MITSUBISHI ELECTRIC

Changes for the Better

Air-cooled Chilling Unit

e-series

Service Handbook

2020

R410A

Model

EACV-P040YBL(-N)(-BS)

EACV-P050YBL(-N)(-BS)

Safety Precautions

- Thoroughly read the following safety precautions prior to use.
- Observe these precautions carefully to ensure safety.

⚠ **WARNING**	Indicates a risk of death or serious injury
⚠ **CAUTION**	Indicates a risk of injury or structural damage
⚠ **IMPORTANT**	Indicates a risk of damage to the unit or other components in the system

All electric work must be performed by personnel certified by Mitsubishi Electric.

General

⚠ WARNING

Do not use refrigerant other than the type indicated in the manuals provided with the unit and on the nameplate.

- Doing so may cause the unit or pipes to burst, or result in explosion or fire during use, during repair, or at the time of disposal of the unit.
- It may also be in violation of applicable laws.
- MITSUBISHI ELECTRIC CORPORATION cannot be held responsible for malfunctions or accidents resulting from the use of the wrong type of refrigerant.

Do not install the unit in a place where large amounts of oil, steam, organic solvents, or corrosive gases, such as sulfuric gas, are present or where acidic/alkaline solutions or sprays containing sulfur are used frequently.

These substances can compromise the performance of the unit or cause certain components of the unit to corrode, which can result in refrigerant leakage, water leakage, injury, electric shock, malfunctions, smoke, or fire.

Do not try to defeat the safety features of the unit or make unauthorized setting changes.

Forcing the unit to operate the unit by defeating the safety features of the devices such as the pressure switch or the temperature switch, making unauthorized changes to the switch settings, or using accessories other than the ones recommended by Mitsubishi Electric may result in smoke, fire, or explosion.

To reduce the risk of fire or explosion, do not use volatile or flammable substances as a heat carrier.

To reduce the risk of burns or electric shock, do not touch exposed pipes and wires.

To reduce the risk of shorting, current leakage, electric shock, malfunctions, smoke, or fire, do not splash water on electric parts.

To reduce the risk of electric shock, malfunctions, smoke or fire, do not operate the switches/buttons or touch other electrical parts with wet hands.

To reduce the risk of electric shock and injury from the fan or other rotating parts, stop the operation and turn off the main power before cleaning, maintaining, or inspecting the unit.

To reduce the risk of burns or frost bites, do not touch the refrigerant pipes or refrigerant circuit components with bare hands during and immediately after operation.

Before cleaning the unit, switch off the power.
(Unplug the unit, if it is plugged in.)

To reduce the risk of injury, keep children away while installing, inspecting, or repairing the unit.

Children should be supervised to ensure that they do not play with the appliance.

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.

Keep the space well ventilated. Refrigerant can displace air and cause oxygen starvation.

If leaked refrigerant comes in contact with a heat source, toxic gas may be generated.

Always replace a fuse with one with the correct current rating.

The use of improperly rated fuses or a substitution of fuses with steel or copper wire may result in fire or explosion.

If any abnormality (e.g., burning smell) is noticed, stop the operation, turn off the power switch, and consult your dealer.

Continuing the operation may result in electric shock, malfunctions, or fire.

Properly install all required covers and panels on the terminal box and control box to keep moisture and dust out.

Dust accumulation and water may result in electric shock, smoke, or fire.

Consult an authorized agency for the proper disposal of the unit.

Refrigerant oil and refrigerant that may be left in the unit pose a risk of fire, explosion, or environmental pollution.

⚠ CAUTION

To reduce the risk of fire or explosion, do not place flammable materials or use flammable sprays around the unit.

Do not operate the unit without panels and safety guards properly installed.

To reduce the risk of injury, do not sit, stand, or place objects on the unit.

Do not connect the makeup water pipe directly to the potable water pipe. Use a cistern tank between them.

Connecting these pipes directly may cause the water in the unit to migrate into the potable water and cause health problems.

To reduce the risk of adverse effects on plants and animals, do not place them where they are directly exposed to discharge air from the unit.

Do not install the unit on or over things that are vulnerable to water damage.

Condensation may drip from the unit.

The model of heat pump unit described in this manual is not intended for use to preserve food, animals, plants, precision instruments, or art work.

To reduce the risk of injury, do not touch the heat exchanger fins or sharp edges of components with bare hands.

Do not place a container filled with water on the unit.

If water spills on the unit, it may result in shorting, current leakage, electric shock, malfunction, smoke, or fire.

Always wear protective gears when touching electrical components on the unit.

Several minutes after the power is switched off, residual voltage may still cause electric shock.

To reduce the risk of injury, do not insert fingers or foreign objects into air inlet/outlet grills.

To reduce the risk of injury, wear protective gear when working on the unit.

Do not release refrigerant into the atmosphere. Collect and reuse the refrigerant, or have it properly disposed of by an authorized agency.

Refrigerant poses environmental hazards if released into the air.

To prevent environmental pollution, dispose of brine in the unit and cleaning solutions according to the local regulations.

It is punishable by law not to dispose of them according to the applicable laws.

The water heated by the heat pump is not suitable for use as drinking water or for cooking.

It may cause health problems or degrade food.

In areas where temperature drops to freezing during the periods of non-use, blow the water out of the pipes or fill the pipes with anti-freeze solution.

Not doing so may cause the water to freeze, resulting in burst pipes and damage to the unit or the furnishings.

In areas where temperature drops to freezing, use an anti-freeze circuit and leave the main power turned on to prevent the water in the water circuit from freezing and damaging the unit or causing water leakage and resultant damage to the furnishings.

Use clean tap water.

The use of acidic or alkaline water or water high in chlorine may corrode the unit or the pipes, causing water leakage and resultant damage to the furnishings.

In areas where temperature can drop low enough to cause the water in the pipes to freeze, operate the unit often enough to prevent the water from freezing.

Frozen water in the water circuit may cause the water to freeze, resulting in burst pipes and damage to the unit or the furnishings.

Periodically inspect and clean the water circuit.

Dirty water circuit may compromise the unit's performance or corrodes the unit or cause water leakage and resultant damage to the furnishings.

Ensure that the flow rate of the feed-water is within the permitted range.

If the flow rate exceeds the permitted range, the unit may become damaged due to corrosion.
Furniture may become wet due to water leaks.

Transportation

⚠ WARNING

Lift the unit by placing the slings at designated locations. Support the outdoor unit securely at four points to keep it from slipping and sliding.

If the unit is not properly supported, it may fall and cause personal injury.

⚠ CAUTION

To reduce the risk of injury, do not carry the product by the PP bands that are used on some packages.

Observe the restrictions on the maximum weight that a person can lift, which is specified in local regurations.

Installation

⚠ WARNING

Do not install the unit where there is a risk of leaking flammable gas.

If flammable gas accumulates around the unit, it may ignite and cause a fire or explosion.

Properly dispose of the packing materials.

Plastic bags pose suffocation hazard to children.

The unit should be installed only by personnel certified by Mitsubishi Electric according to the instructions detailed in the Installation/Operation Manual.

Improper installation may result in refrigerant leakage, water leakage, injury, electric shock, or fire.

Periodically check the installation base for damage.

If the unit is left on a damaged base, it may fall and cause injury.

Remove packing materials from the unit before operating the unit. Note that some accessories may be taped to the unit. Properly install all accessories that are required.

Failing to remove the packing materials or failing to install required accessories may result in refrigerant leakage, oxygen starvation, smoke, or fire.

Consult your dealer and take appropriate measures to safeguard against refrigerant leakage and resultant oxygen starvation. An installation of a refrigerant gas detector is recommended.

Any additional parts must be installed by qualified personnel. Only use the parts specified by Mitsubishi Electric.

Take appropriate safety measures against wind gusts and earthquakes to prevent the unit from toppling over and causing injury.

Be sure to install the unit horizontally, using a level.

If the unit is installed at an angle, it may fall and cause injury or cause water leakage.

The unit should be installed on a surface that is strong enough to support its weight.

As an anti-freeze, use ethylene glycol or propylene glycol diluted to the specified concentration.

The use of other types of anti-freeze solution may cause corrosion and resultant water leakage. The use of flammable anti-freeze may cause fire or explosion.

⚠ CAUTION

Do not install the unit on or over things that are vulnerable to water damage.

When the indoor humidity exceeds 80% or if the drain water outlet becomes clogged, condensation may drip from the indoor unit onto the ceiling or floor.

All drainage work should be performed by the dealer or qualified personnel according to the instructions detailed in the Installation Manual.

Improper drainage work may cause rain water or drain water to enter the buildings and damage the furnishings.

Pipe installation

⚠ WARNING

To prevent explosion, do not heat the unit with refrigerant gas in the refrigerant circuit.

Check for refrigerant leakage at the completion of installation.

If leaked refrigerant comes in contact with a heat source, toxic gas may be generated.

⚠ CAUTION

Check that no substance other than the specified refrigerant (R410A) is present in the refrigerant circuit.

Infiltration of other substances may cause the pressure to rise abnormally high and cause the pipes to explode.

To keep the ceiling and floor from getting wet due to condensation, properly insulate the pipes.

Piping work should be performed by the dealer or qualified personnel according to the instructions detailed in the Installation Manual.

Improper piping work may cause water leakage and damage the furnishings.

To keep the ceiling and floor from getting wet due to condensation, properly insulate the pipes.

Electrical wiring

To reduce the risk of wire breakage, overheating, smoke, and fire, keep undue force from being applied to the wires.

Properly secure the cables in place and provide adequate slack in the cables so as not to stress the terminals.

Improperly connected cables may break, overheat, and cause smoke or fire.

To reduce the risk of injury or electric shock, switch off the main power before performing electrical work.

All electric work must be performed by a qualified electrician according to the local regulations, standards, and the instructions detailed in the Installation Manual.

Capacity shortage to the power supply circuit or improper installation may result in malfunction, electric shock, smoke, or fire.

To reduce the risk of electric shock, smoke, or fire, install an inverter circuit breaker on the power supply to each unit.

Use properly rated breakers and fuses (inverter breaker, Local Switch <Switch + Type-B fuse>, or no-fuse breaker).

The use of improperly rated breakers may result in malfunctions or fire.

To reduce the risk of current leakage, overheating, smoke, or fire, use properly rated cables with adequate current carrying capacity.

Keep the unsheathed part of cables inside the terminal block.

If unsheathed part of the cables come in contact with each other, electric shock, smoke, or fire may result.

Proper grounding must be provided by a licensed electrician. Do not connect the grounding wire to a gas pipe, water pipe, lightning rod, or telephone wire.

Improper grounding may result in electric shock, smoke, fire, or malfunction due to electrical noise interference.

⚠ CAUTION

To reduce the risk of current leakage, wire breakage, smoke, or fire, keep the wiring out of contact with the refrigerant pipes and other parts, especially sharp edges.

To reduce the risk of electric shock, shorting, or malfunctions, keep wire pieces and sheath shavings out of the terminal block.

Transportation and repairs

⚠ WARNING

The unit should be moved, disassembled, or repaired only by qualified personnel. Do not alter or modify the unit.

Improper repair or unauthorized modifications may result in refrigerant leakage, water leakage, injury, electric shock, or fire.

After disassembling the unit or making repairs, replace all components as they were.

Failing to replace all components may result in injury, electric shock, or fire.

If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.

⚠ CAUTION

To reduce the risk of shorting, electric shock, fire, or malfunction, do not touch the circuit board with tools or with your hands, and do not allow dust to accumulate on the circuit board.

IMPORTANT

To avoid damage to the unit, use appropriate tools to install, inspect, or repair the unit.

To reduce the risk or malfunction, turn on the power at least 12 hours before starting operation, and leave the power turned on throughout the operating season.

Recover all refrigerant from the unit.

It is punishable by law to release refrigerant into the atmosphere.

Do not unnecessarily change the switch settings or touch other parts in the refrigerant circuit.

Doing so may change the operation mode or damage the unit.

To reduce the risk of malfunctions, use the unit within its operating range.

Do not switch on or off the main power in a cycle of shorter than 10 minutes.

Short-cycling the compressor may damage the compressor.

To maintain optimum performance and reduce the risk of malfunction, keep the air pathway clear.

To reduce the risk of both the breaker on the product side and the upstream breaker from tripping and causing problems, split the power supply system or provide protection coordination between the earth leakage breaker and no-fuse breaker.

When servicing the refrigerant, open and close the check joint using two spanners, as there is the risk of refrigerant leaking due to damaged piping.



Please build the water circuit so that it is a closed system.

Do not use water directly for showers or other applications. Do not allow other heat source water to mix with the water circuit.

To ensure proper operation of the unit, periodically check for proper concentration of anti-freeze.

Inadequate concentration of anti-freeze may compromise the performance of the unit or cause the unit to abnormally stop.

Take appropriate measures against electrical noise interference when installing the air conditioners in hospitals or facilities with radio communication capabilities.

Inverter, high-frequency medical, or wireless communication equipment as well as power generators may cause the air conditioning system to malfunction. Air conditioning system may also adversely affect the operation of these types of equipment by creating electrical noise.

Check the water system, using a relevant manual as a reference.

Using the system that does not meet the standards (including water quality and water flow rate) may cause the water pipes to corrode.

To reduce the risk of power capacity shortage, always use a dedicated power supply circuit.

Have a backup system, if failure of the unit has a potential for causing significant problems or damages.

This appliance is intended to be used by expert or trained users in shops, in light industry and on farms, or for commercial use by lay persons.

This appliance is Electromagnetic Compatibility Directive Class A. When it uses at residential environment, it may cause electromagnetic interference. User may be asked to prepare the properly way.

Other products installed in the same environment have the risk of malfunction.

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[1] Read Before Servicing

1. **Check the type of refrigerant used in the system to be serviced.**
   Refrigerant Type
   Air-coold Chilling Unit e-series EACV-P040/050YBL: R410A

2. **Check the symptoms exhibited by the unit to be serviced.**
   Refer to this service handbook for symptoms relating to the refrigerant cycle.

3. **Thoroughly read the safety precautions at the beginning of this manual.**

4. **Preparing necessary tools: Prepare a set of tools to be used exclusively with each type of refrigerant.**
   Refer to "Necessary Tools and Materials" for information on the use of tools.(page 4)

5. **If there is a leak of gaseous refrigerant and the remaining refrigerant is exposed to an open flame, a poisonous gas hydrofluoric acid may form. Keep workplace well ventilated.**

> ⚠ **CAUTION**
> ♦Install new pipes immediately after removing old ones to keep moisture out of the refrigerant circuit.
> ♦The use of refrigerant that contains chloride, such as R22, will cause the refrigerating machine oil to deteriorate.

[2] Necessary Tools and Materials

Prepare the following tools and materials necessary for servicing the unit.

Tools for use with R410A (Adaptability of tools that are for use with R22 or R407C)

1. To be used exclusively with R410A (not to be used if used with R22 or R407C)

Tools/Materials	Use	Notes
Gauge Manifold	Evacuation and refrigerant charging	Higher than 4.82 MPa [699 psi] on the high-pressure side
Charging Hose	Evacuation and refrigerant charging	
Refrigerant Recovery Cylinder	Refrigerant recovery	
Refrigerant Cylinder	Refrigerant charging	The refrigerant type is indicated. The cylinder is Gray
Charging Port on the Refrigerant Cylinder	Refrigerant charging	

2. Tools and materials that may be used with R410A with some restrictions

Tools/Materials	Use	Notes
Gas Leak Detector	Gas leak detection	The ones for use with HFC refrigerant may be used.
Vacuum Pump	Vacuum drying	May be used if a check valve adapter is attached.
Refrigerant Recovery Equipment	Refrigerant recovery	May be used if compatible with R410A.

3. Tools and materials that are used with R22 or R407C that may also be used with R410A

Tools/Materials	Use	Notes
Vacuum Pump with a Check Valve	Vacuum drying	
Bender	Bending pipes	
Torque Wrench	Tightening water pipes	
Pipe Cutter	Cutting pipes	
Welder and Nitrogen Cylinder	Welding pipes	
Refrigerant Charging Meter	Refrigerant charging	
Vacuum Gauge	Vacuum level check	

4. Tools and materials that must not be used with R410A

Tools/Materials	Use	Notes
Charging Cylinder	Refrigerant charging	Prohibited to use

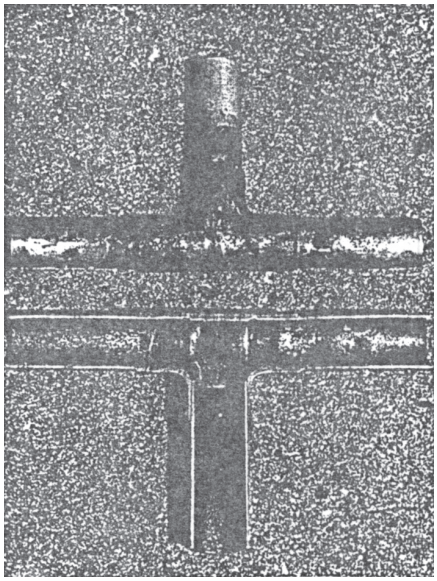
Tools for R410A must be handled with special care to keep moisture and dust from infiltrating the cycle.

[3] Brazing

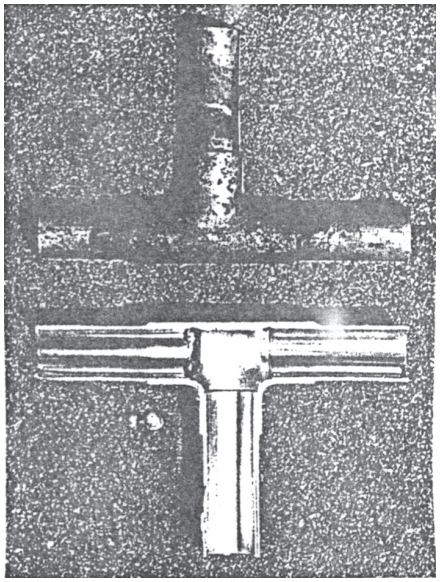
No changes have been made in the brazing procedures. Perform brazing with special care to keep foreign objects (such as oxide scale, water, and dust) out of the refrigerant system.

Example: Inside the brazed connection

Use of oxidized solder for brazing



Use of non-oxidized solder for brazing



1. Items to be strictly observed

- Do not conduct refrigerant piping work outdoors if raining.
- Use non-oxidized solder.
- Use a brazing material (BCuP-3) that requires no flux when brazing between copper pipes or between a copper pipe and copper coupling.
- If installed refrigerant pipes are not immediately connected to the equipment, then braze and seal both ends.

2. Reasons

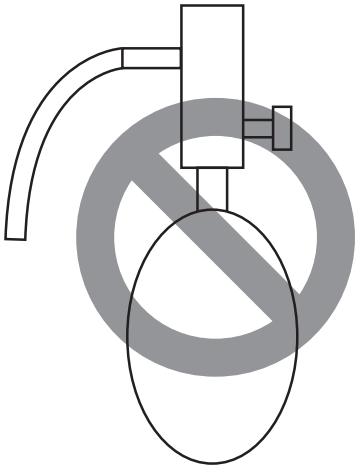
- The new refrigerating machine oil is 10 times as hygroscopic as the conventional oil and is more likely to cause unit failure if water infiltrates into the system.
- Flux generally contains chloride. Residual flux in the refrigerant circuit will cause sludge to form.

3. Notes

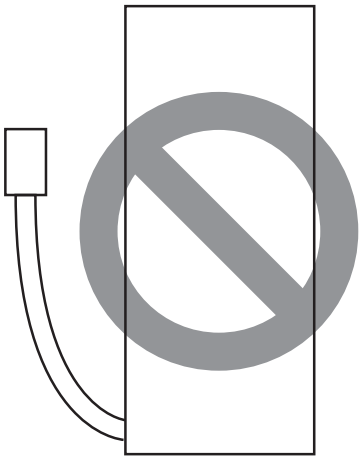
Do not use commercially available antioxidants because they may cause the pipes to corrode or refrigerating machine oil to deteriorate.

[4] Air Tightness Test

No changes have been made in the detection method. Note that a refrigerant leak detector for R22 will not detect an R410A leak.



Halide torch



R22 leakage detector

1. Items to be strictly observed

- Pressurize the equipment with nitrogen up to the design pressure (4.15 MPa [601 psi]), and then judge the equipment's air tightness, taking temperature variations into account.
- Refrigerant R410A must be charged in its liquid state (vs. gaseous state).

2. Reasons

- Oxygen, if used for an air tightness test, poses a risk of explosion. (Only use nitrogen to check air tightness.)
- Refrigerant R410A must be charged in its liquid state. If gaseous refrigerant in the cylinder is drawn out first, the composition of the remaining refrigerant in the cylinder will change and become unsuitable for use.

3. Notes

Procure a leak detector that is specifically designed to detect an HFC leak. A leak detector for R22 will not detect an HFC(R410A) leak.

[5] Vacuum Drying (Evacuation)



(Photo1) 15010H



(Photo2) 14010

Recommended vacuum gauge:
ROBINAIR 14010 Thermistor Vacuum Gauge

1. Vacuum pump with a reverse-flow check valve (Photo1)

To prevent the vacuum pump oil from flowing into the refrigerant circuit during power OFF or power failure, use a vacuum pump with a reverse-flow check valve.
A reverse-flow check valve may also be added to the vacuum pump currently in use.

2. Standard of vacuum degree (Photo 2)

Use a vacuum pump that attains 0.5Torr(65Pa) or lower degree of vacuum after 5 minutes of operation, and connect it directly to the vacuum gauge. Use a pump well-maintained with an appropriate lubricant. A poorly maintained vacuum pump may not be able to attain the desired degree of vacuum.

3. Required precision of vacuum gauge

Use a vacuum gauge that registers a vacuum degree of 5Torr(650Pa) and measures at intervals of 1Torr(130Pa). (A recommended vacuum gauge is shown in Photo2.)
Do not use a commonly used gauge manifold because it cannot register a vacuum degree of 5Torr(650Pa).

4. Evacuation time

- After the degree of vacuum has reached 5Torr(650Pa), evacuate for an additional 1 hour. (A thorough vacuum drying removes moisture in the pipes.) When the outside temperature drops below 1°C (or when the saturation pressure drops below 656 Pa), continue vacuum drying for another 1 hour after the vacuum degree has reached the saturated vapor pressure of the water (ice) at the outside temperature. When performing vacuum drying at a low outside temperature, use a vacuum gauge appropriate for the temperature range.

Degree of vacuum (reference)

Outdoor temp.	-20°C (-4°F)	-15°C (5°F)	-10°C (14°F)	-5°C (23°F)	0°C (32°F)
Degree of vacuum	0.77 Torr (103 Pa)	1.24 Torr (165 Pa)	1.95 Torr (260 Pa)	3.01 Torr (402 Pa)	4.58 Torr (611 Pa)

* Degrees of vacuum shown above are obtained based on the saturated vapor pressure of ice.
* In a system using water heat exchangers, circulate water to prevent the water in the heat exchangers from freezing during vacuum drying.

- Verify that the vacuum degree has not risen by more than 1Torr(130Pa) 1hour after evacuation. A rise by less than 1Torr(130Pa) is acceptable.
- If the vacuum is lost by more than 1Torr(130Pa), conduct evacuation, following the instructions in section 6. Special vacuum drying.

5. Procedures for stopping vacuum pump

To prevent the reverse flow of vacuum pump oil, open the relief valve on the vacuum pump side, or draw in air by loosening the charge hose, and then stop the operation.
The same procedures should be followed when stopping a vacuum pump with a reverse-flow check valve.

6. Special vacuum drying

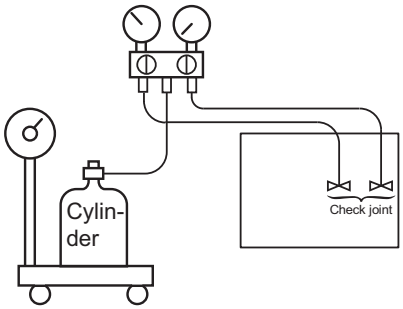
- When 5Torr(650Pa) or lower degree of vacuum cannot be attained after 3 hours of evacuation, it is likely that water has penetrated the system or that there is a leak.
- If water infiltrates the system, break the vacuum with nitrogen. Pressurize the system with nitrogen gas to 7.3 psi (0.05MPa) and evacuate again. Repeat this cycle of pressurizing and evacuation either until the degree of vacuum below 5Torr(650Pa) is attained or until the pressure stops rising.
- Only use nitrogen gas for vacuum breaking. (The use of oxygen may result in an explosion.)

7. Notes

- **Apply a vacuum through the check joints on the low pressure sides.**
- **Evacuating the system from the high-pressure side may damage the compressor.**

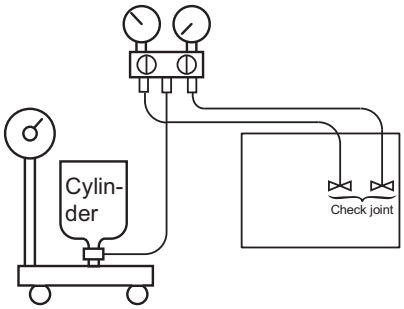
[6] Refrigerant Charging

Cylinder with a siphon

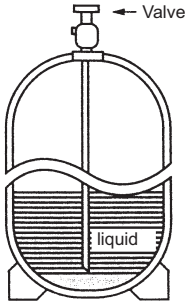


Cylinder color R410A is Pink.

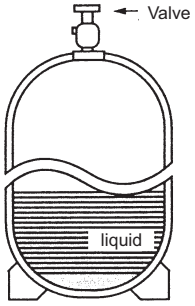
Cylinder without a siphon



Refrigerant charging in the liquid state



Charge refrigerant through the check joint on the high-pressure side.



Charging refrigerant through the check joint on the low-pressure side will create reverse pressure, resulting in compressor malfunctions.

1. Reasons

R410A is a mixture of 2 refrigerants, each with a different evaporation temperature. Therefore, if the equipment is charged with R410A gas, then the refrigerant whose evaporation temperature is closest to the outside temperature is charged frist while the rest of refrigerants remain in the cylinder.

2. Notes

- When using a cylinder with a siphon, refrigerant is charged in the liquid state without the need for turning it upside down. Check the type of the cylinder on the label before use.
- Charging refrigerant through the check joint only on the low-pressure side will create reverse pressure, resulting in compressor malfunctions.

[7] Remedies to be taken in case of a Refrigerant Leak

If the refrigerant leaks out, all of the remaining refrigerant must be replaced with a new charge to maintain the proper composition of the refrigerant. Repair the leak, and then charge the system with the specified amount of refrigerant (15 kg × 4). (Charge refrigerant in the liquid state.)
Refer to "IX [4] Refrigerant Leak."(page 117)

[8] Characteristics of the Conventional and the New Refrigerants

1. Chemical property

As with R22, the new refrigerant (R410A) is low in toxicity and chemically stable nonflammable refrigerant.
However, because the specific gravity of vapor refrigerant is greater than that of air, leaked refrigerant in a closed room will accumulate at the bottom of the room and may cause hypoxia.
If exposed to an open flame, refrigerant will generate poisonous gases. Do not perform installation or service work in a confined area.

	New Refrigerant (HFC type)		Conventional Refrigerant (HCFC type)
	R410A	R407C	R22
	R32/R125	R32/R125/R134a	R22
Composition (wt%)	(50/50)	(23/25/52)	(100)
Type of Refrigerant	Pseudo-azeotropic Refrigerant	Non-azeotropic Refrigerant	Single Refrigerant
Chloride	Not included	Not included	Included
Safety Class	A1/A1	A1/A1	A1
Molecular Weight	72.6	86.2	86.5
Boiling Point (°C/°F)	-51.4/-60.5	-43.6/-46.4	-40.8/-41.4
Steam Pressure (25°C,MPa/77°F,psi) (gauge)	1.557/226	0.9177/133	0.94/136
Saturated Steam Density (25°C,kg/m^3/77°F,lb/ft3)	64.0/4.00	42.5/2.65	44.4/2.77
Flammability	Nonflammable	Nonflammable	Nonflammable
Ozone Depletion Coefficient (ODP)*1	**0**	**0**	**0.055**
Global Warming Coefficient (GWP)*2	2088	1774	1810
Refrigerant Charging Method	Refrigerant charging in the liquid state	Refrigerant charging in the liquid state	Refrigerant charging in the gaseous state
Replenishment of Refrigerant after a Refrigerant Leak	Available	Available	Available

*1 When CFC11 is used as a reference
*2 When CO_2 is used as a reference

2. Pressure characteristics

The pressure in the system using R410A is 1.6 times as great as that in the system using R22.

Temperature (°C/°F)	Saturation Pressure (gauge)		
	R410A	R407C	R22
	MPa/psi	MPa/psi	MPa/psi
-20/-4	0.30/44	0.18/26	0.14/20
0/32	0.70/102	0.47/68	0.40/58
20/68	1.34/194	0.94/136	0.81/117
40/104	2.31/335	1.44/209	1.44/209
60/140	3.73/541	2.43/354	2.33/338
65/149	4.17/605	2.74/399	2.60/377

[9] Notes on Refrigerating Machine Oil

1. Refrigerating machine oil in the HFC refrigerant system

HFC type refrigerants use a refrigerating machine oil different from that used in the R22 system.
Note that the ester oil used in the system has properties that are different from commercially available ester oil.

Refrigerant	Refrigerating machine oil
R22	Mineral oil
R407C	Ester oil
R410A	Ester oil

2. Effects of contaminants*1

Refrigerating machine oil used in the HFC system must be handled with special care to keep contaminants out.
The table below shows the effect of contaminants in the refrigerating machine oil on the refrigeration cycle.

3. The effects of contaminants in the refrigerating machine oil on the refrigeration cycle.

<table>
<tr><th colspan="2">Cause</th><th colspan="2">Symptoms</th><th>Effects on the refrigerant cycle</th></tr>
<tr><td colspan="2" rowspan="2">Water infiltration</td><td></td><td>Frozen expansion valve and capillary tubes</td><td rowspan="3">Clogged expansion valve and capillary tubes
Poor cooling performance
Compressor overheat
Motor insulation failure
Burnt motor
Coppering of the orbiting scroll
Lock
Burn-in on the orbiting scroll</td></tr>
<tr><td>Hydrolysis</td><td rowspan="2">Sludge formation and adhesion
Acid generation
Oxidization
Oil degradation</td></tr>
<tr><td colspan="2">Air infiltration</td><td>Oxidization</td></tr>
<tr><td rowspan="4">Infiltration of contaminants</td><td rowspan="2">Dust, dirt</td><td colspan="2">Adhesion to expansion valve and capillary tubes</td><td>Clogged expansion valve, capillary tubes, and drier
Poor cooling performance
Compressor overheat</td></tr>
<tr><td colspan="2">Infiltration of contaminants into the compressor</td><td>Burn-in on the orbiting scroll</td></tr>
<tr><td rowspan="2">Mineral oil etc.</td><td colspan="2">Sludge formation and adhesion</td><td>Clogged expansion valve and capillary tubes
Poor cooling performance
Compressor overheat</td></tr>
<tr><td colspan="2">Oil degradation</td><td>Burn-in on the orbiting scroll</td></tr>
</table>

*1. Contaminants is defined as moisture, air, processing oil, dust/dirt, wrong types of refrigerant, and refrigerating machine oil.

II Restrictions

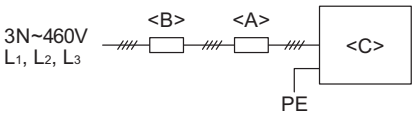
[1] Electrical Wiring Installation 13
[2] System Configurations 16
[3] Switch Types and the Factory Settings 17
[4] Configuring the Settings 20
[5] Water Pipe Installation 30

[1] Electrical Wiring Installation

[1] Main Power Supply Wiring and Switch Capacity

Schematic Drawing of Wiring (Example)

<A> Switch (with current breaking capability)
<B> Current leakage breaker
<C> unit



Main power supply wire size, switch capacities, and system impedance

Model	Minimum wire thickness (mm²)			Current leakage breaker	Local switch (A)		No-fuse breaker (A)	Max. Permissive System Impedance
	Main cable	Branch	Ground		Capacity	Fuse		
EACV-P040,050YBL	35	-	35	160 A 200 mA 0.1 sec. or less	150	150	160	0.08 Ω

1) Use a dedicated power supply for each unit. Ensure that each unit is wired individually.
2) When installing wiring, consider ambient conditions (e.g., temperature).
3) The wire size is the minimum value for metal conduit wiring. If voltage drop is a problem, use a wire that is one size thicker. Make sure the power-supply voltage does not drop more than 5%.
4) Specific wiring requirements should adhere to the wiring regulations of the region.
5) Power supply cords of appliances shall not be lighter than polychloroprene sheathed flexible cord (design 60245 IEC57).
6) A switch with at least 3 mm [1/8 in.] contact separation in each pole shall be provided by the chilling unit installer.
7) Do not install a phase advancing capacitor on the motor. Doing so may damage the capacitor and result in fire.

⚠WARNING

- Be sure to use specified wires and ensure no external force is imparted to terminal connections. Loose connections may cause overheating and fire.
- Be sure to use the appropriate type of overcurrent protection switch. Note that overcurrent may include direct current.

⚠CAUTION

- Some installation sites may require an installation of an earth leakage breaker for the inverter. If no earth leakage breaker is installed, there is a danger of electric shock.
- Only use properly rated breakers and fuses. Using a fuse or wire of the wrong capacity may cause malfunction or fire.

Note

- This device is intended for the connection to a power supply system with a maximum permissible system impedance shown in the above table at the interface point (power service box) of the user's supply.
- Ensure that this device is connected only to a power supply system that fulfills the requirements above. If necessary, consult the public power supply company for the system impedance at the interface point.
- This equipment complies with IEC 61000-3-12 provided that the short-circuit power Ssc is greater than or equal to Ssc (*2) at the interface point between the user's supply and the public system. It is the responsibility of the installer or user of the equipment to ensure, in consultation with the distribution network operator if necessary, that the equipment is connected only to a supply with a short-circuit power Ssc greater than or equal to Ssc (*2).

Ssc(*2)

Ssc (MVA)
10.61

Control cable specifications

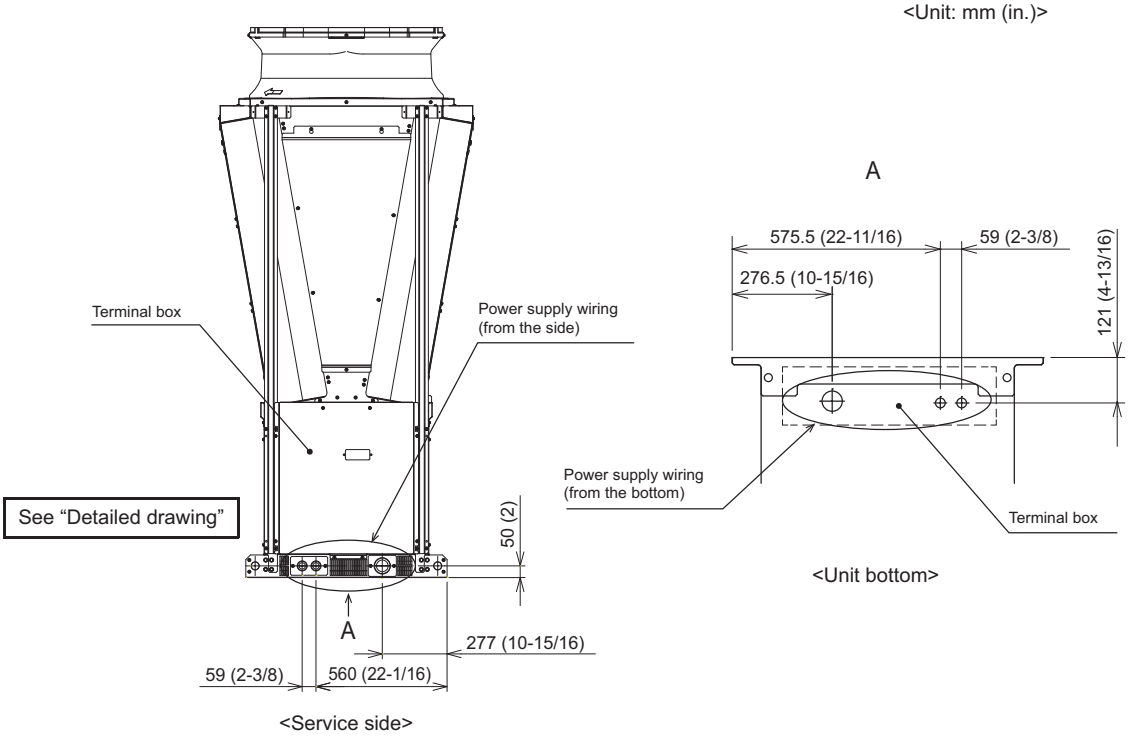
Remote controller cable	Size	0.3 mm² (Max. 200 m [656 ft] total)
	Recommended cable types	2-core sheathed cable
M-NET cable between units *1	Size	Min. 1.25 mm² (Max. 120 m [393 ft] total)
	Recommended cable types	Shielded cable CVVS, CPEVS or MVVS
External input wire size		Min. 0.3 mm²
External output wire size		1.25 mm²

*1 Use a CVVS or CPEVS cable (Max. total length of 200 m [656 ft]) if there is a source of electrical interference nearby (e.g., factory) or the total length of control wiring exceeds 120 m [393 ft].

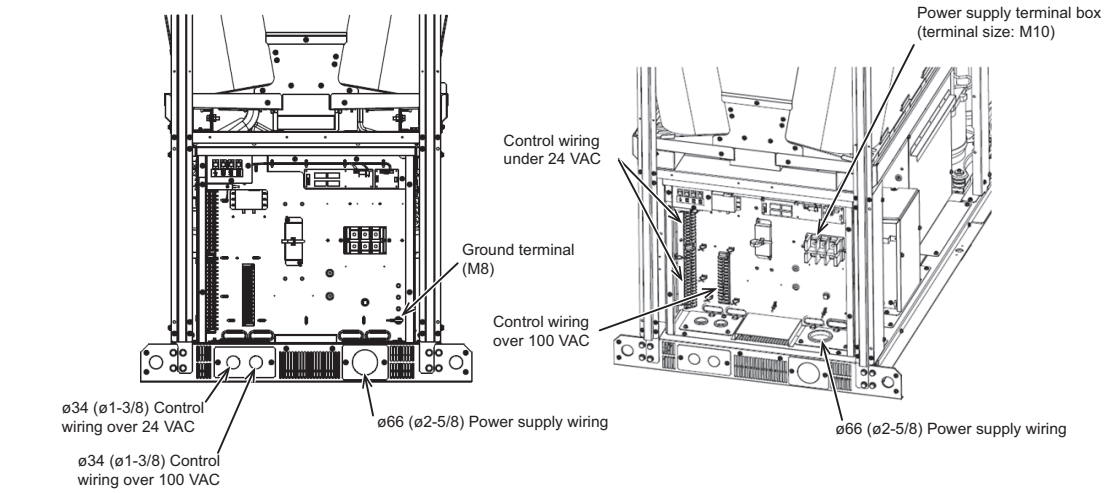
[2] Cable Connections

1. Schematic Diagram of a Unit and Terminal Block Arrangement

<Unit: mm (in.)>



Detailed drawing



(1) Remove the front terminal box cover.
(2) Wire the power supply and control wires. The terminal box is covered with a bush.
Cut the bush before connecting wires to the terminal box.
(3) Fasten the power supply wires by the cable strap.
(4) Secure the cable conduit, and then waterproof the area around the pipe with silicon, etc.
(5) Reattach the terminal box cover.

2. Precautions when fastening screws

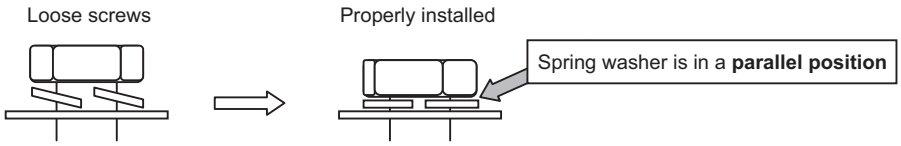
* Faulty contacts due to loose screws may cause overheating and fire.
* Using the circuit board while it is damaged may cause overheating and fire.

<1> Screw fastening torque

Power supply terminal block, M8 screw: **10 to 13.5 N·m**

Use the following methods to check that the screws have been fastened.

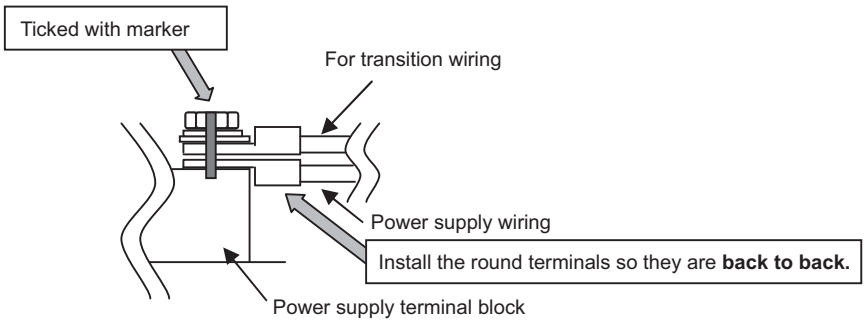
1) Check that the spring washer is in a parallel position.
* If the screw is biting into the washer, simply fastening the screw to the specified torque cannot determine whether it has been installed properly.



2) Check that the wiring does not move at the screw terminal.

<2> Take extra care not to ruin the screw thread due to fastening the screw at an angle.
* To prevent fastening the screw at an angle, install the round terminals so they are back to back.

<3> After fastening the screw, use a permanent marker to tick off the screw head, washer and terminal.



3. Installing the conduit tube

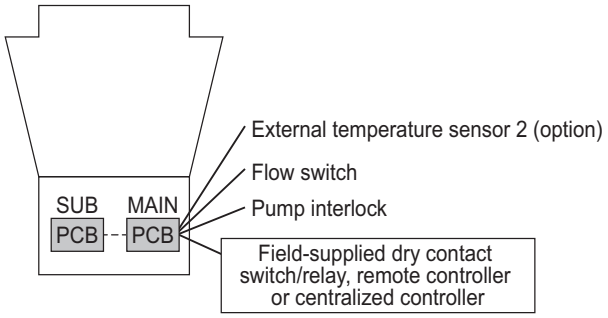
- Always use a conduit to run the power supply wiring.
- Select the conduit size based on the hole.
- The cable conduits must be prepared locally.
- Do not store the 24VDC or less low-voltage circuit and 100VAC or higher main circuit and control circuit cables in the same multi-core cable, or bundle them together.
- Attach cable conduits securely to the foundation, etc. to ensure that excessive loads are not applied to the power supply terminal box.
- Seal the area around the cable conduit connection to ensure that no water penetrates the cable conduit connection port.

[2] System Configurations

The system must be configured only by personnel certified by Mitsubishi Electric.

[1] Schematic Diagrams of Individual and Multiple Unit Connection Systems

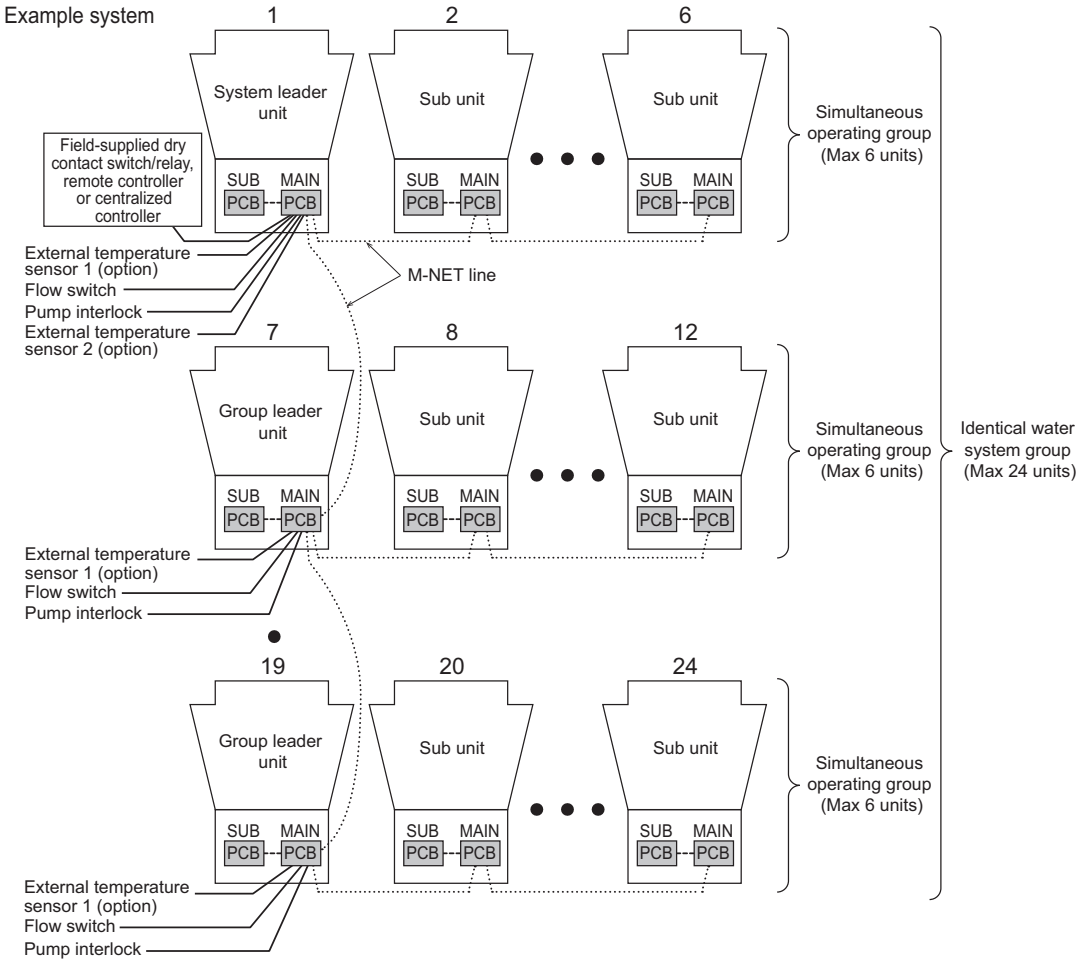
(1) Individual system



Refer to the sections "Switch Types and the Factory Settings" and "Configuring the settings" for further details.

