MITSUBISHI ELECTRIC

Hot Water Heat Pump Unit CAHV

Installation/Operation Manual

For use with R454C

CAHV-R450YA-HPB(-BS)

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.

Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.

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

Do not pierce or burn.

Be aware that refrigerants may not contain an odour.

⚠ CAUTION

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

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

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

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

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

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

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

Condensation may drip from the unit.

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

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

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

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

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

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

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

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

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

Refrigerant poses environmental hazards if released into the air.

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

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

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

It may cause health problems or degrade food.

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

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

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

Use clean tap water.

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

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

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

Periodically inspect and clean the water circuit.

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

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

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

Do not install the unit in an indoor or semi-underground space.

- If the refrigerant leaks, a fire may result.
- The unit must be stored where leaking refrigerant will not accumulate.

Transportation

⚠ WARNING

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

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

⚠ CAUTION

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

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

Installation

⚠ WARNING

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

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

Properly dispose of the packing materials.

Plastic bags pose suffocation hazard to children.

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

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

Periodically check the installation base for damage.

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

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

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

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

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

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

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

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

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

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

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

⚠ CAUTION

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

When the 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 (R454C) is present in the refrigerant circuit.

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

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

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

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

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

Do not open the control box cover while charging refrigerant.

- If the refrigerant leaks, a fire may result.

Electrical wiring

⚠ WARNING

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

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

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

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

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

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

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

Use properly rated breakers and fuses (an earth leakage breaker, local switch <a switch + fuse that meets local electrical codes>, or overcurrent breaker).

The use of improperly rated breakers may result in electric shock, malfunction, smoke, or fire.

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

Keep the unsheathed part of cables inside the terminal block.

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

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

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

Tighten all terminal screws to the specified torque.

Loose screws and contact failure may result in smoke or fire.

Only use standard power cables of sufficient capacity.

Failure to do so may result in current leakage, overheating, smoke, or fire.

⚠ CAUTION

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

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

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.

Do not open the control box cover while charging refrigerant.

- If the refrigerant leaks, a fire may result.

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.

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

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

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

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

Store the unit in a room large enough to allow clearance in the event of refrigerant leakage.

Refrigerant R454C is flammable. Do not use a naked-flame type detector.

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:

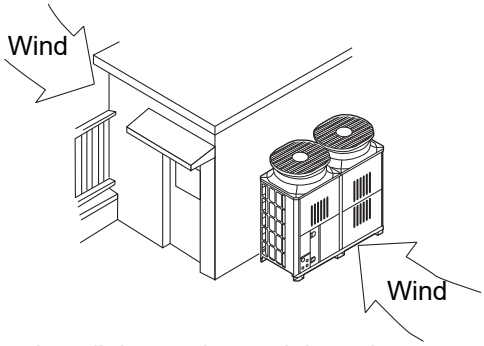
- The unit will not be subject to heat from other heat sources.
- The noise from the unit will not be a problem.
- The unit will not be exposed to strong winds.
- Water from the unit can be drained properly.
- The space requirements (specified on pages 8 through 10) are met.

<1> Providing protection against winds

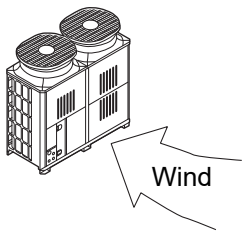
Using the figures at right as a reference, provide adequate protection against winds.

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 snow hoods (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.
- Install snow hoods in regions where the outdoor temperature is -10°C or below.

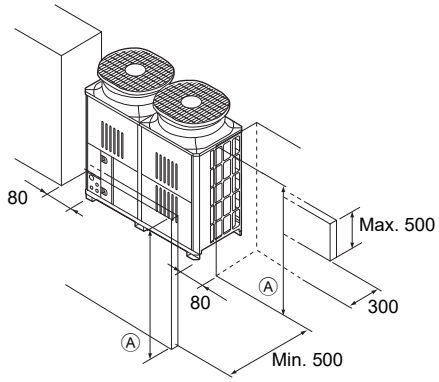
[2] Installation Space Requirements

<1> Single unit installation

Secure enough space around the unit as shown in the figures below.

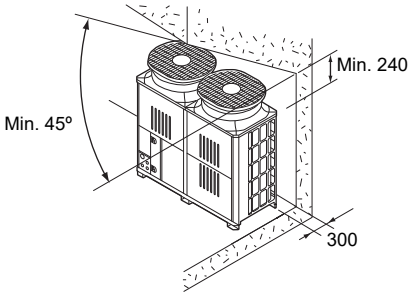
<Unit: mm>

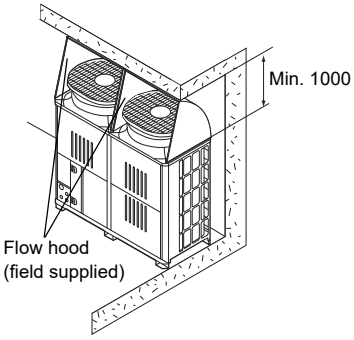
(1) Walls around the unit do not exceed the height limit.



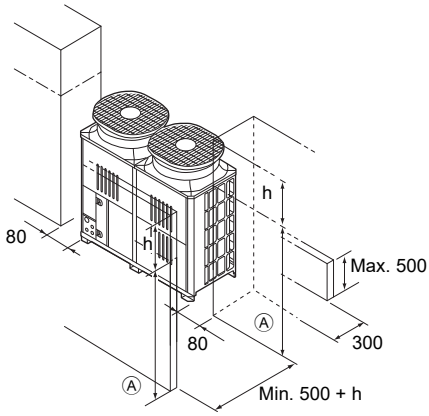
Ⓐ Walls are lower than the unit's height.

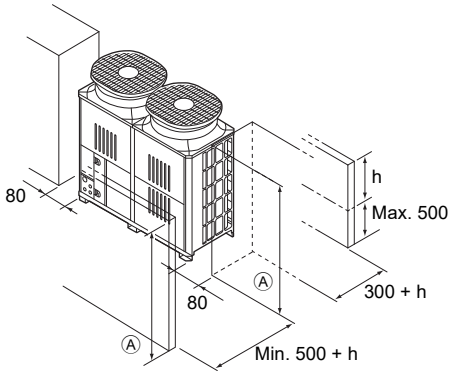
(2) There is a wall above the unit.

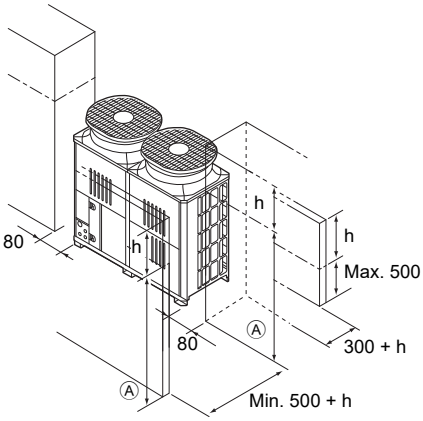




(3) One or more of the walls around the unit are taller than the maximum allowable height <h>.

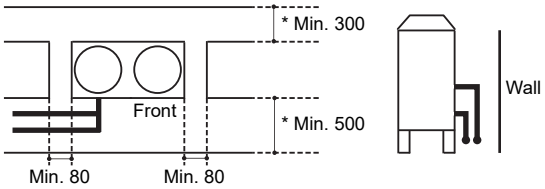




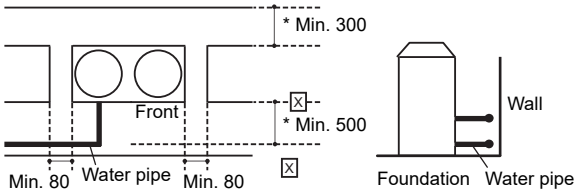


Ⓐ Walls are lower than the unit's height.

(4) Water pipe installation



<Top view> <Side view>



<Top view> <Side view>

Leave a space of at least 500 between the unit and the water pipe if it is not possible to install the unit on a raised foundation. (See ☒ in the figure.)

<2> Grouped and side-by-side installation

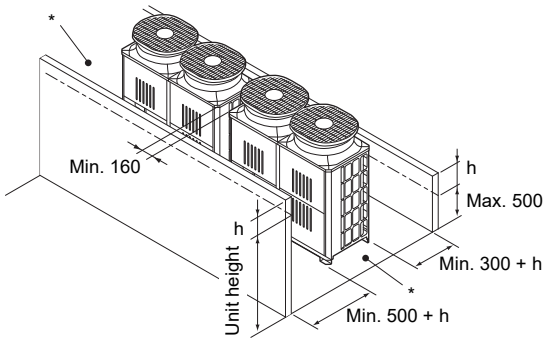
When multiple units are installed adjacent to each other, allow enough space for air circulation and a walk way between groups of units as shown in the figures below.

* Leave both sides of each group of units open.

As with individual installation, if the wall height exceeds the height limit, widen the space in the front and the back of a given group of units by the amount that exceeds the limit (labeled <h> in the figure).

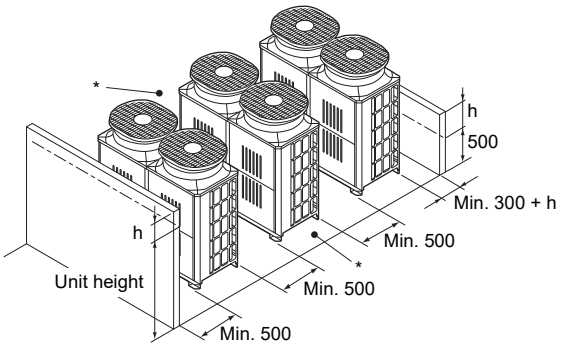
<Unit: mm>

(1) Side-by-side installation

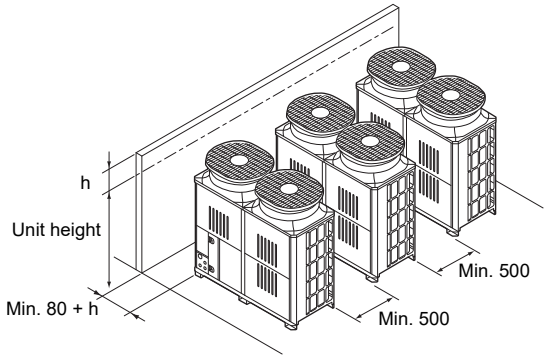


(2) Face-to-face installation

- There are walls in the back and the front of a given group of units.

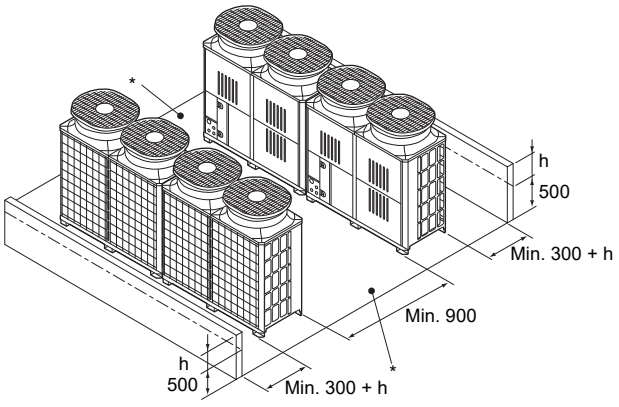


- There is a wall on one side.

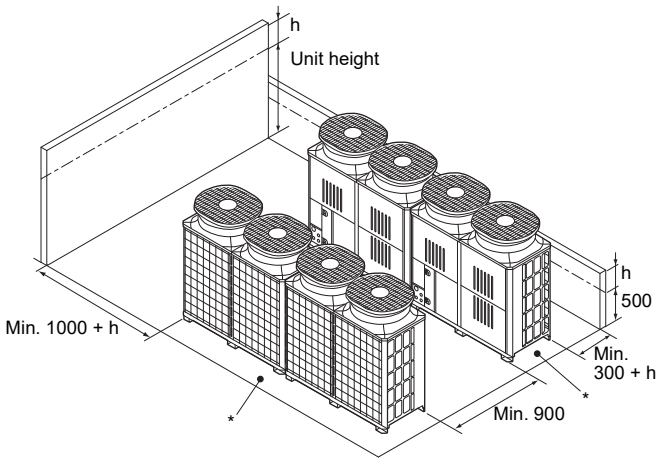


(3) Combination of face-to-face and side-by-side installations

- There are walls in the back and the front of a given group of units.

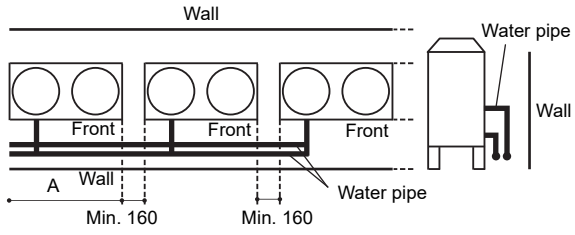


- There is a wall on one side and either the front or the back of a given group of unit.



(4) Water pipe installation

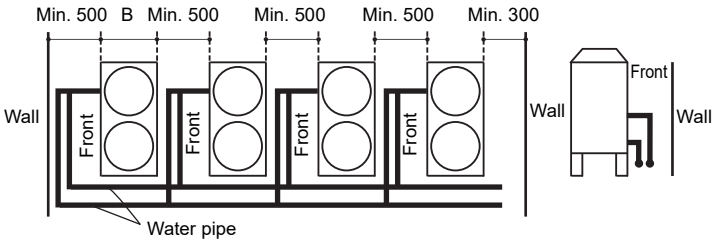
Pattern A



<Top view> <Side view>

If the product width (labeled A in the figure) times the number of units that are installed side by side exceeds 6 m, leave a space of 1000 mm between each block. Each block is defined as a group of units that fit within 6 m.

Pattern B



<Top view> <Side view>

If the product depth (labeled B in the figure) times the number of units that are installed in rows exceeds 6 m, leave a space of 1000 mm between each block. Each block is defined as a group of units that fit within 6 m.

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.
- With some types of installation, unit vibration and sound will be transmitted to the floors and walls.
  Excessive vibrations can damage the pipes, resulting in refrigerant gas leakage. Take measures to prevent vibration (such as using anti-vibration rubber pads).

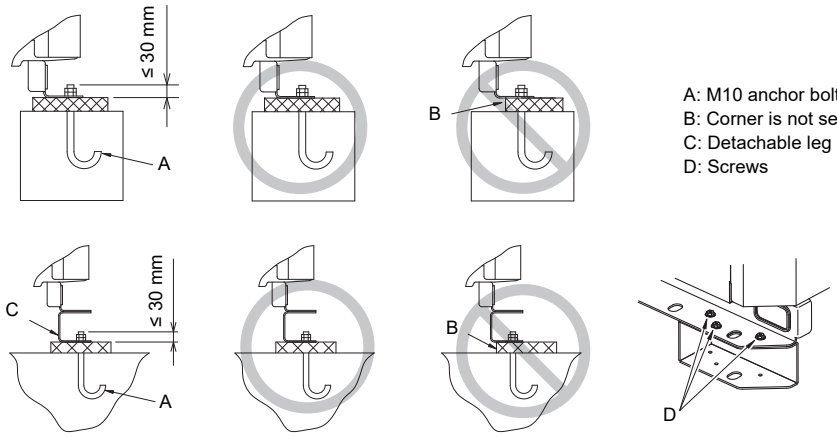
⚠ Warning:

- **Install the unit in accordance with the instructions to minimize the risk of damage from earthquakes and strong winds.**
  - Improper installation will cause the unit to topple, resulting in serious injury.
    To reduce the vibration of the unit operation, irrespective of the cause of the vibration such as earthquakes and strong winds, perform the foundation work in accordance with the installation instructions (including the instructions for installing anti-vibration rubber pads) provided in this section.
- **The unit must be securely installed on a structure that can sustain its weight.**
  - Failure to do so will cause the unit to fall, resulting in serious injury. Abnormal vibrations that result from improper installation can generate abnormal sound and damage the pipes, resulting in refrigerant gas leakage.
    Take adequate measures against typhoon winds and earthquakes so that the unit will not fall or tip over. Consult the local specialists for safety measures to be taken.

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

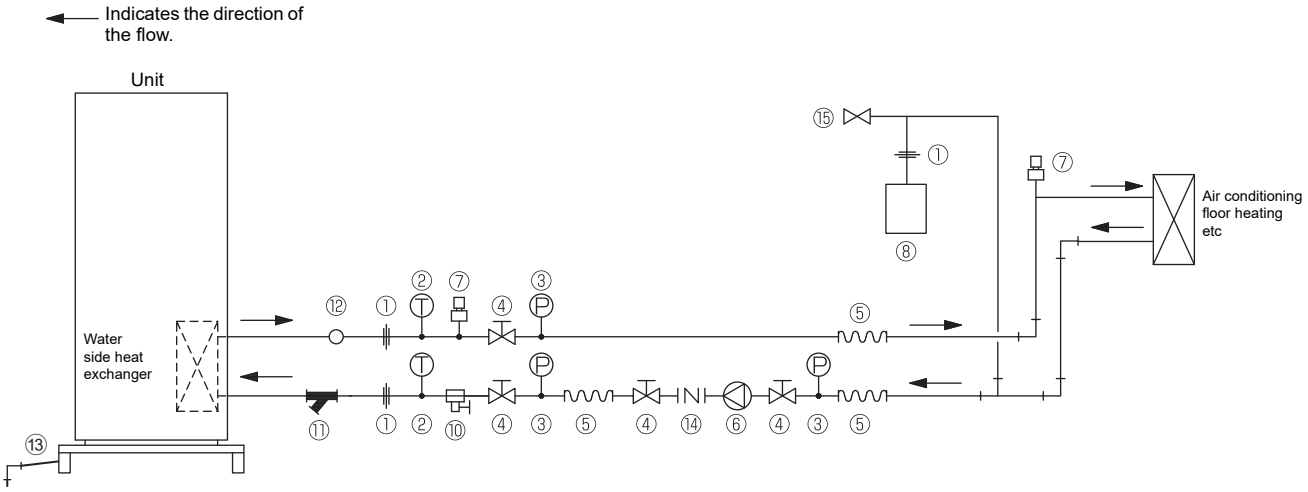
When routing the pipes and wires underneath the unit, make sure that the foundation will not block the piping access holes. Also, make sure the foundation is at least 100 mm high so that the piping can pass under the unit.



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



①	Union joints/flange joints	Required to allow for a replacement of equipment.
②	Thermometer	Required to check the performance and monitor the operation of the units.
③	Water pressure gauge	Recommended for checking the operation status.
④	Valve	Required to allow for a replacement or cleaning of the flow adjuster.
⑤	Flexible joint	Recommended to prevent the noise and vibration from the pump from being transmitted.
⑥	Pump	Use a pump that is large enough to compensate for the total water pressure loss and supply sufficient water to the unit.
⑦	Automatic air vent valve	Install automatic air vent valves where air accumulates. Even in the case of a failure of the water-side heat exchanger in the unit, the refrigerant may leak from the automatic air vent valve. To prevent accidents resulted from refrigerant leakage, install the unit where leaked refrigerant will not accumulate, such as outdoors.
⑧	Closed expansion tank	Install a closed expansion tank to accommodate expanded water and to supply water.
⑨	Water pipe	Use pipes that allow for easy air purging, and provide adequate insulation.
⑩	Drain valve	Install drain valves so that water can be drained for servicing.
⑪	Strainer	Install a strainer near the unit to keep foreign materials from entering the water-side head exchanger.
⑫	Flow switch	Required to protect the unit.
⑬	Drain pipe	Install the drain pipe with a downward inclination of between 1/100 and 1/200. To prevent drain water from freezing in winter, install the drain pipe as steep an angle as practically possible and minimize the straight line. For cold climate installation, take an appropriate measure (e.g., drain heater) to prevent the drain water from freezing.
⑭	Check valve	Required to prevent the backward flow.
⑮	Safety valve	Install a safety valve near the closed expansion tank. Even in the case of a failure of the water-side heat exchanger in the unit, the refrigerant may leak from the safety valve. To prevent accidents resulted from refrigerant leakage, install the unit where leaked refrigerant will not accumulate, such as outdoors.

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

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

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

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

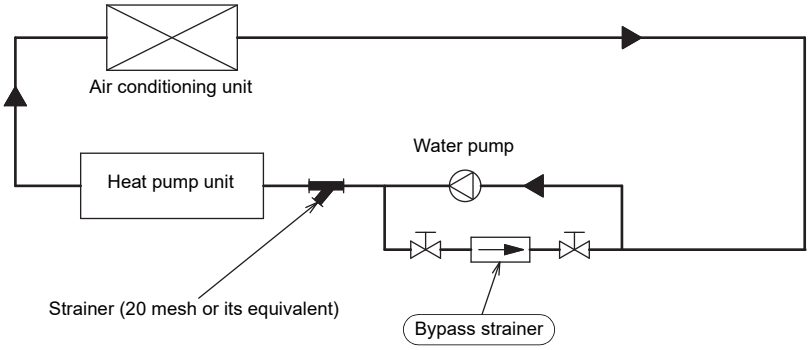
(5) Suspended solids in the water

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

Removing foreign substances from the water system

Consider installing a settlement tank or a bypass strainer to remove foreign substances from the water system.

Select a strainer capable of handling two to three percent of the circulating water. The figure below shows a sample system with a bypass strainer.



