TOSHIBA

FILE NO. A10-1610

SERVICE MANUAL

AIR-CONDITIONER
SPLIT TYPE

OUTDOOR UNIT

<SUPER DIGITAL INVERTER>

RAV-SP1104AT-E1 ***RAV-SP1404AT-E1***

RAV-SP1104ATJ-E1 ***RAV-SP1404ATJ-E1***

HFC

R410A

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CONTENTS

Original instruction

Please read carefully through these instructions that contain important information which complies with the “Machinery” Directive (Directive 2006/42/EC), and ensure that you understand them.

Some of the details provided in these instructions differ from the service manual, and the instructions provided here take precedence.

Generic Denomination: Air Conditioner

Definition of Qualified Installer or Qualified Service Person

The air conditioner must be installed, maintained, repaired and removed by a qualified installer or qualified service person.

When any of these jobs is to be done, ask a qualified installer or qualified service person to do them for you.

A qualified installer or qualified service person is an agent who has the qualifications and knowledge described in the table below.

Agent	Qualifications and knowledge which the agent must have
Qualified installer (∗1)	• The qualified installer is a person who installs, maintains, relocates and removes the air conditioners made by Toshiba Carrier Corporation. He or she has been trained to install, maintain, relocate and remove the air conditioners made by Toshiba Carrier Corporation or, alternatively, he or she has been instructed in such operations by an individual or individuals who have been trained and is thus thoroughly acquainted with the knowledge related to these operations. • The qualified installer who is allowed to do the electrical work involved in installation, relocation and removal has the qualifications pertaining to this electrical work as stipulated by the local laws and regulations, and he or she is a person who has been trained in matters relating to electrical work on the air conditioners made by Toshiba Carrier Corporation or, alternatively, he or she has been instructed in such matters by an individual or individuals who have been trained and is thus thoroughly acquainted with the knowledge related to this work. • The qualified installer who is allowed to do the refrigerant handling and piping work involved in installation, relocation and removal has the qualifications pertaining to this refrigerant handling and piping work as stipulated by the local laws and regulations, and he or she is a person who has been trained in matters relating to refrigerant handling and piping work on the air conditioners made by Toshiba Carrier Corporation or, alternatively, he or she has been instructed in such matters by an individual or individuals who have been trained and is thus thoroughly acquainted with the knowledge related to this work. • The qualified installer who is allowed to work at heights has been trained in matters relating to working at heights with the air conditioners made by Toshiba Carrier Corporation or, alternatively, he or she has been instructed in such matters by an individual or individuals who have been trained and is thus thoroughly acquainted with the knowledge related to this work.
Qualified service person (∗1)	• The qualified service person is a person who installs, repairs, maintains, relocates and removes the air conditioners made by Toshiba Carrier Corporation. He or she has been trained to install, repair, maintain, relocate and remove the air conditioners made by Toshiba Carrier Corporation or, alternatively, he or she has been instructed in such operations by an individual or individuals who have been trained and is thus thoroughly acquainted with the knowledge related to these operations. • The qualified service person who is allowed to do the electrical work involved in installation, repair, relocation and removal has the qualifications pertaining to this electrical work as stipulated by the local laws and regulations, and he or she is a person who has been trained in matters relating to electrical work on the air conditioners made by Toshiba Carrier Corporation or, alternatively, he or she has been instructed in such matters by an individual or individuals who have been trained and is thus thoroughly acquainted with the knowledge related to this work. • The qualified service person who is allowed to do the refrigerant handling and piping work involved in installation, repair, relocation and removal has the qualifications pertaining to this refrigerant handling and piping work as stipulated by the local laws and regulations, and he or she is a person who has been trained in matters relating to refrigerant handling and piping work on the air conditioners made by Toshiba Carrier Corporation or, alternatively, he or she has been instructed in such matters by an individual or individuals who have been trained and is thus thoroughly acquainted with the knowledge related to this work. • The qualified service person who is allowed to work at heights has been trained in matters relating to working at heights with the air conditioners made by Toshiba Carrier Corporation or, alternatively, he or she has been instructed in such matters by an individual or individuals who have been trained and is thus thoroughly acquainted with the knowledge related to this work.

Definition of Protective Gear

When the air conditioner is to be transported, installed, maintained, repaired or removed, wear protective gloves and 'safety' work clothing.

In addition to such normal protective gear, wear the protective gear described below when undertaking the special work detailed in the table below.

Failure to wear the proper protective gear is dangerous because you will be more susceptible to injury, burns, electric shocks and other injuries.

Work undertaken	Protective gear worn
All types of work	Protective gloves "Safety" working clothing
Electrical-related work	Gloves to provide protection for electricians Insulating shoes Clothing to provide protection from electric shock
Work done at heights (50 cm or more)	Helmets for use in industry
Transportation of heavy objects	Shoes with additional protective toe cap
Repair of outdoor unit	Gloves to provide protection for electricians

The important contents concerned to the safety are described on the product itself and on this Service Manual.

Please read this Service Manual after understanding the described items thoroughly in the following contents (Indications/Illustrated marks), and keep them.

[Explanation of indications]

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

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

[Explanation of illustrated marks]

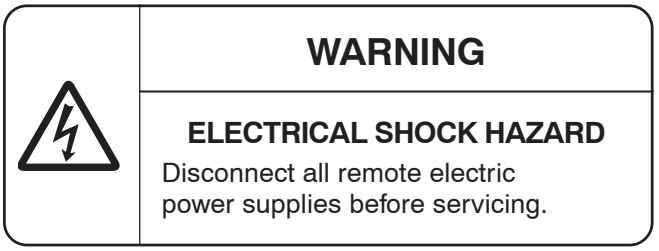
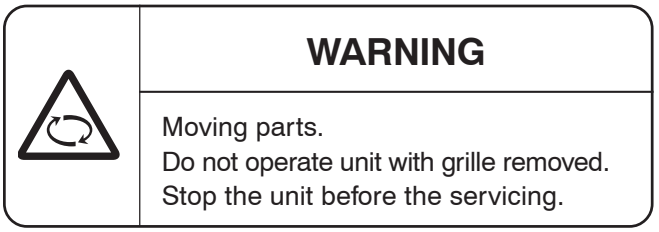
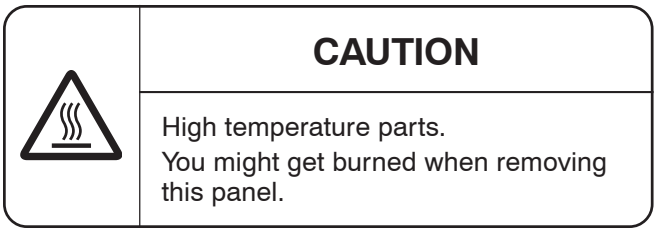
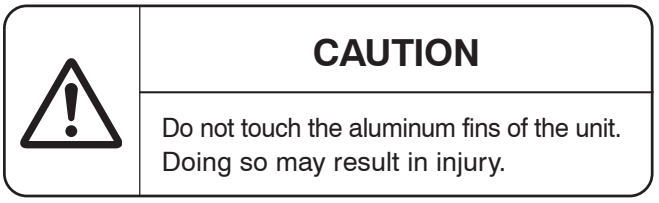
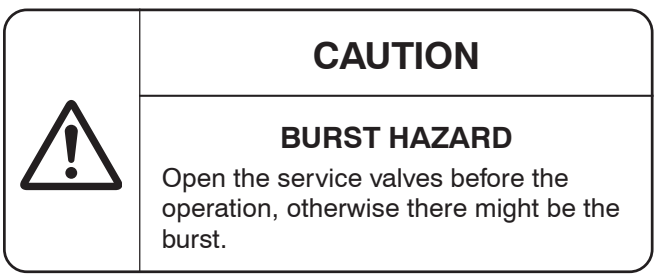
Mark	Explanation
	Indicates prohibited items (Forbidden items to do) The sentences near an illustrated mark describe the concrete prohibited contents.
	Indicates mandatory items (Compulsory items to do) The sentences near an illustrated mark describe the concrete mandatory contents.
	Indicates cautions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

Warning Indications on the Air Conditioner Unit

[Confirmation of warning label on the main unit]

Confirm that labels are indicated on the specified positions

If removing the label during parts replace, stick it as the original.

Warning indication	Description
	**WARNING** ELECTRICAL SHOCK HAZARD Disconnect all remote electric power supplies before servicing.
	**WARNING** Moving parts. Do not operate unit with grille removed. Stop the unit before the servicing.
	**CAUTION** High temperature parts. You might get burned when removing this panel.
	**CAUTION** Do not touch the aluminum fins of the unit. Doing so may result in injury.
	**CAUTION** **BURST HAZARD** Open the service valves before the operation, otherwise there might be the burst.

Precaution for Safety

⚠ WARNING

General	Before starting to repair the air conditioner, read carefully through the Service Manual, and repair the air conditioner by following its instructions.
	Only qualified service person (∗1) is allowed to repair the air conditioner. Repair of the air conditioner by unqualified person may give rise to a fire, electric shocks, injury, water leaks and/or other problems.
	Only a qualified installer (∗1) or qualified service person (∗1) is allowed to carry out the electrical work of the air conditioner. Under no circumstances must this work be done by an unqualified individual since failure to carry out the work properly may result in electric shocks and/or electrical leaks.
	Wear protective gloves and safety work clothing during installation, servicing and removal.
	When connecting the electrical wires, repairing the electrical parts or undertaking other electrical jobs, wear gloves to provide protection for electricians and from heat, insulating shoes and clothing to provide protection from electric shocks. Failure to wear this protective gear may result in electric shocks.
	Use wiring that meets the specifications in the Installation Manual and the stipulations in the local regulations and laws. Use of wiring which does not meet the specifications may give rise to electric shocks, electrical leakage, smoking and/or a fire.
	Only a qualified installer (∗1) or qualified service person (∗1) is allowed to undertake work at heights using a stand of 50 cm or more or to remove the intake grille of the indoor unit to undertake work.
	When working at heights, use a ladder which complies with the ISO 14122 standard, and follow the procedure in the ladder's instructions. Also wear a helmet for use in industry as protective gear to undertake the work.
	When working at heights, put a sign in place so that no-one will approach the work location, before proceeding with the work. Parts and other objects may fall from above, possibly injuring a person below.
	Do not touch the aluminum fin of the outdoor unit. You may injure yourself if you do so. If the fin must be touched for some reason, first put on protective gloves and safety work clothing, and then proceed.
	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 injury.
	When transporting the air conditioner, wear shoes with additional protective toe caps.
	When transporting the air conditioner, do not take hold of the bands around the packing carton. You may injure yourself if the bands should break.
	This air conditioner has passed the pressure test as specified in IEC 60335-2-40 Annex EE.

⚠ DENGER

Turn off breaker.	Before carrying out the installation, maintenance, repair or removal work, be sure to set the circuit breaker to the OFF position. Otherwise, electric shocks may result.
	Before opening the intake grille of the indoor unit or service panel of the outdoor unit, set the circuit breaker to the OFF position. Failure to set the circuit breaker to the OFF position may result in electric shocks through contact with the interior parts. Only a qualified installer (∗1) or qualified service person (∗1) is allowed to remove the intake grille of the indoor unit or service panel of the outdoor unit and do the work required.
	Before starting to repair the outdoor unit fan or fan guard, be absolutely sure to set the circuit breaker to the OFF position, and place a "Work in progress" sign on the circuit breaker.
	When cleaning the filter or other parts of the indoor unit, set the circuit breaker to OFF without fail, and place a "Work in progress" sign near the circuit breaker before proceeding with the work.

 Execute discharge between terminals.	Even if the circuit breaker has been set to the OFF position before the service panel is removed and the electrical parts are repaired, you will still risk receiving an electric shock. For this reason, short-circuit the high-voltage capacitor terminals to discharge the voltage before proceeding with the repair work. For details on the short-circuiting procedure, refer to the Service Manual. You may receive an electric shock if the voltage stored in the capacitors has not been sufficiently discharged.
 Prohibition	Place a “Work in progress” sign near the circuit breaker while the installation, maintenance, repair or removal work is being carried out. There is a danger of electric shocks if the circuit breaker is set to ON by mistake.
 Stay on protection	If, in the course of carrying out repairs, it becomes absolutely necessary to check out the electrical parts with the electrical parts box cover of one or more of the indoor units and the service panel of the outdoor unit removed in order to find out exactly where the trouble lies, wear insulated heat-resistant gloves, insulated boots and insulated work overalls, and take care to avoid touching any live parts. You may receive an electric shock if you fail to heed this warning. Only qualified service person (∗1) is allowed to do this kind of work.

⚠ WARNING

 Check earth wires.	Before troubleshooting or repair work, check the earth wire is connected to the earth terminals of the main unit, otherwise an electric shock is caused when a leak occurs.If the earth wire is not correctly connected, contact an electric engineer for rework.
	After completing the repair or relocation work, check that the ground wires are connected properly.
	Be sure to connect earth wire. (Grounding work) Incomplete grounding causes an electric shock. Do not connect ground wires to gas pipes, water pipes, and lightning rods or ground wires for telephone wires.
 Prohibition of modification.	Do not modify the products.Do not also disassemble or modify the parts. It may cause a fire, electric shock or injury.
 Use specified parts.	When any of the electrical parts are to be replaced, ensure that the replacement parts satisfy the specifications given in the Service Manual (or use the parts contained on the parts list in the Service Manual). Use of any parts which do not satisfy the required specifications may give rise to electric shocks, smoking and/or a fire.
 Do not bring a child close to the equipment.	If, in the course of carrying out repairs, it becomes absolutely necessary to check out the electrical parts with the electrical parts box cover of one or more of the indoor units and the service panel of the outdoor unit removed in order to find out exactly where the trouble lies, place "Keep out" signs around the work site before proceeding. Third-party individuals may enter the work site and receive electric shocks if this warning is not heeded.
 Insulating measures	Connect the cut-off lead wires with crimp contact, etc, put the closed end side upward and then apply a water-cut method, otherwise a leak or production of fire is caused at the users’ side.
 No fire	When performing repairs using a gas burner, replace the refrigerant with nitrogen gas because the oil that coats the pipes may otherwise burn. When repairing the refrigerating cycle, take the following measures. 1) Be attentive to fire around the cycle. When using a gas stove, etc, be sure to put out fire before work; otherwise the oil mixed with refrigerant gas may catch fire. 2) Do not use a welder in the closed room. When using it without ventilation, carbon monoxide poisoning may be caused. 3) Do not bring inflammables close to the refrigerant cycle, otherwise fire of the welder may catch the inflammables.

Refrigerant	The refrigerant used by this air conditioner is the R410A. Check the used refrigerant name and use tools and materials of the parts which match with it. For the products which use R410A refrigerant, the refrigerant name is indicated at a position on the outdoor unit where is easy to see. To prevent miss-charging, the route of the service port is changed from one of the former R22. For an air conditioner which uses R410A, never use other refrigerant than R410A. For an air conditioner which uses other refrigerant (R22, etc.), never use R410A. If different types of refrigerant are mixed, abnormal high pressure generates in the refrigerating cycle and an injury due to breakage may be caused. Do not charge refrigerant additionally. If charging refrigerant additionally when refrigerant gas leaks, the refrigerant composition in the refrigerating cycle changes resulted in change of air conditioner characteristics or refrigerant over the specified standard amount is charged and an abnormal high pressure is applied to the inside of the refrigerating cycle resulted in cause of breakage or injury. Therefore if the refrigerant gas leaks, recover the refrigerant in the air conditioner, execute vacuuming, and then newly recharge the specified amount of liquid refrigerant. In this time, never charge the refrigerant over the specified amount. When recharging the refrigerant in the refrigerating cycle, do not mix the refrigerant or air other than R410A into the specified refrigerant. If air or others is mixed with the refrigerant, abnormal high pressure generates in the refrigerating cycle resulted in cause of injury due to breakage. After installation work, check the refrigerant gas does not leak. If the refrigerant gas leaks in the room, poisonous gas generates when gas touches to fire such as fan heater, stove or cocking stove though the refrigerant gas itself is innocuous. Never recover the refrigerant into the outdoor unit. When the equipment is moved or repaired, be sure to recover the refrigerant with recovering device. The refrigerant cannot be recovered in the outdoor unit; otherwise a serious accident such as breakage or injury is caused.
Assembly/ Cabling	After repair work, surely assemble the disassembled parts, and connect and lead the removed wires as before. Perform the work so that the cabinet or panel does not catch the inner wires. If incorrect assembly or incorrect wire connection was done, a disaster such as a leak or fire is caused at user's side.
Insulator check	After the work has finished, be sure to use an insulation tester set (500V Megger) to check the resistance is 2MΩ or more between the charge section and the non-charge metal section (Earth position). If the resistance value is low, a disaster such as a leak or electric shock is caused at user's side.
Ventilation	When the refrigerant gas leaks during work, execute ventilation. If the refrigerant gas touches to a fire, poisonous gas generates. A case of leakage of the refrigerant and the closed room full with gas is dangerous because a shortage of oxygen occurs. Be sure to execute ventilation.
Compulsion	When the refrigerant gas leaks, find up the leaked position and repair it surely. If the leaked position cannot be found up and the repair work is interrupted, pump-down and tighten the service valve, otherwise the refrigerant gas may leak into the room. The poisonous gas generates when gas touches to fire such as fan heater, stove or cocking stove though the refrigerant gas itself is innocuous. When installing equipment which includes a large amount of charged refrigerant such as a multi air conditioner in a sub-room, it is necessary that the density does not the limit even if the refrigerant leaks. If the refrigerant leaks and exceeds the limit density, an accident of shortage of oxygen is caused.
	Tighten the flare nut with a torque wrench in the specified manner. Excessive tighten of the flare nut may cause a crack in the flare nut after a long period, which may result in refrigerant leakage.
	Nitrogen gas must be used for the airtight test.
	The charge hose must be connected in such a way that it is not slack.
	For the installation/moving/reinstallation work, follow to the Installation Manual. If an incorrect installation is done, a trouble of the refrigerating cycle, water leak, electric shock or fire is caused.

 Check after repair	Once the repair work has been completed, check for refrigerant leaks, and check the insulation resistance and water drainage. Then perform a trial run to check that the air conditioner is running properly.
	After repair work has finished, check there is no trouble. If check is not executed, a fire, electric shock or injury may be caused. For a check, turn off the power breaker.
	After repair work (installation of front panel and cabinet) has finished, execute a test run to check there is no generation of smoke or abnormal sound. If check is not executed, a fire or an electric shock is caused. Before test run, install the front panel and cabinet.
 Do not operate the unit with the valve closed.	Check the following matters before a test run after repairing piping. • Connect the pipes surely and there is no leak of refrigerant. • The valve is opened. Running the compressor under condition that the valve closes causes an abnormal high pressure resulted in damage of the parts of the compressor and etc. and moreover if there is leak of refrigerant at connecting section of pipes, the air is suctioned and causes further abnormal high pressure resulted in burst or injury.
 Check after reinstallation	Only a qualified installer (∗1) or qualified service person (∗1) is allowed to relocate the air conditioner. It is dangerous for the air conditioner to be relocated by an unqualified individual since a fire, electric shocks, injury, water leakage, noise and/or vibration may result.
	Check the following items after reinstallation. 1) The earth wire is correctly connected. 2) The power cord is not caught in the product. 3) There is no inclination or unsteadiness and the installation is stable. If check is not executed, a fire, an electric shock or an injury is caused.
	When carrying out the pump-down work shut down the compressor before disconnecting the refrigerant pipe. Disconnecting the refrigerant pipe with the service valve left open and the compressor still operating will cause air, etc. to be sucked in, raising the pressure inside the refrigeration cycle to an abnormally high level, and possibly resulting in reputing, injury, etc.
 Cooling check	When the service panel of the outdoor unit is to be opened in order for the compressor or the area around this part to be repaired immediately after the air conditioner has been shut down, set the circuit breaker to the OFF position, and then wait at least 10 minutes before opening the service panel. If you fail to heed this warning, you will run the risk of burning yourself because the compressor pipes and other parts will be very hot to the touch. In addition, before proceeding with the repair work, wear the kind of insulated heat-resistant gloves designed to protect electricians.
	When the service panel of the outdoor unit is to be opened in order for the fan motor, reactor, inverter or the areas around these parts to be repaired immediately after the air conditioner has been shut down, set the circuit breaker to the OFF position, and then wait at least 10 minutes before opening the service panel. If you fail to heed this warning, you will run the risk of burning yourself because the fan motor, reactor, inverter heat sink and other parts will be very hot to the touch. In addition, before proceeding with the repair work, wear the kind of insulated heat-resistant gloves designed to protect electricians.
 Installation	Only a qualified installer (∗1) or qualified service person (∗1) is allowed to install the air conditioner. If the air conditioner is installed by an unqualified individual, a fire, electric shocks, injury, water leakage, noise and/or vibration may result.
	Before starting to install the air conditioner, read carefully through the Installation Manual, and follow its instructions to install the air conditioner.
	Do not install the air conditioner in a location that may be subject to a risk of expire to a combustible gas. If a combustible gas leaks and becomes concentrated around the unit, a fire may occur.
	Install the indoor unit at least 2.5 m above the floor level since otherwise the users may injure themselves or receive electric shocks if they poke their fingers or other objects into the indoor unit while the air conditioner is running.
	Install a circuit breaker that meets the specifications in the installation manual and the stipulations in the local regulations and laws.
	Install the circuit breaker where it can be easily accessed by the qualified service person (∗1).
	Do not place any combustion appliance in a place where it is directly exposed to the wind of air conditioner, otherwise it may cause imperfect combustion.

Explanations given to user

- If you have discovered that the fan grille is damaged, do not approach the outdoor unit but set the circuit breaker to the OFF position, and contact a qualified service person to have the repairs done.
  Do not set the circuit breaker to the ON position until the repairs are completed.

Relocation

- Only a qualified installer (∗1) or qualified service person (∗1) is allowed to relocate the air conditioner.
  It is dangerous for the air conditioner to be relocated by an unqualified individual since a fire, electric shocks, injury, water leakage, noise and/or vibration may result.
- When carrying out the pump-down work shut down the compressor before disconnecting the refrigerant pipe.
  Disconnecting the refrigerant pipe with the service valve left open and the compressor still operating will cause air, etc. to be sucked in, raising the pressure inside the refrigeration cycle to an abnormally high level, and possibly resulting in reputing, injury, etc.

(∗1) Refer to the “Definition of Qualified Installer or Qualified Service Person.”

Declaration of Conformity

Manufacturer: TOSHIBA CARRIER CORPORATION
336 Tadehara, Fuji-shi, Shizuoka-ken 416-8521 JAPAN

TCF holder: TOSHIBA CARRIER EUROPE S.A.S
Route de Thil
01120 Montluel FRANCE

Hereby declares that the machinery described below:

Generic Denomination: Air Conditioner

Model/type: RAV-SP1104AT-E1, RAV-SP1104ATJ-E1,
RAV-SP1404AT-E1, RAV-SP1404ATJ-E1

Commercial name: Super Digital Inverter Series Air Conditioner

Complies with the provisions of the “Machinery” Directive (Directive 2006/42/EC) and the regulations transposing into national law

Note: This declaration becomes invalid if technical or operational modifications are introduced without the manufacturer’s consent.

Disposal

How to dispose of air conditioners with a rating of 12 kW and below in accordance with the 2002/96/EC Directive WEEE (Waste Electrical and Electronic Equipment) is provided in the Installation Manual supplied with your product. For disposal of the product above 12 kW in rating you should use a registered company in accordance with any national or EU legislation.

<Model names with a rating of 12 kW and below (outdoor units)>

DI series

RAV-SM564ATP-E	RAV-SM804ATP-E	RAV-SM1104ATP-E
RAV-SM564ATPJ-E	RAV-SM804ATPJ-E	RAV-SM1104ATPJ-E
RAV-SM564ATP-TR	RAV-SM804ATP-TR	RAV-SM1104ATP-TR

SDI series

RAV-SP404AT-E	RAV-SP404ATZ-E	RAV-SP404ATZG-E
RAV-SP454AT-E	RAV-SP454ATZ-E	RAV-SP454ATZG-E
RAV-SP564AT-E	RAV-SP564ATZ-E	RAV-SP564ATZG-E
RAV-SP804AT-E	RAV-SP804ATZ-E	RAV-SP804ATZG-E
RAV-SP1104AT-E1	RAV-SP1104ATJ-1	
RAV-SP1104AT8-E1	RAV-SP1104AT8J-E1	
RAV-SP1104AT8-TR1	RAV-SP1104AT8J-TR1	

Refrigerant R410A

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

1. Safety Caution Concerned to Refrigerant R410A

The pressure of R410A is high 1.6 times of that of the former refrigerant (R22).

Accompanied with change of refrigerant, the refrigerating oil has been also changed.

Therefore, be sure that water, dust, the former refrigerant or the former refrigerating oil is not mixed into the refrigerating cycle of the air conditioner with Refrigerant R410A during installation work or service work.

If an incorrect work or incorrect service is performed, there is a possibility to cause a serious accident.

Use the tools and materials exclusive to R410A to purpose a safe work.

2. Cautions on Installation/Service

1) Do not mix the other refrigerant or refrigerating oil.
   For the tools exclusive to R410A, shapes of all the joints including the service port differ from those of the former refrigerant in order to prevent mixture of them.
2) As the use pressure of the Refrigerant R410A is high, use material thickness of the pipe and tools which are specified for R410A.
3) In the installation time, use clean pipe materials and work with great attention so that water and others do not mix in because pipes are affected by impurities such as water, oxide scales, oil, etc.
   Use the clean pipes.
   Be sure to brazing with flowing nitrogen gas. (Never use gas other than nitrogen gas.)
4) For the earth protection, use a vacuum pump for air purge.
5) R410A refrigerant is azeotropic mixture type refrigerant.
   Therefore use liquid type to charge the refrigerant. (If using gas for charging, composition of the refrigerant changes and then characteristics of the air conditioner change.)

3. Pipe Materials

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

It is necessary to select the most appropriate pipes to conform to the standard.

Use clean material in which impurities adhere inside of pipe or joint to a minimum.

1) Copper pipe

<Piping>

The pipe thickness, flare finishing size, flare nut and others differ according to a refrigerant type.

When using a long copper pipe for R410A, it is recommended to select “Copper or copper-base pipe without seam” and one with bonded oil amount 40mg/10m or less.

Also do not use crushed, deformed, discolored (especially inside) pipes.
(Impurities cause clogging of expansion valves and capillary tubes.)

<Flare nut>

Use the flare nuts which are attached to the air conditioner unit.

2) Joint

The flare joint and socket joint are used for joints of the copper pipe.

The joints are rarely used for installation of the air conditioner.

However clear impurities when using them.

4. Tools

1. Required Tools for R410A

   Mixing of different types of oil may cause a trouble such as generation of sludge, clogging of capillary, etc. Accordingly, the tools to be used are classified into the following three types.

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

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

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

Tools whose specifications are changed for R410A and their interchangeability

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

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

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
3) Pipe cutter
4) Reamer
5) Pipe bender
6) Level vial
7) Screwdriver (+, –)
8) Spanner or Monkey wrench
9) Hole core drill
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 (Megger)
4) Electroscope

1. SPECIFICATIONS

1-1. Outdoor Unit

<Super Digital Inverter>

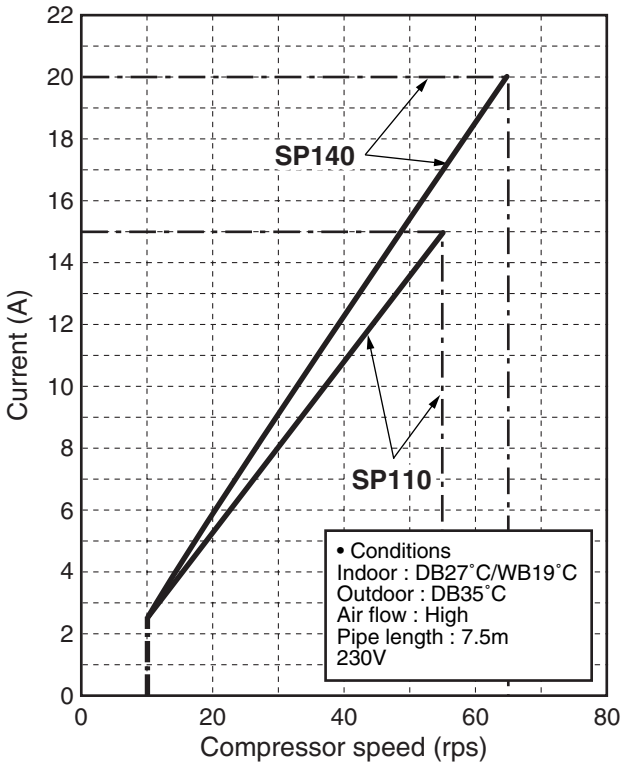
Model	Outdoor unit		RAV-SP	1104AT(J)-E1	1404AT(J)-E1
Power supply				1 phase 230V (220 – 240V) 50Hz (Power exclusive to outdoor is required.)	
Compressor	Type			Hermetic compressor	
	Motor		(kW)	3.75	3.75
	Pole			4	4
Refirigerant charged			(kg)	3.1	3.1
Refirigerant control				Pulse motor valve	
Pipe	Standard length		(m)	7.5	7.5
	Max. total length		(m)	75	75
	Additional refrigerant chrge under long piping connection			40g/m (31m to 75m)	40g/m (31m to 75m)
	Height difference	Outdoor lower	(m)	30	30
		Outdoor higher	(m)	30	30
Outer dimension	Height		(mm)	1340	1340
	Width		(mm)	900	900
	Depth		(mm)	320	320
Appearance				Silky shade (Muncel 1Y8.5-0.5)	
Total weight			(kg)	93	93
Heat exchanger				Finned tube	
Connecting pipe	Gas side		(mm)	15.9	15.9
	Liquid side		(mm)	9.5	9.5
Fan unit	Fan			Propeller fan	
	Standard air flow		(m^3/min)	101	103
	Motor		(W)	100 + 100	100 + 100
Sound pressure level	Cooling/Heating		(dB•A)	49 / 50	51 / 52
Sound power level	Cooling/Heating		(dB•A)	66 / 67	68 / 69
Outside air temperature, cooling			(˚C)	43 to –15 ˚C	
Outside air temperature, Heating			(˚C)	15 to –20 ˚C	

1-2. Operation Characteristic Curve

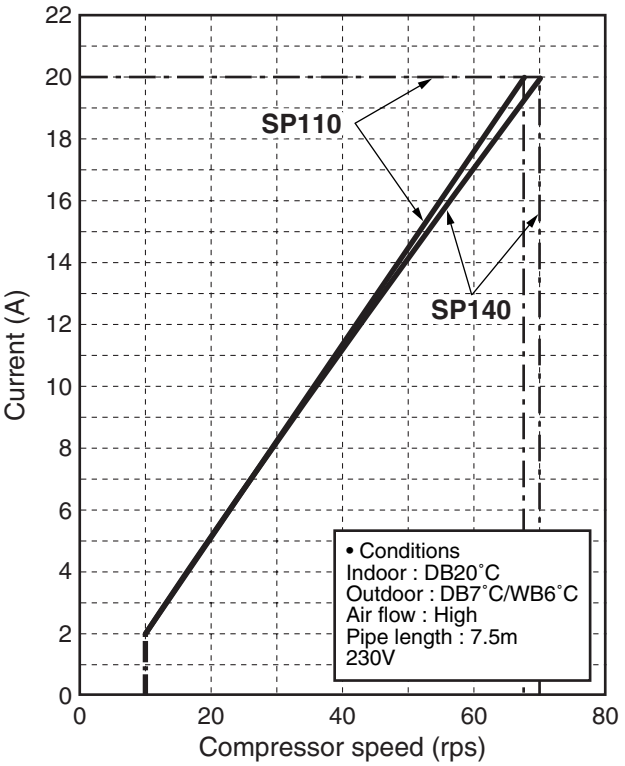
• Operation characteristic curve <Super Digital Inverter>

RAV-SP1104AT-E1, RAV-SP1104ATJ-E1
RAV-SP1404AT-E1, RAV-SP1404ATJ-E1

<Cooling>



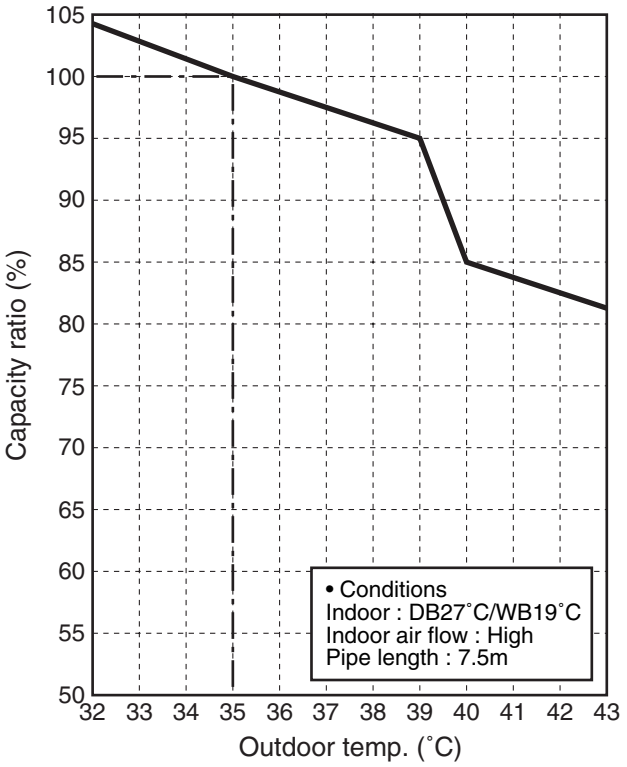
<Heating>



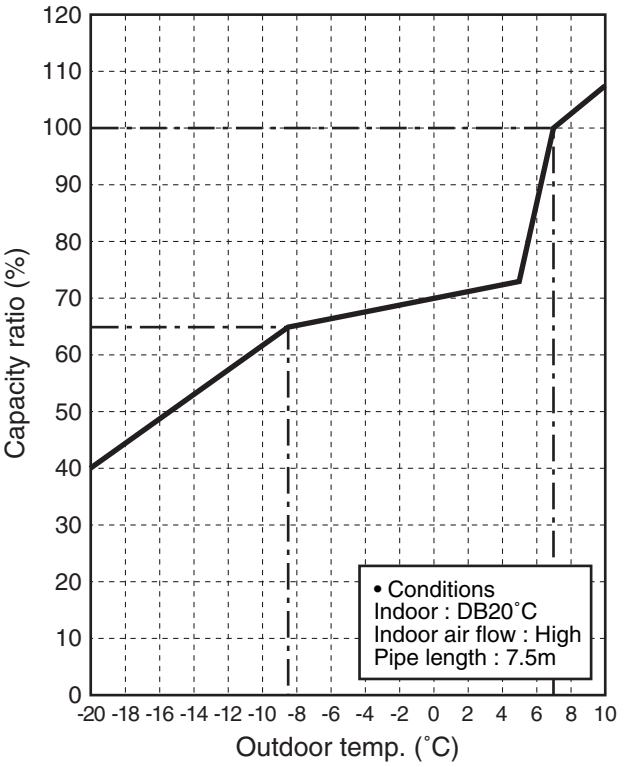
• Capacity variation ratio according to temperature

RAV-SP1104AT-E1, RAV-SP1104ATJ-E1
RAV-SP1404AT-E1, RAV-SP1404ATJ-E1

<Cooling>



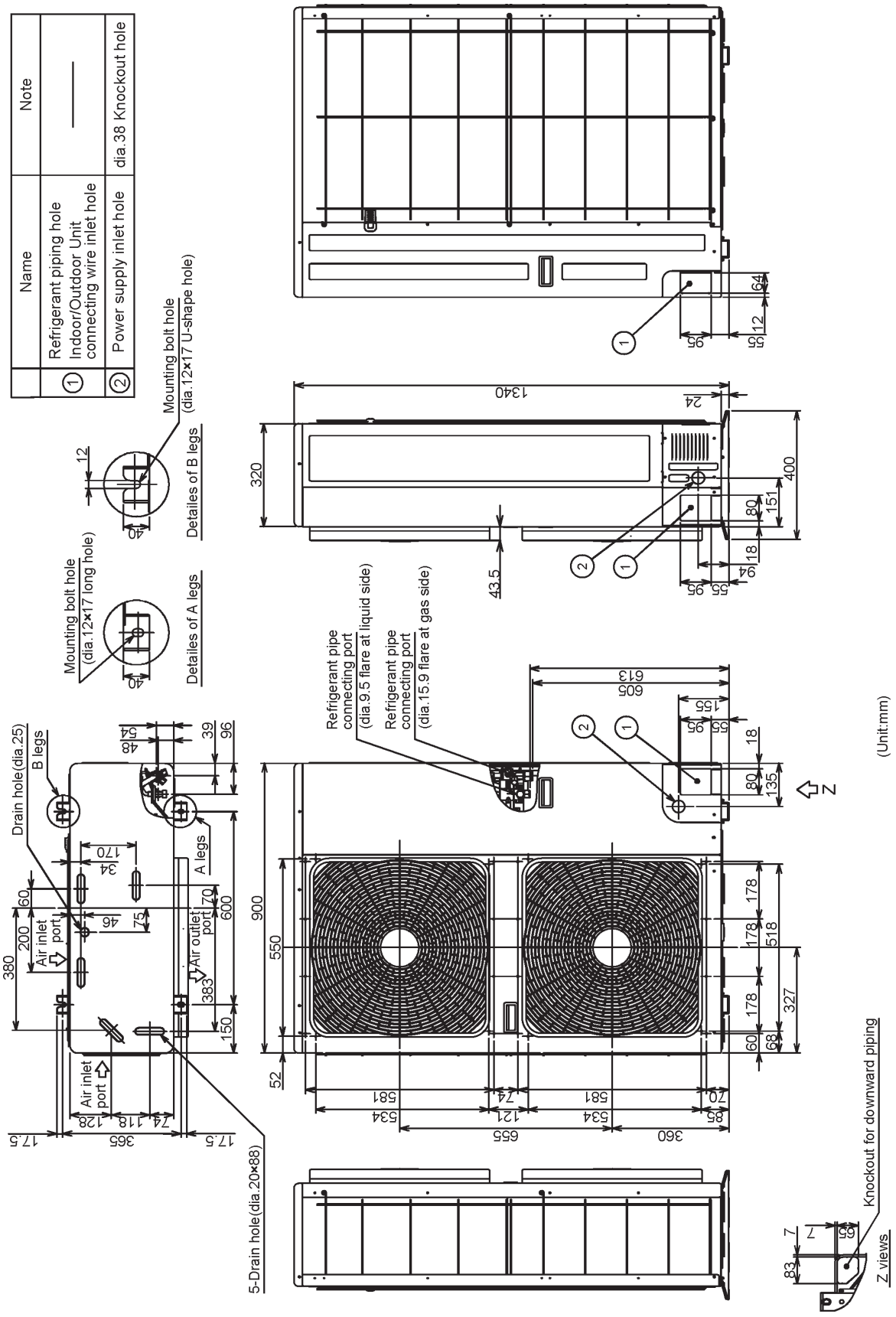
<Heating>



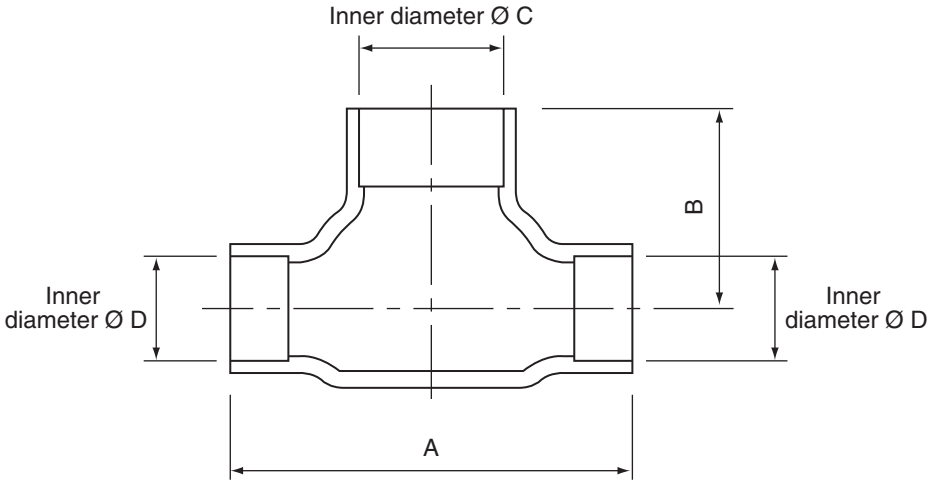
2. CONSTRUCTION VIEWS (EXTERNAL VIEWS)

