MITSUBISHI ELECTRIC

Changes for the Better

Air-cooled Chilling Unit

e-series

2025

R32

Service Handbook

Model

EAHV-M1500YCL(-N) (-BS)
EAHV-M1800YCL(-N) (-BS)
EACV-M1500YCL(-N) (-BS)
EACV-M1800YCL(-N) (-BS)

2nd edition

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, ammonia, and sulfide 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.

The appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater.)

Do not pierce or burn.

Be aware that refrigerants may not contain an odour.

⚠ 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.

Do not install the unit in an enclosed space or a semi-underground space.
- If the refrigerant leaks, a fire may result.
- The unit must be stored where leaking refrigerant will not accumulate.
- Store the unit in a room large enough to allow clearance in the event of refrigerant leakage.

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.

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.

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 unit in hospitals or facilities with radio communication capabilities.
- Inverter, high-frequency medical, or wireless communication equipment as well as power generators may cause the unit to malfunction. The unit 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.

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.

Transportation

⚠ WARNING

Lift the unit by placing the slings at designated locations. Support the 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 regulations.

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 humidity exceeds 80% or if the drain water outlet becomes clogged, condensation may drip from the unit.

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.

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

Pipe installation

⚠ **WARNING**

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

Do not pull out the grounding wire coming from the unit during welding work.

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 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.

Do not open the control box cover while charging refrigerant.
- If the refrigerant leaks, a fire may result.

Electrical wiring

⚠ WARNING

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 earth leakage breaker on the power supply to each unit.

Use properly rated breakers and fuses (an earth leakage breaker, local switch <a switch + fuse that meets local electrical codes>, or overcurrent breaker).
- The use of improperly rated breakers may result in electric shock, malfunction, smoke, 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 qualified personnel. 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.

Tighten all terminal screws to the specified torque.
- Loose screws and contact failure may result in smoke or fire.

Only use standard power cables of sufficient capacity.
- Failure to do so may result in current leakage, overheating, smoke, or fire.

⚠ 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.

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 overcurrent breaker.

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

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.

Recover all refrigerant from the unit.
- It is punishable by law to release refrigerant into the atmosphere.

⚠ 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.

Do not open the control box cover while charging refrigerant.
- If the refrigerant leaks, a fire may result.

IMPORTANT

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.

Refrigerant R32 is flammable. Do not use a naked-flame type detector.

Store the unit in a space with sufficient area so that the refrigerant concentration in the air will not reach a dangerous level in the event of refrigerant leakage.

Avoid frequent switching between Cooling and Heating modes.
- Too frequent switching of operation modes may cause the unit to make an abnormal stop.
- Before switching the operation mode from Heating to Cooling, make sure the water temperature is 35ºC or below.
- Before switching the operation mode from Cooling to Heating, make sure the water temperature is 15ºC or above.
- Before switching the operation mode between Cooling and Heating, leave the unit stopped for approximately 15 minutes.

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Ⅰ Read Before Servicing

[1] Read Before Servicing

1. **Check the type of refrigerant used in the system to be serviced.**
   Refrigerant Type
   Air-cooled Chilling Unit e-series EAHV/EACV-M1500/1800YCL: R32

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 R32 (Adaptability of tools that are for use with R22 or R407C)

1. To be used exclusively with R32 (not to be used if used with R22 or R407C)

Tools/Materials	Use	Notes
Gauge Manifold	Evacuation and refrigerant charging	Higher than 5.09MPa [738psi] on the high-pressure side
Charging Hose	Evacuation and refrigerant charging	The hose diameter is larger than that of the conventional model.
Refrigerant Recovery Cylinder	Refrigerant recovery	
Refrigerant Cylinder	Refrigerant charging	The refrigerant type is indicated. The cylinder is light blue.
Charging Port on the Refrigerant Cylinder	Refrigerant charging	The charge port diameter is larger than that of the current port.

2. Tools and materials that may be used with R32 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 R32.

3. Tools and materials that are used with R22, R407C, or R410A that may also be used with R32

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 R32

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

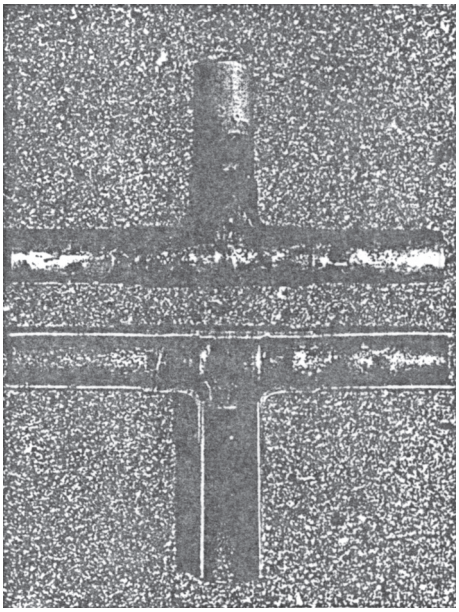
Tools for R32 must be handled with special care to keep moisture and dust from infiltrating the cycle.

[3] Brazing

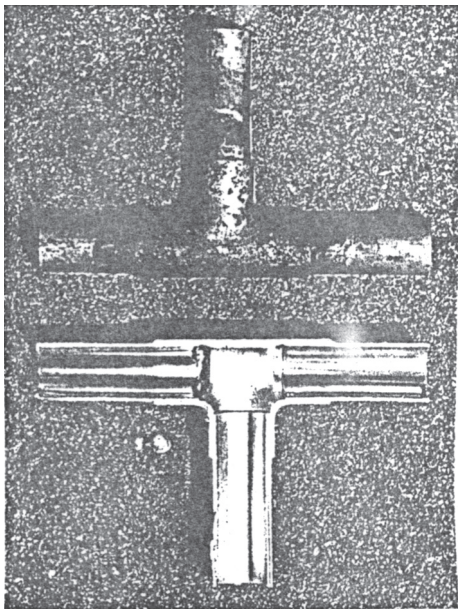
No changes have been made in the brazing procedures. Perform brazing with special care to keep foreign objects (such as oxide scale, water, and dust) out of the refrigerant system.

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 inert gas during brazing.
- 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

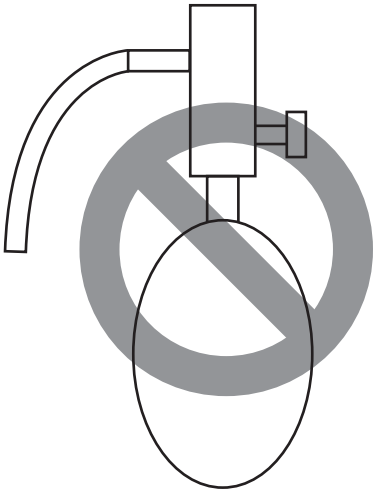
- The new refrigerating machine oil is 10 times as hygroscopic as the conventional oil and is more likely to cause unit failure if water infiltrates into the system.
- Flux generally contains chloride. Residual flux in the refrigerant circuit will cause sludge to form.

3. Notes

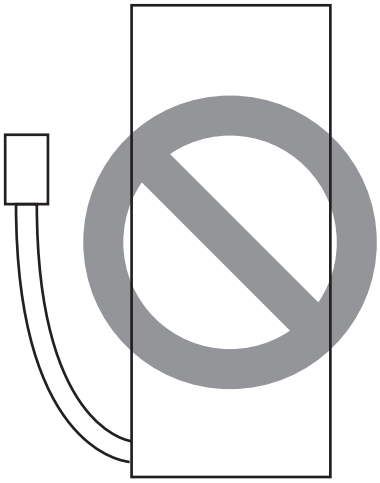
Do not use commercially available antioxidants because they may cause the pipes to corrode or refrigerating machine oil to deteriorate.

[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 R32 leak.



Halide torch



R22 leakage detector

1. Items to be strictly observed

- Pressurize the equipment with nitrogen up to the design pressure (4.15MPa [601psi]), and then judge the equipment's air tightness, taking temperature variations into account.
- Refrigerant R32 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 R32 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(R32) 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

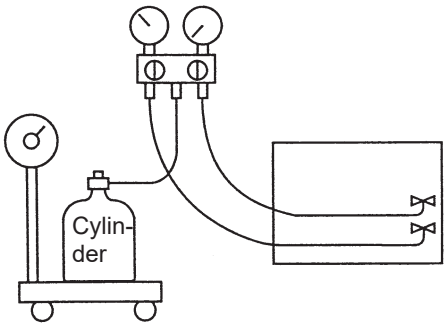
- When 5Torr(650Pa) or lower degree of vacuum cannot be attained after 3 hours of evacuation, it is likely that water has penetrated the system or that there is a leak.
- If water infiltrates the system, break the vacuum with nitrogen. Pressurize the system with nitrogen gas to 0.5kgf/cm^{2}G(0.05MPa) 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.

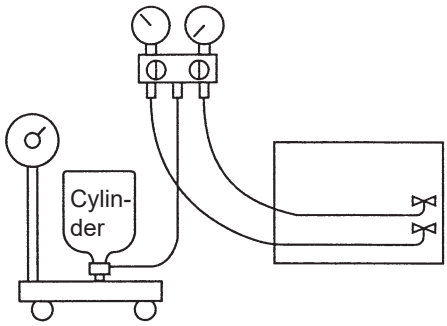
[6] Refrigerant Charging

Cylinder with a siphon

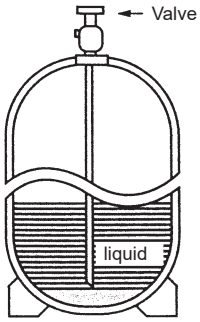


Cylinder color R32 is light blue.

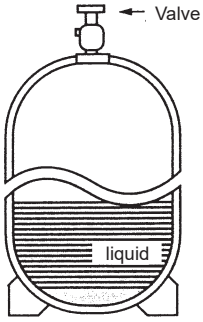
Cylinder without a siphon



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

R32 is a single refrigerant with a boiling point of -52°C (-62°F), and can be handled in a similar manner to other single refrigerants, such as R22.

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.
If the refrigerant leaks out, recharge it in a liquid state. The entire amount of the refrigerant cannot be replaced.

[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 (EAHV: 11.5 kg × 4, EACV: 4.7 kg × 4). (Charge refrigerant in the liquid state.)
Refer to "IX [4] Refrigerant Leak."(page 142)

[8] Characteristics of the Conventional and the New Refrigerants

1. Chemical property

The new refrigerant R32 is as low in toxicity and slightly flammable 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.
Because the refrigerant is slightly flammable, do not perform installation or service work in a confined area.

	New Refrigerant (HFC type)			Conventional Refrigerant (HCFC type)
	R32	R410A	R407C	R22
	R32	R32/R125	R32/R125/R134a	R22
Composition (wt%)	(100)	(50/50)	(23/25/52)	(100)
Type of Refrigerant	Single Refrigerant	Pseudo-azeotropic Refrigerant	Non-azeotropic Refrigerant	Single Refrigerant
Chloride	Not included	Not included	Not included	Included
Safety Class	A2L	A1/A1	A1/A1	A1
Molecular Weight	52.0	72.6	86.2	86.5
Boiling Point (°C/°F)	-51.7/-61.0	-51.4/-60.5	-43.6/-46.4	-40.8/-41.4
Steam Pressure (25°C,MPa/77°F,psi) (gauge)	1.588/230	1.557/226	0.9177/133	0.94/136
Saturated Steam Density (25°C,kg/m^3/77°F,psi)	47.4	64.0	42.5	44.4
Flammability	Slightly flammable	Nonflammable	Nonflammable	Nonflammable
Ozone Depletion Coefficient (ODP)*1	0	0	0	0.055
Global Warming Coefficient (GWP)*2	675	2088	1774	1810
Refrigerant Charging Method	Refrigerant charging in the liquid state/refrigerant charging in the gaseous state	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	Non Available	Available

*1 When CFC11 is used as a reference
*2 When CO_2 is used as a reference (Source: IPCC 4th Assessment part, global warming potential (GWP) 100-year value.)

2. Refrigerant composition

R32 is a single refrigerant and can be handled in a similar manner as with other single refrigerants, such as R22.
If the refrigerant leaks out, it may be replenished.

3. Pressure characteristics

The pressure in the system using R32 is 1.6 times as great as that in the system using R22.

Temperature (°C/°F)	Pressure (gauge)			
	R32	R410A	R407C	R22
	MPa/psi	MPa/psi	MPa/psi	MPa/psi
-20/-4	0.30/44	0.30/44	0.18/26	0.14/20
0/32	0.71/103	0.70/102	0.47/68	0.40/58
20/68	1.37/199	1.34/194	0.94/136	0.81/117
40/104	2.38/345	2.31/335	1.44/209	1.44/209
60/140	3.83/555	3.73/541	2.44/354	2.33/338
65/149	4.28/621	4.17/605	2.75/399	2.60/377

[9] Precautions for handling equipment using R32

When handling the units that use R32 refrigerant, observe the following notes. (The notes are based on the precautions regarding R32 refrigerant contained in IEC 60335-2-40.)

1. Transportation

1) Additional transportation regulations may exist with respect to equipment containing slightly flammable gas.

2. Disposal

1) Follow the local regulations on proper disposal of equipment using R32.

3. Storage

1) Store the unit in a sufficiently large space so that leaked refrigerant will not stagnate in a small confined area.
2) The maximum number of pieces of equipment permitted to be stored together will be determined local regulations.

4. Servicing information

1) Checks to the area
   Prior to beginning work on systems containing slightly flammable refrigerants, safety checks are necessary to ensure that the risk of ignition is minimised. For repair to the refrigerating system, 3) to 7) shall be completed prior to conducting work on the system.

2) Work procedure
   Work shall be undertaken under a controlled procedure so as to minimise the risk of a slightly flammable gas being present while the work is being performed.

3) General work area
   All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. Work in confined spaces shall be avoided. The area around the workspace shall be sectioned off. Ensure that the conditions within the area have been made safe by control of flammable material.

4) Checking for presence of refrigerant
   The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially slightly flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants.

5) Presence of fire extinguisher
   If any hot work is to be conducted on the refrigeration equipment or any associated parts, appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO_2 fire extinguisher adjacent to the charging area.

6) No ignition sources
   No person carrying out work, such as brazing, in relation to a refrigeration system which involves exposing any pipe work shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which refrigerant can possibly be released to the surrounding space. Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. "No Smoking" signs shall be displayed in a conspicuous place in the work area.

7) Ventilated area
Ensure that the area is in the open or that it is adequately ventilated before replacing parts or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.

8) Checks to the refrigeration equipment
Where electrical components are being changed, they shall be fit for the purpose and to the correct specification. At all times the MITSUBISHI ELECTRIC's Installation Manual and Service Handbook shall be followed. If in doubt, consult the dealer's technical department for assistance.
The following checks shall be applied to installations using slightly flammable refrigerants:
- the amount of refrigerant charge depends on the size of the area in which products containing refrigerant are to be installed;
- the ventilation machinery and outlets are operating adequately and are not obstructed;
- if an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant;
- marking to the equipment continues to be visible and legible. Markings and signs that are illegible shall be corrected;
- refrigeration pipe or components are installed in a position where they are unlikely to be exposed to any substance which may corrode components containing refrigerant, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected being so corroded.

9) Checks to electrical devices
Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment so all parties are advised.

10) Initial safety checks shall include:
- that capacitors are discharged: this shall be done in a safe manner to avoid possibility of sparking;
- that no live electrical components and wiring are exposed while charging, recovering or purging the system;
- that there is continuity of earth bonding.

5. Repairing sealed components

1) During repairs to sealed components, all electrical supplies shall be disconnected from the equipment being worked upon prior to any removal of sealed covers, etc. If it is absolutely necessary to have an electrical supply to equipment during servicing, then a permanently operating form of leak detection shall be located at the most critical point to warn of a potentially hazardous situation.

2) Particular attention shall be paid to the following to ensure that by working on electrical components, the casing is not altered in such a way that the level of protection is affected. This shall include damage to cables, excessive number of connections, terminals not made to original specification, damage to seals, incorrect fitting of glands, etc.

3) Ensure that the apparatus is mounted securely.

4) Ensure that seals or sealing materials have not degraded to the point that they no longer serve the purpose of preventing the ingress of flammable atmospheres. Replacement parts shall be in accordance with the MITSUBISHI ELECTRIC's specifications.

5) The use of silicon sealant can inhibit the effectiveness of some types of leak detection equipment. Intrinsically safe components do not have to be isolated prior to working on them.

6. Refrigerant leakage detection

The following leak detection methods are deemed acceptable for all refrigerant systems.

1) Electronic leak detectors may be used to detect refrigerant leaks but, in the case of slightly flammable refrigerants, the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used.

2) If a leak is suspected, all naked flames shall be removed/extinguished.

3) If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak. Because R32 is slightly flammable, oxygen free nitrogen (OFN) shall be poured through the system both before and during the brazing process to purge R32.

7. Refrigerant removal and vacuum drying for service

1) R32 is slightly flammable. Follow the procedures below to reduce the risk of R32 from catching fire:
   1. Remove refrigerant;
   2. Purge the circuit with inert gas;
   3. Evacuate;
   4. Purge again with inert gas;
   5. Open the circuit by cutting or brazing.

2) The charged refrigerant shall be recovered into the recovery cylinders designated for use with R32. For appliances containing slightly flammable refrigerants, the system shall be "flushed" with OFN to render the unit safe. This process may need to be repeated several times. Compressed air or oxygen shall not be used for purging refrigerant systems.

3) Because R32 is slightly flammable, flushing shall be achieved by breaking the vacuum in the system with OFN and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum. This process shall be repeated until no refrigerant is within the system. When the final OFN charge is used, the system shall be vented down to atmospheric pressure to enable work to take place. This operation is absolutely vital if brazing operations on the pipe-work are to take place.

4) Ensure that the outlet for the vacuum pump is not close to any ignition sources and that ventilation is available.

8. Decommissioning

1) Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its detail. It is recommended good practice that all refrigerants are recovered safely. Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of reclaimed refrigerant. It is essential that electrical power is available before the task is commenced.

2) Become familiar with the equipment and its operation.

3) Isolate system electrically.

4) Before attempting the procedure, ensure that:
   - mechanical handling equipment is available, if required, for handling refrigerant cylinders;
   - all personal protective equipment is available and being used correctly;
   - the recovery process is supervised at all times by a competent person;
   - recovery equipment and cylinders conform to the appropriate standards.

5) Pump down refrigerant system, if possible.

6) Make sure that cylinder is situated on the scales before recovery takes place.

7) Start the recovery machine and operate in accordance with MITSUBISHI ELECTRIC's instructions.

8) Do not overfill cylinders. (No more than 80% volume liquid charge)

9) Do not exceed the maximum working pressure of the cylinder, even temporarily.

10) When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.

11) Recovered refrigerant shall not be charged into another refrigeration system unless it has been cleaned and checked.

9. Labelling

1) Equipment shall be labelled stating that it has been de-commissioned and emptied of refrigerant. The label shall be dated and signed. Because R32 is slightly flammable, ensure that there are labels on the equipment stating the equipment contains flammable refrigerant.

10. Appropriate refrigerant recovery method

1) When removing refrigerant from a system, either for repairing or decommissioning, it is recommended good practice that all refrigerants are removed safely.

2) When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct number of cylinders for holding the total system charge are available. All cylinders to be used are designated for recovering refrigerant and labelled for that refrigerant (i.e. special cylinders for the recovery of refrigerant). Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery starts.

3) The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of all appropriate refrigerants including, when applicable, slightly flammable refrigerants. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition. Before using the recovery machine, check that it is in satisfactory working order, has been properly maintained and that any associated electrical components are sealed to prevent ignition in the event of a refrigerant release. Consult dealer if in doubt.

4) The recovered refrigerant shall be returned to the refrigerant supplier in the correct recovery cylinder, and the relevant waste transfer note arranged. Do not mix refrigerants with different properties in recovery units and especially not in cylinders.

5) If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that slightly flammable refrigerant does not remain within the lubricant. The evacuation process shall be carried out prior to returning the compressor to the suppliers. Only electric heating to the compressor body shall be employed to accelerate this process. When oil is drained from a system, it shall be carried out safely.

6) When collecting the refrigerant, keep the water circulated in the water circuit.

11. Competence of service personnel

(1) General

Special training additional to usual refrigerating equipment repair procedures is required when equipment with slightly flammable refrigerants is affected.

(2) Training

The training should include the substance of the following:
Information about the explosion potential of slightly flammable refrigerants to show that flammables may be dangerous when handled without care.

(3) Information about the correct working procedures

Commissioning

1) Carry out a leak test before charging with refrigerant.

2) Check safety equipment before putting into service.

Maintenance

1) Portable equipment shall be repaired outside or in a workshop specially equipped for servicing units with slightly flammable refrigerants.

2) Ensure sufficient ventilation at the repair place.

3) Be aware that malfunction of the equipment may be caused by refrigerant loss and a refrigerant leak is possible.

4) Discharge capacitors in a way that won't cause any spark. The standard procedure to short circuit the capacitor terminals usually creates sparks.

5) Reassemble sealed enclosures accurately. If seals are worn, replace them.

6) Check safety equipment before putting into operation.

7) Carry a portable refrigerant-leak sensor when entering a space with a risk of refrigerant leakage.

Repair

1) Portable equipment shall be repaired outside or in a workshop specially equipped for servicing units with slightly flammable refrigerants.

2) Ensure sufficient ventilation at the repair place.

3) Be aware that malfunction of the equipment may be caused by refrigerant loss and a refrigerant leak is possible.

4) Discharge capacitors in a way that won't cause any spark.

5) When brazing is required, the following procedures shall be carried out in the right order:
   1. Remove the refrigerant. If the recovery is not required by national regulations, drain the refrigerant to the outside. Take care that the drained refrigerant will not cause any danger. In doubt, one person should guard the outlet. Take special care that drained refrigerant will not float back into the building.
   2. Evacuate the refrigerant circuit.
   3. Purge the refrigerant circuit with nitrogen for 5 min.
   4. Evacuate again.
   5. Remove parts to be replaced by cutting, not by flame.
   6. Purge the braze point with nitrogen during the brazing procedure.
   7. Carry out a leak test before charging with refrigerant.

6) Reassemble sealed enclosures accurately. If seals are worn, replace them.

7) Check safety equipment before putting into operation.

Decommissioning

1) If the safety is affected when the equipment is putted out of service, the charged refrigerant shall be removed before decommissioning.

2) Ensure sufficient ventilation at the equipment location.

3) Be aware that malfunction of the equipment may be caused by refrigerant loss and a refrigerant leak is possible.

4) Discharge capacitors in a way that won't cause any spark.

5) Remove the refrigerant. If the recovery is not required by national regulations, drain the refrigerant to the outside. Take care that the drained refrigerant will not cause any danger. In doubt, one person should guard the outlet. Take special care that drained refrigerant will not float back into the building.

6) Evacuate the refrigerant circuit.

7) Purge the refrigerant circuit with nitrogen for 5 min.

8) Evacuate again.

9) Fill with nitrogen up to atmospheric pressure.

10) Put a label on the equipment that the refrigerant is removed.

Disposal

1) Ensure sufficient ventilation at the working place.

2) Remove the refrigerant. If the recovery is not required by national regulations, drain the refrigerant to the outside. Take care that the drained refrigerant will not cause any danger. In doubt, one person should guard the outlet.

3) Evacuate the refrigerant circuit.

4) Purge the refrigerant circuit with nitrogen for 5 min.

5) Evacuate again.

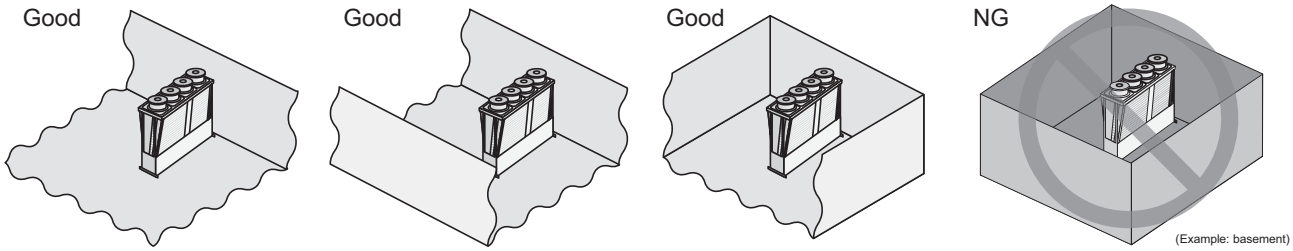
6) Cut out the compressor and drain the oil.

12. Installation restrictions

Do not install the unit where combustible gas may leak.

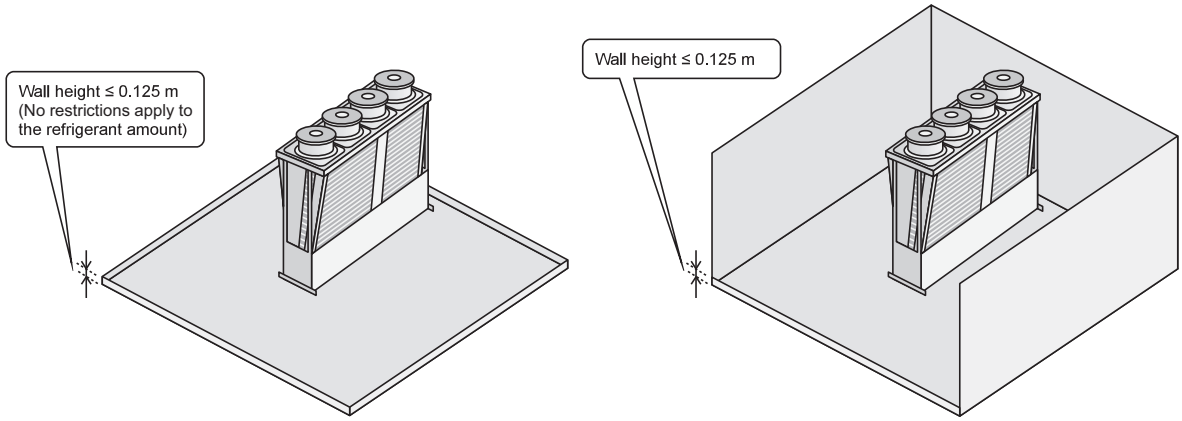
- If combustible gas accumulates around the unit, fire or explosion may result.

- Provide sufficient space around the unit for effective operation, efficient air movement, and ease of access for maintenance.
- All restrictions mentioned in this manual apply not only to new installations but also to relocations and layout changes.
- Refer to the Installation manual for other precautions on installation.
- Do not install the unit inside a building such as the basement or machine room, where the refrigerant may stagnate.
- Install the unit in a place where at least one of four sides is open.

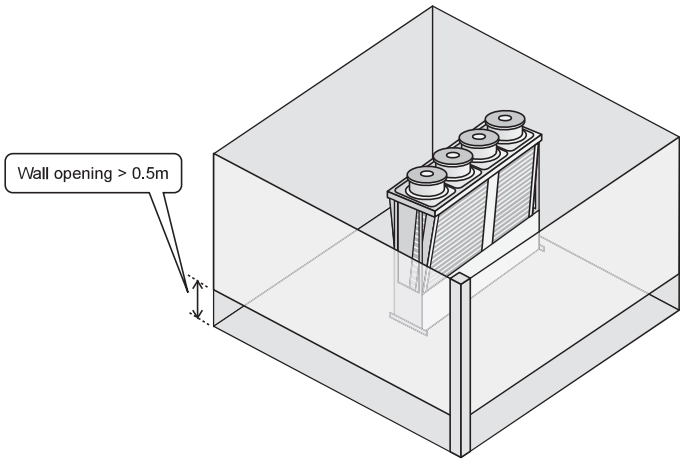


If the unit needs to be installed in a space where all four sides are blocked, confirm that one of the following situations (A or B) is satisfied.

A Install the unit in a space with a wall height of ≤ 0.125 m.



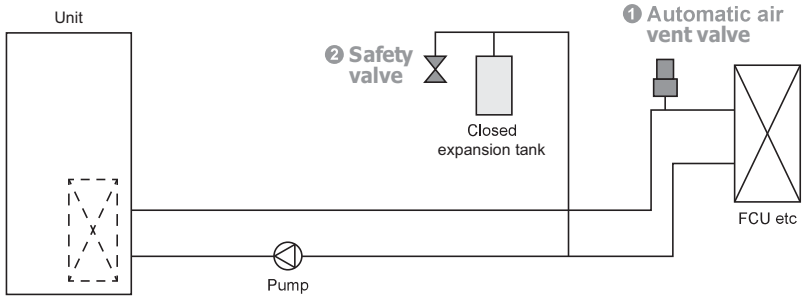
B Create an appropriate ventilation opening.



13. Regulatory requirements for safety

See below for information on installing a safety device on the air cooled chilling unit system.

* Safety devices shall be regularly inspected, maintained, and replaced in accordance with relevant laws, regulations, and the instructions of the manufacturers.
* The requirements listed below were established based on IEC60335-2-40 (Edition 5.0) G.G.6. See the original standards for further information on selecting a safety device.



Required items	Note
❶ Automatic air vent valve	* In the event of a failure of the waterside heat exchanger in the unit, the refrigerant may leak from the automatic air vent valve, so install it in a place where the refrigerant will not accumulate, such as outdoors.
❷ Safety valve	* In the event of a failure of the waterside heat exchanger in the unit, the refrigerant may leak from the safety valve, so install it in a place where the refrigerant will not accumulate, such as outdoors.

[10] 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.
Different types of oil are used for R407C/R410A and for R32.

Refrigerant	Refrigerating machine oil
R22	Mineral oil
R407C	Ester oil
R410A	Ester oil
R32	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.
*1.Contaminants is defined as moisture, air, processing oil, dust/dirt, wrong types of refrigerant, and refrigerating machine oil.

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/heating 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/heating 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/heating performance
Compressor overheat</td></tr>
<tr><td colspan="2">Oil degradation</td><td>Burn-in on the orbiting scroll</td></tr>
</table>

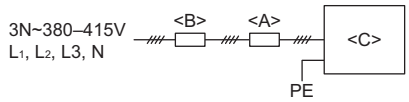
II Restrictions

[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 size (mm²)			Current leakage breaker	Local switch (A)		No-fuse breaker (A)	Max. Permissive System Impedance
	Main cable	Branch	Ground		Capacity	Fuse		
EACV/EAHV-M1500/1800YCL	35	-	35	160 A 200 mA 0.1 sec. or less	150	150	160	0.06 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 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 S_{SC} is greater than or equal to S_{SC} (*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 S_{SC} greater than or equal to S_{SC} (*2).**

S_{SC} (*2)

S_{SC} (MVA)
10.35

Control cable specifications

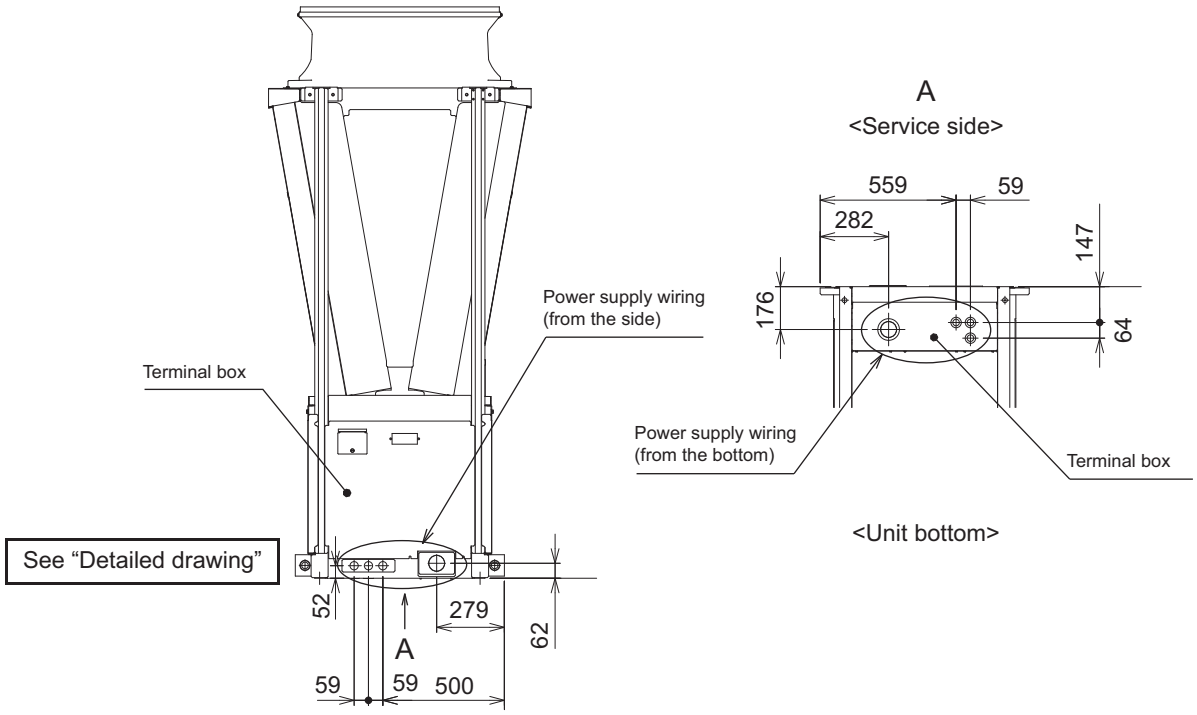
Remote controller cable	Size	0.3 mm² (Max. 250 m total)
	Recommended cable types	2-core sheathed cable
M-NET cable between units *1	Size	Min. 1.25 mm² (Max. 200 m total)
	Recommended cable types	Shielded cable CVVS, CPEVS or MVVS
External input wire size		Min. 0.3 mm²
External output wire size		1.25 mm²

*1 Use a CVVS or CPEVS cable (Max. total length of 250 m) if there is a source of electrical interference nearby (e.g., factory) or the total length of control wiring exceeds 200 m.

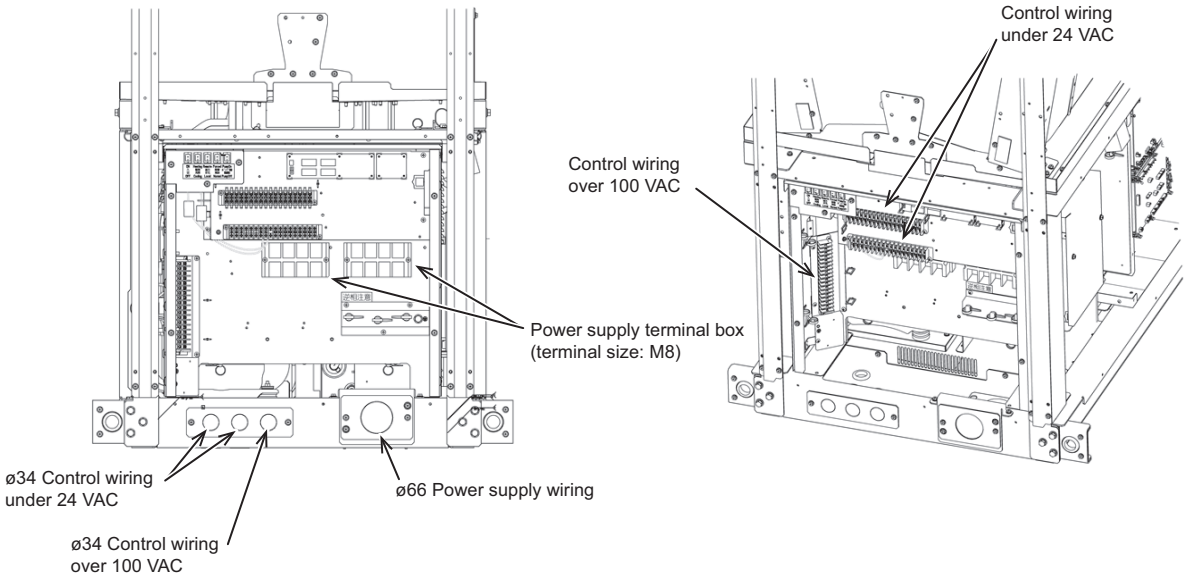
[2] Cable Connections

1. Schematic Diagram of a Unit and Terminal Block Arrangement

<Unit: mm>



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

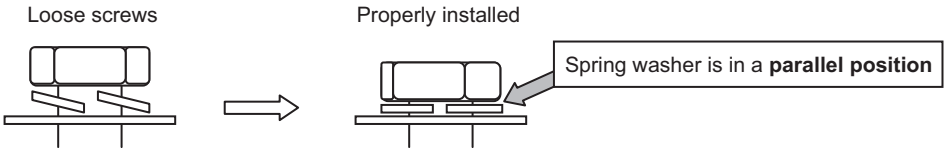
* Faulty contacts due to loose screws may cause overheating and fire.
* Using the circuit board while it is damaged may cause overheating and fire.

<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.

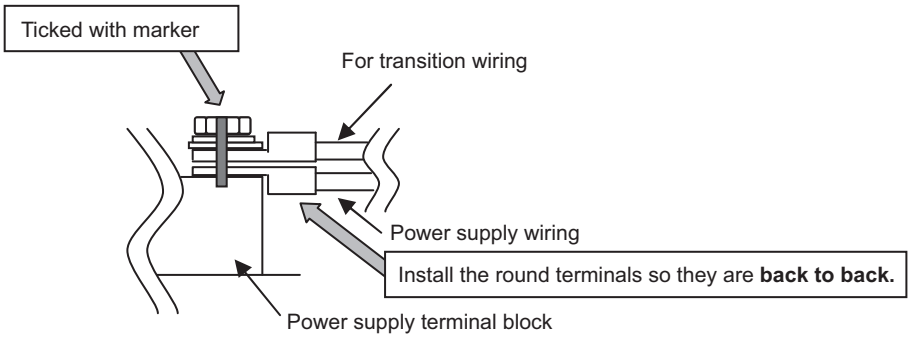
1) Check that the spring washer is in a parallel position.
* If the screw is biting into the washer, simply fastening the screw to the specified torque cannot determine whether it has been installed properly.



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

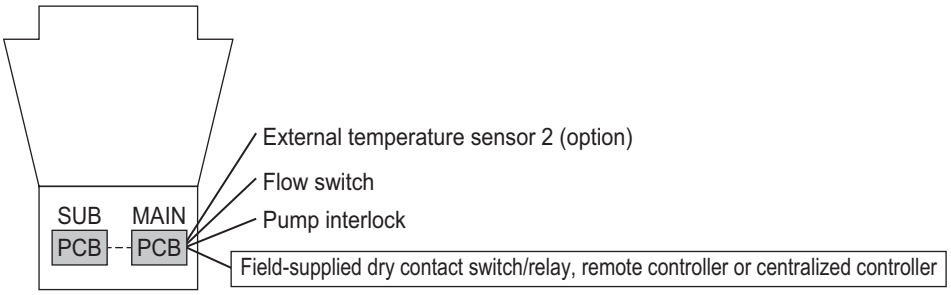
- Always use a conduit to run the power supply wiring.
- Select the conduit size based on the hole.
- The cable conduits must be prepared locally.
- Do not store the 24VDC or less low-voltage circuit and 100VAC or higher main circuit and control circuit cables in the same multi-core cable, or bundle 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

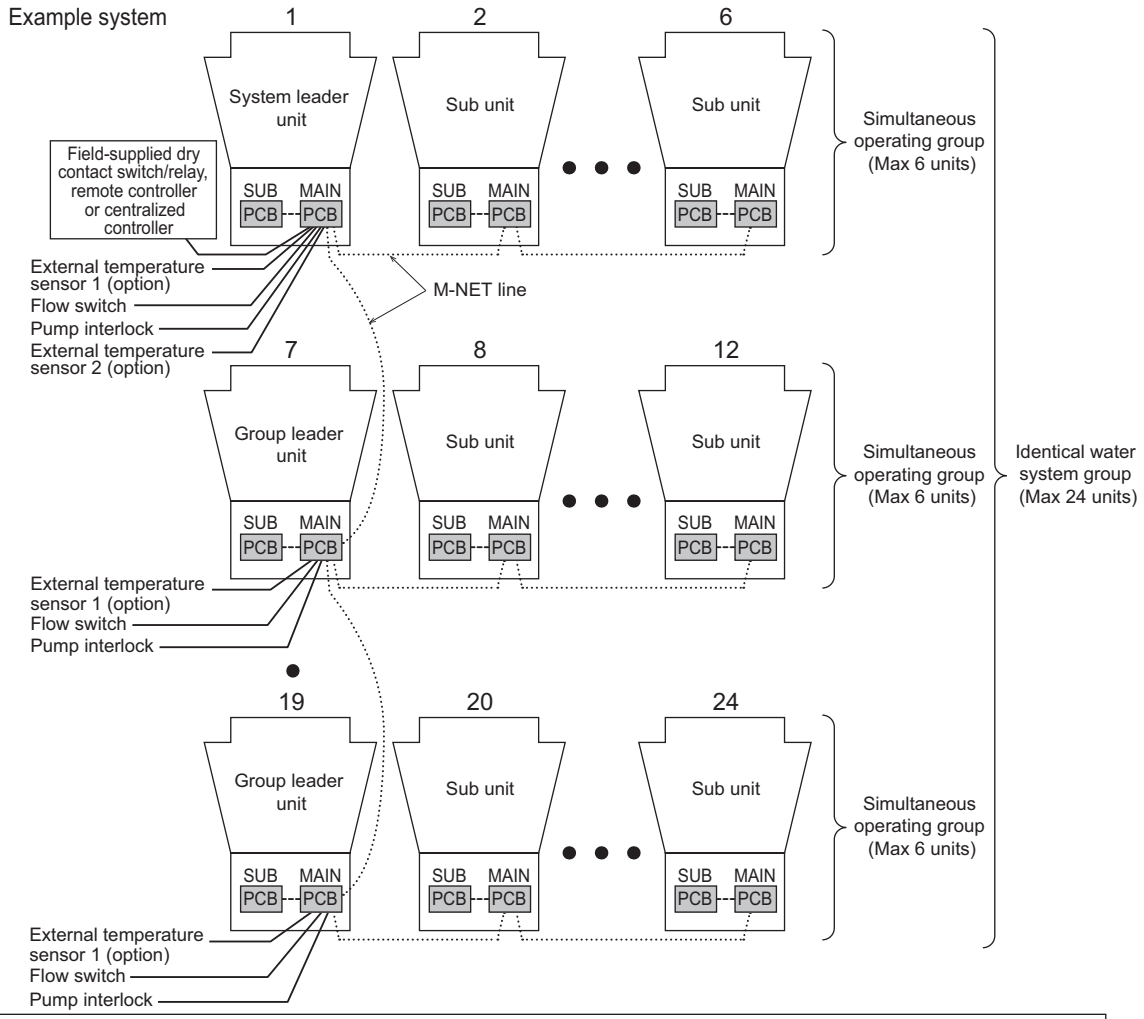
(1) Individual system



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.

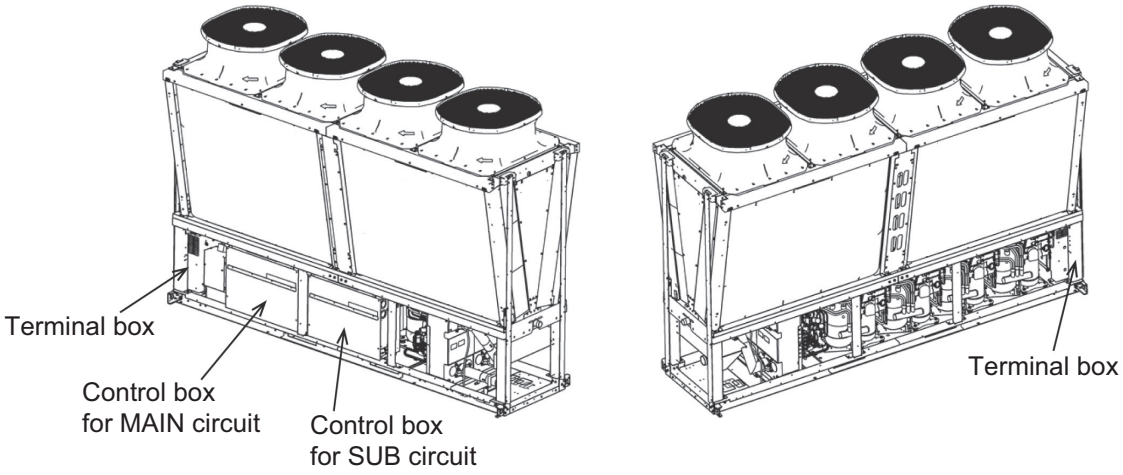


Refer to the sections "Switch Types and the Factory Settings" and "Configuring the settings" for further details.

* Refer to page 41 for the flow switch and pump connections. (The example system shows Pattern 1.)

[3] Switch Types and the Factory Settings

(1) Switch names and functions



<Right side> <Left side>

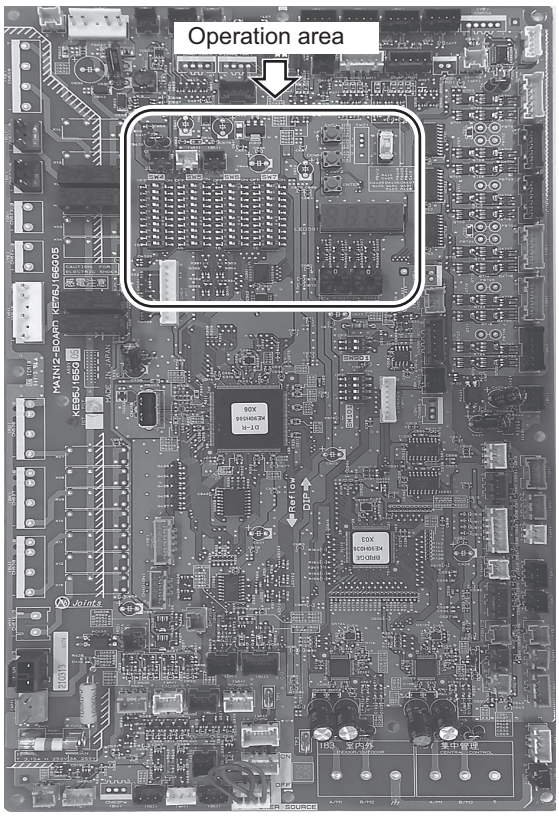
There are three main ways to set the settings as follows:

1) Dip switches (SW4 - SW7)
2) Dip switches used in combination with the push switches
3) Rotary switches

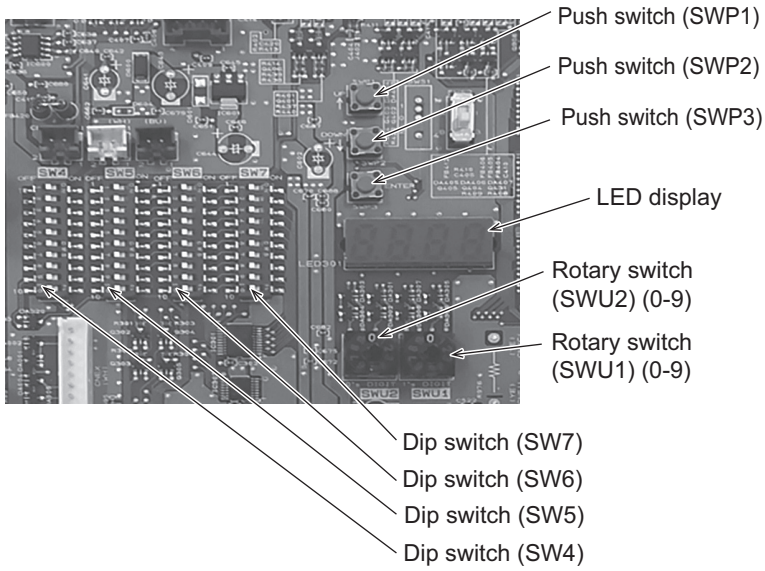
See the next page for how these switches are used to set certain items.

Different types of switches on the PCB

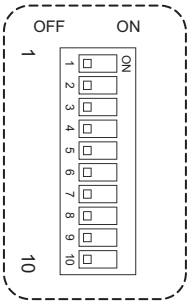
[Control board]



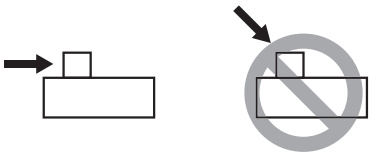
[Enlarged view of operation area]



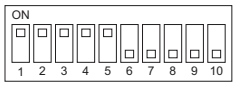
			Initial Setting	
			MAIN circuit	SUB circuit
Rotary switch	SWU1	Sets the 1's digit of the unit address.	"1"	"1"
	SWU2	Sets the 10's digit of the unit address.	"0"	"5"
Push switch	SWP1	Use for increasing the setting value.	-	-
	SWP2	Use for decreasing the setting value.	-	-
	SWP3	Use for changing and deciding the setting value.	-	-
Dip switch	SW4-7	Select a setting which is decided with a combination of switch numbers.	-	-



Example: on the upper figure.
1 to 5 are “ON” and 6 to10 are “OFF”.



