MITSUBISHI ELECTRIC

Changes for the Better

HOT WATER HEAT PUMP

2014

R410A

Service Handbook

Model

CRHV-P600YA-HPB

Safety Precautions

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

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

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

General

⚠ WARNING

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

⚠ CAUTION

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

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

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

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

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

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.

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, wear protective gear when working on the unit.

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

Refrigerant poses environmental hazards if released into the air.

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

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

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

It may cause health problems or degrade food.

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

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

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

Use clean tap water.

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

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

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

Periodically inspect and clean the water circuit.

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

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

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

Transportation

⚠ WARNING

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

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

⚠ CAUTION

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

To reduce the risk of injury, products weighing 20 kg or more should be carried by two or more people.

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.

Pipe installation

⚠ WARNING

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

Check for refrigerant leakage at the completion of installation.

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

⚠ CAUTION

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

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

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

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

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

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

Electrical wiring

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

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

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

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

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

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

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

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

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

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

Keep the unsheathed part of cables inside the terminal block.

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

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

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

⚠ CAUTION

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

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

Transportation and repairs

⚠ WARNING

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

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

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

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

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

⚠ CAUTION

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

IMPORTANT

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

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

Recover all refrigerant from the unit.

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

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

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

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

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

Short-cycling the compressor may damage the compressor.

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

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

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

Please build the hot water and heat source fluid circuit so that it is a closed system.

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

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

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

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

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

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

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

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

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

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

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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
   Hot water Heat pump CRHV-P600YA-HPB:R410A

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

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

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

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

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

[2] Necessary Tools and Materials

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

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

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

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

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

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

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

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

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

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

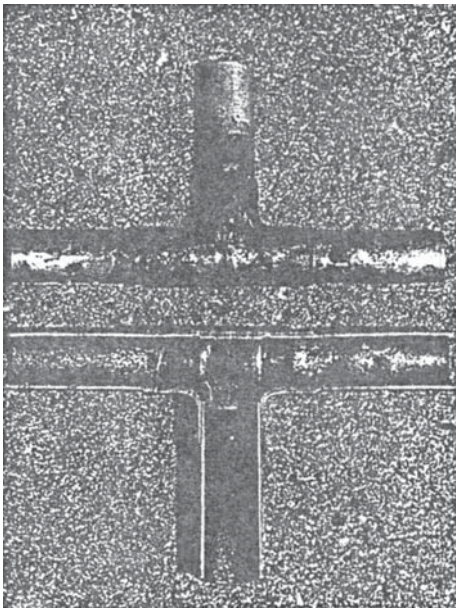
Tools for R410A must be handled with special care to keep moisture and dust from infiltrating the cycle.

[3] Brazing

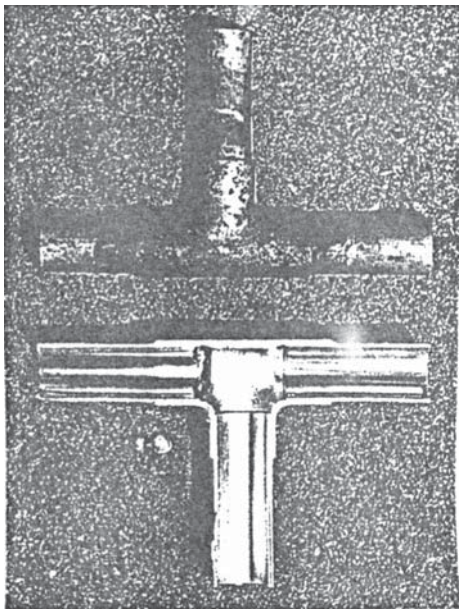
No changes have been made in the brazing procedures. Perform brazing with special care to keep foreign objects (such as oxide scale, water, and dust) out of the refrigerant system.

Example: Inside the brazed connection

Use of oxidized solder for brazing



Use of non-oxidized solder for brazing



1. Items to be strictly observed

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

2. Reasons

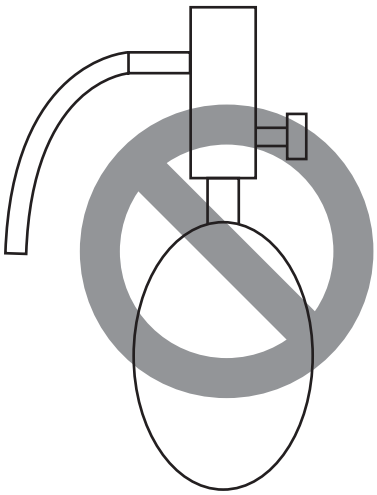
- The new refrigerating machine oil is 10 times as hygroscopic as the conventional oil and is more likely to cause unit failure if water infiltrates into the system.
- Flux generally contains chloride. Residual flux in the refrigerant circuit will cause sludge to form.

3. Notes

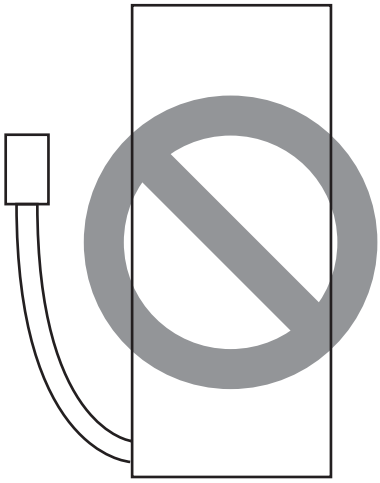
Do not use commercially available antioxidants because they may cause the pipes to corrode or refrigerating machine oil to deteriorate.

[4] Air Tightness Test

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



Halide torch



R22 leakage detector

1. Items to be strictly observed

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

2. Reasons

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

3. Notes

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

[5] Vacuum Drying (Evacuation)

(Photo1) 15010H

(Photo2) 14010

Recommended vacuum gauge:
ROBINAIR 14010 Thermistor Vacuum Gauge

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

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

2. Standard of vacuum degree (Photo 2)

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

3. Required precision of vacuum gauge

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

4. Evacuation time

- After the degree of vacuum has reached 5Torr(650Pa), evacuate for an additional 1 hour. (A thorough vacuum drying removes moisture in the pipes.)
- 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

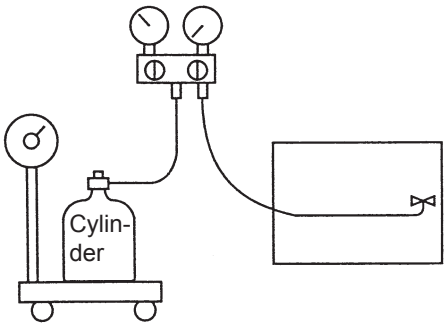
- When 5Torr(650Pa) or lower degree of vacuum cannot be attained after 3 hours of evacuation, it is likely that water has penetrated the system or that there is a leak.
- If water infiltrates the system, break the vacuum with nitrogen. Pressurize the system with nitrogen gas to 0.5kgf/cm^{2}G(0.05MPa)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

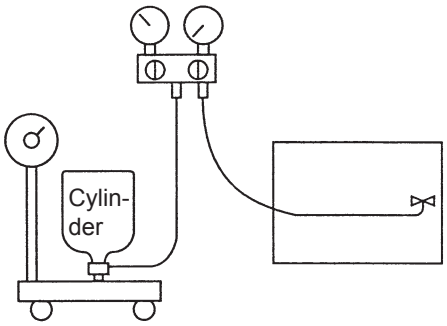
[6] Refrigerant Charging

Cylinder with a siphon

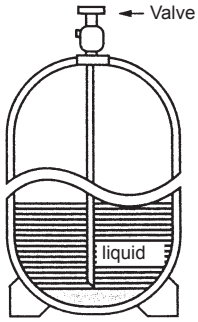


Cylinder color R410A is Pink.

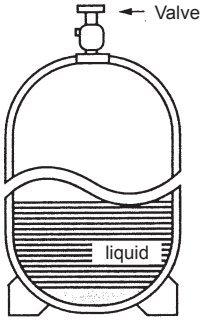
Cylinder without a siphon



Refrigerant charging in the liquid state



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



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

1. Reasons

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

2. Notes

When using a cylinder with a siphon, refrigerant is charged in the liquid state without the need for turning it upside down. Check the type of the cylinder on the label before use.

[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 (4.5 kg). (Charge refrigerant in the liquid state.)

Refer to "IX [4] Refrigerant Leak."(page 139)

[8] Characteristics of the Conventional and the New Refrigerants

1. Chemical property

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

	New Refrigerant (HFC type)		Conventional Refrigerant (HCFC type)
	R410A	R407C	R22
	R32/R125	R32/R125/R134a	R22
Composition (wt%)	(50/50)	(23/25/52)	(100)
Type of Refrigerant	Pseudo-azeotropic Refrigerant	Non-azeotropic Refrigerant	Single Refrigerant
Chloride	Not included	Not included	Included
Safety Class	A1/A1	A1/A1	A1
Molecular Weight	72.6	86.2	86.5
Boiling Point (°C/°F)	-51.4/-60.5	-43.6/-46.4	-40.8/-41.4
Steam Pressure (25°C,MPa/77°F,psi) (gauge)	1.557/226	0.9177/133	0.94/136
Saturated Steam Density (25°C,kg/m^3/77°F,psi)	64.0	42.5	44.4
Flammability	Nonflammable	Nonflammable	Nonflammable
Ozone Depletion Coefficient (ODP)*1	**0**	**0**	**0.055**
Global Warming Coefficient (GWP)*2	1975	1653	1700
Refrigerant Charging Method	Refrigerant charging in the liquid state	Refrigerant charging in the liquid state	Refrigerant charging in the gaseous state
Replenishment of Refrigerant after a Refrigerant Leak	Available	Available	Available

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

2. Pressure characteristics

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

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

[9] Notes on Refrigerating Machine Oil

1. Refrigerating machine oil in the HFC refrigerant system

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

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

2. Effects of contaminants*1

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

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

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

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

II Restrictions

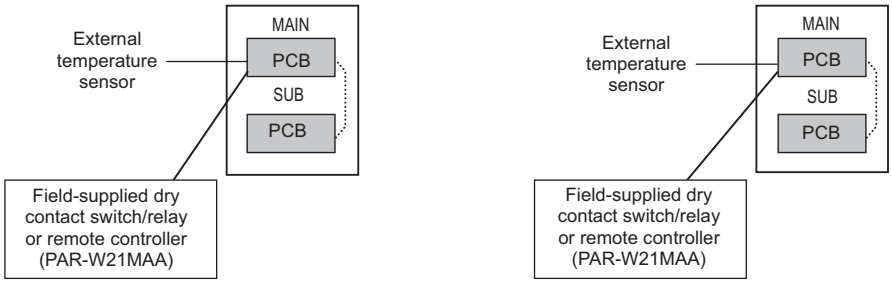
[1] System Configuration

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

1 Schematic Diagrams of Individual and Multiple Systems

(1) Individual system

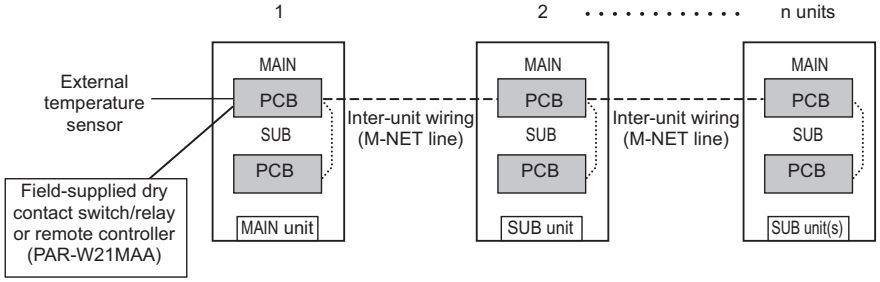
* Each unit is operated individually by connecting a dry contact switch/relay to each unit.



Refer to the sections "Switch Types and the Factory Settings" (page19) and "System configuration procedures: Individual system" (page 21) for further details.

(2) Multiple system (2-16 units)

* A group of unit that consists of one main unit and up to 15 sub units is operated collectively by connecting an external water temperature sensor and a dry contact switch/relay to the main unit.



Refer to the sections "Switch Types and the Factory Settings" (page19) and "System configuration procedures: Multiple system" (page 22) for further details.

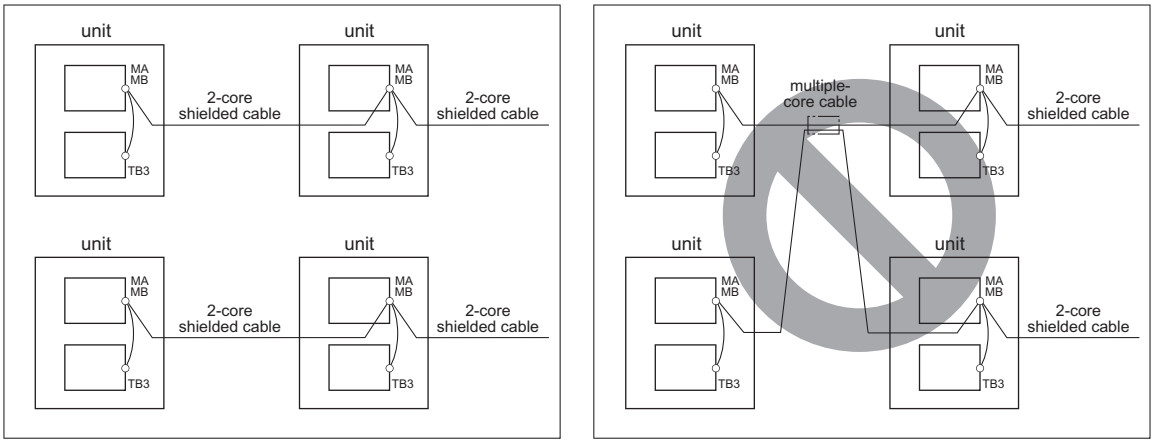
[2] Types and Maximum allowable Length of Cables

1. Wiring work

(1) Notes

1) Have all electrical work performed by an authorized electrician according to the local regulations and instructions in this manual.
2) Install external transmission cables at least 5cm [1-31/32"] away from the power supply cable to avoid noise interference. (Do not put the control cable and power supply cable in the same conduit tube.)
3) Provide grounding for the unit as required.
4) Run the cable from the electric box of the unit in such way that the box is accessible for servicing.
5) Do not connect power supply wiring to the terminal block for transmission line. Doing so will damage the electronic components on the terminal block.
6) Use 2-core shielded cables as transmission cables.

   Use a separate 2-core control cable for each refrigerant system. Do not use a single multiple-core cable to connect units that belong to different refrigerant systems. The use of a multiple-core cable may result in signal transmission errors and malfunctions.



TB3: Terminal block for transmission line

(2) Control wiring

Different types of control wiring are used for different systems.

Types and maximum allowable length of cables

Control lines are categorized into 2 types: transmission line and remote controller line.

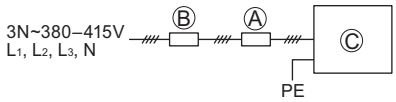
Use the appropriate type of cables and observe the maximum allowable length specified for a given system. If a given system has a long transmission line or if a noise source is located near the unit, place the unit away from the noise source to reduce noise interference.

[3] Main Power Supply Wiring and Switch Capacity

1 Main Power Supply Wiring and Switch Capacity

Schematic Drawing of Wiring (Example)

Ⓐ: Switch (with current breaking capability)
Ⓑ: Current leakage breaker
Ⓒ: Unit



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

Model	Minimum wire thickness (mm^2)			Current leakage breaker	Local swtich (A)		No-fuse breaker (A)	Max. Permissive System Impedance
	Main cable	Branch	Ground		Capacity	Fuse		
CRHV-P600YA-HPB	25	-	25	75 A 100 mA 0.1 sec. or less	75	75	75	0.18 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 10%.
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 Air Conditioner 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)
3.42

Control cable specifications

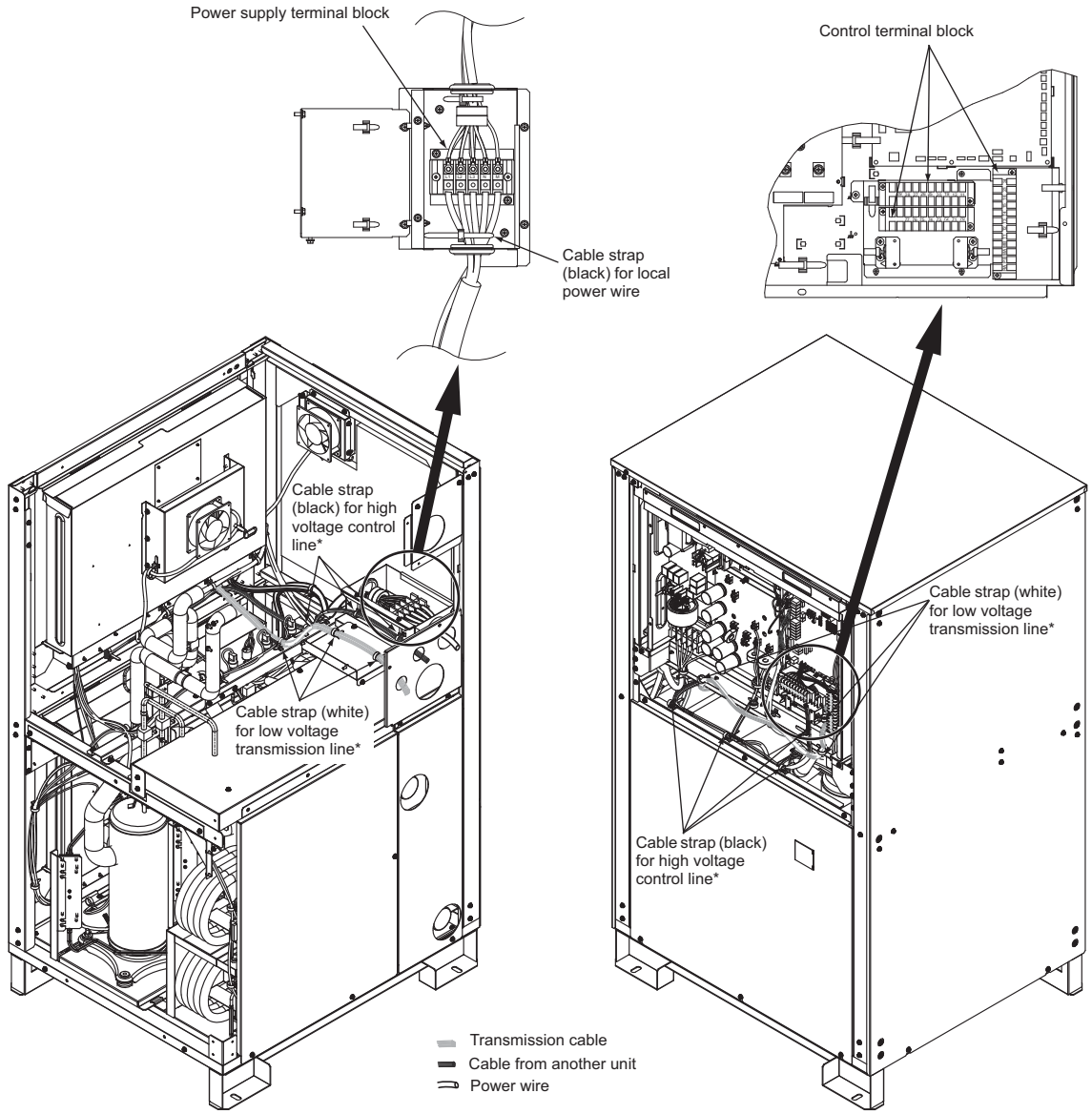
Remote controller cable	Size	0.3 - 1.25 mm² (Max. 200 m total)
	Recommended cable types	CVV
M-NET cable between units *1	Size	Min. 1.25 mm² (Max. 120 m total)
	Recommended cable types	Shielded cable CVVS, CPEVS or MVVS
External input wire size		Min. 0.3 mm²
External output wire size		1.25 mm²

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

2 Cable Connections

<1> Schematic Diagram of a Unit and Terminal Block Arrangement

To remove the front panel of the control box, unscrew the four screws and pull the panel forward and then down.



* When connecting the cables, first temporarily fasten the cables, and then fasten them properly after the cables have been connected to the terminal blocks within the control box.

<2> Precautions when fastening screws

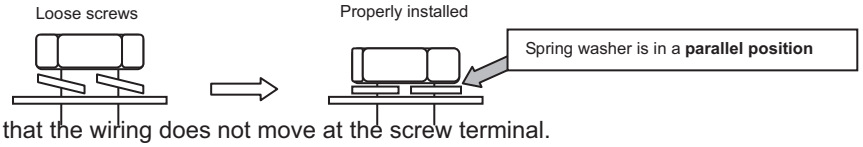
* Faulty contacts due to loose screws may cause overheating and fire.
* Using the circuit board while it is damaged may cause overheating and fire.

① Screw fastening torque

Power supply terminal block (TB2)...M8 screw: **10 to 13.5 N·m**

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

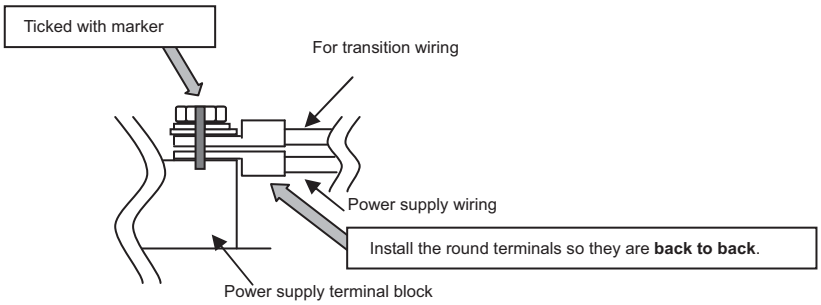
1. Check that the spring washer is in a parallel position.
   * If the screw is biting into the washer, simply fastening the screw to the specified torque cannot determine whether it has been installed properly.



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.

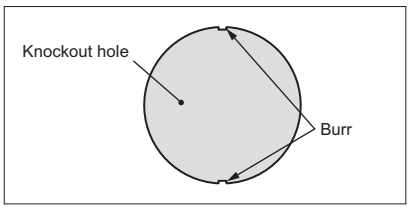
③ After fastening the screw, use a permanent marker to tick off the screw head, washer and terminal.

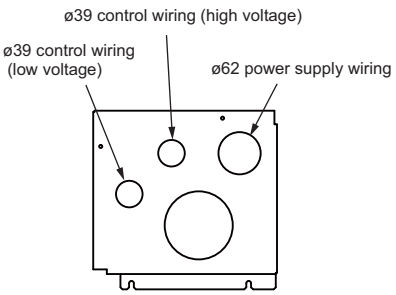


Important: Power supply cables larger than 25 mm^2 in diameter are not connectable to the power supply terminal block (TB2). Use a pull box to connect them.

<3> Installing the conduit tube

- Punch out the knockout hole for wire routing at the bottom of the front panel with a hammer.
- When putting wires through knockout holes without protecting them with a conduit tube, deburr the holes and protect the wires with protective tape.
- If damage from animals is a concern, use a conduit tube to narrow the opening.
- Always use a conduit to run the power supply wiring.
- Select the conduit size based on the knockout hole.





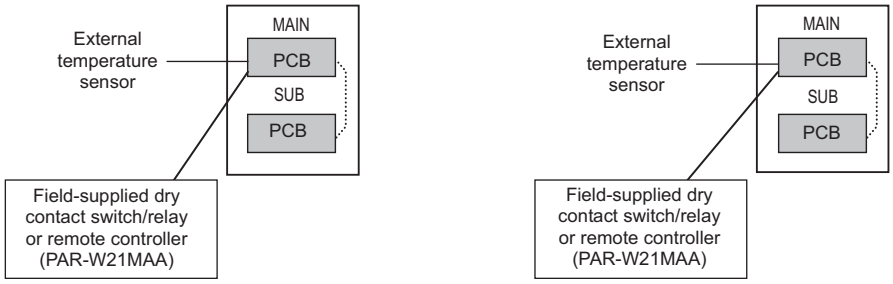
[4] Sample Installation

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

1 Schematic Diagrams of Individual and Multiple Systems

(1) Individual system

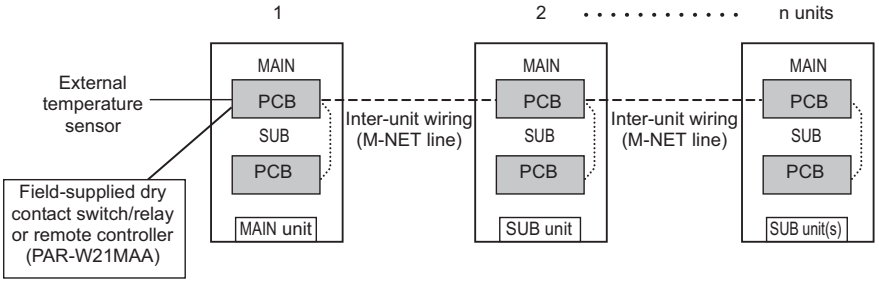
* Each unit is operated individually by connecting a dry contact switch/relay to each unit.



Refer to the sections "Switch Types and the Factory Settings" (page 19) and "System configuration procedures: Individual system" (page 21) for further details.

(2) Multiple system (2-16 units)

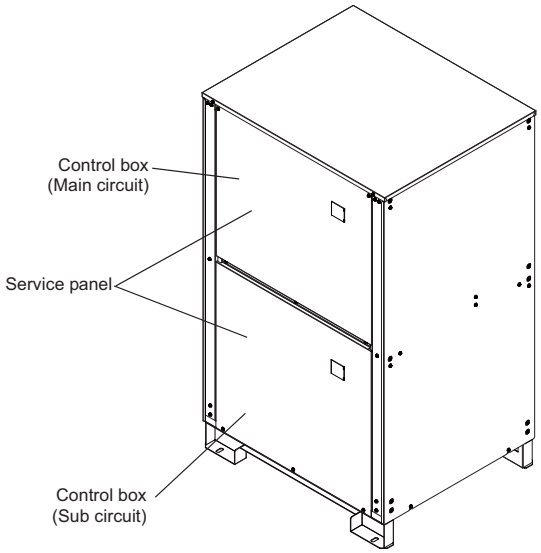
* A group of unit that consists of one main unit and up to 15 sub units is operated collectively by connecting an external water temperature sensor and a dry contact switch/relay to the main unit.



Refer to the sections "Switch Types and the Factory Settings" (page 19) and "System configuration procedures: Multiple system" (page 22) for further details.

[5] Switch Types and the Factory Settings

(1) Switch names and functions



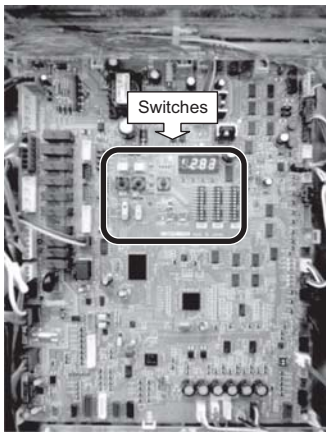
There are four main ways to set the settings as follows:

① Dip switches (SW1 - SW3)
② Dip switches used in combination with the push switches
③ Rotary switches
④ Slide switches

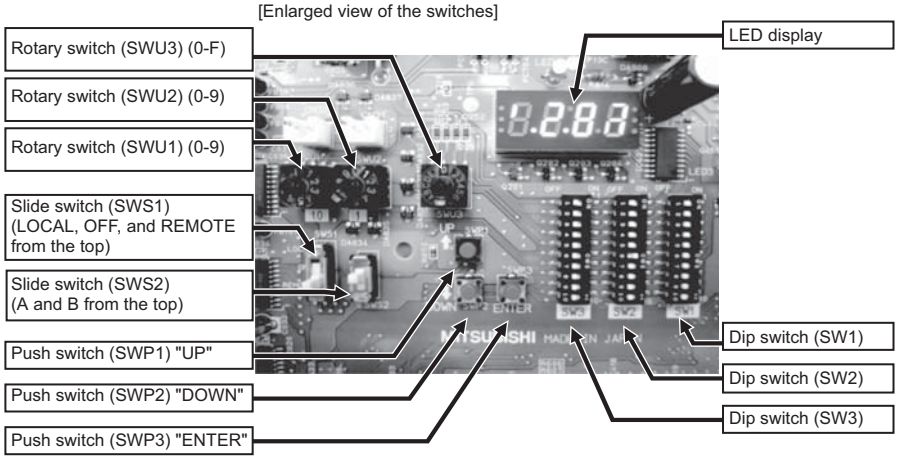
See below for how these switches are used to set certain items.

Different types of switches on the PCB

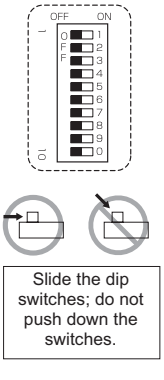
[Entire view of a PCB]



[Enlarged view of the switches]



			Initial Setting	
			MAIN circuit	SUB circuit
Rotary switch (SWU1)	Sets the 10's digit of the unit address (Multiple system).		"0"	"5"
Rotary switch (SWU2)	Sets the 1's digit of the unit address (Multiple system).		"1"	"1"
Rotary switch (SWU3)	Starts up or resets the system (when set to F).		"0"	"0"
Slide switch (SWS1)	LOCAL OFF REMOTE	The action that the switch takes when set to a certain position depends on the type of system configuration (e.g., individual or multiple system)	REMOTE	REMOTE
Slide switch (SWS2)	Unused		A	A
Push switch (SWP1)	Switches the display between the item code and the current value for a specific item. Increases value.		-	-
Push switch (SWP2)	Switches the display between the item code and the current value for a specific item. Decreases value.		-	-
Push switch (SWP3)	Advances the item code. Saves the changed value.		-	-
Dip switches (SW1-3)	Switches the LED display contents.			



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

[6] Configuring the Settings

The settings must be set only by a qualified personnel.

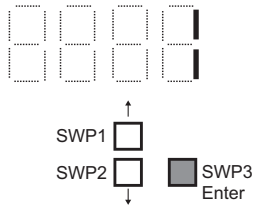
<1> Making the settings

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 switches SW2 and SW3 have been set.

①



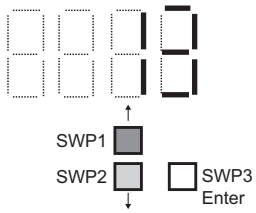
Normally an item code appears on the display.

(The figure at left shows the case where item code 1 is displayed.) Press SWP3 (Enter) to advance the item code.

↓

Press SWP3 (Enter) until the item code appears that corresponds to the item to change or monitor its value.

②

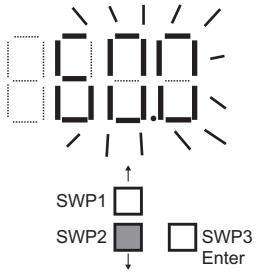


The left figure shows a display example (Code 13 Built-in thermistor temperature setting 2).

↓

Press either SWP1 (↑) or SWP2 (↓) to display the value that corresponds to the selected item.

③



The current setting value will blink.

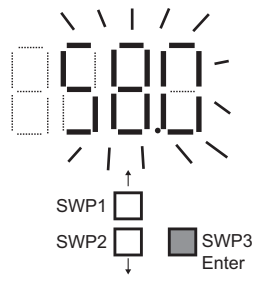
↓

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.

④



<To change the settings>

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.
If SWP3 is not pressed within one minute, the change will not be saved and the display will return to the item code display mode.
Press and hold SWP1 (↑) or SWP2 (↓) for one second or longer to fast forward through the numbers.

<To view the monitored data>

Press SWP3 (Enter) while the LED display is blinking (see step 3 above) to stop the blinking.

*The values of the items that can only be monitored will not change when SWP1 (↑) or SWP2 (↓) is pressed.

The display will stop blinking and stay lit after a minute, and the display will automatically return to the item code display regardless of the type of values displayed.

To change the values of other items, repeat the steps from step 2 above.

(2) System configuration procedures: Individual system

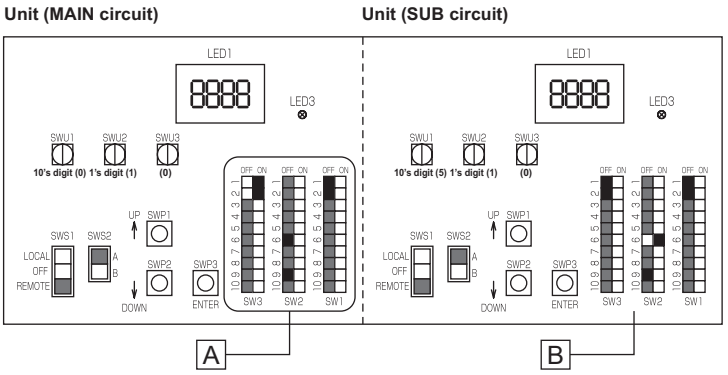
1. Set the dip switches on the MAIN circuit board.

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
- Water temperature control based on the inlet water temperature

Refer to "Dip switch settings table" (page 67) for further details.

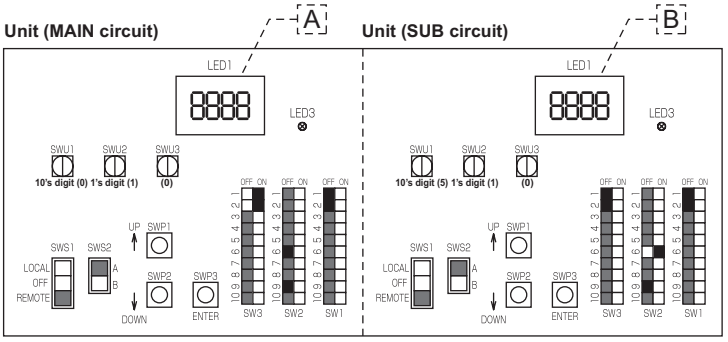


2. Switch on the power to the unit.

Check for loose or incorrect wiring, and then switch on the power to the unit.

When the power is switched on, the following codes will appear on the LED:

- [EEEE] will appear on LED1 in the MAIN circuit board (labeled A in the figure at right).
- [9999] will appear on LED1 in the SUB circuit board (labeled B in the figure at right).



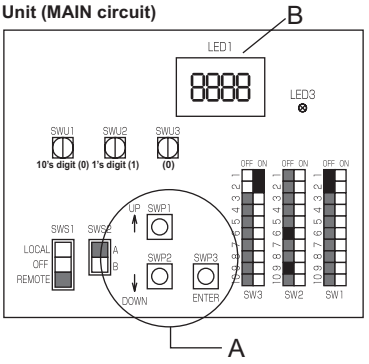
3. Set the preset values with the switches on the MAIN circuit board.

(1) Press either one of the push switches SWP1, 2, or 3 (labeled A in the figure at right) on the MAIN circuit board.
  * [EEEE] will disappear, and an item code ([101]) will appear on LED1 (labeled B in the figure at right).

(2) Use SWP3 to toggle through the item codes and select an item code to change its current value. (The item codes will appear in the following order: [101]→[102]→[104]→[107]→[101] (back to the beginning).)

(3) Use SWP1 to increase the value and SWP2 to decrease the value.

(4) Press SWP3 to save the changed value.



Following the steps above, set the value for the following items as necessary.

[101] Not used

[102] Not used

[104] Not used

[107] Total number of units in the system (Default = 1) (Leave it as it is.)

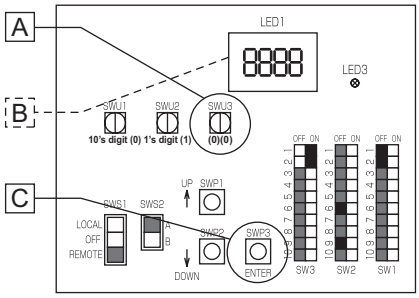
4. Perform an initial setup. (MAIN circuit side)

(1) Set the rotary switch SWU3 (labeled A in the figure at right) to "F." [EEEE] will appear in LED1 (labeled B in the figure at right). *1

(2) Press and hold the push switch (SWP3) (labeled C in the figure at right) for one second or longer.
- While the system is starting up [9999] will appear on LED1 (labeled B in the figure at right).
- When start-up is complete, a control property [0002] will appear.
- Then five seconds later [FFFF] will appear.

(3) Set the rotary switch SWU3 (labeled A in the figure at right) back to "0."
The start-up process is complete, and the settings for such items as clock, peak-demand control, schedule, and thermistor settings can now be made.

Unit (MAIN circuit)

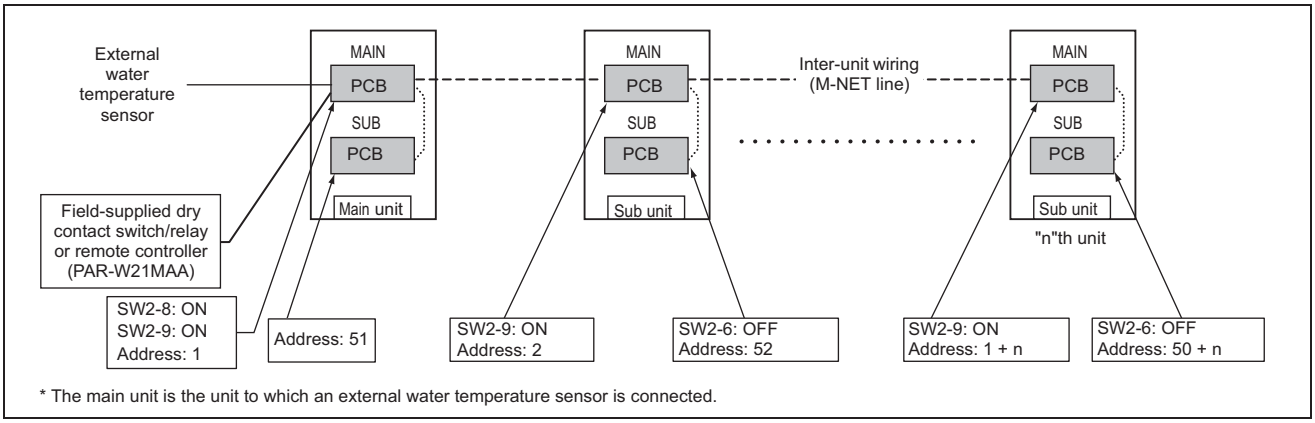


*1 If the start-up process has already been completed, [FFFF] (instead of [EEEE]) will appear when the rotary switch SWU3 is set to "F."

(3) System configuration procedures : Multiple system

1. Set the dip switches and rotary switches.
(Switches on the MAIN circuit on the main unit* AND the MAIN and SUB circuits on all sub units)

System configuration diagram



Setting the switches on the main unit

MAIN circuit

(1) Set the dip switch SW2-8 to ON. (an external water temperature sensor) (labeled A in the figure at right)

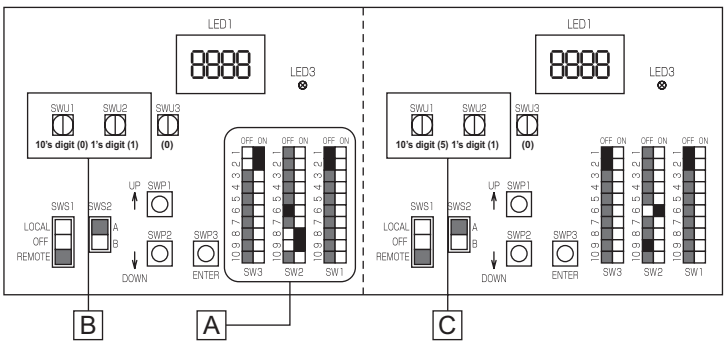
(2) Set the dip switch SW2-9 to ON. (multiple unit control)(labeled A in the figure at right)

SUB circuit

Nothing needs to be changed.

Refer to "Dip switch settings table" (page 67) for further details.

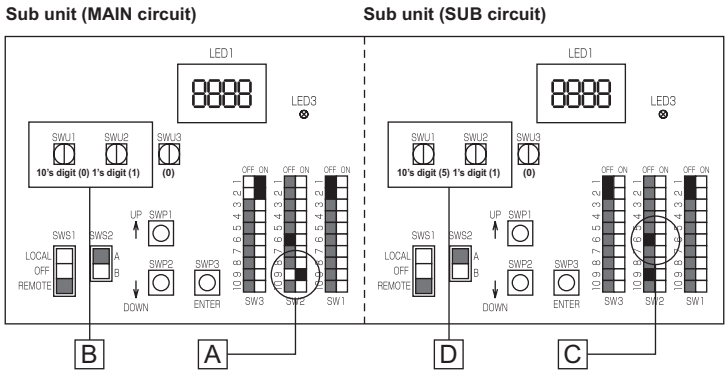
Main unit (MAIN circuit) **Main unit (SUB circuit)**



Make sure the address of the MAIN circuit on the main unit is set to "1" (labeled B in the figure above) and that the address of the SUB circuit on the main unit is set to "51" (labeled C in the figure above).

The address of each SUB circuit should equal the sum of the MAIN circuit address on the same unit and 50.

Setting the switches on all sub units



MAIN circuit

(1) Set the dip switch SW2-9 to ON. (multiple unit control) (labeled A in the figure at right)

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

SUB circuit

(3) Set the dip switch SW2-6 to OFF. (power supply to communication circuit) (labeled C in the figure at right)

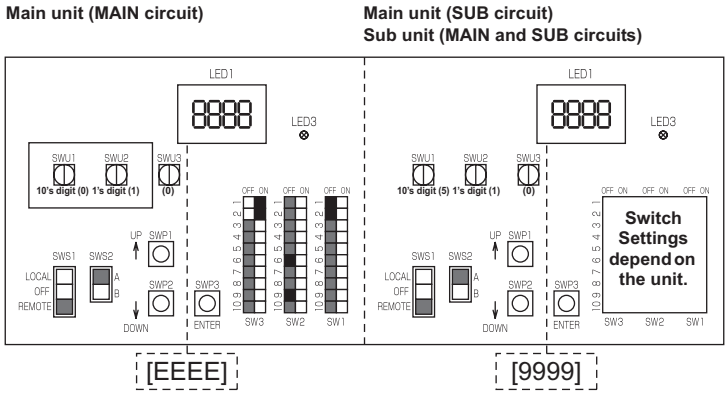
(4) Set the SUB circuit addresses with the rotary switches (labeled D in the figure above). Set the 10's digit with SWU1, and set the 1's digit with SWU2. Assign sequential addresses to the SUB circuit on all sub units starting with 52.

2. Switch on the power to the unit.

Check for loose or incorrect wiring, and then switch on the power to all units.

When the power is switched on, the following codes will appear on the LED:

- [EEEE] will appear on LED1 in the MAIN circuit board.
- [9999] will appear on LED1 in the SUB circuit board on the main unit and both MAIN and SUB circuits on the sub units.



3. Set the preset values with the switches on the MAIN circuit board.

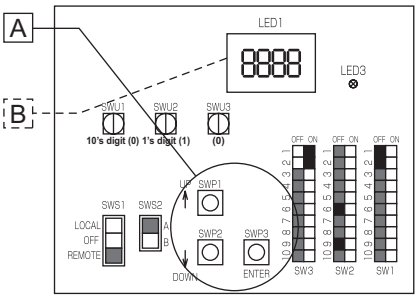
(1) Press either one of the push switches SWP1, 2, or 3 (labeled A in the figure at right) on the MAIN circuit board.

* [EEEE] will disappear, and an item code ([101]) will appear on LED1 (labeled B in the figure at right).

(2) Use SWP3 to toggle through the item codes, and select an item code to change its current value. (The item codes will appear in the following order: [101] →[102]→[104]→[107]→[101] (back to the beginning).)

(3) Use SWP1 to increase the value and SWP2 to decrease the value.

(4) Press SWP3 to save the changed value.



Following the steps above, set the value for the following items with the switches on the MAIN circuit as necessary. Item [107] must be set when multiple units are connected to a system.