Outdoor Unit

RAV-SP1104AT-E1, RAV-SP1104ATJ-E1
RAV-SP1404AT-E1, RAV-SP1404ATJ-E1



RAV-TWP30E2, RAV-TWP50E2 (Simultaneous Twin)

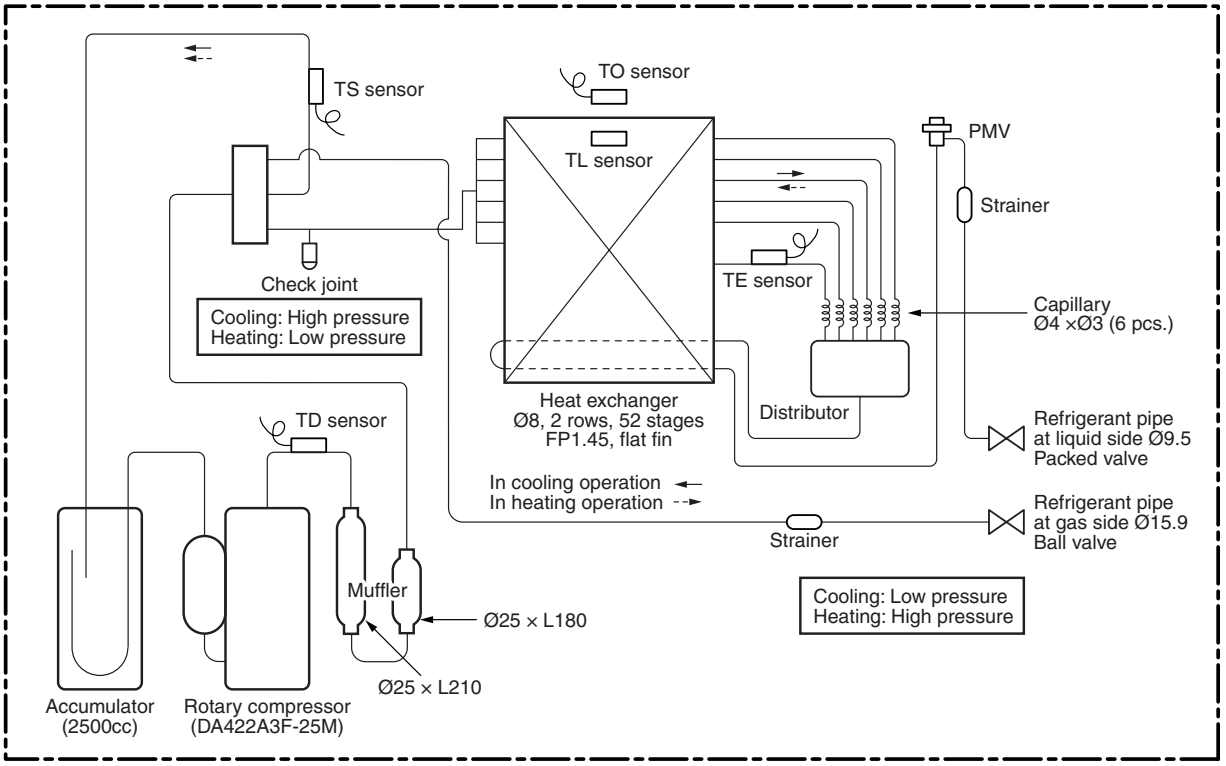


Model (RBC-)		A	B	C	D
TWP30E2	Liquid side	36	14	Ø9.5	Ø6.4
	Gas side	43	23	Ø15.9	Ø12.7
TWP50E2	Liquid side	34	14	Ø9.5	Ø9.5
	Gas side	44	21	Ø15.9	Ø15.9

3. SYSTEMATIC REFRIGERATING CYCLE DIAGRAM

Outdoor Unit

RAV-SP1104AT-E1, RAV-SP1104ATJ-E1, RAV-SP1404AT-E1, RAV-SP1404ATJ-E1



RAV-SP1104AT-E1, RAV-SP1104ATJ-E1

		Pressure				Pipe surface temperature (°C)					Compressor drive revolution frequency (rps)	Indoor fan	Indoor/Outdoor temp. conditions (DB/WB) (°C)	
		(MPa)		(kg/cm²g)		Discharge	Suction	Indoor heat exchanger	Outdoor heat exchanger					
		Pd	Ps	Pd	Ps	(TD)	(TS)	(TC)	(TL)	(TE)			Indoor	Outdoor
Cooling	Standard	2.57	0.99	26.2	10.1	66	14	12	44	38	38	HIGH	27/19	35/–
	Overload	3.30	1.09	33.7	11.1	78	9	13	49	43	53	HIGH	32/24	43/–
	Low load	1.74	0.75	17.8	7.7	46	7	5	32	25	21	LOW	18/15.5	–5/–
Heating	Standard	2.32	0.73	23.7	7.4	65	3	39	2	3	43	HIGH	20/–	7/6
	Overload	3.22	1.17	32.9	11.9	73	19	54	14	15	26	LOW	30/–	24/18
	Low load	2.17	0.30	22.1	3.1	87	–15	38	–14	–13	71	HIGH	15/–	–15/–

* This compressor has 4-pole motor. The value when compressor frequency (Hz) is measured by a clamp meter becomes 2 times of No. of compressor revolutions (rps).

RAV-SP1404AT-E1, RAV-SP1404ATJ-E1

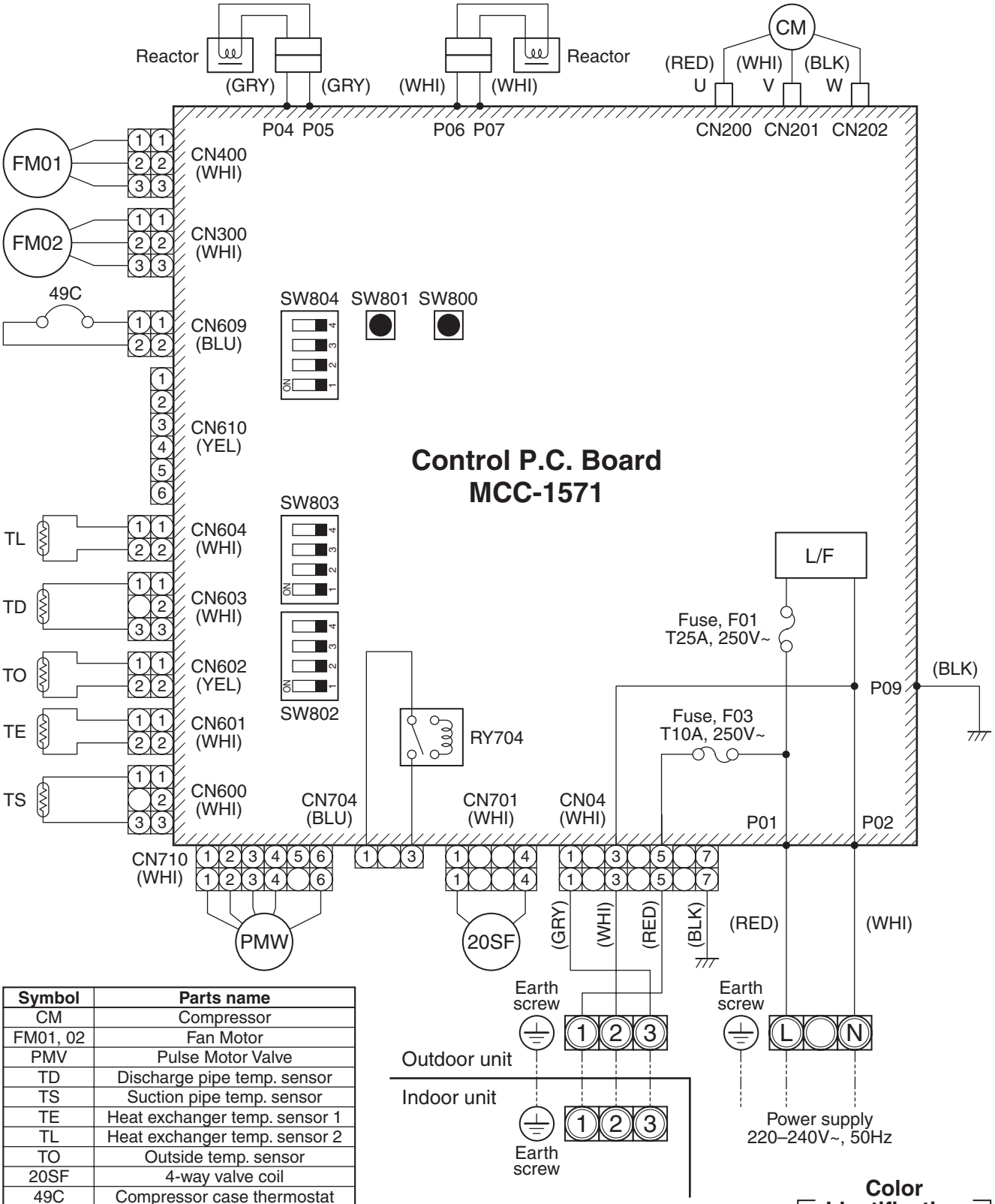
		Pressure				Pipe surface temperature (°C)					Compressor drive revolution frequency (rps)	Indoor fan	Indoor/Outdoor temp. conditions (DB/WB) (°C)	
		(MPa)		(kg/cm²g)		Discharge	Suction	Indoor heat exchanger	Outdoor heat exchanger					
		Pd	Ps	Pd	Ps	(TD)	(TS)	(TC)	(TL)	(TE)			Indoor	Outdoor
Cooling	Standard	2.72	0.90	27.8	9.2	73	12	10	46	38	51	HIGH	27/19	35/–
	Overload	3.34	1.07	34.1	10.9	80	9	13	51	45	55	HIGH	32/24	43/–
	Low load	1.75	0.76	17.9	7.8	47	8	6	33	25	21	LOW	18/15.5	–5/–
Heating	Standard	2.59	0.69	26.4	7.0	75	3	43	2	2	53	HIGH	20/–	7/6
	Overload	3.13	1.05	31.9	10.7	72	16	53	12	13	26	LOW	30/–	24/18
	Low load	2.40	0.21	24.5	2.1	97	–22	42	–19	–18	90	HIGH	15/–	–15/–

* This compressor has 4-pole motor. The value when compressor frequency (Hz) is measured by a clamp meter becomes two times of No. of compressor revolutions (rps).

4. WIRING DIAGRAM

Outdoor Unit

RAV-SP1104AT-E1, RAV-SP1104ATJ-E1, RAV-SP1404AT-E1, RAV-SP1404ATJ-E1



Symbol	Parts name
CM	Compressor
FM01, 02	Fan Motor
PMV	Pulse Motor Valve
TD	Discharge pipe temp. sensor
TS	Suction pipe temp. sensor
TE	Heat exchanger temp. sensor 1
TL	Heat exchanger temp. sensor 2
TO	Outside temp. sensor
20SF	4-way valve coil
49C	Compressor case thermostat
RY	Relay
L/F	Line Filter

1. ◎ indicates the terminal block.
   Alphanumeric characters in the cycle indicate the terminal No.
2. The two-dot chain line indicates the wiring procured locally.
3. ▨ indicates the P.C. board.
4. For the indoor unit circuit, refer to the wiring diagram of the indoor unit.

Color Identification

BLK	:	BLACK
BLU	:	BLUE
RED	:	RED
GRY	:	GRAY
WHI	:	WHITE
YEL	:	YELLOW

5. SPECIFICATIONS OF ELECTRICAL PARTS

Outdoor Unit (Parts Ratings)

RAV-SP1104AT-E1, RAV-SP1104ATJ-E1, RAV-SP1404AT-E1, RAV-SP1404ATJ-E1

No.	Parts name	Type	Specifications
1	Compressor	DA422A3F-25M	—
2	Outdoor fan motor	ICF-280-A100-1	Output 100W
3	Reactor	CH-62	5.7mH, 18.5A
4	4-way valve coil	VHV-01AP552B1	AC240V
5	PMV coil	UKV-A038	DC12V
6	P.C. board	MCC-1571	AC220 – 240V
7	Fuse (Mounted on P.C. board)	—	AC250V, 25A
8	Fuse (Mounted on P.C. board)	—	AC250V, 10A
9	Fuse (Mounted on P.C. board)	—	AC250V, 3.15A
10	Outdoor temp. sensor (TO sensor)	—	10 kΩ at 25°C
11	Heat exchanger sensor (Te sensor)	—	10 kΩ at 25°C
12	Discharge temp. sensor (Td sensor)	—	50 kΩ at 25°C
13	Heat exchanger mid. Temp sensor (TL sensor)	—	10 kΩ at 25°C
14	Compressor thermo. (Protection)	US-622	OFF: 125 ± 4°C, ON: 90 ± 5°C

6. REFRIGERANT R410A

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

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

The next section describes the precautions for air conditioner using the Refrigerant R410A.

Conforming to contents of the next section together with the general cautions included in this manual, perform the correct and safe work.

6-1. Safety During Installation/Servicing

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

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

   If other refrigerant than R410A is mixed, pressure in the refrigeration cycle becomes abnormally high, and it may cause personal injury, etc. by a rupture.
2. Confirm the used refrigerant name, and use tools and materials exclusive for the refrigerant R410A.

   The refrigerant name R410A is indicated on the visible place of the outdoor unit of the air conditioner using R410A as refrigerant.

   To prevent mischarging, the diameter of the service port differs from that of R22.
3. If a refrigeration gas leakage occurs during installation/servicing, be sure to ventilate fully.

   If the refrigerant gas comes into contact with fire, a poisonous gas may occur.
4. When installing or removing an air conditioner, do not allow air or moisture to remain in the refrigeration cycle.

   Otherwise, pressure in the refrigeration cycle may become abnormally high so that a rupture or personal injury may be caused.
5. After completion of installation work, check to make sure that there is no refrigeration gas leakage.

   If the refrigerant gas leaks into the room, coming into contact with fire in the fan-driven heater, space heater, etc., a poisonous gas may occur.
6. When an air conditioning system charged with a large volume of refrigerant is installed in a small room, it is necessary to exercise care so that, even when refrigerant leaks, its concentration does not exceed the marginal level.

   If the refrigerant gas leakage occurs and its concentration exceeds the marginal level, an oxygen starvation accident may result.
7. Be sure to carry out installation or removal according to the installation manual.

   Improper installation may cause refrigeration trouble, water leakage, electric shock, fire, etc.
8. Unauthorized modifications to the air conditioner may be dangerous. If a breakdown occurs please call a qualified air conditioner technician or electrician.

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

6-2. Refrigerant Piping Installation

6-2-1. Piping Materials and Joints Used

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

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

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

1. Copper Pipes

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

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

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

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

   Thicknesses of copper pipes used with R410A are as shown in Table 6-2-1. Never use copper pipes thinner than 0.8mm even when it is available on the market.

NOTE:

Refer to the "**6-6. Instructions for Re-use Piping of R22 or R407C**".

Table 6-2-1 Thicknesses of annealed copper pipes

		Thickness (mm)	
Nominal diameter	**Outer diameter (mm)**	**R410A**	**R22**
1/4	6.4	0.80	0.80
3/8	9.5	0.80	0.80
1/2	12.7	0.80	0.80
5/8	15.9	1.00	1.00

1. 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 6-2-3 to 6-2-5 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 6-2-2.

Table 6-2-2 Minimum thicknesses of socket joints

Nominal diameter	Reference outer diameter of copper pipe jointed (mm)	Minimum joint thickness (mm)
1/4	6.4	0.50
3/8	9.5	0.60
1/2	12.7	0.70
5/8	15.9	0.80

6-2-2. Processing of Piping Materials

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

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

1. Flare Processing Procedures and Precautions

   a) Cutting the Pipe

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

   b) Removing Burrs and Chips

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

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

c) Insertion of Flare Nut

d) Flare Processing

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

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

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

Flare processing dimensions differ according to the type of flare tool.

When using a conventional flare tool, be sure to secure “dimension A” by using a gauge for size adjustment.

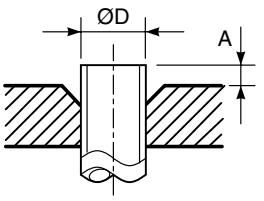


Fig. 6-2-1 Flare processing dimensions

Table 6-2-3 Dimensions related to flare processing for R410A / R22

Nominal diameter	Outer diameter (mm)	Thickness (mm)	A (mm)				
			Flare tool for R410A, R22 clutch type	Conventional flare tool (R410A)		Conventional flare tool (R22)	
				Clutch type	Wing nut type	Clutch type	Wing nut type
1/4	6.4	0.8	0 to 0.5	1.0 to 1.5	1.5 to 2.0	0.5 to 1.0	1.0 to 1.5
3/8	9.5	0.8	0 to 0.5	1.0 to 1.5	1.5 to 2.0	0.5 to 1.0	1.0 to 1.5
1/2	12.7	0.8	0 to 0.5	1.0 to 1.5	2.0 to 2.5	0.5 to 1.0	1.5 to 2.0
5/8	15.9	1.0	0 to 0.5	1.0 to 1.5	2.0 to 2.5	0.5 to 1.0	1.5 to 2.0

Table 6-2-4 Flare and flare nut dimensions for R410A

Nominal diameter	Outer diameter (mm)	Thickness (mm)	Dimension (mm)				Flare nut width (mm)
			A	B	C	D	
1/4	6.4	0.8	9.1	9.2	6.5	13	17
3/8	9.5	0.8	13.2	13.5	9.7	20	22
1/2	12.7	0.8	16.6	16.0	12.9	23	26
5/8	15.9	1.0	19.7	19.0	16.0	25	29

Table 6-2-5 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	6.4	0.8	9.1	9.2	6.5	13	17
3/8	9.5	0.8	13.0	13.5	9.7	20	22
1/2	12.7	0.8	16.2	16.0	12.9	20	24
5/8	15.9	1.0	19.4	19.0	16.0	23	27
3/4	19.0	1.0	23.3	24.0	19.2	34	36

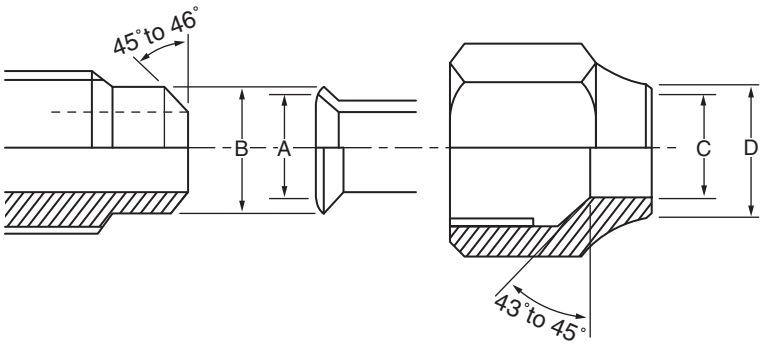


Fig. 6-2-2 Relations between flare nut and flare seal surface

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 R410A is the same as that for conventional R22.
      Incidentally, when the torque is weak, the gas leakage may occur.
      When it is strong, the flare nut may crack and may be made non-removable.
      When choosing the tightening torque, comply with values designated by manufacturers.
      Table 6-2-6 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 6-2-6 Tightening torque of flare for R410A [Reference values]

Nominal diameter	Outer diameter (mm)	Tightening torque N•m (kgf•m)	Tightening torque of torque wrenches available on the market N•m (kgf•m)
1/4	6.4	14 to 18 (1.4 to 1.8)	16 (1.6), 18 (1.8)
3/8	9.5	33 to 42 (3.3 to 4.2)	42 (4.2)
1/2	12.7	50 to 62 (5.0 to 6.2)	55 (5.5)
5/8	15.9	63 to 77 (6.3 to 7.7)	65 (6.5)

6-3. Tools

6-3-1. Required Tools

Refer to the "**4. Tools**" (Page 12)

6-4. Recharging of Refrigerant

When it is necessary to recharge refrigerant, charge the specified amount of Refrigerant R410A 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 of 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, and charge **liquid refrigerant.**

(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.

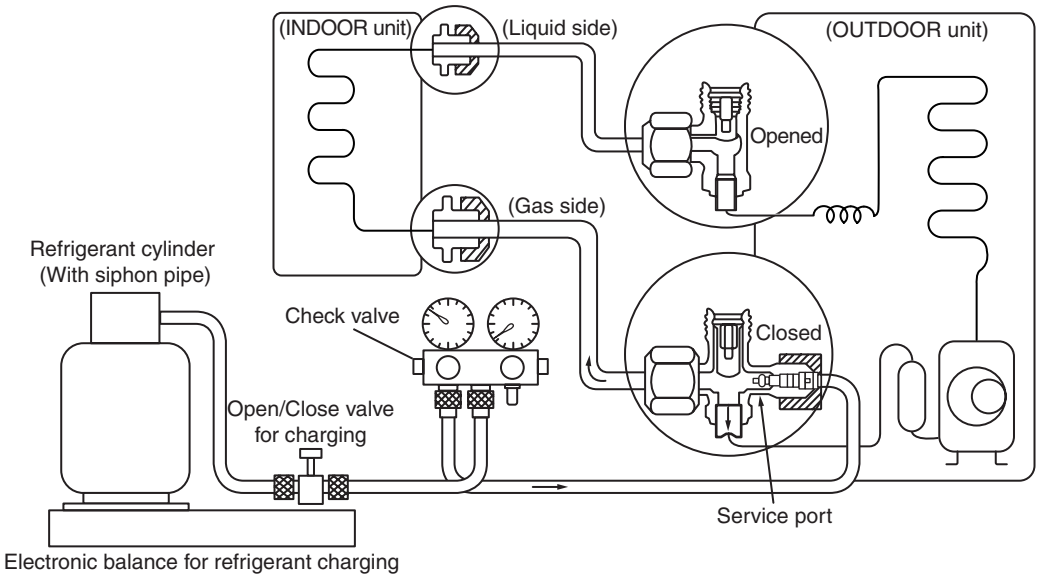
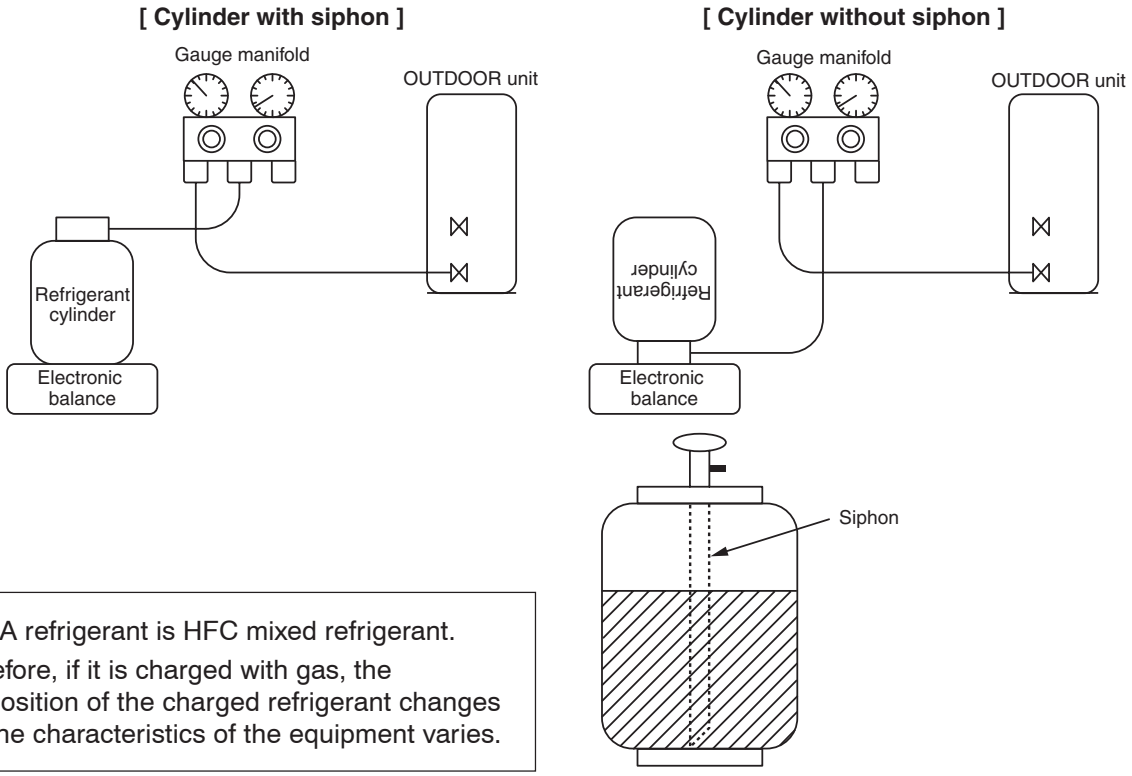


Fig. 6-4-1 Configuration of refrigerant charging

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

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



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

Fig. 6-4-2

6-5. Brazing of Pipes

6-5-1. 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.

6-5-2. 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.

6-5-3. 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 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.

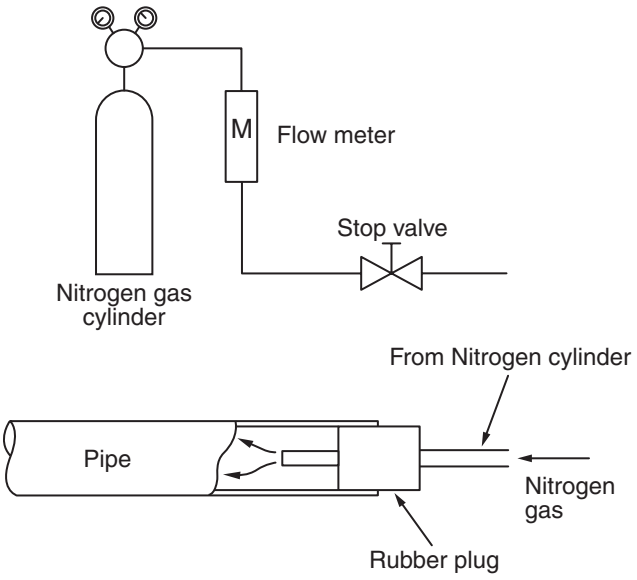


Fig. 6-5-1 Prevention of oxidation during brazing

6-6. Instructions for Re-use Piping of R22 or R407C

Instruction of Works:
The existing R22 and R407C piping can be reused for our digital inverter R410A products installations.

NOTE)

Confirmation of existence of scratch or dent of the former pipes to be applied and also confirmation of reliability of the pipe strength are conventionally referred to the local site.

If the definite conditions can be cleared, it is possible to update the existing R22 and R407C pipes to those for R410A models.

6-6-1. Basic Conditions Needed to Reuse the Existing Pipe

Check and observe three conditions of the refrigerant piping works.

1. Dry (There is no moisture inside of the pipes.)
2. Clean (There is no dust inside of the pipes.)
3. Tight (There is no refrigerant leak.)

6-6-2. Restricted Items to Use the Existing Pipes

In the following cases, the existing pipes cannot be reused as they are. Clean the existing pipes or exchange them with new pipes.

1. When a scratch or dent is heavy, be sure to use the new pipes for the works.
2. When the thickness of the existing pipe is thinner than the specified “Pipe diameter and thickness” be sure to use the new pipes for the works.
   - The operating pressure of R410A is high (1.6 times of R22 and R407C). If there is a scratch or dent on the pipe or thinner pipe is used, the pressure strength is poor and may cause breakage of the pipe at the worst.

∗ **Pipe diameter and thickness (mm)**

Pipe outer diameter		Ø6.4	Ø9.5	Ø12.7	Ø15.9	Ø19.0
Thickness	R410A	0.8	0.8	0.8	1.0	1.0
	R22 (R407C)					

   - In case that the pipe diameter is Ø12.7 mm or less and the thickness is less than 0.7 mm, be sure to use the new pipes for works.
3. The pipes are left as coming out or gas leaks. (Poor refrigerant)
   - There is possibility that rain water or air including moisture enters in the pipe.
4. Refrigerant recovery is impossible. (Refrigerant recovery by the pump-down operation on the existing air conditioner)
   - There is possibility that a large quantity of poor oil or moisture remains inside of the pipe.
5. A dryer on the market is attached to the existing pipes.
   - There is possibility that copper green rust generated.
6. Check the oil when the existing air conditioner was removed after refrigerant had been recovered. In this case, if the oil is judged as clearly different compared with normal oil
   - The refrigerator oil is copper rust green : There is possibility that moisture is mixed with the oil and rust generates inside of the pipe.
   - There is discolored oil, a large quantity of the remains, or bad smell.
   - A large quantity of sparkle remained wear-out powder is observed in the refrigerator oil.
7. The air conditioner which compressor was exchanged due to a faulty compressor. When the discolored oil, a large quantity of the remains, mixture of foreign matter, or a large quantity of sparkle remained wear-out powder is observed, the cause of trouble will occur.
8. Installation and removal of the air conditioner are repeated with temporary installation by lease and etc.
9. In case that type of the refrigerator oil of the existing air conditioner is other than the following oil (Mineral oil), Suniso, Freol-S, MS (Synthetic oil), alkyl benzene (HAB, Barrel-freeze), ester series, PVE only of ether series.
   - Winding-insulation of the compressor may become inferior.

NOTE)

The above descriptions are results of confirmation by our company and they are views on our air conditioners, but they do not guarantee the use of the existing pipes of the air conditioner that adopted R410A in other companies.

6-6-3. Branching Pipe for Simultaneous Operation System

- In the concurrent twin system, when TOSHIBA-specified branching pipe is used, it can be reused. Branching pipe model name: RBC-TWP30E-2, RBC-TWP50E-2 On the existing air conditioner for simultaneous operation system (twin system), there is a case of using branch pipe that has insufficient compressive strength. In this case please change it to the branch pipe for R410A.

6-6-4. Curing of Pipes

When removing and opening the indoor unit or outdoor unit for a long time, cure the pipes as follows:

- Otherwise rust may generate when moisture or foreign matter due to dewing enters in the pipes.
- The rust cannot be removed by cleaning, and a new piping work is necessary.

Place position	Term	Curing manner
Outdoors	1 month or more	Pinching
	Less than 1 month	Pinching or taping
Indoors	Every time	

6-6-5. Final Installation Checks

Is there no scratch or dent on the existing pipes?

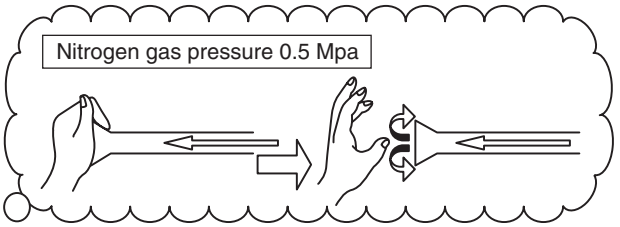
→ Existing pipe: NO * Use a new pipes.

Is it possible to operate the existing air conditioner?

NO

YES

* After the existing air conditioner operated in cooling mode for approx. 30 minutes or longer*, recover the refrigerant.
* For cooling the pipes and recovering of oil
  - Refrigerant recovery: Pump down method



* Remove the existing air conditioner from the piping and carry out flashing (nitrogen pressure 0.5 Mpa) to remove the remains inside of the pipe.

Note] In case of twin, also be sure to flash the branching pipe.

(If there is discharge of remains, it is judged that there is a large quantity of remains.)

Was not largely discolored oil or a large quantity of remains discharged? (When the oil deteriorates, the color of the oil changes to muddy and black color.)

NO → Clean the pipes or use the new pipes.

If you are in trouble of pipe cleaning, please contact us.

YES

■ Connect the indoor/outdoor units to the existing pipe.
- Use a flare nut attached to the main unit for the indoor/outdoor units. (Do not use the flare nut of the existing pipe.)
- Re-machine the flare machining size to size for R410A.

■ In case that the gas pipe Ø19 mm is used for the outdoor unit of SM803 (3 HP) or higher: (Gas pipe size of our R410A model 3 to 6 HP is Ø15.9 mm)

→ Turn the existing pipe switch on the cycle control P.C board of the outdoor unit to ON side. At shipment from factory OFF → ON for existing pipe (Refer to the table below.) (Be sure to set the contents in the table below in order to restrict the refrigerating cycle pressure of the equipment in the pipe standard.)

Existing pipe SW

	Switch
4, 5 HP	Bit 3 of SW802 → ON

* (Airtight test), Vacuum dry, Refrigerant charge, Gas leak check

Trial run

Piping necessary to change the flare nut/ machining size due to pipe compression.

1) Flare nut width: H (mm)

Copper pipe outer dia.	Ø6.4	Ø9.5	Ø12.7	Ø15.9	Ø19.0
For R410A	17	22	26	29	36
For R22	Same as above		24	27	Same as above

2) Flare machining size: A (mm)

Copper pipe outer dia.	Ø6.4	Ø9.5	Ø12.7	Ø15.9	Ø19.0
For R410A	9.1	13.2	16.6	19.7	24.0
For R22	9.0	13.0	16.2	19.4	23.3

Becomes large a little for R410A

Do not apply the refrigerator oil to the flare surface.

6-6-6. Handling of Existing Pipe

When using the existing pipe, carefully check it for the following:

- Wall thickness (within the specified range)
- Scratches and dents
- Water, oil, dirt, or dust in the pipe
- Flare looseness and leakage from welds
- Deterioration of copper pipe and heat insulator

Cautions for using existing pipe

- Do not reuse the flare to prevent gas leak.

  Replace it with the supplied flare nut and then process it to a flare.
- Blow nitrogen gas or use an appropriate means to keep the inside of the pipe clean.

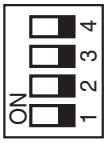
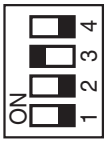
  If discolored oil or much residue is discharged, wash the pipe.
- Check welds, if any, on the pipe for gas leak.

  When the pipe corresponds to any of the following, do not use it. Install a new pipe instead.
- The pipe has been open (disconnected from indoor unit or outdoor unit) for a long period.
- The pipe has been connected to an outdoor unit that does not use refrigerant R22, R410A or R407C.
- The existing pipe must have a wall thickness equal to or larger than the following thickness.

Reference outside diameter (mm)	Wall thickness (mm)
Ø9.5	0.8
Ø15.9	1.0
Ø19.1	1.0

- Never use any pipe with a wall thickness less than these thicknesses due to insufficient pressure capacity.
- To use an existing Ø19.1 mm pipe, set bit 3 of SW802 (switch for existing pipe) on the P.C. board of the outdoor unit to ON.

  In this case, the heating performance may be reduced depending on the outside air temperature and room temperature.

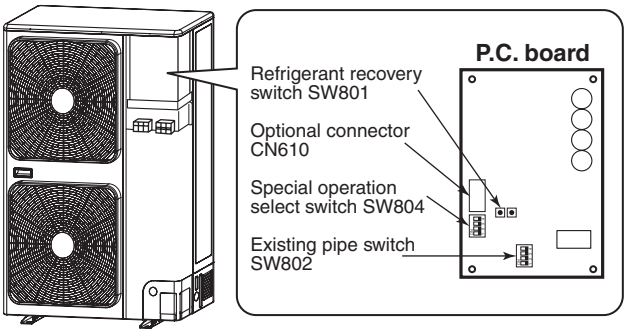
SW802	
When shipped from factory	When using existing pipe
	

6-6-7. Recovery Method of Refrigerant

• Use the refrigerant recovery switch SW801 on the P.C. board of the outdoor unit to recover refrigerant when the indoor unit or outdoor unit is moved.

Procedure

1. Turn on the power of the air conditioner.
2. Select the FAN mode for indoor unit operation with the remote controller.
3. Set SW804 on the P.C. board of the outdoor unit to all OFF, and then push SW801 for one second or more.
   The air conditioner enters the forced cooling mode for up to 10 minutes.
   Operation or handling the valve to recover refrigerant during this time period.
4. Upon completion of refrigerant recovery, close the valve and push SW801 for at least one second to stop operation.
5. Turn off the power.