(2) Multiple unit connection system (Max.24 units)

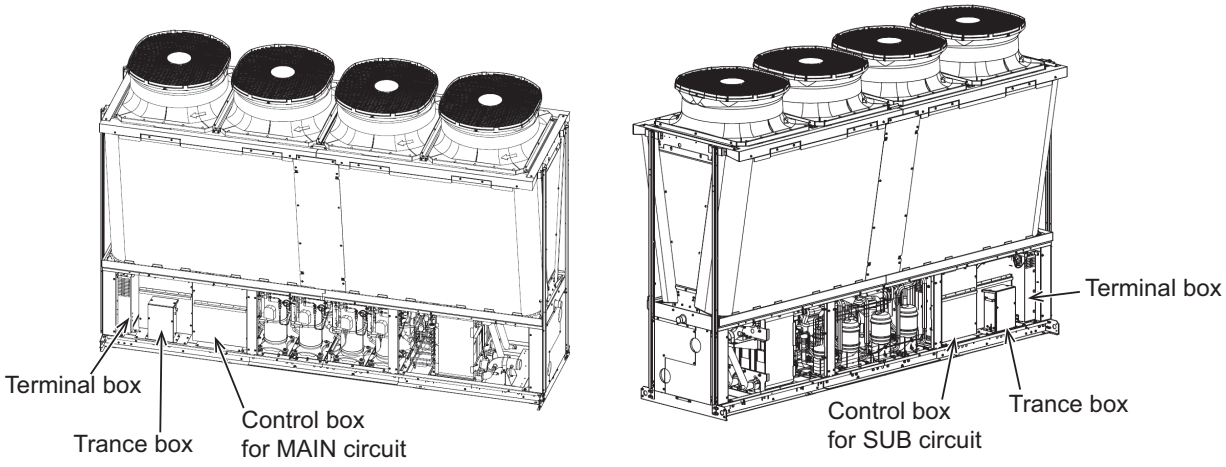
System leader unit	The unit controls the identical water system group.
Group leader unit	The unit transmits the command from the system leader unit to the sub unit.
Sub unit	The unit is other than leader unit.



Refer to the sections "Switch Types and the Factory Settings" and "Configuring the settings" for further details.

[3] Switch Types and the Factory Settings

(1) Switch names and functions



<Right side> <Left side>

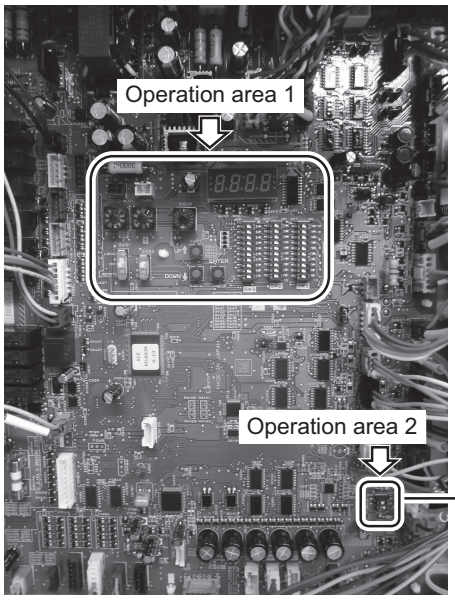
There are three main ways to set the settings as follows:

1) Dip switches (SW1 - SW3, SW421)
2) Dip switches used in combination with the push switches
3) Rotary switches

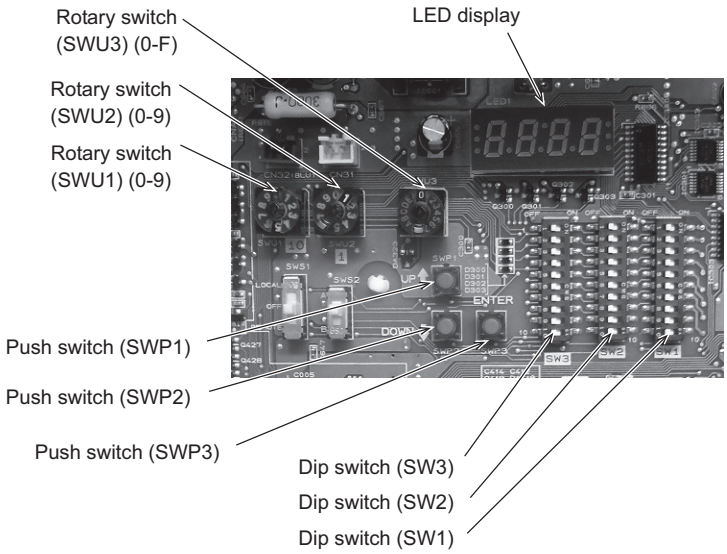
See the next page for how these switches are used to set certain items.

Different types of switches on the PCB

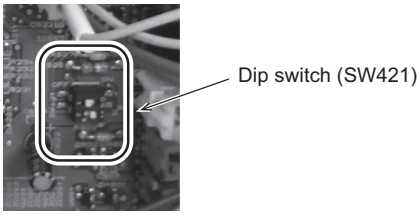
[Control board]



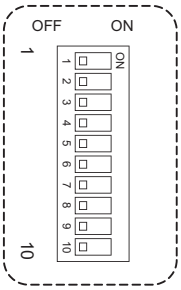
[Enlarged the operation area 1]

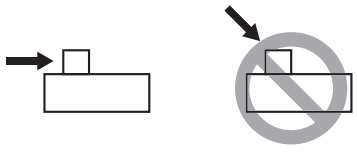


[Enlarged the operation area 2]

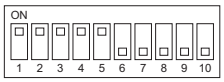


			Initial Setting	
			MAIN circuit	SUB circuit
Rotary switch	SWU1	Sets the 10's digit of the unit address.	"0"	"5"
	SWU2	Sets the 1's digit of the unit address.	"1"	"1"
	SWU3	Use for switching the setting.	"0"	"0"
Push switch	SWP1	Use for increasing the setting value.	-	-
	SWP2	Use for decreasing the setting value.	-	-
	SWP3	Use for changing and deciding the setting value.	-	-
Dip switch	SW1-3	Select a setting which is decided with a combination of switch numbers.	-	-
	SW421	Analog input type setting (Refer to Page 73)	-	(Unused)





Slide the dip switches:
do not push down the switches.



The figure at left shows that the switches 1 through 5 are set to ON and 6 through 10 are set to OFF.

(2) Factory Switch Settings (Dip switch settings table)

SW		Function	Usage	Factory setting		OFF setting	ON setting	System leader unit	Group leader unit	SUB unit	Setting timing
				MAIN circuit	SUB circuit						
SW1	1 2 3 4 5 6 7 8 9 10	Settings change or view the settings	These switches are used for setting change with push switch SWP 1, 2 and 3.	OFF	OFF	The 7-segment LED display is changed.		Depends on the setting	Depends on the setting	Depends on the setting	Depends on the setting
SW2	1	Model setting		-	-	Leave the setting as it is.		-	-	-	At a reset
	2 3	System setting	Set the duties to each unit.	OFF	-	2 / 3 System leader unit : ON ON Group leader unit : ON OFF Sub unit : OFF OFF		Required	Required	Fixed OFF	At a reset
	4	Water-temperature control 1 (option)	Selects either the external water temperature sensor or the built-in sensor to be used to control water temperature. (Simultaneous operating group)	OFF	-	Built-in sensor on the unit	External water temperature sensor 1	Required	Required	Required	At a reset
	5	Water-temperature control 2 (option)	Selects target temperature correction control. (Identical water system group)	OFF	-	OFF	ON (External water sensor 2 is required.)	Required	Fixed OFF	Fixed OFF	At a reset
	6	Multiple unit control	Selects optimum control of number of operating units.	OFF	-	Ineffective	Effective	Required	Fixed OFF	Fixed OFF	At a reset
	7	Analog input setting	Allows or disallows the analog signals from a remote location.	OFF	-	Disallows the external analog signals.	Allows the external analog signals.	Required	Fixed OFF	Fixed OFF	At a reset
	8	Analog input signal switching	Selects either the water temperature or the capacity control ratio. (Effective only when SW2-7 is set to ON.)	OFF	-	Water temperature	Capacity control ratio	Required	Fixed OFF	Fixed OFF	At a reset
	9	BMS setting *		OFF	-	No input from BMS	Input from BMS	Required	Fixed OFF	Fixed OFF	At a reset
	10	BMS Group setting		OFF	-	OFF ON Leader units / Simultaneous group units		Required	Fixed OFF	Fixed OFF	Any time
SW3	1 2	Analog input type setting	Selects analog input 4-20mA/ 0-10V/1-5V/2-10V. (Effective only when SW2-7 is set to ON and SW3-4 is set to OFF.)	OFF	-	1 / 2 4-20mA: OFF OFF 1-5V: ON OFF 0-10V: OFF ON 2-10V: ON ON		Required	Fixed OFF	Fixed OFF	Any time
	3 4 5 6 7 8	Model setting		OFF	OFF	Leave the setting as it is.		Fixed OFF	Fixed OFF	Fixed OFF	Any time
	9	Auto restart after power failure	Enables or disables the automatic restoration of operation after power failure (in the same mode as the unit was in before a power failure).	ON	ON	An alarm will be issued when power is restored after a power outage. The alarm will be reset when the power is turned off and then turned back on.	Automatically restores operation after power failure.	Required	Required	Required	Any time
	10	Model setting		OFF	OFF	Leave the setting as it is.		Fixed OFF	Fixed OFF	Fixed OFF	Any time

"-" in the table indicates that the function in the corresponding row will be disabled regardless of the actual switch setting.
The factory setting for these items is OFF.

* Connection to a BMS requires an installation of PAC-UKPRC001-CN-1(Third-Party Interface).
Use a BMS with insulation

SW2-7	SW2-8	SW2-9	Input from BMS
ON	OFF	ON	Target temperature
ON	ON	ON	Capacity
OFF	OFF	ON	Outdoor temperature

[4] Configuring the Settings

The settings must be set only by a qualified personnel.

1. System configuration

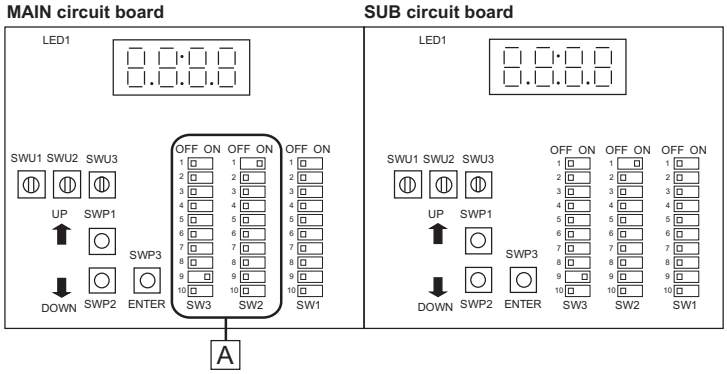
(1) Set the dip switches. (System setting)

Switch settings on the MAIN circuit

Set the dip switches (labeled A in the figure at right) that correspond to the items below, according to the local system.

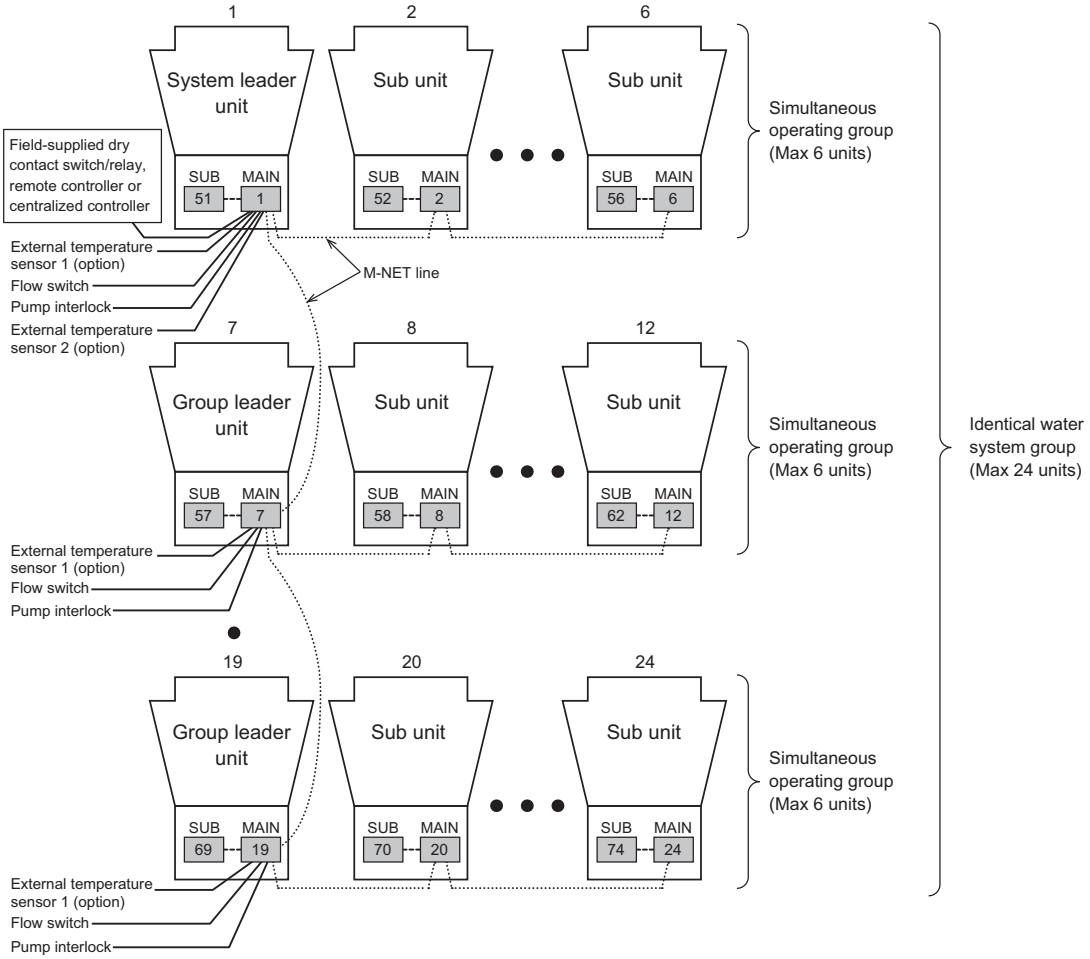
- Water temperature control based on the external water temperature reading
- Analog signals from a remote location

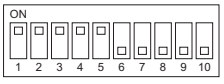
Refer to "Table of settings items" for further details. (Page 24)



(2) M-NET address setting

Example of address setting

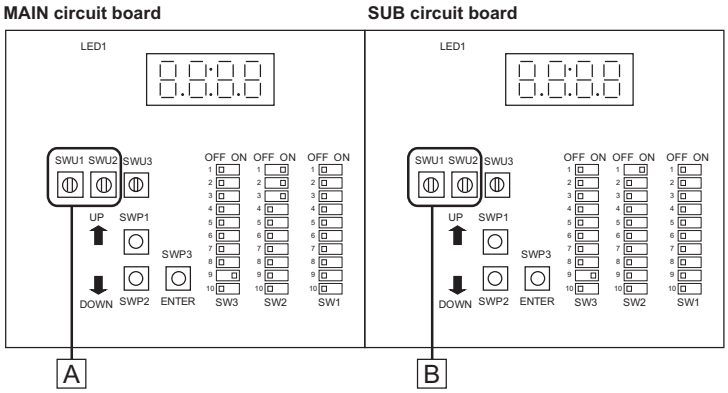




The figure at left shows that the switches 1 through 5 are set to ON and 6 through 10 are set to OFF.

Setting the switches on the system leader unit

Make sure the address of the MAIN circuit on the main unit is set to "1" (labeled A in the figure at right) and that the address of the SUB circuit on the main unit is set to "51" (labeled B in the figure at right).
The address of each SUB circuit should equal the sum of the MAIN circuit address on the same unit and 50.



Setting the switches on the group leader unit and the sub unit

MAIN circuit

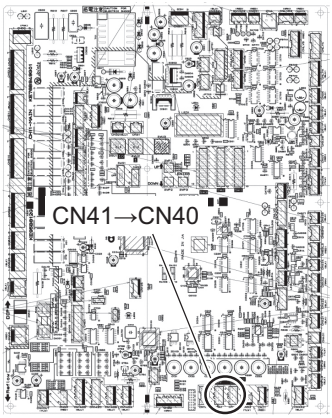
(1) Set the MAIN circuit addresses with the rotary switches. (labeled A in the figure). Set the 10's digit with SWU1, and set the 1's digit with SWU2. Assign sequential addresses to the MAIN circuit on all sub units starting with 2.

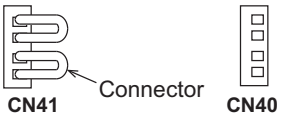
SUB circuit

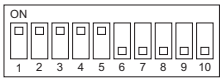
(2) Set the SUB circuit addresses with the rotary switches (labeled B in the figure). Set the 10's digit with SWU1, and set the 1's digit with SWU2. Assign sequential addresses to the SUB circuit on all sub units starting with 52.

(3) Set the M-NET power supply.

When connecting a system leader unit and a group leader unit to a multiple units connection system, the connector connected to CN41 on the MAIN circuit board (Address 1) must be disconnected and then connected to CN40.
*Leave the connector connected to CN41 when using an AE-200 as the centralized controller.

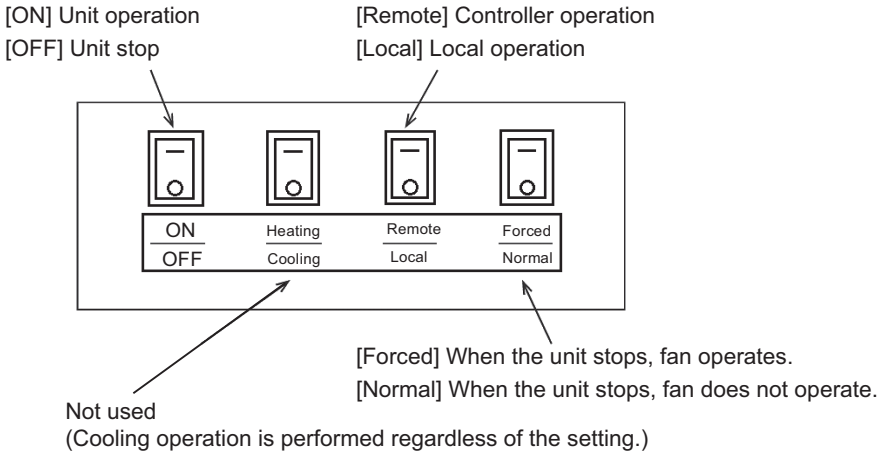


Address 1	All addresses other than Address 1
Move the connector from CN41 to CN40.	Leave the connector connected to CN41.
	



The figure at left shows that the switches 1 through 5 are set to ON and 6 through 10 are set to OFF.

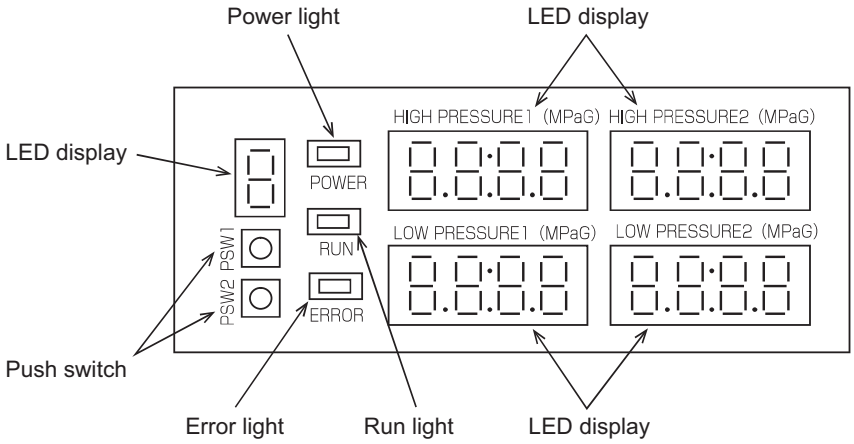
Selector switch settings for local operation

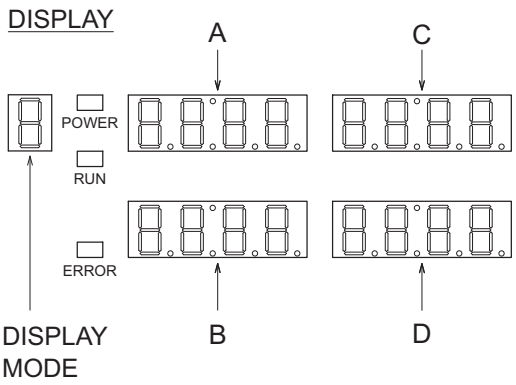


⚠ CAUTION

• Do not open the terminal cover, when selector switches are operated.

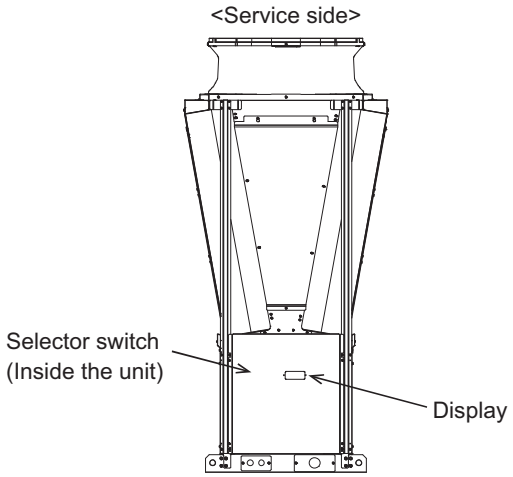
Display





DISPLAY MODE	A	B	C	D
0	Error code	Error detail code	Error module address	-
1	High pressure 1A (MPa)	Low pressure 1A (MPa)	High pressure 1B (MPa)	Low pressure 1B (MPa)
2	High pressure 2A (MPa)	Low pressure 2A (MPa)	High pressure 2B (MPa)	Low pressure 2B (MPa)
3	Inlet water temp. 1 (°C)	Inlet water temp. 2 (°C)	Outlet water temp. (°C)	Ambient temp. (°C)

The positions of the selector switch and the display



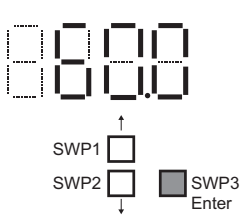
2. Making the setting value

Use the LED display and the three push switches (SWP1 (↑), SWP2 (↓), and SWP3 (Enter)) to change the current settings on the circuit board and to monitor various monitored values.

(1) Setting procedures

Take the following steps to set the push switches SWP1 through SWP3. These switches must be set after the dip switch SW1 has been set.

1)

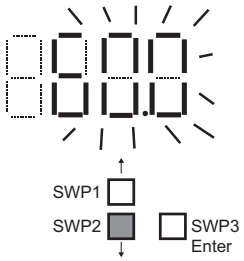


Normally a value of setting item appears on the display.

↓

Press SWP3 (Enter) to enable the configuration changes.

2)



The current setting value will blink.

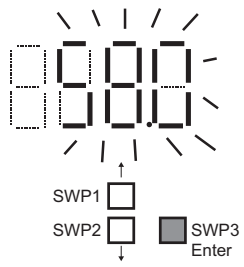
↓

The left figure shows that the current setting value is "60.0."

To decrease this value to 58.0, for example, press SWP2 (↓).

Press SWP1 (↑) to increase the value.

3)



When the desired value is displayed (58.0 in the example at left), press SWP3 (Enter).

↓

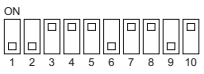
The displayed value will stop blinking and stay lit.

A lit LED indicates that the new setting has been saved.

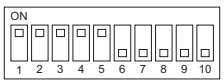
* Pressing SWP1 (↑) or SWP2 (↓) will change the blinking setting value, but the change will not be saved until SWP3 (Enter) is pressed.
  Press and hold SWP1 (↑) or SWP2 (↓) for one second or longer to fast forward through the numbers.

(2) Table of settings items

Set the dip switch SW1 as shown in the table below to set the value for the items in the "Setting item" column.

No.	Rotary switch (SWU3)	Dip switch setting (SW1) *1	Setting Item	Default	Need or non-need to set the setting *2						Notes *4
					System		Group		Sub		
					M	S	M	S	M	S	
1	1		Setting temp 1 (Cooling mode)	7ºC	○	—	—	—	—	—	Range 5–30ºC (41–86ºF)
2	1		Setting temp 2 (Cooling mode)	7ºC	○	—	—	—	—	—	Range 5–30ºC (41–86ºF)
3	1		Peak-demand control signal input source	0	○	—	—	—	—	—	0: Dry contact 1: PAR-W31MAA 2: AE-200
4	1		Maximum peak-demand capacity	100%	○	—	—	—	—	—	Range 60-100%
5	1		Preset temp. A (Cooling)	5ºC	○	—	—	—	—	—	Range 5–30ºC (41–86ºF)
6	1		Preset temp. B (Cooling)	30ºC	○	—	—	—	—	—	Range 5–30ºC (41–86ºF)
7	1		Drain pan heater operation outdoor temp	0ºC	○	—	○	—	○	—	Range -40–20ºC (-40–68ºF)
8	1		Thermo differential 1 (Cooling mode) *3	3ºC	○	—	○	—	○	—	Range 0.2–5ºC (0.4–9ºF)
9	1		Thermo differential 2 (Cooling mode) *3	2ºC	○	—	○	—	○	—	Range 0.2–5ºC (0.4–9ºF)
10	1		Year setting	-	○	—	—	—	—	—	
11	1		Month/Date setting	-	○	—	—	—	—	—	
12	1		Current time	-	○	—	—	—	—	—	

*1: Do not apply undue force when changing the Dip switch settings as this may cause malfunctions.
*2: System: System leader unit
Group: Group leader unit
Sub: Sub unit
M: MAIN circuit
S: SUB circuit
*3: It cannot be set in Fahrenheit.



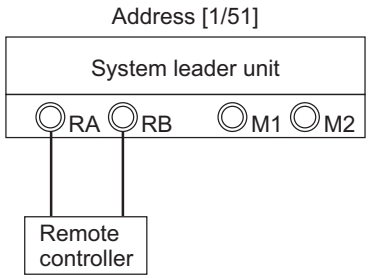
The figure at left shows that the switches 1 through 5 are set to ON and 6 through 10 are set to OFF.

3. Setting procedures

(1) Example of system setting

<1>Making the settings for the initial start-up process

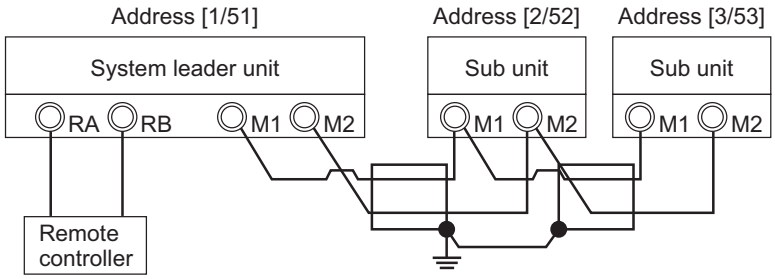
(A) Single unit



Setting address 1
1) Turn off the power.
2) System leader unit (Address 1 SW2-2, 2-3: ON)
3) Turn the power back on.
Address 1 → LED display [EEEE]
Address 51 → LED display [9999]
4) SWU3: Press and hold F and ENTER for 5 seconds.
(Initializes the system)
Address 1 → LED display [9999]
Address 51 → LED display [9999]
5) Start-up process complete
Address 1 → LED display [____||_|]
Address 51 → LED display [____||_|]
6) SWU3: 0

*No settings are required for address 51.

(B) One system leader unit and two sub units (1 group, 3 units in the group)



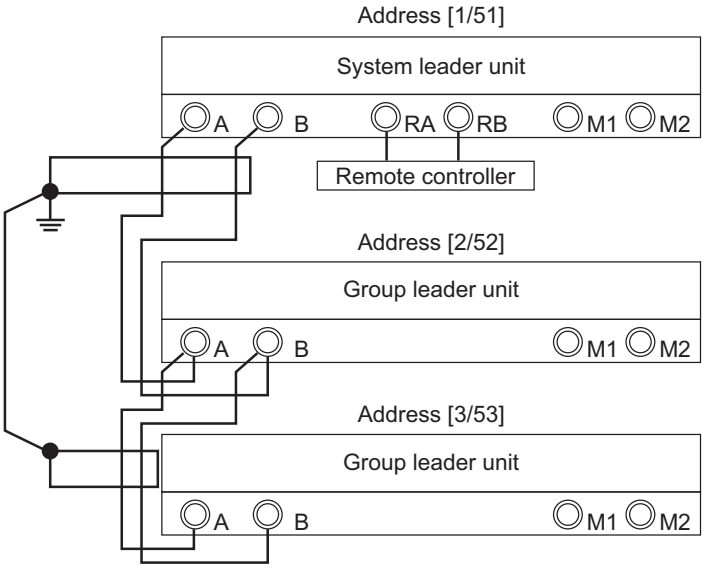
Setting address 1
1) Turn off the power.
2) System leader unit (Address 1 SW2-2, 2-3: ON)
3) Turn the power back on.
Address 1 → LED display [EEEE]
Address 51 → LED display [9999]
4) Setting the number of units for the group
SWU3: 1
SW1: 1, 2, 3, 4, 8, 10 ON
Press ENTER once.
↓
Address 1 → LED display [1]
↓
Press UP twice.
↓
Address 1 → LED display [3]
↓
Press ENTER once.
SW1 all OFF

*The default setting for the number of units in a group is 1.
The maximum number of units per group is 6.

5) SWU3: Press and hold F and ENTER for 5 seconds.
(Initializes the system)
Address 1 → LED display [9999]
Address 51 → LED display [9999]
6) Start-up process complete
Address 1 → LED display [____||_|]
Address 51 → LED display [____||_|]
7) SWU3: 0

*No settings are required for any address other than for address 1.

(C) System leader unit and group leader unit (3 groups, 1 unit in each group)



(1) Setting address 1
1) Turn off the power.
2) System leader unit (Address 1 SW2-2, 2-3: ON)
3) Turn the power back on.
Address 1 → LED display [EEEE]
Address 51 → LED display [9999]
4) Setting the number of units for each group
*The default setting for the number of units in a group is 1.

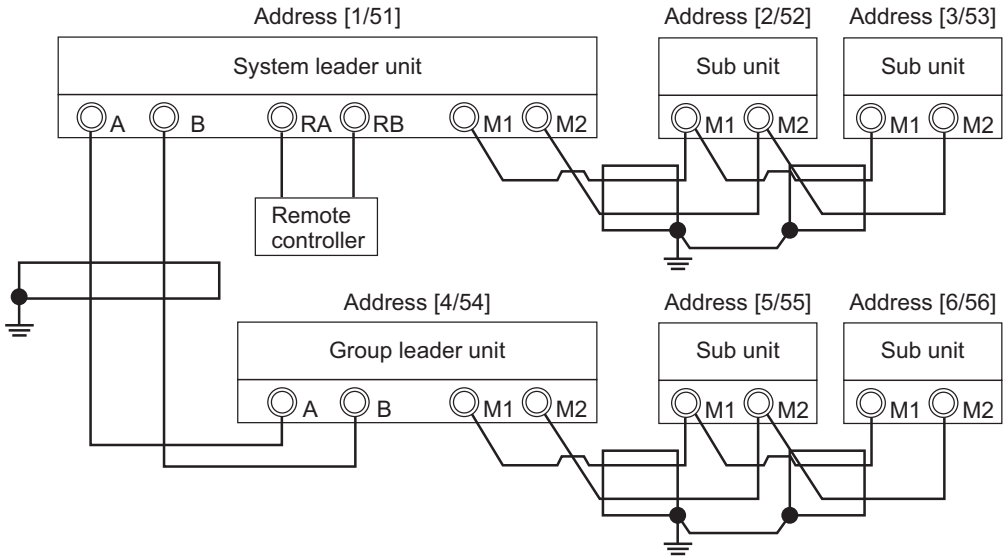
5) Setting the number of groups
SWU3: 1
Press ENTER once.
SW1: 5, 8, 10 ON
↓
Address 1 → LED display [1]
↓
Press UP twice.
↓
Address 1 → LED display [3]
↓
Press ENTER once.
SW1 all OFF
*The default setting for the number of units in a group is 1.
The maximum number of groups is 24.

(2) Setting address 2
6) Turn off the power.
7) Group leader unit (SW2-2: ON)
8) Turn the power back on.
Address 2 → LED display [EEEE]
Address 52 → LED display [9999]
9) Setting the number of units for each group
*The default setting for the number of units in a group is 1.

10) SWU3: Press and hold F and ENTER for 5 seconds.
(Initializes the system)
Address 2 → LED display [9999]
Address 52 → LED display [9999]
Start-up process complete
Address 2 → LED display [9999]
Address 52 → LED display [____||_|]
*Address 3 (Group leader unit) is set in the same way as above.)

(3) Setting address 1 (second time)
11) SWU3: Press and hold F and ENTER for 5 seconds.
(Initializes the system. System leader unit initialized last)
Address 1 → LED display [9999]
Address 51 → LED display [9999]
Start-up process complete
Address 1 → LED display [____||_|]
Address 51 → LED display [____||_|]
12) SWU3: 0

(D) System leader unit, Group leader unit and Sub unit (2 groups, 3 units in each group)



(1) Setting address 1
1) Turn off the power.
2) System leader unit (Address 1 SW2-2, 2-3: ON)
3) Turn the power back on.
Address 1 → LED display [EEEE]
Address 51 → LED display [9999]
4) Setting the number of units for each group
SWU3: 1
Press ENTER once.
SW1: 1, 2, 3, 4, 8, 10 ON
↓
Address 1 → LED display [1]
↓
Press UP twice.
↓
Address 1 → LED display [3]
↓
Press ENTER once.
SW1 OFF
*The default setting for the number of units in a group is 1.
The maximum number of units per group is 6.
5) Setting the number of groups
SWU3: 1
Press ENTER once.
SW1: 5, 8, 10 ON
↓
Address 1 → LED display [1]
↓
Press UP twice.
↓
Address 1 → LED display [2]
↓
Press ENTER once.
SW1 OFF
*The default setting for the number of units in a group is 1.
The maximum number of units per group is 24.

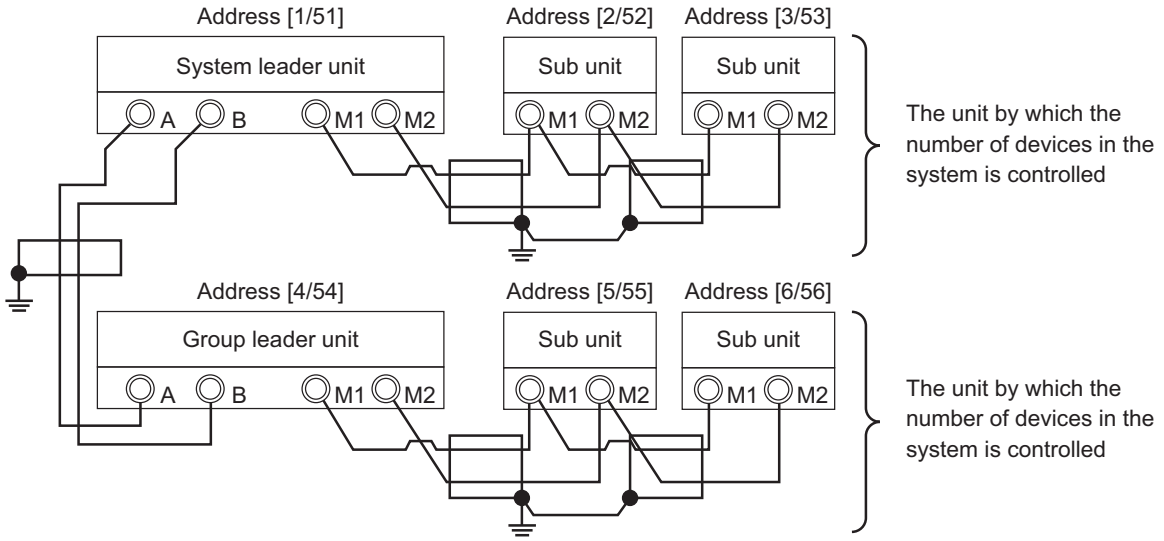
(2) Setting address 4
6) Turn off the power.
7) Group leader unit (SW2-2: ON)
8) Turn the power back on.
Address 4 → LED display [EEEE]
Address 54 → LED display [9999]
9) Setting the number of units for each group
SWU3: 1
Press ENTER once.
SW1: 1, 2, 3, 4, 8, 10 ON
↓
Address 4 → LED display [1]
↓
Press UP twice.
↓
Address 4 → LED display [3]
↓
Press ENTER once.
SW1 OFF
*No group number settings are required for address 4 (Group leader unit).
10) SWU3: Press and hold F and ENTER for 5 seconds.
(Initializes the system)
Address 4 → LED display [9999]
Address 54 → LED display [9999]
Start-up process complete
Address 4 → LED display [9999]
Address 54 → LED display [____||_|]

(3) Setting address 1 (second time)
11) SWU3: Press and hold F and ENTER for 5 seconds.
(Initializes the system. System leader unit initialized last)
Address 1 → LED display [9999]
Address 51 → LED display [9999]
Start-up process complete
Address 1 → LED display [____||_|]
Address 51 → LED display [____||_|]
12) SWU3: 0
*No settings are required for any address other than for addresses 1 and 4.

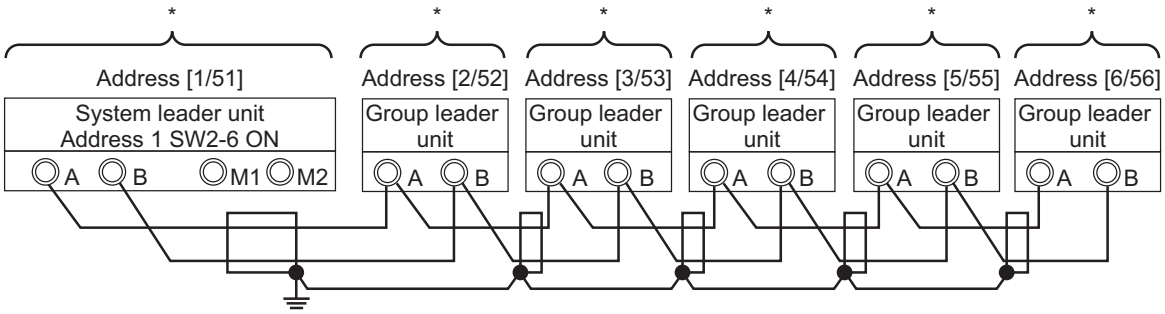
<2>Multiple unit control

By setting SW2-6 to ON for address 1, optimum control of number of operating units will be performed.
All units will simultaneously operate when SW2-6 is set to OFF.

(A) System leader unit, group leader unit, and sub unit

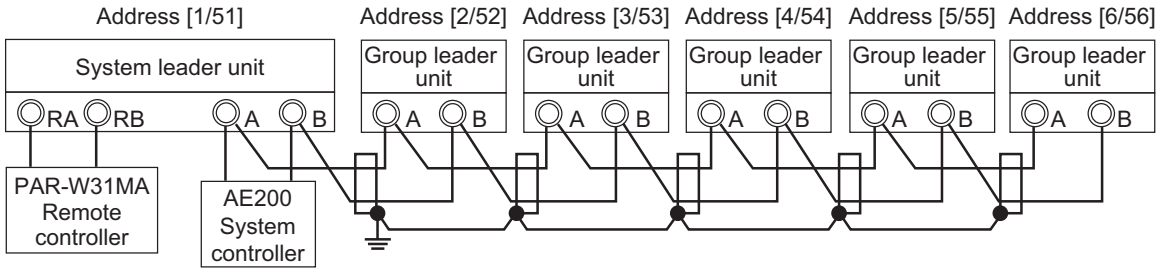


(B) System leader unit and group leader unit



*The unit by which the number of devices in the system is controlled

<3>Example of system configuration
Optimum control of number of operating units

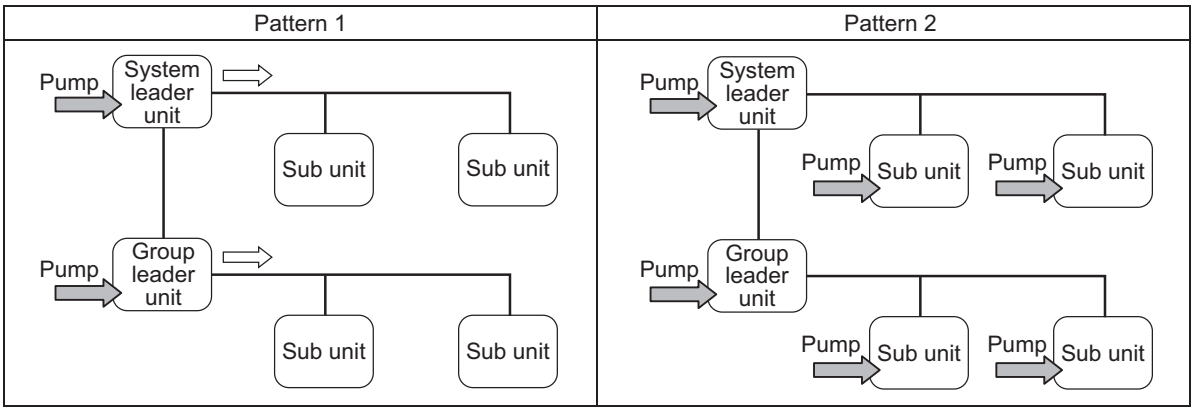


Settings table

Setting item	SWU3	DIP SW	SW1	Setting timing	System leader unit		Simultaneous operation Group leader unit		Simultaneous operation Group leader unit		Simultaneous operation Group leader unit		Simultaneous operation Group leader unit		Simultaneous operation Group leader unit	
					1		2		3		4		5		6	
					MAIN	SUB	MAIN	SUB	MAIN	SUB	MAIN	SUB	MAIN	SUB	MAIN	SUB
M-NET address	-	-	-	At a reset	1	51	2	52	3	53	4	54	5	55	6	56
M-NET power supply	-	-	-	-	CN40	CN41	CN41	CN41	CN41	CN41	CN41	CN41	CN41	CN41	CN41	CN41
System settings	-	2-2	-	At a reset	ON	-	ON	-	ON	-	ON	-	ON	-	ON	-
	-	2-3	-	At a reset	ON	-	OFF	-	OFF	-	OFF	-	OFF	-	OFF	-
Number of groups	1	-	ON 1 2 3 4 5 6 7 8 9 10	At a reset	6	-	1	-	1	-	1	-	1	-	1	-
Number of units per group	1	-	ON 1 2 3 4 5 6 7 8 9 10	At a reset	1	-	1	-	1	-	1	-	1	-	1	-
Multiple unit control	-	2-6	-	At a reset	ON	-	OFF	-	OFF	-	OFF	-	OFF	-	OFF	-

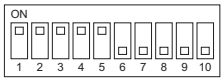
*The shaded cells indicate the settings that requires changes from the default settings.
*Some settings require the following after the settings were changed: A power reset, or setting SWU3 to F, and pressing and holding ENTER for 5 seconds.
*When using an AE-200 as the centralized controller, leave the M-NET power supply connector as it is. (Refer to page 21)

<4>Setting the pump system



Setting item	SWU3	DIPSW	SW1	Factory setting		Note
				MAIN	SUB	
Pump setting	1	-	ON 1 2 3 4 5 6 7 8 9 10	0	-	0: Pattern 1, 1: Pattern 2

*Pump settings must be made on the MAIN circuit on all units.



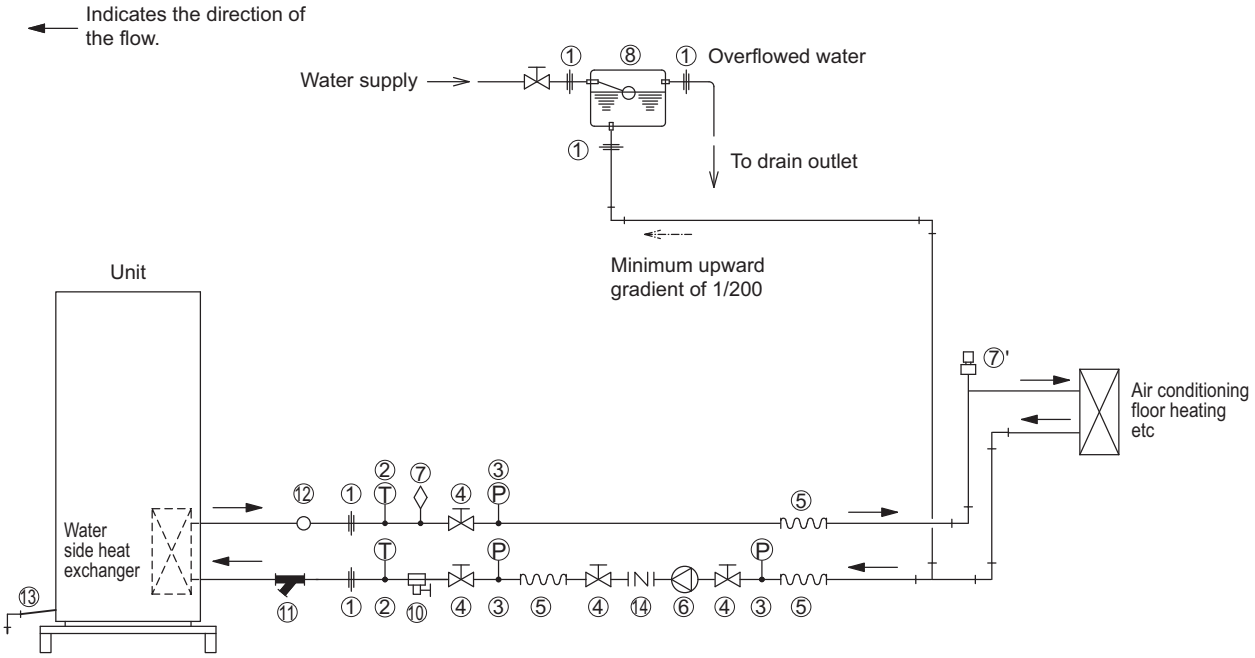
The figure at left shows that the switches 1 through 5 are set to ON and 6 through 10 are set to OFF.

