FILE NO. SVM-24021-1

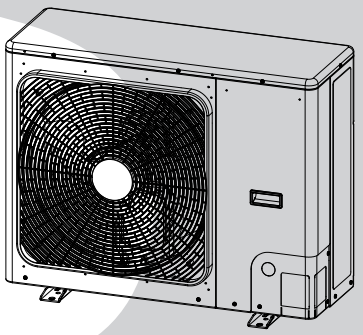
TOSHIBA

SERVICE MANUAL

AIR-CONDITIONER

SPLIT TYPE

RAS-2M60S4AVG-ND



R32

INVERTER

Revised on Jul, 2024

CONTENTS

1. SAFETY PRECAUTIONS

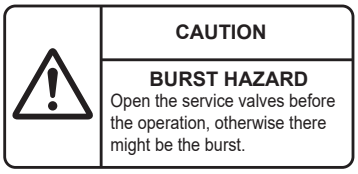
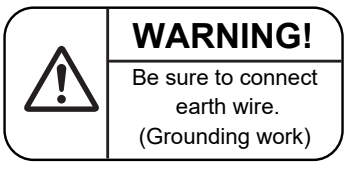
The important contents concerned to the safety are described on the product itself and on this Service Manual. Please read this Service Manual after understanding the described items thoroughly in the following contents (Indications/Illustrated marks), and keep them.

[Explanation of illustrated marks]

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

■ Warning indications on the air conditioner unit

	**WARNING** (Risk of fire)	This mark is for R32 refrigerant only. Refrigerant type is written on nameplate of outdoor unit. In case that refrigerant type is R32, this unit uses a flammabl refrigerant. If refrigerant leaks and comes in contact with fire or heating part it will create harmful gas and there is risk of fire
	Read the OWNER'S MANUAL carefully before operation.	
	Service personnel are required to carefully read the OWNER'S MANUAL and INSTALLATION MANUAL before operation.	
	Further information is available in the OWNER'S MANUAL, INSTALLATION MANUAL, and the like.	

Warning indication	Description
	**CAUTION** **BURST HAZARD** Open the service valves before the operation, otherwise there might be the burst.
	**WARNING** Be sure to connect earth wire. (Grounding work) Incomplete grounding causes an electric shock.

Be sure to follow the precautions provided here to avoid safety risks. The symbols and their meanings are shown below.	
⚠ **DANGER**	It indicates that incorrect use of this unit can result in a high possibility of severe injury(*1) or death.
⚠ **WARNING**	It indicates that incorrect use of this unit may cause severe injury or death.
⚠ **CAUTION**	It indicates that incorrect use of this unit may cause personal injury(*2), or property damage(*3).

*1: A severe injury refers to blindness, injury, burns (hot or cold), electrical shock, bone fracture, or poisoning that leaves after effects and requires hospitalization or extende out-patient treatment.
*2: Personal injury means a slight accident, burn, or electrical shock which does not require admission or repeated hospital treatment.
*3: Property damage means greater damage which affects assets or resources

For general public use

Power supply cord of parts of appliance for outdoor use shall be at least polychloroprene sheathed flexible cord (design H07RN-F) or cord designation 602 5 IEC66 (1.5 mm² or more). (Shall be installed in accordance with national wiring regulations.)
This appliance is not intended for use by person (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.
Children should be supervised to ensure that they do not play with the appliance.

⚠ CAUTION

To disconnect the appliance from the main power supply
This appliance must be connected to the main power supply by means of a circuit breaker or a switch with a contact separation of at least 3 mm in all poles.

⚠ CAUTION

NEW REFRIGERANT AIR CONDITIONER INSTALLATION
THIS AIR CONDITIONER USES THE NEW HFC REFRIGERANT (R32), WHICH DOES NOT DESTROY THE OZONE LAYER.
R32 REFRIGERANT IS APT TO BE AFFECTED BY IMPURITIES SUCH AS WATER, OXIDIZING MEMBRANES, AND OILS BECAUSE THE PRESSURE OF R32 REFRIGERANT IS APPROX. 1.6 TIMES OF REFRIGERANT R22.
AS WELL AS THE ADOPTION OF THIS NEW REFRIGERANT, REFRIGERATING MACHINE OIL HAS ALSO BEEN CHANGED. THEREFORE, DURING INSTALLATION WORK, BE SURE THAT WATER, DUST, FORMER REFRIGERANT, OR REFRIGERATING MACHINE OIL DOES NOT ENTER THE REFRIGERATION CYCLE OF A NEW-REFRIGERANT AIR CONDITIONER. TO AVOID MIXING REFRIGERANT AND REFRIGERATING MACHINE OIL, THE SIZES OF CHARGING PORT CONNECTING SECTIONS ON THE MAIN UNIT ARE DIFFERENT FROM THOSE FOR THE CONVENTIONAL REFRIGERANT, AND DIFFERENT SIZE TOOLS ARE ALSO REQUIRED. FOR CONNECTING PIPES, USE NEW AND CLEAN PIPING MATERIALS WITH HIGH PRESSURE WITHSTAND CAPABILITIES, DESIGNED FOR R32 ONLY, AND ENSURE THAT WATER OR DUST DOES NOT ENTER. MOREOVER, DO NOT USE ANY EXISTING PIPING AS ITS PRESSURE WITHSTAND MAY BE INSUFFICIENT AND MAY CONTAIN IMPURITIES.

⚠ DANGER

- THE MANUFACTURER SHALL NOT ASSUME ANY LIABILITY FOR THE DAMAGE CAUSED BY NOT OBSERVING THE DESCRIPTION OF THIS MANUAL.
- FOR USE BY QUALIFIED PERSONS ONLY.
- MEANS FOR DISCONNECTION FROM THE SUPPLY HAVING A CONTACT SEPARATION OF AT LEAST 3 MM IN ALL POLES MUST BE INCORPORATED IN THE FIXED WIRING.
- TURN OFF MAIN POWER SUPPLY BEFORE ATTEMPTING ANY ELECTRICAL WORK. MAKE SURE ALL POWER SWITCHES ARE OFF. FAILURE TO DO SO MAY CAUSE ELECTRIC SHOCK.
- CONNECT THE CONNECTING CABLES CORRECTLY. IF THE CONNECTING CABLES ARE CONNECTED WRONGLY, ELECTRIC PARTS MAY BE DAMAGED.
- CHECK THE EARTH WIRE THAT IT IS NOT BROKEN OR DISCONNECTED BEFORE INSTALLATION.
- DO NOT INSTALL NEAR CONCENTRATIONS OF COMBUSTIBLE GAS OR GAS VAPORS. FAILURE TO FOLLOW THIS INSTRUCTION CAN RESULT IN FIRE OR EXPLOSION.
- TO PREVENT OVERHEATING THE INDOOR UNIT AND CAUSING A FIRE HAZARD, PLACE THE UNIT WELL AWAY (MORE THAN 2 M) FROM HEAT SOURCES SUCH AS RADIATORS, HEATERS, FURNACE, STOVES, ETC.
- WHEN MOVING THE AIR CONDITIONER FOR INSTALLING IT IN ANOTHER PLACE AGAIN, BE VERY CAREFUL NOT TO GET THE SPECIFIED REFRIGERANT (R32) WITH ANY OTHER GASEOUS BODY INTO THE REFRIGERATION CYCLE. IF AIR OR ANY OTHER GAS IS MIXED IN THE REFRIGERANT, THE GAS PRESSURE IN THE REFRIGERATION CYCLE BECOMES ABNORMALLY HIGH AND IT RESULTANTLY CAUSES BURST OF THE PIPE AND INJURIES ON PERSONS.
- IN THE EVENT THAT THE REFRIGERANT GAS LEAKS OUT OF THE PIPE DURING THE INSTALLATION WORK, IMMEDIATELY LET FRESH AIR INTO THE ROOM. IF THE REFRIGERANT GAS IS HEATED BY FIRE OR SOMETHING ELSE, IT CAUSES GENERATION OF POISONOUS GAS.
- WHEN INSTALLING OR RE-INSTALLING THE AIR CONDITIONER, DO NOT INJECT AIR OR OTHER SUBSTANCES BESIDES THE DESIGNATED REFRIGERANT “R32” INTO THE REFRIGERATING CYCLE.
  IF AIR OR OTHER SUBSTANCES ARE MIXED, AN ABNORMAL PRESSURE CAN OCCUR IN THE REFRIGERATING CYCLE, AND THIS CAN CAUSE AN INJURY DUE TO A PIPE RUPTURE.

⚠ WARNING

About the refrigerant

- This product contains fluorinated greenhouse gases.
- Do not vent gases to the atmosphere.
- The appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater).
- Do not pierce or burn refrigerant cycle parts.
- Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.
- Be aware that refrigerants may not contain an odour.
- The refrigerant inside the unit is flammable. If the refrigerant leaks in the room and comes in contact with fire from a burner, a heater, or a cooker, it may result in fire or the formation of a harmful gas.
- Turn off any combustible heating devices, ventilate the room, and contact the dealer from which you purchased the unit.
- Do not use the unit until a service person confirms that the portion from which the refrigerant leaked is repaired.
- When installing, relocating, or servicing the air conditioner, use only the specified refrigerant (R32) to charge the refrigerant lines. Do not mix it with any other refrigerant and do not allow air to remain in the lines.
- Pipe-work shall be protected from physical damage.
- Compliance with national gas regulations shall be observed.
- Do not use any refrigerant different from the one specified for complement or replacement. Otherwise, abnormally high pressure may be generated in the refrigeration cycle, which may result in a failure or explosion of the product or an injury to your body.
- Installation work must be requested from the supplying retail dealership or professional vendors. Self-installation may cause water leakage, electrical shock, or fire as a result of improper installation.
- Specified tools and pipe parts for model R32 are required, and installation work must be done in accordance with the manual. HFC type refrigerant R32 has 1.6 Times more pressure than that of conventional refrigerant (R22). Use the specified pipe parts, and ensure correct installation, otherwise damage and/or injury may be caused. At the same time, water leakage, electrical shock, and fire may occur.
- Be sure to install the unit in a place which can sufficiently bear its weight. If the load bearing of the unit is not enough, or installation of the unit is improper, the unit may fall and result in injury.
- Electrical work must be performed by a qualified electrical engineer in accordance with the code governing such installation work, internal wiring regulations, and the manual. A dedicated circuit and the rated voltage must be used. Insufficient power supply or improper installation may cause electrical shock or fire.
- Use a cabtyre cable to connect wires in the indoor/outdoor units. Midway connection, stranded wire, and single-wire connections are not allowed. Improper connection or fixing may cause a fire.

⚠ WARNING

- Wiring between the indoor unit and outdoor units must be well shaped so that the cover can be firmly placed. Improper cover installation may cause increased heat, fire, or electrical shock at the terminal area.
- Be sure to use only approved accessories or the specified parts. Failure to do so may cause the unit to fall, water leakage, fire or electrical shock.
- After the installation work, ensure that there is no leakage of refrigerant gas. If the refrigerant gas leaks out of the pipe into the room and is heated by fire or something else from a fan heater, stove or gas range, it causes generation of poisonous gas.
- Make sure the equipment is properly earthed. Do not connect the earth wire to a gas pipe, water pipe, lightning conductor, or telephone earth wire. Improper earth work may be the cause of electrical shock.
- Do not install the unit where flammable gas may leak. If there is any gas leakage or accumulation around the unit, it can cause a fire.
- Do not select a location for installation where there may be excessive water or humidity, such as a bathroom. Deterioration of insulation may cause electrical shock or fire.
- Installation work must be performed following the instructions in this installation manual. Improper installation may cause water leakage, electrical shock or fire. Check the following items before operating the unit.
  - Be sure that the pipe connection is well placed and there are no leaks.
  - Check that the service valve is open. If the service valve is closed, it may cause overpressure and result in compressor damage. At the same time, if there is a leak in the connection part, it may cause air suction and overpressure, resulting in burst or injury.
- The installation of pipe work shall be kept to a minimum.
- The following must be certainly done during pump down.
  - Do not incorporate air into the refrigeration cycle.
  - Close the 2 service valves. Stop the compressor and remove the refrigerant pipe.

  If the refrigerant pipe is removed when the compressor is operating and service valves are opened, the refrigerant cycle will inhale unwanted matter such as air and the pressure in the cycle becomes abnormally elevated. It may cause a burst or injury.
- Do not modify the power cable, connect the cable midway, or use a multiple outlet extension cable. Doing so may cause contact failure, insulation failure, or excess current, resulting in fire or electrical shock.
- If you detect any damage, do not install the unit. Contact your supplying dealer immediately.
- Never modify this unit by removing any of the safety guards or bypassing any of the safety interlock switches.

⚠ WARNING

- Do not modify the power cable, connect the cable midway, or use a multiple outlet extension cable. Doing so may cause contact failure, insulation failure, or excess current, resulting in fire or electrical shock
- If you detect any damage, do not install the unit. Contact your supplying dealer immediately.
- Never modify this unit by removing any of the safety guards or bypassing any of the safety interlock switches.
- Do not wash air conditioners with pressure washers.
  Electric leaks may cause electric shocks or first.
- Be sure to comply with local regulations/codes when running the wire from the outdoor unit to the indoor unit. (Size of wire and wiring method etc.)
- When installing the air conditioner in a small room, provide appropriate measures to ensure that the concentration of refrigerant leakage occur in the room does not exceed the critical level. It is not dangerous refrigerant; it has not toxicity.
  However, a concentration above 0.3 kg/m³ as criterion still causes suffocation. The volume of refrigerant charged to the multi system air conditioner is more than the volume charged to a conventional individual system.
- Minimum floor area for installation the Multi System air conditioner , When combined with the indoor product, shall be installed in a room with a floor area follow as below table
- In accordance with IEC60335-2-40 2018 a minimum floor area MUST be observed when installing the Multi System air conditioner. Follow the table below to calculate the minimum floor area for installed product.

Minimum floor area, When combined with indoor product. (m^2)					
Refrigerant amount (kg)	**BI-FLOW CONSOLE**	**BI-FLOW CONSOLE with refrigerant detection sensor RB-T301-E**	**HIGH-WALL**	**1-WAY, 4-WAY CASSETTE**	**DUCT**
≤ 1.84	-	-	-	-	-
1.92	32	7	4	2	2
2.12	39	7	4	3	3
2.32	46	8	5	3	3
2.39	49	8	5	4	4
2.52	54	9	6	4	4

PLEASE CHECK LOCAL REGULATIONS WHICH MAY IMPOSE DIFFERENT, MORE RESTRICTIVE LIMITS ON REFRIGERANT CHARGE LIMITS, ROOM AREAS AND PREMITTED INSTALLATION LOCATION.

- Before operating the air conditioner after having completed the work, check that the electrical parts control box cover of the indoor unit and valve cover of the outdoor unit are closed, and set the circuit breaker to the ON position. You may receive an electric shock etc. if the power is turned on without first conducting these checks.
- Make sure drain hose insulation if cooling operation is used at sub-zero ambient temperature.

⚠ WARNING

- **After installation work, make sure below before operation.**
  - Connection pipes are connected properly and no leakage.
  - Packed valves are fully open.
  Running compressor without open packed valves may cause abnormal high pressure and parts failure.
  Leakage at connection piping may suck air and make further high pressure cause burst and injure.
- **During pump down work make sure below process.**
  - Don't mix air into the refrigerant cycle.
  - Stop the compressor before removing piping after packed valves are fully closed.
  Removing piping under the compressor running and packed valves open, air might be sucked and refrigeration cycle pressure becomes abnormally high, and it causes burst or injury on persons.

⚠ CAUTION

- Please read this installation manual carefully before installing the unit. It contains further important instructions for proper installation.
- Exposure of unit to water or other moisture before installation could result in electric shock. Do not store it in a wet basement or expose to rain or water.
- After unpacking the unit, examine it carefully for possible damage.
- Do not install in a place that can increase the vibration of the unit. Do not install in a place that can amplify the noise level of the unit or where noise and discharged air might disturb neighbours.
- This appliance must be connected to the main power supply by means of a circuit breaker depending on the place where the unit is installed. Failure to do so may cause electrical shock.
- Follow the instructions in this installation manual to arrange the drain pipe for proper drainage from the unit. Ensure that drained water is discharged. Improper drainage can result in water leakage, causing water damage to furniture.
- Tighten the flare nut with a torque wrench using the prescribed method. Do not appl excess torque. Otherwise, the nut may crack after a long period of usage and it may cause the leakage of refrigerant.
- Wear gloves (heavy gloves such as cotton gloves) for installation work. Failure to do so may cause personal injury when handling parts with sharp edges.
- Do not touch the air intake section or the aluminium fins of the outdoor unit. It may caus injury.
- Do not install the outdoor unit in a place which can be a nest for small animals. Small animals could enter and contact internal electrical parts, causing a failure or fire
- Request the user to keep the place around the unit tidy and clean.
- Make sure to conduct a test run after the installation work, and explain how to use and maintain the unit to the customer in accordance with the manual. Ask the customer to keep the operation manual along with the installation manual.
- Do not climb onto or place objects on top of the outdoor unit. You may fall or the objects may fall off of the outdoor unit and result in injur .

Requirement of report to the local power supplier

Please make absolutely sure that the installation of this appliance is reported to the local power supplier before installation. If you experience any problems or if the installation is not accepted by the supplier, the service agency will take adequate countermeasures.

■ **Important information regarding the refrigerant used**

This product contains fluorinated greenhouse gases
Do not vent gases into the atmosphere.
Refrigerant type: **R32**
GWP(1) value: **675** * (ex. R32 ref. AR4)
(1)GWP = global warming potential
The refrigerant quantity is indicated on the unit name plate.
* This value is based on F gas regulation 517/2014

⚠ CAUTION

- Exposure of unit to water or other moisture before installation may result in an electrical short. Do not store in a wet basement or expose to rain or water.
- Do not install in a place that can increase the vibration of the unit. Do not install in a place that can amplify the noise level of the unit or where noise or discharged air might disturb neighbors.
- To avoid personal injury, be careful when handling parts with sharp edges.
- **Perform the specified installation work to guard against an earthquake.** If the air conditioner is not installed appropriately, accidents may occur due to the falling unit.
- Please read this installation manual carefully before installing the unit.It contains further important instructions for proper installation ,Improper installation may cause fire, burst, electric shock, injury and water leakage.

2. SPECIFICATIONS

The indoor and outdoor units that can be used in combination are shown in the tables below.

Table of models that can be used in combination

Type	Outdoor unit	Combinations of indoor unit models that can be connected
Heat pump	RAS-2M60S4AVG-ND	Refer to page 12 to 13

NOTES

A 1-room connection is not an option for the indoor units (you cannot connect only one indoor unit).
Be sure to connect indoor unit in two or more.

2-1. Specifications

<Heat Pump Models>

Unit model	Outdoor			RAS-2M60S4AVG-ND	
	Connection indoor unit of this specification		RAS-	B25G3KVSG-ND + B35G3KVSG-ND	
Cooling Capacity (*1)			(kW)	6.0	
Cooling Capacity range			(kW)	1.00 to 7.00 *	
Heating Capacity (*1)			(kW)	7.4	
Heating Capacity range			(kW)	1.00 to 8.70 *	
Power supply				1 ph, 50 Hz, 220-240 V	
Electric characteristics	Total	Operation mode		Cooling	Heating
		Running current	(A)	7.96 / 7.62 / 7.32	9.34 / 8.95 / 8.60
		Power consumption	(W)	1680	1980
		Power factor	(%)	96	96
		Starting current	(A)	-	
COP (Cooling/Heating)				3.57 / 4.91	
Operating noise	Outdoor (Cooling/Heating)	Sound pressure level	(dBA)	47 / 50	
		Sound power level	(dBA)	60 / 63	
Outdoor unit	Dimension	Height	(mm)	710	
		Width	(mm)	900	
		Depth	(mm)	320	
	Net weight		(kg)	59	
	Compressor	Motor output	(W)	1810	
		Type		Twin rotary type with DC-inverter variable speed control	
		Model		KTM225D43UMU	
	Fan motor output		(W)	100	
	Air flow rate (Cooling/Heating)		(m^3/h)	2600 / 2700	
	Type			Flare connection	
	Name of refirigerant			R32	
	Weight of refigerant		(kg)	1.84	
Piping connection	Outdoor unit	A unit liquid side/gas side		φ6.35 / φ9.52	
		B unit liquid side/gas side		φ6.35 / φ9.52	
		C unit liquid side/gas side		-	
	Maximum length (per unit)		(m)	25	
	Maximum length (total)		(m)	50	
	Maximum chargeless length		(m)	Over 30 m need extra charge 20 g/m	
	Maximum height difference		(m)	15	
Wiring connection	Power supply / interconnection			3 Wires : includes earth / 4 Wires : includes earth	
Usable temperature range	Outdoor (Cooling/Heating)		(℃)	-15 to 46℃ / -25 to 24℃	
Accessory Outdoor unit	Installation manual			1	

* Values listed for above combination only. For capacity range for other Indoor unit combinations please see separate table
The specifications may be subject to change without notice for purposes of improvement.

(*1) Rated conditions

Cooling : Capacity test condition, inside : 27 °C (Db) / 19 °C (Wb), outside : 35 °C (Db) / 24 °C (Wb)
Heating : Capacity test condition, inside : 20 °C (Db), outside : 7 °C (Db) / 6°C (Wb)
Piping length : 5 m per Indoor Unit.

2-2. Specifications of Performance When Each Indoor Units is Combined with Other Unit

Combination of indoor units

Outdoor unit : RAS-2M60S4AVG-ND

Operation mode : Cooling Power supply voltage : 220V

Operating	Indoor unit			Unit capacity (kW)		Cooling capacity (kW)			Power consumption (W)			Operating current (A)			EER	SEER	Energy Grade
status	A	B	ΣkBTU	A	B	Min	Rate	Max	Min	Rate	Max	Min	Rate	Max	Rate		
1 unit	10	—	10	2.80	—	0.8	2.8	3.5	270	690	1300	1.60	3.52	6.25	4.06	5.40	A+
	13	—	13	3.50	—	0.8	3.5	4.5	270	870	1700	1.60	4.23	8.10	4.02	6.20	A++
	18	—	18	5.00	—	0.9	5.0	6.5	260	980	2180	1.54	4.75	10.32	5.10	7.20	A++
2 units	10	10	20	2.80	2.80	0.9	5.6	7.0	320	1690	2310	1.88	8.05	10.93	3.31	6.50	A++
	13	10	23	2.67	3.33	1.0	6.0	7.0	320	1600	2350	1.88	7.64	11.11	3.75	6.50	A++
	18	10	28	2.15	3.85	1.0	6.0	7.0	320	1680	2350	1.88	8.01	11.11	3.57	6.90	A++
	13	13	26	3.00	3.00	1.0	6.0	7.0	320	1680	2350	1.88	8.01	11.11	3.57	7.00	A++
	18	13	31	2.47	3.53	1.0	6.0	7.0	310	1650	2350	1.82	7.87	11.11	3.64	7.00	A++
	18	18	36	3.00	3.00	1.1	6.0	7.0	310	1630	2350	1.82	7.78	11.11	3.68	7.10	A++

Operation mode : Cooling Power supply voltage : 230V

Operating	Indoor unit			Unit capacity (kW)		Cooling capacity (kW)			Power consumption (W)			Operating current (A)			EER	SEER	Energy Grade
status	A	B	ΣkBTU	A	B	Min	Rate	Max	Min	Rate	Max	Min	Rate	Max	Rate		
1 unit	10	—	10	2.80	—	0.8	2.8	3.5	270	690	1300	1.53	3.36	5.97	4.06	5.40	A+
	13	—	13	3.50	—	0.8	3.5	4.5	270	870	1700	1.53	4.05	7.75	4.02	6.20	A++
	18	—	18	5.00	—	0.9	5.0	6.5	260	980	2180	1.47	4.54	9.87	5.10	7.20	A++
2 units	10	10	20	2.80	2.80	0.9	5.6	7.0	320	1690	2310	1.80	7.70	10.45	3.31	6.50	A++
	13	10	23	2.67	3.33	1.0	6.0	7.0	320	1600	2350	1.80	7.30	10.63	3.75	6.50	A++
	18	10	28	2.15	3.85	1.0	6.0	7.0	320	1680	2350	1.80	7.66	10.63	3.57	6.90	A++
	13	13	26	3.00	3.00	1.0	6.0	7.0	320	1680	2350	1.80	7.66	10.63	3.57	7.00	A++
	18	13	31	2.47	3.53	1.0	6.0	7.0	310	1650	2350	1.75	7.53	10.63	3.64	7.00	A++
	18	18	36	3.00	3.00	1.1	6.0	7.0	310	1630	2350	1.75	7.44	10.63	3.68	7.10	A++

Operation mode : Cooling Power supply voltage : 240V

Operating	Indoor unit			Unit capacity (kW)		Cooling capacity (kW)			Power consumption (W)			Operating current (A)			EER	SEER	Energy Grade
status	A	B	ΣkBTU	A	B	Min	Rate	Max	Min	Rate	Max	Min	Rate	Max	Rate		
1 unit	10	—	10	2.80	—	0.8	2.8	3.5	270	690	1300	1.46	3.22	5.73	4.06	5.40	A+
	13	—	13	3.50	—	0.8	3.5	4.5	270	870	1700	1.46	3.88	7.42	4.02	6.20	A++
	18	—	18	5.00	—	0.9	5.0	6.5	260	980	2180	1.41	4.35	9.46	5.10	7.20	A++
2 units	10	10	20	2.80	2.80	0.9	5.6	7.0	320	1690	2310	1.72	7.38	10.02	3.31	6.50	A++
	13	10	23	2.67	3.33	1.0	6.0	7.0	320	1600	2350	1.72	7.00	10.19	3.75	6.50	A++
	18	10	28	2.15	3.85	1.0	6.0	7.0	320	1680	2350	1.72	7.34	10.19	3.57	6.90	A++
	13	13	26	3.00	3.00	1.0	6.0	7.0	320	1680	2350	1.72	7.34	10.19	3.57	7.00	A++
	18	13	31	2.47	3.53	1.0	6.0	7.0	310	1650	2350	1.67	7.21	10.19	3.64	7.00	A++
	18	18	36	3.00	3.00	1.1	6.0	7.0	310	1630	2350	1.67	7.13	10.19	3.68	7.10	A++

Combination of indoor units

Outdoor unit : RAS-2M60S4AVG-ND

Operation mode : Heating Power supply voltage : 220V

Operating	Indoor unit			Unit capacity (kW)		Cooling capacity (kW)			Power consumption (W)			Operating current (A)			COP	SCOP		Energy Grade	
status	A	B	ΣkBTU	A	B	Min	Rate	Max	Min	Rate	Max	Min	Rate	Max	Rate	Average	Cold	Average	Cold
1 unit	10	—	10	3.20	—	0.7	3.2	7.2	200	1000	2470	1.19	4.84	11.67	3.20	3.70	3.00	A	C
	13	—	13	4.20	—	0.8	4.2	7.6	200	1300	2610	1.19	6.25	12.33	3.23	3.80	3.10	A	B
	18	—	18	6.00	—	0.9	6.0	8.7	200	1850	2920	1.19	8.79	13.81	3.24	4.10	3.30	A+	B
2 units	10	10	20	3.20	3.20	0.9	6.4	8.7	200	1710	2760	1.19	8.15	13.04	3.74	4.50	3.40	A+	A
	13	10	23	4.20	3.20	0.9	7.4	8.7	200	1980	2680	1.19	9.39	12.66	3.74	4.60	3.50	A++	A
	18	10	28	4.83	2.57	1.0	7.4	8.7	200	1960	2630	1.19	9.30	12.43	3.78	4.70	3.70	A++	A
	13	13	26	3.70	3.70	1.0	7.4	8.7	200	1980	2700	1.19	9.39	12.76	3.74	4.60	3.60	A++	A
	18	13	31	4.35	3.05	1.0	7.4	8.7	200	1850	2610	1.19	8.79	12.33	4.00	4.70	3.70	A++	A
	18	18	36	3.70	3.70	1.1	7.4	8.7	200	1850	2520	1.19	8.79	11.91	4.00	4.70	3.80	A++	A

Operation mode : Heating Power supply voltage : 230V

Operating	Indoor unit			Unit capacity (kW)		Cooling capacity (kW)			Power consumption (W)			Operating current (A)			COP	SCOP		Energy Grade	
status	A	B	ΣkBTU	A	B	Min	Rate	Max	Min	Rate	Max	Min	Rate	Max	Rate	Average	Cold	Average	Cold
1 unit	10	—	10	3.20	—	0.7	3.2	7.2	200	1000	2470	1.14	4.63	11.17	3.20	3.70	3.00	A	C
	13	—	13	4.20	—	0.8	4.2	7.6	200	1300	2610	1.14	5.97	11.80	3.23	3.80	3.10	A	B
	18	—	18	6.00	—	0.9	6.0	8.7	200	1850	2920	1.14	8.41	13.21	3.24	4.10	3.30	A+	B
2 units	10	10	20	3.20	3.20	0.9	6.4	8.7	200	1710	2760	1.14	7.79	12.48	3.74	4.50	3.40	A+	A
	13	10	23	4.20	3.20	0.9	7.4	8.7	200	1980	2680	1.14	8.99	12.11	3.74	4.60	3.50	A++	A
	18	10	28	4.83	2.57	1.0	7.4	8.7	200	1960	2630	1.14	8.90	11.89	3.78	4.70	3.70	A++	A
	13	13	26	3.70	3.70	1.0	7.4	8.7	200	1980	2700	1.14	8.99	12.20	3.74	4.60	3.60	A++	A
	18	13	31	4.35	3.05	1.0	7.4	8.7	200	1850	2610	1.14	8.41	11.80	4.00	4.70	3.70	A++	A
	18	18	36	3.70	3.70	1.1	7.4	8.7	200	1850	2520	1.14	8.41	11.39	4.00	4.70	3.80	A++	A

Operation mode : Heating Power supply voltage : 240V

Operating	Indoor unit			Unit capacity (kW)		Cooling capacity (kW)			Power consumption (W)			Operating current (A)			COP	SCOP		Energy Grade	
status	A	B	ΣkBTU	A	B	Min	Rate	Max	Min	Rate	Max	Min	Rate	Max	Rate	Average	Cold	Average	Cold
1 unit	10	—	10	3.20	—	0.7	3.2	7.2	200	1000	2470	1.09	4.44	10.70	3.20	3.70	3.00	A	C
	13	—	13	4.20	—	0.8	4.2	7.6	200	1300	2610	1.09	5.73	11.31	3.23	3.80	3.10	A	B
	18	—	18	6.00	—	0.9	6.0	8.7	200	1850	2920	1.09	8.06	12.66	3.24	4.10	3.30	A+	B
2 units	10	10	20	3.20	3.20	0.9	6.4	8.7	200	1710	2760	1.09	7.47	11.96	3.74	4.50	3.40	A+	A
	13	10	23	4.20	3.20	0.9	7.4	8.7	200	1980	2680	1.09	8.61	11.61	3.74	4.60	3.50	A++	A
	18	10	28	4.83	2.57	1.0	7.4	8.7	200	1960	2630	1.09	8.53	11.39	3.78	4.70	3.70	A++	A
	13	13	26	3.70	3.70	1.0	7.4	8.7	200	1980	2700	1.09	8.61	11.70	3.74	4.60	3.60	A++	A
	18	13	31	4.35	3.05	1.0	7.4	8.7	200	1850	2610	1.09	8.06	11.31	4.00	4.70	3.70	A++	A
	18	18	36	3.70	3.70	1.1	7.4	8.7	200	1850	2520	1.09	8.06	10.92	4.00	4.70	3.80	A++	A

Operation Characteristic Curve

RAS-2M60S4AVG-ND

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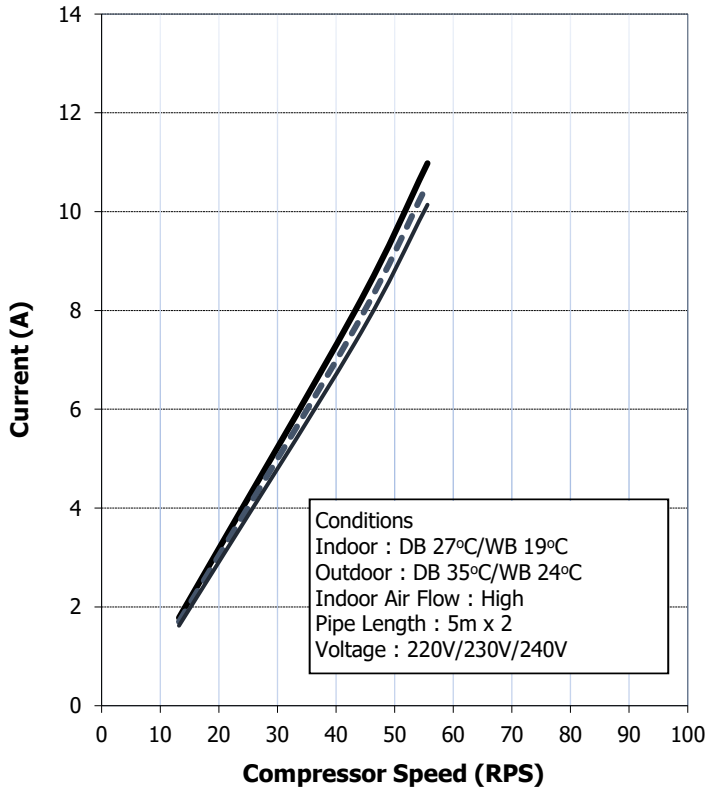

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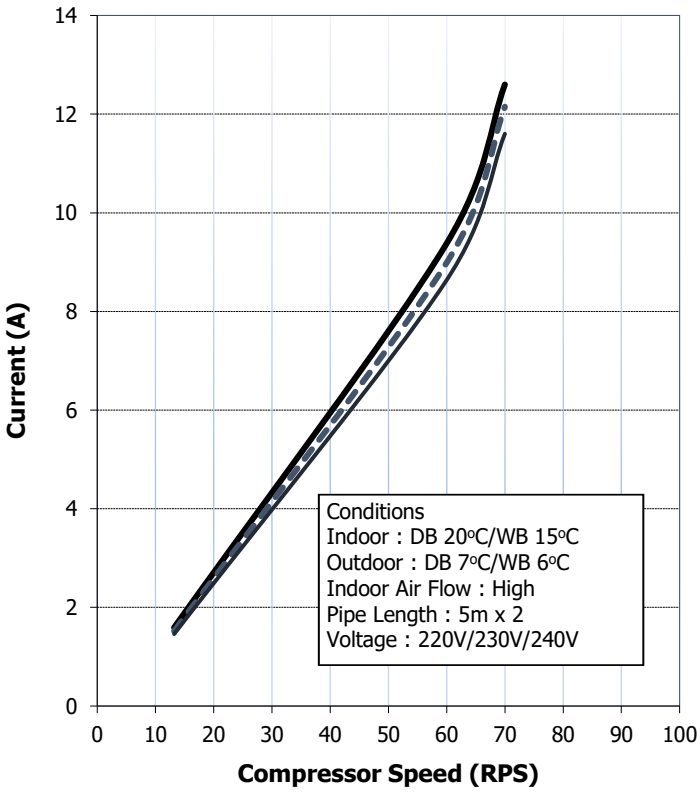

Capacity Variation ratio According to Temperature

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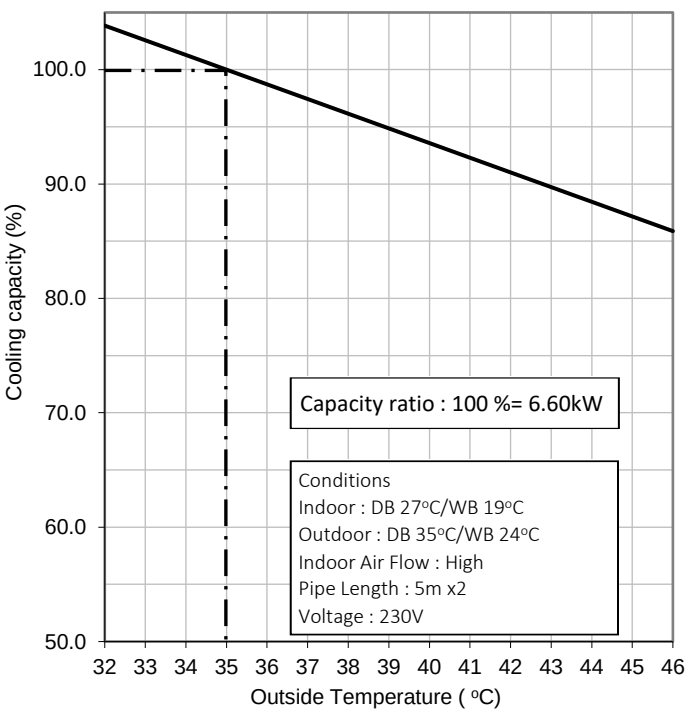

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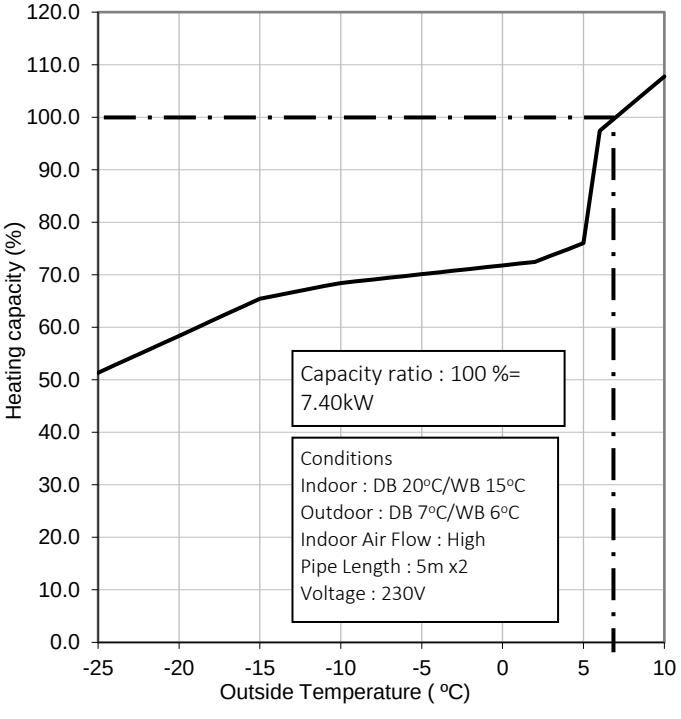


3. REFRIGERANT R32

This air conditioner adopts the new refrigerant HFC (R32) which does not damage the ozone layer.