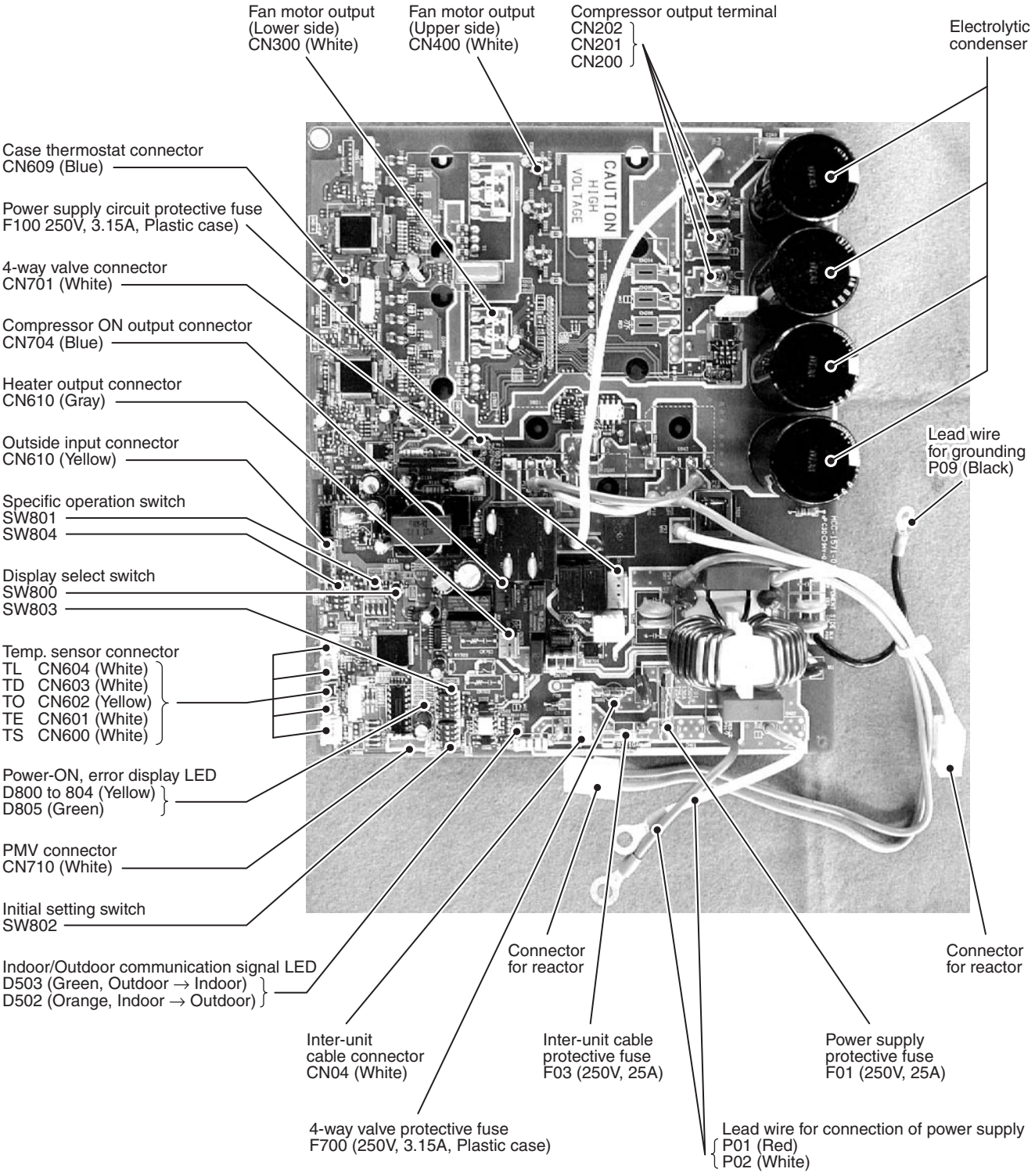
⚠ DANGER

Take care for an electric shock because the P.C. board is electrified.

7. CIRCUIT CONFIGURATION AND CONTROL SPECIFICATIONS

7-1. Outdoor Unit Control

7-1-1. Print Circuit Board, MCC-1571



7-2. Outline of Main Controls

1. PMV (Pulse Motor Valve) control

1) PMV is controlled between 30 and 500 pulsed during operation.
2) In cooling operation, PMV is usually controlled with the temperature difference between TS sensor and TC sensor aiming 1 to 4K as the target value.
3) In heating operation, PMV is usually controlled with the temperature difference between TS sensor and TE sensor aiming –1 to 4K as the target value.
4) When the cycle excessively heated in both cooling and heating operation, PMV is controlled by TD sensor. The target value is usually 91°C in cooling operation and 96°C in heating operation.

REQUIREMENT

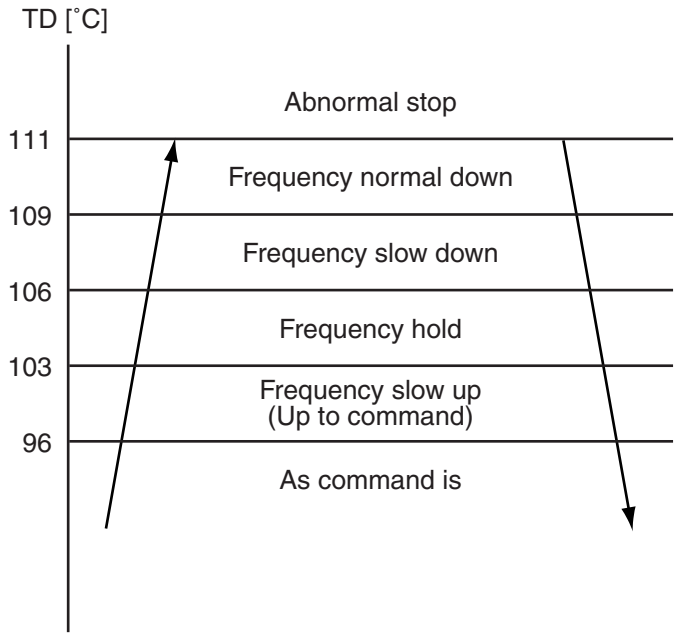
A sensor trouble may cause a liquid back-flow or abnormal overheat resulting in excessive shortening of the compressor life. In a case of trouble on the compressor, be sure to check there is no error in the resistance value or the refrigerating cycle of each sensor after repair and then start the operation.

2. Discharge temperature release control

1) When the discharge temperature did not fall or the discharge temperature rapidly went up by PMV control, this control lowers the operation frequency. It subdivides the frequency control up to 0.6Hz to stabilize the cycle.
2) When the discharge temperature detected an abnormal stop zone, the compressor stops and then restarts after 2 minutes 30 seconds.

   The error counting is cleared when the operation continued for 10 minutes. If the error is detected by 4 times without clearing, the error is determined and restarting is not performed.

   * The cause is considered as excessively little amount of refrigerant, PMV error or clogging of the cycle.
3) For displayed contents of error, confirm on the check code list.



3. Outdoor fan control

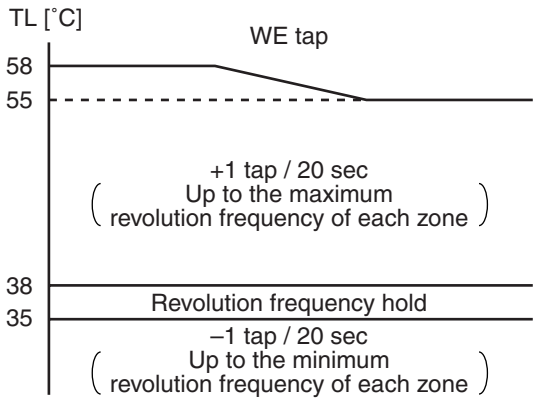
Revolution frequency allocation of fan taps [rpm]

		W1	W2	W3	W4	W5	W6	W7	W8	W9	WA	WB	WC	WD	WE
SP110 SP140	Up	200	240	240	260	320	380	480	500	530	610	640	660	720	780
	Down	—	—	200	280	360	400	500	520	550	630	660	700	740	820

3-1) Cooling fan control

① The outdoor fan is controlled by TL sensor, TO sensor and the operation frequency.
The outdoor fan is controlled by every 1 tap of DC fan control (14 taps).

② Only for 60 seconds after the operation has started, the maximum fan tap corresponding to the zone in the following table is fixed and then the fan is controlled by temperature of TL sensor.



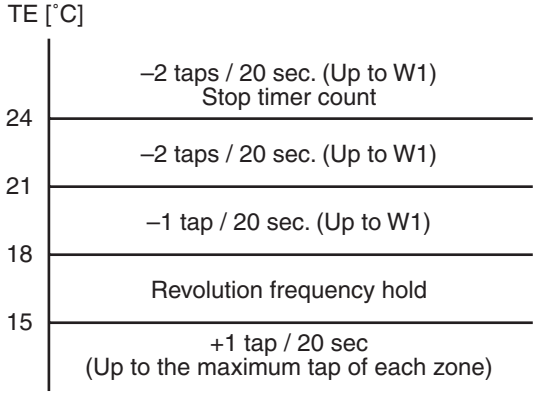
Temp. range	20 Hz or lower		20Hz to 45Hz		45Hz or higher	
	Min.	Max.	Min.	Max.	Min.	Max.
38°C ≤ TO	W6	WC	W8	WC	WA	WD
29°C ≤ TO < 38°C	W5	WB	W7	WC*	W9	WC
15°C ≤ TO < 29°C	W4	W8	W6	WA	W8	WC
5°C ≤ TO < 15°C	W3	W6	W5	W8	W7	WA
0°C ≤ TO < 5°C	W2	W4	W4	W6	W5	W8
–4°C ≤ TO < 0°C	W2	W3	W3	W5	W4	W6
TO < –4°C	W1	W2	W1	W4	W2	W6
TO error	W1	WC	W1	WC	W2	WD

∗ : WB for SP110

3-2) Heating fan control

① The outdoor fan is controlled by TE sensor, TO sensor and the operation frequency.
(Control from minimum W1 to maximum (according to the following table))

② For 3 minutes after the operation has started, the maximum fan tap corresponding to the zone in the following table is fixed and then the fan is controlled by temperature of TE sensor.



③ When TE ≥ 24°C continues for 5 minutes, the compressor stops.
It is the same status as the normal thermostat-OFF without error display.

The compressor restarts after approx. 2 minutes 30 seconds and this intermittent operation is not abnormal.

④ In case that the status in item ③ generates frequently, stain on filter of the suction part of the indoor unit is considered.

Clean the filter and then restart the operation.

Object: SP140

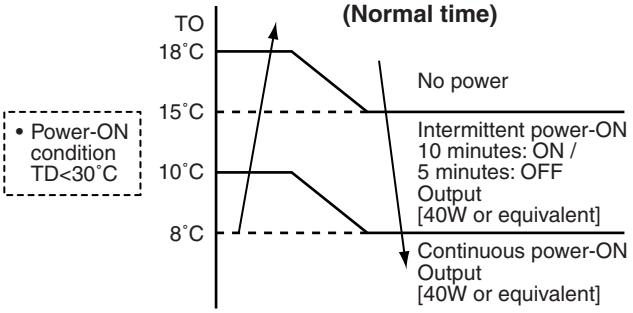
Temp. range	20 Hz or lower	20Hz to 45Hz	45Hz or higher
	Max.	Max.	Max.
10°C ≤ TO	W7	W8	W9
5°C ≤ TO < 10°C	W9	WA	WB
–3°C ≤ TO < 5°C	WB	WB	WC
–10°C ≤ TO < –3°C	WC	WC	WC
TO < –10°C	WD	WD	WD
TO error	WD	WD	WD

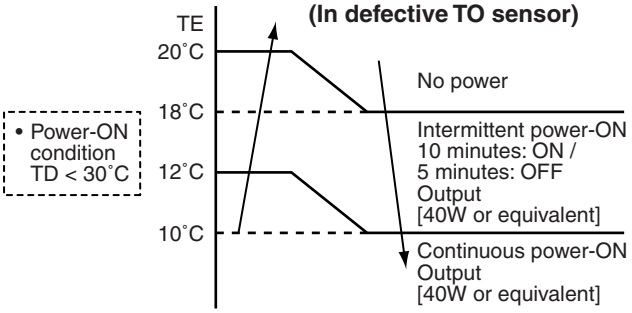
Object: SP110

Temp. range	20 Hz or lower	20Hz to 45Hz	45Hz or higher
	Max.	Max.	Max.
10°C ≤ TO	W7	W8	W9
5°C ≤ TO < 10°C	W9	WA	WA
–3°C ≤ TO < 5°C	WA	WA	WB
–10°C ≤ TO < –3°C	WB	WB	WB
TO < –10°C	WD	WD	WD
TO error	WD	WD	WD

4. Coil heating control

1) This control function heats the compressor by turning on the stopped compressor instead of a case heater.
   It purposes to prevent stagnation of the refrigerant inside of the compressor.
2) As usual, turn on power of the compressor for the specified time before a test run after installation; otherwise a trouble of the compressor may be caused.
   As same as a test run, it is recommended to turn on power of the compressor beforehand when starting operation after power of the compressor has been interrupted and left as it is for a long time.
3) A judgment for electricity is performed by TD and TO sensors.
   If TO sensor is defective, a backup control is automatically performed by TE sensor.
   For a case of defective TO sensor, judge it with outdoor LED display.
4) For every model, the power is turned off when TD is 30°C or more.





REQUIREMENT

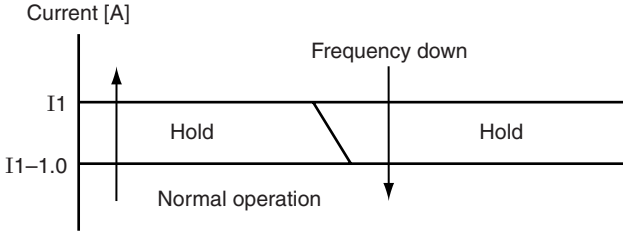
While heating the coil, the power sound may be heard. However it is not a trouble.

5. Short intermittent operation preventive control

1) For 3 to 10 minutes after operation start, in some cases, the compressor does not stop to protect the compressor even if receiving the thermostat-OFF signal from indoor.
   However it is not abnormal status. (The operation continuance differs according to the operation status.)
2) When the operation stops by the remote controller, the operation does not continue.

6. Current release control

No. of revolutions of the compressor is controlled by AC current value detected by T620 on the outdoor P.C. board so that the input current of the inverter does not exceed the specified value.



Objective model	SP110 / SP140	
	COOL	HEAT
I1 value [A]	20.0	20.0

7. Current release value shift control

1) This control purposes to prevent troubles of the electronic parts such as the compressor driving elements and the compressor during cooling operation.
2) The current release control value (I1) is selected from the following table according to TO sensor value.

Current release control value (I1)

[A]

Temperature range	SP110, SP140
44°C ≤ To	15.0
39°C ≤ To < 44°C	17.7
To < 39°C	20.0
TO error	15.0

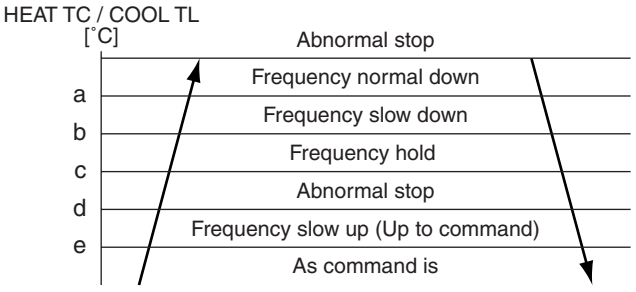
8. Over-current protective control

1) When the over-current protective circuit detected an abnormal current, stop the compressor.
2) The compressor restarts after 2 minutes 30 seconds setting [1] as an error count.
3) When the error count [8] was found, determine an error and restart operation is not performed.
4) For the error display contents, confirm on the check code list.

9. High-pressure release control

1) The operation frequency is controlled to restrain abnormal rising of high pressure by TL sensor in cooling operation and TC sensor in heating operation.
2) When TL sensor in cooling operation or TC sensor in heating operation detects abnormal temperature of the stop zone, stop the compressor and the error count becomes +1.
3) When the compressor stopped with 2), the operation restarts from the point of the normal operation zone (e point or lower) where it returned after 2 minutes 30 seconds.
4) The error count when the compressor stopped with 2) is cleared after the operation continued for 10 minutes.

   If the error count becomes [10] without clearing, the error is determined and reactivation is not performed.
5) For the error display contents, confirm on the check code list.



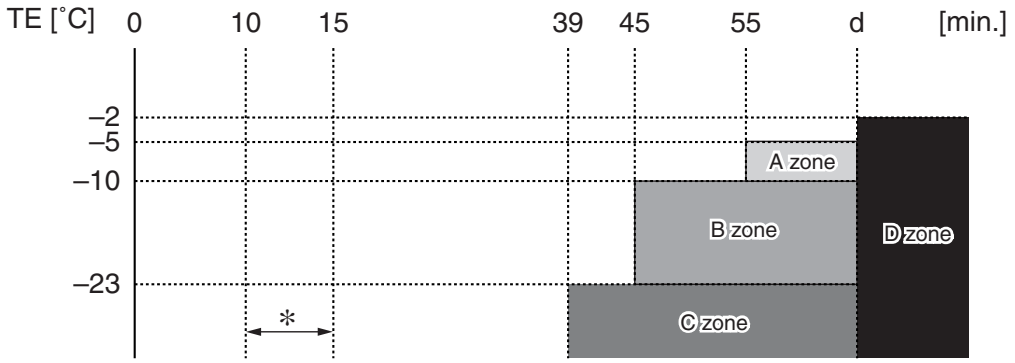
	HEAT	COOL
	TC	TL
a	62°C	63°C
b	57°C	62°C
c	55°C	60°C
d	53°C	58°C
e	49°C	54°C

10. Defrost control

1) In heating operation, defrost operation is performed when TE sensor satisfies any condition in A zone to D zone.
2) During defrosting operation, it finishes if TE sensor continued 12°C or higher for 3 seconds or continued 7°C ≤ TE < 12°C for 1 minute.

   The defrost operation also finishes when it continued for 10 minutes even if TE sensor temperature was 7°C or lower.
3) After defrost operation was reset, the compressor stopped for approx. 40 seconds and then the heating operation starts.

Start of heating operation



* The minimum TE value and To value between 10 and 15 minutes after heating operation has started are stored in memory as TE0 and To0, respectively.

	In normal To	In abnormal To
A zone	When status (TE0 – TE) – (To0 – To) ≥ 3°C continued for 20 seconds	When status (TE0 – TE) ≥ 3°C continued for 20 seconds
B zone	When status (TE0 – TE) – (To0 – To) ≥ 2°C continued for 20 seconds	When status (TE0 – TE) ≥ 2°C continued for 20 seconds
C zone	When status (TE ≤ –23°C) continued for 20 seconds	
D zone	When compressor operation status of TE < –2°C is calculated by d portion	

4) The time of above d can be changed by exchanging jumper [J805] and [J806] of the outdoor control P.C. board.
(Setting at shipment: 150 minutes)

J805	J806	d
○	○	150 minutes Setting at shipment
○	×	90 minutes
×	○	60 minutes
×	×	30 minutes

○ : Short circuit, × : Open

8. TROUBLESHOOTING

8-1. Summary of Troubleshooting

<Wired remote controller type>

1. Before troubleshooting

1) Required tools/instruments
   - ⊕ and ⊖ screwdrivers, spanners, radio cutting pliers, nippers, push pins for reset switch
   - Tester, thermometer, pressure gauge, etc.
2) Confirmation points before check
   a) The following operations are normal.
      1. Compressor does not operate.
         - Is not 3-minutes delay (3 minutes after compressor OFF)?
         - Is not the outdoor unit in standby status though the remote controller reached the setup temperature?
         - Does not timer operate during fan operation?
         - Is not an overflow error detected on the indoor unit?
         - Is not outside high-temperature operation controlled in heating operation?
      2. Indoor fan does not rotate.
         - Does not cool air discharge preventive control work in heating operation?
      3. Outdoor fan does not rotate or air volume changes.
         - Does not high-temperature release operation control work in heating operation?
         - Does not outside low-temperature operation control work in cooling operation?
         - Is not defrost operation performed?
      4. ON/OFF operation cannot be performed from remote controller.
         - Is not the control operation performed from outside/remote side?
         - Is not automatic address being set up?
           (When the power is turned on at the first time or when indoor unit address setting is changed, the operation cannot be performed for maximum approx. 5 minutes after power-ON.)
         - Is not being carried out a test run by operation of the outdoor controller?
   b) Did you return the cabling to the initial positions?
   c) Are connecting cables of indoor unit and remote controller correct?

2. Troubleshooting procedure

When a trouble occurred, check the parts along with the following procedure.

Trouble → **Confirmation of check code display** → **Check defective position and parts.**

NOTE :

For cause of a trouble, power conditions or malfunction/erroneous diagnosis of microcomputer due to outer noise is considered except the items to be checked. If there is any noise source, change the cables of the remote controller to shield cables.

<Wireless remote controller type>

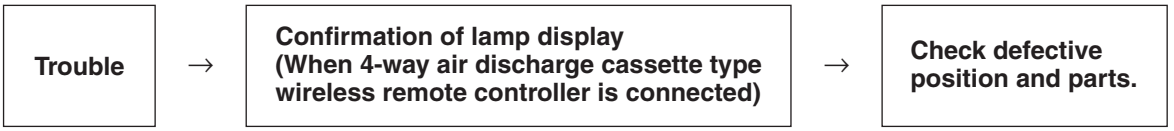
1. Before troubleshooting

1) Required tools/instruments
   - ⊕ and ⊖ screwdrivers, spanners, radio cutting pliers, nippers, etc.
   - Tester, thermometer, pressure gauge, etc.
2) Confirmation points before check
   a) The following operations are normal.
      1. Compressor does not operate.
         - Is not 3-minutes delay (3 minutes after compressor OFF)?
         - Is not the outdoor unit in standby status though the remote controller reached the setup temperature?
         - Does not timer operate during fan operation?
         - Is not an overflow error detected on the indoor unit?
         - Is not outside high-temperature operation controlled in heating operation?
      2. Indoor fan does not rotate.
         - Does not cool air discharge preventive control work in heating operation?
3) Outdoor fan does not rotate or air volume changes.
   - Does not high-temperature release operation control work in heating operation?
   - Does not outside low-temperature operation control work in cooling operation?
   - Is not defrost operation performed?
4) ON/OFF operation cannot be performed from remote controller.
   - Is not forced operation performed?
   - Is not the control operation performed from outside/remote side?
   - Is not automatic address being set up?
   - Is not being carried out a test run by operation of the outdoor controller?
     a) Did you return the cabling to the initial positions?
     b) Are connecting cables between indoor unit and receiving unit correct?

2. Troubleshooting procedure

(When the power is turned on at the first time or when indoor unit address setting is changed, the operation cannot be performed for maximum approx. 5 minutes after power-ON.)

When a trouble occurred, check the parts along with the following procedure.



1) Outline of judgment

   The primary judgment to check where a trouble occurred in indoor unit or outdoor unit is performed with the following method.

Method to judge the erroneous position by flashing indication on the display part of indoor unit (sensors of the receiving unit)

The indoor unit monitors operating status of the air conditioner, and the blocked contents of self-diagnosis are displayed restricted to the following cases if a protective circuit works.

8-2. Troubleshooting

8-2-1. Outline of judgment

The primary judgment to check whether a trouble occurred in the indoor unit or outdoor unit is carried out with the following method.

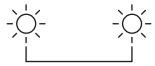
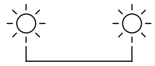
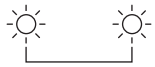
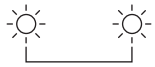
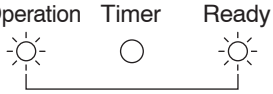
Method to judge the erroneous position by flashing indication on the display part of the indoor unit (sensors of the receiving part)

The indoor unit monitors the operating status of the air conditioner, and the blocked contents of self-diagnosis are displayed restricted to the following cases if a protective circuit works.

● : Go off, ○ : Go on, ☼ : Flash (0.5 sec.)

Lamp indication	Check code	Cause of trouble occurrence
Operation ● Timer ● Ready ● No indication at all	—	Power supply OFF or miswiring between receiving unit and indoor unit
Operation ☼ Timer ● Ready ● Flash	E01	Receiving error } Receiving unit } Miswiring or wire connection error between receiving unit and indoor unit
	E02	Sending error } Receiving unit } Miswiring or wire connection error between receiving unit and indoor unit
	E03	Communication stop } Miswiring or wire connection error between receiving unit and indoor unit
	E08	Duplicated indoor unit No. } Setup error
	E09	Duplicated master units of remote controller } Setup error
	E10	Communication error between CPUs on indoor unit P.C. board
	E18	Wire connection error between indoor units, Indoor power OFF (Communication stop between indoor master and follower or between main and sub indoor twin)
Operation ● Timer ● Ready ☼ Flash	E04	Miswiring between indoor unit and outdoor unit or connection erorr (Communication stop between indoor and outdoor units)
Operation ● Timer ☼ Ready ☼ Alternate flash	P10	Overflow was detected. } Protective device of indoor unit worked.
	P12	Indoor DC fan error } Protective device of indoor unit worked.
Operation ☼ Timer ● Ready ☼ Alternate flash	P03	Outdoor unit discharge temp. error } Protective device of outdoor unit worked. ∗1
	P04	Outdoor high pressure system error } Protective device of outdoor unit worked. ∗1
	P05	Negative phase detection error } Outdoor unit error
	P07	Heat sink overheat error } Outdoor unit error
	P15	Gas leak detection error } Outdoor unit error
	P19	4-way valve system error (Indoor or outdoor unit judged.)
	P20	Outdoor unit high pressure protection
	P22	Outdoor unit: Outdoor unit error } Protective device of outdoor unit worked. ∗1
	P26	Outdoor unit: Inverter Idc operation } Protective device of outdoor unit worked. ∗1
	P29	Outdoor unit: Position detection error } Protective device of outdoor unit worked. ∗1
	P31	Stopped because of error of other indoor unit in a group (Check codes of E03/L03/L07/L08)

∗1: These are representative examples and the check code differs according to the outdoor unit to be combined.

Lamp indication	Check code	Cause of trouble occurrence
Operation Timer Ready  Alternate flash	F01 F02 P10	Heat exchanger sensor (TCJ) error Heat exchanger sensor (TC) error Heat exchanger sensor (TA) error } Indoor unit sensor error
Operation Timer Ready  Alternate flash	F04 F06 F07 F08 F12 F13 F15	Discharge temp. sensor (TD) error Temp. sensor (TE) error Temp. sensor (TL) error Temp. sensor (TO) error Temp. sensor (TS) error Temp. sensor (TH) error Temp. Sensor miswiring (TE, TS) } Sensor error of outdoor unit ∗1
Operation Timer Ready  Simultaneous flash	F29	Indoor EEPROM error
Operation Timer Ready  Simultaneous flash	F31	Outdoor EEPROM error
Operation Timer Ready  Flash	H01 H02 H03 H04 H06	Compressor break down Compressor lock Current detection circuit error Case thermostat worked. } Outdoor compressor system error ∗1 Outdoor unit low pressure system error
Operation Timer Ready  Simultaneous flash	L03 L07 L08 L09	Duplicated master indoor units There is indoor unit of group connection in individual indoor unit. } → AUTO address Unsetting of group address Missed setting (Unset indoor capacity) * If group construction and address are not normal when power supply turned on, automatically goes to address setup mode.
Operation Timer Ready  Simultaneous flash	L10 L20 L29 L30 L31	Unset model type (Service board) Duplicated indoor central addresses Outdoor unit and other error Outside interlock error Negative phase error } Others

∗1: These are representative examples and the check code differs according to the outdoor unit to be combined.

8-2-2. Others (Other than Check Code)

Lamp indication	Check code	Cause of trouble occurrence
Operation Timer Ready  Simultaneous flash	—	During test run
Operation Timer Ready ○  Alternate flash	—	Disagreement of cool/heat (Automatic cool/heat setting to automatic cool/heat prohibited model, or setting of heating to cooling-only model)

8-2-3. Monitor Function of Remote Controller Switch

■ Calling of sensor temperature display

<Contents>

Each data of the remote controller, indoor unit and outdoor unit can be understood by calling the service monitor mode from the remote controller.

<Procedure>

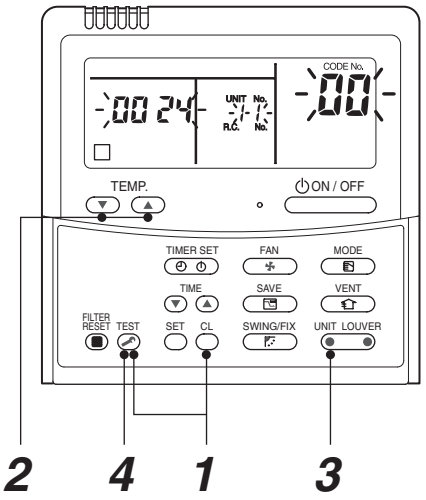
1 **Push TEST + CL buttons simultaneously for 4 seconds to call the service monitor mode.**

The service monitor goes on, the master indoor unit No. is displayed at first and then the temperature of item code **00** is displayed.

⇩

2 **Push temperature set TEMP. buttons and then change the item code of data to be monitored.**

The item code list is shown below.



<Operation procedure>

1→ 2→ 3→ 4

Returned to usual display

	Item code	Data name	Unit
Indoor unit data	01	Room temperature (Remote controller)	°C
	02	Indoor suction temperature (TA)	°C
	03	Indoor heat exchanger (Coil) temperature (TCJ)	°C
	04	Indoor heat exchanger (Coil) temperature (TC)	°C
	07	Indoor fan revolution frequency	rpm
	F2	Indoor fan calculated operation time	×100h
	F3	Filter sign time	×1h
	F8	Indoor discharge temperature*1	°C

	Item code	Data name	Unit
Outdoor unit data	60	Outdoor heat exchanger (Coil) temperature (TE)	°C
	61	Outside temperature (TO)	°C
	62	Compressor discharge temperature (TD)	°C
	63	Compressor suction temperature (TS)	°C
	65	Heat sink temperature (THS)	°C
	6A	Operation current (× 1/10)	A
	6D	Outdoor heat exchanger (Coil) temperature (TL)	°C
	70	Compressor operation frequency	rps
	72	Outdoor fan revolution frequency (Lower)	rpm
	73	Outdoor fan revolution frequency (Upper)	rpm
	F1	Compressor calculated operation time	×100h

⇩

3 **Push UNIT LOUVER button (left side of the button) to select the indoor unit to be monitored. Each data of the indoor unit and its outdoor units can be monitored.**

⇩

4 **Pushing TEST button returns the status to the usual display.**

∗1 The indoor discharge temperature of item code [F8] is the estimated value from TC or TCJ sensor.
Use this value to check discharge temperature at test run.
(A discharge temperature sensor is not provided to this model.)

- The data value of each item is not the real time, but value delayed by a few seconds to ten-odd seconds.
- If the combined outdoor unit is one before 2 or 3 series, the outdoor unit data [6D], [70], [72] and [73] are not displayed.

8-2-4. Check Code List (Outdoor)

○ : Go on, ◎ : Flash, ● : Go off

ALT (Alternate): Alternate flashing when there are two flashing LED SIM (Simultaneous): Simultaneous flashing when there are two flashing LED

Remote controller indication	Sensor lamp part				Representative defective position	Detection	Explanation of error contents	Automatic reset	Operation continuation
	Block indication								
	Operation	Timer	Ready	Flash					
F04	◎	◎	○	ALT	Outdoor unit Discharge temp. sensor (TD) error	Outdoor	Open/Short of discharge temp. sensor was detected.	×	×
F06	◎	◎	○	ALT	Outdoor unit Temp. sensor (TE, TS, TL) error	Outdoor	Open/Short of heat exchanger temp. sensor was detected. Miswiring between TE sensor and TS sensor	×	×
F08	◎	◎	○	ALT	Outdoor unit Outside temp. sensor (TO) error	Outdoor	Open/Short of outside temp. sensor was detected.	○	○
F07	◎	◎	○	ALT	Outdoor unit Temp. sensor (TL) error	Outdoor	Open/Short of heat exchanger temp. sensor was detected.	×	×
F12	◎	◎	○	ALT	Outdoor unit Temp. sensor (TS) error	Outdoor	Open/Short of suction temp. sensor was detected.	×	×
F13	◎	◎	○	ALT	Outdoor unit Temp. sensor (TH) error	Outdoor	Open/Short of heat sink temp. sensor (Board installed) was detected.	×	×
F15	◎	◎	○	ALT	Outdoor unit Misconnection of temp. sensor (TE, TS)	Outdoor	Misconnection of outdoor heat exchanger temp. sensor and suction temp. sensor was detected.	×	×
F31	◎	◎	○	SIM	Outdoor unit EEPROM error	Outdoor	Outdoor P.C. board part (EEPROM) error was detected.	×	×
H01	●	◎	●		Outdoor unit Compressor break down	Outdoor	When reached min-Hz by current release control, short-circuited current (Idc) after DC excitation was detected.	×	×
H02	●	◎	●		Outdoor unit Compressor lock	Outdoor	Compressor lock was detected.	×	×
H03	●	◎	●		Outdoor unit Current detection circuit error	Outdoor	Current detection circuit error	×	×
H04	●	◎	●		Outdoor unit Case thermostat operation	Outdoor	Case thermostat operation was detected.	×	×
L10	◎	○	◎	SIM	Outdoor unit Setting error of service P.C. board type	Outdoor	When outdoor service P.C. board was used, model type select jumper setting was inappropriate.	×	×
L29	◎	○	◎	SIM	Outdoor unit Other outdoor unit error	Outdoor	1) Defective parts on outdoor P.C. board (MCU communication, EEPROM, TH sensor error) 2) When outdoor service P.C. board was used, model type selection was inappropriate. 3) Other error (Heat sink abnormal overheat, gas leak, 4-way valve inverse error) was detected.	×	×
P03	◎	●	◎	ALT	Outdoor unit Discharge temp. error	Outdoor	Error was detected by discharge temp. release control.	×	×
P04	◎	●	◎	ALT	Outdoor unit High pressure system error, Power supply voltage error	Outdoor	When case thermostat worked, error was detected by high release control from indoor/ outdoor heat exchanger temp. sensor. Power supply voltage error	×	×
P05	◎	●	◎	ALT	Power supply error	Outdoor	Power supply voltage error	×	×
P07	◎	●	◎	ALT	Outdoor unit Heat sink overheat	Outdoor	Abnormal overheat was detected by outdoor heat sink temp. sensor.	×	×
P15	◎	●	◎	ALT	Gas leak detection	Outdoor	Abnormal overheat of discharge temp. or suction temp. was detected.	×	×
P20	◎	●	◎	ALT	Outdoor unit High pressure system error	Outdoor	Error was detected by high release control from indoor/outdoor heat exchanger temp. sensor.	×	×
P22	◎	●	◎	ALT	Outdoor unit Outdoor fan error	Outdoor	Error (Over-current, lock, etc.) was detected on outdoor fan drive circuit.	×	×
P26	◎	●	◎	ALT	Outdoor unit Inverter Idc operation	Outdoor	Short-circuited protective operation of compressor drive circuit element (G-Tr /IGBT) worked.	×	×
P29	◎	●	◎	ALT	Outdoor unit Position detection error	Outdoor	Position detection error of compressor motor was detected.	×	×
E01	◎	●	●		No remote controller master unit Remote controller communication error	Remote controller	Signal was not received from indoor unit. Main remote controller was not set. (including 2 remote controllers)	—	—
E02	◎	●	●		Remote controller send error	Remote controller	Signal cannot be sent to indoor unit.	—	—
E03	◎	●	●		Regular communication error between indoor and remote controller	Indoor	No communication from remote controller and network adapter	○	×
E04	●	●	◎		Indoor/Outdoor serial error	Indoor	Serial communication error between indoor and outdoor	○	×
E08	◎	●	●		Duplicated indoor addresses ✧	Indoor	Same address as yours was detected.	○	
E09	◎	●	●		Duplicated main remote controllers	Remote controller	In 2-remote controller control, both were set as master. (Indoor master unit stops warning and follower unit continues operation.)	×	×
E10	◎	●	●		Communication error between CPU	Indoor	MCU communication error between main motor and micro computer	○	△
E18	◎	●	●		Regular communication error between master and follower indoor units	Indoor	Regular communication was impossible between master and follower indoor units. Communication between twin master (Main unit) and follower (sub unit) was impossible.	○	×
L03	◎	●	◎	SIM	Duplicated indoor master units ✧	Indoor	There are multiple master units in a group.	×	×
L07	◎	●	◎	SIM	There is group cable in individual indoor unit. ✧	Indoor	When even one group connection indoor unit exists in individual indoor unit	×	×
L08	◎	●	◎	SIM	Unset indoor group address ✧	Indoor	Indoor address group was unset.	×	×
L09	◎	●	◎	SIM	Unset indoor capacity	Indoor	Capacity of indoor unit was unset.	×	×
L30	◎	○	◎	SIM	Outside error input to indoor unit (Interlock)	Indoor	Abnormal stop by CN80 outside error input	×	×
P19	◎	●	◎	ALT	4-way valve inverse error	Indoor Outdoor	In heating operation, error was detected by temp. down of indoor heat exchanger or temp. up ofTE, TS.	○	×

✧ When this warning was detected before group construction/address check finish at power supply was turned on, the mode shifts automatically to AUTO address setup mode.