(6) Connecting pipes made from different materials

If different types of metals are placed in direct contact with each other, the contact surface will corrode.

Install an insulating material between pipes that are made of different materials to keep them out of direct contact with each other.

[3] Installing the Strainer and Flow Switch

<1> Installing the strainer

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

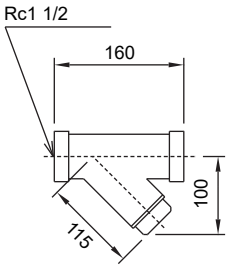
Install the strainer in a way that allows for easy access for cleaning, and instruct the user to clean it regularly.

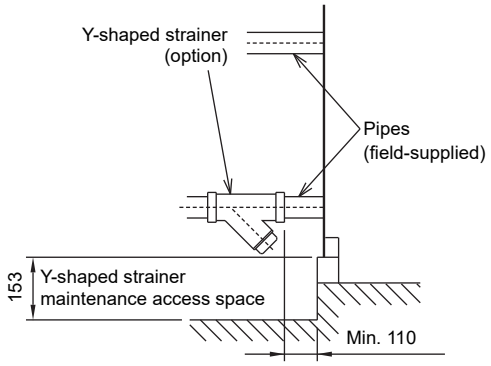
Operating the units with a clogged strainer may cause the units to make an abnormal stop.

Select a location to install a strainer, taking into consideration the installation angle, insulation thickness, and maintenance space.

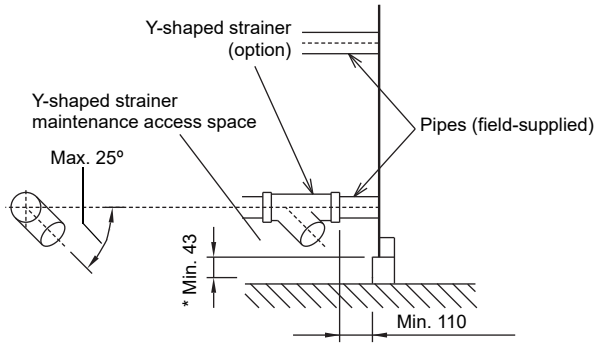
* The dimensions given below indicate the amount of space necessary when screwing in a Y-shaped strainer.

<Unit: mm>





Sample installation 1



Sample installation 2

<2> Installing a flow switch

Install a flow switch (field-supplied) that meets the following specifications on the water pipe.

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

Minimum flow rate= 1.5 m³/h (25 L/min)

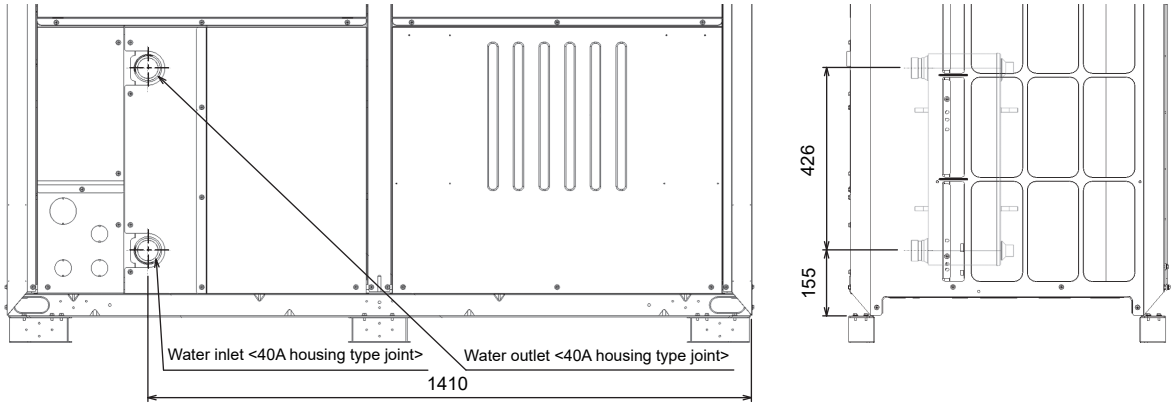
Unit usage range (water flow rate): 1.5 - 15.0 m³/h *

* 4.0 - 15.0 m^3/h under the following conditions:

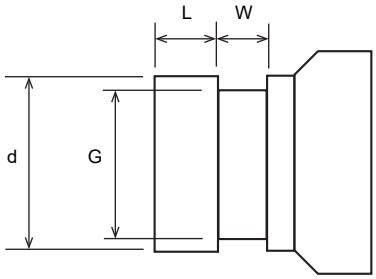
a. When the outdoor temperature is below 0°C,

b. When the outlet water temperature is 30°C or below AND the outdoor temperature is 6°C or below.

[4] Water Pipe Hole Size and Location



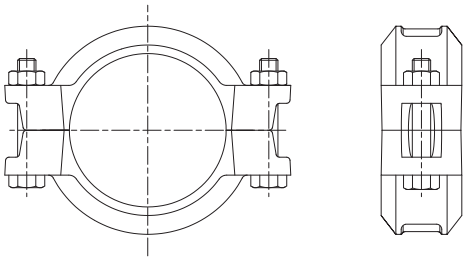
Water pipe groove specifications



(Unit: mm)

	Pipe size
	1-1/2B (40A)
d	ø48.3±0.3
G	$ø45^{0}_{-0.3}$
W	8±0.3
L	15.9±0.3

Housing joint (field-supplied)

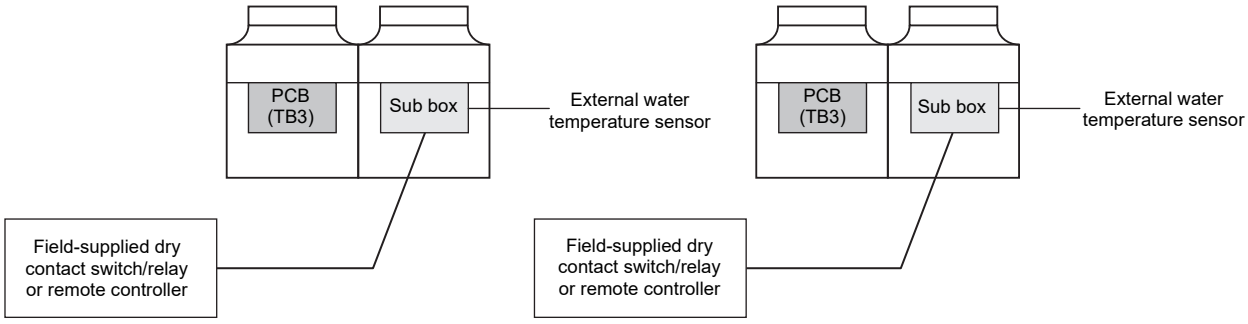


4. System Configurations

[1] Schematic Diagrams of Individual and Multiple Systems

(1) Individual system

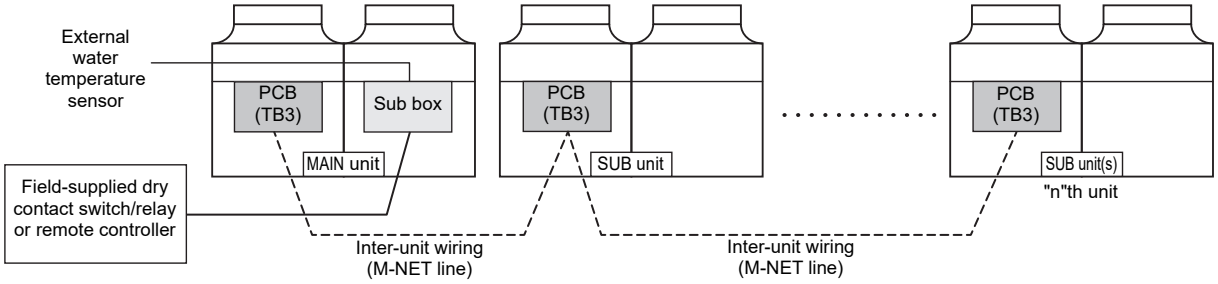
* Each unit is operated individually by connecting a dry contact switch/relay to each unit.



Refer to the sections "Switch Types and the Factory Settings" (page 19) and "System configuration procedures: Individual system" (page 23) for further details.

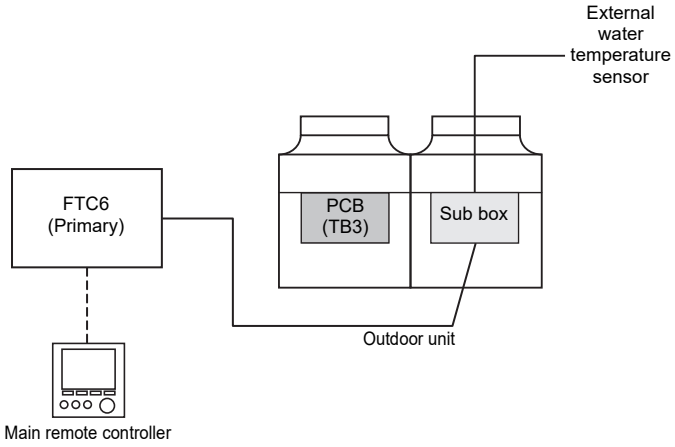
(2) Multiple system (2-16 units)

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



Refer to the sections "Switch Types and the Factory Settings" (page 19) and "System configuration procedures: Multiple system" (page 24) for further details.

(3) Individual system (for FTC connection)

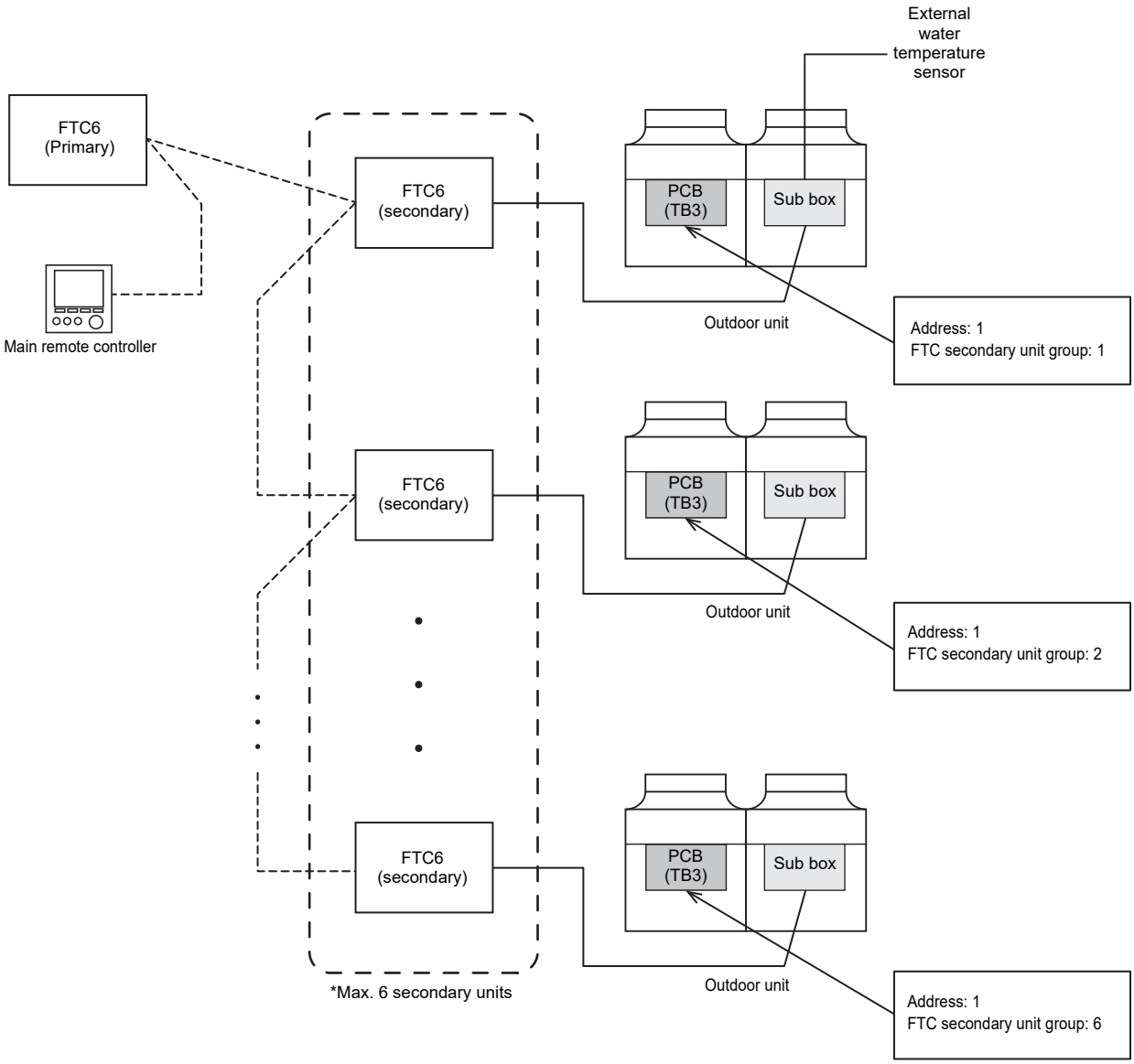


* One unit is connected to one FTC primary unit.

For detailed FTC, please refer to the FTC manual.

Refer to the sections "Switch Types and the Factory Settings" (page 19) and "System configuration procedures: Individual system (for FTC connection)" (page 26) for further details.

(4) Multiple system (2-6 units) (for FTC connection)



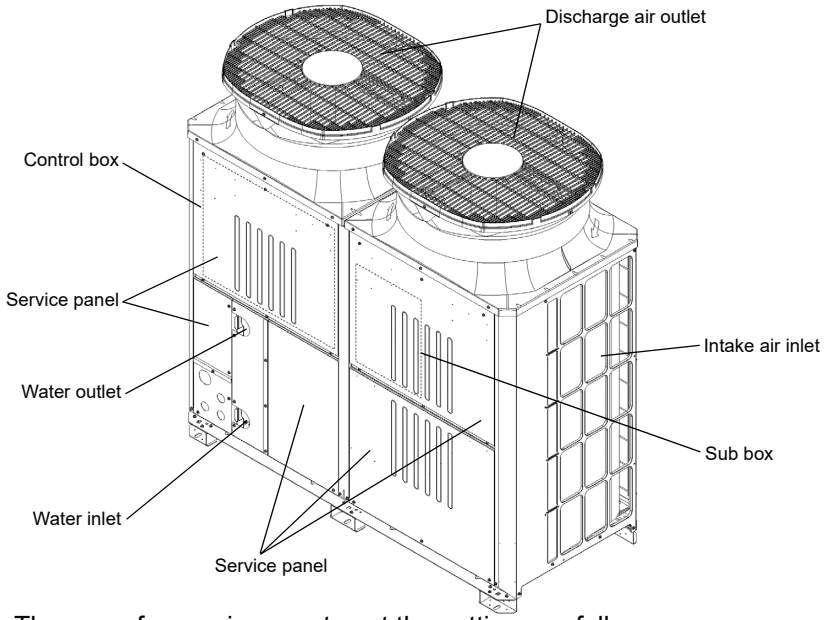
* The main unit is the unit to which an external water temperature sensor is connected.
* One unit is connected to one FTC secondary unit.

For detailed FTC, please refer to the FTC manual.

Refer to the sections "Switch Types and the Factory Settings" (page 19) and "Multiple system (2-6 units) (for FTC connection)" (page 29) for further details.

[2] Switch Types and the Factory Settings

(1) Switch names and functions



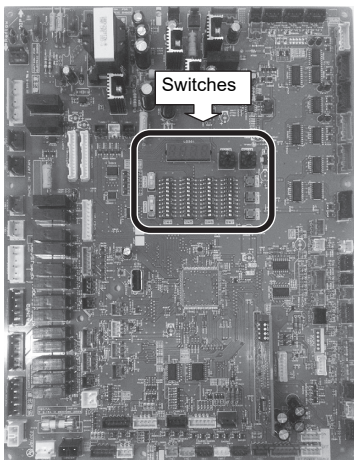
There are four main ways to set the settings as follows:

①Dip switches (SW4 - SW7)
②Dip switches used in combination with the push switches
③Rotary switches
④Slide switches

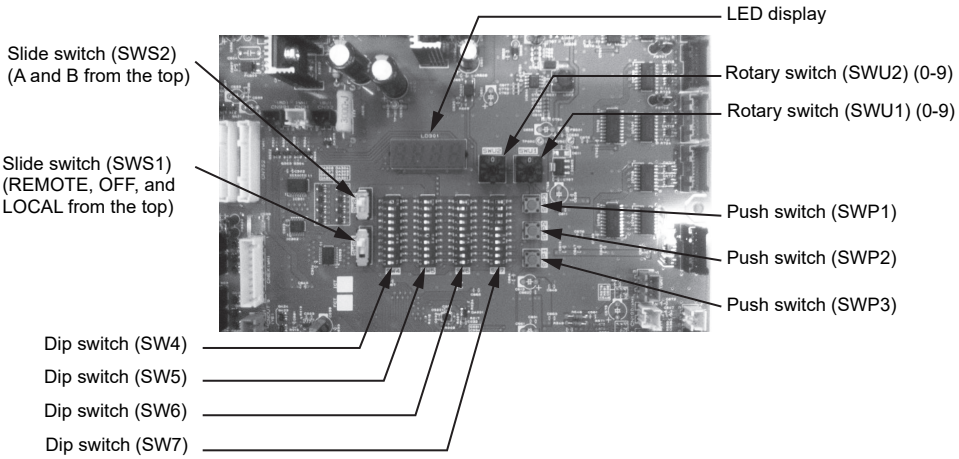
See below for how these switches are used to set certain items.

Different types of switches on the PCB

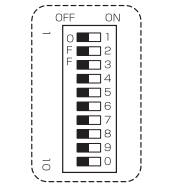
[Entire view of a PCB]

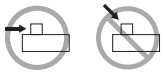


[Enlarged view of the switches]



			Initial Setting
Rotary switch (SWU1)	Sets the 1's digit of the unit address (Multiple system).		"1"
Rotary switch (SWU2)	Sets the 10's digit of the unit address (Multiple system).		"0"
Slide switch (SWS1)	REMOTE OFF LOCAL	The action that the switch takes when set to a certain position depends on the type of system configuration (e.g., individual or multiple system)	REMOTE
Slide switch (SWS2)	Unused		A
Push switch (SWP1)	Switches the display between the item code and the current value for a specific item. Increases value.		-
Push switch (SWP2)	Switches the display between the item code and the current value for a specific item. Decreases value.		-
Push switch (SWP3)	Advances the item code. Saves the changed value.		-
Dip switches (SW4-7)	Switches the LED display contents.		





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

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

.

SW		Function	Usage	Factory setting Circuit board	OFF setting	ON setting	Setting timing
SW4	1	Model setting		Depends on the unit	Leave the setting as it is.		At a reset
	2						
	3						
	4						
	5						
	6						
	7						
	8						
	9						
	10						
SW5	1	Freeze-up protection setting	Starts the pump when both the outside and water temperatures drop to prevent water pipe freeze up.	OFF	The outside temperature condition for Freeze-up protection is 1°C	Same as when set to OFF	At a reset
	2	Scheduled operation display	Turns on and off the remote display during scheduled operation.	OFF	Leaves the operation display on during the period in which the unit is scheduled to be stopped.	Turns off the operation display during the period in which the unit is scheduled to be stopped.	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	Recovery conditions after forced stoppage	Selects what the operation restoration condition will be based on after the unit was forced to stop based on the external thermistor reading (water outlet temperature).	OFF	External thermistor	Built-in thermistor	At a reset
	6	Power supply option to the communication circuit	Switches between supplying or not supplying power to the communication circuit.	ON	Does not supply power to the communication circuit.	Supplies power to the communication circuit.	Any time
	7	Remote water-temperature setting	Allows or disallows the water temperature to be set using analog signals from a remote location.	OFF	Disallows the water temperature to be set using external analog signals.	Allows the water temperature to be set using external analog signals.	At a reset
	8	Water-temperature control option	Selects either the external water temperature sensor or the built-in sensor to be used to control water temperature.	OFF	Built-in sensor on the unit	External water temperature sensor	At a reset
	9	Individual/Multiple system	Selects between individual and Multiple system	OFF	Individual system	Multiple system	At a reset
	10	Display mode switch 7	This switch is used in combination with dip switches SW6-5 through 6-10 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
SW6	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.	Automatically restores operation after power failure.	At a reset
	3	Water-temperature control	Switches between inlet-water-temperature-based control and outlet-water-temperature-based control.	OFF	Outlet-water-temperature-based control	Inlet-water-temperature-based control	At a reset
	4	Pump-thermistor interlock setting	Interlocks or does not interlock the operation of the pump with the external thermistor. (Effective only when SW5-8 is set to ON.)	OFF	The pump turns on when the operation switch is turned on regardless of the Thermo-ON/Thermo-OFF status.	Interlocks the operation of the pump with the Thermo-ON/Thermo-OFF status.	At a reset
	5	Display mode switch 1	These switches are used in combination with dip switches SW6-5~10 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
	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

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.

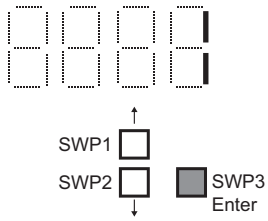
<1> Making the settings

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 SW5 and SW6 have been set.