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

3-1. Safety During Installation/Servicing

The basic installation servicing work procedures are the same as conventional R410A models.
As R32's pressure is about 1.6 times higher than that of R22, improper installation/servicing may cause a serious trouble. By using tools and materi-als exclusive for R32, it is necessary to carry out installation/ servicing safely while taking the following precautions into consideration.

1. Never use refrigerant other than R32 in an air conditioner which is designed to operate with R32. If other refrigerant than R32 is mixed, pressure in the refrigeration cycle becomes abnormally high, and it may cause personal injury, etc. by a rupture.
2. Confirm the used refrigerant name, and use tools and materials exclusive for the refrigerant. The refrigerant name R32 is indicated on the visible place of the outdoor unit of the air conditioner using R32 as refrigerant. To prevent mischarging, the diameter of the service port differs from that of R22. R32 and other HFCs are heavier than air, and therefore they are inclined to settle near the floor surface.
   If the gas fills up the room or the bottom part of a room, it may also cause oxygen deficiency and may reach its combustion concentration.
   In order to prevent oxygen deficiency and R32 combustion, keep the room well-ventilated for a healthy work environment.
   In particular, using HFCs in a basement room or confined area creates a higher risk; be sure to furnish the room with local exhaust ventilation.
   If a refrigerant leak is confirmed in a room an inadequately ventilated location, do not use a flame until the area has been ventilated appropriately and the work environment has been improved.
   The same applies in case of brazing, ensure appropriate ventilation to prevent oxygen deficiency and R32 combustion.
   Check that there are no dangerous or combustible items nearby, and ensure a fire extinguisher is close at hand.
   Keep a sufficient distance away from causes of fire (ignition sources) such as gas-burning equipment and electric heaters in places where installation, repairs, or similar work on air-conditioning equipment is performed.
3. If a refrigeration gas leakage occurs during installation/servicing, be sure to ventilate fully. If the refrigerant gas comes into contact with fire, a poisonous gas may occur.
4. When installing or removing an air conditioner, do not allow air moisture dust or oil to remain in the refrigeration cycle. Otherwise, pressure in the refrigeration cycle may become abnormally high so that a rupture or personal injury may be caused.
5. After completion of installation work, check to make sure that there is no refrigeration gas leakage. If the refrigerant gas leaks into the room, coming into contact with fire in the fan-driven heater, space heater, etc., a poisonous gas may occur
6. When an air conditioning system charged with a large volume of refrigerant is installed in a small room, it is necessary to exercise care so that, even when refrigerant leaks, its concentration does not exceed the marginal level.
   If the refrigerant gas leakage occurs and its concentration exceeds the marginal level, an oxygen starvation accident may result.
7. Be sure to carry out installation or removal according to the installation manual.
   Improper installation may cause refrigeration trouble, water leakage, electric shock, fire, etc.
8. Unauthorized modifications to the air conditioner may be dangerous. If a breakdown occurs please call a qualified air conditioner technician or electrician.
   Improper repair's may result in water leakage, electric shock and fire, etc.

3-2. Refrigerant Piping Installation

3-2-1. Piping Materials and Joints Used

For the refrigerant piping installation, copper pipes and joints are mainly used. Copper pipes and joints suitable for the refrigerant must be chosen and installed. Furthermore, it is necessary to use clean copper pipes and joints whose interior surfaces are less affected by contaminants.

1. Copper Pipes

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

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

As an air conditioner using R32 incurs pres-sure higher than when using R22, it is necessary to choose adequate materials.

Thicknesses of copper pipes used with R32 are as shown in Table 3-2-1. Never use copper pipes thinner than 0.8 mm even when it is available on the market.

Table 3-2-1 Thicknesses of annealed copper pipes

		Thickness (mm)	
Nominal diameter	**Outer diameter (mm)**	**R32(R410A)**	R22
1/4	6.35	0.80	0.80
3/8	9.52	0.80	0.80
1/2	12.70	0.80	0.80
5/8	15.88	1.00	1.00

2. Joints

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

a) Flare Joints

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

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

b) Socket Joints

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

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

Table 3-2-2 Minimum thicknesses of socket joints

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

3-2-2. Processing of Piping Materials

When performing the refrigerant piping installation, care should be taken to ensure that water or dust does not enter the pipe interior, that no other oil than lubricating oils used in the installed air-water heat pump is used, and that refrigerant does not leak. When using lubricating oils in the piping processing, use such lubricating oils whose water content has been removed. When stored, be sure to seal the container with an airtight cap or any other cover.

1. Flare processing procedures and precautions

a) Cutting the Pipe

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

b) Removing Burrs and Chips

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

c) Insertion of Flare Nut

d) Flare Processing

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

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

Use either a flare tool for R32 or conventional flare tool.

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

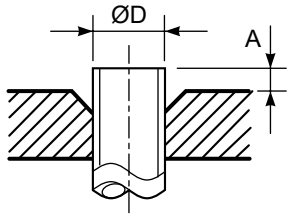


Fig. 3-2-1 Flare processing dimensions

Table 3-2-3 Dimensions related to flare processing for R32(R410A)

Nominal diameter	Outer diameter (mm)	Thickness (mm)	A (mm)		
			Flare tool for R32 clutch type	Conventional flare tool	
				Clutch type	Wing nut type
1/4	6.35	0.8	0 to 0.5	1.0 to 1.5	1.5 to 2.0
3/8	9.52	0.8	0 to 0.5	1.0 to 1.5	1.5 to 2.0
1/2	12.70	0.8	0 to 0.5	1.0 to 1.5	2.0 to 2.5
5/8	15.88	1.0	0 to 0.5	1.0 to 1.5	2.0 to 2.5

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

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

Table 3-2-5 Flare and flare nut dimensions for R32(R410A)

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

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

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

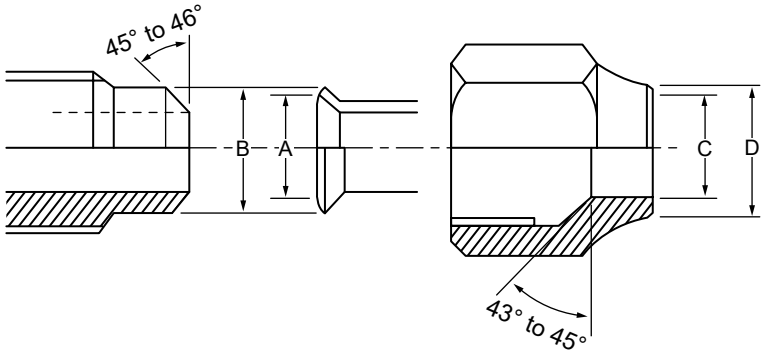


Fig. 3-2-2 Relations between flare nut and flare seal surface

2. Flare Connecting Procedures and Precautions

a) Make sure that the flare and union portions do not have any scar or dust, etc.

b) Correctly align the processed flare surface with the union axis.

c) Tighten the flare with designated torque by means of a torque wrench. The tightening torque for R32 is the same as that for conventional R22. Incidentally, when the torque is weak, the gas leakage may occur. When it is strong, the flare nut may crack and may be made non-removable. When choosing the tightening torque, comply with values designated by manufacturers. Table 3-2-7 shows reference values.

NOTE :

When applying oil to the flare surface, be sure to use oil designated by the manufacturer.
If any other oil is used, the lubricating oils may deteriorate and cause the compressor to burn out.

Table 3-2-7 Tightening torque of flare for R32(R410A) [Reference values]

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

3-3. Tools

3-3-1. Required Tools

The service port diameter of packed valve of the outdoor unit in the air-water heat pump using R32 is changed to prevent mixing of other refrigerant. To reinforce the pressure-resisting strength, flare processing dimensions and opposite side dimension of flare nut (For Ø12.7 copper pipe) of the refrigerant piping are lengthened.

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

1. Tools exclusive for R32 (Those which cannot be used for conventional refrigerant (R22))
2. Tools exclusive for R32, but can be also used for conventional refrigerant (R22)
3. Tools commonly used for R32 and for conventional refrigerant (R22)

The table below shows the tools exclusive for R32 and their interchangeability.

Tools exclusive for R32 (The following tools for R410A are required.)

Tools whose specifications are changed for R32 and their interchangeability

No.	Used tool	Usage	R32(R410A) air-water heat pump installation		Conventional air-water heat pump installation
			Existence of new equipment for R32	Whether conventional equipment can be used	Whether new equipment can be used with conventional refrigerant
1	Flare tool	Pipe flaring	Yes	***(Note 1)**	○
2	Copper pipe gauge for adjusting projection margin	Flaring by conventional flare tool	Yes	***(Note 1)**	***(Note 1)**
3	Torque wrench (For Ø12.7)	Connection of flare nut	Yes	×	×
4	Gauge manifold	Evacuating, refrigerant charge, run check, etc.	Yes	×	×
5	Charge hose				
6	Vacuum pump adapter	Vacuum evacuating	Yes	×	○
7	Electronic balance for refrigerant charging	Refrigerant charge	Yes	×	○
8	Leakage detector	Gas leakage check	Yes	×	○

(Note 1) When flaring is carried out for R32(R410A) using the conventional flare tools, adjustment of projection margin is necessary. For this adjustment, a copper pipe gauge, etc. are necessary.

General tools (Conventional tools can be used.)

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

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

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

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

3-4. Recharging of Refrigerant

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

Recover the refrigerant, and check no refrigerant remains in the equipment.

↓

Connect the charge hose to packed valve service port at the outdoor unit's gas side.

↓

Connect the charge hose to the vacuum pump adapter.

↓

Open fully both packed valves at liquid and gas sides.

↓

Place the handle of the gauge manifold Low in the fully opened position, and turn on the vacuum pump's power switch. Then, evacuating the refrigerant in the cycle.

↓

When the compound gauge's pointer has indicated –0.1 Mpa (–76 cmHg), place the handle Low in the fully closed position, and turn off the vacuum pump's power switch.

↓

Keep the status as it is for 1 to 2 minutes, and ensure that the compound gauge's pointer does not return.

↓

Set the refrigerant cylinder to the electronic balance, connect the connecting hose to the cylinder and the connecting port of the electronic balance.

(For refrigerant charging, see the figure below.)

1. Never charge refrigerant exceeding the specified amount.
2. If the specified amount of refrigerant cannot be charged, charge refrigerant **bit by bit** in COOL mode.
3. Do not carry out additional charging.
   When additional charging is carried out if refrigerant leaks, the refrigerant composition changes in the refrigeration cycle, that is characteristics of the air conditioner changes, refrigerant exceeding the specified amount is charged, and working pressure in the refrigeration cycle becomes abnormally high pressure, and may cause a rupture or personal injury.

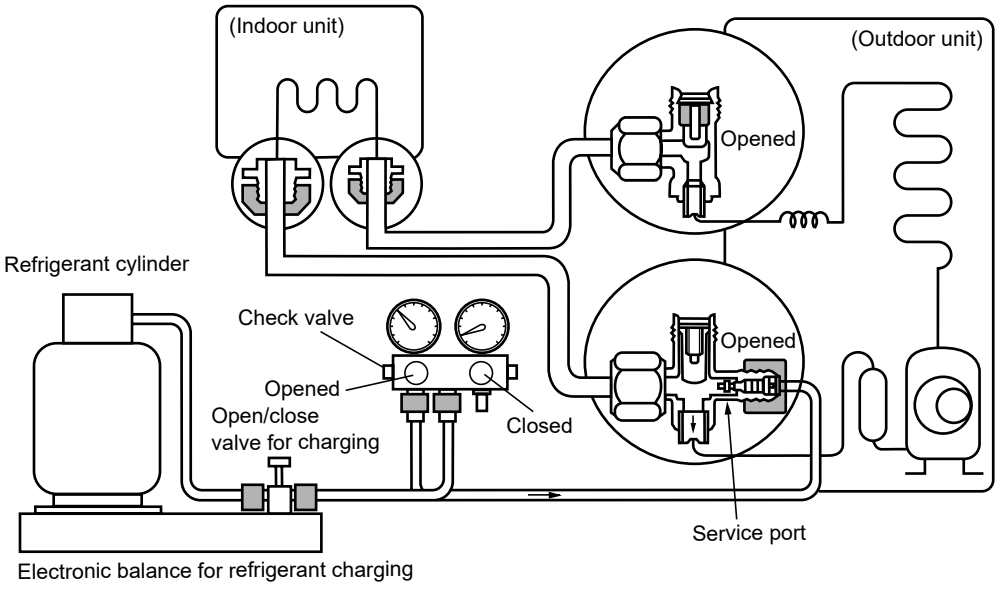


Fig. 3-4-1 Configuration of refrigerant charging

3-5. Brazing of Pipes

3-5-1. Materials for Brazing

1. Silver brazing filler

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

2. Phosphor bronze brazing filler

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

3. Low temperature brazing filler

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

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

3-5-2. Flux

1. Reason why flux is necessary

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

2. Characteristics required for flux

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

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

3. Types of flux

- **Noncorrosive flux**

  Generally, it is a compound of borax and boric acid.
  It is effective in case where the brazing temperature is higher than 800°C.

- **Activated flux**

  Most of fluxes generally used for silver brazing are this type.
  It features an increased oxide film removing capability due to the addition of compounds such as potassium fluoride, potassium chloride and sodium fluoride to the borax-boric acid compound.

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

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

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

3-5-3. Brazing

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

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

Never use gas other than Nitrogen gas.

1. Brazing method to prevent oxidation

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

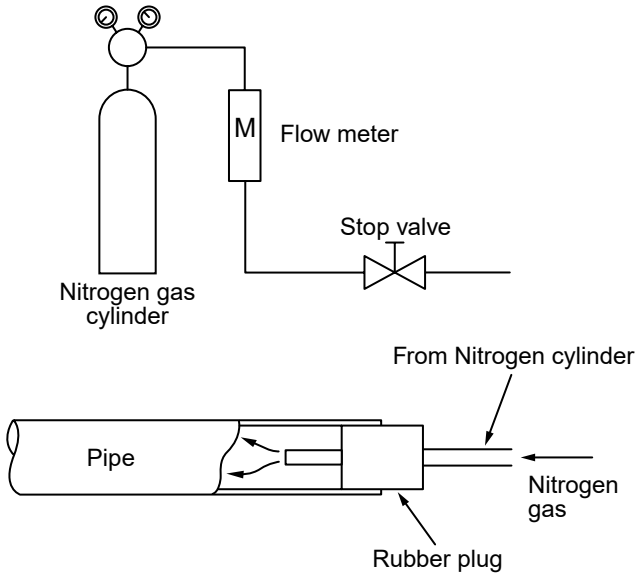
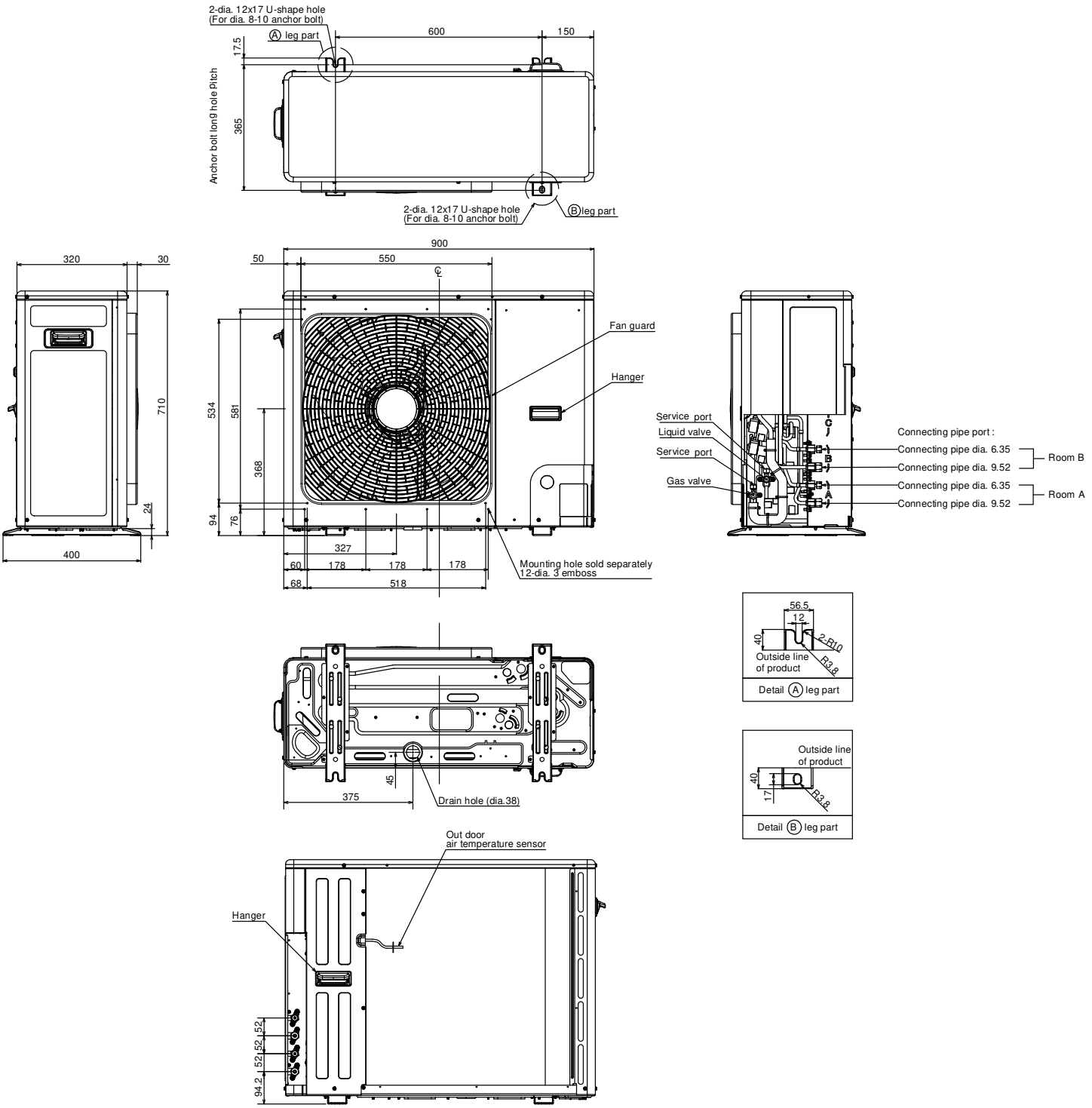
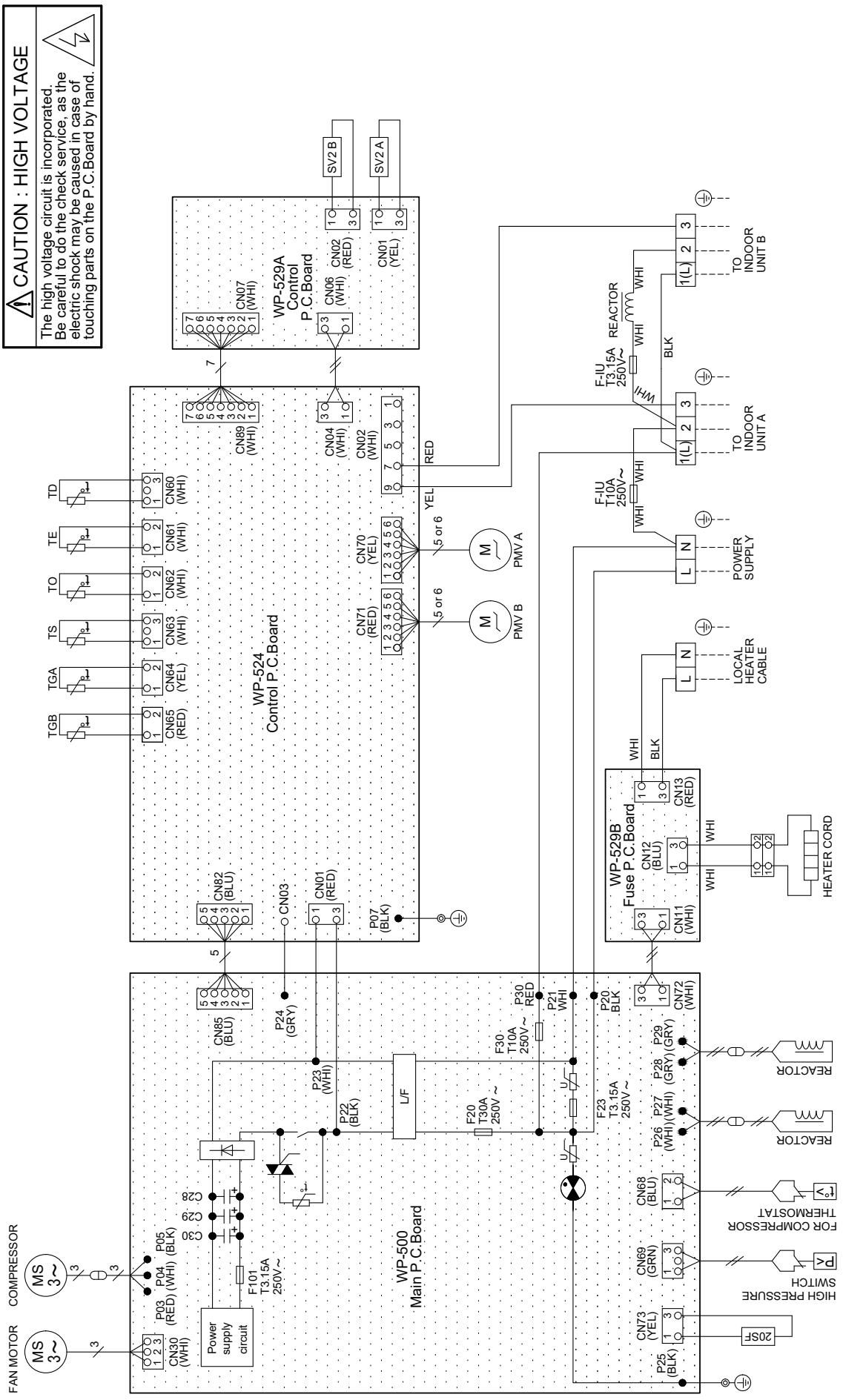


Fig. 3-5-1 Prevention of oxidation during brazing

4. CONSTRUCTION VIEWS



5. WIRING DIAGRAM

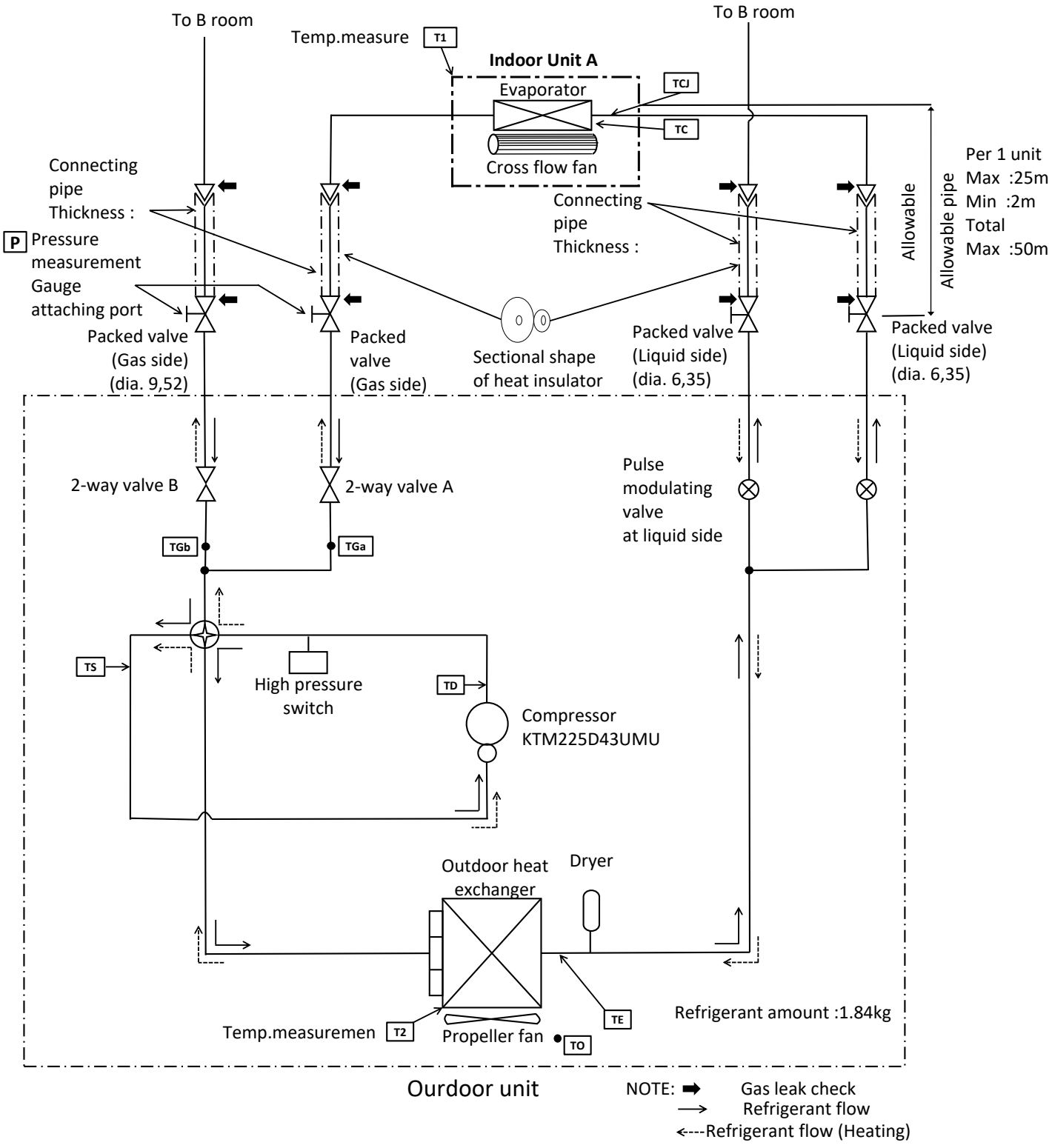


6. SPECIFICATIONS OF ELECTRICAL PARTS

No.	Parts name	Model name	Rating
1	Compressor	KTM225D43UMU	3 Phases (6-Poles) ; 1810 W
2	Outdoor fan motor	LDF-340-A100-1	Output 100 W
3	Reactor	CH-57-Z-T	8.88~10.01 mH, 16A
4	Reactor	CH-76-2VK	9.9 mH, 1A
5	PMV coil	PQ-M10012-000313	DC 12 V
6	4-way valve coil	STF-H01AJ1872A1	AC 220–240 V (50Hz/60Hz)
7	P.C. board (Main PCB)	WP-500	AC 220–240 V
8	P.C. board (Control PCB)	WP-524	DC 5V
9	Fuse (Mounted on P.C. board WP-500)	—	AC 250V, 30 A
10	Fuse (Mounted on P.C. board WP-500, WP-524)	—	AC 250V, 3.15 A
11	Suction temp. sensor (TS sensor)	—	10 kΩ (25°C)
12	Outdoor temp. sensor (TO sensor)	—	10 kΩ (25°C)
13	Outdoor heat exchanger temp. sensor (TE)	—	10 kΩ (25°C)
14	Discharge temp. sensor (TD sensor)	—	50 kΩ (25°C)
15	Temp. sensor at A room gas side (TGa-sensor)	—	10 kΩ (25°C)
16	Temp. sensor at B room gas side (TGb-sensor)	—	10 kΩ (25°C)
17	Compressor thermo.	S104CT4C800-CDH	ON: 90°C, OFF: 125°C
18	High-pressure SW	ACB-1UB177W	OFF : 4.5MPa
19	Terminal block	—	AC 250 V, 20 A

7. REFRIGERANT CYCLE DIAGRAM

7-1. Refrigerant cycle diagram



NOTE :

- You need not add refrigerant if the piping length is 30m or less.
- If the length exceeds 31m, add 20g of refrigerant per 1 meter over.
- Connection of only one indoor unit is unavailable. Two indoor units should be connected.

7-2. Operation Data

Outdoor Unit : RAS-2M60S4AVG-ND

<Cooling>

Temperature condition		No.of operating units	Indoor unit					Standard pressure	Heat exchanger pipe temperature		Indoor fan	Compressor revolution
Indoor	Outdoor		A	B	C	D	E	P(MP)	T1(℃)	T2(℃)		(rps)
27/19	35/-	1 FCU	10	—	—	—	—	1.0 to 1.2	13 to 15	40 to 42	High	30
			13	—	—	—	—	0.9 to 1.1	12 to 14	41 to 43	High	38
			18	—	—	—	—	0.9 to 1.1	12 to 14	42 to 44	High	47
		2 FCUs	10	10	—	—	—	1.1 to 1.3	16 to 18	42 to 44	High	43
			10	13	—	—	—	1.1 to 1.3	16 to 18	42 to 44	High	44
			10	18	—	—	—	1.2 to 1.4	18 to 20	42 to 44	High	40
			13	13	—	—	—	1.1 to 1.3	17 to 19	42 to 44	High	43
			13	18	—	—	—	1.2 to 1.4	19 to 21	41 to 43	High	38
			18	18	—	—	—	1.3 to 1.5	21 to 23	41 to 43	High	35

Notes:

1.Measure surface temperature of heat exchanger pipe around of heat exchanger path U bent.(Thermistor thermometer)
2.Connecting piping condition : 5 meters × 2 units(5m/each indoor unit)

Outdoor Unit : RAS-2M60S4AVG-ND

<Heating>

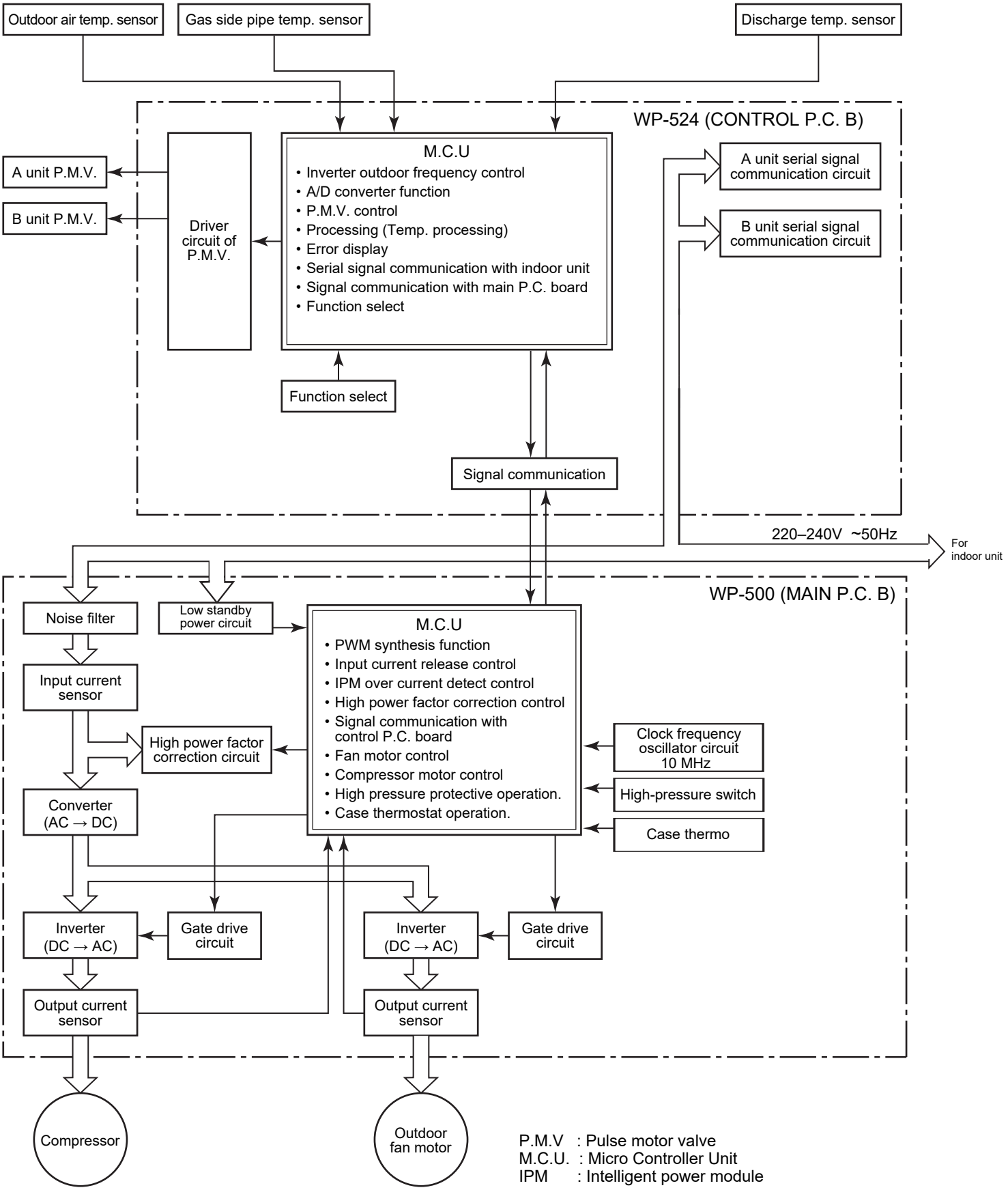
Temperature condition		No.of operating units	Indoor unit					Standard pressure	Heat exchanger pipe temperature		Indoor fan	Compressor revolution
Indoor	Outdoor		A	B	C	D	E	P(MP)	T1(℃)	T2(℃)		(rps)
20/15	7/-	1 unit	10	—	—	—	—	2.5 to 2.7	43 to 45	2 to 4	High	47
			13	—	—	—	—	2.5 to 2.7	41 to 43	2 to 4	High	50
			18	—	—	—	—	2.7 to 2.9	45 to 47	0 to 2	High	74
		2 units	10	10	—	—	—	2.0 to 2.2	33 to 35	1 to 3	High	53
			13	10	—	—	—	2.0 to 2.2	34 to 36	1 to 3	High	62
			18	10	—	—	—	1.7 to 1.9	30 to 32	1 to 3	High	59
			13	13	—	—	—	1.8 to 2.0	31 to 33	1 to 3	High	60
			18	13	—	—	—	1.7 to 1.9	28 to 30	1 to 3	High	57
			18	18	—	—	—	1.6 to 1.8	27 to 29	1 to 3	High	53

Notes:

1.Measure surface temperature of heat exchanger pipe around of heat exchanger path U bent.(Thermistor thermometer)
2.Connecting piping condition : 5 meters × 2 units(5m/each indoor unit)

8. CONTROL BLOCK DIAGRAM

Outdoor Unit (Inverter Assembly)



9. OPERATION DESCRIPTION

9-1. Outline of Air Conditioner Control

This air conditioner is a capacity-variable type air conditioner, which uses DC motor for the indoor fan motor and the outdoor fan motor. And the capacity-proportional control compressor which can change the motor speed in the range from 12 to 100 rps is mounted.

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

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

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

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

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

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

1. Role of indoor unit controller

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

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

2. Role of outdoor unit controller

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

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

} Operations followed to judgment of serial signal from indoor side.

- Detection of inverter input current and current release operation
- Over-current detection and prevention operation to IGBT module (Compressor stop function)
- Compressor and outdoor fan stop function when serial signal is off (when the serial signal does not reach the board assembly of outdoor control by trouble of the signal system)
- Transferring of operation information (Serial signal) from outdoor unit controller to indoor unit controller
- Detection of outdoor temperature and operation revolution control

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

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

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

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

The following signals are sent from the outdoor unit controller.