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 MAIN circuit	Factory setting SUB circuit	OFF setting	ON setting	System leader unit	Group leader unit	SUB unit	Setting timing
SW4	1	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
	2										
	3										
	4										
	5										
	6										
	7										
	8										
	9										
	10										
SW5	1	Model setting		-	-	Leave the setting as it is.		-	-	-	At a reset
	2	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	Required	At a reset
	3										
	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 SW5-7 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	Model setting		OFF	OFF	Leave the setting as it is.		Fixed OFF	Fixed OFF	Fixed OFF	Any time
SW6	1	Analog input type setting	Selects analog input 4-20mA/ 0-10V/1-5V/2-10V. (Effective only when SW5-7 is set to ON and SW6-4 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
	2										
	3	Model setting		OFF	OFF	Leave the setting as it is.		Fixed OFF	Fixed OFF	Fixed OFF	Any time
	4										
	5										
	6										
	7										
	8										
	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 Procon A1M (Modbus interface), which is available from MITSUBISHI ELECTRIC UK.
Use a BMS with insulation.

SW5-7	SW5-8	SW5-9	Input from BMS
ON	OFF	ON	Target temperature
ON	ON	ON	Capacity
OFF	OFF	ON	Outdoor temperature

When using a local controller, refer to the table below for the types of input/output signals that are available and the operations that correspond to the signals.

External Input/Output

Input type	**Dry contact**		**ON (Close)**	**OFF (Open)**	**Terminal block**
	(a) UNIT OPERATION	Run/Stop	The unit will go into operation when the water temperature drops below the preset temperature.	The unit will stop except when the unit is in the Anti-Freeze mode.	K23-K26
	(b) MODE CHANGE (Heating ECO) * EAHV	Heating ECO/Heating	Heating ECO mode (EAHV: When "COOLING/HEATING SWITCHING" contact (item (j) below) is ON, this mode is enabled.)	Heating mode (EAHV: When "COOLING/HEATING SWITCHING" contact (item (j) below) is ON, this mode is enabled.)	K40-K42
	(c) MODE CHANGE (Cooling ECO)	Cooling ECO/Cooling	Cooling ECO mode (When "COOLING/HEATING SWITCHING" contact (item (j) below) is OFF, this mode is enabled.)	Cooling mode (When "COOLING/HEATING SWITCHING" contact (item (j) below) is OFF, this mode is enabled.)	K01-K03
	(d) FAN MODE	Forced/ Normal	When the outdoor temperature is 5ºC or less, the fan will remain in operation after the compressor has stopped.	The fan will stop when the compressor stops.	K91-K92
	(e) ANTI FREEZE * EAHV	On/Off	The unit will operate in the Anti-Freeze mode (with the target temperature 25ºC) when the contact status of (a) "UNIT OPERATION" is "Stop" or the ON/OFF button on the remote controller is turned off. (EAHV: When "COOLING/HEATING SWITCHING" contact (item (j) below) is ON, this mode is enabled.)	The unit will operate according to the status of the "UNIT OPERATION" contact (item (a) above) or the ON/OFF command from the remote controller.	K40-K41
	(f) FLOW SWITCH	Normal/Error	The unit is allowed to operate.	The unit will not operate.	K23-K24
	(g) PUMP INTERLOCK	Normal/Error	The unit is allowed to operate.	The unit will not operate.	K01-K02
	(h) PEAK-DEMAND CONTROL	On/Off	The unit will operate at or below the maximum capacity level that was set for the Peak-demand control setting.	The unit will operate at or below the maximum capacity.	DE1-DE2
	(i) OUTLET WATER TEMP SWITCHING	2nd/1st	Setting temp 2 (Refer to page 90 Settings table)	Setting temp 1 (Refer to page 90 Settings table)	KN51-KN61
	(j) COOLING/HEATING SWITCHING * EAHV	Heating/ Cooling	Heating mode	Cooling mode	K91-K93
	Analog				**Terminal block**
	Input type		**Action**		
	(k) WATER TEMP SETTING/ CAPACITY CONTROL SIGNAL		Water temperature or capacity control signal can be set by using the external analog input to the CN421 on the MAIN circuit board. One analog input type can be selected from the following types: 4-20 mA, 1-5 V, 0-10 V, or 2-10 V. * Use a 4-20 mA signal output devise with insulation.		SG1(+)-KG1(-)
	(l) EXTERNAL WATER SENSOR 1 (option)		For simultaneous operating group		KT11-KT21
	(m)EXTERNAL WATER SENSOR 2 (option)		For identical water system group		KT31-KT41
Output type	**Contact type**		**Conditions in which the contact closes (turns on)**	**Conditions in which the contact opens (turns off)**	**Terminal block**
	(n) ERROR INDICATOR (Individual unit)	Close/Open	The unit has made an abnormal stop.	During normal operation	K33-K34
	(o) ERROR INDICATOR (System leader unit only)	Close/Open	The unit in the system has made an abnormal stop.	During normal operation	SY1-SY2
	(p) OPERATION INDICATOR (Individual unit)	Close/Open	The unit operation output is ON.	The unit operation output is OFF.	K31-K32
	(q) OPERATION INDICATOR (System leader unit only)	Close/Open	The "UNIT OPERATION" contact (item (a) above) or the ON/OFF button on the remote controller is ON.	The "UNIT OPERATION" contact (item (a) above) or the ON/OFF button on the remote controller is OFF.	SS1-SS2
	(r) PUMP OPERATION COMMAND	Close/Open	The pump will operate according to the status of the "UNIT OPERATION" contact or the ON/OFF button on the remote controller button.	Under all conditions other than the ones listed on the left	K75-K76
	(s) SUPPLEMENTARY HEATER SIGNAL	Close/Open	Water and outdoor temperature has dropped below a setting water temperature and a set outdoor temperature.	Water temperature is at or above a set water temperature +2ºC or the outdoor temperature is at or above a set outdoor temperature +2ºC.	RP1-RP2
	(t) DEFROST SIGNAL	Close/Open	The unit is in defrost mode.	The unit is not in defrost mode.	KD1-KD2
	(u) DRAIN PAN HEATER SIGNAL	Close/Open	Outdoor temperature has dropped below a set outdoor temperature.	Outdoor temperature is at or above a set outdoor temperature +2ºC.	KB1-KB2
	(v) HEATING OPERATION DISPLAY	Close/Open	The unit is in heating mode.	The unit is in cooling mode.	K38-K39
RC/M-NET	REMOTE CONTROLLER	PAR-W31MAA			RA-RB
	Centralized controller	AE-200, AE-C400, EW-C50			A-B
	M-NET	-			M1-M2

Input and output correspondence table

When wiring on site, check the operation during the commissioning.

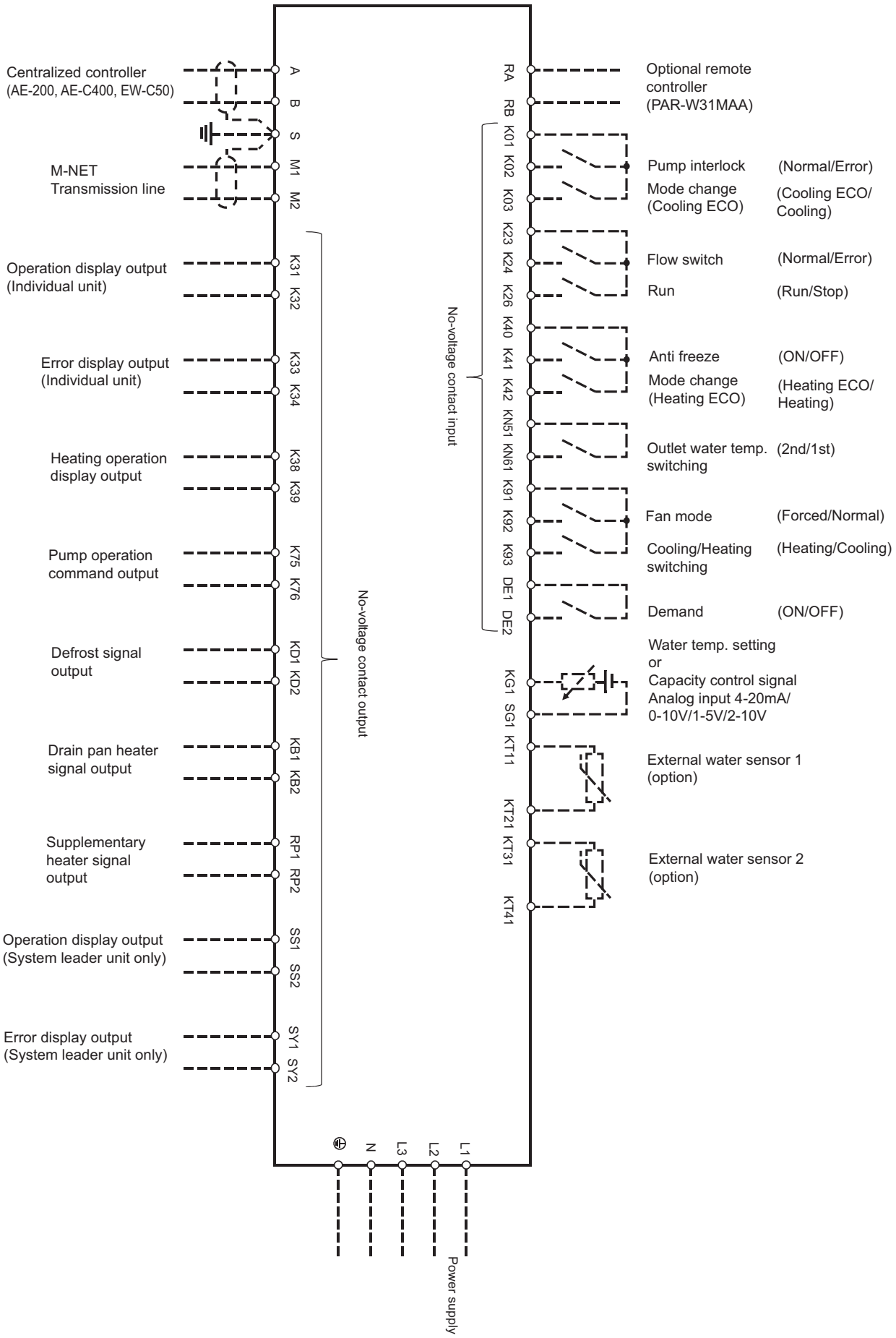
		Terminal block	ON	OFF	System leader unit	Group leader unit	SUB unit
No-voltage contact input	Run	K23-K26	Run	Stop	○	—	—
	Fan mode	K91-K92	Forced	Normal	○	—	—
	Cooling/Heating switching	K91-K93	Heating	Cooling	○	—	—
	Pump interlock	K01-K02	Normal	Error	○	○	○*
	Anti freeze	K40-K41	ON	OFF	○	—	—
	Flow switch	K23-K24	Normal	Error	○	○	○*
	Outlet water temp. switching	KN51-KN61	2nd	1st	○	—	—
	Demand	DE1-DE2	ON	OFF	○	—	—
	Mode change (Heating ECO)	K40-K42	Heating ECO	Heating	○	—	—
	Mode change (Cooling ECO)	K01-K03	Cooling ECO	Cooling	○	—	—
Analog input	Water temp. setting / Capacity control signal	SG1(+)-KG1(-)	4-20mA,0-10,2-10V,1-5V		○	—	—
	External water sensor 1 (Option)	KT11-KT21	For simultaneous operating group		○	○	—
	External water sensor 2 (Option)	KT31-KT41	For identical water system group		○	—	—
No-voltage contact output	Supplementary heater signal output	RP1-RP2	During the low outdoor and water temperature is ON.		○	○	○
	Defrost signal output	KD1-KD2	During the defrosting operation is ON.		○	○	○
	Heating operation display	K38-K39	Heating	Cooling	○	○	○
	Operation display output (Individual unit)	K31-K32	ON while the unit is operating.		○	○	○
	Error display output (Individual unit)	K33-K34	While abnormally stop is ON.		○	○	○
	Pump operation command output	K75-K76	ON is when the pump is required.		○	○	○*
	Drain pan heater signal output	KB1-KB2	During the low outdoor temperature is ON.		○	○	○
	Operation display output (System leader unit only)	SS1-SS2	ON while any of the units is operating.		○	—	—
	Error display output (System leader unit only)	SY1-SY2	ON when any of the units in the system has come to an abnormal stop.		○	—	—
RC	Remote controller	RA-RB	PAR-W31MAA		○	—	—
	Centralized controller	A-B	AE-200, AE-C400, EW-C50		○	—	—

○: Input and output signal is enabled.

—: Invalid

* Invalid when the one pump system

External signal interface



[4] Configuring the Settings

The settings must be set only by a qualified personnel.

1. System configuration

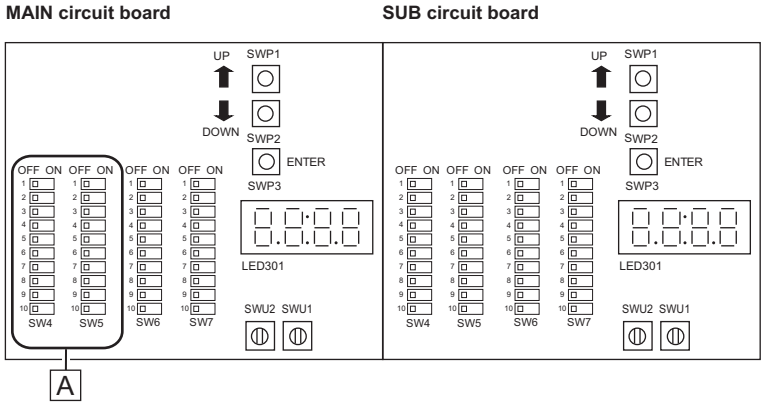
(1) Set the dip switches. (System setting)

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.

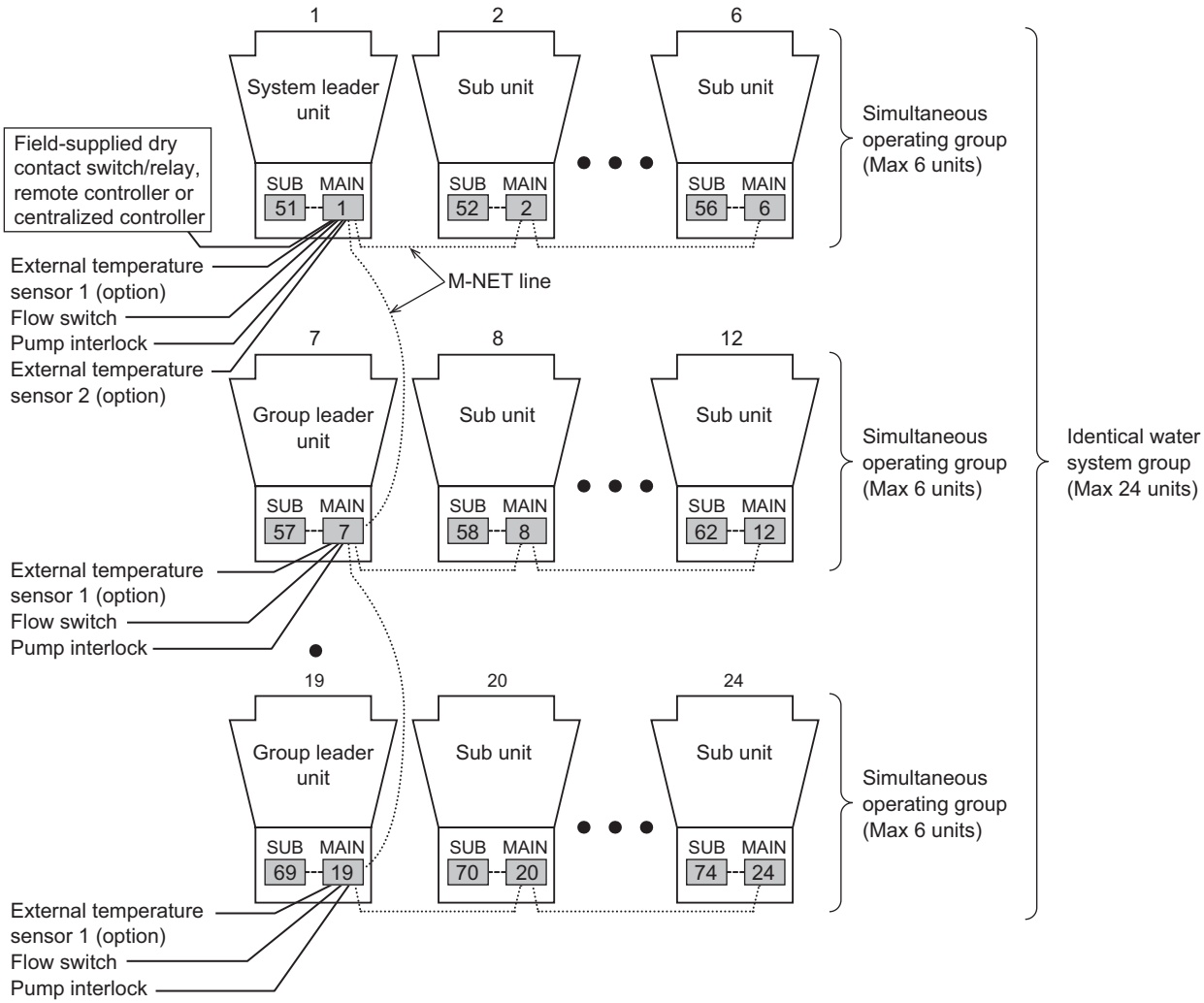
- Water temperature control based on the external water temperature reading
- Analog signals from a remote location

Refer to "Table of settings items" for further details. (Page 35-36)

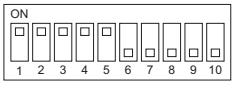


(2) M-NET address setting

Example of address setting



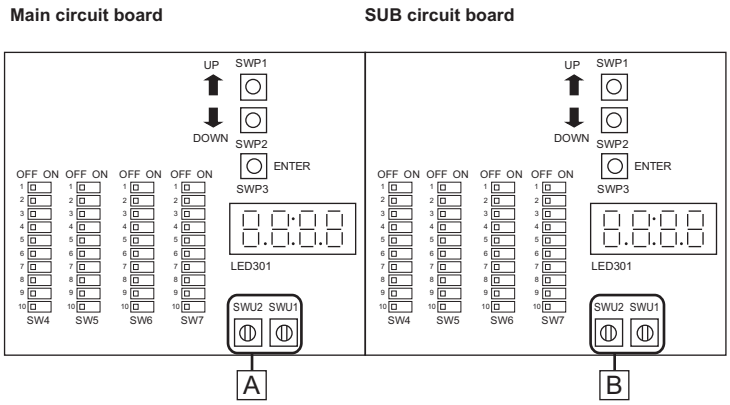
* Refer to page 41 for the flow switch and pump connections. (The example system shows Pattern 1.)



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 module is set to "1" (labeled A in the figure at right) and that the address of the SUB circuit on the main module 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 module 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 SWU2, and set the 1's digit with SWU1. Assign sequential addresses to the MAIN circuit on all sub modules starting with 2.

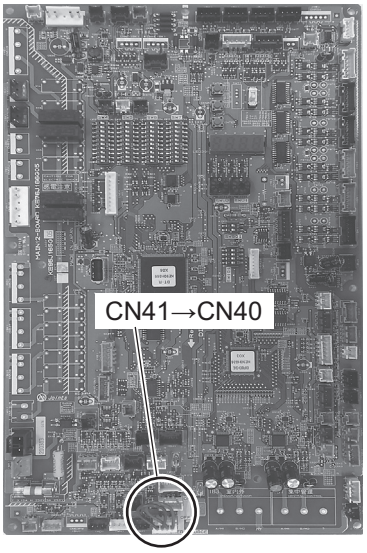
SUB circuit

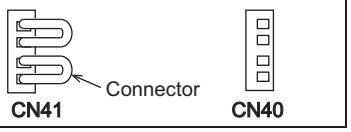
(2)Set the SUB circuit addresses with the rotary switches (labeled B in the figure). Set the 10's digit with SWU2, and set the 1's digit with SWU1. Assign sequential addresses to the SUB circuit on all sub modules starting with 52.

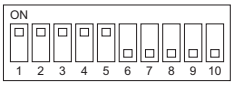
(3) Set the M-NET power supply.

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, AE-C400, EW-C50 as the centralized controller.

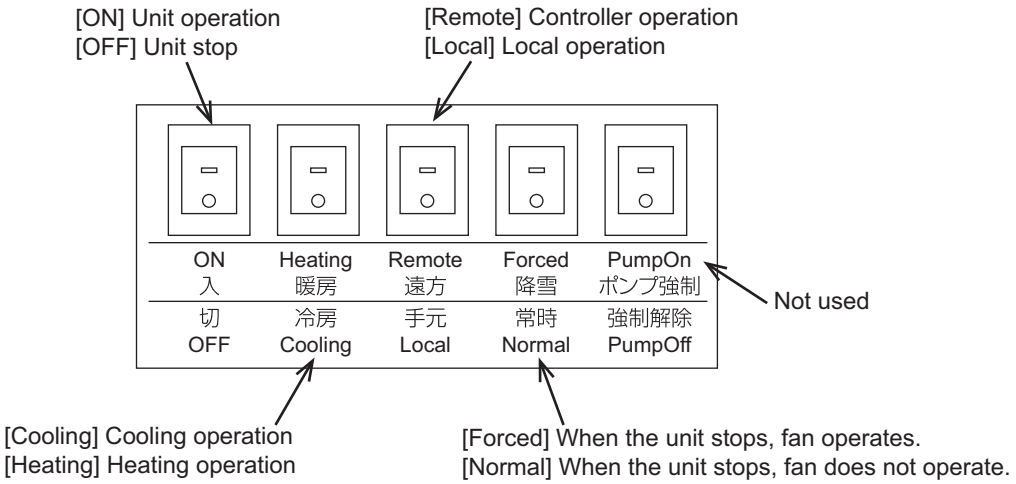


Address 1	All addresses other than Address 1
Move the connector from CN41 to CN40.	Leave the connector connected to CN41.
	



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

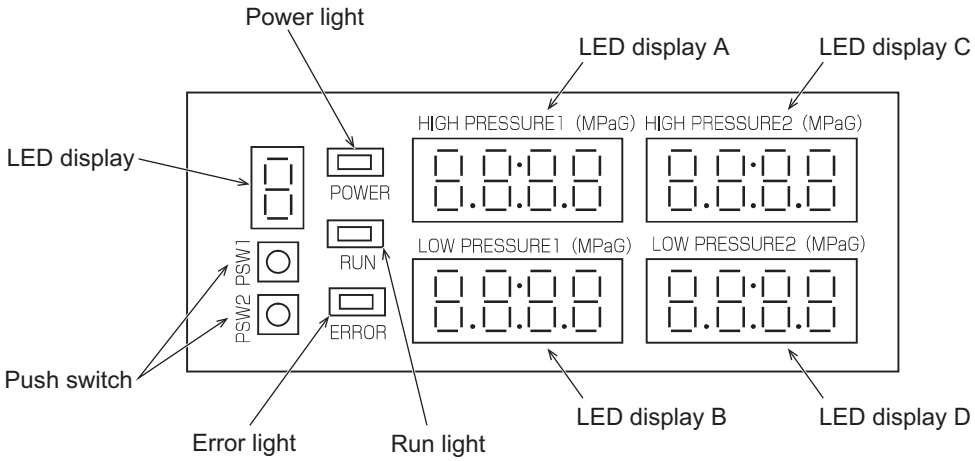
Selector switch settings for local operation



⚠ CAUTION

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

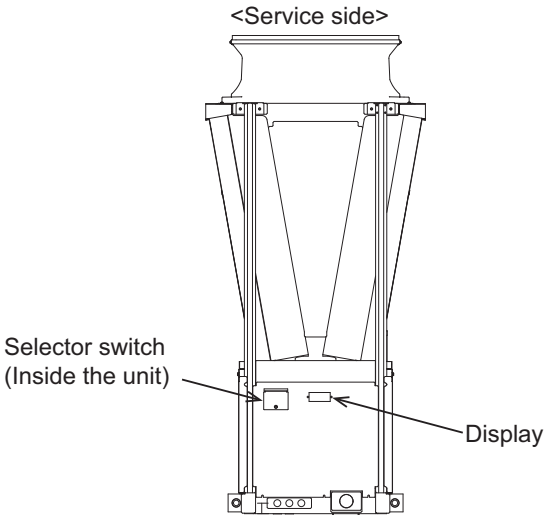
Display



Display mode number

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 (℃)	Inlet water temp. 2 (℃)	Outlet water temp. (℃)	Ambient temp. (℃)

The positions of the selector switch and the display



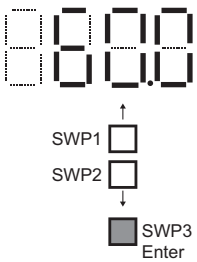
2. Making the setting value

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

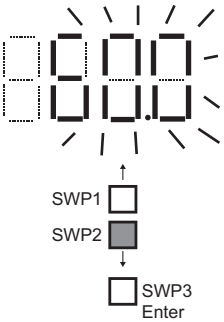
Take the following steps to set the push switches SWP1 through SWP3. These switches must be set after the dip switch SW4 has been set.

<1>



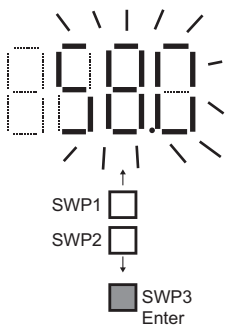
Normally a value of setting item appears on the display.
↓
Press SWP3 (Enter) to enable the configuration changes.

<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.

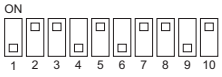
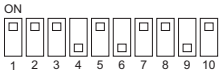
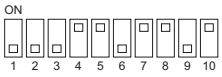
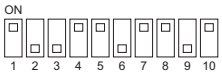
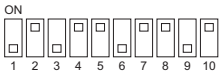
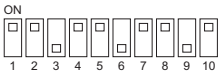
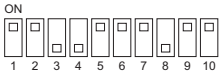
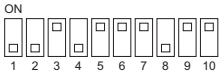
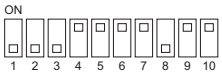
<3>

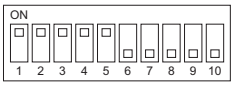


When the desired value is displayed (58.0 in the example at left), press SWP3 (Enter).
↓
The displayed value will stop blinking and stay lit.
A lit LED indicates that the new setting has been saved.
*Pressing SWP1 (↑) or SWP2 (↓) will change the blinking setting value, but the change will not be saved until SWP3 (Enter) is pressed.
Press and hold SWP1 (↑) or SWP2 (↓) for one second or longer to fast forward through the numbers.

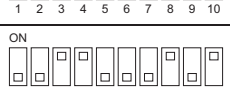
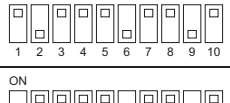
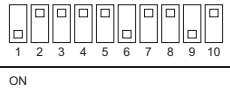
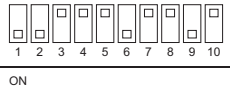
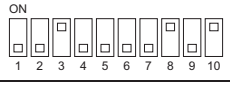
(2) Table of settings items

Set dip switches SW7-1, SW7-2, and SW4 as shown in the table below to set the value for the items in the "Setting item" column.

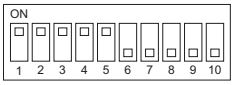
No.	Dip switch setting *1	Dip switch setting (SW4) *2	Setting Item	Default	Need or non-need to set the setting *5						Notes
					System		Group		Sub		
					M	S	M	S	M	S	
1	SW7-1 ON		Setting temp 1 (Cooling mode) *3	7ºC	○	—	—	—	—	—	Range 4–30ºC
2	SW7-1 ON		Setting temp 2 (Cooling mode) *3	7ºC	○	—	—	—	—	—	Range 4–30ºC
3	SW7-1 ON		Setting temp 1 (Heating mode) *4	45ºC	○	—	—	—	—	—	Range 25–55ºC
4	SW7-1 ON		Setting temp 2 (Heating mode) *4	45ºC	○	—	—	—	—	—	Range 25–55ºC
5	SW7-1 ON		Setting water temp A at Heating ECO mode *4	52ºC	○	—	—	—	—	—	Range 25–55ºC
6	SW7-1 ON		Setting outdoor temp A at Heating ECO mode *4	-7ºC	○	—	—	—	—	—	Range -30–50ºC
7	SW7-1 ON		Setting water temp B at Heating ECO mode *4	30ºC	○	—	—	—	—	—	Range 25–55ºC
8	SW7-1 ON		Setting outdoor temp B at Heating ECO mode *4	12ºC	○	—	—	—	—	—	Range -30–50ºC
9	SW7-1 ON		Setting water temp C at Heating ECO mode *4	42ºC	○	—	—	—	—	—	Range 25–55ºC
10	SW7-1 ON		Setting outdoor temp C at Heating ECO mode *4	2ºC	○	—	—	—	—	—	Range -30–50ºC
11	SW7-2 ON		Setting water temp D at Cooling ECO mode *3	11.5ºC	○	—	—	—	—	—	Range 4–30ºC
12	SW7-2 ON		Setting outdoor temp D at Cooling ECO mode *3	20ºC	○	—	—	—	—	—	Range -20–55ºC
13	SW7-2 ON		Setting water temp E at Cooling ECO mode *3	7ºC	○	—	—	—	—	—	Range 4–30ºC
14	SW7-2 ON		Setting outdoor temp E at Cooling ECO mode *3	35ºC	○	—	—	—	—	—	Range -20–55ºC
15	SW7-2 ON		Setting water temp F at Cooling ECO mode *3	10ºC	○	—	—	—	—	—	Range 4–30ºC
16	SW7-2 ON		Setting outdoor temp F at Cooling ECO mode *3	25ºC	○	—	—	—	—	—	Range -20–55ºC
17	SW7-1 ON		Peak-demand control signal input source	0	○	—	—	—	—	—	0: Dry contact 1: PAR-W31MAA
18	SW7-1 ON		Maximum peak-demand capacity	100%	○	—	—	—	—	—	Range 60-100%



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

No.	Dip switch setting *1	Dip switch setting (SW4) *2	Setting Item	Default	Need or non-need to set the setting *5						Notes
					System		Group		Sub		
					M	S	M	S	M	S	
19	SW7-1 ON		Preset temp. A (Cooling)	4ºC	○	—	—	—	—	—	Range 4–30ºC
20	SW7-1 ON		Preset temp. B (Cooling)	30ºC	○	—	—	—	—	—	Range 4–30ºC
21	SW7-1 ON		Preset temp. A (Heating)	25ºC	○	—	—	—	—	—	Range 25–55ºC
22	SW7-1 ON		Preset temp. B (Heating)	55ºC	○	—	—	—	—	—	Range 25–55ºC
23	SW7-1 ON		Supplementary heater operation water temp *4	40ºC	○	—	○	—	○	—	Range 0–55ºC
24	SW7-1 ON		Supplementary heater operation outdoor temp *4	-10ºC	○	—	○	—	○	—	Range -30–50ºC
25	SW7-1 ON		Drain pan heater operation outdoor temp	0ºC	○	—	○	—	○	—	Range -40–20ºC
26	SW7-1 ON		Thermo differential 1 (Cooling mode) *3, *6	3ºC	○	—	○	—	○	—	Range 0.2–5ºC
27	SW7-1 ON		Thermo differential 2 (Cooling mode) *3, *6	2ºC	○	—	○	—	○	—	Range 0.2–5ºC
28	SW7-1 ON		Thermo differential 1 (Heating mode) *4, *6	3ºC	○	—	○	—	○	—	Range 0.2–5ºC
29	SW7-1 ON		Thermo differential 2 (Heating mode) *4, *6	2ºC	○	—	○	—	○	—	Range 0.2–5ºC
30	SW7-1 ON		Year setting	-	○	—	—	—	—	—	
31	SW7-1 ON		Month/Date setting	-	○	—	—	—	—	—	
32	SW7-1 ON		Current time	-	○	—	—	—	—	—	

*1: Only the switches designated in the table must be set to ON. (The other switches must be OFF.)
*2: Do not apply undue force when changing the Dip switch settings as this may cause malfunctions.
*3: They are enabled during the cooling. (EAHV, EACV)
*4: They are enabled during the heating. (EAHV)
*5: System: System leader unit
Group: Group leader unit
Sub: Sub unit
M: MAIN circuit
S : SUB circuit
*6: Thermo - ON/OFF temperature conditions (water temperature control)



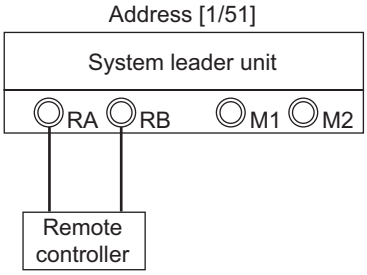
The figure at left shows that the switches 1 through 5 are set to ON and 6 through 10 are set to OFF.

3. Setting procedures

(1) System setting

1. Making the settings for the initial start-up process

(A) Single unit



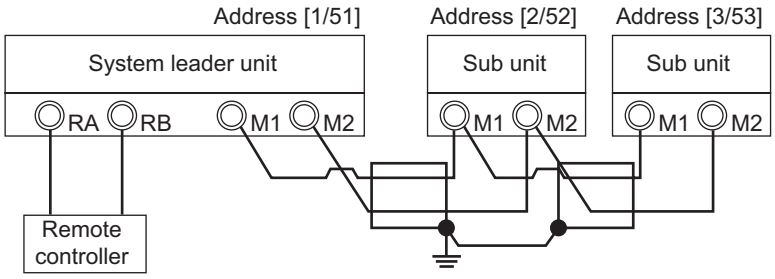
* M-NET cables are required to connect the MAIN unit (address 1) and the SUB unit (address 51). No remote controllers need to be connected to the unit with SUB unit (address 51).

Setting address 1

1) Turn off the power.
2) System leader unit (Address 1 SW5-2, 5-3: ON)
3) Turn the power back on.
   Address 1 → LED display [EEEE]
   Address 51 → LED display [9999]
4) SW7: 1, 2, 3, 4 ON and ENTER for 5 seconds. (Initializes the system)
   Address 1 → LED display [9999] → [FFFF]
   Address 51 → LED display [9999] → [____||_|]
5) SW7: 1, 2, 3, 4 OFF
   Start-up process complete
   Address 1 → LED display [____||_|]
   Address 51 → LED display [____||_|]

*No settings are required for address 51.

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



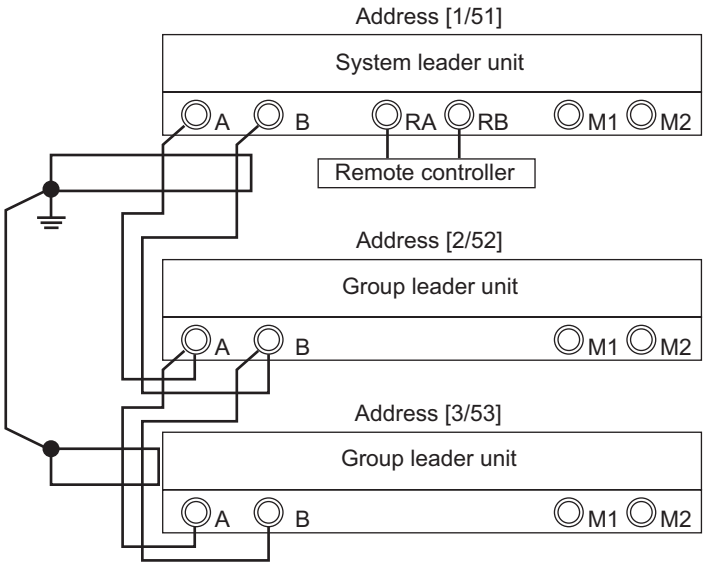
Setting address 1

1) Turn off the power.
2) System leader unit (Address 1 SW5-2, 5-3: 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
   SW7: 1 ON
   SW4: 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.
   SW4: 1, 2, 3, 4, 8, 10 OFF
5) SW7: 1, 2, 3, 4 ON and ENTER for 5 seconds. (Initializes the system)
   Address 1 → LED display [9999] → [FFFF]
   Address 51 → LED display [9999] → [____||_|]
6) SW7: 1, 2, 3, 4 OFF
   Start-up process complete
   Address 1 → LED display [____||_|]
   Address 51 → LED display [____||_|]

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

*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)



* M-NET cables are required to connect the MAIN unit (address 1) and the SUB unit (address 51). No remote controllers need to be connected to the unit with SUB unit (address 51).

(1) Setting address 1

1) Turn off the power.
2) System leader unit (Address 1 SW5-2, 5-3: 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
   SW7: 1 ON
   SW4: 5, 8, 10 ON
   Press ENTER once.
   ↓
   Address 1 → LED display [1]
   ↓
   Press UP twice. ↓
   ↓
   Address 1 → LED display [3]
   ↓
   Press ENTER once.
   SW4: 5, 8, 10, 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

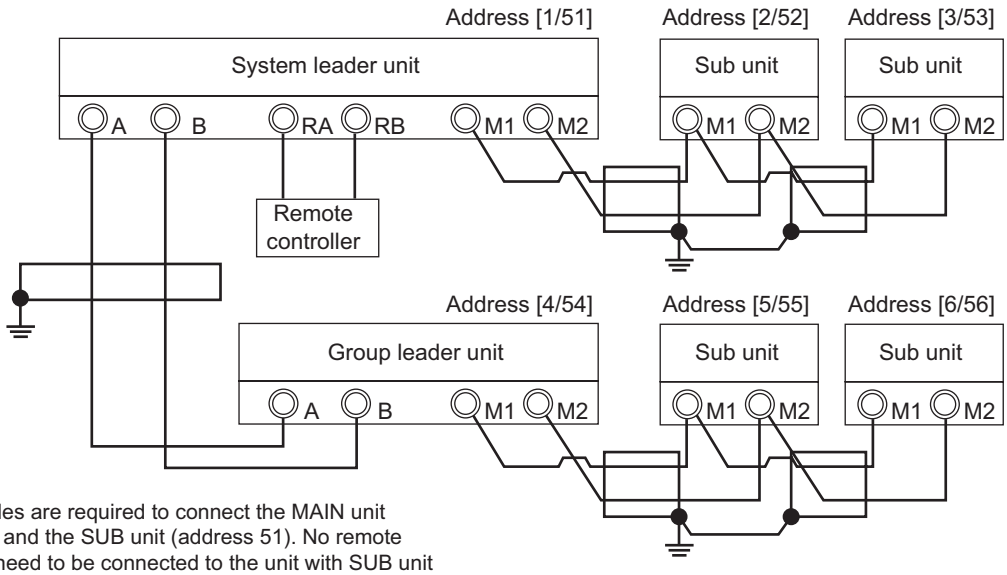
1) Turn off the power.
2) Group leader unit (SW5-2: ON)
3) Turn the power back on.
   Address 2 → LED display [EEEE]
   Address 52 → LED display [9999]
4) Setting the number of units for each group
   *The default setting for the number of units in a group is 1.
5) SW7: 1, 2, 3, 4 ON and ENTER for 5 seconds.
   (Initializes the system)
   Address 2 → LED display [9999] → [FFFF]
   Address 52 → LED display [9999] → [____||_|]
6) SW7: 1, 2, 3, 4 OFF
   Start-up process complete
   Address 2 → LED display [____||_|]
   Address 52 → LED display [____||_|]

*Address 3 (Group leader unit) is set in the same way as above.)

(3) Setting address 1 (second time)

1) SW7: 1, 2, 3, 4 ON and ENTER for 5 seconds.
   (Initializes the system. System leader unit initialized last)
   Address 1 → LED display [9999] → [FFFF]
   Address 51 → LED display [9999] → [____||_|]
2) SW7: 1, 2, 3, 4 OFF
   Start-up process complete
   Address 1 → LED display [____||_|]
   Address 51 → LED display [____||_|]

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



* M-NET cables are required to connect the MAIN unit (address 1) and the SUB unit (address 51). No remote controllers need to be connected to the unit with SUB unit (address 51).

(1) Setting address 1

1) Turn off the power.
2) System leader unit (Address 1 SW5-2, 5-3: 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
   SW7: 1 ON
   SW4: 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.
   SW4: 1, 2, 3, 4, 8, 10 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
   SW7: 1 ON
   SW4: 5, 8, 10 ON
   Press ENTER once.
   ↓
   Address 1 → LED display [1]
   ↓
   Press UP twice.
   ↓
   Address 1 → LED display [2]
   ↓
   Press ENTER once.
   SW4: 5, 8, 10 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

1) Turn off the power.
2) Group leader unit (SW5-2: ON)
3) Turn the power back on.
   Address 4 → LED display [EEEE]
   Address 54 → LED display [9999]
4) Setting the number of units for each group
   SW7: 1 ON
   SW4: 1, 2, 3, 4, 8, 10 ON
   Press ENTER once.
   ↓
   Address 4 → LED display [1]
   ↓
   Press UP twice.
   ↓
   Address 4 → LED display [3]
   ↓
   Press ENTER once.
   SW4: 1, 2, 3, 4, 8, 10 OFF

   *No group number settings are required for address 4 (Group leader unit).
5) SW7: 1, 2, 3, 4 ON and ENTER for 5 seconds.
   (Initializes the system)
   Address 4 → LED display [9999] → [FFFF]
   Address 54 → LED display [9999] → [____||_|]
6) SW7: 1, 2, 3, 4 OFF
   Start-up process complete
   Address 4 → LED display [____||_|]
   Address 54 → LED display [____||_|]

(3) Setting address 1 (second time)

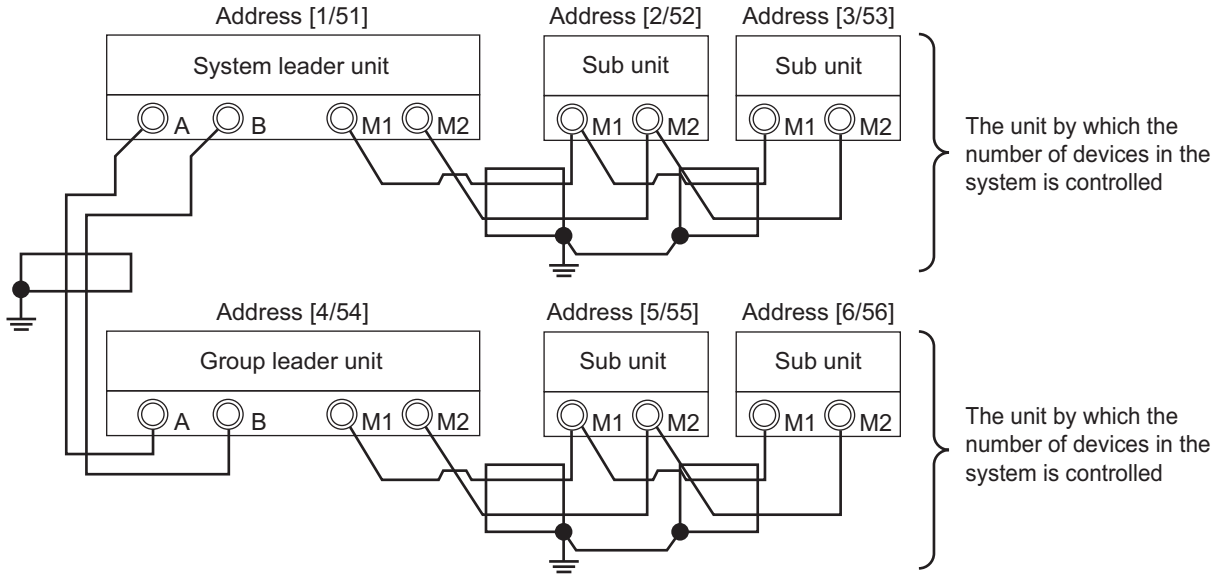
1) SW7: 1, 2, 3, 4 ON and ENTER for 5 seconds.
   (Initializes the system. System leader unit initialized last)
   Address 1 → LED display [9999] → [FFFF]
   Address 51 → LED display [9999] → [____||_|]
2) SW7: 1, 2, 3, 4 OFF
   Start-up process complete
   Address 1 → LED display [____||_|]
   Address 51 → LED display [____||_|]

*No settings are required for any address other than for addresses 1 and 4.

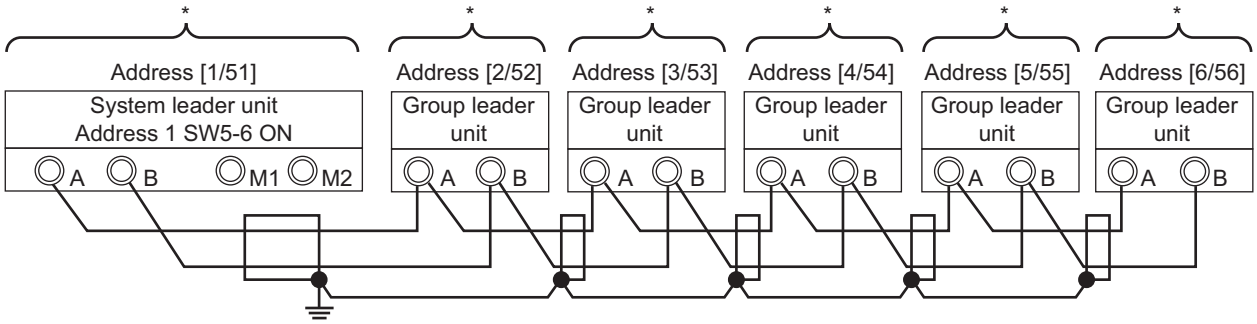
2. Multiple unit control

By setting SW5-6 to ON for address 1, optimum control of number of operating units will be performed.
All units will simultaneously operate when SW5-6 is set to OFF.

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



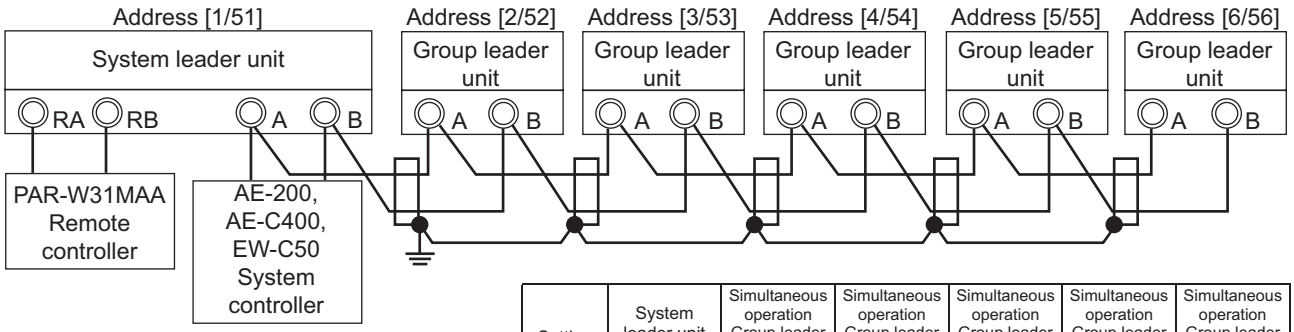
(B) System leader unit and group leader unit



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

3. Example of system configuration

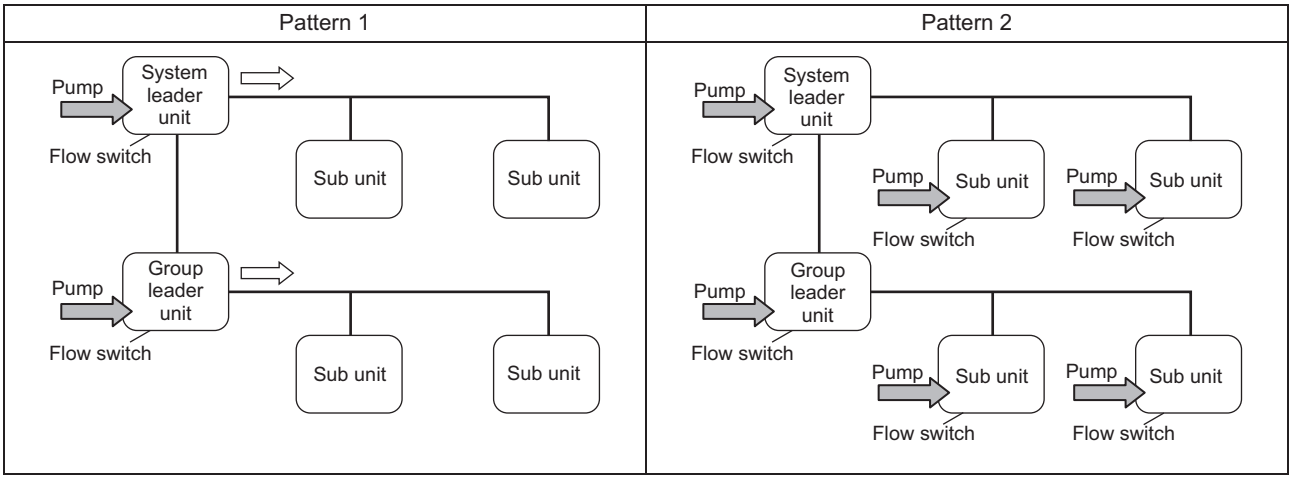
Optimum control of number of operating units



Setting item	SW7-1	DIP SW	SW4	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	-	5-2	-	At a reset	ON	-	ON	-	ON	-	ON	-	ON	-	ON	-
	-	5-3	-	At a reset	ON	-	OFF	-	OFF	-	OFF	-	OFF	-	OFF	-
Number of groups	ON	-		At a reset	6	-	1	-	1	-	1	-	1	-	1	-
Number of units per group	ON	-		At a reset	1	-	1	-	1	-	1	-	1	-	1	-
Multiple unit control	-	5-6	-	At a reset	ON	-	OFF	-	OFF	-	OFF	-	OFF	-	OFF	-

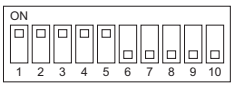
*The shaded cells indicate the settings that requires changes from the default settings.
*Some settings require the following after the settings were changed: A power reset, or setting SW7: 1, 2, 3, 4 ON, and pressing and holding ENTER for 5 seconds.
*When using an AE-200, AE-C400, EW-C50 as the centralized controller, leave the M-NET power supply connector as it is. (Refer to page 32)

4. Setting the pump system



Setting item	SW7-1	DIPSW	SW4	Factory setting		Note
				MAIN	SUB	
Pump setting	ON	-		0	-	0: Pattern 1, 1: Pattern 2
Flow switch settings	ON	-		0	-	0: Pattern 1, 1: Pattern 2

*1: Pump settings must be made on the MAIN circuit on all units.
*2: Flow switch settings must be made on the MAIN circuit on all units.