[101] Not used

[102] Not used

[104] Not used

[107] Total number of the main and sub units in the system

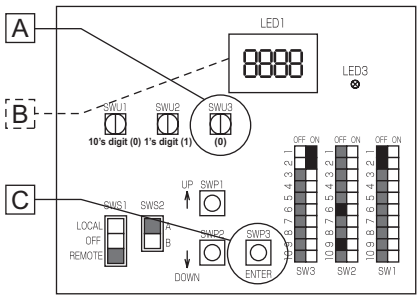
4. Perform an initial setup on the MAIN circuit on the main unit

(1) Set the rotary switch SWU3 on the MAIN circuit on the main unit (labeled A in the figure at right) to "F."
[EEEE] will appear in LED1 (labeled B in the figure at right). *1

(2) Press and hold the push switch (SWP3) (labeled C in the figure at right) for one second or longer.
- While the system is starting up [9999] will appear on LED1 (labeled B in the figure at right).
- When start-up is complete, a control property [0002] will appear.
- Then, five seconds later, [FFFF] will appear.

(3) Set the rotary switch SWU3 (labeled A in the figure at right) back to "0."
The start-up process is complete, and the settings for such items as clock, peak-demand control, schedule, and thermistor settings can now be made.

Main unit (MAIN circuit)



*1 If the start-up process has already been completed, [FFFF] (instead of [EEEE]) will appear when the rotary switch SWU3 is set to "F."

(4) Re-initializing the system

When the settings for the items below have been changed, the system will require re-initialization.

- Dip switch SW2-8 (use or non-use of an external water temperature sensor) (Re-initialization is required only for the Multiple system.)
- Dip switch SW2-9 (multiple unit control)
- Dip switch SW3-3 (water temperature control method)
- External signal input setting [107] (total number of units in the system)
- Rotary switches (SWU1 and SWU2) (unit address)

Take the following steps to re-initialize the system:

(1) Set the rotary switch SWU3 to "F."
[FFFF] will appear in the LED1.

(2) Press and hold the push switch SWP3 for one second or longer.

- While the system is starting up [9999] will appear on LED1.
- When start-up is complete, a control property [0012] will appear.
- Then, five seconds later, [FFFF] will appear.

(3) Press and hold the push switch SWP3 again for one second or longer.

- While the system is starting up [9999] will appear on LED1.
- When start-up is complete, a control property [0002] will appear.
- Then, five seconds later, [FFFF] will appear.

(4) Set the rotary switch SWU3 back to "0."

(5) Resetting the system (MAIN and SUB circuits)

Take the following steps to reset the system. An error can also be reset by taking the steps below.
Note that the errors on the MAIN unit must be reset through the MAIN circuit, and the errors on the sub unit must be reset through the SUB circuit.
When an error on the MAIN unit is reset, all sub units will stop.

(1) Set the rotary switch SWU3 to "F."
[FFFF] will appear in the LED1.

(2) Press and hold the push switch SWP3 for one second or longer.

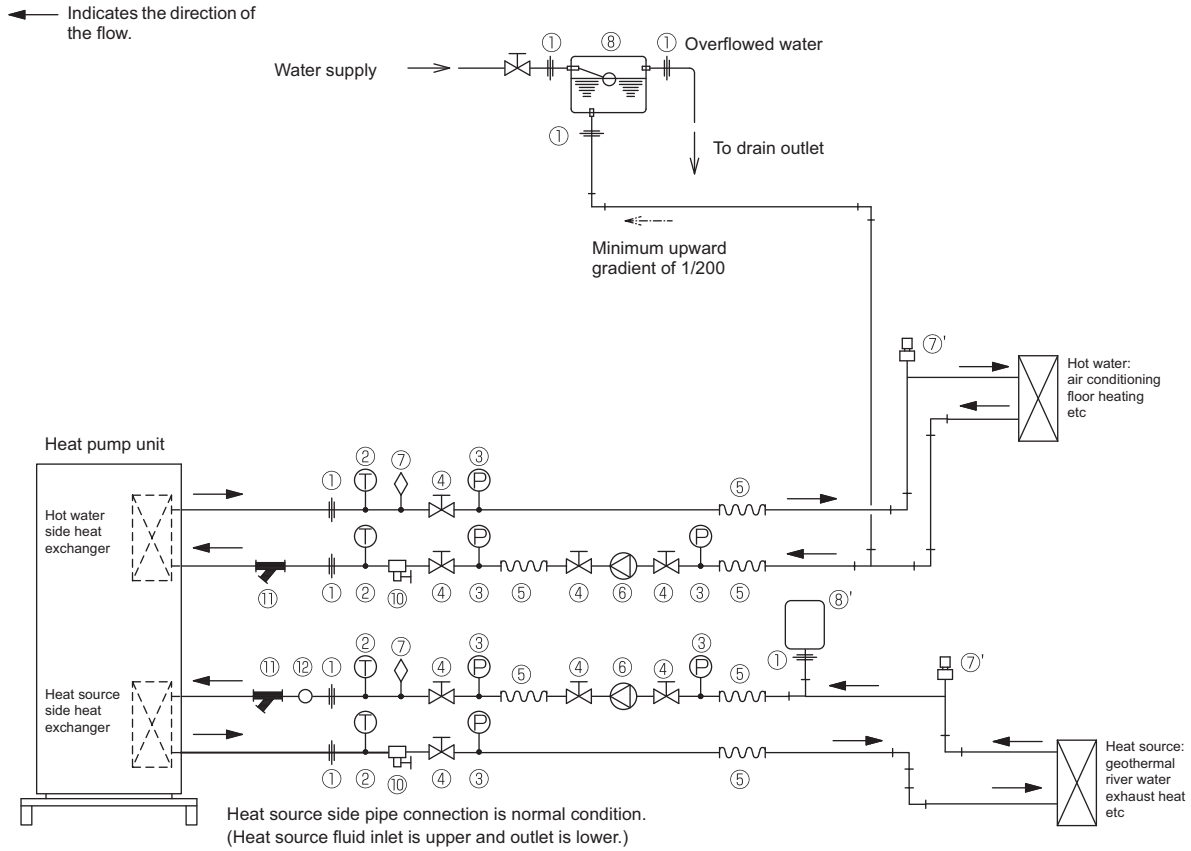
- While the system is starting up [9999] will appear on LED1.
- When start-up is complete, a control property [0012] will appear.
- Then, five seconds later, [FFFF] will appear.

(3) Set the rotary switch SWU3 back to "0."

[7] Water Pipe Installation

1. Schematic Piping Diagram and Piping System Components

Please build the hot water and heat source fluid circuit so that it is a closed system.
Do not use hot water directly for showers or other applications. Do not allow other heat source liquids to mix with the hot water and heat source fluid circuit.



①	Union joints/flange joints	Required to allow for a replacement of equipment.
②	Thermometer	Required to check the performance and monitor the operation of the units.
③	Water pressure gauge	Recommended for checking the operation status.
④	Valve	Required to allow for a replacement or cleaning of the flow adjuster.
⑤	Flexible joint	Recommended to prevent the noise and vibration from the pump from being transmitted.
⑥	Pump	Use a pump that is large enough to compensate for the total water pressure loss and supply sufficient water to the unit.
⑦	Air vent valve	Install air venting valves to the places where air can accumulate. Automatic air vent valves (such as ⑦') are effective.
⑧	Expansion tank	Install an expansion tank to accommodate expanded water and to supply water.
⑧'	Closed expansion tank	Use a closed expansion tank to help manage the concentration of brine.
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 (supplied).
⑫	Flow switch	Required to protect the unit.

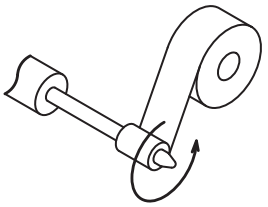
2. Water piping attachment method

Applying sealant

Apply some sealant to the coupling screws.

When applying liquid sealant, use a brush.

Do not let the liquid sealant peel off and reach into the water circuit during installation or operation.

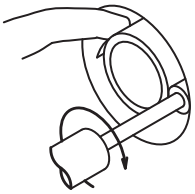


When using sealing tape, wrap the sealing tape around the coupling screws by following the procedures below.

① Wrap sealing tape around the tip of a screwdriver approximately 23 times*, then cut the tape.
(*equivalent to the length sufficient to wrap around the coupling screws three times)

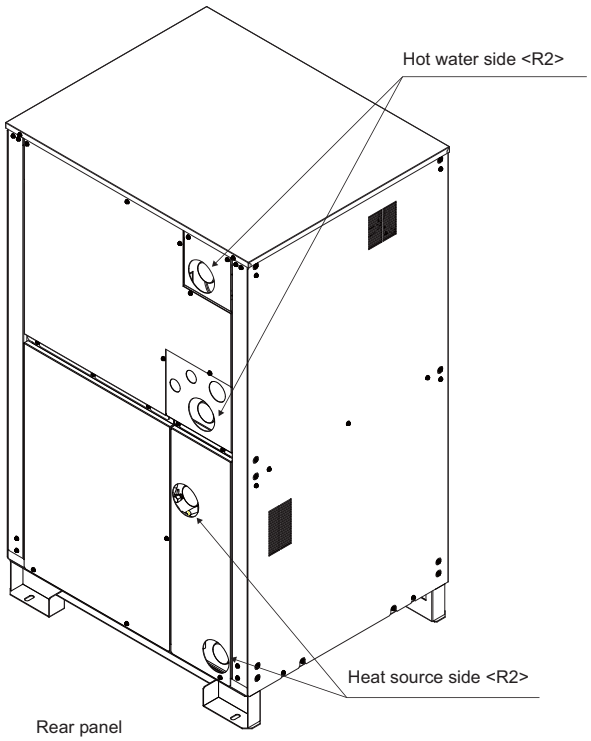
② Attach the end of the sealing tape to the coupling screws, hold it with a finger, and wrap the sealing tape around the coupling screws, gradually turning the screwdriver to unwrap the tape from the screwdriver.

⚠ Wear protective gloves



To reduce the risk of injury from metal sheet edges, wear protective gloves.

- The unit and water piping can be connected using a single spanner. Fastening torque 200 N·m ± 10 N·m.
- The noise level will increase if there is a gap between the water piping hole and the piping, so fill in the gap.



3. Notes on pipe corrosion

Water treatment and water quality control

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

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

- Water Quality Control

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

(2) Water quality standard

Items			Lower mid-range temperature water system Water Temp. ≤ 60ºC		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℃)		7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	○	○
	Electric conductivity	(mS/m) (25℃) (μs/cm) (25℃)	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	1.0 or less	○	
	Sulfide ion	(mg S^{2-}/ℓ)	Not to be detected	Not to be detected	Not to be detected	Not to be detected	○	
	Ammonium ion	(mg NH_4^+/ℓ)	0.3 or less	0.1 or less	0.1 or less	0.1 or less	○	
	Residual chlorine	(mg Cl/ℓ)	0.25 or less	0.3 or less	0.1 or less	0.3 or less	○	
	Free carbon dioxide	(mg CO_2/ℓ)	0.4 or less	4.0 or less	0.4 or less	4.0 or less	○	
	Ryzner stability index		—	—	—	—	○	○

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

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

(4) When replacing an air conditioner (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.

- Brine Quality Control

To protect the heat exchanger from freezing, use the ethylene glycol 35 wt%.

Always use organic brine for this unit, and maintain brine's freezing temperature below -18℃.

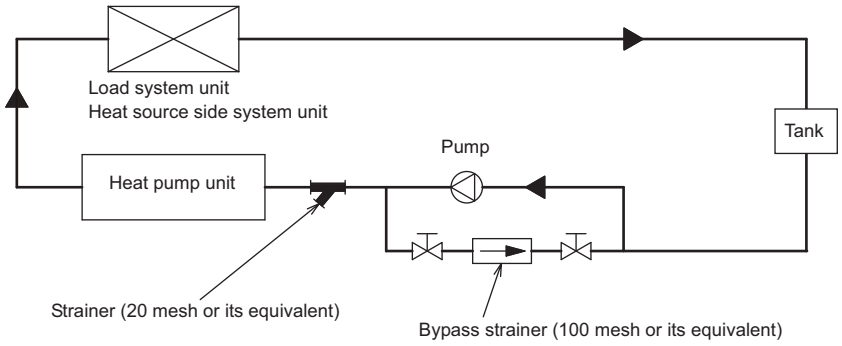
(5) Suspended solids in the water

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 70°C or more. Use hot water input piping material that can withstand the maximum input water temperature. Use heat source piping material that can withstand the minimum temperature. All piping must be made of SUS or similar material to withstand corrosion.

4. 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.

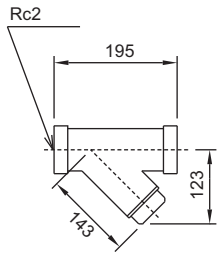
Install a strainer in a way that allows for easy access for cleaning, and instruct the user to clean it regularly.

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.

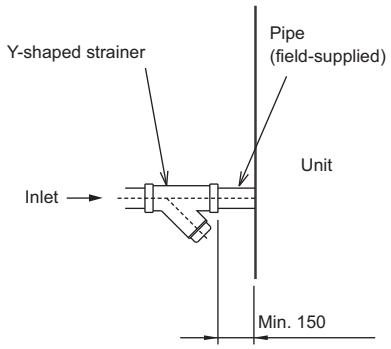
* The dimensions given below indicate the amount of space necessary when screwing in a Y-shaped strainer.

<Unit: mm>



Recommended torque : 200±20 (N·m)

Option Parts : YS-50A



Sample installation

(2) Installing a flow switch

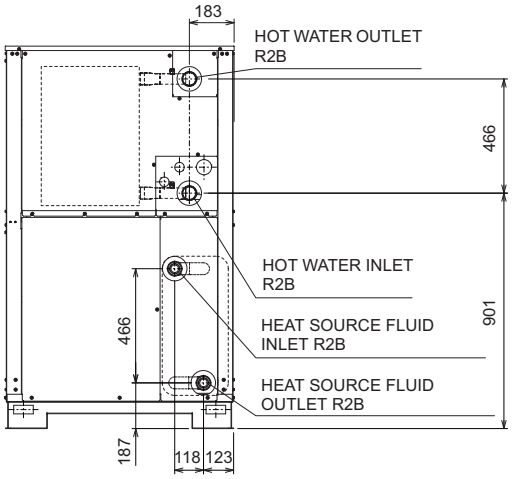
Install a flow switch that meets the following specifications on the heat source fluid pipe.

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

Minimum flow rate= 4.5 m³/h (75 L/min)

Unit usage range (water flow rate): 4.5 - 16.0 m³/h

5. Water pipe hole size and location



Heat source side pipe connection is nomal condition.
(Heat source fluid inlet is upper and outlet is lower.)

6. Minimum and maximum water flow rates

A low flow rate will not only compromise the performance of the unit but also increase the water temperature difference between the periods when the unit is in operation and when the unit is stopped. A high flow rate will cause the pipes to corrode. Adjust the circulating flow rate so that the difference between the inlet and outlet temperatures will be between 3 ºC and 10 ºC. Refer to the table below for the standard, minimum, and maximum flow rates.

Standard, Minimum, and Maximum flow rates Unit: m^3/h

CRHV-P600YA-HPB	Standard flow rate (50Hz)	Minimum allowable flow rate	Maximum allowable flow rate
	Heating		
Hot water side	10.3	3.2	15.0
Heat source side	14.7	4.5	16.0

The hot water flow rate will be considered appropriate if the difference between the inlet and outlet water temperatures is between 3 ºC and 10 ºC.

- If the temperature difference is less than 3 ºC
  Decrease the flow rate.
- If the temperature difference is more than 10 ºC
  Increase the flow rate. Check the pipes for air pockets, and make sure that the pump has enough capacity to sustain appropriate water pressure in a given water circuit.

7. Maintaining the appropriate amount of water in the water circuit.

(1) Amount of water in the water circuit

Shortage of water in the circulating water circuit may shorten the operation time of the unit or cause large fluctuations of water temperature. The table below shows the minimum allowable amount of water in the water circuit. If the piping length is too short to secure this amount, install a cushion tank to ensure that the circuit has enough water in it.

Model	Minimum allowable amount of hot water (ℓ)	Minimum allowable amount of heat source (ℓ)
CRHV-P600YA-HPB	550	390

(2) Calculating the amount of water in the circuit

The amount of water in the circuit can be obtained using the following formula.
Amount of water in the water circuit = Amount of water in the water piping + Amount of water in the unit + and Amount of water in the load-side or heat source unit

The table below shows the amount of water in the water piping per 1 m

Amount of water in the piping

	Pipe size					
	3/4B (20A)	1B (25A)	1 1/4B (32A)	1 1/2B A(40A)	2B (50A)	1 1/2B (65A)
Internal volume per meter (ℓ/m)	0.37	0.60	0.99	1.36	2.20	3.62

The table below shows the amount of water in the unit.

Amount of water in the unit

Model	Hot water side (ℓ)	Heat source side (ℓ)
CRHV-P600YA-HPB	15	10

8. Sizes and the material types of the pipes on the unit

The table below shows the sizes of the pipes.

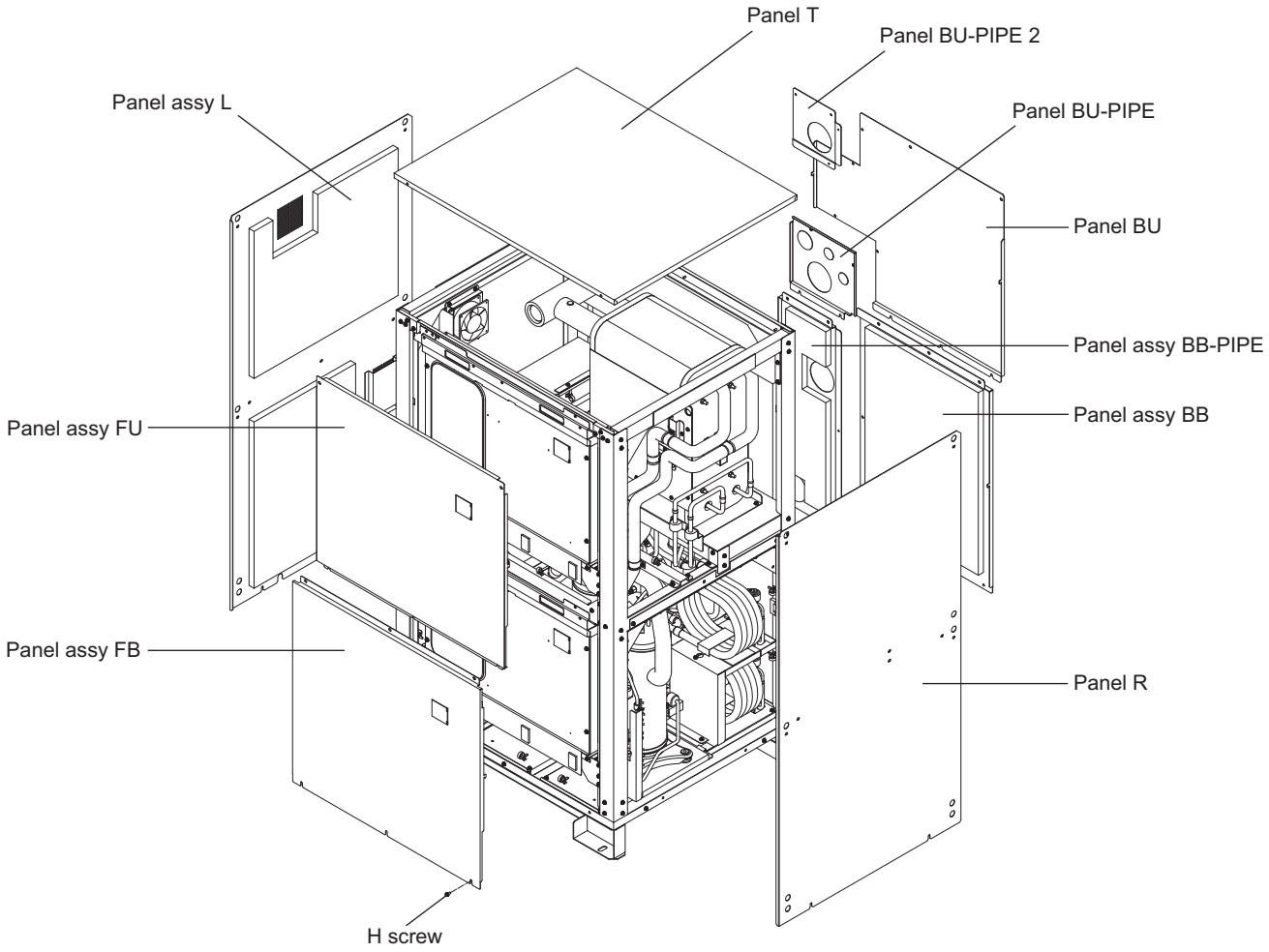
Pipe sizes

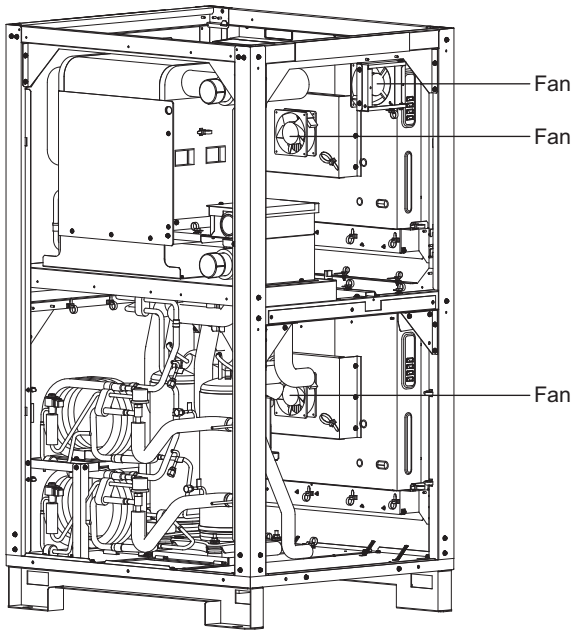
Model	Hot water side	Heat source side
CRHV-P600YA-HPB	R2 male thread pipe <SUS304>	R2 male thread pipe <SUS304>

III Unit Components

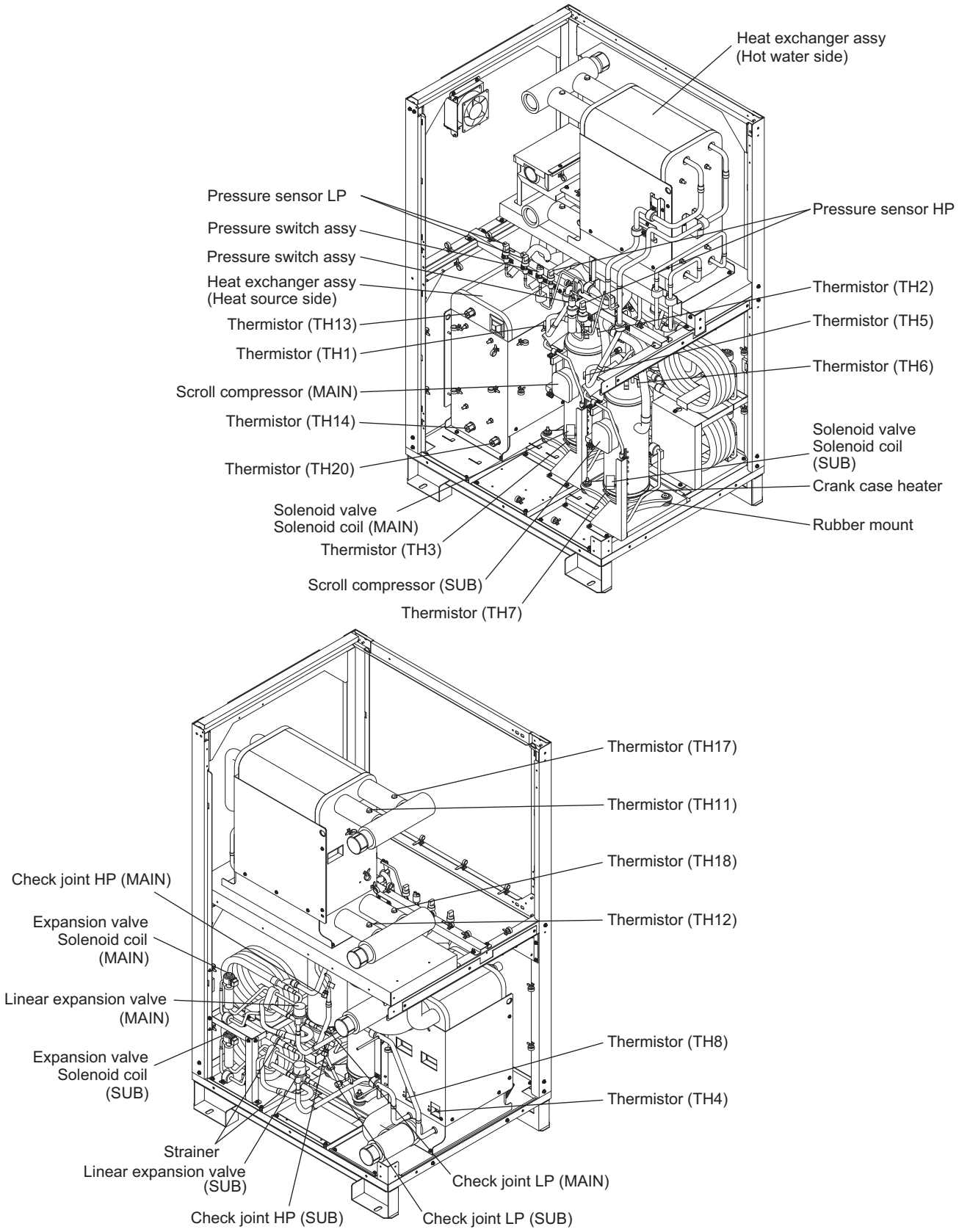
[1] Unit Components and Refrigerant Circuit

1. Unit Components



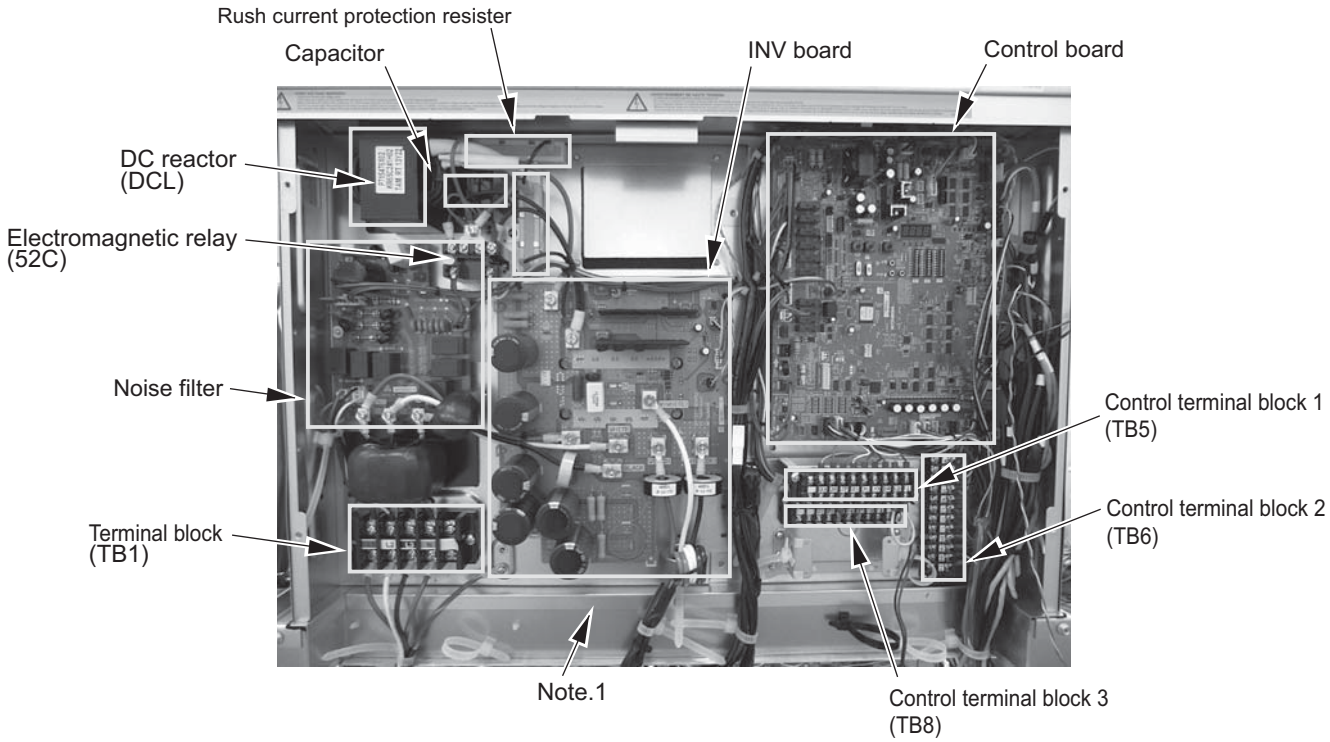


2. Refrigerant circuit

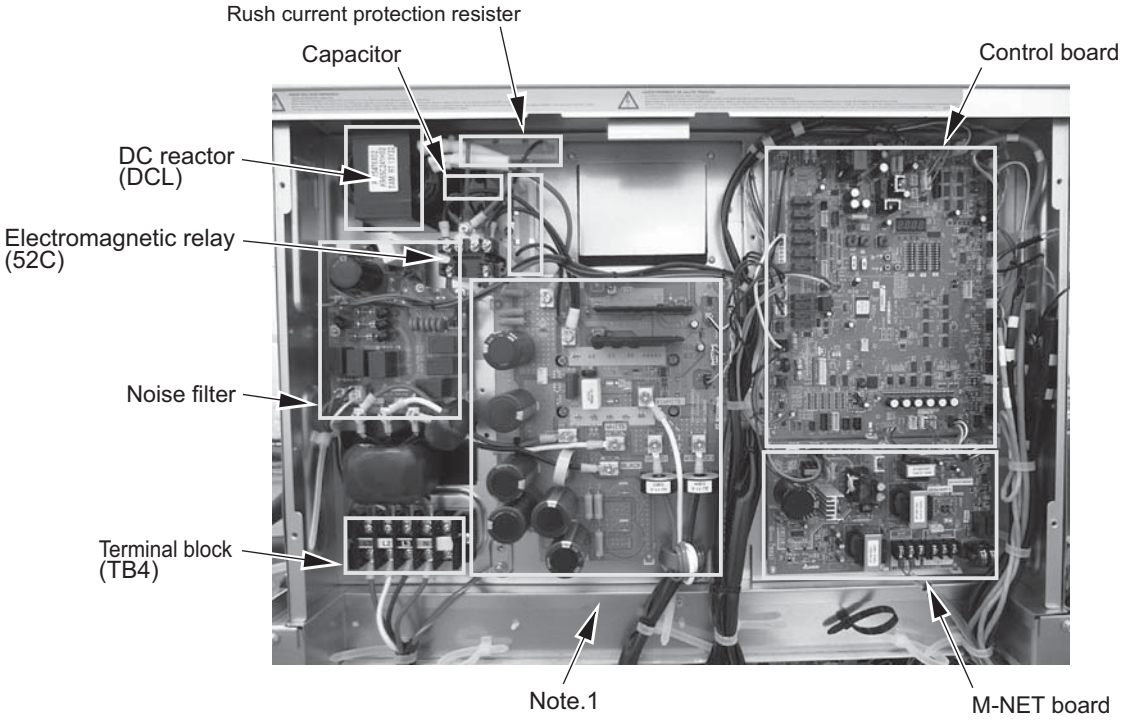


[2] Control Box of the Unit

(1) Main circuit control box



(2) Sub circuit control box

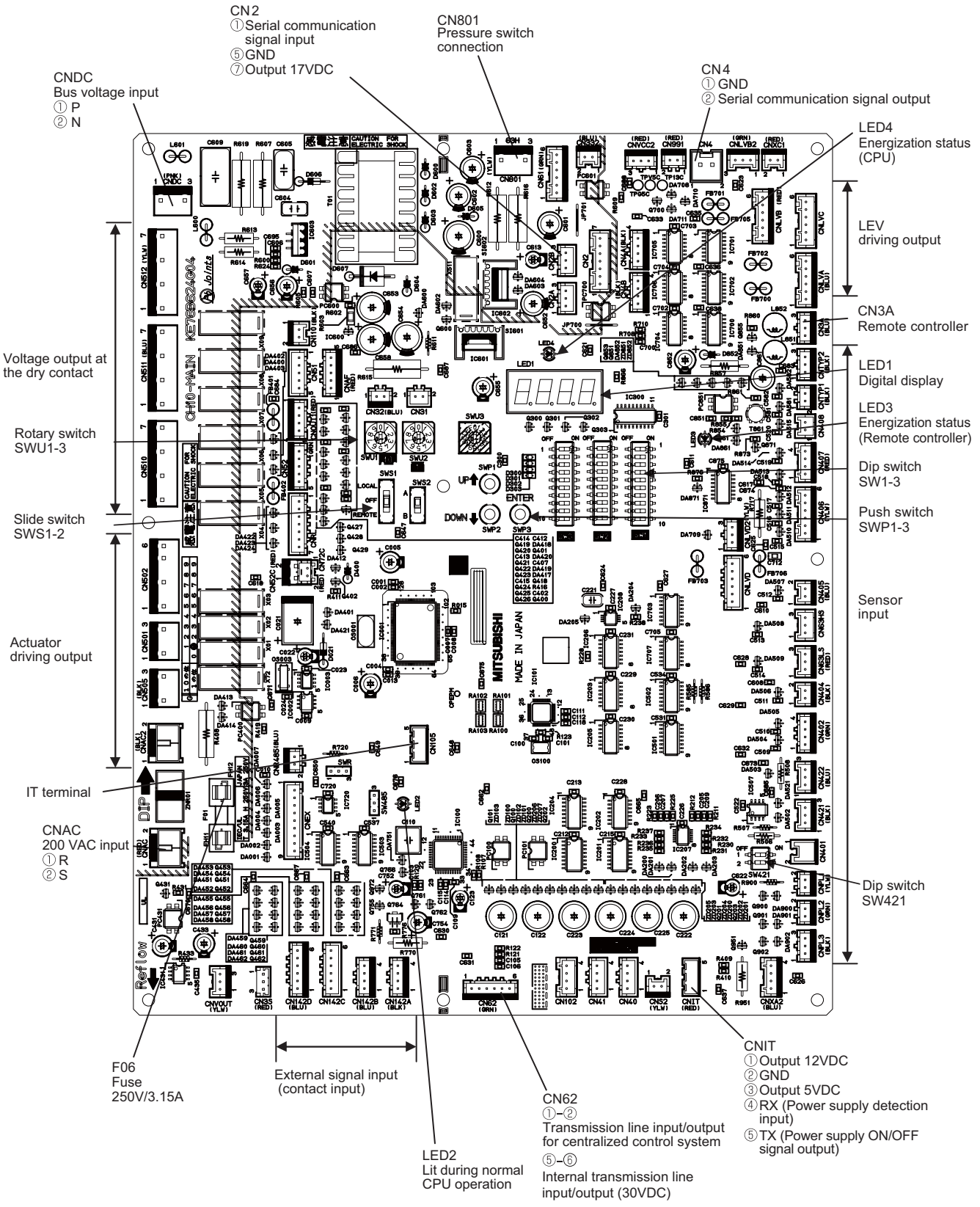


Note

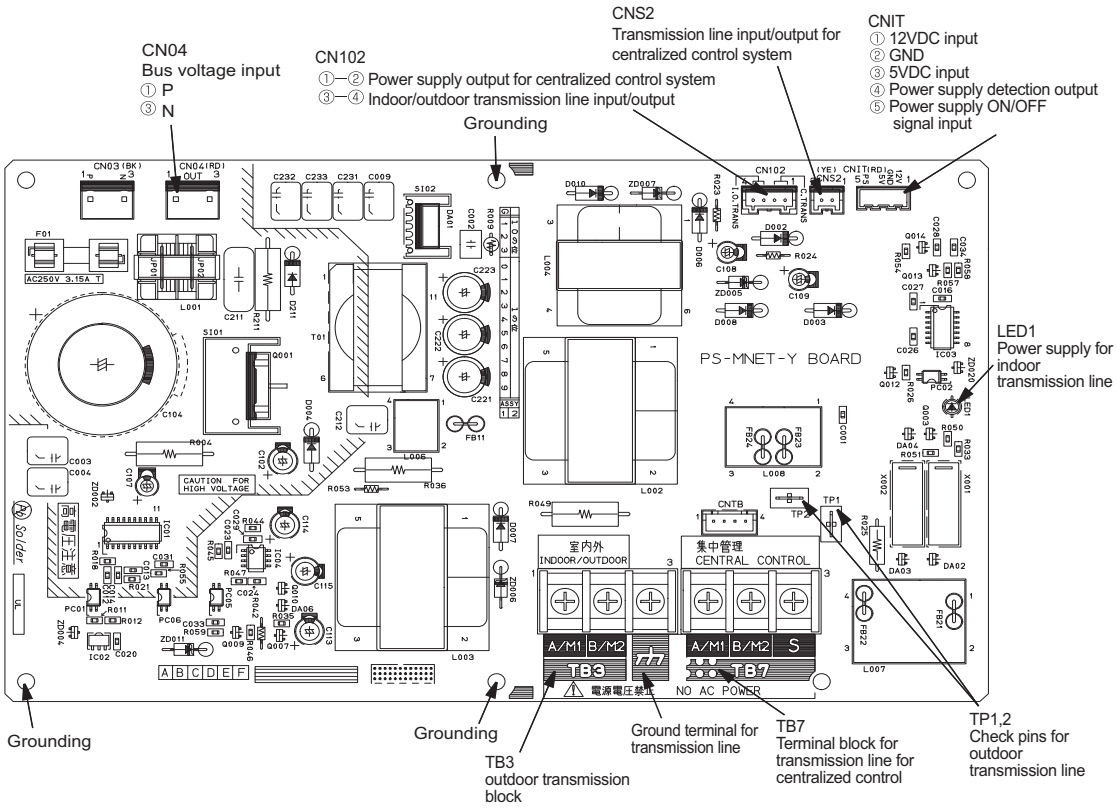
1) Exercise caution not to damage the bottom and the front panel of the control box. Damage to these parts affect the waterproof and dust proof properties of the control box and may result in damage to its internal components.
2) Faston terminals have a locking function. Make sure the cable heads are securely locked in place. Press the tab on the terminals to remove them.

[3] Unit Circuit Board

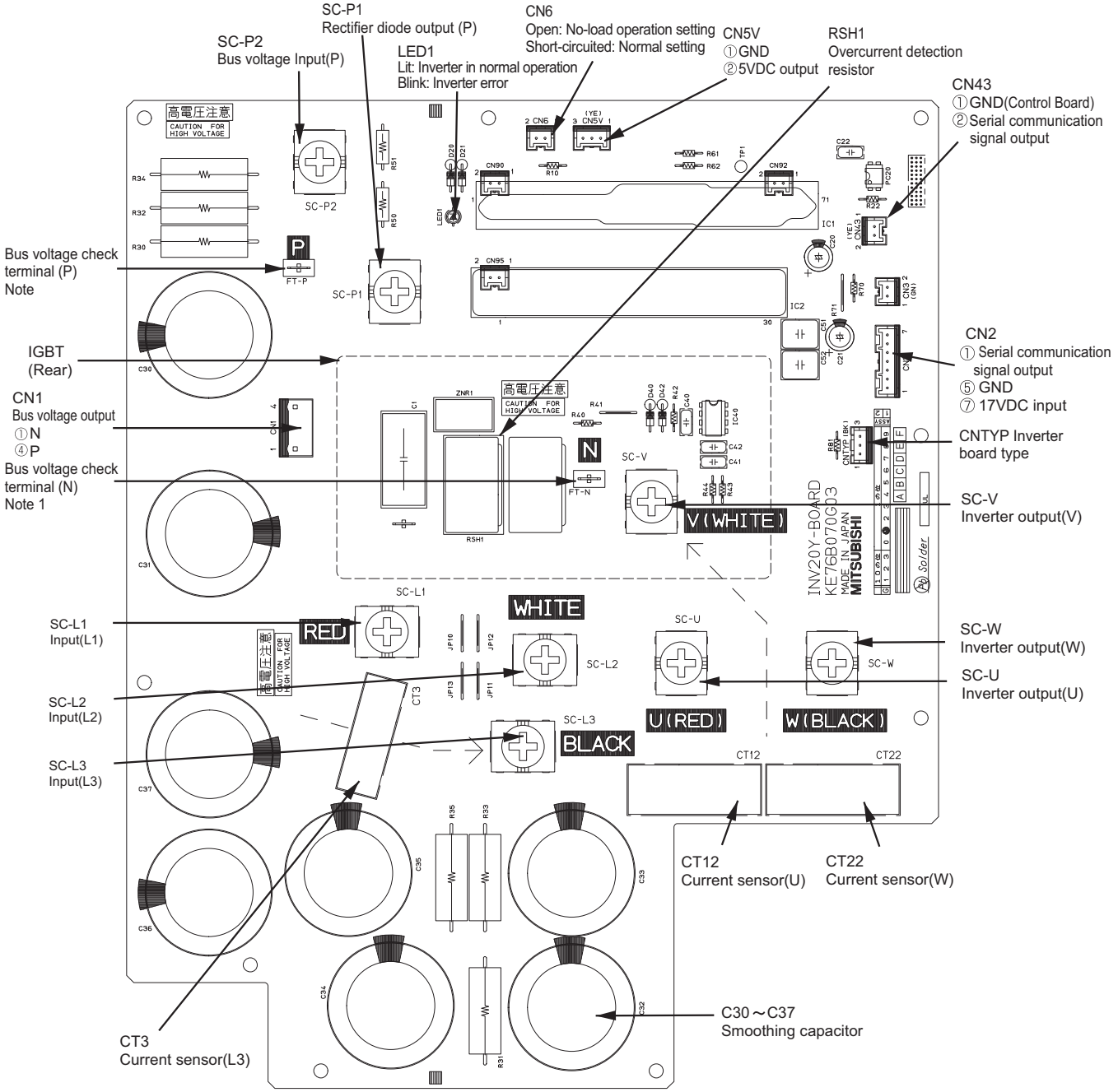
1. Control board (MAIN board)



2. M-NET board


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

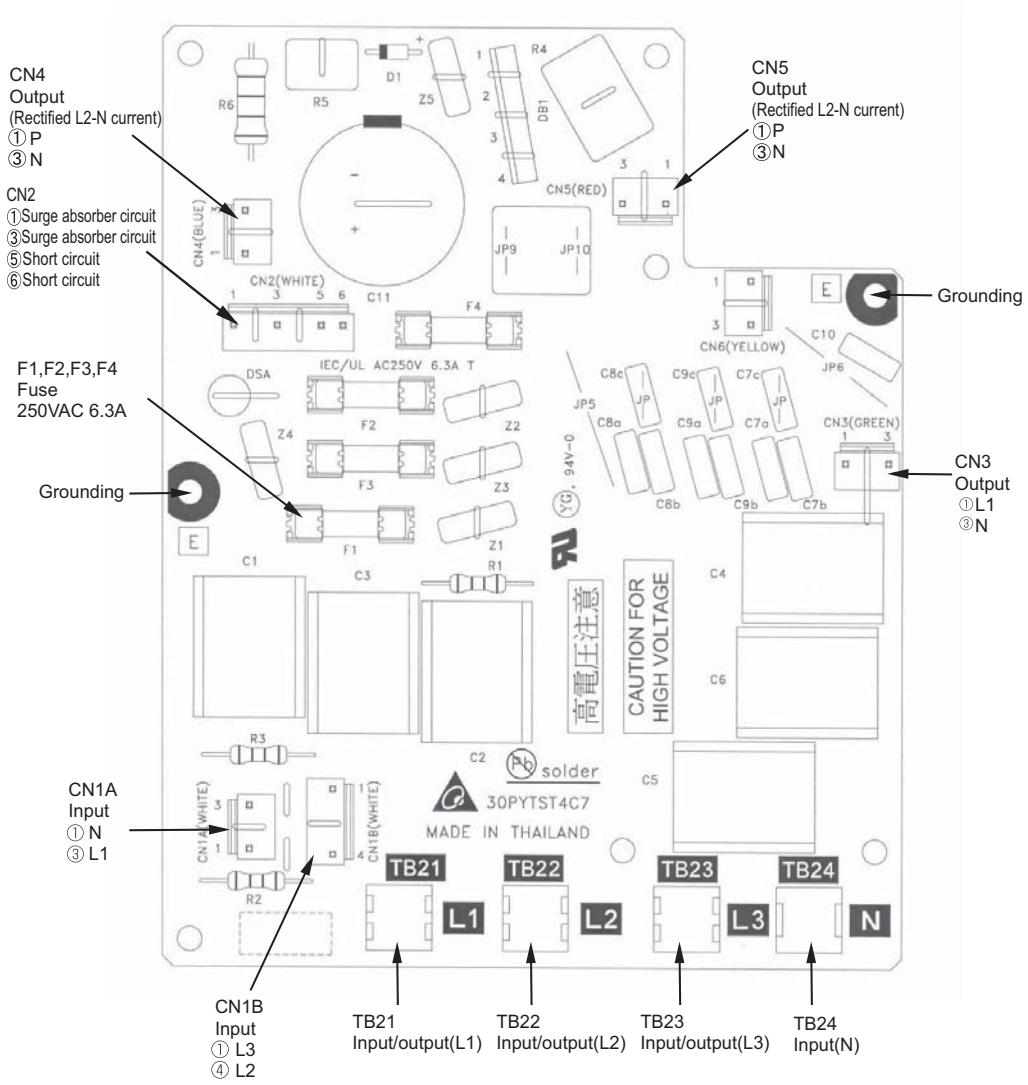
3. INV board



Note

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

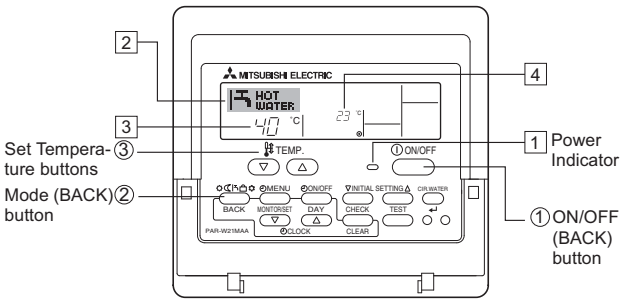
4. Noise Filter



Ⅳ Remote Controller

[1] Using the Remote Controller

<1> Starting and Stopping Operation and Changing the Operation Mode



To Start Operation

1. Press the ON/OFF (BACK) button ①.
   The power indicator [1] and the display will light up.

To Stop Operation

1. Press the ON/OFF (BACK) button ① while the unit is in operation.
   The power indicator [1] and the display will light off.
   The remote controller will remember the last mode and temperature settings when turned off.