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

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

  Contents of judgment are described below.
  - Whether distinction of the current operation status meets to the operation command signal
  - Whether protective circuit operates

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

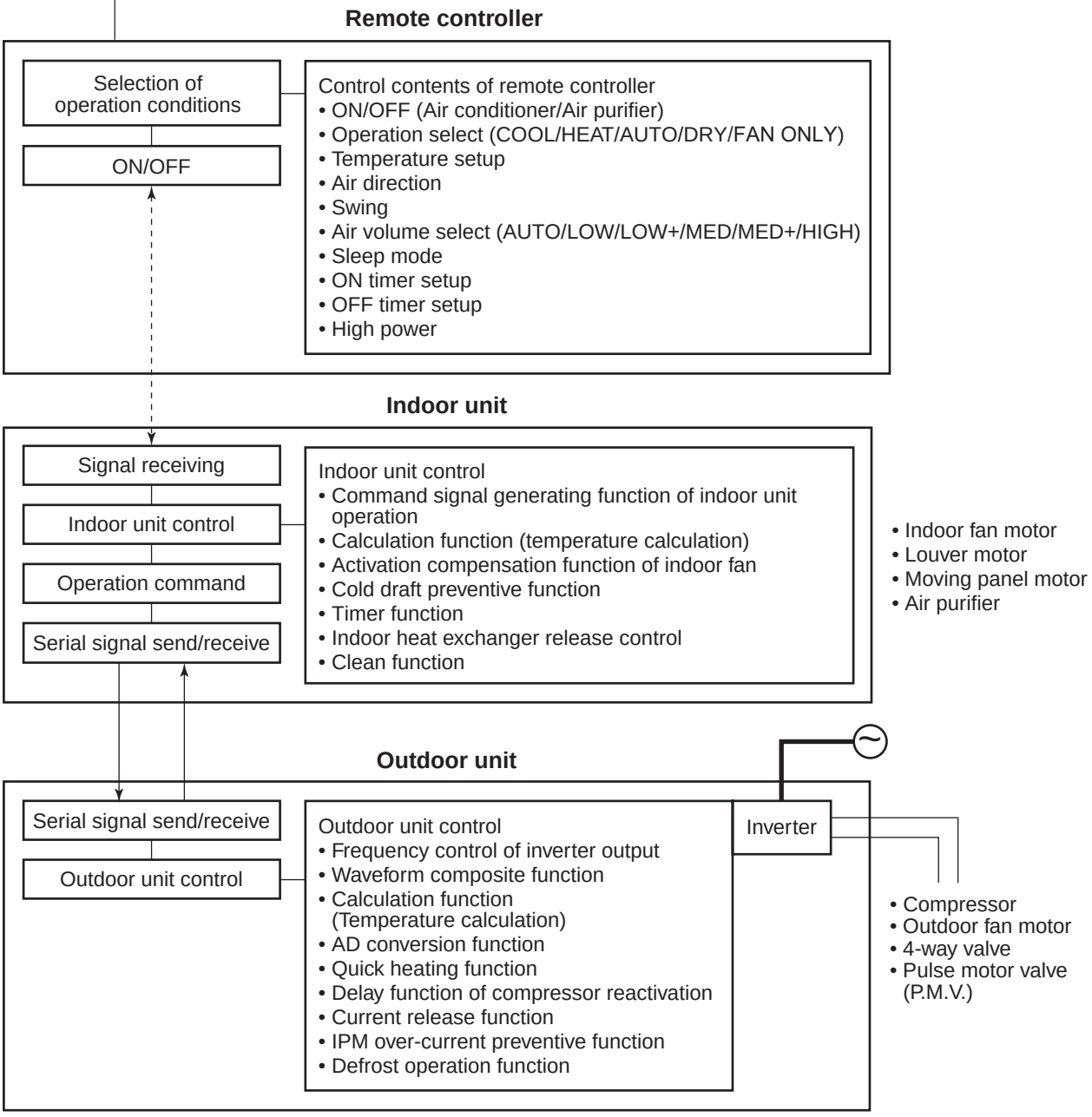
9-2. Operation Description

9-2. Operation Description

Item	Operation flow and applicable data, etc.	Description
1. Basic operation	**1. Operation control**	

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

1) The operation conditions are selected by the remote controller as shown in the below.
2) A signal is sent by ON button of the remote controller.
3) The signal is received by a sensor of the indoor unit and processed by the indoor controllers as shown in the below.
4) The indoor controller controls the indoor fan motor and louver motor.
5) The indoor controller sends the operation command to the outdoor controller, and sends/receives the control status with a serial signal.
6) The outdoor controller controls the operation as shown in the below, and also controls the compressor, outdoor fan motor, 4-way valve and pulse motor valve.



Item	Operation flow and applicable data, etc.	Description
1. Basic operation		

2. Operating mode selection when performing 2-room operation

1) The outdoor unit operating mode conforms to the instructions of the indoor unit that was pushed first.
2) When combined operation consisting of cooling (dry) and heating, fan (air purification) and heating, or cleaning operation and heating is performed, operation conforms to the instructions of the indoor unit that was pushed first as shown in the following table.
3) The indoor fan stops for the indoor unit that was pushed last and which instructions are ignored.
4) When three or four indoor units are operated concurrently, the priority is also given to operating mode of the indoor unit which was pushed first as same as the case when two indoor units are operated concurrently.

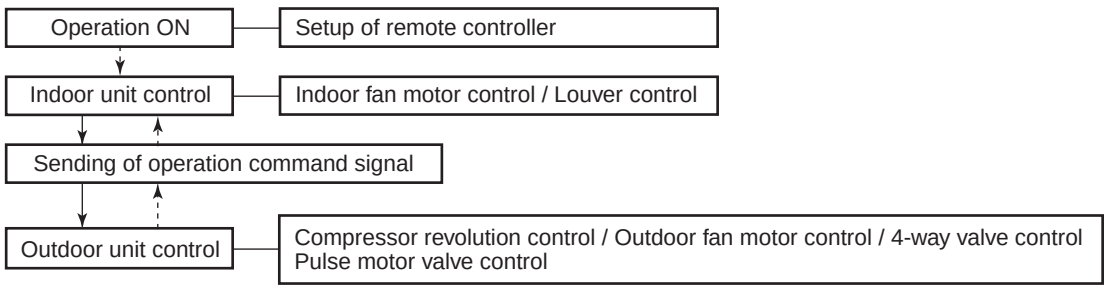
No.	Indoor unit	Set operating mode	Actual indoor unit operation	Actual outdoor unit operation
1	Pushed first	Cooling (dry)	Cooling (dry)	Cooling
	Pushed last	Cooling (dry)	Cooling (dry)	
2	Pushed first	Heating	Heating	Heating
	Pushed last	Heating	Heating	
3	Pushed first	Fan (solo air purification)	Fan (solo air purification)	Stopped
	Pushed last	Fan (solo air purification)	Fan (solo air purification)	
4	Pushed first	Fan (solo air purification)	Fan (solo air purification)	Cooling
	Pushed last	Cooling (dry)	Cooling (dry)	
5	Pushed first	Cooling (dry)	Cooling (dry)	Cooling
	Pushed last	Fan (solo air purification)	Fan (solo air purification)	
6	Pushed first	Cooling (dry)	Cooling (dry)	Cooling
	Pushed last	Heating	Fan stopped	
7	Pushed first	Heating	Heating	Heating
	Pushed last	Cooling (dry)	Fan stopped	
8	Pushed first	Fan (solo air purification)	Fan (solo air purification)	Heating
	Pushed last	Heating	Heating	
9	Pushed first	Heating	Heating	Heating
	Pushed last	Fan (solo air purification)	Fan (solo air purification)	
10	Pushed first	Cleaning operation	Cleaning operation	Stopped
	Pushed last	Cleaning operation	Cleaning operation	
11	Pushed first	Cleaning operation	Cleaning operation	Cooling
	Pushed last	Cooling (dry)	Cooling (dry)	
12	Pushed first	Cooling (dry)	Cooling (dry)	Cooling
	Pushed last	Cleaning operation	Cleaning operation	
13	Pushed first	Cleaning operation	Cleaning operation	Stopped
	Pushed last	Fan (solo air purification)	Fan (solo air purification)	
14	Pushed first	Fan (solo air purification)	Fan (solo air purification)	Stopped
	Pushed last	Cleaning operation	Cleaning operation	
15	Pushed first	Cleaning operation	Cleaning operation	Stopped
	Pushed last	Heating	Fan stopped	
16	Pushed first	Heating	Heating	Heating
	Pushed last	Cleaning operation	Fan stopped	

3. Cooling/Heating operation

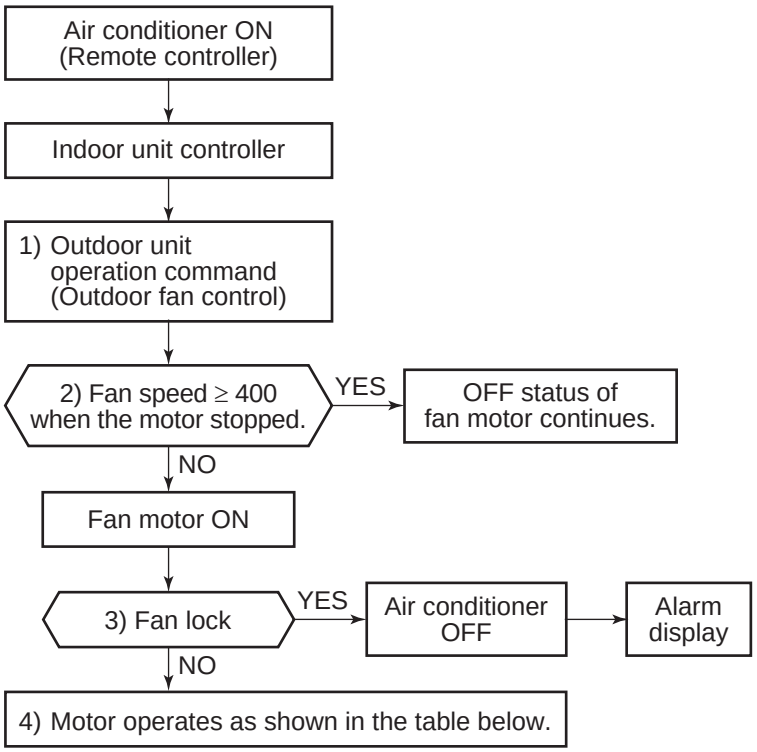
The operations are performed in the following parts by controls according to cooling/heating conditions.

1) Receiving the operation ON signal of the remote controller, the cooling or heating operation signal starts being transferred from the indoor controller to the outdoor unit.
2) At the indoor unit side, the indoor fan is operated according to the contents of "**2. Indoor fan motor control**" and the louver according to the contents of "**Louver control**", respectively.
3) The outdoor unit controls the outdoor fan motor, compressor, pulse motor valve (PMV) and 4-way valve according to the operation signal sent from the indoor unit.

∗1. The relay of 4-way valve is turned on, for a few seconds when 4-way valve is driven.



Item	Operation flow and applicable data, etc.	Description
2. Outdoor fan motor control	The blowing air volume at the outdoor unit side is controlled. Receiving the operation command from the controller of indoor unit, the controller of outdoor unit controls fan speed. * For the fan motor, a DC motor with non-stage variable speed system is used. However, it is limited to 8 stages for reasons of controlling.	1) The operation command sent from the remote controller is processed by the indoor unit controller and transferred to the controller of the outdoor unit. 2) When strong wind blows at outdoor side, the operation of air conditioner continues with the fan motor stopped. 3) Whether the fan is locked or not is detected, and the operation of air conditioner stops and an alarm is displayed if the fan is locked. 4) According to each operation mode, by the conditions of outdoor temperature (To) and compressor revolution, the speed of the outdoor fan shown in the table is selected.



Cooling operation, dry operation

Compressor revolution (rps)			~20	~50	~55	56~
Outdoor temp. sensor To	Normal operation	To≧38℃	410	720	880	980
		28≦To＜38℃	410	640	720	850
		15≦To＜28℃	300	500	640	720
		10≦To＜15℃	300	500	500	640
		5≦To＜10℃	300	410	410	500
		0≦To＜5℃	300	300	300	410
		To＜0℃	0	0~300	0~300	0~300
	Sleep or quiet operation	To≧38℃	410*	600*	720*	850*
		To＜38℃	300*	480*	640*	720*
	To is abnormal		300~410	300~640	300~720	300~850

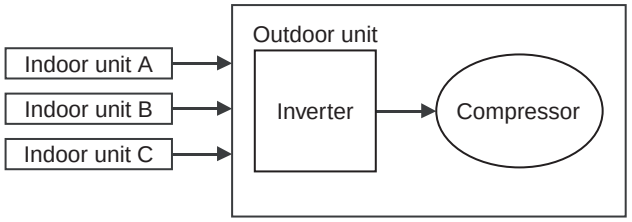
*Maximum revolution
To : Outdoor temp. sensor

Heating operation

Compressor revolution (rps)			~20	~60	61~
Outdoor temp. sensor To	Normal operation	To≧10℃	480	600	700
		0≦To＜10℃	600	700	800
		-5≦To＜0℃	800	800	930
		To＜-5℃	800	800	930
	Sleep or quiet operation	To≧10℃	480*	480*	600*
		0≦To＜10℃	600*	600*	700*
		-5≦To＜0℃	700*	700*	700*
		To＜-5℃	700*	700*	700*
	To is abnormal		700	700	800

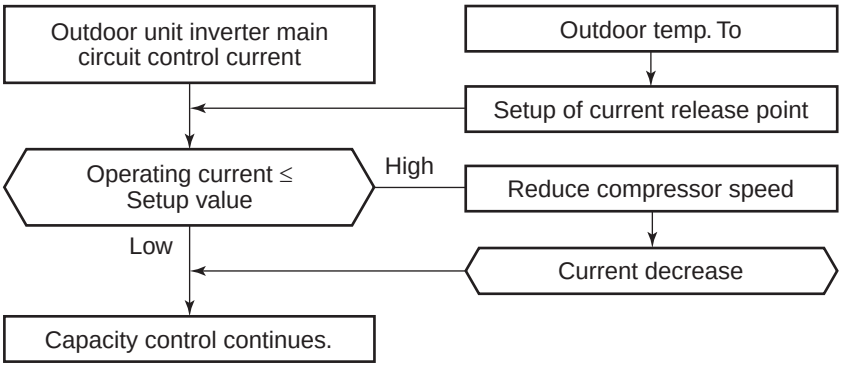
*Maximum revolution
To : Outdoor temp. sensor

Item	Operation flow and applicable data, etc.	Description
3. Capacity control	1) Four indoor units from A to E determine the respective instruction revolutions from the difference between the remote controller setting temperature (Ts) and the indoor temperature (Ta), and transmit this to the outdoor unit. 2) The outdoor unit receives the instructions from the indoor units, and the inverter operates the compressor at the calculated revolutions. 3) The compressor operation range in each operating mode is shown in the left table.	
4. Current release control	This function prevents troubles on the electronic parts of the compressor driving inverter. This function also controls drive circuit of the compressor speed so that electric power of the compressor drive circuit does not exceed the specified value.	1) The input current of the outdoor unit is detected in the inverter section of the outdoor unit. 2) According to the detected outdoor temperature, the specified value of the current is selected. 3) Whether the current value exceeds the specified value or not is judged. 4) If the current value exceeds the specified value, this function reduces the compressor speed and controls speed up to the closest one commanded from the indoor unit within the range which does not exceed the specified value.

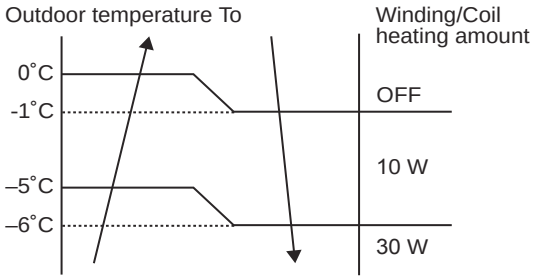
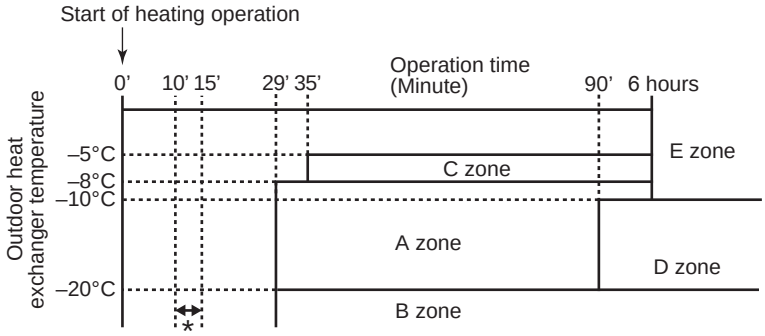


Operation mode	No.of operating unit	Combination of indoor units (kBTU)	Compressor revolution (rps)	Operation mode	No.of operating unit	Combination of indoor units (kBTU)	Compressor revolution (rps)
COOL	1 unit	10	17～27	HEAT	1 unit	10	17～108
		17	17～27			17	17～108
		18	17～27			18	17～108
	2 units	*	17～55		2 units	*	17～108
	Sleep or quiet operation	-	～43		Sleep or quiet operation	-	～48

* In case that any multiple indoor units are combined.



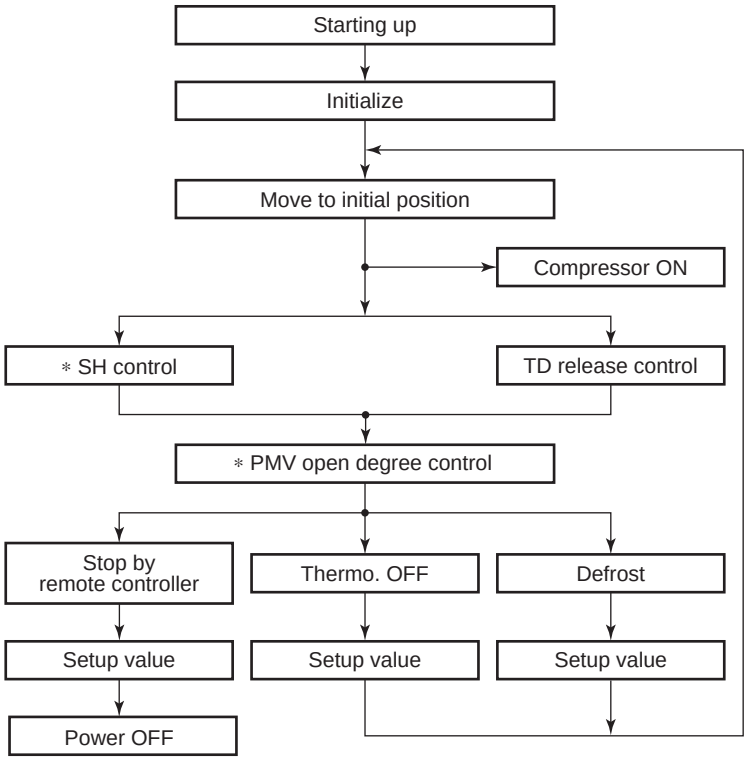
Outdoor temp.		Cooling current release value	Heating current release value
45˚C			
40˚C	44˚C	12.0 A	16.0 A
16˚C	39˚C	16.0 A	
11˚C	15.5˚C	16.0 A	
	10.5˚C		16.0 A
			16.0 A

<table>
<tr><th>Item</th><th>Operation flow and applicable data, etc.</th><th>Description</th></tr>
<tr><td>5. Winding/Coil heating control</td><td>When the outdoor temperature is low, the windings/coils are heated to ensure compressor reliability.
 
</td><td>Winding/Coil heating is performed when the following conditions are met.
Condition 1 :
When the discharge sensor temperature (Td) is less than 30°C.
Condition 2 :
When the outdoor sensor temperature (To) is as shown in the left figure.</td></tr>
<tr><td>6. Defrost control (Only in heating operation)</td><td>(This function removes frost adhered to the outdoor heat exchanger.)
The temperature sensor of the outdoor heat exchanger (Te sensor) judges the frosting status of the outdoor heat exchanger and the defrost operation is performed with 4-way valve reverse defrost system.
 

* The minimum value of Te sensor 10 to 15 minutes after start of operation is stored in memory as Te0 and Te1. (–10°C < Te1 ≤ 10°C)
Table 1
<table>
<tr><td>A zone</td><td>When Te0 - TE ≥ 2.5 continued for 2 minutes in A zone, defrost operation starts.</td></tr>
<tr><td>B zone</td><td>When the operation continued for 2 minutes in B zone, defrost operation starts.</td></tr>
<tr><td>C zone</td><td>When Te0 - TE ≥ 3 continued for 2 minutes in C zone, defrost operation starts.</td></tr>
<tr><td>D zone</td><td>When the operation continued for 2 minutes in D zone, defrost operation starts.</td></tr>
<tr><td>E zone</td><td>When Te1 - TE ≥ 1 continued for 2 minutes in E zone, defrost operation starts.</td></tr>
</table></td><td>The necessity of defrost operation is detected by the outdoor heat exchanger temperature. The conditions to detect the necessity of defrost operation differ in A, B, C, D or E zone each. (Table 1)
<Defrost operation>
• Defrost operation in A to E zones
1) Stop operation of the compressor for 30 seconds.
2) Invert (OFF) 4-way valve 10 seconds after stop of the compressor.
3) The outdoor fan stops at the same time when the compressor stops.
4) When temperature of the indoor heat exchanger becomes 38°C or lower, stop the indoor fan.
<Finish of defrost operation>
• Returning conditions from defrost operation to heating operation
1) Temperature of outdoor heat exchanger rises to +8°C or higher.
2) Temperature of outdoor heat exchanger is kept at +5°C or higher for 80 seconds.
3) Defrost operation continues for 10 minutes.
<Returning from defrost operation>
1) Stop operation of the compressor for approx. 60 seconds.
2) Invert (ON) 4-way valve approx. 40 seconds after stop of the compressor.
3) The outdoor fan starts rotating at the same time when the compressor starts.</td></tr>
<tr><td>7. Compressor protective control</td><td colspan="2">1) This control purposes to raise the operation frequency until 45Hz for 2 minutes in order to protect the compressor (Prevention of oil accumulation in the refrigerating cycle) when the status that the operation frequency is 45Hz or less has continued for 10 hours was calculated.
The operation frequency follows the normal indoor command after controlling.
2) Although the compressor may stop by THERMO-OFF control when the room temperature varies and then attains the set temperature by this control, it is not abnormal.
3) During this control works, it stopping the operation by the remote controller, the operation does not continue.
4) During 1 room operated, second room turn by remote controller might occur sound on first start.</td></tr>
</table>

Item	Operation flow and applicable data, etc.	Description
8. Discharge temperature control		**1. Purpose** This function detects error on the refrigerating cycle or error on the compressor, and performs protective control. **2. Operation** • Control of the compressor speed The speed control is performed as described in the left table based upon the discharge temperature.
9. Pulse motor valve (PMV) control	This function controls throttle amount of the refrigerant in the refrigerating cycle. According to operating status of the air conditioner, this function also controls the open degree of valve with an expansion valve with pulse motor.	1) When starting the operation, move the valve once until it fits to the stopper. (Initialize) ∗ In this time, “Click” sound may be heard. 2) Adjust the open degree of valve by super heat amount. (SH control) 3) If the discharge temperature was excessively up, adjust the open degree of valve so that it is in the range of set temperature. (Discharge temp. control) 4) When defrost operation is performed, the open degree of PMV is adjusted according to each setup conditions during preparation for defrost and during defrost operation (4-way valve is inversed.). 5) When turning off the compressor by thermo. OFF or STOP by remote controller, the open degree of the PMV is adjusted to the setup value.
10. High-pressure switch/ Compressor case thermostat control	1) When the high-pressure switch or the compressor case thermostat operates, the operation of the compressor is terminated. 2) The compressor restarts after 2 minutes 30 seconds using [1] as an error count. After restart, the error count is cleared when operation continues for 10 minutes or more. 3) An error is confirmed with the error count [10]. 4) For the indicated contents of error, confirm using the check code table.	

Td value	Control operation
120°C	Judges as an error and stops the compressor.
115°C	Reduce the compressor speed.
111°C	Reduce slowly compressor speed.
108°C	Keeps the compressor speed.
101°C	If the operation is performed with lower speed than one commanded by the serial signal, speed is slowly raised up to the commanded speed.
	Operates with speed commanded by the serial signal.



∗ SH (Super Heat amount) =
Ts (Temperature of suction pipe of the compressor) –
Tc or Te (Heat exchanger temperature at evaporation side)

∗ PMV: Pulse Motor Valve

9-3. Service switch (SW81, SW82) operations

Various displays and various operations are enabled by push buttons (service) switches and LED on the outdoor control P.C. board.

9-3-1. LED display

5 patterns are provided for LED display.

○:ON (○*:3 sec ON/0.5 sec OFF), ●:OFF, ◎:Rapid Flashing(5 times/sec), ◇:Slow Flashing(1 time/sec)

D800 (Yellow)	D801 (Yellow)	D802 (Yellow)	D803 (Yellow)	D804 (Yellow)	D805 (Green)
●/○(*)/◎	●/○(*)/◎	●/○(*)/◎	●/○(*)/◎	●/○(*)/◎/◇	●/○/◎/◇

In the initial status of LED display, D805 is ON as below.

Normal

D800 (Yellow)	D801 (Yellow)	D802 (Yellow)	D803 (Yellow)	D804 (Yellow)	D805 (Green)
●	●	●	●	●	○

○:ON ●:OFF

Error occurring

D800 (Yellow)	D801 (Yellow)	D802 (Yellow)	D803 (Yellow)	D804 (Yellow)	D805 (Green)
●/○*	●/○*	●/○*	●/○*	●/○*	○

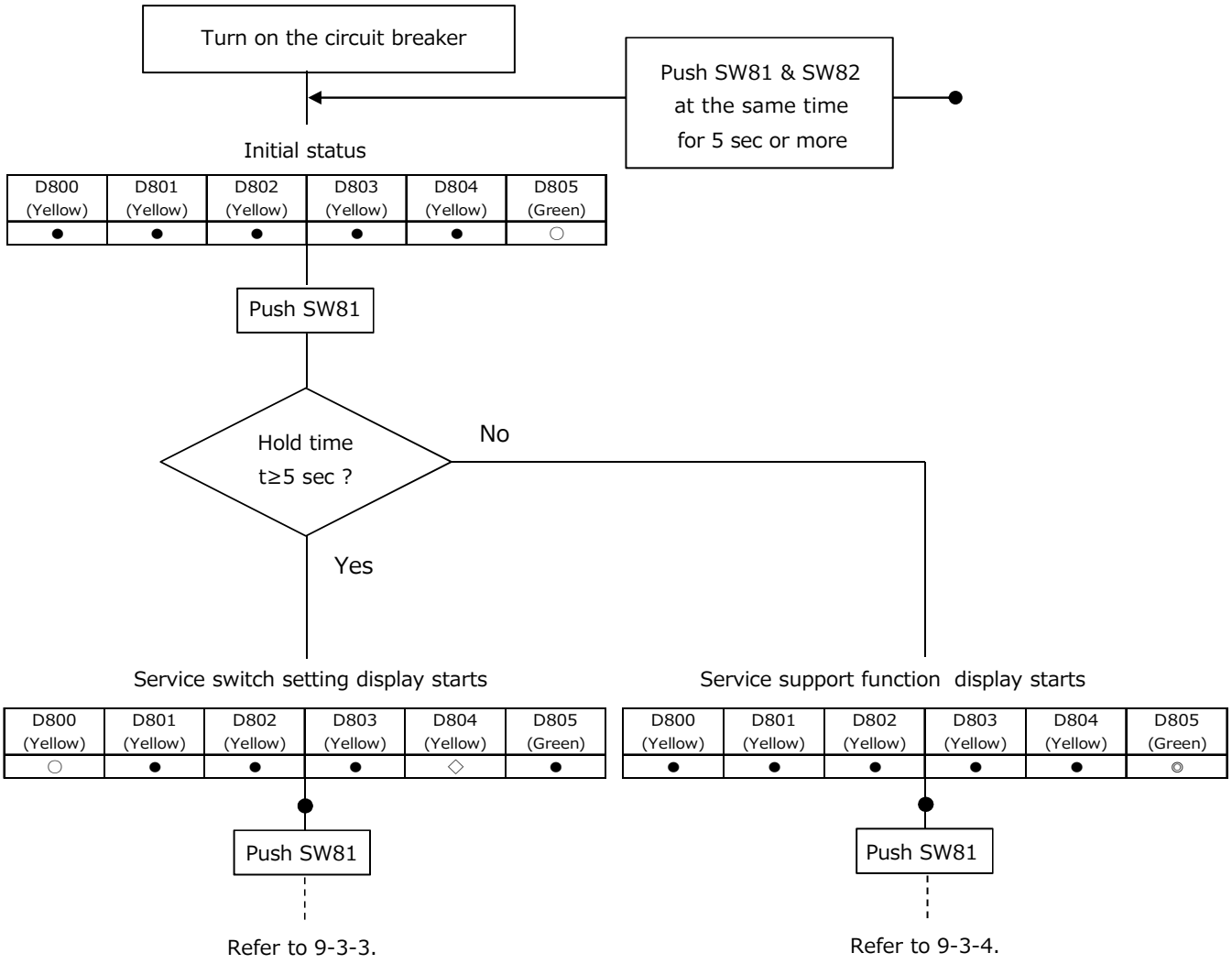
○:ON ○*:3 sec ON/0.5 sec OFF ●:OFF

When the initial status does not appear (in case of flashing of D804 or D805), LED display can be returned to the initial status by pushing and holding the service switches SW81 and SW82 for 5 seconds or more simultaneously.

9-3-2. Service switch setting and service support function

You can choose service switch setting and service support function.

Operating method is as below.



9-3-3. Service switch setting

Various settings are available by setting service switches.

[Operating method]

1) Check LED display is the initial status. If it is not so, set the initial status.
2) Push and hold SW81 for 5 seconds or more and then check D804 flashes slowly (1 times/sec).
3) Push SW81 several times and then stop it at the LED display of function item to be set up.
4) Push SW82 and then D805 will flash rapidly (5 times/sec). (D805 is turned off by pressing the SW82 again.)
5) Push and hold SW82 for 5 seconds or more. D804 changes to slow flashing, D805 changes to lighting and then various settings are validated.
6) When you want to continue the settings, moreover repeat items from 3) to 5).
7) To invalidate various settings, execute items 1) to 3), push SW82 and then D805 will turn off.
8) Push and hold SW82 for 5 seconds or more. D804 changes to slow flashing, D805 is turned off and then various settings are invalidated.

* If an unknown point generated on the way of the operation, push and hold SW81 and SW82 for 5 seconds or more simultaneously. You can return to the item 1).

[Confirmation method of various settings]

You can confirm that various settings are validated.

1) Check LED displays are in the initial status. If it are not so, return them to the initial status.
2) Push and hold SW81 for 5 seconds or more. D804 changes to slow flashing.
3) Push SW81 several times and then stop it at the point where LED display (D800 to D804) to be checked. If the setting became valid, D804 and D805 flash rapidly. (When the setup was invalid, D804 flashes rapidly and D805 goes off.)
4) Push SW81 and SW82 for 5 seconds or more simultaneously to return LED display to the initial status.

○:ON (○*:3 sec ON/0.5 sec OFF) ●:OFF
◎:Rapid Flashing(5 times/sec) ◇:Slow Flashing(1 time/sec)

No.	Display D800 (YL)	D801 (YL)	D802 (YL)	D803 (YL)	D804 (YL)	D805 (GN)	Item	Control contents
1	○	●	●	●			Refrigerant collection operation At shipment from factory (default): D805 (Green) ●	The outdoor unit performs cooling operation. As the indoor unit does not operate by this switch setting only, carry out the operation beforehand. (Before switch setting, you have to operate in cooling mode of all indoor units.) During the check, the display is kept as below. *Operation is up to 10 minutes. *After the collection is finished, promptly stop the operation of all the indoor unit. (There are cases that the compressor restarts.) D800 (Yellow) ○ / D801 (Yellow) ● / D802 (Yellow) ● / D803 (Yellow) ● / D804 (Yellow) ◇ / D805 (Green) ○
2	●	●	○	●			Miswiring (mispiping) check At shipment from factory (default): D805 (Green) ●	The outdoor unit performs cooling operation. As the indoor unit does not operate by this switch setting only, carry out the operation beforehand. (Before switch setting, you have to operate in cooling mode of all indoor units.) During the check, the display is kept as below. *Operation is up to 30 minutes. *You cannot check wiring/piping when the external temperature is 5℃ or less. *During the check, the compressor and the fun of the outdoor/indoor unit repeat ON/OFF. D800 (Yellow) ● / D801 (Yellow) ● / D802 (Yellow) ○ / D803 (Yellow) ● / D804 (Yellow) ◇ / D805 (Green) ○
3	○	●	○	●			Fan motor operation check At shipment from factory (default): D805 (Green) ●	Operate the fan motor forcedly. The motor rotates at 500rpm and operation is 2 minutes. During the check, the display is kept as below. D800 (Yellow) ○ / D801 (Yellow) ● / D802 (Yellow) ○ / D803 (Yellow) ● / D804 (Yellow) ◇ / D805 (Green) ○
4	●	○	○	●	◇*1 or ◎*2	●/○*1 or ●/◎*2	PMV operation check At shipment from factory (default): D805 (Green) ●	PMV is initialized to order from unit A. (only one time) Checking its operation sound and you can see that it is operating. During the check, the display is kept as below. D800 (Yellow) ● / D801 (Yellow) ○ / D802 (Yellow) ○ / D803 (Yellow) ● / D804 (Yellow) ◇ / D805 (Green) ○
5	○	○	○	●			Cooling only setting At shipment from factory (default): D805 (Green) ●	When using the air conditioner as a cooling-only conditioner, set the switch. (If the heating mode is selected by remote control, outdoor unit will remain stop. If mixed with indoor unit cooling and heating, outdoor unit performs cooling operation.) When the setting is finished, the display is as below. D800 (Yellow) ○ / D801 (Yellow) ○ / D802 (Yellow) ○ / D803 (Yellow) ● / D804 (Yellow) ◇ / D805 (Green) ○
6	●	○	●	○			Power save function At shipment from factory (default): D805 (Green) ●	When using the power save function, set the switch. The current limit is enabled. When the setting is finished, the display is as below. D800 (Yellow) ● / D801 (Yellow) ○ / D802 (Yellow) ● / D803 (Yellow) ○ / D804 (Yellow) ◇ / D805 (Green) ○
7	○	○	●	○			Select current limit At shipment from factory (default): D805 (Green) ●	If you enabled the power save function, you have to choose two of the current limit value. When the setting is finished, the display is as below. (1)8.5A D800 (Yellow) ○ / D801 (Yellow) ○ / D802 (Yellow) ● / D803 (Yellow) ○ / D804 (Yellow) ◇ / D805 (Green) ○ (2)11.0A D800 (Yellow) ○ / D801 (Yellow) ○ / D802 (Yellow) ● / D803 (Yellow) ○ / D804 (Yellow) ◇ / D805 (Green) ●

*1. Item and setting is displaying.
*2. Item and setting is selecting.

9-3-4. Service support function

Various displays are available by setting service switches.

[Operating method]

1) Check LED display is the initial status. If it is not so, set the initial status.

2) Push SW81 several times and stop it at the item that you want to check.