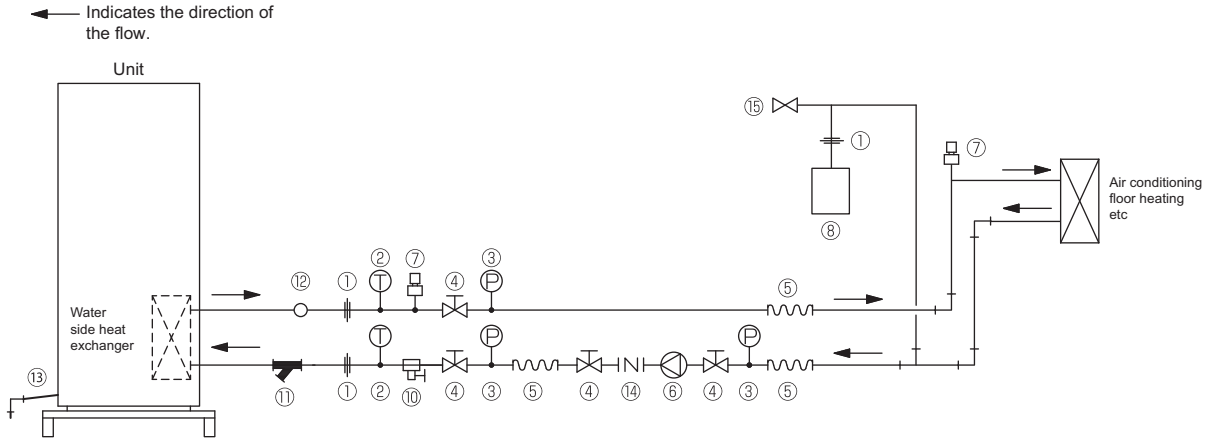
The figure at left shows that the switches 1 through 5 are set to ON and 6 through 10 are set to OFF.

[5] Water Pipe Installation

[1] Schematic Piping Diagram and Piping System Components

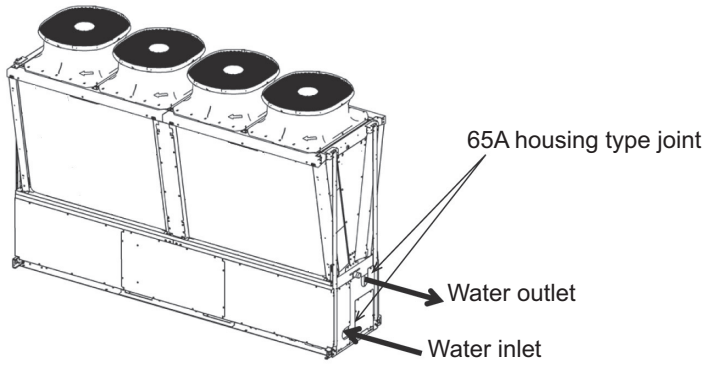
1. Water circuit

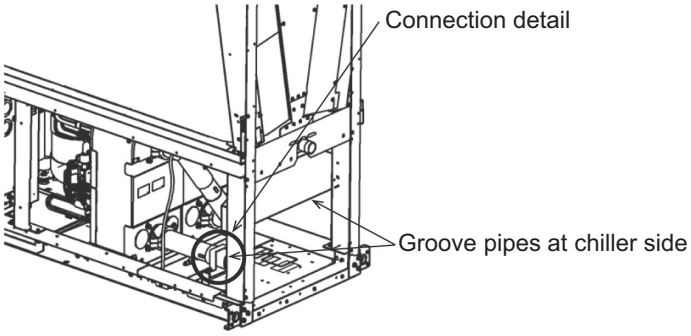
Please build the water circuit so that it is a closed system.
Do not use water directly for showers or other applications. Do not allow other heat source water to mix with the water circuit. Build a water circuit as inlet water temperature fluctuation is within 5ºC/10 minutes.

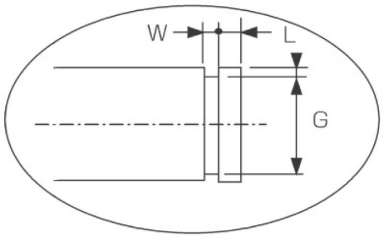


①	Union joints/flange joints	Required to allow for a replacement of equipment.
②	Thermometer	Required to check the performance and monitor the operation of the units.
③	Water pressure gauge	Recommended for checking the operation status.
④	Valve	Required to allow for a replacement or cleaning of the flow 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	Automatic air vent valve	Install automatic air vent valves where air accumulates. Even in the case of a failure of the water-side heat exchanger in the unit, the refrigerant may leak from the automatic air vent valve. To prevent accidents resulted from refrigerant leakage, install the unit where leaked refrigerant will not accumulate, such as outdoors.
⑧	Closed expansion tank	Install a closed 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.
⑮	Safety valve	Install a safety valve near the closed expansion tank. Even in the case of a failure of the water-side heat exchanger in the unit, the refrigerant may leak from the safety valve. To prevent accidents resulted from refrigerant leakage, install the unit where leaked refrigerant will not accumulate, such as outdoors.

[2] Standard piping type

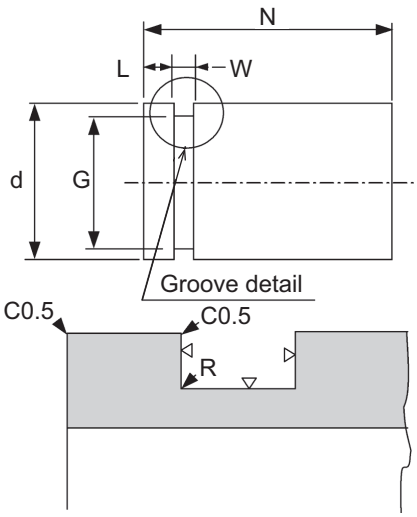






The dimension of the groove pipe at the chiller side

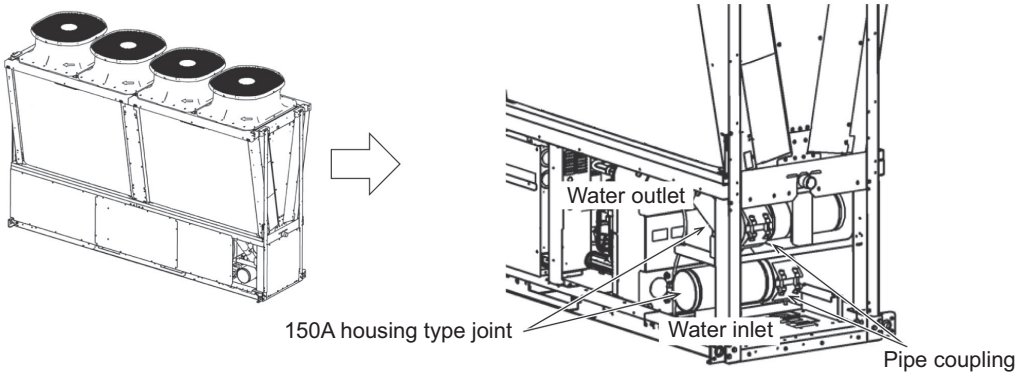
Groove specifications

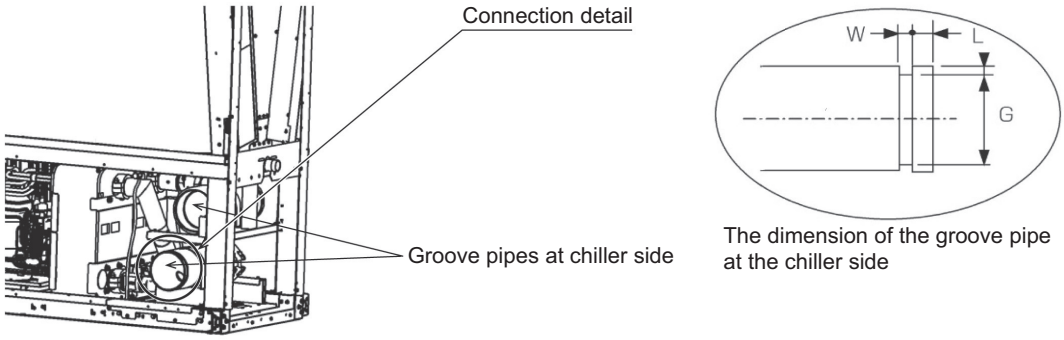


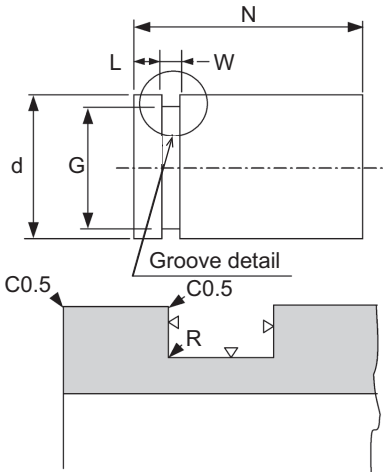
(Unit: mm)

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

[3] Inside header piping type



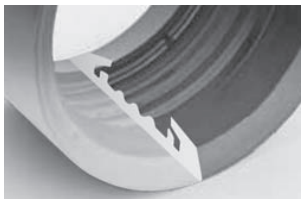




(Unit: mm)

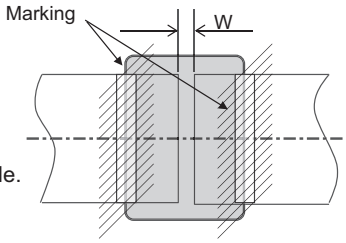
	Pipe size
	6B (150A)
d	ø165.1
G	ø160.8
W	$8.7^{+0.7}_{-0}$
L	$15.9^{+0.7}_{-0}$
N	50.0
R	1.0

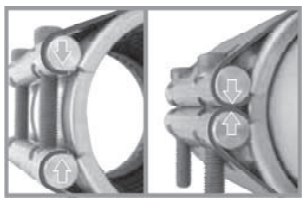
Installing the pipe coupling



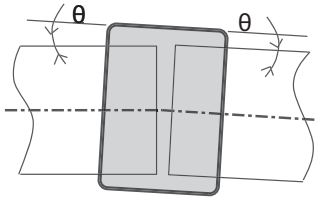
The seal rubber has a lip construction to improve water stopping performance.

Adjust the Pipe coupling 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
  Allowable pipe tilt angle [θ]: ±2°

[4] Notes on pipe corrosion

Water processing and water quality control

Poor-quality circulating water can cause scale build-up and corrosion in the water-side heat exchanger, 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		Higher mid-range temperature water system Water Temp. > 60ºC		Tendency	
			Recirculating water	Make-up water	Recirculating water	Make-up water	Corrosive	Scale-forming
Standard items	pH (25 ˚C)		7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	○	○
	Electric conductivity	(mS/m) (25 ˚C) (μs/cm) (25 ˚C)	30 or less [300 or less]	30 or less [300 or less]	30 or less [300 or less]	30 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	0.1 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)

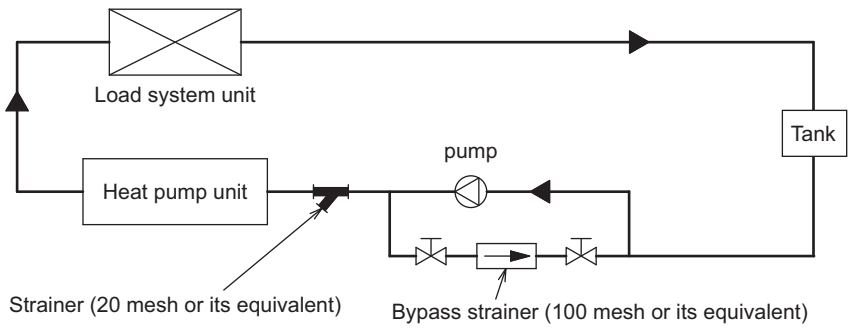
(3) Please consult with a water quality control specialist about water quality control methods and water quality calculations before using anti-corrosive solutions for water quality management.

(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.



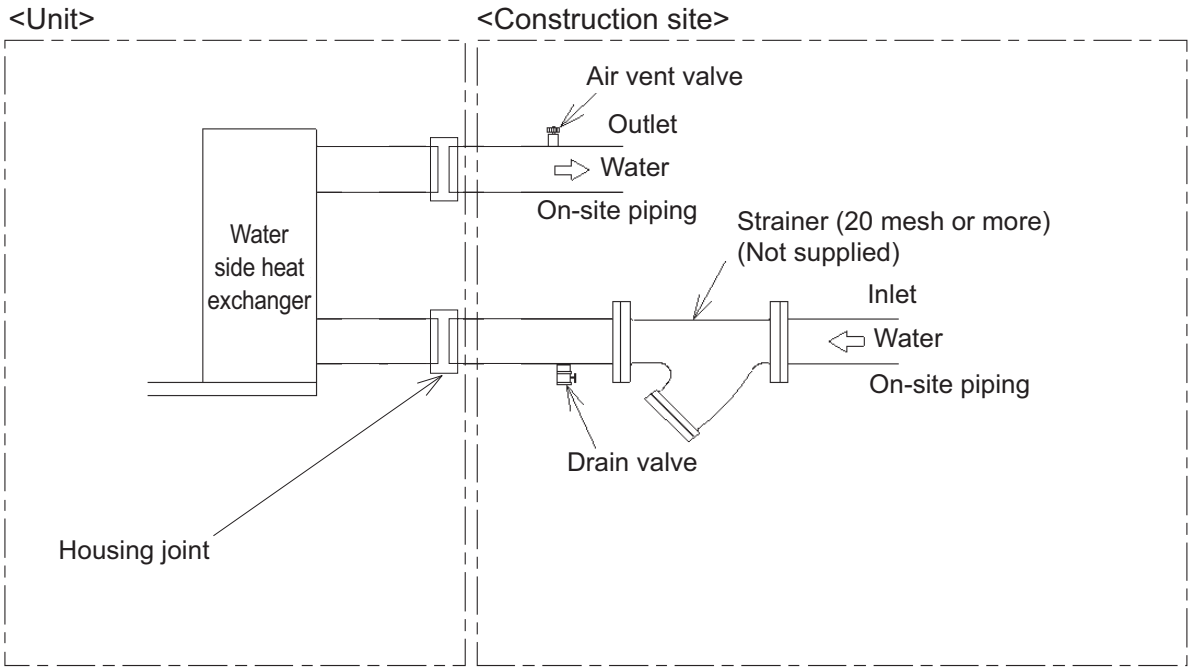
(6) Connecting pipes made from different materials
If different types of metals are placed in direct contact with each other, the contact surface will corrode.
Install an insulating material between pipes that are made of different materials to keep them out of direct contact with each other.

(7) Piping material
Use hot water output piping material that can withstand heat of 60°C 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.
When considering reusing the existing piping, check for rust. Replace the piping if it is severely rusted.

[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 (215 L/min)
Unit usage range (water flow rate): 12.9 - 45.0 m³/h

[6] Installing the external water temperature sensor TW-TH16

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

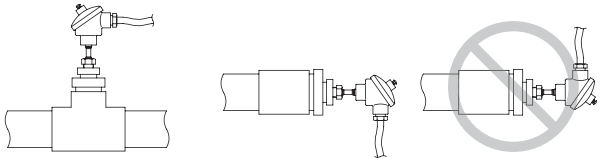
(1) External water temperature sensor
(2) Wiring to connect the sensor and the unit*
(3) Wiring terminals to connect the wiring to the sensor and the terminal block on the unit
(Four for M4 screws)*
*Items (1) and (2) are field supplied.

Wire specifications

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

2. Installing the external water temperature sensor

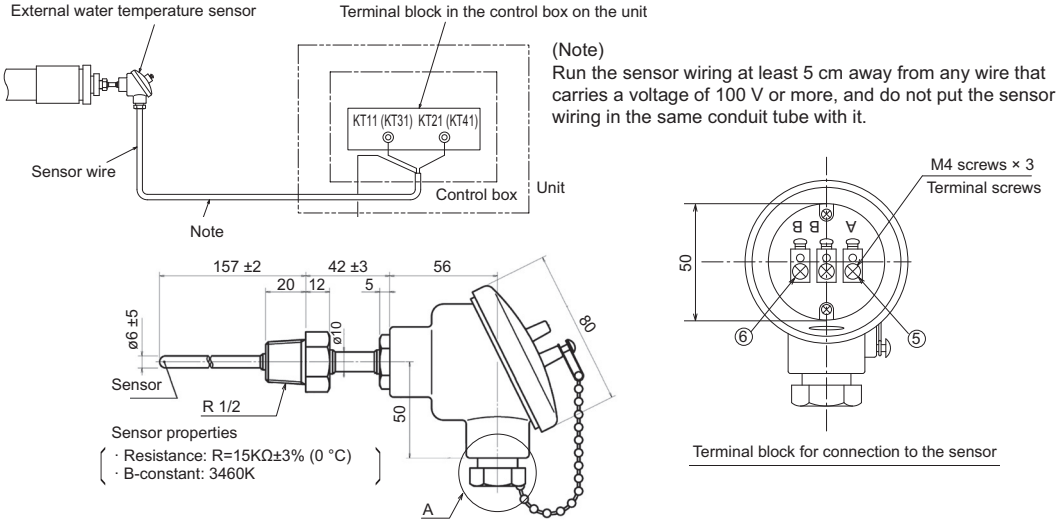
- Install the external water temperature sensor where the water pipes merge or on the load-side tank as shown in the figure at right.
- Install horizontally or vertically on top of the pipe.
- When installing horizontally, make sure the wire faces down.



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.



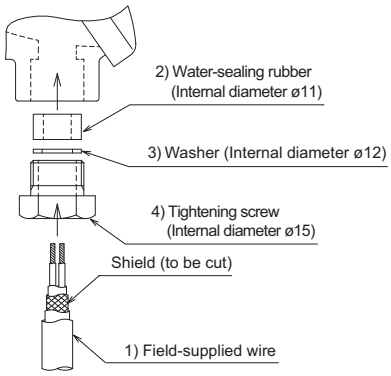
Terminal block for connection to the sensor

Connect the sensor wiring to terminals KT11 and KT21 (or KT31 and KT41) 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)
EAHV-M1500/1800YCL	1650
EACV-M1500/1800YCL	850

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)

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

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

Standard	Inside header piping type
35	75

3. Inlet/Outlet pipe connection size and material

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

Inlet/Outlet pipe connection size

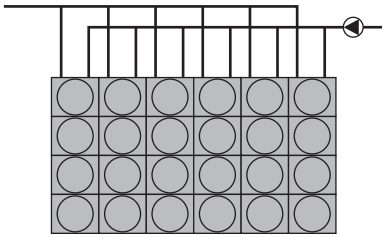
Piping type	Inlet pipe connection	Outlet pipe connection
Standard	65A housing type joint (Field-supplied housing joint)	65A housing type joint (Field-supplied housing joint)
Inside header piping type	150A housing type joint (Field-supplied housing joint)	150A housing type joint (Field-supplied housing joint)

4. Required amount of water (for multiple units)

The total water volume required for an air conditioning system is determined by whichever operation (cooling or heating) requires more water.

Cooling operation: 850 L per unit

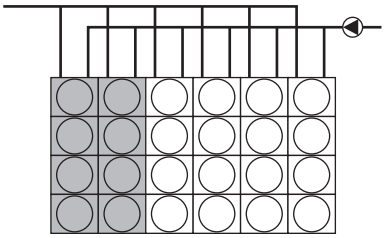
The total water volume required for a system is the sum of the water required for each unit in the system.



The system shown above requires six times the volume of water required for a single unit.

Heating operation: 1650 L per unit

The total water volume required for a system is the sum of the water required for all units that simultaneously go into the defrost mode in the same water system.



Two units operate in the defrost mode while the function to suppress the simultaneous operation of multiple units in the defrost mode is enabled.
Requires twice as much water as a system with a single unit

(1) Simultaneous operation of multiple units in the defrost mode

This operation is performed to keep multiple units from simultaneously operating in the defrost mode which leads to a sudden decrease in supply temperature.
This function sets the ratio of units that can simultaneously be operated in the defrost mode in the same water system and the ratio of units that can simultaneously be operated in the groups that are concurrently operated, and suppresses the number of units that operate in the defrost mode at the same time.

Ratio of units that are operable in the defrost mode in the same system	40% (Enabled)
Ratio of units that are operable in the defrost mode in the groups that are concurrently operated	35% (Enabled)

Calculation results less than 1 unit will be rounded up to 1 unit.
Calculation results more than 1 unit will be rounded down to the nearest integer.

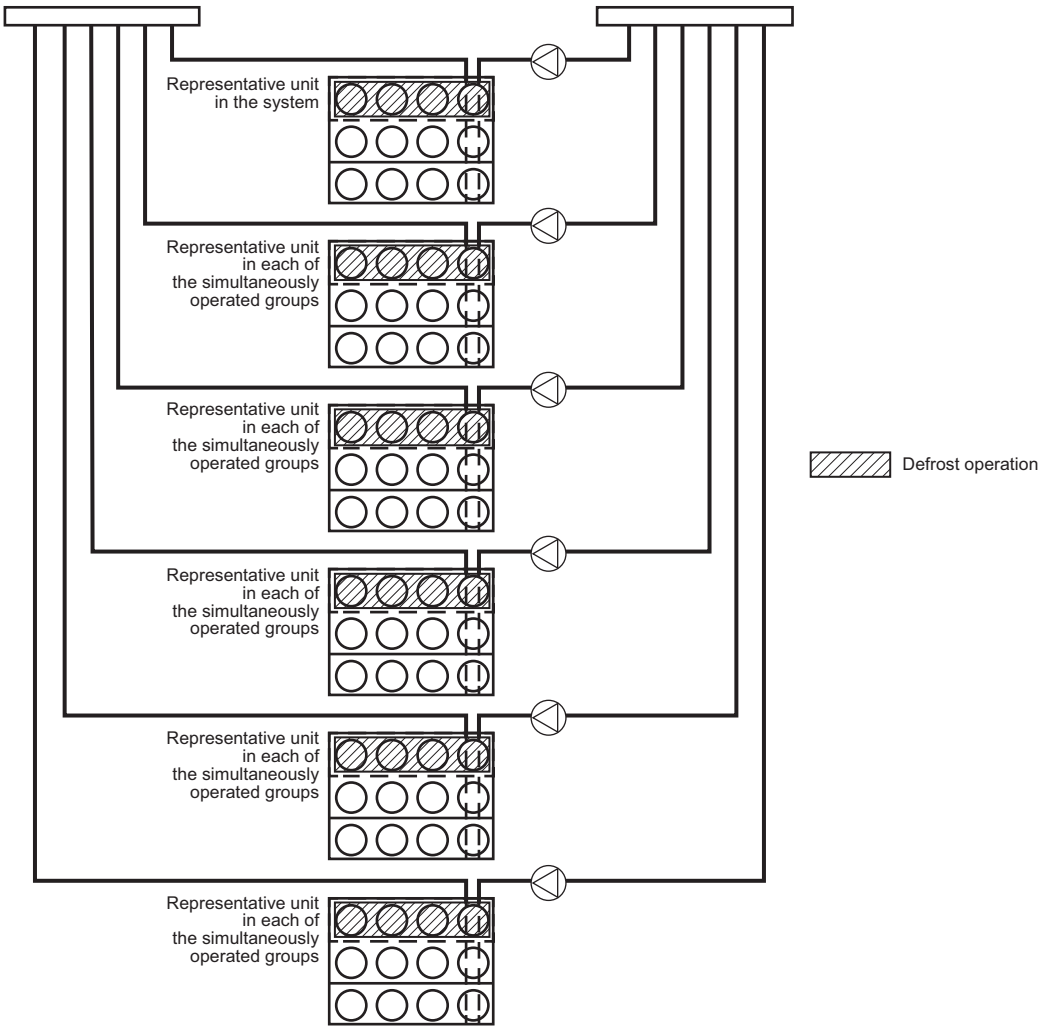
The representative unit of the system and the representative unit of the simultaneously operated groups send a command to allow defrost operation to the unit that meets the defrost conditions, ensuring that the total number of units operating in the defrost mode will not exceed the set value.

*Each unit will not go into the defrost mode until it receives a command to allow defrost operation. However, if a command to allow defrost operation is not sent within 60 minutes after the defrost conditions are met, defrost operation will start regardless of the above settings.

*If set to a value lower than the default value, defrost operation may not be performed properly. Additionally, this may cause multiple units to go into the defrost mode simultaneously. Do not set this value below the default value.

Example system with 18 EAHV-M1500YCL units (with 6 simultaneously operated groups)

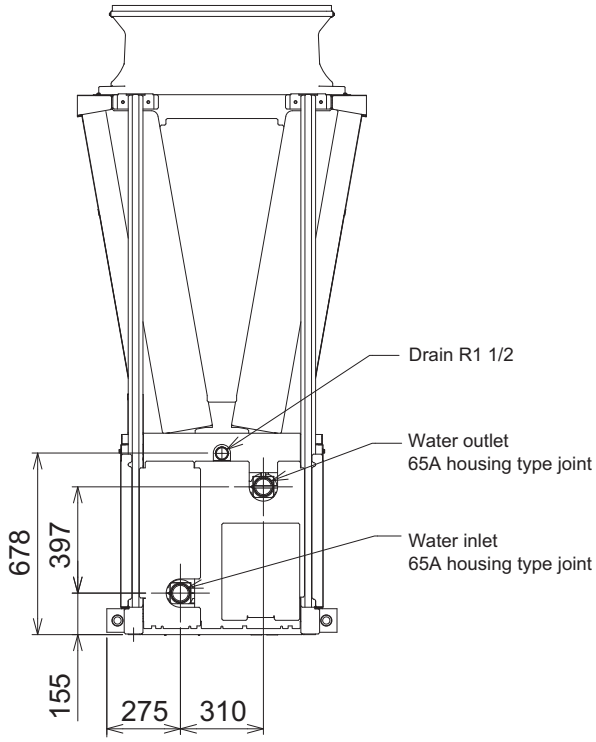
There are 7 units (18 units × 40% = 7.2 units → 7 units) that are simultaneously operable in the defrost mode within the system. Among the simultaneously operated groups, a total of 6 units in 6 groups (3 units × 35% = 1.05 unit→ 1 unit, 1 unit × 6 groups = 6 units) can simultaneously perform defrost operation. The maximum number of units that can simultaneously perform defrost operation in this system is 6.



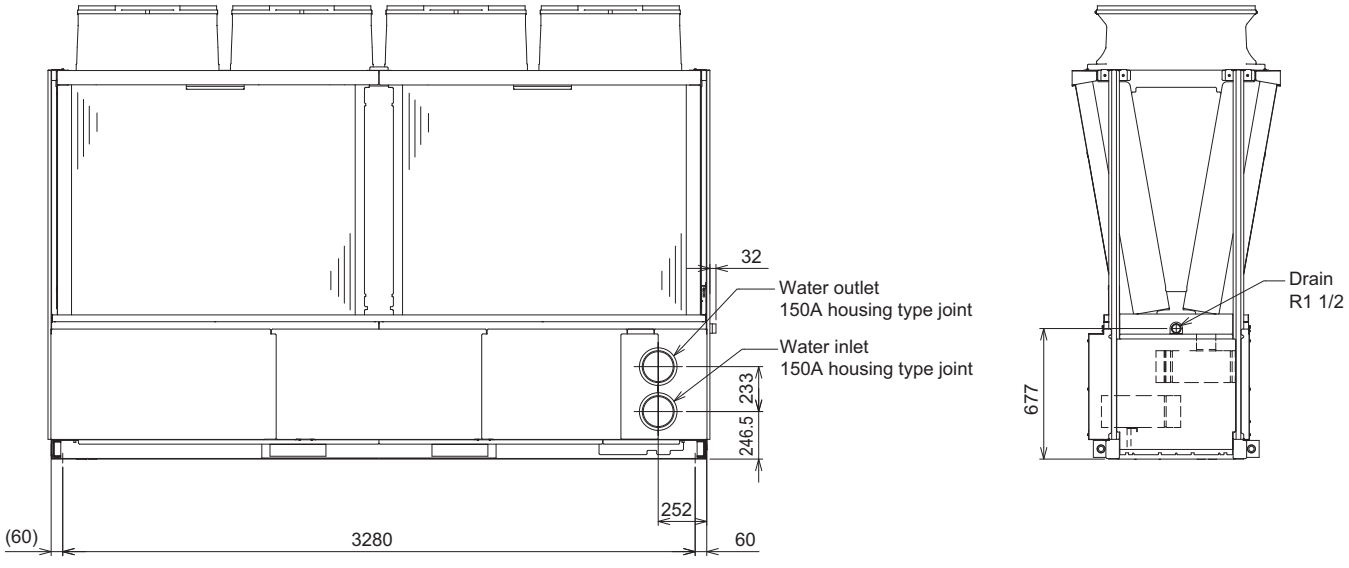
1) Unit that are operated from the local remote controller are operable in the defrost mode, regardless of the status of the function to suppress simultaneous defrost operation.
   However, during defrosting, this unit is counted as a unit in the defrost mode toward simultaneous defrost prevention control among other units that are operated remotely.
2) The input signal to force the unit to operate in the defrost mode is effective regardless of the setting of simultaneous defrost prevention control for units that are operated both remotely and locally.
3) The unit that is triggered into the defrost mode by this input signal is also counted as a unit in the defrost mode toward simultaneous defrost prevention control among other units that are operated remotely.

[8] Water Piping Size and Location

1. Standard piping type



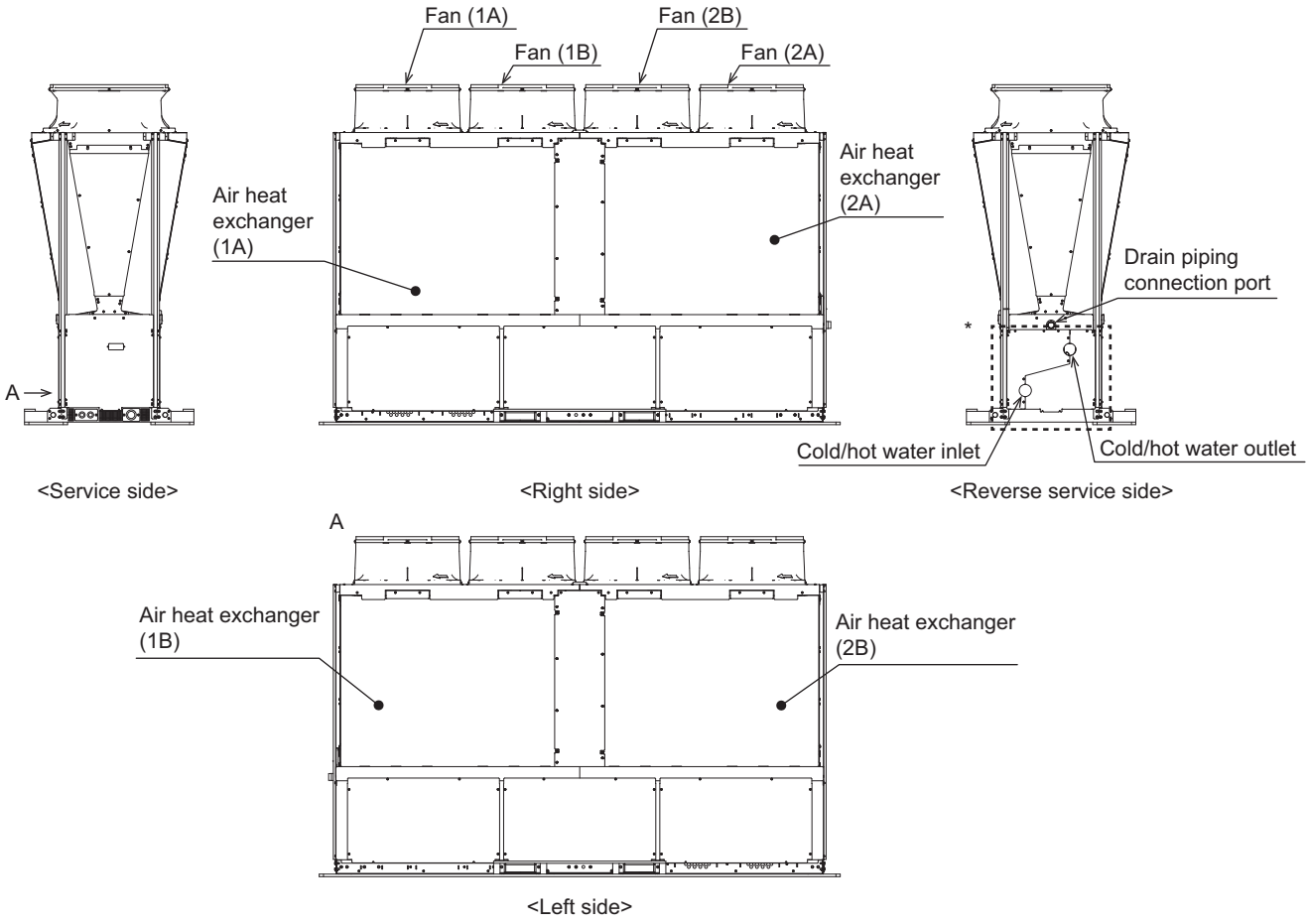
2. Inside header piping type



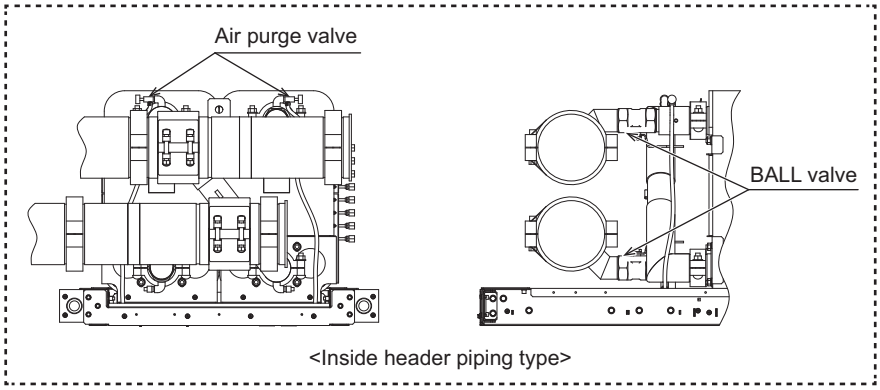
III Unit Components

[1] Unit Components and Refrigerant Circuit

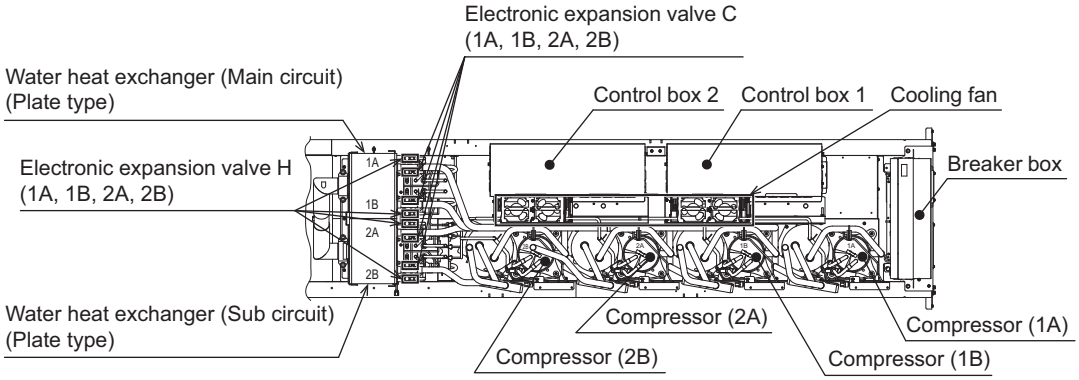
1. Unit Components

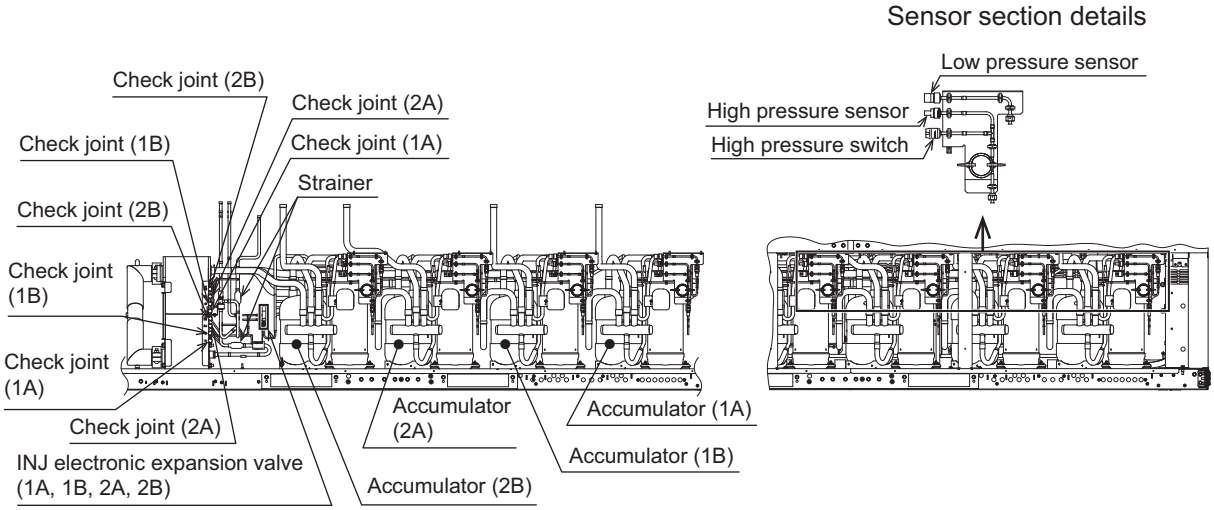


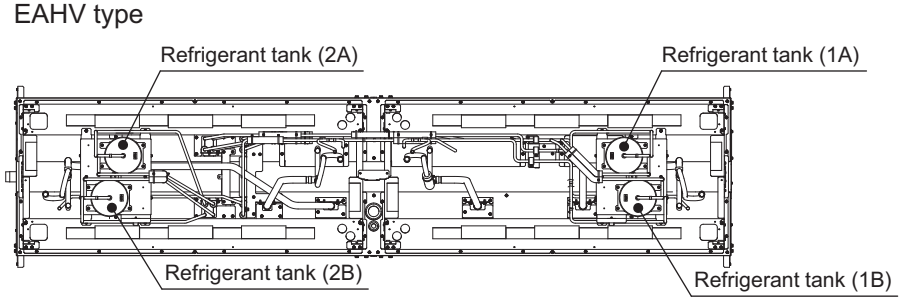
* For header built-in specifications



2. Refrigerant circuit



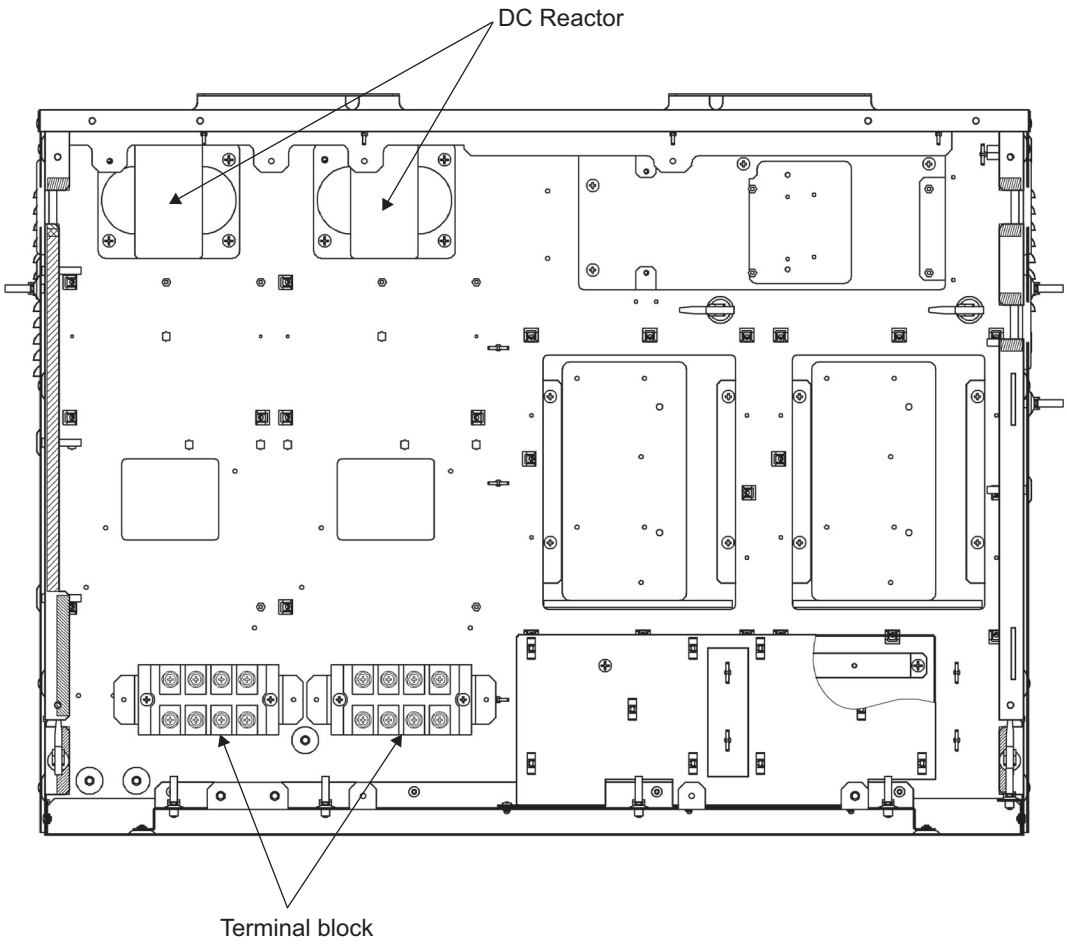


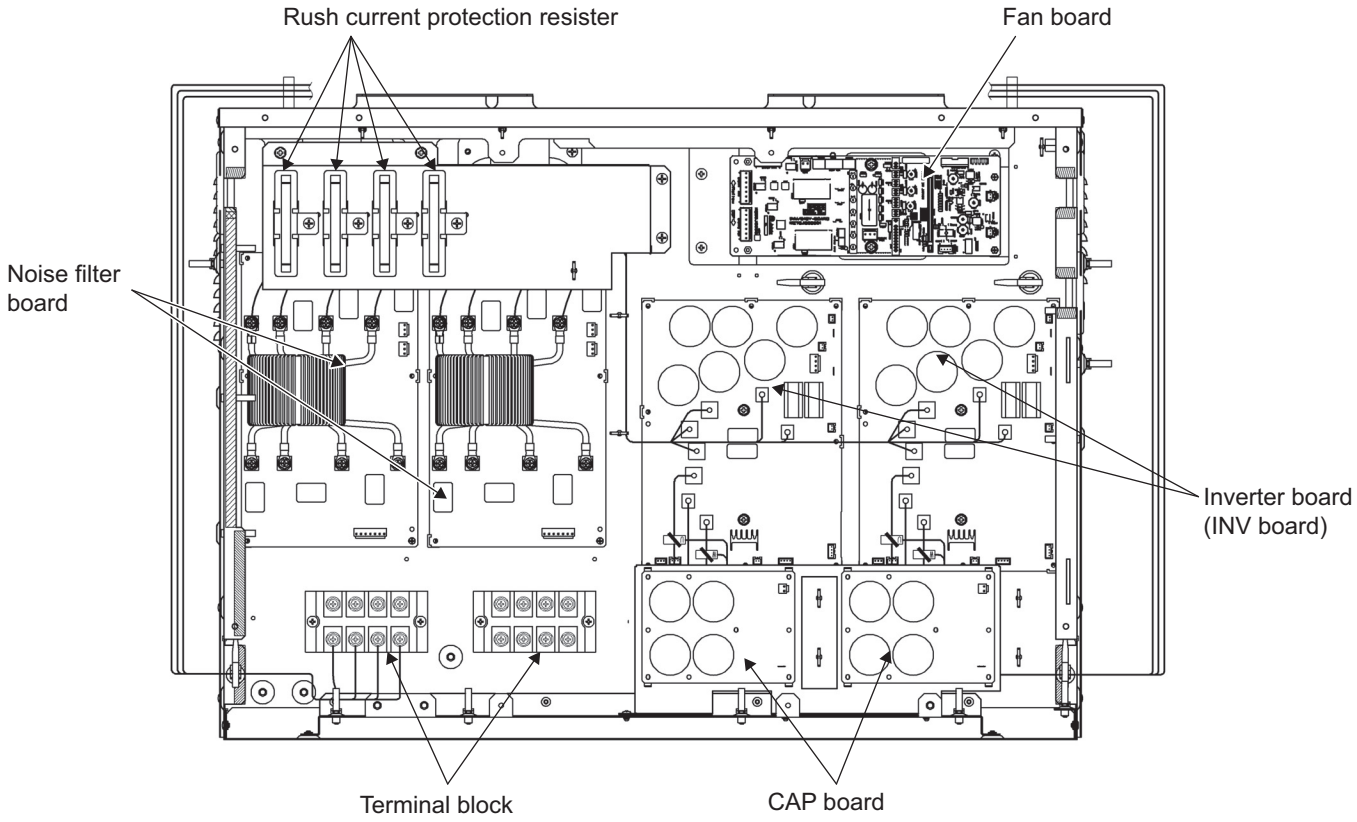


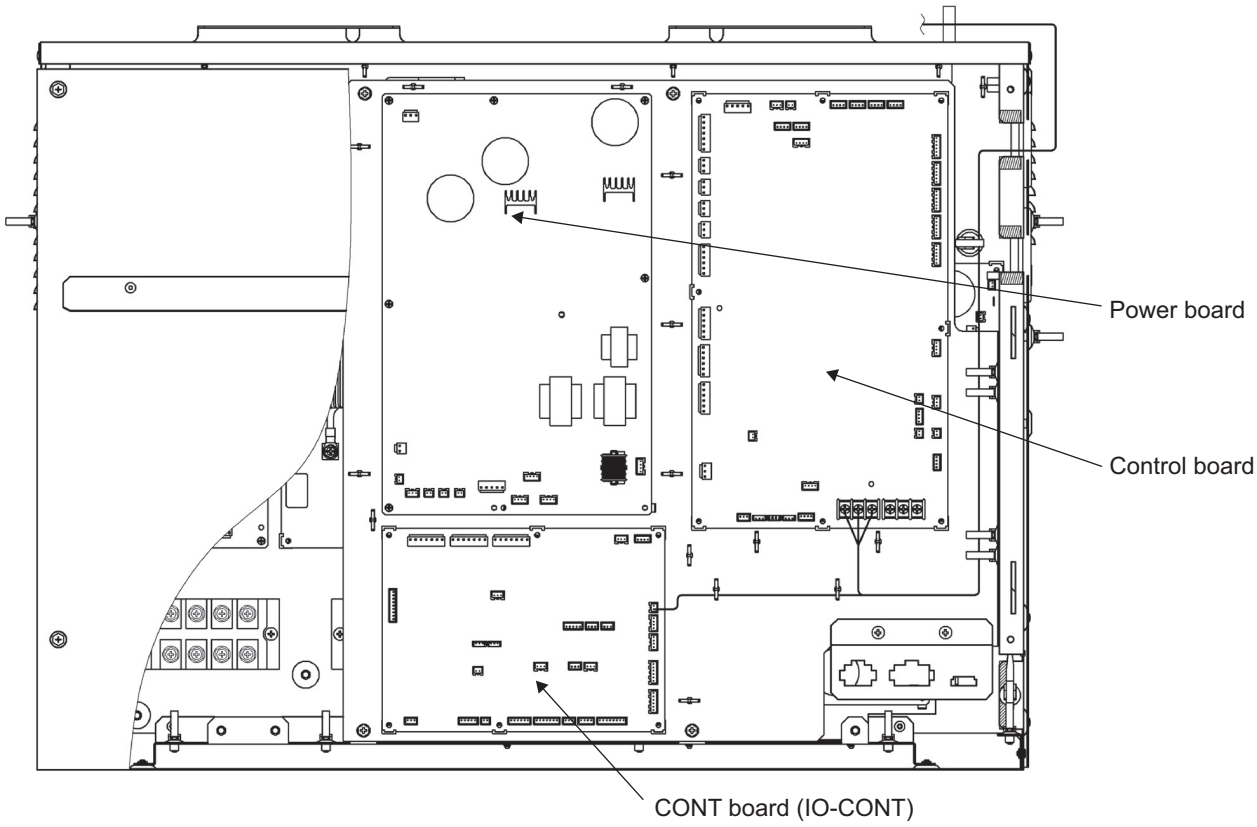
<Standard piping type>

[2] Control Box of the Unit

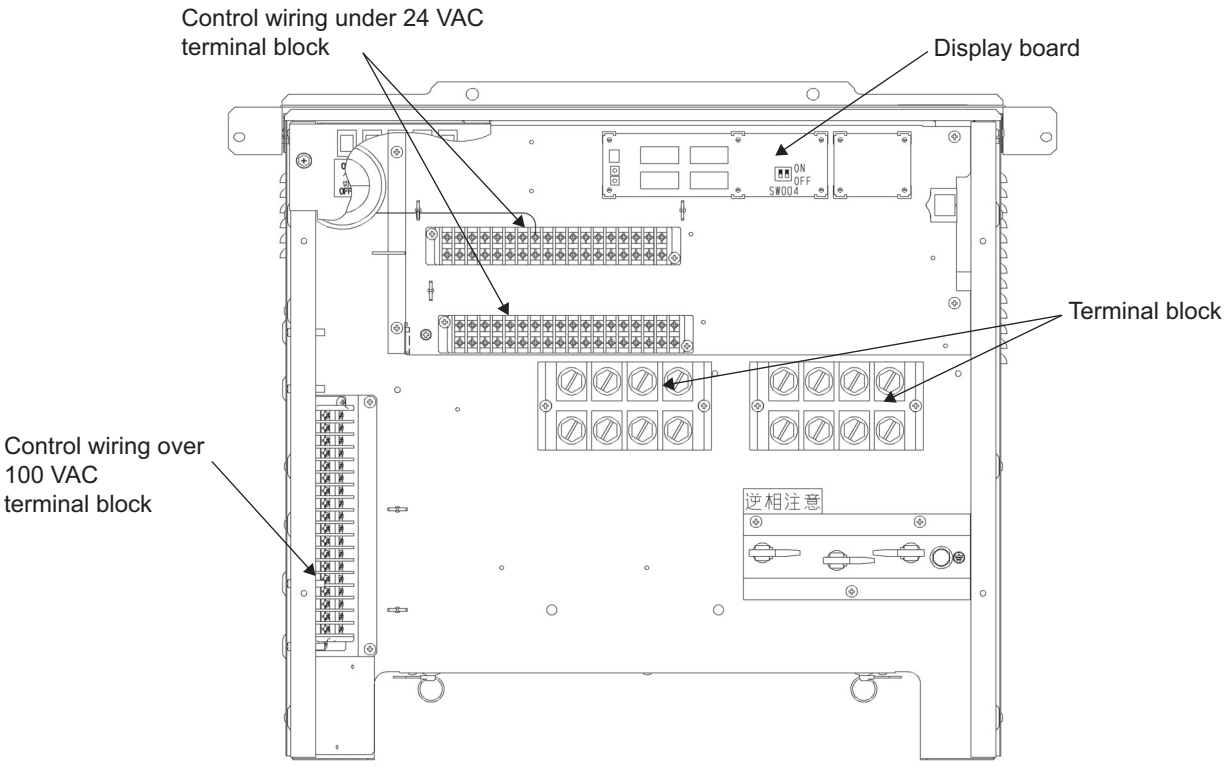
(1) Control box (The main and sub circuits are common.)