To select the Mode

1. With the power turned on, press the Mode (BACK) button ② until the desired mode appears.
   - Each press changes the operation mode in the following sequence (see notes *1 and *2 below):
     Heating→Heating ECO→Hot water→Anti-freeze→Back to Heating.
     The currently selected mode will appear in the area labeled [2].

*1 If CN142A 3-4 is ON (CLOSE), the operation mode cannot be changed from the remote controller.

*2 The available modes vary depending on the model.

*3 Refer to section [2] "Function Settings" [4]-2. (2) for how to change the settings for a specific function.

<2> Setting the Water Temperature

The current water temperature will appear in the area labeled 3.

How to Change the Temperature Setting

1. To lower the water temperature setting
   Press the ▽ Set Temperature button ③.
2. To raise the water temperature setting
   Press the △ Set Temperature button ③.
   - Each press increases or decreases the temperature by 1 °C (1 °F).
     The current setting will appear in the area labeled 3 in the figure on the previous page.
   - The settable ranges for the “Hot Water” and “Heating” modes are as follows. *1, *2

Hot Water	Heating
30 °C - 65 °C 86 °F - 149 °F *3	30 °C - 55 °C 86 °F - 131 °F *3

Note:

*1 Available ranges vary depending on the type of unit connected.

*2 If the temperature ranges are restricted from the remote controller, the settable ranges may be narrower than shown above. If an attempt is made to set a value outside of the restricted range, the display will show a message indicating that the range is currently restricted.
For information about how to set and clear the restrictions, refer to section [2], item [4]–2. (3).

*3 Temperatures can be displayed in Celsius or Fahrenheit (factory setting: Fahrenheit). For information about how to select °C or °F , refer to section [2], item [4]–4. (1).

*4 If the target water temperature setting for the Heating mode has been set to a temperature outside of the remote controller’s setting range (above 55°C) from the circuit board, any signal from the remote controller to change the temperature setting will be ignored. If this happens, disconnect the remote controller, set the target temperature to 55°C or below from the circuit board, reconnect the remote controller, and then change the temperature setting from the remote controller.

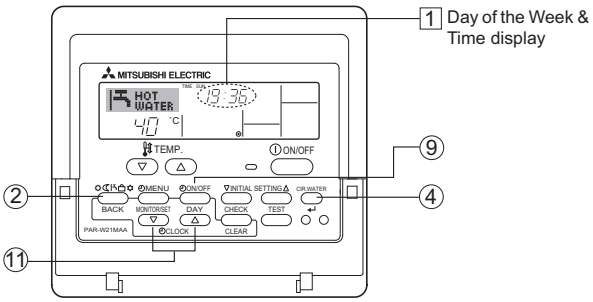
- Water temperature can be controlled based on the inlet or outlet temperature.

* The water temperature range that can be displayed is between 0 °C to 100 °C. Outside this range, the display flashes either 0 °C or 100 °C.

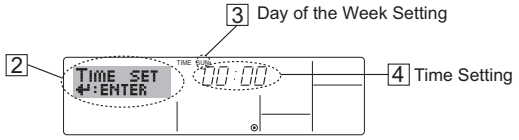
<3> Setting the Day of the Week and Time

Use this screen to set and change the current day of the week and time settings.

Note:
The day and time will not appear if the clock display is disabled from the remote controller on the Function Selection menu.



How to Set the Day of the Week and Time



1. Press the ▽ or △ Set Time button ⑪ to bring up TIME SET ENTER in the area labeled 2.
2. Press the TIMER ON/OFF (SET DAY) button ① to set the day (labeled 3 in the figure).
   * Each press advances the day.
3. Press the Set Time button ⑪ as necessary to set the time.
   * When the button is held down, the time (at 4) will increment first in one-minute intervals, then in ten-minute intervals, and then in one-hour intervals.
4. After making the appropriate settings in Steps 2 and 3, press the CIR.WATER ↵ button ④ to save the values.

Note:
The changes will be lost unless the Mode (BACK) button ② is pressed before the CIR.WATER ↵ button ④ is pressed.

5. Press the Mode (BACK) button ② to complete the setting procedure and return the display to the normal operation screen. The new day and time will appear in the area labeled 3.

<4> Using the Timer

Three types of timers are available as follows: ① Weekly timer, ② Simple timer, or ③ Auto-Off timer. The timer type can be selected from the remote controller on the Function Selection menu.
For information about how to use the Function Selection menu on the remote controller, refer to [4]–3. (3) (page 51).

Using the Weekly Timer

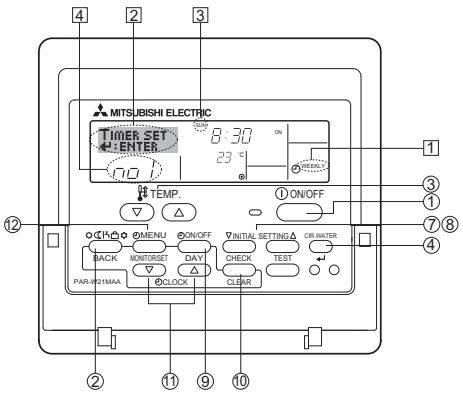
1. The weekly timer can be used to schedule up to six events for each day of the week.
   - Each operation event can consist of any of the following: ON/OFF time together with a temperature setting, ON/OFF time only, or temperature setting only.
   - When the timer reaches the preset time, the schedule event will take place.
2. The time can be set to the nearest minute.

Note:

*1 The Weekly, Simple, and Auto-Off timers cannot be used concurrently.

*2 The weekly timer will not operate when any of the following conditions is met.
The timer is off; the system is in error; a test run is in progress; the remote controller is performing self-check or remote controller check; the timer, function, day, or time is being set. If the ON/OFF status and/or the temperature setting is centrally controlled, their settings cannot be changed according to a schedule that was set from the remote controller.

Operation No.



How to Set the Weekly Timer

1. On the Normal Operation screen, make sure that the weekly timer icon [1] is displayed.
2. Press the TIMER MENU button ⑫, so that the “Set Up” appears on the screen ([2]). (Each press toggles between “Set Up” and “Monitor”.)
3. Press the TIMER ON/OFF (SET DAY) button ⑨ to set the day. Each press advances the day, which appears in the area labeled [3].
4. Press the ▽ or △ INITIAL SETTING button (⑦ or ⑧) to select a desired operation pattern number (1 through 6) [4].
   * (The remote-controller display on the previous page shows how the display would appear if operation #1 for Sunday were set to the values shown below.)

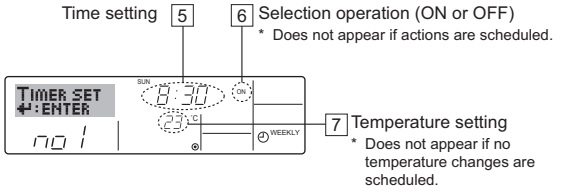
Setup Matrix

Op No.	Sunday	Monday	···	Saturday
No. 1	• 8:30 • ON • 23 °C (73 °F)			
No. 2	• 10:00 • OFF	• 10:00 • OFF	• 10:00 • OFF	• 10:00 • OFF
···				
No. 6				

<Operation 1 settings for Sunday>
Start the unit at 8:30, with the temperature set to 23 °C (73 °F).

<Operation 2 settings for every day>
Turn off the unit at 10:00.

Note:
By selecting the day to “Sun Mon Tues Wed Thurs Fri Sat”, the same action can be carried out at the same time every day.
(Example: In Operation #2 above, the unit is scheduled to be turned off at 10:00 every day.)

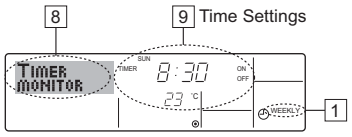


5. Press the Set Time button ⑪ to set the time ([5]).
   * Time will first increment in one-minute intervals, then in ten-minute intervals, and then in one-hour intervals.
6. Press the ON/OFF button ① to select the desired operation (ON or OFF), at [6].
   * Each press toggles through the following options:
     No display (no setting) → “ON” → “OFF”
7. Press the Set Temperature button ③ to set the temperature ([7]).
   * Each press:
     No display (no setting) ↔ 5 (41) ↔ 6 (43) ↔ ... ↔ 89 (192) ↔ 90 (194) ↔ No display. (Available temperature range: The temperature display range is between 5 °C (41 °F) and 90 °C (194 °F). The actual range which the temperature can be controlled will vary according to the type of the connected unit.)
8. To clear the current values for the selected operation, press and quickly release the CHECK (CLEAR) button ⑩ once.
   * The displayed time setting will change to “—:—”, and the ON/OFF and temperature settings will disappear.
     (To clear all weekly timer settings at once, hold down the CHECK (CLEAR) button ⑩ for two seconds or more. The display will begin flashing, indicating that all settings have been cleared.)
9. After making the appropriate settings in Steps 5, 6. and 7, press the CIR.WATER ↵ button ④ to save the values.

Note:
The changes will not be saved unless the Mode (BACK) button ② is pressed before the CIR.WATER ↵ button ④ is pressed.
If two or more different operation patterns have been scheduled for exactly the same time, only the operation with the highest Operation No. will be carried out.

10. Repeat Steps 3 through 9 as necessary to add more settings.
11. Press the Mode (BACK) button ② to return to complete the setting procedure and return to the Normal Operation screen.
12. To activate the timer, press the TIMER ON/OFF button ⑨, so that the “Timer Off” icon ([10]) disappears.
    * If no timer settings have been made, the “Timer Off” icon will flash on the screen.

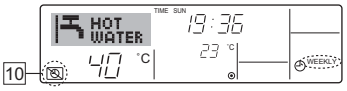
How to View the Weekly Timer Settings



1. Make sure that “WEEKLY” is displayed ([1]).
2. Press the TIMER MENU button ⑫ so that “Monitor” appears on the screen ([8]).
3. Press the TIMER ON/OFF (SET DAY) button ⑨ to select the desired day.
4. Press the ▽ or △ INITIAL SETTING (⑦ or ⑧) to toggle through the settings ([9]).
   * Each press will advance the display to the next timer operation in order of time.
5. To close the monitor display and return to the Normal Operation screen, press the Mode (BACK) button ②.

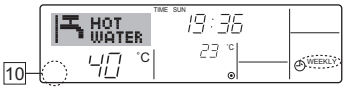
To Turn Off the Weekly Timer

Press the TIMER ON/OFF button ⑨ so that “Timer Off” appears at [10].



To Turn On the Weekly Timer

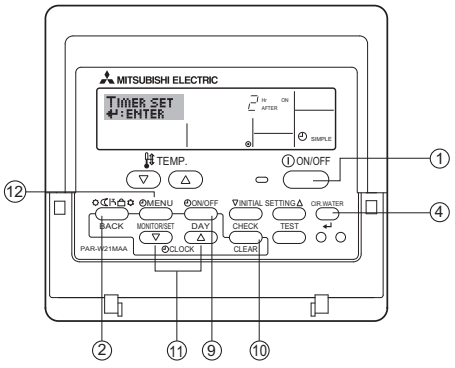
Press the TIMER ON/OFF button ⑨ so that the “Timer Off” icon ([10]) disappears.



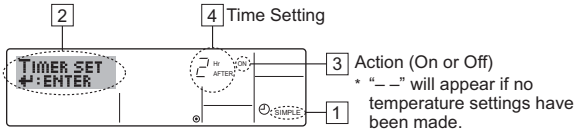
Using the Simple Timer

1. The simple timer can be set in any of the following three ways.
   - Start time only — The unit starts when the set time has elapsed.
   - Stop time only — The unit stops when the set time has elapsed.
   - Start & stop times — The unit starts and stops at the respective elapsed times.
2. The simple timer can be set to start and stop the unit only once each within a 72-hour period.
   The time setting can be made in one-hour increments.

Note:
*1 Weekly, Simple, and AUTO-off timers cannot be used concurrently.
*2 The simple timer will not operate when any of the following conditions is met. The timer is disabled; the system is in error; a test run is in progress; the remote controller is performing self-check or remote controller check; or a function or the timer is being set. If the ON/OFF status and/or the temperature setting is centrally controlled, their settings cannot be changed according to the schedule that was set from the remote controller.



How to Set the Simple Timer

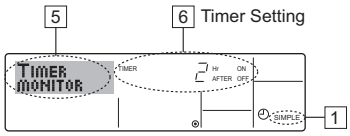


1. On the normal operation screen, make sure that the simple timer icon is displayed (1). If anything other than "SIMPLE" is displayed, select the simple timer by referring to 4.[4]-3(3) (page 51).
2. Press the TIMER MENU button ⑫, so that "Set Up" appears (2). (Each press toggles between "Set Up" and "Monitor".)
3. Press the ON/OFF button ① to display the current ON or OFF setting. Each press toggles between the time remaining until the unit turns on or off. ("ON" or "OFF" will appear in the area labeled 3.)
   - ON timer The unit will start operation when the specified hours have elapsed.
   - OFF timer The unit will stop operation when the specified hours have elapsed.
4. With "ON" or "OFF" displayed on the screen (3), press the Set Time button ⑪ to set the hours until the unit turns on or off (4).
   - Available Range: 1 to 72 hours
5. To set both the ON and OFF times, repeat Steps 3 and 4.
   * Note that ON and OFF times cannot be set to the same value.
6. To clear the current ON or OFF setting: Display the ON or OFF setting (see step 3) and then press the CHECK (CLEAR) button ⑩ so that "-" appears where the remaining time was. To use only the ON-timer or the OFF-timer, make sure that the time setting for the timer that will not be used is set to "-".
7. After completing steps 3 through 6 above, press the CIR.WATER ↵ button ④ to save the value.

Note:
The changes will not be saved unless the Mode (BACK) button ② is pressed before the CIR.WATER ↵ button ④ is pressed.

8. Press the Mode (BACK) button ② to return to the Normal Operation screen.
9. Press the TIMER ON/OFF button ⑨ to start the timer countdown. When the timer is running, the remaining time should appear on the screen. **Make sure that the remaining time is displayed on the screen and that it is correct.**

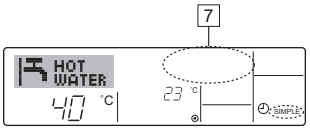
Viewing the Current Simple Timer Settings



1. Make sure that "SIMPLE" is displayed (1).
2. Press the TIMER MENU button ⑫, so that "Monitor" appears on the screen (5).
   - If the ON or OFF simple timer is running, the current timer value will appear in the area labeled 6.
   - If ON and OFF values have both been set, the two values will appear alternately.
3. Press the Mode (BACK) button ② to close the monitor display and return to the Normal Operation screen.

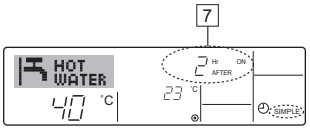
To Turn Off the Simple Timer

Press the TIMER ON/OFF button ⑨ so that the timer setting no longer appears on the screen (at 7).



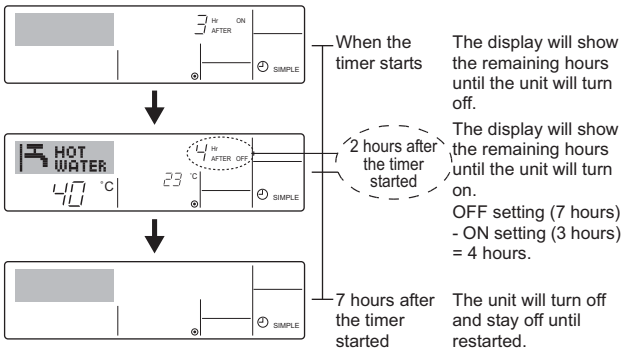
To Turn On the Simple Timer

Press the TIMER ON/OFF button ⑨ so that the timer setting appears in the area labeled 7.

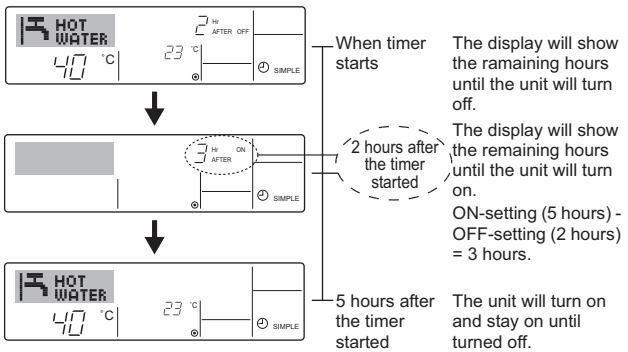


Examples
The two examples below show how the screen will appear when both the ON- and Off- timers have been set.

Example 1:
The ON-timer is set to 3 hours, and the OFF-timer is set to 7 hours.



Example 2:
The ON-timer is set to 5 hours, and the OFF-timer is set to 2 hours.



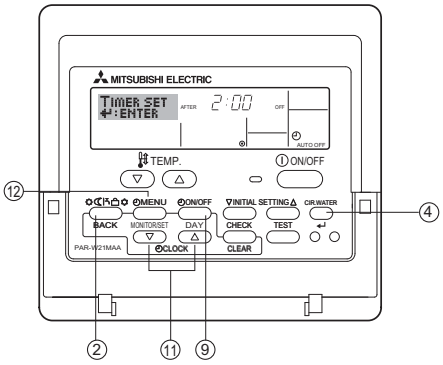
Using the Auto-Off Timer

1. This timer begins countdown when the unit starts, and shuts the unit off when the set time has elapsed.
2. Available settings range from 30 minutes to 4 hours in 30-minute intervals.

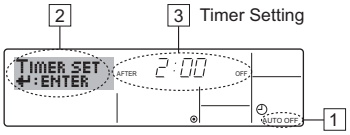
Note:

*1 Weekly Timer/Simple Timer/Auto Off Timer cannot be used at the same time.

*2 The Auto Off timer will not operate when any of the following conditions is in effect.
The timer is off; the system is in error; a test run is in progress; the remote controller is performing self-check or remote controller check; or a function or the timer is being set. If the ON/OFF status and/or the temperature setting is centrally controlled, their settings cannot be changed according to the schedule that was set from the remote controller.



How to Set the Auto-Off TIMER

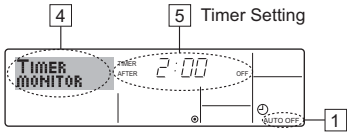


1. On the Normal Operation screen, make sure that “AUTO OFF” is displayed (1).
   If anything other than “AUTO OFF” is displayed, select the Auto-OFF timer by referring to [4]-3(3) (page 51).
2. Press and hold the TIMER MENU button ⑫ for **3 seconds**, so that “Set Up” appears on the screen (2).
   (Each press toggles between “Set Up” and “Monitor”.)
3. Press the Set Time button ⑪ to set the OFF time (3).
4. Press the CIR.WATER ↵ button ④ to save the setting.

Note:
The changes will not be saved unless the Mode (BACK) button ② is pressed before the CIR.WATER ↵ button ④ is pressed.

5. Press the Mode (BACK) button ② to complete the setting procedure and return to the Normal Operation screen.
6. If the unit is already running, the timer will start counting down immediately. **Make sure that the remaining time is displayed on the screen and that it is correct.**

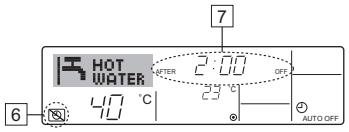
Checking the Current Auto-Off Timer Setting



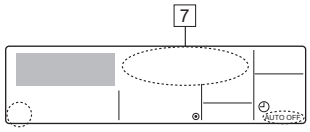
1. Make sure that “AUTO OFF” is displayed (1).
2. Press and hold the TIMER MENU button ⑫ for **3 seconds** so that “Monitor” appears (4).
   - The time remaining until the unit will turn off will appear in the area labeled 5.
3. To close the monitor display and return to the Normal Operation screen, press the Mode (BACK) button ②.

To Turn Off the Auto-Off Timer

- Press and hold the TIMER ON/OFF button ⑨ for **3 seconds** so that “Timer Off” appears (6) and the timer value (7) disappears.

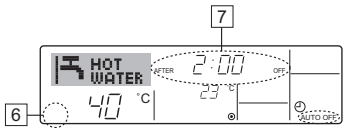


- Alternatively, turn off the unit itself. The timer value (7) will disappear from the screen.



To Turn On the Auto-Off Timer

- Press and hold the TIMER ON/OFF button ⑨ for **3 seconds**. The “Timer Off” will disappear (6), and the timer setting will appear on the display (7).
- Alternatively, turn on the unit. The timer value will appear in the area labeled 7.



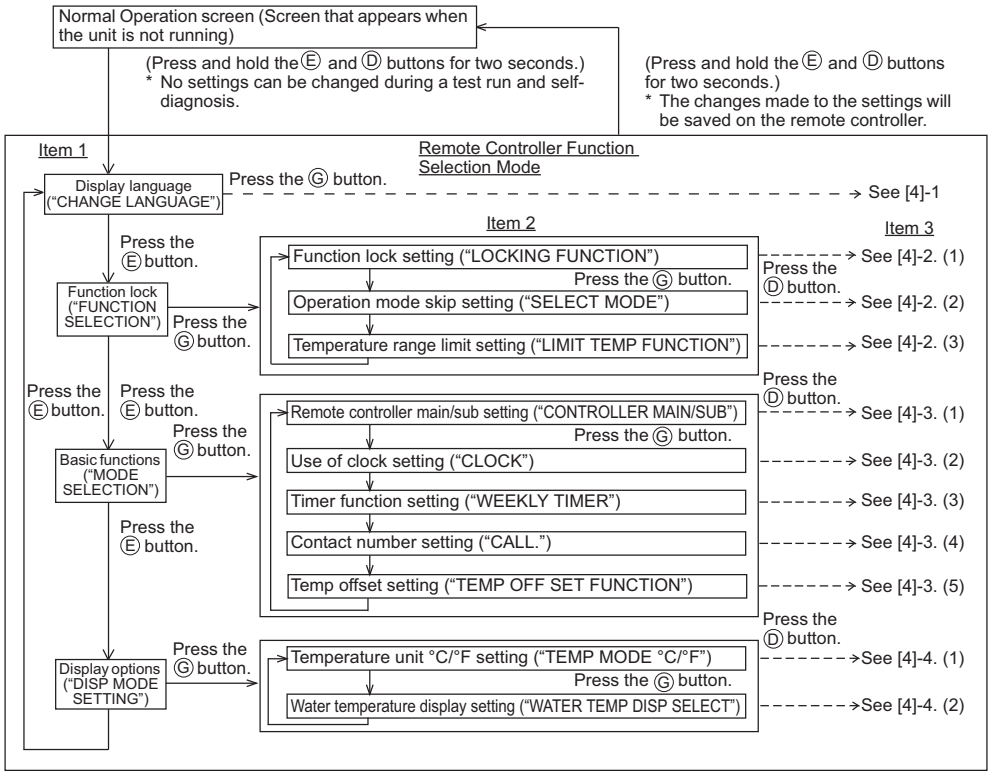
[2] Function Settings

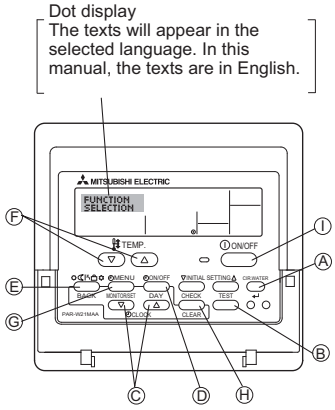
The settings for the following remote controller functions can be changed using the remote controller function selection mode. Change the settings as necessary.

Item 1	Item 2	Item 3 (Setting content)
1. Display language setting (“CHANGE LANGUAGE”)	Display language selection	• Use to select the display language from available languages.
2. Function lock settings (“FUNCTION SELECTION”)	(1) Function lock (“LOCKING FUNCTION”)	• Use to lock functions.
	(2) Operation mode skip setting (“SELECT MODE”).	• Use to show or hide specific modes.
	(3) Temperature range limit setting (“LIMIT TEMP FUNCTION”)	• Use to restrict the temperature range.
3. Basic function settings (“MODE SELECTION”)	(1) Remote controller main/sub setting (“CONTROLLER MAIN/SUB”)	• Use to designate the remote controller as Main or Sub. *When two remote controllers are connected to one group, one controller must be set to sub.
	(2) Use of clock setting (“CLOCK”)	• Use to enable or disable the clock.
	(3) Timer function setting (“WEEKLY TIMER”)	• Use to select a timer type.
	(4) Contact number setting (“CALL.”)	• Use to show or hide, or enter the emergency contact number.
	(5) Temp offset setting (“TEMP OFF SET FUNCTION”)	• Use to show or hide the offset value.
4. Display options (“DISP MODE SETTING”)	(1) Temperature unit °C/°F setting (“TEMP MODE °C/°F”)	• Use to show or hide the temperature unit (°C or °F).
	(2) Water temperature display setting (“WATER TEMP DISP SELECT”)	• Use to show or hide the water temperature.

Function setting flowchart

[1] Stop the unit and go into the remote controller function selection mode. → [2] Select from item 1. → [3] Select from item 2. → [4] Make the setting. → [5] Return to the Normal Operation screen.





Settings details

[4]-1. Display language setting

The display language can be selected from the languages listed below.

- Press the [MENU] button to change the language.
  ① English (GB), ② German (D), ③ Spanish (E), ④ Russian (RU), ⑤ Italian (I), ⑥ French (F), ⑦ Swedish (SW)

[4]-2. Function lock settings

(1) Function lock

- Press the [ON/OFF] button to toggle through the following options.
  ① no1: All buttons except the [ON/OFF] button will be locked.
  ② no2: All buttons will be locked.
  ③ OFF (Default): No buttons will be locked.

* Press and hold the [CIR.WATER] and [ON/OFF] buttons simultaneously for two seconds on the Normal Operation screen to enable the button-lock function.

(2) Operation mode skip setting

The following modes can be made available for selection or can be hidden.

- Press the [ON/OFF] button to toggle through the following options.
  ① Heating mode
  ② Heating ECO mode
  ③ Hot Water mode
  ④ Anti-freeze mode
  ⑤ Cooling mode
  ⑥ OFF (Default): All modes will be available for selection.

* The mode that is not supported on the connected unit will not be available, even if the mode is available for selection on the display.

(3) Temperature range limit setting

The temperature range for the following modes can be restricted. Once the range has been restricted, the preset temperature can only be set to a value within the restricted range.

- Press the [ON/OFF] button to toggle through the following options.
  ① LIMIT TEMP HEATING MODE
  ② LIMIT TEMP HOT WATER MODE
  ③ LIMIT TEMP ANTI-FREEZE MODE
  ④ LIMIT TEMP COOLING MODE
  ⑤ OFF (Default) : The temperature ranges are not active.
- To increase or decrease the temperature, press the [TEMP. ▽ or △] button.
- Settable range

Hot Water mode	:	Lower limit:	30 ~65 °C (86 ~149 °F)
		Upper limit:	65 ~30 °C (149 ~ 86 °F)
Heating mode	:	Lower limit:	30 ~55 °C (86 ~131 °F)
		Upper limit:	55 ~30 °C (131 ~ 86 °F)

* The settable range varies depending on the type of unit to be connected.

[4]-3. Basic functions

(1) Remote controller main/sub setting

- Press the [ON/OFF] button Ⓓ to toggle between the following options.
  ① Main The controller will be designated as the main controller.
  ② Sub The controller will be designated as the sub controller.

(2) Use of clock setting

- Press the [ON/OFF] button Ⓓ to toggle between the following options.
  ① ON The clock function.
  ② OFF The clock function.

(3) Timer function setting

- Press the [ON/OFF] button Ⓓ to toggle through the following options.
  ① WEEKLY TIMER (Default)
  ② AUTO OFF TIMER
  ③ SIMPLE TIMER
  ④ TIMER MODE OFF

* When the use of clock setting is set to OFF, the “WEEKLY TIMER” cannot be used.

(4) Contact number setting

- Press the [ON/OFF] button Ⓓ to toggle through the following options.

①	CALL OFF	The contact number will not be displayed when a problem occurs.
②	CALL **** *** ****	The contact number will be displayed when a problem occurs.
	CALL_	Use this option to enter the contact number.

- Setting the contact number
  To set the contact number, follow the following procedures.
  Press the [TEMP. ▽ or △] button Ⓕ to move the cursor to the right (left). Press the [CLOCK ▽ or △] button Ⓒ to set the contact number.

(5) Temp offset setting

- Press the [ON/OFF] button Ⓓ to toggle between the following options.
  ① ON The offset value will be displayed under the water temperature initial setting mode.
  ② OFF The offset value will not be displayed.

[4]-4. Display options

(1) Temperature unit °C/°F setting

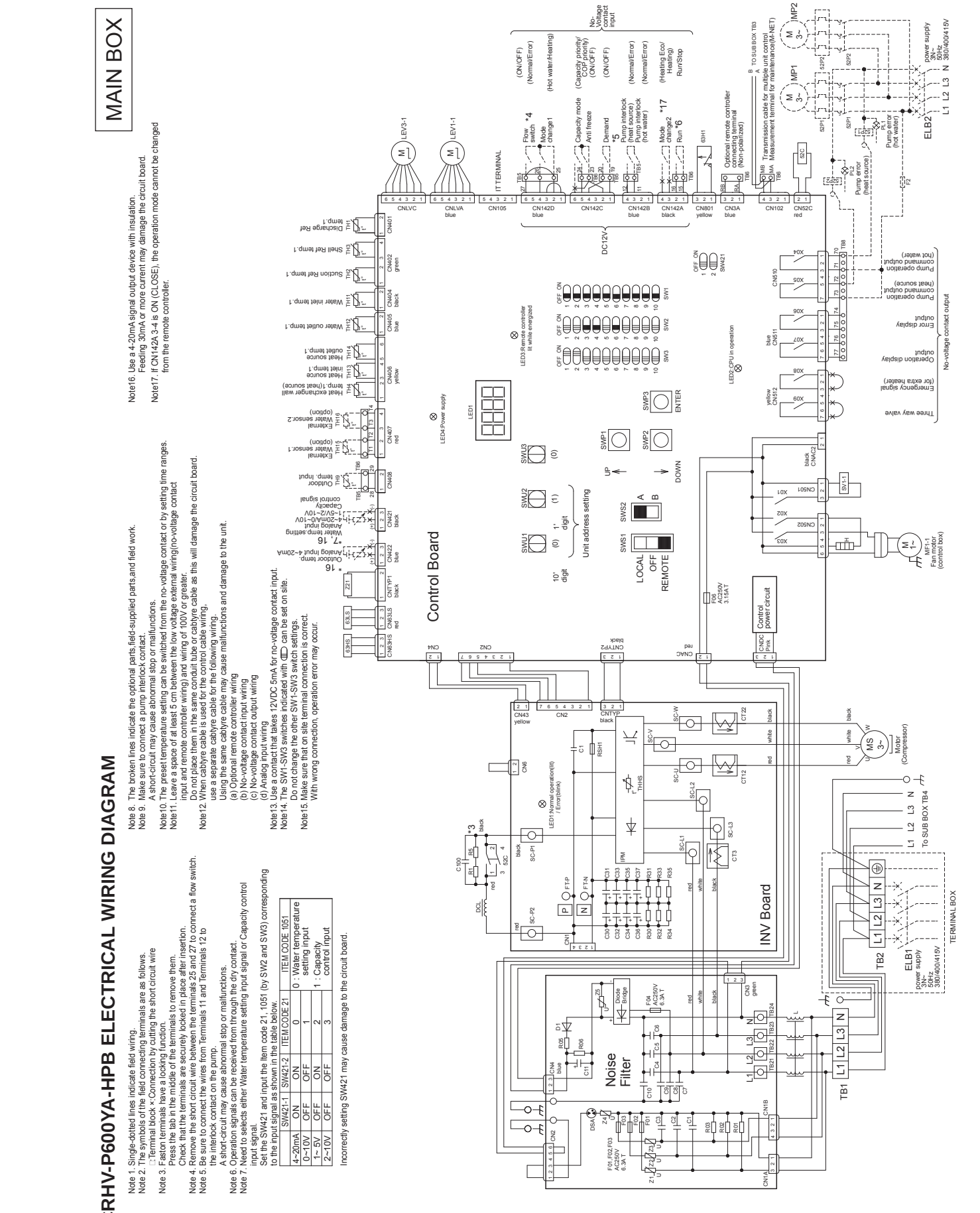
- Press the [ON/OFF] button Ⓓ to toggle between the following options.
  ① °C Celcius
  ② °F Fahrenheit

(2) Water temperature display setting

- Press the [ON/OFF] button Ⓓ to toggle between the following options.
  ① ON The water temperature will be displayed.
  ② OFF The water temperature will not be displayed.

Ⅴ Electrical Wiring Diagram

[1] Electrical Wiring Diagram



Note 1. Single-dotted lines indicate field wiring.
Note 2. The symbols of the field connecting terminals are as follows.
□Terminal block ×:Connection by cutting the short circuit wire
Note 3. Faston terminals have a locking function.
Press the tab in the middle of the terminals to remove them.
Check that the terminals are securely locked in place after insertion.
Note 4. Remove the short circuit wire between the terminals 25 and 27 to connect a flow switch.
Note 5. Be sure to connect the wires from Terminals 11 and Terminals 12 to the interlock contact on the pump.
A short-circuit may cause abnormal stop or malfunctions.
Note 6. Operation signals can be received from through the dry contact.
Note 7. Need to selects either Water temperature setting input signal or Capacity control input signal.
Set the SW421 and input the item code 21, 1051 (by SW2 and SW3) corresponding to the input signal as shown in the table below.

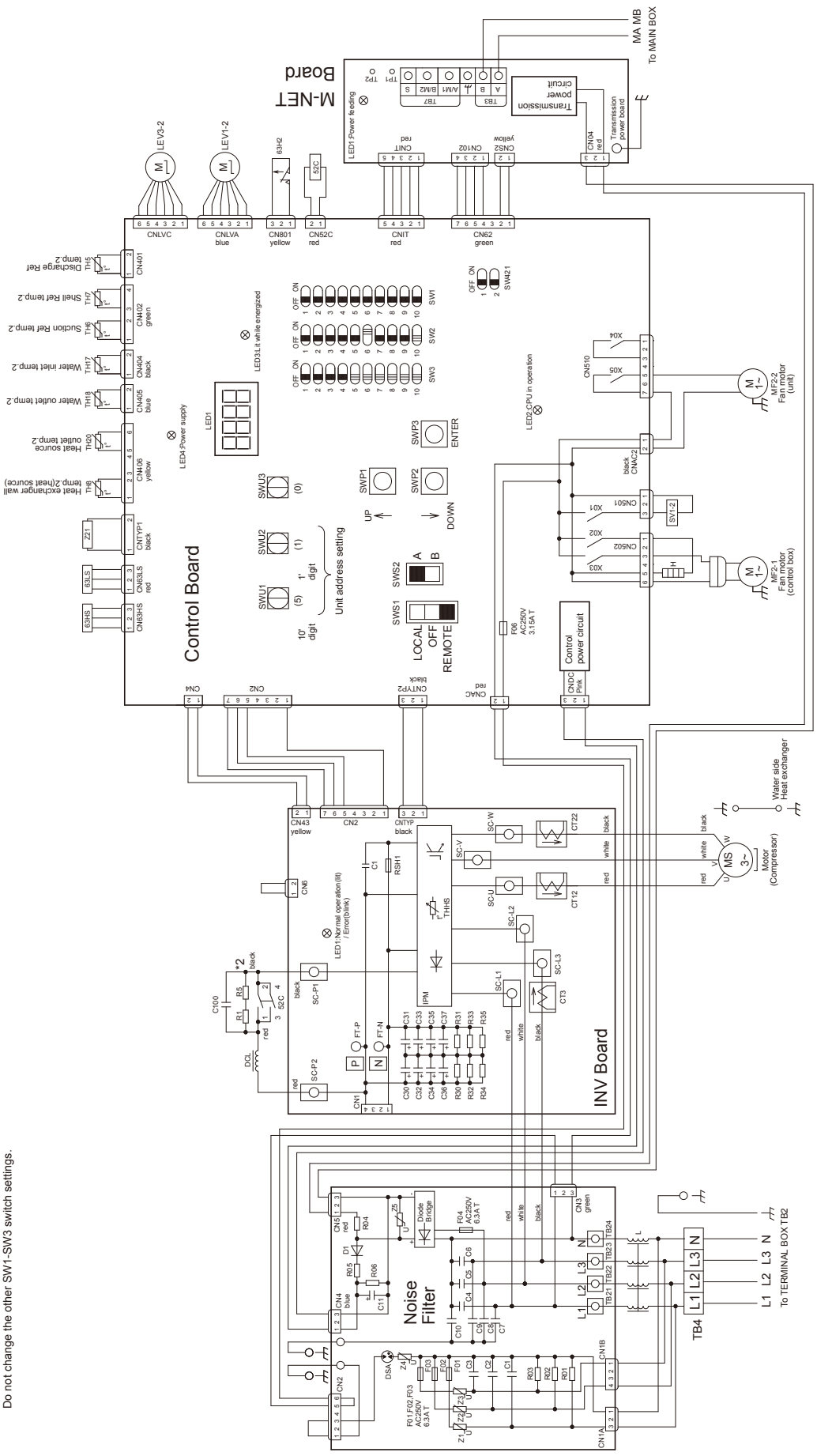
	SW421-1	SW421-2	ITEM CODE 21	ITEM CODE 1051
4~20mA	ON	ON	0	0 : Water temperature setting input
0~10V	OFF	ON	1	
1~5V	OFF	OFF	2	1 : Capacity control input
2~10V	OFF	OFF	3	

Incorrectly setting SW421 may cause damage to the circuit board.

Note 8. The broken lines indicate the optional parts,field-supplied parts,and field work.
Note 9. Make sure to connect a pump interlock contact.
A short-circuit may cause abnormal stop or malfunctions.
Note10. The preset temperature setting can be switched from the no-voltage contact or by setting time ranges.
Note11. Leave a space of at least 5 cm between the low voltage external wiring(no-voltage contact input and remote controller wiring) and wiring of 100V or greater.
Do not place them in the same conduit tube or cabtyre cable as this will damage the circuit board.
Note12. When cabtyre cable is used for the control cable wiring,
use a separate cabtyre cable for the following wiring.
Using the same cabtyre cable may cause malfunctions and damage to the unit.
(a) Optional remote controller wiring
(b) No-voltage contact input wiring
(c) No-voltage contact output wiring
(d) Analog input wiring
Note13. Use a contact that takes 12VDC 5mA for no-voltage contact input.
Note14. The SW1-SW3 switches indicated with ▯ can be set on site.
Do not change the other SW1-SW3 switch settings.
Note15. Make sure that on site terminal connection is correct.
With wrong connection, operation error may occur.
Note16. Use a 4-20mA signal output device with insulation.
Feeding 30mA or more current may damage the circuit board.
Note17. If CN142A 3-4 is ON (CLOSE), the operation mode cannot be changed from the remote controller.

SUB BOX

CRHV-P600YA-HPB ELECTRICAL WIRING DIAGRAM



Note 1. Single-dotted lines indicate field wiring.
Note 2. Faston terminals have a locking function.
Press the tab in the middle of the terminals to remove them.
Check that the terminals are securely locked in place after insertion.
Note 3. The SW1-SW3 switches indicated with ⓓ can be set on site.
Do not change the other SW1-SW3 switch settings.

Note

1. The broken lines indicate the optional parts,field-supplied parts, and field work.
2. Make sure to connect a pump interlock contact.
   A short-circuit may cause abnormal stop or malfunctions.
3. The preset temperature setting can be switched from the no-voltage contact or by setting time ranges.
4. Leave a space of at least 5 cm between the low voltage external wiring (no-voltage contact input and remote controller wiring) and wiring of 100V or greater.Do not place them in the same conduit tube or cabtyre cable as this will damage the circuit board.
5. When cabtyre cable is used for the control cable wiring, use a separate cabtyre cable for the following wiring. Using the same cabtyre cable may cause malfunctions and damage to the unit.
   (a) Optional remote controller wiring
   (b) No-voltage contact input wiring
   (c) No-voltage contact output wiring
   (d) Remote water temperature setting
6. Use a contact that takes 12VDC 5mA for no-voltage contact input.