①

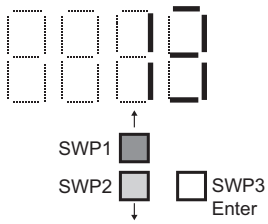


Normally an item code appears on the display.
(The figure at left shows the case where item code 1 is displayed.) Press SWP3 (Enter) to advance the item code.

↓

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

②

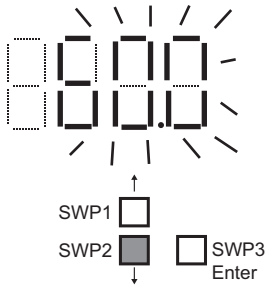


The left figure shows a display example.

↓

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

③

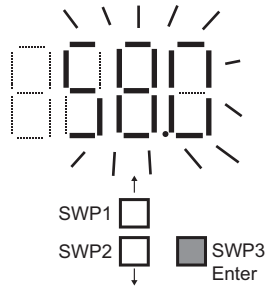


The current setting value will blink.

↓

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.

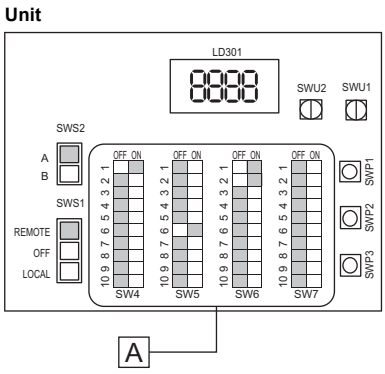
(2) Table of settings items

Set the dip switches SW5 and SW6 as shown in the table below to set the value for the items in the "Setting item" column.

SW5 and SW6 settings				Setting Item	Item Code	Default	Notes
SW5-1	SW6-8	SW6-9	SW6-10				
OFF	OFF	ON	OFF	Current time	1		Set the current time.
				Maximum peak-demand capacity	2	100%	
				Peak-demand control start time	3	13:00	
				Peak-demand control end time	4	13:00	
				Enable/disable schedule setting	5	0	Set to "1" to enable scheduled operation.
				ON-time 1 (schedule mode without remote)	6	0:00	
				OFF-time 1 (schedule mode without remote)	7	0:00	
				ON-time 2 (schedule mode without remote)	8	0:00	
				OFF-time 2 (schedule mode without remote)	9	0:00	
				ON-time 3 (schedule mode without remote)	18	0:00	
				OFF-time 3 (schedule mode without remote)	19	0:00	
				Setting temp D,E for analog input	11 13	D=45ºC, E=65ºC	When SW5-7 is set to ON
				Setting temp A (Heating mode)	11	45ºC	Range 24-70
				Setting temp B (Hot water mode)	13	65ºC	Range 24-70
				Remote water temperature input signal type	21	0	0: 4-20 mA; 1: 0-10V; 2: 1-5 V; 3: 2-10V
				Setting temp C1,C2,C3,C4 for Setting temp C for Heating Eco mode	22-25	C1=34ºC; C2=-7ºC C3=24ºC; C4=12ºC	
				Water temperature/Capacity control	1051	0	0: Water temperature input 4-20 mA 1: Capacity control input 4-20 mA 2: Water temperature input IT terminal 3: Capacity control input IT terminal
				Drain pan heater/Defrost signal	1056	0	Selects between drain pan output and defrost output for IO-Board (CN513 5-7) output.
				TWL1	1057	40	Water temperature 1 for emergency signal 1
				TAL1	1058	-10	Outside temperature 1 for emergency signal 1
OFF	ON	OFF	OFF	Thermo differential 2	1016	2.0	Range 0-8
				Multiple System Thermo-ON/OFF prohibition periods	1020	1	Range 1-5
				Outdoor temperature input source selection	1080	0	0: Outdoor temperature sensor (TH9) 1: IT terminal
				Control Sensor selection (Target Setting temp A)	1215	TH14	Selectable from TH14 or TH15
				Control Sensor selection (Target Setting temp B)	1216	TH14	Selectable from TH14 or TH15
				Control Sensor selection (Target Setting temp C)	1217	TH14	Selectable from TH14 or TH15
				Setting temp selection 1 (ON-time 1-OFF-time 1)	1218	A (1)	A=1; B=2; C=3
				Setting temp selection 2 (ON-time 2-OFF-time 2)	1219	A (1)	A=1; B=2; C=3
				Setting temp selection 3 (ON-time 3-OFF-time 3)	1220	A (1)	A=1; B=2; C=3

(3) System configuration procedures: Individual system

1. Set the dip switches on the control board.



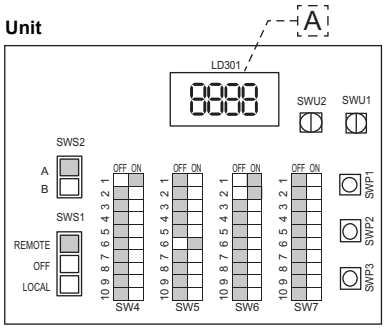
Switch settings on the control board

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

- Water temperature control based on the external water temperature reading
- Water temperature control based on the inlet water temperature

Refer to "Dip switch settings table" (page 20) for further details.

2. Switch on the power to the unit.

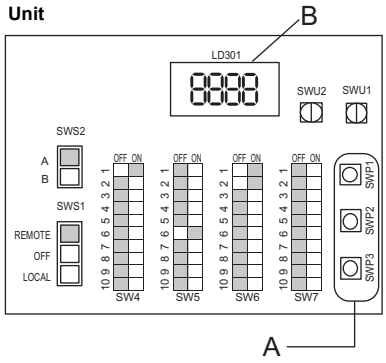


Check for loose or incorrect wiring, and then switch on the power to the unit.

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

- [EEEE] will appear on LD301 in the circuit board (labeled A in the figure at right).

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



(1) 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 LD301 (labeled B in the figure at right).

(2) Use SWP3 to toggle through the item codes and select an item code to change its current value. (The item codes will appear in the following order: [101]→[102]→[105]→ [107]→ [108]→[101] (back to the beginning).)

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

(4) Press SWP3 to save the changed value.

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

[101] Not used

[102] Not used

[105] Not used

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

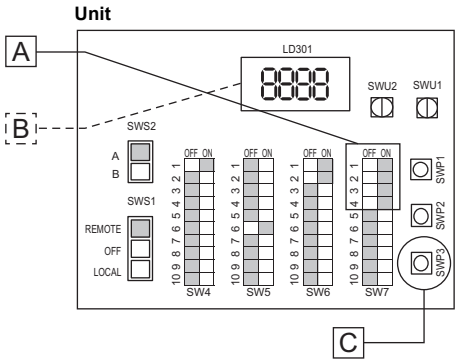
[108] FTC secondary unit group (Default = 0) (Leave it as it is.)

4. Perform an initial setup.

(1) Set dip switches SW7-1, -2, -3, and -4 to ON (labeled A in the figure at right).
[EEEE] will appear in LD301 (labeled B in the figure at right). *1

(2) Press and hold the push switch (SWP3) (labeled C in the figure at right) for one second or longer.
- While the system is starting up [9999] will appear on LD301 (labeled B in the figure at right).

(3) Set dip switches SW7-1, -2, -3, and -4 to OFF (labeled A in the figure at right).
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.

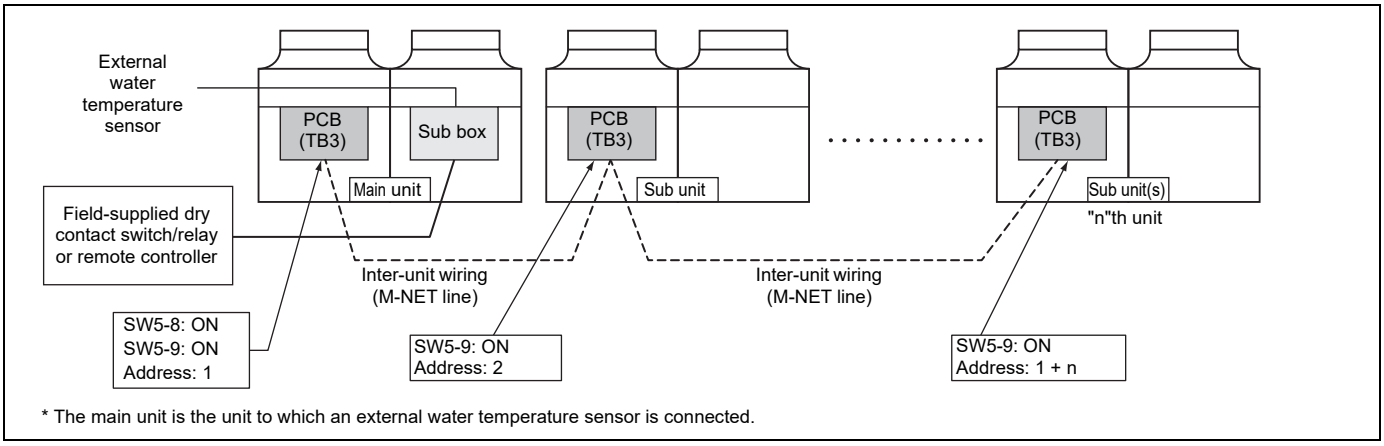


*1 If the start-up process has already been completed, [FFFF] (instead of [EEEE]) will appear when the dip switches SW7-1, 2, 3, 4 are set to ON.

(4) System configuration procedures: Multiple system

1. Set the dip switches and rotary switches.

System configuration diagram

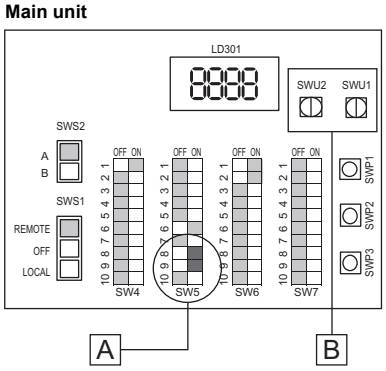


Setting the switches on the main unit

(1) Set the dip switch SW5-8 to ON. (an external water temperature sensor) (labeled A in the figure at right)

(2) Set the dip switch SW5-9 to ON. (multiple unit control) (labeled A in the figure at right)

Refer to "Dip switch settings table" (page 20) for further details.



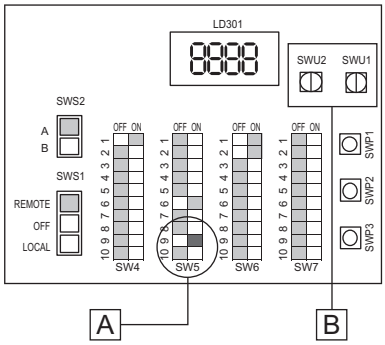
Make sure the address on the main unit is set to "1" (labeled B in the figure above).

Setting the switches on all sub units

(1) Set the dip switch SW5-9 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 1's digit with SWU1, and set the 10's digit with SWU2. Assign sequential addresses on all sub units starting with 2.

Sub unit



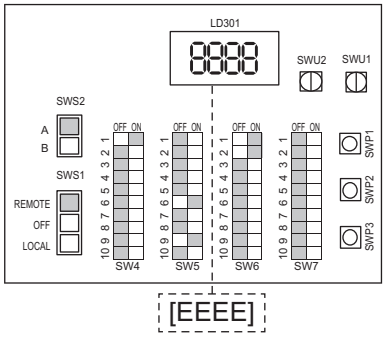
2. Switch on the power to the unit.

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 LD301 on the main unit.
- [9999] will appear on LD301 on the sub units.

Main unit



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

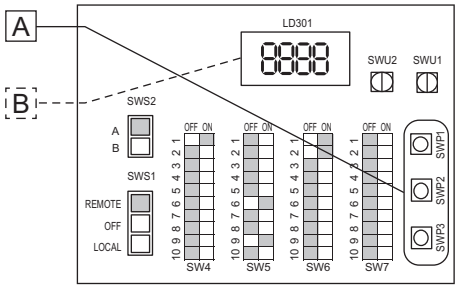
(1) Press either one of the push switches SWP1, 2, or 3 (labeled A in the figure at right) on the control board.

* [EEEE] will disappear, and an item code ([101]) will appear on LD301 (labeled B in the figure at right).

(2) Use SWP3 to toggle through the item codes, and select an item code to change its current value. (The item codes will appear in the following order: [101] →[102]→[105]→[107]→[108]→[101] (back to the beginning).)

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

(4) Press SWP3 to save the changed value.



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

[101] Not used

[102] Not used

[105] Not used

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

[108] FTC secondary unit group (Default = 0) (Leave it as it is.)

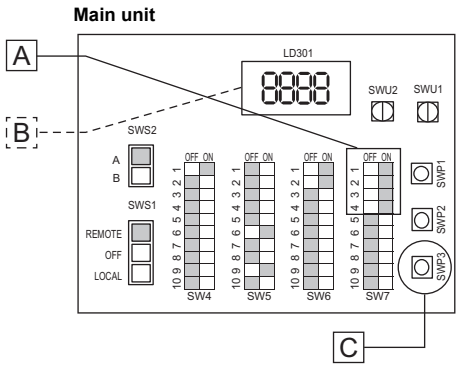
4. Perform an initial setup on the main unit.

(1) Set dip switches SW7-1, -2, -3, and -4 to ON (labeled A in the figure at right).
[EEEE] will appear in LD301 (labeled B in the figure at right). *1

(2) Press and hold the push switch (SWP3) (labeled C in the figure at right) for one second or longer.

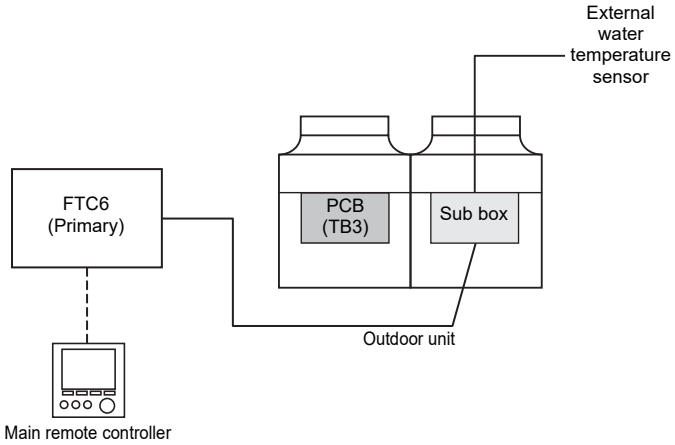
- While the system is starting up [9999] will appear on LD301 (labeled B in the figure at right).

(3) Set dip switches SW7-1, -2, -3, and -4 to OFF (labeled A in the figure at right).
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.



*1 If the start-up process has already been completed, [FFFF] (instead of [EEEE]) will appear when the dip switches SW7-1, 2, 3, 4 are set to ON.

(5) System configuration procedures: Individual system (for FTC connection)

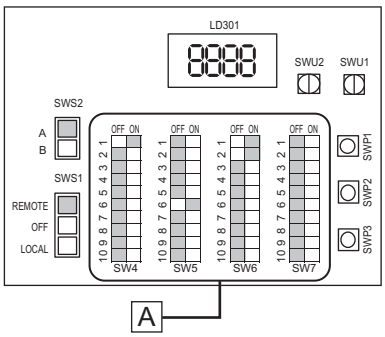


* One unit is connected to one FTC primary unit.

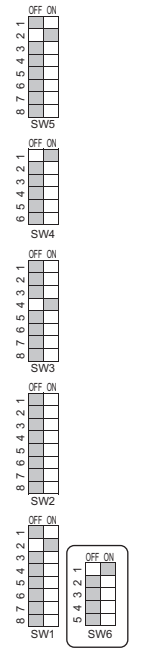
1. Set the dip switches and rotary switches.

Switch settings on the control board

(1) Set the dip switches (labeled A in the figure at right) that correspond to the items below, according to the local system.
Refer to "Dip switch settings table" (page 20) for further details.



(2) Be sure to turn ON DipSW6-1 on the FTC board. (both primary and secondary ON)



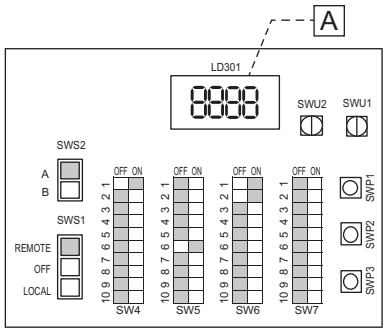
FTC board

2. Switch on the power to the unit.

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

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

- [EEEE] will appear on LD301 in the circuit board (labeled A in the figure at right).



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

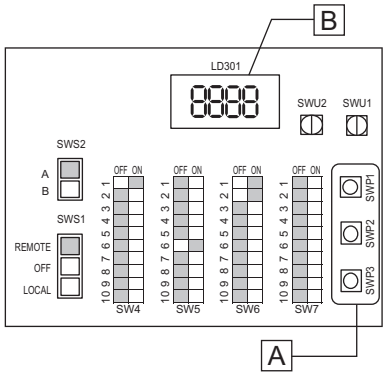
(1) Press either one of the push switches SWP1, 2, or 3 (labeled A in the figure at right) on the circuit board.

* [EEEE] will disappear, and an item code ([101]) will appear on LD301 (labeled B in the figure at right).

(2) Use SWP3 to toggle through the item codes and select an item code to change its current value. (The item codes will appear in the following order: [101] →[102]→[105]→[107]→[108]→[101] (back to the beginning).)

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

(4) Press SWP3 to save the changed value.



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

[101] Not used

[102] Not used

[105] Not used

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

[108] FTC secondary unit group (Default = 0) (Leave it as it is.)

4. Perform an initial setup.

(1) Set dip switches SW7-1, -2, -3, and -4 to ON (labeled A in the figure at right).
[EEEE] will appear in LD301 (labeled B in the figure at right). *1

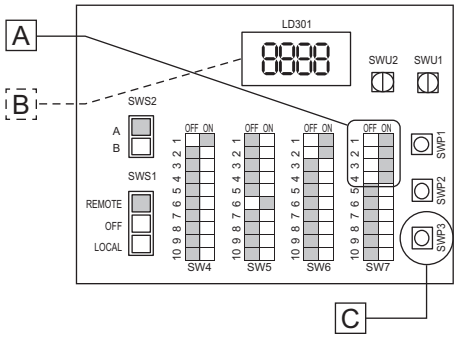
(2) Press and hold the push switch (SWP3) (labeled C in the figure at right) for one second or longer.

- While the system is starting up [9999] will appear on LD301 (labeled B in the figure at right).

(3) Set dip switches SW7-1, -2, -3, and -4 to OFF (labeled A in the figure at right).
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.

*1 If the start-up process has already been completed, [FFFF] (instead of [EEEE]) will appear when the dip switches SW7-1, 2, 3, 4 are set to ON.

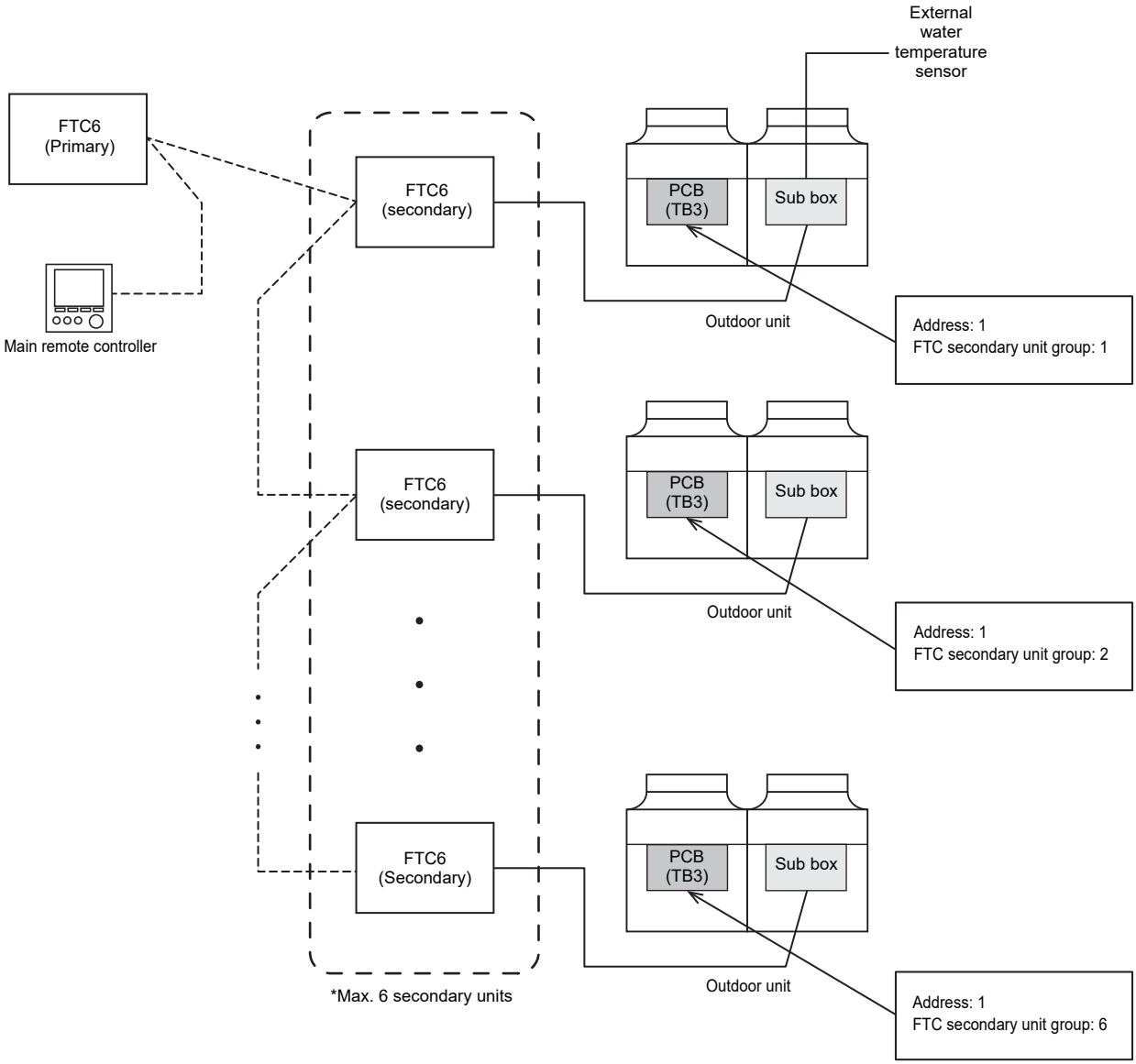
For detailed FTC, please refer to the FTC manual.