○:ON (○*:3 sec ON/0.5 sec OFF)●:OFF
◎:Rapid Flashing(5 times/sec) ◇:Slow Flashing(1 time/sec)

No.	Display						Item	Description
	D800 (YL)	D801 (YL)	D802 (YL)	D803 (YL)	D804 (YL)	D805 (GN)		
0	●	●	●	●			Error display (Error which is occurring at present)	The error which is occurring at present is displayed. LED goes off while an error does not occur. (Refer to table A)
1	○	●	●	●	●		Error display (The latest error: The latest error including this moment)	After error status was eliminated, if you want to check the error which occurred before, call this setting and check it. (Even after turning off the power supply once, you can recheck it.) * This error display displays only the errors related to compressor stop. * In the case that an error occurred at present, the same contents as that at present is displayed. (Refer to table B)
2	●	○	●	●	●		Miswiring (mispiping) display	You can check the room judged as error by operating the miswiring (mispiping) check. (Refer to table C)
3	○	○	●	●			Discharge temperature sensor (TD) display	The detected value of the discharge temperature (TD) is displayed. (Refer to table C)
4	●	●	○	●			Outdoor heat exchanger temperature sensor (TE) display	The detected value of the outdoor heat exchanger temperature sensor (TE) is displayed. (Refer to table C)
5	○	●	○	●			Suction temperature sensor (TS) display	The detected value of the suction temperature sensor (TS) is displayed. (Refer to table C)
6	●	○	○	●	●		Outside temperature sensor (TO) display	The detected value of the outside temperature sensor (TO) is displayed. (Refer to table C)
7	○	○	○	●		◎	Current display	The current value which flows to the outdoor unit is displayed. (Refer to table C)
8	●	●	●	○			Compressor operation frequency display	The operation frequency of the compressor is displayed. (Refer to table C)
9	○	●	●	○	●		PMV opening display (unit A)	The opening of PMV (Electronic expansion valve) is displayed. (Refer to table C)
10	●	○	●	○			PMV opening display (unitB)	The opening of PMV (Electronic expansion valve) is displayed. (Refer to table C)
11	●	○	○	○	●		Gas temperature sensor (TG) display (unit A)	The detected value of the gas temperature sensor (TG) is displayed. (Refer to table C)
12	○	○	○	○	●		Gas temperature sensor (TG) display (unit B)	The detected value of the gas temperature sensor (TG) is displayed. (Refer to table C)
13	○	○	●	●	○		Indoor suction temperature sensor (TA) display (unit A)	The detected value of the indoor suction temperature sensor (TA) is displayed. (Refer to table C)
14	●	●	○	●	○		Indoor suction temperature sensor (TA) display (unit B)	The detected value of the indoor suction temperature sensor (TA) is displayed. (Refer to table C)
15	●	●	●	○	○		Indoor heat exchanger temperature sensor (TC/TCJ) display (unit A)	The detected value of the indoor heat exchanger temperature sensor (TC) is displayed. Only while you press the SW02, the detected value of the indoor heat exchanger temperature sensor (TCJ) is displayed. (Refer to table C)
16	○	●	●	○	○		Indoor heat exchanger temperature sensor (TC/TCJ) display (unit B)	The detected value of the indoor heat exchanger temperature sensor (TC) is displayed. Only while you press the SW02, the detected value of the indoor heat exchanger temperature sensor (TCJ) is displayed. (Refer to table C)

3) Pushing SW82, the display changes to next item. To see other display contents, repeat that.
4) To finish LED display, be sure to execute item 1) to return LED to the initial status (error display of current occurrence) and then finish LED display.

[Error display]
The error which is occurring at present and the latest error (including error that is occurring now) can be confirmed by checking display on the outdoor control P.C. board.

A. Error display which occurs at present

○:ON (○*:3 sec ON/0.5 sec OFF) ●:OFF
◎:Rapid Flashing(5 times/sec) ◇:Slow Flashing(1 time/sec)

	Display						Indoor check code	Description
	D800 (YL)	D801 (YL)	D802 (YL)	D803 (YL)	D804 (YL)	D805 (GN)		
	●	●	●	●	●		-	Normal operation (no error)
	○*	●	●	●	●		1C	Compressor case thermostat error
	●	○*	●	●	●		21	High pressure switch error
	○*	○*	●	●	●		1C	Compressor system error
	●	●	○*	●	●		1D	Compressor lock
	○*	●	○*	●	●		1F	Compressor breakdown
	●	○*	○*	●	●		14	Driving element short circuit
	○*	○*	○*	●	●		16	Position detection circuit error
	●	●	●	○*	●		17	Current detection circuit error
	○*	●	●	○*	●		1C	Communication error between MCU
	●	○*	●	○*	●	○	1A	Fan system error
	○*	○*	●	○*	●		1E	Discharge temperature error
	●	●	○*	○*	●		19	Discharge temperature sensor (TD) error
*1	○*	●	○*	○*	●		1B	Outdoor air temperature sensor (TO) error
	●	○*	○*	○*	●		18	Suction temperature sensor (TS) error
	○*	○*	○*	○*	●		18	Heat exchanger temperature sensor (TE) error
*2	●	●	●	●	○*		1C	Gas pipe (unit A) temperature sensor (TGa) error
*2	○*	●	●	●	○*		1C	Gas pipe (unit B) temperature sensor (TGb) error
	○*	●	○*	●	○*		-	PMV error (SH≥20)
	●	○*	○*	●	○*		-	PMV error (SH≤−8)
	●	●	●	○*	○*		20	PMV leakage error (unit A)
	○*	●	●	○*	○*		20	PMV leakage error (unit B)
	○*	●	○*	○*	○*		-	Miswiring (mispiping) check error

*1: Back-up operation is performed without error display of the indoor unit.
*2: Operated normally when the air conditioners in other rooms are driven.

B. Error display of the latest error (including error which occurs at present)

○:ON (*:3 sec ON/0.5 sec OFF) ●:OFF
◎:Rapid Flashing(5 times/sec) ◇:Slow Flashing(1 time/sec)

Display						Indoor check code	Description
D800 (YL)	D801 (YL)	D802 (YL)	D803 (YL)	D804 (YL)	D805 (GN)		
●	●	●	●	●		-	Normal operation (no error)
◎	●	●	●	●		1C	Compressor case thermostat error
●	◎	●	●	●		21	High pressure switch error
◎	◎	●	●	●		1C	Compressor system error
●	●	◎	●	●		1D	Compressor lock
◎	●	◎	●	●		1F	Compressor breakdown
●	◎	◎	●	●		14	Driving element short circuit
◎	◎	◎	●	●		16	Position detection circuit error
●	●	●	◎	●		17	Current detection circuit error
◎	●	●	◎	●		1C	Communication error between MCU
●	◎	●		●		1A	Fan system error
◎	◎	●	◎	●	◇	1E	Discharge temperature error
●	●	◎	◎	●		19	Discharge temperature sensor (TD) error
◎	●	◎	◎	●		1B	Outdoor air temperature sensor (TO) error
●	◎	◎	◎	●		18	Suction temperature sensor (TS) error
◎	◎	◎	◎	●		18	Heat exchanger temperature sensor (TE) error
●	●	●	●	◎		1C	Gas pipe (unit A) temperature sensor (TGa) error
◎	●	●	●	◎		1C	Gas pipe (unit B) temperature sensor (TGb) error
◎	●	◎	●	◎		-	PMV error (SH≥20)
●	◎	◎	●	◎		-	PMV error (SH≤−8)
●	●	●	◎	◎		20	PMV leakage error (unit A)
◎	●	●	◎	◎		20	PMV leakage error (unit B)
◎	●	◎	◎	◎		-	Miswiring (mispiping) check error

C. Sensor, current, compressor operation frequency, PMV opening, Miswiring (mispiping) check display

Using the service display function, you can check a variety of information.

○:ON (○*:3 sec ON/0.5 sec OFF)●:OFF

◎:Rapid Flashing(5 times/sec) ◇:Slow Flashing(1 time/sec)

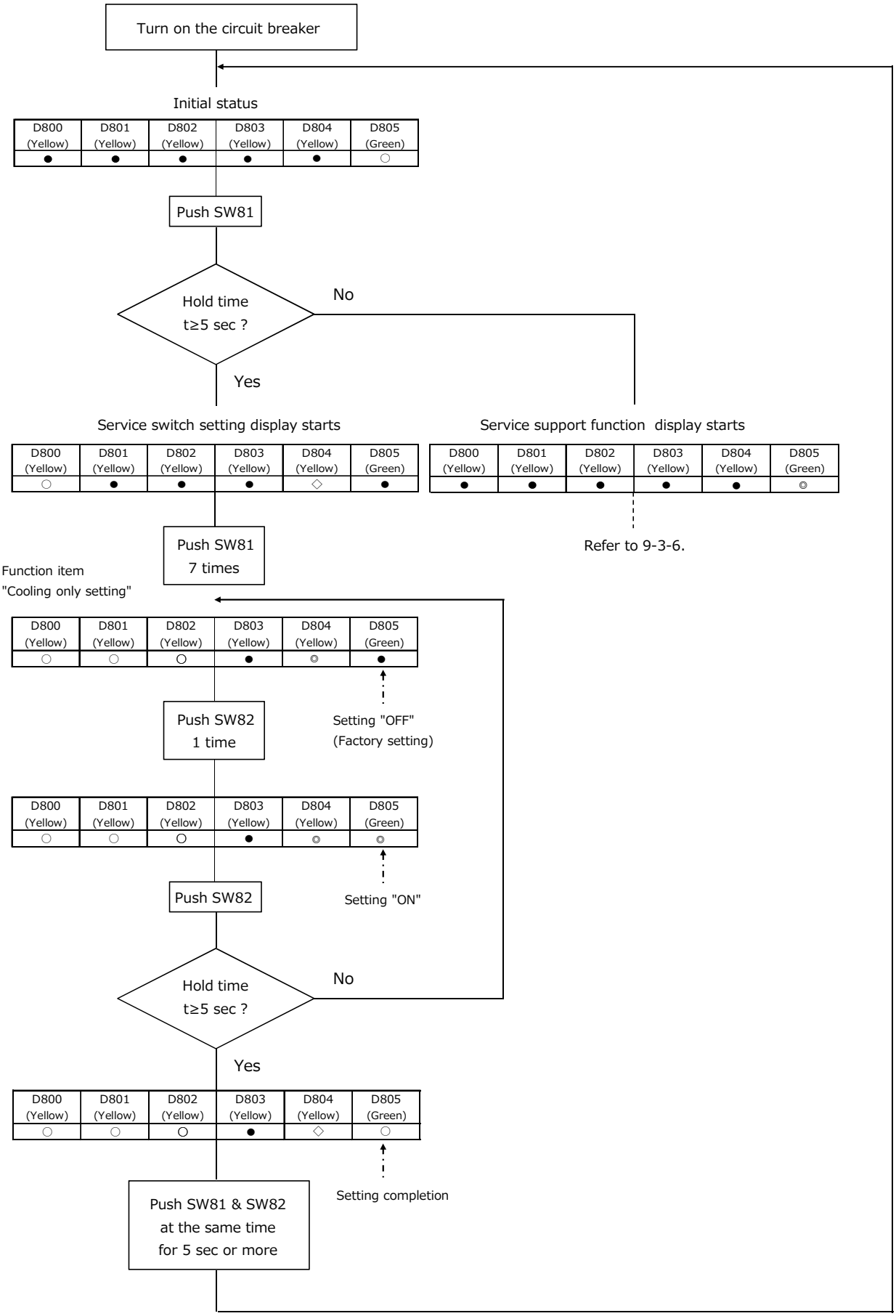
No.	display						Contents				
	D800 (YL)	D801 (YL)	D802 (YL)	D803 (YL)	D804 (YL)	D805 (GN)	Temp. sensor (˚C)	Current (A)	Compressor frequency (rps)	PMV opening (pls)	Miswiring (mispiping) check
0	●	●				◇	-26 or less	0～0.9	0～4.9	0～19	No error
1	○	●	●				-25～-21	1～1.9	5～9.9	20～39	Trouble in unit A
2	●	○					-20～-16	2～2.9	10～14.9	40～59	Trouble in unit B
3	○	○					-15～-11	3～3.9	15～19.9	60～79	Trouble in unit A and B

(Note 1) Basically carry out the service switch settings while the machine stops. If carry out during the operation, the pressure may change suddenly and a danger may grow.

9-3-5. How to set the SERVICE SWITCH SETTING.

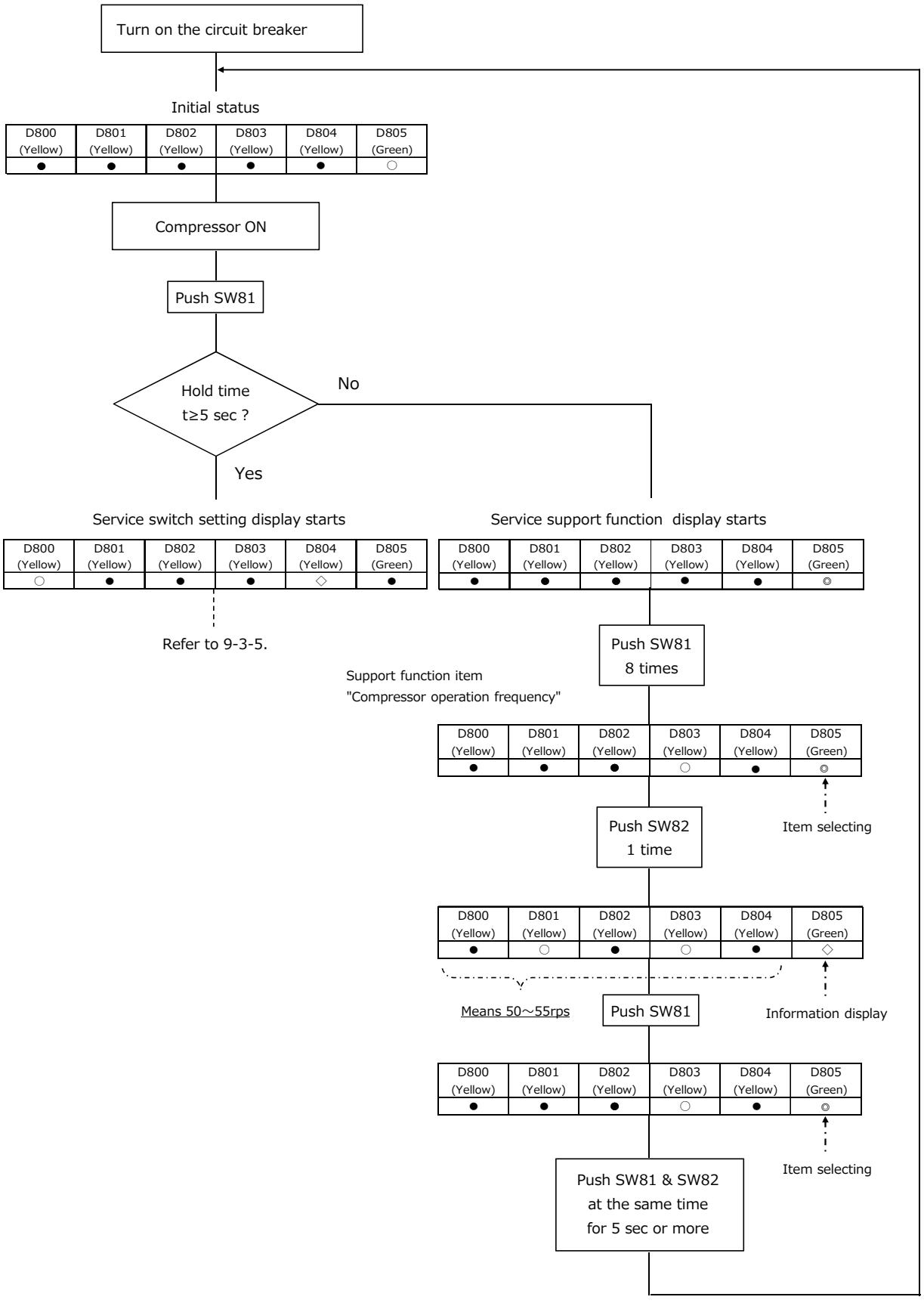
If you want to set the "COOLING ONLY SETTING OFF ⇒ ON" .

○:ON, ●:OFF, ◎:Rapid Flashing(5 times/sec), ◇:Slow Flashing(1 time/sec)



9-3-6. How to set the SERVICE SUPPORT FUNCTION.
If you want to check the "COMPRESSOR FREQUENCY" .

○:ON, ●:OFF, ◎:Rapid Flashing(5 times/sec), ◇:Slow Flashing(1 time/sec)



9-4. Intermittent Operation Control for Indoor Fans of the Indoor Unit at Thermo-off Side in Heating Operation

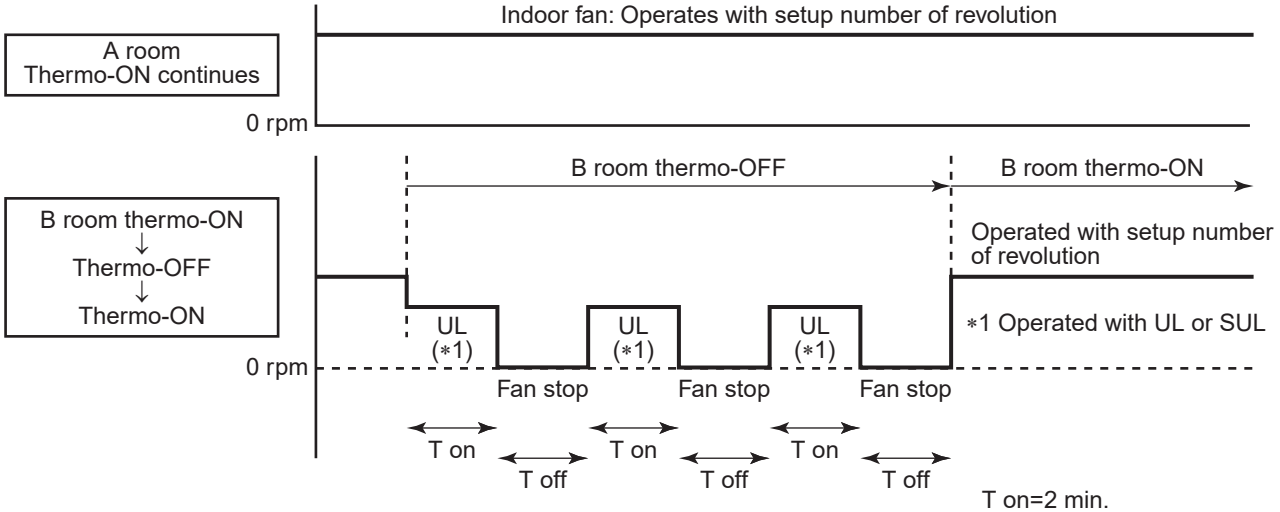
While heating operation is executed in two rooms, if room temperature reached the setup temperature in one room and thermo-off occurred, the following operations start. (Refer to the figure below.)

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

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

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

While heating operation is executed in 2 rooms, if room temperature reached the setup temperature in both rooms and thermo-off occurred, both indoor units start intermittent operation of the indoor fan.



∗ In case which Tc sensor temperature exceeds 55°C in B room, the fan stops intermittent operation and starts continuous operation with UL or SUL (∗1).

T on=2 min.

T off time	
To < 5°C	2 min.
5 ≤ To < 10	3 min.
10 ≤ To	4 min.

10. INSTALLATION PROCEDURE

10-1. Installation/Servicing Tools

Changes in the product and components

In the case of an air conditioner using R32, in order to prevent any other refrigerant from being charged accidentally, the service port diameter of the outdoor unit control valve (3-way valve) has been changed. (1/2 UNF 20 threads per inch)

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

New tools for R32 (R410A)

New tools for R32 (R410A)	Applicable to R22 model		Changes
Gauge manifold	×		As pressure is high, it is impossible to measure by means of conventional gauge. In order to prevent any other refrigerant from being charged, each port diameter has been changed.
Charge hose	×		In order to increase pressure resisting strength, hose materials and port size have been changed (to 1/2 UNF 20 threads per inch). When purchasing a charge hose, be sure to confirm the port size.
Electronic balance for refrigerant charging	○		As pressure is high and gasification speed is fast, it is difficult to read the indicated value by means of charging cylinder, as air bubbles occur.
Torque wrench (nominal diam. 1/2, 5/8)	×		The size of opposite sides of flare nuts have been increased. Incidentally, a common wrench is used for nominal diameters 1/4 and 3/8.
Flare tool (clutch type)	○		By increasing the clamp bar's receiving hole, strength of spring in the tool has been improved.
Gauge for projection adjustment	—	—	Used when flare is made by using conventional flare tool.
Vacuum pump adapter	○		Connected to conventional vacuum pump. It is necessary to use an adapter to prevent vacuum pump oil from flowing back to the charge hose. The charge hose connecting part has two ports-one for conventional refrigerant (7/16 UNF 20 threads per inch) and one for R410A. If the vacuum pump oil (mineral) mixes with R410A a sludge may occur and damage the equipment.
Gas leakage detector	×		Exclusive for HFC refrigerant.

- Incidentally, the "refrigerant cylinder" comes with the refrigerant designation R32 (R410A) and protector coating in the
  U. S's ARI specified rose color (ARI color code: PMS 507).
- Also, the "charge port and packing for refrigerant cylinder" require 1/2 UNF 20 threads per inch corresponding to the charge hose's port size.

⚠ CAUTION

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

10-2. Outdoor Unit

10-2-1. Installation / service tools

Changes in the product and components
In air conditioners using R32, in order to prevent any other refrigerant from being accidentally charged, the service port diameter size of the outdoor unit service valve has been changed. (1/2 UNF 20 threads per inch)

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

Gauge manifold for R32
Charge hose for R32
Vacuum pump for R32
Gas leakage detector for R32

Phillips screwdriver
Level
Scale
Utility knife

Pipe cutter
Torque wrench
Wrench (or spanner)
Reamer

Flare tool for R32
4 mm hexagonal wrench

10-2-2. Specifications

		RAS-2M60S4AVG-ND
Operating conditions*1	Cooling operation	10 to 46 °C
	Dry operation	10 to 46 °C
	Heating operation	–
Dimension	Height	710 mm
	Width	900 mm
	Depth	320 mm
Net weight		59 kg
Refrigerant R32		1.84 kg
Power supply		1 ph, 50 Hz, 220-240 V
Maximum running current		16.0 A
Installation fuse rating		20 A breaker (all types can be used)
Power cord (H07RN-F or 60245 IEC66)		3-core 2.5 mm^2
Connecting cable (H07RN-F or 60245 IEC66)		4-core 0.75 mm^2 or more
Pipe length	Minimum for 1 unit	2 m
	Maximum for 1 unit	25 m
	Maximum for total unit	50 m
	Height difference	15 m
	No additional refrigerant charge	30 m
Refrigerant adjustment		Over 30 m need extra charge 20 g/m

The specifications for performance of this air conditioner differs depending on the combination of the indoor units which are operated.
The information in this specifications table applies for the combinations with the catalogue.
For operation, read the owner's manual packed with the indoor unit.
Equipment complying with IEC 61000-3-12.
*1 If the air conditioner is used in conditions other than the above, the safety protection functions may be activated.

* Example of indoor unit class: RAS-B25S4KVPG-ND is abbreviated as "10"

	Indoor unit class	Standard connecting pipe diameter
B	10 or 13 or 18*2	6.35, 9.52 mm
A	10 or 13 or 18*2	6.35, 9.52 mm
Total	65 (RAS-2M60S4AVG-ND)	—

All combinations that do not exceed the "Total" number can be installed.
When 2 indoor units are connected to an outdoor unit, note that some combinations of indoor units are not compatible.
For the further details, refer to the catalogue.

*2 Need the reducer (12.7 to 9.52 mm).

• Locally procured.

10-2-3. Optional parts, accessories

Optional parts

Parts name	Specifications			Q'ty
Refrigerant piping*3	Indoor unit (abbreviation)	Liquid side (O.D.)	Gas side (O.D.)	1 ea.
	10, 13	6.35 mm	9.52 mm	
	18	6.35 mm	9.52 mm	
Putty, PVC tapes	—			1 ea.

*3 Refrigerant piping covered with insulating material (Polyethylene form, 6 mm thick) When duct-type or cassette-type unit is to be installed, it shall be covered with thicker insulating material (Polyethylene form, 10 mm thick)

Accessories

Installation Manual	1		Rubber cap (Water-proof)	5		F-GAS label	1		Drain nipple	1	
Safety Manual	1									

10-2-4. Installation of outdoor unit

■ Installation Location

- A place which can bear the weight of the outdoor unit and does not cause an increase in noise level and vibration.
- A place where the operation noise and air discharge do not disturb neighbors.
- A place which is not exposed to strong wind.
- A place free of combustible gas.
- A place which does not block a passageway.
- A place where the drain water does not cause any problems.
- A place where there are no obstructions near its air intake or air discharge.

Installation in the following places may result in trouble:
- A place with a lot of machine oil.
- A place with saline-rich atmosphere such as a coastal area.
- A place with high level of sulfide gas.
- A place where high-frequency waves are likely to be generated, such as from audio equipment, welders, or medical equipment.

Do not install the unit in such places.

⚠ CAUTION

When the outdoor unit is installed in a place where the drain water might cause any problems, Seal the water leakage point tightly using a silicone adhesive or caulking compound.

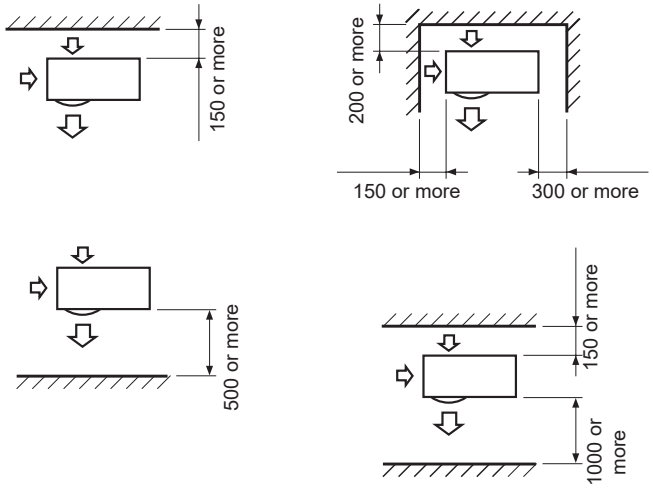
■ Precautions for Installation

- When the outdoor unit is to be installed in an elevated position, be sure to secure its feet.
- If the outdoor unit is to be mounted on a wall, make sure the base plate supporting it is sturdy enough.
- The base plate should be designed and manufactured to maintain its strength over a long period of time, and sufficient consideration should be given to ensure that the outdoor unit will not fall.
- When the outdoor unit is installed in a place that is always exposed to strong wind such as a coastal area or on a high story of a building, secure the normal fan operation using a duct or a wind shield.
- Especially in windy areas, install the unit in such a way as to prevent the admission of wind.
- When the outdoor unit is to be mounted high on a wall, take particular care to ensure that parts do not fall, and that the installer is protected.
- When doing installation work at ground level, it is usual to make wiring and pipe connections to the indoor units first, and then to make connections to the outdoor units. However, if outdoor work is difficult, you can change the procedure. For example, by making adjustments to the wiring and piping lengths on the inside (rather than the outside).

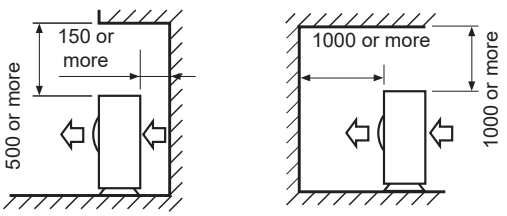
Necessary Space for Installation

If you need to install the outdoor unit in a location where there are some obstructions or a wall, secure sufficient space as shown in the figure below. The cooling effect may be reduced by 10%.

Upper side view (Unit: mm)



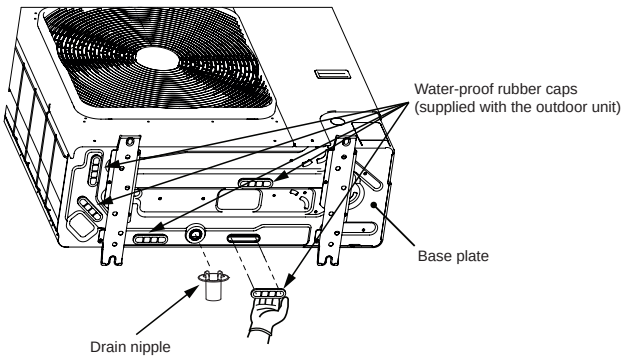
Side view (Unit: mm)



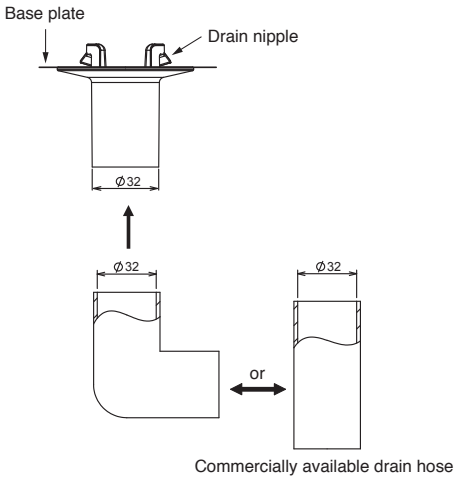
■ Draining the Water

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

1. Proceed with water-proofing by installing the water-proof rubber caps in the 5 elongated holes on the base plate of the outdoor unit. [How to install the water-proof rubber caps]
   1) Place four fingers into each cap, and insert the caps into the water drain holes by pushing them into place from the underside of the base plate.
   2) Press down on the outer circumferences of the caps to ensure that they have been inserted tightly. (Water leaks may result if the caps have not been inserted properly, if their outer circumferences lift up or the caps catch on or wedge against something.)



2. Install the drain nipple and a commercially available drain hose
   32 mm inside diameter), and drain off the water.
   (For the position where the drain nipple is installed, refer to the installation diagram of the indoor and outdoor units.)
   - Check that the outdoor unit is horizontal, and route the drain hose at a downward sloped angle while ensuring that it is connected tautly.

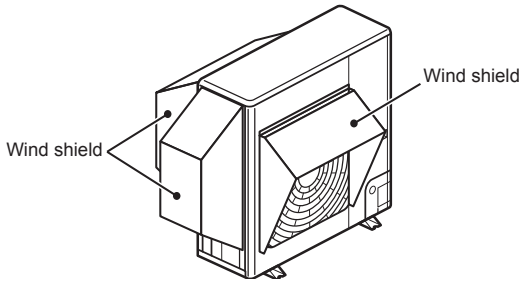


Do not use ordinary garden hose, but one can atten and prevent water from draining.

Installation in Regions with Snowfall and Cold Temperatures

Do not use waterproof rubber caps or a drain nipple.

- If you need to install the outdoor unit in a location where there is a possibility of the drain freezing, pay close attention so that the drain does not become frozen.
- To protect the outdoor unit from snow, install the outdoor unit on a holding frame, and attach a snow protection hood and plate.
- Keep the outdoor unit at least 500 mm above the snow accumulation line.

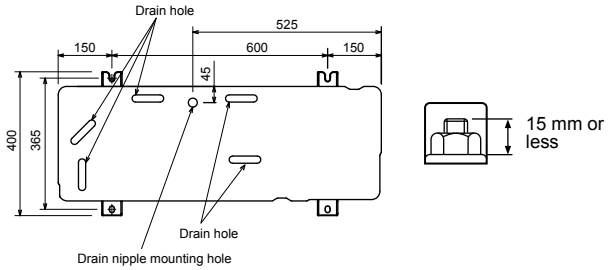


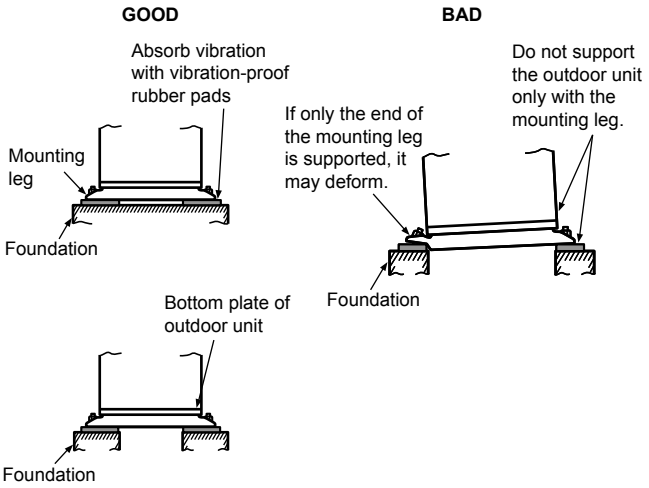
Fixing the Outdoor Unit

Fix the outdoor unit using attachment bolts.

- Use 8 mm or 10 mm anchor bolts and nuts.
- Do not allow the attachment bolts to protrude by more than 15 mm.
- Install the outdoor unit at ground level.
- Attach the vibration-proof rubber pads under the fixing legs.

(Unit : mm)





Support the bottom surface of the mounting leg that is in contact with and underneath the bottom plate of the outdoor unit.

10-2-5. Refrigerant piping

⚠ CAUTION

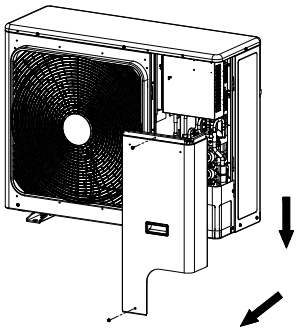
Install in rooms that are 13 m^3 or larger. If a leak of refrigerant gas occurs inside the room, an oxygen deficiency may occur.

■ Detaching the Front and side panel to service

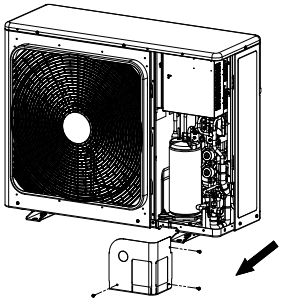
Remove the 10 screws follow 3 step.

- Pull out the front and side panel according to the direction of the arrows on the illustration below.

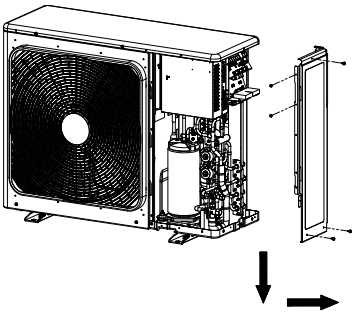
①



②



③



■ Refrigerant Piping Connection

Flaring

1. Cut the pipe with a pipe cutter.

2. Remove the burr inside of the pipe.
   When removing the burr, be careful so that chips do not fall into the pipe.
3. Remove the flare nuts attached to the outdoor/indoor unit, then insert the into each of the pipes.
4. Flare the pipes.
   See the following table for the projection margin (A) and flaring size (B)

Pipe		A		B	Flare Nut		
Outside diameter	Thickness	Rigid (clutch type) R32 tool	Imperial (wing nut type) R32 tool		Width across flat	Tighten torque	
mm	mm	mm	mm	mm	mm	N•m	kgf•m
6.35	0.8	0 to 0.5	1.5 to 2.0	9.1	17	14 to 18	1.4 to 1.8
9.52	0.8	0 to 0.5	1.5 to 2.0	13.2	22	33 to 42	3.3 to 4.2
12.7	0.8	0 to 0.5	2.0 to 2.5	16.6	26	50 to 62	5.0 to 6.2

⚠ CAUTION

- Do not scratch the inner surface of the flared part when removing burrs
- Flare processing under the condition of scratches on the inner surface of flar processing part will cause refrigerant gas leak.

Pipe connection

1. Make wire and pipe connections for each indoor unit separately.
2. Align the centres of the connecting pipes and tighten the flare nut as much as possible with your fingers, then tighten the nut using a torque wrench. Be sure to tighten the nut at the specified torque value.
   - If you use one outdoor unit for several indoor units of a different class, connect the largest one first A, then connect the rest in the order B to D.
   - Do not remove the flare nuts for any ports you are not going to use for connection.
   - Do not leave the flare nut unattached for a long period of time.
   - Use a different-diameter joint if the diameters of the connection port and connection piping are different.
   - Mount the different-diameter joint on the connection port of the outdoor unit.

⚠ CAUTION

- **KEEP IMPORTANT 7 POINTS FOR PIPING WORK.**

(1) Take away dust and moisture (inside of the connecting pipes).
(2) Tighten the connections (between pipes and unit).
(3) Evacuate the air in the connecting pipes using a VACUUM PUMP.
(4) Check gas leak (connected points).
(5) Be sure to fully open the packed valves before operation.
(6) Reusable mechanical connectors and flared joints are not allowed indoors. When mechanical connectors are reused indoors, sealing parts shall be renewed. When flared joints are reused indoors, the flare part shall be refabricated.
(7) Don't operate air conditioner in case no refrigerant in the system.

■ Air Purge

From the sake of environmental protection, use a vacuum pump to extract the air during installation.
* Prepare a 4 mm hexagon wrench.

1. Connect a charge hose.
   - Make sure that the Handle Hi of the gauge manifold valve is closed fully.
   - Connect the port of the gauge manifold valve and the service port (Valve core (Setting Pin)) using the charge hose.

NOTE

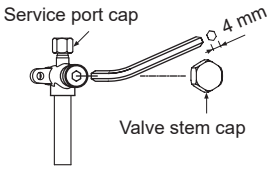
If a control valve or charge valve is attached to the charge hose, leak of R32 refrigerant can be avoided.

2. Open the Handle Low of the gauge manifold valve fully, then operate the vacuum pump.
   - Loosen the flare nut of the at the gas end a little to make sure that air i taken in, then tighten the nut.
   - If you find air is not taken in, make sure that the charge hose i connected to the port(s) securely.
   - Perform extraction for about 40 minutes and make sure that the compound pressure gauge reading is –101 kPa (–76 cmHg).
   - If the compound pressure gauge reading is not –101 kPa (–76 cmHg), there is a possibility air is being taken in from the port(s).
   - Make sure that the charge hose is connected to the port(s) securely.

3. Close the Handle Low of the gauge manifold valve fully, then stop operating the vacuum pump.
   • Leave the gauge and pump as they are for 1 or 2 minutes, then make sure that the compound pressure gauge reading stays at –101 kPa (–76 cmHg).

4. Disconnect the charge hose from the service port, then open the valve stem fully using a 4 mm hexagon wrench.

Hexagon wrench is required.