Symbol explanation

	Symbol	explanation
MAIN BOX and SUB BOX	CT12	Ac current sensor
	CT22	
	CT3	
	C100	Capacitor(Electrolysis)
	DCL	DC reactor
	F01	Fuse(Noise Filter)
	F02	
	F03	
	F04	
	F06	Fuse(Control Board)
	H	Crankcase heater(for heating the compressor)
	R1	Electrical resistance
	R5	
	THHS	IPM temperature
	Z21	Function setting connector
	52C	Electromagnetic relay(Inverter main circuit)
	63HS	High pressure sensor
	63LS	Low pressure sensor
MAIN BOX	LEV1-1	Electronic expansion valve(Main circuit)
	LEV3-1	Electronic expansion valve(Main injection circuit)
	SV1-1	Solenoid valve(Main injection circuit)
	TH1~4,11~16	Thermistor
	63H1	High pressure switch(Main circuit)
SUB BOX	LEV1-2	Electronic expansion valve(Sub circuit)
	LEV3-2	Electronic expansion valve(Sub injection circuit)
	SV1-2	Solenoid valve(Injection circuit)
	TH5~8,17,18,20	Thermistor
	63H2	High pressure switch(Sub circuit)
Field-supplied	<ELB1,2>	Earth leakage breaker
	<F2>	Fuse
	<MP1,2>	Pump motor
	<PL1,2>	Pilot lamp(Pump)
	<TH9>	Thermistor
	<51P1,2>	Overcurrent relay(Pump)
	<52P1,2>	Electromagnetic contactor(Pump)

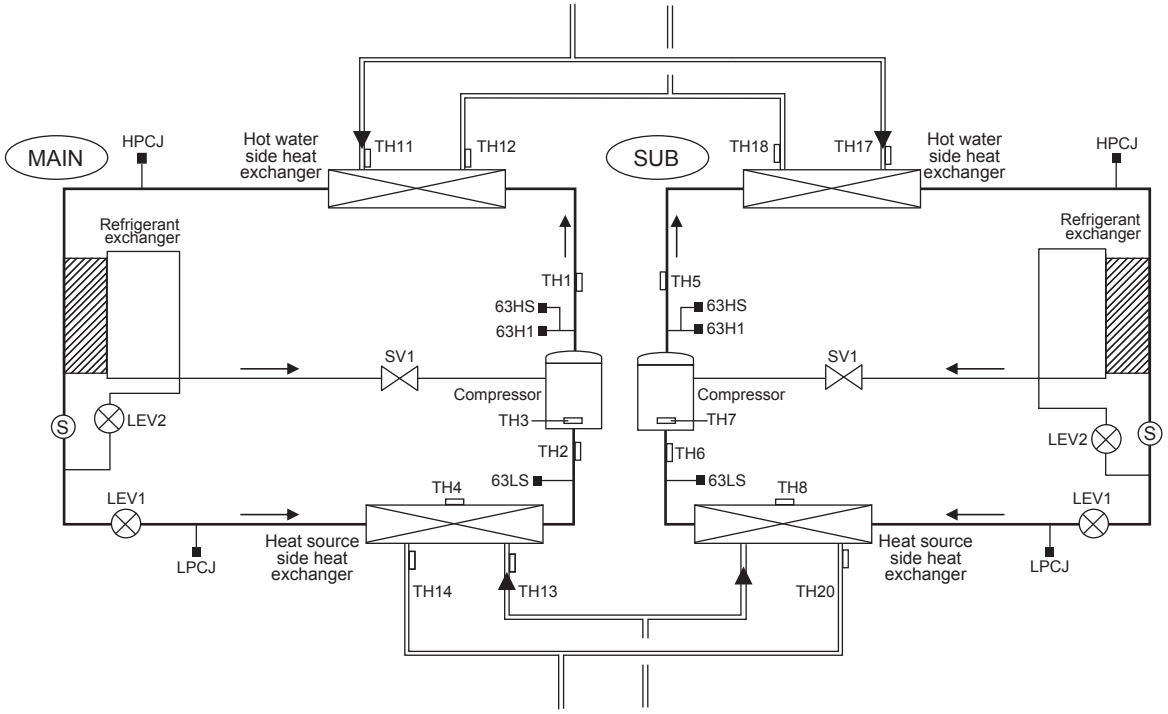
Ⅵ Refrigerant Circuit

[1] Refrigerant Circuit Diagram

Table of symbols and circuit components

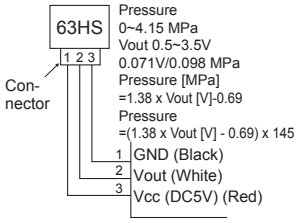
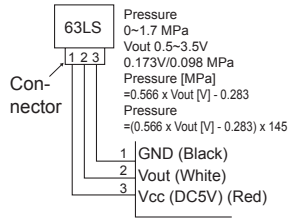
Symbol		Component
MAIN circuit	SUB circuit	
LEV1	LEV1	Linear expansion valve (Main circuit)
LEV2	LEV2	Linear expansion valve (Injection circuit)
63HS	63HS	High-pressure sensor
63LS	63LS	Low-pressure sensor
SV1	SV1	Solenoid valve (Injection circuit)
63H1	63H1	High-pressure switch
TH11	TH17	Inlet hot water temperature sensor

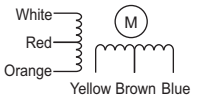
Symbol		Component
MAIN circuit	SUB circuit	
TH12	TH18	Outlet hot water temperature sensor
TH13	-	Inlet heat source temperature sensor
TH14	TH20	Outlet heat source temperature sensor
TH1	TH5	Compressor discharge temperature sensor
TH2	TH6	Compressor suction temperature sensor
TH4	TH8	Heat source HEX wall temperature sensor
TH3	TH7	Compressor shell temperature sensor



[2] Principal Parts and Functions

1. Outdoor unit

Part name	Symbols (functions)	Notes	Usage	Specifications	Check method
Compressor	MS (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] : 0.092 ohm	
High pressure sensor	63HS		1) Detects high pressure 2) Regulates frequency and provides high-pressure protection		
Low pressure sensor	63LS		1) Detects low pressure 2) Provides low-pressure protection		
Pressure switch	63H1		1) Detects high pressure 2) Provides high-pressure protection	4.15MPa OFF setting	
Thermistor	TH1,5 (Discharge)		1) Detects discharge temperature 2) Provides high-pressure protection 0°C[32°F] :698kohm 10°C[50°F] :413kohm 20°C[68°F] :250kohm 30°C[86°F] :160kohm 40°C[104°F] :104kohm 50°C[122°F] : 70kohm 60°C[140°F] : 48kohm 70°C[158°F] : 34kohm 80°C[176°F] : 24kohm 90°C[194°F] :17.5kohm 100°C[212°F] :13.0kohm 110°C[230°F] : 9.8kohm	Degrees Celsius R_{120} = 7.465kΩ $R_{25/120}$ = 4057 $R_t = 7.465\exp\{4057(\frac{1}{273+t} - \frac{1}{393})\}$	Resistance check

Part name	Symbols (functions)	Notes	Usage	Specifications	Check method
Thermistor	TH2,6 (suction)		1) Detects suction temperature 2) Provide low pressure protection	Degrees Celsius R_0 = 15kΩ $R_{0/80}$ = 3385 $R_t = 15\exp\{3385\ (\frac{1}{273+t} - \frac{1}{273})\}$ 0°C[32°F] :15kohm 10°C[50°F] :9.7kohm 20°C[68°F] :6.5kohm 25°C[77°F] :5.3kohm 30°C[86°F] :4.4kohm 40°C[104°F] :3.0kohm	Resistance check
	TH3,7 (Compressor shell temperature)		1) Detects compressor shell temperature 2) Provides protection for the compressor		
	TH4,8 (Heat source HEX wall temperature)		1) Detects heat source HEX wall temperature 2) Provides protection for the heat-source heat exchanger		
	TH11-14 17,18,20		1) Detects water temperature 2) Controls water temperature		
	THHS Inverter heat sink temperature		Controls inverter cooling fan based on THHS temperature	Degrees Celsius R_{50} = 17kΩ $R_{25/120}$ = 4016 $R_t = 17\exp\{4016\ (\frac{1}{273+t} - \frac{1}{323})\}$ 0°C[32°F] :161kohm 10°C[50°F] :97kohm 20°C[68°F] :60kohm 25°C[77°F] :48kohm 30°C[86°F] :39kohm 40°C[104°F] :25kohm	
Solenoid valve	SV1 INJ control		Turns on/off the injection	AC220 - 240V Open while being powered/ closed while not being powered	Continuity check with a tester
Heater	CH		Heats the refrigerant in the compressor	Cord heater 240V 35W	Resistance check
Fan motor	FAN motor		Cools the heatsink and exhausts air from the unit	AC230V	
Linear expansion valve	LEV2 (INJ control)		Adjusts the amount of bypass flow from the liquid pipe on the outdoor unit during heating	DC12V Opening of a valve driven by a stepping motor 0-480 pulses (direct driven type)	Refer to the section "Continuity Test with a Tester". Continuity between white, brown, and orange. Continuity between yellow, red, and blue.
	LEV1 (Refrigerant flow adjustment)		Adjusts refrigerant flow during heating	DC12V Opening of a valve driven by a stepping motor 1400 pulses	Refer to the section "Continuity Test with a Tester". Continuity between white, red, and orange. Continuity between yellow, brown, and blue. 

VII Control

[1] Functions and Factory Settings of the Dipswitches

1. Factory Switch Settings (Dip switch settings table)

SW		Function	Usage	Factory setting MAIN circuit	Factory setting SUB circuit	OFF setting	ON setting	Setting timing
SW1	1	Model setting		Depends on the unit	-	Leave the setting as it is.		At a reset
	2							
	3							
	4							
	5							
	6							
	7							
	8							
	9							
	10	Model setting		OFF	-	Leave the setting as it is.		At a reset
SW2	1	Freeze-up protection setting		OFF	-	Starts the pump when both the outside and water temperatures drop to prevent water pipe freeze up.	Same as when set to OFF	At a reset
	2	Model setting		OFF	-	Leave the setting as it is.		At a reset
	3							
	4	Model setting		OFF	OFF	Leave the setting as it is.		At a reset
	5	Recovery conditions after forced stoppage	Selects what the operation restoration condition will be based on after the unit was forced to stop based on the external thermistor reading (water outlet temperature).	OFF	-	External thermistor	Built-in thermistor	At a reset
	6	Power supply option to the communication circuit	Switches between supplying or not supplying power to the communication circuit.	-	ON	Does not supply power to the communication circuit.	Supplies power to the communication circuit.	Any time
	7	Remote water-temperature setting	Allows or disallows the water temperature to be set using analog signals from a remote location.	OFF	-	Disallows the water temperature to be set using external analog signals.	Allows the water temperature to be set using external analog signals.	At a reset
	8	Water-temperature control option	Selects either the external water temperature sensor or the built-in sensor to be used to control water temperature.	OFF	-	Built-in sensor on the unit	External water temperature sensor	At a reset
	9	Individual/Multiple system	Selects between individual and Multiple system	OFF	-	Individual system	Multiple system	At a reset
	10	Display mode switch 7	This switch is used in combination with dip switches SW3-5 through 3-10 and push switches SWP 1, 2, and 3 to configure or view the settings when performing a test run or changing the system configuration.	OFF	OFF	Changes the 7-segment LED display mode.		Any time
SW3	1	Remote reset	Enables or disables the error to be reset from a remote location.	ON	-	Disables the error to be reset from a remote location.	Enables the error to be reset from a remote location.	At a reset
	2	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	-	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.	At a reset
	3	Water-temperature control	Switches between inlet-water-temperature-based control and outlet-water-temperature-based control.	OFF	-	Outlet-water-temperature-based control	Inlet-water-temperature-based control	At a reset
	4	Pump-thermistor interlock setting	Interlocks or does not interlock the operation of the pump with the external thermistor. (Effective only when SW2-8 is set to ON.)	OFF	-	The pump turns on when the operation switch is turned on regardless of the Thermo-ON/Thermo-OFF status.	Interlocks the operation of the pump with the Thermo-ON/Thermo-OFF status.	At a reset
	5	Display mode switch 1	These switches are used in combination with dip switches SW2-5 and push switches SWP 1, 2, and 3 to configure or view the settings when performing a test run or changing the system configuration.	OFF	OFF	Changes the 7-segment LED display mode.		Any time
	6	Display mode switch 2		OFF	OFF	Changes the 7-segment LED display mode.		Any time
	7	Display mode switch 3		OFF	OFF	Changes the 7-segment LED display mode.		Any time
	8	Display mode switch 4		OFF	OFF	Changes the 7-segment LED display mode.		Any time
	9	Display mode switch 5		OFF	OFF	Changes the 7-segment LED display mode.		Any time
	10	Display mode switch 6		OFF	OFF	Changes the 7-segment LED display mode.		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.
Refer to page 68 for how to reset errors.

2. Slide switch (SWS1) settings

Individual system

SWS1 Setting		Unit Operation	
MAIN circuit	SUB circuit	MAIN circuit	SUB circuit
LOCAL	LOCAL	Follows the input signal of the MAIN circuit	Follows the input signal of the sub circuit
	OFF		Ignores the signal input
	REMOTE		Follows the input signal of the sub circuit
OFF	LOCAL	Ignores the signal input	Ignores the signal input
	OFF		
	REMOTE		
REMOTE	LOCAL	Follows the input signal fed through a dry contact interface	Follows the input signal of the MAIN circuit
	OFF		Ignores the signal input
	REMOTE		Follows the input signal of the MAIN circuit

Multiple system (SWS1 in the SUB circuit on both the main and sub units will be ineffective.)

SWS1 Setting		Unit Operation			
Main unit MAIN circuit	Sub unit MAIN circuit	Main unit MAIN circuit	Main unit SUB circuit	Sub unit MAIN circuit	Sub unit SUB circuit
LOCAL	LOCAL	Follows the input signal of the MAIN circuit on the Main unit	Follows the input signal of the MAIN circuit on the Main unit	Follows the input signal of the MAIN circuit on the Sub unit	Follows the input signal of the MAIN circuit on the Sub unit
	OFF			Ignores the signal input	
	REMOTE			Follows the input signal of the MAIN circuit on the Sub unit	
OFF	LOCAL	Ignores the signal input		Ignores the signal input	
	OFF				
	REMOTE				
REMOTE	LOCAL	Follows the input signal fed through a dry contact interface		Follows the input signal of the MAIN circuit on the Main unit	
	OFF			Ignores the signal input	
	REMOTE			Follows the input signal of the MAIN circuit on the Main unit	

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.

Priority 1	Priority 2	Priority 3		Priority 4			Target water temperature	Sensor that becomes active (when SW2-8 is set to ON)(*1)
Analog input	Main board on the unit	Dry contact input		Remote controller PAR-W21MAA				
	Schedule setting	Mode Change 1	Mode Change 2	No remote controller	Manual setting	Schedule setting		
SW2-7: ON	Ineffective	Ineffective	Ineffective	-	Ineffective	Ineffective	Temperature setting for the analog signal input	TH15
SW2-7: OFF	When schedule has been set	Ineffective	Ineffective	-	Ineffective	Ineffective	Selectable from temperature settings A through C	Selectable from TH15 or TH16
	When no schedule has been set	ON (Heating Eco)	ON (Hot water)	-	Ineffective	Ineffective	Temperature setting B (Hot water mode)	Selectable from TH15 or TH16
		ON (Heating Eco)	OFF (Heating)	-	Ineffective	Ineffective	Temperature setting C (Heating Eco mode)	Selectable from TH15 or TH16
		OFF (Heating)	ON (Hot water)	-	Ineffective	Ineffective	Temperature setting B (Hot water mode)	Selectable from TH15 or TH16
		OFF (Heating)	OFF (Heating)	When no RC is used	-	-	Temperature setting A (Heating mode)	Selectable from TH15 or TH16
				-	Hot water mode	-	Temperature setting B (Hot water mode)	Selectable from TH15 or TH16
				-	Heating ECO mode(*2)	-	Temperature setting C (Heating Eco mode)	Selectable from TH15 or TH16
				-	Heating	-	Temperature setting A (Heating mode)	Selectable from TH15 or TH16
				-	-	When schedule has been set	Target water temp is controlled according to the setting on the remote controller.	TH15

*1 If SW2-8 is set to OFF, water temperature will be controlled by the built-in thermistors TH12 and TH18 on the unit.
*2 Can be set when item code 1080 is a value other than "0".

Water-temperature setting

Different water temperature settings can be set for different modes. Use item codes 11, 13, 22, 23, 24, 25, 26, or 27 to set the water temperatures.

(1) Setting procedures

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

Step 0
Set the ON/OFF switch (SWS1) to OFF.

Set SWS1 to OFF from the remote controller or with the local switch.
Most settings (other than item codes 11 and 13 (water temperature setting)) cannot be changed unless the ON/OFF setting is set to OFF. *
* Settings can be changed from the optional remote controller, regardless of the ON/OFF status of the operation switch.

Step 1
Set the dip switches SW2 and SW3.

SW2	SW3					
-10	5	6	7	8	9	10
OFF	OFF	OFF	OFF	OFF	ON	OFF

Step 2
Select the desired item with the push switch SWP3.

Item codes 11, 13, 22, 23, 24, 25, 26, and 27 relate to water-temperature setting.
Press the push switch SWP3 to select an item code.
Press the push switches SWP1 and SWP2 to change the value of the selected item.
The value will keep blinking while it is being changed.

Step 3
Press the push switches SWP1 (↑) or SWP2 (↓) to increase or decrease the value.

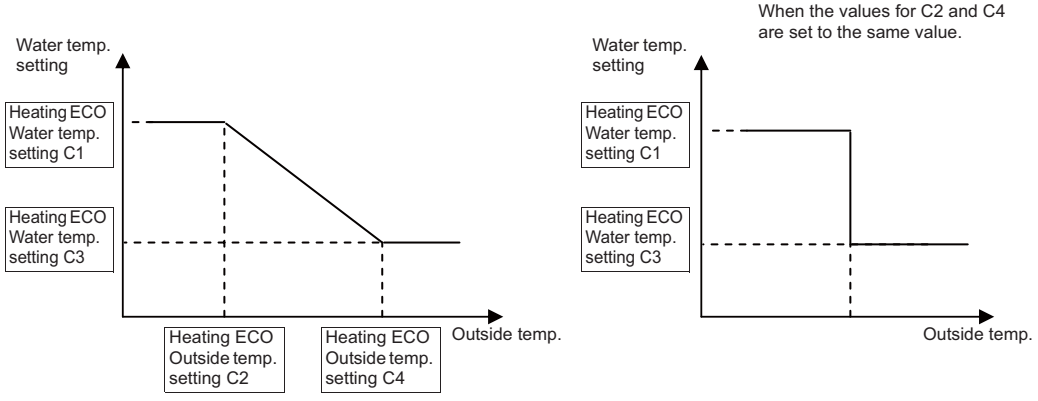
Settings table

Settable item	Item code	Initial value	
Heating ECO mode/ 2-point system or Curve	20	1	2-point system: 0 Curve: 1

Items that can be set	Item code	Initial value	Unit	Setting			Setting change from an optional remote controller (PAR-W21MAA)
				Increments	Lower limit	Upper limit	
Water temp. setting A (Heating mode)	11	35	°C	0.1°C	30	65	Possible
Water temp. setting B *1 (Hot water mode)	13	55	°C	0.1°C	30	65	Possible
Heating ECO mode/ Water temp. setting C1 *2	22	60	°C	0.1°C	30	65	Not possible
Heating ECO mode/ Outside temp. setting C2 *2	23	0	°C	0.1°C	-30	50	Not possible
Heating ECO mode/ Water temp. setting C3 *2	24	35	°C	0.1°C	30	65	Not possible
Heating ECO mode/ Outside temp. setting C4 *2	25	25	°C	0.1°C	-30	50	Not possible
Heating ECO mode/ Water temp. setting C5	26	45	°C	0.1°C	30	65	Not possible
Heating ECO mode/ Outside temp. setting C6	27	15	°C	0.1°C	-30	50	Not possible

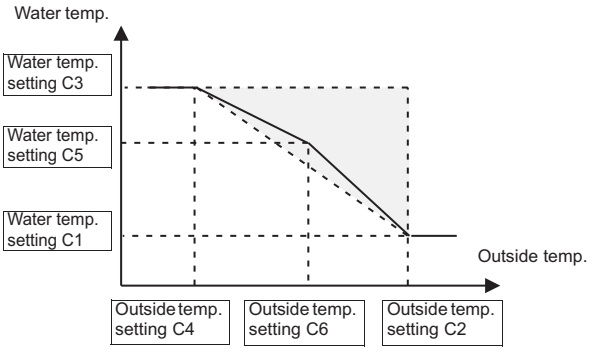
*1 Only in hot water mode will the main unit three way valve output X09 turn ON.
*2 These items need not be set when only a single water temperature setting is used.
These items require an outdoor temperature input. (Item code 1080 1-3)

Heating ECO (2-point system)



* C5 and C6 cannot be used.

Heating ECO (Curve)



* Always use a value for setting C6 that is between setting value C2 and setting value C4, and for setting C5 between setting value C1 and setting value C3.

Step 4
Press the push switch SWP3 to save the change.

Press SWP3 once within one minute of changing the setting with SWP1 or SWP2 to save the setting.
Once the new setting is saved, the display will stop blinking and stay lit. The display will, then, return to the item code display mode.
If SWP3 is not pressed within one minute, the change will not be saved and the display will return to the item code display mode.

(2) Scheduled operation

Up to three sets of start/end times can be assigned for each day.

To operate the units according to the schedule, set the item code 5 to "1", and set the time for item codes 6 through 9 and 1300 through 1302.

Note **The operation schedule function will operate only when SWS1 is set to "REMOTE."**

Setting procedures

Step 0
Set the ON/OFF switch (SWS1) to OFF.

Set SWS1 to OFF from the remote controller or with the local switch.
Settings cannot be changed unless the ON/OFF setting is set to OFF. *

Step 1
Set the dip switches SW2 and SW3.

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

SW2	SW3					
-10	5	6	7	8	9	10
OFF	OFF	OFF	OFF	OFF	ON	OFF

Step 2
Select the desired item with the push switch SWP3.

Item codes 5 through 9, 18, 19, and 1300 through 1302 relate to scheduled operation setting.
Set the item code 5 to "1", and set the time for each of the relevant items.
Press the push switch SWP3 to select an item code.
Use the push switches SWP1 and SWP2 to change the value of the selected item.
The value will keep blinking while it is being changed.

Step 3
Press the push switches SWP1 (↑) or SWP2 (↓) to increase or decrease the value.

Settings table

Settable item	Item code	Initial value	Unit	Limits and increments		
				Increments	Lower limit	Upper limit
Enable or disable scheduled operation (ON/OFF)	5	0	Enable: 1 Disable: 0	1	0	1
Operation start time 1	6	0000	Hour: minute	1 minute	0000	2359
Operation end time 1	7	0000	Hour: minute	1 minute	0000	2359
Operation start time 2	8	0000	Hour: minute	1 minute	0000	2359
Operation end time 2	9	0000	Hour: minute	1 minute	0000	2359
Operation start time 3	18	0000	Hour: minute	1 minute	0000	2359
Operation end time 3	19	0000	Hour: minute	1 minute	0000	2359
Current time	1300	-	Hour: minute	1 minute	0000	2359
Month/Date setting	1301	-	Month: day	1 day	0101	1231
Year setting	1302	-	Year	1 year	2000	2099

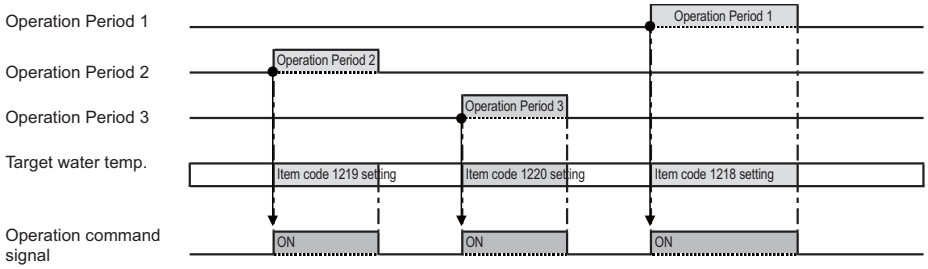
Step 4
Press the push switch SWP3 to save the change.

Press SWP3 once within one minute of changing the setting with SWP1 or SWP2 to save the setting.
Once the new setting is saved, the display will stop blinking and stay lit. The display will, then, return to the item code display mode.
If SWP3 is not pressed within one minute, the change will not be saved and the display will return to the item code display mode.

Note **A mode (preset temperatures) can be selected for each operation time period. See the next page for how to make the settings.**

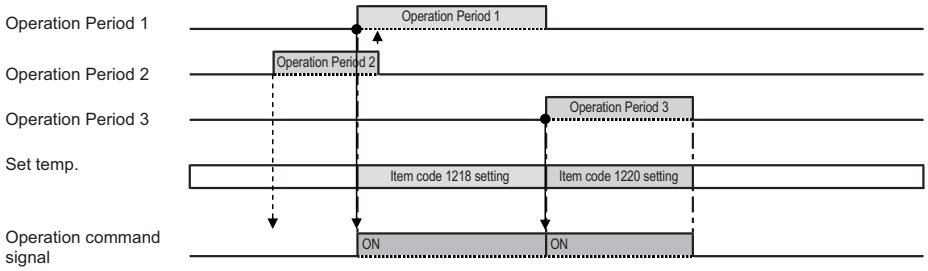
Note **If Code 5 is set to "1," lock the remote controller's schedule function.**

[When the operation Start/End times do not overlap]



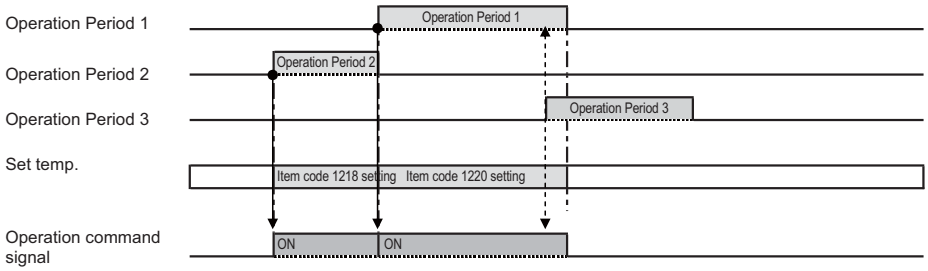
If "Start time1 - End time 1", "Start time 2 - End time 2", "Start time 3 - End time 3" overlap, the settings for the period with a larger number will be ineffective.

[When operation period 1 and 2 overlap]

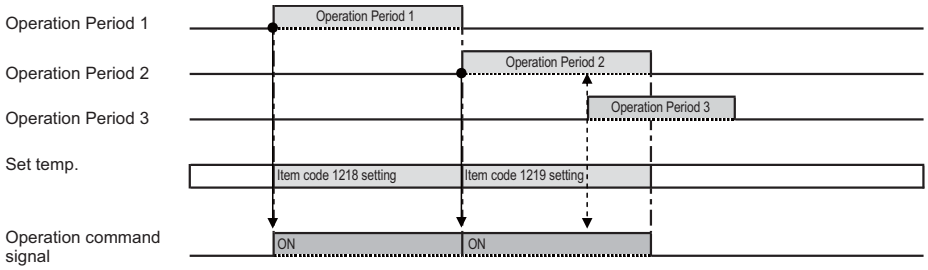


If two or more operation periods overlap, the settings for the period with a larger number will be ineffective.
If Start time 1 and start time 3 are set to the same value, the setting for Start time 3 will be ineffective.
Set the setting for Start time 3 to a time at least one minute after End time 1.
(Once the compressor stops when End time 1 comes, the 3-minute restart delay function will keep the compressor from restarting for three minutes. Because of this, even if Start 3 time is set to a time within three minutes after End time 1, the compressor will not start right away.)

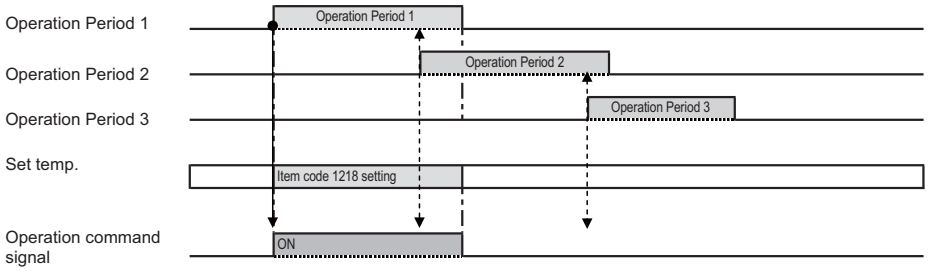
[When operation periods 1 and 3 overlap]



[When operation periods 2 and 3 overlap]



[When operation periods 2 and 3 overlap]



(*) Refer to the section on how to select the preset water temperatures on the next page.

(3) Selecting the preset temperature for different operation periods

Setting procedures

Step 0
Set the ON/OFF switch (SWS1) to OFF.

Set SWS1 to OFF from the remote controller or with the local switch.
Settings cannot be changed unless the ON/OFF setting is set to OFF.

Step 1
Set the dip switches SW2 and SW3.

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

SW2	SW3					
-10	5	6	7	8	9	10
OFF	OFF	OFF	OFF	ON	OFF	OFF

Step 2
Select the desired item with the push switch SWP3.

Item codes 1215 through 1220 relate to selecting the preset temperature setting.
Press the push switch SWP3 to select an item code.
Use the push switches SWP1 and SWP2 to change the value of the selected item.
The value will keep blinking while it is being changed.

Step 3
Press the push switches SWP1 (↑) or SWP2 (↓) to increase or decrease the value.

Settings table

Items that can be set	Item code	Initial value	Unit	Setting			Note	Setting change from an optional remote controller
				Increments	Lower limit	Upper limit		
Preset temp. 1 (Heating)	1215	15	TH	1	15	16		Possible
Preset temp. 1 (Hot Water)	1216	15	TH	1	15	16		Possible
Preset temp. 1 (Heating ECO)	1217	15	TH	1	15	16		Not possible
Start/End time setting 1 (ON/OFF) water temp. setting	1218	1		1	1	3	*	Not possible
Start/End time setting 2 (ON/OFF) water temp. setting	1219	1		1	1	3	*	Not possible
Start/End time setting 3 (ON/OFF) water temp. setting	1220	1		1	1	3	*	Not possible

*1: Preset temp. A (Heating)
2: Preset temp. B (Hot Water)
3: Preset temp. C (Heating ECO)

Step 4
Press the push switch SWP3 to save the change.

Press SWP3 once within one minute of changing the setting with SWP1 or SWP2 to save the setting.
Once the new setting is saved, the display will stop blinking and stay lit. The display will, then, return to the item code display mode.
If SWP3 is not pressed within one minute, the change will not be saved and the display will return to the item code display mode.

Selecting the preset temperature for different operation periods

When operating the units on schedule, preset temperatures can be selected from A, B, or C for time periods 1 through 3.

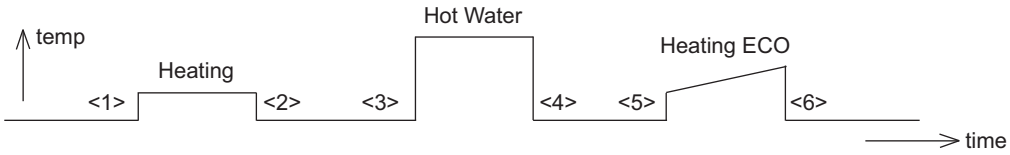
Item code 1218: Operation time setting 1
Item code 1219: Operation time setting 2
Item code 1220: Operation time setting 3

→ Item code 1215: Preset temp. 1 (Item code 11: Heating)
→ Item code 1216: Preset temp. 2 (Item code 13: Hot Water)
→ Item code 1217: Preset temp. 3 (Item codes: 22-27: Heating ECO)

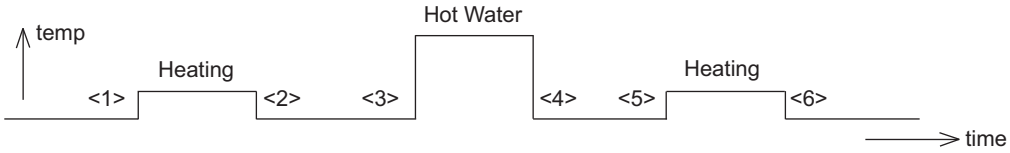
Preset temperature selection for different time periods

			Example 1	Example 2	Example 3
<1> <2>	Start time 1 End time 1	Operation 1 (Preset temperature is selectable from A, B, or C.)	Heating	Heating	Hot Water
<3> <4>	Start time 2 End time 2	Operation 2 (Preset temperature is selectable from A, B, or C.)	Hot Water	Hot Water	Heating ECO
<5> <6>	Start time 3 End time 3	Operation 2 (Preset temperature is selectable from A, B, or C.)	Heating ECO	Heating	Hot Water

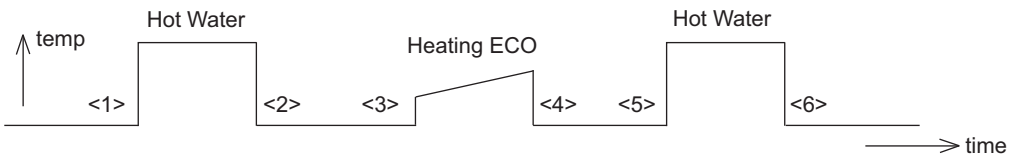
Example 1



Example 2



Example 3



(4) Peak-demand control operation

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

The number of units in operation and the compressor's maximum operating frequency will be controlled according to the peak-demand control signal.

Individual system control	Multiple system control
Individual unit control Maximum frequency = Maximum capacity under peak-demand control	Depending on the peak-demand control setting that is made on the main unit, the number of units in operation and the maximum operating frequency of the units in operation will be adjusted.

Setting procedures

Set the maximum capacity setting on the circuit board.

Step 0
Set the ON/OFF switch (SWS1) to OFF.

Set SWS1 to OFF from the remote controller or with the local switch.
Settings cannot be changed unless the ON/OFF setting is set to OFF.

Step 1
Set the dip switches SW2 and SW3.

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

SW2	SW3					
-10	5	6	7	8	9	10
OFF	OFF	OFF	OFF	OFF	ON	OFF

Step 2
Select the desired item with the push switch SWP3.

Press the push switch SWP3 to select item code 2.
Press the push switches SWP1 or SWP2 to change the value of the selected item.
The value will keep blinking while it is being changed.

Step 3
Press the push switches SWP1 (↑) or SWP2 (↓) to increase or decrease the value.

Settings table

Items that can be set	Item code	Initial value	Unit	Setting			Setting change from an optional remote controller
				Increments	Lower limit	Upper limit	
Maximum capacity setting	2	100	%	5%	0	100	Not possible
Peak-demand control start time	3	1300	Hour: minute	1	0000	2359	Not possible
Peak-demand control end time	4	1300	Hour: minute	1	0000	2359	Not possible

Step 4
Press the push switch SWP3 to save the change.

Press SWP3 once within one minute of changing the setting with SWP1 or SWP2 to save the setting.
Once the new setting is saved, the display will stop blinking and stay lit. The display will, then, return to the item code display mode.
If SWP3 is not pressed within one minute, the change will not be saved and the display will return to the item code display mode.
(*) If the peak-demand control contact is ON, units will operate at the maximum capacity that was set in the steps above.

(5) Setting the total number of units for a multiple system

Step 0
Set the ON/OFF switch (SWS1) to OFF.

Set SWS1 to OFF from the remote controller or with the local switch.
Settings cannot be changed unless the ON/OFF switch is set to OFF.

Step 1
Set the dip switches SW2 and SW3.

Set the dip switches on the circuit board as follows to select how external inputs are received.

SW2	SW3					
-10	5	6	7	8	9	10
OFF	OFF	OFF	OFF	ON	ON	ON

Step 2
Select the desired item with the push switch SWP3.

The item codes shown in the table below will appear in order every time the push switch SWP3 is pressed.
Use the push switches SWP1 and SWP2 to change the value of the selected item.
The value will keep blinking while it is being changed.

Step 3
Press the push switches SWP1 (↑) or SWP2 (↓) to increase or decrease the value.

Setting thetotal number of units

	Item code	Increments	Lower limit	Upper limit	Initial value
Total number of units in the system*1	107	1	1	16	1

*1 Enter the total number of units including the main unit. Applicable only to the main unit.

Step 4
Press the push switch SWP3 to save the change.

Press SWP3 once within one minute of changing the setting with SWP1 or SWP2 to save the setting.
Once the new setting is saved, the display will stop blinking and stay lit. The display will, then, return to the item code display mode.
If SWP3 is not pressed within one minute, the change will not be saved and the display will return to the item code display mode.

Step 5
Turn the power back on.
Reset the system.

After changing the settings, re-initialize the system according to the procedures detailed on page 25.

Note **The new setting will not be saved unless a reset is performed.**

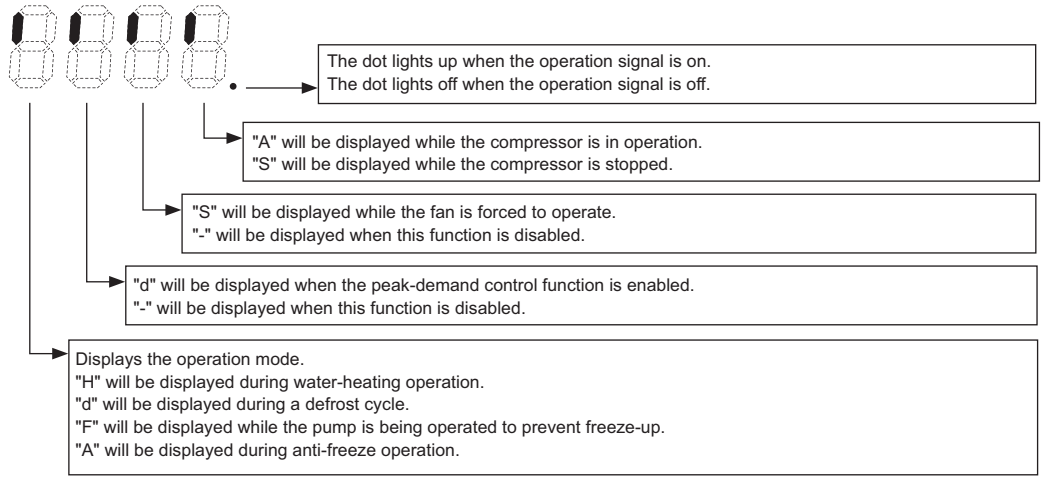
Setting the unit addresses

Refer to "System configuration procedures: Multiple system" (page 22).

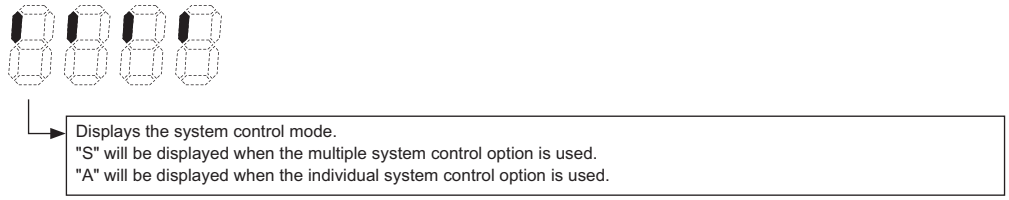
(6) Selecting the item that normally appears on the LED

SW2	SW3						Display content
-10	5	6	7	8	9	10	
OFF	OFF	OFF	ON	OFF	OFF	OFF	Displays the operation mode.(*1)
OFF	OFF	ON	ON	OFF	OFF	OFF	Displays the operation mode.(*2)
OFF	ON	ON	OFF	OFF	OFF	OFF	Displays the current water temperature.
OFF	ON	OFF	OFF	OFF	OFF	OFF	Displays the water-temperature setting.
OFF	OFF	OFF	OFF	OFF	OFF	OFF	Displays the high and low refrigerant pressures.

(*1)



(*2)



(7) Remote water temperature setting input signal type

By setting SW2-7 to ON, external analog signals can be used to set the water temperatures.

Analog input type can be selected from the following four types:

"0": 4-20 mA

"1": 0-10 V

"2": 1-5 V

"3": 2-10 V

Select item code 21 to set the type of analog input signal to be used to set the water temperature from a remote location.

Setting procedures

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

Step 1
Set dip switches SW2, SW3, SW421-1, and SW421-2.

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

	SW421-1	SW421-2	ITEM CODE 21
4-20 mA	ON	ON	0
0-10 V	OFF	OFF	1
1-5 V	OFF	ON	2
2-10 V	OFF	OFF	3

	SW2	SW3					
	-10	5	6	7	8	9	10
Switch settings	OFF	OFF	OFF	OFF	OFF	ON	OFF

Step 2
Select the item to be set with push switch SWP3.

Select the type of analog input signal to be used to set the water temperature from a remote location.

Step 3
Change the values with push switches SWP1 (↑) or SWP2 (↓).

Press push switch SWP3 to select the item code.

Change the values with push switches SWP1 and SWP2.

Until the changed values are saved, the values will blink.

Items that can be set	Item code	Initial value	Unit	Setting			Note	Setting change from an optional remote controller
				Incre-ments	Lower limit	Upper limit		
Water temperature setting input signal type	21	0		1	0	3		Not possible

Step 4
Press push switch SWP3 to save the changed value.

Press SWP3 once within one minute of changing the settings to save the change.

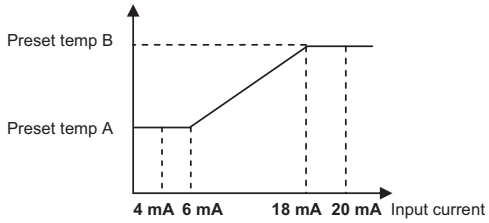
When the new setting is saved, the display will stop blinking and stay lit. The display will, then, return to the item code display mode.

If SWP3 is not pressed within one minute, the change will not be saved, and the display will return to the item code display mode.

(8) Setting the water temperature using analog signal input

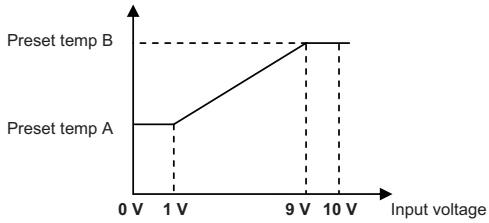
- When dip switch SW2-7 is set to ON (Enable external input) and item code 1051 is set to "0", the target water temperature varies with the preset temperatures A and B and the type of analog input signal.
  - When the water temperature setting input signal type is set to 0 (4-20 mA)

    - External analog input signal of 4 mA: Preset temp. A (Item code 11)
    - External analog input signal of 20 mA: Preset temp. B (Item code 13)
    - External analog input signal of between 6 and 18 mA: the preset temperature will be linearly interpolated.



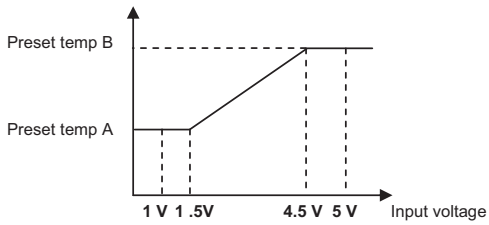
  - When the water temperature setting input signal type is set to 1 (0-10 V)

    - External analog input signal of 0 V: Preset temp. A (Item code 11)
    - External analog input signal of 10 V: Preset temp. B (Item code 13)
    - External analog input signal of between 1 and 9 V: the preset temperature will be linearly interpolated.



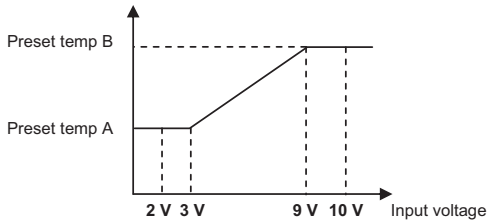
  - When the water temperature setting input signal type is set to 2 (1-5 V)

    - External analog input signal of 1 V: Preset temp. A (Item code 11)
    - External analog input signal of 5 V: Preset temp. B (Item code 13)
    - External analog input signal of between 1.5 and 4.5 V: the preset temperature will be linearly interpolated.



  - When the water temperature setting input signal type is set to 3 (2-10 V)

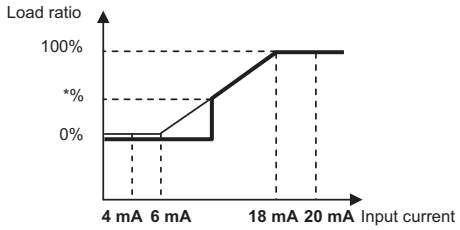
    - External analog input signal of 2 V: Preset temp. A (Item code 11)
    - External analog input signal of 10 V: Preset temp. B (Item code 13)
    - External analog input signal of between 3 and 9 V: the preset temperature will be linearly interpolated.



(9) Setting the capacity control ratio using analog signal input

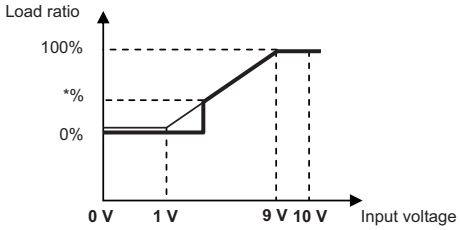
- When dip switch SW2-7 is set to ON (Enable external input) and item code 1051 is set to "1", the capacity control ratio varies with the type of analog input signal.
  - When the water temperature setting input signal type is set to 0 (4-20 mA)

    - External analog input signal of 4-6 mA: 0%
    - External analog input signal of 18-20 mA: 100%
    - External analog input signal of between 6 and 18 mA: the percent will be linearly interpolated.



