MITSUBISHI ELECTRIC

Hot Water Heat Pump Unit QAHV

Installation/Operation Manual

QAHV-N560YA-HPB

CONTENTS

Thoroughly read this manual prior to use.
Save this manual for future reference.
Some of the items in this manual may not apply to made-to-order units.
Make sure that this manual is passed on to the end users.

Safety Precautions

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

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

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

General

⚠ WARNING

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Consult an authorized agency for the proper disposal of the unit

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

⚠ CAUTION

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

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

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

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

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

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

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

Condensation may drip from the unit.

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

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

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

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

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

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

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

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

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

Refrigerant poses environmental hazards if released into the air.

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

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

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

It may cause health problems or degrade food.

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

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

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

Use clean tap water.

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

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

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

Periodically inspect and clean the water circuit.

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

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.

⚠ CAUTION

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

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

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

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

Pipe installation

⚠ WARNING

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

Check for refrigerant leakage at the completion of installation.

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

⚠ CAUTION

Check that no substance other than the specified refrigerant (R744) 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.

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 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.

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.

1. Selecting the Installation Site

[1] Installation Conditions

Select the installation site in consultation with the client.

Select a site to install the outdoor unit that meets the following conditions:

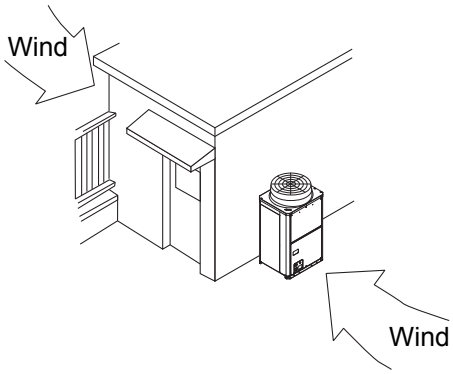
- This unit is for outdoor installation only.
- The unit will not be subject to heat from other heat sources.
- The noise from the unit will not be a problem.
- The unit will not be exposed to strong winds.
- Water from the unit can be drained properly.
- The space requirements (specified on pages 7 through 9) are met.

<1> Providing protection against winds

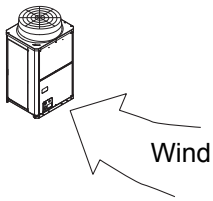
Using the figures at right as a reference, provide adequate protection against winds.

A unit installed alone is vulnerable to strong winds. Select the installation site carefully to minimize the effect of winds.

When installing a unit in a place where the wind always blows from the same direction, install the unit so that the outlet faces away from the direction of the wind.



- Install the outdoor unit in a place where it is not exposed to direct wind, such as behind a building.



- Install the outdoor unit so that the outlet/inlet faces away from the wind.

<2> Cold Climate Installation

Observe the following when installing the units in areas where snow or strong winds prevail.

- Avoid direct exposure to rain, winds, and snow.
- Icicles that may form under the foundation can fall and inflict personal injury or property damage. Select the installation site carefully to reduce these risks, especially when installing the unit on a roof.
- If the units are installed in the direct line of rain, winds, or snow, install the optional snow hood (on both the discharge and suction ducts). Use a snow net or snow fence as necessary to protect the unit.
- Install the unit on a base approximately twice as high as the expected snowfall.
- If the unit is continuously operated for a long time with the outside air temperature below the freezing point, install a heater at the base of the unit to prevent the water from freezing at the unit bottom.
- When using the unit in an outdoor temperature of -15ºC or below, install a drain pan (with heater whose capacity is 320 W or more) at the bottom surface of the unit.

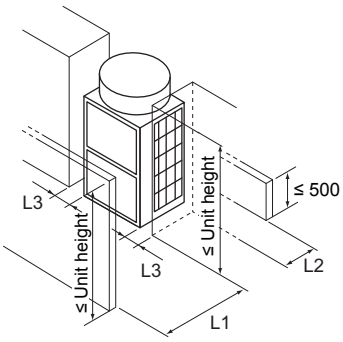
[2] Installation Space Requirements

Provide sufficient space around the unit for effective operation, efficient air movement, and ease of access for maintenance.

<1> Single unit installation

(1) When all walls are within their height limits*.

[mm]



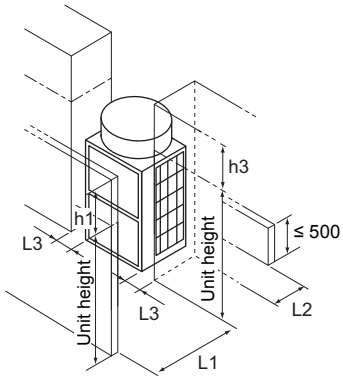
* Height limit

Front/Right/Left	Same height or lower than the overall height of the unit
Rear	500 mm or lower from the unit bottom

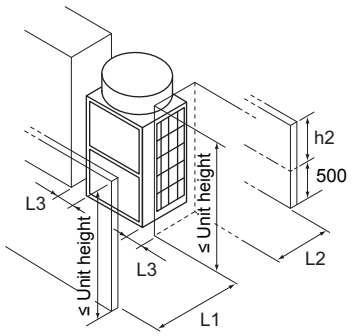
	Required minimum distance [mm]		
	L1 (Front)	L2 (Rear)	L3 (Right/Left)
When the distance behind the unit (L2) needs to be small	500	300	50

(2) When one or more walls exceed their height limits*.

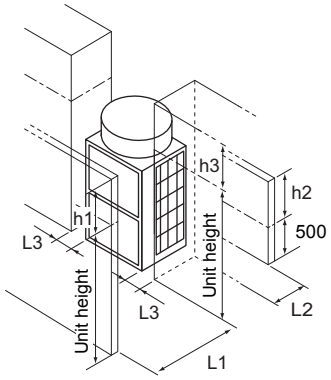
When the wall(s) at the front and/or the right/left exceed(s) their height limits



When the wall at the rear exceeds its height limit



When all walls exceed their height limits



Add the dimension that exceeds the height limit (shown as "h1" through "h3" in the figures) to L1, L2, and L3 as shown in the table below.

	Required minimum distance [mm]		
	L1 (Front)	L2 (Rear)	L3 (Right/Left)
When the distance behind the unit (L2) needs to be small	500 + h1	300 + h2	50 + h3

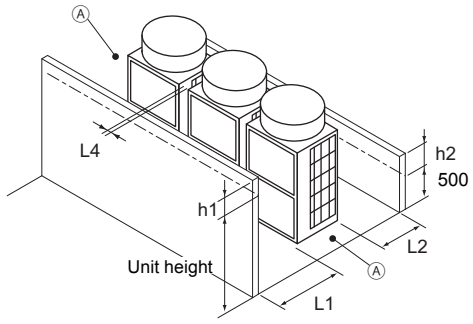
<2> Multiple unit installation

When installing multiple units, make sure to take into consideration factors such as providing enough space for people to pass through, ample space between blocks of units, and sufficient space for airflow. (The areas marked with Ⓐ in the figures below must be left open.)

In the same way as with the single unit installation, add the dimension that exceeds the height limit (shown as "h1" through "h3" in the figures) to L1, L2, and L3 as shown in the tables below.

(1) Side-by-side installation

[mm]

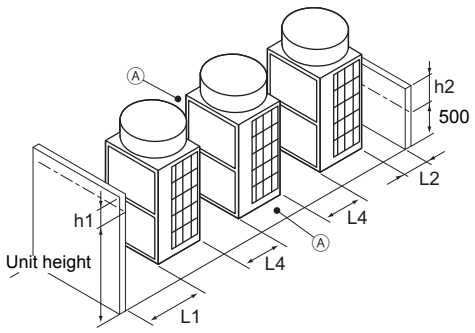


Required minimum distance [mm]		
L1 (Front)	L2 (Rear)	L4 (Between)
500 + h1	300 + h2	100

Ⓐ Leave open in two directions.

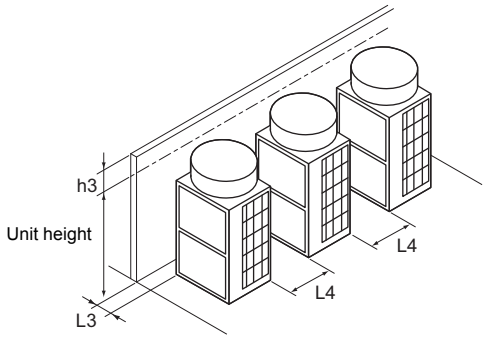
(2) Face-to-face installation

When there are walls in the front and rear of the block of units



Required minimum distance [mm]		
L1 (Front)	L2 (Rear)	L4 (Between)
500	300	500

When there is a wall on either the right or left side of the block of units

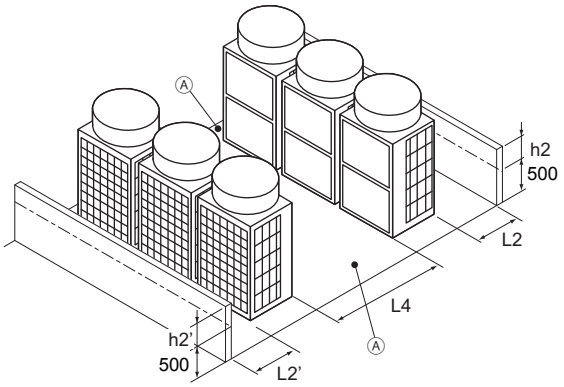


Required minimum distance [mm]	
L3 (Right/Left)	L4 (Between)
50 + h3	500

Ⓐ Leave open in two directions.

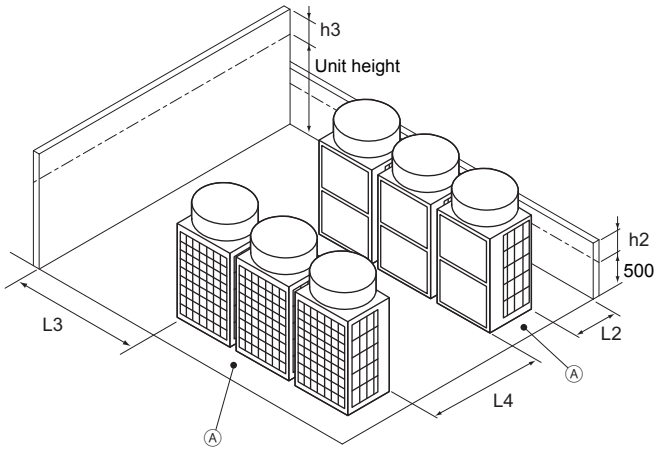
(3) Combination of face-to-face and side-by-side installations

When there are walls in the front and rear of the block of units



Required minimum distance [mm]		
L2 (Right)	L2' (Left)	L4 (Between)
300 + h2	300 + h2'	1000

When there are two walls in an L-shape



Required minimum distance [mm]		
L2 (Right)	L3 (Right/Left)	L4 (Between)
300 + h2	1000 + h3	1000

Ⓐ Leave open in two directions.

[3] System installation restrictions

• Piping length restrictions

The maximum piping length is 60 m.

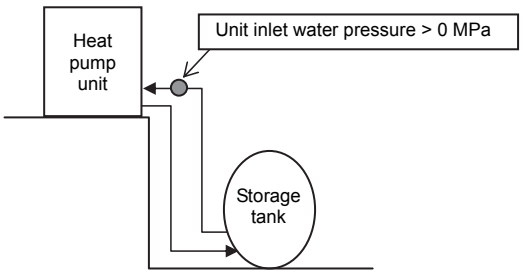
Select appropriate diameter pipes to prevent negative pressure from the pumping head and the pressure loss in the pipes.

Pumping head (when maximum flow rate is 17 ℓ/min): 70 kPa

• Installation height restrictions

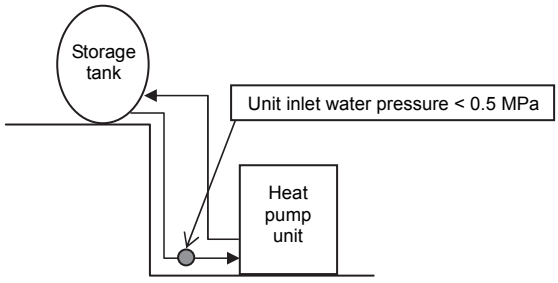
- When the unit is installed above the storage tank

  Decide the height so that the unit inlet water pressure will not be negative for the tank pressure.



- When the unit is installed below the storage tank

  Decide the height so that the unit inlet water pressure will be 0.5 MPa or below for the tank pressure.



2. Unit Installation

Units should be installed only by personnel certified by Mitsubishi Electric.

- Securely fix the unit with bolts to keep the unit from falling down during earthquakes or due to strong winds.
- Install the unit on a foundation made of concrete or iron.
- Noise and vibrations from the unit may be transmitted through the floor and walls. Provide adequate protection against noise and vibration.
- Build the foundation in such way that the corners of the installation legs are securely supported as shown in the figure below. When using rubber vibration isolators, make sure they are large enough to cover the entire width of the unit's legs. If the corners of the legs are not firmly seated, the legs may bend.
- The projecting length of the anchor bolt should be less than 30 mm.
- This unit is not designed to be installed using hole-in anchor bolts unless brackets are used to support the four corners of the unit.
- The legs on the unit are detachable.
- Detaching the legs
  Loosen the three screws on the legs to detach each leg (two each in the front and back). If the finish coat becomes damaged when detaching the legs, be sure to touch it up.

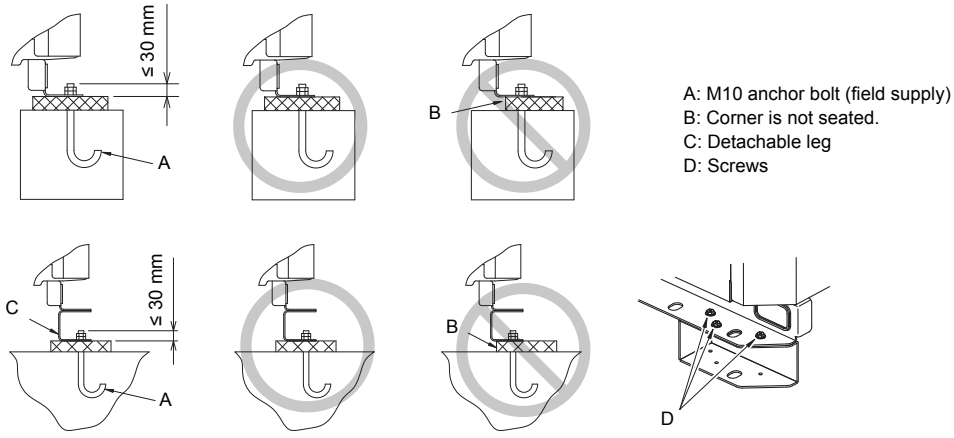
⚠ Warning:

- **Be sure to install the unit on a surface strong enough to withstand its weight to keep the unit from falling down and causing injury.**
- **Provide adequate protection against strong winds and earthquakes. Improper installation may cause the unit to fall down, resulting in personal injury.**

When building the foundation, take the floor strength, water drainage during operation, and piping and wiring routes into consideration.

Precautions for routing the pipes and wires underneath the unit without detachable legs

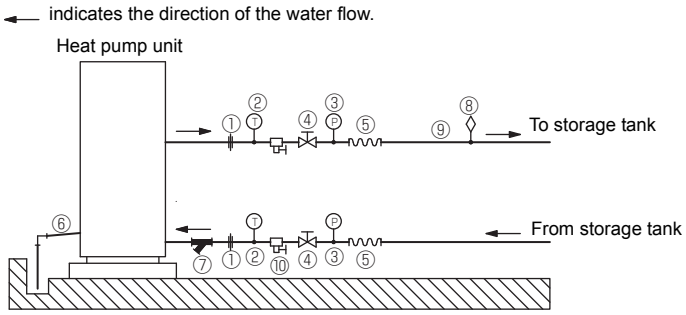
When routing the pipes and wires underneath the unit, make sure that the foundation will not block the piping access holes. Also, make sure the foundation is at least 100 mm high so that the piping can pass under the unit.



A: M10 anchor bolt (field supply)
B: Corner is not seated.
C: Detachable leg
D: Screws

3. Water Pipe Installation

[1] Schematic Piping Diagram and Piping System Components



Water piping diagram

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	Drain pipe	Install the drain pipe with a downward inclination of between 1/100 and 1/200. To prevent drain water from freezing in winter, install the drain pipe as steep an angle as practically possible and minimize the straight line. For cold climate installation, take an appropriate measure (e.g., drain heater) to prevent the drain water from freezing.
⑦	Strainer	Install a strainer near the unit to keep foreign materials from entering the water-side head exchanger (supplied).
⑧	Air vent valve	Install air venting valves to the places where air can accumulate. Automatic air vent valves are effective.
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.

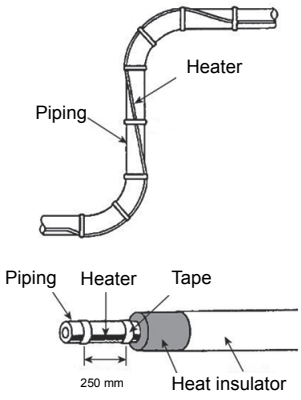
* Installing a freezing prevention heater

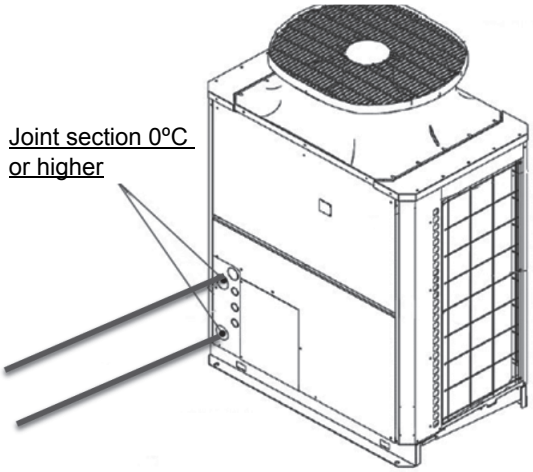
① In cold areas (where the outside temperature drops below freezing), provide a freezing prevention heater at all local pipes to prevent spontaneous freezing.

② After the heater is installed, check outside temperature +25ºC is ensured at the heat pump unit inlet/outlet pipe joint section (at outside temperature -25ºC, joint section 0ºC or higher).

③ Depending on the local piping material, prevent overheating by selecting a self temperature adjustment type heater or other method.

Heater installation example



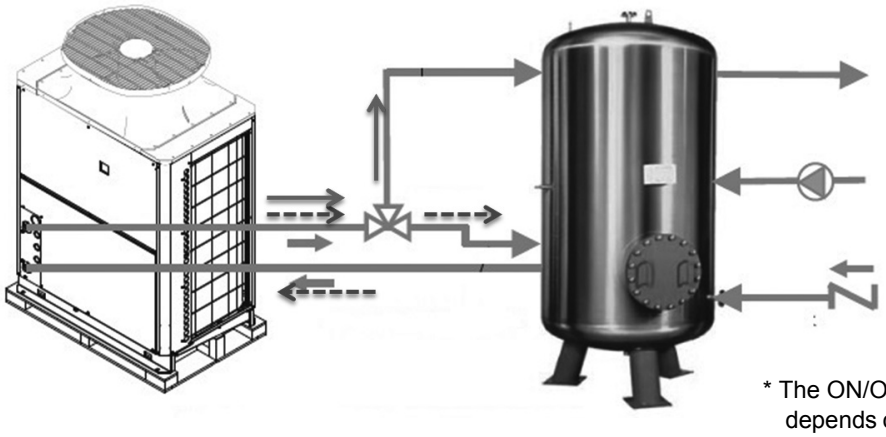


* 3-way valve installation

Please connect 3-way valve on the lower part of the storage tank except when the unit is in operation. Anti-freezing operation will keep the water in the tank circulated and water storage tanks can become thermally stratified.

: Anti-freezing operation
Residual running of the pump

: Hot water storage operation



* The ON/OFF control of 3-way valve depends on the output type “(r) EXTERNAL DEVICE” on page 58.

[2] 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 on the air-conditioner side. 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			Higher mid-range temperature water system Water Temp. > 60ºC	Make-up water criteria (with secondary side control enabled) Water Temp. > 60ºC	Tendency	
			Recirculating water	Recirculating water	Corrosive	Scale-forming
Standard items	pH (25˚C)		6.5 ~ 8.0	6.5 ~ 8.0	○	○
	Electric conductivity	(mS/m) (25˚C) (μs/cm) (25˚C)	30 or less [300 or less]	30 or less [300 or less]	○	○
	Chloride ion	(mg Cl^-/ℓ)	30 or less	30 or less	○	
	Sulfate ion	(mg $SO4^{2-}$/ℓ)	30 or less	30 or less	○	
	Acid consumption (pH4.8)	(mg $CaCO_3$/ℓ)	50 or less	50 or less		○
	Calcium hardness	(mg $CaCO_3$/ℓ)	6.5 ≤ pH ≤ 7.5 : 90 or less 7.5 ≤ pH ≤ 8.0 : 50 or less	250 or less		○
	Ionic silica	(mg SiO_2/ℓ)	30 or less	30 or less		○
Reference items	Iron	(mg Fe/ℓ)	0.3 or less	0.3 or less	○	○
	Copper	(mg Cu/ℓ)	0.1 or less	0.1 or less	○	
	Sulfide ion	(mg S^{2-}/ℓ)	Not to be detected	Not to be detected	○	
	Ammonium ion	(mg NH_4^+/ℓ)	0.1 or less	0.1 or less	○	
	Residual chlorine	(mg Cl/ℓ)	0.1 or less	0.1 or less	○	
	Free carbon dioxide	(mg CO_2/ℓ)	10.0 or less	10.0 or less	○	

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.