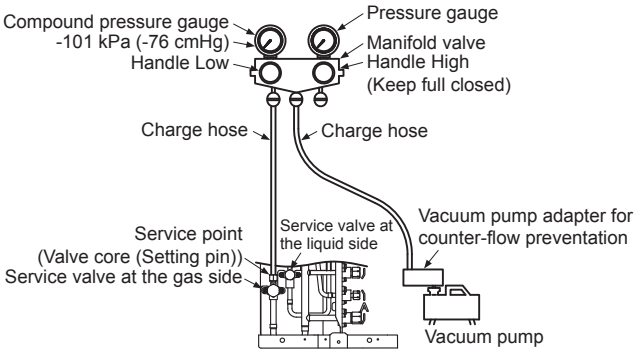
5. Tighten the service valve stem cap and service port cap securely.

⚠ CAUTION

Use a torque wrench and tighten the nut at the specified torque value

6. Tighten all the caps on the valves securely, then perform a gas leak inspection.
   • The cap with the 9.52 mm outer diameter is available in two sizes in accordance with the type of packed valve for which the cap is used. The tightening torque depends on the width across flats of the cap s check it in the table below.

Service valve		Tighten torque			
		Valve stem cap		Service port cap	
mm		N•m	kgf•m	N•m	kgf•m
Liquid side (9.52)	H19 mm	14 to 18	1.4 to 1.8	–	–
	H22 mm	33 to 42	3.3 to 4.2		
Gas side (12.7)		33 to 42	3.3 to 4.2	14 to 18	1.4 to 1.8

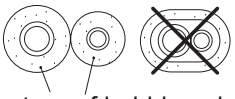


Precautions for Adding Refrigerant

• Use a scale with a precision of at least 10 g per index line when adding the refrigerant.
  Do not use bathroom scales or similar instruments.

■ Insulation of the Refrigerant Pipes

• Insulate the refrigerant pipes for liquid and gas separately.

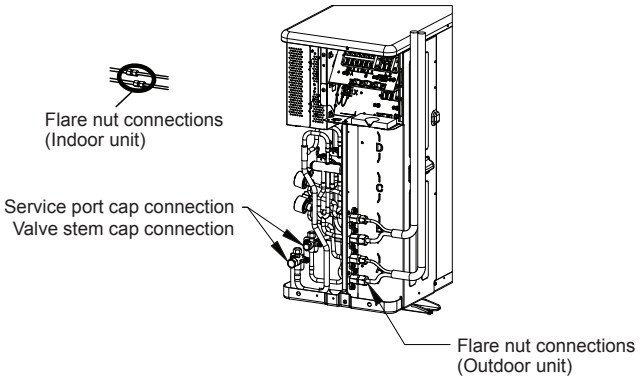


Heat-proof bubble polyethylene

Underground piping: 10t
(Laying the pipes on the wall, ceiling, or under the floor)

■ Gas Leak Inspection

• Perform a gas leak inspection for the flare nut connections, valve stem connection, and service port cap without fail.
• Use a leak detector exclusively manufactured for R32.



* Check point example (RAS-2M60S4AVG-ND)

■ Performing Additional Installation of an Indoor Unit

1. Collect refrigerant from the outdoor unit.
2. Turn off the circuit breaker.
3. Perform additional installation referring to the procedure from “Refrigerant Piping Connection” on the previous page.

7 Electrical work

⚠ WARNING

• Be sure to comply with local regulations codes when running the wire from the outdoor unit to the indoor unit. (Size of wire and wiring method etc.)
• A lack of electrical capacitance or incorrect wiring may cause an electric shock or a fire.
• To make sure that the wiring connection are secure, use designated cables.
• Fix the cables securely so that no externa force applied to the cables may effect the terminals.
• If wiring connections are incomplete or cables are not fixed securely, it may cause a fire.
• Be sure to ground the outdoor unit
• Incomplete grounding may lead to a electric shock.

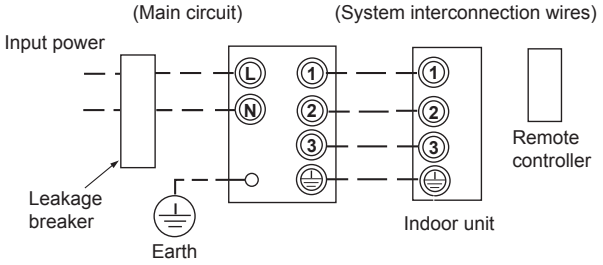
⚠CAUTION

- Use a circuit breaker of a type that is not tripped by shock waves.
- Incorrect/incomplete wiring will caus electrical fires or smoke.
- Prepare the power source for exclusivuse with the air conditioner.
- This product can be connected to the main power.
  Fixed wire connections:
  A switch that disconnects all poles and has a contact separation of at least 3 mm must be incorporated into the fixed wiring.

■ Wire Connection

- The dash lines show on-site wiring.

For indoor unit RAS-M series.

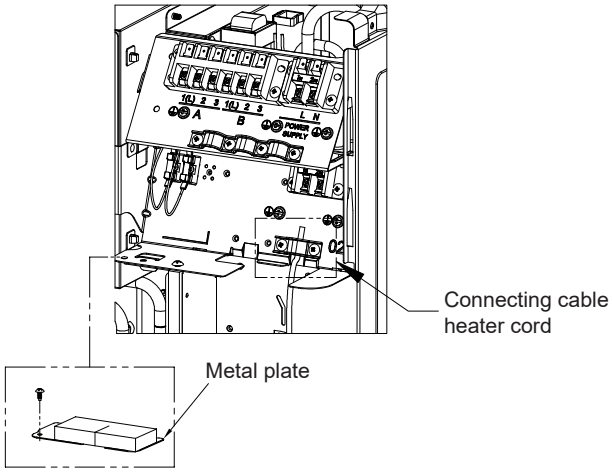


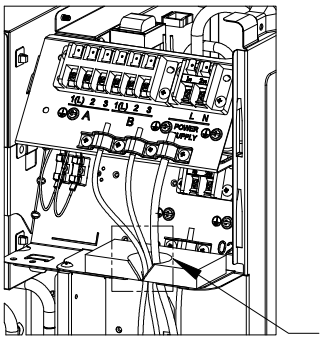
- Connect the indoor/outdoor connecting cables to the identical terminal numbers on the terminal block of each unit.
- Incorrect connection may cause a failure.

Model	RAS-2M60S4AVG-ND
Power supply	1 ph, 50 Hz, 220-240 V
Maximum running current	16.0 A
Installation fuse rating	20 A (All types can be used)
Power cord	H07RN-F or 60245 IEC66 3-core 2.5 mm²
Connecting cable	H07RN-F or 60245 IEC66 4-core 7.5 mm²

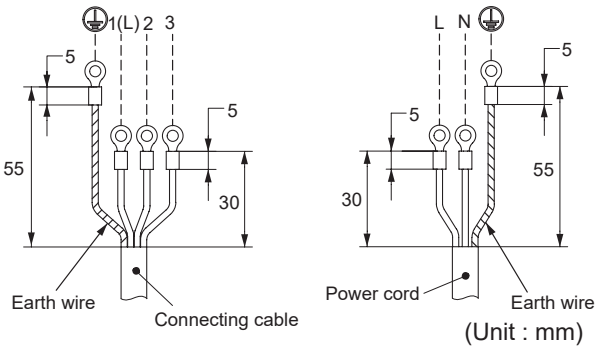
1. Detach the front and side panel from the outdoor unit.
2. Remove the cord clamp and the metal plate.
3. Connect the wires for the heater cord.
4. Fix the wiring connecting for the heater cord securely using a cord clamp and metal plate.
5. Connect the wires for the power source and indoor units A, B.
6. Fix the wiring connecting for the power source and indoor A, B securely using a cord clamp.
7. Attach the front and side panel to the unit.

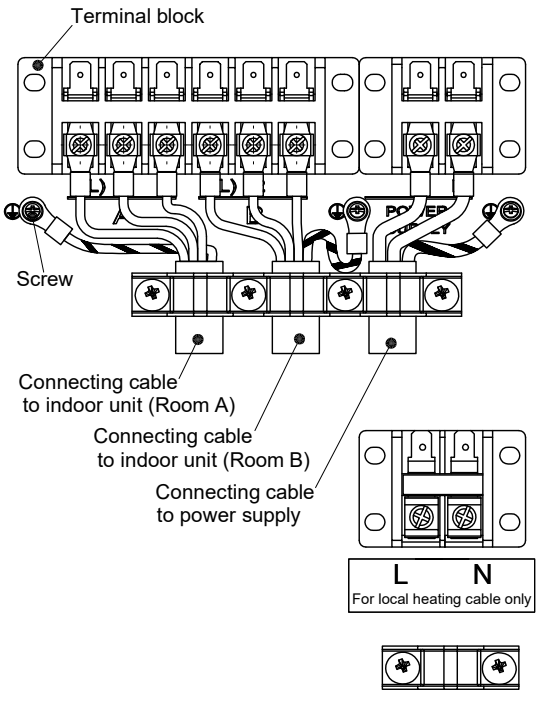
* Connect the connecting cable to the terminal as identified by the matching numbers on the terminal block of the indoor unit and the outdoor unit.





Stripping Length of connecting cable for outdoor unit





* Connection example (RAS-2M60S4AVG-ND)

10-2-6. Grounding

This air conditioner must be grounded without fail.

- Grounding is necessary not only to safeguard against the possibilityof receiving an electric shock but also to absorb both static, which is generated by high frequencies and held in the surface of the outdoor unit, and noise since the air conditioner incorporates a frequency conversion device (called an inverter) in the outdoor unit.
- If the air conditioner is not grounded, users may receive an electric shock if they touch the surface of the outdoor unit and that unit is charged with static.

<Pump down process>

1. Turn off the Air Conditioner system.
2. Connect the charge hose from the manifold valve to the service port of the packed valve at gas side.
3. Turn on the Air Conditioner system in cooling operation more than 10 minutes.
4. Check the operating pressure of the system should be normal value. (Ref. with product specification)
5. Release the valve rod cap of both service valves.
6. Use the Hexagon wrench to turning the valve rod of Liquid side fully close.
   (*Make sure no entering air into the system)
7. Continue operate Air Conditioner system until the gauge of manifold dropped into the range of 0.5 - 0 kgf/cm^2
8. Use the Hexagon wrench to turning the valve rod of Gas side fully close. And turn off the Air Conditioner system immediately thereafter.
9. Remove the gauge manifold from the service port of the packed valve.
10. Securely tighten the valve rod cap to the both service valves.

CAUTION

Should be check the compressor operating condition while pumping down process. It must not any abnormal sound, more vibration. It is abnormal condition appears and must turn off the Air Conditioner immediately.

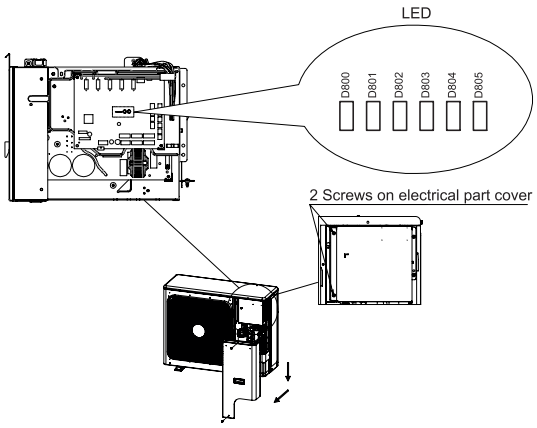
10-2-7. Test run

■ **Wiring/Piping Check**

⚠ CAUTION

Electric current is applied on the control board. Beware of electric shock.

1. Detach the front panel and electrical cover by removing the 4 screws.
   Do not remove the air discharge grille.



2. Turn on the circuit breaker to supply electricity.
   In the initial LED display status, D805 is lighted as below.

○ : ON, ● : OFF, ◎ : Rapid Flashing (5 times/sec.), ◇ : Slow Flashing (1 time/sec.)

D800	D801	D802	D803	D804	D805
●	●	●	●	●	○

   Start running all the indoor units connected to the outdoor unit in the cooling mode.
   (The indoor unit in the room that doesn't operate the cooling mode cannot be checked.)

3. After 5 minutes, hold down SW81 for at least 5 seconds, and check that D800 is lighted and D804 light is flashing (1 time/sec.)

D800	D801	D802	D803	D804	D805
○	●	●	●	◇	●

4. Press the SW81 4 times until the LED is displayed as below.

D800	D801	D802	D803	D804	D805
●	●	○	●	◎	●

5. Press SW82 for 1 times. Then D805 light is flashing (5 times/sec.)

D800	D801	D802	D803	D804	D805
●	●	○	●	◎	◎

6. Hold down SW82 for at least 5 seconds. Then the wiring/piping check starts automatically. (The LED display is lighted for a moment.)

D800	D801	D802	D803	D804	D805
●	●	○	●	◇	○

   • If no problems are detected, the checking operation returns to the normal operation automatically. The LED is displayed as below.

D800	D801	D802	D803	D804	D805
●	●	●	●	●	○

7. The below is displayed when the error is detected.
   (* Repetition of 3 sec ON / 0.5 sec OFF)

D800	D801	D802	D803	D804	D805
○*	○*	○*	○*	○*	○

   Press the SW81 3 times until the LED is displayed as below, to check the room judged as error.

D800	D801	D802	D803	D804	D805
●	○	●	●	●	◎

   Incorrect wiring/piping can be checked by pressing SW82. The LED is displayed as below. Turn off the circuit break , then check wiring/piping again.

○ : ON, ● : OFF, ◎ : Rapid Flashing (5 times/sec.), ◇ : Slow Flashing (1 time/sec.)

	LED						Description
	D800	D801	D802	D803	D804	D805	
Check results	●	●	●	●	●	◇	Normal operation (no error)
	○	●	●	●	●	◇	Trouble in unit A
	●	○	●	●	●	◇	Trouble in unit B
	○	○	●	●	●	◇	Trouble in units A and B
	○	○	○	○	○	◇	"Trouble in all units Service valve stays closed"

• The D800 LED represents unit. A.
• The D801 LED represents unit. B.

8. When you want to start over the operation of the SW81 and SW82, press the SW81 and the SW82 at the same time for 5 sec. (The procedure will set back to step 3.) However, do not execute the operation during the check. If by any chance the check is stopped by the operation, start over the check after turning off the power once

9. Notes
   - It sometimes takes about 30 minutes maximum for the check.
   - During the check, the compressor and the fan of the outdoor/indoor unit repeat ON/OFF.
   - You cannot check wiring/piping when the external temperature is 5°C or less. Also, there is a possibility to misjudge if the indoor temperature becomes too low by cooling operation. In that case, execute the cooling operation for per room and check if the connection is normal.

■ Gas Leak Inspection

Refer to the "■ Gas Leak Inspection"

■ Test run

For the test run, be sure to satisfy the following conditions below:

- Perform the test run for each indoor unit respectively.
- Perform the test run for about 10 minutes in the cooling mode.

- You can perform the test run in the cooling/heating mode by utilizing the thermo sensor of the indoor unit.
  Cooling mode: Warm the thermo sensor using an appliance such as a hair dryer.

■ Instructions for the Customers

- Explain to the customers the proper operation procedure and let them operate the air conditioner along with the supplied instruction manual.
- When you start running the indoor unit or change the operation mode, the unit starts running after 3 minutes. This is due to the protection function of the unit, not a malfunction.
- Electronic expansion valves are used for the outdoor unit.
  When you turn on the power, the outdoor unit starts clattering every 1 or 2 months. This clattering is not a malfunction, but occurs when the unit is returning to the default setting for optimised control.

■ Pump-down Operation (Recovering refrigerant)

⚠ CAUTION

Since the forcible running for collecting refrigerant stops automatically after 10 minutes, finish collecting refrigerant withi 10 minutes.

Electric current is applied on the control board. Beware of electric shock.

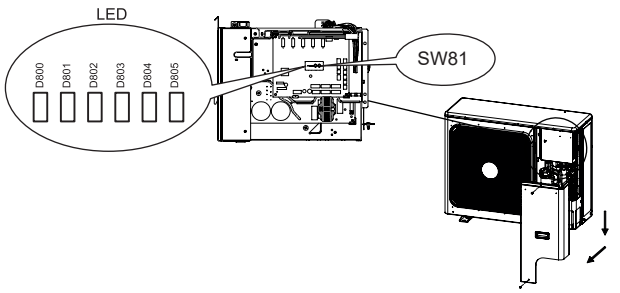
- **The following must be certainly done during pump down.**
  - **Do not incorporate air into the refrigeration cycle.**
  - **Close the 2 service valves. Stop the compressor and remove the refrigerant pipe.**
    If the refrigerant pipe is removed when the compressor is operating and service valves are opened, the refrigerant cycle will inhale unwanted matter such as air and the pressure in the cycle becomes abnormally elevated. It may cause a burst or injury.

1. Detach the front panel. Do not remove the air discharge grille.
2. Turn on the circuit breaker to supply electricity.
   In the initial LED display status, D805 is lighted as below.

○ : ON, ● : OFF, ◎ : Rapid Flashing (5 times/sec.),
◇ : Slow Flashing (1 time/sec.)

D800	D801	D802	D803	D804	D805
●	●	●	●	●	○

Start running all the indoor units connected to the outdoor unit in the cooling mode.
The checking procedure cannot be completed if the cooling mode is not operated in every indoor units.



3. Hold down SW81 for at least 5 seconds, and check that D800 is lighted and D804 light is flashing(1time/sec.)

D800	D801	D802	D803	D804	D805
○	●	●	●	◇	●

4. Press SW81 for 1 time. Then D804 light is flashing (5 times/sec.)

D800	D801	D802	D803	D804	D805
○	●	●	●	◎	●

5. Press SW82 for 1 time. Then D805 light is flashing (5 times/sec.)

D800	D801	D802	D803	D804	D805
○	●	●	●	◎	◎

6. Hold down SW82 for at least 5 seconds. Then outdoor unit start cooling mode.
(The display is kept during the refrigerants collection operation.)

D800	D801	D802	D803	D804	D805
○	●	●	●	◇	○

7. Close the valve stem of the service valve at the liquid end.
8. Make sure that the compound pressure gauge reading is –101 kPa (–76 cmHg)
9. Close the valve stem of the service valve at the gas end.
10. The refrigerants collection operation is finished in maximum 10 minutes After the collection is finished, promptly stop the operation of all th indoor unit.
(There are cases that the compressor restarts.)
11. When you want to start over the operation of the SW81 and SW82, press the SW81 and SW82 at the same time for 5 sec. (It back to the initial condition of 3.)
However, do not execute the operation during the refrigerants collection. If by any chance the collection is stopped by the operation, start over the refrigerants collection operation.

12-2-8. Troubleshooting

You can perform fault diagnosis of the outdoor unit with the LEDs on the P.C. board of the outdoor unit in addition to using the check codes displayed on the remote controller of the indoor unit.
Use the LEDs and check codes for various checks. Details of the check codes displayed on the remote controller of the indoor unit are described in the Installation Manual of the indoor unit.

LED displays and check codes

○:ON (○*:3 sec ON/0.5 sec OFF) ● :OFF

	Display						Indoor check code	Description
	D800 (YL)	D801 (YL)	D802 (YL)	D803 (YL)	D804 (YL)	D805 (GN)		
	●	●	●	●	●	○	-	Normal operation (no error)
	○*	●	●	●	●		1C	Compressor case thermostat error
	●	○*	●	●	●		21	High pressure switch error
	○*	○*	●	●	●		1C	Compressor system error
	●	●	○*	●	●		1d	Compressor lock
	○*	●	○*	●	●		1F	Compressor breakdown
	●	○*	○*	●	●		14	Driving element short circuit
	○*	○*	○*	●	●		16	Position detection circuit error
	●	●	●	○*	●		17	Current detection circuit error
	○*	●	●	○*	●		1C	Communication error between MCU
	●	○*	●	○*	●		1A	Fan system error
	○*	○*	●	○*	●		1E	Discharge temperature error
	●	●	○*	○*	●		19	Discharge temperature sensor (TD) error
*1	○*	●	○*	○*	●		1b	Outdoor air temperature sensor (TO) error
	●	○*	○*	○*	●		18	Suction temperature sensor (TS) error
*2	●	●	●	●	○*		1C	Gas pipe (unit A) temperature sensor (TGa) error
*2	○*	●	●	●	○*		1C	Gas pipe (unit B) temperature sensor (TGb) error
	○*	●	○*	●	○*		-	PMV error (SH≥20)
	●	○*	○*	●	○*		-	PMV error (SH≤–8)
	●	●	●	○*	○*		20	PMV leakage error (unit A)
	○*	●	●	○*	○*		20	PMV leakage error (unit B)
	○*	●	○*	○*	○*		-	Miswiring (mispiping) check error
	●	○*	○*	○*	○*		1C	Communication error between MCU
	○*	○*	○*	○*	○*		1C	Communication error between MCU

*1 : Back-up operation is performed without error display of the indoor unit.
*2 : Operated normally when the air conditioners in other rooms are driven.

- The D800 LED represents unit A.
- The D801 LED represents unit B.

11. HOW TO DIAGNOSE THE TROUBLE

The pulse modulating circuits are mounted to both indoor and outdoor units.

Therefore, diagnose troubles according to the trouble diagnosis procedure as described below.
(Refer to the check points in servicing written on the wiring diagrams attached to the indoor/outdoor units.)

Table 11-1

No.	Troubleshooting Procedure	Page
1	First Confirmation	57
2	Primary Judgment	59
3	Judgment by Flashing LED of Indoor Unit	59
4	Self-Diagnosis by Remote Controller (Check Code)	60
5	Judgment of Trouble by Symptom	67
6	Trouble Diagnosis by Outdoor LED	69
7	Inspection of the Main Parts	77
8	Outdoor Unit	77
9	How to Simply Judge Whether Outdoor Fan Motor is Good or Bad	78

NOTE

A large-capacity electrolytic capacitor is used in the outdoor unit controller (inverter). Therefore, if the power supply is turned off, charge (charging voltage DC280V to 373V) remains and discharging takes a lot of time (for more than 5 minutes). After turning off the power source, if touching the charging section before discharging, an electrical shock may be caused.

Discharge the electrolytic capacitor completely by using solder iron, etc.

⚠ WARNING

The electrolytic capacitor may not normally discharge according to error contents and the voltage may remain.

Therefore, be sure to discharge the capacitor.

⚠ WARNING

For discharging, never use a screwdriver and others for short-circuiting between + and – electrodes,

As the electrolytic capacitor is one with a large capacity, it is very dangerous because a large electric spark will occur.

<Discharging method>

Connect the discharge resistance (approx. 100Ω/40W) or plug of the soldering iron to voltage between + and – of C28 on the main P.C. board WP-500, and then perform discharging.

Discharge position + and - of C28
(Discharging period: 10 seconds or more)

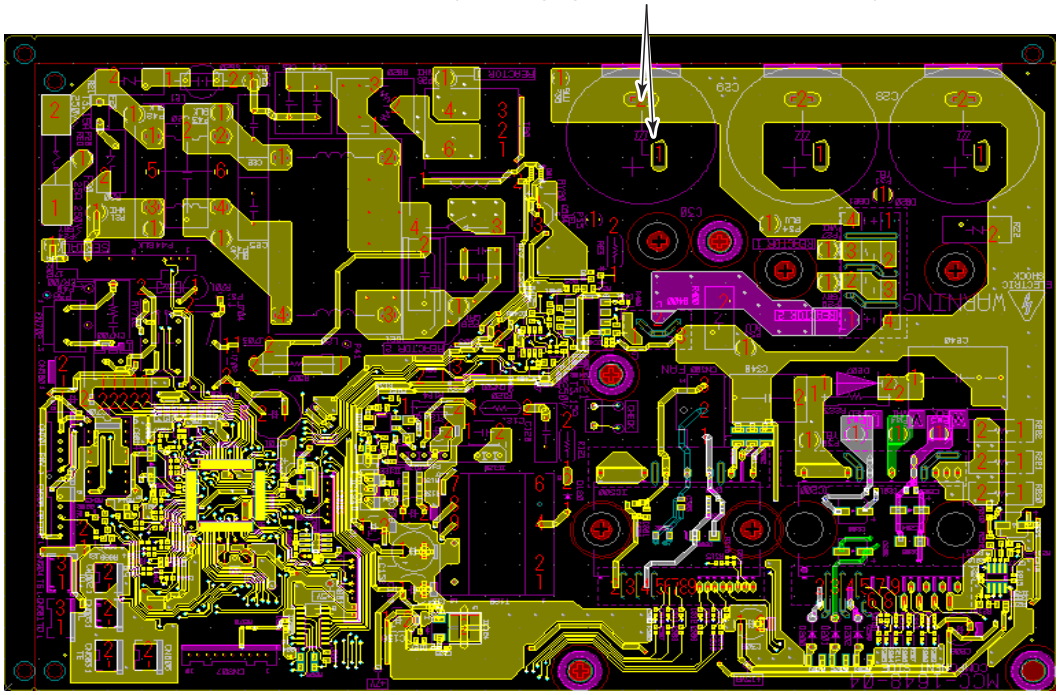


Fig. 11-1

11-1. First Confirmation

11-1-1. Confirmation of Power Supply

Confirm that the power breaker operates (ON) normally.

11-1-2. Confirmation of Power Voltage

Confirm that power voltage is AC 220–240 ±10%.

If power voltage is not in this range, the unit may not operate normally.

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

For controlling the air conditioner, the program operations are built in the microcomputer as described in the following table.

If a claim is made for running operation, check whether or not it meets to the contents in the following table.

When it does, we inform you that it is not trouble of equipment, but it is indispensable for controlling and maintaining of air conditioner.

Table 11-1-1

No.	Operation of air conditioner	Description
1	When power breaker is turned “ON”, the operation lamp (Green) of the indoor unit flashes.	The OPERATION lamp of the indoor unit flashes when power source is turned on. If “START/STOP” button is operated once, flashing stops. (Flashes also in power failure)
2	Compressor may not operate even if the room temperature is within range of compressor-ON.	The compressor does not operate while compressor restart delay timer (3-minutes timer) operates. The same phenomenon is found after power source has been turned on because 3-minutes timer operates.
3	In DRY and SLEEP MODE, FAN (air flow) display does not change even though FAN (air flow select) button is operated.	The air flow indication is fixed to [AUTO].
4	Increasing of compressor motor speed stops approx. 30 seconds after operation started, and then compressor motor speed increases again approx. 30 seconds after.	For smooth operation of the compressor, the compressor motor speed is restricted to Max. 33 rps for 2 minutes and Max. 57 rps for 2 minutes to 4 minutes, respectively after the operation has started.
5	The set value of the remote control should be below the room temperature.	If the set value is above the room temperature, Cooling operation is not performed. And check whether battery of the remote control is consumed or not.

11-2. Primary Judgment

To diagnose the troubles, use the following methods.

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

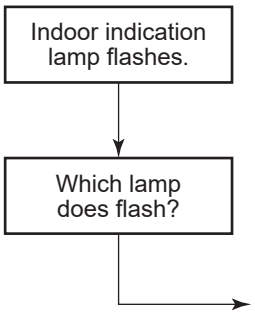
Firstly use the method (1) for diagnosis. Then, use the method (2) or (3) to diagnose the details of troubles.

For any trouble occurred at the outdoor unit side, detailed diagnosis is possible by 6-serial LED on the control P.C. board.

11-3. Judgment by Flashing LED of Indoor Unit

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

Table 11-3-1



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

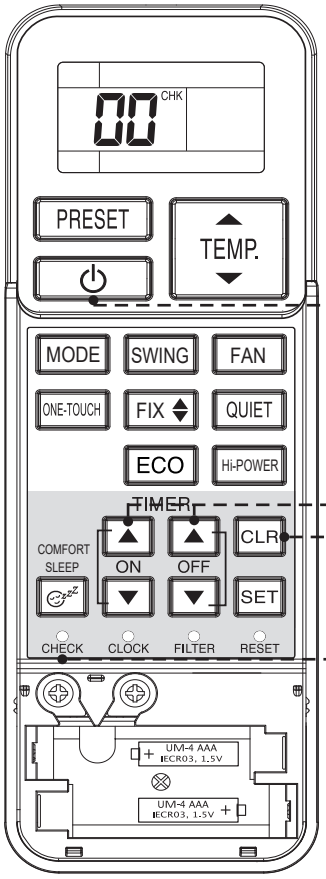
NOTE

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

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

1. If the lamps are indicated as shown B to E in Table 11-3-1, execute the self-diagnosis by the remote controller.
2. When the remote controller is set to the service mode, the indoor controller diagnoses the operation condition and indicates the information of the self-diagnosis on the display of the remote controller with the check codes.
   If a fault is detected, all lamps on the indoor unit will flash at 5Hz and it will beep for 10 seconds (beep, beep, beep ...). The timer lamp usually flashes (5Hz) during self-diagnosis.

11-4-1. How to Use Remote Controller in Service Mode



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

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

2 **Press [ON ▲] or [OFF ▲] button**

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

00 → 01 → 02 ·· 1d → 1E → 33

- The TIMER indicator of the indoor unit flashes continuously. (5 times per 1 sec.)
- Check the unit with all 52 check codes (00 to 33) as shown in Table-11-4-1.
- Press [ON▼] or [OFF ▼] button to change the check code backward.

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

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

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

3 **Press [CLR] button. After service finish for clear service code in memory.**

- "7F" is indicated on the display of the remote control.

4 **Press [⏻] button to release the service mode.**

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

Alphanumeric characters are used for the check codes.

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

Fig. 11-4-1

11-4-2. Caution at Servicing

1. After using the service mode of remote controller finished, press the [⏻] button to reset the remote controller to normal function.
2. After finished the diagnosis by the remote controller, turn OFF power supply and turn its ON again to reset the air conditioner to normal operation. However, the check codes are not deleted from memory of the microcomputer.
3. After servicing finished, press [CLR] button of remote controller under service mode status to send code "7F" to the indoor unit. The check code stored in memory is cleared.

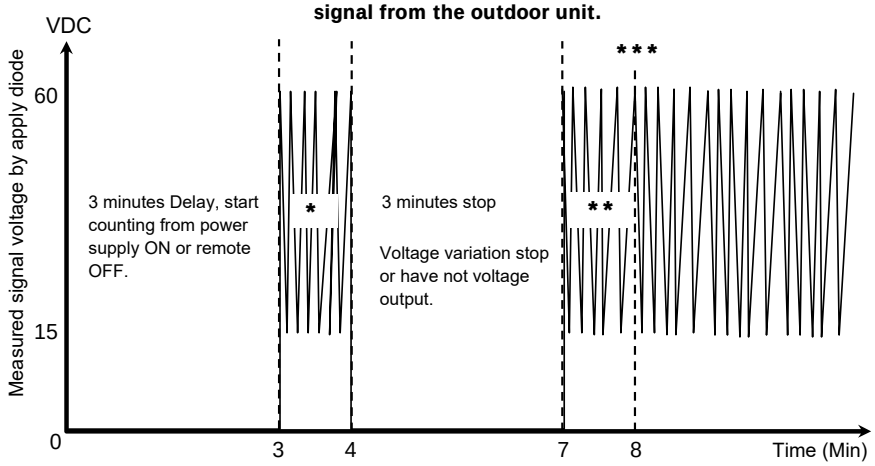
Table 11-4-1

Block distinction		Operation of diagnosis function				Action and Judgment
Check code	Block	Check code	Cause of operation	Air conditioner status	Display flashing error	
00	Indoor P.C. board.	0C	TA sensor ; The room temperature sensor is short-Circuit or disconnection.	Operation continues.	Flashes when error is detected.	1. Check the sensor TA and connection. 2. In case of the sensor and its connection is normal, check the P.C. board.
		0d	TC sensor ; The heat exchanger temperature sensor of the indoor unit is out of place, disconnection, short-circuit or migration.	Operation continues.	Flashes when error is detected.	1. Check the sensor TC and connection. 2. In case of the sensor and its connection is normal, check the P.C. board.
		0E	Gas detector sensor failure	Outdoor Unit "OFF" Indoor Unit continue fan only operation for 250 minute or "OFF".	Flashes when error is detected.	1. Check Gas sensor shortage / open. 2. Check Gas sensor disconnect.
		11	Fan motor of the indoor unit is failure, lock-rotor, short-circuit, disconnection, etc. Or its circuit on P.C. board has problem.	All OFF	Flashes when error is detected.	1. Check the fan motor and connection. 2. In case of the motor and its connection is normal, check the P.C. board.
		12	Other trouble on the indoor P.C. board.	Depend on cause of failure.	Depend on cause of failure.	1. Reset power supply. 2. Replace P.C. board.
		26	• Gas detector sensor life time	Operation continues.	Flashes when error is detected.	Replace new sensor.
			• Smart sensing failure.	Operation continues.	No flashing	1. Check the smart sensing sensor and connection. 2. In case of the sensor and its connection is normal, check the P.C.board.
		27	Ionizer sensor failure	Operation continues.	No flashing	1. Check the Ionizer sensor and connection. 2. In case of the sensor and its connection is normal, check the P.C.board.

Block distinction		Operation of diagnosis function				Action and Judgment
Check code	**Block**	**Check code**	**Cause of operation**	**Air conditioner status**	**Display flashing error**	
01	Serial signal and connecting cable.	04	1) Defective wiring of the connecting cable or miss-wiring. 2) Operation signal has not send from the indoor unit when operation start. 3) Outdoor unit has not send return signal to the indoor unit when operation started. 4) Return signal from the outdoor unit is stop during operation. ● Some protector (hardware, if exist) of the outdoor unit open circuit of signal. ● Signal circuit of indoor P.C. board or outdoor P.C. board is failure in some period.	Indoor unit operates continue. Outdoor unit stop.	Flashes when error is detected. Flashing stop and outdoor unit start to operate when the return signal from the outdoor unit is normal.	1) to 3) The outdoor unit never operate. ● Check connecting cable and correct if defective wiring. ● Check 25A fuse of inverter P.C. board. ● Check 3.15A fuse of inverter P.C. board. ● Check operation signal of the indoor unit by using diode. Measure voltage at terminal block of the indoor unit between No.2 and No.3 (or L2 and S) If signal is varied 15-60V continuously, replace inverter P.C. board. If signal is not varied, replace indoor P.C. board. 4) The outdoor unit abnormal stop at some time. ● If the other check codes are found concurrently, check them together. ● Check protector (hardware) such as Hi-Pressure switch, Thermal-Relay, etc. ● Check refrigerant amount or any possibility case which may caused high temperature or high pressure. ● Check operation signal of the indoor unit by using diode. Measure voltage at terminal block of the indoor unit between No.2 and No.3 (or L2 and S) If signal is varied 15-60V continuously, replace inverter P.C. board. If signal is not varied, replace indoor P.C. board.

Note : Operation signal of the indoor unit shall be measured in the sending period as picture below.

Sending signal of the indoor unit when have not return signal from the outdoor unit.



* Signal send only 1 minute and stop. Because of return signal from outdoor unit has not received.

** Signal resend again after 3 minutes stop. And the signal will send continuously.

*** 1 minute after resending, the indoor unit display flashes error.

Block distinction		Operation of diagnosis function				Action and Judgment
Check code	Block	Check code	Cause of operation	Air conditioner status	Display flashing error	
02	Outdoor	14	Current on inverter circuit is over limit in short time. ● Inverter P.C. board is failure, IGBT shortage, etc. ● Compressor current is higher than limitation, lock rotor, etc.	All OFF	Flashes after error is detected 8 times*.	1. Remove connecting lead wire of the compressor, and operate again. 2. If outdoor fan does not operate or operate but stop after some period, replace the inverter P.C. board. 3. If outdoor fan operates normally, measure 3-Phase output of inverter P.C. board (150-270VAC) at the connecting lead wire of compressor. 4. If 3-Phase output is abnormal, replace inverter P.C.Board. 5. If 3-Phase output is normal, replace compressor. (lock rotor, etc.)
		16	Compressor position-detect circuit error or short-circuit between winding of compressor.	All OFF	Flashes after error is detected 8 times*.	1. Remove connecting lead wire of the compressor, and operate again. 2. If outdoor fan does not operate or operation but stop after some period, replace the inverter P.C. board. 3. If outdoor fan operates normally, measure resistance of compressor winding. If circuit is shortage, replace the compressor.
		17	Current-detect circuit of inverter P.C. board error.	All OFF	Flashes after error is detected 4 times*.	Even if trying to operate again, all operations stop, replace inverter P.C. board.
		18	TG sensor; abnormal. Out of place, disconnection, shortage, or mis connection (TG sensor is connected to TG connector, TG sensor is connected to TG sensor connector) TG sensor; Outdoor heat exchanger temperature sensor TG sensor; Suction pipe temperature sensor	All OFF	Flashes after error is detected 4 times*.	1. Check sensors, TG connection. In case of sensors and it's connection is normal, check the inverter P.C. board 2. Check 4way valve operation/position. In case TG detected temperature relationship are different from normal operation, "18" might be detected.
		19	TD sensor ; Discharge pipe temperature sensor is disconnection or shortage.	All OFF	Flashes after error is detected 4 times*.	1. Check sensors TD and connection. 2. In case of the sensor and its connection is normal, check the inverter P.C. board.
		1A	Outdoor fan failure or its drive-circuit on the inverter P.C. board failure.	All OFF	Flashes after error is detected 8 times*.	1. Check the motor, measure winding resistance, shortage or lock rotor. 2. Check the inverter P.C. board.
		1b	TO sensor ; The outdoor temperature sensor is disconnection or shortage.	Operation continues.	Record error after detected 4 times*. But does not flash display.	1. Check sensors TO and connection. 2. In case of the sensor and its connection is normal, check the inverter P.C. board.