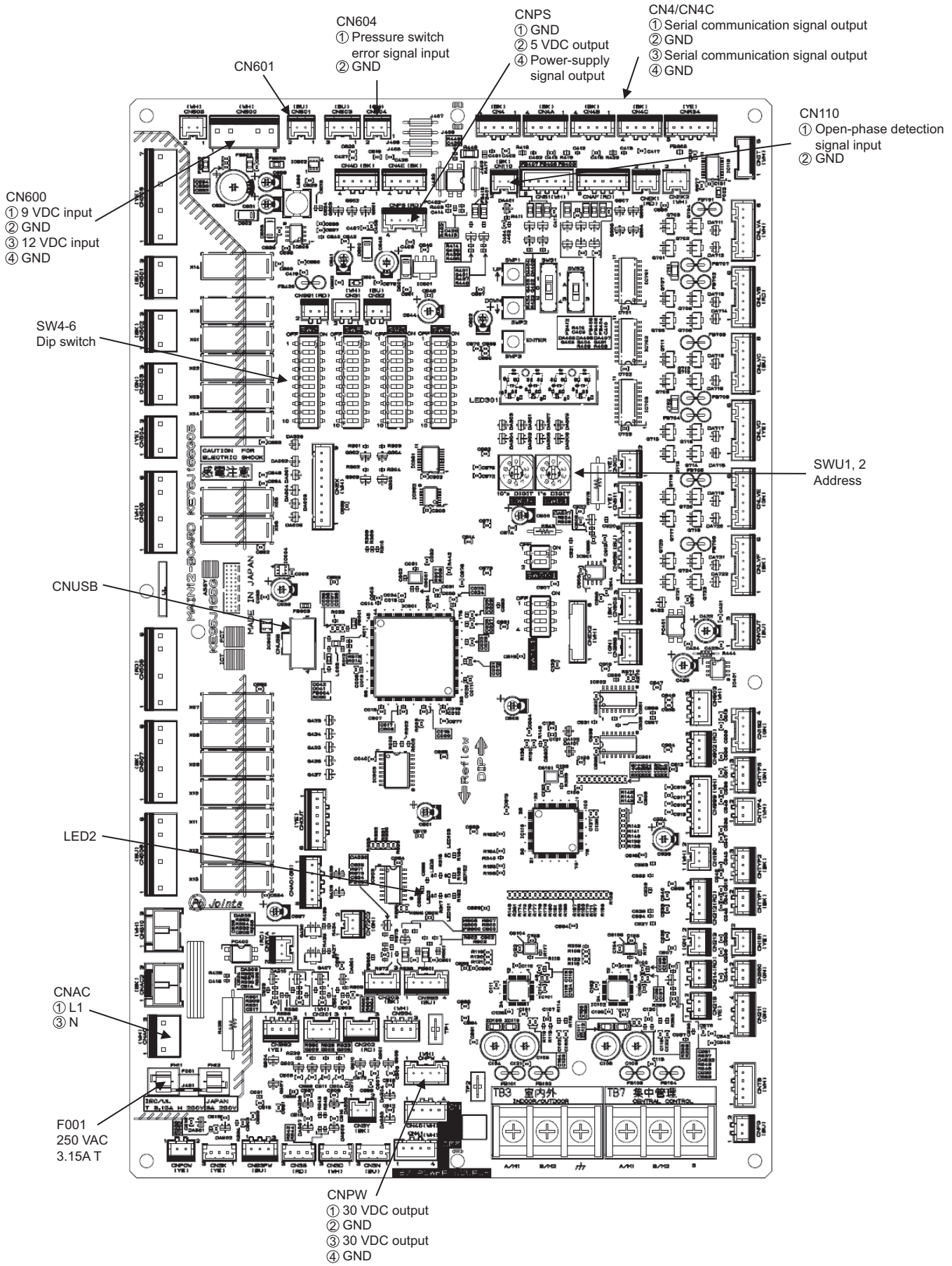


(2) Terminal box

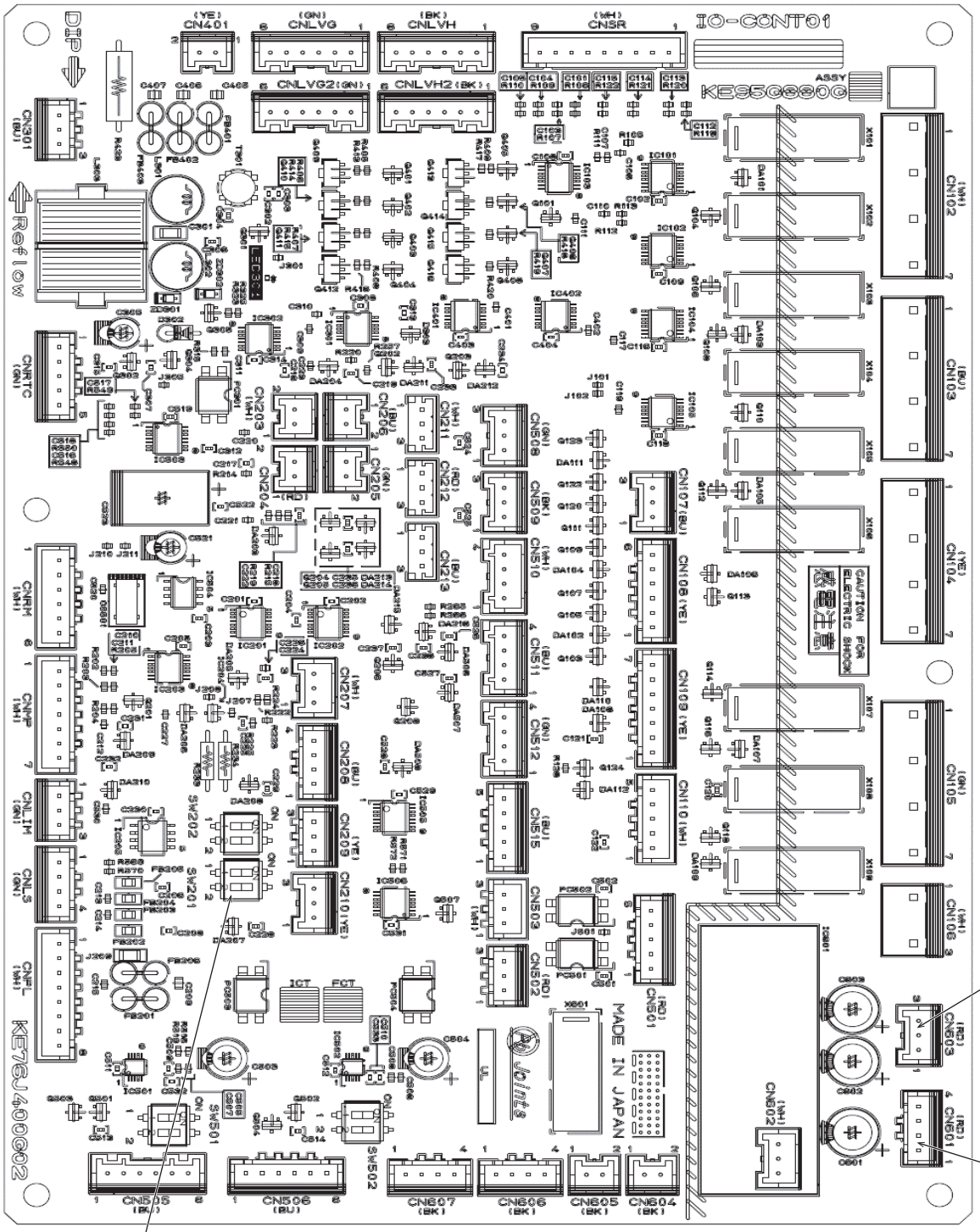


[3] Unit Circuit Board

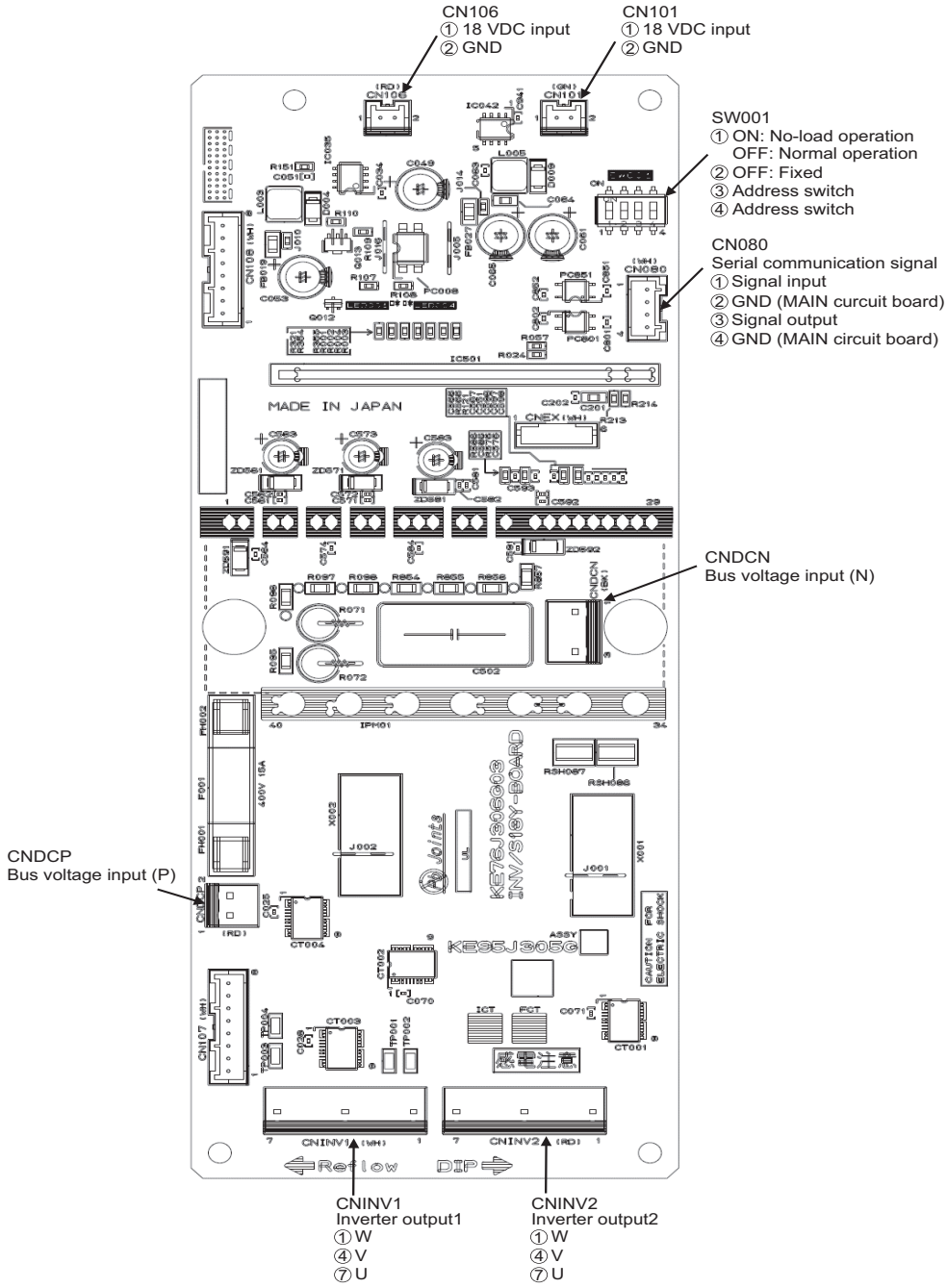
1. Control board (MAIN board)



2. CONT board (IO-CONT)



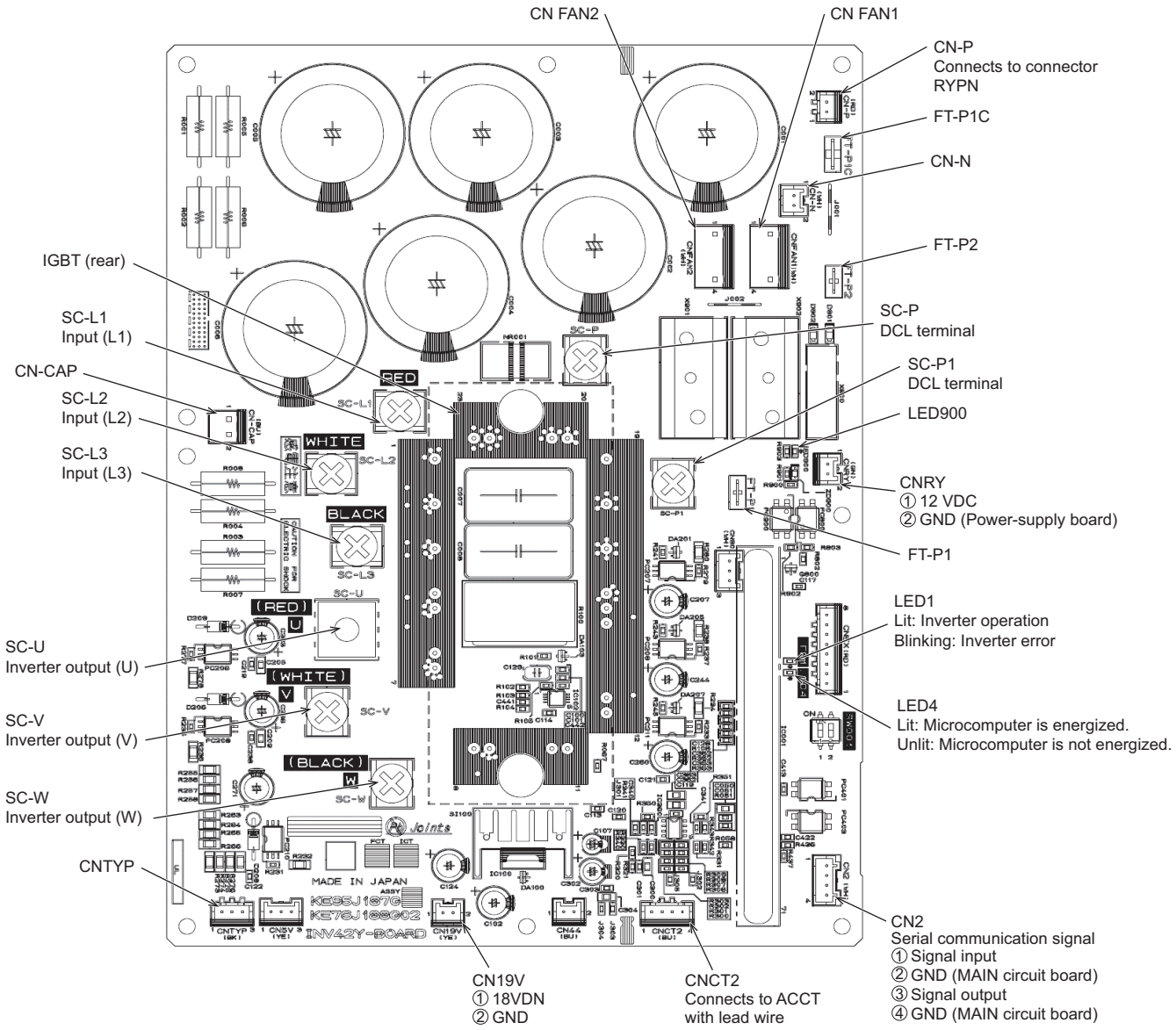
3. Fan board



Note

1) When opening or closing the front panel of the control box, do not let it come into contact with any of the internal components. 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 capacitor voltage (inverter main circuit) has dropped to 20 VDC or less. It takes about 10 minutes to discharge electricity after the power supply is turned off.
2) Control box houses high temperature parts. Be well careful even after turning off the power source.
3) **Perform the service after disconnecting the relay connector (RYFAN1A, RYFAN1B). Before plugging in or unplugging connectors, check that the outdoor unit fan is not rotating and that the voltage across pins 1 and 5 of connector RYPN is 20 VDC or less. The capacitor may collect a charge and cause an electric shock when the outdoor unit fan rotates in windy conditions.** Refer to the wiring nameplate for details.
4) To connect wiring to TB7, check that the voltage is 20 VDC or below.
5) After servicing, reconnect the relay connector (RYFAN1A, RYFAN1B) of the fan as it was.

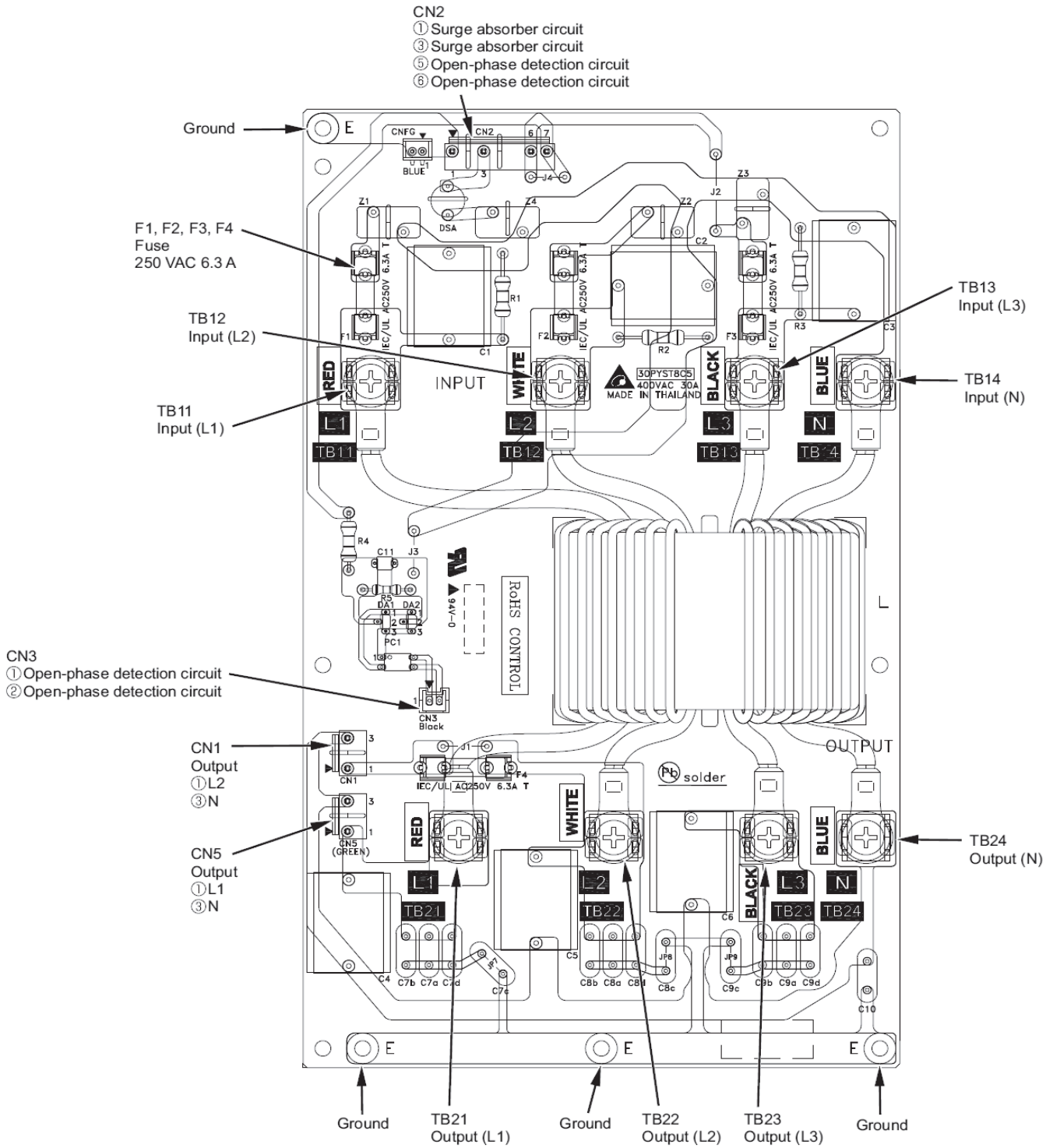
4. Inverter board (INV board)



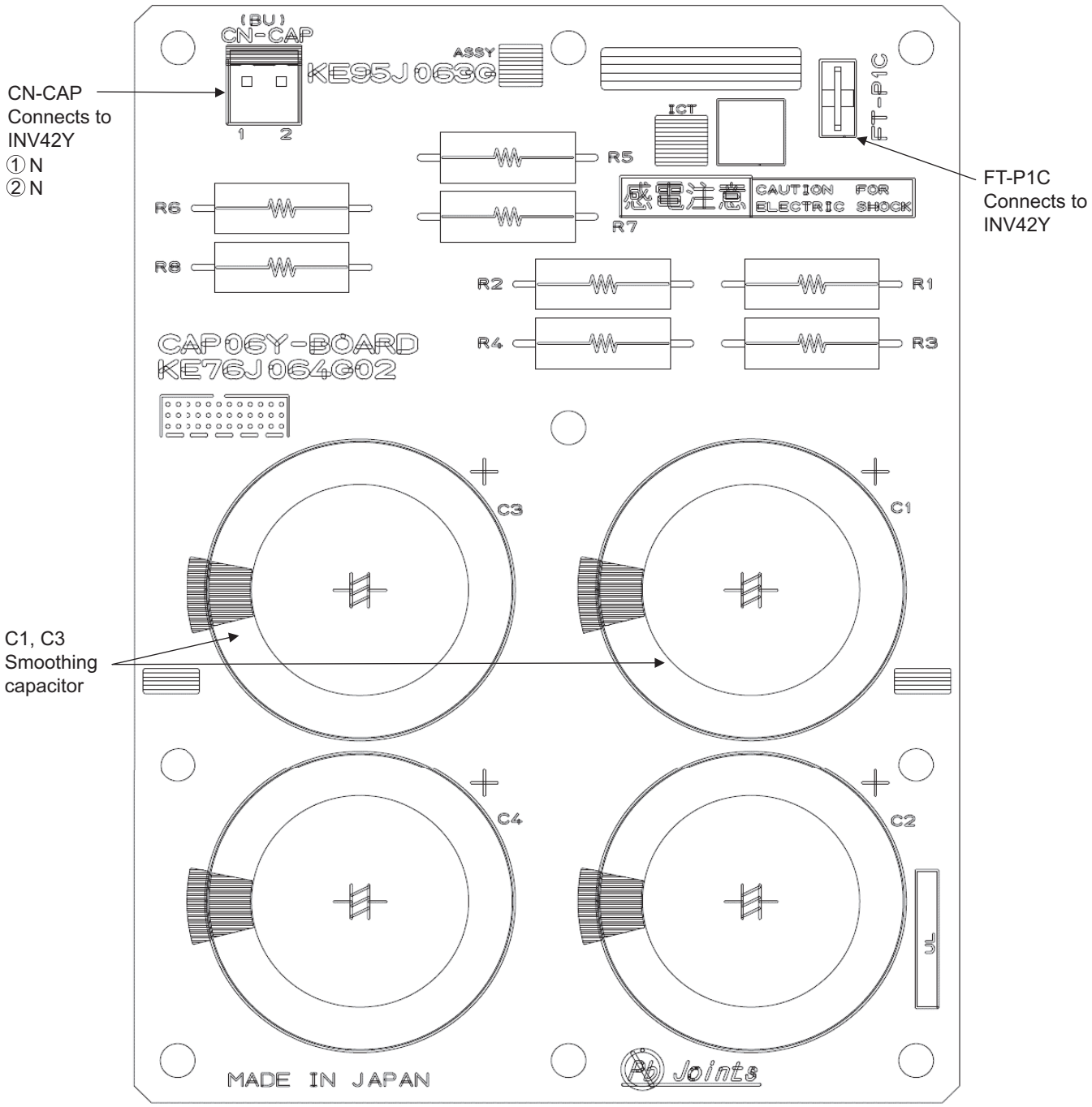
Note

1) When opening or closing the front panel of the control box, do not let it come into contact with any of the internal components. 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 across pins 1 and 5 of connector RYPN has dropped to 20 VDC or less. It takes about 10 minutes to discharge electricity after the power supply is turned off.
2) A Faston terminal on the inrush current resistor has a locking function. Make sure the cable heads are securely locked in place. Press the tab on the terminals to remove them.
3) Control box houses high temperature parts. Be well careful even after turning off the power source.
4) **Perform the service after disconnecting the relay connector (RYFAN1A, RYFAN1B). Before plugging in or unplugging connectors, check that the outdoor unit fan is not rotating and that the voltage across pins 1 and 5 of connector RYPN is 20 VDC or less. The capacitor may collect a charge and cause an electric shock when the outdoor unit fan rotates in windy conditions.** Refer to the wiring nameplate for details.
5) After servicing, reconnect the relay connector (RYFAN1A, RYFAN1B) of the fan as it was.
6) When the power is on, the compressor or heater is energized even while the compressor is stopped. Before turning on the power, disconnect all power supply wires from the compressor terminal block, and measure the insulation resistance of the compressor. Check the compressor for a ground fault. If the insulation resistance is 1.0 MΩ or below, connect all power supply wires to the compressor and turn on the power to the outdoor unit. It is energized to evaporate the liquid refrigerant that has accumulated in the compressor.

5. Noise filter board



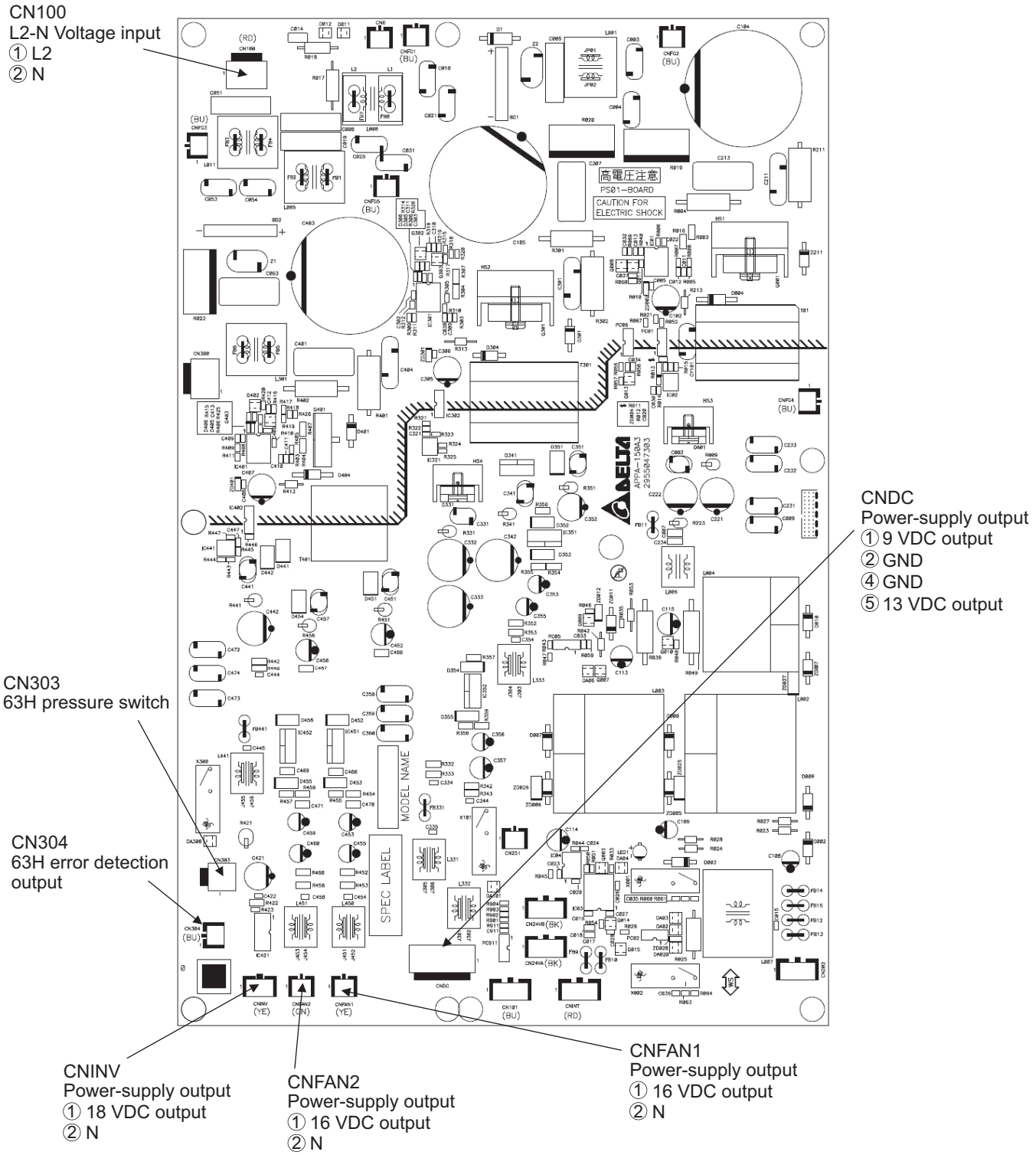
6. CAP board



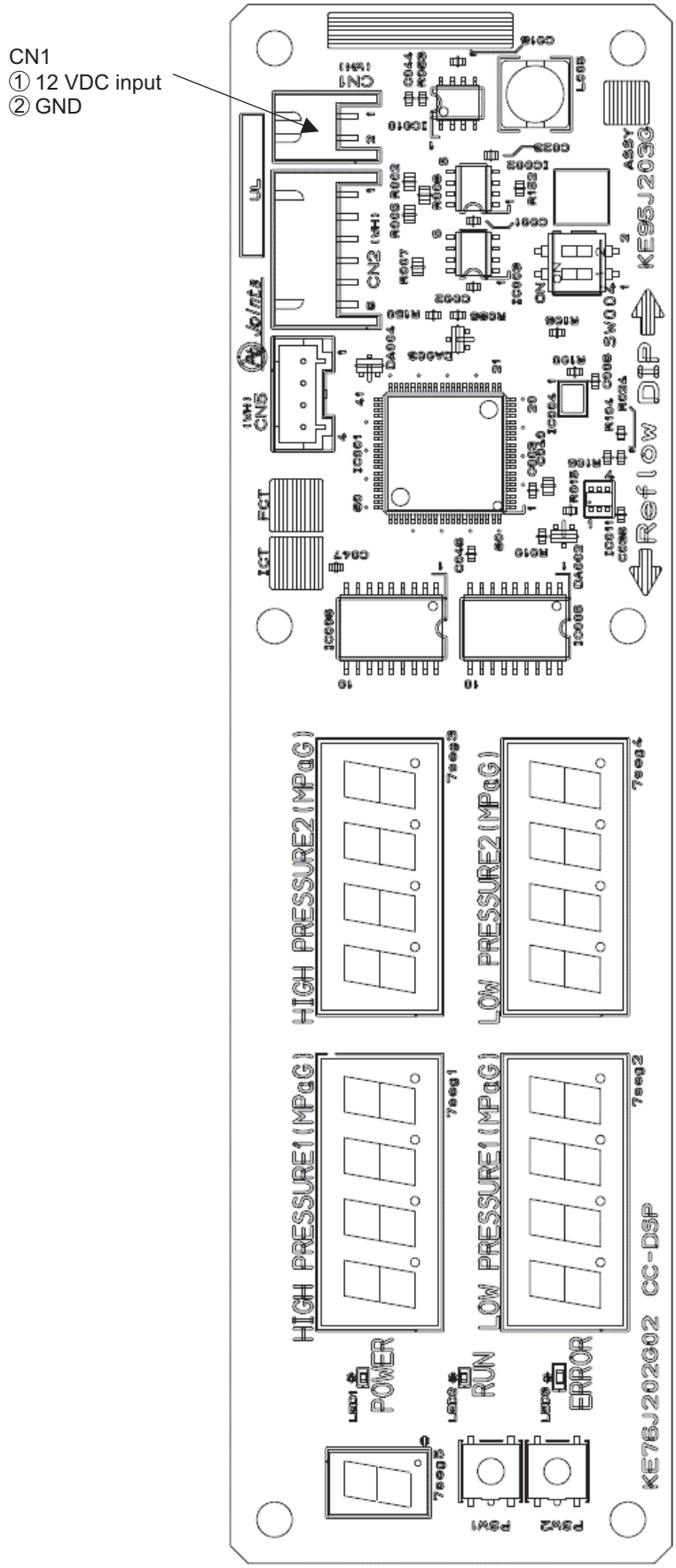
Note

1) When opening or closing the front panel of the control box, do not let it come into contact with any of the internal components. 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 capacitor voltage (inverter main circuit) has dropped to 20 VDC or less. It takes about 10 minutes to discharge electricity after the power supply is turned off.
2) A Faston terminal on the inrush current resistor has a locking function. Make sure the cable heads are securely locked in place. Press the tab on the terminals to remove them.
3) Control box houses high temperature parts. Be well careful even after turning off the power source.
4) **Perform the service after disconnecting the relay connector (RYFAN1A, RYFAN1B). Before plugging in or unplugging connectors, check that the outdoor unit fan is not rotating and that the voltage across pins 1 and 5 of connector RYPN is 20 VDC or less. The capacitor may collect a charge and cause an electric shock when the outdoor unit fan rotates in windy conditions.** Refer to the wiring nameplate for details.
5) After servicing, reconnect the relay connector (RYFAN1A, RYFAN1B) of the fan as it was.

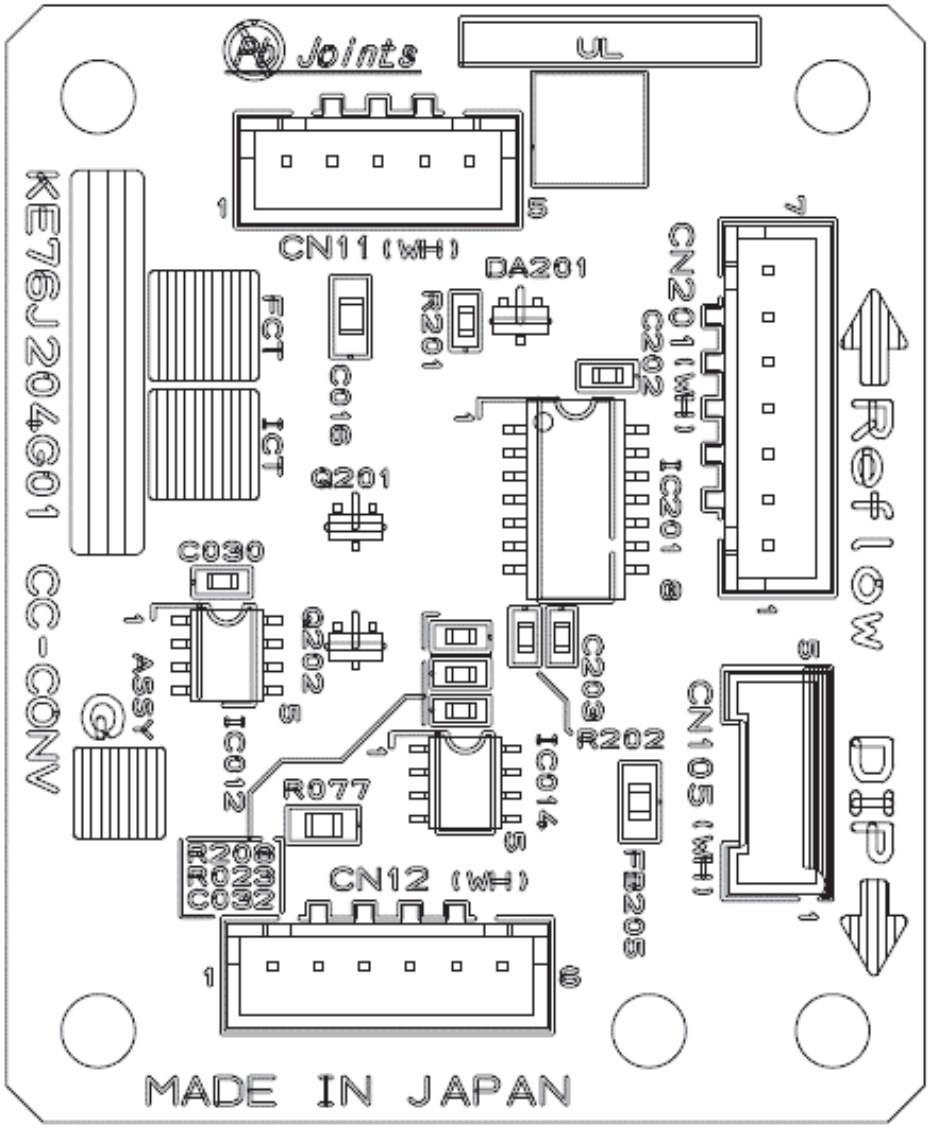
7. Power board



8. Display board



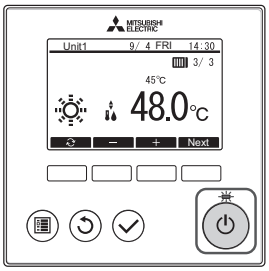
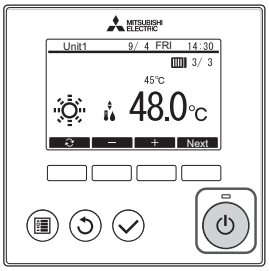
9. Conv board


Joints
UL
CN11 (WH)
DA201
R201
C202
CN201 (WH)
IC201
C016
Q201
FCT
ICT
C030
Q202
C203
R202
IC012
IC014
R077
CN12 (WH)
FB203
CN105 (WH)
Reflow
DIP
KE76J204G01 CC-CONV
ASSY
MADE IN JAPAN

Ⅳ Remote Controller

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

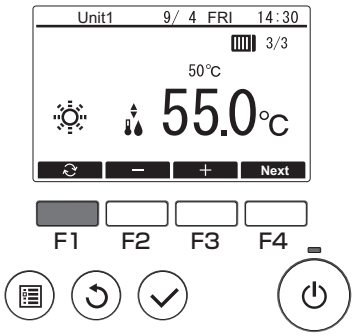
<1> Power ON/OFF

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



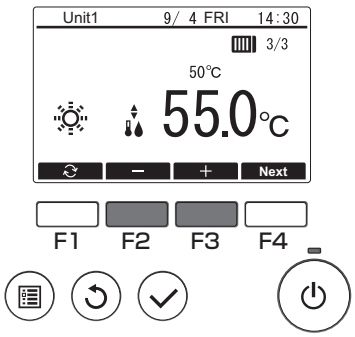
Press the [F1] button to go through the operation modes in the order of "Heating, Anti-Freeze, Cooling and Heating-ECO."
Select the desired operation mode.

 **Heating**  **Anti-Freeze**

 **Cooling**  **Heating-ECO**

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

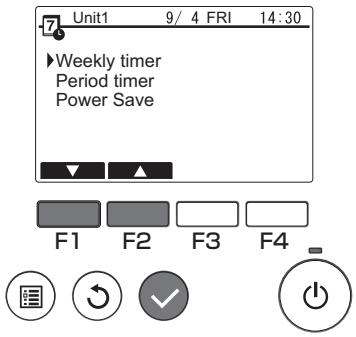
Function description

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.

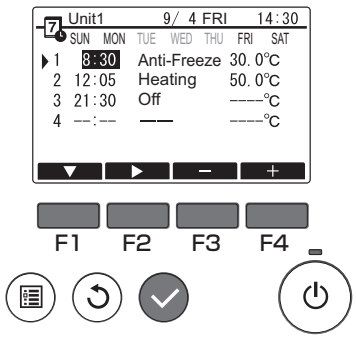
Button operation

1



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

2

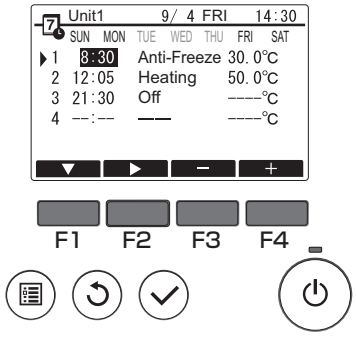


The Weekly timer screen will be displayed.

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).

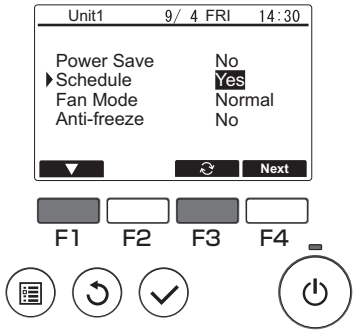
Weekly timer operation is disabled in the following situations:

- 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

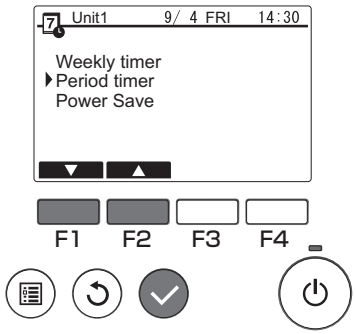
Following settings can be made to change the specified period and daily operating schedule.

- 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.

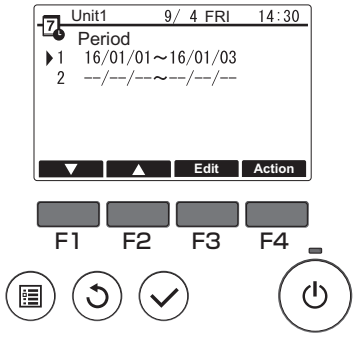
Button operation

1



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

2

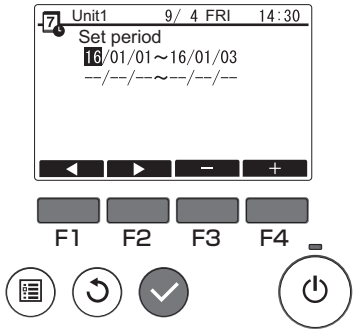


The suitable periods for the period timer will be displayed.

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

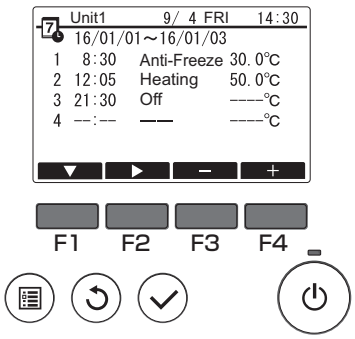
To set the operation:
Press the [F1] or [F2] button to select the specified date and then press the [F4] button. … Move to **4**.

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



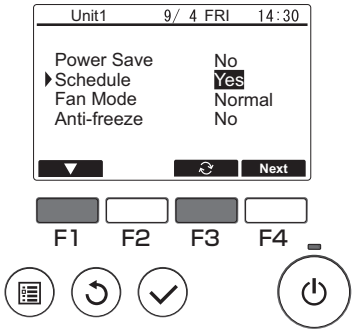
The pattern setting screen will be displayed.
* Refer to the section on Weekly timer for details on using the pattern setting screen.

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".

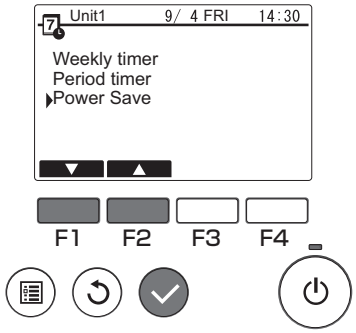
<5> Using power save

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.

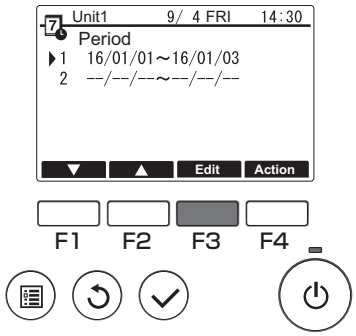
Button operation

1



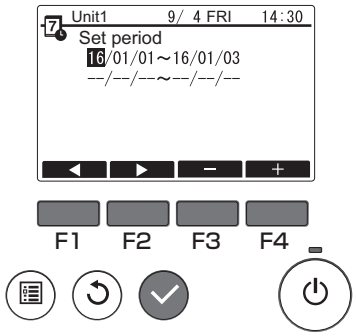
From the Main menu, select "Schedule" > "Power Save" and press the [Select] button.

2



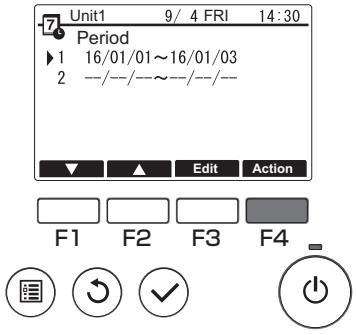
Press the [F3] button to proceed to the settings screen.
You can set 2 types of pattern, as necessary.

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



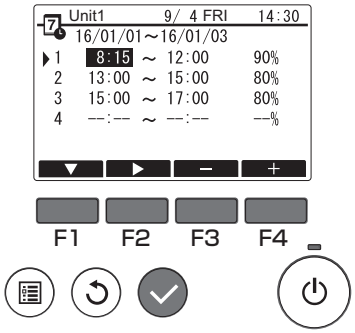
Press the [F1] to [F4] buttons to set the period and then press the [Select] button.

3



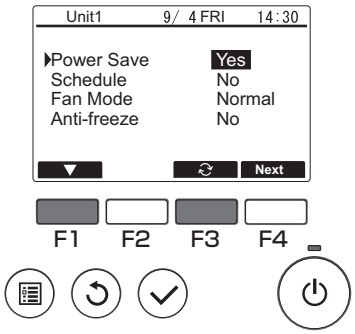
The Power Save screen will be displayed.
Press the [F4] button.

4



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

5



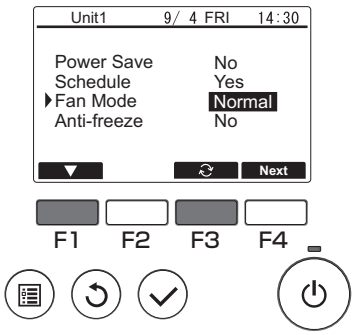
In the Operation setting screen, press the [F1] button to move the cursor to Power Save.
Press the [F3] button to select "Yes".