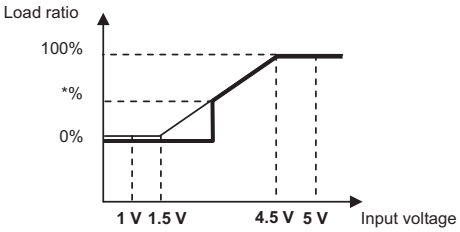
  - When the water temperature setting input signal type is set to 1 (0-10 V)

    - External analog input signal of 0-1 V: 0%
    - External analog input signal of 9-10 V: 100%
    - External analog input signal of between 1 and 9 V: the percent will be linearly interpolated.



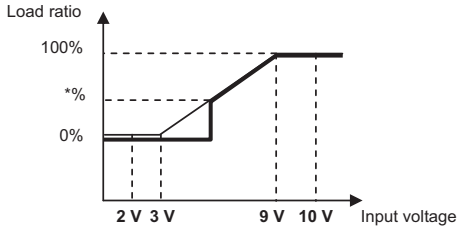
  - When the water temperature setting input signal type is set to 2 (1-5 V)

    - External analog input signal of 1-1.5 V: 0%
    - External analog input signal of 4.5-5 V: 100%
    - External analog input signal of between 1.5 and 4.5 V: the percent will be linearly interpolated.



  - When the water temperature setting input signal type is set to 3 (2-10 V)

    - External analog input signal of 2-3 V: 0%
    - External analog input signal of 9-10 V: 100%
    - External analog input signal of between 3 and 9 V: the percent will be linearly interpolated.



*%: When the compressor frequency drops below 30 Hz, the compressor stops.
The frequency value that causes the compressor to stop varies depending on the outside temperature and water temperature.

(10) Setting the booster heater 1 operation conditions

A temperature at which the booster heater 1 will go into operation (TWL) can be selected.

Select item code 1057 and 1058 to set the threshold temperature (TWL1 and TAL1) for booster heater operation.

Booster heater 1 operation conditions

- **Individual system**

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

1 Water-temperature control option is set to OFF, the water temperature drops below TWL1, and the outside temperature drops below TAL1.
2 Water-temperature control option is set to ON, the external water temperature sensor reading drops below TWL1, and the outside temperature drops below TAL1.

The booster heater 1 signal of the MAIN circuit comes on.

- **Multiple system**

The operation command signal is ON and the following condition is met.

External water temperature sensor readings (TH15 and TH16) drop below TWL1, and the reading of the outside temperature sensor connected to the MAIN circuit of the main unit drops below TWL1.

The booster heater 1 signal of the MAIN circuit comes on.

Booster heater 1 operation-stop conditions

The operation command signal is OFF or all of the following two conditions are met.

1 The water temperature is at or above TWL1+2°C or the outside temperature is at or above TAL1+2°C.
2 External water temperature sensor readings (TH15 and TH16) are at or above TWL1+2°C.

(*) Unit's inlet water temperature: Average value between the water temperature settings of the MAIN and SUB circuits

Setting procedures

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

Step 1
Set dip switches SW2 and SW3.

	SW2	SW3					
	-10	5	6	7	8	9	10
Switch settings	OFF	OFF	OFF	OFF	OFF	ON	OFF

Step 2
Select the item to be set with push switch SWP3.

Step 3
Change the values with push switches SWP1 (↑) or SWP2 (↓).

Select item code 1057 and 1058 to set the operation temperature (TWL1 and TAL1) for the booster heater 1.
Press push switch SWP3 to select the item code.
Change the values with push switches SWP1 and SWP2.
Until the changed values are saved, the values will blink.

Items that can be set	Item code	Initial value	Unit	Setting			Note	Setting change from an optional remote controller
				Increm-ents	Lower limit	Upper limit		
Booster heater 1 operation water temperature (TWL1)	1057	40	°C	0.1	0	70		Not possible
Booster heater 1 operation outside temperature (TAL1)	1058	-10		0.1	-30	50		

Press and hold push switches SWP1 and SWP2 to fast forward the numbers.

Step 4
Press push switch SWP3 to save the changed value.

Press SWP3 once within one minute of changing the settings to save the change.
When the new setting is saved, the display will stop blinking and stay lit. The display will, then, return to the item code display mode.
If SWP3 is not pressed within one minute, the change will not be saved, and the display will return to the item code display mode.

[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	63H1	HP	63H1	ON	MPa	(3.25)
						OFF	MPa	$4.15\ ^{+0}_{-0.15}$
		High-pressure sensor	63HS	HP	63HS	OFF	MPa	-
		Low-pressure sensor	63LS	LP	63LS	OFF	MPa	♦The low pressure has dropped below 0.06 MPa. ♦During water heating, the low pressure has dropped by 0.02 MPa after the air-side suction pipe temperature has reached -33ºC.
	Compressor overcurrent relay			Compressor current		OFF	A	23
	Thermistor	Discharge refrigerant temp. (Discharge temp. overrise protection)	TH1 TH5	Discharge gas temp.		OFF	ºC	♦A discharge gas temperature of 115ºC or above has been detected for 30 seconds while the compressor is in operation. (Preliminary abnormal stop) If this happens three times, the unit will make an abnormal stop. ♦If a discharge gas temperature of 120ºC or above was detected, the unit will make an abnormal stop.
		Heat source HEX wall temp. (Hex protection)	TH4 TH8	Heat source HEX wall temp.		OFF	ºC	A heat source HEX wall temperature of -17.5ºC was detected.
		Suction temp. (vacuum and freeze-up protection)	TH2 TH6	Suction gas temp.		OFF	ºC	A suction gas temperature of -36ºC was detected.
		Compressor shell temp. (compressor floodback protection)	TH3 TH7	Comp. shell temp.		OFF	ºC	A shell bottom SH temperature of 10ºC or below has been detected for 40 minutes while the compressor is in operation.
		Inverter heatsink temp	THHS	INV. heatsink temp.		OFF	ºC	A temperature of 80ºC or above has been detected for 10 minutes or a temperature of 90ºC or above was detected.
Refrigerant circuit control	Liquid injection circuit		LEV2 SV2	Discharge gas temp.			ºC	Injection is controlled by referencing the discharge gas temperature.
Pump control	Water temperature thermister		TH11-14	Hot water side		ON	ºC	3
						OFF	ºC	5
			TH17 TH18 TH20	Heat source side		ON	ºC	-8
						OFF	ºC	-6
	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 two minutes.)
- During the initial processing " 9999 " will appear on the LED monitor on the MAIN board.

-3- Compressor frequency

- The upper limit of frequency during the first 30 seconds of operation is 48 Hz.
- The upper limit of frequency during the first 90 seconds of operation is 60 Hz.
- If the water temperature is controlled based on the outlet water temperature (SW3-3 is set to OFF.), for 90 seconds after the startup, the compressor will be controlled every 30 seconds so that the frequency fluctuation will be kept within ± 5 Hz.
- If the water temperature is controlled based on the external water temperature sensor reading or the inlet water temperature (SW3-3 is set to ON.), for 90 seconds after the startup, the compressor will be controlled every 30 seconds so that the frequency fluctuation will be kept within ± 10 Hz.
  (The above does not apply when the high-pressure is suppressed to protect the system or when the defrost operation is in progress.)
- 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 30 Hz.
- The maximum frequency will be determined based on the relationship between the hot water temperature and the heat source inlet temperature as well as the ON/OFF status of the Energy-save/Maximum capacity contact.
  (The values not on listed in the table are interpolated.)

"Energy-save/Maximum capacity" contact is ON.

（Maximum frequency of the compressor Hz）

		Heat source inlet temp. °C													
		- 8	- 3	2	4	5	7	9	12	15	17	22	27	32	37 or above
Hot water temperature °C	35	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	45	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	60	75	76	77	80	80	80	80	80	80	80	80	80	80	80
	65	75	75	78	78	78	78	78	78	78	78	78	78	78	78

"Energy-save/Maximum capacity" contact is OFF.

（Maximum frequency of the compressor Hz）

		Heat source inlet temp. °C													
		- 8	- 3	2	4	5	7	9	12	15	17	22	27	32	37 or above
Hot water temperature °C	35	79	69	62	60	58	56	53	50	47	46	43	43	42	42
	45	80	71	66	63	61	59	57	53	51	49	46	46	45	45
	60	77	70	67	69	67	65	63	61	59	57	55	53	54	54
	65	76	70	70	68	68	68	66	62	61	60	57	54	53	54

-4- Injection LEV

Operating range of the LEV

Opening range: 40-480 (fully open)
LEV operation speed

- Open 133 plus/sec
- Close 200 plus/sec

At startup

- For one minute after startup, the valve will be fixed to Initial Setting 1.
- Between one and five minutes after startup, the valve will be fixed to Initial Setting 2.

During operation

- Five or more minutes after startup, LEV2 (Injection LEV) opening will be controlled every 30 seconds to approximate the discharge SH to the target value according to the changes in high pressure and discharge gas temperature.
(Refer to the table below for the target discharge SH values.)

Target discharge SH (Item code c31: Discharge gas temp. - discharge pressure saturation temperature)
Refer to Chapter IX [1] 2. "Checking the sensor status."

Outlet water temperature (B) (°C)	Heat source inlet temp.(A) (°C)						
	≤ -8	-8< A ≤ -5	-5< A ≤ 0	0< A ≤ 5	5< A ≤ 10	10< A ≤ 15	15< A
B ≤ 30	50	50	45	45	45	45	40
30 < B ≤35	45	45	34	33	33	33	35
35 < B ≤45	40	34	40	40	40	40	45
45 < B ≤55	40	35	42	42	42	42	45
55 < B ≤65	40	35	42	45	45	45	50
65 < B	40	45	45	45	45	45	50

-5- LEV in the main circuit

Operating range of the LEV

The opening range of the LEV is between 100 and 1400 (fully open).
LEV operation speed

- Open 133 plus/sec
- Close 200 plus/sec

At startup

- For one minute and thirty seconds after startup, the valve will be fixed to the Initial Setting.

During operation

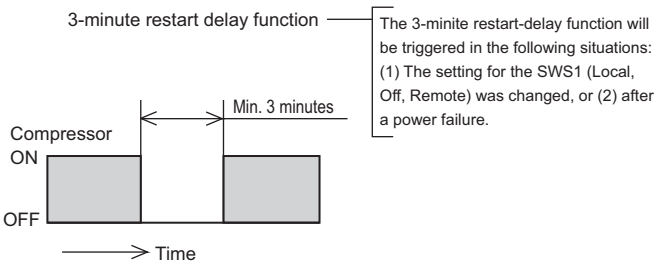
- Ninety or more seconds after startup, the LEV opening will be controlled every 30 seconds according to the changes in compressor frequency, pressure, and temperature.
- The LEV will be controlled to keep the suction SH in 5K.
- If the heat source outlet temperature reaches 16ºC or above, the MOP function will be triggered to keep the low pressure from rising too high.
  (The LEV opening will be decreased to keep the low pressure at or below 1.2 MPa.)
- When the heat source inlet temperature is high and the hot water temperature is low (water temperature below 35ºC), the function to keep the low pressure from rising too high will trip.
  (The LEV opening will be decreased so that the compression ratio of 1.5 or above will be maintained.)

-6- Operation during power failure

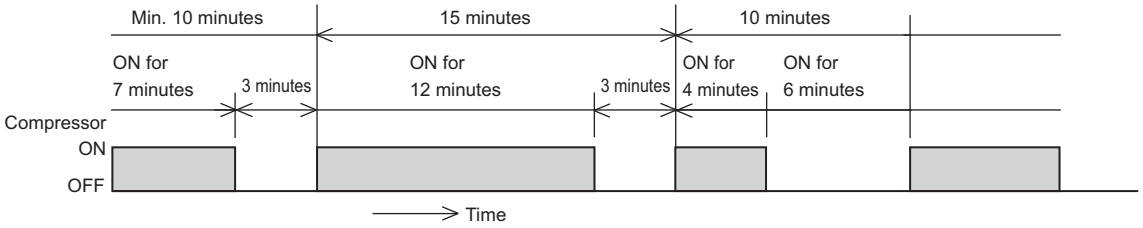
<table>
<tr><td colspan="2">Duration of power failure</td><td>20 ms or shorter</td><td>20 ~ 200ms</td><td>200 ms or longer</td></tr>
<tr><td colspan="2">Detection of power failure</td><td>Undetectable</td><td>Instantaneous power failure</td><td>Detection of power failure</td></tr>
<tr><td colspan="2">Operation 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" (SW3-2 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 dry contact after the power is restored will override the one before the power failure. For three minutes after the power is restored, the unit will not operate.</td></tr>
<tr><td>Automatic restoration after power failure is set to "Disabled" (SW3-2 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 3-minute restart-delay function to protect the compressor from short-cycling. This function is effective even after a power failure.



The unit has a function to keep the compressor from short-cycling when the amount of circulating water is low or when the load is light. After the compressor cycles off, it will not restart for 10 minutes.

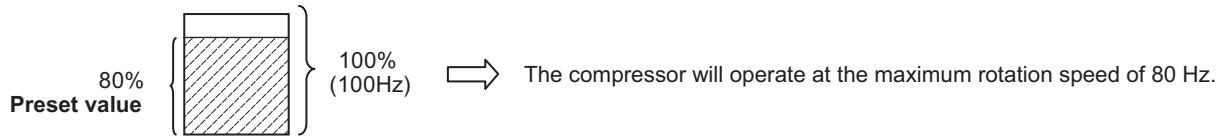


-8- Peak-demand control

General idea about demand control in the system with a combination of a heat pump and a combustion-type hot water boiler.
→During peak-demand hours, the operation of the air conditioning units is given higher priority than that of the heat pump units.

1.Individual system

The peak-demand control function is a function that restricts the maximum capacity of the units. The maximum operation capacities of the units are restricted to specific levels relative to the maximum capacity of the units (= the compressors are operating at the maximum rotation speed (100 Hz on the unit described in this manual)) being set as 100%.



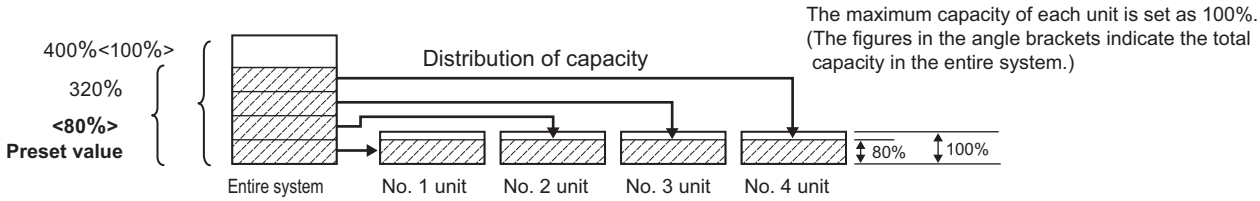
2.Peak-demand control in a multiple system

The peak-demand control function is a function that restricts the maximum capacity of the units. The maximum operation capacities of the units are restricted to specific levels relative to the maximum capacity of all units (= the compressors are operating at the maximum rotation speed (100 Hz on the unit described in this manual)) being set as 100%.

Standard operation

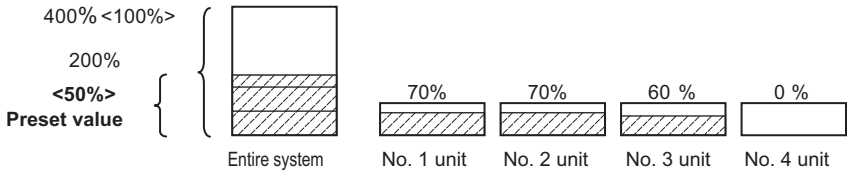
The units are designed to operate in the patterns as shown below to optimize operation efficiency.

a. Maximum capacity setting (D%) ≥ 70% → All units will be operated at D Hz.

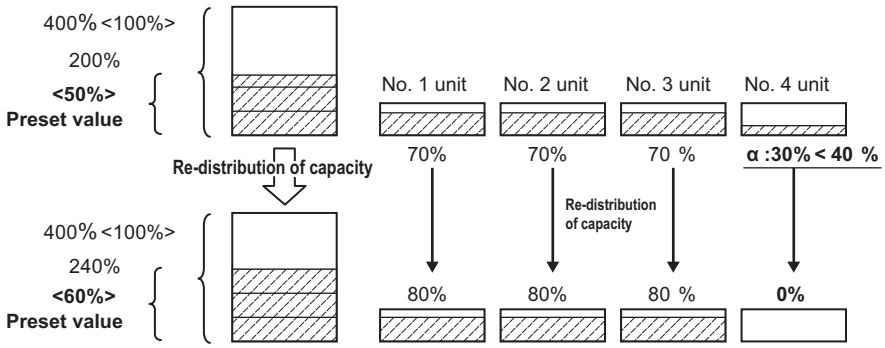


b. Maximum capacity setting D% < 70% → The number of units "N" and the capacity at which the units operate "α" will be determined so that either the condition (1) or (2) below is met.

1) D × M = 70% × (N-1) + α × 1 (40 % ≤ α < 70 %)
(N-1) units will be operated at 70 Hz, and one unit will be operated at α Hz.



2) D × M = α× N 70% ≤ α, The α value will be set to a value as close to 70 Hz as possible.
N units will be operated at α Hz.



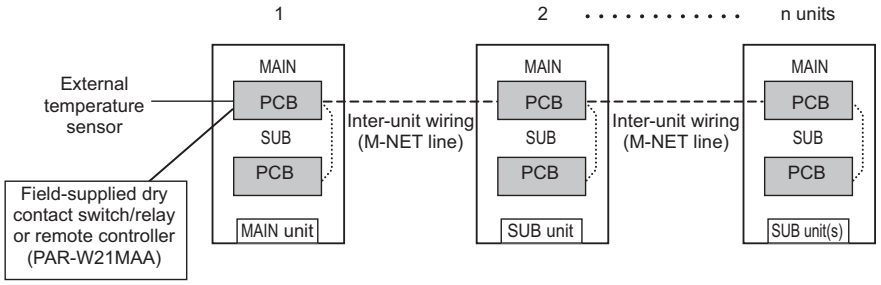
Nomenclature

D %	Maximum capacity setting: The capacity of the system when all units are operated at 100 Hz will be set as 100%.
M	Total number of units
N	No. of units in operation (calculated value)
α % (α Hz)	Operating capacity (calculated value)

note. During the heating season, the unit will not be operated at 100 Hz to save energy consumption in the first place, so the unit's performance may not be affected even if the maximum capacity setting is changed.

-9- Multiple system control

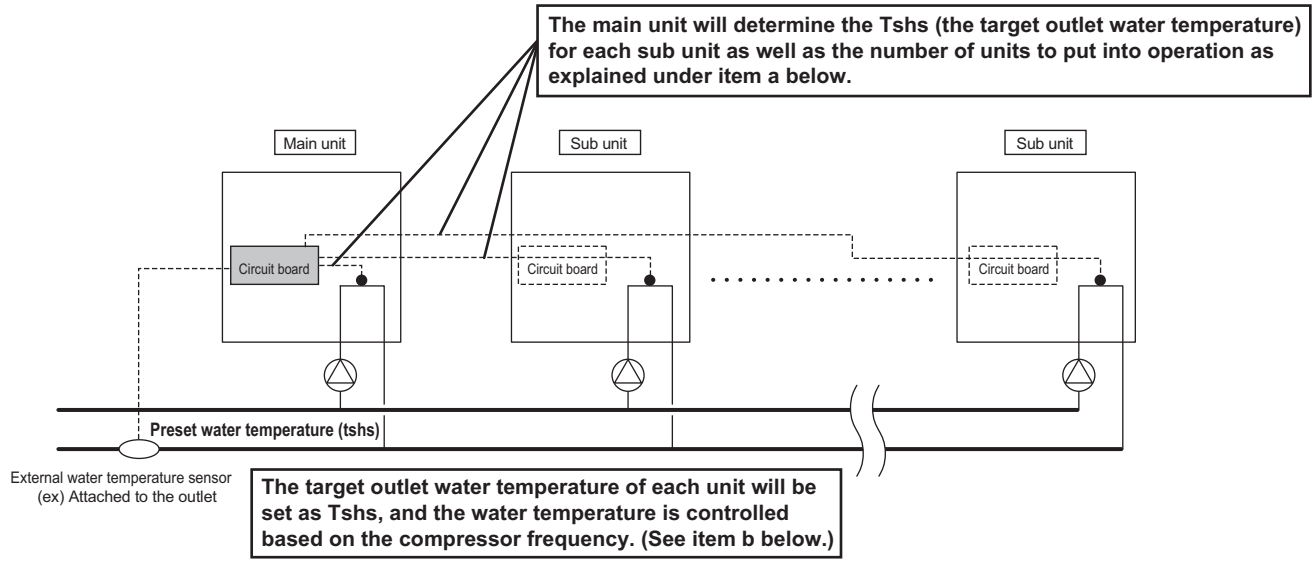
1. Electrical wiring diagram



(*) Main/Sub units and switch settings

	SW2-8 (Use of external water temperature sensor)	SW2-9 (Multiple system)
Main unit (Unit to which the external water temperature sensor is connected.)	ON	ON
Sub unit	OFF	ON

2. Water piping system configuration



a. Changing the number of units to go into operation and changing the startup sequence of the units (controlled by the main unit)

Check interval : Variable between 1 and 5
DIFF2 : Differential (Variable between 0 and 8 K)

1) One unit will stop when the external water temperature meets the following formula: External water temperature ≤ [Set temperature (Tshs)] + [DIFF 2 value divided by 2].

   If two or more units are operating at the same frequency, the one with more hours of cumulative operation hours will be stopped first.

2) One unit will go into operation when the external water temperature meets the following formula: External water temperature ≤ [Set temperature (Tshs)] - [DIFF 2 value divided by 2].

   The unit with shorter cumulative operation hours will go into operation first.

   The cumulative operation hours of a given unit is determined by the cumulative operation hours of the compressor with more hours than the other compressor.

b. Operation control based on the compressor frequency (Each unit controls its own frequency.)

Each unit increases or decreases the compressor frequency based on the difference between the preset and the current water temperatures.

The frequency of the compressor is adjusted to a range between 50 and 70 Hz to optimize operation efficiency.

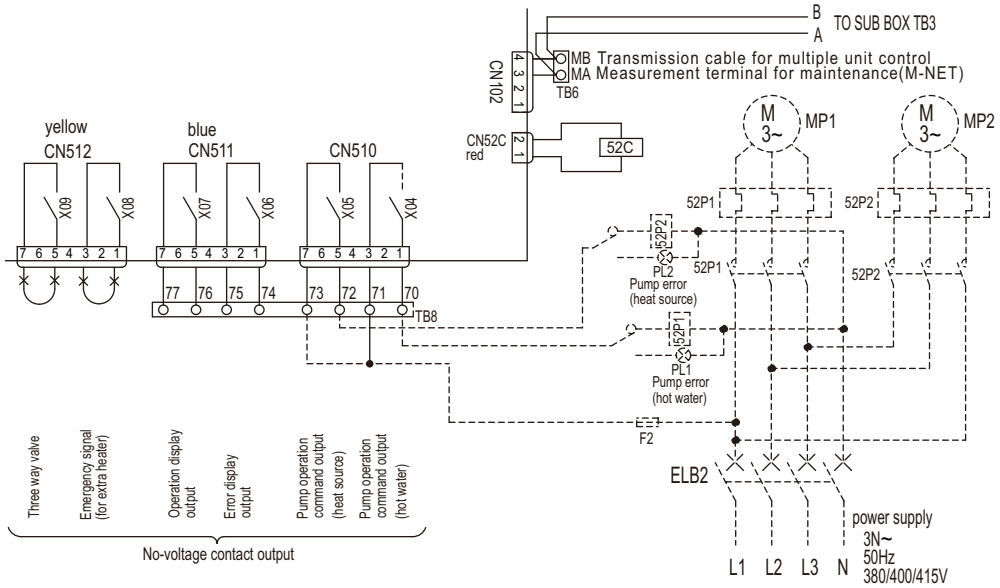
Only when all units are under the Thermo-ON condition, the operating frequency may exceed 70 Hz.

-10- Automatic operation of pump for freeze-up protection

1. Purpose

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

2. Pump wire connection



3. Natural freeze-up protection

The units will operate according to the dip switch SW2-1 on the control board as shown in the table below.

Dip switch settings		SW2-1 OFF	SW2-1 ON
Control method		Natural freeze-up protection based on the water temperature	
Hot water side	Pump start conditions	Hot water temperature is within ±1ºC of 3 ºC	Same as left
	Pump stop conditions	Hot water temperature is more than ±1ºC of 5 ºC	Same as left
Heat source side	Pump start conditions	Heat source temperature is more than ±1ºC of -8 ºC	Same as left
	Pump stop conditions	Heat source temperature is more than ±1ºC of -6 ºC	Same as left

-11- Water-temperature control

Water temperature can be controlled in the following three ways. Select one that works best.

	Switch	Factory setting
Outlet-water-temperature-based control	SW3-3	OFF
Inlet-water-temperature-based control		-
Water temperature control based on the external water temperature reading	SW2-8	OFF

	SW3-3	SW2-8
Outlet-water-temperature-based control	OFF	OFF
Inlet-water-temperature-based control	ON	OFF
Water temperature control based on the external water temperature reading	Arbitrary*1	ON

*1 When dip switch SW2-8 is set to ON, the ON/OFF operation of the units is controlled based on the external water temperature sensor reading.
How the operating frequency of the compressor is controlled depends on the SW3-3 setting (outlet-/inlet-based control option).
(Sub units will be controlled based on the water-temperature control method that has been selected for the Main unit.)

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

- The control option was changed from built-in thermistor reading based control to the external thermistor reading based control.
- Pump interlock is off.
- When one of the units in a set is forced to stop
- When the Capacity priority/Cop priority setting was changed.
- When the units were stopped under the following conditions:
  1. Tmax has reached 67ºC (Hot water side)
  2. Tmin has reached -10ºC (Heat source side)

DIFF1 = 2 ºC (Initial setting): “1015” Digitally set value
DIFF2 = 2 ºC (Initial setting): “1016” Digitally set value
Tmax=67 ºC

Single/Multiple system	sensor	Control method	Thermo-ON conditions
Individual system	Built-in thermistor	Inlet-water-temperature-based control	Outlet water temperatures < (Preset water temperature - DIFF1ºC) AND Inlet water temperatures < (Preset water temperature - DIFF1ºC)
		Outlet-water-temperature-based control	Outlet water temperatures < (Preset water temperature - DIFF1ºC) AND Inlet water temperatures < (Preset water temperature - DIFF1ºC) AND Average outlet water temperature ≤ (Preset water temperature+ DIFF2ºC)
	Representative water temperature	Representative water temperature	Representative water temperature < (Preset water temperature - DIFF1ºC)
Multiple system	Representative water temperature	Representative water temperature	Representative water temperature < (Preset water temperature - DIFF2/2) AND The number of units to run an optimal operation will be determined by the main unit. (The unit with the least amount of cumulative operation hours will go into operation first.)

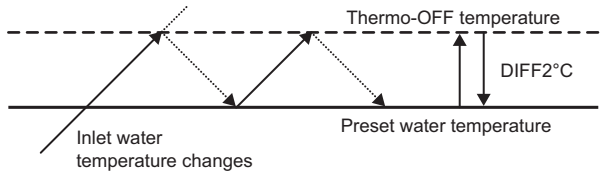
2. Normal Thermo-ON/OFF operations

DIFF1 = 2 ºC (Initial setting): “1015” Digitally set value
DIFF2 = 2 ºC (Initial setting): “1016” Digitally set value
Tmax=67 ºC

Single/Multiple system	sensor	Thermo-ON conditions	Thermo-ON conditions	Thermo-OFF conditions
Individual system	Built-in thermistor	Inlet-water-temperature-based control	Inlet water temperatures is lower than the "Inlet temperature at Thermo-OFF - DIFF2ºC" and the system is not in the short-cycling protection mode.	Inlet water temperatures are greater than the "set temperature + DIFF2 value (ºC)" AND at least 60 seconds have passed since the last Thermo-ON.
		Outlet-water-temperature-based control	Inlet temperatures are below the "Inlet temperature at Thermo-OFF - DIFF2ºC"AND the average outlet temperature is at or below "Preset temperature + DIFF2ºC" AND the system is not in the short-cycling protection mode.	Average outlet water temperature is greater than the "set temperature + DIFF2 value (ºC)" AND at least 60 seconds have passed since the last Thermo-ON.
	Representative water temperature	Water temperature control based on the external water temperature reading	Inlet water temperatures is lower than the "Inlet temperature at Thermo-OFF - DIFF2ºC"	External water temperature sensor reading is greater than the "set temperature * DIFF2 value (ºC)" AND at least 60 seconds have passed since the last Thermo-ON.
Multiple system	Representative water temperature	Water temperature control based on the external water temperature reading	External water temperature thermistor reading < Set temperature - DIFF 2 value (ºC) AND the anti-short-cycling protection function is not been triggered. The number of units to run an optimal operation will be determined by the main unit. (The unit with the least amount of cumulative operation hours will go into operation first.)	External water temperature sensor reading is greater than the "set temperature * DIFF2/2 value (ºC)" AND at least 60 seconds have passed since the last Thermo-ON. The number of units to run an optimal operation will be determined by the main unit. (The unit with the least amount of cumulative operation hours will go into operation first.)

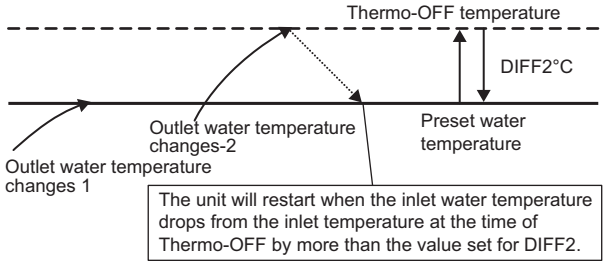
1) Thermo-ON/OFF temperature conditions

♦Intlet-temperature-based water temperature control in an individual system (with the external water temperature sensor setting being set to ON and the Inlet-/outlet-based control option being set to inlet)



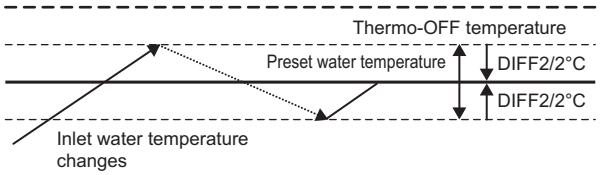
When the water temperature is controlled based on the inlet temperature, compressor frequency will be controlled as described in section -3- "Compressor frequency" (page 86). (Automatic operation according to the preset temperature)

♦Outlet-temperature-based water temperature control in an individual system (with the external water temperature sensor setting being set to ON and the Inlet-/outlet-based control option being set to outlet)



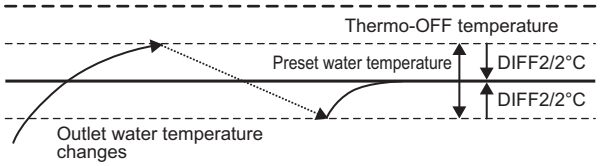
When the water temperature is controlled based on the external water temperature sensor reading (outlet water temperature), compressor frequency will be controlled in the way that the target water temperature will be maintained. If there is a sudden increase in water temperature and the unit did not stop at the preset temperature, the unit will stop when the temperature that equals "the preset temperature + the value set for DIFF2" is reached.

♦**Multiple system control (inlet-water-temperature-based control)**



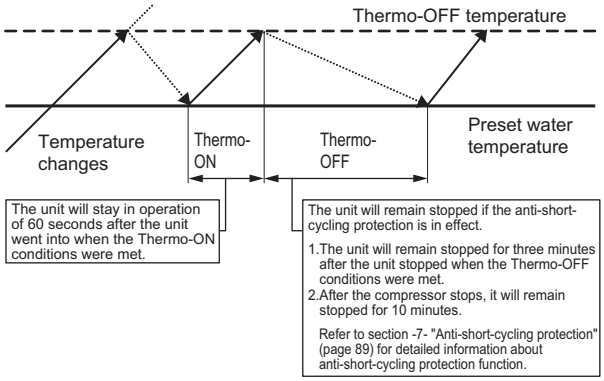
When the water temperature is controlled based on the representative inlet temperature, compressor frequency will be controlled as described in section -3-"Compressor frequency" (page 86). (Automatic operation according to the preset temperature)

♦**Multiple system control (outlet-water-temperature-based control)**



When the water temperature is controlled based on the external water temperature sensor reading (outlet water temperature), compressor frequency will be controlled in the way that the target water temperature will be maintained. The number of units to be in operation will be determined by the main unit to maintain the proper operating frequency of each unit.

2) Thermo-ON/OFF conditions (time)



When the water temperature is controlled based on the inlet temperature, compressor frequency will be controlled as described in section -3- "Compressor frequency"(page 86). (Automatic operation according to the preset temperature)

3. When the units are stopped after the water temperature has reached the upper limit setting

DIFF1 = 2 ºC (Initial setting): “1015” Digitally set value
DIFF2 = 2 ºC (Initial setting): “1016” Digitally set value
Tmax=67 ºC

Individual system	sensor	Control method	Thermo-ON conditions	Thermo-OFF conditions
Refer to the section on individual system.	Built-in thermistor External water temperature	Inlet-water-temperature-based control Outlet-water-temperature-based control Water temperature control based on the external water temperature reading	When SW2-5 (operation restoration after forced stoppage) is set to ON Inlet water temperatures are lower than the "Inlet temperature at Thermo-OFF DIFF2ºC" AND outlet temperatures are lower than "Tmax - DIFF1ºC."	"External water temperature of each unit > Tmax" or "Inlet water temperature of each unit > Tmax"
			When SW2-5 (operation restoration after forced stoppage) is set to OFF Inlet temperatures are lower than "Tmax - DIFF1ºC" AND outlet temperatures are lower than "Tmax - DIFF1ºC."	

-12- Controlling the operation of unit using external water temperature sensors

The water temperature can be controlled using the built-in sensor on the unit or a separately sold external water temperature sensor.
The factory setting for the sensor option is "built-in sensor on the unit." (SW2-8: OFF)
To control the water temperature with an external water temperature sensor, set SW2-8 to ON.
(Note) If the settings for the dip switches are changed while the power to the circuit board is being supplied, reset the unit according to the instructions in [6]. (4) "Re-initializing the system" (page 25).
A separately sold water temperature sensor "TW-TH16" will be required to control the water temperature based on the external water temperature reading.
It is possible to switch between two external water temperature sensors. Refer to the installation manual for how to set the sensors.
Install the external water temperature sensor and wiring according to the instructions on the next page.

-13- Remote water temperature setting input signal type

By setting SW2-7 to ON, external analog signals can be used to set the water temperatures.
Analog input type can be selected from the following four types:
"0": 4-20 mA
"1": 0-10 V
"2": 1-5 V
"3": 2-10 V

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)*

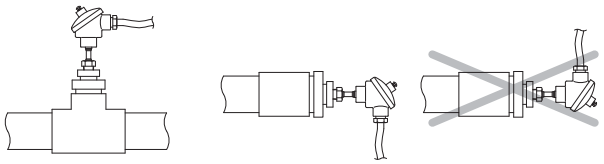
*Items (1) and (2) are field supplied.

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

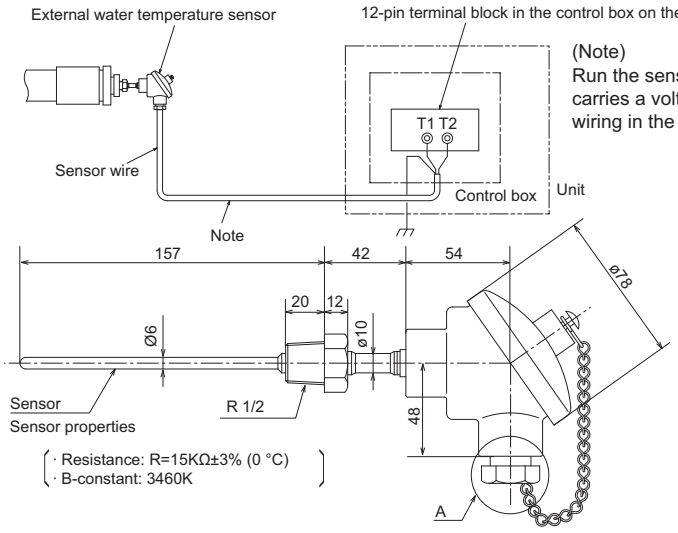
- Install the external water temperature sensor where the water pipes merge or on the load-side tank as shown in the figure at right.
- Install horizontally or vertically on top of the pipe.
- When installing horizontally, make sure the wire faces down.



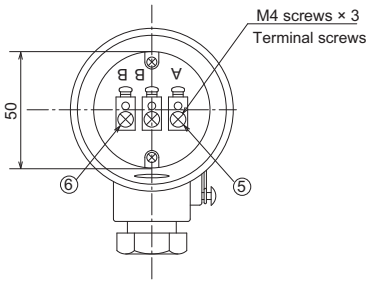
Vertical installation　　Horizontal installation

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.



(Note)
Run the sensor wiring at least 5 cm away from any wire that carries a voltage of 100 V or more, and do not put the sensor wiring in the same conduit tube with it.



Terminal block for connection to the sensor

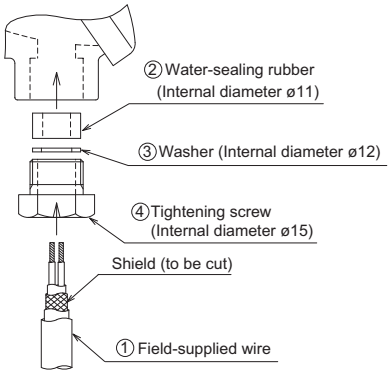
Connect the sensor wiring to terminals T1 and T2 of the 12-pin terminal block in the control box on the unit.

Connect the shield to the earth terminal.

Thread the wire to the external water temperature sensor through parts ②through ④as 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.)

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.



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

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,MA,MB(TB3). Do not attempt to measure the insulation resistance of TB7.
- The insulation resistance between the power supply terminal block and the ground could go down to close to 1Mohm immediately after installation or when the power is kept off for an extended period of time because of the accumulation of refrigerant in the compressor.
- If insulation resistance reads at least 1Mohm, by turning on the main power and powering the belt heater 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.

Note

Securely tighten the cap.

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

Note

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

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

(5) Pre-energize the compressor.

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

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

(6) Check the pressure.

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

Condensing and evaporating temperatures during operation

Saturation pressure equivalent to refrigerant pressure	Heating (outside temperature: between -20 ºC and +40 ºC)	
	At the initial stage of heating water (Before water has been heated up)	During normal operation
Condensing temperature	Outlet hot water temperature + (0 - 10 °C)	Outlet hot water temperature + (0 - 5 °C)
Evaporating temperature	Outlet heat source temperature. - (0 - 10 °C)	Outlet heat source temperature. - (0 - 5 °C)*

* To maintain proper compression ratio, when the outside temperature exceeds 16 ºC, evaporating temperature may drop below " - 5 ºC"

(7) Check that the correct voltage is applied.

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

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

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

(9) Check for 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.

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

When a pull-down 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 10 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 "VII [1]1.Factory Switch Settings (Dip switch settings table)(page 67) and "(1)Setting procedures"(page 71) 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.)

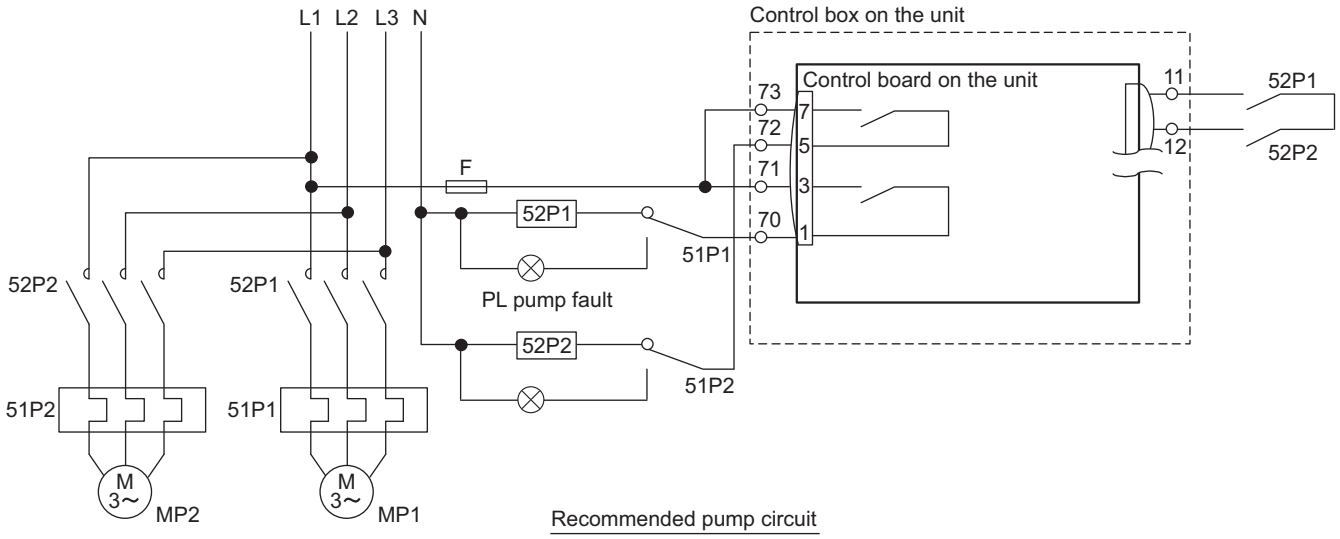
(11) Connect the pump-interlock wire to the appropriate contacts.

1) Connecting the pump-interlock wire

Connect the pump-interlock wire to the pump-interlock circuit (Terminal block ⑪ and ⑫). 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.

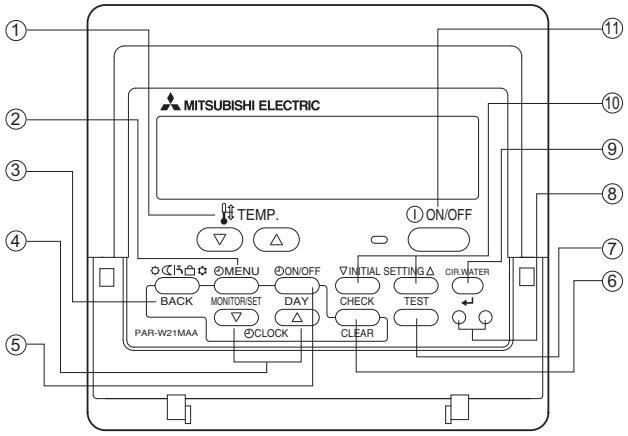


Recommended pump circuit

(12) 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 [Set Temperature] buttons (▽ Down/△ Up buttons)
② [TIMER MENU] button (MONITOR/SET button)
③ [Mode] button (BACK button)
④ [Set Time] buttons (▽ Back/△ Ahead buttons)
⑤ [TIMER ON/OFF] button (DAY button)
⑥ [CHECK] button (CLEAR button)
⑦ [TEST RUN] button
⑧ Not available
⑨ [CIR. WATER] button (↵ <Enter> button)
⑩ [INITIAL SETTING] button (▽ Down/△ Up buttons)
⑪ [ON/OFF] button
* Opening the lid.

Operation procedures	
Turn on the main power.	→ "PLEASE WAIT" appears on the LCD for up to five minutes.
Set the water temperature to a temperature at least 5 °C above the current settings. Press the ⑪ ON/OFF button to start operation.	→ Run
To stop the operation, press the ⑪ ON/OFF button.	→ Stop
Note 1: Refer to the following pages if an error code appears on the remote controller or when the unit malfunctions.	

[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.
* To prevent the heat exchanger from freezing, check that the concentration of brine is such that the freezing temperature is -18°C or less before operation.