○ : Go on, ◎ : Flash, ● : Go off
ALT (Alternate): Alternate flashing when there are two flashing LED SIM (Simultaneous): Simultaneous flashing when there are two flashing LED

Remote controller indication	Sensor lamp part				Representative defective position	Detection	Explanation of error contents	Automatic reset	Operation continuation
	Block indication								
	Operation	Timer	Ready	Flash					
F01	◎	◎	●	ALT	Indoor unit Heat exchanger sensor (TCJ) error	Indoor	Open/Short of heat exchanger (TCJ) was detected.	○	×
F02	◎	◎	●	ALT	Indoor unit Heat exchanger sensor (TC) error	Indoor	Open/Short of heat exchanger (TC) was detected.	○	×
F10	◎	◎	●	ALT	Indoor unit Room temp. sensor (TA) error	Indoor	Open/Short of room temp. (TA) was detected.	○	×
F29	◎	◎	●	SIM	Indoor unit Other indoor P.C. board error	Indoor	EEPROM error (Other error may be detected. If no error, automatic address is repeated.	×	×
P01	●	◎	◎	ALT	Indoor unit Indoor fan error	Indoor	Indoor AC fan error was detected. (Fan thermal relay worked.)	×	×
P10	●	◎	◎	ALT	Indoor unit Overflow detection	Indoor	Float switch worked.	×	×
P12	●	◎	◎	ALT	Indoor unit Indoor fan error	Indoor	Indoor fan error (Over-current / Lock, etc.) was detected.	×	×
P31	◎	●	◎	ALT	Other indoor unit error	Indoor	Other indoor under condition of warning in group. E03/L07/L03/L08 warning	○	×
—	By unit with warning No.			ALT	Error in indoor group	Network adapter	Sub remote controller error in a group (Details of remote controller are displayed with unit No. Only central control side is displayed.)	—	—
—	—				LAN system communication error	Network adapter/ Center	Communication error of central control system signal * Is not displayed on the remote controller	○	○
L20	◎	○	◎	SIM	LAN system communication error	Network adapter/ Center	Duplicated indoor address of central control system communication	○	×
—	—				There are multiple communication adapters.	Network adapter	There are multiple communication adapters on remote controller communication line.	○	○

Error mode detected by outdoor unit

The check code has been ramified from 4 series and after.
The ramified check code is displayed only when both the indoor unit and the outdoor unit are 4 series and after.
(Ex. Combination of RAV-SM1404UTP with RAV-SP1404AT-E1)
When the indoor unit is 3 series and before, the conventional check code is displayed.
(Ex. Combination of RAV-SM1406BTP and RAV-SP1404AT-E1: Outdoor unit only is 4 series.)

Operation of diagnostic function					Judgment and measures
Check code		Cause of operation	Status of air conditioner	Condition	
Indoor unit					
before 3 series	after 4 series				
F04	F04	Disconnection, short of discharge temp. sensor (TD)	Stop	Displayed when error is detected	1. Check discharge temp. sensor (TD). 2. Check outdoor P.C. board.
F06	F06	Disconnection, short of outdoor temp. sensor (TE)	Stop	Displayed when error is detected	1. Check temp. sensor (TE). 2. Check outdoor P.C. board.
	F07	Disconnection, short of outdoor temp. sensor (TL)	Stop	Displayed when error is detected	1. Check temp. sensor (TL). 2. Check outdoor P.C. board.
	F12	Disconnection, short of suction temp. sensor (TS)	Stop	Displayed when error is detected	1. Check suction temp. sensor (TS). 2. Check outdoor P.C. board.
	F15	Miss-mounting of outdoor temp. sensor (TE, TS)	Stop	Displayed when error is detected	1. Check temp. sensor (TE, TS). 2. Check outdoor P.C. board.
F08	F08	Disconnection, short of outside temp. sensor (TO)	Continue	Displayed when error is detected	1. Check outside temp. sensor (TO). 2. Check outdoor P.C. board.
L29	F13	Disconnection, short of heat sink temp. sensor (TH)	Stop	Displayed when error is detected	1. Check outdoor P.C. board.
	F31	Outdoor P.C. EEPROM error	Stop	Displayed when error is detected	1. Check outdoor P.C. board.
	L10	Unset jumper of service P.C. board	Stop	Displayed when error is detected	1. Outdoor service P.C. board Check model type setting jumper wire.
	L29	Communication error between outdoor P.C. board MCU	Stop	Displayed when error is detected	1. Check outdoor P.C. board.
	P07	Heat sink overheat error ∗ Heat sink temp. sensor detected over specified temperature.	Stop	Displayed when error is detected	1. Check screw tightening between PC. Board and heat sink and check radiator grease. 2. Check heat sink blast path.
	P15	Detection of gas leak ∗ Discharge temp. sensor (TD), Suction temp. sensor (TS) detected temperature over specified temp.	Stop	Displayed when error is detected	1. Check gas leak, recharge 2. Check full open of service valve. 3. Check PMV (Pulse Motor Valve). 4. Check broken pipe. 5. Check discharge temp. sensor (TD), suction temp. sensor (TS).
	P19	4-way valve inverse error ∗ After heating operation has started, indoor heat exchanger temp. lowers under the specified temp. ∗ After heating operation has started, outdoor heat exchanger / suction temp. rises over the specified temp.	Stop	Displayed when error is detected	1. Check operation of 4-way valve. 2. Check outdoor heat exchanger (TE), suction temp. sensor (TS). 3. Check indoor heat exchanger sensor (TC). 4. Check 4-way valve coil. 5. Check PMV (Pulse Motor Valve).
H01	H01	Compressor break down ∗ Although operation has started, operation frequency decreases and operation stops.	Stop	Displayed when error is detected	1. Check power supply voltage. (AC198 to 264V) 2. Overload operation of refrigerating cycle
H02	H02	Compressor lock ∗ Over-current detection after compressor start-up	Stop	Displayed when error is detected	1. Trouble of compressor (Lock, etc.): Replace compressor. 2. Wiring error of compressor (Open phase)
H03	H03	Current detection circuit error	Stop	Displayed when error is detected	1. Check outdoor P.C. board. (AC current detection circuit)

Operation of diagnostic function					Judgment and measures
Check code		Cause of operation	Status of air conditioner	Condition	
Indoor unit					
before 3 series	after 4 series				
P03	P03	Discharge temp. error * Discharge temp. (TD) over specified value was detected.	Stop	Displayed when error is detected	1. Check refrigerating cycle (Gas leak) 2. Trouble of electronic expansion valve 3. Check discharge temp. sensor (TD).
P04	H04	Case thermostat operation * Abnormal overheat of compressor	Stop	Displayed when error is detected	1. Check case thermostat and connector. 2. Check gas leak, recharge 3. Check full open of service valve. 4. Check PMV (Pulse Motor Valve). 5. Check broken pipe.
	P05	Power supply voltage error	Stop	Displayed when error is detected	1. Check power supply voltage. AC198 to 264V
	P20	High pressure protective operation • During cooling operation, outdoor temp. sensor (TL) detected temperature over specified temp. • During heating operation, indoor temp. sensor (TC, TCJ) detected temperature over specified temp.	Stop	Displayed when error is detected	1. Check outdoor heat exchanger sensor (TL). 2. Check indoor heat exchanger sensor (TC, TCJ). 3. Check full open of service valve. 4. Check indoor/outdoor fan. 5. Check PMV (Pulse Motor Valve). 6. Check clogging and short circuit of indoor/outdoor heat exchanger. 7. Overcharge of refrigerant. Recharge
P22	P22	Outdoor fan system error	Stop	Displayed when error is detected	1. Check lock of fan motor. 2. Check power supply voltage. AC198 to 264V 3. Check outdoor P.C. board.
P26	P26	Short-circuit error of compressor driving element	Stop	Displayed when error is detected	1. When performing operation while taking-off compressor wire, P26 error occurs. Check control P.C. board. 2. When performing operation while taking-off compressor wire, an error does not occur. (Compressor rare short)
P29	P29	Position detection circuit error	Stop	Displayed when error is detected	1. Check control P.C. board.

8-2-5. Diagnostic Procedure for Each Check Code (Outdoor Unit)

1) This section describes the diagnostic method for each check code displayed on the remote controller.
2) In some cases, a check code indicates multiple symptoms.
   In this case, confirm LED display on the outdoor P.C. board to narrow the contents to be confirmed.
3) The check code on the remote controller is displayed only when the same error occurred continuously by multiple times while LED of the outdoor P.C. board displays even an error which occurred once.
   Therefore the display on the remote controller may differ from that of LED.

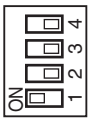
LED display on outdoor P.C. board

Dip switch setup

- When turning on 1) only of SW803, the latest error is displayed. As the memory is stored, it can be confirmed even if the power supply is turned off once. (excluding outside temp. sensor (TO) error)
- When the work finished or the outdoor temp. sensor (TO) error was found, turn off all of SW803. (The error which occurs at present is displayed.)

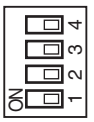
<Latest error display>

Only 1) of SW803 is ON.



<Error display, which occurs at present>

All SW803 are OFF. (Initial status)



Display selection

- When even a LED of D800 to D804 (Yellow) goes on, error occurrence is indicated. **<Display 1>**
- If pushing the button switch SW800 for 1 second under the above condition, the yellow LED is displayed with flashing. **<Display 2>**
- When pushing SW800 for 1 second again, the status returns to **<Display 1>**.
- The error contents can be confirmed by combining **<Display 1>** and **<Display 2>**.

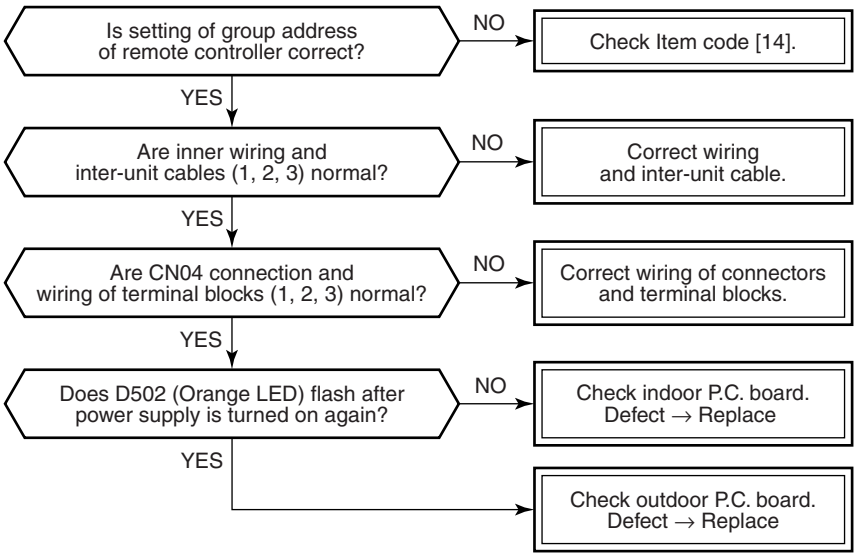
<Display 1> ⇔ <Display 2>

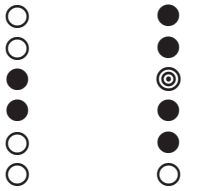
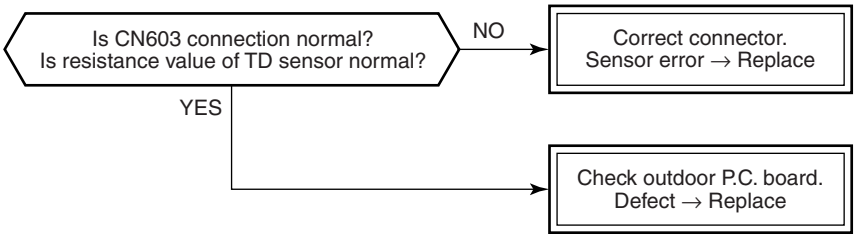
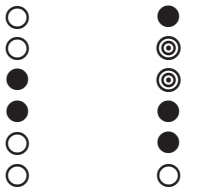
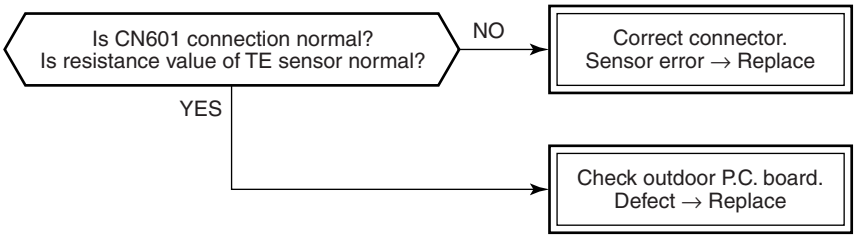
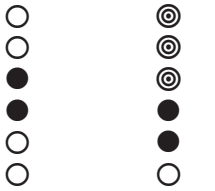
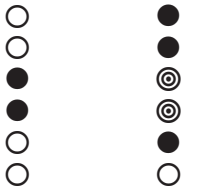
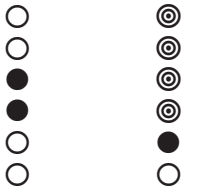
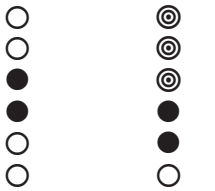
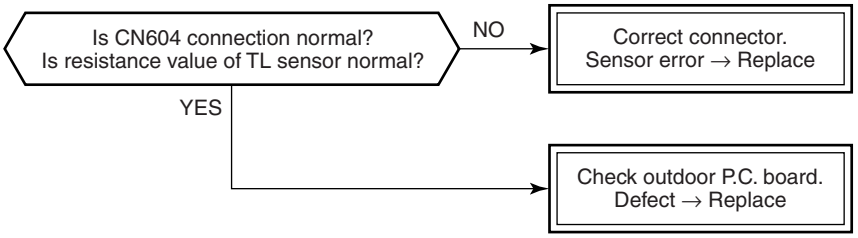
	(No error)	(Error occurred)	(Push SW800)
D800 (Yellow)	●	○	●
D801 (Yellow)	●	○	●
D802 (Yellow)	●	●	◎
D803 (Yellow)	●	●	●
D804 (Yellow)	●	○	●
D805 (Green)	○	○	○

(Example of discharge temp. sensor error)

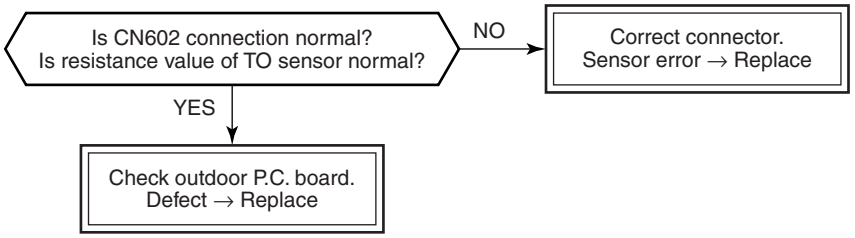
● : Go off, ○ : Go on, ◎ : Flash

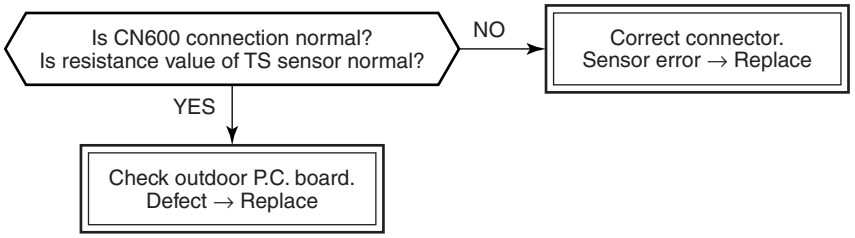
Check code	Outdoor LED display	Check and troubleshooting (Item without special mention Indicates part of outdoor unit.)
[E04]	—	[Indoor/Outdoor communication error]

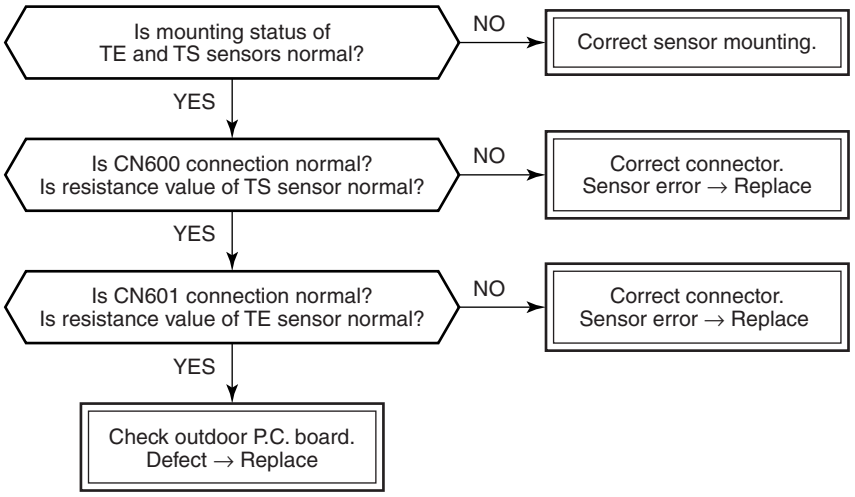


<table>
<tr><th>Check code</th><th>Outdoor LED display</th><th>Check and troubleshooting
(Item without special mention Indicates part of outdoor unit.)</th></tr>
<tr><td>[F04]</td><td><Display 1> <Display 2>
  </td><td>[Discharge temp. sensor (TD) error]
 
</td></tr>
<tr><td>[F06]</td><td></td><td>• 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.
Heat exchanger temp. sensor (TE) error, Heat exchanger temp. sensor (TL) error, Suction temp. sensor (TS) error, Miswiring of heat exchanger sensor (TE, TS)</td></tr>
<tr><td></td><td><Display 1> <Display 2>
  </td><td>Heat exchanger temp. sensor (TE) error]
 
</td></tr>
<tr><td></td><td><Display 1> <Display 2>
  </td><td>[Heat exchanger temp. sensor (TL) error] → Refer to [F07] column.</td></tr>
<tr><td></td><td><Display 1> <Display 2>
  </td><td>[Suction temp. sensor (TS) error] → Refer to [F12] column.</td></tr>
<tr><td></td><td><Display 1> <Display 2>
  </td><td>[Miswiring of heat exchanger sensor (TE, TS)] → Refer to [F15] column.</td></tr>
<tr><td>[F07]</td><td><Display 1> <Display 2>
  </td><td>[Heat exchanger temp. sensor (TL) error]
 
</td></tr>
</table>

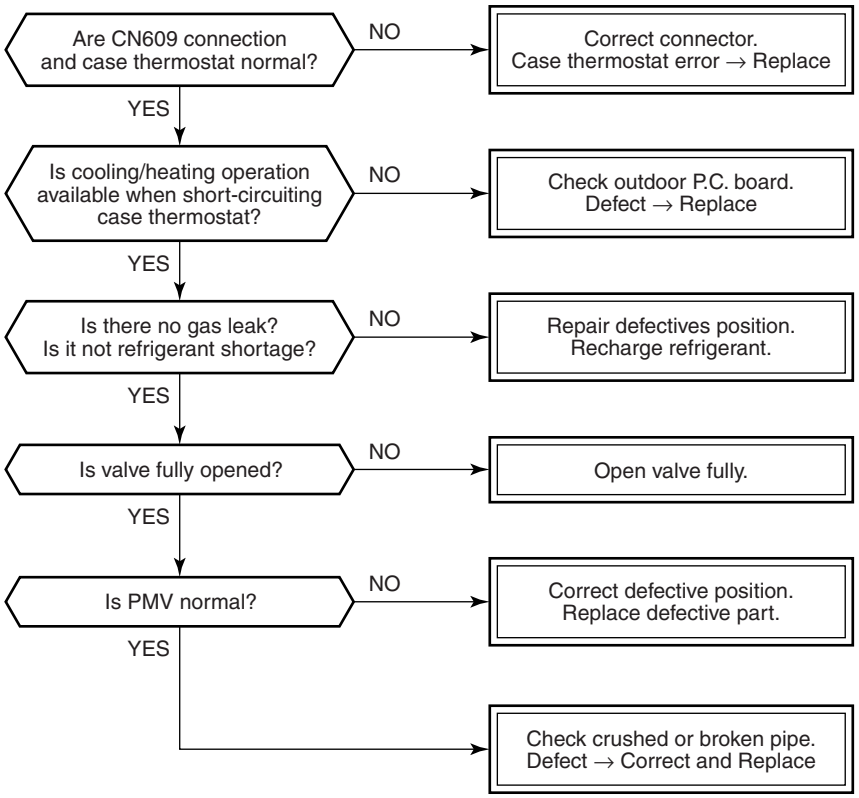
Check code	Outdoor LED display	Check and troubleshooting (Item without special mention Indicates part of outdoor unit.)
[F08]	<Display 1> <Display 2>	**[Outside air temp. sensor (TO) error]**
[F12]	<Display 1> <Display 2>	**[Suction temp. sensor (TS) error]**
[F13]	<Display 1> <Display 2>	**[Heat sink temp. sensor (TH) error]**
[F15]	<Display 1> <Display 2>	**[Miswiring of heat exchanger sensor (TE, TS)]**
[F31]	<Display 1> <Display 2>	**[EEPROM error]**



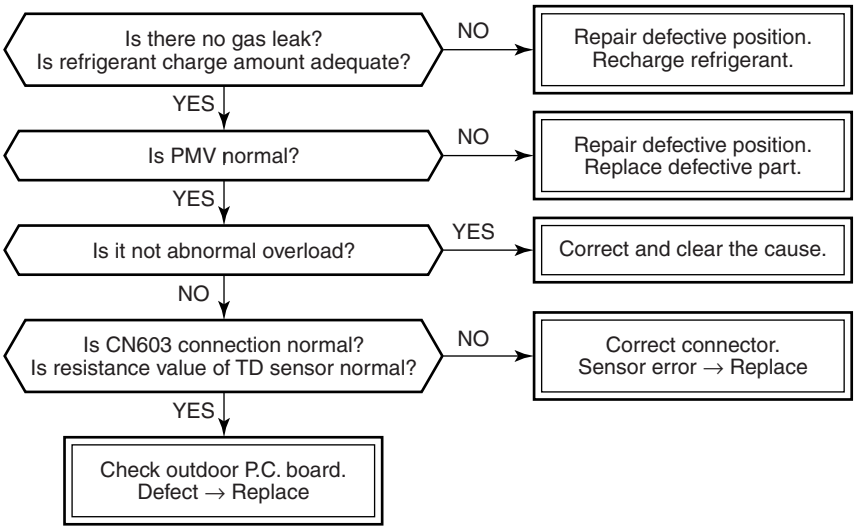
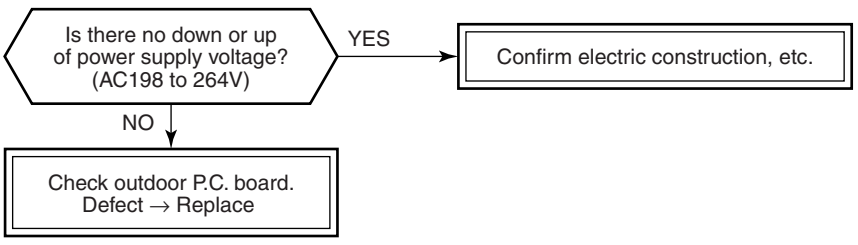


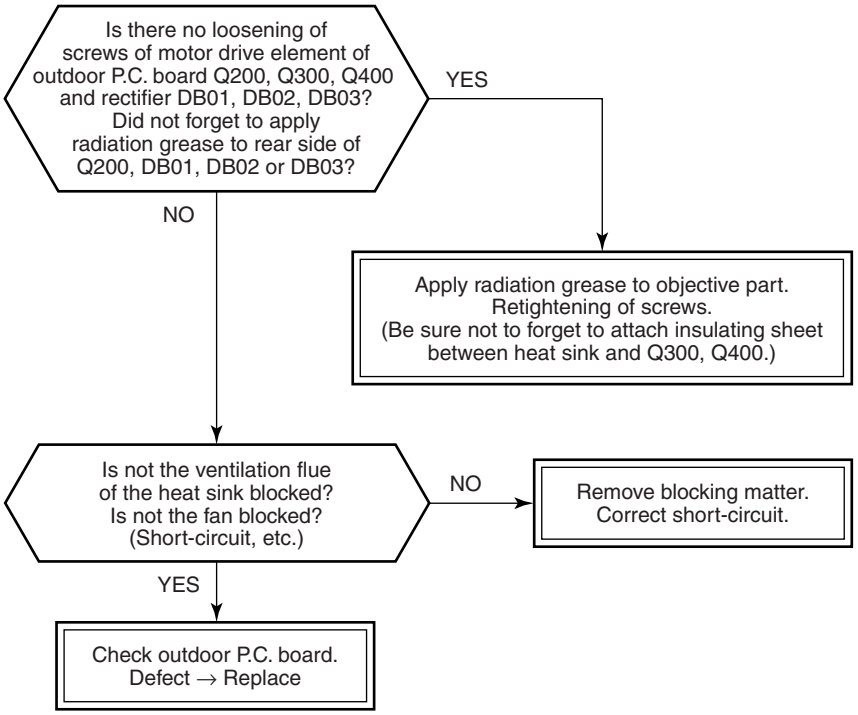
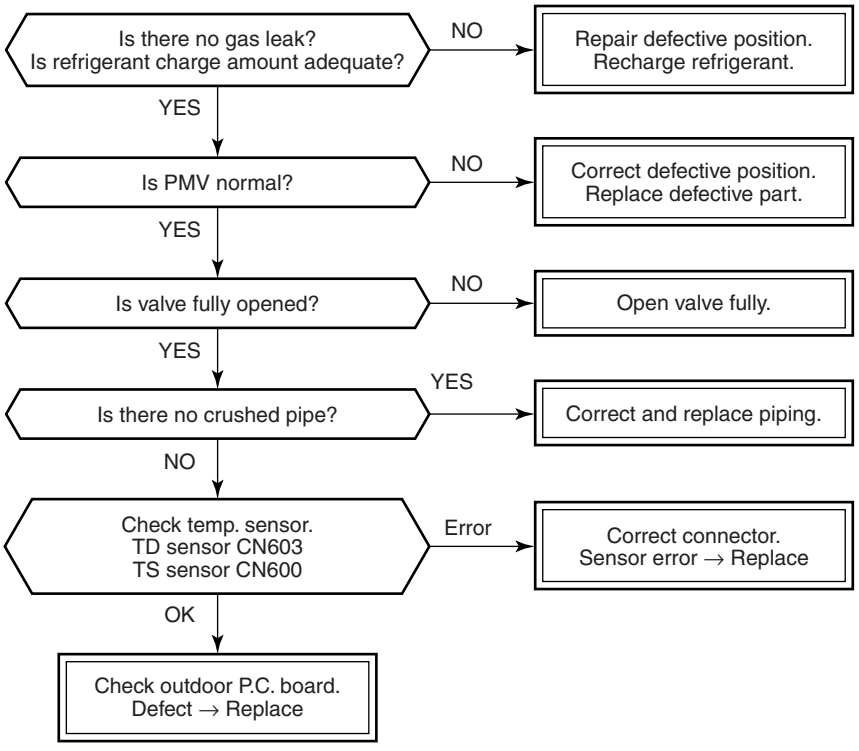


Check code	Outdoor LED display	Check and troubleshooting (Item without special mention Indicates part of outdoor unit.)
[H01]	<Display 1> <Display 2> ● ◎ ● ● ○ ● ● ● ○ ● ○ ○	**[Compressor break down]** Is power supply voltage normal? AC198 to 264V — NO → Correct power supply line. YES ↓ Is wire connection normal? Compressor lead (Board side, Compressor side), Reactor lead, Power supply lead — NO → Check wire connection and correct it. YES ↓ Is it not abnormal overload? — YES → Correct and clear the cause. NO ↓ Check outdoor P.C. board. Defect → Replace
[H02]	<Display 1> <Display 2> ● ● ● ◎ ○ ● ● ● ○ ● ○ ○	**[Compressor lock]** Is power supply voltage normal? AC198 to 264V — NO → Correct power supply line. YES ↓ Is wire connection normal? Compressor lead (Board side, Compressor side), Reactor lead, Power supply lead — NO → Check wire connection and correct it. YES ↓ Is compressor normal? — YES → Check outdoor P.C. board. Defect → Replace NO ↓ Is there no refrigerant stagnation? — NO → Compressor lock → Replace YES ↓ Does PMV normally operate? — NO → Check TE, TS sensors and PMV. Defect → Replace YES ↓ Check outdoor P.C. board. Defect → Replace
[H03]	<Display 1> <Display 2> ● ◎ ● ◎ ○ ● ● ● ○ ● ○ ○	**[Current detection circuit error]** Check outdoor P.C. board. Defect → Replace

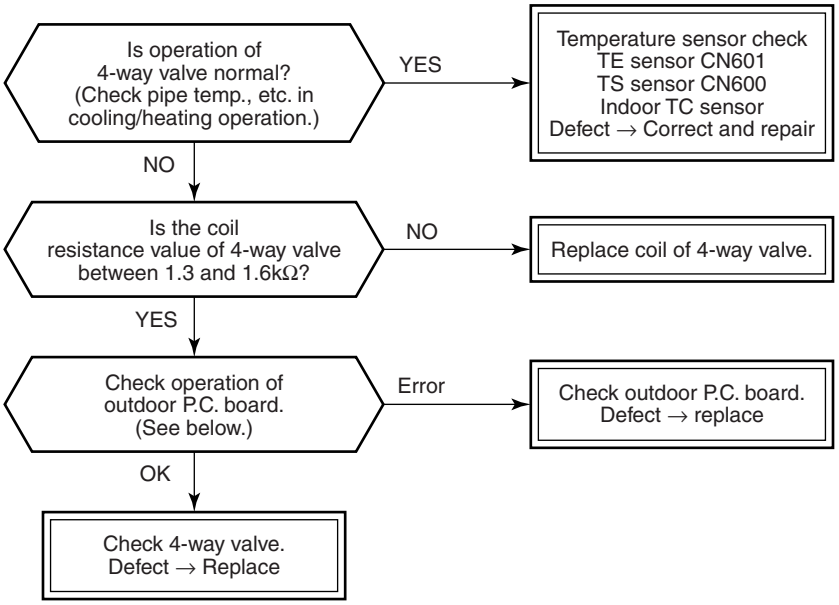
Check code	Outdoor LED display	Check and troubleshooting (Item without special mention Indicates part of outdoor unit.)
[H04]	<Display 1> <Display 2> ● ● ● ● ○ ● ● ◎ ○ ● ○ ○	**[Case thermostat operation]** 
[L10]	<Display 1> <Display 2> ● ● ○ ◎ ○ ● ● ◎ ○ ● ○ ○	**[Unset model type]:** Only when service P.C. board is used Cut jumper line according to the explanation sheet packaged with the service P.C. board.

Check code	Outdoor LED display	Check and troubleshooting (Item without special mention Indicates part of outdoor unit.)
[L29]		∗ 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. Communication error between MCU, Heat sing temp. sensor (TH) error, EEPROM error, Unset model type, Heat sink overheat error, Gas leak detection, 4-way valve inverse error
	<Display 1> <Display 2> 	**[Communication error between MCU]** Check outdoor P.C. board. Defect → Replace
	<Display 1> <Display 2> 	**[Heat sink temp. sensor (TH) error]** → Refer to **[F13]** column.
	<Display 1> <Display 2> 	**[EEPROM error]** → Refer to **[F31]** column.
	<Display 1> <Display 2> 	**[Unset model type]** → Refer to **[L10]** column.
	<Display 1> <Display 2> 	**[Heat sink overheat error]** → Refer to **[P07]** column.
	<Display 1> <Display 2> 	**[Gas leak detection]** → Refer to **[P15]** column.
	<Display 1> <Display 2> 	**[4-way valve inverse error]** → Refer to **[P19]** column.

<table>
<tr><th>Check code</th><th>Outdoor LED display</th><th>Check and troubleshooting
(Item without special mention Indicates part of outdoor unit.)</th></tr>
<tr><td>[P03]</td><td><Display 1> <Display 2>
○ ◎
○ ◎
○ ●
● ●
○ ●
○ ○</td><td>[Discharge temp. error]
 
</td></tr>
<tr><td>[P04]</td><td></td><td>∗ 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.
Power supply error (Vdc), High pressure protective operation, Case thermostat operation</td></tr>
<tr><td></td><td><Display 1> <Display 2>
● ●
● ●
○ ◎
● ●
○ ●
○ ○</td><td>[Case thermostat operation] → Refer to [H04] column.</td></tr>
<tr><td></td><td><Display 1> <Display 2>
○ ◎
○ ●
○ ◎
● ●
○ ●
○ ○</td><td>[Power supply error (Vdc)] → Refer to [P05] column.</td></tr>
<tr><td></td><td><Display 1> <Display 2>
○ ●
○ ●
○ ◎
● ●
○ ◎
○ ○</td><td>[High pressure protective operation] → Refer to [P20] column.</td></tr>
<tr><td>[P05]</td><td><Display 1> <Display 2>
○ ◎
○ ●
○ ◎
● ●
○ ●
○ ○</td><td>[Power supply error (Voltage error)]
 
</td></tr>
</table>

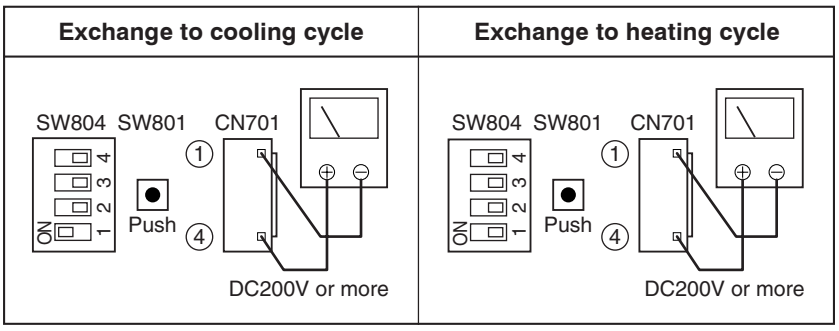
Check code	Outdoor LED display	Check and troubleshooting (Item without special mention Indicates part of outdoor unit.)
[P07]	<Display 1> <Display 2> ○ ◎ ○ ◎ ○ ◎ ● ● ○ ● ○ ○	**[Heat sink overheat error]** 
[P15]	<Display 1> <Display 2> ○ ◎ ○ ◎ ○ ◎ ● ◎ ○ ● ○ ○	**[Gas leak detection]** 

Check code	Outdoor LED display	Check and troubleshooting (Item without special mention Indicates part of outdoor unit.)
[P19]	<Display 1> <Display 2>	**[4-way valve inverse error]**



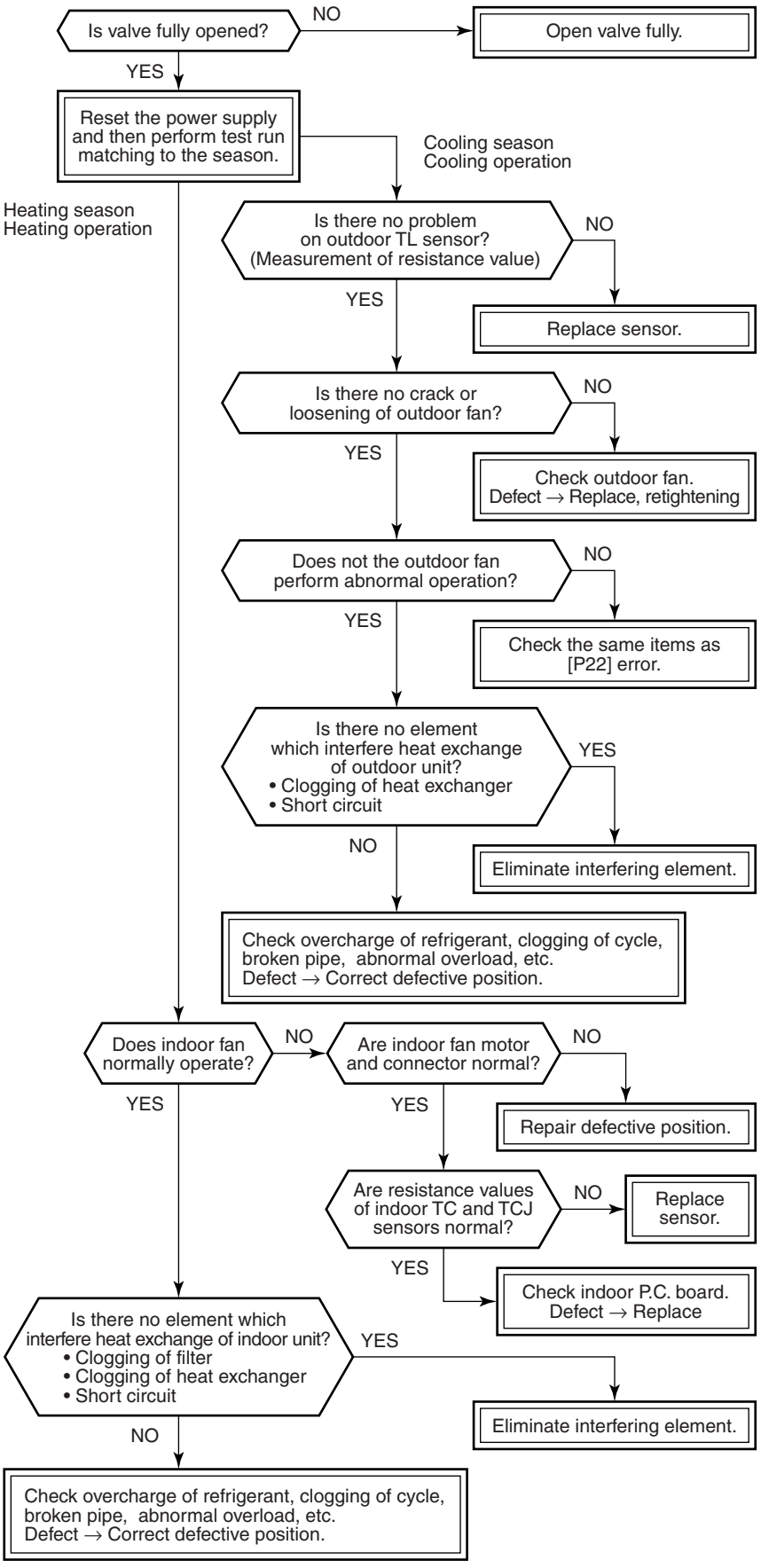
Check method of outdoor P.C. board operation (Self-hold valve type)

1) Set SW804 of Dip switch as the following figure and then push SW801 for approx. 1 second to check exchange operation to cooling cycle/heating cycle.
   - Power is turned on for approx. 10 seconds.
   - When checking again, check operation 1 minute or more after the first check because exothermic of part (Coil, resistance R700) is large. (There is no problem when coil is not connected.)
2) After check, turn off all the Dip switch SW804.



Note) Check by tester
Analog tester : Good if over DC200V
Digital tester : Good if Max. value is over DC200V though the varied value may be displayed.