<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

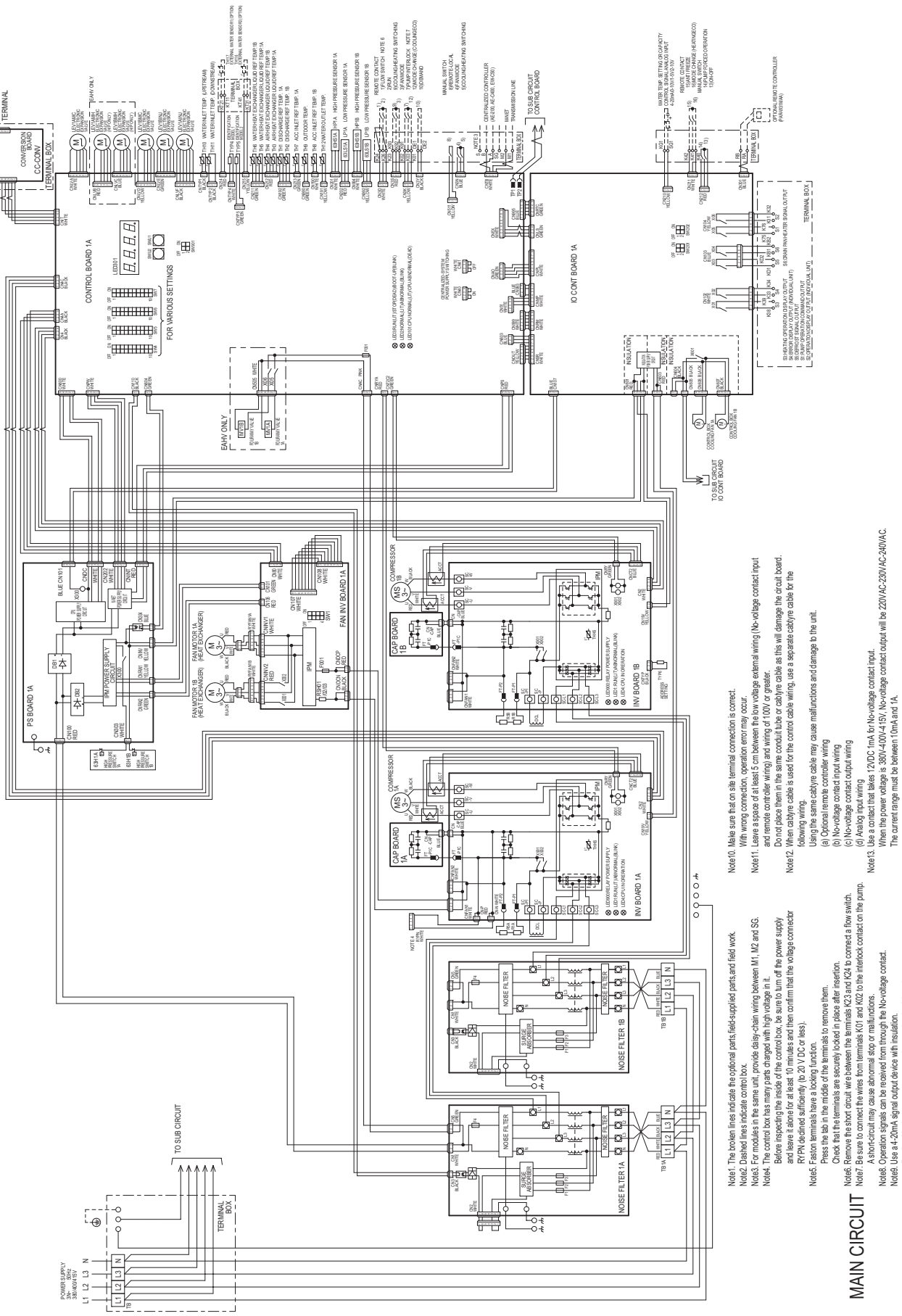


Select "Fan Mode" from the menu, and press the [F3] button to select "Snow".

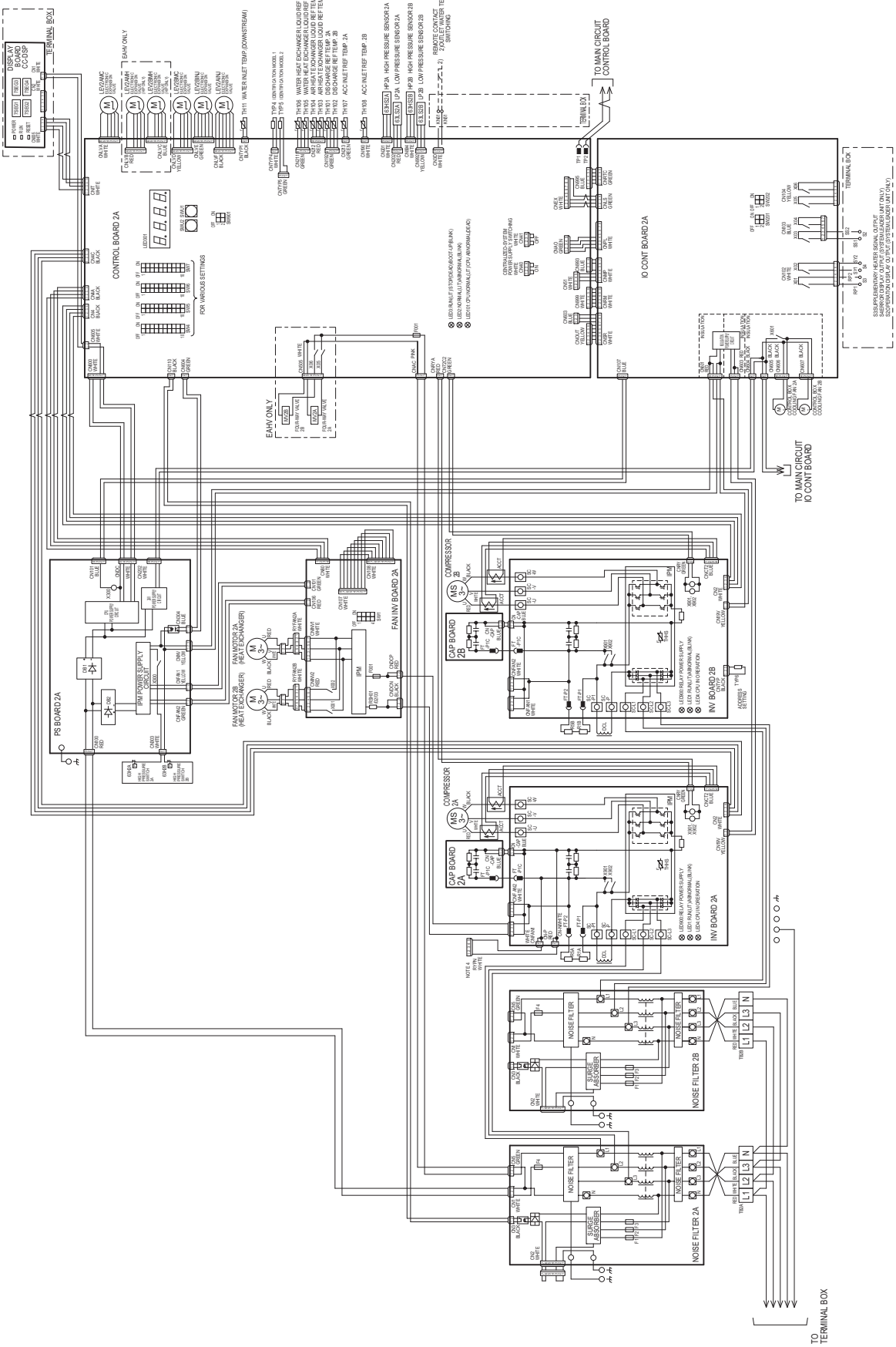
Ⅴ Electrical Wiring Diagram

[1] Electrical Wiring Diagram

EAHV-M1500, 1800YCL (-N)(-BS)
EACV-M1500, 1800YCL (-N)(-BS)



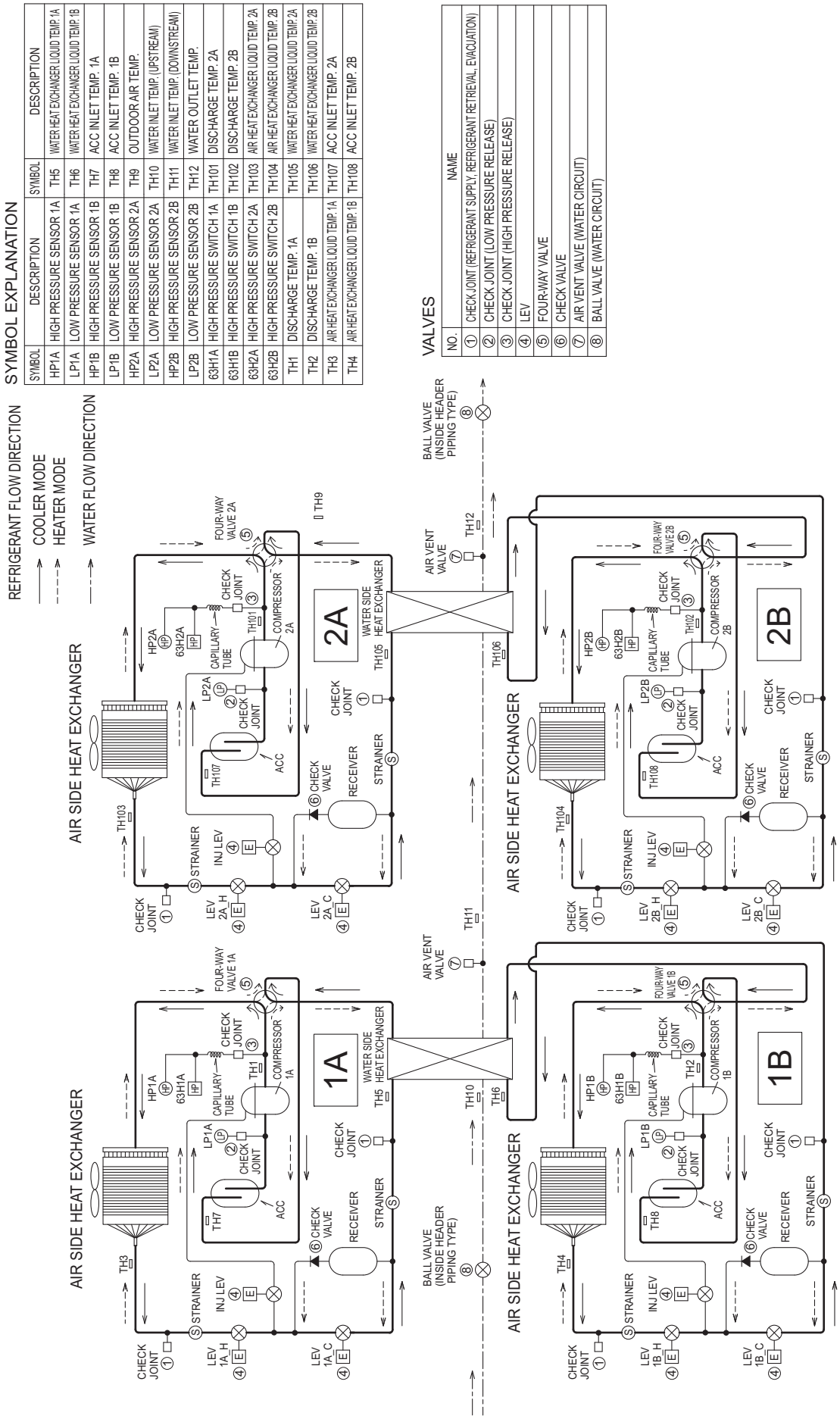
EAHV-M1500, 1800YCL (-N)(-BS)
EACV-M1500, 1800YCL (-N)(-BS)



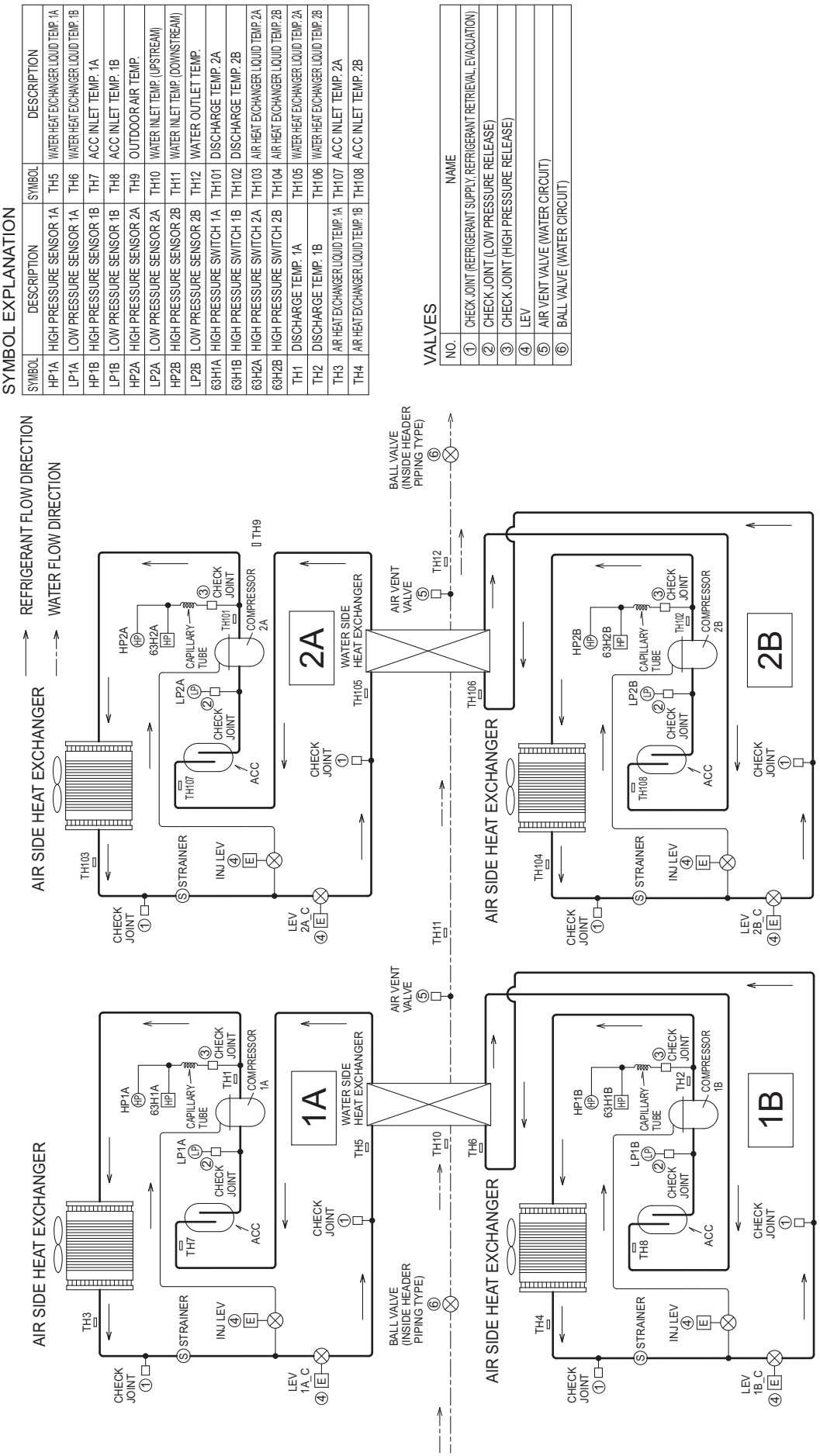
Ⅵ Refrigerant Circuit

[1] Refrigerant Circuit Diagram

♦ **EAHV-M1500, 1800YCL(-N)**

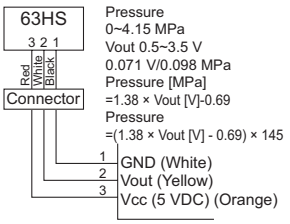
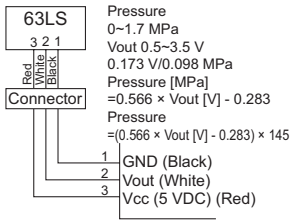


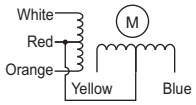
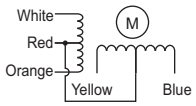
♦ **EACV-M1500, 1800YCL(-N)**



[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 OFF setting	
Thermistor	TH1,2 (Discharge)		1) Detects discharge temperature 2) Provides high-pressure protection 0°C [32°F]: 698 kohm 10°C [50°F]: 413 kohm 20°C [68°F]: 250 kohm 30°C [86°F]: 160 kohm 40°C [104°F]: 104 kohm 50°C [122°F]: 70 kohm 60°C [140°F]: 48 kohm 70°C [158°F]: 34 kohm 80°C [176°F]: 24 kohm 90°C [194°F]: 17.5 kohm 100°C [212°F]: 13.0 kohm 110°C [230°F]: 9.8 kohm	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]: 15 kohm 10°C [50°F]: 9.7 kohm 20°C [68°F]: 6.5 kohm 25°C [77°F]: 5.3 kohm 30°C [86°F]: 4.4 kohm 40°C [104°F]: 3.0 kohm	Resistance check
	TH3,4 (Air HEX Ref temperature)		Controls SC during cooling operation		
	TH5,6 (Water HEX Ref temperature)		Controls SC during heating operation		
	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]: 161 kohm 10°C [50°F]: 97 kohm 20°C [68°F]: 60 kohm 25°C [77°F]: 48 kohm 30°C [86°F]: 39 kohm 40°C [104°F]: 25 kohm	
4-way valve	MV (EAHV only)		Changeover between heating and cooling or defrost	AC220 - 240V OFF: cooling or defrost cycle ON: heating cycle	Continuity check with a tester
Fan motor	FAN motor		Adjusts the operating frequency of the propeller fan based on the condensation or evaporation temperature	DC400V 92W	
Linear expansion valve	LEV (Main)		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.  Make sure the resistance is normal (100 ± 10 ohm).
	LEV (Injection)		Adjusts refrigerant flow during heating	DC12V Opening of a valve driven by a stepping motor (480 pulses).	Continuity check with a tester Continuity between white, red, and orange. Continuity between yellow and blue.  Make sure the resistance is normal (46 ± 4 ohm).

VII Control

[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 four 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 four items.

No-voltage contact input K91-K93 ON: Heating (EAHV)

Priority 1	Priority 2	Priority 3	Priority 4			Target water temperature
No-voltage contact input K40-K41	Analog input or BMS (SW 5-9: ON)	No-voltage contact input K40-K42	Remote controller PAR-W31MAA Input from centralized controller AE-200, AE-C400, EW-C50 or BMS (*3)			
Anti-freeze		Mode change	No remote controller	Manual setting	Schedule setting	
ON	Ineffective	Ineffective	-	Ineffective	Ineffective	25ºC
OFF	SW5-7: ON	Ineffective	-	Ineffective	Ineffective	Temperature setting for the analog signal input
	SW5-7: OFF	ON (Heating ECO)	-	Ineffective	Ineffective	Heating ECO
		OFF (Heating)	When no RC is used	-	-	Heating
			-	Anti-freeze	-	25ºC
			-	Heating ECO	-	Heating ECO
			-	Heating	-	Heating
			-	Cooling (*1)	-	Cooling
			-	-	When schedule has been set (*2)	Target water temp is controlled according to the setting on the remote controller.

*1 This mode is disabled in EAHV.
*2 EAHV can also set Cooling.
*3 AE-200, AE-C400, EW-C50 and BMS cannot both be simultaneously connected. Only connect one or the other.

No-voltage contact input K91-K93 OFF: Cooling (EAHV, EACV)
* When the operation mode is Cooling, K40-K41 (Anti-freeze) and K40-K42 (Mode change) are disabled.

Priority 1	Priority 2	Priority 3			Target water temperature
Analog input or BMS (SW5-9: ON)	No-voltage contact input K01-K03	Remote controller PAR-W31MAA Input from centralized controller AE-200, AE-C400, EW-C50 or BMS (*3)			
	Mode Change (Cooling ECO)	No remote controller	Manual setting	Schedule setting	
SW5-7: ON	Ineffective	-	Ineffective	Ineffective	Temperature setting for the analog signal input
SW5-7: OFF	ON (Cooling ECO)	-	Ineffective	Ineffective	Cooling ECO
	OFF (Cooling)	When no RC is used	-	-	Cooling
		-	Anti freeze (*1)	-	25ºC
		-	Heating ECO (*1)	-	Heating ECO
		-	Heating (*1)	-	Heating
		-	Cooling	-	Cooling
		-	-	When schedule has been set (*2)	Target water temp is controlled according to the setting on the remote controller.

*1 This mode is disabled in EACV.
*2 EAHV can also set Heating or Heating ECO.
*3 AE-200, AE-C400, EW-C50 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, AE-C400, EW-C50 or BMS
Unit operation (Run/Stop)		The last setting has priority.		
Operation mode	Cooling *1	The last setting has priority.		
	Cooling ECO *1*2	OFF	Cooling ECO can not be set from the remote controller or the centralized controller.	
		ON		
	Heating *1	The last setting has priority.		
	Heating ECO *1*3	OFF	The last setting has priority.	
		ON	Ineffective	
	Anti-freeze *3	OFF	The last setting has priority.	
		ON	Ineffective	
Fan mode (The contact ON has priority.)		OFF	The last setting has priority.	
		ON	Ineffective	

*1 When the Anti-freeze contact is ON during heating operation, the setting change is ineffective.
*2 Changing by contact is effective during cooling operation.
*3 Changing by contact is effective during heating operation.

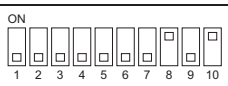
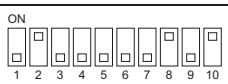
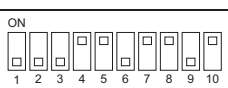
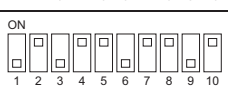
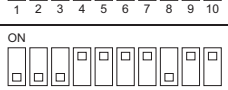
2. Water-temperature setting

Different water temperature settings can be set for different modes.

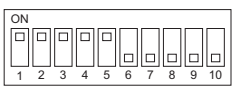
Set the dip switches on the circuit board as follows to make the settings for the items described in this section.

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

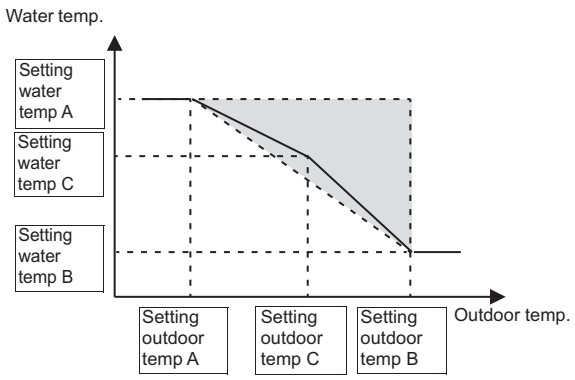
No.	Dip switch setting *1	Dip switch setting (SW4)	Setting Item	Initial value	Unit	Setting			Setting change from an optional remote controller (PAR-W31MAA) *2
						Increments	Lower limit	Upper limit	
1	SW7-1 ON		Setting temp 1 (Cooling mode) *3	7	ºC	0.1°C	4	30	Possible
2	SW7-1 ON		Setting temp 2 (Cooling mode) *4	7	ºC	0.1°C	4	30	Possible
3	SW7-1 ON		Setting temp 1 (Heating mode) *3	45	ºC	0.1°C	25	55	Possible
4	SW7-1 ON		Setting temp 2 (Heating mode) *4	45	ºC	0.1°C	25	55	Possible
5	SW7-1 ON		Setting water temp A at Heating ECO mode	52	ºC	0.1°C	25	55	Not possible
6	SW7-1 ON		Setting outdoor temp A at Heating ECO mode	-7	ºC	0.1°C	-30	50	Not possible
7	SW7-1 ON		Setting water temp B at Heating ECO mode	30	ºC	0.1°C	25	55	Not possible
8	SW7-1 ON		Setting outdoor temp B at Heating ECO mode	12	ºC	0.1°C	-30	50	Not possible
9	SW7-1 ON		Setting water temp C at Heating ECO mode	42	ºC	0.1°C	25	55	Not possible
10	SW7-1 ON		Setting outdoor temp C at Heating ECO mode	2	ºC	0.1°C	-30	50	Not possible
11	SW7-2 ON		Setting water temp D at Cooling ECO mode	11.5	ºC	0.1°C	4	30	Not possible
12	SW7-2 ON		Setting outdoor temp D at Cooling ECO mode	20	ºC	0.1°C	-20	55	Not possible
13	SW7-2 ON		Setting water temp E at Cooling ECO mode	7	ºC	0.1°C	4	30	Not possible
14	SW7-2 ON		Setting outdoor temp E at Cooling ECO mode	35	ºC	0.1°C	-20	55	Not possible
15	SW7-2 ON		Setting water temp F at Cooling ECO mode	10	ºC	0.1°C	4	30	Not possible
16	SW7-2 ON		Setting outdoor temp F at Cooling ECO mode	25	ºC	0.1°C	-20	55	Not possible

*1 Only the switches designated in the table must be set to ON. (The other switches must be OFF.)
*2 Temperature setting increments: 0.5ºC
*3 No-voltage contact KN51-KN61: OFF
*4 No-voltage contact KN51-KN61: ON

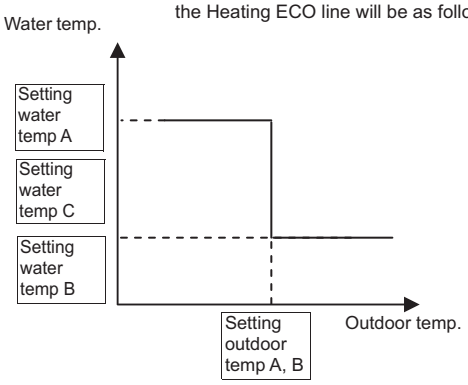


The figure at left shows that the switches 1 through 5 are set to ON and 6 through 10 are set to OFF.

Heating ECO

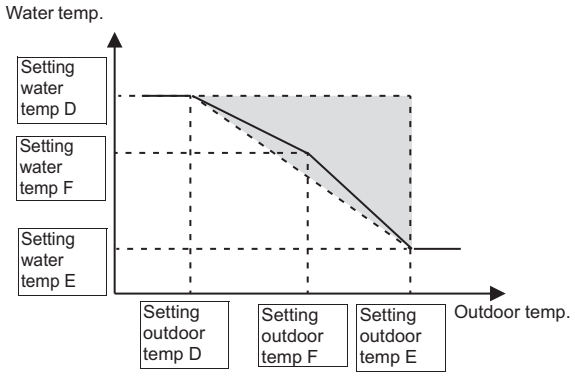


When the outdoor temp A and B are set to the same value, the Heating ECO line will be as follows.

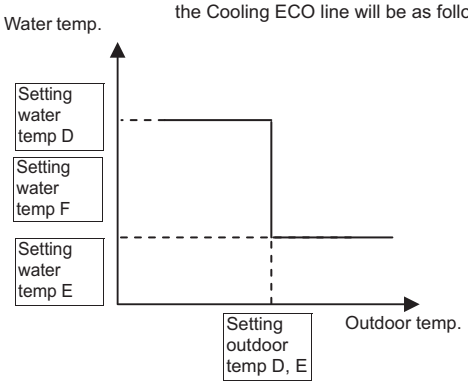


*Always use a value for setting C that is between setting value A and setting value B.

Cooling ECO



When the outdoor temp D and E are set to the same value, the Cooling ECO line will be as follows.



* Always use a value for setting C that is between setting value D and setting value E.

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.	Dip switch setting (SW7-1)	Dip switch setting (SW4)	Setting Item	Initial value	Unit	Setting			Setting change from an optional remote controller (PAR-W31MAA)
						Increments	Lower limit	Upper limit	
1	ON	ON 1 2 3 4 5 6 7 8 9 10	Peak-demand control signal input source	0	-	1	0	1	Not possible
2	ON	ON 1 2 3 4 5 6 7 8 9 10	Maximum peak-demand capacity	100	%	1%	60	100	Possible

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

When SW5-7 is ON, SW5-8 is OFF, and SW5-9 is OFF, external analog signals can be used to set the water temperatures.
When SW5-7 and SW5-8 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:

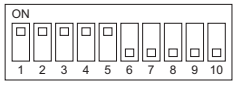
4-20 mA
1-5 V
0-10 V
2-10 V

Select SW6-1 and SW6-2 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.

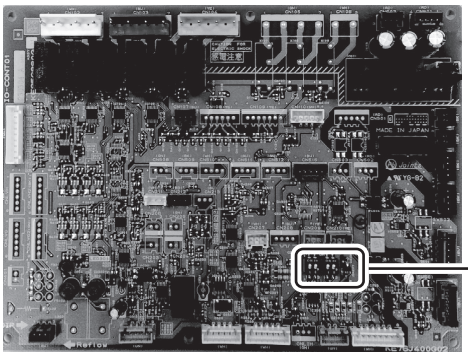
	SW201-1	SW201-2	SW6-1	SW6-2
4-20 mA	ON	ON	OFF	OFF
1-5 V	OFF	ON	ON	OFF
0-10 V	OFF	OFF	OFF	ON
2-10 V	OFF	OFF	ON	ON

*Incorrectly setting SW201 may cause damage to the circuit board.

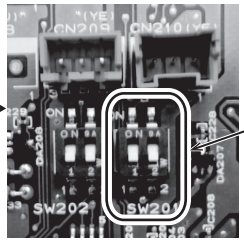


The figure at left shows that the switches 1 through 5 are set to ON and 6 through 10 are set to OFF.

[IO cont board]



[Enlarged view of operation area]



Dip switch (SW201)

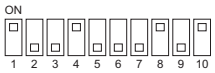
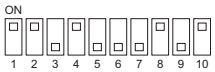
5. Setting the water temperature using analog signal input

When dip switch SW5-7 is set to ON (Enable external input), SW5-8 is set to OFF, and SW5-9 is set to OFF, the target water temperature varies with the preset temperatures A and B and the type of analog input signal.

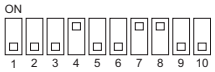
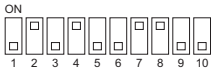
Set the dip switches on the circuit board as follows to make the settings for the items described in this section.

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.	Dip switch setting (SW7-1)	Dip switch setting (SW4)	Setting Item	Initial value	Unit	Setting			Setting change from an optional remote controller (PAR-W31MAA)
						Increments	Lower limit	Upper limit	
1	ON		Preset temp. A (Cooling)	4	ºC	1ºC	4	30	Not possible
2	ON		Preset temp. B (Cooling)	30	ºC	1ºC	4	30	Not possible
3	ON		Preset temp. A (Heating)	25	ºC	1ºC	25	55	Not possible
4	ON		Preset temp. B (Heating)	55	ºC	1ºC	25	55	Not possible

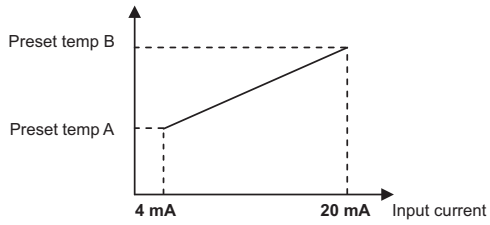
* Due to the resistance of the wire that is connected to the analog input, the preset temperature may not properly be sent. If this is the case, check the current value of the analog input, and adjust the output value of the connected signal output device. Refer to the table below for how to display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

No.	Dip switch setting (SW7-1)	Dip switch setting (SW4)	Monitorable items	Unit
1	OFF		Current value (4-20 mA)	mA
2	OFF		5V voltage value (1-5 V)	V
3	OFF		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.

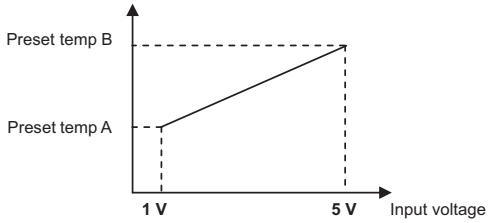
• When the water temperature setting input signal type is 4-20 mA

• External analog input signal of 4 mA: Preset temp. A
• External analog input signal of 20 mA: Preset temp. B
• External analog input signal of between 4 and 20 mA: the preset temperature will be linearly interpolated.



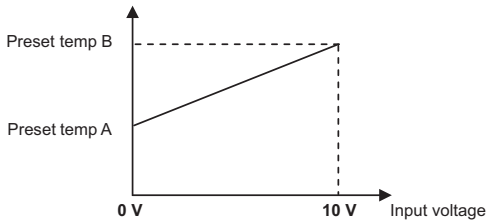
• When the water temperature setting input signal type is 1-5 V

• External analog input signal of 1 V: Preset temp. A
• External analog input signal of 5 V: Preset temp. B
• External analog input signal of between 1 and 5 V: the preset temperature will be linearly interpolated.



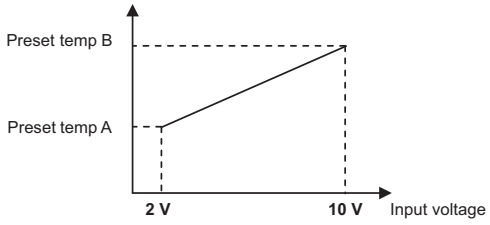
• When the water temperature setting input signal type is 0-10 V

• External analog input signal of 0 V: Preset temp. A
• External analog input signal of 10 V: Preset temp. B
• External analog input signal of between 0 and 10 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 2 V: Preset temp. A
• External analog input signal of 10 V: Preset temp. B
• External analog input signal of between 2 and 10 V: the preset temperature will be linearly interpolated.

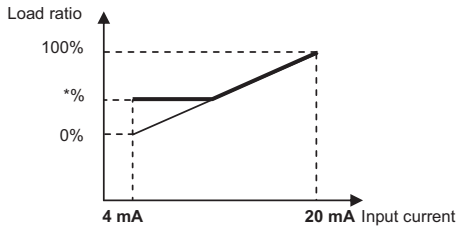


6. Setting the capacity control ratio using analog signal input

When dip switch SW5-7 is set to ON (Enable external input), SW5-8 is set to ON, and SW5-9 is set to OFF, the capacity control ratio varies with the type of analog input signal.

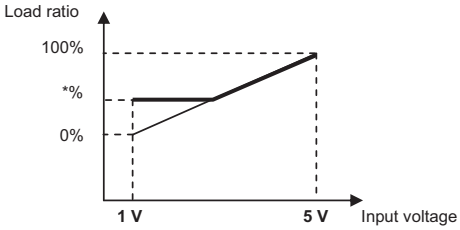
- When the capacity control setting input signal type is 4-20 mA

  - External analog input signal of 4 mA: 0%
  - External analog input signal of 20 mA: 100%
  - External analog input signal of between 4 and 20 mA: the percent will be linearly interpolated.



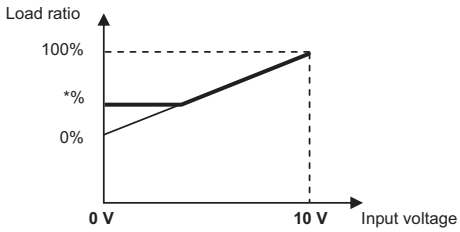
- When the capacity control setting input signal type is 1-5 V

  - External analog input signal of 1 V: 0%
  - External analog input signal of 5 V: 100%
  - External analog input signal of between 1 and 5 V: the percent will be linearly interpolated.



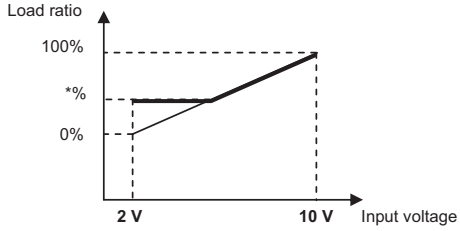
- When the capacity control setting input signal type is 0-10 V

  - External analog input signal of 0 V: 0%
  - External analog input signal of 10 V: 100%
  - External analog input signal of between 0 and 10 V: the percent will be linearly interpolated.



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

  - External analog input signal of 2 V: 0%
  - External analog input signal of 10 V: 100%
  - External analog input signal of between 2 and 10 V: the percent will be linearly interpolated.



*%:The compressor runs at the lowest frequency.

7. Setting the supplementary heater signal output conditions

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

Supplementary heater signal output conditions

The operation command signal is ON and at least one of the following two conditions is met.

1 Water-temperature control option (SW5-4) is set to OFF, the inlet water temperature drops below a set water temperature, and the outdoor temperature drops below a set outdoor temperature.
2 Water-temperature control option (SW5-4) is set to ON, the external water temperature sensor reading (TH117) drops below a set water temperature, and the outdoor temperature drops below a set outdoor temperature.

The supplementary heater signal is output from RP1-RP2.

Supplementary heater signal output stop conditions

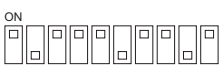
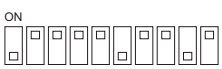
The operation command signal is OFF or at least one of the following two conditions is met.

1 The inlet water temperature is at or above a set water temperature +2°C or the outdoor temperature is at or above a set outdoor temperature +2°C.
2 External water temperature sensor reading (TH117) is at or above a set water temperature +2°C.

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.	Dip switch setting (SW7-1)	Dip switch setting (SW4)	Setting Item	Initial value	Unit	Setting			Setting change from an optional remote controller (PAR-W31MAA)
						Increments	Lower limit	Upper limit	
1	ON		Supplementary heater operation water temp	40	ºC	0.1ºC	0	55	Not possible
2	ON		Supplementary heater operation outdoor temp	-10		0.1ºC	-30	50	Not possible

8. 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.

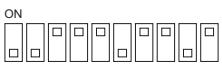
Drain pan heater signal output stop condition
The following condition is met.

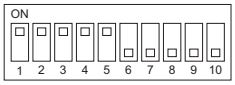
The outdoor temperature is at or above a set outdoor temperature +2ºC.

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.	Dip switch setting (SW7-1)	Dip switch setting (SW4)	Setting Item	Initial value	Unit	Setting			Setting change from an optional remote controller (PAR-W31MAA)
						Increments	Lower limit	Upper limit	
1	ON		Drain pan heater operation outdoor temp	0	ºC	1ºC	-40	20	Not possible



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	Trigger condition
Unit protection	Pressure switch	High-pressure switch	63H	HP	ON	MPa	(3.25)
					OFF	MPa	$4.15\ ^{+0}_{-0.15}$
	Pressure sensor	High-pressure sensor	HP	HP	OFF	MPa	3.9
		Low-pressure sensor	LP	LP	OFF	MPa	♦The low pressure has dropped below 0.1 MPa. ♦During water cooling, the low pressure has dropped below 0.61 MPa.
	Thermistor	Discharge refrigerant temp. (Discharge temp. overrise protection)	TH1 TH2	Discharge gas temp.	OFF	ºC	♦If a discharge gas temperature of 120ºC 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 was detected.
				Outlet water temp. (heating)	OFF	ºC	An outlet water temperature of 57ºC was detected.
		Air-side HEX refrigerant temp.	TH3 TH4	SC (cooling)	-	ºC	-
		Water-side HEX refrigerant temp.	TH5 TH6	SC (heating)	-	ºC	-
		ACC inlet refrigerant temp.	TH7 TH8	SH	OFF	ºC	ACC inlet SH above 20ºC has been detected for 10 minutes.
		Inverter heatsink temp.	THHS	INV. heatsink temp.	OFF	ºC	A temperature above 95ºC has been detected for 10 minutes.
Pump control	Water temperature thermister		TH10-12	Water temp.	ON	ºC	3
					OFF	ºC	5
	Freeze-up protection circuit						The pump turns on when the water temperature has reached below the "ON" threshold when the compressor is stopped.

-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 is fixed at 20 Hz for 60 seconds after startup, and is 50 Hz or below for 180 seconds thereafter.
- ♦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 20 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 pulse/sec
- Close 200 pulse/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 3K.
- If the low pressure reaches 1.45 MPa or above, the LEV opening will be controlled to keep the low pressure from rising too high.

-5- LEV in the injection circuit

LEV operation range

The LEV operation range is between 32 and 480.

- Open 30.77 pulses/sec
- Close 30.77 pulses/sec

At startup

- At the startup, the valve will be moved to the initial setting.

During operation

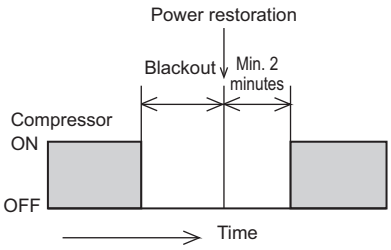
- After the startup, the LEV operation will be controlled every 30 seconds according to the change in the refrigerant discharge temperature.
- The LEV will be controlled to keep the refrigerant discharge temperature constant.

-6- Operation during power failure

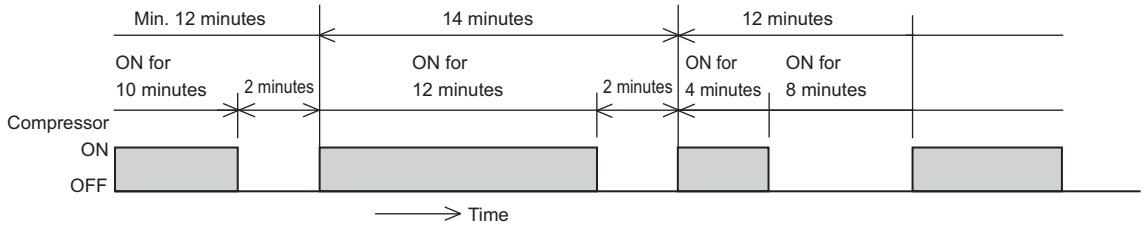
<table>
<tr><td colspan="2">Duration of power failure</td><td>20 ms or shorter</td><td>20 ~ 200ms</td><td>200 ms or longer</td></tr>
<tr><td colspan="2">Detection of power failure</td><td>Undetectable</td><td>Instantaneous power failure</td><td>Detection of power failure</td></tr>
<tr><td colspan="2">Operation 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" (SW6-9 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" (SW6-9 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>

-7- Anti-short-cycling protection

The unit has a 2-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.

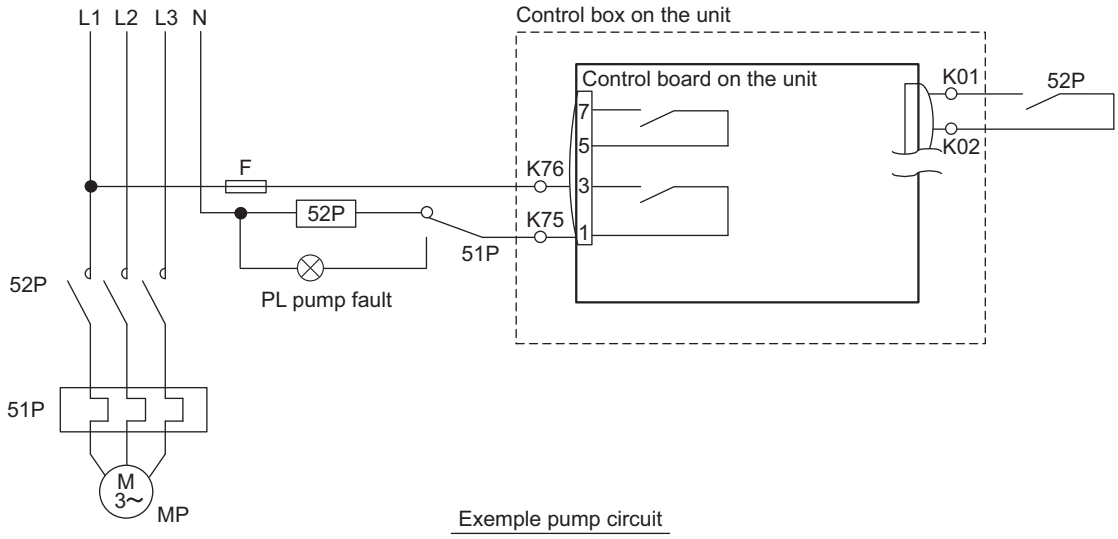


-8- Automatic operation of pump for freeze-up protection

1. Purpose

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

2. Pump wire connection



Exemple pump circuit

3. Natural freeze-up protection

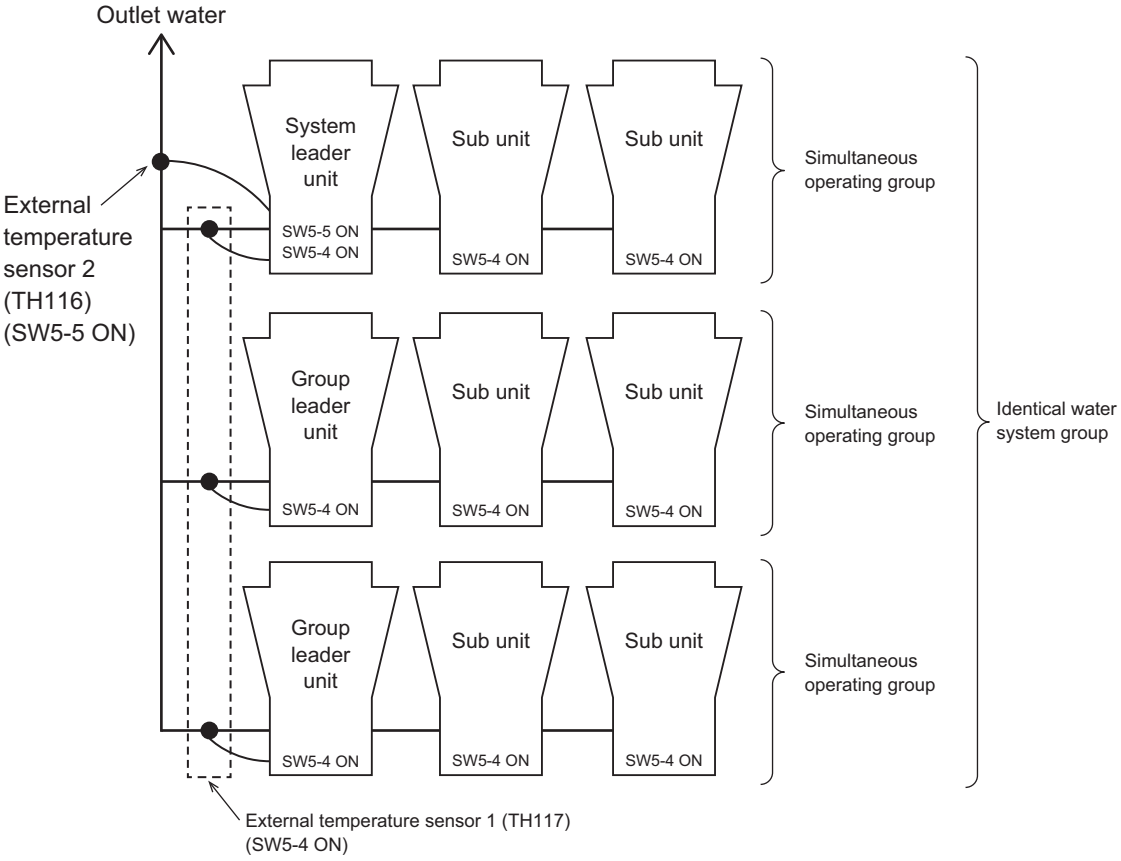
Control method		Natural freeze-up protection based on the water temperature
Details	Pump start conditions	Water temperature is within 3 ºC
	Pump stop conditions	Water temperature is more than 5 ºC

-9- Water-temperature control

Water temperature can be controlled in the following way.

	SW5-4	SW5-5
Outlet-water-temperature-based control	OFF	OFF
External temperature sensor 1 (TH117)	ON	-
External temperature sensor 2 (TH116)	-	ON

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



External temperature sensor 1 (Enable only TH117)

When only TH117 is enabled, the Simultaneous operating group is controlled so that the TH117 will reach the target water temperature.

External temperature sensor 2 (Enable only TH116)

When only TH116 is enabled, the target outlet water temperature will be corrected to approximate TH116 to the target water temperature.

External temperature sensor 1 and 2 (Enable TH117 and TH116)

When both TH117 and TH116 are enabled, the target water temperature of TH117 will be corrected to approximate TH116 to the target water temperature. Simultaneous operating group will be controlled to meet the corrected TH117.