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 10 minutes. If the unit does not start when the ON/OFF switch is turned on, leave the switch turned on for 10 minutes. The unit will automatically start up within 10 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)
Refer to the following pages for how to use the remote controller.

IMPORTANT

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

3. Operating the unit from the control board on the unit.

(1) To start the unit
Set the switch SWS1 on the circuit board to "LOCAL."

(2) To stop the unit
Set the switch SWS1 on the circuit board to "OFF."

[4] Refrigerant

Unit type	CRHV-P600YA-HPB
Refrigerant type	R410A
Refrigerant charge	4.5kg × 2

[5] Symptoms that do not Signify Problems

Symptom	Remote controller display	Cause
The display shown right will appear on the unit remote controller for about 5 minutes when the main power source is turned on.	**"PLEASE WAIT" ("HO") blinking display**	The system is under starting up. Operate the remote controller after the blinking of “PLEASE WAIT” (“HO”) is disappeared.

[6] Standard operating characteristics (Reference data)

Reference data

Temperature	Discharge refrigerant	°C	65
	Suction refrigerant	°C	0
	Shell temperature	°C	17
	Inlet heat source temperature	°C	0
	Outlet heat source temperature	°C	-3
	Inlet hot water temperature	°C	30
	Outlet hot water temperature	°C	35
Pressure	High pressure	MPa	2.05
	Low pressure	MPa	0.57
Compressor	Frequency	Hz	82

IX Troubleshooting

[1] Maintenance items

1. Checking the error history
   Take the following steps to view the last six error histories (error codes).

Note

Refer to “[2] 2.Error code list” for information about error codes. (page 119)

Setting procedure

Step 1
Set the dip switches SW2 and SW3.

Set the dip switches on the circuit board as follows to view error histories.

SW2	SW3					
10	5	6	7	8	9	10
OFF	OFF	OFF	OFF	OFF	ON	ON

Step 2
Select the desired item with the push switch SWP3.

Press the push switch SWP3 to toggle through the item codes listed below.
Select an item code from 1 through 18, and press either of the push switches SWP1 or SWP2 to display the error history (error code) in blinking form.

Step 3
Press the push switches SWP1 (↑) or SWP2 (↓) to increase or decrease the value.

Refer to "Error history item list" for the types of errors that appear on error history.

Step 4
Press the push switch SWP3 to save the change.

Press SWP3 to stop the blinking and return to the item code display.

Error history item list

Item	Item code	LED display	Unit and circuit type				Notes
			Main unit		Sub unit		
			MAIN circuit	SUB circuit	MAIN circuit	SUB circuit	
Error history 1	1	Error Code	○	○	○	○	(Note1) (Note2) (Note3)
Error history 1 details (Inverter error)	2	Error Code	○	○	○	○	
Error history 1/Occurrence time	3	Time	○	○	○	○	
Error history 2	4	Error Code	○	○	○	○	
Error history 2 details (Inverter error)	5	Error Code	○	○	○	○	
Error history 2/Occurrence time	6	Time	○	○	○	○	
Error history 3	7	Error Code	○	○	○	○	
Error history 3 details (Inverter error)	8	Error Code	○	○	○	○	
Error history 3/Occurrence time	9	Time	○	○	○	○	
Error history 4	10	Error Code	○	○	○	○	
Error history 4 details (Inverter error)	11	Error Code	○	○	○	○	
Error history 4/Occurrence time	12	Time	○	○	○	○	
Error history 5	13	Error Code	○	○	○	○	
Error history 5 details (Inverter error)	14	Error Code	○	○	○	○	
Error history 5/Occurrence time	15	Time	○	○	○	○	
Error history 6	16	Error Code	○	○	○	○	
Error history 6 details (Inverter error)	17	Error Code	○	○	○	○	
Error history 6/Occurrence time	18	Time	○	○	○	○	
Inlet water temp (Twi) (* Sub circuit: TH17)	c01	First decimal place	○	○	○	○	(Note4)
Outlet water temperature (Two)	c02	First decimal place	○	○	○	○	
Discharge refrigerant temperature 1 TH1 / Discharge refrigerant temperature 2 TH5	c03	First decimal place	○	○	○	○	
Suction refrigerant temperature 1 TH2 / Suction refrigerant temperature 2 TH6	c04	First decimal place	○	○	○	○	
Shell temperature 1 TH3 / Shell temperature 2 TH7	c05	First decimal place	○	○	○	○	
Heat exchanger wall temperature 1 TH4 / Heat exchanger wall temperature 2 TH8	c06	First decimal place	○	○	○	○	
Outdoor temperature TH9 or 4-20 mA or IT	c07	First decimal place	(Note6)	-	-	-	
Inlet water temperature 1 TH11 / Inlet water temperature 2 TH17	c08	First decimal place	○	○	○	○	
Outlet water temperature 1 TH12 / Outlet water temperature 2 TH18	c09	First decimal place	○	○	○	○	
Representative water temperature 1 TH15	c10	First decimal place	○	Fixed to 0	Fixed to 0	Fixed to 0	
Representative water temperature 2 TH16	c11	First decimal place	○	Fixed to 0	Fixed to 0	Fixed to 0	
High pressure 1 HP1 / High pressure 2 HP2	c12	Second decimal place	○	○	○	○	
Low pressure 1 LP1 / Low pressure 2 LP2	c13	Second decimal place	○	○	○	○	
Heatsink temperature (THHS)	c14	First decimal place	○	○	○	○	
Water temperature setting using an external analog input (4-20 mA Current input)	c15	First decimal place	(Note5)	Fixed to 0	Fixed to 0	Fixed to 0	
I u(U-phase current)(Compressor)	c16	First decimal place	○	○	○	○	
I w(W-phase current)(Compressor)	c17	First decimal place	○	○	○	○	
I dc(Bus current)(Compressor)	c18	First decimal place	○	○	○	○	
Vdc(Bus voltage)(Compressor)	c19	Integer	○	○	○	○	
Suction SH (target)	c24	First decimal place	○	○	○	○	
Compressor frequency (actual frequency)	c25	Integer	○	○	○	○	
Suction SH	c26	First decimal place	○	○	○	○	
Shell bottom SH	c27	First decimal place	○	○	○	○	
Opening of the LEV on the main circuit	c29	Integer	○	○	○	○	
Injection LEV opening	c30	Integer	○	○	○	○	
Discharge SH (target)	c31	First decimal place	○	○	○	○	
Discharge SH	c32	First decimal place	○	○	○	○	
4-20 mA (2) current	c34	First decimal place	○	Fixed to 0	Fixed to 0	Fixed to 0	
Target water temperature	c33	First decimal place	○	○	○	○	
Water temperature setting using an external analog input (0-10 V or 2-10 V Voltage input)	c35	First decimal place	(Note5)	Fixed to 0	Fixed to 0	Fixed to 0	
Water temperature setting using an external analog input (1-5 V Voltage input)	c36	First decimal place	(Note5)	Fixed to 0	Fixed to 0	Fixed to 0	
Heat source inlet temperature 1 TH13	c37	First decimal place	○	○	○	○	
Heat source outlet temperature 1 TH14/Heat source outlet temperature 2 TH20	c38	First decimal place	○	○	○	○	

(Note1) Item codes 1 through 18 indicate error histories. Each history has the error code, error detail code, and time as a set.
(Note2) Error histories are displayed from the newest to the oldest. (Each history has the error code, error detail code, and time as a set.)
Up to the past six histories can be displayed. (The older ones will be deleted.)
(Note3) If the error history is empty, "----" will blink.
(Note4) Refer to section “2. Checking the sensor status” for details. (page 111)
(Note5) When the input type is selected
When the input type is not selected = 0
(Note6) Effective when the value for item code 1080 is a value other than 0

2. Checking the sensor status

Setting procedure

Step 1
Set the dip switches SW2 and SW3.

Set the dip switches on the circuit board as follows to check temperatures and pressures.

SW2	SW3					
10	5	6	7	8	9	10
OFF	OFF	OFF	OFF	OFF	ON	ON

Step 2
Select the desired item with the push switch SWP3.

Press the push switch SWP3 to toggle through the item codes listed below.
Select an item code from c01 through c36, and press either of the push switches SWP1 or SWP2 to display the current temperature, pressure, and electrical current in blinking form.

Step 3
Press the push switches SWP1 (↑) or SWP2 (↓) to increase or decrease the value.

Refer to "Sensors and item code list" for the types of errors that appear on error history.

Step 4
Press the push switch SWP3 to save the change.

Press SWP3 to stop the blinking and return to the item code display.

Sensors and item code list

Item		Item code	LED display	Unit and circuit type				Notes
				Main unit		Sub unit		
MAIN circuit	SUB circuit			MAIN circuit	SUB circuit	MAIN circuit	SUB circuit	
Error history 1		1	Error Code	○	○	○	○	(Note1)
Error history 1 details (Inverter error)		2	Error Code	○	○	○	○	
Error history 1/Occurrence time		3	Time	○	○	○	○	
Error history 2		4	Error Code	○	○	○	○	
Error history 2 details (Inverter error)		5	Error Code	○	○	○	○	
Error history 2/Occurrence time		6	Time	○	○	○	○	
Error history 3		7	Error Code	○	○	○	○	
Error history 3 details (Inverter error)		8	Error Code	○	○	○	○	
Error history 3/Occurrence time		9	Time	○	○	○	○	
Error history 4		10	Error Code	○	○	○	○	
Error history 4 details (Inverter error)		11	Error Code	○	○	○	○	
Error history 4/Occurrence time		12	Time	○	○	○	○	
Error history 5		13	Error Code	○	○	○	○	
Error history 5 details (Inverter error)		14	Error Code	○	○	○	○	
Error history 5/Occurrence time		15	Time	○	○	○	○	
Error history 6		16	Error Code	○	○	○	○	
Error history 6 details (Inverter error)		17	Error Code	○	○	○	○	
Error history 6/Occurrence time		18	Time	○	○	○	○	
Inlet water temp (Twi)	Inlet water temp 2 TH17	c01	First decimal place	○	○	○	○	(Note2)
Outlet water temperature (Two)		c02	First decimal place	○	○	○	○	(Note2)
Discharge refrigerant 1 TH1	Discharge refrigerant 2 TH5	c03	First decimal place	○	○	○	○	(Note2)
Suction refrigerant 1 TH2	Suction refrigerant 2 TH6	c04	First decimal place	○	○	○	○	(Note2)
Shell temperature 1 TH3	Shell temperature 2 TH7	c05	First decimal place	○	○	○	○	(Note2)
Heat exchanger wall temp. 1 TH4	Heat exchanger wall temp. 2 TH8	c06	First decimal place	○	○	○	○	(Note2)
Outdoor temp. TH9 or 4-20 mA or IT	-	c07	First decimal place	(Note14)	-	-	-	(Note2)
Inlet water temperature 1 TH11	Inlet water temperature 2 TH17	c08	First decimal place	○	○	○	○	(Note2)
Outlet water temperature 1 TH12	Outlet water temperature 2 TH18	c09	First decimal place	○	○	○	○	(Note2)
Representative water temperature 1 TH15	-	c10	First decimal place	○	Fixed to 0	Fixed to 0	Fixed to 0	(Note2)
Representative water temperature 2 TH16	-	c11	First decimal place	○	Fixed to 0	Fixed to 0	Fixed to 0	(Note2)
High pressure 1 HP1	High pressure 2 HP2	c12	Second decimal place	○	○	○	○	(Note3)
Low pressure 1 LP1	Low pressure 2 LP2	c13	Second decimal place	○	○	○	○	(Note3)
Heatsink temperature(THHS)		c14	First decimal place	○	○	○	○	(Note2)
Water temperature setting using an external analog input (4-20 mA Current input)	-	c15	First decimal place	(Note13)	Fixed to 0	Fixed to 0	Fixed to 0	(Note4)
I u(U-phase current)(Compressor)		c16	First decimal place	○	○	○	○	(Note4)
I w(W-phase current)(Compressor)		c17	First decimal place	○	○	○	○	(Note4)
I dc(Bus current)(Compressor)		c18	First decimal place	○	○	○	○	(Note4)
Vdc(Bus voltage)(Compressor)		c19	Integer	○	○	○	○	(Note5)
Suction SH (target)		c24	First decimal place	○	○	○	○	(Note6)
Compressor frequency (actual frequency)		c25	Integer	○	○	○	○	(Note7)
Suction SH		c26	First decimal place	○	○	○	○	(Note8)
Shell bottom SH		c27	First decimal place	○	○	○	○	(Note9)
Opening of the LEV on the main circuit		c29	Integer	○	○	○	○	(Note10)
Injection LEV opening		c30	Integer	○	○	○	○	(Note10)
Discharge SH (target)		c31	First decimal place	○	○	○	○	(Note6)
Discharge SH		c32	First decimal place	○	○	○	○	(Note11)
Target water temperature		c33	First decimal place	○	○	○	○	(Note6)
4-20 mA (2) current		c34	First decimal place	○	Fixed to 0	Fixed to 0	Fixed to 0	(Note13)
Water temperature setting using an external analog input (0-10 V or 2-10 V Voltage input)		c35	First decimal place	(Note12)	Fixed to 0	Fixed to 0	Fixed to 0	(Note13)
Water temperature setting using an external analog input (1-5 V Voltage input)		c36	First decimal place	(Note12)	Fixed to 0	Fixed to 0	Fixed to 0	(Note13)
Heat source inlet temperature 1 TH13		c37	First decimal place	○	○	○	○	(Note2)
Heat source outlet temperature 1 TH14/Heat source outlet temperature 2 TH20		c38	First decimal place	○	○	○	○	(Note2)

(Note1) Refer to the section “1. Checking the error history” for further information. (Page 109)
(Note2) Codes c01 through c11,c14,c37 and c38 indicate temperature sensors.
(Note3) Codes c12 and c13 indicate pressure sensors.
(Note4) Codes c15 through c18 indicate current sensors.
(Note5) Codes c19 indicate voltage sensor.
(Note6) Codes c24, c31, and c33 indicate target values.
(Note7) Code c25 indicates compressor's operating frequency.
(Note8) Code c26 indicates superheat that was calculated based on the low pressure and suction refrigerant temperature.
(Note9) Code c27 indicates superheat that was calculated based on the low pressure and shell temperature.
(Note10) Codes c29 and c30 indicate the degree of LEV opening.
(Note11) Code c32 indicates superheat that was calculated based on high pressure and discharge refrigerant temperature.
(Note12) When the input type is selected. When the input type is not selected = 0.
(Note13) c34,c35 and c36 show the external analog input values (water temperature settings)
(Note14) Effective when the value for item code 1080 is a value other than 0

3. Operation status before error

Setting procedure

Step 1
Set the dip switches SW2 and SW3.

Set the dip switches on the circuit board as follows to view the operation status before error.

SW2	SW3					
10	5	6	7	8	9	10
ON	OFF	OFF	OFF	OFF	OFF	OFF

Step 2
Select the desired item with the push switch SWP3.

Press the push switch SWP3 to toggle through the item codes listed below.

Step 3
Press the push switches SWP1 (↑) or SWP2 (↓) to increase or decrease the value.

Select an item code, and press either of the push switches SWP1 or SWP2 to display the data acquisition time (operation data before error; 0 minute before = error occurrence time) and data type. They will appear alternately at one-second intervals.
Every time SWP2 is pressed, the time will go back by one minute, and the time and the temperature (or pressure) will appear alternately at one-second intervals.
Each time SWP1 is pressed, the time will advance by one minute, and the time and the temperature (or pressure) will appear alternately at one-second intervals.
The time immediately before the occurrence of error is defined as 0, and the time can go back up to 19 minutes in one-minute increments.
Up to 20 collections of data can be viewed for each operation data.

Refer to "Time of data storage before error" for the types of errors that appear on error history.

Step 4
Press the push switch SWP3 to save the change.

Press SWP3 to stop the blinking and return to the item code display.

Time of data storage before error

Item		Item code	LED display	Unit and circuit type			
				Main unit		Sub unit	
MAIN circuit	SUB circuit			MAIN circuit	SUB circuit	MAIN circuit	SUB circuit
Inlet water temp (Twi)	Inlet water temp 2 TH17	c01	First decimal place	○	○	○	○
Outlet water temperature (Two)		c02	First decimal place	○	○	○	○
Discharge refrigerant temperature 1 TH1	Discharge refrigerant temperature 2 TH5	c03	First decimal place	○	○	○	○
Suction refrigerant temperature 1 TH2	Suction refrigerant temperature 2 TH6	c04	First decimal place	○	○	○	○
Shell temperature 1 TH3	Shell temperature 2 TH7	c05	First decimal place	○	○	○	○
Heat exchanger wall temperature 1 TH4	Heat exchanger wall temperature 2 TH8	c06	First decimal place	○	○	○	○
Outdoor temp. TH9 or 4-20 mA or IT	-	c07	First decimal place	(Note4)	-	-	-
Inlet water temperature 1 TH11	Inlet water temperature 2 TH17	c08	First decimal place	○	○	○	○
Outlet water temperature 1 TH12	Outlet water temperature 2 TH18	c09	First decimal place	○	○	○	○
Representative water temperature 1 TH15		c10	First decimal place	○	Fixed to 0	Fixed to 0	Fixed to 0
Representative water temperature 2 TH16		c11	First decimal place	○	Fixed to 0	Fixed to 0	Fixed to 0
High pressure 1 HP1	High pressure 2 HP2	c12	Second decimal place	○	○	○	○
Low pressure 1 LP1	Low pressure 2 LP2	c13	Second decimal place	○	○	○	○
Heatsink temperature(THHS)		c14	First decimal place	○	○	○	○
Water temperature setting using an external analog input (4-20 mA Current input)		c15	First decimal place	(Note3)	Fixed to 0	Fixed to 0	Fixed to 0
I u(U-phase current)(Compressor)		c16	First decimal place	○	○	○	○
I w(W-phase current)(Compressor)		c17	First decimal place	○	○	○	○
I dc(Bus current)(Compressor)		c18	First decimal place	○	○	○	○
V dc(Bus voltage)(Compressor)		c19	Integer	○	○	○	○
I u(U-phase current)(Fan)		c20	First decimal place	○	○	○	○
I w(W-phase current)(Fan)		c21	First decimal place	○	○	○	○
I dc(Bus current)(Fan)		c22	First decimal place	○	○	○	○
V dc(Bus voltage)(Fan)		c23	Integer	○	○	○	○
Suction SH (target)		c24	First decimal place	○	○	○	○
Compressor frequency (actual frequency)		c25	Integer	○	○	○	○
Suction SH		c26	First decimal place	○	○	○	○
Shell bottom SH		c27	First decimal place	○	○	○	○
Operating frequency of the fan (actual frequency)		c28	Integer	○	○	○	○
Opening of the LEV on the main circuit		c29	Integer	○	○	○	○
Injection LEV opening		c30	Integer	○	○	○	○
Discharge SH (target)		c31	First decimal place	○	○	○	○
Discharge SH		c32	First decimal place	○	○	○	○
Target water temperature		c33	First decimal place	○	○	○	○
Water temperature setting using an external analog input (0-10 V or 2-10 V Voltage input)		c35	First decimal place	(Note3)	Fixed to 0	Fixed to 0	Fixed to 0
Water temperature setting using an external analog input (1-5 V Voltage input)		c36	First decimal place	(Note3)	Fixed to 0	Fixed to 0	Fixed to 0

(Note1) Each circuit board displays error data of its own unit and not other units.
(Note2) "Before error" is defined as the period between 19 minutes before the occurrence of an error up to immediately before the occurrence of the error.
(Note3) When the input type is selected. When the input type is not selected = 0
(Note4) Effective when the value for item code 1080 is a value other than 0

4. Maintenance setting 1
This category includes items that are set during test run and maintenance.

Setting procedure

Step 1
Set the dip switches SW2 and SW3.

Set the dip switches on the circuit board as follows.

SW2	SW3					
10	5	6	7	8	9	10
OFF	OFF	OFF	OFF	ON	OFF	OFF

Note

By setting SW3-9 to ON after setting the dip switches SW2 and SW3 as shown left, the setting values can be checked.
(The settings cannot be changed.)

Step 2
Select the desired item with the push switch SWP3.

Press the push switch SWP3 to toggle through the item codes listed below.
Press the push switches SWP2 and SWP3 to change the value of the selected item.

Step 3
Press the push switches SWP1 (↑) or SWP2 (↓) to increase or decrease the value.

Refer to "Maintenance item (1) list" on the next page for information about the items that can be set.

Step 4
Press the push switch SWP3 to save the change.

Press SWP3 once within one minute of changing the setting with SWP1 or SWP2 to save the setting.
Once the new setting is saved, the display will stop blinking and stay lit. The display will, then, return to the item code display mode.
If SWP3 is not pressed within one minute, the change will not be saved, and the display will return to the item code display mode.

Maintenance item (1) list

	Item code	Incre-ments	Lower limit	Upper limit	Default	Switch setting timing	Unit type				Notes
							Main unit		Sub unit		
							MAIN circuit	SUB circuit	MAIN circuit	SUB circuit	
Forcing the units in a specific system to stop	1004	1	0	3	0	When unit is stopped	○	-	○	-	(Note1)
Outlet water temperature sensor correction (hot water)TH12	1009	-	-	-	-	-	○	-	○	-	(Note2)
Outlet water temperature sensor correction (hot water)TH18	1010	-	-	-	-	-	-	○	-	○	
Inlet water temperature sensor correction (hot water)TH11	1011	-	-	-	-	-	○	-	○	-	
Inlet water temperature sensor correction (hot water)TH17	1012	-	-	-	-	-	-	○	-	○	
Representative water temperature sensor correction (hot water)TH15	1013	-	-	-	-	-	○	-	-	-	
Representative water temperature sensor correction (hot water)TH16	1014	-	-	-	-	-	○	-	-	-	
Built-in thermistor differential DIFF1	1015	-	-	-	-	-	○	○	○	○	(Note3)
Built-in thermistor differential DIFF2	1016	-	-	-	-	-	○	○	○	○	
Cumulative operation time of the compressor	1017	-	-	-	-	Can be reset only when unit is stopped	○	○	○	○	(Note4) (Note5) (Note6)
Cumulative operation time of the compressor (Unit: 10,000 hours)	1018	-	-	-	-	Can be reset only when unit is stopped	○	○	○	○	(Note4) (Note5) (Note6) (Note7)
Temperature data collection interval (S seconds)	1019	1 second	1	9999	60	When unit is stopped	○	○	○	○	(Note8)
Multiple system Thermo-ON/OFF status check interval	1020	1 minute	1	5	1	When unit is stopped	○	-	-	-	(Note9)
Representative water temperature thermistor while the "Temperature shift (Setting temperature A)" function is enabled.	1215	1	14	15	14	When unit is stopped	○	-	-	-	(Note10)
Representative water temperature thermistor while the "Temperature shift (Setting temperature B)" function is enabled.	1216	1	14	15	14	When unit is stopped	○	-	-	-	
Representative water temperature thermistor while the "Temperature shift (Setting temperature C)" function is enabled.	1217	1	14	15	14	When unit is stopped	○	-	-	-	
Start/End time setting 1 Water temp setting	1218	1	1	3	1	When unit is stopped	○	-	-	-	(Note11)
Start/End time setting 2 Water temp setting	1219	1	1	3	1	When unit is stopped	○	-	-	-	
Start/End time setting 3 Water temp setting	1220	1	1	3	1	When unit is stopped	○	-	-	-	

(Note1) Do not use this item. (Stop the units in a given system by setting the slide switch SWS1 to OFF.)
(Note2) Consult your nearest Mitsubishi representative if the sensors go off below the preset values.
(Note3) Consult your nearest Mitsubishi representative.
(Note4) These items can only be displayed. (Their settings cannot be changed.)
(Note5) The cumulative time between 1 and 9999 hours will be displayed in four digits. (unit: hour)
(Note6) Pressing the push switches SW01 and SW02 simultaneously while the time is displayed will reset (initialize) the data to 0.
(Note7) The cumulative time between 10,000 and 99,990,000 hours will be displayed in four digits (unit: 10000 hours)
(Note8) Set the data collection interval by referring to section “3. Operation status before error”. (Page 113)
(Note9) The Thermo-ON/OFF status check interval can be adjusted to optimize the ON/OFF operation when the piping length to the load side is long and the detection of changes in water temperature tends to lag behind.
(Note10) Set these settings when using both external thermistors TH15 and TH16 and switching between the two according to the preset water temperature. (Heating temperature = A°C, Hot water temperature = B °C, Heating ECO temperature = C °C)
(Note11) Set these settings when changing the temperature settings for the units by using the schedule function of the control board. (Heating temperature: 1 Hot water temperature: 2, Heating ECO temperature: 3)

[2] Troubleshooting

1. If a problem occurs, please check the following. If a protection device has tripped and brought the unit to stop (when an error code is blinking on the LED), 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.	Protection devices have not tripped.	INV board problem		Repair or replace the INV board.
			Noise filter board problem		Repair or replace the noise filter board.
		High-pressure cutout switch has tripped. 1302	Abnormal high pressure	Dirty condenser (scaling formation)	Clean the condenser.
				Air in the refrigerant circuit	Vacuum the refrigerant circuit, and charge it with refrigerant.
				Water flow shortage	Secure enough water flow rate.
		The discharge temperature thermistor has tripped. 1102	LEV fault in the main circuit		Replace the LEV in the main circuit.
			Injection LEV fault		Replace the injection LEV.
			Injection solenoid valve fault		Replace the solenoid valve.
			Refrigerant gas leakage		Leakage test
			Refrigerant undercharge		Repair the cause of refrigerant shortage, evacuate the system, and charge the refrigerant circuit with refrigerant.
		A thermistor error was detected. 5101~5116	Broken or short-circuited thermistor wiring		Check the thermistor wiring for broken connections or short circuit. Replace the thermistor.
		Overcurrent passed through the compressor. 4250	Compressor motor		Replace the compressor.
			Overload operation		Check the operation patterns.
			Seized compressor shaft		Replace the compressor.
		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.
		The flow switch has tripped.	The flow switch wiring is not connected.		Connect the flow switch wiring to the system.
			Water flow shortage		Increase the water flow rate.
			Flow switch contact failure		Polish the contact point.
		Automatic Start/Stop thermistor has tripped.	The water temperature has reached above the preset temperature.		Normal
		The motor whines, but will not turn.	Contact failure at a connector terminal		Polish the contact point.
			Loose wire connection		Tighten the wire connection.
			Seized compressor or fan bearing		Disassemble the compressor or the fan, and repair as necessary.
			High-pressure is too high.		Check the operation patterns.
		A momentary overcurrent was detected.	Burned, short-circuited, or ground faulted motor		Replace the compressor, and clean the refrigerant circuit.

Problem	Check item		Cause	Solution
The unit has stopped during operation and does not restart.	Automatic Start/Stop thermistor has tripped.	Water temperature is high.		Normal
		Water temperature is low.	The setting for the automatic Start/Stop thermistor is too low.	Change the setting for the automatic Start/Stop thermistor.
	The high-pressure switch has tripped.1302	Water temperature is not high.	Dirty condenser	Clean the condenser.
			Refrigerant overcharge	Evacuate the system, and charge the system with refrigerant.
			Air in the refrigerant circuit	Evacuate the system, and charge the system with refrigerant.
			Water flow shortage	Secure enough water flow rate.
	The vacuum protection has tripped. 1303	Heat source temperature is not low.	Refrigerant undercharge, refrigerant gas leakage	Perform a leakage test, repair the leaks, evacuate the system, and charge the refrigerant circuit with refrigerant.
			Dirty evaporator	Clean the evaporator.
			LEV fault in the main circuit	Replace the LEV in the main circuit.
			Clogged strainer	Replace the strainer.
			Clogged check valve	Replace the check valve.
	The discharge temperature thermistor has tripped. 1102	Suction gas is overheated.	Refrigerant undercharge, refrigerant gas leakage	Perform a leakage test, repair the leaks, evacuate the system, and charge the refrigerant circuit with refrigerant.
			LEV fault in the main circuit	Replace the LEV in the main circuit.
			Injection LEV actuation failure	Replace the injection LEV.
			Injection solenoid valve fault	Replace the injection solenoid valve.
			Clogged strainer	Replace the strainer.
			High pressure is too high.	Check the items above and make necessary adjustments so that the suction gas temperature falls within the specified temperature range.
The unit has stopped during operation and does not restart.	Overcurrent passed through the compressor. 4250	Heat source temperature is high.	Overload operation Burnt motor Seized compressor	Reduce the operation load, and check the operation patterns. Replace the compressor.
	A water supply cutoff was detected. 2501	The pump is operating normally.	Water flow shortage	Increase the water flow rate.
			Flow switch fault	Replace the flow switch.
		The pump does not operate.	Problem with the solenoid contactor for the pump	Replace the electromagnetic contactor.
			Pump fault	Replace the pump.
	The freeze-up protection function has tripped. 1503	Water flow shortage	Plate heat exchanger freeze-up	Increase the water flow rate.
The unit is in operation, but the water does not heat up.	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 making a great deal of vibrations and noise.	The compressor is being flooded.		LEV fault in the main circuit	Replace the LEV.

2. Error code list

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 (PCB *2)	Error type		Cause (Installation/Setting error)	Cause (Parts problems)	Error reset *3	
					Unit side (PCB)	Remote
					SWS1	Operation SW
A000	Unreset errors *5		Some of the errors have not been reset.		–	–
4106	Power failure		Power failure occurred when the operation switch is switched on.		◎	◎
2501	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	○	○
1302	High pressure fault		No water Water supply cutoff	• Linear expansion valve fault • High-pressure sensor fault	○	○
1502	Compressor flooding			• Low-pressure sensor fault • Shell temperature thermistor fault • High-pressure sensor fault • Discharge refrigerant temperature thermistor fault • Linear expansion valve fault	○	○
1303	Vacuum protection fault		The heat source temperature was below the operating range.	• Low-pressure sensor fault • Suction refrigerant temperature thermistor fault • Linear expansion valve fault • Refrigerant deficiency (refrigerant gas leak)	○	○
1103	Shell temperature fault		The heat source temperature was above the upper limit of the operating range. Excessive oil flow	• Shell temperature thermistor fault • Linear expansion valve fault	○	○
5109	Ther-mistor fault	Outside temperature (TH9)		• Broken or shorted thermistor wiring	○	○
5111 5117		Inlet water temperature (TH11 MAIN Circuit) Inlet water temperature (TH17 SUB Circuit)		• Broken or shorted thermistor wiring	○	○
5112 5118		Outlet water temperature (TH12 MAIN Circuit) Outlet water temperature (TH18 SUB Circuit)		• Broken or shorted thermistor wiring	○	○
5113		Inlet heat source temperature (TH13)		• Broken or shorted thermistor wiring	○	○
5114 5120		Outlet heat source temperature (TH14 MAIN Circuit) Outlet heat source temperature (TH20 SUB Circuit)		• Broken or shorted thermistor wiring	○	○
5103 5107		Shell temperature (TH3 MAIN Circuit) Shell temperature (TH7 SUB Circuit)		• Broken or shorted thermistor wiring	○	○
5101 5105		Discharge temperature (TH1 MAIN Circuit) Discharge temperature (TH5 SUB Circuit)		• Broken or shorted thermistor wiring	○	○
5102 5106		Suction temperature (TH2 MAIN Circuit) Suction temperature (TH6 SUB Circuit)		• Broken or shorted thermistor wiring	○	○
5104 5108		Evaporator wall temperature (TH4 MAIN Circuit) Evaporator wall temperature (TH8 SUB Circuit)		• Broken or shorted thermistor wiring	○	○
5115		External water temperature (TH15)		• Broken or shorted thermistor wiring	○	○
5116		External water temperature (TH16)		• Broken or shorted thermistor wiring	○	○
5201	High-pressure sensor fault/high-pressure fault			• Broken or shorted pressure sensor wiring	○	○
5202	Low-pressure sensor fault/low-pressure fault			• Broken or shorted pressure sensor wiring	○	○
7113	Model setting error 1		Dip switches on the PCB were set incorrectly during maintenance.		×	×
7117	Model setting error 2			• Resistor R21 fault (connected to the Main control board)	×	×
4115	Power supply frequency fault		Power supply frequency is a frequency other than 50 Hz or 60 Hz.		×	×
4102	Open phase		There is an open phase.	• Circuit board fault	×	×
4106 (255)	Power supply fault			• Transmission power supply PCB fault	–	–

Error code *1 (PCB *2)	Error type			Cause (Installation/Setting error)	Cause (Parts problems)	Error reset *3	
						Unit side (PCB)	Remote
						SWS1	Operation SW
1101	Suction temperature fault			The heat source temperature was above the upper limit of the operating range.	• Suction refrigerant temperature thermistor fault	○	○
1102	Discharge temperature fault (A discharge refrigerant temperature of 120ºC or above is detected for 30 seconds while the compressor is in operation.) (A discharge refrigerant temperature of 125ºC or above is detected momentarily while the compressor is in operation.)			No water Abrupt change in water temperature (5K/min. or greater) Pump failure	• High-pressure sensor fault • Linear expansion valve fault (Main circuit LEV, injection LEV) • Injection solenoid valve fault • Refrigerant deficiency (refrigerant gas leak)	○	○
1503	Heat exchanger freeze up *4			Drop in heat source flow or heat source supply cutoff Heat source temperature drop		○	○
1512	Low evaporation temperature fault			Drop in heat source flow Heat source temperature drop		○	○
4250 (101)	Inverter error	Electric current related errors during operation	IPM error		• INV board fault • Ground fault of the compressor • Coil problem • IPM error (loose terminal screws, cracked due to swelling) • Items listed under "Heatsink overheat protection" below	○	○
4250 (102)			ACCT overcurrent		• INV board fault • Ground fault of the compressor • Coil problem • IPM error (loose terminal screws, cracked due to swelling)	○	○
4250 (103)			DCCT overcurrent			○	○
4250 (107)			Overcurrent relay trip (effective value) (During operation)			○	○
4250 (106)			Overcurrent relay trip (momentary value) (During operation)			○	○
4250 (104)			Short-circuited IPM/ground fault (During operation)		• Ground fault of the compressor • IPM error (loose terminal screws, cracked due to swelling)	○	○
4250 (105)			Overcurrent error due to a short-circuited (During operation)	Inter-phase voltage drop (Inter-phase voltage at or below 180 V)	• Ground fault of the compressor • Shorted output wiring	○	○
4250 (101)		Current related prob-lems at start up	IPM error (At startup)		• INV board fault • Ground fault of the compressor • Coil problem • IPM error (loose terminal screws, cracked due to swelling) • Items listed under "Heatsink overheat protection" below	○	○
4250 (102)			ACCT overcurrent (At startup)		• INV board fault • Ground fault of the compressor • Coil problem • IPM error (loose terminal screws, cracked due to swelling)	○	○
4250 (103)			DCCT overcurrent (At startup)			○	○
4250 (107)			Overcurrent relay trip (effective value) (At startup)			○	○
4250 (106)			Overcurrent relay trip (momentary value) (At startup)			○	○

Error code *1 (PCB *2)	Error type			Cause (Installation/Setting error)	Cause (Parts problems)	Error reset *3	
						Unit side (PCB)	Remote
						SWS1	Operation SW
4220 (108)	Inverter error	Voltage related problems during operation	Bus voltage drop protection	Momentary power failure/power failure Power supply voltage drop (Inter-phase voltage is 180 V or below.) Voltage drop	• INV board CNDC2 wiring fault • INV board fault • 52C fault • Diode stack failure	○	○
4220 (109)			Bus voltage rise protection	Incorrect power supply voltage	• INV board fault	○	○
4220 (111)			Logic error	Malfunction due to external noise interference • Faulty grounding • Improper transmission and external wiring installation (Shielded cable is not used.) • Low-voltage signal wire and high-voltage wire are in contact. (Placing the signal wire and power wire in the same conduit)	• INV board fault	○	○
4220 (131)		Voltage meter error at start up (Bus voltage drop protection at start up (detected by the Main unit side))		Power supply voltage drop	• PCB fault	○	○
4230		Heatsink fault (Heatsink overheat protection)		Power supply voltage drop (Inter-phase voltage is 180 V or below.) Clogged heatsink cooling air passage	• Fan motor fault • THHS sensor fault • IPM error (loose terminal screws, cracked due to swelling)	○	○
4240		Overload protection		Clogged heatsink cooling air passage Power supply voltage drop (Inter-phase voltage is 180 V or below.)	• THHS sensor fault • Current sensor fault • INV circuit fault • Compressor fault	○	○
5301 (115)		ACCT sensor fault			• INV board fault • Ground fault of the compressor and IPM error	○	○
5301 (116)		DCCT sensor			• Poor contact at the INV board connector CNCT • Poor contact at the INV board connector DCCT • Ground fault of the compressor and IPM error	○	○
5301 (117)		ACCT sensor/circuit fault			• Poor contact at the INV board connector CNCT2 (ACCT) • ACCT sensor fault	○	○
5301 (118)		DCCT sensor/circuit fault			• Poor contact at the INV board connector CNCT • Poor contact at the INV board connector DCCT • DCCT sensor fault • INV board fault	○	○
5301 (119)		Open-circuited IPM/loose ACCT sensor			• Disconnected ACCT sensor (CNCT2) • ACCT sensor fault • Broken compressor wiring • INV circuit fault (IPM error etc.)	○	○
5301 (120)		Faulty wiring			• ACCT sensor is connected in the wrong phase. • ACCT sensor is connected in the wrong orientation.	○	○
5110		THHS sensor/circuit fault			• THHS sensor contact failure • THHS sensor fault • INV board fault	○	○
0403		Serial communication error			• Communication error between control board and INV board (noise interference, broken wiring)	○	○
–		IPM system error		INV board switch setting error	• Wiring or connector connection between connectors on IPM-driven power supply circuit • INV board fault	○	○
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	×	×

Error code *1 (PCB *2)	Error type		Cause (Installation/Setting error)	Cause (Parts problems)	Error reset *3	
					Unit side (PCB)	Remote
					SWS1	Operation SW
7105	Multiple system error	Address setting error	Address setting error (Non-consecutive address)		×	×
7130		Incompatible combination of units	Different types of units are connected to the same system.		×	×
7102		No.-of-connected-unit setting is incorrect.	No.-of-connected-unit setting is incorrect (Main unit).		×	×
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 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	Communication error between the main and sub units (Simple multiple unit control mode)				–	–

*1: The codes in the parentheses in the "Error code" column indicate error detail codes.
*2: If an error occurs, error codes shown above will appear in the 4-digit digital display on the PCB.
*3: Definition of symbols in the "Error reset" column.
◎: Errors that can be reset regardless of the switch settings
○: 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
*4: This error code will appear when multiple errors occur that are reset in different ways and when one or more of these errors have not been reset. This error can be reset by turning off and then back on the unit's power.
*5: 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.")
*6: Before resetting this error, remove its causes. Resuming operation without removing the causes of heat exchanger freeze up will cause heat exchanger damage.

[3] Troubleshooting Principal Parts

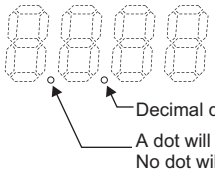
-1- High-Pressure Sensor (63HS)

1. Compare the pressure that is detected by the high pressure sensor, and the high-pressure gauge pressure to check for failure.

Error history, temperature and pressure readings of the sensor, and LEV opening

SW2	SW3					
10	5	6	7	8	9	10
OFF	OFF	OFF	OFF	OFF	OFF	OFF

High pressure and low pressure will appear alternately on the 7-segment LED at P-second intervals (Default: 3 seconds). See below for how they are displayed.



Indicates that the high pressure is displayed

Indicates that the low pressure is displayed

(1) While the sensor is stopped, compare the gauge pressure and the pressure displayed on self-diagnosis LED1.

1) When the gauge pressure is between 0 and 0.098MPa, internal pressure is caused due to gas leak.
2) When the pressure displayed on self-diagnosis LED1 is between 0 and 0.098MPa, the connector may be defective or be disconnected. Check the connector and go to (4).
3) When the pressure displayed on self-diagnosis LED1 exceeds 4.15MPa, go to (3).
4) If other than 1), 2) or 3), compare the pressures while the sensor is running. Go to (2).

(2) Compare the gauge pressure and the pressure displayed on self-diagnosis LED1 while the sensor is running. (Compare them by MPa unit.)

1) When the difference between both pressures is within 0.098MPa, both the high pressure sensor and the control board are normal.
2) When the difference between both pressures exceeds 0.098MPa, the high pressure sensor has a problem. (performance deterioration)
3) When the pressure displayed on self-diagnosis LED1 does not change, the high pressure sensor has a problem.

(3) Remove the high pressure sensor from the control board to check the pressure on the self-diagnosis LED1.

1) When the pressure displayed on self-diagnosis LED1 is between 0 and 0.098MPa , the high pressure sensor has a problem.
2) When the pressure displayed on self-diagnosis LED1 is approximately 4.15MPa, the control board has a problem.

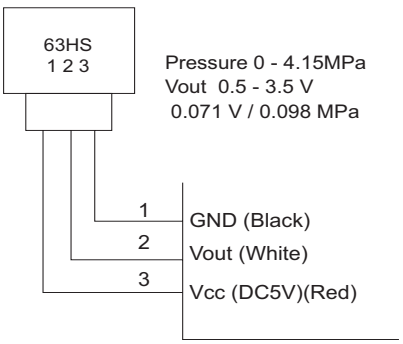
(4) Remove the high pressure sensor from the control board, and short-circuit between the No.2 and 3 connectors (63HS:CN63HS) to check the pressure with self-diagnosis LED1.

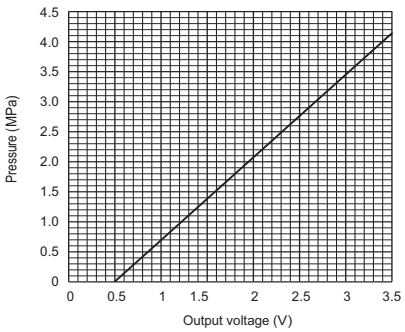
1) When the pressure displayed on the self-diagnosis LED1 exceeds 4.15MPa, the high pressure sensor has a problem.
2) If other than 1), the control board has a problem.

2. Pressure sensor configuration

The high pressure sensor consists of the circuit shown in the figure below. If DC 5V is applied between the red and the black wires, voltage corresponding to the pressure between the white and the black wires will be output, and the value of this voltage will be converted by the microcomputer. The output voltage is 0.071V per 0.098MPa.

	Control board side
Vcc	Pin 3
Vout	Pin 2
GND	Pin 1





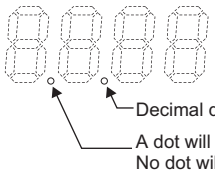
-2- Low-Pressure Sensor (63LS)

1. Compare the pressure that is detected by the low pressure sensor, and the low pressure gauge pressure to check for failure.

Error history, temperature and pressure readings of the sensor, and LEV opening

SW2	SW3					
10	5	6	7	8	9	10
OFF	OFF	OFF	OFF	OFF	OFF	OFF

High pressure and low pressure will appear alternately on the 7-segment LED at P-second intervals (Default: 3 seconds). See below for how they are displayed.



Indicates that the high pressure is displayed

Indicates that the low pressure is displayed

(1) While the sensor is stopped, compare the gauge pressure and the pressure displayed on self-diagnosis LED1.

1) When the gauge pressure is between 0 and 0.098MPa, internal pressure is caused due to gas leak.
2) When the pressure displayed on self-diagnosis LED1 is between 0 and 0.098MPa , the connector may be defective or be disconnected. Check the connector and go to (4).
3) When the pressure displayed on self-diagnosis LED1 exceeds 1.7MPa, go to (3).
4) If other than 1), 2) or 3), compare the pressures while the sensor is running. Go to (2).

(2) Compare the gauge pressure and the pressure displayed on self-diagnosis LED1 while the sensor is running.(Compare them by MPa unit.)

1) When the difference between both pressures is within 0.03MPa, both the low pressure sensor and the control board are normal.
2) When the difference between both pressures exceeds 0.03MPa, the low pressure sensor has a problem. (performance deterioration)
3) When the pressure displayed on the self-diagnosis LED1 does not change, the low pressure sensor has a problem.