(6) Multiple system (2-6 units) (for FTC connection)

1. Set the dip switches and rotary switches.

System configuration diagram: Multiple FTC units connect



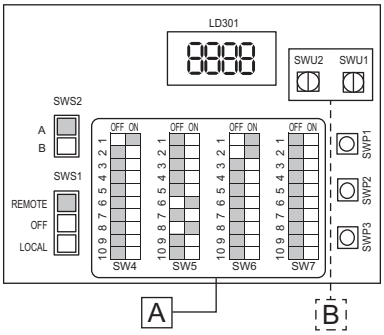
* The main unit is the unit to which an external water temperature sensor is connected.
* One unit is connected to one FTC secondary unit.

Setting the switches on all units

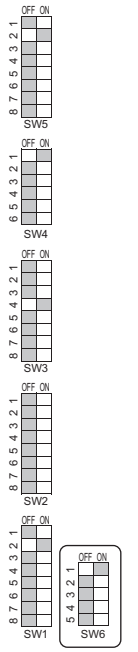
(1) Set the dip switch SW5-8 to ON. (an external water temperature sensor) (labeled A in the figure at right)

Refer to "Dip switch settings table" (page 20) for further details.

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



(2) Be sure to turn ON DipSW6-1 on the FTC board. (both primary and secondary ON)



FTC board

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 LD301 on the all unit.

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

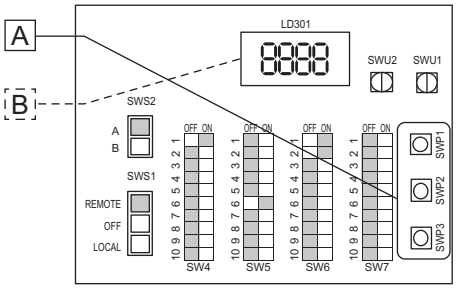
(1) Press either one of the push switches SWP1, 2, or 3 (labeled A in the figure at right) on the control board.

* [EEEE] will disappear, and an item code ([101]) will appear on LD301 (labeled B in the figure at right).

(2) Use SWP3 to toggle through the item codes, and select an item code to change its current value. (The item codes will appear in the following order: [101] →[102]→[105]→[107]→[108]→[101] (back to the beginning).)

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

(4) Press SWP3 to save the changed value.



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

Item [108] must be set when multiple FTC are connected to a system.

[101] Not used

[102] Not used

[105] Not used

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

[108] FTC secondary unit group

4. Perform an initial setup on the unit.

(1) Set dip switches SW7-1, -2, -3, and -4 to ON (labeled A in the figure at right).
[EEEE] will appear in LD301 (labeled B in the figure at right). *1

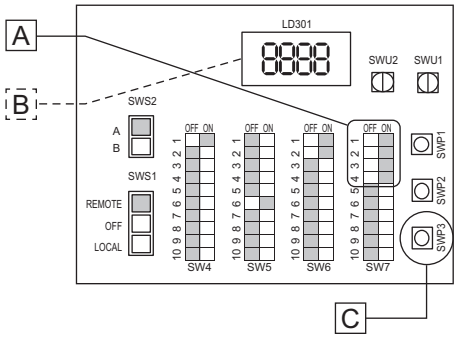
(2) Press and hold the push switch (SWP3) (labeled C in the figure at right) for one second or longer.

- While the system is starting up [9999] will appear on LD301 (labeled B in the figure at right).

(3) Set dip switches SW7-1, -2, -3, and -4 to OFF (labeled A in the figure at right).
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.

*1 If the start-up process has already been completed, [FFFF] (instead of [EEEE]) will appear when the dip switches SW7-1, 2, 3, 4 are set to ON.

For detailed FTC, please refer to the FTC manual.



Slide switch (SWS1) settings

Individual system

SWS1 Setting	Unit Operation
REMOTE	Follows the input signal fed through a dry contact interface or controllers
OFF	Ignores the signal input
LOCAL	Follows the input signal

Multiple system

SWS1 Setting		Unit Operation	
Main unit	Sub unit	Main unit	Sub unit
REMOTE	REMOTE	Follows the input signal fed through a dry contact interface or controllers	Follows the input signal on the Main unit
	OFF		Ignores the signal input
	LOCAL		Follows the input signal on the Main unit
OFF	REMOTE	Ignores the signal input	Ignores the signal input
	OFF		
	LOCAL		
LOCAL	REMOTE	Follows the input signal on the Main unit	Follows the input signal on the Sub unit
	OFF		Ignores the signal input
	LOCAL		Follows the input signal on the Sub unit

(7) Re-initializing the system

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

- Dip switch SW5-8 (use or non-use of an external water temperature sensor) (Re-initialization is required only for the Multiple system.)
- Dip switch SW5-9 (multiple unit control)
- Dip switch SW6-3 (water temperature control method)
- System setting [107] (total number of units in the system)
- Rotary switches (SWU1 and SWU2) (unit address)

Take the following steps to re-initialize the system:

(1) Set the dip switches SW7-1, 2, 3, 4 to ON.
[FFFF] will appear in the LD301.

(2) Press and hold the push switch SWP3 for 5 seconds.

- While the system is starting up [9999] will appear on LD301.

(3) Set the dip switches SW7-1, 2, 3, 4 to OFF.

(8) Resetting the system

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

(1) Set the dip switches SW7-1, 2, 3, 4 to ON.
[FFFF] will appear in the LD301.

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

- While the system is starting up [9999] will appear on LD301.

(3) Set the dip switches SW7-1, 2, 3, 4 to OFF.

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

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

Priority 1	Priority 2	Priority 3		Priority 4			Priority 5	Target water temperature	Sensor that becomes active (when SW5-8 is set to ON) (*1)
Analog input (SW 5-7)	Schedule setting from control board	SWS1	Schedule type (RC)	Dry contact (*2)			Remote controller Input from centralized controller AE-200 or BMS		
		RC		Anti-freeze	Hot water	Heating ECO			
ON	ON	SWS1: LOCAL	-	-	-	-	-	Temperature setting for the analog signal input	TH14
		SWS1: REMOTE Dry contact: Run	In time	-	-	-	-	Temperature setting for the analog signal input	TH14
			After-hours	ON	-	-	-	25°C	-
				OFF	-	-	-	Stop	-
		SWS1: REMOTE Dry contact: Stop	-	ON	-	-	-	25°C	-
				OFF	-	-	-	Stop	-
	OFF	SWS1: LOCAL Operation command: ON	-	ON	-	-	-	25°C	-
				OFF	-	-	Anti-freeze	25°C	-
					-	-	Heating	Temperature setting for the analog signal input	TH14
		SWS1: REMOTE Operation command: OFF	-	ON	-	-	-	25°C	-
				OFF	-	-	Anti-freeze	Stop	-
					-	-	Heating	Stop	-
OFF	ON	SWS1: LOCAL	-	-	-	-	-	Selectable from temperature settings A through C by scheduled operation of the control board	Selectable from TH14 or TH15
		SWS1: REMOTE Dry contact: Run	In time	-	-	-	-	Selectable from temperature settings A through C by scheduled operation of the control board	Selectable from TH14 or TH15
			After-hours	ON	-	-	-	25°C	-
				OFF	-	-	-	Stop	-
		SWS1: REMOTE Dry contact: Stop	-	ON	-	-	-	25°C	-
				OFF	-	-	-	Stop	-
	OFF	SWS1: LOCAL Operation command: ON	-	ON	-	-	-	25°C	-
				OFF	ON	-	-	Temperature setting B (Hot water mode)	Selectable from TH14 or TH15
					OFF	ON	-	Temperature setting C (Heating ECO mode)	Selectable from TH14 or TH15
						OFF	Heating	Temperature setting A (Heating mode)	Selectable from TH14 or TH15
							Hot water	Temperature setting B (Hot water mode)	Selectable from TH14 or TH15
							Heating ECO	Temperature setting C (Heating ECO mode)	Selectable from TH14 or TH15
							Anti-freeze	25°C	-
		SWS1: REMOTE Operation command: OFF	-	ON	-	-	-	25°C	-
				OFF	ON	-	-	Stop	-
					OFF	ON	-	Stop	-
						OFF	Heating	Stop	-
							Hot water	Stop	-
							Heating ECO	Stop	-
							Anti-freeze	Stop	-

*1 If SW5-8 is set to OFF, water temperature will be controlled by the built-in thermistor TH11 on the unit.

*2 Priority is given in order of Anti-freeze, Hot water, and Heating ECO.

Water-temperature setting

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

(1) Setting procedures

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

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

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

* Settings can be changed from the optional remote controller, regardless of the ON/OFF status of the operation switch.

Step 1
Outdoor temperature input source selection

SW5	SW6					
10	5	6	7	8	9	10
OFF	OFF	OFF	OFF	ON	OFF	OFF

Items that can be set	Item code	Initial value	Unit	Setting			Note	Setting change from an optional remote controller
				Increments	Lower limit	Upper limit		
Outdoor temperature input source selection	1080	0		1	0	1		Not possible

0: Outdoor temperature sensor (TH9)
1: IT terminal

Step 2
Set the dip switches SW5 and SW6.

SW5	SW6					
10	5	6	7	8	9	10
OFF	OFF	OFF	OFF	OFF	ON	OFF

Step 3
Select the desired item with the push switch SWP3.

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

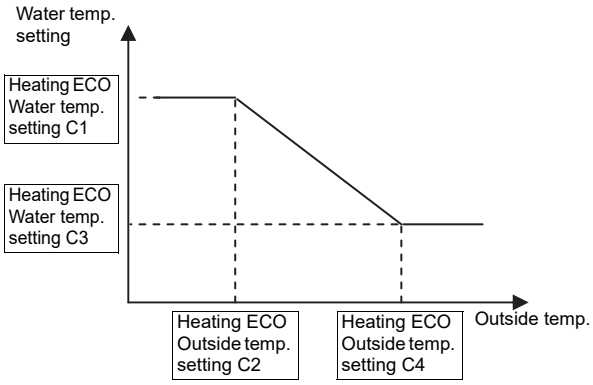
Step 4

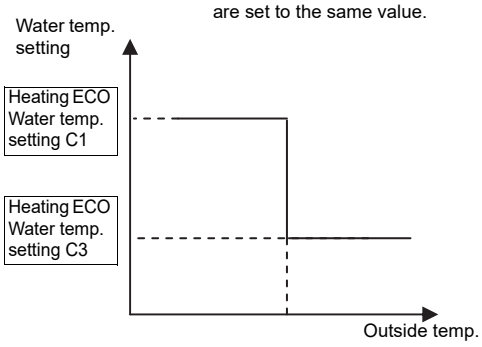
Press the push switches SWP1 (↑) or SWP2 (↓) to increase or decrease the value.

Settings table

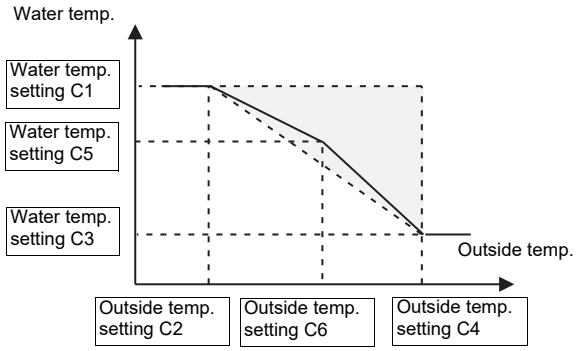
Items that can be set	Item code	Initial value	Unit	Setting			Setting change from an optional remote controller
				Increments	Lower limit	Upper limit	
Water temp. setting A (Heating mode)	11	45	°C	0.1°C	24	70	Possible
Water temp. setting B (Hot water mode)	13	65	°C	0.1°C	24	70	Possible
Heating ECO mode/ Water temp. setting C1 *1	22	34	°C	0.1°C	24	70	Not possible
Heating ECO mode/ Outside temp. setting C2 *1	23	-7	°C	0.1°C	-20	50	Not possible
Heating ECO mode/ Water temp. setting C3 *1	24	24	°C	0.1°C	24	70	Not possible
Heating ECO mode/ Outside temp. setting C4 *1	25	12	°C	0.1°C	-20	50	Not possible
Heating ECO mode/ Water temp. setting C5 *1	26	30	°C	0.1°C	24	70	Not possible
Heating ECO mode/ Outside temp. setting C6 *1	27	2	°C	0.1°C	-20	50	Not possible

* When the values for C2 and C4 are set to the same value.





Heating ECO (Curve)



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

*1 These items need not be set when only a single water temperature setting is used.
When a signal through a dry contact is used to switch between the three modes, the water temperature setting is selected as shown in the table below.

* The setting ranges for the water temperature setting A, B, C1, and C3 are shown in the table below.

Water-temperature control	Lower limit	Upper limit
Outlet-water-temperature-based control	24.0°C	70.0°C
Inlet-water-temperature-based control	24.0°C	65.0°C

* When the outside temperature is -5ºC or below and the water temperature is set as follows, the unit may operate at a higher preset temperature than the preset temperature: Outlet temperature 35ºC/Inlet temperature 30ºC.

Step 5

Press the push switch SWP3 to save the change.

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

(2) Scheduled operation

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

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

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

Setting procedures

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

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

Step 1
Set the dip switches SW5 and SW6.

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

SW5	SW6					
10	5	6	7	8	9	10
OFF	OFF	OFF	OFF	OFF	ON	OFF

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

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

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

Settings table

Settable item	Item code	Initial value	Unit	Limits and increments		
				Increments	Lower limit	Upper limit
Current time	1	0000	Hour: minute	1 minute	0000	2359
Enable or disable scheduled operation (ON/OFF)	5	0	Enable: 1 Disable: 0	1	0	1
Operation start time 1	6	0000	Hour: minute	1 minute	0000	2359
Operation end time 1	7	0000	Hour: minute	1 minute	0000	2359
Operation start time 2	8	0000	Hour: minute	1 minute	0000	2359
Operation end time 2	9	0000	Hour: minute	1 minute	0000	2359
Operation start time 3	18	0000	Hour: minute	1 minute	0000	2359
Operation end time 3	19	0000	Hour: minute	1 minute	0000	2359

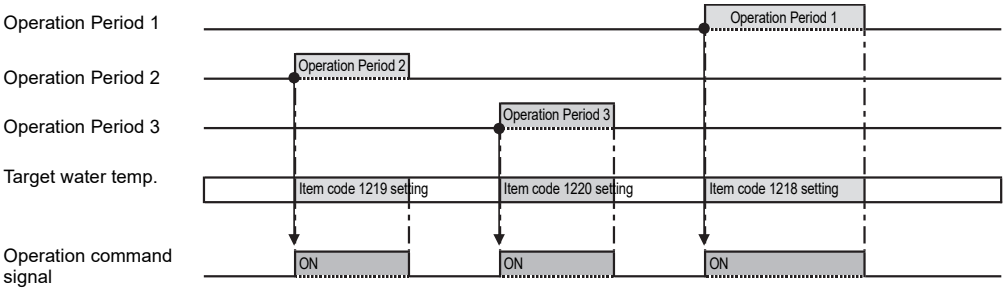
Step 4
Press the push switch SWP3 to save the change.

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

Note **A mode (preset temperatures) can be selected for each operation time period. Refer to page 39 (3) for how to make the settings.**

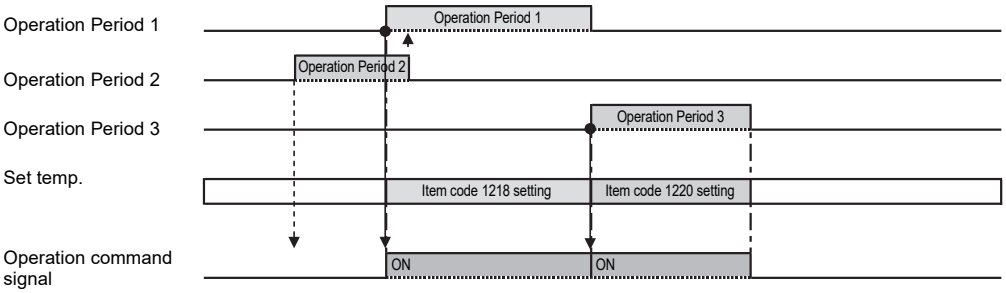
Note **If Code 5 is set to "1," lock the remote controller's schedule function.**

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



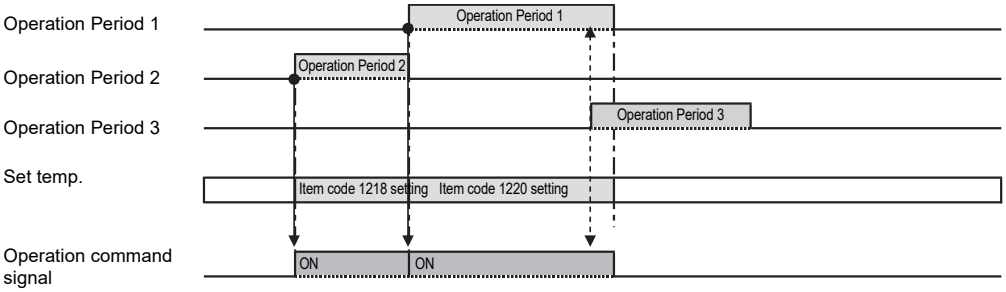
If "Start time1 - End time 1", "Start time 2 - End time 2", "Start time 3 - End time 3" overlap, the settings for the period with a larger number will be ineffective.

[When operation period 1 and 2 overlap]

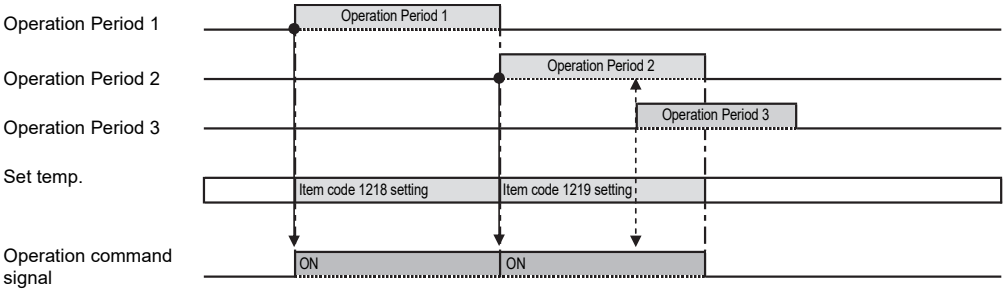


If two or more operation periods overlap, the settings for the period with a larger number will be ineffective.
If Start time 1 and start time 3 are set to the same value, the setting for Start time 3 will be ineffective.
Set the setting for Start time 3 to a time at least one minute after End time 1.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

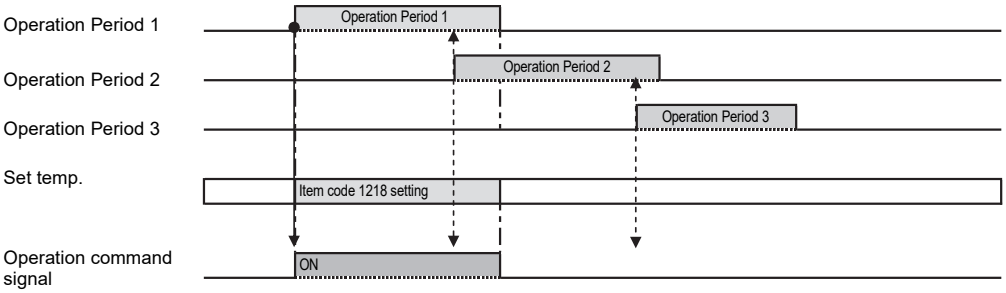
[When operation periods 1 and 3 overlap]



[When operation periods 2 and 3 overlap]



[When operation periods 2 and 3 overlap]



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

(3) Selecting the preset temperature for different operation periods

Setting procedures

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

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

Step 1
Set the dip switches SW5 and SW6.