[5] Water Pipe Installation

[1] Schematic Piping Diagram and Piping System Components

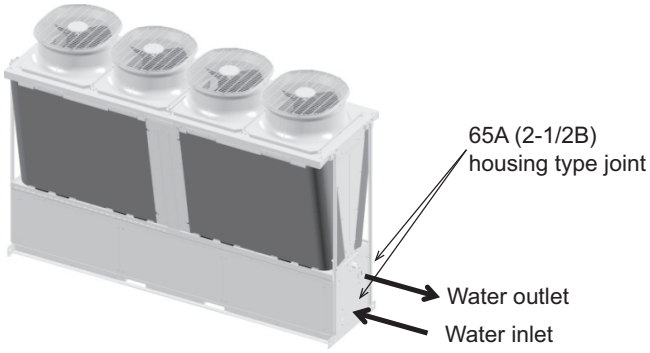
Water circuit

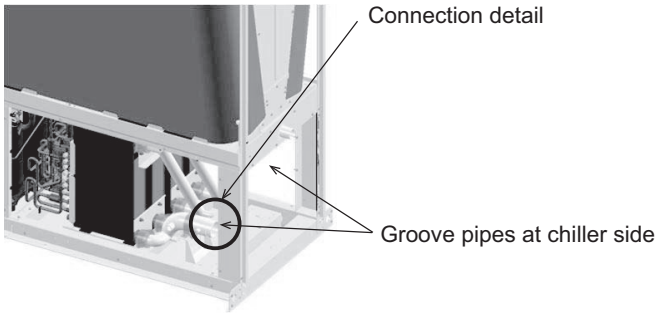
Please build the water circuit so that it is a closed system.
Do not use water directly for showers or other applications. Do not allow other heat source water to mix with the water circuit. Build a water circuit as inlet water temperature fluctuation is within 5ºC [9ºF]/10 minutes.

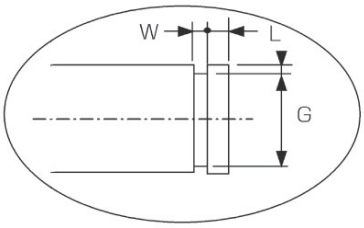


① Union joints/flange joints	Required to allow for a replacement of equipment.
② Thermometer	Required to check the performance and monitor the operation of the units.
③ Water pressure gauge	Recommended for checking the operation status.
④ Valve	Required to allow for a replacement or cleaning of the flow adjuster.
⑤ Flexible joint	Recommended to prevent the noise and vibration from the pump from being transmitted.
⑥ Pump	Use a pump that is large enough to compensate for the total water pressure loss and supply sufficient water to the unit.
⑦ Air vent valve	Install air venting valves to the places where air can accumulate. Automatic air vent valves (such as ⑦') are effective.
⑧ Expansion tank	Install an expansion tank to accommodate expanded water and to supply water.
⑨ Water pipe	Use pipes that allow for easy air purging, and provide adequate insulation.
⑩ Drain valve	Install drain valves so that water can be drained for servicing.
⑪ Strainer	Install a strainer near the unit to keep foreign materials from entering the water-side head exchanger.
⑫ Flow switch	Required to protect the unit.
⑬ Drain pipe	Install the drain pipe with a downward inclination of between 1/100 and 1/200. To prevent drain water from freezing in winter, install the drain pipe as steep an angle as practically possible and minimize the straight line. For cold climate installation, take an appropriate measure (e.g., drain heater) to prevent the drain water from freezing.
⑭ Check valve	Required to prevent the backward flow.

[2] Standard piping type

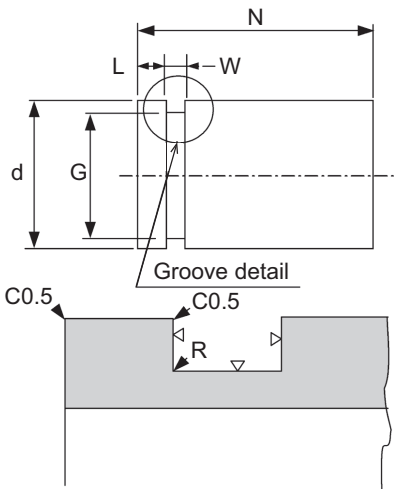






The dimension of the groove pipe at the chiller side

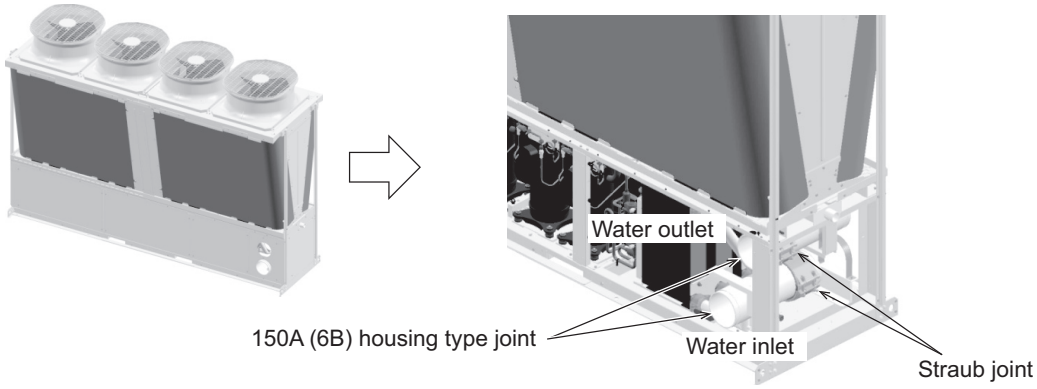
Victaulic standard groove specifications

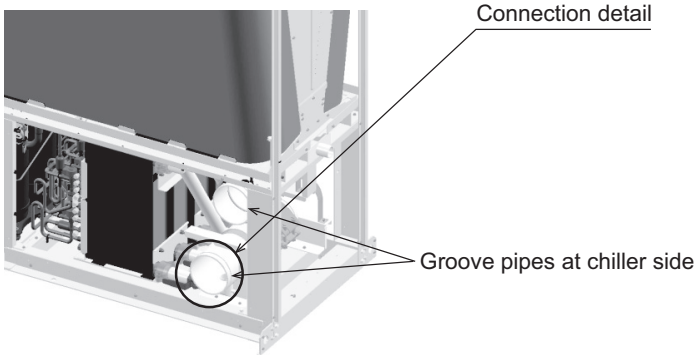


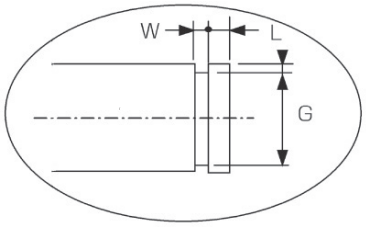
<Unit: mm (in.)>

	Pipe size
	65A (2-1/2B)
d	ø76.1 (ø3)
G	ø72.2 $^{+0}_{-0.4}$ (ø2-7/8$^{+0}_{-1/16}$)
W	8.7 $^{+0}_{-0.7}$ (3/8 $^{+0}_{-1/16}$)
L	15.88 $^{+0}_{-0.7}$ (11/16 $^{+0}_{-1/16}$)
N	50 (2)
R	1.0 (1/16)

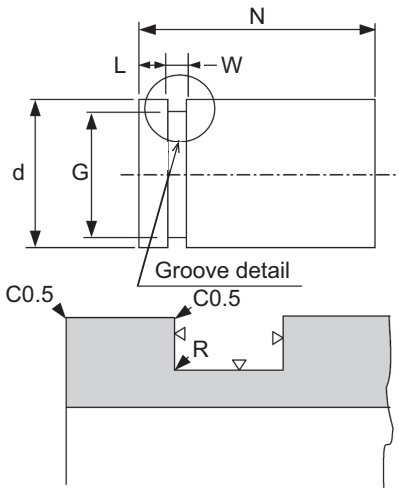
[3] Inside header piping type





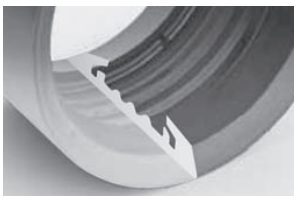


The dimension of the groove pipe at the chiller side



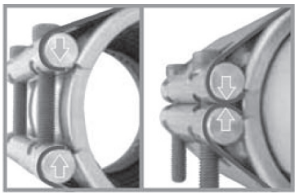
<Unit: mm (in.)>

	Pipe size
	150A (6B)
d	ø165.1 (ø6-1/2)
G	ø160.8 (ø6-3/8)
W	$8.7^{+0.7}_{-0}$ (3/8 $^{+1/16}_{-0}$)
L	$15.9^{+0.7}_{-0}$ (11/16$^{+1/16}_{-0}$)
N	50.0 (2)
R	1.0 (1/16)

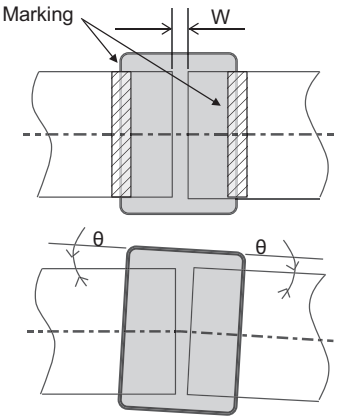


The seal rubber has a lip construction to improve water stopping performance.

Adjust the Straub position to that the marking on both sides is visible.



The bolts need only be tightened until the casing is sealed (metal touches). Consequently, the procedure can be carried out accurately by anyone to the same level, regardless of worker proficiency or the type of pipe.



- Allowable tolerance for gaps and tilting
  Pipe gap tolerance [W]: 0 to 25 mm (0 to 1 in)
  Allowable pipe tilt angle [θ]: ±2°

[4] Notes on pipe corrosion

Water processing and water quality control

Poor-quality circulating water can cause the water-side heat exchanger to scale up or corrode, reducing heat-exchange performance. Properly control the quality of the circulating water.

♦Removing foreign objects and impurities in the pipes

During installation, keep foreign objects, such as welding and sealant fragments and rust, out of the pipes.

♦Water Quality Control

(1) Poor-quality water can corrode or scale up the heat exchanger. Regular water treatment is recommended.
Water circulation systems using open heat storage tanks are particularly prone to corrosion.
When using an open heat storage tank, install a water-to-water heat exchanger, and use a closed-loop circuit.
If a water supply tank is installed, keep contact with air to a minimum, and keep the level of dissolved oxygen in the water no higher than 1 mg/ ℓ.

(2) Water quality standard

Items			Lower mid-range temperature water system Water Temp. ≤ 60ºC (140ºF)		Higher mid-range temperature water system Water Temp. > 60ºC (140ºF)		Tendency	
			Recirculating water	Make-up water	Recirculating water	Make-up water	Corrosive	Scale-forming
Standard items	pH (25ºC (77ºF))		7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	○	○
	Electric conductivity	(mS/m) (25ºC (77ºF))	30 or less	30 or less	30 or less	30 or less	○	○
		(μs/cm) (25ºC (77ºF))	[300 or less]	[300 or less]	[300 or less]	[300 or less]		
	Chloride ion	(mg Cl^-/ℓ)	50 or less	50 or less	30 or less	30 or less	○	
	Sulfate ion	(mg $SO4^{2-}$/ℓ)	50 or less	50 or less	30 or less	30 or less	○	
	Acid consumption (pH4.8)	(mg $CaCO_3$/ℓ)	50 or less	50 or less	50 or less	50 or less		○
	Total hardness	(mg $CaCO_3$/ℓ)	70 or less	70 or less	70 or less	70 or less		○
	Calcium hardness	(mg $CaCO_3$/ℓ)	50 or less	50 or less	50 or less	50 or less		○
	Ionic silica	(mg SiO_2/ℓ)	30 or less	30 or less	30 or less	30 or less		○
Reference items	Iron	(mg Fe/ℓ)	1.0 or less	0.3 or less	1.0 or less	0.3 or less	○	○
	Copper	(mg Cu/ℓ)	1.0 or less	1.0 or less	1.0 or less	1.0 or less	○	
	Sulfide ion	(mg S^{2-}/ℓ)	Not to be detected	Not to be detected	Not to be detected	Not to be detected	○	
	Ammonium ion	(mg NH_4^+/ℓ)	0.3 or less	0.1 or less	0.1 or less	0.1 or less	○	
	Residual chlorine	(mg Cl/ℓ)	0.25 or less	0.3 or less	0.1 or less	0.3 or less	○	
	Free carbon dioxide	(mg CO_2/ℓ)	0.4 or less	4.0 or less	0.4 or less	4.0 or less	○	
	Ryzner stability index		—	—	—	—	○	○

Reference: Guideline of Water Quality for Refrigeration and Air Conditioning Equipment. (JRA GL02E-1994)

(3) Please consult with a water quality control specialist about water quality control methods and water quality calculations before using anti-corrosive solutions for water quality management.

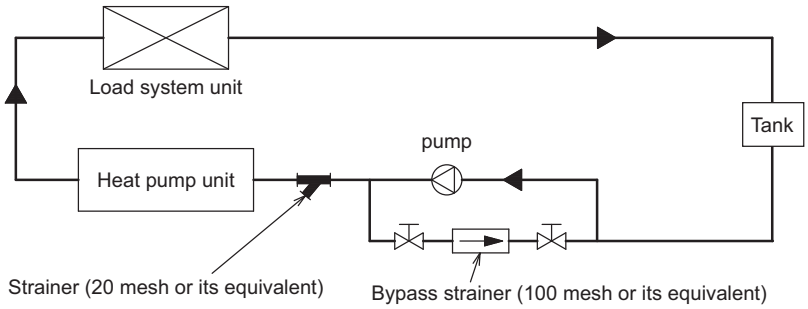
(4) When replacing a chilling unit (including when only the heat exchanger is replaced), first analyze the water quality and check for possible corrosion.
Corrosion can occur in water systems in which there has been no signs of corrosion. If the water quality level has dropped, adjust the water quality before replacing the unit.

(5) Suspended solids in the water

Sand, pebbles, suspended solids, and corrosion products in water can damage the heating surface of the heat exchanger and cause corrosion. Install a good quality strainer (20 mesh or better) at the inlet of the unit to filter out suspended solids.

Removing foreign substances from the water system

Consider installing a settlement tank or a bypass strainer to remove foreign substances from the water system. Select a strainer capable of handling two to three percent of the circulating water. The figure below shows a sample system with a bypass strainer.



(6) Connecting pipes made from different materials

If different types of metals are placed in direct contact with each other, the contact surface will corrode. Install an insulating material between pipes that are made of different materials to keep them out of direct contact with each other.

(7) Piping material

Use hot water output piping material that can withstand heat of 60°C [140°F] or more. Use hot water input piping material that can withstand the maximum input water temperature. All piping must be made of SUS or similar material to withstand corrosion.

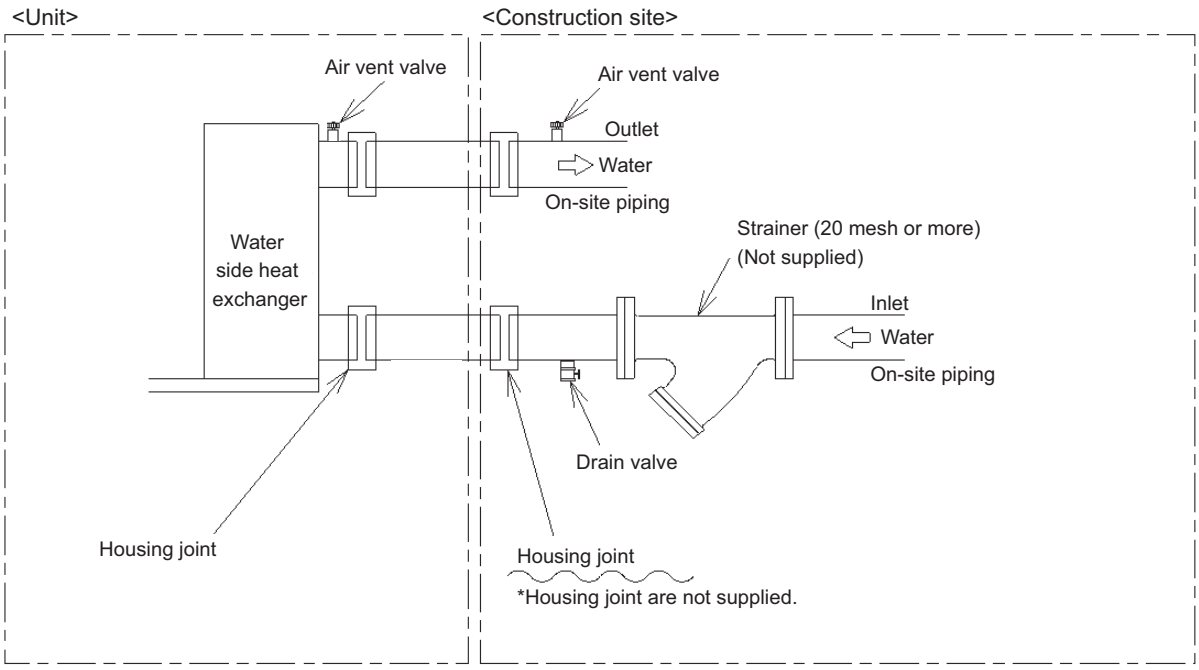
[5] Installing the Strainer and Flow Switch

1. Installing the strainer

Install a strainer on the inlet pipe near the unit to filter out suspended solids and prevent clogging or corrosion of the heat exchanger.

Install a strainer in a way that allows for easy access for cleaning, and instruct the user to clean it regularly.

Operating the units with a clogged strainer may cause the units to make an abnormal stop. Select a location to install a strainer, taking into consideration the installation angle, insulation thickness, and maintenance space.



2. Installing a flow switch

Install a flow switch that meets the following specifications on the water pipe.

Connect the flow switch to the flow switch contact on the unit.

Minimum flow rate = 12.9 m³/h [56.8 GMP]

Unit usage range (water flow rate): 12.9 - 34.0 m³/h [56.8 - 149.7 GMP]

[6] Installing the external water temperature sensor

<1> Parts that are required to install an external water temperature sensor

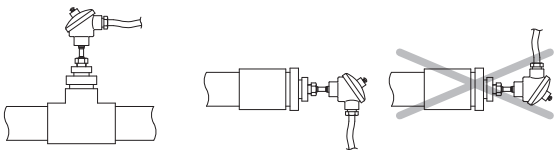
(1) External water temperature sensor
(2) Wiring to connect the sensor and the unit*
(3) Wiring terminals to connect the wiring to the sensor and the terminal block on the unit
(Four for M4 screws)*
*Items (1) and (2) are field supplied.

Wire specifications

Wire size	2-core cable Min. 1.25 mm^2
Type	CVVS or CPEVS
Maximum length	20 m (66 ft)

<2> Installing the external water temperature sensor

- Install the external water temperature sensor where the water pipes merge or on the load-side tank as shown in the figure at right.
- Install horizontally or vertically on top of the pipe.
- When installing horizontally, make sure the wire faces down.

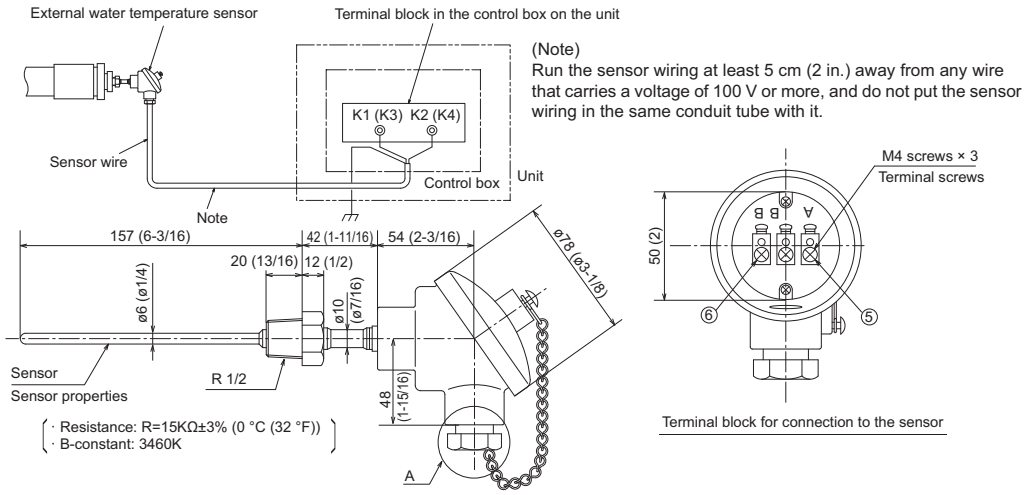


Vertical installation　　Horizontal installation

<3> Wiring the external water temperature sensor

Connect the external temperature sensor wiring to the terminal block in the control box on the unit as shown in the figure below.

<Unit: mm (in.)>

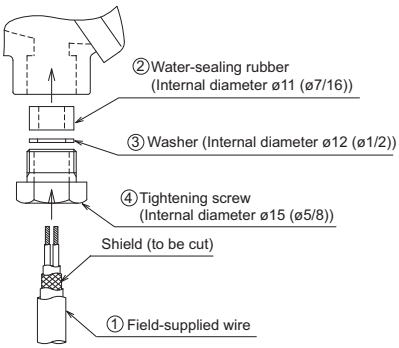


Connect the sensor wiring to terminals K1 and K2 (or K3 and K4) of the terminal block in the control box on the unit.

Connect the shield to the earth terminal.

Thread the wire to the external water temperature sensor through parts ② through ④ as shown in the figure at right. Attach M4 terminals (field-supplied) to the wires, and connect them to ⑤ and ⑥ (terminals A and B).

Cut the shield wire. Do not connect it to the terminal. (Connect the shield on the unit side to the ground terminal.)



Detailed view of the area labeled "A" in the figure above

After the wire is connected, securely tighten the tightening screw ④, and then caulk the gap between the wire ① and the tightening screw to keep water from entering.

*1 In a multiple module connection system, install the temperature sensor where the cold/hot water from each module is sufficiently mixed to provide a representative temperature.
*2 The temperature sensor must be installed on a pipe between the outlet of the unit and the entrance to the load-side system.
*3 Install the sensor at least 5D (D: pipe diameter) away from pipe bends and other areas that can obstruct the normal water flow and so that the sensing probe (protective tube) will not vibrate from the whirl or shock flow.
*4 The sensor is for use at a flow rate of 3 m/sec or below.

[7] Ensuring enough water in the water circuit

<1> Required amount of water

If the amount of water in the water circuit (circulating water circuit) is insufficient, the unit operation hours may become shorter or the amount of water temperature change to be controlled may become extremely large. Also, the defrost operation during the heating mode may not function properly. Refer to the table below for the minimum amount of water required in the circuit. If the water pipe is too short to keep enough amount of water, install a cushion tank in the water pipe to ensure enough amount of water.

Model	Minimum amount of water <ℓ (gal)>
EACV-P040,050YBL	800 (211)

<2> Calculating the required amount of water in the water circuit

The required amount of water in the water circuit can be obtained from the following formula.

(Required amount of water in the water circuit) = (Amount of water that can be held in the water pipe) + (Amount of water that can be held in the heat source unit) + (Amount of water that can be held in the load-side unit)

The amount of water that can be held per meter of the water pipe <ℓ/m (gal/ft)>

Pipe size					
2 1/2B (65A)	3B (80A)	4B (100A)	5B (125A)	6B (150A)	8B (200A)
3.77 (0.30)	5.16 (0.42)	8.87 (0.71)	13.23 (1.07)	18.91 (1.52)	32.44 (2.61)

The amount of water that can be held in the heat source unit <ℓ (gal)>

Standard	Inside header piping type
27 (7.1)	68 (18.0)

<3> Inlet/Outlet pipe connection size and material

The table below shows the inlet/outlet pipe connection size.

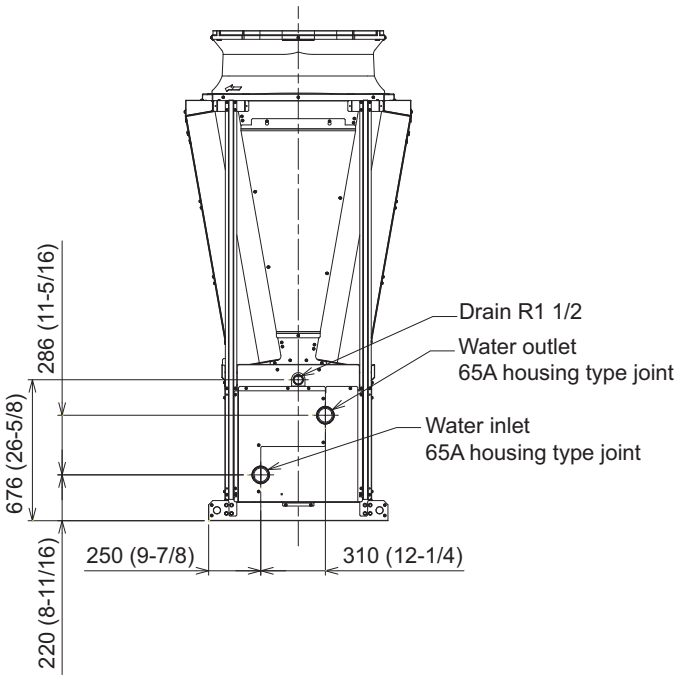
Inlet/Outlet pipe connection size

Piping type	Inlet pipe connection	Outlet pipe connection
Standard	65A (2-1/2B) housing type joint (Field-supplied Victaulic joint)	65A (2-1/2B) housing type joint (Field-supplied Victaulic joint)
Inside header piping type	150A (6B) housing type joint (Field-supplied Victaulic joint)	150A (6B) housing type joint (Field-supplied Victaulic joint)

[8] Water Piping Size and Location

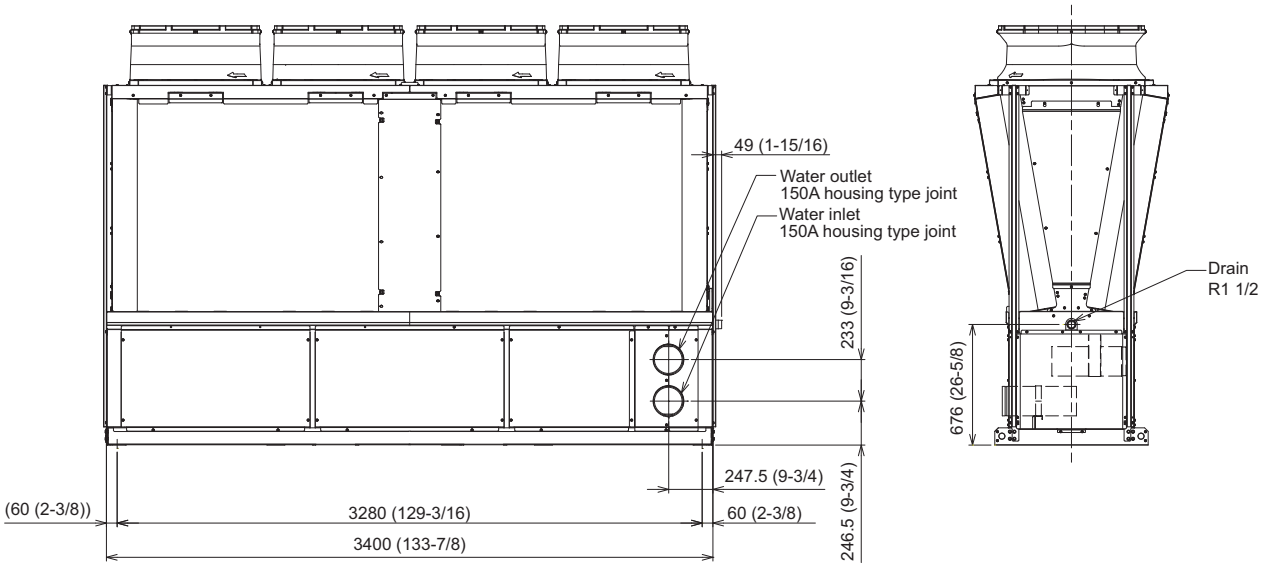
1. Standard piping type

<Unit: mm (in.)>



2. Inside header piping type

<Unit: mm (in.)>

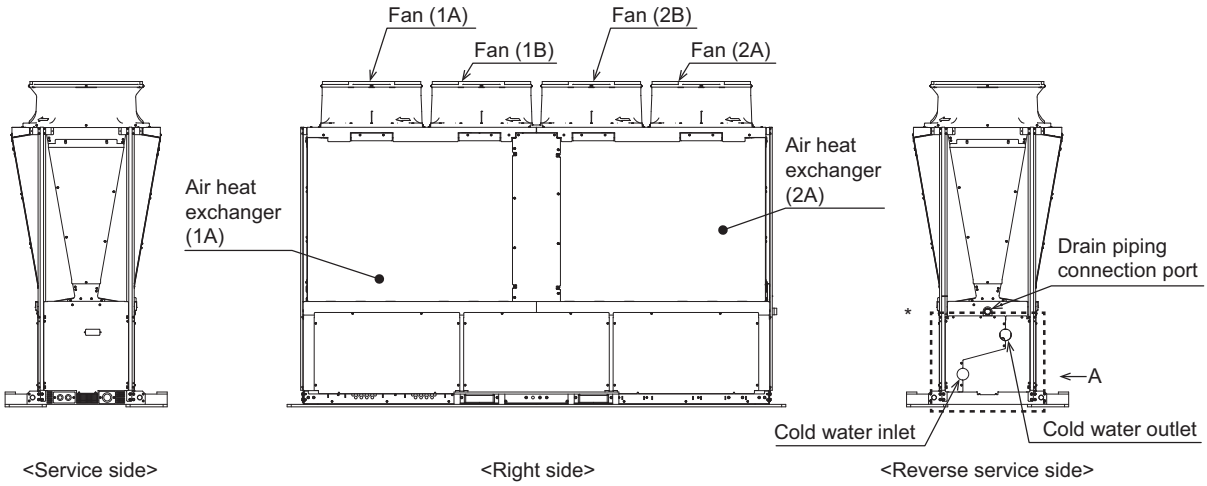


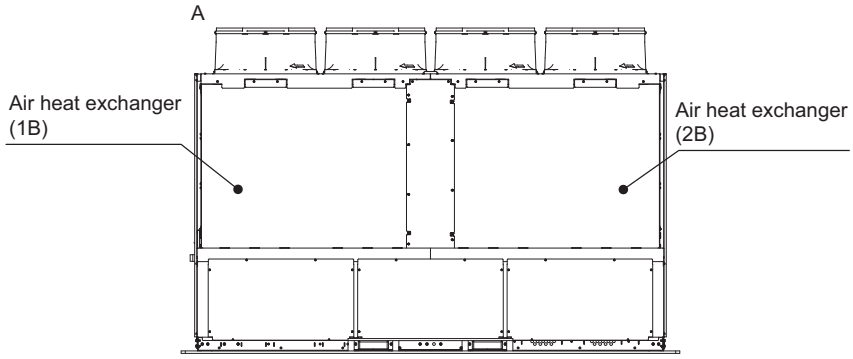
III Unit Components

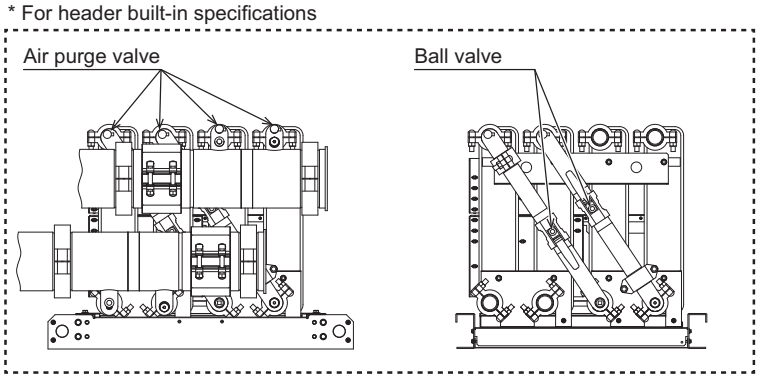
[1] Unit Components and Refrigerant Circuit 41
[2] Control Box of the Unit 43
[3] Unit Circuit Board 45