Block distinction		Operation of diagnosis function				Action and Judgment
Check code	Block	Check code	Cause of operation	Air conditioner status	Display flashing error	
02	Outdoor	1C	Compressor drive output error. (Relation of voltage, current and frequency is abnormal) ● Overloading operation of compressor caused by over-charge refrigerant, P.M.V. failure, etc. ● Compressor failure (High current). ● TG sensor; abnormal. Out of place, disconnection, shortage, or mis connection (TG sensor is connected to TG connector, TG sensor is connected to TG sensor connector) TG sensor; Outdoor heat exchanger temperature sensor TG sensor; Suction pipe temperature sensor	All OFF	Flashes after error is detected 8 times*.	1. Check installation conditions such as packed valve opening, refrigerant amount and power supply (rate ±10%, both of operation and non operation condition). 2. (In case of P.M.V. exists) Check P.M.V. by measure the resistance of the coil and confirm its operation (sound of initial operation, etc.) 3. Observe any possibility cause which may affect operation load of compressor. 4. Operate again. If compressor operation is failure when 20 seconds passed (count time from operation starting of compressor), replace compressor. 5. Check sensors, TG connection. In case of sensors and it's connection is normal, check the inverter P.C. board. 6. Check 4way valve operation/position. In case TG detected temperature relationship are different from normal operation, "1C" might be detected.
	* 4 or 8 times ; When first error is detected, error is count as 1 time, then once operation is stop and re-started. After re-starting operation within 6 minutes, if same error is detected, error count is add (count become 2 times) When error count comes 4, 8, 11 or 18 times, record error to check code. But after re-starting operation, if no error is detected and air conditioner can operate more than 6 minutes, error count is cleared.					
03	The others (including compressor)	07	Return signal of the outdoor unit has been sent when operation start. But after that, signal is stop some time. ● Instantaneous power failure. ● Some protector (hardware) of the outdoor unit open circuit of signal. ● Signal circuit of indoor P.C. board or outdoor P.C. board is failure in some period.	Indoor unit operates continue. Outdoor unit stop.	Flashes when error is detected. Flashing stop and outdoor unit start to operate when the return signal from the outdoor unit is normal.	1. Check power supply (Rate ± 10%) 2. If the air conditioner repeat operates and stop with interval of approx. 10 to 40 minutes. ● (In case of these exist) Check protector (hardware) such as Hi-Pressure switch, Thermal-Relay, etc. ● Check refrigerant amount, packed valve opening and any possibility cause which may affect high temperature or high pressure. 3. Check operation signal of the indoor unit by using diode. Measure voltage at terminal block of the indoor unit between No.2 and No.3 (or L2 and S) If signal is varied 15-60V continuously, replace inverter P.C. board. If signal is not varied, replace indoor P.C. board.

Block distinction		Operation of diagnosis function				Action and Judgment
Check code	Block	Check code	Cause of operation	Air conditioner status	Display flashing error	
03	The others (including compressor)	1d	Compressor does not rotate. Because of missed wiring, missed phase or shortage.	All OFF	Flashes after error is detected 8 times*.	1. Remove connecting lead wire of the compressor, and operate again. 2. If outdoor fan does not operate or operation but stop after some period, replace the inverter P.C. board. 3. If outdoor fan operates normally, measure 3-Phase output of inverter P.C. board (150-270VAC) at the connecting lead wire of compressor. 4. If 3-Phase output is abnormal, replace inverter P.C.Board. 5. If 3-Phase output is normal, measure resistance of compressor winding. 6. If winding is shortage, replace the compressor.
		1E	Discharge temperature exceeded 117°C.	All OFF	Flashes after error is detected 4 times*.	1. Check sensors TD. 2. Check refrigerant amount. 3. (In case of P.M.V. exists) Check P.M.V. by measure the resistance of the coil and confirm its operation (sound of initial operation, etc.) 4. Observe any possibility cause which may affect high temperature of compressor.
		1F	Compressor is high current though operation Hz is decreased to minimum limit. ● Installation problem. ● Instantaneous power failure. ● Refrigeration cycle problem. ● Compressor break down. ● Compressor failure (High current).operation, etc.)	All OFF	Flashes after error is detected 8 times*.	1. Check installation conditions such as packed valve opening, refrigerant amount and power supply (rate ±10%, both of operation and non operation condition). 2. (In case of P.M.V. exists) Check P.M.V. by measure the resistance of the coil and confirm its operation (sound of initial operation, etc.) 3. Observe any possibility cause which may affect high current of compressor. 4. If 1, 2 and 3 are normal, replace compressor.
		20	PMV error	All OFF	Displayed when error is detected.	1. Check LED (D800-D805) on inverter P.C.board. 2. Check connection of PMV wiring. 3. Start operation. (Excluding error room) 4. If the same error is occurred. Replace PMV

Block distinction		Operation of diagnosis function				Action and Judgment
Check code	Block	Check code	Cause of operation	Air conditioner status	Display flashing error	
03	The others (including compressor)	21	Return signal of the outdoor unit has been sent when operation start. But after that, signal is stop some time. ● Instantaneous power failure. ● Some protector (hardware) of the outdoor unit open circuit of signal. ● Signal circuit of indoor P.C.board of outdoor P.C.board is failure in some period. ● TE, TC high temperature TE for cooling operation TC for heating operation. (TE only exists in the Heat Pump system) ● TE of TG sensor; abnormal. Out of place, disconnection, shortage, or mis connection (TE sensor is connected to TS connector, TG sensor is connected to TE sensor connector) TE sensor; Outdoor heat exchanger temperature sensor TG sensor; Suction pipe temperature sensor	Indoor unit operates continue. Outdoor unit stop.	Flashes when error is detected 11 times*. Flashing stop and outdoor unit start to operate when the return signal from the outdoor unit is normal.	1. Check power supply (Rate ±10%) 2. If the air conditioner repeat operat and stop with interval of approx. 10 to 40 minutes. ● (In case of these exist) Check protector (hardware) such as Hi-Pressure switch, Thermal-Relay, etc. ● Check refrigerant amount, packed valve opening and any possibility cause which may affect high temperature or high pressure. 3. Check operation signal of the indoor unit by using diode. Measure voltage at terminal block of the indoor unit between No.2 and No.3 (or L2 and S) If signal is varied 15-60V continuously, replace inverter P.C. board. If signal is not varied, replace indoor P.C. board. 4. Check and clean heat exchanger area Indoor and Outdoor unit. 5. Check sensors, TE, TG connection. In case of sensors and it's connection is normal, check the inverter P.C. board. 6. Check 4way valve operation/position. In case TE, TG detected temperature relationship are different from normal operation, "21" might be detected.

* 4, 8 or 11 times ; When first error is detected, error is count as 1 time, then once operation is stop and re-started. After re-starting operation within 6 minutes, if same error is detected, error count is add (count become 2 times) When error count comes 4, 8, 11 or 18 times, record error to check code. But after re-starting operation, if no error is detected and air conditioner can operate more than 6 minutes, error count is cleared.

11-5. Judgment of Trouble by Symptom

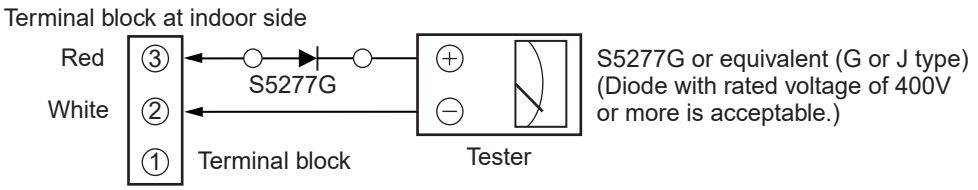
11-5-1. Wiring Failure (Interconnecting and Serial Signal

Wire)(1) Outdoor unit does not operate

1) Is the voltage between ② and ③ of the indoor terminal block varied?
2) Confirm that transmission from indoor unit to outdoor unit is correctly performed based upon the following diagram.

NOTE

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

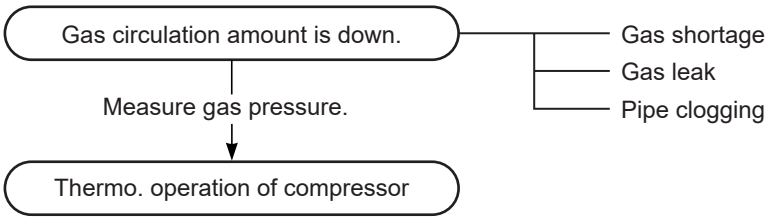


Normal time : Voltage swings between DC15 and 60V. ..... Inverter Assembly check
Abnormal time : Voltage does not vary.

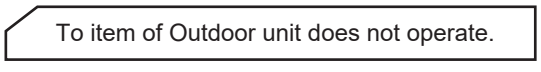
(2) Outdoor unit stops in a little while after operation started

<Check procedure> Select phenomena described below.

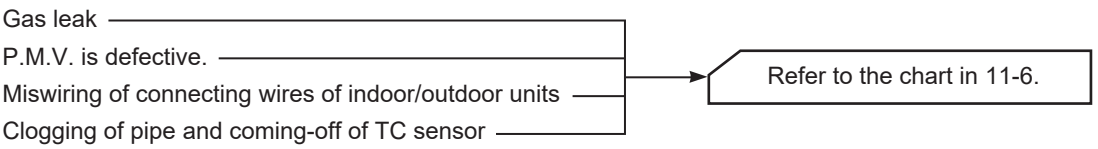
1) The outdoor unit stops 10 to 20 minutes after operation started, and 10 minutes or more are required to restart the unit.



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



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



Service Support Function (LED Display, Switch Operation)

1. Outline

A various setup and operation check can be performed by the push down button switches (SW81, SW82) on the outdoor control P.C. board WP-524.

Operation part

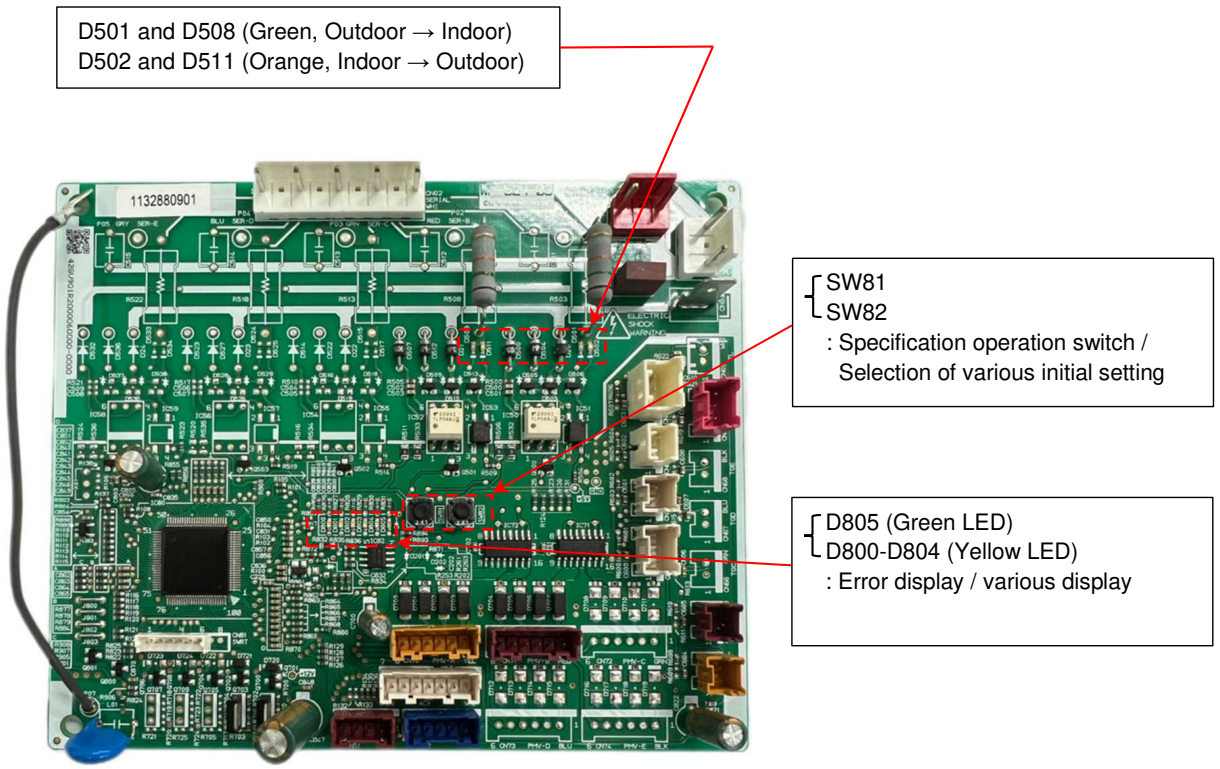
Part No.	Specifications	Operation contents
SW81 SW82	Push down button switch	Performs the specific operation to check maintenance and various initial settings.

Display part

Part No.	Specifications	Operation contents
D502, D511	Orange LED	Indoor/Outdoor communication (Serial communication) signal display (Receive signal from indoor signal)
D501, D508	Green LED	Indoor/Outdoor communication (Serial communication) signal display (Send signal from outdoor signal)
D805	Green LED	(1) Power-ON display When the power of the outdoor unit is turned on, D805 LED goes on. (2) Error display When the outdoor controller detects some errors, some LEDs go on or flash according to the error as described in Error display table. (Refer to 11-6) (3) Specific operation display When SW81 is pushed and a specific operation is operated, some LEDs go on or flash.
D800 to D804	Yellow LED	

∗ Every LED is colorless when it goes off.

Control P.C.B WP-524



11-6. Trouble Diagnosis by Outdoor LED

For the outdoor unit, the self-diagnosis is possible by LED (Green) and five LEDs (Yellow).
Green LED (D805) and Yellow LEDs (D800 to D804) are provided on the display P.C. board WP-524.

1. In the initial LED display status, Green LED(D805) is lighted as below.

Normal

D800 (Yellow)	D801 (Yellow)	D802 (Yellow)	D803 (Yellow)	D804 (Yellow)	D805 (Green)
●	●	●	●	●	○

○:ON ●:OFF

Error occurring

D800 (Yellow)	D801 (Yellow)	D802 (Yellow)	D803 (Yellow)	D804 (Yellow)	D805 (Green)
●/○*	●/○*	●/○*	●/○*	●/○*	○

○:ON ○*:3 sec ON/0.5 sec OFF ●:OFF

2. If there is an error, Yellow LED are lighted according to the error as described in the below table.
3. When there are two or more errors, LEDs flash cyclically.
4. When D804 or D805 are flashing (rapid or slow), push and hold SW81 and SW82 simultaneously for 5 seconds or more. (Display returns to the error display.)

○:ON (○*:3 sec ON/0.5 sec OFF)●:OFF

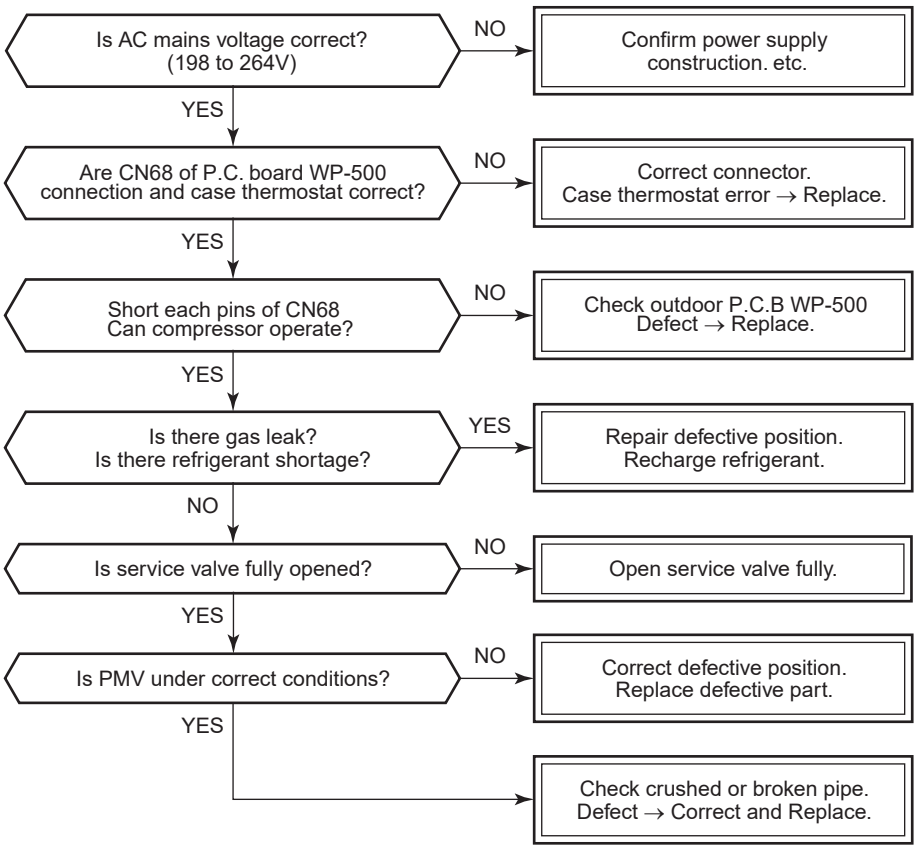
	Display						Indoor check code	Description
	D800 (YL)	D801 (YL)	D802 (YL)	D803 (YL)	D804 (YL)	D805 (GN)		
	●	●	●	●	●		-	Normal operation (no error)
	○*	●	●	●	●		1C	Compressor case thermostat error
	●	○*	●	●	●		21	High pressure switch error
	○*	○*	●	●	●		1C	Compressor system error
	●	●	○*	●	●		1d	Compressor lock
	○*	●	○*	●	●		1F	Compressor breakdown
	●	○*	○*	●	●		14	Driving element short circuit
	○*	○*	○*	●	●		16	Position detection circuit error
	●	●	●	○*	●		17	Current detection circuit error
	○*	●	●	○*	●	○	1C	Communication error between MCU
	●	○*	●	○*	●		1A	Fan system error
	○*	○*	●	○*	●		1E	Discharge temperature error
	●	●	○*	○*	●		19	Discharge temperature sensor (TD) error
*1	○*	●	○*	○*	●		1b	Outdoor air temperature sensor (TO) error
	●	○*	○*	○*	●		18	Suction temperature sensor (TS) error
*2	●	●	●	●	○*		1C	Gas pipe (unit A) temperature sensor (TGa) error
*2	○*	●	●	●	○*		1C	Gas pipe (unit B) temperature sensor (TGb) error
	○*	●	○*	●	○*		-	PMV error (SH≥20)
	●	○*	○*	●	○*		-	PMV error (SH≤−8)
	●	●	●	○*	○*		20	PMV leakage error (unit A)
	○*	●	●	○*	○*		20	PMV leakage error (unit B)
	○*	●	○*	○*	○*		-	Miswiring (mispiping) check error
	●	○*	○*	○*	○*		1C	Communication error between MCU
	○*	○*	○*	○*	○*		1C	Communication error between MCU

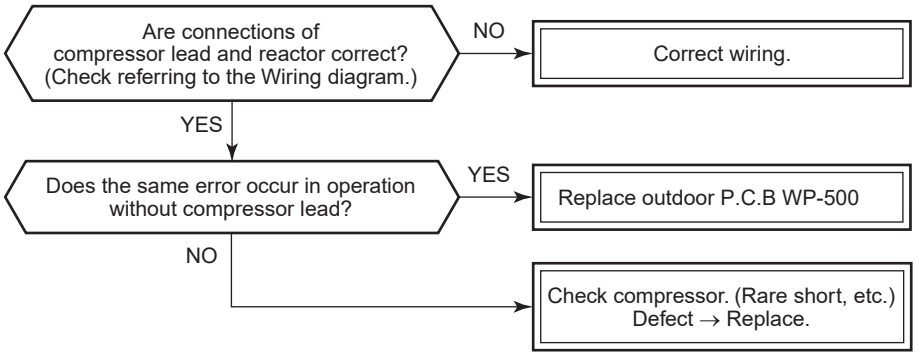
∗1: Back-up operation is performed without error display of the indoor unit.
∗2: Operated normally when the air conditioners in other rooms are driven.

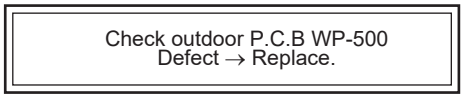
- The D800 LED represents unit A.
- The D801 LED represents unit B.

○:ON (○*:3 sec ON / 0.5 sec OFF) ●:OFF

Check code	Outdoor LED display	Check and troubleshooting (Item without special mention indicates part of outdoor unit.)
[1C]	○*●●●●○	**[Case thermo operation, Power supply error]**
[14]	●○*○*●●○	**[Short-circuit of compressor drive element]**
[16]	○*○*○*●●○	**[Position detection circuit error]**
[17]	●●●○*●○	**[Current detection circuit error]**

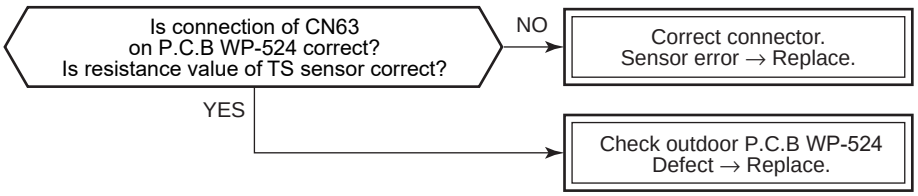


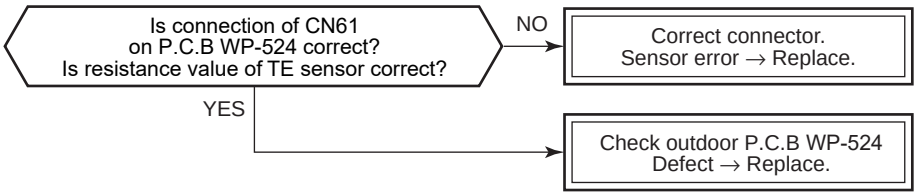


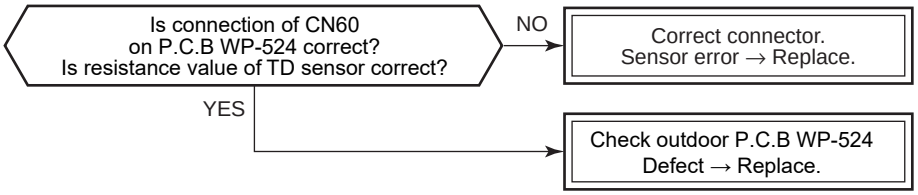


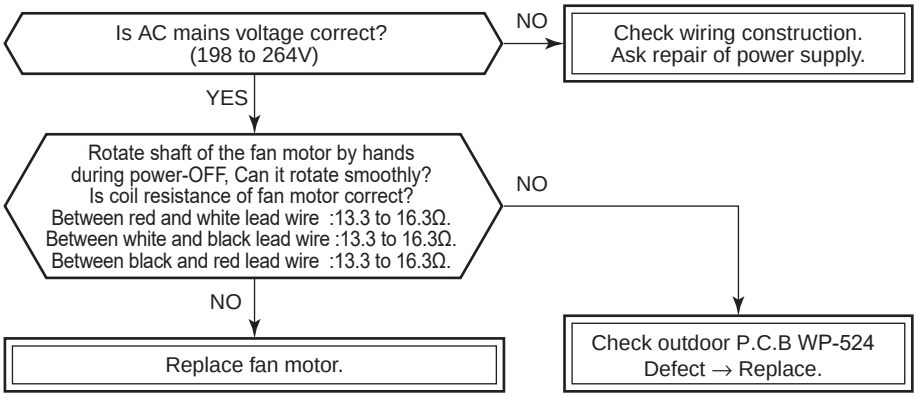
○:ON (○*:3 sec ON / 0.5 sec OFF) ●:OFF

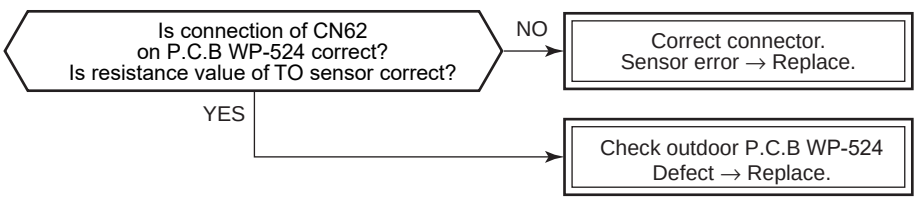
Check code	Outdoor LED display	Check and troubleshooting (Item without special mention indicates part of outdoor unit.)
[18]		
	●○*○*○*●○	**[Suction temp. sensor (TS) error]**
	○*○*○*○*●○	**[Heat exchanger temp. sensor (TE) error]**
[19]	●●○*○*●○	**[Discharge temp. sensor (TD) error]**
[1A]	●○*●○*●○	**[Fan system error]**
[1B]	○*●○*○*●○	**[Outside temp. sensor (TO) error]**





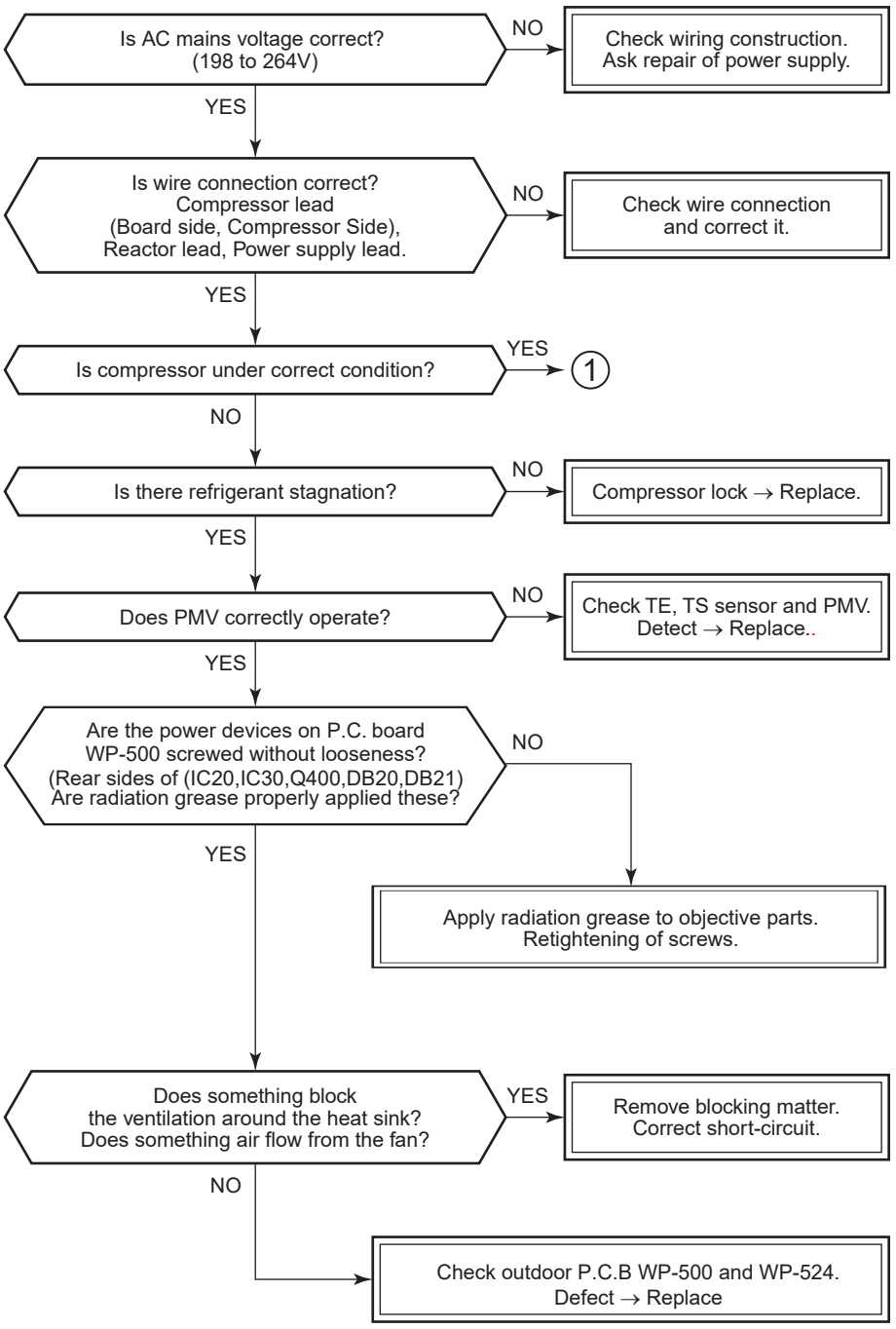






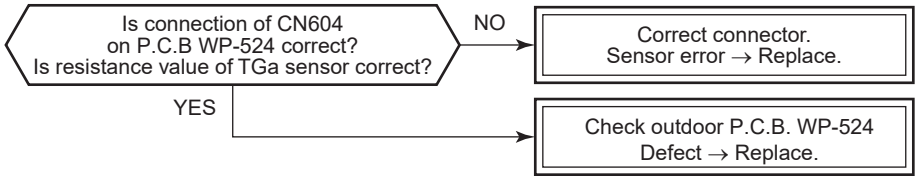
○:ON (○*:3 sec ON / 0.5 sec OFF) ●:OFF

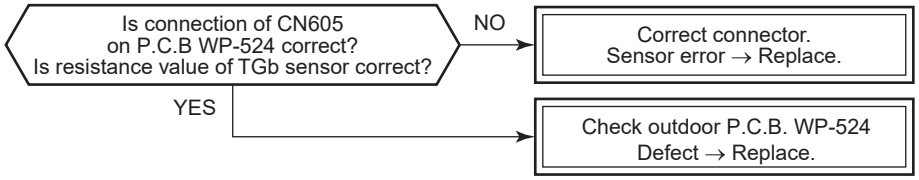
Check code	Outdoor LED display	Check and troubleshooting (Item without special mention indicates part of outdoor unit.)
[1C]		∗ There is a possibility that it is one of the following errors. Confirm LED on display P.C. board to judge which error it is. Compressor system error, Compressor lock, Gas side temp. sensor (TGa to TGb) error, Gas leakage, PMV error
	○*○*●●●○	**[Compressor system error, Compressor lock]**

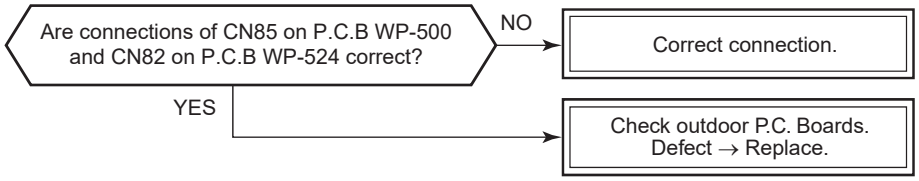


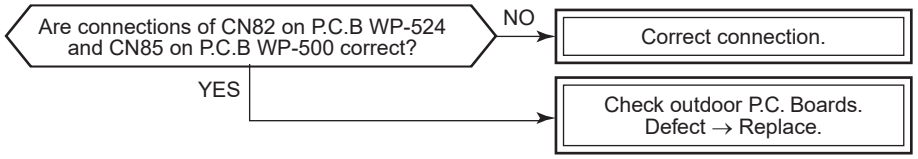
○:ON (○*:3 sec ON / 0.5 sec OFF) ●:OFF

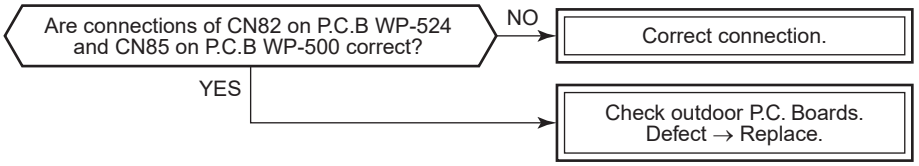
Check code	Outdoor LED display	Check and troubleshooting (Item without special mention indicates part of outdoor unit.)
[1C] (Continued)	●●●●○*○	**[A room gas side temp. sensor (TGa) error]**
	○*●●●○*○	**[B room gas side temp. sensor (TGb) error]**
	○*●●○*●○	**Communication error between MCUs**
	●○ *○*○*○*○	**[Communication error between MCUs]**
	○*○*○*○*○*○	**[Communication error between MCUs]**





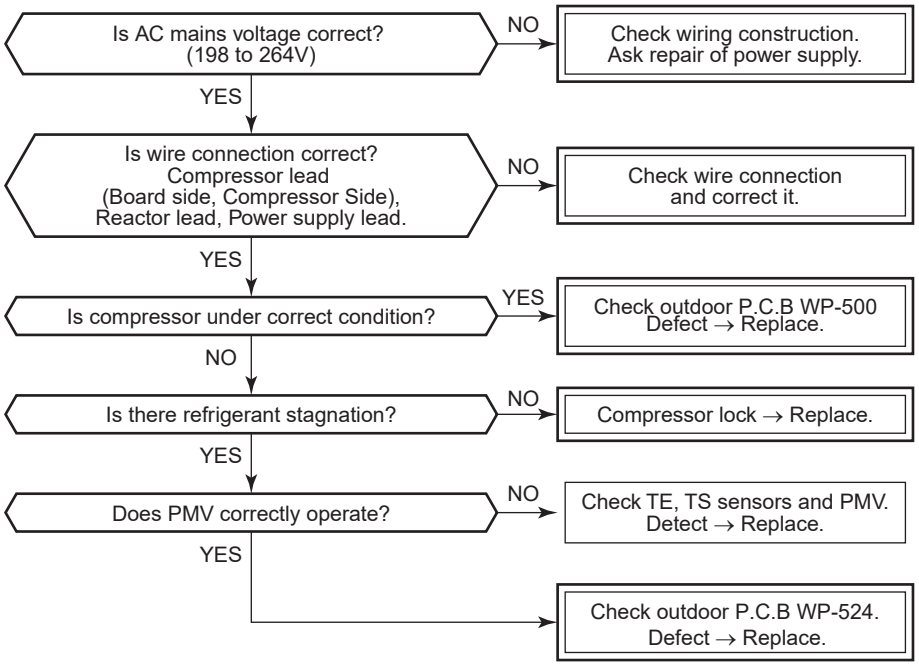


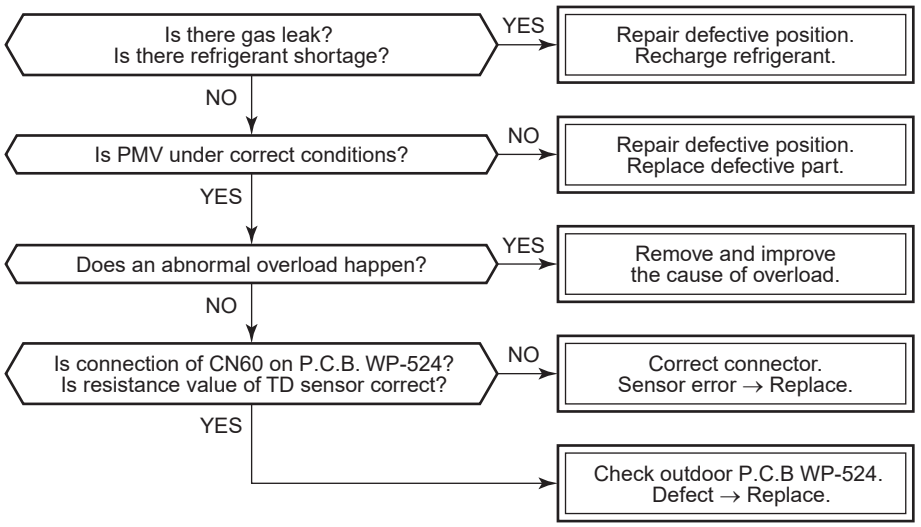


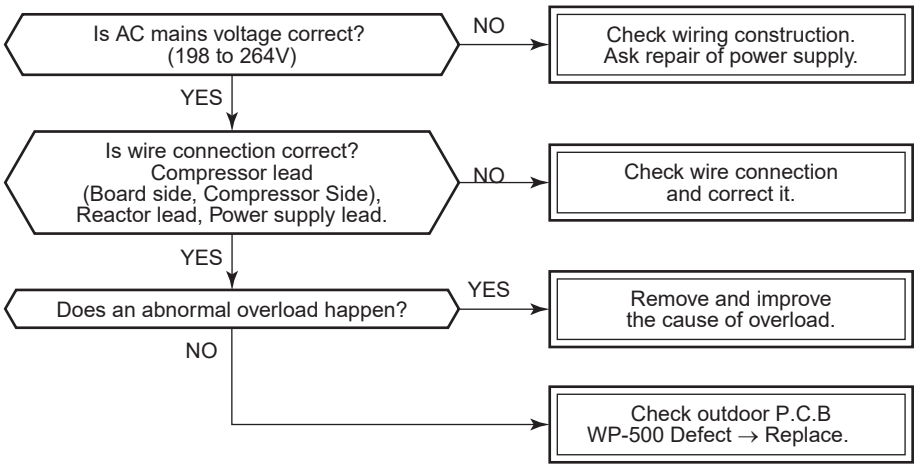


○:ON (○*:3 sec ON / 0.5 sec OFF) ●:OFF

Check code	Outdoor LED display	Check and troubleshooting (Item without special mention indicates part of outdoor unit.)
[1d]	●●○*●●○	**[Compressor lock]**
[1E]	○*○*●○*●○	**[Discharge temp. error]**
[1F]	○*●○*●●○	**[Compressor break down]**





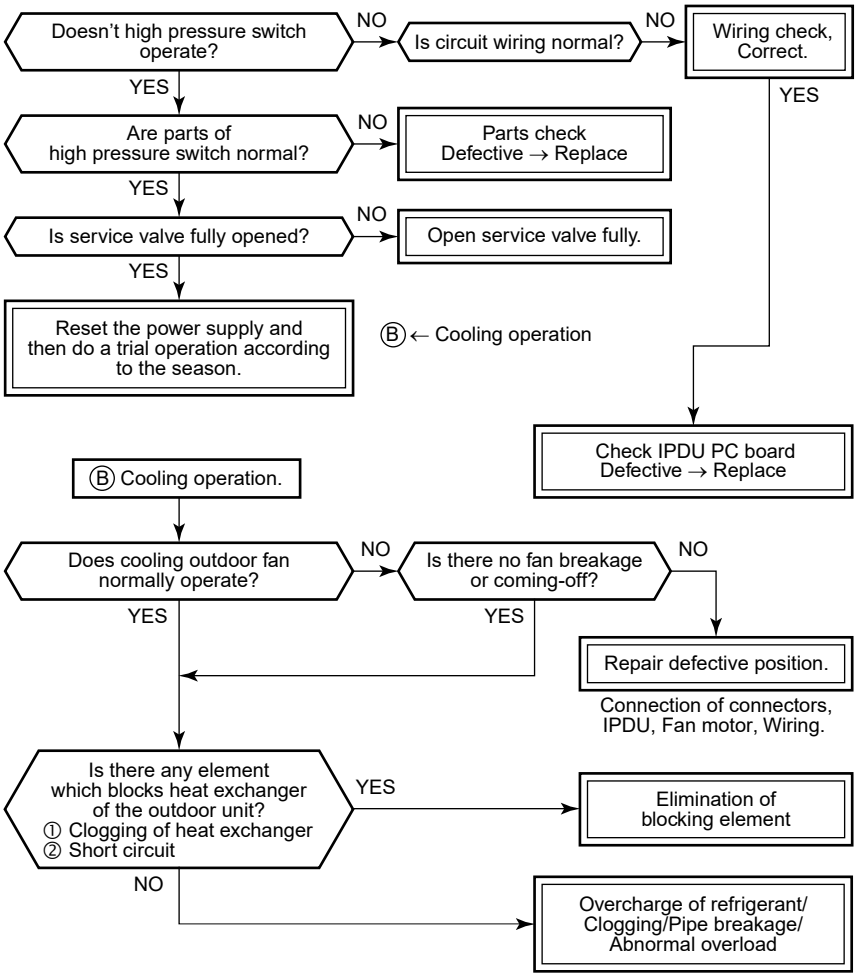


○:ON (○*:3 sec ON / 0.5 sec OFF) ●:OFF

Check code	Outdoor LED display	Check and troubleshooting (Item without special mention indicates part of outdoor unit.)
[20]		∗ There is a possibility that it is one of the following errors. Confirm LED on outdoor P.C. board to judge which error it is. PMV error for A room and B room.
	●●●○*○*○	∗ **[PMV error for A room]** Is PMV under correct conditions? NO → Repair defective position. Replace defective part. YES Check temp. sensor of A room indoor unit? TA sensor, TC sensor Error → Correct connector. Sensor error → Replace. OK Check outdoor P.C.B. WP-524 and indoor A room P.C. board. Defect → Replace.
	○*●●○*○*○	**[PMV error for B room]** Is PMV under correct conditions? NO → Repair defective position. Replace defective part. YES Check temp. sensor of B room indoor unit? TA sensor, TC sensor Error → Correct connector. Sensor error → Replace. OK Check outdoor P.C.B. WP-524 and indoor B room P.C. board. Defect → Replace.