(3) Remove the low pressure sensor from the control board to check the pressure with the self-diagnosis LED1 display.

1) When the pressure displayed on the self-diagnosis LED1 is between 0 and 0.098MPa, the low pressure sensor has a problem.
2) When the pressure displayed on self-diagnosis LED1 is approximately 1.7MPa, the control board has a problem.

♦When the outdoor temperature is 40°C or less, the control board has a problem.
♦When the outdoor temperature exceeds 40°C, go to (5).

(4) Remove the low pressure sensor from the control board, and short-circuit between the No.2 and 3 connectors (63LS:CN63LS) to check the pressure with the self-diagnosis LED1.

1) When the pressure displayed on the self-diagnosis LED1 exceeds 1.7MPa, the low pressure sensor has a problem.
2) If other than 1), the control board has a problem.

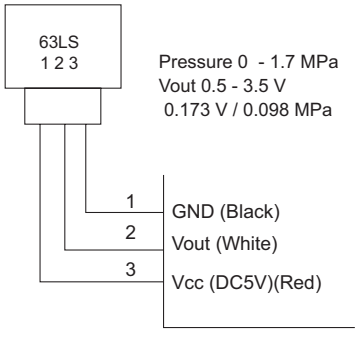
(5) Remove the high pressure sensor (63HS) from the control board, and insert it into the connector for the low pressure sensor (63LS:CN63LS) to check the pressure with the self-diagnosis LED1.

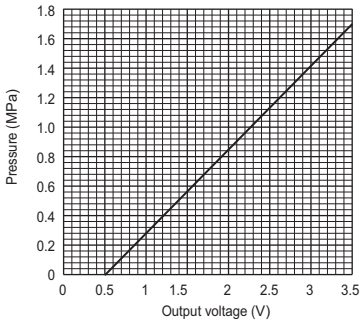
1) When the pressure displayed on the self-diagnosis LED1 exceeds 1.7MPa, the control board has a problem.
2) If other than 1), the control board has a problem.

2. Low-pressure sensor configuration

The low pressure sensor consists of the circuit shown in the figure below. If DC5V is applied between the red and the black wires, voltage corresponding to the pressure between the white and the black wires will be output, and the value of this voltage will be converted by the microcomputer. The output voltage is 0.173V per 0.098MPa.

	Control board side
Vcc	Pin 3
Vout	Pin 2
GND	Pin 1

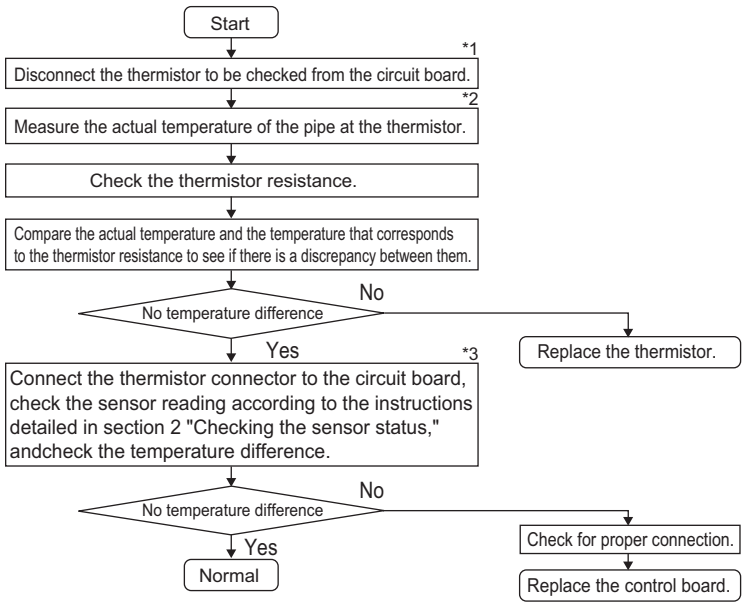




-3- Temperature sensor

Use the flowchart below to troubleshoot the temperature sensor.

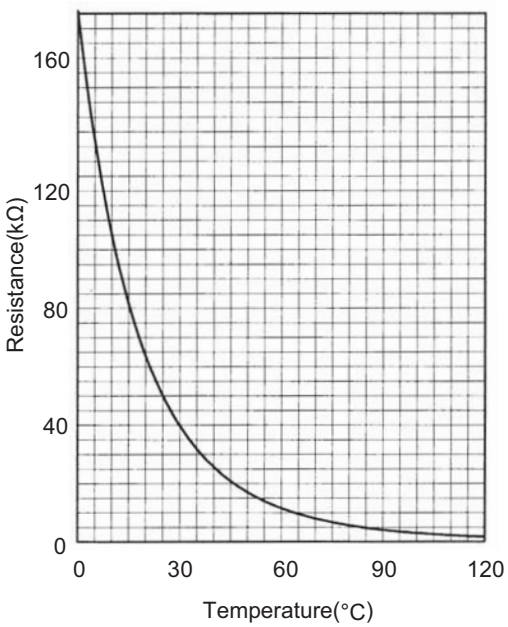
Troubleshooting the thermistor



(1)Thermistor <Heatsink temperature> :THHS

Thermistor $R_{50} = 17k\Omega \pm 2\%$

$$R_t = 17\exp\{4016(\frac{1}{273+t} - \frac{1}{323})\}$$



* 1 The table below shows the thermistor numbers and their corresponding connectors.
Check each sensor by disconnecting the corresponding connector.

TH1 · TH5	CN401	TH11 · TH17	CN404
TH3 · TH7	CN402 3-4	TH12 · TH18	CN405
TH2 · TH6	CN402 1-2	TH13	CN406 3-4
TH4 · TH8	CN406 1-2	TH14 · TH20	CN406 5-6

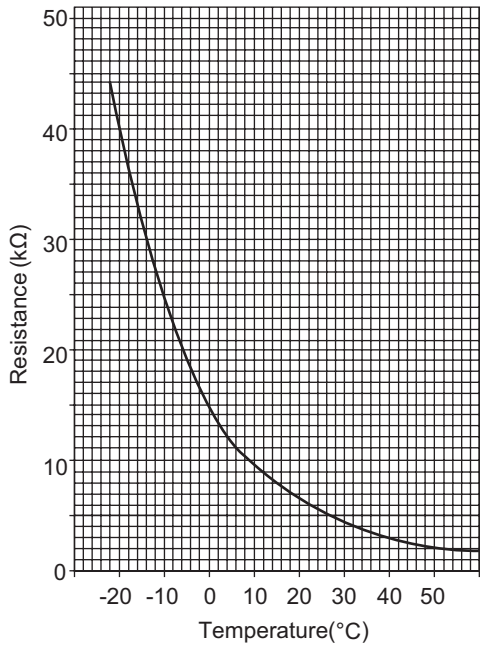
* 2 · Pull out the sensor connector from the I/O board.
Do not pull on the lead wire.
· Measure the resistance with a tester.
· If the measured value is within ± 10% of the value as shown in the table below, the circuit sensor is normal.

* 3 Use the dip switches and push switches to view the sensor reading on the LED.

(2) Low-temperature-range thermistor
: TH2,3,4,6,7,8,11,12,13,14,17,18,20

Thermistor $R_0 = 15k\Omega \pm 3\%$

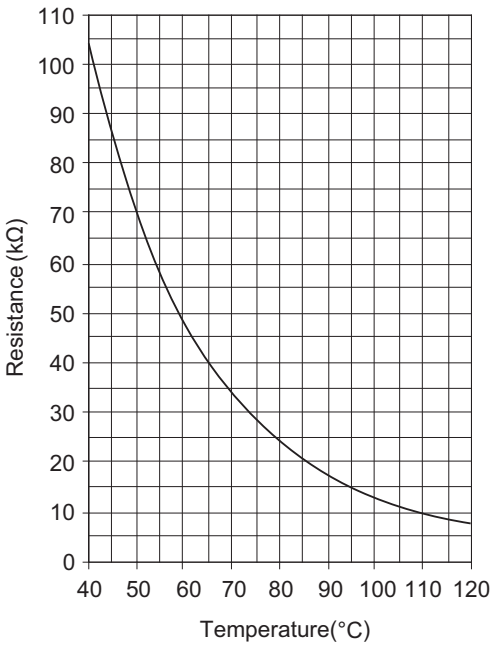
$$R_t = 15\exp\{3385(\frac{1}{273+t} - \frac{1}{273})\}$$



(3) High-temperature-range thermistor: TH1,TH5

Thermistor $R_{120} = 7.465k\Omega \pm 2\%$

$$R_t = 7.465\exp\{4057(\frac{1}{273+t} - \frac{1}{393})\}$$



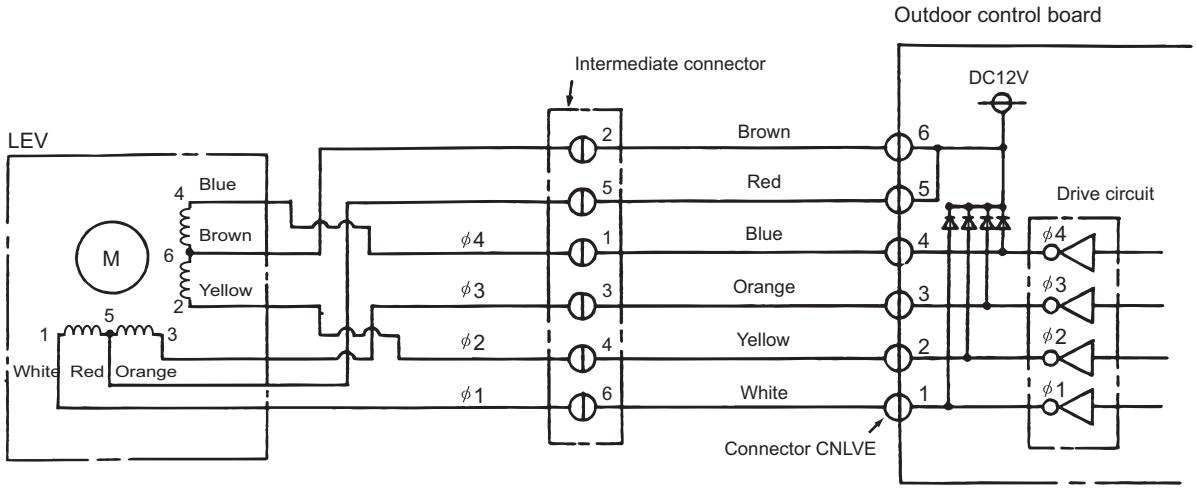
-4- LEV

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

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

The valve opening changes according to the number of pulses

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.

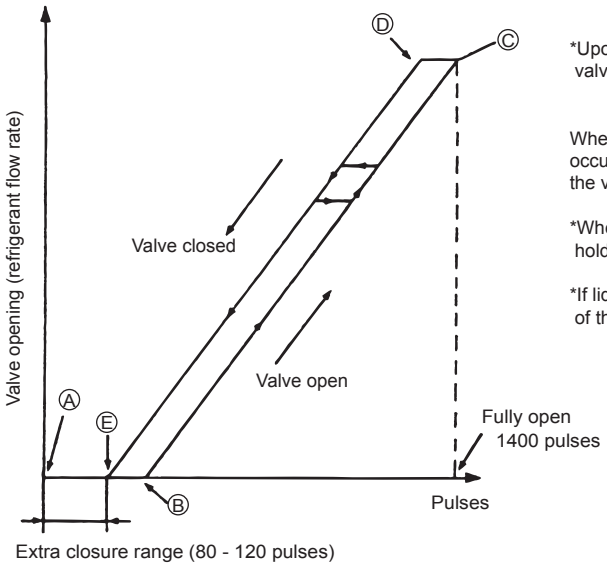
2) Pulse signal output and valve operation

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

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

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

3) LEV valve closing and opening operatio



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

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

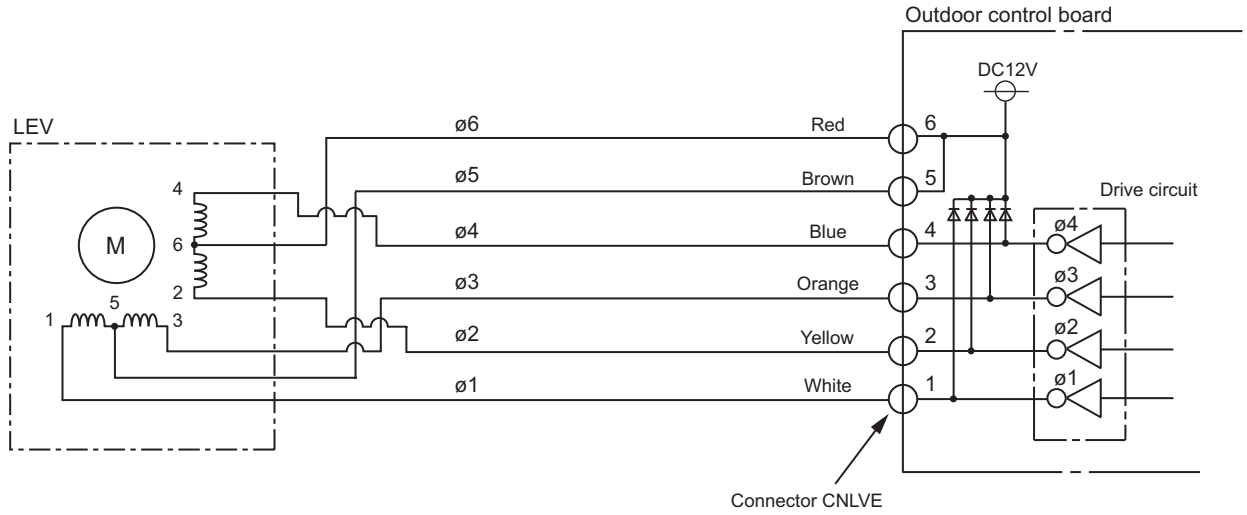
*Whether a sound is generated or not can be determined by holding a screwdriver against it, then placing your ear against the handle.

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

2. General descriptions of injection LEV operation

The valve opening changes according to the number of pulses.

1) Control board and LEV



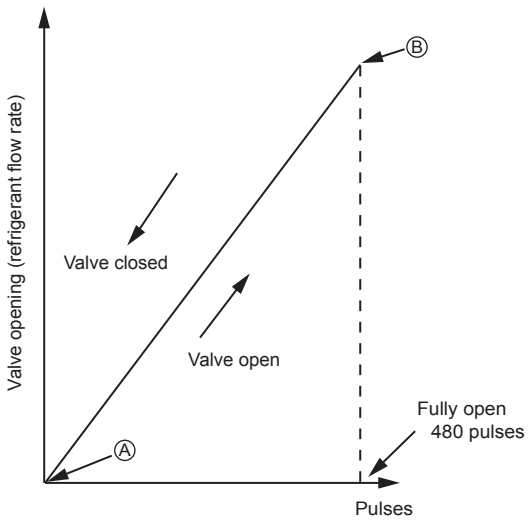
2) Pulse signal output and valve operation

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

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



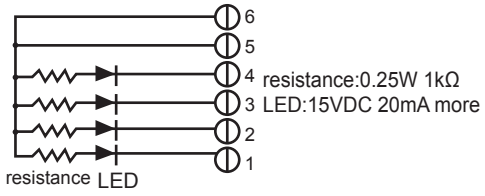
*Upon power on, a 520 pulse signal is sent to the LEV to determine the valve position and bring the valve to the position indicated by "Ⓐ" in the diagram. (Pulse signal is output for approximately 17 seconds.)

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.

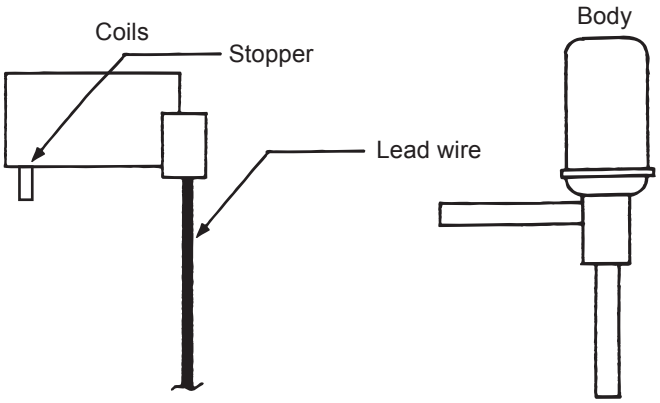
*If liquid refrigerant is present in the LEV, it may make the operating sound of the LEV difficult to detect.

(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, brown - yellow, brown - blue) using a tester. They are normal if resistance is 150ohm ± 10%.	Replace the LEV coils.
	Measure resistance between the coils (red - white, red -orange, brown - yellow, brown - blue) using a tester. They are normal if resistance is 46ohm ± 3%.	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.

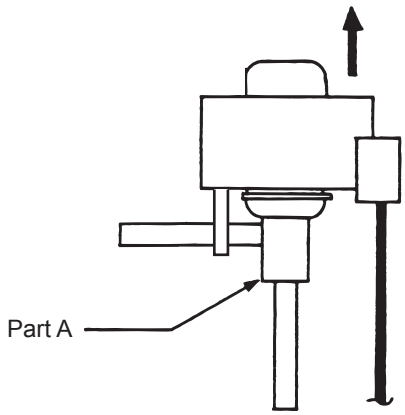
3. Injection LEV coil removal procedure

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



(1) Removing the coils

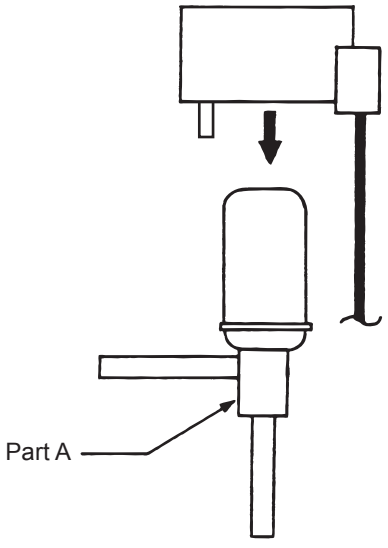
Fasten the body tightly at the bottom (Part A in the figure) so that the body will not move, then pull out the coils toward the top.If the coils are pulled out without the body gripped, undue force will be applied and the pipe will be bent.



(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.

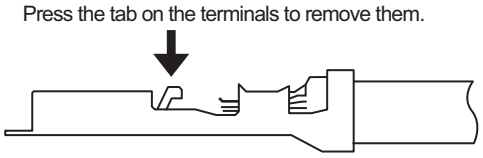


-5- Inverter

- 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, 5110, 0403	Check the details of the inverter error in the error log at [1] Error history item list. Take appropriate measures to the error code and the error details in accordance with [2] 2.Error code list.
[2]	Main power breaker trip	Refer to "(3) Trouble treatment when the main power breaker is tripped".(page 134)
[3]	Main power earth leakage breaker trip	Refer to "(4) Trouble treatment when the main power earth leakage breaker is tripped".(page 134)
[4]	Only the compressor does not operate.	Check the inverter frequency on the LED monitor and proceed to (2) - [4] if the compressor is in operation.(page 133)
[5]	The compressor vibrates violently at all times or makes an abnormal sound.	See (2)-[4].(page 133)
[6]	Noise is picked up by the peripheral device	<1> Check that power supply wiring of the peripheral device does not run close to the power supply wiring of the unit.
		<2> Check if the inverter output wiring is not running parallel to the power supply wiring and the transmission lines.
		<3> Check that the shielded wire is used as the transmission line when it is required, and check that the grounding work is performed properly on the shielded wire.
		<4> Meg failure for electrical system other than the inverter
		<5> Attach a ferrite core to the inverter output wiring. (Contact the factory for details of the service part settings.)
		<6> Provide separate power supply to the air conditioner and other electric appliances.
		<7> If the error occurred suddenly, a ground fault of the inverter output can be considered. See (2)-[4].(page 133)
		*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, 104, 105, 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 0.092 ohm (20°C)	Replace the compressor.
[3] Check whether the inverter is damaged. (No load)	(1) Disconnect the inverter output wire from the terminals of the INV board (SC-U, SC-V, SC-W). (2) Disconnect the short-circuit connector from CN6 on the INV board. (3) Put the outdoor unit into operation. Check the inverter output voltage after the inverter output frequency has stabilized.	1) Inverter-related problems are detected.	Connect the short-circuit connector to CN6, and go to section [1].
		2) Inverter voltage is not output at the terminals (SC-U, SC-V, and SC-W)	Replace the INV board.
		3) There is an voltage imbalance between the wires. Greater than 5% imbalance or 5V	Replace the INV board.
		4) There is no voltage imbalance between the wires.	Normal *Reconnect the short-circuit connector to CN6 after checking the voltage.

	Items to be checked	Phenomena	Remedy
[4] Check whether the inverter is damaged. (During compressor operation)	Put the outdoor unit into operation. Check the inverter output voltage after the inverter output frequency has stabilized.	1) Overcurrent-related problems occur immediately after compressor startup. Error code : 4250 Detail code : 101, 106, 107	a. Check items [1] through [3] for problems. b. Check that high and low pressures are balanced. c. Check that no liquid refrigerant is present in the compressor. →Go to "d." when the problem persists after compressor startup was repeated several times. If normal operation is restored, check the crankcase heater for problems. d. Check that there is a pressure difference between high and low pressures after compressor startup. →Check the high pressure with LED monitor for changes. Replace the compressor if there is no pressure difference. (the compressor may be locked.)
		2) There is a voltage imbalance between the wires after the inverter output voltage is stabilized. Greater than the larger of the following values: imbalance of 5% or 5V	Replace the INV board if there is a voltage imbalance. Check the crankcase heater for problems if there is no voltage imbalance. →When the error occurred, liquid refrigerant may have been present in the compressor.

(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 TB4.	Zero to several ohm, or Meg failure	Check each part and wiring. *Refer to (5) "Simple checking procedures for individual components of main inverter circuit".(page 135) ♦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]-[4].

(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 procedures for individual components of main inverter circuit".(page 135) ♦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.

Note

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

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

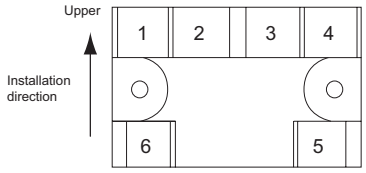
Earth leakage current measurement method

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

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

Note

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

<table>
<tr><th>Part name</th><th>Judgment method</th></tr>
<tr><td>IGBT module</td><td>See "Troubleshooting for IGBT Module ". (IX [4] -5- (6))(page 135)</td></tr>
<tr><td>Rush current protection resistor
R1, R5</td><td>Measure the resistance between terminals R1 and R5: 22 ohm ± 10%</td></tr>
<tr><td>Electromagnetic relay
52C</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(W)</th></tr>
<tr><td>Coil</td><td>Between Terminals 5 and 6</td><td>Not to be short-circuited (Center value 75 ohm)</td></tr>
<tr><td>Contact</td><td>Between Terminals 1 and 2</td><td>∞</td></tr>
<tr><td></td><td>Between Terminals 3 and 4</td><td>∞</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>
</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.)

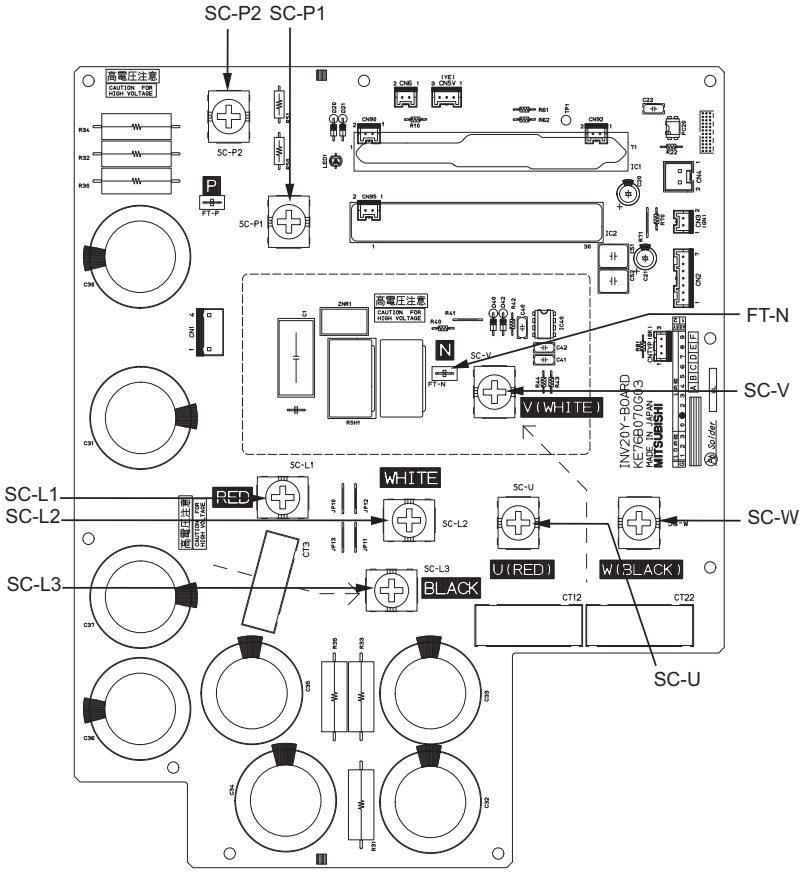
- Use a low-range tester if possible. A more accurate resistance can be measured.

Judgment value (reference)

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

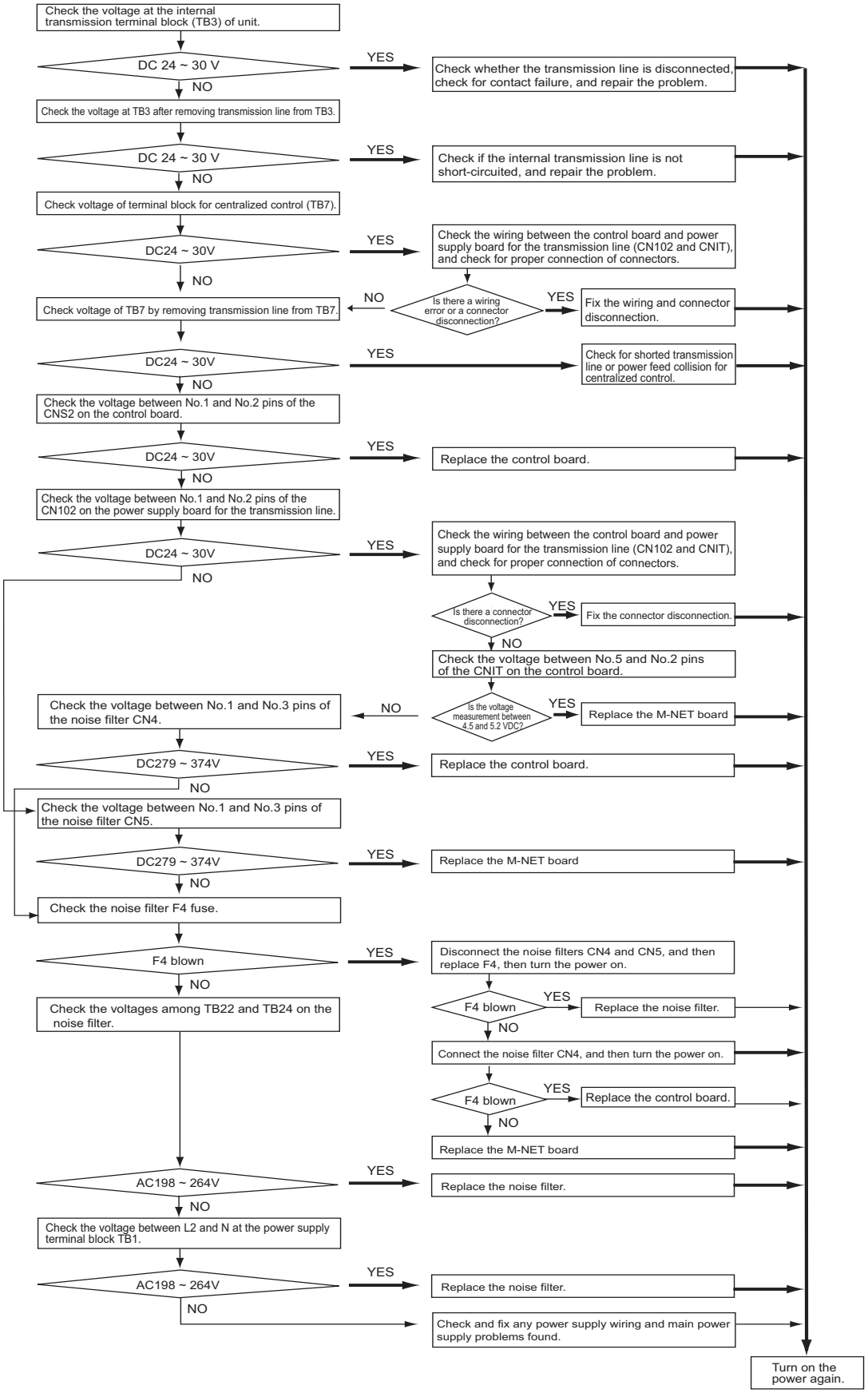
		Black (+)				
		SC-P2	FT-N	SC-U	SC-V	SC-W
Red (-)	SC-P2	-	-	5 - 200 ohm	5 - 200 ohm	5 - 200 ohm
	FT-N	-	-	∞	∞	∞
	SC-U	∞	5 - 200 ohm	-	-	-
	SC-V	∞	5 - 200 ohm	-	-	-
	SC-W	∞	5 - 200 ohm	-	-	-

INV board external diagram



-6- Control Circuit

Troubleshooting transmission power circuit of unit



-7- Troubleshooting

1. Important notes

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

(1) Diagnose the problem and find the cause.

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

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

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

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

[4] Refrigerant Leak

⚠ WARNING

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

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

1. Leak spot: In the case of unit (Heating season)

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 4.5 kg of R410A.

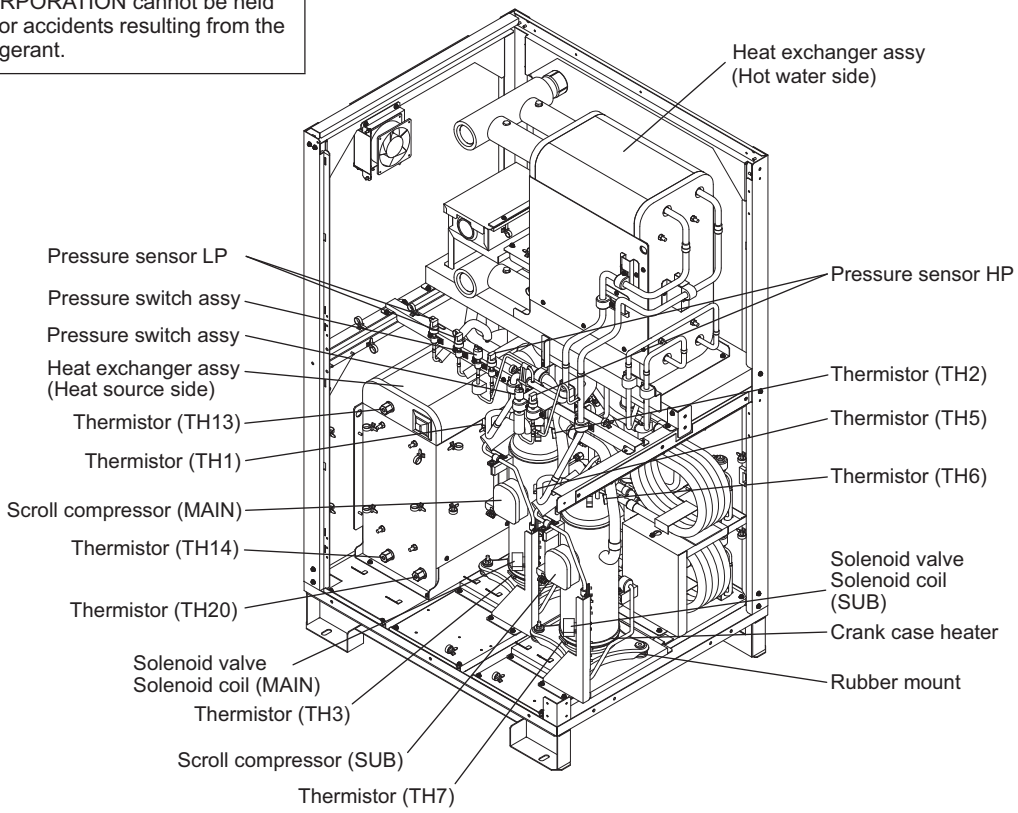
*1. Refer to Chapter I [5] Vacuum Drying (Evacuation) for detailed procedure. (page 7)

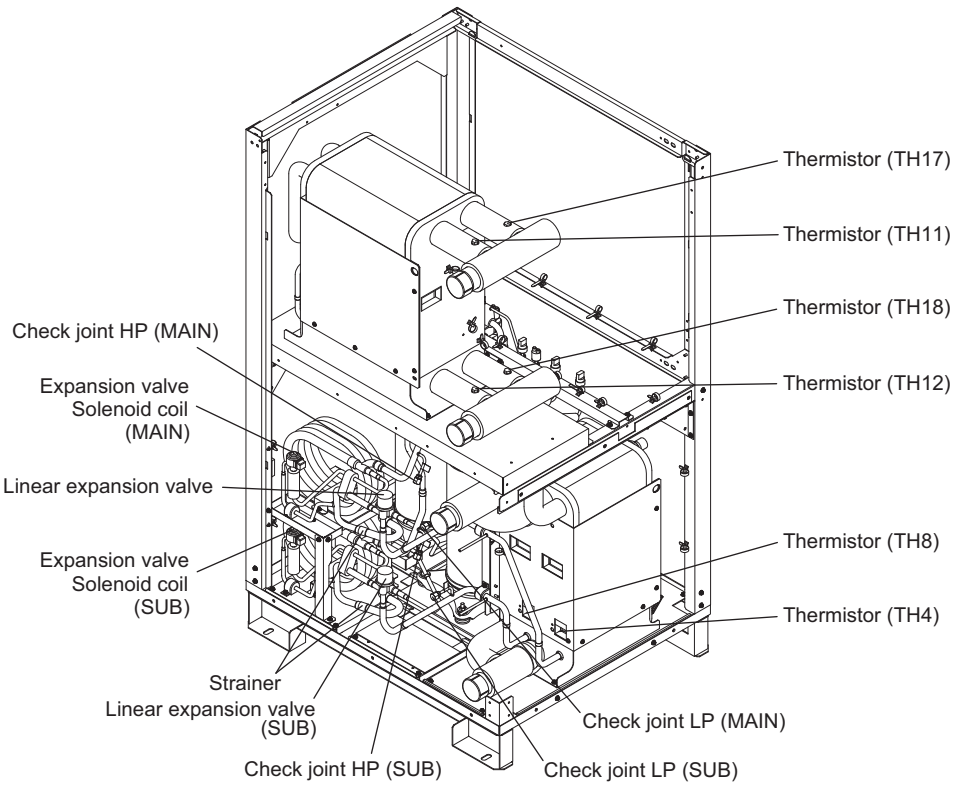
[5] Parts Replacement Procedures

⚠ WARNING

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

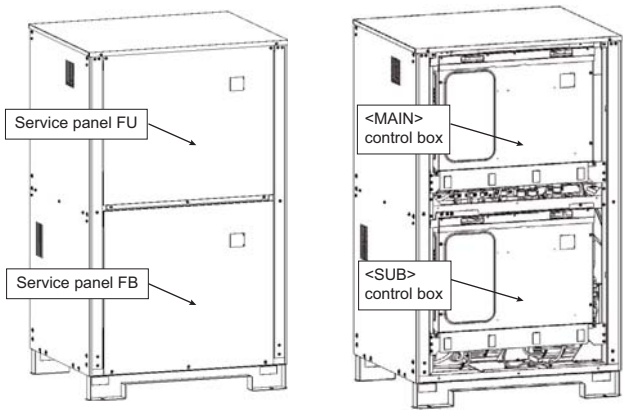
- Doing so may cause the unit or pipes to burst, or result in explosion or fire during use, during repair, or at the time of disposal of the unit.
- It may also be in violation of applicable laws.
- MITSUBISHI ELECTRIC CORPORATION cannot be held responsible for malfunctions or accidents resulting from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





Compressor Replacement Procedure

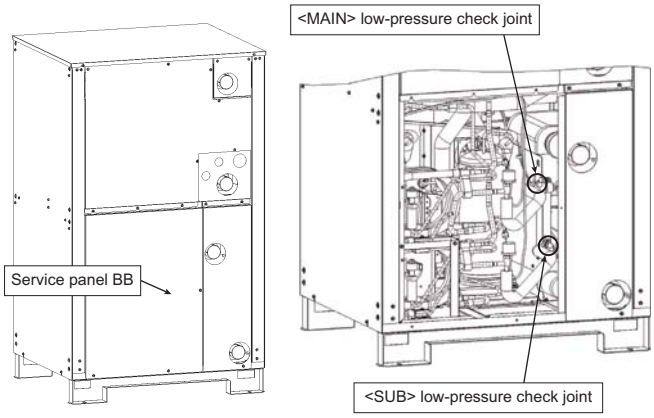
1



1. At the front of the product, remove the service panel FU and then remove the cover of the <MAIN> control box.
2. Set the SWS1 switch of the control board to OFF and then turn the main power (breaker) OFF.
3. Remove the service panel FB and then remove the cover of the <SUB> control box.

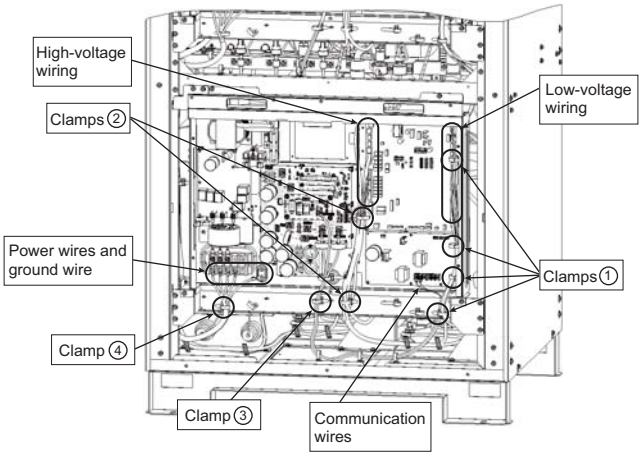
Caution
If the main power (breaker) is not turned OFF, the compressor terminal part will be a live part even if you set the SWS1 switch to OFF.

2



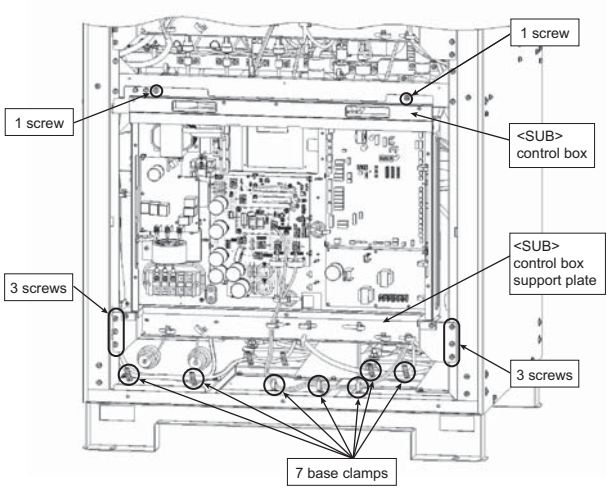
1. At the back of the product, remove the service panel BB.
2. Perform refrigerant recovery from the low-pressure check joints.

3



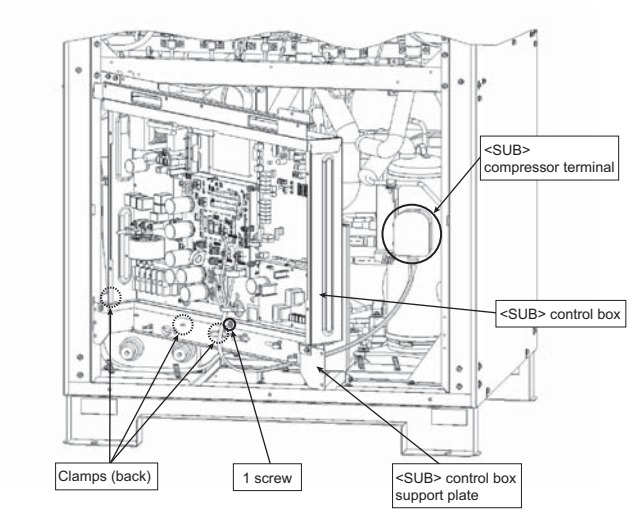
1. Disconnect the connector of the low-voltage wiring connected to the control board of the <SUB> control box and then remove the 4 clamps ① securing the low-voltage wiring.
2. Disconnect the communication wires connected to the terminal block.
3. Disconnect the exhaust fan power wires (CN510 white and CNAC2 black), cooling fan connector (relay connector white), belt heater wiring (CN502 white), solenoid coil wiring (CN501 white), and high-voltage switch wiring (CN801 yellow), and then remove the 2 clamps ② securing the high-voltage wiring.
4. Remove the 1 clamp ③ securing the compressor power wiring.
5. Disconnect the power wires and ground wire and then remove the 1 clamp ④ securing the wiring.

4



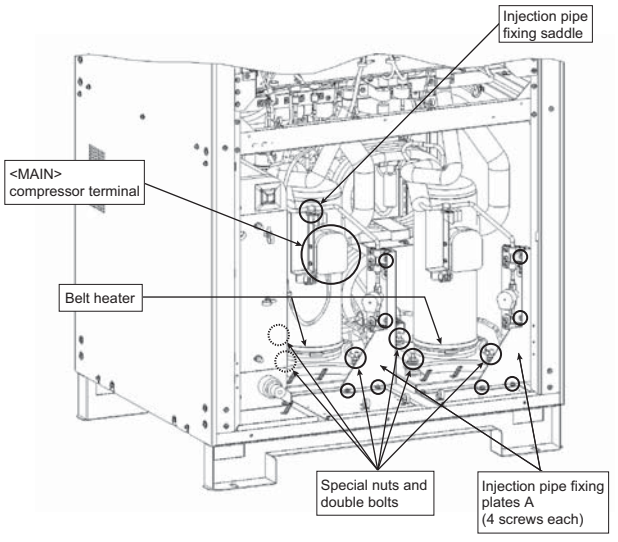
1. Remove the 7 base clamps.
2. Remove the 6 fixing screws of the <SUB> control box support plate and the 2 mounting screws of the <SUB> control box.

5



1. Open the <SUB> control box.
2. Disconnect the compressor power wiring of the <SUB> compressor terminal.
3. Remove the 1 mounting screw of the <SUB> control box and then remove the <SUB> control box.
4. Remove the 3 clamps securing the wiring to the back of the <SUB> control box support plate and then remove the <SUB> control box support plate.

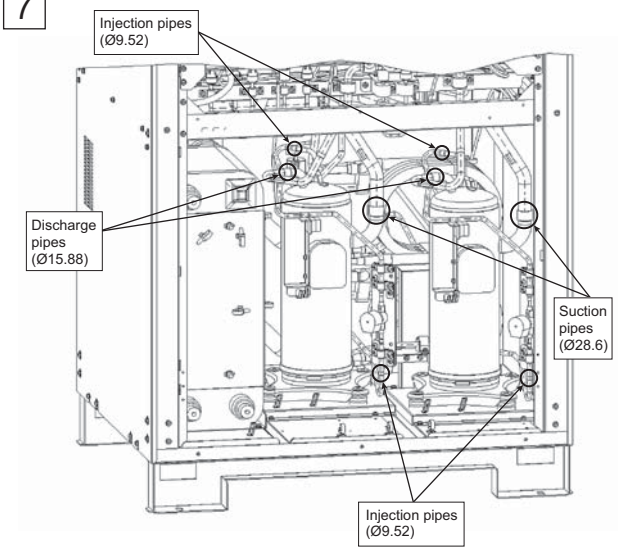
6



1. Remove the 4 mounting screws of injection pipe fixing plates A and then remove injection pipe fixing plate A.
2. Remove the parts around the brazed portions such as the injection pipe fixing saddle (2 screws), the heat insulating pipes wrapped around the discharge, suction, and injection pipes, and wiring. (When replacing the compressor on the MAIN side, also disconnect the compressor power wiring of the <MAIN> compressor terminal.)
3. Remove the belt heater.
4. Remove the special nuts and double bolts (3 places for each compressor).
   (If you remove the double bolts from above, you will be able to pull out the compressors without lifting them up.)