[1] Unit Components and Refrigerant Circuit

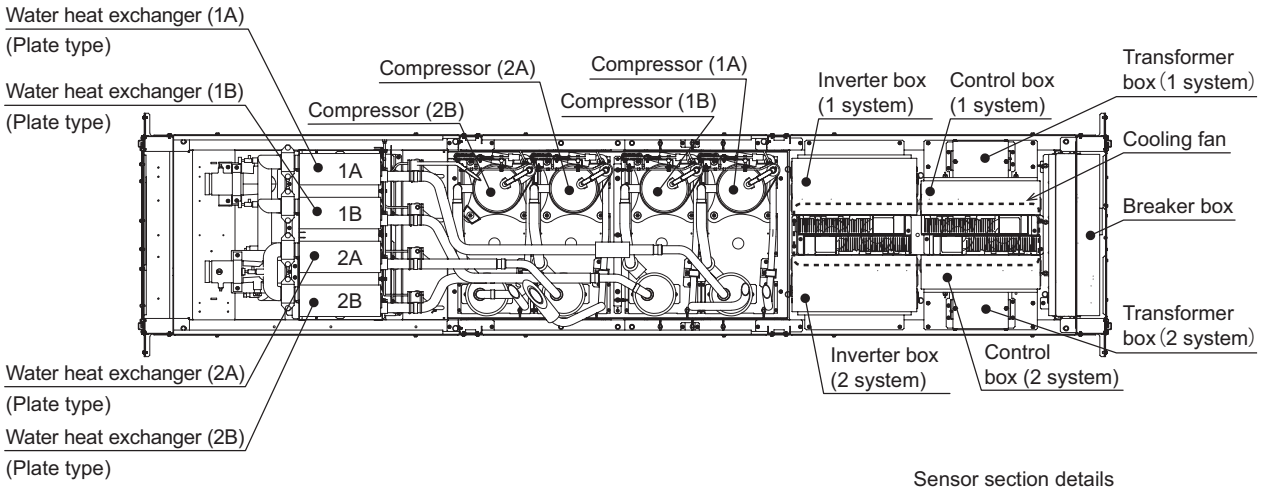
1. Unit Components

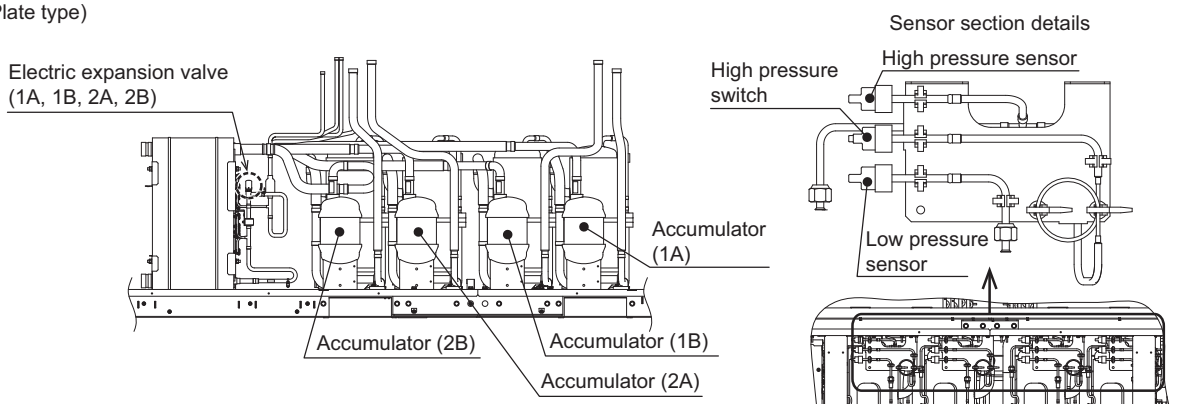


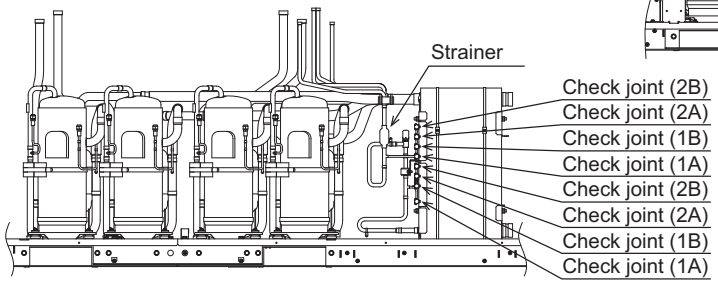




2. Refrigerant circuit

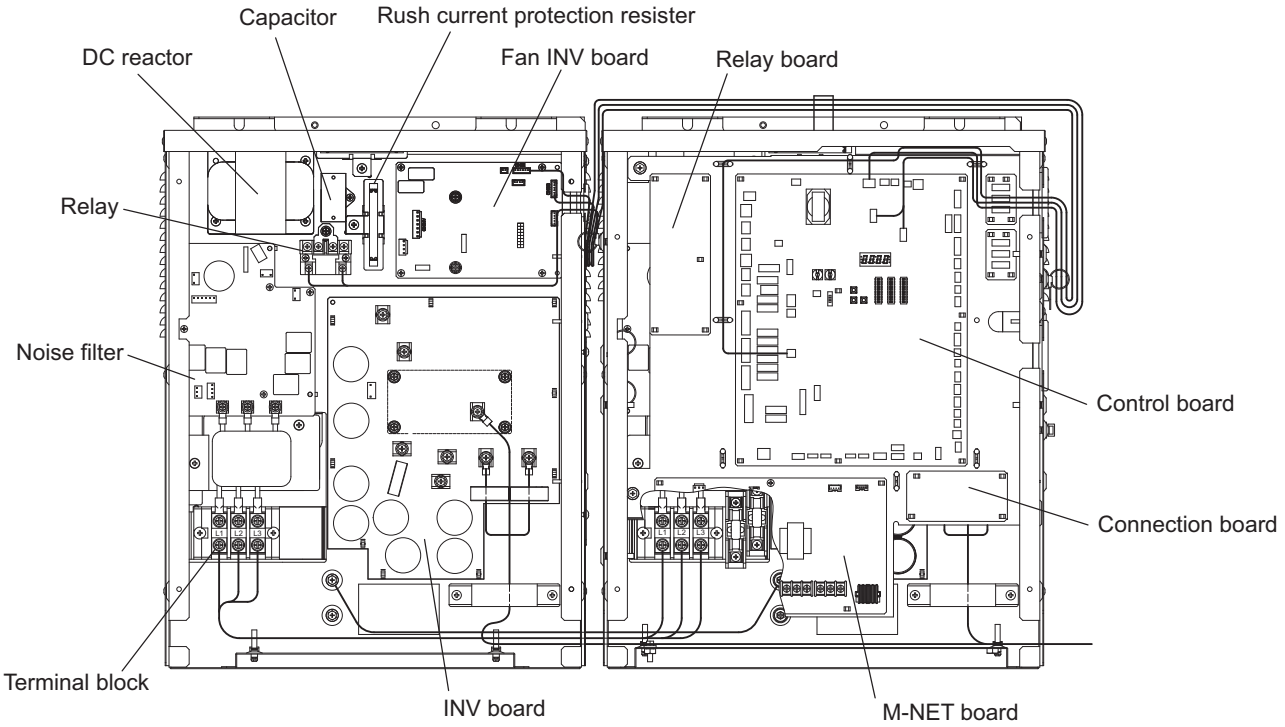




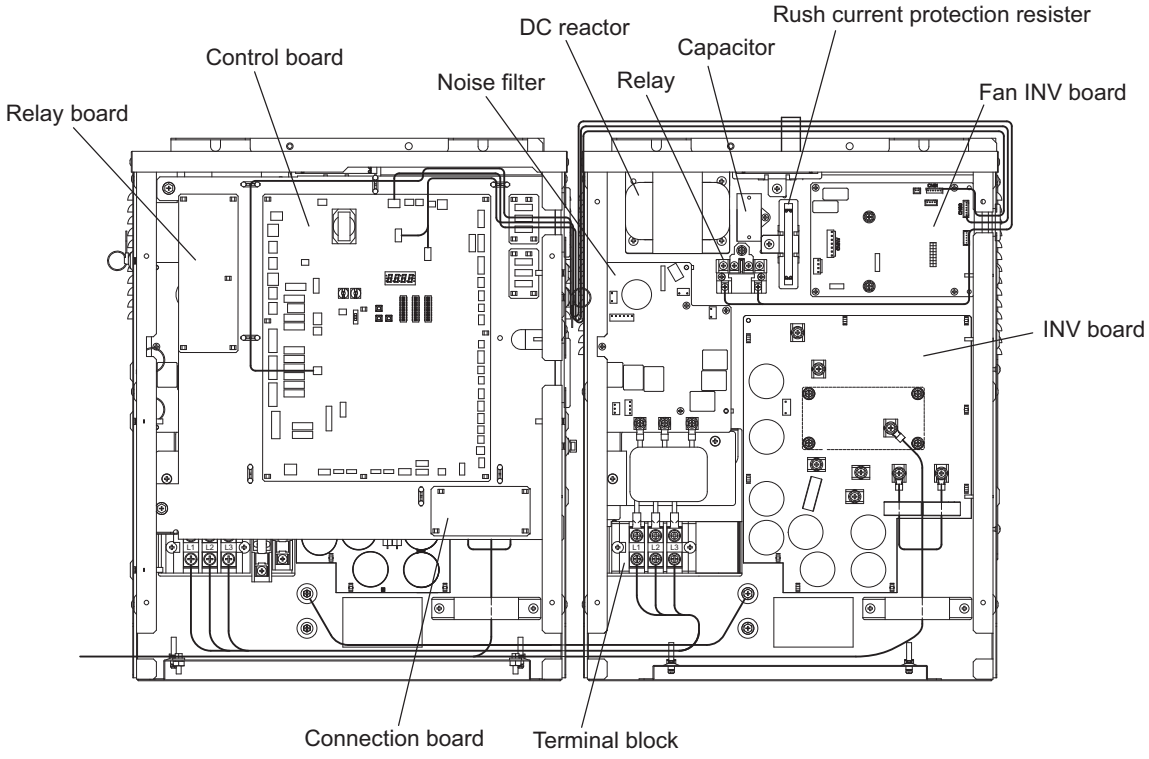


[2] Control Box of the Unit

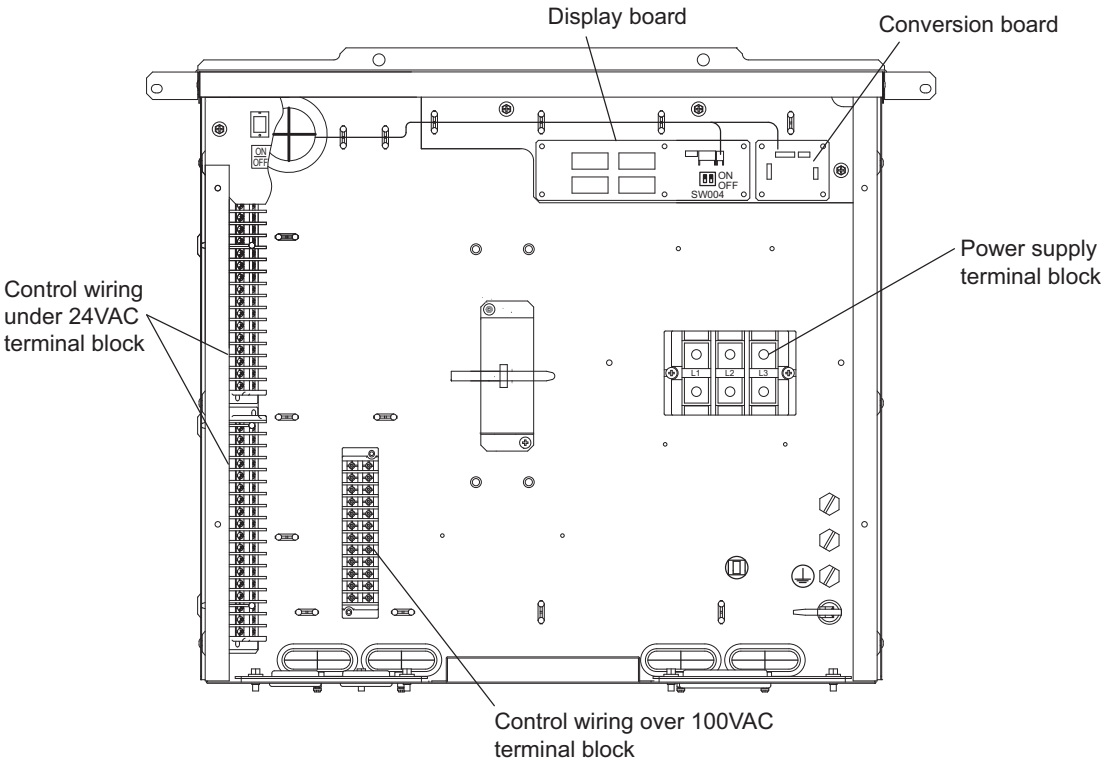
(1) Main circuit control box



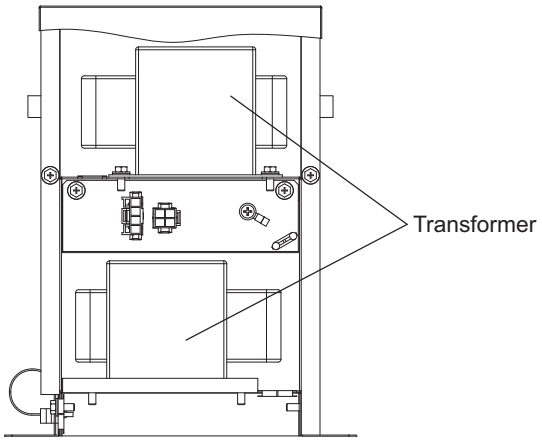
(2) Sub circuit control board



(3) Terminal box

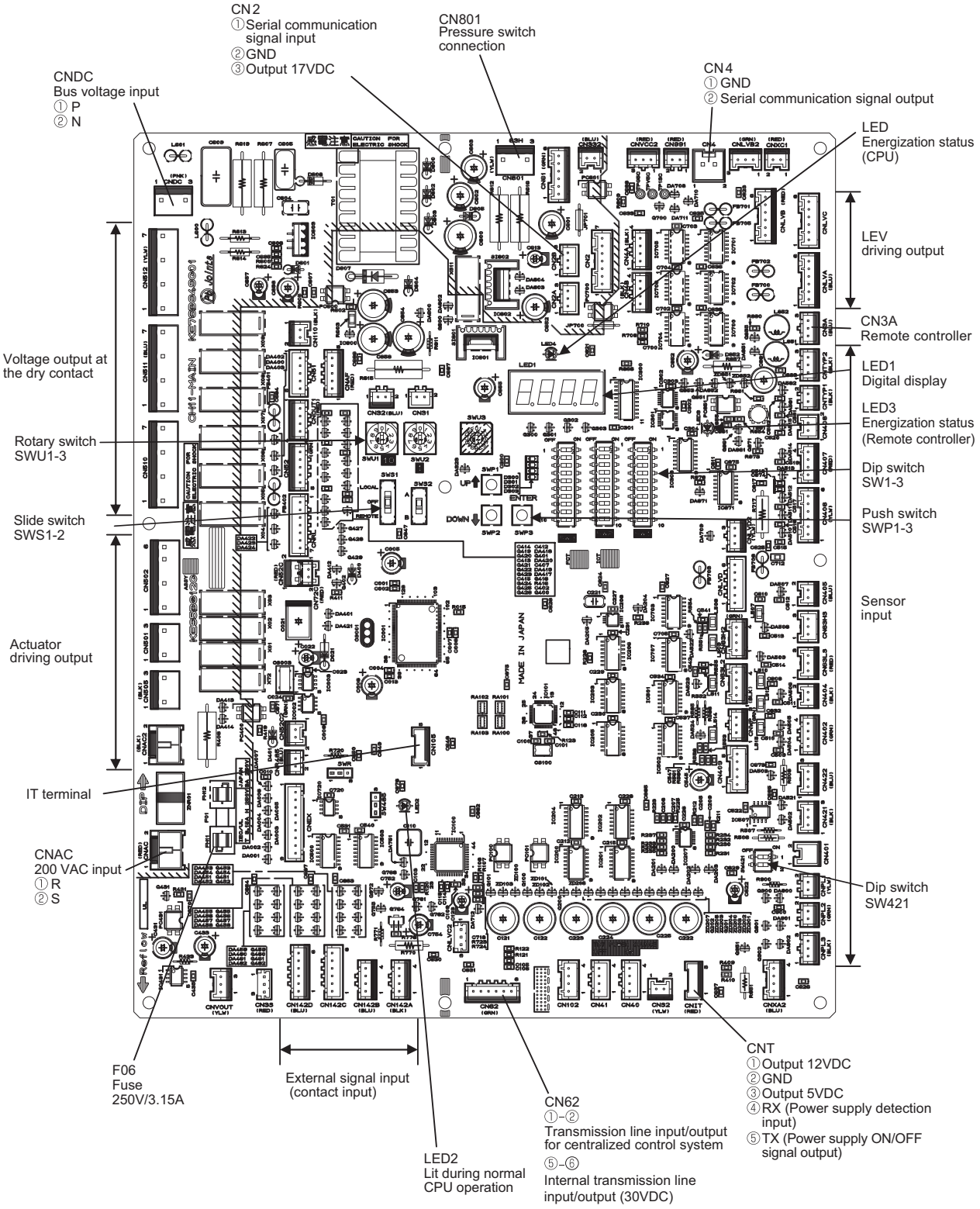


(4) Transformer box

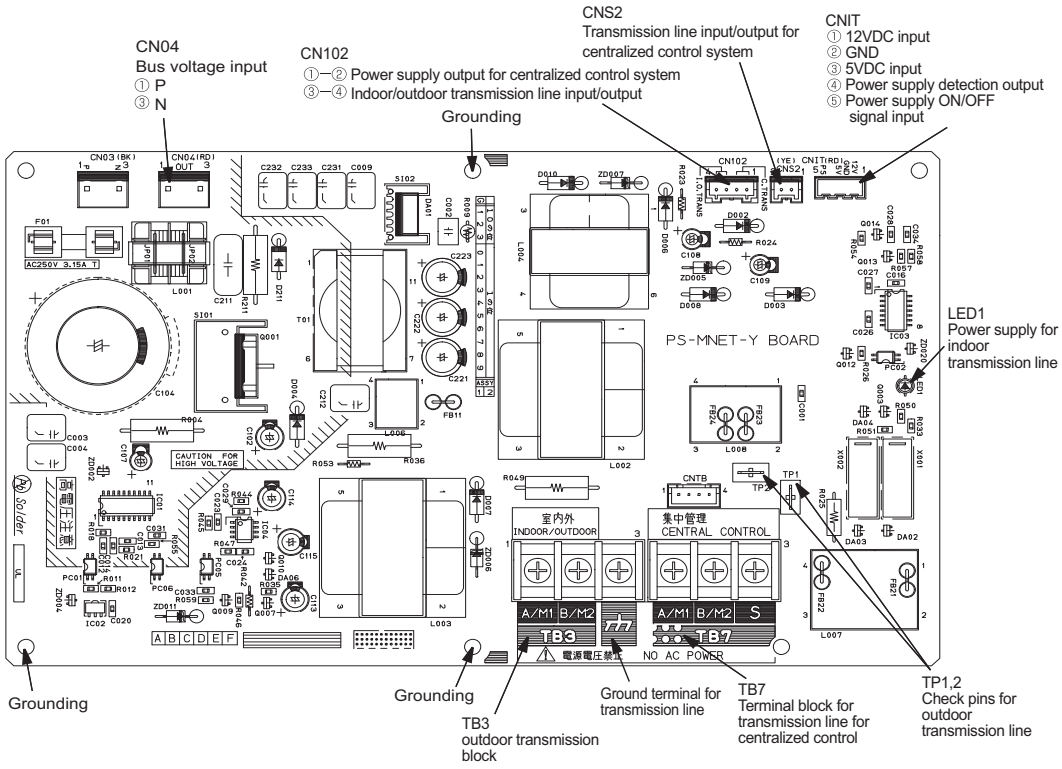


[3] Unit Circuit Board

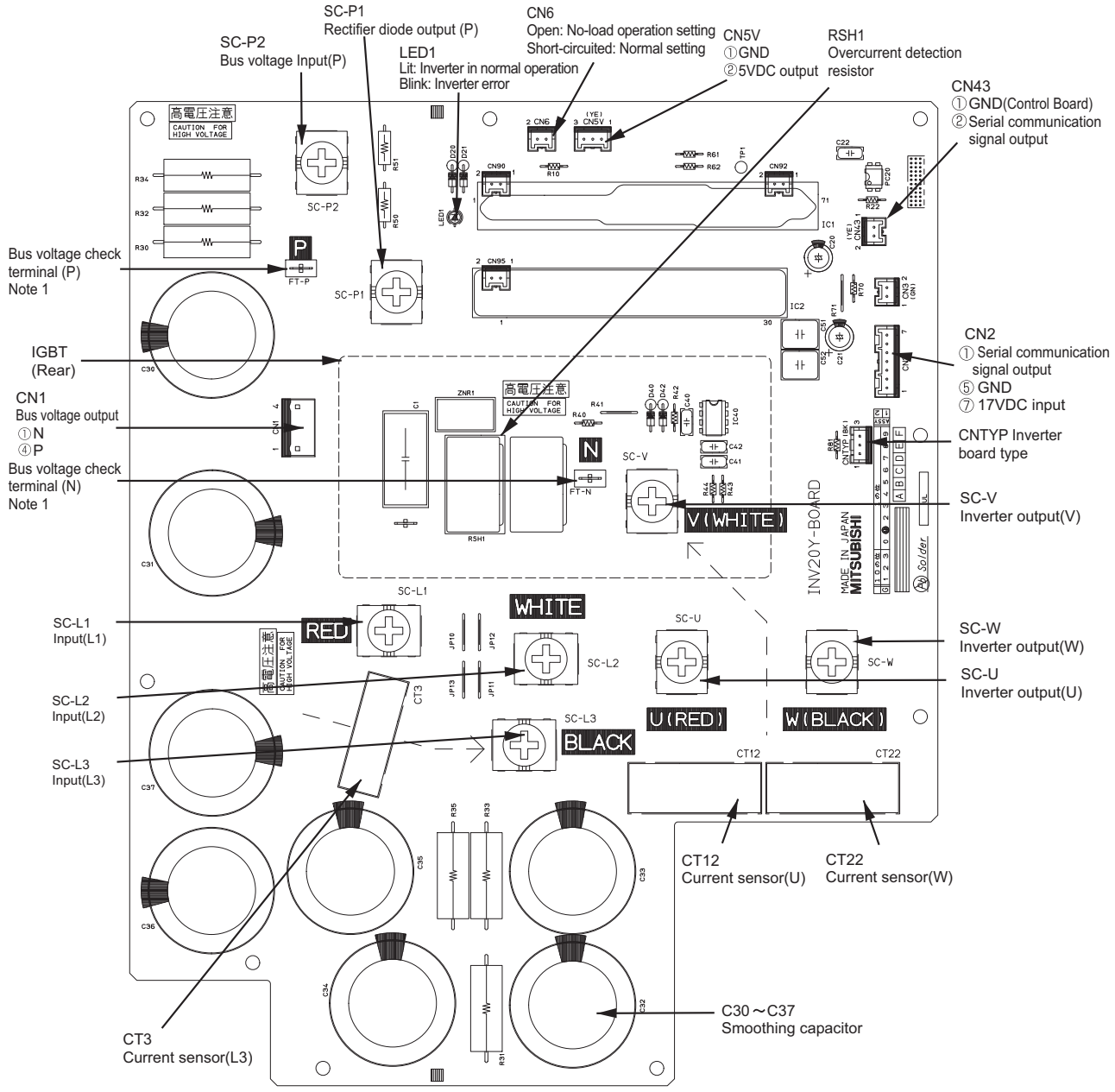
1. Control board (MAIN board)



2. M-NET board


CN04
Bus voltage input
① P
③ N
CN102
①—② Power supply output for centralized control system
③—④ Indoor/outdoor transmission line input/output
Grounding
CNS2
Transmission line input/output for centralized control system
CNIT
① 12VDC input
② GND
③ 5VDC input
④ Power supply detection output
⑤ Power supply ON/OFF signal input
LED1
Power supply for indoor transmission line
PS-MNET-Y BOARD
CAUTION FOR HIGH VOLTAGE
室内外
INDOOR/OUTDOOR
集中管理
CENTRAL CONTROL
A/M1 B/M2
TB3
A/M1 B/M2 S
TB7
NO AC POWER
Grounding
Grounding
TB3
outdoor transmission block
Ground terminal for transmission line
TB7
Terminal block for transmission line for centralized control
TP1,2
Check pins for outdoor transmission line

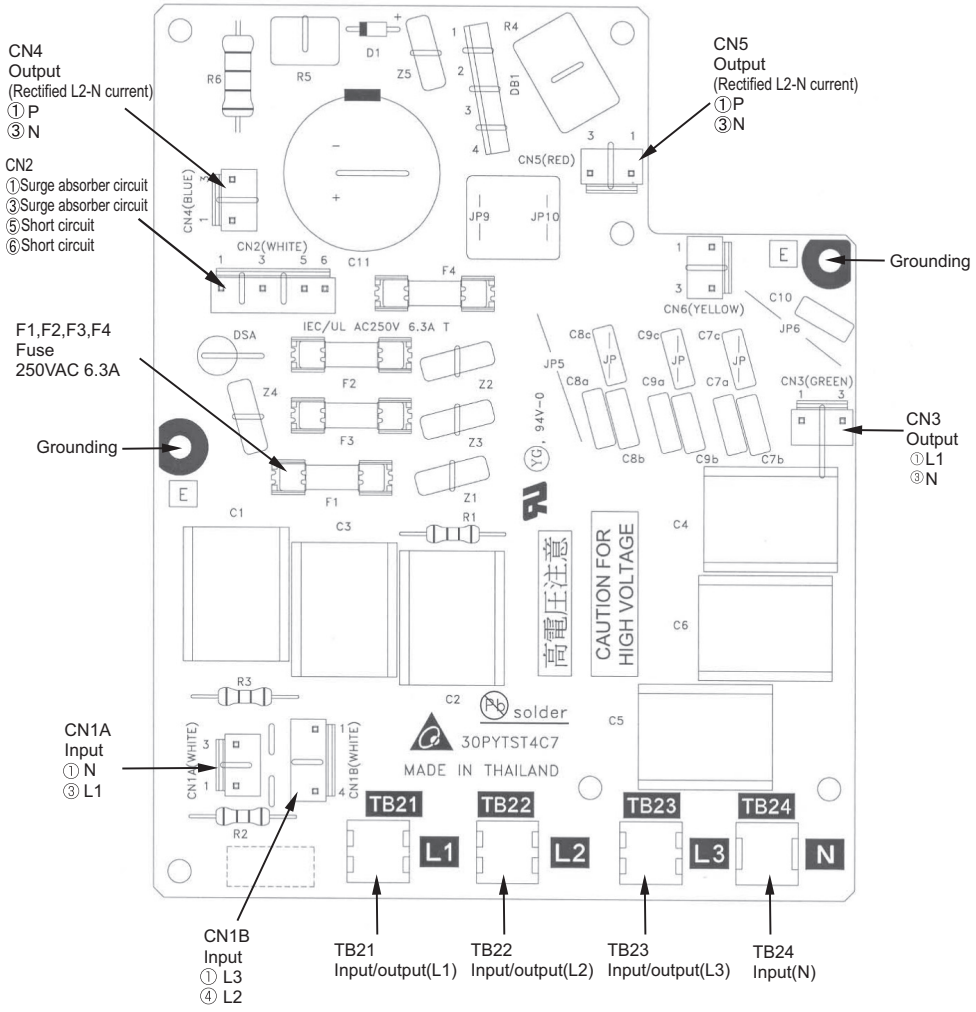
3. INV board



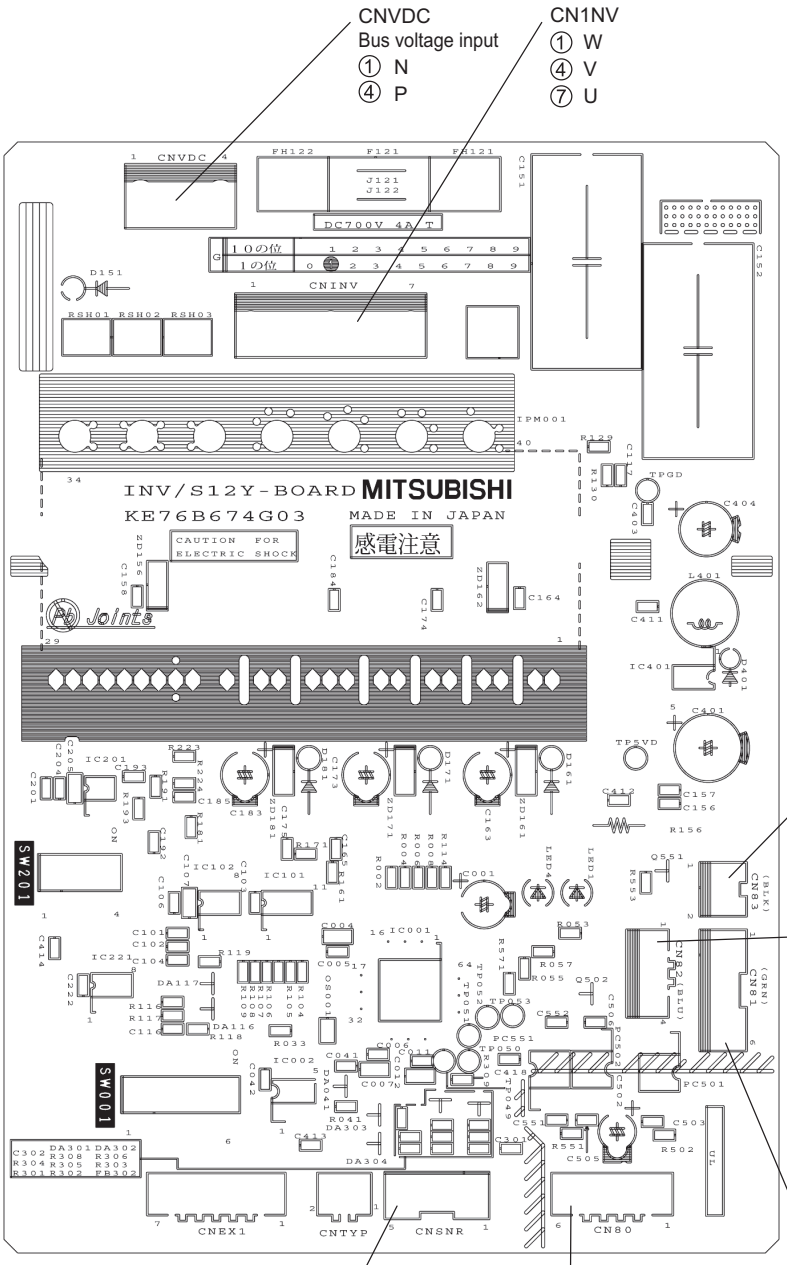
Note

1) Before inspecting the inside of the control box, turn off the power, keep the unit off for at least 10 minutes, and confirm that the voltage between FT-P and FT-N on INV Board has dropped to DC20V or less.
It takes about 10 minutes to discharge electricity after the power supply is turned off.

4. Noise Filter (Compressor)



5. Fan INV board

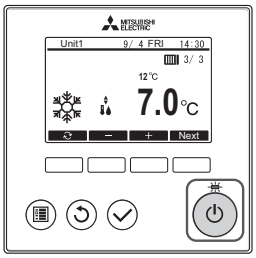
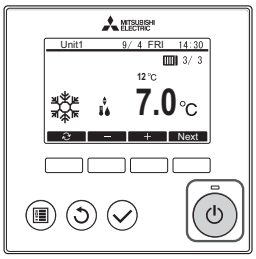


Ⅳ Remote Controller

[1] Using the Remote Controller (PAR-W31MAA) 53

[1] Using the Remote Controller (PAR-W31MAA)

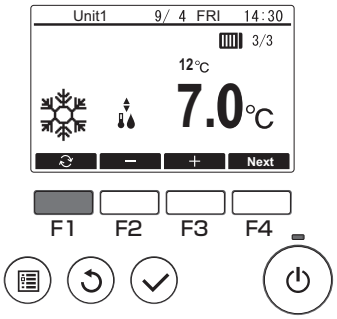
<1> Power ON/OFF

During operation		Press the [ON/OFF] button. The ON/OFF lamp will light up in green, and the operation will start.
During stoppage		Pressing the [ON/OFF] button brings up a confirmation screen. When it appears, press the [F3] button. The ON/OFF lamp will come off, and the operation will stop.

<2> Operation mode and set temperature settings

Operation mode setting

Button operation

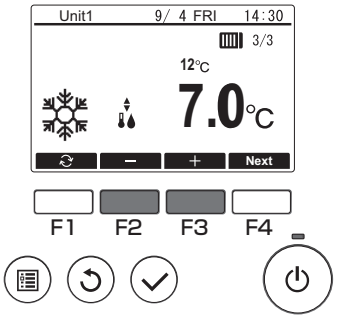


Select the operation mode “Cooling.”

 **Cooling**

Set temperature setting

Button operation



Press the [F2] button to decrease the set temperature, and press the [F3] button to increase.

<3> Using Weekly timer

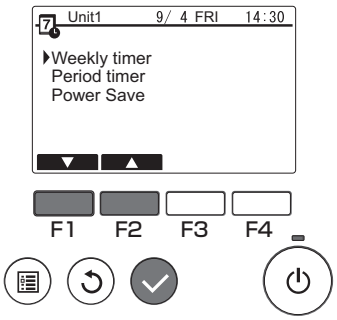
Function description

Following settings can be used to change the operating schedule according to the day of the week.

- Set the schedule for ON/OFF, operation mode and set temperature for each day of the week.

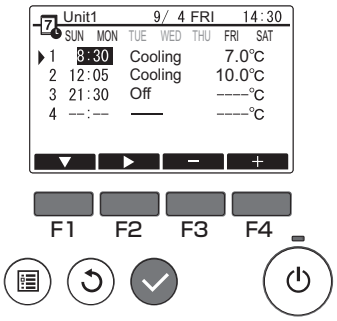
Button operation

1



Select "Weekly timer" from the Schedule menu, and press the [Select] button.

2

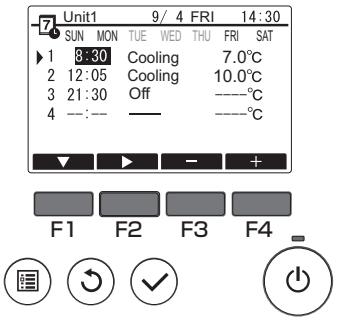


The Weekly timer screen will be displayed.

To check the operation settings:
Press the [F1] or [F2] button to check the settings from Monday to Sunday.
The [F4] button displays the following page.

To change the operation settings:
Press the [F1] or [F2] button to select a day and then press the [F3] button to confirm the day to be set. (Multiple days can be selected.)
After selecting the desired day, press the [Select] button.

3



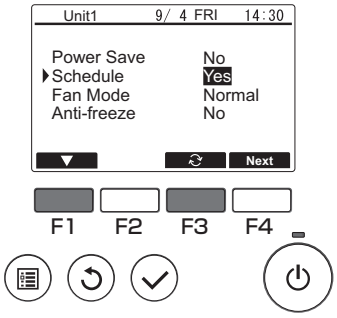
The pattern setting screen will be displayed.
Press the [F1] button to select a pattern.
Press the [F2] button to select the item you want to change.
Press the [F3] or [F4] button to switch to the desired setting.

Time	Set in 5-minute increments. * Hold down the button to change the value continuously.
Operation mode, Off	The options available vary depending on the connected unit. * If you select an operation mode other than Off, the connected unit will operate.
Set temperature	You can change the set temperature (in 0.5°C increments).

Weekly timer operation is disabled in the following situations:
- When Schedule is disabled
- On days when the period timer is also enabled

Weekly timer operation may not be executed depending on the system configuration.

Navigating through the screens
■ To save the settings ..... [Select] button
■ To return to the Main display ..... [Menu] button
■ To return to the previous screen ..... [Return] button



In the Operation setting screen, press the [F1] button to move the cursor to "Schedule".
Press the [F3] button to select "Yes".

<4> Using Period timer

Function description

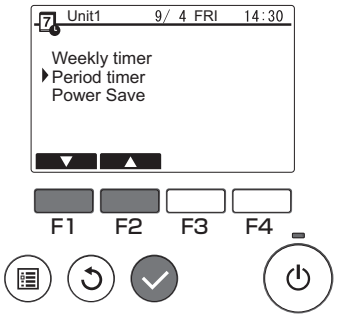
Following settings can be made to change the specified period and daily operating schedule.

- Set the schedule for ON/OFF, operation mode and set temperature.

* If the periods specified in 1 and 2 overlap, only the period specified in 1 will be implemented.

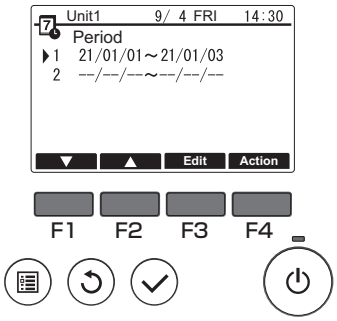
Button operation

1



Select "Period timer" from the Schedule menu, and press the [Select] button.

2

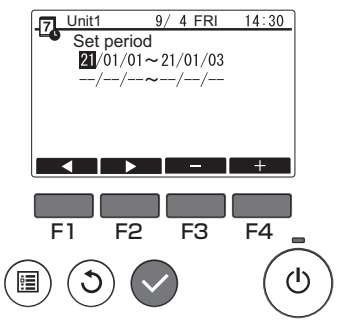


The suitable periods for the period timer will be displayed.

To set the period:
Press the [F1] or [F2] button to select the specified date and then press the [F3] button. ... Move to **3**.

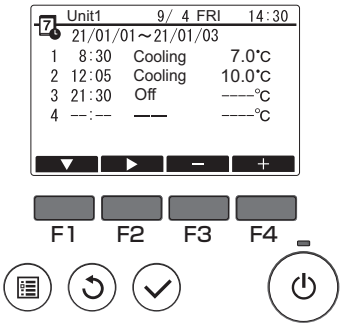
To set the operation:
Press the [F1] or [F2] button to select the specified date and then press the [F4] button. … Move to **4**.

3



The period setting screen will be displayed.
Press the [F1] or [F2] button to move to the item you want to change.
Press the [F3] or [F4] button to change the start date and end date for the period timer and then press the [Select] button to update the setting.

4



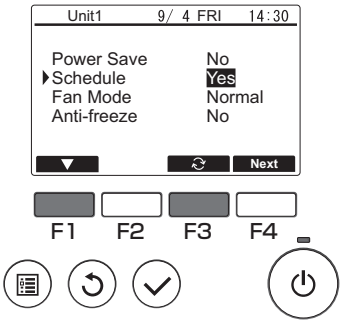
The pattern setting screen will be displayed.
* Refer to the section on Weekly timer for details on using the pattern setting screen.

Weekly timer operation will be disabled in the following situations:
• When Schedule is disabled

When Schedule is disabled with the centralized controller or the connected unit, Schedule settings cannot be made with the remote controller.

After switching to the desired setting, press the [Select] button.
A setting confirmation screen will appear.

Navigating through the screens
■ To save the settings ..... [Select] button
■ To return to the Main display ..... [Menu] button
■ To return to the previous screen ..... [Return] button



In the Operation setting screen, press the [F1] button to move the cursor to "Schedule".
Press the [F3] button to select "Yes".

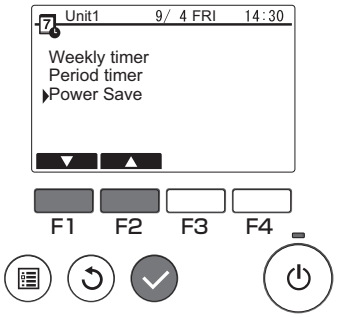
<5> Using power save

Function description

Power Save is a function that regulates the compressor rotation count either daily or according to a specified period and according to a preset time interval or regulated capacity. Use this function when you want to inhibit electric power use.
A typical scenario where Power Save can be used to inhibit the power consumption for water heating would be periods of particularly heavy operating loads for air conditioning and other equipment, such as periods when large numbers of people check in at a hotel or similar accommodation facility.

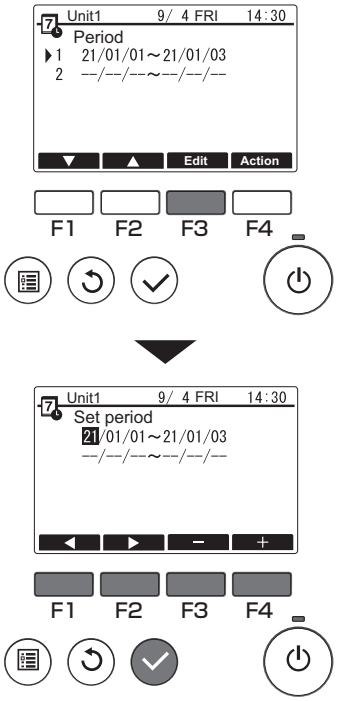
Button operation

1



From the Main menu, select "Schedule" > "Power Save" and press the [Select] button.

2

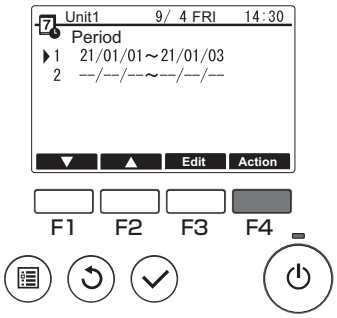


Press the [F3] button to proceed to the settings screen.
You can set 2 types of pattern, as necessary.

* If the periods specified in 1 and 2 overlap, only period specified in 1 will be implemented.

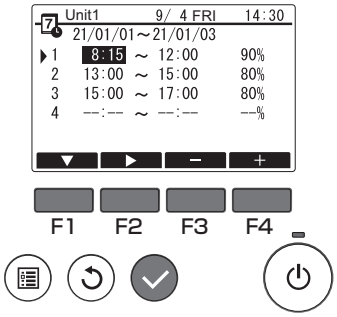
Press the [F1] to [F4] buttons to set the period and then press the [Select] button.

3



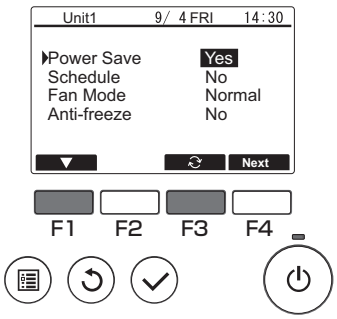
The Power Save screen will be displayed.
Press the [F4] button.

4



Press the [F1] to [F4] buttons to set the Power Save start time, end time and control value.

5



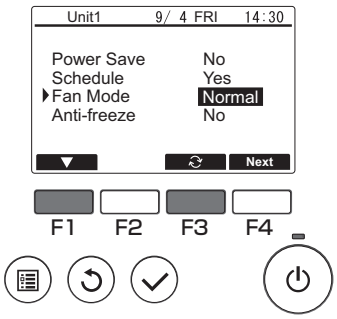
In the Operation setting screen, press the [F1] button to move the cursor to Power Save.
Press the [F3] button to select "Yes".

<6> Fan mode

Function description

Spins the fan even when the compressor is stopped to prevent snow buildup on the fan when it snows in regions where there is relatively little snow cover.
Normal: The fan also stops when the compressor is stopped.
Snow: The fan continues to operate even when the compressor is stopped.

Button operation



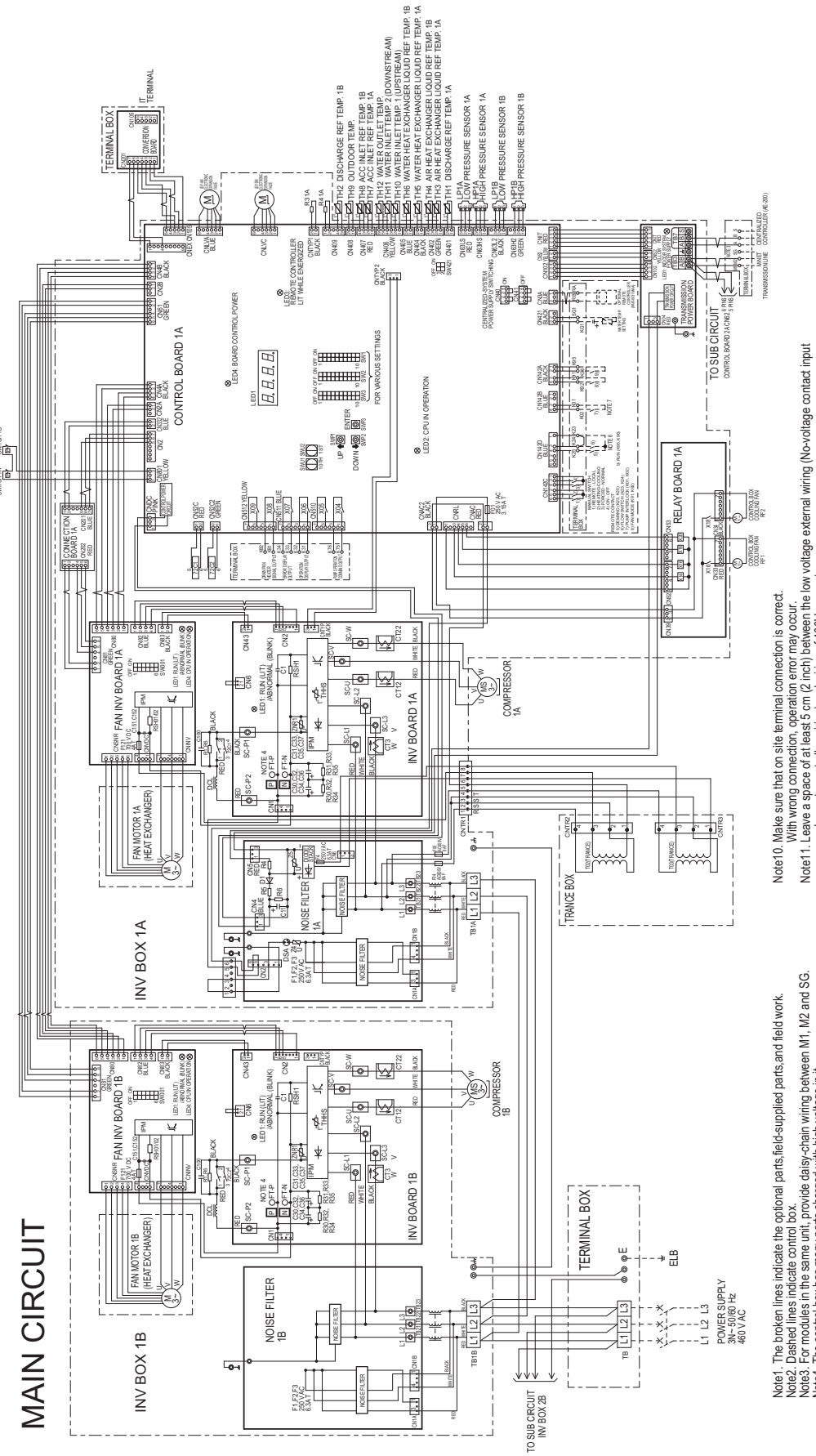
Select "Fan Mode" from the menu, and press the [F3] button to select "Snow".

Ⅴ Electrical Wiring Diagram

[1] Electrical Wiring Diagram.....61

[1] Electrical Wiring Diagram

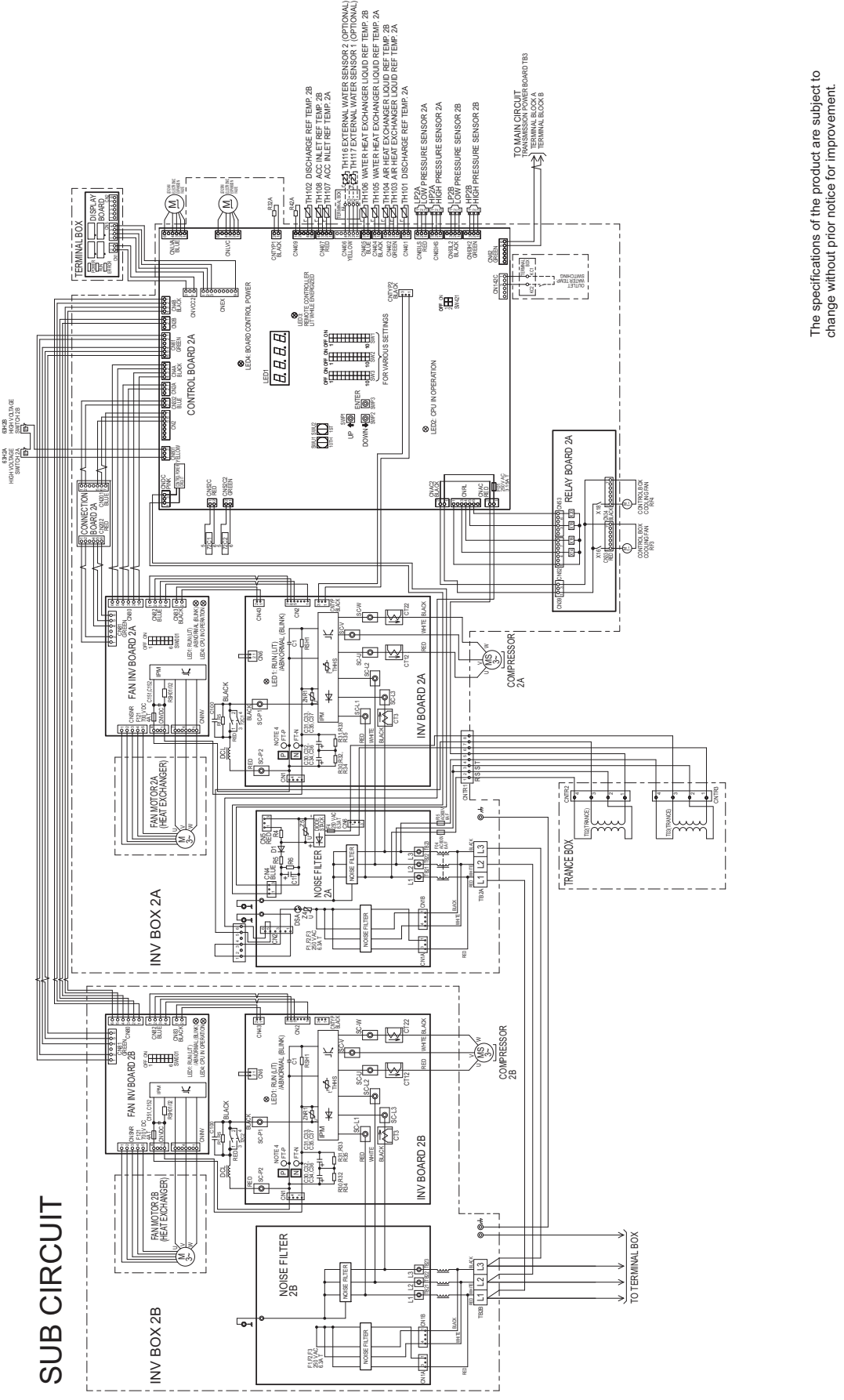
EACV-P040, 050YBL



Note1. The broken lines indicate the optional parts,field-supplied parts,and field work.
Note2. Dashed lines indicate control box.
Note3. For modules in the same unit, provide daisy-chain wiring between M1, M2 and SG.
Note4. The control box has many parts charged with high voltage in it.
Before inspecting the inside of the control box, be sure to turn off the power supply and leave it alone for at least 10 minutes and then confirm that the voltage between the tab terminal (FT-P and FT-N) declined sufficiently (to 20 V DC or less).
Note5. Faston terminals have a locking function.
Press the tab in the middle of the terminals to remove them.
Check that the terminals are securely locked in place after insertion.
Note6. Remove the short circuit wire between the terminals K01 and K02 to the interlock contact on the pump.
A short-circuit may cause abnormal stop or malfunctions.
Note7. Be sure to connect the wires from terminals K01 and K02 to the interlock contact on the pump.
A short-circuit may cause abnormal stop or malfunctions.
Note8. Operation signals can be received from through the No-voltage contact.
Note9. Use a 4-20mA signal output device with insulation.
Feeding 30mA or more current may damage the circuit board.
Note10. Make sure that on site terminal connection is correct.
With wrong connection, operation error may occur.
Note11. Leave a space of at least 5 cm (2 inch) between the low voltage external wiring (No-voltage contact input and remote controller wiring) and wiring of 100V or greater.
Do not place them in the same conduit tube or cabtyre cable as this will damage the circuit board.
Note12. When cabtyre cable is used for the control cable wiring, use a separate cabtyre cable for the following wiring.
Using the same cabtyre cable may cause malfunctions and damage to the unit.
(a) Optional remote controller wiring
(b) No-voltage contact input wiring
(c) No-voltage contact output wiring
(d) Analog input wiring
Note13. Use a contact that takes 12VDC 1mA for No-voltage contact input.
When the power voltage is 460V, No-voltage contact output will be 250VAC.
The current range must be between 10mA and 1A.

The specifications of the product are subject to change without prior notice for improvement.

EACV-P040, 050YBL



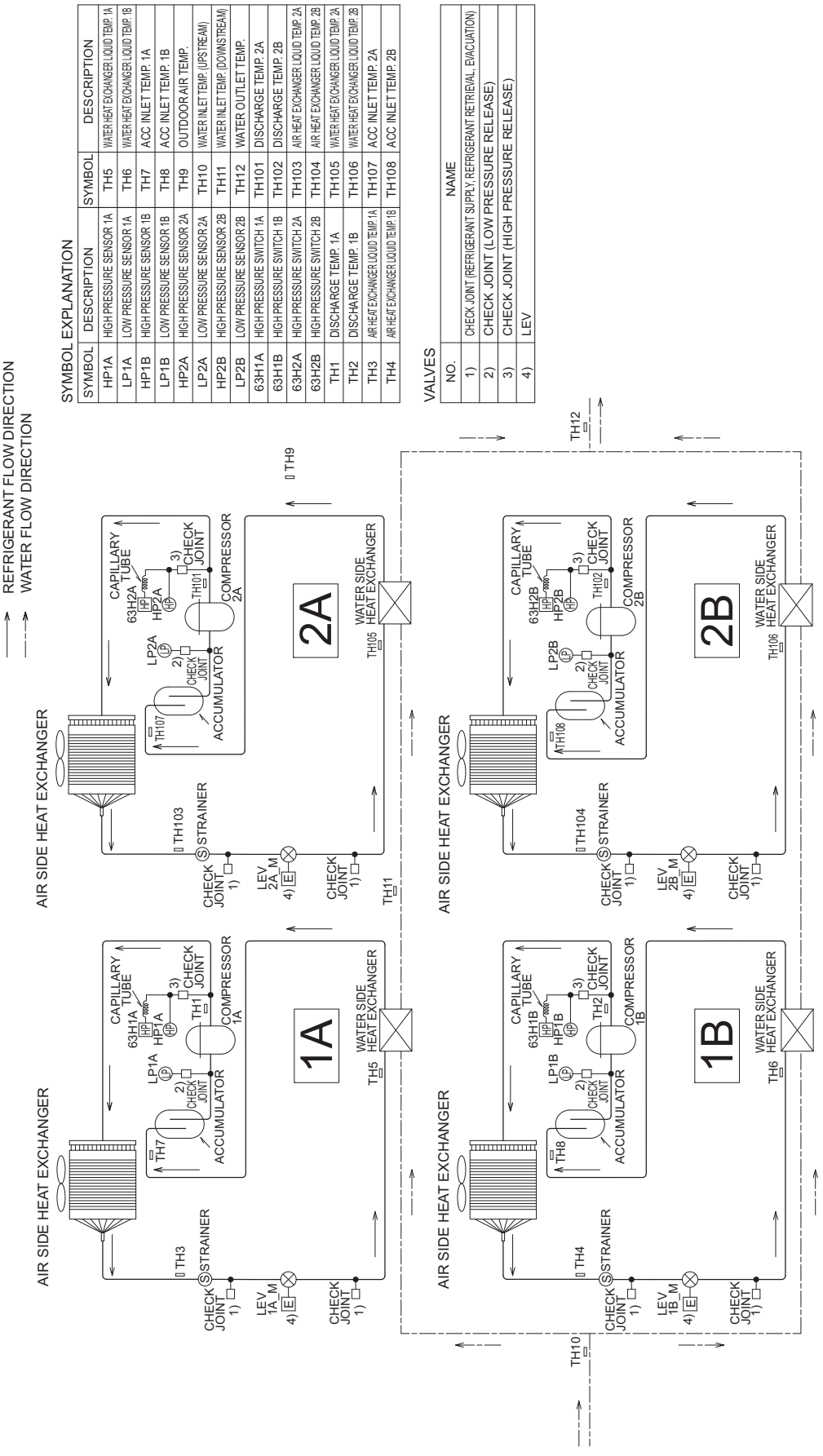
The specifications of the product are subject to change without prior notice for improvement.

VI Refrigerant Circuit

[1] Refrigerant Circuit Diagram 65
[2] Principal Parts and Functions 66

[1] Refrigerant Circuit Diagram

♦ **EACV-P040,050YBL(-N)**



SYMBOL EXPLANATION

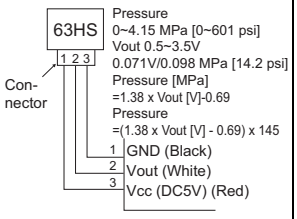
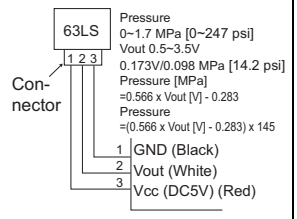
SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
HP1A	HIGH PRESSURE SENSOR 1A	TH5	WATER HEAT EXCHANGER LIQUID TEMP. 1A
LP1A	LOW PRESSURE SENSOR 1A	TH6	WATER HEAT EXCHANGER LIQUID TEMP. 1B
HP1B	HIGH PRESSURE SENSOR 1B	TH7	ACC. INLET TEMP. 1A
LP1B	LOW PRESSURE SENSOR 1B	TH8	ACC. INLET TEMP. 1B
HP2A	HIGH PRESSURE SENSOR 2A	TH9	OUTDOOR AIR TEMP.
LP2A	LOW PRESSURE SENSOR 2A	TH10	WATER INLET TEMP. (UPSTREAM)
HP2B	HIGH PRESSURE SENSOR 2B	TH11	WATER INLET TEMP. (DOWNSTREAM)
LP2B	LOW PRESSURE SENSOR 2B	TH12	WATER OUTLET TEMP.
63H1A	HIGH PRESSURE SWITCH 1A	TH101	DISCHARGE TEMP. 2A
63H1B	HIGH PRESSURE SWITCH 1B	TH102	DISCHARGE TEMP. 2B
63H2A	HIGH PRESSURE SWITCH 2A	TH103	AIR HEAT EXCHANGER LIQUID TEMP. 2A
63H2B	HIGH PRESSURE SWITCH 2B	TH104	AIR HEAT EXCHANGER LIQUID TEMP. 2B
TH1	DISCHARGE TEMP. 1A	TH105	WATER HEAT EXCHANGER LIQUID TEMP. 2A
TH2	DISCHARGE TEMP. 1B	TH106	WATER HEAT EXCHANGER LIQUID TEMP. 2B
TH3	AIR HEAT EXCHANGER LIQUID TEMP. 1A	TH107	ACC. INLET TEMP. 2A
TH4	AIR HEAT EXCHANGER LIQUID TEMP. 1B	TH108	ACC. INLET TEMP. 2B

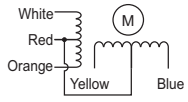
VALVES

NO.	NAME
1)	CHECK JOINT (REFRIGERANT SUPPLY, REFRIGERANT RETRIEVAL, EVACUATION)
2)	CHECK JOINT (LOW PRESSURE RELEASE)
3)	CHECK JOINT (HIGH PRESSURE RELEASE)
4)	LEV

[2] Principal Parts and Functions

1. Outdoor unit

Part name	Symbols (functions)	Notes	Usage	Specifications	Check method
Compressor	MC (Comp)		Adjusts the amount of circulating refrigerant by adjusting the operating frequency based on the operating pressure data	Low-pressure shell scroll compressor Wirewound resistance 20°C[68°F] : 0.219 ohm	
High pressure sensor	63HS (HP)		1) Detects high pressure 2) Regulates frequency and provides high-pressure protection		
Low pressure sensor	63LS (LP)		1) Detects low pressure 2) Provides low-pressure protection		
Pressure switch	63H		1) Detects high pressure 2) Provides high-pressure protection	4.15MPa [601 psi] OFF setting	
Thermistor	TH1,2 (Discharge)		1) Detects discharge temperature 2) Provides high-pressure protection 0°C[32°F] :698kohm 10°C[50°F] :413kohm 20°C[68°F] :250kohm 30°C[86°F] :160kohm 40°C[104°F] :104kohm 50°C[122°F] : 70kohm 60°C[140°F] : 48kohm 70°C[158°F] : 34kohm 80°C[176°F] : 24kohm 90°C[194°F] :17.5kohm 100°C[212°F] :13.0kohm 110°C[230°F] : 9.8kohm	Degrees Celsius R_{120} = 7.465kΩ $R_{25/120}$ = 4057 $R_t = 7.465\exp\{4057(\frac{1}{273+t} - \frac{1}{393})\}$	Resistance check

Part name	Symbols (functions)	Notes	Usage	Specifications	Check method
Thermistor	TH7,8 (ACC inlet Ref temperature)		1) Detects suction temperature 2) Provide low pressure protection	Degrees Celsius R_0 = 15kΩ $R_{0/80}$ = 3385 $R_t = 15\exp\{3385\ (\frac{1}{273+t} - \frac{1}{273})\}$ 0°C[32°F] :15kohm 10°C[50°F] :9.7kohm 20°C[68°F] :6.5kohm 25°C[77°F] :5.3kohm 30°C[86°F] :4.4kohm 40°C[104°F] :3.0kohm	Resistance check
	TH3,4 (Air HEX Ref temperature)		Controls SC during cooling operation		
	TH5,6 (Water HEX Ref temperature)		Detects refrigerant temperature		
	TH9 (Outdoor temperature)		1) Detects outdoor air temperature 2) Controls fan and compressor operation		
	TH10,11,12		1) Detects water temperature 2) Controls water temperature		
	THHS Inverter heat sink temperature		Provide the inverter circuit protection	Degrees Celsius R_{50} = 17kΩ $R_{25/120}$ = 4016 $R_t = 17\exp\{4016\ (\frac{1}{273+t} - \frac{1}{323})\}$ 0°C[32°F] :161kohm 10°C[50°F] :97kohm 20°C[68°F] :60kohm 25°C[77°F] :48kohm 30°C[86°F] :39kohm 40°C[104°F] :25kohm	
Fan motor	FAN motor		Adjusts the operating frequency of the propeller fan based on the condensation or evaporation temperature	DC415V 920W	
Linear expansion valve	LEV (Refrigerant flow adjustment)		Adjusts refrigerant flow during heating	DC12V Opening of a valve driven by a stepping motor 2000 pulses	Continuity check with a tester Continuity between white, red, and orange. Continuity between yellow, and blue. 