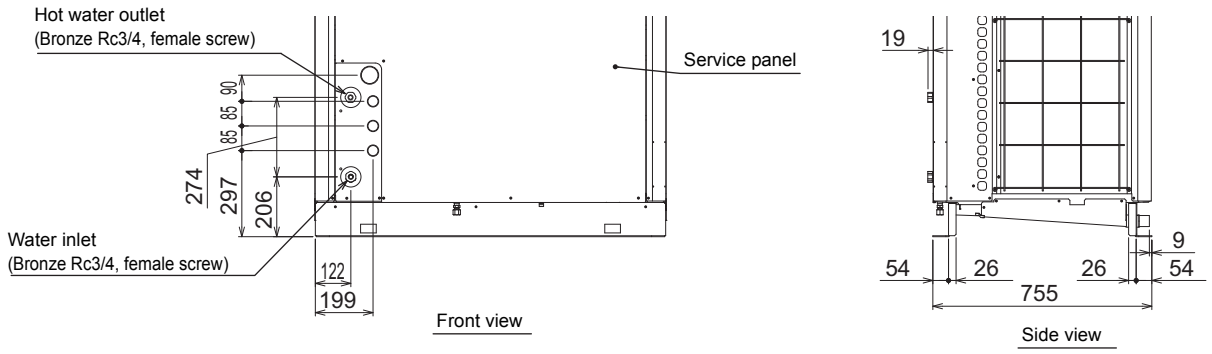
(5) Suspended solids in the water

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 (60 mesh or better) at the inlet of the unit to filter out suspended solids.

(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.

[3] Water Pipe Hole Size and Location



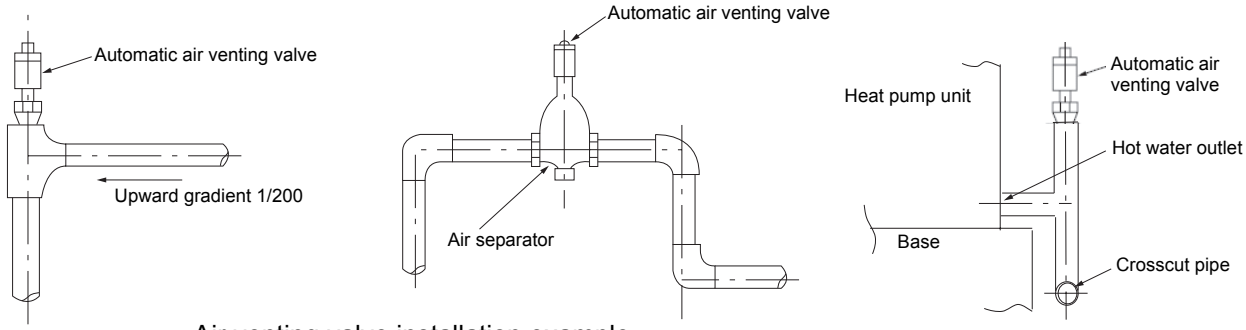
[4] Pipe gradient and air venting valve (Outlet hot water pipe)

During the hot water storage operation, the air dissolved in the water is discharged in the form of bubbling from the outlet hot water pipe to quickly raise low-temperature water to the required temperature. When the air accumulates in the pipe, the resistance of the water circuit will increase and the flow rate will extremely decrease. Because of this, an installation of automatic air venting valves is required when there is a pipe that slopes down in the outlet hot water pipe.

Install the pipe with an upward gradient of 1/200 or more toward the air vent to prevent air accumulation in the pipe. Also, install air venting valves to the places where air can accumulate. The installation example is shown below.

Note:

- If the crosscut pipe is located lower than the hot water outlet of the heat pump unit, raise the pipe near the unit and install an automatic air venting valve.



Air venting valve installation example

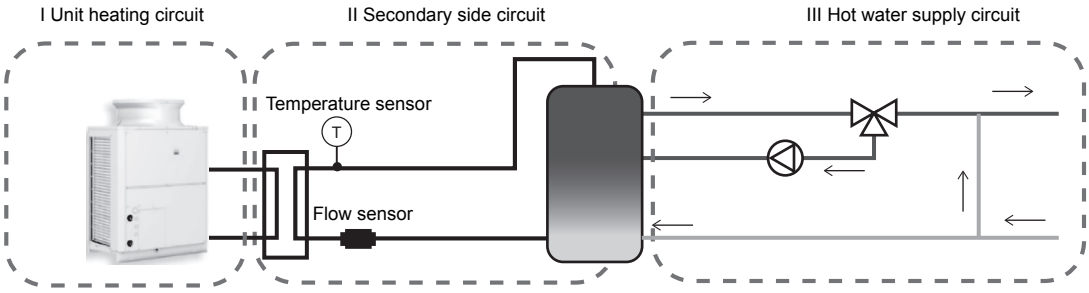
[5] Outlet check valve (When installing multiple units)

When connecting multiple units with pipes in parallel, install a check valve at the outlet pipe of each unit. If a check valve is not installed, a circuit in which warm water flows back will be created in some units during the defrost cycle or abnormal stop, and other units will come to an abnormal stop due to sudden change of the inlet water temperature.

[6] Secondary side control system

When employing an indirect heat exchanger system using a separately sold Q-1SCK, be careful with regard to the following points.

Install the Q-1SCK (flow sensor and temperature sensor) in the secondary side circuit as shown below to perform control.



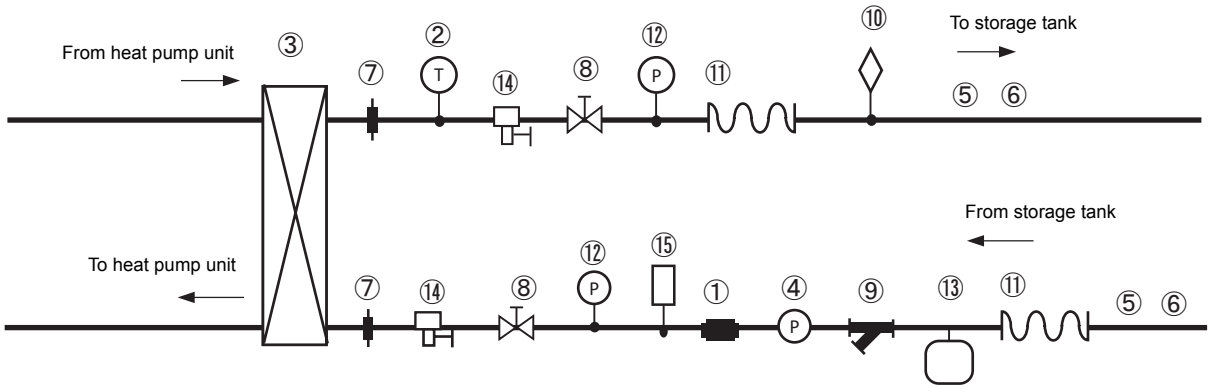
(1) Notes on configuring and selecting components

① Points to note for secondary side water piping

I Details on components in the unit heating circuit
* For details, refer to page 11.

II Details on components in heat exchanger heating circuit

Schematic Piping Diagram and Piping System Components for secondary circuit



No.	Component	Application	Remarks and notes on selecting and installing components
①	Flow sensor (Optional parts)	Measures and controls the secondary side flow rate.	Be sure to install this component between the downstream of the flow rate adjustment device and the heat exchanger.
②	Temperature sensor (Optional parts)	Measures and controls the secondary side outlet hot water temperature.	Install this component at the outlet of the heat exchanger.
③	Plate heat exchanger	Exchanges heat between hot water output from the unit and water input from the tank.	Select a heat exchanger that is appropriate for the capacity.
④	Pump + Flow rate adjustment device	Outputs hot water from the secondary side and adjusts the flow rate.	Select a pump and flow rate adjustment device that are suitable for the system. Install them at the lower outlet of the tank.
⑤	Water piping	Water flow channel	Be sure to perform insulation work. Select pipes that allow for easy air bleeding.
⑥	Anti-freeze heater	Prevents pipe damage due to freezing of the water circuit.	This component needs to be installed in a location where an ambient temperature may fall to 0˚C or less.
⑦	Union joint	Improves the workability of replacing equipment.	Install these components in the two places of the chilled water passage section and the high temperature water passage section to enable replacement.

No.	Component	Application	Remarks and notes on selecting and installing components
⑧	Valve	Improves the workability of cleaning the heat exchanger and replacing parts.	Install these components in the two places of the chilled water passage section and the high temperature water passage section to enable replacement.
⑨	Strainer	Prevents foreign materials from entering into the heat exchanger.	Install a strainer with 60 mesh or better near the heat exchanger.
⑩	Air vent valve	Bleeds air from the pipe.	Install air vents in places where there is a risk of air accumulating.
⑪	Flexible joint	Prevents the propagation of vibration.	These components need to be installed in consideration of the pipe load as pipes are easily damaged by bending.
⑫	Water pressure gauge	Used to check the operation status.	Attach this component to each piping section to check the water pressure.
⑬	Expansion tank	Absorbs excessive water pressure due to expansion caused by a rise in temperature.	Select an expansion tank that is suitable for the system.
⑭	Drain valve	Improves workability of replacing equipment.	Install these components in the two places of the chilled water passage section and the high temperature water passage section to enable replacement.
⑮	Safety valve	Prevents rupturing of the water circuit.	Be sure to provide an escape pipe to prevent discharged water from spraying on passersby.

② Selection criteria for heat exchanger

Step 1 Determination of prerequisites for selection

I Heat exchanger capacity 40000 W

II Estimation of outlet hot water and inlet water temperatures
As a guide, select a heat exchanger of which the temperature difference between the high temperature section and the low temperature section will be 5˚C or below.

II-1 Outlet hot water temperature (when secondary side outlet hot water temperature is set to 65˚C (setting at the time of shipment))
- Secondary side circuit outlet hot water temperature: 65˚C
- Unit outlet hot water temperature: 70˚C

II-2 Inlet water temperature
- Secondary side inlet water temperature: 10˚C
- Unit inlet water temperature: 15˚C

III Used flow rate
(40000 W/(70-15)˚C/4200 J/kg•K) × 60 s = 10.4 kg/min ≈ 10.4 ℓ/min

Step 2 Determination of model

Notes on selection
- Select a heat exchanger that allows water to pass through both of the flow channels.
- Select a heat exchanger so that the pressure applied to the heat exchanger in the on-site system will not exceed the maximum operating pressure of the heat exchanger.
- Select a heat exchanger that allows flowing at a flow rate of maximum 30 ℓ/min.
- Select a heat exchanger with a capacity of at least 40000 W.
- Ensure that the shearing stress at the flow rate to be used will be 16 Pa or more. (Refer to step 4.)

* To increase the shearing stress:
- When the area per plate is equal, select a vertically long heat exchanger.
- Select a heat exchanger of which NTU is high (although the heat transfer capacity improves as NTU increases, the pressure loss becomes high).

Step 3 Determination of specifications of the heat exchanger

Determine the model of heat exchanger and number of plates in consultation with the heat exchanger manufacturer based on the above requirements.

* To determine the number of plates, calculate the number of plates while referring to the example below.

Values to use when determining the number of plates:

① Overall heat transfer coefficient of corresponding heat exchanger

② Heat transfer area per plate

Calculation method

A Obtain the data of ① and ② from the heat exchanger manufacturer.

B Estimate the number of plates of the heat exchanger.

C Check that the number of transfer units for the corresponding number of plates matches between NTU1 and NTU2 (NTU1=NTU2).
If they are matched, select a heat exchanger having the corresponding number of plates. If they are not matched, change the number of plates and then return to B to perform the calculation again.

$$NTU1 = \frac{\Delta T1}{\Delta T} \quad NTU2 = \frac{K \times A}{V \times C}$$

ΔT1: Temperature difference between inlet and outlet

ΔT: Temperature difference of high temperature part (low temperature part)

K: Overall heat transfer coefficient (W/m^{2}K)

A: Total heat transfer area (m^2)

G: Total mass flow rate (kg/s)

C: Specific heat (J/kgK)

Step 4 Calculation of the shearing stress

Calculate the shearing stress using the following method.

Values required for calculation

- Relationship between flow rate and pressure loss of corresponding heat exchanger (Obtain the data from the heat exchanger manufacturer.)

Calculation method

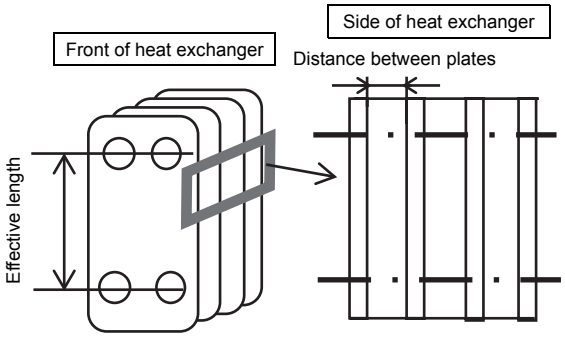
Calculate the shearing stress using the following formula.

$$\tau = \frac{\Delta P}{4} * \frac{\text{Representative length of 1 channel}}{\text{Effective length}}$$

Effective length:
Length between water inlet and water outlet
(refer to the figure on the right)

Representative length of 1 channel:
Distance between plates
(refer to the figure on the right) × 2

ΔP: Pressure loss



A shearing stress of 16 Pa or higher is required to reduce the amount of scale that adheres.
If the shearing stress is low:

- Select a vertically short shape.
- Change the shape of the plates.

Reselect a heat exchanger that will increase the shearing stress by following methods described above.

③ Configuration method and selection criteria of flow rate adjustment device

In this system, a flow rate adjustment device is installed in the secondary side circuit to perform secondary side flow rate adjustment control by outputting 0 to 10 V from the unit.

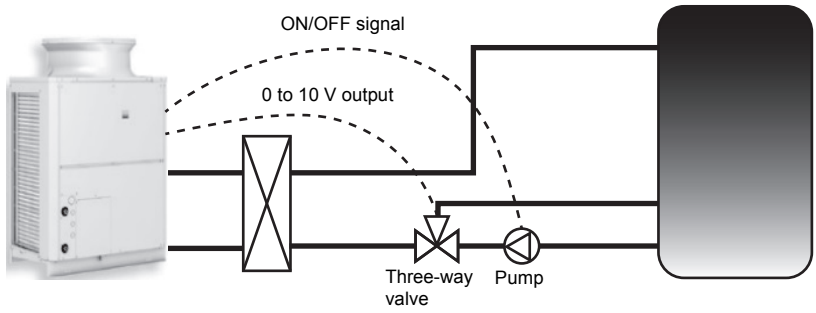
* 10-V power supply is not supplied.

The following shows a system configuration example of the flow rate adjustment device and notes on the system configuration.

The following three system types are recommended as flow rate adjustment devices:

1. System using a three-way valve
2. System using a two-way valve
3. System using an inverter

1. System using a three-way valve



Overview of system

This system has a pump provided at the outlet of the tank and a three-way valve provided downstream of the pump, and adjusts the flow rate by controlling the opening and closing of the three-way valve.

	Flow rate output device	Flow rate adjustment device
	Pump	Three-way valve
Wiring connection places	1-3 of CN512 of control board (ON/OFF output)	Sub box terminal block No. 10, 11, 12

Notes on selection method and system configuration

Notes on pump selection and connection

- Calculate the total pump head according to the system at the site and then select a pump capable of outputting the minimum flow rate of about 3 ℓ/min and maximum flow rate of about 30 ℓ/min with the necessary pump head for the piping at the site.
- When selecting the pump, please note that output at a high flow rate will not occur if the flow rate with the pump head of the system at the site is low, and output at a low flow rate will not occur if the flow rate is too high.
- Be sure to check that the flow rate becomes 20 to 30 ℓ/min at the maximum output during a flow rate adjustment test run (refer to page 37).
  For how to check the flow rate, refer to page 38.

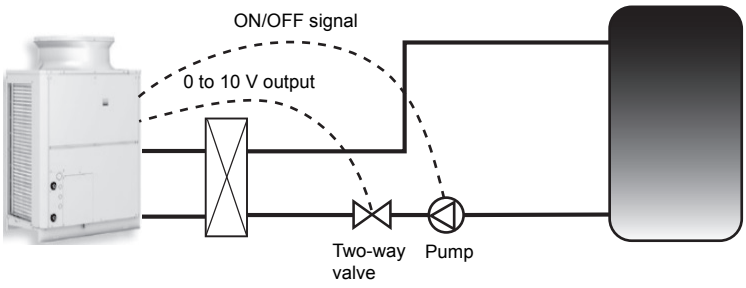
* If the flow rate is not within the range of 20 to 30 ℓ/min, select a different pump or adjust the maximum frequency using an inverter, etc. so that the maximum flow rate of 20 to 30 ℓ/min is achieved.

* To select a proper pump, first select a pump that supports slightly high flow rate, and then adjust the frequency with an inverter so that the flow rate becomes 20 to 30 ℓ/min at the maximum output.
(In that case, an inverter is necessary to be prepared separately.)

Notes on three-way valve selection and connection

- Use a valve that is capable of adjusting the flow rate with a 0 to 10 V input.
- Calculate the Cv value and select a valve that supports an appropriate rate.
- Select a valve of which the ratio of the maximum flow rate and the minimum flow rate will be at least 1:10.
- Place the three-way valve downstream of the pump. Connect one outlet to the heat exchanger.
  Connect the other outlet to the lower part of the tank.
- Carefully read the instruction manual and use the three-way valve in accordance with the usage procedures.

2. System using a two-way valve



Overview of system

This system has a pump provided at the outlet of the tank and a two-way valve provided downstream of the pump, and adjusts the flow rate by controlling the opening and closing of the two-way valve.

	Flow rate output device	Flow rate adjustment device
	Pump	Two-way valve
Wiring connection places	1-3 of CN512 of control board (ON/OFF output)	Sub box terminal block No. 10, 11, 12

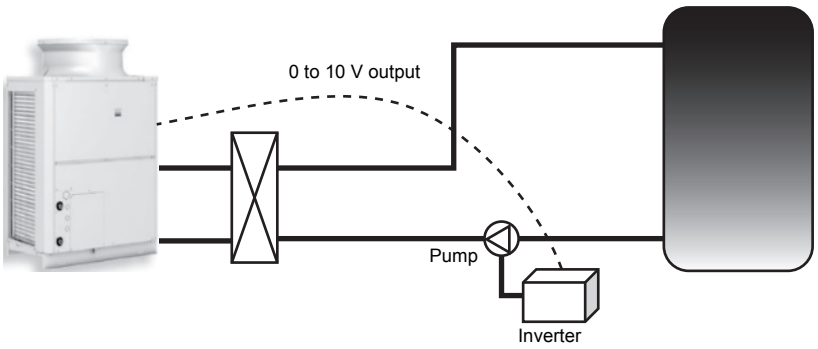
Notes on pump selection and connection

Select a pump in the same way as for a system with a three-way valve.

Notes on two-way valve selection and connection

- Use a valve that is capable of adjusting the flow rate with a 0 to 10 V input.
- Calculate the Cv value and select a valve that supports an appropriate rate.
- Select a valve of which the ratio of the maximum flow rate and the minimum flow rate will be at least 1:10.
- There are various kinds of two-way valve (such as ball valve, butterfly valve, and globe valve), and there are valves suitable for flow rate adjustment and valves that are not suitable for flow rate adjustment. Therefore be sure to select a two-way valve of a kind capable of precisely controlling the flow rate, such as a butterfly valve or globe valve.
- Place the two-way valve downstream of the pump.
- Carefully read the instruction manual and use the two-way valve in accordance with the usage procedures.

3. System using an inverter



Overview of system

This system has a pump provided at the outlet of the tank and an inverter connected to the pump, and adjusts the flow rate by changing the frequency of the inverter.

	Flow rate output device	Flow rate adjustment device
	Pump	Inverter
Wiring connection places	-	Sub box terminal block No. 10, 11, 12

Notes on pump selection and connection

Select a pump in basically the same way as for a system with a three-way valve or two-way valve.

- Select a pump that can be used also at a low frequency (6 Hz or less).
  (The motor may be seized depending on the pump selected as this control is performed at a low frequency.)
- Select a pump of which flow rate at 100% output is between 20 to 30 ℓ/min.

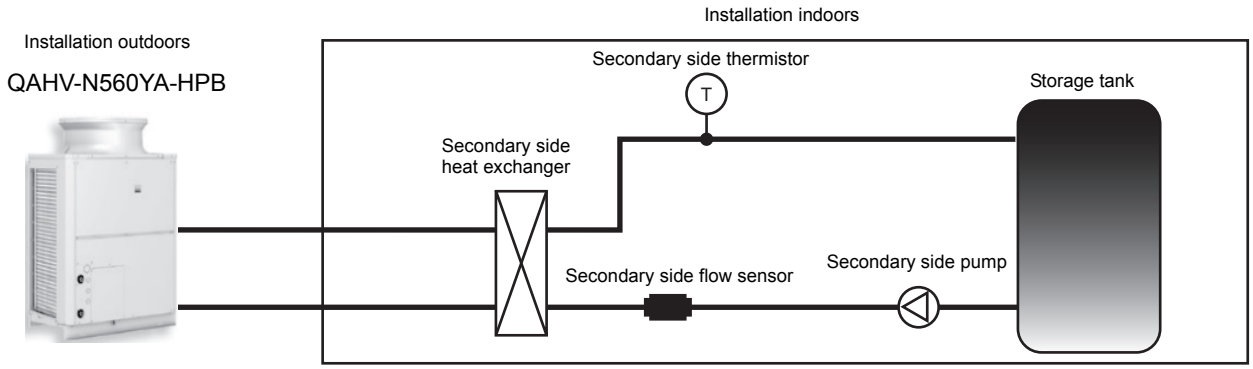
Notes on inverter selection and connection

- The inverter needs to be able to adjust output with a 0 to 10 input.
- Select an inverter that will not cause the seizing of the motor.
- Configure the settings so that the flow rate on the secondary side will become 0 ℓ/min when the unit is not operating.
- Carefully read the instruction manual and use the inverter in accordance with the usage procedures.