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:
  1. Outlet water temperature has reached 57ºC (Heating)
  2. Outlet water temperature has reached 3ºC (Cooling)

2. Normal Thermo-ON/OFF operations

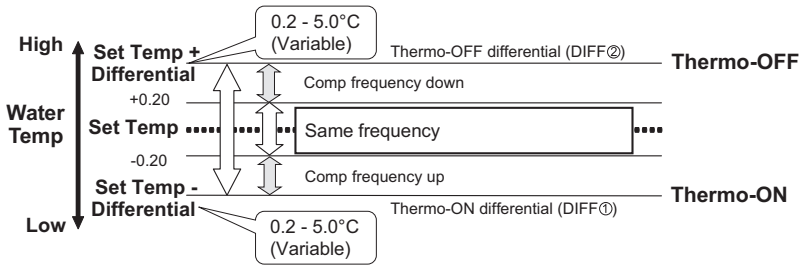
DIFF① = 3 ºC (Initial setting)
DIFF② = 2 ºC (Initial setting)

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

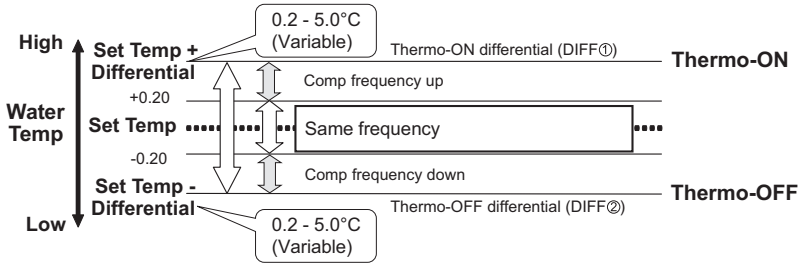
1) Thermo-ON/OFF temperature conditions

♦**Water temperature control**

On/Off control in case of Heating mode

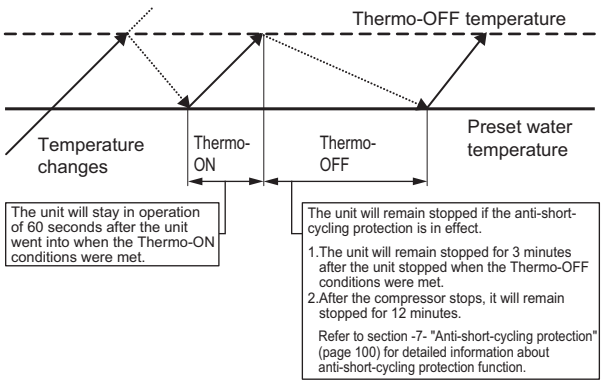


On/Off control in case of Cooling mode



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)



-10- Remote water temperature setting input signal type

By setting SW5-7 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 before a Test Run

(1) Check for refrigerant leak and loose cables and connectors.

(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, M1, M2. Do not attempt to measure the insulation resistance of A, B.
- 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. Switch on the power 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 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.

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

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

(8) 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 3ºC and 10ºC. Inlet temperature outside the range between 3ºC and 10ºC may be a sign of insufficient water flow rate. Check that the water flow rate is within the normal range. If a low water flow rate is found, check for air pockets in the pipe, and make sure that the pump has the appropriate capacity for the circuit.

(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 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 10 ºC. A temperature difference of 12 ºC 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 27) and "2. Water-temperature setting"(page 90) 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.)

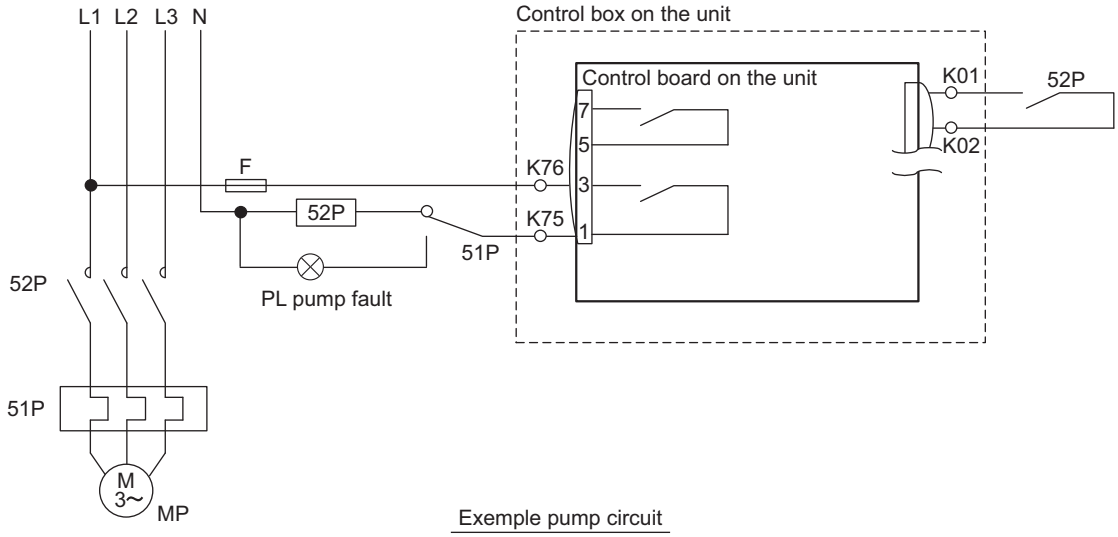
(12) Connect the pump-interlock wire to the appropriate contacts.

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 away from any wire that carries a voltage of 100 V or above to avoid damage to the circuit board.



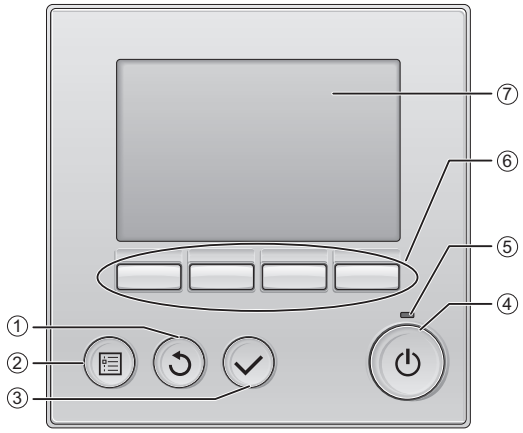
Exemple pump circuit

(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)

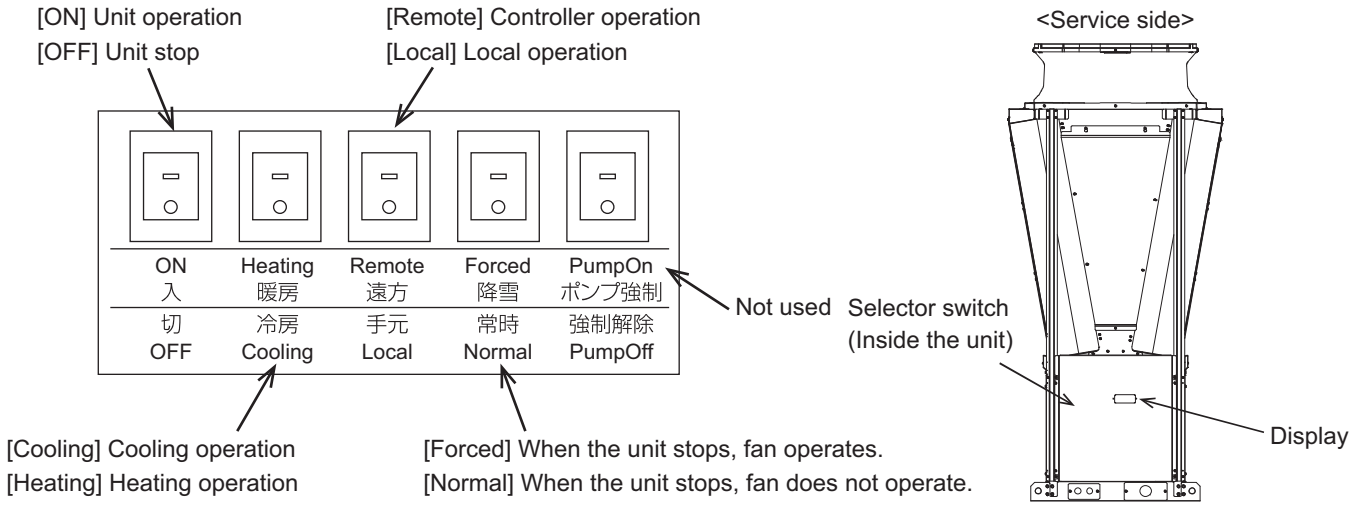
*1 Refer to [2] Test Run Method (page 109) for how to use the remote controller.

- 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] 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	Heating	Cooling
	During normal operation (outdoor temperature: between -20 ºC and +43 ºC)	During normal operation (outdoor temperature: between -15 ºC and +52 ºC)
Condensing temperature	Outlet water temperature + (0 - 5 °C)	Outdoor temperature + (3 - 8 °C)*
Evaporating temperature	Outdoor temperature - (5 - 11 °C)	Outlet water temperature - (0 - 5 °C)

* To maintain proper compression ratio, when the outdoor temperature is below 20 ºC, condensing temperature may exceed "(Outdoor temperature) - 8 ºC"

[5] Refrigerant

Unit type	EAHV/EACV-M1500/1800YCL
Refrigerant type	R32
Refrigerant charge	EAHV: 11.5 kg × 4 EACV: 4.7 kg × 4

* Amount of factory-charged refrigerant is 2.95 (kg) × 4. Please add the refrigerant on site.

[6] 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.

[7] Standard operating

Reference data

			50HP			60HP		
			EAHV		EACV	EAHV		EACV
			Heating	Cooling	Cooling	Heating	Cooling	Cooling
Ambient temperature	DB	°C	7	35	35	7	35	35
	WB	°C	6	24	24	6	24	24
Temperature	Discharge refrigerant	°C	98	87	93	99	90	95
	ACC inlet refrigerant	°C	2	9	9	1	9	8
	Water heat exchanger refrigerant	°C	41	7	6	42	6	6
	Air heat exchanger refrigerant	°C	1	37	37	2	38	37
	Outdoor temperature	°C	7	35	35	7	35	35
	Inlet water temperature	°C	40	12	12	40	12	12
	Outlet water temperature	°C	45	7	7	45	7	7
Pressure	High pressure	MPa	2.93	3.00	2.98	2.96	3.05	3.02
	Low pressure	MPa	0.68	0.90	0.87	0.68	0.89	0.87
LEV opening	Main circuit	pulse	595	778	705	711	915	836
Compressor	Frequency	Hz	66	66	65	77	77	77
Fan	Frequency	Hz	68	81	80	95	95	95

IX Troubleshooting

[1] Maintenance items

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

Input

Mark	Official Name	Meaning
CN3D-3	[MAIN] Flow switch [SUB] -	[MAIN] Normal/Error [SUB] -
CN3D-2	[MAIN] RUN [SUB] Outlet water temp. switching	[MAIN] Run/Stop (*Setting change through contact input can only be made when the power is turned on.) [SUB] ON 2nd (temp. 2)/OFF 1st (temp. 1)
CN3S-2	[MAIN] Fan mode [SUB] -	[MAIN] Forced/Normal [SUB] -
CN3N-3	[MAIN] Fan mode [SUB] -	[MAIN] Forced/Normal (*Setting change by switch on the unit.) [SUB] -
CN3N-2	[MAIN] Cooling/Heating switching [SUB] -	[MAIN] Heating/Cooling (*Setting change by switch on the unit.) [SUB] -
CN3K-2	[MAIN] Mode change (Cooling ECO) [SUB] -	[MAIN] Cooling ECO/Cooling [SUB] -
CN3K-3	[MAIN] Pump Interlock [SUB] -	[MAIN] Normal/Error [SUB] -
CN511-3	[MAIN] Remote/Local switching [SUB] -	[MAIN] Remote/Local (*Setting change by switch on the unit.) [SUB] -
CN3S-3	[MAIN] Cooling/Heating switching [SUB] -	[MAIN] ON → Heating/OFF → Cooling (*Setting change through contact input can only be made when the power is turned on.) [SUB] -
CN3Y-2	[MAIN] Demand [SUB] -	[MAIN] ON/OFF [SUB] -
CN211-2	[MAIN] Anti-Freeze [SUB] -	[MAIN] ON/OFF [SUB] -
CN211-3	[MAIN] Mode change (Heating ECO) [SUB] -	[MAIN] Heating ECO/Heating [SUB] -
CN212-2	[MAIN] Run (Local) [SUB] -	[MAIN] Run/Stop (Setting change by switch on the unit.) [SUB] -
CN212-3	[MAIN]- [SUB] -	[MAIN] - [SUB] -

Unit condition

Mark	Meaning
TH1	Discharge refrigerant temp. A
TH2	Discharge refrigerant temp. B
TH3	Air hex refrigerant temp. A
TH4	Air hex refrigerant temp. B
TH5	Water hex refrigerant temp. A
TH6	Water hex refrigerant temp. B
TH7	ACC inlet refrigerant temp. A
TH8	ACC inlet refrigerant temp. B
TH9	Outdoor temperature
TH10	Inlet water temp. (Upstream)
TH11	Inlet water temp. (Downstream)
TH12	Outlet water temp.
TH16	External water sensor 2
TH17	External water sensor 1
4-20mA (2)	Nothing
4-20mA (3)	Target water temperature/Capacity control (4-20mA)
Analog volt (3) [V]	Target water temperature/Capacity control (1-5 V, 0-10 V, 2-10 V)
ETm	Target ET
TdSH_limA	Discharge SH threshold A
TdSH_limB	Discharge SH threshold B
IdcA	COMP bus current A
VdcA	COMP bus voltage A
IuA	Phase-U current of compressor A
IwA	Phase-W current of compressor 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
Ts	Target water temperature
Twg	External water temperature (TH17 is higher priority to show the value than TH16.)
Tout	Outdoor temperature
CTm	Target CT
Twi_ave	Average inlet water temperature in same group
Two_ave	Average outlet water temperature in same group
THHSA	Heat sink temperature A
VunbA	Voltage unbalance A

THHSB	Heat sink temperature B
VunbB	Voltage unbalance B
FanIuA	U phase fan output current A
FanIuB	U phase fan output current B
FanIwA	W phase fan output current A
FanIwB	W phase fan output current B
FanTHHSA	Fan INV heat sink thermo A
FanTHHSB	Fan INV heat sink thermo B
CompTempDclA	Compressor DCL temperature A
CompTempDclB	Compressor DCL temperature B
CompIdclA	Compressor DCL current A
CompIdclB	Compressor DCL current B
CompRippleVA	Compressor ripple voltage A
CompRippleVB	Compressor ripple voltage B
HPA	High pressure sensor A
LPA	Low pressure sensor A
HPB	High pressure sensor B
LPB	Low pressure sensor B
63H	High pressure switch
LEV_AM_C	Main LEV (cooling) A opening degree
LEV_AM_H	Main LEV (Heating) A opening degree
LEV_BM_C	Main LEV (cooling) B opening degree
LEV_BM_H	Main LEV (Heating) B opening degree
LEV_Ainj	Injection LEV A opening degree
LEV_Binj	Injection LEV B opening degree
SHsA	Target SH A
SHA	ACC inlet SH A
SCA	SC A
TdSHA	Discharge Ref. SH A
SHsB	Target SH B
SHB	ACC inlet SH B
SCB	SC B
TdSHB	Discharge Ref. SH B
Start up	0: Start up/1: Start up end
Two Temp setting	Outlet water temp. switching setting ON/OFF
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
Demand (Ope)	contact input/remote controller (MA)/contact input & 4-20mA
Dtemp	Defrost start temperature
On/Off Ctrl	Run/Stop
Fan Mode	OFF/ON → Normal operation/Forced operation
Mode	Cooling/Heating/Heating ECO/Anti-Freeze
Water temp Ctrl	TH17 ON/OFF
Main Water temp Ctrl	Water temp control of External water sensor (OFF/ON)
Mode Ctrl	Stop/Heating/Cooling/Thermo stand-by/Defrost/Force Stop/Anti-freeze/ Defrost stand-by/Pump stand-by/Retry/Error Stop/Heating ECO/Cooling ECO
Remote/Manual Ctrl	Remote/Manual
Remain1A (min)	Remaining time for compressor A restart by 12 min limitation
Remain2A (min)	Remaining time for compressor A restart by 2 min limitation
Remain3A (min)	Remaining time A
Remain1B (min)	Remaining time for compressor B restart by 12 min limitation
Remain2B (min)	Remaining time for compressor B restart by 2 min limitation
Remain3B (min)	Remaining time B
Defrost Mode	Other/Wait/On
Err code	Error code
Detail	Error code detail
Defrost Ask	Defrost Ask
Month	Month (00 - 12)
Day	Day (00 - 31)
Time	Time (00:00)
Demand (%)	Maximum capacity demand (%)
Cap (kw)	Capacity
Ele-Pw (kw)	Power consumption
EER/COP	EER/COP
Flow rate	Water flow rate

All-Units	The number of units
Run-Units	The number of operating units
Ant-frz Ctrl	Anti-freeze control (Pump operation command) (0/1 → OFF/ON)
Re-Ant-frz (startup)	Retry for anti-freeze (start up)
Re-Ant-frz (stationary)	Retry for anti-freeze (stationary)
Init-Run Ctrl	Initial run control (0/1 → OFF/ON)
Total-Comp (Hz)	Total compressor frequency
TotalA (hr)	Total operating time for compressor A
ON/OFF-CntA	Count of ON/OFF for compressor A
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
Comp ON/OFF	Compressor ON/OFF
PumpOnTimer	Nothing
CTA	Condensing temperature A
ETA	Evaporating temperature A
CTB	Condensing temperature B
ETB	Evaporating temperature B
Pd bkup1	Limitation of increasing compressor frequency (Discharge pressure error)
Pd bkup2	Forced unload compressor (Discharge pressure error)
Ps bkup1-2	Forced LEV open (Low pressure control)
Td bkup1	Limitation of increasing compressor frequency (Discharge temperature control)
Td bkup2	Forced unload compressor (Discharge temperature control)
Liquid bag bkup	Protection of Liquid back
Cold-low bkup	Protection of hot water upper 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)
Cfan bkup	Protection of control FAN
SConA	Main LEV A is controlled by SC (ON/OFF)
SConB	Main LEV B is controlled by SC (ON/OFF)
Start up	0: Start up/1: Start up end
Ps bkup1-1	Limitation of increasing compressor frequency (Low pressure control)
Ps bkup2	Forced unload compressor (Low pressure control)
IH_A	Heater for compressor A
IH_B	Heater for compressor B
Ps-up bkupA	Forced increase compressor (Low pressure control) A
Ps-up bkupB	Forced increase compressor (Low pressure control) B

Output

Mark	Official Name	Meaning
X05	[MAIN] 4way valve 1A [SUB] 4way valve 2A	[MAIN] 0/1 → OFF/ON [SUB] 0/1 → OFF/ON
X06	[MAIN] 4way valve 1B [SUB] 4way valve 2B	[MAIN] 0/1 → OFF/ON [SUB] 0/1 → OFF/ON
X72	-	13 V output (CN72C)
X72A	-	Signal for 72A
X101	[MAIN] Heating operation display output [SUB] Supplementary heater signal output	[MAIN] 0/1 → Cooling/Heating [SUB] 0/1 → OFF/ON
X102	[MAIN] Error display output (individual unit) [SUB] Error display output (System leader unit only)	[MAIN] 0/1 → Normal/Error (individual unit) [SUB] 0/1 → Normal/Error (System leader unit only)
X103	[MAIN] Defrost signal output [SUB] Operation display output (System leader unit only)	[MAIN] 0/1 → Normal/Defrost [SUB] 0/1 → Stop/Run (System leader unit only)
X104	[MAIN] Drain pan heater signal output [SUB] -	[MAIN] 0/1 → OFF/ON [SUB] -
X105	[MAIN] Pump operation command output [SUB] -	[MAIN] 0/1 → OFF/ON [SUB] -
X106	[MAIN] Operation display output (individual unit) [SUB] -	[MAIN] 0/1 → Stop/Run (individual unit) [SUB] -
X601	[MAIN] Control box cooling fan A, B [SUB] Control box cooling fan A, B	[MAIN] 0/1 → OFF/ON [SUB] 0/1 → OFF/ON
INVRST	Inverter Reset	0/1 → Err/Normal INV board reset output
FANOUT	Inverter Reset	0/1 → Err/Normal INV board reset output

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

Time of data storage before error

Mark	Meaning
TH1	Discharge refrigerant temp. A
TH2	Discharge refrigerant temp. B
TH3	Air hex refrigerant temp. A
TH4	Air hex refrigerant temp. B
TH5	Water hex refrigerant temp. A
TH6	Water hex refrigerant temp. B
TH7	ACC inlet refrigerant temp. A
TH8	ACC inlet refrigerant temp. B
TH9	Outdoor temperature
TH10	Inlet water temp. (Upstream)
TH11	Inlet water temp. (Downstream)
TH12	Outlet water temp.
HPA	High pressure sensor A
LPA	Low pressure sensor A
HPB	High pressure sensor B
LPB	Low pressure sensor B
CTm	Target CT
ETm	Target ET
TdSH_limA	Discharge SH threshold A
TdSH_limB	Discharge SH threshold B
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
SHA	ACC inlet SH A
SCA	SC A
TdSHA	Discharge Ref. SH A
SHsB	Target SH B
SHB	ACC inlet SH B
SCB	SC B
TdSHB	Discharge Ref. SH B
FanIuA	U phase fan output current A
FanIuB	U phase fan output current B
FanIwA	W phase fan output current A
FanIwB	W phase fan output current B
FanTHHSA	Fan INV heat sink thermo A
FanTHHSB	Fan INV heat sink thermo B
CompTempDclA	Compressor DCL temperature A
CompTempDclB	Compressor DCL temperature B
CompIdclA	Compressor DCL current A
CompIdclB	Compressor DCL current B
CompRippleVA	Compressor ripple voltage A
CompRippleVB	Compressor ripple voltage B
Month	Month (00 - 12)
Day	Day (00 - 31)
Time	Time (00:00)
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
CTA	Condensing temperature A
ETA	Evaporating temperature A
CTB	Condensing temperature B
ETB	Evaporating temperature B
LEV_AM_C	Main LEV (cooling) A opening degree
LEV_AM_H	Main LEV (Heating) A opening degree
LEV_BM_C	Main LEV (cooling) B opening degree
LEV_BM_H	Main LEV (Heating) B opening degree
LEV_Ainj	Injection LEV A opening degree
LEV_Binj	Injection LEV B opening degree

[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.
		Water temperature is low. (Heating)	The setting for the automatic Start/Stop thermistor is too low.	Change the setting for the automatic Start/Stop thermistor.
The unit is in operation, but the water does not heat up. (Heating)	Water temperature is low.	The water inlet/outlet temperature differential is normal.	The water-heating 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.
	Water temperature is high.	-	Water flow shortage	Increase the water flow rate.
			Problem with the external devices	Repair the devices.
The unit is in operation, but the water does not cool down. (Cooling)	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: Upstream side 102, 202: Downstream 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: A circuit 102: B circuit		No water Water supply cutoff	• Linear expansion valve fault • High-pressure sensor fault	○	○
1176	Discharge SH fault 101: A circuit 102: B 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: A circuit 102: B 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: A circuit 102: B circuit		-	• ACC inlet refrigerant temperature thermistor fault • Linear expansion valve fault • Low-pressure sensor fault	○	○
5109	Ther-mistor fault	Outdoor temperature (TH9)	-	• Broken or shorted thermistor wiring	○	○
5110		Inlet water temperature (TH10)	-	• Broken or shorted thermistor wiring	○	○
5111		Inlet water temperature (TH11)	-	• Broken or shorted thermistor wiring	○	○
5112		Outlet water temperature (TH12)	-	• Broken or shorted thermistor wiring	○	○
5107 5108		ACC inlet refrigerant temperature (TH7, 8/TH107, 108)	-	• Broken or shorted thermistor wiring	○	○
5103 5104		Air heat exchanger refrigerant temperature (TH3, 103/TH4, 104)	-	• Broken or shorted thermistor wiring	○	○
5105 5106		Water heat exchanger refrigerant temperature (TH5, 105/TH6, 106)	-	• Broken or shorted thermistor wiring	○	○
5101 5102		Discharge refrigerant temperature (TH1, 101/TH2, 102) 101: Sensor error 103: Installation error	-	• Broken or shorted thermistor wiring	○	○
5116		External water sensor 2 fault (TH116)	-	• Broken or shorted thermistor wiring	○	○
5117		External water sensor 1 fault (TH117)	-	• Broken or shorted thermistor wiring	○	○
5201	High-pressure sensor fault/high-pressure fault 101: A circuit 102: B circuit		-	• Broken or shorted pressure sensor wiring	○	○
5202	Low-pressure sensor fault/low-pressure fault 101: A circuit 102: B 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)	○	○
4102	Open phase		There is an open phase.	• Circuit board 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 or above is detected momentarily while the compressor is in operation.) 101: A circuit 102: B 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			Drop in water flow Water temperature drop	-	×	×
426*	Cooling fan fault			-	• Cooling fan fault	○	○
4122	Fan interlock fault			Disconnection of wiring	• Fan motor fault • FANCONT board fault	○	○
425* (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	○	○
425* (102)		ACCT overcurrent		-	• INV board fault • Ground fault of the compressor • Coil problem • IPM error (loose terminal screws, cracked due to swelling)	○	○
425* (107)		Overcurrent relay trip (effective value) (During operation)		-		○	○
425* (106)		Overcurrent relay trip (momentary value) (During operation)		-		○	○
425* (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)	○	○
425* (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	○	○
425* (137)		Fan motor stepping out error		Fan motor stepping out	• Fan motor fault • Fan INV board, wiring fault	○	○
422* (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	○	○
422* (109)			Bus voltage rise protection	Incorrect power supply voltag	• INV board fault	○	○
422* (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	○	○
422* (129)			Control power supply error	Control power supply failure	• INV board, main board fault • Broken wiring between INV and main control board	○	○
422* (131)			Inverter bus voltage faul	Power supply voltage dro	• MAIN board fault • Power supply voltage drop	○	○
423* (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)	○	○
424*		Overload protection		Clogged heatsink cooling air passage Power supply voltage drop	• Cooling fan fault • Current sensor fault • INV circuit fault • Compressor fault	○	○
530* (115)		ACCT sensor fault		-	• INV board fault • Ground fault of the compressor and IPM error	○	○

Error code *1	Error type		Cause (Installation/Setting error)	Cause (Parts problems)	Error reset *2	
					Operation SW	
					Selector switch	Remote controller
530* (117)	Inverter error	ACCT sensor/circuit fault	-	• INV board fault	○	○
530* (119)		Open-circuited IPM/loose ACCT sensor	-	• ACCT sensor fault • Broken compressor wiring • INV circuit fault (IPM error etc.)	○	○
530* (120)		Faulty wiring	-	• INV board fault	○	○
5114 (0*)		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) CN210)		Analog input type fault (SW6-1, SW6-2)	• Broken or open analog signal output device wiring (CN210)	—	—
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					—	—
0206	Expansion board error		Control failure	• Wiring, connector fault between expansion and main control board • Expansion board, main control board fault	×	×
7100	Capacity code error		Other capacity units in a group	• Group setting fault	—	—
7105	Address setting error		Address setting except for 01 - 50	• Main control board fault	○	○
7109	Prevention error of malfunction		Change setting value that requires power supply reset	• System and switch setting check	○	○
7130	Combination error		Different model in system	• Different model check • Main control board fault	○	○
8000	Normal		-	-	—	—

*1: If an error occurs, error codes shown above will appear in the 4-digit digital display on the PCB 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	×	◎
4106	Power supply fault	-	×	◎
4122	Fan interlock fault	4172	×	◎
4126	Analog input error	-	—	—
422*	Inverter bus voltage fault	432*	○	◎
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 (TH12)	-	×	◎
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	-	×	◎
0206	Expansion board error	-	×	◎
7100	Capacity code error	-	×	×
7102	Connection count error	-	×	◎
7105	Address setting error	-	×	◎
7109	Prevention error of malfunction	-	×	◎
7113 7117	Model setting error	-	×	◎
7130	Combination error	-	×	◎

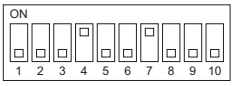
○: One side circuit can be operated.
◎: Another module can be operated.
×: Operation impossible
—: Not abnormal stop
*1: Case of the one pump system
*2: Case of the communication error between the MAIN and SUB circuits
3: "" shows types of components. (0/1: COMP A, 2: COMP B, 5: FAN A, 6: FAN B)

[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 (SW4) 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 → Internal pressure drop due to gas leakage
2) When the pressure displayed on the LD1 is about 0 - 0.098 MPa → Check the connector for contact failure and disconnection and see (4)
3) When the pressure displayed on the LD is 4.15 MPa 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 → The high pressure sensor and the main circuit board are normal
2) When the difference in pressure is over 0.098 MPa → 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 → The high pressure sensor is malfunctioning
2) When the pressure displayed on the LD1 is about 4.15 MPa → The main circuit board is malfunctioning

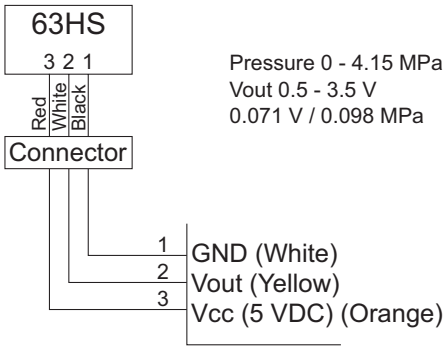
(4) Remove the high pressure sensor from the main circuit board, short-circuit 2-3 of the connector (63HS), and check the pressure displayed on the LD1.

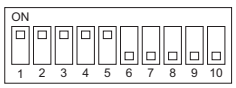
1) When the pressure displayed on the LD1 is 4.15 MPa or above → The high pressure sensor is malfunctioning
2) When 1) does not apply → The main circuit board is malfunctioning

2. High pressure sensor structure

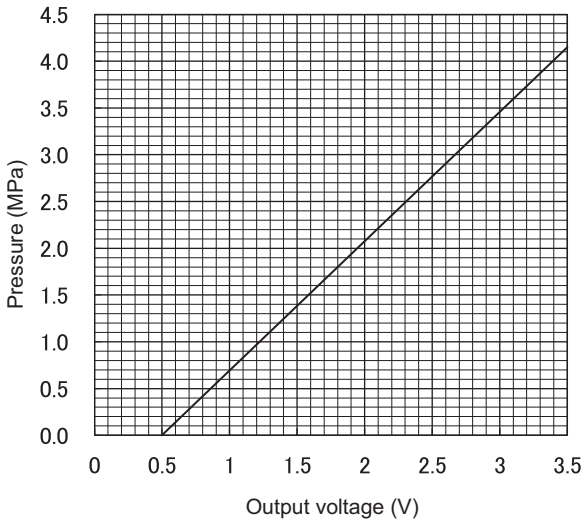
The high pressure sensor consists of the circuit shown on the right. When 5 VDC is applied between red and black, a voltage corresponding to pressure is output between white and black, and this voltage is taken in by the microcomputer.
The output voltage is 0.071 V per 0.098 MPa.

* 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.





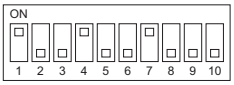
The figure at left shows that the switches 1 through 5 are set to ON and 6 through 10 are set to OFF.



-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 (SW4) 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 → Internal pressure drop due to gas leakage
2) When the pressure displayed on the LD1 is about 0 - 0.098 MPa → Check the connector for contact failure and disconnection and see (4)
3) When the pressure displayed on the LD is 1.7 MPa 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 → The low pressure sensor and the main circuit board are normal
2) When the difference in pressure is over 0.03 MPa → 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 → The low pressure sensor is malfunctioning
2) When the pressure displayed on the LD1 is about 1.7 MPa → 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 or above → The low pressure sensor is malfunctioning
2) When 1) does not apply → The main circuit board is malfunctioning

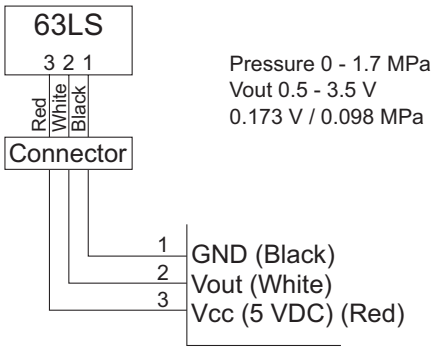
(5) Remove the high pressure sensor (63HS) from the main circuit board, connect the sensor to the connector for the low pressure sensor (63LS), and check the pressure displayed on the LD1.

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

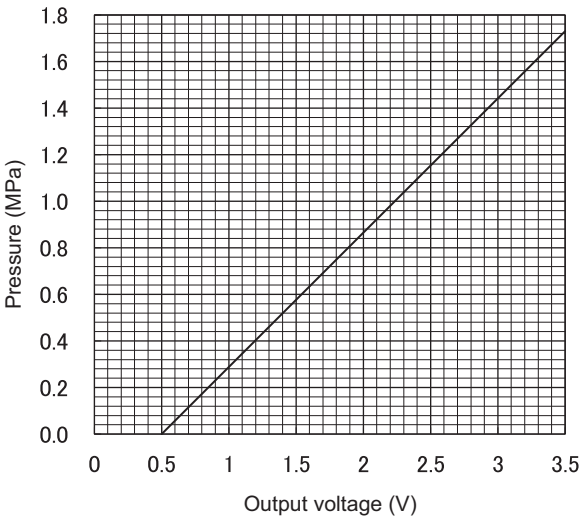
2. Low pressure sensor structure

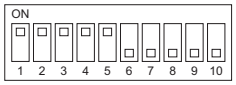
The low pressure sensor consists of the circuit shown on the right. When 5 VDC is applied between red and black, a voltage corresponding to pressure is output between white and black, and this voltage is taken in by the microcomputer.
The output voltage is 0.173 V per 0.098 MPa.

* 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.



Pressure 0 - 1.7 MPa
Vout 0.5 - 3.5 V
0.173 V / 0.098 MPa



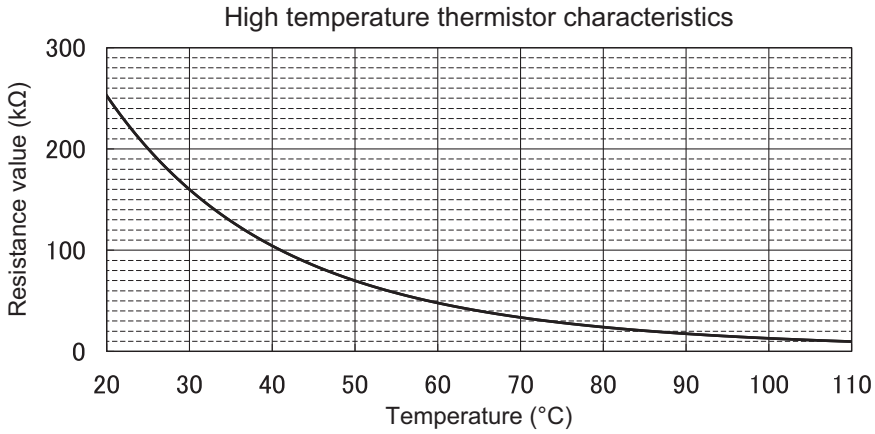


The figure at left shows that the switches 1 through 5 are set to ON and 6 through 10 are set to OFF.

-3- Temperature sensor

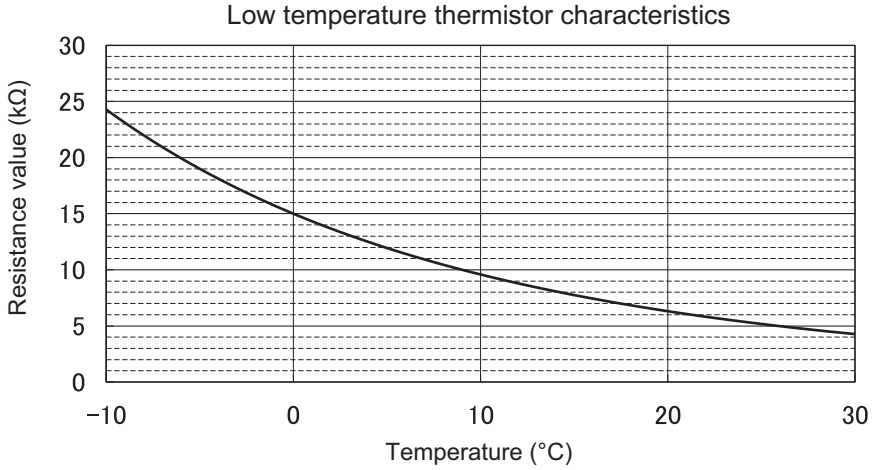
Perform a check while comparing sensor detection temperature and measured value.
See the diagram below for comparison with sensor resistance value.

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



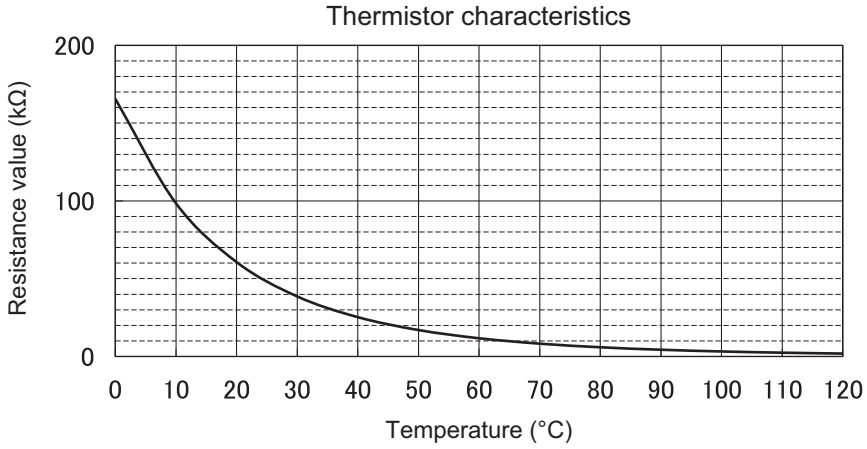
Upper limit value of the sensor temperature characteristic	150°C or more
Lower limit value of the sensor temperature characteristic	-30.0°C or less

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 or more
Lower limit value of the sensor temperature characteristic	-30.0°C or less

3. Thermistor (THHS)



-4- LEV

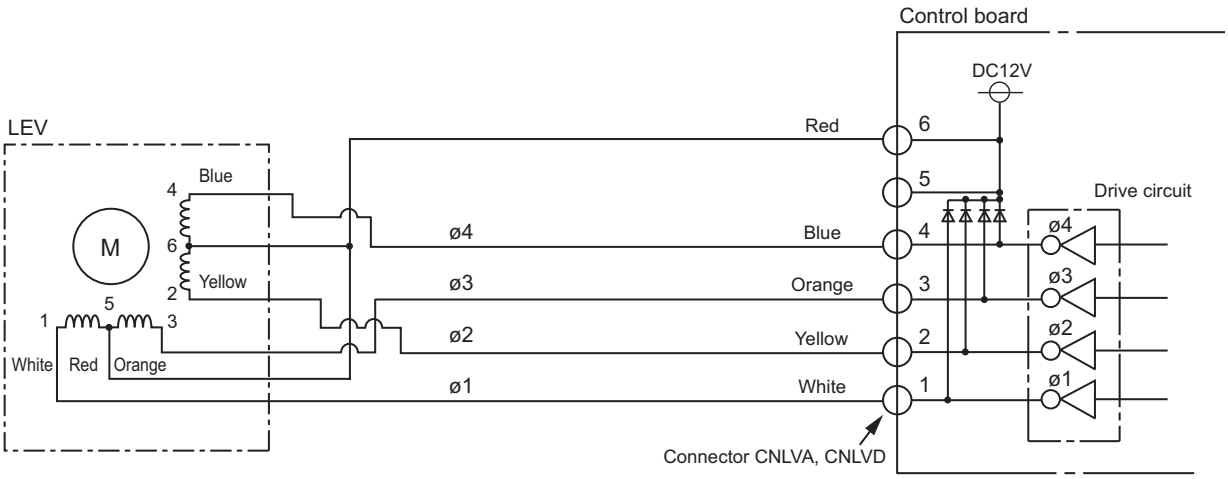
Main LEV

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

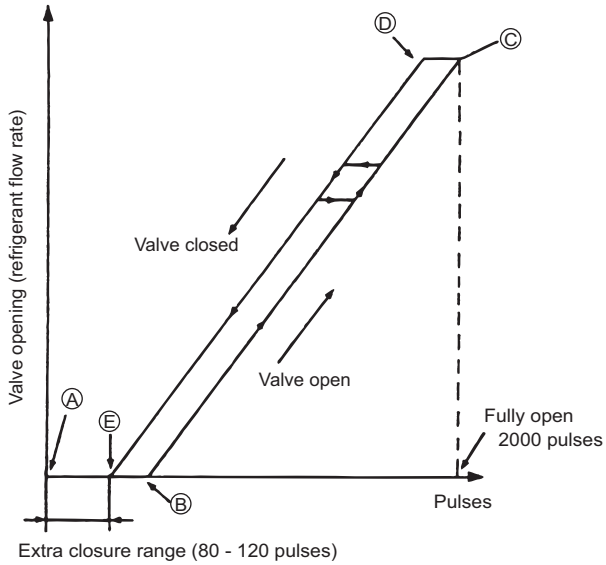
Output (phase) number	Output state			
	1	2	3	4
ϕ1	ON	OFF	OFF	ON
ϕ2	ON	ON	OFF	OFF
ϕ3	OFF	ON	ON	OFF
ϕ4	OFF	OFF	ON	ON

* 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 2200 pulse signal is sent to the LEV to determine the valve position and bring the valve to the position indicated by "Ⓐ" in the diagram. After the valve position has been adjusted to the position as indicated by Ⓐ in the diagram, the circuit board sends a 40-pulse signal to bring the LEV opening to the position as 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.

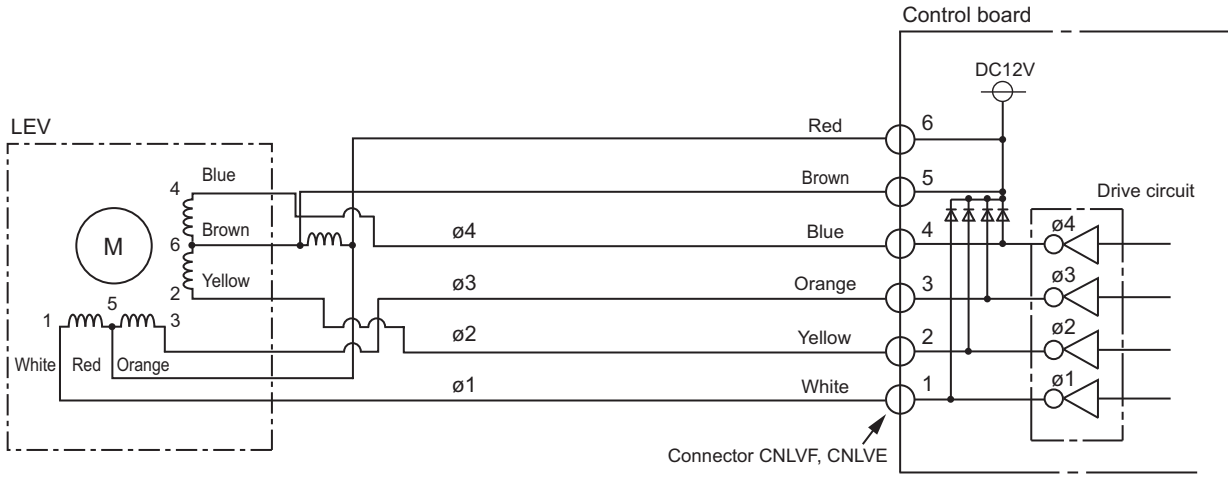
Injection LEV

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 0 ~ all open 480).

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

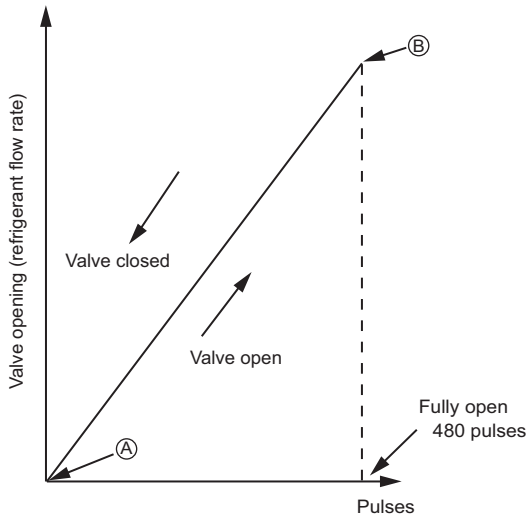
Output (phase) number	Output state							
	1	2	3	4	5	6	7	8
ϕ1	ON	ON	OFF	OFF	OFF	OFF	OFF	ON
ϕ2	OFF	ON	ON	ON	OFF	OFF	OFF	OFF
ϕ3	OFF	OFF	OFF	ON	ON	ON	OFF	OFF
ϕ4	OFF	OFF	OFF	OFF	OFF	ON	ON	ON

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

Output pulses change in the following orders when the
Valve is closed; 8 → 7 → 6 → 5 → 4 → 3 → 2 → 1
Valve is open; 1 → 2 → 3 → 4 → 5 → 6 → 7 → 8

*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



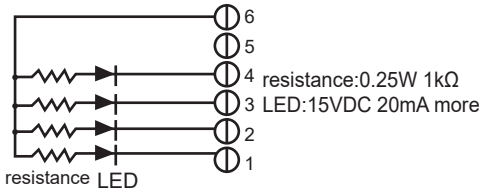
*Upon power on, a 520 pulse signal is sent to the LEV to determine the valve position and bring the valve to the position indicated by "Ⓐ" in the diagram. (Pulse signal is output for approximately 17 seconds.)

The LEV is free of noise and vibration when it is functioning properly, but it makes a noise when it becomes locked.

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

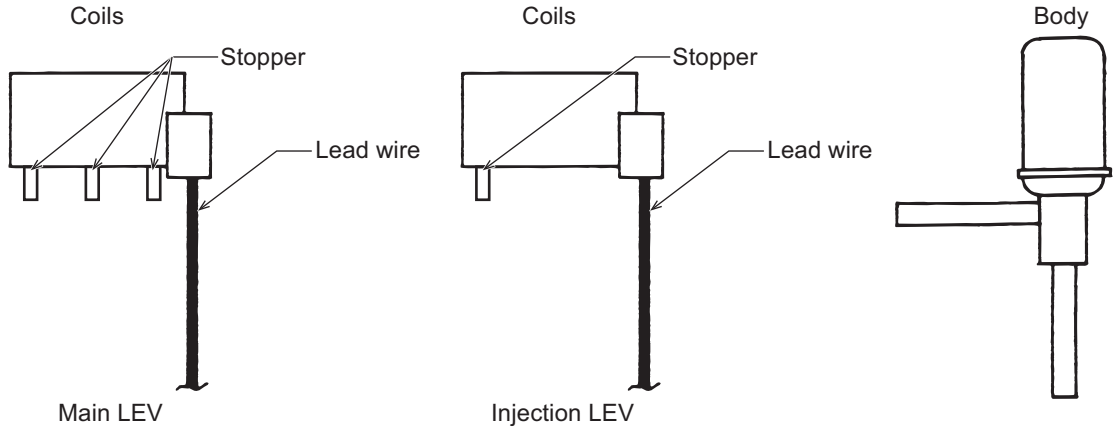
*If liquid refrigerant is present in the LEV, it may make the operating sound of the LEV difficult to detect.

(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 100 ± 10 ohm (Main LEV), 46 ± 4 ohm (Injection LEV).	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.

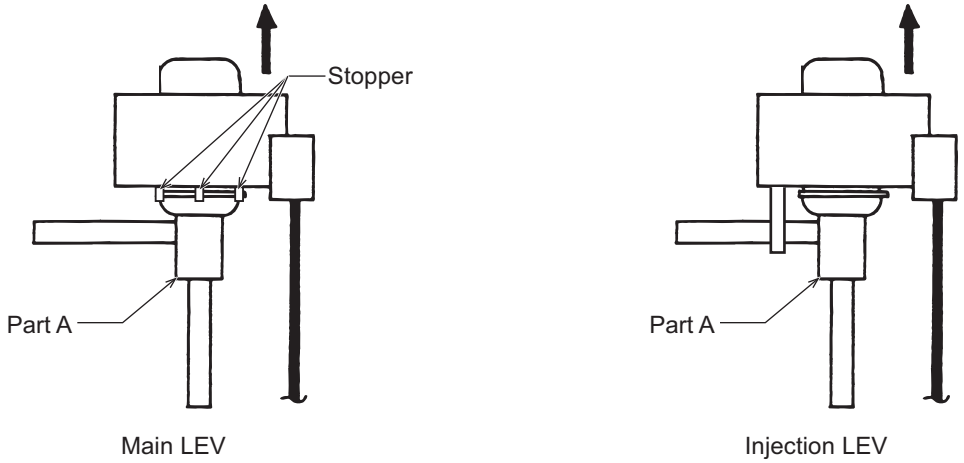
2. LEV coil removal procedure

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



(1) Removing the coils

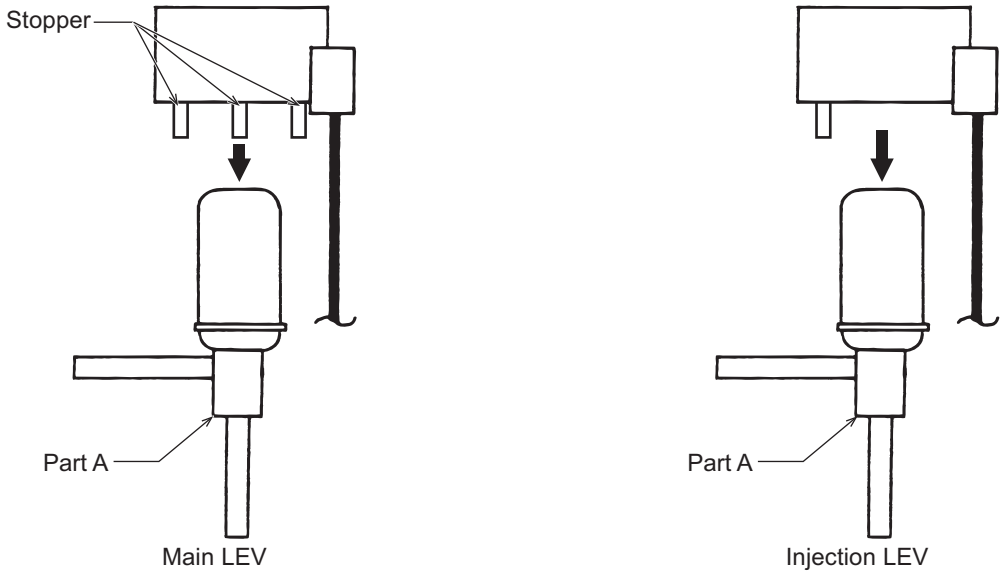
Fasten the body tightly at the bottom (Part A in the figure) so that the body will not move, then pull out the coils toward the top. If the coils are pulled out without the body gripped, undue force will be applied and the pipe will be bent.