VII Control

[1] Functions and Factory Settings of the Dipswitches 71
[2] Operating characteristics and Control Capabilities 78

[1] Functions and Factory Settings of the Dipswitches

1. Priority order of the water-temperature-setting-input-signal sources

Water temperature can be controlled by using the signals from the two types of input sources listed below. The setting for the item with higher priority will override the settings for the items with lower priorities. The water temperature will be controlled according to the temperature setting in the "Target water temperature" column that corresponds to a specific combination of the settings for the two items.

Priority 1	Priority 2			Target water temperature
Analog input	Remote controller PAR-W31MAA Input from centralized controller AE-200 or BMS (*)			
	No remote controller	Manual setting	Schedule setting	
SW2-7: ON	-	Ineffective	Ineffective	Temperature setting for the analog signal input
SW2-7: OFF	When no RC is used	-	-	Target water temperature is set from the main board.
	-	When the remote controller is used by manual setting	-	Target water temperature is set from the remote controller directly.
	-	-	When schedule has been set	Target water temperature is controlled according to the setting on the remote controller.

* AE-200 and BMS cannot both be simultaneously connected. Only connect one or the other.

Priority order of the operation signal sources

	No-voltage contact	Remote controller PAR-W31MAA	Input from centralized controller AE-200 or BMS
Unit operation (Run/Stop)	The last setting has priority.		
Fan mode (The contact ON has priority.)	OFF	The last setting has priority.	
	ON	Ineffective	

2. Water-temperature setting

Different water temperature settings can be set for different modes.

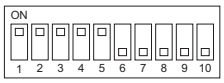
Set the dip switches on the circuit board as follows to make the settings for the items described in this section.

Press the push switch SWP3 to enable the configuration changes.
Press the push switches SWP1 (↑) or SWP2 (↓) to increase or decrease the value.
When the desired value is displayed, press SWP3 to save the setting value.

Settings table

No.	Rotary switch (SWU3)	Dip switch setting (SW1)	Setting Item	Initial value	Unit *4	Setting			Setting change from an optional remote controller (PAR-W31MAA) *1
						Increments	Lower limit	Upper limit	
1	1		Setting temp 1 (Cooling mode) *2	7	ºC	0.1°C	5	30	Possible
2	1		Setting temp 2 (Cooling mode) *3	7	ºC	0.1°C	5	30	Possible

*1 Temperature setting increments: 0.5ºC
*2 No-voltage contact KC1-KC2: OFF
*3 No-voltage contact KC1-KC2: ON
*4 It cannot be set in Fahrenheit.



The figure at left shows that the switches 1 through 5 are set to ON and 6 through 10 are set to OFF.

3. Peak-demand control operation

Peak-demand control is a function used to control the power consumptions of the units.

The compressor's maximum operating frequency will be controlled according to the peak-demand control signal.

Set the dip switches on the circuit board as follows to make the settings for the items described in this section.

Press the push switch SWP3 to enable the configuration changes.
Press the push switches SWP1 (↑) or SWP2 (↓) to increase or decrease the value.
When the desired value is displayed, press SWP3 to save the setting value.

Settings table

No.	Rotary switch (SWU3)	Dip switch setting (SW1)	Setting Item	Initial value	Unit	Setting			Setting change from an optional remote controller (PAR-W31MAA)
						Increments	Lower limit	Upper limit	
1	1		Peak-demand control signal input source	0	-	1	0	2	Not possible
2	1		Maximum peak-demand capacity	100	%	1%	60	100	Not possible

4. Remote water temperature or capacity control ratio setting input signal type

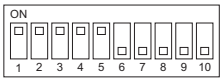
When SW2-7 is ON, SW2-8 is OFF and SW2-9 is OFF external analog signals can be used to set the water temperatures.
When SW2-7 and SW2-8 are ON, external analog signals can be used to set the capacity control ratio.
Analog input type can be selected from the following four types:
4-20 mA
0-10 V
1-5 V
2-10 V

Select SW3-1 and SW3-2 to set the type of analog input signal from a remote location.

Set the dip switches on the circuit board as follows to change the settings.

	SW421-1	SW421-2	SW3-1	SW3-2
4-20 mA	ON	ON	OFF	OFF
1-5 V	OFF	ON	ON	OFF
0-10 V	OFF	OFF	OFF	ON
2-10 V	OFF	OFF	ON	ON

* Incorrectly setting SW421 may cause damage to the circuit board.



The figure at left shows that the switches 1 through 5 are set to ON and 6 through 10 are set to OFF.

5. Setting the water temperature using analog signal input

When dip switch SW2-7 is set to ON (Enable external input), SW2-8 is set to OFF and SW2-9 is set to OFF, the target water temperature varies with the preset temperatures A and B and the type of analog input signal.

Set the dip switches on the circuit board as follows to make the settings for the items described in this section.

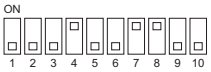
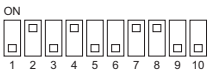
Press the push switch SWP3 to enable the configuration changes.
Press the push switches SWP1 (↑) or SWP2 (↓) to increase or decrease the value.
When the desired value is displayed, press SWP3 to save the setting value.

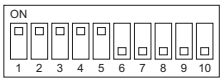
Settings table

No.	Rotary switch (SWU3)	Dip switch setting (SW1)	Setting Item	Initial value	*1 Unit	Setting			Setting change from an optional remote controller (PAR-W31MAA)
						Increments	Lower limit	Upper limit	
1	1		Preset temp. A (Cooling)	5	°C	1ºC	5	30	Not possible
2	1		Preset temp. B (Cooling)	30	°C	1ºC	5	30	Not possible

* Due to the resistance of the wire that is connected to the analog input, the preset temperature may not properly be sent. If this is the case, check the current value of the analog input, and adjust the output value of the connected signal output device. Refer to the table below for how to display the value of the analog input.

*1 It cannot be set in Fahrenheit.

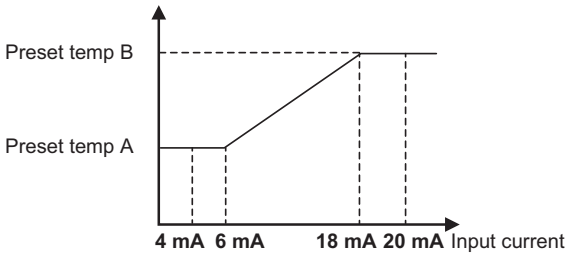
No.	Rotary switch (SWU3)	Dip switch setting (SW1)	Monitorable items	Unit
1	0		Current value (4-20 mA)	mA
2	0		5V voltage value (1-5 V)	V
3	0		10V voltage value (0-10 V or 2-10 V)	V



The figure at left shows that the switches 1 through 5 are set to ON and 6 through 10 are set to OFF.

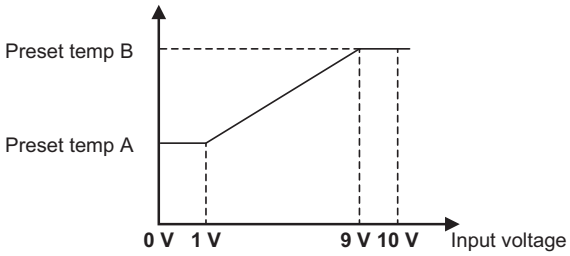
- When the water temperature setting input signal type is 4-20 mA

  • External analog input signal of 6 mA: Preset temp. A
  • External analog input signal of 18 mA: Preset temp. B
  • External analog input signal of between 6 and 18 mA: the preset temperature will be linearly interpolated.



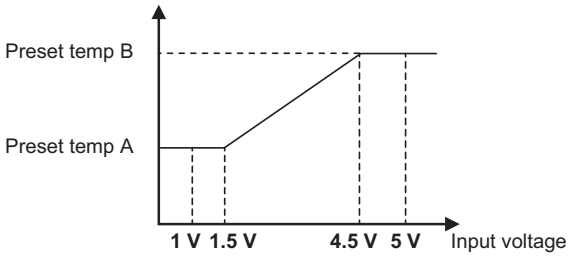
- When the water temperature setting input signal type is 0-10 V

  • External analog input signal of 1 V: Preset temp. A
  • External analog input signal of 9 V: Preset temp. B
  • External analog input signal of between 1 and 9 V: the preset temperature will be linearly interpolated.



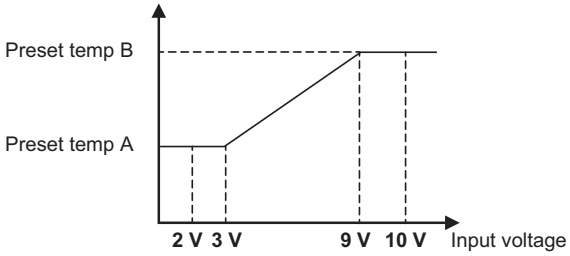
- When the water temperature setting input signal type is 1-5 V

  • External analog input signal of 1.5 V: Preset temp. A
  • External analog input signal of 4.5 V: Preset temp. B
  • External analog input signal of between 1.5 and 4.5 V: the preset temperature will be linearly interpolated.



- When the water temperature setting input signal type is 2-10 V

  • External analog input signal of 3 V: Preset temp. A
  • External analog input signal of 9 V: Preset temp. B
  • External analog input signal of between 3 and 9 V: the preset temperature will be linearly interpolated.

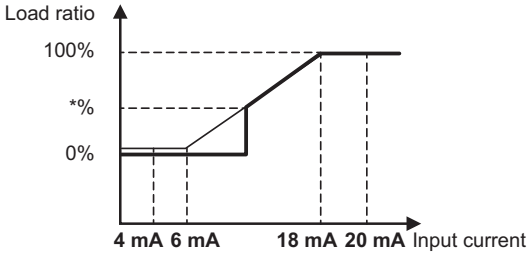


6. Setting the capacity control ratio using analog signal input

When dip switch SW2-7 is set to ON (Enable external input), SW2-8 is set to ON and SW2-9 is set to OFF, the capacity control ratio varies with the type of analog input signal.

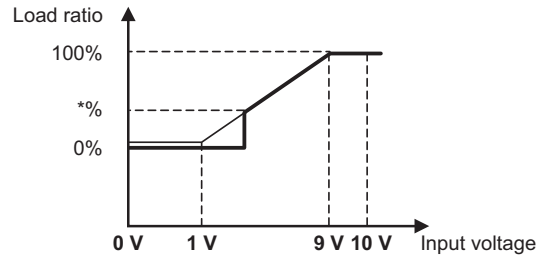
- When the capacity control ratio setting input signal type is 4-20 mA

  • External analog input signal of 6 mA: 0%
  • External analog input signal of 18 mA: 100%
  • External analog input signal of between 6 and 18 mA: the percent will be linearly interpolated.



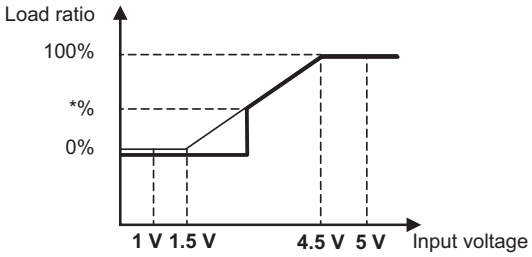
- When the capacity control ratio setting input signal type is 0-10 V

  - External analog input signal of 1 V: 0%
  - External analog input signal of 9 V: 100%
  - External analog input signal of between 1 and 9 V: the percent will be linearly interpolated.



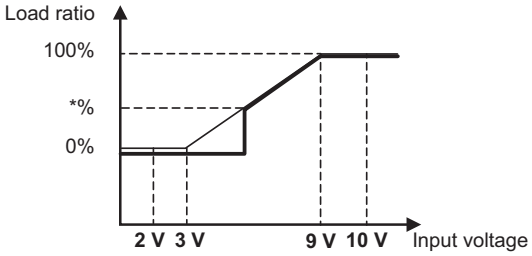
- When the capacity control ratio setting input signal type is 1-5 V

  - External analog input signal of 1.5 V: 0%
  - External analog input signal of 4.5 V: 100%
  - External analog input signal of between 1.5 and 4.5 V: the percent will be linearly interpolated.



- When the capacity control ratio setting input signal type is 2-10 V

  - External analog input signal of 3 V: 0%
  - External analog input signal of 9 V: 100%
  - External analog input signal of between 3 and 9 V: the percent will be linearly interpolated.



*%: When the compressor frequency drops below the lowest frequency, the compressor stops.
The frequency value that causes the compressor to stop varies depending on the outside temperature and water temperature.

7. Setting the drain pan heater signal output condition

A temperature at which the signal output to operate drain pan heaters can be selected.

Drain pan heater signal output condition
The following condition is met.

- The outdoor temperature drops below a set outdoor temperature.

The drain pan signal is output from KB1-KB2.

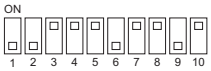
Drain pan heater signal output stop condition
The following condition is met.

- The outdoor temperature is at or above a set outdoor temperature +2ºC.

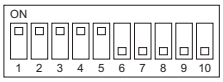
Set the dip switches on the circuit board as follows to make the settings for the items described in this section.

Press the push switch SWP3 to enable the configuration changes.
Press the push switches SWP1 (↑) or SWP2 (↓) to increase or decrease the value.
When the desired value is displayed, press SWP3 to save the setting value.

Settings table

No.	Rotary switch (SWU3)	Dip switch setting (SW1)	Setting Item	Initial value	*1 Unit	Setting			Setting change from an optional remote controller (PAR-W31MAA)
						Increments	Lower limit	Upper limit	
1	1		Drain pan heater operation outdoor temp	0	ºC	1ºC	-40	20	Not possible

*1 It cannot be set in Fahrenheit.



The figure at left shows that the switches 1 through 5 are set to ON and 6 through 10 are set to OFF.

[2] Operating characteristics and Control Capabilities

-1- Operating characteristics

Function	Component		Symbol	Control/ Detection	Action	Unit *1	Trigger condition
Unit protection	Pressure switch	High-pressure switch	63H	HP	ON	MPa	(3.25 [471 psi])
					OFF	MPa	4.15 $^{+0}_{-0.15}$ [601 $^{+0}_{-22}$ psi]
	Pressure sensor	High-pressure sensor	HP	HP	OFF	MPa	3.9 [566 psi]
		Low-pressure sensor	LP	LP	OFF	MPa	♦The low pressure has dropped below 0.1 MPa [15 psi]. ♦During water cooling, the low pressure has dropped below 0.56 MPa [81 psi].
	Thermistor	Discharge refrigerant temp. (Discharge temp. overrise protection)	TH1 TH2	Discharge gas temp.	OFF	ºC	♦If a discharge gas temperature of 120ºC [248 ºF] or above was detected three times in 1 hour, the unit will make an abnormal stop.
		Outlet water	TH12	Outlet water temp. (cooling)	OFF	ºC	An outlet water temperature of 3ºC [37ºF] was detected.
		Air-side HEX refrigerant temp.	TH3 TH4	SC (cooling)	-	ºC	-
		ACC inlet refrigerant temp.	TH7 TH8	SH	OFF	ºC	ACC inlet SH above 20ºC [36ºF] has been detected for 10 minutes.
		Inverter heatsink temp.	THHS	INV. heatsink temp.	OFF	ºC	A temperature above 95ºC [203ºF] has been detected for 10 minutes.
Pump control	Water temperature thermister		TH10-12	Water temp.	ON	ºC	3 [5ºF]
					OFF	ºC	5 [9 ºF]
	Freeze-up protection circuit						The pump turns on when the water temperature has reached below the "ON" threshold when the compressor is stopped.

*1. It cannot be displayed in Fahrenheit and Pound per square inch.

-2- Initial control

♦When the power is turned on, the initial processing of the microcomputer is given top priority.
♦During the initial processing, processing of the operation signal is suspended and is resumed after the initial processing is completed.
(Initial processing involves data processing by the microcomputer and initial setup of the LEV opening. This process takes up to one minute.)
♦During the initial processing " EEEE " will appear on the LED monitor on the MAIN board of the MAIN circuit.
♦During the initial processing " 9999 " will appear on the LED monitor on the MAIN board of the SUB circuit.

-3- Compressor frequency

♦The upper limit of frequency during the first 60 seconds of operation is less than 20 Hz.
♦The upper limit of frequency during the first 180 seconds of operation is less than 50 Hz.
♦For 180 seconds after the startup, the compressor will be controlled every 15 seconds so that the frequency fluctuation will be kept within ± 20% of the current frequency.
♦The amount of frequency change is controlled to approximate the target value that are determined based on the temperature difference between the current and the preset water temperatures.
♦The minimum operating frequency is 15 Hz.

-4- LEV in the main circuit

Operating range of the LEV

The opening range of the LEV is between 100 and 2000 (fully open).
LEV operation speed

- Open 100 plus/sec
- Close 200 plus/sec

At startup

- During startup, the valve will be moved to the Initial Setting.

During operation

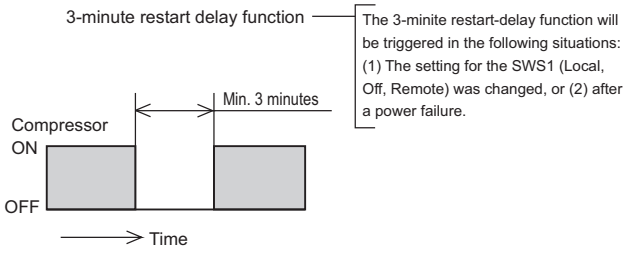
- After startup, the LEV opening will be controlled every 20 seconds according to the changes in compressor frequency, pressure, and temperature.
- The LEV will be controlled to keep the suction SH in 4K (7ºF).
- If the low pressure reaches 1.45 MPa (210 psi) or above, the LEV opening will be controlled to keep the low pressure from rising too high.

-5- Operation during power failure

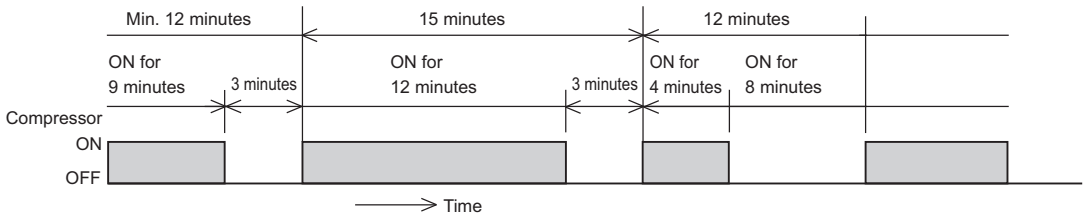
<table>
<tr><td colspan="2">Duration of power failure</td><td>20 ms or shorter</td><td>20 ~ 200ms</td><td>200 ms or longer</td></tr>
<tr><td colspan="2">Detection of power failure</td><td>Undetectable</td><td>Instantaneous power failure</td><td>Detection of power failure</td></tr>
<tr><td colspan="2">Operation during power failure</td><td>Normal operation</td><td>During an instantaneous power failure, the unit will be controlled according to the input status of the circuit board immediately before the instantaneous power failure.</td><td>All outputs will be turned off immediately after power failure.</td></tr>
<tr><td rowspan="2">Operation after power is restored</td><td>Automatic restoration after power failure is set to "Enabled" (SW3-9 is set to ON.)</td><td rowspan="2">Normal operation</td><td rowspan="2">The circuit board will start receiving input.</td><td>The unit will be controlled according to the input status of the circuit board immediately before the power failure, except that the input status of the No-voltage contact after the power is restored will override the one before the power failure. For three minutes after the power is restored, the unit will not operate.</td></tr>
<tr><td>Automatic restoration after power failure is set to "Disabled" (SW3-9 is set to OFF.)</td><td>The unit will stop, displaying the error code for power failure.
The error will be cleared when the operation command signal is off.</td></tr>
</table>

-6- Anti-short-cycling protection

The unit has a 3-minute restart-delay function to protect the compressor from short-cycling. This function is effective even after a power failure.



The unit has a function to keep the compressor from short-cycling when the amount of circulating water is low or when the load is light. After the compressor cycles off, it will not restart for 12 minutes.

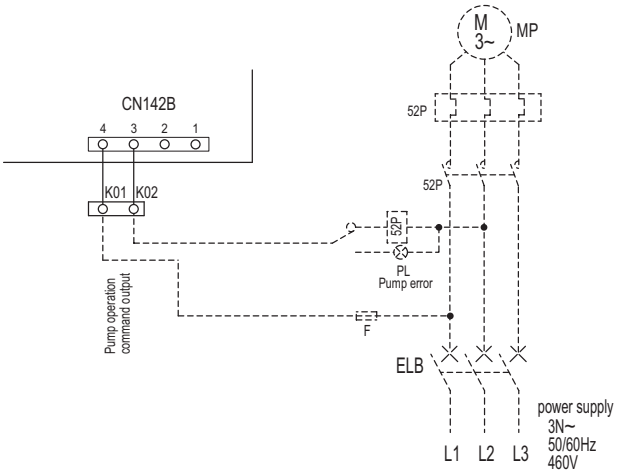


-7- Automatic operation of pump for freeze-up protection

1. Purpose

This is a function to protect the water circuit from freezing up in winter.

2. Pump wire connection



3. Natural freeze-up protection

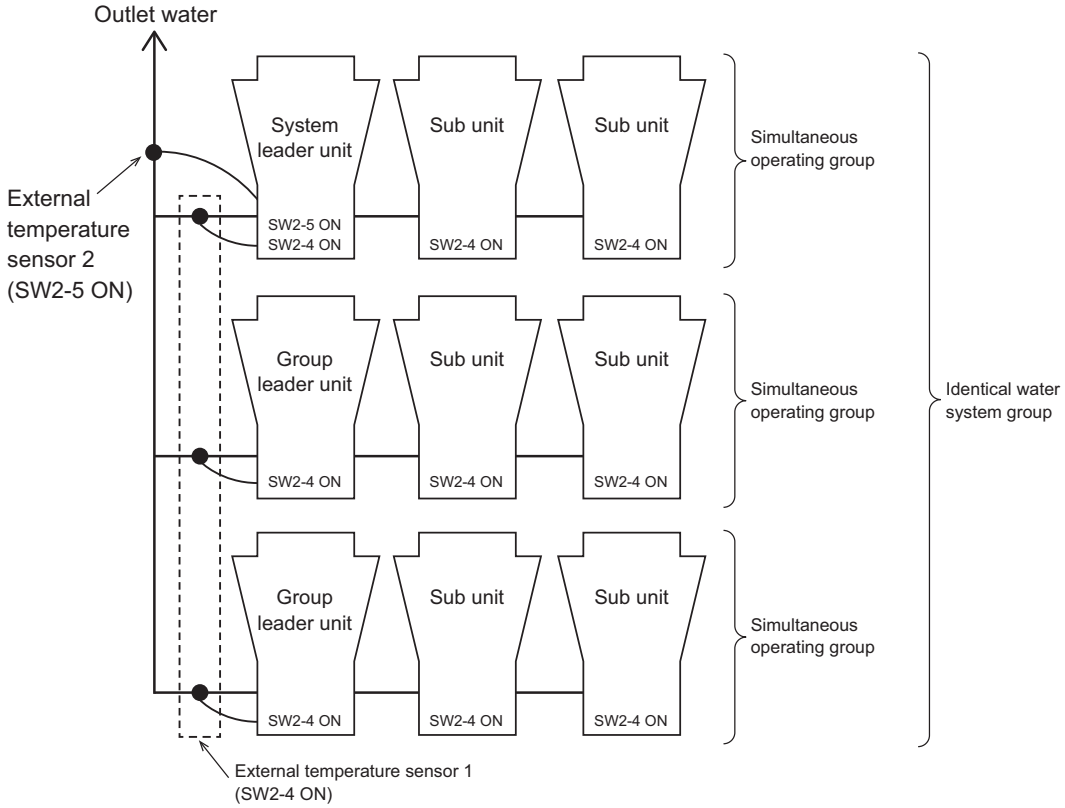
Control method		Natural freeze-up protection based on the water temperature
Details	Pump start conditions	Water temperature is within 3ºC [37ºF]
	Pump stop conditions	Water temperature is more than 5ºC [41ºF]

-8- Water-temperature control

Water temperature can be controlled in the following way.

	SW2-4	SW2-5
Outlet-water-temperature-based control	OFF	OFF
External temperature sensor 1	ON	-
External temperature sensor 2	-	ON

An optional External temperature sensor (TW-TH16) is required.



External temperature sensor 1

Used to control the water temperature of simultaneous operating group.

External temperature sensor 2

The water outlet temperature of each unit in the identical water system group is corrected to bring the water temperature at the merged section of the outlet water pipes toward the target temperature.

1. When the units are restarted after stopping for under a condition other than Thermo-OFF

Conditions for the units to stop other than the Thermo-OFF condition

- Pump interlock is off.
- When one of the units in a set is forced to stop
- When the units were stopped under the following conditions:
  Outlet water temperature has reached 3.6ºC [38ºF]

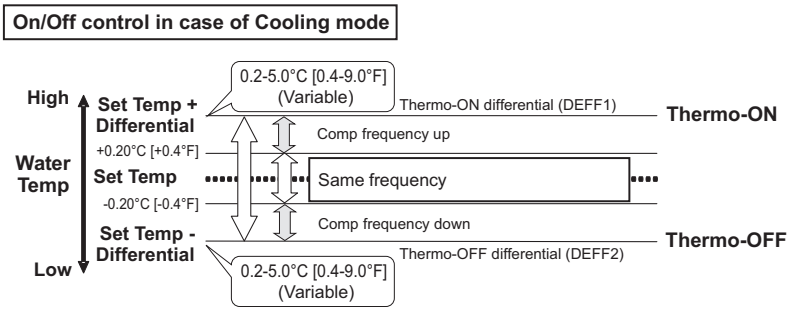
2. Normal Thermo-ON/OFF operations

DIFF1 = 3ºC [5ºF] (Initial setting)
DIFF2 = 2ºC [4ºF] (Initial setting)

sensor	Control method	Thermo-ON conditions	Thermo-OFF conditions
Built-in thermistor	Outlet-water-temperature-based control	Outlet water temperature is greater than "Preset temperature + DIFF1 (ºC)". Except the short-cycling protection mode.	Outlet water temperature is below the "Preset temperature - DIFF2 (ºC)". At least 60 seconds have passed since the last Thermo-ON.
External water temperature	Water temperature control based on the external water temperature reading	External water temperature is greater than "Preset temperature + DIFF1 (ºC)". Except the short-cycling protection mode.	External water temperature is below the "Preset temperature - DIFF2 (ºC)". At least 60 seconds have passed since the last Thermo-ON.

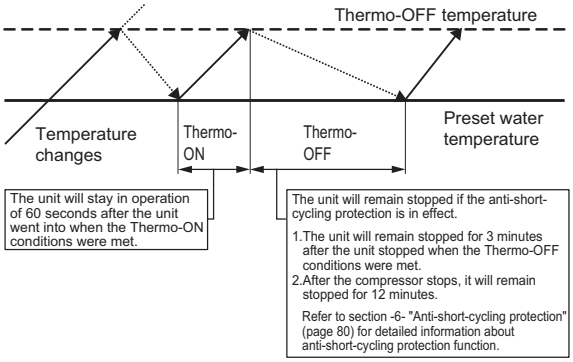
1) Thermo-ON/OFF temperature conditions

♦Water temperature control



When the water temperature is controlled based on the outlet water temperature, compressor frequency will be controlled in the way that the target water temperature will be maintained.

2) Thermo-ON/OFF conditions (time)



-9- Remote water temperature setting input signal type

By setting SW2-7 to ON, external analog signals can be used to set the water temperatures.
Analog input type can be selected from the following four types:
4-20 mA
1-5 V
0-10 V
2-10 V

VIII Test Run Mode

[1] Items to be checked during a Test Run 85
[2] Test Run Method 87
[3] Operating the Unit 88
[4] Refrigerant 89
[5] Symptoms that do not Signify Problems 89

[1] Items to be checked during a Test Run

(1) Check for refrigerant leak and loose cables and connectors before a test run.

(2) Measure the insulation resistance between the power supply terminal block and the ground with a 500V megger and make sure it reads at least 1.0Mohm.

Note

- Do not operate the unit if the insulation resistance is below 1.0Mohm.
- Do not apply megger voltage to the terminal block for transmission line. Doing so will damage the controller board.
- Never measure the insulation resistance of the transmission terminal block for the RA,RB,MA,MB(TB3). Do not attempt to measure the insulation resistance of TB7.
- The insulation resistance between the power supply terminal block and the ground could go down to close to 1Mohm immediately after installation or when the power is kept off for an extended period of time because of the accumulation of refrigerant in the compressor.
- If insulation resistance reads at least 1Mohm, by turning on the main power and powering the IH for at least 12 hours, the refrigerant in the compressor will evaporate and the insulation resistance will go up.
- Do not measure the insulation resistance of the terminal block for transmission line for the unit remote controller.

(3) Check the phase order of the 3-phase power source and the voltage between each phase.

Note

Open phase or reverse phase causes the emergency stop of test run. (4102 error)

(4) When a power supply unit is connected to the transmission line for centralized control, perform a test run with the power supply unit being energized.

(5) Pre-energize the compressor.

A. A case heater is attached to the bottom of the compressor to prevent the refrigerant oil from foaming when starting up. Switch on the power to the case heater and keep it turned on for **at least 12 hours** before starting a test run. (Compression of liquid refrigerant that may happen if the unit is started up without pre-energizing the compressor may damage the valve or cause other problems. When foaming is happening, the compressor will make cracking sounds for a few seconds at the beginning of operation.)

B. Supply water to the water circuit before operating the pump. Operating the pump without water may damage the shaft seal.

(6) Check the pressure.

Translate the pressure readings into saturating temperatures, and make sure these values fall into the ranges specified in the table below.

Condensing and evaporating temperatures during operation

Saturation pressure equivalent to refrigerant pressure	During normal operation (outdoor temperature: between -15 ºC [5ºF] and +43 ºC [109ºF])
	Cooling
Condensing temperature	Outdoor temperature + (3 - 8°C [5 - 14°F])*
Evaporating temperature	Outlet water temperature - (0 - 5°C [0 - 9°F])

* To maintain proper compression ratio, when the outdoor temperature is below 20ºC [68ºF], condensing temperature may exceed "(Outdoor temperature) + 8ºC [14ºF]"

(7) Check that the correct voltage is applied.

Check that the voltage that is applied while the unit is stopped and the load-side voltage of the solenoid contactor in the relay box during operation are within the voltage ranges. Check the voltage in all phases (L1, L2, and L3), and make sure that the voltage imbalance between the phases is 2% or less.

(8) Check either the power supply current or the compressor current.

Check the compressor current in all phases (L1, L2, and L3).

(9) Check for short-cycling of discharge air.

Check that the intake air temperature is not unusually higher or lower than the outside temperature. During operation, the difference between the heat exchanger inlet temperature and outside temperature should be 1ºC [2ºF] or less.

(10) Check for proper circulating water flow rate.

Measure the circulating water flow rate, if possible. If it is not, check that the temperature difference between the outlet and inlet temperatures is between 3 and 10ºC [5 and 18ºF]. A temperature difference of 12ºC [22ºF] or more indicates not enough water flow. Check for air pockets in the pipe, and make sure that the pump has the appropriate capacity for the circuit.

(11) Check that the unit is operating properly according to the temperature adjustment function.

When a start-up operation is completed, check that the hot water temperature adjustment function will come on and that the unit will automatically go on and off. Make sure the ON/OFF cycle (beginning of an operation until the next) is at least 12 minutes. (The unit features an anti-short-cycling protection.)

Notes on temperature adjustment function

The water temperature can be controlled based on the inlet or the outlet temperature sensor reading. Select one to use. Refer to "II [3] (2) Factory Switch Settings (Dip switch settings table) (page 19) and "2. Water-temperature setting"(page 72) for how to select the water temperature control method and how to set the water temperature.

Do not disconnect the power wire to the compressor in an attempt to keep the compressor from going into operation during test run. (If it is done, the control board will not sense that the compressor is stopped, and the water temperature will not be controlled properly and the unit may come to an abnormal stop.)

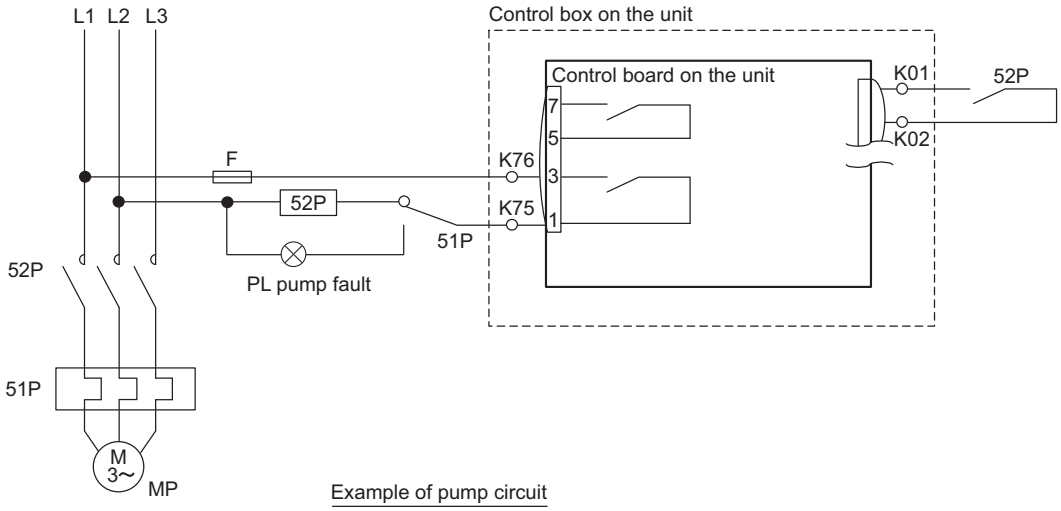
(12) Connect the pump-interlock wire to the appropriate contacts.

1) Connecting the pump-interlock wire

Connect the pump-interlock wire to the pump-interlock circuit (Terminal block K01 and K02). The unit will not operate unless this circuit is complete.

2) Notes on connecting the pump-interlock wire

- Connect an NO relay (solenoid switch) for the pump.
- This circuit is a low-voltage circuit. Keep the pump-interlock wire at least 5 cm [2 in.] away from any wire that carries a voltage of 100 V or above to avoid damage to the circuit board.



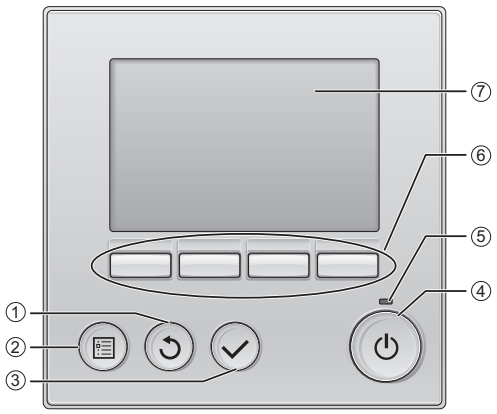
Example of pump circuit

(13) Checking the rotation direction of the pump

Check that the circulating water pump is rotating in the correct direction. If the pump is rotating in the wrong direction, disconnect the pump wiring from the solenoid switch, and reconnect them so that the pump will rotate in the correct direction.

[2] Test Run Method

(1) PAR-W31MAA



① [Return] button
② [Menu] button
③ [Select] button
④ [ON/OFF] button
⑤ ON/OFF lamp
⑥ Function button
([F1], [F2], [F3], and [F4] from the left)
⑦ Backlit LCD

Operation procedures		
Press the [ON/OFF] button.	→	The ON/OFF lamp will light up in green and the operation will start.
Press the [F1] button to select the desired operation mode. Press the [F2] button to decrease the set temperature, and press the [F3] button to increase.		
To stop the operation, press the [ON/OFF] button.	→	Stop

[3] Operating the Unit

1. Initial Operation

(1) Make sure the Run/Stop switch that controls the unit on the local control panel is switched off.
(2) Switch on the main power.
(3) Leave the main power switched on for at least 12 hours before turning on the Run/Stop switch that controls the unit on the on-site control panel to warm up the compressor.
(4) Switch on the Run/Stop switch that controls the unit on the on-site control panel.

2. Daily Operation

To start an operation

Switch on the Run/Stop switch that controls the unit on the local control panel, or press the ON/OFF button on the remote controller. (*1)

Note

The unit described in this manual features a circuit that protects the compressor from short-cycling. Once the compressor stops, it will not start up again for up to 12 minutes. If the unit does not start when the ON/OFF switch is turned on, leave the switch turned on for 12 minutes. The unit will automatically start up within 12 minutes.

To stop an operation

Switch off the Run/Stop switch that controls the unit on the on-site control panel, or press the ON/OFF button on the remote controller. (*1)

*1 Refer to [2] Test Run Method (page 87) for how to use the remote controller.

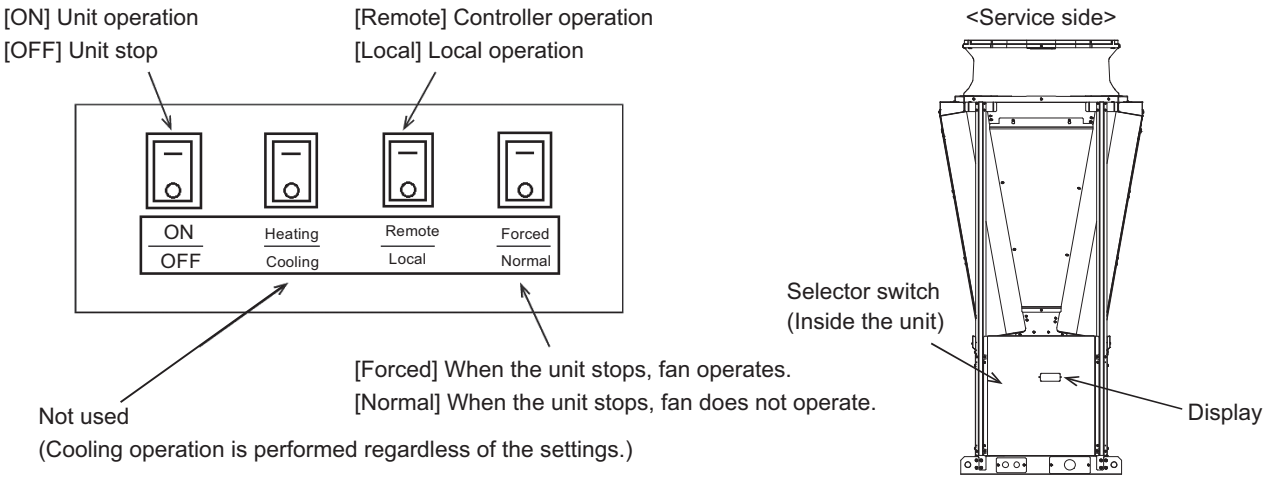
IMPORTANT

- Keep the main power turned on throughout the operating season, in which the unit is stopped for three days or shorter (e.g., during the night and on weekends).
- Unless in areas where the outside temperature drops to freezing, switch off the main power when the unit will not be operated for four days or longer. (Switch off the water circulating pump if the pump is connected to a separate circuit.)
- When resuming operation after the main power has been turned off for a full day or longer, follow the steps under “Initial Operation” above.
- If the main power was turned off for six days or longer, make sure that the clock on the unit is correct.

3. Operating the unit from the selector switch on the unit.

(1) To start the unit
Switch the Selector switch to “Local” and press “ON”.

(2) To stop the unit
With the Selector switch on “Local”, press “OFF”.



[4] Refrigerant

Unit type	EACV-P040,050YBL
Refrigerant type	R410A
Refrigerant charge	15 kg [33 lbs] × 4

[5] Symptoms that do not Signify Problems

Symptom	Remote controller display	Cause
Fan does not stop while stopping operation.	“Fan mode Snow” (PAR-W31MAA).	If terminals K91 and K92 are short-circuited, the fan will be forced to operate even after the compressor has stopped.
The display shown “PLEASE WAIT” will appear on the unit remote controller for about 5 minutes when the main power source is turned on.	“PLEASE WAIT” blinking display (PAR-W31MAA).	The system is under starting up. Operate the remote controller after the blinking of “PLEASE WAIT” is disappeared.