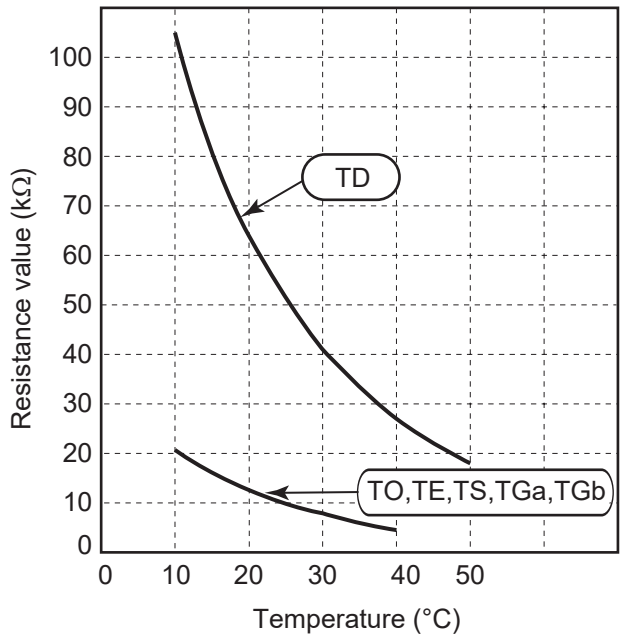
○:ON (○*:3 sec ON / 0.5 sec OFF) ●:OFF

Check code	Outdoor LED display	Check and troubleshooting (Item without special mention indicates part of outdoor unit.)
[21]		∗ There is a possibility that it is one of the following errors. Confirm LED on outdoor P.C. board to judge which error it is. (1) high-pressure SW system error, (2) power supply error (Vdc), (3) high-pressure protective operation, (4) case thermo operation.
	●○*●●●○	**[High pressure SW system error]** High pressure protective operation.



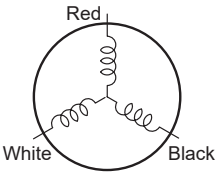
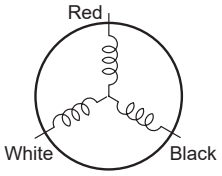
11-7. Inspection of the Main Parts

[1] Sensor characteristic table



TD : Discharge temp. sensor
TO : Outdoor temp. sensor
TE : Outdoor heat exchanger temp. sensor
TS : Suction temp. sensor
TGa to TGb : Gas side temp. sensor

11-8. Outdoor Unit

<table>
<tr><th>No.</th><th>Part name</th><th>Checking procedure</th></tr>
<tr><td>1</td><td>Compressor
(Model : KTM225D43UMU)</td><td>Measure the resistance value of each winding by using the tester.
 
<table><tr><th>Position</th><th>Resistance value</th></tr><tr><td>Red - White</td><td rowspan="3">0.61Ω</td></tr><tr><td>White - Black</td></tr><tr><td>Black - Red</td></tr></table>Under 20°C</td></tr>
<tr><td>2</td><td>Outdoor fan motor
(Model : LDF-340-A100-1)</td><td>Measure the resistance value of winding by using the tester.
 
<table><tr><th>Position</th><th>Resistance value</th></tr><tr><td>Red - White</td><td rowspan="3">14.8 ± 1.5Ω</td></tr><tr><td>White - Black</td></tr><tr><td>Black - Red</td></tr></table>Under 20°C</td></tr>
<tr><td>3</td><td>Compressor thermo. Bimetal type
(Model : S104CT4C800-CDH)</td><td>Check conduction by using the tester.</td></tr>
<tr><td>4</td><td>High pressure switch
(Model : ACB-1UB177W)</td><td>Check conduction by using the tester.</td></tr>
<tr><td>5</td><td>Outdoor temperature sensor (TO),
pipe temperature sensor
(TGa, TGb)
discharge temperature sensor (TD)</td><td>Disconnect the connector, and measure resistance value with the tester.
(Normal temperature)
<table><tr><th>Temperature / Sensor</th><th>10°C</th><th>20°C</th><th>25°C</th><th>40°C</th><th>50°C</th></tr><tr><td>TD (kΩ)</td><td>105</td><td>64</td><td>51</td><td>27</td><td>18</td></tr><tr><td>TO (kΩ)</td><td>20.6</td><td>12.6</td><td>10.0</td><td>5.1</td><td>3.4</td></tr><tr><td>TGa to TGb (kΩ)</td><td>20.0</td><td>12.5</td><td>10.0</td><td>5.3</td><td>3.6</td></tr></table></td></tr>
</table>

11-9. How to Simply Judge Whether Outdoor Fan Motor is Good or Bad

1. Symptom

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

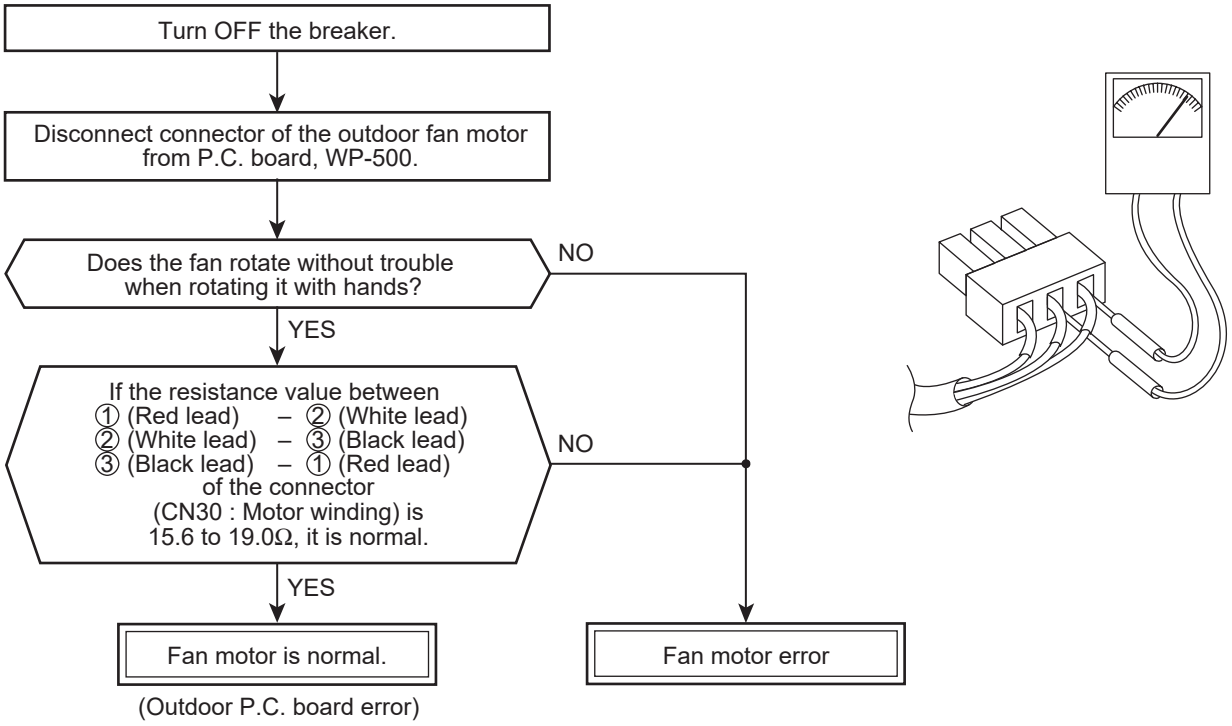
Remote controller check code “02 : Outdoor block, 1A : Outdoor fan drive system error”

2. Cause

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

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

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

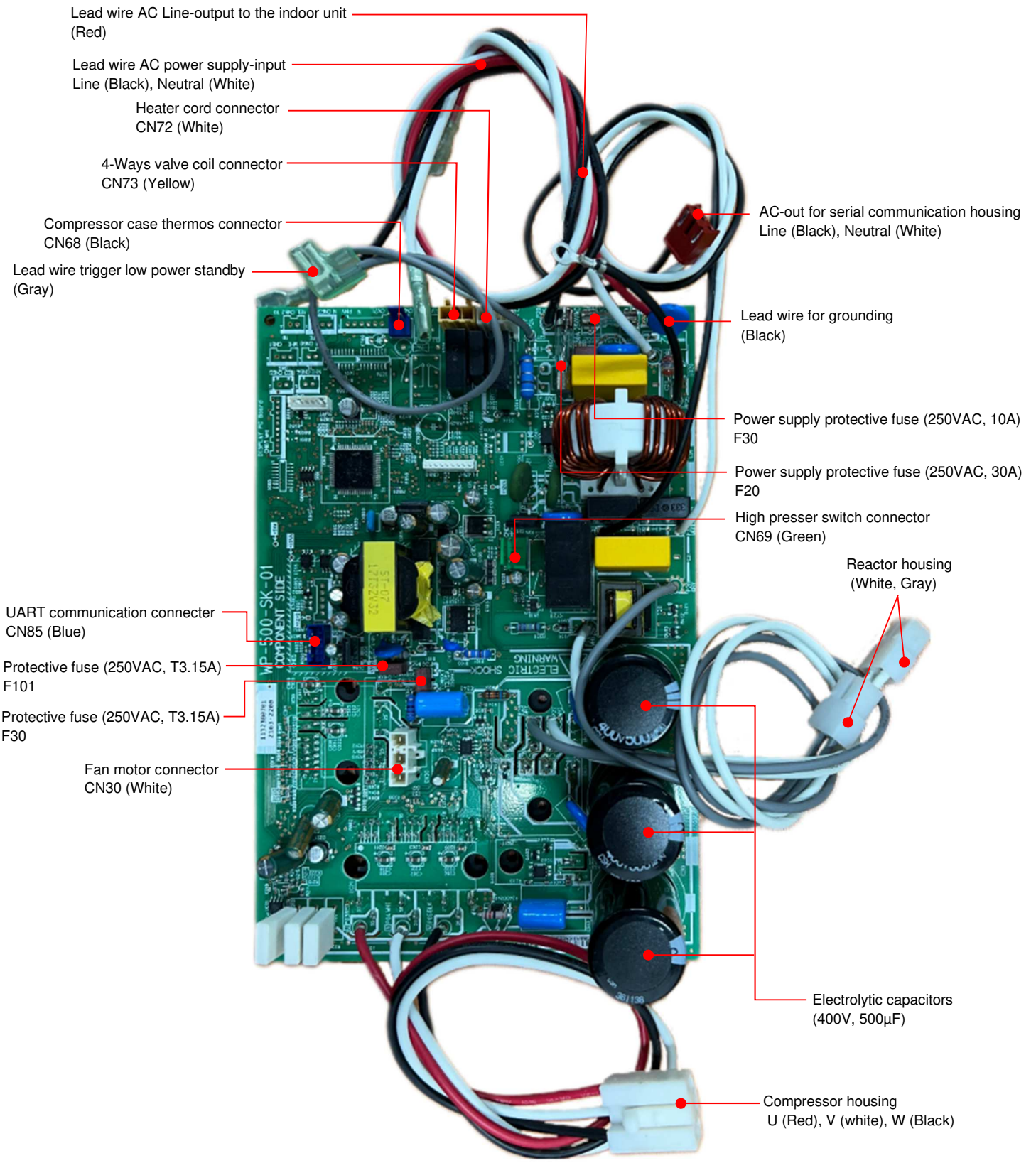


NOTE

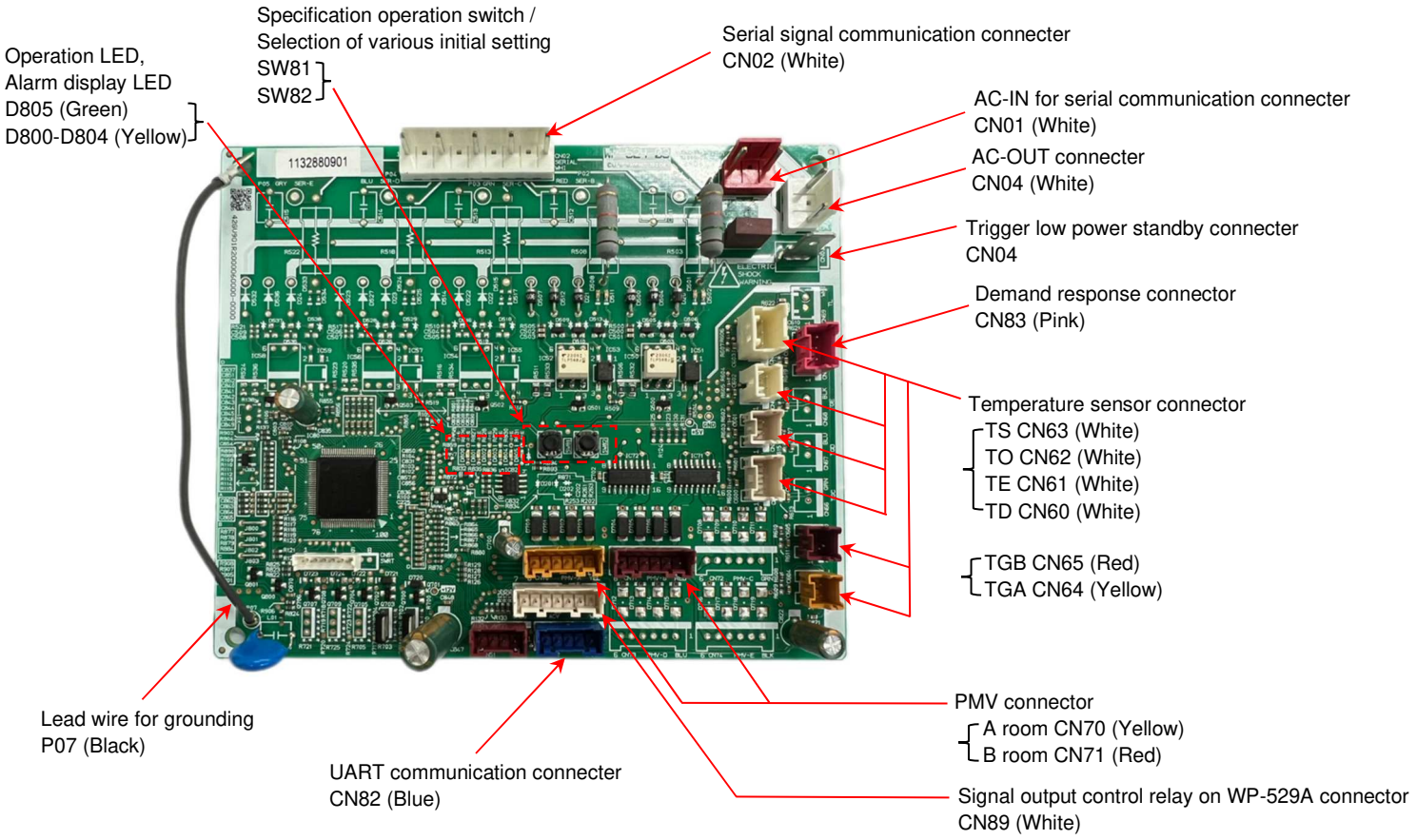
However, GND circuit error inside of the motor may be accepted in some cases when the above check is performed.

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

<WP-500>

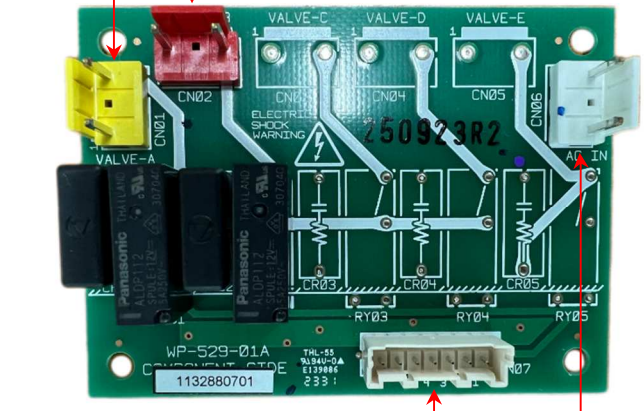

Lead wire AC Line-output to the indoor unit (Red)
Lead wire AC power supply-input Line (Black), Neutral (White)
Heater cord connector CN72 (White)
4-Ways valve coil connector CN73 (Yellow)
Compressor case thermos connector CN68 (Black)
Lead wire trigger low power standby (Gray)
AC-out for serial communication housing Line (Black), Neutral (White)
Lead wire for grounding (Black)
Power supply protective fuse (250VAC, 10A) F30
Power supply protective fuse (250VAC, 30A) F20
High presser switch connector CN69 (Green)
Reactor housing (White, Gray)
UART communication connecter CN85 (Blue)
Protective fuse (250VAC, T3.15A) F101
Protective fuse (250VAC, T3.15A) F30
Fan motor connector CN30 (White)
Electrolytic capacitors (400V, 500µF)
Compressor housing U (Red), V (white), W (Black)

<WP-524>

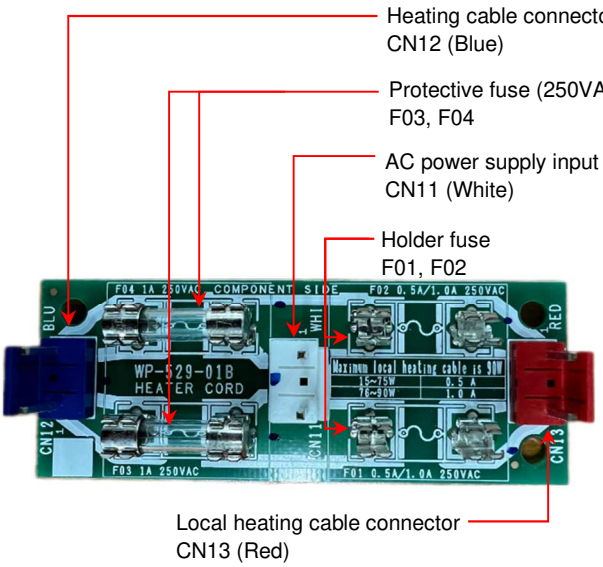


<WP-529>

WP-529-01A

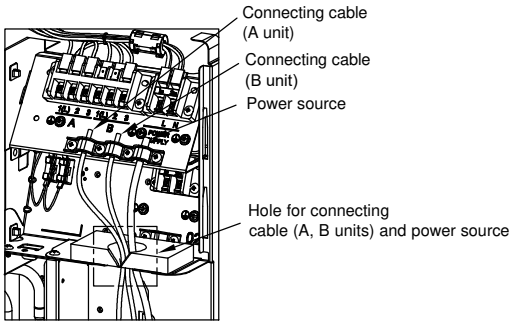
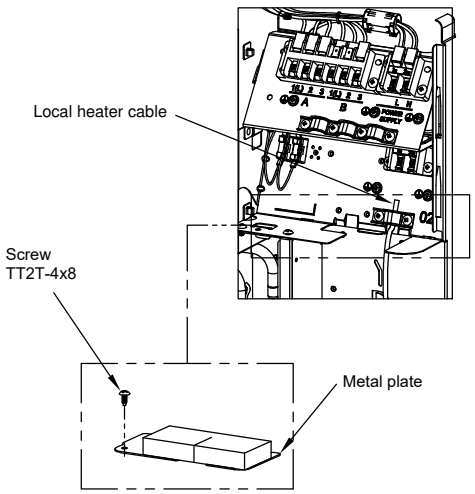
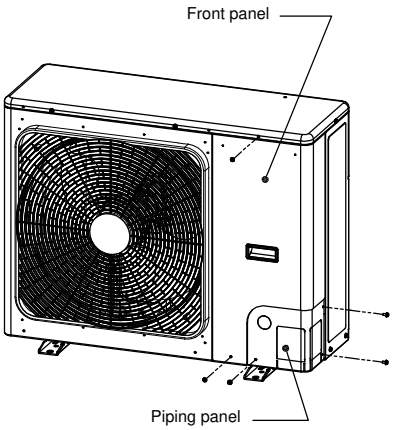
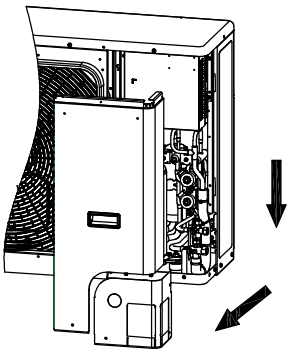
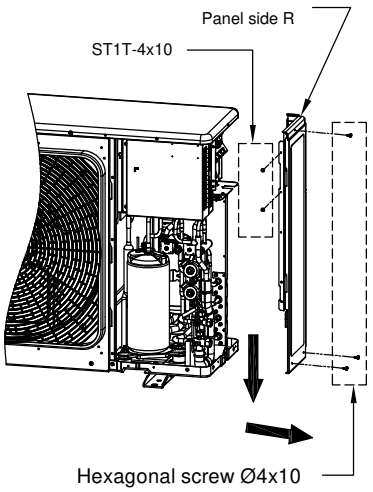


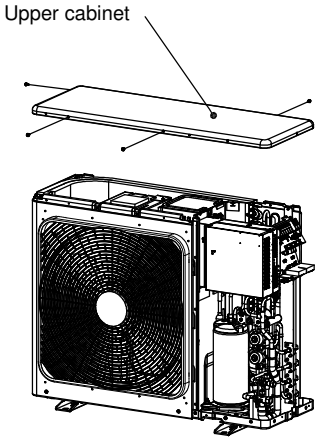
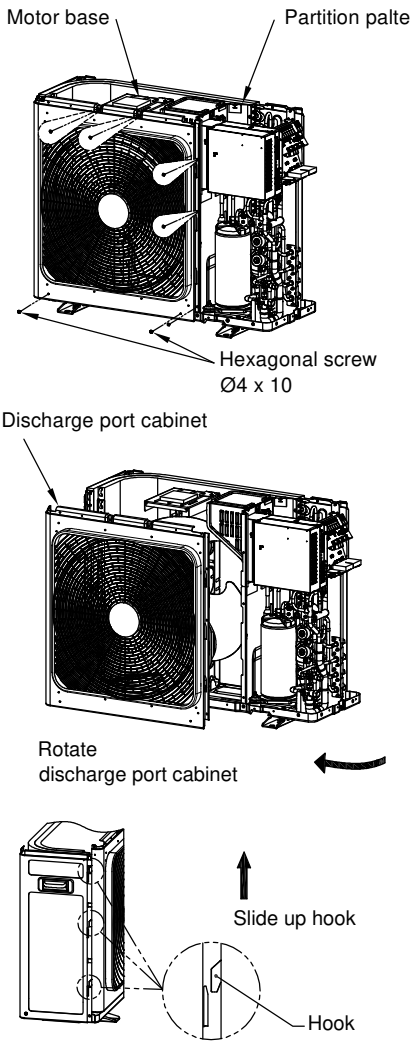
WP-529-01B

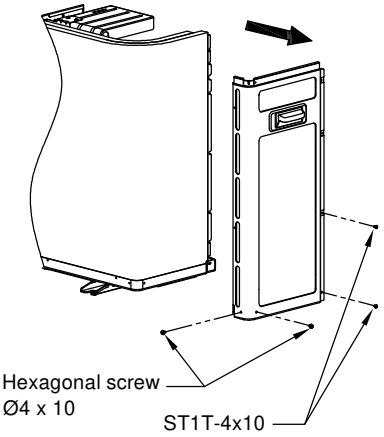
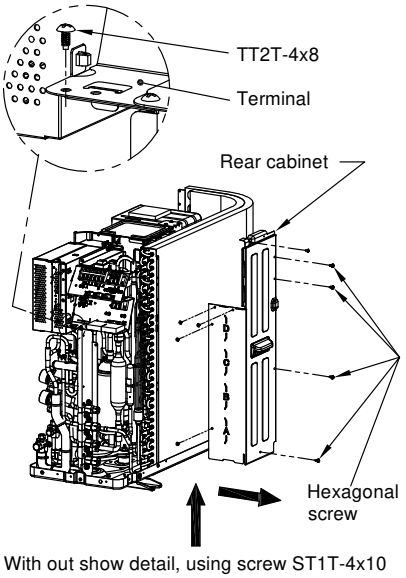


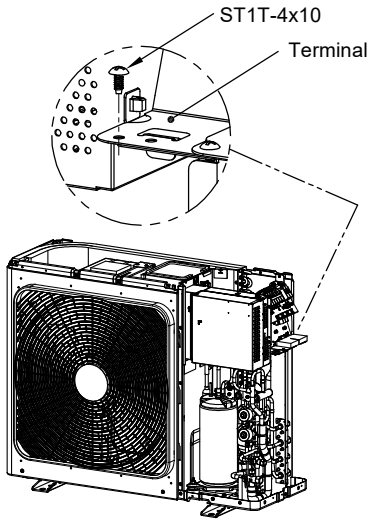
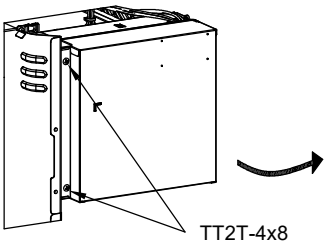
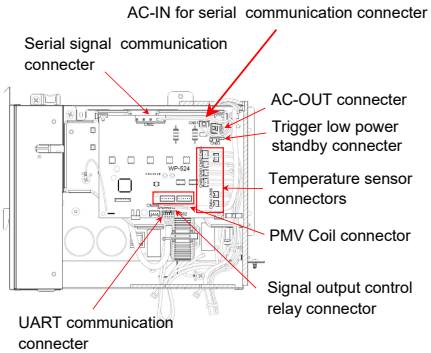
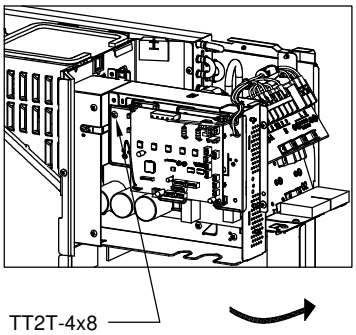
12. HOW TO REPLACE THE MAIN PARTS

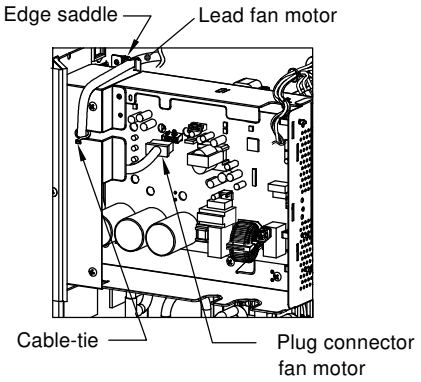
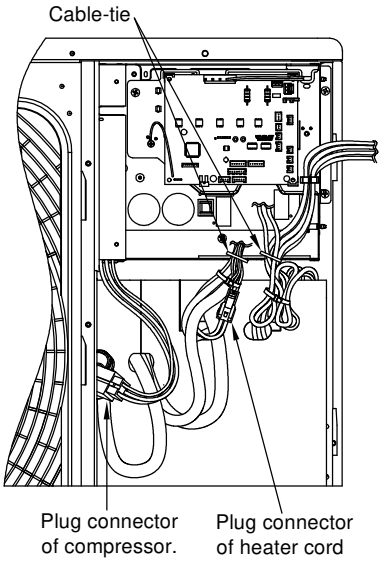
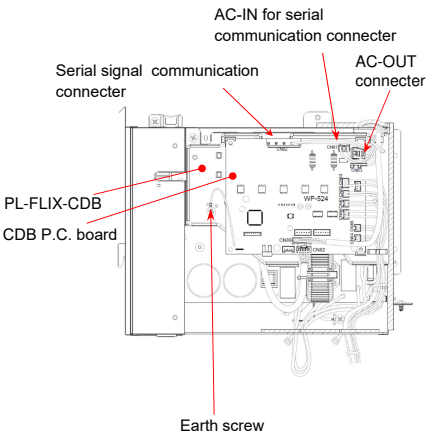
Outdoor Unit

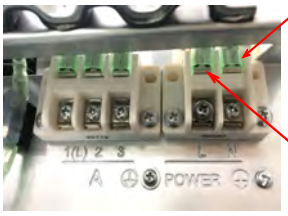
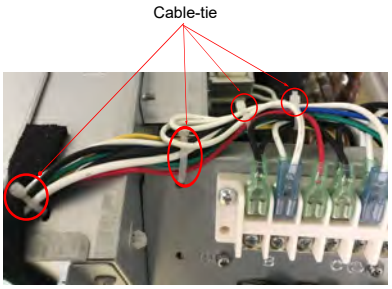
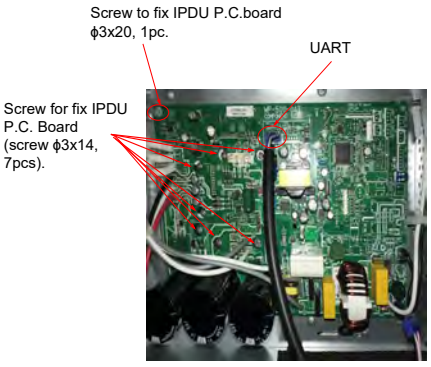
No.	Part name	Procedure	Remarks
①	Common procedure	**CAUTION** Never forget to put on the gloves at working time; otherwise an injury will be caused by the parts etc. 1. Detachment 1) Stop operation of the air conditioner, and turn off the switch of the breaker. 2) Remove the front panel and piping panel (Hexagonal screw Ø4x10, 5 pcs) • After taking off screw, draw the front panel to slide down and remove it while pulling the front panel. • Remove piping panel. 3) Remove the panel side R (Hexagonal screw Ø4x10, 3 pcs) (ST1T-4x10, 2 pcs). • After taking off screw, draw the panel side R to slide down and remove it while pulling the panel side R. 4) Remove the power supply cable and the indoor/ outdoor connecting wire from the cord clamp, metal plate (TT2T-4x8, 1pc) and the terminal.   	   **Screw type** HEX-ST-SCREW Ø4 x 10 TT2T-4x8 MS-GM Ø4 x 8 ST2T-4X8SS5-DP Ø4 x 8 ST1T-4X10SS5-DP Ø4 x 10

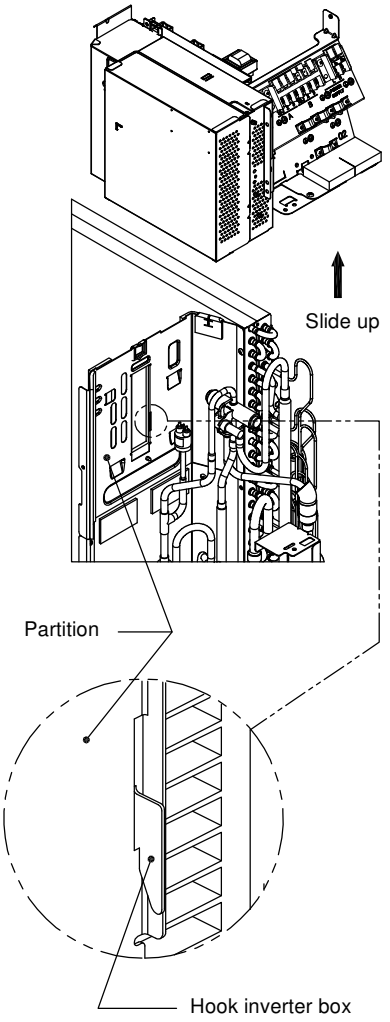
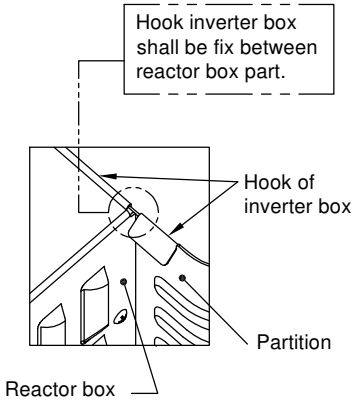
No.	Part name	Procedure	Remarks
		5) Remove the upper cabinet. (Hexagonal screw Ø4 x 10, 4 pcs). 2. Attachment. 1) Mount the upper cabinet (Hexagonal screw Ø4x10, 4 pcs). 2) Connect the power supply cable and the indoor/ outdoor connecting wire to the terminal and the fix them with the cord clamp and metal plate. 3) Mount the piping panel, front panel and panel side R.	
②	Discharge port cabinet	1. Detachment 1) Perform work of Detachment 1 of ① . 2) Take off screw for the discharge port cabinet and the partition plate. (ST1T-4x10, 3 pcs). 3) Take off screw for the discharge port cabinet and the motor base. (ST1T-4 x 10, 2 pcs). 4) Take off screw for the discharge port cabinet and the bottom plate (Hexagonal screw Ø4x10, 2 pcs). 5) Remove the discharge port cabinet * After taking off screw, rotate the discharge port cabinet and slide up from hooks.	

