O
	54	HOLDER-P.S. CORD	1	CWH311083	←	
⚠	55	POWER SUPPLY CORD	1	CWA20C3084	←	

SAFETY	REF NO.	PART NAME & DESCRIPTION	QTY.	CS-VE9NKE	CS-VE12NKE	REMARK
	56	HOLDER-P.S. CORD	1	CWH311001	←	
	57	PARTICULAR PIECE	1	CWD933197	←	
	58	CONTROL BOARD COVER	1	CWH131370	←	
⚠	59	ELECTRONINC CONTROL-MAIN	1	CWA73C6759	CWA73C6760	O
	60	FRONT GRILLE FRAME	1	CWE121212	←	
	61	FRONT GRILLE FRAME	1	CWE121213	←	
	62	GRILLE DOOR	1	CWE14C1100	←	
	63	INTAKE GRILLE	1	CWE22C1788	←	
	64	GEAR	1	CWH681032	←	
	65	DRAIN HOSE	1	CWH851142	←	
	66	OPE.. INST. (EN,FR,ES,DE,IT,NL)	1	CWF568728	←	
	67	OPE.. INST. (BG,SE,DK,FI,NO,HR)	1	CWF568770	←	
	68	OPE.. INST. (RU,UA,KZ)	1	CWF568771	←	
	69	INSTAL. INST. (NO,SE,FI,DK)	1	CWF60C1732	←	
	70	INSTAL. INST. (EN,ES,IT,NL)	1	CWF60C1733	←	
	71	INSTAL. INST. (BG,FR,DE,HR)	1	CWF60C1734	←	
	72	INSTAL. INST. (RU,UA,KZ)	1	CWF60C1735	←	
	73	REMOTE CONTROL	1	CWA75C4116	←	
	74	INSTALLING HOLDER	1	CWH361115	←	
	75	SCREWS FOR INSTALLATION	1	CWH82C1461	←	
	76	PACKAGING-C.C.BOARD	1	CWG572706	←	
	77	SHOCK ABSORBER	1	CWG713379	←	
	78	SHOCK ABSORBER	1	CWG70C2171	←	
	79	SHOCK ABSORBER	1	CWG70C2172	←	
	80	PACKAGING-C.C.BOARD	1	CWG572654	←	
	81	PACKAGING-C.C.CASE	1	CWG568488	←	
	82	MODEL LABEL	2	CWF858656	CWF858614	

(Note)

- All parts are supplied from ACBU, Japan (Vendor Code: 00025800).
- “O” marked parts are recommended to be kept in stock.

18.2 Outdoor Unit



Note
The above exploded view is for the purpose of parts disassembly and replacement.
The non-numbered parts are not kept as standard service parts.