IX Troubleshooting

[1] Maintenance items 93
[2] Troubleshooting 97
[3] Troubleshooting Principal Parts 102
[4] Refrigerant Leak 117
[5] Parts Replacement Procedures 118
[6] Draining the water from the water-pipes of the unit and from the water heat exchanger ... 136

[1] Maintenance items

1. Operation status monitor
   Check the contents in the maintenance tool.

Input

Mark	Official Name	Meaning
CN142A2	RUN	Run/Stop (*Setting change through contact input can only be made when the power is turned on.)
CN142A4	Fan mode	Forced/Normal
CN142B2	Cooling/Heating switching	ON→Heating / OFF→Cooling (*Setting change through contact input can only be made when the power is turned on.)
CN142B4	Pump Interlok	Normal/Error
CN142C3	Outlet water temp. switching	ON→2nd (temp.2) / OFF→1st (temp.1)
CN142C4	Fan mode	Forced/Normal (*Setting change by switch on the unit.)
CN142C5	Cooling/Heating switching	Heating/Cooling (*Setting chagne by switch on the unit.)
CN142C6	Remote/Local switching	Remote/Local (*Setting chagne by switch on the unit.)
CN142D3	Flow switch	Normal/Error
CN142D4	Demand	ON/OFF
CN142D5	Anti-Fleeze	ON/OFF
CN142D6	Mode Change	Heating ECO/Heating

Unit condition

Mark	Official Name	Meaning
TH1	Thermistor	Discharge Ref. temperature A
TH2	Thermistor	Discharge Ref. temperature B
TH3	Thermistor	Air hex Ref. temperature A
TH4	Thermistor	Air hex Ref. temperature B
TH5	Thermistor	Water hex Ref. temperature A
TH6	Thermistor	Water hex Ref. temperature B
TH7	Thermistor	ACC Inlet Ref. temperature A
TH8	Thermistor	ACC Inlet Ref. temperature B
TH9	Thermistor	Outdoor temperature
TH10	Thermistor	Inlet water temperature （Upper side）
TH11	Thermistor	Inlet water temperature （Lower side）
TH12	Thermistor	Outlet water temperature
TH16	Thermistor	External temperature sensor 2
TH17	Thermistor	External temperature sensor 1
Tsc	-	Correction value of target water temperature
HPA	63HS A	High pressure sensor A
HPB	63HS B	High pressure sensor B
LPA	63LS A	Low pressure sensor A
LPB	63LS B	Low pressure sensor B
Ts	-	Target water temperature
Twi	-	Inlet water temperature
Two	-	Outlet water temperature
Twg	-	External water temperature (TH17 is higher priority to show the value than TH16.)
Tout	-	BMS outdoor temperature
CTm	-	Target CT
IdcA	-	COMP bus current A
VdcA	-	COMP bus voltage A
IuA	-	Phase-U current of compressor A
IwA	-	Phase-W current of compressor A
THHSA	-	Heat sink temperature A
VunbA	-	Voltage unbalance A
SHsA	-	Target SH A
TdsA	-	Target Td A
SHA	-	Inlet ACC SH A
SCA	-	SC A
Twi_ave	-	Average inlet water temperature in same group
TdSHA	-	Discharge Ref. SH A
4-20mA (1)	-	Target temperature / Target capacity percent
THc9	-	Outdoor temperature compensation
THc10	-	Inlet water temperature (Upper side) compensation
THc11	-	Inlet water temperature (Lower side) compensation
THc12	-	Outlet water temperature compensation
THc16	-	External water temperature 2 compensation
THc17	-	External water temperature 1 compensation
IdcB	-	COMP bus current B
VdcB	-	COMP bus voltage B
IuB	-	Phase-U current of compressor B
IwB	-	Phase-W current of compressor B
THHSB	-	Heat sink temperature B
VunbB	-	Voltage unbalance B

SHsB	-	Target SH B
TdsB	-	Target Td B
SHB	-	Inlet ACC SH B
SCB	-	SC B
Two_ave	-	Average outlet water temperature in same group
TdSHB	-	Discharge Ref. SH B

Status

Mark	Official Name	Meaning
SW1-1～1-10	-	Dip switch 1 settings
SW2-1～2-10	-	Dip switch 2 settings
SW3-1～3-10	-	Dip switch 3 settings
SWU1-2	-	Rotary switch 1, 2
SWU3	-	Rotary switch 3
Demand (Ope)	-	SW = contact input, RC = remote controller
Hot water	-	Two temperature setting ON/OFF
63H1	-	High pressure switch (CN801-2/CN801-3)
Dtemp	-	Temperature of started defrost
On/Off Ctrl	-	Run/Stop
Fan Mode	-	ON→Forced operation OFF→Normal operation
Remote/Manual Ctrl	-	Remote/Manual
Mode	-	Heating/HeatingEcp/Hotwater/AntiFreeze/Cooling
Ps-bkup Stop	-	Stop for low pressure increase
Pd-bkup Stop	-	High pressure protection
Td-Temp bkup Stop	-	Discharge temperature protection
Ant-frz Ctrl	-	Anti freeze control
Re-Ant-frz (startup)	-	Retry for anti freeze(start up)
Re-Ant-frz (stationary)	-	Retry for anti freeze (stationary)
IH	-	Compressor heater
Init-Run Ctrl	-	Initial run control
Defrost Ask	-	Defrost ask
Mode Ctrl	-	Stop/Heating/Cooling/Thermo stand-by/Defrost/Force Stop /Defrost stand-by/Pump stand-by/Retry/Error Stop/Heating ECO /Anti-freeze
Multi Ctrl	-	ON → Multi, OFF → Single
Water temp Ctrl	-	TH17 ON/OFF
Main Water temp Ctrl	-	TH16 ON/OFF
Thr-ON/OFF	-	Thermostat ON/OFF
Defrost Mode	-	Defrost mode Other/Wait/On
Demand	-	Demand (ON = 0, OFF = 1)
Remain1A (min)	-	Remaining time for compressor A restart by 12min limitation
Remain2A (min)	-	Remaining time for compressor A restart by 3min limitation
Remain3A (min)	-	Remaining time A
Remain1B (min)	-	Remaining time for compressor B restart by 12min limitation
Remain2B (min)	-	Remaining time for compressor B restart by 3min limitation
Remain3B (min)	-	Remaining time B
Total-Comp (Hz)	-	Total compressor frequency
SH/SC-CtrlA	-	Target discharge temp. control ON/OFF (A)
SH/SC-CtrlB	-	Target discharge temp. control ON/OFF (B)
All-Units	-	The number of units
Run-Units	-	The number of operating units
Unit1～Unit24	-	Operating condition (Unit 1～24) Thermo OFF/Thermo ON/Error/-
TotalA (hr)	-	Total operating time for compressor A
ON/OFF-CntA	-	Count of ON/OFF for compressor A
Err code	-	Error code
Detail	-	Error code detail
TotalB (hr)	-	Total operating time for compressor B
ON/OFF-CntB	-	Count of ON/OFF for compressor B
Comp min (Hz)	-	Compressor minimum frequency
Comp max (Hz)	-	Compressor maximum frequency
sys-chg Comp (Hz)	-	Compressor frequency at changing the number of operating compressor
Comp ON/OFF	-	Compressor ON/OFF
Comp Auto/Manual	-	Compressor Auto/Manual
Target-Comp (Hz)	-	Target compressor frequency
CTA	-	Condensing temperature A
ETA	-	Evaporating temperature A
CTB	-	Condensing temperature B
ETB	-	Evaporating temperature B
Fan Auto/Manual	-	Fan Auto/Manual
LEV Auto/Manual	-	LEV Auto/Manual

Pd bkup1	-	Limitation of increasing compressor frequency (PD error)
Pd bkup2	-	Forced unload compressor (PD error)
Ps bkup3	-	Anti freeze (stationary)
Ps bkup1-1	-	Limitation of increasing compressor frequency (Low pressure control)
Ps bkup1-2	-	Forced LEV open (Low pressure control)
Ps bkup2	-	Forced unload compressor (Low pressure control)
Td bkup1	-	Limitation of increasing compressor frequency (Discharge temperature control)
Td bkup2	-	Forced unload compressor (Discharge temperature control)
Ps-up bkup	-	Protection of increasing low pressure
Liquid bag bkup	-	Protection of Liquid back
Cold-low bkup	-	Protection of cold water lower limit
Hot-up bkup	-	Protection of hot water upper limit
Ta Cold-low bkup	-	Ambient temperature lower limit (Cooling)
Ta Cold-up bkup	-	Ambient temperature upper limit (Cooling)
Ta Hot-low bkup	-	Ambient temperature lower limit (Heating)
Ta Hot-up bkup	-	Ambient temperature upper limit (Heating)
Ant-frz bkup1	-	Anti freeze stop 1
Ant-frz bkup2	-	Anti freeze stop 2
Cfan bkup	-	Protection of control FAN
COMPAR	-	Real compressor frequency A
COMPA	-	Compressor frequency A
FANAR	-	Real FAN frequency A
FANA	-	FAN frequency A
COMPBR	-	Real compressor frequency B
COMPB	-	Compressor frequency B
FANBR	-	Real FAN frequency B
FANB	-	FAN frequency B
RX03	-	Control FAN 1 (Main) / Control FAN 3 (Sub)
RX04	-	Control FAN 2 (Main) / Control FAN 4 (Sub)
RX05	-	4way valve 1B (Main) / 4way valve 2B (Sub)
X01	-	4way valve 1A (Main) / 4way valve 2A (Sub)
LEV1	-	Main LEV 1A (Main) / Main LEV 2A (Sub)
LEV2	-	Sub1 LEV1 (Main) / Sub1 LEV2 (Sub)
LEV3	-	Main LEV 1B (Main) / Main LEV 2B (Sub)
LEV4	-	Sub2 LEV1 (Main) / Sub2 LEV2 (Sub)

Schedule

Mark	Official Name	Meaning
Time	-	Time
Month	-	Month (00-12)
Day	-	Day (00-99)
Demand (%)	-	Maximum capacity demand (%)
Setting temp1	-	Target temperature (Cooling)
Setting temp2	-	Target temperature (Heating)
Thr-diff1	-	Thermo diferrential (Thermostat ON)
Thr-diff2	-	Thermo diferrential (Thermostat OFF)

Output

Mark	Official Name	Meaning
X04	MAIN BOX = SUB BOX=	MAIN BOX = Pump operation command output
X05	MAIN BOX = SUB BOX=	MAIN BOX = Defrost signal output
X06	MAIN BOX = SUB BOX=	MAIN BOX = Operation display output SUB BOX = Supplementary heater signal output
X07	MAIN BOX = SUB BOX=	MAIN BOX = Error display output
X08	MAIN BOX = SUB BOX=	MAIN BOX = Drain pan heater signal output
X09	MAIN BOX = SUB BOX=	MAIN BOX = Heating operation diplay output

2. Operation status before error
   Check the contents in the maintenance tool.

Time of data storage before error

Mark	Official Name	Meaning
TH1	Thermistor	Discharge Ref. temperature A
TH2	Thermistor	Discharge Ref. temperature B
TH3	Thermistor	Air hex Ref. temperature A
TH4	Thermistor	Air hex Ref. temperature B
TH5	Thermistor	Water hex Ref. temperature A
TH6	Thermistor	Water hex Ref. temperature B
TH7	Thermistor	ACC Inlet Ref. temperature A
TH8	Thermistor	ACC Inlet Ref. temperature B
TH9	Thermistor	Out door temperature
TH10	Thermistor	Inlet water temperature (Upper side)
TH11	Thermistor	Inlet water temperature (Lower side)
TH12	Thermistor	Outlet water temperature
TH16	Thermistor	External temperature sensor 2
TH17	Thermistor	External temperature sensor 1
HPA	63HS A	High pressure sensor A
HPB	63HS B	High pressure sensor B
LPA	63LS A	Low pressure sensor A
LPB	63LS B	Low pressure sensor B
CTm	-	Target CT
IdcA	-	COMP bus current A
VdcA	-	COMP bus voltage A
IuA	-	Phase-U current of compressor A
IwA	-	Phase-W current of compressor A
THHSA	-	Heat sink temperature A
IdcB	-	COMP bus current B
VdcB	-	COMP bus voltage B
IuB	-	Phase-U current of compressor B
IwB	-	Phase-W current of compressor B
THHSB	-	Heat sink temperature B
SHsA	-	Target SH A
TdsA	-	Target Td A
SHA	-	Inlet ACC SH A
SCA	-	SC A
TdSHA	-	Discharge Ref. SH A
SHsB	-	Target SH B
TdsB	-	Target Td B
SHB	-	Inlet ACC SH B
SCB	-	SC B
TdSHB	-	Discharge Ref. SH B
SH/SC-CtrlA	-	Target discharge temp. control ON/OFF (A)
SH/SC-CtrlB	-	Target discharge temp. control ON/OFF (B)
Month	-	Month (00-12)
Day	-	Day (00-99)
Time	-	Time
LEV1	-	Main LEV 1A (Main) / Main LEV 2A (Sub)
LEV2	-	Sub1 LEV1 (Main) / Sub1 LEV2 (Sub)
LEV3	-	Main LEV 1B (Main) / Main LEV 2B (Sub)
LEV4	-	Sub2 LEV1 (Main) / Sub2 LEV2 (Sub)
COMPAR	-	Real compressor frequency A
COMPAR	-	Compressor frequency A
FANAR	-	Real FAN frequency A
COMPBR	-	FAN frequency A
COMPB	-	Real compressor frequency B
FANBR	-	Compressor frequency B
FANB	-	Real FAN frequency B
CTA	-	Condensing temperature A
ETA	-	Evaporating temperature A
CTB	-	Condensing temperature B
ETB	-	Evaporating temperature B

[2] Troubleshooting

Troubleshooting must be performed only by personnel certified by Mitsubishi Electric.

1. Diagnosing Problems for which No Error Codes Are Available
   If a problem occurs, please check the following. If a protection device has tripped and brought the unit to stop, resolve the cause of the error before resuming operation.
   Resuming operation without removing the causes of an error may damage the unit and its components.

Problem	Check item		Cause	Solution
The unit does not operate.	The fuse in the control box is not blown.	The power lamp on the circuit board is not lit.	The main power is not turned on.	Switch on the power.
		The power lamp on the circuit board is lit.	The pump interlock circuit is not connected.	Connect the pump interlock circuit wiring to the system.
			The flow switch wiring is not connected.	Connect the flow switch wiring to the system.
	The fuse in the control box is blown.	Measure the circuit resistance and the earth resistance.	Short-circuited circuit or ground fault	Resolve the cause, and replace the fuse.
	The compressor does not operate.	The pump interlock has tripped.	The pump interlock circuit is not connected.	Connect the pump interlock wiring.
			The water pump is not operating.	Operate the pump.
			Problem with the solenoid contactor for the pump	Replace the solenoid contactor.
	Automatic Start/Stop thermistor has tripped.	Water temperature is high. (Cooling)	The setting for the automatic Start/Stop thermistor is too high.	Change the setting for the automatic Start/Stop thermistor.
The unit is in operation, but the water does not heat up.	Water temperature is low.	-	Water flow shortage	Increase the water flow rate.
			Problem with the external devices	Repair the devices.
	Water temperature is high.	The water inlet/outlet temperature differential is normal.	The water-cooling load is too high.	Install more units.
			Low refrigerant charge due to a leak.	Perform a leakage test, repair the leaks, evacuate the system, and charge the refrigerant circuit with refrigerant.
		The water inlet/outlet temperature differential is small.	LEV fault in the main circuit	Replace the LEV in the main circuit.
			Compressor failure	Replace the compressor.
			High pressure is too high, or low pressure is too low.	Operate the units within the specified pressure range.

2. Diagnosing Problems Using Error Codes
   If a problem occurs, please check the following before calling for service.
   (1) Check the error code against the table below.
   (2) Check for possible causes of problems listed in the "Cause" column that correspond to the error code.
   (3) If the error codes that appear on the display are not listed in the table below, or no problems were found with the items listed in the "Cause" column, please consult your dealer or servicer.

Diagnosing Problems Using Error Codes

Error code *1	Error type	Cause (Installation/Setting error)	Cause (Parts problems)	Error reset *2	
				Operation SW	
				Selector switch	Remote controller
4106	Power supply fault *3	Power supply fault occurred when the operation switch is switched on.	-	○	○
2503	Water supply cutoff (Flow switch has been triggered.)	The water flow rate dropped below the flow switch threshold. Water supply cutoff	•Open-circuited flow switch •Broken flow switch wiring	×	×
2501	Water supply cutoff (detection by sensor) 101, 201: Upper side 102, 202: Lower side 203: Inlet/outlet of unit	No water Water supply cutoff	•Inlet water thermistor fault •Outlet water thermistor fault	×	×
1302 1303	High pressure fault 101: MAIN circuit 102: SUB circuit	No water Water supply cutoff	•Linear expansion valve fault •High-pressure sensor fault	○	○
1176	Discharge SH fault 101: MAIN circuit 102: SUB circuit	-	•Low-pressure sensor fault •ACC inlet refrigerant temperature thermistor fault •High-pressure sensor fault •Discharge refrigerant temperature thermistor fault •Linear expansion valve fault	○	○
1301	Low pressure fault 101: MAIN circuit 102: SUB circuit	The outdoor temperature was below the operating range.	•Low-pressure sensor fault •ACC inlet refrigerant temperature thermistor fault •Linear expansion valve fault •Refrigerant deficiency (refrigerant gas leak)	○	○
1189	ACC inlet SH fault 101: MAIN circuit 102: SUB circuit	-	•ACC inlet refrigerant temperature thermistor fault •Linear expansion valve fault •Low-pressure sensor fault	○	○
5109	Thermistor fault: Outdoor temperature (TH9)	-	•Broken or shorted thermistor wiring	○	○
5110	Thermistor fault: Inlet water temperature (TH10)	-	•Broken or shorted thermistor wiring	○	○
5111	Thermistor fault: Inlet water temperature (TH11)	-	•Broken or shorted thermistor wiring	○	○
5112	Thermistor fault: Outlet water temperature (TH12)	-	•Broken or shorted thermistor wiring	○	○
5107 5108	Thermistor fault: ACC inlet refrigerant temperature (TH7, 8/TH107, 108)	-	•Broken or shorted thermistor wiring	○	○
5103 5104	Thermistor fault: Air heat exchanger refrigerant temperature (TH3, 103/TH4, 104)	-	•Broken or shorted thermistor wiring	○	○
5105 5106	Thermistor fault: Water heat exchanger refrigerant temperature (TH5, 105/TH6, 106)	-	•Broken or shorted thermistor wiring	○	○
5101 5102	Thermistor fault: Discharge refrigerant temperature (TH1, 101/TH2, 102) 101: Sensor error 102: Installation error	-	•Broken or shorted thermistor wiring	○	○
5116	Thermistor fault: External water sensor 2 fault (TH116)	-	•Broken or shorted thermistor wiring	○	○
5117	Thermistor fault: External water sensor 1 fault (TH117)	-	•Broken or shorted thermistor wiring	○	○
5201	High-pressure sensor fault/high-pressure fault 101: MAIN circuit 102: SUB circuit	-	•Broken or shorted pressure sensor wiring	○	○
5202	Low-pressure sensor fault/low-pressure fault 101: MAIN circuit 102: SUB circuit	-	•Broken or shorted pressure sensor wiring	○	○
7102	Connection count error	-	•Setting of connection count fault	×	×
7113	Model setting error 1	Dip switches on the PCB were set incorrectly during maintenance.	-	○	○
7117	Model setting error 2	-	•CNTYP1 resistor fault (connected to the Main control board)	○	○
4115	Power supply frequency fault	Power supply frequency is a frequency other than 50 Hz or 60 Hz.	-	○	○
4102	Open phase	There is an open phase.	•Circuit board fault	×	×
4103	Reversed phase error	Reversed phase	•Wiring fault	×	×

Error code *1	Error type			Cause (Installation/Setting error)	Cause (Parts problems)	Error reset *2	
						Operation SW	
						Selector switch	Remote controller
1102	Discharge temperature fault (A discharge refrigerant temperature of 120ºC [248ºF] or above is detected momentarily while the compressor is in operation.) 101: MAIN circuit 102: SUB circuit			No water Abrupt change in water temperature (5K/min. or greater) Pump failure	•High-pressure sensor fault •Linear expansion valve fault •Refrigerant deficiency (refrigerant gas leak)	○	○
1138	Hot water abnormal rise			Drop in water flow or water supply cutoff Water temperature rise	-	○	○
1503	Cold water abnormal drop *4			Drop in water flow or water supply cutoff Water temperature drop	-	×	×
1510	Gas leak fault			-	•High pressure sensor fault •Refrigerant deficiency (refrigerant gas leak)	○	○
1512	Low evaporation temperature fault 101: MAIN circuit 102: SUB circuit			Drop in water flow Water temperature drop	-	×	×
4260*	Cooling fan fault			-	•Cooling fan fault	○	○
4122	Fan interlock fault			Disconnection of wiring	•Fan motor fault •Fan INV board fault	○	○
4250* (101)	Inverter error	IPM error		-	•INV board, Fan INV board fault •Ground fault of the compressor •Coil problem •IPM error (loose terminal screws, cracked due to swelling) •Items listed under "Heatsink overheat protection" below	○	○
4250* (102)		ACCT overcurrent		-	•INV board fault •Ground fault of the compressor •Coil problem •IPM error (loose terminal screws, cracked due to swelling)	○	○
4250* (103)		DCCT overcurrent		-		○	○
4250* (107)		Overcurrent relay trip (effective value) (During operation)		-		○	○
4250* (106)		Overcurrent relay trip (momentary value) (During operation)		-		○	○
4250* (104)		Short-circuited IPM/ground fault (During operation)		-	•INV board, Fan INV board fault •Ground fault of the compressor •IPM error (loose terminal screws, cracked due to swelling)	○	○
4250* (105)		Overcurrent error due to a short-circuited (During operation)		Inter-phase voltage drop	•INV board, Fan INV board fault •Ground fault of the compressor •Shorted output wiring	○	○
4220* (108)		Voltage related problems during operation	Bus voltage drop protection	Momentary power failure/power failure Power supply voltage drop	•INV board fault •72C fault •R1, R5 fault	○	○
4220* (109)			Bus voltage rise protection	Incorrect power supply voltage	•INV board fault	○	○
4220* (110)			VDC error	Power supply voltage rise or drop	•Fan INV board fault •R1, R5 fault •INV board fault •72C fault	○	○
4220* (111)			Logic error	Malfunction due to external noise interference •Faulty grounding •Improper transmission and external wiring installation (Shielded cable is not used.) •Low-voltage signal wire and high-voltage wire are in contact. (Placing the signal wire and power wire in the same conduit)	•INV board, Fan INV board fault	○	○
4220* (131)			Inverter bus voltage fault	Power supply voltage drop	•MAIN board fault •Power supply voltage drop	○	○
4230* (125)		Heatsink fault (Heatsink overheat protection)		Power supply voltage drop Clogged heatsink cooling air passage	•Cooling fan fault •INV board fault •IPM error (loose terminal screws, cracked due to swelling)	○	○
4240*		Overload protection		Clogged heatsink cooling air passage Power supply voltage drop	•Cooling fan fault •Current sensor fault •INV circuit fault •Compressor fault	○	○
5300* (115)		ACCT sensor fault		-	•INV board fault •Ground fault of the compressor and IPM error	○	○
5300* (116)		DCCT sensor		-	•INV board fault •Ground fault of the compressor and IPM error	○	○
5300* (117)		ACCT sensor/circuit fault		-	•INV board fault	○	○

Error code *1	Error type		Cause (Installation/Setting error)	Cause (Parts problems)	Error reset *2	
					Operation SW	
					Selector switch	Remote controller
5301 (118)	Inverter error	DCCT sensor/circuit fault	-	•INV board fault	○	○
5301 (119)		Open-circuited IPM/loose ACCT sensor	-	•ACCT sensor fault •Broken compressor wiring •INV circuit fault (IPM error etc.)	○	○
5301 (120)		Faulty wiring	-	•INV board fault	○	○
5301 (132)	Fan position error at startup		-	•Fan INV board fault (CNSMR)	○	○
5301 (133)	Fan position error at startup		-	•Fan INV board fault (CNSMR)	○	○
5301 (134)	Fan position error before startup		-	•Fan INV board fault (CNSMR)	○	○
5114 (0*)	Inverter error	THHS sensor/circuit fault	-	•INV board fault	○	○
0403 (0*)		Serial communication error	-	•Communication error between control board and INV board, Fan INV board (noise interference, broken wiring)	○	○
6831	Remote controller error (incl. remote controller wiring fault)	Remote controller signal reception error 1	Remote controller cable is not connected. Broken wiring	•Broken remote controller wiring •Main control board communication circuit fault	—	—
6832		Remote controller signal transmission error	Communication error due to external noise interference	•Main control board communication circuit fault	—	—
6834		Remote controller signal reception error 2	Communication error due to external noise interference	•Main control board communication circuit fault	—	—
6833		Remote controller over current	Remote controller cable short circuit Remote controller malfunction	•Broken remote controller wiring	×	×
4126	Analog input error (Control board (MAIN) CN421)		Analog input type fault (SW3-1, SW3-2)	•Broken or open analog signal output device wiring (CN421)	—	—
6500	Communication error between the main and sub units Communication error between the MAIN and SUB circuits		-	-	—	—
6600	Transmission line power supply PCB fault Communication error between the main and sub units (Simple multiple unit control mode)		Communication error due to external noise interference	•Broken wiring to the transmission power supply circuit board (between the main and sub units) •Transmission power supply PCB communication circuit fault	×	×
6602 6603 6606 6607 6608					—	—
7100	Capacity code error		Other capacity units in a group	•Group setting fault	—	—

*1: If an error occurs, error codes shown above will appear in the 4-digit digital display on the display board and the remote controller.

*2: Definition of symbols in the "Error reset" column.

○ : Errors that can be reset if the remote reset setting on the unit is set to "Enable" (factory setting)
Errors that cannot be reset if the remote reset setting on the unit is set to "Disable"

× : Errors that cannot be reset

— : Errors that will be automatically cancelled once its cause is removed

*3: Power failure will be detected as an error only when the "Automatic recovery after power failure" setting on the unit is set to "Disable."
(The default setting for the "Automatic recovery after power failure" setting is "Enable.")

*4: Before resetting this error, remove its causes. Resuming operation without removing the causes of heat exchanger freeze up will cause heat exchanger damage.

5: "" shows types of components. (0/1: COMP A, 2: COMP B, 5: FAN A, 6: FAN B)

Abnormal stop condition table

Error code	Error type	Preliminary error code	One side circuit can be operated	Another unit can be operated in the group
1102	Discharge temperature fault	1202	○	◎
1138	Hot water abnormal rise	-	×	◎
1176	Discharge SH fault	1276	○	◎
1189	ACC inlet SH fault	1289	○	◎
1301	Low pressure fault	1401	○	◎
1302 1303	High pressure fault	1402	○	◎
1503	Cold water abnormal drop	-	×	◎
1510	Gas leak fault	-	×	◎
1512	Low evaporation temperature fault	1612 or none	×	◎
2503	Water supply cutoff (Flow switch)	-	×	×*1
2501	Water supply cutoff (Sensor)	-	×	◎
4102	Open phase	4152 or none	×	◎
4103	Reversed phase error	-	×	◎
4106	Power supply fault	-	×	◎
4115	Power supply frequency fault	-	×	◎
4122	Fan interlock fault	4172	×	◎
4126	Analog input error	-	—	—
422*	Inverter bus voltage fault	432*	COMP: ○ / FAN: ×	◎
423*	Inverter overheat protection fault	433*	○	◎
424*	Inverter overload protection	434*	COMP: ○ / FAN: ×	◎
425*	IPM error (inclusive)/overcurrent relay	435*	COMP: ○ / FAN: ×	◎
426*	Cooling fan fault	-	○	◎
5101	Discharge refrigerant temp. (TH1, 101)	1201	×	◎
5102	Discharge refrigerant temp. (TH2, 102)	1202	×	◎
5103	Air heat exchanger refrigerant temp. (TH3, 103)	-	×	◎
5104	Air heat exchanger refrigerant temp. (TH4, 104)	-	×	◎
5105	Water heat exchanger refrigerant temp. (TH5, 105)	-	×	◎
5106	Water heat exchanger refrigerant temp. (TH6, 106)	-	×	◎
5107	ACC inlet refrigerant temperature (TH7, 8)	-	×	◎
5108	ACC inlet refrigerant temp. (TH107, 108)	-	×	◎
5109	Outdoor temperature (TH9)	-	×	◎
5110	Inlet water temperature (TH10)	-	×	◎
5111	Inlet water temperature (TH11)	-	×	◎
5112	Outlet water temperature	-	×	◎
5114	THHS sensor/Circuit fault	1214	○	◎
5116	External water sensor 2 fault (TH116)	-	×	◎
5117	External water sensor 1 fault (TH117)	-	×	◎
5201	High pressure sensor fault	-	×	◎
5202	Low pressure sensor fault	-	×	◎
530*	ACCT sensor fault/Circuit fault	430*	COMP: ○ / FAN: ×	◎
0403	Serial communication error	430*	COMP: ○ / FAN: ×	◎
6500	Communication error between the MAIN and SUB units	-	×*2	◎
6600	Communication error between the MAIN and SUB units	-	×	◎
6602	Communication error between the MAIN and SUB units	-	×	◎
6603	Communication error between the MAIN and SUB units	-	×	◎
6606	Communication error between the MAIN and SUB units	-	×	◎
6607	Communication error between the MAIN and SUB units	-	×	◎
6608	Communication error between the MAIN and SUB units	-	×	◎
6831	Remote controller signal reception error 1	-	—	—
6832	Remote controller signal transmission error	-	—	—
6834	Remote controller signal reception error 2	-	—	—
6833	Remote controller over current	-	×	◎
7100	Capacity code error	-	×	×
7102	Connection count error	-	×	◎
7113 7117	Model setting error	-	×	◎

○ : One side circuit can be operated.
◎ : Another unit can be operated.
× : Operation impossible
— : Not abnormal stop

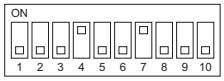
*1: Case of the one pump system
*2: Case of the communication error between the MAIN and SUB circuits
3: "" shows types of components. (0/1: COMP A, 2: COMP B, 5: FAN A, 6: FAN B)

[3] Troubleshooting Principal Parts

-1- High pressure sensor (63HS)

1. Perform a check while comparing the detected pressure by the high pressure sensor with the high pressure gauge pressure.

When the digital display changeover switch (SW1) is set as follows, the detected pressure of the high pressure sensor is displayed on the LED (LD1).



(Also possible with the display monitor)

(1) Compare the gauge pressure and the pressure displayed on the LD1 while the operation is stopped.

1) When the gauge pressure is about 0 - 0.098 MPa [0 - 14.2 psi] → Internal pressure drop due to gas leakage
2) When the pressure displayed on the LD1 is about 0 - 0.098 MPa [14.2 psi] → Check the connector for contact failure and disconnection and see (4)
3) When the pressure displayed on the LD is 4.15 MPa [601 psi] or above → See (3)
4) When any of 1) to 3) do not apply, compare the pressure during operation → See (2)

(2) Compare the gauge pressure and the pressure displayed on the LD1 during operation. (Compare using MPa unit)

1) When the difference in pressure is within 0.098 MPa [14.2 psi] → The high pressure sensor and the main circuit board are normal
2) When the difference in pressure is over 0.098 MPa [14.2 psi] → The high pressure sensor is malfunctioning (characteristic deterioration)
3) When the pressure displayed on the LD1 does not change → The high pressure sensor is malfunctioning

(3) Remove the high pressure sensor from the main circuit board and check the pressure displayed on the LD1.

1) When the pressure displayed on the LD1 is about 0 - 0.098 MPa [0 - 14.2 psi] → The high pressure sensor is malfunctioning
2) When the pressure displayed on the LD1 is about 4.15 MPa [601 psi] → The main circuit board is malfunctioning

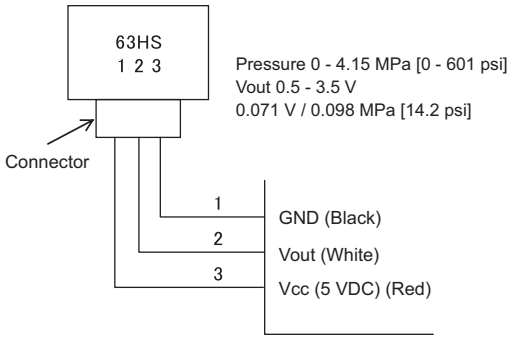
(4) Remove the high pressure sensor from the main circuit board, short-circuit 2-3 of the connector (63HS), and check the pressure displayed on the LD1.

1) When the pressure displayed on the LD1 is 4.15 MPa [601 psi] or above → The high pressure sensor is malfunctioning
2) When 1) does not apply → The main circuit board is malfunctioning

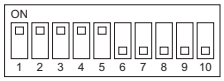
2. High pressure sensor structure

The high pressure sensor consists of the circuit shown on the right. When 5 VDC is applied between red and black, a voltage corresponding to pressure is output between white and black, and this voltage is taken in by the microcomputer.
The output voltage is 0.071 V per 0.098 MPa [14.2 psi].

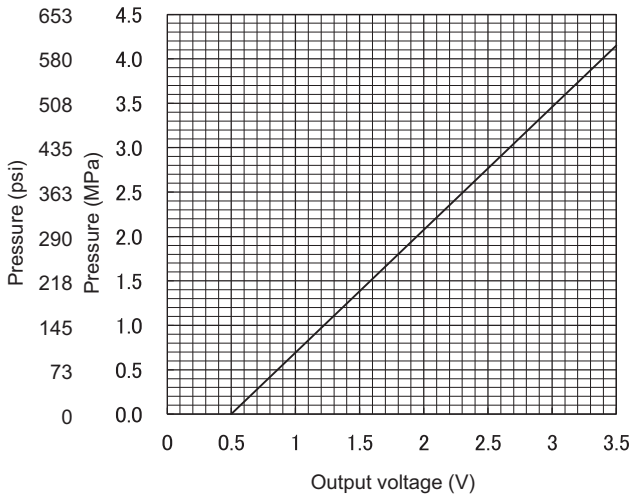
* The pressure sensor main body side is to be connected to a connector.
The pin number of the connector is different between the pressure sensor main body side and the main circuit board side.



	Main body side	Main circuit board side
Vcc	Pin 1	Pin 3
Vout	Pin 2	Pin 2
GND	Pin 3	Pin 1



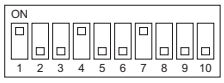
The figure at left shows that the switches 1 through 5 are set to ON and 6 through 10 are set to OFF.



-2- Low pressure sensor (63LS)

1. Perform a check while comparing the pressure detected by the low pressure sensor with the pressure of the low pressure gauge.

When the digital display changeover switch (SW1) is set as follows, the detected pressure of the low pressure sensor is displayed on the LED (LD1).



(Also possible with the display monitor)

(1) Compare the gauge pressure and the pressure displayed on the LD1 while the operation is stopped.

1) When the gauge pressure is about 0 - 0.098 MPa [0 - 14.2 psi] → Internal pressure drop due to gas leakage
2) When the pressure displayed on the LD1 is about 0 - 0.098 MPa [0 - 14.2 psi] → Check the connector for contact failure and disconnection and see (4)
3) When the pressure displayed on the LD is 1.7 MPa [247 psi] or above → See (3)
4) When any of 1) to 3) do not apply, compare the pressure during operation → See (2)

(2) Compare the gauge pressure and the pressure displayed on the LD1 during operation. (Compare using MPa unit)

1) When the difference in pressure is within 0.03 MPa [4.4 psi] → The low pressure sensor and the main circuit board are normal
2) When the difference in pressure is over 0.03 MPa [4.4 psi] → The low pressure sensor is malfunctioning (characteristic deterioration)
3) When the pressure displayed on the LD1 does not change → The low pressure sensor is malfunctioning

(3) Remove the low pressure sensor from the main circuit board and check the pressure displayed on the LD1.

1) When the pressure displayed on the LD1 is about 0 - 0.098 MPa [0 - 14.2 psi] → The low pressure sensor is malfunctioning
2) When the pressure displayed on the LD1 is about 1.7 MPa [247 psi] → The main circuit board is malfunctioning

(4) Remove the low pressure sensor from the main circuit board, short-circuit 2-3 of the connector (63LS), and check the pressure displayed on the LD1.

1) When the pressure displayed on the LD1 is 1.7 MPa [247 psi] or above → The low pressure sensor is malfunctioning
2) When 1) does not apply → The main circuit board is malfunctioning

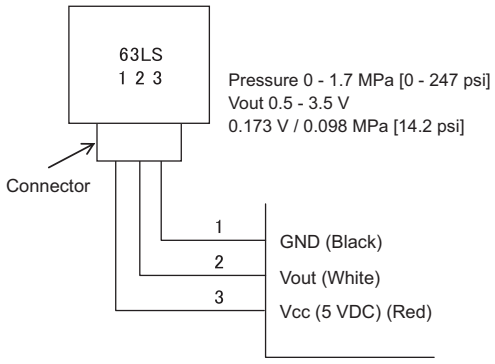
(5) Remove the high pressure sensor (63HS) from the main circuit board, connect the sensor to the connector for the low pressure sensor (63LS), and check the pressure displayed on the LD1.

1) When the pressure displayed on the LD1 is 1.7 MPa [247 psi] or above → The main circuit board is malfunctioning
2) When 1) dose not apply → The low pressure sensor is malfunctioning

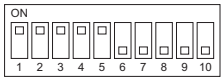
2. Low pressure sensor structure

The low pressure sensor consists of the circuit shown on the right. When 5 VDC is applied between red and black, a voltage corresponding to pressure is output between white and black, and this voltage is taken in by the microcomputer.
The output voltage is 0.173 V per 0.098 MPa [14.2 psi].

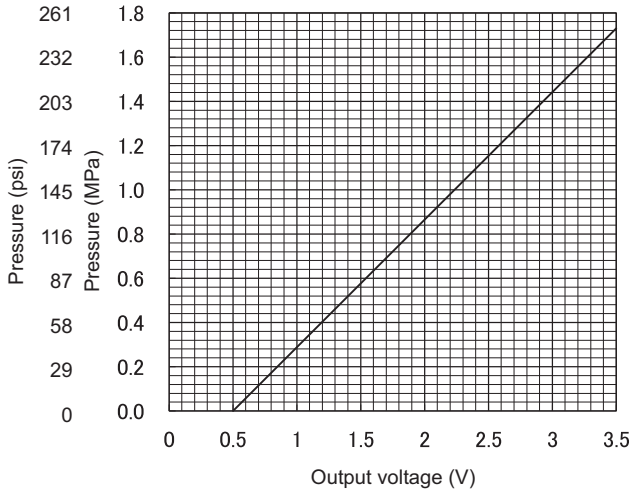
* The pressure sensor main body side is to be connected to a connector.
The pin number of the connector is different between the pressure sensor main body side and the main circuit board side.



	Main body side	Main circuit board side
Vcc	Pin 1	Pin 3
Vout	Pin 2	Pin 2
GND	Pin 3	Pin 1



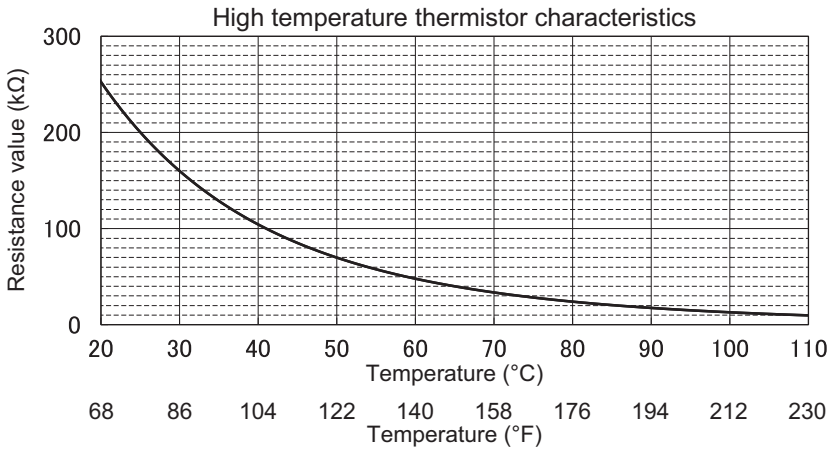
The figure at left shows that the switches 1 through 5 are set to ON and 6 through 10 are set to OFF.



-3- Temperature sensor

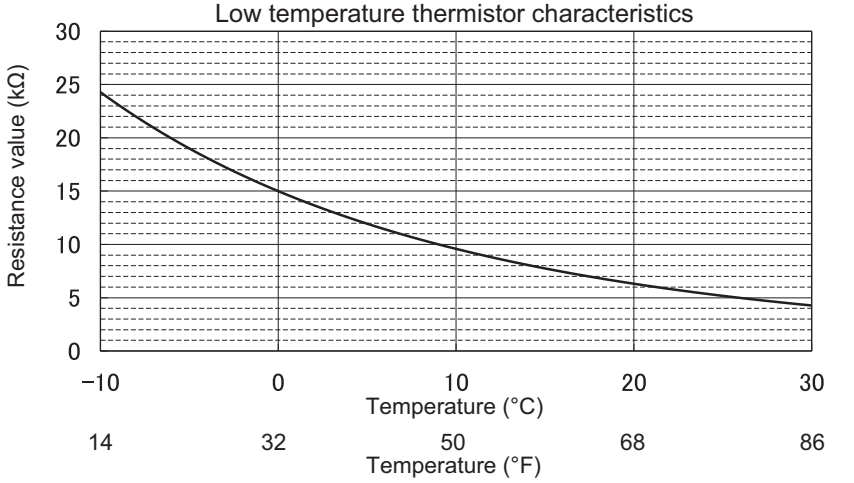
Perform a check while comparing sensor detection temperature and measured value.
See the diagram below for comparison with sensor resistance value.

1. High temperature thermistor (TH1, TH2, TH101, TH102)



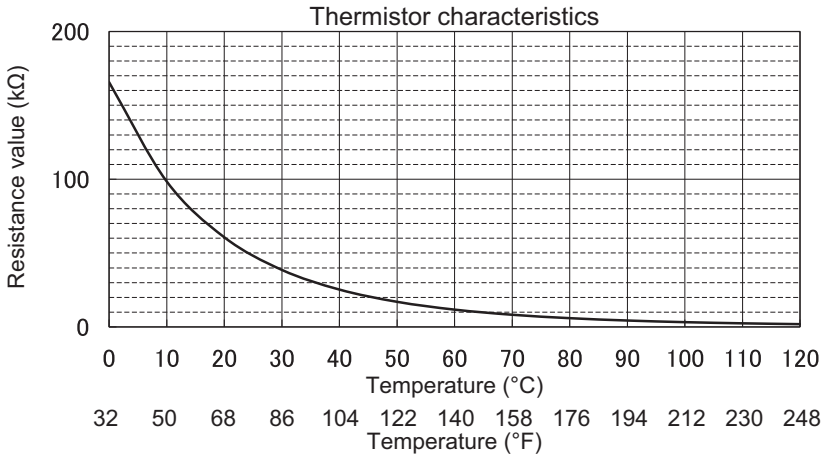
Upper limit value of the sensor temperature characteristic	150°C [302°F] or more
Lower limit value of the sensor temperature characteristic	-30.0°C [-22°F] or less

2. Low temperature thermistor (TH3, TH4, TH5, TH6, TH7, TH8, TH9, TH10, TH11, TH12, TH103, TH104, TH105, TH106, TH107, TH108, when there is a representative water temperature sensor (TH116, TH117))



Upper limit value of the sensor temperature characteristic	80°C [176°F] or more
Lower limit value of the sensor temperature characteristic	-30.0°C [-22°F] or less

3. Thermistor (THHS)



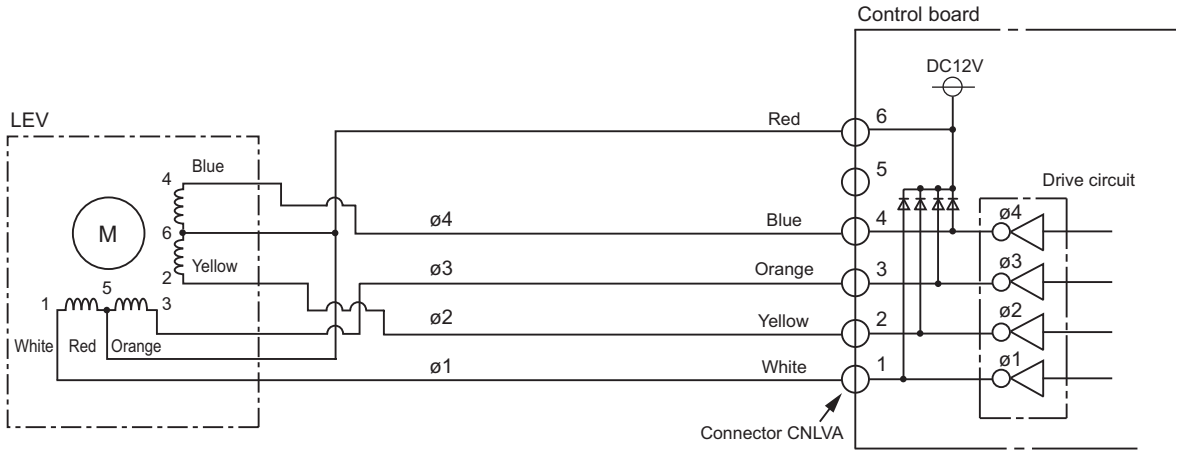
-4- LEV

1. General descriptions of the operation of the LEV in the main circuit

LEV1 is driven by the pulse signal from the circuit board and is controlled by a stepping motor.

The valve opening changes according to the number of pulses (All closed 40 ~ all open 2000).

1) Control board and LEV



Note. The connector numbers on the intermediate connector and the connector on the control board differ. Check the color of the lead wire to judge the number.

2) Pulse signal output and valve operation

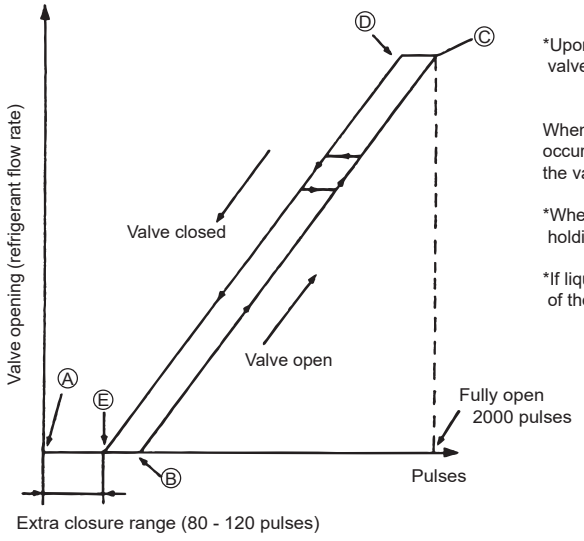
Output (phase) number	Output state			
	1	2	3	4
ϕ1	ON	OFF	OFF	ON
ϕ2	ON	ON	OFF	OFF
ϕ3	OFF	ON	ON	OFF
ϕ4	OFF	OFF	ON	ON

* Inter-coil resistance value: 150Ω (normal temperature)

Output pulses change in the following orders when the
Valve is closed; 1 →2 →3 → 4 → 1
Valve is open; 4 →3 →2 → 1 → 4

*1. When the LEV opening angle does not change, all the output phases will be off.
*2. When the output is open phase or remains ON, the motor cannot run smoothly, and rattles and vibrates.

3) LEV valve closing and opening operatio



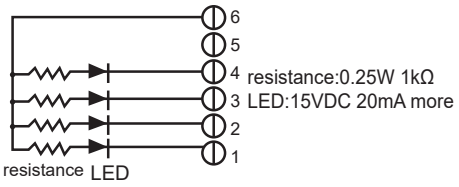
*Upon power on, a 2260 pulse signal is sent to the LEV to determine the valve position and bring the valve to the position indicated by " Ⓐ " in the diagram.

When the valve operates smoothly, no sound from LEV or no vibration occurs, however, when the pulses change from Ⓔ to Ⓐ in the chart or the valve is locked, a big sound occurs.

*Whether a sound is generated or not can be determined by holding a screwdriver against it, then placing your ear against the handle.

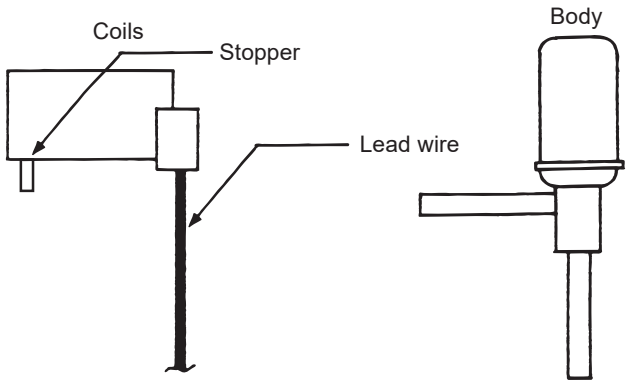
*If liquid refrigerant is present in the LEV, it may make the operating sound of the LEV difficult to detect.

(1) Judgment methods and possible failure mode

Malfunction mode	Judgment method	Remedy
Microcomputer driver circuit failure	Disconnect the control board connector and connect the check LED as shown in the figure below.  Pulse signal is output for 17 seconds when the main power is turned on. If there is any LED that remains unlit or remains lit, there is a problem with the drive circuit.	When the drive circuit has a problem, replace the control board.
LEV mechanism is locked	If the LEV is locked, the drive motor runs idle, and makes a small clicking sound. When the valve makes a closing and opening sound, the valve has a problem.	Replace the LEV.
Disconnected or short-circuited LEV motor coil	Measure resistance between the coils (red - white, red -orange, red - yellow, red - blue) using a tester. They are normal if resistance is 150ohm ± 10%.	Replace the LEV coils.
Faulty wire connections in the connector or faulty contact	1. Check for loose pins on the connector and check the colors of the lead wires visually 2. Disconnect the control board's connector and conduct a continuity check using a tester.	Check the continuity at the points where an error occurs.

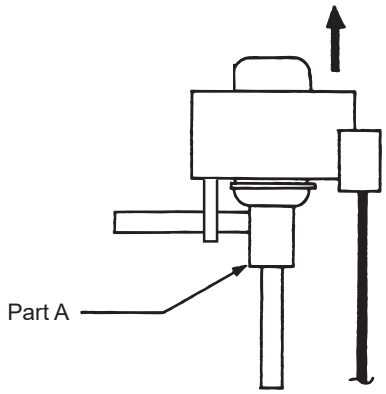
2. LEV coil removal procedure

The LEV consists of a coil and a valve body that can be separated from each other.