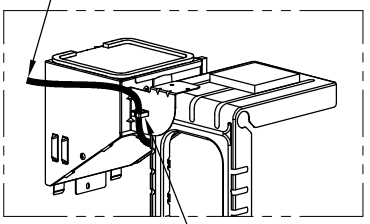
No.	Part name	Procedure	Remarks
③	Left cabinet	1. Detachment. 1) Perform work of Detachment 1 of ① and ②. 2) Take off screw (ST1T-4x10, 2 pcs). 3) Take off screw (Hexagonal screw Ø4x10, 2 pcs). 4) Remove the left cabinet.	
④	Rear cabinet	1. Detachment. 1) Perform work of Detachment 1 of ①. 2) Take off screw (Hexagonal screw Ø4x10, 4pcs). 3) Take off screw (ST1T-4x10, 5 pcs). 4) Take off screw (TT2T-4x8, 1pc).	

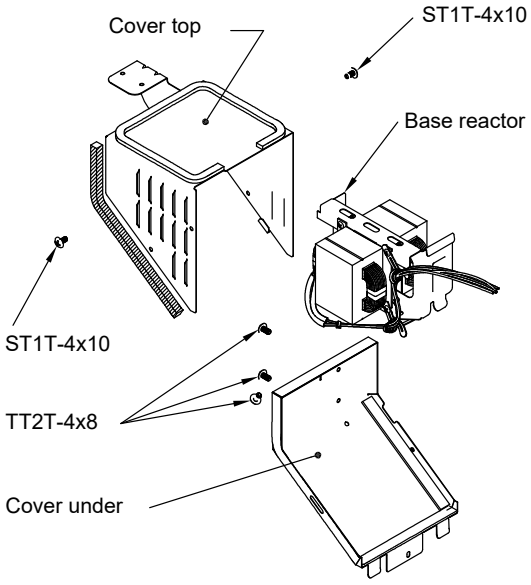
No.	Part name	Procedure	Remarks
⑤	Inverter assembly.	1) Perform works of Detachment 1 of ①. 2) Perform works of Detachment 2 of ④. **WARNING** Never disassemble the inverter until 5 minutes after the power supply was turned off because there is a fear that an electric shock may occur. **NOTE)** When working, be sure to use the insulate tools and put on the insulated gloves. 3) Take off screw for the inverter cover. (TT2T -4x8, 2 pcs). 4) Remove the inverter cover (Rotate the cover to right hand.) 5) Take off the screw fixed CDB P.C board (TT2T-4x8, 1 pc). 6) Remove the CDB P.C board. (Rotate the cover to right hand). to the other parts. CN01 : AC IN (2P, Red) CN02 : Serial communication (5P, White) CN03 : Trigger low power standby power CN04 : AC out (2P, White) CN60 : TD sensor (3P, White) CN61 : TE sensor (2P, White) CN62 : TO sensor (2P, White) CN63 : TS sensor (3P, White) CN64 : TGa sensor (2P, Yellow) CN65 : TGb sensor (2P, Red) CN70 : PMV coil (6P, Yellow) CN71 : PMV coil (6P, Red) CN82 : UART (5P, Blue) CN89 : 2 ways valve coil (7P, White) 7) Move plug connector of fan motor out of board inverter. 8) Cut cable-tie at lead fan motor. 9) Take lead fan motor out of edge saddle. 10) Take lead fan motor out of inverter box. 11) Remove the connector that are connected from IPDU P.C.board to the other parts. CN69 : Hight presser switch (2P, Green) CN68 : Compressor case thermo (2P, Blue)	   

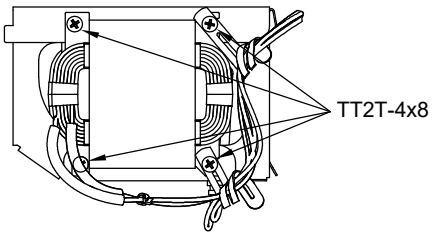
No.	Part name	Procedure	Remarks
⑤	Inverter assembly. (Continue)	12) Take off plug connector of compressor. 13) Take off plug connector of heater-cord. 14) Take off plug connector of reactor. 15) Cut cable-tie 2 pcs. on inverter box. 16) Detail take off connector on board.	 
		CDB P.C.board 1) Remove the connector UART connected from CDB P.C.board to IPDU P.C.board, Power supply, Serial signal and the inter unit wire. CN82 : UART (5P, Blue) CN01 : AC IN connector (2P, Red) CN02 : Serial communication (5P, White) CN03 : Trigger low power standby CN04 : AC out connector (2P, White) 2) Remove the earth wire of CDB P.C.board (Truss head B tight Ø4 x 8, 1 pc). 3) Remove CDB P.C.board from spacer fixed board. 4) Mount a new CDB P.C.board * When connecting the connectors on CDB P.C.board to support CDB fixed boa with hand.	

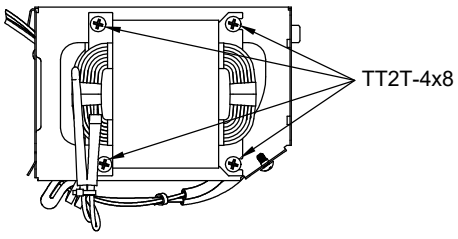
No.	Part name	Procedure	Remarks
⑤	Inverter assembly. (Continue)	**IPDU P.C.board** 1) Take off PL-FIX-CDB for fixed CDB P.C.board and the inverter box. 2) Take off screw fixed cover IPDU (TT2T-4x8, 2pcs.) 3) Remove the connectors connected to IPDU P.C.board (UART, Inter-unit wire). 4) Remove the lead wire connceted to IPDU P.C.board. Remove the power supply cable from the Power supply terminal block Power supply lead L : Black Power supply lead N : White 5) Cut cable tie 6 pcs. at Lead power and Lead compressor. 6) Remove the earth wire of IPDU P.C.board. (Truss head B tight screw Ø4 x 8, 1 pc). 7) Take off fixing screws for IPDU P.C.board. (Flange nut to fix element Ø3 x 14, 7 pcs). Pan head S tight screw to fix IPDU P.C.board (Ø3 x 20, 1 pc). 8) Remove IPDU P.C.board (3 supporters). **NOTE)** Be careful that IPDU P.C.board is difficult to be taken out by radiating grease for the heat sink. 9) Mount a new IPDU P.C.board. **NOTE)** Be sure not to forget to attach the IPDU	    

No.	Part name	Procedure	Remarks
⑤	Inverter assembly (Continue).	17) Move partition of inverter box up. **NOTE)** 1) When move inverter box out of the unit. make sure, all connecting shall be take off. 2) Check position hook locking shall be fixed them position.	 **Back side view of partiton**  **Position hook is on top side of inverter box**

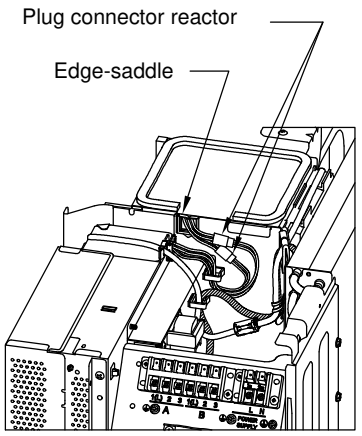
No.	Part name	Procedure	Remarks
⑥	Reactor	1) Perform works of Detachment 1 of ① and ② . 2) Move lead motor out of wire saddle. 3) Take off plug connector reactor. 4) Take off screw fixed the reactor box. (ST1T-4x10, 3 pcs). 5) Move the reactor box up and from partition and move reactor lead out of edge saddle. 6) Detail and component part remove reactor on box. ● Take off screw fixed cover top. (ST1T -4x10, 2pcs). ● Take off screw fixed base reactor box and cover under (TT2T -4x8, 3 pcs.) ● Take off screw fixed reactor 2 pcs. (TT2T-4x8, 8 pcs).	Lead fan motor.  Wire saddle

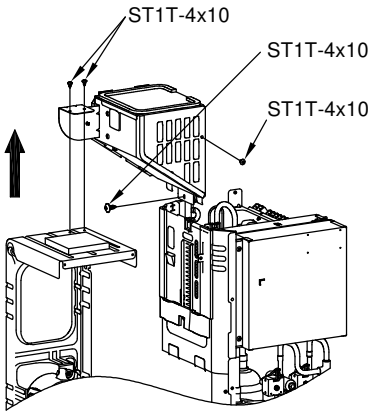


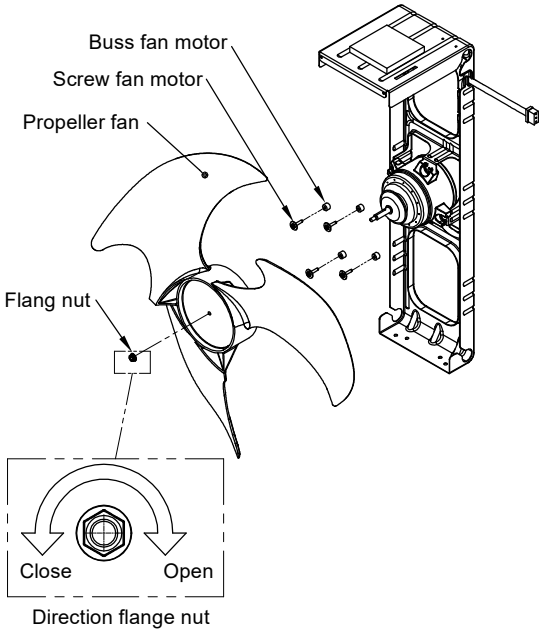
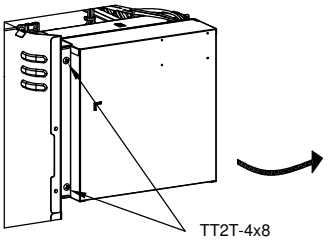
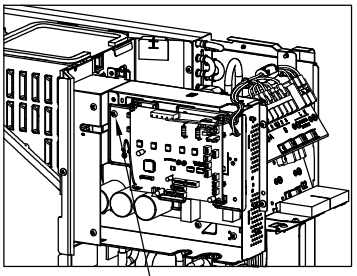
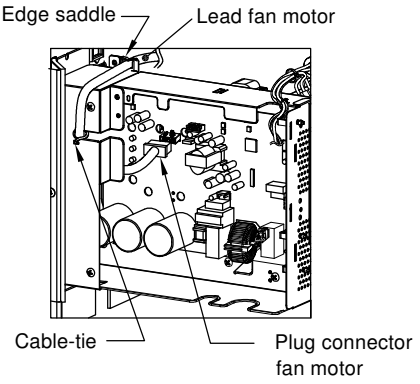
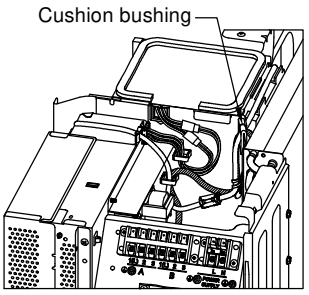
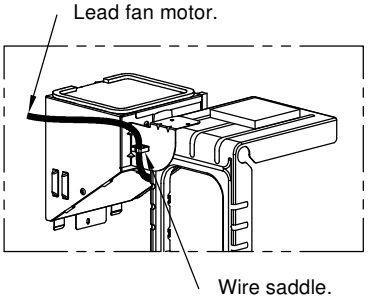


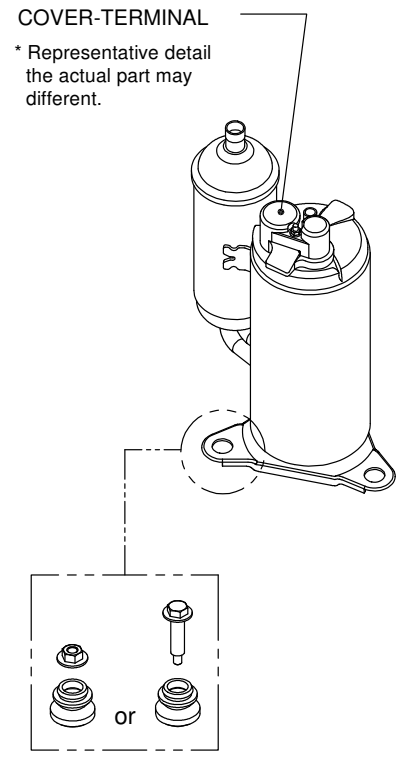
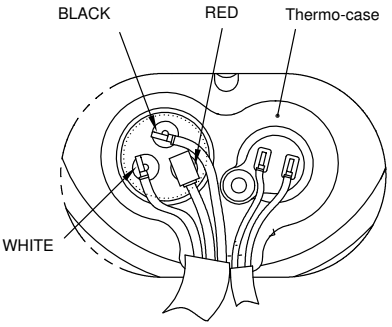


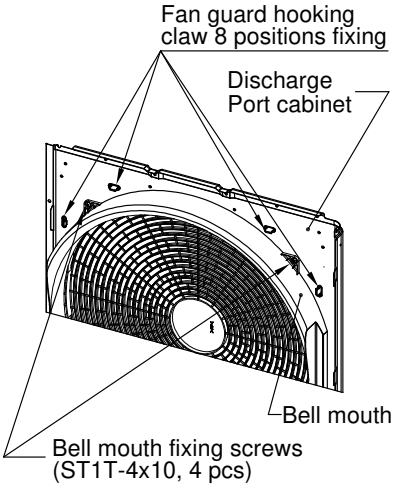
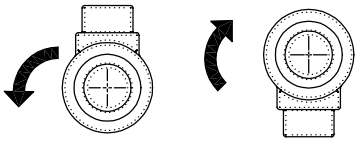
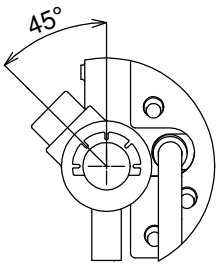
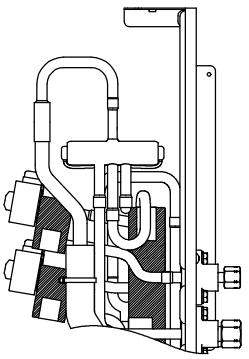
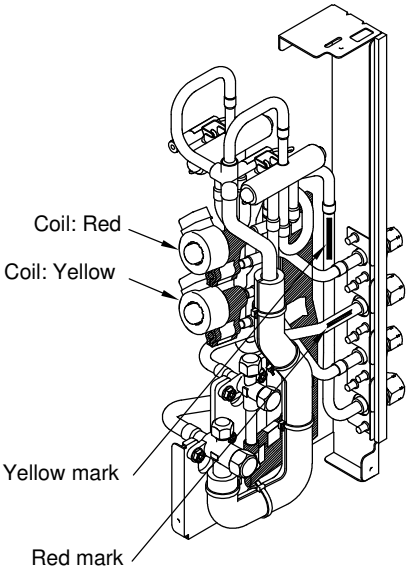
Position screw (TT2T-4x8) fixed reactor

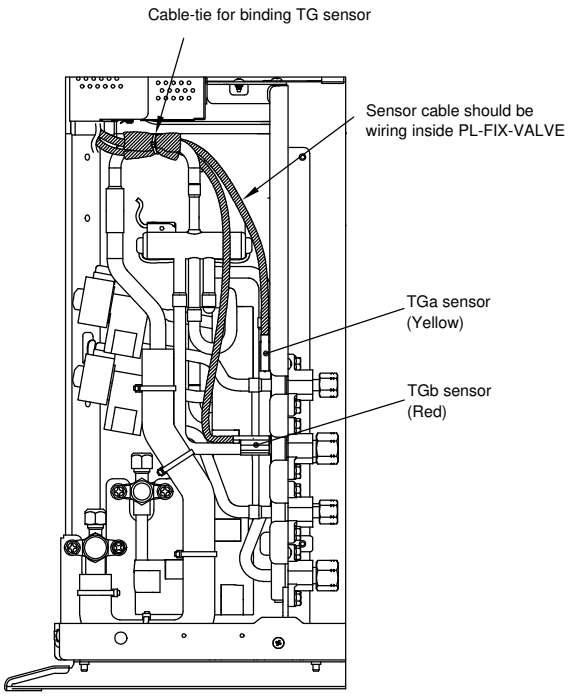


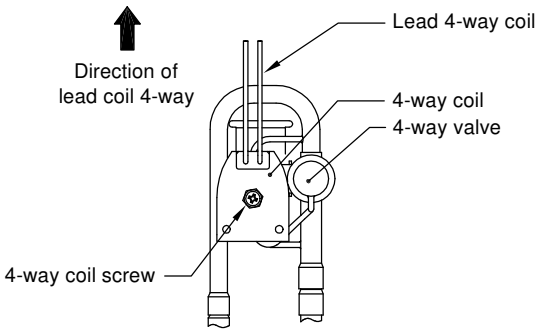
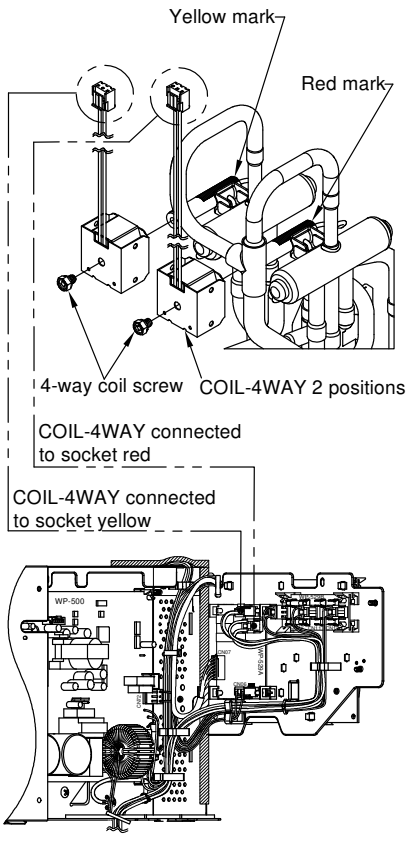


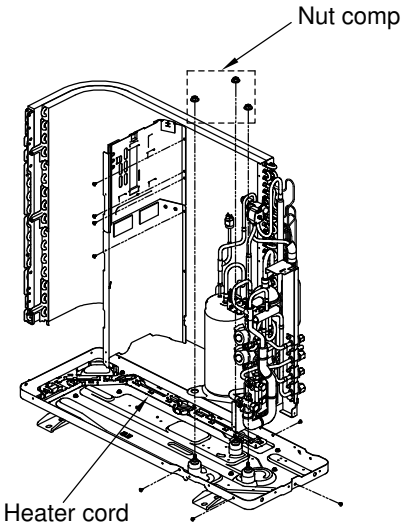
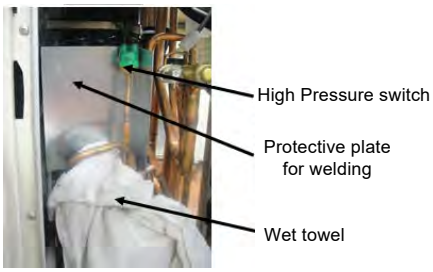
No.	Part name	Procedure	Remarks
⑦	Fan motor	1) Perform works 1 of ① and ②. 2) Take off screw for the inverter cover. (TT2T-4x8, 2 pcs). 3) Remove the inverter cover (Rotate the cover to right hand). 4) Take off the screw fixed CDB P.C board (TT2T-4x8, 1 pcs). 5) Remove the CDB P.C board. (Rotate the cover to right hand). 6) Move plug connector of fan motor out of board inverter. 7) Cut cable-tie at lead fan motor. 8) Take lead fan motor out of inverter box. 9) Take lead fan motor out of edge saddle, bushin on partition and wire saddle on reactor box. 10) Take off flange nut on propeller fan. (Nut Ø10). * The flange nut is loosened by turning it clockwise. (To tihgten the flange nut, turn it counterclockwise). 11) Remove the propeller fan. 12) Take off screw fixed fan motor (4 pcs. each) while supporting the fan motor, so that it does not fall. * Caution to assembly fan motor. ● Tighten the flange nut with 4.95 N.m (50Kgf.cm).  Direction flange nut **CAUTION** Using the metal band of the motor base, be sure to fix the fan motor lead to the motor base so that the fan motor lead does not come to contact with the propeller fan.	    

No.	Part name	Procedure	Remarks
⑧	Compressor	1) Perform works of Detachment 1 of ① and ② . 2) Recover the refrigerant gas from the outdoor unit. 3) Perform works of ② to ⑤ . 4) Remove the soundproof plate and TD sensor. 5) Take off fixing screw for the anchor board and the partition plate. 6) Take off cover terminal of compressor. 7) Take off plug connector and bi metal-thermo on terminal of compressor. 8) Move all lead out of terminal compressor. **NOTE)** Take care that the electric parts, sensors, compressor, and etc. are not caught by flame. (Otherwise operation trouble may occur.) 9) Pull out the refrigeration cycle upward. **NOTE)** Pull out the refrigerating cycle by two or more persons. 10) Take off the compressor bolts (3 pcs.) which fix the compressor to the compressor fixing plate. 11) Remove the compressor from the compressor fixing plate. **NOTE)** A compressor weighs approx. 15kg. Treat a compressor by two or more personals. * Caution to assemble compressor • Tighten the compressor bolt with 5N•m (50kgf•cm). • Be sure not to burn lead wire of the coil. • Take care there is no missing of sensor.	 Nut or Bolt compressor Hexagonal Ø13  Plug terminal compresor

No.	Part name	Procedure	Remarks
⑨	Fan guard	1. Detachment 1) Perform works of Detachment ① and ②. **CAUTION** Work on the cardboard, cloth, and etc. in order to prevent damage on the product. 3) Take off the discharge port cabinet and put it as the fan guard side directs downward. 4) Take off the hooking claws (8 positions) of the fan guard. 2. Attachment 1) Push the hooking claws (8 positions) with hands from the front side and then fix the claws. **CAUTION** Check all the hooking claws are fixed at each specified position.	
⑩	PMV Coil: Red Coil: Yellow	1. Detachment 1) Perform works of Detachment 1 of ① 2) Rotate PMV coil 2 steps (counterclockwise) and the move PMV main unit (All coils). 2. Attachment 1) Assemble PMV coil follow direction as below.  Rotate 2 step (clockwise) Detachment Rotate 2 step (counterclockwise) Attachment  	

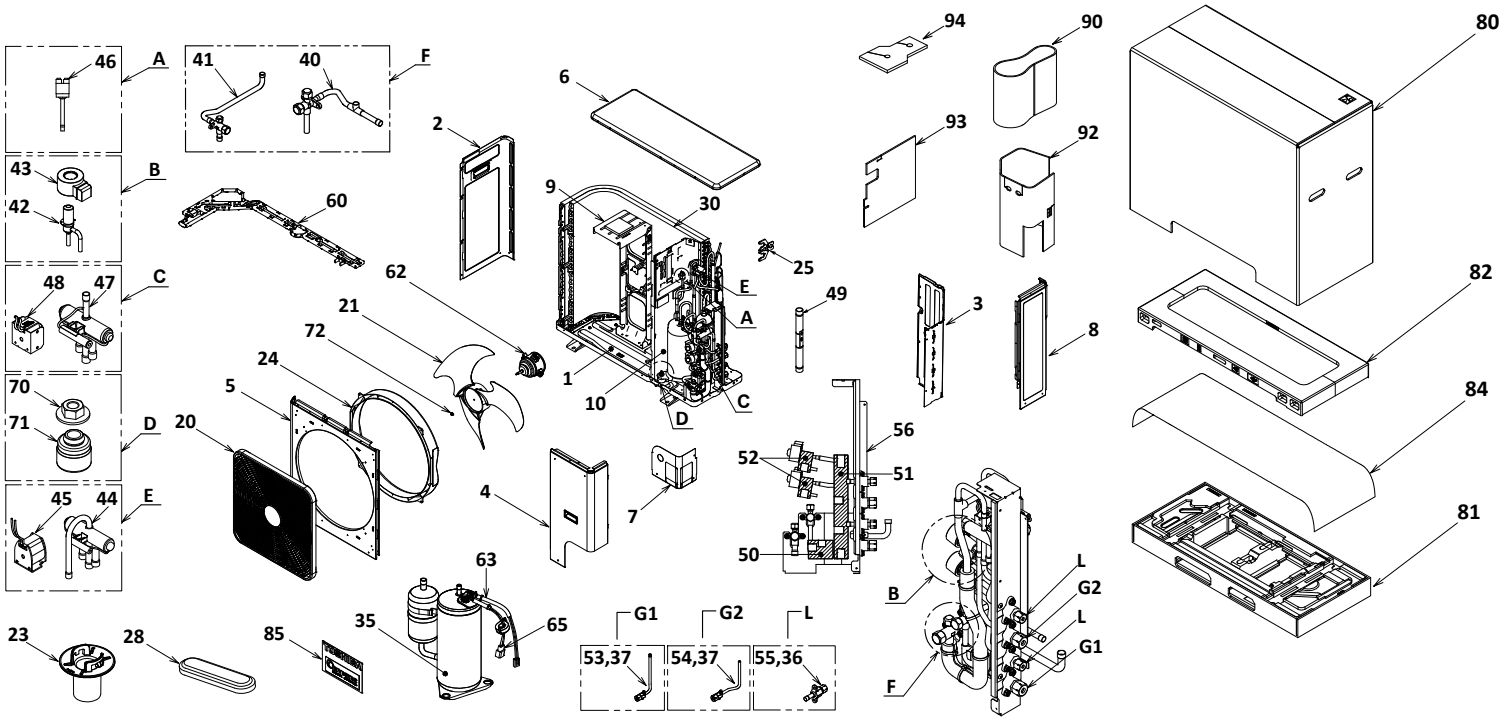
No.	Part name	Procedure	Remarks
⑪	TG sensor TGa: yellow TGb: Red	∗ **Attachment** Mount these sensors on the directly arranged part of the header connecting pipe at gas side so that the cabinet turns toward the front side and the sensors turn toward upper cabinet. ∗ **NOTE)** When mounting the sensors, check paint color of the sensor lead tube part and the pipe color. Mount the sensors to the position of same color.  **NOTE)** Using the bundling band being on the market, be sure to bind the position which was bound.	**NOTE)** At working time (finish time), be sure not to damage the cover of the sensor lead wire with edge of sheet metal, etc. If the cover of the sensor lead wire is damaged, it is dangerous because an electric shock or fire may be caused. **NOTE)** After replacing of parts, check the sensors are mounted at the specified positions. If there are incorrect mounted positions, control of the product does not operate correctly and a trouble may be caused.

No.	Part name	Procedure	Remarks
⑫	TE sensor (outdoor heat exchanging temperature sensor) • **Attachment** Install the sensor onto the straight pipe part of the condenser output pipe.		
⑬	TS sensor (Suction pipe temperature sensor) • **Attachment** Install the senser onto the straight pipe part of the suction pipe. Be careful for the lead direction of the sensor.		
⑭	TD sensor (Discharge pipe temperature sensor) • **Attachment** With its leads pointed upward, install the sensor onto the vertical straight pipe part of the discharge pipe.		
⑮	TO sensor (Outside air temperature sensor) • **Attachment** Insert the outdoor air temperature sensor into the holder, and install the holder onto the heat exchanger. **CAUTION** During the installation work (and on its completion), take care not to damage the coverings of the sensor leads on the edges of the metal plates or other parts. It is dangerous for these coverings to be damaged since damage may cause electric shocks and/or a fire. **CAUTION** After replacing the parts, check whether the positions where the sensors were installed are the proper positions as instructed. The product will not be controlled properly and trouble will result if the sensors have not been installed in their proper positions.		
⑯	4-way valve coil	1. Detachment. 1) Perform works of Detachment 1 of ①. 2) Remove a inverter cover screw (TT2T-4x8). 3) Remove a plate fixing CDB P.C. board screw (TT2T-4x8). 4) Cut a cable tie fixing lead at the inverter box then remove plug of 4-way coil. 5) Remove 4-way coil screw and remove 4-way coil. 2. Attachment 1) Assemble 4-way coil follow direction as below. * Tightening torque is 2.5±1.0 N.m  	

No.	Part name	Procedure	Remarks
⑰	Heater cord	1. Detachment 1) Perform work 1 of ① to ⑦ 2) Take off screw for base (ST1T-4x10L 2 Pcs.) 3) Take off screw for the partition (ST1T-4x10L 4 pcs.) 4) Take off screw comp on the base (3 pcs.) 5) To replace the new base with heater cord	
⑱	Pressure switch	1. Detachment 1) Perform work of Detachment 1 of ①. 2) Recover the refrigerant gas from the outdoor unit. 3) Perform works of 5. 4) Remove the soundproof plate, TD sensor and butyl on the pipe of pressure switch. 5) Using a burner, remove the welded parts of the pipe of pressure switch. **NOTE) "Case of using 4-way valve unit"** Take care that the electric parts, 4-way valve unit, butyle, compressor, accum tank, and etc. are not caught by flame. (Otherwise operaion trouble may occur.) 2. Attachment • Be sure not to burn lead wire of the pressure switch. • Take care there is no missing of sensor. **NOTE)** Take care that the body of the pressure is not be 100°C or more. For cooling pressure switch, use the wet towel and etc. Use the protective plate for the welding.	

13. EXPLODED VIEWS AND PARTS LIST

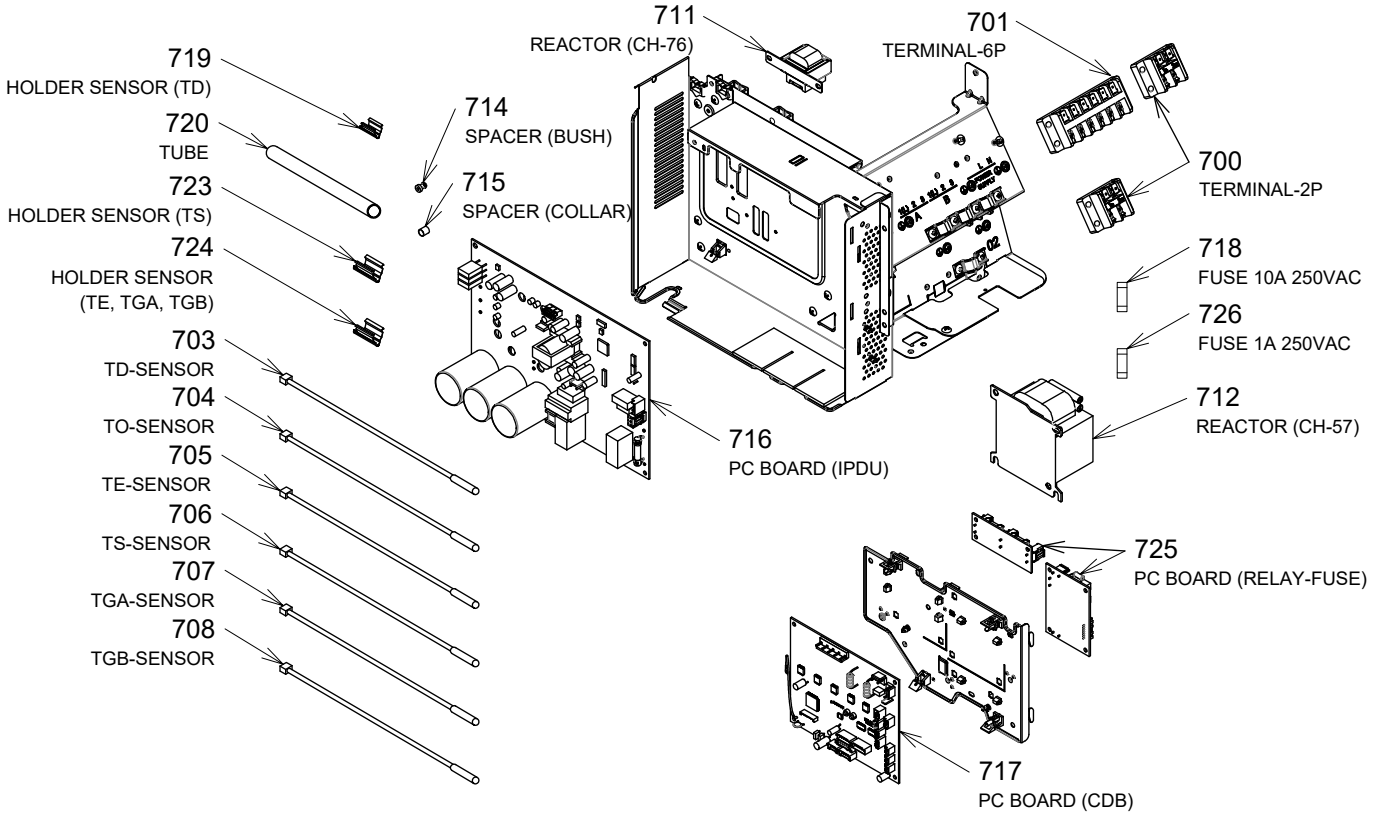
13-1. Outdoor Unit



Location No.	Part No.	Description
1	43T42400	BASE ASSEMBLY (WITH HEATER)
2	43T00956	LEFT SIDE PANEL ASSEMBLY
3	43T00852	BACK SIDE PANEL ASSEMBLY
4	43T00854	FRONT SIDE PANEL ASSEMBLY
5	43T00857	AIR OUTLET CABINET
6	43T00858	UPPER CABINET ASSEMBLY
7	43T00608	ASM-COAT-P-P-FR
8	43T00859	RIGHT SIDE PANEL ASSEMBLY
9	43T39435	MOTOR BASE ASSEMBLY
10	43T04516	PARTITION ASSEMBLY
20	43T19372	FAN GUARD(TOSHIBA)
21	43T20329	PROPELLER FAN
23	43T79324	DRAIN NIPPLE
24	43T22313	BELLMOUTH
25	43T63376	HOLDER, SENSOR
28	43T79331	CAP, WATERPROOF
30	43T43721	CONDENSER ASSEMBLY
35	43T41610	COMPRESSOR
36	43T47403	BONNET, 6.35 DIA
37	43T47404	BONNET, 9.52 DIA
40	43T46581	VALVE PACKED ASSEMBLY, 9.52DIA
41	43T46582	VALVE PACKED ASSEMBLY, 12.7DIA
42	43T46534	BODY-PMV
43	43T63360	COIL PMV
44	43T46375	4 WAY VALVE
45	43T63337	4 WAY VALVE COIL ASSEMBLY
46	43T63381	HIGH PRESSURE SWITCH ASSEMBLY

Location No.	Part No.	Description
47	43T46583	4WAY VALVE
48	43T63407	COIL-4WAY
49	43T46399	VALVE, CHECK
50	43T49408	BUTYL-RUBBER (HI)
51	43T49409	BUTYL-RUBBER (HI)
52	43T49410	BUTYL-RUBBER (HI)
53	43T46579	SOCKET PIPE JOINT ASSEMBLY
54	43T46580	SOCKET PIPE JOINT ASSEMBLY
55	43T46561	SOCKET ASSEMBLY (6.35D)
56	43T46584	VALVE PIPE ASSEMBLY
60	43T57320	HEATER CORD ASSEMBLY
62	43T21542	FAN-MOTOR(LDF-340-A100-1)
63	43T50457	TEMPERATURE SENSOR
65	43T60443	ASM-LEAD-COMP
70	43T97333	NUT
71	43T49357	RUBBER,CUSHION
72	43T47001	NUT FLANGE
80	43T91415	CARTON BOX
81	43T91442	FIBERBOARD UNDER ASSEMBLY
82	43T91416	CUSHION PACKING UPPER
84	43T91301	PE SHEET
85	43T85591	MARK-T
90	43T04517	SOUND INSULATION (INSIDE)
92	43T04514	SOUND INSULATION (OUTSIDE)
93	43T04515	SOUND INSULATION (BACK)
94	43T04416	SOUND INSULATION(UP)

13-2. Inverter Assembly



Location No.	Part No.	Description
700	43T60569	TERMINAL-2P
701	43T60423	SERV-TERMINAL
703	43T50334	TEMPERATURE SENSOR
704	43T50360	TC-SENSOR(TO)
705	43T50352	TEMPERATURE SENSOR
706	43T50412	TC-SENSOR
707	43T50361	SENSOR-TEMP
708	43T50362	SENSOR-TEMP
711	43T58341	REACTOR
712	43T58306	REACTOR
714	43T61315	SPACER(BUSH)

Location No.	Part No.	Description
715	43T61316	SPACER(COLLAR)
716	43TNV452	PC BOARD (IPDU)
717	43TNV453	PC BOARD (CDB)
718	43T60570	FUSE (10A)
719	43T63317	HOLDER,SENSOR
720	43T62401	TUBE
723	43T63323	HOLDER,SENSOR
724	43T63316	HOLDER,SENSOR
725	43TNV454	PC BOARD (RELAY-FUSE)
726	43T60638	FUSE (1A)

CARRIER AIR CONDITIONING (THAILAND) CO., LTD.

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