(2) Notes on other piping work

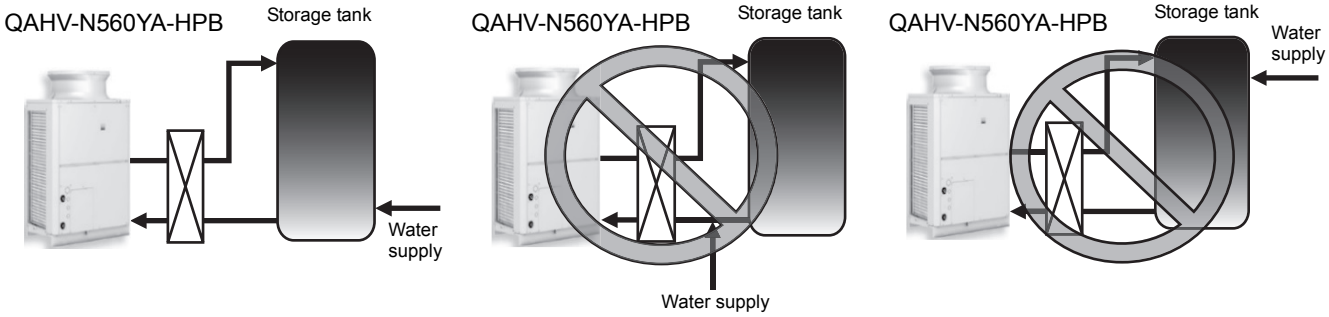
① Notes on installation location of secondary side circuit

Install the secondary side heat exchanger, secondary side thermistor, secondary side flow sensor, and secondary side pump indoors as shown in the figure for the secondary side circuit system. Also, take measures so that the piping will not freeze.



② Notes on hot water supply piping

Be sure to connect the hot water supply piping to the lower part of the storage tank. If you connect it to the unit inlet pipe, an abnormal stop (high pressure or gas cooler outlet temperature) may occur or the outlet hot water temperature may decrease due to the sudden change of the inlet water temperature (5 K/min or more instantaneously or 1 K/min or more consecutively) during operation.



③ About anti-freezing operation

This unit performs anti-freezing operation. Furthermore, the control method can be changed according to the system at the site. The following two items can be changed.

1. Prevent disturbance of thermal stratification in the tank

To prevent the disturbance of the thermal stratification in the tank while the indoor temperature is sufficiently high, set the item code 1514 to "1" so that the judgment criterion for starting the anti-freezing operation of the secondary side circuit matches with the secondary side circuit water temperature criterion.

Setting procedure and operation overview

Setting procedure		Operation
Item code 1514	0 (Initial setting)	Performs anti-freezing operation in the secondary side circuit when the water temperature in the unit side circuit becomes the standard value or below.
	1	Performs anti-freezing operation in the secondary side circuit when the water temperature in the secondary side circuit becomes the standard value or below.

2. Purpose and application: Prevent piping freezing when the secondary side control is used

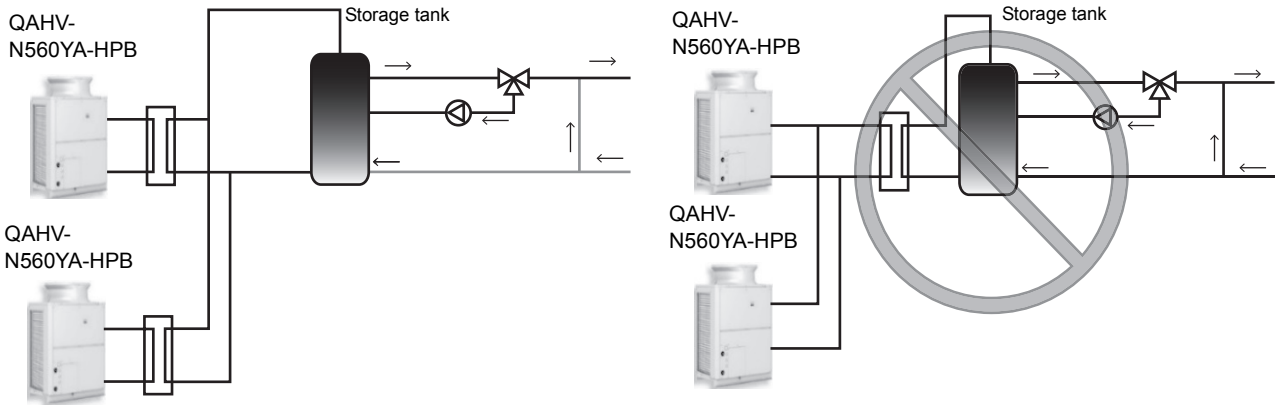
If the compressor is not run during the anti-freezing operation in the secondary side control system, there is a risk of the piping of the primary side freezing, so set SW2-5 to "ON" so that the compressor runs during the anti-freezing operation.

Setting procedure and operation overview

Setting procedure		Operation
SW2-5	OFF (Initial setting)	The compressor does not operate when the anti-freezing operation is performed.
	ON	The compressor operates when the anti-freezing operation is performed.

④ **When connecting multiple units**

To connect multiple units, configure one secondary side circuit system for each unit as shown in the figure below. (Install a heat exchanger, flow sensor, and thermistor for each unit.)

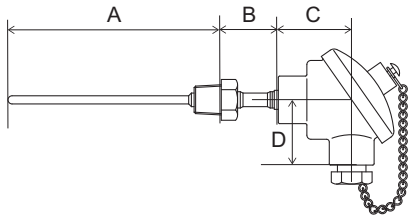
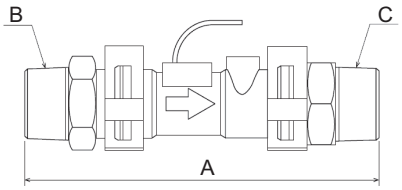


(3) Optional parts

The flow sensor and thermistor in the system are sold separately.

For the pipe connection method, refer to the manuals of the optional parts (Q-1SCK).

Secondary circuit kit Q-1SCK — The size and length noted are approximate.

Parts	Shape	Specification
Thermistor		A: 157 mm B: 42 mm C: 54 mm D: 48 mm
Flow sensor		A: 129 mm B: R3/4 C: R3/4 Wiring length: 1.9 m

(4) Setting method for secondary side control

After configuring the secondary side control system, perform the following operation to perform the secondary side control operation.

1. Set the digital setting item "121" to 1 (for details on the operating procedure, refer to page 28).
2. Perform a water flow rate adjustment operation (for details, refer to “Water flow rate adjustment operation (when the secondary side control is enabled)” (page 37)).

4. System Configurations

Test run procedural flow

1. System startup (*)

Configure the settings needed for the local system.

Refer to page 23 for details.

2. Air bleeding operation

Operate the unit's pump to perform the air bleeding operation.

Refer to page 33 for details.

3. Water flow rate adjustment operation

Adjust the unit's pump and flow rate adjustment valve.

Refer to pages 35 and 37 for details.

* If multiple units are connected to the same water circuit, perform the water flow rate adjustment operation for each unit simultaneously.

(*)

Request at the Time of a Test Run

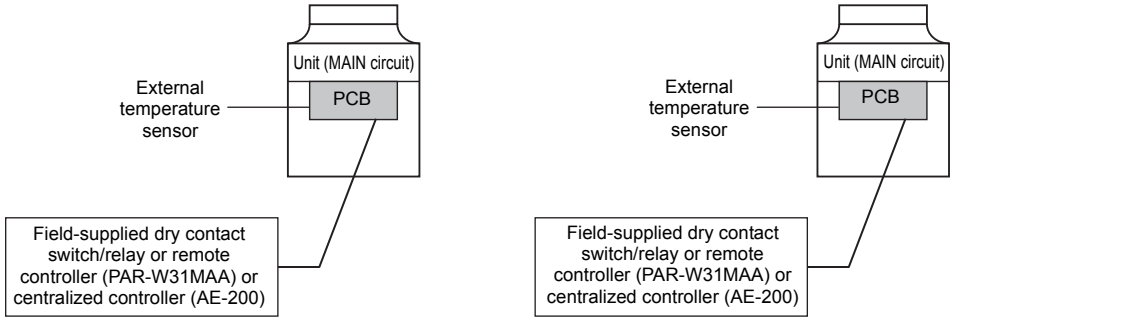
Set the slide switch SWS2 on the board inside the control box to the "lower side" during the test run.

By default, it is set to the "upper side" for forced stop of the pump and compressor to prevent the pump being damaged by the anti-freezing process in no water passing status or valve closed status before the test run.

[1] Schematic Diagrams of Individual and Multiple Systems

(1) Individual system

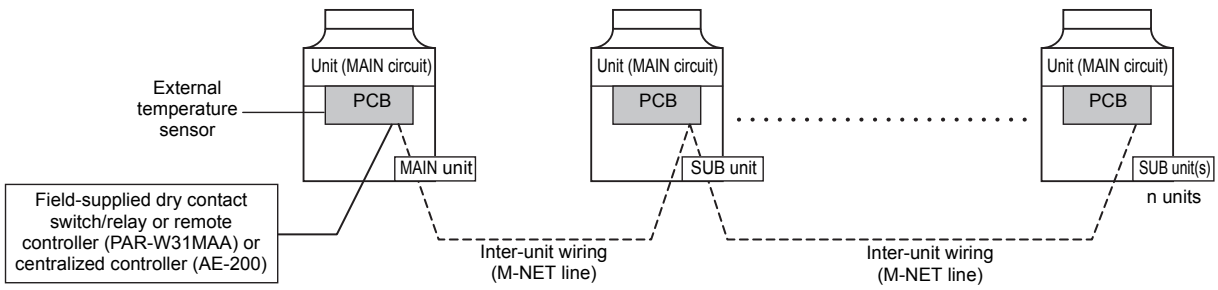
* Each unit is operated individually by connecting a dry contact switch/relay to each unit.



Refer to the sections "[2] Switch Types and the Factory Settings" (page 23) and "(3) System configuration procedures: Individual system" (page 27) for further details.

(2) Multiple system (2-16 units)

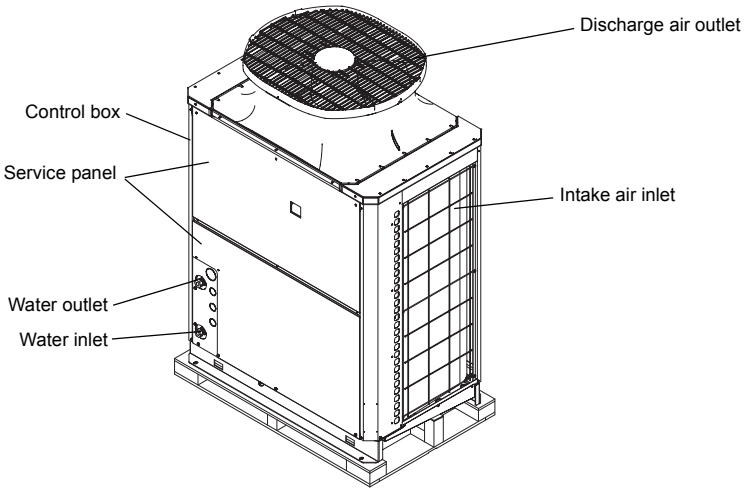
* A group of unit that consists of one main unit and up to 15 sub units is operated collectively by connecting an external water temperature sensor and a dry contact switch/relay to the main unit.



Refer to the sections "[2] Switch Types and the Factory Settings" (page 23) and "(4) System configuration procedures : Multiple system" (page 29) for further details.

[2] Switch Types and the Factory Settings

(1) Switch names and functions

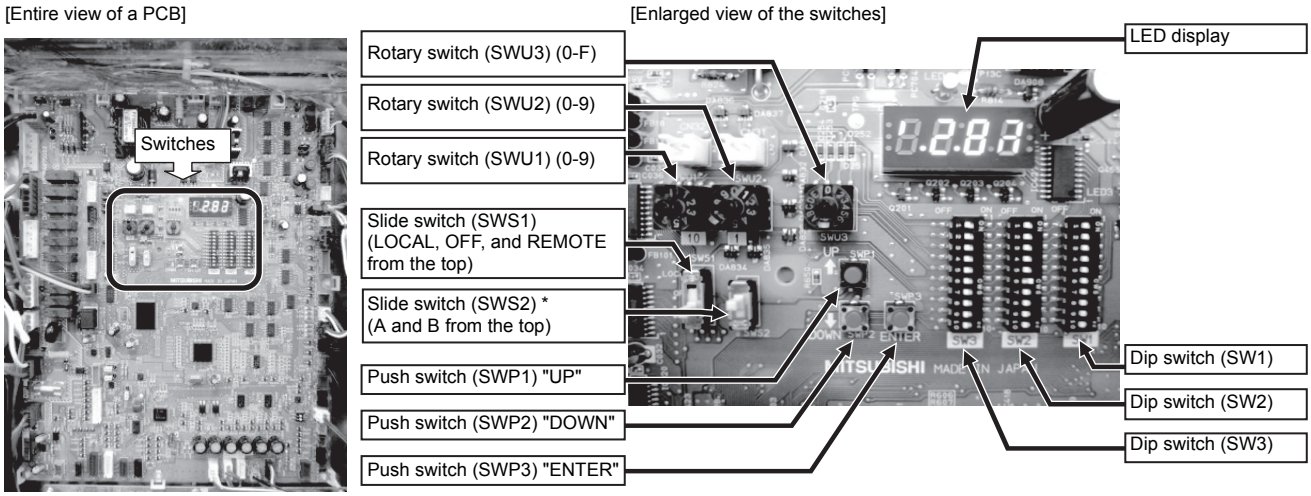


There are four main ways to set the settings as follows:

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

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

Different types of switches on the PCB

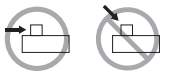


Set the slide switch SWS2 on the board inside the control box to the **lower side** during the trial run.

By default, it is set to the upper side for forced stop of the pump and compressor to prevent the pump being damaged by the anti-freezing process in no water passing status or valve closed status before the test run.

Upper side: A (under preparation)
Lower side: B (auto)
Always set to the lower side.

*** Setting to the upper side forcefully stops the pump and compressor thus the unit does not operate.**
*** When SWS2 is set to the upper side, the display shows "P.OFF" and the setting cannot be made. When "P.OFF" appears, set SWS2 to the lower side.**



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

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

SW		Function	Usage	Factory setting MAIN 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	Test run 1		OFF	-	Operation during test run	Any time
	7	Not used		OFF	Leave the setting as it is.		At a reset
	8	Test run 2		OFF	-	Operation during test run	Any time
	9	Test run 3		OFF	-	Operation during test run	
	10	Model setting		ON	Leave the setting as it is.		At a reset
SW2	1	Model setting		OFF	Leave the setting as it is.		At a reset
	2	Model setting		OFF	Leave the setting as it is.		At a reset
	3	Model setting		OFF	Leave the setting as it is.		At a reset
	4	Model setting		OFF	Leave the setting as it is.		At a reset
	5	Freeze-up protection method switching		OFF	Pump operation + heater energization	Compressor operation + heater energization	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	Model setting		OFF	Leave the setting as it is.		At a reset
	8	Model setting		OFF	Leave the setting as it is.		At a reset
	9	①Individual/Multiple system ②AE connection	①Selects between individual and Multiple system ②Selects AE connection or not	OFF	Individual system	Multiple system or during AE connection	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	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.	Any time
	3	Test run 4		OFF	-	Operating during test run	Any time
	4	Function switching (Do not change this setting.)		OFF	Leave the setting as it is.		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	Changes the 7-segment LED display mode.		Any time
	6	Display mode switch 2		OFF	Changes the 7-segment LED display mode.		Any time
	7	Display mode switch 3		OFF	Changes the 7-segment LED display mode.		Any time
	8	Display mode switch 4		OFF	Changes the 7-segment LED display mode.		Any time
	9	Display mode switch 5		OFF	Changes the 7-segment LED display mode.		Any time
	10	Display mode switch 6		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 32 for how to reset errors.

[3] Configuring the Settings

The settings must be set only by a qualified personnel.

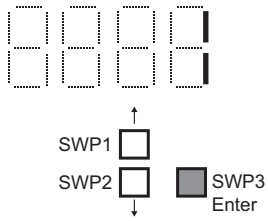
<1> Making the settings

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

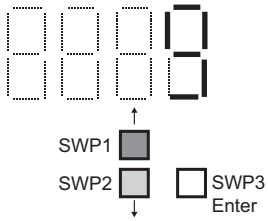


Normally an item code appears on the display.
(The figure at left shows the case where item code 1 is displayed.) Press SWP3 (Enter) to advance the item code.

↓

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

②

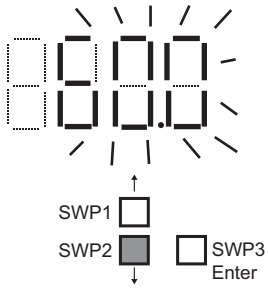


The left figure shows a display example (Code 9 Outlet hot water temperature setting).

↓

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

③

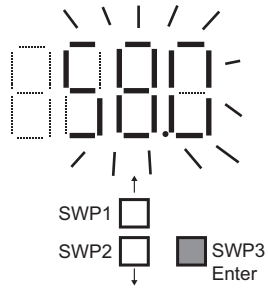


The current setting value will blink.

↓

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) Table of settings items

Set the dip switches SW2 and SW3 as shown in the table below to set the value for the items in the "Setting item" column.

	Dip switch settings	Setting item	Item code	Unit	Lower limit	Upper limit	Initial value	Setting value
Basic settings	SW2-10: OFF SW3-5, 6, 7: OFF SW3-8, 9, 10: ON	Unit address	105	-	1	8	2	
		Number of connected GS to M-NET	106	-	0	16	1	
		AE-200 connection (0: Not connected, 2: Connected)	107	-	0	2	0	
		Function 1 (Sub sensor: 2, Main sensor: 1, Sub unit: 0)	110	-	0	2	0	
		M-NET address of main sensor of own tank	111	-	1	50	1	
		Address of sensor connection unit	112	-	1	51	51	
		Secondary control availability (0: Not available 1: Available)	121	-	0	1	0	
Basic settings	SW2-10: OFF SW3-5~8, 10: OFF SW3-9: ON	Model display	0	-	-	-	-	
		Current time	1	Hour and minutes	0:00	23:59	-	
		Current inlet water temperature (display function only)	c01	ºC	-	-	-	
		Current outlet water temperature (display function only)	c02	ºC	-	-	-	
		Outdoor temperature (display function only)	c03	ºC	-	-	-	
		Storage tank water temperature (display function only)	c04	ºC	-	-	-	
		Demand control - maximum capacity setting	2	%	0	100	100	
		Demand control - start time	3	Hour and minutes	0:00	23:59	13:00	
		Demand control - end time	4	Hour and minutes	0:00	23:59	16:00	
		Outlet hot water temperature (boiling temperature)	9	ºC	40	Secondary contlol disabled: 90.0 Secondary contlol enabled: 80.0	65	
		High- and low-pressure display interval P	1051	Seconds	0	100	3	
		Low noise operation - maximum capacity	1054	%	0	100	70	
		Low noise operation - start time	1058	Hour and minutes	0:00	23:59	0:00	
		Low noise operation - end time	1059	Hour and minutes	0:00	23:59	0:00	
	SW2-10: OFF SW3-5~7, 9, 10: OFF SW3-8: ON	Thermo-ON prohibition time Sjs1	1025	Seconds	0	480	60	
		Sensor method setting (0: Local control, 1: Three-sensor, 2: Six-sensor)	1214	-	0	2	0	
		Mode 1 Thermo-ON thermistor selection	1500	-	1	Six-sensor system: 6 Other system: 3	3	
		Mode 1 Thermo-OFF thermistor selection	1501	-	1	Six-sensor system: 6 Other system: 3	3	
		Mode 2 Thermo-ON thermistor selection	1502	-	1	Six-sensor system: 6 Other system: 3	1	
		Mode 2 Thermo-OFF thermistor selection	1503	-	1	Six-sensor system: 6 Other system: 3	2	
		Mode 3 Thermo-ON thermistor selection	1504	-	1	Six-sensor system: 6 Other system: 3	1	
		Mode 3 Thermo-OFF thermistor selection	1505	-	1	Six-sensor system: 6 Other system: 3	3	
		Number of water control modes	1507	-	1	3	1	
		Mode 1 Thermo differential value	1508	-	0	30	10	
		Mode 2 Thermo differential value	1509	-	0	30	10	
		Mode 3 Thermo differential value	1510	-	0	30	10	
		Anti-freezing setting (0: Outdoor, 1: Indoor)	1514	-	0	1	0	

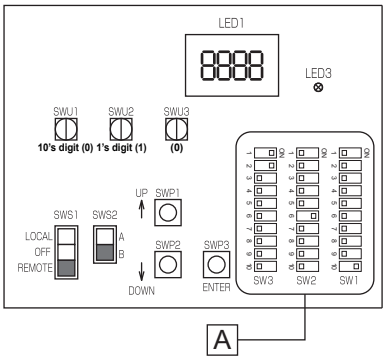
(3) System configuration procedures: Individual system

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

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

Refer to “Factory Switch Settings (Dip switch settings table)” (page 24) for further details.

- When AE-200 is connected, set the dip switch 2-9 to ON.

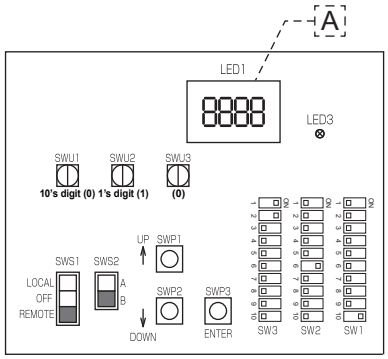


2. Switch on the power to the unit.

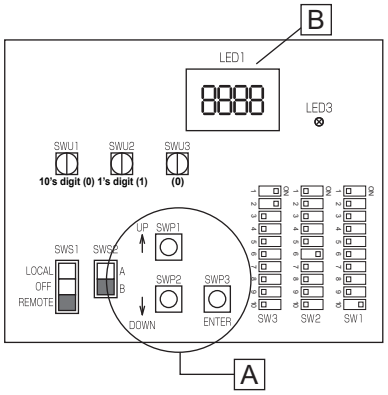
Check for loose or incorrect wiring, and then switch on the power to the unit.

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

- [EEEE] will appear on LED1 in the circuit board (labeled A in the figure at right).
  [--ng] is displayed before the water flow rate adjustment operation is performed. Cancel the [--ng] display by using one of the following methods.
  - •Press SWP3.
  - •Press SWP1 or SWP2.



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



(1) Set the dip switches SW2 and SW3 by following the procedure in page 49. (Set the dip switches 3-8, 3-9, and 3-10 to ON.)
   * [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]→[104]→[105]→[106]→ [107]....)