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

SW5	SW6					
10	5	6	7	8	9	10
OFF	OFF	OFF	OFF	ON	OFF	OFF

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

Item codes 1215 through 1220 relate to scheduled operation setting.
Set the item code to 1, and set the time for each of the relevant items.
Press the push switch SWP3 to select an item code.
Use the push switches SWP1 and SWP2 to change the value of the selected item.
The value will keep blinking while it is being changed.

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

Settings table

Items that can be set	Item code	Initial value	Unit	Setting			Setting change from an optional remote controller
				Increments	Lower limit	Upper limit	
Preset temp. A (Heating)	1215	14	TH	1	14	15	Possible
Preset temp. B (Hot Water)	1216	14	TH	1	14	15	Possible
Preset temp. C (Heating ECO)	1217	14	TH	1	14	15	Not possible
Start/End time setting 1 (ON/OFF) water temp. setting *	1218	1		1	1	3	Not possible
Start/End time setting 2 (ON/OFF) water temp. setting *	1219	1		1	1	3	Not possible
Start/End time setting 3 (ON/OFF) water temp. setting *	1220	1		1	1	3	Not possible

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

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

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

Selecting the preset temperature for different operation periods

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

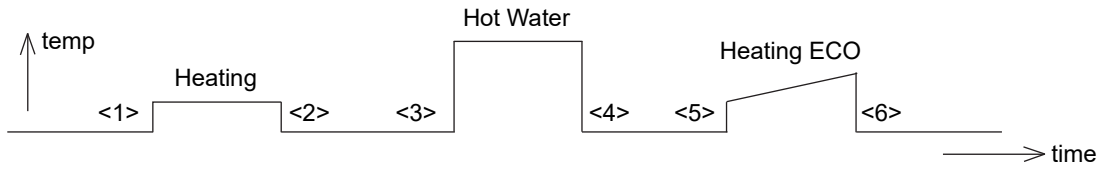
Item code 1218: Operation time setting 1
Item code 1219: Operation time setting 2
Item code 1220: Operation time setting 3

→ Item code 1215: Preset temp. A (Item code 11: Heating)
→ Item code 1216: Preset temp. B (Item code 13: Hot Water)
→ Item code 1217: Preset temp. C (Item codes: 22-25: Heating ECO)

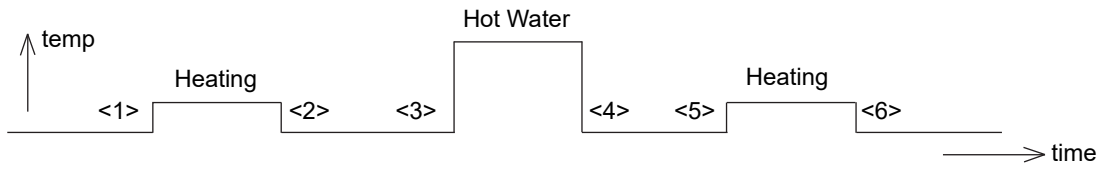
Preset temperature selection for different time periods

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

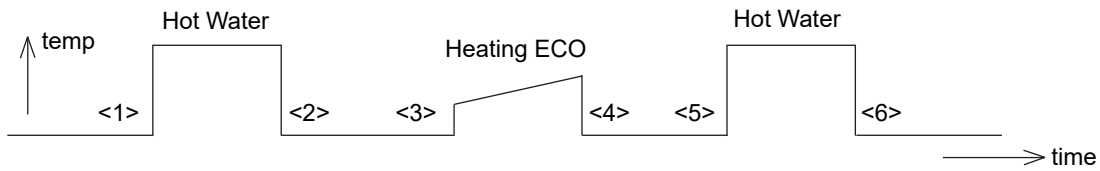
Example 1



Example 2



Example 3



(4) Peak-demand control operation

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

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

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

Setting procedures

Set the maximum capacity setting on the circuit board.

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

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

Step 1
Set the dip switches SW5 and SW6.

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

SW5	SW6					
10	5	6	7	8	9	10
OFF	OFF	OFF	OFF	OFF	ON	OFF

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

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

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

Settings table

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

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

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

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

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

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

Step 1
Set the dip switches SW5 and SW6.

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

SW5	SW6					
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 the total number of units

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

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

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

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

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

After changing the settings, re-initialize the system according to the procedures detailed on page 32.

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

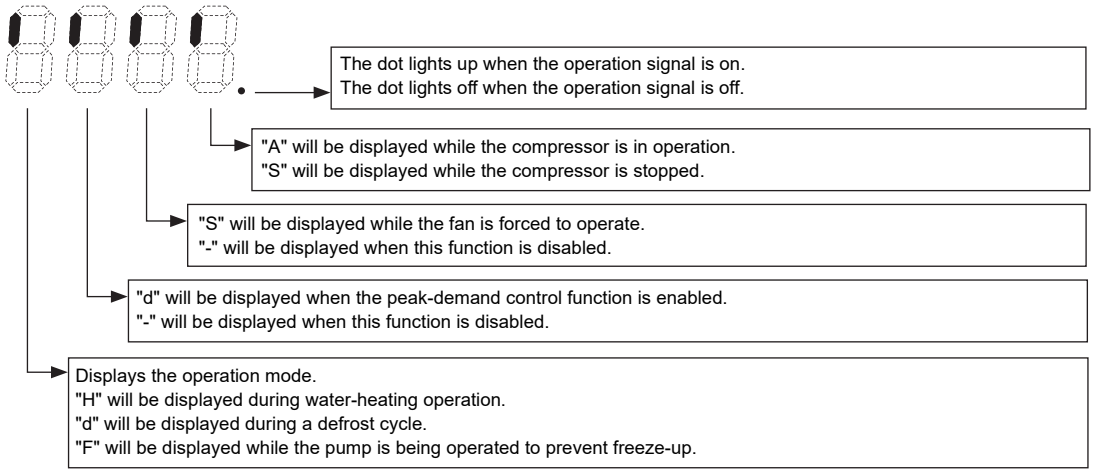
Setting the unit addresses

Refer to "System configuration procedures: Multiple system" (page 24).

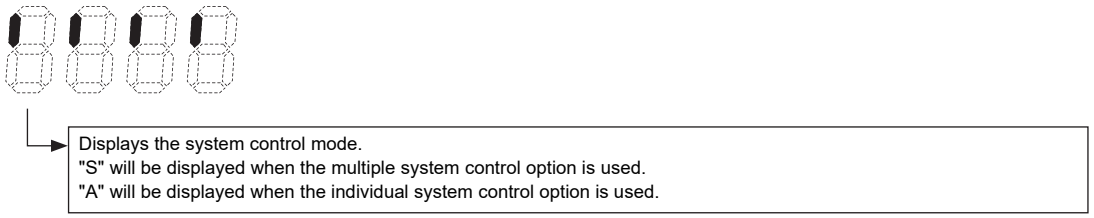
(6) Selecting the item that normally appears on the LED

SW5	SW6						Display content
10	5	6	7	8	9	10	
OFF	OFF	OFF	ON	OFF	OFF	OFF	Displays the operation mode.(*1)
OFF	OFF	ON	ON	OFF	OFF	OFF	Displays the operation mode.(*2)
OFF	ON	ON	OFF	OFF	OFF	OFF	Displays the current water temperature.
OFF	ON	OFF	OFF	OFF	OFF	OFF	Displays the water-temperature setting.
OFF	OFF	OFF	OFF	OFF	OFF	OFF	Displays the high and low refrigerant pressures.

(*1)



(*2)



(7) Remote water temperature setting input signal type

By setting SW5-7 to ON, external analog signals can be used to set the water temperatures.

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

"0": 4-20 mA

"1": 0-10 V

"2": 1-5 V

"3": 2-10 V

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

Setting procedures

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

Step 1
Set dip switches SW5, SW6, SW501-1, and SW501-2.

	SW501-1	SW501-2
4-20 mA	ON	ON
0-10 V	OFF	OFF
1-5 V	OFF	ON
2-10 V	OFF	OFF

	SW5	SW6					
	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	Setting			Setting change from an optional remote controller
			Incre-ments	Lower limit	Upper limit	
Water temperature setting input signal type	21	0	1	0	3	Not possible

* 0: 4-20 mA, 1: 0-10 V, 2: 1-5 V, 3: 2-10 V

Step 4
Press push switch SWP1 to save the changed value.

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

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

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

(8) Setting the water temperature using analog signal input

Select the analog input format

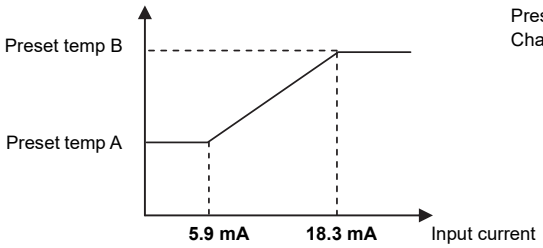
	SW5	SW6					
	10	5	6	7	8	9	10
Switch settings	OFF	OFF	OFF	OFF	OFF	ON	OFF

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		
Select the analog input format	1051	0		1	0	3		Not possible

Select "0"

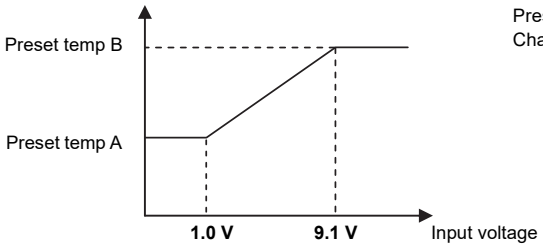
0: Water temperature input 4-20 mA
1: Capacity control input 4-20 mA
2: Water temperature input IT terminal
3: Capacity control input IT terminal

- When dip switch SW5-7 is set to ON (Enable external input), the target water temperature varies with the preset temperatures A and B and the type of analog input signal.
  - When the water temperature setting input signal type is set to 0 (4-20 mA)
    - External analog input signal of 5.9 mA: Preset temp. A (Item code 11)
    - External analog input signal of 18.3 mA: Preset temp. B (Item code 13)
    - External analog input signal of between 5.9 and 18.3 mA: the preset temperature will be linearly interpolated.



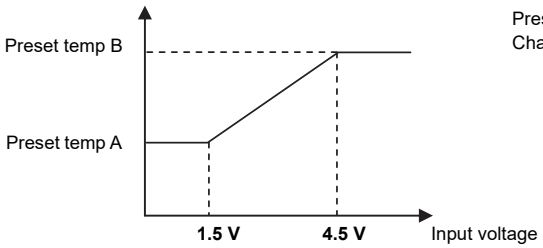
Preset temperature = (B - A) * (Input current - 5.9 mA) / 12.4 mA + A
Change of 0.12 mA or less is not recognized.

  - When the water temperature setting input signal type is set to 1 (0-10 V)
    - External analog input signal of 1.0 V: Preset temp. A (Item code 11)
    - External analog input signal of 9.1 V: Preset temp. B (Item code 13)
    - External analog input signal of between 1.0 and 9.1 V: the preset temperature will be linearly interpolated.



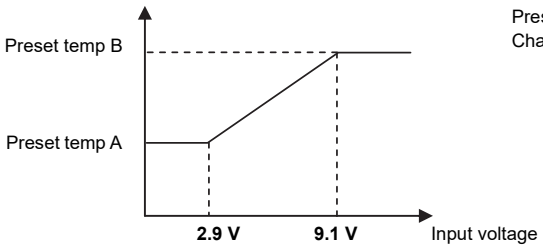
Preset temperature = (B - A) * (Input voltage - 1.0 V) / 8.1 V + A
Change of 59 mV or less is not recognized.

  - When the water temperature setting input signal type is set to 2 (1-5 V)
    - External analog input signal of 1.5 V: Preset temp. A (Item code 11)
    - External analog input signal of 4.5 V: Preset temp. B (Item code 13)
    - External analog input signal of between 1.5 and 4.5 V: the preset temperature will be linearly interpolated.



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 2.9 V: Preset temp. A (Item code 11)
  - External analog input signal of 9.1 V: Preset temp. B (Item code 13)
  - 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.

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

Select the analog input format

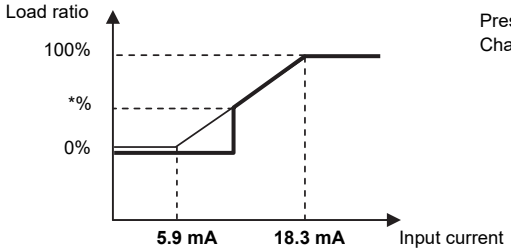
	SW5	SW6					
	10	5	6	7	8	9	10
Switch settings	OFF	OFF	OFF	OFF	OFF	ON	OFF

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		
Select the analog input format	1051	0		1	0	3		Not possible

Select "1"

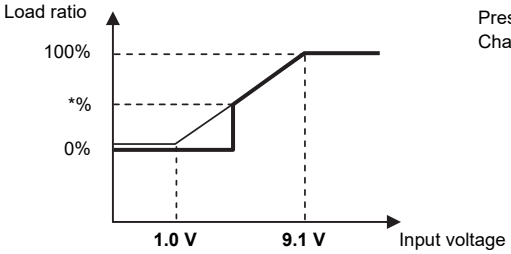
0: Water temperature input 4-20 mA
1: Capacity control input 4-20 mA
2: Water temperature input IT terminal
3: Capacity control input IT terminal

- When dip switch SW5-7 is set to ON (Enable external input), the capacity control ratio varies with the type of analog input signal.
  - When the water temperature setting input signal type is set to 0 (4-20 mA)
    - External analog input signal of 5.9 mA: 0%
    - External analog input signal of 18.3 mA: 100%
    - External analog input signal of between 5.9 and 18.3 mA: the percent will be linearly interpolated.



Preset temperature = 100% * (Input current - 5.9 mA) / 12.4 mA
Change of 0.12 mA or less is not recognized.

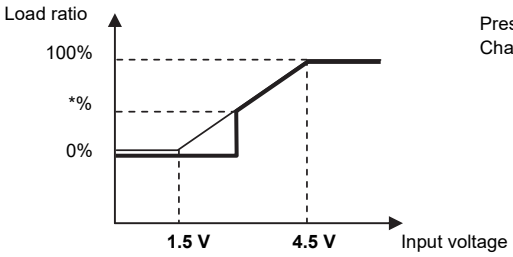
  - When the water temperature setting input signal type is set to 1 (0-10 V)
    - External analog input signal of 1.0 V: 0%
    - External analog input signal of 9.1 V: 100%
    - External analog input signal of between 1.0 and 9.1 V: the percent will be linearly interpolated.



Preset temperature = 100% * (Input voltage - 1.0) / 8.1 V
Change of 59 mV or less is not recognized.

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

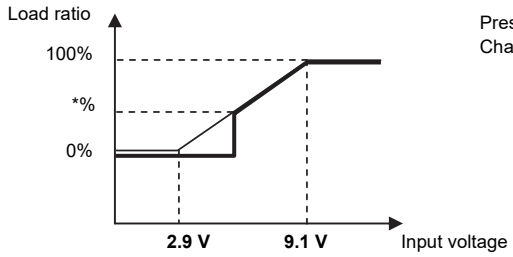
  - External analog input signal of 1.5 V: 0%
  - External analog input signal of 4.5 V: 100%
  - External analog input signal of between 1.5 and 4.5 V: the percent will be linearly interpolated.



Preset temperature = 100% * (Input voltage - 1.5) / 3.0 V
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 2.9 V: 0%
  - External analog input signal of 9.1 V: 100%
  - External analog input signal of between 2.9 and 9.1 V: the percent will be linearly interpolated.



Preset temperature = 100% * (Input voltage - 2.9 V) / 6.2 V
Change of 59 mV or less is not recognized.

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

(10) Setting the booster heater 1 operation conditions

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

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

Booster heater 1 operation conditions

- **Individual system**

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

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

The booster heater 1 signal of the main unit comes on.

- **Multiple system**

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

External water temperature sensor readings (TH14 and TH15) drop below TWL1, and the reading of the outside temperature sensor connected to the main unit drops below TWL1.

The booster heater 1 signal of the main unit comes on.

Booster heater 1 operation-stop conditions

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

1. The water temperature is at or above TWL1+2°C or the outside temperature is at or above TAL1+2°C.
2. External water temperature sensor readings (TH14 and TH15) are at or above TWL1+2°C, or the reading of the outside temperature sensor (TH9) connected to the main unit exceeds TAL1+2°C.

Setting procedures

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

Step 1 Outdoor temperature input source selection

	SW5	SW6					
	10	5	6	7	8	9	10
Switch settings	OFF	OFF	OFF	OFF	ON	OFF	OFF

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		
Outdoor temperature input source selection	1080	0		1	0	1		Not possible

0: Outdoor temperature sensor (TH9)
1: IT terminal

Step 2
Set dip switches SW5 and SW6.

	SW5	SW6					
	10	5	6	7	8	9	10
Switch settings	OFF	OFF	OFF	OFF	OFF	ON	OFF

Step 3
Select the item to be set with push switch SWP3.

Step 4
Change the values with push switches SWP1 (↑) or SWP2 (↓).

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

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

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

Step 5
Press push switch SWP3 to save the changed value.

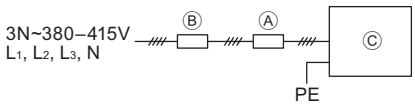
Press SWP3 once within one minute of changing the settings to save the change.
When the new setting is saved, the display will stop blinking and stay lit. The display will, then, return to the item code display mode.
If SWP3 is not pressed within one minute, the change will not be saved, and the display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

5. Electrical Wiring Installation

[1] Main Power Supply Wiring and Switch Capacity

Schematic Drawing of Wiring (Example)

Ⓐ: Switch (with current breaking capability)
Ⓑ: Earth leakage breaker
Ⓒ: Outdoor unit



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

Model	Minimum wire thickness (mm^2)			Earth leakage breaker	Local switch (A)		Overcurrent breaker (A)	Max. Permissive System Impedance
	Main cable	Branch	Ground		Capacity	Fuse		
CAHV-R450YA-HPB	14	-	14	50 A 100 mA 0.1 sec. or less	50	50	50	0.16 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. **Do not install a phase advancing capacitor on the motor. Doing so may damage the capacitor and result in fire.**
7. **Use the breakers that match the unit capacity (leakage current limit, current breaking threshold, etc.).**
8. **Select the type of breaker for an inverter circuit as an earth leakage breaker. (Mitsubishi Electric NV-S series or its equivalent)**
9. **A breaker with at least 3.0 mm contact separation in each pole shall be provided.**
10. **When using an earth leakage breaker without an overcurrent breaker, use a local switch and a molded-case circuit breaker in combination.**
11. **If the power cable is damaged, it must be replaced by qualified personnel in order to avoid a hazard.**
12. **The appliance shall be installed in accordance with national wiring regulations. However, the local standards and/or regulations is applicable at a higher priority.**
13. **When the power cable is connected, the grounding wire must be longer than the power wire.**

⚠ Warning:

- **All electric work must be performed by a qualified electrician according to the local regulations, standards, and the instructions detailed in the Installation Manual.**
- **Be sure to use specified wires and ensure no external force is imparted to terminal connections. Loose connections may cause overheating and fire.**
- **Proper grounding must be provided by a qualified personnel. Do not connect the grounding wire to 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.
- **Include some slack in the power cables.**
  - Failure to do so may break or overheat the cables, resulting in smoke or fire.
- **Install an earth leakage breaker on the power supply of each unit.**
  - Failure to do so may result in electric shock or fire.
- **Only use properly rated breakers (an earth leakage breaker, local switch <a switch + fuse that meets local electrical codes>, or overcurrent breaker).**
  - Failure to do so may result in electric shock, malfunction, smoke, or fire.
- **Only use standard power cables of sufficient capacity.**
  - Failure to do so may result in current leakage, overheating, smoke, or fire.
- **Tighten all terminal screws to the specified torque.**
  - Loose screws and contact failure may result in smoke or fire.