(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.

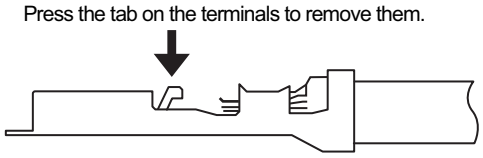


-5- Inverter

- 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 136)
[3]	Main power earth leakage breaker trip	Refer to "(4) Trouble treatment when the main power earth leakage breaker is tripped".(page 136)
[4]	Only the compressor does not operate.	Check the inverter frequency on the LED monitor and proceed to (2) - [3] if the compressor is in operation.(page 134)
[5]	The compressor vibrates violently at all times or makes an abnormal sound.	See (2)-[3].(page 134)
[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 chilling unit and other electric appliances.
		<7> If the error occurred suddenly, a ground fault of the inverter output can be considered. See (2)-[3].(page 134)
		*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, 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. (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 [2] 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 IH 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 IH for problems if there is no voltage imbalance. →When the error occurred, liquid refrigerant may have been present in the compressor.

	Items to be checked	Phenomena	Remedy
[4] 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)	
[5] 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 CNVDC/CNDCP 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 137) ♦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]-[5].

(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 137) ♦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

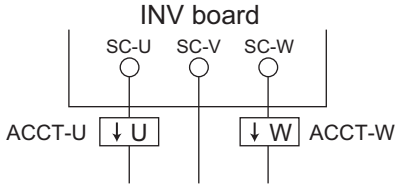
♦For easy on-site measurement of the earth leakage current, enable the filter with a measurement instrument that has filter functions as below, clamp all the power supply wires, and measure.
Recommended measurement instrument: CLAMP ON LEAK HiTESTER 3283 made by HIOKI E.E. CORPORATION
♦When measuring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

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

Note

Turn off the power supplied to the unit, and leave it off for at least 10 minutes. Check that the voltage across pins 1 (+) and 5 (-) of the connector RYPN1 is 20 VDC or less before removing components from the control box.

<table>
<tr><th>Part name</th><th>Judgment method</th></tr>
<tr><td>IGBT module</td><td>See "Troubleshooting for IGBT module". (IX [3] -5- (6)) (page 137)</td></tr>
<tr><td>Rush current protection resistor R1, R5</td><td>Measure the resistance between terminals R1A, R5A, R1B and R5B: 22 ohm ± 10%</td></tr>
<tr><td>Electromagnetic relay X901, X902</td><td>Note
This electromagnetic relay is rated at DC12V and is driven by a coil.
Check the resistance between terminals
 

<table><tr><th></th><th>Check point</th><th>Checking criteria</th></tr><tr><td>Coil</td><td>INV board
X901, X902
Across pins 1-2</td><td>160Ω ± 10%</td></tr><tr><td>Contact</td><td>INV board
FT-P1 and FT-P2
*Faston terminal removed</td><td>INV board CNRY
Open: ∞
INV board CNRY
At a voltage input of 12 VDC: 0Ω</td></tr></table></td></tr>
<tr><td>DC reactor DCL</td><td>Measure the resistance between terminals: 1ohm or lower (almost 0 ohm)
Measure the resistance between terminals and the chassis: ∞</td></tr>
<tr><td>Current sensor ACCT</td><td>Disconnect the wiring connector from CNCT2, and measure the inter-terminal resistance: 280Ω±30Ω
Between pins 1 and 2 (U-phase), pins 3 and 4 (W-phase)
 

*Check ACCT wiring for correct phase and direction.</td></tr>
</table>

(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.)

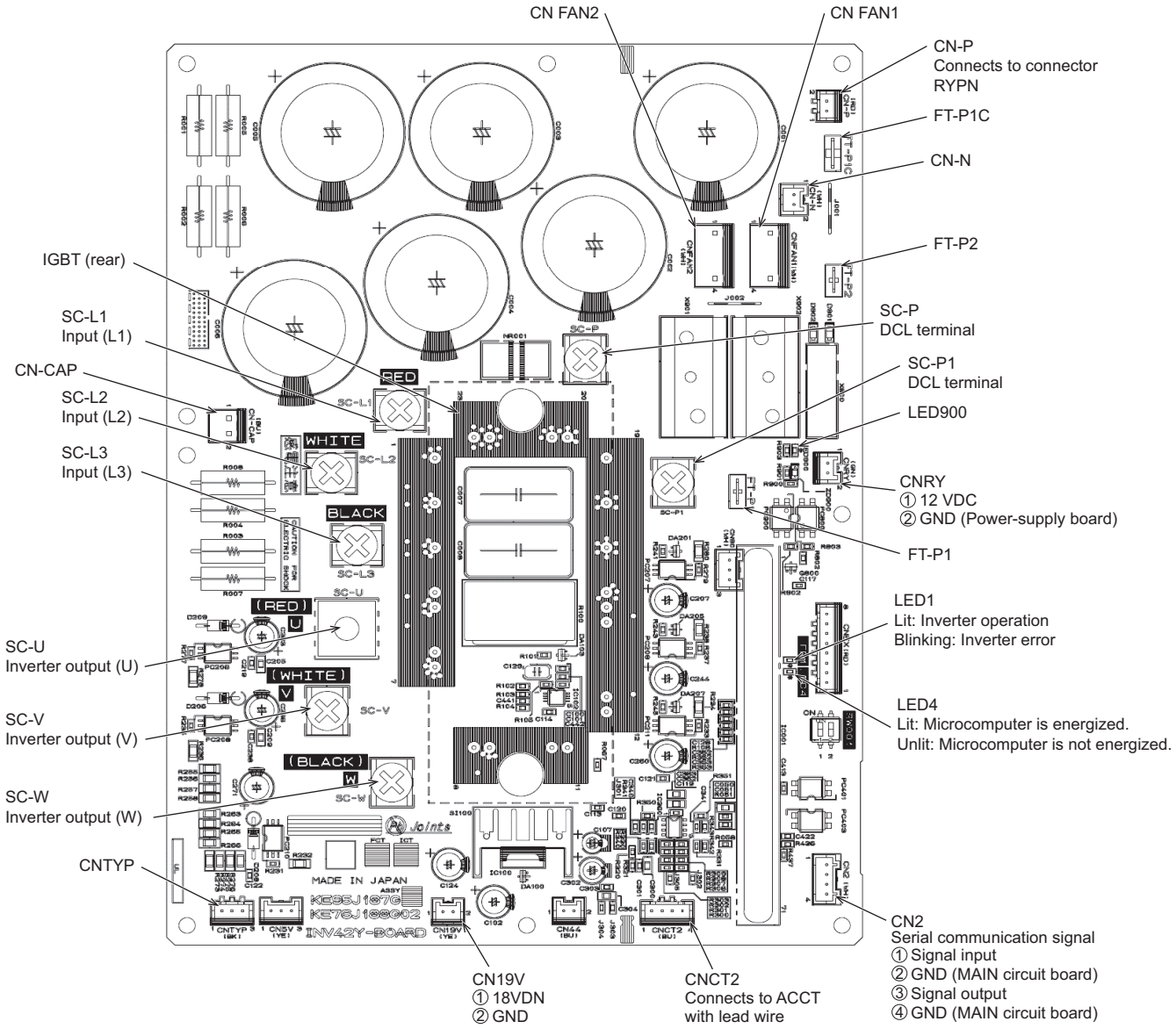
- Use a low-range tester if possible. A more accurate resistance can be measured.

Judgment value (reference)

		Black (+)				
		SC-P	CN-N	SC-L1	SC-L2	SC-L3
Red (-)	SC-P	-	-	5 - 200 ohm	5 - 200 ohm	5 - 200 ohm
	CN-N	-	-	∞	∞	∞
	SC-L1	∞	5 - 200 ohm	-	-	-
	SC-L2	∞	5 - 200 ohm	-	-	-
	SC-L3	∞	5 - 200 ohm	-	-	-

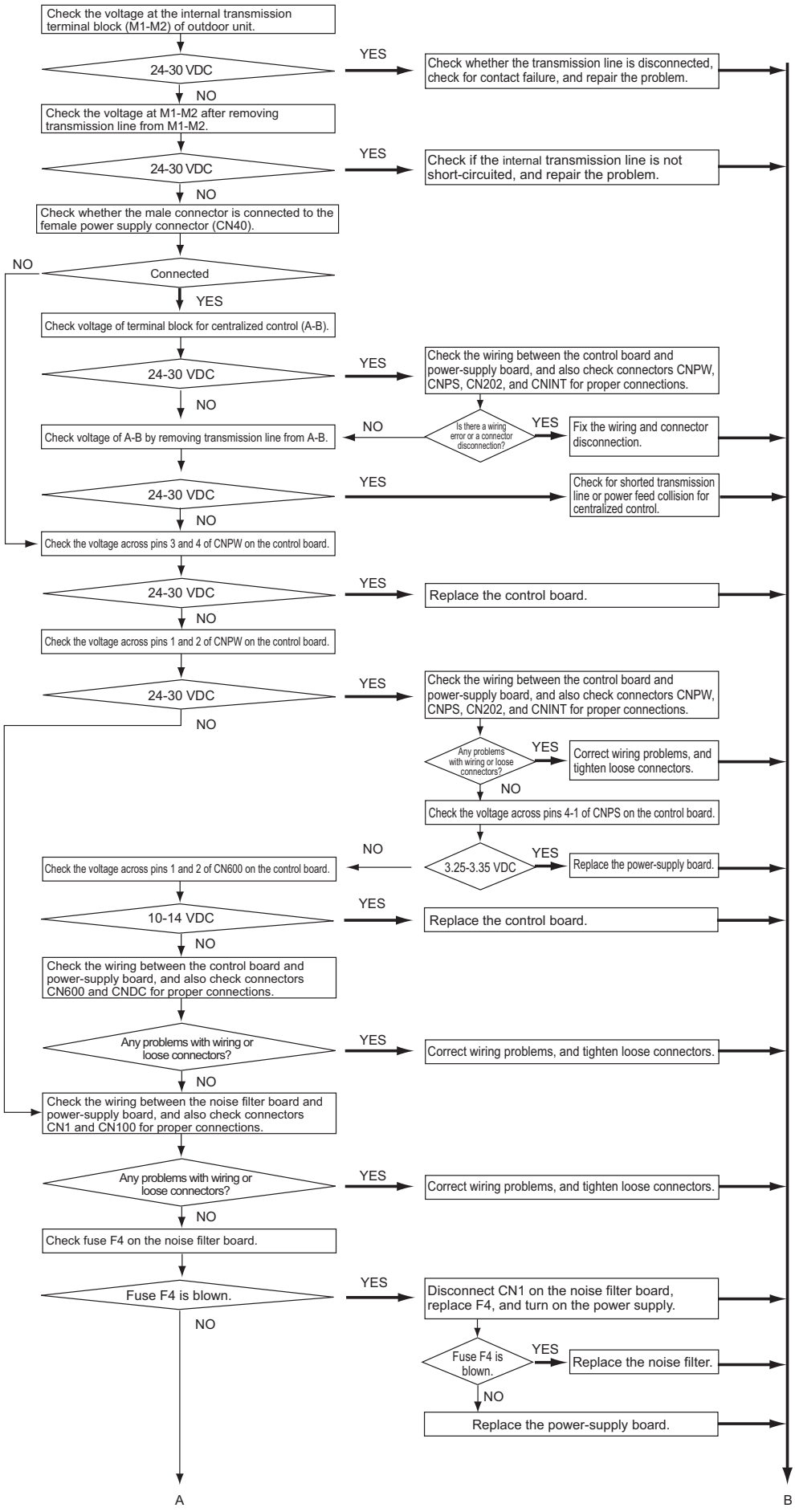
		Black (+)				
		SC-P1	CN-N	SC-U	SC-V	SC-W
Red (-)	SC-P1	-	-	5 - 200 ohm	5 - 200 ohm	5 - 200 ohm
	CN-N	-	-	∞	∞	∞
	SC-U	∞	5 - 200 ohm	-	-	-
	SC-V	∞	5 - 200 ohm	-	-	-
	SC-W	∞	5 - 200 ohm	-	-	-

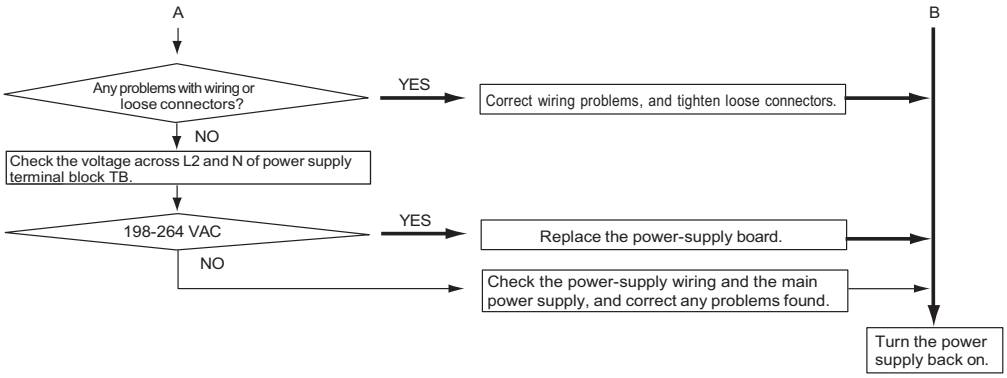
INV board external diagram



-6- Control Circuit

Troubleshooting transmission power circuit of unit




A
Any problems with wiring or loose connectors?
YES
Correct wiring problems, and tighten loose connectors.
B
NO
Check the voltage across L2 and N of power supply terminal block TB.
198-264 VAC
YES
Replace the power-supply board.
NO
Check the power-supply wiring and the main power supply, and correct any problems found.
Turn the power supply back on.

-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 EAHV: 11.5 kg or EACV: 4.7 kg of R32.

∗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.

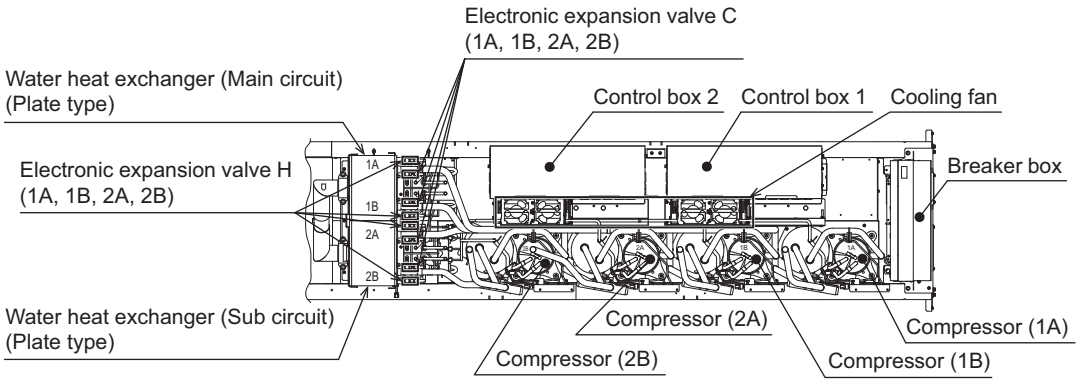
*1. Refer to Chapter I [5] Vacuum Drying (Evacuation) for detailed procedure. (page 7)

[5] Parts Replacement Procedures

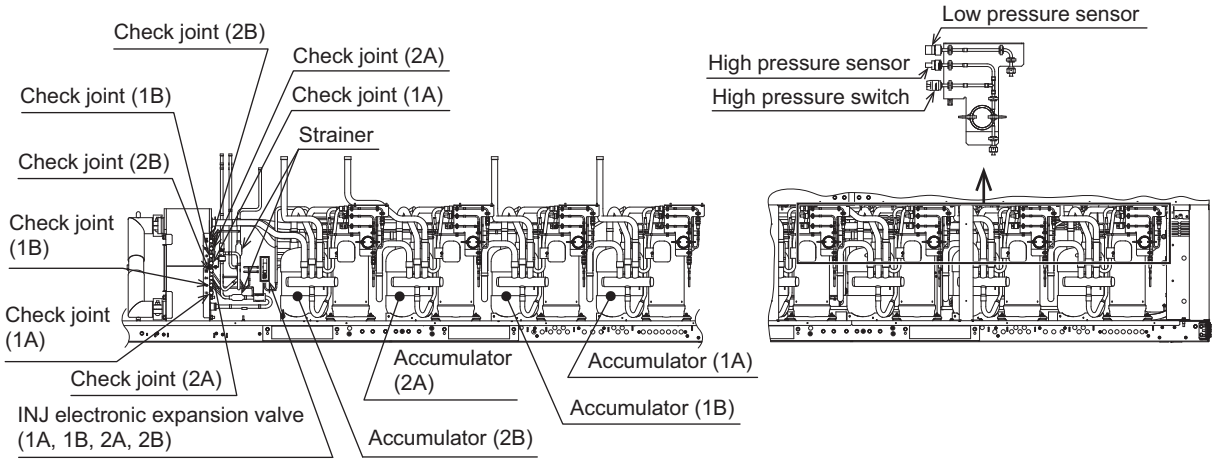
⚠ WARNING

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

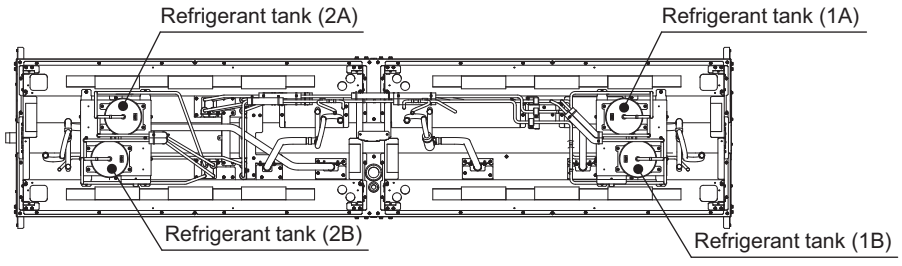
- Doing so may cause the unit or pipes to burst, or result in explosion or fire during use, during repair, or at the time of disposal of the unit.
- It may also be in violation of applicable laws.
- MITSUBISHI ELECTRIC CORPORATION cannot be held responsible for malfunctions or accidents resulting from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



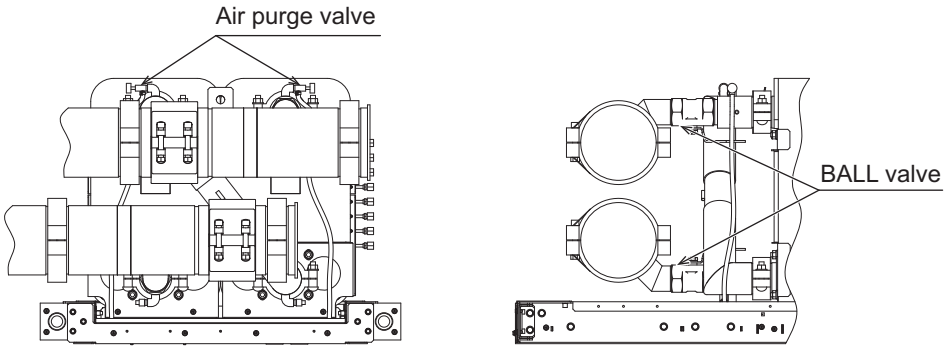
Sensor section details



EAHV type



<Standard piping type>



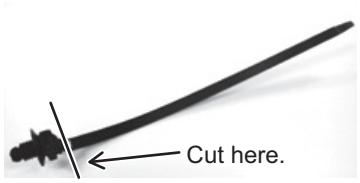
<Inside header piping type>

Compressor Replacement Instructions

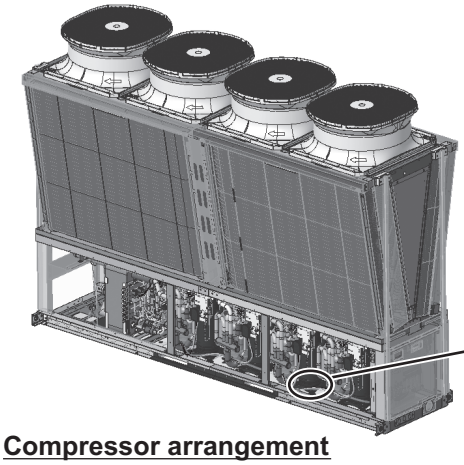
Required tools

- Screwdriver (for M4 and M5 screws)
- Nippers (for cutting the tie band)
- Small ratchet (for M6 nuts)
- Metal saw
- Welding tool set

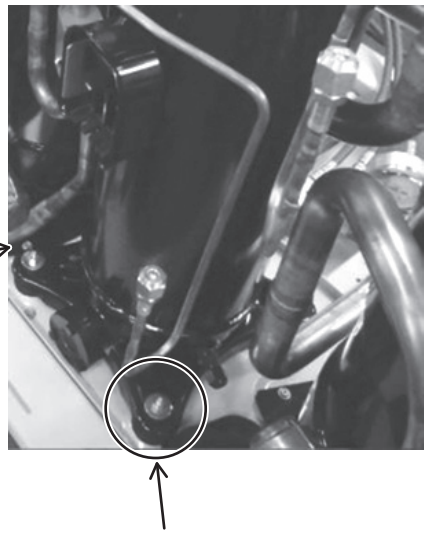
* Notes on tie band (cable tie with a locking device)
If you accidentally cut the cable tie on tie band during replacement, cut off the tie all the way to the locking device, and insert a regular cable tie (5 mm max.) through the locking device.



Location of the nut that requires a small ratchet

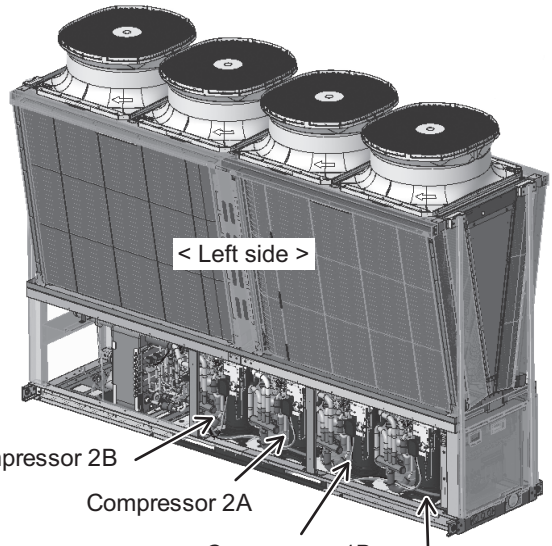


Compressor mounting nut (M6)



Compressor arrangement

< Compressor weight > 45 kg



< Opposite side of the service side >

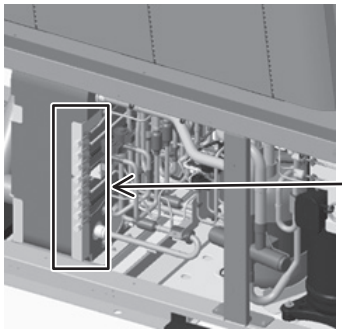
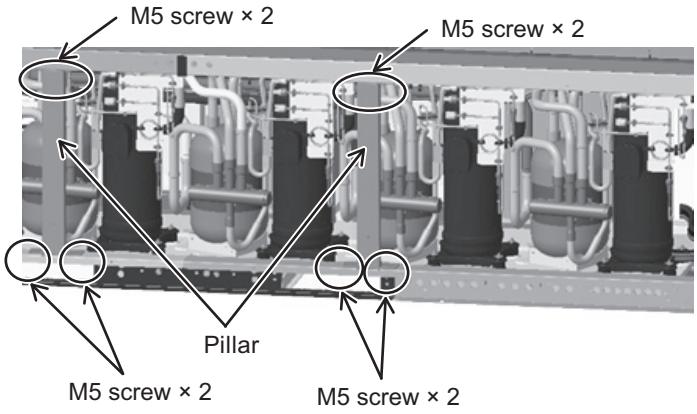
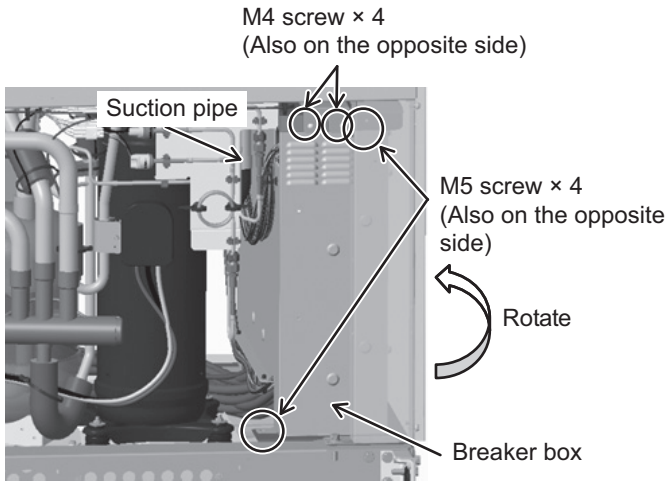
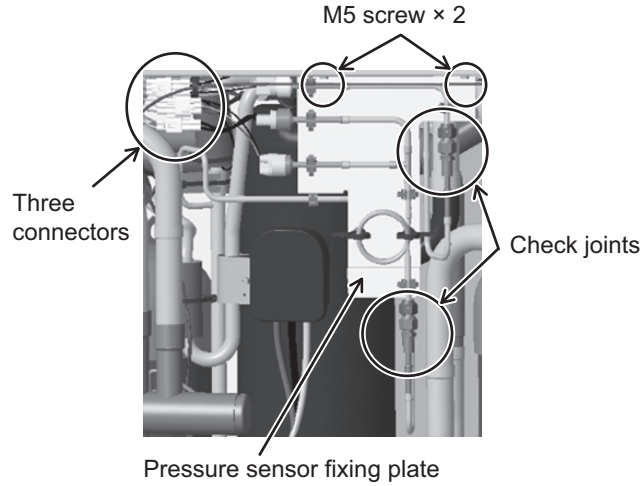
< Service side >

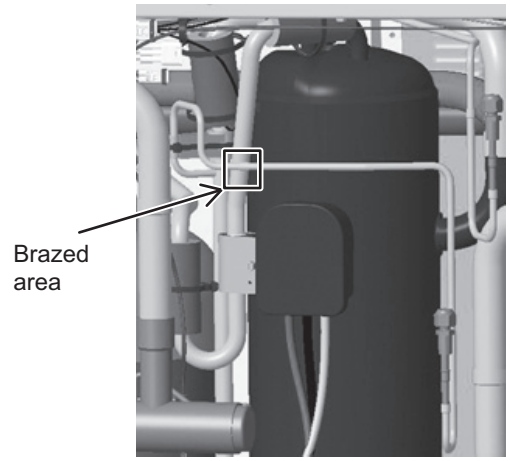
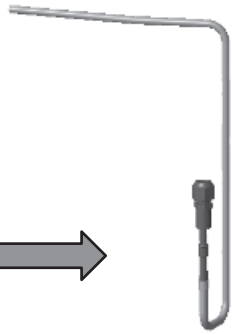
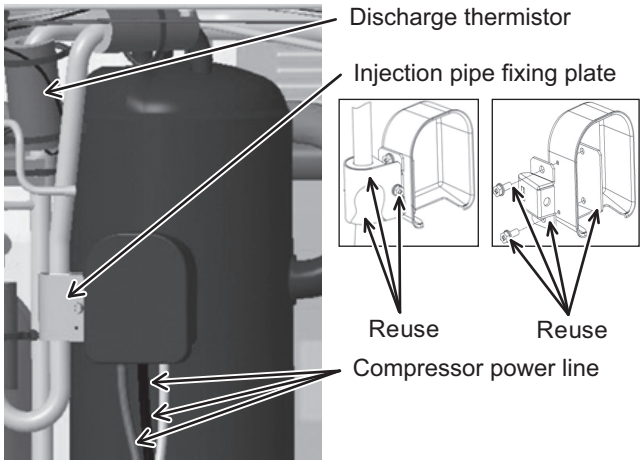
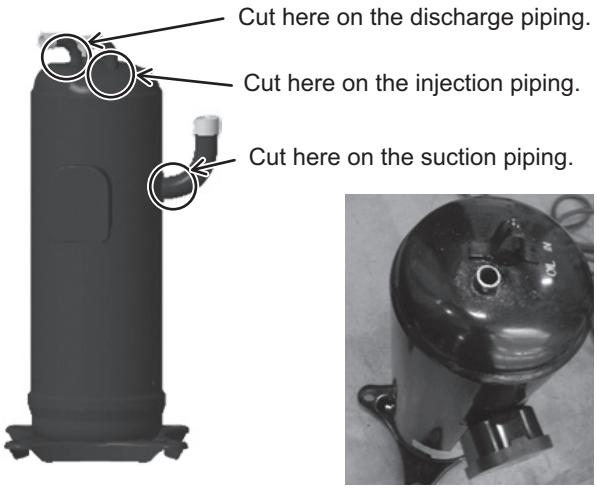
Compressor 2B

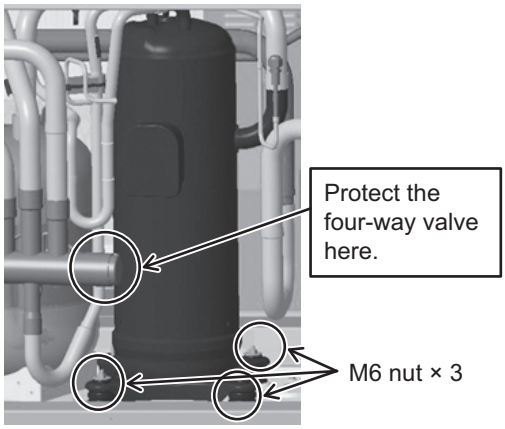
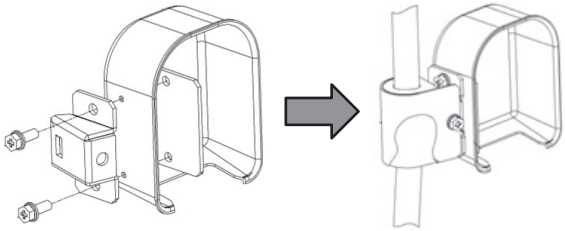
Compressor 2A

Compressor 1B

Compressor 1A

1	 < Left side > Check joint (in order from top to bottom) ▪ HP 2B ▪ HP 2A ▪ HP 1B ▪ HP 1A ▪ LP 2B ▪ LP 2A ▪ LP 1B ▪ LP 1A	①Recover the refrigerant through the check joint (low-pressure (LP) side) on the left side of the unit next to the plate heat exchanger side. * Each refrigerant circuit is independent. Only collect the refrigerant from the system whose LEV needs to be replaced. ■ Refrigerant (R32) EAHV type: 11.5 kg per circuit EACV type: 4.7 kg per circuit
2	 	①When replacing compressors 1B, 2A, and 2B, remove the pillars by unscrewing the eight M5 screws. Pillar: Mounted with M5 screws (3.0±0.3 Nm) * When the pillar is removed, the frame will sag down by its own weight.
3	 	①When replacing compressor 1A, remove the four M5 screws and four M4 screws, and move the breaker box out of the way, avoiding the wire running near the suction pipe.
4	 	①Remove the two check joints, two pressure sensors, and three connectors. ②Remove the pressure sensor fixing plate by unscrewing the two M5 screws. * The pressure sensor or the high pressure switch does not need to be removed from the pipe fixing saddle to do the work.

5		①Disconnect the check joint pipe located in front of the compressor by removing the braze from the areas shown in the figure. 
6		①Remove the three M5 screws from the compressor, and disconnect the compressor power line. Power line: M5 (2.2±0.2 Nm) ②Remove the discharge temperature sensor from the discharge pipe. ③Remove the injection pipe fixing plate and the two packing rubbers by unscrewing the M5 screws. Injection pipe fixing plate: M5 (3.0±0.3 Nm)
7		①Cut off the discharge pipe, suction pipe, and injection pipe at their roots with a saw or a pipe cutter. * Note that there may be cases where there is not enough room for a pipe cutter. ②Heat the brazed area, and remove the pipe from the compressor. * When heating the brazed area, make sure to cover the area inside the unit with a fireproof sheet.

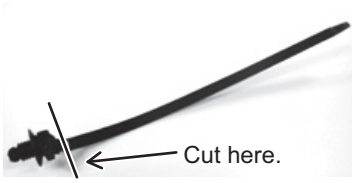
8	 Example 	①Remove the compressor by unscrewing the three M6 nuts. Compressor: Fixed with an M6 nut (5.6±0.6 Nm) * When removing the compressor, cut the tie band holding the wire in front of the compressor. *When removing the compressor, tilt it forward. * Protect the four-way valve when removing the compressor.
9		①Reverse the procedure to complete the replacement. * When installing the compressor, start with the suction pipe side, and properly align the compressor with the pipe. * When the unit is airtight or charged with refrigerant, pressurize the unit from the high pressure side. Failure to do so may damage the compressor. ■ Refrigerant (R32) EAHV type: 11.5 kg per circuit EACV type: 4.7 kg per circuit

Water-to-Refrigerant Heat Exchanger Replacement Instructions

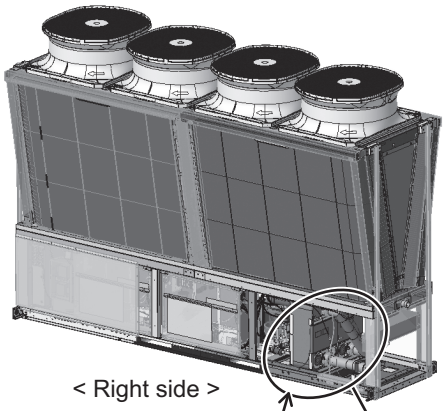
Required tools

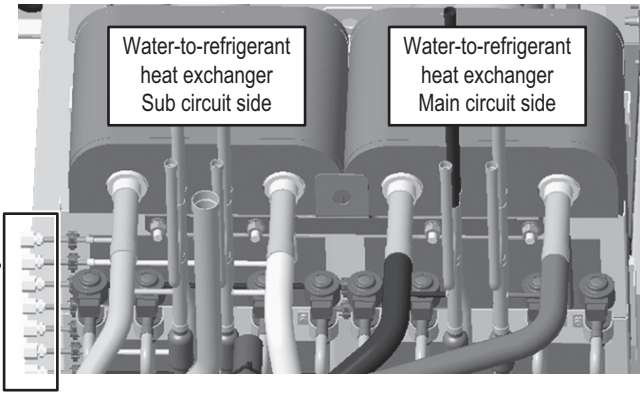
- Screwdriver (for M5 screws)
- Nippers (for cutting tie band)
- 17-mm spanners (for M10 nuts)
- 19-mm spanners (for M12 bolts and nuts)
- Metal saw
- Welding tool set

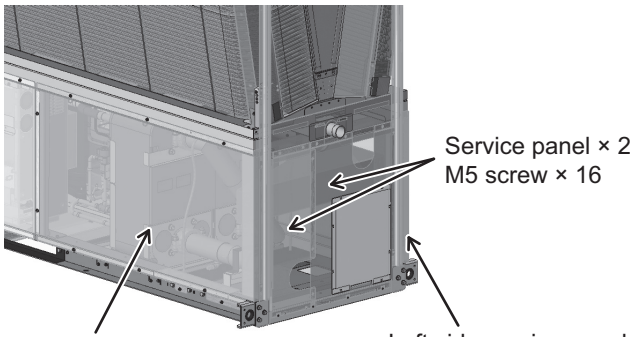
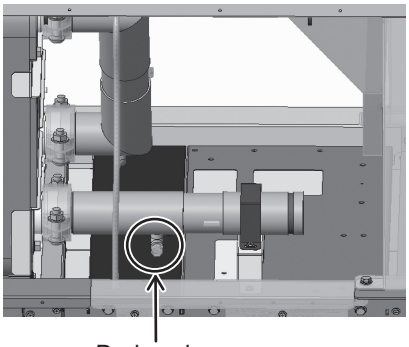
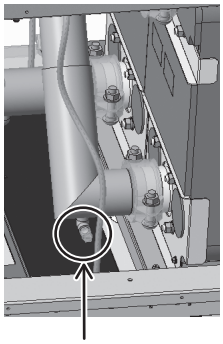
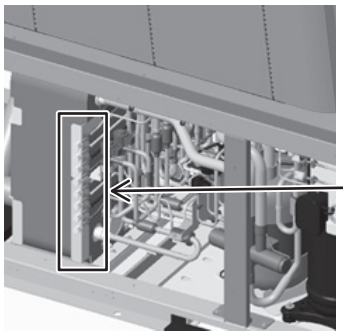
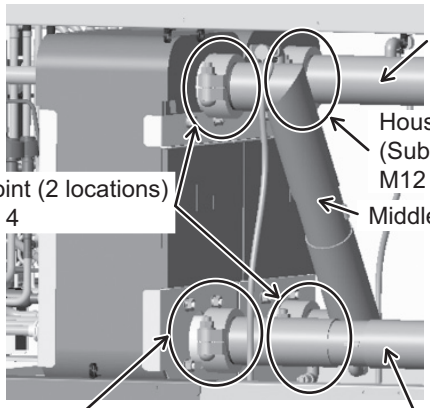
* Notes on tie band (cable tie with a locking device)
  If you accidentally cut the cable tie on tie band during replacement, cut off the tie all the way to the locking device, and insert a regular cable tie (5 mm max.) through the locking device.

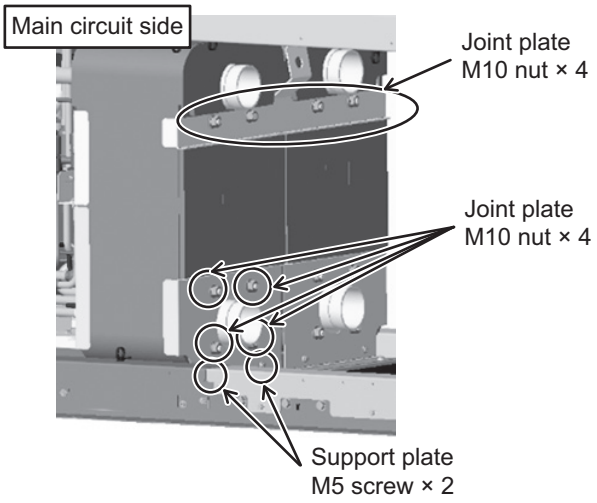
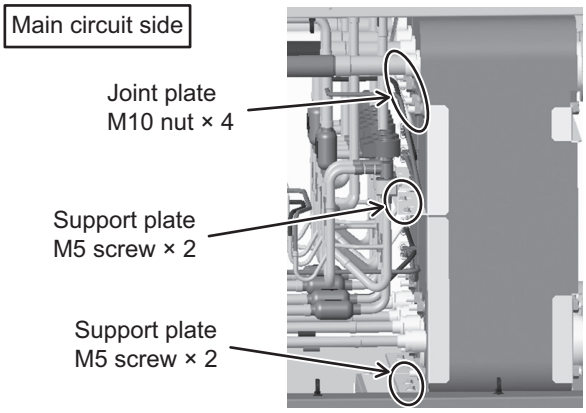
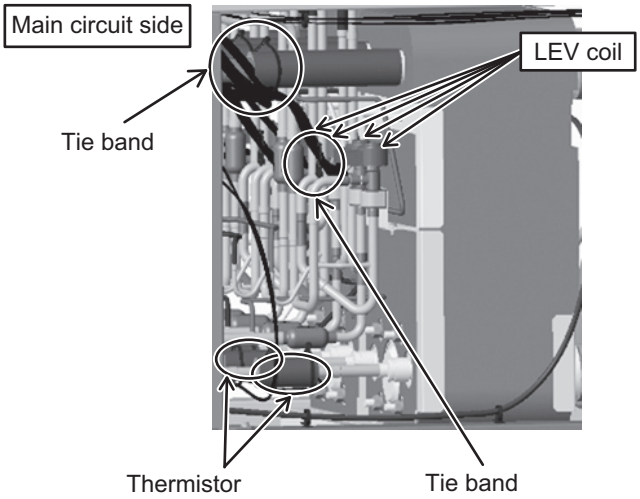


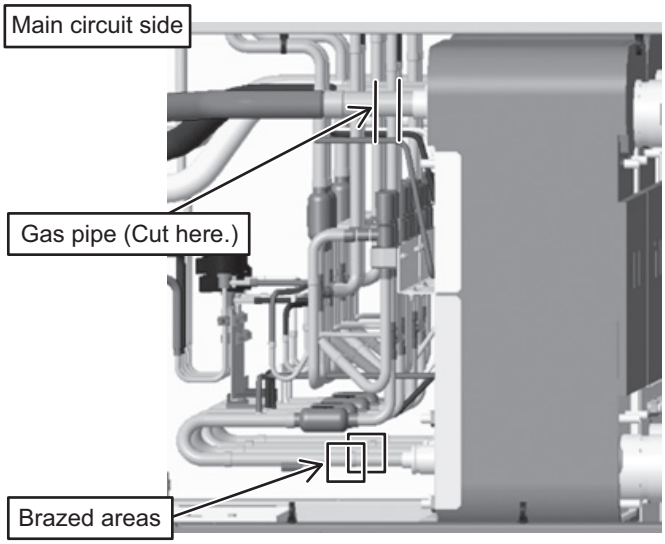
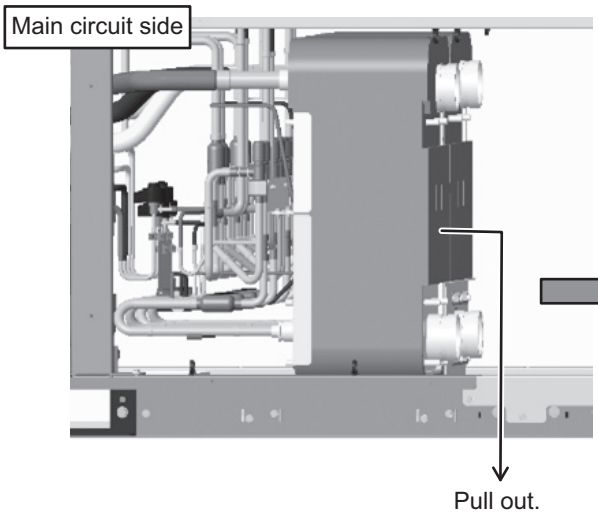
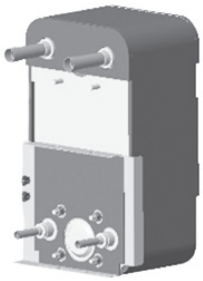
Water-to-refrigerant heat exchanger arrangement





1	 < Opposite side of the service side >	①Remove the service side panels from the opposite side of the service side. Panel: Fixed with M5 screws (3.0±0.3 Nm)
2	< Right side >  Drain valve < Left side >  Drain valve	①Completely drain the water from the water circuit.
3	 < Left side > Check joint (in order from top to bottom) · HP 2B · HP 2A · HP 1B · HP 1A · LP 2B · LP 2A · LP 1B · LP 1A	①Recover refrigerant through the check joint (low-pressure (LP) side) on the left side of the unit next to the plate heat exchanger side. * Each refrigerant circuit is independent. Only collect the refrigerant from the system whose heat exchanger needs to be replaced. ■ Refrigerant (R32) EAHV type: 11.5 kg per circuit EACV type: 4.7 kg per circuit
4		①Remove the middle water pipe. Housing joint: M12 nut ②Remove the housing joint from the heat exchanger to be replaced, and then remove the water pipes. Housing joint: M12 nut

5		①Remove the upper joint plate from the water pipe side. Joint plate: Fixed with M10 nuts (26.5±4 Nm) ②Remove the lower support plate from the heat exchanger to be replaced. Support plate: Fixed with M5 screws (3.0± 0.3 Nm) and M10 nuts (26.5±4 Nm) * Do the same for the Sub circuit side.
6		①Remove the upper joint plate of the heat exchanger on the LEV side. Joint plate: Fixed with M10 nuts (26.5±4 Nm) ②Remove the lower support plate of the heat exchanger to be replaced on the LEV side. Support plate: Fixed with M5 screws (3.0± 0.3 Nm) * Do the same for the Sub circuit side.
7		①Cut the tie band as required, and remove the LEV coil. EAHV type: 4 locations; EACV type: 2 locations ②Remove the thermistor below the LEV. * Do the same for the Sub circuit side.

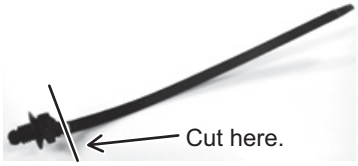
8		①Remove the pipes below and above the LEV by removing the braze from the areas shown in the figure. Liquid pipe: ø15.88 (2 locations) ②Cut the gas pipe with a metal saw. * Note that there may be cases where there is not enough room for a pipe cutter. ③Heat the brazed area, and remove the compressor pipe. * Do the same for the Sub circuit side.
9		①Move the heat exchanger horizontally, and remove it from the unit. Weight: 48 kg  * Do the same for the Sub circuit side.
10		①Install the plate removed in step 10 to the new heat exchanger. Heat exchanger fixing plate: M10 nut (26.5±4 Nm) ②Reverse the procedure to complete the replacement. * When the unit is airtight or charged with refrigerant, pressurize the unit from the high pressure side. Failure to do so may damage the compressor. ■ Refrigerant (R32) EAHV type: 11.5 kg per circuit EACV type: 4.7 kg per circuit

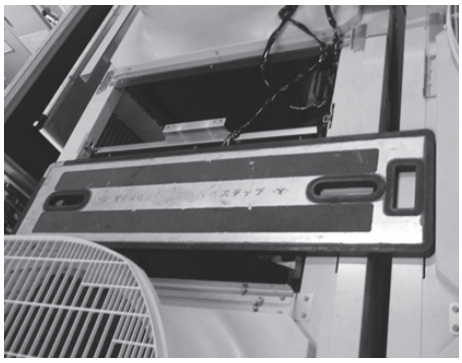
Fan Replacement Instructions

Required tools

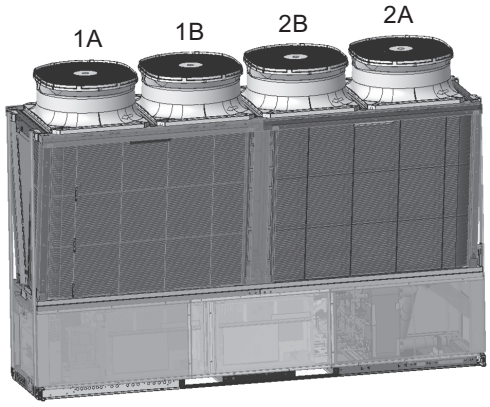
- Screwdrivers (for M5 and M6 screws)
- Nippers (for cutting the tie band)
- Spanners (for M12 hexagon cap nuts)
- Stepladder (approx. 2 m)
- Scaffold board (approx. 1150 × 300 × 20 mm)

* Notes on tie band (cable tie with a locking device)
  If you accidentally cut the cable tie on tie band during replacement, cut off the tie all the way to the locking device, and insert a regular cable tie (5 mm max.) through the locking device.