Check code	Outdoor LED display	Check and troubleshooting (Item without special mention Indicates part of outdoor unit.)
[P20]	<Display 1> <Display 2>	[High pressure protective operation]



Check code	Outdoor LED display	Check and troubleshooting (Item without special mention Indicates part of outdoor unit.)
[P22]	<Display 1> <Display 2> ○ ● ○ ◎ ○ ◎ ● ● ○ ◎ ○ ○	**[Fan system error]** Is there no problem on power supply voltage? (198 to 264V) NO → Check wiring construction. Ask repair of power supply. YES Does the fan rotate without trouble when rotating shaft of fan motor with hands during power-OFF? Is there no problem on coil resistance of fan motor? Between red and white lead wire : 12 to 20Ω Between white and black lead wire : 12 to 20Ω Between black and red lead wire : 12 to 20Ω YES → Check outdoor P.C. board. Defect → Replace NO → Replace fan motor. **Single operation check for outdoor fan** 1) Set SW804 of Dip switch as the following figure and then push SW801 for approx. 1 second to check single operation of outdoor fan. Use this method to check which fan, upper or lower fan, has a trouble. • When pushing SW801 for 1 second again or 2 minutes passed, the fan stops. 2) After check, turn off all Dip switch SW804. **Outdoor fan single operation** SW804 SW801 ON 1 2 3 4 Push
[P26]	<Display 1> <Display 2> ○ ● ○ ◎ ○ ● ● ◎ ○ ◎ ○ ○	**[Short-circuit of compressor drive element]** Is there no problem on connection of compressor lead or reactor? (Check referring to Wiring diagram.) NO → Correct wiring. YES The same error does not occur in operation without compressor lead. NO → Replace outdoor P.C. board. YES Check compressor. (Rear short, etc.) Defect → Replace
[P29]	<Display 1> <Display 2> ○ ◎ ○ ● ○ ◎ ● ◎ ○ ◎ ○ ○	**[Position detection circuit error]** Check outdoor P.C. board. Defect → Replace
— No code	<Display 1> <Display 2> ● ◎ ○ ◎ ○ ◎ ● ◎ ○ ◎ ○ ○	**[Other error]** Compressor disorder due to sudden change of load, etc. ∗ Although the display of outdoor LED outputs, the unit automatically restarts and error is not determined. ∗ LED display also may output due to negative phase of compressor or wire coming-off.

Temperature sensor Temperature – Resistance value characteristic table

TA, TC, TCJ, TE, TS, TO sensors

Representative value

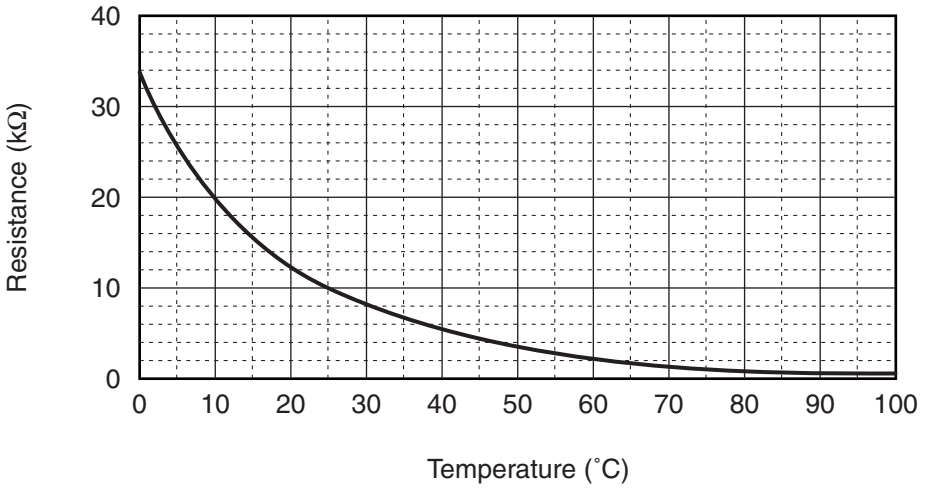
Temperature (°C)	Resistance value (kΩ)		
	(Minimum value)	(Standard value)	(Maximum value)
0	32.33	33.80	35.30
10	19.63	20.35	21.09
20	12.23	12.59	12.95
25	9.75	10.00	10.25
30	7.764	7.990	8.218
40	5.013	5.192	5.375
50	3.312	3.451	3.594
60	2.236	2.343	2.454
70	1.540	1.623	1.709
80	1.082	1.146	1.213
90	0.7740	0.8237	0.8761
100	0.5634	0.6023	0.6434

TD, TL sensors

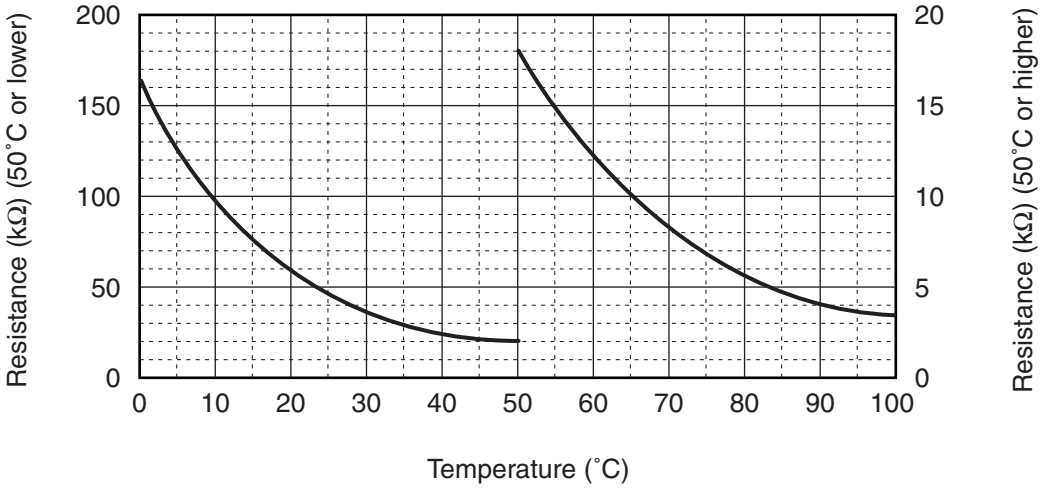
Representative value

Temperature (°C)	Resistance value (kΩ)		
	(Minimum value)	(Standard value)	(Maximum value)
0	150.5	161.3	172.7
10	92.76	99.05	105.6
20	58.61	62.36	66.26
25	47.01	49.93	52.97
30	37.93	40.22	42.59
40	25.12	26.55	28.03
50	17.00	17.92	18.86
60	11.74	12.34	12.95
70	8.269	8.668	9.074
80	5.925	6.195	6.470
90	4.321	4.507	4.696
100	3.205	3.336	3.468

TA, TC, TCJ, TE, TS, TO sensors



TD, TL sensors



∗ As TH sensor (Outdoor unit heat sink temp. sensor) is incorporated in the outdoor control P.C. board, the resistance value cannot be measured.

8-2-6. Outline of judgment

The primary judgment to check whether a trouble occurred in the indoor unit or outdoor unit is carried out with the following method.

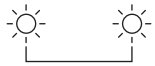
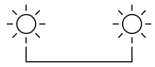
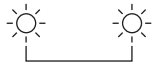
Method to judge the erroneous position by flashing indication on the display part of the indoor unit (sensors of the receiving part)

The indoor unit monitors the operating status of the air conditioner, and the blocked contents of self-diagnosis are displayed restricted to the following cases if a protective circuit works.

● : Go off, ○ : Go on, ☼ : Flash (0.5 sec.)

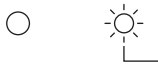
Lamp indication	Check code	Cause of trouble occurrence
Operation ● Timer ● Ready ● No indication at all	—	Power supply OFF or miswiring between receiving unit and indoor unit
Operation ☼ Flash Timer ● Ready ●	E01	Receiving error / Sending error } Receiving unit / Communication stop } Miswiring or wire connection error between receiving unit and indoor unit
	E02	
	E03	
	E08	Duplicated indoor unit No. / Duplicated master units of remote controller } Setup error
	E09	
	E10	Communication error between CPUs on indoor unit P.C. board
	E18	Wire connection error between indoor units, Indoor power OFF (Communication stop between indoor master and follower or between main and sub indoor twin)
Operation ● Timer ● Ready ☼ Flash	E04	Miswiring between indoor unit and outdoor unit or connection erorr (Communication stop between indoor and outdoor units)
Operation ● Timer ☼ Ready ☼ Alternate flash	P10	Overflow was detected. / Indoor DC fan error } Protective device of indoor unit worked.
	P12	
Operation ☼ Alternate flash Timer ● Ready ☼ Alternate flash	P03	Outdoor unit discharge temp. error } Protective device of outdoor unit worked. ∗1
	P05	Negative phase detection error } Outdoor unit error
	P19	4-way valve system error (Indoor or outdoor unit judged.)
	P22	Outdoor unit: Outdoor fan error / Outdoor unit: Inverter Idc operation / Outdoor unit: Position detection error } Protective device of outdoor unit worked. ∗1
	P26	
	P29	
	P31	Stopped because of error of other indoor unit in a group (Check codes of E03/L03/L07/L08)

∗1: These are representative examples and the check code differs according to the outdoor unit to be combined.

Lamp indication	Check code	Cause of trouble occurrence
Operation Timer Ready  Alternate flash	F01 F02 P10	Heat exchanger sensor (TCJ) error Heat exchanger sensor (TC) error Heat exchanger sensor (TA) error } Indoor unit sensor error
Operation Timer Ready  Alternate flash	F04 F06 F08 F12	Discharge temp. sensor (TD) error Temp. sensor (TE) error Temp. sensor (TO) error Temp. sensor (TS) error } Sensor error of outdoor unit ∗1
Operation Timer Ready  Simultaneous flash	F29	Indoor EEPROM error
Operation Timer Ready  Flash	H01 H02 H03	Compressor break down Compressor lock Current detection circuit error } Outdoor compressor system error ∗1
Operation Timer Ready  Simultaneous flash	L03 L07 L08 L09	Duplicated master indoor units There is indoor unit of group connection in individual indoor unit. Unsetting of group address Missed setting (Unset indoor capacity) } → AUTO address * If group construction and address are not normal when power supply turned on, automatically goes to address setup mode.
Operation Timer Ready  Simultaneous flash	L20 L30 L31	Duplicated indoor central addresses Outside interlock error Negative phase error } Others

∗1: These are representative examples and the check code differs according to the outdoor unit to be combined.

8-2-7. Others (Other than Check Code)

Lamp indication	Check code	Cause of trouble occurrence
Operation Timer Ready  Simultaneous flash	—	During test run
Operation Timer Ready  Alternate flash	—	Disagreement of cool/heat (Automatic cool/heat setting to automatic cool/heat prohibited model, or setting of heating to cooling-only model)

9. SETUP AT LOCAL SITE AND OTHERS

9-1. Calling of Error History

<Contents>

The error contents in the past can be called.

<Procedure>

1 **Push SET + TEST buttons simultaneously for 4 seconds or more to call the service check mode.**

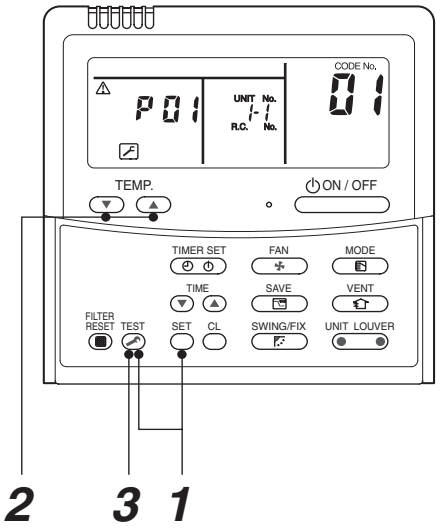
Service Check goes on, the **item code *01*** is displayed, and then the content of the latest alarm is displayed. The number and error contents of the indoor unit in which an error occurred are displayed.

2 **In order to monitor another error history, push the set temperature ▼ / ▲ buttons to change the error history No. (Item code).**

Item code *01* (Latest) → **Item code *04*** (Old)

NOTE : 4 error histories are stored in memory.

3 **Pushing TEST button returns the display to usual display.**



<Operation procedure>

1 → ***2*** → ***3***

↑

Returned to usual display

REQUIREMENT

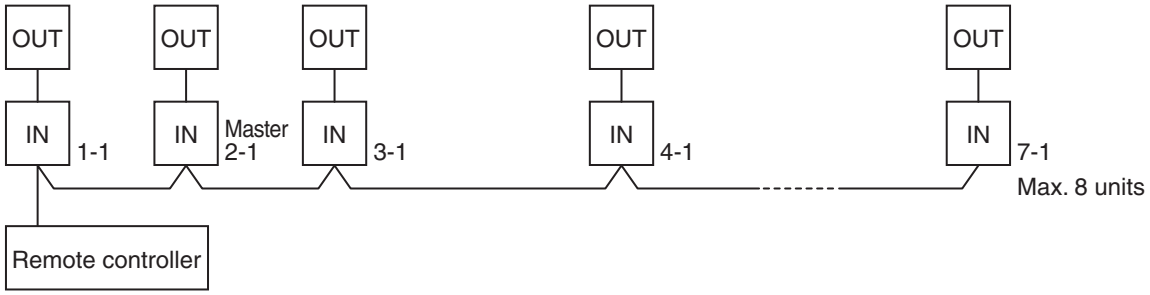
Do not push CL button, otherwise all the error histories of the indoor unit are deleted.

9-2. Group Control Operation

In a group control, operation of maximum 8 indoor units can be controlled by a remote controller.

The indoor unit connected with outdoor unit (Individual/Master of twin) controls room temperature according to setting on the remote controller.

<System example>



1. Display range on remote controller

   The setup range (Operation mode/Air volume select/Setup temp) of the indoor unit which was set to the master unit is reflected on the remote controller.

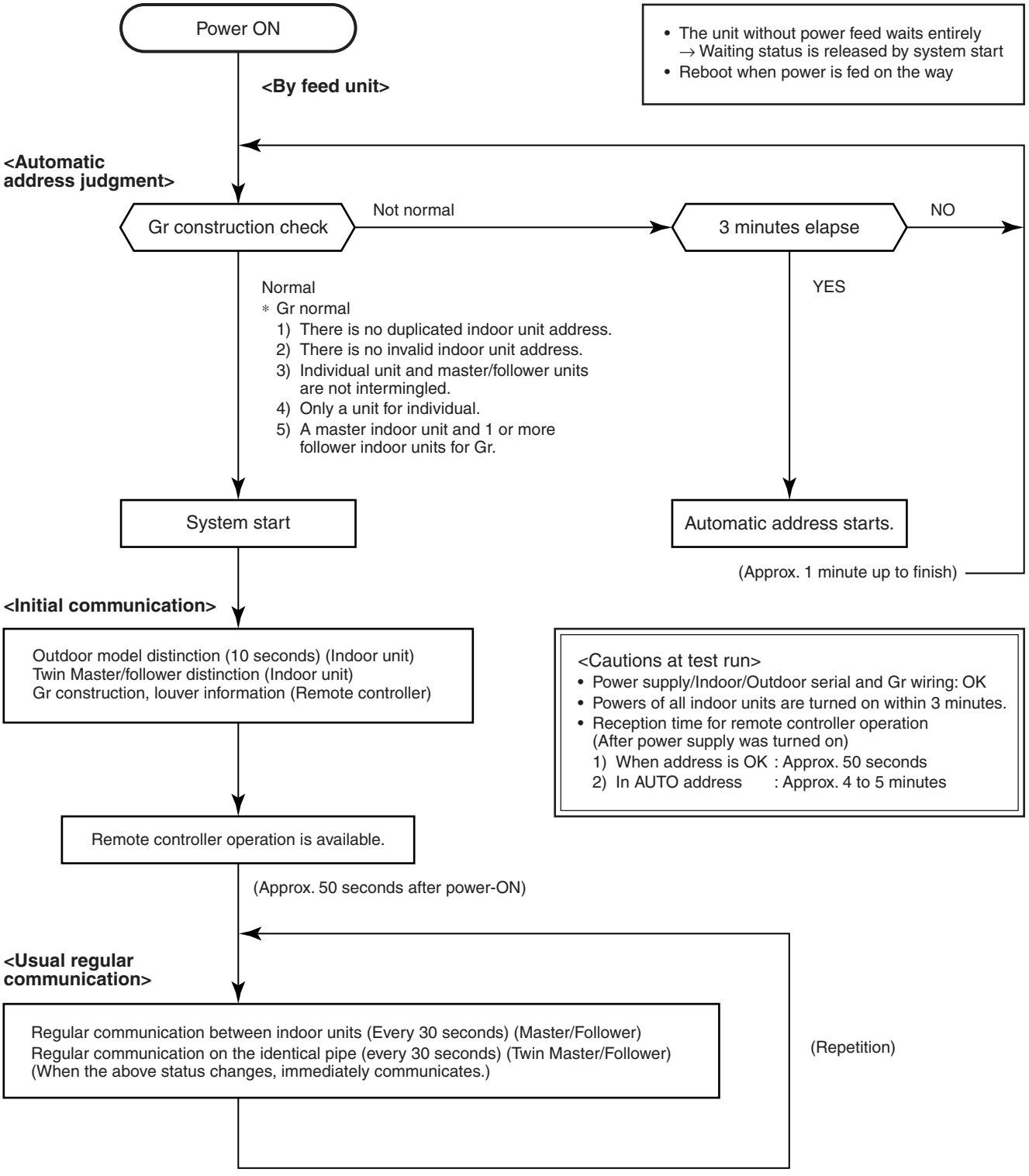
2. Address setup

   Turn on power of the indoor unit to be controlled in a group within 3 minutes after setting of automatic address.

   If power of the indoor unit is not turned on within 3 minutes (completion of automatic address setting), the system is rebooted and the automatic address setting will be judged again.

   1) Connect 3 In/Out cables surely.
   2) Check line address/indoor address/group address of the unit one by one.
   3) The unit No. (line/indoor gout address) which have been set once keep the present status as a rule if the unit No. is not duplicated with one of another unit.

■ Indoor unit power-ON sequence



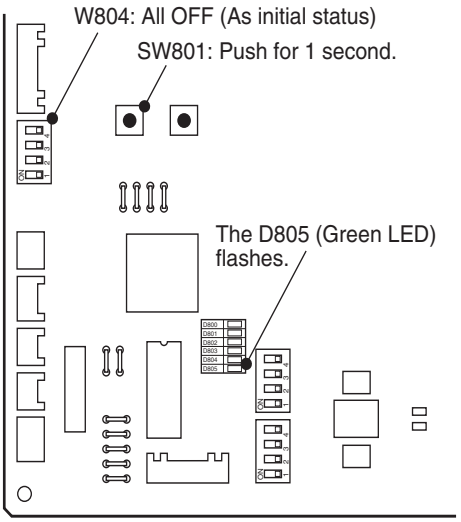
- In a group operation, if the indoor unit which was fed power after judgment of automatic address cannot receive regular communication from the master unit and regular communication on identical pipe within 120 seconds after power was turned on, it reboots (system reset).
  → The operation starts from judgment of automatic address (Gr construction check) again.
  (If the address of the master unit was determined in the previous time, the power fed to the master unit and reboot works, the master unit may change though the indoor unit line address is not changed.)

9-3. Outdoor Unit

9-3-1. Refrigerant Recovery Control

The “ozone destruction coefficient” of HFC refrigerant is 0 and the discharge regulation is set as anathermal effect gas.

To this model, a switch which can perform the refrigerant recovery (pump down) by the outdoor unit is mounted so that it is easy to react against the environment at reinstalling or rejection time.



[Operation method]

1) Set the mode of the indoor unit to fan mode.
2) Set all DIP switch SW804 to OFF (Initial status) and then push the button switch SW801 for approx. 1 second. The cooling operation starts. (During this time, D805 (Green LED) flashes.) This operation finishes by 10 minutes.
3) After operation for 3 minutes or more, close valve at liquid side.
4) After recovery of refrigerant, close valve at gas side.
5) Push the button switch SW801 again for approx. 1 second. The outdoor unit stops.
6) Stop the indoor unit and then turn off the power supply.

9-3-2. Various Setting on Outdoor Unit (Existing piping, Power save, Cooling-only, etc.)

The following settings are available by DIP switch setup and jumper line setup.

<table>
<tr><th>Function</th><th>Set position</th><th>Control contents</th></tr>
<tr><td>High static pressure setup</td><td rowspan="4">SW802
ON 1 2 3 4
4 High static pressure setup
3 Existing piping setup
2 Power save setup
1 Snow-proof fan control
* all are OFF at shipment.</td><td>Turn the switch to ON when mounting a duct to the discharge port of the outdoor unit. Add 3 taps to the upper limit value of the outdoor fan tap.
The operation is performed with
(Max: Upper fan: 890 rpm / Lower fan: 910 rpm (WF)).
In this case, the upper limit value of static pressure for duct is 5Pa or less on 25°C degrees and please use straight duct.
In this case, the outdoor noise level may increase.</td></tr>
<tr><td>Existing piping setup</td><td>Turn the switch to ON when Ø19.1 is used for the existing pipe.
In this case, the heating capacity may lower according to outside temp. and indoor temp. in heating operation.</td></tr>
<tr><td>Power save setup</td><td>Turn the switch to ON when using the power save function.
The control to lower the compressor frequency (Approx. –10%) is performed by indoor heat exchanger temp. in heating operation.</td></tr>
<tr><td>Snow-proof fan control</td><td>When snow enters from clearance of the fan guard or heat exchanger into blast path and it is accumulated, the control to prevent generation of motor lock is validated.
When outside temp. is below 0°C though the compressor stops, the outdoor fan operates with W5.</td></tr>
<tr><td>Defrost time change</td><td>J805, J806</td><td>The defrost interval is cut to shorten it than the standard status.
For contents of control and cutting method, refer to Section 7-2. 10. Defrost control.</td></tr>
<tr><td>Max. frequency change</td><td>J807</td><td>When it is needed to lower the maximum value of the compressor frequency, cut the jumper line. Max. frequency at cooling/heating is lowered.
In this case the Max. capacity decreases.
Max. frequency of compressor
<table>
<tr><th rowspan="2">Model</th><th colspan="2">RAV-SP1104</th><th colspan="2">RAV-SP1404</th></tr>
<tr><th>COOL</th><th>HEAT</th><th>COOL</th><th>HEAT</th></tr>
<tr><td>Standard status</td><td>53.4</td><td>71.4</td><td>64.2</td><td>90.6</td></tr>
<tr><td>When J807 is cut</td><td>53.4</td><td>64.2</td><td>64.2</td><td>72.0</td></tr>
</table></td></tr>
<tr><td>Cooling-only setup</td><td>J808</td><td>When using the air conditioner as a cooling-only conditioner, cut the jumper line. (An air conditioner can be changed to cooling-only conditioner by “0F” of DN code on the remote controller.)</td></tr>
</table>

9-4. Service Support Function (LED Display, Switch Operation)

1. Outline

A various setup and operation check can be performed by DIP switches at 3 positions (SW802, SW803, SW804) and the pushdown button switches (SW800, SW801) at 2 positions.

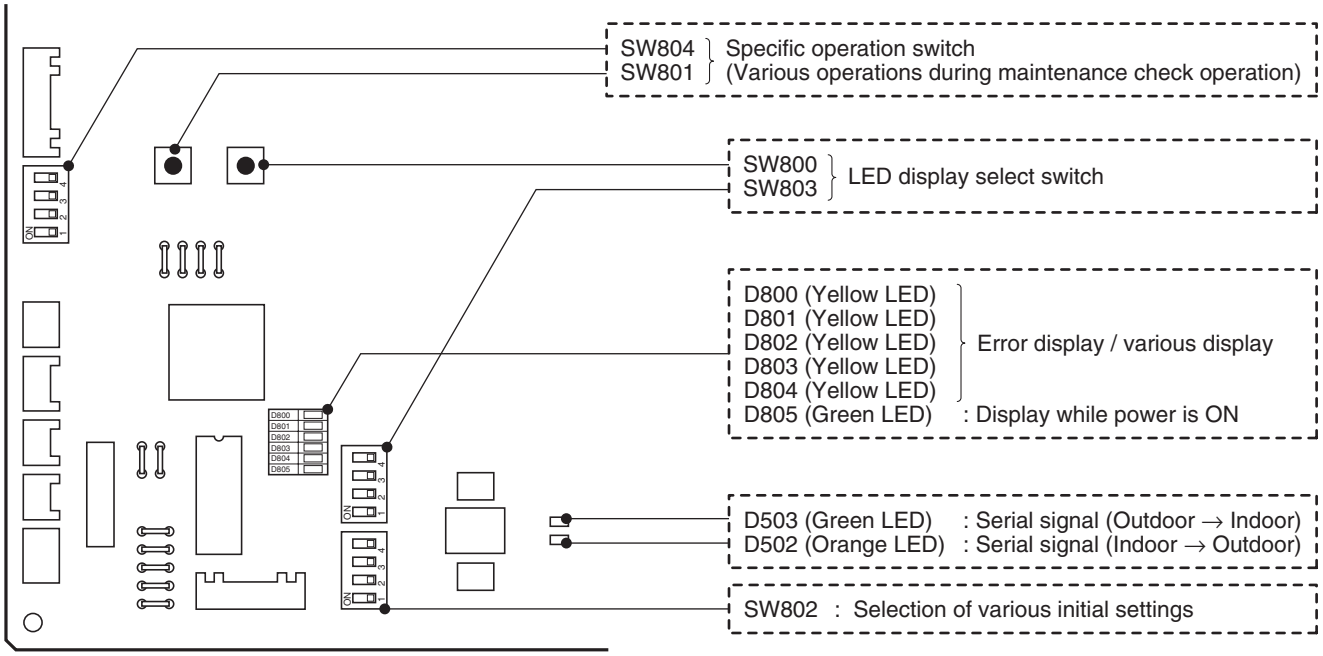
Operation part

Part No.	Specifications	Operation contents
SW800	Pushdown button switch	Exchanges the displayed contents of LED (D800 to D804) on the outdoor control P.C. board.
SW803	DIP switch	
SW801	Pushdown button switch	Performs the specific operation to check maintenance.
SW804	DIP switch	
SW802	DIP switch	Performs various initial settings. (Refer to 10-4.)

Display part

Part No.	Specifications	Operation contents
D502	Orange LED	Indoor/Outdoor communication (Serial communication) signal display (Receive signal from indoor signal)
D503	Green LED	Indoor/Outdoor communication (Serial communication) signal display (Send signal from outdoor signal)
D800 to D804	Yellow LED	Error display When all SW803 are OFF, or when any of D800 to D804 goes on, LED displays that the outdoor controller detects an error. When status of SW803 is other than OFF, various indications are displayed.
D805	Green LED	Power-ON display When the power of the outdoor unit is turned on, LED goes on. When SW801 and SW804 operate the specific operation, LED flashes.

∗ All LED are colorless when it goes off.

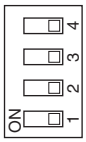
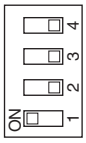
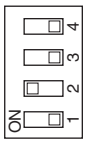
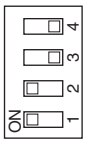
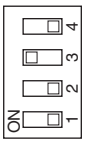
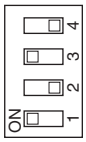
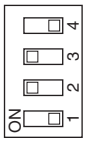
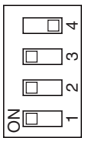
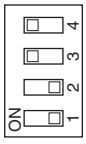
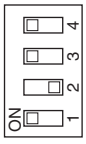
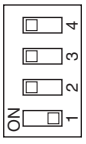
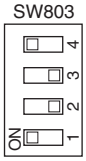
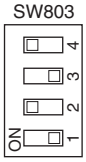
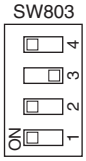


9-5. Others

1. Selection of LED display (SW800, SW803 operation)

1) Display selection list

The displayed contents of LED D800 to D804 on the outdoor control P.C. board can be exchanged by operation of SW803.

Switch	Function / Contents	Refer
SW803 	Error display (Error generating at present) Error generating at present is displayed. This switch goes off when an error does not generate.	Refer to Page 66.
SW803 	Error display (The latest error: Latest error including present) After error status was cleared, the error which generated before can be confirmed by this setting. (Reconfirmation is available even if power supply was turned off once.) • If an error generates at present, the same contents as those of error which is generating at present are displayed. • Only error of TO sensor is not displayed by this setting. (Confirm it by setting of error which is generating at present.)	Refer to Page 66.
TD SW803  TE SW803  TS SW803  TO SW803  TL SW803  TH SW803  TA SW803  TC SW803  TCJ SW803 	Temperature sensor display The detected value of temperature sensor is displayed.	Refer to Page 66.
SW803 	Current display The current value which flows in the outdoor unit is displayed.	Refer to Page 67.
SW803 	Compressor operation frequency display The operation frequency of the compressor is displayed.	Refer to Page 67.
SW803 	PMV opening display The opening of PMV (Pulse Motor Valve) is displayed.	Refer to Page 67.

2) Error display

The error which is generating at present and the latest error (Latest error information including present) can be confirmed by lighting LED D800 toD804 on the outdoor control P.C. board.

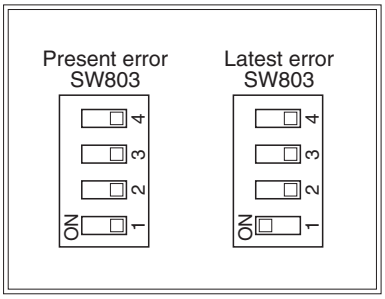
a) When all DIP switch SW803 are OFF, the status of error which is generating at present is displayed.

b) <1> only of DIP switch SW803 is turned on, the error which generated before (Latest error information including present) is displayed.a)

c) If there is an error, any of LED D800 to D804 goes on. (Display 1)

d) When pushing the pushdown button switch SW800 for approx. 1 second, the display is exchanged. (Display 2)

e) When pushing SW800 again or after 2 minutes, the status returns to that of Display ①.



(Legend)

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

● : Go off, ○ : Go on, ◎ : Flash

Display 1) (Initial display)	Display 2) (SW800 operation)	Error contents	Wired remote controller Error code
●●●●●○	●●●●●○	Normal	—
○○●●○○	●●◎●●○	Discharge temp. sensor (TD) error	F04
	●◎◎●●○	Heat exchanger temp. sensor (TE) error	F06
	◎◎◎●●○	Heat exchanger temp. sensor (TL) error	F06, F07
	●●●◎●○	Outside temp. sensor (TO) error	F08
	●●◎◎●○	Suction temp. sensor (TS) error	F06, F12
	◎●◎◎●○	Heat sink temp. sensor (TH) error	F13, L29
	◎◎◎◎●○	Heat exchanger sensor (TE, TS) miswiring	F06, F15
	◎◎◎◎◎○	EEPROM error	F31, L29
●●○●○○	◎●●●●○	Compressor break down	H01
	●◎●●●○	Compressor lock	H02
	◎◎●●●○	Current detection circuit error	H03
	●●◎●●○	Case thermostat operation	H04, P04
●○○●○○	●◎●◎●○	Model unset	L10, L29
	◎●◎◎◎○	Communication error between MCU	L29
	◎◎◎◎◎○	Other error (Compressor disorder, etc.)	Error is not determined.
○○○●○○	◎◎●●●○	Discharge temp. error	P03
	◎●◎●●○	Power supply error	P04, P05
	◎◎◎●●○	Heat sink overheat error	P07, L29
	◎◎◎◎●○	Gas leak detection	P15, L29
	◎◎●●◎○	4-way valve reverse error	P19, L29
	●●◎●◎○	High pressure protective operation	P04, P20
	●◎◎●◎○	Fan system error	P22
	●◎●◎◎○	Driving element short-circuit	P26
	◎●◎◎◎○	Position detection circuit erro	P29

∗ As the error code displayed on the wired remote controller may differ according to type of indoor model, multiple codes are described.

3) Sensor, current, compressor operation frequency, PMV opening display

The values detected by the controller, such as temperature sensor or current value are simply confirmed.

(Legend)

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

● : Go off, ○ : Go on

LED display \ Item setup	Temperature sensor (°C) (TD, TE, TS, TO, TL, TH, TA, TC, TCJ SW803)	Current (A) (SW803)	Compressor operation frequency (rpm) (SW803)	PMV opening (Pulse) (SW803)
●●●●●○	Below –25	0 to 0.9	0 to 4	0 to 19
○●●●●○	–25 to –21	1 to 1.9	5 to 9	20 to 39
●○●●●○	–20 to –16	2 to 2.9	10 to 14	40 to 59
○○●●●○	–15 to –11	3 to 3.9	15 to 19	60 to 79
●●○●●○	–10 to – 5	4 to 4.9	20 to 24	80 to 99
○●○●●○	–5 to –1	5 to 5.9	25 to 29	100 to 119
●○○●●○	0 to 4	6 to 6.9	30 to 34	120 to 139
○○○●●○	5 to 9	7 to 7.9	35 to 39	140 to 159
●●●○●○	10 to 14	8 to 8.9	40 to 44	160 to 179
○●●○●○	15 to 19	9 to 9.9	45 to 49	180 to 199
●○●○●○	20 to 24	10 to 10.9	50 to 54	200 to 219
○○●○●○	25 to 29	11 to 11.9	55 to 59	220 to 239
●●○○●○	30 to 34	12 to 12.9	60 to 64	240 to 259
○●○○●○	35 to 39	13 to 13.9	65 to 69	260 to 279
●○○○●○	40 to 44	14 to 14.9	70 to 74	280 to 299
○○○○●○	45 to 49	15 to 15.9	75 to 79	300 to 319
●●●●○○	50 to 54	16 to 16.9	80 to 84	320 to 339
○●●●○○	55 to 59	17 to 17.9	85 to 89	340 to 359
●○●●○○	60 to 64	18 to 18.9	80 to 84	360 to 379
○○●●○○	65 to 69	19 to 19.9	95 to 99	380 to 399
●●○●○○	70 to 74	20 to 20.9	100 to 104	400 to 419
○●○●○○	75 to 79	21 to 21.9	105 to 109	420 to 439
●○○●○○	80 to 84	22 to 22.9	110 to 114	440 to 459
○○○●○○	85 to 89	23 to 23.9	115 to 119	460 to 479
●●●○○○	90 to 94	24 to 24.9	120 to 124	480 to 499
○●●○○○	95 to 99	25 to 25.9	125 to 129	500
●○●○○○	100 to 104	26 to 26.9	130 to 134	—
○○●○○○	105 to 109	27 to 27.9	135 to 139	—
●●○○○○	110 to 114	28 to 28.9	140 to 144	—
○●○○○○	115 to 119	29 to 29.9	145 to 149	—
●○○○○○	Over 120	30 to 30.9	150 to 154	—
○○○○○○	Sensor error, unconnected	Over 31	Over 155	—

∗ As TD, TL and TH are sensors for high temperature, there is error at normal temperature or below position.

∗ For current value, the current for the outdoor unit only is displayed.

4) Specific operation for maintenance check (SW801, SW804)

The following specific operations for the maintenance check are performed by operation of SW801 or SW804.

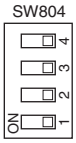
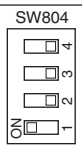
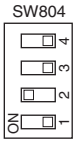
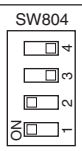
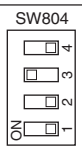
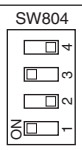
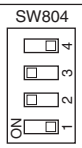
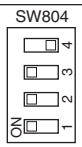
a) Select DIP switch SW804. (See table below)

b) Push the pushdown button switch SW801 for approx. 1 second.

c) The following functions start. While each function starts, LED D805 (Green) flashes.

d) When pushing the pushdown button switch SW801 again for approx. 1 second, when selecting DIP switch SW804 or when the specified time of each function elapsed, each function stops and LED D805 (Green) returns to the continuous lighting.

<Specific operation>

SW804	Operation when pushdown button switch SW801 is pushed
	Refrigerant recovery operation The outdoor unit performs cooling operation. The indoor unit does not work by this operation alone. Therefore operate the fan beforehand. (Refer → **11-4-1. Refrigerant Recovery Control**)
	Indoor cooling test run demand The cooling test run is performed. (→ **Note 1**)
	Indoor heating test run demand The heating test run is performed. (→ **Note 1**)
	Fan motor forced operation Drive the fan motor forcedly. When pushing SW801 again or when 2 minutes elapsed, the operation returns to the normal control.
	(No operation especially)
	PMV full open operation Open PMV (Pulse Motor Valve) fully. When pushing SW801 again or when 2 minutes elapsed, the operation returns to the normal control.
	PMV full close operation Close PMV (Pulse Motor Valve) fully. When pushing SW801 again or when 2 minutes elapsed, the operation returns to the normal control.
	PMV middle opening operation Set PMV (Pulse Motor Valve) to middle opening (250 pulses). When pushing SW801 again or when 2 minutes elapsed, the operation returns to the normal control.

[NOTE]
Although these operations can be performed even during operation, basically perform operation while the unit stops.
If performing this operation during driving the unit, it is dangerous because the pressure may change suddenly.

Note 1) Indoor cooling test run demand / Indoor heating test run demand

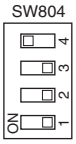
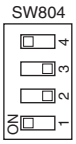
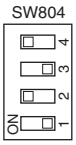
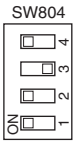
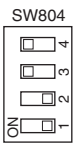
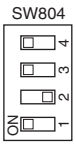
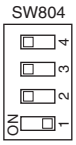
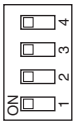
Only when combining with the following indoor unit, cooling/heating operation can be performed from the outdoor unit.

Test run is available: Indoor unit of 4 series and after (RAV-SM∗∗∗4UTP etc.)

Test run is unavailable: Indoor units other than the above-mentioned indoor units, or indoor units other than above-mentioned indoor units are included in the twin connection.

Note 2) The forced test run by this setting cannot be cleared on the indoor remote controller.