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

(4) Press SWP3 to save the changed value.

(5) Set the dip switches 3-8, 3-9, and 3-10 to OFF.

(6) When connecting AE-200, perform the procedures described in 4 on page 31.

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

[101] Not used

[104] Not used

[105] Function setting (When AE-200 is not connected to QAHV, the values set by rotary switches SWU1 and SWU2 are set as the preset values. When AE-200 is connected to QAHV, set the preset values referring to the notes below.)

[106] Total number of units in the system (Initial value: 1) (Leave it as it is.)

[107] “2” when connected to AE-200 (Initial value: 0)

[108] Not used

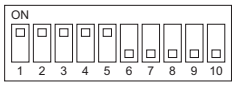
[109] Not used

[110] Function setting (“1” when connected to AE-200) (Initial value: 0)

[111] M-NET address of main sensor of own tank (Initial value: 1)

[112 to 120] Not used

[121] Secondary side control is enabled when “1” is set. (Initial value: 0)



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

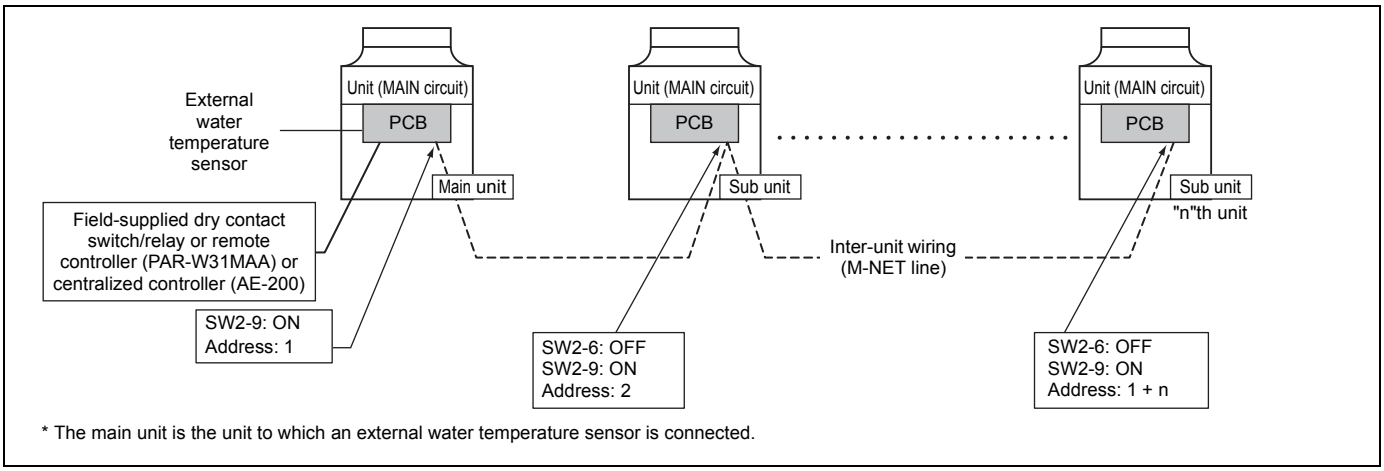
* When connecting AE-200 and remote controller (PAR-W31MAA) simultaneously, make the settings above, and then turn off the power, turn it back on, and set “1” for item code [105]. After these settings, perform the procedures described in (5) on page 32.

* 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.

(4) System configuration procedures : Multiple system

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

System configuration diagram



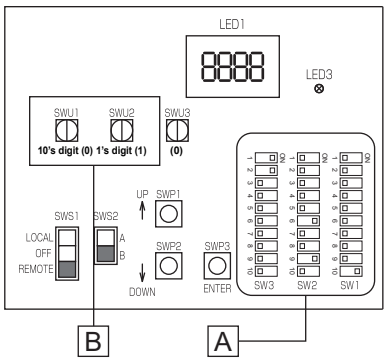
* The main unit is the unit to which an external water temperature sensor is connected.

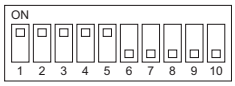
Setting the switches on the main unit

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

Refer to “Factory Switch Settings (Dip switch settings table)” (page 24) for further details.

Make sure the address of the main unit is set to "1" (labeled B in the figure at right).

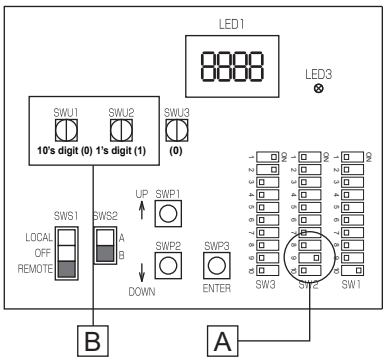




The figure at left shows that the switches 1 through 5 are set to ON and 6 through 10 are set to OFF.

Setting the switches on all sub units

(1) Set the dip switch SW2-9 to ON. (multiple unit control) (labeled A in the figure at right)
(2) Set the 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 on all sub units starting with 2.
(3) Set the dip switch SW2-6 to OFF. (power supply to communication circuit)

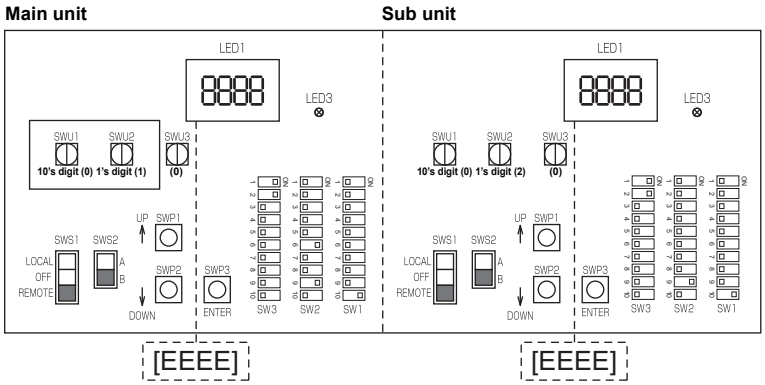


2. Switch on the power to the unit.

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 circuit board.



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

(1) Set the dip switches SW2 and SW3 by following the procedure in page 49. (Set the dip switches 3-8, 3-9, and 3-10 to ON.)

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

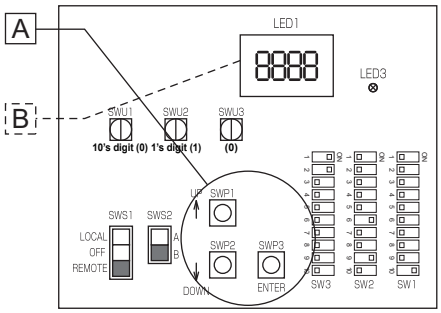
* [EEEE] will disappear, and an item code ([101]) will appear on LED1 (labeled B in the figure at right).

(3) 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] →[104]→[105]→[106]→[107]....)

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

(5) Press SWP3 to save the changed value.

(6) Set the dip switches 3-8, 3-9, and 3-10, to OFF.



Following the steps above, set the value for the following items with the switches on the circuit as necessary. Item [106] must be set when multiple units are connected to a system.

[101] Not used

[104] Not used

[105] Function setting (When AE-200 is not connected to QAHV, the values set by rotary switches SWU1 and SWU2 are set as the preset values. When AE-200 is connected to QAHV, set the preset values referring to the notes on page 31.)

[106] Total number of units in the system (Initial value: 1)

[107] “2” when connected to AE-200 (Initial value: 0)

[108] Not used

[109] Not used

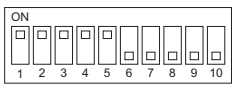
[110] Function setting (Initial value: 0)

[111] M-NET address of main sensor of own tank (Initial value: 1)

[112] Address of sensor connection unit

[113 to 120] Not used

[121] Secondary side control is enabled when "1” is set. (Initial value: 0)



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

*For details of the setting, see page 43.

4. Perform an initial setup on the unit

(1) Set the sub unit rotary switch SWU3 on the 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 sub unit 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).

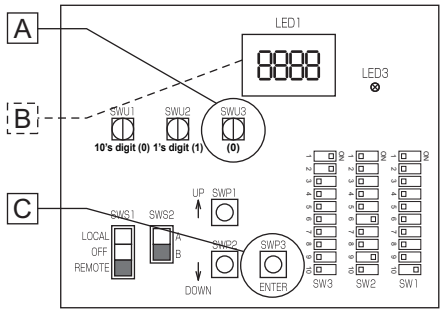
(3) Set the main unit rotary switch SWU3 on the unit (labeled A in the figure at right) to "F."
[EEEE] will appear in LED1 (labeled B in the figure at right). *1

(4) Press and hold the main unit 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).

(5) When start-up is complete, a control property [0001] will appear.
- Then, five seconds later, [FFFF] will appear. *2

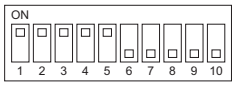
(6) Set the rotary switch SWU3 (labeled A in the figure at right) back to "0."
The start-up process is complete, and the settings for such items as clock, peak-demand control, schedule, and thermistor settings can now be made.

Main unit



*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."

*2 [--ng] is displayed before the water flow rate adjustment operation is performed.
Refer to “2. Switch on the power to the unit.” on page 27 for how to cancel [--ng].



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

* When connecting AE-200 and remote controller (PAR-W31MAA) simultaneously, make the settings above, and then turn off the power, turn it back on, and set “1” for item code [105] for the unit to which a remote controller is connected. After these settings, perform the procedures described in (5) on page 32.

Slide switch (SWS1) settings

Individual system

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

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	Sub unit
LOCAL	LOCAL	Follows the input signal of the Main unit	Follows the input signal of the Sub unit
	OFF		Ignores the signal input
	REMOTE		Follows the input signal of 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 unit
	OFF		Ignores the signal input
	REMOTE		Follows the input signal of the Main unit

(5) Re-initializing the system

When the settings for the items below have been changed, the system will require re-initialization.
- Dip switch SW2-9 (multiple unit control)
- External signal input setting: Item codes [105], [106], [107], [110], [111], [112], [121], and [1214]
- 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 [0001] will appear.
- Then, five seconds later, [FFFF] will appear.*

* If [EEEE] appears, perform the procedures in (2) again.
[--ng] is displayed before the water flow rate adjustment operation is performed.

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

(6) Resetting the system

Take the following steps to reset the system. An error can also be reset by taking the steps below.
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 [0001] will appear.
- Then, five seconds later, [FFFF] will appear.

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

[4] Air bleeding operation and flow rate adjustment operation during test run

(1)Air bleeding operation

Check there is no water leakage during operation.

For each circuit, perform at least three sets of at least 5 minutes in duration. During the air bleeding operation, use the method below (*1) to display the water flow rate during operation and check it is stable (no air entrainment).

(1)-1. Primary side water circuit air bleeding operation

Step	Contents	Operation and check points	Supplemental explanation
a	Water level check	Check the water level is not the full level. (Water is supplied even when the target water level has been reached.)	-
b	Power operation	Turn the power ON.	If the startup operation has not finished, SW2-9 and SW2-3 need to be set as a stopgap measure (see Note 1).
c	PCB DIP switch setting	Change the setting of SW1-8 from OFF to ON. SW1: 8 = ON, 9 = OFF	* Make sure SWS2 is set to the lower side. (See page 23.)
d	Operation procedure 2	Change the setting of PCB slide SWS1 from REMOTE to LOCAL. * When the pump sound has become quiet, end operation.	The compressor does not operate. * The pump and motor-operated valve 2 are automatically set to OPEN (starting water flow).
e	Stop operation 1	Change the setting of PCB DIP SW1-8 from ON to OFF.	* The pump and motor-operated valve 2 are automatically set to CLOSED (ending water flow).
f	Stop operation 2	Change the setting of PCB slide SWS1 from LOCAL to REMOTE.	-

(1)-2. Secondary side water circuit air bleeding operation

Step	Contents	Operation and check points	Supplemental explanation
a	Water level check	Check the water level is not the full level. (Water is supplied even when the target water level has been reached.)	-
b	Power operation	Turn the power ON.	If the startup operation has not finished, SW2-9 and SW2-3 need to be set as a stopgap measure (see Note 1).
c	Operation procedure 1	Check that the secondary side control is enabled.	For details, refer to page 28 (4-[3]-(3)-3).
d	PCB DIP switch setting	Change the setting of SW1-8 from OFF to ON. SW1: 8 = ON, 9 = OFF; SW3: 3 = ON	* Make sure SWS2 is set to the lower side. (See page 23.)
e	Operation procedure 2	Change the setting of PCB slide SWS1 from REMOTE to LOCAL. * When the pump sound has become quiet, end operation.	The compressor does not operate. * The pump and motor-operated valve 2 are automatically set to OPEN (starting water flow).
f	Stop operation 1	Change the setting of PCB DIP SW1-8 and SW3-3 from ON to OFF.	* The pump and motor-operated valve 2 are automatically set to CLOSED (ending water flow).
g	Stop operation 2	Change the setting of PCB slide SWS1 from LOCAL to REMOTE.	-

(*1) Water flow rate display method

①Set the PCB DIP switches as shown below.

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

②If the flow rate adjustment operation has never been performed, 'ng' appears on the PCB's digital display after the system startup operation. Press SWP1 (up) or SWP2 (down) to delete the 'ng' from the PCB's digital display (changing the display to a value such as 1).

③Press SWP3 repeatedly to change the code shown in the PCB's display. The code changes with each press. Continue pressing SWP3 until item code 'C25' is displayed in the PCB's digital display.

④Once 'C25' is displayed, press SWP1 or SWP2 to display and check the current flow rate.
After displaying the flow rate, the display shows the current item code (*2) if SWP1 to SWP3 are not operated for one minute. Display and check the current flow rate by pressing SWP1 or SWP2 again.

(*2) If the flow rate adjustment operation has never been performed, 'ng' appears in the PCB's digital display after the system startup operation. Press SWP1 or SWP2 to delete the 'ng' from the PCB's digital display (changing the display to 'C25').

(Note 1) As a stopgap measure, change the settings of SW2-9 and SW2-3 as shown in the table below, then restart the power.

	Multiple unit change-over switch SW2-9	Local/internal change-over switch SW2-3
When startup operation has not completed	OFF	ON
When startup operation has completed	-	-

If water shutoff error 2601 occurs during the air bleeding operation, remove the cause of the problem, then change the setting of PCB slide SWS1 from LOCAL to OFF, and back to LOCAL again. The air bleeding operation starts.

(You can clear water shutoff error by turning the power OFF and ON again. The equipment enters standby mode in this case.)

(You can also clear water shutoff errors by changing the setting of PCB DIP SW1-8 or 1-9 from ON to OFF. Turning DIP SW1-8 OFF starts circulation heating circuit air bleeding (manual). Turning DIP SW1-9 OFF starts water supply circuit air bleeding (manual).)

(2)Water flow rate adjustment operation (when the secondary side control is disabled)

Step	Contents	Operation and check points	Supplemental explanation
a	Water level check	Check the water level is neither at the full or empty level.	Water is supplied even when the target water level has been reached.
b	Power operation	Turn the power ON.	If the startup operation has not finished, SW2-9 and SW2-3 need to be set as a stopgap measure (see Note 1). If this flow rate adjustment operation has never been performed '--ng' is displayed.
c	Operation procedure	Change the setting of PCB slide SWS1 from REMOTE to LOCAL.	* Make sure SWS2 is set to the lower side. (See page 23.)
d	Operation procedure	Change the setting of SW1-6 from OFF to ON.	* Step c and Step d must be taken in sequence to run the flow-adjustment operation. * The pump operation and flow rate adjustment valve opening are automatically adjusted, and the flow rate is measured in 30 second intervals. * You can check whether this flow rate adjustment operation has ended or is underway using the setting given in Note 2.
e	Stop operation 1	Change the setting of SW1-6 from ON to OFF.	-
f	Stop operation 2	Change the setting of PCB slide SWS1 from LOCAL to REMOTE.	-

Checking the flow rate after the flow rate adjustment operation

The flow rate adjustment operation adjusts the pump output and water flow rate valve opening to determine how to match the flow rate characteristic to the local circuit. **Use the method below (*3 ① to ④) to check the operation result (characteristic).**

If air bleeding was not done fully and the map not created properly, a water shutoff error, high pressure error or other problems will occur when operating the system. Check the points below in this case. If the values are abnormal, redo the air bleeding and flow rate adjustment operations.

(*3)

①Set the PCB's DIP switches as shown below.

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

②Press SWP3 repeatedly to change the code shown in the PCB's display. The code changes with each press (*4).
Continue pressing SWP3 until 'dxx' is displayed in the PCB's digital display.
('dxx' is a code that stores the flow rate for a given pump output opening and valve opening. See Table 1.)

(*4) If the flow rate adjustment operation has never been performed, 'ng' appears after the system startup operation. Perform the flow rate adjustment operation in this case.

③Press SWP1 or SWP2 to display the operation result (flow rate characteristic) corresponding each flow rate code ‘dxx’ in Table 1 and write them down.

Table 1

	Close <---------- Water flow rate adjust valve opening ----------> Open								
Pump output opening/water flow rate adjust valve opening	1600	1400	1200	1000	800	600	400	200	100
Flow rate (pump output opening 16%)	d01	d02	d03	d04	d05	d06	d07	d08	d09
Flow rate (pump output opening 27%)	d10	d11	d12	d13	d14	d15	d16	d17	d18
Flow rate (pump output opening 100%)	d19	d20	d21	d22	d23	d24	d25	d26	d27

<Check result>

	Close <---------- Water flow rate adjust valve opening ----------> Open								
Pump output opening/water flow rate adjust valve opening	1600	1400	1200	1000	800	600	400	200	100
Flow rate (pump output opening 16%)									
Flow rate (pump output opening 27%)									
Flow rate (pump output opening 100%)									

④**Check the following.**

↓ Check the checkbox.

☐ **All places with flow rate valve opening 1000 through 100 are 2 L or above?**
If 2 L/min or below, air may not be bled out. Perform an air bleeding operation and water flow rate adjustment operation again.

☐ **When there are multiple units, the values of the same pump output opening and the same valve opening are not greater or less than those for other units by 10% and 2 L/min or more.**
(In multiple-unit system, perform a water flow rate adjustment operation at the same time.)

☐ **All the values (item codes d01 through d09) are not “0” when the pump output opening is 16%. (Not whole air is bled out.)**

(Note 1) Change SW2-9 and SW2-3 as a stopgap procedure as shown in the table below, and then turn the power on.

	Multiple unit change-over switch SW2-9	Local/internal change-over switch SW2-3
When startup operation has not completed	OFF	ON
When startup operation has completed	-	-

(Note 2) The table below shows the water flow rate adjustment operation status in 4 figures when the PCB DIP switch is set as shown in Note 3.

Water flow rate adjustment operation status	Display
Not completed	- - n g
Completed	- - - g
In operation	- i n g

(Note 3) PCB DIP switch settings

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

(3)Water flow rate adjustment operation (when the secondary side control is enabled)

Step	Contents	Operation and check points	Supplemental explanation
a	Water level check	Check the water level is neither at the full or empty level.	Water is supplied even when the target water level has been reached.
b	Power operation	Turn the power ON.	If the startup operation has not finished, SW2-9 and SW2-3 need to be set as a stopgap measure (see Note 1). If this flow rate adjustment operation has never been performed '--ng' is displayed.
c	Operation procedure 1	Check that the secondary side control is enabled.	For details, refer to page 28 (4-[3]-(3)-3).
d	Operation procedure 2	Change the setting of PCB slide SWS1 from REMOTE to LOCAL.	* Make sure SWS2 is set to the lower side. (See page 23.)
e	Operation procedure 3	Change the setting of SW1-6 from OFF to ON.	* Step d and Step e must be taken in sequence to run the flow-adjustment operation. The pump operation and flow rate adjustment valve opening are automatically adjusted, and the flow rate is measured in 30 second intervals. * You can check whether this flow rate adjustment operation has ended or is underway using the setting given in Note 2.
f	Stop operation 1	Change the setting of SW1-6 from ON to OFF.	-
g	Stop operation 2	Change the setting of PCB slide SWS1 from LOCAL to REMOTE.	-

Checking the flow rate after the flow rate adjustment operation

The flow rate adjustment operation adjusts the pump output and water flow rate valve opening to determine how to match the flow rate characteristic to the local circuit. **Use the method below (*3 ① to ④) to check the operation result (characteristic).**

If air bleeding was not done fully and the map not created properly, a water shutoff error, high pressure error or other problems will occur when operating the system. Check the points below in this case. If the values are abnormal, redo the air bleeding and flow rate adjustment operations.

(*3)

① Set the PCB's DIP switches as shown below.

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

② Press SWP3 repeatedly to change the code shown in the PCB's display. The code changes with each press (*4).

Continue pressing SWP3 until 'dxx' is displayed in the PCB's digital display.

('dxx' is a code that stores the flow rate for a given pump output opening and valve opening. See Table 1.)

(*4) If the flow rate adjustment operation has never been performed, 'ng' appears after the system startup operation. Perform the flow rate adjustment operation in this case.

③ Press SWP1 or SWP2 to display the operation result (flow rate characteristic) corresponding each flow rate code 'dxx' in Table 1 and write them down.

Table 1

Primary side circuit flow rate map

	Close <---------- Water flow rate adjust valve opening ----------> Open								
Pump output opening/water flow rate adjust valve opening	1600	1400	1200	1000	800	600	400	200	100
Flow rate (pump output opening 16%)	d01	d02	d03	d04	d05	d06	d07	d08	d09
Flow rate (pump output opening 27%)	d10	d11	d12	d13	d14	d15	d16	d17	d18
Flow rate (pump output opening 100%)	d19	d20	d21	d22	d23	d24	d25	d26	d27

(Check result)

	Close <---------- Water flow rate adjust valve opening ---------->Open								
Pump output opening/water flow rate adjust valve opening	1600	1400	1200	1000	800	600	400	200	100
Flow rate (pump output opening 16%)									
Flow rate (pump output opening 27%)									
Flow rate (pump output opening 100%)									

④-1 **Check the following. (Primary side circuit)**

Primary side circuit

↓ Check the checkbox.