Fan motor position

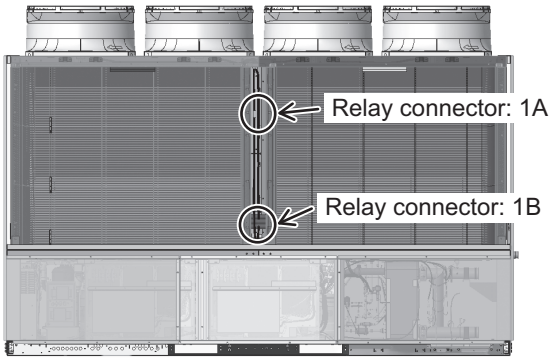


< Service side >

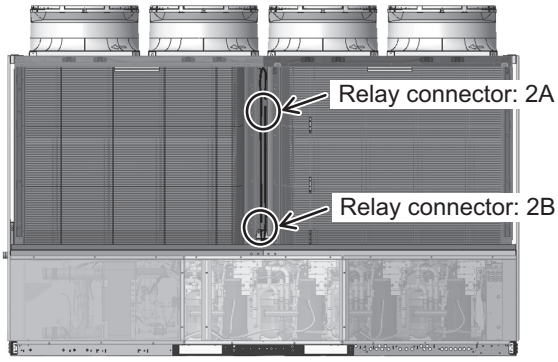
< Opposite side of the service side >

< Right side >

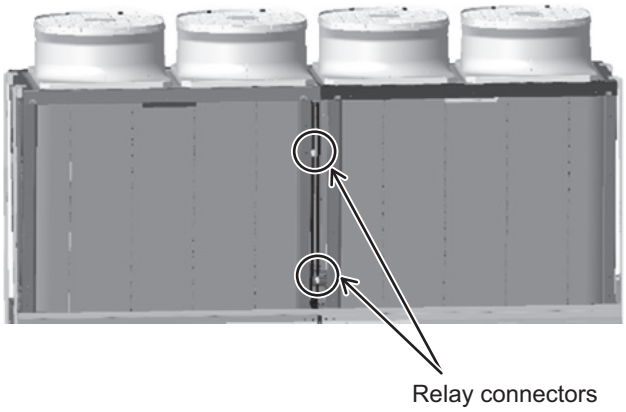
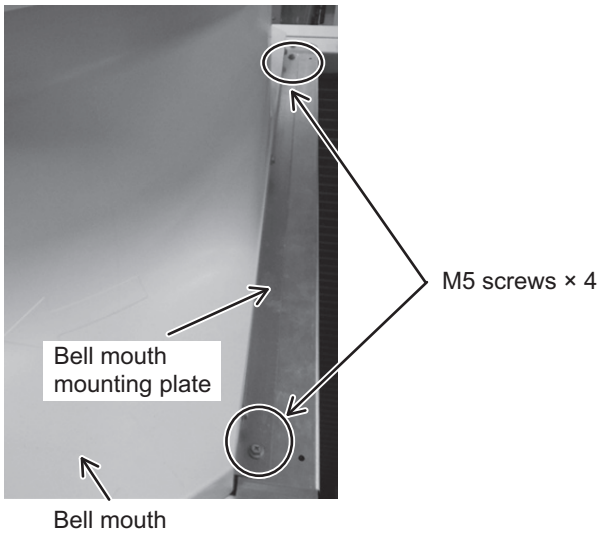
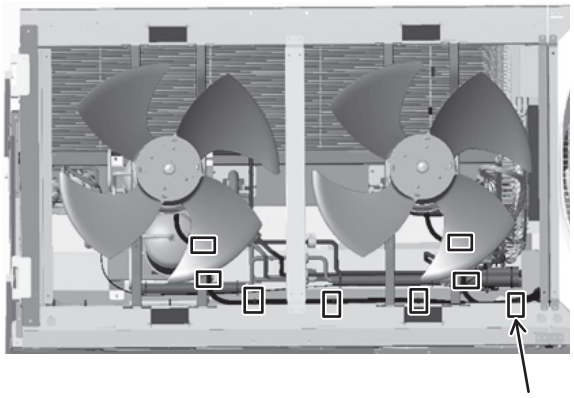
Fan motor relay connector position

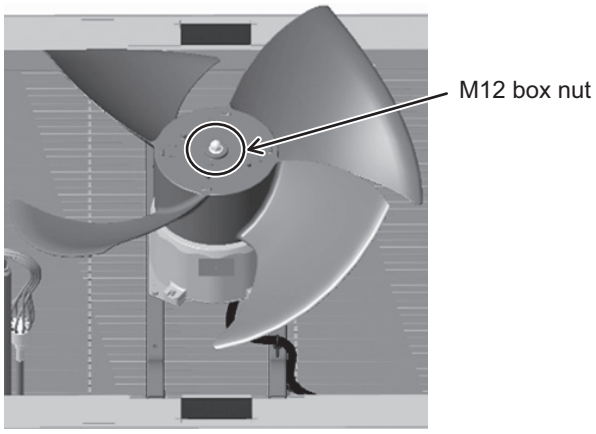
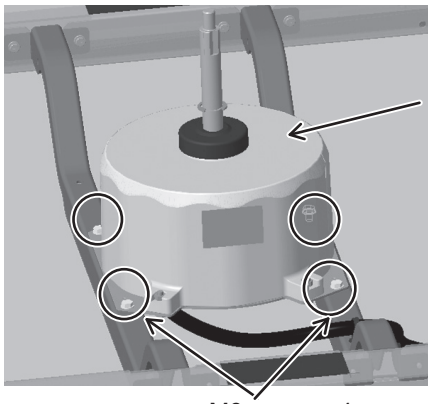


< Right side >



< Left side >

1		①Remove the center panel by unscrewing the ten M5 screws from the panel. Panel: Fixed with ten M5 screws (3.0±0.3 Nm) ②Disconnect the fan motor relay connectors. * When replacing the fan motors (1A, 1B), remove the relay connectors on the right side. When replacing the fan motors (2A, 2B), remove the relay connectors on the left side.
2		①Remove the bell mouth together with the bell mouth mounting plate by unscrewing the four M5 screws. Bell mouth mounting plate: M5 screw (3.0±0.3 Nm) * The screws on the bell mouth side are holding the bell mouth and the bell mouth mounting plate. * When replacing the 1A fan motor, remove the 1B bell mouth.
3		①Cut the tie band. Bundle the fan motor wire, and place it near the fan motor.

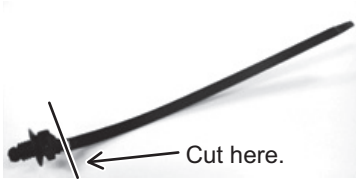
4		①Remove the propeller by unscrewing the M12 box nut. Propeller: Fixed with an M12 box nut (20±2 Nm)
5		①Remove the fan motor by unscrewing the four screws. Fan motor: Fixed with four M6 screws (5.0±0.5 Nm)
6		①Reverse the procedure to complete the replacement.

LEV Replacement Instructions

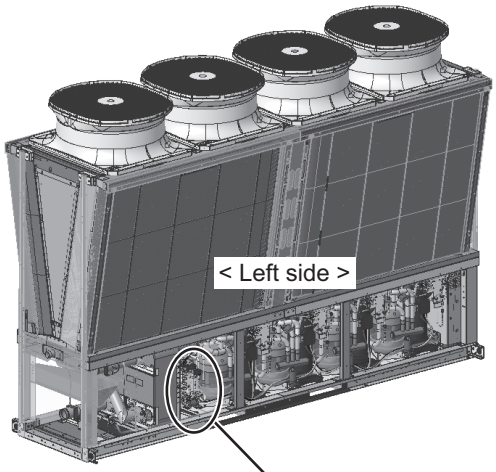
Required tools

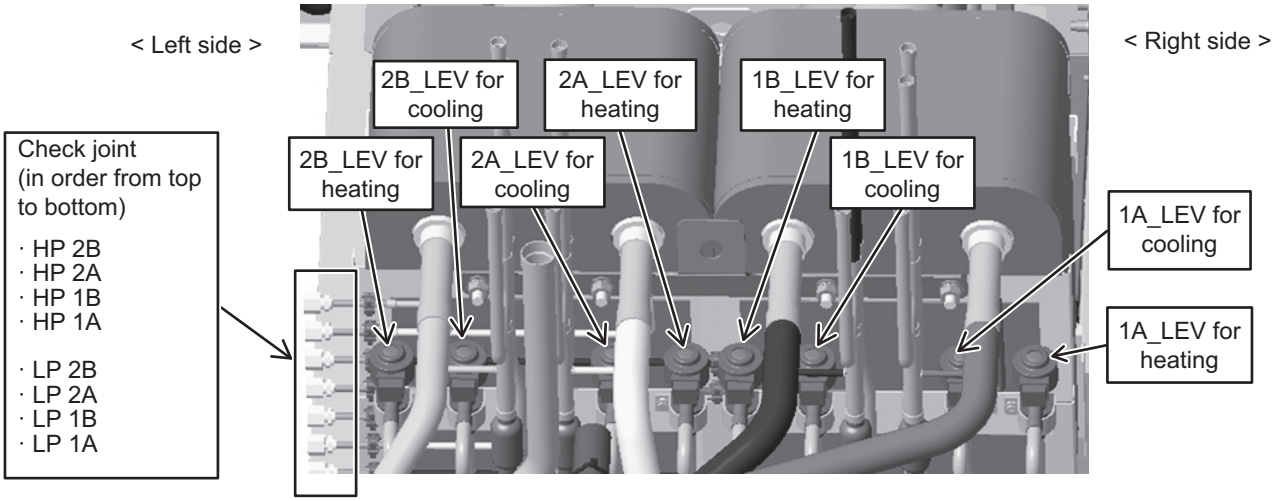
- Screwdriver (for M5 screws)
- Nippers (for cutting the tie band)
- Welding tool set

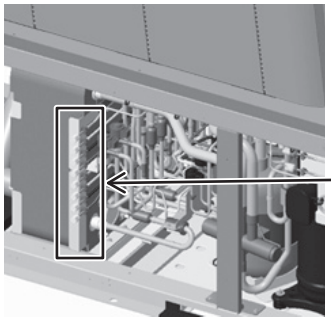
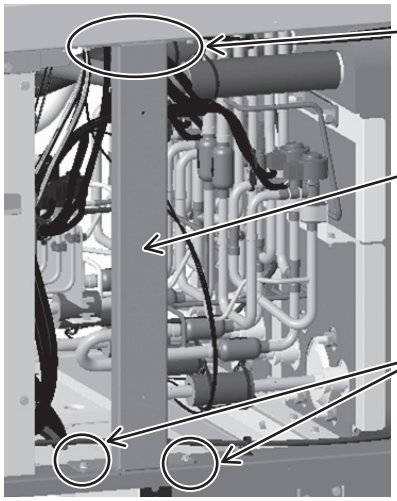
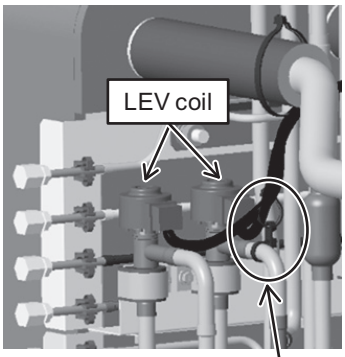
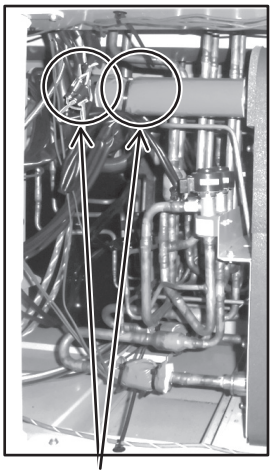
* Notes on tie band (cable tie with a locking device)
  If you accidentally cut the cable tie on tie band during replacement, cut off the tie all the way to the locking device, and insert a regular cable tie (5mm max.) through the locking device.

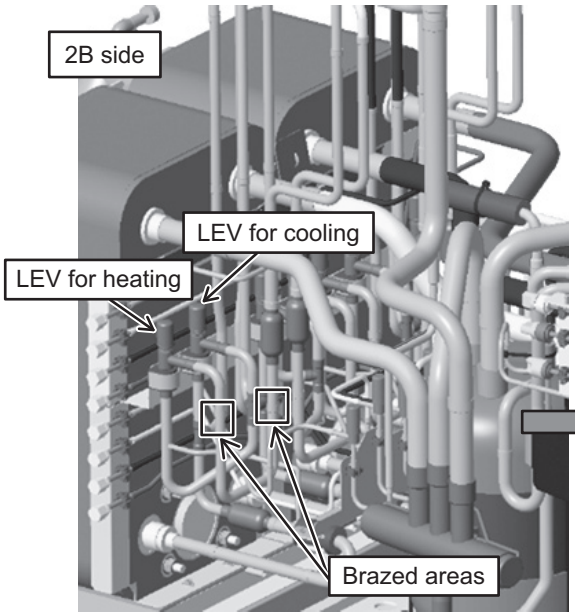
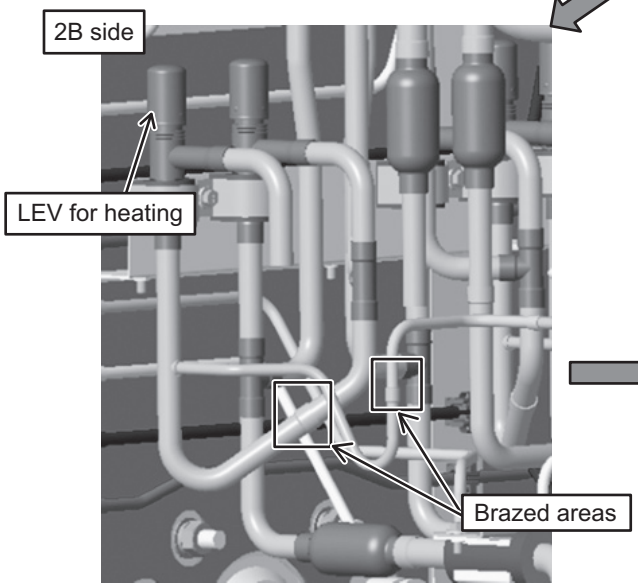


LEV location

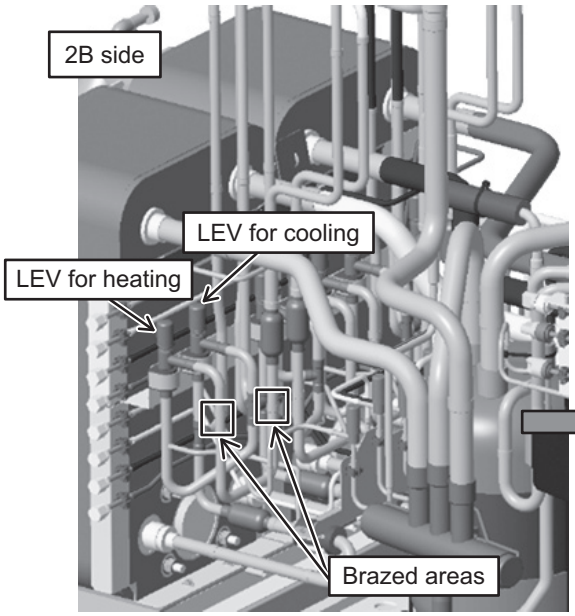




1	 < Left side > Check joint (in order from top to bottom) · HP 2B · HP 2A · HP 1B · HP 1A · LP 2B · LP 2A · LP 1B · LP 1A	①Recover the refrigerant through the check joint (low-pressure (LP) side) on the left side of the unit next to the plate heat exchanger. * Each refrigerant circuit is independent. Only cellect the refrigerant from the system whose LEV needs to be replaced. ■ Refrigerant (R32) EAHV type: 11.5 kg per circuit EACV type: 4.7 kg per circuit
2	 M5 screw × 2 Pillar M5 screw × 2 < Right side >	①When replacing the LEVs (1A, 1B), remove the pillars by unscrewing the four M5 screws. Pillar: Fixed with M5 screws (3.0±0.3 Nm) * When the pillar is removed, the frame will sag down by its own weight.
3	 LEV coil Tie band  Connector	①Cut the tie band as required, and remove the LEV coil. Go to the following steps for the instructions for the respective LEVs. EAHV type LEV for heating: Step 4 EAHV type LEV for cooling: Step 7 EACV type LEV for cooling: Step 10

4		<EAHV type LEV for heating> ①To create work space, remove the U-pipe located in front of the LEV by removing the braze from the two areas shown in the figure. * Save the U-pipe for later use. Do the same for the 1A, 1B, and 2A sides. 
5		<EAHV type LEV for heating> ①To create work space, remove the U-pipe located in front of the LEV by removing the braze from the two areas shown in the figure. * Cool the LEV with a wet cloth when brazing the pipe. 
6		<EAHV type LEV for heating> ①Braze the pipe that was removed in step 5 to the new LEV. ②Reverse the procedure to complete the replacement. * When the unit is airtight or charged with refrigerant, pressurize the unit from the high pressure side. Failure to do so may damage the compressor. Refrigerant (R32): EAHV type, 11.5 kg per circuit

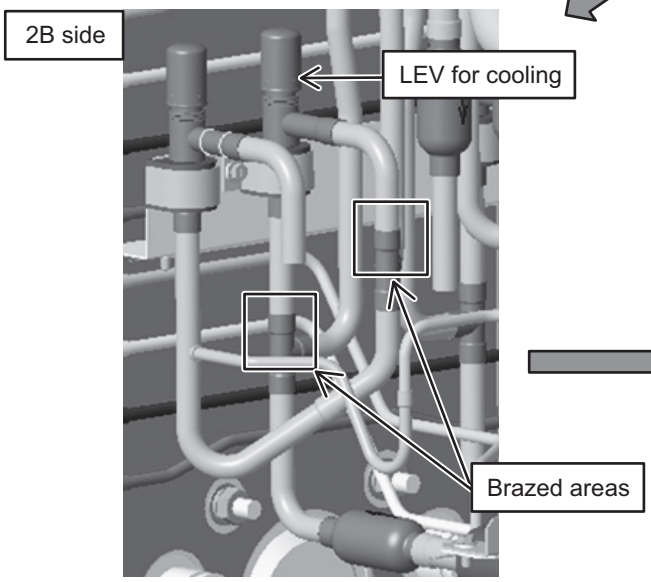
7



<EAHV type LEV for cooling>
①To create work space, remove the U-pipe located in front of the LEV by removing the braze from the two areas shown in the figure.
* Save the U-pipe for later use.

Do the same for the 1A, 1B, and 2A sides.

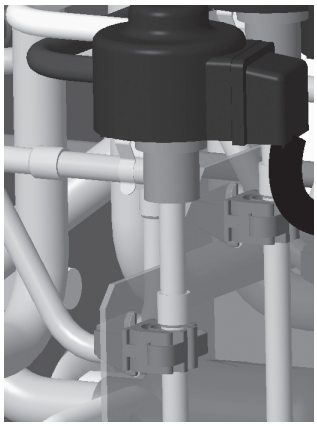
8



<EAHV type LEV for cooling>
①Remove the T joints below the LEV by removing the braze from the two areas shown in the figure.

* Cool the LEV with a wet cloth when brazing the pipe.

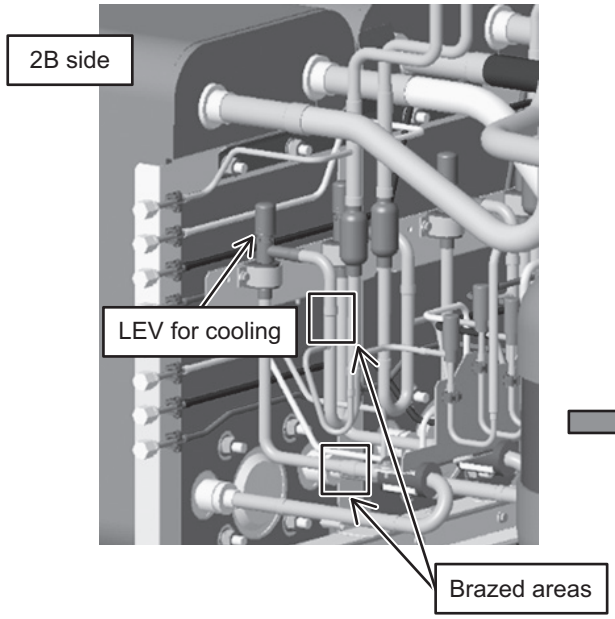
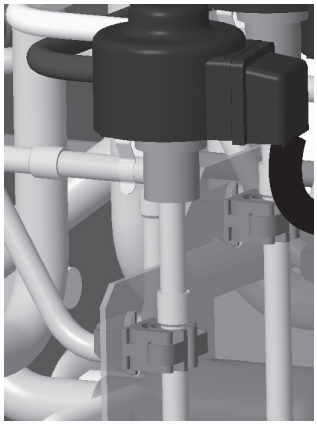
9



<EAHV type LEV for cooling>
①Braze the pipe that was removed in step 8 to the new LEV.

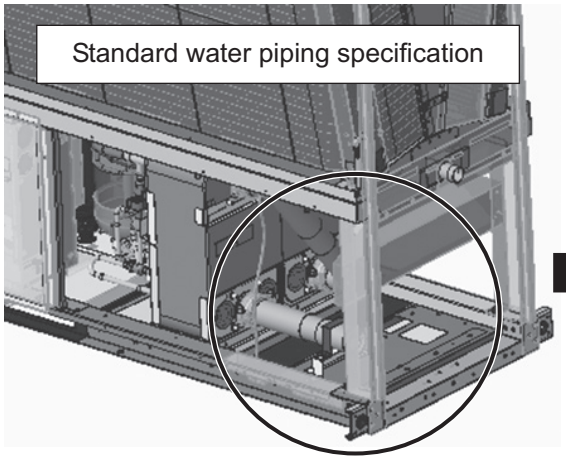
②Reverse the procedure to complete the replacement.

* When the unit is airtight or charged with refrigerant, pressurize the unit from the high pressure side.
Failure to do so may damage the compressor.
Refrigerant (R32): EAHV type, 11.5 kg per circuit

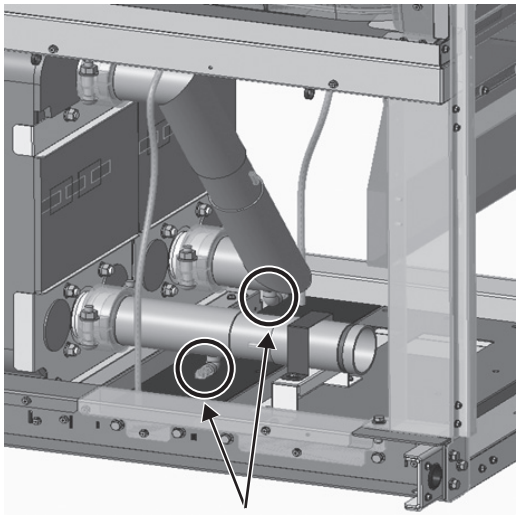
10		<EACV type LEV for cooling> ①Remove the U-pipe located in front of the LEV by removing the braze from the two areas shown in the figure. * Cool the LEV with a wet cloth when brazing the pipe. Do the same for the 1A, 1B, and 2A sides. 
11		<EACV type LEV for cooling> ①Braze the pipe that was removed in step 10 to the new LEV. ②Reverse the procedure to complete the replacement. * When the unit is airtight or charged with refrigerant, pressurize the unit from the high pressure side. Failure to do so may damage the compressor. Refrigerant (R32): EACV type, 4.7 kg per circuit

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



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

[7] Software Rewrite Function on the USB

The USB memory stick may be used to rewrite the software of the outdoor unit in the same way as using a ROM writer.

1. Preparation

· Prepare a USB memory stick and a portable battery charger.
A LEAD WIRE ASSY USB for connecting the control board and the charger is also necessary.
Make sure the portable battery charger is sufficiently charged.
· Prepare a countermeasure program file "******.mot" for the intended model.
· Copy the software rewrite program file "******.mot" onto the root folder of the USB memory stick.
Install only one program and only in the root folder of the USB memory stick.

2. Rewriting Software

The procedure is shown below.

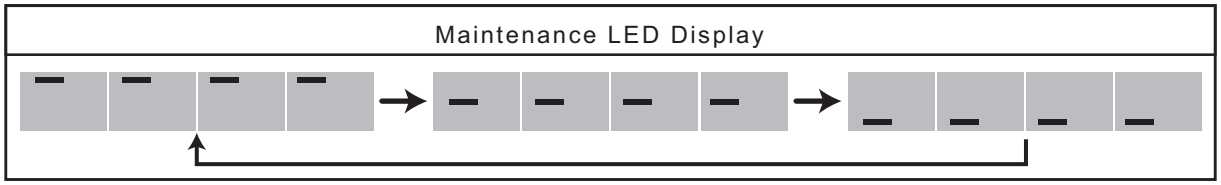
< 1 > Operation procedure

(1) Starting software rewrite mode

1) Shut down the power for the outdoor unit. Make sure the power for the control board is off.
This is done by confirming LED2 is off.
2) Turn on switches SW7-9 of the control board.
3) Insert the USB memory stick into the USB port (CNUSB) on the control board.
4) Connect the portable battery charger to the Micro-USB port (Control board (MAIN board) CN601)
or the XA connector (Control board (MAIN board) CN601). The control board will turn on.
Type A: Micro-USB port (Control board (MAIN board) CN601)
Type A1/A2: XA connector (Control board (MAIN board) CN601)
5) Make sure the display “Pro” is shown on the maintenance LED (LED301)
This shows that Software Rewrite Mode has been started.

(2) Performing software rewriting

1) Wait for 5 seconds after “Pro” appeared on the LED, and press SWP3 (ENTER) to start software rewrite.
When the rewrite process is in progress, progress bars move as shown below.



2) If "End" is displayed on the LED, the rewrite process has been completed correctly. * Generally, this process takes about five minutes.

(3) Confirmation of operation

1) Disconnect the portable battery charger from the Micro-USB port (Control board (MAIN board) CN601)
or the XA connector (Control board (MAIN board) CN601). The control board will turn off.
Type A: Micro-USB port (Control board (MAIN board) CN601)
Type A1/A2: XA connector (Control board (MAIN board) CN601)
2) Remove the USB memory stick from the USB port (CNUSB) on the control board.
3) Turn off the switches SW7-9 on the control board.
4) Turn on the outdoor unit, and check that the versions of the outdoor unit and the software are the same.
The version of the software may be found using the maintenance tool or other means.
Perform a test run, and check for normal operation.

3. Precautions

- Take care to choose the correct countermeasure program for the intended model and version.
  Store only one software rewrite program on the USB memory stick.
  If this requirement is not met, software rewrite may not start.
- Be cautious of electric shock when connecting an USB memory stick or a portable battery charger to the control board.
- Connect the portable battery charger to the LEAD WIRE ASSY USB and then to the control board.
- Make sure the portable battery charger is sufficiently charged. Rewrite error may occur if battery charge is insufficient.
- Take care not to forget to remove the USB memory stick in step (3) - 2) or forget to turn off SW7-9 in step (3) - 3). [2.Rewriting Software] If these precautions are not taken, the system may not start normally.
- When rewriting ended unsuccessfully, redo the procedure from step (1) - 3). [2.Rewriting Software] When rewriting ended unsuccessfully, the system may be started in Software Rewrite Mode instead of using the switches on the control board.
- If software cannot be successfully rewritten using an USB memory stick, use a ROM writer to rewrite the software.
- A battery charger not compatible with the energy-saving mode may turn off while the data are being collected or while the S/W is being re-written, and these actions may not be completed successfully.

X Attachments

[1] R32 saturation temperature table

Saturation pressure	Saturating temperature
MPa (gauge)	°C
0.00	-51.66
0.01	-49.83
0.02	-48.12
0.03	-46.52
0.04	-45.02
0.05	-43.59
0.06	-42.24
0.07	-40.95
0.08	-39.72
0.09	-38.54
0.10	-37.40
0.11	-36.31
0.12	-35.26
0.13	-34.24
0.14	-33.26
0.15	-32.31
0.16	-31.39
0.17	-30.49
0.18	-29.62
0.19	-28.78
0.20	-27.95
0.21	-27.15
0.22	-26.37
0.23	-25.60
0.24	-24.85
0.25	-23.77
0.26	-22.71
0.27	-22.02
0.28	-21.35
0.29	-20.69
0.30	-20.04
0.31	-19.41
0.32	-18.78
0.33	-18.17
0.34	-17.57
0.35	-16.98
0.36	-16.40
0.37	-15.82
0.38	-15.26
0.39	-14.71
0.40	-14.16
0.41	-13.62
0.42	-13.09
0.43	-12.57
0.44	-12.05
0.45	-11.54
0.46	-11.04
0.47	-10.54
0.48	-10.06
0.49	-9.57
0.50	-9.10
0.51	-8.63
0.52	-8.16
0.53	-7.70
0.54	-7.25
0.55	-6.80
0.56	-6.36
0.57	-5.92
0.58	-5.48
0.59	-5.06
0.60	-4.63
0.61	-4.21
0.62	-3.80
0.63	-3.38
0.64	-2.98
0.65	-2.58
0.66	-2.18
0.67	-1.78
0.68	-1.39
0.69	-1.00
0.70	-0.62
0.71	-0.24
0.72	0.14
0.73	0.51
0.74	1.07
0.75	1.61
0.76	1.97
0.77	2.33
0.78	2.68
0.79	3.03

Saturation pressure	Saturating temperature
MPa (gauge)	°C
0.80	3.38
0.81	3.73
0.82	4.07
0.83	4.41
0.84	4.75
0.85	5.08
0.86	5.42
0.87	5.75
0.88	6.07
0.89	6.40
0.90	6.72
0.91	7.04
0.92	7.36
0.93	7.67
0.94	7.98
0.95	8.30
0.96	8.60
0.97	8.91
0.98	9.21
0.99	9.52
1.00	9.82
1.01	10.12
1.02	10.41
1.03	10.71
1.04	11.00
1.05	11.29
1.06	11.58
1.07	11.86
1.08	12.15
1.09	12.43
1.10	12.71
1.11	12.99
1.12	13.27
1.13	13.55
1.14	13.82
1.15	14.09
1.16	14.37
1.17	14.64
1.18	14.90
1.19	15.17
1.20	15.44
1.21	15.70
1.22	15.96
1.23	16.35
1.24	16.74
1.25	17.00
1.26	17.25
1.27	17.50
1.28	17.76
1.29	18.01
1.30	18.26
1.31	18.51
1.32	18.75
1.33	19.00
1.34	19.24
1.35	19.49
1.36	19.73
1.37	19.97
1.38	20.21
1.39	20.45
1.40	20.68
1.41	20.92
1.42	21.16
1.43	21.39
1.44	21.62
1.45	21.85
1.46	22.08
1.47	22.31
1.48	22.54
1.49	22.77
1.50	22.99
1.51	23.22
1.52	23.44
1.53	23.67
1.54	23.89
1.55	24.11
1.56	24.33
1.57	24.55
1.58	24.77
1.59	24.98

Saturation pressure	Saturating temperature
MPa (gauge)	°C
1.60	25.20
1.61	25.42
1.62	25.63
1.63	25.84
1.64	26.06
1.65	26.27
1.66	26.48
1.67	26.69
1.68	26.90
1.69	27.11
1.70	27.31
1.71	27.52
1.72	27.83
1.73	28.13
1.74	28.34
1.75	28.54
1.76	28.74
1.77	28.94
1.78	29.14
1.79	29.34
1.80	29.54
1.81	29.73
1.82	29.93
1.83	30.13
1.84	30.32
1.85	30.52
1.86	30.71
1.87	30.90
1.88	31.10
1.89	31.29
1.90	31.48
1.91	31.67
1.92	31.86
1.93	32.05
1.94	32.24
1.95	32.42
1.96	32.61
1.97	32.80
1.98	32.98
1.99	33.17
2.00	33.35
2.01	33.53
2.02	33.72
2.03	33.90
2.04	34.08
2.05	34.26
2.06	34.44
2.07	34.62
2.08	34.80
2.09	34.98
2.10	35.16
2.11	35.33
2.12	35.51
2.13	35.69
2.14	35.86
2.15	36.04
2.16	36.21
2.17	36.39
2.18	36.56
2.19	36.73
2.20	36.90
2.21	37.17
2.22	37.42
2.23	37.59
2.24	37.76
2.25	37.92
2.26	38.09
2.27	38.26
2.28	38.43
2.29	38.59
2.30	38.76
2.31	38.93
2.32	39.09
2.33	39.26
2.34	39.42
2.35	39.58
2.36	39.75
2.37	39.91
2.38	40.07
2.39	40.23

Saturation pressure	Saturating temperature
MPa (gauge)	°C
2.40	40.40
2.41	40.56
2.42	40.72
2.43	40.88
2.44	41.04
2.45	41.19
2.46	41.35
2.47	41.51
2.48	41.67
2.49	41.83
2.50	41.98
2.51	42.14
2.52	42.29
2.53	42.45
2.54	42.60
2.55	42.76
2.56	42.91
2.57	43.07
2.58	43.22
2.59	43.37
2.60	43.52
2.61	43.68
2.62	43.83
2.63	43.98
2.64	44.13
2.65	44.28
2.66	44.43
2.67	44.58
2.68	44.73
2.69	44.87
2.70	45.10
2.71	45.32
2.72	45.46
2.73	45.61
2.74	45.76
2.75	45.90
2.76	46.05
2.77	46.19
2.78	46.34
2.79	46.48
2.80	46.63
2.81	46.77
2.82	46.91
2.83	47.06
2.84	47.20
2.85	47.34
2.86	47.48
2.87	47.62
2.88	47.76
2.89	47.91
2.90	48.05
2.91	48.19
2.92	48.32
2.93	48.46
2.94	48.60
2.95	48.74
2.96	48.88
2.97	49.02
2.98	49.16
2.99	49.29
3.00	49.43
3.01	49.57
3.02	49.70
3.03	49.84
3.04	49.97
3.05	50.11
3.06	50.24
3.07	50.38
3.08	50.51
3.09	50.65
3.10	50.78
3.11	50.91
3.12	51.05
3.13	51.18
3.14	51.31
3.15	51.44
3.16	51.57
3.17	51.71
3.18	51.84
3.19	52.04

Saturation pressure	Saturating temperature
MPa (gauge)	°C
3.20	52.23
3.21	52.36
3.22	52.49
3.23	52.62
3.24	52.75
3.25	52.88
3.26	53.00
3.27	53.13
3.28	53.26
3.29	53.39
3.30	53.51
3.31	53.64
3.32	53.77
3.33	53.89
3.34	54.02
3.35	54.15
3.36	54.27
3.37	54.40
3.38	54.52
3.39	54.65
3.40	54.77
3.41	54.90
3.42	55.02
3.43	55.14
3.44	55.27
3.45	55.39
3.46	55.51
3.47	55.64
3.48	55.76
3.49	55.88
3.50	56.00
3.51	56.12
3.52	56.25
3.53	56.37
3.54	56.49
3.55	56.61
3.56	56.73
3.57	56.85
3.58	56.97
3.59	57.09
3.60	57.21
3.61	57.33
3.62	57.44
3.63	57.56
3.64	57.68
3.65	57.80
3.66	57.92
3.67	58.04
3.68	58.21
3.69	58.39
3.70	58.50
3.71	58.62
3.72	58.74
3.73	58.85
3.74	58.97
3.75	59.08
3.76	59.20
3.77	59.31
3.78	59.43
3.79	59.54
3.80	59.66
3.81	59.77
3.82	59.88
3.83	60.00
3.84	60.11
3.85	60.23
3.86	60.34
3.87	60.45
3.88	60.56
3.89	60.68
3.90	60.79
3.91	60.90
3.92	61.01
3.93	61.12
3.94	61.23
3.95	61.34
3.96	61.46
3.97	61.57
3.98	61.68
3.99	61.79

Saturation pressure	Saturating temperature
MPa (gauge)	°C
4.00	61.90
4.01	62.01
4.02	62.12
4.03	62.23
4.04	62.33
4.05	62.44
4.06	62.55
4.07	62.66
4.08	62.77
4.09	62.88
4.10	62.98
4.11	63.09
4.12	63.20
4.13	63.31
4.14	63.41
4.15	63.52
4.16	63.63
4.17	63.73

[2] Maintenance

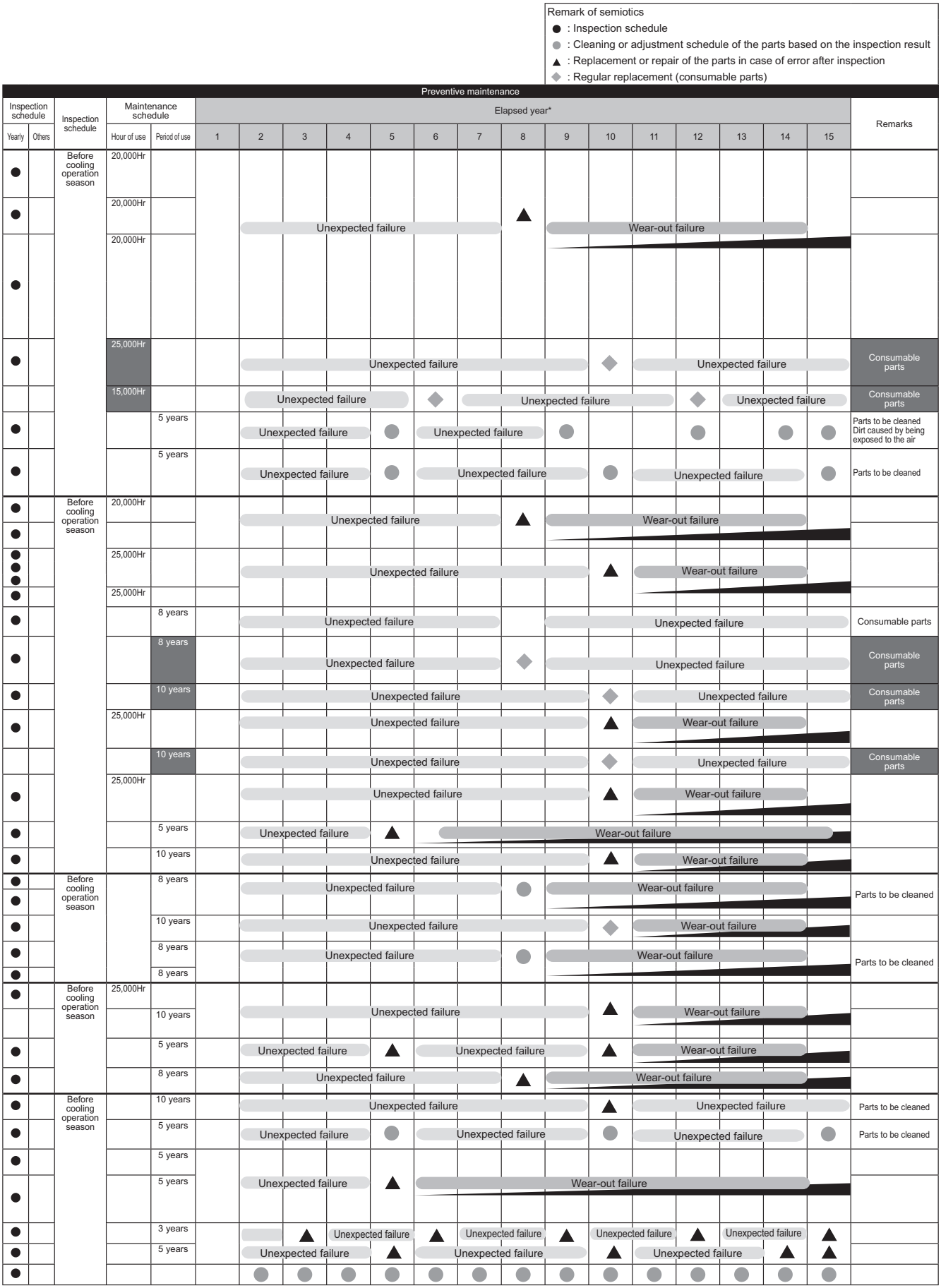
The table below shows regular inspection items, schedule, and parts replacement criteria under normal use condition. The "Inspection schedule" column under the "Preventive maintenance" column indicates the regular inspection schedule, and the "Maintenance schedule" column indicates an estimation of the time when the parts need to be cleaned or adjusted or when old parts need to be replaced or repaired. The cleaning/adjustment schedule is provided in order to take proper measure to protect the parts from deterioration or performance drop, and the estimated operating time or use period when each part goes into the wear-out failure period is provided so that replacement of the parts can be made at the right timing after the inspection.

Parts name			Regular inspection			Preventive maintenance
Component parts	Parts name		Inspection item	Inspection method/tools	Judgement criteria <Reference>	Maintenance item
Refrigerant circuit	Compressor		• Sound or vibration at startup, during operation, and at stoppage of the compressor • Insulation resistance • Terminals and wiring	Visual, auditory, and tactile check 500V megahertz Screwdriver, visual check	• Free from abnormal noise and vibration • The insulation resistance is 1MΩ or greater. • Free from loose terminals and wiring contacts	• If abnormal, replace the compressor. • If the insulation resistance is 1MΩ or less, replace the compressor. • Retighten the terminals, and rewire the wiring.
	Electronic expansion valve		• Operation • Operating sound by turning ON or OFF the unit (pressure check)	Tactile check Auditory and tactile check	• Refrigerant circulation is confirmed. • Operating sound is heard and temperature change is confirmed.	• Replace the electronic expansion valve if it is stuck.
	Refrigerant system	Inner piping	• Sympathetic vibration, contact, and corrosion of the inner piping • Sympathetic vibration and contact of the capillary tube	Visual check Visual check	• Free from abnormal sympathetic vibration, sound, and corrosion • Free from abnormal sympathetic vibration and contact wear	• If the pipes are severely corroded, replace or repair the pipe. • If the pipes are severely worn out, replace or repair the pipe. • If the insulation resistance is 1MΩ or less, replace the valve. • If there is corrosion, paint the surface.
		Solenoid valve, 4-way valve	• Operation and insulation performance of the solenoid valve and the 4-way valve •Corrosion and abnormal sound	500V megahertz Visual and auditory check	• The insulation resistance is 1MΩ or greater. • Free from abnormal noise and corrosion	
		Container	• Corrosion of the accumulator or the oil separator	Visual check	• Free from corrosion	
	Protection device (security parts)	High pressure switch	• Operating pressure, refrigerant leak, and insulation resistance	Pressure gauge etc.	• The high-voltage circuit breaker operates at the set value. • The measured value is within the range specified by the regulation.	• Replace the parts regularly.
		Fusible plug	• Appearance (swollen soluble metal)	Visual check	• The soluble metal is at the normal position.	
	Heat exchanger	Air side	• Clogging and damage • Refrigerant leak	Visual check Refrigerant leak detector	• Free from clogging and damage • Free from leakage	• Clean the air inlet if clogged. • If the refrigerant leak is detected, repair or replace the heat exchanger
		Water side	• Amount of water, temperature • Refrigerant leak • Drain	• Thermometer, flowmeter and differential pressure gauge • Refrigerant leak detector • Check the heat exchanger and the inside the pipe.	• Tolerance • Free from leakage • Installation	• Adjust the valve and operation setting • If the refrigerant leak is detected, repair or replace the heat exchanger • Add the drain valve
Electrical/ Electronic parts	Fan motor		• Abnormal sound • Insulation resistance	Auditory check 500V megahertz	• Free from abnormal noise • The insulation resistance is 1MΩ or greater.	• If the bearing sound is loud, replace the bearing. • If the insulation erodes, replace the motor.
	Cooling fan		• Insulation resistance and abnormal sound	500V megahertz, auditory check	• The insulation resistance is 1MΩ or greater. Free from abnormal sound	• Replace the cooling fan if the fan is stuck.
	Switch (including FFB and ELB)	Electromagnetic switch Overcurrent relay Auxiliary relay	• Operation and appearance • Contact points	Visual check	• Free from deformation • Normal operation and free from deformation • Free from deformation and discoloration	• Replace the switches in case of malfunction, deformation, or discoloration.
	Thermostat		• Operation check	• Operation by the unit	• Operation as per the technical document	• Replace or adjust (calibration)
	Oil heater		• Check energization • Insulation resistance	• Tester or ammeter • Visual check • 500V megahertz	• Heat up • More than 1MΩ	• Replace
	Crankcase heater		• Whether the crankcase heater is powered during compressor stop • Insulation resistance of the crankcase heater	Tester 500V megahertz	• The crankcase heater is powered during compressor stop, and is heated up. • The insulation resistance is 1MΩ or greater.	• Rewire the electric wiring. • If the insulation resistance is 1MΩ or less, replace the crankcase heater.
	Fuse		• Appearance	Visual check	• Free from deformation and discoloration	• Replace the fuse if the fuse is blown.
	Control box (including inverter) Electrolytic capacitor		• Insulation resistance or the circuit • Dust of the circuit board • Terminals and connectors • Appearance of the electrolytic capacitor	500V megahertz Visual check Screwdriver, visual check Visual check	• The insulation resistance is 1MΩ or greater. • Free from accumulation of dust • All connectors are properly connected. • Free from liquid leak and deformation	• If tainted with a large amount of dust, clean with a brush. • Replace the circuit board in case of malfunction. • Retighten the terminals, and reconnect the connectors. • Replace the electrolytic capacitor in case of liquid leak.
	Smoothing capacitor		• Capacitance and insulation resistance	Electrostatic meter, 500V megahertz	• At or over the specified value	• Replace the capacitor regularly.
	Electric parts box (including circuit board)		• Insulation resistance of the circuit and appearance of the capacitor • Terminals and connectors • Self-diagnosis mode and appearance	500V megahertz Visual check Visual check	• The insulation resistance is 1MΩ or greater. • All connectors are properly connected. • No error display appears.	• Replace the circuit board in case of malfunction. • Retighten the terminals, and reconnect the connectors. • Replace the circuit board in case of liquid leak.
	Pressure sensor, thermistor		• Open, short-circuit, and appearance	Tester, visual check	• Within the specified value, and free from discoloration	• If the wire is disconnected or short-circuit, replace the pressure sensor or the thermistor.
	SW power source		• Output voltage	Tester	• Within the specified output voltage range	• Replace the SW if the voltage is abnormal.
Structural parts	Decorative part (design part)		• Dirt and damage	Visual check	• Free from dirt, damage, and deformation	• Wash the panel with neutral detergent, and paint the surface.
	Frame, bottom plate		• Rust and insulation material • Flaked coating	Visual check	• Free from rust and damaged insulation	• Repair the frame or the bottom plate if the insulation material is torn. • Paint the surface.
	Propeller fan		• Vibration and appearance	Visual check	• Free from runout and matter biting	• Replace the propeller fan if the runout and balance is significantly worse
	Drain pan		• Check the drain for clogging. • Check for peeling paint.	Visual check	• Free from drain clogging • Free from rust and holes	• Clean the drain pan and check tilt • Repair painting
	Guard panel		• Flaked coating	Visual check	• Free from rust	• Paint the surface.
Optional parts	Remote controller switch		• Controllability	Visual check	• The display obeys the operation command.	• Replace the remote controller switch if the display does not obey the operation command or wrong display appears.
	Central control system		• Controllability • Loose terminal, wiring contact • Insulation resistance	• Visual check • 500V megahertz	• The display obeys the operation command • Free from loose and contact • More than 1MΩ	• Retightening • Replace if the resistance is less than 1MΩ
	Flow switch		• Controllability • Water leak check • Insulation resistance	• Visual check • 500V megahertz	• The display obeys the operation command • Free from water leak • More than 1MΩ	• Replace the flow switch
	Phase-advanced condenser Elapsed time integrator Ammeter		• Insulation resistance	• 500V megahertz	• More than 1MΩ	• Replace if the resistance is less than 1MΩ
Water circuit	Strainer		• Check clogging	• Visual check	• Free from stain and clogging	• Clean
	Water pipe		• Water leak • Inclusion of air	• Visual check • Sensory inspection/Air vent valve is open	• Free from water leak • Free from strange noise	• Retightening • Release air, or replace and adjust the air vent vane.
	Flow regulating valve		• Water temperature difference (flow rate)	• Thermometer	• Proper temperature difference range	• Replace and adjust
	Pump		• Vibration • Insulation resistance • Water leak check • Loose terminal, wiring contact • Clean and inspect the strainer	• Visual/audibility/tactile impression check • 500V megahertz • Visual check	• Free from strange noise • More than 1MΩ • Free from loose and contact • Free from water leak • Free from clogging	• Replace • Retightening • Modify the wiring
	Pressure gauge		• Display value under suspension	• Visual check	• Free from incorrect display value	• Replace
	Thermometer		• Display value under suspension	• Surface thermometer	• Free from incorrect display value	• Replace
	Water		• Water quality management	• Water quality analysis	• Water quality criterion	• Adjust water quality

Note1) Unexpected failure is a sudden and unpredictable failure that occurs randomly before the parts or the device reaches its lifespan. It is difficult to take the technical measures, and at the moment where only the measures based on statistics can be taken.

Note2) The elapsed year shown in the column marked with * is the estimated period of time under the condition the equipment used 10 hours per day and for 2500 hours per year without frequent start and stop. The years vary depending on the operating condition. Confirm the details whenever conclude the maintenance contract.

Note3) ◢ shows the estimated the year of initial wear-out happen and increase of failure rate year by year.


Remark of semiotics
● : Inspection schedule
● : Cleaning or adjustment schedule of the parts based on the inspection result
▲ : Replacement or repair of the parts in case of error after inspection
◆ : Regular replacement (consumable parts)
Preventive maintenance
Inspection schedule
Yearly
Others
Inspection schedule
Maintenance schedule
Hour of use
Period of use
Elapsed year*
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Remarks
Before cooling operation season
20,000Hr
25,000Hr
15,000Hr
5 years
8 years
10 years
Unexpected failure
Wear-out failure
Consumable parts
Parts to be cleaned
Dirt caused by being exposed to the air

Service Handbook

Model

EAHV-M1500YCL(-N)(-BS)
EAHV-M1800YCL(-N)(-BS)
EACV-M1500YCL(-N)(-BS)
EACV-M1800YCL(-N)(-BS)

MITSUBISHI ELECTRIC CORPORATION

www.MitsubishiElectric.com

HWE2001A

New publication effective Apr. 2025
Specifications subject to change without notice