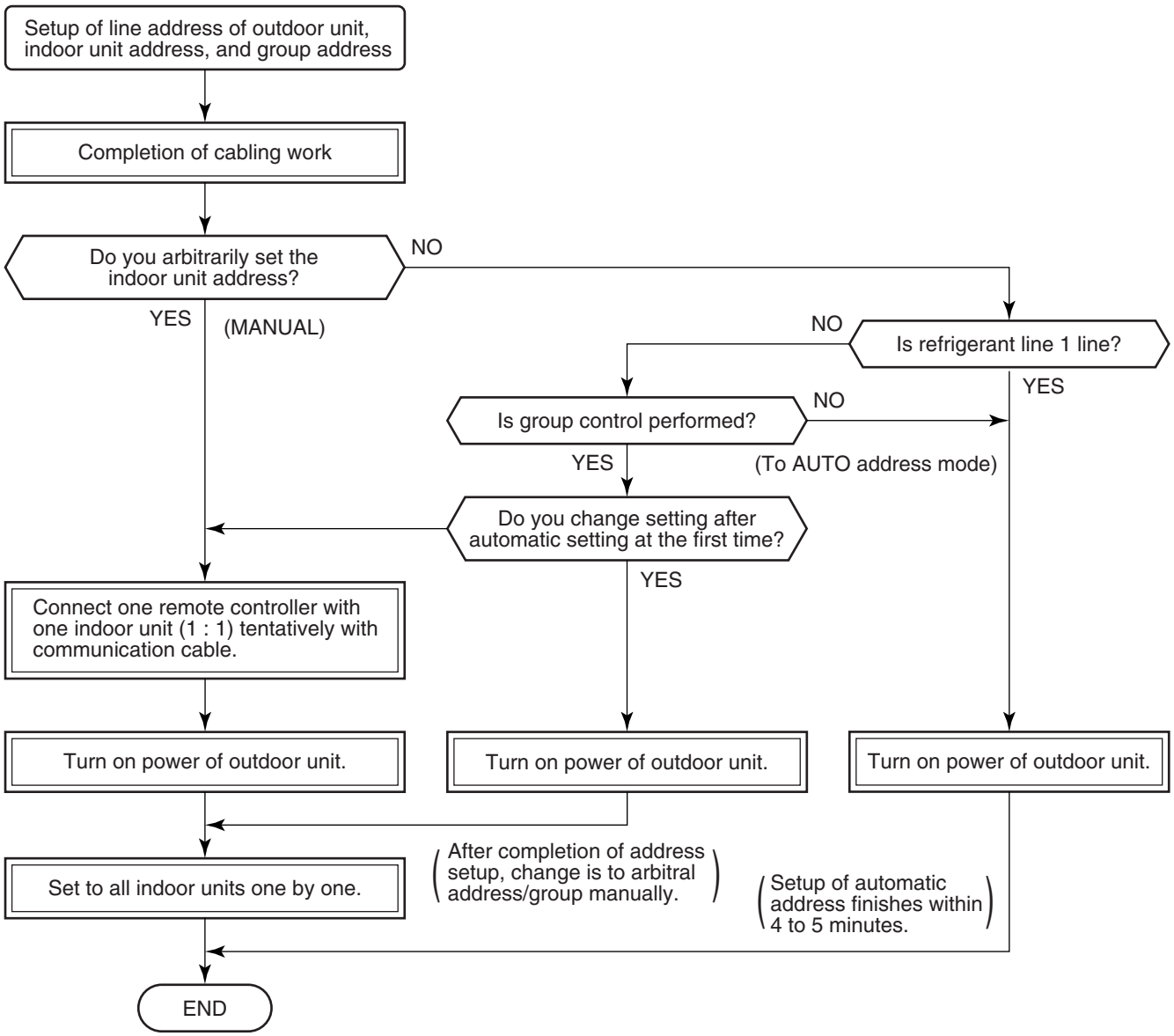
Be sure to clear the test run by operation of the outdoor unit. (Push SW801 again for 1 second.)

SW804	Operation when pushdown button switch SW801 is pushed	
	4-way valve relay operation (For RY700, CN70 check) Turn on 4-way valve power relay (RY700). When pushing SW801 again or when 2 minutes elapsed, the operation returns to the normal control. **[NOTE]** In case of model adopting the self hold valve (RAV-SP1104AFE, RAV-SP1404T-E), the coil develops fever. Therefore do not perform this operation as coil is connected.	
	Self-hold valve suction operation (Exchange to heating cycle) (For RY700 RY701, RY705, CN701 check) Turn on relay RY700, RY701, RY705. (CN701 between ① and ④ : Voltage=Approx. +198 to 380V) This function works for 10 seconds and then is OFF.	
	Self-hold valve separation operation (Exchange to cooling cycle) Turn on relay RY700. (CN701 between 1) and 4): Voltage=Approx. −198 to 380V) This function works for 10 seconds and then is OFF.	
	SV valve relay operation (For RY702, CN702 check) Turn on SV valve relay (RY702). When pushing SW801 again or when 2 minutes elapsed, the operation returns to the normal control. ∗ For RAV-SP1104 to RAV-SP1404, the part is not mounted, so do not operate.	**[CAUTION]** Although these operations can be performed even during operation, basically perform operation while the unit stops. If performing this operation during driving the unit, it is dangerous because the pressure may change suddenly.
	Heater output relay operation (For check RY703, CN703 check) Turn on relay for option heater (RY703). When pushing SW801 again or when 2 minutes elapsed, the operation returns to the normal control.	
	Outside output relay operation (RY704, CN704) Turn on relay for outside output (RY704). When pushing SW801 again or when 2 minutes elapsed, the operation returns to the normal control.	
	(No operation especially)	
	Relay operation change for outside output **[CAUTION]** Do not use this setting.	

10. ADDRESS SETUP

10-1. Address Setup Procedure

When an outdoor unit and an indoor unit are connected, or when an outdoor unit is connected to each indoor unit respectively in the group operation even if multiple refrigerant lines are provided, the automatic address setup completes with power-ON of the outdoor unit. The operation of the remote controller is not accepted while automatic address works. (Approx. 4 to 5 minutes)



- When the following addresses are not stored in the neutral memory (IC503) on the indoor P.C. board, a test run operation cannot be performed. (Unfixed data at shipment from factory)

	Item code	Data at shipment	Setup data range
Line address	12	0099	0001 (No. 1 unit) to 0064 (No. 64 unit)
Indoor unit address	13	0099	0001 (No. 1 unit) to 0064 (No. 64 unit) Max. value of indoor units in the identical refrigerant line
Group address	14	0099	0000 : Individual (Indoor units which are not controlled in a group) 0001 : Master unit (1 indoor unit in group control) 0002 : Sub unit (Indoor units other than master unit in group control)

10-2. Address Setup & Group Control

<Terminology>

Indoor unit No. : N - n = Outdoor unit line address N (Max. 30) - Indoor unit address n (Max. 64)

Group address : 0 = Single (Not group control)
1 = Master unit in group control
2 = Sub unit in group control

Master unit (= 1) : The representative of multiple indoor units in group operation sends/receives signals to/from the remote controllers and sub indoor units.
(* It has no relation with an indoor unit which communicates serially with the outdoor units.)

The operation mode and setup temperature range are displayed on the remote controller LCD.
(Except air direction adjustment of louver)

Sub unit (= 2) : Indoor units other than master unit in group operation

Basically, sub units do not send/receive signals to/from the remote controllers.
(Except errors and response to demand of service data)

Header unit (Representative unit) (Master Twin)

: This unit communicates with the indoor unit (follower) which serial-communicates with the outdoor units and sends/receives signal (Command from compressor) to/from the outdoor units as the representative of the cycle control in the indoor units of the identical line address within the minimum unit which configures one of the refrigerating cycles of Twin.

Follower unit (Subordinate unit) (Sub Twin)

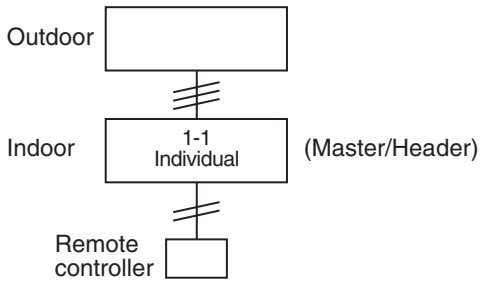
: Indoor units excluding the header unit in Twin

This unit communicates with (Header) indoor unit in the identical line address and performs control synchronized with (Header) indoor unit.

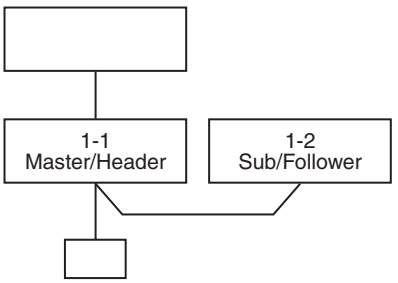
This unit does not perform the signal send/receive operation with the outdoor units. :
No judgment for serial signal error.

10-2-1. System Configuration

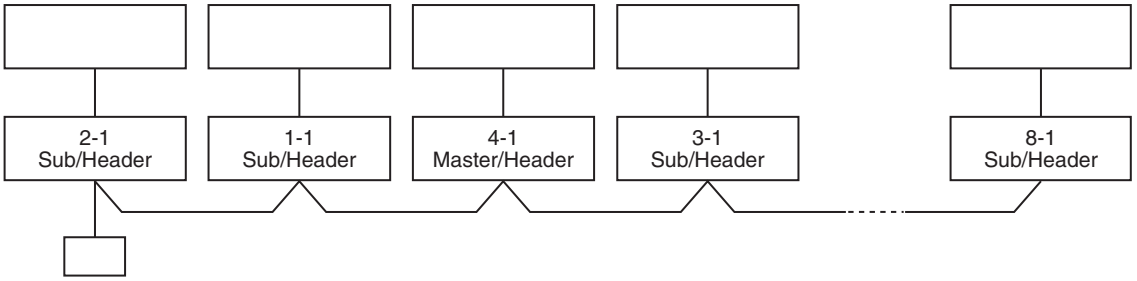
1. Single



2. Twin

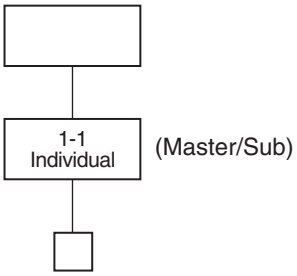


3. Single group operation

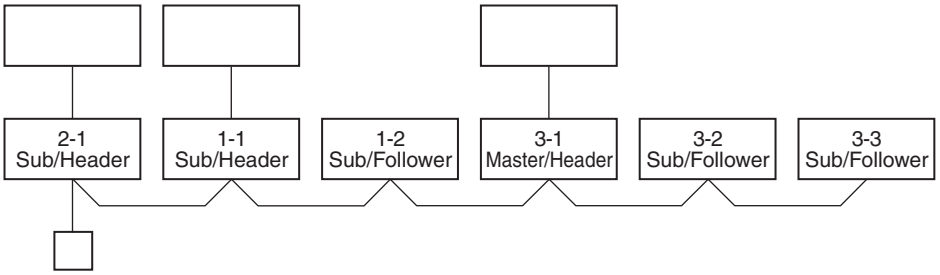


10-2-2. Automatic Address Example from Unset Address (No miswiring)

1. Standard (One outdoor unit)
   1) Single



   2) Group operation (Twin, Triple operation)
   (Multiple outdoor units = Miltiple indoor units only with serial communication)



Only turning on source power supply (Automatic completion)

- Header unit: The header unit receives the indoor unit data (thermo status) of the follower (Without identical line address & indoor/outdoor serial) and then finally controls the outdoor compressor matching with its own thermo status.
  The header unit sends this command information to the follower unit.
- Follower unit: The follower unit receives the indoor unit data from the header (With identical line address & indoor/outdoor serial) and then performs the thermo operation synchronized with the header unit.
  The follower unit sends own thermo ON/OFF demand to the header unit.

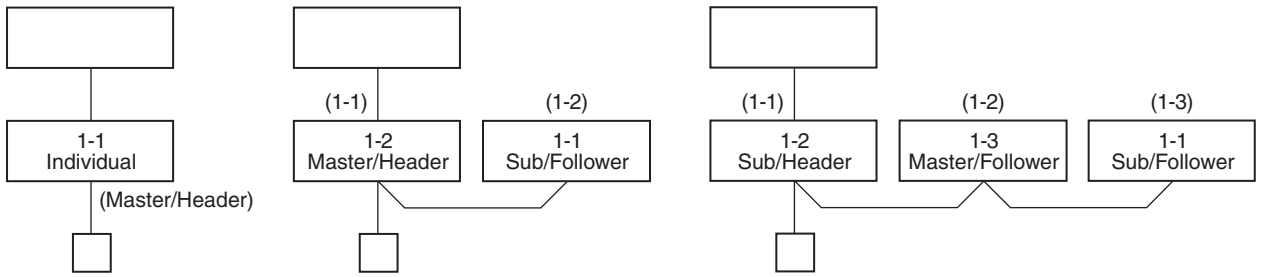
(Example)

No. 1-1 header unit sends/receives signal to/from No. 1-2 and No. 1-3 follower units.
(It is not influenced by the line 2 or 3 address indoor unit.)

10-2-3. Automatic Address Example from Unset Address (No miswiring)

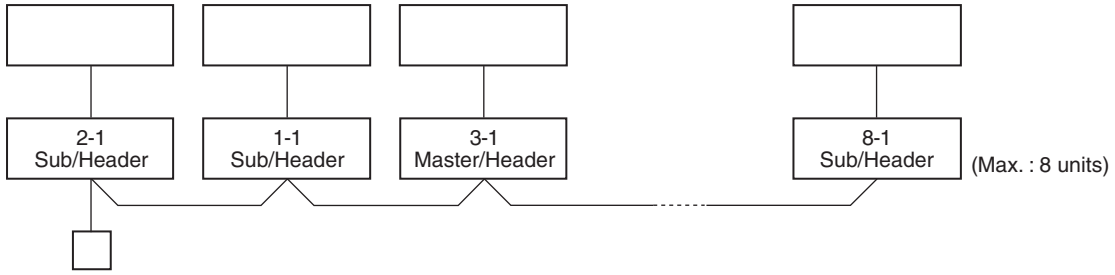
1. Standard (One outdoor unit)

1) Single 2) Twin 3) Triple



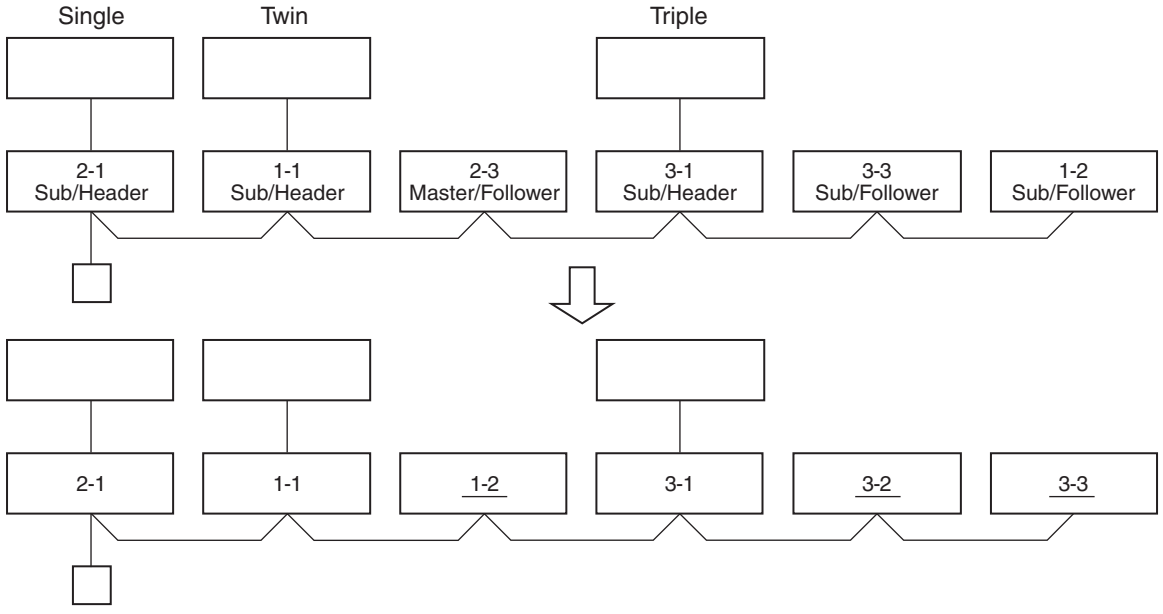
Only turning on source power supply (Automatic completion)

2. Group operation
(Multiple outdoor units = Multiple indoor units with serial communication only, without twin)



Only turning on source power supply (Automatic completion)

3. Multiple groups operation

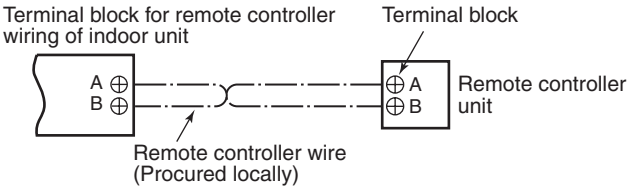


Change is necessary
Manually change addresses of the multiple follower units simultaneously from the remote controller.

10-3. Remote Controller Wiring

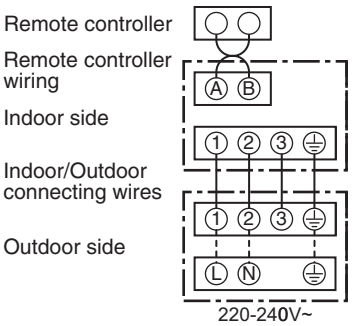
- Strip off approx. 9 mm the wire to be connected.
- For single system, use non polarity, 2 core wire is used for wiring of the remote controller. (0.5 mm² to 2.0 mm² wires)
- For the synchronous twin, triple system, use 2-conre shield wire (Vinyl cord for microphone 0.5 to 2.0 mm²) to conform to the EMC standard.

Wiring diagram

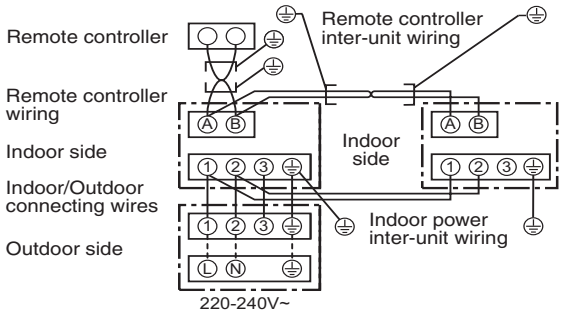


* For details of wiring/installation of the remote controller, refer to the Installation Manual enclosed with the remote controller.

<Single system>



<Synchronous twin system>

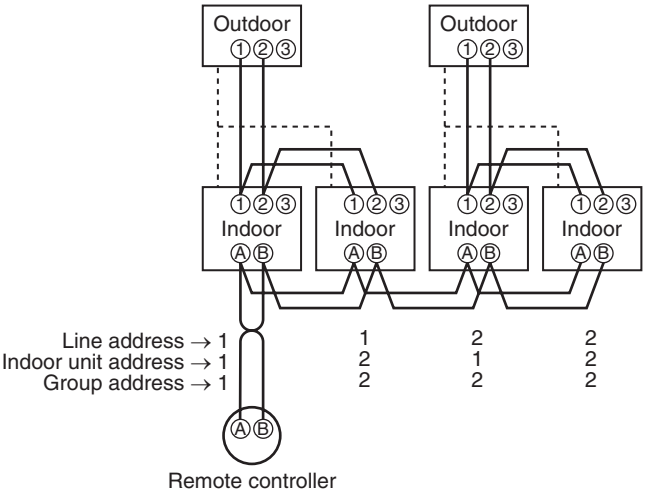


10-4. Address Setup (Manual setting from remote controller)

In case that addresses of the indoor units will be determined prior to piping work after cabling work

- Set an indoor unit per a remote controller.
- Turn on power supply.

(Example of 2-lines cabling)
(Real line: Cabling, Broken line: Refrigerant pipe)



For the above example, perform setting by connecting singly the wired remote controller without remote controller inter-unit cable.

Group address
Individual : 0000
Master unit : 0001
Sub unit : 0002
} In case of group control

1 **Push SET + CL + TEST buttons simultaneously for 4 seconds or more.**

2 **(← Line address)**
Using the temperature setup ▼ / ▲ buttons, set *12* to the item code.

3 **Using timer time ▼ / ▲ buttons, set the line address.**

4 **Push SET button.** (OK when display goes on.)

5 **(← Indoor unit address)**
Using the temperature setup ▼ / ▲ buttons, set *13* to the item code.

6 **Using timer time ▼ / ▲ buttons, set 1 to the line address.**

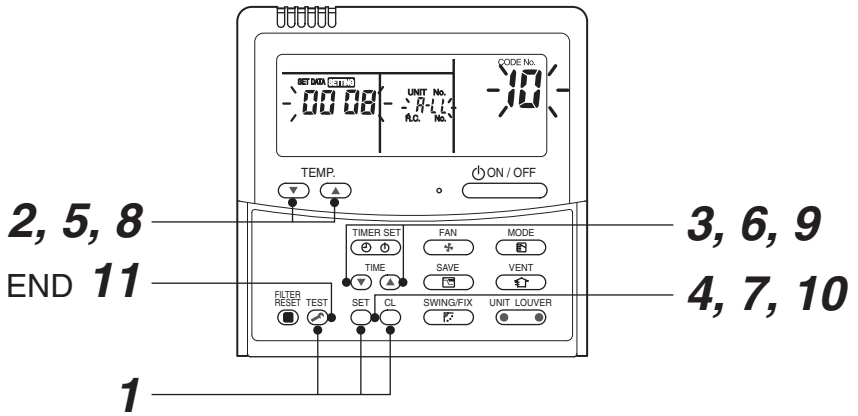
7 **Push SET button.** (OK when display goes on.)

8 **(← Group address)**
Using the temperature setup ▼ / ▲ buttons, set *14* to the item code.

9 **Using timer time ▼ / ▲ buttons, set *0000* to Individual, *0001* to Master unit, and *0002* to sub unit.**

10 **Push SET button.** (OK when display goes on.)

11 **Push TEST button.**
Setup completes. (The status returns to the usual stop status.)



<Operation procedure>

1→2→3→4→5→6→7→8→9→10→11 END

10-5. Confirmation of Indoor Unit No. Position

1. To know the indoor unit addresses though position of the indoor unit body is recognized

- In case of individual operation (Wired remote controller : indoor unit = 1 : 1)
  (Follow to the procedure during operation)

<Procedure>

1 **Push ON / OFF button if the unit stops.**

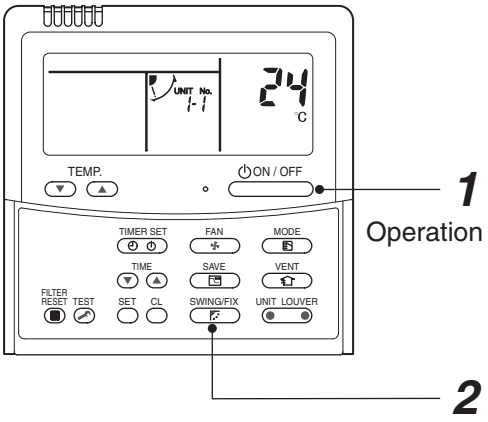
2 **Push UNIT LOUVER button (left side of the button).**

Unit No. *1-1* is displayed on LCD.

(It disappears after several seconds.)

The displayed unit No. indicate line address and indoor unit address.

(When other indoor units are connected to the identical remote controller (Group control unit), other unit numbers are also displayed every pushing UNIT LOUVER button (left side of the button).



<Operation procedure>

1 → ***2*** END

2. To know the position of indoor unit body by address

- To confirm the unit No. in the group control
  (Follow to the procedure during operation) (in this procedure, the indoor units in group control stop.)

<Procedure>

The indoor unit numbers in the group control are successively displayed, and fan, louver, and drain pump of the corresponding indoor unit are turned on.
(Follow to the procedure during operation)

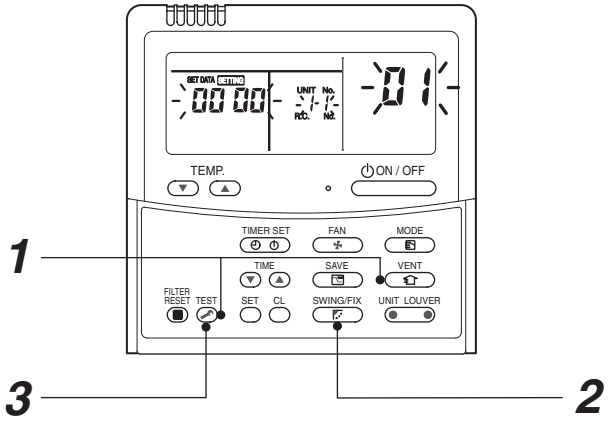
1 **Push VENT and TEST buttons simultaneously for 4 seconds or more.**

- Unit No. *ALL* is displayed.
- Fans and louvers of all the indoor units in the group control operate.

2 **Every pushing UNIT LOUVER button (left side of the button), the unit numbers in the group control are successively displayed.**

- The unit No. displayed at the first time indicates the master unit address.
- Fan and louver of the selected indoor unit only operate.

3 **Push TEST button to finish the procedure.**
All the indoor units in the group control stop.



<Operation procedure>

1 → ***2*** → ***3*** END

<Maintenance/Check list>

Aiming in environmental preservation, it is strictly recommended to clean and maintain the indoor/outdoor units of the operating air conditioning system regularly to secure effective operation of the air conditioner.

It is also recommended to maintain the units once a year regularly when operating the air conditioner for a long time.

Check periodically signs of rust or scratches, etc. on coating of the outdoor units.
Repair the defective position or apply the rust resisting paint if necessary.

If an indoor unit operates for approx. 8 hours or more per day, usually it is necessary to clean the indoor/outdoor units once three months at least.

These cleaning and maintenance should be carried out by a qualified dealer.

Although the customer has to pay the charge for the maintenance, the life of the unit can be prolonged.

Failure to clean the indoor/outdoor units regularly will cause shortage of capacity, freezing, water leakage or trouble on the compressor.

Part name	Object		Contents of check	Contents of maintenance
	Indoor	Outdoor		
Heat exchanger	○	○	• Blocking with dust, damage check	• Clean it when blocking is found.
Fan motor	○	○	• Audibility for sound	• When abnormal sound is heard
Filter	○	—	• Visual check for dirt and breakage	• Clean with water if dirty • Replace if any breakage
Fan	○	○	• Visual check for swing and balance • Check adhesion of dust and external appearance.	• Replace fan when swinging or balance is remarkably poor. • If a large dust adheres, clean it with brush or water.
Suction/ Discharge grille	○	—	• Visual check for dirt and scratch	• Repair or replace it if deformation or damage is found.
Drain pan	○	—	• Check blocking by dust and dirt of drain water.	• Clean drain pan, Inclination check
Face panel, Louver	○	—	• Check dirt and scratch.	• Cleaning/Coating with repair painting
External appearance	—	○	• Check rust and pealing of insulator • Check pealing and floating of coating film	• Coating with repair painting

11. REPLACEMENT OF SERVICE P.C. BOARD

11-1. Outdoor Unit

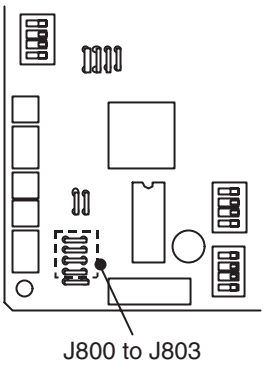
1. Setting the jumper wires and DIP switches

Part name		Function	Setting
Jumper wire	J800 to J803	Model switching	Cut these jumper wires according to the following table.
	J804 to J810	Settings	Set these jumper wires to the settings of the P.C. board before replacement.
DIP switch	SW802	Settings	Set SW802 to the setting of the P.C. board before replacement.
	SW803	LED indication switching	Set SW803 to all OFF.
	SW804	Special operations for service	Set SW804 to all OFF.

Model switching (J800 to J803)

Since this service P.C. board is available for several models, cut the jumper wires according to the following table. If they are not cut correctly, an error code “L10” or “L29” appears on the remote controller and the operation of the air conditioner is disabled.

Model name	J 800	J 801	J 802	J 803
Factory setting (default)	○	○	○	○
RAV-SP1104AT∗-E	×	○	○	○
RAV-SP1404AT∗-E	○	×	○	○
∗ : Characters that indicate the following: No character ... Standard models J ..... For heavily salt-affected areas	○ : Connected, × : Cut			



2. Installing the P.C. Board

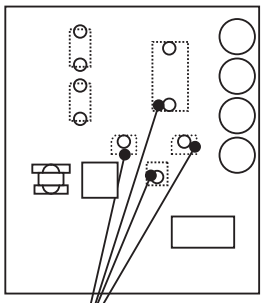
(1) Apply thermal grease to the back (heat sink contacting side) of devices Q201, Q650, DB01, DB02 and aluminum plate.(Q300 and Q400 are not necessary to be applied thermal grease.)

(2) Reuse the aluminum plate.

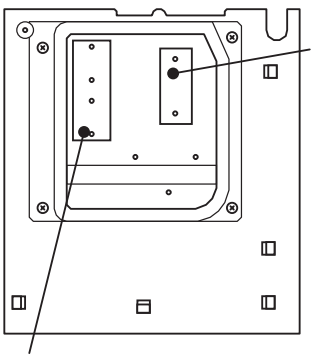
(3) Reuse the insulating sheet. When a small amount of thermal grease is applied to the back of the insulating sheet, it adheres temporarily to the heat sink, which makes it easy to attach the insulating sheet.

(4) Insert the P.C. board, align the holes of the insulating sheets, semiconductor devices, and heat sinks, and then secure them with screws.

(5) Connect the lead wires according to the wiring diagram stuck on the backside of the panel.

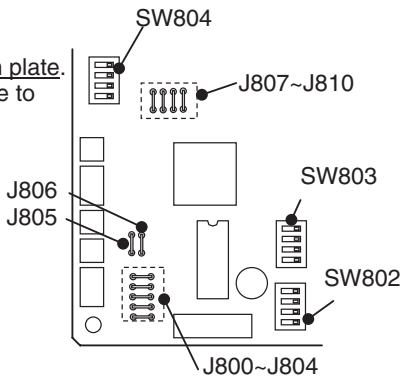


Apply thermal grease to the back (heat sink contacting side) of Q201,Q650, DB01, and DB02.



Reuse the aluminum plate. Apply thermal grease to its both sides.

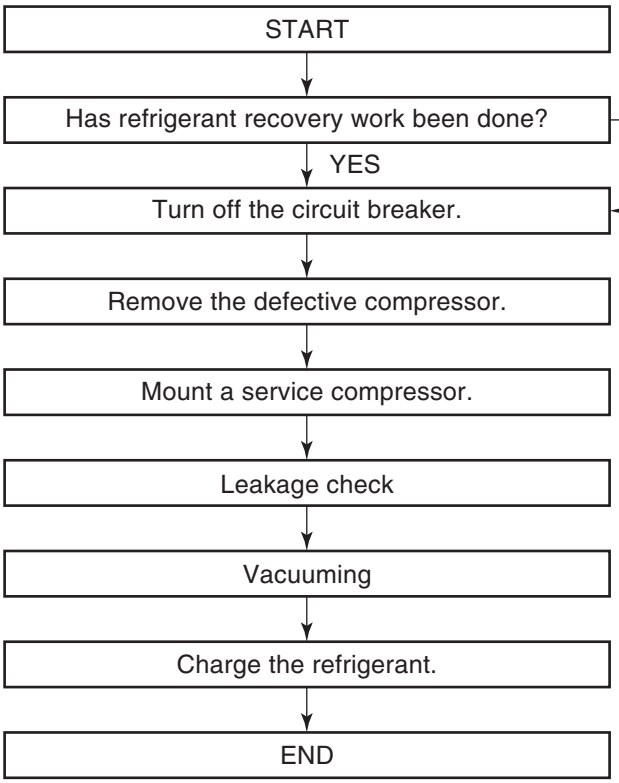
Reuse the insulating sheet. Applying thermal grease to the back of the insulating sheet makes it easy to attach the insulating sheet.



Position of jumper wires and DIP switches.

12. HOW TO EXCHANGE COMPRESSOR

12-1. Exchanging Procedure of Compressor (Outline)



Open PMV forcedly and then recover refrigerant using a refrigerant recovery unit.

Never recover the refrigerant to the outdoor unit.

For the refrigerant recovery work during reinstallation of repair work, be sure to use the refrigerant recovery unit.

Recovery of refrigerant to the outdoor unit is unavailable; otherwise a serious accident such as explosion or injury may be caused.

12-2. Exchange of Compressor

For exchange of compressors, refer to (11) Compressor in Section **14. Detachments**.

3 INSTALLATION OF NEW REFRIGERANT AIR CONDITIONER

- The R410A refrigerant is more susceptible to impurities such as water, oxide membranes, oils, and fats.
  With the adoption of the new refrigerant, the refrigerating oil has also been changed.
  Be careful not to let water, dust, conventional refrigerant, and/or conventional refrigerating oil enter the refrigerating cycle of the new refrigerant air conditioner.
- To prevent different refrigerant or refrigerating oil from becoming mixed, the sizes of the charging port of the unit and the installation tool connection sections are different from those of the conventional refrigerant. Accordingly, the following exclusive tools are required for the new refrigerant R410A.

■ Required Tools/Equipment and Precautions for Use

Prepare the tools and equipment listed in the following table before starting the installation work.
Newly prepared tools and equipment must be used exclusively.

Legend

△ : Prepared newly (Use for R410A only. Do not use for refrigerant R22 or R407C etc.)

◎ : Conventional tools/equipment are available

Tools/equipment	Use	How to use tools/equipment
Gauge manifold	Vacuuming/charging refrigerant and operation check	△ Prepared newly for R410A only
Charging hose		△ Prepared newly for R410A only
Charging cylinder	Can not be used	Unusable (Use the refrigerant charging measure instead.)
Gas leak detector	Gas leak check	△ Prepared newly
Vacuum pump	Vacuum drying	Unusable
Vacuum pump with backflow prevention function	Vacuum drying	◎ R22 (Conventional tools)
Flare tool	Flare machining of pipes	◎ Usable if dimensions are adjusted.
Bender	Bending pipes	◎ R22 (Conventional tools)
Refrigerant recovery equipment	Refrigerant recovery	△ For R410A only
Torque wrench	Tightening flare nuts	△ Exclusive for Ø12.7 mm and Ø15.9 mm
Pipe cutter	Cutting pipes	◎ R22 (Conventional tools)
Welding machine and nitrogen cylinder	Welding pipes	◎ R22 (Conventional tools)
Refrigerant charging measure	Charging refrigerant	◎ R22 (Conventional tools)

■ Refrigerant Piping

New refrigerant (R410A)

When using the conventional piping kit

- When using the conventional piping kit with no indication of applicable refrigerant types, be sure to use it with a wall thickness of 0.8 mm for Ø9.5 mm and with a wall thickness of 1.0 mm for Ø15.9 mm. Do not use the conventional piping kit with a wall thickness less than these thicknesses due to insufficient pressure capacity.

When using general copper pipes

- Use general copper pipes with a wall thickness of 0.8 mm for Ø9.5 mm and with a wall thickness of 1.0 mm for Ø15.9 mm.
  Do not use any copper pipes with a wall thickness less than these thicknesses.

Flare nuts and flare machining

- The flare nuts and flare machining are different from those for the conventional refrigerant.
  Use the flare nuts supplied with the air conditioner or those for R410A.
- Before performing flare machining, carefully read “REFRIGERANT PIPING”.

4 INSTALLATION CONDITIONS

■ Before installation

Be sure to prepare to the following items before installation.

Length of refrigerant pipe

Length of refrigerant pipe connected to indoor/outdoor unit	Item
5 to 30 m	Addition of refrigerant is unnecessary at the local site.
*31 to 75 m	<Addition of refrigerant> Add 40 g of refrigerant for every 1 m of piping that exceeds 30 m.

* Caution during addition of refrigerant
When the total length of refrigerant piping exceeds 30 m, add 40 g/m of refrigerant up to a maximum total length of piping at 75 m. (Max. amount of additional refrigerant is 1,800 g.)
Charge the refrigerant accurately. Overcharging may cause serious trouble with the compressor.

- Do not connect a refrigerant pipe that is shorter than **3 m**.
  This may cause a malfunction of the compressor or other devices.

■ Airtight test

1. Before starting an airtight test, further tighten the spindle valves on the gas and liquid sides.
2. Pressurize the pipe with nitrogen gas charged from the service port to the design pressure (4.15 MPa) to conduct an airtight test.
3. After the airtight test is completed, evacuate the nitrogen gas.

Air purge

- To purge air, use a vacuum pump.
- Do not use refrigerant charged in the outdoor unit to purge air. (The air purge refrigerant is not contained in the outdoor unit.)

Electrical wiring

- Be sure to fix the power wires and indoor/outdoor connecting wires with clamps so that they do not come into contact with the cabinet, etc.

Earthing

- Proper earthing can prevent charging of electricity on the outdoor unit surface due to the presence of a high frequency in the frequency converter (inverter) of the outdoor unit, as well as prevent electric shock. If the outdoor unit is not properly earthed, you may be exposed to an electric shock.

Test Run

Turn on the leakage breaker at least 12 hours before starting a test run to protect the compressor during startup.

■ Installation Location

⚠ CAUTION

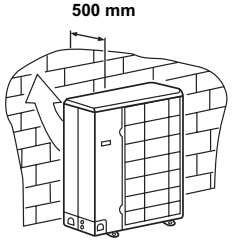
Install the outdoor unit in a location that meets the following conditions after the customer's consent is obtained.

- A well-ventilated location free from obstacles near the air inlets and air outlet
- A location that is not exposed to rain or direct sunlight
- A location that does not increase the operating noise or vibration of the outdoor unit
- A location that does not produce any drainage problems from discharged water

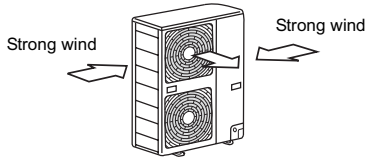
Do not install the outdoor unit in the following locations.

- A location with a saline atmosphere (coastal area) or one that is full of sulfide gas (hot-spring area) (Special maintenance is required.)
- A location subject to oil, vapor, oily smoke, or corrosive gases
- A location in which organic solvent is used
- Places where iron or other metal dust is present. If iron or other metal dust adheres to or collects on the interior of the air conditioner, it may spontaneously combust and start a fire.
- A location where high-frequency equipment (including inverter equipment, private power generator, medical equipment, and communication equipment) is used (Installation in such a location may cause malfunction of the air conditioner, abnormal control or problems due to noise from such equipment.)
- A location in which the discharged air of the outdoor unit blows against the window of a neighboring house
- A location where the operating noise of the outdoor unit is transmitted
- When the outdoor unit is installed in an elevated position, be sure to secure its feet.
- A location in which drain water poses any problems.