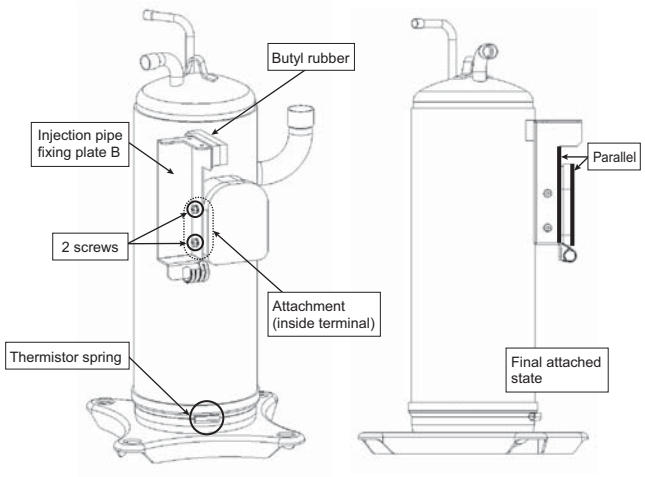
* The removed parts are required as they will be reattached after replacement of the compressors. Do not throw them away.

7



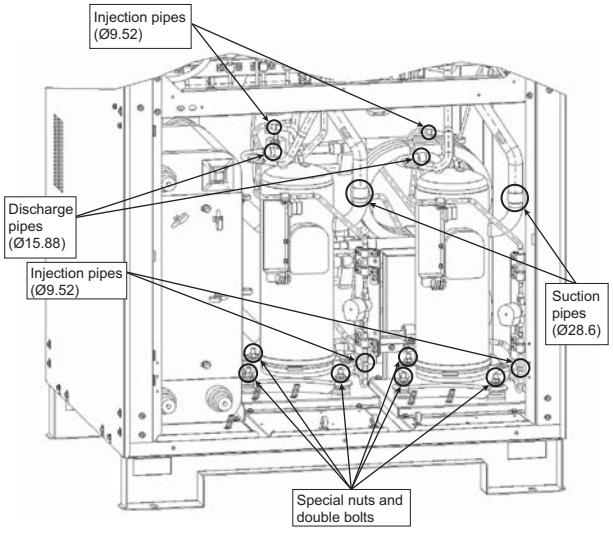
1. Remove the brazing from the suction pipe openings, discharge pipe openings, and injection pipes.
2. Remove the injection pipes.
3. Drag out the compressors to replace them.

8



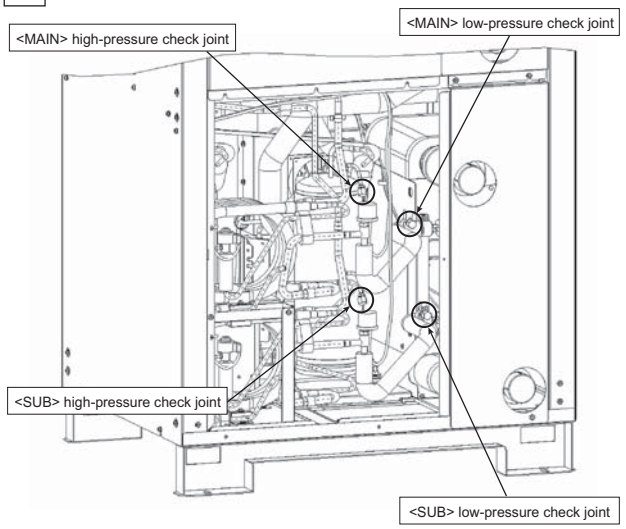
1. Remove the 2 screws and the remove injection pipe fixing plate B and attachment.
2. Remove the thermistor spring.
3. Attach the thermistor spring and the injection pipe fixing plate B to the new compressor.
   When attaching the injection pipe fixing pate B, push it so that the butyl rubber touches the compressor shell and tighten the screws. Also, check that it is attached so that the fixing plate edge and terminal box top are parallel to each other.

9



1. Attach vibration absorption rubber to the new compressor (4 places on each compressor) and then fix the compressors to the compressor fixing plates.
2. Install the special nuts and double bolts.
3. Install the injection pipes.
4. Join the suction pipe opening, discharge pipe opening, and injection pipe opening brazing portions.

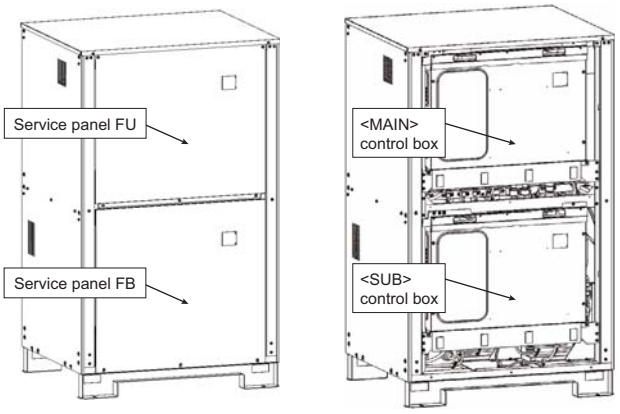
10



1. Perform evacuation with a vacuum pump from the low-pressure check joints.
2. While evacuation is being performed, assemble the unit by performing the procedure in reverse in the order of 6→5→4→3.
3. Perform refrigerant charging from the high-pressure check joints.
   (Be sure to perform refrigerant charging from the high-pressure check joints so that a back pressure is not applied to the compressor.)
4. Attach the cover of the control box and the service panels to complete the procedure.

Hot Water Side Heat Exchanger Replacement Procedure

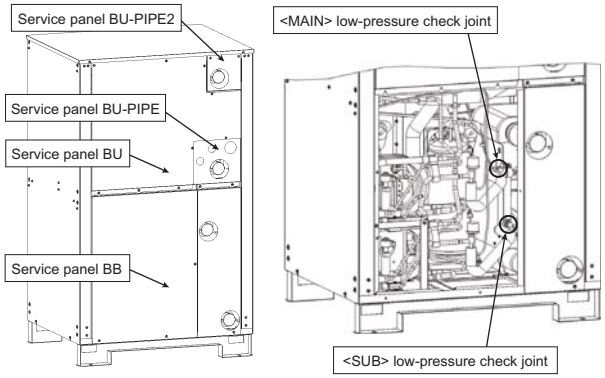
1



1. At the front of the product, remove the service panel FU and then remove the cover of the <MAIN> control box.
2. Set the SWS1 switch of the control board to OFF and then turn the main power (breaker) OFF.
3. Remove the service panel FB and then remove the cover of the <SUB> control box.

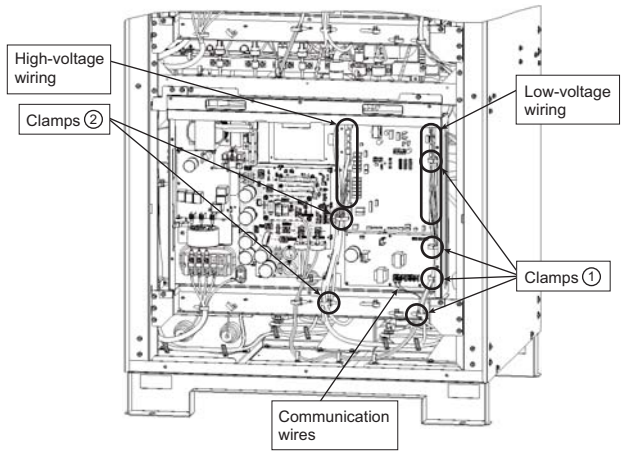
Caution
If the main power (breaker) is not turned OFF, the compressor terminal part will be a live part even if you set the SWS1 switch to OFF.

2



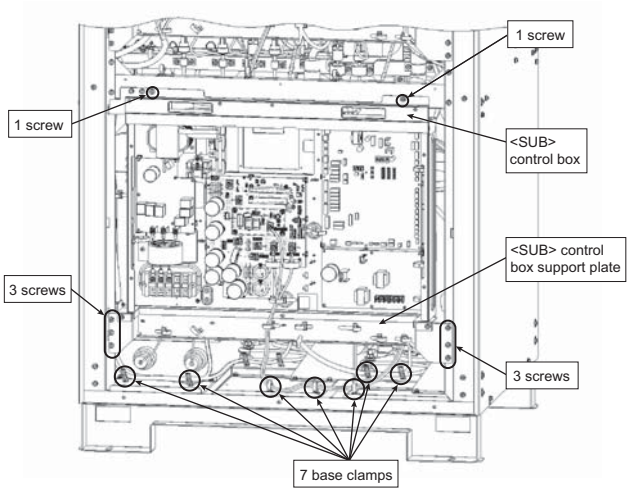
1. At the back of the product, remove the service panel BU, BU-PIPE, BU-PIPE2, and BB.
2. Perform refrigerant recovery from the low-pressure check joints.

3



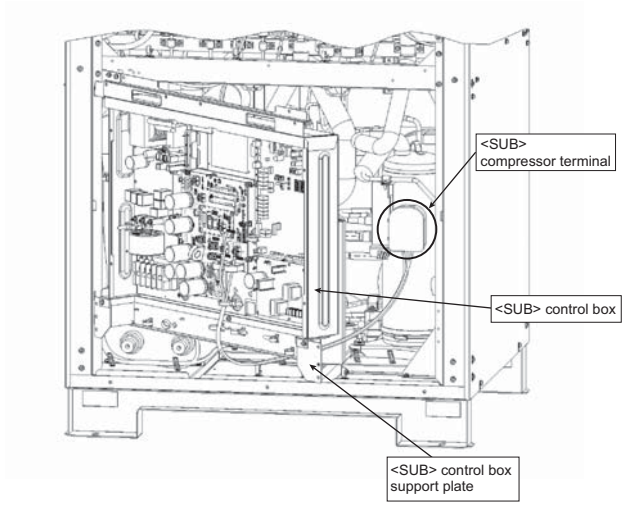
1. Disconnect the connector of the low-voltage wiring connected to the control board of the <SUB> control box and then remove the 4 clamps ① securing the low-voltage wiring.
2. Disconnect the communication wires connected to the terminal block.
3. Disconnect the exhaust fan power wires (CN510 white and CNAC2 black), cooling fan connector (relay connector white), belt heater wiring (CN502 white), solenoid coil wiring (CN501 white), and high-voltage switch wiring (CN801 yellow), and then remove the 2 clamps ② securing the high-voltage wiring.

4



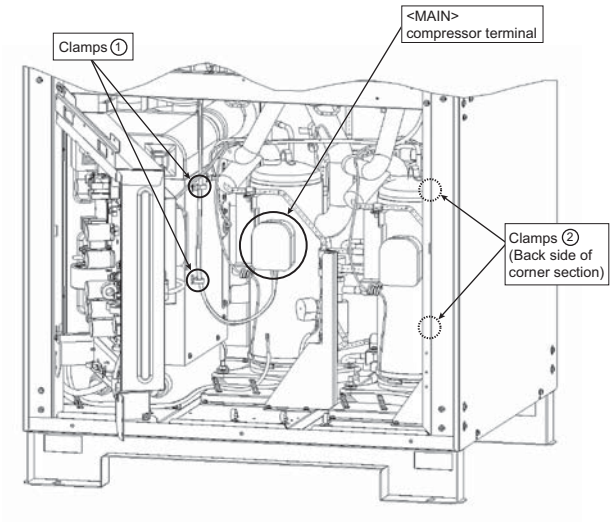
1. Remove the 7 base clamps.
2. Remove the 6 fixing screws of the <SUB> control box support plate and the 2 mounting screws of the <SUB> control box.

5



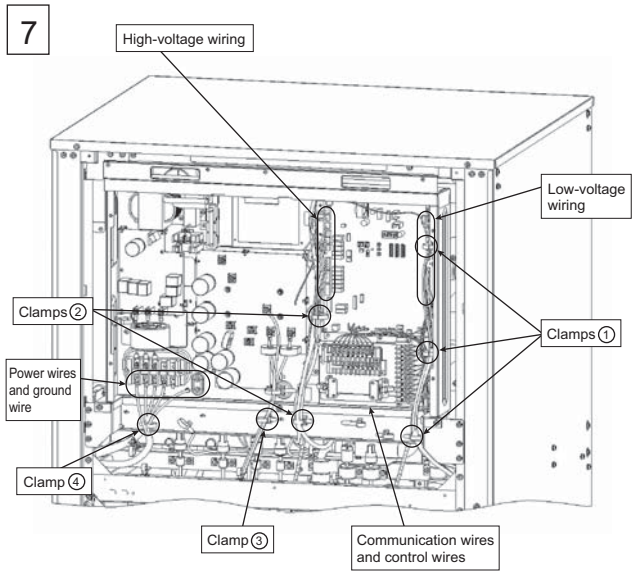
1. Open the <SUB> control box.
2. Disconnect the compressor power wiring of the <SUB> compressor terminal.

6



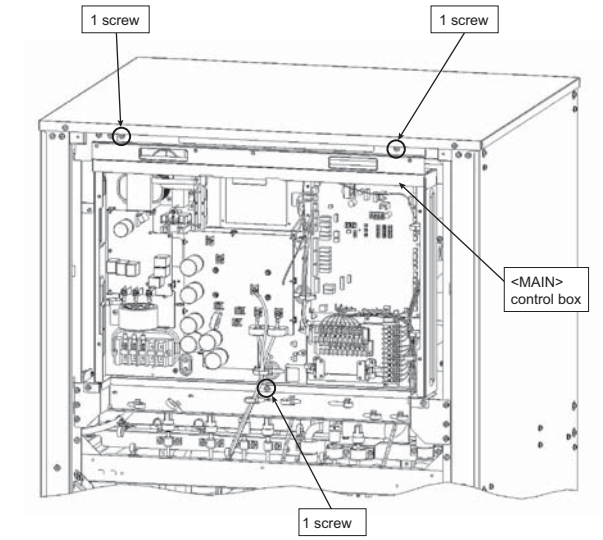
1. Open the <SUB> control box even further, disconnect the compressor power wiring from the <MAIN> compressor terminal, and then remove the 2 clamps ① securing the compressor power wiring of the <MAIN> compressor terminal.
2. Remove the 2 fixing clamps ② of the low-voltage wiring running along the back side of the corner section.
3. Close the <SUB> control box and then install the 6 fixing screws of the <SUB> control box support plate and 2 mounting screws of the <SUB> control box you removed in step 4.

7



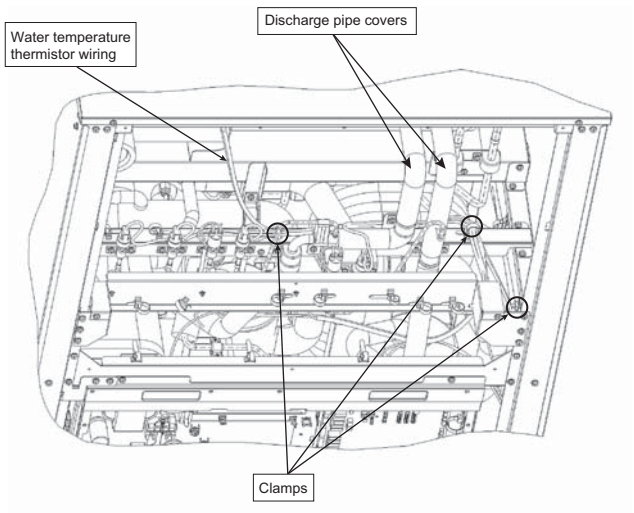
1. Disconnect the connector of the low-voltage wiring connected to the control board of the <MAIN> control box and then remove the 3 clamps ① securing the low-voltage wiring.
2. Disconnect the communication wires and control wires connected to the terminal block.
3. Disconnect the cooling fan connector (relay connector white), belt heater wiring (CN502 white), solenoid coil wiring (CN501 white), and high-voltage switch wiring (CN801 yellow), and then remove the 2 clamps ② securing the high-voltage wiring.
4. Remove the 1 clamp ③ securing the compressor power wiring.
5. Disconnect the power wires and ground wire and then remove the 1 clamp ④ securing the wiring.

8



1. Remove the 3 mounting screws of the <MAIN> control box and then remove the <MAIN> control box.

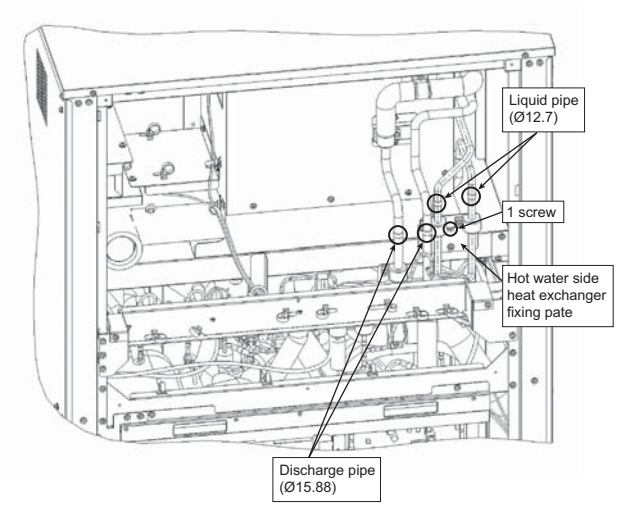
9



1. Remove the 3 clamps securing the water temperature thermistor.
2. Remove the pipe covers from the discharge pipes.

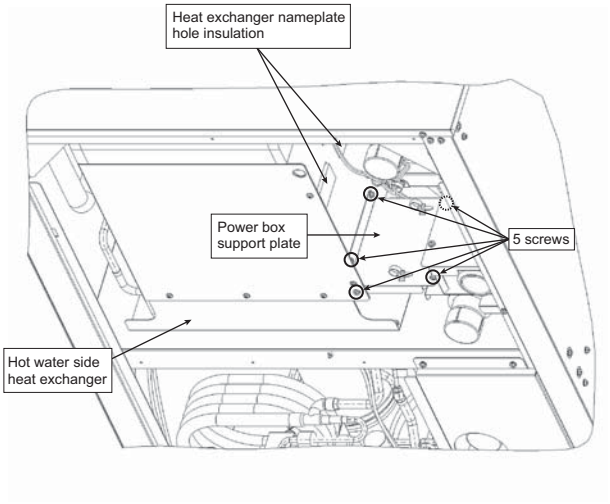
* The removed parts are required as they will be reattached after replacement of the heat exchanger. Do not throw them away.

10



1. Remove the brazing from the discharge pipes and liquid pipes.
2. Remove the 1 heat exchanger fixing screw of the hot water side heat exchanger fixing plate.

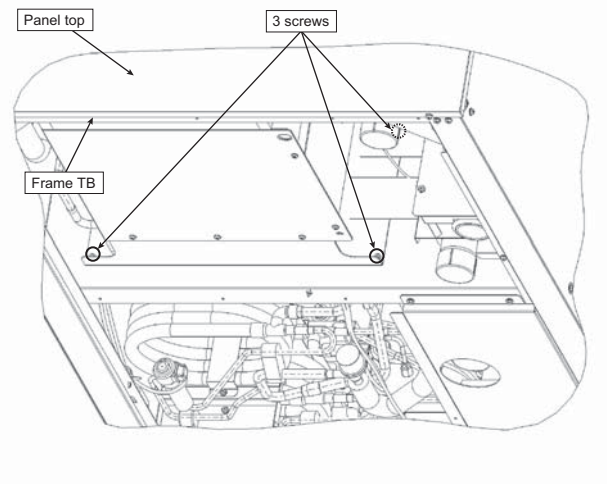
11



1. At the back of the product, remove the power box support plate (5 screws).
2. Remove the insulation (2 places) covering the heat exchanger nameplate holes.

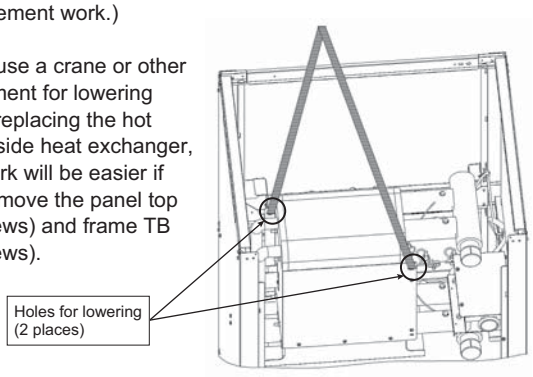
* The removed parts are required as they will be reattached after replacement of the heat exchanger. Do not throw them away.

12

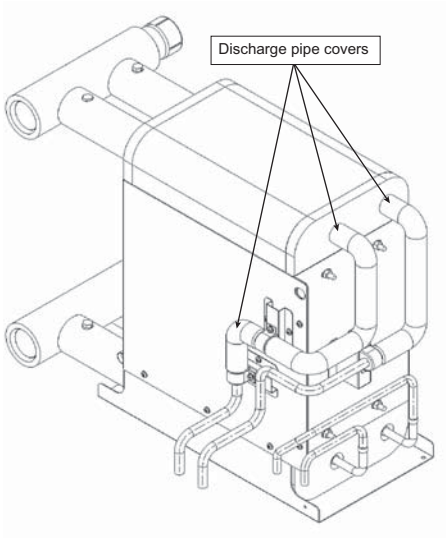


1. Remove the 3 fixing screws of the hot water side heat exchanger.
2. Drag out the hot water side heat exchanger to replace it. (Be careful handling heavy objects when performing the replacement work.)

* If you use a crane or other equipment for lowering when replacing the hot water side heat exchanger, the work will be easier if you remove the panel top (4 screws) and frame TB (8 screws).



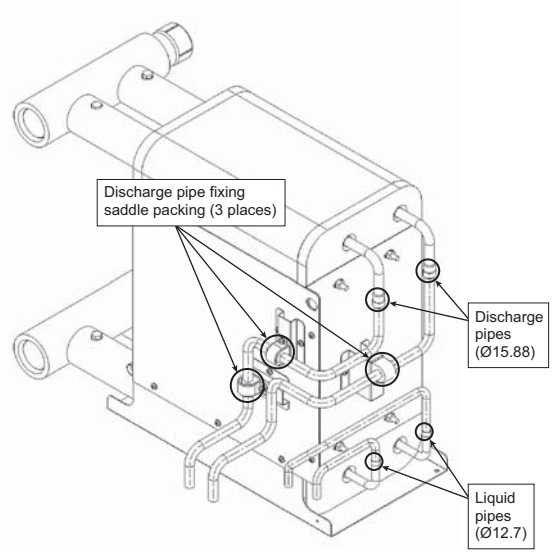
13



1. Remove the pipe covers from the discharge pipes.

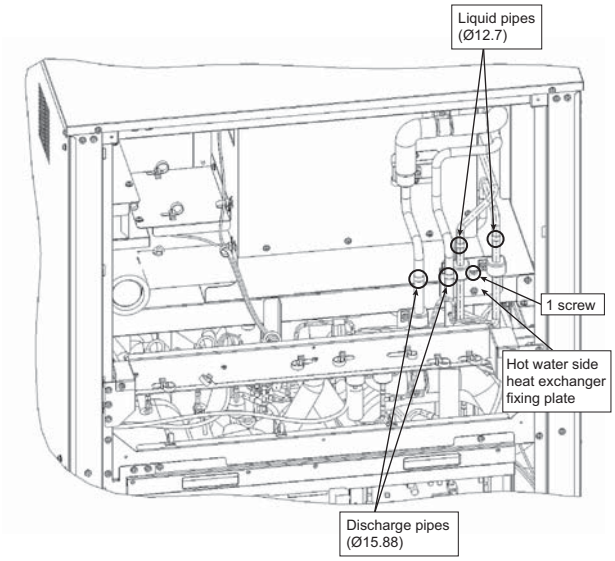
* The removed parts are required as they will be reattached after replacement of the heat exchanger. Do not throw them away.

14



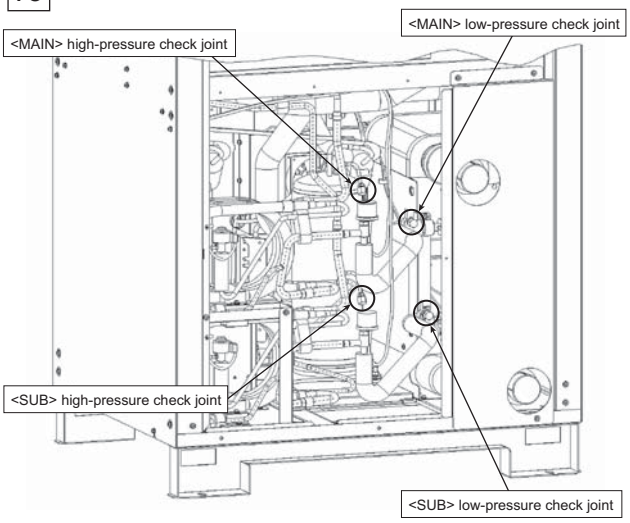
1. Remove the brazing from the discharge pipes and liquid pipes.
2. Remove the discharge pipe fixing saddle packing (3 places) and then remove the discharge pipes (2 types) and liquid pipes (2 types).
3. Attach the pipes and pipe fixing saddle packing removed in 2 to the new hot water side heat exchanger.
4. Join the discharge pipe and liquid pipe brazing portions.

15



1. Attach the hot water side heat exchanger to the product by performing the procedure in reverse in the order of 13→12→11.
2. Install the 1 heat exchanger fixing screw of the hot water side heat exchanger fixing plate.
3. Join the discharge pipe and liquid pipe brazing portions.

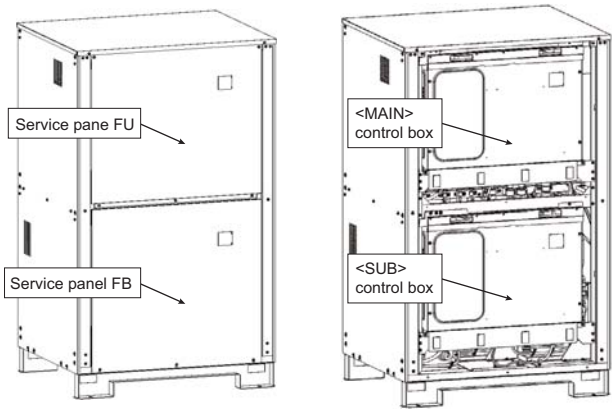
16



1. Perform evacuation with a vacuum pump from the low-pressure check joints.
2. While evacuation is being performed, assemble the unit by performing the procedure in reverse in the order of 9→8→7→6→5→4→3.
3. Perform refrigerant charging from the high-pressure check joints.
   (Be sure to perform refrigerant charging from the high-pressure check joints so that a back pressure is not applied to the compressor.)
4. Attach the cover of the control box and the service panels to complete the procedure.

Heat Source Water Side Heat Exchanger Replacement Procedure

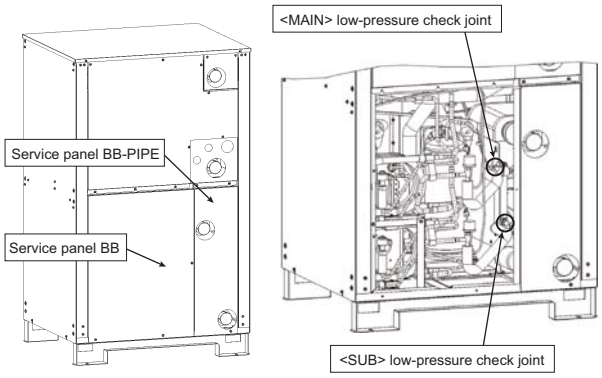
1



1. At the front of the product, remove the service panel FU and then remove the cover of the <MAIN> control box.
2. Set the SWS1 switch of the control board to OFF and then turn the main power (breaker) OFF.
3. Remove the service panel FB and then remove the cover of the <SUB> control box.

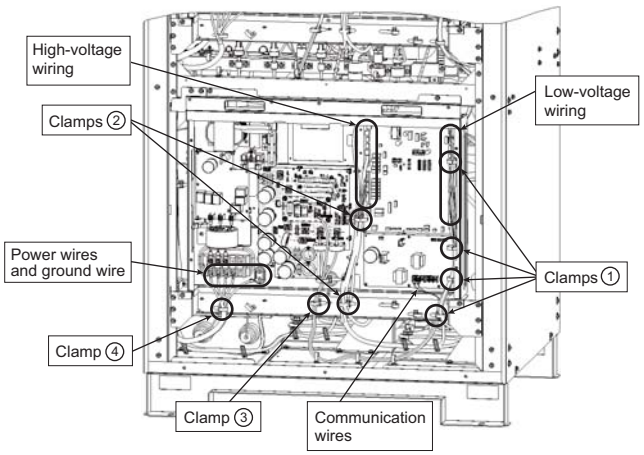
Caution
If the main power (breaker) is not turned OFF, the compressor terminal part will be a live part even if you set the SWS1 switch to OFF.

2



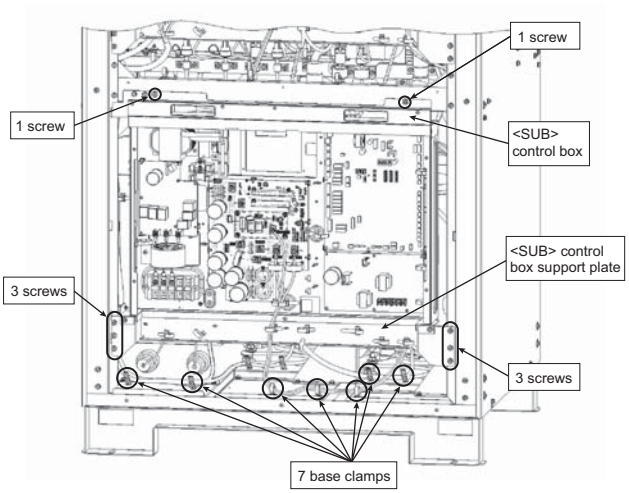
1. At the back of the product, remove the service panel BB and BB-PIPE.
2. Perform refrigerant recovery from the low-pressure check joints.

3



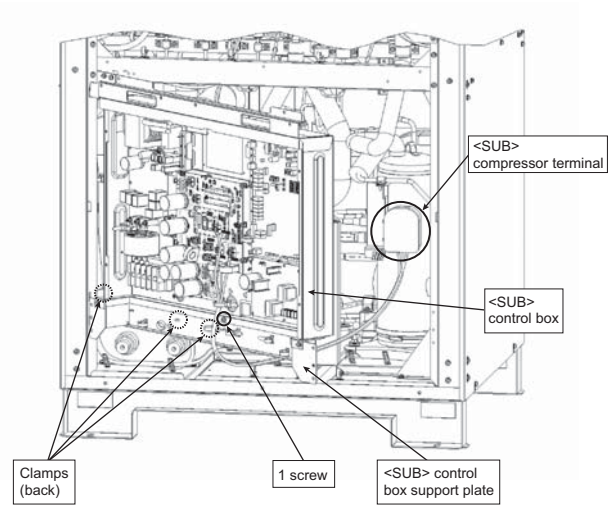
1. Disconnect the connector of the low-voltage wiring connected to the control board of the <SUB> control box and then remove the 4 clamps ① securing the low-voltage wiring.
2. Disconnect the communication wires connected to the terminal block.
3. Disconnect the exhaust fan power wires (CN510 white and CNAC2 black), cooling fan connector (relay connector white), belt heater wiring (CN502 white), solenoid coil wiring (CN501 white), and high-voltage switch wiring (CN801 yellow), and then remove the 2 clamps ② securing the high-voltage wiring.
4. Remove the 1 clamp ③ securing the compressor power wiring.
5. Disconnect the power wires and ground wire and then remove the 1 clamp ④ securing the wiring.

4



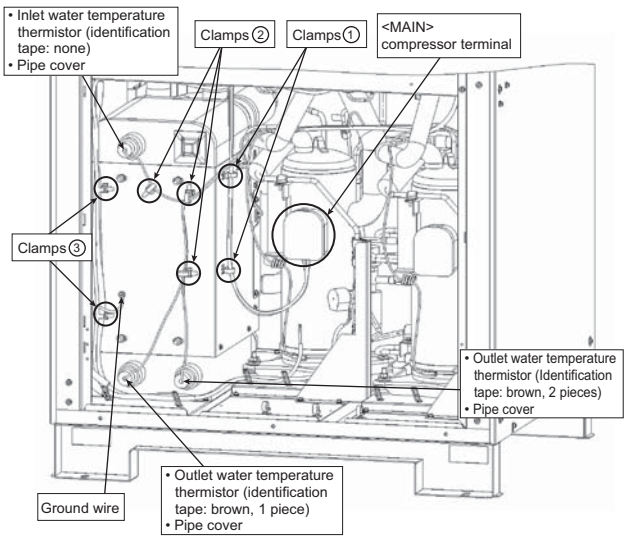
1. Remove the 7 base clamps.
2. Remove the 6 fixing screws of the <SUB> control box support plate and the 2 mounting screws of the <SUB> control box.

5



1. Open the <SUB> control box.
2. Disconnect the compressor power wiring of the <SUB> compressor terminal.
3. Remove the 1 mounting screw of the <SUB> control box and then remove the <SUB> control box.
4. Remove the 3 clamps securing the wiring to the back of the <SUB> control box support plate and then remove the <SUB> control box support plate.

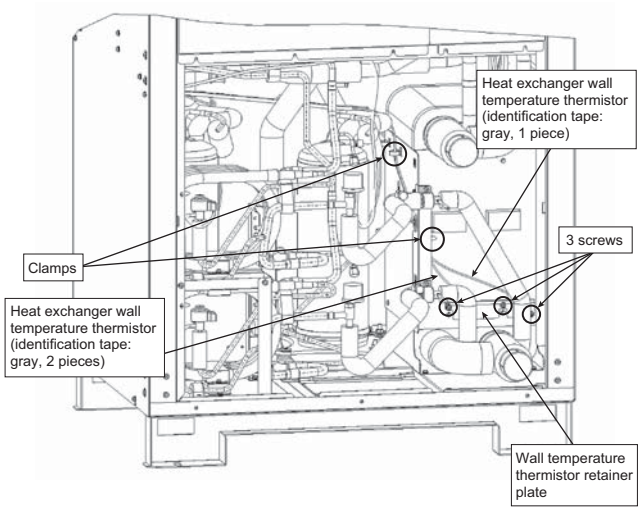
6



1. Remove the 2 clamps ① securing the compressor power wiring connected to the <MAIN> compressor terminal.
2. Remove the 3 clamps ② securing the water temperature thermistors and then remove the water temperature thermistors and pipe covers from the heat exchanger.
3. Remove the 2 clamps ③ securing the high-voltage wiring.
4. Remove the 1 screw securing the refrigerant circuit ground wiring.

* The removed parts are required as they will be reattached after replacement of the heat exchanger. Do not throw them away.

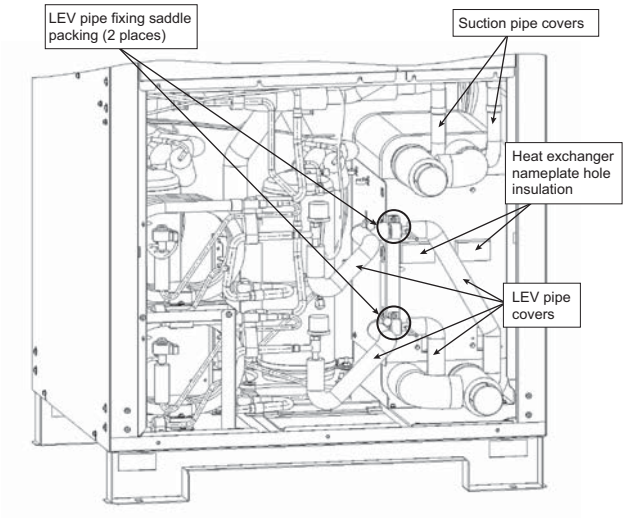
7



1. Remove the wall temperature thermistor retainer plate (3 screws).
2. Remove the 2 clamps securing the wall temperature thermistors and then remove the wall temperature thermistors from the heat exchanger.

* The removed parts are required as they will be reattached after replacement of the heat exchanger. Do not throw them away.

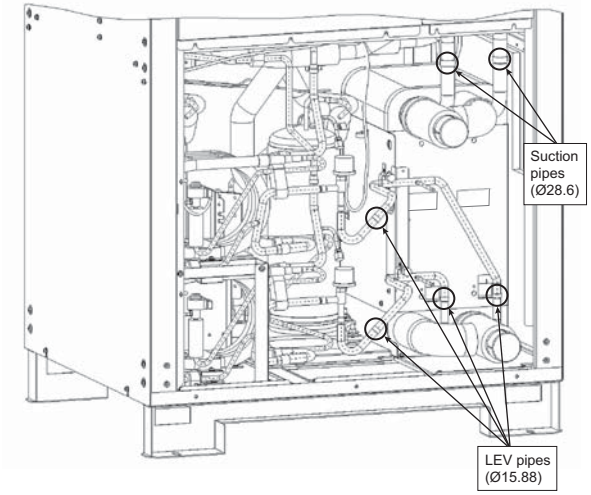
8



1. Remove the pipe fixing saddle packing (3 places).
2. Remove the covers of the suction pipes and LEV pipes.
3. Remove the insulation (2 places) covering the heat exchanger nameplate holes.

* The removed parts are required as they will be reattached after replacement of the heat exchanger. Do not throw them away.

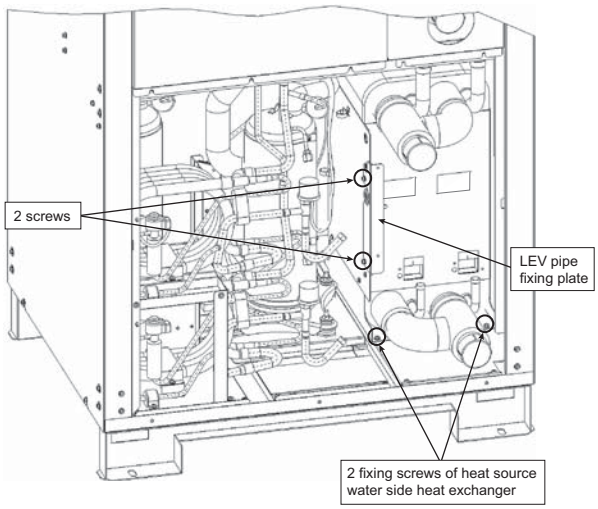
9



1. Remove the brazing from the suction pipes and LEV pipes.
2. Remove the LEV pipes.

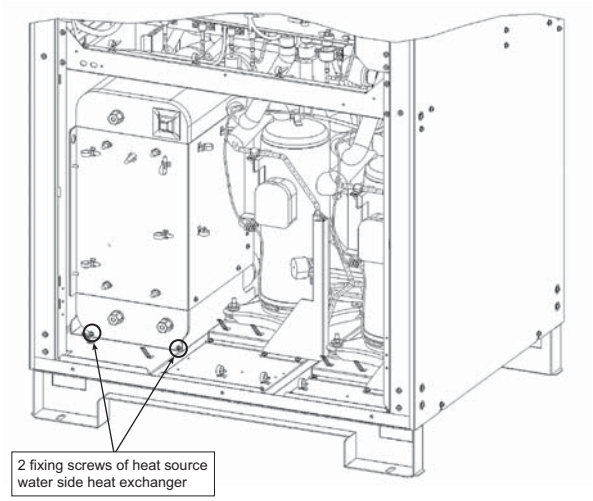
* The removed parts are required as they will be reattached after replacement of the heat exchanger. Do not throw them away.

10



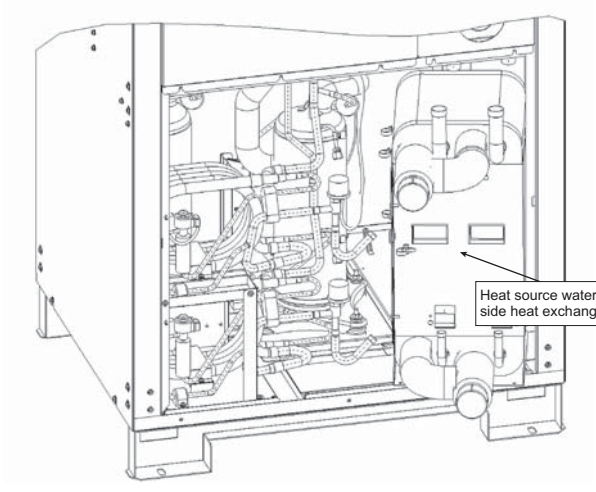
1. Remove the LEV pipe fixing plate (2 screws).
2. Remove the 2 fixing screws of the heat source water side heat exchanger.

11



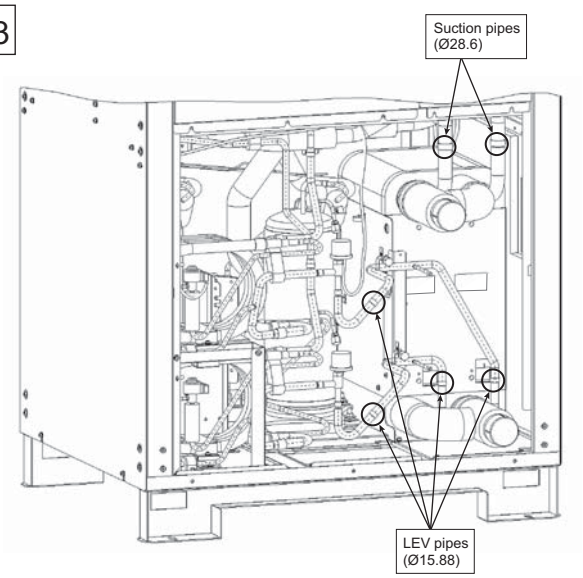
1. Remove the 2 fixing screws of the heat source water side heat exchanger at the front of the product.

12



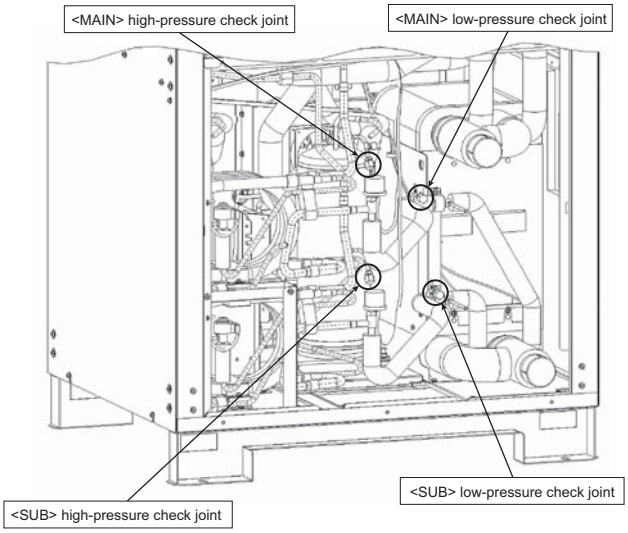
1. Drag out the heat source water side heat exchanger from the back of the product to replace it.
   (Be careful handling heavy objects when performing the replacement work.)
2. Attach heat source water side heat exchanger and LEV pipe fixing plate by performing the procedure in reverse in the order of 11→10.

13



1. Install the LEV pipes.
2. Join the suction pipe and LEV pipe brazing portions.

14



1. Perform evacuation with a vacuum pump from the low-pressure check joints.
2. While evacuation is being performed, assemble the unit by performing the procedure in reverse in the order of 8→7→6→5→4→3.
3. Perform refrigerant charging from the high-pressure check joints.
   (Be sure to perform refrigerant charging from the high-pressure check joints so that a back pressure is not applied to the compressor.)
4. Attach the cover of the control box and the service panels to complete the procedure.

X Attachments

[1] R410A saturation temperature table

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

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

Service Handbook

Model

CRHV-P600YA-HPB

MITSUBISHI ELECTRIC CORPORATION

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