⚠ 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.**
- **If a large electric current flows due to a malfunction or faulty wiring, earth-leakage breakers on the unit side and on the upstream side of the power supply system could both operate. Depending on the importance of the system, separate the power supply system or take protective coordination of breakers.**

Note:

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

S_{SC} (*2)

S_{SC} (MVA)
3.80

Control cable specifications

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

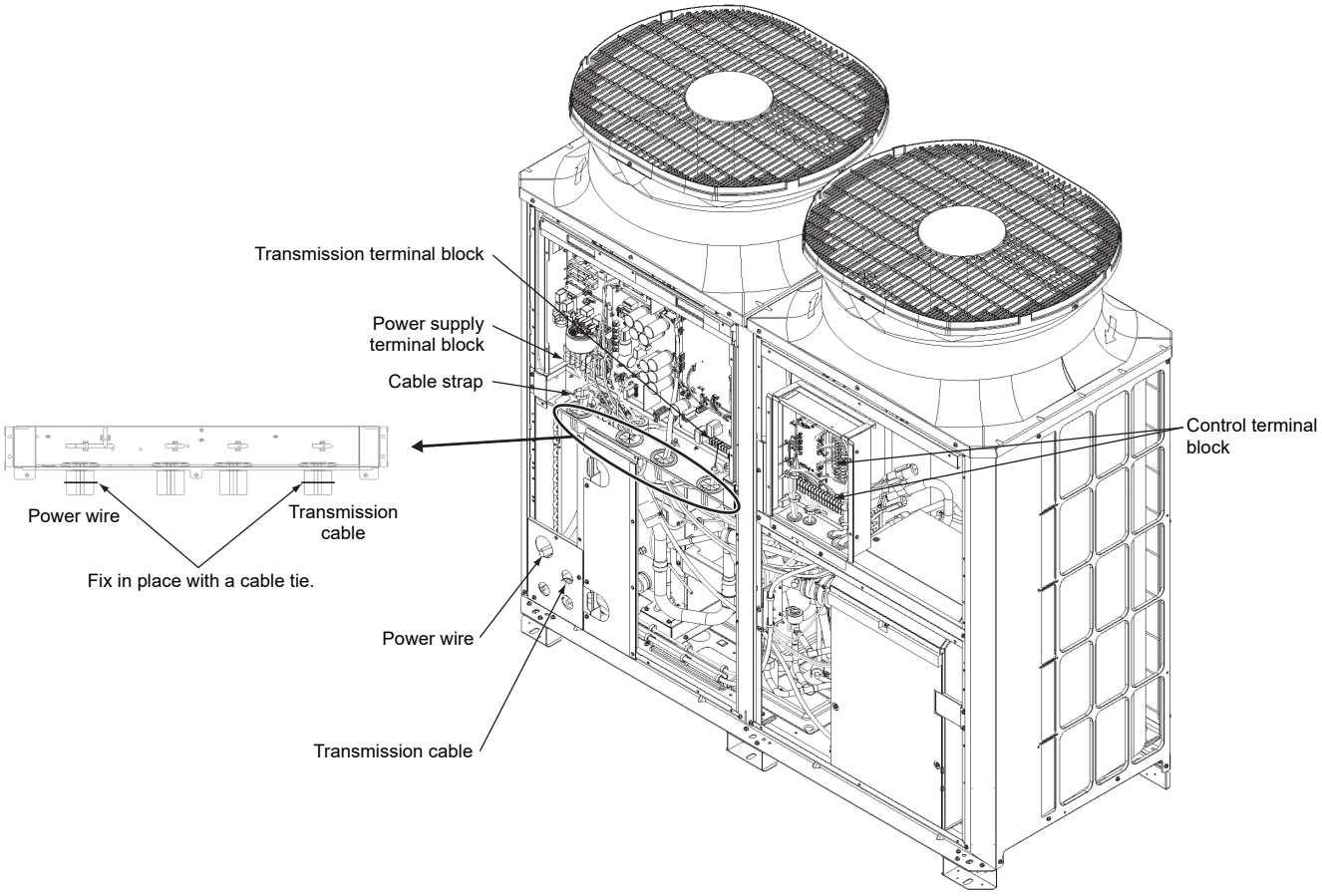
*1 Use a CVVS or CPEVS cable (Max. total length of 200 m) if there is a source of electrical interference near by (e.g., factory) or the total length of control wiring exceeds 120 m.

*2 At least 1 mm thickness of supplementary insulation shall be provided.

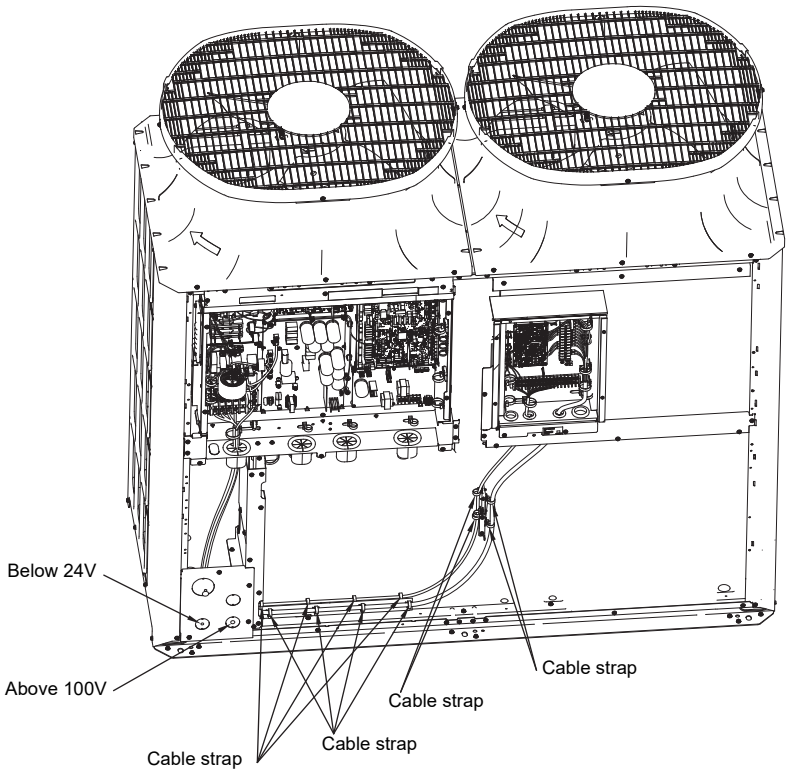
[2] Cable Connections

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

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

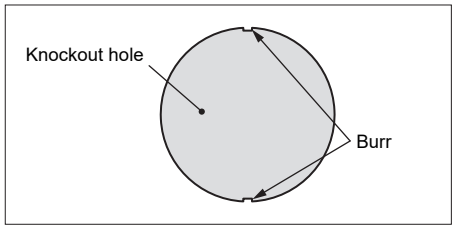


Important: Power supply cables larger than 25 mm^2 in diameter are not connectable to the power supply terminal block (TB1). Use a pull box to connect them.



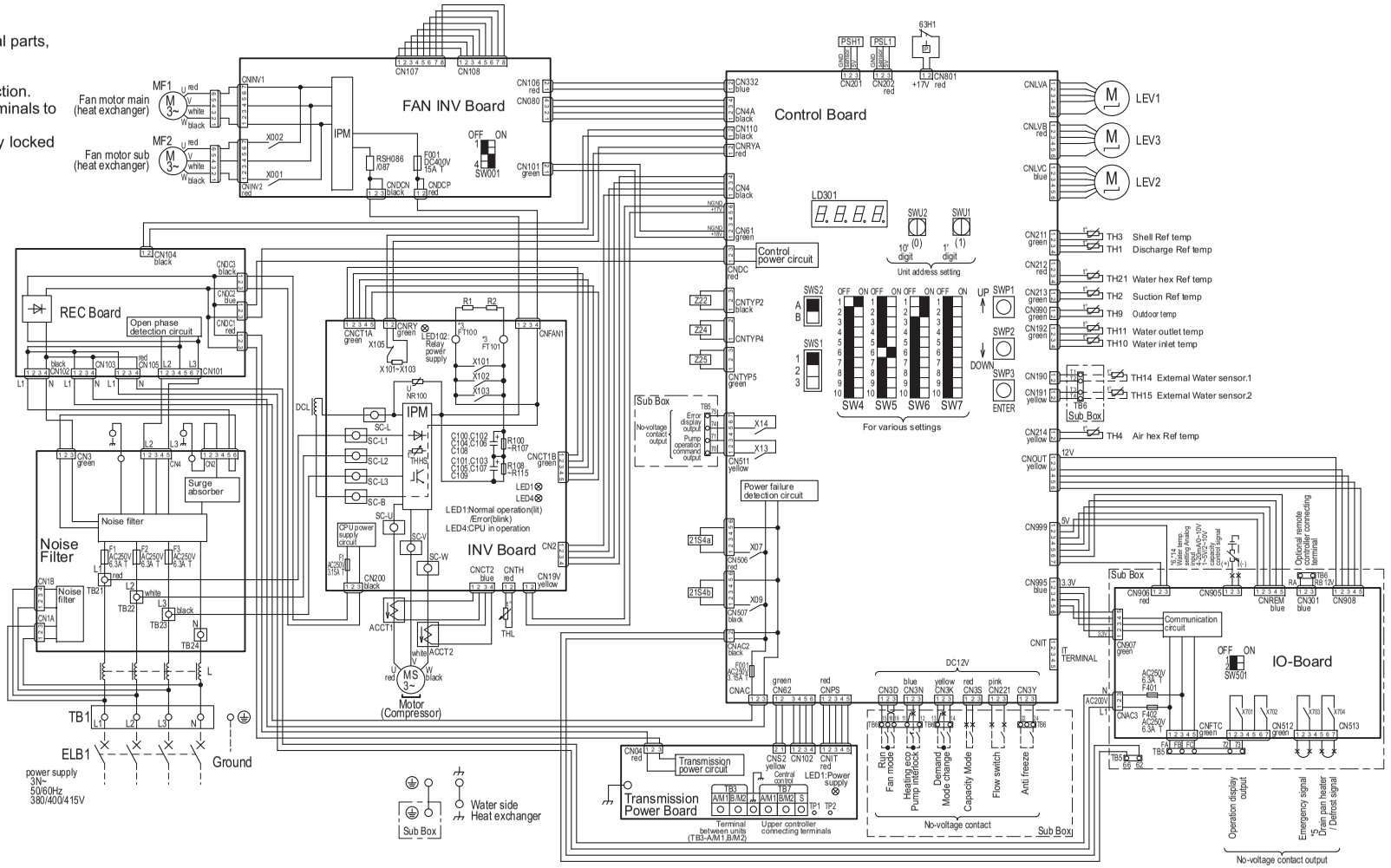
<2> Installing the conduit tube

- 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.



CAHV-R450YA-HPB ELECTRICAL WIRING DIAGRAM

Note1. The broken lines indicate the optional parts, field-supplied parts, and field work.
Note2. Dashed lines indicate Sub box.
Note3. Faston terminals have a locking function.
Press the tab in the middle of the terminals to remove them.
Check that the terminals are securely locked in place after insertion.



Note 4. The symbols of the field connecting terminals are as follows.
○: Terminal block
×: Connection by cutting the short circuit wire

Note 5. Selects either Drain pan signal or Defrost signal by SW5 and SW6 settings. (Item code 1056)

Note 6. Selects either Water temperature setting input signal or Capacity control input signal by SW5 and SW6 settings. (Item code 1051)

Note 7. Make sure to connect a pump interlock contact.
A short-circuit may cause abnormal stop or malfunctions.

Note 8. The preset temperature setting can be switched from the no-voltage contact or by setting time ranges.

Note 9. The method of input signal of operation can choose one of optional remote controller or no-voltage input.

Note 10. 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.

Note 11. 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

Note 12. Use a contact that takes 12VDC 1mA for no-voltage contact input.

Note 13. Need to selects either Water temperature setting input signal.
Set the SW501 as shown in the table below.

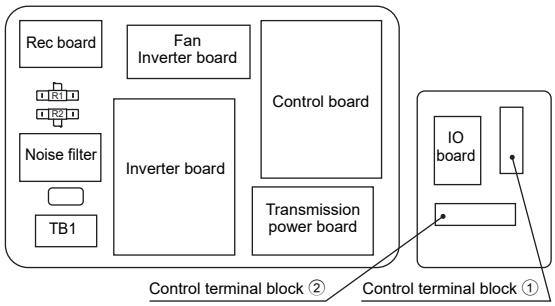
	SW501-1	SW501-2
4~20mA	ON	ON
0~10V	OFF	OFF
1~5V	OFF	ON
2~10V	OFF	OFF

Note 14. Use a 4-20mA signal output device with insulation.
Feeding 30mA or more current may damage the circuit board.

Symbol explanation

	Symbol	Explanation
MAIN BOX and SUB BOX	ACCT1	AC current sensor
	ACCT2	
	DCL	DC reactor
	F1~F3 (Noise Filter)	Fuse
	F1 (INV Board)	
	F001 (FAN INV Board)	
	F001 (Control Board)	
	F401	
	F402	
	LEV1, 3	Electronic expansion valve (Main circuit)
	LEV2	Electronic expansion valve (Injection)
	MF1, 2	Fan motor
	MS	Compressor motor
	PSH1	High pressure sensor
	PSL1	Low pressure sensor
	R1, R2	Electrical resistance
	21S4a	4-way valve
	21S4b	
	THL	DC reactor temperature
	Z22, 24, 25	Function setting connector
	63H1	High pressure switch
	72C	Electromagnetic relay (Inverter main circuit)
MAIN BOX	TH1~4, 9~11, 21	Thermistor
	TH14, 15	
Field-supplied	<ELB1>	Earth leakage breaker

Inside the control box (front view)



Display setting

Control board display	Control board SW setting *1	
Preset water temperature	SW6-5: ON	SW6-6: OFF
Current water temperature *2	SW6-5: ON	SW6-6: ON
High pressure/Low pressure	SW5-10: OFF SW6-5: OFF SW6-6: OFF SW6-7: OFF	SW6-8: OFF SW6-9: OFF SW6-10: OFF

*1 Select an item to be displayed by setting the switches.
*2 The current water temperature will be displayed according to the selection on the preset water temperature display option.
*3 If an error occurs, a 4-digit error code, from a list of error codes in the table at right will blink on the board and remote controller display. ([Error code] and [Error source address] appear alternately on the remote controller display.)
*4 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 reset after the cause of the error is removed
*5 Power failure can be detected only when the switch setting "Automatic recovery after power failure" on the unit is set to "Disable." (The default setting is "Enable.")
*6 Depending on the system configuration, the unit may come to an abnormal stop when the communication error lasts for 10 minutes or longer. In this case, the error needs to be reset by setting either SWS1 on the unit (PCB) or remote operation switch.
*7 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.
*8 Remove the cause of the error before resetting the error.
Resuming operation without removing the cause may burst the heat exchanger.
*9 [Error code] and [Detail code] appear alternately.
Refer to the Installation Manual for detail codes.

Error Codes

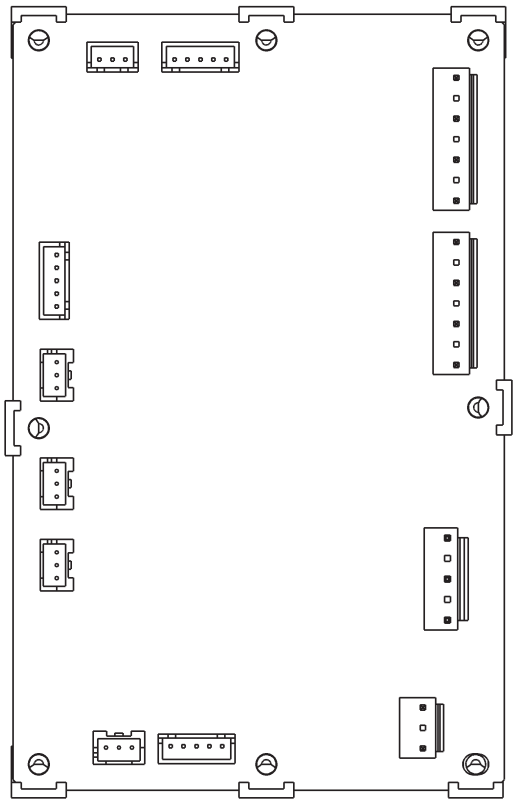
No.	Error code (PCB *3)	Error type	Error reset *4	
			Unit side (PCB)	Remote controller
			SWS1	Operation SW
1	R000	Unreset errors *7	×	×
2	4106 R-P0	Power failure *5	◎	◎
3	1102 RC61	Discharge temperature fault	○	○
4	1502 RdSH	Compressor flooding	○	○
5	2501 RF5R	Water supply cutoff (Flow switch)	○	○
6	1302 RHP1	High pressure fault	○	○
7	4102 R471	Open phase	×	×
8	0403	Serial communication error	○	○
9	1103	Shell temperature fault	○	○
10	1503	Heat exchanger freeze up *8	○	○
11	1505	Vacuum protection fault	○	○
12	4102	Open phase (T phase)	×	×
13	4106	Power supply fault *9	—	—
14	4115	Power supply frequency fault	×	×
15	4220,4225, 4226	Inverter bus voltage fault *9	○	○
16	4230,4235 4236	Inverter overheat protection fault	○	○
17	4240,4245 4246	Inverter overload protection fault	○	○
18	4250,4255 4256	IPM error (inclusive)/overcurrent relay trip *9	○	○
19	5101	Discharge temperature thermistor error (TH1)	○	○
20	5102	Compressor inlet temperature thermistor error (TH2)	○	○
21	5103	Shell temperature thermistor error (TH3)	○	○
22	5104	Air-side heat exchanger refrigerant temperature thermistor error (TH4)	○	○
23	5109	Outside temperature thermistor error (TH9)	○	○
24	5116	Inlet water temperature thermistor error (TH10)	○	○
25	5111	Outlet water temperature thermistor error (TH11)	○	○
26	5114,5115	External water temperature thermistor error (TH14, TH15)	○	○
27	5121	Water-side heat exchanger refrigerant temperature thermistor error (TH21)	○	○
28	5201	High-pressure sensor fault	○	○
29	5202	Low-pressure sensor fault	○	○
30	5301,5305	ACCT•DCCT sensor fault/Circuit fault *9	○	○
31	6500	Communication error	—	—
32	6600	Communication error (Simple multiple unit control)	×	×
	6603		—	—
	6606		—	—
	6607 *6		—	—
	6608 *6		—	—
33	6830	Address overlap	×	×
34	6831	Remote controller signal reception error 1	—(○)	—(○)
35	6832	Remote controller signal transmission error	—(○)	—(○)
36	6834	Remote controller signal reception error 2	—(○)	—(○)
37	7102	Incorrect setting of No.-of-connected-unit *9	×	×
38	7105	Address setting error	×	×
39	7113,7117	Model setting error	×	×
40	7130	Incompatible combination of units	×	×
41	0100	FTC Error	×	×

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.

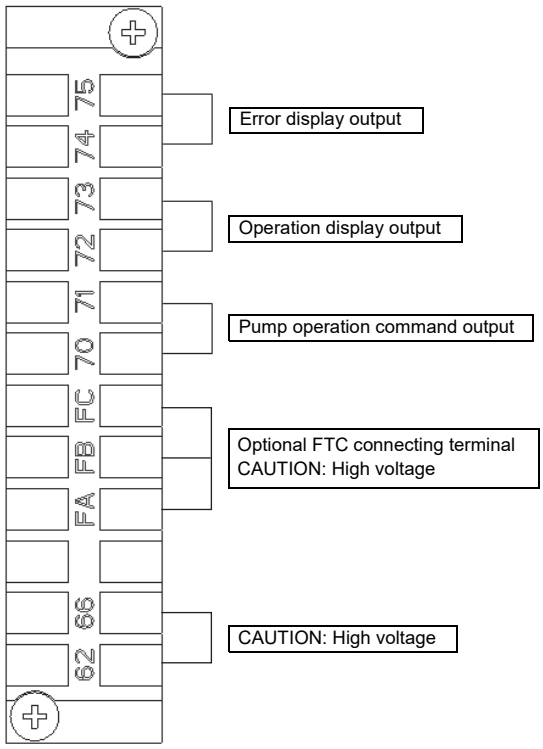
External Input/Output

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 15-16
	(b) MODE CHANGE 2	Heating Eco/Heating	The unit will go into operation when the water temperature drops below the temperature setting for "Water Temp Setting C." (Heating ECO mode)	The unit will go into operation when the water temperature drops below the temperature setting for "Water Temp Setting A." (Heating mode)	CN3N 1-2
	(c) PRIORITY MODE	COP/Capacity	The unit will operate in the energy-efficient mode (COP priority mode).	The unit will operate at the maximum capacity setting (Capacity priority mode).	CN3S 1-2
	(d) MODE CHANGE 1	Hot water/Heating	The unit will go into operation when the water temperature drops below the temperature setting for "Water Temp Setting B."	The unit will go into operation when the water temperature drops below the temperature setting for "Water Temp Setting A." (Heating mode)	TB6 13-14
	(e) ANTI FREEZE	On/Off	The unit will operate in the Anti-Freeze mode (with the target temperature 25ºC) when the contact status of (a) "Unit Operation" is "Stop" OR the ON/OFF button on the remote controller is turned off.	The unit will operate according to the status of the "Unit Operation" contact (item (a) above) or the ON/OFF command from the remote controller.	TB6 22-24
	(f) 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.	TB6 15-19
	(g) FLOW SWITCH	Normal/Error	The unit is allowed to operate.	The unit will not operate.	CN221 1-3
	(h) PUMP INTERLOCK	Normal/Error	The unit is allowed to operate.	The unit will not operate.	TB6 11-12
	(i) 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. (If the maximum capacity setting for item (c) above "Priority mode" is below the setting for the Peak-demand control setting, the unit will operate at whichever capacity is the smaller.)	The unit will operate at or below the maximum capacity setting for either "Capacity Priority Mode" or "COP Priority Mode" that was selected for item (c) "Priority Mode" above.	CN3K 1-2
	Analog				**Terminal block/connector**
	Input type		**Action**		
	(j) WATER TEMP SETTING/CAPACITY CONTROL		Water temperature or capacity control can be set by using the external analog input to the CN905 on the IO-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.		CN905 1-3
	(k) EXTERNAL WATER SENSOR (optional)		-		TB6 T1-T2
	(l) EXTERNAL WATER SENSOR (optional)		-		TB6 T3-T4
Output type	**Contact type**		**Conditions in which the contact closes (turns on)**	**Conditions in which the contact opens (turns off)**	**Terminal block/connector**
	(m)ERROR INDICATOR	Close/Open	The unit has made an abnormal stop.	During normal operation	TB5 74-75
	(n) 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.	TB5 72-73
	(o) PUMP OPERATION COMMAND	Close/Open	(1) When SW5-8 is set to ON The pump will operate according to the Thermo-ON/OFF status of the unit. (2) When SW5-8 is set to OFF The pump will operate according to the status of the "Unit Operation" contact or the ON/OFF button on the remote controller button.	Under all conditions other than the ones listed on the left	TB5 70-71
	(p) 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".	CN513 1-3
	(q) DRAIN PAN HEATER SIGNAL/ DEFROST SIGNAL Selects either the drain pan signal or defrost signal by Item code 1056	Close/Open	In case of the defrost signal when item code 1056 is "1". In case of the drain pan signal when item code 1056 is "0", the outside temperature is above 1ºC or the outside temperature has risen above 3ºC after the conditions has been met under which the contact turns on.	-	CN513 5-7
RC/M-NET	REMOTE CONTROLLER	PAR-W31MAA			TB6 RA-RB
	M-NET	Terminal between units			TB3 A/M1-B/M2
	Centralized controller	AE-200			TB7 A/M1-B/M2
	A control internal and external signal Flow temperature controller	FLOW TEMP CONTROLLER(FTC) PAC-IF071B-E PAC-IF072B-E PAC-IF073B-E PAC-SIF051B-E			TB5 FA-FB-FC