☐ **All places with flow rate valve opening 1000 through 100 are 2 L or above?**
If 2 L/min or below, air may not be bled out. Perform an air bleeding operation and water flow rate adjustment operation again.

☐ **When there are multiple units, the values of the same pump output opening and the same valve opening are not greater or less than those for other units by 10% and 2 L/min or more.**
(In multiple-unit system, perform a water flow rate adjustment operation at the same time.)

☐ **All the values (item codes d01 through d09) are not "0" when the pump output opening is 16%. (Not whole air is bled out.)**

Table 2

Secondary side circuit flow rate map

Pump output value	0	5	10	15	20	25	30	35	40	45	50
Flow rate	d55	d56	d57	d58	d59	d60	d61	d62	d63	d64	d65
Pump output value	55	60	65	70	75	80	85	90	95	100	
Flow rate	d66	d67	d68	d69	d70	d71	d72	d73	d74	d75	

(Check result)

Pump output value	0	5	10	15	20	25	30	35	40	45	50
Flow rate											
Pump output value	55	60	65	70	75	80	85	90	95	100	
Flow rate											

④-2 **Check the following. (Secondary side circuit)**

↓ Check the checkbox.

☐ **Is the output at 100% (d75) between 20 ℓ/min and 30 ℓ/min?**
If the output is below 20 ℓ/min, water may not flow at a high flow rate during normal operation.
If the output is above 30 ℓ/min, water may not flow at a low flow rate during normal operation.

- Take a measure such as adjusting the frequency using an inverter, etc. so that the output at 100% (d75) becomes between 20 ℓ/min and 30 ℓ/min.

☐ **Does a value from 1 ℓ/min to 4 ℓ/min exist for the flow rate at an arbitrary output except 0%?**
If there was no value from 1 ℓ/min to 4 ℓ/min for the flow rate when any output except 0%, the flow rate may not be able to be controlled at a low flow rate.

- Carry out the air bleeding and flow rate adjustment operations again.
- Take a measure such as adjusting the frequency using an inverter, etc. so that a value from 1 ℓ/min to 4 ℓ/min exists for the flow rate during output.

(Note 1) Change SW2-9 and SW2-3 as a stopgap procedure as shown in the table below, and then turn the power on.

	Multiple unit change-over switch SW2-9	Local/internal change-over switch SW2-3
When startup operation has not completed	OFF	ON
When startup operation has completed	-	-

(Note 2) The table below shows the water flow rate adjustment operation status in 4 figures when the PCB DIP switch is set as shown in Note 3.

Water flow rate adjustment operation status	Display
Not completed	--ng
Completed	---g
In operation	-ing

(Note 3) PCB DIP switch settings

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

(1) Sensor method settings

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 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.

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.

	Item code	Increments	Lower limit	Upper limit	Initial value
Sensor method setting	1214	1	0	2	0

0: Local control method
1: Three-sensor method
2: Six-sensor method

* PAR-W31MAA or AE-200 is required when three-sensor or six-sensor method is used.

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.

* When using multiple units, configure the same settings for each unit.
* When “Local control method” is selected, hot water storage operation ON/OFF control is performed by ON/OFF status of TB6 32-33.

(2) Three-sensor method or six-sensor method setting

Use the separately sold thermistor (TW-TH16E) to control the water temperature in the storage tank.

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.

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 1500 through 1510 relate to sensor method 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	Limits and increments		
				Increments	Lower limit	Upper limit
Mode 1 Thermo-ON thermistor selection	1500	3	-	1	1	3 (6*)
Mode 1 Thermo-OFF thermistor selection	1501	3	-	1	1	3 (6*)
Mode 2 Thermo-ON thermistor selection	1502	1	-	1	1	3 (6*)
Mode 2 Thermo-OFF thermistor selection	1503	2	-	1	1	3 (6*)
Mode 3 Thermo-ON thermistor selection	1504	1	-	1	1	3 (6*)
Mode 3 Thermo-OFF thermistor selection	1505	3	-	1	1	3 (6*)
Number of water control modes	1507	1	-	1	1	3
Mode 1 Thermo differential value	1508	10	ºC	1	0	30
Mode 2 Thermo differential value	1509	10	ºC	1	0	30
Mode 3 Thermo differential value	1510	10	ºC	1	0	30

* Only for six-sensor method
  Thermistor number 1: TH15, 2: TH16, 3: TH17
* Set the item code 1507 to “3” when using all modes (Mode 1, 2, and 3).
  Set the item code 1507 to “2” when using mode 1 and mode 2.
  Set the item code 1507 to “1” when using mode 1.

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.

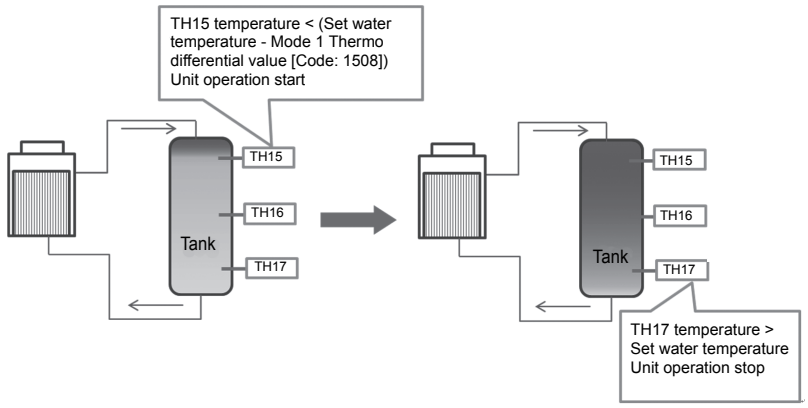
Usage example

Operation example (Three-sensor method - when a remote controller PAR-W31MAA is used)

Operation mode: Mode 1

Mode 1 Thermo-ON thermistor selection (Item code 1500): 1

Mode 1 Thermo-OFF thermistor selection (Item code 1501): 3

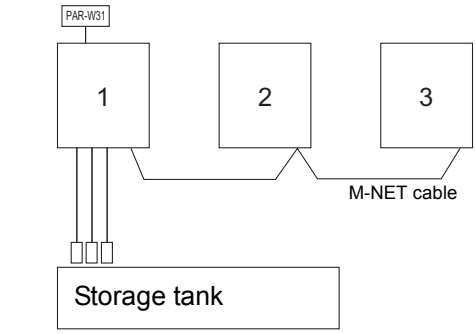


* Set the operation mode and water temperature from the remote controller PAR-W31MAA.

* Use the separately sold TW-TH16E temperature thermistor. Two or more units are needed to use the six-sensor method.
* Make sure to set the unit outlet hot water temperature.

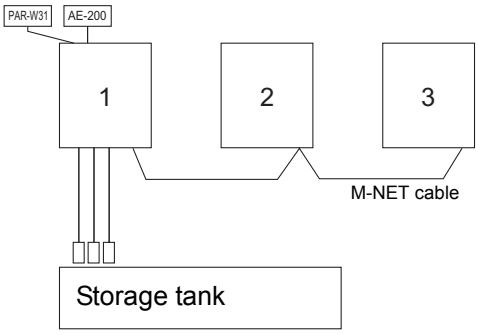
Referring to the figure below, configure the settings for each unit according to the system.

Three-sensor method



Address	Item code			
	106	110	111	1214
1	3	1	1	1
2	3	0	1	1
3	3	0	1	1

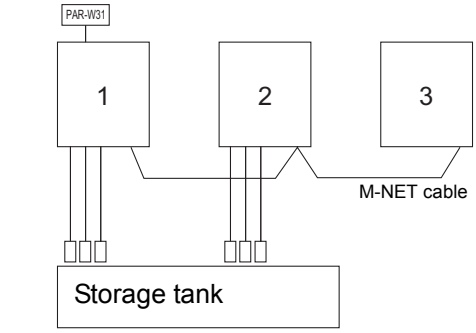
* SW2-9: ON (When multiple units are connected)



Address	Item code					
	105	106	107	110	111	1214
1	1	3	2	1	1	1
2	2	3	2	0	1	1
3	3	3	2	0	1	1

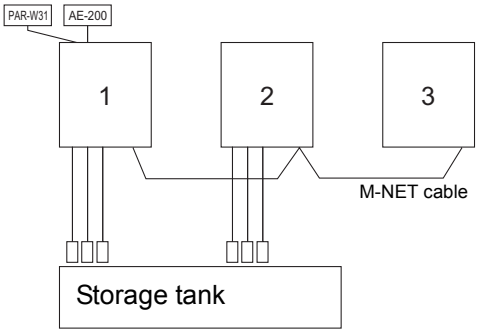
* SW2-9: ON (When multiple units are connected)
* When a remote controller is not connected, the setting for item code [105] is not required.

Six-sensor method



Address	Item code				
	106	110	111	112	1214
1	3	1	1	2	2
2	3	2	1	-	2
3	3	0	1	-	2

* SW2-9: ON



Address	Item code						
	105	106	107	110	111	112	1214
1	1	3	2	1	1	2	2
2	2	3	2	2	1	-	2
3	3	3	2	0	1	-	2

* SW2-9: ON
* When a remote controller is not connected, the setting for item code [105] is not required.

* For how to make item code settings, refer to page 40.

(3) Setting the outlet hot water temperature

① Selecting the outlet hot water temperature setting method

Select one of the following three outlet hot water temperature setting methods.

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.

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	
Setting method selection	1073	0	-	1	0	2	Not possible

0: Outlet Hot Water Temp. input PCB or PAR-W31MAA or AE-200
1: Outlet Hot Water Temp. input IT terminal
2: Outlet Hot Water Temp. input 4-20 mA (Analog input)

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.

* Configure the settings for all units even when controlling multiple units.

② Outlet hot water temperature setting method from PCB

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.

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	
Outlet Hot Water Temp. setting	9	65	ºC	0.5	40	*90 (80)	Possible

* This becomes the secondary side outlet hot water temperature when the secondary side control is enabled.

* Secondary control disabled: 90ºC, Secondary control enabled: 80ºC

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.

③Settings from PAR-W31MAA
Refer to page 75.

④Settings using Analog input

Remote water temperature setting input signal type

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 1075 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.

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

	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	1075	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.

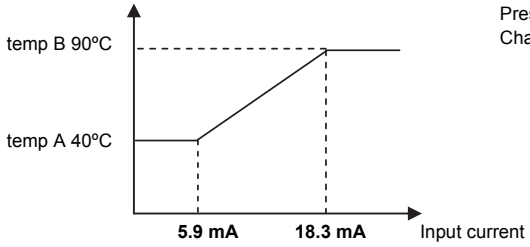
When the new setting is saved, the display will stop blinking and stay lit. The display will, then, return to the item code display mode.

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.

Setting the water temperature using analog signal input

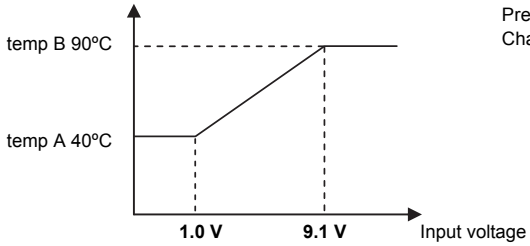
Select the analog input format

- When the water temperature setting input signal type is set to 0 (4-20 mA)
  - External analog input signal of between 5.9 and 18.3 mA: the preset temperature will be linearly interpolated.



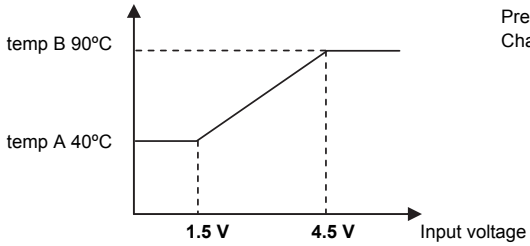
Preset temperature = (B - A) * (Input current - 5.9 mA) / 12.4 mA + A
Change of 0.12 mA or less is not recognized.

- When the water temperature setting input signal type is set to 1 (0-10 V)
  - External analog input signal of between 1.0 and 9.1 V: the preset temperature will be linearly interpolated.



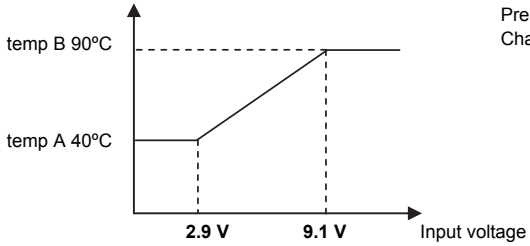
Preset temperature = (B - A) * (Input voltage - 1.0 V) / 8.1 V + A
Change of 59 mV or less is not recognized.

- When the water temperature setting input signal type is set to 2 (1-5 V)
  - External analog input signal of between 1.5 and 4.5 V: the preset temperature will be linearly interpolated.



Preset temperature = (B - A) * (Input voltage - 1.5 V) / 3.0 V + A
Change of 29 mV or less is not recognized.

- When the water temperature setting input signal type is set to 3 (2-10 V)
  - External analog input signal of between 2.9 and 9.1 V: the preset temperature will be linearly interpolated.



Preset temperature = (B - A) * (Input voltage - 2.9 V) / 6.2 V + A
Change of 59 mV or less is not recognized.

(4) Scheduled operation

Configure the schedule settings using a remote controller (PAR-W31MAA) or a system controller (AE-200).

(5) 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	13:00	Hour: minute	1	0000	2359	Not possible
Peak-demand control end time	4	16:00	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.

* The maximum frequency may be restricted depending on the inputs of maximum demand capacity and maximum low-noise capacity. Refer to page 73 for details.

(6) 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 table

	Item code	Increments	Lower limit	Upper limit	Initial value
Unit address	105	1	1	8	2
Total number of units in the system*1	106	1	0	16	1
AE-200 connection	107	2	0	2	0
Own unit role*2	110	1	0	2	0
Main sensor address	111	1	1	50	1
Sub sensor address*3	112	1	1	51	51
Secondary circuit control*4	121	1	0	1	0

*1 Enter the total number of units including the main unit. Applicable only to the main unit.
*2 0: Sub unit
1: Main sensor
2: Sub sensor (For six-sensor method)
*3 Set the address of the sub sensor for six-sensor method.
*4 0: Secondary side control disabled
1: Secondary side control enabled

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 32.

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

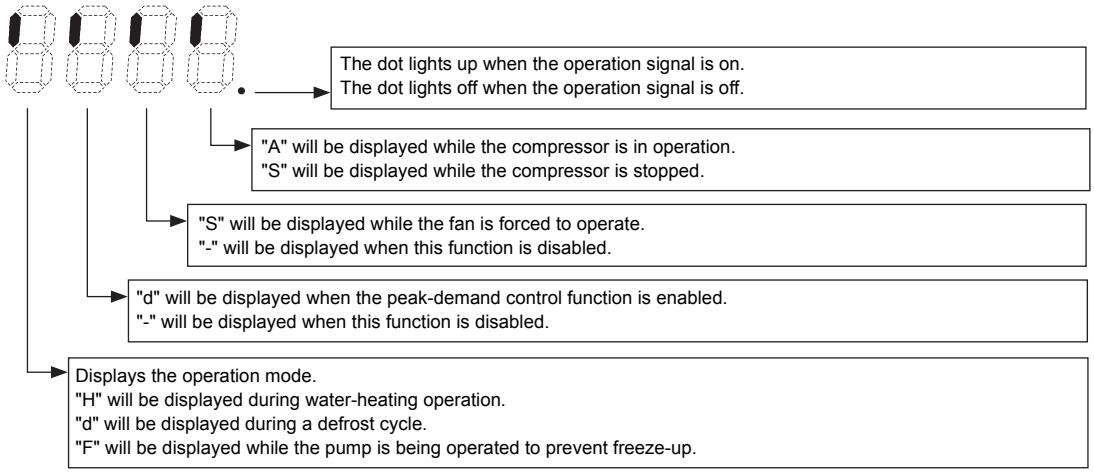
Setting the unit addresses

Refer to “(4) System configuration procedures : Multiple system” (page 29).

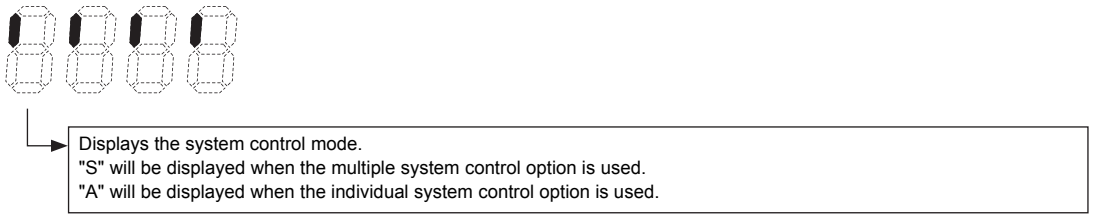
(7) Selecting the item that normally appears on the LED

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)

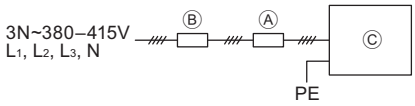


5. Electrical Wiring Installation

[1] Main Power Supply Wiring and Switch Capacity

Schematic Drawing of Wiring (Example)

Ⓐ: Switch (with current breaking capability)
Ⓑ: Current leakage breaker
Ⓒ: Outdoor 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		
QAHV-N560YA-HPB	10	-	10	63 A 100 mA 0.1 sec. or less	63	63	63	0.21 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, sunlight, rain).**
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 for outdoor use 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)
2.62 Ω

Control cable specifications

Remote controller cable	Size	0.3 - 1.25 mm² (Max. 200 m total)*2
	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 When the wiring length exceeds 10 m, use wire of 1.25 mm^2.

[2] Wiring for Configuring Secondary Side Control System

To configure a secondary side control system, you need to connect the wiring of the following three devices from the secondary side water circuit to the primary side unit.

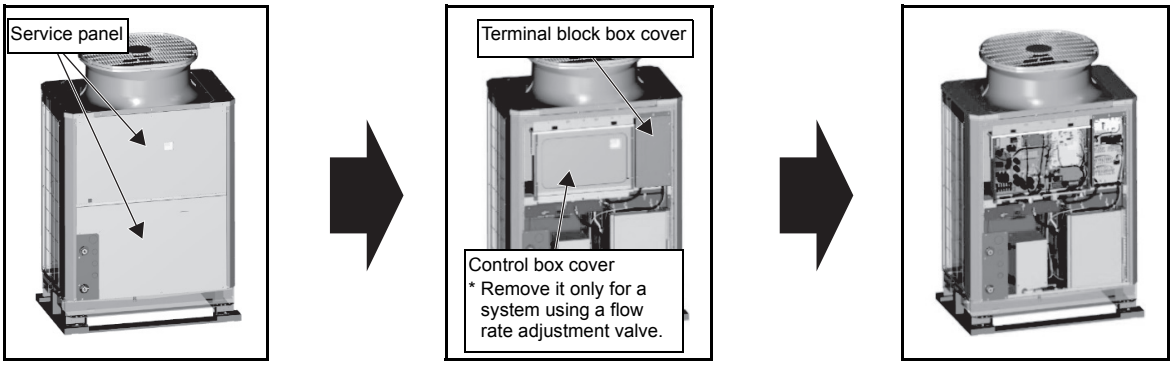
① Flow sensor ② Secondary side thermistor ③ Pump + flow rate adjustment device (three-way valve, two-way valve, or inverter)

Wiring of secondary side circuit

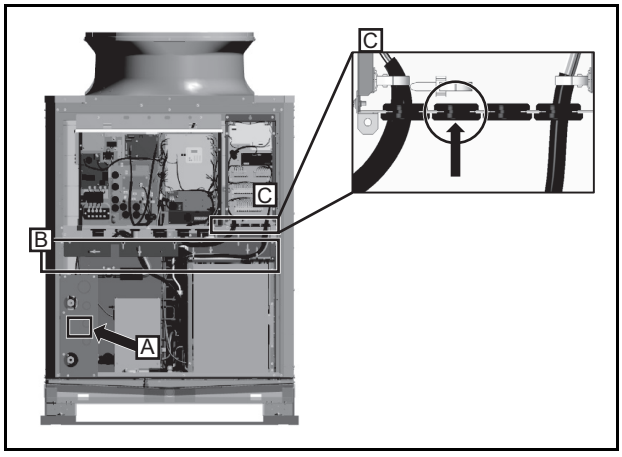
Perform the installation work of steps (1) to (4) below.

(1) Open the panel.

Use a screwdriver to remove the service panel, terminal block box cover, and control box cover (only for system using flow rate adjustment valve (two-way valve or three-way valve)).



(2) Thread the wiring through into the unit



① Thread the flow sensor wiring through A in the figure.

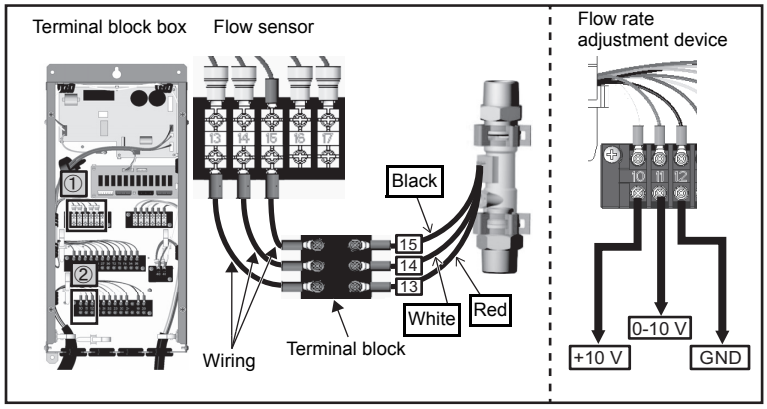
② Hold the wiring with the cable strap inside the unit indicated as B in the figure to keep it out of contact with the pipes and other components.

③ Thread the wiring through the rubber bush indicated as C in the figure (second one from the left).

* For details on the opening procedure of A and the wiring of B, refer to pages 54 and 55.

(3) Wiring connections

① Connect the flow sensor and flow rate adjustment device



Connect the flow sensor wiring to the terminal block inside the BOX. The numbers on the wirings correspond to the numbers on the terminal block.
Connect each wiring to the correct terminal. When done, hold the excess wiring with the supplied cable tie (long). Also, hold the wirings in place with a cable tie (long) where indicated as B in the figure to keep them out of contact with the pipes and other components.