1. Install the outdoor unit in a location where the discharge air is not blocked.
2. When an outdoor unit is installed in a location that is always exposed to strong winds like a coast or on the high stories of a building, secure normal fan operation by using a duct or wind shield.
3. When installing the outdoor unit in a location that is constantly exposed to strong winds such as on the upper stairs or rooftop of a building, apply the windproofing measures referred to in the following examples.
   1) Install the unit so that its discharge port faces the wall of the building.
      Keep a distance 500 mm or more between the unit and wall surface.

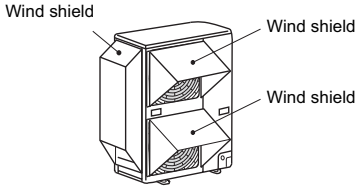


   2) Consider the wind direction during the operational season of the air conditioner, and install the unit so that the discharge port is set at a right angle relative to the wind direction.



- When using an air conditioner under low outside temperature conditions (Outside temp: -5 °C or lower) in COOL mode, prepare a duct or wind shield so that it is not affected by the wind.
- When installing the unit in an area where snowfalls may be heavy, take steps to prevent the unit from being adversely affected by the fallen or accumulated snow.
  - Either make the foundation higher or install a stand (which is high enough to ensure that the unit will be above the fallen or accumulated snow) and place the unit on it.
  - Attach a snow shield (locally procured).

<Example>

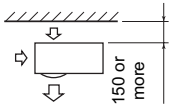


■ Necessary Space for Installation (Unit: mm)

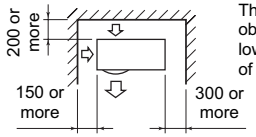
Obstacle at rear side

Upper side is free

1. Single unit installation

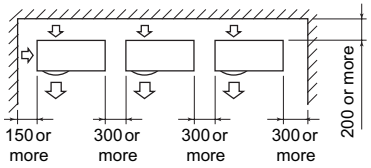


2. Obstacles on both right and left sides



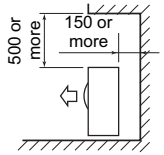
The height of the obstacle should be lower than the height of the outdoor unit.

3. Serial installation of two or more units



The height of the obstacle should be lower than the height of the outdoor unit.

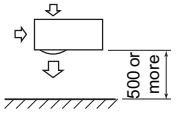
Obstacle also above unit



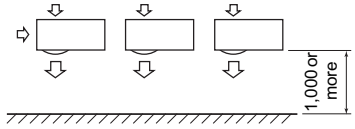
Obstacle in front

Above unit is free

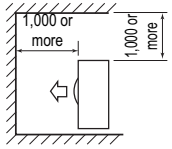
1. Single unit installation



2. Serial installation of two or more units



Obstacle also at the above unit

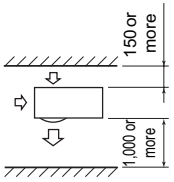


Obstacles in both front and rear of unit

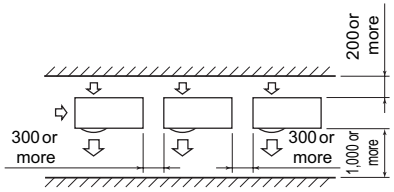
Open above and to the right and left of the unit.
The height of an obstacle in both the front and rear of the unit, should be lower than the height of the outdoor unit.

Standard installation

1. Single unit installation



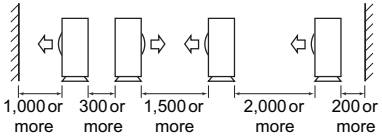
2. Serial installation of two or more units



Serial installation in front and rear

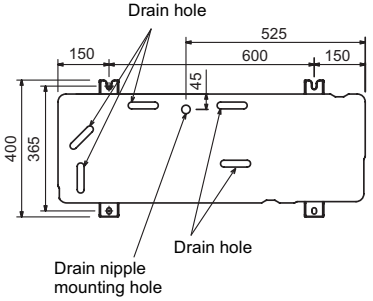
Open above and to the right and left of the unit.
The height of an obstacle in both the front and rear of the unit should be lower than the height of the outdoor unit.

Standard installation



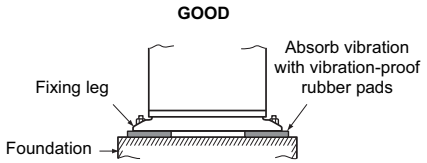
■ Installation of Outdoor Unit

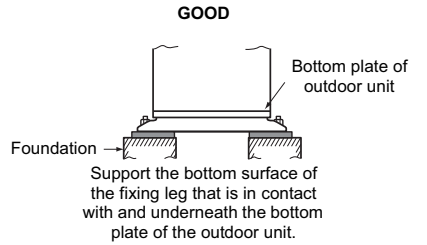
- Before installation, check the strength and horizontalness of the base so that abnormal sounds do not emanate.
- According to the following base diagram, fix the base firmly with the anchor bolts.
  (Anchor bolt, nut: M10 x 4 pairs)

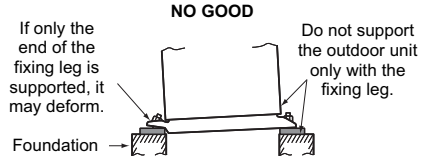


- As shown in the figure below, install the foundation and vibration-proof rubber pads to directly support the bottom surface of the fixing leg that is in contact with and underneath the bottom plate of the outdoor unit.

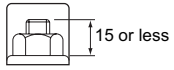
* When installing the foundation for an outdoor unit with downward piping, consider the piping work.



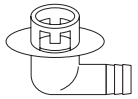


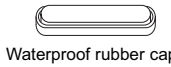


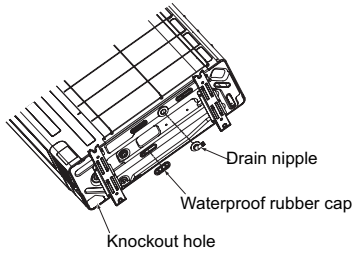
Set the out margin of the anchor bolt to 15 mm or less.



- When water is to be drained through the drain hose, attach the following drain nipple and waterproof rubber cap, and use the drain hose (Inner diam: 16 mm) sold on the market. Also seal knockout hole and the screws securely with silicone material, etc., to prevent water from leaking.
  Some conditions may cause dewing or dripping of water.
- When collectively draining discharged water completely, use a drain pan.







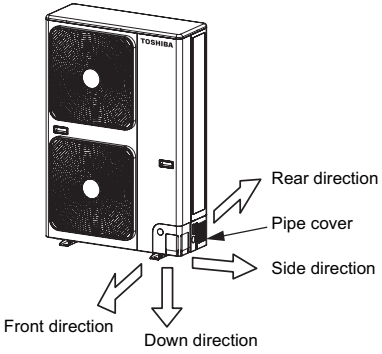
■ For Reference

If a heating operation is to be continuously performed for a long time under the condition that the outdoor temperature is 0 °C or lower, draining defrosted water may be difficult due to the bottom plate freezing, resulting in trouble with the cabinet or fan.
It is recommended to procure an anti-freeze heater locally in order to safely install the air conditioner.
For details, contact the dealer.

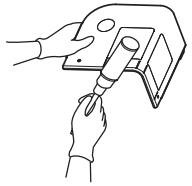
5 REFRIGERANT PIPING

■ Knockout of Pipe Cover

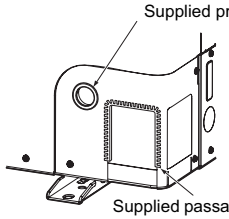
Knockout procedure



- The indoor/outdoor connecting pipes can be connected in 4 directions.
  Take off the knockout part of the pipe cover through which pipes or wires will pass through the base plate.
- Detach the pipe cover and tap on the knockout section a few times with the shank of a screwdriver. A knockout hole can easily be punched.
- After punching out the knockout hole, remove burrs from the hole and then install the supplied protective bush and guard material around the passage hole to protect wires and pipes.
  Be sure to attach the pipe covers after pipes have been connected. Cut the slits under the pipe covers to facilitate the installation.
  After connecting the pipes, be sure to mount the pipe cover. The pipe cover is easily mounted by cutting off the slit at the lower part of the pipe cover.



* Be sure to wear heavy work gloves while working.



■ Optional Installation Parts (Locally procured)

	Parts name	Q'ty
A	Refrigerant piping Liquid side: Ø9.5 mm Gas side: Ø15.9 mm	One each
B	Pipe insulating material (polyethylene foam, 10 mm thick)	1
C	Putty, PVC tape	One each

■ Refrigerant Piping Connection

⚠ CAUTION

TAKE NOTE OF THESE 4 IMPORTANT POINTS BELOW FOR PIPING WORK

1. Keep dust and moisture away from inside the connecting pipes.
2. Tightly connect the connection between pipes and the unit.
3. Evacuate the air in the connecting pipes using a VACUUM PUMP.
4. Check for gas leaks at connection points.

Piping connection

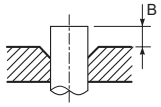
Liquid side	
Outer diameter	**Thickness**
Ø9.5 mm	0.8 mm

Gas side	
Outer diameter	**Thickness**
Ø15.9 mm	1.0 mm

Flaring

1. Cut the pipe with a pipe cutter.
   Be sure to remove burrs that may cause a gas leak.
2. Insert a flare nut into the pipe, and then flare the pipe.
   Use the flare nuts supplied with the air conditioner or those for R410A.
   Insert a flare nut into the pipe, and flare the pipe.
   As the flaring sizes of R410A differ from those of refrigerant R22, the flare tools newly manufactured for R410A are recommended.
   However, the conventional tools can be used by adjusting the projection margin of the copper pipe.

Projection margin in flaring: B (Unit: mm)



Rigid (Clutch type)

Outer diam. of copper pipe	R410A tool used	Conventional tool used
	R410A	
9.5	0 to 0.5	1.0 to 1.5
15.9		

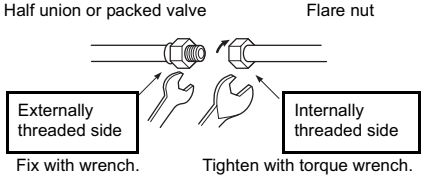
Flaring diameter size: A (Unit: mm)

Outer dia. of copper pipe	$A^{+0}_{-0.4}$
9.5	13.2
15.9	19.7

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

■ Tightening of Connecting Part

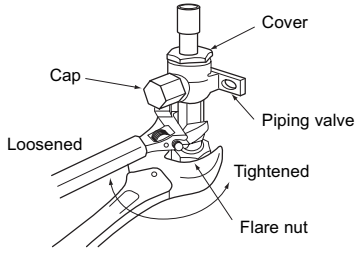
1. Align the centers of the connecting pipes and fully tighten the flare nut with your fingers. Then fix the nut with a wrench as shown in the figure and tighten it with a torque wrench.



2. As shown in the figure, be sure to use two wrenches to loosen or tighten the flare nut of the valve on the gas side. If you use a single crescent, the flare nut cannot be tightened to the required tightening torque. On the other hand, use a single crescent to loosen or tighten the flare nut of the valve on the liquid side.

(Unit: N•m)

Outer dia.	Tightening torque
Ø9.5	33 to 42
Ø15.9	33 to 42

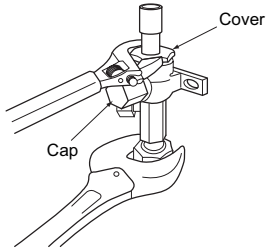


Valve at gas side

⚠ CAUTION

1. Do not put the crescent wrench on the cap or cover. The valve may break.
2. If applying excessive torque, the nut may break according to some installation conditions.

NO GOOD



- After the installation work, be sure to check for gas leaks of the pipe connections with nitrogen.
- Pressure of R410A is higher than that of R22 (Approx. 1.6 times).
  Therefore, using a torque wrench, tighten the flare pipe connecting sections that connect the indoor/outdoor units at the specified tightening torque.
  Incomplete connections may cause not only a gas leak, but also trouble with the refrigeration cycle.

Do not apply refrigerating machine oil to the flared surface.

■ Refrigerant Pipe Length

Single

Allowable pipe length (m)	Height difference (Indoor-outdoor H) (m)	
Total length L	Indoor unit: Upper	Outdoor unit: Lower
75	30	30

Pipe diameter (mm)		Number of bent portions
Gas side	Liquid side	10 or less
Ø15.9	Ø9.5	

Simultaneous twin

System	Model	Allowable pipe length (m)			Height difference (m)		
		Total length • ℓ1 + ℓ2 • ℓ1 + ℓ3 • ℓ1 + ℓ4 Maximum	Distributed pipes • ℓ2 • ℓ3 • ℓ4 Maximum	Distributed pipes • ℓ3 – ℓ2 • ℓ4 – ℓ2 • ℓ4 – ℓ3 Maximum	Indoor-outdoor H		Indoor-indoor (Δh)
					Indoor unit: Upper	Outdoor unit: Upper	
TWIN	SP110	50	15	10	30	30	0.5
	SP140	50	15	10	30	30	0.5

System	Model	Pipe diameter (mm)				Number of bent portions
		Main pipe		Branching pipe		
		Gas side	Liquid side	Gas side	Liquid side	
TWIN	SP110	Ø15.9	Ø9.5	Ø12.7	Ø6.4	10 or less
	SP140	Ø15.9	Ø9.5	Ø15.9	Ø9.5	10 or less

Figure of Single

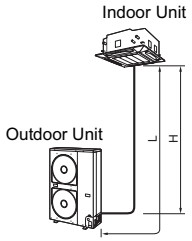
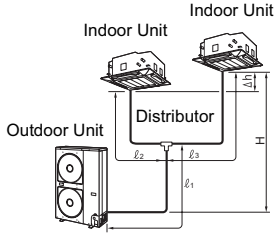


Figure of Simultaneous twin



6 AIR PURGING

■ Airtight test

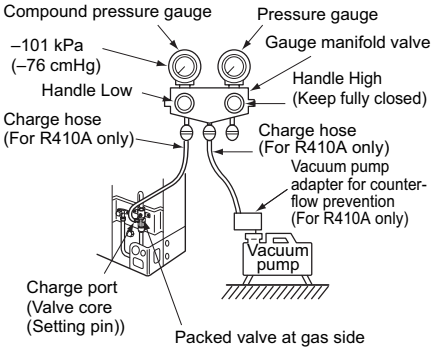
Before starting an airtight test, further tighten the spindle valves on the gas side and liquid side.
Pressurize the pipe with nitrogen gas charged from the service port to the design pressure (4.15 MPa) to conduct the airtight test.
After the airtight test is completed, evacuate the nitrogen gas.

■ Air Purge

With respect to the preservation of the terrestrial environment, adopt "Vacuum pump" to purge air (Evacuate air in the connecting pipes) when installing the unit.

- Do not discharge the refrigerant gas to the atmosphere to preserve the terrestrial environment.
- Use a vacuum pump to discharge the air (nitrogen, etc.) that remains in the set. If air remains, the capacity may decrease.

For the vacuum pump, be sure to use one with a backflow preventer so that the oil in the pump does not backflow into the pipe of the air conditioner when the pump stops.
(If oil in the vacuum pump is put in an air conditioner including R410A, it may cause trouble with the refrigeration cycle.)



Vacuum pump

As shown in the figure, connect the charge hose after the manifold valve is closed completely.
↓
Attach the connecting port of the charge hose with a projection to push the valve core (setting pin) to the charge port of the set.
↓
Open Handle Low fully.
↓
Turn ON the vacuum pump. (*1)
↓
Loosen the flare nut of the packed valve (Gas side) a little to check that the air passes through. (*2)
↓
Retighten the flare nut.
↓
Execute vacuuming until the compound pressure gauge indicates –101 kPa (–76 cmHg). (*1)
↓
Close Handle Low completely.
↓
Turn OFF the vacuum pump.
↓
Leave the vacuum pump as it is for 1 or 2 minutes, and check that the indicator of the compound pressure gauge does not return.
↓
Open the valve stem or valve handle fully. (First, at liquid side, then gas side)
↓
Disconnect the charge hose from the charge port.
↓
Tighten the valve and caps of the charge port securely.

*1 Use the vacuum pump, vacuum pump adapter, and gauge manifold correctly referring to the manuals supplied with each tool before using them.
Check that the vacuum pump oil is filled up to the specified line of the oil gauge.

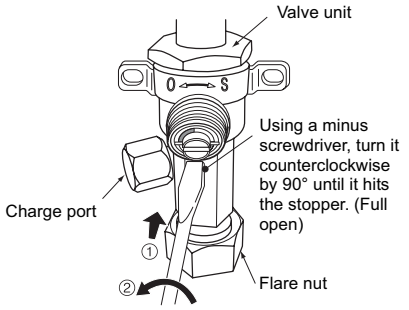
*2 When air is not charged, check again whether the connecting port of the discharge hose, which has a projection to push the valve core, is firmly connected to the charge port.

■ How to open the valve

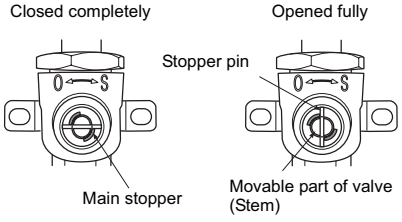
Open or close the valve.

Liquid side
Open the valve with a **4 mm** hexagon wrench.

Gas side



Handle position



- While the valve is fully opened, after the screwdriver has reached the stopper, do not apply torque exceeding 5 N•m. Applying excessive torque may damage the valve.

Valve handling precautions
- Open the valve stem until it strikes the stopper. It is unnecessary to apply further force.
- Securely tighten the cap with a torque wrench.

Cap tightening torque
- The cap with the 9.5 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 so check it in the table below.

(Unit: N•m)

Valve size	Ø9.5 (H19 mm)	14 to 18
	Ø9.5 (H22 mm)	33 to 42
	Ø15.9	20 to 25
Charge port		14 to 18

■ Replenishing refrigerant

This model is a 30 m chargeless type that does not need to have its refrigerant replenished for refrigerant pipes up to 30 m. When a refrigerant pipe longer than 30 m is used, add the specified amount of refrigerant.

Refrigerant replenishing procedure

1. After vacuuming the refrigerant pipe, close the valves and then charge the refrigerant while the air conditioner is not working.
2. When the refrigerant cannot be charged to the specified amount, charge the required amount of refrigerant from the charge port of the valve on the gas side during cooling.

Requirement for replenishing refrigerant

Replenish liquid refrigerant.
When gaseous refrigerant is replenished, the refrigerant composition varies, which disables normal operation.

Adding additional refrigerant

31~75 m: L
40 g × (L-30)

- L: Pipe length
- To add additional refrigerant to twin system, refer to the installation manual supplied with the branching pipe (sold separately).
- The refrigerant need not be reduced for a 30 meter (or less) refrigerant pipe.

7 ELECTRICAL WORK

⚠ WARNING

1. **Using the specified wires, ensure that the wires are connected, and fix wires securely so that the external tension to the wires does not affect the connecting part of the terminals.**
   Incomplete connection or fixation may cause a fire, etc.
2. **Be sure to connect the earth wire. (grounding work)**
   Incomplete grounding may lead to electric shock.
   Do not connect ground wires to gas pipes, water pipes, lightning rods or ground wires for telephone wires.
3. **The appliance shall be installed in accordance with national wiring regulations.**
   Capacity shortages of the power circuit or an incomplete installation may cause an electric shock or fire.

⚠ CAUTION

- Wrong wiring may cause a burn-out of some electrical parts.
- Be sure to use the cord clamps attached to the product.
- Do not damage or scratch the conductive core or inner insulator of the power and inter-connecting wires when peeling them.
- Use the power and Inter-connecting wires with specified thicknesses, specified types and protective devices required.

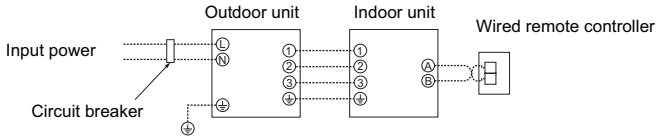
NOTE

- Remove the panel, and you can see electric parts on the front side.
- A metal pipe can be installed through the hole for wiring. If the hole size does not fit the wiring pipe to be used, drill the hole again to an appropriate size.
- Be sure to clamp the power wires and indoor/outdoor connecting wires with a banding band along the connecting pipe so that the wires do not touch the compressor or discharge pipe.
  (The compressor and the discharge pipe become hot.)

Furthermore, be sure to secure these wires with the cord clamps on the valve fixing plate.

■ Wiring between Indoor Unit and Outdoor Unit

The dashed lines show on-site wiring.



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

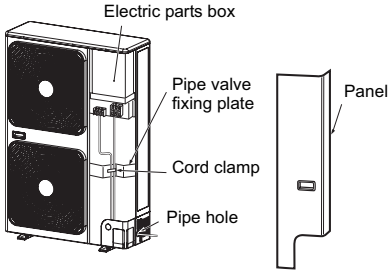
For the air conditioner, connect a power wire with the following specifications.

Model (RAV- Type)	SP110	SP140
Power supply	220-240 V~ 50 Hz	
Maximum running current	22.8 A	
Recommended field fuse	25 A	
Power wire*	3 × 2.5 mm^2 or more (H07 RN-F or 60245 IEC 66)	
Indoor/outdoor connecting wires*	4 × 1.5 mm^2 or more (H07 RN-F or 60245 IEC 66)	

* Number of wire × wire size

How to wire

1. Remove the front panel (two screws).
2. Connect the connecting wire to the terminal as identified with their respective numbers on the terminal block of the indoor and outdoor units.
   H07 RN-F or 60245 IEC 66 (1.5 mm^2 or more)
   - When connecting the connecting wire to the outdoor unit terminal, prevent water from coming into the outdoor unit.
   - Insulate the unsheathed cords (conductors) with electrical insulation tape. Process them so that they do not touch any electrical or metal parts.
   - For interconnecting wires, do not use a wire joined to another on the way.
     Use wires long enough to cover the entire length.



⚠ CAUTION

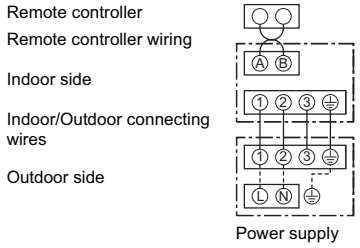
Wiring connections differ in conformance to EMC standards, depending whether the system is single or twin. Connect wires according to respective instructions.

- An installation fuse must be used for the power supply line of this air conditioner.
- Incorrect/incomplete wiring may lead to an electrical fire or smoke.
- Prepare an exclusive power supply for the air conditioner.
- This product can be connected to the mains power.
  Fixed wire connections:
  A switch that disconnects all poles and has a contact separation of at least 3 mm must be incorporated in the fixed wiring.

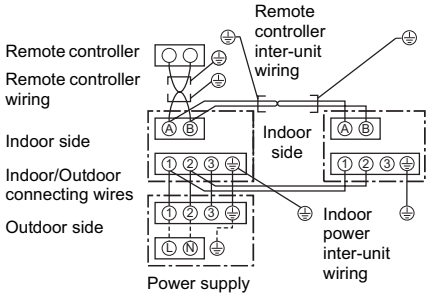
Wiring diagram

* For details on the remote controller wiring/installation, refer to the Installation Manual enclosed with the remote controller.

Single system

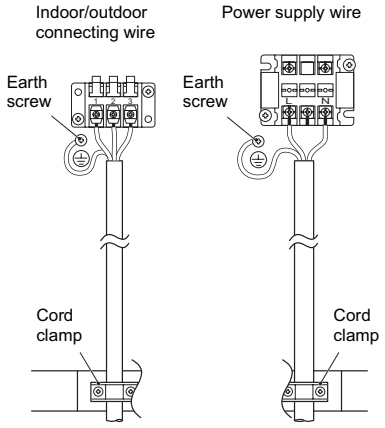


Simultaneous twin system

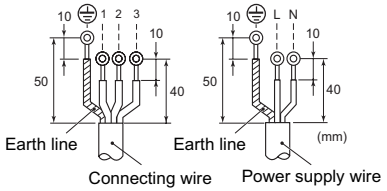


* Use 2-core shield wire (MVVS 0.5 to 2.0 mm² or more) for the remote controller wiring in the simultaneous twin system to prevent noise problems. Be sure to connect both ends of the shield wire to earth leads.

* Connect earth wires for each indoor unit in the simultaneous twin system.



Stripping length power cord and connecting wire



8 EARTHING

Connect the earth line properly following applicable technical standards.
Connecting the earth line is essential to preventing electric shock and to reducing noise and electrical charges on the outdoor unit surface due to the high-frequency wave generated by the frequency converter (inverter) in the outdoor unit.
If you touch the charged outdoor unit without an earth line, you may experience an electric shock.

9 FINISHING

After the refrigerant pipe, inter-unit wires, and drain pipe have been connected, cover them with finishing tape and clamp them to the wall with off-the-shelf support brackets or their equivalent.
Keep the power wires and indoor/outdoor connecting wires off the valve on the gas side or pipes that have no heat insulator.

10 TEST RUN

- **Turn on the leakage breaker at least 12 hours before starting a test run to protect the compressor during startup.**
  To protect the compressor, power is supplied from the 220-240 VAC input to the unit to preheat the compressor.
- **Check the following before starting a test run:**
  - **That all pipes are connected securely without leaks.**
  - **That the valve is open.**

  If the compressor is operated with the valve closed, the outdoor unit will become overpressurized, which may damage the compressor or other components.
  If there is a leak at a connection, air can be sucked in and the internal pressure further increases, which may cause a burst or injury.
- Operate the air conditioner in the correct procedure as specified in the Owner's Manual.

11 ANNUAL MAINTENANCE

- For an air conditioning system that is operated on a regular basis, cleaning and maintenance of the indoor/outdoor units are strongly recommended.
  As a general rule, if an indoor unit is operated for about 8 hours daily, the indoor/outdoor units will need to be cleaned at least once every 3 months. This cleaning and maintenance should be carried out by a qualified service person.
  Failure to clean the indoor/outdoor units regularly will result in poor performance, icing, water leaking and even compressor failure.

12 FUNCTIONS TO BE IMPLEMENTED LOCALLY

■ Night operation control

- Low-noise operation is available during nighttime hours by connecting a commercially available timer and separately sold applicable control wire TCB-KBOS1E. For more information, refer to the manuals of these parts.
- The power saving function of the air conditioner reduces the level of nighttime operating noise.
- Sufficient capacity for low-noise operation cannot always be provided, depending on external conditions, including the outside air temperature.

■ Handling Existing Pipe

When using the existing pipe, carefully check for the following:
- Wall thickness (within the specified range)
- Scratches and dents
- Water, oil, dirt, or dust in the pipe
- Flare looseness and leakage from welds
- Deterioration of copper pipe and heat insulator

Cautions for using existing pipe

- Do not reuse a flare nut to prevent gas leaks.
  Replace it with the supplied flare nut and then process it to a flare.
- Blow nitrogen gas or use an appropriate means to keep the inside of the pipe clean. If discolored oil or much residue is discharged, wash the pipe.
- Check welds, if any, on the pipe for gas leaks.

When the pipe corresponds to any of the following, do not use it. Install a new pipe instead.
- The pipe has been opened (disconnected from indoor unit or outdoor unit) for a long period.
- The pipe has been connected to an outdoor unit that does not use refrigerant R22, R410A or R407C.
- The existing pipe must have a wall thickness equal to or larger than the following thicknesses.

Reference outside diameter (mm)	Wall thickness (mm)
Ø9.5	0.8
Ø15.9	1.0
Ø19.1	1.0

- Do not use any pipe with a wall thickness less than these thicknesses due to insufficient pressure capacity.

- To use an existing Ø19.1 mm pipe, set bit 3 of SW802 (switch for existing pipe) on the P.C. board of the outdoor unit to ON. In this case, the heating performance may be reduced depending on the outside air temperature and room temperature.

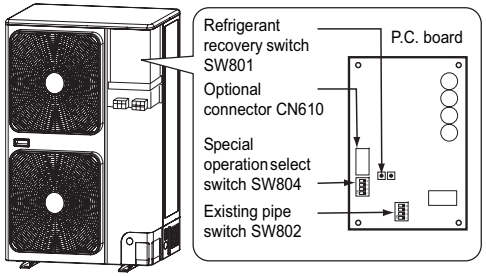
SW802	
When shipped from factory	When using existing pipe
	

■ Recovering Refrigerant

- Use refrigerant recovery switch SW801 on the P.C. board of the outdoor unit to recover refrigerant when the indoor or outdoor unit is moved.

Procedure

1. Turn on the power of the air conditioner.
2. Select the FAN mode for indoor unit operation with the remote controller.
3. Set SW804 on the P.C. board of the outdoor unit to all OFF, and then press SW801 for 1 second or more. The air conditioner enters the forced cooling mode for up to 10 minutes.
   Operate or handle the valve to recover refrigerant during this time period.
4. Upon completion of refrigerant recovery, close the valve and press SW801 for at least 1 second to stop operation.
5. Turn off the power.



⚠ DANGER

Be careful of electric shock because the P.C. board has an electrical current running through it.

13 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 wired remote controller of the indoor unit.
Use the LEDs and check codes for various checks. Details of the check codes displayed on the wired remote controller of the indoor unit are described in the Installation Manual of the indoor unit.

Verifying current abnormal status

1. Check that DIP switch SW803 is set to OFF.
2. Jot down the states of LED800 to LED804. (Display mode 1)
3. Press SW800 for at least 1 second. The LED status changes to display mode 2.
4. Check the code whose display mode 1 equals the LED states jotted down and display mode 2 equals the current flashing status of LED800 to LED804 from the following table to identify the cause.

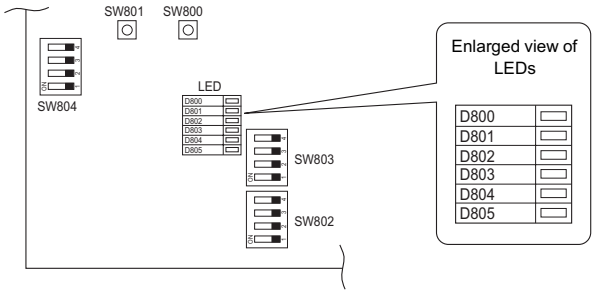
Verifying an abnormal state in the past although the abnormal state no longer occurs

1. Set bit 1 of DIP switch SW803 to ON.
2. Jot down the states of LED800 to LED804. (Display mode 1)
3. Press SW800 for at least 1 second. The LED status changes to display mode 2.
4. Find an error whose display mode 1 equals the LED states jotted down and display mode 2 equals the current flashing states of LED800 to LED804 from the following table to identify the error.
   - An outside **air temperature (TO) sensor error** can be checked only while it occurs.

No.	Cause	Display mode 1					Display mode 2				
		D800	D801	D802	D803	D804	D800	D801	D802	D803	D804
1	Normal	●	●	●	●	●	●	●	●	●	●
2	Discharge (TD) sensor error	○	○	●	●	○	●	●	◎	●	●
3	Heat exchanger (TE) sensor error	○	○	●	●	○	●	◎	◎	●	●
4	Heat exchanger (TL) sensor error	○	○	●	●	○	◎	◎	◎	●	●
5	Outside air temperature (TO) sensor error	○	○	●	●	○	●	●	●	◎	●
6	Suction (TS) sensor error	○	○	●	●	○	●	●	◎	◎	●
7	Heat sink (TH) sensor error	○	○	●	●	○	◎	●	◎	◎	●
8	Outdoor temperature sensor (TE/TS) connection error	○	○	●	●	○	◎	◎	◎	◎	●
9	Outdoor EEPROM error	○	○	●	●	○	◎	◎	◎	◎	◎
10	Compressor breakdown	●	●	○	●	○	◎	●	●	●	●
11	Compressor lock	●	●	○	●	○	●	◎	●	●	●
12	Current detection circuit error	●	●	○	●	○	◎	◎	●	●	●
13	Thermostat for compressor activated	●	●	○	●	○	●	●	◎	●	●
14	Model data not set (on the service P.C. board)	●	○	○	●	○	●	◎	●	◎	●
15	MCU-MCU communication error	●	○	○	●	○	◎	●	◎	◎	◎
16	Discharge temperature error	○	○	○	●	○	◎	◎	●	●	●
17	Abnormal power (open phase detected or abnormal voltage)	○	○	○	●	○	◎	●	◎	●	●
18	Heat sink overheat	○	○	○	●	○	◎	◎	◎	●	●
19	Gas leak detected	○	○	○	●	○	◎	◎	◎	◎	●
20	4-way valve reverse error	○	○	○	●	○	◎	◎	●	●	◎
21	High pressure release operation	○	○	○	●	○	●	●	◎	●	◎
22	Outdoor fan motor error	○	○	○	●	○	●	◎	◎	●	◎
23	Compressor driver short-circuit protection	○	○	○	●	○	●	◎	●	◎	◎
24	Position detection circuit error in one-line display	○	○	○	●	○	◎	●	◎	◎	◎

(●:OFF ○:ON ◎:Flashing)

* The LEDs and DIP switches are located on the lower left of the P.C. board of the outdoor unit.



14 APPENDIX

Work instructions

The existing R22 and R407C piping can be reused for our digital inverter R410A product installations.

⚠ WARNING

Confirming the existence of scratches or dents on the existing pipes and confirming the reliability of the pipe strength are conventionally referred to the local site.
If the specified conditions can be cleared, it is possible to update existing R22 and R407C pipes to those for R410A models.

Basic conditions needed to reuse existing pipes

Check and observe the presence of three conditions in the refrigerant piping works.

1. **Dry** (There is no moisture inside of the pipes.)
2. **Clean** (There is no dust inside of the pipes.)
3. **Tight** (There are no refrigerant leaks.)

Restrictions for use of existing pipes

In the following cases, the existing pipes should not be reused as they are. Clean the existing pipes or exchange them with new pipes.

1. When a scratch or dent is heavy, be sure to use new pipes for the refrigerant piping works.
2. When the existing pipe thickness is thinner than the specified “Pipe diameter and thickness,” be sure to use new pipes for the refrigerant piping works.
   - The operating pressure of R410A is high (1.6 times that of R22 and R407C). If there is a scratch or dent on the pipe or a thinner pipe is used, the pressure strength may be inadequate, which may cause the pipe to break in the worst case.

*** Pipe diameter and thickness (mm)**

Pipe outer diameter		Ø6.4	Ø9.5	Ø12.7	Ø15.9	Ø19.0
Thickness	R410A	0.8	0.8	0.8	1.0	1.0
	R22 (R407C)					

   - In case the pipe diameter is Ø12.7 mm or less and the thickness is less than 0.7 mm, be sure to use new pipes for the refrigerant piping works.
3. When the outdoor unit was left with the pipes disconnected, or the gas leaked from the pipes and the pipes were not repaired and refilled.
   - There is the possibility of rain water or air, including moisture, entering the pipe.
4. When refrigerant cannot be recovered using a refrigerant recovery unit.
   - There is the possibility that a large quantity of dirty oil or moisture remains inside the pipes.
5. When a commercially available dryer is attached to the existing pipes.
   - There is the possibility that copper green rust has been generated.
6. When the existing air conditioner is removed after refrigerant has been recovered.
   Check if the oil is judged to be clearly different from normal oil.
   - The refrigerator oil is copper rust green in color: There is the possibility that moisture has mixed with the oil and rust has been generated inside the pipe.
   - There is discolored oil, a large quantity of residue, or a bad smell.
   - A large quantity of shiny metal dust or other wear residue can be seen in the refrigerant oil.
7. When the air conditioner has a history of the compressor failing and being replaced.
   - When discolored oil, a large quantity of residue, shiny metal dust, or other wear residue or mixture of foreign matter is observed, trouble will occur.
8. When temporary installation and removal of the air conditioner are repeated such as when leased etc.
9. If the type of refrigerator oil of the existing air conditioner is other than the following oil (Mineral oil), Suniso, Freol-S, MS (Synthetic oil), alkyl benzene (HAB, Barrel-freeze), ester series, PVE only of ether series.
   - The winding-insulation of the compressor may deteriorate.

NOTE

The above descriptions are results have been confirmed by our company and represent our views on our air conditioners, but do not guarantee the use of the existing pipes of air conditioners that have adopted R410A in other companies.

Branching pipe for simultaneous operation system

- In the concurrent twin system, when TOSHIBA has specified that branching pipe is to be used, it can be reused.
  Branching pipe model name:
  RBC-TWP30E2, RBC-TWP50E2
  On the existing air conditioner for simultaneous operation system (twin, triple system), there are cases of branch pipes being used that have insufficient compressive strength.
  In such case, please change the piping to a branch pipe for R410A.

Curing of pipes

When removing and opening the indoor or outdoor unit for a long time, cure the pipes as follows:

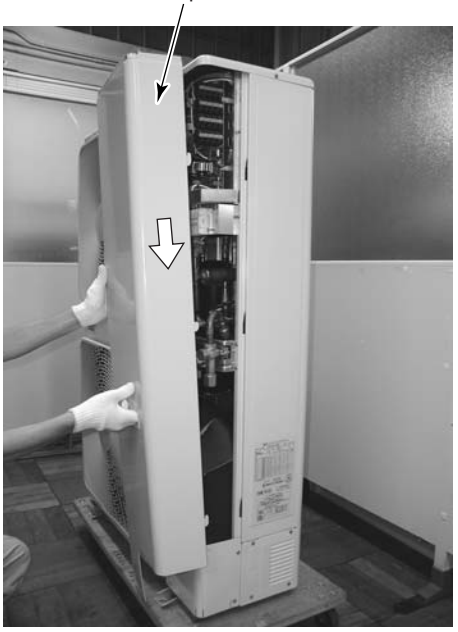
- Otherwise rust may be generated when moisture or foreign matter due to condensation enters the pipes.
- The rust cannot be removed by cleaning, and new pipes are necessary.