IO Board

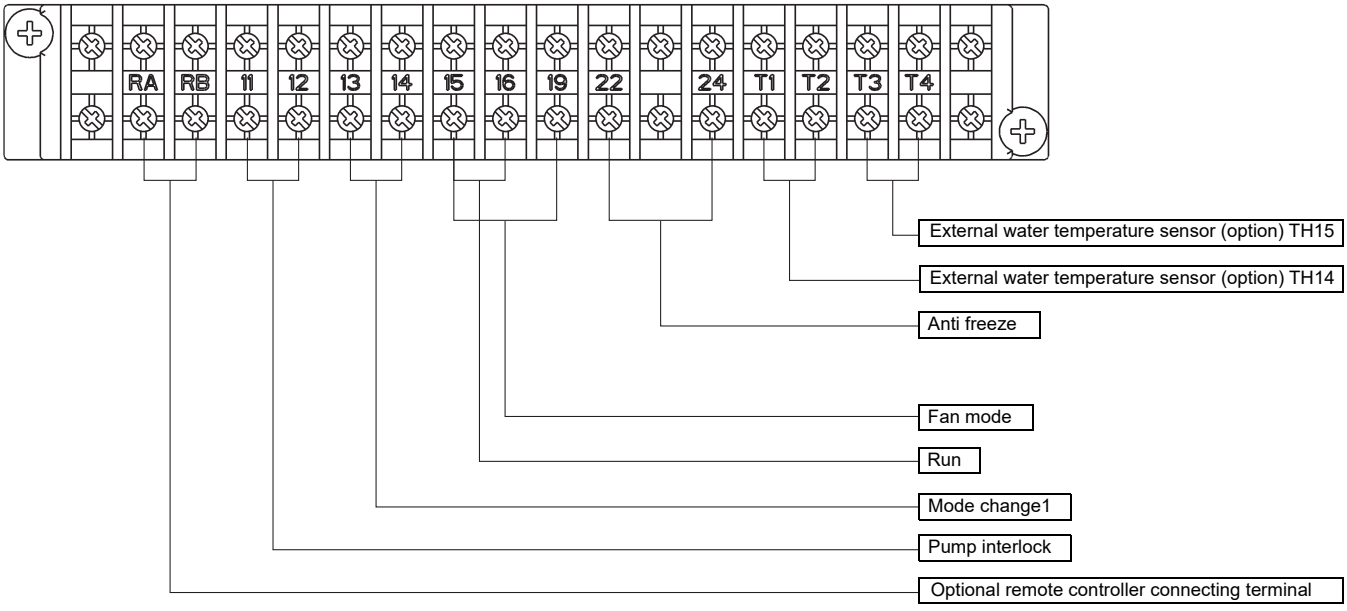


TB5



Connect FA, FB, and FC of the outdoor unit to S1, S2, and S3 of the FTC control board, respectively.
For detailed connection with FTC, please refer to the FTC manual.

TB6



Wire color

Heating ECO	: Black
Demand	: Brown
Capacity mode	: Blue
Flow switch	: White

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	Replace the LEV.
			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)	Error type		Cause (Installation/Setting error)	Cause (Parts problems)	Preliminary code	Error reset *3	
						Unit side (PCB)	Remote
						SWS1	Operation SW
A000	Unreset errors *6		Some of the errors have not been reset.		—	—	—
4106 A-P0	Power failure *4		Power failure occurred when the operation switch is switched on.		—	◎	◎
2501 AF5A	Water supply cutoff (Flow switch has been triggered.)		The water flow rate dropped below the flow switch threshold. Water supply cutoff	• Open-circuited flow switch • Broken flow switch wiring	—	○	○
1302 AHP1	High pressure fault		No water Water supply cutoff	• Linear expansion valve fault • High-pressure sensor fault	—	○	○
1502 Ad5H	Compressor flooding			• Fan motor fault/broken fan motor wiring • Low-pressure sensor fault • Shell temperature thermistor fault • High-pressure sensor fault • Discharge refrigerant temperature thermistor fault • Linear expansion valve fault	—	○	○
1505	Suction pressure fault		The outside temperature was below the operating range. Sudden frosting or heavy snow clogged up the air-side heat exchanger.	• Low-pressure sensor fault • Air-side heat exchanger inlet thermistor fault • Suction refrigerant temperature thermistor fault • Linear expansion valve fault • Fan motor fault/broken fan motor wiring • Refrigerant deficiency (refrigerant gas leak)	—	○	○
1103	Shell temperature fault		The outside temperature was above the upper limit of the operating range. Excessive oil flow	• Shell temperature thermistor fault • Linear expansion valve fault	—	○	○
5101	Ther-mistor fault	Discharge refrigerant temperature (TH1)		• Broken or shorted thermistor wiring	—	○	○
5102		Suction refrigerant temperature (TH2)		• Broken or shorted thermistor wiring	—	○	○
5103		Shell temperature (TH3)		• Broken or shorted thermistor wiring	—	○	○
5104		Air-side heat exchanger outlet refrigerant temperature (TH4)		• Broken or shorted thermistor wiring	—	○	○
5109		Outside temperature (TH9)		• Broken or shorted thermistor wiring	—	○	○
5116		Inlet water temperature (TH10)		• Broken or shorted thermistor wiring	—	○	○
5111		Outlet water temperature (TH11)		• Broken or shorted thermistor wiring	—	○	○
5114		External water sensor temperature 1 (TH14)		• Broken or shorted thermistor wiring	—	○	○
5115		External water sensor temperature 2 (TH15)		• Broken or shorted thermistor wiring	—	○	○
5121		Water-side heat exchanger refrigerant temperature thermistor error (TH21)		• Broken or shorted thermistor wiring	—	○	○
5201	High-pressure sensor fault/high-pressure fault			• Broken or shorted pressure sensor wiring	—	○	○
5202	Low-pressure sensor fault/low-pressure fault			• Broken or shorted pressure sensor wiring	—	○	○
7113	Model setting error 1		Dip switches on the PCB were set incorrectly during maintenance.		—	×	×
7117	Model setting error 2			• Resistor Z22, 24 or 25 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 8471	Open phase		Power supply problem • There is an open phase. • Power supply voltage drop	• Circuit board fault • Wiring fault	—	×	×
4106 (255)	Power supply fault			• Transmission power supply PCB fault	—	—	—

Error code *1 (PCB *2)	Error type			Cause (Installation/Setting error)	Cause (Parts problems)	Preliminary code	Error reset *3	
							Unit side (PCB)	Remote
							SWS1	Operation SW
1102 AE61	Discharge temperature fault (A discharge refrigerant temperature of 120ºC or above is detected for 30 seconds while the compressor is in operation.) (A discharge refrigerant temperature of 125ºC or above is detected momentarily while the compressor is in operation.)			No water Abrupt change in water temperature (5K/min. or greater) Pump failure	• High-pressure sensor fault • Linear expansion valve fault (Main circuit LEV, injection LEV) • Refrigerant deficiency (refrigerant gas leak)	1202	○	○
1503	Heat exchanger freeze up *7			Drop in water flow or water supply cutoff during the defrost cycle Water temperature drop during defrost cycle	• 4-way valve switching failure	—	○	○
4250 4255 4256 (101) *8	Inverter error	Inverter error Electric current related errors during operation	IPM error		• INV board fault • Ground fault of the compressor • Compressor coil problem • IPM error (loose terminal screws, cracked due to swelling) • Fan motor failure • Fan board failure	4350 4355 4356 (101)	○	○
4250 4255 4256 (107) *8			Over current due to current sensor detection (effective value) (During operation)		• INV board fault • Ground fault of the compressor • Compressor coil problem • IPM error (loose terminal screws, cracked due to swelling) • Fan motor failure • Fan board failure	4350 4355 4356 (107)	○	○
4250 4255 4256 (106) *8			Over current due to current sensor detection (momentary value) (During operation)			4350 4355 4356 (106)	○	○
4250 4255 4256 (104) *8			Short-circuited IPM/ground fault (During operation)			4350 4355 4356 (104)	○	○
4250 4255 4256 (105) *8			Overcurrent error due to a short-circuited (During operation)	Inter-phase voltage drop (Inter-phase voltage at or below 180 V)		4350 4355 4356 (105)	○	○
4255 4256 (137) *8			Step-out fault	Motor synchronization loss	• Fan motor failure • Fan board failure	4355 4356 (137)	○	○
4250 (121) (128)			DCL over current error (H/W)	DCL overcurrent	• INV board fault • Ground fault of the compressor • Compressor coil problem	4350 (121) (128)	○	○
4250 (122)			DCL over current error (S/W)			4350 (122)	○	○
4250 4255 4256 (101) *8		Current related prob-lems at start up	IPM error (At startup)		• INV board fault • Ground fault of the compressor • Compressor coil problem • IPM error (loose terminal screws, cracked due to swelling) • Fan motor failure • Fan board failure	4350 4355 4356 (101)	○	○
4250 4255 4256 (107) *8			Over current due to current sensor detection (effective value) (At startup)		• INV board fault • Ground fault of the compressor • Compressor coil problem • IPM error (loose terminal screws, cracked due to swelling) • Fan motor failure • Fan board failure	4350 4355 4356 (107)	○	○
4250 4255 4256 (106) *8			Over current due to current sensor detection (momentary value) (At startup)			4350 4355 4356 (106)	○	○

Error code *1 (PCB *2)	Error type			Cause (Installation/Setting error)	Cause (Parts problems)	Preliminary code	Error reset *3	
							Unit side (PCB)	Remote
							SWS1	Operation SW
4220 4225 4226 (108) *8	Inverter error	Voltage related problems during operation	Bus voltage drop protection (S/W)	Momentary power failure/power failure Power supply voltage drop (Inter-phase voltage is 248 V or below.) Voltage drop	• INV board fault • 72C fault • Noise filter coil (L) fault • Wiring connections between noise filter board and INV board fault • Wiring connections between noise Fan board and INV board fault • Resistor (R1, R2) fault	4320 4325 4326 (108)	○	○
4220 (109)			Bus voltage rise protection (S/W)	Incorrect power supply voltage	• INV board fault	4320 (109)	○	○
4220 (110)			Bus voltage error (H/W)	VDC error	• INV board fault	4320 (110)	○	○
4220 4225 4226 (111) (112) *8			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 • Fan board fault	4320 4325 4326 (111) (112)	○	○
4220 4225 4226 (131) *8		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 • 72C fault • Noise filter coil (L) fault • Wiring connections between noise filter board and INV board fault • Wiring connections between noise Fan board and INV board fault • Resistor (R1, R2)fault	4320 4325 4326 (131)	○	○
4220 (129)		Control power supply error		Control power supply failure	• INV board, main board fault • Broken wiring between INV and main control board • Contact failure	4320 (129)	○	○
4220 (123)		Voltage boost control error		• Power supply voltage drop • Installation condition	• INV board fault • Ground fault of the compressor	4320 (123)	○	○
4230 4235 4236 *8		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 and Fan board fault • THHS sensor fault • IPM error (loose terminal screws, cracked due to swelling)	4330 4335 4336	○	○
4230 (126)		DCL temperature fault		DCL temperature exceeds 150ºC	• Contact or connector failure (CNTH) • INV board fault	4320 (126)	○	○
4240 4245 4246 *8		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 • Fan motor fault • Current sensor fault • Compressor fault • INV and Fan board fault	4320 4325 4326	○	○
5301 (115)		ACCT sensor fault			• INV board fault • Ground fault of the compressor and IPM error	4301 (115)	○	○
5301 (117)		ACCT sensor/circuit fault			• Poor contact at the INV board connector CNCT2 (ACCT) • ACCT sensor fault	4300 (117)	○	○
5301 (119)		Open-circuited IPM/loose ACCT sensor			• Disconnected ACCT sensor (CNCT2) ACCT sensor fault • Broken compressor wiring INV circuit fault (IPM error etc.)	4300 (119)	○	○
5301 (120)		Faulty wiring			• ACCT sensor is connected in the wrong phase. • ACCT sensor is connected in the wrong orientation.	4300 (120)	○	○
5110 (01) (05) (06)		THHS sensor/circuit fault			• THHS sensor contact failure • THHS sensor fault • INV board fault	1214 (01) (05) (06)	○	○
5301 (127)		DCL electric current circuit error			• Contact failure between CNCT1A and CNCT1B • INV board fault	4300 (127)	○	○
5305 5306 (135) *8		Current sensor fault			• Fan board fault • Fan motor error	4305 4306 (135)	○	○

Error code *1 (PCB *2)	Error type		Cause (Installation/Setting error)	Cause (Parts problems)	Preliminary code	Error reset *3	
						Unit side (PCB)	Remote
						SWS1	Operation SW
5305 5306 (136) *8		Current sensor/circuit fault		• Fan board fault	4305 4306 (136)	○	○
5120 (01)		THL sensor/circuit fault		• THL sensor contact failure (CNTH) • THL sensor fault • INV board fault	1248 (01)	○	○
0403 (01) (05) (06)	Inverter error	Serial communication error		• Communication error between control board and INV board (noise interference, broken wiring)	4300 4305 4306 (01) (05) (06)	○	○
—		IPM system error	INV board switch setting error	• Wiring or connector connection between connectors on IPM-driven power supply circuit • INV board fault	—	○	○
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	—	—	—
6834		Remote controller signal reception error 2	Communication error due to external noise interference	• Main control board communication circuit fault	—	—	—
7105	Multiple system error	Address setting error	Address setting error (Non-consecutive address)		—	×	×
7130		Incompatible combination of units	Different types of units are connected to the same system.		—	×	×
7102		No.-of-connected-unit setting is incorrect.	No.-of-connected-unit setting is incorrect (Main unit).		—	×	×
6500	Communication error between the main and sub units				—	—	—
6600	Transmission line power supply PCB fault		Communication error due to external noise interference	• Broken wiring to the transmission power supply circuit board (between the main and sub units) • Transmission power supply PCB communication circuit fault	—	×	×
6602 6603 6606 6607 6608	Communication error between the main and sub units (Simple multiple unit control mode) *5					—	—
0100	FTC error				2 digits code*9	×	○*10

*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.
*8: When the last digit is 5: MF1 (Fan motor at the upper left when seen from the front of the unit)
When the last digit is 6: MF2 (Fan motor at the upper right when seen from the front of the unit)
*9: Refer to FTC install manual.
*10: Can only be operated from the main remote controller connected to the FTC.

[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 "CAHV" and is found on the lower part of the left side of the unit.

(2) Serial number

Example: 75W00001

(3) Error code

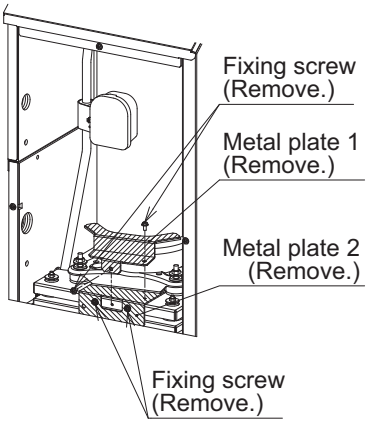
(4) Nature of the problem in detail

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. Remove the shipping fixture from the compressor.



3. Switch on the main power.
4. 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.
5. 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)

Refer to the following pages for how to use the remote controller.

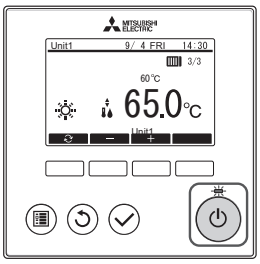
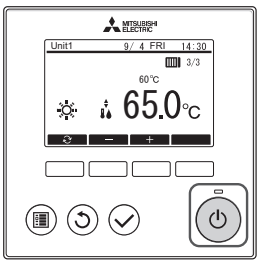
IMPORTANT

- 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

*Refer to FTC install manual for using the main remote controller connected to the FTC.

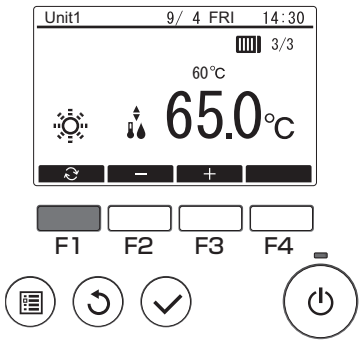
<1> Power ON/OFF

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

<2> Operation mode and set temperature settings

Operation mode setting

Button operation



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

 **Heating**

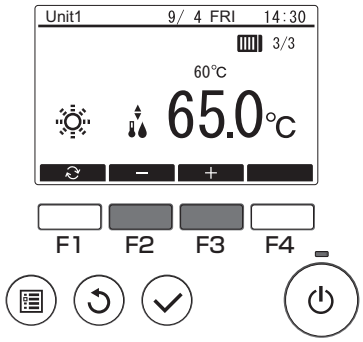
 **Anti-Freeze**

 **Hot water**

 **Heating-ECO**

Set temperature setting

Button operation



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

<3> Using Weekly timer

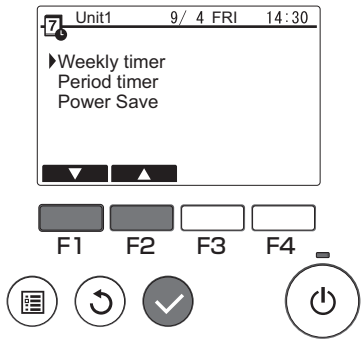
Function description

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

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

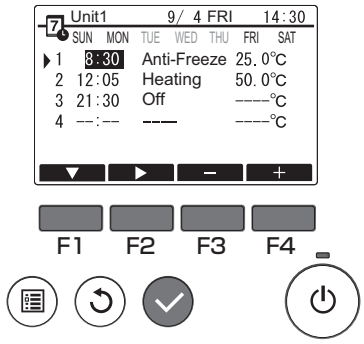
Button operation

1



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

2

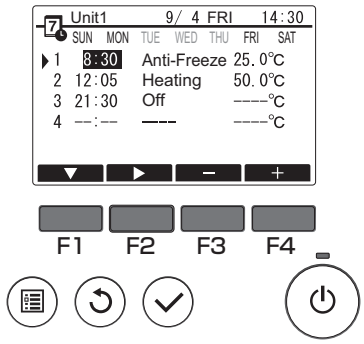


The Weekly timer screen will be displayed.

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

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

3



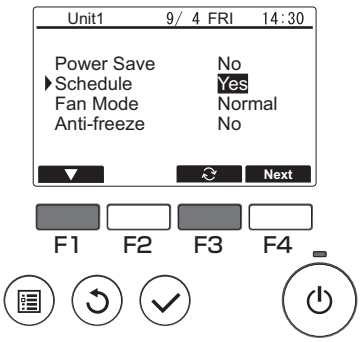
The pattern setting screen will be displayed.
Press the [F1] button to select a pattern.
Press the [F2] button to select the item you want to change.
Press the [F3] or [F4] button to switch to the desired setting.

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

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

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

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



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

<4> Using Period timer

Function description

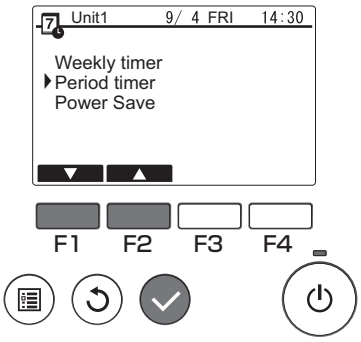
Following settings can be made to change the specified period and daily operating schedule.

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

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

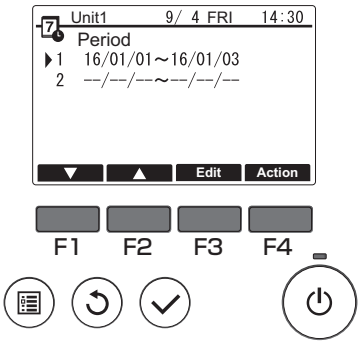
Button operation

1



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

2

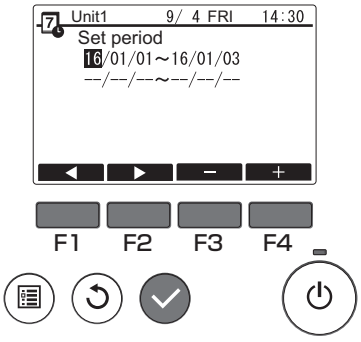


The suitable periods for the period timer will be displayed.