* The 10-V power supply to be connected to No. 10 on the terminal block is not supplied. Furthermore, make sure that the output of the 10-V power supply is within 10 V ±0.5 V.

* For details on the wiring procedure of the separately sold thermistor, refer to the separately sold kit Q-1SCK.

* For a system that outputs the pump on/off signal from the unit (system that uses a flow rate adjustment valve), connect the wires to 1-3 of CN512.

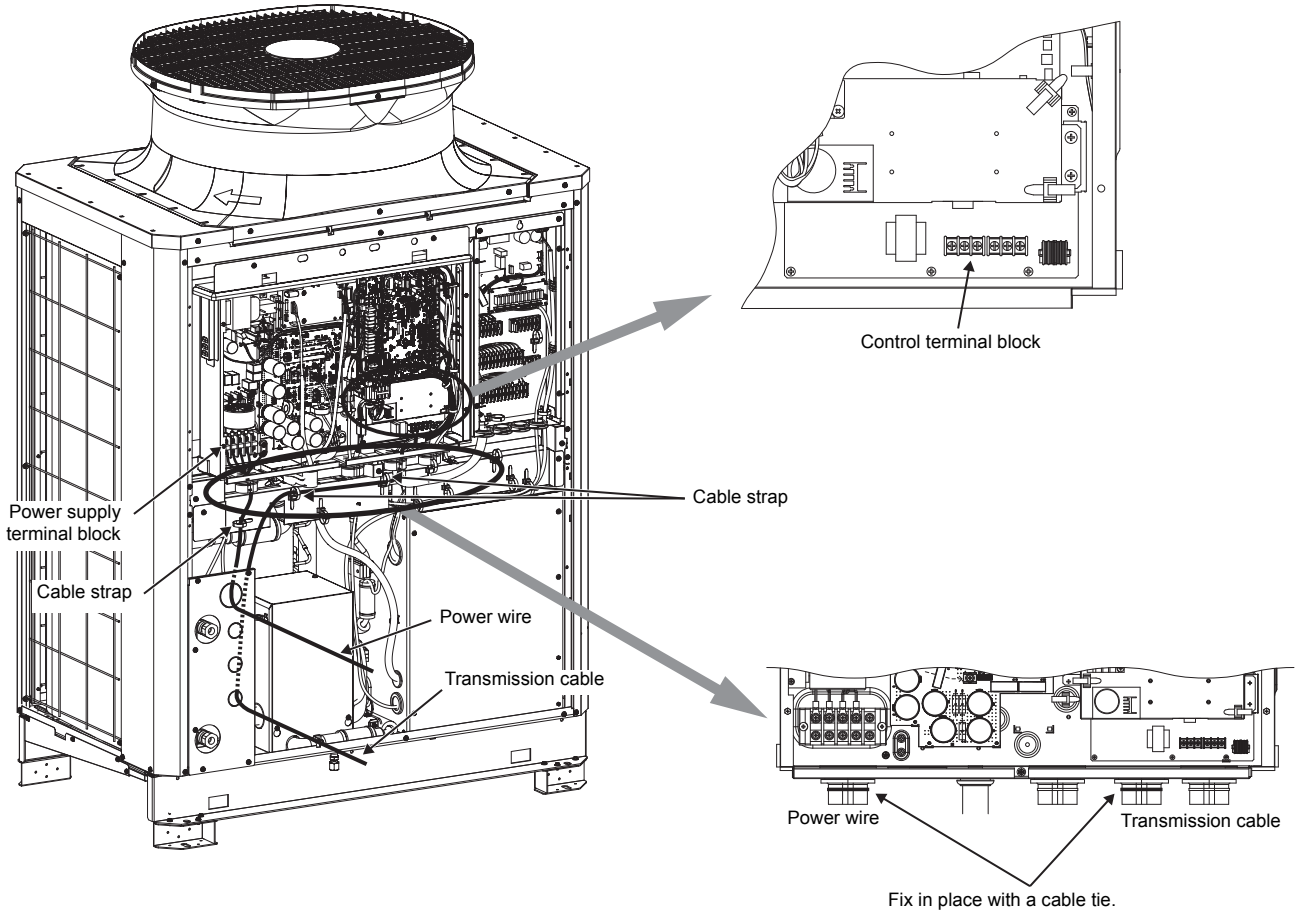
(4) Close the panel.

Using a screwdriver, re-place the SERVICE PANEL and the CONTROL BOX (SUB) cover.

[3] Cable Connections

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

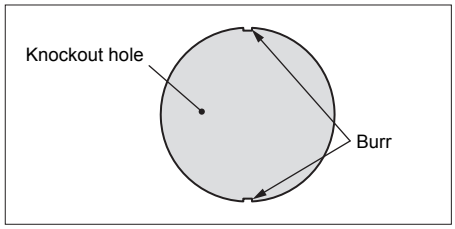
To remove the front panel of the control box, unscrew the four screws and pull the panel forward and then down.



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.

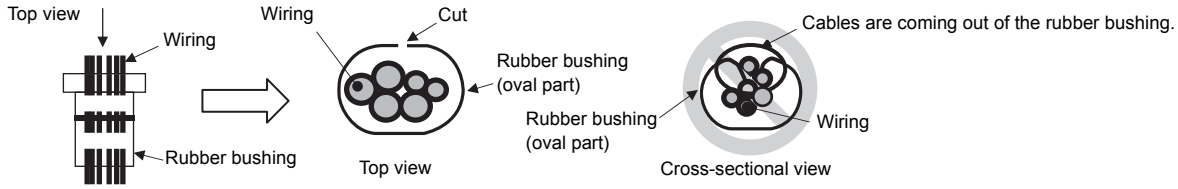
<2> Installing the conduit tube

- 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.

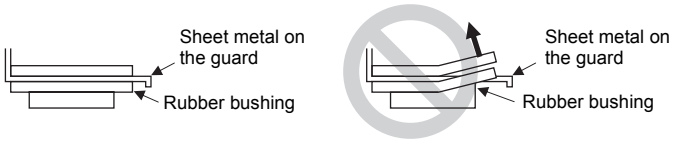


Note:

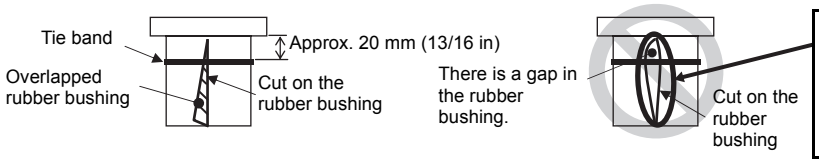
- Make sure the cables are not coming out of the rubber bushing cut.



- When threading the wiring through the rubber bushing, make sure the rubber bushing will not come off the sheet metal on the control box guard.



- When tying the supplied tie band around the rubber bushing, make sure to leave no gap between the ends.

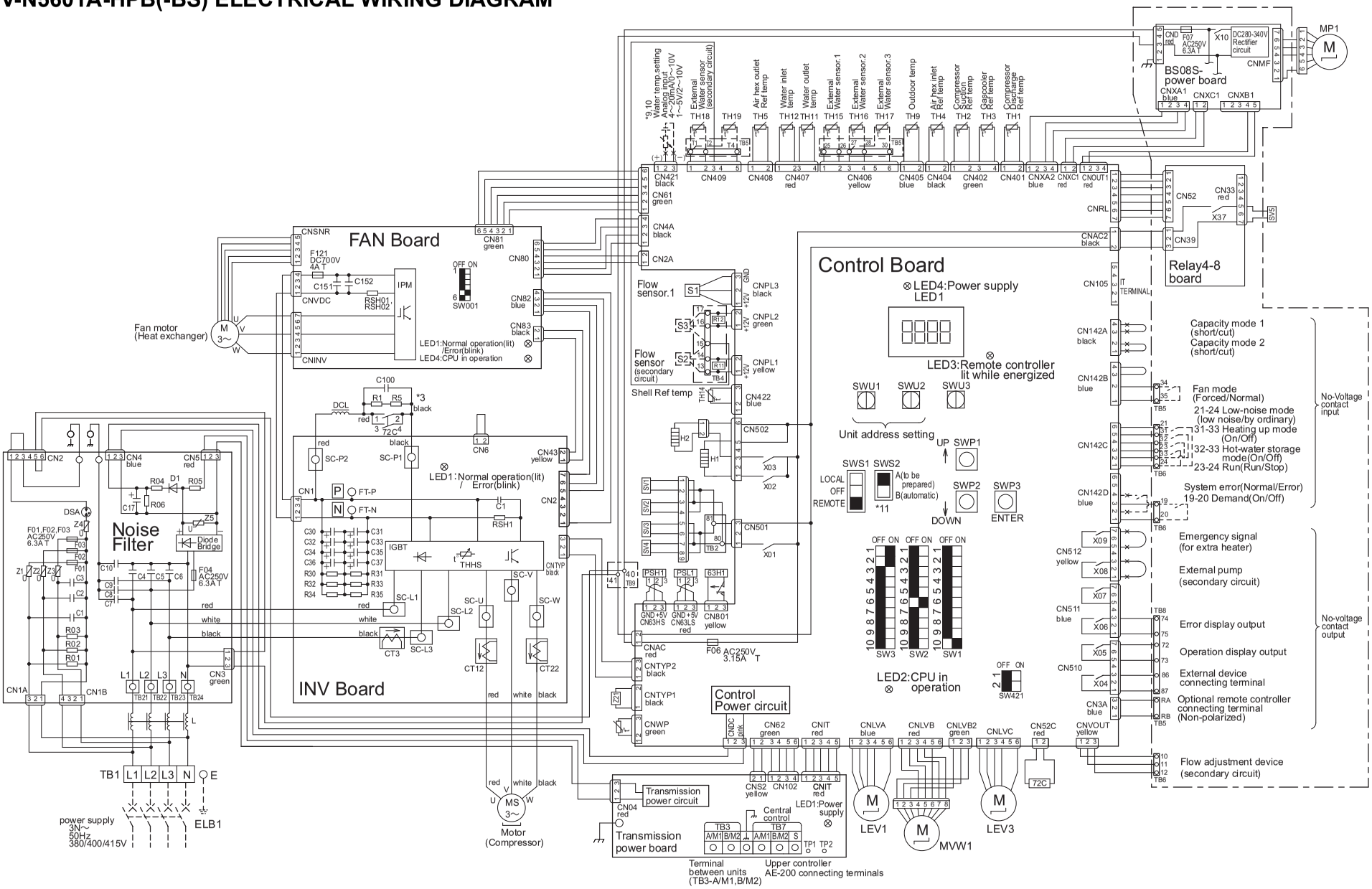


<<Important>>
When putting the tie band on the rubber bushing, make sure the ends of the rubber bushing overlap each other as shown in the figure at left.
* If there is a gap, water from snow or rain may enter, resulting in equipment damage.

A power wire exceeding the specified power wire thickness cannot be connected to the power terminal block (TB2). Use a separate pull box.

To ensure that the transmission cable is not affected by electrical noise from the power cable, route the power cable away from the transmission cable (distance of at least 50 mm (2 in)).

QAHV-N560YA-HPB(-BS) ELECTRICAL WIRING DIAGRAM



* Capacity mode table

mode	input
Max capacity operation	Capacity mode 1「cut」
Energy saving operation 1 (factory setting)	Capacity mode 1,2「short」
Energy saving operation 2	Capacity mode 1「short」 Capacity mode 2「cut」

Note

1. The broken lines indicate the optional parts,field-supplied parts,and field work.
2. Dashed lines indicate sub box
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.
4. The symbols of the field connecting terminals are as follows.
   ○:Terminal block ×:Connection by cutting the short circuit wire
5. The method of input signal of operation can choose one of optinal remote controller or no-voltage input.
6. 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.
7. 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
8. Use a contact that takes 12VDC 1mA for no-voltage contact input.
9. Need to selects either Water temperature setting input signal.
   Set the SW421 as shown in the table below.

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

10. Use a 4-20mA signal output device with insulation.
    Feeding 30mA or more current may damage the circuit board.
11. For prevention of damage of the pump, SWS2 is set in "A"(factory setting).
    Change the slide switch SWS2「B(automatic)」in Test Run.
12. Use a contact that takes 250VAC, 10mA or above, and 1A or below for no-voltage contact output.

Symbol explanation

Symbol	explanation
CT12	Ac current sensor
CT22	
CT3	
C100	Capacitor (Electrolysis)
DCL	DC reactor
F01	Fuse
F02	
F03	
F04	
F06	
F07	
F121	
H1	Crankcase heater (for heating the compressor)
H2	Electric heater (Antifreeze)
LEV1	Electronic expansion valve (Main circuit)
LEV3	Electronic expansion valve (Injection)
M	Fan motor
MP1	Pump motor
MS	Compressor motor
MVW1	Water flow control valve
PSH1	High pressure sensor
PSL1	Low pressure sensor
R11	Resistance (for Water flow rate sensor 2)
R12	Resistance (for Water flow rate sensor 3)
R1	Electrical resistance
R5	
SV1	Solenoid valve (Defrost)1
SV2	Solenoid valve (Defrost)2
SV3	Solenoid valve (Defrost)3
SV4	Solenoid valve (Defrost)4
SV5	Solenoid valve (Injection circuit)
S1	Water flow rate sensor
THHS	IGBT temperature
TH1～5,9,11,12,14	Thermistor
Z21	Function setting connector
63H1	High pressure switch
72C	Electromagnetic relay (Inverter main circuit)
*TH15～18	Thermistor
*S2,3	Water flow rate sensor
<ELB1>	Earth leakage breaker

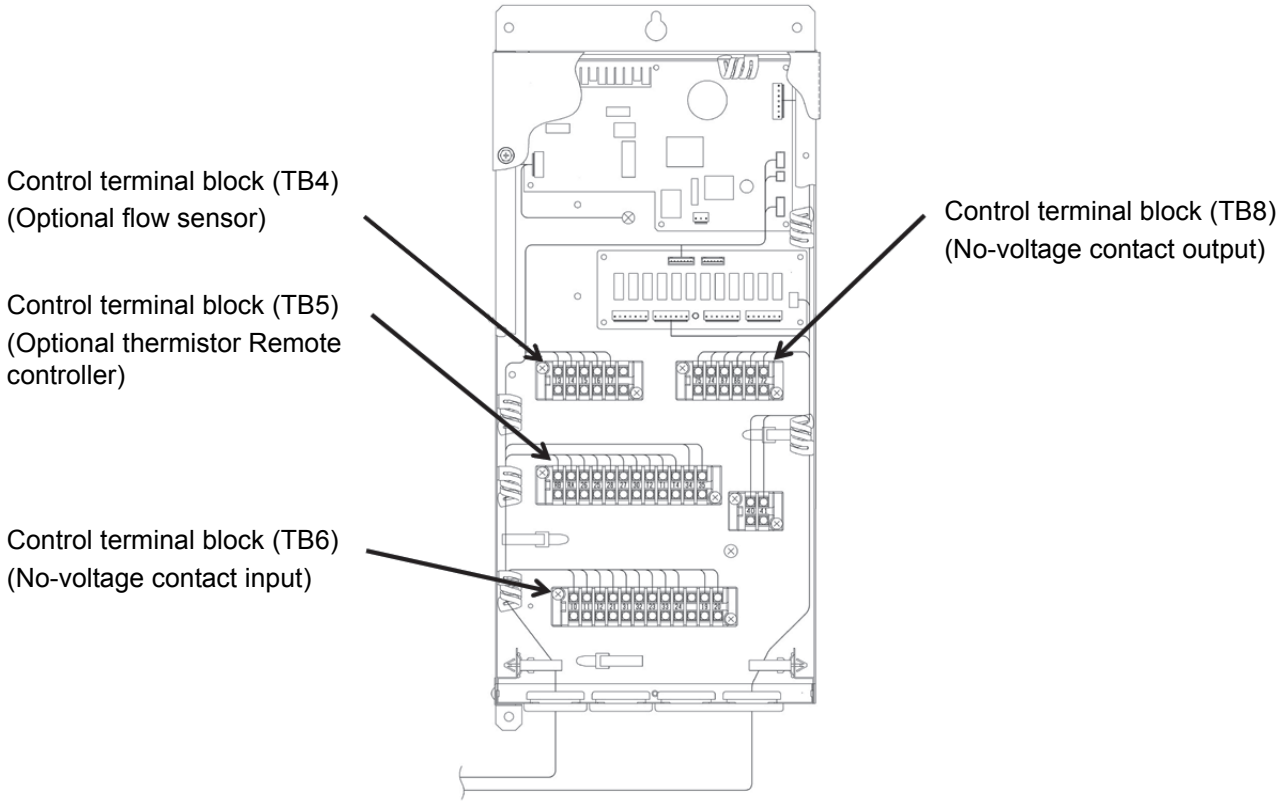
* of symbol item is the optional parts, <> is field-supplied parts.

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

External Input/Output

Input type	**Dry contact**		**ON (Close)**	**OFF (Open)**	**Terminal block/connector**
	(a) UNIT OPERATION	Run/Stop	The unit will go into operation when the water temperature drops below the preset temperature.	The unit will stop except when the unit is in the Anti-Freeze mode.	TB6 23-24
	(b) FAN MODE	Forced/Normal	The fan will remain in operation after the compressor has stopped (including when the OPERATION status is "STOP").	The fan will stop when the compressor stops.	TB5 34-35
	(c) PEAK-DEMAND CONTROL	On/Off	The unit will operate at or below the maximum capacity level that was set for the Peak-demand control setting.	-	TB6 19-20
	(d) Hot water storage mode	On/Off	Heating operation with the set outlet hot water temperature	Stop	TB6 32-33
	(e) Heating-up mode	On/Off	Heating operation with the maximum water flow amount	Stop	TB6 31-33
	(f) Low-noise mode	On/Off	Operation using the set capacity as an upper limit	Normal operation	TB6 21-24
	Analog				**Terminal block/connector**
	Input type		**Action**		
	(g) WATER TEMP SETTING CONTROL		Water temperature control can be set by using the external analog input to the CN421 on the circuit board. One analog input type can be selected from the following types: 4-20 mA, 1-5 V, 0-10 V, or 2-10 V.		CN421 2(+)-3(-)
	(h) EXTERNAL WATER SENSOR 1 (optional)		-		TB5 25-26
	(i) EXTERNAL WATER SENSOR 2 (optional)		-		TB5 27-28
	(j) EXTERNAL WATER SENSOR 3		-		TB5 27-30
	(k) EXTERNAL WATER SENSOR (secondary circuit)		-		TB5 T1-T2
	(l) EXTERNAL PUMP (secondary circuit)		-		CN512 1-3
	(m) FLOW SENSOR (secondary circuit)		-		TB4 13-14
	(n) FLOW ADJUSTMENT DEVICE (secondary circuit)		-		TB6 10-12
Output type	**Contact type**		**Conditions in which the contact closes (turns on)**	**Conditions in which the contact opens (turns off)**	**Terminal block/connector**
	(o) ERROR INDICATOR	Close/Open	The unit has made an abnormal stop.	During normal operation	TB8 74-75
	(p) OPERATION INDICATOR	Close/Open	The "Unit Operation" contact (item (a) above) or the ON/OFF button on the remote controller is ON.	The "Unit Operation" contact (item (a) above) or the ON/OFF button on the remote controller is OFF.	TB8 72-73
	(q) EMERGENCY SIGNAL	Close/Open	Water temperature has dropped below the Booster Heater Operation Water Temperature (TWL1 value)(Item code 1057) and the outside temperature (TAL1 value)(Item code 1058).	Water temperature is at or above "TWL1+2ºC" or the outside temperature is at or above "TAL1+2ºC".	CN512 5-7
	(r) EXTERNAL DEVICE	Close/Open	During freeze-up protection operation During pump residue operation	Other than the items at left	TB8 86-87
RC/ SC/ M-NET	REMOTE CONTROLLER	PAR-W31MAA			TB5 RA-RB
	SYSTEM CONTROLLER	AE-200			TB7 MA-MB *
	M-NET	-			TB3 MA-MB

* When AE-200 is connected, leave the power jumper on the outdoor unit as it is (Connected to CN41 at factory shipment). If the power jumper is connected to CN40, power will excessively be supplied and AE-200 will not properly function.


Control terminal block (TB4)
(Optional flow sensor)
Control terminal block (TB5)
(Optional thermistor Remote controller)
Control terminal block (TB6)
(No-voltage contact input)
Control terminal block (TB8)
(No-voltage contact output)

6. Troubleshooting

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

[1] Diagnosing Problems for which No Error Codes Are Available

If a problem occurs, please check the following. If a protection device has tripped and brought the unit to stop, resolve the cause of the error before resuming operation.

Resuming operation without removing the causes of an error may damage the unit and its components.

Problem	Check item		Cause	Solution
The unit does not operate.	The fuse in the control box is not blown.	The power lamp on the circuit board is not lit.	The main power is not turned on.	Switch on the power.
		The power lamp on the circuit board is lit.	The pump interlock circuit is not connected.	Connect the pump interlock circuit wiring to the system.
			The flow switch wiring is not connected.	Connect the flow switch wiring to the system.
	The fuse in the control box is blown.	Measure the circuit resistance and the earth resistance.	Short-circuited circuit or ground fault	Resolve the cause, and replace the fuse.
	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 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.

[2] Diagnosing Problems Using Error Codes

If a problem occurs, please check the following before calling for service.

(1) Check the error code against the table below.

(2) Check for possible causes of problems listed in the "Cause" column that correspond to the error code.

(3) If the error codes that appear on the display are not listed in the table below, or no problems were found with the items listed in the "Cause" column, please consult your dealer or servicer.