(1) Removing the coils

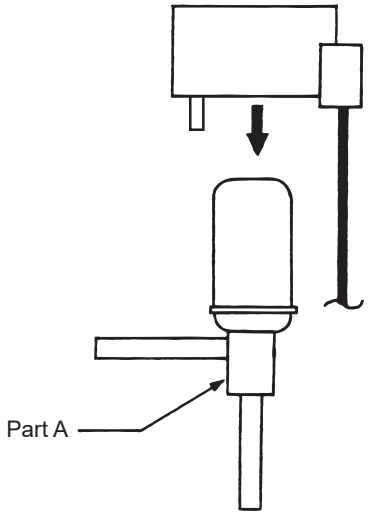
Fasten the body tightly at the bottom (Part A in the figure) so that the body will not move, then pull out the coils toward the top. If the coils are pulled out without the body gripped, undue force will be applied and the pipe will be bent.



(2) Installing the coils

Fix the body tightly at the bottom (Part A in the figure) so that the body will not move, then insert the coils from the top, and insert the coil stopper securely in the pipe on the body. Hold the body when pulling out the coils to prevent so that the pipe will not be bent.

If the coils are pushed without the body gripped, undue force will be applied and the pipe will be bent. Hold the body when pulling out the coils to prevent so that the pipe will not be bent.

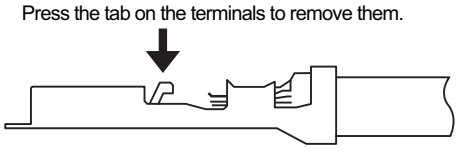


-5- Inverter

- Replace only the compressor if only the compressor is found to be defective.
- Replace only the fan motor if only the fan motor is found to be defective.
- Replace the defective components if the inverter is found to be defective.
- If both the compressor and the inverter are found to be defective, replace the defective component(s) of both devices.

(1) Inverter-related problems: Troubleshooting and remedies

1) The INV board has a large-capacity electrolytic capacitor, in which residual voltage remains even after the main power is turned off, posing a risk of electric shock. Before inspecting the inside of the control box, turn off the power, keep the unit off for at least 10 minutes, and confirm that the voltage between FT-P and FT-N on INV Board has dropped to DC20V or less. (It takes about 10 minutes to discharge electricity after the power supply is turn off.)
2) The IPM on the inverter becomes damaged if there are loose screws are connectors. If a problem occurs after replacing some of the parts, mixed up wiring is often the cause of the problem. Check for proper connection of the wiring, screws, connectors, and Faston terminals.
3) To avoid damage to the circuit board, do not connect or disconnect the inverter-related connectors with the main power turned on.
4) Faston terminals have a locking function. Make sure the terminals are securely locked in place after insertion.



5) When the IPM or IGBT is replaced, apply a thin layer of heat radiation grease that is supplied evenly to these parts. Wipe off any grease that may get on the wiring terminal to avoid terminal contact failure.
6) Faulty wiring to the compressor damages the compressor. Connect the wiring in the correct phase sequence.

	Error display/failure condition	Measure/inspection item
[1]	Inverter related errors 4250, 4220, 4230, 4240, 5301, 5114, 0403	Check the details of the inverter error in the error log at maintenance tool. Take appropriate measures to the error code and the error details in accordance with [2] 2.Diagnosing Problems Using Error Codes.
[2]	Main power breaker trip	Refer to "(3) Trouble treatment when the main power breaker is tripped".(page 112)
[3]	Main power earth leakage breaker trip	Refer to "(4) Trouble treatment when the main power earth leakage breaker is tripped".(page 112)
[4]	Only the compressor does not operate.	Check the inverter frequency on the LED monitor and proceed to (2) -[4] if the compressor is in operation.(page 111)
[5]	The compressor vibrates violently at all times or makes an abnormal sound.	See (2)-[4].(page 111)
[6]	Noise is picked up by the peripheral device	<1> Check that power supply wiring of the peripheral device does not run close to the power supply wiring of the unit.
		<2> Check if the inverter output wiring is not running parallel to the power supply wiring and the transmission lines.
		<3> Check that the shielded wire is used as the transmission line when it is required, and check that the grounding work is performed properly on the shielded wire.
		<4> Meg failure for electrical system other than the inverter
		<5> Attach a ferrite core to the inverter output wiring. (Contact the factory for details of the service part settings.)
		<6> Provide separate power supply to the air conditioner and other electric appliances.
		<7> If the error occurred suddenly, a ground fault of the inverter output can be considered. See (2)-[4].(page 111)
		*Contact the factory for cases other than those listed above.
[7]	Sudden malfunction (as a result of external noise.)	<1> Check that the grounding work is performed properly.
		<2>Check that the shielded wire is used as the transmission line when it is required, and check that the grounding work is performed properly on the shielded wire.
		<3>Check that neither the transmission line nor the external connection wiring does not run close to another power supply system or does not run through the same conduit pipe.
		* Contact the factory for cases other than those listed above.

(2) Inverter output related troubles

	Items to be checked	Phenomena	Remedy
[1] Check the INV board error detection circuit.	(1) Disconnect the inverter output wire from the terminals of the INV board (SC-U, SC-V, SC-W). (2) Put the outdoor unit into operation.	1) Overcurrent error (4250 Detail code No. 101, 102, 103, 106, and 107)	Replace the INV board.
		2) Logic error (4220 Detail code No. 111)	Replace the INV board.
		3) ACCT sensor circuit failure (5301 Detail code No.117)	Replace the INV board.
		4) IPM open (5301 Detail code No.119)	Normal
[2] Check for compressor ground fault or coil error.	Disconnect the compressor wiring, and check the compressor Meg, and coil resistance.	1) Compressor Meg failure Error if less than 1 Mohm.	Check that there is no liquid refrigerant in the compressor. If there is none, replace the compressor.
		2) Compressor coil resistance failure Coil resistance value of 0.219 ohm (20°C [68°F])	Replace the compressor.
[3] Check whether the inverter is damaged. (No load)	(1) Disconnect the inverter output wire from the terminals of the INV board (SC-U, SC-V, SC-W). (2) Disconnect the short-circuit connector from CN6 on the INV board. (3) Put the outdoor unit into operation. Check the inverter output voltage after the inverter output frequency has stabilized.	1) Inverter-related problems are detected.	Connect the short-circuit connector to CN6, and go to section [1].
		2) Inverter voltage is not output at the terminals (SC-U, SC-V, and SC-W)	Replace the INV board.
		3) There is an voltage imbalance between the wires. Greater than 5% imbalance or 5V	Replace the INV board.
		4) There is no voltage imbalance between the wires.	Normal *Reconnect the short-circuit connector to CN6 after checking the voltage.

	Items to be checked	Phenomena	Remedy
[4] Check whether the inverter is damaged. (During compressor operation)	Put the outdoor unit into operation. Check the inverter output voltage after the inverter output frequency has stabilized.	1) Overcurrent-related problems occur immediately after compressor startup. Error code : 4250 Detail code : 101, 106, 107	a. Check items [1] through [3] for problems. b. Check that high and low pressures are balanced. c. Check that no liquid refrigerant is present in the compressor. →Go to "d." when the problem persists after compressor startup was repeated several times. If normal operation is restored, check the crankcase heater for problems. d. Check that there is a pressure difference between high and low pressures after compressor startup. →Check the high pressure with LED monitor for changes. Replace the compressor if there is no pressure difference. (the compressor may be locked.)
		2) There is a voltage imbalance between the wires after the inverter output voltage is stabilized. Greater than the larger of the following values: imbalance of 5% or 5V	Replace the INV board if there is a voltage imbalance. Check the crankcase heater for problems if there is no voltage imbalance. →When the error occurred, liquid refrigerant may have been present in the compressor.
[5] Check the fan motor ground fault or the winding.	Remove the wire for the outdoor fan motor, and check the fan motor megger and the winding resistance.	1) Fan motor megger failure Failure when the megger is 1Mohm or less.	Replace the fan motor.
		2) Fan motor disconnection Standard: The winding resistance is approximately several ohm. (It varies depending on the temperature, or while the inner thermo is operating, it will be ∞ ohm)	
[6] Check the fan board failure.	(1) Check the fan output wiring.	Connector contact failure ♦Board side ♦Fan motor side	Connect the connector.
	(2) Check the connector CN-VDC connection.	Cnnector contact failure	Connect the connector.
	(3) Check the FAN board failure.	1) The voltage imbalance among each motor wiring during operation (The voltage imbalance is greater than the larger of the values represented by 5% or 5V.)	Replace the FAN board.
		2) The same error occurs even after the operation is restarted.	

(3) Trouble treatment when the main power breaker is tripped

	Items to be checked	Phenomena	Remedy
[1]	Check the breaker capacity.	Use of a non-specified breaker	Replace it with a specified breaker.
[2]	Perform Meg check between the terminals on the power terminal block.	Zero to several ohm, or Meg failure	Check each part and wiring. *Refer to (5) "Simple checking procedure for individual components of main inverter circuit".(page 113) ♦IGBT module ♦Rush current protection resistor ♦Electromagnetic relay ♦DC reactor
[3]	Turn on the power again and check again.	1) Main power breaker trip 2) No remote control display	
[4]	Turn on the unit and check that it operates normally.	1) Operates normally without tripping the main breaker. 2) Main power breaker trip	a) The wiring may have been short-circuited. Search for the wire that short-circuited, and repair it. b) If item a) above is not the cause of the problem, refer to (2)-[1]-[6].

(4) Trouble treatment when the main power earth leakage breaker is tripped

	Items to be checked	Phenomena	Remedy
[1]	Check the earth leakage breaker capacity and the sensitivity current.	Use of a non-specified earth leakage breaker	Replace with a regulation earth leakage breaker.
[2]	Check the resistance at the power supply terminal block with a megger.	Failure resistance value	Check each part and wiring. *Refer to (5) "Simple checking procedure for individual components of main inverter circuit".(page 113) ♦IGBT module ♦Rush current protection resistor ♦Electromagnetic relay ♦DC reactor
[3]	Disconnect the compressor wirings and check the resistance of the compressor with a megger.	Failure compressor if the insulating resistance value is not in specified range. Failure when the insulating resistance value is 1 Mohm or less.	Check that there is no liquid refrigerant in the compressor. If there is none, replace the compressor.
[4]	Disconnect the fan motor wirings and check the resistance of the fan motor with a megger.	Failure fan motor if the insulating resistance value is not in specified range. Failure when the insulating resistance value is 1 Mohm or less.	Replace the fan motor.

Note

The insulation resistance could go down to close to 1Mohm after installation or when the power is kept off for an extended period of time because of the accumulation of refrigerant in the compressor. If the earth leakage breaker is triggered, please use the following procedure to take care of this.

- ♦Disconnect the wires from the compressor's terminal block.
- ♦If the resistance is less than 1 Mohm, switch on the power for the unit with the wires still disconnected.
- ♦Leave the power on for at least 12 hours.
- ♦Check that the resistance has recovered to 1 Mohm or greater.

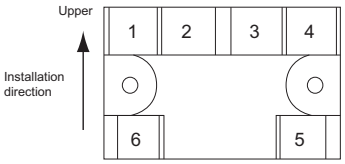
Earth leakage current measurement method

- ♦For easy on-site measurement of the earth leakage current, enable the filter with a measurement instrument that has filter functions as below, clamp all the power supply wires, and measure.
  Recommended measurement instrument: CLAMP ON LEAK HiTESTER 3283 made by HIOKI E.E. CORPORATION
- ♦When measuring one device alone, measure near the device's power supply terminal block.

(5) Simple checking procedure for individual components of main inverter circuit

Note

Before inspecting the inside of the control box, turn off the power, keep the unit off for at least 10 minutes, and confirm that the voltage between FT-P and FT-N on INV Board has dropped to DC20V or less.

Part name	Judgment method
IGBT module	See "Troubleshooting for IGBT module". (IX [4] -5- (6))(page 113)
Rush current protection resistor R11, 12, 21, 22	Measure the resistance between terminals R1 and R5: 22 ohm ± 10%
Electromagnetic relay 52C	**Note** This electromagnetic relay is rated at DC12V and is driven by a coil. Check the resistance between terminals  Check point / Checking criteria(W) Coil: Between Terminals 5 and 6 — Not to be short-circuited (Center value 75 ohm) Contact: Between Terminals 1 and 2 — ∞ Contact: Between Terminals 3 and 4 — ∞
DC reactor DCL	Measure the resistance between terminals: 1ohm or lower (almost 0 ohm) Measure the resistance between terminals and the chassis: ∞

(6) Troubleshooting for IGBT module

Measure the resistances between each pair of terminals on the IGBT with a tester, and use the results for troubleshooting. The terminals on the INV board are used for the measurement.

1) Notes on measurement

- Check the polarity before measuring. (On the tester, black normally indicates plus.)
- Check that the resistance is not open (∞ ohm) or not shorted (to 0 ohm).
- The values are for reference, and the margin of errors is allowed.
- The result that is more than double or half of the result that is measured at the same measurement point is not allowed.
- Disconnect all the wiring connected the INV board, and make the measurement.

2) Tester restriction

- Use the tester whose internal electrical power source is 1.5V or greater
- Use the dry-battery-powered tester.

Note

(The accurate diode-specific resistance cannot be measured with the button-battery-powered card tester, as the applied voltage is low.)

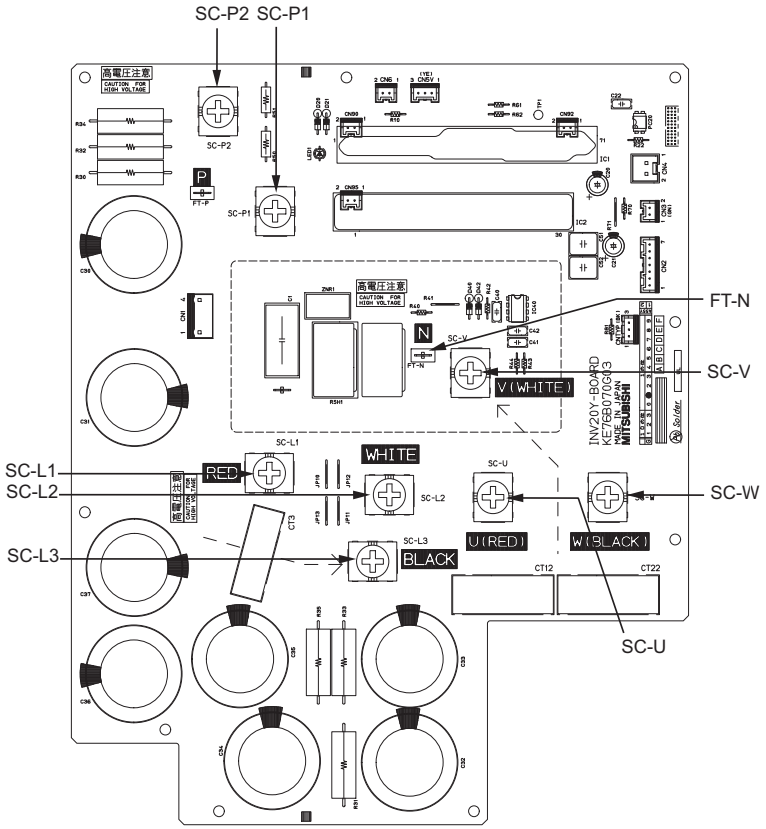
- Use a low-range tester if possible. A more accurate resistance can be measured.

Judgment value (reference)

		Black (+)				
		SC-P1	FT-N	SC-L1	SC-L2	SC-L3
Red (-)	SC-P1	-	-	5 - 200 ohm	5 - 200 ohm	5 - 200 ohm
	FT-N	-	-	∞	∞	∞
	SC-L1	∞	5 - 200 ohm	-	-	-
	SC-L2	∞	5 - 200 ohm	-	-	-
	SC-L3	∞	5 - 200 ohm	-	-	-

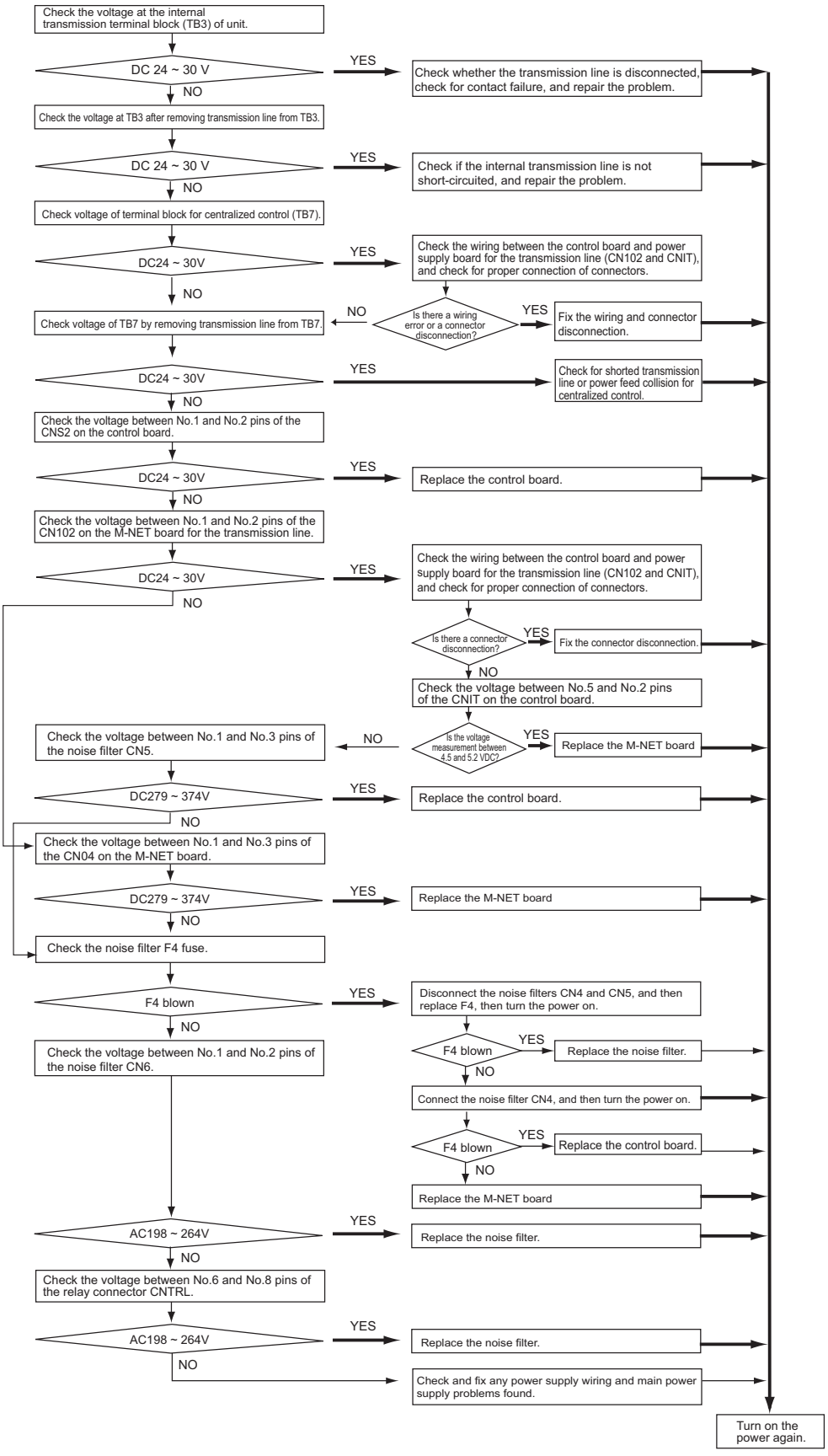
		Black (+)				
		SC-P2	FT-N	SC-U	SC-V	SC-W
Red (-)	SC-P2	-	-	5 - 200 ohm	5 - 200 ohm	5 - 200 ohm
	FT-N	-	-	∞	∞	∞
	SC-U	∞	5 - 200 ohm	-	-	-
	SC-V	∞	5 - 200 ohm	-	-	-
	SC-W	∞	5 - 200 ohm	-	-	-

INV board external diagram



-6- Control Circuit

Troubleshooting transmission power circuit of unit



-7- Troubleshooting

1. Important notes

If the unit or its refrigerant circuit components experience malfunctions, take the following steps to prevent recurrence.

(1) Diagnose the problem and find the cause.

(2) Before repairing leaks on the brazed sections on the pipes, recover the refrigerant. Braze under nitrogen purge to prevent oxidation.

(3) If any component (including the compressor) malfunctions, only replace the affected parts; it is not necessary to replace the entire unit.

(4) Be sure to recover the refrigerant from the unit before disposing of the unit.

(5) If the cause of the problem cannot be identified, contact the service desk with the following information: unit model, serial number, and the nature of the problem.

[4] Refrigerant Leak

⚠ WARNING

Do not use refrigerant other than the type indicated in the manuals provided with the unit and on the nameplate.

- Doing so may cause the unit or pipes to burst, or result in explosion or fire during use, during repair, or at the time of disposal of the unit.
- It may also be in violation of applicable laws.
- MITSUBISHI ELECTRIC CORPORATION cannot be held responsible for malfunctions or accidents resulting from the use of the wrong type of refrigerant.
- Before heating the brazed sections, remove the gas and oil that are trapped in the pipes.

1. Leak spot: In the case of unit

1) Collect the refrigerant in the entire system (unit).Do not discharge refrigerant into the atmosphere when it is collected.
2) Repair the leak.
3) Repair the leak, and evacuate the air from the entire system *1.
   Charge the system with 15 kg [33 lbs] of R410A.

∗When recovering the refrigerant, circulate water in the unit. If unable to circulate the water, drain it from the unit.
If the refrigerant is recovered without circulation, the water heat exchanger may freeze and be damaged.

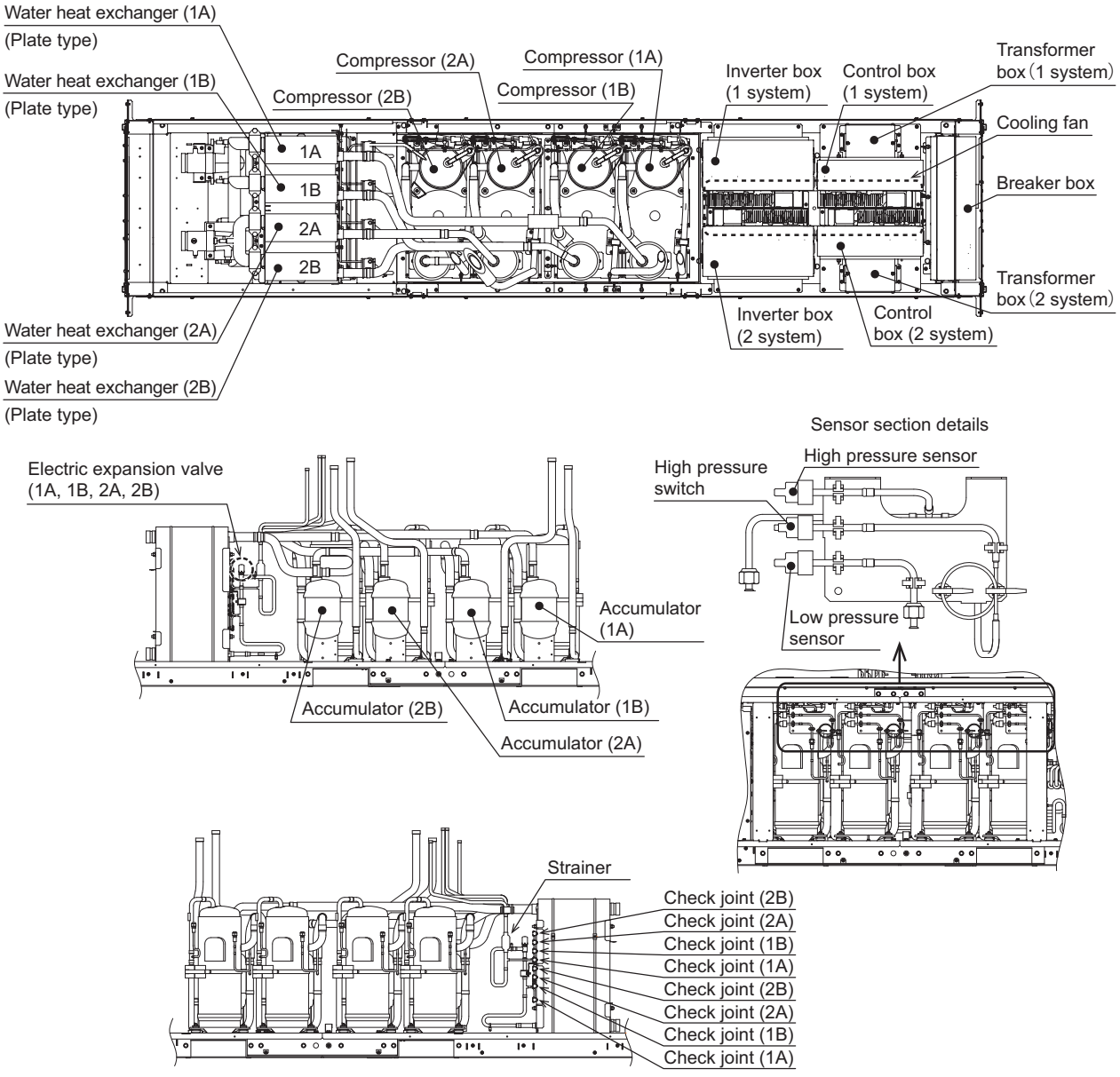
*1. Refer to Chapter I [5] Vacuum Drying (Evacuation) for detailed procedure. (page 7)

[5] Parts Replacement Procedures

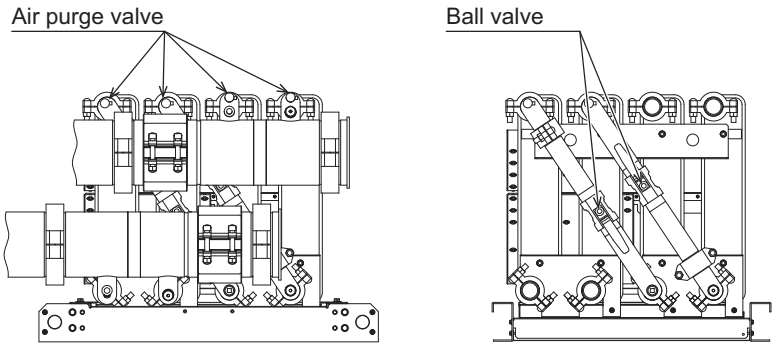
⚠ WARNING

Do not use refrigerant other than the type indicated in the manuals provided with the unit and on the nameplate.

- Doing so may cause the unit or pipes to burst, or result in explosion or fire during use, during repair, or at the time of disposal of the unit.
- It may also be in violation of applicable laws.
- MITSUBISHI ELECTRIC CORPORATION cannot be held responsible for malfunctions or accidents resulting from the use of the wrong type of refrigerant.



<Standard piping type>



<Inside header piping type>

Compressor Replacement Instructions

Required tools

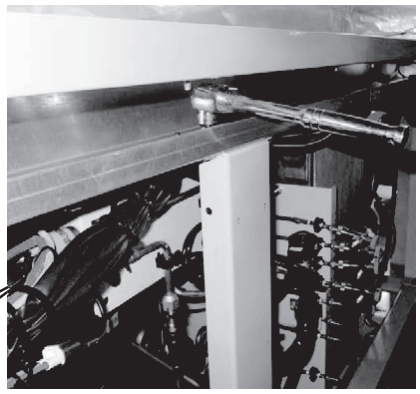
- Screwdriver (M5 screw)
- Nipper (for cutting tie band)
- Small ratchet (M5 screw, M6 nut)
- Endless tie tightening tool
- Metal saw
- Welding tool set

* Since endless tie is set as a service part, when replacing the compressor, please arrange the band assembly (set of tie band and head set, R15 001 843) stated in the service catalog.

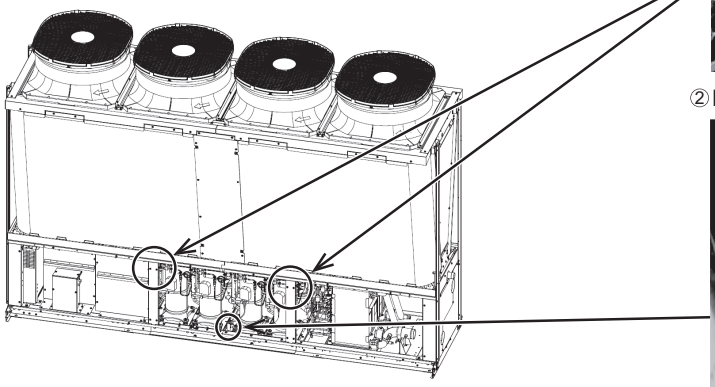
* About fixed part with tie band to the sheet metal part, if the tie band section is cut off during replacement, cut the tie band from the root, and use it as a fixing mount for the metal sheet part. (Use tie band with width up to 5 mm [0.2 in.].)



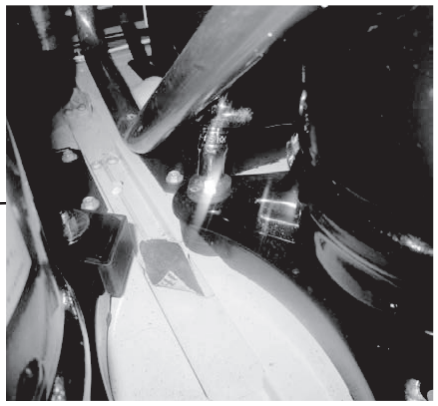
①Pillar upper part fixing screw (M5)



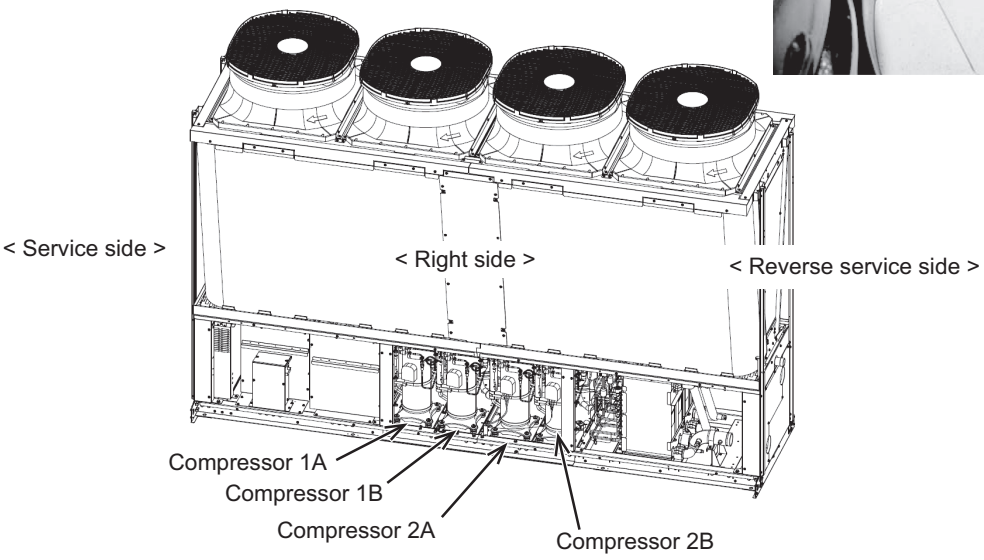
Location to use small ratchet

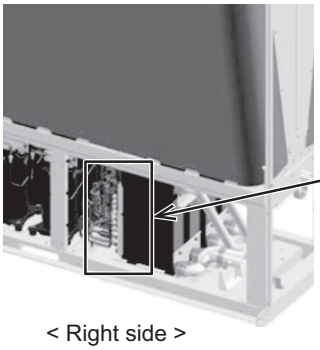
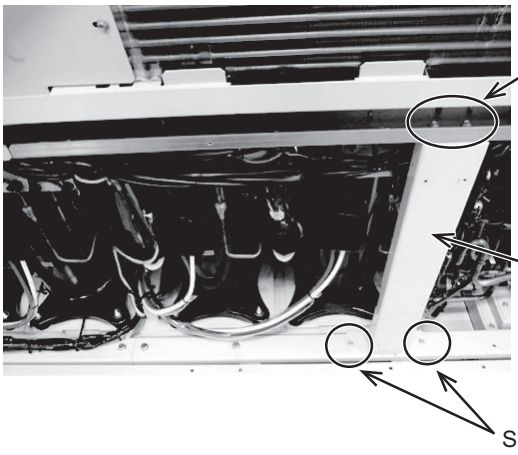
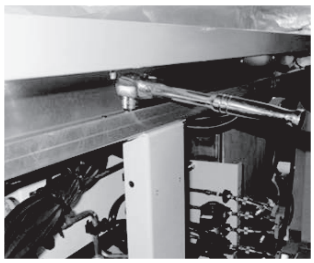
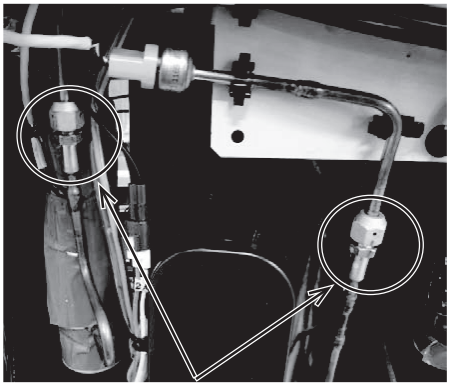


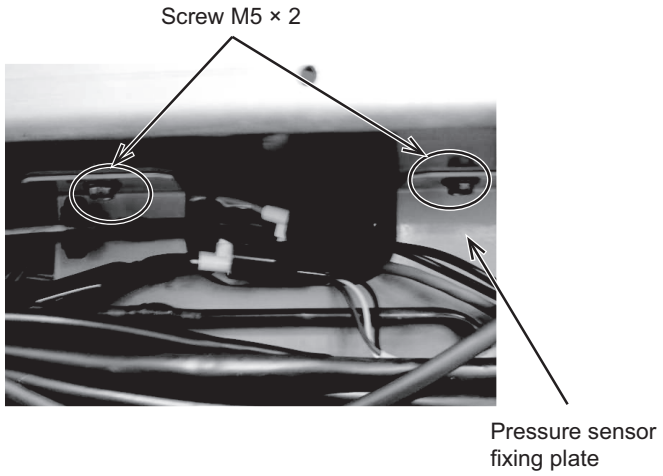
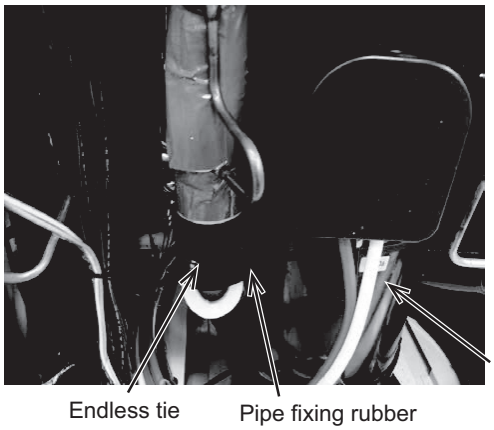
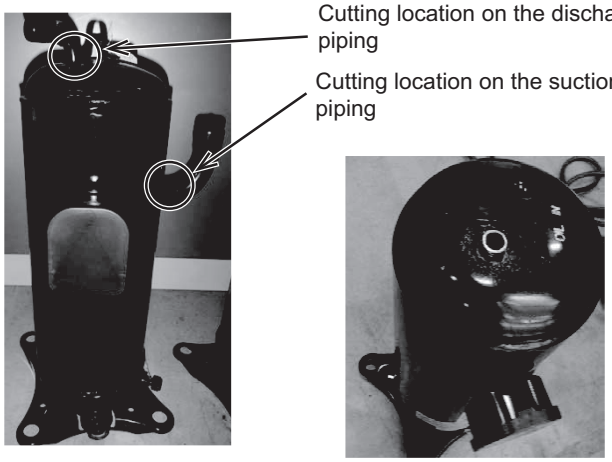
②Nut for fixing compressor (M6)



Compressor location



1	 < Right side > Check joint (in order from the top) ▪ HP 2B ▪ HP 2A ▪ HP 1B ▪ HP 1A ▪ LP 2B ▪ LP 2A ▪ LP 1B ▪ LP 1A	① Recover refrigerant from the check joint (lower pressure (LP) side) of the unit right side and the plate heat exchanger side. * Because each refrigerant circuit is independent, collect the refrigerant from the system in which the compressor is to be replaced. (Refrigerant quantity: 15 kg [33 lbs] per system) * Before recovering refrigerant, either make the water in the unit circulate or drain water from the unit.
2	 Screw M5 × 2 Pillar Screw M5 × 2	① When replacing compressor on both ends (1A, 2B), remove the screws M5 (4 locations) and remove the pillar. Pillar fixed: M5 screw (3.0±0.3 Nm) * Because the M5 screws above (2 locations) are located where you cannot use a screwdriver, use the small ratchet to perform the work. * When the pillar is removed, the frame, due to its own gravity, will deflect down. 
3	 Check joint	① Remove the check joints (2 locations), connectors (3 locations). * The work can be performed without removing the pressure sensor or the high pressure switch from the pipe fixing saddle.

4		① Remove screws M5 (2 locations) and then the pressure sensor fixing plate. Pressure sensor fixing plate; M5 screw (3.0±0.3 Nm) * The work can be performed without removing the pressure sensor or the high pressure switch from the pipe fixing saddle.
5		① Disconnect the compressor power line. Power line: M5 screw (2.2±0.2 Nm) ② Cut the endless tie and remove the piping fixing rubber. * Tie band is set as a service part. When replacing the compressor, please arrange the band assembly (R15 001 843) stated in the service catalog. * If the endless tie is fastened again after replacing the compressor, a dedicated tool is required. Prepare an endless tie fastening tool. ③ Remove the discharge temperature thermistor from the discharge piping.
6		① Cut the root of the discharge piping and suction piping on the compressor side with a saw. * Depending on the piping condition and working space, the pipe cutter cannot be used. In this case, use a saw. ② Heat the brazed section and remove the compressor piping. * When heating the brazed section, make sure to cover the area inside the unit with materials such as a fireproof sheet.

7	 Nut M6 × 4	① Remove nuts M6 (4 locations) and remove the compressor. Compressor fixed: M6 nut (5.6±0.6 Nm) * When installing the compressor, align the mounting pipe position from the suction piping side.
8		① Reverse the procedure to complete the replacement. * When installing the compressor, align the mounting and piping position from the suction piping side. * When the endless tie, removed in step 5 is fastened, a dedicated tool is required. Prepare an endless tie fastening tool.

* When the unit is airtight or charged with refrigerant, pressurize it from the high pressure side. Failure to do so may cause damage to the compressor.

Water-to-Refrigerant Heat Exchanger Replacement Instructions

Required tools

- Screwdriver (M5 screw)
- Nipper (to cut tie band)
- 13 mm [1/2 in.] Spanner (M8 nut: for bolt to install water-to-refrigerant heat exchanger assembly)
- 19 mm [3/4 in.] Spanner (M12 bolt / nut: for bolt for housing joint)

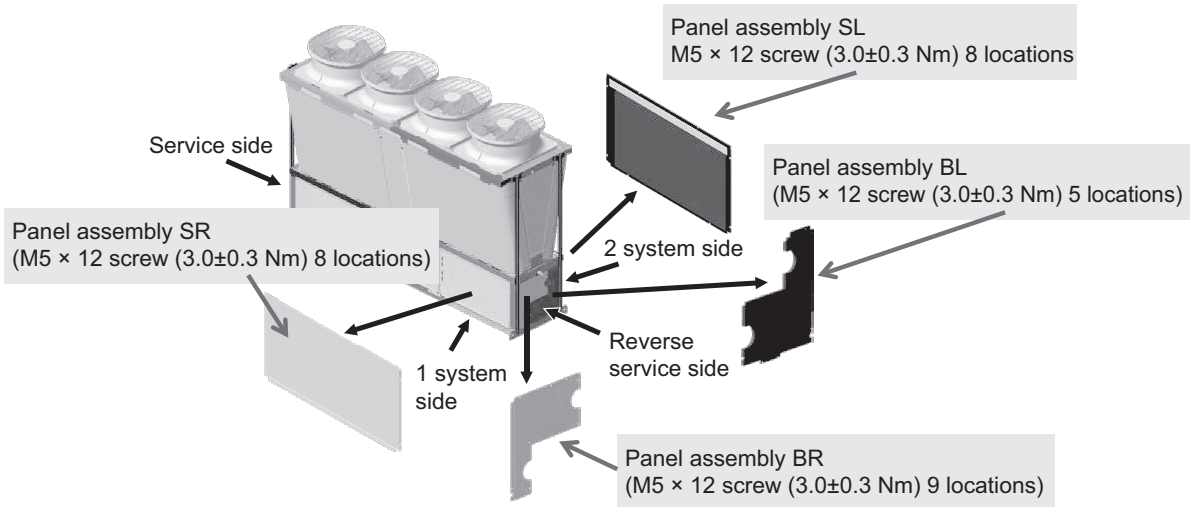
Exchange procedure

1. Preparation before the replacement

①Turn OFF the unit power and secure safety before replacement.
②Completely discharge the cold (hot) water inside the water circuit.

2. Remove the external panels

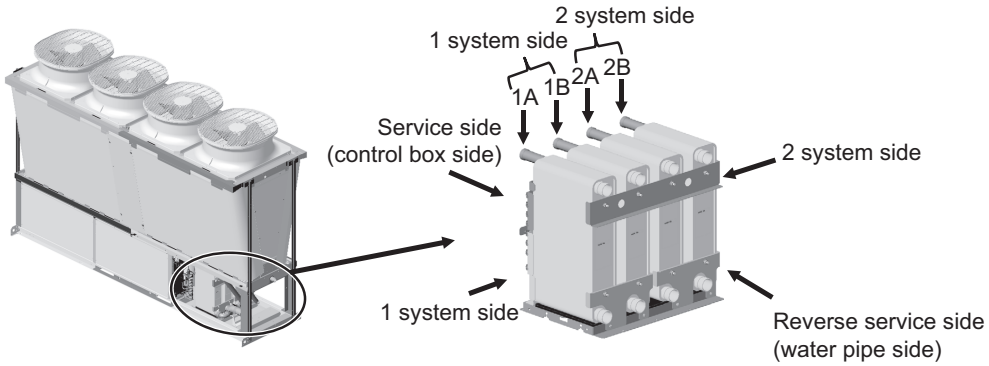
Remove the external panels around the water piping.



3. Check replacement target system

Check the system in which the water-to-refrigerant heat exchanger is to be replaced.

Note: Before removing the water-to-refrigerant heat exchanger assemblies of 1B and 2A, it is necessary to remove the water-to-refrigerant heat exchanger assemblies of 1A and 2B besides 1B and 2A.



4. Recover refrigerant

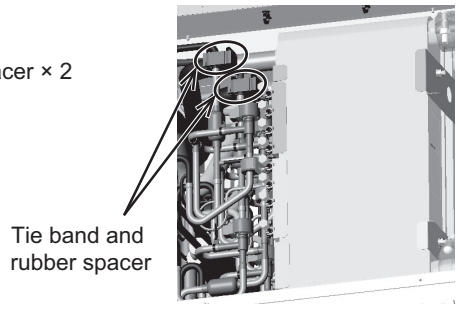
Collect refrigerant (15 kg [33 lbs]/system) for system where the refrigerant pipe brazing needs to be removed.

5. Remove the rubber spacer

Cut the tie band before removing the rubber spacer.

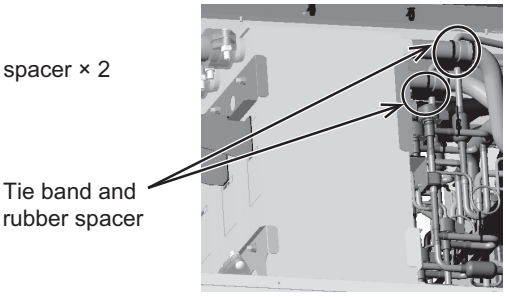
5-1 For replacement on the 1 system side
5-1-1 For 1A only: Tie band × 2 + rubber spacer × 1

5-1-2 For 1B only/for both 1A and 1B: Tie band × 4 + rubber spacer × 2



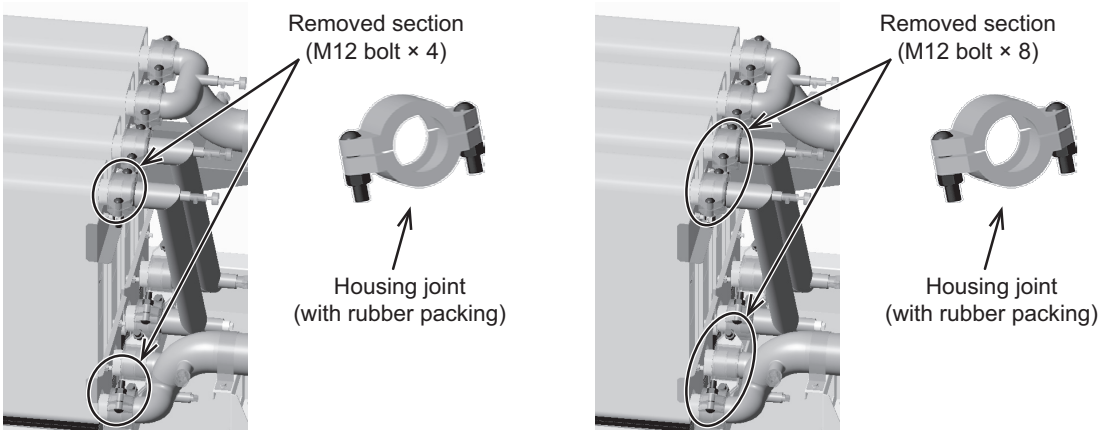
5-2 For replacement on the 2 system side
5-2-1 For 2B only: Tie band × 2 + rubber spacer × 1

5-2-2 For 2A only/for both 2A and 2B: Tie band × 4 + rubber spacer × 2

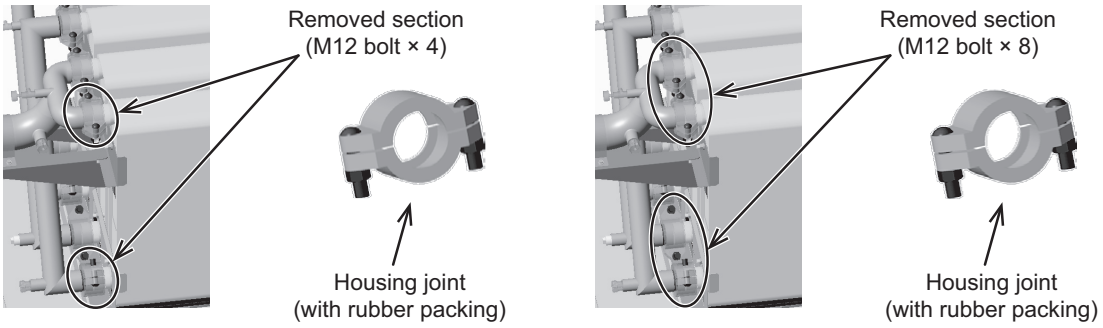


6. Remove housing joint

6-1 For replacement on the 1 system side
6-1-1 For 1A only: M12 bolt × 4 (Until the housings metal-touch with each other)
6-1-2 For 1B only/for both 1A and 1B: M12 bolt × 8 (Until the housings metal-touch with each other)



6-2 For replacement on the 2 system side
6-2-1 For 2B only: M12 bolt × 4 (Until the housings metal-touch with each other)
6-2-2 For 2A only/for both 2A and 2B: M12 bolt × 8 (Until the housings metal-touch with each other)

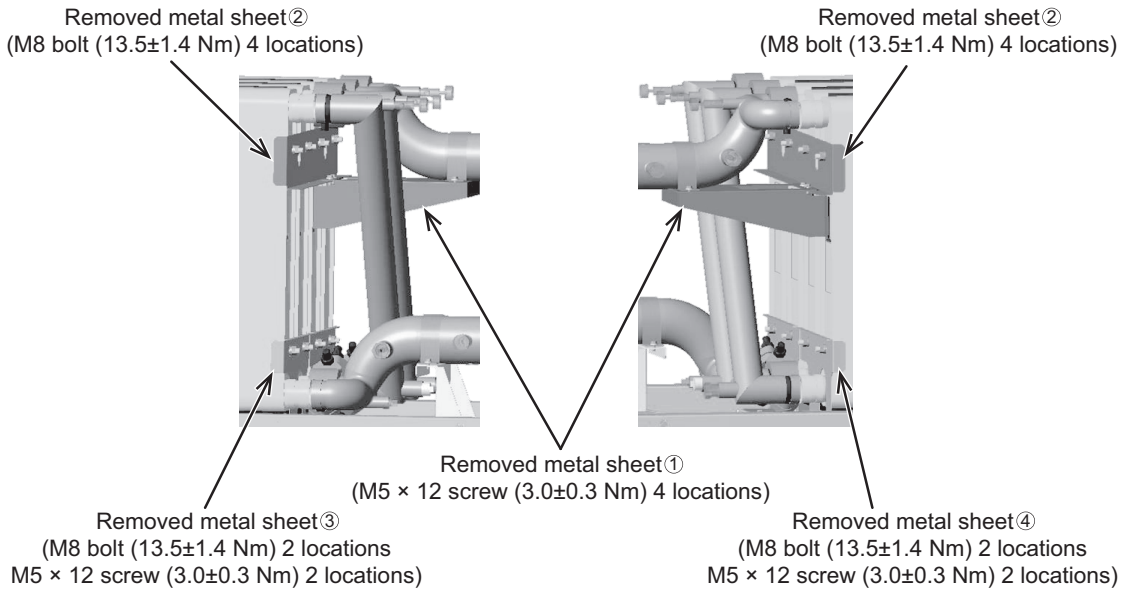


7. Remove the supporting metal sheet on the water pipe side

Remove the supporting metal sheet.