SAFETY	REF. NO.	DESCRIPTION & NAME	QTY.	CU-VE9NKE	CU-VE12NKE	REMARK
	1	CHASSIS	1	CWD50K2229	←	
	2	HEATER	1	CWA341072	←	
	3	ANTI-VIBRATION BUSHING	3	CWH50077	←	
⚠	4	COMPRESSOR	1	CWB092610	←	O
	5	MULTIBENT TUBE	1	CWT338949	←	
	6	PARTICULAR PIECE	1	CWD933310	←	
	7	SENSOR-COMPLETE	1	CWA50C2676	←	
	8	TERMINAL COVER	1	CWH171053	←	
	9	NUT-TERMINAL COVER	1	CWH7080300J	←	
	10	HEAT CHARGER	1	CWH90C0037X	←	
	11	SENSOR-COMPLETE	1	CWA50C2742XE	←	O
	12	NUT	2	CWH56000J	←	
	13	FAN MOTOR BRACKET	1	CWD541140	←	
⚠	14	MOTOR (SMALL DC)	1	ARS8406AC	←	O
	15	SCREW	4	CWH55252J	←	
	16	PROPELLER FAN ASSY	1	CWH03K1067	←	
	17	NUT	1	CWH56053J	←	
	18	HEAT EXCHANGER	1	CWB32C3187	←	
	19	TUBE ASS'Y (4-WAYS VALVE)	1	CWT028012	←	
	20	3-WAYS VALVE	1	CWB011654	←	O
	21	HOLDER-COUPLING	1	CWH351180	←	
	22	2-WAYS VALVE	1	CWB021540	←	O
	23	TUBE ASS'Y (2-WAYS VALVE)	1	CWT028014	←	
	24	MANIFOLD TUBE	1	CWT071013	←	
	25	TUBE ASS'Y (STRAINER)	1	CWT028162	←	
	26	TUBE ASS'Y (EXPANSION VALVE)	1	CWT027235	←	
	27	TUBE ASS'Y (STRAINER)	1	CWT027224	←	
	28	TUBE ASS'Y (2-WAYS VALVE)	1	CWT028175	←	
	29	MANIFOLD TUBE	1	CWT071014	←	
	30	SOUND-PROOF BOARD	1	CWH15C1066	←	
⚠	31	REACTOR	1	G0C392J00011	←	
	32	SOUND PROOF MATERIAL	1	CWG302688	←	
	33	PARTICULAR PLATE-A'SSY	1	CWD90K1059	←	
	34	CONTROL BOARD COVER	1	CWH131550	←	
⚠	35	TERMINAL BOARD ASS'Y	1	CWA28K1121	←	O
	36	SENSOR-COMPLETE	1	CWA50C2765	←	O
	37	HOLDER-SENSOR	1	CWH321091	←	
⚠	38	ELECTRONIC CONTROL-MAIN	1	CWA73C6695R	CWA73C6696R	O
⚠	39	V-COIL 4-WAYS VALVE	1	CWA43C2400	←	
	40	SCREW	1	CWH551298	←	
⚠	41	V-COIL EXPANTION VALVE	1	CWA43C2413	←	
⚠	42	V-COIL 2-WAYS VALVE	1	CWA43C2426	←	
	43	SCREW	1	CWH551068J	←	
⚠	44	V-COIL 2-WAYS VALVE	1	CWA43C2471	←	
	45	SCREW	1	CWH551068J	←	
	46	HOLDER-SENSOR	1	CWH321048	←	
	47	SENSOR-COMPLETE	1	CWA50C2746	←	O
	48	HOLDER-SENSOR	1	CWH321048	←	
	49	CABINET SIDE PLATE	1	CWE04C1401	←	
	50	CABINET SIDE PLATE	1	CWE041673	←	
	51	SOUND PROOF MATERIAL	1	CWG302588	←	
	52	CABINET FRONT PLATE	1	CWE06C1436	←	
	53	CABINET TOP PLATE	1	CWE031130	←	
	54	WIRE NET.RESIN NET	1	CWD041143	←	
	55	UNION NUT 1/4"	1	CWT251048	←	

SAFETY	REF. NO.	DESCRIPTION & NAME	QTY.	CU-VE9NKE	CU-VE12NKE	REMARK
	56	UNION NUT 3/8"	1	CWT251049	←	
	57	CONTROL BOARD COVER	1	CWH131551	←	
	58	HOLDER-P.S. CORD	1	CWH311082	←	
	59	CONTROL BOARD COVER	1	CWH13C1214	←	
	60	SCREW	2	CWH551060J	←	
	61	PACKAGING-C.C.CASE	1	CWG50C2950	←	
	62	SHOCK ABSORBER	1	CWG713492	←	
	63	SHOCK ABSORBER	1	CWG713493	←	
	64	PACKAGING-C.C.CASE	1	CWG568489	←	
	65	MODEL LABEL	4	CWF858652	CWF858653	

(Note)

- All parts are supplied from ACBU, Japan (Vendor Code: 00025800).
- “O” marked parts are recommended to be kept in stock.

Printed in Japan
YB0712-0