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

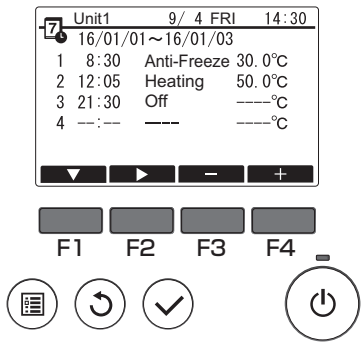
To set the operation:
Press the [F1] or [F2] button to select the specified date and then press the [F4] button. … Move to **4**.

3



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

4



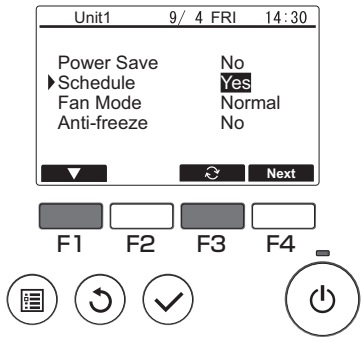
The pattern setting screen will be displayed.
* Refer to the section on Weekly timer for details on using the pattern setting screen.

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

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

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

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



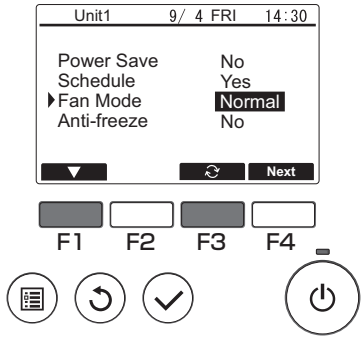
In the Operation setting screen, press the [F1] button to move the cursor to "Schedule".
Press the [F3] button to select "Yes".

<5> Fan mode

Function description

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

Button operation



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

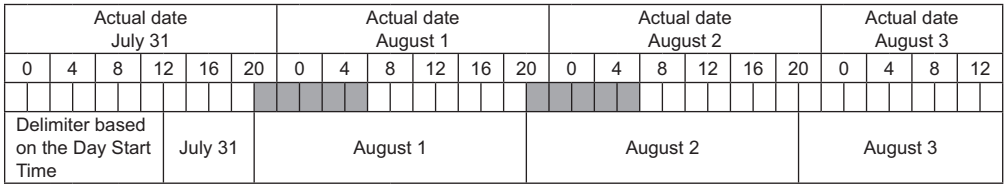
<6> Using Power Save

Function description

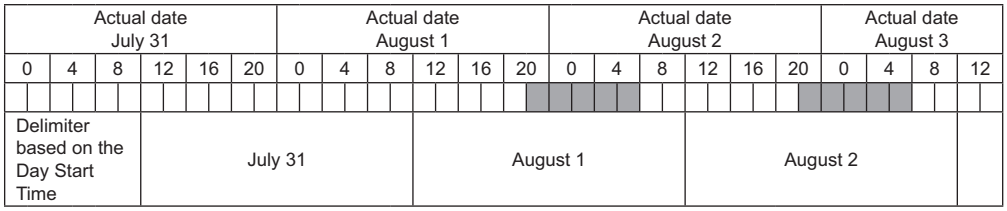
Power Save is a function that regulates the compressor rotation count either daily or according to a specified period and according to a preset time interval or regulated capacity. Use this function when you want to inhibit electric power use.
A typical scenario where Power Save can be used to inhibit 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.



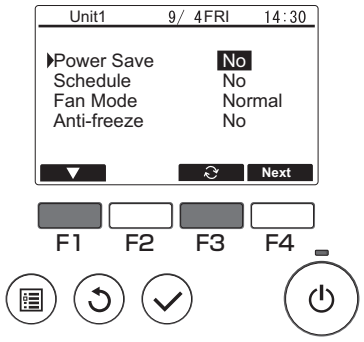
Power Save will not be implemented in the following situations:
- If a system controller is connected
- While Power Save is disabled

• 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.

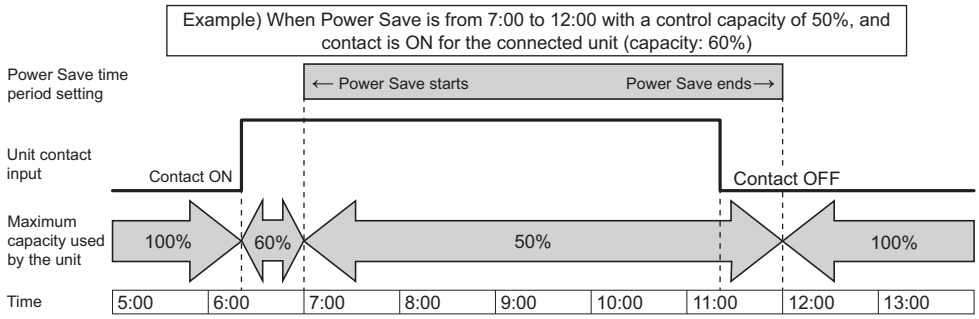
(b) To use both connected unit demand control (contact input) and Power Save on the remote controller

* 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%	60%
7:00-11:30	50%	60%	50%
11:30-12:00	50%	– (100%)	50%

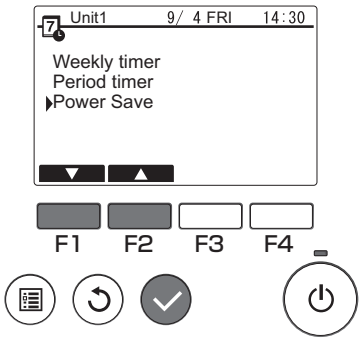
→ Because Power Save is set from 7:00, control begins based on the Power Save setting.



• 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%.

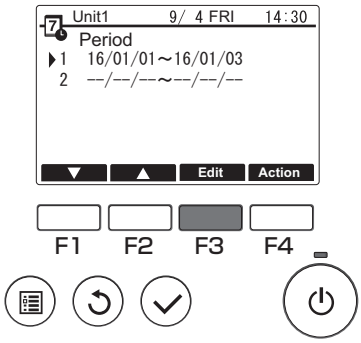
Button operation

1



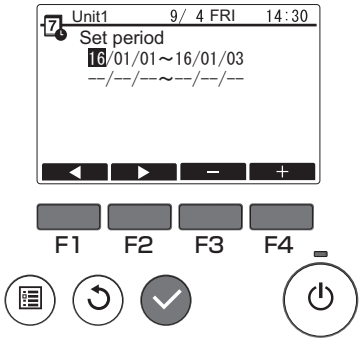
From the Main menu, select "Schedule" > "Power Save" and press the [Select] button.

2



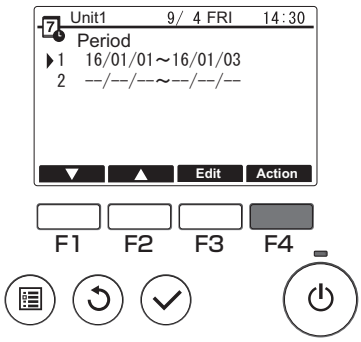
Press the [F3] button to proceed to the settings screen.
You can set 2 types of pattern, as necessary.

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



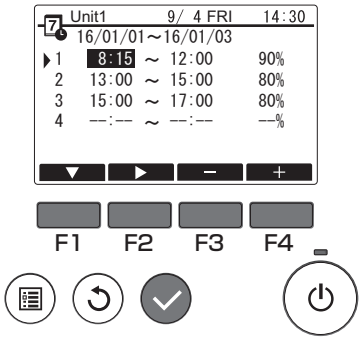
Press the [F1] to [F4] buttons to set the period and then press the [Select] button.

3



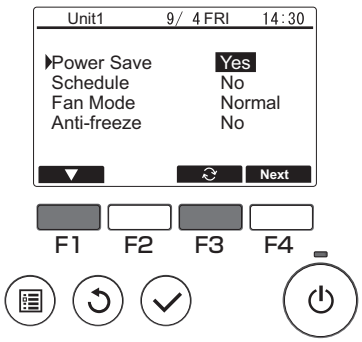
The Power Save screen will be displayed.
Press the [F4] button.

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".

<7> Function setting

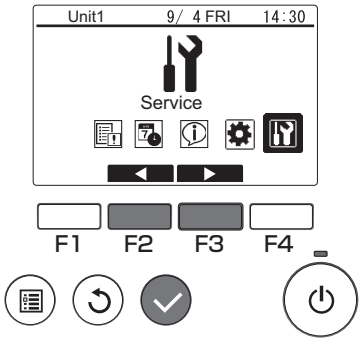
Function description

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

- If the function settings change the connected unit functions, all the settings must be managed appropriately, such as by writing them down on paper.

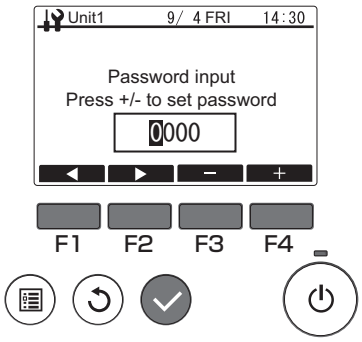
Button operation

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.

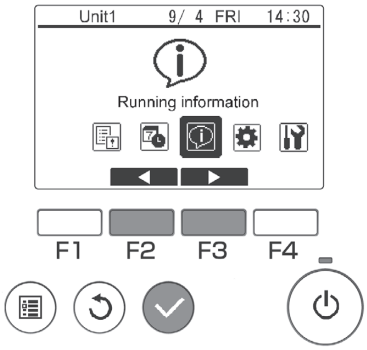
<8> Operation status monitoring

Function description

Check the running information of each unit from the remote controller

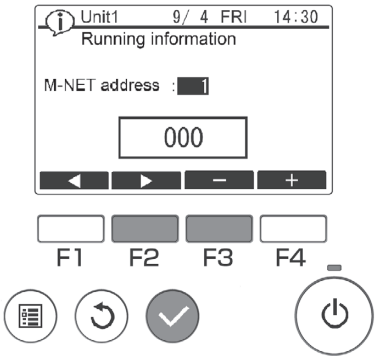
Button operation

1



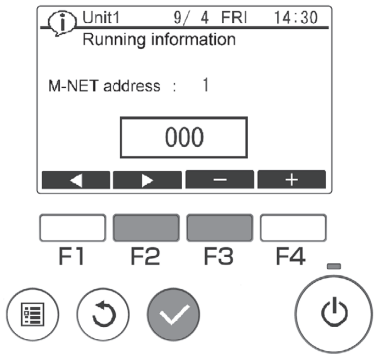
Select "Running information" from the main menu screen, and press the [Select] button.

2

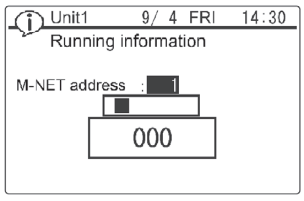


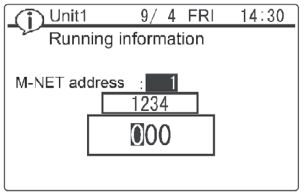
Set the desired M-NET address with the [F2] and [F3] buttons, and press the [Select] button.

3



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





When the information is sent successfully, the running information 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 running information 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

[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.)

8. Main Specifications

SPECIFICATIONS			
Model			CAHV-R450YA-HPB (-BS)
Power source			3-phase 4-wire 380-400-415 V 50/60 Hz
Capacity (EN14511) *1		kW	40.0
		BTU/h	136,480
	Power input	kW	14.03
	Current input	A	23.7-22.5-21.7
	COP (kW/kW)		2.85
	SCOP Low/Medium		3.57/3.24
Capacity (EN14511) *2		kW	40.0
		BTU/h	136,480
	Power input	kW	23.0
	Current input	A	38.8-36.9-35.5
	COP (kW/kW)		1.74
Capacity (EN14511) *3		kW	33.4
		BTU/h	113,960
	Power input	kW	16.6
	Current input	A	28.0-26.6-25.7
	COP (kW/kW)		1.99
Maximum current input		A	44.0-41.8-40.3
Water pressure drop *1			10.2 kPa (1.47 psi)
Temperature range *4	Outlet water temperature		24–70ºC 75.2–158ºF
	Outdoor temperature	D.B.	-25–43ºC -13–109.4ºF
Circulating water volume range *7			1.5 m^3/h-15.0 m^3/h
Sound pressure level (measured 1 m below the unit in an anechoic room) *1 *6		dB (A)	64
Sound pressure level (measured 1 m below the unit in an anechoic room) *3 *6		dB (A)	72
Water pipe diameter and type	Inlet	mm (in)	38.1 (1 1/2"), housing type joint
	Outlet	mm (in)	38.1 (1 1/2"), housing type joint
External finish			Acrylic painted steel sheet <Munsell 5Y 8/1 or similar>
External dimensions H x W x D		mm	1710 x 1750 x 740
Net weight		kg (lb)	359 (791)
Design pressure	R454C	MPa	3.85
	Water	MPa	1.0
Drawing number	Wiring		KW94C870
	External appearance		KW94C397
Heat exchanger	Water-side		Copper brazed stainless steel sheet
	Air-side		Plate fins and copper tubes
Compressor	Type		Inverter scroll hermetic compressor
	Manufacturer		MITSUBISHI ELECTRIC CORPORATION
	Starting method		Inverter
	Motor output	kW	12.1
	Lubricant		FVC32EA
Fan	Air flow rate	m^3/min	150 x 2
		L/s	2500 x 2
		cfm	5297 x 2
	External static pressure		10 Pa (1 mm H_2O)
	Type and quantity		Propeller fan x 2
	Control and driving mechanism		Inverter control, direct driven by motor
	Motor output	kW	0.92 x 2
HIC (Heat inter-changer) circuit			Copper pipe
Protection devices	High pressure		High-pressure sensor and switch set at 3.85 MPa (643 psi)
	Inverter circuit		Overheat and overcurrent protection
	Compressor		Overheat protection
	Fan motor		Thermal switch
Defrosting method			Auto-defrost mode (Reversed refrigerant cycle)
Refrigerant	Type and factory charge	kg	R454C, 9.0 kg
	GWP *5		146
	Flow and temperature control		LEV and HIC circuit

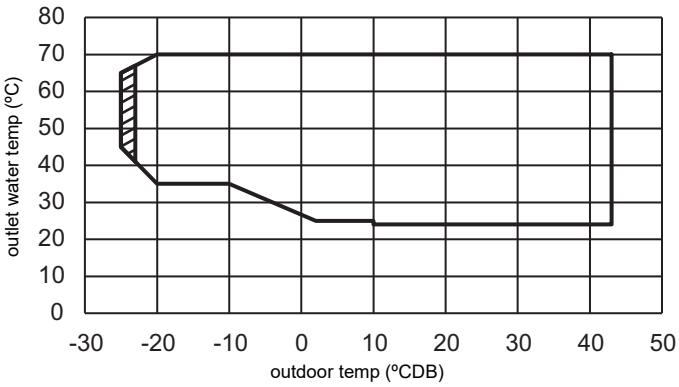
*1 Under normal heating conditions at the outdoor temperature of 7ºCDB/6ºCWB (44.6ºFDB/42.8ºFWB), the outlet water temperature of 45ºC (113ºF), and the inlet water temperature of 40ºC (104ºF)

*2 Under normal heating conditions at the outdoor temperature of 7ºCDB/6ºCWB (44.6ºFDB/42.8ºFWB) and the outlet water temperature of 70ºC (158ºF)

*3 Under normal heating conditions at the outdoor temperature of -5°C and the outlet water temperature of 55°C (131°F)

*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

*5



Outdoor temp. -25ºCDB/Outlet water temp. 45~65ºC
(Outdoor temp. -13ºFDB/Outlet water temp. 113~149ºF)
Outdoor temp. -20ºCDB/Outlet water temp. 35~70ºC
(Outdoor temp. -4ºFDB/Outlet water temp. 95~158ºF)
Outdoor temp. 43ºCDB/Outlet water temp. 24~70ºC
(Outdoor temp. -109ºFDB/Outlet water temp. 75.2~158ºF)

* Do not start up the unit at or below the outdoor temperature of -23ºC.
* Stops operation at the outdoor temperature of -28ºC or below

*6 IPCC 5th assessment report

*7 The sound pressure level is a value measured in an anechoic room in accordance with the conventional method in JRA4060.

*8 4.0 - 15.0 m^3/h under the following conditions:
a. When the outdoor temperature is below 0°C,
b. When the outlet water temperature is 30°C or below AND the outdoor temperature is 6°C or below.

- 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.

Unit converter

Kcal = kW x 860

BTU/h = kW x 3,412

cfm = m^3/min x 35.31

Lb = kg/0.4536

9. Maintenance

[1] Guidelines for Maintenance and Inspection of Major Parts

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

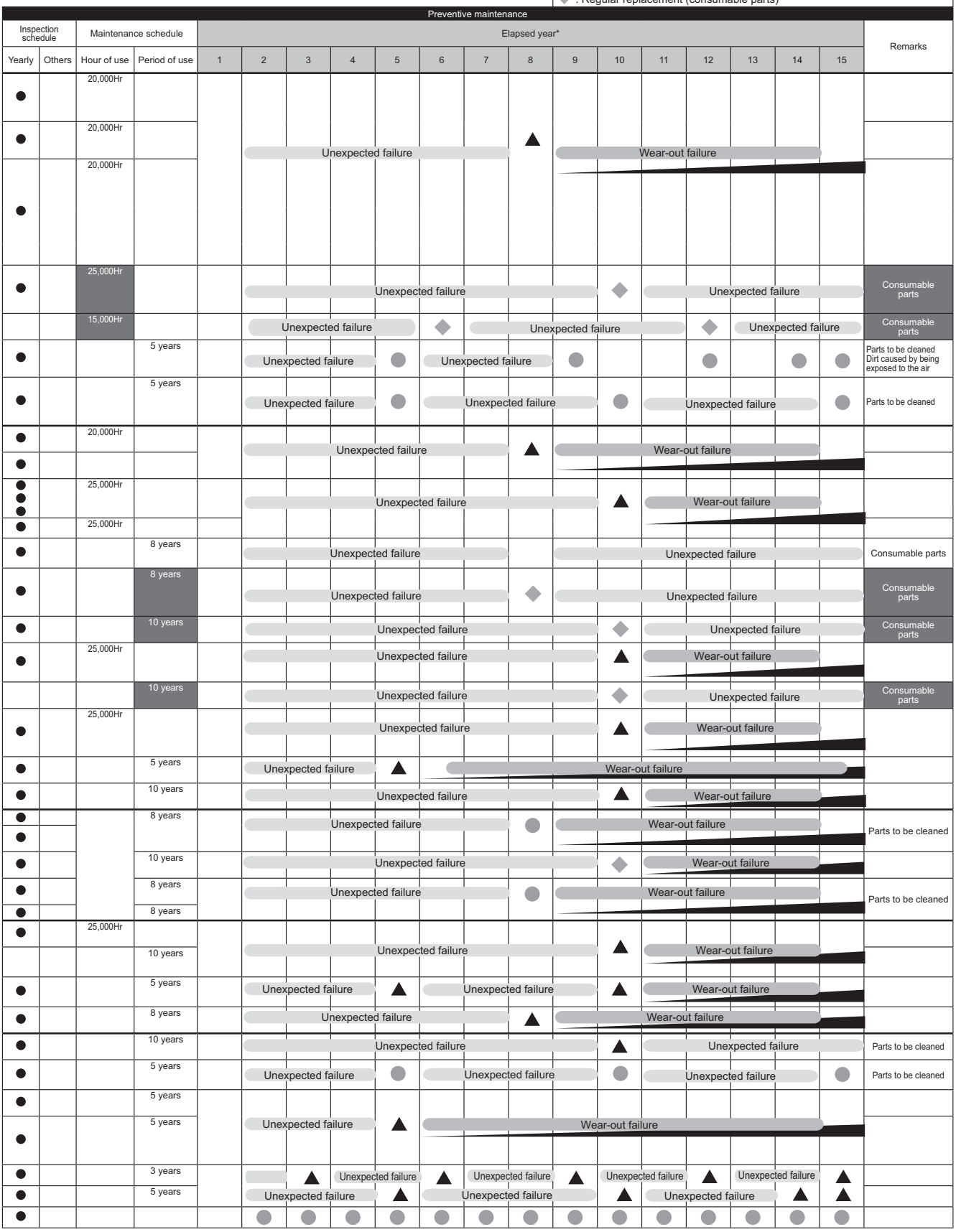
Parts name			Regular inspection			Preventive maintenance
Component parts	Parts name		Inspection item	Inspection method/tools	Judgement criteria <Reference>	Maintenance item
Refrigerant circuit	Compressor		• Sound or vibration at startup, during operation, and at stoppage of the compressor • Insulation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

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

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

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

Remark of semiotics
- ● : Inspection schedule
- ● : Cleaning or adjustment schedule of the parts based on the inspection result
- ▲ : Replacement or repair of the parts in case of error after inspection
- ◆ : Regular replacement (consumable parts)



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
- Machinary Directive 2006/42/EC

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

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