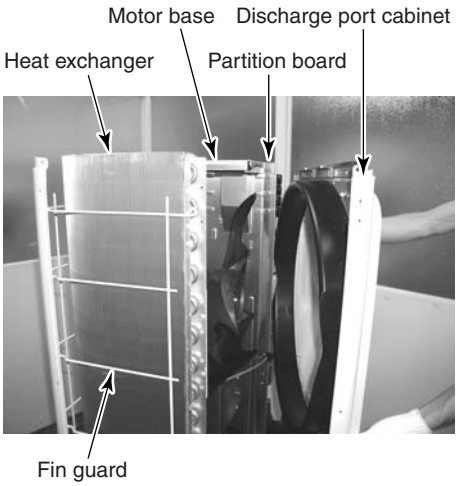
Placement location	Term	Curing manner
Outdoors	1 month or more	Pinching
	Less than 1 month	Pinching or taping
Indoors	Every time	

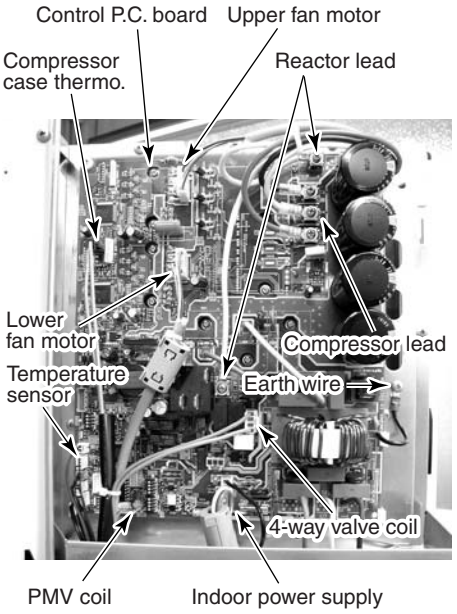
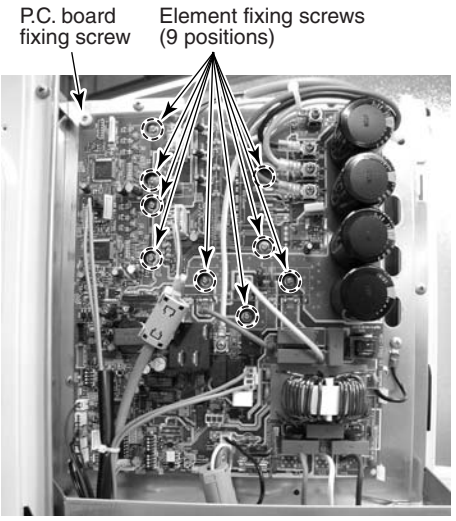
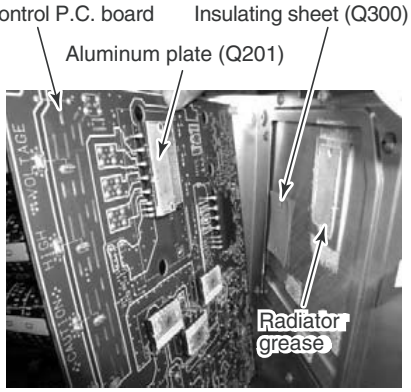
14. DETACHMENTS

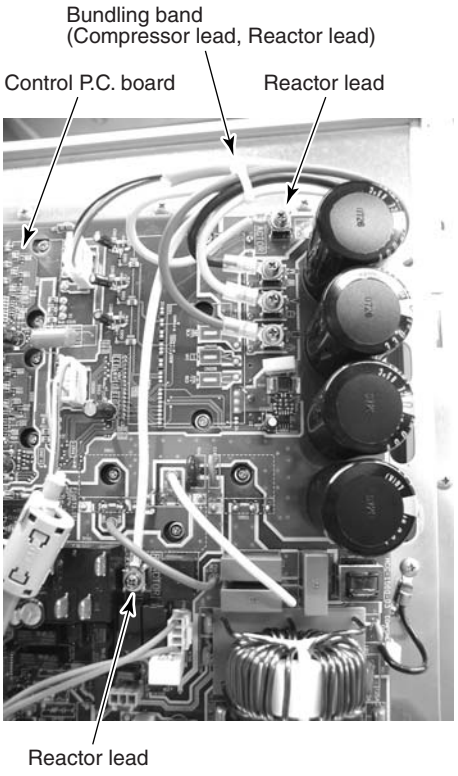
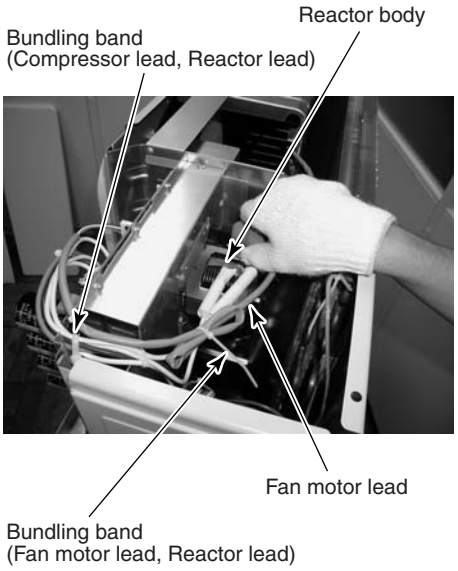
Outdoor Unit

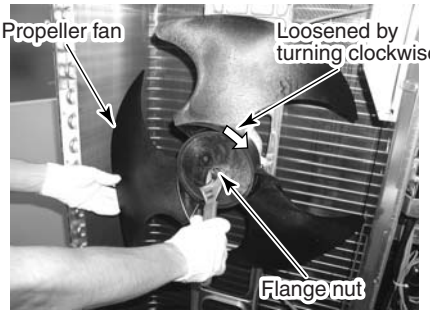
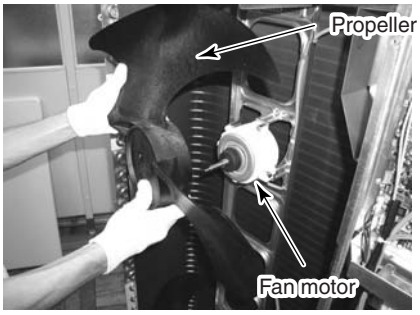
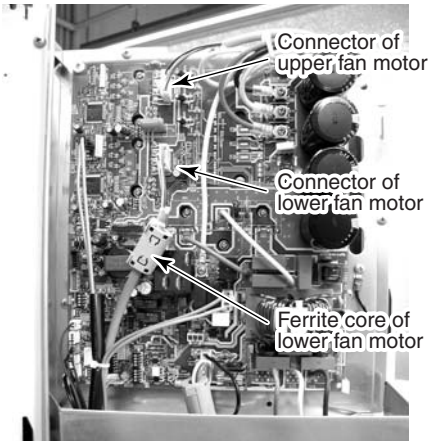
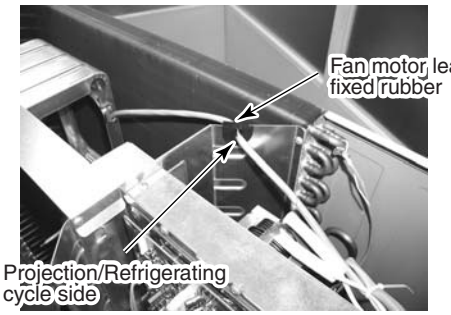
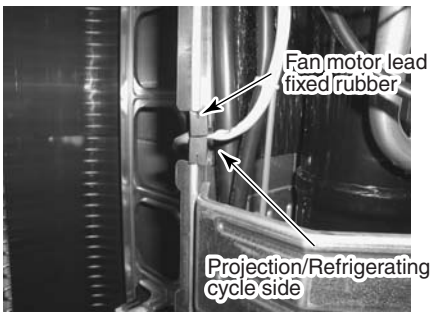
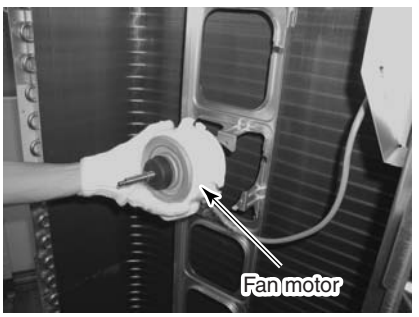
RAV-SP1104AT-E1, RAV-SP1104ATJ-E1
RAV-SP1404AT-E1, RAV-SP1404ATJ-E1

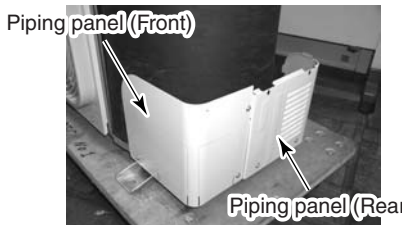
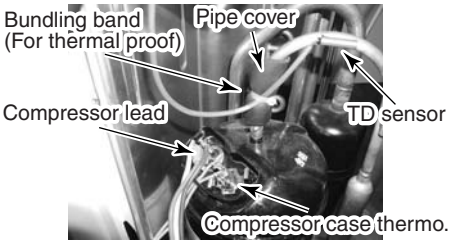
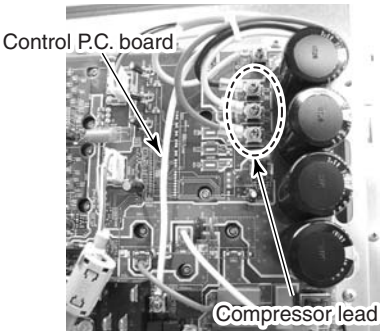
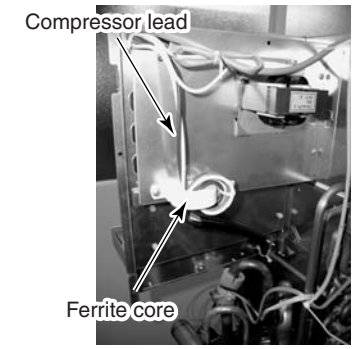
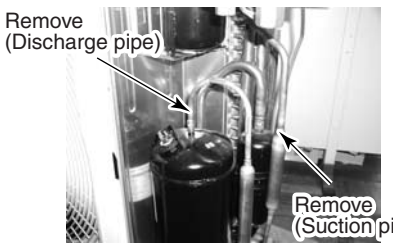
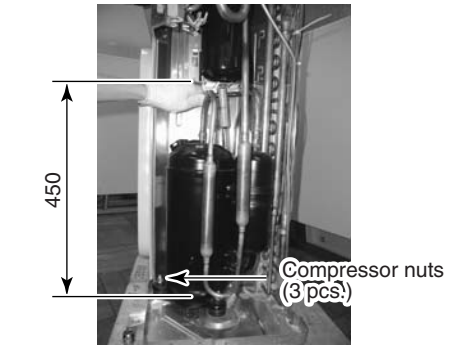
No.	Part name	Procedure	Remarks
①	Common procedure	**CAUTION** Never forget to put on the gloves at working time; otherwise an injury will be caused by the parts, etc. **1. Detachment** 1) Stop operation of the air conditioner and then turn off switch of the breaker. 2) Remove the front panel. (Hexagonal screw Ø4 × 10, 2 pcs.) • Remove the screws and then remove the front panel by pulling it downward. 3) Remove the power supply cable and the indoor/outdoor connecting wire from the cord clamp and the terminal. 4) Remove the top plate. (Hexagonal screw Ø4 × 10, 5 pcs.) **2. Attachment** 1) Attach the top plate. (Hexagonal screw Ø4 × 10, 5 pcs.) 2) Connect the power supply cable and the indoor/outdoor connecting wire to the terminal and then fix them with the cord clamp. **REQUIREMENT** For the power supply cable and the indoor/outdoor connecting wire, be sure fix them using the bundling band on the market along the crossover pipe so that they do not come to contact with the compressor, valve at gas side, pipe at gas side and discharge pipe. 3) Attach the front panel. (Hexagonal screw Ø4 × 10, 2 pcs.)	Front panel  Top plate 

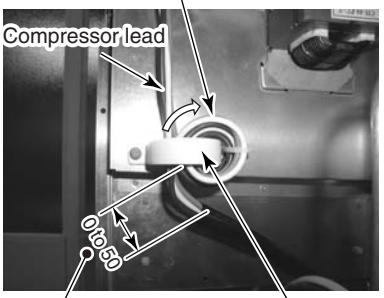
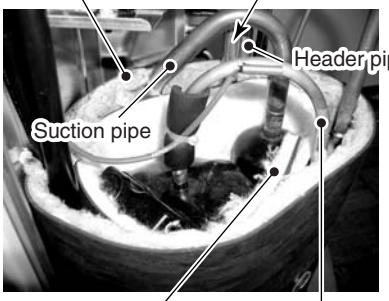
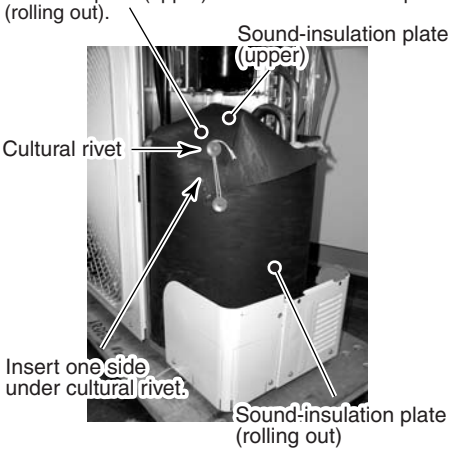
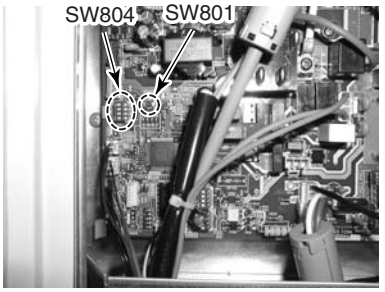
No.	Part name	Procedure	Remarks
②	Discharge port cabinet	**1. Detachment** 1) Carry out work of 1 of ①. 2) Remove screws for the discharge port cabinet and the partition board. (ST1T Ø4 × 8, 4 pcs.) 3) Remove screws for the discharge port cabinet and the bottom plate. (Hexagonal screw Ø4 × 10, 2 pcs.) 4) Remove screws for the discharge cabinet and the motor base. (ST1T Ø4 × 8, 2 pcs.) 5) Remove screw for the discharge cabinet and the heat exchanger. (ST1T Ø4 × 8, 1 pc.) 6) Remove screws for the discharge port cabinet and the fin guard. (Hexagonal screw Ø4 × 10, 2 pcs.)	
③	Side cabinet	1) Carry out work of 1 of ①. 2) Remove the screws which fix the inverter assembly and the side cabinet. (ST1T Ø4 × 8, 2 pcs.) 3) Remove the screws for the side cabinet and the valve fixing plate. (ST1T Ø4 × 8, 2 pcs.) 4) Remove screws for the side cabinet and the piping panel (Rear). (Hexagonal screw Ø4 × 10, 2 pcs.) 5) Remove screw for the side cabinet and the bottom plate. (Hexagonal screw Ø4 × 10, 1 pc.) 6) Remove screws for the side cabinet and the fin guard (Heat exchanger). (Hexagonal screw Ø4 × 10, 5 pcs.)	

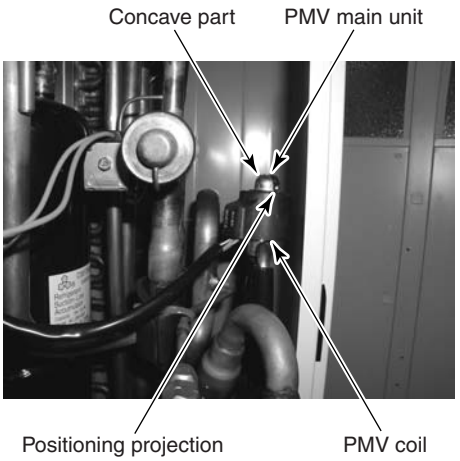
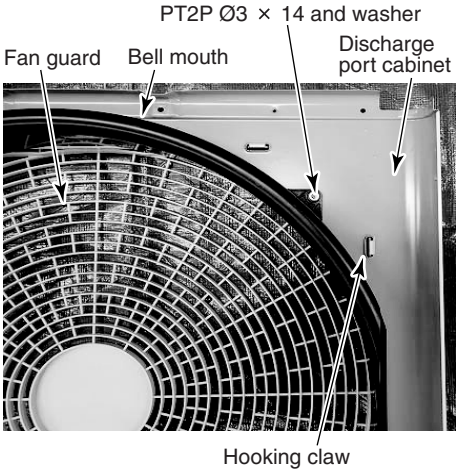
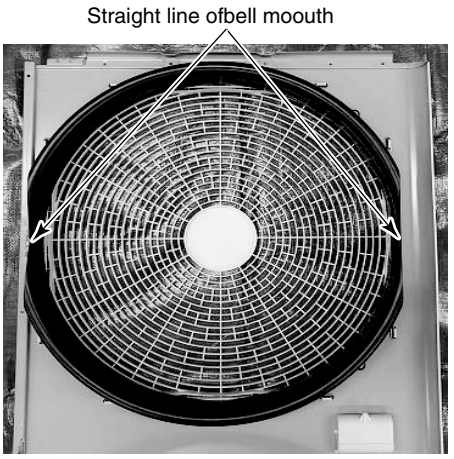
No.	Part name	Procedure	Remarks
④	Replacement of electric parts	**1. Control P.C. board** 1) Carry out work of 1 of ①. **⚠ WARNING** Never disassemble the inverter for 1 minute after power supply has been turned off because an electric shock may be caused. 2) Remove the connectors connected to the control P.C. board. (Indoor power supply, Temperature sensor, PMV coil, 4-way valve coil, Compressor case thermo, Fan motor) • Unlock the lock of the housing part and then remove the connectors. 3) Remove the lead wires connected to the control P.C. board. Compressor lead U: CN200 Red V: CN201 White W: CN202 Black Reactor cord CN05 White CN06 White 4) Remove the earth wire from the control P.C. board. **NOTE :** • Be sure not to confuse for Compressor lead V (CN201 White), Reactor lead CN05 and CN06. • Be sure not to come-off of the insulating sheet. (Trust B tight screw Ø4 × 6, 1 pc.) 5) Remove the fixing screws of the control P.C. board. (Screw with collar for fixing element Ø3 × 16, 9 pcs. Pan S tight screw for fixing board Ø3 × 20, 1 pc.) 6) Remove the control P.C. board. (Supporter: 5 positions) **NOTE :** Be careful to take out because there is sealing material for the heat sink. 7) Mount a new control P.C. board. **NOTE:** Do not forget to attach the aluminum plate (Q201) and the insulating sheet (Q300). (Applying a little of radiator grease at the rear surface of the insulating sheet in advance to adhere to the heat sink makes easy the work.)	  

No.	Part name	Procedure	Remarks
④	Replacement of electric parts (Continued)	**2. Reactor** 1) Carry out work of 1 of ①. 2) Remove the reactor lead connected to the control P.C. board. CN05 White, CN06 White 3) Cut the bundling band which bundled the compressor lead and fan motor lead. 4) Remove the reactor. (Trust B tight screw, Ø4 × 6, 2 pcs.) 5) Replace the reactor with a new one. **NOTE :** Be sure to bundle the removed bundling band with the bundling band on the market. Be careful so that the fan motor lead does not come to contact with the reactor body.	 

No.	Part name	Procedure	Remarks
⑤	Fan motor	1) Carry out works of item 1 of ① and work of ②. 2) Remove the flange nut fixing the fan motor and the propeller fan. • The flange nut is loosened by turning it clockwise. (When tightening it, turn it counterclockwise.) 3) Remove the propeller fan. 4) Remove the connector for the fan motor from the inverter. (Remove the ferrite core of the lower fan motor because it is used.) 5) Remove the fan motor lead from the fan motor lead fixed rubber of the penetrated part of the partition board. 6) Remove the fixing screws (4 pieces each) while supporting the fan motor so that it does not fall down. ∗ Cautions for assembling of fan motor • Tighten the flange nut with 4.95N•m (50kgf•cm). • Adjust length of the fan motor lead wire at the fan motor lead fixed rubber so that the fan motor lead is not slackened; otherwise the fan motor lead may come to contact with the propeller fan. Attach the fan motor lead fixed rubber to the partition board so that the projection is set at the refrigerating cycle side. • Be sure so that the rector body does not contact with the fan motor lead. • Be sure to bundle the removed bundling band with the bundling band on the market. • Necessarily attach the ferrite core of the lower fan motor again. (Fix it with bundling band on the market.) **REQUIREMENT** Be sure to fix the fan motor lead to the motor base using the metal band of the motor base so that the fan motor lead does not come to contact with the propeller fan.	     

No.	Part name	Procedure	Remarks
⑥	Compressor Compressor lead	**1. Removal of defective compressor** 1) Recover the refrigerant gas. 2) Carry out work of item 1 of ① and work of ③. 3) Remove the piping panel (Front). Remove the piping panel (Front) and screws of the bottom plate. (Hexagonal screw Ø4 × 10, 2 pcs.) Remove screw of the piping panel (Front) and the piping panel (Rear). (Hexagonal screw Ø4 × 10, 1 pc.) 4) Remove the piping panel (Rear). Remove the piping panel (Rear) and screws of the bottom plate. (Hexagonal screw Ø4 × 10, 2 pcs.) 5) Remove the sound-insulation plate. (Upper, rolling in, rolling out) 6) Remove the terminal cover of the compressor and then remove the compressor lead and the compressor case thermo. 7) Remove TD sensor which is fixed to the discharge pipe. 8) Remove the compressor lead. (Leave the ferrite core as it is attached to the electric parts box.) Control P.C. board U : CN200 Red V : CN201 White W: CN202 Black 9) Using a burner, remove the discharge pipe and the suction pipe which are connected to the compressor. **⚠ WARNING** In case of removing the piping by broiling the welded part with a burner, if there is oil in the pipe, it may burst into flames at the moment that wax melted, so take sufficient care. **CAUTION** Note so that the flame does not catch the 4-way valve and PMV. (A malfunction may be caused.) 10) Pull off the discharge pipe and the suction pipe of the refrigerating cycle upward. 11) Remove the compressor nuts which fix the compressor to the bottom plate. (3 pcs.) 12) Pull out the compressor toward you. **CAUTION** As weight of the compressor is 20kg or more, handle it by 2 workers.	     

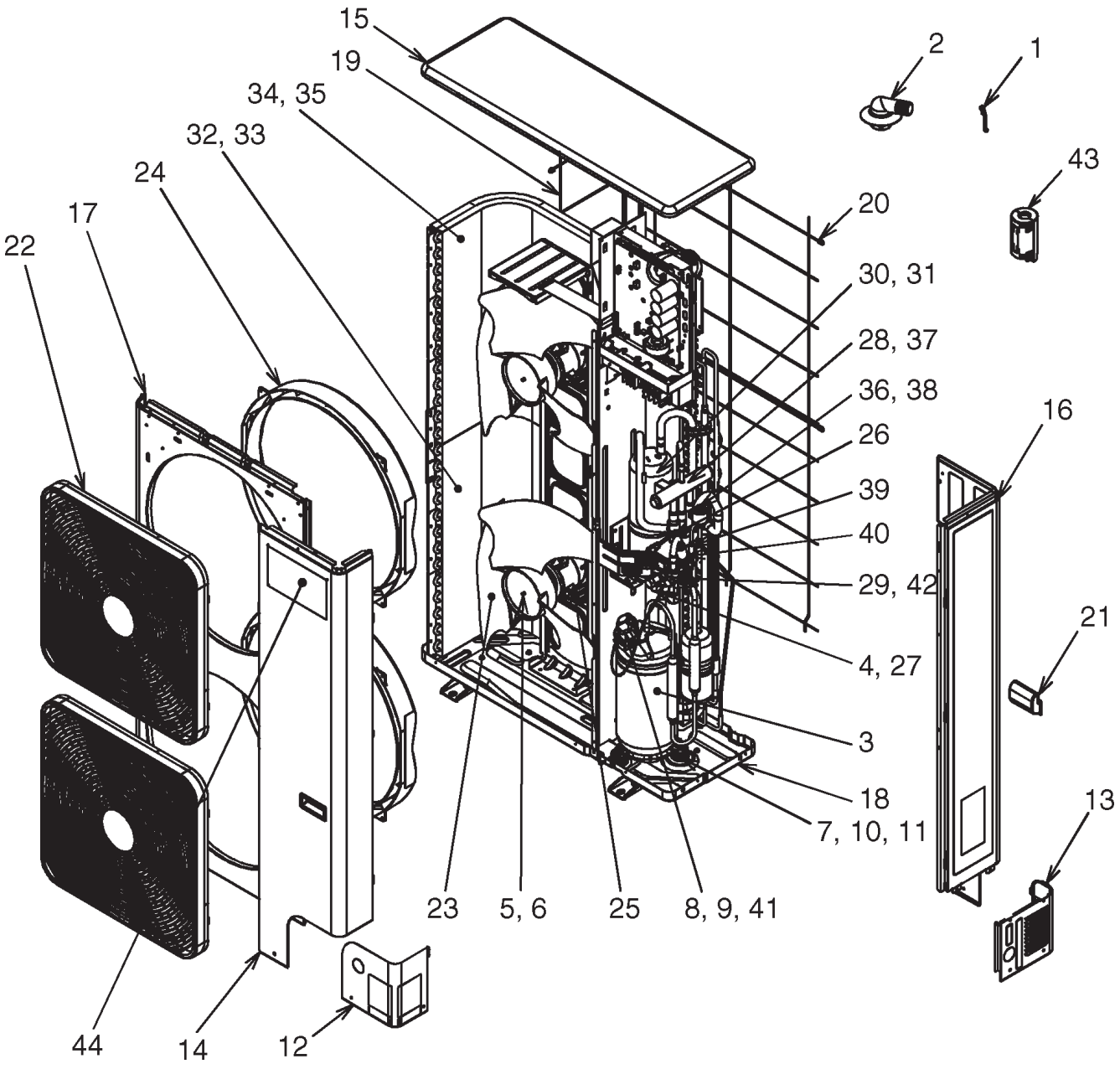
No.	Part name	Procedure	Remarks
⑥	Compressor Compressor lead (Continued)	**2. Mounting of compressor** 1) Mount the compressor in the reverse procedure for removal. **NOTE :** • After replacement of the compressor, be sure to replace the compressor lead. (Repair part code of compressor lead: 43160591) In this time, wrap the ferrite core with the compressor lead wire by 4 times. • As shown in the right figure, mount the sound-insulation plate (rolling in, rolling out) by passing through it between the compressor and the piping, and between the piping and the partition board. • Fix TD sensor by the bundling band for heat-proof on the market via the pipe cover so that TD sensor does not directly come to contact with the discharge pipe. **3. Vacuuming** 1) Connect the vacuum pump to the charge port and the check joint of the gas pipe valve and then drive the vacuum pump. 2) Carry out vacuuming until the vacuum low pressure gauge indicates 1 (mmHg). **NOTE :** Before vacuuming, open PMV fully. If PMV is closed, vacuum may be impossible between liquid pipe valve and PMV of the outdoor unit. Forced full-opening method of PMV • Turn on the leakage breaker. • Turn on 1 and 3 of Dip switch SW804 on the control P.C. board of the outdoor unit. • Keep pushing SW801 on the control P.C. board of the outdoor unit for 1 second or more. • After pushing SW801 for 1 second or more, turn off the leakage breaker within 2 minutes. **4. Refrigerant charge** 1) Add the refrigerant amount determined by the pipe length from the charge port of the valve.	Wrap the ferrite core with the compressor lead wire for 4 times.  (Compressor lead positioning standard) Put the end of sound-insulation plate (rolling out) on the other end at this position. Pass through sound-insulation plate (rolling out) between suction pipe and header pipe.  Pass through sound-insulation plate (rolling in) between compressor and discharge pipe, suction pipe and then put the end of sound-insulation plate on the other end at this position. There should be no clearance between sound-insulation plate (upper) and sound-insulation plate (rolling out).  

No.	Part name	Procedure	Remarks
⑦	PMV coil	**1. Detachment** 1) Carry out work of item 1 of ①. 2) Turn the coil while pulling upward and then remove the coil from the PMV main unit. **2. Attachment** 1) Surely match the positioning projection of the coil with the concave part of PMV main unit and then fix it.	
⑧	Fan guard	**1. Detachment** 1) Carry out works of item 1 of ① and 1 of ②. **REQUIREMENT** To prevent scratch on the product, carry out the work on cardboard, cloth, etc. 2) Remove the discharge port cabinet and then put on it so that the fan guard side directs downward. 3) Remove the screw for the bell mouth and fan guard. (PT2P Ø3 × 14 and washer, 4 pcs.) 4) Remove the hooking claws (8 positions) of the fan guard. **2. Attachment** 1) Push the hooking claws (8 positions) with hands from the front side to fix the claws. 2) Attach the bell mouth fixed with screws and washers. (PT2P Ø3 × 14 and washer, 4 pcs.) **REQUIREMENT** Check that all the hooking claws are fixed at the specified positions.	 

15. EXPLODED VIEWS AND PARTS LIST

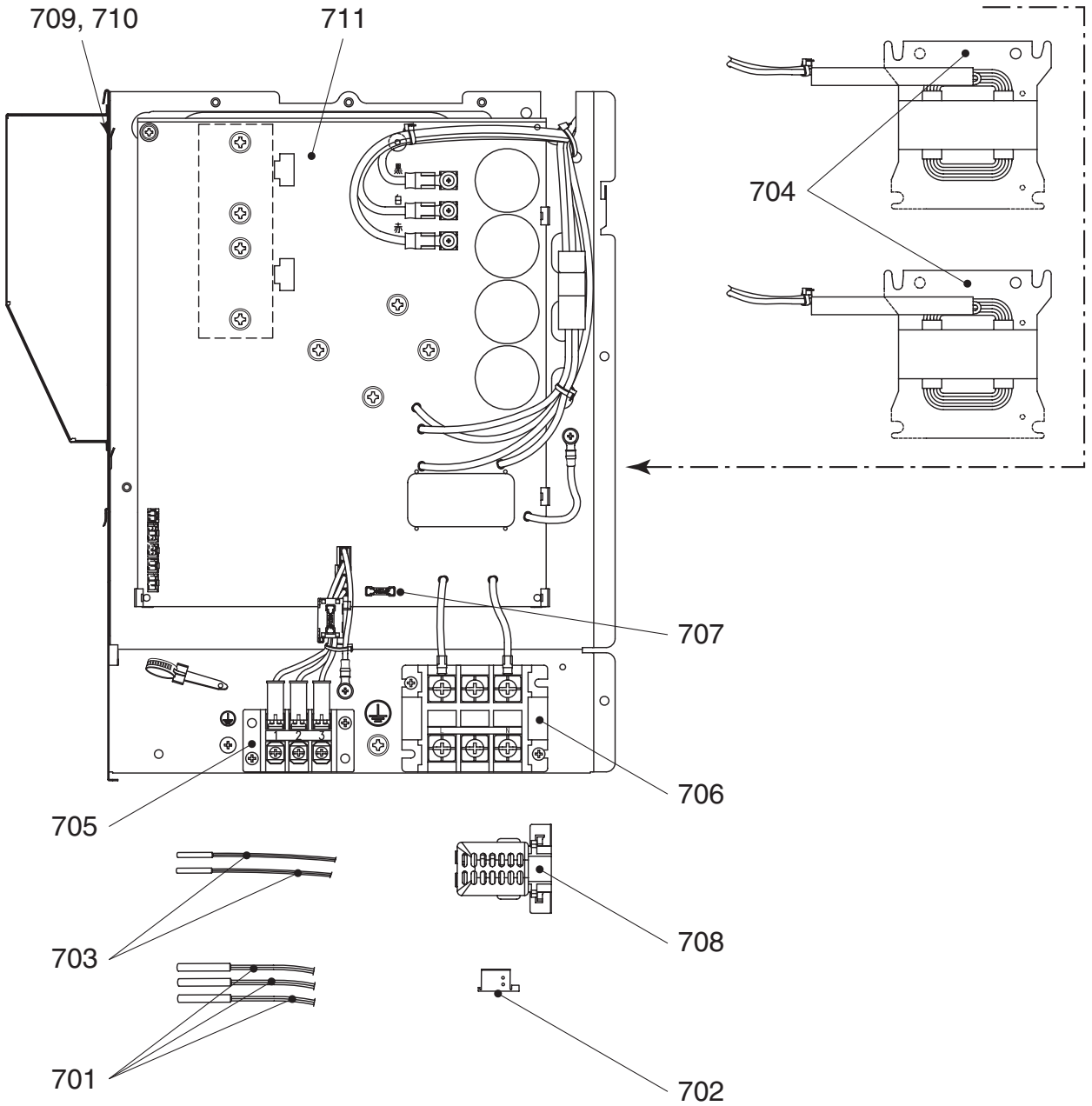
Outdoor Unit

RAV-SP1104AT-E1, RAV-SP1104ATJ-E1
RAV-SP1404AT-E1, RAV-SP1404ATJ-E1



Location No.	Part No.	Description	Model name RAV-SP			
			1104 AT-E1	1404 AT-E1	1104 ATJ-E1	1404 ATJ-E1
1	43F19904	HOLDER, SENSOR (TS)	3	3	3	3
2	43F32441	NIPPLE, DRAIN	1	1	1	1
3	43041794	COMPRESSOR, DA422A3F-25M	1	1	1	1
4	43F47401	BONNET, 3/8 IN	1	1	1	1
5	43F47669	NUT, FLANGE	2	2		
6	43197164	NUT, FLANGE			2	2
7	43049739	CUSHION, RUBBER	3	3	3	3
8	43F50407	THERMOSTAT,BIMETAL	1	1	1	1
9	43F63317	HOLDER,THERMOSTAT	1	1	1	1
10	43F97212	NUT	3	3		
11	43197174	NUT, COMP			3	3
12	43100437	PANEL, FRONT, PIPING	1	1	1	1
13	43100438	PANEL, BACK, PIPING	1	1	1	1
14	43100439	PANEL, FRONT	1	1	1	1
15	43100440	PLATE, ROOF	1	1	1	1
16	43100441	PANEL, SIDE	1	1	1	1
17	43100442	PANEL, AIR OUTLET	1	1	1	1
18	43100443	BASE ASSY	1	1	1	1
19	43107274	GUARD, FIN, SIDE	1	1	1	1
20	43107275	GUARD, FIN, BACK	1	1	1	1
21	43107276	HANGER	3	3	3	3
22	43119540	GUARD, FAN ASSY	2	2	2	2
23	43120244	FAN, PROPELLER, PB521	2	2	2	2
24	43122113	BELL MOUTH	2	2	2	2
25	4312C100	MOTOR, FAN, ICF-280-A100-1 (A)	2	2	2	2
26	43146676	JOINT,CHECK	1	1	1	1
27	4314N092	VALVE, PACKED, 9.52	1	1	1	1
28	43146687	VALVE, 4-WAY, STF-0401G	1	1	1	1
29	43146724	VALVE, BALL, SBV-JA5GTC-1, ROHS	1	1	1	1
30	43148170	ACCUMULATOR ASS'Y	1	1		
31	43148188	ACCUMULATOR			1	1
32	4314G266	CONDENSER ASSY, DOWN	1	1		
33	4314G268	CONDENSER ASSY, DOWN			1	1
34	4314G269	CONDENSER ASSY, UP	1	1		
35	4314G271	CONDENSER ASSY, UP			1	1
36	4314N023	VALVE, PLUS, MODULAING, UKV-25D100	1	1	1	1
37	4314N024	COIL, VALVE, 4WAY, VHV-01AP552B1	1	1	1	1
38	4314N025	COIL, PMV, UKV-A038	1	1	1	1
39	4314Q031	STRAINER	1	1	1	1
40	4314Q032	STRAINER	1	1	1	1
41	43160591	LEAD ASSY, COMPRESSOR	1	1	1	1
42	43147194	BONNET, 5/8 IN	1	1	1	1
43	43F60029	FILTER,NOISE	1	1	1	1
44	4311M659	MARK, TOSHIBA	1	1	1	1

RAV-SP1104AT-E1, RAV-SP1104ATJ-E1
RAV-SP1404AT-E1, RAV-SP1404ATJ-E1



Location No.	Part No.	Description	Model name RAV-SP			
			1104 AT-E1	1404 AT-E1	1104 ATJ-E1	1404 ATJ-E1
701	43050425	SENSOR ASSY, SERVICE	3	3	3	3
702	43F63325	HOLDER, SENSOR (TE)	1	1	1	1
703	43150319	SENSOR ASSY, SERVICE	2	2	2	2
704	43158190	REACTOR	2	2	2	2
705	43160565	TERMINAL BLOCK, 3P, 20A	1	1	1	1
706	43160581	TERMINAL	1	1	1	1
707	43160589	FUSE	1	1	1	1
708	43163055	HOLDER, SENSOR	1	1	1	1
709	43163059	SPACER, BUSH	1	1	1	1
710	43163060	SPACER, COLLAR	1	1	1	1
711	4316V613	PC BOARD ASSY, MCC-1571	1	1	1	1

WARNINGS ON REFRIGERANT LEAKAGE

Check of Concentration Limit

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

The refrigerant R410A which is used in the air conditioner is safe, without the toxicity or combustibility of ammonia, and is not restricted by laws to be imposed which protect the ozone layer. However, since it contains more than air, it poses the risk of suffocation if its concentration should rise excessively. Suffocation from leakage of R410A is almost non-existent.

If a conditioner system is to be installed in a small room, select a suitable model and installation procedure so that if the refrigerant accidentally leaks out, its concentration does not reach the limit (and in the event of an emergency, measures can be made before injury can occur).
In a room where the concentration may exceed the limit, create an opening with adjacent rooms, or install mechanical ventilation combined with a gas leak detection device.

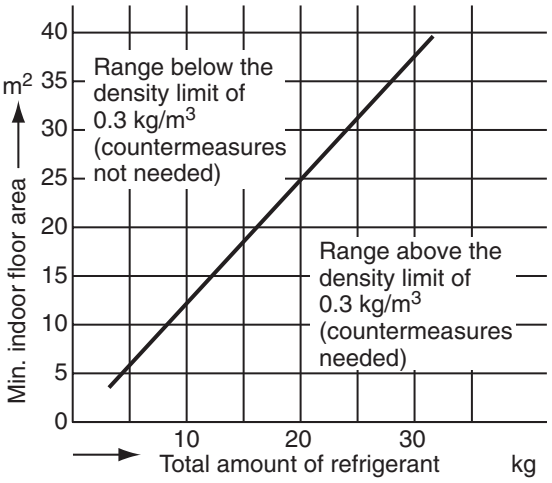
The concentration is as given below.

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

The concentration limit of R410A which is used in air conditioners is 0.3kg/m^3.

NOTE

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



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