7-1 For replacement on the 1 system side

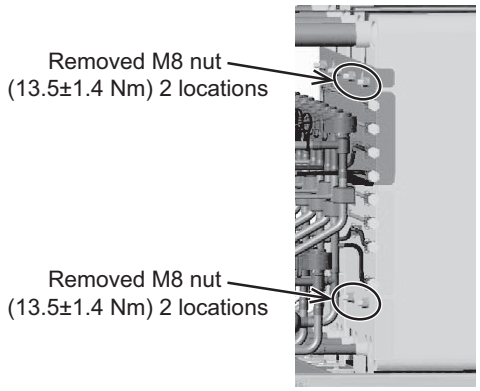
7-2 For replacement on the 2 system side



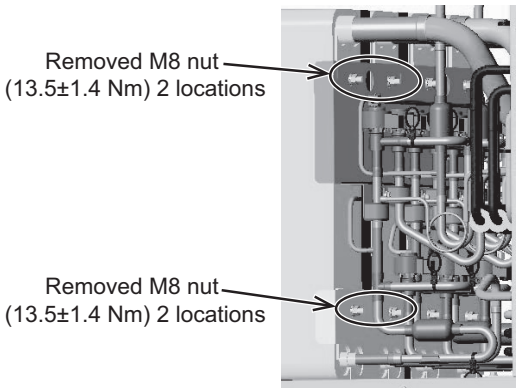
8. Remove the nut on the LEV side

Remove the nuts on the LEV side.

8-1 For replacement on the 1 system side



8-2 For replacement on the 2 system side

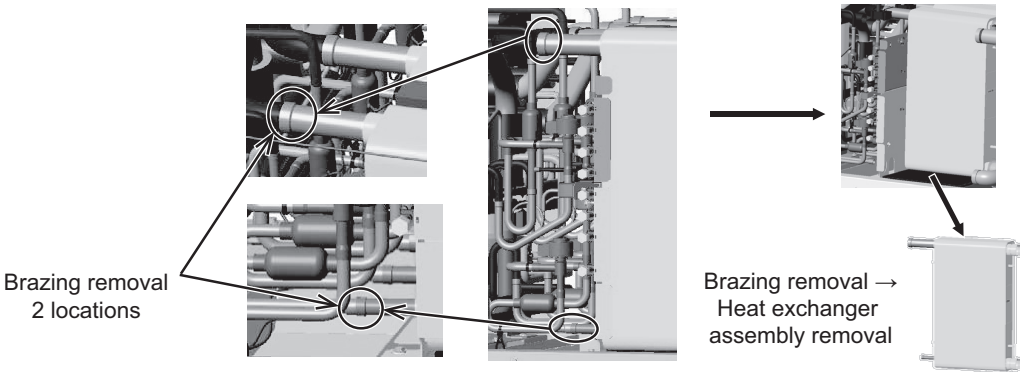


9. Remove the water-to-refrigerant heat exchanger assembly

Remove the brazing before removing the water-to-refrigerant heat exchanger assembly.

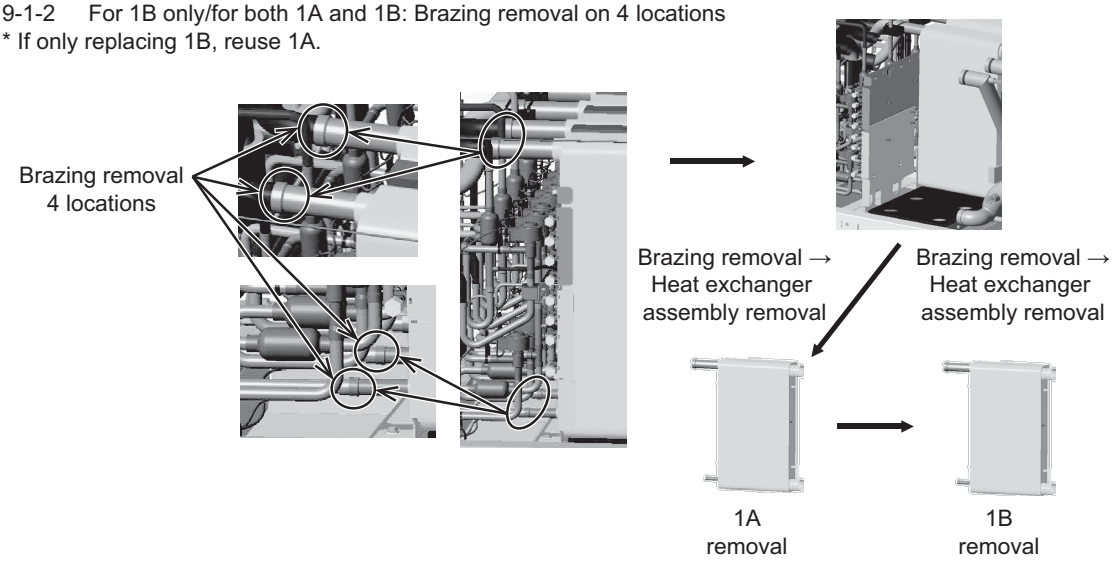
9-1 For exchanging on the 1 system side

9-1-1 For 1A only: Brazing removal on 2 locations



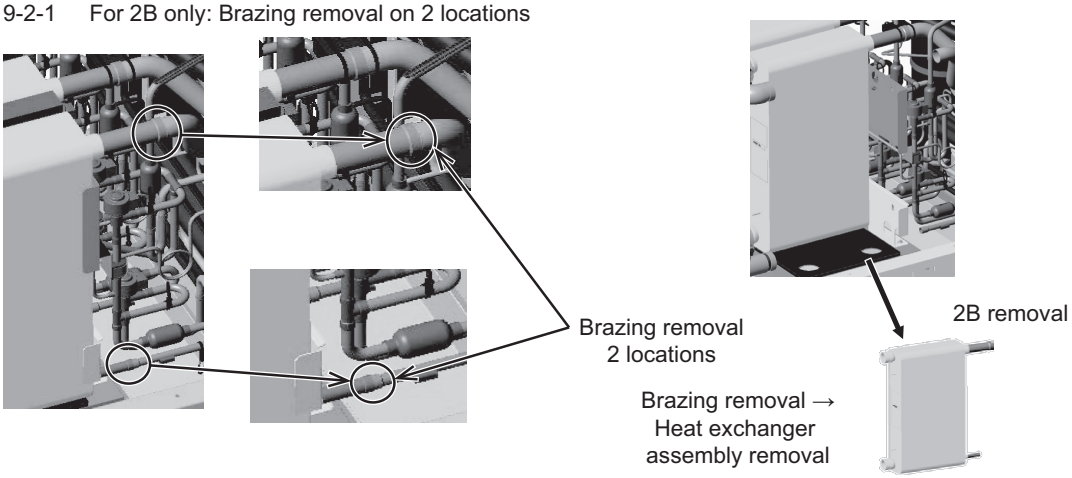
9-1-2 For 1B only/for both 1A and 1B: Brazing removal on 4 locations

* If only replacing 1B, reuse 1A.



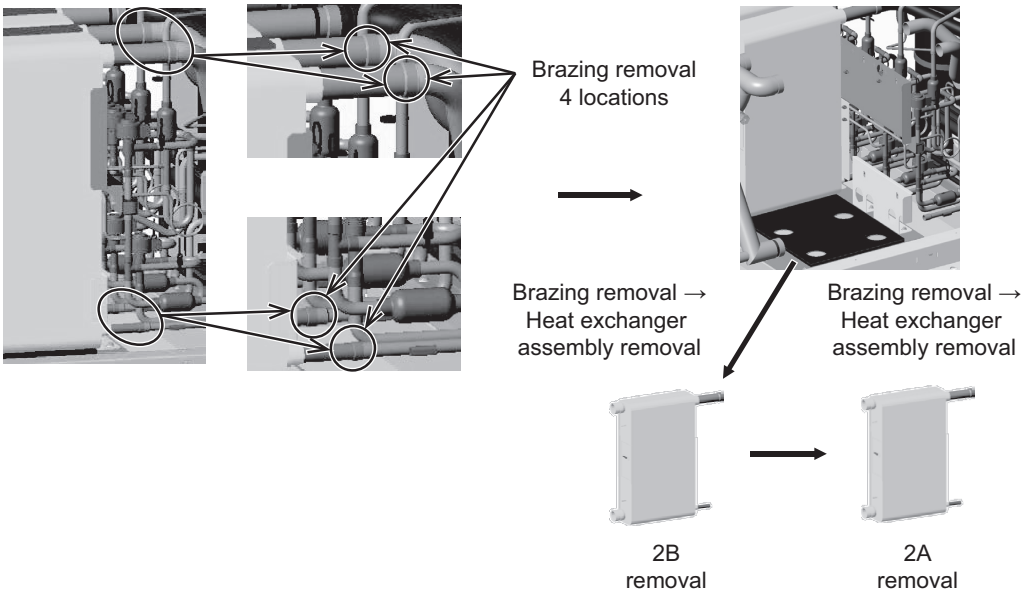
9-2 For replacement on the 2 system side

9-2-1 For 2B only: Brazing removal on 2 locations



9-2-2 For 2A only/for both 2A and 2B: Brazing removal on 4 locations

* If only replacing 2A the reuse 2B.



10. Replacing water-to-refrigerant heat exchanger

Replace a new heat exchanger in the replacement target system.

11. Reassembly

When the replacement of the heat exchanger is completed, reverse the procedure above to perform reassembly.

* Warning:
  - Perform a leakage check to make sure there is no gas leakage from the brazed section. (Air tightness test (4.15 MPa [601psi]))
  - When no leakage is found, evacuate the unit and recharge it with refrigerant (15 kg [33 lbs]/system).
    (When the unit is airtight or charged with refrigerant, pressurize it from the high pressure side. Failure to do so may cause damage to the compressor.)

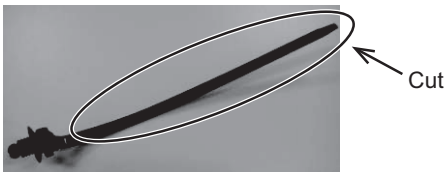
Fan Replacement Instructions

Required tools

- Screwdriver (M5, M6 screw)
- Nipper (for cutting tie band)
- Spanner (M12 hexagon cap nut)
- Stepladder (approx. 2 m)
- Scaffold board (about 1150 × 300 × 20 mm [45-5/16 × 11-13/16 × 13/16 in.])

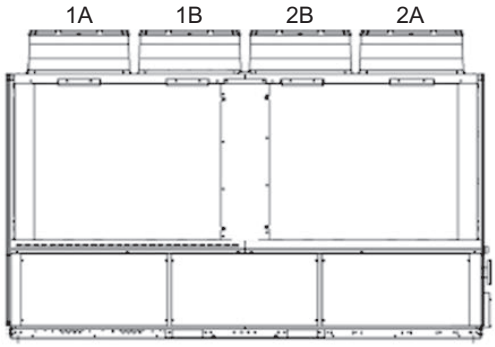


* About fixed part with tie band to the sheet metal part, if the tie band section is cut off during replacement, cut the tie band from the root, and use it as a fixing mount for the metal sheet part. (Use tie band with width up to 5 mm [0.2 in.].)





Fan motor position

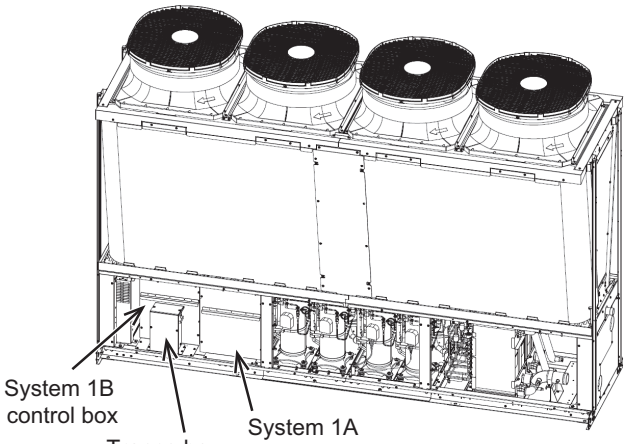


< Service side >

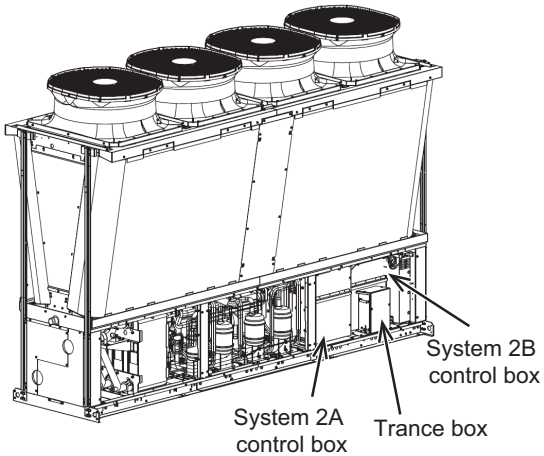
< Reverse service side >

< Right side >

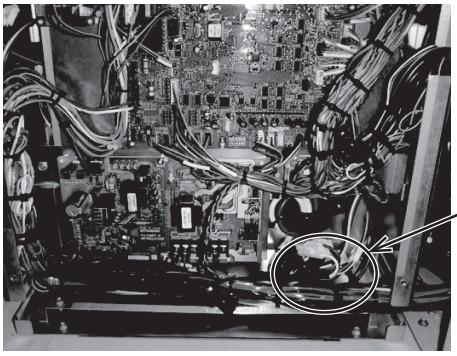
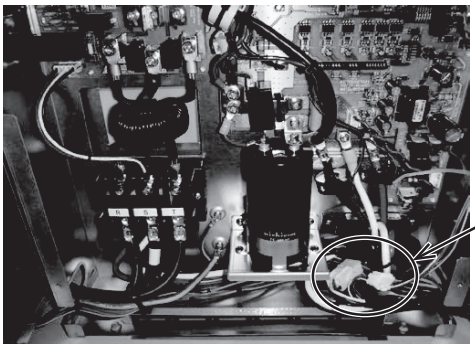
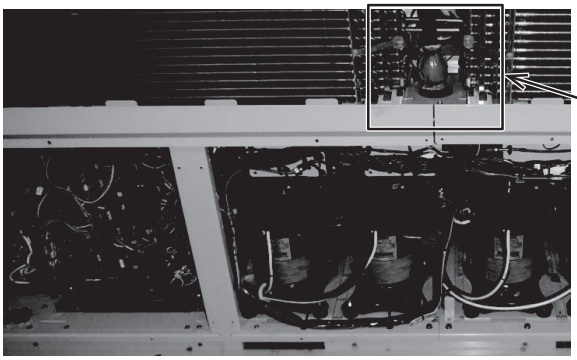
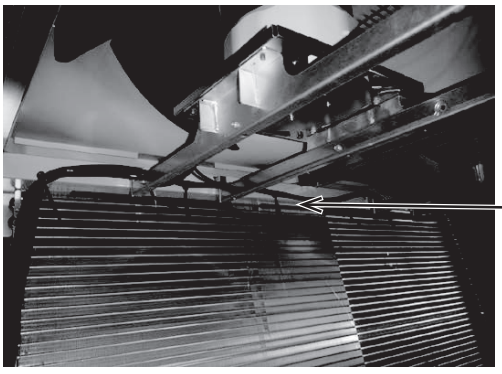
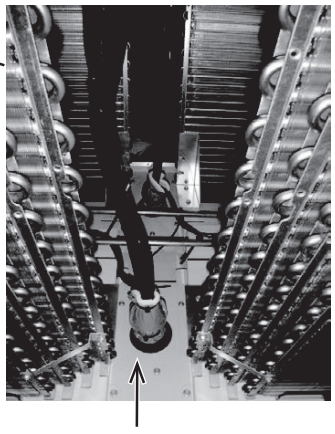
Control box position

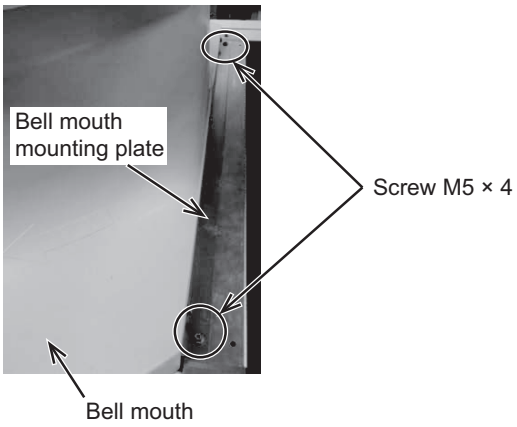
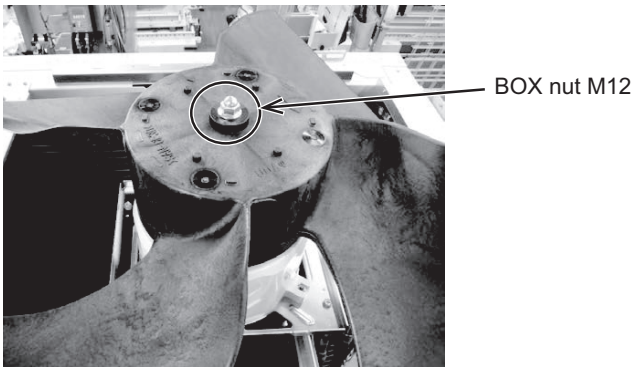
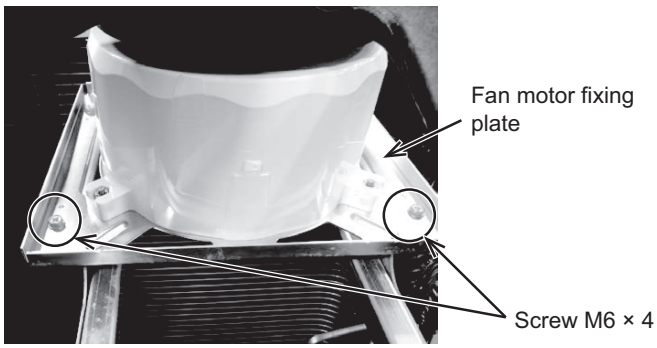
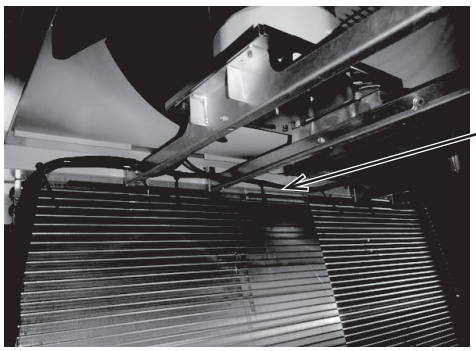


< Right side >



< Left side >

1	①For 1A and 2A system control boxes  Connector × 2 ②For 1B and 2B system control boxes  Connector × 2	①Open the panel corresponding to the fan motor to be replaced, and remove the connectors (2 locations). * When replacing the 1A fan motor, remove the connector inside the 1A system control box, when replacing the 1B fan motor, remove the connector inside the 1B system control box.
2	 	①Cut the tie band and bundle the fan motor wiring near the fan motor.  * Remove the panel of the wiring leading-in section before performing the work. * When entering the inside of the blower chamber and removing the fixed wires, be careful not to damage the refrigerant piping in the lower part of the blower chamber.

3		① Remove screws M5 (4 places) fixing the bell mouth mounting plate and remove the bell mouth together with the bell mouth mounting plate. Bell mouth mounting plate: M5 screw (3.0±0.3 Nm) * The screw on the bell mouth side is for fixing the bell mouth and the bell mouth mounting plate, so it is not necessary to be removed. * When replacing the 1A fan motor, also remove the 1B bell mouth. When replacing the 2A fan motor, also remove the 2B bell mouth. Refer to the fan motor position on page 129 for the position of the fan motor and bell mouth.
4		① Remove the BOX nut M12 and remove the propeller. Fixed propeller: BOX nut M12 (20±2 Nm)
5		① Remove screws (4 locations) and remove the entire fan motor fixing plate. Fan motor fixing plate: M6 screw (5.0±0.5 Nm)
6		① Reverse the procedure above to complete the replacement. * When entering the inside of the blower chamber and fixing the wiring, be careful not to damage the refrigerant piping in the lower part of the blower chamber. 

LEV Replacement Instructions

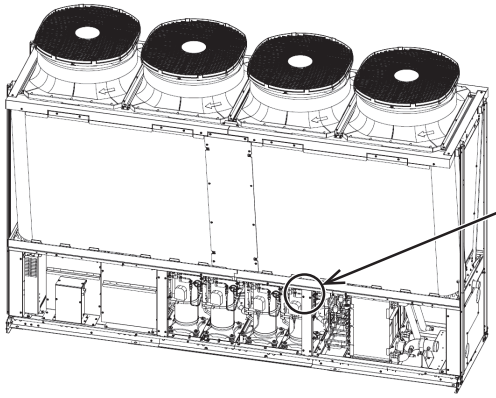
Required tools

- Screwdriver (M5 screw)
- Nipper (for cutting tie band)
- Small ratchet (M5 screw, M6 nut)
- Welding tool set

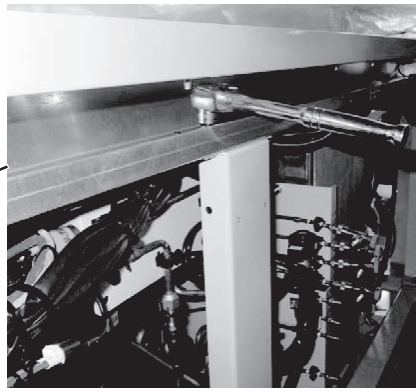
* About fixed part with tie band to the sheet metal part, if the tie band section is cut off during replacement, cut the tie band from the root, and use it as a fixing mount for the metal sheet part. (Use tie band with width up to 5 mm [0.2 in.].)

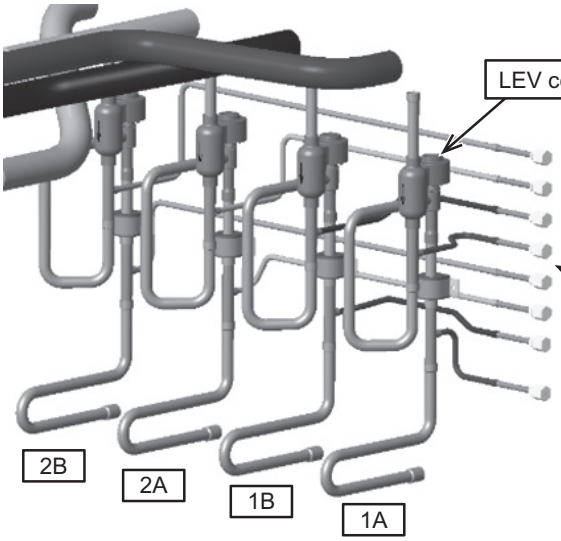


Location to use small ratchet



· Pillar upper part fixing screw (M5)

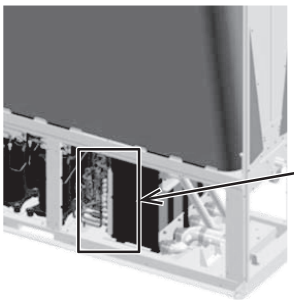
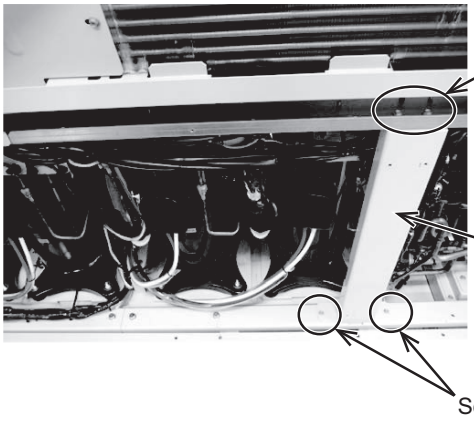
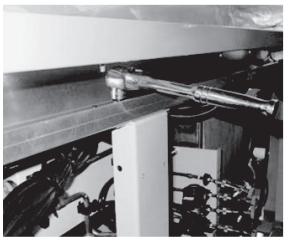
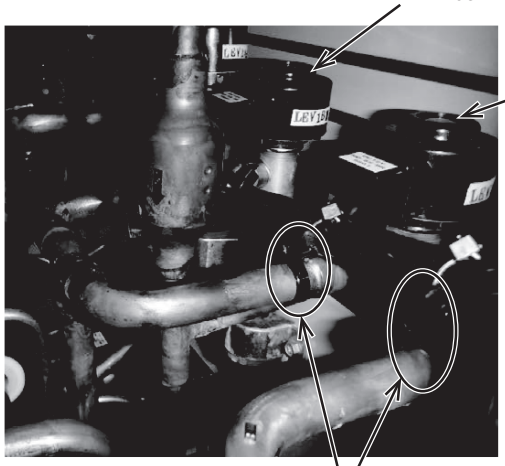


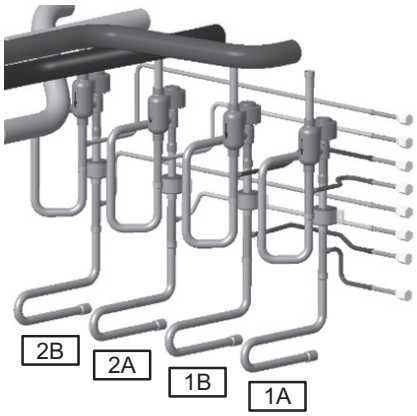


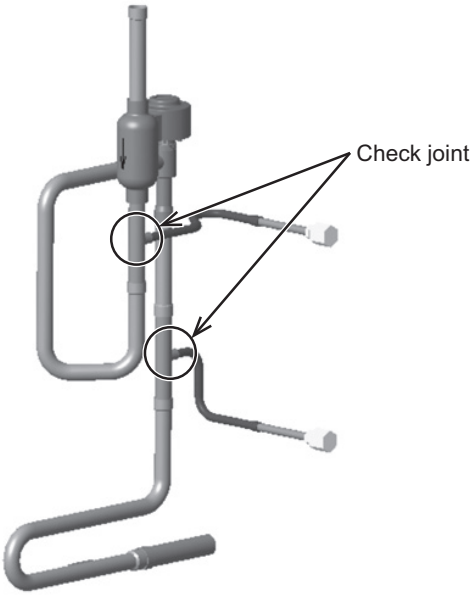
Check joint
(in order from the top)

· HP 2B
· HP 2A
· HP 1B
· HP 1A

· LP 2B
· LP 2A
· LP 1B
· LP 1A

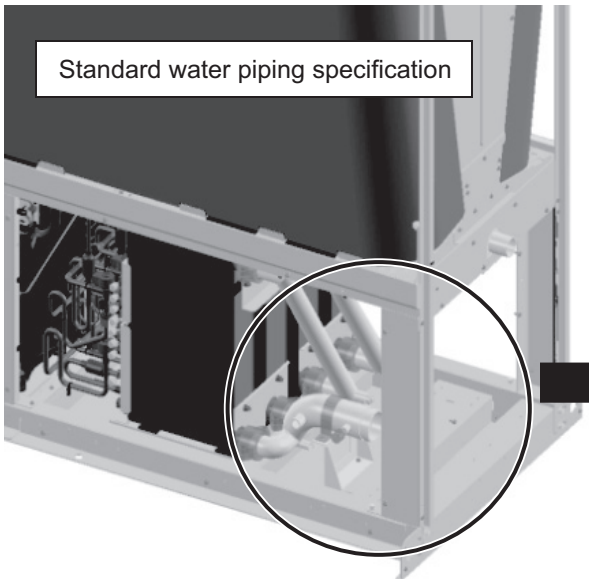
1	 < Right side > Check joint (in order from the top) · HP 2B · HP 2A · HP 1B · HP 1A · LP 2B · LP 2A · LP 1B · LP 1A	① Recover refrigerant from the check joint (lower pressure (LP) side) of the unit right side and the plate heat exchanger side. * Each refrigerant circuit is independent. Only collect the refrigerant from the system in which the compressor is to be replaced when exchanging the LEV of 1A or 2B. When exchanging the LEV of 1B or 2A, also collect the refrigerant in 1A or 2B. (Refrigerant quantity: 15 kg [33 lbs] per system)
2	 Screw M5 × 2 Pillar Screw M5 × 2	① When replacing the LEV, remove screws M5 (4 locations) and remove the pillar. Pillar fixed: M5 screw (3.0±0.3 Nm) * Because M5 screws above (2 locations) are located where you cannot use a screwdriver, use the small ratchet to perform the work. * When the pillar is removed, the frame, due to its own gravity, will deflect down. 
3	LEV coil  LEV coil Tie band	① Cut the tie band as required, and remove the LEV coil.

4		①Cut the 2 locations indicated with the arrow with a pipe cutter, and remove the LEV ASSY from the unit. * To make space for the replacement work, remove the LEV ASSY 1A before replacing 1B in the middle and remove 2B before replacing 2A in the middle. 
5		①Remove the unnecessary piping remaining in the unit side (mouth part) from the blazed part.

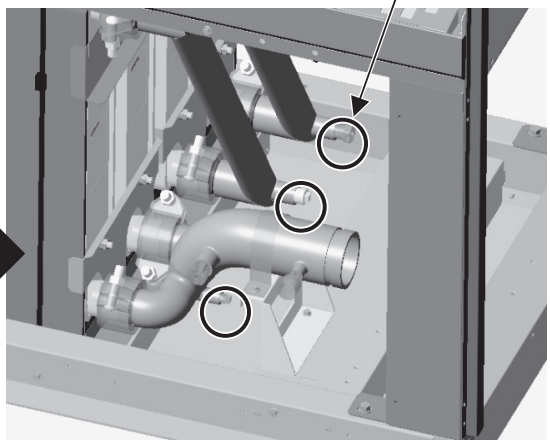
6		①After removing the LEV ASSY from the unit, remove the check joints from the blazed part indicated with the arrows. * The 2 check joints will be reused.
7		①Blaze the check joints removed in step 6 to the service part. ②Blaze the 2 locations as indicated with the arrows.
8		①Return the LEV coil and fixing wiring to the original positions.

[6] Draining the water from the water-pipes of the unit and from the water heat exchanger

• Drain the water by unplugging the drain plug on the water pipe at the lower part of the water heat exchanger.



The plug has a water-temperature thermistor.
Remove the plug with the thermistor on it when draining water.



The drain plug is at the lower part of the water heat exchanger (where circled in the figure).

X Attachments

[1] R410A saturation temperature table 139

[1] R410A saturation temperature table

Saturation pressure	Saturating temperature °C		Saturation pressure	Saturating temperature °C		Saturation pressure	Saturating temperature °C		Saturation pressure	Saturating temperature °C		Saturation pressure	Saturating temperature °C	
MPa(gauge)	Saturated liquid	Saturated gas	MPa(gauge)	Saturated liquid	Saturated gas	MPa(gauge)	Saturated liquid	Saturated gas	MPa(gauge)	Saturated liquid	Saturated gas	MPa(gauge)	Saturated liquid	Saturated gas
0.00	-51.86	-51.81	0.80	3.80	3.89	1.60	26.09	26.20	2.40	41.40	41.51	3.20	53.30	53.40
0.01	-49.96	-49.91	0.81	4.16	4.25	1.61	26.31	26.43	2.41	41.56	41.68	3.21	53.43	53.53
0.02	-48.20	-48.15	0.82	4.51	4.61	1.62	26.53	26.65	2.42	41.73	41.84	3.22	53.56	53.66
0.03	-46.55	-46.50	0.83	4.86	4.96	1.63	26.75	26.87	2.43	41.89	42.01	3.23	53.70	53.80
0.04	-44.99	-44.94	0.84	5.21	5.31	1.64	26.97	27.09	2.44	42.06	42.17	3.24	53.83	53.93
0.05	-43.52	-43.47	0.85	5.56	5.66	1.65	27.19	27.31	2.45	42.22	42.33	3.25	53.96	54.06
0.06	-42.13	-42.08	0.86	5.90	6.00	1.66	27.41	27.52	2.46	42.38	42.50	3.26	54.09	54.19
0.07	-40.81	-40.75	0.87	6.25	6.35	1.67	27.63	27.74	2.47	42.55	42.66	3.27	54.22	54.32
0.08	-39.54	-39.48	0.88	6.58	6.68	1.68	27.84	27.96	2.48	42.71	42.82	3.28	54.36	54.45
0.09	-38.33	-38.27	0.89	6.92	7.02	1.69	28.06	28.17	2.49	42.87	42.98	3.29	54.49	54.59
0.10	-37.16	-37.11	0.90	7.25	7.35	1.70	28.27	28.38	2.50	43.03	43.15	3.30	54.62	54.72
0.11	-36.04	-35.99	0.91	7.58	7.69	1.71	28.18	28.60	2.51	43.19	43.31	3.31	54.75	54.85
0.12	-34.97	-34.91	0.92	7.91	8.02	1.72	28.69	28.81	2.52	43.35	43.47	3.32	54.88	54.98
0.13	-33.93	-33.86	0.93	8.24	8.34	1.73	28.91	29.02	2.53	43.51	43.63	3.33	55.01	55.11
0.14	-32.92	-32.86	0.94	8.56	8.67	1.74	29.12	29.23	2.54	43.67	43.79	3.34	55.14	55.24
0.15	-31.95	-31.88	0.95	8.88	8.99	1.75	29.33	29.44	2.55	43.83	43.94	3.35	55.27	55.36
0.16	-31.00	-30.94	0.96	9.20	9.31	1.76	29.53	29.65	2.56	43.99	44.10	3.36	55.40	55.49
0.17	-30.09	-30.02	0.97	9.52	9.62	1.77	29.74	29.86	2.57	44.15	44.26	3.37	55.53	55.62
0.18	-29.19	-29.13	0.98	9.84	9.94	1.78	29.95	30.06	2.58	44.31	44.42	3.38	55.65	55.75
0.19	-28.33	-28.26	0.99	10.15	10.25	1.79	30.15	30.27	2.59	44.46	44.58	3.39	55.78	55.88
0.20	-27.49	-27.42	1.00	10.46	10.56	1.80	30.36	30.47	2.60	44.62	44.73	3.40	55.91	56.01
0.21	-26.66	-26.20	1.01	10.77	10.87	1.81	30.56	30.68	2.61	44.78	44.89	3.41	56.04	56.13
0.22	-25.86	-25.79	1.02	11.07	11.18	1.82	30.77	30.88	2.62	44.93	45.04	3.42	56.16	56.26
0.23	-25.08	-25.01	1.03	11.38	11.48	1.83	30.97	31.09	2.63	45.09	45.20	3.43	56.29	56.39
0.24	-24.31	-24.25	1.04	11.68	11.78	1.84	31.17	31.29	2.64	45.24	45.35	3.44	56.42	56.51
0.25	-23.57	-23.50	1.05	11.98	12.08	1.85	31.37	31.49	2.65	45.40	45.51	3.45	56.54	56.64
0.26	-22.84	-22.77	1.06	12.28	12.38	1.86	31.57	31.69	2.66	45.55	45.66	3.46	56.67	56.76
0.27	-22.12	-22.05	1.07	12.57	12.68	1.87	31.77	31.89	2.67	45.71	45.82	3.47	56.80	56.89
0.28	-21.42	-21.35	1.08	12.87	12.97	1.88	31.97	32.09	2.68	45.86	45.97	3.48	56.92	57.02
0.29	-20.73	-20.66	1.09	13.16	13.27	1.89	32.17	32.29	2.69	46.01	46.12	3.49	57.05	57.14
0.30	-20.06	-19.99	1.10	13.45	13.56	1.90	32.37	32.48	2.70	46.16	46.27	3.50	57.17	57.26
0.31	-19.40	-19.32	1.11	13.74	13.85	1.91	32.56	32.68	2.71	46.32	46.43	3.51	57.30	57.39
0.32	-18.75	-18.68	1.12	14.03	14.13	1.92	32.76	32.88	2.72	46.47	46.58	3.52	57.42	57.51
0.33	-18.11	-18.04	1.13	14.31	14.42	1.93	32.95	33.07	2.73	46.62	46.73	3.53	57.55	57.64
0.34	-17.49	-17.41	1.14	14.59	14.70	1.94	33.15	33.27	2.74	46.77	46.88	3.54	57.67	57.76
0.35	-16.87	-16.80	1.15	14.88	14.98	1.95	33.34	33.46	2.75	46.92	47.03	3.55	57.79	57.88
0.36	-16.27	-16.19	1.16	15.16	15.26	1.96	33.54	33.65	2.76	47.07	47.18	3.56	57.92	58.01
0.37	-15.67	-15.60	1.17	15.43	15.54	1.97	33.73	33.84	2.77	47.22	47.33	3.57	58.04	58.13
0.38	-15.09	-15.01	1.18	15.71	15.82	1.98	33.92	34.04	2.78	47.37	47.48	3.58	58.16	58.25
0.39	-14.51	-14.44	1.19	15.99	16.09	1.99	34.11	34.23	2.79	47.52	47.63	3.59	58.28	58.37
0.40	-13.95	-13.87	1.20	16.26	16.37	2.00	34.30	34.42	2.80	47.67	47.78	3.60	58.41	58.50
0.41	-13.39	-13.31	1.21	16.53	16.64	2.01	34.49	34.61	2.81	47.81	47.92	3.61	58.53	58.62
0.42	-12.84	-12.76	1.22	16.80	16.91	2.02	34.68	34.79	2.82	47.96	48.07	3.62	58.65	58.74
0.43	-12.30	-12.22	1.23	17.07	17.18	2.03	34.87	34.98	2.83	48.11	48.22	3.63	58.77	58.86
0.44	-11.76	-11.68	1.24	17.34	17.45	2.04	35.05	35.17	2.84	48.26	48.36	3.64	58.89	58.98
0.45	-11.24	-11.16	1.25	17.60	17.71	2.05	35.24	35.36	2.85	48.40	48.51	3.65	59.01	59.10
0.46	-10.72	-10.64	1.26	17.87	17.98	2.06	35.43	35.54	2.86	48.55	48.66	3.66	59.13	59.22
0.47	-10.21	-10.12	1.27	18.13	18.24	2.07	35.61	35.73	2.87	48.69	48.80	3.67	59.25	59.34
0.48	-9.70	-9.62	1.28	18.39	18.50	2.08	35.80	35.91	2.88	48.84	48.95	3.68	59.37	59.46
0.49	-9.20	-9.12	1.29	18.65	18.76	2.09	35.98	36.10	2.89	48.98	49.09	3.69	59.49	59.58
0.50	-8.71	-8.62	1.30	18.91	19.02	2.10	36.16	36.28	2.90	49.13	49.24	3.70	59.61	59.70
0.51	-8.22	-8.14	1.31	19.17	19.28	2.11	36.35	36.46	2.91	49.27	49.38	3.71	59.73	59.82
0.52	-7.74	-7.66	1.32	19.42	19.53	2.12	36.53	36.65	2.92	49.42	49.52	3.72	59.85	59.94
0.53	-7.27	-7.18	1.33	19.68	19.79	2.13	36.71	36.83	2.93	49.56	49.67	3.73	59.97	60.06
0.54	-6.80	-6.71	1.34	19.93	20.04	2.14	36.89	37.01	2.94	49.70	49.81	3.74	60.09	60.17
0.55	-6.34	-6.25	1.35	20.18	20.29	2.15	37.07	37.19	2.95	49.84	49.95	3.75	60.21	60.29
0.56	-5.88	-5.79	1.36	20.43	20.55	2.16	37.25	37.37	2.96	49.99	50.09	3.76	60.33	60.41
0.57	-5.43	-5.34	1.37	20.68	20.79	2.17	37.43	37.55	2.97	50.13	50.23	3.77	60.44	60.53
0.58	-4.98	-4.89	1.38	20.93	21.04	2.18	37.61	37.73	2.98	50.27	50.38	3.78	60.56	60.64
0.59	-4.54	-4.45	1.39	21.18	21.29	2.19	37.79	37.90	2.99	50.41	50.52	3.79	60.68	60.76
0.60	-4.10	-4.01	1.40	21.42	21.54	2.20	37.97	38.08	3.00	50.55	50.66	3.80	60.79	60.88
0.61	-3.67	-3.58	1.41	21.67	21.78	2.21	38.14	38.26	3.01	50.69	50.80	3.81	60.91	60.99
0.62	-3.24	-3.15	1.42	21.91	22.02	2.22	38.32	38.43	3.02	50.83	50.94	3.82	61.03	61.11
0.63	-2.81	-2.72	1.43	22.15	22.26	2.23	38.49	38.61	3.03	50.97	51.08	3.83	61.14	61.23
0.64	-2.40	-2.30	1.44	22.39	22.51	2.24	38.67	38.78	3.04	51.11	51.22	3.84	61.26	61.34
0.65	-1.98	-1.89	1.45	22.63	22.74	2.25	38.84	39.96	3.05	51.25	51.36	3.85	61.38	61.46
0.66	-1.57	-1.48	1.46	22.87	22.98	2.26	39.02	39.13	3.06	51.39	51.49	3.86	61.49	64.57
0.67	-1.16	-1.07	1.47	23.11	23.22	2.27	39.19	39.31	3.07	51.53	51.63	3.87	61.61	61.69
0.68	-0.76	-0.67	1.48	23.34	23.46	2.28	39.36	39.48	3.08	51.67	51.77	3.88	61.72	61.80
0.69	-0.36	-0.27	1.49	23.58	23.69	2.29	39.54	39.65	3.09	51.80	51.91	3.89	61.84	61.91
0.70	0.04	0.13	1.50	23.81	23.93	2.30	39.71	39.82	3.10	51.94	52.04	3.90	61.95	62.03
0.71	0.43	0.52	1.51	24.04	24.16	2.31	39.88	39.99	3.11	52.08	52.18	3.91	62.06	62.14
0.72	0.82	0.91	1.52	24.28	24.39	2.32	40.05	40.16	3.12	52.21	52.32	3.92	62.18	62.26
0.73	1.20	1.30	1.53	24.51	24.62	2.33	40.22	40.33	3.13	52.35	52.45	3.93	62.29	62.37
0.74	1.58	1.68	1.54	24.74	24.85	2.34	40.39	40.50	3.14	52.49	52.59	3.94	62.41	62.48
0.75	1.96	2.05	1.55	24.96	25.08	2.35	40.56	40.67	3.15	52.62	52.72	3.95	62.52	62.60
0.76	2.33	2.43	1.56	25.19	25.31	2.36	40.73	40.84	3.16	52.76	52.86	3.96	62.63	62.71
0.77	2.70	2.80	1.57	25.42	25.53	2.37	40.89	41.01	3.17	52.89	52.99	3.97	62.75	62.82
0.78	3.07	3.17	1.58	25.64	25.76	2.38	41.06	41.18	3.18	53.03	53.13	3.98	62.86	62.93
0.79	3.44	3.53	1.59	25.87	25.98	2.39	41.23	41.34	3.19	53.16	53.26	3.99	62.97	63.04

Saturation pressure	Saturating temperature °C	
MPa(gauge)	Saturated liquid	Saturated gas
4.00	63.08	63.19
4.01	63.19	63.27
4.02	63.31	63.38
4.03	63.42	63.49
4.04	63.53	63.60
4.05	63.64	63.71
4.06	63.75	63.82
4.07	63.86	63.93
4.08	63.97	64.04
4.09	64.08	64.15
4.10	64.19	64.26
4.11	64.30	64.37
4.12	64.41	64.48
4.13	64.52	64.59
4.14	64.63	64.69
4.15	64.74	64.80

Service Handbook

Model

EACV-P040YBL(-N)(-BS)

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