Diagnosing Problems Using Error Codes

Error code *1 (PCB *2 RC M-NET)	Error type	Cause (Installation/Setting error)	Cause (Parts problems)	Error reset *3	
				Unit side (PCB)	Remote
				SWS1	Operation SW
0 100	Unreset errors	Some of the errors have not been reset.		—	—
4 106 (254)	Power failure	Power failure occurred when the operation switch is switched on.		◎	◎
4 106 (255)	Power supply fault		• Transmission power board fault	—	—
2613	Water flow drop		• Water flow control valve fault • Pump fault	○	○
1301	Vacuum protection fault	• Outside temperature is below the minimum usage temperature. • Sudden frosting or heavy snow has clogged the heat exchanger.	• Low-pressure sensor fault • Suction refrigerant temperature thermistor fault • Electric expansion valve fault on the main circuit • Fan motor error/broken motor wire • Refrigerant shortage (gas leakage)	○	○
1302	High pressure fault		• Electronic expansion valve fault • High-pressure sensor fault • Water flow control valve fault • Pump fault	○	○
1104	Low evaporation temperature fault		• Low-pressure sensor fault • Suction refrigerant temperature thermistor fault • Electric expansion valve fault on the main circuit • Fan motor error/broken motor wire • Refrigerant shortage (gas leakage)	○	○
2601	Water supply cutoff (Water flow rate sensor)	Water flow drop	• Water flow control valve fault • Pump fault • Water flow rate sensor	○	○
2601 (2)	Secondary side water supply cutoff error	Water circuit air entrainment, water strainer clogged	Flow sensor fault, pump fault, motor-operated valve fault, water flow rate control valve fault	○	○
2138	Outlet water temperature fault (low temp)		• Fan motor error/broken motor wire • Refrigerant shortage (gas leakage)	○	○

Error code *1 (PCB *2 RC M-NET)	Error type		Cause (Installation/Setting error)	Cause (Parts problems)	Error reset *3	
					Unit side (PCB)	Remote
					SWS1	Operation SW
5101	Thermistor fault	Discharge temp sensor (TH1)		Broken or shorted thermistor wiring	○	○
5102		Suction temp sensor (TH2)		Broken or shorted thermistor wiring	○	○
5103		Heat exchanger outlet refrigerant temp sensor (TH3)		Broken or shorted thermistor wiring	○	○
5104		Air-side heat exchanger inlet refrigerant temp sensor (TH4)		Broken or shorted thermistor wiring	○	○
5105		Air-side heat exchanger outlet refrigerant temp sensor (TH5)		Broken or shorted thermistor wiring	○	○
5109		Outside temp sensor (TH9)		Broken or shorted thermistor wiring	○	○
5111		Outlet water temp sensor (TH11)		Broken or shorted thermistor wiring	○	○
5112		Inlet water temp sensor (TH12)		Broken or shorted thermistor wiring	○	○
5114		Shell temp sensor (TH14)		Broken or shorted thermistor wiring	○	○
5115		External water sensor1 (TH15)		Broken or shorted thermistor wiring	○	○
5116		External water sensor2 (TH16)		Broken or shorted thermistor wiring	○	○
5117		External water sensor3 (TH17)		Broken or shorted thermistor wiring	○	○
5118 (when the secondary side control is enabled)		Secondary side water sensor (TH18)		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	○	○
1102	Discharge temperature fault			• Water flow control valve fault • Pump fault • High-pressure sensor fault • Discharge refrigerant thermistor fault • Linear expansion valve fault (Main circuit LEV, injection LEV) • Refrigerant shortage (gas leakage)	○	○
1105	Heat exchanger outlet temperature fault			• Water flow control valve fault • Pump fault	○	○
1502	Liquid refrigerant floodback			• Fan motor error/broken motor wire • Low-pressure sensor fault • Discharge refrigerant temperature thermistor fault • Electronic expansion valve fault	○	○
7113	Model setting error 1		Dip switches on the PCB were set incorrectly during maintenance.		×	×
7117	Model setting error 2			• Resistor Z21 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	×	×

Error code *1 (PCB *2 RC M-NET)	Error type			Cause (Installation/Setting error)	Cause (Parts problems)	Error reset *3	
						Unit side (PCB)	Remote
						SWS1	Operation SW
4250 4255 (101)	Inverter error	Electric current related errors during operation	IPM error		• INV board fault (4250) • Fan board fault (4255) • Ground fault of the compressor • Coil problem • IPM error (loose terminal screws, cracked due to swelling) • Items listed under "Heatsink overheat protection" below	○	○
4250 4255 (102)			ACCT overcurrent		• INV board fault (4250) • Fan board fault (4255) • Ground fault of the compressor • Coil problem • IPM error (loose terminal screws, cracked due to swelling)	○	○
4250 4255 (103)			DCCT overcurrent			○	○
4250 4255 (106)			Overcurrent relay trip (momentary value) (During operation)			○	○
4250 4255 (107)			Overcurrent relay trip (effective value) (During operation)			○	○
4250 4255 (104)			Short-circuited IPM/ground fault (During operation)		• Ground fault of the compressor • IPM error (loose terminal screws, cracked due to swelling)	○	○
4250 4255 (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 4255 (101)		Current related prob-lems at start up	IPM error (At startup)		• INV board fault (4250) • Fan board fault (4255) • Ground fault of the compressor • Coil problem • IPM error (loose terminal screws, cracked due to swelling) • Items listed under "Heatsink overheat protection" below	○	○
4250 4255 (102)			ACCT overcurrent (At startup)		• INV board fault (4250) • Fan board fault (4255) • Ground fault of the compressor • Coil problem • IPM error (loose terminal screws, cracked due to swelling)	○	○
4250 4255 (103)			DCCT overcurrent (At startup)			○	○
4250 4255 (106)			Overcurrent relay trip (momentary value) (At startup)			○	○
4250 4255 (107)			Overcurrent relay trip (effective value) (At startup)			○	○

Error code *1 (PCB *2 RC M-NET)	Error type			Cause (Installation/Setting error)	Cause (Parts problems)	Error reset *3	
						Unit side (PCB)	Remote
						SWS1	Operation SW
4220 4225 (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 (4220) • Fan board fault (4225) • 72C fault • Diode stack failure	○	○
4220 4225 (109)			Bus voltage rise protection	Incorrect power supply voltage	• INV board fault (4220) • Fan board fault (4225)	○	○
4220 4225 (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) • Fan board fault (4225)	○	○
4220 4225 (131)		Voltage meter error at start up (Bus voltage drop protection at start up (detected by the Main unit side))		Power supply voltage drop	• INV board fault (4220) • Fan board fault (4225)	○	○
4230 4235		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 • INV board fan output fault • THHS sensor fault • IPM error (loose terminal screws, cracked due to swelling)	○	○
4240 4245		Overload protection		Short-cycling of air (reduced air flow) Clogged heatsink cooling air passage Power supply voltage drop (Inter-phase voltage is 180 V or below.)	• THHS sensor fault • Current sensor fault • INV board fan output fault • INV circuit fault • Compressor fault	○	○
5301 5305 (115)		ACCT sensor fault			• INV board fault • Ground fault of the compressor and IPM error	○	○
5301 5305 (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 5305 (117)		ACCT sensor/circuit fault			• Poor contact at the INV board connector CNCT2 (ACCT) • ACCT sensor fault	○	○
5301 5305 (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 5305 (119)		Open-circuited IPM/loose ACCT sensor			• Disconnected ACCT sensor (CNCT2) • ACCT sensor fault • Broken compressor wiring • INV circuit fault (IPM error etc.)	○	○
5301 5305 (120)		Faulty wiring			• ACCT sensor is connected in the wrong phase. • ACCT sensor is connected in the wrong orientation.	○	○
5110 (01) (05)		THHS sensor/circuit fault			• THHS sensor contact failure • THHS sensor fault • INV board fault	○	○
0403 (01) (05)		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	○	○

Error code *1 (PCB *2 RC M-NET)	Error type		Cause (Installation/Setting error)	Cause (Parts problems)	Error reset *3	
					Unit side (PCB)	Remote
					SWS1	Operation SW
6830	Remote controller error (incl. remote controller wiring fault)	Address overlap	There are two or more of the same address.		×	×
7109		Non-consecutive address, system error	Address setting error (Non-consecutive address)		×	×
6831		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	—	—
6833		Remote controller over current	Remote controller cable is short		×	×
6834		Remote controller signal reception error 2	Communication error due to external noise interference	• Main control board communication circuit fault	—	—
7130	Multiple system error	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).		×	×
4126 (1)	Analog input error (Control board (MAIN) CN421)		Analog input type fault Set Item code 1075	• Broken or Open 4-20mA signal output device wiring (CN421)	○	○
6500	Communication error between the main and sub units Communication error between the MAIN and SUB circuits				—	—
6600	Transmission line power supply PCB fault Communication error between the main and sub units (Simple multiple unit control mode) *7		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					—	—
5701	Water flow adjusting value limit switch error			Water flow rate control valve fault	×	×
2518	Secondary side hot water temperature reduction error		Insufficient pump capacity Outdoor air temperature is below operating range lower limit	Secondary side pump fault Secondary side heat exchanger deteriorated Flow sensor fault	○	○
2616 (1)	Secondary side heat exchanger error (Deterioration of heat exchanger)		Heat exchanger deteriorated		○	○
2616 (2)	Secondary side heat exchanger error (Heat exchanger selection error)		Initial heat exchanger selection error		○	○

*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: 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.")
*5: Depending on the system configuration, if communication error lasts for 10 minutes or longer, units will make an abnormal stop.
This error can be reset by turning off and then back on the unit's power.
*6: 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.
*7: Before resetting this error, remove its causes. Resuming operation without removing the causes of heat exchanger freeze up will cause heat exchanger damage.

[3] Calling for Service

If the problem cannot be solved by following the instructions provided in the table on the previous pages, please contact your dealer or servicer along with the types of information listed below.

(1) Model name

The model name is a string that starts with "QAHV" and is found on the lower part of the left side of the unit.

(2) Serial number

Example: 75W00001

(3) Error code

(4) Nature of the problem in detail

Example: The unit stops approximately one minute after it was started.

7. 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. (The compressor will not be warmed up if initial settings have not been made. Make sure to make initial settings.)
4. Switch on the Run/Stop switch that controls the unit on the on-site control panel.

[2] Daily Operation

To start an operation

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

Note

The unit described in this manual features a circuit that protects the compressor from short-cycling. Once the compressor stops, it will not start up again for up to 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)

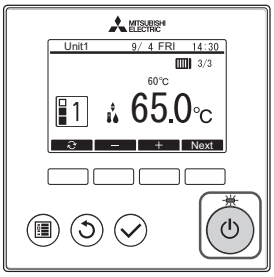
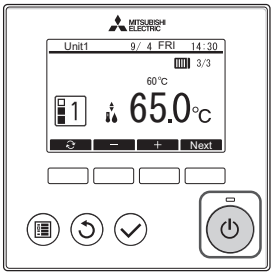
(*1) Refer to the following pages for how to use the remote controller.

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] Using the Remote Controller

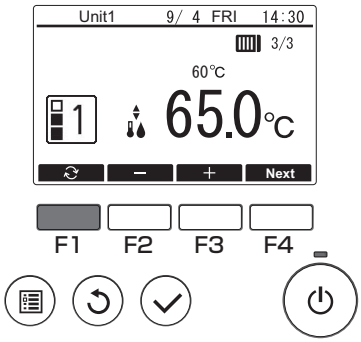
<1> Power ON/OFF

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

<2> Operation mode and set temperature settings

Operation mode setting

Button operation

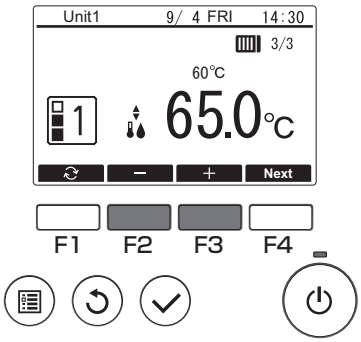


Press the [F1] button to go through the operation modes in the order of "Mode1, Mode2, and Mode3."
Select the desired operation mode.

 **Mode1**  **Mode2**  **Mode3**

Set temperature setting

Button operation



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

<3> Using Weekly timer

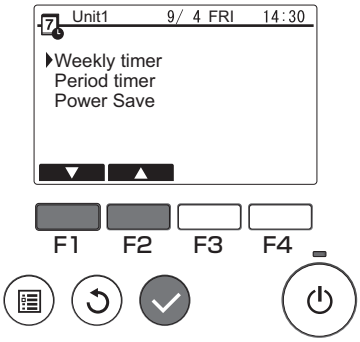
Function description

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

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

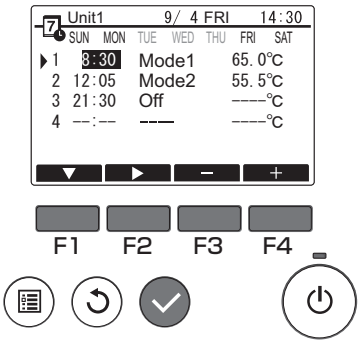
Button operation

1



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

2

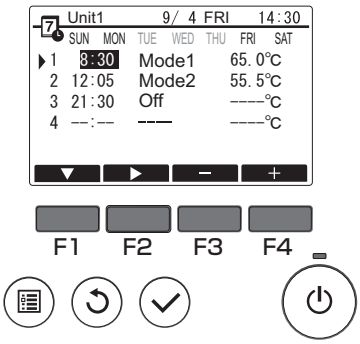


The Weekly timer screen will be displayed.

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

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

3



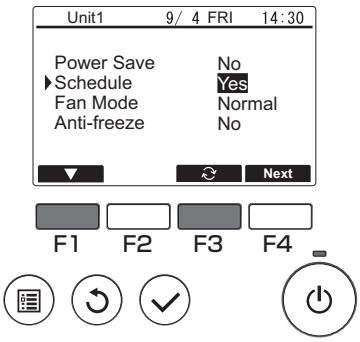
The pattern setting screen will be displayed.
Press the [F1] button to select a pattern.
Press the [F2] button to select the item you want to change.
Press the [F3] or [F4] button to switch to the desired setting.

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

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

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

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



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

<4> Using Period timer

Function description

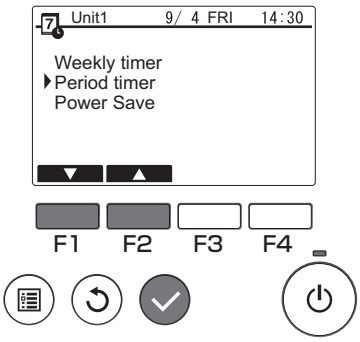
Following settings can be made to change the specified period and daily operating schedule.

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

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

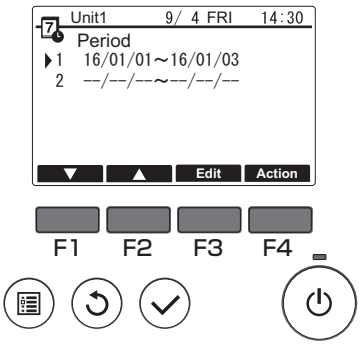
Button operation

1



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

2

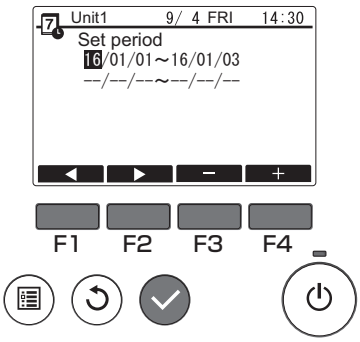


The suitable periods for the period timer will be displayed.

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

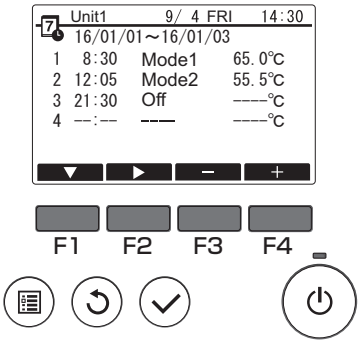
To set the operation:
Press the [F1] or [F2] button to select the specified date and then press the [F4] button. … Move to **4**.

3



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

4



The pattern setting screen will be displayed.

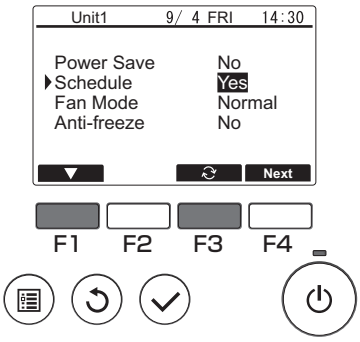
* Refer to the section on Weekly timer for details on using the pattern setting screen.

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

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

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

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



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

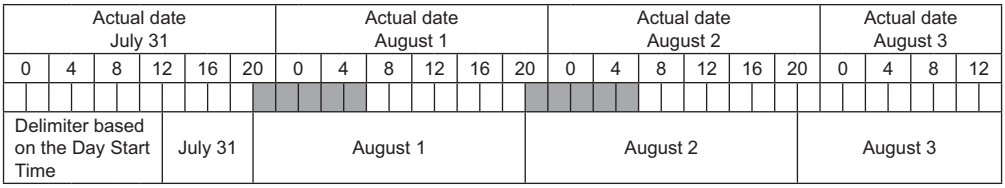
<5> Using Power Save

Function description

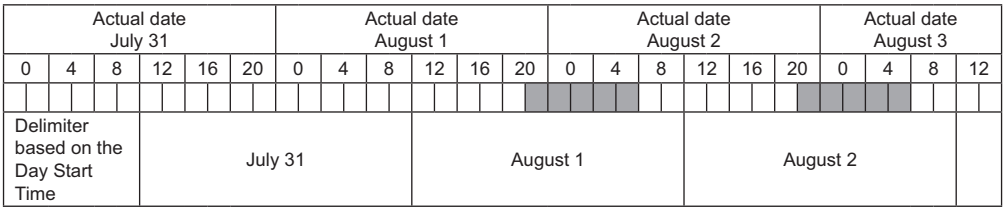
Power Save is a function that regulates the compressor rotation count either daily or according to a specified period and according to a preset time interval or regulated capacity. Use this function when you want to inhibit electric power use.
A typical scenario where Power Save can be used to inhibit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

- Approach to power save intervals and time periods
  Specify intervals by using the Day Start Time as the delimiter. Note that this may not match the actual date. Refer to section on "Unit Setting" (Installation Manual) for details.
  You cannot set a time period that spans the Day Start Time.

Example 1) When the Day Start Time is 22:00 on August 1 and 2 and the time period is 22:00 to 08:00
The shaded (■) periods in the figure below indicate when Power Save is used.



Example 2) When the Day Start Time is 12:00 on August 1 and 2 and the time period is 22:00 to 08:00
The shaded (■) periods in the figure below indicate when Power Save is used.



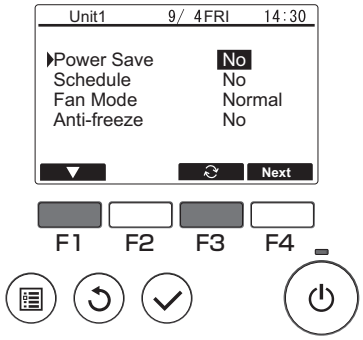
Power Save will not be implemented in the following situations:
- If a system controller is connected
- While Power Save is disabled

• To use demand control on the connected units, make the settings as shown below.

(a) To use only connected unit demand control (contact input) without using Power Save on the remote controller

Button operation

1



In the Operation setting screen, press the [F1] button to move the cursor to Power Save.

Press the [F3] button to select "No".

* Refer to the connected unit Instruction Book for details on connected unit demand control.
* Do not set the Power Save settings on the remote controller. Refer to the connected unit Instruction Book for details.
* Some items are not available for selection on this model.

(b) To use both connected unit demand control (contact input) and Power Save on the remote controller

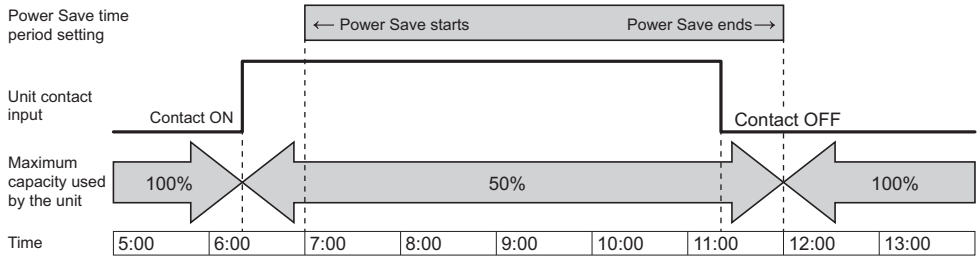
* Exercise control using low values in the demand control settings and Power Save control capacity. When the contact ON and Power Save start times differ, control will be exercised as of the earliest low value. (See the table below.)

Table: Control values when Power Save and demand control are both used

Period	Power Save value	Connected unit demand control value	Control value actually used
12:00-6:30	– (100%)	– (100%)	100%
6:30-7:00	– (100%)	60%	50%
7:00-11:30	50%	60%	50%
11:30-12:00	50%	– (100%)	50%

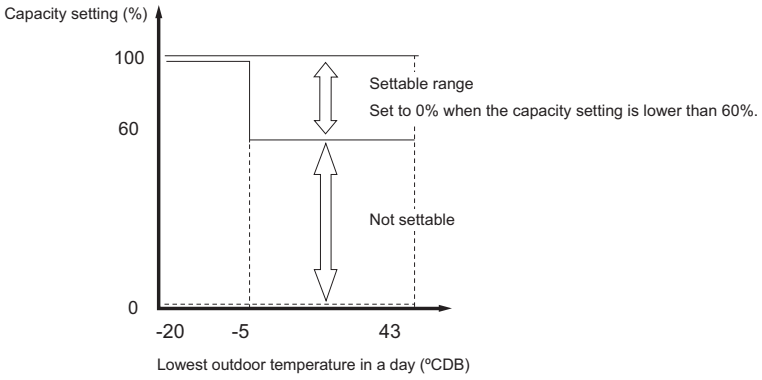
→ Because Power Save is set from 7:00, control begins based on the Power Save setting.

Example) When Power Save is from 7:00 to 12:00 with a control capacity of 50%, and contact is ON for the connected unit (capacity: 60%)



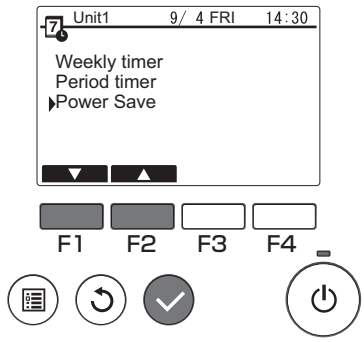
• While the contact is ON or Power Save is being applied, the maximum capacity will be limited to whichever is the lower value of the Power Save and demand control settings.
• While the contact is OFF and Power Save is not applied, control will be exercised with the maximum capacity of 100%.
• The control capacity during periods when Power Save is not set will be 100%.

* The maximum frequency is restricted depending on the inputs of maximum demand capacity and maximum low-noise capacity as shown below.



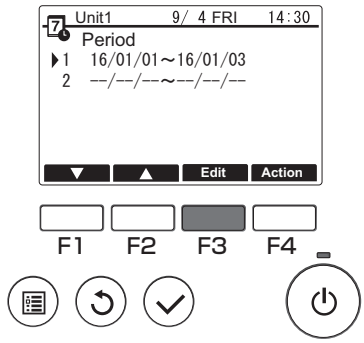
Button operation

1



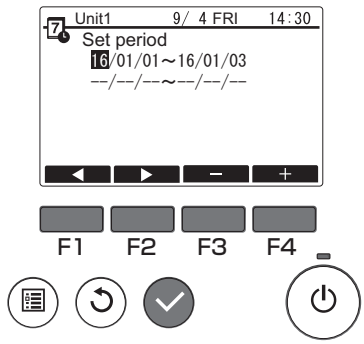
From the Main menu, select "Schedule" > "Power Save" and press the [Select] button.

2



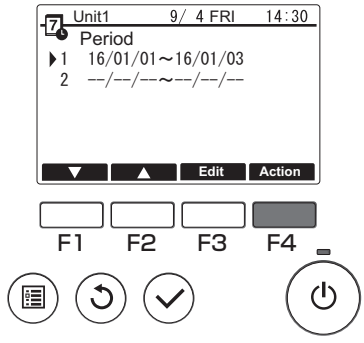
Press the [F3] button to proceed to the settings screen.
You can set 2 types of pattern, as necessary.

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



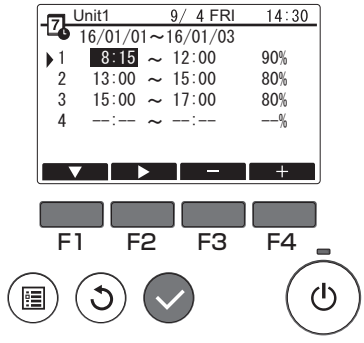
Press the [F1] to [F4] buttons to set the period and then press the [Select] button.

3



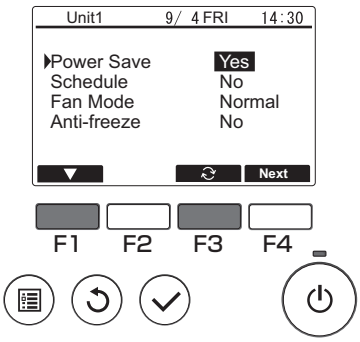
The Power Save screen will be displayed.
Press the [F4] button.

4



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

5



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

<6> Function setting

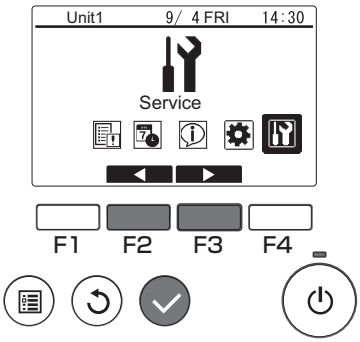
Function description

Sets the functions for each connected unit from the remote controller as required.

- Refer to the Installation Manual for the connected units for details on the connected unit settings at shipment, Function No. and the Data.
- If the function settings change the connected unit functions, all the settings must be managed appropriately, such as by writing them down on paper.

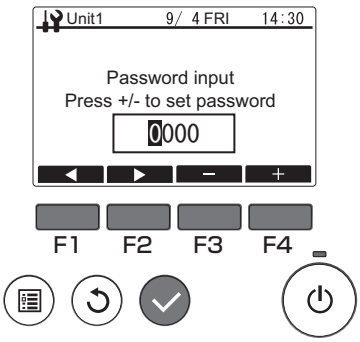
Button operation

1



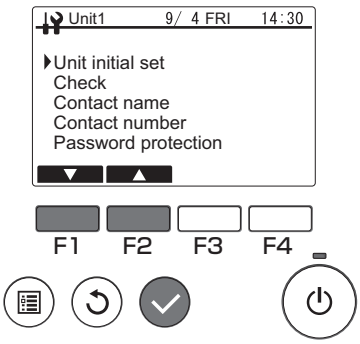
Select "Service" from the Main menu, and press the [Select] button.

2



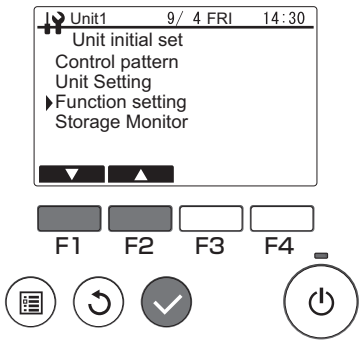
A password input screen will be displayed.
Enter the current maintenance password (a 4-digit number).
After entering the 4-digit password, press the [Select] button.
If the password is correct, the Service menu will be displayed.

3



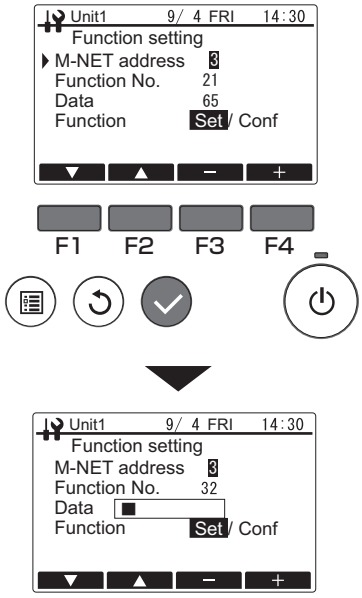
Select "Unit initial set" from the Service menu, and press the [Select] button.

4



Select "Function setting" from the Unit initial set menu, and press the [Select] button.

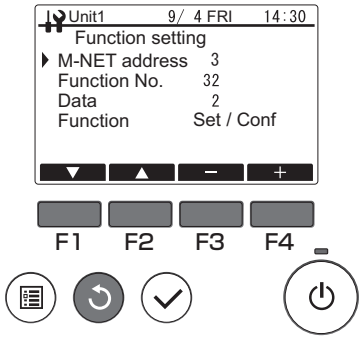
5



The Function setting screen will be displayed.
Press the [F1] or [F2] button to select the connected unit "M-NET address", "Function No." or "Data", and then press the [F3] or [F4] button to change to the desired setting.
After changing to the desired setting, press the [Select] button.
The setting data transmission screen will be displayed.

To check the current settings, set the "M-NET address" or "Function No." of the connected unit to be checked, select "Conf" in "Function" and press the [Select] button. The screen indicating that the confirmation is being processed will be displayed and the data will be displayed when checking is completed.

6



Once data transmission is completed, the screen indicating that the settings have been made will be displayed.
To continue making settings, press the [Return] button to return to the screen in procedure 3. Use the same procedure to set other connected unit and Data settings.

Navigating through the screens
■ To return to the Service menu ..... [Menu] button
■ To return to the previous screen ..... [Return] button

Function setting	Item
015	Mode 1 differential value (Schedule value)
016	Mode 2 differential value (Schedule value)
017	Mode 3 differential value (Schedule value)
021(*)	Outlet hot water temperature setting

* When setting the set temperature for Mode 1, Mode 2, or Mode 3 to 65ºC or higher, the setting for Function No.21 is required.
* This setting will be used for the secondary side outlet hot water temperature when the secondary side control is enabled.

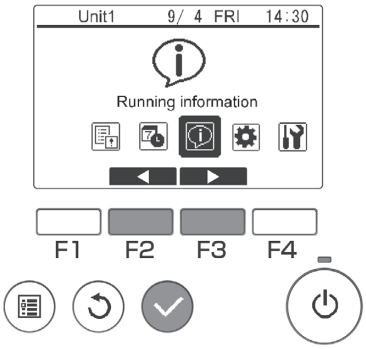
<7> Operation status monitoring

Function description

Check the function information of each unit from the remote controller

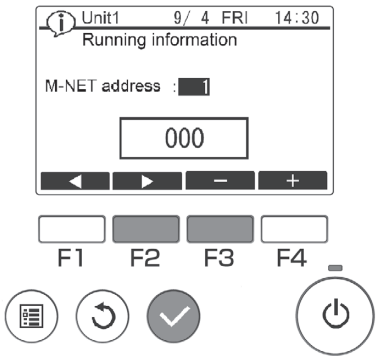
Button operation

1



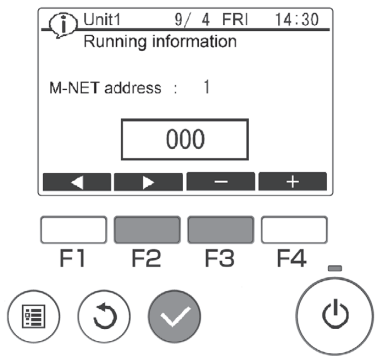
Select "Running information" from the main menu screen, and press the [Select] button.

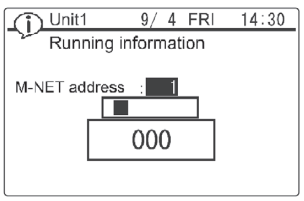
2



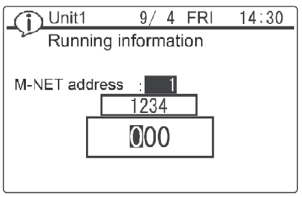
Set the desired M-NET address with the [F2] and [F3] buttons, and press the [Select] button.

3





Enter a 3-digit function setting number, and press the [Select] button.
The setting information send screen appears.



When the information is sent successfully, the function setting values appear in the result display screen.
To continue operation, press the [Return] button to return to the screen of step 2.
Set other M-NET address and function setting number using the same procedure.

Navigating through the screens

■ To return to the Service menu ..... [Menu] button
■ To return to the previous screen ..... [Return] button

Function setting No.

Function setting No.	Description	Remarks
001	High pressure operation data [× 0.1 MPa]	Data of last hot water storage operation
002	Low pressure operation data [× 0.1 MPa]	
003	Outlet hot water temperature operation data [× 0.1ºC]	
004	Outdoor air temperature during operation [× 0.1ºC]	
005	Total compressor operation time [× 10 h]	
006	Outlet hot water temperature [× 0.1ºC]	Current values
007	Inlet water temperature [× 0.1ºC]	
008	High pressure [× 0.1 MPa]	
009	Low pressure [× 0.1 MPa]	
010	Discharge refrigerant temperature [× 0.1ºC]	
011	Suction refrigerant temperature [× 0.1ºC]	
012	Operating frequency [× 0.1 Hz]	
013	Flow velocity sensor [× 0.1 L/min]	
016	Secondary side outlet water temperature [× 0.1ºC]	
017	Secondary side flow velocity sensor [× 0.1 L/min]	
018	Secondary side pump output [%]	

Example) No. 001

Remote control display: 38

Actual value: 3.8 MPa

[4] Using the Unit in Sub-freezing or Snowy Conditions

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 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.

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.

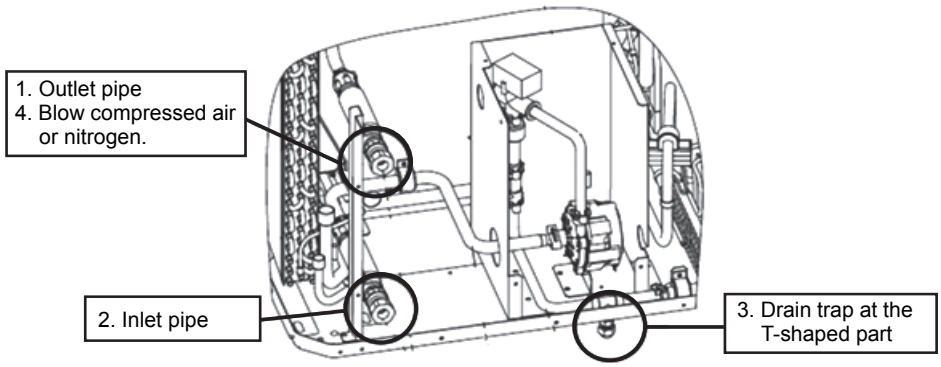
- Remove the snow off the unit before switching on the ON/OFF switch.
- In areas where the outside air drops below freezing, leave the main switch turned on even when the unit will not be operated for four days or longer. Leave the switch on the water circulation pump turned on if the pump is connected to a separate circuit.
- If the unit is left turned off for a while (e.g., overnight) when the outside temperature drops below freezing, the water in the water circuit will freeze and damage the pipes and the heat exchanger.
- The recommended electric circuit has an anti-freeze circuit. For this circuit to function, the main power must be turned on.
- If the water circulation pump is connected differently from the recommended way, make sure the circuit has some type of anti-freeze function*.
  (* A function that automatically operates the water circulation pump to prevent the water in the circuit from freezing when the water temperature drops.)

In cold areas (where the lowest outside temperature drops below freezing), if power is not supplied while the unit is stopped during winter, make sure to completely drain water from the piping. Failure to do so may cause the residual water to freeze, resulting in damage to the heat exchanger.
Before using the unit, perform a test run such as water fill test or air bleeding test again.

Drainage method

Procedure

1. Disconnect the outlet pipe.
2. Disconnect the inlet pipe.
3. Open the drain trap at the T-shaped part.
4. Completely remove water by blowing compressed air or nitrogen (cylinder) of 0.5 to 0.6 MPa into the outlet pipe.



8. Main Specifications

SPECIFICATIONS			
Model			QAHV-N560YA-HPB (-BS)
Power source			3-phase 4-wire 380-400-415 V 50 Hz
Capacity *1		kW	40
		kcal/h	34400
		Btu/h	136480
	Power input	kW	10.31
	Current input	A	17.8-16.9-16.3
	COP (kW/kW)		3.88
Capacity *2		kW	40
		kcal/h	34400
		Btu/h	136480
	Power input	kW	10.97
	Current input	A	20.0-19.0-18.3
	COP (kW/kW)		3.65
Capacity *3		kW	40
		kcal/h	34400
		Btu/h	136480
	Power input	kW	11.6
	Current input	A	20.4-19.4-18.7
	COP (kW/kW)		3.44
Maximum current input *4		A	28.8-27.4-26.4
Allowable external pump head			77 kPa
Temperature range	Outlet water temperature		55–90ºC (when the secondary side control is enabled: 55–80ºC) 131–194ºF (when the secondary side control is enabled: 131–176ºF)
	Outdoor temperature	D.B.	-25–43ºC -13–109.4ºF
Sound pressure level (measured 1 m below the unit in an anechoic room) *1		dB (A)	56
Water pipe diameter and type	Inlet	mm (in)	19.05 (Rc 3/4"), screw pipe
	Outlet	mm (in)	19.05 (Rc 3/4"), screw pipe
External finish			Acrylic painted steel sheet <Munsell 5Y 8/1 or similar>
External dimensions H x W x D		mm in	1837 (1777 not including legs) x 1220 x 760 72.3 (69.9 not including legs) x 48.0
Net weight		kg (lb)	400 (882)
Design pressure	R744	MPa	14
	Water	MPa	0.5
Heat exchanger	Water-side		Copper tube coil
	Air-side		Plate fins and copper tubes
Compressor	Type		Inverter scroll hermetic compressor
	Manufacturer		MITSUBISHI ELECTRIC CORPORATION
	Starting method		Inverter
	Motor output	kW	11.0
	Case heater	kW	0.045
	Lubricant		PAG
Fan	Air flow rate	m^3/min	220
		L/s	3666
		cfm	7768
	Type and quantity		Propeller fan
	Control and driving mechanism		Inverter control, direct driven by motor
	Motor output	kW	0.92
HIC (Heat inter-changer) circuit			Copper pipe
Protection devices	High pressure		High-pressure sensor and switch set at 14 MPa (643 psi)
	Inverter circuit		Overheat and overcurrent protection
	Compressor		Overheat protection
	Fan motor		Thermal switch
Defrosting method			Auto-defrost mode (Hot gas)
Refrigerant	Type and factory charge	kg	CO_2 (R744) 6.5 kg
	Flow and temperature control		LEV

*1 Under normal heating conditions at the outdoor temperature of 16ºCDB/12ºCWB (60.8ºFDB/53.6ºFWB), the outlet water temperature of 65ºC (149ºF), and the inlet water temperature of 17ºC (62.6ºF)

*2 Under normal heating conditions at the outdoor temperature of 7ºCDB/6ºCWB (44.6ºFDB/42.8ºFWB), the outlet water temperature of 65ºC (149ºF), and the inlet water temperature of 9ºC (48.2ºF)

*3 Under normal heating conditions at the outdoor temperature of 7ºCDB/6ºCWB (44.6ºFDB/42.8ºFWB), the outlet water temperature of 65ºC (149ºF), and the inlet water temperature of 15ºC (59.0ºF)

*4 Under normal heating conditions at the outdoor temperature of 7ºCDB/6ºCWB (44.6ºFDB/42.8ºFWB) when the unit is set to the "Capacity Priority" mode through the dry NC-contact

- Due to continuing improvements, specifications may be subject to change without notice.
- Do not use steel pipes as water pipes.
- Keep the water circulated at all times. Blow the water out of the pipes if the unit will not be used for an extended period of time.
- Do not use ground water or well water.
- Do not install the unit in an environment where the wet bulb temperature exceeds 32ºC.
- The water circuit must be a closed circuit.
- There is a possibility that the unit may abnormally stop when it operates outside its operating range. Provide backup (ex. boiler start with error display output signal (blue CN511 1-3)) for abnormal stop.
- In a system in which the ascent rate of inlet water temperature becomes 5 K/min or above instantly or 1 K/min or above continuously, this model of units cannot be used.

Unit converter

Kcal = kW x 860

BTU/h = kW x 3,412

cfm = m^3/min x 35.31

Lb = kg/0.4536

Spec label

MITSUBISHI ELECTRIC

CE 0035

HOT WATER HEAT PUMP

MODEL **QAHV-N560YA-HPB <H>**

REFRIGERANT	R744 6.5kg
LEGAL REFRIGERATION TON	4.8RT
ALLOWABLE PRESSURE(Ps)	HP 14.0MPa (140.0bar) LP 8.5 MPa (85.0 bar)
WEIGHT	400kg
IP CODE	IP24
YEAR OF MANUFACTURE	
SERIAL No.	

RATED VOLTAGE 3N~ V		380	400	415	415
FREQUENCY	Hz	50			
CAPACITY	kW	40.0			
	kcal/h	34400			
	Btu/h	136480			
RATED INPUT	kW	10.97			11.6
COP		3.65			3.44
RATED CURRENT	A	20.0	19.0	18.3	18.7
RATED CONDITION					
OUTLET WATER TEMP.	°C	65			65
INLET WATER TEMP.	°C	9			15
OUTDOOR DB/WB	°C	7/6			7/6

RATED VOLTAGE 3N~ V		380	400	415
FREQUENCY	Hz	50		
CAPACITY	kW	40.0		
	kcal/h	34400		
	Btu/h	136480		
RATED INPUT	kW	10.31		
COP		3.88		
RATED CURRENT	A	17.8	16.9	16.3
RATED CONDITION				
OUTLET WATER TEMP.	°C	65		
INLET WATER TEMP.	°C	17		
OUTDOOR DB/WB	°C	16/12		

Contains fluorinated greenhouse gases covered by the Kyoto Protocol.

MANUFACTURER:
MITSUBISHI ELECTRIC CORPORATION
AIR-CONDITIONING & REFRIGERATION SYSTEMS WORKS
5-66, TEBIRA, 6-CHOME, WAKAYAMA CITY, JAPAN
MADE IN JAPAN

DWG.No.KC79P648

MITSUBISHI ELECTRIC

CE 0035

HOT WATER HEAT PUMP

MODEL **QAHV-N560YA-HPB-BS <H>**

REFRIGERANT	R744 6.5kg
LEGAL REFRIGERATION TON	4.8RT
ALLOWABLE PRESSURE(Ps)	HP 14.0MPa (140.0bar) LP 8.5 MPa (85.0 bar)
WEIGHT	400kg
IP CODE	IP24
YEAR OF MANUFACTURE	
SERIAL No.	

RATED VOLTAGE 3N~ V		380	400	415	415
FREQUENCY	Hz	50			
CAPACITY	kW	40.0			
	kcal/h	34400			
	Btu/h	136480			
RATED INPUT	kW	10.97			11.6
COP		3.65			3.44
RATED CURRENT	A	20.0	19.0	18.3	18.7
RATED CONDITION					
OUTLET WATER TEMP.	°C	65			65
INLET WATER TEMP.	°C	9			15
OUTDOOR DB/WB	°C	7/6			7/6

RATED VOLTAGE 3N~ V		380	400	415
FREQUENCY	Hz	50		
CAPACITY	kW	40.0		
	kcal/h	34400		
	Btu/h	136480		
RATED INPUT	kW	10.31		
COP		3.88		
RATED CURRENT	A	17.8	16.9	16.3
RATED CONDITION				
OUTLET WATER TEMP.	°C	65		
INLET WATER TEMP.	°C	17		
OUTDOOR DB/WB	°C	16/12		

Contains fluorinated greenhouse gases covered by the Kyoto Protocol.

MANUFACTURER:
MITSUBISHI ELECTRIC CORPORATION
AIR-CONDITIONING & REFRIGERATION SYSTEMS WORKS
5-66, TEBIRA, 6-CHOME, WAKAYAMA CITY, JAPAN
MADE IN JAPAN

DWG.No.KC79P648

This product is designed and intended for use in the residential, commercial and light-industrial environment.

The product at hand is based on the following EU regulations:

- Low Voltage Directive 2014/35/EU
- Electromagnetic Compatibility Directive 2014/30/EU
- Pressure Equipment Directive 2014/68/EU
- Machinery Directive 2006/42/EC

Please be sure to put the contact address/telephone number on this manual before handing it to the customer.

MITSUBISHI ELECTRIC CORPORATION

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